SUZUKI

SF416

SERVICE MANUAL

SUZUKI
Caring for Customers

99500-71C10-01E
(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.

FOREWORD

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

Applicable model:
SF416 of and after following body No. or vehicle identification number.

Europe & Australia spec. vehicle
x JSAEAH14S00140001 x (2WD MODEL)
x JSAEAJ 14S00140001 x (4WD MODEL)

Canada spec. vehicle
JS2AH14S▨N5100001 (1992 MODEL)

Other spec. vehicle
AH14S–200001

The contents are classified into sections each of which is given a section number as indicated in the Table of Contents on this page. And on the first page of each individual section is an index of that section.
The GROUP 2 is a supplement to GROUP 1 and has prepared for 4WD model.
When servicing 4WD model, consult GROUP 2 first. And for any section, item or description not found in GROUP 2, refer to GROUP 1.
This manual should be kept in a handy place for ready reference of the service work. Strict observance of the so specified items will enable one to obtain the full performance of the vehicle.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools, and service materials (lubricants, 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 publications approval. As this service manual is intended mainly for the left hand steering vehicle, it is possible that some illustrations do not correspond to the right hand steering vehicle. The right is reserved to make changes at any time without notice.

NOTE:
- **Refer to "RELATED SERVICE MANUAL" on next page.**

SUZUKI MOTOR CORPORATION

TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

TABLE OF CONTENTS		SECTION
GENERAL INFORMATION	GROUP 1	
General Information		0A
Maintenance and Lubrication (Fuel Injection Model)		0B
Maintenance and Lubrication (Carburetor Model)		0B1
Maintenance and Lubrication (Canada Market)		0B2
HEATING AND AIR CONDITIONING		
Heating and Ventilation		1A
BUMPER AND SHEET METAL		2
STEERING, SUSPENSION WHEEL AND TIRES		3
Front End Alignment		3A
Manual Rack and Pinion		3B
Power Steering (P/S) System		3B1
Steering Wheel and Column		3C
Front Suspension		3D
Rear Suspension		3E
Wheel and Tires		3F
FRONT DRIVE SHAFT (DOJ Type)		4
(Tripod Type)		4A
BRAKES		5
ENGINE		
General Information and Diagnosis		6
Engine Mechanical		6A
Engine Cooling		6B
Engine Fuel		6C
Carburetor		6D
Electronic Fuel Injection System		6E
Ignition System		6F
Cranking System (0.8 & 1.0 kw Type)		6G
Cranking System (1.2 & 1.4 kw Type)		6G1
Charging System		6H
Emission Control (Carburetor Model)		6J
Emission Control (Injection Model)		6J1
Engine Exhaust		6K
TRANS.		
Manual Transmission		7A
Automatic Transmission		7B
Clutch (Hydraulic type)		7C1
BODY ELECTRICAL SYSTEM		8
BODY SERVICE		9
SUPPLEMENT FOR 4WD MODEL		GROUP 2

NOTE:
"Carburetor model" or "Carburetor type" as used in this manual means the vehicle equipped with a carburetor and "Injection model" or "Injection type" the vehicle equipped with an electronic fuel injection system.

RELATED SERVICE MANUAL

MANUAL NAME	MANUAL NO.	APPLICABILITY
SF416 Service Manual	99500-71C01	Vehicles before body Nos. listed in "FOREWORD".
SF416 Supplementary Service manual for 4-Wheel Drive Model	99501-71C00	Vehicles produced before body Nos. listed in "FOREWORD" and equipped with 4-wheel drive system

SECTION 0A

GENERAL INFORMATION

CONTENTS

GENERAL PRECAUTIONS 0A-2
GENERAL INFORMATION 0A-4
Vehicle Identification 0A-4
Engine and Transmission Identification 0A-4
METRIC INFORMATION 0A-5
Metric Fasteners 0A-5
Fastener Strength Identification 0A-5
Standard Tightening Torque 0A-6
VEHICLE LIFTING POINTS 0A-7
ABBREVIATIONS USED IN THIS MANUAL 0A-8

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.

CAUTION:
- Before starting any service work, cover fenders, seats, and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g, buttons) may cause damage to the vehicle's finish.
- When 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.
- When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.
- When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal covers.
- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.
- Make sure that all parts used in reassembly are perfectly clean.
- When use of a certain type of lubricant, bond, or sealant is specified, be sure to use the specified type.
- Be sure to use special tools when instructed.
- When disconnecting vacuum hoses, attach a tag describing the correct installation position so that the hoses can be reinstalled correctly.
- After servicing fuel, oil, water, vacuum, exhaust, or brake systems, check all lines related to the system for leaks.
- Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit). The static electricity from you body can damage these parts.

CAUTION:

- 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.
- For vehicles equipped with a catalytic converter, 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).
- 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.

GENERAL INFORMATION

VEHICLE IDENTIFICATION

Refer to Fig. 0A-1 for vehicle identification numbers (body numbers) location.

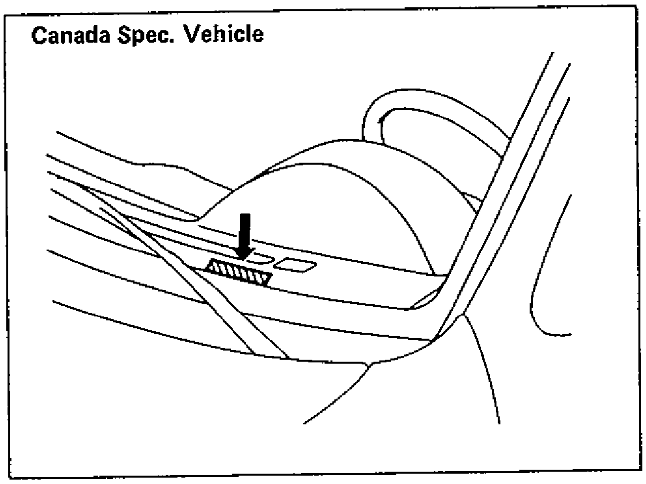


Fig. 0A-1 Vehicle Identification Number Location

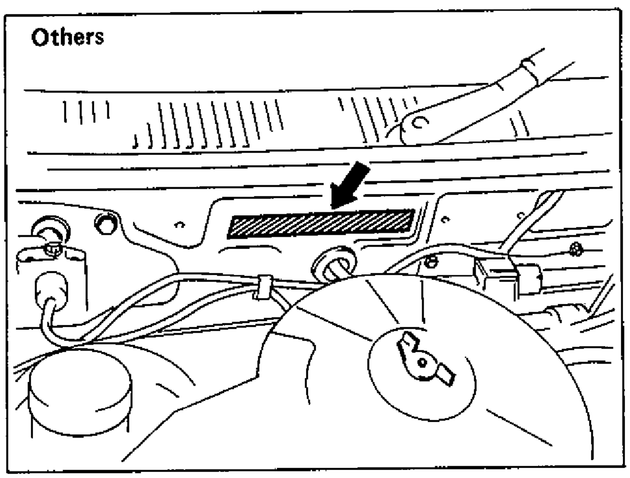


Fig. 0A-1-1 Vehicle Identification Number Location

ENGINE AND TRANSMISSION IDENTIFICATION

Refer to Fig. 0A-2 and 0A-3 for engine and transmission identification numbers and their locations.

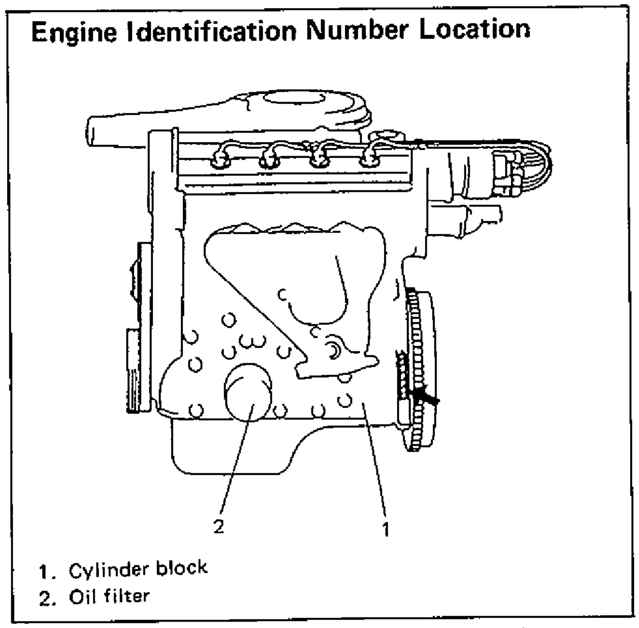


Fig. 0A-2 Engine Identification Number Location

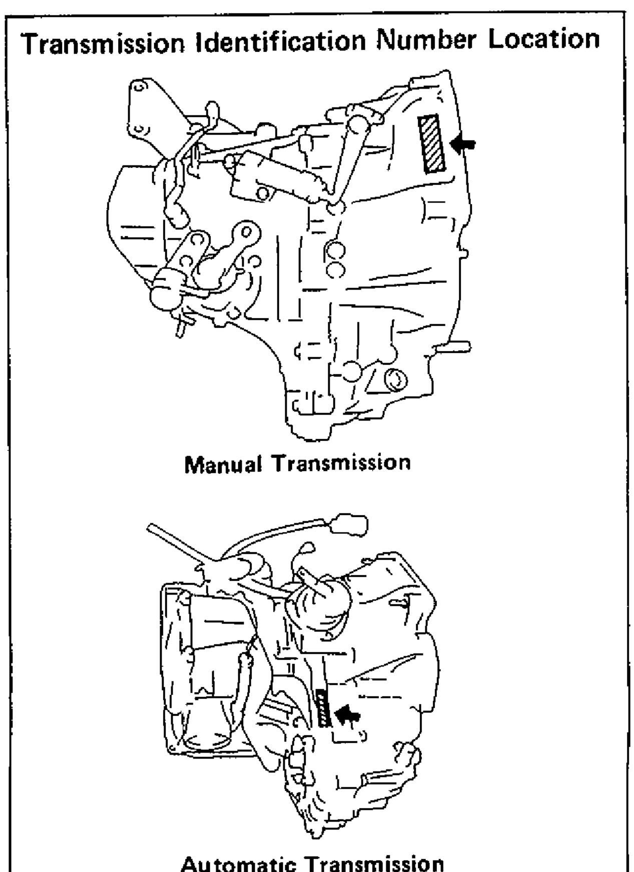


Fig. 0A-3 Transmission Identification Number Location

METRIC INFORMATION

METRIC FASTENERS

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

> CAUTION:
> **It is important to note that, during any vehicle maintenance procedures, replacement fasteners must have the same measurements as those removed.**
> **Mismatched or incorrect fasteners can result in vehicle damage or malfunction, or possible personal injury.**
> **Therefore, fasteners removed from the vehicle should be saved for re-use whenever possible.**
> **Where the fasteners are not satisfactory for re-use, care should be taken to select a replacement that matches the original.**

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. Fig. 0A-4 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.

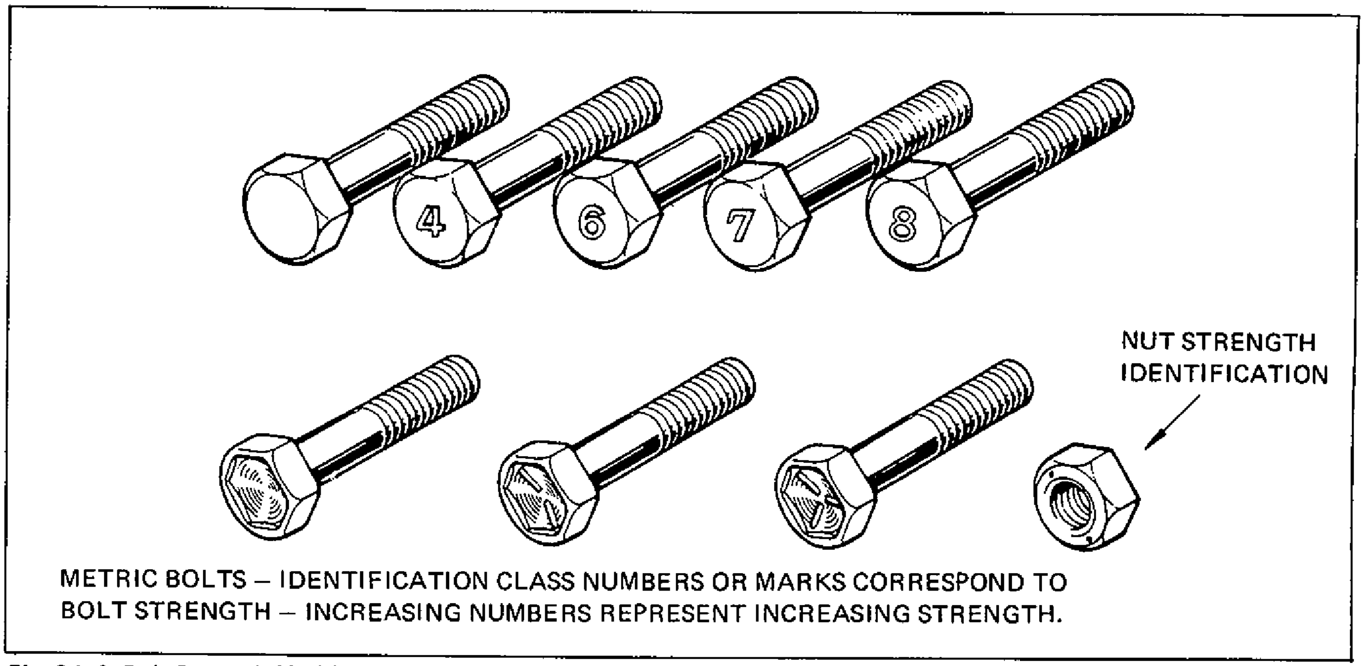


Fig. 0A-4 Bolt Strength Markings

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 or light alloy.**

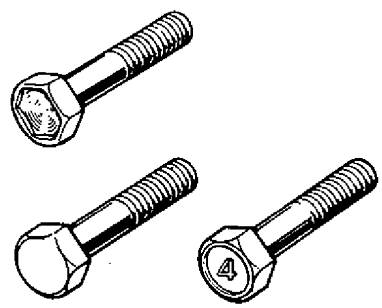
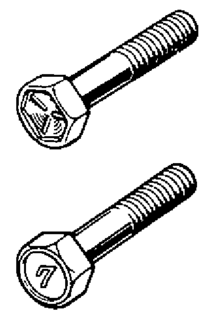
STRENGTH / THREAD DIAMETER (mm)	 Conventional bolt & "4T" bolt			 "7T" bolt		
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
4	1 – 2	0.1 – 0.2	0.7 – 1.5	1.5 – 3.0	0.15 – 0.30	1.0 – 2.2
5	2 – 4	0.2 – 0.4	1.5 – 3.0	3 – 6	0.3 – 0.6	2.0 – 4.5
6	4 – 7	0.4 – 0.7	3.0 – 5.0	8 – 12	0.8 – 1.2	6.0 – 8.5
8	10 – 16	1.0 – 1.6	7.0 – 11.5	18 – 28	1.8 – 2.8	13.0 – 20.0
10	22 – 35	2.2 – 3.5	16.0 – 25.0	40 – 60	4.0 – 6.0	29.0 – 43.5
12	35 – 55	3.5 – 5.5	25.0 – 40.0	70 – 100	7.0 – 10.0	50.5 – 72.5
14	50 – 80	5.0 – 8.0	36.0 – 58.0	110 – 160	11.0 – 16.0	79.5 – 116.0
16	80 – 130	8.0 – 13.0	57.5 – 94.5	170 – 250	17.0 – 25.0	122.5 – 181.0
18	130 – 190	13.0 – 19.0	94.0 – 137.5	200 – 280	20.0 – 28.0	144.5 – 203.0

Fig. 0A-5 Tightening Torque Chart

VEHICLE LIFTING POINTS

Fig. 0A-6 and 0A-7 indicate the methods of lifting the car using a hoist, and Fig. 0A-8 and 0A-9 show additional locations for lifting with a floor jack.

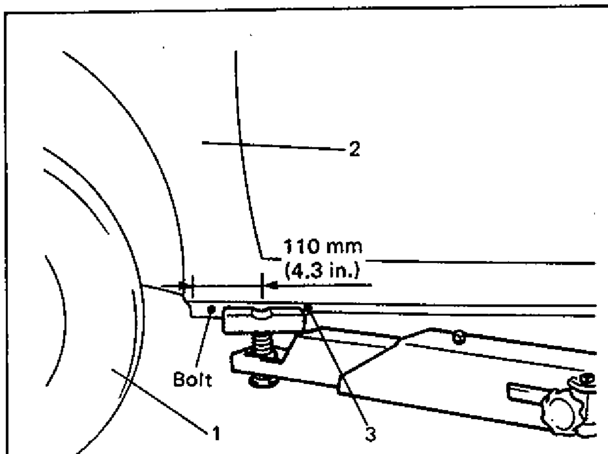
WARNING:

- **When using frame contact hoist, apply hoist as shown below (right and left at the same position). Lift up the car till 4 tires are a little off the ground and make sure that the car will not fall off by trying to move car body in both ways. Work can be started only after this confirmation.**
- **Before applying hoist to underbody, always take car balance throughout service into consideration. Car balance on hoist may change depending of what part to be removed.**
- **Make absolutely sure to lock hoist after car is hoisted up.**
- **If the car to be jacked up only at the front or rear end, be sure to block the wheels in order to ensure safety. After the car is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the car raised on jack alone.**

PRECAUTION AGAINST TIPPING

On front-wheel drive cars, the centerline-of-gravity is further forward than on rear-wheel drive car. Therefore, **whenever removing major components from the rear** of the car, while supported on a hoist, it is **mandatory** to support the car in a manner to prevent the possibility of the car tipping forward.

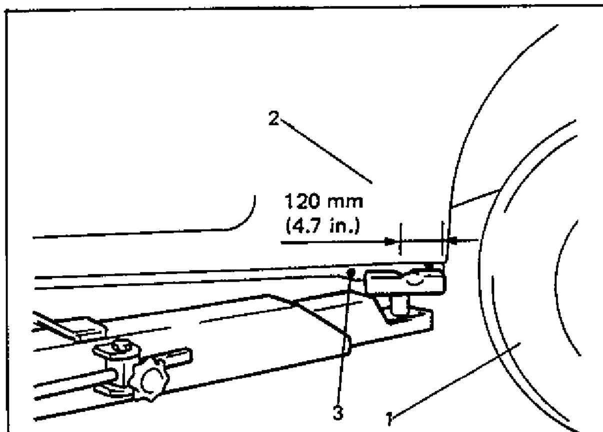
When using frame contact hoist:



SUPPORT LOCATION:
Forward of embossed-mark

1. Front left tire
2. Front fender left panel
3. Embossed-mark

Fig. 0A-6 Front Support Location



SUPPORT LOCATION:
Rearward of embossed-mark

1. Rear left tire
2. Rear left panel
3. Embossed-mark

Fig. 0A-7 Rear Support Location

When using floor jack:

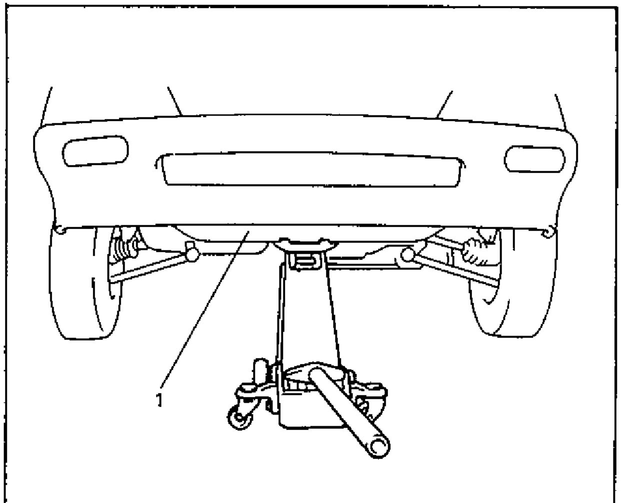


Fig. 0A-8 Front Support Location

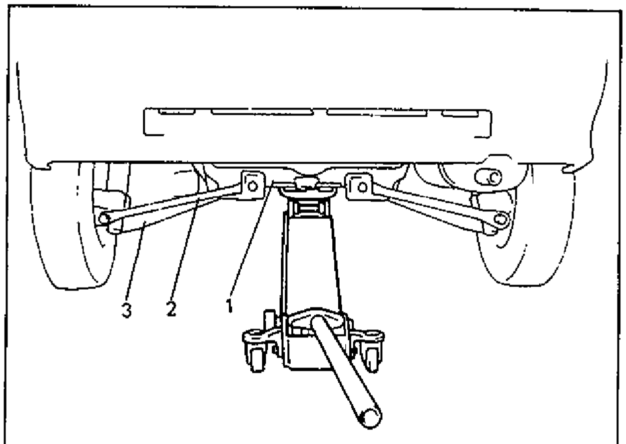


Fig. 0A-9 Rear Support Location

ABBREVIATIONS USED IN THIS MANUAL

A

A/T : Automatic Transmission
A/C : Air-Conditioner
AFM : Air Flow Meter
AFS : Air Flow Sensor
ATS : Air Temperature Sensor

B

BTDC : Before Top Dead Center
BVSV : Bimetal Vacuum Switching Valve

C

CAS : Crank Angle Sensor

D

DOJ : Double Offset Joint

E

ECM : Electronic Control Module
EGR : Exhaust Gas Recirculation
ESA : Electronic Spark Advance

I

ISC : Idle Speed Control

M

M/T : Manual Transmission

O

OHC : Over Head Camshaft
OVCV : Outer Vent Control Valve

P

PCV : Positive Crankcase Ventilation
P/S : Power Steering

R

REGTS : Recirculated Exhaust Gas Temperature Sensor
REV : Reverse

L

LSPV : Load Sensing Proportioning Valve

T

TPS : Throttle Position Sensor
TVSV : Thermal Vacuum Switching Valve

V

VSV : Vacuum Switching Valve
VCV : Vacuum Control Valve
VTV : Vacuum Transmitting Valve

W

WTG : Water Temperature Gauge
WTS : Water Temperature Sensor

SECTION 0B

MAINTENANCE AND LUBRICATION

FOR FUEL INJECTION MODEL OTHER THAN CANADA

CONTENTS

MAINTENANCE SCHEDULE 0B- 2
MAINTENANCE SERVICE 0B- 5
Engine 0B- 5
Ignition System 0B- 9
Fuel System 0B-10
Emission Control System 0B-11
Brake 0B-12
Chassis and Body 0B-13
Final Inspection 0B-16
OWNER INSPECTIONS AND SERVICES 0B-17
RECOMMENDED FLUIDS AND LUBRICANTS 0B-20

MAINTENANCE SCHEDULE

NORMAL CONDITION SCHEDULE

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 48,000 miles (80,000 km) mileage. Beyond 48,000 miles (80,000 km), 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
1. ENGINE									
1-1. Water pump belt (tension, damage)		–	–	–	I	–	–	–	R
1-2. Valve lash (clearance)		–	I	–	I	–	I	–	I
1-3. Engine oil and oil filter	API Grade SD, SE, SF or SG	R	R	R	R	R	R	R	R
1-4. Cooling system, hoses and connections (leakage, damage)		–	I	–	I	–	I	–	I
1-5. Engine coolant		–	–	–	R	–	–	–	R
1-6. Exhaust system (leakage, damage, tightness)		–	I	–	I	–	I	–	I
1-7. Wiring harness and connections		–	–	–	I	–	–	–	I
2. IGNITION SYSTEM									
2-1. Spark plugs		–	–	–	R	–	–	–	R
2-2. Distributor cap and rotor (crack, wear)		–	–	–	I	–	–	–	I
2-3. Ignition wiring		–	–	–	–	–	–	–	R
2-4. Ignition timing		–	–	–	I	–	–	–	I
3. FUEL SYSTEM									
3-1. Air cleaner filter element	Paved-road	–	–	–	R	–	–	–	R
	Dusty condition	Refer to "Severe Driving Condition" schedule							
3-2. Fuel tank, cap & lines (Deterioration, leakage, damage)		–	–	–	I	–	–	–	I (R)
4. EMISSION CONTROL SYSTEM									
4-1. PCV (Positive Crankcase Ventilation) Valve		–	–	–	–	–	–	–	I
4-2. Charcoal canister .... (if equipped)		–	–	–	–	–	–	–	I
5. BRAKE									
5-1. Brake discs and pads (thickness, wear, damage) Brake drums and shoes (wear, damage)		I	–	I	–	I	–	I	–
5-2. Brake hoses and pipes (leakage, damage, clamp)		I	–	I	–	I	–	I	–
5-3. Brake fluid		–	I	–	I	–	I	–	R
5-4. Brake lever and cable (damage, stroke, operation)		I	–	I	–	I	–	I	–
5-5. Brake pedal		–	I	–	I	–	I	–	I

NOTE:
- **Item 3-2 (R) is applicable only to the fuel tank cap.**
- **For Sweden only, The maintenance service on items 2-1, 2-3, 4-1 and 4-2 should be performed only by the odometer reading.**

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 48,000 miles (80,000 km) mileage. Beyond 48,000 miles (80,000 km), 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
6. CHASSIS AND BODY									
6-1. Tires/wheel discs (wear, damage, rotation)		I	I	I	I	I	I	I	I
6-2. Drive axle boots (breakage, damage)		I	I	I	I	I	I	I	I
6-3. Suspension system (Tightness, damage, rattle, breakage)		I	I	I	I	I	I	I	I
6-4. Steering system (tightness, damage, breakage, rattle)		I	I	I	I	I	I	I	I
6-5. Power steering (if equipped)		I	I	I	I	I	I	I	I
6-6. Manual transmission oil (leakage, level)		I	R	I	R	I	R	I	R
6-7. 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	–	–
6-8. Door hinges & Gear shift control lever/cables		I	I	I	I	I	I	I	I

NOTES:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

"L" : Lubricate

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the car is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the chart below.

Severe condition code

A — Repeated short trips
B — Driving on rough and/or muddy roads
C — Driving on dusty roads
D — Driving in extremely cold weather and/or salted roads
E — Repeated short trips in extremely cold weather

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
— — C D E —	Engine oil and oil filter	R	Every 5,000 km (3,000 miles) or 3 months
— — C — — —	Air cleaner filter element *1	I	Every 2,500 km (1,500 miles)
		R	Every 40,000 km (24,000 miles) or 24 months
— — — D — —	Fuel tank, cap and lines	I	Every 20,000 km (12,000 miles) or 12 months
A B C — E —	Brake discs and pads Brake drums and shoes	I	Every 10,000 km (6,000 miles) or 6 months
A B — D E —	Brake hoses and pipes	I	Every 10,000 km (6,000 miles) or 6 months
A B — — E —	Automatic transmission fluid change	R	Every 20,000 km (12,000 miles) or 12 months
— B C D —	Wheel bearings	I	Every 20,000 km (12,000 miles) or 12 months
— — C D — —	Water pump drive belt	I	Every 20,000 km (12,000 miles) or 12 months
		R	Every 40,000 km (24,000 miles) or 24 months
— — — — — F	Spark plugs (Carburetor model only)	R	Every 10,000 km (6,000 miles) or 6 months

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

NOTES:
"R" : Replace or change "I" : Inspect and correct or replace if necessary

MAINTENANCE SERVICE

ENGINE

1-1
Water Pump Belt Inspection and Replacement

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

[Inspection]

1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. Replace, if necessary.
2) Check pump belt for tension and adjust it as necessary. Refer to SECTION 6B for its procedure.

[Replacement]

Replace belt. Refer to P. 6B-12 of SECTION 6B for replacement procedure of pump belt.

1-2
Valve Lash Inspection

1) Remove cylinder head cover.
2) Inspect intake and exhaust valve lash and adjust as necessary.

Valve lash (gap A) specification		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
	Intake	0.08 – 0.12 mm (0.0032 – 0.0047 in.)	0.12 – 0.16 mm (0.0047 – 0.0063 in.)
	Exhaust		

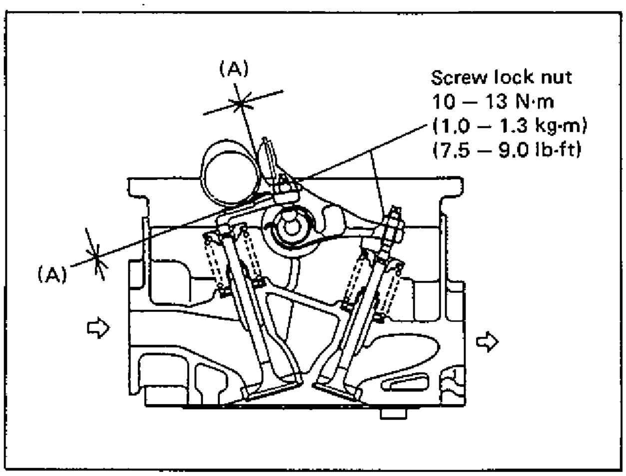


Fig. 0B-1-1

3) Refer to SECTION 6A for valve lash inspection and adjustment procedures.
4) Install cylinder head cover and tighten bolts to specification.

1-3
Engine Oil and Filter Change

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

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

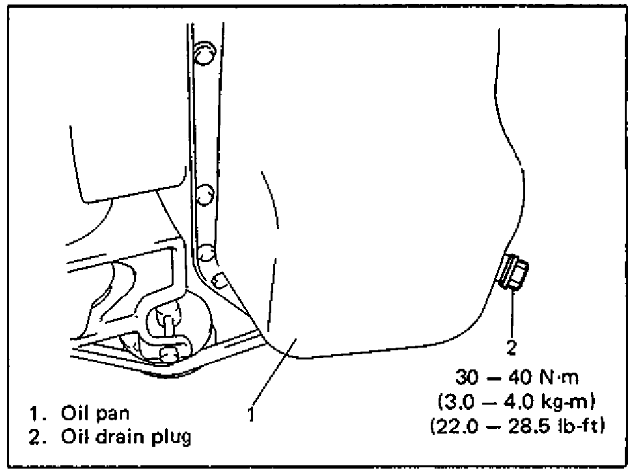


Fig. 0B-1-2

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

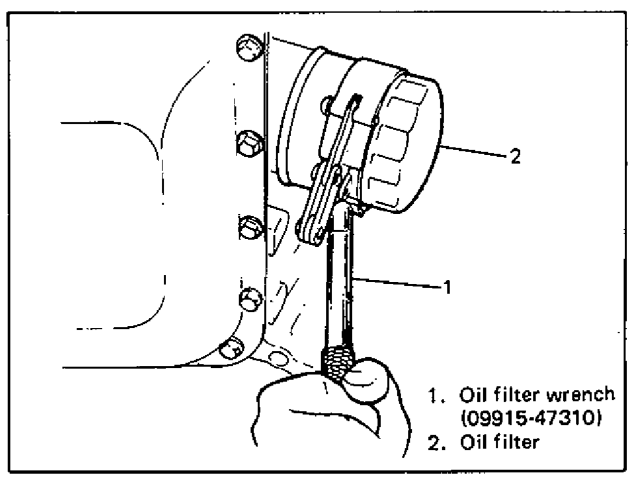


Fig. 0B-1-3

NOTE:
Before fitting new oil filter, be sure to apply engine oil to its "O" ring.

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

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

5) Using oil filter wrench, tighten filter 3/4 turn from contact point described above.

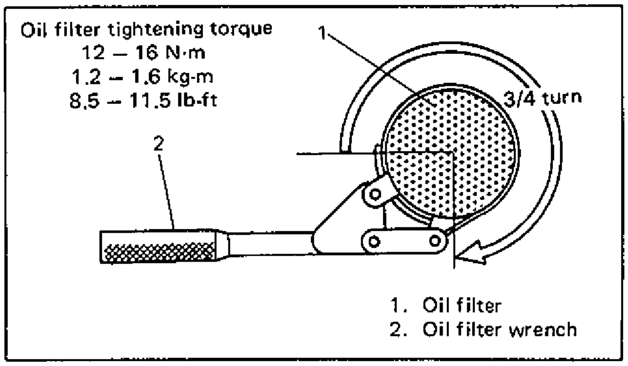


Fig. 0B-1-4

6) Replenish oil until oil level is brought to FULL level mark on dipstick. (about 3.3 liters or 6.9/5.8 US/Imp pt.). Filler inlet is at the top of cylinder head cover.
It is recommended to use engine oil of SD, SE, SF or SG class. Select the appropriate oil viscosity according to the chart at the right.

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

7) Start engine and run it for three minutes. Stop it and wait another 3 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dip stick.

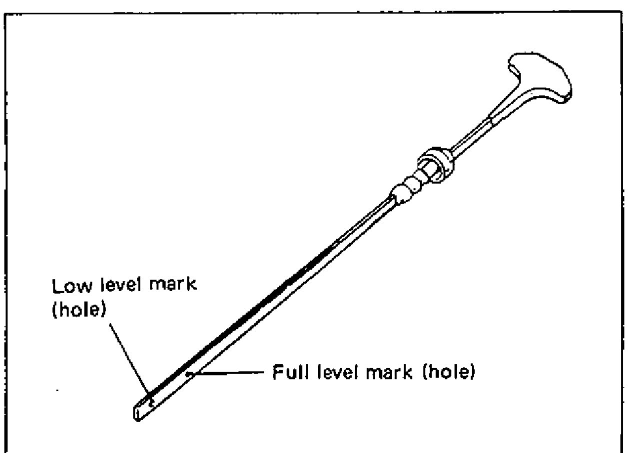


Fig. 0B-1-5

NOTE:
Steps 1) – 6) outlined above must be performed with ENGINE NOT RUNNING. For step 7), be sure to have adequate ventilation while engine is running.

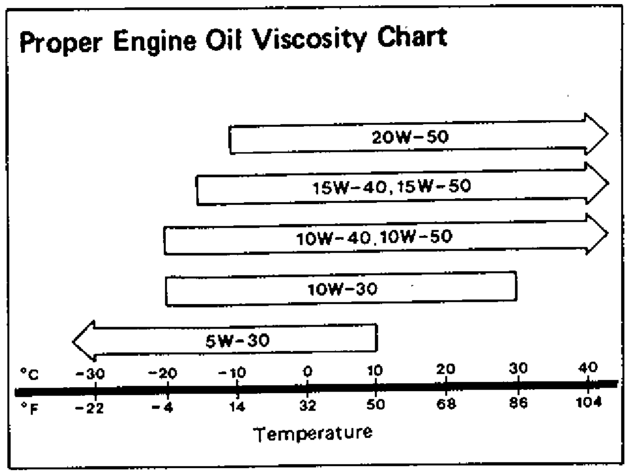


Fig. 0B-1-5-1

Engine oil capacity

Oil pan capacity	about 3.1 liters (6.5/5.5 US/Imp pt.)
Oil filter capacity	about 0.2 liters (0.4/0.3 US/Imp pt.)
Others	about 0.3 liters (0.6/0.5 US/Imp pt.)
Total	about 3.6 liters (7.5/6.3 US/Imp pt.)

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

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

1-4
Cooling System, Hoses and Connections
Inspection

1) Visually inspect cooling system hoses for any evidence of leakage and cracks. Examine them for damage, and check connection clamps for tightness.

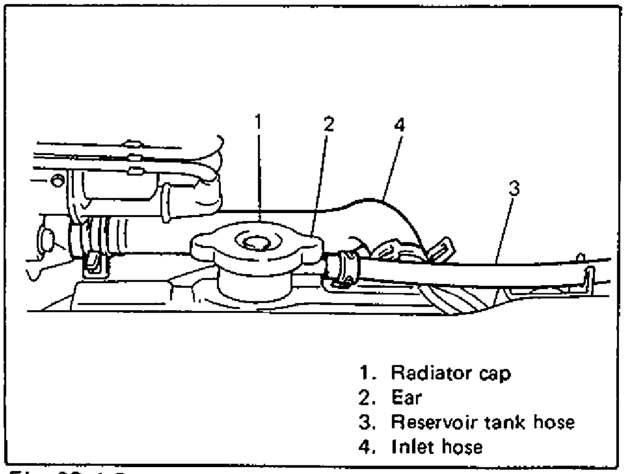


Fig. 0B-1-6

2) Replace all hoses which show evidence of leakage, cracks or other damage. Replace all clamps which cannot maintain proper tightness.
3) Clean frontal area of radiator core.
4) Test system and radiator cap for proper pressure holding capacity, 0.9 kg/cm^2 (12.8 psi). If replacement cap is needed, use a cap desinged for cooling system of this car.
5) Check coolant level and concentration. Add if necessary. Refer to COOLANT LEVEL of SECTION 6B for procedure of level check.

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 tank, and drain.
4) Tighten plug securely. Also reinstall reservoir tank.

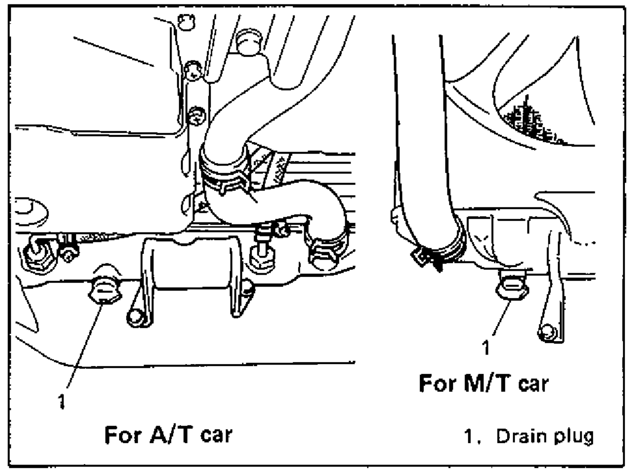


Fig. 0B-1-7

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 filler throat of radiator. Reinstall radiator cap.
6) Add coolant to reservoir tank so that its level aligns with Full mark. Then, reinstall cap aligning arrow marks on tank and cap.

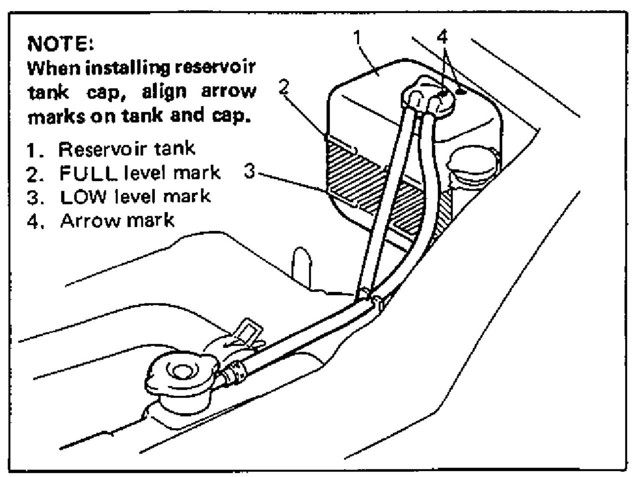


Fig. 0B-1-8

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.

Refer to SECTION 6B for COOLANT CAPACITY.

1-6
Exhaust System Inspection

WARNING:
To avoid danger of being burned, do not touch exhaust system when it is still hot.
Any service on exhaust system should be performed when it is cool.

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

- Check rubber mountings for damage and deterioration.
- Check muffler pipe for leakage, loose connections, dents, and damages.
  If bolts or nuts are loose, tighten them to specification. Refer to SECTION 6K for torque specification of bolts and nuts.
- Check nearby body areas for damaged, missing, or mispositioned parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into car.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to floor carpet.
- Any defects should be fixed at once.

1-7
Wiring Harness and Connections Inspection

1) Visually inspect all wires in engine compartment for evidence of breakage.
   Inspect condition of insulation (cracks). All clips and clamps should have solid connections to wires.
2) Replace any wires in a deteriorated or otherwise defective condition.

IGNITION SYSTEM

2-1
Spark Plugs Replacement

1) Disconnect high tension cords at spark plugs. To avoid inside damage of cords, DO NOT pull on cords for disconnection. Pull on cap.

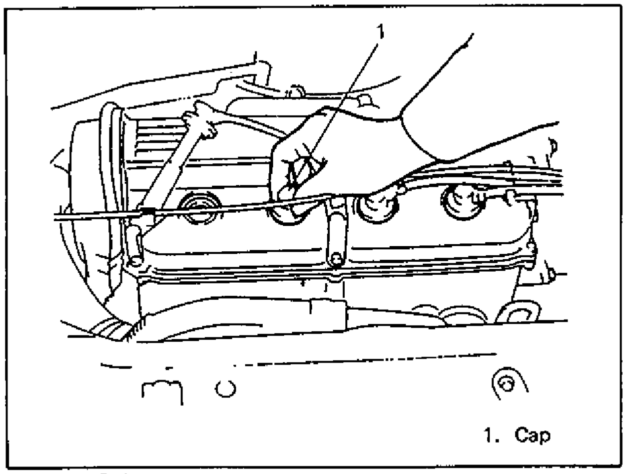


Fig. 0B-2-1

2) Dust off cylinder head around spark plugs.
3) Using a spark plug wrench, remove spark plugs.
4) Check plug gaps of new spark plugs, and adjust them to specification as necessary.

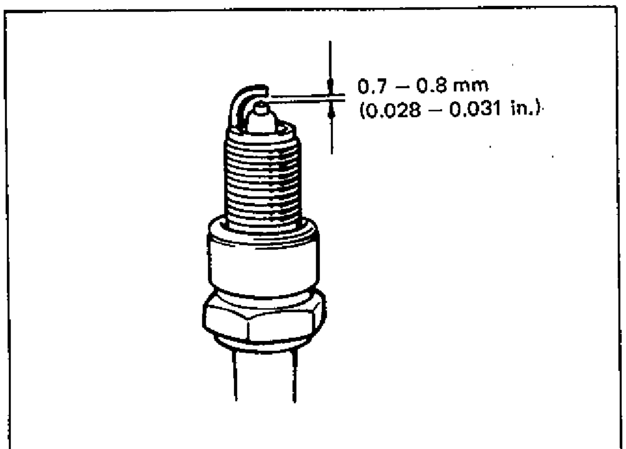


Fig. 0B-2-2

NOTE:
Make sure to use new plugs of specified heat range and size.

PLUG SPECIFICATION

Maker	Heat range Standard type
NGK	BKR6E or BK6E
NIPPONDENSO	K20PR-U or K20P-U

As can be seen in the above table, there are two types of spark plugs for this car, one without R included in its code and the other with R. Which one is used depends on countries. Look at the label attached to the car. If originally equipped plug was with R included in its code, replacement plug should have R in its code, too.

5) Install new spark plugs. Tighten plugs to specification.
6) Connect high tension cords to spark plugs. DO NOT push cords for connection. Push caps.

	N·m	kg-m	lb-ft
Tightening torque for spark plug	20 – 30	2.0 – 3.0	14.5 – 21.5

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.

2-3

Ignition Wiring (high-tension cord) Replacement

1) Disconnect high tension cords from spark plugs, ignition coil and distributor.
2) Connect new high tension cords and clamp them securely. DO NOT push cords for connection. Push boots.

2-4

Ignition Timing Inspection

Check to make sure that ignition timing is set properly. If out of specification, adjust it.

Refer to SECTION 6F for inspection and adjustment procedure.

FUEL SYSTEM

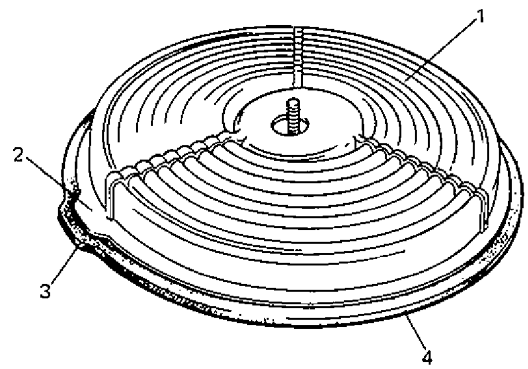
3-1

Air Cleaner Element Replacement

1) Remove air cleaner cap.
2) Take cleaner element out of air cleaner case.
3) Install new cleaner element into cleaner case.
4) Install air cleaner cap securely.

NOTE:

Replace more often under dusty conditions. Ask your dealer for proper replacement interval for your driving conditions.



1. Air cleaner element
2. Lug
3. Recession
4. Air cleaner lower case

Fig. 0B-3-1

Air Cleaner Element Inspection

1) Visually check that air cleaner element is not excessively dirty, damaged or oily.
2) Clean element with compressed air from inside of element.

NOTE:

If car is used in dusty area, clean every 2,500 km (1,500 miles) or more frequently.

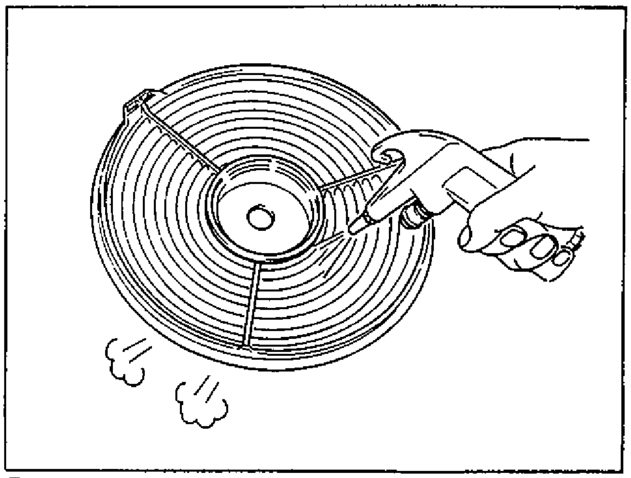


Fig. 0B-3-2

3-2

Fuel Tank, Cap Gasket and Fuel Lines Inspection

- Check fuel tank, fuel filler cap and fuel lines for loose connection, deterioration or damage which could cause leakage.
  Make sure all clamps are secure.
- Check fuel filler cap gasket for an even filler neck imprint or any damage.
- Replace any damaged or deteriorated parts.
  There should be no sign of fuel leakage or moisture at any fuel connection.

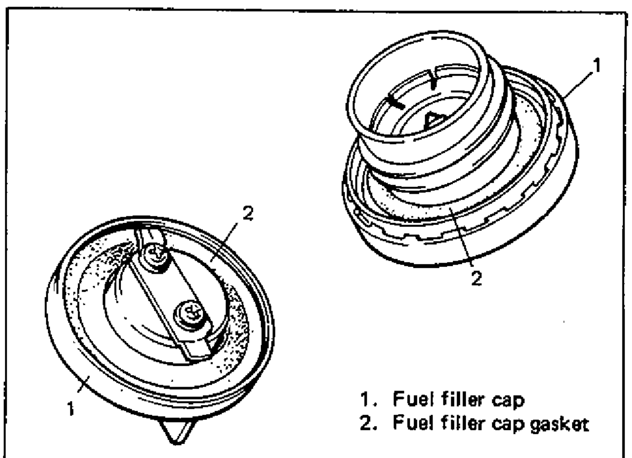


Fig. 0B-3-3

EMISSION CONTROL SYSTEM

4-1

PCV (Positive Crankcase Ventilation) Valve Inspection

Check crankcase ventilation hoses and PCV hoses for leaks, cracks or clog, and PCV valve for stick or clog. Refer to ON CAR SERVICE of SECTION 6J or 6J1 for PCV valve checking procedure.

4-2

Charcoal Canister Inspection

Applicable to the car equipped with canister in engine compartment

Check charcoal canister. Refer to ON CAR SERVICE of SECTION 6J or 6J1 for procedures to check charcoal canister.

BRAKE

5-1
Brake Discs, Pads, Brake Drums and Shoes Inspection

Brake discs and pads

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

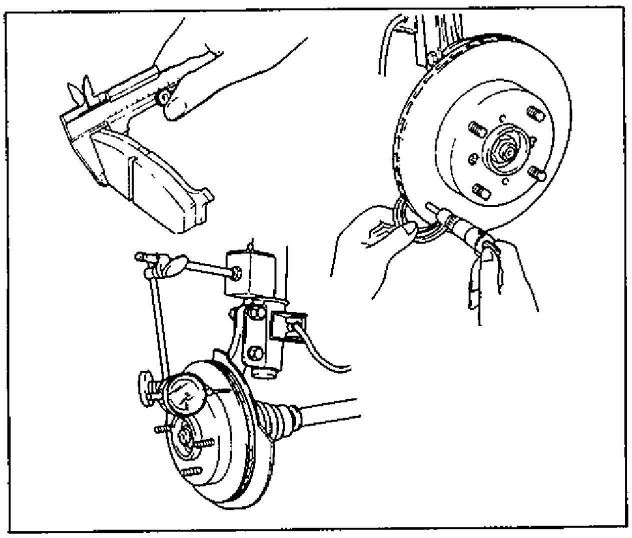


Fig. 0B-4-1

NOTE:
If noise is heard from front brake when brake pedal is depressed, check brake pad lining for wear. If it is worn, both right and left brake pads should be replaced with new ones.

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

Brake drums and shoes

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

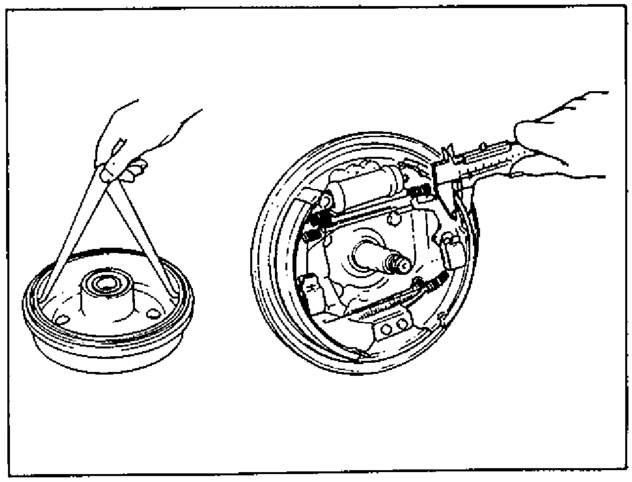


Fig. 0B-4-2

5-2
Brake Hoses and Pipes Inspection

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

- Check brake hoses and pipes for proper hook-up, leaks, cracks, chafing, wear, corrosion bends, twists and other damage.
  Replace any of these parts as necessary.
- Check all clamps for tightness and connections for leakage.
- Check that hoses and pipes are clear of sharp edges, moving parts.

5-3
Brake Fluid Inspection and Change

[Inspection]

1) Check around master cylinder and reservoir for fluid leakage.
   If found leaky, correct.
2) Check fluid level
   If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluid.

	Specification
Brake fluid	DOT3 or SAE J1703

For the details, refer to ON-CAR SERVICE of SECTION 5.

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

[Change]
Change brake fluid as follows.
Drain existing fluid from brake system completely, fill system with above recommended fluid and carry out air purge operation.
For air purging procedure, refer to p. 5-23 and 5-24 of SECTION 5.

5-4
Brake Lever and Cable Inspection
Parking brake lever
- Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking lever.
- Check parking brake lever for proper operation and stroke, and adjust it if necessary.
  For checking and adjusting procedures, refer to PARKING BRAKE INSPECTION AND ADJUSTMENT (p. 5-22) of SECTION 5.

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

5-5
Brake Pedal Inspection
Check brake pedal travel.
For checking procedure, refer to PEDAL TRAVEL CHECK of SECTION 5.

CHASSIS AND BODY

6-1
Tire and Wheel Disc Inspection
[Tire inspection]
- Check tire for uneven or excessive wear, or damage. If defective, replace.
- Check inflating pressure of each tire and adjust pressure to specification as necessary.

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

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

[Tire rotation]
Rotate tires.
For details of above steps, refer to SECTION 3F.

6-1'
Wheel Bearing Inspection
1) Check front wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to FRONT SUSPENTION INSPECTION (p. 3D-15) of SECTION 3D.
2) Check rear wheel bearing for wear, damage abnormal noise or rattle. For details, refer to WHEEL BEARING INSPECTION (p. 3E-16) of SECTION 3E.

6-2

Drive Axle Boot Inspection

Check drive axle boots (wheel side and differential side) for leakage, detachment, tear or any other damage.

Replace boot as necessary.

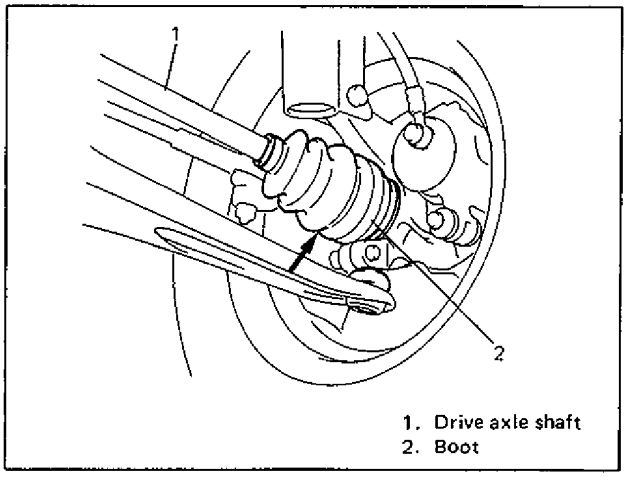


Fig. 0B-5-1

6-3

Suspension System Inspection

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

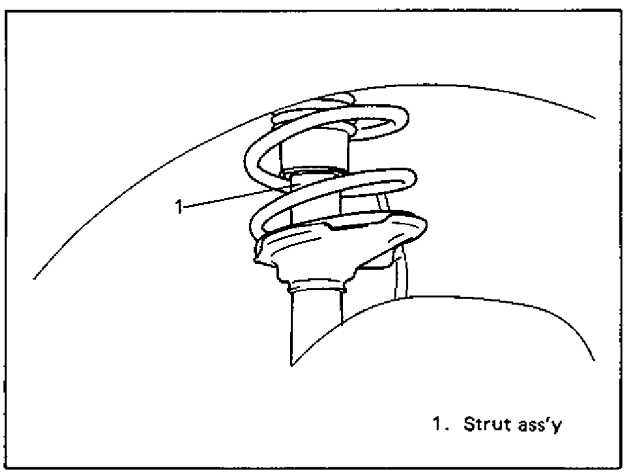


Fig. 0B-5-2

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

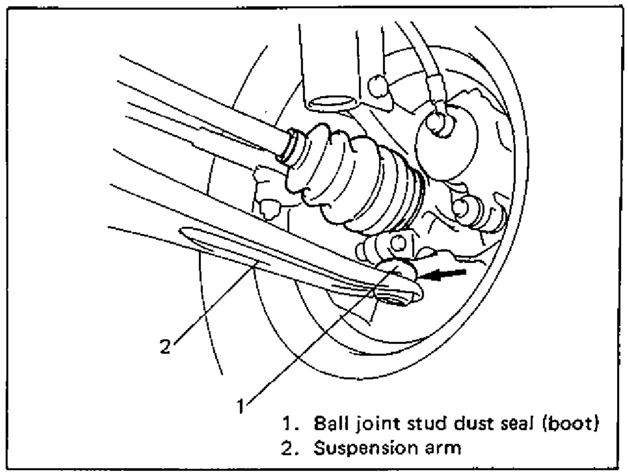


Fig. 0B-5-3

6-4

Steering System Inspection

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

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

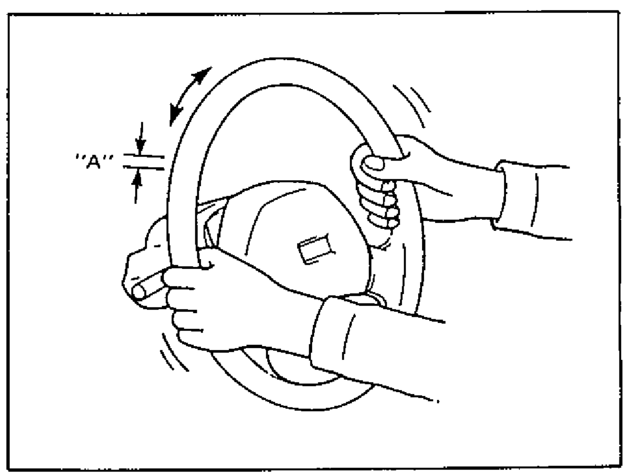
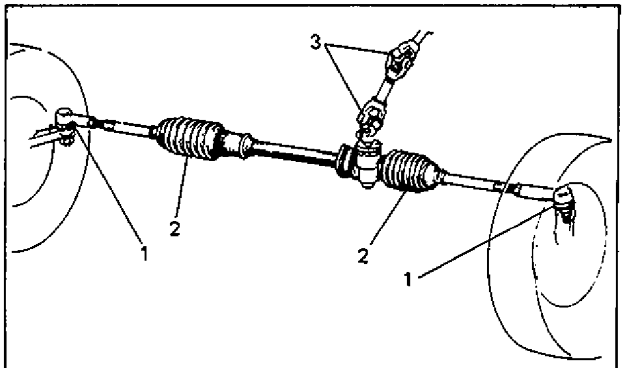


Fig. 0B-5-4

2) Check steering linkage for looseness and damage. Repair or replace defective parts, if any.
3) Check boots of steering linkage and steering gear case for damage (leaks, detachment, tear, etc.). If damage is found, replace defective boot with new one.
4) Check universal joints of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.



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

Fig. 0B-5-5

6-5
Power Steering System Inspection (if equipped)

1) Visually check power steering system for leaks or damage.
   Repair or replace defective parts, if any.
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 A/T fruid for power steering fluid.**
- **Fluid level should be checked when fluid is cool.**

3) Make sure that power steering belt deflects 8 – 10 mm (0.31 – 0.39 in) with 10 kg thumb pressure applied on the midway point between the pulleys.
   Also, visually check the belt for damage.
   If necessary, have the belt adjusted or replaced.

6-6
Manual Transmission Oil Inspection and Change

[Inspection]

1) Inspect transmission case for evidence of oil leakage.
   Repair leaky point if any.
2) Make sure that car is placed level for oil level check.
3) Remove level plug of transmission.
4) Check oil level.
   Oil level can be checked roughly by means of filler/level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified oil up to level hole.
   For specified oil, refer to description of oil change under ON-CAR SERVICE in SECTION 7A.

[Change]

1) Place the car level and drain oil by removing drain plug.
2) Apply sealant to drain plug and tighten drain plug to specified torque.
3) Pour specified oil up to level hole.
4) Tighten filler plug to specified torque.
   For recommended oil, its amount and tightening torque data, refer to ON-CAR SERVICE of SECTION 7A.

6-7
Automatic Transmission

[Fluid level inspection]

1) Inspect transmission case for evidence of fluid leakage.
   Repair leaky point, if any.
2) Make sure that car is placed level for fluid level check.
3) Check fluid level.
   For fluid level checking procedure, refer to ON-CAR SERVICE in SECTION 7B and be sure to perform it under specified conditions.
   If fluid level is low, replenish specified fluid.

[Fluid change]

1) Perform steps 1) and 2) of above Fluid Level inspection.
2) Change fluid. For its procedure, refer to ON-CAR SERVICE in SECTION 7B.

> CAUTION:
> **Use of specified fluid is absolutely necessary.**

[Fluid cooler hose change]

Replace inlet and outlet hoses of cooler hose and their clamps. For replacement procedure, refer to ON-CAR SERVICE in SECTION 7B.

6-8
Door Hinges and Gear Shift Control Lever/ Cables Inspection

Check that doors and gear shift control lever move smoothly without abnormal noise.
If defective, lubricate as follows.
Wipe off dirt of door hinges and apply a thin coat of engine oil. Open and close door several times to insure that oil has worked in effectively.
Lubricate lever seat and bushings with water resistant chassis grease.

FINAL INSPECTION

BODY PARTS OPERATION

Hood Latch

Check that hood opens and closes smoothly and properly. Also check that it locks securely when closed.

Doors

Check that each door opens and closes smoothly and locks securely when closed.

Seats

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

ROAD TEST

Carry out road test in safe place.

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

Engine Start

Check engine start for readiness.

Clutch (For Manual transmission)

Check for the following.

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

Gearshift or Selector Lever (Transmission)

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

> CAUTION:
> **With automatic transmission equipped car, make sure that car is at complete stop when shifting selector lever to "P" range position.**

Brake

[Foot brake]
Check the following when depressing brake pedal while driving;

- that brake works properly,
- that it is free from noise,
- and that braking force is applied equally on all wheels.

[Parking brake]
Check to ensure that parking brake is fully effective when the car is stopped on the slope and brake lever is pulled all the way.

Steering

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

Engine

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

Body, Wheels and Power Transmitting System

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

Meters and Gauge

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

Lights

Check that all lights operate properly.

Seat Belt

Inspect belt system, including webbing, buckles, latch plates, retractors and anchors.
Check that seat belt is securely locked.

> **WARNING:**
> **For this test, select a safe place without any running car so as to prevent any accident. And again make sure that no man or no other car is seen in front or behind and use great care to the surroundings when carrying out the test.**

OWNER INSPECTIONS AND SERVICES

Listed below are items which should be checked and serviced by either the owner himself or a qualified technician daily or periodically to help ensure safety and dependability of each car. Should any problem occur, contact nearby dealer or a qualified technician for proper service advice. For the safety of the driver himself and others, be sure to inspect any safety-related parts that could have been damaged in any accident and take corrective measures for whatever in need of repair before using car again.

BEFORE OPERATING CAR

[OUTSIDE CAR]

Fluid Leak Check

Check for fuel, coolant, oil, or other fluid leakage by looking at surface beneath car after it has been parked for a while. Water dripping from air conditioning system after use is normal. If gasoline fume of fluid is noted at any time, investigate its cause and correct it at once.

Door Operation

Check that all doors including back door operate smoothly, and that all doors close and all latches lock securely.

Tire, Wheel and Wheel Nut Inspection

- Check pressure as shown on tire placard (including spare tire). Pressure should be checked when tires are "cold".
- Check tire for cuts, damage or excessive wear.
- Check wheel nuts for looseness of for missing nuts. If necessary, tighten them.

[INSIDE CAR]

Seat Adjuster Operation

- Move seat back and forth and check that seat adjuster operates smoothly and locks properly and securely.
- Check that seat back can be reclined smoothly and locked securely at any angle.

Warning Light, Buzzer and Tone Operation
Check all warning lights, buzzers and interior indicator lights for operation. For details, refer to Owner's Manual.

Glass, Mirror, Light and/or Reflector Condition
Check each glass, mirror, light and reflector for breakage, scratch, dirt or any other damage which could reduce driver's view or visibility or cause injury. Replace, clean or repair promptly, if necessary.

Rear View Mirror and Sun Visor Operation
Check that friction joints hold mirrors and sun visors in place.

Seat Belts Condition and Operation
Check belt system including webbing, buckles, latch plates, retractors, guide loops, and anchors for proper operation, damage and/or wear.

Light Operation
Check license plate lights, headlights, small lights, taillights, brake lights, turn signals, back-up lights, instrument panel lights and interior lights, hazard warning flashers and other lights. Have headlight aim checked at once if beams seem improperly aimed.

Clutch Pedal Free Travel Check
- Check free travel.
- Check pedal for smooth operation.

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

Exhaust System Check
Check for cracks or loose supports.

Brake Pedal Check
- Check pedal for smooth operation.
- Check pedal travel (pedal-to-wall clearance). For checking procedure, see your Owner's Manual.
- Check brake booster function.

Parking Brake Lever Travel Check
Check that lever has proper travel.

Automatic Transmission Shift Indicator and Park Mechanism Operation
- Move selector lever and check that indicator points to exact gear as chosen.
- Check the lock release button of the selector lever for proper and smooth operation.

[UNDER HOOD]

Engine Hood Latch Operation
Check that hood closes firmly. Check for damaged, loose, or missing parts that might prevent tight latching. Make sure secondary latch keeps hood from opening all the way when primary latch is released.

Engine Oil Level Check
Check engine oil on the dipstick with the engine turned off and add if necessary.
See your Owner's Manual.

NOTE:
A large loss in this system may indicate a problem. Have it inspected and repaired at once.

Engine Coolant Level and Condition
When engine is cool, check coolant level in reservoir tank and add if necessary.
Inspect coolant and replace if dirty or rusty.
A normal coolant level should be between "FULL" and "LOW" marks on reservoir tank.
See Owner's Manual.

NOTE:
A large loss in this system may indicate a problem. Have it inspected and repaired at once.

Windshield Washer Fluid Level Check
Check washer fluid level in tank and add if necessary.

Brake Master Cylinder Fluid Level Check
Check reservoir tank fluid level in accordance with Owner's Manual and keep at proper level.

NOTE:
A large loss in this system may indicate a problem. Have it inspected and repaired at once.

Battery Electrolyte Level Check
Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case.

Engine Drive Belt(s) Inspection
Inspect all belts for cracks, fraying and wear. Adjust or replace as needed.

[WHILE OPERATING CAR]

Horn Operation
Check to make sure that horn works when its button is pushed at its any part.

Windshield Wiper and Washer Operation
Check wipers and washer for proper operation. Also check spray direction of washer fluid.
Check wiper blades for wear or cracks whenever they fail to wipe clean. If necessary, replace.

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

Steering System Operation
Be alert for any changes in steering action. An inspection or service is needed when: the steering wheel is harder to turn or has too much free play, or if there are strange sounds when turning.

Brake System Operation
Be alert to abnormal noise, increase in brake pedal travel or repeated pull to one side when braking.
When any of such conditions is noted, check brake system. If brake warning light stays on or keeps flashing, there may be some trouble in brake system.
Also, test parking brake by pulling parking brake lever.

Exhaust System Operation
Be alert for any changes in the sound of the exhaust system or any smell of fumes. These are signs the system may be leaking or overheating. Have it check and/or repaired at once.

Tire and Wheel Operation
Be alert to vibration of the steering wheel or seat at normal highway speeds. This may mean a wheel balance is needed. Also, a pull right or left on a straight, level road may show the need for a tire pressure adjustment or wheel alignment.

RECOMMENDED FLUIDS AND LUBRICANTS

Engine oil	SD, SE, SF or SG (Refer to Fig. 0B-1-5-1)
Engine coolant (long life coolant)	Ethylene-glycol base coolant ("Antifreeze/Anticorrosion coolant" GOLDEN CRUISER 1200)
Brake fluid	DOT3 or SAE J1703
Manual transmission oil	See oil chart on page 7A-7
Automatic transmission fluid and power steering fluid	Automatic transmission fluid DEXRON®-II
Door hinges	Engine oil
Hood latch assembly	Engine oil
Gear shift control lever and cables	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Key lock cylinder	Spray lubricant

Fig. 0B-6

SECTION 0B1

MAINTENANCE AND LUBRICATION

FOR CARBURETOR MODEL

CONTENTS

MAINTENANCE SCHEDULE 0B1-2
MAINTENANCE SERVICE 0B1-4
Engine 0B1-4
Ignition System 0B1-4
Fuel System 0B1-5
Emission Control System 0B1-6
Brake .....
Chassis and Body .....
Final Inspection ..... Refer to SECTION 0B of this manual.
OWNER INSPECTIONS AND SERVICES .....
RECOMMENDED FLUIDS AND LUBRICANTS .....

MAINTENANCE SCHEDULE

NORMAL CONDITION SCHEDULE

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 48,000 miles (80,000 km) mileage. Beyond 48,000 miles (80,000 km), 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
1. ENGINE									
1-1. Water pump belt (tension, damage)		–	I	–	I	–	I	–	R
1-2. Valve lash (clearance)		–	I	–	I	–	I	–	I
1-3. Engine oil and oil filter	API Grade SD, SE, SF or SG	R	R	R	R	R	R	R	R
1-4. Cooling system, hoses and connections (leakage, damage)		–	I	–	I	–	I	–	I
1-5. Engine coolant		–	–	–	R	–	–	–	R
1-6. Exhaust system (leakage, damage, tightness)		–	I	–	I	–	I	–	I
1-7. Wiring harness and connections		–	–	–	I	–	–	–	I
2. IGNITION SYSTEM									
2-1. Spark plugs	When unleaded fuel is used	–	I	–	R	–	I	–	R
	When leaded fuel is used	Refer to "Severe Driving Condition" Schedule							
2-2. Distributor cap and rotor (crack, wear)		–	–	–	I	–	–	–	I
2-3. Ignition wiring		–	–	–	I	–	–	–	R
3. FUEL SYSTEM									
3-1. Air cleaner filter element	Paved-road	–	–	–	R	–	–	–	R
	Dusty condition	Refer to "Severe Driving Condition" schedule							
3-2. Fuel tank, cap & lines (Deterioration, leakage, damage)		–	–	–	I	–	–	–	I
3-3. Engine idle speed & idle mixture		(I)	I	–	I	–	I	–	I
3-4. Fuel filter		–	–	–	*R	–	–	–	R
4. EMISSION CONTROL SYSTEM									
4-1. PCV (Positive Crankcase Ventilation) Valve		–	–	–	I	–	–	–	I
4-2. Charcoal canister . . . . (if equipped)		–	–	–	–	–	–	–	I
4-3. Fuel cut (or solenoid valve) system		–	–	–	I	–	–	–	I
4-4. Intake Air Temperature Control System		–	–	–	I	–	–	–	I
5. BRAKE									
5-1. Brake discs and pads (thickness, wear, damage) Brake drums and shoes (wear, damage)		I	–	I	–	I	–	I	–
5-2. Brake hoses and pipes (leakage, damage, clamp)		I	–	I	–	I	–	I	–
5-3. Brake fluid		–	I	–	I	–	I	–	R
5-4. Brake lever and cable (damage, stroke, operation)		I	–	I	–	I	–	I	–
5-5. Brake pedal		–	I	–	I	–	I	–	I

NOTES:
- **Item 3-3 (I) is applicable only to the 10,000 km inspection.**
- **Item 3-4 *R is recommended maintenance item.**

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 48,000 miles (80,000 km) mileage. Beyond 48,000 miles (80,000 km), 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
6. CHASSIS AND BODY									
6-1. Tires/wheel discs (wear, damage, rotation)		I	I	I	I	I	I	I	I
6-2. Drive axle boots (breakage, damage)		I	I	I	I	I	I	I	I
6-3. Suspension system (Tightness, damage, rattle, breakage)		I	I	I	I	I	I	I	I
6-4. Steering system (tightness, damage, breakage, rattle)		I	I	I	I	I	I	I	I
6-5. Power steering (if equipped)		I	I	I	I	I	I	I	I
6-6. Manual transmission oil (leakage, level)		I	R	I	R	I	R	I	R
6-7. 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	–	–
6-8. Door hinges & Gear shift control lever/cables		I	I	I	I	I	I	I	I

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

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the car 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 page 0B-4.

Severe condition code

A — Repeated short trips
B — Driving on rough and/or muddy roads
C — Driving on dusty roads
D — Driving in extremely cold weather and/or salted roads
E — Repeated short trips in extremely cold weather
F — Leaded fuel use

MAINTENANCE SERVICE

ENGINE

1-1
Water Pump Belt Inspection and Replacement
Refer to item 1-1 in Section 0B.

1-2
Valve Lash Inspection
Refer to item 1-2 in Section 0B.

1-3
Engine Oil and Filter Change
Refer to item 1-3 in Section 0B.

1-4
Cooling System, Hoses and Connections Inspection
Refer to item 1-4 in Section 0B.

1-5
Engine Coolant Change
Refer to item 1-5 in Section 0B.

1-6
Exhaust System Inspection
Refer to item 1-6 in Section 0B.

1-7
Wiring Harness and Connections Inspection
Refer to item 1-7 in Section 0B.

IGNITION SYSTEM

2-1
Spark Plugs Inspection and Replacement

1) Disconnect high tension cords at spark plugs. To avoid inside damage of cords, DO NOT pull on cords for disconnection. Pull on cap.

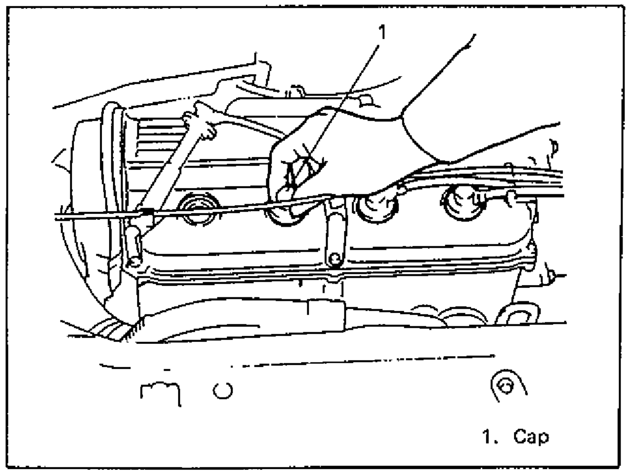


Fig. 0B1-2-1

2) Dust off cylinder head around spark plugs.
3) Using a spark plug wrench, remove spark plugs.
4) Check plug gaps of spark plugs, and adjust them to specification as necessary.

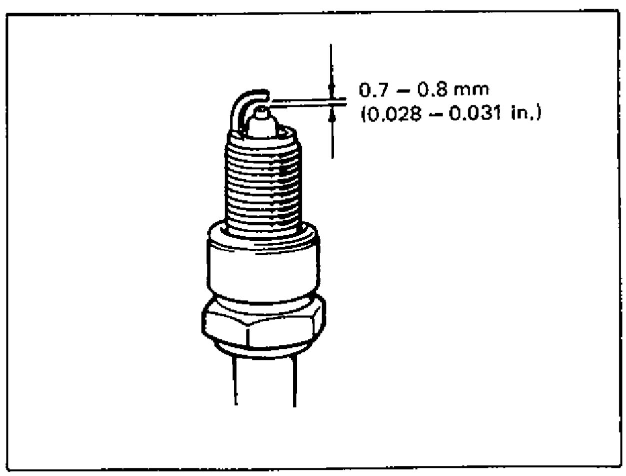


Fig. 0B1-2-2

NOTE:
When replacing plugs, make sure to use new plugs of specified heat range and size.

PLUG SPECIFICATION

Maker	Heat range Standard type
NGK	BKR6E or BK6E
NIPPONDENSO	K20PR-U or K20P-U

As can be seen in the above table, there are two types of spark plugs for this car, one without R included in its code and the other with R. Which one is used depends on countries. Look at the label attached to the car. If originally equipped plug was with R included in its code, replacement plug should have R in its code, too.

5) Install spark plugs. Tighten plugs to specification.
6) Connect high tension cords to spark plugs. DO NOT push cords for connection. Push caps.

	N·m	kg-m	lb-ft
Tightening torque for spark plug	20 – 30	2.0 – 3.0	14.5 – 21.5

2-2
Distributor Cap and Rotor Inspection
Refer to item 2-2 in Section 0B.

2-3
Ignition Wiring (high-tension cord) Inspection and Replacement

[Inspection]
1) Inspect high-tension cords for cracks and check that their connections are secure.
2) Measure resistance of high-tension cords. Refer to ON CAR SERVICE of SECTION 6F for resistance data and measuring procedure.
3) Replace high-tension cords that shown evidence of deterioration.

NOTE:
Check to make sure that each of the high-tension cord terminals and connections is secure and fully inserted into its mating component. Any burnt fitting must be replaced.

[Replacement]
1) Disconnect high tension cords from spark plugs, ignition coil and distributor.
2) Connect new high tension cords and clamp them securely. DO NOT push cords for connection. Push boots.

FUEL SYSTEM

3-1
Air Cleaner Element Replacement
Refer to item 3-1 in Section 0B.

3-2
Fuel Tank, Cap Gasket and Fuel Lines Inspection
Refer to item 3-2 in Section 0B.

3-3
Engine Idle Speed And Idle Mixture Inspection
Check idle speed and idle mixture, and adjust them as necessary. Refer to ON CAR SERVICE of SECTION 6D for procedures to check and adjust idle speed/idle mixture.

3-4
Fuel Filter Replacement

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

The entire filter unit is replaced at regular scheduled intervals. The method of replacement is as follows:
1) Fuel filter is located at the front part of fuel tank, inside the left-hand side of chassis. Remove filter.
2) Position the new filter in place, and connect inlet and outlet hoses to it. Refer to Section 6C.

NOTE:
The top connection is for the outlet hose, the lower one for the inlet hose.

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

EMISSION CONTROL SYSTEM

4-1
PCV (Positive Crankcase Ventilation) Valve Inspection
Refer to item 4-1 in Section 0B.

4-2
Charcoal Canister Inspection
Applicable to the car equipped with canister in engine compartment
Refer to item 4-2 in Section 0B.

4-3
Fuel Cut (solenoid valve) System Inspection
Check fuel cut system for proper operation. For checking procedure, refer to ON CAR SERVICE of SECTION 6D.

4-4
Intake Air Temperature Control System Inspection

NOTE:
This section is only applicable to the cars equipped with this system.

The system should be inspected for operation. Refer to ON CAR SERVICE of SECTION 6J for inspection procedure.

SECTION 0B2

MAINTENANCE AND LUBRICATION

FOR CANADA MARKET

CONTENTS

MAINTENANCE SCHEDULE 0B2-2
MAINTENANCE SERVICE 0B2-4
Engine 0B2-4
Ignition System 0B2-6
Fuel System 0B2-7
Brake 0B2-8
Chassis and Body 0B2-8
Final Inspection .... Refer to SECTION 0B of this manual.
OWNER INSPECTIONS AND SERVICES .... Refer to SECTION 0B of this manual.
RECOMMENDED FLUIDS AND LUBRICANTS 0B2-9

MAINTENANCE SCHEDULE

NORMAL CONDITION SCHEDULE

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 60,000 miles (100,000 km) mileage. Beyond 60,000 miles (100,000 km), carry out the same services at the same intervals respectively.								
	Miles (x 1,000)	7.5	15	22.5	30	37.5	45	52.5	60
	Km (x 1,000)	12.5	25	37.5	50	62.5	75	87.5	100
	Months	7.5	15	22.5	30	37.5	45	52.5	60
1. ENGINE									
1-1. Water pump belt (tension, damage)		–	–	–	I	–	–	–	I
1-2. Valve lash (clearance)		–	I	–	I	–	I	–	I
1-3. Engine oil and filter		R	R	R	R	R	R	R	R
1-4. Cooling system, hoses and connections (leakage, damage)		–	*I	–	*I	–	*I	–	I
1-5. Engine coolant		–	–	–	R	–	–	–	R
1-6. Exhaust system		–	–	–	I	–	–	–	I
1-7. Wiring harness and connections		–	–	–	–	–	–	–	I
2. IGNITION SYSTEM									
2-1. Spark plugs		–	–	–	R	–	–	–	R
2-2. Ignition wiring		–	–	–	–	–	–	–	R
3. FUEL SYSTEM									
3-1. Air cleaner filter element	Paved-road	–	–	–	R	–	–	–	R
3-2. Fuel tank, cap & lines (leakage, damage)		–	*I	–	*I	–	*I	–	I
4. BRAKE									
4-1. Brake discs, pads, drums and shoes (thickness, wear, damage)		I	–	I	–	I	–	I	–
4-2. Brake hoses and pipes (leakage, damage, clamp)		I	–	I	–	I	–	I	–
4-3. Brake fluid		–	I	–	I	–	I	–	R
4-4. Brake lever and cable (damage, stroke, operation)		I	–	I	–	I	–	I	–
4-5. Brake pedal		–	I	–	I	–	I	–	I
5. CHASSIS AND BODY									
5-1. Tires/wheel discs (wear, damage, rotation)		I	I	I	I	I	I	I	I
5-2. Drive axle boots (breakage, damage)		I	I	I	I	I	I	I	I
5-3. Suspension system (tightness, damage, rattle, breakage)		I	I	I	I	I	I	I	I
5-4. Steering system (tightness, damage, breakage, rattle)		I	I	I	I	I	I	I	I
5-5. Power steering (if equipped)		I	I	I	I	I	I	I	I
5-6. Manual transmission oil (leakage, level)		I	R	I	R	I	R	I	R
5-7. Automatic transmission	Fluid level	I	I	I	I	I	I	I	I
	Fluid change	Replace every 100,000 miles (160,000 km)							
	Fluid hose	–	–	–	–	–	R	–	–
5-8. Door hinges & Gear shift control lever/cable (operation)		I	I	I	I	I	I	I	I

NOTES:
"R" : Replace or change
"I" : Inspect and correct or replace if necessary

* *Asterisk means that maintenance is recommended. After 60,000 miles (100,000 Km), however, it should be included in regular maintenance schedule.*

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

Follow this schedule if your car is mainly operated under one or more of the following conditions:

- When most trips are less than 4 miles (6 kilometers).
- When most trips are less than 10 miles (16 kilometers) and outside temperatures remain below freezing.
- Idling and/or low-speed operation in stop-and-go traffic.
- Operating in dusty areas.

Schedule should also be followed if the car is used for delivery service, police, taxi or other commercial applications.

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 60,000 miles (100,000 km) mileage. Beyond 60,000 miles (100,000 km), carry out the same services at the same intervals respectively.																				
	Miles (x 1,000)	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
	Km (x 1,000)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
	Months	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
1. ENGINE																					
1-1. Water pump belt (tension, damage)		—	—	—	—	—	—	—	—	—	I	—	—	—	—	—	—	—	—	—	I
1-2. Valve lash (clearance)		—	—	—	—	I	—	—	—	—	I	—	—	—	—	I	—	—	—	—	I
1-3. Engine oil and filter		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
1-4. Cooling system hoses and connections (leakage, damage)		—	—	—	—	I	—	—	—	—	I	—	—	—	—	I	—	—	—	—	I
1-5. Engine coolant		—	—	—	—	—	—	—	—	—	R	—	—	—	—	—	—	—	—	—	R
1-6. Exhaust system (leakage, damage, tightness)		—	—	—	—	I	—	—	—	—	I	—	—	—	—	I	—	—	—	—	I
1-7. Wiring harness and connections		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	I
2. IGNITION SYSTEM																					
2-1. Spark plugs		—	—	—	—	—	—	—	—	—	R	—	—	—	—	—	—	—	—	—	R
2-2. Ignition wiring		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	R
3. FUEL SYSTEM																					
3-1. Air cleaner filter element		I	I	I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	I	I	R
3-2. Fue tank, cap & lines (leakage, damage)		—	—	—	—	I	—	—	—	—	I	—	—	—	—	I	—	—	—	—	I
4. BRAKE																					
4-1. Brake discs, pads, drums and shoes (thickness, wear, damage)		—	I	—	I	—	—	—	I	—	—	—	I	—	—	—	I	—	—	—	I
4-2. Brake hoses and pipes (leakage, damage, clamp)		—	I	—	I	—	—	—	I	—	—	—	I	—	—	—	I	—	—	—	I
4-3. Brake fluid		—	—	—	—	I	—	—	—	—	I	—	—	—	—	I	—	—	—	—	R
4-4. Brake lever and cable (damage, stroke, operation)		—	I	—	—	I	—	—	—	—	I	—	—	—	—	I	—	—	—	—	I
4-5. Brake pedal		—	—	—	—	I	—	—	—	—	I	—	—	—	—	I	—	—	—	—	I
5. CHASSIS AND BODY																					
5-1. Tires/wheel discs (wear, damage, rotation)		—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I
5-1'. Wheel bearings (loose, wear, noise, damage)		—	—	—	I	—	—	—	I	—	—	—	I	—	—	—	I	—	—	—	I
5-2. Drive axle boots (breakage, damage)		—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I
5-3. Suspension system (tightness, damage, rattle, breakage)		—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I
5-4. Steering system (tightness, damage, breakage, rattle)		—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I
5-5. Power steering (if equipped)		—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I
5-6. Manual transmission oil (leakage, level)		—	I	—	R	—	I	—	R	—	I	—	R	—	I	—	R	—	I	—	R
5-7. Automatic transmission	Fluid level	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I
	Fluid change	—	—	—	—	R	—	—	—	—	R	—	—	—	—	R	—	—	—	—	R
	Fluid hose	—	—	—	—	—	—	—	—	—	—	—	—	—	—	R	—	—	—	—	—
5-8. Door hinges & Gear shift control lever/cables		—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I	—	I

NOTES: "R" : Replace or change "I" : Inspect and correct or replace if necessary

MAINTENANCE SERVICE

ENGINE

1-1
Water Pump Belt Inspection and Replacement
Refer to item 1-1 in Section 0B.

1-2
Valve Lash Inspection
Refer to Item 1-2 in Section 0B.

1-3
Engine Oil and Filter Change
Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to following work.

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

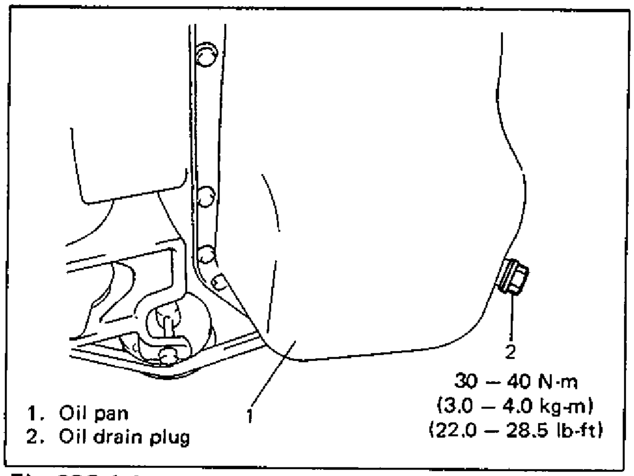


Fig. 0B2-1-1

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

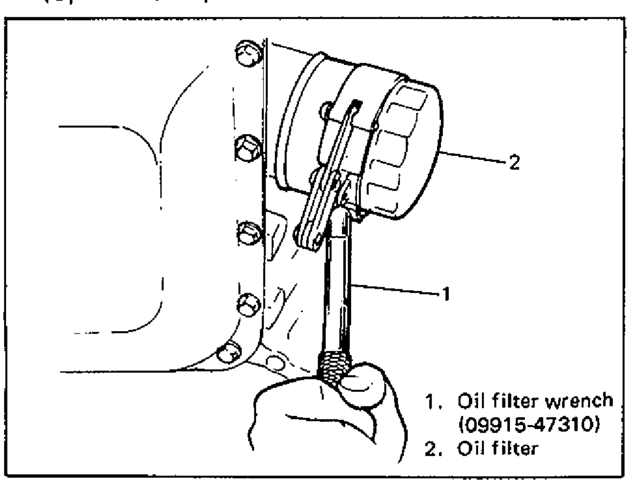


Fig. 0B2-1-2

NOTE:
Before fitting new oil filter, be sure to apply engine oil to its "O" ring.

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

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

5) Using oil filter wrench, tighten filter 3/4 turn from contact point described above.

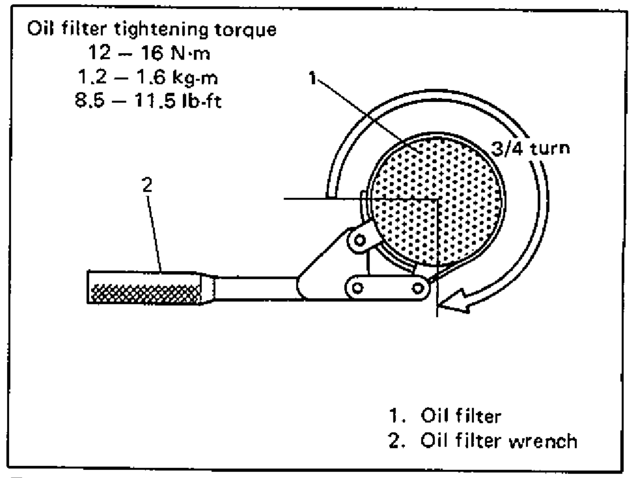


Fig. 0B2-1-3

6) Replenish oil until oil level is brought to FULL level mark on dipstick. (about 3.3 liters or 6.9/5.8 US/Imp pt.). Filler inlet is at the top of cylinder head cover.
It is recommended to use engine oil of SF or SG class. Select the appropriate oil viscosity according to the chart on the next page.

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

7) Start engine and run it for three minutes. Stop it and wait another 3 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dip stick.

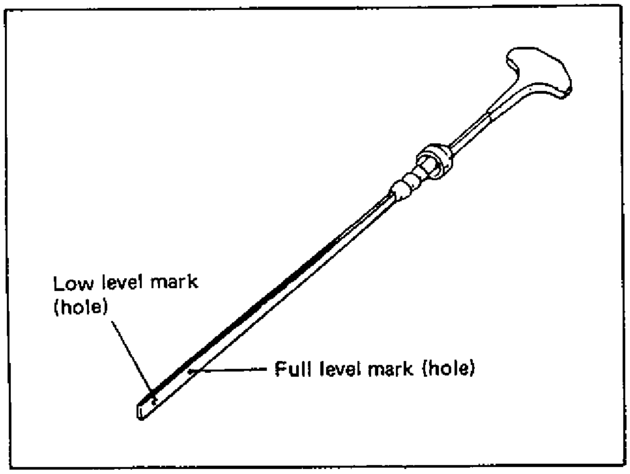


Fig. 0B2-1-4

NOTE:
Steps 1) — 6) outlined above must be performed with ENGINE NOT RUNNING. For step 7), be sure to have adequate ventilation while engine is running.

Proper Engine Oil Viscosity Chart

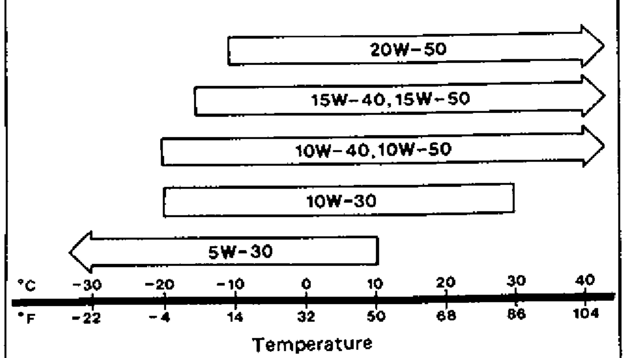


Fig. 0B2-1-5

Engine oil capacity

Oil pan capacity	about 3.1 liters (6.5/5.5 US/Imp pt.)
Oil filter capacity	about 0.2 liters (0.4/0.3 US/Imp pt.)
Others	about 0.3 liters (0.6/0.5 US/Imp pt.)
Total	about 3.6 liters (7.5/6.3 US/Imp pt.)

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

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

1-4
Cooling System, Hoses and Connections Inspection
Refer to item 1-4 in Section 0B.

1-5
Engine Coolant Change
Refer to item 1-5 in Section 0B.

1-6
Exhaust System Inspection
Refer to item 1-6 in Section 0B.

1-7
Wiring Harness and Connections Inspection
Refer to item 1-7 in Section 0B.

IGNITION SYSTEM

2-1
Spark Plugs Replacement

1) Disconnect high tension cords at spark plugs. To avoid inside damage of cords, DO NOT pull on cords for disconnection. Pull on cap.

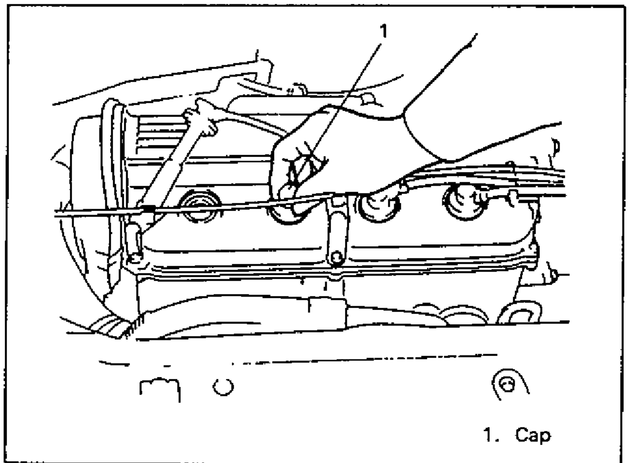


Fig. 0B2-2-1

2) Dust off cylinder head around spark plugs.
3) Using a spark plug wrench, remove spark plugs.
4) Check plug gap of new spark plug, and adjust them to specification as necessary.

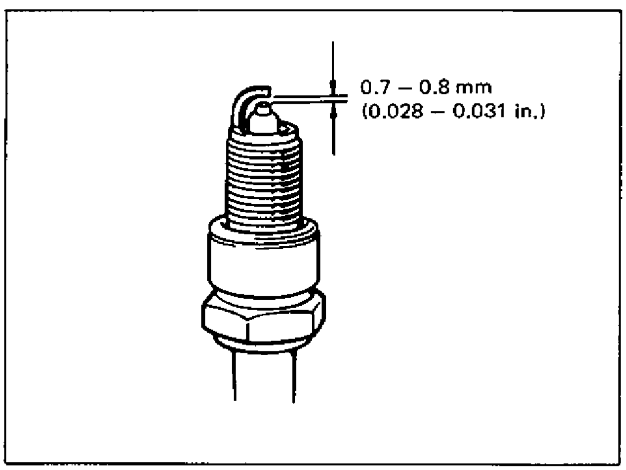


Fig. 0B2-2-2

NOTE:
Make sure to use new plugs of specified heat range and size.

PLUG SPECIFICATION

Maker	Heat range Standard type
NGK	BKR6E
NIPPONDENSO	K20PR-U

5) Install new spark plugs. Tighten plugs to specification.
6) Connect high tension cords to spark plugs. DO NOT push cords for connection. Push caps.

Tightening torque for spark plug	N·m	kg-m	lb-ft
	20 – 30	2.0 – 3.0	14.5 – 21.5

2-2
Ignition Wiring (high-tension cord) Replacement

1) Disconnect high tension cords from spark plugs, ignition coil and distributor.
2) Connect new high tension cords and clamp them securely. DO NOT push cords for connection. Push boots.

FUEL SYSTEM

3-1

Air Cleaner Element Replacement

1) Remove air cleaner cap.
2) Take cleaner element out of air cleaner case.
3) Install new cleaner element into cleaner case.
4) Install air cleaner cap securely.

NOTE:

Replace more often under dusty conditions. Ask your dealer for proper replacement interval for your driving conditions.

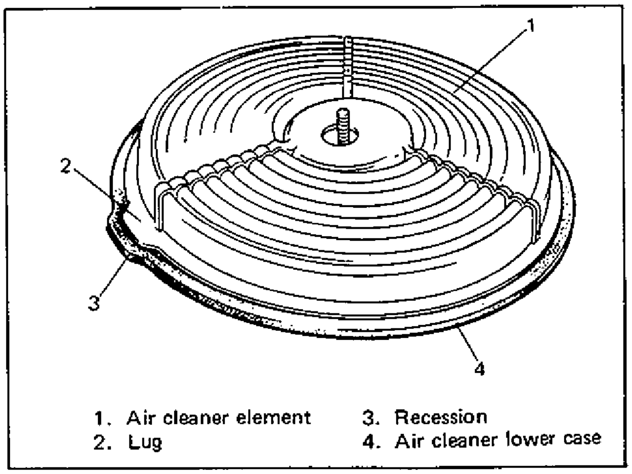


Fig. 0B2-3-1

Air Cleaner Element Inspection

1) Visually check that air cleaner element is not excessively dirty, damaged or oily.
2) Clean element with compressed air from inside of element.

NOTE:

If car is used in dusty area, clean every 5,000 km (3,000 miles) or more frequently.

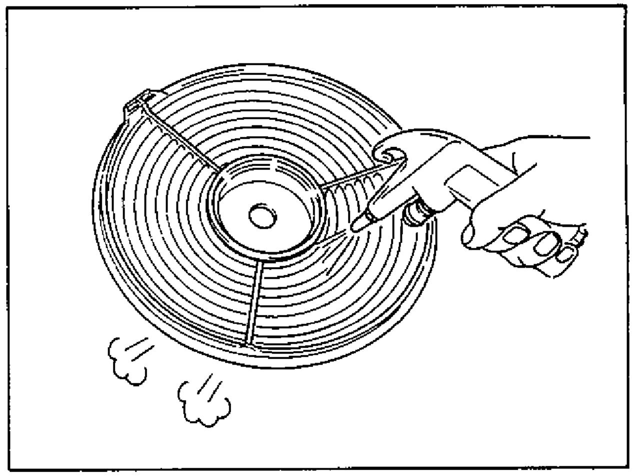


Fig. 0B2-3-2

3-2

Fuel Tank, Cap Gasket and Fuel Lines Inspection

- Check fuel tank, fuel filler cap and fuel lines for loose connection, deterioration or damage which could cause leakage.
  Make sure all clamps are secure.
- Check fuel filler cap gasket for an even filler neck imprint or any damage.
- Replace any damaged or deteriorated parts.
  There should be no sign of fuel leakage or moisture at any fuel connection.

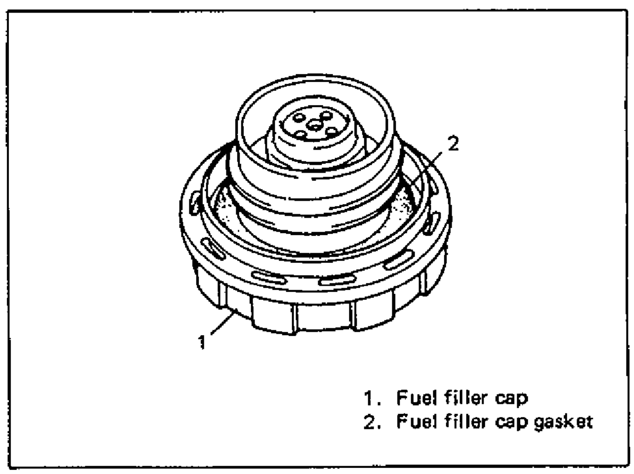


Fig. 0B2-3-3

BRAKE

4-1
Brake Discs, Pads, Brake Drums and Shoes Inspection
Refer to item 5-1 in Section 0B.

4-2
Brake Hoses and Pipes inspection
Refer to item 5-2 in Section 0B.

4-3
Brake Fluid Inspection and Change
Refer to item 5-3 in Section 0B.

4-4
Brake Lever and Cable Inspection
Refer to item 5-4 in Section 0B.

4-5
Brake Pedal Inspection
Refer to item 5-5 in Section 0B.

CHASSIS AND BODY

5-1
Tire and Wheel Disc Inspection
Refer to item 6-1 in Section 0B.

5-1′
Wheel Bearing Inspection
Refer to item 6-1′ in Section 0B.

5-2
Drive Axle boots Inspection
Refer to item 6-2 in Section 0B.

5-3
Suspention System Inspection
Refer to item 6-3 in Section 0B.

5-4
Steering System Inspection
Refer to item 6-4 in Section 0B.

5-5
Power Steering System Inspection
Refer to item 6-5 in Section 0B.

5-6
Manual Transmission Oil Inspection and Change
Refer to item 6-6 in Section 0B.

5-7
Automatic Transmission Fluid Inspection, Fluid Change and Hose Change
Refer to item 6-7 in Section 0B.

5-8
Door Hinges and Gear Shift Control Lever/ Cables Inspection
Refer to item 6-8 in Section 0B.

RECOMMENDED FLUIDS AND LUBRICANTS

Engine oil	SF or SG (Refer to Fig. 0B2-1-5)
Engine coolant (long life coolant)	Ethylene-glycol base coolant ("Antifreeze/Anticorrosion coolant" GOLDEN CRUISER 1200)
Brake fluid	DOT3 or SAE J1703
Manual transmission oil	See oil chart on page 7A-7
Automatic transmission fluid and power steering fluid	Automatic transmission fluid DEXRON®-II
Door hinges	Engine oil
Hood latch assembly	Engine oil
Gear shift control lever and cables	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Key lock cylinder	Spray lubricant

Fig. 0B2-6

SECTION 1A

HEATER AND VENTILATION

NOTE:
Although figures in this section mainly show the left-hand steering car, the same work procedure and data also apply to the right-hand steering car.

CONTENTS

GENERAL DESCRIPTION 1A-1
Body Ventilation 1A-1
Heater 1A-2
Heater Control Operation 1A-3
DIAGNOSIS 1A-4
ON-CAR SERVICE 1A- 4
Heater Blower Motor 1A- 4
Heater Blower Motor Resistor 1A- 5
Heater Blower Motor Switch 1A- 6
Heater Control Cables 1A- 7
Heater Unit 1A- 8
Rear Duct (If equipped) 1A-10

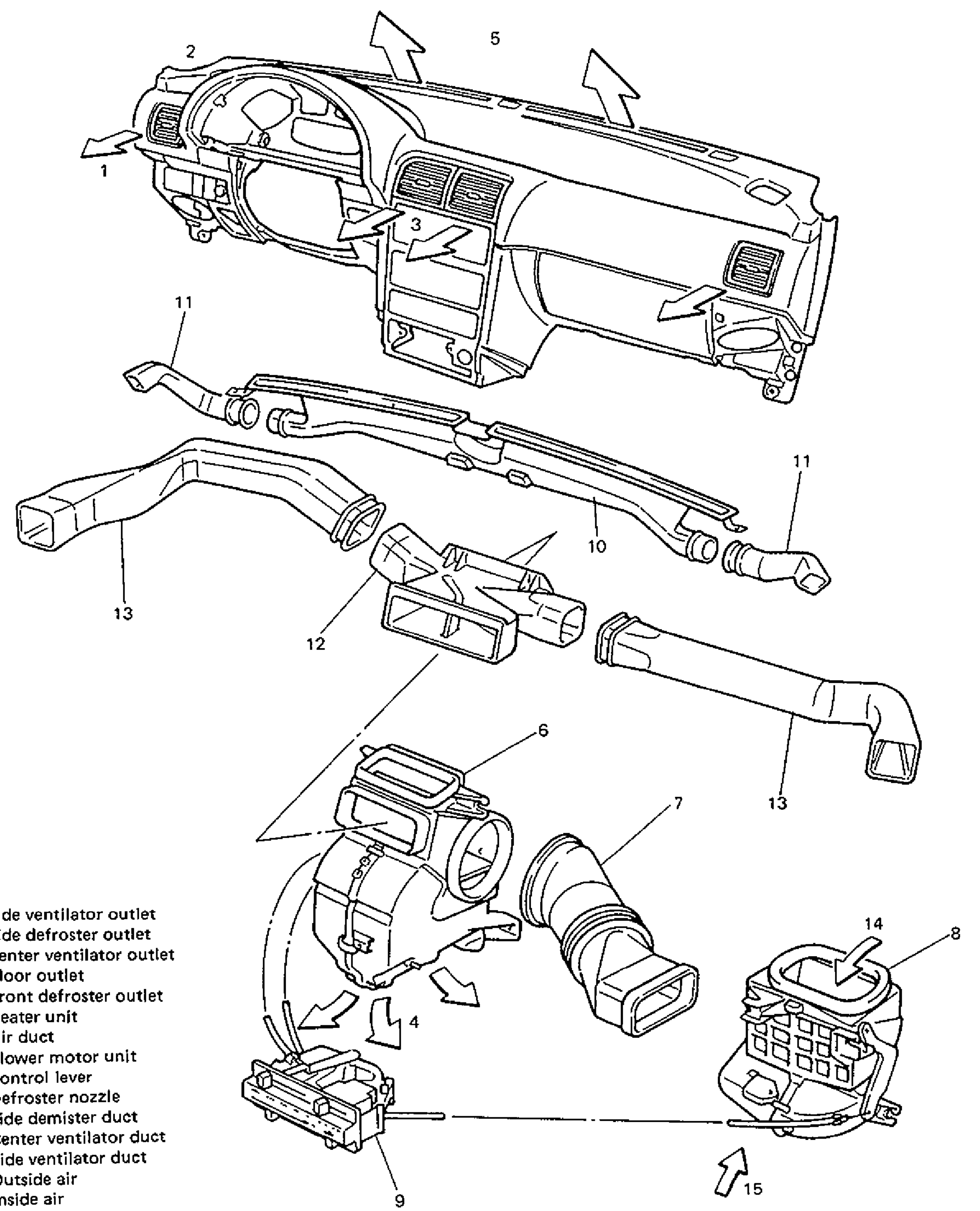
GENERAL DESCRIPTION

BODY VENTILATION

The body ventilation system of this car is equipped with air conditioning that consists of a fresh air intake located at the cowl top panel. Ventilating air is drawn into the interior from the intake grille and drawn out from the ventilator outlet provided at each side of the body outer panel.

HEATER

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

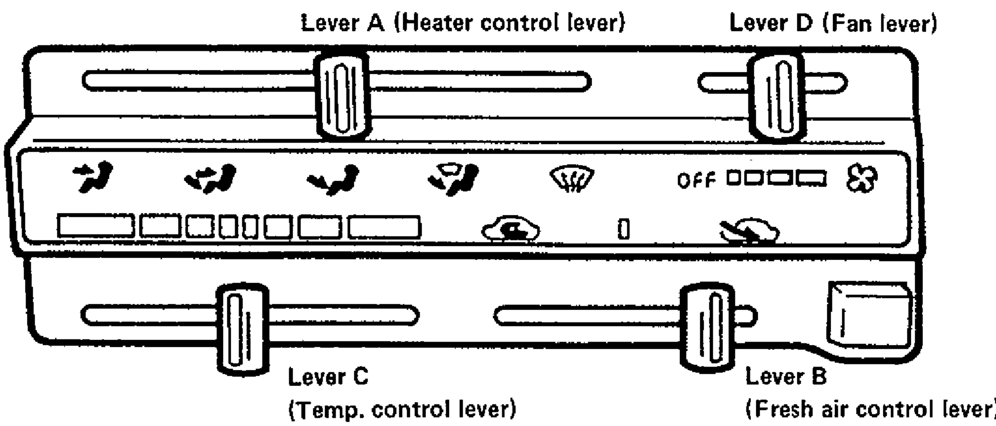


1. Side ventilator outlet
2. Side defroster outlet
3. Center ventilator outlet
4. Floor outlet
5. Front defroster outlet
6. Heater unit
7. Air duct
8. Blower motor unit
9. Control lever
10. Defroster nozzle
11. Side demister duct
12. Center ventilator duct
13. Side ventilator duct
14. Outside air
15. Inside air

Fig. 1A-1

HEATER CONTROL OPERATION

The heater and ventilation provide temperature control, ventilation and defrosting functions. Their operation is controlled by selecting the positions of the control levers on the instrument panel. Each lever position and function of heater and ventilation are as given below.



Lever A
Heater control lever.

	VENTILATION	(Air flows from center and side outlets)	A-1
	BI-LEVEL	(Air flows from center, side and floor outlets)	A-2
	HEAT	(Air flows from floor outlet)	A-3
	HEAT/ DEFROSTER	(Air flows from floor outlet, front defroster and side dermister outlets)	A-4
	DEFROSTER	(Air flows from front defroster and side demister outlets)	A-5

Lever B
Fresh air control lever.

	CIRCULATION	B-1
	FRESH AIR	B-2

Lever C
Temperature control lever.

COOL	C-1
HOT	C-2

Lever D
Blower motor speed selection lever.

	D

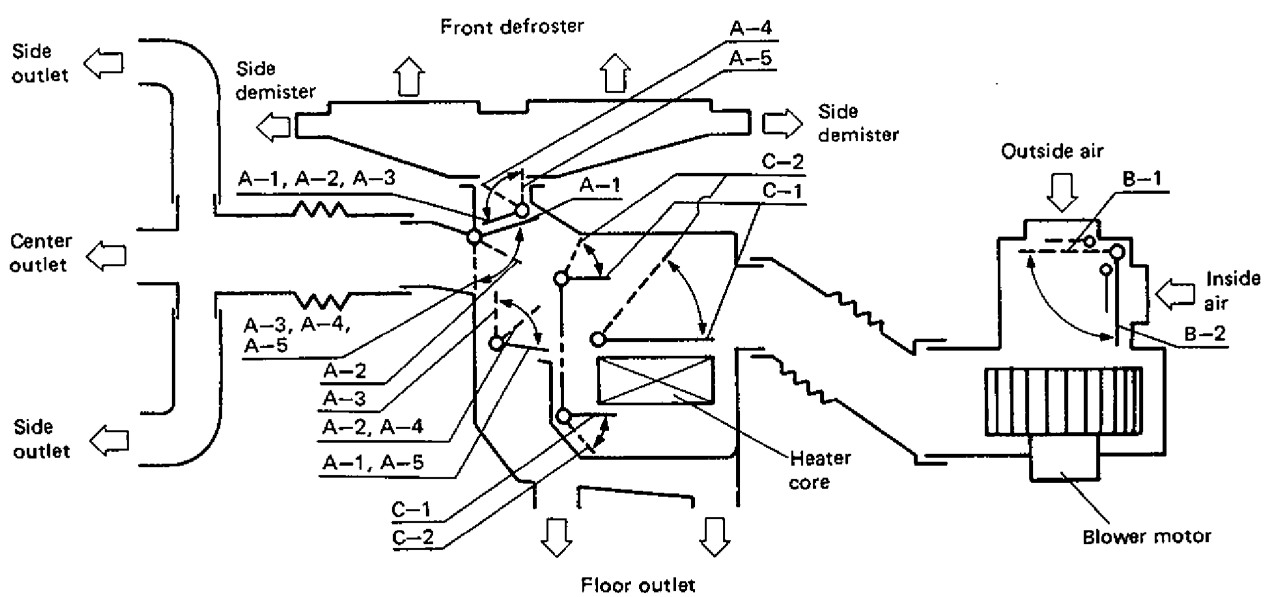


Fig. 1A-2

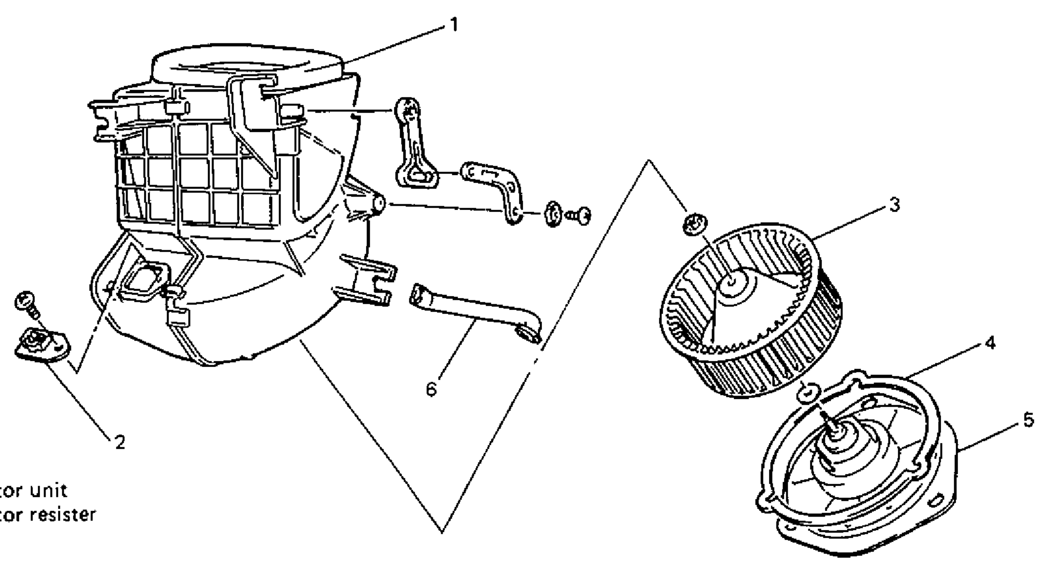
DIAGNOSIS

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

ON-CAR SERVICE

HEATER BLOWER MOTOR

NOTE:
Heater blower motor unit in left-hand steering car and that in right-hand steering care are symmetrical.



1. Blower motor unit
2. Blower motor resister
3. Blower fan
4. Packing
5. Motor assembly
6. Air hose

Fig. 1A-3

REMOVAL

1) Disconnect battery (–) leadwire.
2) Disconnect blower motor and resister leadwires at couplers.
3) Disconnect fresh air control cable from motor unit.
4) Remove blower motor unit after removing glove box upper panel and bolts as shown below.

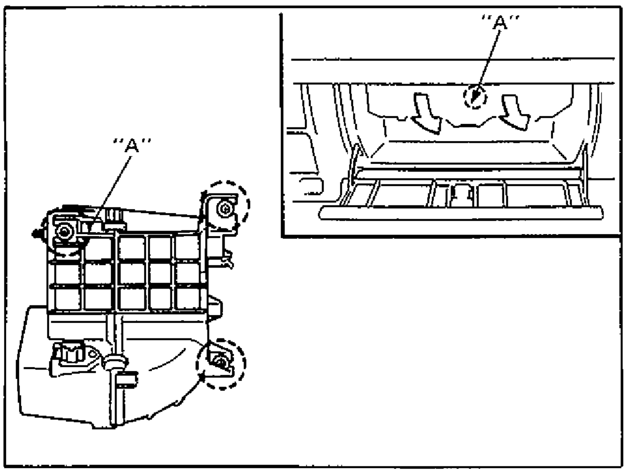


Fig. 1A-4

5) Remove blower motor.

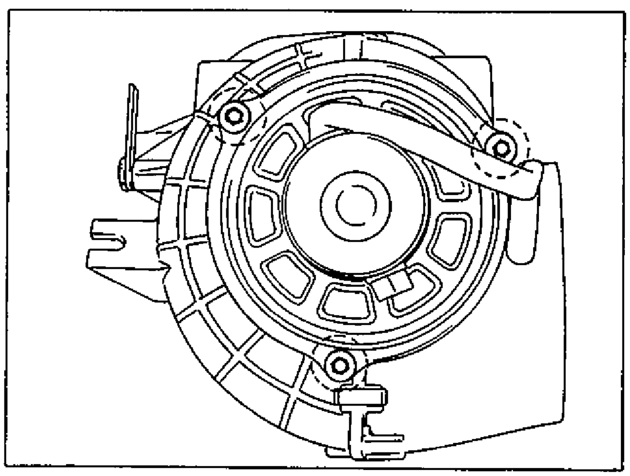


Fig. 1A-5

INSTALLATION

Reverse removal procedure for installation.

HEATER BLOWER MOTOR RESISTOR

REMOVAL

1) Remove blower motor unit. (Refer to p. 1A-4)
2) Remove heater blower motor resistor.

INSPECTION

Check blower motor register for each terminal-to-terminal continuity. If there is no continuity, replace blower motor resistor.

INSTALLATION

Reverse removal procedure for installation.

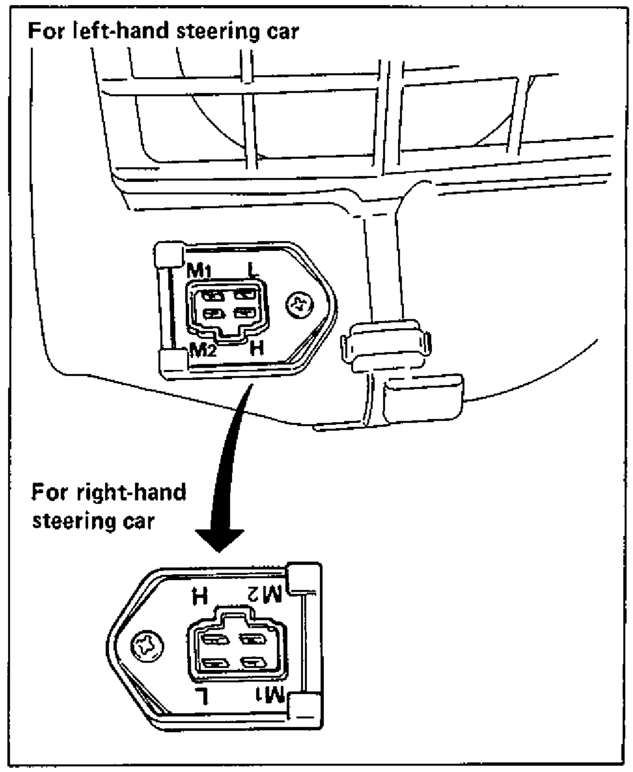


Fig. 1A-6

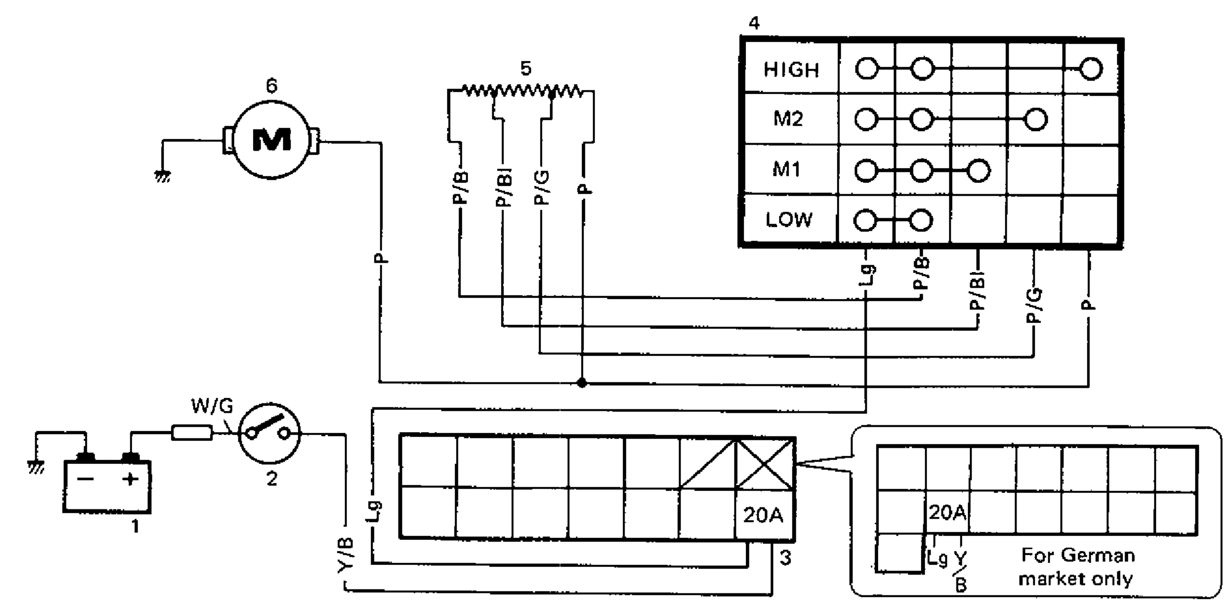
HEATER BLOWER MOTOR SWITCH

REMOVAL

1) Remove console box.
2) Remove ashtray and ashtray upper plate.
3) Remove cigaratte lighter.
4) Remove control lever knobs and control panel garnish.
5) Remove control panel.
6) Disconnect leadwire from blower motor switch at coupler.
7) Disconnect control cables from blower motor unit and heater unit.
8) Remove control lever ass'y.

INSPECTION

Heater blower motor switch is connected between battery and blower motor, through fuse and resistor as shown below.
Check switch for each terminal-to-terminal continuity. If there is no continuity, replace control lever ass'y.



1. Battery
2. Ignition switch
3. Fuse box
4. Heater blower switch
5. Heater resistor
6. Blower motor

W/G : White/Green
Lg : Light green
P/Bl : Pink/Blue
P : Pink
Y/B : Yellow/Black
P/B : Pink/Black
P/G : Pink/Green

Fig. 1A-7

INSTALLATION

Install in the reverse order of removal.

HEATER CONTROL CABLES

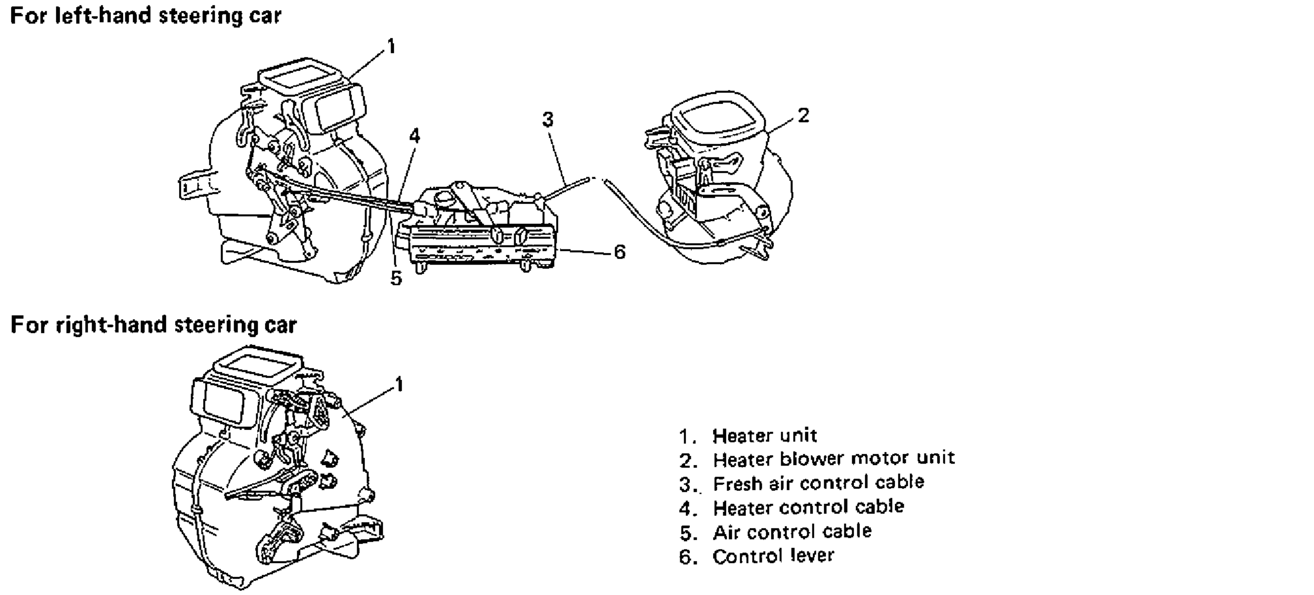


Fig. 1A-8

REMOVAL

1) Remove conslole box.
2) Remove ashtray and ashtray upper plate.
3) Remove cigarette lighter and radio. (If equipp-ed)
4) Remove control lever knobs and control panel garnish.
5) Remove control panel.
6) Disconnect leadwire from blower motor switch at coupler.
7) Disconnect control cables from blower motor unit and heater unit.
8) Remove control lever ass'y.
9) Disconnect control cables from control lever.

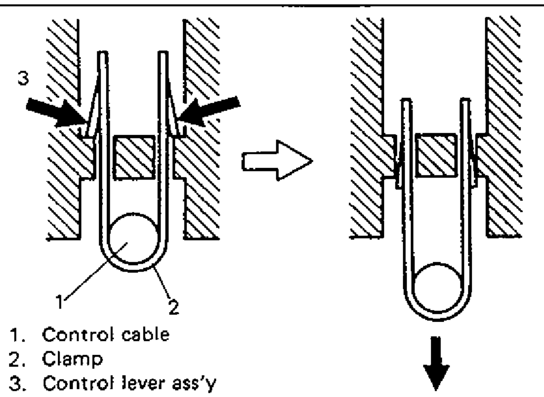


Fig. 1A-8-1

INSTALLATION

Install control cables by reversing removal procedure, noting the following point.

After installing control cables to control levers, move control levers to such position as to pull cables fully, then connect and clamp control cables to heater unit and blower motor unit levers as shown.

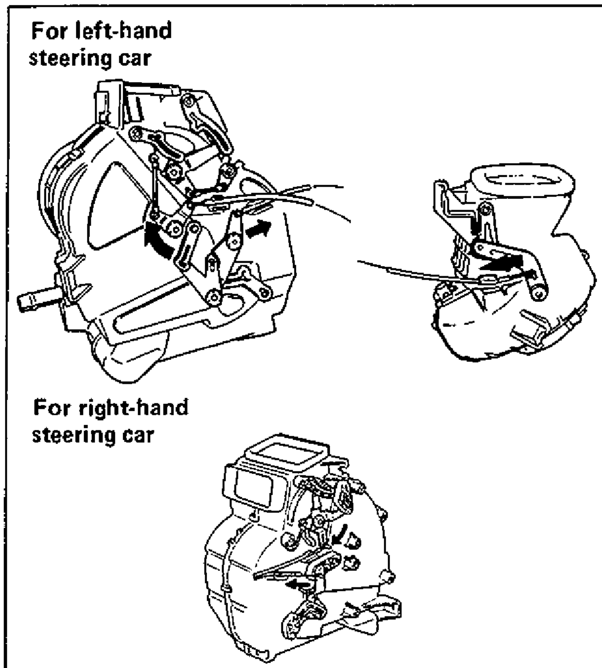
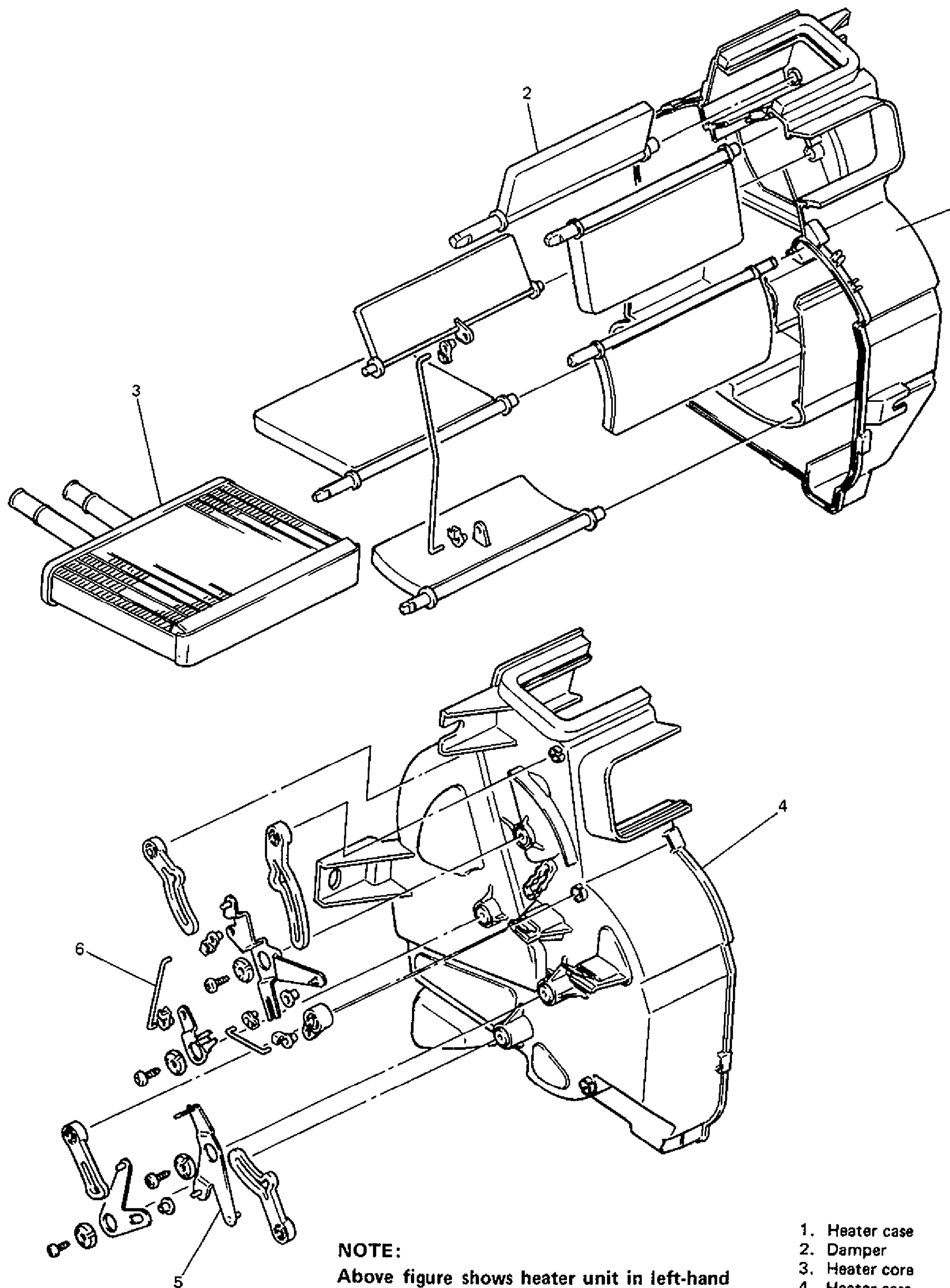


Fig. 1A-9

NOTE:

After installing control cables, be sure that control knobs move smoothly and stop at proper position.

HEATER UNIT



NOTE:
Above figure shows heater unit in left-hand steering car. The one in right-hand steering car differs only in its link parts.

1. Heater case
2. Damper
3. Heater core
4. Heater case
5. Control lever
6. Control shaft

Fig. 1A-10

REMOVAL

1. Disconnect battery (–) leadwire, drain coolant and disconnect 2 water hoses from heater unit.
2. Remove instrument panel as follows.
   1) Remove console box.
   2) Disconnect wires and cables from heater and blower unit.
   3) Remove steering wheel, steering column unit and steering joint upper bolt. (Refer to SECTION 3C.)
   4) Remove front speaker covers and front speakers (if equipped).
   5) Disconnect speedometer cable and remove speedometer ass'y.
   6) Remove engine hood opener.
   7) Remove instrument panel member mounting bolts.

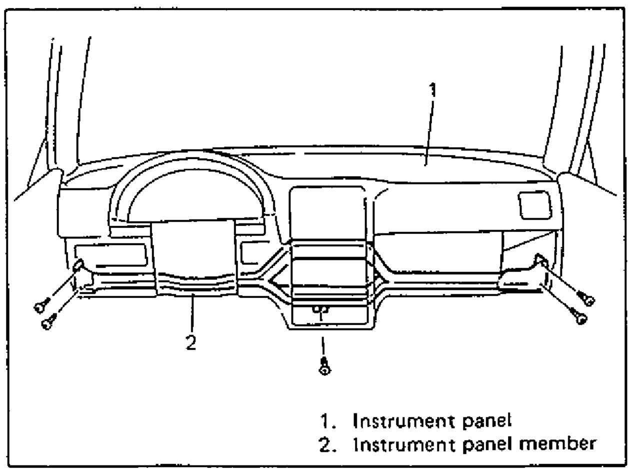


Fig. 1A-11-1

   8) Remove instrument panel together with instrument panel member.

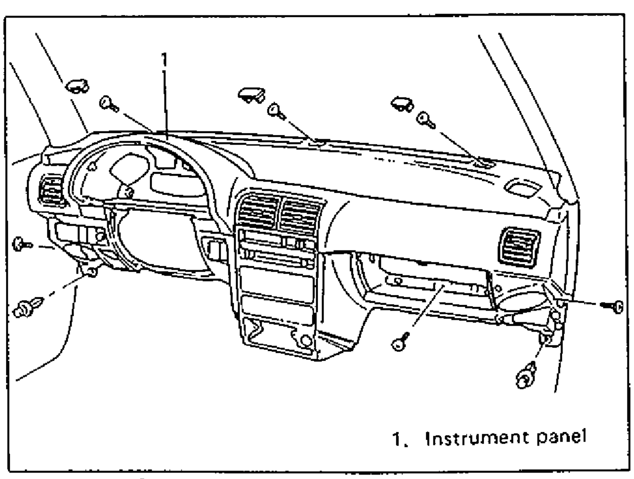


Fig. 1A-11-2

3. Remove heater unit.

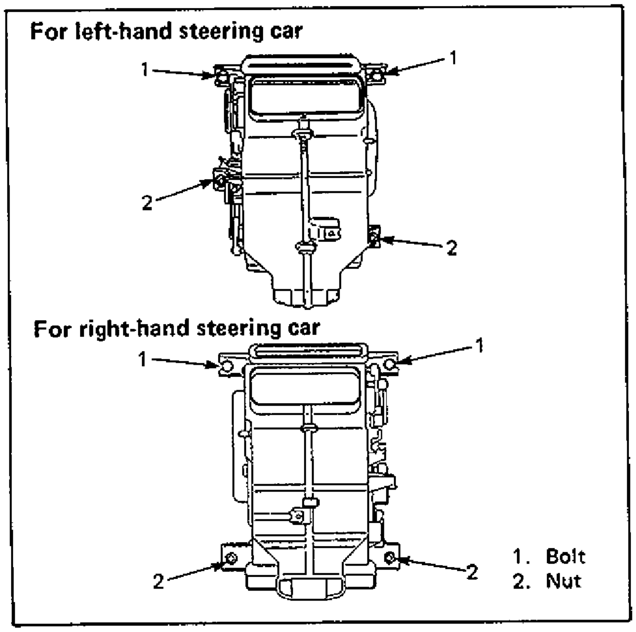


Fig. 1A-12

4. Remove heater unit clips and screws to separate heater unit.

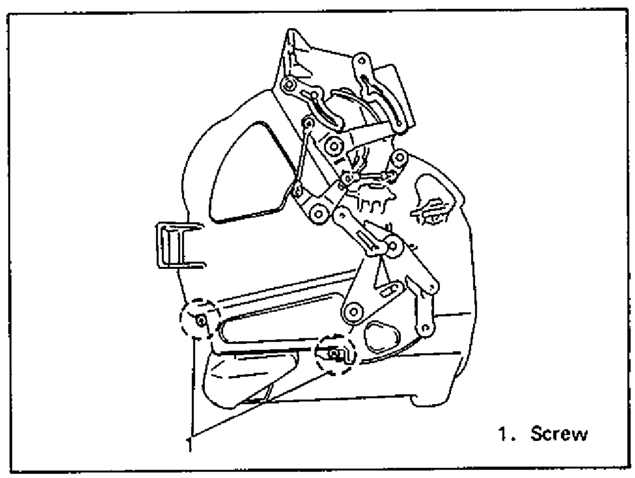


Fig. 1A-13

5. Pull out heater core from unit.

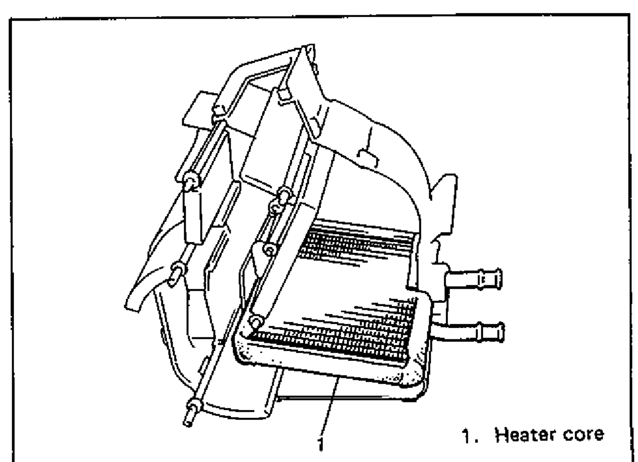


Fig. 1A-14

INSTALLATION

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

1) Adjust control cables. (Refer to p. 1A-7)
2) Fill coolant to radiator.

NOTE:

- **When installing each part, be careful not to catch any cable or wiring harness.**
- **When installing steering shaft to steering shaft joint, set front wheels (right and left) in the straight ahead state and check to make sure that steering wheel is also in that state.**
- **When fastening steering column ass'y to car body, start with lower nuts on column and then upper nuts. Be sure to tighten them to specified torque. (Refer to p. 3C-6 for details.)**

REAR DUCT (If equipped)

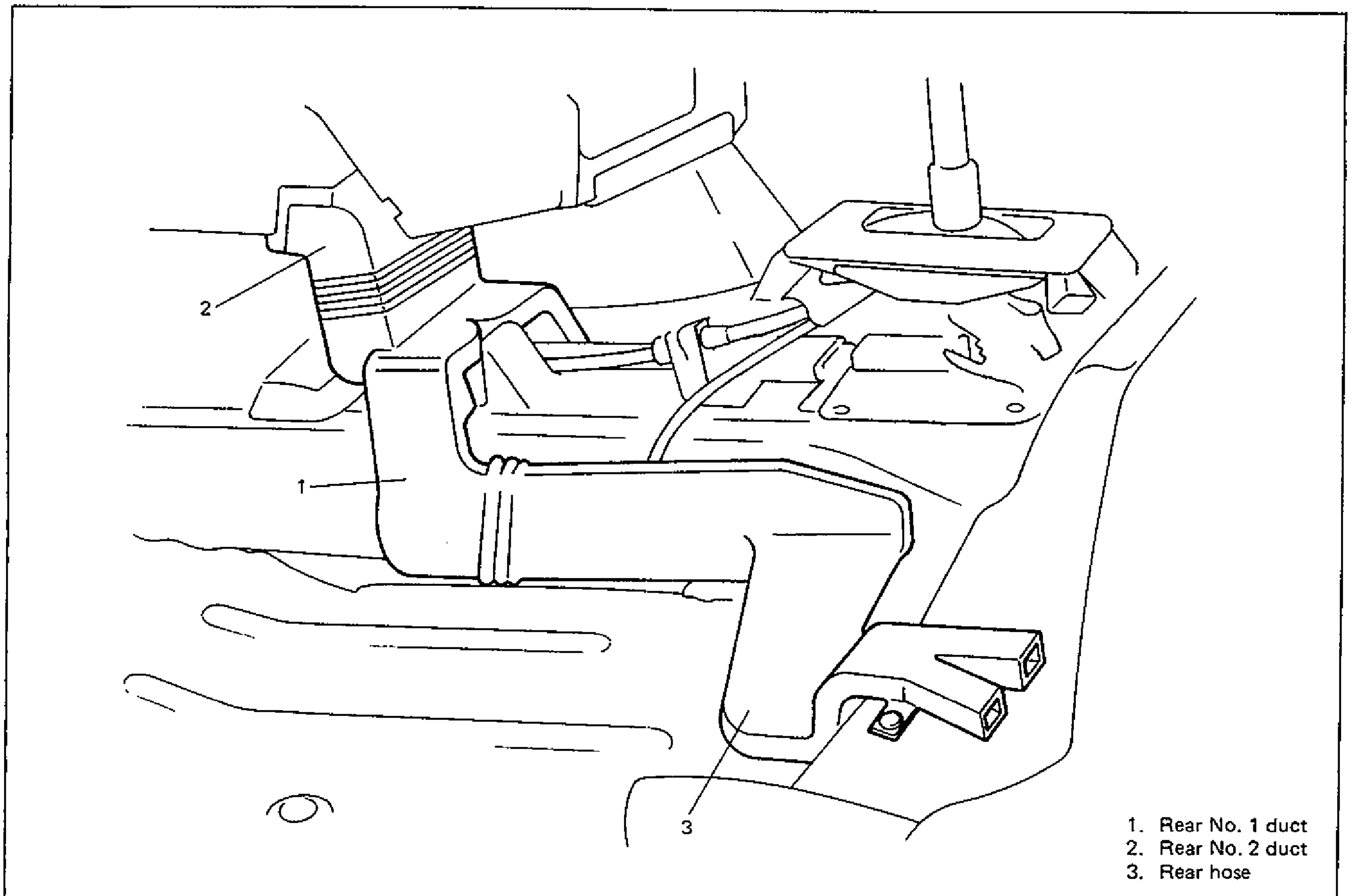


Fig. 1A-15

DESCRIPTION

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

REMOVAL

1) Remove front seats.

NOTE:
If seat belt warning light is provided, disconnect its switch wire.

2) Remove dash side trim and side sill front scuff from both sides (right and left).

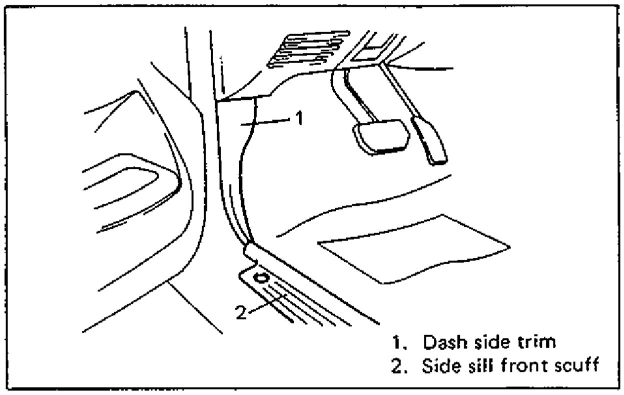


Fig. 1A-16

3) Remove console box.
4) Loosen instrument panel menber support mounting screw/bolt.
   Then move support in arrow direction as shown below.

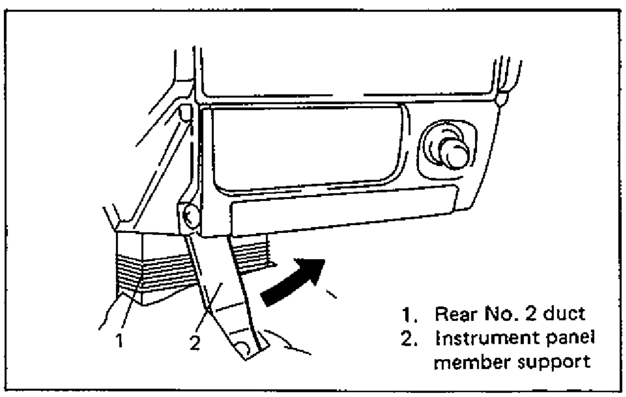


Fig. 1A-17

5) Remove rear No. 2 duct.
6) Take off floor carpet till rear duct is totally exposed.
7) Remove rear No. 1 duct and rear hoses.

INSTALLATION

Reverse removal sequence to install rear duct.
But note following point.

Refer to Section 9 for tightening torque for front seat mounting bolts.

SECTION 2

BUMPERS AND SHEET METAL

CONTENTS

BUMPERS 2-1
HOOD 2-4
FRONT FENDER 2-5

BUMPERS

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

FRONT BUMPER

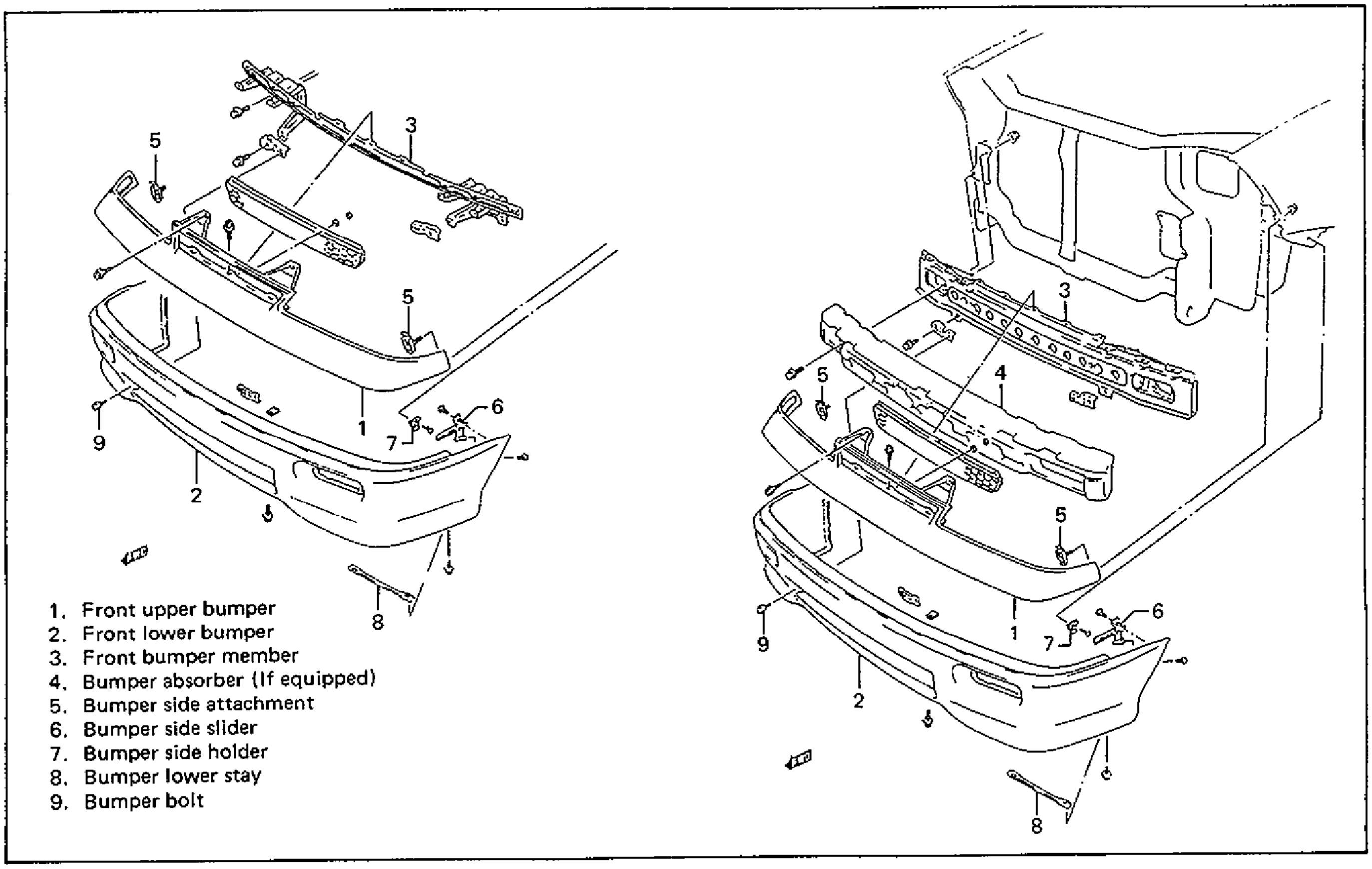


Fig. 2-1

REMOVAL

1) Remove front fender lining.
2) Remove front turn signal lamps.
3) Remove bumper fitting bolts and nuts shown in Fig. 2-2.

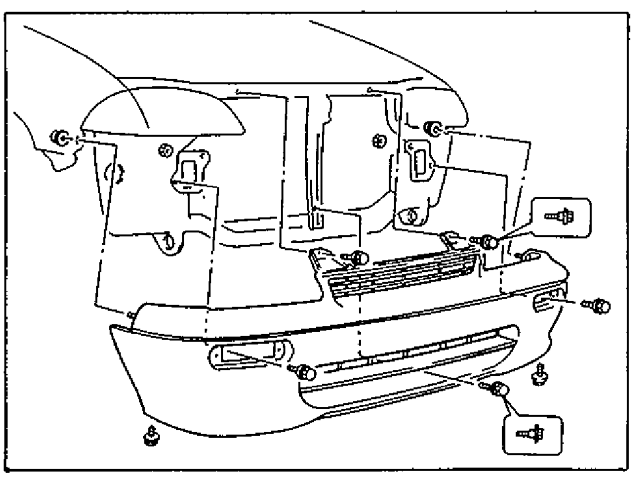


Fig. 2-2

4) Slide bumper (with bumper member) forward to remove it.

INSTALLATION

1) Slide bumper onto bumper side attachments on both fenders.
2) Use five bolts and four nuts to fix bumper in position.

REAR BUMPER

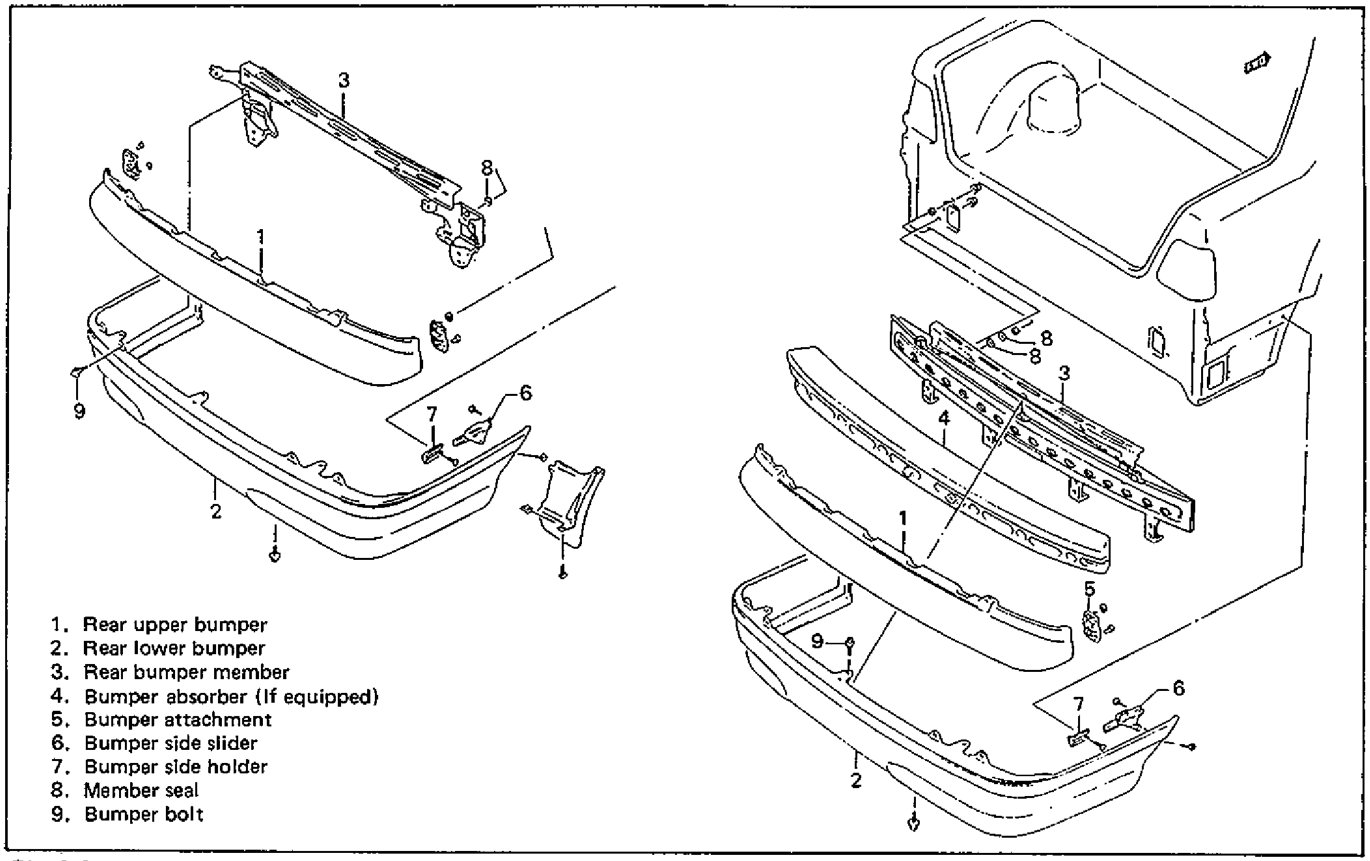


Fig. 2-3

REMOVAL

1) Remove mud flaps. (If equipped)
2) Remove bumper fitting nuts shown in Fig. 2-4.

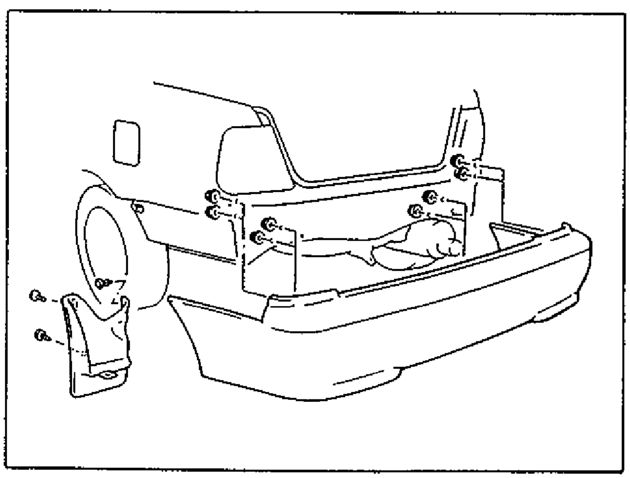


Fig. 2-4

3) Slide bumper (with bumper member) backward to remove it.

INSTALLATION

1) Slide bumper onto side attachments on both fenders.
2) Install removed parts in reverse order of removal.

HOOD

REMOVAL

Remove four mounting bolts to detach hood.

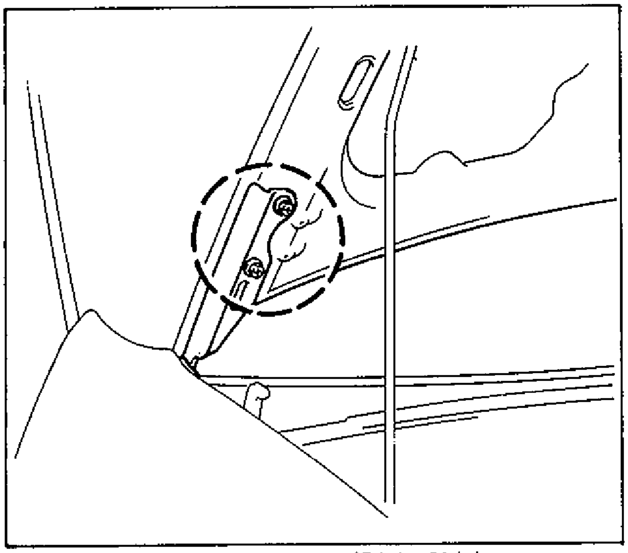


Fig. 2-5 Food Mounting Bolts (Right Side)

ADJUSTMENT

A. Fore-and-aft and right-and-left adjustment
Slacken four mounting bolts for adjustment.

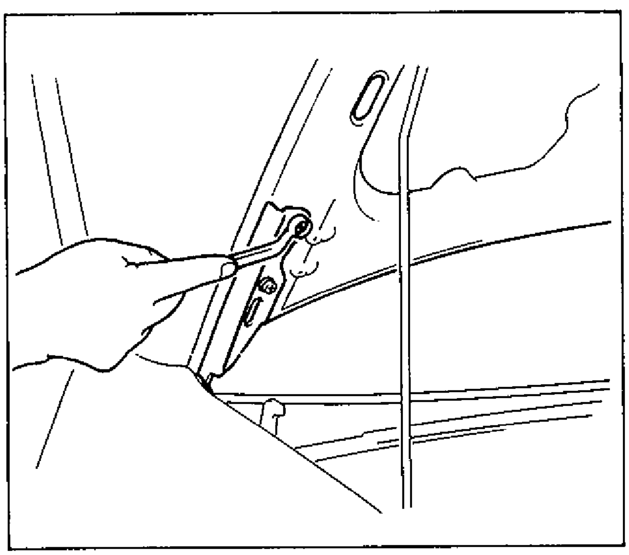


Fig. 2-6 Hood Mounting Bolts (Right Side)

B. Vertical adjustment
If only one side (right or left) of hood is not level with front fender, make it level by tightening or loosening hood cushion.

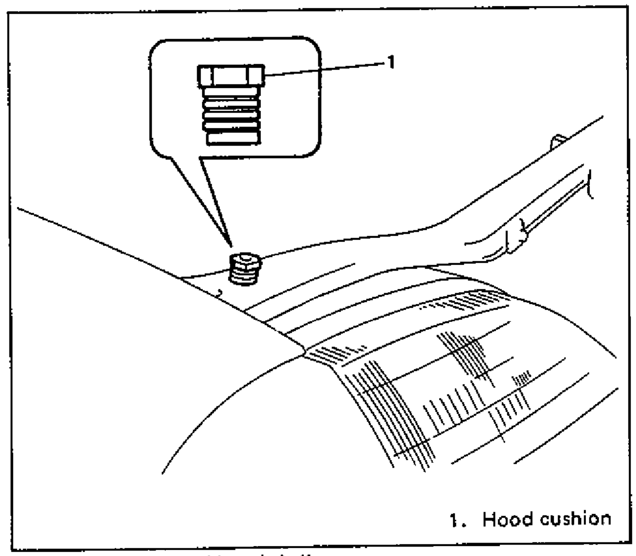


Fig. 2-7 Vertical Hood Adjustment

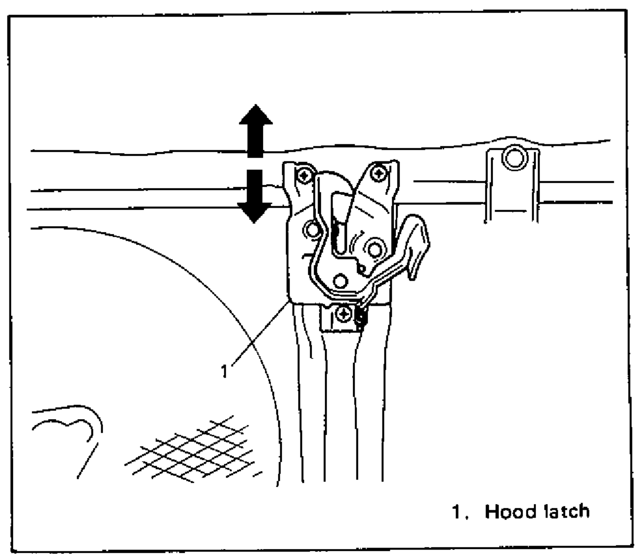


Fig. 2-8 Hood Latch Adjustment

FRONT FENDER

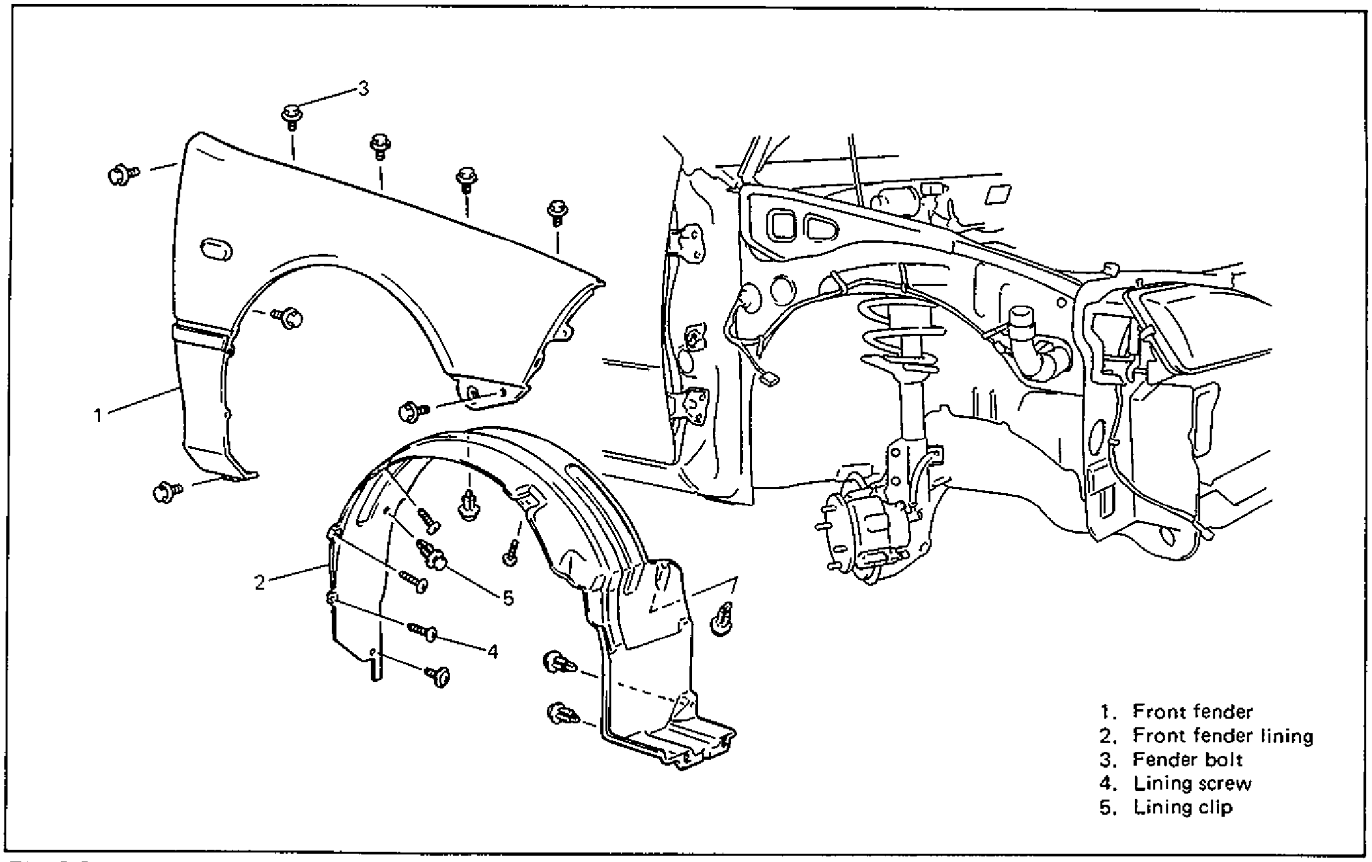


Fig. 2-9

REMOVAL

1) Remove front bumper (Refer to p. 2-2).
2) Remove small light and side turn signals.

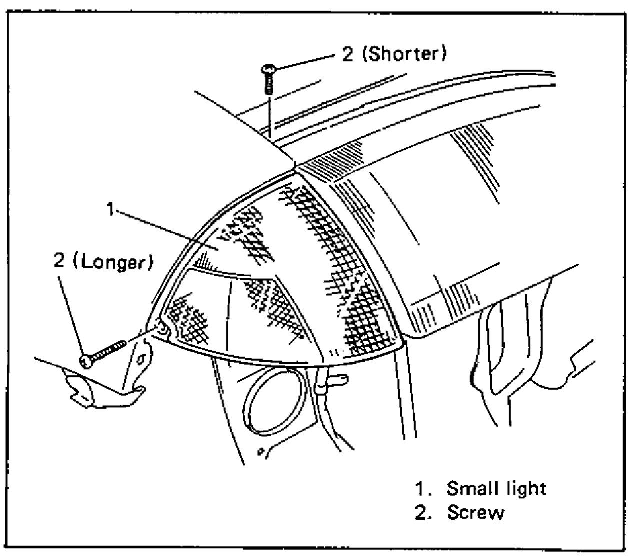


Fig. 2-10 Removing Small Light

3) Remove front fender.

INSTALLATION

1. Reverse removal procedure for installation.

NOTE:

When replacing front fender, be sure to apply anti-corrosive treatment to replacement fender.

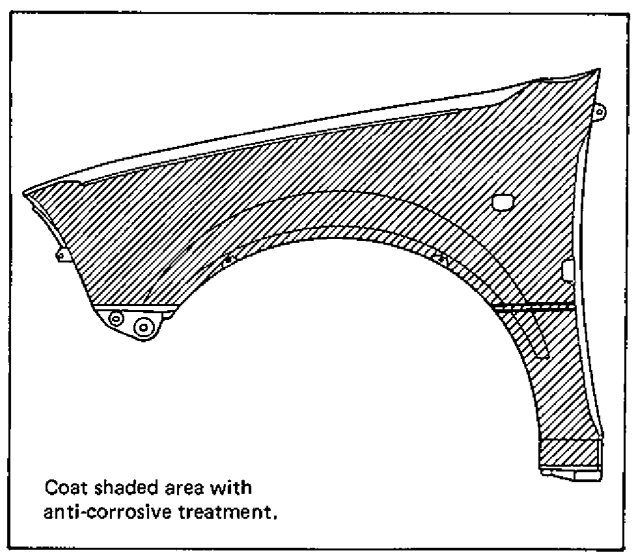


Fig. 2-11 Replacement Fender

SECTION 3

STEERING, SUSPENSION, WHEELS AND TIRES

DIAGNOSIS 3-1
FRONT END ALIGNMENT 3A-1
MANUAL RACK AND PINION 3B-1
STEERING COLUMN 3C-1
FRONT SUSPENSION 3D-1
REAR SUSPENSION 3E-1
WHEELS AND TIRES 3F-1

CONTENTS

GENERAL DIAGNOSIS 3-1
TIRE DIAGNOSIS 3-6
Irregular and/or Premature Wear 3-6
Wear Indicators 3-6
Radial Tire Waddle 3-6
Radial Tire Lead 3-8
VIBRATION DIAGNOSIS 3-8

GENERAL DIAGNOSIS

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

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

GENERAL DIAGNOSIS CHART A

Condition	Possible Cause	Correction
Car Pulls (Leads)	1. Mismatched or uneven tires.	Replace tire.
	2. Tires not adequately inflated.	Adjust tire pressure.
	3. Broken or sagging springs.	Replace spring.
	4. Radial tire lateral force.	Replace tire.
	5. Disturbed front end alignment.	Check and adjust front end alignment.
	6. Disturbed rear wheel alignment.	Check and adjust rear wheel alignment.
	7. Brake dragging in one road wheel.	Repair front brake.
	8. Loose, bent or broken front or rear suspension parts.	Tighten or replace suspension parts.

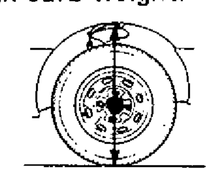
GENERAL DIAGNOSIS CHART B

Condition	Possible cause	Correction
Abnormal or Excessive Tire Wear	1. Sagging or broken spring.	Replace spring.
	2. Tire out of balance.	Adjust balance or replace tire.
	3. Disturbed front or rear end alignment.	Check and adjust front end alignment.
	4. Faulty strut (shock absorber).	Replace strut.
	5. Hard driving.	Replace tire.
	6. Overloaded car.	Replace tire.
	7. Not rotating tire.	Replace or rotate tire.
	8. Worn or loose road wheel bearing.	Replace wheel bearing.
	9. Wobbly wheel or tire.	Replace wheel or tire.
	10. Tires not adequately inflated.	Adjust tire pressure.
Wheel Tramp	1. Blister or bump on tire.	Replace tire.
	2. Improper strut (shock absorber) action.	Replace strut.
Shimmy, Shake or Vibration	1. Tire or wheel out of balance.	Balance wheels or replace tire and/or wheel.
	2. Loose wheel bearings.	Replace wheel bearing.
	3. Worn tie rod ends.	Replace tie rod end.
	4. Worn lower ball joints.	Replace front suspension arm.
	5. Excessive wheel runout.	Repair or replace wheel and/or tire.
	6. Blister or bump on tire.	Replace tire.
	7. Excessively loaded radial runout of tire/wheel assembly.	Replace tire or wheel.
	8. Disturbed front end alignment.	Check and adjust front end alignment.
	9. Loose or worn steering linkage.	Tighten or replace steering linkage.
	10. Loose steering gear case bolts.	Tighten case bolts.
Hard Steering	1. Bind in tie rod end ball studs or lower ball joints.	Replace tie rod end or front suspension arm.
	2. Disturbed front end alignment.	Check and adjust front end alignment.
	3. Rack and pinion adjustment.	Check and adjust rack & pinion torque.
	4. Tire not adequately inflated.	Inflate tires to proper pressure.
	5. Bind in steering column.	Repair or replace.

GENERAL DIAGNOSIS CHART C

Condition	Possible Cause	Correction
Too Much Play In Steering	1. Wheel bearings worn.	Replace.
	2. Rack and pinion attachments loose.	Tighten or repair.
	3. Rack and pinion adjustments.	Check and adjust rack & pinion torque.
	4. Worn steering shaft joints.	Replace joint.
	5. Worn tie rod ends or tie rod inside ball joints.	Replace tie rod end or tie rod.
	6. Worn lower ball joints.	Replace front suspension control arm.
Poor Returnability	1. Bind in tie rod end ball studs.	Replace tie rod end.
	2. Bind in ball joints.	Replace.
	3. Bind in steering column.	Repair or replace.
	4. Poorly lubricated rack and pinion.	Check, repair or lubricate rack & pinion.
	5. Disturbed front end alignment.	Check and adjust front end alignment.
	6. Rack and pinion adjustment.	Check and adjust rack & pinion torque.
	7. Tires not adequately inflated.	Adjust tire pressure.
Rack and Pinion Noise (Rattle or Chuckle)	1. Rack and pinion attachments loose.	Tighten steering gear case mounting bolts.
	2. Worn rack bush.	Replace.
	3. Rack and pinion adjustment.	Check and adjust rack & pinion torque.
Abnormal Noise, Front End	1. Worn, sticky or loose tie rod ends, lower ball joints, tie rod inside ball joints or drive shaft joints.	Replace tie rod end, suspension arm, tie rod or drive shaft joint.
	2. Damaged struts or mountings.	Repair or replace.
	3. Worn suspension arm bushings.	Replace.
	4. Loose stabilizer bar.	Tighten bolts or nuts, replace bushes.
	5. Loose wheel nuts.	Tighten wheel nuts.
	6. Loose suspension bolts or nuts.	Tighten suspension bolts or nuts.
	7. Broken or otherwise damaged wheel bearings.	Replace.
	8. Broken suspension springs.	Replace.
	9. Poorly lubricated or worn strut bearings.	Lubricate or replace strut bearing.
	10. Worn or sticky stabilizer joints.	Replace.

GENERAL DIAGNOSIS CHART D

Condition	Possible Cause	Correction
Wander Or Poor Steering Stability	1. Mismatched or uneven tires.	Replace or inflate tires to proper pressure.
	2. Loose ball joints and tie rod ends.	Replace suspension arm or tie rod end.
	3. Faulty struts or mounting.	Replace strut or repair mounting.
	4. Loose stabilizer bar.	Tighten or replace stabilizer bar or bush.
	5. Broken or sagging springs.	Replace spring.
	6. Rack and pinion adjustment.	Check and adjust rack and pinion torque.
	7. Front end alignment.	Check and adjust front end alignment.
	8. Loose stabilizer joints.	Replace joint.
Erratic Steering When Braking	1. Worn wheel bearings.	Replace.
	2. Broken or sagging springs.	Replace coil spring.
	3. Leaking wheel cylinder or caliper.	Repair or replace wheel cylinder or caliper.
	4. Warped brake discs.	Replace.
	5. Badly worn brake shoe linings.	Replace.
	6. Drum is out of round in some brakes.	Replace brake drum.
	7. Wheel tires are inflated unequally.	Inflate tires to proper pressure.
	8. Defective wheel cylinders.	Repair or Replace wheel cylinder.
	9. Disturbed front end alignment.	Check and adjust front end alignment.
Low Or Uneven Trim Height Right-to-left trim height (H) difference should be within 15 mm (0.6 in) with curb weight.  * Same with rear side.	1. Broken or sagging springs.	Replace.
	2. Over loaded.	Check loading.
	3. Incorrect springs.	Replace.
Ride Too Soft	1. Faulty struts (shock absorbers).	Replace strut.
Suspension Bottoms	1. Overloaded.	Check loading.
	2. Faulty struts (shock absorbers).	Replace strut.
	3. Incorrect broken or sagging springs.	Replace.

GENERAL DIAGNOSIS CHART E

Condition	Possible Cause	Correction
Body Leans Or Sways In Corners	1. Loose stabilizer bar.	Tighten stabilizer bar bolts or nuts, or replace bushes or joint.
	2. Faulty struts (shock absorbers) or mounting.	Replace strut or tighten mounting.
	3. Broken or sagging springs.	Replace.
	4. Overloaded.	Check loading.
Cupped Tires	1. Front Struts defective.	Replace.
	2. Worn wheel bearings.	Replace.
	3. Excessive tire or wheel run-out.	Replace tire or wheel disc.
	4. Worn ball joints.	Replace front suspension arm.
	5. Tire out of balance.	Adjust tire balance.

TIRE DIAGNOSIS

IRREGULAR AND/OR PREMATURE WEAR

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

If the following conditions are noted, rotation is necessary:

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

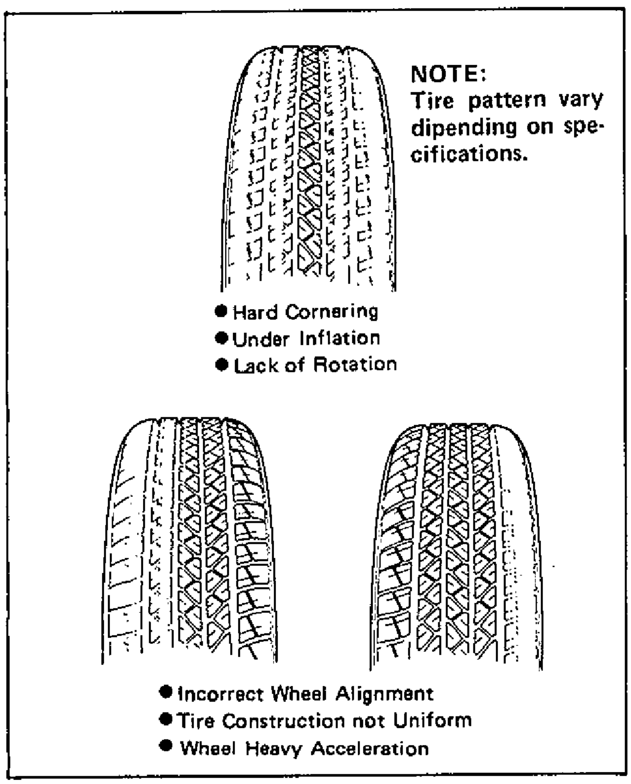


Fig. 3-1 Tire Wear Diagnosis

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

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

WEAR INDICATORS (FIG. 3-2)

Original equipment tires have built-in tread wear indicators to show when they need replacement. These indicators will appear as 12 mm (0.47 inch) wide bands when the tire tread depth becomes 1.6 mm (0.063 inch). When the indicators appear in 3 or more grooves at 6 locations, tire replacement is recommended.

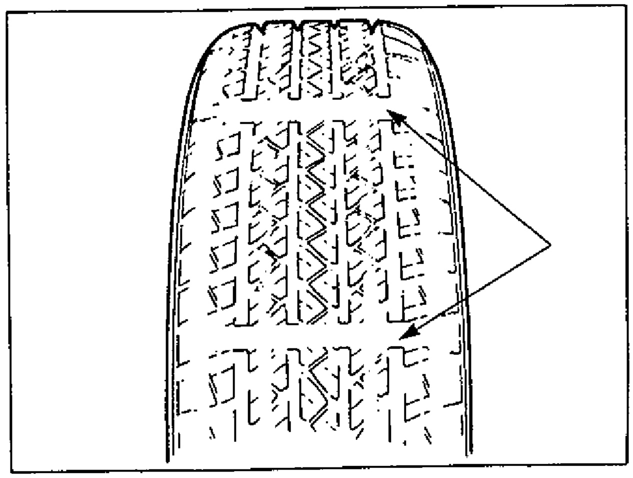


Fig. 3-2 Tire Wear Indicator

RADIAL TIRE WADDLE (FIG. 3-3)

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

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

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

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

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

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

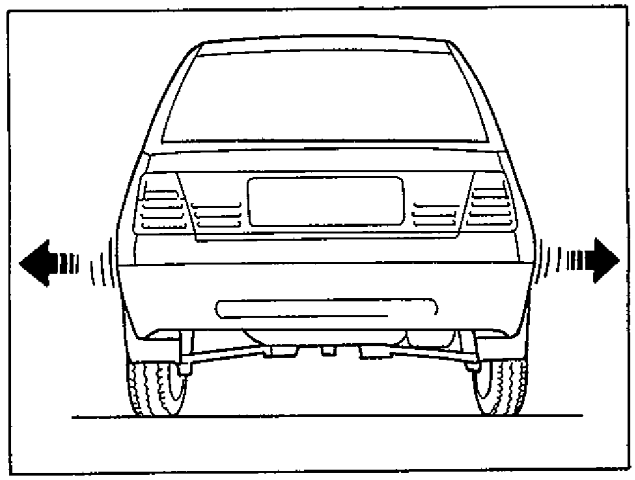


Fig. 3-3 Radial Tire Waddle

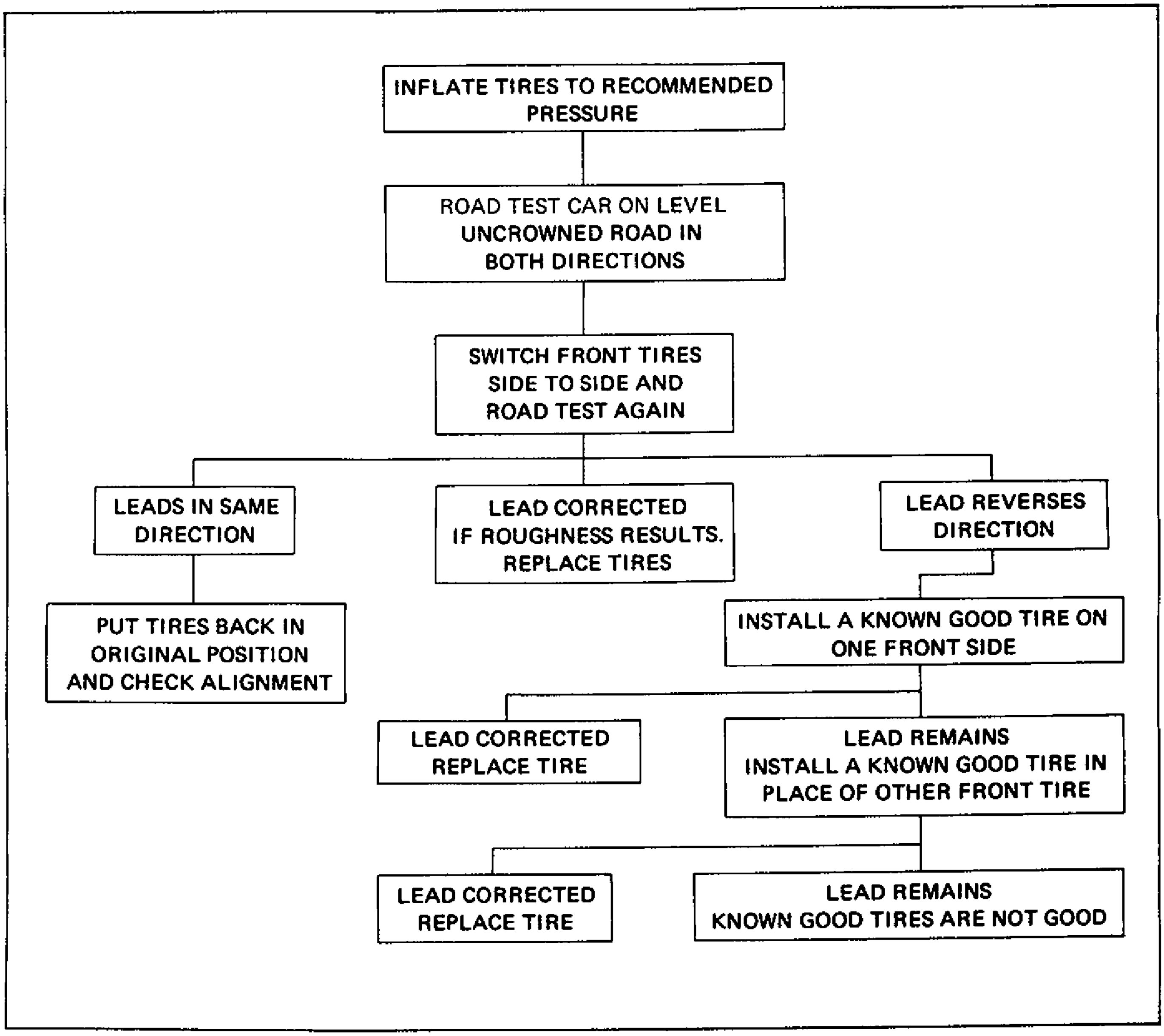


Fig. 3-4 Lead Diagnosis

RADIAL TIRE LEAD

"Lead" is the deviation of the car from a straight path on a level road even with no pressure on the steering wheel.

Lead is usually caused by:

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

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

The procedure in Fig. 3-4 should be used to make sure that front alignment is not mistaken for tire lead.

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

VIBRATION DIAGNOSIS

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

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

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

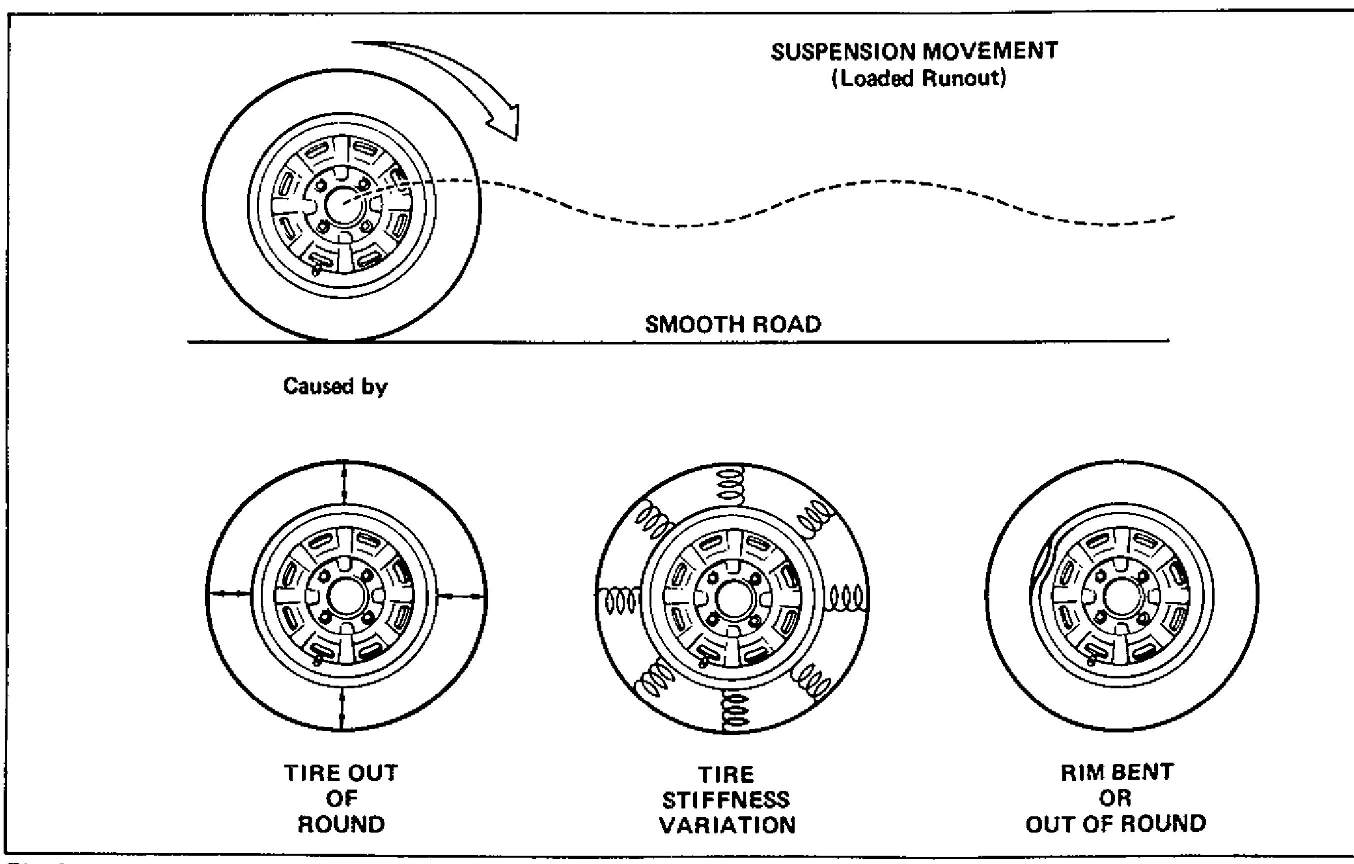


Fig. 3-5 Vibration

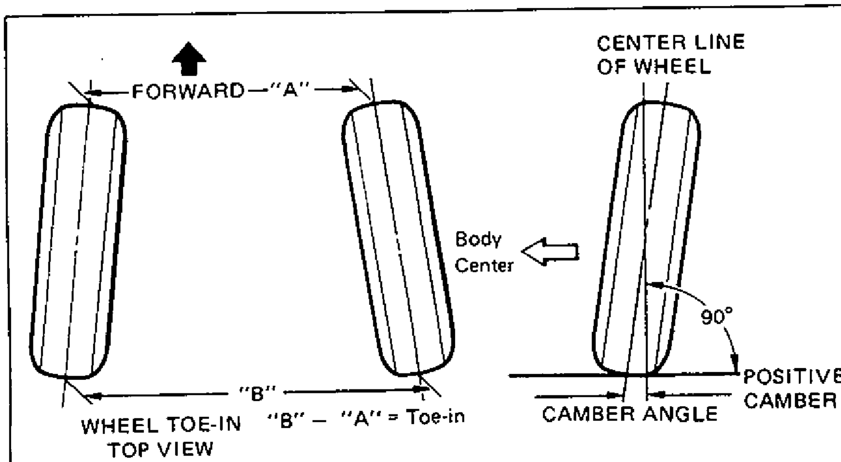
SECTION 3A

FRONT END ALIGNMENT

CONTENTS

DIAGNOSIS 3-1
GENERAL DESCRIPTION 3A-1
Toe Setting — Figure 3A-1 .... 3A-1
Camber — Figure 3A-1 .... 3A-1
Preliminary Checks Prior to Adjusting Front Alignment 3A-2
Toe Adjustment 3A-2
Camber and Caster Adjustment 3A-2
Steering Angle 3A-3

GENERAL DESCRIPTION



Alignment service data	
Toe-in	−2 ~ +2 mm (−0.079 ~ +0.078 in.)
Camber	0° ± 1°
Caster	3° ± 2° (16 mm 0.65 in.)
Kingpin inclination	12° 55′ ± 3°

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

Fig. 3A-1 Toe-in and Camber

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

TOE SETTING-FIGURE 3A-1

Toe is the turning in or out of the front wheels. The purpose of a toe specification is to ensure parallel rolling of the front wheels (Excessive toe-in or toe-out may increase tire wear).
Amount of toe can be obtained by subtracting "A" from "B" as shown in Fig. 3A-1 and therefore is given in mm (in.).

CAMBER-FIGURE 3A-1

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

PRELIMINARY CHECKS PRIOR TO ADJUSTING FRONT ALIGNMENT

Steering and vibration complaints are not always the result of improper alignment. An additional item to be checked is possibility of tire lead due to worn or improperly manufactured tires. "Lead" is the deviation of the car from a straight path on a level road without hand pressure on the steering wheel. Section 3 of this manual contains a procedure for determining presence of a tire lead problem.

Before making any adjustment affecting toe setting, following checks and inspections should be made to insure correctness of alignment readings and alignment adjustments:

1) Check all tires for proper inflation pressures and approximately the same tread wear.
2) Check ball joints for looseness. Check tie rod ends; if excessive looseness in noted, it must be corrected before adjusting.
3) Check wheels and tires for run-out.
4) Check car trim height. If it is out of limit and correction is necessary, it must be made before adjusting toe (Refer to p. 3-4).
5) Check suspension arms for looseness.
6) Check for loose or missing stabilizer bar attachment.
7) Consideration must be given to excess loads, such as tool boxes. If this excess load is normally carried in car, it should remain there during alignment checks.
8) Consider the condition of the equipment being used to check alignment and follow its manufacturer's instructions.
9) Whatever equipment is used to check alignment, car must be placed on level surface.

TOE ADJUSTMENT

Toe is adjusted by changing tie rod length. Loosen right and left tie rod end lock nuts first and then rotate right and left tie rods by the same amount to align toe-in to specification. In this adjustment, right and left tie rods should become equal in length ("A" in Fig. 3A-2).

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

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

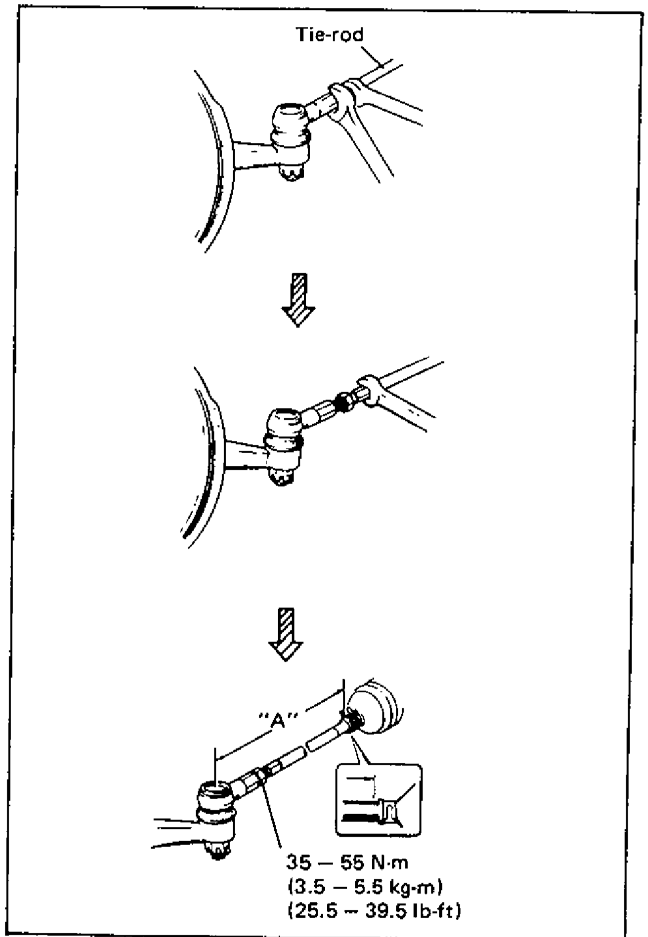


Fig. 3A-2 Toe-Adjustment

CAMBER AND CASTER ADJUSTMENT

Should camber or caster be found out of specifications upon inspection, locate its cause first. If it is in damaged, loose, bent, dented or worn suspension parts, they should be replaced. If it is in car body, repair it so as to attain specifications. To prevent possible incorrect reading of camber or caster, car front end must be moved up and down a few times before inspection.

STEERING ANGLE

Steering angle	inside	38°
	outside	32°

When tie rod or tie rod end was replaced, check toe and then also steering angle with turning radius gauge.
If steering angle is not correct, check if right and left tie rods are equal in length ("A" in Fig. 3A-3).

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

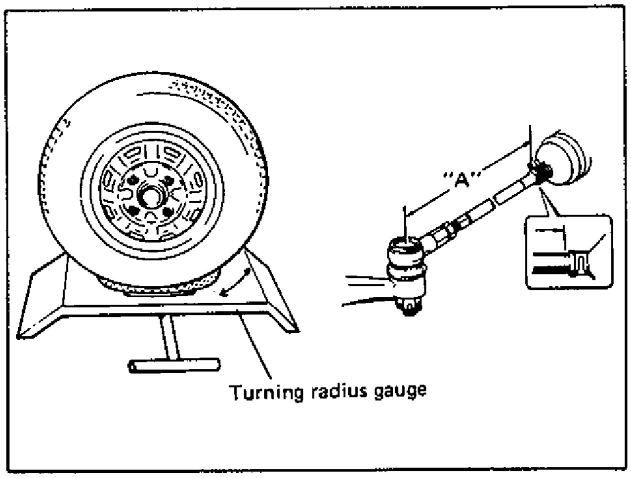


Fig. 3A-3 Steering Angle Inspection

Referrence information:
SIDE SLIP:
For inspecting front wheel side slip with side slip tester:
Side slip limit: Less than 3 mm/m
(Less than 0.118 in/3 ft)

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

SECTION 3B

MANUAL RACK AND PINION

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

CONTENTS

DIAGNOSIS 3-1
GENERAL DESCRIPTION 3B- 2
ON-CAR SERVICE 3B- 3
Lubrication 3B- 3
1. Remove and Install Tie Rod End .. 3B- 4
2. Remove and Install Manual Rack and Pinion Assembly (Steering Gear Case) 3B- 5
3. Remove and Install Rack Boot/Tie Rod 3B- 7
4. Remove and Install Steering Rack Plunger 3B- 9
5. Remove and Install Steering Pinion 3B-10
6. Remove and Install Steering Rack 3B-11
7. Remove and Install Pinion Bearing 3B-12
8. Remove and Install Rack Bushing 3B-13
RACK AND PINION INSPECTION 3B-14
RECOMMENDED TORQUE SPECIFICATIONS 3B-16
REQUIRED SERVICE MATERIAL ... 3B-16
SPECIAL TOOLS 3B-17

GENERAL DESCRIPTION

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

NOTE:
Although the figure below show only the left-hand side steering car, the same work procedure and data apply to the right-hand side steering car.

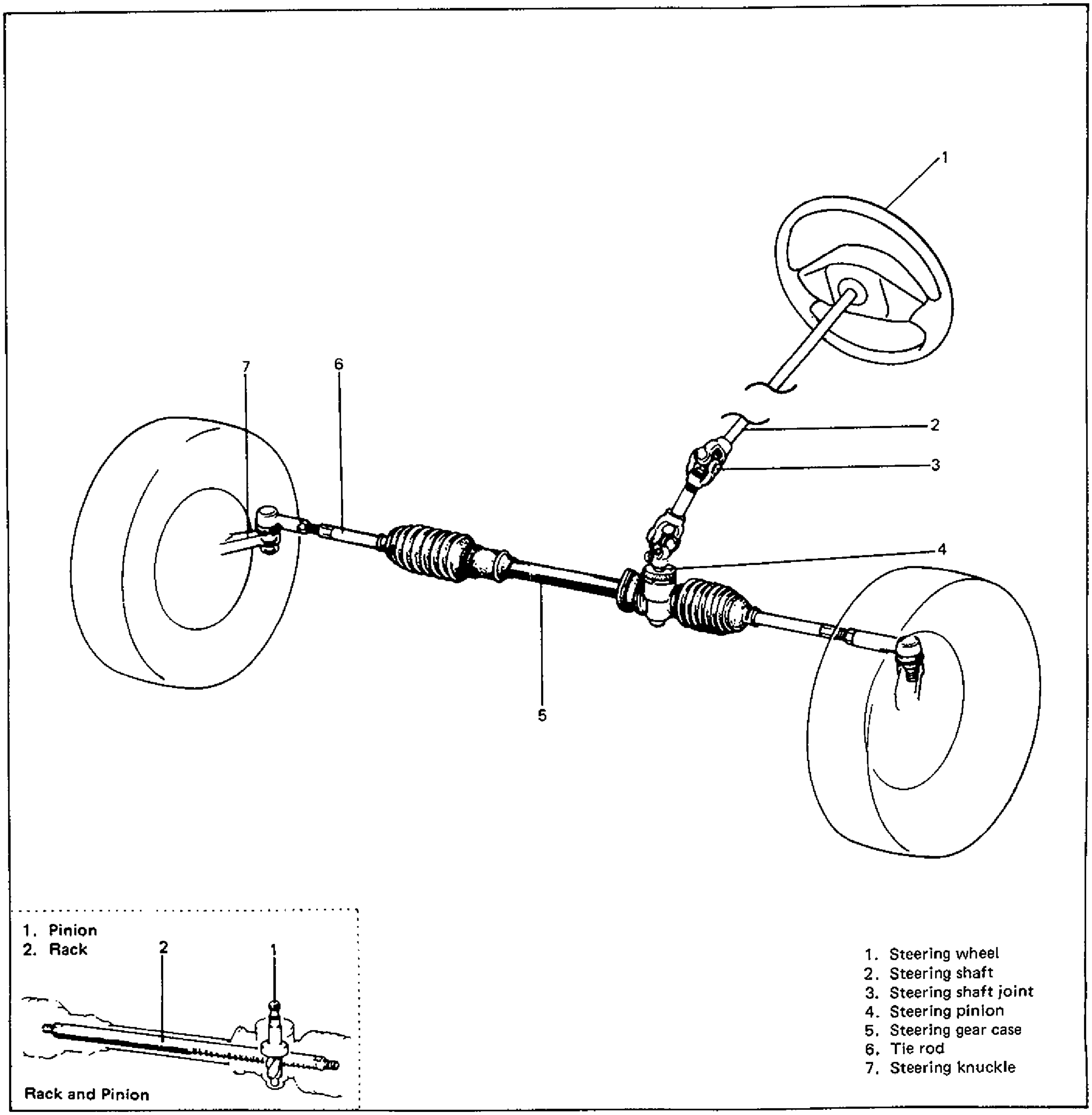


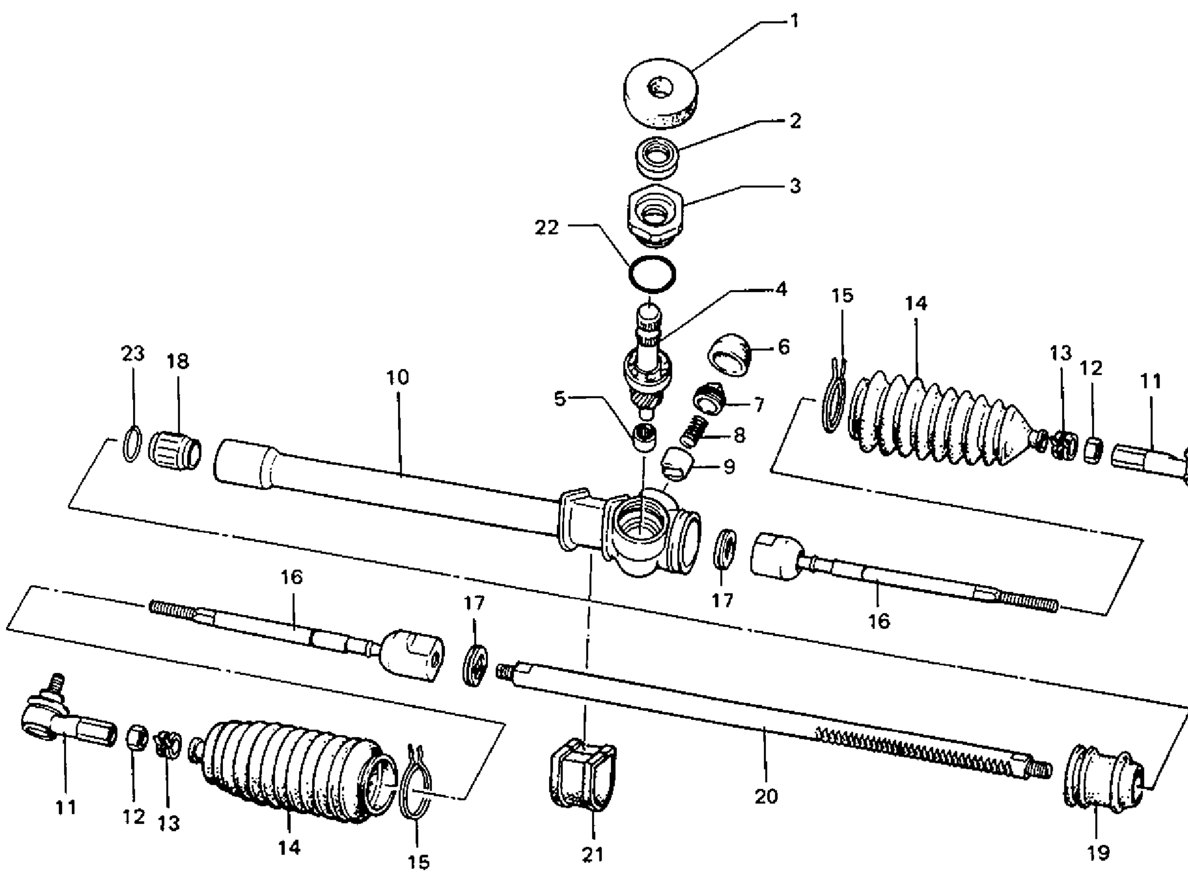
Fig. 3B-1 General Description of Steering System

ON-CAR SERVICE

LUBRICATION

When innner parts of the steering gear case were disassembled, they should be washed clean before reassembly. It is recommended to use the grease as given at the right where grease application is indicated in the text.

*SUZUKI SUPER GREASE (E) 99000-25050, or Lithium grease (applicable for −40°C ~ 130°C or −40°F ~ 266°F)



1. Steering gear case packing
2. Steering gear case oil seal
3. Pinion bearing plug
4. Steering pinion
5. Steering pinion needle bearing
6. Rack damper screw cap
7. Rack damper screw
8. Rack plunger spring
9. Steering rack plunger
10. Steering rack housing & gear case
11. Tie-rod end
12. Tie-rod end lock nut
13. Rack boot clip
14. Boot
15. Wire
16. Steering tie-rod
17. Tie-rod lock washer
18. Steering rack bushing
19. Steering rack side mount
20. Steering rack
21. Steering pinion side mount
22. Gear case seal
23. Snap ring

Fig. 3B-2 Exploded View of Manual Rack and Pinion

1. REMOVE AND INSTALL TIE ROD END

REMOVAL

1) Hoist car and remove wheel.
2) Remove split pin and tie rod end castle nut from steering knuckle.

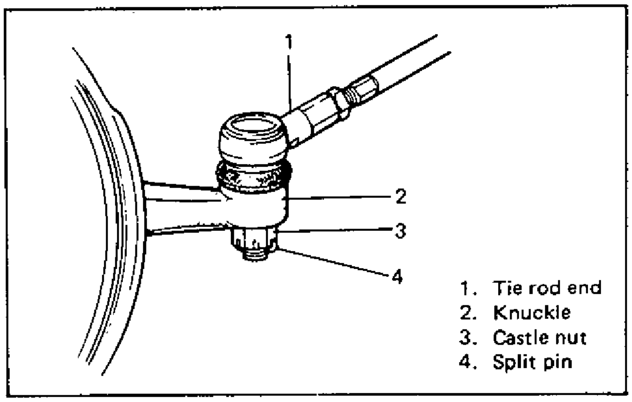


Fig. 3B-3

3) Disconnect tie rod end from knuckle, using special tool (A).

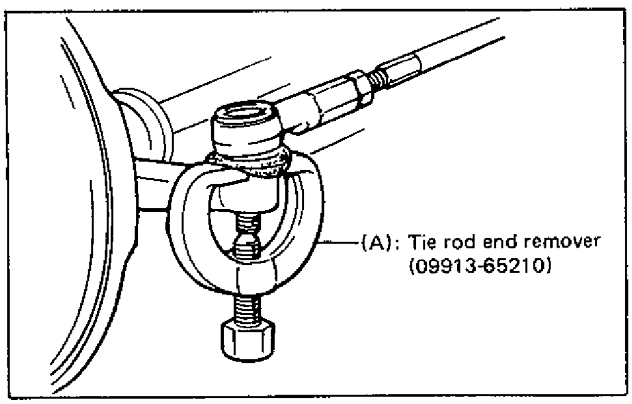


Fig. 3B-4

4) For ease of adjustment after installation, make marking of tie rod end lock nut position on tie rod thread. Then loosen lock nut and remove tie rod end from tie rod.

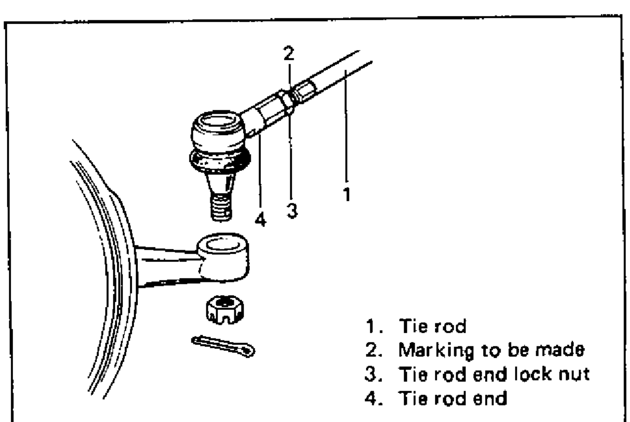


Fig. 3B-5

INSTALLATION

1) Install tie rod end lock nut and tie rod end to tie rod. Align lock nut with mark on tie rod thread.
2) Connect tie rod end to knuckle. Tighten castle nut until holes for split pin are aligned, but only within specified torque.
3) Bend split pin as shown below.
4) Inspect for proper toe (Refer to FRONT END ALIGNMENT).
5) After confirming proper toe, tighten tie rod end lock nut to specified torque.
6) Tighten wheel to specified torque and lower hoist.

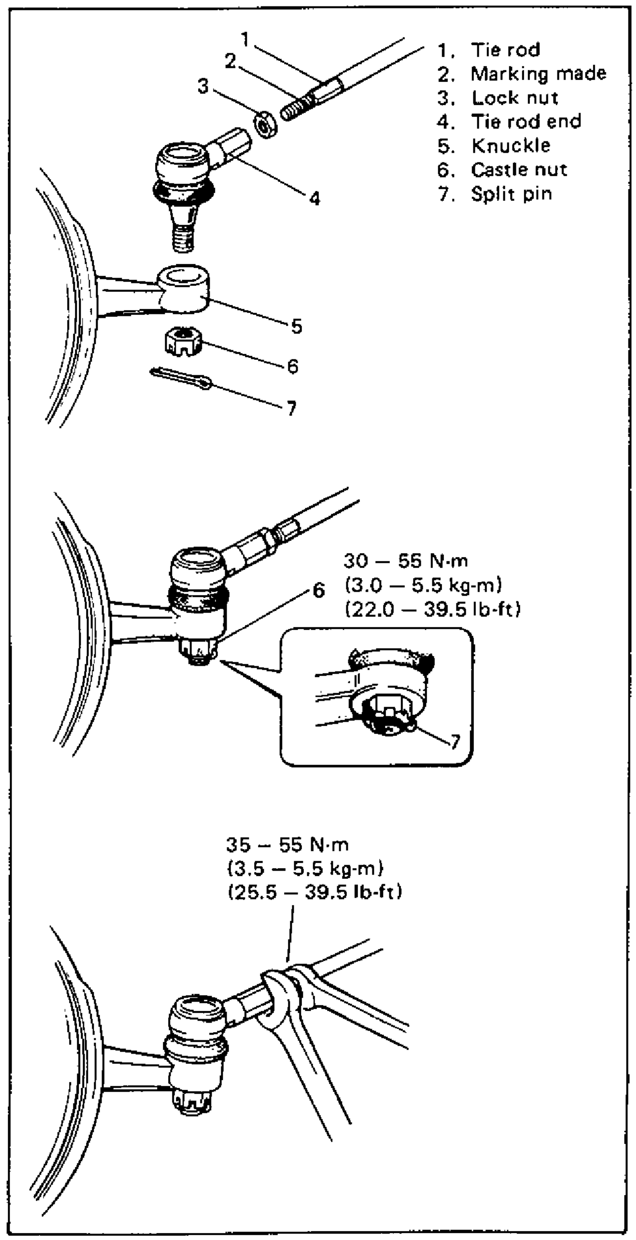


Fig. 3B-6

2. REMOVE AND INSTALL MANUAL RACK AND PINION ASSEMBLY (STEERING GEAR CASE)

REMOVAL

1) Slide driver's seat as far back as possible.
2) Pull off front part of floor mat on driver's side and remove steering shaft joint cover.
3) For ease of installation, loosen steering shaft upper joint bolt but don't remove.
4) Remove steering shaft lower joint bolt and disconnect lower joint from pinion.

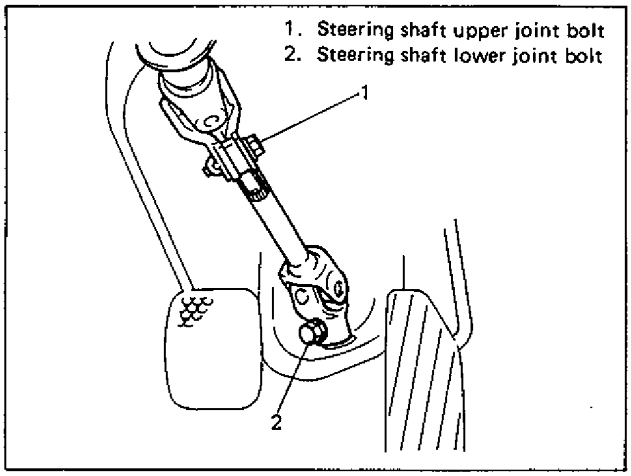


Fig. 3B-7

5) Hoist car and remove both wheels.
6) Remove split pins and tie rod castle nuts from both knuckles.

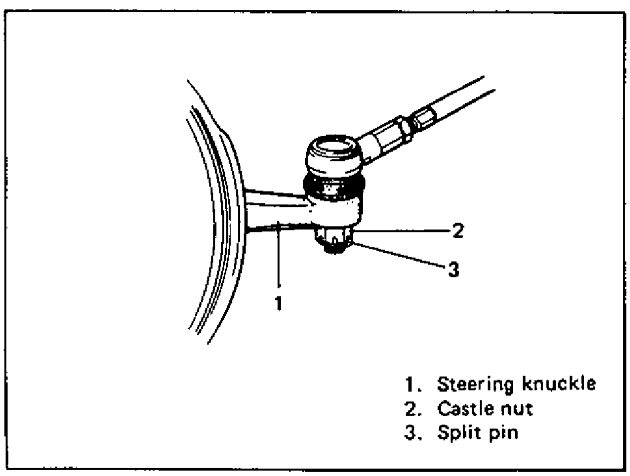


Fig. 3B-8

7) Disconnect both tie rod ends from knuckles, using special tool (A).

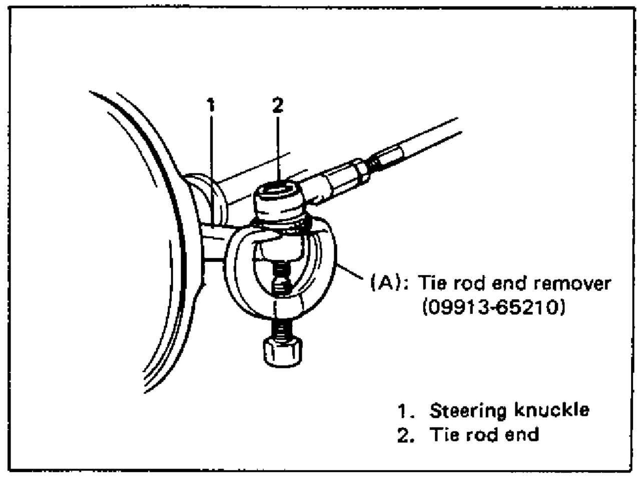


Fig. 3B-9

8) Remove steering gear case mount bolts, gear case brackets and then gear case.

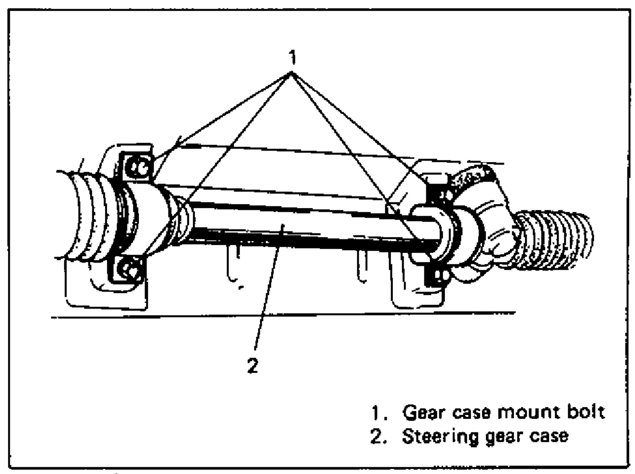


Fig. 3B-10

INSTALLATION

1) Mount steering gear case to body and tighten gear case mount bolts to specified torque.

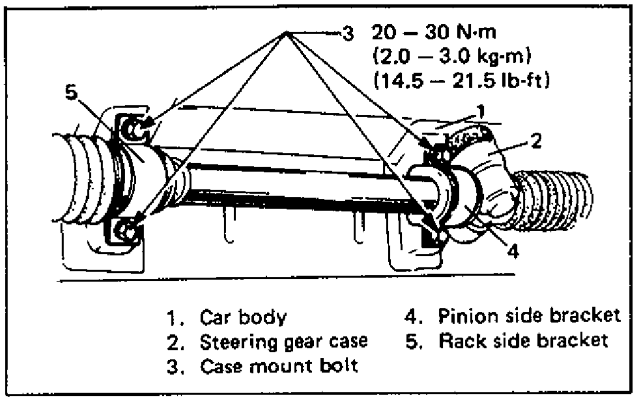


Fig. 3B-11

2) Install tie rod ends to knuckles (R & L). Tighten each castle nut until holes for split pin align but within specified torque and then bend split pin as shown.

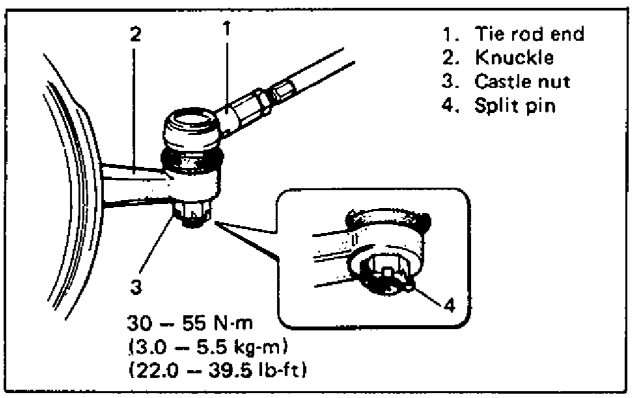


Fig. 3B-12

3) Be sure that steering wheel and brake discs (R & L) are all straightahead driving state and then insert steering lower joint into steering pinion shaft.
4) Tighten steering shaft joint bolts to specified torque (Lower side first and then upper side).

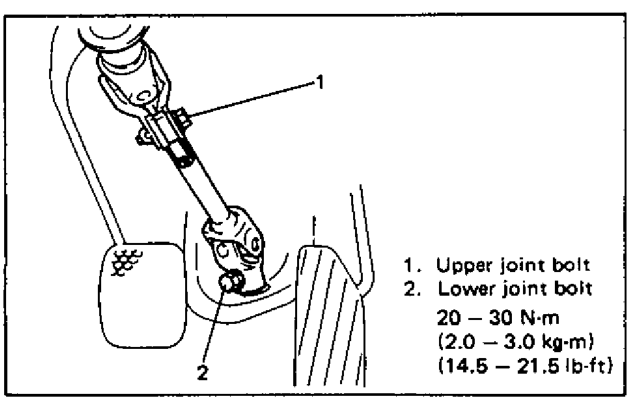


Fig. 3B-13

5) Reinstalll cover removed previously to steering shaft joint.

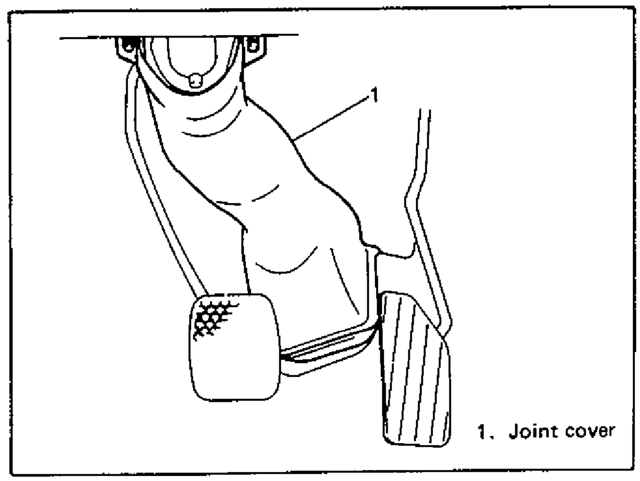


Fig. 3B-14

6) Put back floor mat as it was.
7) Install both wheels and tighten wheel nuts to specified torque.

N·m	kg-m	lb-ft
40 – 70	4.0 – 7.0	29.0 – 50.5

8) Lower hoist.
9) Check toe setting. Adjust as required (Refer FRONT END ALIGNMENT).
10) Tighten both tie rod end lock nuts to specified torque.

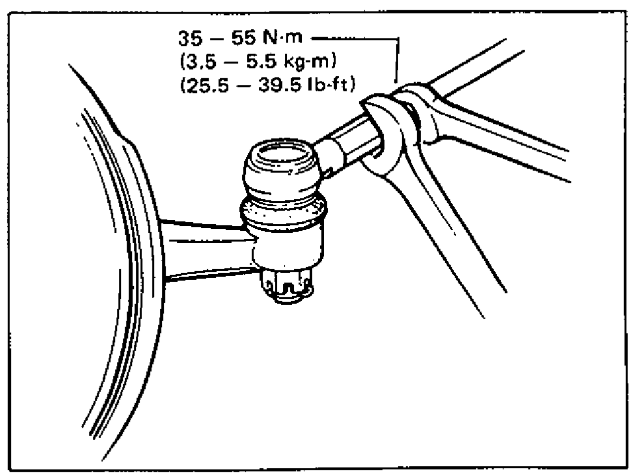


Fig. 3B-15

3. REMOVE AND INSTALL RACK BOOT/TIE ROD

REMOVAL

1) Remove steering gear case by performing Steps 1) – 8) in Item 2 REMOVAL of this section.
2) For ease of adjustment after installation, make marking of tie rod end lock nut position on tie rod thread.

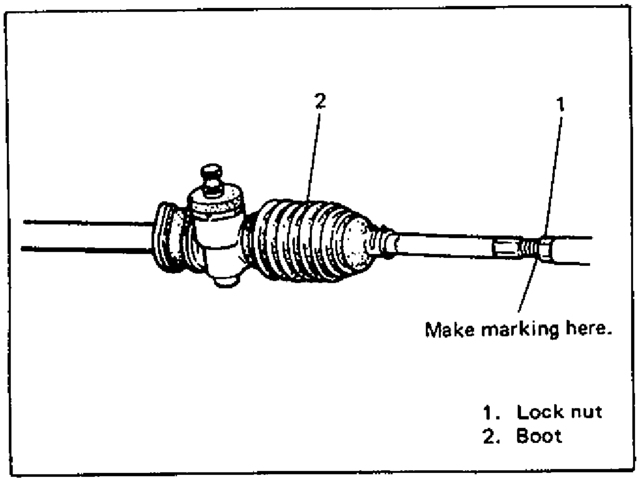


Fig. 3B-16

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

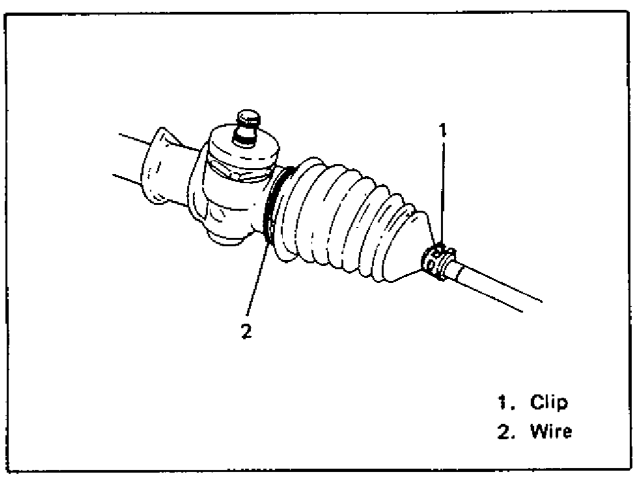


Fig. 3B-17

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

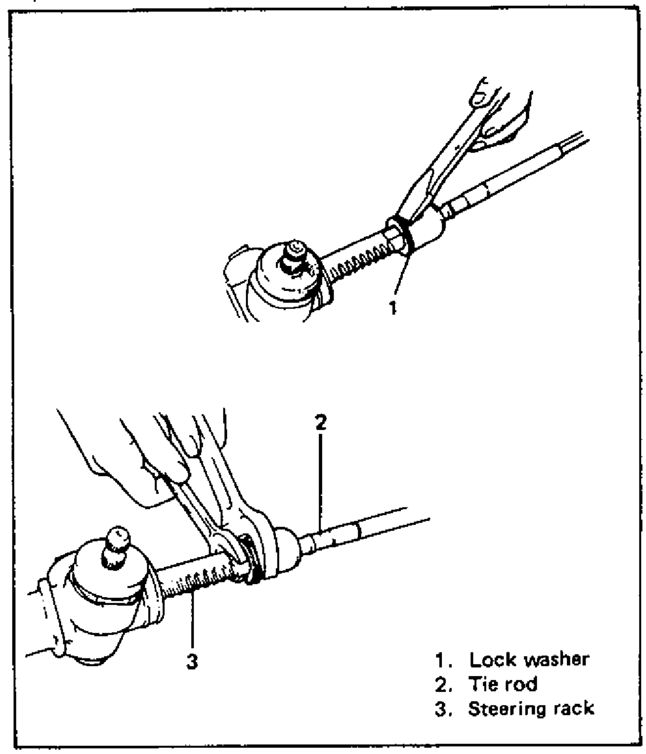


Fig. 3B-18

INSTALLATION

1) Install tie rod lock washer and tie rod to rack. Align straight part "A" of washer with flat part "B" of rack.

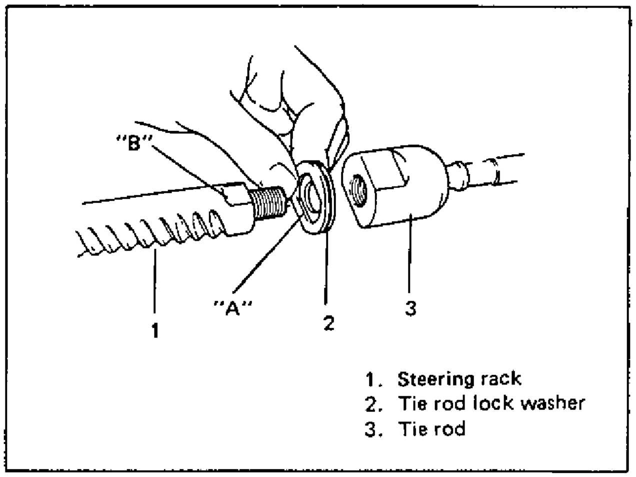


Fig. 3B-19

2) Tighten tie rod inside ball nut to specified torque.

N·m	kg-m	lb-ft
70 – 100	7.0 – 10.0	51.0 – 72.0

3) Bend lock washer to tie rod side as shown below.

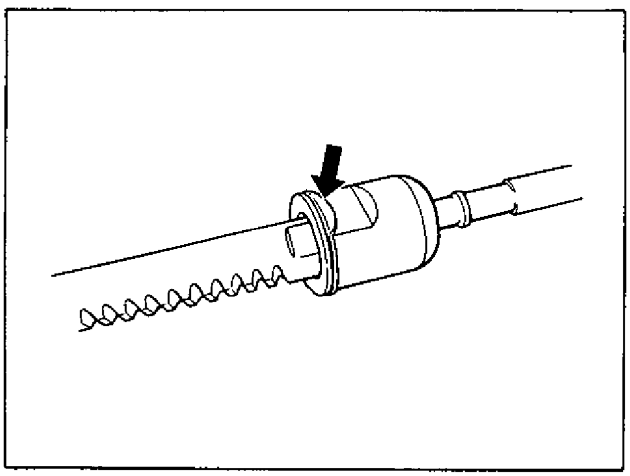


Fig. 3B-20

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

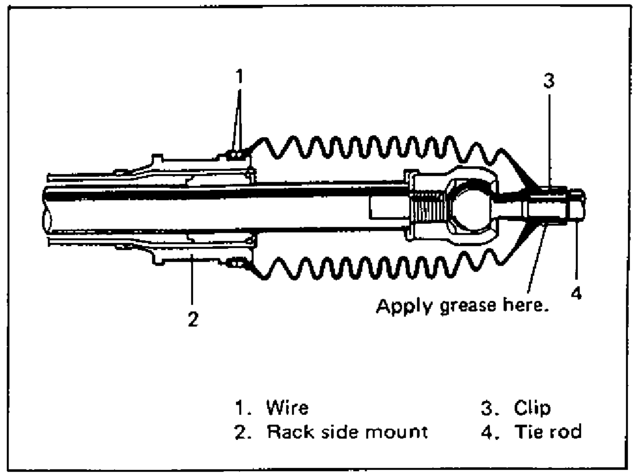


Fig. 3B-21

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

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

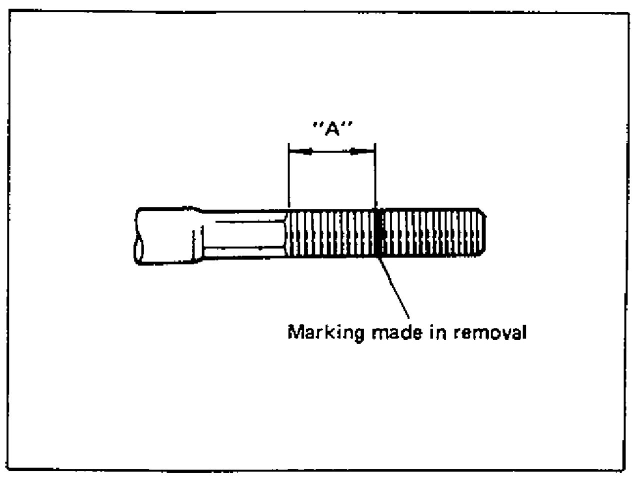


Fig. 3B-22

6) For installation procedures following the above, use Steps 1) – 10), INSTALLATION of STEERING GEAR CASE on p. 3B-6.

4. REMOVE AND INSTALL STEERING RACK PLUNGER

REMOVAL

1) Remove parts as shown below.

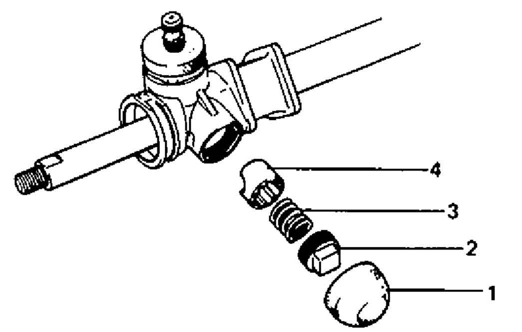


Fig. 3B-23

INSTALLATION

1) Apply grease lightly to sliding part of plunger against rack.
2) Install parts as shown.
3) After tightening rack damper screw to the tightest point, turn it back by 0 – 90° and check for rotation torque of pinion.

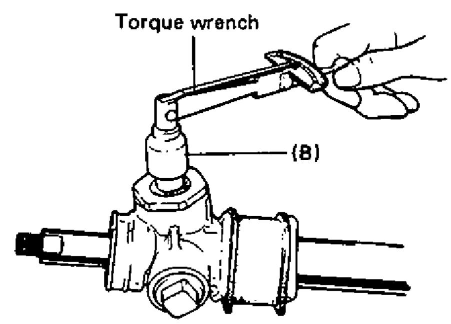


Fig. 3B-24

Also, check if rack as a whole moves smoothly.

Pinion torque:

N·m	kg-m	lb-ft
0.8 – 1.3	0.08 – 0.13	0.58 – 0.94

4) After adjustment, put rack damper screw cap as deeply as possible.

5. REMOVE AND INSTALL STEERING PINION

REMOVAL

1) Remove rack plunger as shown Item 4.
2) Remove gear case packing.
3) Remove bearing plug with special tool (C).

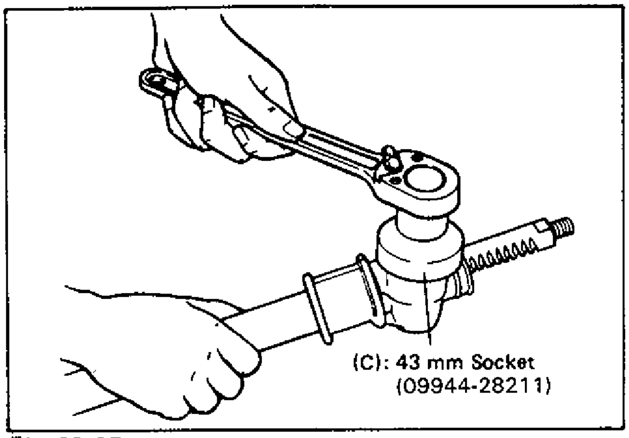


Fig. 3B-25

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

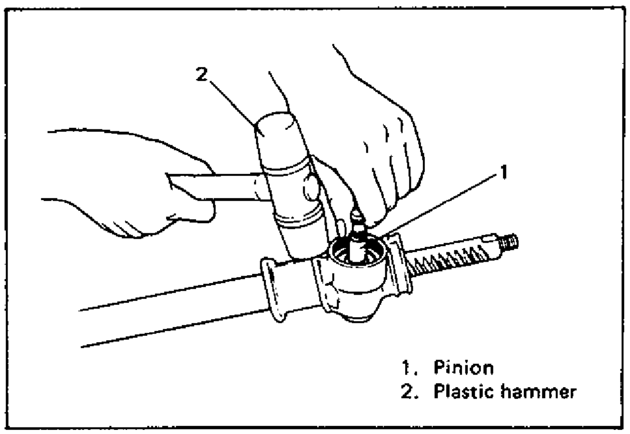


Fig. 3B-26

5) Remove pinion assembly.

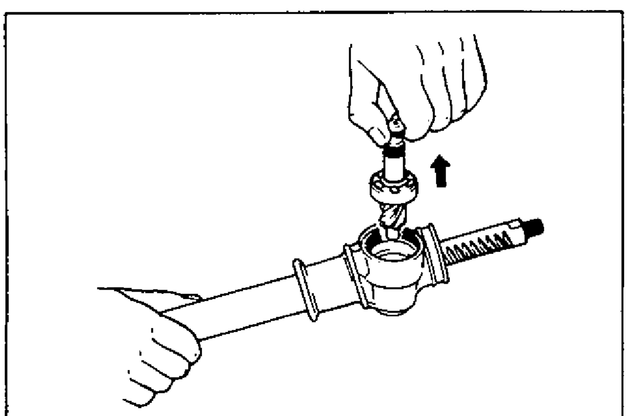


Fig. 3B-27

INSTALLATION

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

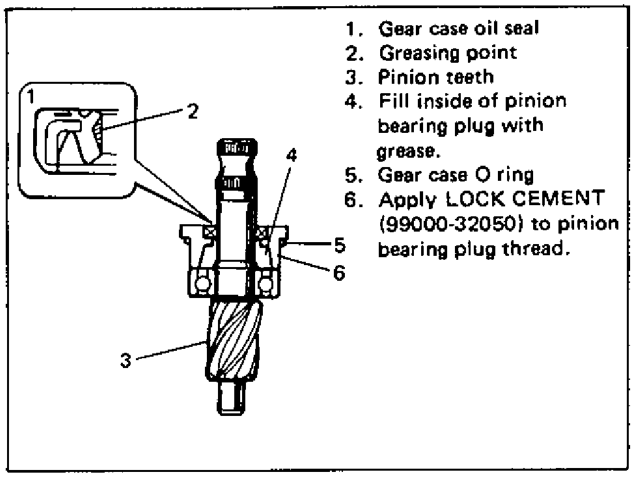


Fig. 3B-28

2) Install pinion assembly.
3) Tighten pinion bearing plug to specified torque.

N·m	kg-m	lb-ft
80 – 110	8.0 – 11.0	58.0 – 79.5

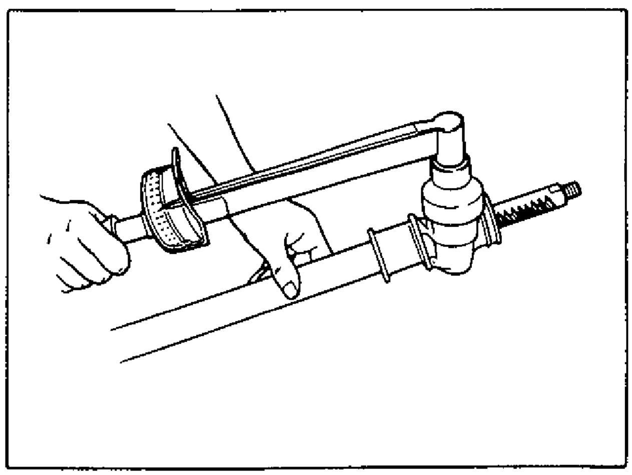


Fig. 3B-29

4) Install gear case packing.
5) Install rack plunger as described in Item 4.

6. REMOVE AND INSTALL STEERING RACK

REMOVAL

1) Remove boot wires and clips.

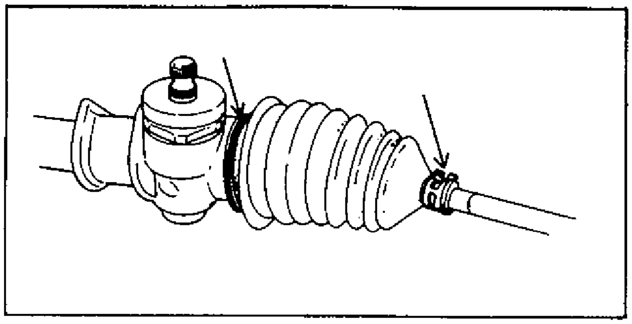


Fig. 3B-30

2) Move both boots toward tie rod end.
3) Unbend bent part of tie rod lock washers and remove tie rods from right and left sides of steering rack.
4) Mark left and right tie rods accordingly.

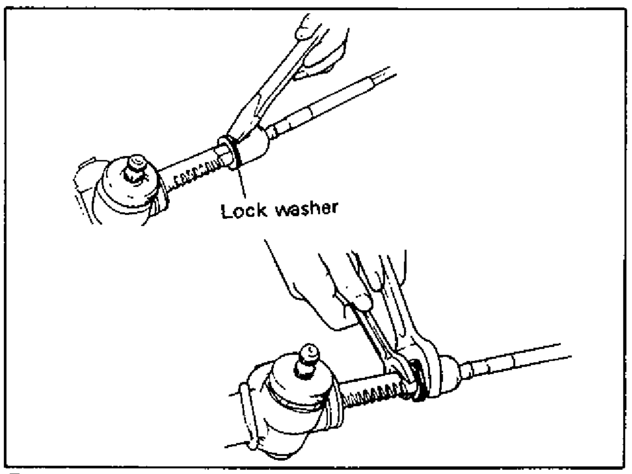


Fig. 3B-31

5) Remove rack plunger and pinion assembly from gear case by performing Steps 1) – 5) in Item 5 STEERING PINION REMOVAL of this section.
6) Remove rack from gear case. Direction for rack removal is as shown below.

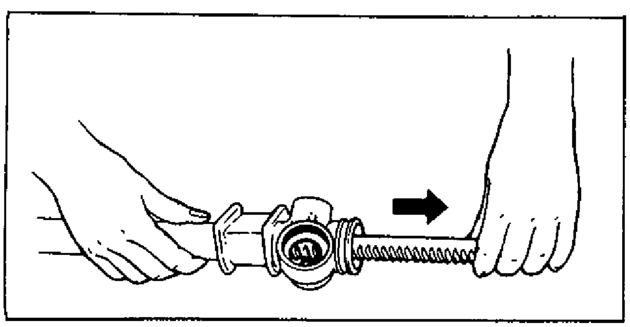


Fig. 3B-32

INSTALLATION

1) Apply grease to entire teeth surface of rack and its periphery.
2) Slide rack into steering gear case in the direction as shown below.

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

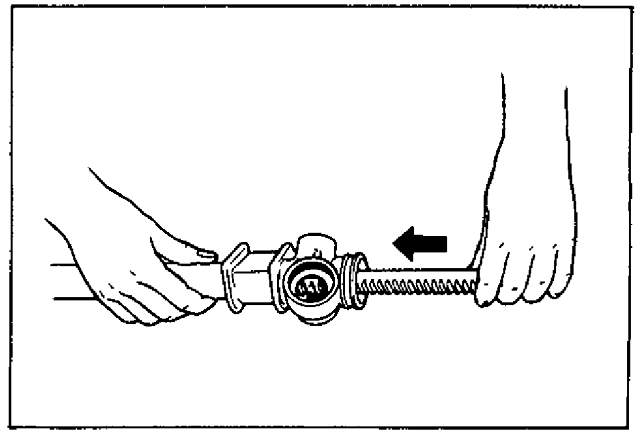


Fig. 3B-33

3) Install pinion assembly to gear case by performing Steps 1) – 4) in Item 5 STEERING PINION INSTALLATION of this section.
4) Perform Steps 1) – 4) in Item 4 STEERING RACK PLUNGER INSTALLATION of this section.
5) Before installing boot to steering rack housing, make sure that rack side mount is positioned as shown below. Install tie rods to rack by performing Steps 1) – 6) in Item 3 RACK BOOT/TIE ROD INSTALLATION of this section.

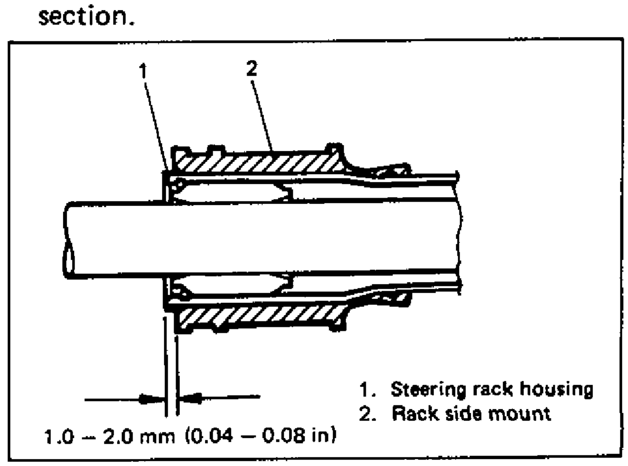


Fig. 3B-34

7. REMOVE AND INSTALL PINION BEARING

REMOVAL

1) Remove rack from steering gear case, referring to Item 6 STEERING RACK REMOVAL of this section.
2) Pull out pinion bearing from gear case with special tools (D and E) as shown.

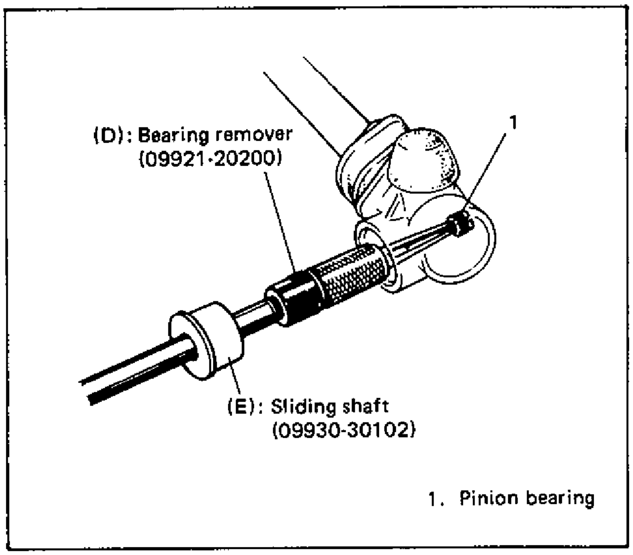


Fig. 3B-35

INSTALLATION

1) Apply grease to rollers of pinion bearing.
2) Press-fit pinion bearing into gear case with special tool (F) as shown.
   After press-fitting, make sure that bearing rollers are installed properly.

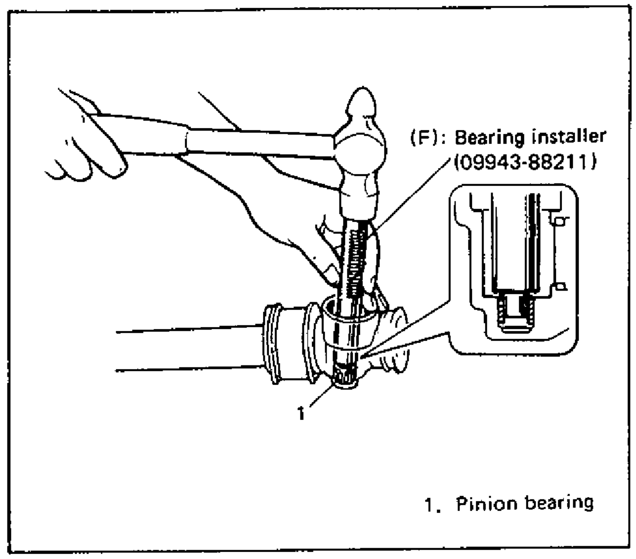


Fig. 3B-36

3) Follow Steps 1) – 5) in Item 6 STEERING RACK INSTALLATION of this section to complete insallation.

8. REMOVE AND INSTALL RACK BUSHING

REMOVAL

1) Remove rack from steering gear case, referring to Item 6 STEERING RACK REMOVAL of this section.

NOTE:

When removing rack bushing, be careful not to pull out bushing by holding gear case in a vise. Or housing (pipe) may come off gear case. For this work, be sure to use the below specified special tool.

2) Remove snap ring.

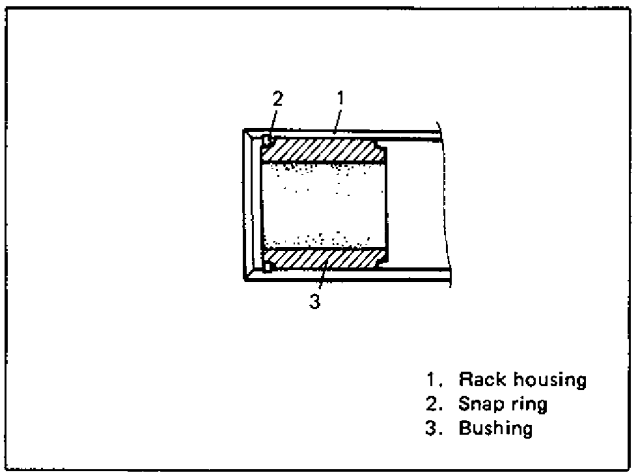


Fig. 3B-37

3) Pull out bushing from rack housing with special tool (G) as shown.

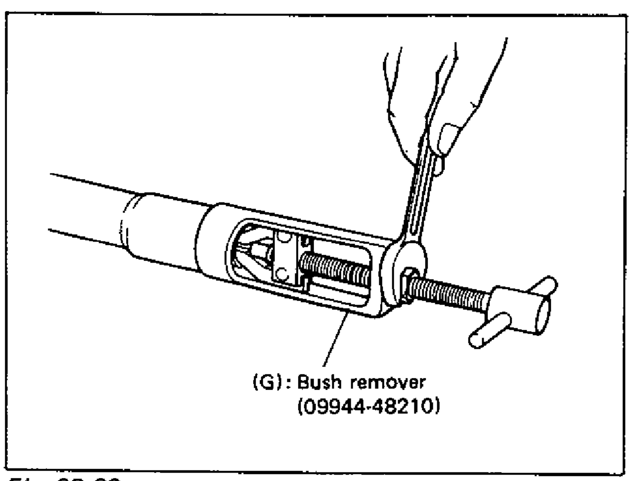


Fig. 3B-38

INSTALLATION

1) Apply grease lightly to entire inner surface of bushing.
2) Press-fit bushing as far into rack housing as shown below by using special tool (H).

> **CAUTION:**
> **Inside of bushing is coated with special coating. As it is damageable, be sure to use specail tool and special care not to cause damage to inside of bushing when press-fitting it.**

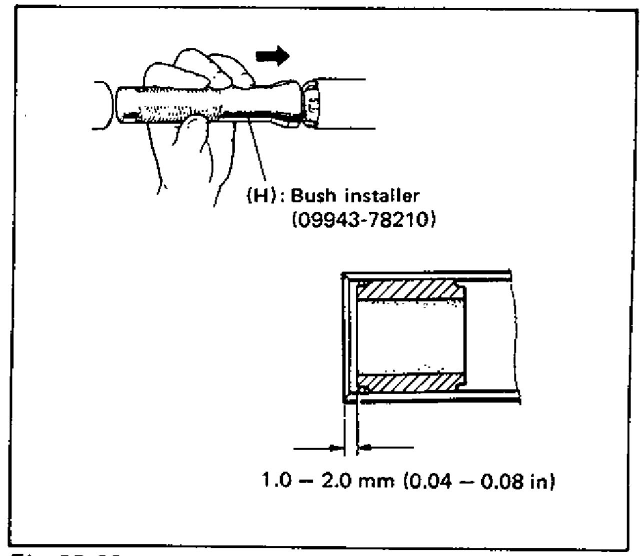


Fig. 3B-39

3) Install snap ring.
4) Follow Steps 1 – 5) in Item 6 STEERING RACK INSTALLATION of this section to complete installation.

RACK AND PINION INSPECTION

STEERING RACK BOOTS

Hoist car.

Inspect each boot for tear. A torn boot allows entry of dust and water which can cause wear to steering rack and pinion to produce noise as well as rust to result in malfunction of steering system.
If even a small tear is noted, replace with new one.

Boots should be visually inspected for any damage and tear during every periodical inspection at specified intervals and whenever car is hoisted for any other purpose.

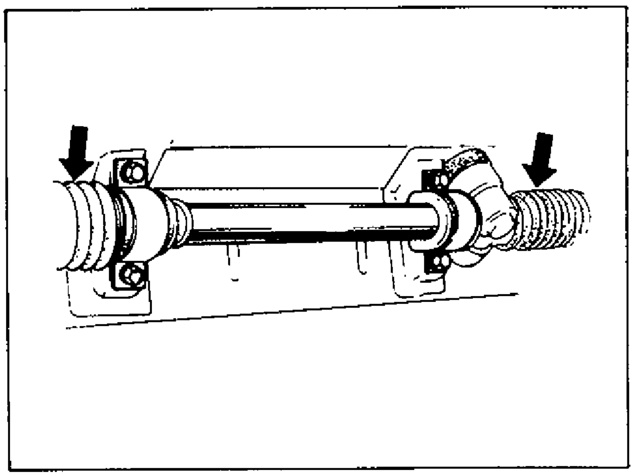


Fig. 3B-40

TIE ROD END BOOTS

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

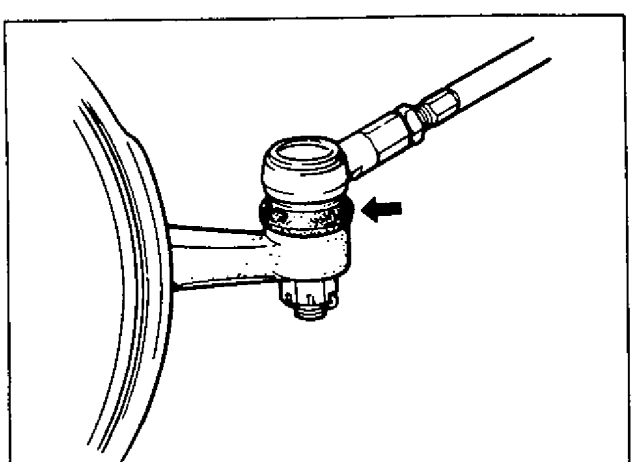


Fig. 3B-41

STEERING SHAFT JOINT

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

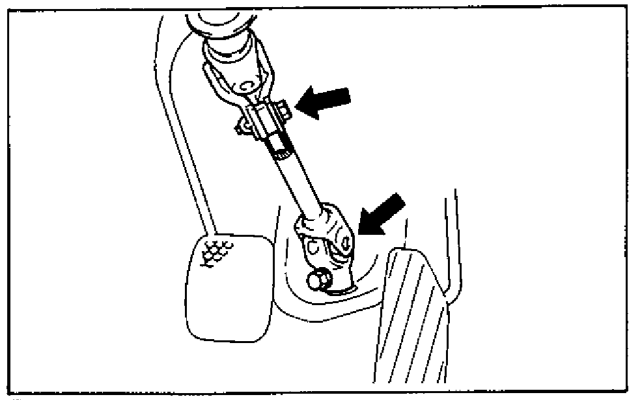


Fig. 3B-42

TIE ROD END

1) Inspect for play in ball joint.
2) Inspect for play in rack end ball joint.
   In either case, if found defective, replace.

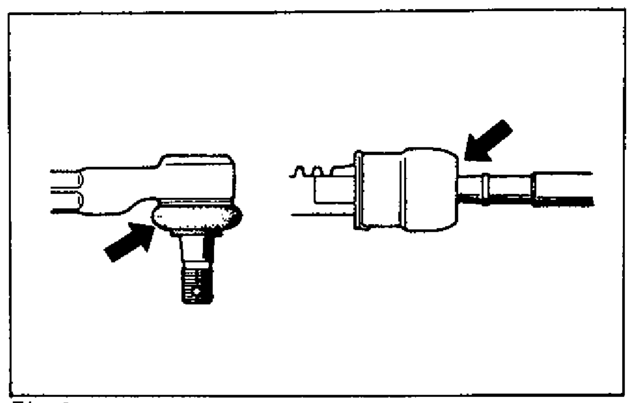


Fig. 3B-43

RACK PLUNGER

1) Inspect rack plunger for wear or damage.
2) Inspect rack plunger spring for deterioration.
   In either case, if found defective, replace.

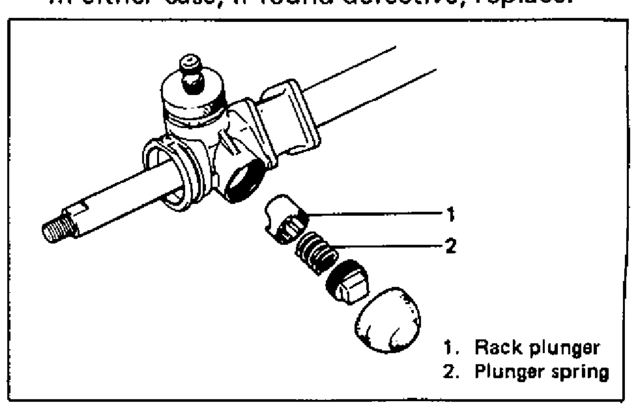


Fig. 3B-44

STEERING PINION

1) Inspect pinion teeth surface for wear or damage.
2) Inspect oil seal for damage.
3) Inspect gear case packing for damage.
   Replace any part found defective.

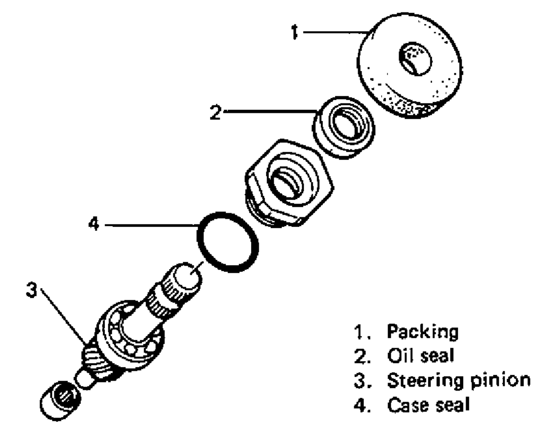


Fig. 3B-45

STEERING PINION BEARING

Check rotation condition of bearing and inspect for wear.
If found defective, replace.

STEERING RACK

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

Limit of rack deflection	0.40 mm (0.016 in)

If deflection exceeds limit, replace rack.

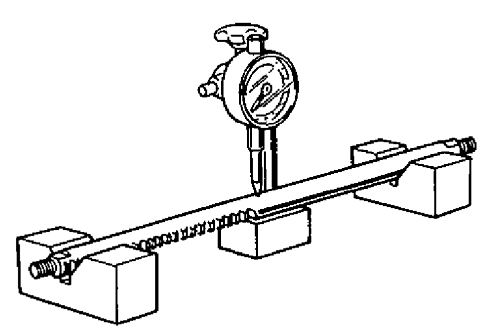


Fig. 3B-46

STEERING RACK BUSHING

Inspect rack bushing for wear or damage.
If found defective, replace.

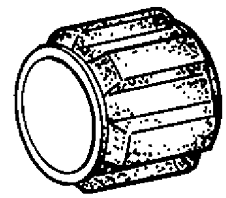


Fig. 3B-47

STEERING WHEEL

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

Steering wheel play (A)	0 – 30 mm (0 – 1.2 in.)

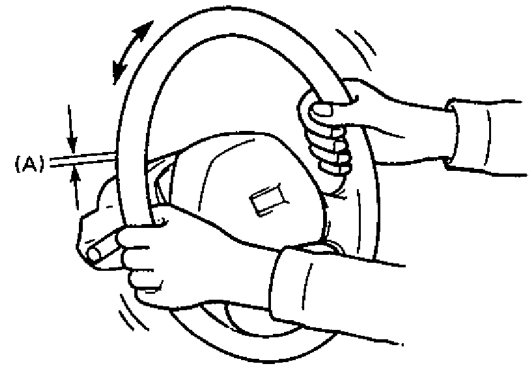


Fig. 3B-48

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

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

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Steering shaft joint bolts	20 – 30	2.0 – 3.0	14.5 – 21.5
2. Steering gear case bolts	20 – 30	2.0 – 3.0	14.5 – 21.5
3. Tie-rod end castle nuts	30 – 55	3.0 – 5.5	22.0 – 39.5
4. Tie-rod end lack nuts	35 – 55	3.5 – 5.5	25.5 – 39.5
5. Steering pinion bearing plug	80 – 110	8.0 – 11.0	58.0 – 79.5
6. Tie-rod	70 – 100	7.0 – 10.0	51.0 – 72.0
7. Wheel nut	50 – 70	5.0 – 7.0	36.5 – 50.5

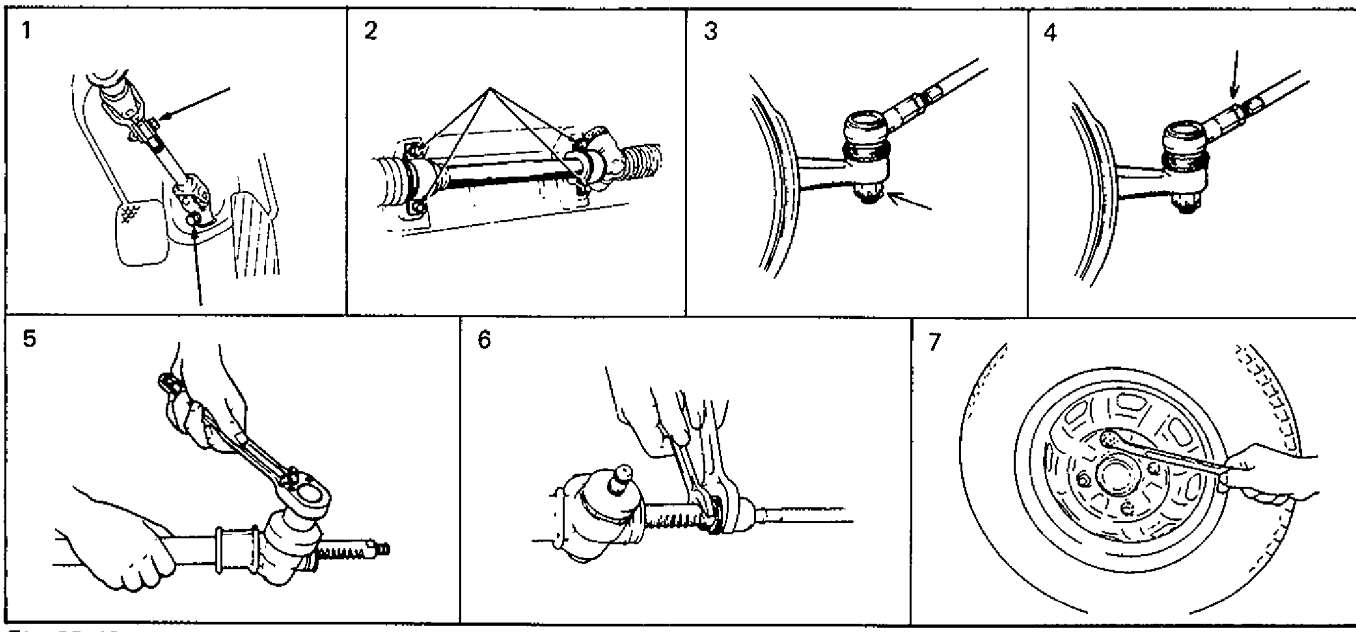


Fig. 3B-49

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium Grease (Should be applicable for −40°C ~ 130°C)	SUZUKI SUPER GREASE (E) (99000-25050)	• Sliding part of rack against steering housing (All around rack plunger, rack bushing and rack) • Sliding part against steering pinion (Oil seal lip, needle bearing) • Steering rack and pinion gear teeth • Filled into pinion bearing cap • Contacting parts of tie-rod and rack side boots • Rack end ball joint

SPECIAL TOOLS

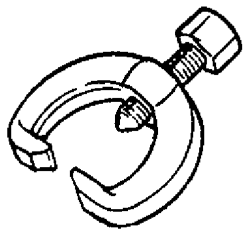
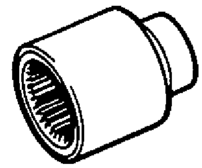
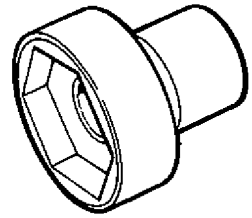
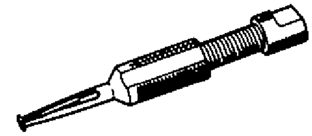
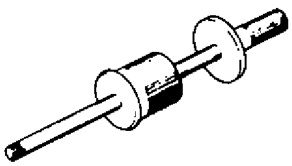
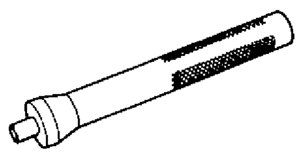
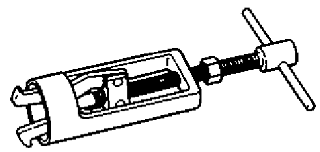
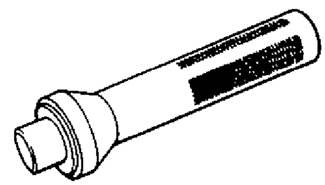
 09913-65210 Tie-rod end remover	 09944-18211 Pinion torque checking socket	 09944-28211 43 mm Socket (Pinion bearing plug remover)	 09921-20200 Pinion bearing remover
 09930-30102 Sliding shaft	 09943-88211 Pinion bearing installer	 09944-48210 Rack bush remover	 09943-78210 Rack bush installer

Fig. 3B-50

SECTION 3B1

POWER STEERING (P/S) SYSTEM

(If equipped)

NOTE:

- All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.
- For items related to the rack and pinion, if not included in this section, refer to SECTION 3B MANUAL RACK AND PINION.

CONTENTS

GENERAL DESCRIPTION 3B1- 2
CONSTRUCTION AND OPERATION 3B1- 4
  Steering Gear Box 3B1- 4
  Power Steering (P/S) Pump 3B1- 8
DIAGNOSIS 3B1-10
ON CAR SERVICE 3B1-12
  Inspection 3B1-12
    Steering wheel play 3B1-12
    Steering force 3B1-12
    Power steering fluid level 3B1-13
    Power steering belt tension 3B1-13
    Power steering belt tension adjustment 3B1-13
    Idle up system 3B1-13
    Fluid leakage 3B1-14
    Hydraulic pressure in P/S circuit 3B1-15
    Steering rack boot 3B1-16
    Tie rod end boot 3B1-17
    Steering shaft joint 3B1-17
  Air Breeding Procedure 3B1-17
  Remove and Install Tie Rod End 3B1-17
  Remove and Install Power Steering Gear Box 3B1-19
  Remove and Install Power Steering Pump 3B1-26
SPECIAL TOOLS 3B1-32

GENERAL DESCRIPTION

The power steering (P/S) system in this car reduces the driver's effort needed in turning the steering wheel by unilizing the hydraulic pressure generated by the power steering (P/S) pump which is driven by the engine.
It is an integral type with the rack and pinion gears and the control valve unit, hydraulic pressure cylinder unit all built in the steering gear box.
There are two types of this system: one for the RH steering model and the other for the LH steering model.

For LH-steering model

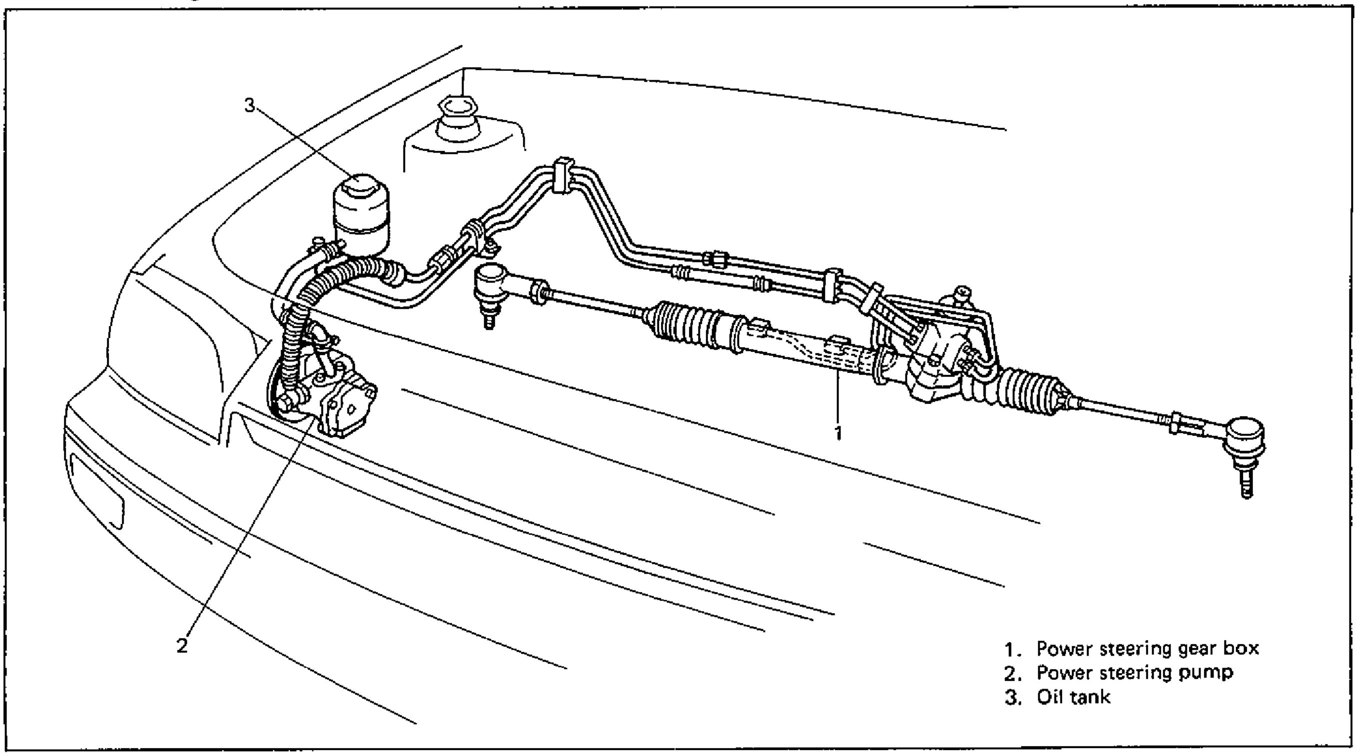


Fig. 3B1-1 Power Steering System Layout

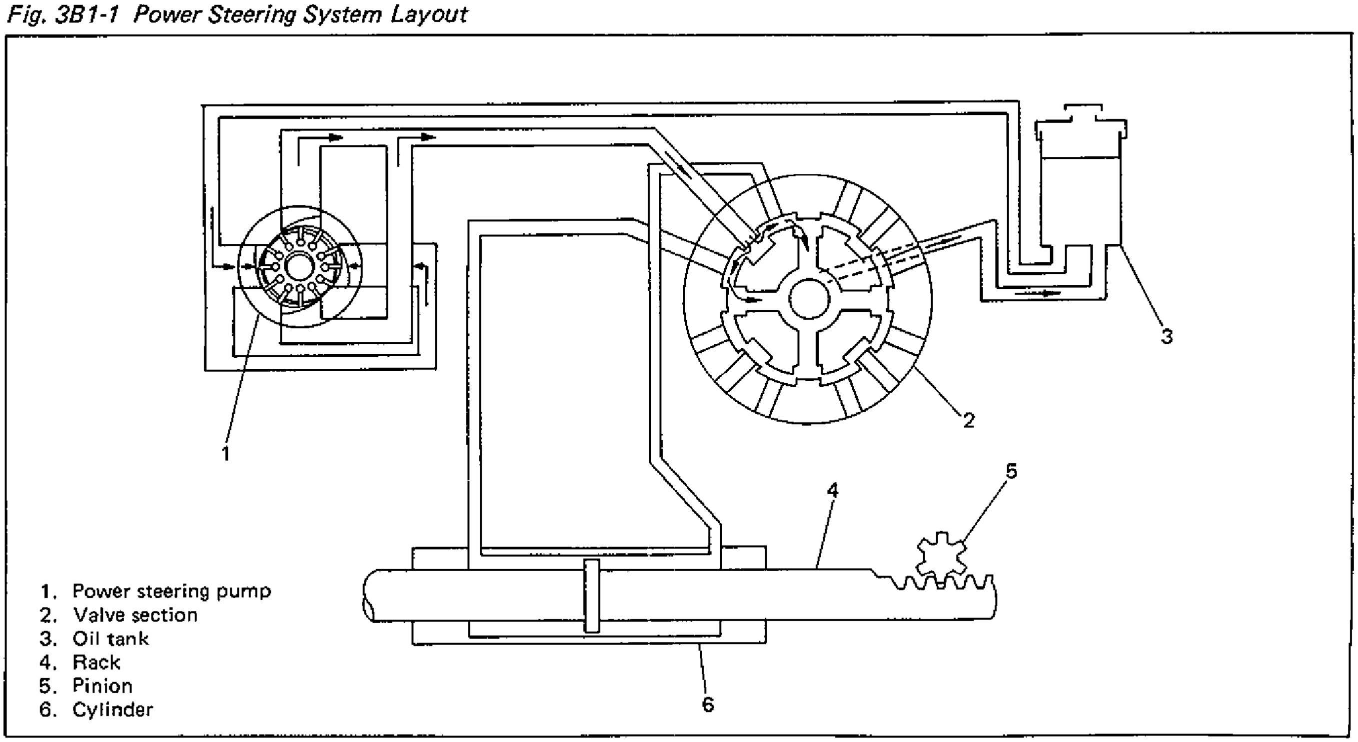
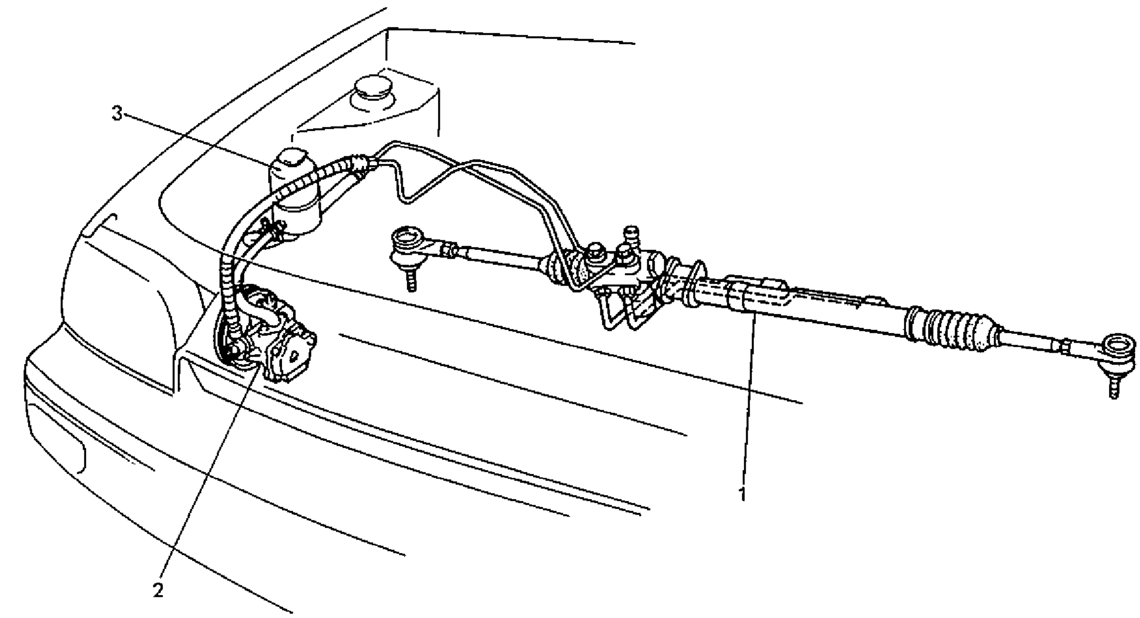


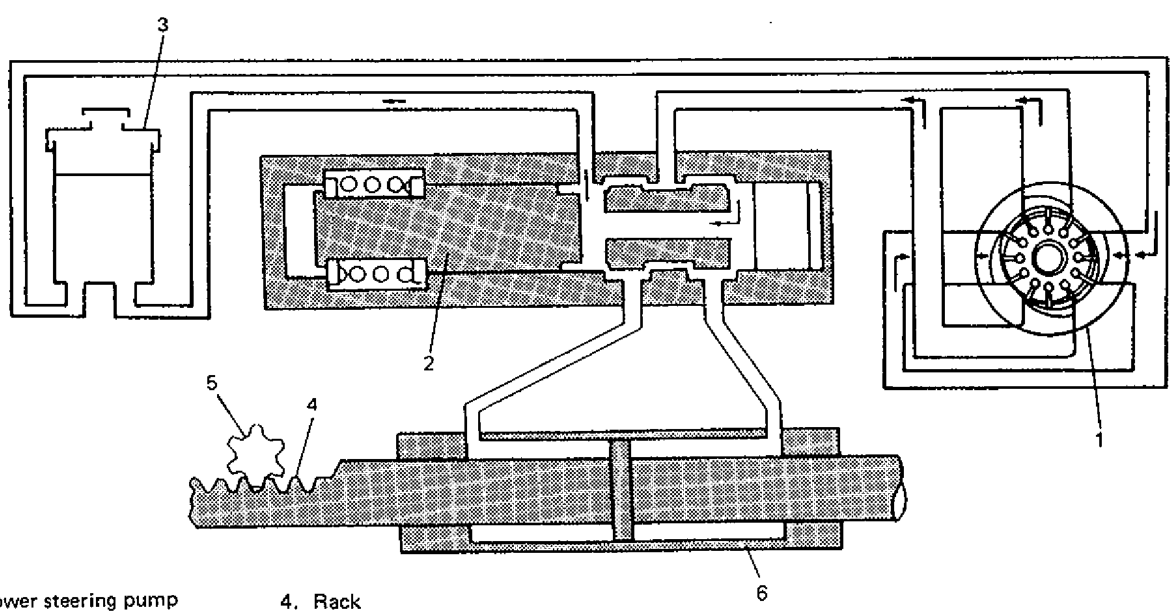
Fig. 3B1-2 Hydraulic Pressure Circuit

For RH-steering model



1. Power steering gear box
2. Power steering pump
3. Oil tank

Fig. 3B1-3 Power Steering System Layout



1. Power steering pump
2. Spool valve
3. Oil tank
4. Rack
5. Pinion
6. Cylinder

Fig. 3B1-4 Hydraulic Pressure Circuit

CONSTRUCTION AND OPERATION

STEERING GEAR BOX

- **For LH steering model**

The steering gear box consists of two sections: one including a cylinder and the other a valve. Main components of the cylinder section are a gear box, a rack and a tube and those of the valve section are a valve case, a sleeve and a stub shaft. The sleeve is linked with the pinion through a pin and the valve and stab shaft are integrated into one unit. Then the pinion and the stub shaft are linked to each other by means of the torsion bar.
Thus, when the stub shaft moves, the valve changes its position, thereby switching the hydraulic passage from the pump to the cylinder to help steering operation.
When turning the steering wheel feels heavy due to P/S fluid leakage or for some other reason (i.e., when in the manual steering mode), the stub shaft and pinion are in direct linkage and the force is output directly through the pinion and rack.

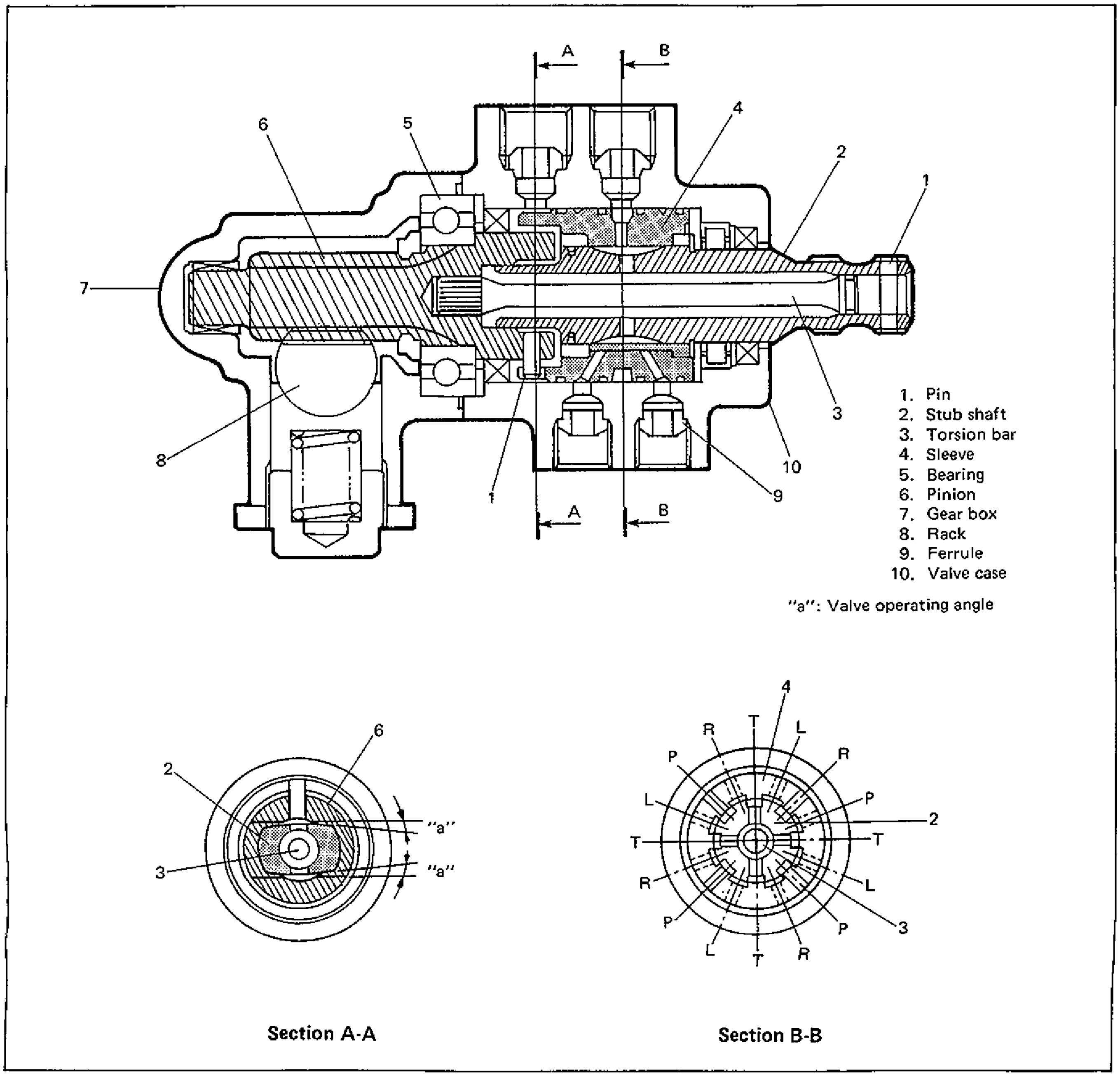


Fig. 3B1-5 Steering Gear and Valve Unit

WHEN STEERING WHEEL HELD AT STRAIGHT POSITION

When the steering wheel is not turned, the valve is held at the neutral position by the torsion bar and the fluid from the pump flows through the valve back to the tank.

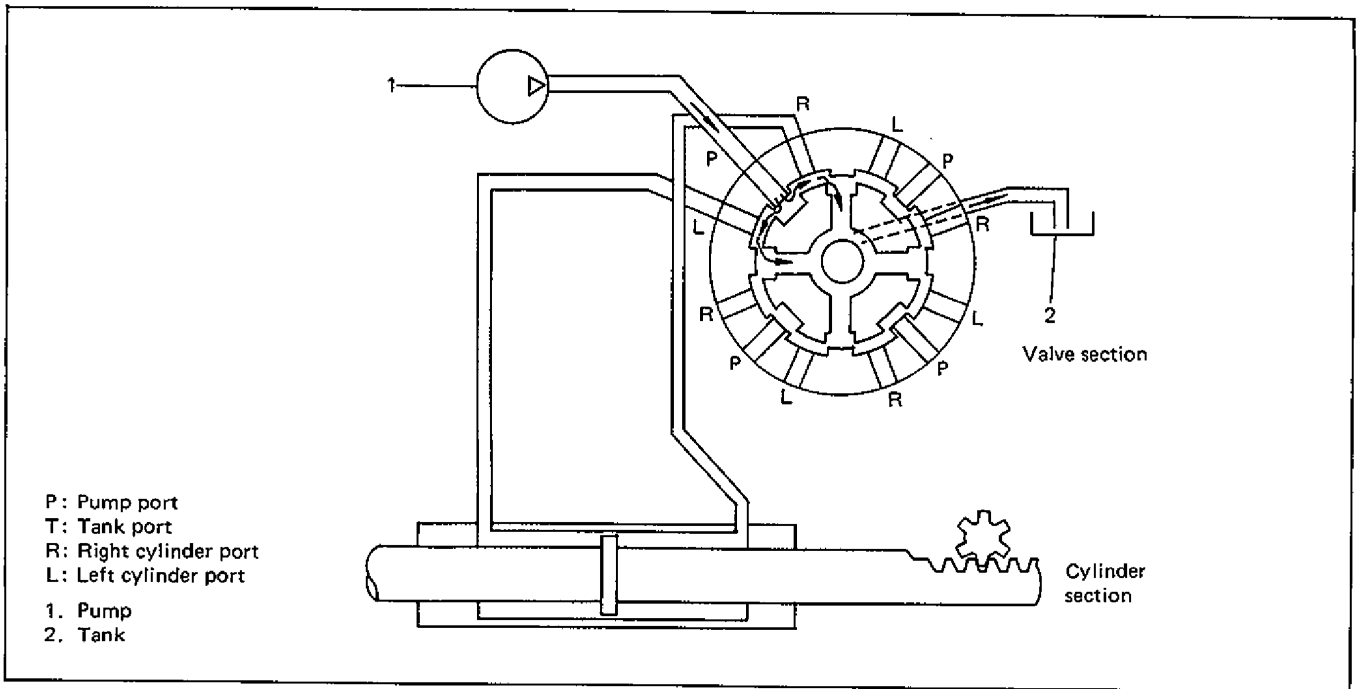


Fig. 3B1-6 Hydraulic Pressure Circuit When Steering Wheel at Straight

WHEN STEERING WHEEL TURNED (to the right)

Turning the steering wheel clockwise will cause the stub shaft to turn clockwise, twisting the torsion bar. Then the valve is switched to allow the fluid pressure to be applied to the cylinder which then pushes the rack.

As the rack moves, the pinion turns clockwise to actuate the torsion bar which then causes the valve to return to the neutral position. This is called the feed back operation of the power steering system.

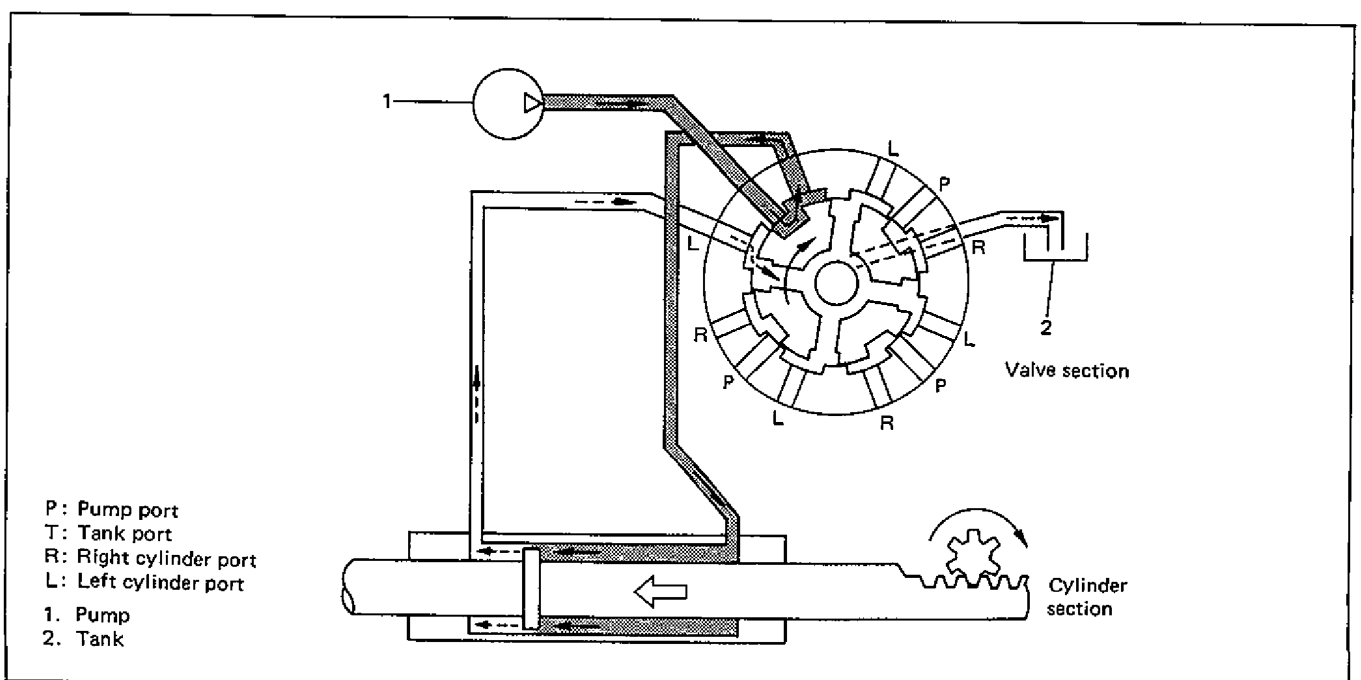
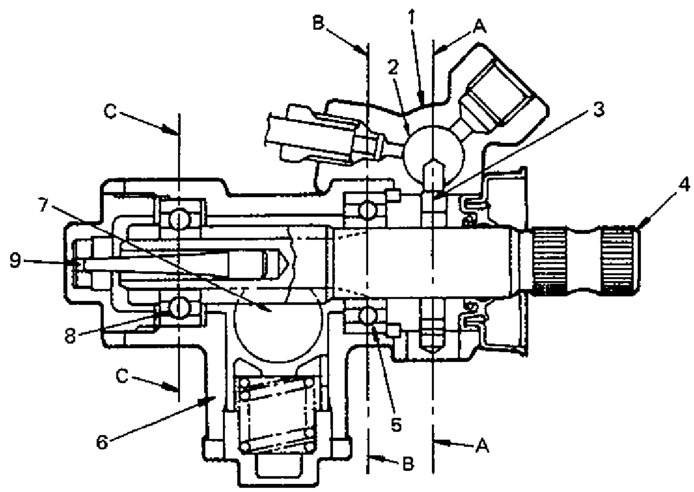
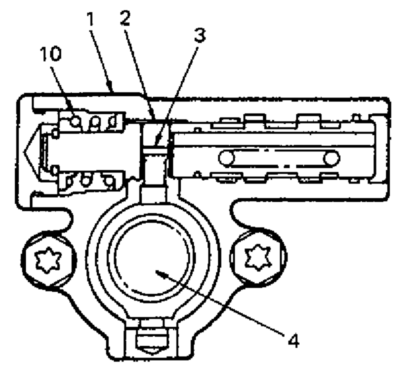


Fig. 3B1-7 Operation When Steering Wheel Turned to the Right

- **For RH steering model**

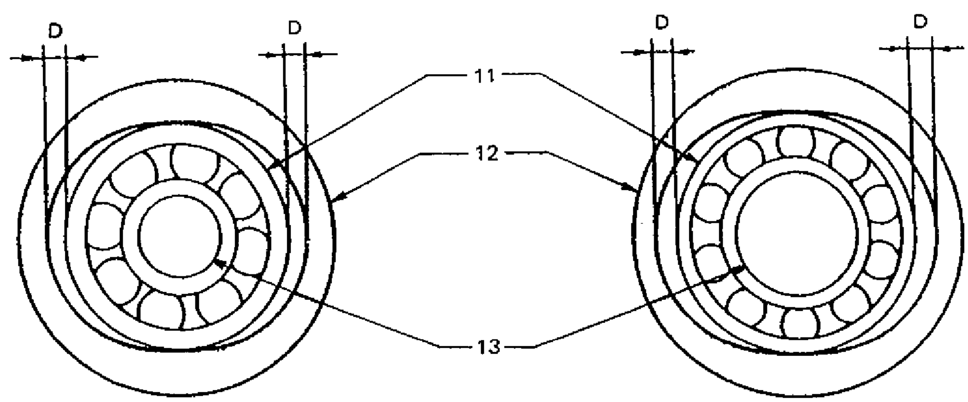
The steering gear box contains a gear, valve and cylinder sections. The gear and valve section consist of a valve case, spool valve, lever, pinion and other parts. There are two bearings to support the pinion in the gear case whose section is an oblong hole so that the bearing and pinion shaft can move to the right and left. And as the pinion shaft moves, the spool valve moves in the same direction, for they are connected. Such valve movement opens and closes the hydraulic pressure passage from the pump to either right or left cylinder port to assist the steering operation.





Section A – A

1. Valve case
2. Spool valve
3. Lever
4. Pinion
5. Bearing
6. Gear case
7. Rack
8. Bearing
9. Spring pin
10. Spring



Section B – B

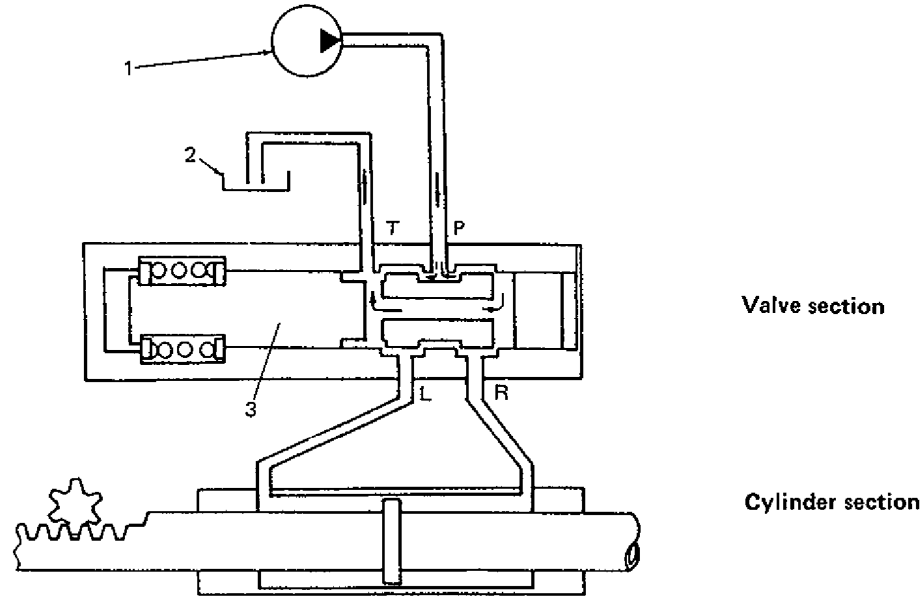
Section C – C

D: Play
11. Bearing
12. Gear case
13. Pinion

Fig. 3B1-8 Steering Gear and Valve Unit

WHEN STEERING WHEEEL HELD AT STRAIGHT POSITION

When the steering wheel is not turned in either way, the spool valve is kept at its neutral position by the spring force and the hydraulic pressure from the pump passes through the short circuit.

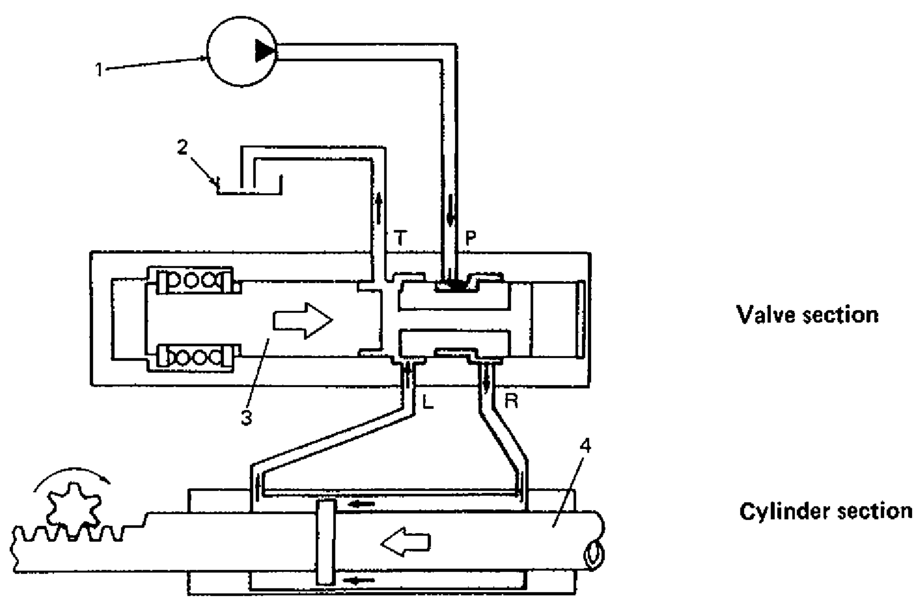


P : Pump port
T : Tank port
R : Right cylinder port
L : Left cylinder port
1. Pump
2. Tank
3. Spool valve

Fig. 3B1-9 Hydraulic Pressure Circuit When Steering Wheel at Straight Position

WHEN STEERING WHEEL TURNED (to the right)

Turning the steering wheel to the right causes the pinion shaft to move to the right by the amount equal to the play in the oblong hole provided in the periphery of the bearing. At the same time, the spool valve moves to the right through the lever, allowing hydraulic pressure to flow into the cylinder and push the rack shaft. When the force in the rotation direction of the pinion is released, the spool valve is returned to its neutral position by the reaction of the spring, thus shutting off the hydraulic pressure to the cylinder.



P : Pump port
T : Tank port
R : Right cylinder port
L : Left cylinder port
1. Pump
2. Tank
3. Spool valve
4. Rack shaft

Fig. 3B1-10 Operation When Steering Wheel Turned to the Right

POWER STEERING (P/S) PUMP

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

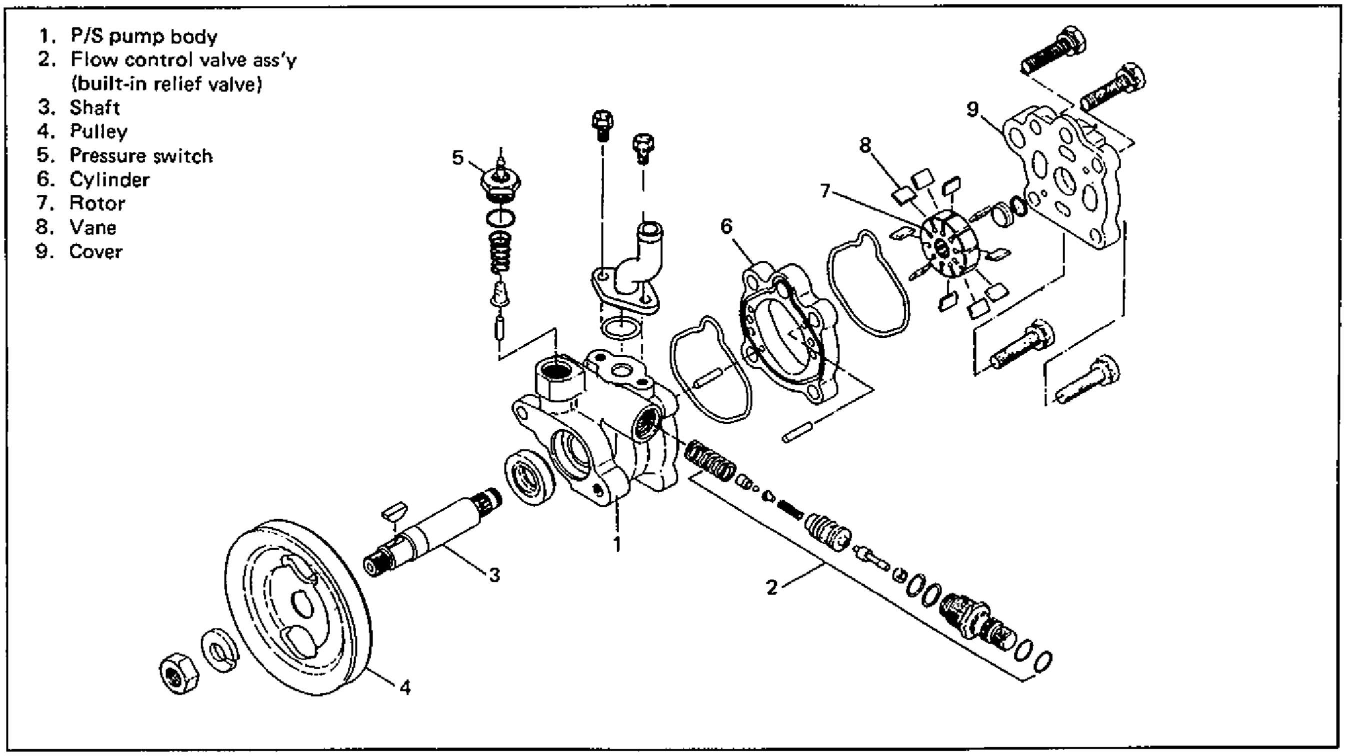


Fig. 3B1-11 Components of P/S Pump

Model		Vane type
Discharge rate		5.1 cm^3/rev
Hydraulic pressure control	Hydraulic pressure	4900 kPa 50 kg/cm^2 711 psi
	Control device	Flow control valve
		Relief valve
Specified fluid		DEXRON-II A/T fluid
Capacity		600 – 650 cm^3 (1.27/1.06 – 1.37/1.14 US/Imp. pt)
Idle-up system		Idle-up function performed when hydraulic pressure in P/S pump rises higher than following value. 1470 – 1960 kPa 15 – 20 kg/cm^2 213 – 284 psi

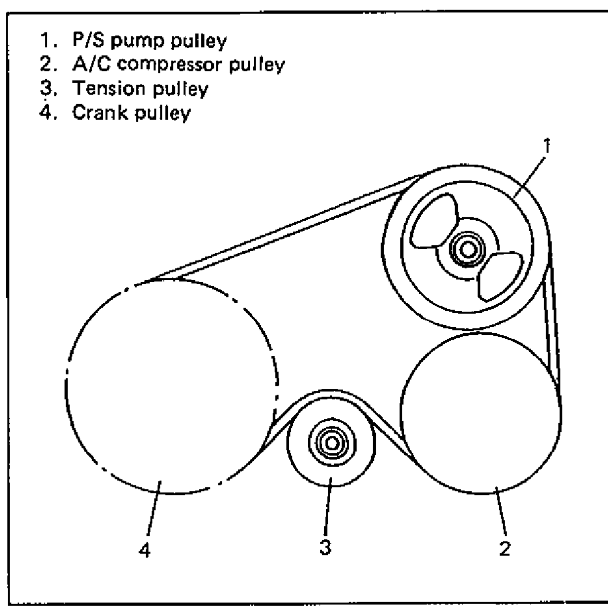


Fig. 3B1-12 P/S Pump Layout (Vehicle with A/C)

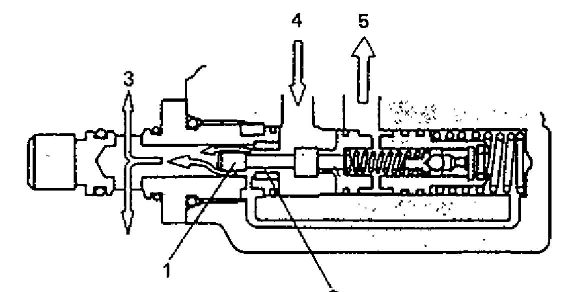
FLOW CONTROL VALVE

As the discharge rate of the P/S pump increases in proportion to the pump revolution speed, a flow control valve is added to control it so that the optimum amount of fluid for steering operation is supplied according to the engine speed (driving condition).

Described below is its operation at different engine speed.

When Idling

The fluid discharged from the pump is supplied through the clearance around the rod in orifice A_1 to the gear box.

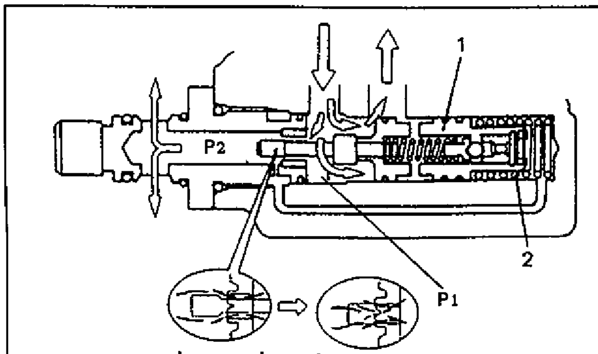


1. Rod
2. Orifice A_1
3. To gear box
4. From pump
5. To pump

Fig. 3B1-13 Operation of Flow Control Valve (When Idling)

When Running at Low Speed

As the engine speed rises, the pump discharge rate increases and causes a pressure difference to occur between both ends of the orifice (P_1 − P_2). Thus the pressure exceeding the flow control spring force pushes the flow control valve to the right in the below figure, making the opening in the orifice narrower through which only a necessary amount of fluid is fed to the gear box and the excess fluid is returned to the pump.



1. Flow control valve
2. Flow control spring

Fig. 3B1-14 Operation of Flow Control Valve (When Running at Low Speed)

When Running at High Speed

As the engine speed rises higher, opening in the orifice is made narrower and fluid flow to the gear box reduces. As a result, hydraulic pressure application is slow at the start of the steering wheel turn. This provides straight-ahead stability to suit the driving condition with the steering wheel operated near its neutral position.

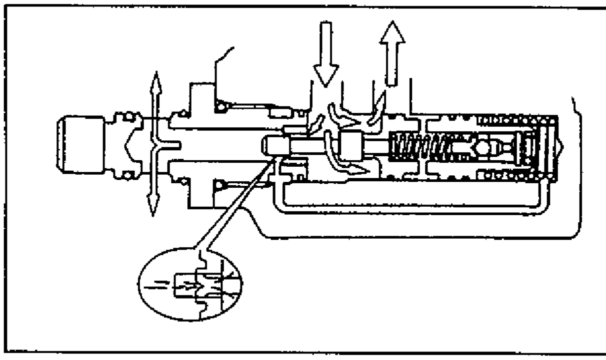


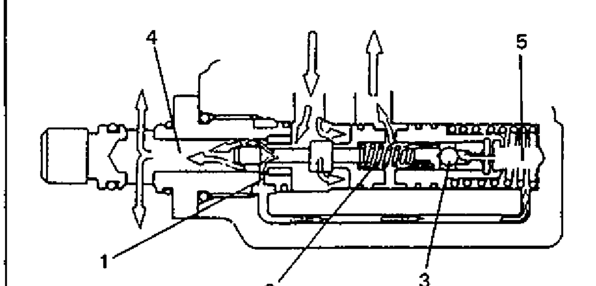
Fig. 3B1-15 Operation of Flow Control Valve (When Running at High Speed)

RELIEF VALVE

The relief valve located in the flow control valve controls the maximum hydraulic pressure.

The steel ball in the relief valve is under the hydraulic pressure in the circuit coming through orifice A_2. When the steering wheel is turned and the hydraulic pressure increases higher than 4900 kPa (50 kg/cm^2, 711 psi), it compresses the relief spring to push the steel ball which then allows the fluid to flow to the P/S pump.

Such relief valve operation causes a pressure difference to occur between chambers A and B. Then the flow control valve moves to the right to make opening in orifice A_1 narrower, maintaining the hydraulic pressure constant.



1. Orifice A_2
2. Relief valve spring
3. Steel ball
4. Chamber A
5. Chamber B

Fig. 3B1-16 Operation of Relief Valve

DIAGNOSIS

Condition	Possible Cause	Correction
Steering wheel feels heavy (at low speed)	1. Fluid deteriorated, low viscocity, different type of fluid mixed	Replace fluid.
	2. Pipes or hoses deformed, air entering through joint	Replace defective part.
	3. Insufficient air purging from P/S circuit	Purge air.
	4. P/S belt worn, lacking in tension	Adjust belt tension or replace belt as necessary.
	5. Tire inflation pressure excessively low	Inflate tire.
	6. Front end alignment maladjusted	Check and adjust front end alignment.
	7. Steering wheel installed improperly (twisted)	Install steering wheel correctly.
	8. Bind in tie rod or tie rod end ball joint	Replace defective part.
	9. P/S pump hydraulic pressure fails to increase	Replace P/S pump.
	10. P/S pump hydraulic pressure increases but slowly	Replace P/S pump.
	NOTE: **Make sure to warm up engine fully before measuring hydraulic pressure from pump.**	
Steering wheel feels heavy momentarily when turning it to the left (right)	1. Air drawn in due to insufficient amount of fluid	Add fluid and purge air.
	2. Slipping P/S belt	Adjust belt tension or replace belt as necessary.
	3. Refer to check items 9 and 10 in above section	
No idle-up	1. P/S pump pressure switch defective	Replace P/S pump pressure switch.
Poor recovery from turns	NOTE: **To check steering wheel for recovery, with car running at 22 mile/h (35 km/h), turn it 90° and let it free. It should return more than 60°.**	
	1. Deformed pipes or hoses	Replace defective part.
	2. Steering column installed improperly	Install steering column correctly.
	3. Front end alignment maladjusted	Check and adjust front end alignment.
	4. Ball joints binding	Replace defective part.
	5. Refer to items 9 and 10 in above section	

Condition	Possible Cause	Correction
Vehicle pulls to one side during straight driving	1. Low or uneven tire inflation pressure	Inflate tires to proper pressure or adjust right & left tires inflation pressure.
	2. Front end alignment maladjusted	Check and adjust front end alignment.
	3. Malfunction of control valve in gear box	Replace gear box.
	4. Refer to check items 9 and 10 in previous page	
Steering wheel play is large and vehicle wanders	1. Loose steering shaft nut	Retighten.
	2. Loose linkage or joints	Retighten.
	3. Loose gear box fastening bolt	Retighten.
	4. Front wheel bearing worn	Replace wheel bearing.
Oil leakage	1. Loose joints of (hydraulic pressure) pipes and hoses	Retighten.
	2. Deformed or damaged pipes or hoses	Replace defective part.
Abnormal noise	**NOTE: (For RH steering model) Some sound may be heard through steering column when turning steering wheel with vehicle at a stop but it is not an abnormal noise but operating sound of valve in gear box.**	
	1. Air drawn in due to insufficient amount of fluid	Add fluid and purge air.
	2. Air mixed into fluid from pipes or hoses	Replace pipes or hoses.
	3. Slipping (loose) P/S belt	Adjust belt tension.
	4. Worn P/S belt	Replace belt.
	5. Loose gear box fastening bolt	Retighten bolts.
	6. Loose pitman arm nut	Retighten nut.
	7. Loose linkage or joints	Retighten.
	8. Pipes or hoses in contact with part of vehicle body	Install pipes and hoses correctly.
	9. Vanes of P/S pump defective	Replace pump.
	10. Malfunction of control valve in gear box	Replace gear box.
	11. Bearing of P/S pump shaft defective	Replace pump.

ON CAR SERVICE

INSPECTION

STEERING WHEEL PLAY

- With engine stopped, check steering wheel play as follows. Move steering wheel from its straight-ahead position lightly in both directions and measure distance along its circumference it must be turned before wheels start to move. It should be within below specification.

Steering wheel play	Less than 30 mm (1.2 in.)

- Check steering wheel for looseness or rattle by trying to move it in its shaft direction and lateral direction.

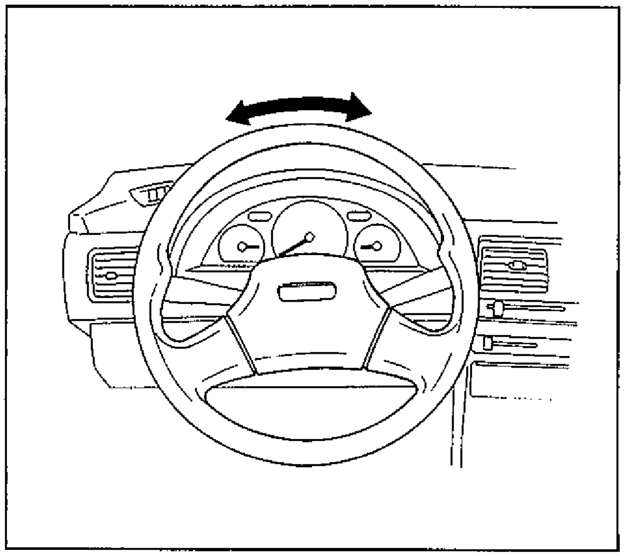


Fig. 3B1-17 Steering Wheel Play

STEERING FORCE

1) Place vehicle on level road and set steering wheel at straight-ahead position.
2) Check that tire inflation pressure is as specified. (Refer to tire placard).
3) Start engine and keep it running till power steering fluid is warmed to 50 to 60°C (122 to 140°F).

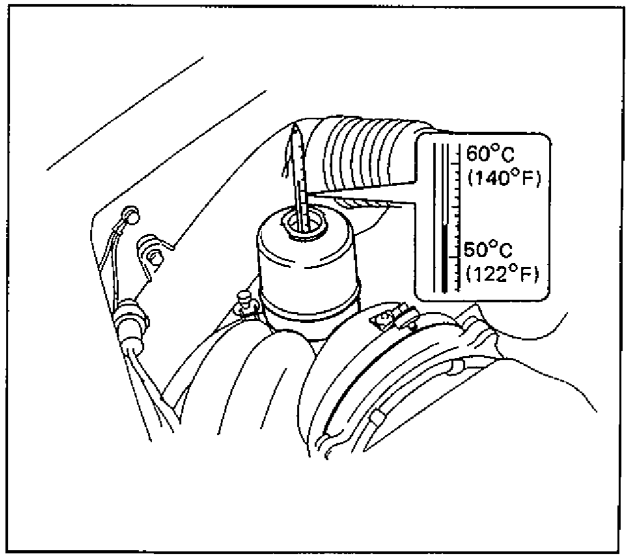


Fig. 3B1-18 Checking Fluid Temperature

4) With engine idling, measure steering force by pulling spring balancer hooked on steering wheel in tangential direction.

Steering force	Less than 4.0 kg (8.8 lb)

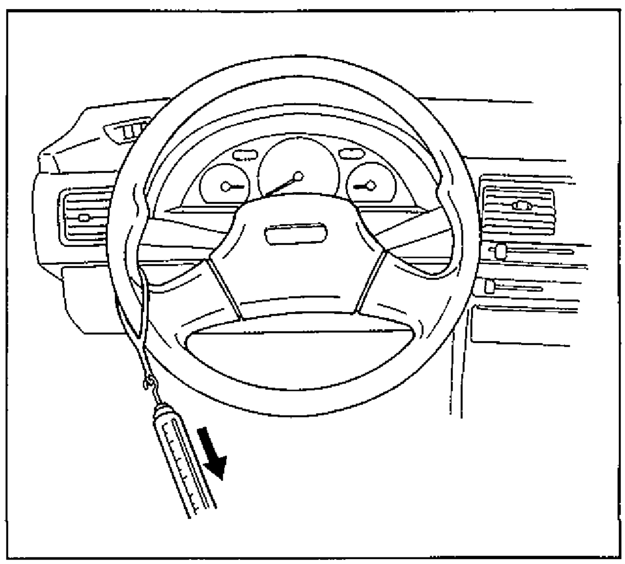


Fig. 3B1-19 Checking Steering Force

POWER STEERING FLUID LEVEL

With engine stopped, 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 A/T fluid DEXRON-II.**
- **Fluid level should be checked when fluid is cool.**

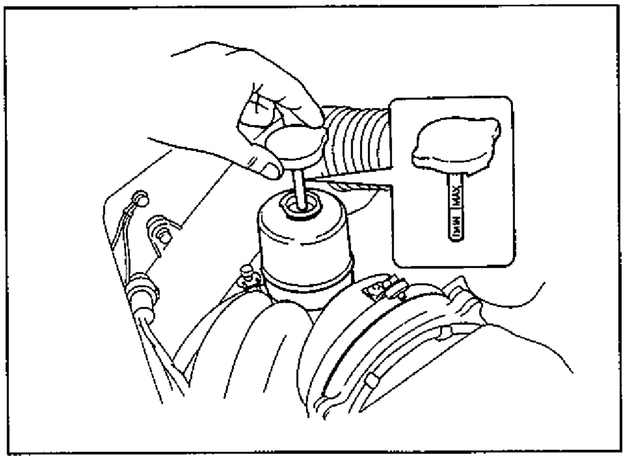


Fig. 3B1-20 Checking P/S Fluid Level

POWER STEERING BELT TENSION

- Check that belt is free from any damage and properly fitted in pulley groove.
- Check belt tension by measuring how much it deflects when pushed at intermediate point between P/S pump pulley and crank pulley with about 10 kg (22 lb) force.

Deflection of P/S belt (A)	8 – 10 mm (0.31 – 0.39 in.)

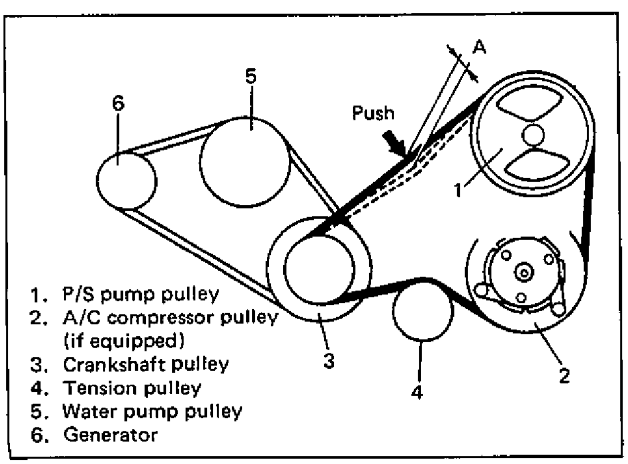


Fig. 3B1-21 Checking P/S Belt Tension

POWER STEERING BELT TENSION ADJUSTMENT

1. Remove splash cover and loosen tension nut.
2. Adjust belt tension. With A/C equipped vehicles, turning tension bolt counterclockwise causes pulley to rise, increasing belt tension. With A/C non-equipped vehicles, turning tension bolt clockwise causes pulley to lower, increasing belt tension. In both cases, turning tension bolt in the other way decreases belt tension.
   Be sure to tighten tension nut after adjusting belt tension.

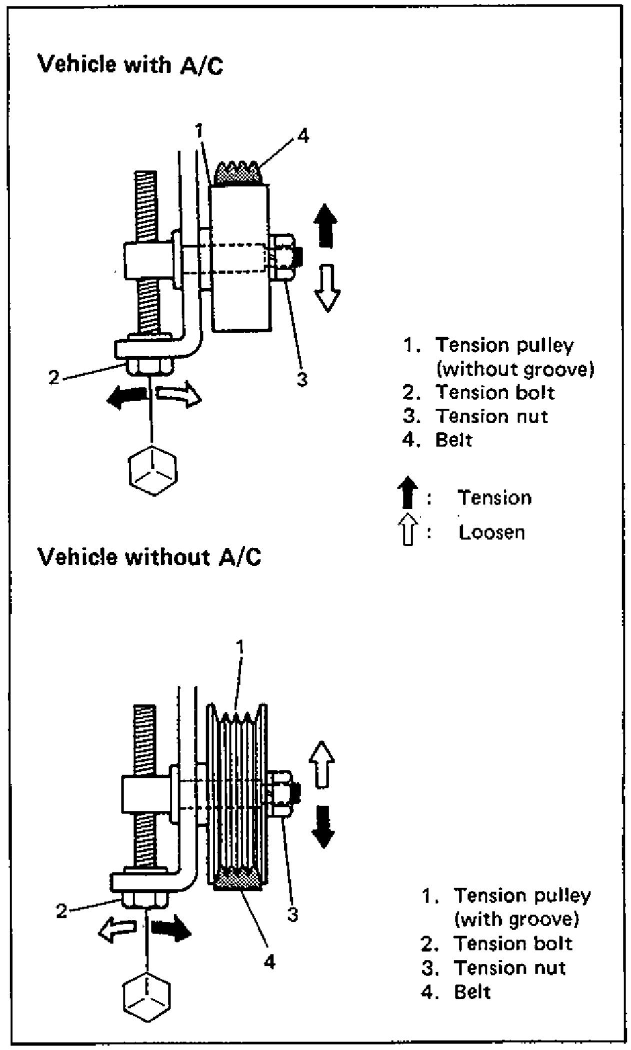


Fig. 3B1-22 Adjusting P/S Belt Tension

IDLE UP SYSTEM

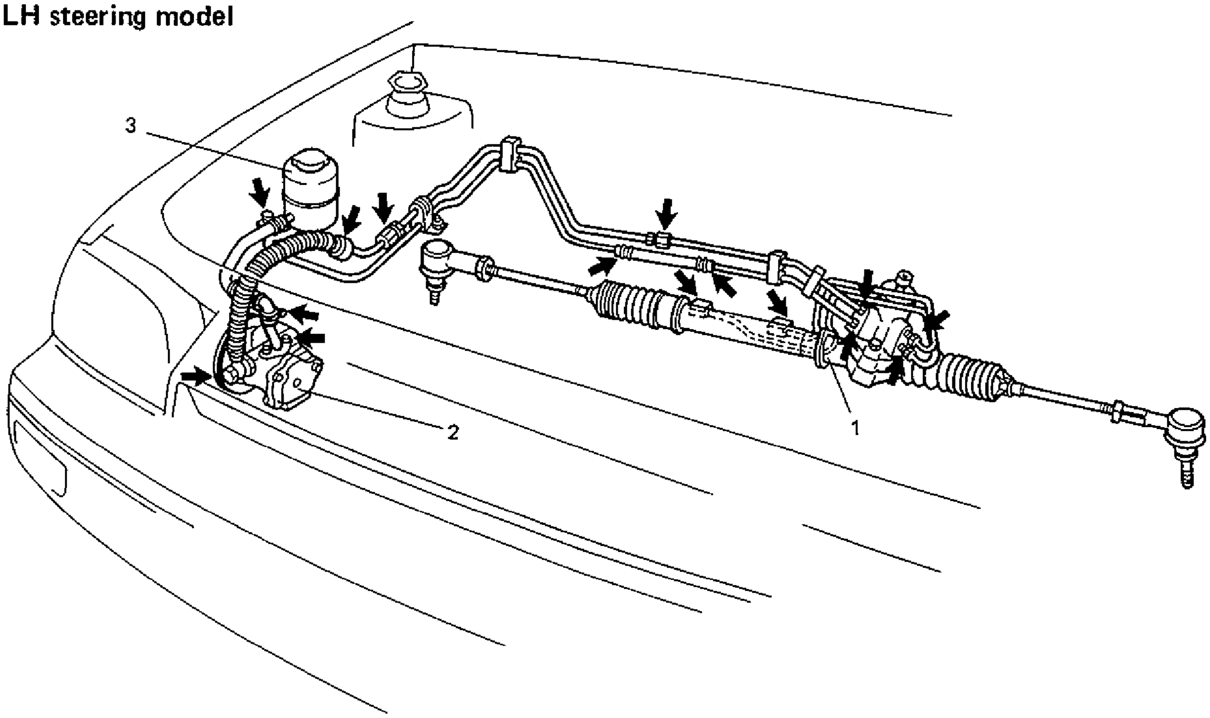
With air conditioner turned OFF (if equipped), turn steering wheel and check that engine idling speed is not slowed down even when load is imposed on engine by P/S pump.

FLUID LEAKAGE

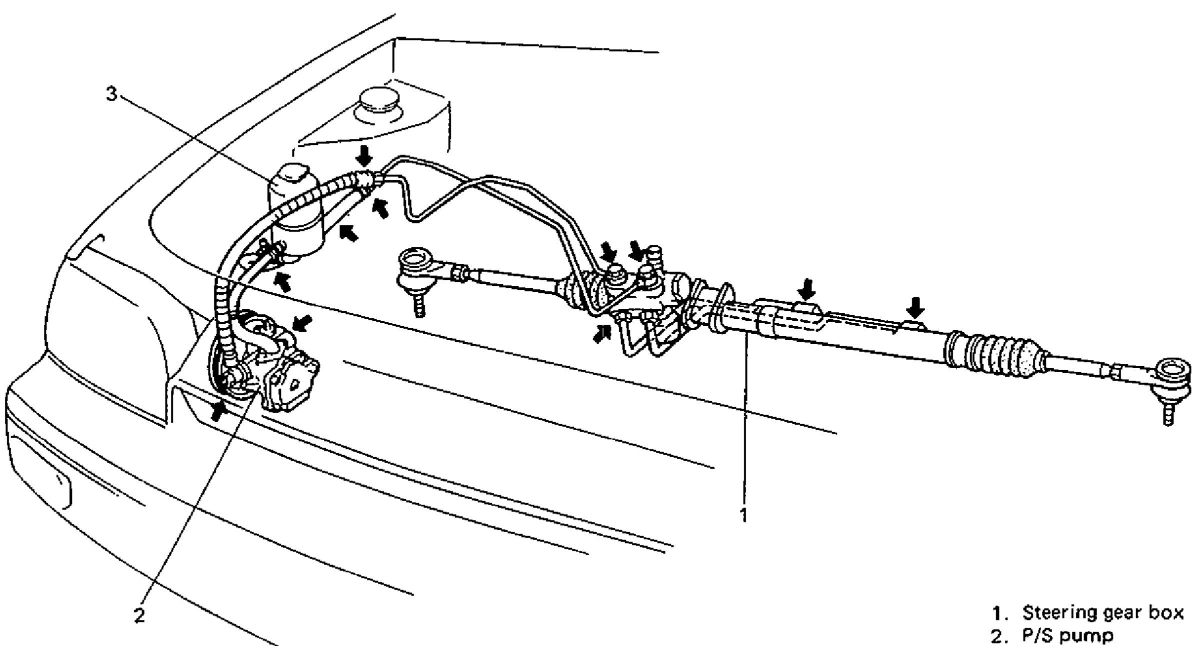
Start engine and turn steering wheel fully to the right and left so that maximum hydraulic pressure is provided. Then visually check gear box, P/S pump and oil tank themselves and each joint of their connecting pipes for leakage.

CAUTION: Never keep steering wheel turned fully for longer than 10 seconds.

For LH steering model



For RH steering model



1. Steering gear box
2. P/S pump
3. Oil tank

Fig. 3B1-23 Check for Fluid Leakage

HYDRAULIC PRESSURE IN P/S CIRCUIT

1. After cleaning joint of high pressure hose and power steering pump thoroughly, disconnect hose from pump and install oil pressure gauge, attachment (special tools) and hose (spare part).

> **CATION:**
> **Take care not to cause damage to A/C condenser during service operation.**

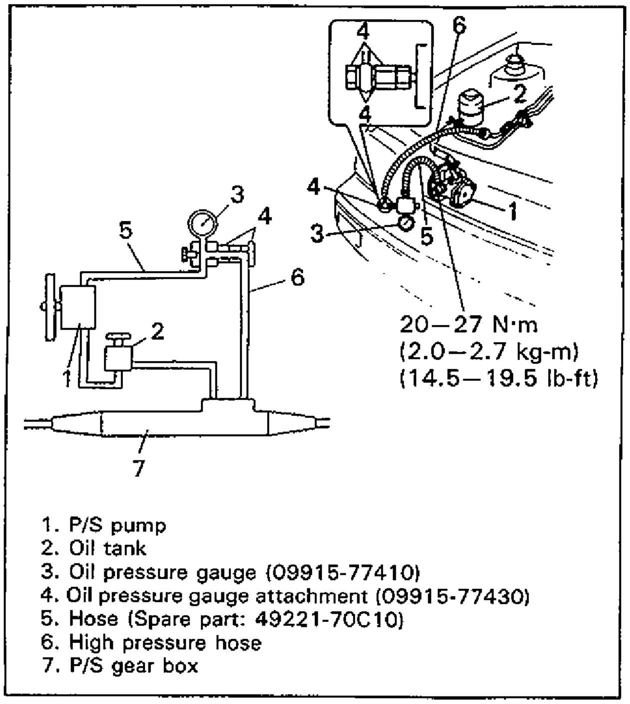


Fig. 3B1-24 Setting Oil Pressure Gauge

2. Bleed air. (Refer to AIR BLEEDING PROCEDURE.)
3. With engine idling, turn steering wheel and warm up engine till temperature of fluid in tank rises to 50 – 60°C (122 – 140°F).

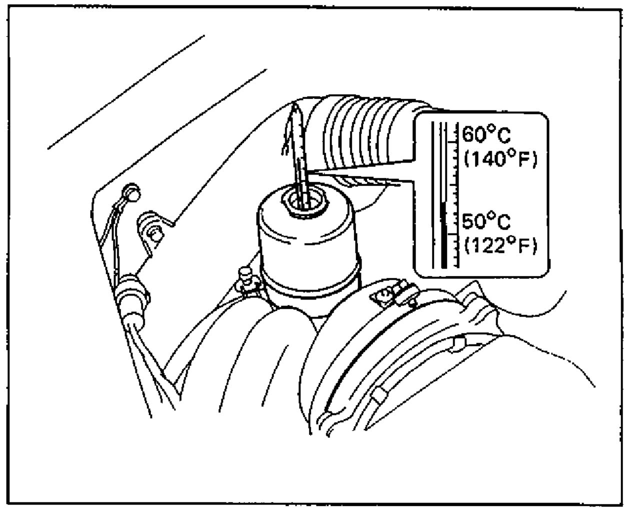


Fig. 3B1-25 Checking Fluid Temperature

4. Back pressure check
   Check back pressure by measuring hydraulic pressure with engine idling and hands off steering wheel.

Back pressure	Lower than 980 kPa (10 kg/cm², 142 psi)

When back pressure is higher than 980 kPa (10 kg/cm², 142 psi), check control valve and piping for clogging.

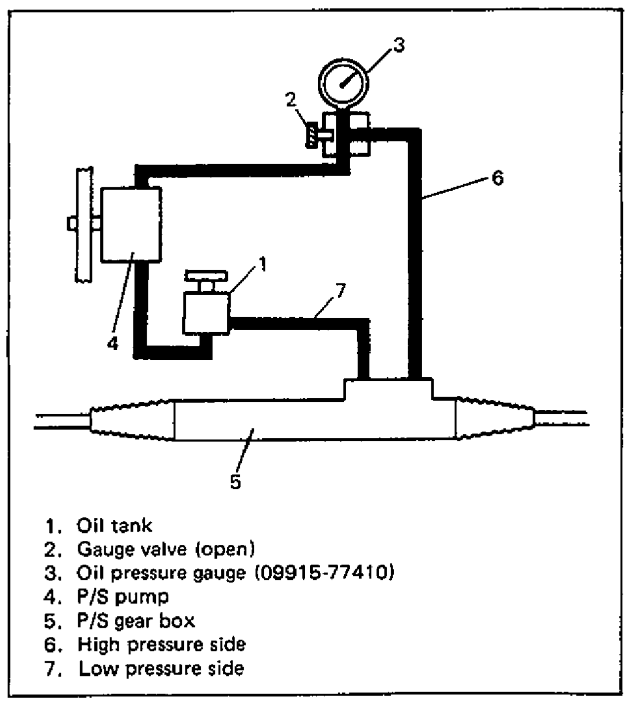


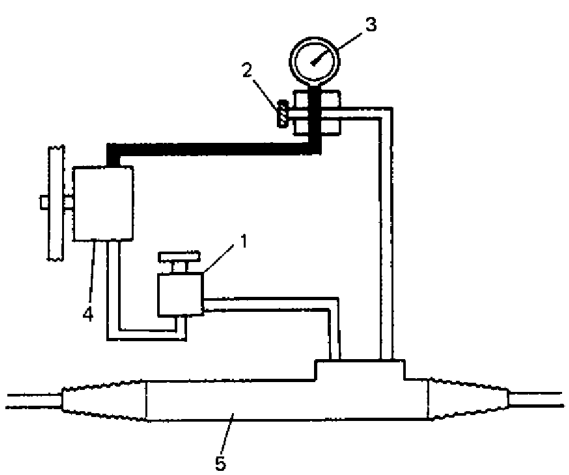
Fig. 3B1-26 Checking Back Pressure

5. Relief pressure check
   - Increase engine speed to about 1,500 r/min (rpm). Close gauge valve gradually while watching pressure increase indicated by gauge and take reading of relief pressure (maximum hydraulic pressure).

Relief pressure	4400 – 6400 kPa (45 – 65 kg/cm²) (640 – 924 psi)

   - When it is higher than 6400 kPa (65 kg /cm², 924 psi), possible cause is malfunction of relief valve.
     Replace steering gear box comp.
   - When it is lower than 4400 kPa (45 kg/cm², 640 psi), possible cause is either failure of P/S pump or settling of relief valve spring.

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



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

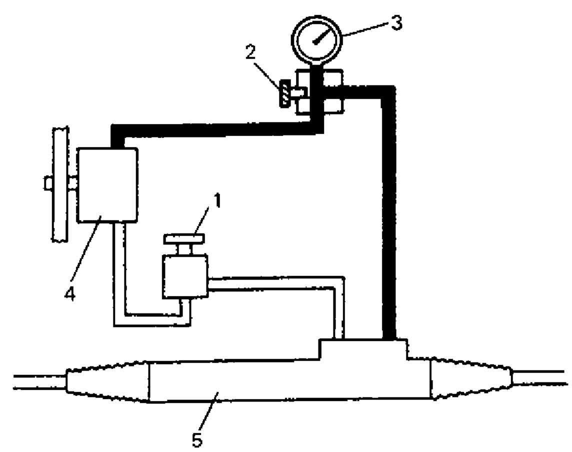
Fig. 3B1-27 Relief Pressure Check

Next, open gauge valve fully and increase engine speed to about 1,500 r/min. Then turn steering wheel to the left or right fully and take reading of relief pressure.

Relief pressure	4400–6400 kPa (45–65 kg/cm²) (640–924 psi)

- When it is lower than 4400 kPa (45 kg/cm², 640 psi), possbile cause is failure in steering gear box.
  Replace gear box.

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



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

Fig. 3B1-28 Relief Pressure Check

STEERING RACK BOOT

Check boot for crack and damage which, if any, means possibility of rusty gear, entry of dust or lack of grease. Also, check if any of such faulty conditions exists.

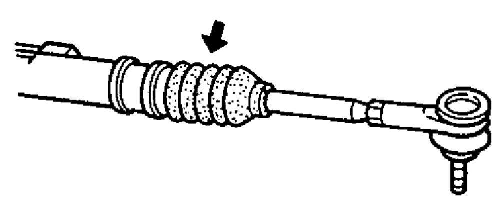


Fig. 3B1-29

TIE ROD END BOOT

Check boot for crack and damage and if any, replace it with a new one.

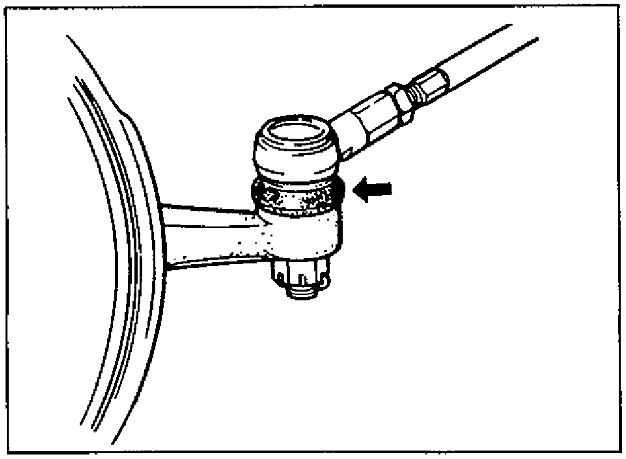


Fig. 3B1-30

STEERING SHAFT JOINT

Check each shaft joint for wear, breakage and any other damage and if any, replace it with a new one.

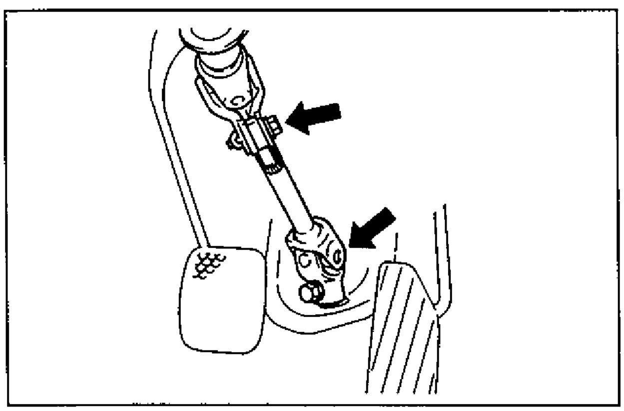


Fig. 3B1-31

AIR BLEEDING PROCEDURE

1. Jack up the front end of car and apply rigid rack.
2. Fill oil tank with fluid up to specified level. Then turn steering wheel to the right and left for 3 or 4 times.
3. After running engine at idling speed for 3 to 5 seconds, stop it and add fluid to satisfy specification.
4. With engine stopped, turn steering wheel to the right and left as far as it stops, repeat it a few times and fill fluid to specified level.
5. With engine running at idling speed, repeat stop-to-stop turn of steering wheel till all foams in oil tank are gone.

NOTE:
Make sure to bleed air completely. If air remains in fluid, P/S pump may make humming noise or steering wheel may feel heavy.

6. Finally check to make sure that fluid is filled to specified level.

REMOVE AND INSTALL TIE ROD END

REMOVAL

1. Jack up vehicle and remove wheel.
2. Remove split pin and tie rod end castle nut.

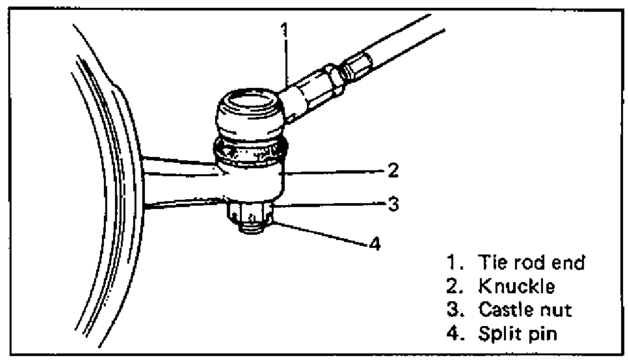


Fig. 3B1-32 Tie Rod End

3. Using special tool, remove tie rod end from knuckle.

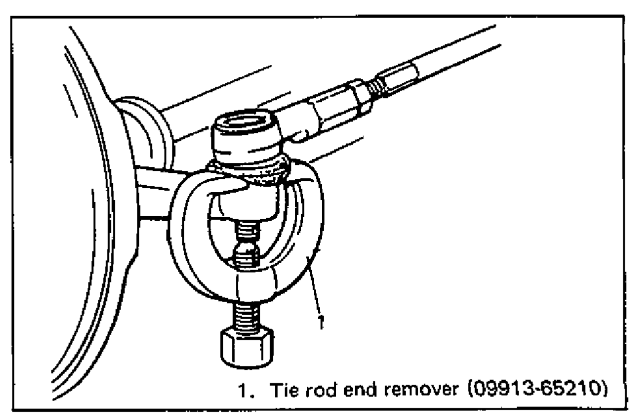


Fig. 3B1-33 Removing Tie Rod End

4. To facilitate adjustment after installation, put a mark on tie rod thread indicating position of tie rod end lock nut. Then loosen lock nut and remove tie rod end from tie rod.

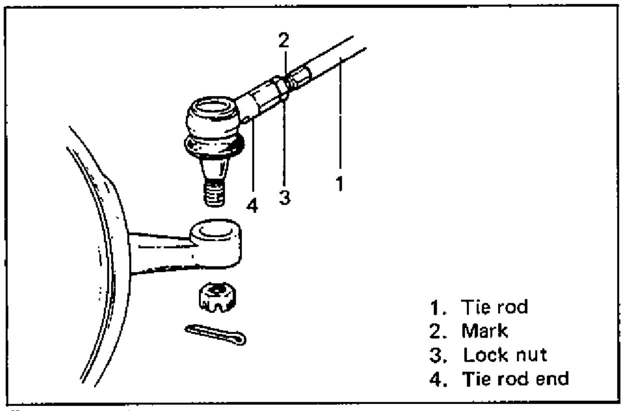


Fig. 3B1-34

INSPECTION

Tie-rod End Ball Joint

Inspect for play in tie-rod end ball joint. If found defective, replace.

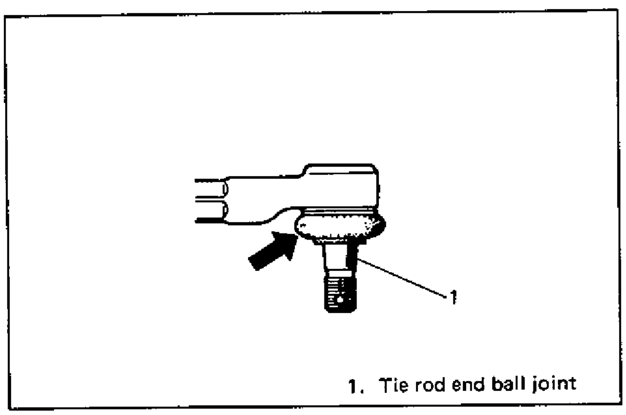


Fig. 3B1-35 Inspection of Ball Joint

INSTALLATION

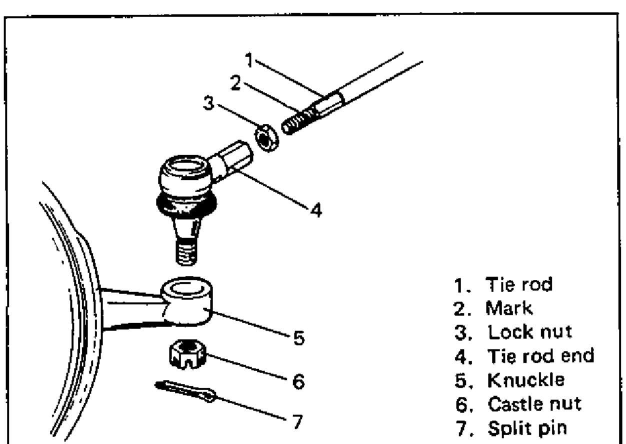


Fig. 3B1-36

1. Install tie rod end lock nut and tie rod end to tie rod. Tighten lock nut to mark on tie rod thread.
2. Install tie rod end to knuckle. Tighten castle nut till holes for split pin are aligned but within specified torque range.

Tightening torque	N·m	kg-m	lb-ft
	30 – 55	3.0 – 5.5	22.0 – 39.5

3. Bend split pin as shown in figure.

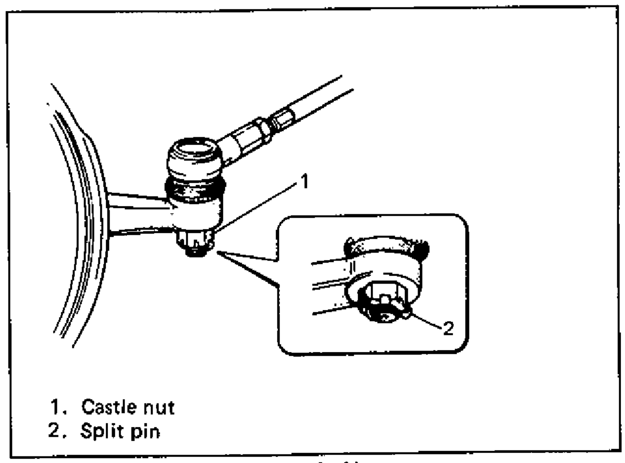


Fig. 3B1-37 Tightening Castle Nut

4. Check that proper amount of toe-in is obtained. (Refer to FRONT WHEEL ALIGNMENT.)
5. After confirming proper amount of toe-in, tighten tie rod end lock nut to specified torque.

Tightening torque	N·m	kg-m	lb-ft
	35 – 55	3.5 – 5.5	25.5 – 39.5

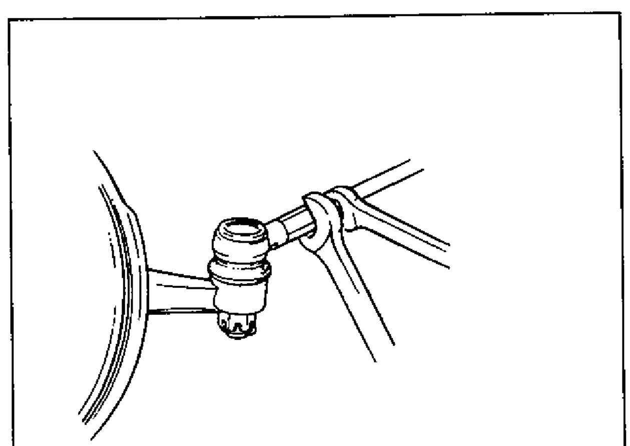


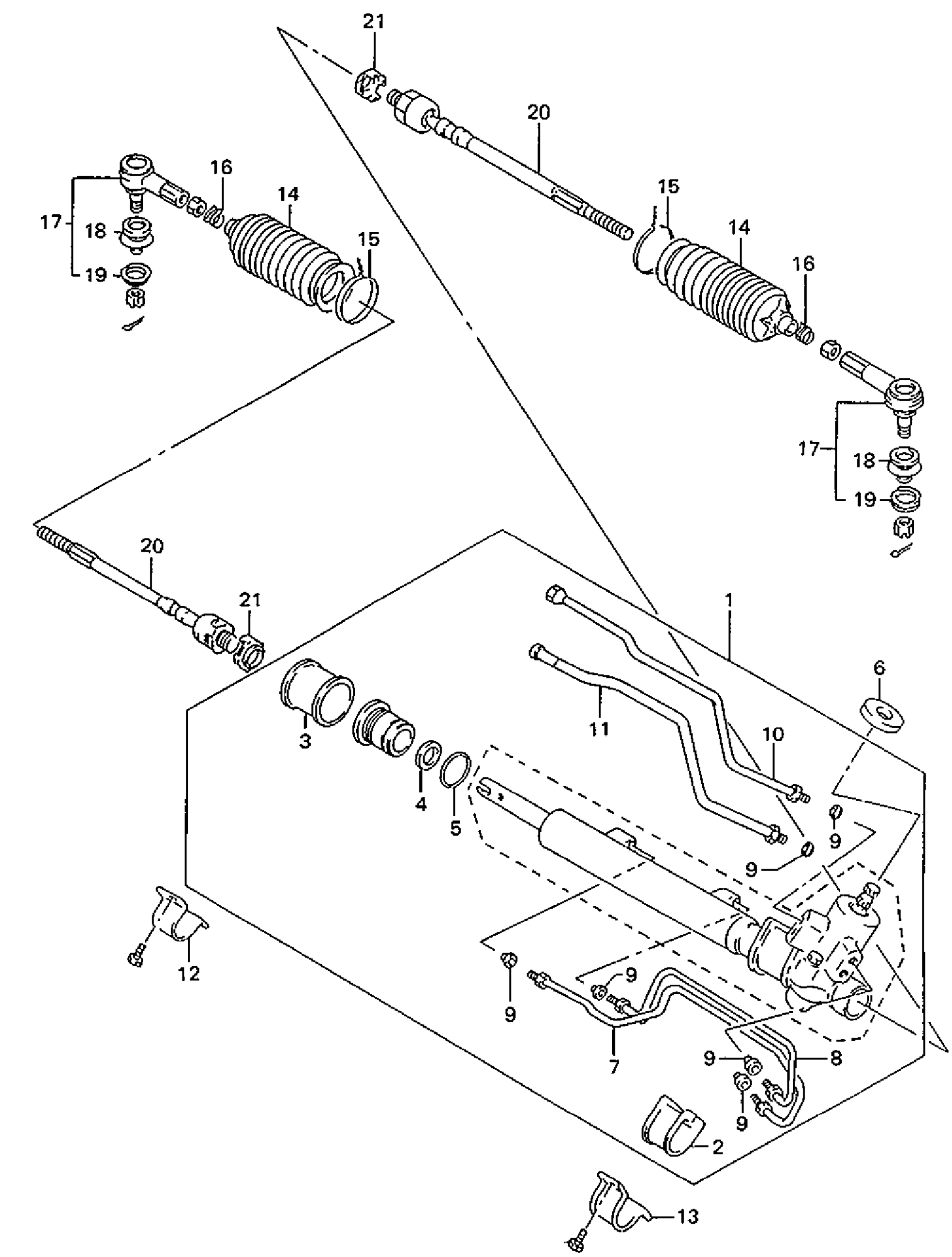
Fig. 3B1-38 Tightening Lock Nut

6. After installing wheels, lower car and tighten wheel nuts to specified torque.

REMOVE AND INSTALL POWER STEERING GEAR BOX

POWER STEERING GEAR BOX COMPONENTS

For LH steering model



1. Steering gear
2. Steering pinion side mount
3. Steering rack side mount
4. U-packing
5. O-ring
6. Gasket
7. Pipe ass'y A
8. Pipe ass'y B
9. Ferrule
10. Pressure pipe
11. Return pipe
12. Rack side bracket
13. Pinion side bracket
14. Steering boot
15. Rack boot wire
16. Rack boot clip
17. Steering tie rod end
18. Boot set
19. Clip
20. Tie rod
21. Tie rod lock washer

NOTE:
Component enclosed in broken line cannot be disassembled.

Fig. 3B1-39 Exploded View of Power Steering Gear Box

STEERING GEAR BOX

Removal

1. Loosen steering shaft upper joint bolt (but it must not be removed).
2. Remove lower joint bolt and separate pinion and lower joint.

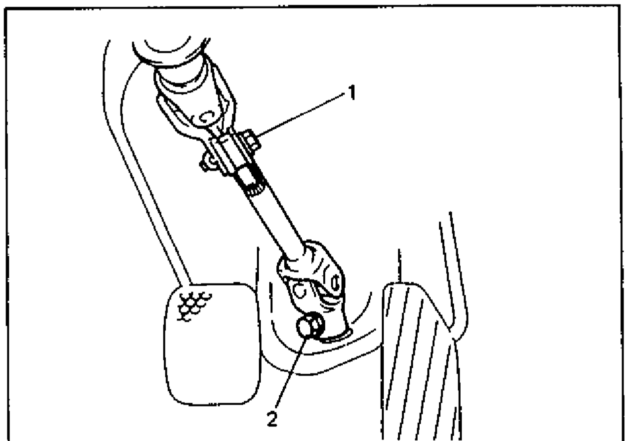


Fig. 3B1-40 Removing Joint Bolt

3. Jack up vehicle and remove both right and left wheels.
4. Remove split pin and then remove tie rod castle nut from steering knuckle.

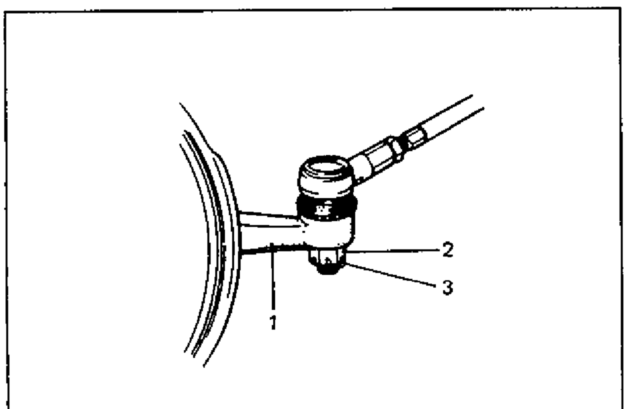


Fig. 3B1-41

5. Using special tool, remove tie rod end from knuckle.

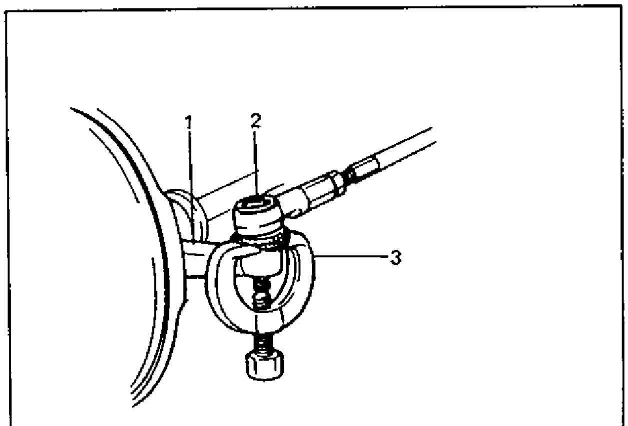


Fig. 3B1-42 Removing Tie Rod End

6. Remove exhaust pipe.
7. For A/T model:
   Remove engine rear torque rod with torque rod bracket.
   For M/T model:
   Disconnect both gear shift control shaft and extension rod at their transmission side.
8. Remove all pipes from steering gear box.

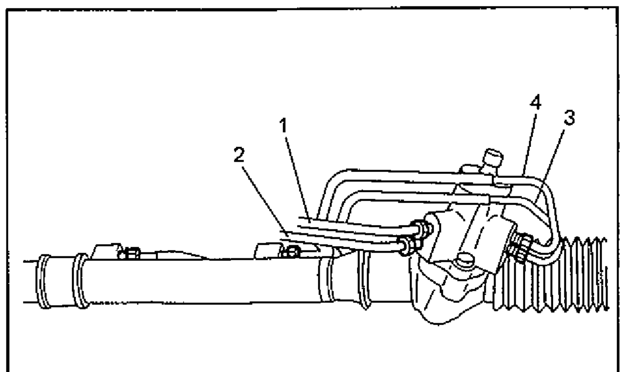


Fig. 3B1-43 Removing Pipes

9. Remove steering gear box mounting bolts and then remove steering gear box from car.

Installation

Reverse removal procedure for installation of steering gear box.

	Tightening torque		
	N·m	kg-m	lb-ft
Gear box mounting bolt	20 – 30	2.0 – 3.0	14.5 – 21.5

For specific tightening torque for each part, refer to respective section as indicated in below table.

• Rear torque rod bolt • Rear torque rod bracket bolts	SECTION 6A
• Gear shift control shaft bolt/nut • Extension rod nut	SECTION 7A
• Exhaust pipe bolts and nuts	SECTION 6K
• Castle nut • Steering shaft lower joint bolts	SECTION 3B

- Tighten flare nuts to specified torque.

	N·m	kg-m	lb-ft
"A"	40 – 50	4.0 – 5.0	29.0 – 36.0
"B"	30 – 40	3.0 – 4.0	22.0 – 28.5
"C"	20 – 30	2.0 – 3.0	14.5 – 21.5

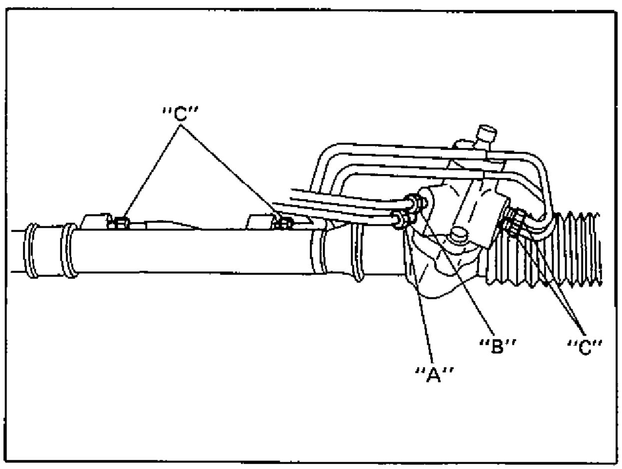


Fig. 3B1-44

NOTE:
After installation, be sure to fill A/T fluid and bleed air.

OIL SEAL

Removal

1. Remove gear box from car.
   Refer to item STEERING GEAR BOX.
2. As shown below, move boot so that joint section of tie rod and steering rack is exposed.

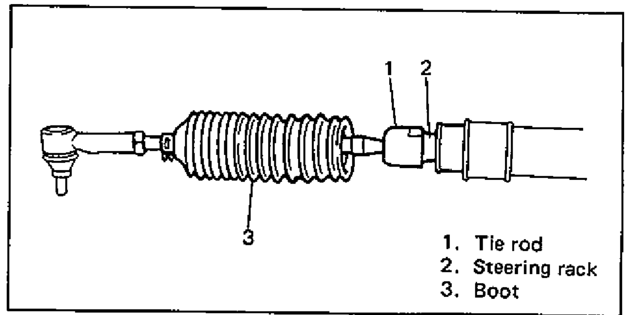


Fig. 3B1-45

3. Remove tie rod with tie rod end from gear box as shown below.

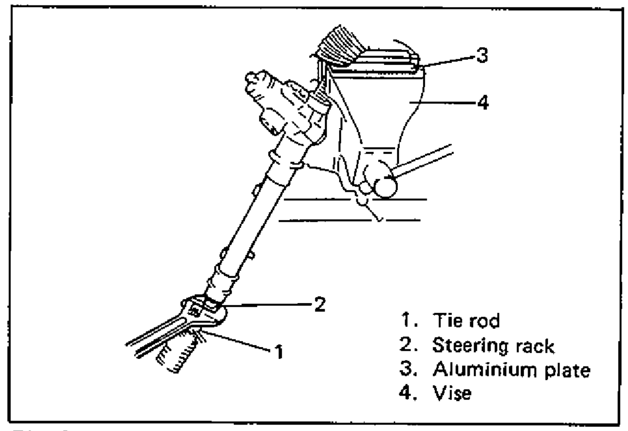


Fig. 3B1-46

4. Using special tool, remove box.

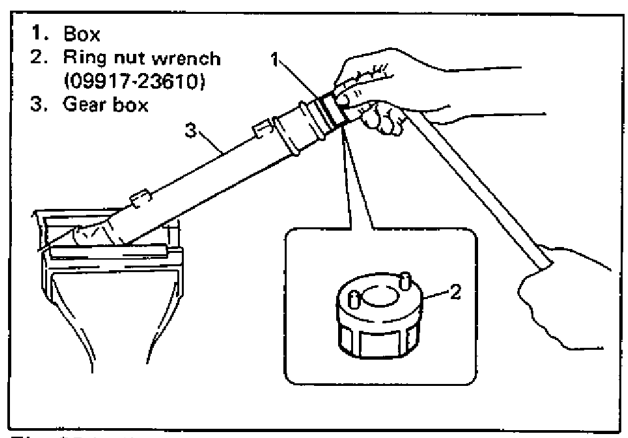


Fig. 3B1-47

5. Remove O-ring and/or U-packing.

Installation

Reverse removal procedure to install oil seals noting following points.

- Apply SUZUKI SUPER GREASE E to O-ring and U-packing of box and install them into groove in box.

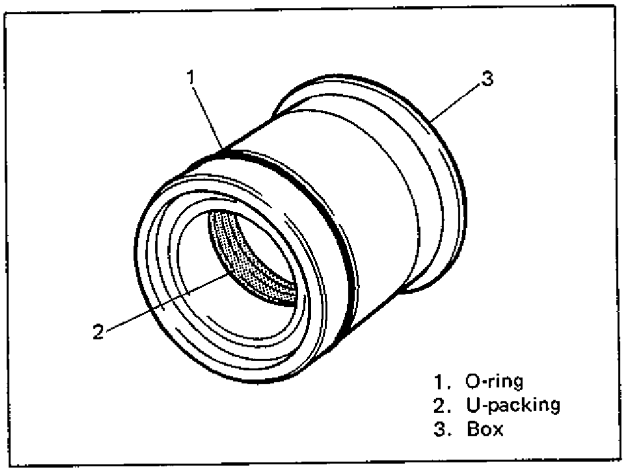


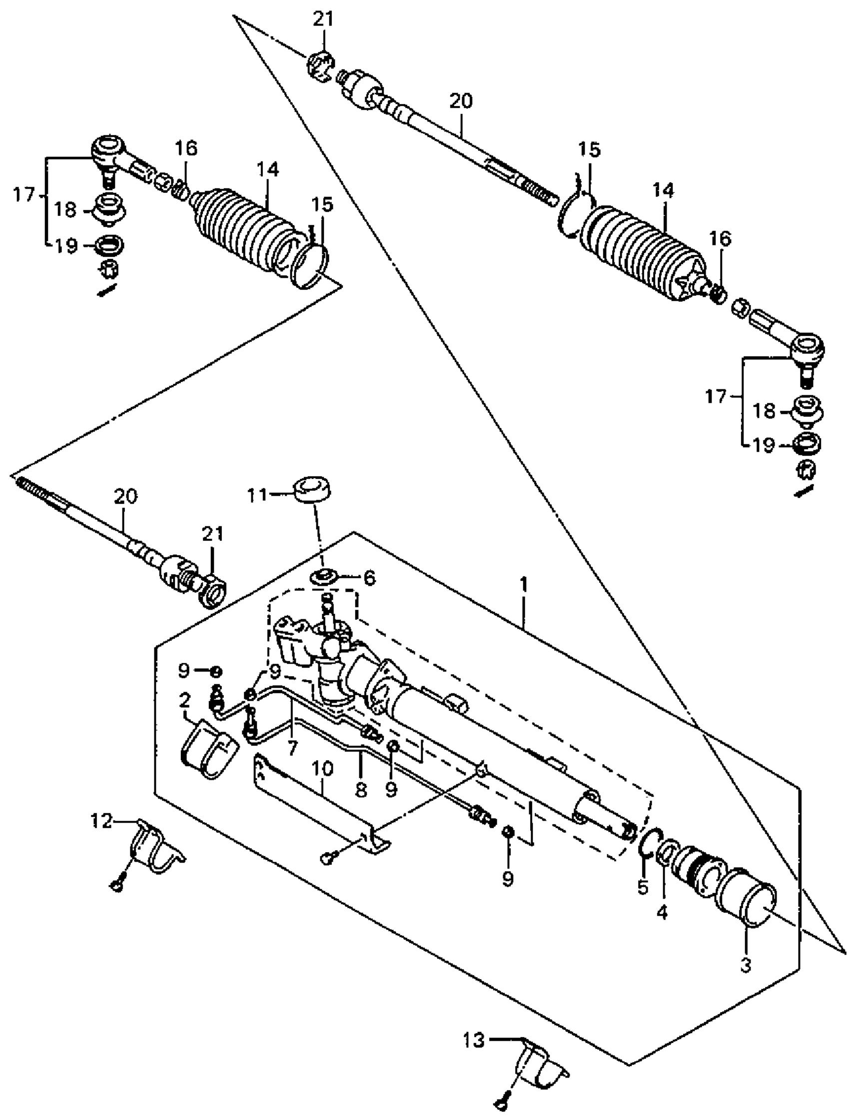
Fig. 3B1-48

- Tighten box and tie rod to specified torque.

	N·m	kg-m	lb-ft
Tightening torque for box	40 – 50	4.0 – 5.0	29.0 – 36.0
Tightening torque for tie rod	60 – 80	6.0 – 8.0	43.5 – 57.5

- Make sure to use new tie rod lock washer and caulk it after installation.

For RH steering model



1. Right steering gear
2. Steering pinion-side mount
3. Steering rack-side mount
4. U-packing
5. O-ring
6. Oil seal
7. Pipe ass'y A
8. Pipe ass'y B
9. Ferrule
10. Power steering cover
11. Steering gear case packing
12. Pinion side bracket
13. Rack side bracket
14. Steering boot
15. Rack boot wire
16. Rack boot clip
17. Tie rod end
18. Boot set
19. Clip
20. Steering tie rod
21. Tie rod lock washer

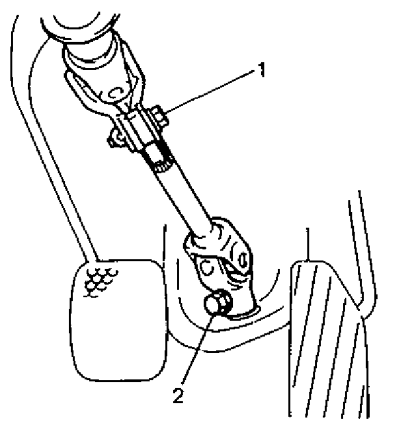
NOTE:
Component enclosed in broken line cannot be disassembled.

Fig. 3B1-49 Exploded View of Power Steering Gear Box

STEERING GEAR BOX

Removal

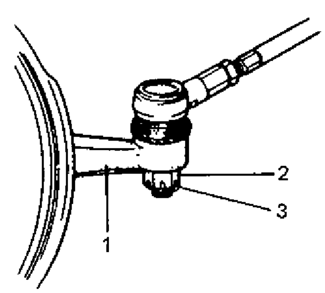
1. Loosen steering shaft upper joint bolt (but it must not be removed).
2. Remove lower joint bolt and separate pinion and lower joint.



1. Steering shaft upper joint bolt
2. Steering shaft lower joint bolt

Fig. 3B1-50 Removing Joint Bolt

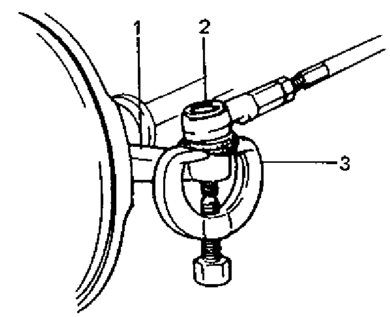
3. Jack up vehicle and remove both right and left wheels.
4. Remove split pin and then remove tie rod castle nut from steering knuckle.



1. Steering knuckle
2. Castle nut
3. Split pin

Fig. 3B1-51

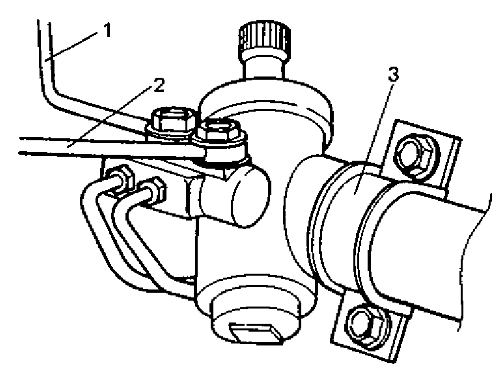
5. Using special tool, remove tie rod end from knuckle.



1. Knuckle
2. Tie rod end
3. Tie rod end remover (09913-65210)

Fig. 3B1-52 Removing Tie Rod End

6. Remove high pressure pipe and low pressure pipe from steering gear box.



1. High pressure pipe
2. Low pressure pipe
3. Pinion side bracket

Fig. 3B1-53 Removing Pressure Pipe

7. Remove steering gear box mounting bolts and then remove steering gear box from vehicle.

Installation

Reverse removal procedure for installation of steering gear box.

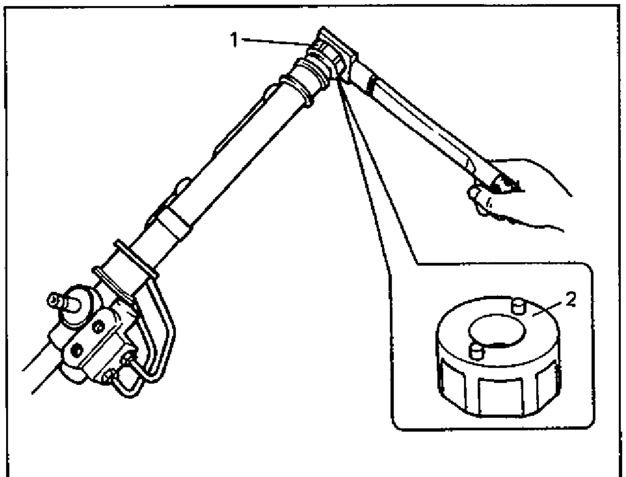
	Tightening torque		
	N·m	kg-m	lb-ft
Gear box mounting bolt	20 – 30	2.0 – 3.0	14.5 – 21.7
Castle nut	30 – 55	3.0 – 5.5	21.7 – 39.8
Joint bolt	20 – 30	2.0 – 3.0	14.5 – 21.7

NOTE:
After installation, be sure to fill A/T fluid and bleed air.

OIL SEAL

Removal

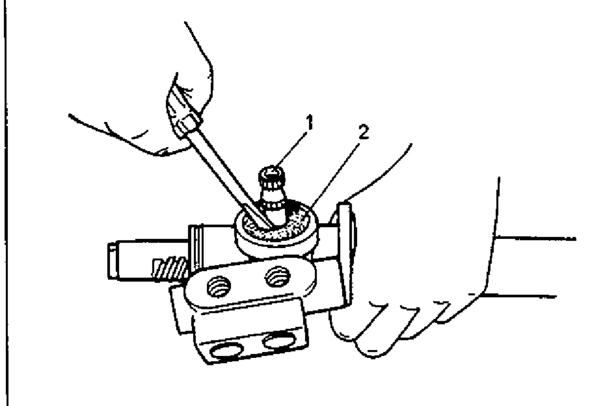
1. Remove gear box, tie rod end and tie rod.
2. Using special tool, remove box.



1. Box
2. Ring nut wrench (09917-23610)

Fig. 3B1-54 Removing Box

3. Remove oil seal by using screwdriver or the like.



1. Pinion shaft
2. Oil seal

Fig. 3B1-55 Removing Oil Seal

NOTE:

Use care not to damage pinion shaft with screwdriver.

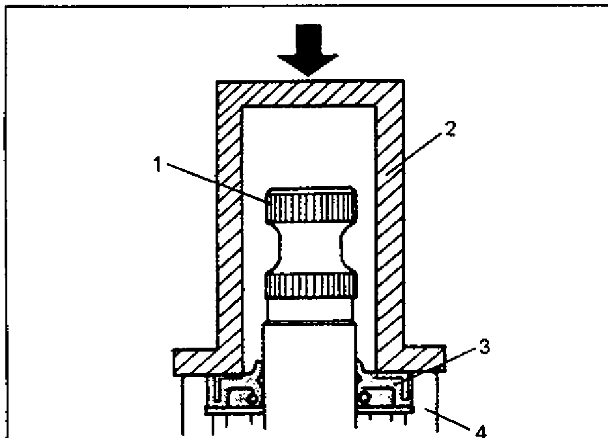
Installation

Reverse removal procedure, noting the following.

- Apply SUZUKI SUPER GREASE E to inside and outside of oil seal lip and press-fit it till its upper surface becomes flush with end face of steering gear case.

NOTE:

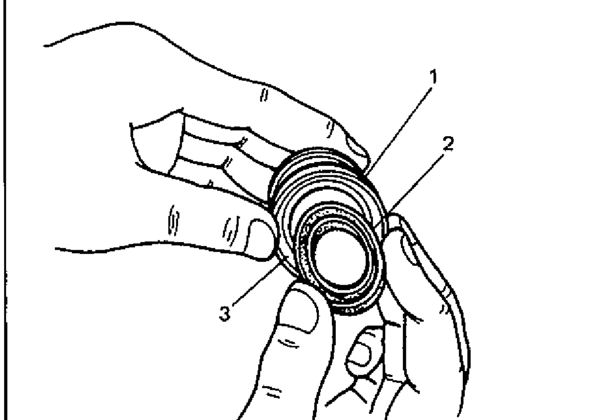
- **Cover serrated part of pinion shaft with vinyl tape or the like so as to prevent damage to oil seal lip.**
- **Use care not to allow oil seal lip to turn over.**



1. Pinion shaft
2. Bearing installer
3. Oil seal
4. End of steering gear case

Fig. 3B1-56 Press-fitting Oil Seal

- Apply SUZUKI SUPER GREASE E to O-ring and U-packing of box and install them into groove in box.

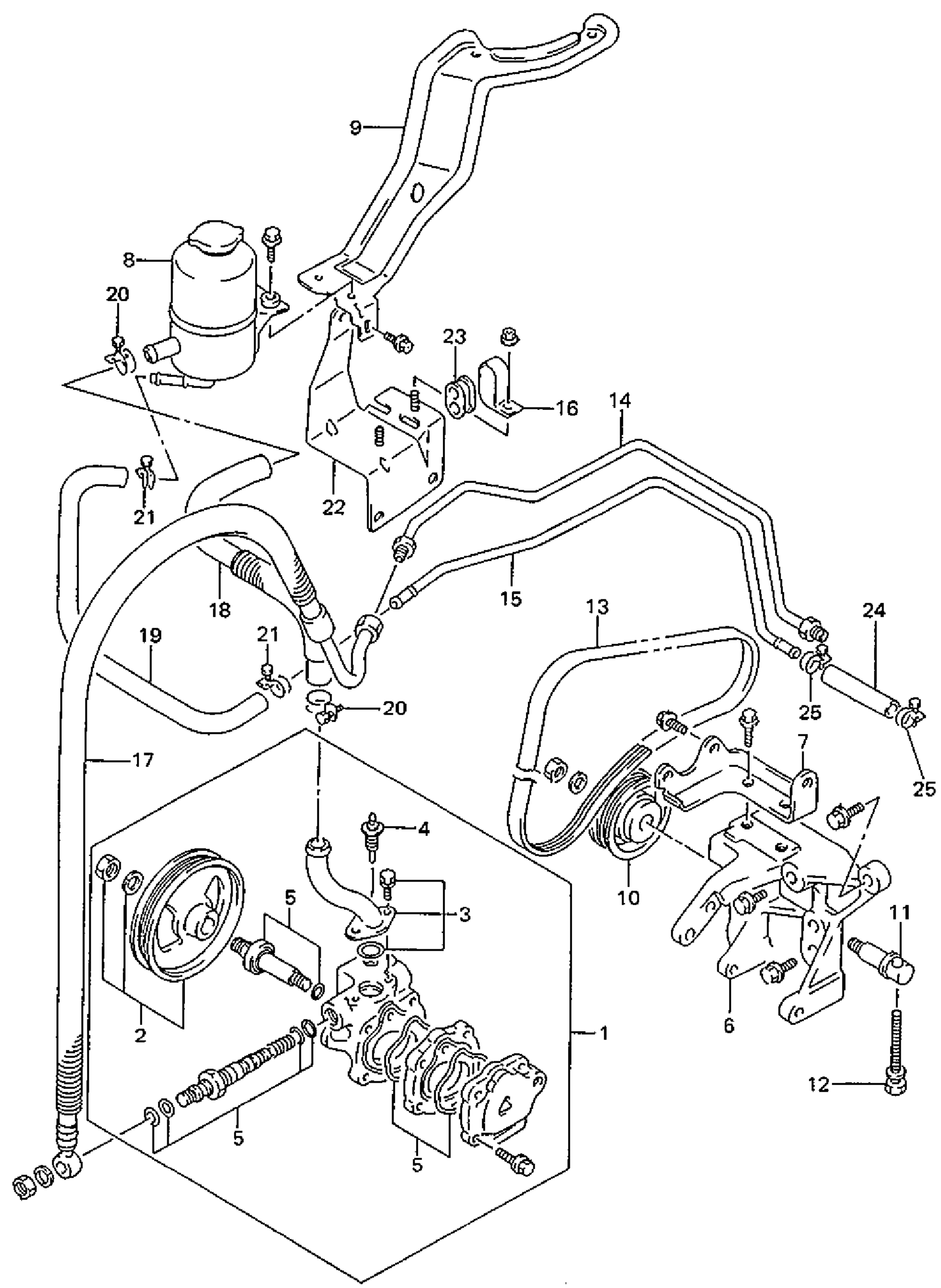


1. O-ring
2. U-packing
3. Box

Fig. 3B1-57 Installing U-packing

REMOVE AND INSTALL POWER STEERING PUMP

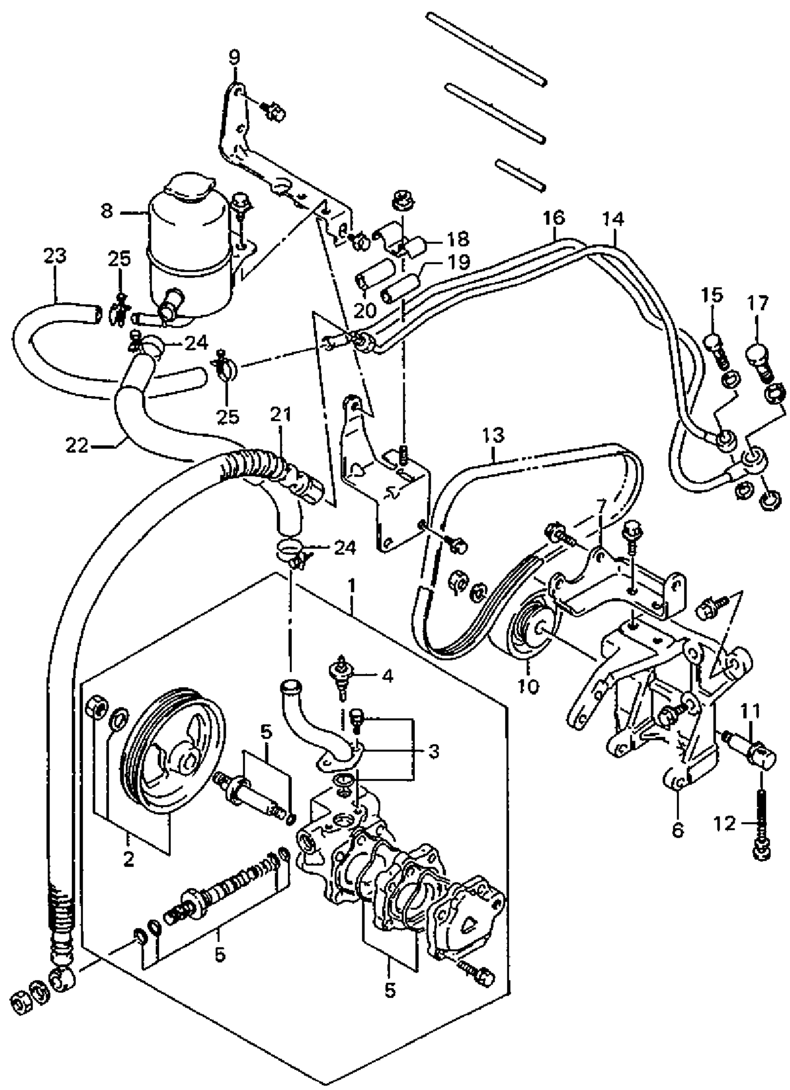
Components (For LH steering model)



1. Power steering pump assembly
2. Pulley set
3. Connector set
4. Terminal set (Including pressure switch)
5. Seal set
6. Power steering bracket assembly
7. Pump bracket
8. Power steering oil tank
9. Oil tank bracket
10. Belt tension pulley
11. Belt tension pulley bolt
12. Belt tension bolt
13. Power steering belt
14. High pressure pipe
15. Low pressure pipe
16. Pipe clamp
17. High pressure hose
18. Low pressure hose No. 1
19. Low pressure hose No. 2
20. Low pressure hose No. 1 clamp
21. Low pressure hose No. 2 clamp
22. Oil tank stay
23. Bushing
24. Hose
25. Clamp

Fig. 3B1-58 P/S Pump Components

Components (For RH steering model)



1. Power steering pump assembly
2. Pulley set
3. Connector set
4. Terminal set (Include pressure switch)
5. Seal set
6. Power steering bracket assembly
7. Pump bracket
8. Power steering oil tank
9. Oil tank braket
10. Belt tension pulley
11. Belt tension pulley bolt
12. Belt tension bolt
13. Power steering belt
14. High pressure pipe
15. High pressure union bolt
16. Low pressure pipe
17. Low pressure union bolt
18. Pipe clamp
19. Pipe bushing (D8)
20. Pipe bushing (D10)
21. High pressure hose
22. Low pressure hose No. 1
23. Low pressure hose No. 2
24. Low pressure hose No. 1 clamp
25. Low pressure hose No. 2 clamp

Fig. 3B1-59 P/S Pump Components

Removal

1. Remove splash cover, loosen belt tension pulley and remove P/S V-ribbed belt.
2. Disconnect high pressure hose and low pressure hose.
3. Disconnect pressure switch lead harness.
4. Remove compressor and bracket.
   Compressor needs not be removed with A/C equipped vehicle.
5. Remove oil pump together with its bracket (and 3 fixing bolts).

NOTE:

- **Be sure to clean each joint of suction and discharge sides thoroughly before removal.**
- **Plug each port of removed pump to prevent dust or any other foreign matter from entering.**

Installation

Reverse removal procedure.

NOTE:

Fill A/T fluid after installation and bleed air without failure.

Disassembly

1. Using special tool, remove oil pump pulley.

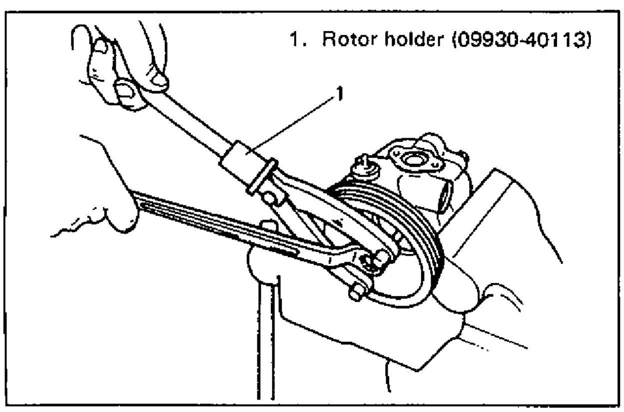


Fig. 3B1-60 Removing Oil Pump Pulley

2. Remove suction connector by removing its fixing bolts (M6, 2 pcs).
3. Remove terminal assembly and discharge connector.

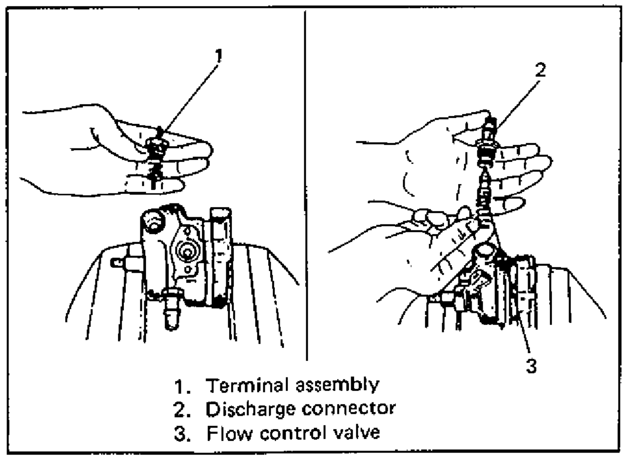


Fig. 3B1-61 Removing Terminal Assembly and Discharge Connector

4. Remove oil pump cover by removing its fixing bolts (M8, 4 pcs).

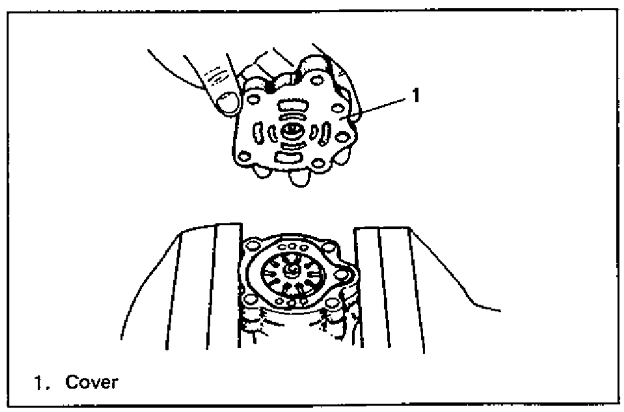


Fig. 3B1-62 Removing Oil Pump Cover

5. Remove cam ring.

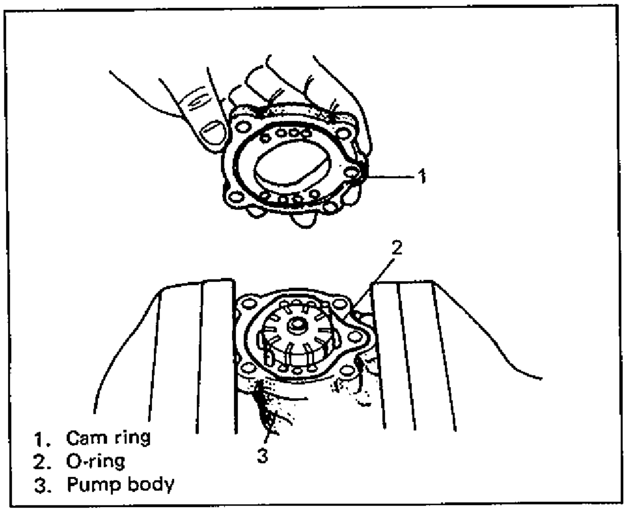


Fig. 3B1-63 Removing Cam Ring

6. Remove snap ring and pull out rotor.

NOTE:
When pulling rotor out of shaft, be careful not to lose vane.

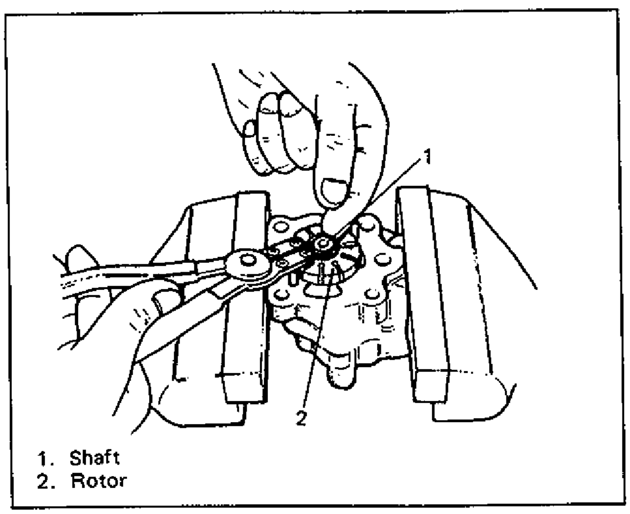


Fig. 3B1-64 Removing Rotor

7. Pull out shaft.
8. Remove oil seal.

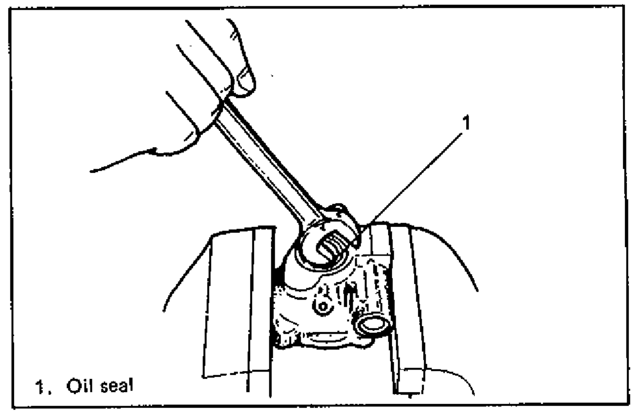


Fig. 3B1-65 Removing Oil Seal

Assembly
Reverse disassembly procedure for assembly, noting the following.

1. Apply DEXRON-II to shaft where bushing slides against and insert shaft from oil seal side.

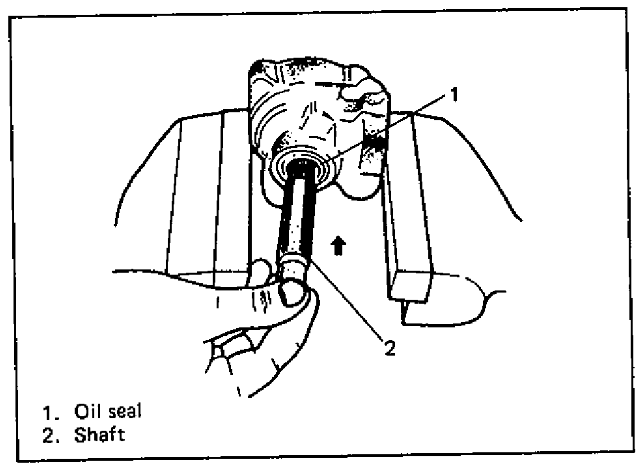


Fig. 3B1-66 Installing Shaft

2. Install rotor to shaft facing its splined part chamfered side up (to cover).

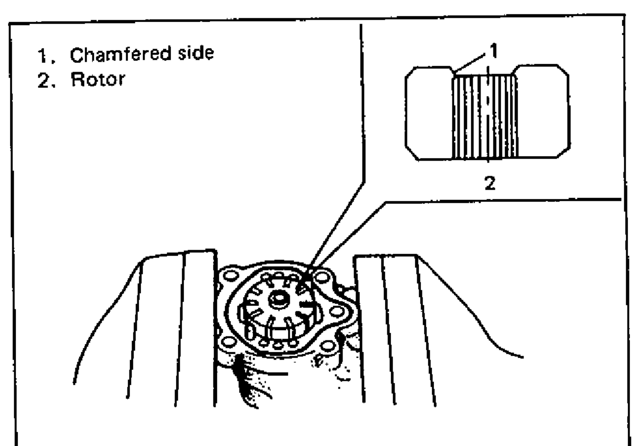


Fig. 3B1-67 Installing Rotor

3. Apply DEXRON-II to each vane and install it to rotor with its R part faced outward as shown below.

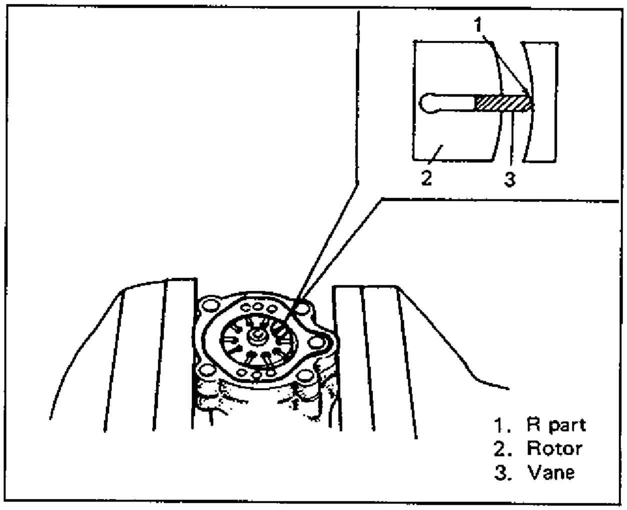


Fig. 3B1-68 Installing Vane

4. Apply DEXRON-II to O-ring and install it to pump body securely.
5. Install cam ring.

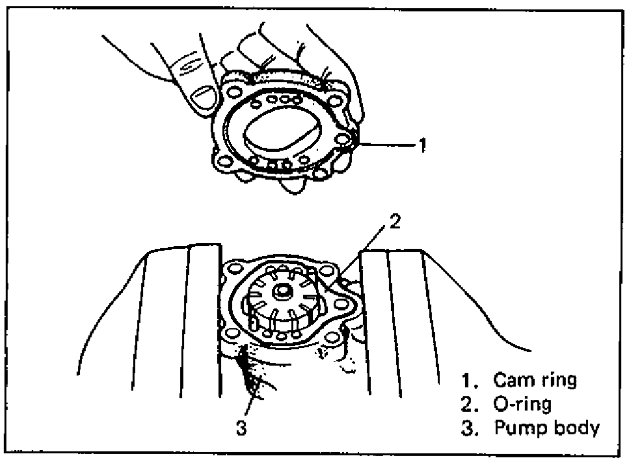


Fig. 3B1-69 Installing Cam Ring

6. Install snap ring to shaft.
7. Tighten cover bolts to specified torque.

Tightening torque for cover bolts	N·m	kg-m	lb-ft
	18 – 22	1.8 – 2.2	13.5 – 15.5

NOTE:
After installing cover, check to make sure that shaft can be turned by hand.

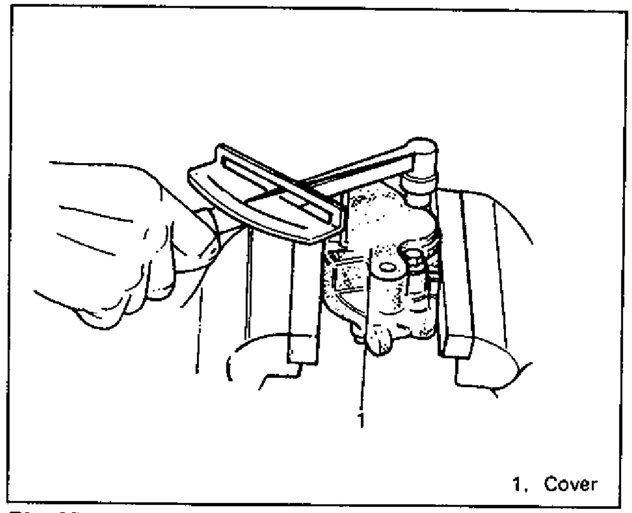


Fig. 3B1-70 Installing Cover

8. Check that flow control valve slides smoothly and tighten discharge (delivery) connector to specified torque.

Tightening torque for discharge connector	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

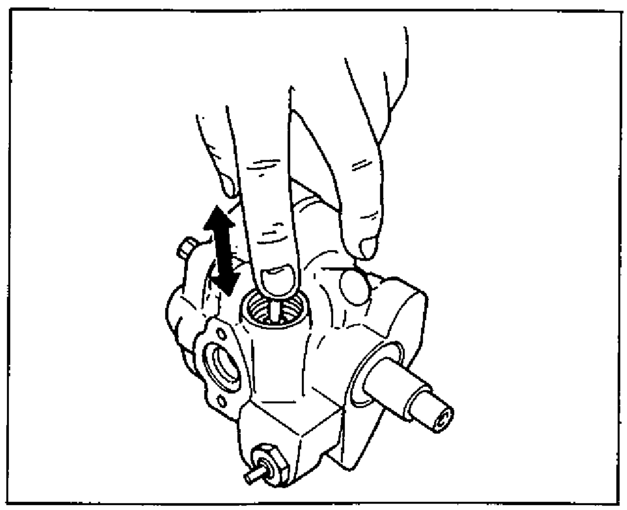


Fig. 3B1-71 Installing Flow Control Valve

9. Tighten terminal ass'y (pressure switch) to specified torque.

Tightening torque for terminal ass'y	N·m	kg-m	lb-ft
	25 – 30	2.5 – 3.0	18.5 – 21.5

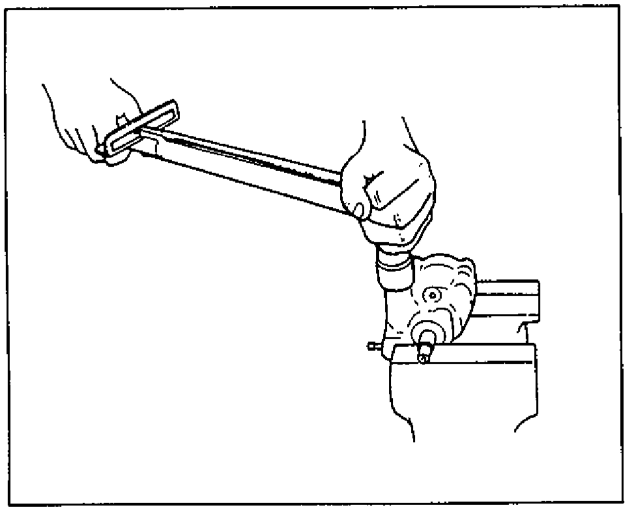


Fig. 3B1-72 Installing Terminal

10. Tighten suction connector bolts to specified torque.

Tightening torque for suction connector bolts	N·m	kg-m	lb-ft
	6 – 10	0.6 – 1.0	4.5 – 7.0

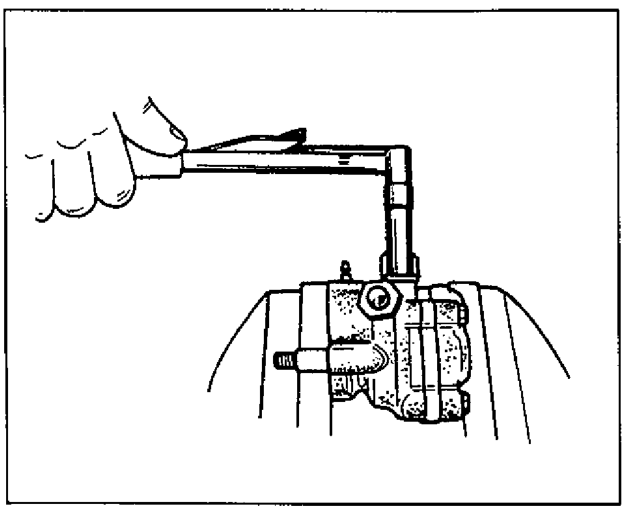


Fig. 3B1-73 Installing Suction Connector

INSPECTION

P/S Pump Body and Shaft

- Wear and damage of pump body sliding surface.
- Stepped wear and damage of shaft where bushing slides against.

  Replace P/S pump if any of the above is found.

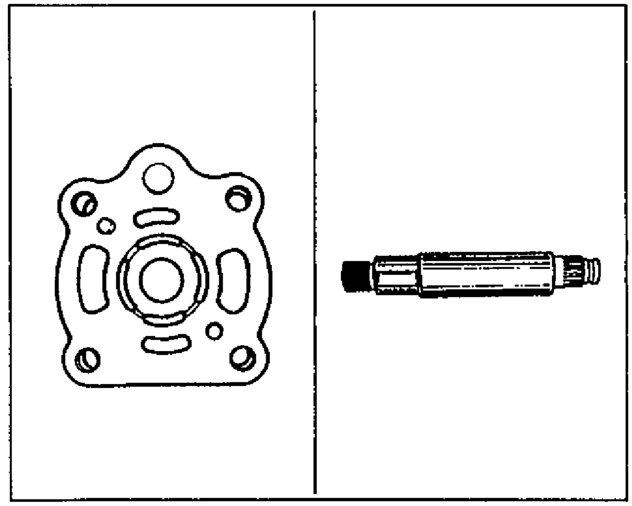


Fig. 3B1-74 Inspecting Pump Body and Shaft

Cam Ring

Inspect vane sliding surface of cam ring for wear and damage. Replace P/S pump if either of the above is found.

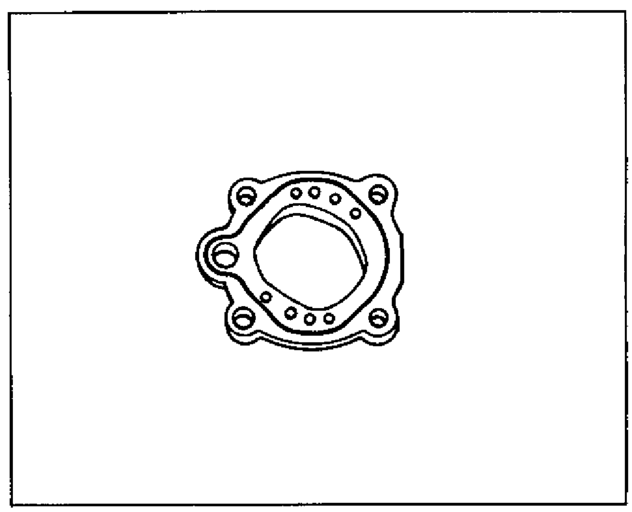


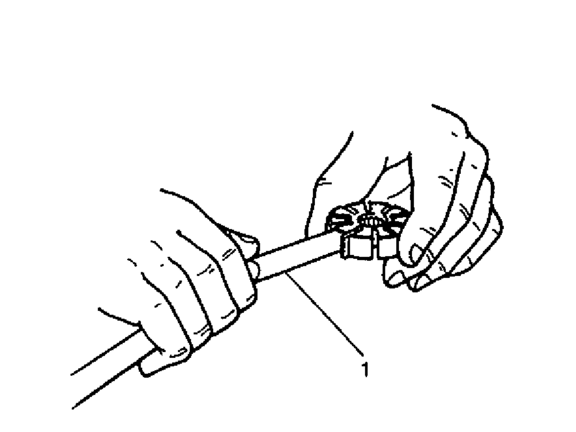
Fig. 3B1-75 Inspecting Cam Ring

Rotor and Vane

- Wear and damage of rotor sliding surface against pump body.
- Wear and damage of vane sliding surface against cam ring.
- Vane to rotor clearance.

Standard	0.01 mm (0.0004 in.)
Limit	0.06 mm (0.0023 in.)

Replace P/S pump if any of the above is found.



1. Thickness gauge

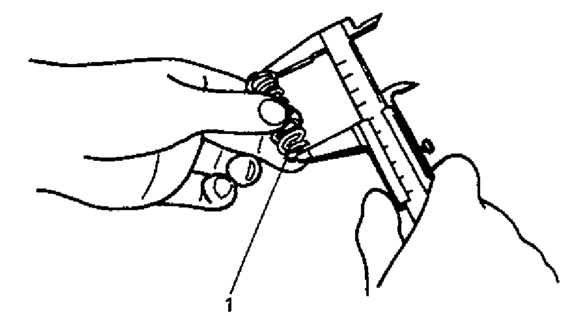
Fig. 3B1-76 Inspecting Rotor and Vane

Flow Control Valve

- Wear and damage on outside of valve.
- Obstruction in connector orifice.
- Free length of flow control spring.

Standard	36.5 mm (1.43 in.)
Limit	33.5 mm (1.32 in.)

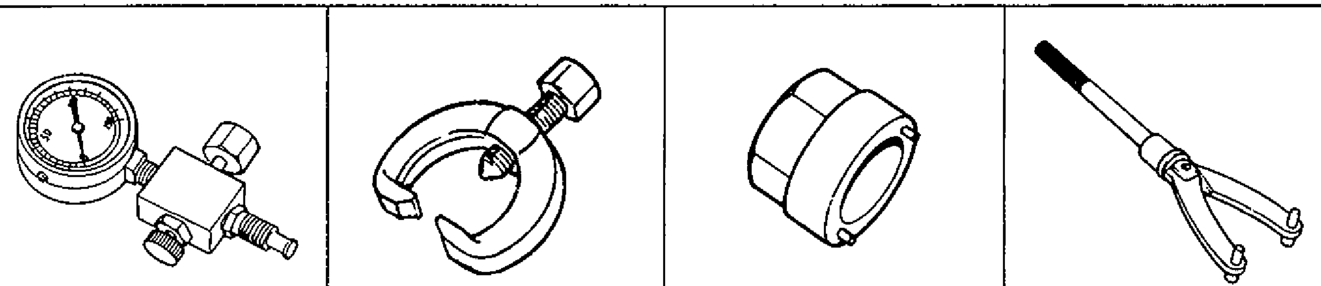
Replace P/S pump if any of the above is found.



1. Flow control spring

Fig. 3B1-77 Inspecting Flow Control Spring

SPECIAL TOOLS



09915-77410 Oil pressure gauge	09913-65210 Tie-rod end remover	09917-23610 Ring nut wrench	09930-40113 Transfer flange lock holder

Fig. 3B1-78

SECTION 3C

STEERING WHEEL AND COLUMN

NOTE:
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 of substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.

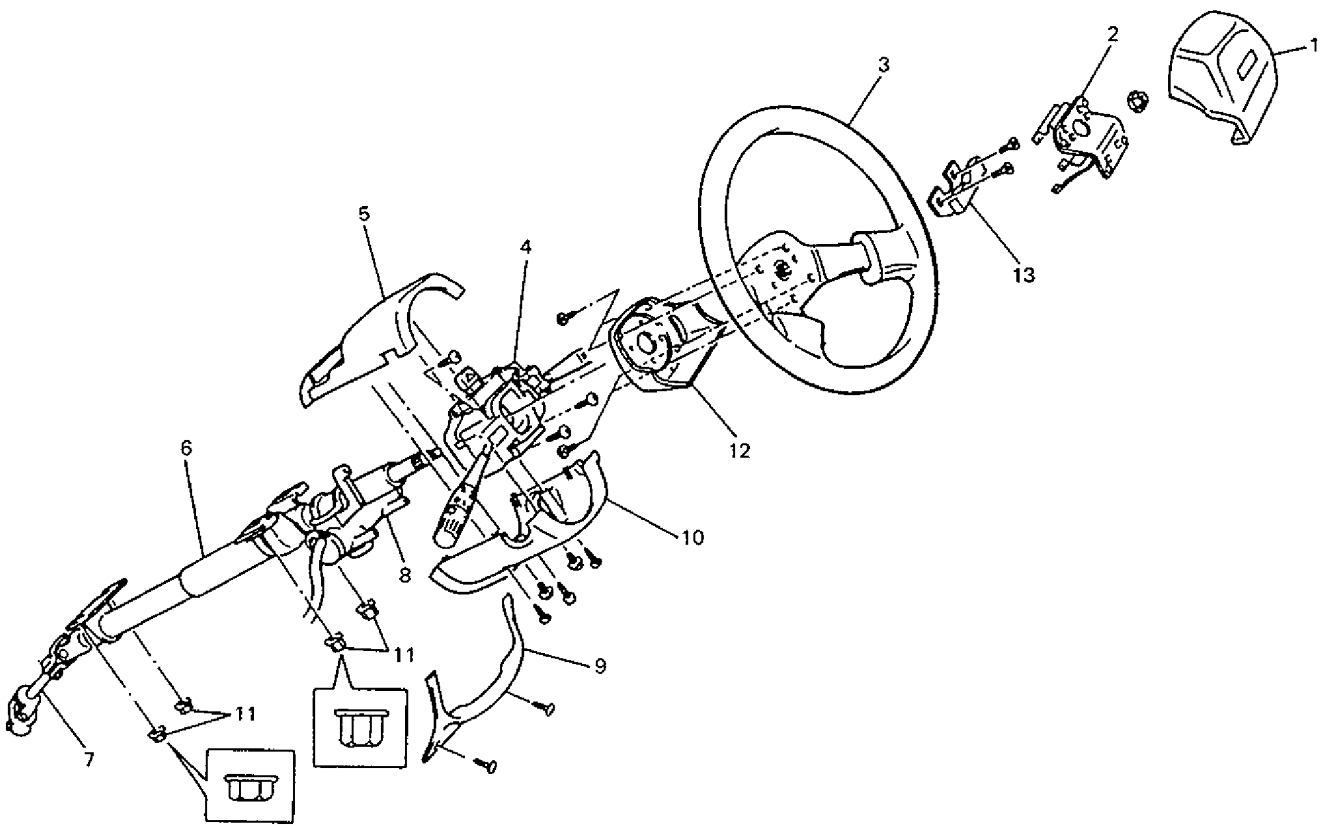
CONTENTS

DIAGNOSIS 3-1
GENERAL DESCRIPTION 3C-1
ON CAR SERVICE 3C-3
1. Remove and Install Steering Wheel .. 3C-3
2. Remove and Install Combination Switch 3C-4
3. Remove and Install Steering Column 3C-5
4. Remove and Install Steering Lock 3C-7
5. Remove and Install Steering Shaft Lower Joint 3C- 8
6. Checking Steering Column for Accident Damage 3C- 9
7. Checking Tilt Steering Column (If equipped) 3C-10
RECOMMENDED TORQUE SPECIFICATIONS 3C-10
SPECIAL TOOL 3C-10

GENERAL DESCRIPTION

For installation, it is important that only the specified screws, bolts, and nuts be used as disignated and that they are tightened to the specified torque.

When removing the column assembly from the car, special care must be taken in handling it. Use of a steering wheel puller other than the steering wheel remover recommended in this manual or a sharp blow on the end of the steering shaft, leaning on the assembly, or dropping the assembly is prohibited. Any of such actions could shear the plastic shear pins which maintain column length especially.



1. Steering wheel pad
2. Steering wheel bumper
3. Steering wheel
4. Combination switch
5. Steering column upper cover
6. Steering column assembly
7. Steering shaft lower joint
8. Steering lock assembly
9. Steering column under cover
10. Steering column lower cover
11. Steering column mounting nut
12. Steering wheel lower cover
13. Steering wheel mass damper

NOTE:
Use of steering column mounting nuts is different between key cylinder side and lower joint side. Refer to above figure for proper installation.

Fig. 3C-1 Steering Wheel and Column

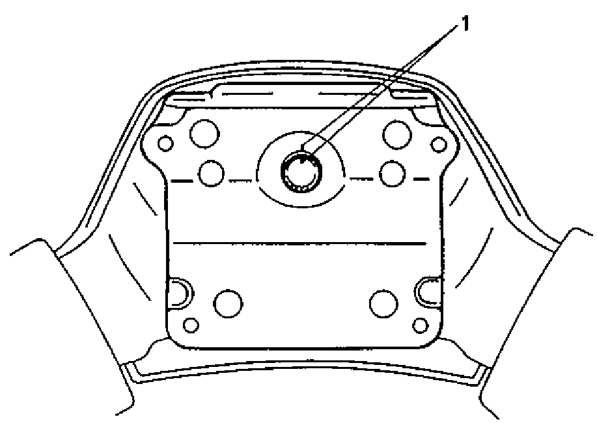
ON CAR SERVICE

1. REMOVE AND INSTALL STEERING WHEEL

NOTE:
Removal and installation procedures of steering wheel may vary somewhat from description below depending on specifications.

REMOVAL

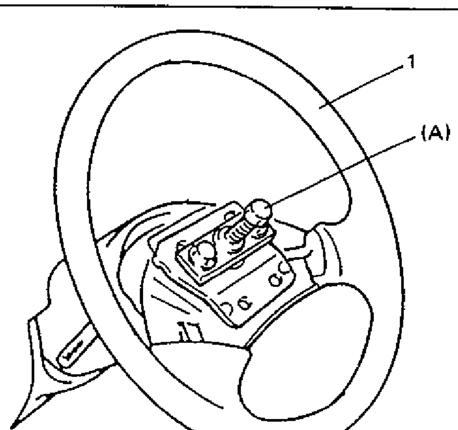
1) Disconnect negative battery cable.
2) Remove pad by pulling it upward.
3) Remove steering shaft nut and mass damper screws.
4) Make alignment marks on steering wheel and shaft for a guide during reinstallation.



1. Make alignment marks

Fig. 3C-2

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

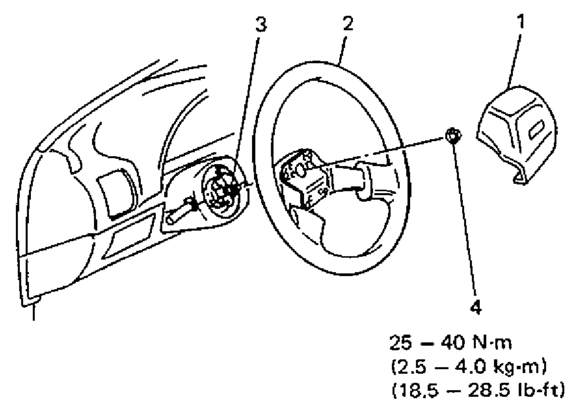


1. Steering wheel
(A): Steering wheel remover (09944-36010)

Fig. 3C-3

INSTALLATION

1) Install steering wheel onto shaft, aligning alignment marks on them.
2) Torque steering shaft nut to specification as given below.
3) Connect horn wire to steering wheel and then, install pad bumper and pad.



1. Steering wheel pad
2. Steering wheel
3. Steering shaft
4. Steering shaft nut

Fig. 3C-4

4) Connect negative battery cable.

2. REMOVE AND INSTALL COMBINATION SWITCH

REMOVAL

1) Disconnect negative battery cable.
2) Before removing this switch, remove steering wheel. Refer to STEERING WHEEL REMOVAL.
3) Remove column covers (under and lower).

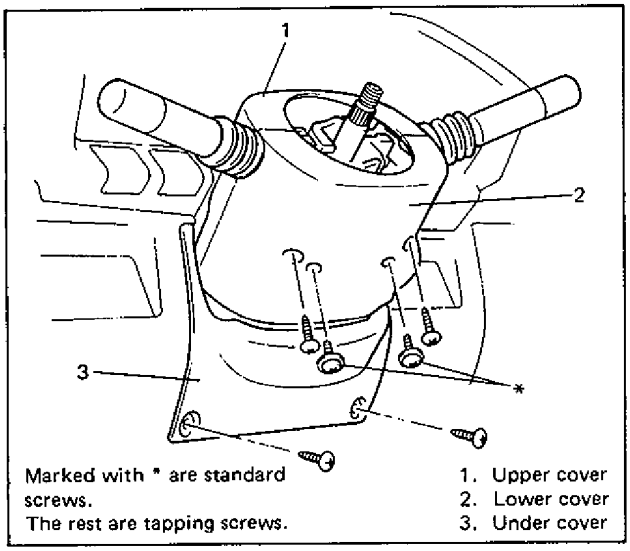


Fig. 3C-5

4) Disconnect lead wire from combination switch at coupler.
5) Loosen wire bands.
6) Remove combination switch assembly from steering column.

INSTALLATION

1) Install combination switch.
2) Connect lead wire from this switch at coupler.
3) Tighten wire bands.
4) Install column lower cover and under cover.

NOTE:
When tightening lower cover and upper cover, be careful so that combination switch lead wire is not caught between covers.

5) Install steering wheel. Refer to step 1) through 4) under STEERING WHEEL INSTALLATION.

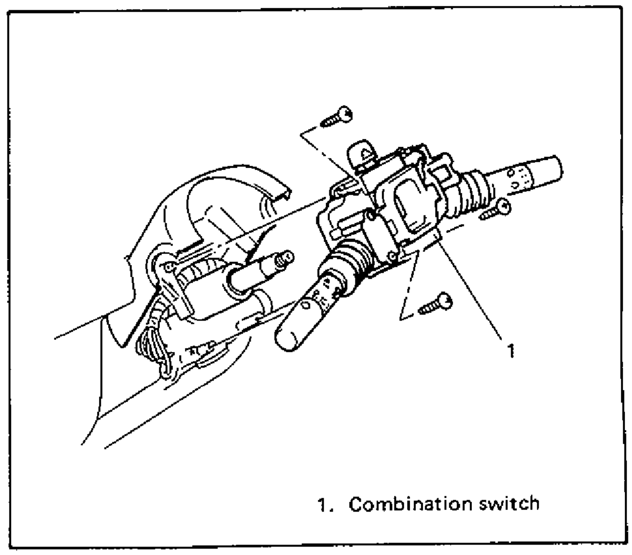


Fig. 3C-6

3. REMOVE AND INSTALL STEERING COLUMN

NOTE:

Once the steering column is removed from the car, 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 the jacket 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 upon as hammering could loosen the plastic shear pins which maintain column length.

REMOVAL

1) Disconnect negative battery cable.
2) Remove steering wheel. Refer to STEERING WHEEL REMOVAL.
3) Remove combination switch. Refer to Steps 3 through 6 under COMBINATION SWITCH REMOVAL.
4) Disconnect lead wires from ignition switch and ignition key warning switch (if equipped) at coupler.
5) Pull off floor mat at the foot of steering shaft and remove steering joint cover.

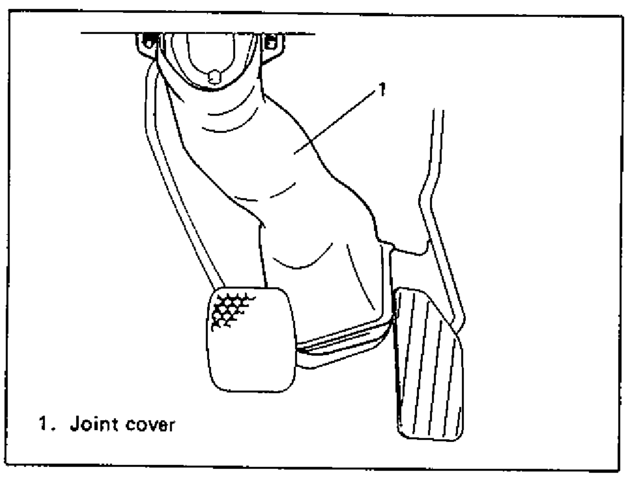


Fig. 3C-7

6) Remove steering shaft joint upper side bolt.

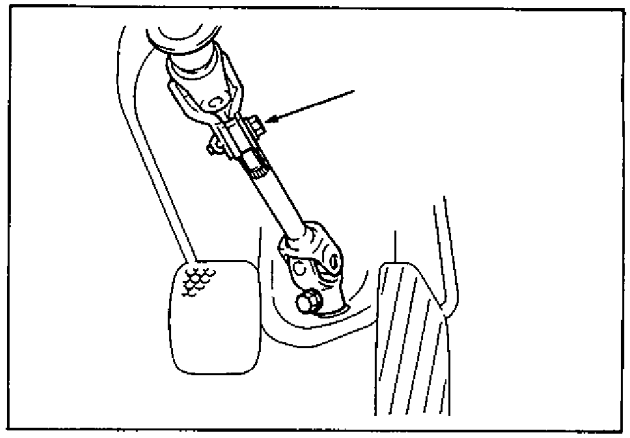


Fig. 3C-8

7) Remove steering column mount nuts.

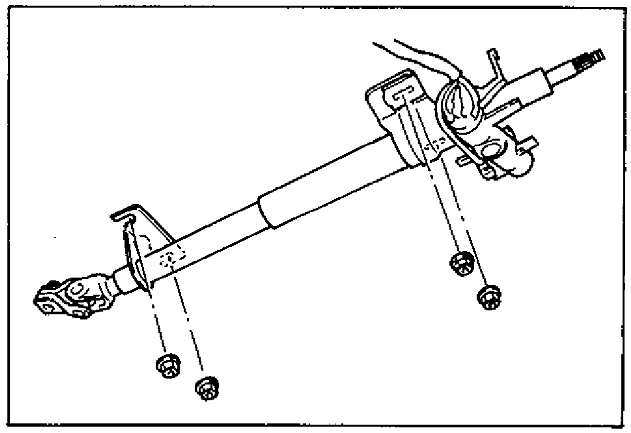


Fig. 3C-9

8) Remove steering column assembly.

NOTE:

Don't separate steering column assembly into steering column and shaft. If column or shaft is defective replace as an assembly.

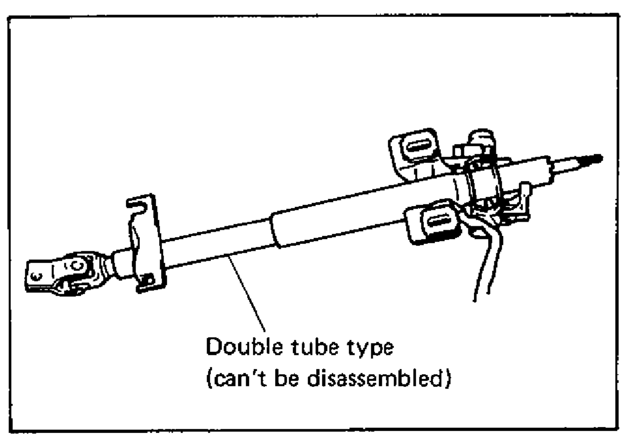


Fig. 3C-10 Steering Column Assembly

INSTALLATION

1) Align flat part "A" of lower joint shaft with bolt hole "B" of upper side joint as shown. Then insert upper side joint into lower joint shaft.

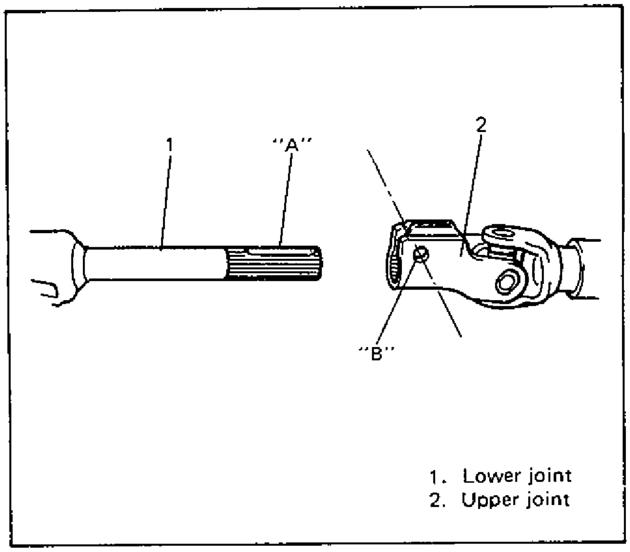


Fig. 3C-11

2) Install steering column assembly to lower and upper brackets. Torque steering column nuts to specifications as given below.
   - Tighten nuts (a) first to specified torque.
   - Then tighten nuts (b) to specified torque.

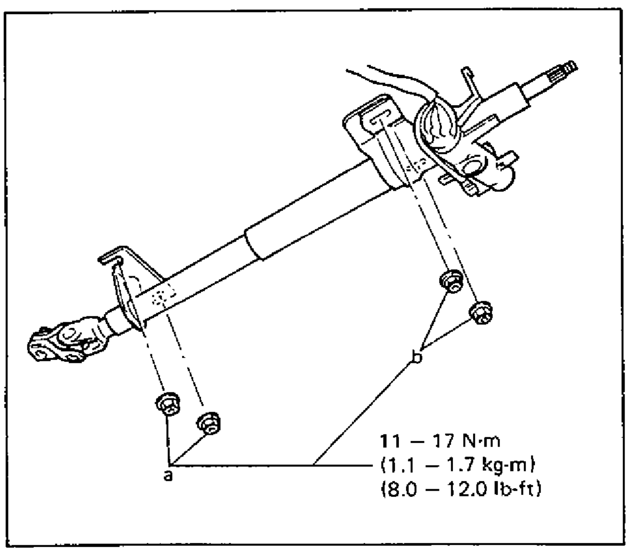


Fig. 3C-12

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

NOTE:

After tightening column nuts, bolt 1 should be tightened.

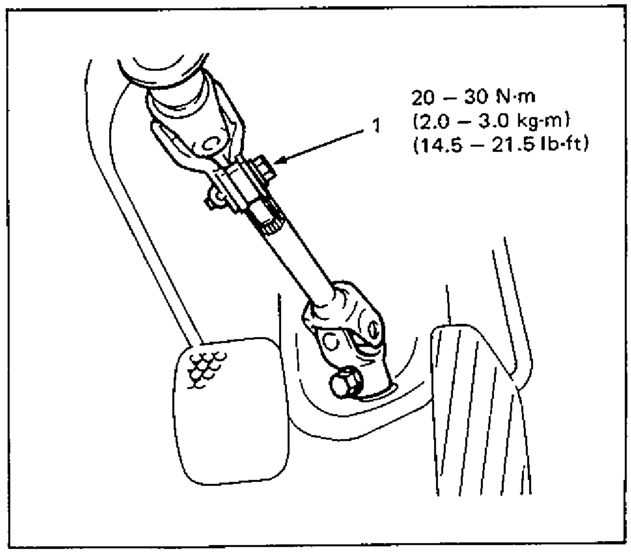


Fig. 3C-13

4) Install steering joint cover and put floor mat back as it was originally.
5) Connect lead wires from ignition switch and ignition key warning switch (if equipped) at coupler.
6) Install combination switch. Refer to Steps 1 through 4 under COMBINATION SWITCH INSTALLATION.
7) Install steering wheel. Refer to Steps 1 through 4 under STEERING WHEEL INSTALLATION.

4. REMOVE AND INSTALL STEERING LOCK

(Applicable to car equipped with steering lock.)

REMOVAL

1) Remove steering column. Refer to STEERING COLUMN REMOVAL.

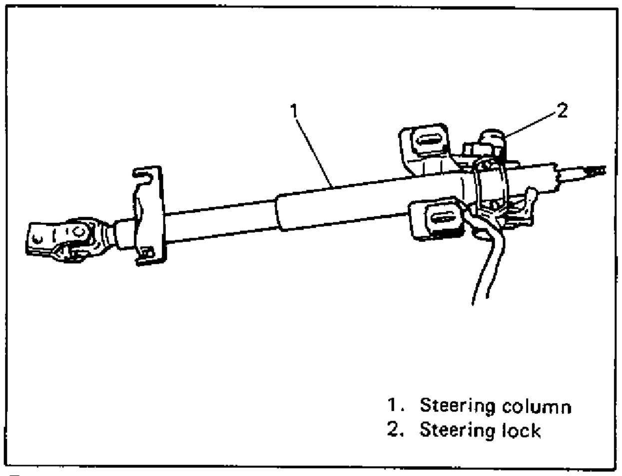


Fig. 3C-14

2) Using center punch as shown, loosen and remove steering lock mounting bolts. Use care not to damage aluminum part of steering lock body with center punch.

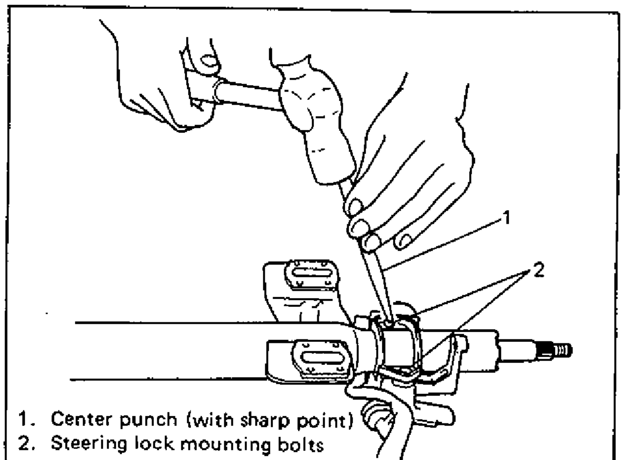


Fig. 3C-15

3) 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.

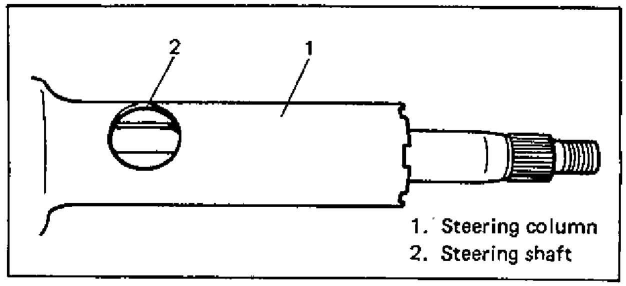


Fig. 3C-16

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.

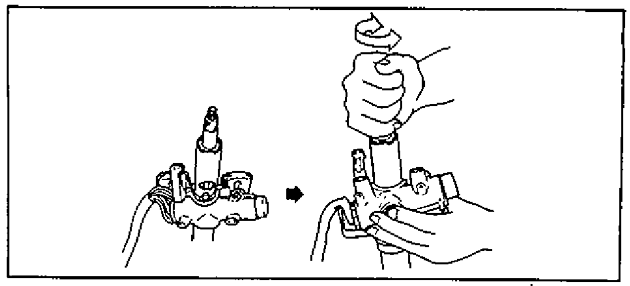


Fig. 3C-17

5) Tighten two new bolts until head of each bolt is broken off.

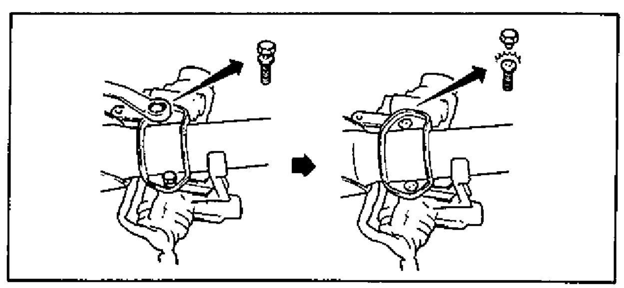


Fig. 3C-18

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 Steps 1) through 7) under STEERING COLUMN INSTALLATION.

5. REMOVE AND INSTALL STEERING SHAFT LOWER JOINT

REMOVAL

1) Set front wheels in straightforward state and remove steering shaft joint cover.
2) Remove steering shaft joint bolts.

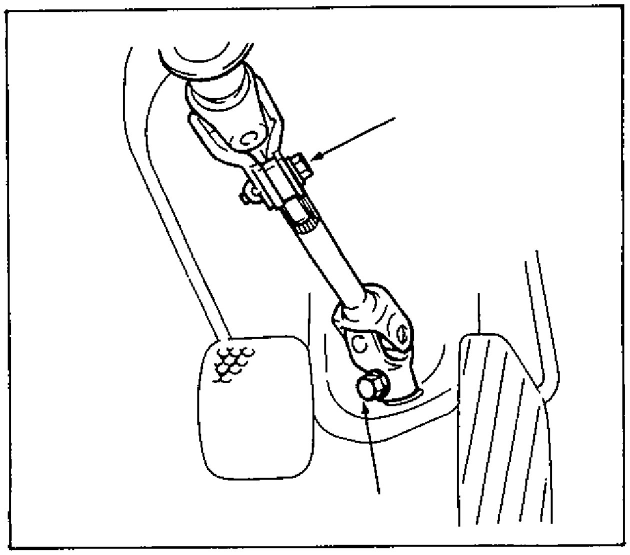


Fig. 3C-19

3) Remove steering shaft lower joint.
   If it's hard to remove, loosen steering column mounting nuts a little.

INSTALLATION

1) Align flat part of lower joint shaft with bolt hole of upper joint as shown. Then insert lower joint shaft into upper joint.

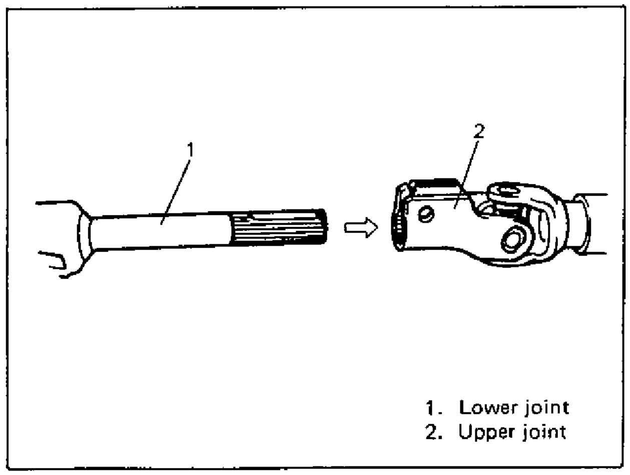


Fig. 3C-20

2) Be sure that front wheels and steering wheel are in straightforward state and insert lower joint into steering pinion shaft.
3) If steering column nuts were loosened in removal, torque lower bracket nuts to below specification first.

N·m	kg-m	lb-ft
11 – 17	1.1 – 1.7	8.0 – 12.0

And then torque upper bracket nuts to specification.

N·m	kg-m	lb-ft
11 – 17	1.1 – 1.7	8.0 – 12.0

4) Torque steering shaft joint bolts to specification.

N·m	kg-m	lb-ft
20 – 30	2.0 – 3.0	14.5 – 21.5

5) Install steering shaft joint cover.

6. CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

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

CHECKING PROCEDURE

1) Check capsules on steering column bracket; all should be contacting the bottom of slots. If not, steering column assembly should be replaced. Use thickness gauge for convenience.

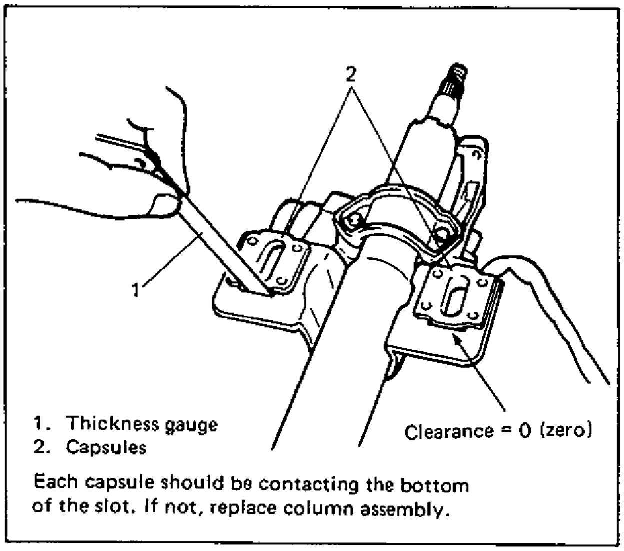


Fig. 3C-21 Checking Steering Column

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

NOTE:
Specified length "A" varies depending on vehicle specifications. Measure measurement "B" first and by using that data, check specified length "A" applicable to specifications and then take measurement "A".

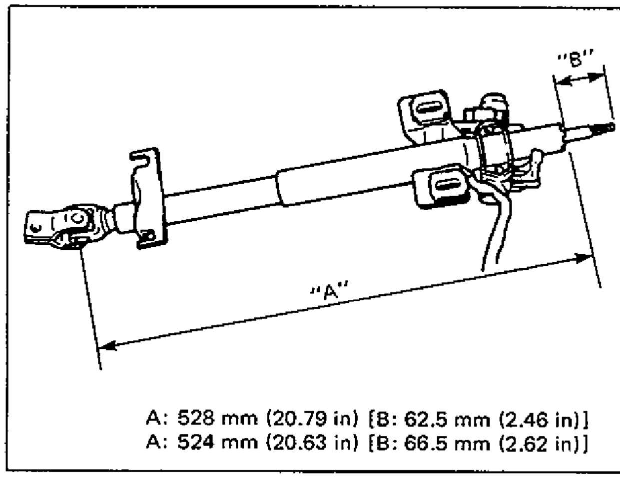


Fig. 3C-22

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 joint assembly.

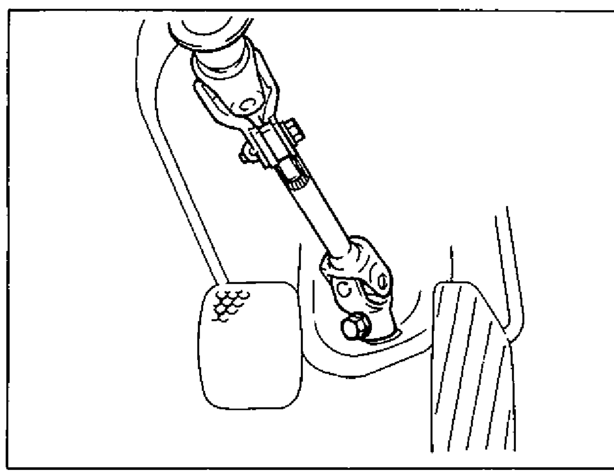


Fig. 3C-23

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

7. CHECKING TILT STEERING COLUMUN (If equipped)

Check to make sure the following:

- Steering column moves smoothly when tilt lever is at lower position (i.e., steering column is unlocked).
- Steering column is fixed securely when tilt lever is at higher position (i.e., steering column is locked).

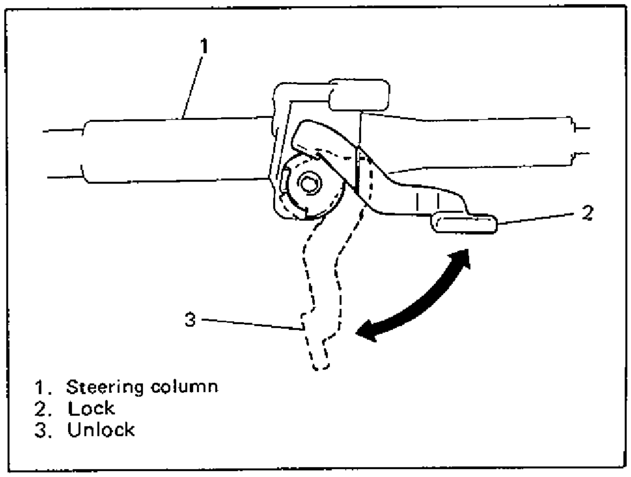


Fig. 3C-23-1

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Steering shaft nut	25 – 40	2.5 – 4.0	18.5 – 28.5
2. Steering shaft joint bolts	20 – 30	2.0 – 3.0	14.5 – 21.5
3. Steering column nuts	11 – 17	1.1 – 1.7	8.0 – 12.0

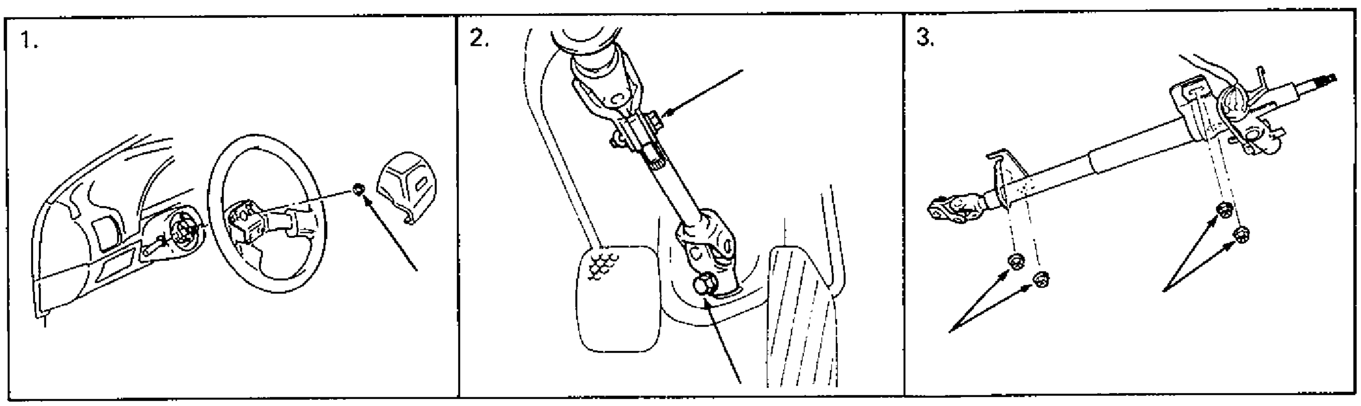
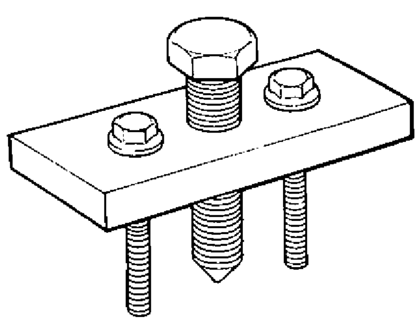


Fig. 3C-24

SPECIAL TOOL



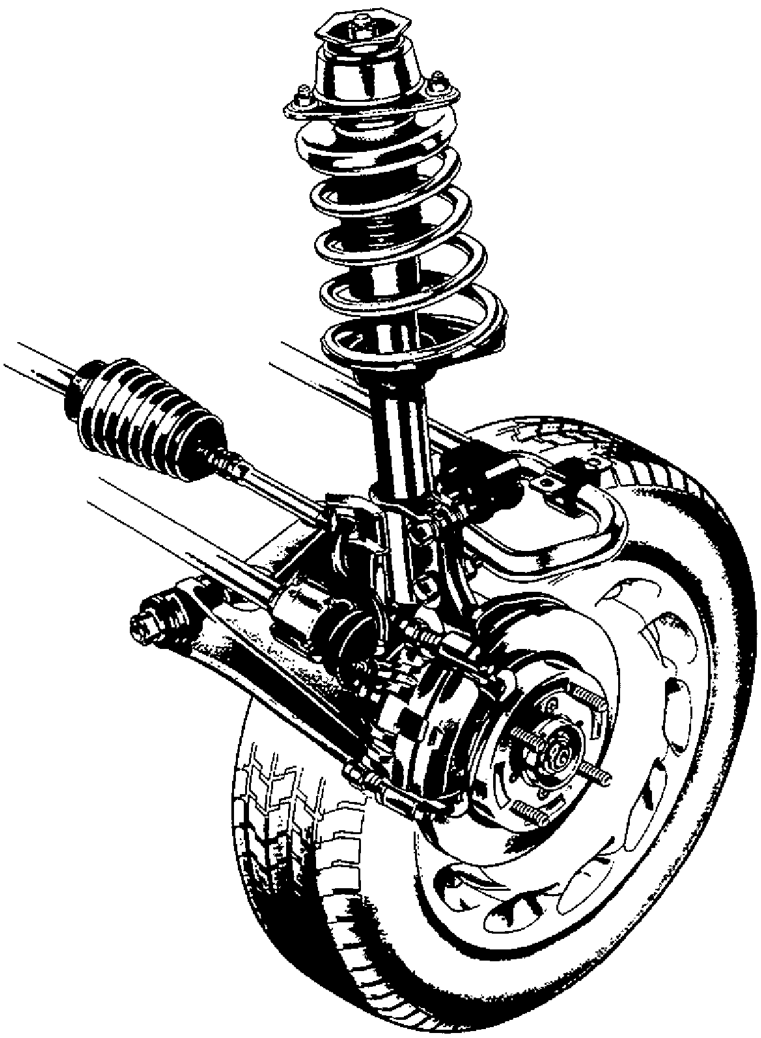
09944-36010
Steering wheel remover

Fig. 3C-25

SECTION 3D

FRONT SUSPENSION

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



CONTENTS

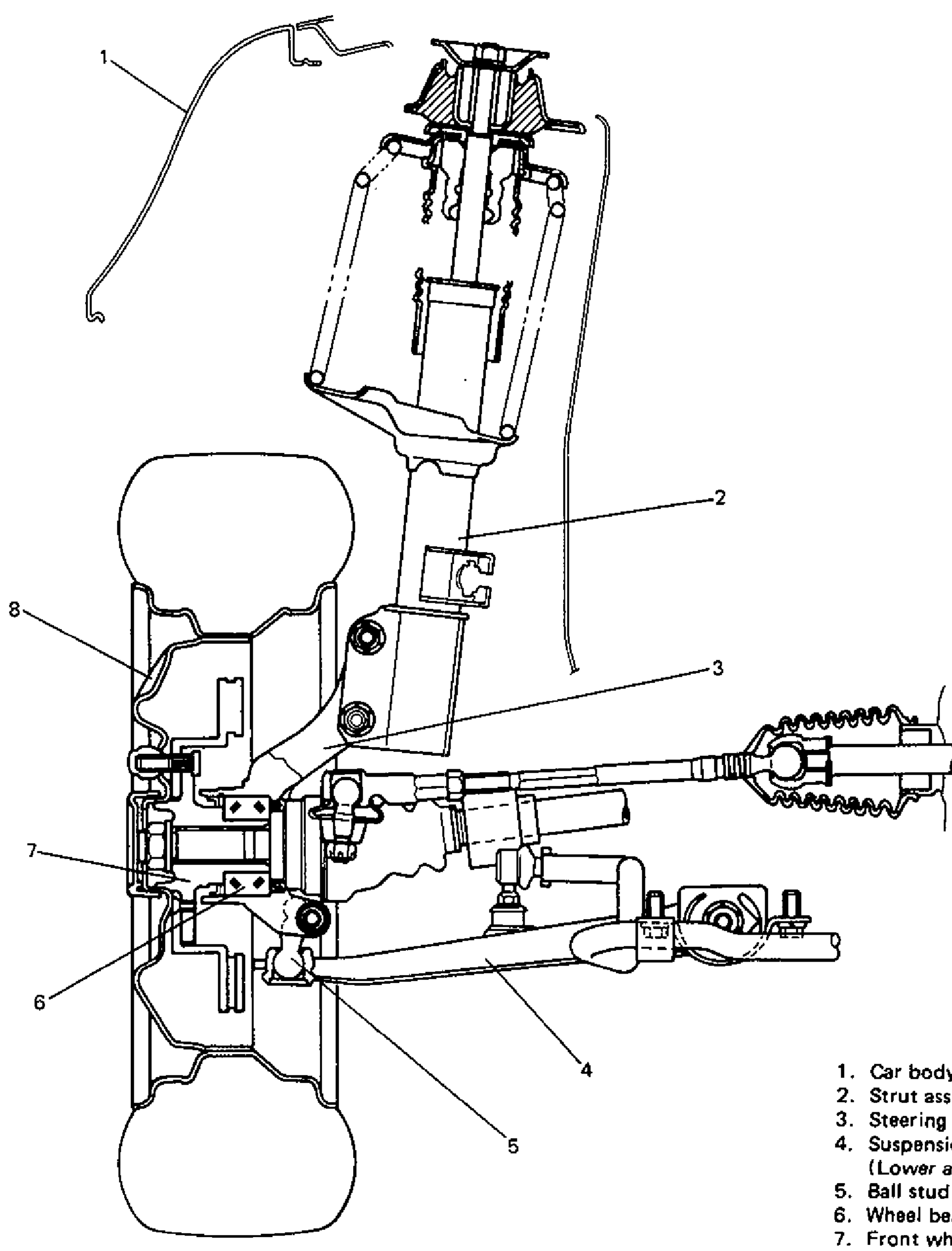
GENERAL DESCRIPTION 3D- 2
ON CAR SERVICE 3D- 4
1. Remove and Install Stabilizer Bar and/or Bushings 3D- 4
2. Remove and Install Strut Damper Assembly 3D- 5
3. Disassembly and Assembly Strut Damper 3D- 6
4. Remove and Install Wheel Hub, Wheel Stud/Wheel Bearing Outside Inner Race 3D- 8
5. Remove and Install Suspension Arm/Bushing 3D-10
6. Remove and Install Knuckle/Bearing 3D-12
7. Front Suspension Inspection ... 3D-15
RECOMMENDED TORQUE SPECIFICATIONS 3D-17
REQUIRED SERVICE MATERIALS 3D-17
SPECIAL TOOLS 3D-18

GENERAL DESCRIPTION

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

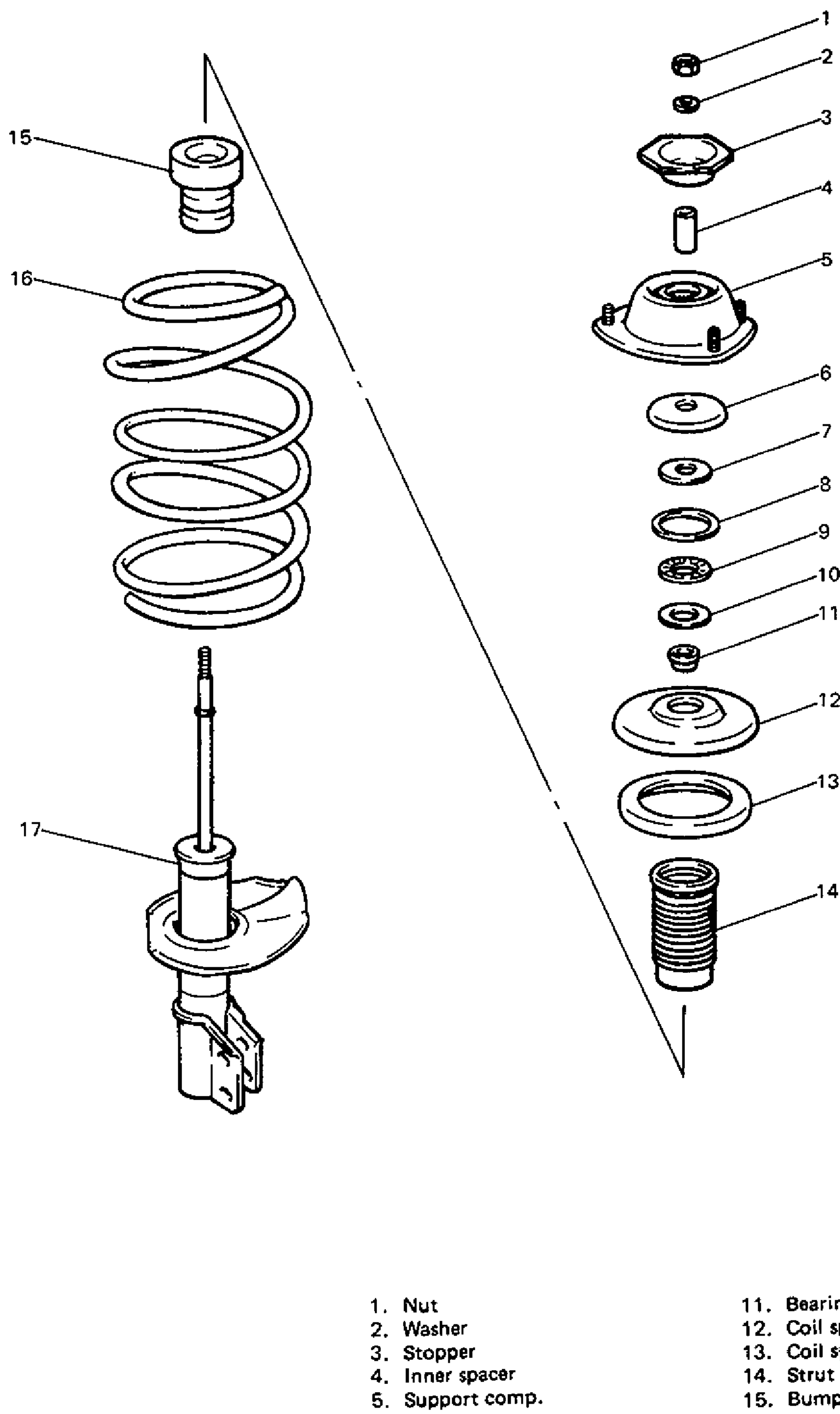
The lower end of the strut is connected to the upper end of a steering knuckle and lower end of knuckle is attached to the strud of a ball joint which is incorporated in a unit with a suspension control arm. And connected to this steering knuckle is the tie-rod end.

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



1. Car body
2. Strut assembly
3. Steering knuckle
4. Suspension arm (Lower arm)
5. Ball stud
6. Wheel bearing
7. Front wheel hub
8. Wheel

Fig. 3D-1



1. Nut
2. Washer
3. Stopper
4. Inner spacer
5. Support comp.
6. Bearing seat
7. Bearing upper washer
8. Bearing seal
9. Bearing
10. Bearing lower washer
11. Bearing spacer
12. Coil spring upper seat
13. Coil spring seat
14. Strut cover
15. Bump stopper
16. Coil spring
17. Strut

Fig. 3D-2 Front Suspension

ON-CAR SERVICE

1. REMOVE AND INSTALL STABILIZER BAR AND/OR BUSHINGS

REMOVAL

1) Remove stabilizer link nuts, washers and cushions.
2) Remove stabilizer mount brackets.
3) Remove stabilizer.
4) Remove stabilizer joints from stabilizer.

INSTALLATION

1) When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side. Refer to figure "A" below for its check.
   For correct installation in vertical direction, Refer to figure "B".
2) Install parts by reversing Steps 1) – 3) of REMOVAL.

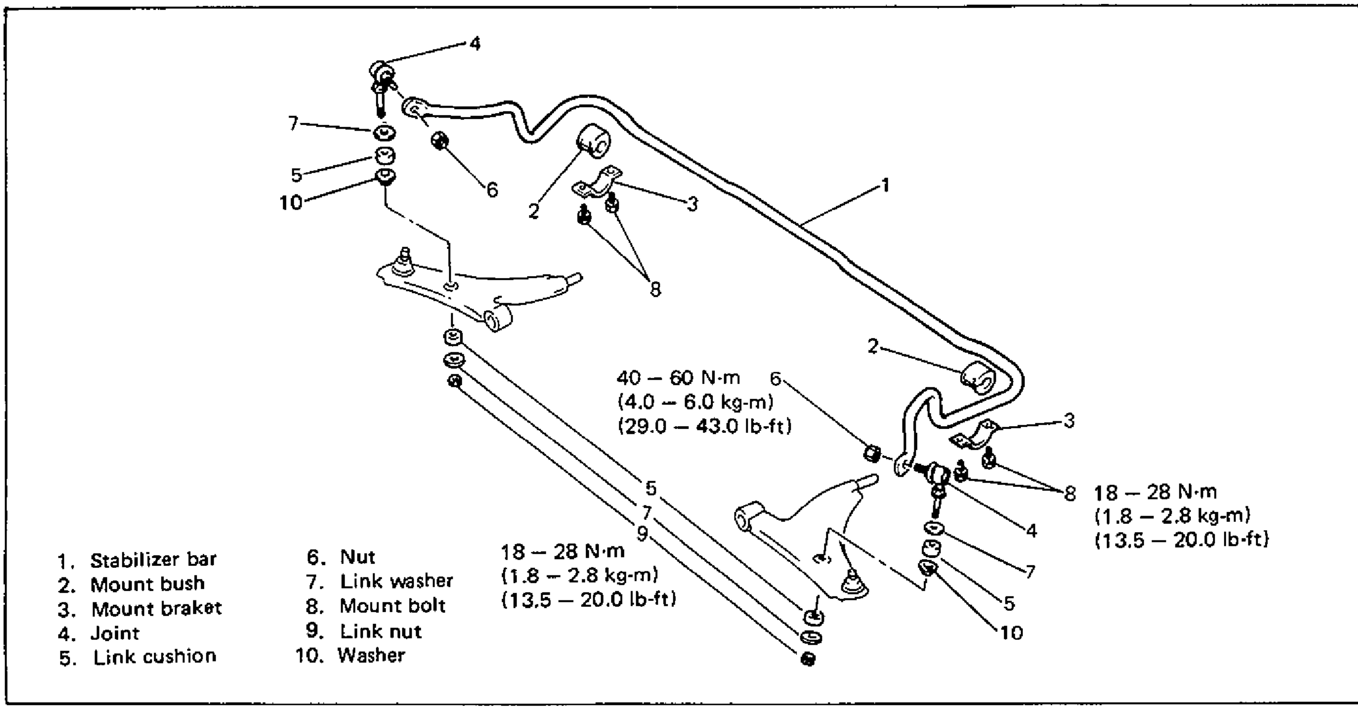
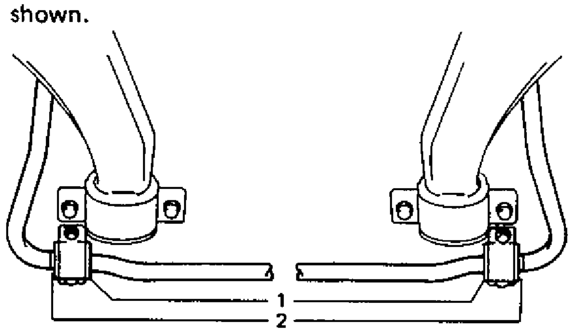


Fig. 3D-1-1

"A"

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



1. Mount bush
2. Painted mark

Fig. 3D-1-2

"B"

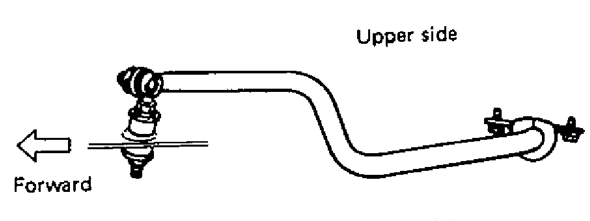


Fig. 3D-1-3

2. REMOVE AND INSTALL STRUT DAMPER ASSEMBLY

REMOVAL

1) Hoist car, allowing front suspension to hang free.
2) Remove wheel.
3) Remove E ring securing brake hose and take brake hose off strut bracket as shown below.

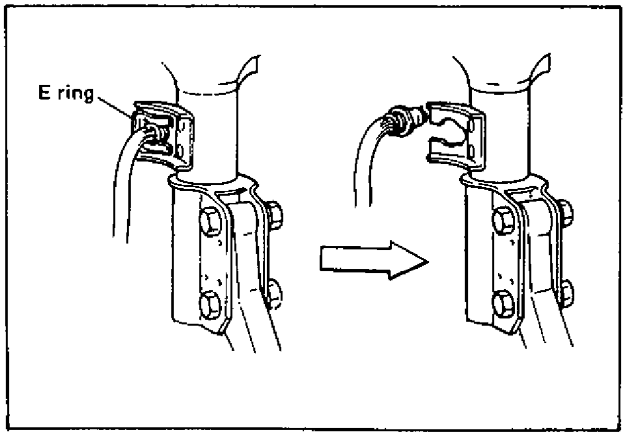


Fig. 3D-2-1

4) Remove strut bracket bolts.

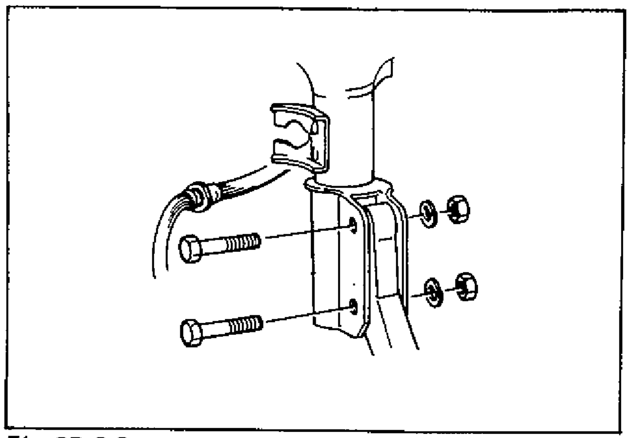


Fig. 3D-2-2

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

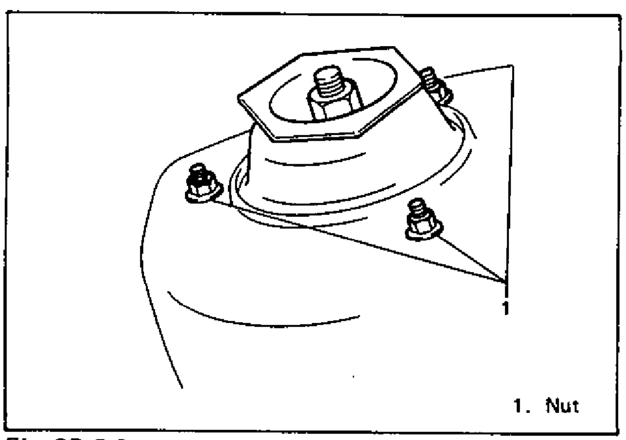


Fig. 3D-2-3

6) Remove strut assembly.

INSTALLATION

1) Install strut by reversing REMOVAL Steps 1) – 6). Insert bolts in such a direction as shown below.
2) Torque all fasteners to specification.

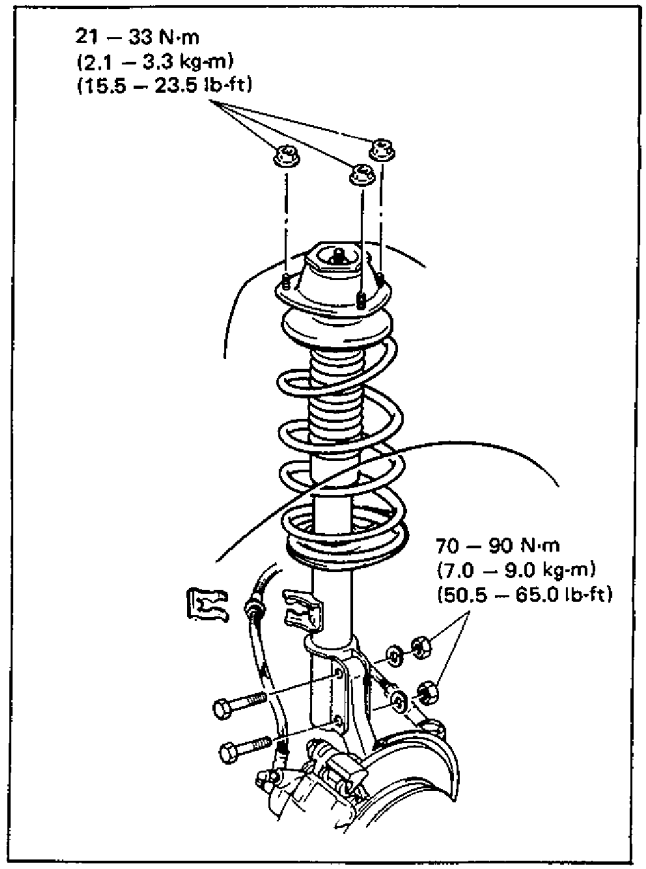


Fig. 3D-2-4

NOTE:

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

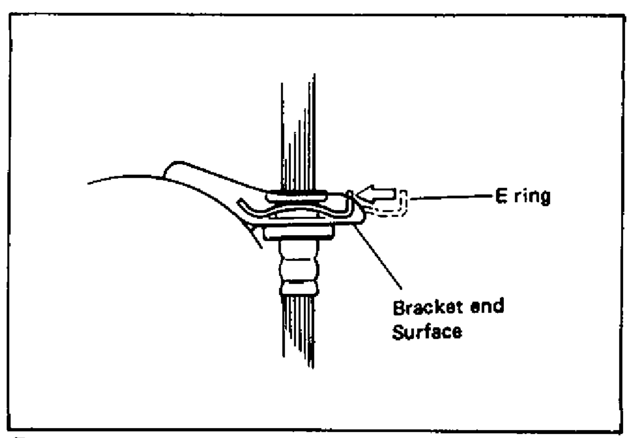


Fig. 3D-2-5

3. DISASSEMBLY AND ASSEMBLY STRUT DAMPER

DISASSEMBLY

1) With special tool (A) placed to spring as shown, turn special tool bolts alternately until spring tension is released. Whether it is released or not can be known by whether strut turns lightly while strut spring is held stationary.

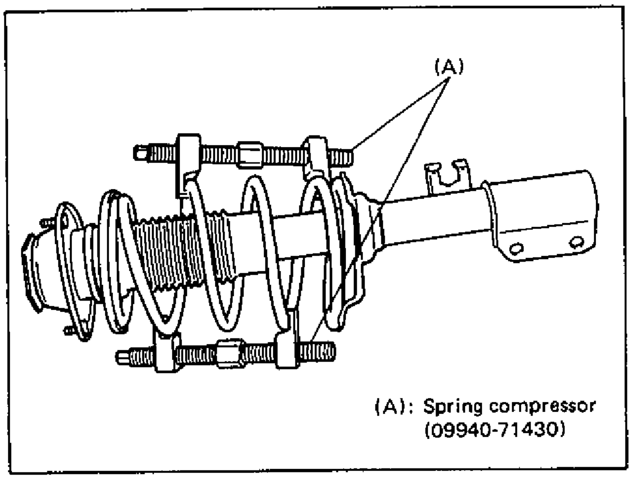
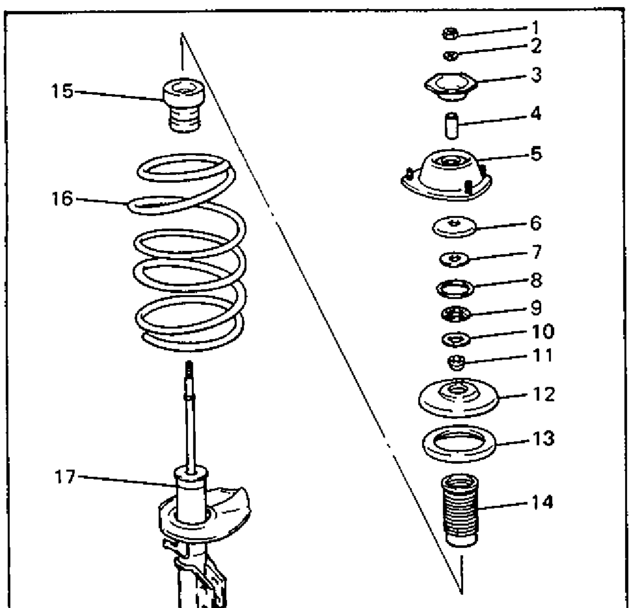


Fig. 3D-3-1

2) While keeping spring compressed with special tool as shown above, remove strut nut and then disassemble parts.



1. Nut
2. Washer
3. Stopper
4. Inner spacer
5. Support comp.
6. Bearing seat
7. Bearing upper washer
8. Bearing seal
9. Bearing
10. Bearing lower washer
11. Bearing spacer
12. Coil spring upper seat
13. Coil spring seat
14. Strut cover
15. Bump stopper
16. Coil spring
17. Strut

Fig. 3D-3-2

ASSEMBLY

1) Compress spring with special tool (A) until total length becomes about 230 mm (9.06 in) as shown.

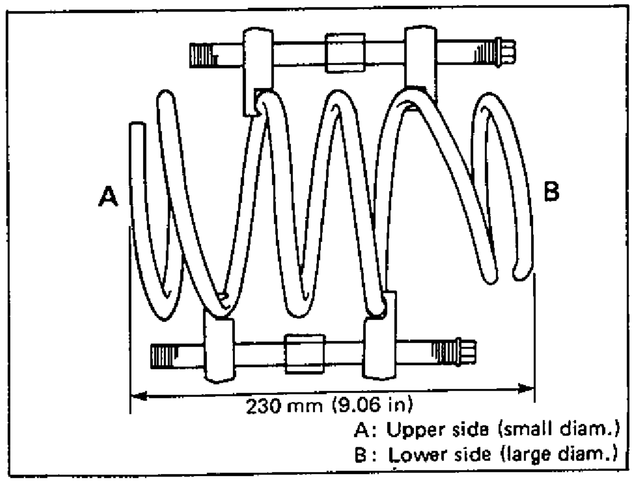


Fig. 3D-3-3

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

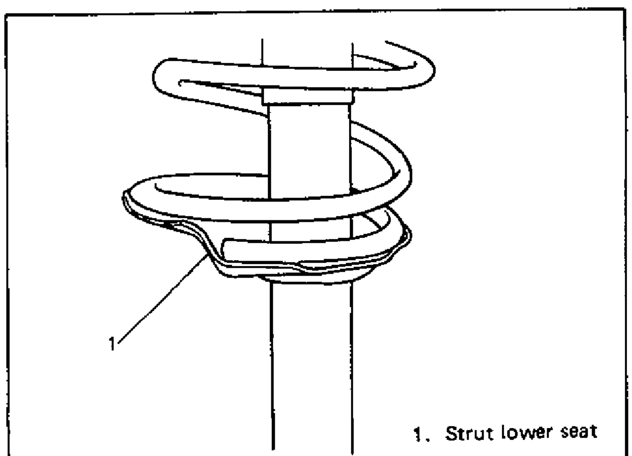


Fig. 3D-3-4

3) Install bump stopper onto strut rod. For installing direction, refer to the figure at the left.
4) Pull strut rod as far up as possible and use care not to allow it to retract into strut.
5) Install spring seat, bearing spacer and strut cover to spring upper seat and then install strut bracket with its center aligned with "A" mark on spring upper seat.

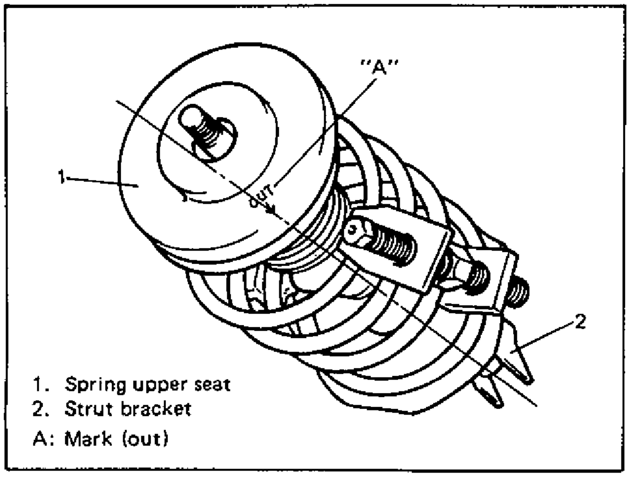


Fig. 3D-3-5

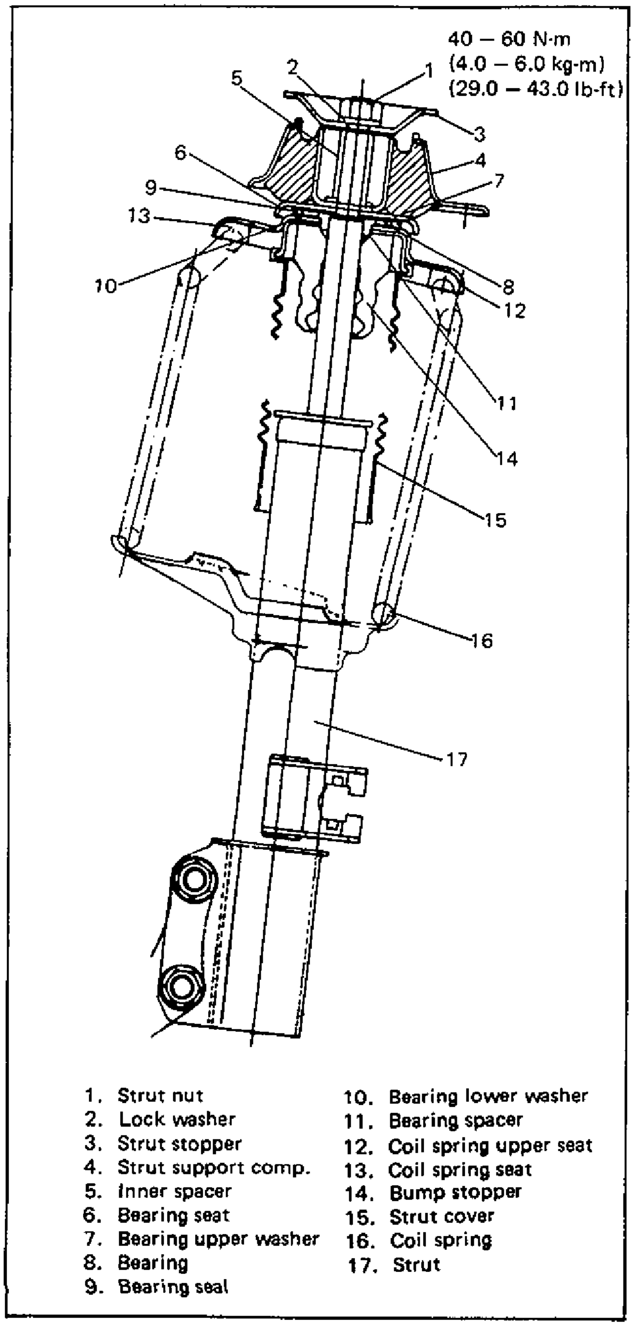


Fig. 3D-3-6

6) Wash bearing lower washer and install it.
7) Wash strut bearing and apply grease. Install it on bearing lower washer.
8) Wash bearing upper washer and install it.
9) Install bearing seal, bearing seat, strut support, inner spacer, washer and strut nut in this sequence.
   Be careful for installing directions.
   Tighten strut nut to specified torque and then apply water-proof coating (paint or lacquer) all around nut and strut rod thread.
10) Loosen and remove special tool (A) compressing coil spring. While loosening special tool, recheck that stepped part of spring seat and spring end are in place to each other as described in foregoing Step 2).
11) Install strut to car body. Refer to STRUT DAMPER INSTALLATION of this section.

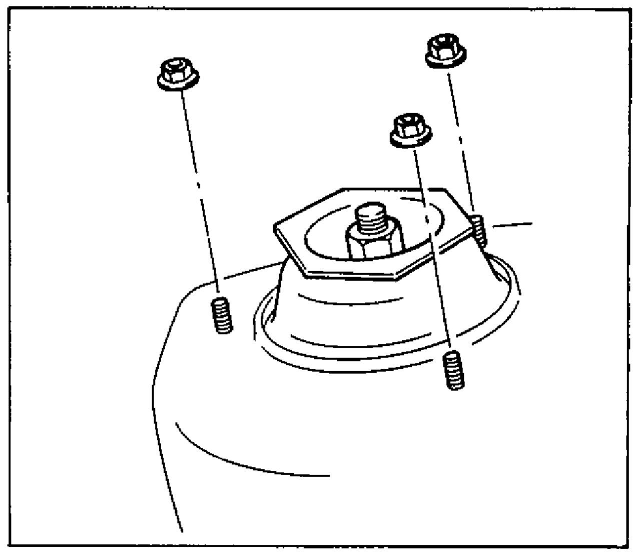


Fig. 3D-3-7

4. REMOVE AND INSTALL WHEEL HUB, WHEEL STUD/WHEEL BEARING OUTSIDE INNER RACE

REMOVAL

1) Hoist car and remove wheel.
2) Uncalk drive shaft nut.
3) Depress foot brake pedal and hold it there. Remove drive shaft nut.
4) Remove caliper carrier bolts.

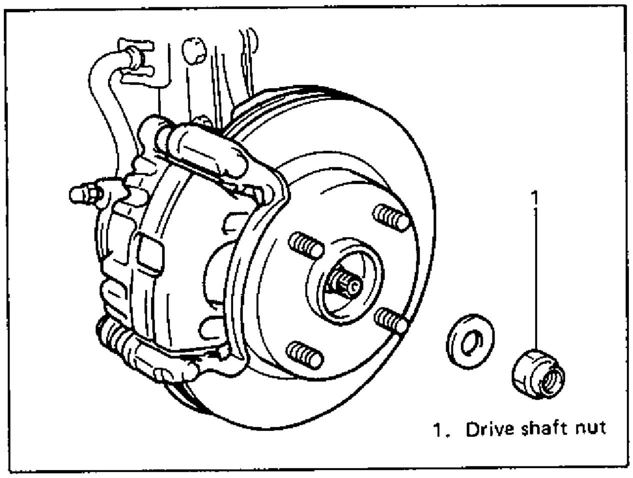


Fig. 3D-4-1

5) Remove caliper with carrier.
6) Remove disc screws.
7) Pull brake disc off by using two 8 mm bolts.

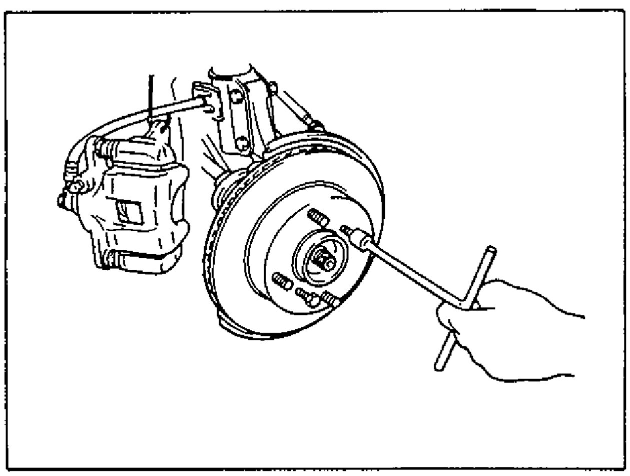


Fig. 3D-4-2

8) Pull out wheel hub with special tools (B) and (C).

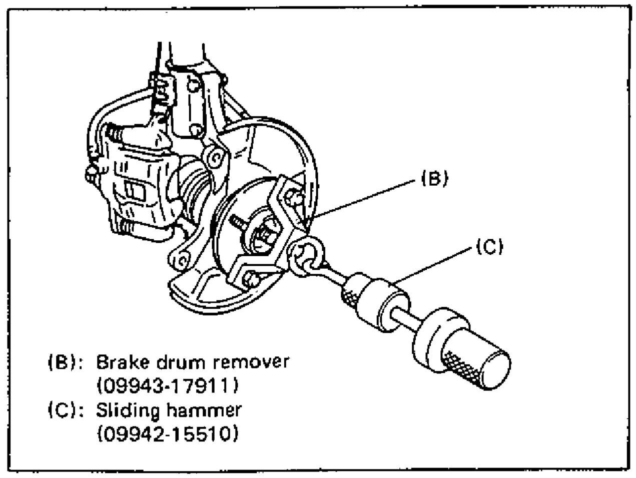


Fig. 3D-4-3

9) Remove hub bolts.

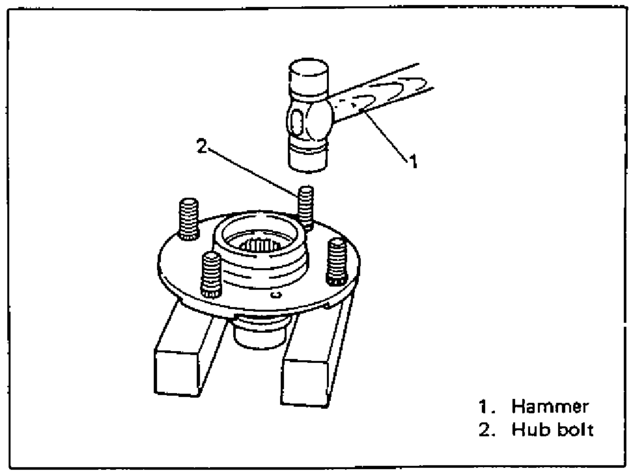


Fig. 3D-4-4

10) Remove wheel bearing inner race.

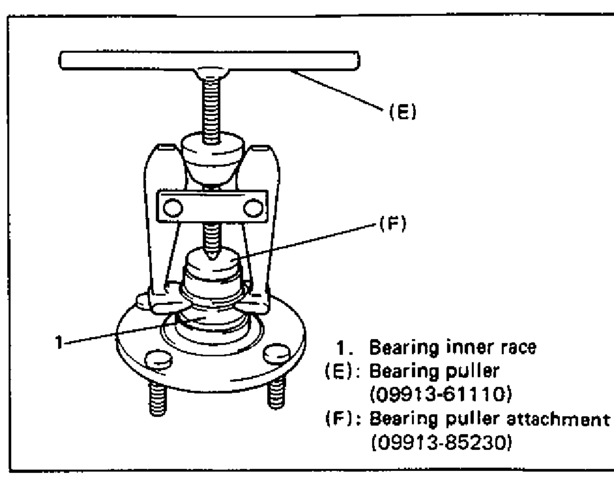


Fig. 3D-4-5

INSTALLATION

Install Hub Bolts

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

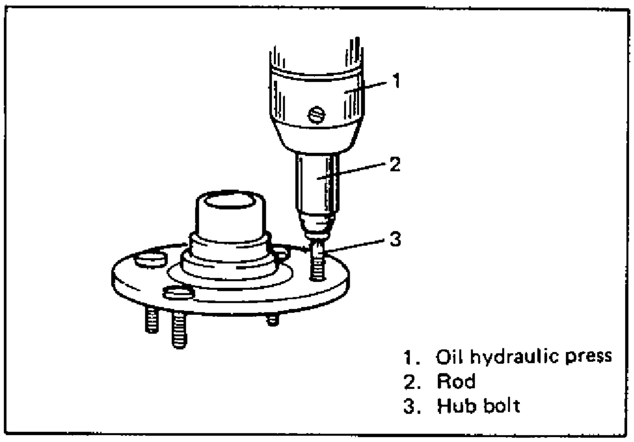


Fig. 3D-4-6

1) Install outside inner race to wheel hub using special tool (G). Installing direction is as shown.

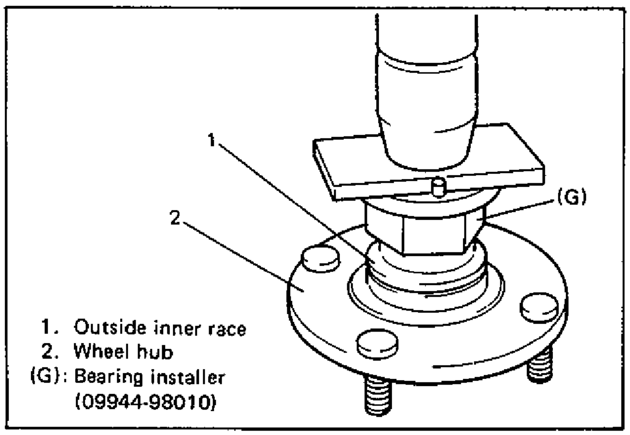


Fig. 3D-4-7

2) Apply grease to outside bearing, outside inner race and oil seal lip.

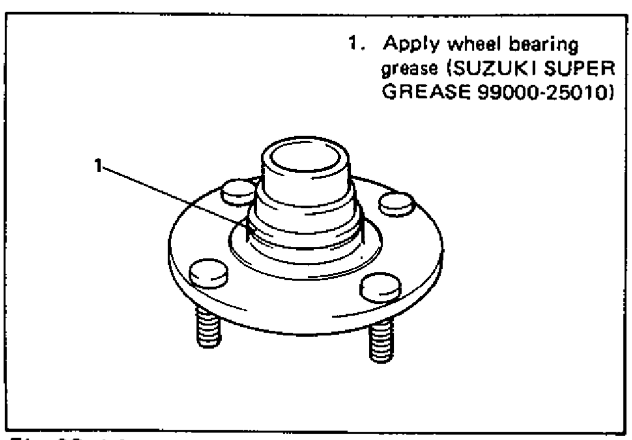


Fig. 3D-4-8

3) Install wheel hub to knuckle by tightening drive shaft nut. Don't tap wheel hub.

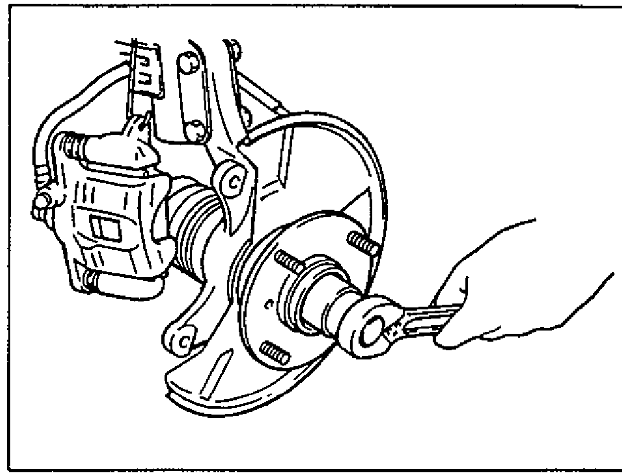


Fig. 3D-4-9

4) Install brake disc.
5) Install brake caliper/caliper carrier.

6) Tighten caliper carrier bolts to specified torque.
7) Depress foot brake pedal and hold it there. Tighten drive shaft nut and brake disc screws to specified torque.
8) Calk drive shaft nut as shown below.

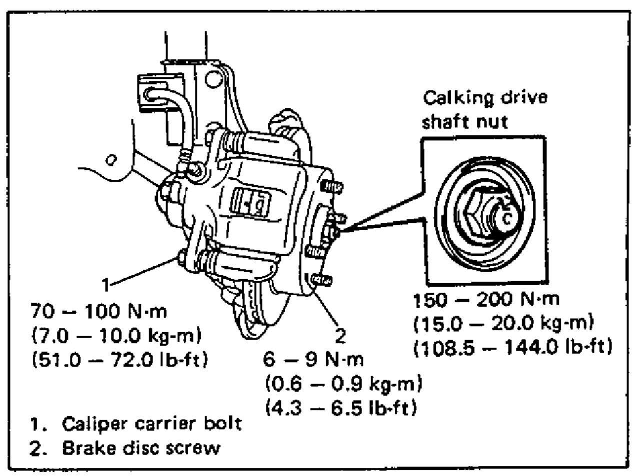


Fig. 3D-4-10

9) Install wheel and lower hoist.

5. REMOVE AND INSTALL SUSPENSION ARM/BUSHING

REMOVAL

1) Hoist car and remove wheel.
2) Remove stabilizer link nut, washer and cushion.
3) Remove ball stud bolt.
4) Remove suspension arm bracket nut.
5) Remove suspension arm bracket bolts.
6) Remove rear bracket and suspension arm.
7) Remove rear bushing with hydraulic press as shown.

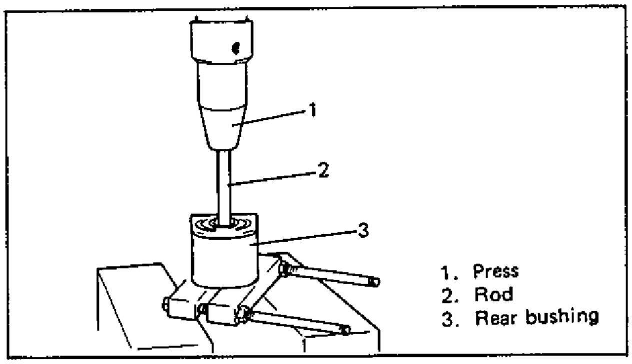


Fig. 3D-5-1

8) Cut off flange of front bushing as shwon in below figure "A" and then push out front bushing by using hydraulic press as shown in figure "B".

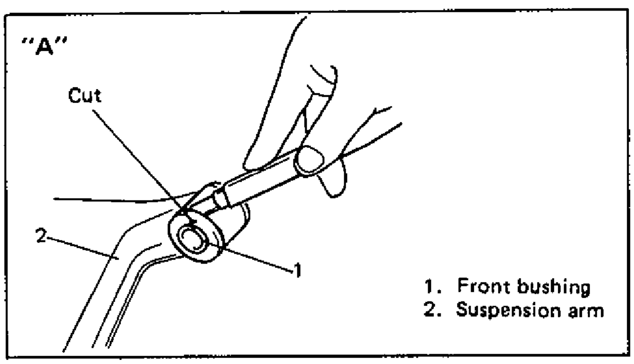


Fig. 3D-5-2

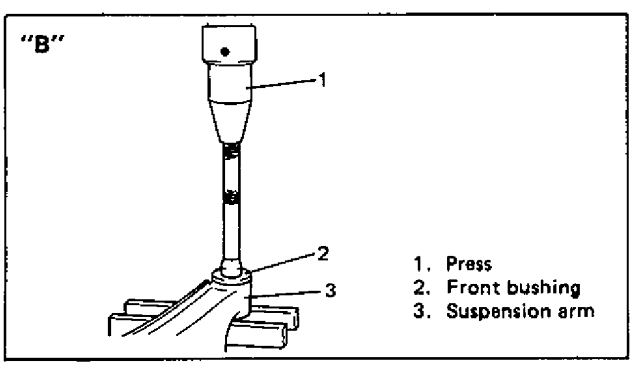


Fig. 3D-5-3

INSTALLATION

1) Install front bushing.
   Before installing bushing, apply soap water on its circumference to facilitate installation.

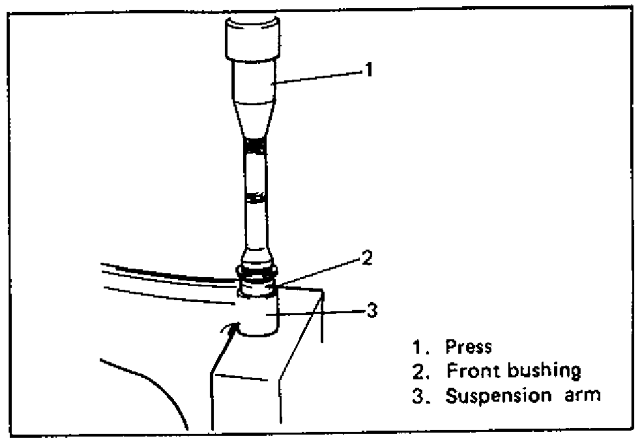


Fig. 3D-5-4

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

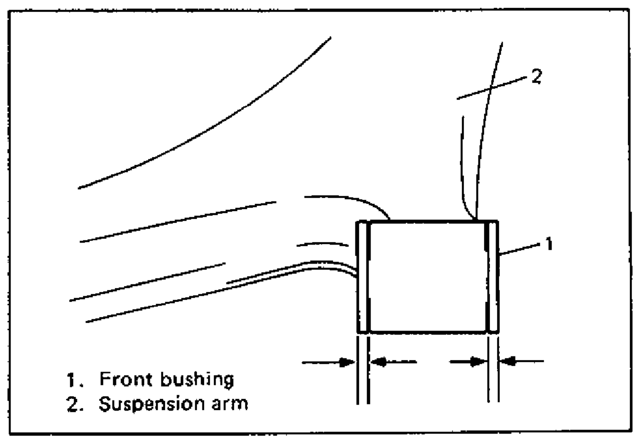


Fig. 3D-5-5

2) Install rear bushing to suspension arm as follows. First, push in rear bushing in such direction and angle as shown in below figure "A" and drive it into such position as shown in figure "B".

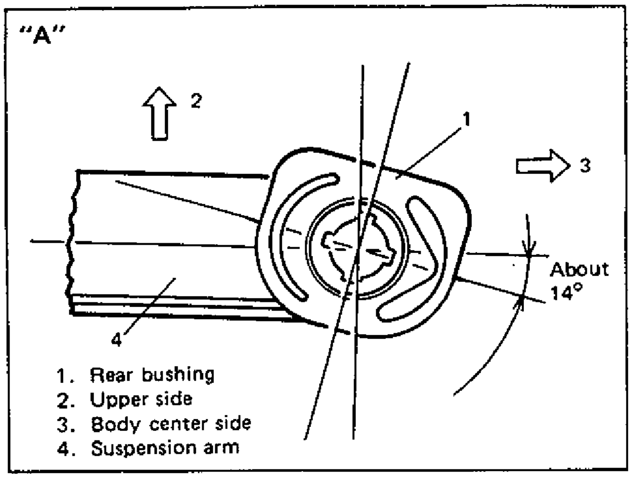


Fig. 3D-5-6

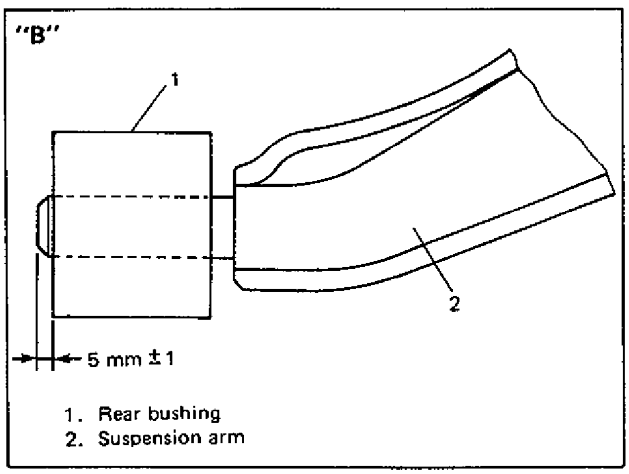


Fig. 3D-5-7

3) Fit suspension arm bracket to suspension arm in such direction as shown in Fig. 3D-5-9 and hand-tighten bracket nut lightly and then install suspension arm bracket to car body. At this point, tighten bracket bolt only lightly by hand.
4) Install ball stud to knuckle.
   Align ball stud groove with knuckle bolt hole as shown in figure. Then drive in ball stud bolt from the direction as shown and install washer and nut.

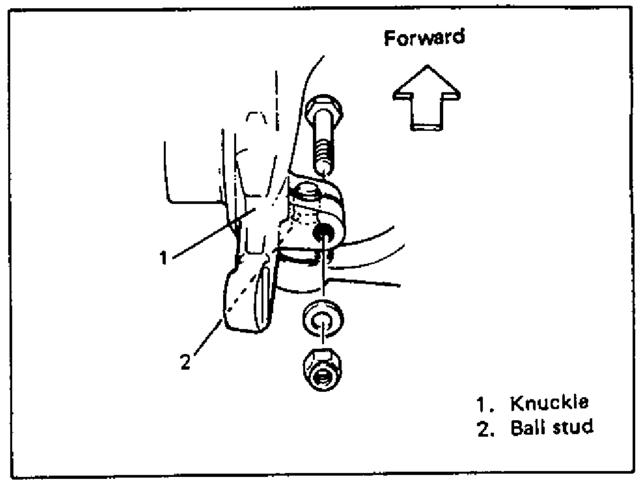


Fig. 3D-5-8

5) Install suspension arm rear bracket.
6) Install stabilizer cushion, washer and link nut.
   Link nut tightening torque:
   18 – 28 N·m (1.8 – 2.8 kg-m, 13.5 – 20.0 lb ft)
7) Tighten all bolts and nuts in figure to each specified torque.
8) Install wheel and lower hoist.
9) Check toe seating and adjust as required.

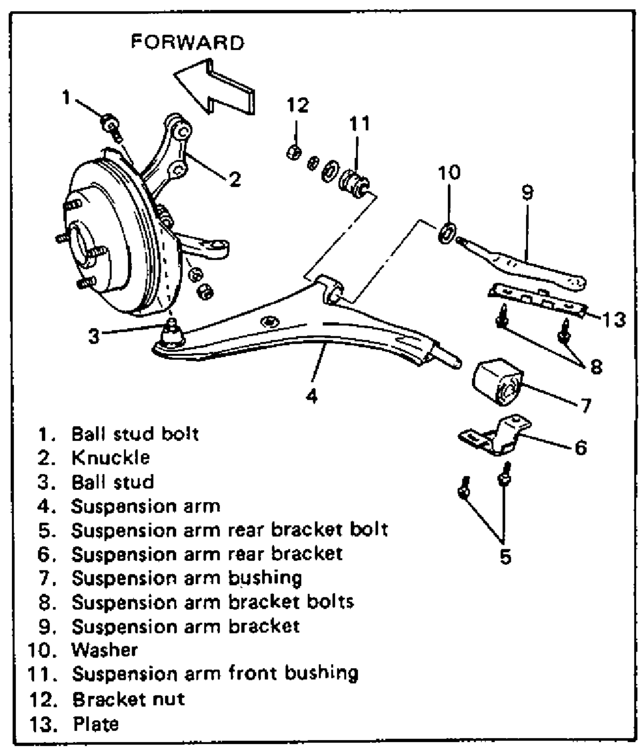


Fig. 3D-5-9

6. REMOVE AND INSTALL KNUCKLE/BEARING

REMOVAL

1) Hoist car and remove wheel.
2) Remove wheel hub. Refer to Step 2) – 8) in item 4 of WHEEL HUB REMOVAL of this section.
3) Disconnect tie-rod end from knuckle with special tool (H).

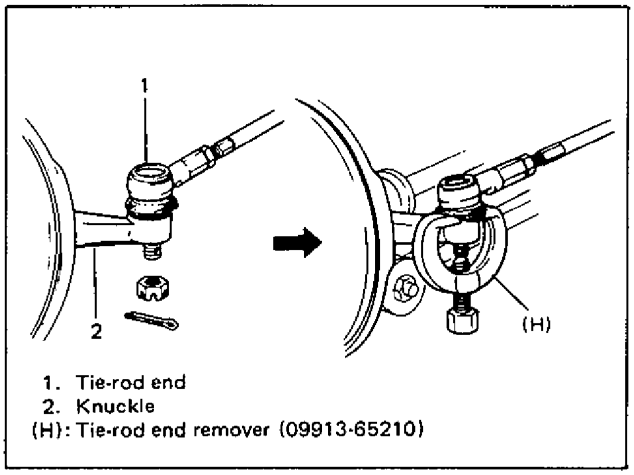


Fig. 3D-6-1

4) Remove strut bracket bolts from strut bracket and then ball stud bolt.

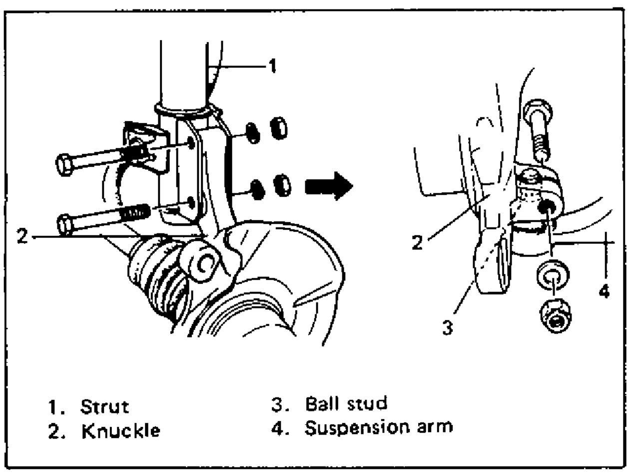


Fig. 3D-6-2

5) Remove knuckle.

INSTALLATION

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

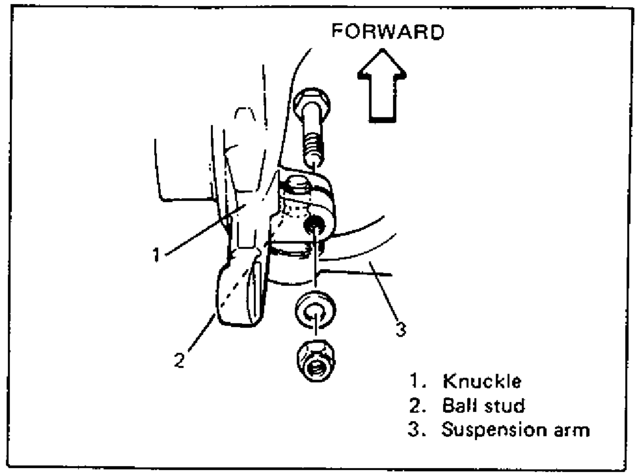


Fig. 3D-6-3

2) Connect tie-rod end to knuckle and tighten tie-rod end castle nut to specified torque. Install split pin.

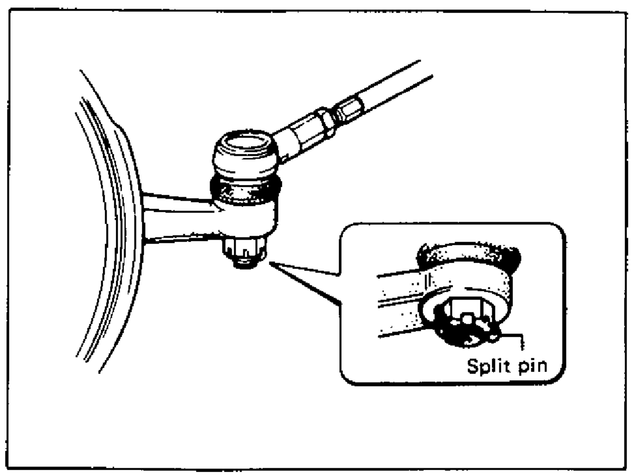


Fig. 3D-6-4

3) For installation procedures following the above, refer to Steps 3) – 9) in Item 4, WHEEL HUB INSTALLATION of this section.

For tightening torque, refer to next page.

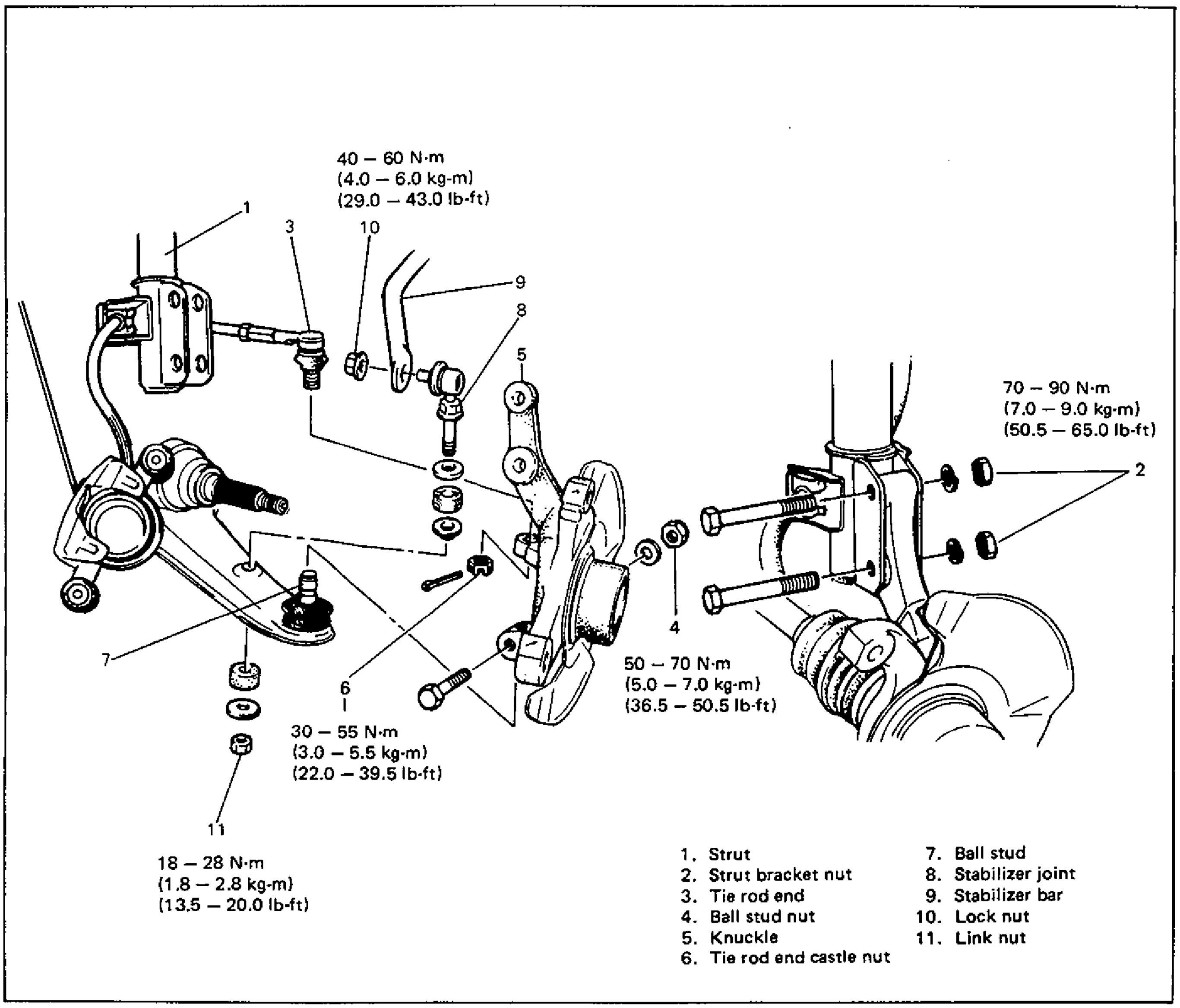

40 – 60 N·m
(4.0 – 6.0 kg-m)
(29.0 – 43.0 lb-ft)
1
3
10
9
8
5
70 – 90 N·m
(7.0 – 9.0 kg-m)
(50.5 – 65.0 lb-ft)
2
4
7
6
50 – 70 N·m
(5.0 – 7.0 kg-m)
(36.5 – 50.5 lb-ft)
30 – 55 N·m
(3.0 – 5.5 kg-m)
(22.0 – 39.5 lb-ft)
11
18 – 28 N·m
(1.8 – 2.8 kg-m)
(13.5 – 20.0 lb-ft)
1. Strut
2. Strut bracket nut
3. Tie rod end
4. Ball stud nut
5. Knuckle
6. Tie rod end castle nut
7. Ball stud
8. Stabilizer joint
9. Stabilizer bar
10. Lock nut
11. Link nut

Fig. 3D-6-5

REMOVE OIL SEALS, SNAP RING AND WHEEL BEARING

Once bearing outer race is removed, bearing set (outer race, bearings and inner races) should be replaced with new one.

- Remove outside oil seal, snap ring, outside bearing and inside oil seal in that order.

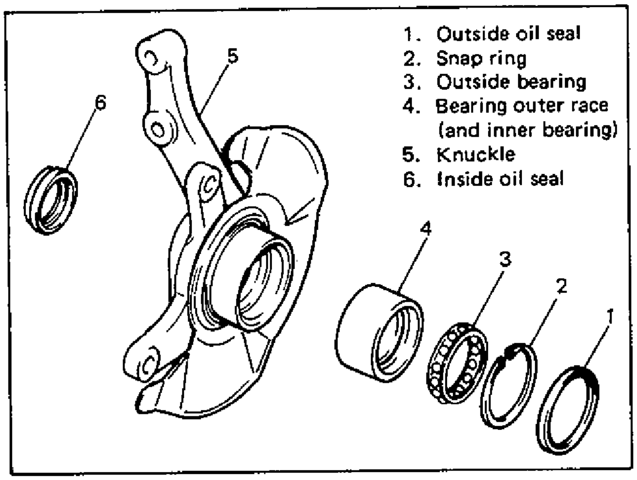


Fig. 3D-6-6

- Remove bearing outer race/inner bearing using special tool (I) and (J), and hydraulic press.

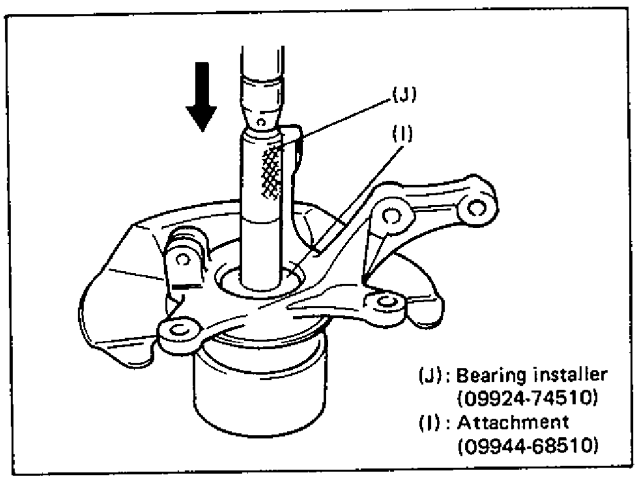


Fig. 3D-6-7

INSTALL OIL SEALS, SNAP RING AND WHEEL BEARING

When replacing bearing, inner bearing or outer bearing, be sure to replace them with new ones as a set.

- Press-fit bearing outer race/inner bearing using special tools (J), (K) and (L).

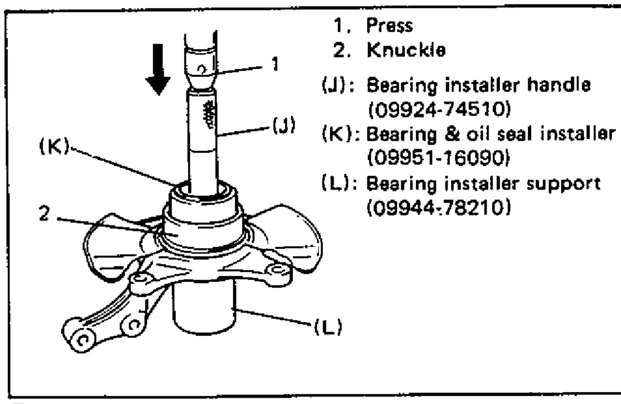
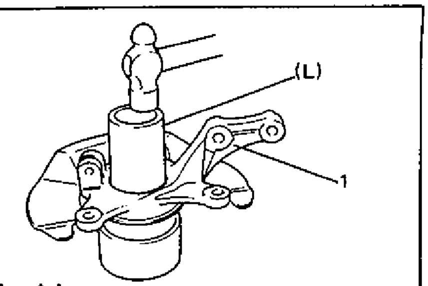


Fig. 3D-6-8

- After greasing (litchic grease) bearing outer race, bearings and oil seal lips, install them.

Inside Oil Seal

Drive in Oil seal until seal is flush with stopped surface of knuckle by using special tool (L).



NOTE:
When driving in oil seal, be careful not to deform or tilt it or not to cause damage to rubber part.

Fig. 3D-6-9

Outside Oil Seal

Drive in oil seal until its end contacts snap ring using special tools (J), (K) and (L). As for its installing direction, refer to Fig. 3D-6-10.

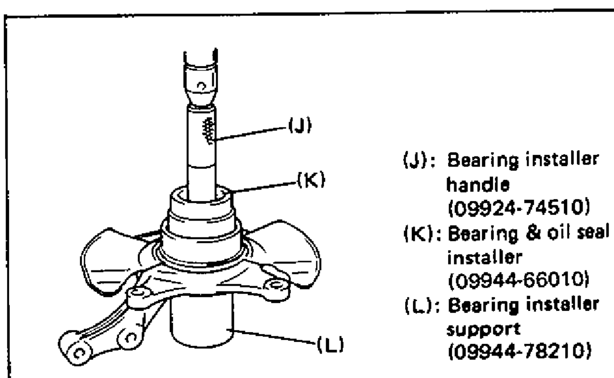


Fig. 3D-6-10

7. FRONT SUSPENSION INSPECTION

STABILIZER BAR AND/OR BUSHING

Bar

Inspect for damage or deformation. If defective, replace.

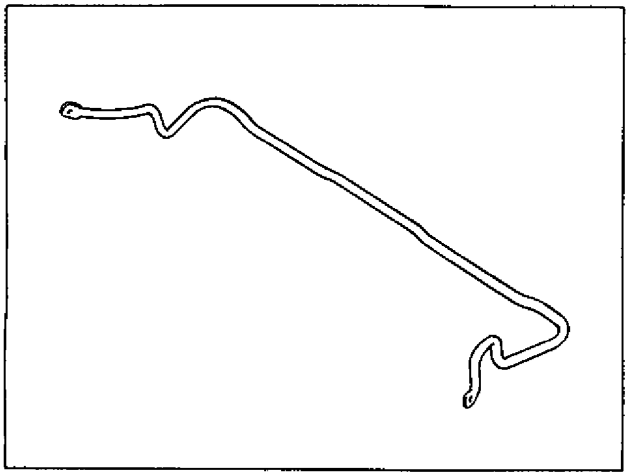


Fig. 3D-7-1

Bushing

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

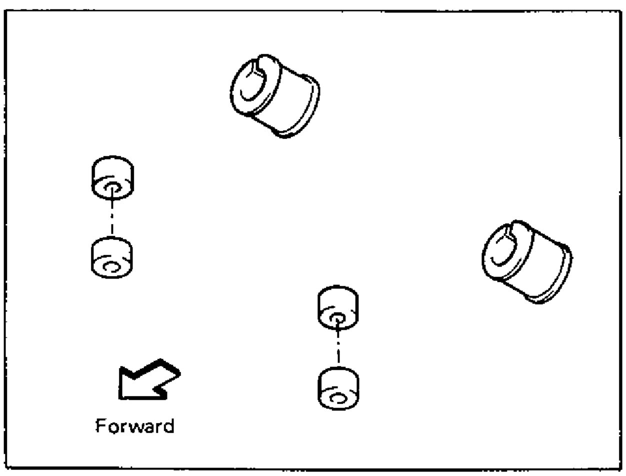


Fig. 3D-7-2

STRUT DAMPER

1) Inspect strut for oil leakage. If strut is found faulty, replace it as an assembly unit, because it can not be disassembled.

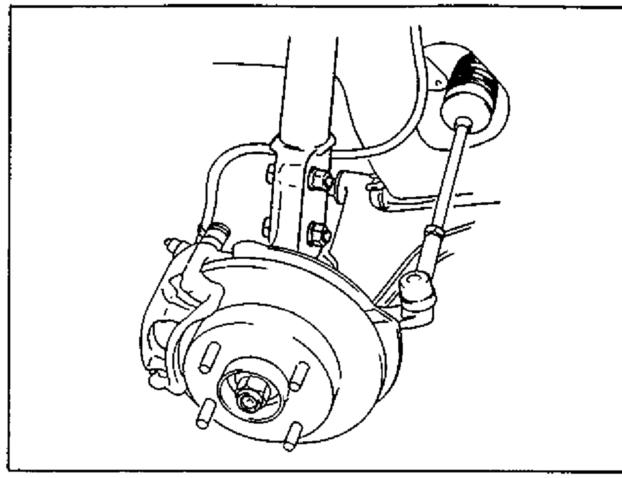


Fig. 3D-7-3

2) Strut function check
   Check and adjust tire pressures as specified. Bounce car body three or four times continuously by pushing front end on the side with strut to be checked. Apply the same amount of force at each push and note strut resistance both when pushed and rebounding. Also, note how many times car body rebounds before coming to stop after hands are off.
   Do the same for strut on the other side.
   Compare strut resistance and number of rebound on the right with those on the left. And they must be equal in both. With proper strut, car body should come to stop the moment hands are off or after only one or two small rebounds. If struts are suspected, compare them with known good car or strut.
3) Inspect for damage or deformation.
4) Inspect bearing for wear, abnormal noise or gripping.
5) Inspect for cracks or deformation in spring seat.
6) Inspect for deterioration of bump stopper.
7) Inspect rebound stopper and strut mount for wear, cracks or deformation.

Replace any parts found defective in Steps 2) — 7).

SUSPENSION ARM/ARM BRACKET/ KNUCKLE ARM

Inspect for cracks, deformation or damage.

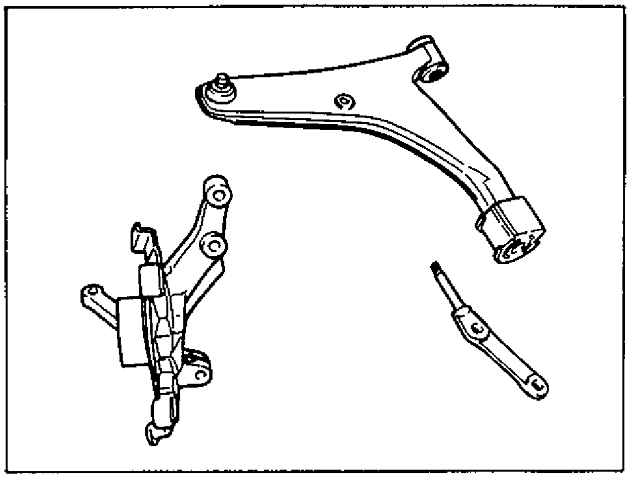


Fig. 3D-7-4

SUSPENSION ARM JOINT

1) Check for smooth rotation.
2) Inspect ball stud for damage.
3) Inspect dust cover for damage.

NOTE:

Suspension arm and arm joint cannot be separated.

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

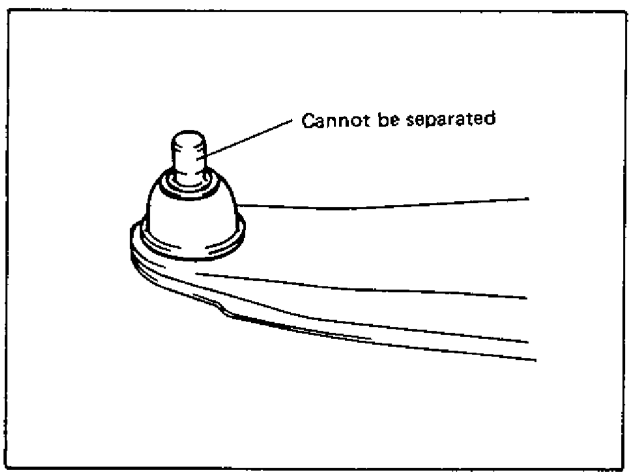


Fig. 3D-7-5

SUSPENSION ARM BUSHING

Inspect for damage, wear or deterioration.

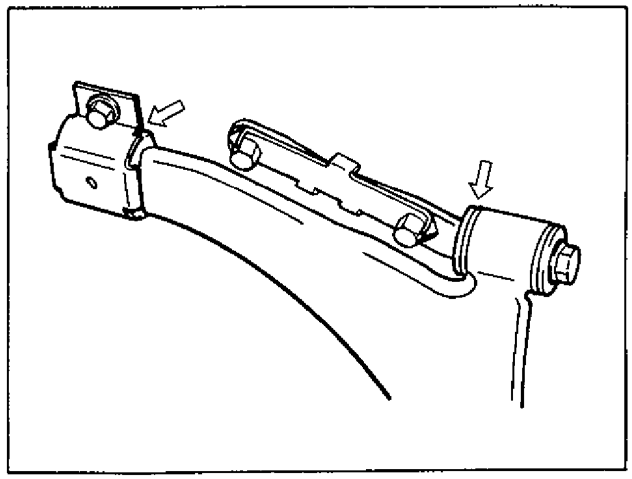


Fig. 3D-7-6

WHEEL DISC, NUT & BEARING

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

	N·m	kg-m	lb-ft
Tightening torque for wheel nuts	50 – 70	5.0 – 7.0	36.5 – 50.5

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

Thrust play limit	0.4 mm (0.016 in)

When measurement exceeds limit, replace bearing.

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

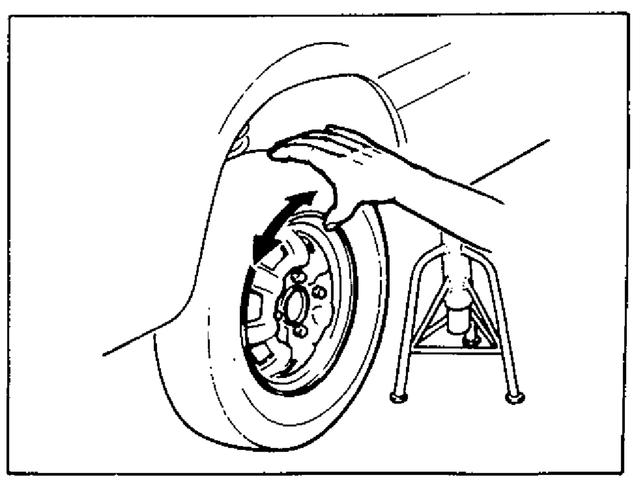


Fig. 3D-7-7

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Strut bracket nut	70 – 90	7.0 – 9.0	50.5 – 65.0
2. Strut nut	40 – 60	4.0 – 6.0	29.0 – 43.0
3. Strut support nut	21 – 33	2.1 – 3.3	15.5 – 23.5
4. Ball stud nut	50 – 70	5.0 – 7.0	36.5 – 50.5
5. Suspension arm rear bracket bolt	30 – 55	3.0 – 5.5	22.0 – 39.5
6. Suspension arm bracket bolt	85 – 100	8.5 – 10.0	61.5 – 72.0
7. Bracket nut	100 – 150	10.0 – 15.0	72.5 – 108.0
8. Stabilizer joint nut	40 – 60	4.0 – 6.0	29.0 – 43.0
9. Stabilizer link nut	18 – 28	1.8 – 2.8	13.5 – 20.0
10. Stabilizer bracket bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
11. Drive shaft nut	150 – 200	15.0 – 20.0	108.5 – 144.0
12. Tie rod end castle nut	30 – 55	3.0 – 5.5	22.0 – 39.0
13. Wheel nut	50 – 70	5.0 – 7.0	36.5 – 50.5

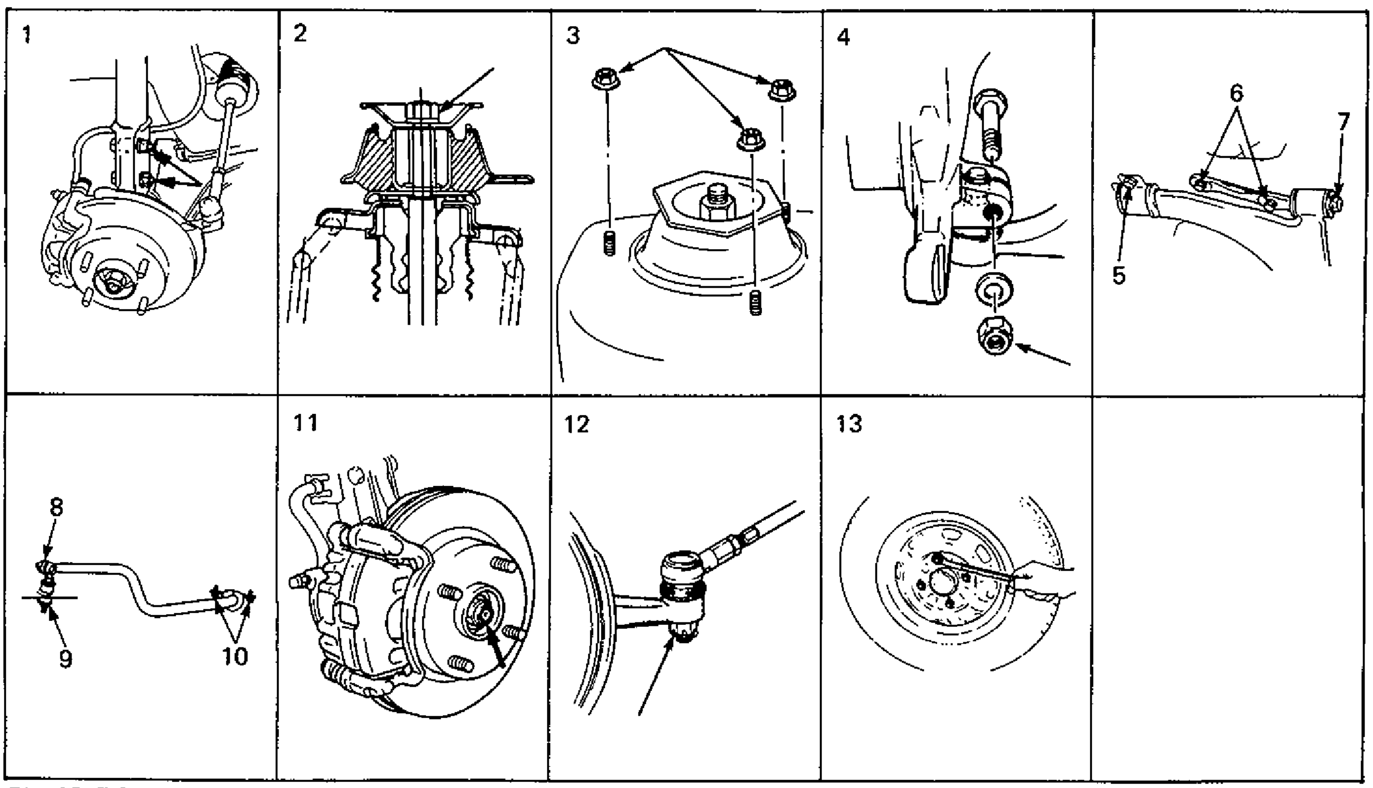
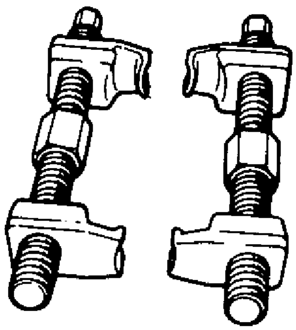


Fig. 3D-7-8

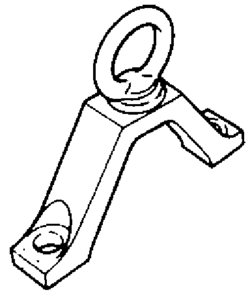
REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE (A) (99000-25010)	Strut bearing
Lithic wheel bearing grease	SUZUKI SUPER GREASE (A) (99000-25010)	Wheel bearing, wheel bearing oil seal lip

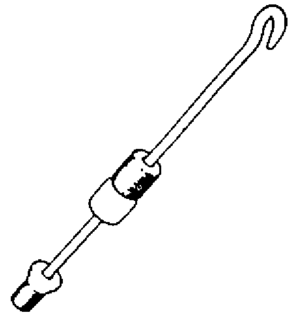
SPECIAL TOOLS



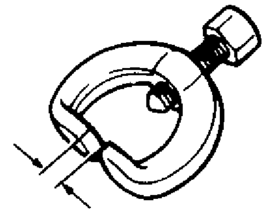
09940-71430
Spring compressor



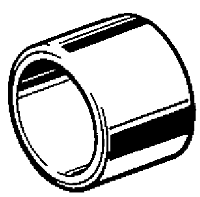
09943-17911
Front wheel hub remover
(Brake drum remover)



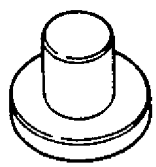
09942-15510
Sliding hammer



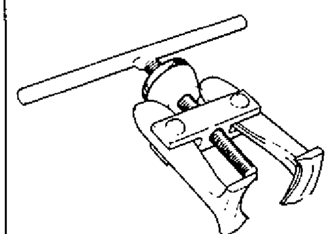
09913-65210
Tie-rod end remover



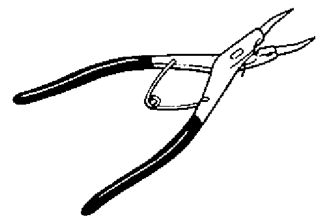
09944-78210
Bearing installer support



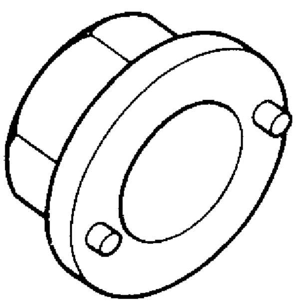
09913-85230
Bearing puller attachment



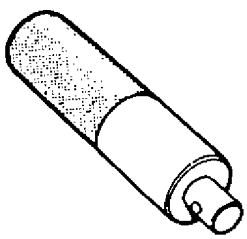
09913-61110
Bearing puller



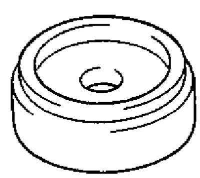
09900-06108
Snap ring pliers
(closing type)



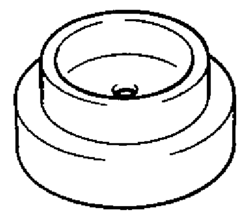
09944-98010
Bearing installer



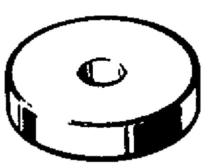
09924-74510
Bearing installer handle



09951-16090
Bearing & oil seal installer



09944-66010
Oil seal installer



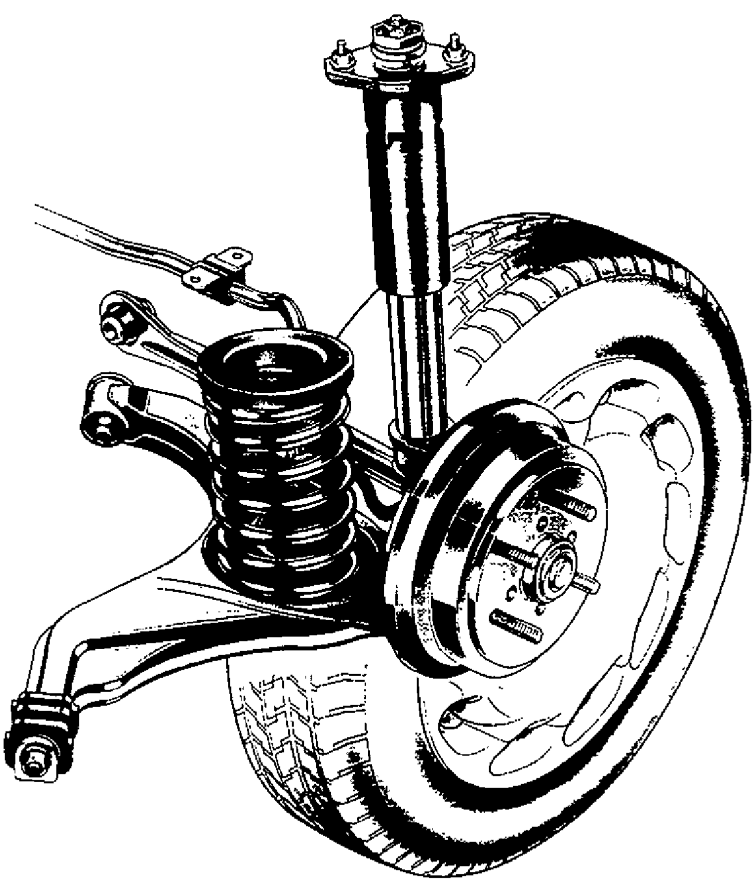
09944-68510
Bearing installer
attachment

Fig. 3D-7-9

SECTION 3E

REAR SUSPENSION

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



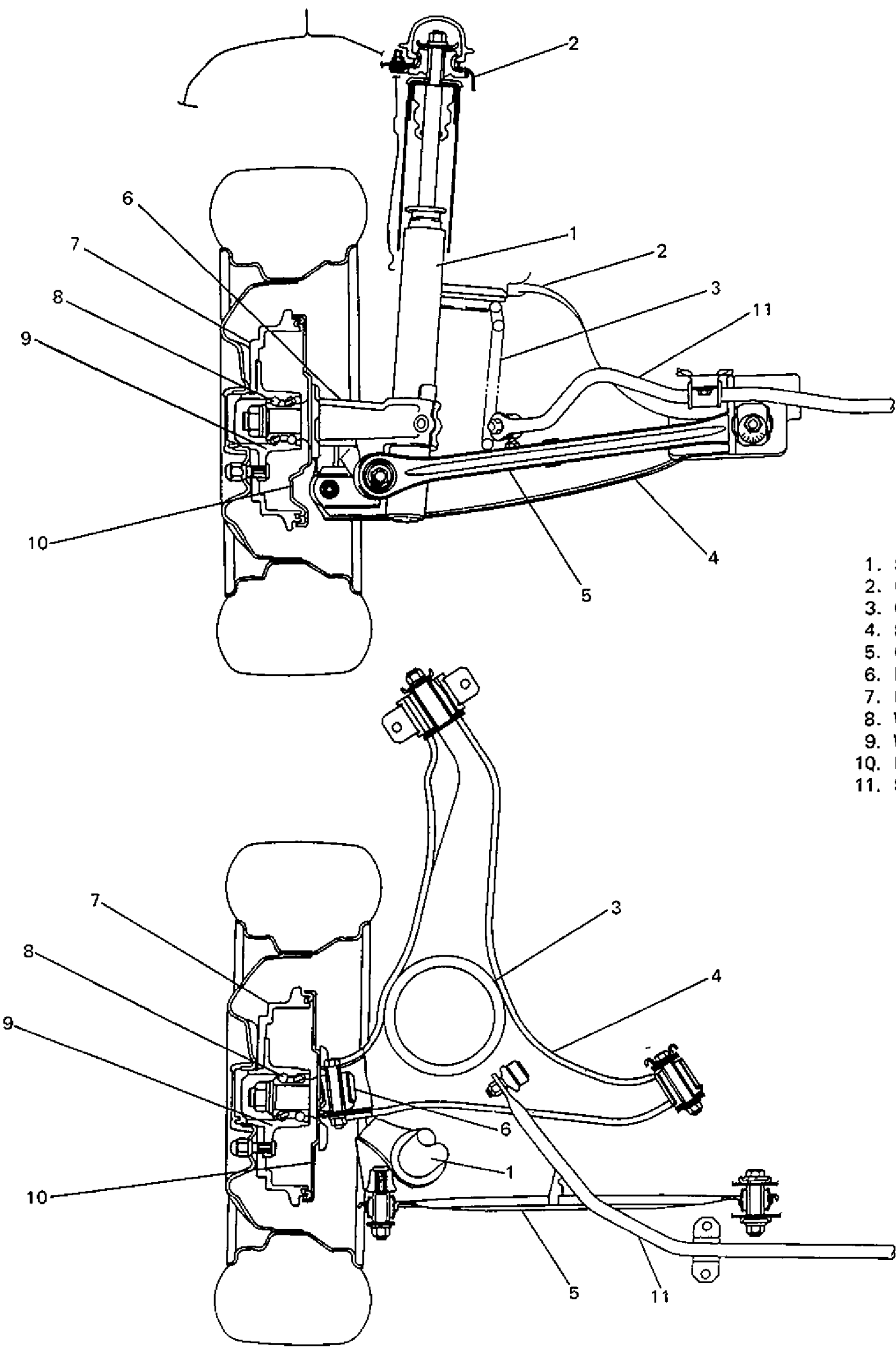
CONTENTS

DIAGNOSIS .... Refer to SECTION 3
GENERAL DESCRIPTION 3E- 2
ON-CAR SERVICE
(Remove and Install) 3E- 3
Control Rod 3E- 3
Coil Spring and Suspension Arm .. 3E- 5
Rear Strut Assembly 3E- 8
Wheel Hub and Rear Suspension
Knuckle 3E-10
Wheel Bearing and Wheel Stud 3E-13
Stabilizer Bar 3E-13
REAR SUSPENSION INSPECTION .. 3E-15
REAR WHEEL ALIGNMENT 3E-17
Toe Setting 3E-17
Toe Inspection and Adjustment ... 3E-17
RECOMMENDED TORQUE
SPECIFICATIONS 3E-18
REQUIRED SERVICE
MATERIALS 3E-19

GENERAL DESCRIPTION

The upper end of the strut is installed to the car body with a rubber mount inbetween and its lower side to the rear knuckle, whose lower end is connected to the suspension arm through the rubber bush. There is a coil spring between the suspension arm and car body.

Shown in the figure below are main components of the rear suspension.



1. Strut
2. Car body
3. Coil spring
4. Suspension arm
5. Control rod
6. Rear knuckle
7. Brake drum
8. Wheel bearing
9. Wheel hub
10. Brake back plate
11. Stabilizer bar

Fig. 3E-1

ON-CAR SERVICE

(REMOVE AND INSTALL)

CONTROL ROD

REMOVAL

1) Hoist car and remove wheel.
2) Disconnect brake flexible hose from control rod and remove LSPV stay bolts (if equipped) from control rod.

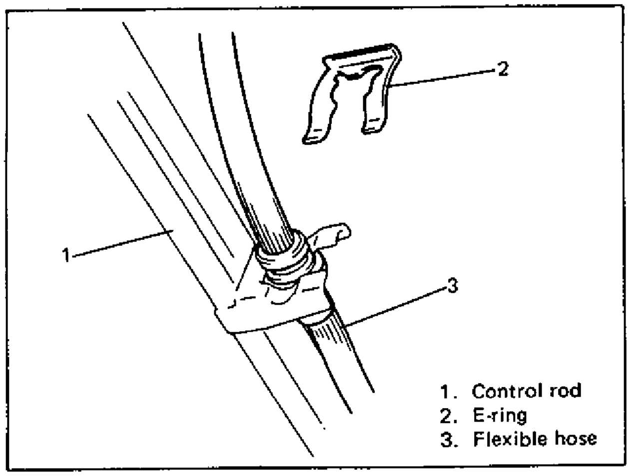


Fig. 3E-2

3) To facilitate toe adjustment after reinstallation, take following preparatory step before removing control rod. Confirm which one of lines stamped on washer is in the closest alignment with stamped line "A" on car body or put match marks.

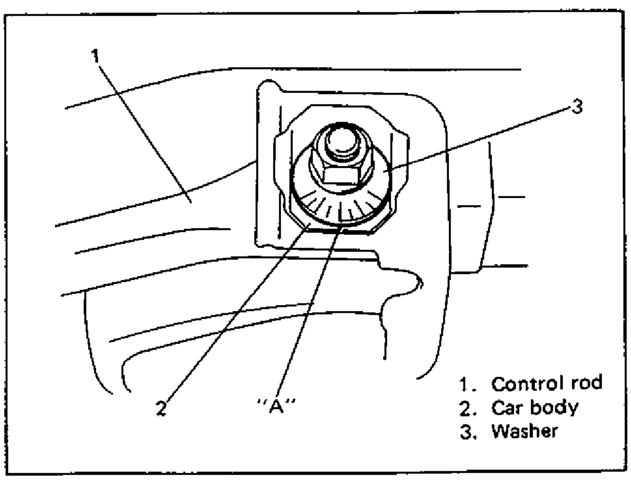


Fig. 3E-3

4) Remove control rod outside nut.
5) Loosen Control rod inside nut (body center side).
   Hold inside bolt with another wrench to prevent it from turning as nut is turned.
6) Remove control rod inside bolt and control rod.

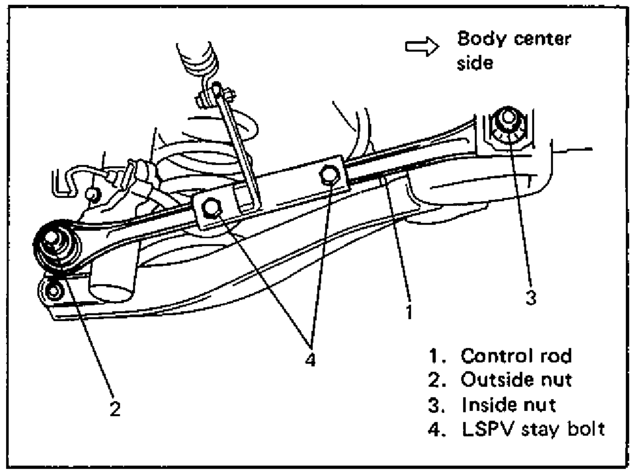


Fig. 3E-4

INSTALLATION

Install in reverse order of removal procedure, noting following items.

1) To determine installing direction of control rod, use installed position and shape of brake flexible hose mounting bracket welded on it, referring to Fig. 3E-5 which shows both control rods as installed.

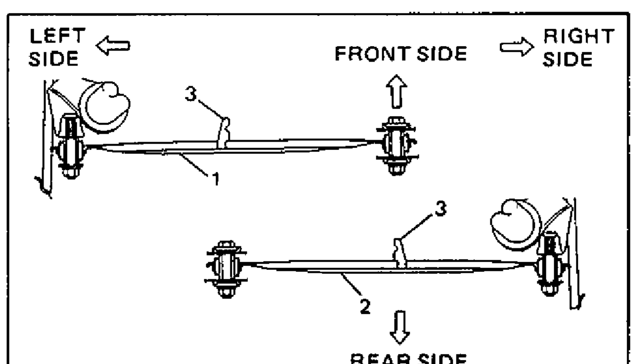


Fig. 3E-5

2) Install control rod inside bolt with its cam "B" faced down as shown below.

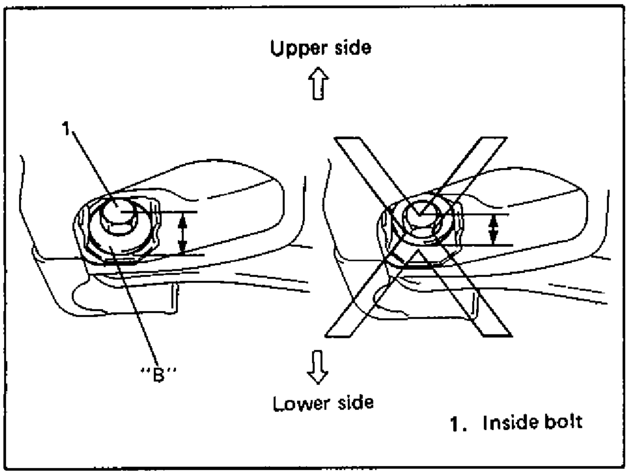


Fig. 3E-6

3) Tighten control rod nuts (inside & outside) to such extent that they can be turned by hand.
4) Connect brake flexible hose to bracket securely and install LSPV stay bolts (if equipped) to control rod.

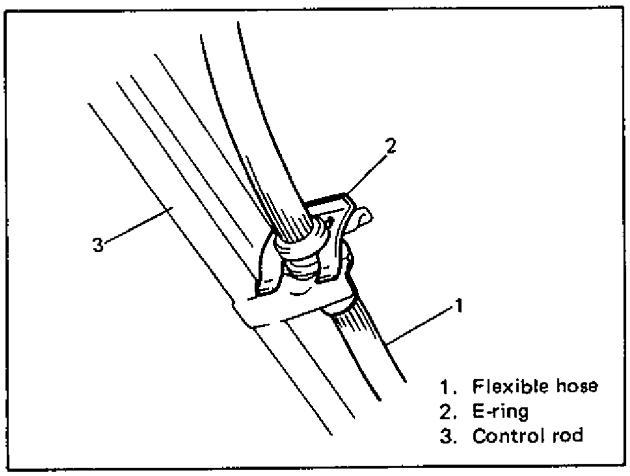


Fig. 3E-7

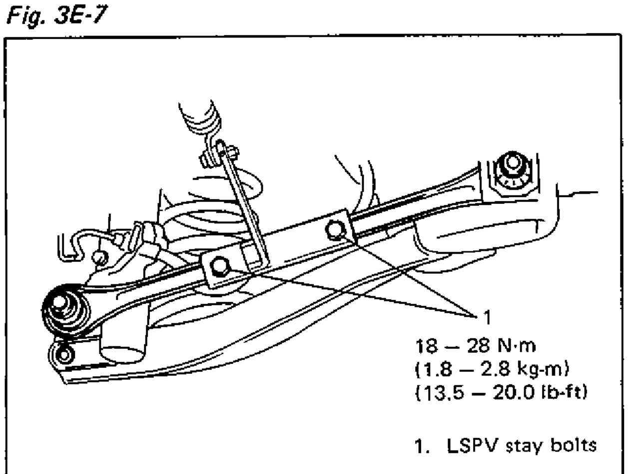


Fig. 3E-7-1

5) Install wheel and tighten wheel nuts to specified torque (Refer to Fig. 3E-53).
6) Lower hoist.
7) Tighten control rod outside nut and inside nut to specified torque.
   It is the most desirable to have car off hoist and in non-loaded condition when tightening them.

NOTE:
Tighten inside nut with line "A" stamped on body aligned with such line as confirmed before removal or match marks aligned.

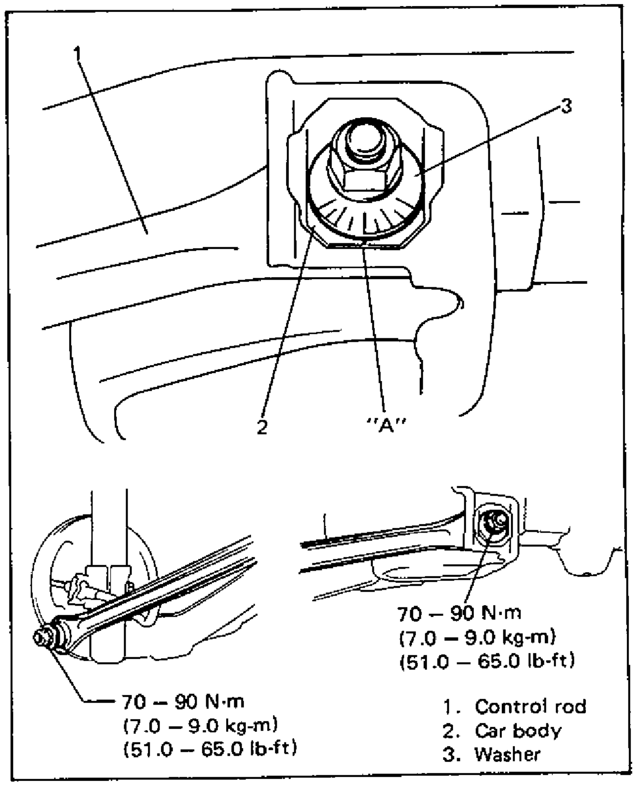


Fig. 3E-8

8) Check rear toe and ajust it as necessary. For check and adjustment procedures, Refer to p. 3E-17.

COIL SPRING AND SUSPENSION ARM

REMOVAL

1) Hoist car and remove wheel.
2) To facilitate toe adjustment after reinstallation, confirm which one of lines stamped on washer is in the closest alignment with stamped line "A" on control rod inside mount part of car body or put match marks.
   Then remove control rod inside bolt (body center side) and remove LSPV stay bolts (if equipped) from control rod.

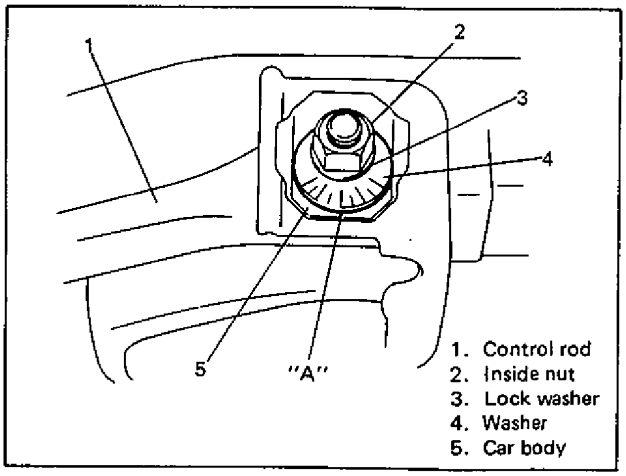


Fig. 3E-9

3) Remove outside (wheel side) of control rod from rear knuckle stud bolt and disconnect stabilizer bar from suspension arm.

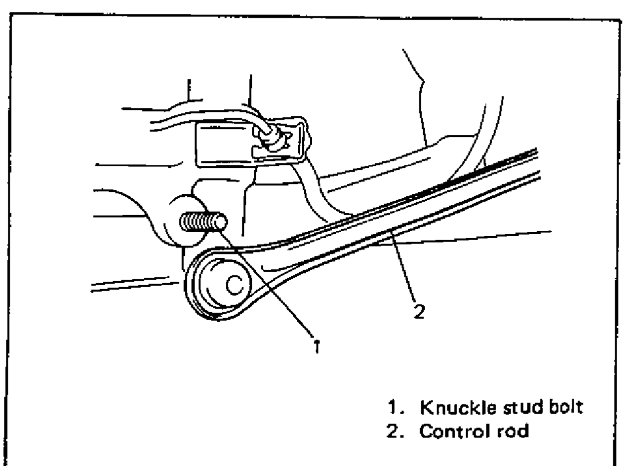


Fig. 3E-10

4) Loosen rear mount nut of suspension arm.

NOTE:
But don't remove bolt.

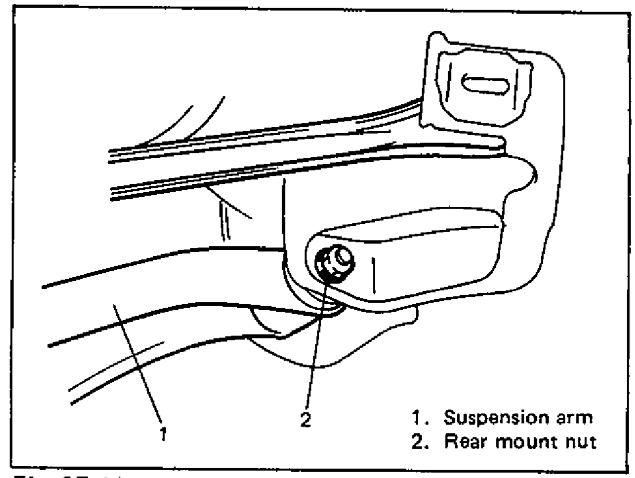


Fig. 3E-11

5) Loosen front nut of suspension arm.

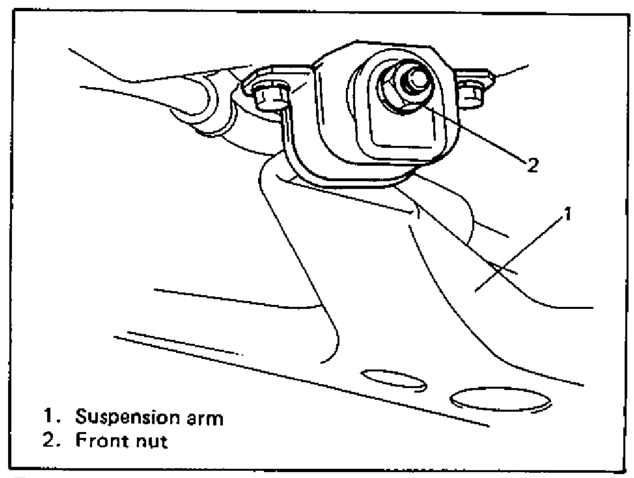


Fig. 3E-12

6) After loosening lower mount nut of knuckle, place jack under suspension arm to prevent it from lowering suddenly and then remove lower mount nut of knuckle.

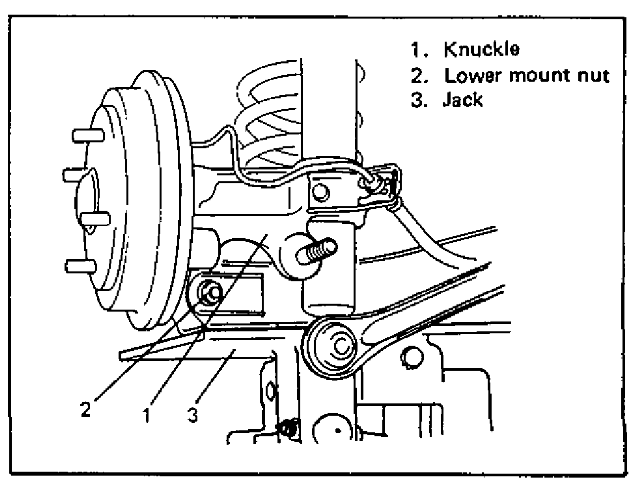


Fig. 3E-13

7) Raise jack placed under suspension arm a little and remove lower mount bolt of knuckle.

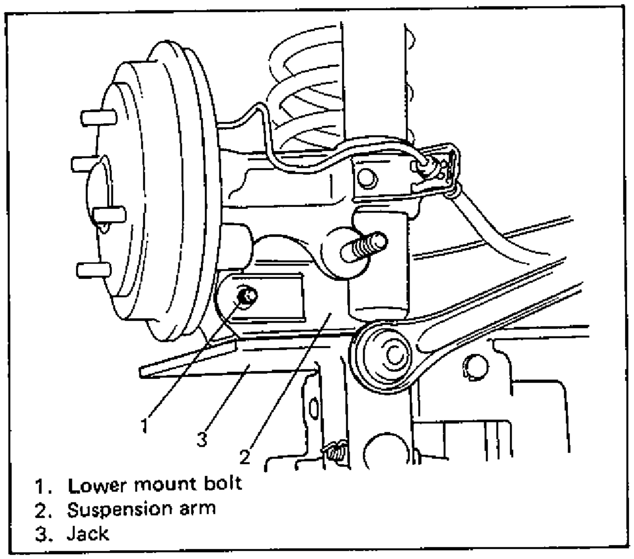


Fig. 3E-14

8) Move brake drum/brake back plate toward outside of car body (in arrow direction) to separate lower mount part of knuckle from suspension arm as shown below. Then lower jack gradually and remove coil spring.

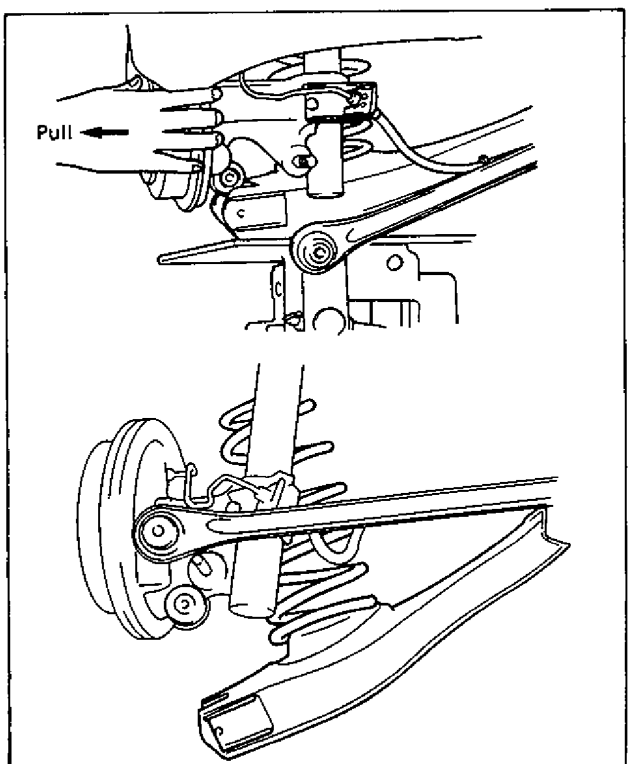


Fig. 3E-15

9) Remove suspension arm.
To remove its front part, remove bracket bolts as shown in figure below.

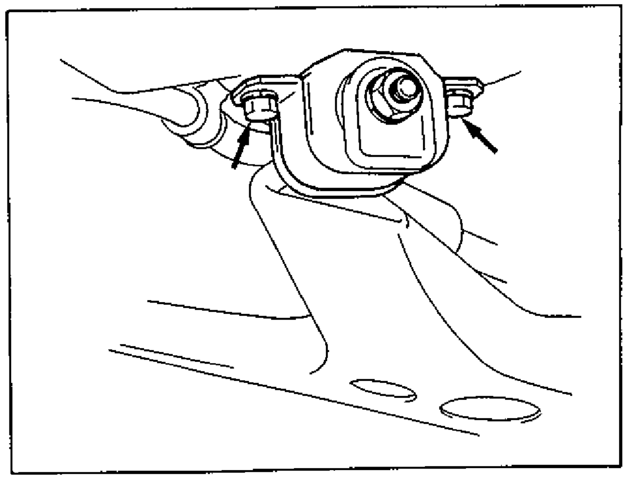


Fig. 3E-16

INSTALLATION

1) When installing front mount bush to suspension arm, set it so that its slit "A" (as shown in figure) faces outside of body. Also, make sure that it is installed properly in regard to its vertical direction, referring to figure below.

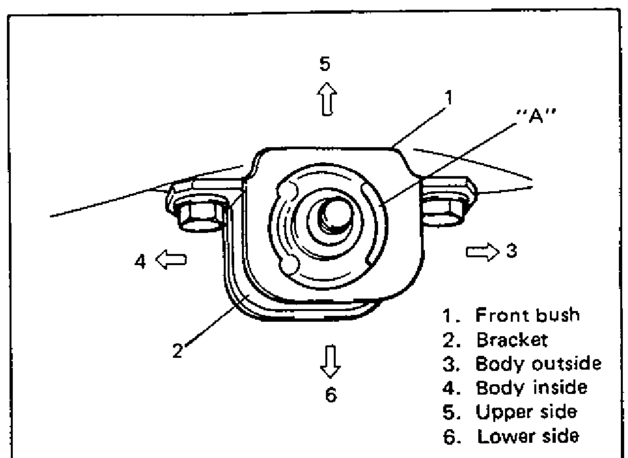


Fig. 3E-17

2) Tighten front mounting bracket bolts to specified torque. Tighten rear and front mounting nuts to such extent that they can be turned by hand. Check to make sure that front mounting washer is installed in proper direction referring to figure below.

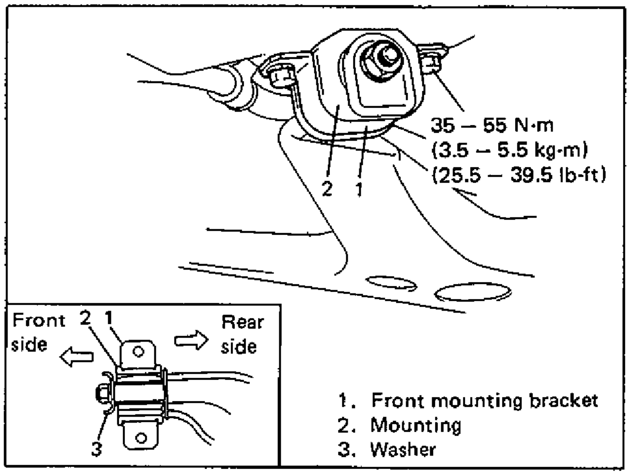


Fig. 3E-18

3) Place jack under suspension arm.
4) Install coil spring on spring seat of suspension arm and then raise suspension arm.

NOTE:
When seating coil spring, mate spring end with stepped part of suspension arm spring seat as shown.

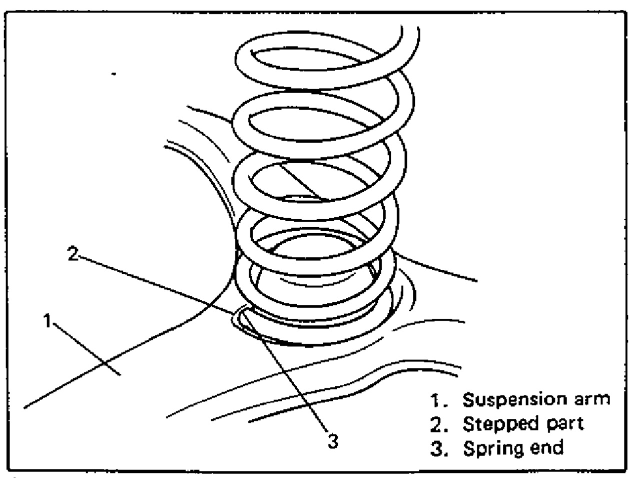


Fig. 3E-19

5) Install lower mount bolt of knuckle and torque nut to specification.

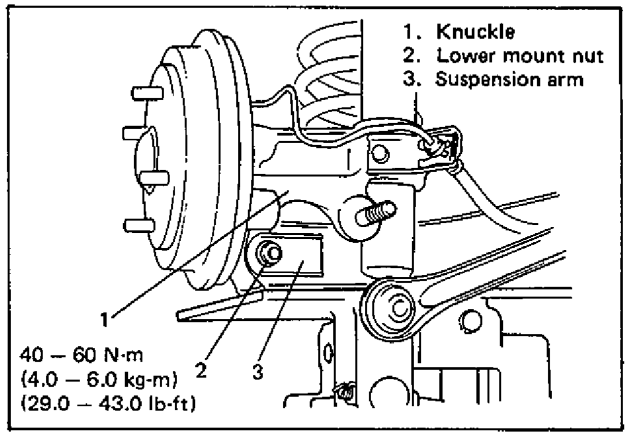


Fig. 3E-20

6) Remove jack from under suspension arm and install stabilizer bar to suspension arm and torque its bolts and nuts to specification. (Refer to p. 3E-14)
7) Install both inside and outside of control rod. When installing its inside bolt, refer to Control Rod INSTALLATION 2) on p. 3E-4.
   Install LSPV stay bolts (if equipped) to control rod.
8) Install wheel and tighten wheel nuts to specified torque. (Refer to Fig. 3E-53)
9) Lower hoist.
10) Tighten control rod outside nut and inside nut to specified torque.
   When tightening them, it is the most desirable to have car off hoist and in non-loaded state.
   Also, when tightening inside nut, align line "A" stamped on body with such stamped line on washer as confirmed before removal or align match marks if marked.

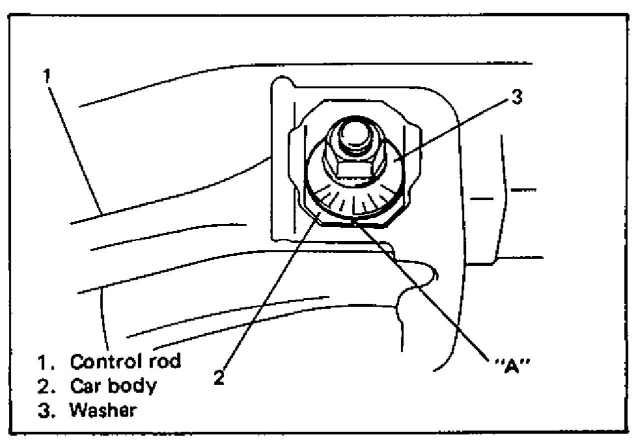


Fig. 3E-21

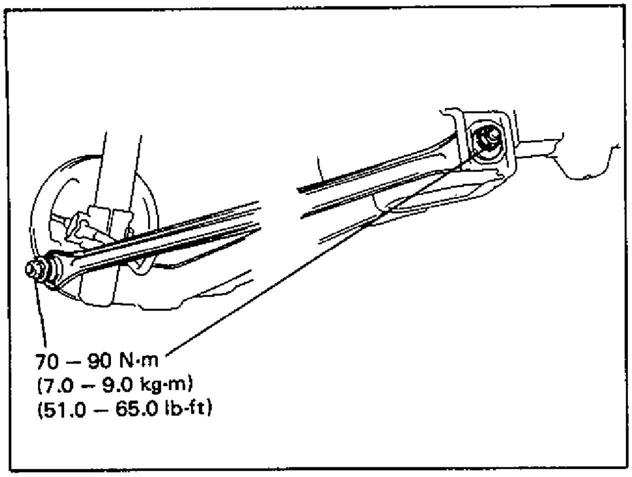


Fig. 3E-22

11) Tighten suspension arm front nut and rear nut to specified torque. It is desirable to have car off hoist and in non-loaded state when tightening them.

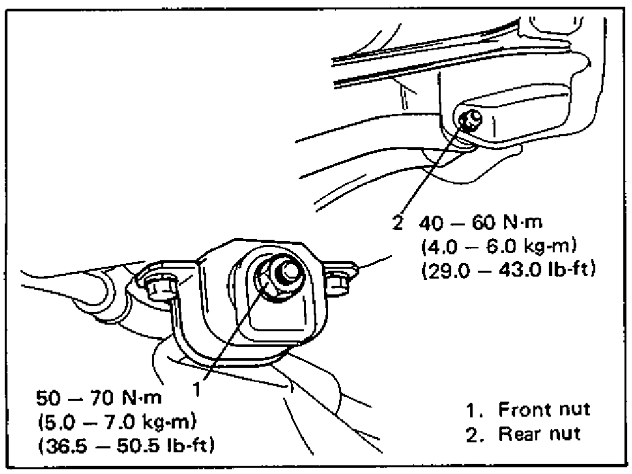


Fig. 3E-23

12) After tightening suspension arm front nut, check to make sure that washer as shown below is not tilted.

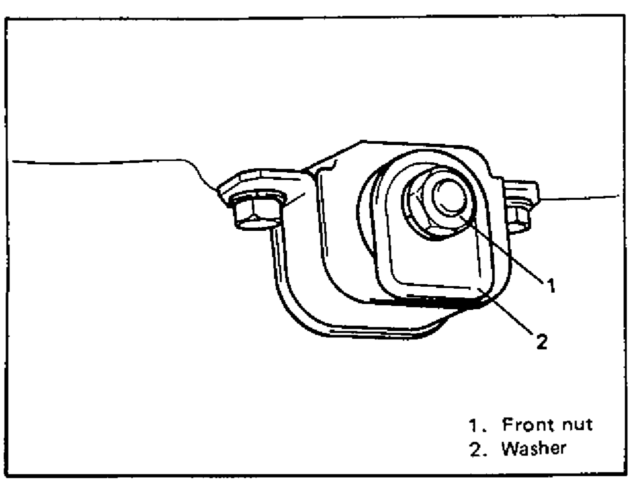


Fig. 3E-23-1

13) Check rear toe and adjust it as necessary. For check and adjustment procedures, refer to p. 3E-15.

REAR STRUT ASSEMBLY

REMOVAL

1) Hoist car and remove wheel.
2) Place jack under suspension arm so that it will be supported when it lowers.
3) Remove strut support nuts and push down strut fully as arrow shows in figure below.

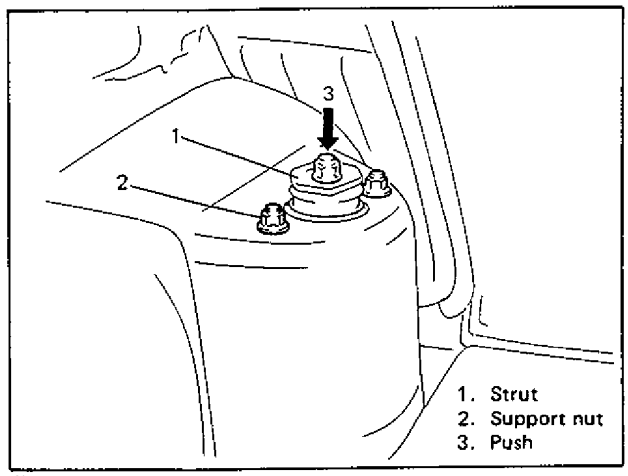


Fig. 3E-24

4) Remove strut lower mount bolt.

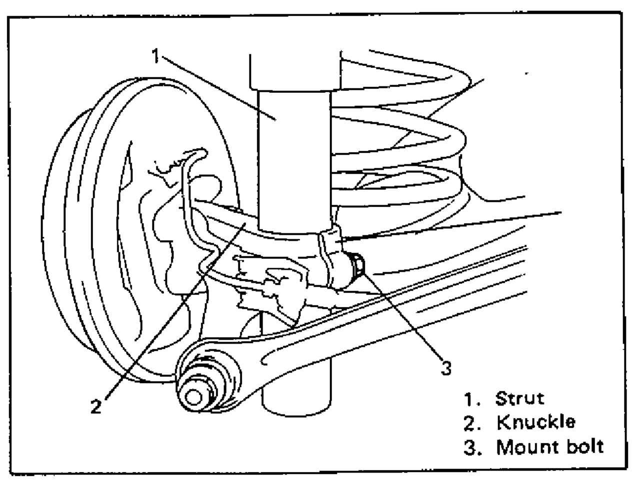


Fig. 3E-25

5) Remove strut from knuckle by pulling it up from upper side of knuckle. Make strut as short as possible for removal.
If it is hart to remove it, open slit of knuckle a little by inserting a wedge as shown.

CAUTION:
Do not open slit wider than necessary.

WARNING:
Do not lower jack more than necessary for strut removal, for coil spring may come off, or so much as to make brake flexible hose stretch.

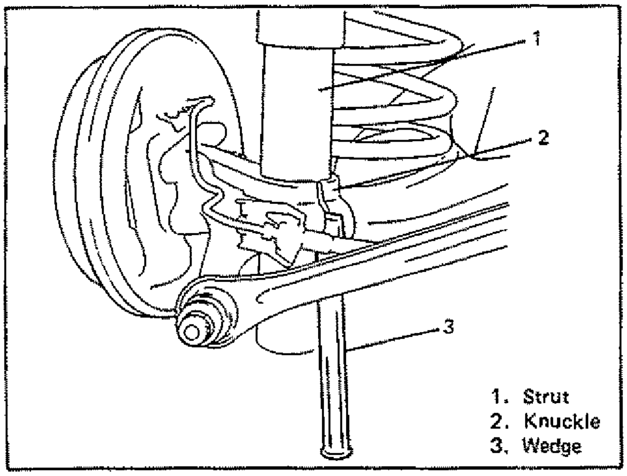


Fig. 3E-26

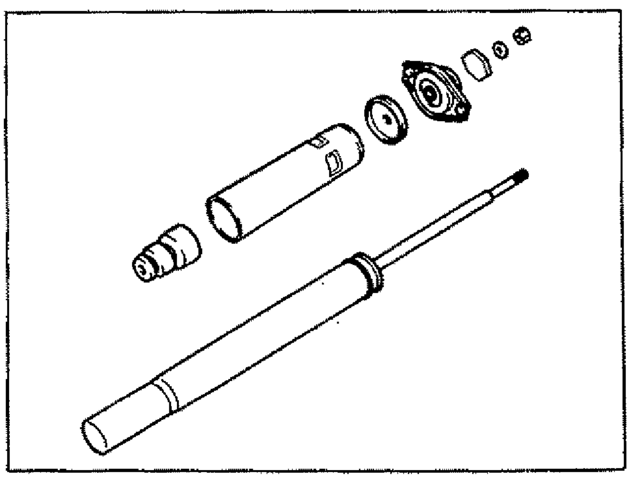


Fig. 3E-27

INSTALLATION

1) Make strut short by pushing it.

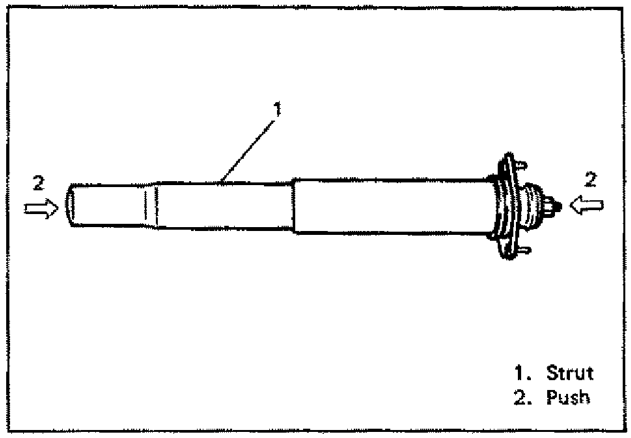


Fig. 3E-28

2) Install strut to knuckle.
Bring projection "A" on strut against slit of knuckle and push strut into knuckle till upper end of knuckle contacts "B" on strut as shown in figure below.

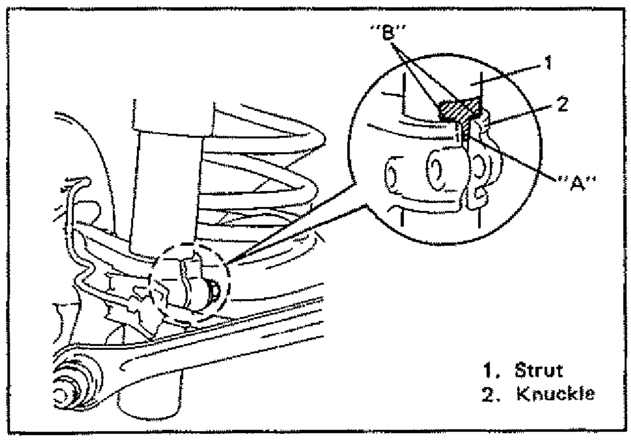


Fig. 3E-29

3) Tighten strut lower mount bolt to specified torque.

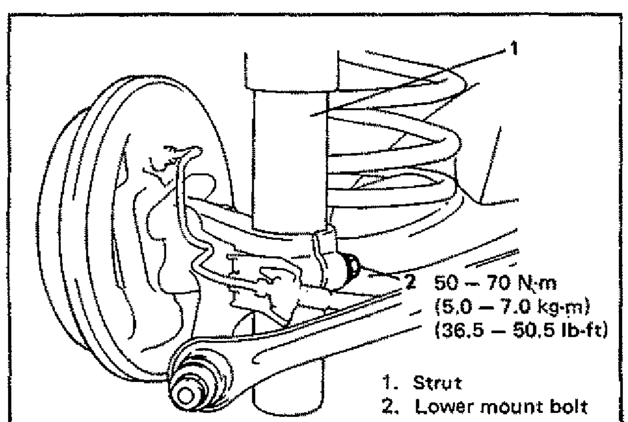


Fig. 3E-30

4) With strut extended fully, install upper part of strut to car body and tighten support nuts to specified torque.
If upper part of strut does not reach car body, raise jack under suspension arm a little.

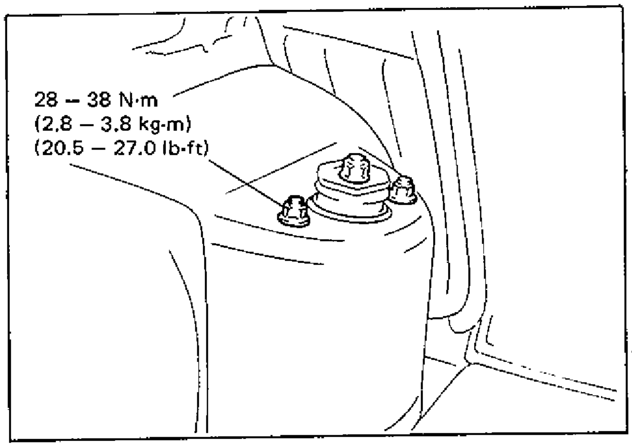


Fig. 3E-31

5) Remove jack from under suspension arm.
6) Tighten wheel nuts to specified torque (Refer to Fig. 3E-53).
7) Lower hoist.

WHEEL HUB AND REAR SUSPENSION KNUCKLE

REMOVAL

1) Perform Steps 1) to 4) of brake back plate REMOVAL on page 5-43.
2) Disconnect brake hose bracket from knuckle.

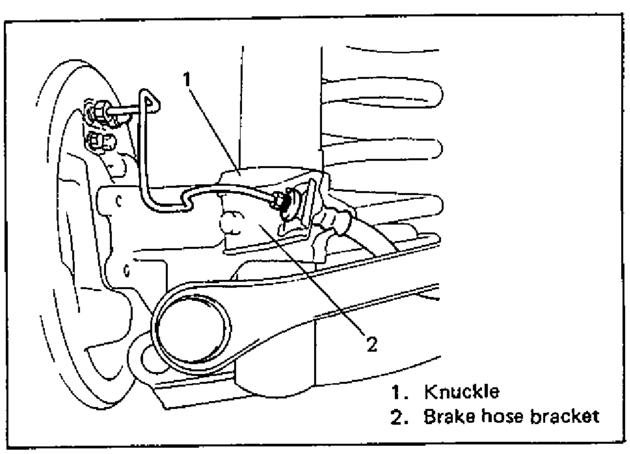


Fig. 3E-32

3) Disconnect brake pipe from wheel cylinder and put wheel cylinder breather plug cap onto pipe to prevent fluid from spilling.

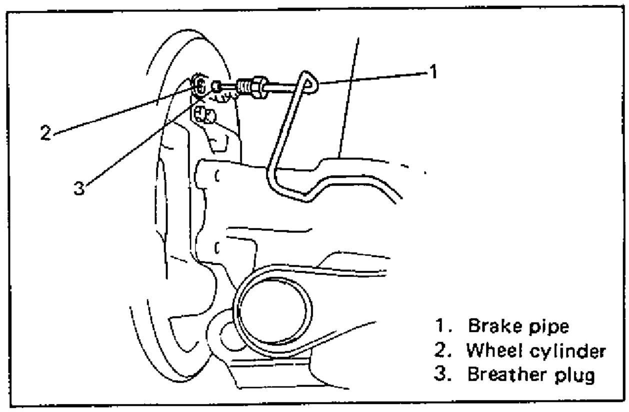


Fig. 3E-33

4) Remove brake back plate from knuckle.

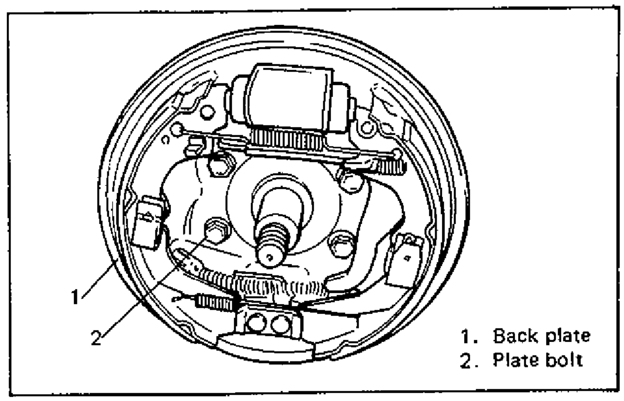


Fig. 3E-34

5) Place jack under suspension arm so as to prevent it from lowering.
6) Remove nut and washer from inside (body center side) of control rod. As preparatory step of this removal, check stamped line on washer to use for guide in reinstallation. Refer to SUSPENSION ARM REMOVAL 2) on p. 3E-5 for details.
Remove LSPV stay bolts (if equipped) from control rod.
7) Remove outside (wheel side) of control rod from rear knuckle stud bolt and disconnect stabilizer bar from suspension arm.

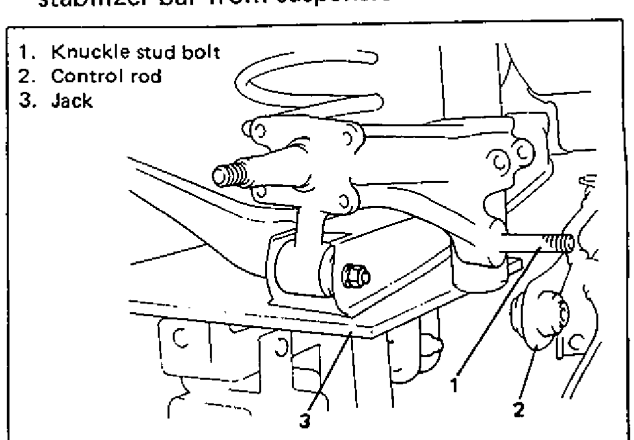


Fig. 3E-35

8) Remove strut lower mount bolt.

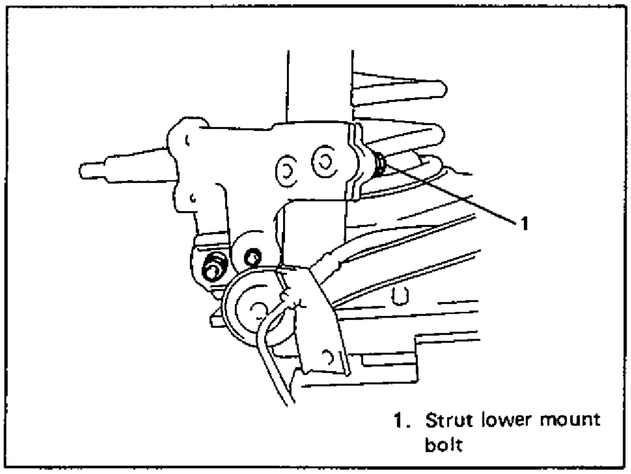


Fig. 3E-36

9) Remove knuckle lower mount bolt.

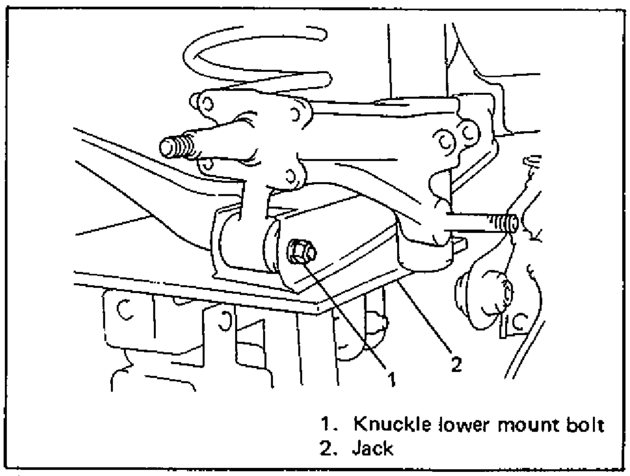


Fig. 3E-37

10) Disconnect knuckle from suspension arm and remove knuckle from strut.
If it is hard to remove knuckle from strut, open slit of knuckle a little by inserting wedge there as shown below.

CAUTION:
Don't open slit wider than necessary.

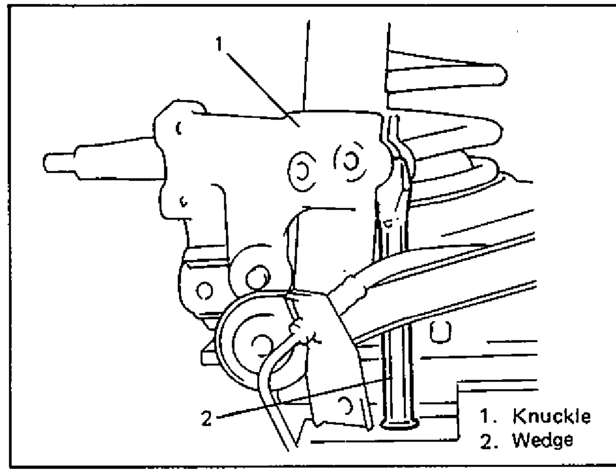


Fig. 3E-38

INSTALLATION

1) Install knuckle to strut.
Bring projection "A" on strut against slit of knuckle and push strut into knuckle till upper end of knuckle contacts "B" on strut as shown in figure below.

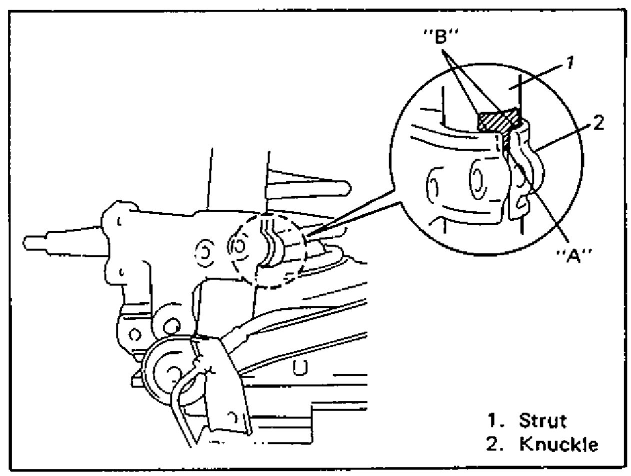


Fig. 3E-39

2) Install strut lower mount bolt.
3) Install lower mount part of knuckle to suspension arm.

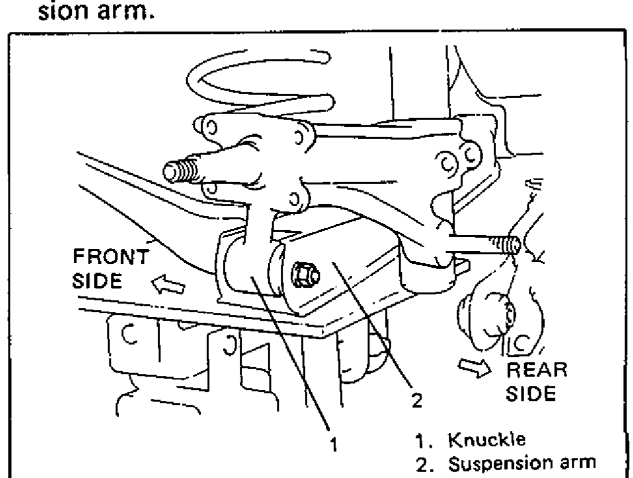


Fig. 3E-40

4) Tighten strut lower mount bolt to specified torque. For torque data, refer to Fig. 3E-41.
5) Remove jack from under suspension arm.
6) Torque lower mount nut of knuckle to specification.

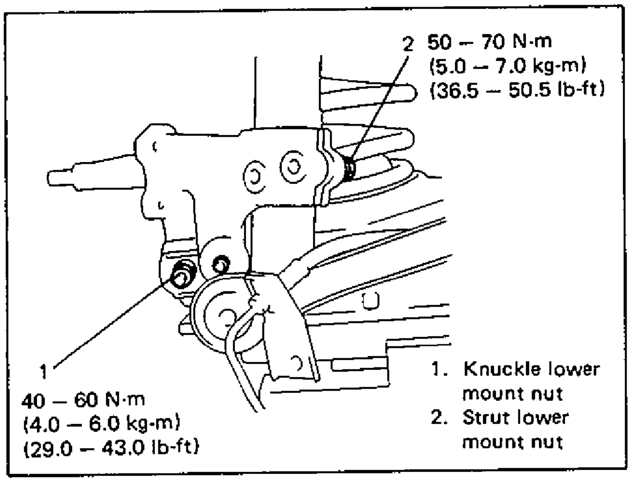


Fig. 3E-41

7) Apply water tight sealant to mating surfaces of brake back plate and rear knuckle.

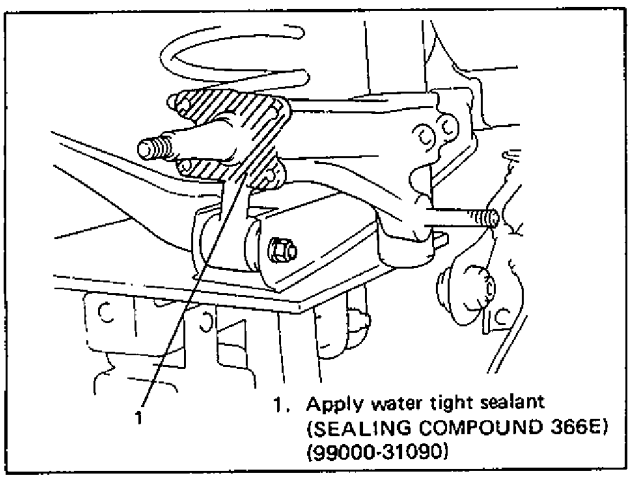


Fig. 3E-42

8) Install brake back plate and tighten back plate bolts to specified torque.

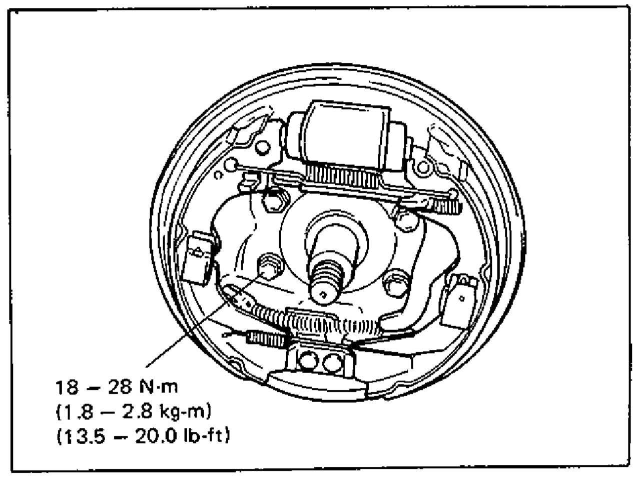


Fig. 3E-43

9) Install brake hose bracket to knuckle and stabilizer bar to suspension arm. (Refer to Fig. 3E-46-3)
10) Tighten brake pipe flare nut to specified torque and install breather plug cap taken off from pipe back to breather plug.

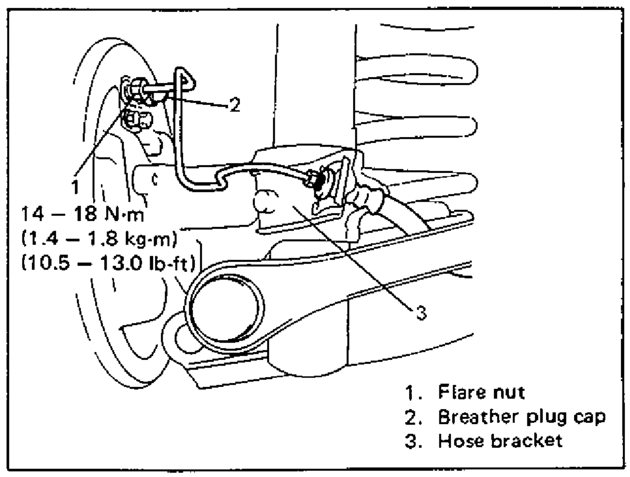


Fig. 3E-44

11) Install wheel hub (Refer to Steps 6) to 9) of BRAKE BACK PLATE INSTALLATION on p. 5-44 of this manual).
12) Install brake drum (Refer to Steps 1) to 4) of its INSTALLATION on p. 5-40 of this manual).
13) Install control rod and control rod nuts (inside & outside) and tighten them to such extent that they can be turned by hand.
Install LSPV stay bolts (if equipped) to control rod.
14) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see p. 5-23.)

15) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
    Adjust parking brake cable. (For adjustment, see p. 5-22.)
16) Tighten parking brake lever cover screws.
17) Install wheel and tighten wheel nuts to specified torque. (Refer to Fig. 3E-53.)
18) Check to ensure that brake drum is free from dragging and proper braking is obtained.
19) Lower hoist.
20) Tighten outside and inside nuts of control rod to specified torque. When tightening inside nut, refer to CONTROL ROD INSTALLATION 7) on p. 3E-4. Then check toe.
21) Perform brake test (foot brake and parking brake).
22) Check each installed part for fluid leakage.

WHEEL BEARING AND WHEEL STUD

REMOVAL

Perform Steps 1) to 4) of BRAKE BACK PLATE REMOVAL on p. 5-43.
Wheel bearing and wheel hub form a solid unit. When wheel bearing is found defective and its replacement is necessary, replace hub assembly.

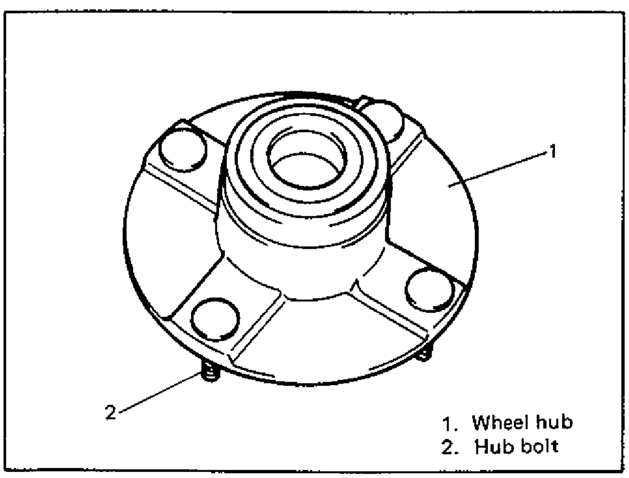


Fig. 3E-45

Remove and install hub bolt. Refer to REMOVE AND INSTALL WHEEL STUD on p. 3D-8.

INSTALLATION

1) Install wheel hub, brake drum and wheel. (Refer to Steps 6) to 10) of BRAKE BACK PLATE INSTALLATION on p. 5-44).
2) Lower hoist.
3) Perform brake test (foot brake and parking brake).

STABILIZER BAR

REMOVAL

1) Hoist car and remove stabilizer bar nuts (right & left).

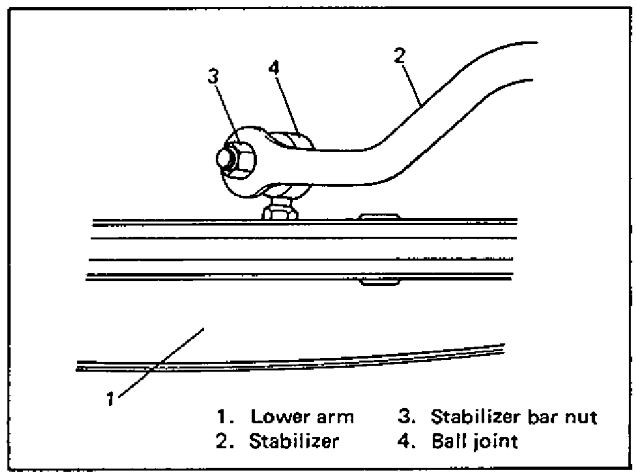


Fig. 3E-46

2) Remove stabilizer bar brackets and stabilizer bar.

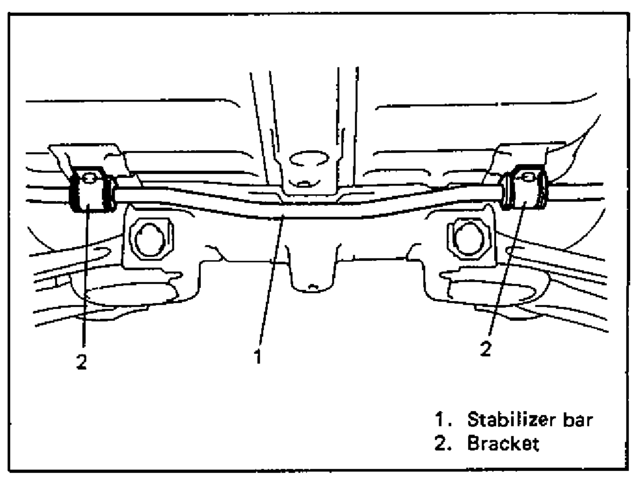


Fig. 3E-46-1

INSTALLATION

1) When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side. Refer to Fig. 3E-46-2 for its check.
2) Install parts by reversing REMOVAL procedure.
3) Torque stabilizer nuts and bolts to specification. (Refer to Fig. 3E-46-3)

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

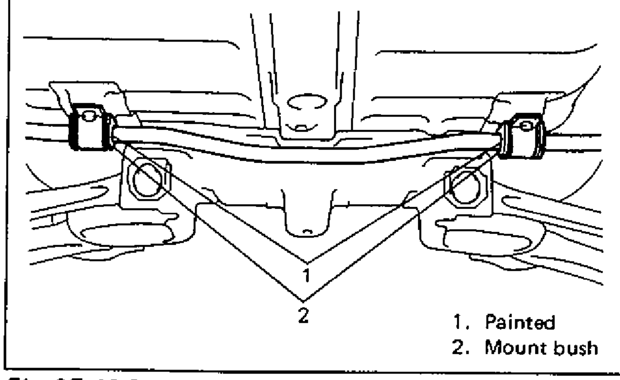


Fig. 3E-46-2

For installing directions (and position) of mount bushes and washers, refer to below figure.

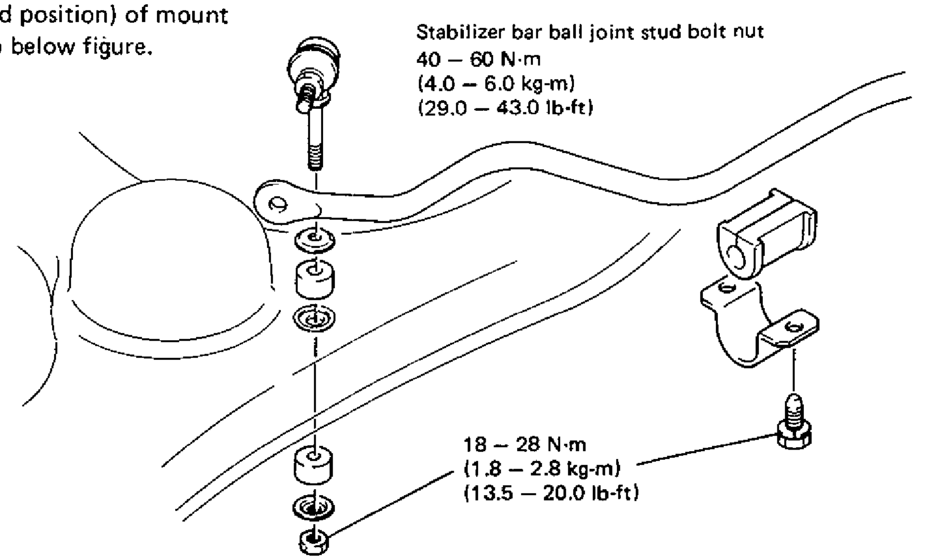


Fig. 3E-46-3

REAR SUSPENSION INSPECTION

STRUT DAMPER

1) Inspect strut for oil leakage. If strut is found faulty, replace it as an assembly unit, because it can not be disassembled.

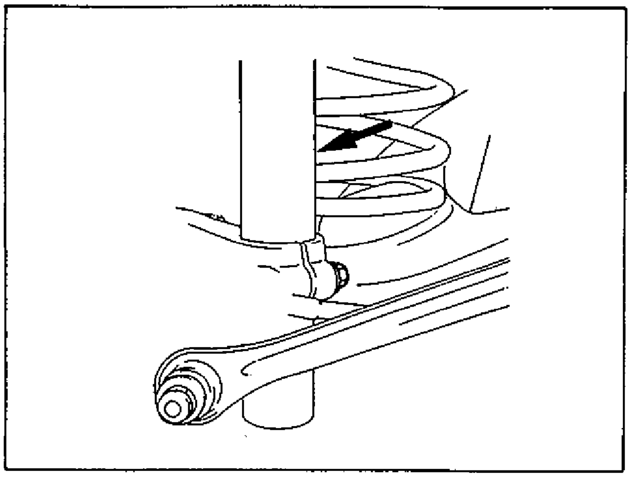


Fig. 3E-47

2) Strut function check
Check and adjust tire pressures as specified. Bounce car body three or four times continuously by pushing rear end on the side with strut to be checked. Apply the same amount of force at each push and note strut resistance both when pushed and rebounding.
Also, note how many times car body rebounds before coming to stop after hands are off. Do the same for strut on the other side.
Compare strut resistance and number of rebound on the right with those on the left. And they must be equal in both. With proper strut, car body should come to stop the moment hands are off or after only one or two small rebounds. If struts are suspected, compare them with known good car or strut.
3) Inspect for damage or deformation.
4) Inspect for abnormal noise.
5) Inspect for cracks or deformation in spring seat.
6) Inspect for deterioration of bump stopper.
7) Inspect strut mount for wear, cracks or deformation.

Replace any parts found defective in Steps 2) – 7).

SUSPENSION CONTROL ARM, COIL SPRING AND KNUCKLE ARM

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

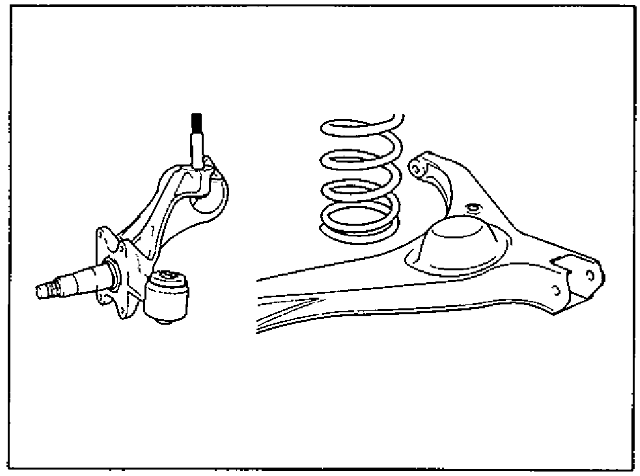


Fig. 3E-47-1

Replace any defective part.

CONTROL ROD

- Inspect for cracks, deformation or damage.
- Inspect bushings for wear and breakage.

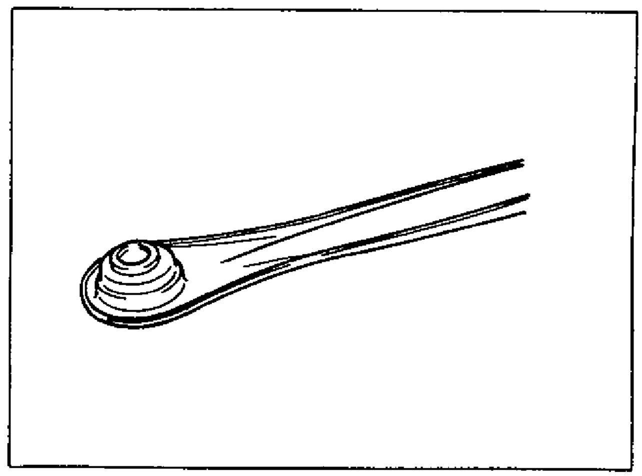


Fig. 3E-47-2

Replace any defective part.

REAR SUSPENSION FASTENERS

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque, referring to Fig. 3E-53 of this section.

WHEEL DISC, NUT & BEARING

- Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.
- Check wheel hub nuts for tightness and, as necessary, retighten to specification (Refer to Fig. 3E-53).
- Check wheel bearings for wear. When measuring thrust play, apply a dial gauge to spindle cap center.

Thrust play limit	Rear	0.3 mm (0.012 in)

When measurement exceeds limit, replace bearing.

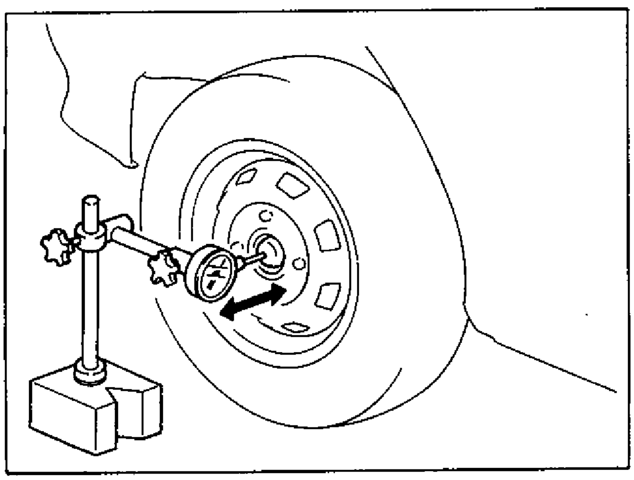


Fig. 3E-48

- By rotating wheel actually, check wheel bearing for noise and smooth rotation. If it is defective, replace bearing.

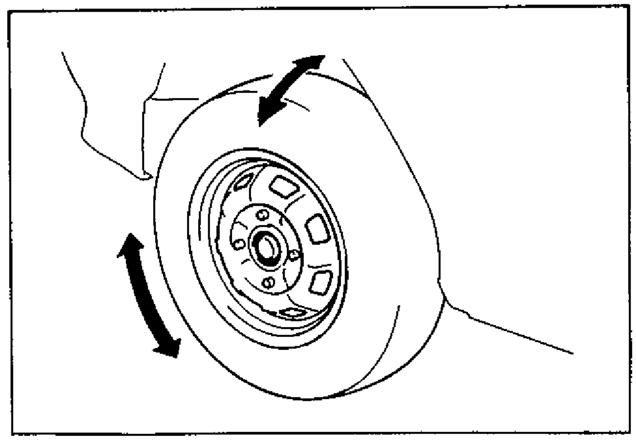


Fig. 3E-49

STABILIZER BAR, JOINT AND/OR BUSHING

BAR

Inspect for damage or deformation. If defective, replace.

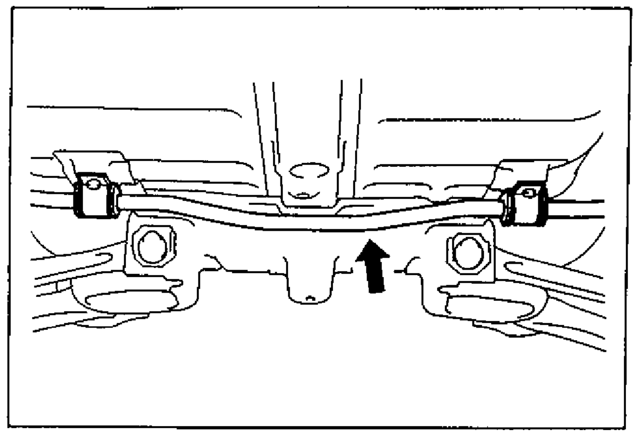


Fig. 3E-49-1

BUSHING

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

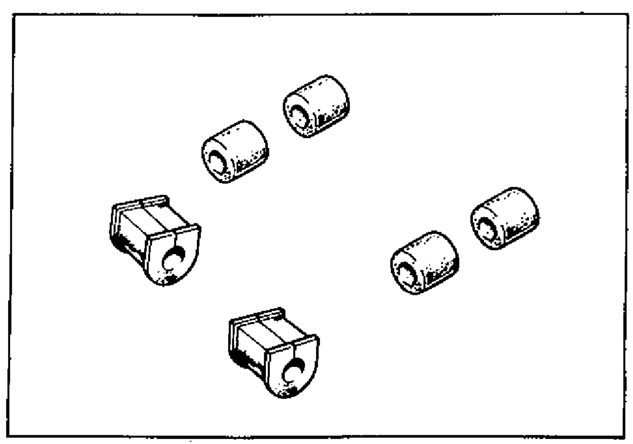


Fig. 3E-49-2

REAR WHEEL ALIGNMENT

Among factors for rear wheel alignment, only toe setting can be adjusted.
Camber and caster can't be adjusted. Therefore, should camber or caster be out of specification due to the damage caused by hazardous road conditions or collision, whether the damage is in body or in suspension should be determined and damaged body should be repaired or damaged suspension should be replaced.

TOE SETTING

Amount of toe can be obtained by subtracting "A" from "B" as shown in Fig. 3E-50 and therefore is given in mm (in.).

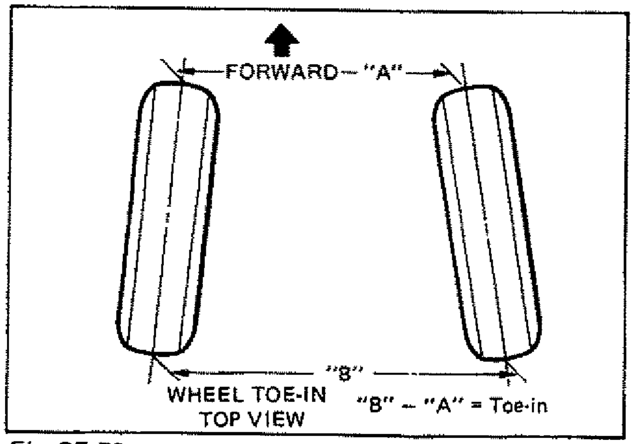


Fig. 3E-50

TOE INSPECTION AND ADJUSTMENT

Preparation for toe inspection and adjustment

- Place car in non-loaded state on level floor.
- Set steering wheel in straight state.
- Check that inflation pressure of each tire is adjusted properly and disc wheel is free from deflection.
- Check that each suspension part is free from bend, dent, wear or damage in any other form.
- Check that ground clearance at the right and left is just about the same.

INSPECTION

Measure toe with toe-in gauge.
Toe should be within following specification.

Toe-in	2 ± 2 mm (0.079 ± 0.079 in.)

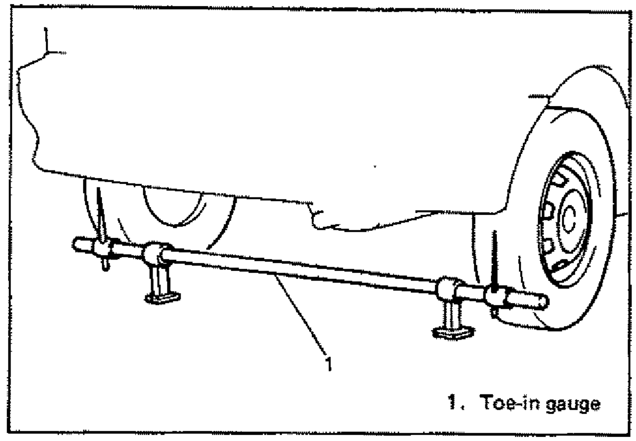


Fig. 3E-51

When checked with side slip tester, side slip should satisfy following specification.

Side slip	2 ± 3 mm/m (0.079 ± 0.118 in/3 ft)

If toe-in or side slip is out of above corresponding specification, adjust toe properly.

ADJUSTMENT

1) Loosen right and left control rod inside nuts.
2) Adjust toe to satisfy specification by turning right and left control rod inside bolts (cam bolts) by the same amount.
3) After adjustment, tighten right and left inside nuts to specified torque while holding cam bolt with another wrench to prevent it from turning.

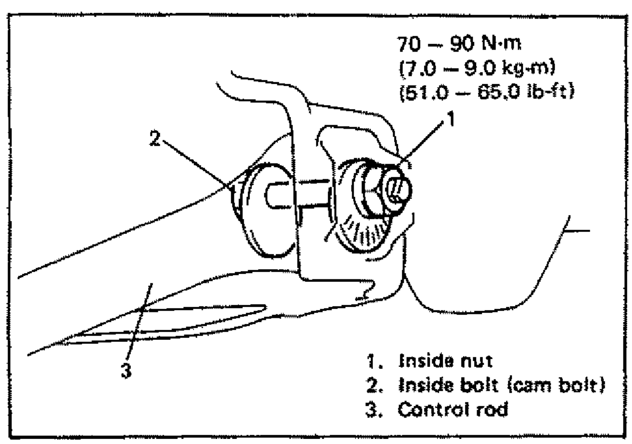


Fig. 3E-52

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Control rod outside nut 2. Control rod inside nut	70 – 90	7.0 – 9.0	51.0 – 65.0
3. Suspension arm mounting bracket bolt	35 – 55	3.5 – 5.5	25.5 – 39.5
4. Suspension arm front nut	50 – 70	5.0 – 7.0	36.5 – 50.5
5. Suspension arm rear nut 6. Knuckle arm lower mount nut	40 – 60	4.0 – 6.0	29.0 – 43.0
7. Strut support nut	28 – 38	2.8 – 3.8	20.5 – 27.0
8. Strut upper nut	40 – 60	4.0 – 6.0	29.0 – 43.0
9. Strut lower mount bolt	50 – 70	5.0 – 7.0	36.5 – 50.5
10. Rear spindle nut	150 – 200	15.0 – 20.0	108.5 – 144.5
11. Wheel nut	50 – 70	5.0 – 7.0	36.5 – 50.5
12. LSPV stay bolt	18 – 28	1.8 – 2.8	13.5 – 20.0

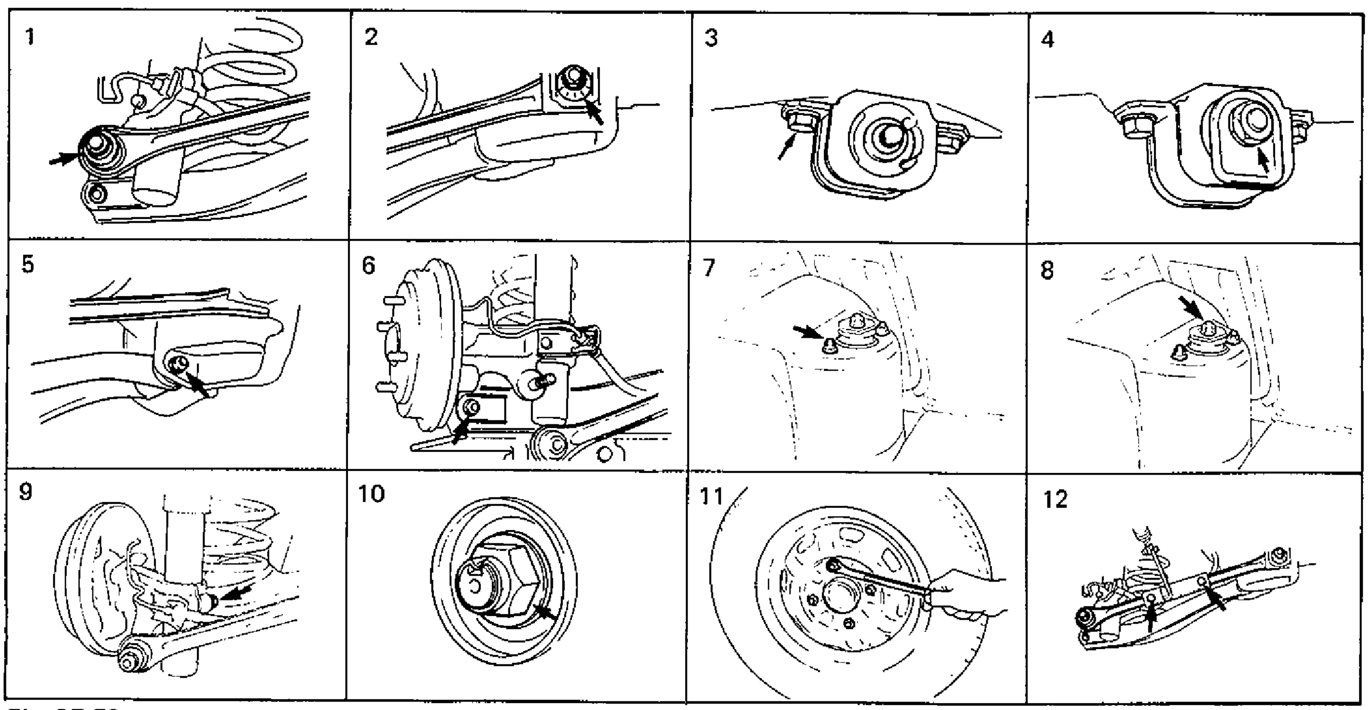


Fig. 3E-53

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Brake fluid	DOT3 or SAE J1703	Brake reservoir tank
Water tight sealant	SEALING COMPOUND 366E (99000-31090)	Joint seam of knuckle and brake back plate

SECTION 3F

WHEELS AND TIRES

NOTE:
All wheel fasteners are important attaching parts in that they could affect the performance of vital parts and system, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts.
There is to be no welding as it may result in extensive damage and weakening of the metal.

CONTENTS

DIAGNOSIS 3-1
GENERAL DESCRIPTION 3F-1
Tires 3F-1
Wheels 3F-1
Replacement Tires 3F-1
Replacement Wheels 3F-2
MAINTENANCE AND MINOR ADJUSTMENTS 3F-2
Wheel Maintenance 3F-2
Wheel attaching studs 3F-3
Matched tires and wheels 3F-3
Inflation of tires 3F-3
Tire placard 3F-3
Tire Rotation 3F-4
ON CAR SERVICE 3F-4
Service Operations 3F-4
Metric lug nuts and wheel studs 3F-4
Wheel removal 3F-4
Tire mounting and demounting 3F-5
Tire repair 3F-5
Balancing Wheels 3F-5
General balance procedures 3F-6
Off-car balancing 3F-6
On-car balancing 3F-6
TORQUE SPECIFICATION 3F-6

GENERAL DESCRIPTION

TIRES

This car is equipped with P165/65R 14 tire.
The tire is of tubeless type. The tire is designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressures.
Correct tire pressures and driving habits have an important influence on tire life. Heavy cornering, excessively rapid acceleration, and unnesessary sharp braking increase tire wear.

WHEELS

Standard equipment wheels are 14 x 5J steel or aluminum wheels.

REPLACEMENT TIRES

When replacement is necessary, the original equipment type tire should be used. Refer to the Tire Placard.
Replacement tires should be of the same size, load range and construction as those originally on the car. Use of any other size or type tire may affect ride, handling, speedometer/odometer calibration, car ground clearance and tire or snow chain clearance to the body and chassis.

WARNING:
Do not mix different types of tires on the same car such as radial, bias and bias-belted tires except in emergencies, because handling may be seriously affected and may result in loss of control.

It is recommended that new tires be installed in pairs on the same axle. If necessary to replace only one tire, it should be paired with the tire having the most tread, to equalize braking traction.

The metric term for tire inflation pressure is the kilopascal (kPa). Tire pressures is usually printed in both kPa and psi on the Tire Placard. Metric tire gages are available from tool suppliers. The chart in Fig. 3F-1 converts commonly used inflation pressures from kPa to psi.

kPa	kgf/cm²	psi
160	1.6	23
180	1.8	26
200	2.0	29
220	2.2	32
240	2.4	35
260	2.6	38
280	2.8	41
300	3.0	44

Fig. 3F-1 Tire Pressure Conversion Chart

REPLACEMENT WHEELS

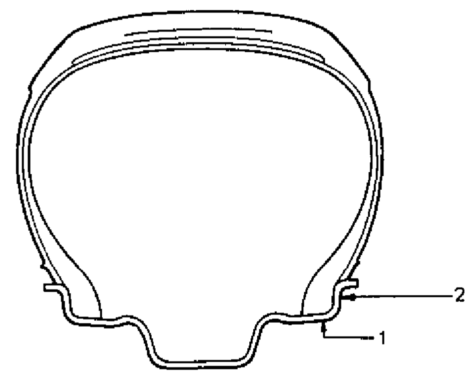
Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, air leak through welds, have elongated bolt holes, if lug nuts won't stay tight, or if they are heavily rusted. Wheels with greater runout than shown in Fig. 3F-2 may cause objectional vibrations.

Replacement wheels must be equivalent to the original equipment wheels in load capacity, diameter, rim width, offset and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer/odometer calibration, car ground clearance and tire clearance to body and chassis.

HOW TO MEASURE WHEEL RUNOUT

To measure the wheel runout, it is necessary to use an accurate dial indicator. The tire may be on or off the wheel. The wheel should be installed to the wheel balancer of the like for proper measurement.

Take measurements of both lateral runout and radial runout at both inside and outside of the rim flange. With the dial indicator set in place securely, turn the wheel one full revolution slowly and record every reading of the indicator. When the measured runout exceeds the specification and correction by the balancer adjustment is impossible, replace the wheel. If the reading is affected by welding, paint or scratch, it should be ignored.



* TOTAL INDICATOR READING
IGNORE INDICATOR "JUMPS"
DUE TO WELD SEAMS, PAINT
RUNS, SCRATCHES, ETC.

1. Radial runout
2. Lateral runout

Fig. 3F-2 Wheel Runout

	Radial runout limit	Lateral runout limit
Steel wheel	1.14 mm (0.045 in.)	1.40 mm (0.055 in.)
Alminum wheel	0.70 mm (0.028 in.)	0.70 mm (0.028 in.)

MAINTENANCE AND MINOR ADJUSTMENTS

WHEEL MAINTENANCE

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

WHEEL ATTACHING STUDS

If a broken stud is found, see Section 3E (rear) or Section 3D (front) for Note and Replacement procedure.

MATCHED TIRES AND WHEELS

(For car equipped with steel wheels)

Tires and wheels are matchmounted at the assembly plant. This means that the radially stiffest part of the tire, or "high spot", is matched to the smallest radius or "low spot" of the wheel. This is done to provide the smoothest possible ride.

The "high spot" of the tire is originally marked by paint dot on the outboard sidewall. This paint dot will eventually wash off the tire.

The "low spot" of the wheel is originally marked by paint dot on the wheel rim-flange. Properly assembled, the wheel rims' paint dot should be aligned with the tires' paint dot as shown in Fig. 3F-3.

Whenever a tire is dismounted from its wheel, it should be remounted so that the tire and wheel are matched. If the tire's paint dot cannot be located, a line should be scribed on the tire and wheel before dismounting to assure that it is remounted in the same position.

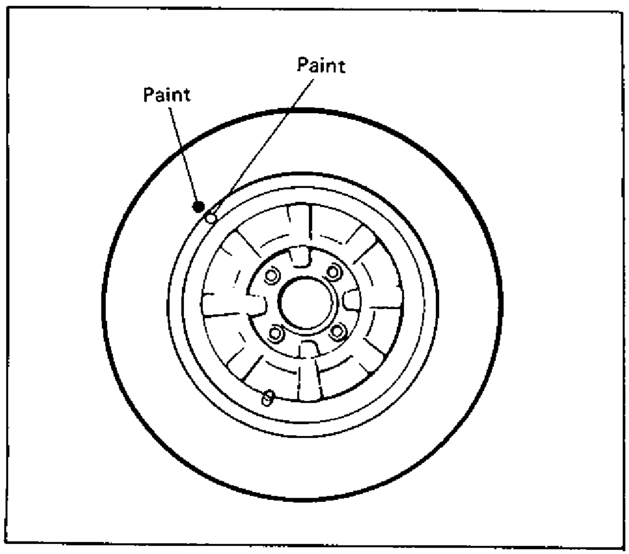


Fig. 3F-3 Matched Tires and Wheels

INFLATION OF TIRES

The pressure recommended for any model is carefully calculated to give a satisfactory ride, stability, steering, tread wear, tire life and resistance to bruises.

Tire pressure, with tires cold, (after car has set for three hours or more, or driven less than one mile) should be checked monthly or before any extended trip. Set to the specifications on the tire placard located on the left door (right door for right-hand side steering car) lock pillar.

It is normal for tire pressure to increase to 28 kPa (4 psi) when the tires become hot during driving. **Do not** bleed or reduce tire pressure after driving. Bleeding reduces the "Cold Inflation Pressure".

Higher than recommended pressure can cause:

1. Hard ride
2. Tire bruising or carcass damage
3. Rapid tread wear at center of tire

Lower than recommended pressure can cause:

1. Tire squeal on turns
2. Hard Steering
3. Rapid and uneven wear on the edges of the tread
4. Tire rim bruises and rupture
5. Tire cord breakage
6. High tire temperature
7. Reduced handling
8. High fuel consumption

Unequal pressure on same axle can cause:

1. Uneven braking
2. Steering lead
3. Reduced handling
4. Swerve on acceleration

Valve caps should be on the valves to keep dust and water out.

TIRE PLACARD

The tire placard is located on the left door (right door for right-hand side steering car) lock pillar and should be referred to for tire information. The placard lists the maximum load, tire size and cold tire pressure where applicable.

NOTE:

Whether rim size and/or maximum load are listed or not depends on regulations of each country.

TIRE ROTATION

To equalize wear, rotate tires according to Fig. 3F-4. Radial tires should be rotated at the first 10,000 km (6,000 miles) and after that, tire rotation at least every 6,000 miles is recommended. Set tire pressure.

NOTE:
Due to their design, radial tires tend to wear faster in the shoulder area, particularly in front positions. This makes regular rotation especially necessary.

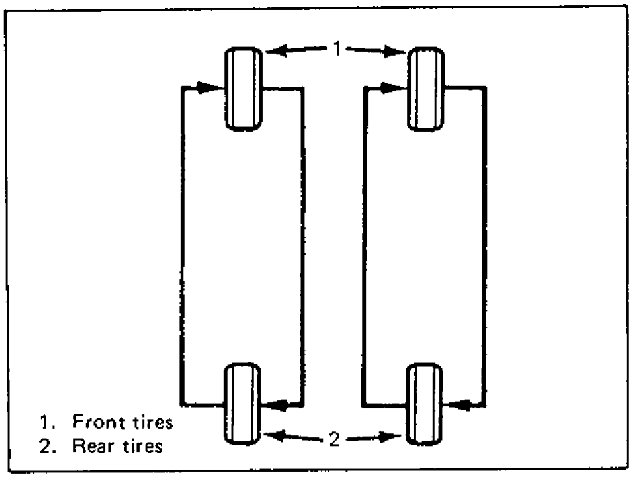


Fig. 3F-4 Tire Rotation

ON-CAR SERVICE

SERVICE OPERATIONS

METRIC LUG NUTS AND WHEEL STUDS

All models use metric lug nuts and wheel studs size: M12 x 1.25

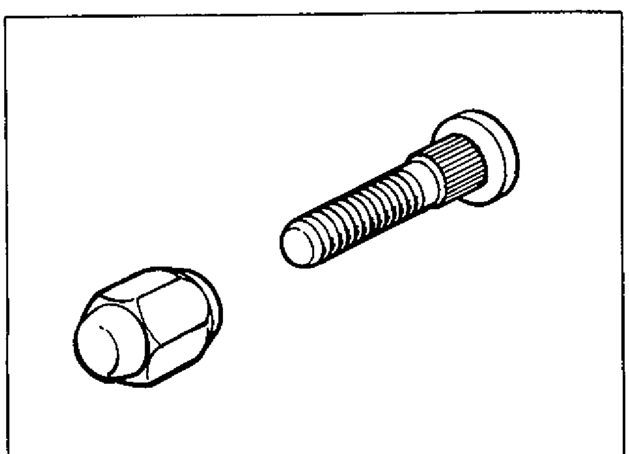


Fig. 3F-5 Metric Stud and Nut

WHEEL REMOVAL

1) Loosen wheel nuts by approximately 180° (half a rotation).
2) Hoist car.
3) Remove wheel.

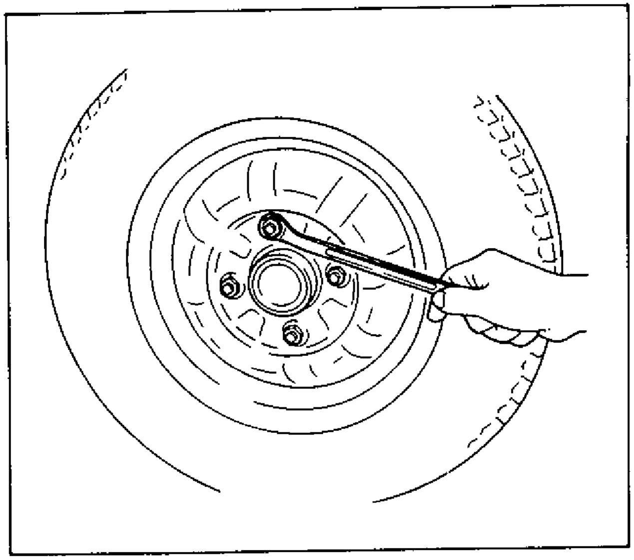


Fig. 3F-6

> **CAUTION:**
> **Never use heat to loosen tight wheel because application of heat to wheel can shorten life of wheel and damage wheel bearings.**

Wheel nuts must be tightened in sequence and to proper torque to avoid bending wheel or brake disc, Fig. 3F-7.

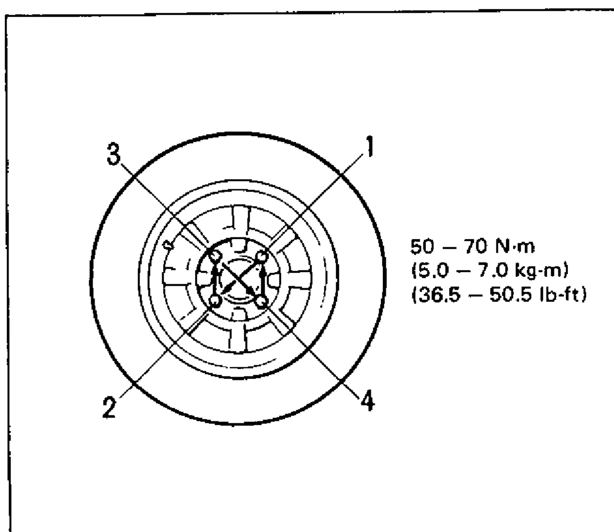


Fig. 3F-7 Wheel Nut Tightening Sequence

NOTE:
Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake drum or disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel nuts to loosen, which can later allow a wheel to come off while car is moving.

TIRE MOUNTING AND DEMOUNTING

Use a tire changing machine to mount or demount tires. Follow equipement manufacturer's instructions. Do not use hand tools or tire irons alone to change tires as they may damage tire beads or wheel rim.

Rim bead seats should be cleaned with a wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or demounting a tire, bead area should be well lubricated with approved tire lubricant.

After mounting, inflate to specified pressure shown on tire pracard so that beads are completely seated.

WARNING:
Do not stand over tire when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury.
Do not exceed specified pressure when inflating. If specified pressure will not seat beads, deflate, re-lubricate and reinflate. Over inflation may cause bead to break and cause serious personal injury.

Install valve core and inflate to proper pressure.

TIRE REPAIR

There are many different materials and techniques on the market to repair tires. As not all of these work on all types of tires, tire manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from each tire manufacturer.

BALANCING WHEELS

There are two types of wheel and tire balance: static and dynamic. Static balance, Fig. 3F-8, is the equal distribution of weight around the wheel. Wheels that are statically unbalanced cause a bouncing action called tramp. This condition will eventually cause uneven tire wear.

Dynamic balance, Fig. 3F-9, is the equal distribution of weight on each side of the wheel centerline so that when the tire spins there is no tendency for the assembly to move from side to side. Wheels that are dynamically unbalanced may cause shimmy.

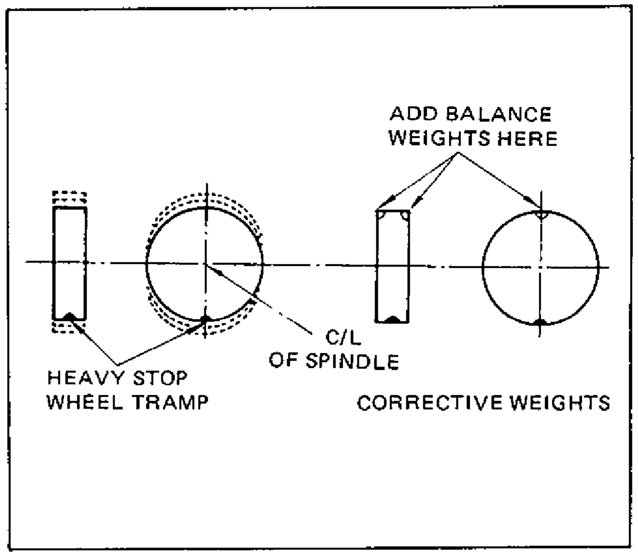


Fig. 3F-8 Static Unbalance Correction

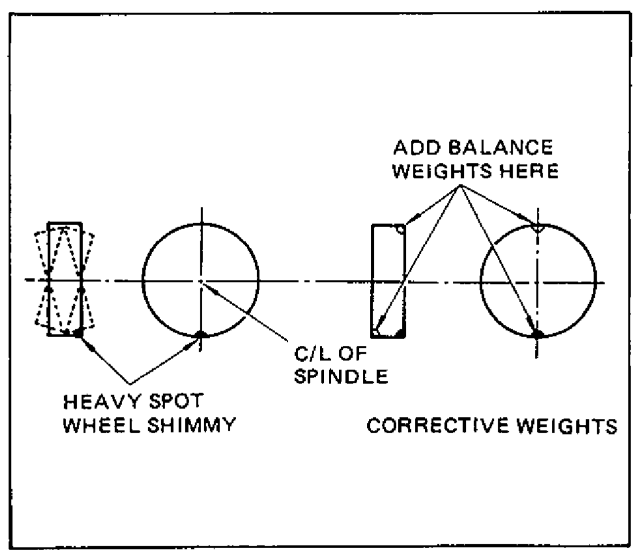


Fig. 3F-9 Dynamic Unbalance Correction

GENERAL BALANCE PROCEDURES

Deposits of mud, etc. must be cleaned from inside of rim.

> **WARNING:**
> **Stones should be removed from the tread in order to avoid operator injury during spin balancing and to obtain good balance.**

Each tire should be inspected for any damage, then balanced according to equipment manufacturer's recommendation.

OFF-CAR BALANCING

Most electronic off-car balancers are more accurate than the on-car spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-car spin blancing, this is overcome by their accuracy, usually to within 1/8 ounce.

ON-CAR BALANCING

On-car balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

> **WARNING:**
> **Wheel spin should be limited to 35 mph (55 km/h) as indicated on speedometer. This limit is necessary because speedometer only indicates one-half of actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped. Unless care is taken in limiting drive wheel spin, spinning wheel can reach excessive speeds. This can result in possible tire disintegration or differential failure, which could cause serious personal injury or extensive car damage.**

RECOMMENDED TORQUE SPECIFICATIONS

Wheel nuts: 50 – 70 N·m (5,0 – 7,0 kg-m, 36.5 – 50.5 lb-ft)

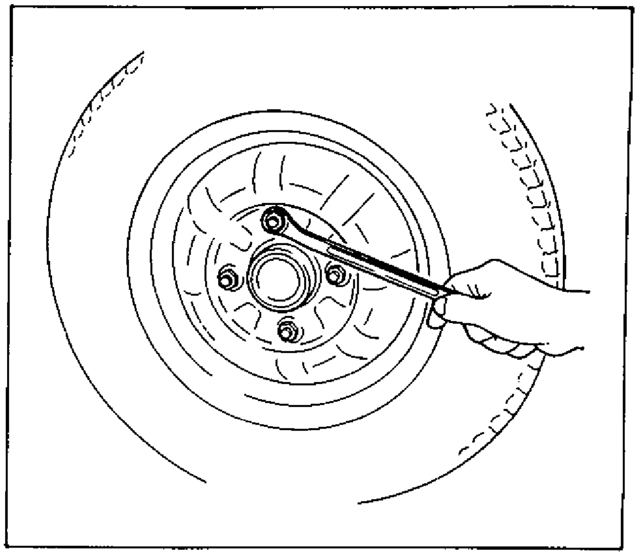


Fig. 3F-10

SECTION 4

FRONT DRIVE SHAFT (Double Offset Joint (DOJ) Type)

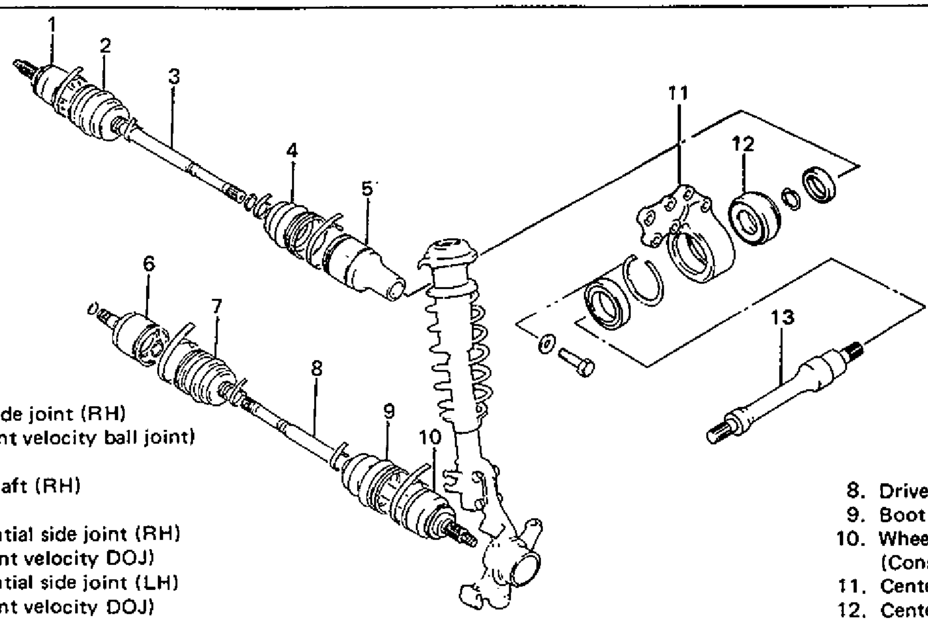
NOTE:
This type of front drive shaft is used for manual transmission models.

CONTENTS

GENERAL DESCRIPTION 4- 1
REMOVAL (Left side shaft) 4- 2
REMOVAL (Right side shaft) 4- 3
DISASSEMBLY (Drive shaft) 4- 4
INSPECTION 4- 5
DISASSEMBLY (Center shaft and center bearing support) 4- 5
REASSEMBLY (Drive shaft) 4- 5
REASSEMBLY (Center shaft and center bearing supprt) 4- 8
INSTALLATION 4- 9
RECOMMENDED TORQUE SPECIFICATIONS 4- 9
REQUIRED SERVICE MATERIALS 4-10

GENERAL DESCRIPTION

A constant velocity ball joint is used on the wheel side of front drive shaft and a constant velocity double offset joint (DOJ) on the differential side.



1. Wheel side joint (RH) (Constant velocity ball joint)
2. Boot
3. Drive shaft (RH)
4. Boot
5. Differential side joint (RH) (Constant velocity DOJ)
6. Differential side joint (LH) (Constant velocity DOJ)
7. Boot
8. Drive shaft (LH)
9. Boot
10. Wheel side joint (LH) (Constant velocity ball joint)
11. Center bearing support
12. Center bearing
13. Center shaft

Fig. 4-1 Front Drive Shaft Assembly

REMOVAL (Left Side Shaft)

ON FLOOR

Undo caulking and remove drive shaft nut and washer.

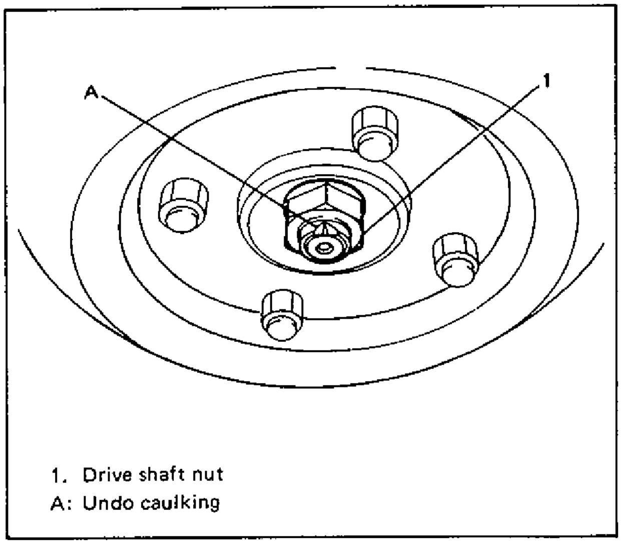


Fig. 4-2 Removing Drive Shaft Nut

ON LIFT

1. Drain transmission oil.
2. By using large size screwdrivers, pull out drive shaft joint so as to release snap ring fitting of joint spline at differential side.

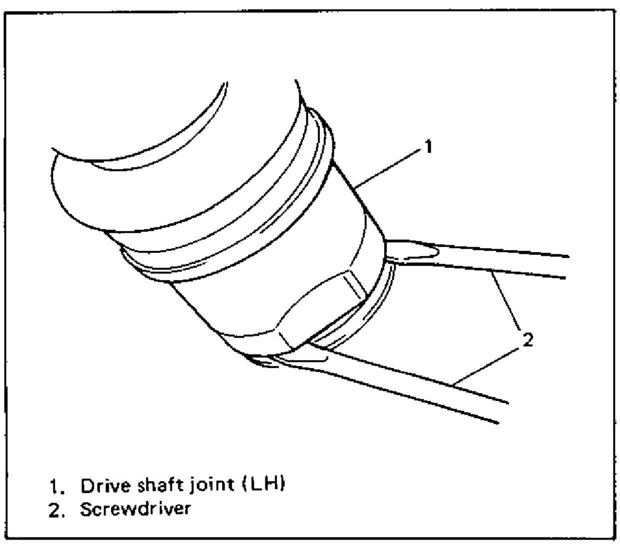


Fig. 4-3 Detaching Snap Ring from Differential

3. Disconnect stabilizer joint from suspension arm.
4. Remove ball stud bolt and nut, and then separate suspension arm from knuckle.

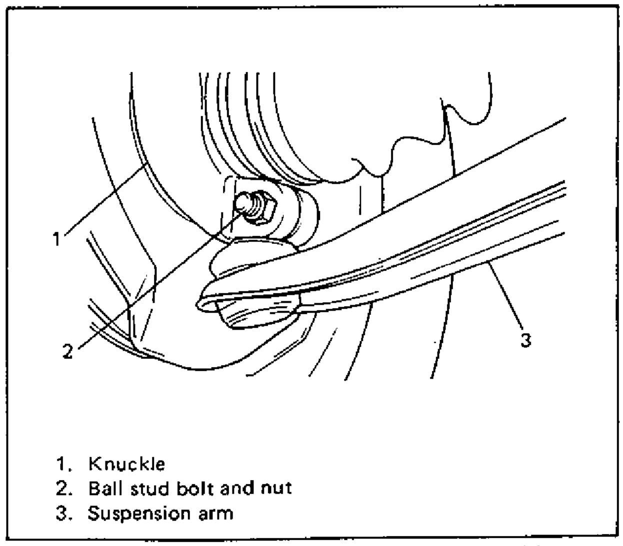


Fig. 4-4 Detaching Suspension Arm from Knuckle

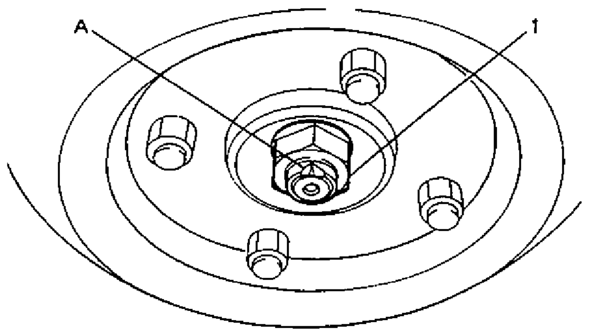
5. To remove drive shaft assembly, pull out inboard joint from differential side and then wheel side joint from steering knuckle.

> **CAUTION:**
> **To prevent breakage of boots, be careful not to bring them into contact with other parts, when removing drive shaft assembly.**

REMOVAL (Right Side Shaft)

ON FLOOR

Undo caulking and remove drive shaft nut and washer.

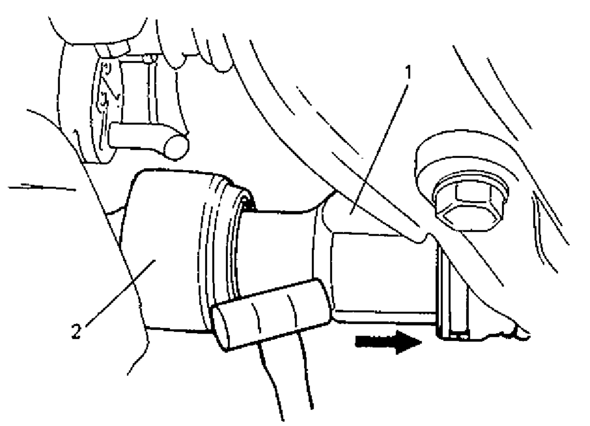


1. Drive shaft nut
A: Undo caulking

Fig. 4-5

ON LIFT

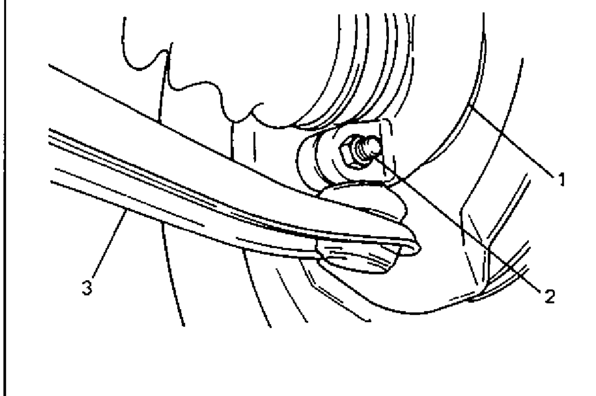
1. By using plastic hammer, drive out drive shaft joint so as to release snap ring fitting of joint spline at center shaft.



1. Drive shaft joint
2. Center bearing support

Fig. 4-6

2. Disconnect stabilizer joint from suspension arm.
3. Remove ball stud bolt and nut, and then separate suspension arm from knuckle.



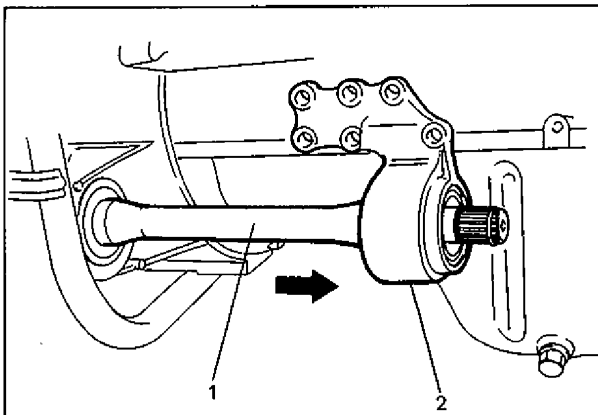
1. Knuckle
2. Ball stud bolt and nut
3. Suspension arm

Fig. 4-7

4. To remove drive shaft assembly, pull out inboard joint from center shaft and then wheel side joint from steering knuckle.

> CAUTION:
> **To prevent breakage of boots, be careful not to bring them into contact with other parts, when removing drive shaft assembly.**

5. Drain transmission oil.
6. Loosen center bearing support bolts and remove center shaft from differential side gear.



1. Center shaft
2. Center bearing support

Fig. 4-8

DISASSEMBLY (Drive Shaft)

1. Remove boot band of differential side joint.

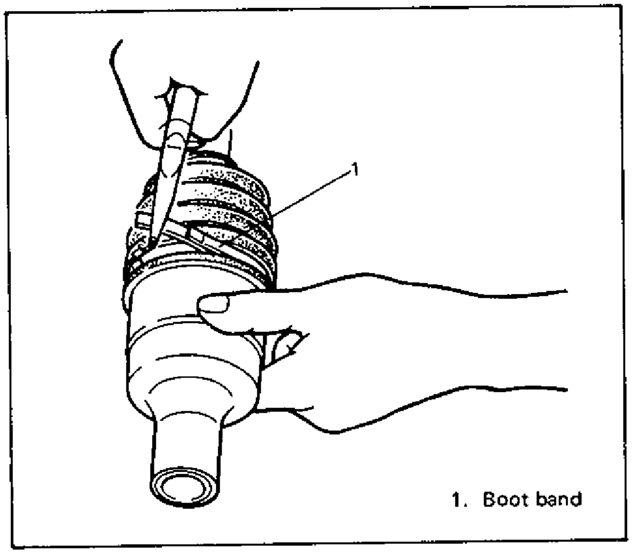


Fig. 4-9

2. Slide boot toward the center of shaft and remove snap ring from outer race, then take shaft out of outer race.

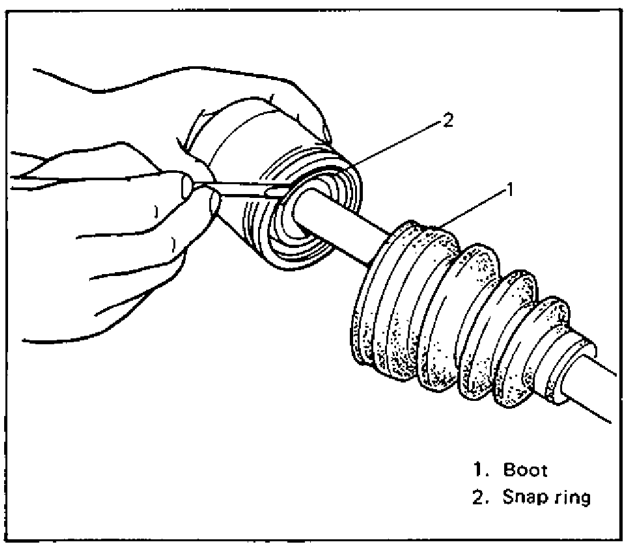


Fig. 4-10

3. Wipe off grease and remove circlip used to fix cage by using special tool (A).

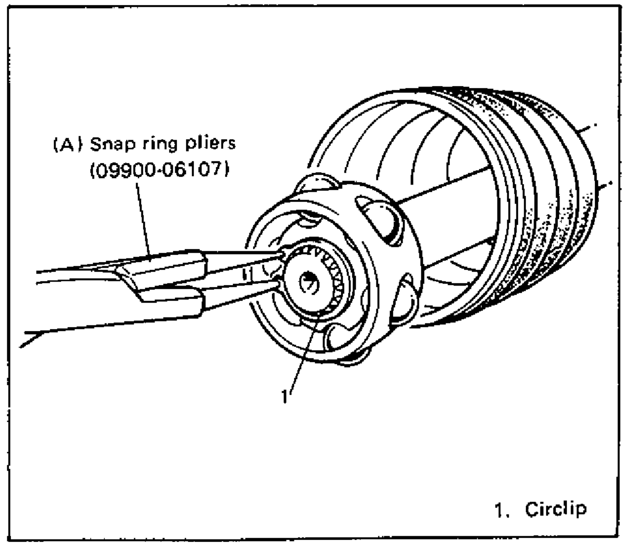


Fig. 4-11

4. Draw away cage and boot from shaft.

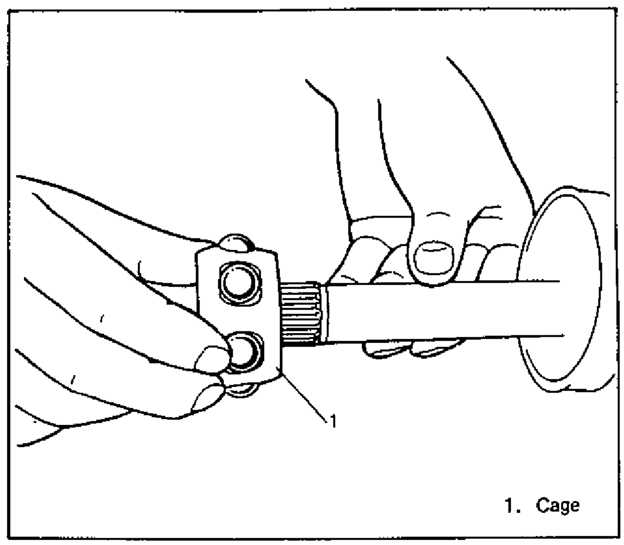


Fig. 4-12

NOTE:
Do not disassemble wheel side joint (outboard joint). If any malcondition is found in any joint, replace it as assembly.

INSPECTION

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

DISASSEMBLY (Center Shaft and Center Bearing Support)

1. Remove right side oil seal from center bearing support.
2. Remove circlip.

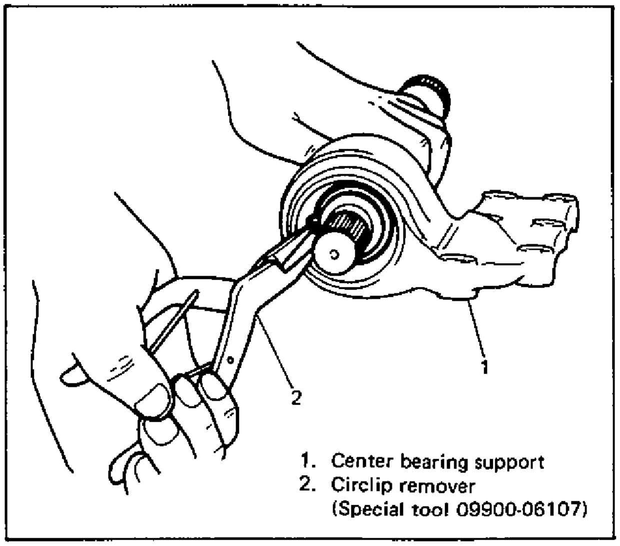


Fig. 4-13

3. By using hydraulic press, draw out center shaft from center bearing.

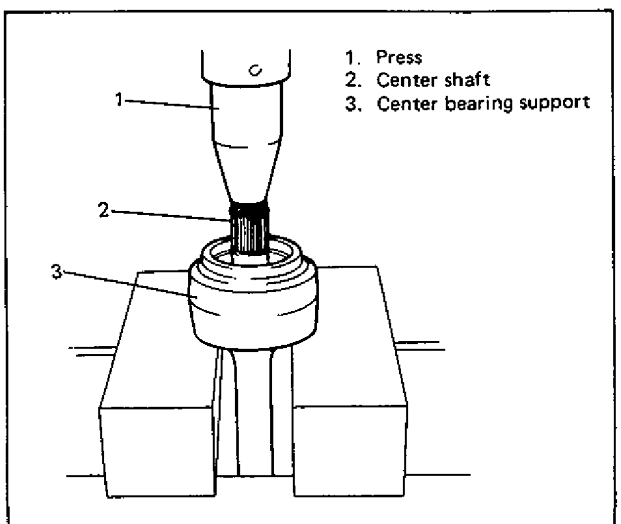


Fig. 4-14

4. Remove left side oil seal from center bearing support.
5. Remove bearing support circlip.

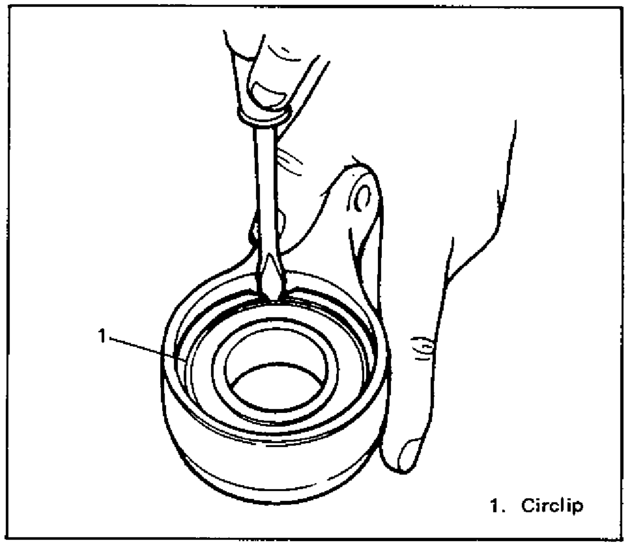


Fig. 4-15

6. Remove center bearing from center bearing support.

REASSEMBLY (Drive Shaft)

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

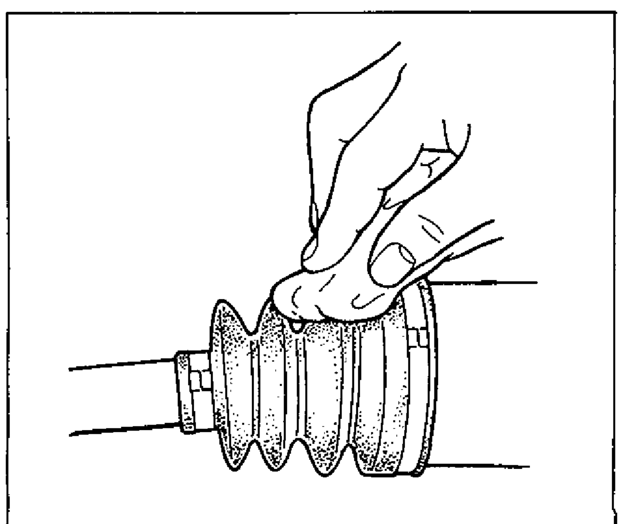


Fig. 4-16

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

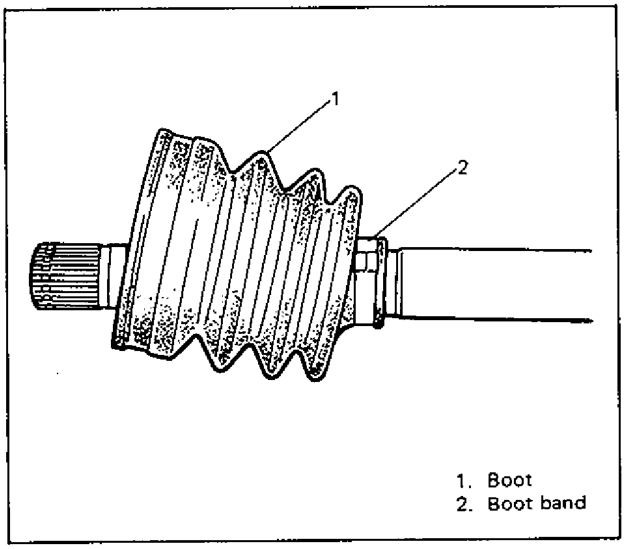


Fig. 4-17

4. Install cage to shaft.

CAUTION:
Install cage directing smaller outside diameter side to shaft end.

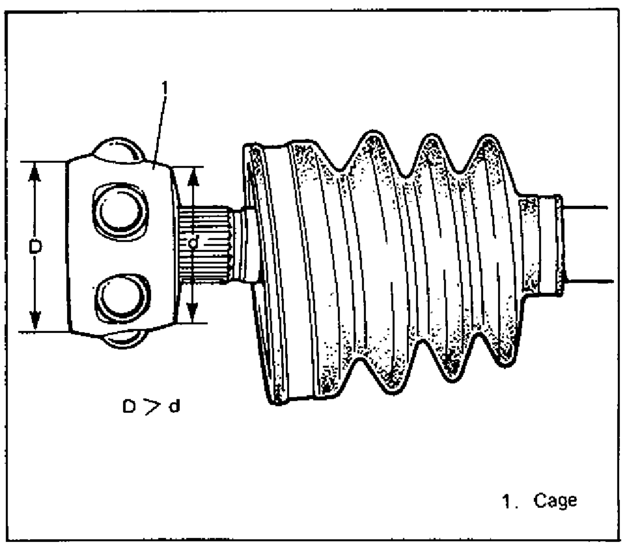


Fig. 4-18

5. Install circlip by using special tool (A).

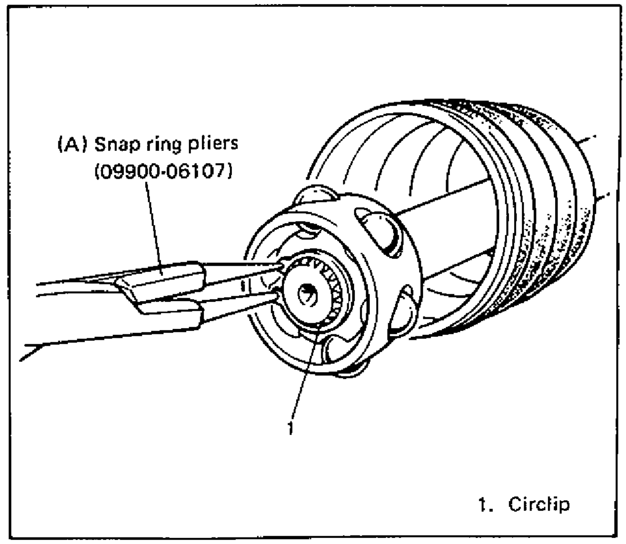


Fig. 4-19

6. Apply 30 – 40 g (1.06 – 1.41 oz) SUZUKI SUPER GREASE H (C.V. joint grease) to entire surface of cage.

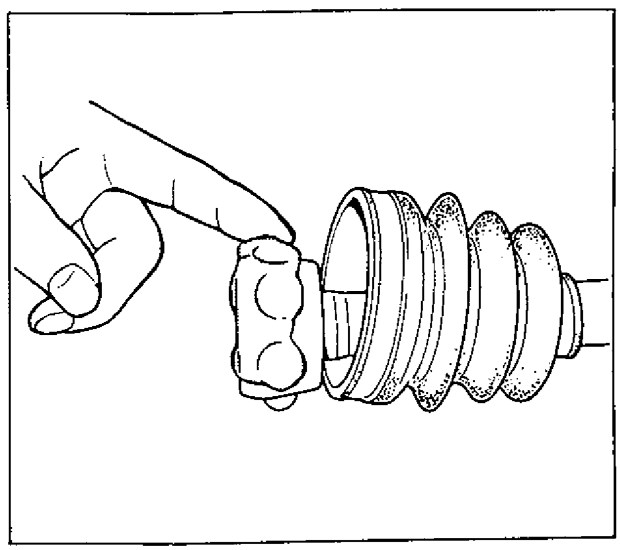


Fig. 4-20

7. Insert cage into outer race and fit snap ring into groove of outer race.

> **CAUTION:**
> **Position opening of snap ring (A) so that it will not be lined up with a ball.**

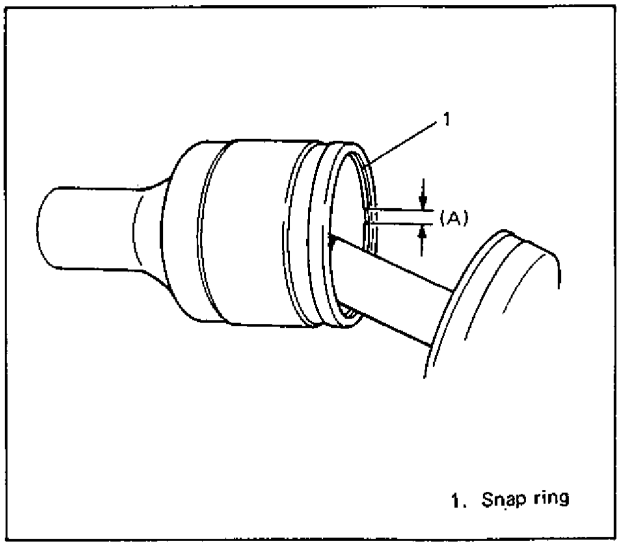


Fig. 4-21

8. Apply 25 – 35 g (0.88 – 1.23 oz) SUZUKI SUPER GREASE H to inside of outer race, and fit boot to outer race.
   After fitting boot, insert screw driver into boot on outer race side and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

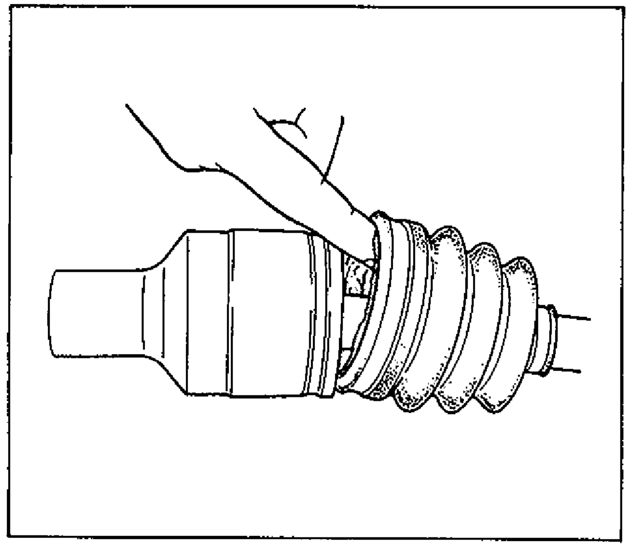


Fig. 4-22

9. When fixing boot to outer race with boot band, adjust so that measurements (A) and (B) become as indicated in figure below.

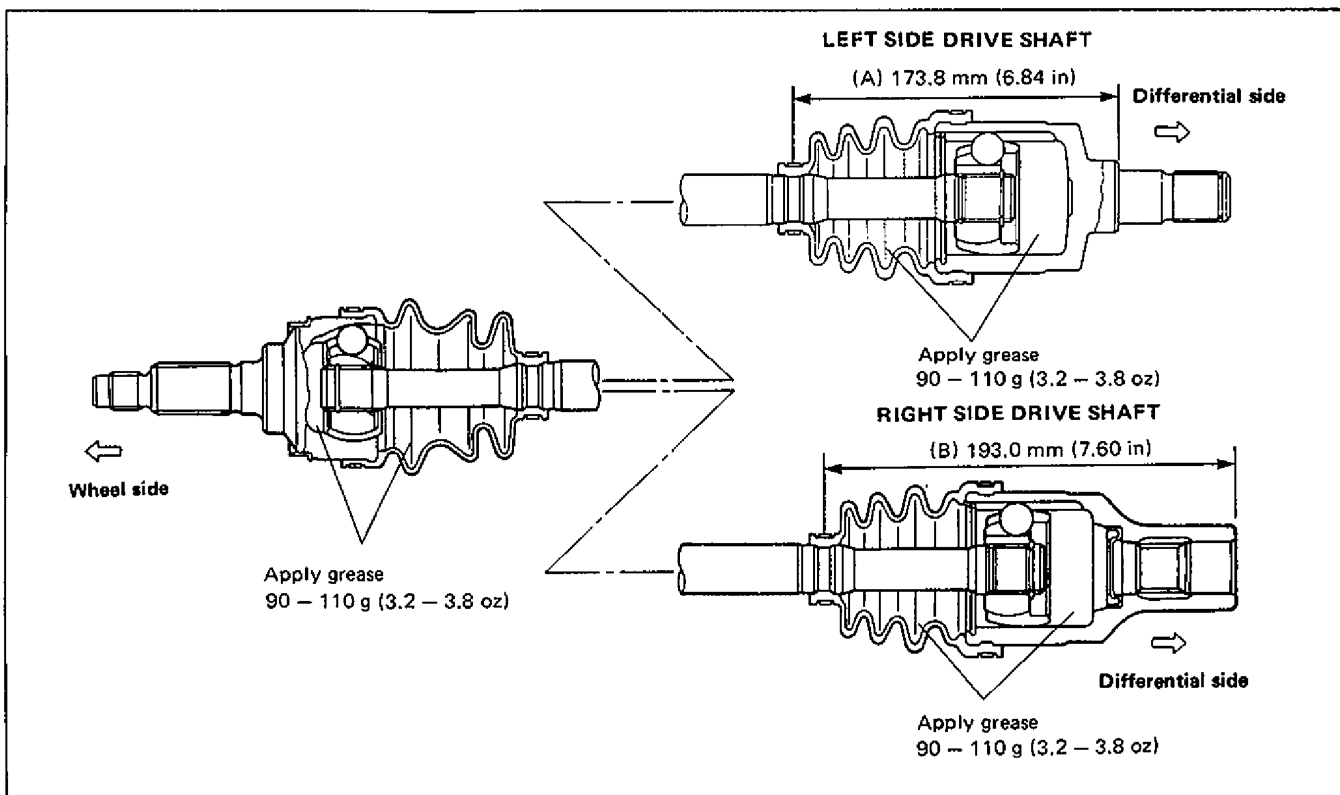


Fig. 4-23

REASSEMBLY (Center Shaft and Center Bearing Support)

Install center shaft by reversing removal procedure and noting following points.

- When installing bearing support circlip, make sure that it fits in circlip groove in center bearing support securely as shown below.

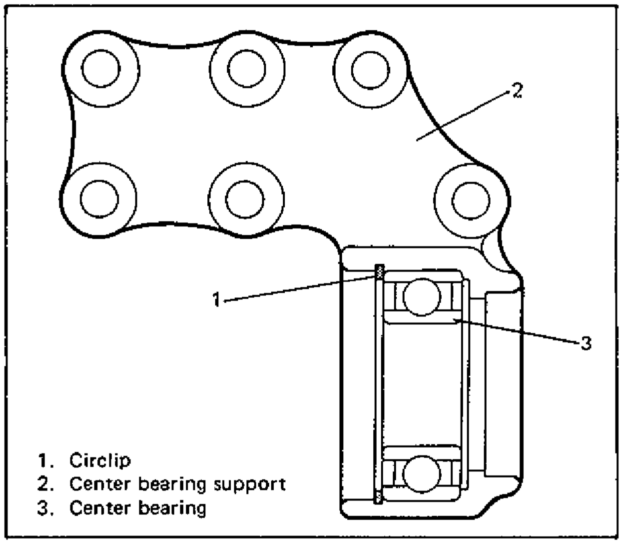


Fig. 4-24

- When installing left side oil seal, use care so that it is in proper direction by referring to below figure.

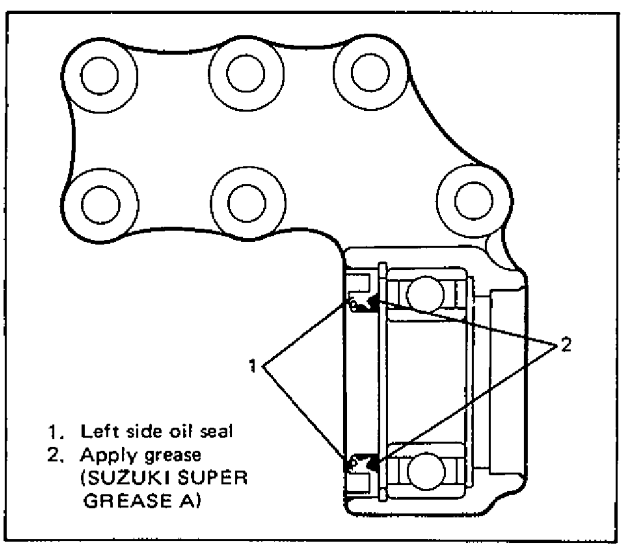


Fig. 4-25

- After press-fitting center shaft from left side oil seal side, fit circlip into groove in shaft securely.

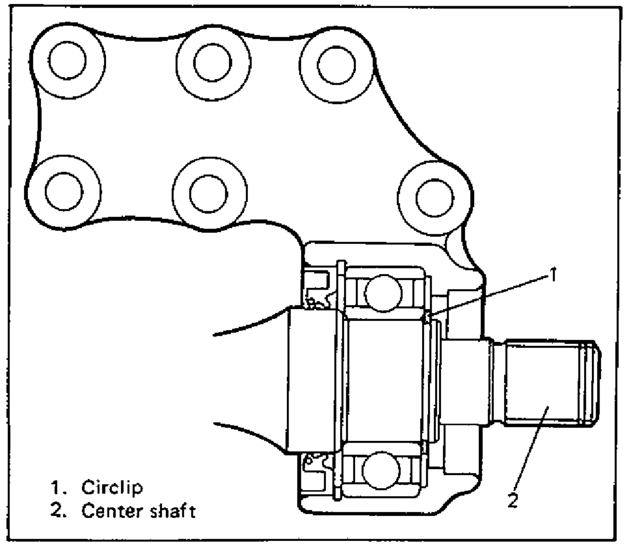


Fig. 4-26

- When installing right side oil seal, use care so that it is in proper direction by referring to below figure.

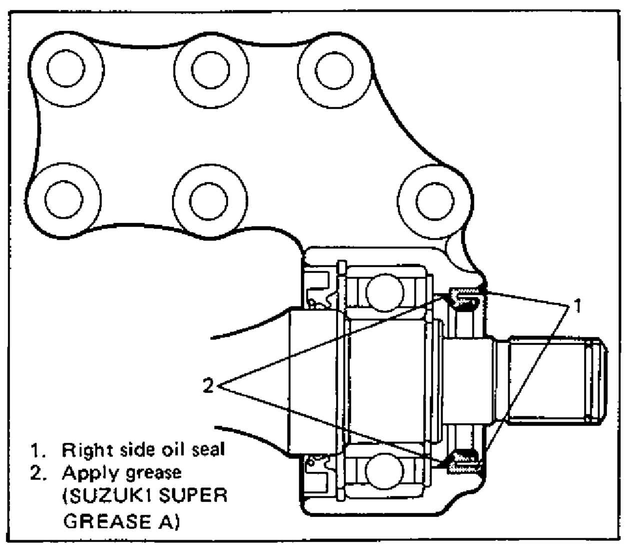
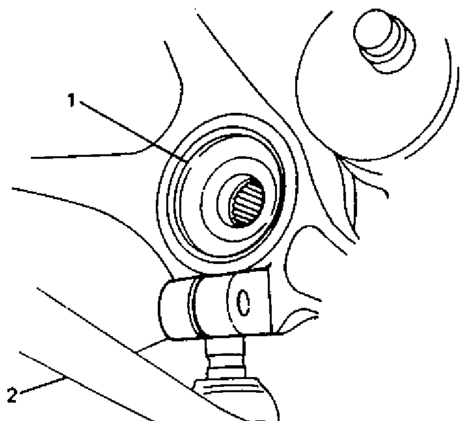


Fig. 4-27

INSTALLATION

Install drive shaft assembly by reversing removal procedure and noting following points.

- Clean front wheel bearing oil seal and then apply grease. Replace it if required.



1. Front wheel bearing oil seal (Apply SUZUKI SUPER GREASE A 99000-25010)
2. Suspension arm

Fig. 4-28 Lubricating Oil Seal with Grease

- Install wheel side joint to steering knuckle first and then DOJ to differential side.
- Apply sealant to drain plug for manual transmission.
- Fill transmission with oil as specified.

CAUTION:
- **Protect oil seals and boots from any damage, preventing them from unnecessary contact while installing drive shaft.**
- **Do not hit joint boot with hammer. Inserting joint only by hands is allowed.**
- **Make sure that differential side joint is inserted fully and its snap ring is seated as it was.**

RECOMMENDED TORQUE SPECIFICATIONS

Fastener		Tightening torque		
		N·m	kg-m	lb-ft
Oil drain plug	M/T	25 – 30	2.5 – 3.0	18.5 – 21.5
	A/T	40 – 55	4.0 – 5.5	30.0 – 39.5
Oil filler and level plug	M/T	36 – 54	3.6 – 5.4	26.5 – 39.0
Ball joint stud bolt and nut		50 – 70	5.0 – 7.0	36.5 – 50.5
Drive shaft nut		150 – 200	15.0 – 20.0	108.5 – 144.5
Center bearing support bolt		40 – 60	4.0 – 6.0	29.0 – 43.0
Stabilizer link nut		18 – 28	1.8 – 2.8	13.5 – 20.0

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lips
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	Oil drain plug for manual transmission
Grease	SUZUKI SUPER GREASE H (99000-25120)	Drive shaft joints

SECTION 4A

FRONT DRIVE SHAFT (Tripod Joint Type)

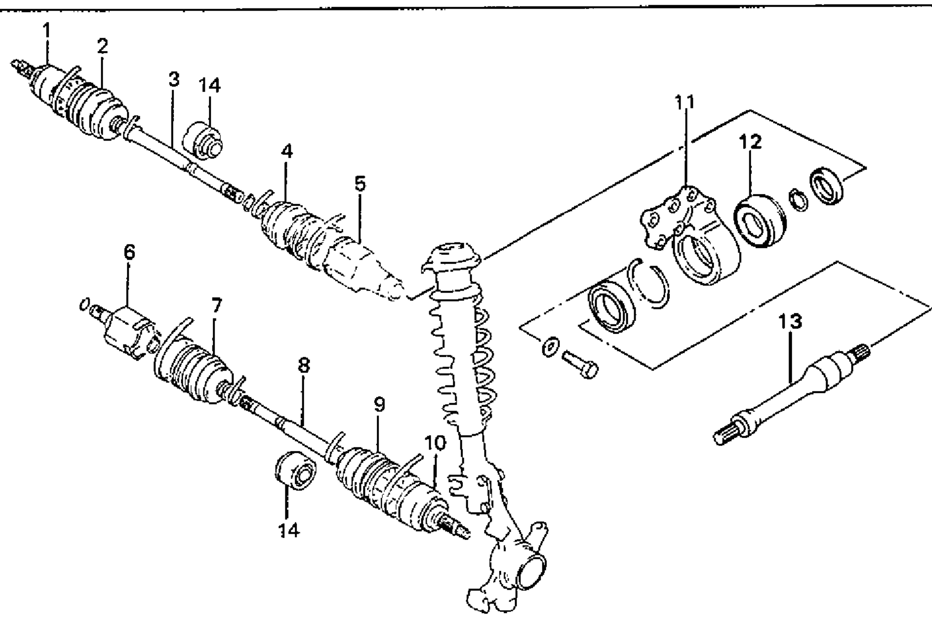
NOTE:
This type of front drive shaft is used for automatic transmission models.

CONTENTS

GENERAL DESCRIPTION 4A-1
REMOVAL 4A-2
DISASSEMBLY (Drive shaft) 4A-2
DISASSEMBLY (Center shaft and center bearing support) 4A-2
INSPECTION 4A-2
REASSEMBLY (Drive shaft) 4A-3
REASSEMBLY (Center shaft and center bearing support) 4A-4
INSTALLATION 4A-4
REQUIRED SERVICE MATERIALS 4A-4

GENERAL DESCRIPTION

A constant velocity ball joint is used on the wheel side of front drive shaft and a constant velocity tripod joint on the differential side. The drive shaft can slide through the tripod joint in the extension/contraction direction.



1. Wheel side joint (RH) (Constant velocity ball joint)
2. Boot
3. Drive shaft (RH)
4. Boot
5. Differential side joint (RH) (Constant velocity tripod joint)
6. Differential side joint (LH) (Constant velocity tripod joint)
7. Boot
8. Drive shaft (LH)
9. Boot
10. Wheel side joint (LH) (Constant velocity ball joint)
11. Center bearing support
12. Center bearing
13. Center shaft
14. Dynamic damper

Fig. 4A-1 Front Drive Shaft Assembly

REMOVAL

When removing drive shaft (whether it is left side one or right side one), refer to REMOVAL description in Section 4 of this manual for its removal procedure.

DISASSEMBLY (Drive Shaft)

1. Remove tripod joint boot band, then take out tripod joint housing.

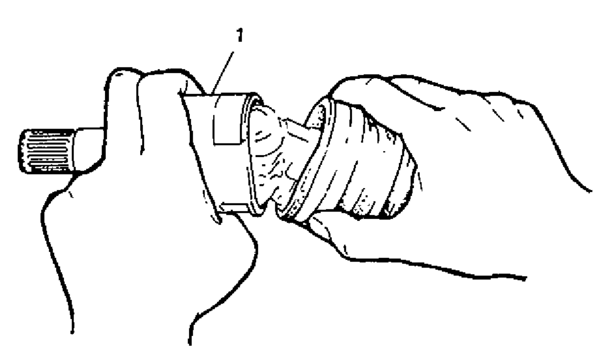


Fig. 4A-2 Removing Tripod Joint Housing

2. Remove grease from shaft and take off circlip by using special tool, then pull out spider from shaft.

CAUTION:
To prevent needle bearing of joint from being degreased, do not wash it if it is to be reused.

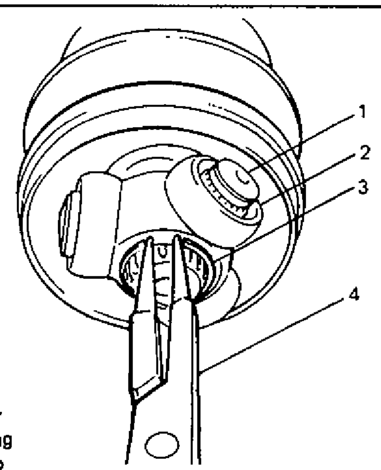


Fig. 4A-3 Removing Tripod Joint Spider

3. Remove boot band, then pull out differential side boot from shaft.
4. Undo boot bands of wheel side joint boot, then pull out boot through shaft.

CAUTION:
- **Disassembly of wheel side joint is not allowed. If noise or damage exists in it, replace it as assembly.**
- **Do not disassemble tripod joint spider. If any malcondition is found in it, replace it as differential side joint assembly.**

DISASSEMBLY (Center Shaft and Center Bearing Support)

For disassembly procedure of these parts, refer to DISASSEMBLY description in Section 4 of this manual.

INSPECTION

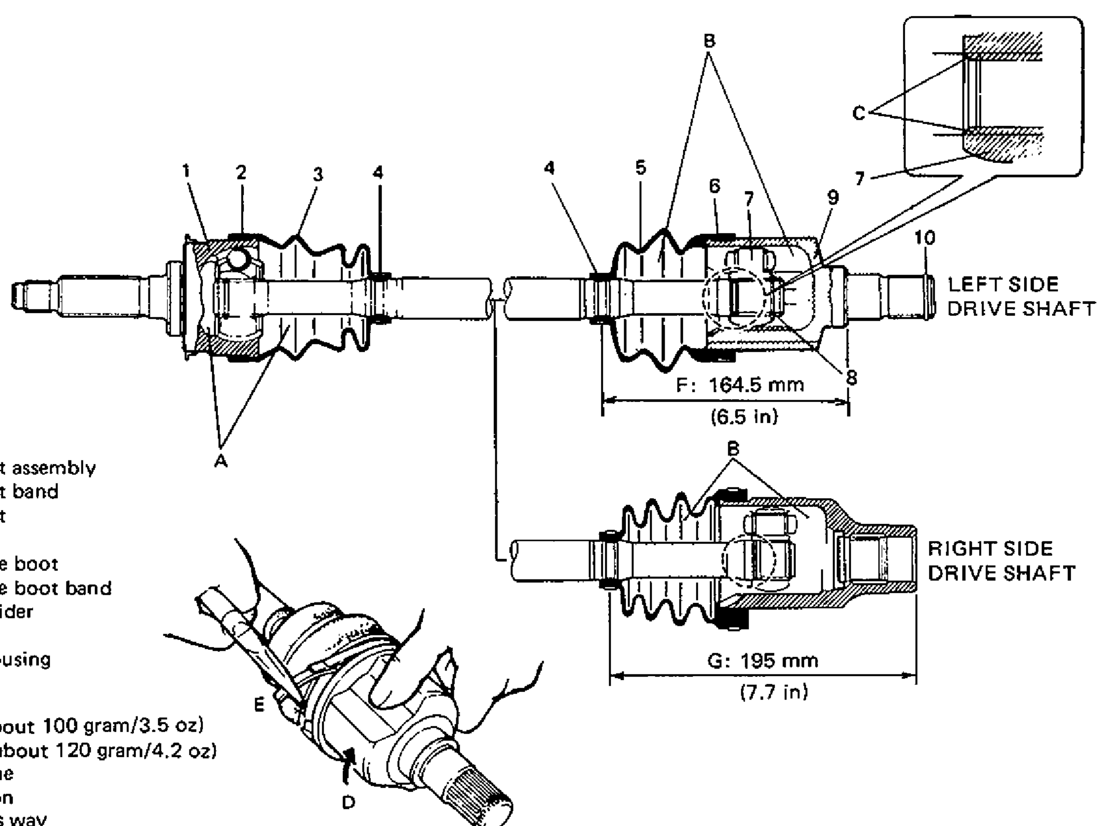
- Check boots for breakage or deterioration. Replace them as necessary.
- Check circlip, snap ring and boot bands for breakage or deformation. Replace as necessary.

REASSEMBLY (Drive Shaft)

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly.
Make sure that wheel side joint assembly and tripod joint housing are washed thoroughly and air dried, and boots are cleaned with cloth if they are to be reused.

1. Apply grease to wheel side joint. Use black grease in tube included in wheel side boot set.
2. Install wheel side boot on shaft.
3. Fill up boot inside with grease and then fasten boot with bands.
4. Install differential side boot on shaft.
   Apply grease to tripod joint. Use yellow grease in tube included in differential side boot set or differential side joint assembly of spare parts.
5. Install tripod joint spider on shaft, facing its chamfered spline inward (wheel side), then fasten it with circlip.
6. Fill up differential side boot inside with grease, then install housing and joint it with boot.
7. Fasten boot with bands.

CAUTION:
- **To prevent any problem caused by washing solution, do not wash joint boots and tripod joint except its housing. Degreasing of those parts with cloth is allowed.**
- **To ensure full performance of joint as designed, be sure to distinguish between two types of grease in repair set and apply specified volume to respective joint, i.e. black grease (130 g tube) to wheel side joint and yellow one (150 g tube) to tripod joint.**
- **Bend each boot band against forward rotation.**
- **Do not squeeze or distort boot when fastening it with bands.**
  Distorted boot caused by squeezing air may reduce its durability.



1. Wheel side joint assembly
2. Wheel side boot band
3. Wheel side boot
4. Boot band
5. Differential side boot
6. Differential side boot band
7. Tripod joint spider
8. Circlip
9. Tripod joint housing
10. Snap ring

A: Black grease (about 100 gram/3.5 oz)
B: Yellow grease (about 120 gram/4.2 oz)
C: Chamfered spline
D: Forward rotation
E: Clamp band this way
F & G: Measurement when fixing boot with band.

Fig. 4A-4 Assembling Front Drive Shaft

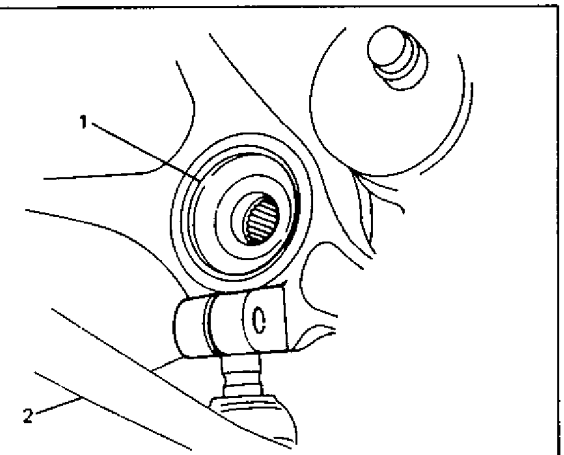
REASSEMBLY (Center Shaft and Center Bearing Support)

For reassembly procedure of these parts, refer to REASSEMBLY description in Section 4 of this manual.

INSTALLATION

Install drive shaft assembly by reversing removal procedure and noting following points.

- Clean front wheel bearing oil seal and then apply grease. Replace it if required.



1. Front wheel bearing oil seal
(Apply Suzuki Super grease A 99000-25010)
2. Suspension arm

Fig. 4A-5 Lubricating Oil Seal with Grease

- Install wheel side joint to steering knuckle first and then tripod joint to differential side.

CAUTION:
- **To avoid excessive expansion of boot and consequential disconnection of joint in boot, do not pull tripod joint housing.**
- **Protect oil seals and boots from any damage, preventing them from unnecessary contact while installing drive shaft.**
- **Do not hit joint boot with hammer. Inserting joint only by hands is allowed.**
- **Make sure that differential side joint is inserted fully and its snap ring is seated as it was.**

- Tighten each bolt and nut to specified torque. For torque data, refer to RECOMMENDED TORQUE SPECIFICATION table in Section 4 of this manual.
- Fill transmission with oil as specified.

NOTE:
For automatic transmission, carry out full step of fluid level check procedure i.e. FLUID LEVEL, referring to p. 7B-39.

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lips

SECTION 5

BRAKES

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

CONTENTS

GENERAL DESCRIPTION 5- 2
Disc Brake Caliper Assembly 5- 3
Drum Brake Assembly 5- 5
Master Cylinder Assembly 5- 8
Booster Assembly 5-10
LSPV Assembly 5-13
DIAGNOSIS 5-17
Road Testing Brakes 5-17
Brake Fluid Leaks 5-17
Substandard or Contaminated Brake Fluid 5-17
Brake Diagnosis Chart A 5-18
Brake Diagnosis Chart B 5-19
ON CAR SERVICE 5-20
1. Brake Pedal Free Height Adjustment 5-20
2. Stop Light Switch Adjustment 5-20
3. Excessive Pedal Travel Check 5-20
4. Rear Brake Shoe Inspection 5-21
5. Brake Pedal Play Inspection 5-21
6. Rear Drum Brake Shoe Adjustment 5-21
7. Master Cylinder Inspection 5-21
8. Disc Inspection 5-22
9. Pad Lining Inspection 5-22
10. Parking Brake Inspection and Adjustment 5-22
11. Flushing Brake Hydraulic System 5-23
12. Bleeding Brakes 5-23
13. Brake Hose and Pipe Inspection 5-25
14. Brake Fluid Level Inspection 5-25
BRAKE HOSE/PIPE R & I 5-26
1. Remove and Install Front Brake Hose/Pipe 5-26
2. Remove and Install Rear Brake Hose/Pipe 5-27
PARKING BRAKE LEVER/CABLE R & I 5-28
1. Remove and Install Parking Brake Lever 5-28
2. Remove and Install Parking Brake Cable 5-29
DISC BRAKE R & I 5-32
1. Remove and Install Pad (Shoe & Lining) 5-32
2. Remove and Install Caliper Assembly 5-33
3. Remove and Install Caliper Inner Parts 5-34
4. Remove and Install Disc 5-36
DISC BRAKE INSPECTION 5-37
DRUM AND COMPONENTS R & I 5-39
1. Remove and Install Brake Drum 5-39
2. Remove and Install Brake Shoe 5-41
3. Remove and Install Wheel Cylinder 5-42
4. Remove and Install Brake Back Plate 5-43
BRAKE DRUM AND COMPONENTS INSPECTION 5-45
MASTER CYLINDER REPAIR 5-47
1. Remove and Install Master Cylinder Reservoir 5-47
2. Remove and Install Master Cylinder Assembly 5-48
3. Disassemble and Assemble Master Cylinder 5-49
MASTER CYLINDER INSPECTION 5-50
LSPV R & I 5-51
1. Remove and Install LSPV 5-51
2. After – Installation Inspection & Adjustment 5-52
3. Fluid Pressure Test 5-53
BRAKE BOOSTER REPAIR 5-55
1. Remove and Install Booster 5-55
2. Disassemble and Assemble Booster 5-56
BRAKE BOOSTER INSPECTION AND ADJUSTMENT 5-62
RECOMMENDED TORQUE SPECIFICATIONS 5-66
REQUIRED SERVICE MATERIALS 5-67
SPECIAL TOOLS 5-68

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 right & rear left brakes and the other connects front left & rear right brakes.

The proportioning valve (P valve) [or load sensing proportioning valve (LSPV)] is included in these circuits between the master cylinder and rear wheels.

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 wheel brake.

The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

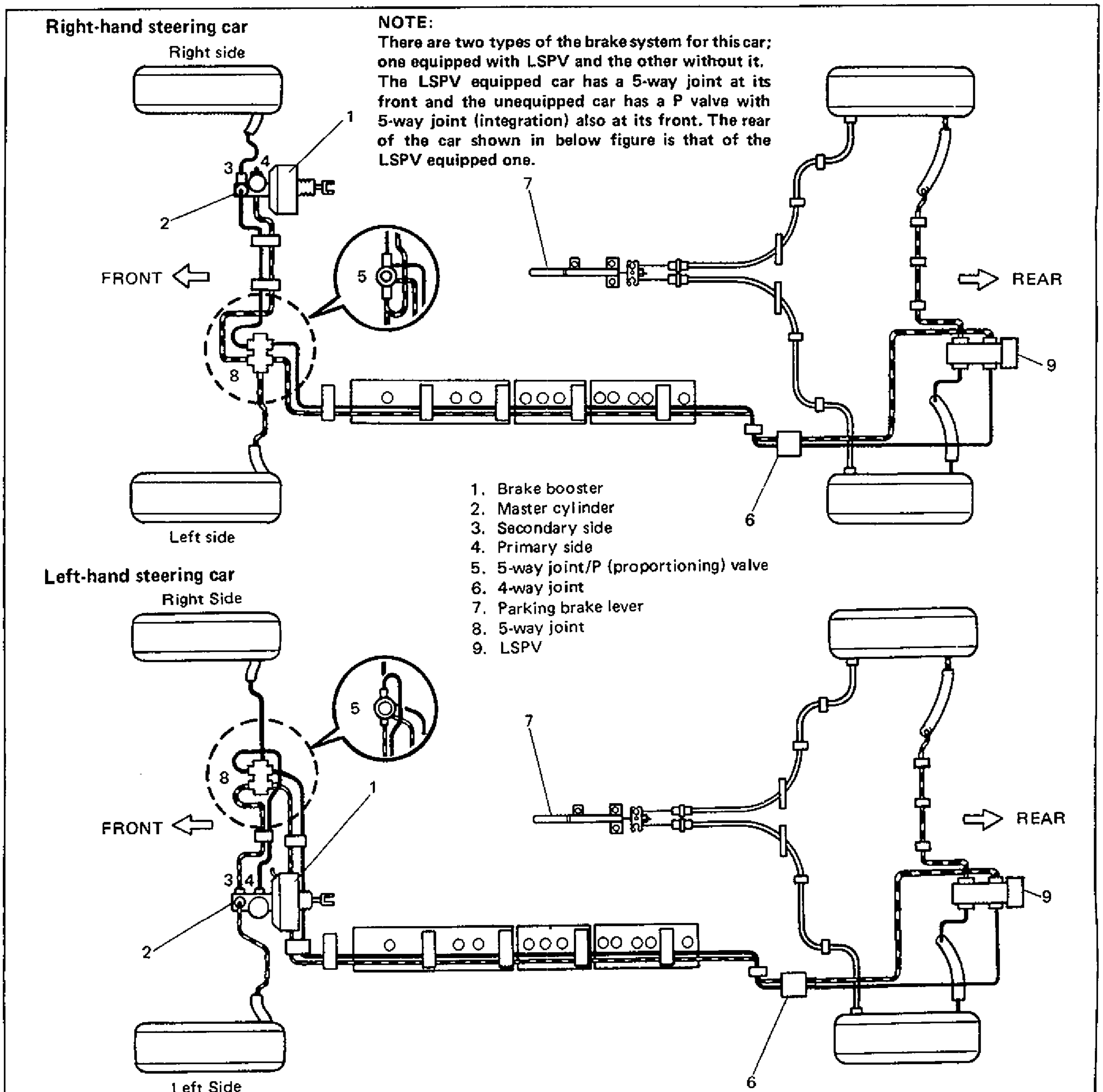


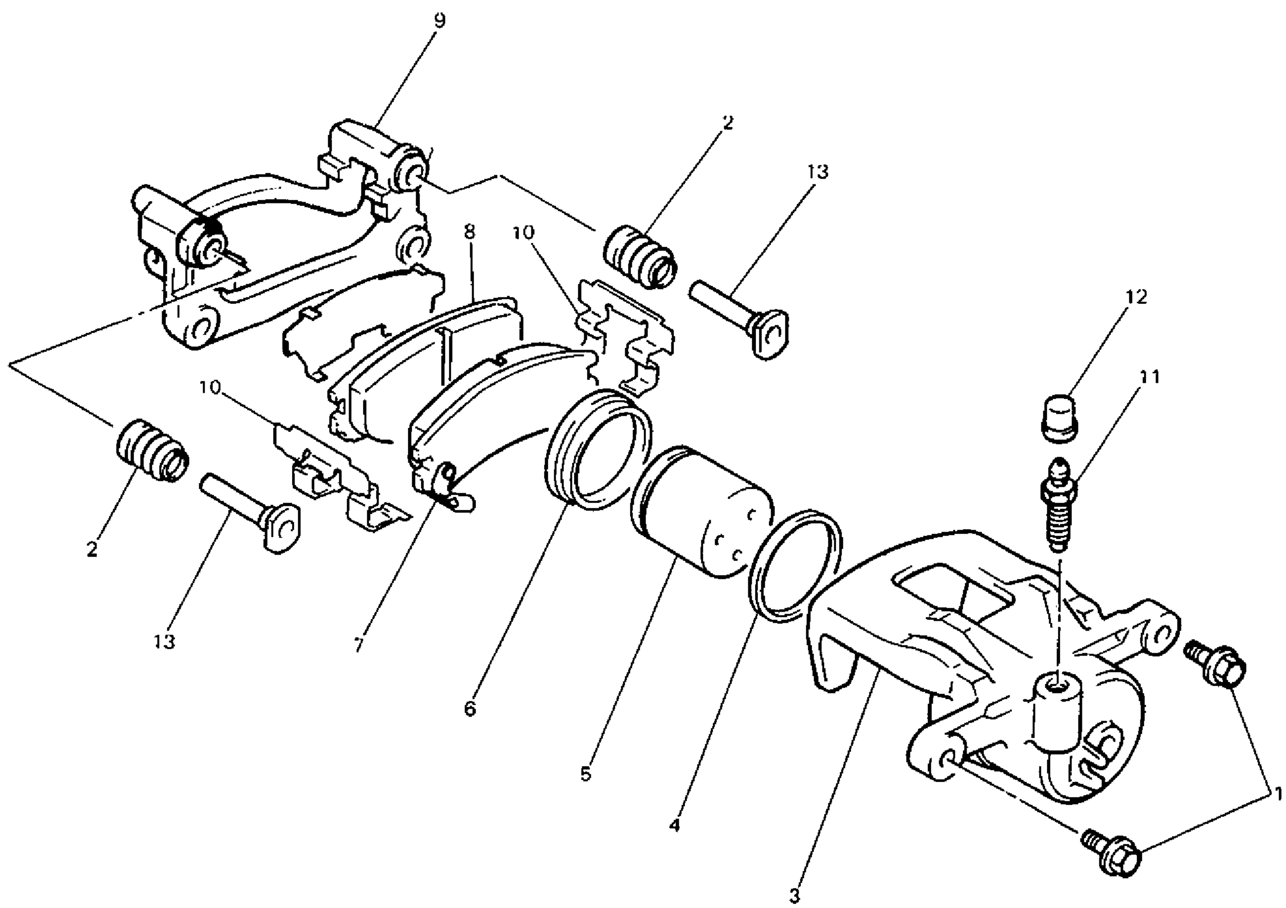
Fig. 5-1

FRONT DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

This caliper has a single bore. Hydraulic force, created by applying force to the brake pedal, is converted by the caliper to friction. The hydraulic force acts equally against the piston and the bottom of the caliper bore to move the pistón 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 car.
For details, refer to OPERATION in the next page.

NOTE:
Lubricate parts as specified. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any component is removed or line disconnected, bleed the brake system. Replace pads in axle sets only. The torque values specified are for dry, unlubricated fasteners.



1. 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

Fig. 5-2 Front Caliper Assembly

Caliper OPERATION

Single piston floating caliper type

The single piston floating caliper type brake is employed in this model. One cylinder and one piston are used for this type. (The cylinder is constructed as a monoblock with the caliper.) Fluid pressure generated in the cylinder causes the pad (1) on the piston side to press against the disc. At the same time, the floating type caliper body is moved to the right by the cylinder pressure, as shown in below figure, which pulls pad (2) against the disc and so brakes the wheel.

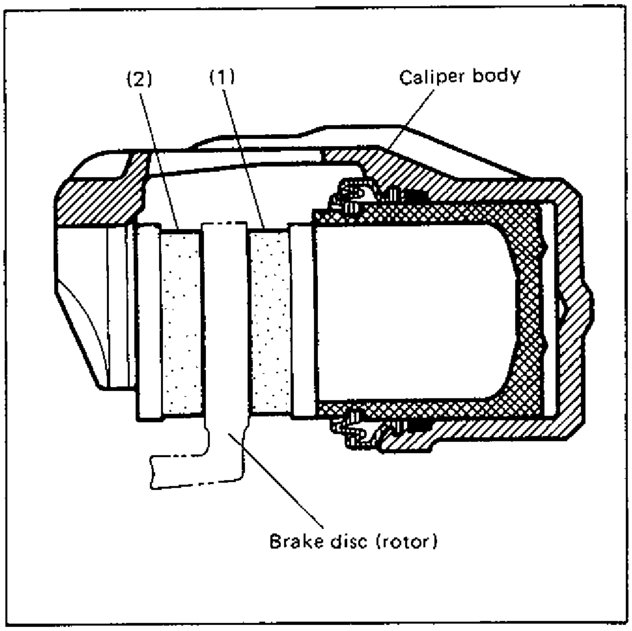


Fig. 5-3

The disc brake has no servo assistance as in drum braking, and it is necessary to increase the working pressure of the piston and pad. For this purpose, the wheel cylinder has a large bore. Even only a little change in clearance between the disc and pad has therefore a large influence on the brake pedal stroke. It is necessary to keep the clearance adjusted to the minimum at all times, by means of the piston (rubber) seal.

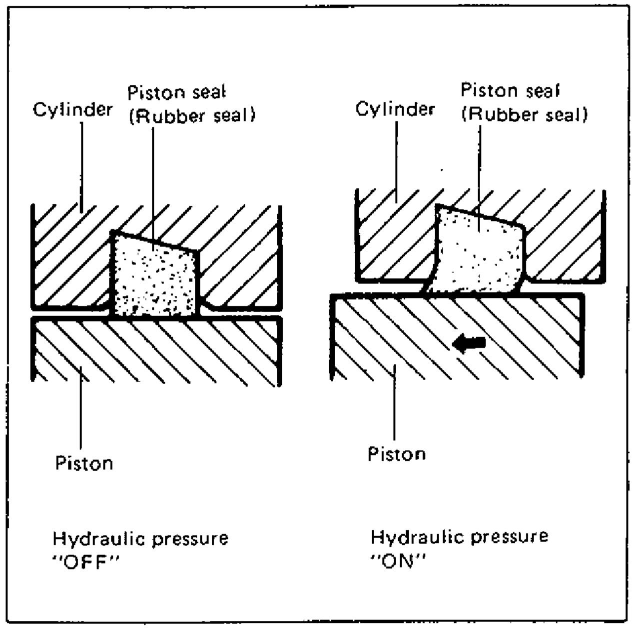


Fig. 5-4

Clearance correction

When oil pressure is applied to the piston, the piston moves forward. The rubber seal, which exerts considerable pressure against the piston, moves with the cylinder. However, as a part of the rubber seal has been fixed into a groove in the cylinder, the shape of the rubber seal is distorted toward internal end of the cylinder, as shown in above figure. When pressure is taken off from the foot brake pedal and fluid pressure is released from the piston, a restoring force is generated at the seal and pushes the piston back. As the pads wear away and the clearance between the disc and pads becomes larger, the piston moves a larger distance. The seal then could change in shape further but, since the end of the seal is fixed into the groove in the cylinder, the distortion is limited to the same amount as previously described. The piston moves further to cover the distance of clearance. The piston returns by the same distance and the rubber seal recovers its shape as described above and thus the clearance between the disc and pads is maintained in adjustment.

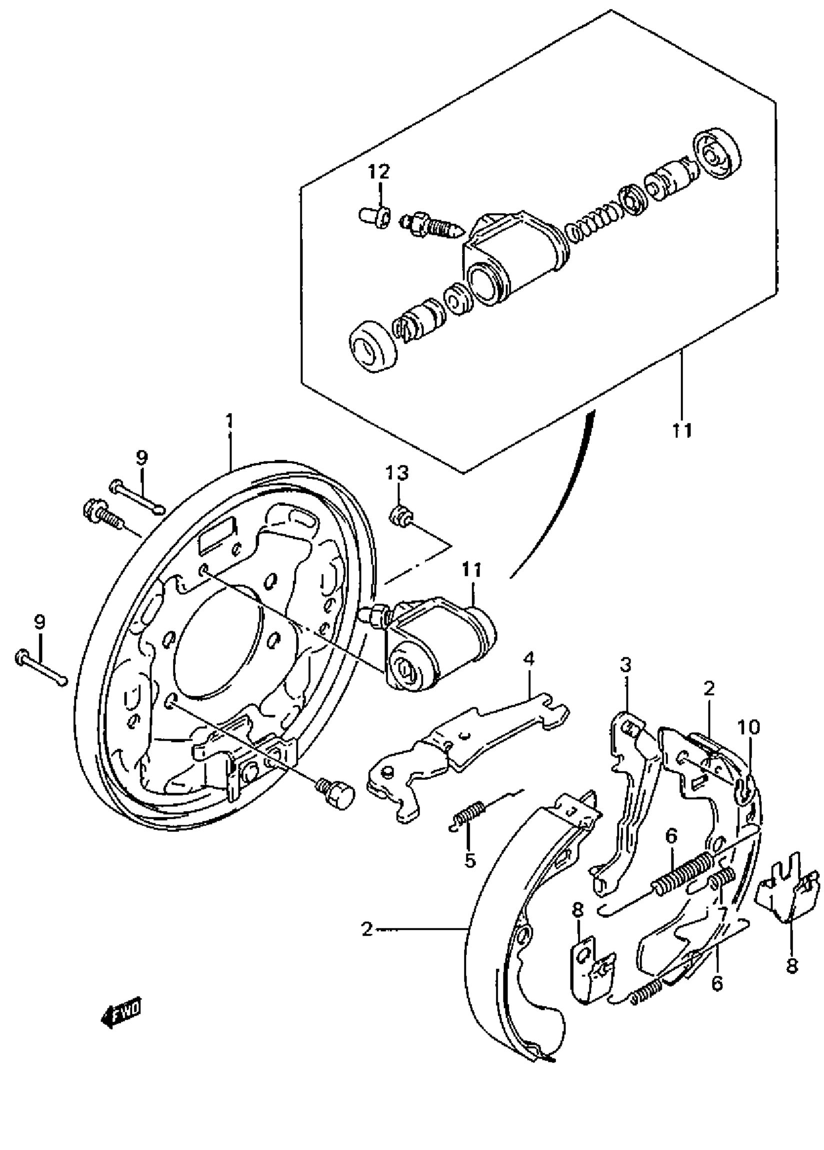
DRUM BRAKE ASSEMBLY

GENERAL DESCRIPTION

The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times. For details, refer to OPERATION in the 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. Parking brake shoe lever
4. Brake strut
5. Quadrant spring
6. Shoe return spring
7. Antirattle spring
8. Shoe hold down spring
9. Shoe hold down pin
10. Parking lever retainer
11. Wheel cylinder
12. Bleeder plug cap
13. Rubber plug

Fig. 5-5

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.

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.

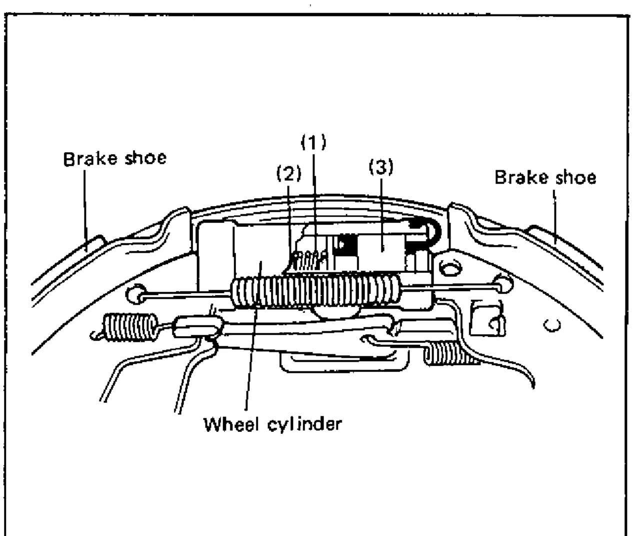


Fig. 5-6

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.

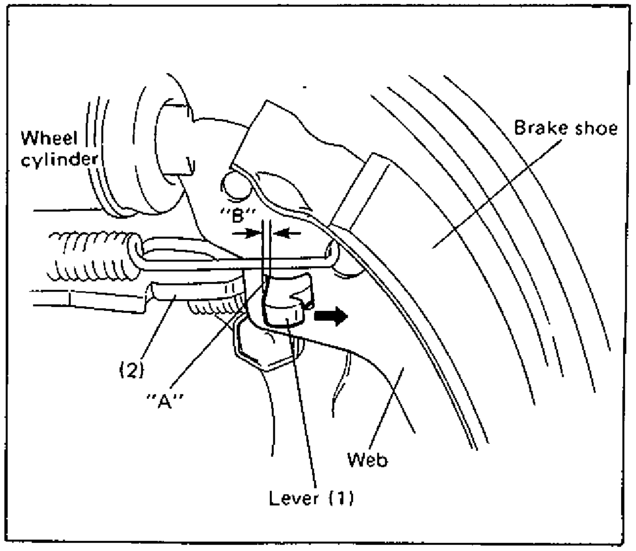


Fig. 5-7

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 10 – 12 kg (22 – 26 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.

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 depressed.

The brake shoe-to-drum clearance "B" corresponds to 0.36 – 0.54 mm (0.014 – 0.021 in.) in terms of the brake drum diameter A ⟷ A'. And the amount adjusted by one notch of the ratchet corresponds to 0.16 mm (0.006 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.

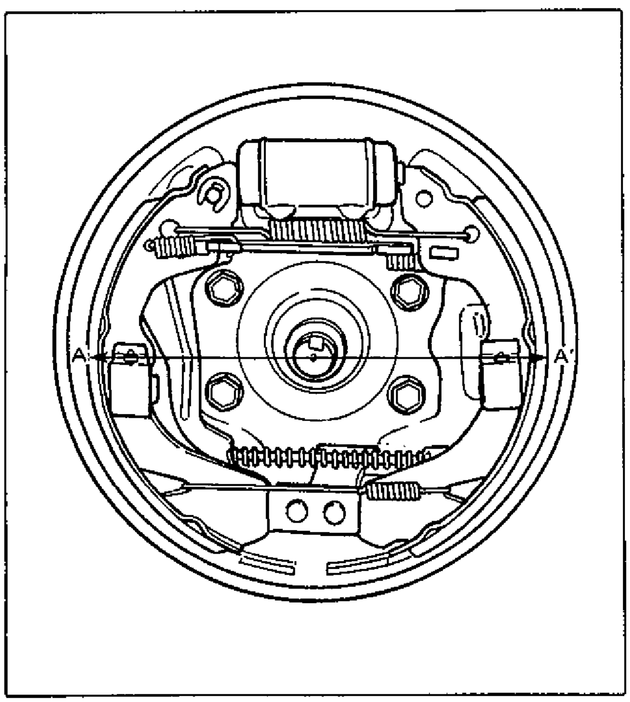


Fig. 5-8

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 right front wheel brake and left rear wheel brake (For right-hand steering car, it acts on the left front wheel brake and right rear wheel brake).
Also, the hydraulic pressure produced in the secondary chamber ("b") acts on the left front wheel brake and right rear wheel brake (For right-hand steering car, it acts on the right front wheel brake and left rear wheel brake).

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.

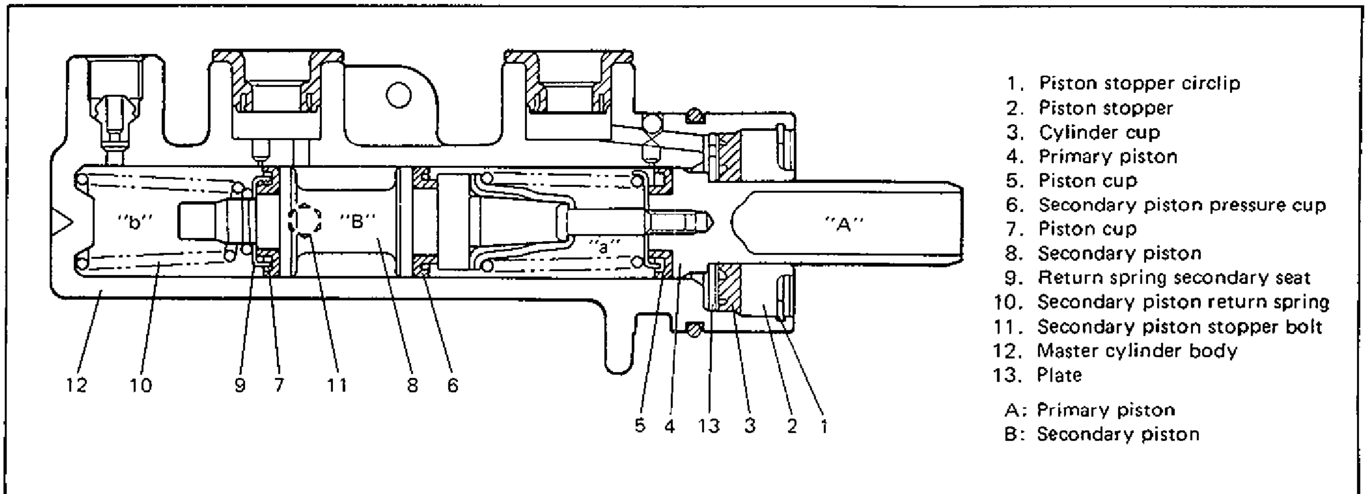


Fig. 5-9

Master Cylinder OPERATION

Normal operation

Depressing the brake pedal forces the primary piston "A" to move to the left in the below figure and consequently the hydraulic pressure is produced in the chamber "a".
By means of this pressure and the return spring force, the secondary piston "B" is also pushed to the left and thus the hydraulic pressure is produced in the chamber "b".

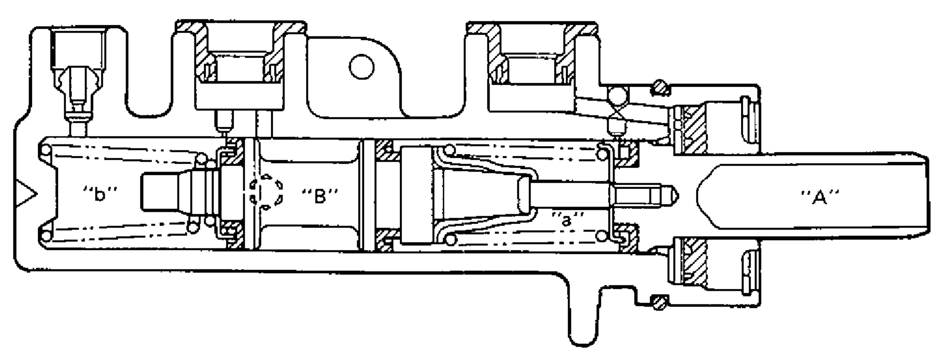


Fig. 5-10

One-circuit operation (Primary chamber "a" circuit failure)

Depressing the brake pedal forces the primary piston "A" to move as described previously, but since the brake circuit connected to the chamber "a" cannot hold the pressure, no pressure is produced in the fluid immediately ahead of the piston "A". The piston "A" keeps moving while compressing the spring and when it reaches the retainer, the piston "B" is pushed and begins to move. This causes the pressure to rise in the chamber "b" and the pressure acts on the left front wheel brake and right rear wheel brake. (For right hand steering car, it acts on the right front wheel brake and left rear wheel brake).

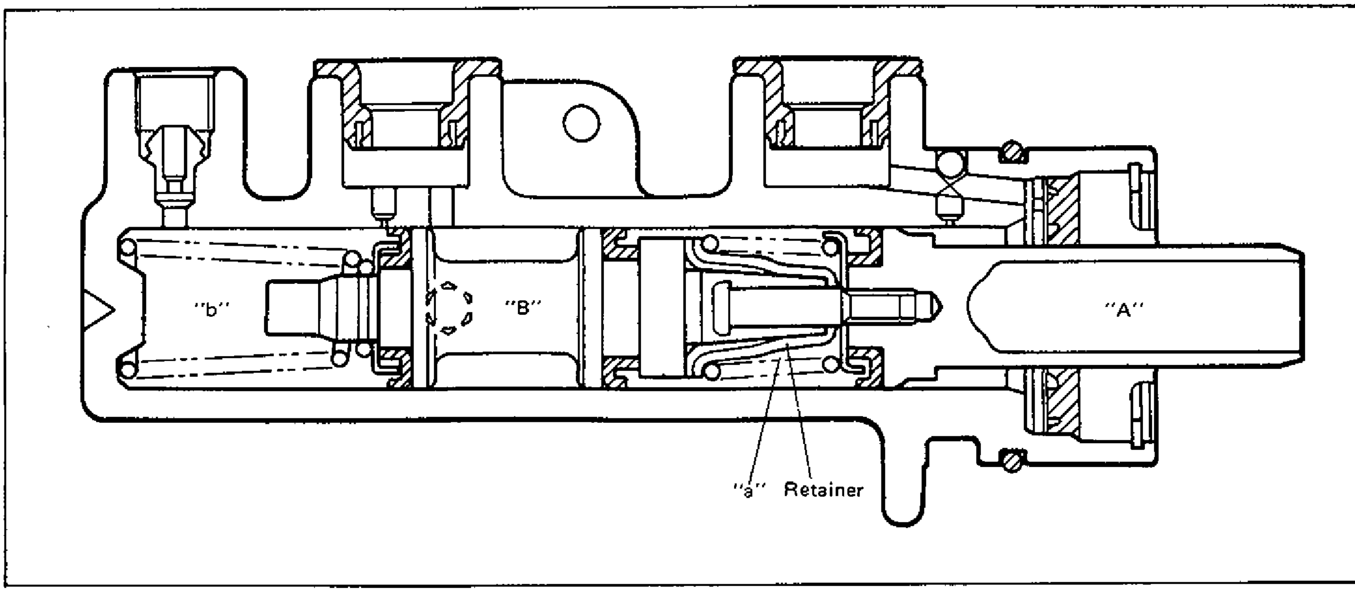


Fig. 5-11

One-circuit operation (Secondary chamber "b" circuit failure)

In this case, the leftward movement of the piston "A" has but little effect in causing the fluid pressure to rise in the chamber "a" in the beginning, because the initial rise of the fluid pressure causes the piston "B" to promptly yield and move to the left. However, when the forward end of the piston "B" comes to the head of the cylinder and stops there, the leftward movement of the piston "A" becomes effective. Thus the fluid pressure is produced in the chamber "a" and it acts on the right front wheel brake and left rear wheel brake (For right-hand steering car, it acts on the left front wheel brake and right rear wheel brake). The below figure shows secondary piston "B" at halt.

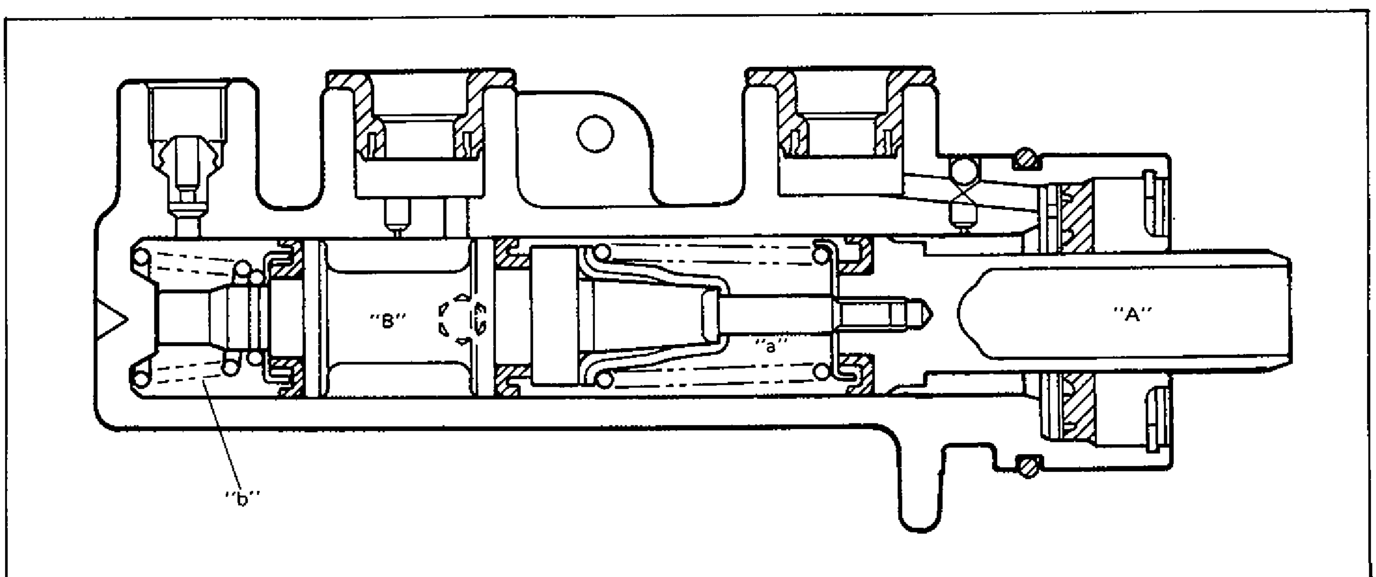


Fig. 5-12

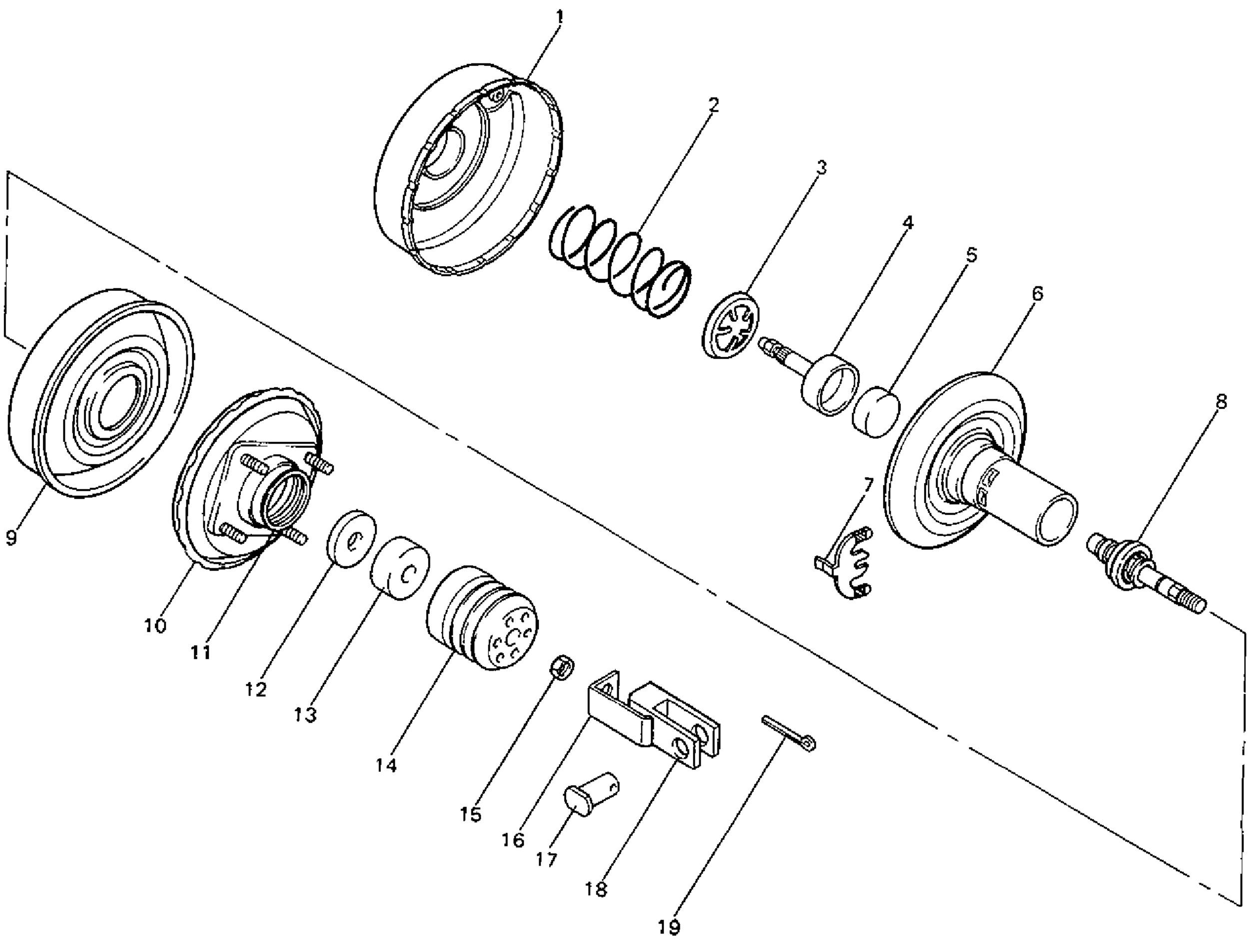
BOOSTER ASSEMBLY

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. The booster has a diaphragm of ϕ 155 mm (6 in.) effective diameter. Its operation is described in the following pages.

NOTE:

- **Use all components included in repair kits to service this booster. Lubricate rubber parts, where indicated, with silicone grease provided in kits. The torque values specified are for dry, unlubricated fasteners. If any hydraulic component is removed or brake line disconnected, bleed the brake system.**
- **Never lubricate any hydraulic component with silicone grease.**



1. Booster No. 1 body
2. Booster piston return spring
3. Rod retainer
4. Piston rod
5. Reaction disc
6. Booster piston
7. Valve stopper key
8. Booster air valve assembly
9. Diaphragm
10. Booster No. 2 body
11. No. 2 body oil seal
12. Air cleaner separator
13. Air cleaner element
14. Body boot
15. Nut
16. Bracket
17. Pin
18. Push rod clevis
19. Split pin

Fig. 5-13

Booster OPERATION

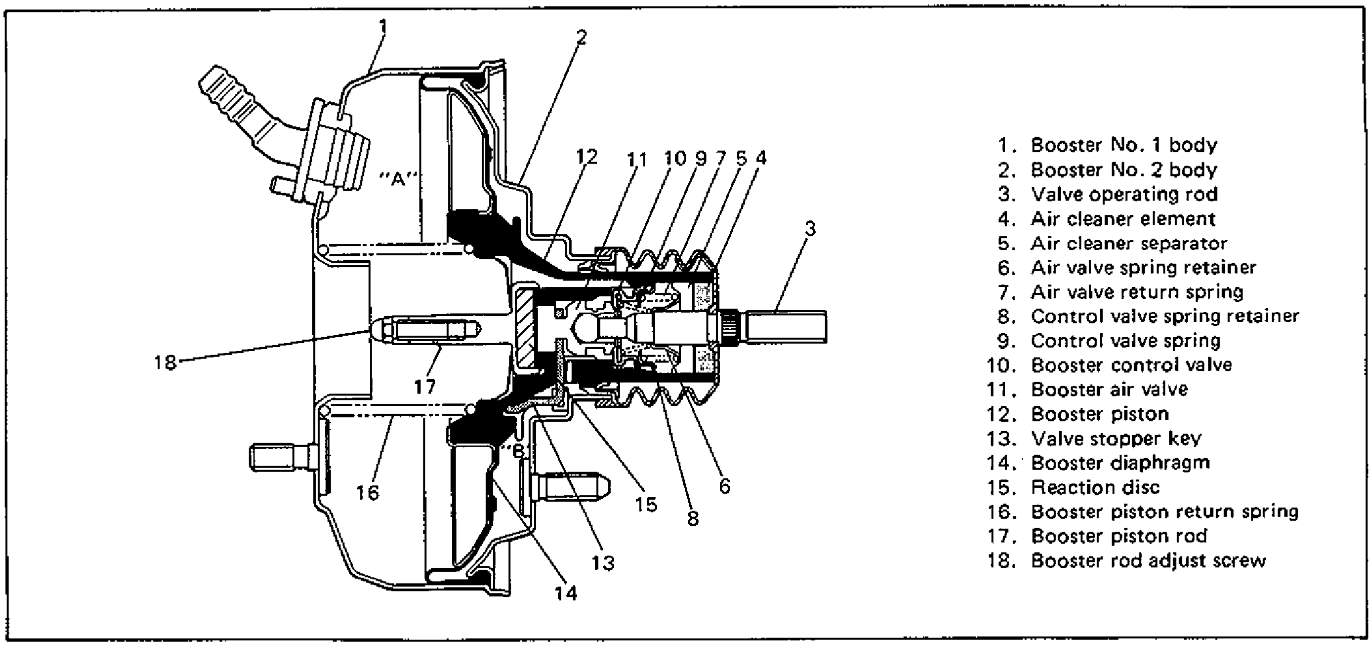


Fig. 5-14 Vacuum Booster Assembly

When the brake pedal is depressed, the force is transmitted to the piston of the master cylinder through the valve operating rod, booster air valve, reaction disc and piston rod. At the same time, the force of the booster piston developed due to the pressure difference between the two chambers "A" and "B" in the above figure is added to it.
The end of the booster control valve has a double function of a vacuum valve and air valve. That is, as shown in the figure, the booster control valve closes between the "A" and "B" chambers as its outer end "C" contacts the booster piston seat and opens as "C" leaves the booster piston seat (vacuum valve function). Also it closes between the "B" chamber and outside air as its inner end "D" contacts the air valve seat and opens as "D" leaves the air valve seat (air valve function).

When foot brake pedal is not depressed
The valve operating rod is pushed to the right by the spring force as shown. The air valve is also enough to the right to contact the valve stopper key as shown. In this state, the vacuum valve (control valve "C") is open and the air valve (control valve "D") is closed. Thus the chambers "A" and "B" conduct and share the same negative pressure (because of no pressure difference) which allows the return spring to push the booster piston to the right.

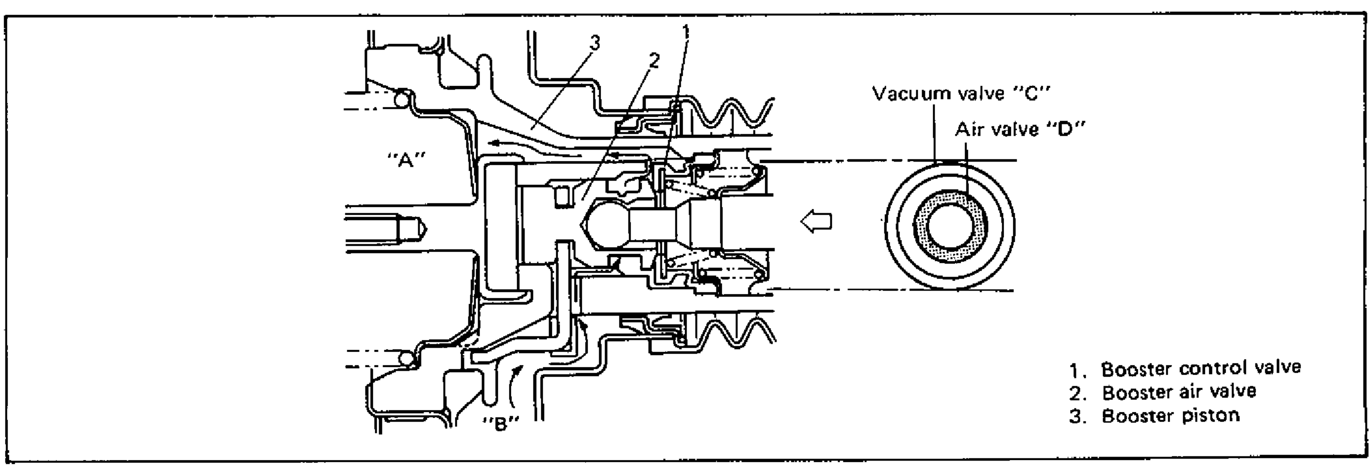


Fig. 5-15

When foot brake pedal is depressed

Being pushed by the operating rod, the booster air valve moves to the left as shown. Then the control valve is pushed against the booster piston seat closely by the valve spring force. Thus the vacuum valve (control valve "C") is closed to cut off between the chambers "A" and "B". At this time the air valve (control valve "D") is still closed.

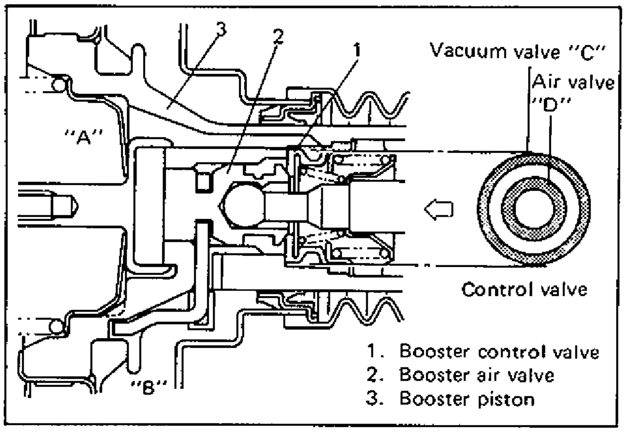


Fig. 5-16

As the booster air valve moves further to the left, it leaves the control valve and the air valve (control valve "D") opens to allow the air to flow into the chamber "B". The entry of air causes a difference in pressures between the chambers "A" and "B". When this pressure difference grows greater than the piston return spring force, the booster piston moves to the left and the booster control valve also moves to the left. The resulting air valve (control valve "D") closure stops the air flow into the chamber "B" and its pressure remains as it is. In this way, a small brake pedal depressing force is made into a strong push to the master cylinder push rod to produce high hydraulic pressure.

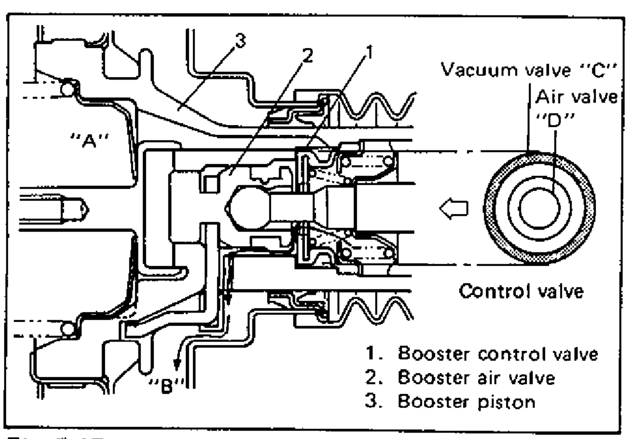


Fig. 5-17

When foot brake pedal is released

When the brake pedal is released, the booster air valve returns to the right by the master cylinder piston return force and the air valve return spring force as shown. Then the vacuum valve (control valve "C") opens and causes negative pressure in the chamber "B". The result is that the master cylinder piston and booster piston return to their original positions. This is the same state as described under **"When foot brake pedal is not depressed".**

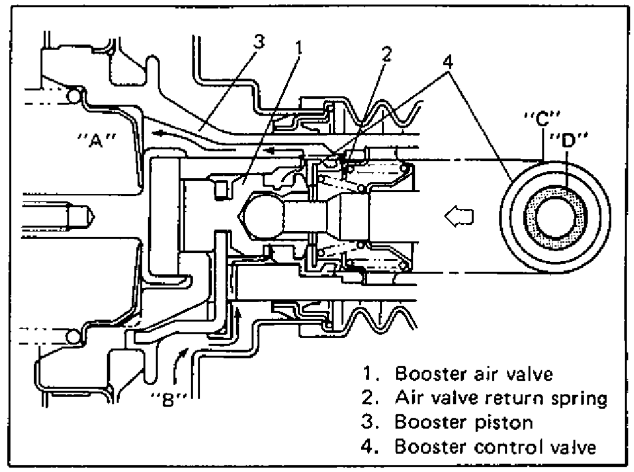


Fig. 5-18

Reference

Should any of the vacuum related parts in the booster be faulty, the brake force is not increased. Even then, however, the brake depressing force is transmitted to the valve operating rod, booster air valve, valve stopper key and booster piston in that order, to push the master cylinder push rod. Thus, the braking operation itself will not fail.

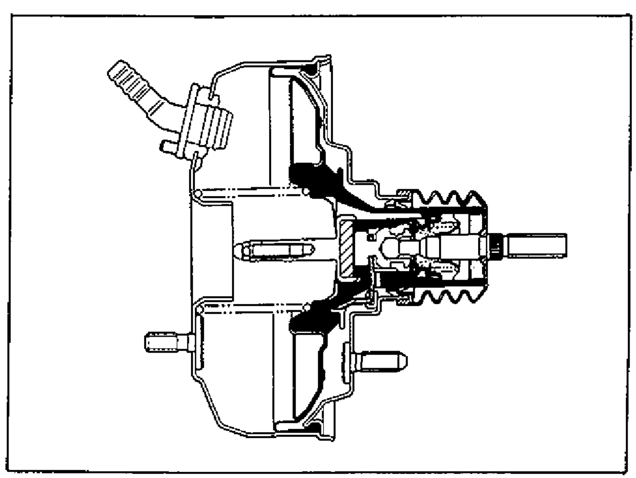


Fig. 5-19

LSPV (Load Sensing Proportioning Valve) ASSEMBLY

GENERAL DESCRIPTION

As shown in Fig. 5-1, 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 car (or weight of the load), whereby preventing the rear wheels from getting locked prematurely.
Also, LSPV has a sensor and such a structure as to control hydraulic pressure through its two systems (right & left rear brakes).

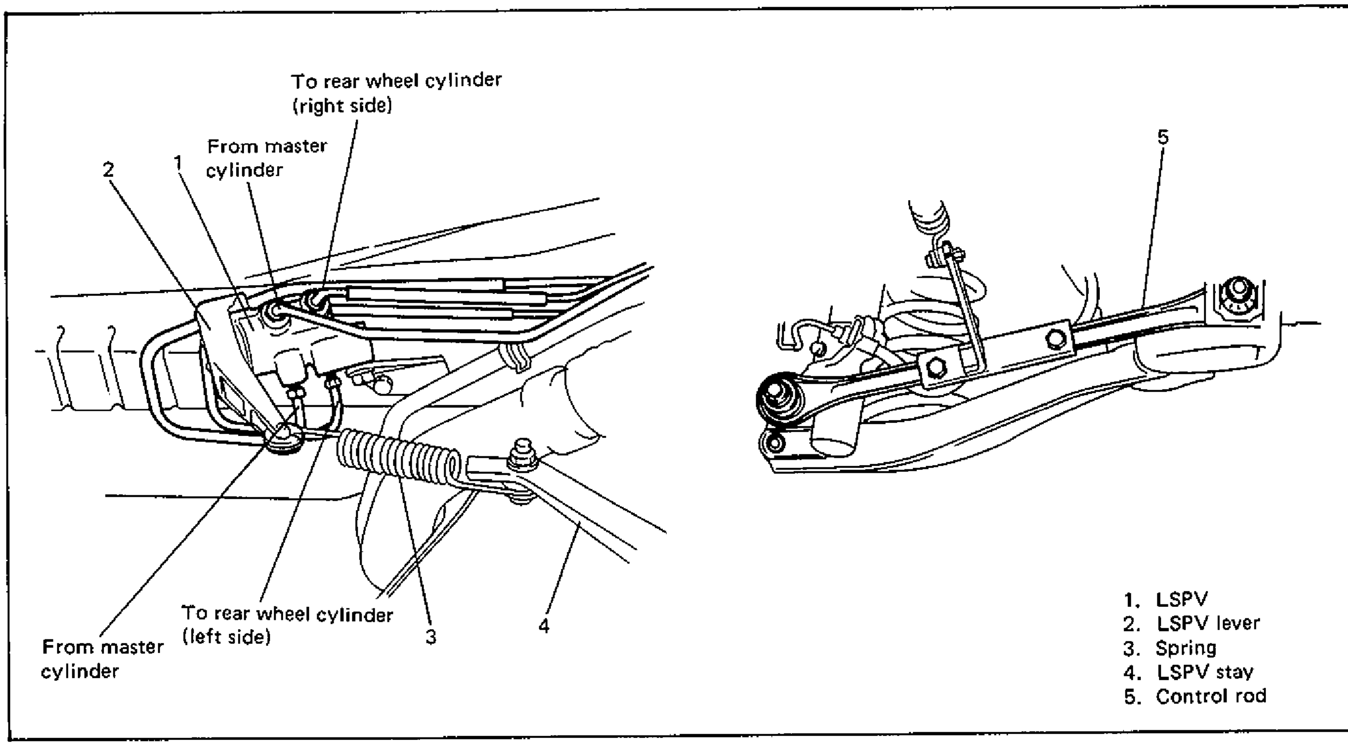


Fig. 5-20

CONSTRUCTION

The LSPV components are grouped into two sections as follows.

"A": Sensor section
The main parts in this section are a lever and a spring which senses variation in the car height as affected by the loaded condition and converts it into the load.

"B": Hydraulic pressure control section
Included in this section are a plunger and valve mechanism to execute proportional control.

For the details, refer to Fig. 5-20-1.

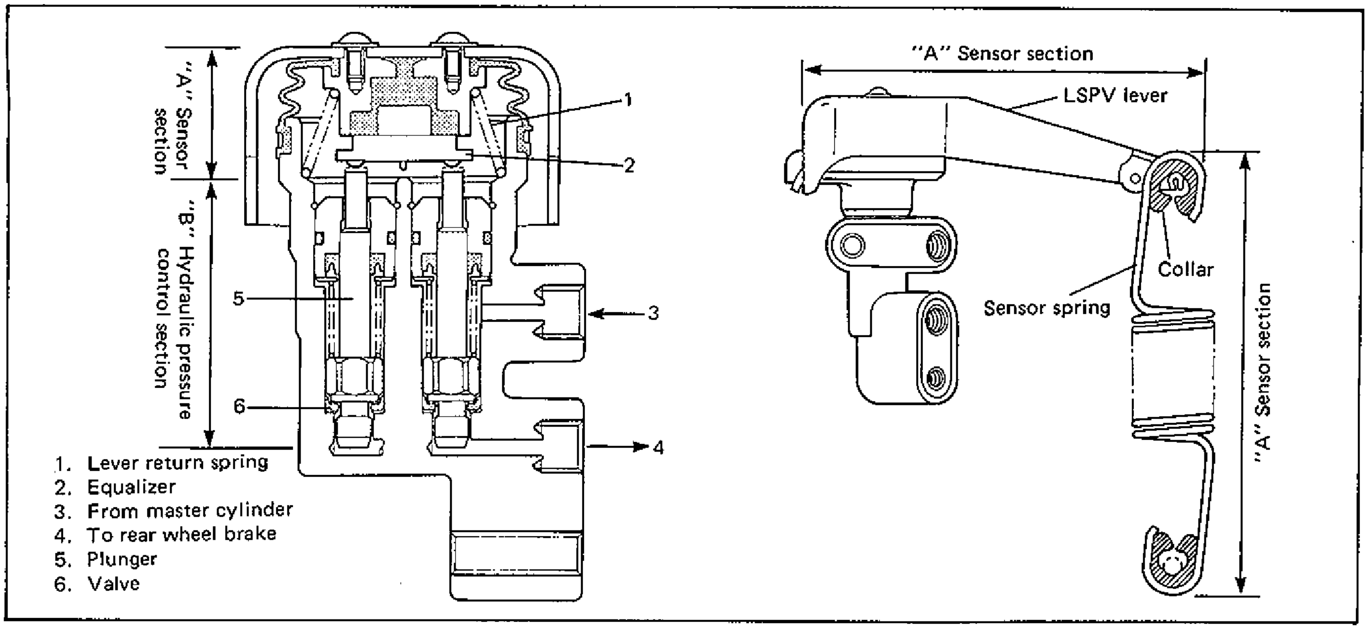


Fig. 5-20-1

OPERATION

As shown in Fig. 5-20, LSPV is installed to the car body, with the end of the lever at its top connected to the control rod of the rear suspension by way of the sensor spring and the LSPV stay.

When some load is placed on the car, the distance between the control rod of the rear suspension and the car 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 under 2. Operation of hydraulic pressure control section on the following page.

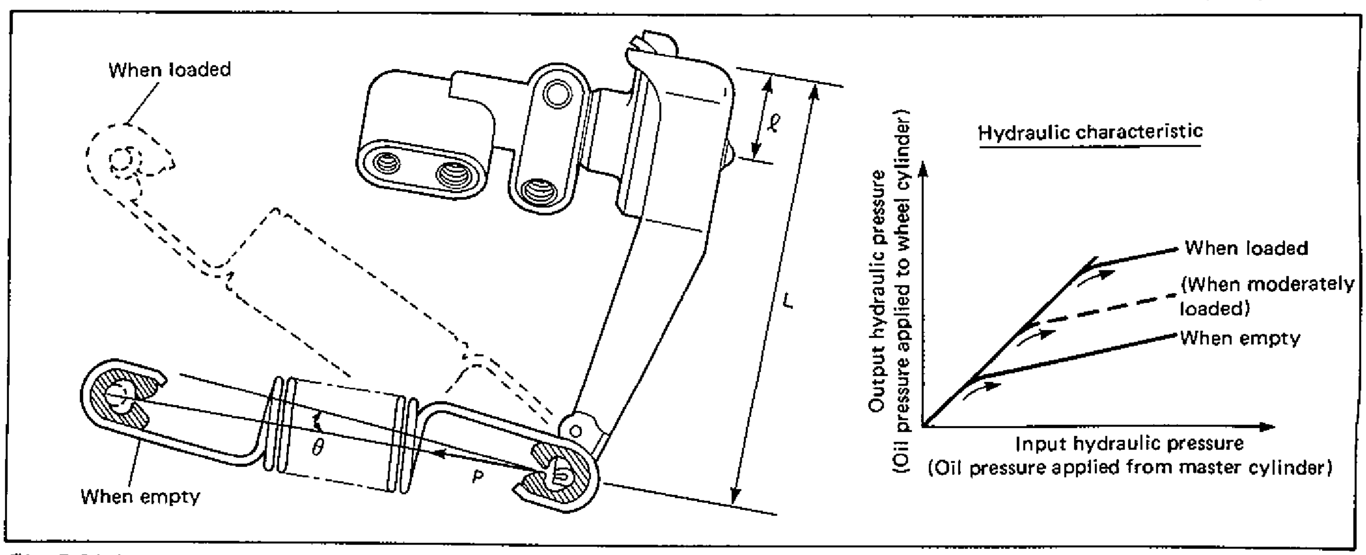


Fig. 5-20-2

1. Operation of sensor section (Refer to Fig. 5-20-2.)
   One end of the sensor spring is installed to the rear suspension control rod and the other end to the LSPV lever.
   The spring power P is applied to the plunger by way of the lever. The force on the plunger then is expressed as $2F = \frac{L}{\ell} P \cos\theta - W$
   (W: force from lever return spring)
2. Operation of hydraulic pressure control section
   1) Operation from the inoperative state till the incoming hydraulic pressure (fluid pressure from the master cylinder) reaches the bend point Pc in the graph as shown in Fig. 5-20-3:
   As the valve is open during this stage, the hydraulic pressure supplied through the supply port passes through the incoming chamber, plunger outer passage, valve inner passage and outgoing chamber, and it is discharged out of the discharge port without being controlled.

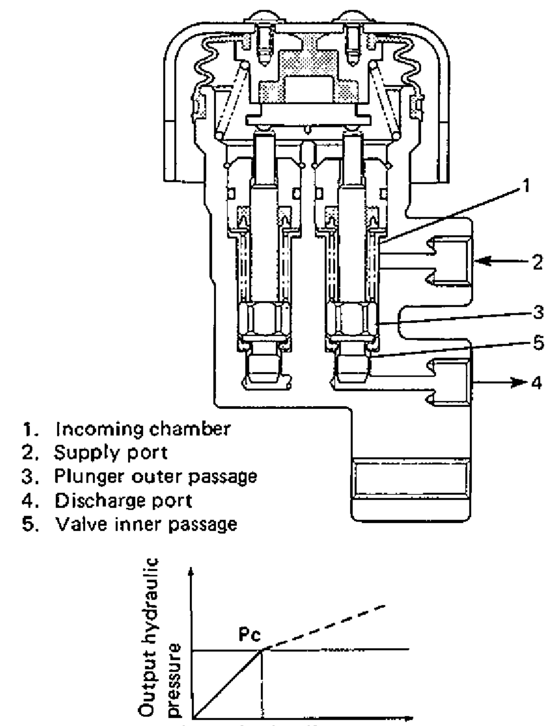
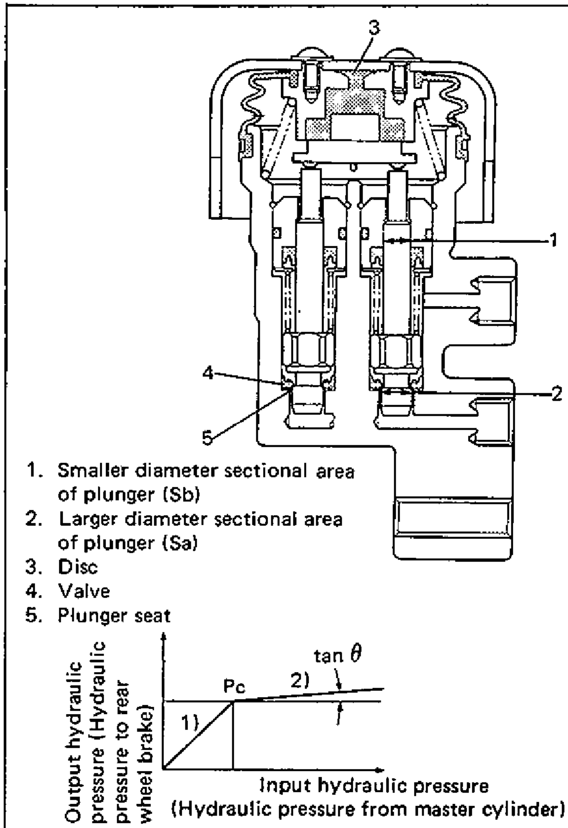


Fig. 5-20-3

   2) As the incoming hydraulic pressure increases, the force applied to the plunger grows stronger than the sensor spring power and moves the plunger and as a result, the valve closes the fluid passage. The hydraulic pressure then is represented by the bend point Pc in the graph.

As the incoming hydraulic pressure rises even higher, the passage between the plunger seat and valve opens due to the difference between larger and smaller diameter sectional areas of the plunger and the outgoing hydraulic pressure rises a little. At the same time as the rise in outgoing hydraulic pressure, the force to close the plunger increases again to close the passage between the plunger seat and valve. In this way, through repetition of the operation as described above, the outgoing hydraulic pressure is increased and decreased at a certain rate to the incoming hydraulic pressure. Also, the force applied to the right and left plungers is made almost uniform by the equalizer and disc which deflects as necessary.



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

$$Pc = \frac{F + f}{Sb} \qquad \tan\theta = \frac{Sa - Sb}{Sa}$$

F : Force from sensor spring
f : Force from plunger spring
Sa : Larger diameter sectional area of plunger
Sb : Smaller diameter sectional area of plunger

Fig. 5-20-4

3) As the incoming hydraulic pressure reduces, the plunger moves backward till it contacts the stopper, and such plunger movement causes the fluid amount on discharge port to reduce, thereby the outgoing hydraulic pressure reduces ("A" in the graph below).
As the incoming hydraulic pressure reduces further, the plunger remains in contact with the stopper and the outgoing hydraulic pressure becomes constant ("B" in the graph below). When the incoming hydraulic pressure lowers than the outgoing one, the valve is pushed by the outgoing hydraulic pressure. As a result, the state of plunger changes from as shown by the plunger at the right in the figure below to that at the left and the incoming hydraulic pressure becomes equal to the outgoing one ("C" in the figure below). Further decrease in the incoming hydraulic pressure allows the sensor spring to move the plunger to its initial position.

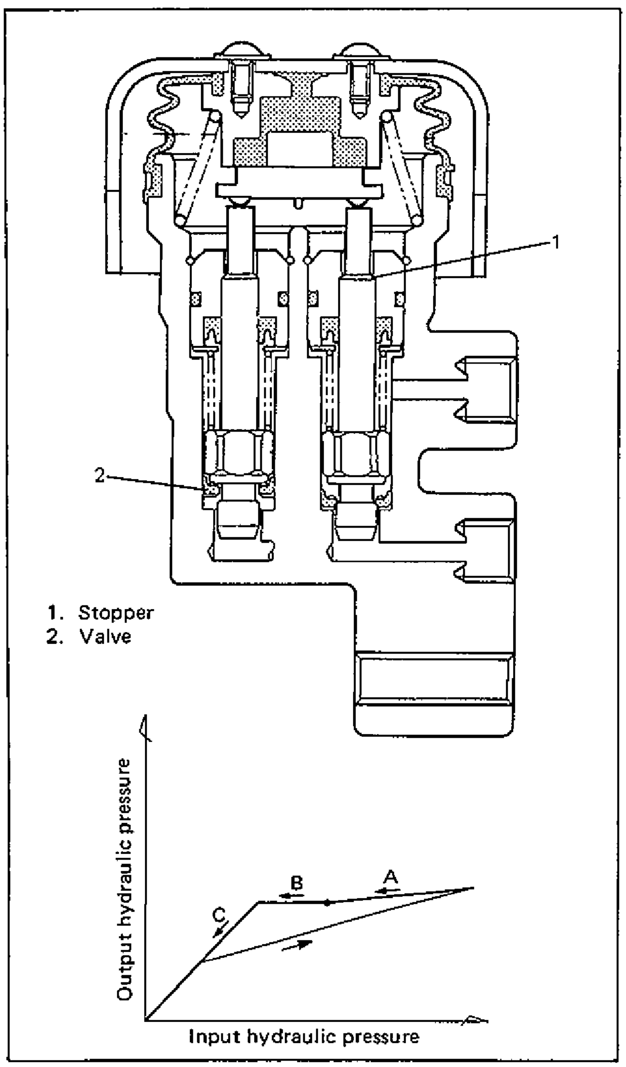


Fig. 5-20-5

3. Operation when one system fails
If one of two systems fails, the equalizer tilts and the sensor spring force reduces but as the plunger of the other system alone supports the sensor spring force, the bend point in the hydraulic characteristic graph becomes higher than usual as shown below.

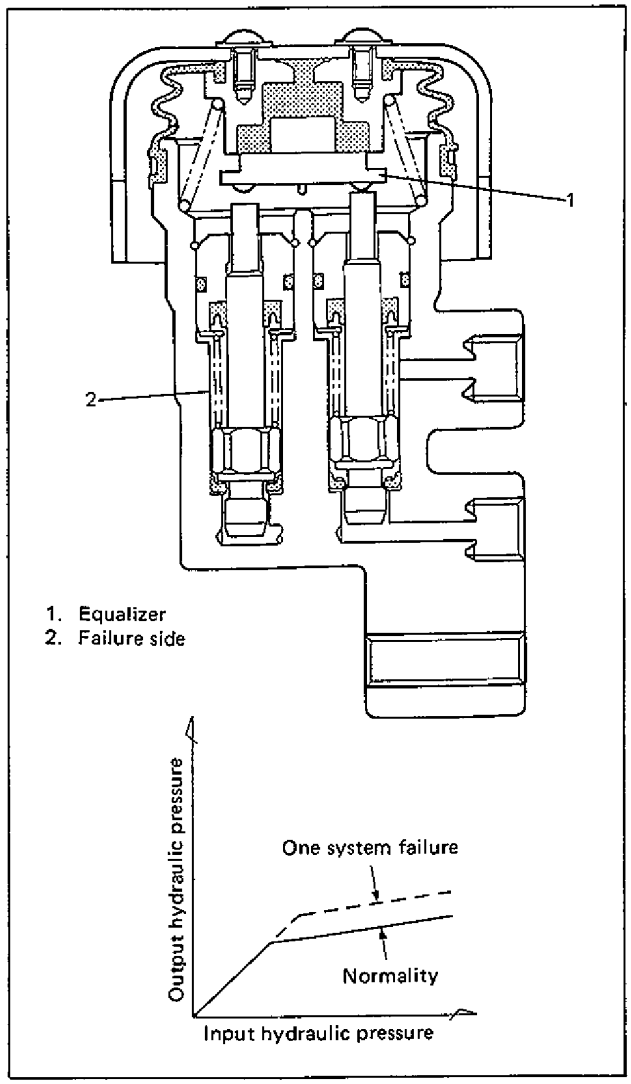


Fig. 5-20-6

DIAGNOSIS

ROAD TESTING BRAKES

Brakes should be tested on dry, clean, smooth and reasonably level roadway which is not crowned. Road test brakes by making brake applications with both light and heavy pedal forces at various speeds to determine if the car stops evenly and effectively.

Also drive car to see if it leads to one side or the other without brake application. If it does, check the tire pressure, front end alignment and front suspension attachments for looseness. See diagnosis chart for other causes.

BRAKE FLUID LEAKS

Check the master cylinder fluid levels. While a slight drop in reservoir level does result from normal lining wear, an abnormally low level indicates a leak in the system. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

SUBSTANDARD OR CONTAMINATED BRAKE FLUID

Improper brake fluid, mineral oil or water in the fluid may cause the brake fluid to boil or the rubber components in the hydraulic system to deteriorate.

If primary piston cups are swollen, then rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston cups on the drum brake wheels.

If deterioration of rubber is evident, disassemble all hydraulic parts and wash with alcohol. Dry these parts with compressed air before assembly to keep alcohol out of the system. Replace all rubber parts in the system, including hoses. Also, when working on the brake mechanisms, check for fluid on the linings. If excessive fluid is found, replace the linings.

If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If condition is not found, drain fluid, flush with brake fluid, refill and bleed system.

The system must be flushed if there is any doubt as to the grade of fluid in the system or if fluid has been used which contained parts that have been subjected to contaminated fluid.

BRAKE DIAGNOSIS 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. Maladjusted sensor spring length of LSPV.	Check or adjust.
	11. Broken sensor spring of LSPV.	Replace.
	12. Defective collar of LSPV.	Replace.
Brake pull (Brakes not working in unison)	1. 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.
Rear brake locked prematurely	1. Maladjusted sensor spring length of LSPV.	Check or adjust.
	2. Malfunctioning LSPV assembly.	Replace assembly.

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 mechanism. 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.	Repair master cylinder.
	2. Restricted brake tubes or hoses.	Check for soft hoses or damaged tubes and replace with new hoses and/or new double-walled steel brake tubing.
	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.
Pedal pulsation (Pedal pulsates when depressed for braking.)	1. Damaged or loose wheel bearings.	Replace wheel bearings.
	2. Distorted steering knuckle or rear wheel spindle.	Replace knuckle or rear wheel spindle.
	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 within 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.

ON CAR SERVICE

1. BRAKE PEDAL FREE HEIGHT ADJUSTMENT

For right-hand steering car:
Height of brake pedal is normal if it is as high as clutch pedal.
For left-hand steering car:
Height of brake pedal is normal if it is about 8 mm (0.3 in.) lower than clutch pedal.

1) When booster push rod clevis has been reinstalled, it is important that measurement between booster mounting surface and center of clevis pin hole is adjusted within 114.5 – 115.5 mm (4.51 – 4.54 in.). See page 5-61.
2) When stop light switch has been removed, refer to the following STOP LIGHT SWITCH ADJUSTMENT for proper installation.
   Services in above steps 1) and 2) may affect brake pedal height.

2. 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 stay (shown as "A" in figure) is within 0.5 – 1.0 mm (0.02 – 0.04 in.). Then tighten lock nut to specified torque.

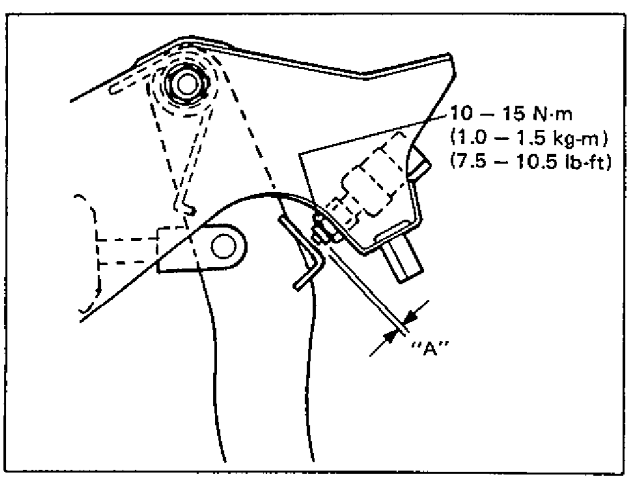


Fig. 5-21

3. EXCESSIVE PEDAL TRAVEL CHECK

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 60 mm (2.36 in.).

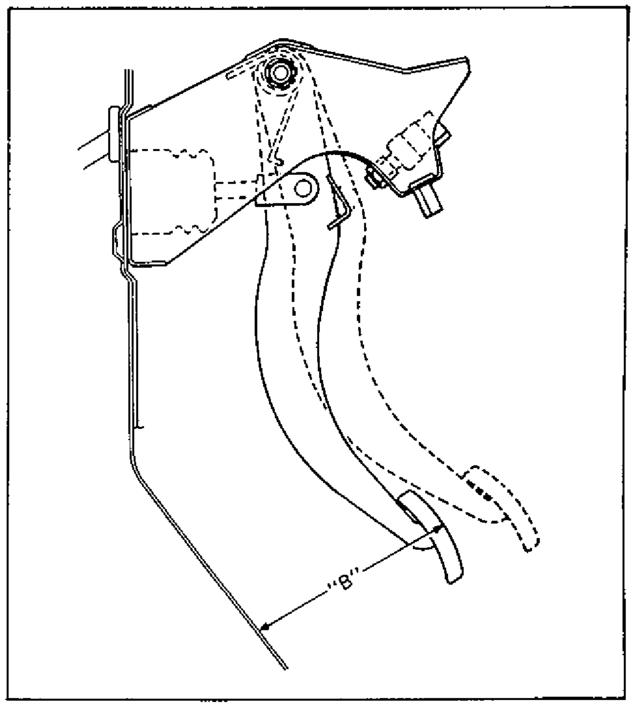


Fig. 5-22

4) If clearance "B" is less than 60 mm (2.36 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 60 mm (2.36 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.

- See page 5-45 for brake shoe inspection.
- See page 5-23 for bleeding brake system.
- Remove brake drums for adjuster inspection. (See page 5-39.). If defective, correct or replace.

4. 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 in Item 3 on page 5-20 of this section, even when it is more than 60 mm (2.36 in.).
For brake shoe inspection, refer to INSPECT BRAKE SHOE & LINING of this section, page 5-45.

5. BRAKE PEDAL PLAY INSPECTION

Pedal play should be within below specification. If out of specification, check stop light switch for proper installation position and adjust if necessary.
Also check pedal shaft bolt and master cylinder pin installation for looseness and replace if defective.

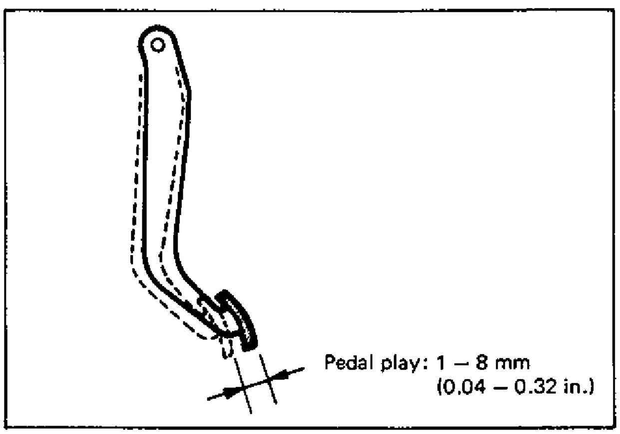


Fig. 5-23

6. REAR DRUM BRAKE SHOE ADJUSTMENT

Rear brake has self-adjusting mechanism but it does require adjustment for proper drum to shoe clearance when brake shoe has been replaced or brake drum has been removed for some other service.
Adjustment is automatically accomplished by depressing brake pedal 3 to 5 times with approximately 30 kg (66 lbs) load after all parts are installed.
Then check brake drum for dragging and brake system for proper performance. After lowering car from hoist, brake test should be performed.

7. MASTER CYLINDER INSPECTION

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.

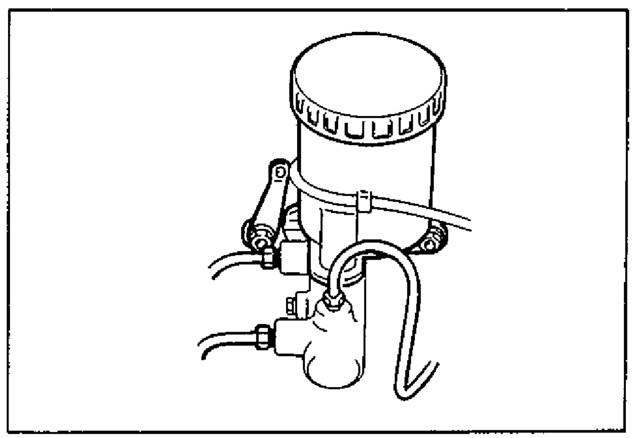


Fig. 5-24

8. DISC INSPECTION

Refer to page 5-38 of this section for inspection point and procedure.

9. PAD LINING INSPECTION

Inspect pad linings periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through each end (or hole) of caliper and check lining thickness of outside and inside pads. If lining is worn and its thickness ("C" in figure) is less than 3 mm (0.12 in.), all pads must be replaced at the same time.

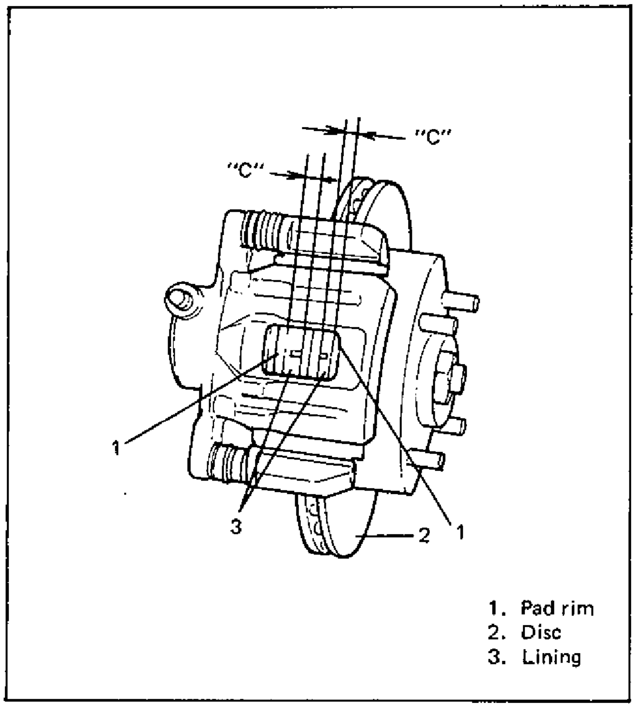


Fig. 5-25

10. PARKING BRAKE INSPECTION AND ADJUSTMENT

a) Inspection

Hold center of parking brake lever grip and pull it up with 20 to 25 kg (44 to 55 lbs) force.
With parking brake lever pulled up as above, count ratchet notches in "A" as shown in figure. There should be 4 to 9 notches.
Also, check if both right and left rear wheels are locked firmly.
To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake lever without pressing its button. One click sound corresponds to one notch.

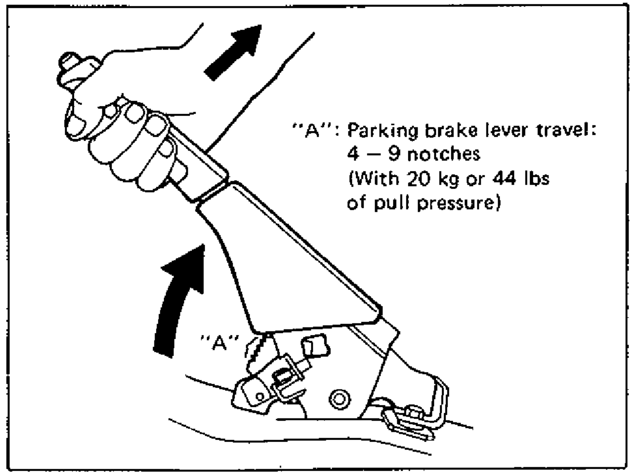


Fig. 5-26

If number of notches is out of specification, adjust cable by referring to adjustment procedure described on the following step b) so as to obtain specified parking brake stroke.

NOTE:
Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking brake lever.

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 force.**
- **Rear brake shoes are not worn beyond limit, and self adjusting mechanism operates properly.**

After confirming that above 5 conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening self locking nut (3 in figure below).

NOTE:
Check brake drum for dragging after adjustment.

Parking brake stroke; when lever is pulled up at 20 kg (44 lbs)	Within 4 – 9 notches

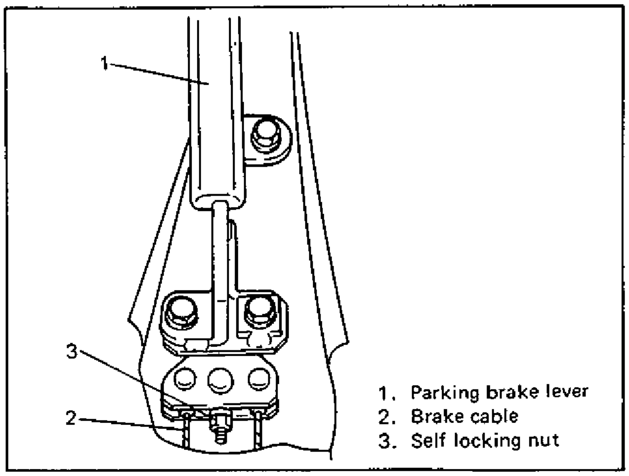


Fig. 5-27

11. FLUSHING BRAKE HYDRAULIC SYSTEM

It is recommended that entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in hydraulic system.
Periodical change of brake fluid is also recommended.

12. BLEEDING BRAKES

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

Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
Hydraulic lines of brake system are based on the diagonal split system. When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder or other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be bled at all 4 wheel brakes.

NOTE:
Perform bleeding operation starting with wheel cylinder farthest from master cylinder and then at front caliper of the same brake line. Do the same on the other brake line.

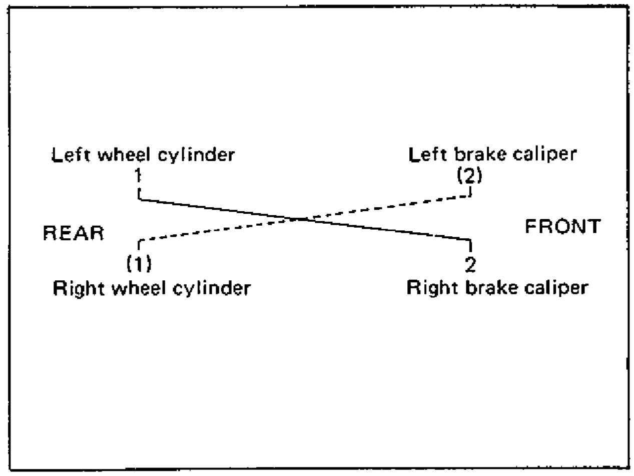


Fig. 5-28

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 of wheel cylinder, and insert the other end into container.

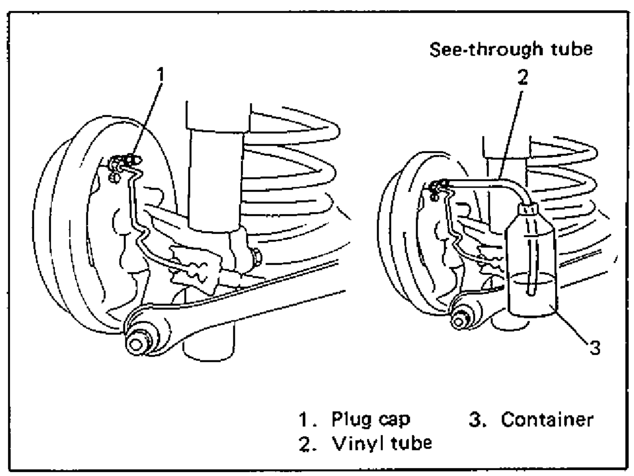


Fig. 5-29

3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.

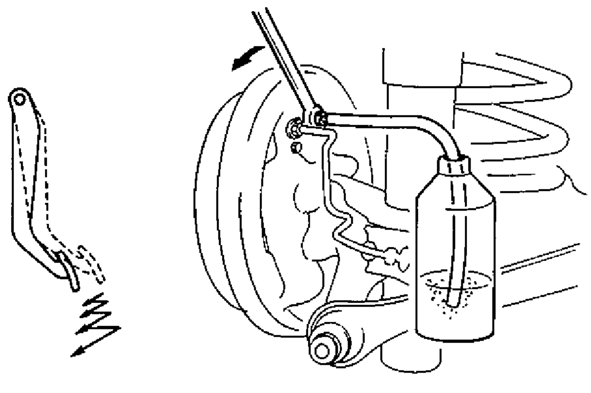

Depress brake pedal several times and with pedal depressed, loosen bleeder plug a little.

Fig. 5-30

4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.

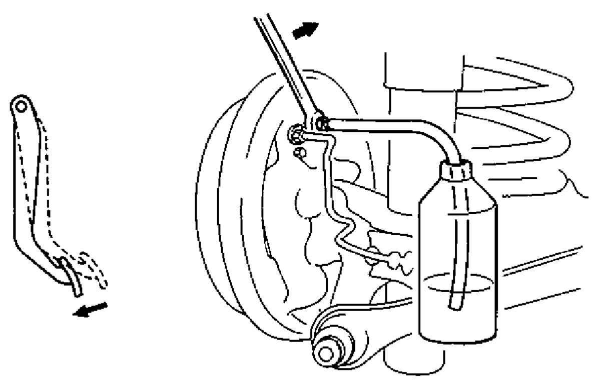

With brake pedal depressed, retighten bleeder plug.

Fig. 5-31

5) Repeat this operation until there are no more air bubbles in hydraulic line.
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug. (For tightening torque specification of air bleeder plug, see page 5-66.)
7) Then attach bleeder plug cap.

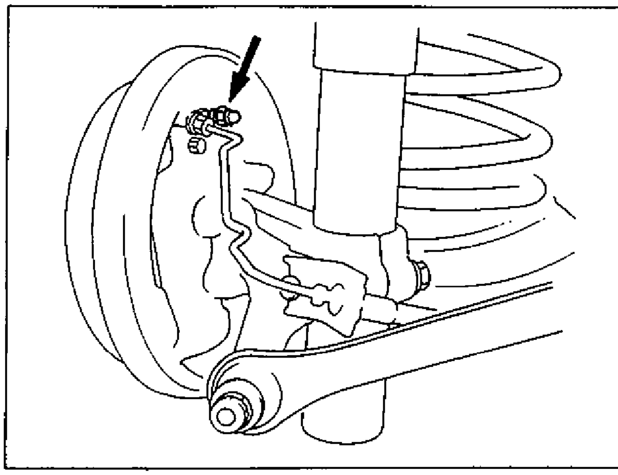


Fig. 5-32

8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.

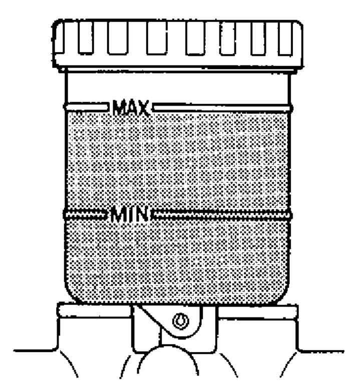


Fig. 5-33

10) Check brake pedal for "sponginess". If found spongy, repeat entire procedure of bleeding.

13. BRAKE HOSE AND PIPE INSPECTION

HOSE

The brake hose assembly should be checked for road hazard damage, for cracks and chafing of the outer cover, for leaks and blisters. A light and mirror may be needed for an adequate inspection. If any of the above conditions are observed on the brake hose, it is necessary to replace it.

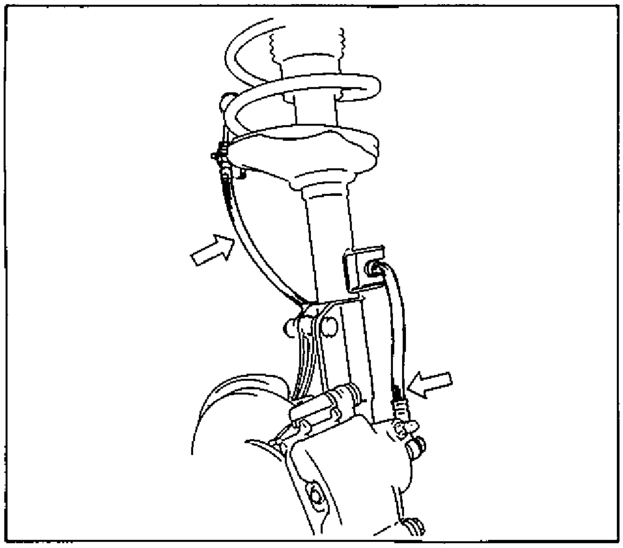


Fig. 5-34

PIPE

Inspect the tube for damage, cracks, dents and corrosion. If any defect is fount, replace it.

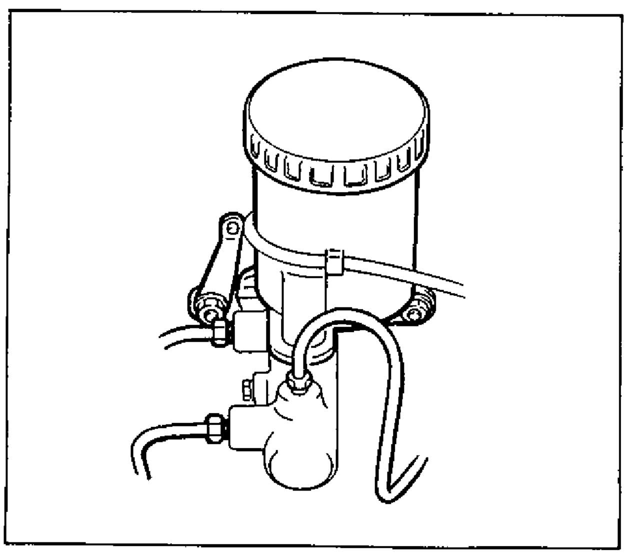


Fig. 5-35

14. BRAKE FLUID LEVEL INSPECTION

Be sure to use particular brake fluid either as indicated on reservoir cap of that car or recommended in owner's manual which comes along with that car.
Use of any other fluid is strictly prohibited.
Fluid level should be between MIN and MAX lines marked on reservoir.
When warning light lights sometimes during driving, replenish fluid to MAX line.
When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

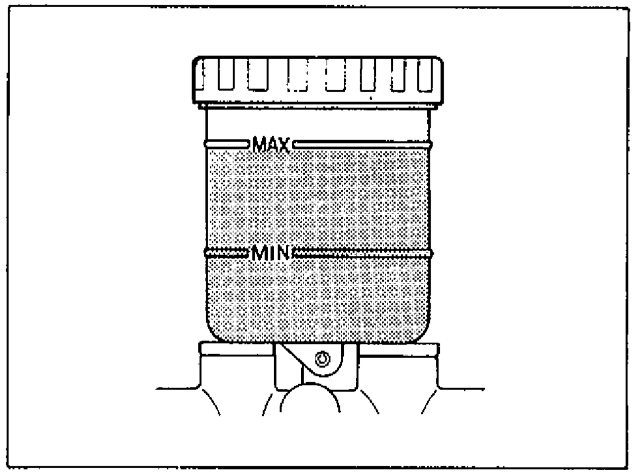


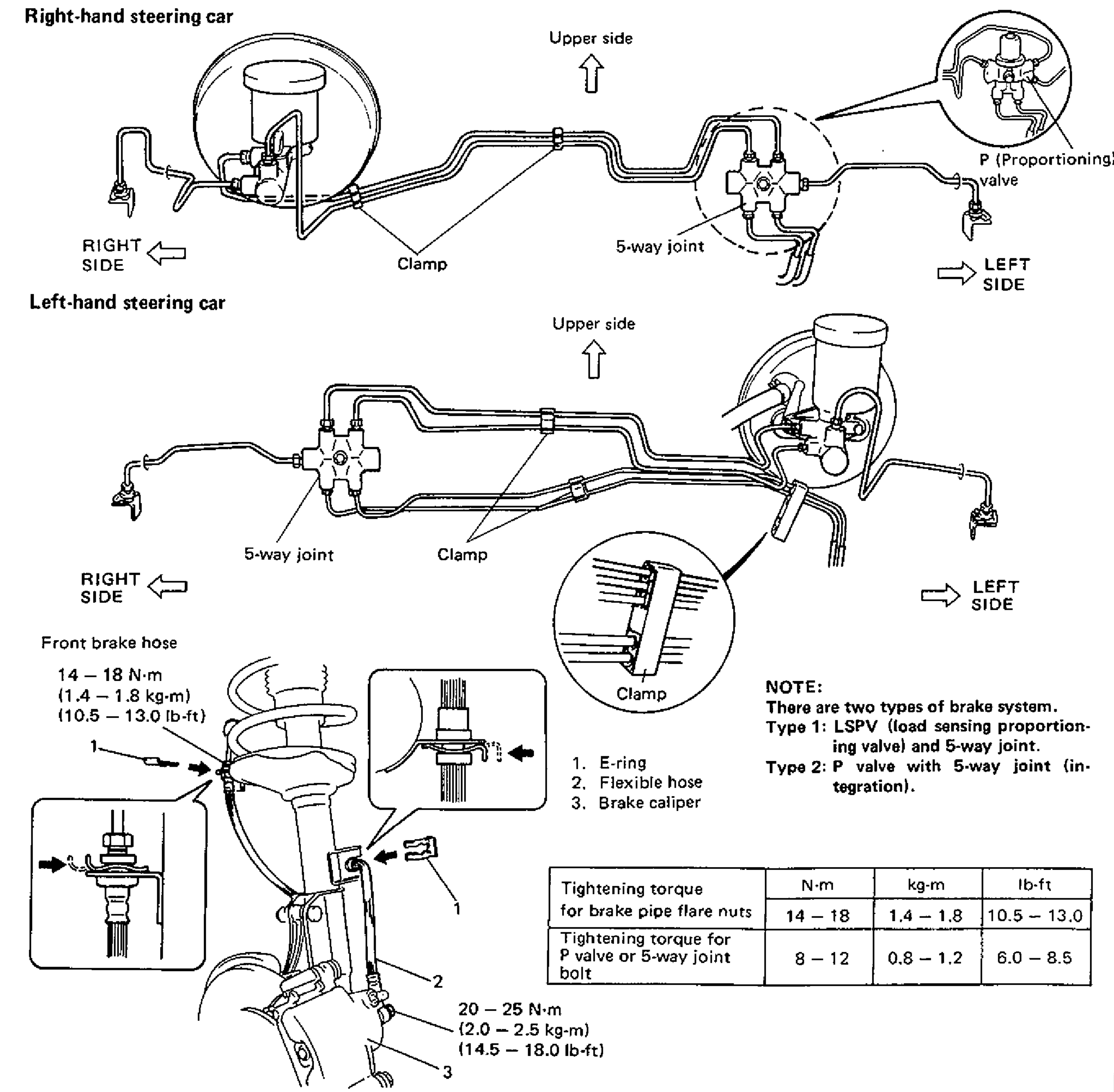
Fig. 5-36

CAUTION:
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

BRAKE HOSE/PIPE R & I

1. REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

1) Raise and suitably support car. Remove tire and wheel.
   This operation is not necessary when removing pipes connecting master cylinder and P valve (or 5-way joint).
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse brake hose 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.



1. E-ring
2. Flexible hose
3. Brake caliper

NOTE:
There are two types of brake system.
Type 1: LSPV (load sensing proportioning valve) and 5-way joint.
Type 2: P valve with 5-way joint (integration).

	N·m	kg-m	lb-ft
Tightening torque for brake pipe flare nuts	14 – 18	1.4 – 1.8	10.5 – 13.0
Tightening torque for P valve or 5-way joint bolt	8 – 12	0.8 – 1.2	6.0 – 8.5

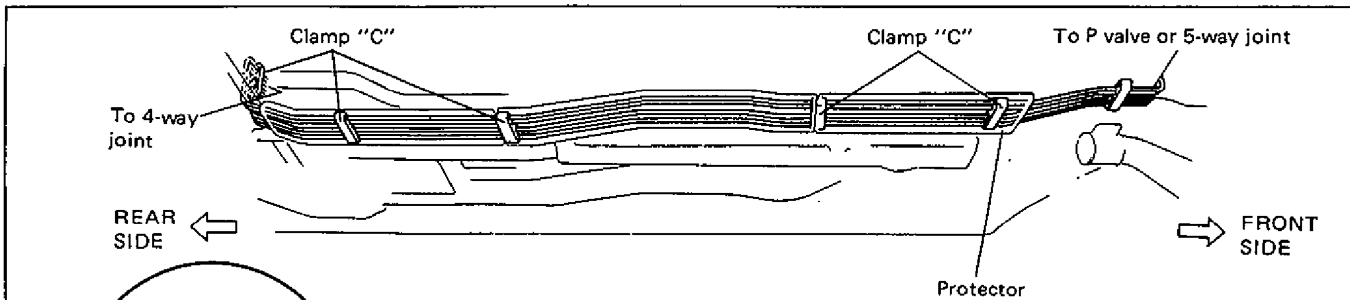
Fig. 5-37 Front Brake Hose/Pipe R & I

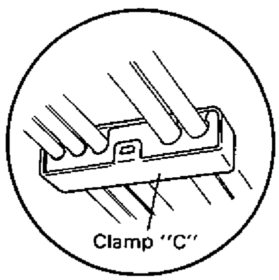
2. REMOVE AND INSTALL REAR BRAKE HOSE/PIPE

1) Raise and suitably support car. 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 brake hose installation procedure. Fill and maintain brake fluid level in reservoir. Bleed brake system.

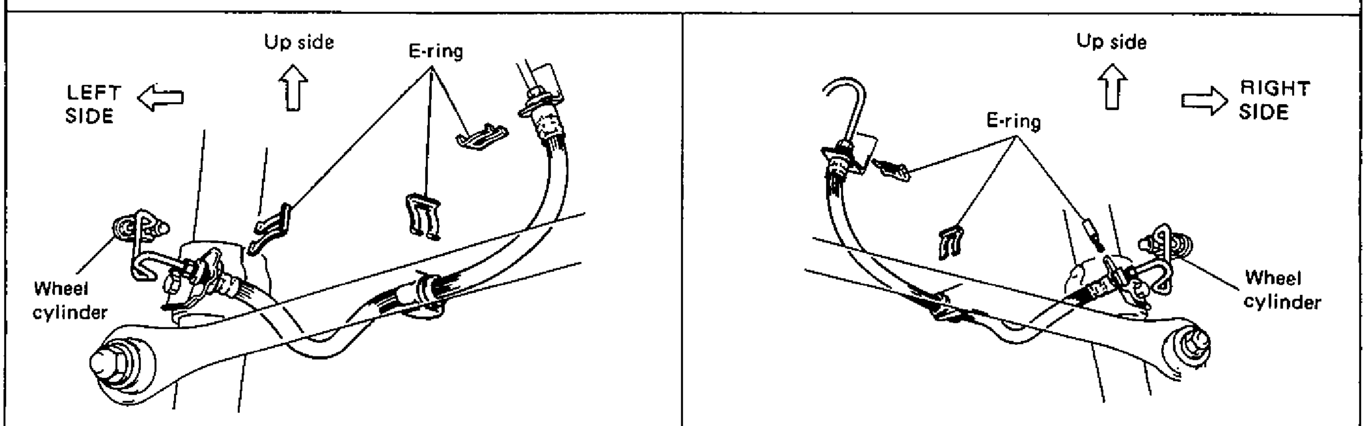
PRECAUTION FOR INSTALLATION

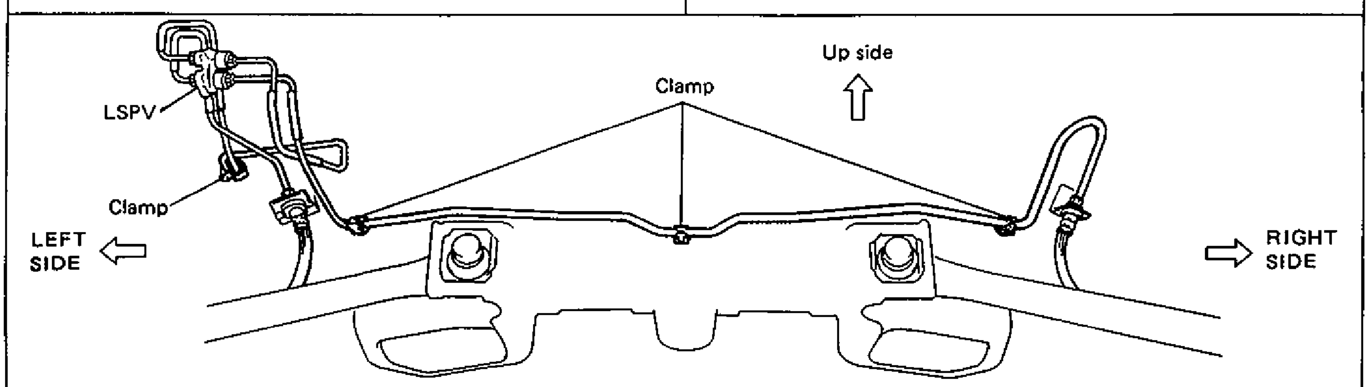
- Never reuse protector nut once removed. Be sure to use a new one.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.





To remove brake pipe as indicated in figure, disconnect its front side at 5-way joint or P valve and rear side at 4-way joint. Then, remove it together with clamps from car body.
For removal and reinstallation procedures from and to car body, refer to SECTION 6C ENGINE FUEL on p. 6C-6.





Tightening torque for brake flare nut	N·m	kg-m	lb-ft
	14 – 18	1.4 – 1.8	10.5 – 13.0

Fig. 5-38 Rear Brake Hose/Pipe R & I

PARKING BRAKE LEVER/CABLE R & I

1. REMOVE AND INSTALL PARKING BRAKE LEVER

REMOVAL

1) Remove parking brake lever cover.
2) Disconnect lead wire of parking brake switch at coupler.
3) Remove parking brake cable locking nut.
4) Remove parking brake lever bolts and then remove parking brake lever assembly from equalizer.
5) 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.

INSTALLATION

1) Install in reverse order of REMOVAL procedure.
2) After all parts are installed, parking brake lever needs to be adjusted. Refer to PARKING BRAKE INSPECTION AND ADJUSTMENT in this section (page 5-22).
3) Check brake drum for dragging and brake system for proper performance.

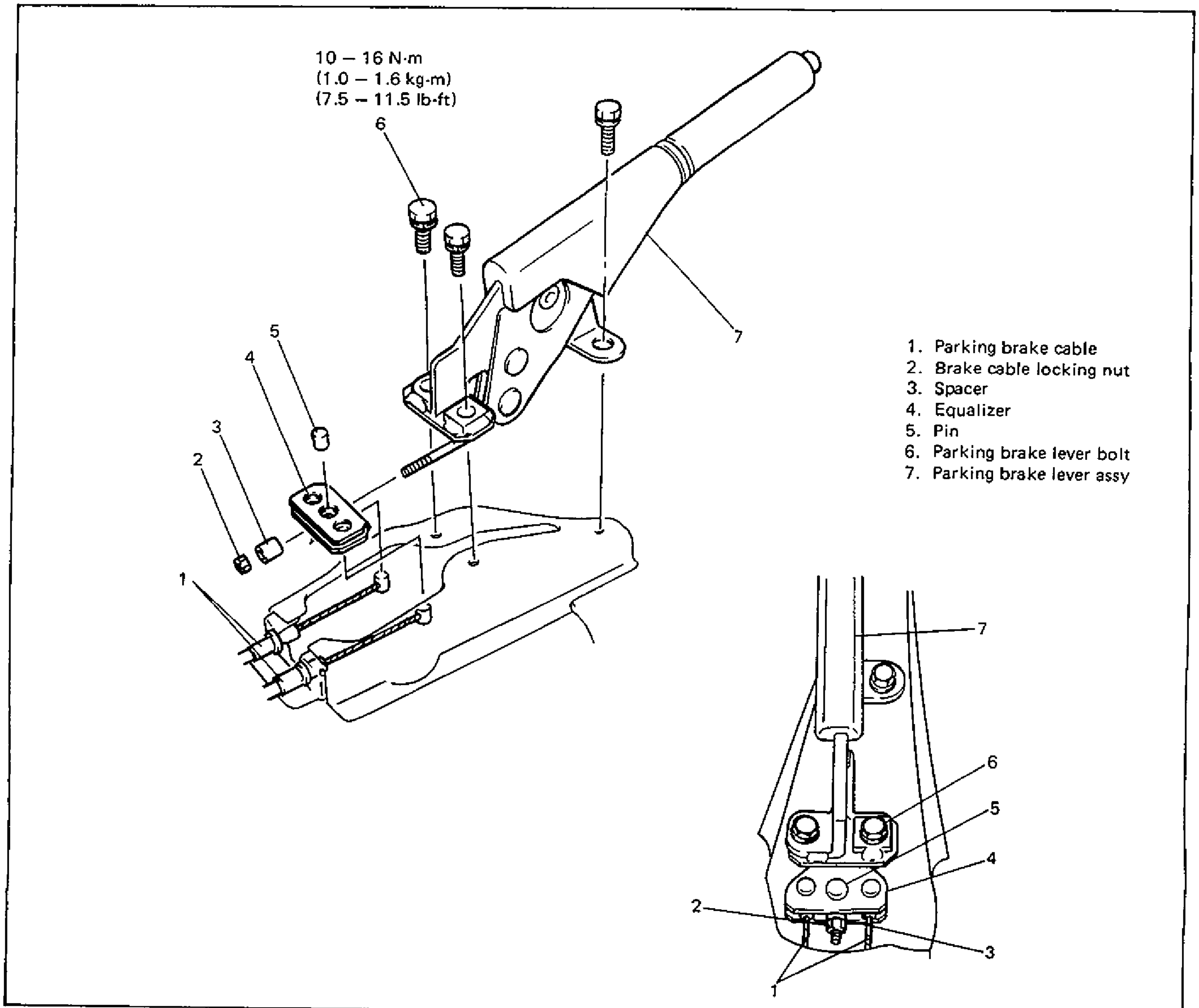


Fig. 5-39

2. REMOVE AND INSTALL PARKING BRAKE CABLE

REMOVAL

1) Remove brake drum. (Refer to steps 1) to 6) of BRAKE DRUM REMOVAL of this section, page 5-39.)
2) Disconnect parking brake cable from brake shoe lever. (Refer to steps 2) & 3) of BRAKE SHOE REMOVAL of this section, page 5-41.)
3) Disconnect brake cable from brake back plate. (Refer to step 7) of BRAKE BACK PLATE REMOVAL section, page 5-43.)

NOTE:
When it is necessary to remove both right and left parking brake cables, repeat above steps 1) to 3) on right and left wheels.

4) Remove cable from parking brake lever. (Refer to steps 1), 2) & 3) of PARKING BRAKE LEVER REMOVAL of this section, page 5-28.)

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 below.

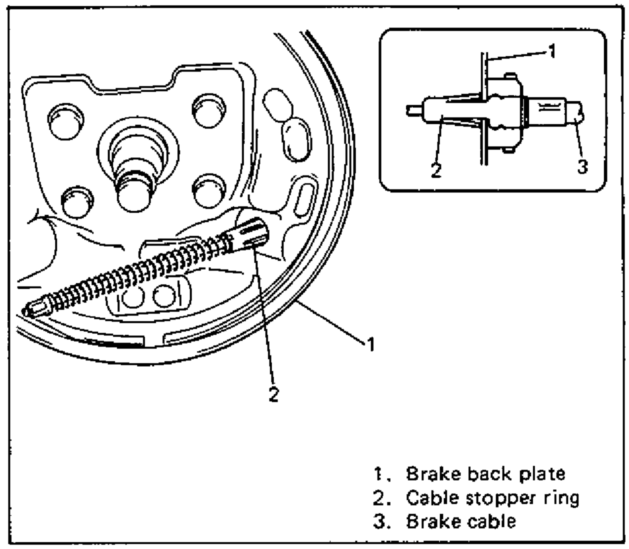


Fig. 5-40

2) Install brake cable spring and nipple end to parking brake shoe lever securely as shown below.

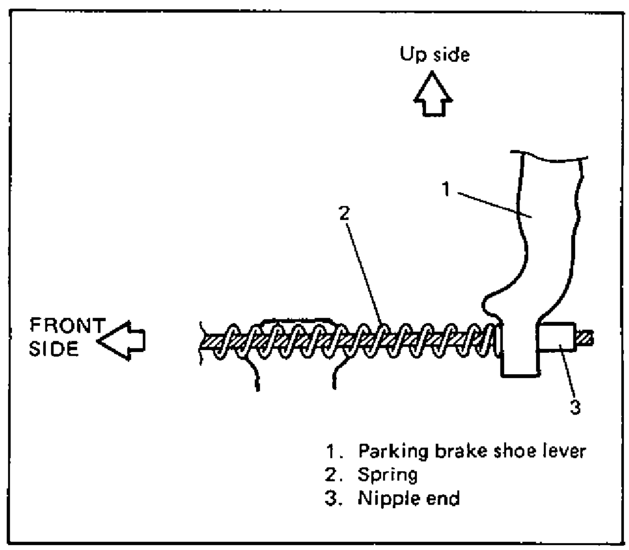
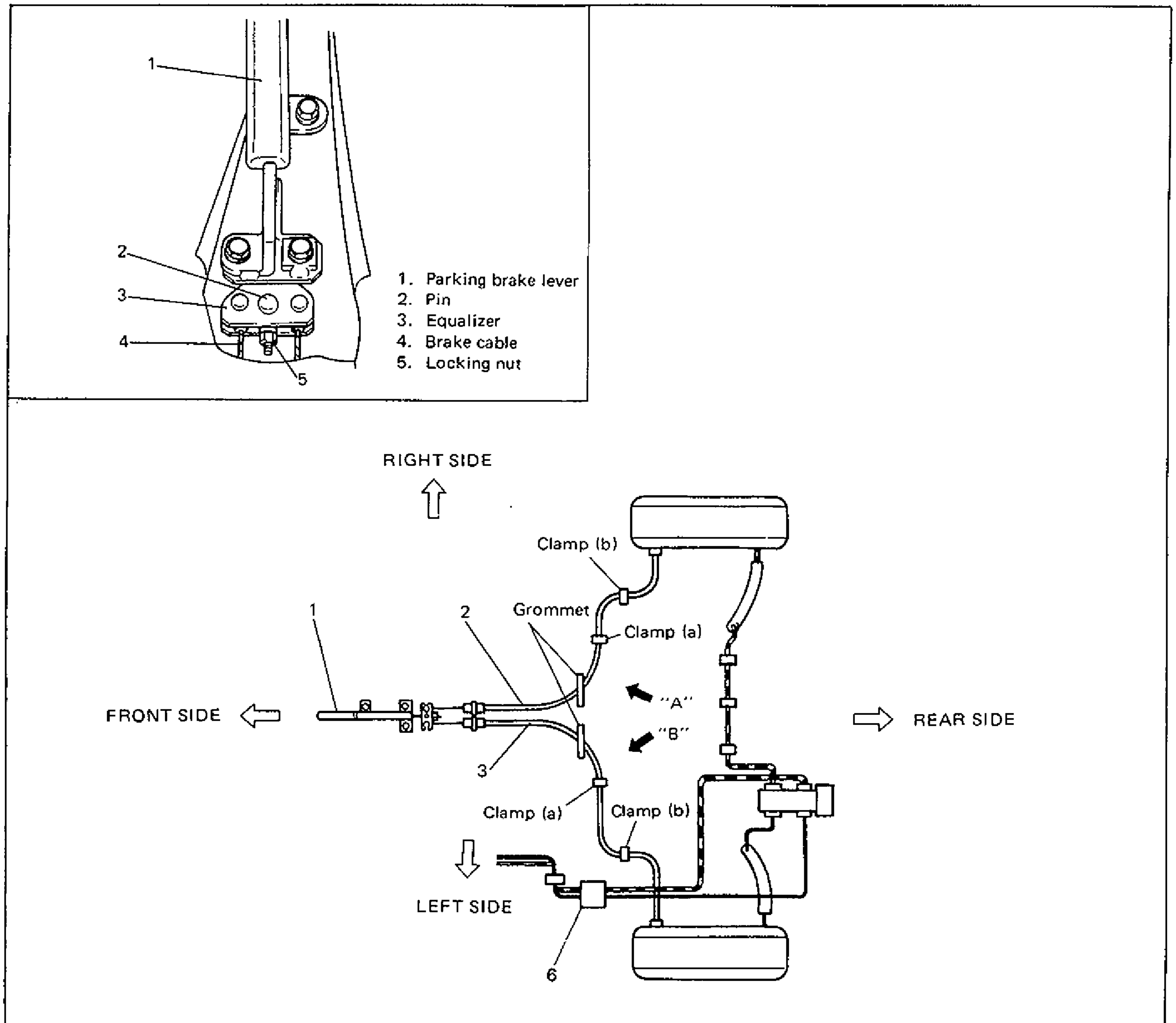


Fig. 5-41

3) For brake shoe installation, refer to steps 1) and 2) of BRAKE SHOE INSTALLATION of this section, page 5-41.
4) For brake drum installation, refer to steps 1) and 4) of BRAKE DRUM INSTALLATION of this section, page 5-40.
5) For proper routing and secure clamping of parking brake cable, refer to figure below.
6) For installation of cable to parking brake lever, refer to PARKING BRAKE LEVER INSTALLATION of this section, page 5-28.
7) Upon completion of installation, adjust cable. (Refer to PARKING BRAKE INSPECTION AND ADJUSTMENT of this section, page 5-22.) Then check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.



1. Parking brake lever
2. Parking brake cable (right side)
3. Parking brake cable (left side)

Fig. 5-42

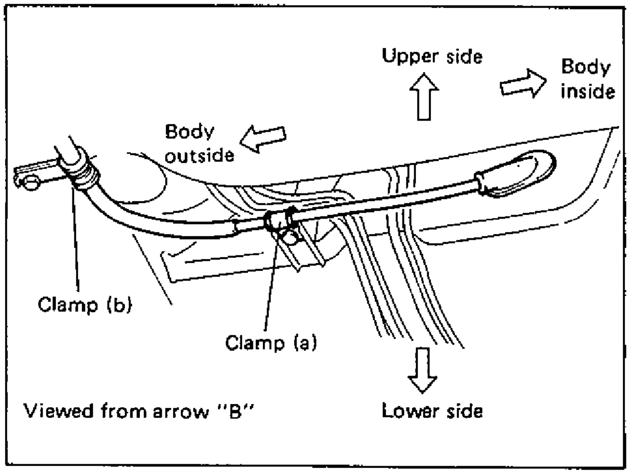


Fig. 5-43

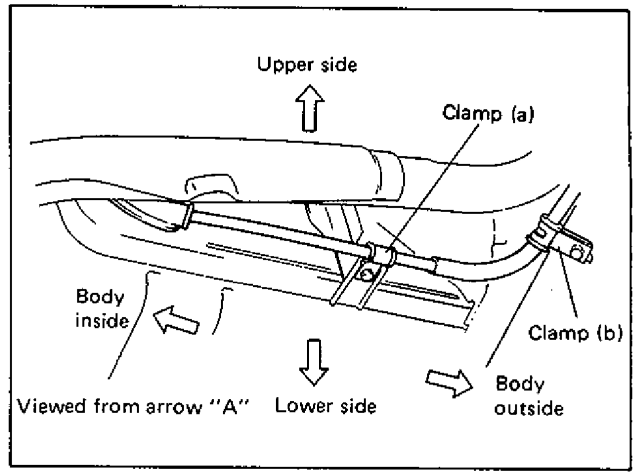


Fig. 5-44

FRONT DISC BRAKE R & I

1. REMOVE AND INSTALL PAD (SHOE & LINING)

REMOVAL

1) Hoist car and remove wheel.
2) Remove caliper pin bolts.

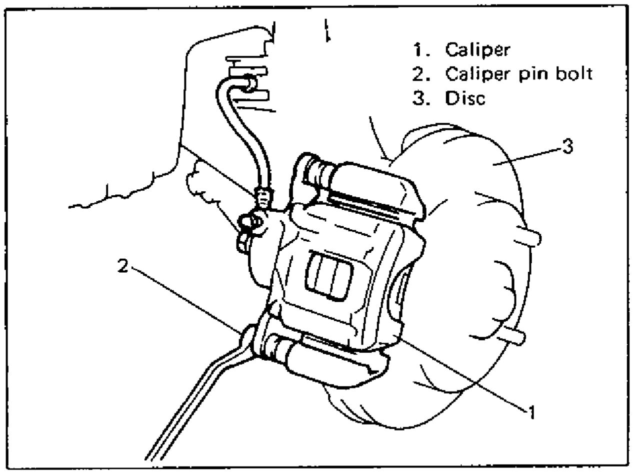


Fig. 5-45

3) Remove caliper from caliper carrier.

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

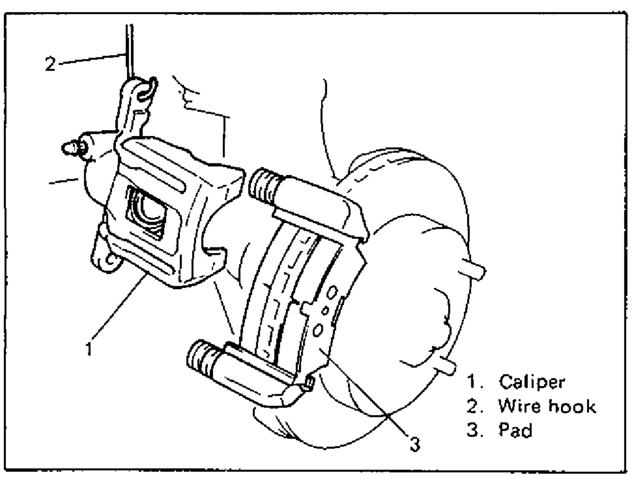


Fig. 5-46

4) Remove pads.

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Install pad clips and pads.

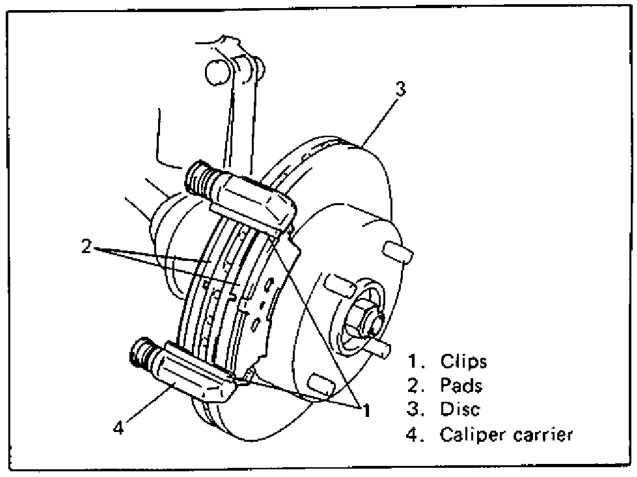


Fig. 5-47

2) Install caliper and torque caliper pin bolts to specification.

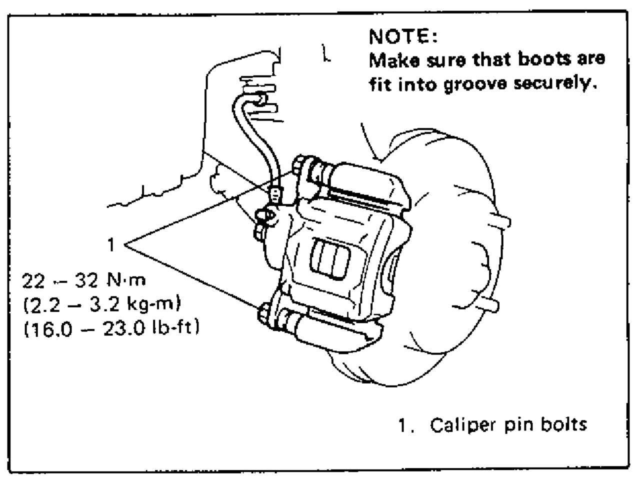


Fig. 5-48

3) Torque front wheel nuts to specification. (Refer to Fig. 5-149)
4) Upon completion of installation, perform brake test.

2. REMOVE AND INSTALL CALIPER ASSEMBLY

REMOVAL

1) Hoist car and remove wheel.
2) Remove brake flexible hose mounting bolt from caliper. As this will allow fluid to flow out of hose, have a container ready beforehand.

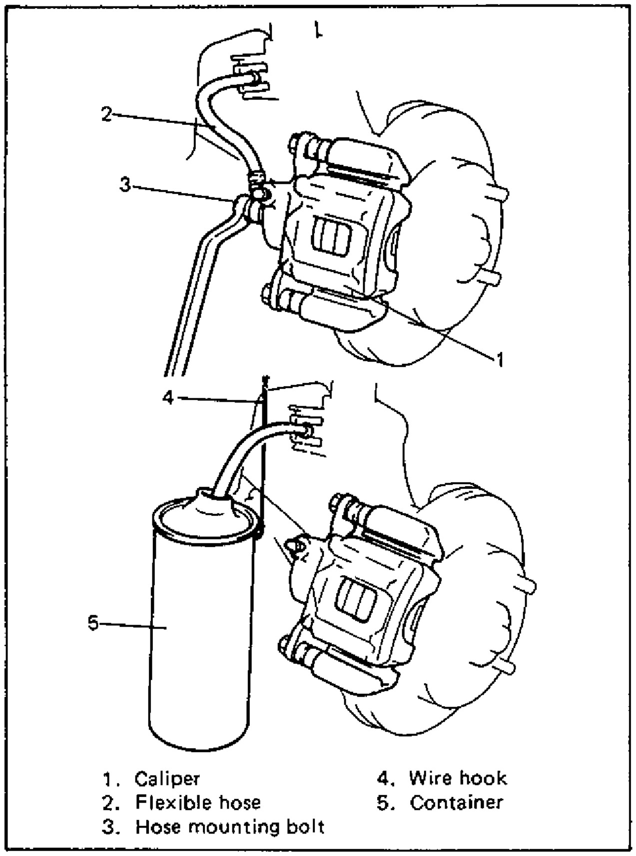


Fig. 5-49

3) Remove caliper pin bolts.

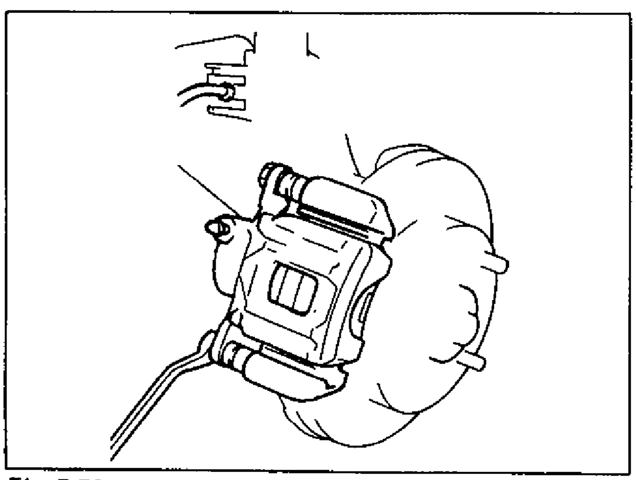


Fig. 5-50

4) Remove caliper from carrier.

INSTALLATION

1) Install caliper to caliper carrier.
2) Torque caliper pin bolts to specification.

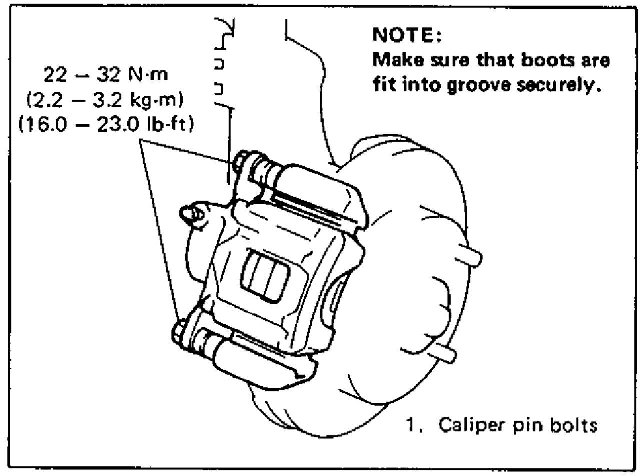


Fig. 5-51

3) Install brake flexible hose as shown and torque hose mounting bolt to specification.

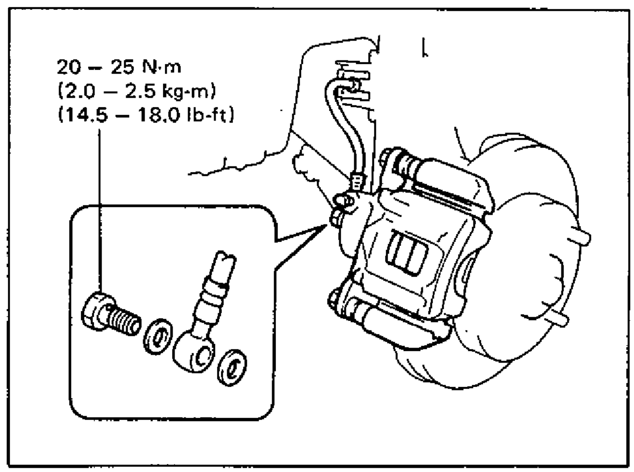


Fig. 5-52

4) Torque wheel nuts to specification. (Refer to Fig. 5-149)
5) After completing installation, fill reservoir with brake fluid and bleed brake system. Perform brake test and check each installed part for oil leakage.

3. REMOVE AND INSTALL SEAL, PISTON, DUST BOOT AND BLEEDER SCREW

REMOVAL

Before disassembly, clean all around caliper with brake fluid.

1) Blow compressed air into cylinder through bolt hole where flexible hose was fitted. With this air pressure, piston can be pushed out of cylinder.

> WARNING:
> **Do not apply too highly compressed air which will cause piston to jump out of cylinder. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.**

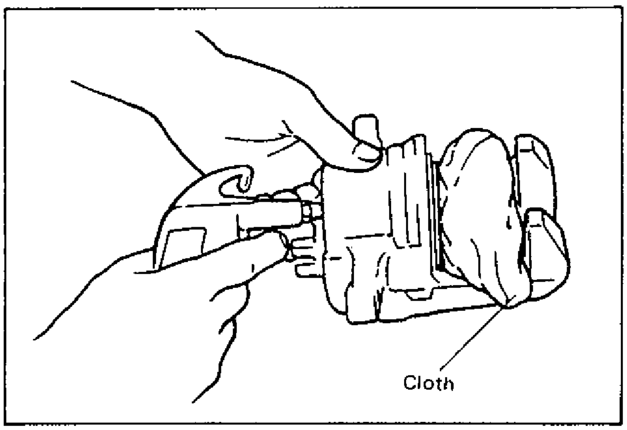


Fig. 5-53

2) Remove piston seal using a thin blade like a thickness gauge, etc.

NOTE:
Be careful not to damage inside (bore side) of cylinder.

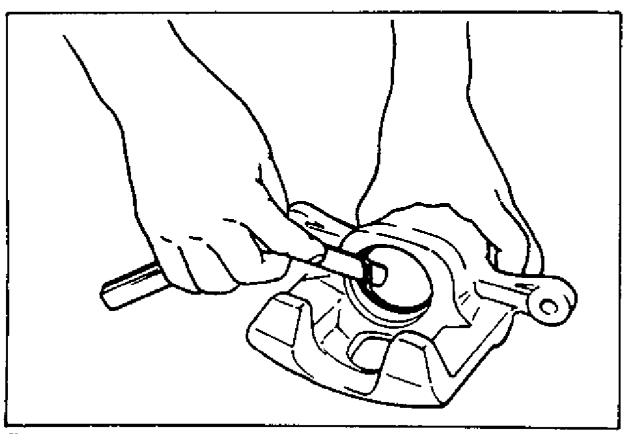


Fig. 5-54

INSTALLATION

Reassemble front brake in reverse order of disassembly, noting the following points.

> CAUTION:
> - **Wash each part cleanly before installation in the same fluid as the one used in master cylinder reservoir.**
> - **Never use other fluid or thinner.**
> - **Before installing piston and piston seal to cylinder, apply fluid to them.**
> - **After reassembling brake lines, bleed air from them.**

Piston Seal

Piston seal is used to seal piston and cylinder and to adjust clearance between pad and disc. Replace with a new one at every overhaul. Fit piston seal into groove in cylinder taking care not to twist it.

Piston and Boot

1) Before inserting piston into cylinder, install boot onto piston as shown below.

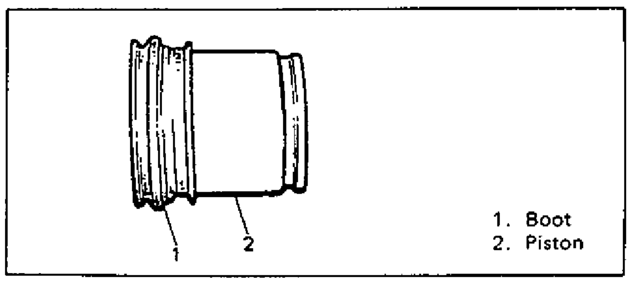


Fig. 5-55

2) Fit boot as it is in above figure into boot groove in cylinder with fingers.

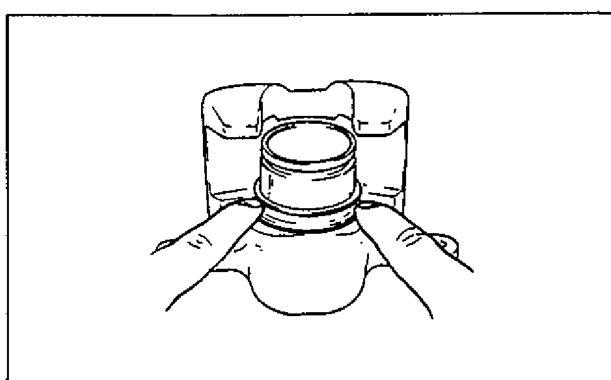


Fig. 5-56

3) Insert piston into cylinder by hand and fit boot in boot groove in piston.

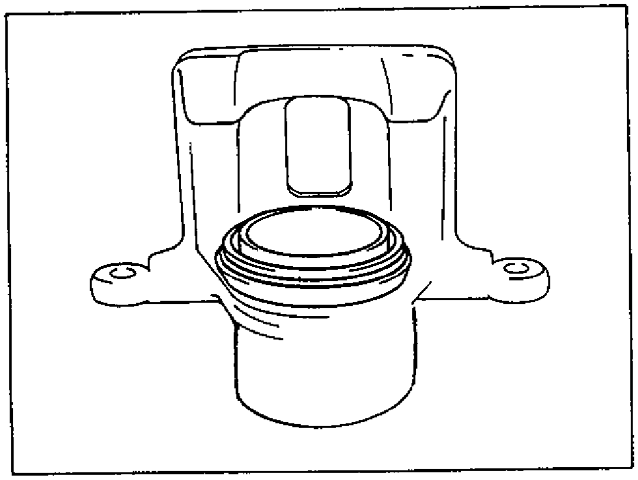
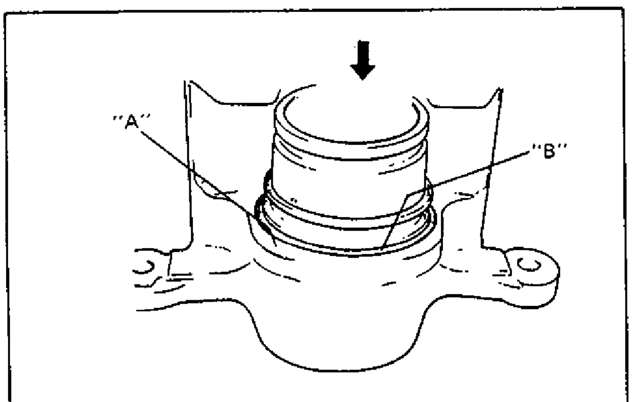


Fig. 5-57

4) To confirm that boot is fitted in its groove in cylinder properly, pull piston out of cylinder a little but do not take it all out.



Boot's face "B" should be at the same level from cylinder's face "A" all around.

Fig. 5-58

5) Insert piston into cylinder by hand.

Caliper
Before installing caliper (cylinder body) to carrier, check to ensure that guide pin inserted in each caliper carrier hole can be moved smoothly in thrust direction.

NOTE:
Where temperature gets as low as –30°C in cold weather, use rubber grease whose viscosity varies very little even at –40°C (–40°F).

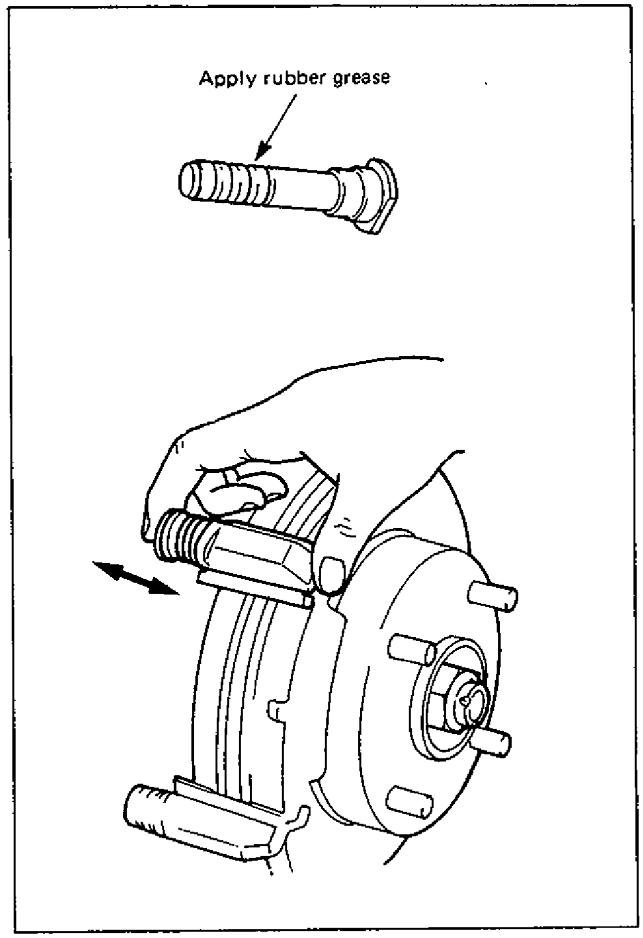


Fig. 5-59

4. REMOVE AND INSTALL DISC

REMOVAL

1) Hoist car and remove wheel.
2) Remove caliper assembly by loosening carrier bolts (2 pcs).

> **CAUTION:**
> **During removal, be careful not to damage brake flexible hose and not to depress brake pedal.**

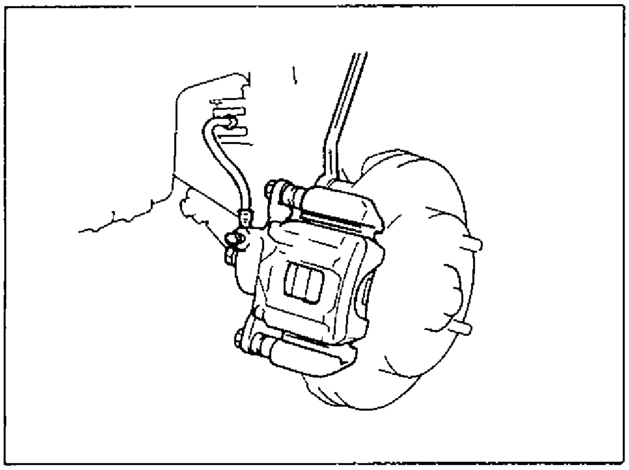


Fig. 5-60

3) Remove brake disc screws (2 pcs).

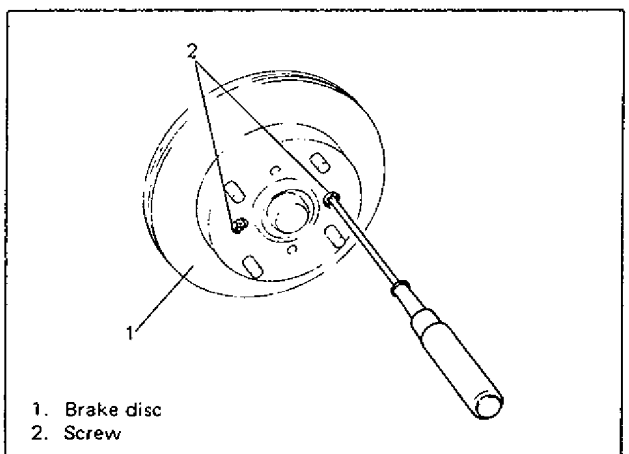


Fig. 5-61

4) Pull brake disc off by using 8 mm bolts (2 pcs).

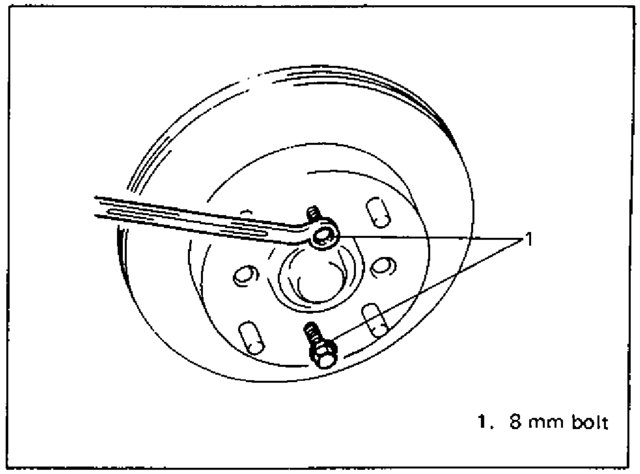


Fig. 5-62

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Install disc to wheel hub.
2) Install caliper assembly to steering knuckle.
3) Torque caliper carrier bolts to specification.

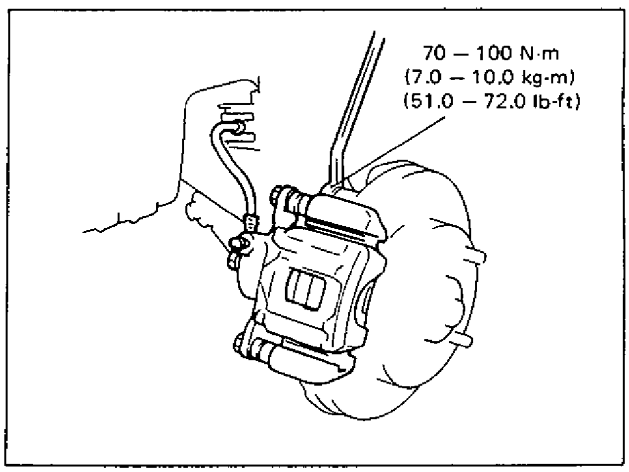


Fig. 5-63

4) Torque front wheel nuts to specification. (Refer to Fig. 5-149)
5) Upon completion of installation, perform brake test.

FRONT DISC BRAKE INSPECTION

1. INSPECT BRAKE PAD LINING

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

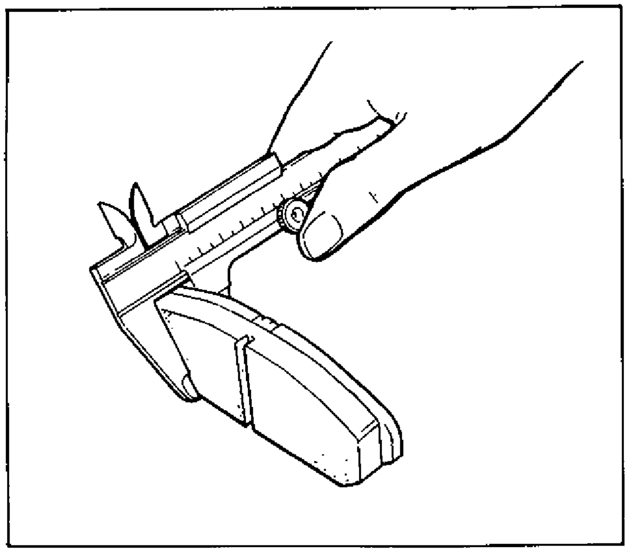


Fig. 5-64

> **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.**

	Standard	Limit
Pad thickness (lining + pad rim)	16.0 mm (0.630 in.)	9.0 mm (0.354 in.)

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

2. INSPECT BRAKE CALIPER INNER PARTS

Cylinder Slide Guide Pin

Check guide pin for smooth movement as shown. If it is found faulty, correct or replace. Apply rubber grease to guide pin outer surface. Rubber grease should be the one whose viscosity is less affected by such low temperature as −40°C (−40°F).

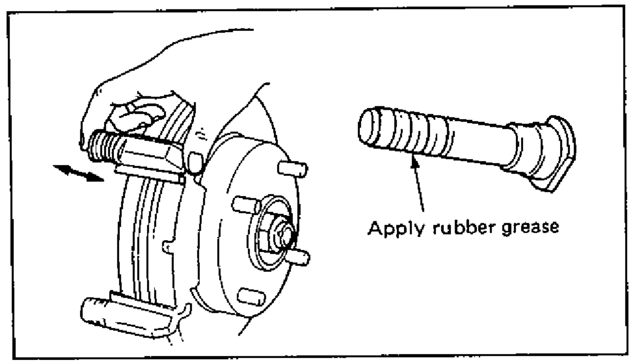


Fig. 5-65

Bush Dust Boot and Cylinder Boot

Check boots for breakage, crack and damage. If defective, replace.

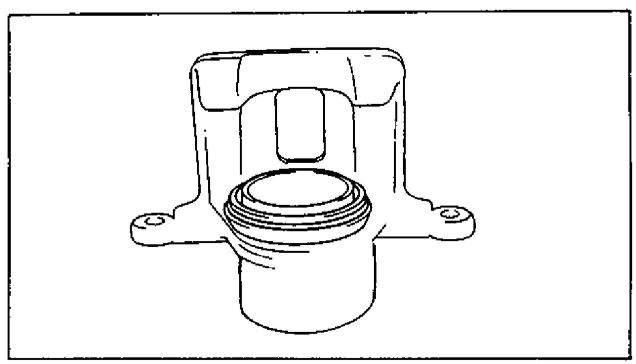


Fig. 5-66

Piston Seal

Excessive or uneven wear of pad lining may indicate unsmooth return of the piston. In such a case, replace rubber seal.

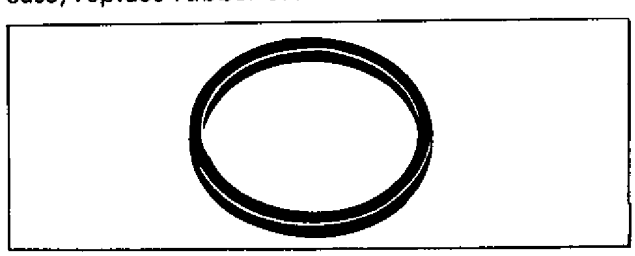


Fig. 5-67

3. INSPECT BRAKE DISC

Before this inspection, brake pads must be removed (according to steps 1) to 4) on page 5-32.)

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.

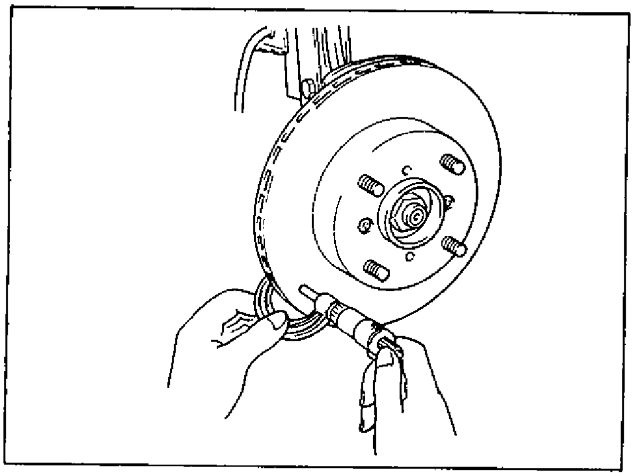


Fig. 5-68

Disc thickness	Standard	Limit
	18.5 mm (0.73 in.)	16.5 mm (0.65 in.)

To measure deflection of disc, take measurement at 2 points on its periphery and center with dial gauge while rotating it.

Limit on disc deflection	0.1 mm (0.004 in.)

NOTE:
Check front wheel bearing for looseness before measurement.

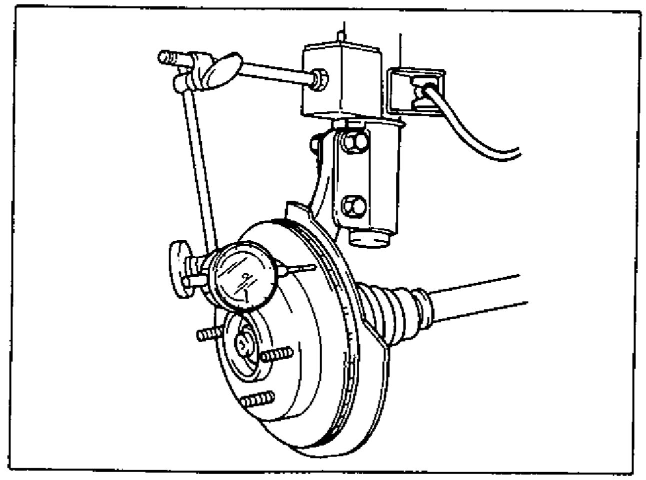


Fig. 5-69

DRUM AND COMPONENTS R & I

1. REMOVE AND INSTALL BRAKE DRUM

REMOVAL

1) Hoist car and remove wheel.
2) Remove brake drum screws (2 pcs).

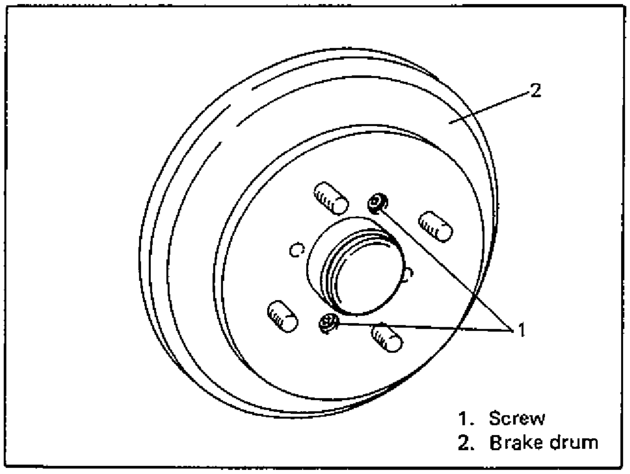


Fig. 5-76

3) Release parking brake lever.
4) Remove parking brake lever cover screws and loosen parking brake cable locking nut.

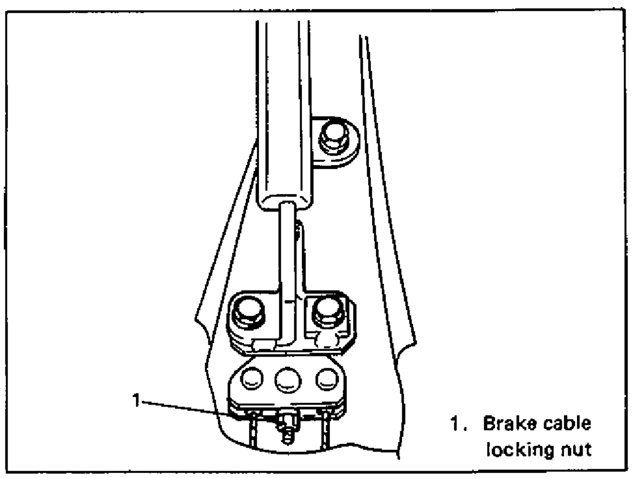


Fig. 5-77

5) 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 a screwdriver into plug hole till its tip contacts shoe hold down spring and push driver in the arrow direction.

With this push, hold down spring is pushed up and releases parking shoe lever from hold down spring, resulting in larger clearance.

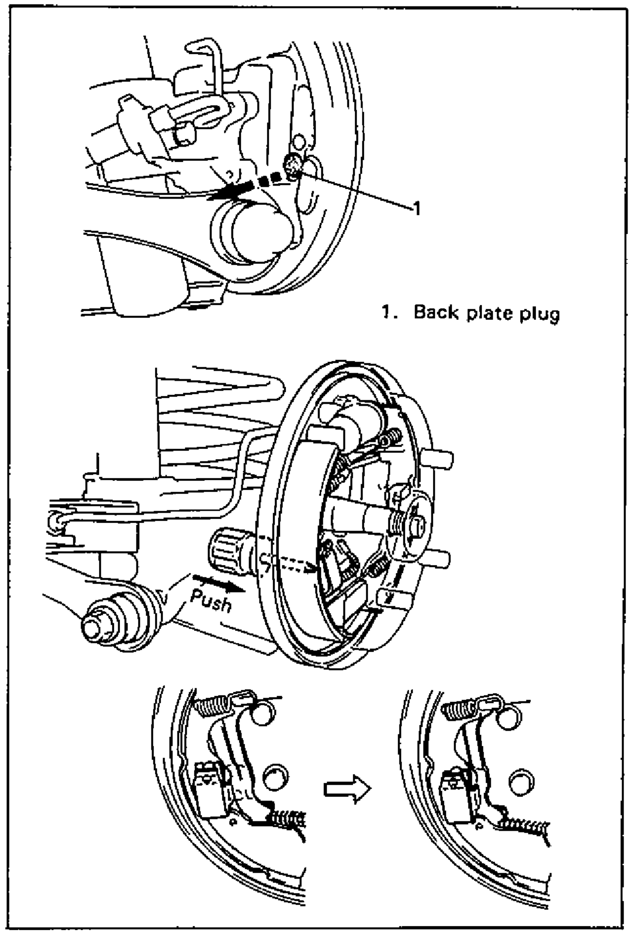


Fig. 5-78

6) Pull brake drum off by using 8 mm bolts (2 pcs).

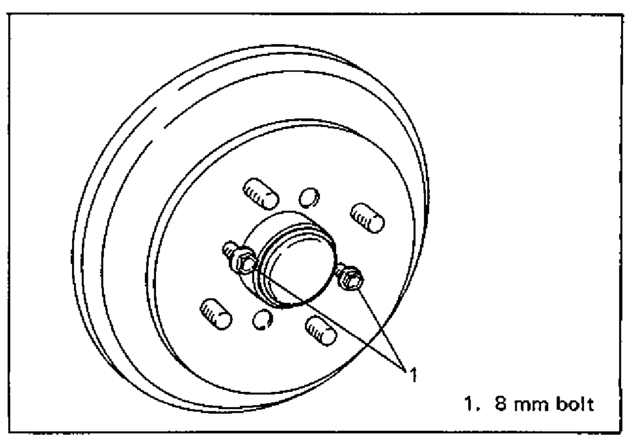


Fig. 5-79

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

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 figure.

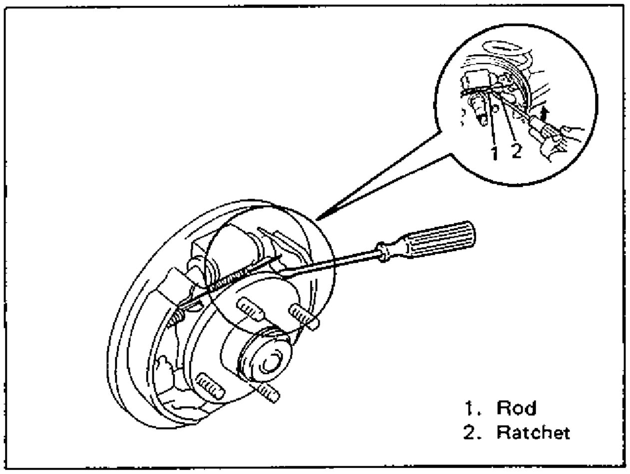


Fig. 5-80

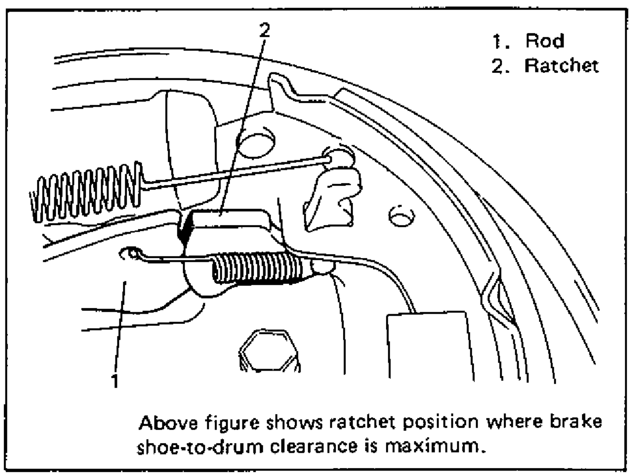


Fig. 5-81

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.)

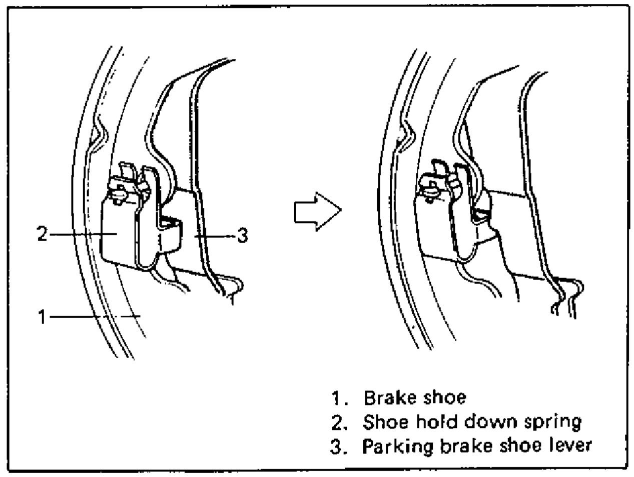


Fig. 5-82

3) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.
4) Tighten brake durm screws.
5) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, see page 5-22.)
6) Tighten parking brake lever cover screws.
7) Install wheel and tighten wheel nuts to specified torque.

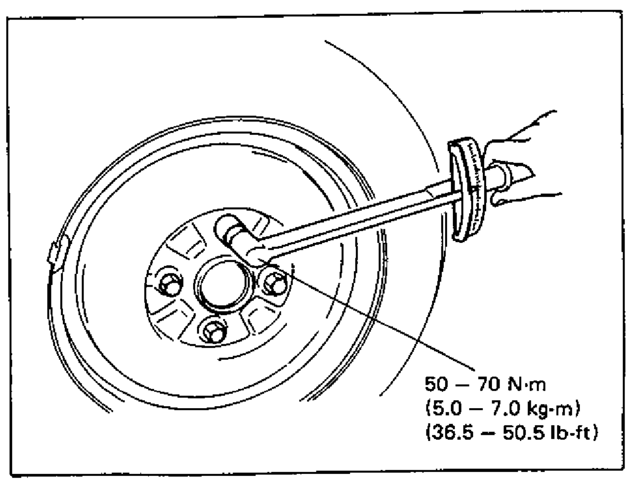


Fig. 5-83

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

2. REMOVE AND INSTALL BRAKE SHOE

REMOVAL

1) Perform steps 1) to 6) of brake drum REMOVAL.
2) Remove shoe hold down springs by turning shoe hold down pins as shown.

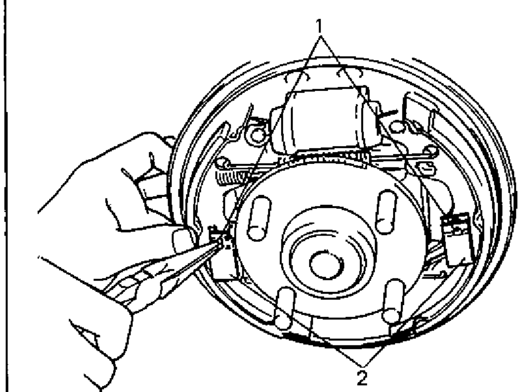


Fig. 5-84

3) Disconnect parking brake shoe lever from parking brake cable and remove brake shoes.

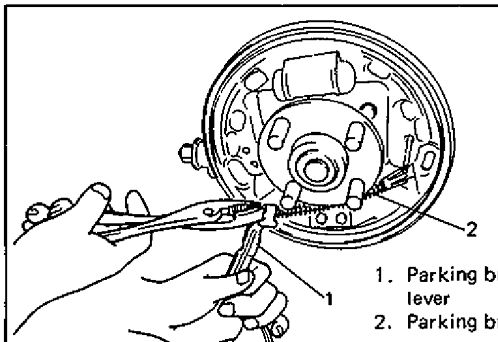


Fig. 5-85

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

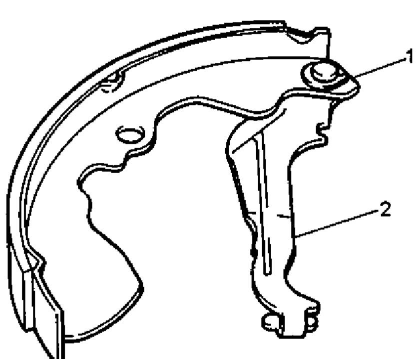


Fig. 5-86

INSTALLATION

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

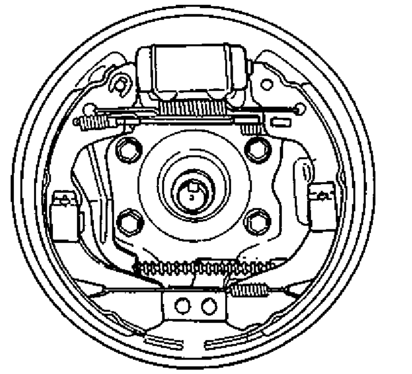


Fig. 5-87

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

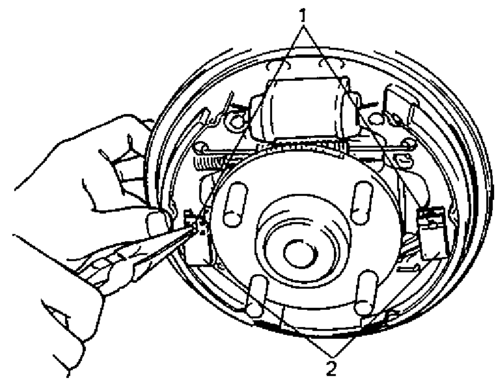


Fig. 5-88

3) For procedure hereafter, refer to steps 1) to 8) of BRAKE DRUM INSTALLATION on page 5-40.

3. REMOVE AND INSTALL WHEEL CYLINDER

REMOVAL

1) Perform steps 1) to 6) of brake drum REMOVAL.
2) Perform steps 2) and 3) of brake shoe REMOVAL.
3) Loosen brake pipe flare nut but only within the extent that fluid does not leak.

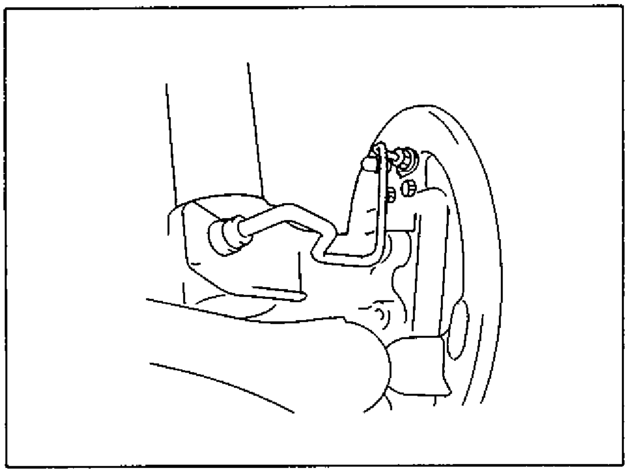


Fig. 5-89

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

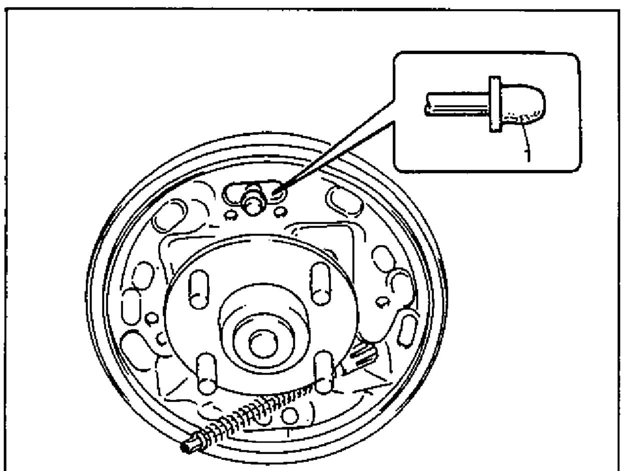


Fig. 5-90

INSTALLATION

1) Apply water tight sealant to joint seam of wheel cylinder and brake back plate. Then take off breather plug cap from brake pipe and connect pipe to wheel cylinder just enough to prevent fluid from leaking.

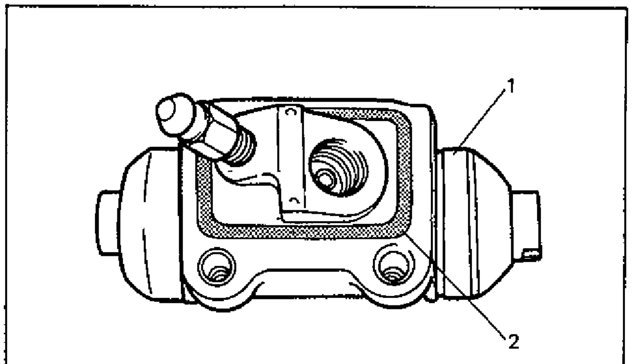


Fig. 5-91

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

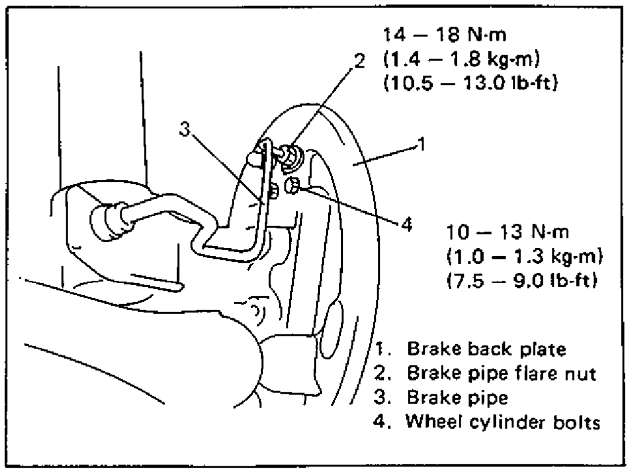


Fig. 5-92

4) Install breather plug cap taken off from pipe back to breather plug.
5) Install brake shoes, referring to steps 1) and 2) of its INSTALLATION on page 5-41.
6) Install brake drum. (Refer to steps 1) to 4) of its INSTALLATION on page 5-40 of this section.
7) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see page 5-23.)
8) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, see page 5-22.)

9) Tighten parking brake lever cover screws.
10) Install wheel and tighten wheel nuts to specified torque. (refer to Fig. 5-149.)
11) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove car from hoist and perform brake test (foot brake and parking brake).
12) Check each installed part for oil leakage.

4. REMOVE AND INSTALL BRAKE BACK PLATE

REMOVAL

1) Perform steps 1) to 6) of brake drum REMOVAL on page 5-39.
2) Remove spindle cap as shown (by hammering lightly at 3 locations around it so as not to deform or cause damage to seating part of cap).

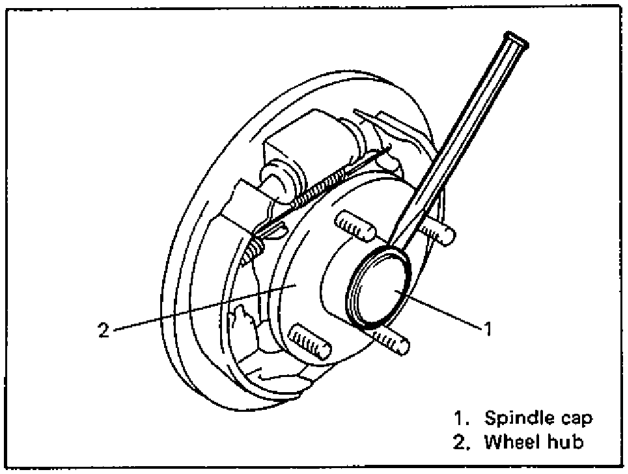


Fig. 5-92-1

3) Uncalk spindle nut and remove spindle nut and washer.

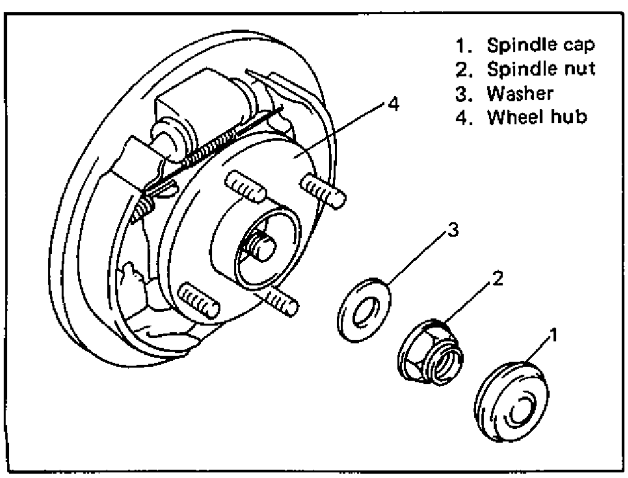


Fig. 5-92-2

4) Pull wheel hub off by using special tools.

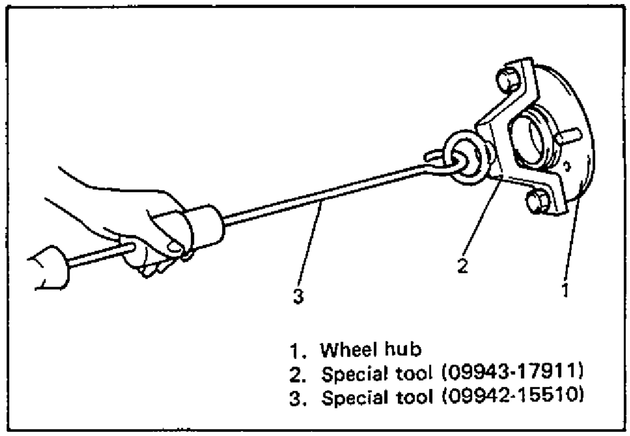


Fig. 5-92-3

5) Perform steps 2) and 3) of brake shoe REMOVAL on page 5-41.
6) Perform steps 3) and 4) of wheel cylinder REMOVAL on page 5-42.
7) Remove cable from brake back plate by squeezing parking brake cable stopper ring.

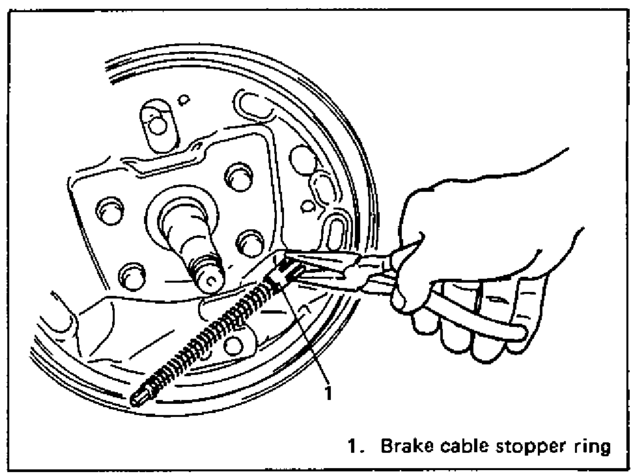


Fig. 5-93

8) Remove brake back plate.

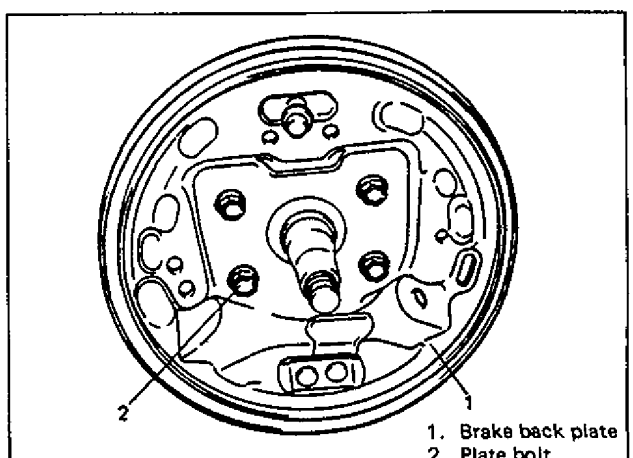


Fig. 5-94

INSTALLATION

1) Apply water tight sealant to mating surfaces of brake back plate and rear knuckle.

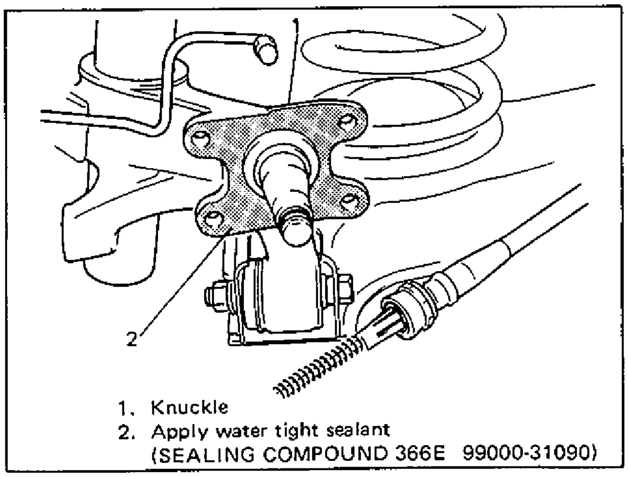


Fig. 5-95

2) Install brake back plate and tighten back plate bolts to specified torque.

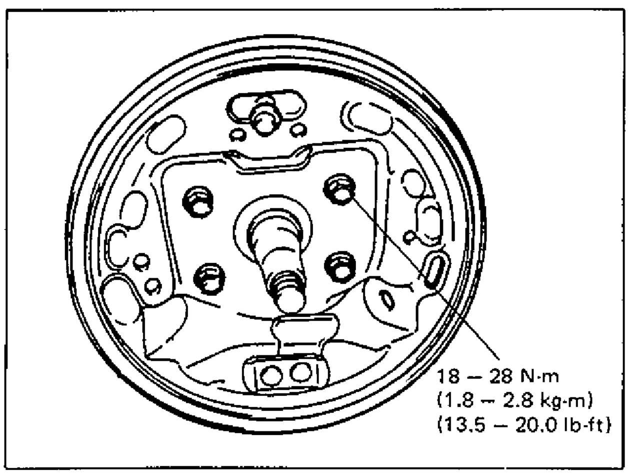


Fig. 5-96

3) Install parking brake cable to brake back plate.

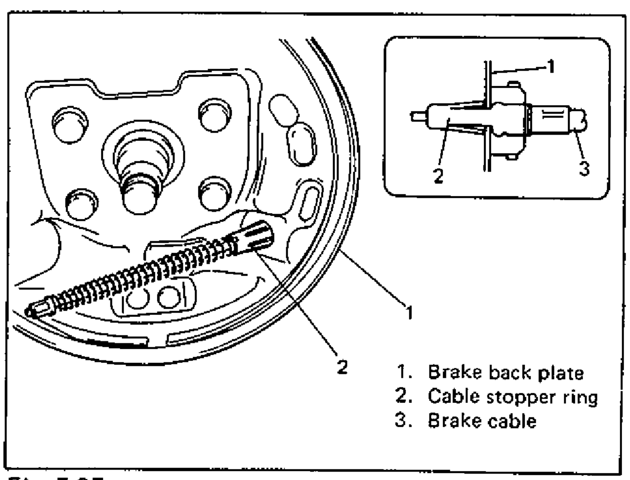


Fig. 5-97

4) Install wheel cylinder, and tighten wheel cylinder bolts and brake pipe flare nut to specified torque. (Refer to steps 1) to 4) of wheel cylinder INSTALLATION on page 5-42 of this section.)
5) Install brake shoes, referring to steps 1) and 2) of its INSTALLATION on page 5-41.
6) Install wheel hub, washer and new spindle nut.
7) Tighten spindle nut to specified torque.

NOTE:
Removed spindle nut should be replaced with new one.

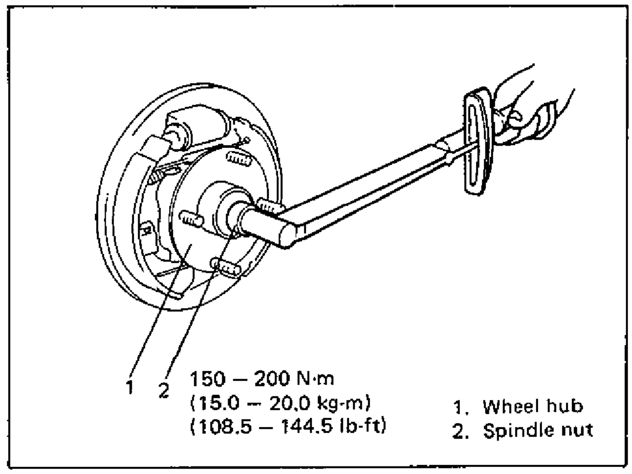


Fig. 5-97-1

8) Calk spindle nut as shown.

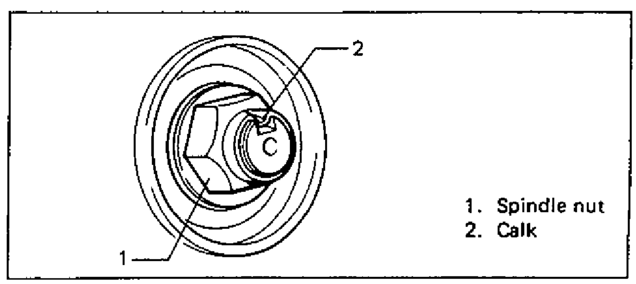


Fig. 5-97-2

9) Install spindle cap.

NOTE:
- **When installing spindle cap, hammer lightly several locations on the collar of cap until collar comes closely into contact with brake drum.**
- **If fitting part of cap is deformed or damaged or if it is fitted loosely, replace with new one.**

10) For procedure hereafter, refer to steps 6) to 12) of wheel cylinder INSTALLATION on page 5-42.

BRAKE DRUM AND COMPONENTS INSPECTION

1. INSPECT BRAKE DRUM

Inspect drum for cleanliness. Check wear of its braking surface by measuring its inside diameter.

Item	Standard	Service limit
Brake drum ID	200 mm (7.87 in.)	202 mm (7.95 in.)

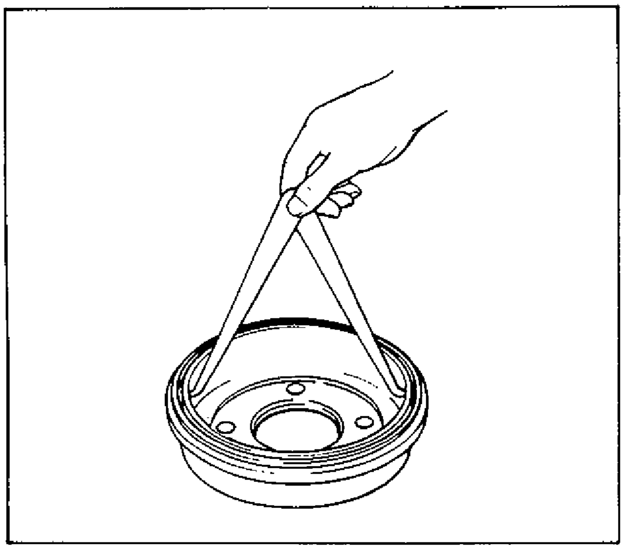


Fig. 5-98

Whenever brake drums are removed, they should be thoroughly cleaned and inspected for cracks, scores, deep grooves.

Cracked, Scored, or Grooved Drum

A cracked drum is unsafe for further service and must be replaced. Do not attempt to weld a cracked drum.

Smooth up any slight scores. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to resurface drum braking surface.

If brake linings are slightly worn and drum is grooved, drum should be polished with fine emery cloth but should not be turned.

NOTE:

When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.

2. INSPECT BRAKE SHOE & LINING

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

Brake lining	Standard	Service limit
Thickness (lining + shoe rim)	6.1 mm (0.24 in.)	2.8 mm (0.11 in.)

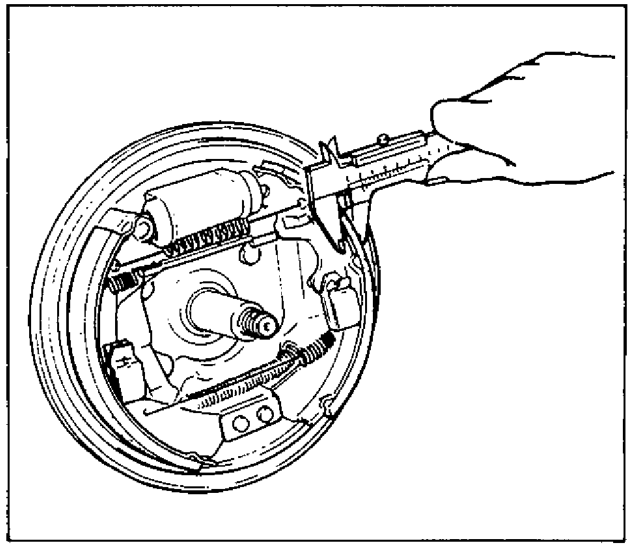


Fig. 5-99

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

NOTE:

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.

3. INSPECT WHEEL CYLINDER

Inspect wheel cylinder disassembled parts for wear, cracks, corrosion or damage.

NOTE:
Clean wheel cylinder components with brake fluid.

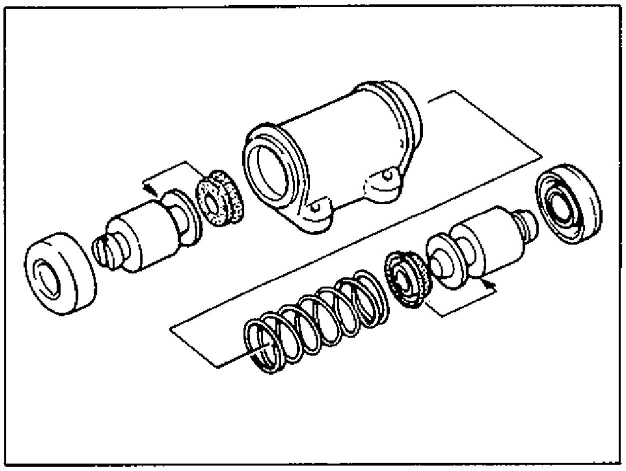


Fig. 5-100

4. INSPECT BRAKE STRUT

Inspect ratchet of strut for wear or damage.

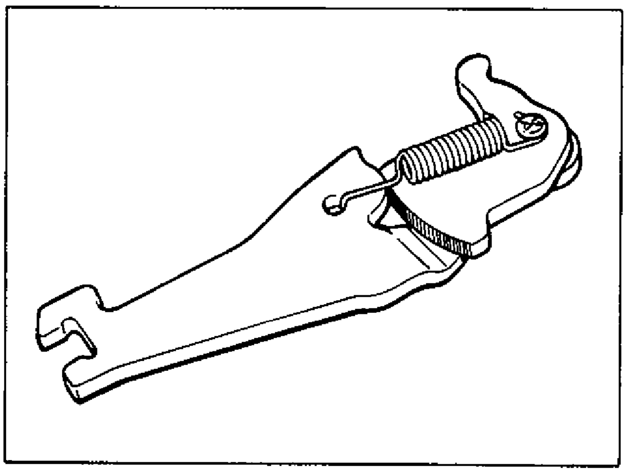


Fig. 5-101

5. INSPECT SPRINGS

Inspect for damage or weakening.
Inspect each part with arrow for rust. If found defective, replace.

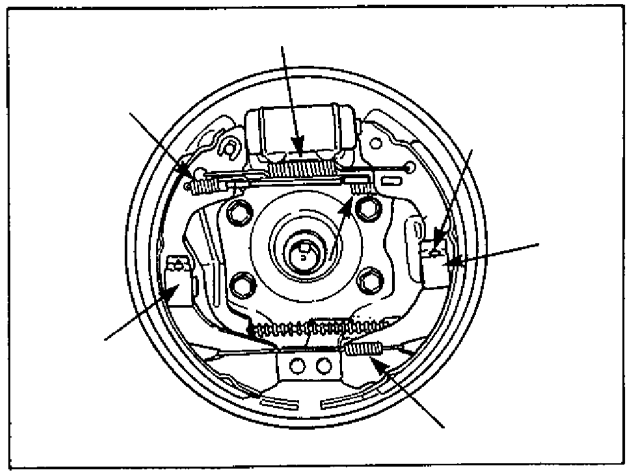


Fig. 5-102

6. INSPECT PARKING SHOE LEVER

Inspect brake shoe lever for free movement against brake shoe web. If defective, correct or replace.

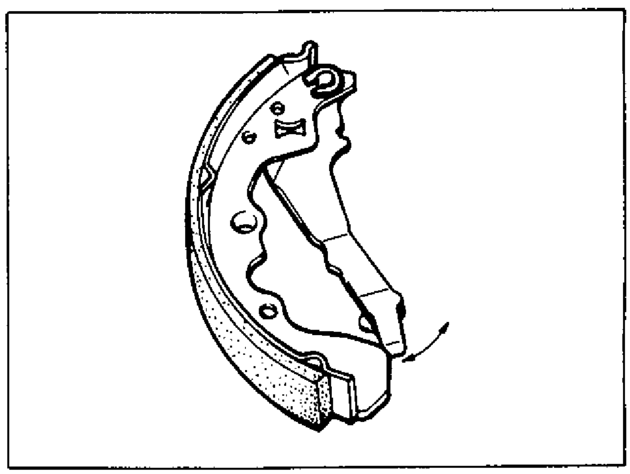


Fig. 5-103

MASTER CYLINDER REPAIR

1. REMOVE AND INSTALL MASTER CYLINDER RESERVOIR

REMOVAL

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

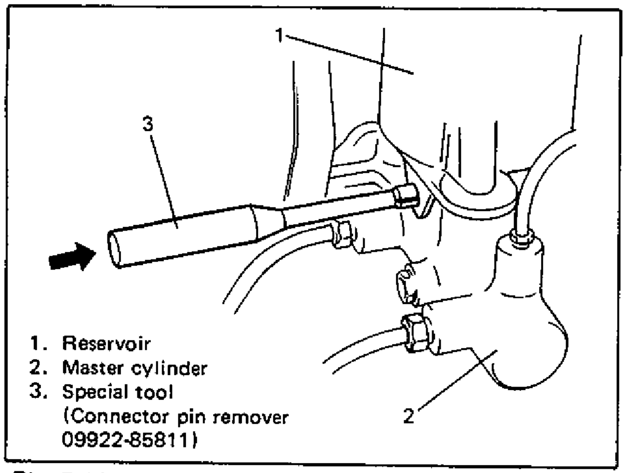


Fig. 5-104

5) Remove reservoir.

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

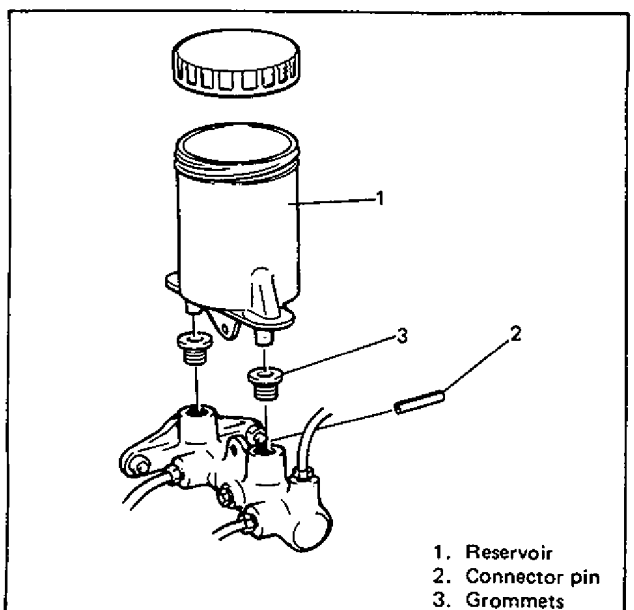


Fig. 5-105

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 of reservoir become the same length.

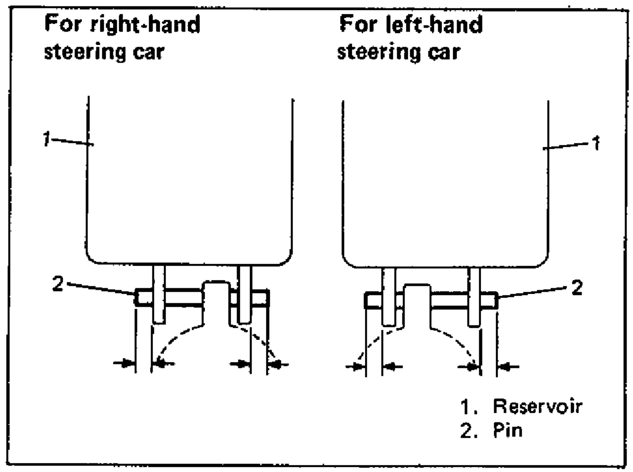


Fig. 5-106

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

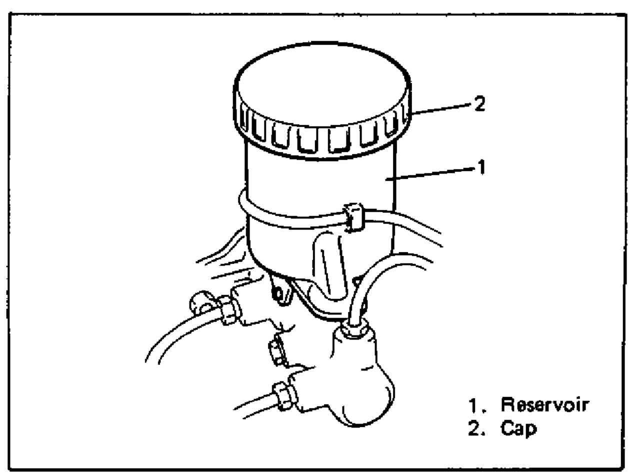


Fig. 5-107

2. REMOVE AND INSTALL MASTER CYLINDER ASSEMBLY

REMOVAL

1) Disconnect reservoir lead wire at coupler.
2) Clean around reservoir cap and take out fluid with syringe or such.
3) Disconnect three brake pipes from master cylinder.

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

4) Remove two attaching nuts/washers.
5) Remove master cylinder.

INSTALLATION

NOTE:
- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and primary piston with special tool (See page 5-62).**

1) Install master cylinder as shown and torque attaching nuts to specification.
2) Attach three hydraulic lines and torque flare nuts to specification.
3) Connect reservoir lead wire.
4) Fill reservoir with specified brake fluid.
5) After installing, check brake pedal play and bleed air from system (See pages 5-23 and 5-24).

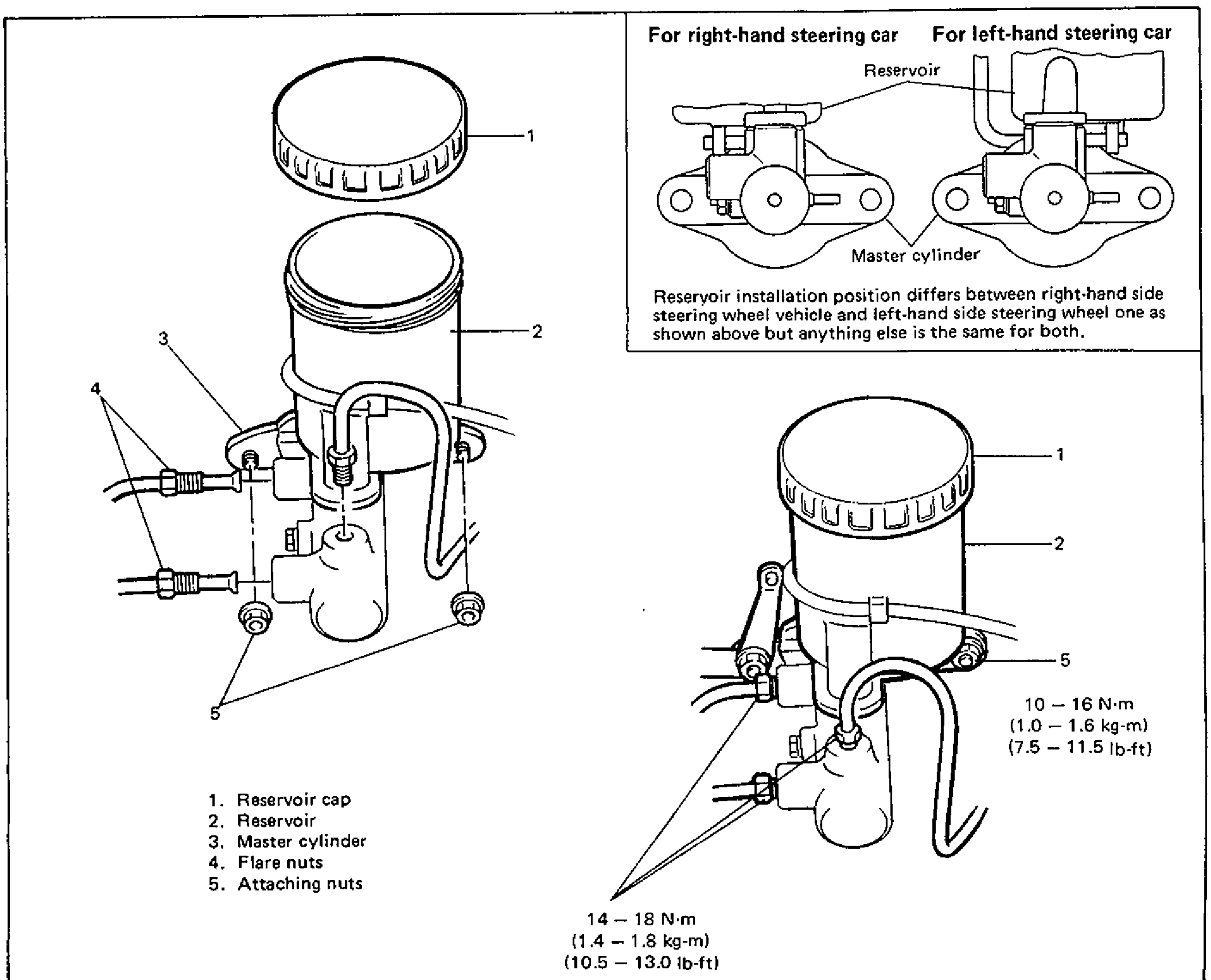


Fig. 5-108 Master Cylinder Repair - A

3. DISASSEMBLE AND ASSEMBLE MASTER CYLINDER

DISASSEMBLY

1) Remove circlip.
2) Remove primary piston.

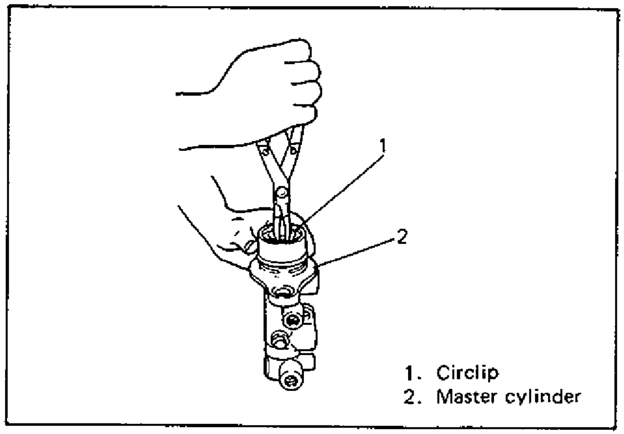


Fig. 5-109

3) Remove piston stopper bolt. Then remove secondary piston by blowing compressed air into hole from which piston stopper bolt was removed.
   Be cautious during removal as secondary piston jumps out.

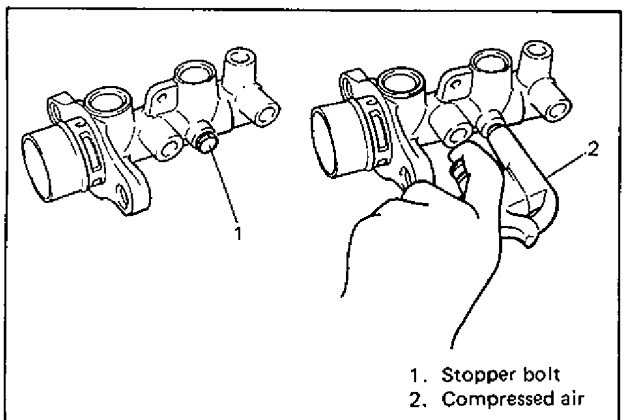


Fig. 5-110

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 in Fig. 5-112.
2) Install secondary piston assembly into cylinder.
3) install primary piston in cylinder.
4) Depress, and install circlip.

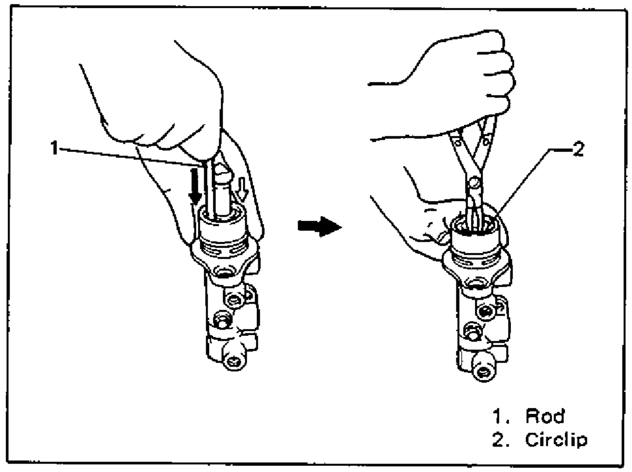


Fig. 5-111

5) Install piston stopper bolt with pistons pushed in all the way and tighten it to specified torque.
6) For installation on vehicle, refer to INSTALLATION on page 5-48.

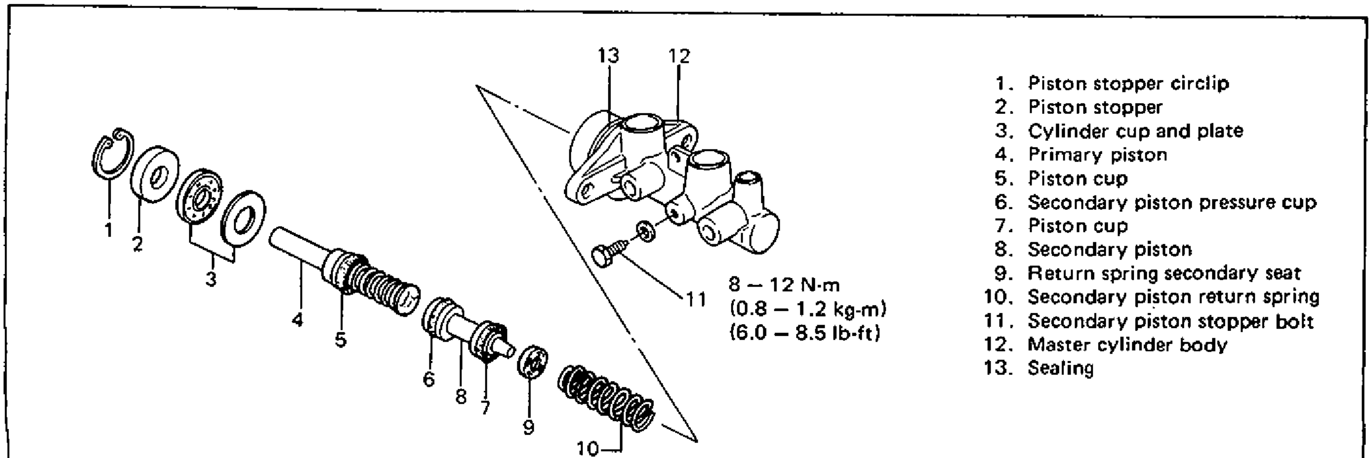


Fig. 5-112 Master Cylinder Repair - B

MASTER CYLINDER INSPECTION

1. INSPECT MASTER CYLINDER

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:

- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston cups.**

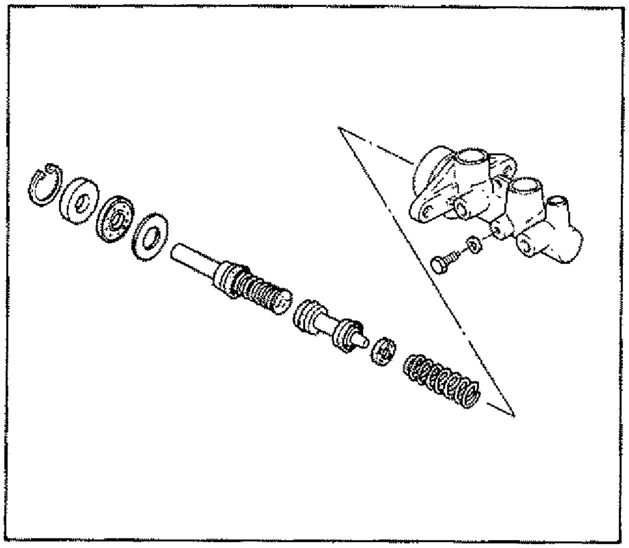


Fig. 5-113

Inspect master cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:

Polishing bore of master cylinder with cast aluminum body with anything abrasive is prohibited, as damage to cylinder bore may occur.

Rinse cylinder in clean brake fluid. Shake excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept from cylinder bore surfaces.

2. FILL RESERVOIR

NOTE:

Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use container which has been used for mineral oil or which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water will mix with brake fluid, lowering fluid boiling point. Keep all fluid containers capped to prevent contamination.

Fluid to fill reservoir with is indicated on reservoir cap of that vehicle with embossed letters or in owner's manual supplied with it.
Add fluid up to MAX line.

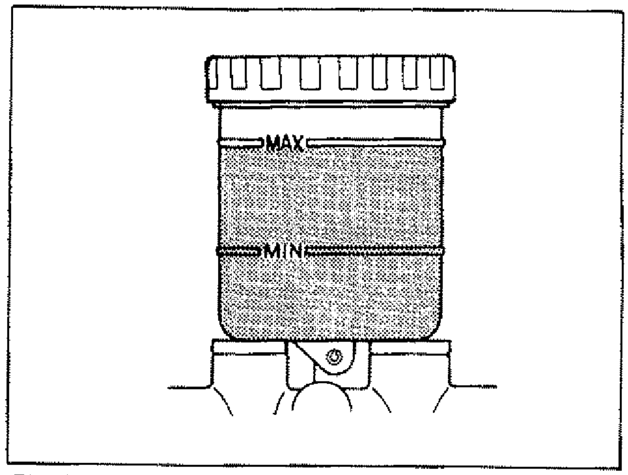


Fig. 5-114

LSPV (Load Sensing Proportioning Valve) R & I

1. REMOVE AND INSTALL LSPV

REMOVAL

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Hoist car.
3) Disconnect brake pipes from LSPV.

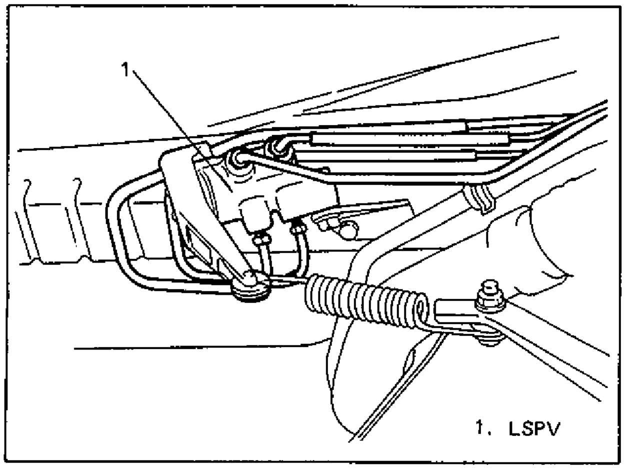


Fig. 5-103-1

4) Remove LSPV assembly from car body.

NOTE:
As shown in figure below, LSPV assembly should be removed together with its spring and stay installed as they are.

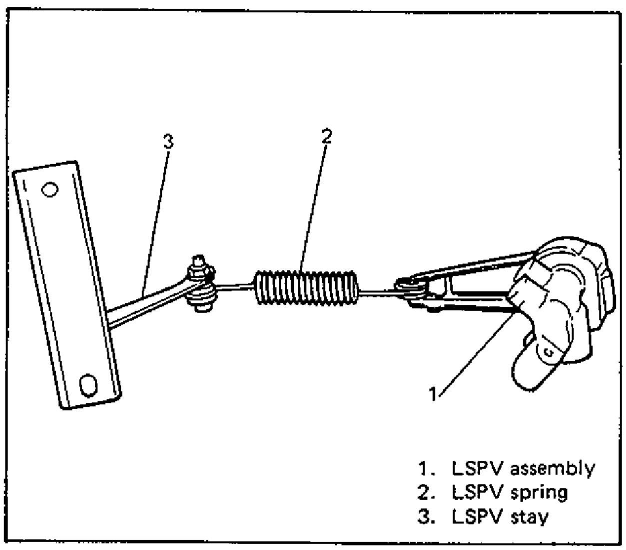


Fig. 5-103-2

5) Remove spring and stay from lever.

CAUTION:
- **None of below indicated screw of LSPV assembly should be loosened or tightened.**
- **LSPV assembly must not be disassembled. Replace with new one if defective.**

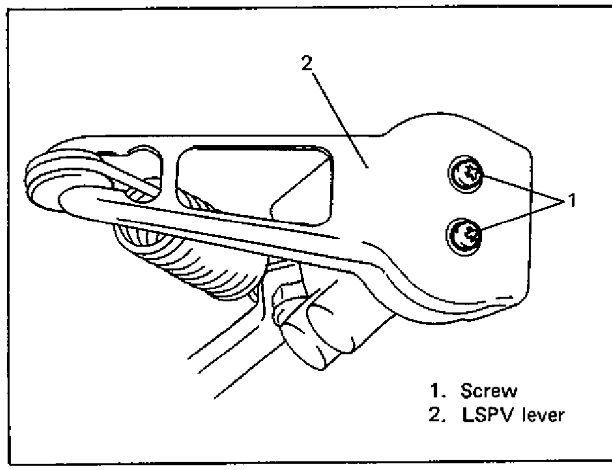


Fig. 5-103-3

INSTALLATION

CAUTION:
Refer to above CAUTION.

Install by reversing removal procedure, noting the following.

1) Apply multi-purpose grease to upper and lower joint of coil spring.

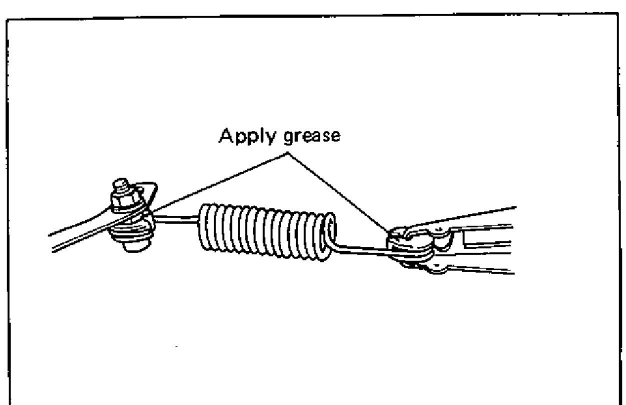


Fig. 5-103-4

2) Torque each bolt and nut to specification as indicated respectively in figure below.

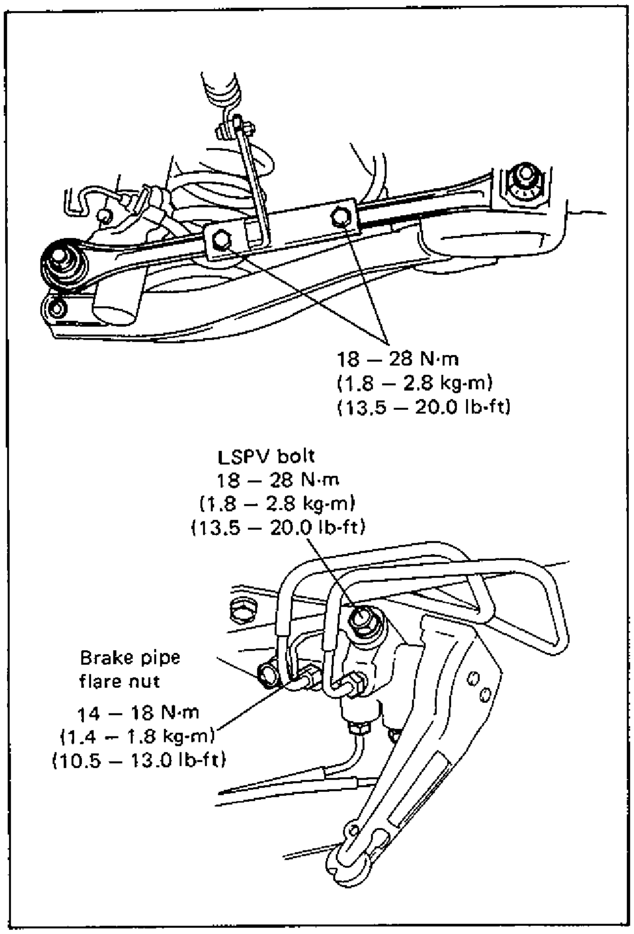


Fig. 5-103-5

3) Upon completion of installation, fill reservoir tank with specified fluid and bleed air from brake system.
4) After bleeding air, check that LSPV is installed properly, referring to following INSPECTION & ADJUSTMENT section.

2. AFTER–INSTALLATION INSPECTION & ADJUSTMENT

Confirm the following before inspection and adjustment.

- Car is equipped with spare tire, tools, jack and jack handle.
- Car is free from any other load.
- Fuel tank is filled with fuel fully.

With car in above conditions;
1) Place it on level floor.
2) Measure sensor spring length ("L" in below figure) under thumb pressure (about 5 kg or 11 lb.)

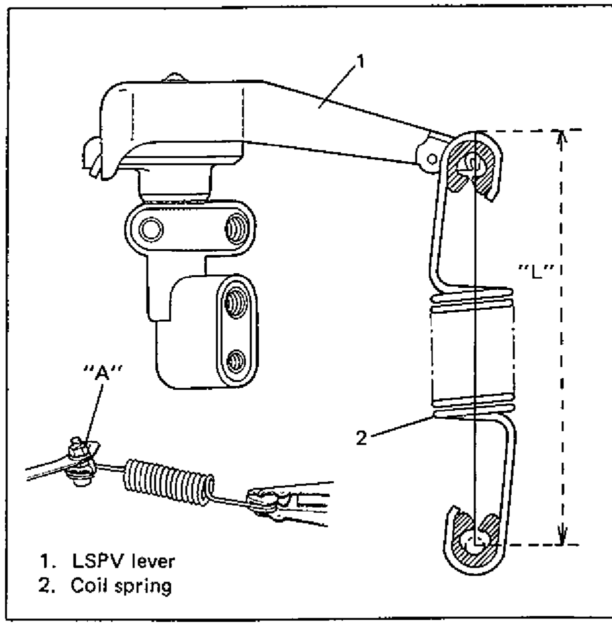


Fig. 5-103-6

3) Spring length "L" should be the value specified below.

Spring length "L"	145 mm (5.709 in.)

4) If it isn't, adjust it to specification by changing bolt "A" tightening position as shown in Fig. 5-103-6. After adjustment, tighten nut to specified torque.
For details, refer to Fig. 5-103-6.

NOTE:
Check to make sure that LSPV body and brake pipe joints are free from fluid leakage. Replace defective parts, if any.

3. FLUID PRESSURE TEST

Test procedure for LSPV assembly is as follows.

Before testing, confirm the following.

- Fuel tank is filled with fuel fully.
- Car is equipped with spare tire, tools, jack and jack handle.

1) Place car on level floor and set 100 kg (221 lbs) weight slowly on axle housing center.
2) Install pressure gauge to front and rear brake.

NOTE:
Pressure gauge should be connected to breather of front (left side brake) and rear (right side brake).
After testing front left side and rear right side, test front right side and rear left side in the same way.

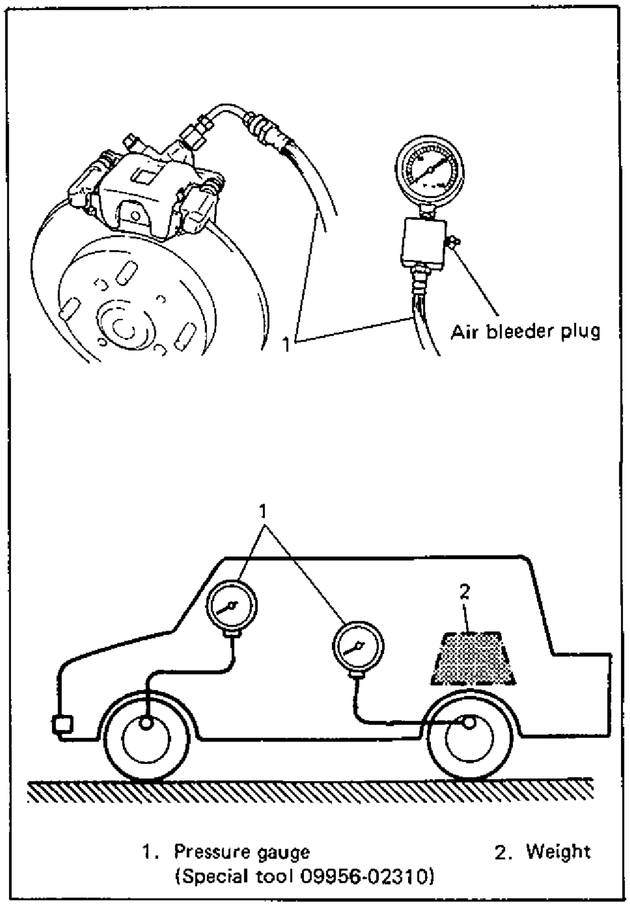


Fig. 5-103-7

3) Depress brake pedal gradually till fluid pressure of front brake becomes as specified below and check corresponding pressure of rear brake then. It should be within specification given below.

Front brake	Rear brake
5000 kPa 50 kg/cm² 711 psi	2000 – 3200 kPa 20 – 32 kg/cm² 285 – 455 psi

As done above, apply 100 kg/cm² pressure to front brake and check that rear brake pressure then is within specification as given below.

Front brake	Rear brake
10.000 kPa 100 kg/cm² 1422 psi	3800 – 5200 kPa 38 – 52 kg/cm² 541 – 739 psi

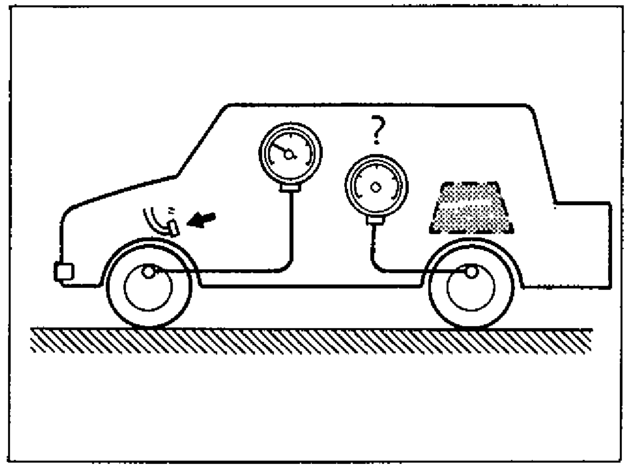


Fig. 5-103-8

4) If rear brake pressure is not within specification, adjust it by changing bolt "A" tightening position as follows.
   - If rear brake pressure is higher than specification, move bolt "A" upward and if it is lower, downward.
   - Repeat steps 3) and 4) until rear brake pressure is within specification.

- After adjustment, be sure to torque nut to specification.

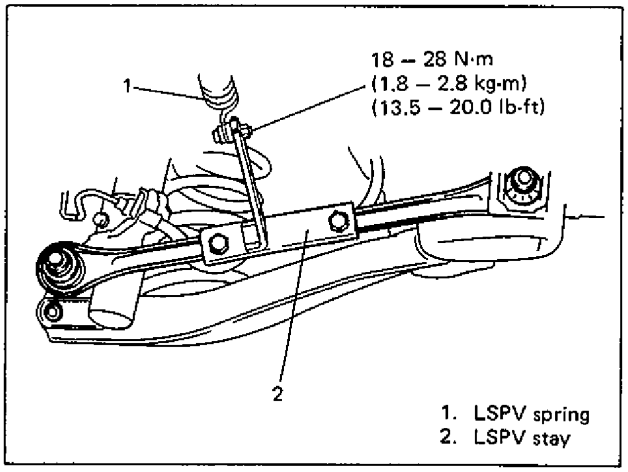


Fig. 5-103-9

5) Upon completion of fluid pressure test, bleed brake system and perform brake test.

BRAKE BOOSTER REPAIR

1. REMOVE AND INSTALL BOOSTER

REMOVAL

1) Remove master cylinder assembly, referring to steps 1) to 5) of its REMOVAL on page 5-48.
2) Disconnect vacuum hose from booster.
3) Disconnect push rod clevis from brake pedal arm.
4) Remove attaching nuts and then booster as shown.

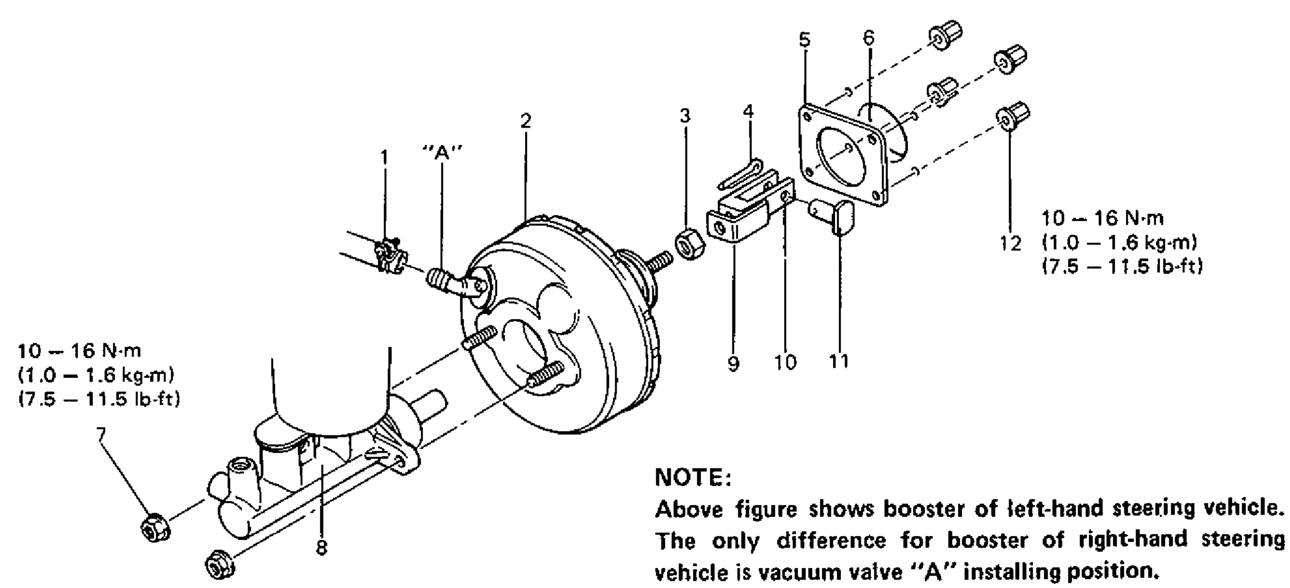
INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and master cylinder piston with special tool. (See page 5-62.)**
- **Check length of push rod clevis. (See page 5-61.)**

1) Install booster to dash panel as shown. Then connect booster push rod clevis to pedal arm with clevis pin and split pin.
2) Torque booster attaching nuts to specification.
3) Install master cylinder to booster and torque attaching nuts to specification.
4) Connect three brake pipes and torque flare nuts to specification. (See page 5-48.)
5) Connect booster vacuum hose.
6) Connect reservoir lead wire at coupler.
7) Fill reservoir with specified fluid.
8) Bleed air from brake system. (See air bleeding section, pages 5-23 and 5-24.)
9) After installing, check pedal height and play. (See pages 5-20 and 5-21.)
10) Perform brake test and check each installed part for fluid leakage

1. Vacuum hose
2. Booster
3. Push rod clevis lock nut
4. Split pin
5. Gasket
6. Dash panel
7. Attaching nut
8. Master cylinder
9. Push rod bracket
10. Push rod clevis
11. Clevis pin
12. Attaching nut



NOTE:
Above figure shows booster of left-hand steering vehicle. The only difference for booster of right-hand steering vehicle is vacuum valve "A" installing position.

Fig. 5-115

2. DISASSEMBLE AND ASSEMBLE BOOSTER

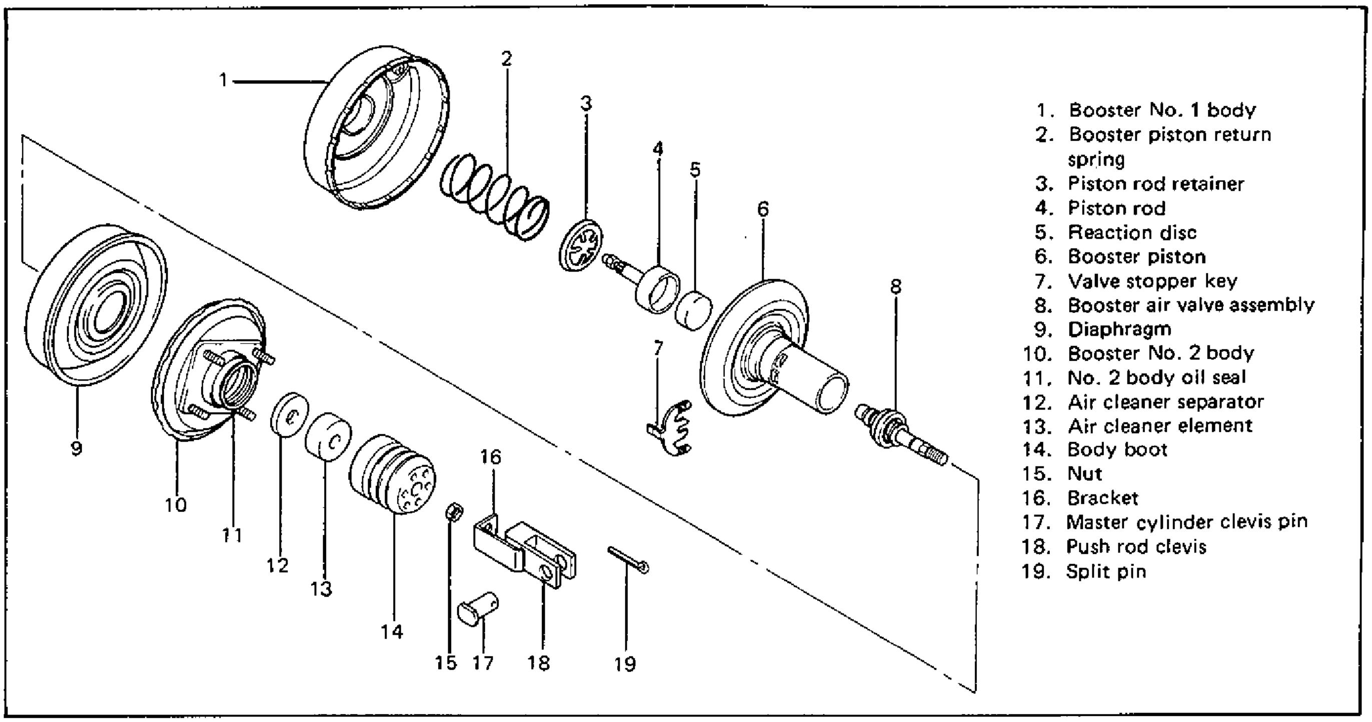


Fig. 5-116

DISASSEMBLY

1) Remove push rod clevis and nut.

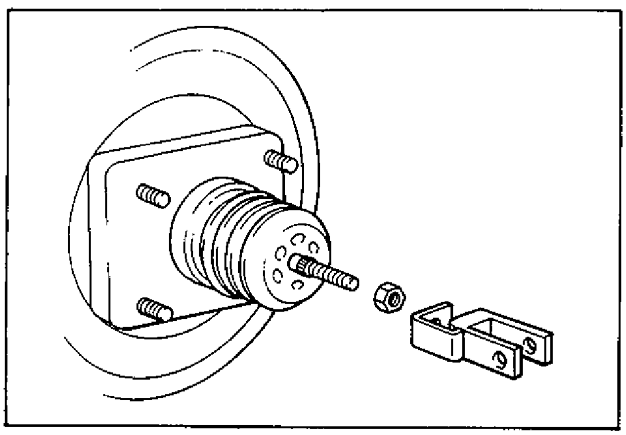


Fig. 5-117

2) Attach booster to special tool (A) as shown and install special tool (B) to booster as shown.

NOTE:

- **When attaching, check to be sure that booster vacuum pipe is not in faulty contact with base of special tool (A).**
- **Be careful not to over-tighten nuts, or booster body will be deformed.**

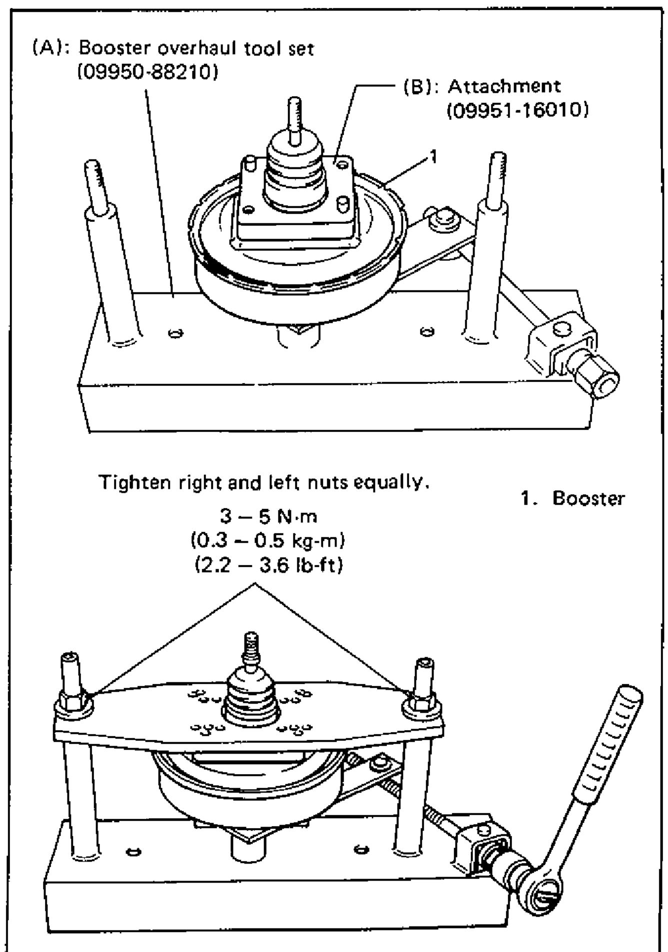


Fig. 5-118

3) Turn special tool bolt clockwise until No. 1 body projecting part and No. 2 body depressed part fit each other.
Once they are matched, make match marking on No. 1 and No. 2 bodies to facilitate their installation.

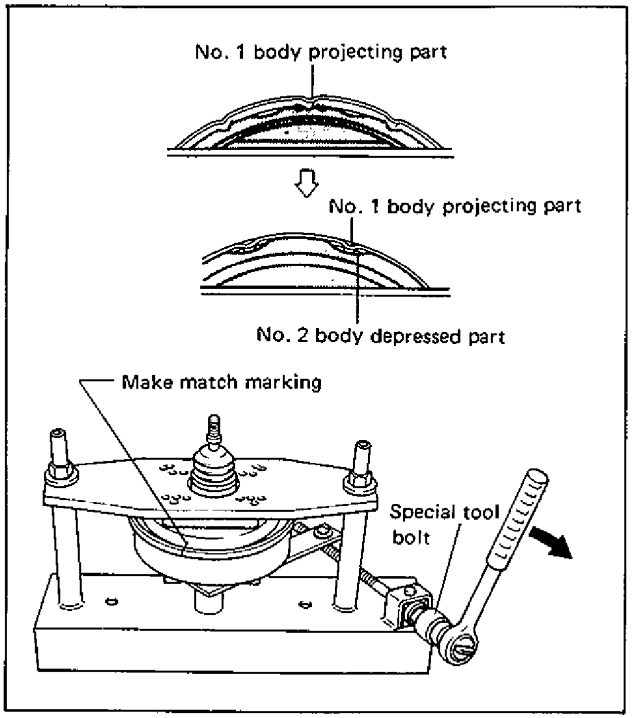
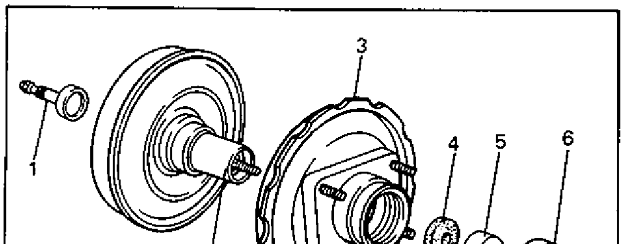


Fig. 5-119

4) Detach booster from special tool and separate No. 1 body and No. 2 body. Remove piston return spring.

WARNING:
When separating two bodies, carefully hold both bodies to prevent either body from jumping off by spring force.

5) From booster No. 2 body, remove piston rod, boot, air cleaner element and air cleaner separator in this order.



1. Piston rod
2. Piston
3. No. 2 body
4. Air cleaner separator
5. Air cleaner element
6. Boot

Fig. 5-120

6) Remove diaphragm from booster piston.

NOTE:
Don't use driver or other tool for removal. Pull it off by hand carefully handling piston groove area where diaphragm is fitted.

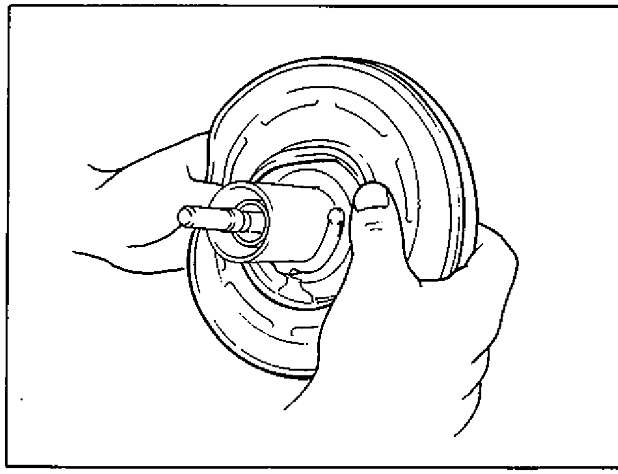
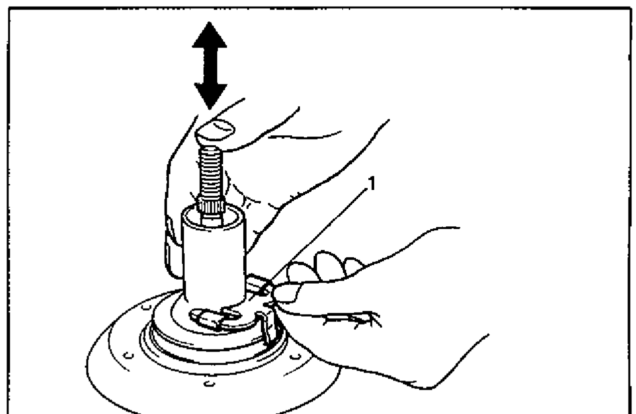


Fig. 5-121

7) While compressing air valve spring (by moving rod up and down as shown), remove valve stopper key. Then remove booster air valve assembly from booster piston.



1. Valve stopper key

Fig. 5-122

NOTE:
Booster air valve assembly can't be disassembled.

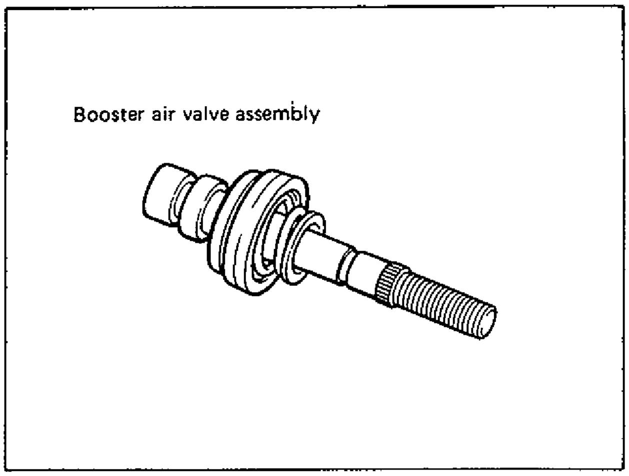


Fig. 5-123

8) Remove reaction disc from booster piston rod.

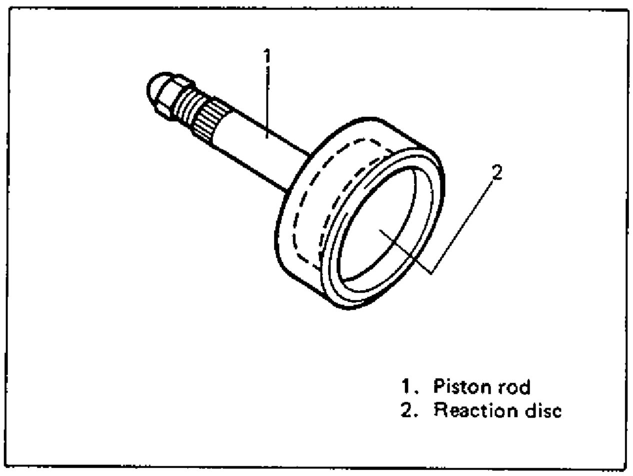


Fig. 5-124

9) Remove oil seal from booster No. 2 body with special tools as shown.

NOTE:
Removed oil seal must not be reused.

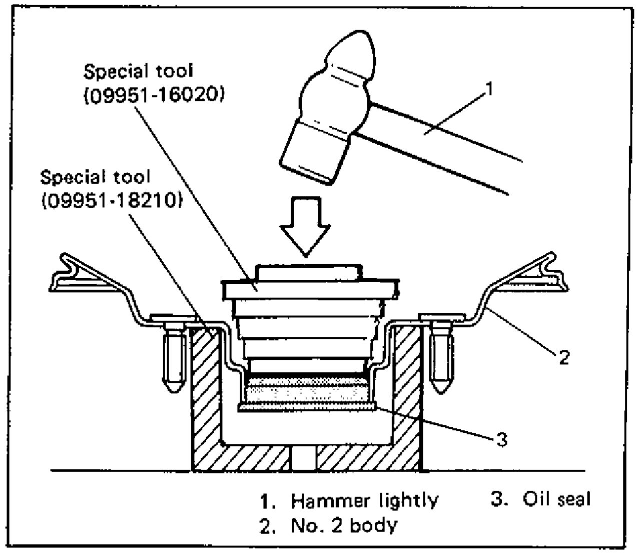


Fig. 5-125

ASSEMBLY

NOTE:

- **See NOTE at the beginning of this section.**
- **Be sure to use silicon grease wherever application of grease is instructed during assembly.**

1) Apply grease to new oil seal outer surface and oil seal lip as shown.
   Press-fit new oil seal to booster No. 2 body by using special tools (C) and (D).

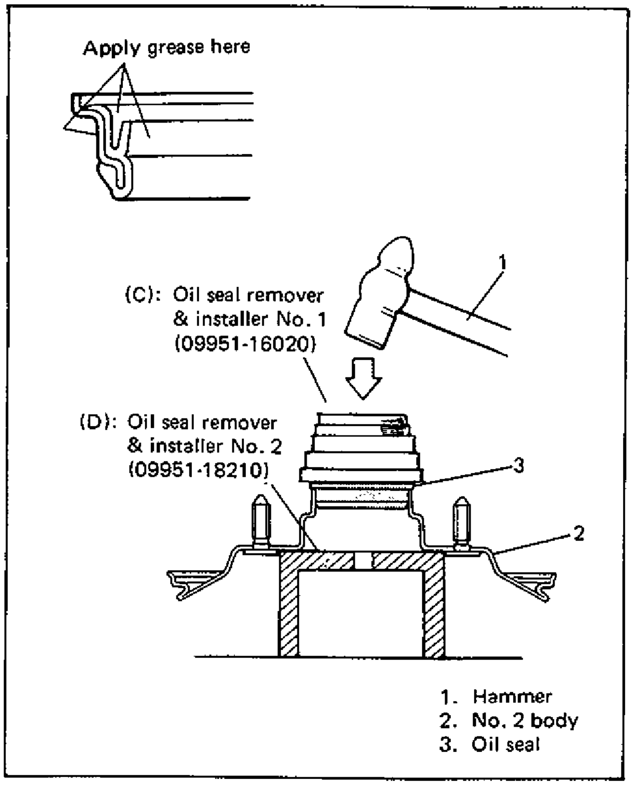


Fig. 5-126

2) Install booster air valve assembly to booster piston. Before installation, apply grease as shown.

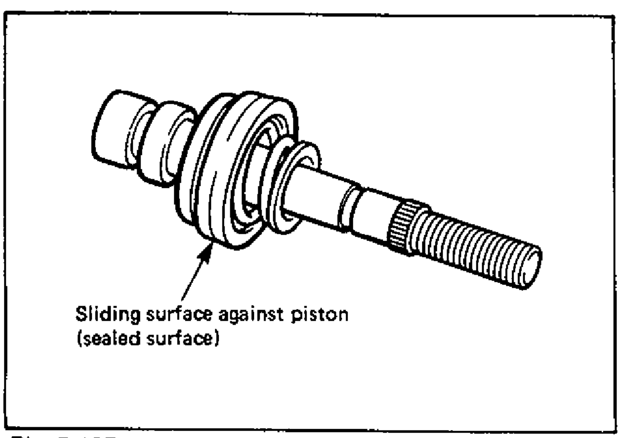


Fig. 5-127

3) Compress air valve assembly and insert valve stopper key.

NOTE:
Don't compress air valve assembly forcibly.

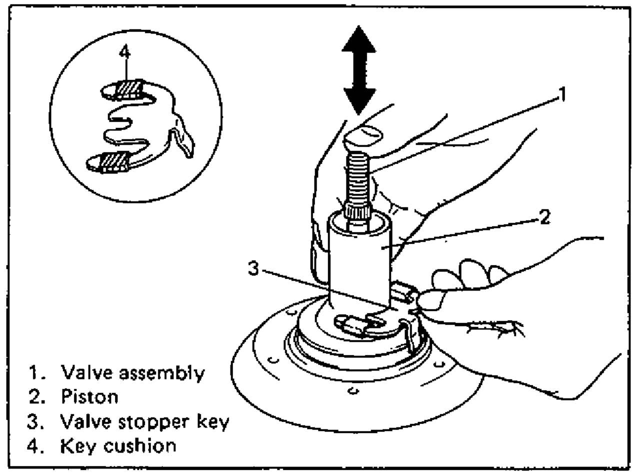


Fig. 5-128

4) Install diaphragm to booster piston by hand.

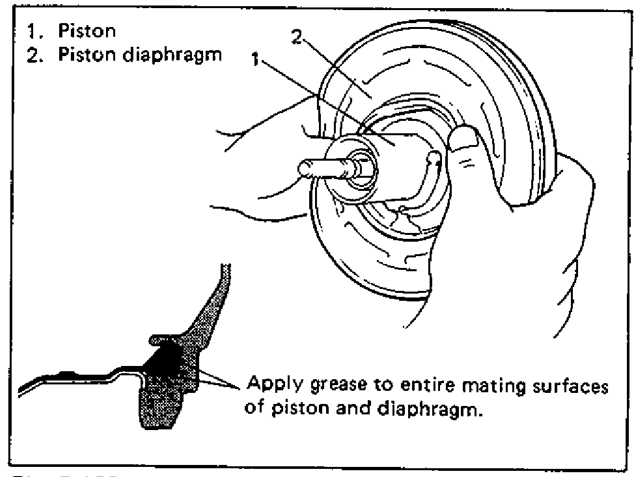


Fig. 5-129

5) Install booster piston to booster No. 2 body.

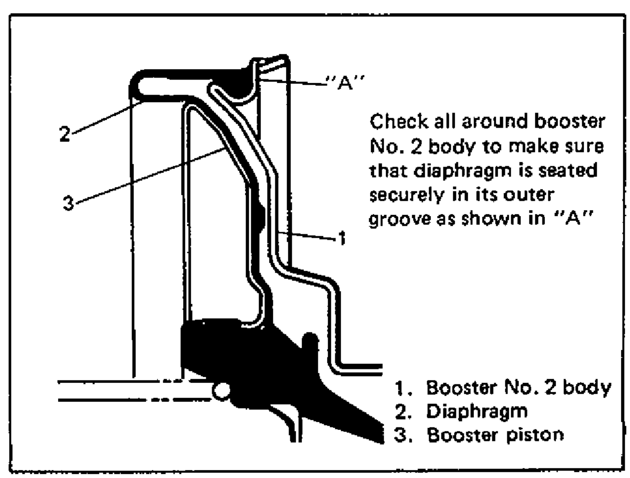


Fig. 5-130

6) Install air cleaner separator and then element to rod of air valve assembly.
7) Install body boot to booster No. 2 body. Both ends of boot must be fitted securely as shown.

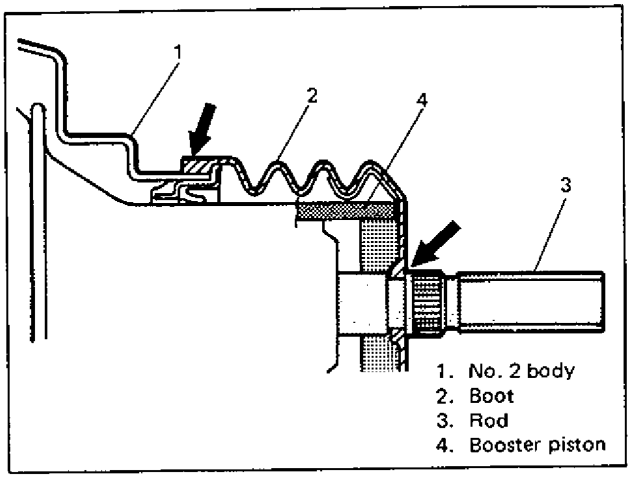


Fig. 5-131

8) Install reaction disc to booster piston rod after greasing its outer face.

NOTE:
Make sure that no air exists between piston rod and reaction disc.

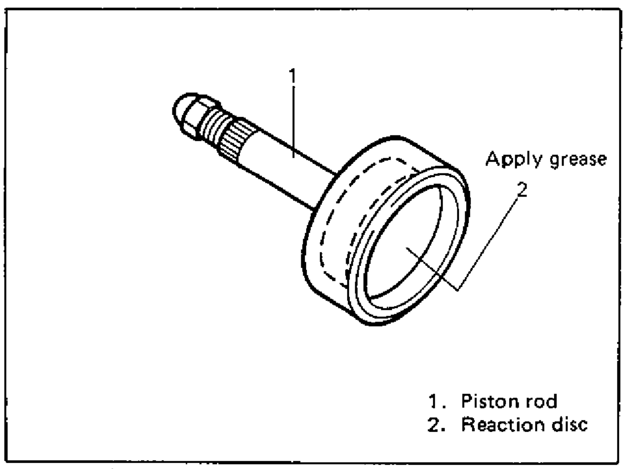


Fig. 5-132

9) Place No. 1 body on special tool (A).

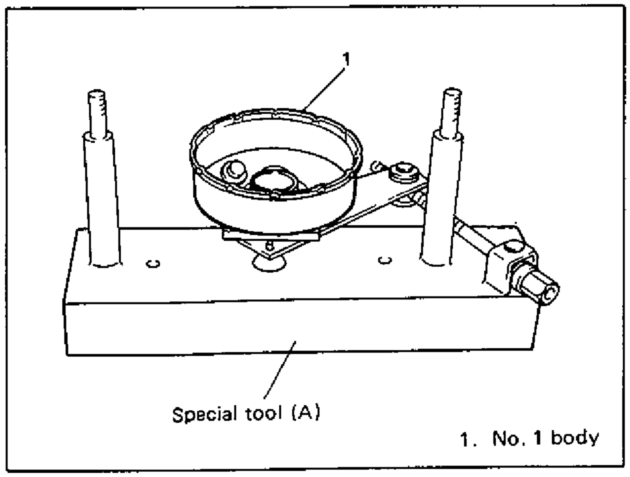


Fig. 5-133

10) Install piston rod, rod retainer and piston return spring to booster piston as shown below. Then install them to booster No. 1 body.

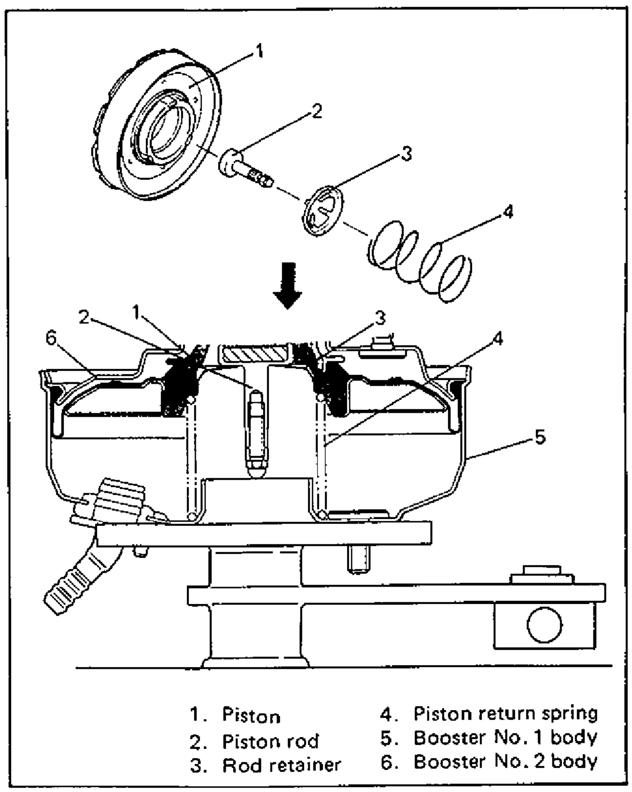


Fig. 5-134

11) Put No. 1 and No. 2 bodies together by aligning markings made before disassembly.
Holding No. 2 body with upper plate (special tool) as shown, torque two nuts equally to specification.

Special tool nuts tightening torque	N·m	kg-m	lb-ft
	3 – 5	0.3 – 0.5	2.2 – 3.6

NOTE:
When holding No. 2 body, use care so that diaphragm is not caught by projections at 12 locations around No. 1 body.

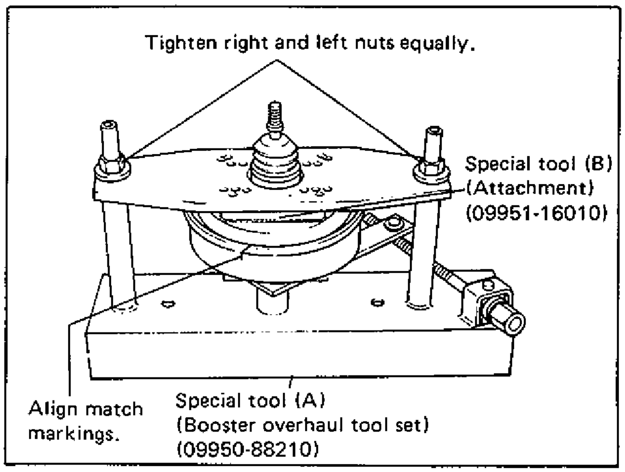


Fig. 5-135

12) Turn special tool bolt counterclockwise until No. 1 body projecting part comes to mid-position of No. 2 body depressed parts as shown.

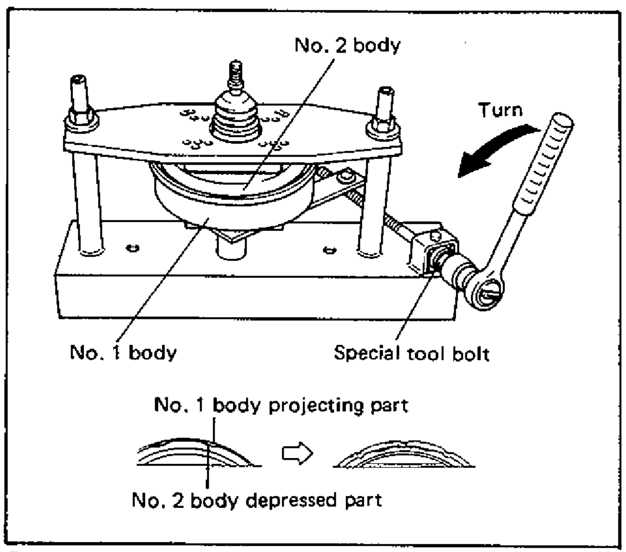


Fig. 5-136

13) Remove booster from special tool.
14) Install push rod clevis so that dimension "A" as shown below is within 114.5 – 115.5 mm (4.51 – 4.54 in) and torque nut to specification.

NOTE:
Dimension "A" does not include thickness of gasket.

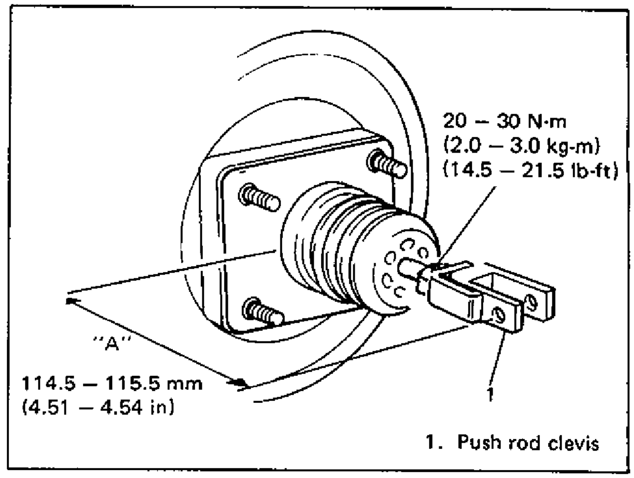


Fig. 5-137

NOTE:
Whenever booster was disassembled, make sure to check clearance between piston rod and master cylinder piston after reassembly. (For details, refer to page 5-62.)

15) For installation of booster, see steps 1) to 10) of its INSTALLATION on page 5-51.

BRAKE BOOSTER INSPECTION AND ADJUSTMENT

1. INSPECT BOOSTER INNER PARTS

NOTE:

After disassembly, soak all metal parts in ethyl alcohol. Wipe rubber diaphragm and plastic parts with a clean cloth. Use ethyl alcohol damped cloth to wipe out heavy dirt. Application of much ethyl alcohol especially to rubber parts is prohibited.

RUBBER PARTS

Wipe fluid from rubber parts and carefully inspect each rubber part for cuts, nicks or other damage. These parts are key to air flow control. If there is any question as to serviceability of rubber parts, **REPLACE** them.

METAL PARTS

BADLY DAMAGED ITEMS, OR THOSE WHICH WOULD TAKE EXTENSIVE WORK OR TIME TO REPAIR, SHOULD BE REPLACED. IN CASE OF DOUBT, INSTALL NEW PARTS.

2. INSPECT/ADJUST CLEARANCE BETWEEN BOOSTER PISTON ROD AND MASTER CYLINDER PISTON

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

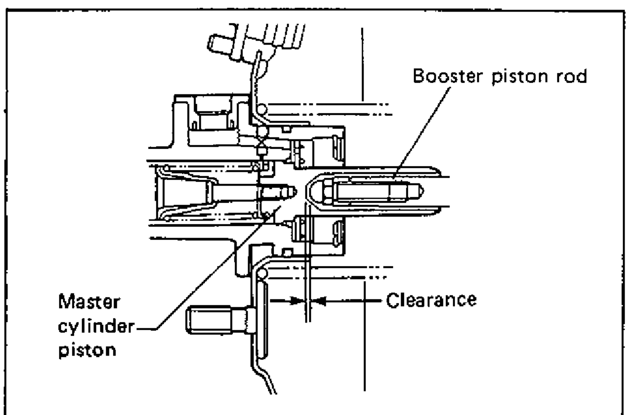


Fig. 5-138

- 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 (E) on master cylinder and push pin until contacts piston.

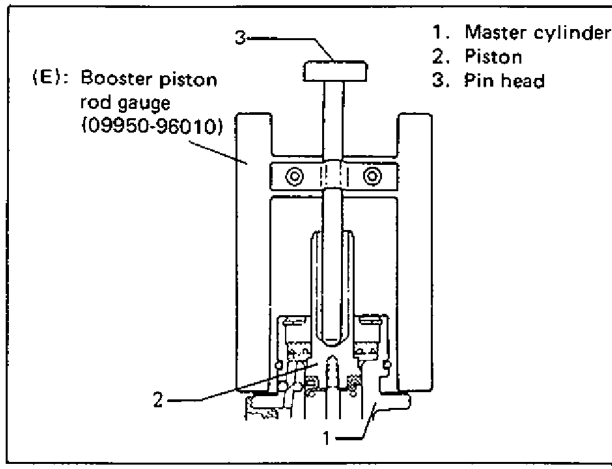


Fig. 5-139

2) Turn special tool upside down and place it on booster. Adjust booster piston rod length until rod end contacts pin head.
3) Adjust clearance by turning adjusting screw of piston rod.

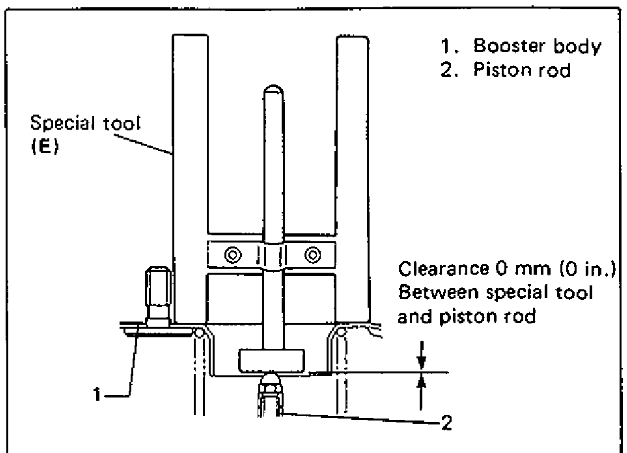


Fig. 5-140

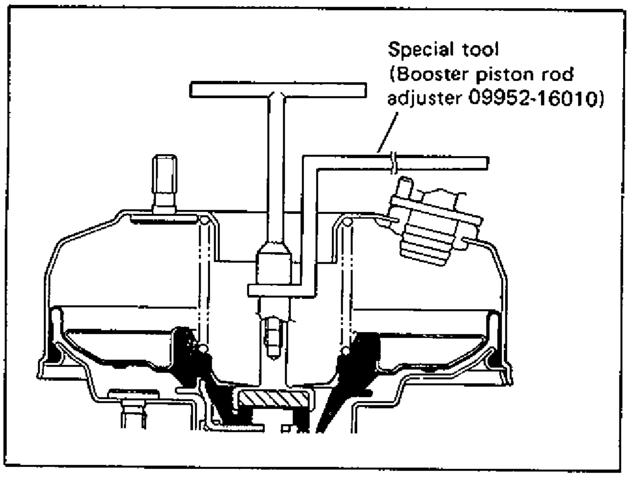


Fig. 5-141

Reference
When adjusted as above, if negative pressure is applied to booster with engine at idle, piston to piston rod clearance should become 0.10 – 0.35 mm (0.004 – 0.013 in.).

3. INSPECT BOOSTER OPERATION

There are two ways to perform this inspection, with and without a tester. Ordinarily, it is possible to roughly determine its condition without using a tester.

NOTE:
For this check, make sure that no air is in hydraulic line.

INSPECTION WITHOUT TESTER
Check Air Tightness
1) Start engine.
2) Stop engine after running for 1 to 2 minutes.
3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.

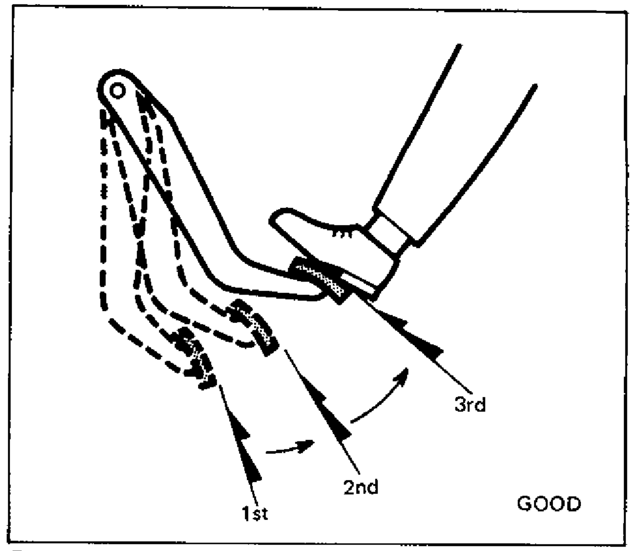


Fig. 5-142

4) If pedal travel doesn't change, air tightness isn't obtained.

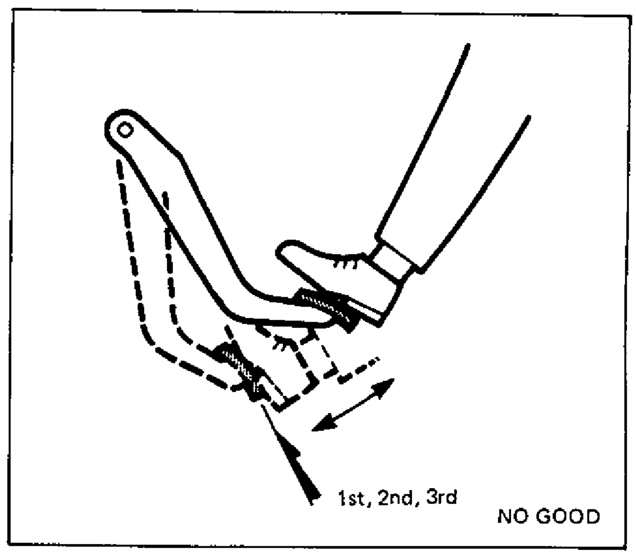


Fig. 5-143

NOTE:
If defective, inspect vacuum lines and sealing parts, and replace any faulty part.
When this has been done, repeat the entire test!

Check Operation

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.

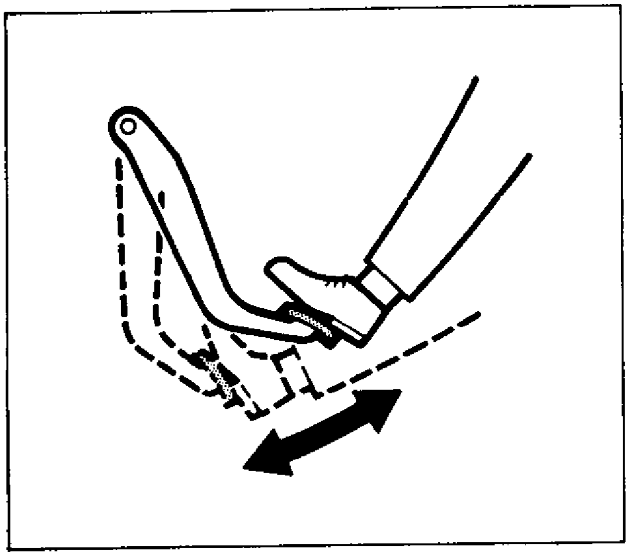


Fig. 5-144

2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.

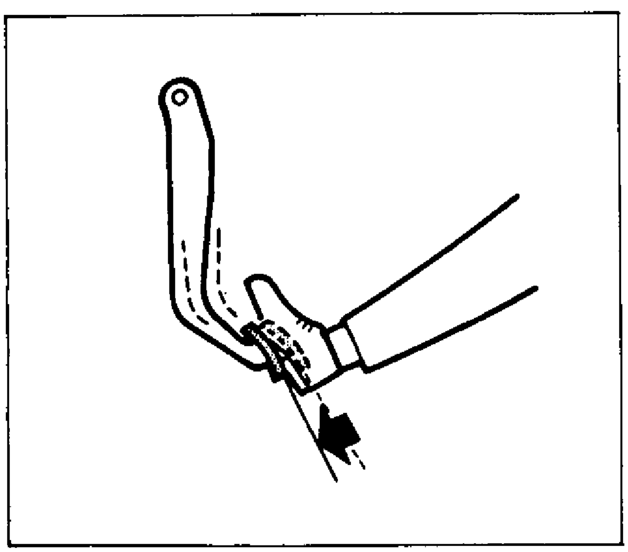


Fig. 5-145

Check Air Tightness Under Load

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.

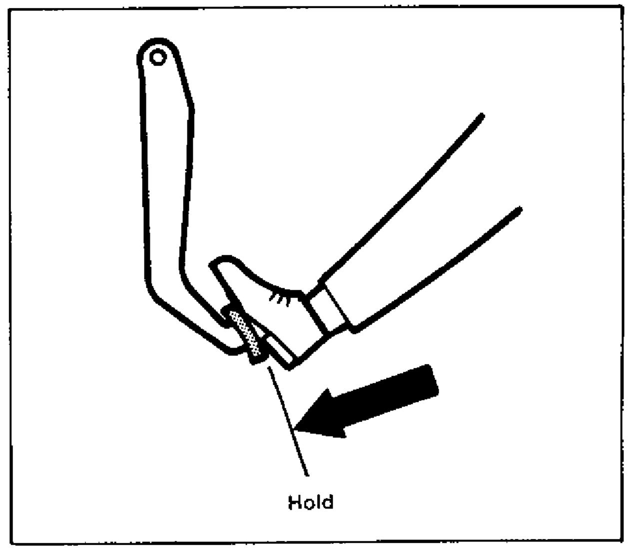


Fig. 5-146

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.

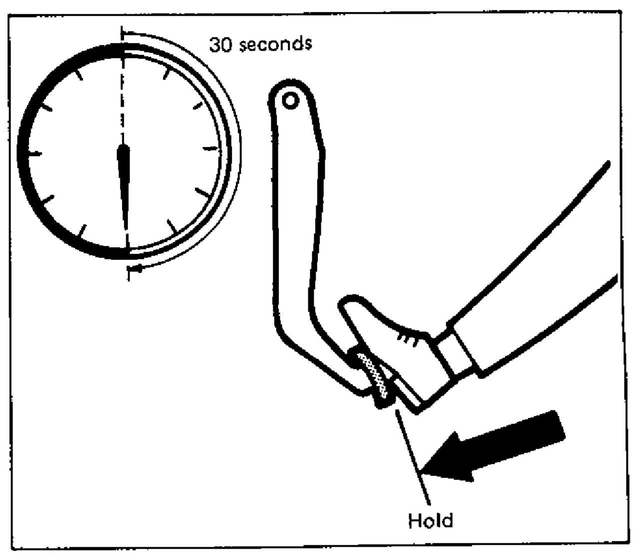


Fig. 5-147

4. BOOSTER INSPECTION TABLE

Part	Inspect For	Corrective Action
1. Booster piston	Cracks, distortion or damage.	Replace.
2. Air valve ass'y (Control valve and spring)	Damaged or worn seal surfaces.	Replace.
3. Reaction disc	Damage or wear.	Replace.
4. Diaphragm, boot and rubber	Damage.	Replace.
5. Piston rod and retainer	Damage, bend or cracks.	Replace.
6. Booster No. 1 & No. 2 body	1. Scratches, scores, pits, dents, or other damage affecting rolling or sealing of diaphragm or other seals.	Replace, unless easily repaired.
	2. Cracks, damage at ears, damaged threads on studs.	Replace, unless easily repaired.
	3. Bent or nicked locking lugs.	Replace, unless easily repaired.
	4. Loose studs.	Replace.
7. Air filters and separator	Dirt.	Replace.

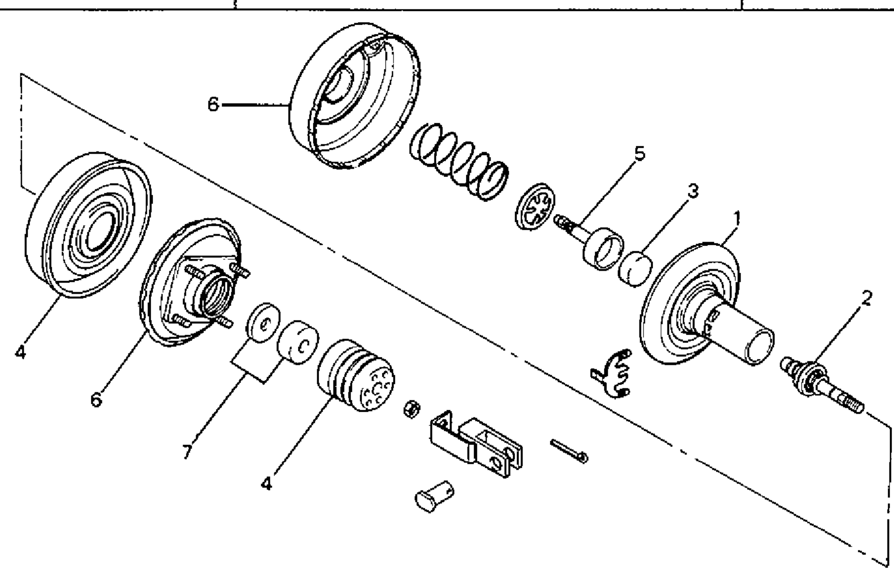


Fig. 5-148

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. Brake caliper pin bolt		22 – 32	2.2 – 3.2	16.0 – 23.0
2. Brake caliper carrier bolt		70 – 100	7.0 – 10.0	51.0 – 72.0
3. Front brake flexible hose bolt		20 – 25	2.0 – 2.5	14.5 – 18.0
4. Rear brake bolt (Brake back plate bolt)		18 – 28	1.8 – 2.8	13.5 – 20.0
5. Master cylinder nut or booster nut		10 – 16	1.0 – 1.6	7.5 – 11.5
6. Brake pipe 4-way joint bolt		8 – 12	0.8 – 1.2	6.0 – 8.5
7. 5-way joint bolt				
8. Proportioning valve bolt				
9. Brake pipe flare nut		14 – 18	1.4 – 1.8	10.5 – 13.0
10. Brake pedal shaft nut		18 – 28	1.8 – 2.8	13.5 – 20.0
11. Rear spindle nut		150 – 200	15.0 – 20.0	108.5 – 144.5
12. Brake bleeder plug	(Front caliper)	7 – 10	0.7 – 1.0	5.5 – 7.5
	(Rear cylinder)			
13. Wheel nut		50 – 70	5.0 – 7.0	36.5 – 50.5
14. Front drive shaft nut		150 – 200	15.0 – 20.0	108.5 – 144.5
15. LSPV stay bolt		18 – 28	1.8 – 2.8	13.5 – 20.0

Fig. 5-149

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Brake fluid	Indicated on reservoir tank cap or described in owner's manual of car	• To fill master cylinder reservoir. • To clean and apply to inner parts of master cylinder caliper and wheel cylinder when they are disassembled.
Silicone grease	Furnished in repair kit	• To apply to brake booster inner parts where application is instructed in this manual.
Water tight sealant	SEALING COMPOUND 366E 99000-31090	• To apply to mating surfaces of brake back plate and rear knuckle. • To apply to joint seam of wheel cylinder and brake back plate.

SPECIAL TOOLS

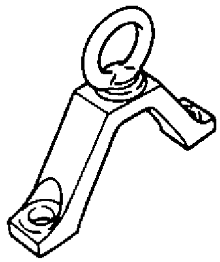
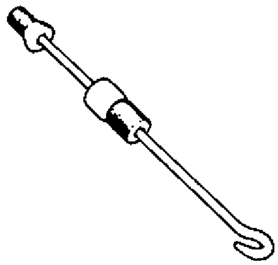
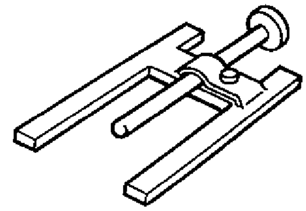
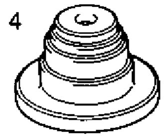
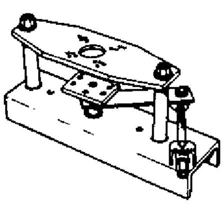
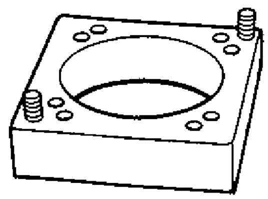
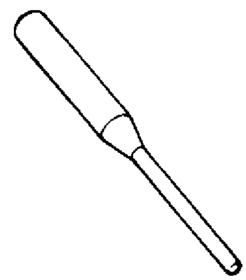
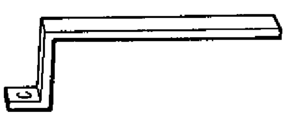
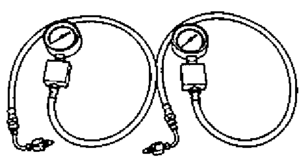
1  09943-17911 Wheel hub remover	2  09942-15510 Sliding hammer	3  09950-96010 Booster piston rod gauge	4  No. 1 09951-16020  No. 2 09951-18210 Booster No. 2 body Oil seal remover & Installer No. 1, No. 2
5  09950-88210 Booster overhaul tool set	6  09950-78210 Flare nut wrench (10 mm)	7  09951-16010 Booster overhaul attachment	8  09922-85811 Connector pin remover
9  09952-16010 Booster piston rod adjuster	 09956-02310 Fluid pressure gauge		

Fig. 5-150

SECTION 6

ENGINE

CONTENTS

GENERAL INFORMATION 6-1
ENGINE DIAGNOSIS 6-4
ENGINE MECHANICAL 6A-1
ENGINE COOLING 6B-1
ENGINE FUEL 6C-1
CARBURETOR 6D-1
ELECTRONIC FUEL INJECTION SYSTEM 6E-1
ENGINE IGNITION SYSTEM 6F-1
ENGINE CRANKING SYSTEM 6G-1
ENGINE CHARGING SYSTEM 6H-1
ENGINE EMISSION CONTROLS (for carburetor model) 6J-1
ENGINE EMISSION CONTROLS (for injector model) 6J1-1
ENGINE EXHAUST 6K-1

GENERAL INFORMATION

STATEMENT ON CLEANLINESS AND CARE

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

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.
  At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine.
  Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- Throughout this manual, the four cylinders of the engine are identified by numbers; No. 1, No. 2, No. 3 and No. 4 counted from crankshaft pulley side to flywheel side as shown in Fig. 6-1.

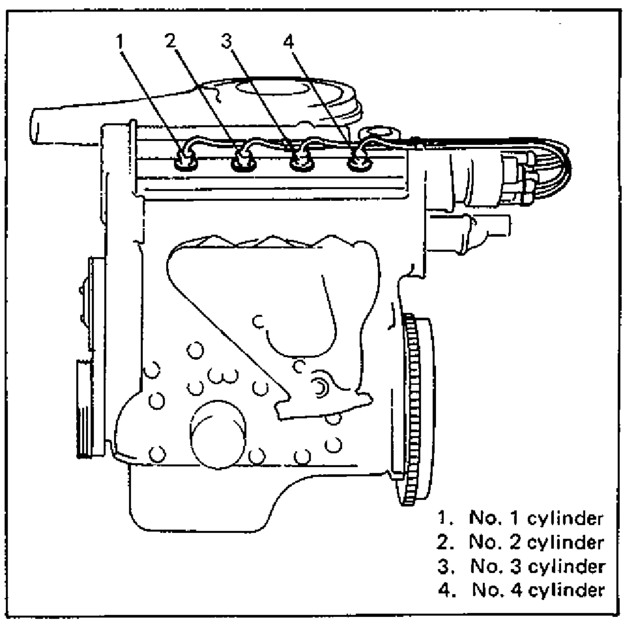


Fig. 6-1 Cylinder Numbers

GENERAL INFORMATION ON ENGINE SERVICE

THE FOLLOWING INFORMATION ON ENGINE SERVICE SHOULD BE NOTED CAREFULLY, AS IT IS IMPORTANT IN PREVENTING DAMAGE, AND IN CONTRIBUTING TO RELIABLE ENGINE PERFORMANCE.

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

  When connecting lock type coupler, insert it till clicking sound is heard and connect it securely.

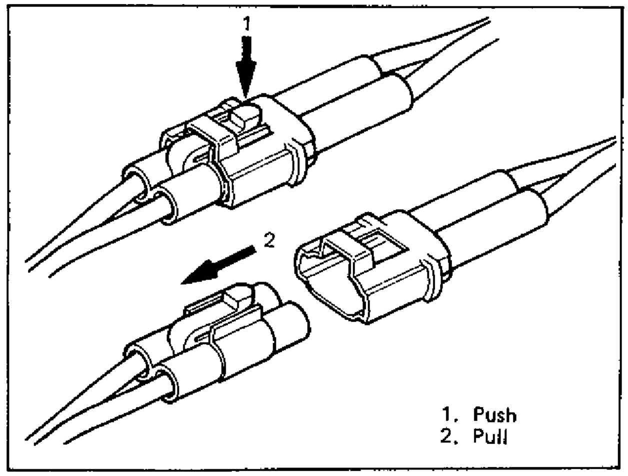


Fig. 6-2 Disconnection of Lock Type Coupler

PRECAUTIONS ON FUEL LINE SERVICE

- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- [For Electronic Fuel Injection model]

  As fuel feed line (between fuel pump and fuel pressure regulator) is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected.

  Before loosening or disconnecting fuel feed line, make sure to relieve fuel pressure according to "FUEL PRESSURE RELIEF PROCEDURE".
- A small amount of fuel may be released after the fuel line is disconnected.

  In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Put that cloth in an approved container when disconnection is completed.
- Fuel or fuel vapor hose connection varies with each type of pipe. When reconnecting fuel or fuel vapor hose, be sure to connect and clamp each hose correctly referring to Fig. 6-3 Hose Connection. After connecting, make sure that it has no twist or kink.

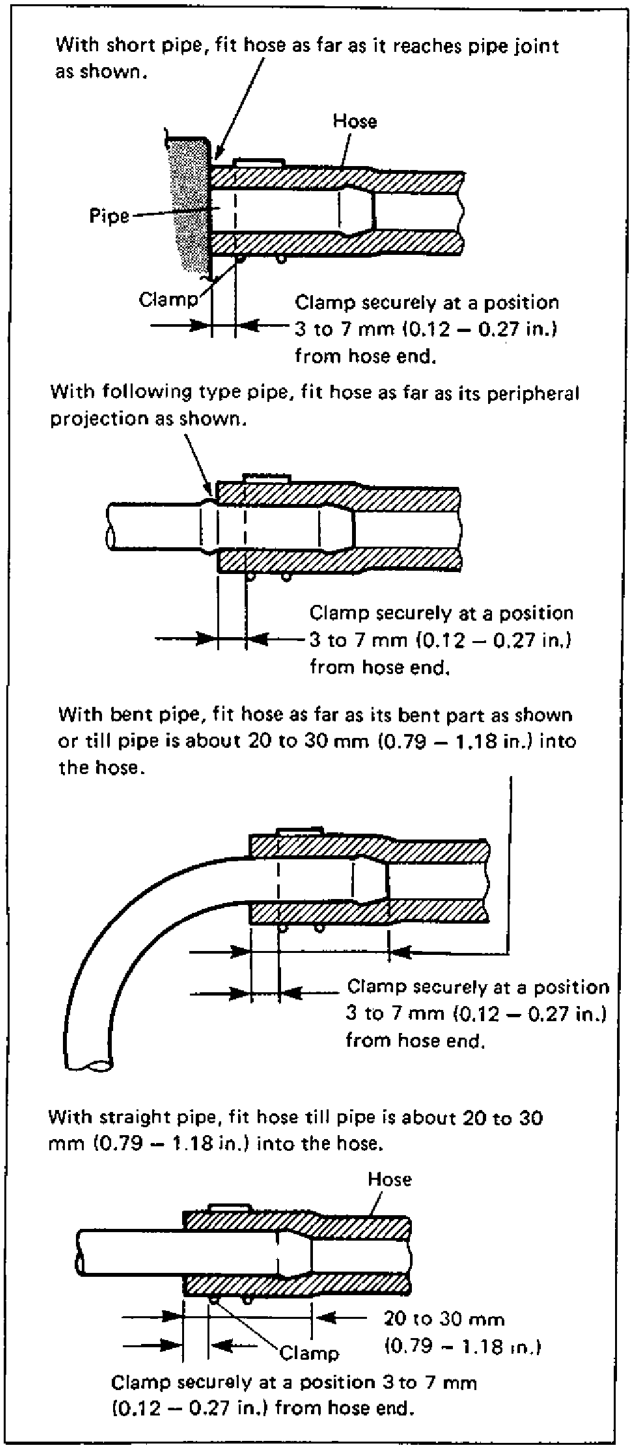


Fig. 6-3 Hose Connection

FUEL PRESSURE RELIEF PROCEDURE
(for injector model)

> **CAUTION:**
> **This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.**

After making sure that engine is cold, relief fuel pressure as follows.

1. Place transmission gear shift lever in "Neutral" (Shift selector lever to "P" range for A/T model), set parking brake, and block drive wheels.
2. Remove main fuse box cover and engine cooling water reservoir from its bracket.
3. Detach main fuse box from body and disconnect coupler from fuel pump relay.

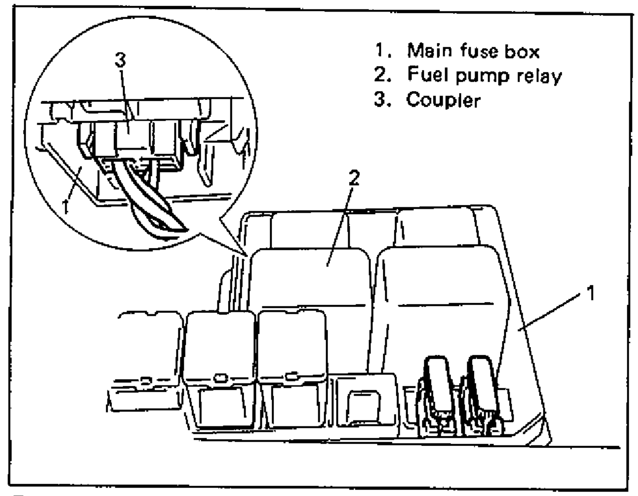


Fig. 6-4 Disconnecting Fuel Pump Relay Coupler

4. Remove fuel filler cap to release fuel vapor pressure in fuel tank and then reinstall it.
5. Start engine and run it till it stops for lack of fuel. Repeat cranking engine 2 – 3 times for about 3 seconds each time to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
6. Upon completion of servicing, connect coupler to fuel pump relay and fix main fuse box.

ENGINE DIAGNOSIS

Condition	Possible Cause	Correction
Hard Starting (Engine cranks OK)	**Ignition system out of order**	
	• Blown fuse	Repair or replace
	• Faulty spark plug	Clean and adjust plug gap or replace
	• Leaky high-tension cord	Replace
	• Loose connection or disconnection of high-tension cords or lead wires	Repair or replace.
	• Maldjusted signal rotor air gap	Adjust
	• Faulty signal generator in distributor	Replace
	• Improper ignition timing	Adjust
	• Faulty ignition coil	Replace
	• Cracked rotor or cap in distributor	Replace
	• Faulty noise suppressor	Replace
	Fuel system out of order	
	• Lack of fuel in fuel tank	Refill
	• Dirty fuel filter	Replace
	• Dirty or clogged fuel hose or pipe	Clean
	• Malfunctioning fuel pump	Replace
	• Air inhaling from intake manifold gasket, carburetor gasket or throttle body gasket	Replace
	• Carburetor choke will not work properly (for carburetor model)	Check and adjust
	• Improper adjustment of float level (for carburetor model)	Adjust
	• Malfunctioning fuel cut solenoid valve (for carburetor model)	Check solenoid valve for operation. Replace if necessary.
	• Carburetor out of adjustment (for carburetor model)	Adjust
	Injector system out of order	Refer to SECTION 6E
	Low compression	
	• Poor spark plug tightening or faulty gasket	Tighten to specified torque or replace gasket
	• Compression leak from valve seat	Remove cylinder head and lap valves
	• Sticky valve stem	Correct or replace valve and valve guide
	• Weak or damaged valve springs	Replace
	• Compression leak at cylinder head gasket	Repair or replace
	• Sticking or damaged piston ring	Replace
	• Worn piston, ring or cylinder	Replace ring and piston. Rebore or replace cylinder
	• Incorrect valve lash	Adjust

Condition	Possible Cause	Correction
Hard Starting (Engine cranks OK)	**Others**	
	• Broken valve timing belt	Replace
	• Malfunctioning PCV valve	Replace
Engine has no power	**Ignition system out of order**	
	• Incorrect ignition timing	Adjust
	• Faulty spark plug	Adjust or replace
	• Worn distributor terminals	Dress or replace. Also check rotor
	• Leaks, loose connection or disconnection of high-tension cord	Connect or replace as necessary
	• Malfunctioning ignition timing advancers	Replace
	Engine overheating	Refer to "Overheating" section
	Fuel system out of order	
	• Clogged fuel hose or pipe	Clean
	• Dirty or clogged fuel filter	Replace
	• Clogged air cleaner element	Clean or replace
	• Air inhaling from intake manifold gasket, carburetor gasket or throttle body gasket	Replace
	• Malfunction of choke system (for carburetor model)	Adjust or replace
	• Fuel pump will not work properly	Replace
	• Clogged carburetor jets (for carburetor model)	Clean
	Injector system out of order	Refer to SECTION 6E
	Low compression	Previously outlined
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect securely
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary
	• Dragging brakes	Repair or replace
	• Slipping clutch	Adjust or replace

Condition	Possible Cause	Correction
Improper engine idling or engine fails to idle	**Ignition system out of order**	
	• Faulty spark plug	Adjust or replace
	• Leaky or disconnected high tension cord	Connect or replace
	• Worn distributor terminals	Replace
	• Improper ignition timing	Adjust
	• Cracked cap in distributor with leakage inside	Replace
	• Malfunctioning ignition timing advancer	Replace
	Fuel system out of order	
	• Shortage of fuel in fuel tank	Refill
	• Clogged air cleaner element	Clean or replace
	• Leaky manifold, carburetor, throttle body, or cylinder head gasket	Replace
	• Clogged carburetor jets (for carburetor model)	Clean
	• Improper float level (for carburetor model)	Adjust
	• Malfunctioning of choke system (for carburetor model)	Adjust or replace
	• Malfunctioning fuel cut solenoid valve (for carburetor model)	Replace
	Injector system out of order	Refer to SECTION 6E
	Engine overheating	Refer to "Overheating" section
	Low compression	Previously outlined
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect securely
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary
	• Malfunctioning PCV valve	Check and replace as necessary
Engine hesitates (Momentary lack of response as accelerator is depressed. Can occur at all car speeds. Usually most severe when first trying to make car move, as from a stop sign.)	**Ignition system out of order**	
	• Improper ignition timing	Adjust
	• Spark plug faulty or plug gap out of adjustment	Replace or adjust gap
	• Leaky high tension cord	Replace

Condition	Possible Cause	Correction
Engine hesitates (Momentary lack of response as accelerator is depressed. Can occur at all car speeds. Usually most severe when first trying to make car move, as from a stop sign.)	**Fuel system out of order**	
	• Clogged air cleaner element	Clean or replace
	• Clogged fuel filter, hose or pipe	Clean or replace
	• Leaky manifold or carburetor gaskets	Replace
	• Improper adjustment of float level (for carburetor model)	Adjust
	• Clogged carburetor jets (for carburetor model)	Clean
	• Loose manifold and carburetor bolts and nuts (for carburetor model)	Retighten
	• Malfunctioning accelerator pump (for carburetor model)	Check and replace as necessary
	Injector system out of order	Refer to SECTION 6E
	Engine overheating	Refer to "Overheating" section
	Low compression	Previously outlined
	Others	
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary
Surges (Engine power variation under steady throttle or cruise. Feels like car speeds up and down with no change in accelerator pedal.)	**Ignition system out of order**	
	• Improper ignition timing	Adjust
	• Malfunctioning ignition timing advancers	Replace
	• Leaky or loosely connected high-tension cord	Check and repair or replace
	• Faulty spark plug (excess carbon deposits, improper gap, and burned electrodes, etc.)	Check and clean, adjust or replace
	• Cracked rotor or cap in distributor	Replace
	Fuel system out of order	
	• Clogged fuel filter	Replace
	• Kinky or damaged fuel hose and lines	Check and replace as necessary
	• Leaky manifold or carburetor gaskets	Replace
	• Malfunctioning fuel pump	Check and replace as necessary
	• Improper float level (for carburetor model)	Adjust
	Injector system out of order	Refer to SECTION 6E
	Others	
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary
	• Leaky vacuum hoses	Repair or replace

Condition	Possible Cause	Correction
Excessive detonation (Engine makes sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.)	**Engine overheating**	Refer to "Overheating" section
	Ignition system out of order	
	• Faulty spark plug	Replace
	• Improper ignition timing	Adjust
	• Loose connection of high tension cord	Connect securely
	Fuel system out of order	
	• Clogged fuel filter or fuel lines	Replace or clean
	• Air inhaling from intake manifold, carburetor or throttle body gasket	Replace
	• Clogged carburetor jets (for carburetor model)	Clean
	• Improper adjustment of float level (for carburetor model)	Adjust
	• Malfunctioning fuel pump	Replace
	Injector system out of order	Refer to SECTION 6E
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect securely
	• Excessive combustion chamber deposits	Remove carbon
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary
Overheating	• Insufficient coolant	Replenish
	• Loose water pump belt	Adjust
	• Inoperative thermostat	Replace
	• Poor water pump performance	Replace
	• Improper ignition timing	Adjust
	• Clogged or leaky radiator	Flush, repair or replace
	• Improper engine oil grade	Replace with proper grade oil
	• Clogged oil filter or oil strainer	Replace or clean (oil strainer)
	• Not enough oil	Replenish
	• Poor oil pump performance	Repair or replace
	• Oil leakage	Repair
	• Dragging brakes	Repair or replace
	• Slipping clutch	Adjust or replace
	• Blown cylinder head gasket	Replace

Condition	Possible Cause	Correction
Poor gasoline mileage	**Fuel system out of order**	
	• Fuel leakage from fuel tank, carburetor and lines	Repair or replace
	• Clogged air cleaner element	Clean or replace
	• Malfunctioning carburetor choke system (for carburetor model)	Repair or replace
	• Improper float level (for carburetor model)	Adjust
	• Dirty or clogged carburetor jets (for carburetor model)	Clean
	Ignition system out of order	
	• Improper ignition timing	Adjust
	• Leaks or loose connection of high-tension cord	Repair or replace
	• Faulty spark plug (improper gap, heavy deposits, and burned electrodes, etc..)	Clean, adjust or replace
	• Malfunctioning ignition timing advancers	Check and repair or replace
	Injector system out of order	Refer to SECTION 6E
	Low compression	Previously outlined
	Others	
	• Poor valve seating	Repair or replace
	• Dragging brakes	Repair or replace
	• Slipping clutch	Adjust or replace
	• Thermostat out of order	Replace
	• Improper tire pressure	Adjust
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary

Condition	Possible Cause	Correction
Excessive engine oil consumption	**Oil leakage**	
	• Loose oil drain plug	Tighten
	• Loose oil pan bolts	Tighten
	• Deteriorated or broken oil pan sealant	Replace sealant
	• Leaky crankshaft oil seals	Replace
	• Leaky cylinder head cover gasket	Replace
	• Improper tightening of oil filter	Tighten
	• Loose oil pressure switch	Tighten
	• Blown cylinder head gasket	Replace
	• Leaky camshaft oil seals	Replace
	Oil entering combustion chamber	
	• Sticky piston ring	Remove carbon and replace rings
	• Worn piston and cylinder	Replace or rebore cylinder, and replace piston
	• Worn piston ring groove and ring	Replace piston and ring
	• Improper location of piston ring gap	Reposition ring gap
	• Worn or damaged valve stem seal	Replace
	• Worn valve stem	Replace
Low oil pressure	• Not enough oil	Replenish
	• Improper oil viscosity	Use oil of proper viscosity
	• Malfunctioning oil pressure switch	Replace
	• Clogged oil strainer	Clean
	• Functional deterioration of oil pump	Replace
	• Worn oil pump relief valve	Replace
	• Excessive clearance in various sliding parts	Replace worn parts
Engine noise Note: Before checking mechanical noise, make sure that: • Ignition timing is properly adjusted. • Specified spark plug is used. • Specified fuel is used.	**Valve noise**	
	• Maladjusted valve lash	Adjust
	• Worn valve stem and guide	Replace
	• Weak or broken valve spring	Replace
	• Warped or bent valve	Replace
	• Loose camshaft housing bolts	Tighten to specification
	Piston, ring and cylinder noise	
	• Worn piston, ring and cylinder bore	Rebore or replace cylinder Replace piston and ring

Condition	Possible Cause	Correction
	Connecting rod noise	
	• Worn rod bearing	Replace
	• Worn crank pin	Repair by grinding or replace crankshaft
	• Loose connecting rod nuts	Tighten to specification
	• Low oil pressure	Previously outlined
	Crankshaft noise	
	• Low oil pressure	Previously outlined
	• Worn bearing	Replace
	• Worn crankshaft journal	Repair by grinding, or replace crankshaft
	• Loose bearing cap bolts	Tighten to specification
	• Excessive crankshaft thrust play	Replace thrust bearing
Dieseling (Engine continues to run after ignition switch is turned off. It runs unevenly and may make knocking noise.)	Malfunctioning fuel cut solenoid valve in carburetor	Check the valve for proper operation, and replace as necessary.

SECTION 6A

ENGINE MECHANICAL

CONTENTS

GENERAL DESCRIPTION 6A- 2
ON CAR SERVICE 6A- 5
Compression Check 6A- 6
Engine Vacuum Check 6A- 6
Oil Pressure Check 6A- 7
Air Cleaner Element 6A- 9
Air Cleaner Assembly 6A- 9
Cylinder Head Cover 6A-10
Valve Lash 6A-11
Carburetor and Intake Manifold (for carburetor model) 6A-12-1
Throttle body and Intake Manifold (for injector model) 6A-13
Exhaust Manifold 6A-15
Timing Belt and Belt Tensioner 6A-16
Oil Pan and Oil Pump Strainer 6A-19
Oil Pump 6A-21
Rocker Arms, Rocker Arm Shaft and Camshaft 6A-24
Valves and Cylinder Head 6A-31
Pistons, Piston Rings, Connecting Rods and Cylinders 6A-40
UNIT REPAIR OVERHAUL 6A-48
Engine Assembly 6A-48
Main Bearings, Crankshaft and Cylinder Block 6A-50
SPECIAL TOOLS 6A-60
REQUIRED SERVICE MATERIALS 6A-61
RECOMMENDED TORQUE SPECIFICATIONS 6A-62

NOTE:
In this section, the following system and parts appear in some description or illustrations, but whether they are installed in the particular car or not depends on specifications or models. Be sure to bear this in mind when performing inspection and service work.

- **EGR system (EGR valve, EGR modulator, VSV and vacuum hoses)**
- **Evaporative emission control system (charcoal canister, BVSV and vacuum hoses)**

For what each abbreviation stands for (i.e., full term), refer to SECTION 0A.

GENERAL DESCRIPTION

ENGINE

The engine is a water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit equipped with its S.O. H.C. (Single Overhead Camshaft) valve mechanism arranged for "V"-type valve configuration and 16 valves (IN 2 and EX 2/one cylinder).

The single overhead camshaft is mounted over the cylinder head: it is driven from crankshaft through timing belt and opens and closes its valves via the rocker arms.

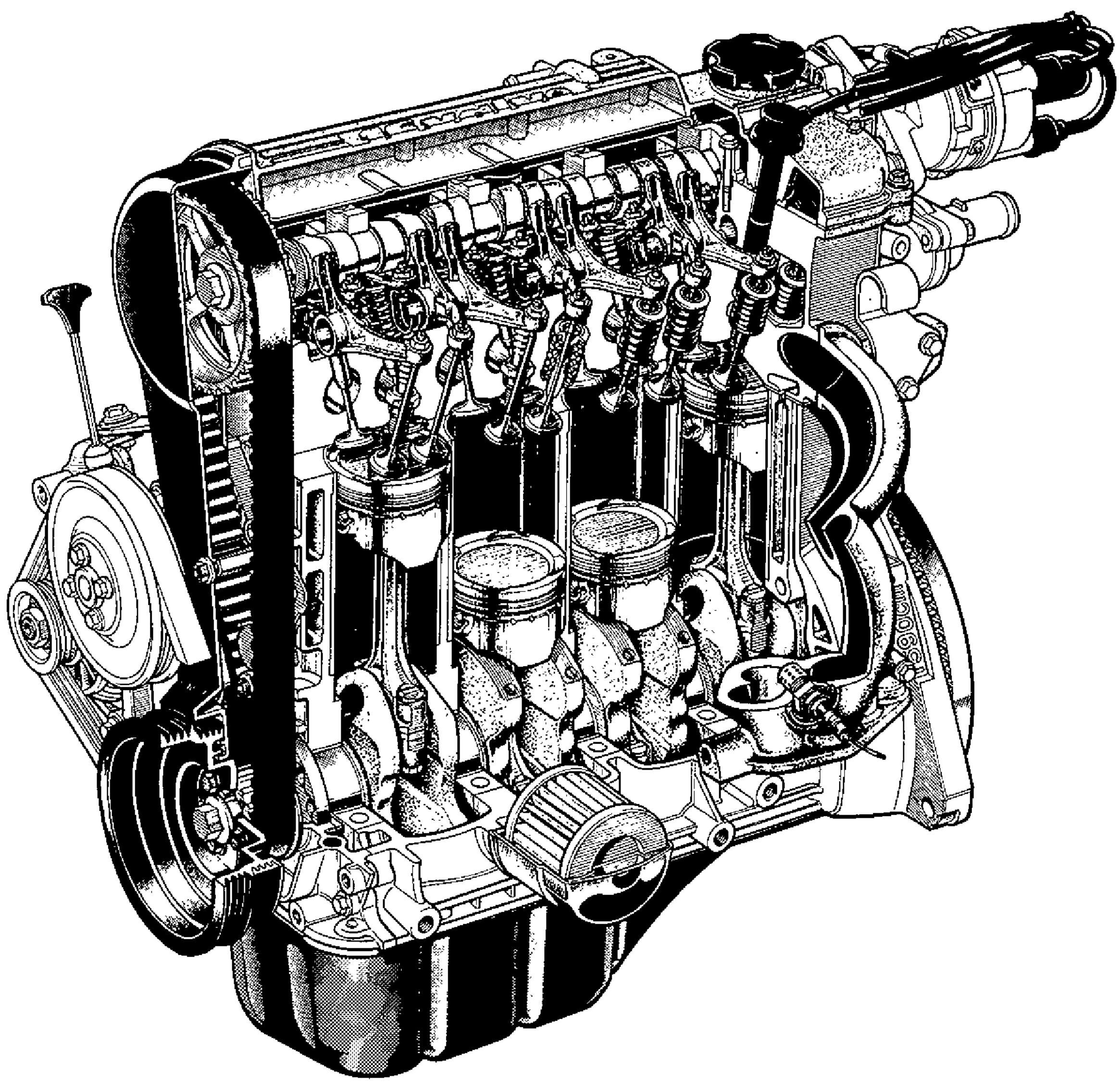


Fig. 6A-1 Engine Construction

ENGINE LUBRICATION

The oil pump is of a trochoid type, and mounted on crankshaft at crankshaft pulley side.

Oil is drawn up through oil pump strainer and passed through pump to oil filter.

The filtered oil flows into two paths in cylinder block.

In one path, oil reaches crankshaft journal bearings.

Oil from crankshaft journal bearings is supplied to connecting rod bearings by means of intersecting passages drilled in crankshaft, and then injected from a small hole provided on big end of connecting rod to lubricate piston, rings, and cylinder wall.

In another path, oil goes up to cylinder head and lubricates camshaft journals, rocker arm, camshaft, etc., passing through oil gallery in rocker arm shaft.

An oil relief valve is provided on oil pump. This valve starts relieving oil pressure when the pressure comes over about 4.0 kg/cm^2 (56.9 psi, 400 kPa). Relieved oil drains back to oil pan.

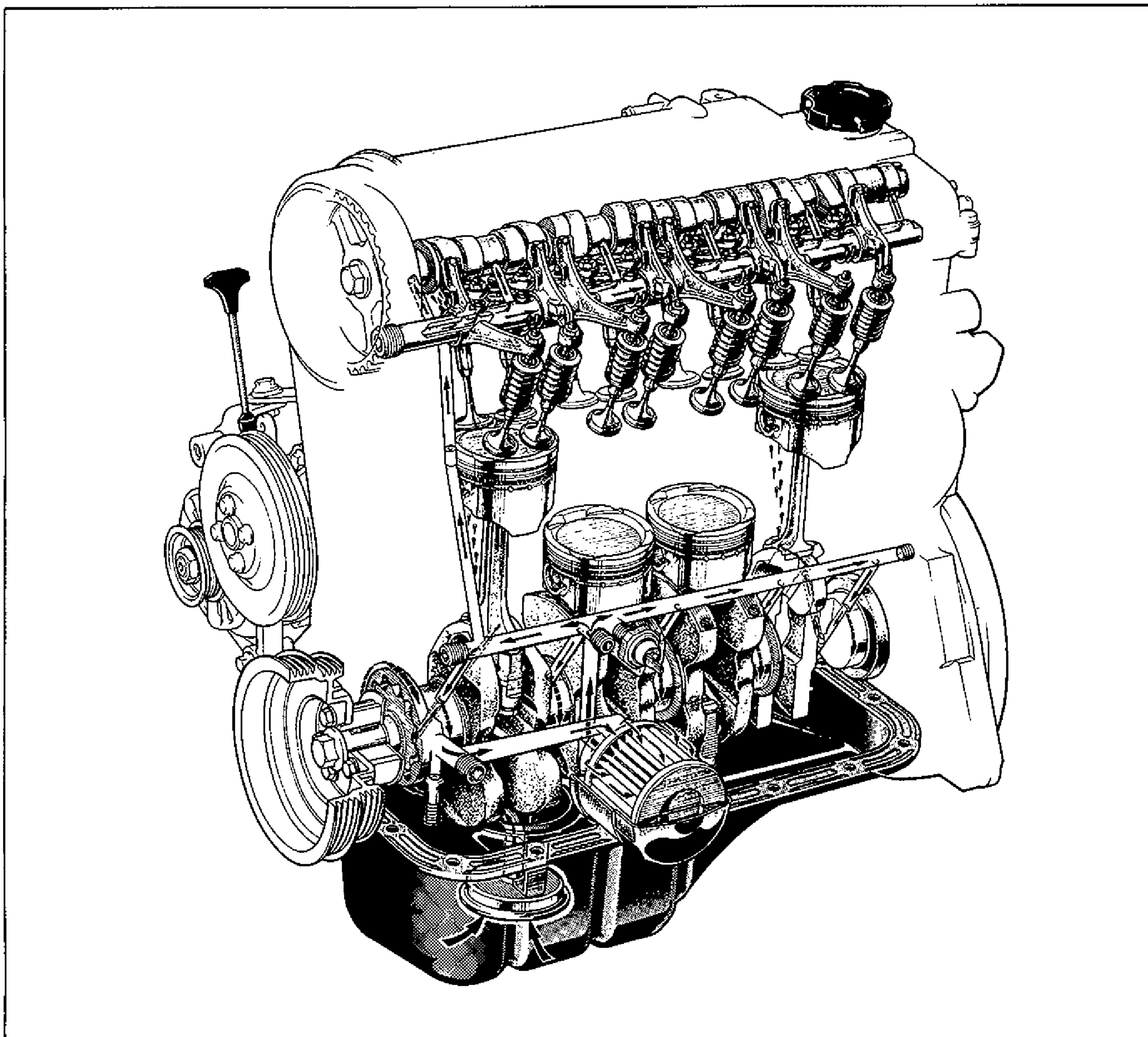


Fig. 6A-2 Engine Lubrication

CYLINDER BLOCK

The cylinder block is made of cast aluminum alloy and has 4 cylinders arranged "In-Line". A cylindrical cast iron sleeve is installed in each cylinder.

CRANKSHAFT AND MAIN BEARINGS

A monoblock casting crankshaft is supported by 5 main bearings which are of precision insert type. Four crank pins on the crankshaft are positioned 180° apart.

PISTONS, RINGS, PISTON PINS AND CONNECTING RODS

The piston is cast aluminum alloy, and has two compression rings and one oil ring.

Among two compression rings (top and 2nd rings), the outer surface of the top ring is plated with hard chromium for improvement in abrasion resistance.

The oil ring consists of two rails and one spacer.

The piston pin is offset 0.5 mm towards the major thrust side.

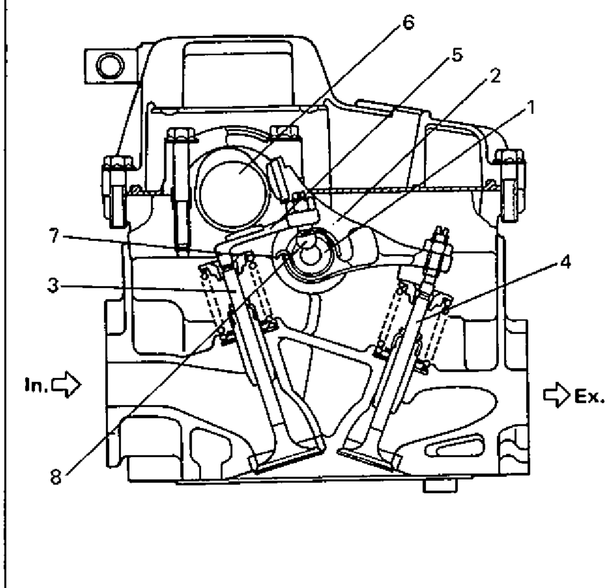
This allows a gradual change in thrust pressure against the cylinder wall as the piston travels its path. Pins, made of chromium steel, have a floating fit in the pistons and in the connecting rods. The connecting rods are made of forged steel, and the rod bearings are of precision insert type.

CYLINDER HEAD AND VALVE TRAIN

The cylinder head is made of aluminum casting. The supporting part of the camshaft and rocker arm is an independent cap type. The combustion chamber has 4 valves and uses the center plug type pent roof shape for higher intake and exhaust efficiency.

As the intake side swing arm is end pivot type, it swings according to the camshaft movement to open and close the intake valve.

On the other hand, the exhaust side rocker arm is seesaw type. It swings with the rocker arm shaft as its supporting point and according to the camshaft movement to open and close the exhaust valve.



1. Rocker shaft
2. Rocker arm (EX)
3. Intake valve
4. Exhaust valve
5. Rocker arm (IN)
6. Camshaft
7. Clip
8. Pivot

Fig. 6A-3

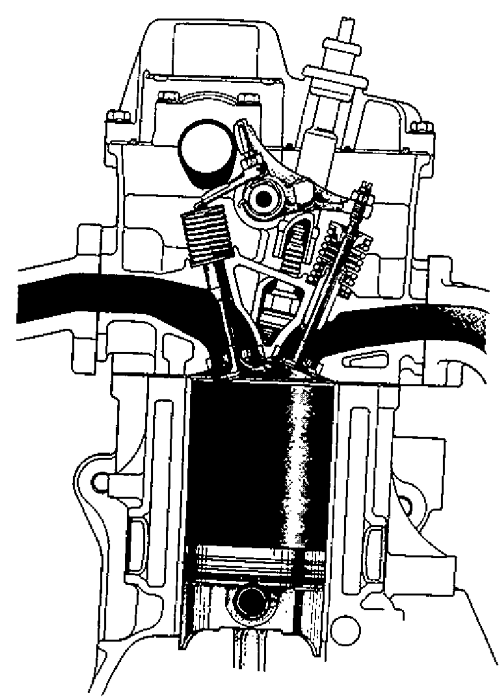


Fig. 6A-3-1

ON CAR SERVICE

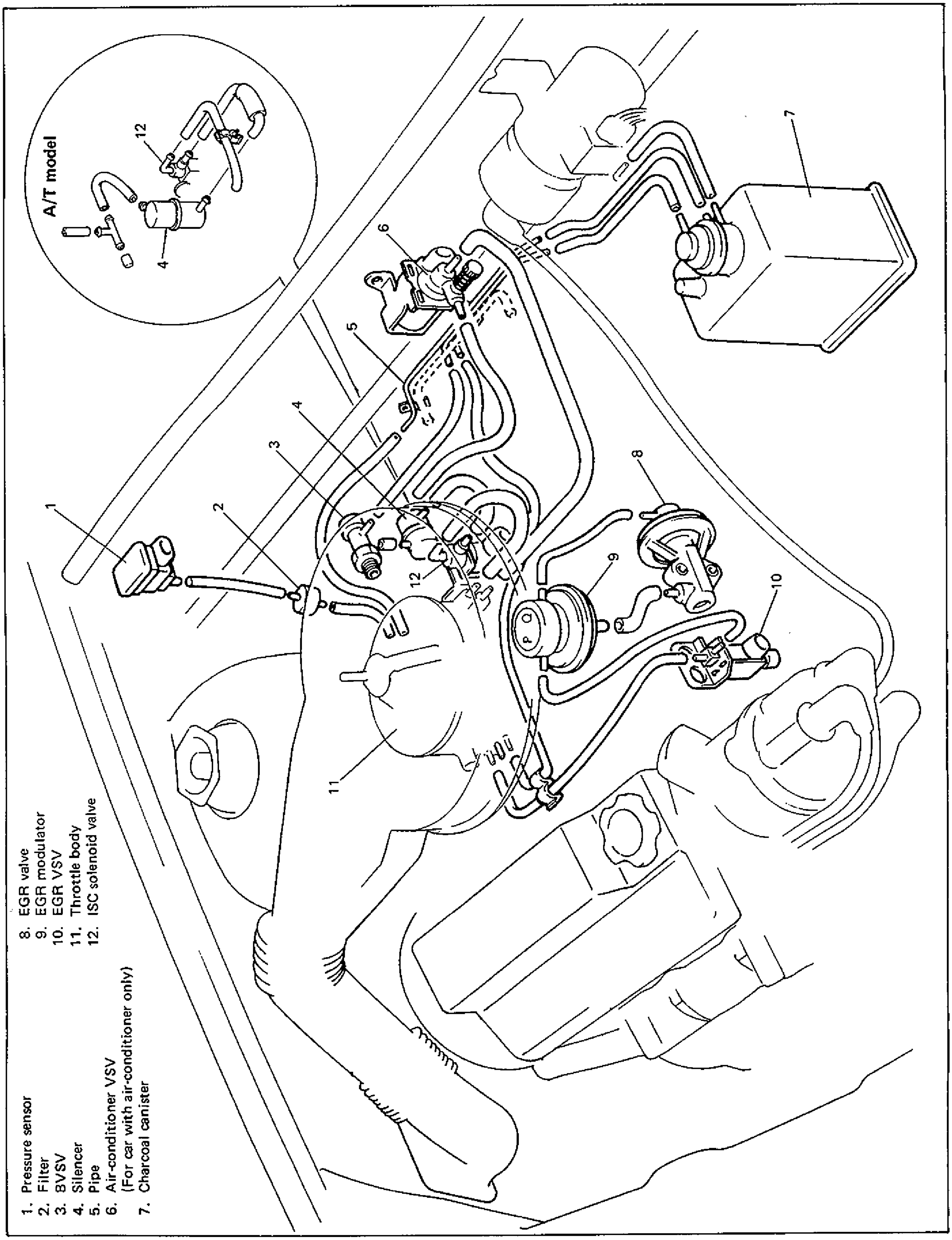


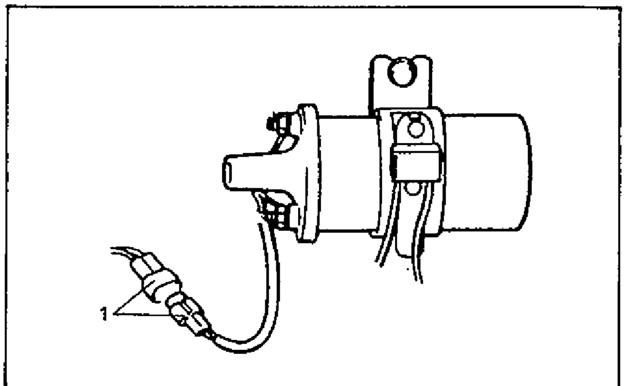
Fig. 6A-4 Hose Connection and Routing (for injector model)

COMPRESSION CHECK

Check compression pressure on all four cylinders as follows:

1. Warm up engine.
2. Stop engine after warming up.
3. Remove all spark plugs.
4. Disconnect ignition coil wire harness at coupler.

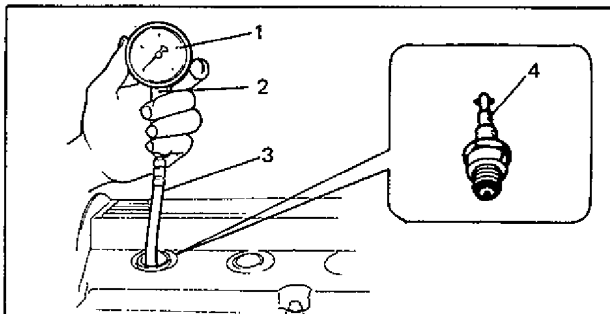
> **WARNING:**
> **Failure in disconnecting the coupler can cause spark to occur in engine room possibly resulting in a dangerous explosion.**



1. Couper disconnected

Fig. 6A-4-1 Disconnecting Ignition Coil Coupler

5. Install special tool (Compression gauge) into spark plug hole.



1. Special tool (Compression gauge 09915-64510-001)
2. Special tool (Connector 09915-64510-002)
3. Special tool (Compression gauge hose 09915-64530)
4. Special tool (Compression gauge attachment (C) 09915-67010)

Fig. 6A-5 Installing Compression Gauge

6. Disengage clutch (to lighten starting load on engine) for M/T model, and depress accelerator pedal all the way to make throttle valve full-open.
7. Crank engine with fully charged battery, and read the highest pressure on compression gauge.

NOTE:
For measuring compression pressure, crank engine at least 250 r/min. by using fully charged battery.

	Compression pressure
Standard	14.0 kg/cm² (199.0 psi, 1400 kPa)
Limit	11.0 kg/cm² (156.4 psi, 1100 kPa)
Max. difference between any two cylinders	1.0 kg/cm² (14.2 psi, 100 kPa)

8. Carry out steps 5 through 7 on each cylinder to obtain four readings.
9. After checking, install main relay fuse (for injector model) or connect coupler of distributor and install spark plugs.

ENGINE VACUUM CHECK

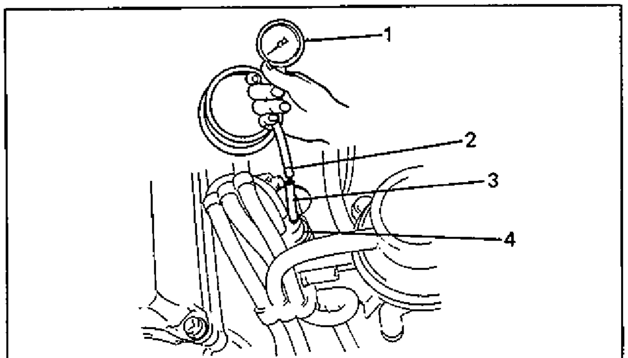
The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

1. Warm up engine to normal operating temperature.

NOTE:
After warming up engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake and block drive wheels.

[For carburetor model]

2. Disconnect vacuum hose from gas filter and connect the special tools (Vaccum gauge and vacuum gauge hose joint) to the hose disconnected.

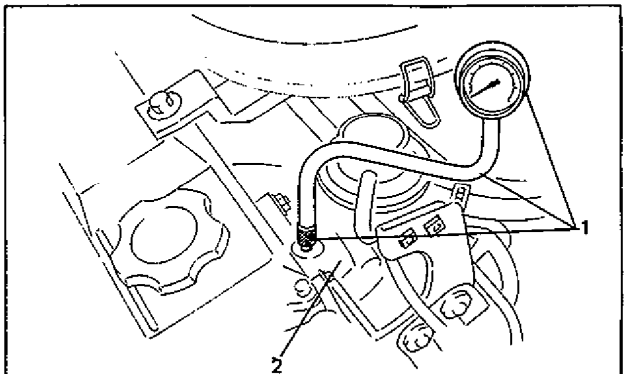


1. Special tool (Vacuum gauge 09915-67310)
2. Special tool (Hose joint 09918-08210)
3. Hose
4. Gas filter on intake manifold

Fig. 6A-6 Installing Vacuum Gauge (for carburetor model)

[For injector model with M/T]

2. With engine stopped, remove blind plug from intake manifold and connect special tool (vacuum gauge) to intake manifold.

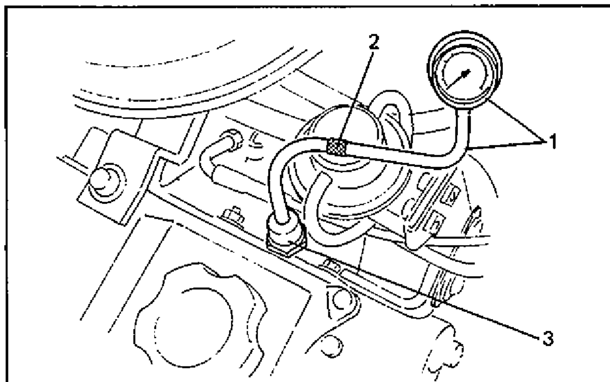


1. Special tool (Vacuum gauge 09915-67310)
2. Intake manifold

Fig. 6A-6-1 Installing Vacuum Gauge (for injector model with M/T)

[For injector model with A/T]

2. With engine stopped, disconnect vacuum hose (for A/T) from its pipe and connect special tools (vacuum gauge and hose joint) to the hose disconnected.



1. Special tool (Vacuum gauge 09915-67310)
2. Special tool (Hose joint 09918-08210)
3. Gas filter

Fig. 6A-6-2 Installing Vacuum Gauge (for injector model with A/T)

3. Run engine at specified idle speed (see section 6D or 6E), and read vacuum gauge. Vacuum should be within following specification.

Vacuum specification (at sea level)	45 – 55 cmHg (17.7 – 21.6 in.Hg) at specified idling speed

[For carburetor model]

4. After checking, remove the hose joint and the vacuum gauge, and connect the vacuum hose to gas filter securely.

[For injector model]

4. After checking, remove special tool(s) and connect vacuum hose or install blind plug after applying sealing tape to its threads.

OIL PRESSURE CHECK

NOTE:

Prior to checking oil pressure, check the followings.

- **Oil level in oil pan.**
  If oil level is low, add oil up to Full level hole on oil level gauge.
- **Oil quality.**
  If oil is discolored, or deteriorated, change it. For particular oil to be used, refer to the table in Section 0B or 0B2.
- **Oil leaks.**
  If leak is found, repair it.

1. Using special tool (Oil filter wrench), remove oil filter.
2. After removing oil filter, remove oil pressure switch from cylinder block.

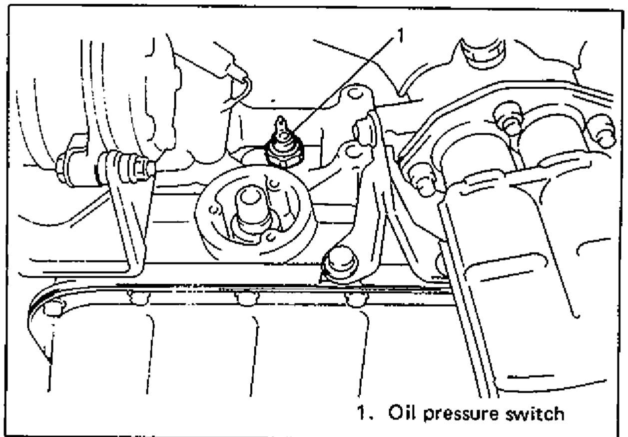


Fig. 6A-7 Oil Pressure Switch

3. Install special tool (Oil pressure gauge) to vacated threaded hole.

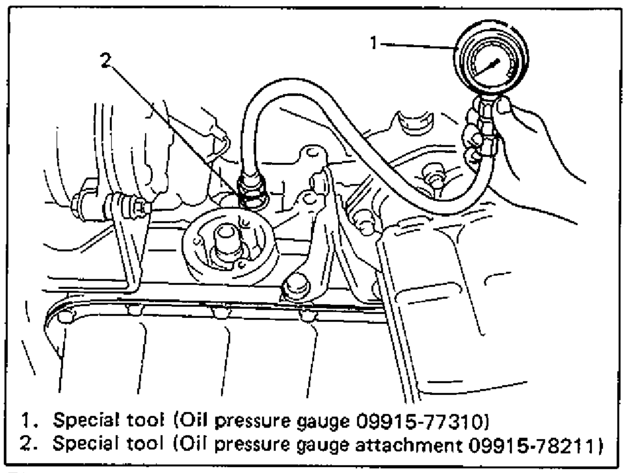


Fig. 6A-8 Oil Pressure Gauge Installation

4. Reinstall oil filter.
5. Start engine and warm it up to normal operating temperature.
6. After warming up, raise engine speed to 4,000 r/min and measure oil pressure.

Oil pressure specification	3.3 – 4.3 kg/cm^2 46.9 – 61.1 psi at 4,000 r/min (rpm)

7. After checking oil pressure, stop engine and remove oil filter and oil pressure gauge.
8. Before reinstalling oil pressure switch, be sure to wrap its screw threads with a sealing tape and tighten switch to specified torque.

Tightening torque for oil pressure switch	N·m	kg-m	lb-ft
	12 – 15	1.2 – 1.5	9.0 – 10.5

NOTE:
If sealing tape edge is bulged out from screw threads of switch, cut it off.

9. After oiling oil filter "O" ring (rubber gasket), screw oil filter on oil filter stand by hand until filter "O" ring contacts mounting surface.

CAUTION:
To tighten oil filter properly, it is important to accurately identify the position where filter "O" ring first contacts mounting surface.

10. Tighten filter 3/4 (270°) turn from the point of contact with mounting surface using an oil filter wrench.

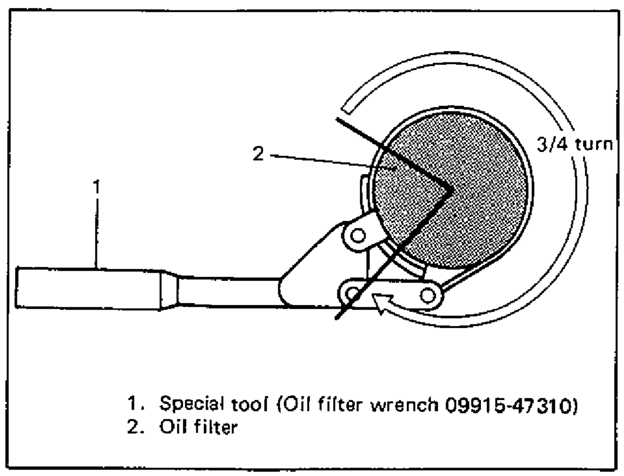


Fig. 6A-9 Tightening Oil Filter

CAUTION:
To prevent oil leakage, make sure that oil filter is tight, but do not overtighten it.

11. After installing oil filter, start engine and check oil filter for oil leakage.

AIR CLEANER ELEMENT

This air cleaner element is of dry type. Remember that it needs cleaning according to following procedure.

REMOVE OR DISCONNECT

1. Air cleaner upper case after removing case nut and 4 clamps.

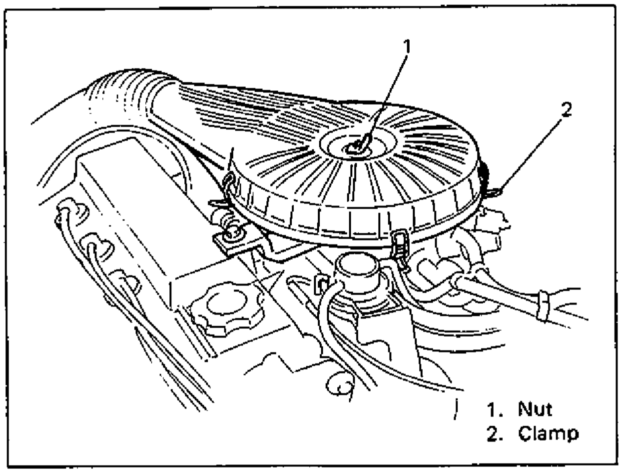


Fig. 6A-10 Removing Upper Case

2. Air cleaner element.

INSPECT

Check air cleaner element for dirt.

CLEAN

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

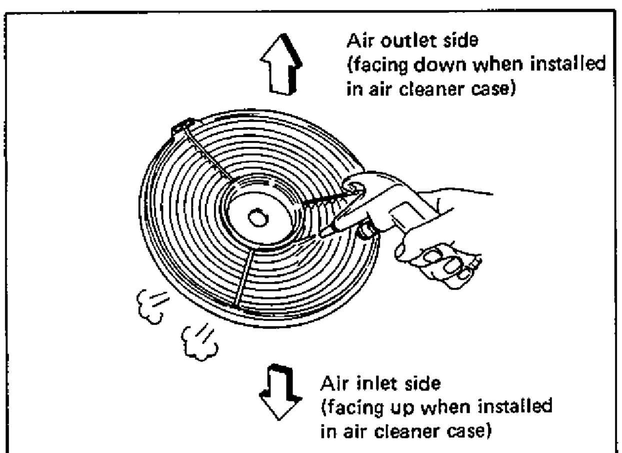


Fig. 6A-11 Cleaning Air Cleaner Element

INSTALL OR CONNECT

1. Air cleaner element to its lower case.
   Fit the lug of element to the recession of lower case as shown in below figure.

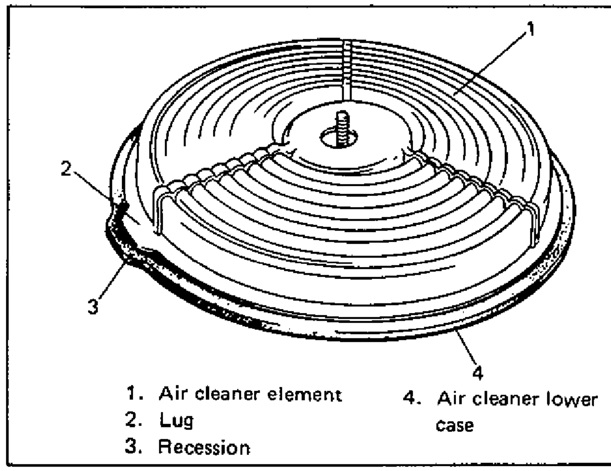


Fig. 6A-12 Installing Air Cleaner Element

2. Air cleaner upper case.
   Tighten case nut and clamps securely.

AIR CLEANER ASSEMBLY

REMOVE OR DISCONNECT

[For carburetor model]

1. Negative cable at battery.
2. Air cleaner nut and lower case bolt.
3. Air suction guide, warm air hose, PCV hose and other hoses from air cleaner case.
4. Air cleaner assembly.

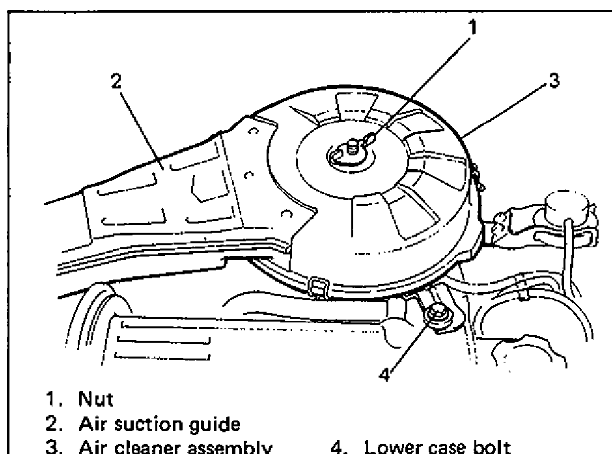


Fig. 6A-13 Removing Air Cleaner Assembly

[For injector model]

1. Negative cable at battery.
2. Coupler from ATS.
3. ISC solenoid valve hose from air cleaner lower case.
4. Air suction hose and resonator hose from air cleaner case.
5. Air cleaner assembly from throttle body and PCV hose.

INSTALL OR CONNECT

Reverse removal procedure for installation, noting following.

- Before installing, make sure that air cleaner case seal is installed to air cleaner case securely.

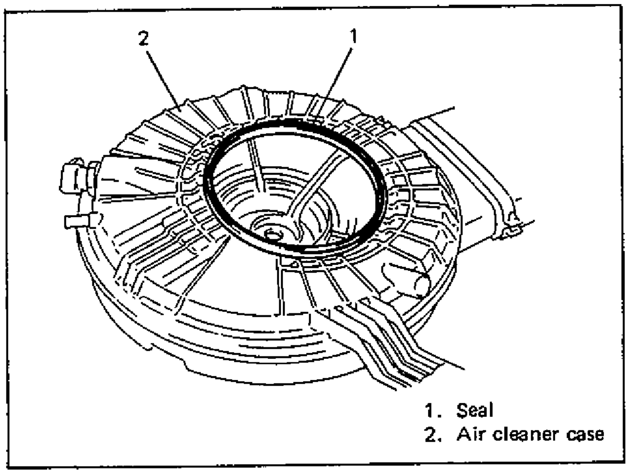


Fig. 6A-14 Air Cleaner Case Seal

- Clamp hose(s) securely.

CYLINDER HEAD COVER

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Air cleaner assembly as previously outlined.
3. High-tension cord clamps from cylinder head cover.
4. PCV valve hose.
5. Cylinder head cover bolts.

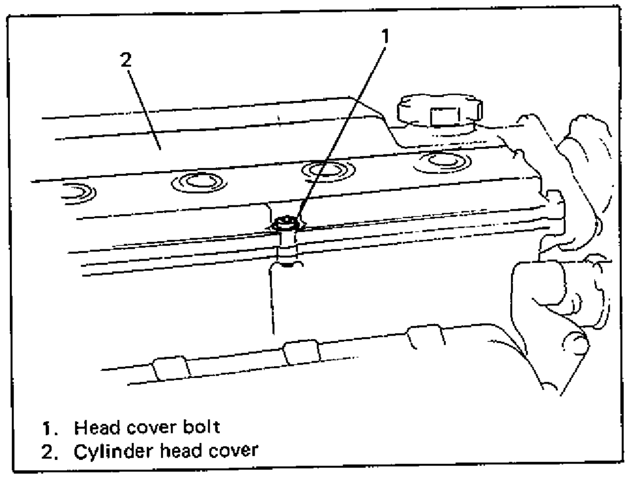


Fig. 6A-15 Removing Cylinder Head Cover Bolt

6. Cylinder head cover from cylinder head.

INSTALL OR CONNECT

1. Cylinder head cover gasket to head cover. Before installing gasket, check it for deterioration or damage, and replace as necessary.
2. Cylinder head cover and tighten cover bolts to specified torque.

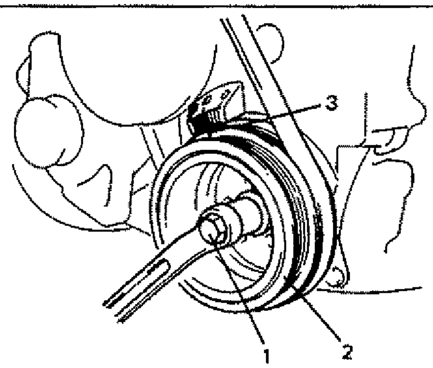
Tightening torque for cover bolt	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

3. High-tension cord clamps to cylinder head cover.
4. Air cleaner assembly as previously outlined.
5. Negative cable at battery.

VALVE LASH (CLEARANCE)

CHECKING AND ADJUSTING PROCEDURES

1. Remove negative cable at battery.
2. Remove cylinder head cover as previously outlined.
3. Using special tool (17 mm socket), turn crankshaft pulley clockwise until "V" mark (in white paint) on pulley aligns with "0" (zero) calibrated on timing belt cover.



1. Special tool (17 mm socket 09919-16020)
2. Crankshaft pulley
3. V mark

Fig. 6A-16 Aligning Marks

4. Remove distributor cap, and check if rotor is positioned as shown in figure (i.e. No. 1 piston is at TDC of compression stroke).
   If rotor is out of place, turn crankshaft clockwise once (360°).
   In this state, check valve clearance at valves ①, ②, ⑤ and ⑦.

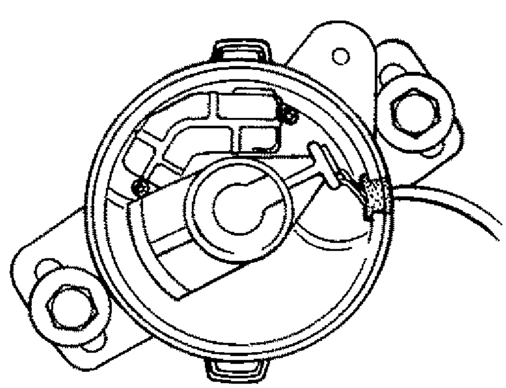


Fig. 6A-17 Checking Rotor Position

NOTE:
When checking valve clearance, insert thickness gauge between camshaft and cam-riding face of rocker arm.

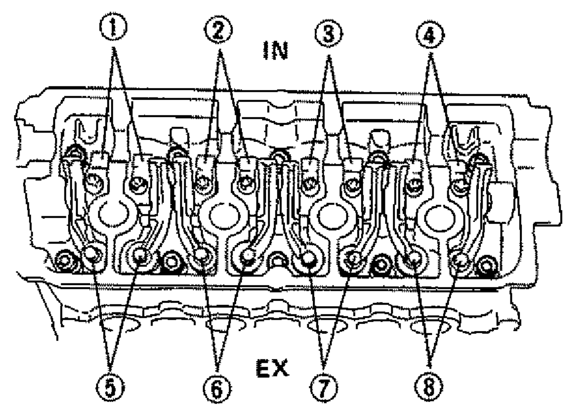
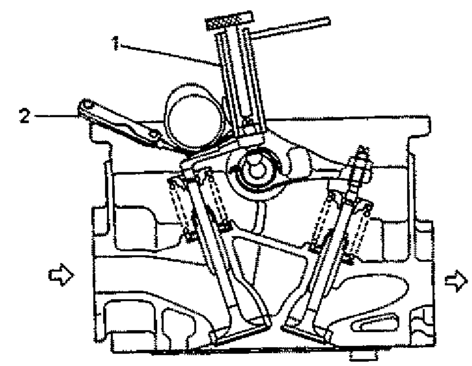
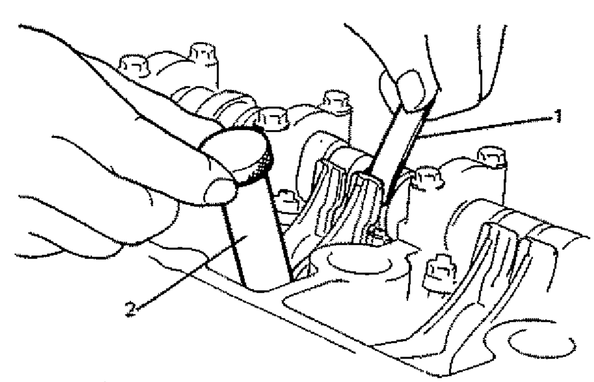


Fig. 6A-18 Valve Identification



1. Special tool (Tappet adjuster wrench 09917-18210)
2. Thickness gauge

Fig. 6A-19 Checking Valve Clearance (IN side)



1. Thickness gauge
2. Special tool

Fig. 6A-20 Checking Valve Clearance (EX side)

5. If valve lash is out of specification, adjust it to specification by turning adjusting screw after loosening lock nut. After adjustment, tighten lock nut to specified torque while holding adjusting screw stationary with screwdriver, and then make sure again that valve lash is within specification.

<table>
<tr><td rowspan="3">Valve clearance specification</td><td></td><td>When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)</td><td>When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)</td></tr>
<tr><td>Intake</td><td rowspan="2">0.08 – 0.12 mm (0.0031 – 0.0047 in)</td><td rowspan="2">0.12 – 0.16 mm (0.0047 – 0.0063 in)</td></tr>
<tr><td>Exhaust</td></tr>
</table>

Tightening torque for adjusting screw lock nut	N·m	kg·m	lb-ft
	10 – 13	1.0 – 1.3	7.5 – 9.0

6. After checking and adjusting valve lashes at valves ①, ②, ⑤ and ⑦, rotate crankshaft exactly one full turn (360°), and check the same at valves ③, ④, ⑥ and ⑧. Adjust them as necessary.
7. After checking and adjusting all valves, reverse removal procedure for installation.

CARBURETOR AND INTAKE MANIFOLD (for carburetor model)

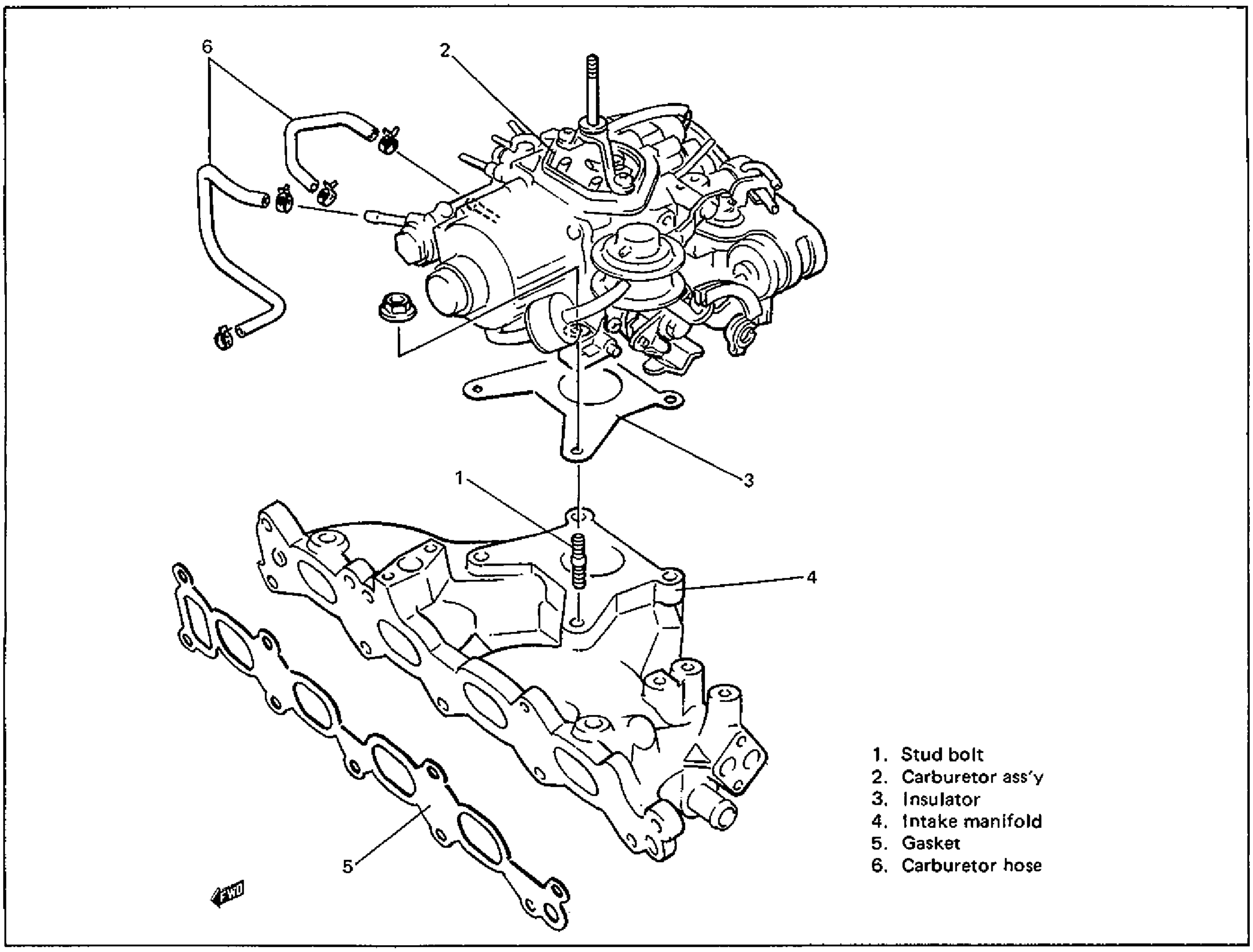


Fig. 6A-21 Carburetor and Intake Manifold

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Drain cooling water.

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

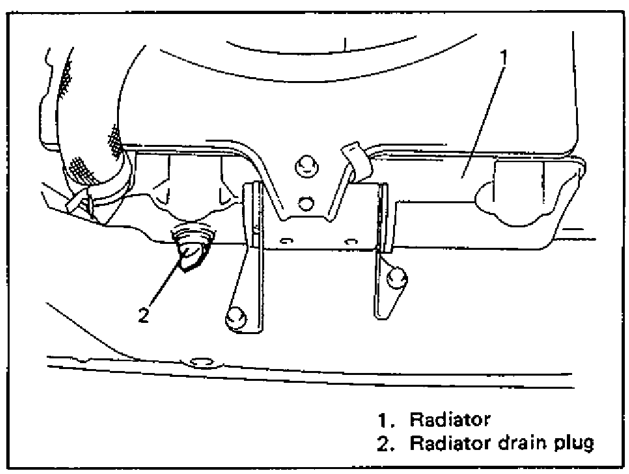


Fig. 6A-22 Radiator Drain Plug

3. Air cleaner assembly as previously outlined.

4. Acclerator cable from carburetor.
5. Electric lead wires.
6. Fuel feed and return hoses.
   Before disconnecting hose, remove fuel filler cap to release the pressure in fuel tank and reinstall it.
7. Hoses.
8. Other jointed parts from carburetor and intake manifold, if any.
9. Intake manifold with carburetor from cylinder head.

INSTALL OR CONNECT

1. Intake manifold gasket to cylinder head. Use a new gasket.
2. Intake manifold with carburetor to cylinder head.

Tightening torque for bolts and nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

3. PCV hose to PCV valve.
4. Vacuum hoses.
5. Water hoses.
6. Fuel return and feed hoses to pipes.
7. Electric lead wires according to description in section 8.
8. Accelerator cable to carburetor.
   Adjust accelerator cable play to specification according to description in section 6D.
9. Air cleaner assembly to carburetor as previously outlined.
10. Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
11. Refill cooling system.
12. Negative cable at battery.
13. Upon completion of installation, start engine and check for fuel leaks and engine cooling water leaks.

THROTTLE BODY AND INTAKE MANIFOLD (for injector model)

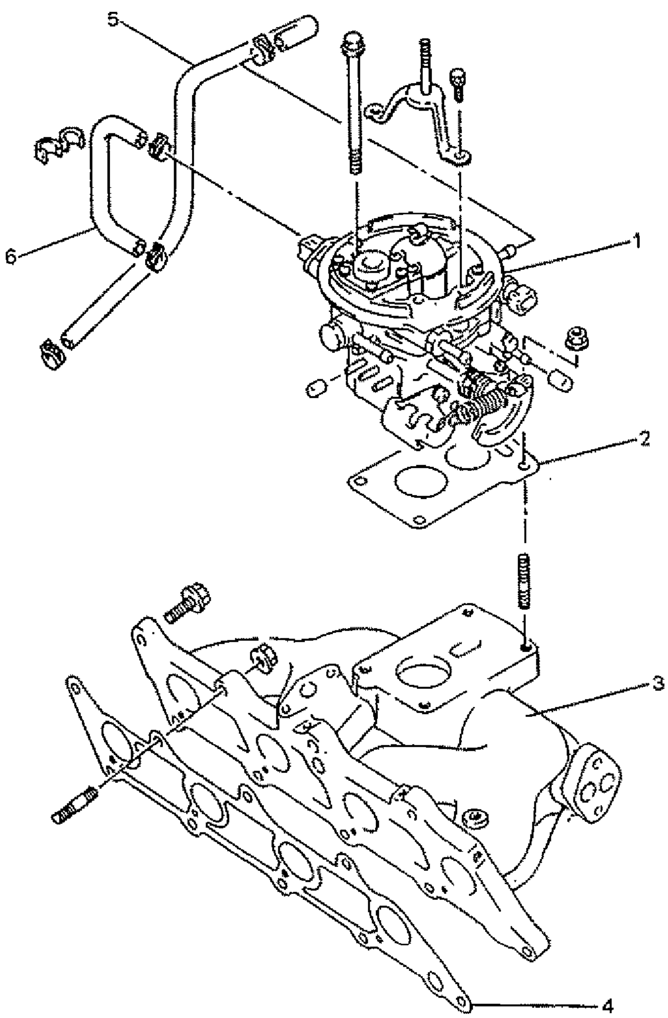


Fig. 6A-23 Throttle Body and Intake Manifold

REMOVE OR DISCONNECT

1. Relieve fuel pressure according to procedure described in P. 6-3.
2. Negative cable at battery.
3. Drain cooling water.

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

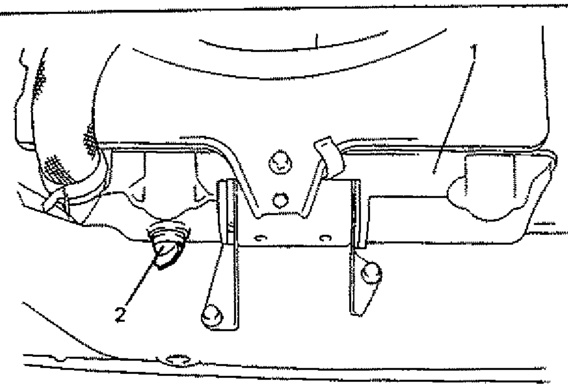


Fig. 6A-24 Radiator Drain Plug

4. Air cleaner assembly as previously outlined.
5. Electric lead wires.

6. Fuel return and feed hoses from throttle body.
7. Water hoses from throttle body and intake manifold.
8. Vacuum hoses.
9. PCV hose from cylinder head cover.
10. Accelerator cable from throttle body.
11. Other connected to throttle body and intake manifold, if any.
12. Intake manifold with throttle body from cylinder head.

INSTALL OR CONNECT

1. Intake manifold gasket to cylinder head. Use a new gasket.
2. Intake manifold with throttle body to cylinder head.
   - Install clamps as shown in Fig. 6A-25, and tighten bolts and nuts to specification.

Tightening torque for bolts and nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

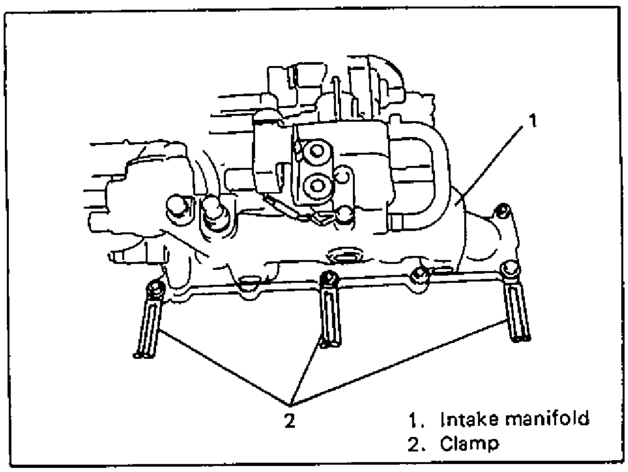


Fig. 6A-25 Clamps

3. PCV hose to cylinder head cover.
4. Vacuum hoses.
   Refer to Fig. 6A-4 for routing and connection.
5. Water hoses.
6. Fuel return and feed hoses to throttle body.
7. Electric lead wires.

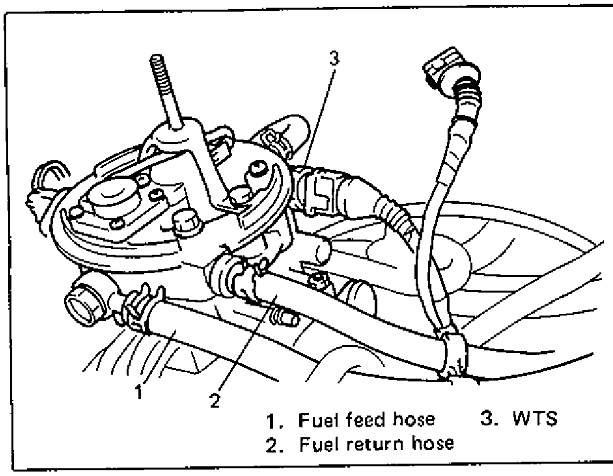


Fig. 6A-26 Connecting Hoses and Coupler

8. Accelerator cable to throttle body.
   Adjust accelerator cable play to specification according to description in section 6E.
9. Air cleaner assembly to throttle body as previously outlined.
10. Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
11. Refill cooling system.
12. Negative cable at battery.
13. Upon completion of installation, start engine and check for fuel leaks and engine cooling water leaks.

EXHAUST MANIFOLD

NOTE:
Oxygen sensor is applicable to injector model.

> **WARNING:**
> **To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.**

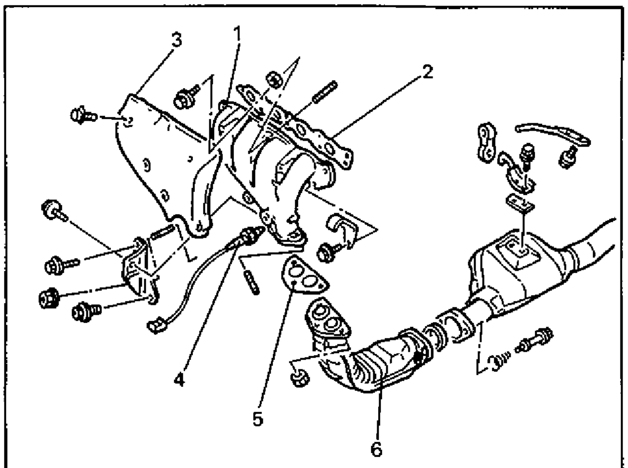


Fig. 6A-27 Exhaust Manifold, No. 1 Pipe, etc.

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Oxygen sensor coupler.
   Release its wire from clamps.
3. Cover on exhaust manifold.
4. Exhaust manifold stiffener bolts.
5. Exhaust No. 1 pipe from exhaust manifold.

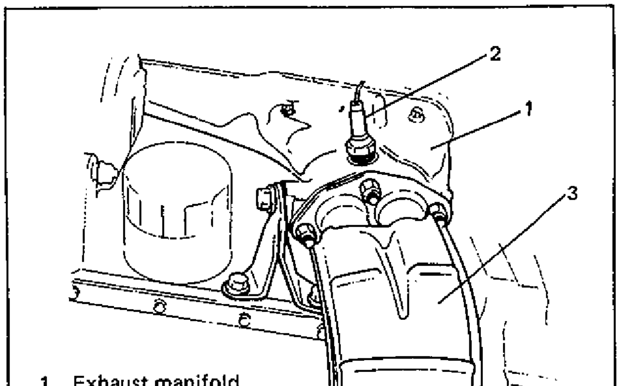


Fig. 6A-28 Exhaust No. 1 Pipe

6. Exhaust manifold and its gasket from cylinder head.

INSTALL OR CONNECT

1. Manifold gasket to cylinder head.
   Before installing gasket, check it for deterioration or damage, and replace as necessary.
2. Exhaust manifold.
   Tighten manifold bolts and nuts to specified torque.

Tightening torque for bolts and nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

3. Pipe gasket and exhaust No.1 pipe.
   Before installing pipe gasket, check it for deterioration or damage, and replace as necessary.
   Tighten pipe nuts to specified torque.

Tightening torque for No. 1 pipe nuts	N·m	kg-m	lb-ft
	25 – 35	2.5 – 3.5	18.5 – 25.0

4. Tighten exhaust manifold stiffener bolts to specified torque.

Tightening torque for exhaust manifold stiffener bolts	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

5. Cover to exhaust manifold.
6. Oxygen sensor coupler.
   Clamp its wire securely.
7. Negative cable at battery.
8. Check exhaust system for exhaust gas leakage.

TIMING BELT AND BELT TENSIONER

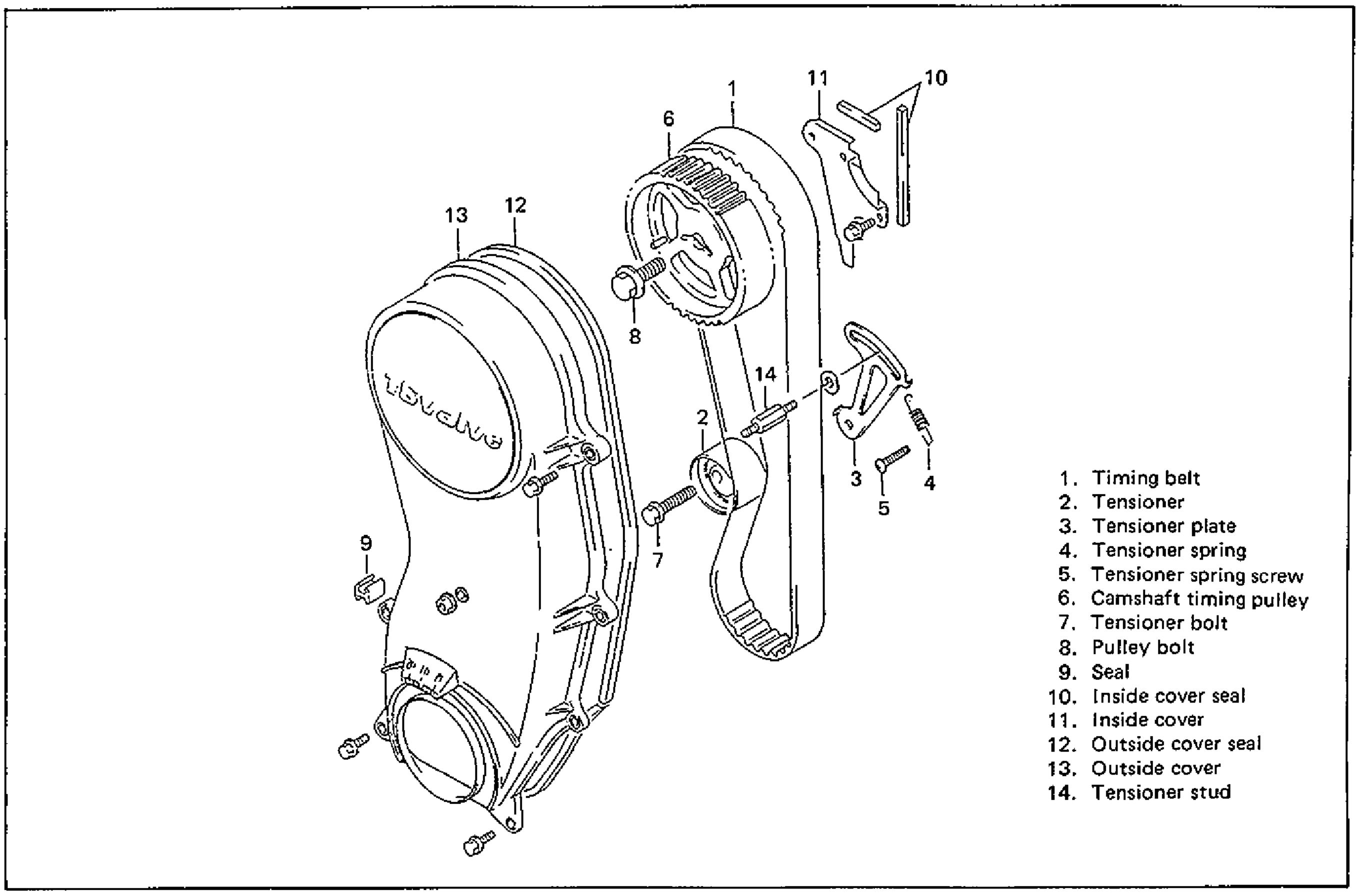


Fig. 6A-29 Timing Belt, Tensioner and Camshaft Timing Pulley, etc.

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Raise car.
3. Fender apron extension on right side.
   Remove clip after pushing center pin.

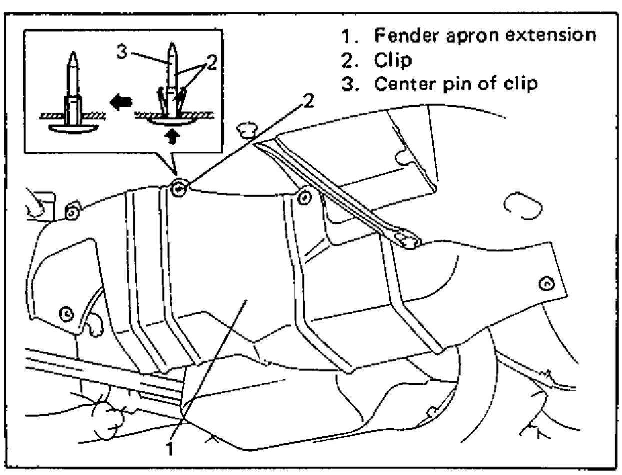


Fig. 6A-30 Removing Fender Apron Extension

4. Water pump belt and its pulley.
   Loosen generator pivot bolts and its adjusting bolt and remove water pump belt.
5. Crankshaft pulley by removing 5 pulley bolts and crankshaft timing belt pully bolt.

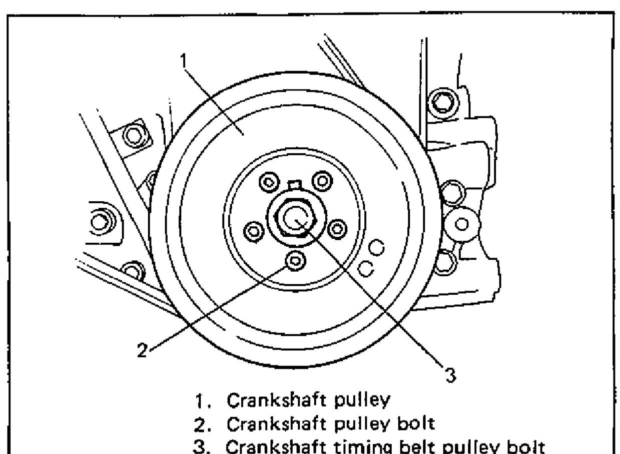


Fig. 6A-31 Crankshaft Pulley and Pulley Bolts

After removing crankshaft pulley, hand tighten crankshaft timing belt pulley bolt.

6. Timing belt outside cover.
7. For installation of timing belt, align 4 timing marks as shown in Fig. 6A-32 by turning crankshaft.

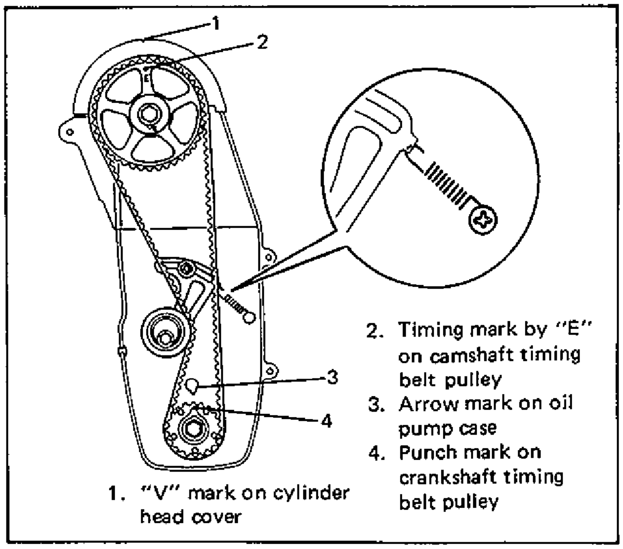


Fig. 6A-32 Aligning Timing Marks

8. Timing belt tensioner, tensioner plate, tensioner spring and timing belt.

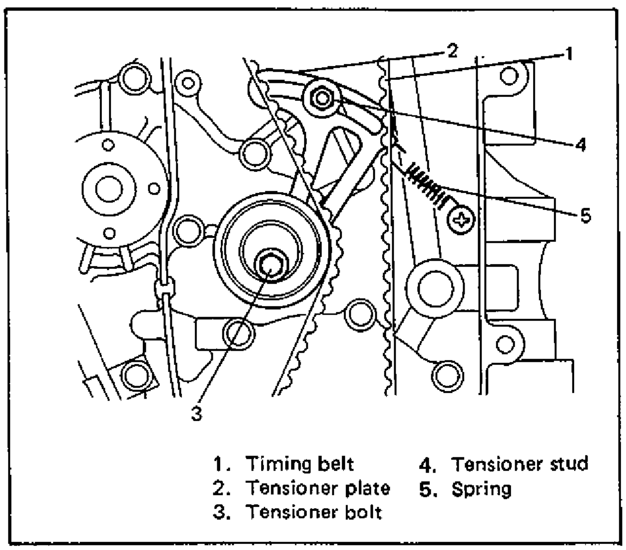


Fig. 6A-33 Timing Belt Tensioner and Belt

CAUTION:

- **After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown below. If turned, interference may occur among piston and valves, and parts related to piston and valves may be damaged.**

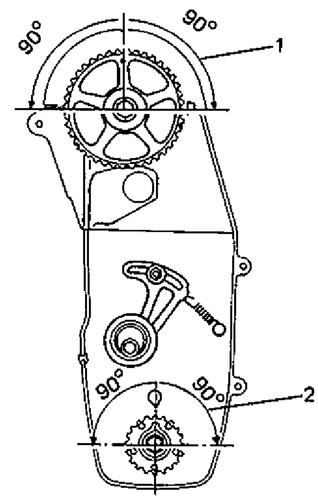


Fig. 6A-34 Allowable Turning Range

- **Never bend timing belt.**

INSPECT

- Timing belt for wear or crack. Replace it as necessary.
- Tensioner for smooth rotation.

INSTALL OR CONNECT

1. Tensioner plate to tensioner.
   Insert lug of tensioner plate into hole of tensioner.

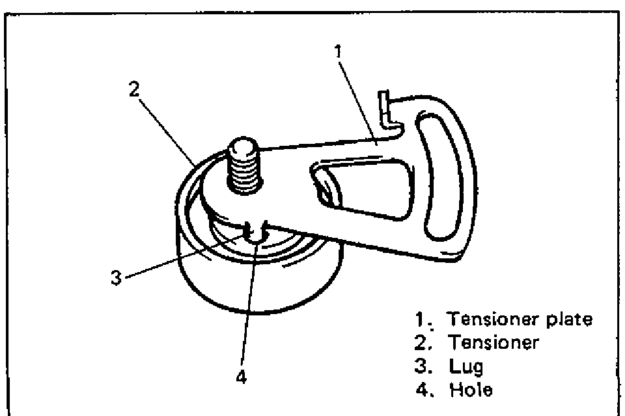
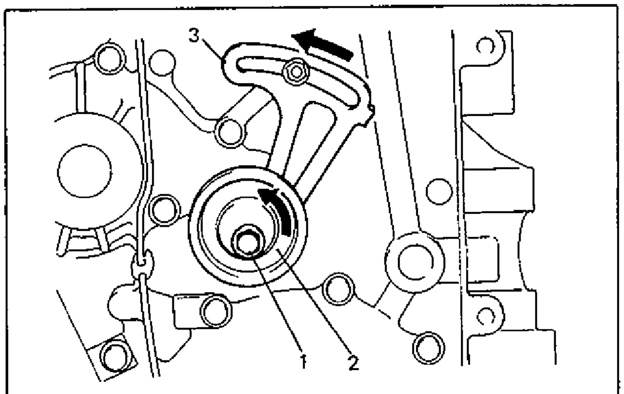


Fig. 6A-35 Lug and Hole

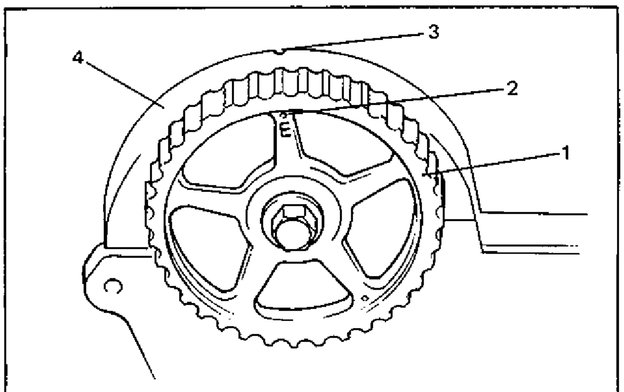
2. Tensioner and tensioner plate:
   Do not tighten tensioner bolt with wrench yet. Hand tighten only at this time.
   Check to ensure that plate movement in arrow direction as shown in Fig. 6A-36 causes tensioner to move in the same direction. If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert plate lug into tensioner hole.



1. Tensioner bolt
2. Tensioner
3. Tensioner plate

Fig. 6A-36 Tensioner Installation

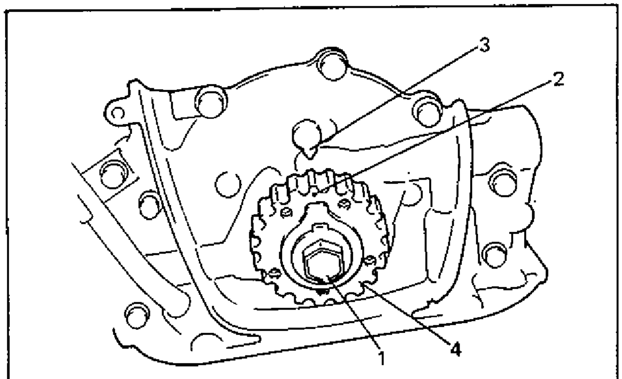
3. Check that timing mark on camshaft timing belt pulley is aligned with "V" mark on cylinder head cover. If not, align two marks by turning camshaft but be careful not to turn it more than its allowable turning range which is described on Fig. 6A-34.



1. Camshaft timing belt pulley
2. Timing mark
3. "V" mark
4. Cylinder head cover

Fig. 6A-37 Timing Marks

4. Check that punch mark on crankshaft timing belt pulley is aligned with arrow mark on oil pump case. If not, align two marks by turning crankshaft but be careful not to turn it more than its allowable turning range which is described on Fig. 6A-34.

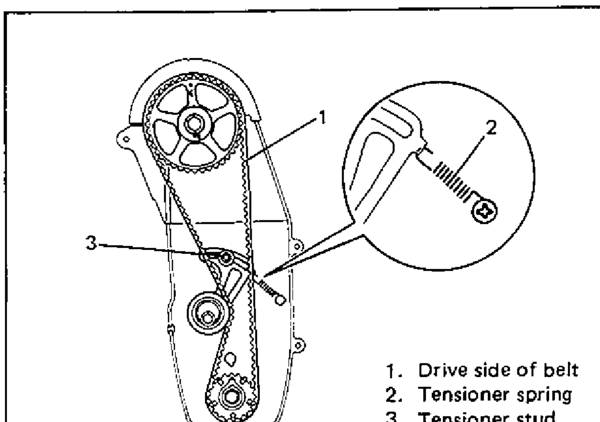


1. Crankshaft timing belt pulley bolt
2. Punch mark
3. Arrow mark
4. Crankshaft timing belt pulley

Fig. 6A-38 Timing Marks

5. Timing belt and tensioner spring.
   With two sets of marks aligned and tensioner plate pushed up, install timing belt on two pulleys in such a way that drive side of belt is free from any slack.
   And then install tensioner spring and spring damper as shown in Fig. 6A-39, and hand-tighten tensioner stud.

NOTE:
- **When installing timing belt, match arrow mark (⇨) on timing belt with rotating direction of crankshaft.**
- **In this state, No. 4 piston is at top dead center of compression stroke.**



1. Drive side of belt
2. Tensioner spring
3. Tensioner stud

Fig. 6A-39 Installing Timing Belt and Tensioner Spring

6. To take up slack of timing belt, turn crankshaft two rotations clockwise after installing it. After making sure that belt is free from slack, tighten tensioner stud first and then tensioner bolt to each specified torque.
   Then confirm again that two sets of marks are aligned respectively.

	N·m	kg-m	lb-ft
Tightening torque for tensioner stud	9 – 12	0.9 – 1.2	7.0 – 8.5
Tightening torque for tensioner bolt	22 – 28	2.2 – 2.8	16.0 – 20.0

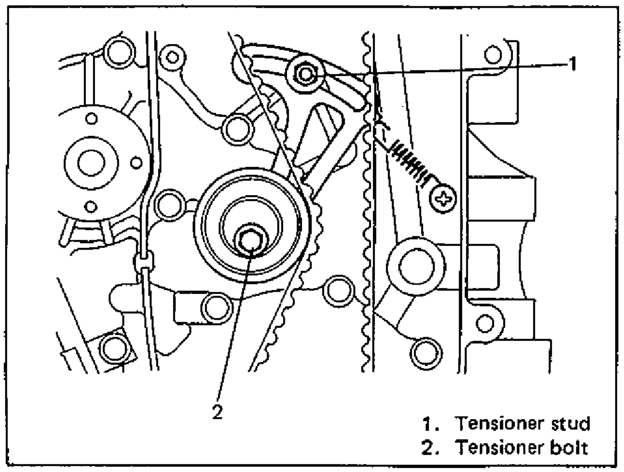


Fig. 6A-40 Tensioner Bolt and Stud

7. Timing belt outside cover.
   Before installing, make sure that seal is between water pump and oil pump case.

	N·m	kg-m	lb-ft
Tightening torque for timing belt outside cover bolt & nut	9 – 12	0.9 – 1.2	7.0 – 8.5

8. Crankshaft pulley.
   Remove crankshaft timing belt pulley bolt and fit keyway on pulley to the key on crankshaft timing belt pulley, and tighten 5 bolts and timing belt pulley bolt to specification.

	N·m	kg-m	lb-ft
Tightening torque for pulley bolts	14 – 18	1.4 – 1.8	10.5 – 13.0
Tightening torque for timing belt pulley bolt	105–115	10.5–11.5	76.0 – 83.0

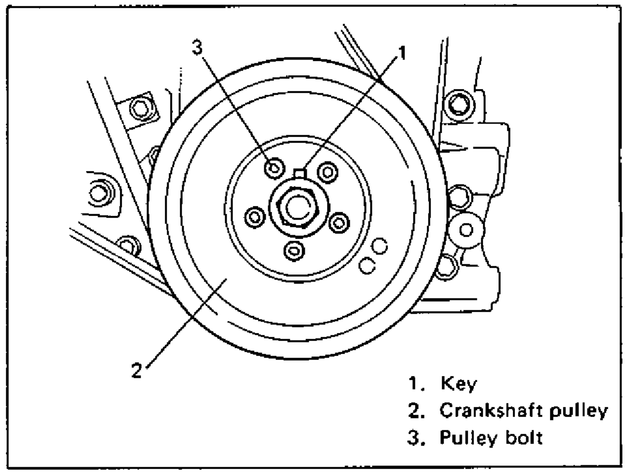


Fig. 6A-41 Installing Crankshaft Pulley

9. Water pump pulley and water pump belt.
   Adjust belt tension to specification. Refer to Section "6B" for procedure to adjust belt tension.
10. Fender apron extension of right side.
11. Negative cable at battery.

OIL PAN AND OIL PUMP STRAINER

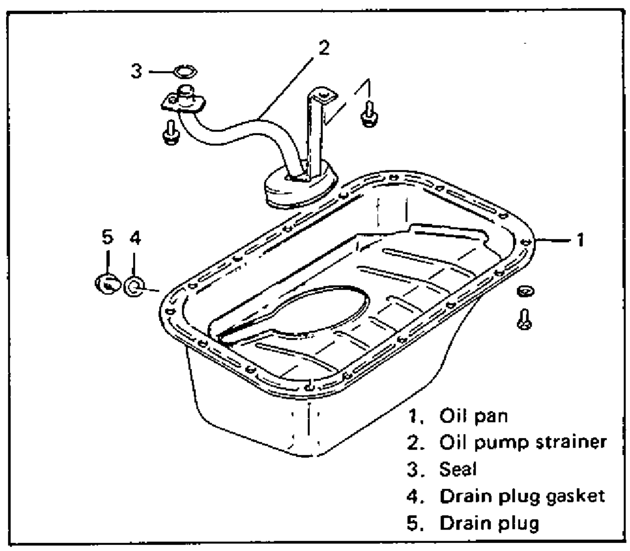


Fig. 6A-42 Oil Pan and Oil Pump Strainer

REMOVE OR DISCONNECT

1. Hoist car.
2. Drain engine oil by removing drain plug.

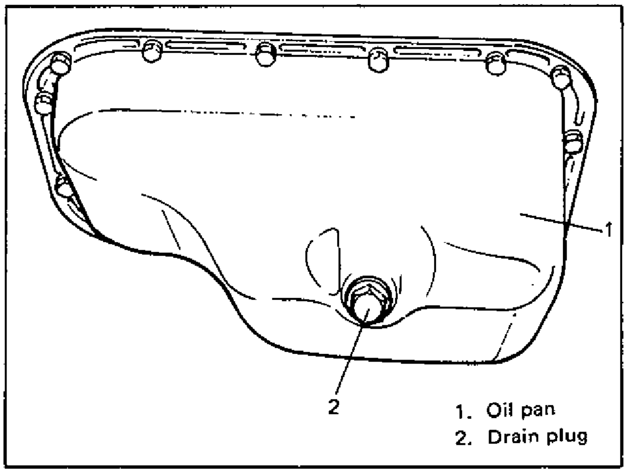


Fig. 6A-43 Drain Plug

3. Clutch housing (torque converter housing for A/T) lower plate.
4. Oil pan from cylinder block.
5. Oil pump strainer.

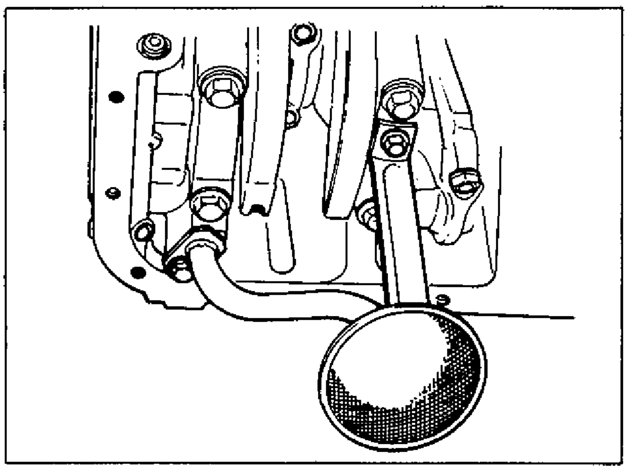


Fig. 6A-44 Oil Pump Strainer

CLEAN

- Inside of oil pan and oil pump strainer screen.

INSTALL OR CONNECT

1. Oil pump strainer.
   Install seal in such position as shown in Fig. 6A-45.
   Tighten strainer bolt first and then bracket bolt to specified torque.

Tightening torque for bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

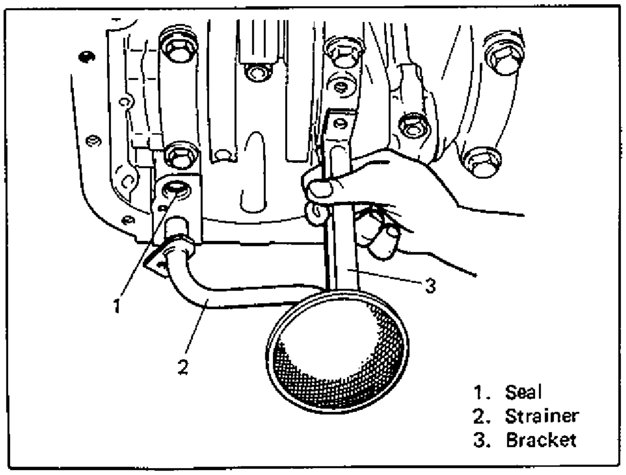


Fig. 6A-45 Installing Seal and Strainer

2. Clean mating surfaces of oil pan and cylinder block. Remove oil, old sealant, and dusts from mating surfaces.
   After cleaning, apply silicon type sealant to oil pan mating surface continuously as shown in Fig. 6A-46.

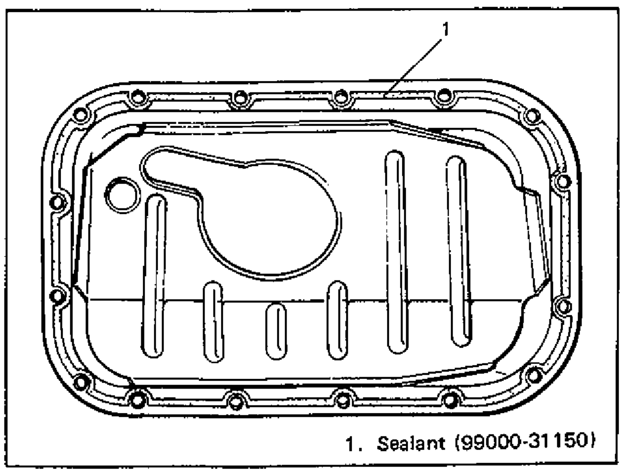


Fig. 6A-46 Applying Sealant to Oil Pan

3. Oil pan to cylinder block.
   After fitting oil pan to block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time. Tighten bolts to specified torque.

Tightening torque for oil pan bolt and nut	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

4. Gasket and drain plug to oil pan.
   Tighten drain plug to specified torque.

	N·m	kg-m	lb-ft
Tightening torque for drain plug	30 – 40	3.0 – 4.0	22.0 – 28.5

5. Clutch housing (torque converter housing for A/T) lower plate.
6. Refill engine with engine oil.

OIL PUMP

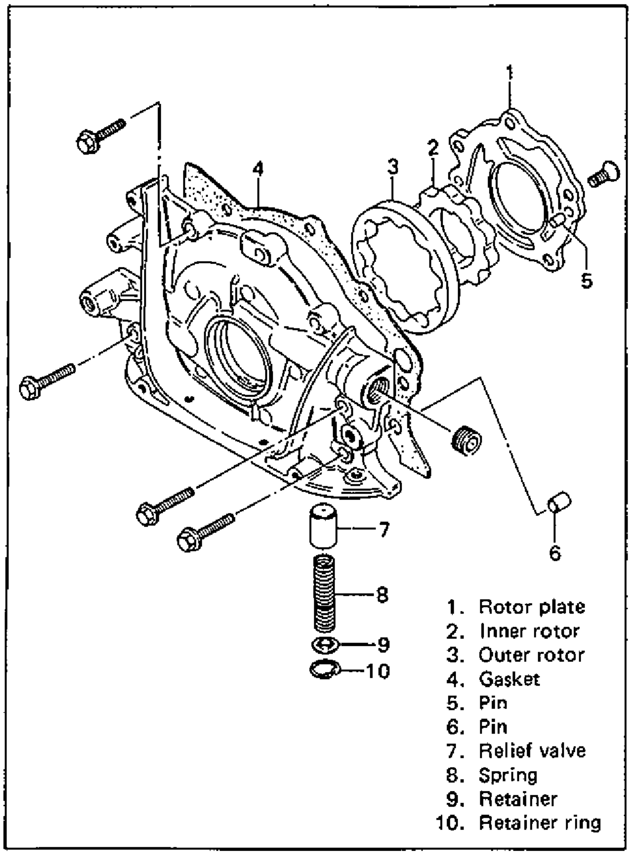


Fig. 6A-47 Oil Pump

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Hoist car.
3. Drain engine oil.
4. Oil level gauge guide, water pump belt, pulley, generator and its bracket.
5. Crankshaft pulley, water pump pulley, timing belt outside cover, timing belt and tensioner as previously outlined.
6. Crankshaft timing belt pulley and timing belt guide.
7. Oil pan and oil pump strainer.
8. Oil pump assembly after removing bolts.

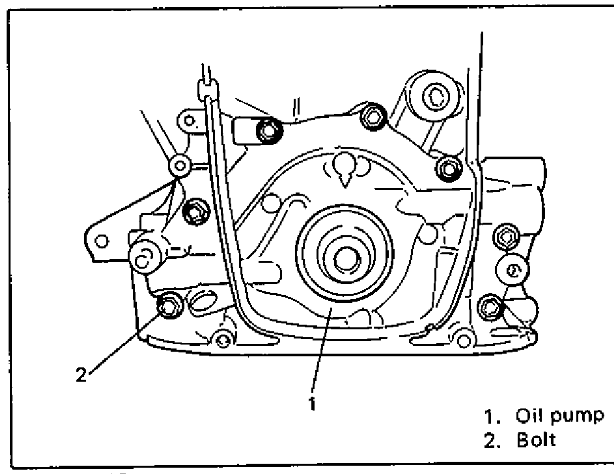


Fig. 6A-48

DISASSEMBLE

1. Rotor plate.

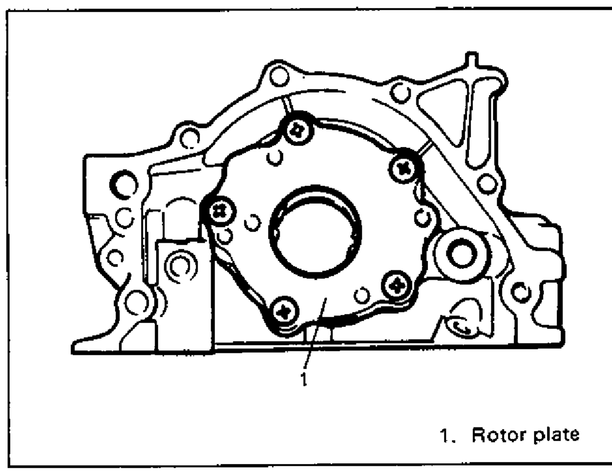


Fig. 6A-49

2. Outer rotor and inner rotor.

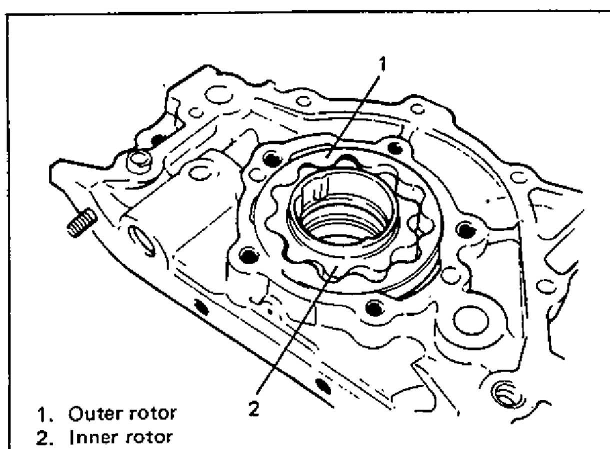


Fig. 6A-50

INSPECT

- Oil seal lip for fault or other damage. Replace as necessary.
- Outer and inner rotors, rotor plate, and oil pump case for excessive wear or damage.

MEASURE

- **Radial clearance**
  Check radial clearance between outer rotor and case, using thickness gauge.
  If clearance exceeds its limit, replace outer rotor or case.

Radial clearance between:	Limit on radial clearance
Outer rotor and case	0.310 mm (0.0122 in.)

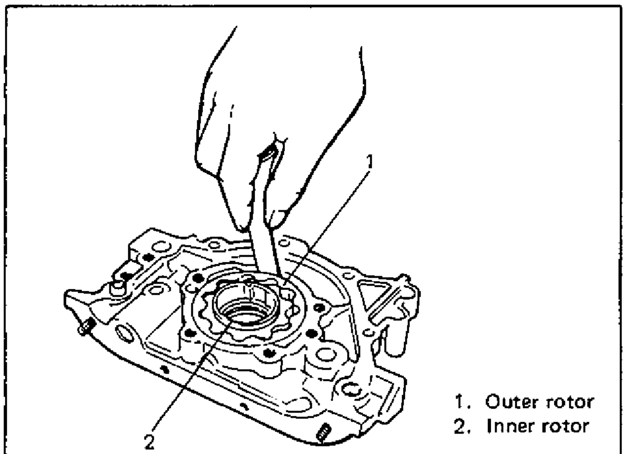


Fig. 6A-51 Measuring Radial Clearance

- **Side clearance**
  Using straight edge and thickness gauge, measure side clearance.

Limit on side clearance	0.15 mm (0.0059 in.)

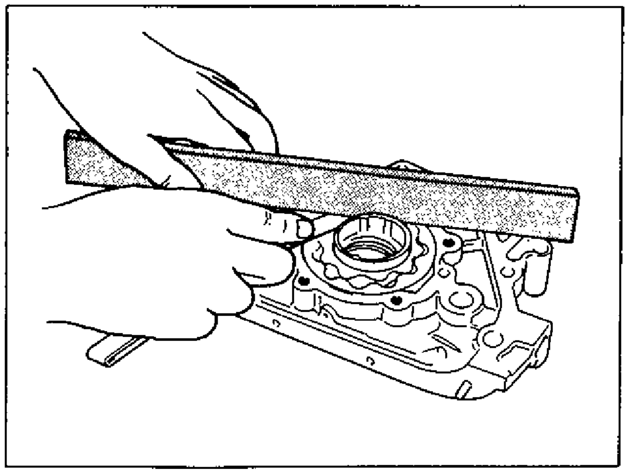


Fig. 6A-52 Measuring Side Clearance

ASSEMBLE

1. Wash, clean and then dry all disassembled parts.
2. Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, and inside surfaces of oil pump case and plate.
3. Outer and inner rotors to pump case.
4. Rotor plate. Tighten 5 screws securely.
   After installing plate, check to be sure that gears turn smoothly by hand.
5. Guide seal to pump case and then oil level gauge guide.

INSTALL OR CONNECT

Reverse removal procedure and pay attention to followings.

- Use a new oil pump gasket.
- To prevent oil seal lip from being damaged or upturned when installing oil pump to crankshaft, fit special tool (Oil seal guide) to crankshaft, and apply engine oil to special tool.

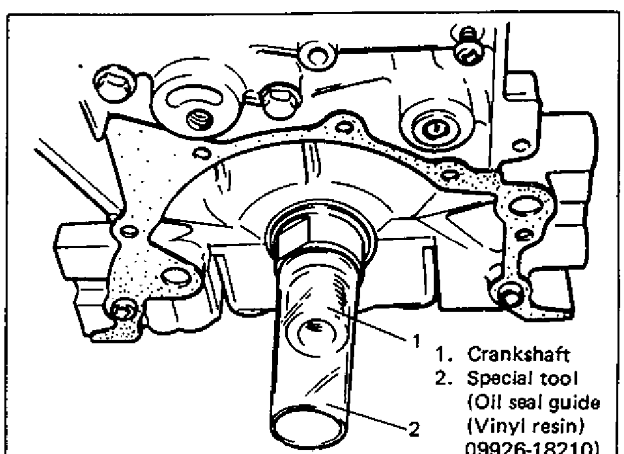


Fig. 6A-53 Special Tool (Oil Seal Guide) Installation

Tightening torque for oil pump bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

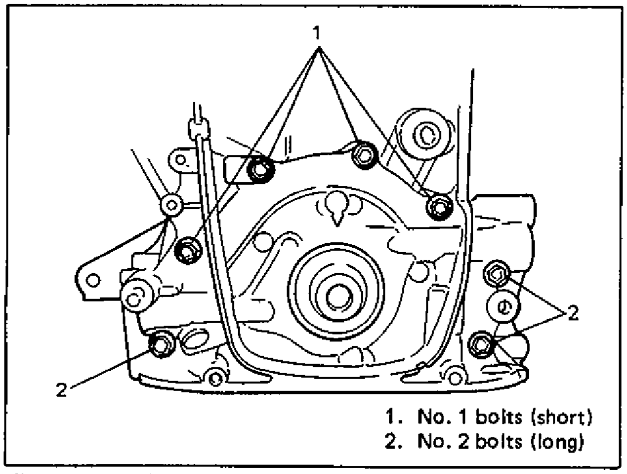


Fig. 6A-54 Oil Pump Bolts

- Edge of oil pump gasket might bulge out: if it does, cut bulge off with a sharp knife, making edge smooth and flush with end faces of pump case and cylinder block.

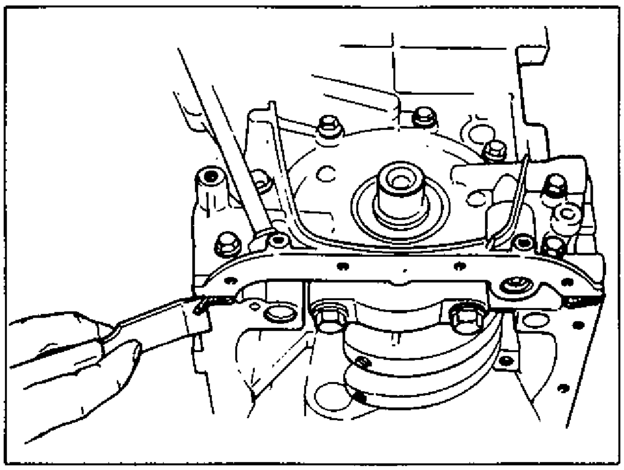


Fig. 6A-54-1 Cutting Edge of Gasket

- Timing belt guide, key, and crankshaft timing belt pulley.
  Refer to Fig. 6A-54-2 for proper installation of these parts.
  Install timing belt guide in such a way that its concave side faces oil pump.

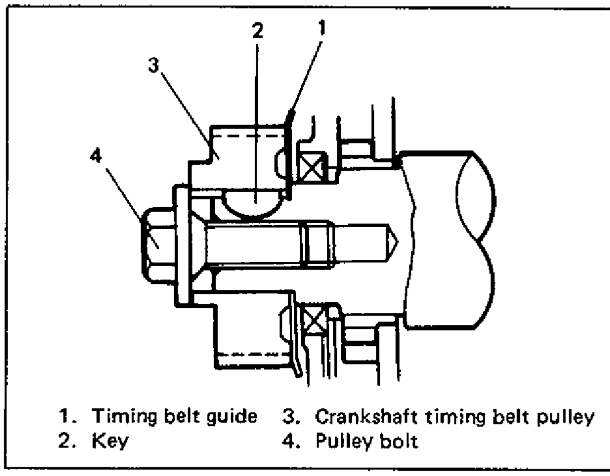


Fig. 6A-54-2 Installing Guide, Key and Pulley

- Timing belt, tensioner, and other parts as previously outlined.

ROCKER ARMS, ROCKER ARM SHAFTS AND CAMSHAFT

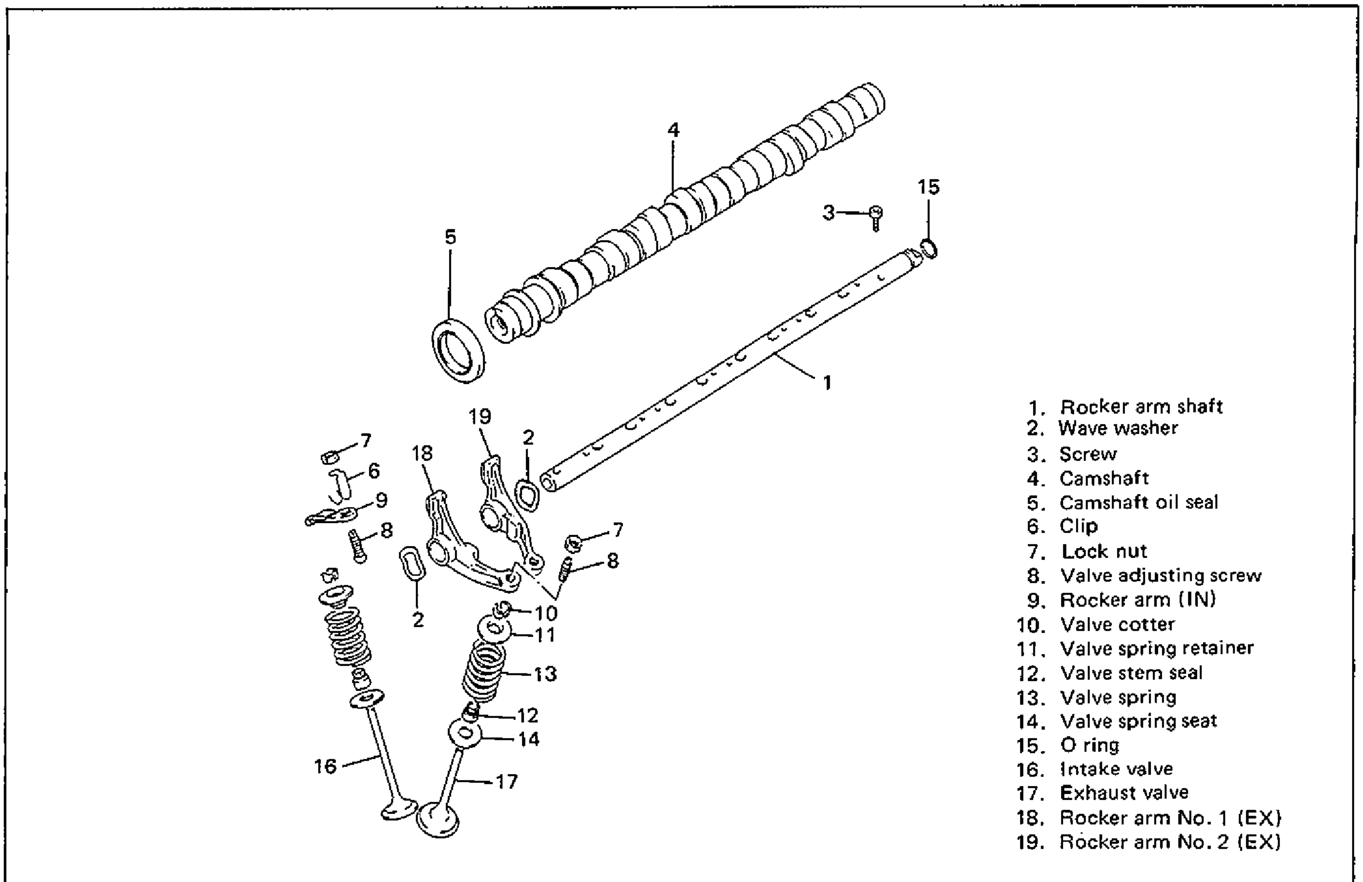


Fig. 6A-55 Rocker Arms, Rocker Arm Shafts, and Camshaft, etc.

Remove or disconnect

1. Negative cable at battery and battery.
2. Cylinder head cover and air cleaner assembly as previously outlined.
3. Distributor and distributor case from cylinder head.
4. After loosening all valve adjusting screw lock nuts, turn the adjusting screws back all the way to allow all rocker arms to move freely.

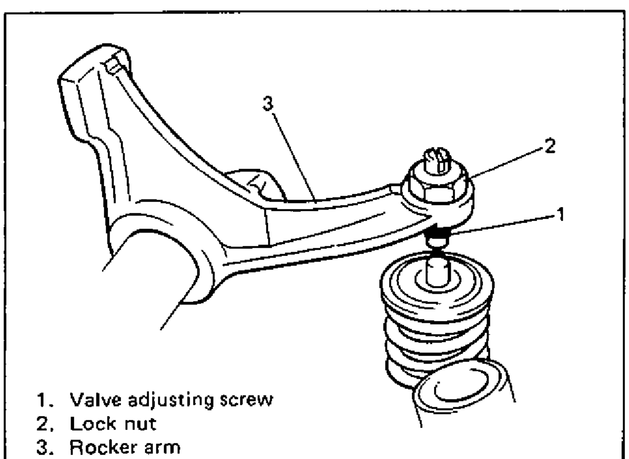


Fig. 6A-56 Adjusting Screw and Lock Nut

5. Camshaft timing belt pulley by using special tool.

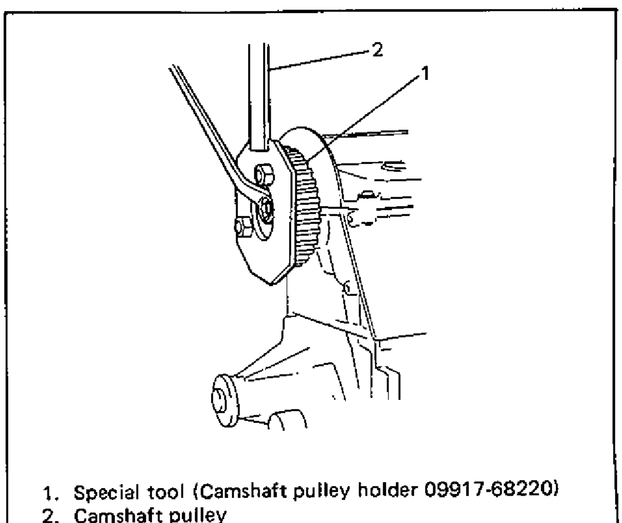


Fig. 6A-57 Camshaft Pulley Removal

6. Camshaft housings and camshaft.

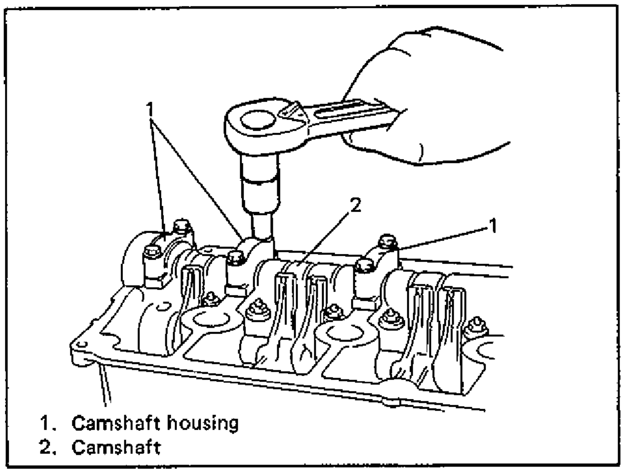


Fig. 6A-58 Camshaft and Its Housing Removal

7. Intake rocker arm with clip from rocker arm shaft.

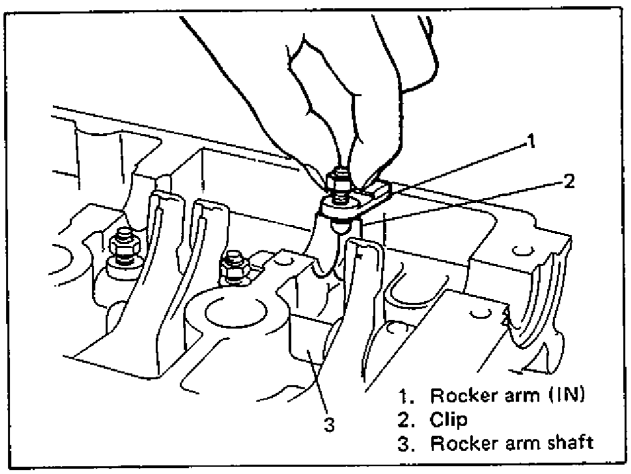


Fig. 6A-59 Rocker Arm (IN) Removal

NOTE:
Do not bend clip when removing intake rocker arm.

8. Rocker shaft bolts.

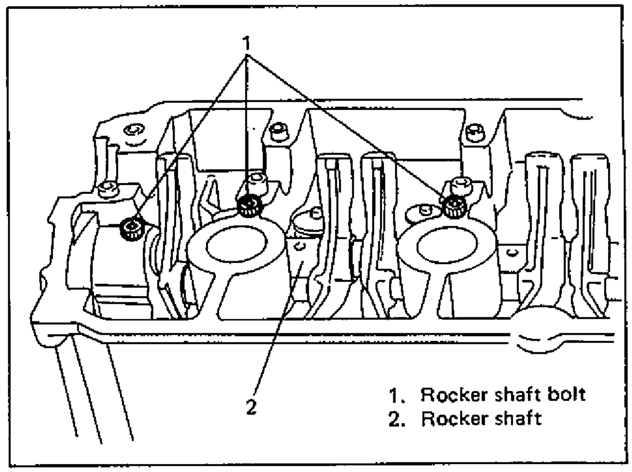


Fig. 6A-60 Rocker Shaft Bolts Removal

9. Exhaust rocker arm and wave washers by pulling rocker shaft to transmission side.

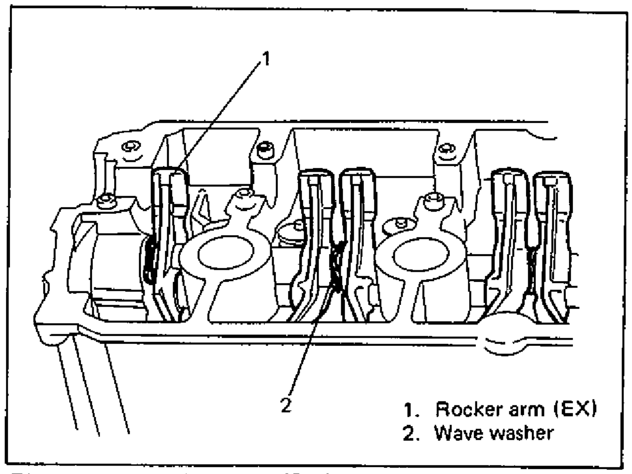


Fig. 6A-61 Rocker Arm (EX) and Wave Washer

Inspect

- **Adjusting screw and rocker arm.**
  If the tip of adjusting screw is badly worn, replace the screw.
  The arm must be replaced if its cam-riding face is badly worn.

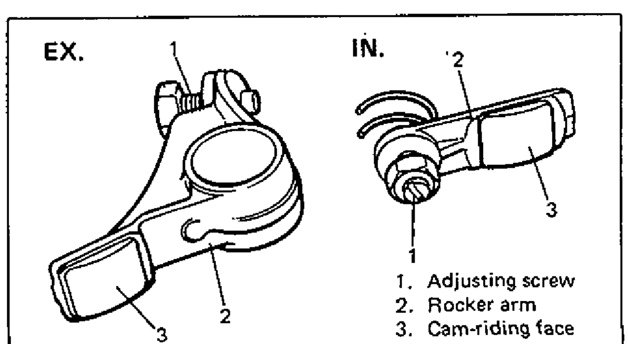


Fig. 6A-62 Adjusting Screw and Rocker Arm

- **Rocker arm shaft runout.**
  Using "V" blocks and dial gauge, check the runout. If the runout exceeds the limit, replace the rocker arm shaft.

Runout limit	0.20 mm (0.008 in.)

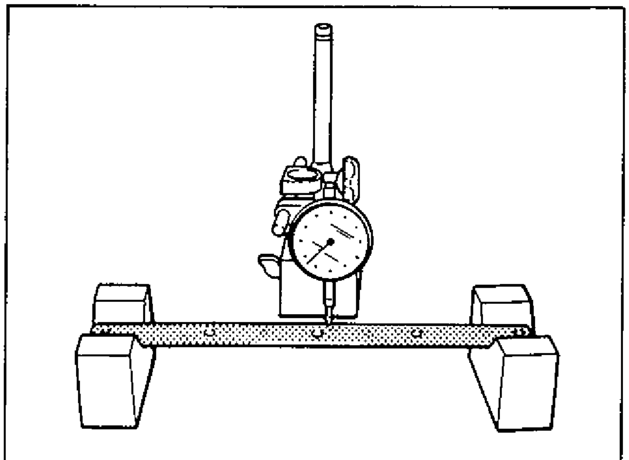


Fig. 6A-63 Measuring Runout

- **Rocker arm-to-rocker arm shaft clearance [In & Ex]**
  Using a micrometer and a bore gauge, measure rocker shaft dia. and rocker arm I.D..
  The difference between the two readings is the arm-to-shaft clearance on which a limit is specified.
  If the limit is exceeded, replace shaft or arm, or both.

Item	Standard	Limit
Rocker arm I. D.	15.985 – 16.005 mm (0.6293 – 0.6301 in)	–
Rocker arm Shaft dia.	15.969 – 15.984 mm (0.6287 – 0.6293 in)	–
Arm-to-Shaft clearance	0.001 – 0.036 mm (0.0001 – 0.0014 in)	0.09 mm (0.0035 in.)

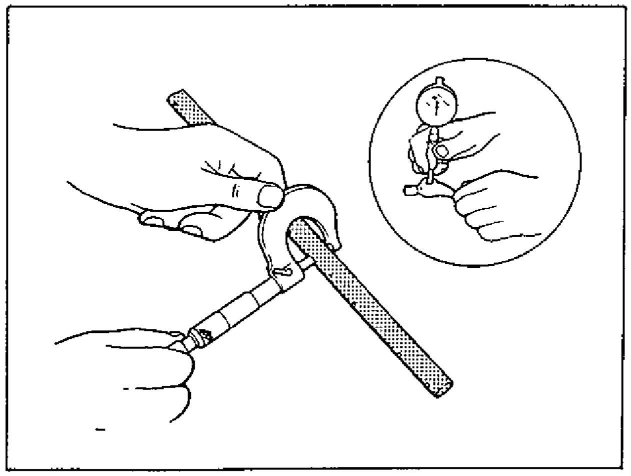


Fig. 6A-64 Measuring Shaft Dia. and Arm I.D.

- **Cam wear.**
  Using a micrometer, measure the height of cam. If the height measured is below the limits, replace the camshaft.

Cam height	Standard	Limit
Intake cam	35.968 mm (1.4161 in.)	35.788 mm (1.4090 in.)
Exhaust cam	36.402 mm (1.4331 in.)	36.222 mm (1.4261 in.)

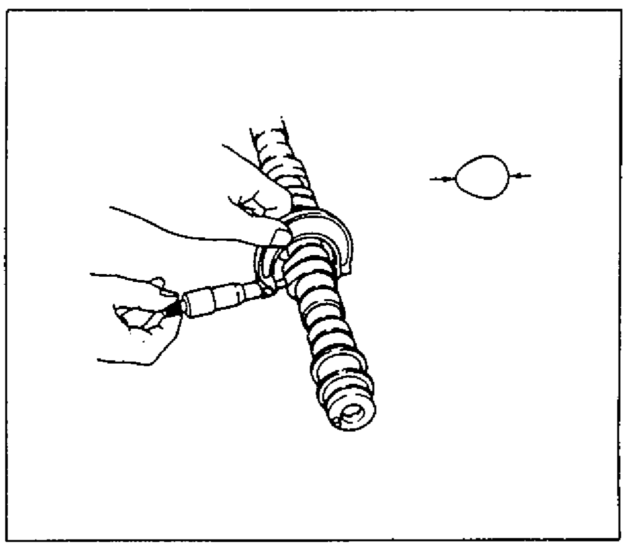


Fig. 6A-65 Measuring Cam Height

- **Camshaft runout.**
  Hold the camshaft between two "V" blocks, and measure the runout by using a dial gauge.
  If the runout exceeds the limit, replace camshaft.

Runout limit	0.10 mm (0.0039 in.)

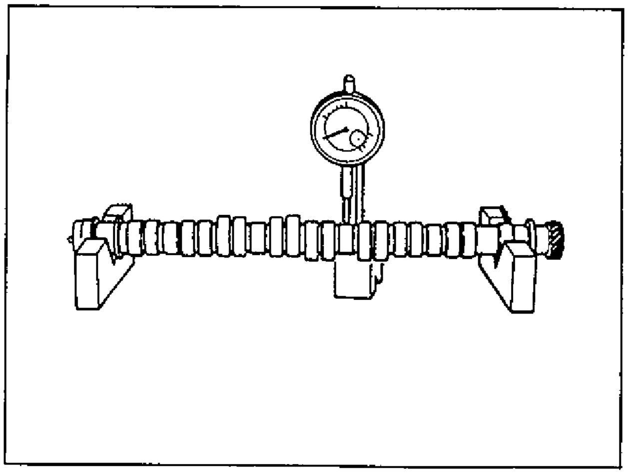


Fig. 6A-66 Camshaft Runout Measurement

- **Camshaft journal wear.**
  Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.
  If any malcondition is found, replace camshaft or cylinder head with housing. Never replace cylinder head without replacing housings.
  Check clearance by using gaging plastic. The procedure is as follows.
  1. Clean housings and camshaft journals.
  2. Make sure that all valve lash adjusters are removed and install camshaft to cylinder head.
  3. Place a piece of gaging plastic the full width of journal of camshaft (parallel to camshaft).
  4. Install housings as outlined on p. 6A-27 and evenly torque housing bolts to specified torque. Housings MUST be torqued to specification in order to assure proper reading of camshaft journal clearance.

NOTE:
Do not rotate camshaft while gaging plastic is installed.

5. Remove housing, and using scale on gaging plastic envelop, measure gaging plastic width at its widest point.

	Standard	Limit
Journal clearance	0.040 – 0.082 mm (0.0016 – 0.0032 in.)	0.12 mm (0.0047 in.)

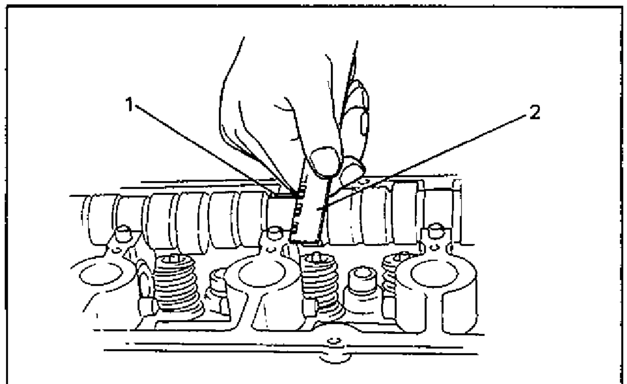


Fig. 6A-67 Measuring Camshaft Journal Clearance

If measured camshaft journal clearance exceeds limit, measure journal (housing) bore and outside diameter of camshaft journal. Replace camshaft or cylinder head assembly whichever the difference from specification is greater.

Item	Standard
Camshaft journal bore dia.	28.000 – 28.021 mm (1.1024 – 1.1031 in.)
Camshaft journal O.D.	27.939 – 27.960 mm (1.1000 – 1.1008 in.)

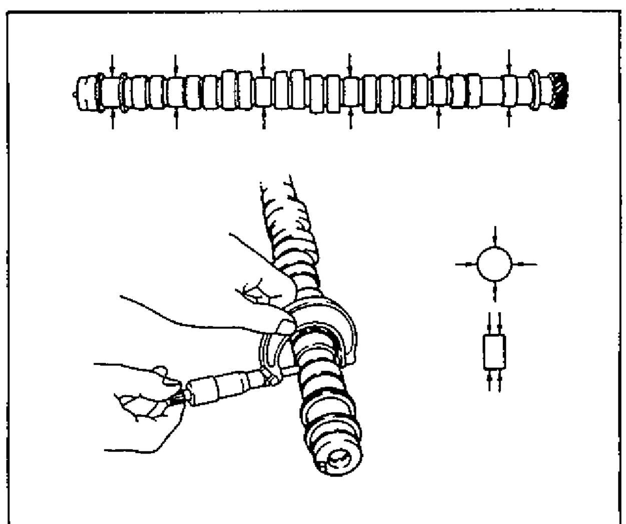


Fig. 6A-68 Camshaft Journal Dia. Measurement

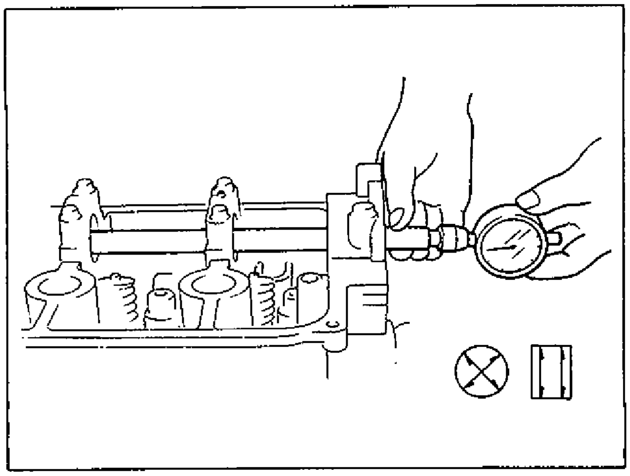


Fig. 6A-69 Journal Bore Dia. Measurement

Install or connect

1. Apply engine oil to cams and journals on camshaft, and oil seal on cylinder head.
2. Rocker arm shaft, rocker arm (exhaust side) and wave washer.

NOTE:

If removing rocker arm shaft plug, install plug before installing rocker arm shaft.

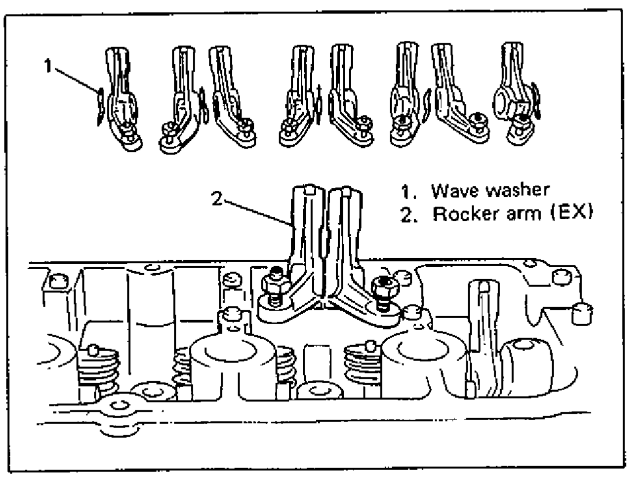


Fig. 6A-70 Rocker Arm Shaft Installation

3. Set rocker arm shaft as shown.

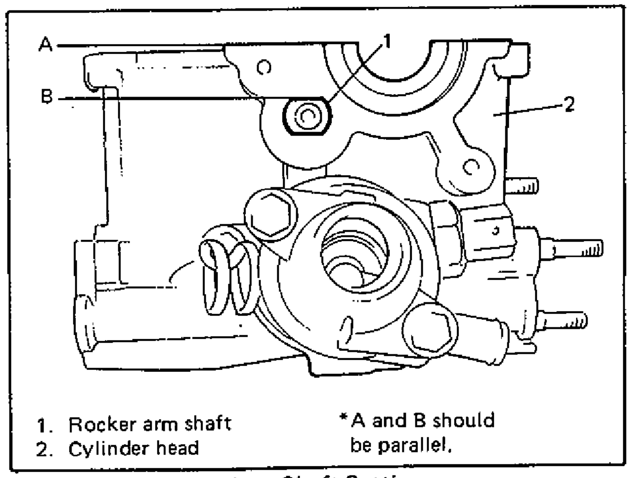


Fig. 6A-71 Rocker Arm Shaft Setting

4. Rocker arm shaft bolts.

Tightening torque for rocker shaft bolt	N·m	kg·m	lb·ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

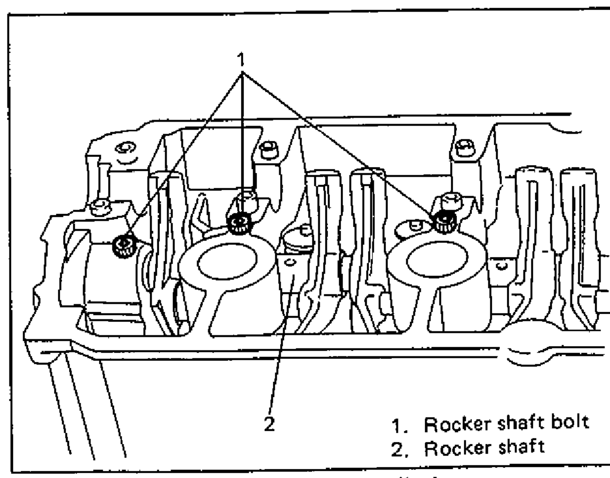


Fig. 6A-72 Rocker Shaft Bolt Installation

5. Rocker arms (intake side) and clips to rocker arm shaft.

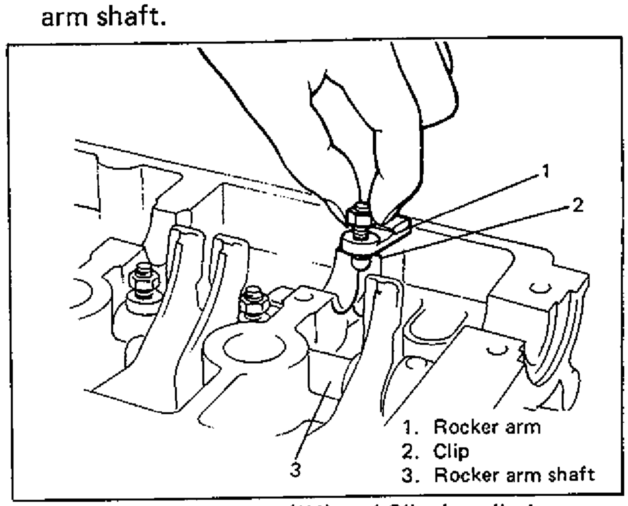
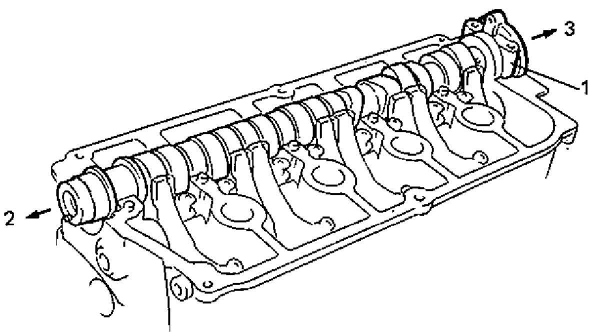


Fig. 6A-73 Rocker Arm (IN) and Clip Installation

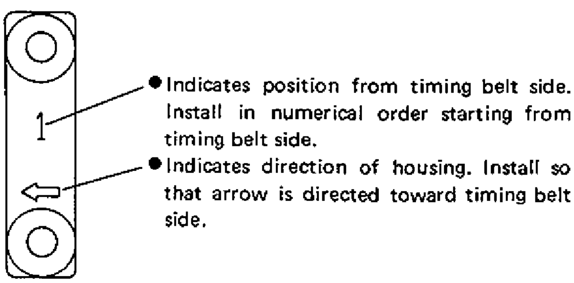
6. Apply engine oil to cams and journals on camshaft.
7. Camshaft housing to camshaft and cylinder head.
   - Apply engine oil to sliding surface of each housing against camshaft journal.
   - Apply sealant to mating surface of No. 6 housing which will mate with cylinder head.



1. Apply sealant (SUZUKI BOND 1215, 99000-31110)
2. Timing belt side
3. Flywheel side

Fig. 6A-74 Applying Sealant

- Embossed marks are provided on each camshaft housing, indicating position and direction for installation.
  Install housing as indicated by these marks.



- As camshaft housing No. 1 retains camshaft in proper position as to thrust direction, make sure to first fit No. 1 housing to No. 1 journal of camshaft securely.
- After applying engine oil to housing bolts, tighten them temporarily first. Then tighten them by following sequence as indicated in figure below.
  Tighten a little at a time and evenly among bolts and repeat tightening sequence three to four times before they are tightened to specified torque.

Tightening torque for housing bolt	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

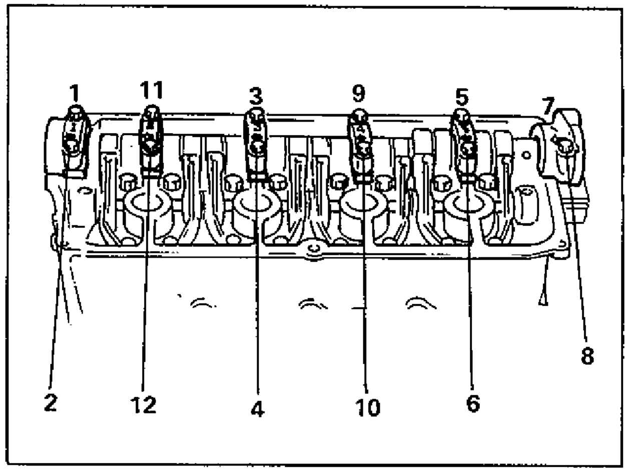


Fig. 6A-75 Tightening Sequence of Housing Bolts

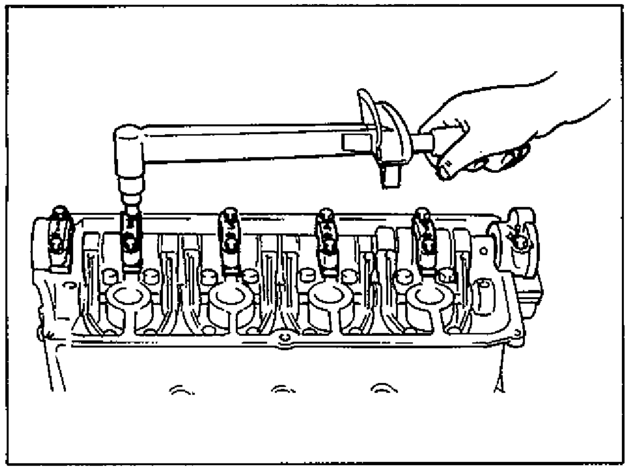
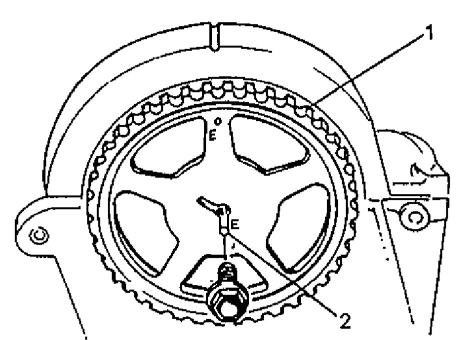


Fig. 6A-76 Tightening Housing Bolt

8. Camshaft oil seal.
   After applying engine oil to oil seal lip, press-fit camshaft oil seal till oil seal surface becomes flush with housing surface.
9. Camshaft timing belt pulley to camshaft after installing dwell pin to camshaft.
   With locking camshaft as shown in Fig. 6A-57, tighten pulley bolt to specified torque.

Tightening torque for pulley bolt	N·m	kg-m	lb-ft
	56 – 64	5.6 – 6.4	41.0 – 46.0

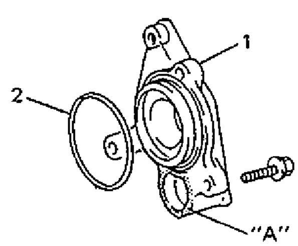


1. Camshaft timing belt pulley
2. Dwell pin

Fig. 6A-77 Installing Pulley

10. After applying sealant to part "A" as shown in figure below, install distributor case to cylinder head and tighten its fixing bolts to specified torque.

Tightening torque for distributor case bolt	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5



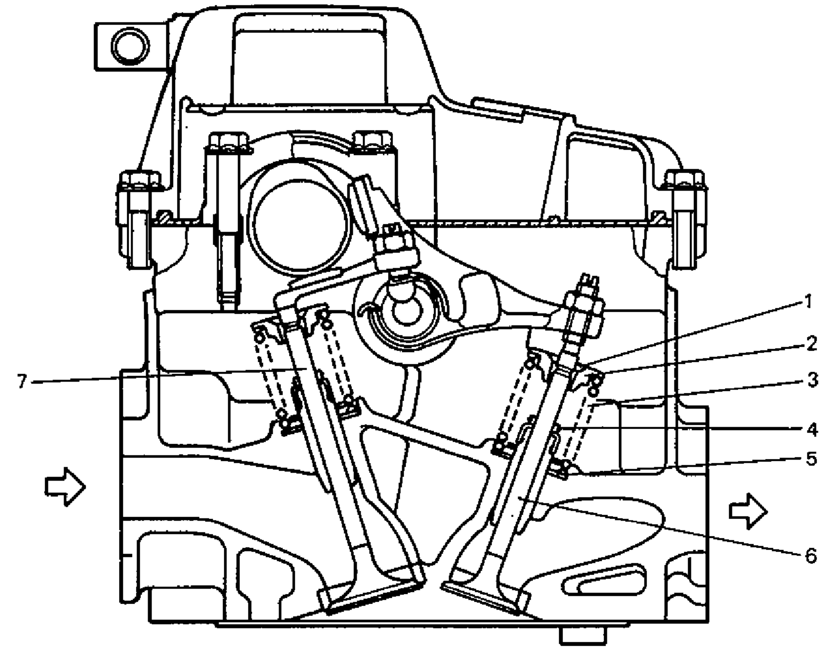
1. Distributor case
2. O ring

"A" : Apply sealant (SUZUKI BOND No. 1215)

Fig. 6A-77-1

11. Distributor assembly.
12. Belt tensioner, timing belt, outside cover, crankshaft pulley and water pump belt as priviously outlined.
13. Adjust valve clearance as priviously outlined.
14. Cylinder head cover and air cleaner assembly.
15. Negative cable at battery.
16. Adjust ignition timing. Refer to section 6F for adjustment.

VALVES AND CYLINDER HEAD



1. Valve cotters
2. Valve spring retainer
3. Valve spring
4. Valve stem seal
5. Valve spring seat
6. Exhaust valve
7. Intake valve

Fig. 6A-78 Valve Components

Remove or disconnect

1. Relieve fuel pressure according to procedure described in p. 6-3 (for injector model).
2. Negative cable at battery.
3. Drain cooling water.
4. Air cleaner assembly.
5. Electric wire harness and release above wire harness from clamps.
6. Water hoses.
7. Vacuum hoses.
8. Fuel return hose and fuel feed hose from carburetor (or throttle body).
9. Accelerator cable from carburetor (or throttle body).
10. Check all around cylinder head for any other parts required to be removed or disconnected and remove or disconnect whatever necessary.
11. Hoist car.
12. Water pump pulley, crankshaft pulley and timing belt as previously outlined.
13. Exhaust No. 1 pipe from exhaust monifold.
14. Cylinder head cover.
15. Rocker arm shaft, rocker arm and camshaft as previously outlined.
16. Cylinder head bolts.
    Cylinder head with carburetor (or throttle body), intake manifold and exhaust manifold.

DISASSEMBLY

1. For ease in servicing cylinder head, remove intake manifold with carburetor (or throttle body) and exhaust manifold from cylinder head.
2. Using special tool (Valve lifter), compress the valve springs and then remove valve cotters by using special tool (Forceps) as shown.

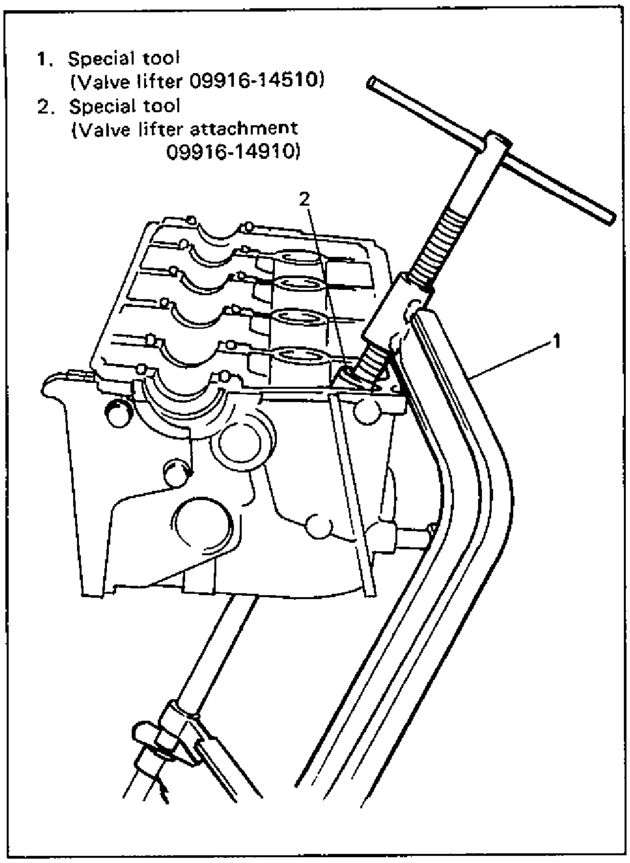


Fig. 6A-79 Special Tool (Valve Lifter) Installation

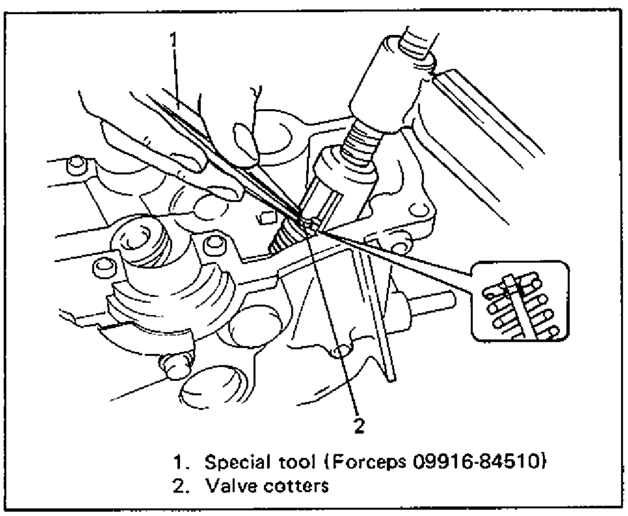


Fig. 6A-80 Special Tool (Forceps) and Valve Cotters

3. Release the special tool, and remove spring retainer and valve spring.
4. Remove valve from combustion chamber side.
5. Remove valve stem oil seal from valve guide, and then valve spring seat.

NOTE:
Do not reuse the oil seal disassembled. Be sure to use new oil seal when assembling.

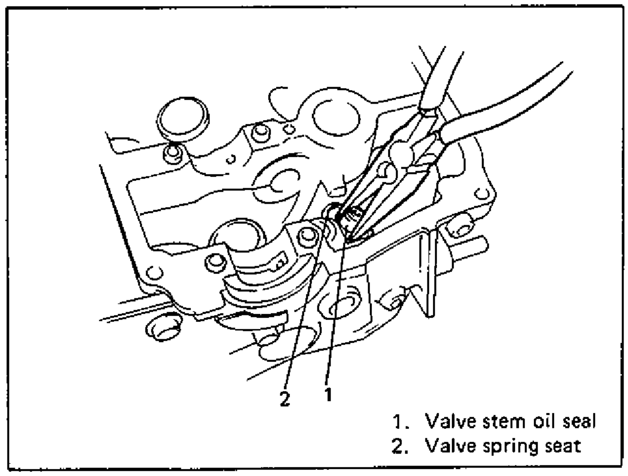


Fig. 6A-81 Valve Stem Oil Seal Removal

6. Using special tool (Valve guide remover), drive the valve guide out from combustion chamber side to valve spring side.

NOTE:
Do not reuse the valve guide disassembled. Be sure to use new valve guide (Oversize) when assembling.

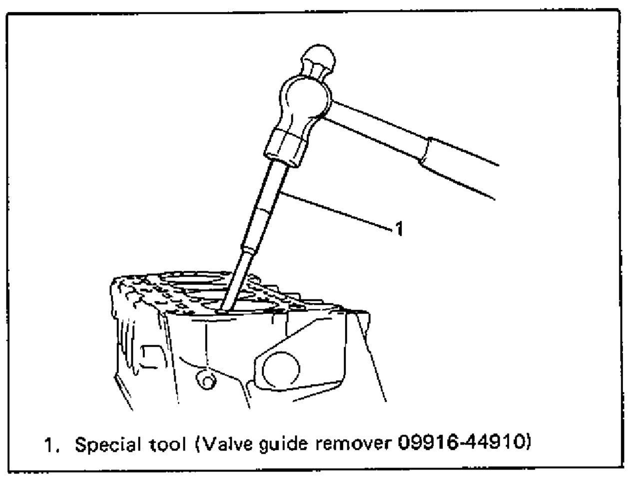


Fig. 6A-82 Valve Guide Removal

7. Place the disassembled parts except valve stem seal and valve guide in order, so that they can be installed in their original positions.

Inspect

Valve guides

Using a micrometer and bore gauge, take diameter readings on valve stems and guides to check stem-to-guide clearance. Be sure to take reading at more than one place along the length of each stem and guide.

If clearance exceeds limit, replace valve and valve guide.

Item		Standard	Limit
Valve stem diameter	In	5.465 – 5.480 mm (0.2152 – 0.2157 in.)	–
	Ex	5.440 – 5.455 mm (0.2142 – 0.2148 in.)	–
Valve guide I. D.	In	5.500 – 5.512 mm (0.2166 – 0.2170 in.)	–
	Ex	5.500 – 5.512 mm (0.2166 – 0.2170 in.)	–
Stem-to-guide clearance	In	0.020 – 0.047 mm (0.0008 – 0.0018 in.)	0.07 mm (0.0027 in.)
	Ex	0.045 – 0.072 mm (0.0018 – 0.0028 in.)	0.09 mm (0.0035 in.)

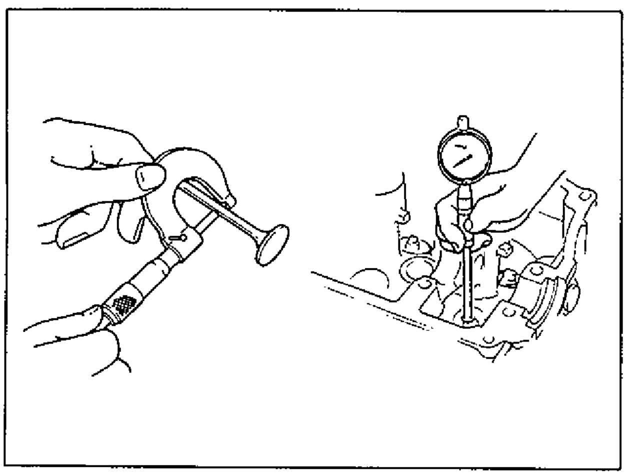


Fig. 6A-83 Valve Stem Dia. and Valve Guide I.D. Measurement

Valves

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem and, as necessary, replace it.
- Measure thickness of valve head. If measured thickness exceeds limit, replace valve.

Valve head thickness		
	Standard	Limit
IN	1.0 mm (0.039 in.)	0.6 mm (0.024 in.)
EX		0.7 mm (0.027 in.)

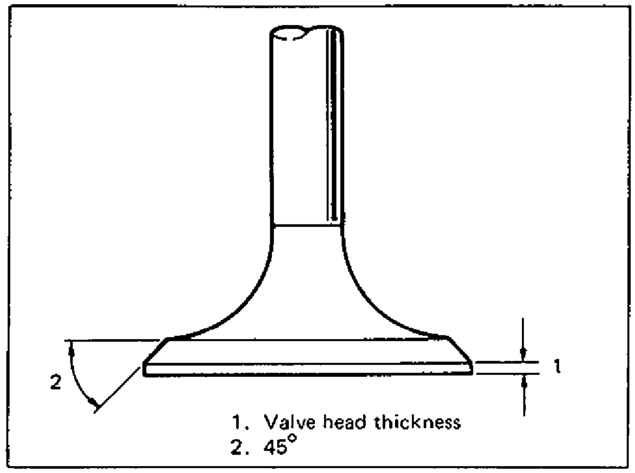


Fig. 6A-84 Valve head Thickness

- Inspect valve stem end face for pitting and wear. If pitting or wear is found there, valve stem end may be resurfaced, but not so much as to grind off its chamfer. When it is worn so much that its chamfer is gone, replace valve.
- Check each valve for radial runout with a dial gauge and "V" block. To check runout, rotate valve slowly. If runout exceeds its limit, replace valve.

Limit on valve head radial runout	0.08 mm (0.003 in.)

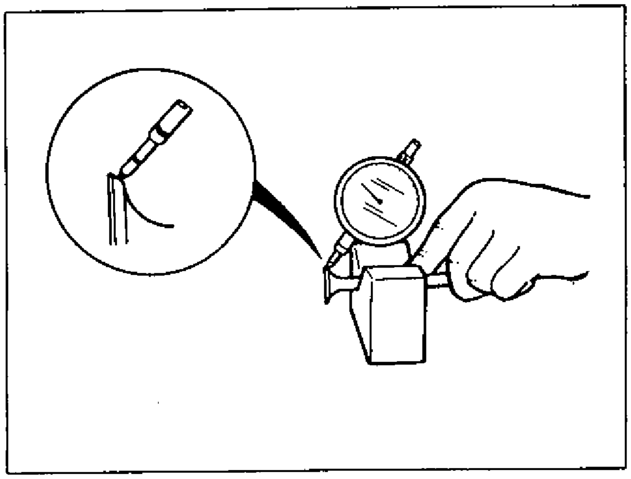


Fig. 6A-85 Radial Runout Measurement

- Seating contact width:
  Create contact pattern on each valve in the usual manner, i. e., by giving uniform coat of marking compound to valve seat and by rotatingly tapping seat with valve head. Valve lapper (tool used in valve lapping) must be used.

  Patter produced on seating face of valve must be a continuous ring without any break, and the width of pattern must be within specified range.

Standard seating width revealed by contact pattern on valve face	In	1.1 – 1.3 mm (0.0433 – 0.0512 in.)
	Ex	

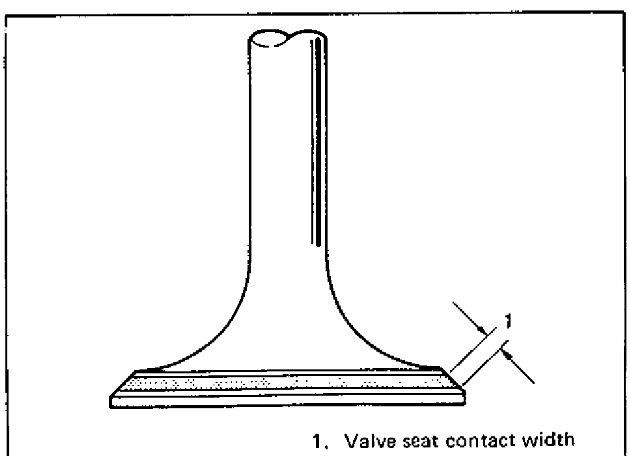


Fig. 6A-86 Valve Seating Contact Width

- Valve seat repair:
  A valve seat not producing a uniform contact with its valve or showing width of seating contact that is out of specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

1. EXHAUST VALVE SEAT: Use valve leat cutters to make two cuts in order illustrated in Figure 6A-88. Two cutters must be used: the first for making the 15° angle, and the second for making the 45° angle. The second cut must be made to produce desired seat width.

Seat width for exhaust valve seat	1.1 – 1.3 mm (0.0433 – 0.0512 in.)

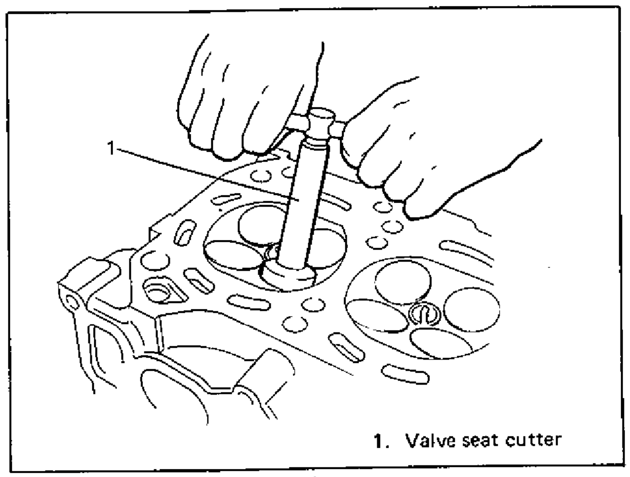


Fig. 6A-87 Valve Seat Cutting

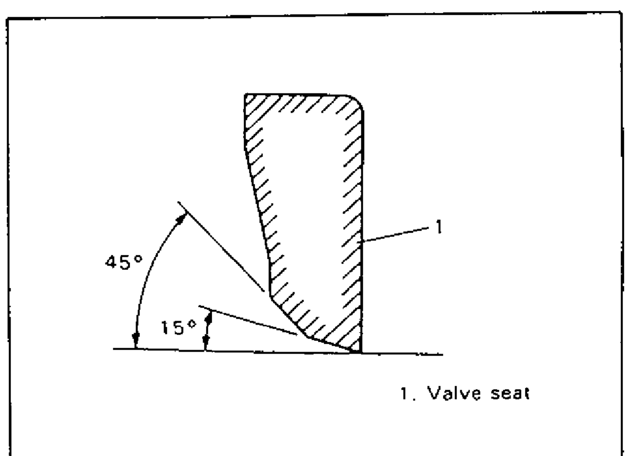


Fig. 6A-88 Valve Seat Angles for Exhaust Valve

2. INTAKE VALVE SEAT: The cutting sequence is the same as for exhaust valve seats.

Seat width for intake valve seat	1.1 – 1.3 mm (0.0433 – 0.0512 in.)

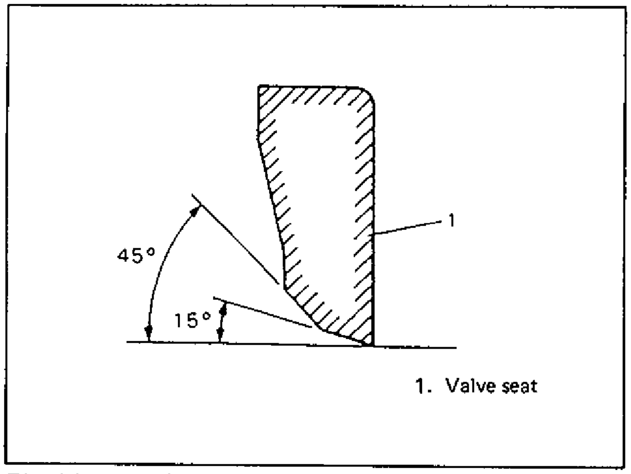


Fig. 6A-89 Valve Seat Angles for Intake Valve

3. VALVE LAPPING: Lap valve on seat in two steps, first with coarsesize lapping compound applied to face and the second with fine-size compound, each time using valve lapper according to usual lapping method.

Cylinder Head

- Remove all carbon from combustion chambers.

NOTE:

Do not use any sharp-edged tool to scrape off carbon. Be careful not to scuff or nick the metal surfaces when decarboning. The same applies to valves and valve seats, too.

- Check cylinder head for cracks in intake and exhaust ports, combustion chambers, and head surface.
- Flatness of gasketed surface:
  Using a straightedge and thickness gauge, check surface at a total of 6 locations. If distortion limit, given below, is exceeded, correct gasketed surface with a surface plate and abrasive paper of about # 400 (Waterproof silicon carbide abrasive paper): place paper on and over surface plate, and rub gasketed surface against paper to grind off high spots.
  Should this fail to reduce thickness gauge readings to within the limit, replace cylinder head.
  Leakage of combustion gases from this gasketed joint is often due to a warped gasketed surface; such leakage results in reduced power output.

Limit of distortion	0.05 mm (0.002 in.)

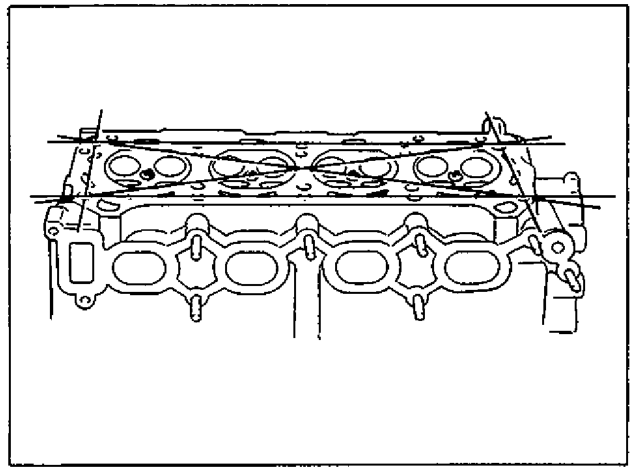


Fig. 6A-90 Locations for Measurement of Distortion

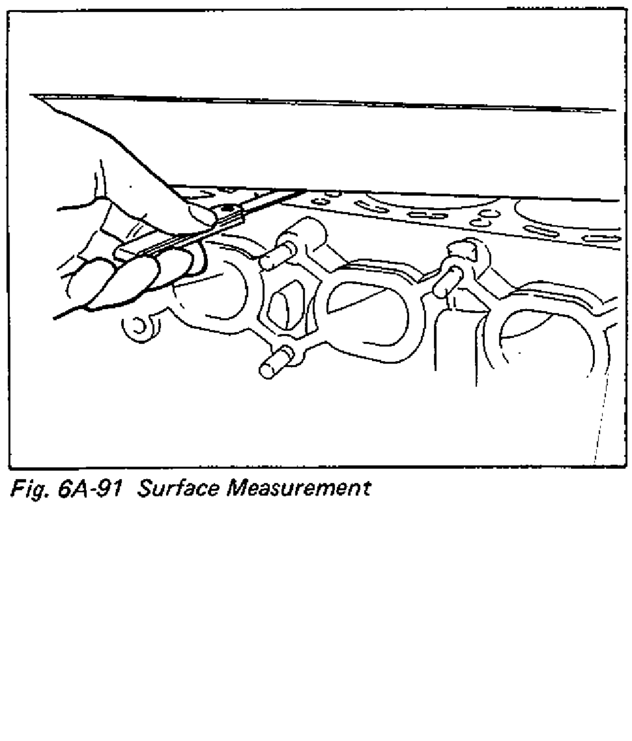


Fig. 6A-91 Surface Measurement

- Distortion of manifold seating faces:
  Check seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, in order to determine whether these faces should be corrected or cylinder head replaced.

Limit of distortion	0.10 mm (0.004 in.)

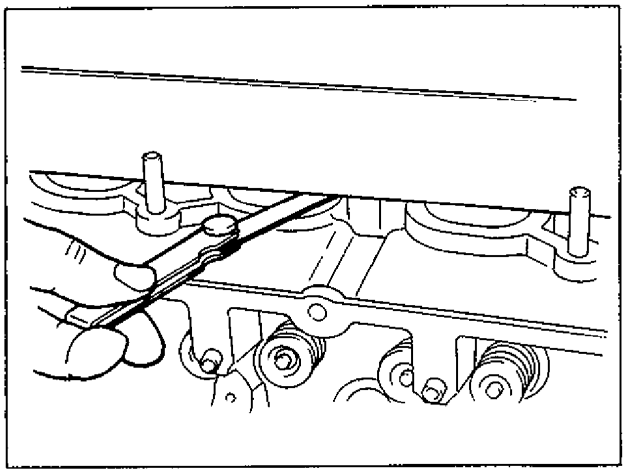


Fig. 6A-92 Measuring Surface of Intake Manifold Seating Face

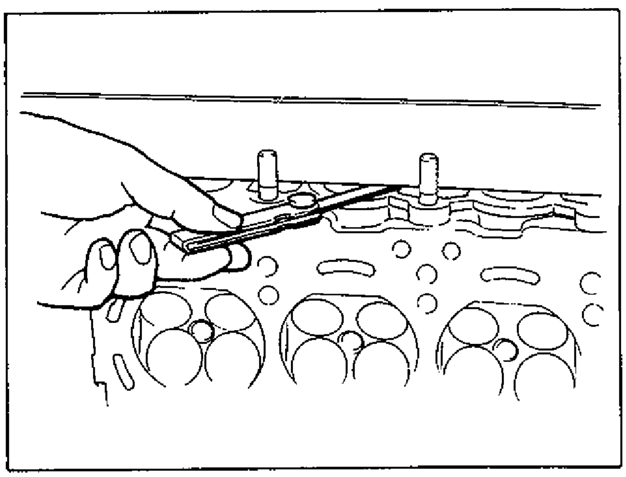


Fig. 6A-93 Measuring Surface of Exhaust Manifold Seating Face

Valve Springs

- Referring to data given below, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Item	Standard	Limit
Valve spring free length	36.83 mm (1.4500 in.)	35.67 mm (1.4043 in.)
Valve spring preload	10.7 – 12.5 kg for 31.5 mm (23.6 – 27.5 lb/ 1.24 in.)	9.3 kg for 31.5 mm (20.5 lb/ 1.24 in.)

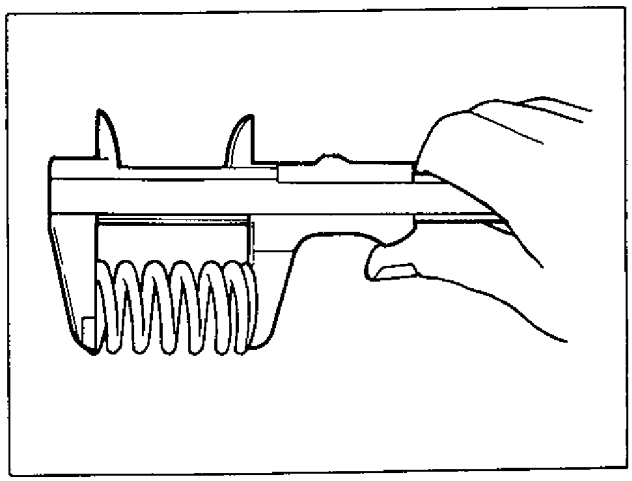


Fig. 6A-94 Measuring Free Length of Spring

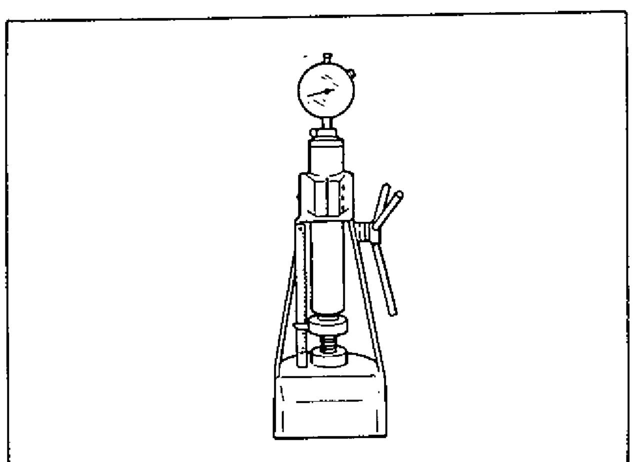


Fig. 6A-95 Measuring Spring Preload

- Spring squareness:
  Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve springs found to exhibit a larger clearance than limit given below must be replaced.

Valve spring squareness limit	2.0 mm (0.079 in.)

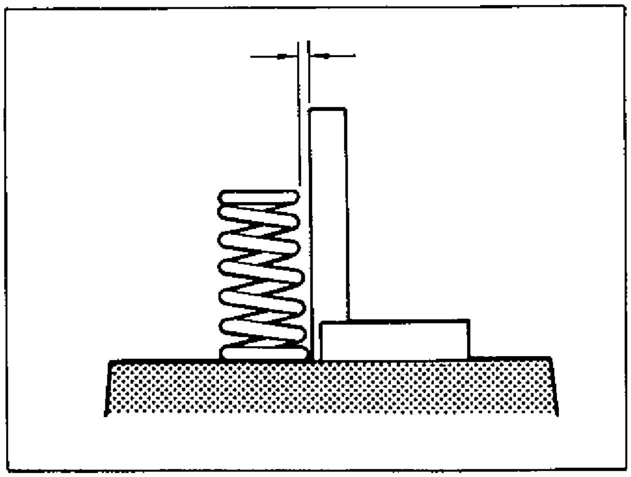
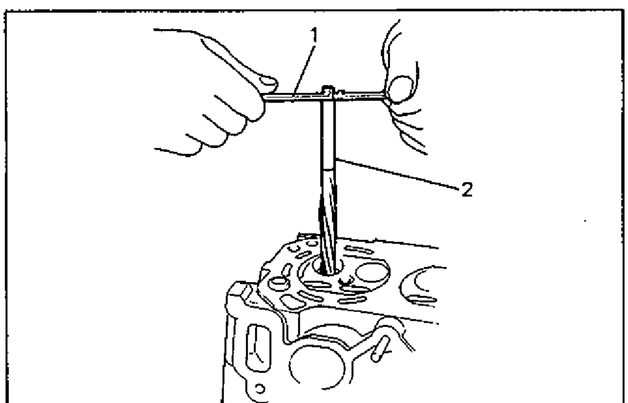


Fig. 6A-96 Measuring Spring Squareness

ASSEMBLY

1. Before installing valve guide into cylinder head, ream guide hole with special tool (11 mm reamer) to remove burrs and make it truly round.



1. Special tool (Reamer handle 09916-34541)
2. Special tool (11 mm reamer 09916-38210)

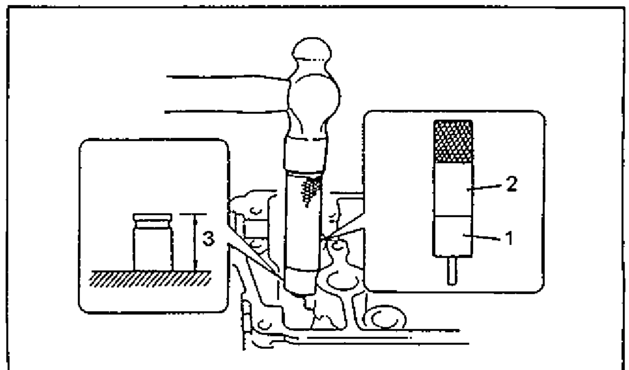
Fig. 6A-97 Reaming Guide Hole

2. Valve guide to cylinder head.
   Heat cylinder head uniformly at a temperature of 80 to 100°C (176 to 212°F) so that head will not be distorted, and drive new valve guide into hole with special tools.
   Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head.
   After installing, make sure that valve guide protrudes by 11.5 mm (0.45 in.) from cylinder head.

NOTE:

- **Do not reuse valve guide once disassembled. Install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

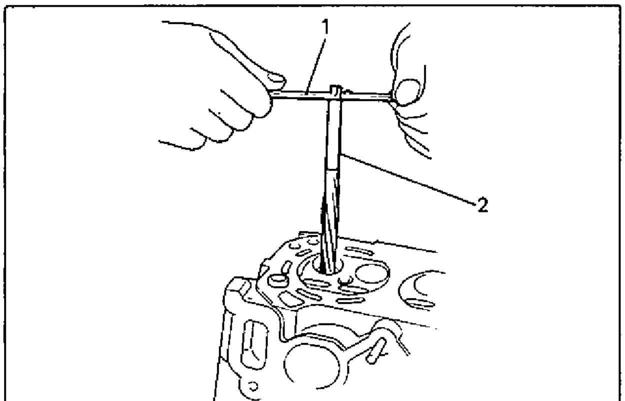
Valve guide oversize	0.03 mm (0.0012 in.)
Valve guide protrusion (In and Ex)	11.5 mm (0.45 in.)



1. Special tool (Valve guide installer attachment 09916-56011)
2. Special tool (Valve guide installer handle 09916-58210)
3. Valve guide protrusion (11.5 mm)

Fig. 6A-98 Valve Guide Installation

3. Ream valve guide bore with special tool (5.5 mm reamer).
   After reaming, clean the bore.

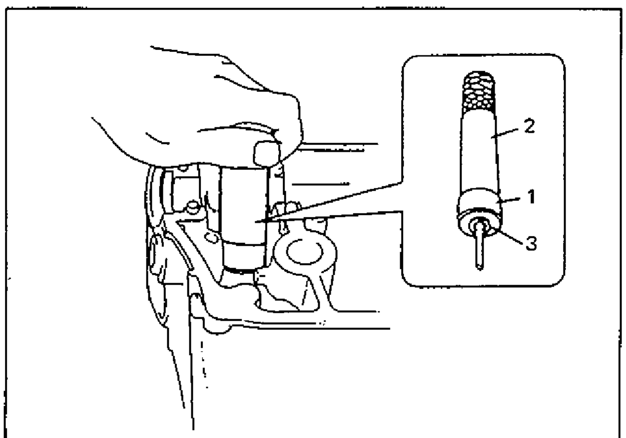


1. Special tool (Reamer handle 09916-34541)
2. Special tool (5.5 mm reamer 09916-34550)

Fig. 6A-99 Reaming Valve Guide Bore

4. Valve spring seat to cylinder head.
5. New valve stem seal to valve guide.
   After applying engine oil to seal and spindle of special tool (Valve guide installer handle), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand.
   After installing, check to be sure that seal is properly fixed to valve guide.

NOTE:
- **Do not reuse seal once disassembled. Be sure to install new seal.**
- **When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool by hand. Tapping or hitting special tool may cause damage to seal.**



1. Special tool (Valve stem seal installer 09917-98221)
2. Special tool (Valve guide installer handle 09916-58210)
3. Valve stem seal

Fig. 6A-100 Valve Stem Seal Installation

6. Valve to valve guide.
   Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore, and valve stem.

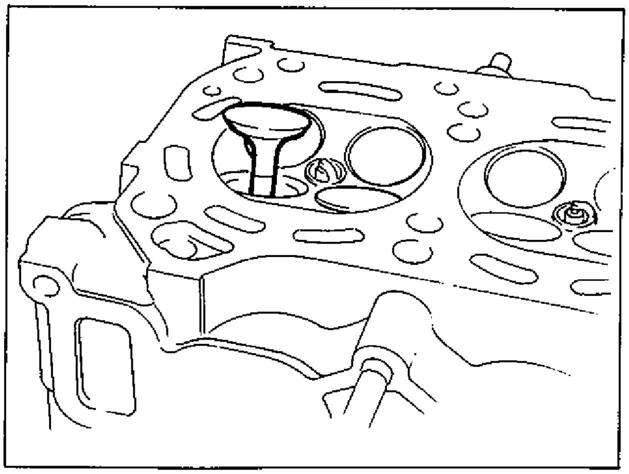
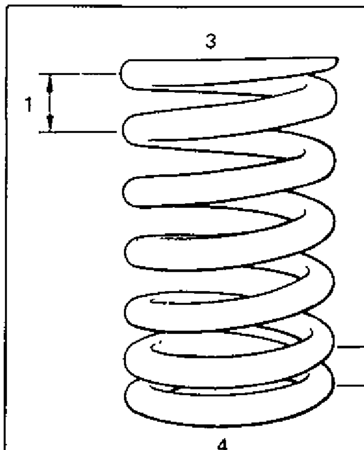


Fig. 6A-101 Valve Installation

7. Valve spring and spring retainer.
   Each valve spring has top end (large-pitch end) and bottom end (small-pitch end). Be sure to position spring in place with its bottom end (small-pitch end) facing the bottom (valve spring seat side).



1. Large-pitch
2. Small-pitch
3. Valve spring retainer side
4. Valve spring seat side

Fig. 6A-102 Installing Valve Spring

8. Using special tool (Valve lifter), compress valve spring and fit two valve cotters into groove provided on the valve stem.

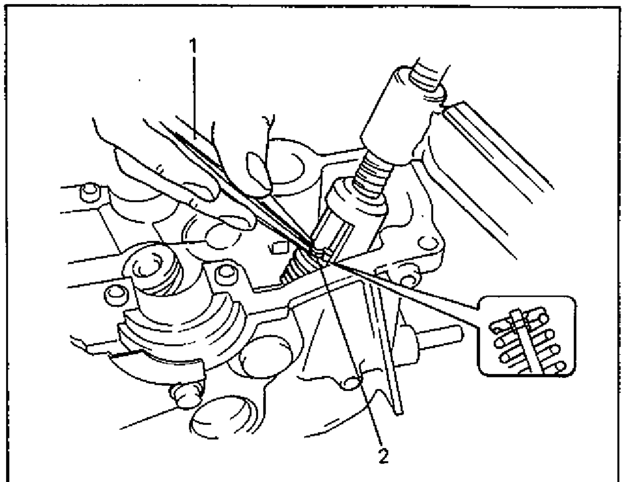


Fig. 6A-103 Valve Cotters Installation

9. Intake manifold with carburetor (throttle body) and exhaust manifold to cylinder head.

INSTALL OR CONNECT

1. Cylinder head gasket.
   Install new head gasket as shown in Fig. 6A-104 in such a way that "TOP" mark provided on the gasket comes on top side (toward cylinder head) and on crankshaft pulley side.

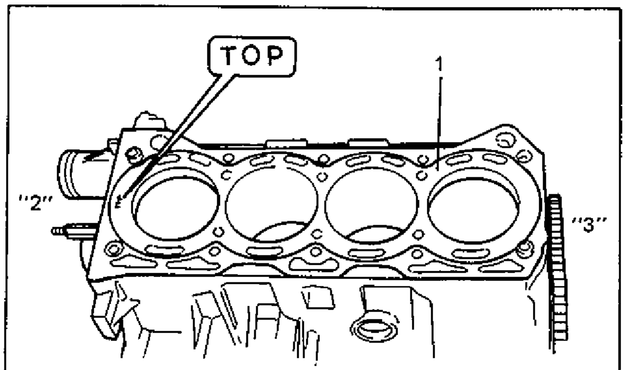


Fig. 6A-104 Cylinder Head Gasket Installation

2. Cylinder head:
   After applying engne oil to cylinder head bolts, tighten them gradually with a torque wrench, following sequence given in below figure. Finally tighten bolts to specified torque.

Tightening torque for cylinder head bolts	N·m	kg-m	lb-ft
	65 – 70	6.5 – 7.0	47.5 – 50.5

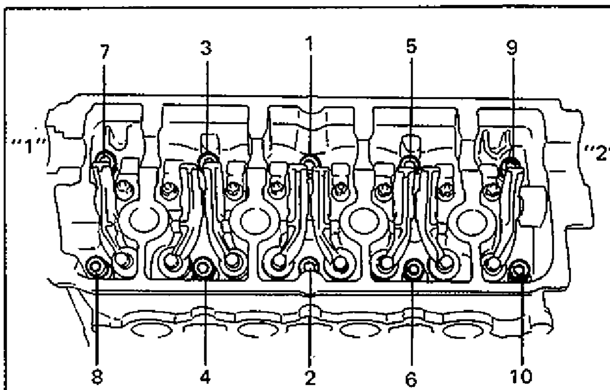


Fig. 6A-105 Tightening Sequence of Cylinder Head Bolts

3. Camshaft, rocker arm and rocker arm shaft as previously outlined.
4. Timing belt as previously outlined.
5. Reverse removal procedure for installation of remainder.
6. Adjust intake and exhaust valve lashes as previously outlined.
7. Adjust water pump belt. Refer to section 6B for adjusting procedure.
8. Adjust accelerator cable play according to procedure described in section 6D.
9. Refill cooling system, referring to section 6B.
10. Negative cable at battery.
11. Adjust ignition timing. Refer to section 6F for adjustment.
12. Upon completion of installation, verify that there is no fuel leakage, water leakage or exhaust gas leakage at each connection.

PISTONS, PISTON RINGS, CONNECTING RODS AND CYLINDERS

REMOVE OR DISCONNECT

1. Cylinder head from cylinder block as previously outlined.
2. Drain engine oil.
3. Oil pan and oil pump strainer as previously outlined.
4. Mark cylinder number on all pistons, connecting rods and rod bearing caps, using silver pencil or quick drying paint.
5. Rod bearing caps.
6. Install guide hose over threads of rod bolts. This is to prevent damage to bearing journal and rod bolt threads when removing connecting rod.

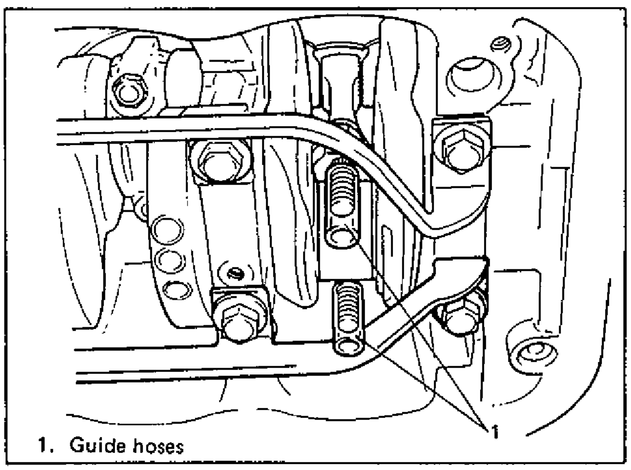


Fig. 6A-106 Installing Guide Hoses

7. Decarbon top of cylinder bore before removing piston from cylinder.
8. Push piston and connecting rod assembly out through the top of cylinder bore.

DISASSEMBLY

1. Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.
2. Piston pin from connecting rod.
   - Ease out piston pin circlips, as shown.

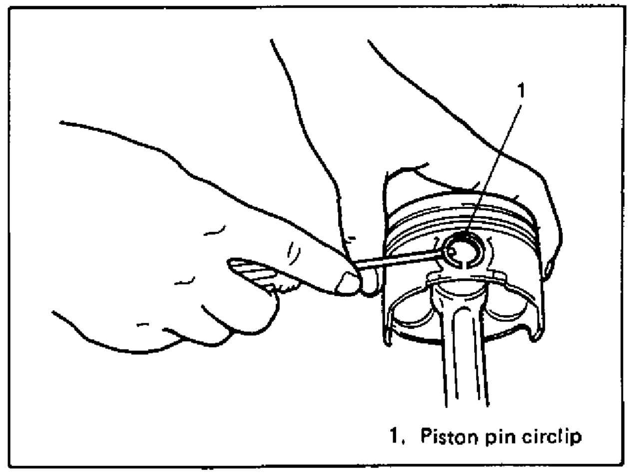


Fig. 6A-107 Removing Piston Pin Circlips

   - Force piston pin out.

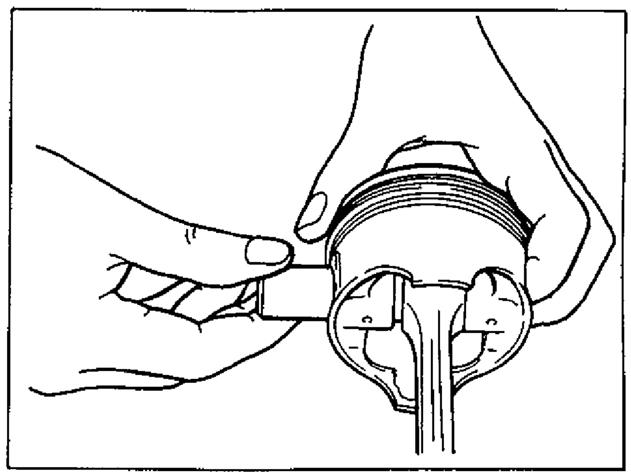


Fig. 6A-108 Removing Piston Pin

CLEAN

Clean carbon from piston head and ring grooves, using a suitable tool.

INSPECT

Cylinders

- Inspect cylinder walls for scratches, roughness, or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, rebore cylinder and use oversize piston.
- Using a cylinder gauge, measure cylinder bore in thrust and axial directions at two positions as shown in Fig. 6A-109.
  If any of following conditions is noted, rebore cylinder.
  1. Cylinder bore dia. exceeds limit.
  2. Difference of measurements at two positions exceeds taper limit.
  3. Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore dia. limit	75.15 mm (2.9586 in.)
Taper and out-of-round limit	0.10 mm (0.0039 in.)

NOTE:

If any one of four cylinders has to be rebored, rebore the four to the same next oversize. This is necessary for the sake of uniformity and balance.

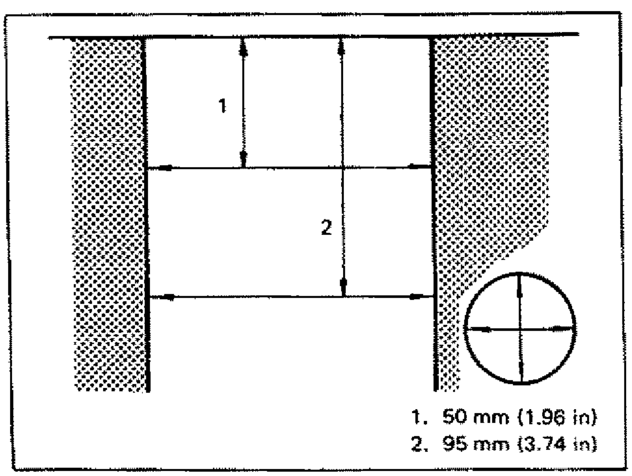


Fig. 6A-109 Positions to be Measured

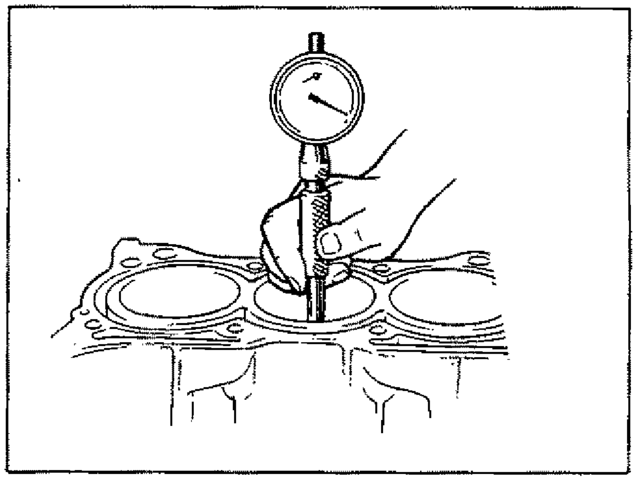


Fig. 6A-110 Measuring Cylinder Bore with Cylinder Gauge

Pistons

- Inspect piston for faults, cracks or other damaged. Damaged or faulty piston should be replaced.
- Piston diameter:
  As indicated in Fig. 6A-111, piston diameter should be measured at a position 15 mm, 0.59 in from piston skirt end in the direction perpendicular to piston pin.

Piston diameter	Standard	74.970 – 74.990 mm (2.9516 – 2.9523 in.)
	Oversize: 0.25 mm (0.0098 in.)	75.220 – 75.230 mm (2.9614 – 2.9618 in.)
	0.50 mm (0.0196 in.)	75.470 – 75.480 mm (2.9712 – 2.9716 in.)

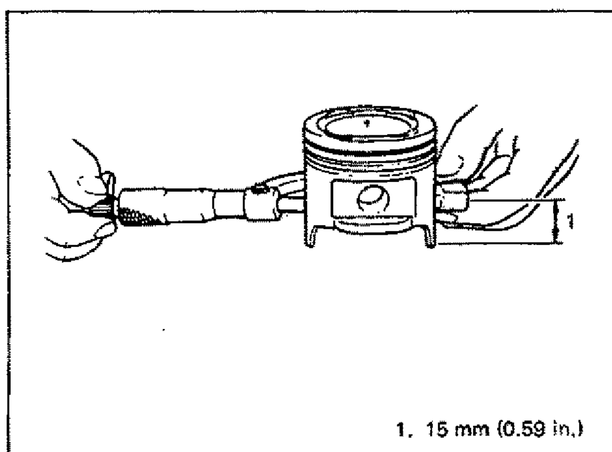


Fig. 6A-111 Measuring Piston Diameter with Micrometer

- Piston clearance:
  Measure cylinder bore diameter and piston diameter to find their difference which is piston clearance. Piston clearance should be within specification as given below. If it is out of specification, rebore cylinder and use oversize piston.

Piston clearance	0.02 – 0.04 mm (0.0008 – 0.0015 in.)

NOTE:
Cylinder bore diameters used here are measured in thrust direction at two positions as shown in Fig. 6A-109.

- Ring groove clearance:
  Before checking, piston grooves must be clean, dry and free of carbon.
  Fit new piston ring into piston groove, and measure clearance between ring and ring land by using thickness gauge.
  If clearance is out of specification, replace piston.

Ring groove clearance	Top	0.03 – 0.07 mm (0.0012 – 0.0027 in.)
	2nd	0.02 – 0.06 mm (0.0008 – 0.0023 in.)

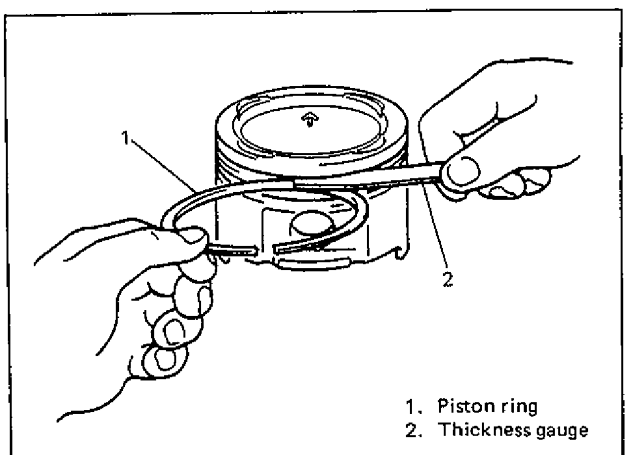


Fig. 6A-112 Measuring Ring Groove Clearance

Piston Pin

- Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod or piston.
- Piston pin clearance:
  Check the piston pin clearance in the small end. Replace the connecting rod if its small end is badly worn or damaged or if the clearance checked exceeds the limit.

Item	Standard	Limit
Pin clearance in small end	0.003 – 0.016 mm (0.0001 – 0.0006 in.)	0.05 mm (0.0020 in.)

Small-end bore	19.003 – 19.011 mm (0.7482 – 0.7486 in.)
Piston pin dia.	18.995 – 19.000 mm (0.7479 – 0.7480 in.)

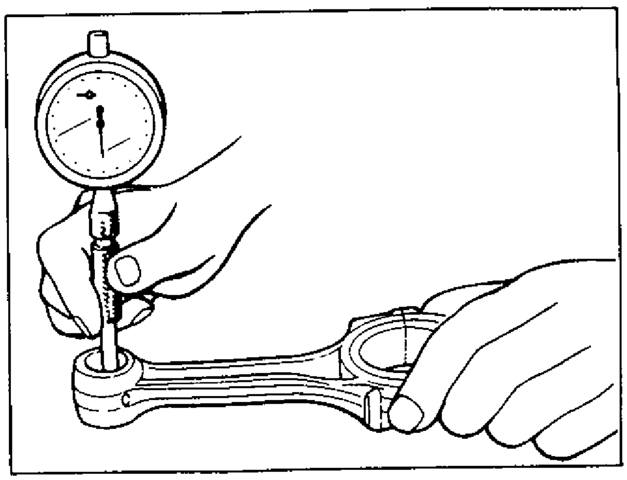


Fig. 6A-113 Measuring Small End Bore

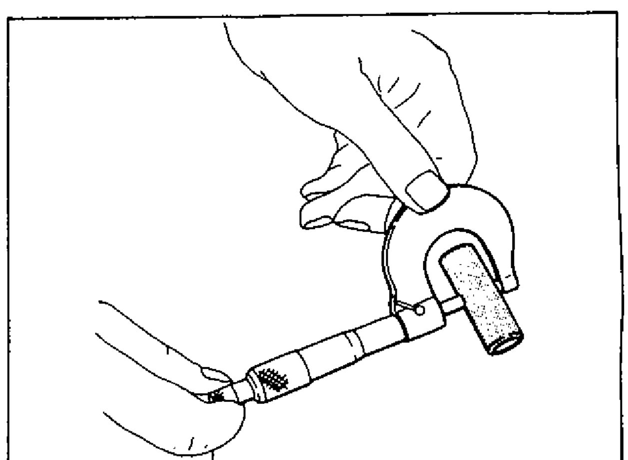


Fig. 6A-114 Measuring Piston Pin Diameter

Piston Rings

To measure end gap, insert piston ring into cylinder bore as shown in Fig. 6A-115 and then measure the gap by using thickness gauge.
If measured gap is out of specification, replace ring.

NOTE:

Decarbon and clean the top of cylinder bore before inserting piston ring.

Item		Standard	Limit
Piston ring end gap	Top ring	0.20 – 0.35 mm (0.0079 – 0.0137 in.)	0.7 mm (0.0275 in.)
	2nd ring	0.20 – 0.35 mm (0.0079 – 0.0137 in.)	0.7 mm (0.0275 in.)
	Oil ring	0.20 – 0.70 mm (0.0079 – 0.0275 in.)	1.7 mm (0.0669 in.)

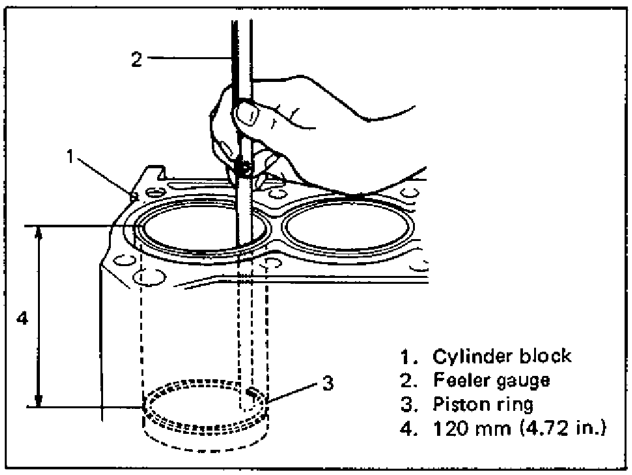


Fig. 6A-115 Measuring Piston Ring End Gap

Connecting Rod

- Big-end side clearance:
  Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

Item	Standard	Limit
Big-end side clearance	0.10 – 0.20 mm (0.0039 – 0.0078 in.)	0.35 mm (0.0137 in.)

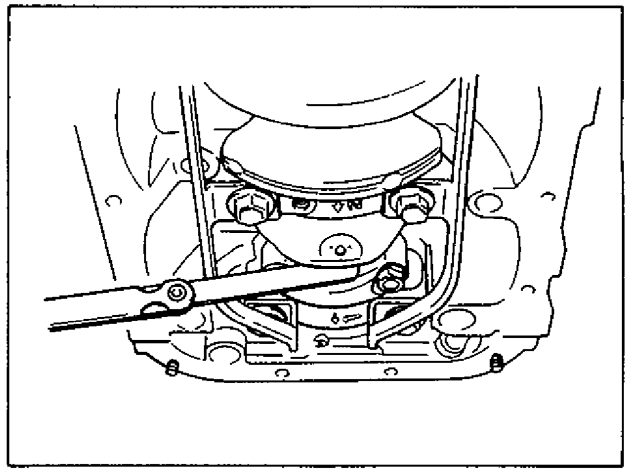


Fig. 6A-116 Measuring Side Clearance

- Connecting rod alignment:
  Mount connecting rod on aligner to check it for bow and twist and, if limit is exceeded, replace it.

Limit on bow	0.05 mm (0.0020 in.)
Limit on twist	0.10 mm (0.0039 in.)

Crank Pin and Connecting Rod Bearings

- Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged, or out-of-round or taper is out of limit, replace crankshaft or regrind crank pin to undersize and use undersize bearing.

Connecting rod bearing size	Crank pin diameter
Standard	43.982 – 44.000 mm (1.7316 – 1.7322 in.)
0.25 mm (0.0098 in.) undersize	43.732 – 43.750 mm (1.7218 – 1.7224 in.)

Out-of-round and taper limit	0.01 mm (0.0004 in.)

- Rod bearing:

Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.

Two kinds of rod bearing are available; standard size bearing and 0.25 mm undersize bearing. To distinguish them, 0.25 mm undersize bearing has the stamped number (US 025) on its backside as indicated in Fig. 6A-117, but standard size one has no number.

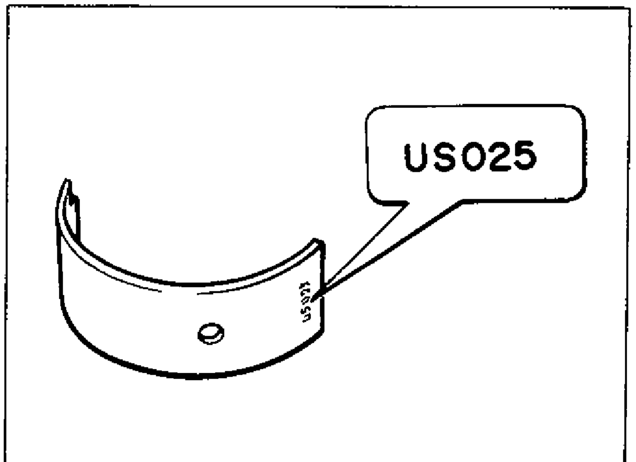


Fig. 6A-117 0.25 mm Undersize Bearing

- Rod bearing clearance:

1. Before checking bearing clearance, clean bearing and crank pin.
2. Install bearing in connecting rod and bearing cap.
3. Place a piece of gaging plastic to full width of crankpin as contacted by bearing (parallel to crankshaft), avoiding oil hole.
4. Install rod bearing cap to connecting rod. When installing cap, be sure to point the arrow mark on cap to crankshaft pulley side, as shown in Fig. 6A-118. After applying engine oil to rod bolts, tighten cap nuts to specified torque. DO NOT turn crankshaft with gaging plastic installed.

Tightening torque for rod bearing cap nuts	N·m	kg-m	lb-ft
	33 – 37	3.3 – 3.7	24.0 – 26.5

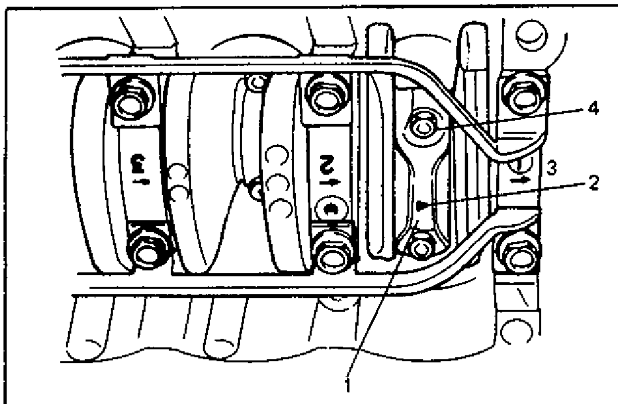


Fig. 6A-118 Insalling Bearing Cap

5. Remove cap and using a scale on gaging plastic envelope, measure gaging plastic width at the widest point (clearance).
   If clearance exceeds its limit, use a new standard size bearing and remeasure clearance.

Item	Standard	Limit
Bearing clearance	0.020 – 0.050 mm (0.0008 – 0.0019 in.)	0.080 mm (0.0031 in.)

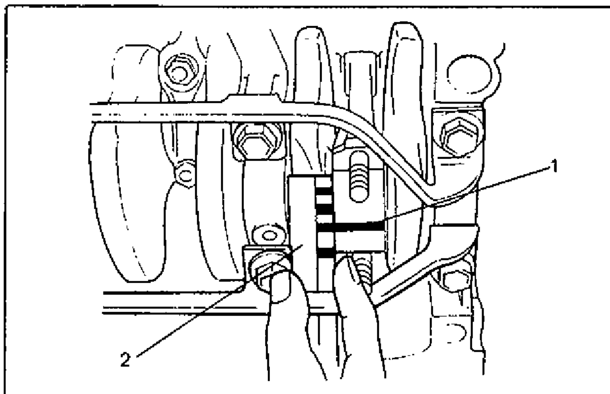


Fig. 6A-119 Measuring Rod Bearing Clearance

6. If clearance can not be brought to within its limit even by using a new standard size bearing, regrind crankpin to undersize and use 0.25 mm undersize bearing.

ASSEMBLE

NOTE:
Two sizes of piston are available as standard size spare part so as to ensure proper piston-to-cylinder clearance. When installing a standard size piston, make sure to match piston with cylinder as follows.

a) Each piston has stamped number 1 or 2 as shown. It represents outer diameter of piston.

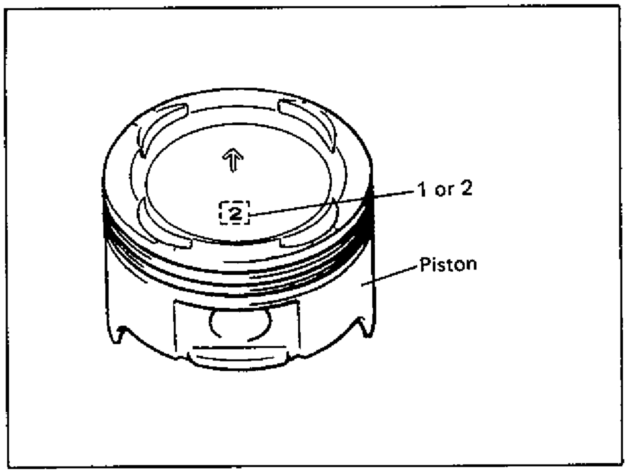


Fig. 6A-120

b) There are also stamped numbers of 1 and 2 on the cylinder block as shown below. The first number represents inner diameter of No. 1 cylinder, the second number of No. 2 cylinder, the third number of No. 3 cylinder and the fourth number of No. 4 cylinder.

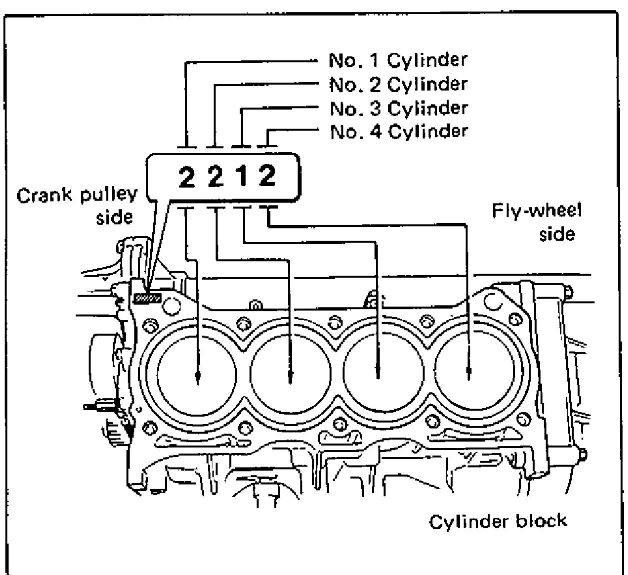


Fig. 6A-121

c) Stamped number on piston and that on cylinder block should correspond. That is, install a number 2 stamped piston to cylinder which is identified with number 2 and a number 1 piston to cylinder with number 1.

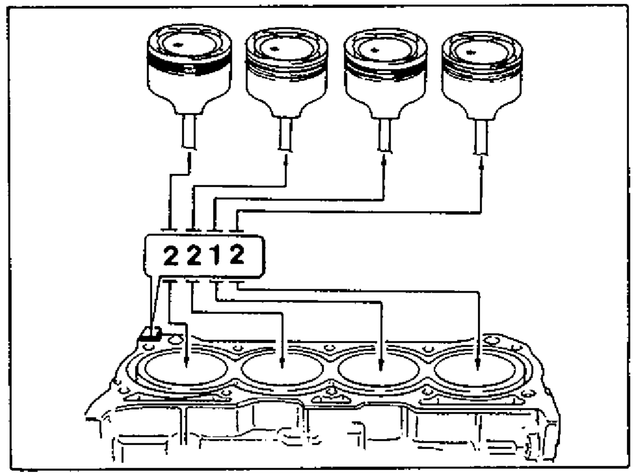


Fig. 6A-122 Piston-to-cylinder Orientation

Piston		Cylinder		Piston-to-Cylinder Clearance
Number at the top (mark)	Outside diameter	Number (mark)	Bore diameter	
1	74.98–74.99 mm (2.9520–2.9524 in.)	1	75.01–75.02 mm (2.9531–2.9535 in.)	0.02–0.04 mm (0.0008–0.0015 in.)
2	74.97–74.98 mm (2.9516–2.9520 in.)	2	75.00–75.01 mm (2.9528–2.9531 in.)	0.02–0.04 mm (0.0008–0.0015 in.)

Also, a letter A, B or C is stamped on piston head but ordinarily it is not necessary to discriminate each piston by this letter.

1. Piston pin to piston and connecting rod:
   After applying engine oil to piston pin and piston pin holes in piston and connecting rod, fit connecting rod to piston as indicated in below figure and insert piston pin to piston and connecting rod, and install piston pin circlip.

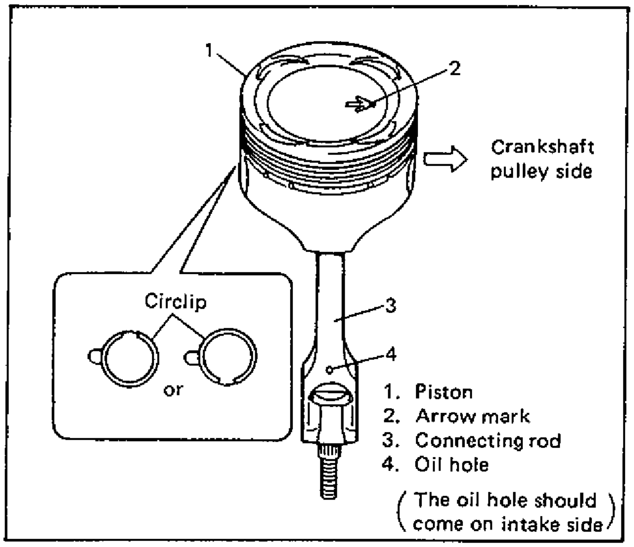


Fig. 6A-123 Fitting Connecting Rod to Piston

2. Piston rings to piston:
   - As indicated in below figure, 1st and 2nd rings have "RN", "T" or "R" mark respctively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
   - 1st ring differs from 2nd ring in thickness, shape and color of surface contacting cylinder wall.
     Distinguish 1st ring from 2nd ring by referring to below figure.
   - When installing oil ring, install spacer first and then two rails.

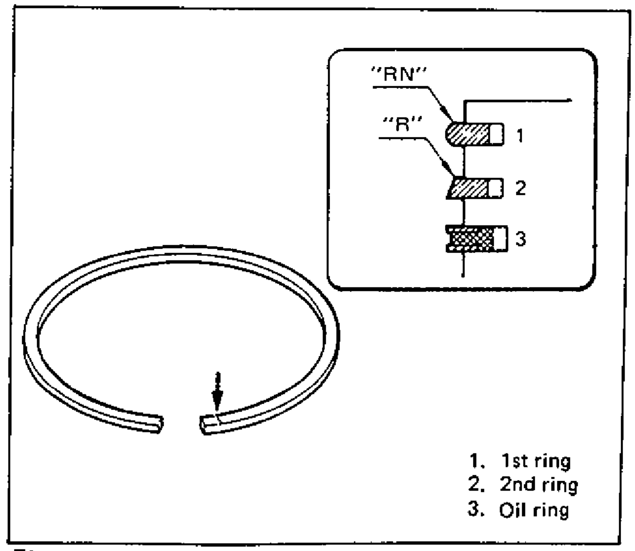


Fig. 6A-124 Installing Piston Rings

3. After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in Fig. 6A-125.

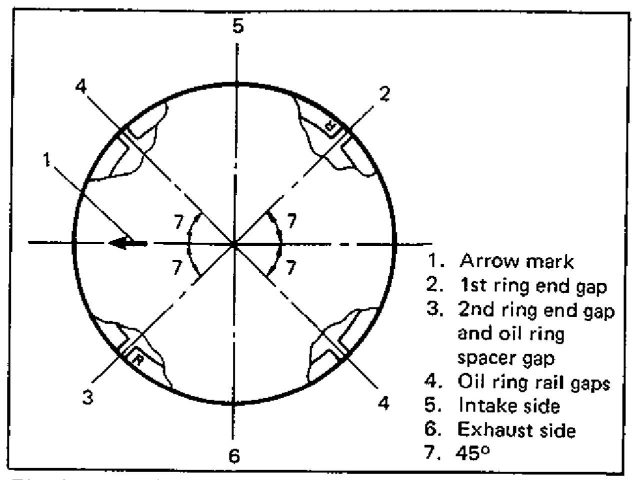


Fig. 6A-125 Piston Ring End Gaps Positions

INSTALL OR CONNECT

1. Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crankpins.
2. Guide hoses over connecting rod bolts. These guide hoses protect crankpin and threads of rod bolt from damage during installation of connecting rod and piston assembly. Refer to Fig. 6A-106 for installation of guide hoses.
3. When installing piston and connecting rod assembly into cylinder bore, point arrow mark on piston head to crankshaft pulley side.

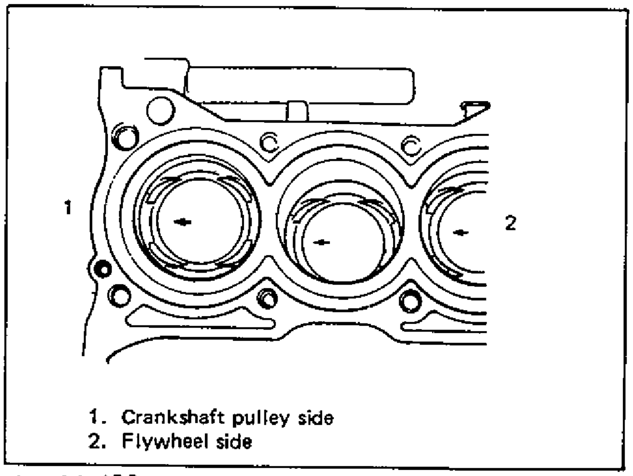


Fig. 6A-126 Direction of Arrow Mark on Piston Head

4. Piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft. Using a hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

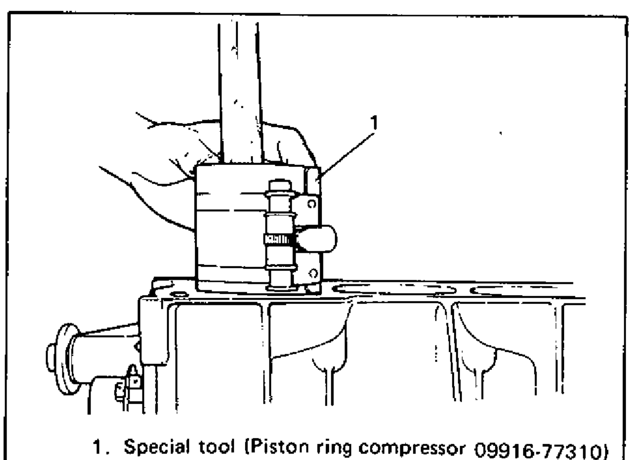


Fig. 6A-127 Installing Piston to Cylinder

5. Bearing cap: When installing cap to rod, point arrow mark on cap to crankshaft pulley side. Tighten cap nuts to specification.

Tightening torque for rod bearing cap nuts	N·m	kg·m	lb·ft
	33 – 37	3.3 – 3.7	24.0 – 26.5

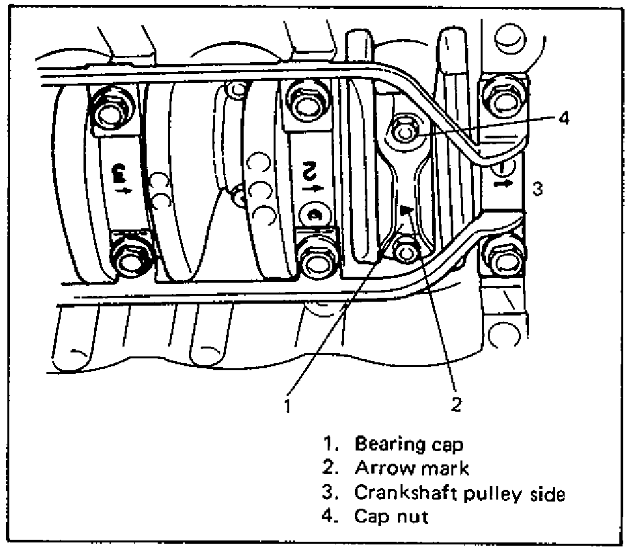


Fig. 6A-128 Installing Bearing Cap

6. Reverse removal procedure for installation of remainder, as previously outlined.
7. Adjust intake and exhaust valve lashes as previously outlined.
8. Adjust water pump belt tension. See section 6B for adjustment.
9. Adjust accelerator cable play. See section 6D for adjustment.
10. Refill engine with engine oil.
11. Refill cooling system, referring to section 6B.
12. Negative cable at battery.
13. Check ignition timing and adjust as necessary.
14. Upon completion of installation, verify that there is no fuel leakage, water leakage or exhaust gas leakage at each connection.

UNIT REPAIR OVERHAUL

ENGINE ASSEMBLY

REMOVE OR DISCONNECT

1. Relieve fuel pressure according to procedure described in p. 6-3 (for injection model).
2. Engine hood after disconnecting front window washer hose.
3. Remove battery and its tray.
4. Drain cooling system and clutch operating cylinder from transmission (For M/T model).
5. Air cleaner assembly as previously outlined.
6. Radiator with cooling fan. Refer to section 6B for removal.
7. Electric wire harness.
8. Vacuum hoses.
9. Fuel return hose and fuel feed hose.
10. Heater inlet and outlet hoses.
11. Following cables:
    - Accelerator cable.
    - Gear select cable and oil pressure control cable from transmission (For A/T model)
    - Speedometer cable from transmission.
12. Hoist car.
13. Exhaust No. 1 pipe from exhaust manifold.
14. Gear shift cable and select cable from transmission. (For M/T model)
15. Drain engine oil and transmission oil.
16. By using large size screwdrivers, pull out left drive shaft joint at differential side and right drive shaft joint at drive intermediate shaft so as to release snap ring fitting.
    Refer to SECTION 4 DRIVE SHAFT details for this procedure.
17. Remove ball stud bolts and nuts from both side knuckles and detach suspension arms and then pull out both drive shaft joints from differential.

17-1. Disconnect propeller shaft No.1 from transfer, if equipped.

18. Engine rear torque rod bracket from transmission. (For A/T model)
19. Lower car.
20. Other attached parts from engine and transmission, if any.
21. Install lifting device.

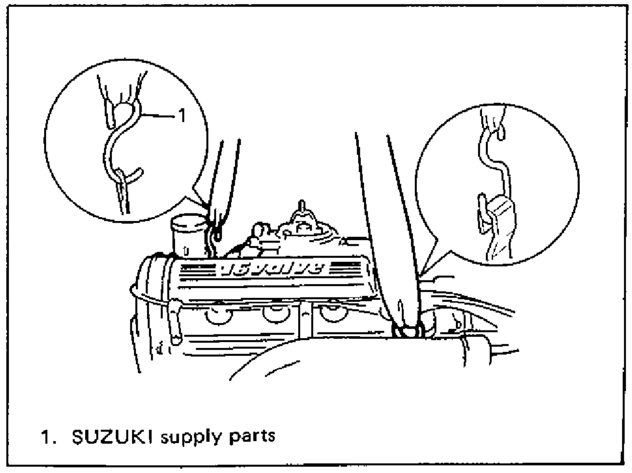


Fig. 6A-129

22. Right side engine mounting from its bracket.

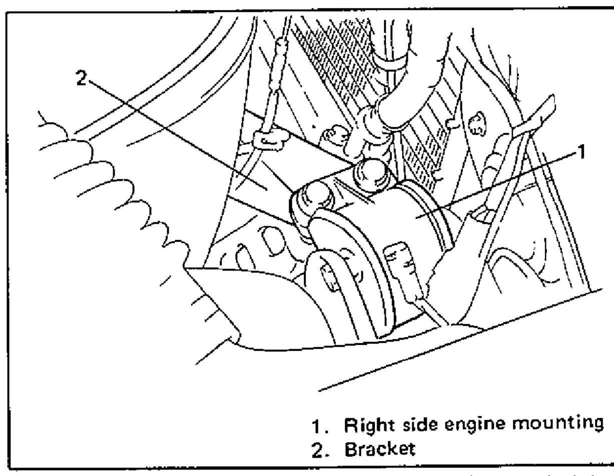


Fig. 6A-130 Removing Engine Mounting (Right Side)

23. Transmission rear mounting from body. (For M/T model)
    Transmission rear mounting nut. (For A/T model)
24. Transmission left side mounting bracket.
25. Engine with transmission from body.

INSTALL OR CONNECT

1. Lower engine with transmission into engine compartment, but do not remove lifting device.
2. Transmission rear mounting to body. (For M/T model)
   Transmission rear mounting nut. (For A/T model)
3. Transmission left side mounting bracket.
4. Right side engine mounting to its bracket.
5. Tighten bolts and nuts of all parts installed in above steps 2, 3 and 4 to specified torque.

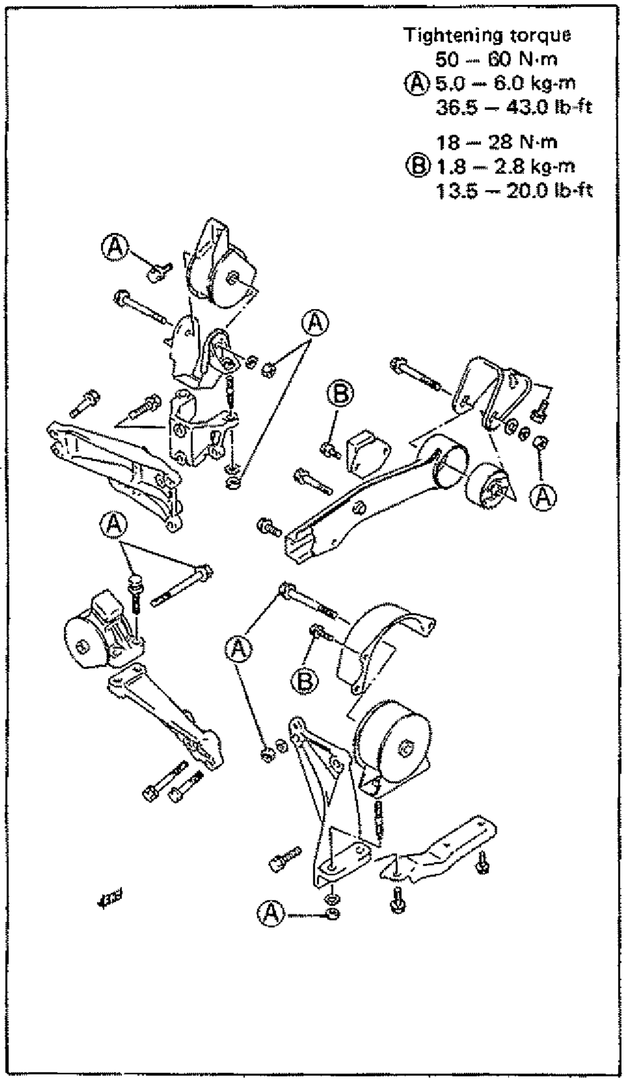


Fig. 6A-131 Engine Mounting (For M/T 2WD Model)

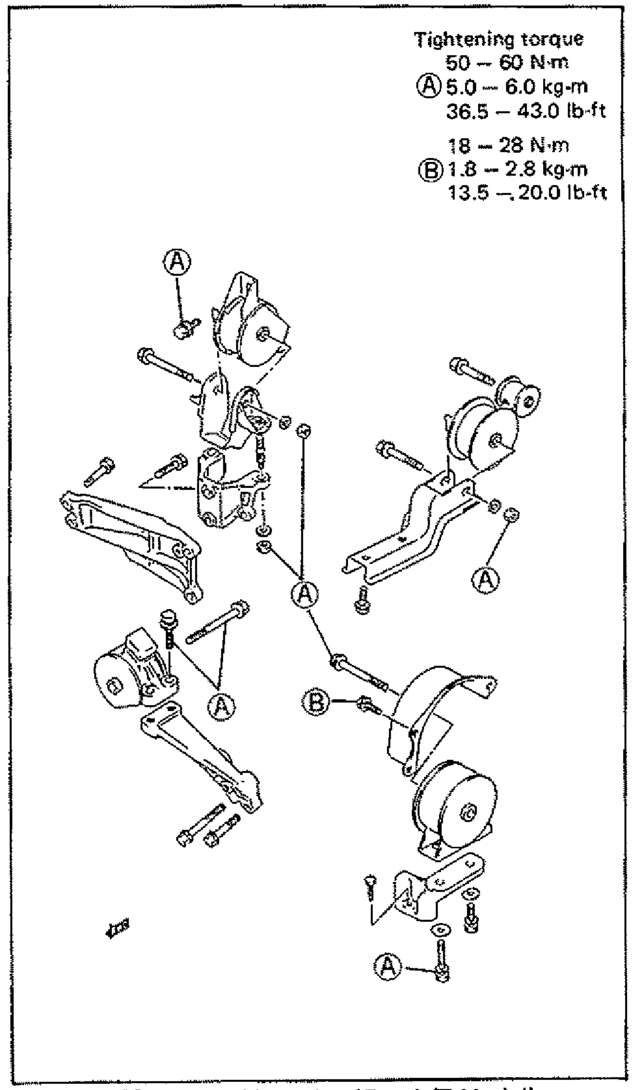
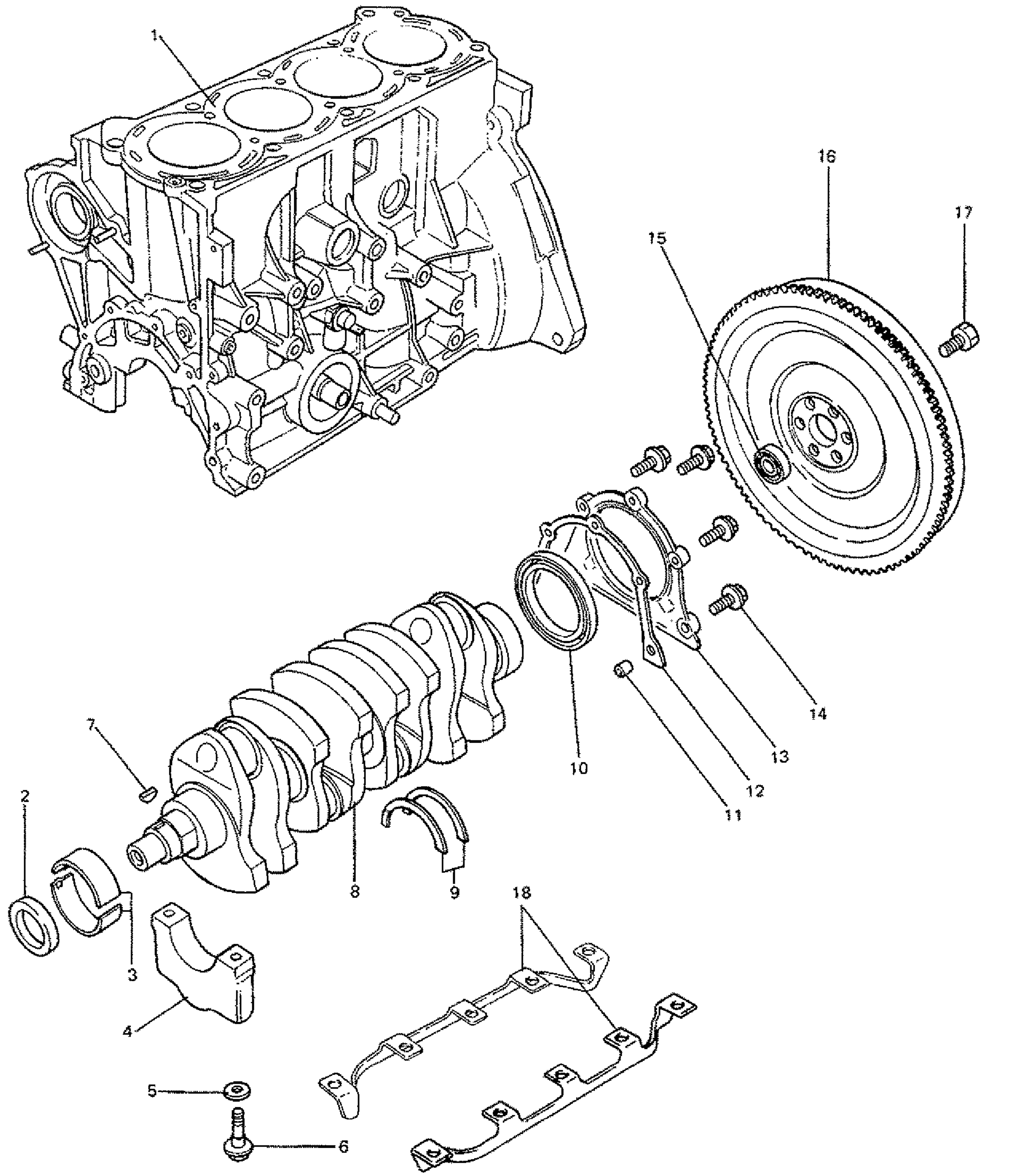


Fig. 6A-132 Engine Mounting (For A/T Model)

6. Remove lifting device.
7. Reverse removal procedures for installation of remainder.
8. Adjust gear select cable referring to section 7B. (For A/T model)
9. Adjust accelerator cable play, referring to section 6E.
10. Refill engine with engine oil and transmission with gear oil.
11. Refill cooling system, referring to section 6B.
12. Upon completion of installation, verify that there is no fuel leakage, water leakage or exhaust gas leakage at each connection.

MAIN BEARINGS, CRANKSHAFT AND CYLINDER BLOCK



1. Cylinder block
2. Front oil seal
3. Main bearing
4. Bearing cap
5. Cap washer
6. Cap bolt
7. Timing pulley key
8. Crankshaft
9. Thrust bearing
10. Rear oil seal
11. Pin
12. Oil seal housing gasket
13. Oil seal housing
14. Housing bolt
15. Input shaft bearing
16. Flywheel
17. Flywheel bolt
18. Bearing cap stiffener

Fig. 6A-133 Main Bearing, Crankshaft and Cylinder Block

REMOVE OR DISCONNECT

1. Engine with transmission from body as previously outlined.
2. Transmission from engine, and then clutch and flywheel (drive plate for A/T).
3. Water pump belt, generator bracket, crankshaft pulley, timing belt, and crankshaft timing belt pulley, etc..
4. Cylinder head assembly.
5. Oil pan and oil pump strainer.
6. Pistons and connecting rods.
7. Oil pump and oil seal housing.
8. Main bearing caps and crankshaft.

INSPECT

Crankshaft

Crankshaft runout

Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

Limit on runout	0.06 mm (0.0023 in.)

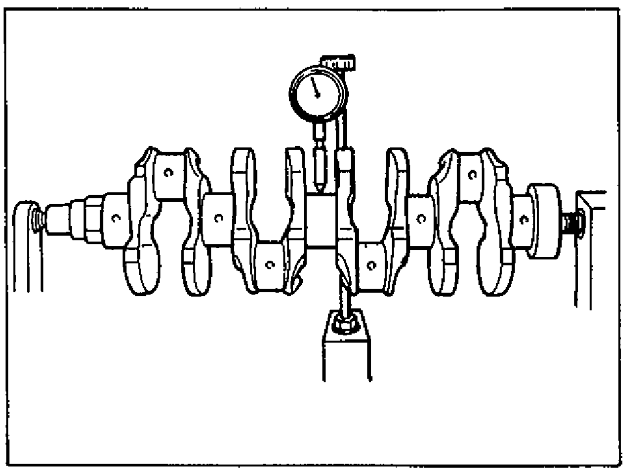


Fig. 6A-134 Measuring Runout

Crankshaft thrust play

Measure this play with crankshaft set in cylinder block in the normal manner, that is, with thrust bearing and journal bearing caps installed. Tighten bearing cap bolts to specified torque.

Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.

If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

Tightening torque for main bearing cap bolts	N·m	kg-m	lb-ft
	50 – 57	5.0 – 5.7	36.5 – 41.0

Item	Standard	Limit
Crankshaft thrust play	0.11 – 0.31 mm (0.0044 – 0.0122 in.)	0.38 mm (0.0149 in.)

Thickness of crankshaft thrust bearing	Standard		2.500 mm (0.0984 in.)
	Oversize:	0.125 mm (0.0049 in.)	2.563 mm (0.1009 in.)

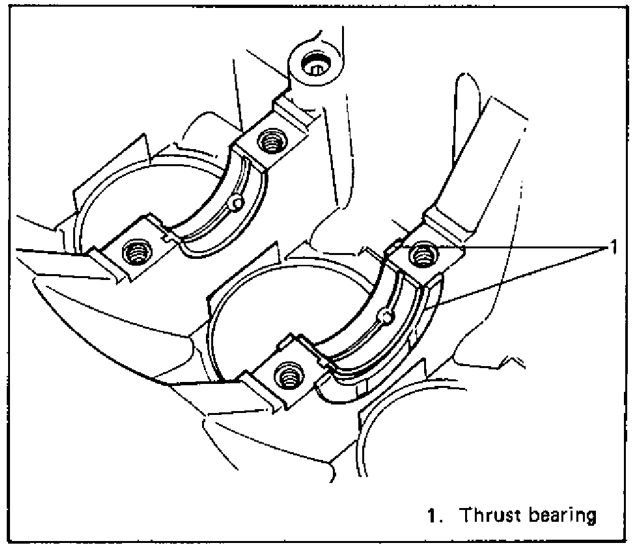


Fig. 6A-135 Thrust Bearings

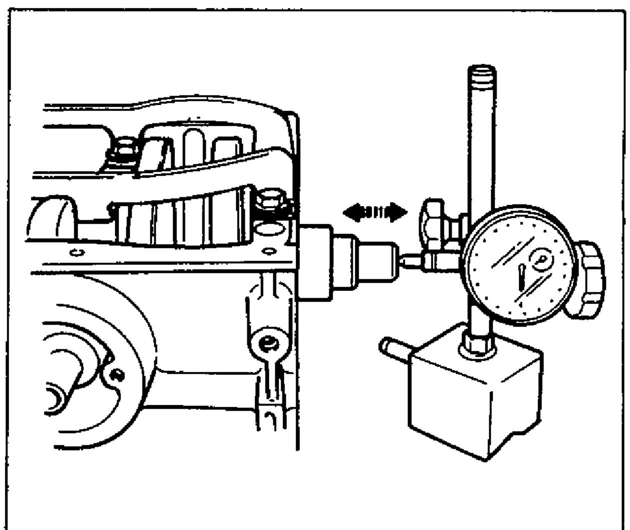


Fig. 6A-136 Measuring Thrust Play of Crankshaft

Out-of-round and taper (uneven wear) of journals

An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings.

If any one of journals is badly damaged or if amount of uneven wear in the sense explained above exceeds its limit, regrind or replace crankshaft.

Limit on out-of-round and taper	0.01 mm (0.0004 in.)

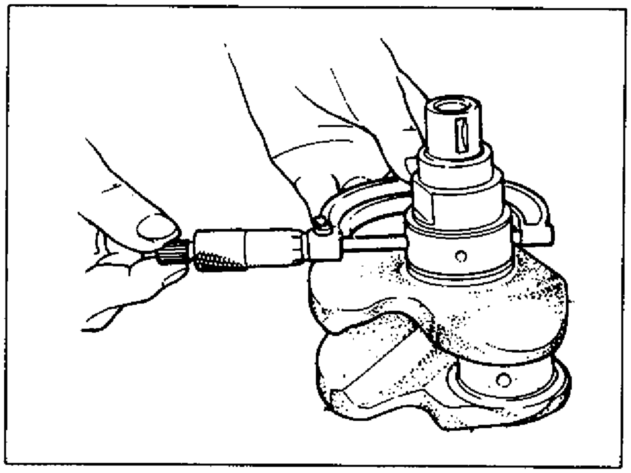


Fig. 6A-137 Checking Uneven Wear

Main Bearings

General information

- Service main bearings are available in standard-size and 0.25 mm (0.0098 in.) undersize, and each of them has 5 kinds of bearings differing in tolerance.
- Upper half of bearing has oil groove as shown in Fig. 6A-139. Install this half with oil groove to cylinder block.

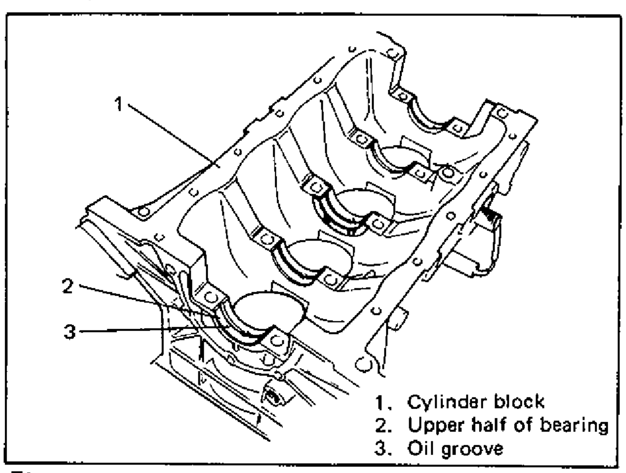


Fig. 6A-138 Upper Half of Bearing Installation

- On each main bearing cap, arrow mark and number are embossed as shown in Fig. 6A-140. When installing each bearing cap to cylinder block, point arrow mark toward crankshaft pulley side and install each cap from that side to flywheel side in ascending order of numbers "1", "2", "3", "4" and "5". Tighten cap bolts to specified torque.

Tightening torque for main bearing cap bolts	N·m	kg-m	lb-ft
	50 – 57	5.0 – 5.7	36.5 – 41.0

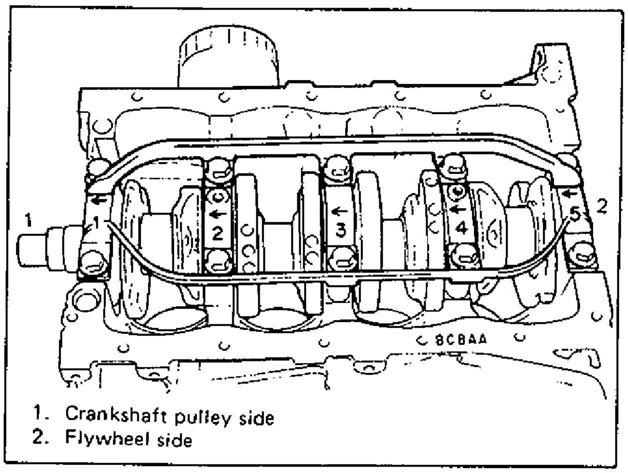


Fig. 6A-139 Bearing Caps Installation

Inspect

Check bearings for pitting, scratches, wear or damage.

If any malcondition is found, replace both upper and lower halves. Never replace one half without replacing the other half.

Main bearing clearance

Check clearance by using gaging plastic according to following procedure.

1. Remove bearing caps.
2. Clean bearings and main journals.
3. Place a piece of gaging plastic to full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.
4. Install bearing cap as previously outlined and evenly torque cap bolts to specified torque. Bearing cap MUST be torqued to specification in order to assure proper reading of clearance.

NOTE:

Do not rotate crankshaft while gaging plastic is installed.

5. Remove cap, and using scale on gaging plastic envelop, measure gaging plastic width at its widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.
   A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.
   After selecting new bearing, recheck clearance.

	Standard	Limit
Bearing clearance	0.020 – 0.040 mm (0.0008 – 0.0016 in.)	0.060 mm (0.0023 in.)

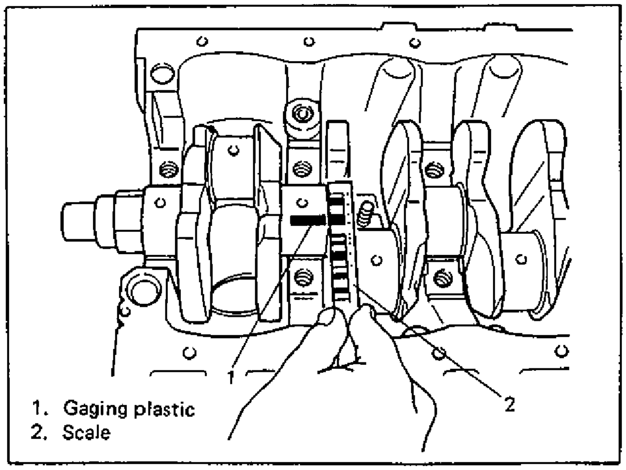


Fig. 6A-140 Measuring Main Bearing Clearance

Selection of main bearings

STANDARD BEARING:

If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to following procedure and install it.

1. First check journal diameter by using following procedure.
   As shown in Fig. 6A-141, crank webs of No. 2 and No. 3 cylinders have five stamped numerals.
   The three kinds of numerals ("1", "2" and "3") represent following journal diameters.

Numeral stamped	Journal diameter
1	51.994 – 52.000 mm (2.0470 – 2.0472 in.)
2	51.988 – 51.994 mm (2.0468 – 2.0470 in.)
3	51.982 – 51.988 mm (2.0465 – 2.0468 in.)

The first, second, third, fourth and fifth (left to right) stamped numerals represent journal diameters at bearing caps "1", "2", "3", "4" and "5" respectively.

For example, in Fig. 6A-141, the first (leftmost) numeral "3" indicates that journal dia. at bearing cap "1" is within 51.982 – 51.988 mm, and second one "1" indicates that journal dia. at cap "2" is within 51.994 – 52.000 mm.

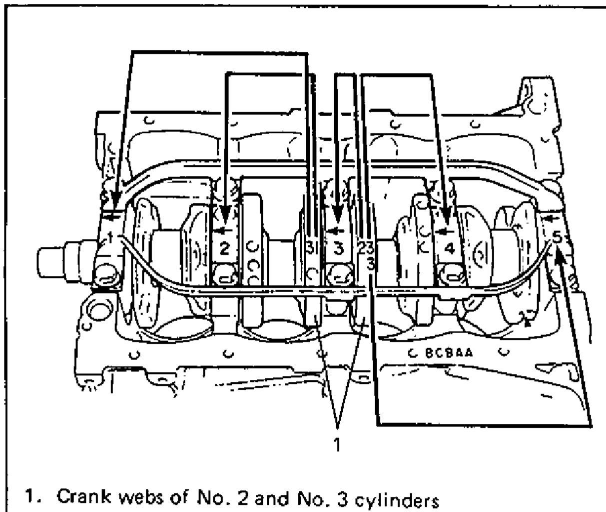


Fig. 6A-141 Stamped Numerals on Crank Webs of No. 2 and No. 3 Cylinders

2. Next, check bearing cap bore diameter without bearing.
   On mating surface of cylinder block, four alphabets are stamped as shown in Fig. 6A-143.
   Three kinds of alphabets ("A", "B" and "C") represent following cap bore diameters.

Alphabet stamped	Bearing cap bore diameter (without bearing)
A	56.000 – 56.006 mm (2.2047 – 2.2050 in.)
B	56.006 – 56.012 mm (2.2050 – 2.2052 in.)
C	56.012 – 56.018 mm (2.2052 – 2.2054 in.)

The first, second, third, fourth and fifth (left to right) stamped alphabets represent cap bore diameters of bearing caps "1", "2", "3", "4" and "5", respectively.
For example, in Fig. 6A-143, the first (leftmost) alphabet "B" indicates that cap bore dia. of bearing cap "1" is within 56.006 – 56.012 mm, and the fifth (rightmost) alphabet "A" indicates that cap bore dia. of cap "5" is within 56.000 – 56.006 mm.

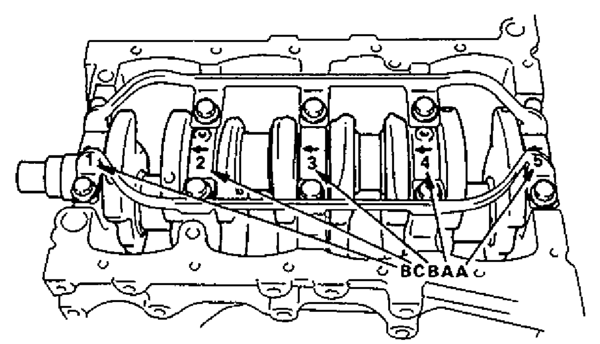


Fig. 6A-142 Stamped Alphabets on Cylinder Block

3. There are five kinds of standard bearings differing in thickness. To distinguish them, they are painted in following colors at the position as indicated in Fig. 6A-143.
   Each color indicates following thickness at the center of bearing.

Color painted	Bearing thickness
Green	1.996 – 2.000 mm (0.0786 – 0.0787 in.)
Black	1.999 – 2.003 mm (0.0787 – 0.0788 in.)
Colorless (no paint)	2.002 – 2.006 mm (0.0788 – 0.0789 in.)
Yellow	2.005 – 2.009 mm (0.0789 – 0.0790 in.)
Blue	2.008 – 2.012 mm (0.0790 – 0.0791 in.)

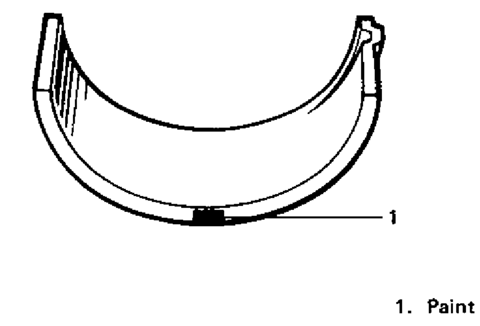


Fig. 6A-143 Paint on Standard Bearing

4. From numerals stamped on crank webs of No. 2 and No. 3 cylinders and the alphabets stamped on mating surface of cylinder block, determine new standard bearing to be installed to journal, by referring to table given below.
   For example, if numeral stamped on crank web is "1" and alphabet stamped on mating surface is "B", install a new standard bearing painted in "Black" to its journal.

		Numeral stamped on crank web (Journal diameter)		
		1	2	3
Alphabet stamped on mating surface	A	Green	Black	Colorless
	B	Black	Colorless	Yellow
	C	Colorless	Yellow	Blue
		New standard bearing to be installed.		

5. Using gaging plastic, check bearing clearance with newly selected standard bearing.
   If clearance still exceeds its limit, use next thicker bearing and recheck clearance.
6. When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to numerals stamped on new crankshaft or alphabets stamped on mating surface of new cylinder block.

UNDERSIZE BEARING (0.25 mm):

- 0.25 mm undersize bearing is available, in five kinds varying in thickness.
  To distinguish them, each bearing is painted in following colors at such position as indicated in Fig. 6A-144.
  Each color represents following thicknesses at the center of bearing.

Color painted	Bearing thickness
Green & Red	2.121 – 2.125 mm (0.0835 – 0.0836 in.)
Black & Red	2.124 – 2.128 mm (0.0836 – 0.0837 in.)
Red only	2.127 – 2.131 mm (0.0837 – 0.0838 in.)
Yellow & Red	2.130 – 2.134 mm (0.0838 – 0.0839 in.)
Blue & Red	2.133 – 2.137 mm (0.0839 – 0.0840 in.)

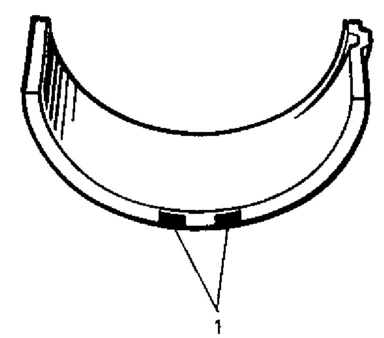


Fig. 6A-144 Paints on Undersize Bearing

- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.

1. Regrind journal to following finished diameter.

Finished diameter	51.732 – 51.750 mm (2.0367 – 2.0373 in.)

2. Using micrometer, measure reground journal diameter. Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
3. Using journal diameter measured above and alphabets stamped on mating surface of cylinder block, select an undersize bearing by referring to table given below.
   Check bearing clearance with newly selected undersize bearing.

		Measured journal diameter		
		51.744 – 51.750 mm (2.0371 – 2.0373 in.)	51.738 – 51.744 mm (2.0369 – 2.0371 in.)	51.732 – 51.738 mm (2.0367 – 2.0369 in.)
Alphabets stamped on mating surface of cylinder block	A	Green & Red	Black & Red	Red only
	B	Black & Red	Red only	Yellow & Red
	C	Red only	Yellow & Red	Blue & Red
		Undersize beraing to be installed.		

Rear Oil Seal

Carefully inspect oil seal for wear or damage. If its lip is worn or damaged, replace it.

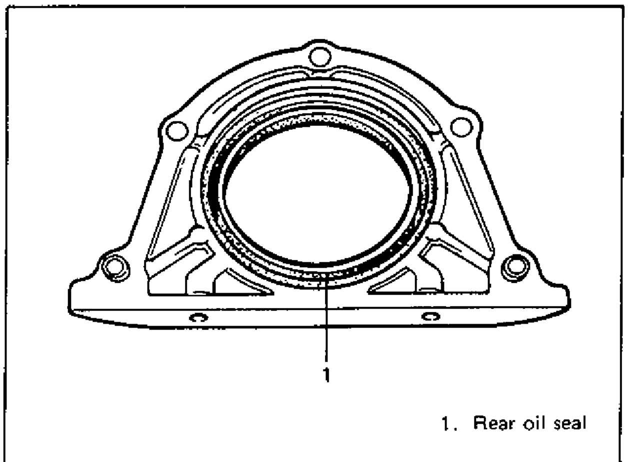


Fig. 6A-145 Rear Oil Seal

Flywheel (M/T model only)

- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.
- Check flywheel for face runout with a dial gauge.
  If runout exceeds its limit, replace flywheel.

Limit on runout	0.2 mm (0.0078 in.)

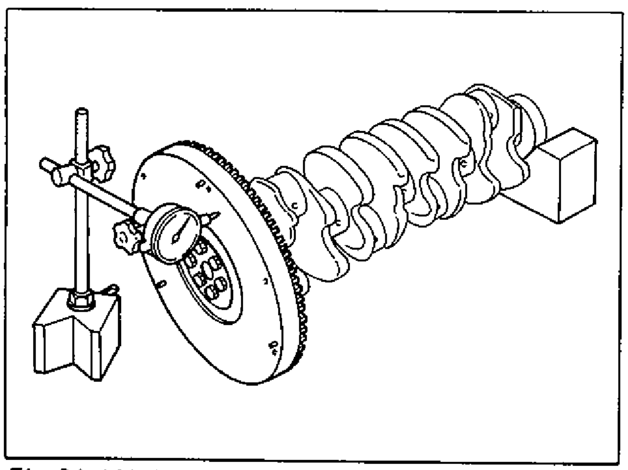


Fig. 6A-146 Measuring Runout

Cylinder Block

Distortion of gasketed surface

Using a straightedge and a thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct it.

Item	Standard	Limit
Flatness	0.03 mm (0.0012 in.)	0.06 mm (0.0024 in.)

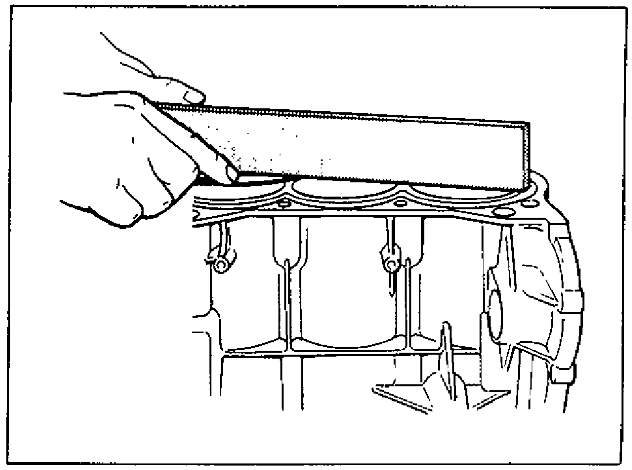


Fig. 6A-147 Checking Surface

Honing or reboring cylinders

1. When any cylinder needs reboring, all other cylinders must also be rebored at the same time.
2. Select oversized piston according to amount of cylinder wear.

Size	Piston diameter
O/S 0.25	75.220 – 75.230 mm (2.9614 – 2.9618 in.)
O/S 0.50	75.470 – 75.480 mm (2.9712 – 2.9716 in.)

3. Using micrometer, measure piston diameter.

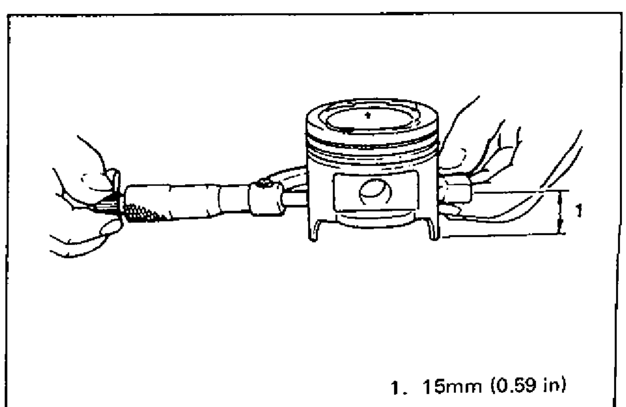


Fig. 6A-148 Measuring Piston Diameter

4. Calculate cylinder bore diameter to be rebored.

   D = A + B − C

   D : Cylinder bore diameter to be rebored.
   A : Piston diameter as measured.
   B : Piston clearance = 0.02 − 0.04 mm (0.0008 − 0.0015 in.)
   C : Allowance for honing = 0.02 mm (0.0008 in.)

5. Rebore and hone cylinder to calculated dimension.

NOTE:
Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

6. Measure piston clearance after honing.

INSTALL OR CONNECT

NOTE:
- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb such combination and make sure that each part goes back to where it came from, when installing.**

1. Main bearings to cylinder block.
   One of two halves of main bearing, has an oil groove. Install it to cylinder block, and the other half without oil groove to bearing cap.
   ·Make sure that two halves are painted in the same color.

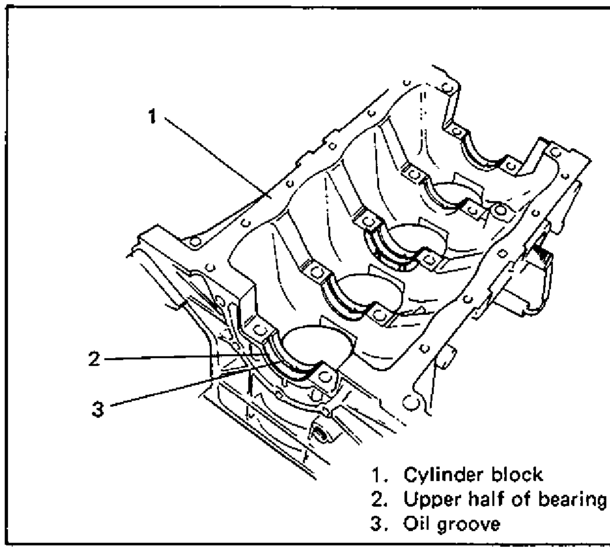


Fig. 6A-149 Installing Bearing Half with Oil Groove

2. Thrust bearings to cylinder block between No. 2 and No. 3 cylinders. Face oil groove sides to crank webs.

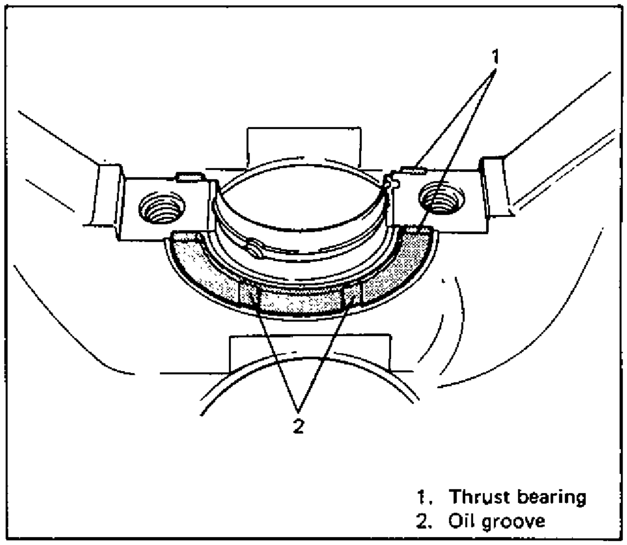


Fig. 6A-150 Installing Thrust Bearings

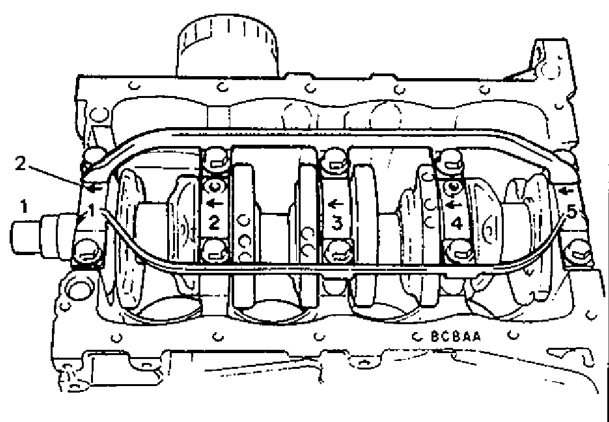
3. Crankshaft to cylinder block.
4. When fitting bearing caps to journals after setting crankshaft in place, be sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side.

Tightening torque for main bearing cap bolts	N·m	kg-m	lb-ft
	50 – 57	5.0 – 5.7	36.5 – 41.0

Gradual and uniform tightening is important for bearing cap bolts. Make sure that five caps become tight equally and progressively till specified torque is attained.

NOTE:

After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turned by hand.



1. Crankshaft pulley side
2. Arrow mark

Fig. 6A-151 Installing Main Bearing Caps

5. Oil seal housing and its gasket.
Install new gasket. Do not reuse gasket removed in disassembly. Oil lip portion of oil seal, before installing. Tighten housing bolts to specification.

After installing oil seal housing, gasket edges might bulge out; if so, cut them off to make them flush with cylinder block and oil seal housing.

Tightening torque for housing bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

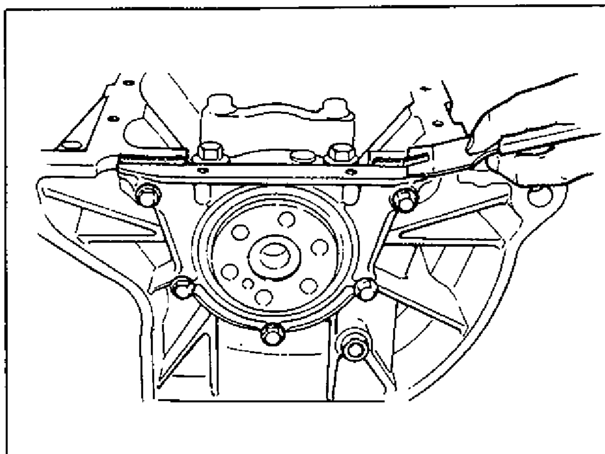
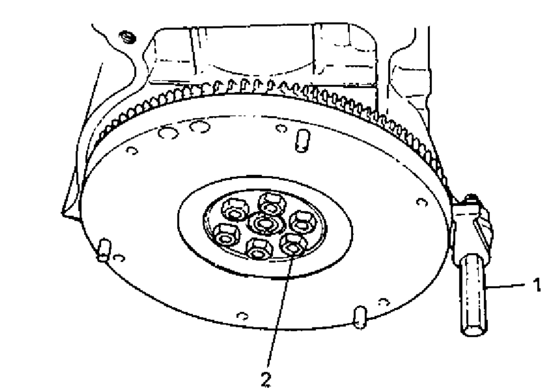


Fig. 6A-152 Cutting Off Edges of Gasket

6. Oil pump.
Refer to item "Oil pump" for installation of oil pump.
7. Flywheel (M/T model) or drive plate (A/T model)
Using special tool, lock flywheel or drive plate, and torque its bolts to specification.

Tightening torque for flywheel or drive plate bolts	N·m	kg-m	lb-ft
	75 – 80	7.5 – 8.0	54.5 – 57.5



1. Special tool (Flywheel holder 09924-17810)
2. Flywheel bolts

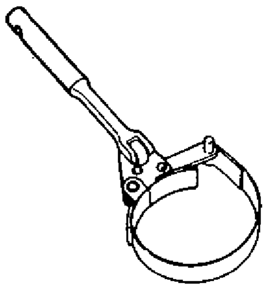
Fig. 6A-153 Flywheel

8. Pistons and connecting rods as previously outlined.
9. Oil pump strainer and oil pan.
10. Cylinder head assembly to cylinder block.

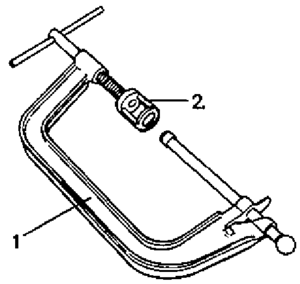
NOTE:
Tighten cylinder head bolts to specified torque as previously outlined.
Whenever installing cylinder head to new cylinder block, use following procedure to tighten cylinder head bolts.
- **Tighten cylinder head bolts to specified torque as previously outlined and loosen them once till tightening torque becomes "zero". And then torque them to specification again.**

11. Crankshaft timing belt pulley, timing belt, crankshaft pulley, water pump pulley, etc., as previously outlined.
12. Clutch to flywheel (M/T model)
    For clutch installation, refer to section 7C.
13. Engine with transmission to body as previously outlined.

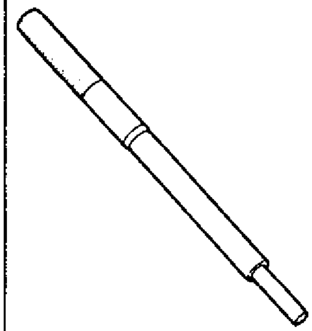
SPECIAL TOOLS



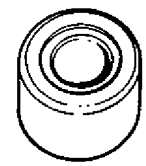
09915-47310
Oil filter wrench



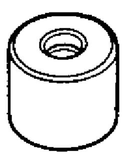
1. 09916-14510
   Valve lifter
2. 09916-14910
   Valve lifter attachment



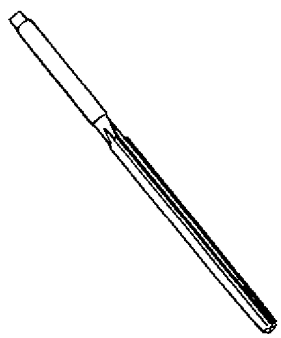
09916-44910
Valve guide remover



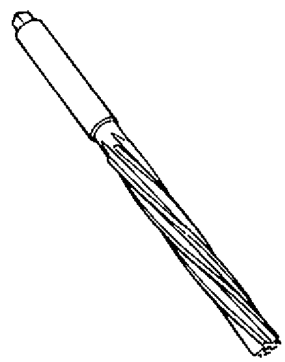
09916-56011
Valve guide installer attachment



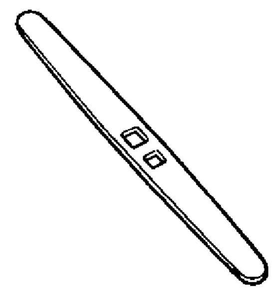
09917-98221
Valve stem seal installer



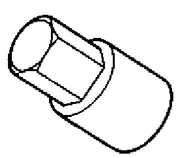
09916-34550
Reamer (5.5 mm)



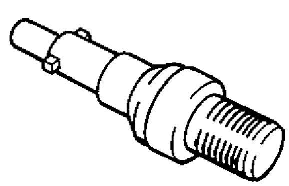
09916-38210
Reamer (11 mm)



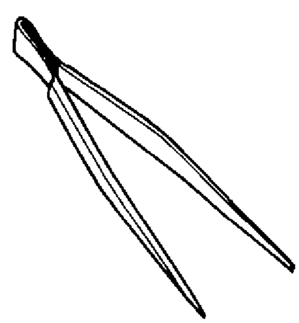
09916-34541
Reamer handle



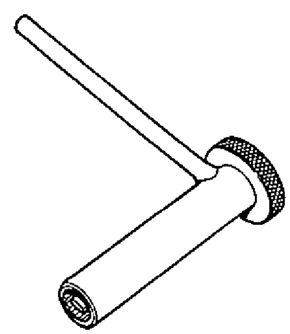
09919-16020
17 mm socket



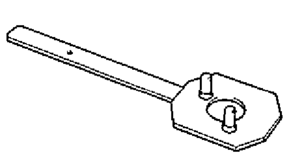
09915-67010
Compression gauge attachment (C)



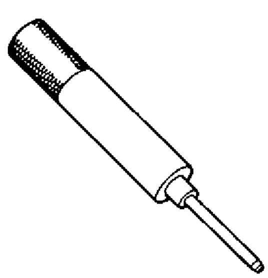
09916-84510
Forceps



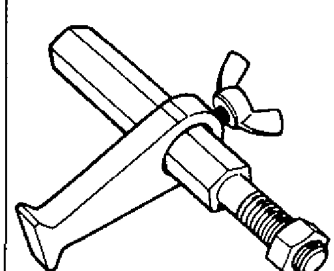
09917-18210
Tappet adjuster wrench



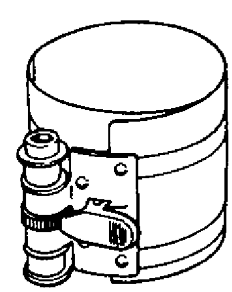
09917-68220
Camshaft pulley holder



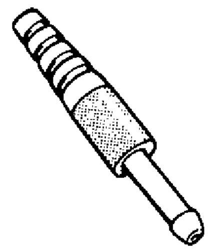
09916-58210
Valve guide installer handle



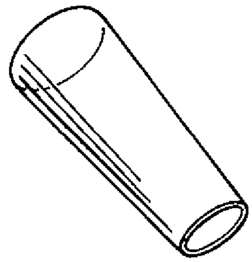
09924-17810
Flywheel holder



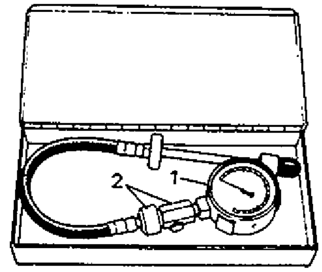
09916-77310
Piston ring compressor



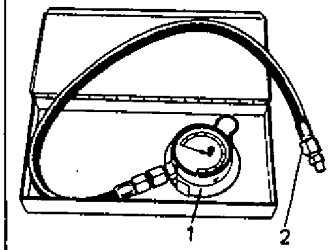
09918-08210
Vacuum gauge hose joint



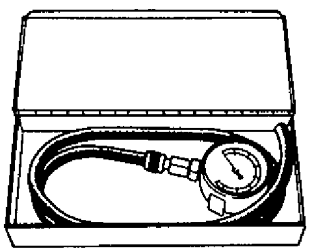
09926-18210
Oil seal guide (Vinyl resin)



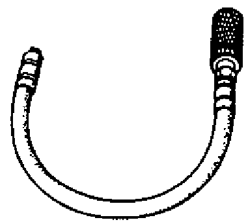
09915-64510
Compression gauge set
(1. 09915-64510-001 Compression gauge
2. 09915-64510-002 Connector)



1. 09915-77310
Oil pressure gauge
2. 09915-78211
Oil pressure gauge attachment



09915-67310
Vacuum gauge



09915-64530
Compression gauge hose

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND NO. 1207C (99000-31150)	• Mating surfaces of cylinder block and oil pan.
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Mating surfaces of camshaft housings (No. 6) • Mating surfaces of distributor case and cylinder head.

RECOMMENDED TORQUE SPECIFICATIONS

System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Engine	Cylinder head bolt	65 – 70	6.5 – 7.0	47.5 – 50.5
	Spark plug	20 – 30	2.0 – 3.0	14.5 – 21.5
	Intake & exhaust manifold bolt and nut	18 – 28	1.8 – 2.8	13.5 – 20.0
	Camshaft timing pully bolt	56 – 64	5.6 – 6.4	41.0 – 46.0
	Timing belt cover bolt and nut	9 – 12	0.9 – 1.2	7.0 – 8.5
	Crankshaft pully bolt	14 – 18	1.4 – 1.8	10.5 – 13.0
	Connecting rod bearing cap nut	33 – 37	3.3 – 3.7	24.0 – 26.5
	Crankshaft main bearing cap bolt	50 – 57	5.0 – 5.7	36.5 – 41.0
	Flywheel bolt (drive plate bolt)	75 – 80	7.5 – 8.0	54.5 – 57.5
	Oil pressure switch	12 – 15	1.2 – 1.5	9.0 – 10.5
	Oil filter stand	20 – 25	2.0 – 2.5	14.5 – 18.0
	Oil pan bolt and nut	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil drain plug	30 – 40	3.0 – 4.0	22.0 – 28.5
	Cylinder head cover bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Valve adjusting screw lock nut	10 – 13	1.0 – 1.3	7.5 – 9.0
	Exhaust No. 1 pipe nut	25 – 35	2.5 – 3.5	18.5 – 25.0
	Oil pump strainer bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil pump case bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Crankshaft timing belt pulley bolt	105 – 115	10.5 – 11.5	76.0 – 83.0
	Timing belt tensioner bolt	22 – 28	2.2 – 2.8	16.0 – 20.0
	Timing belt tensioner stud	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil pump rotor plate screw	9 – 12	0.9 – 1.2	7.0 – 8.5
	Engine mounting & bracket bolt and nut	Refer to Fig. 6A-131 and 6A-132.		
	Camshaft housing bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Rocker arm shaft bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Water pump pulley bolt	9 – 12	0.9 – 1.2	7.0 – 8.5

SECTION 6B

ENGINE COOLING

CONTENTS

GENERAL DESCRIPTION 6B- 2
DIAGNOSIS 6B- 6
MAINTENANCE 6B- 6
Coolant 6B- 6
Coolant Level 6B- 7
Cooling System Service 6B- 8
Cooling System Flush and Refill 6B- 8
Water Pump Belt Tension 6B- 9
ON CAR SERVICE 6B-10
Coolant Draining 6B-10
Coolant Water Pipes or Hoses 6B-10
Thermostat 6B-10
Water Pump Belt 6B-12
Fan Thermo Switch 6B-12
Radiator 6B-13
Water Pump 6B-13
REQUIRED SERVICE MATERIALS 6B-15

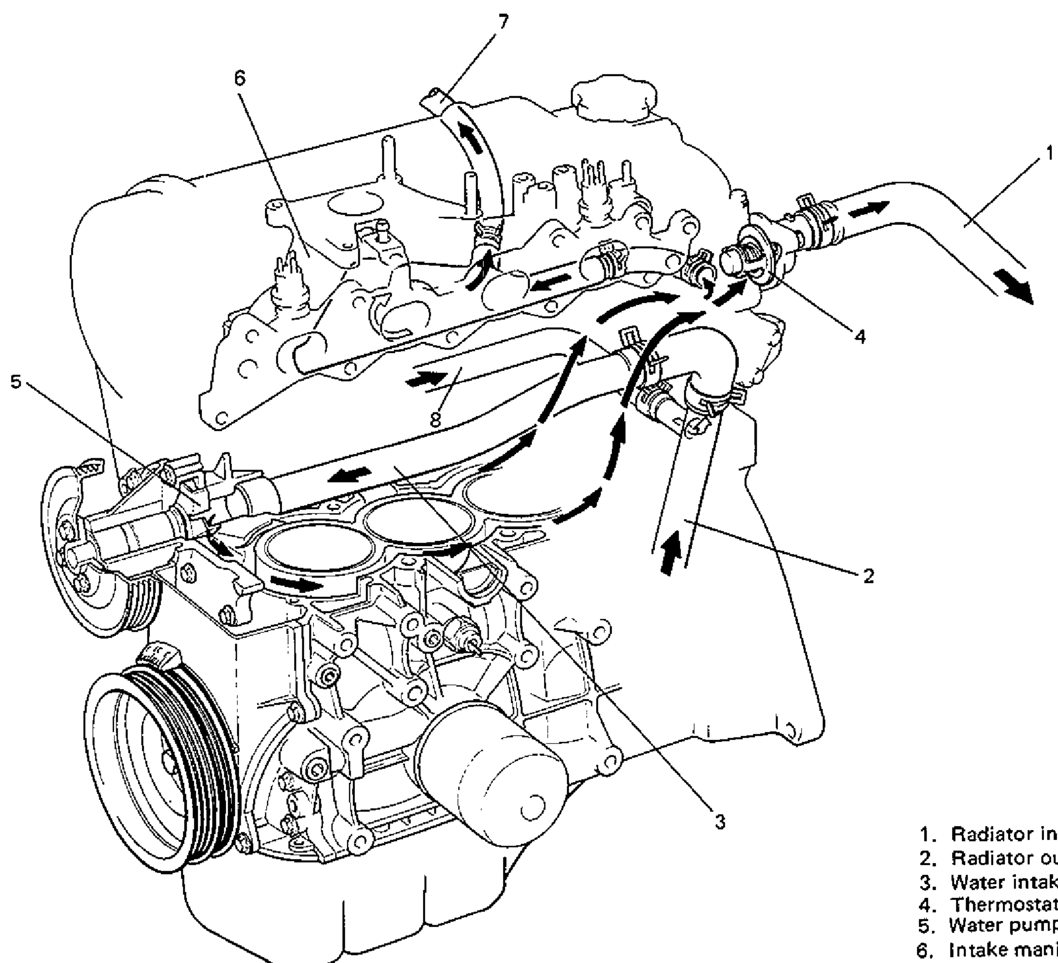
GENERAL DESCRIPTION

The cooling system consists of the radiator cap, radiator, water reservoir tank, hoses, water pump, cooling fan, thermostat. The radiator is of tube-and-fin type.

COOLING SYSTEM CIRCULATION

During engine warm-up (thermostat closed), the water pump discharges coolant into the water jacket chamber adjacent to No. 1 cylinder. Coolant then flows through the cylinder block and the cylinder head. Coolant then returns to the water pump through intake manifold, heater inlet hose, heater unit, heater outlet hose, and water intake pipe.

During normal temperatures (thermostat open), coolant takes the same basic route but is now allowed to flow past the thermostat, the inlet hose and the radiator, and then back to the water pump through the outlet hose and the water intake pipe.



1. Radiator inlet hose
2. Radiator outlet hose
3. Water intake pipe
4. Thermostat
5. Water pump
6. Intake manifold
7. Heater inlet hose
8. Heater outlet hose

Fig. 6B-1

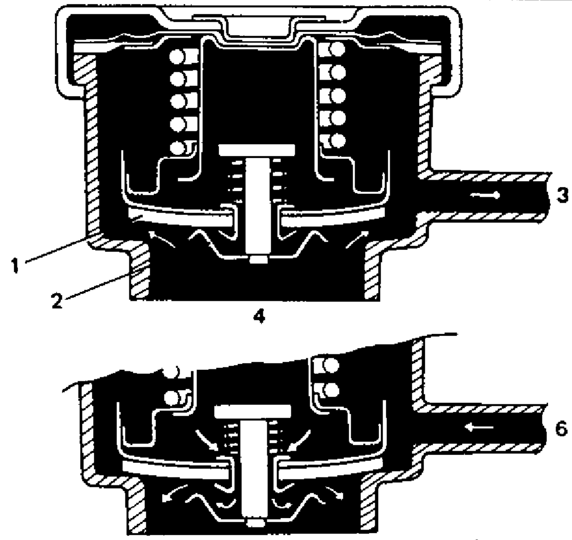
RADIATOR CAP

A pressure-vent cap is used on the radiator. The cap contains a pressure valve and vacuum valve. The pressure valve is held against its seat by a spring of pre-determined strength which protects the cooling system by relieving the pressure if the pressure in cooling system rises by 0.9 kg/cm^2 (12.8 psi, 90 kPa). The vaccum valve is held against its seat by a light spring which permits opening of the valve to relieve vacuum created in the system when it cools off and which otherwise might cause the radiator to collapse.

The cap has its face marked 0.9, which means that its pressure valve opens at 0.9 kg/cm^2 (12.8 psi, 90 kPa).

NOTE:
Do not remove radiator cap to check engine coolant level; check coolant visually at the see-through water reservoir tank.
Coolant should be added only to reservoir tank as necessary.

WARNING:
As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.



1. Pressure valve
2. Vacuum valve
3. To water reservoir tank
4. Pressure relief
5. Vacuum relief
6. From water reservoir tank

Fig. 6B-2 Pressure Type Radiator Cap

WATER RESERVOIR TANK

A "see-through" plastic reservoir tank is connected to the radiator by a hose. As the car 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.

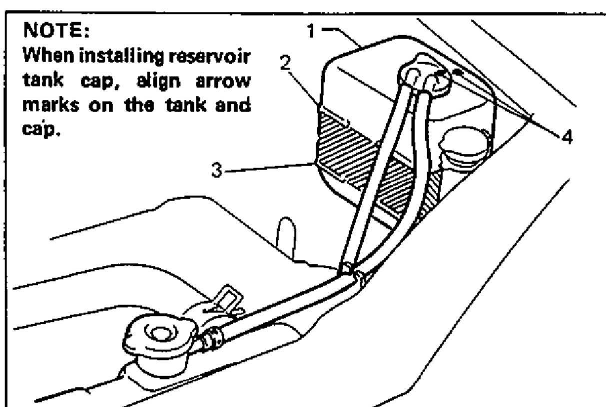
When the car is stopped and the coolant cools and contracts, the displaced coolant is drawn back into the radiator by vacuum.

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.



1. Reservoir tank
2. FULL level mark
3. LOW level mark
4. Arrow mark

Fig. 6B-3 Water Reservoir Tank

WATER PUMP

The centrifugal type water pump is used in the cooling system. The pump impeller is supported by a totally sealed bearing. The water pump can not be disassembled.

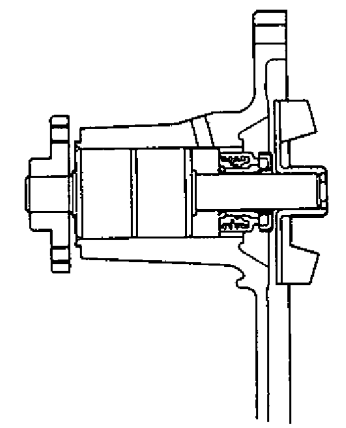


Fig. 6B-4 Water Pump

THERMOSTAT

A wax pellet type thermostat is used in the coolant outlet passage to control the flow of engine coolant, to provide fast engine warm up and to regulate coolant temperatures.
A wax pellet element is hermetically contained in a metal case, and expands when heated and contracts when cooled.
When the pellet is heated and expands, the metal case pushes down the valve to open it.
As the pellet is cooled, the contraction allows the spring to close the valve.
Thus, the valve remains closed while the coolant is cold, preventing circulation of coolant through the radiator.

At this point, coolant is allowed to circulate only throughout the engine to warm it quickly and evenly.
As the engine warms, the pellet expands and the thermostat valve opens, permitting coolant to flow through the radiator.

In the top portion of the thermostat, an air bleed valve is provided; this valve is for venting out the gas or air, if any, that is accumulated in the circuit.

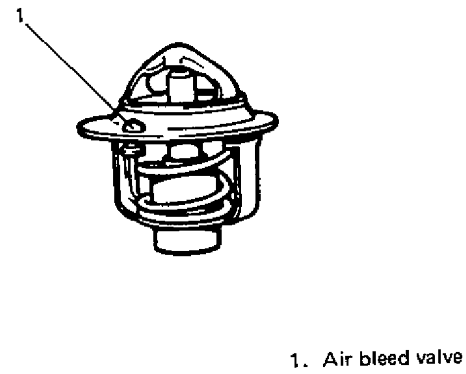


Fig. 6B-5 Thermostat

There are two types of thermostat, A and B, as given below.
Either one is used depending on vehicle specifications. The temperature at which the valve begins to open is stamped on each thermostat. Be sure to note this stamped temperature for replacement.

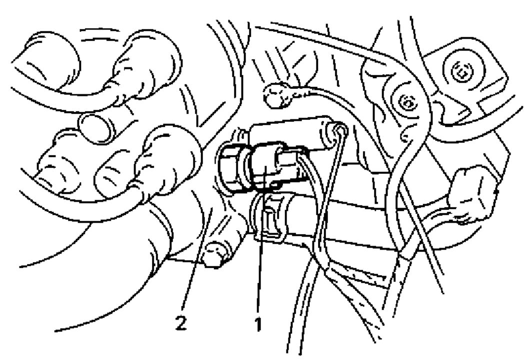
Thermostat functional spec. ± 2.8°C (5.0°F)		
Thermostat	"A"	"B"
Temp. at which valve begins to open	82°C (179°F)	88°C (190°F)
Temp. at which valve become fully open	95°C (203°F)	100°C (212°F)

COOLING FAN

The cooling fan is driven by electric motor, and the motor is activated by thermo switch.

Fan thermo switch functional spec. ± 5°C (9°F)		
Switch for cooling fan	"A"	"B"
Temp. at switch "ON"	More than 93°C (199°F)	More than 98°C (208°F)
Temp. at switch "OFF"	Less than 88°C (190°F)	Less than 93°C (199°F)

WARNING:
Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the thermo switch with the ignition switch in the "ON" position.

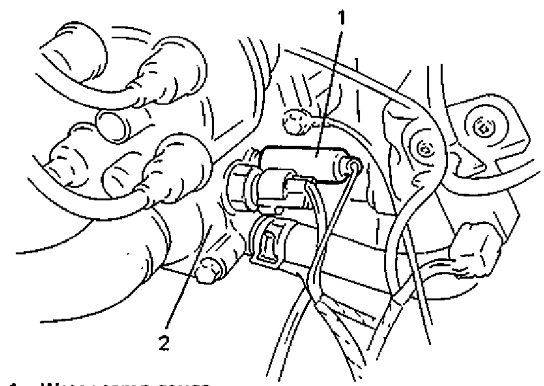


1. Thermo switch
2. Thermostat case

Fig. 6B-6 Thermo Switch

WATER TEMP GAUGE

A water temp. gauge is located at thermostat case. This gauge activates a temp. meter gauge in the instrument cluster.



1. Water temp gauge
2. Thermostat case

Fig. 6B-7 Water Temp Gauge

DIAGNOSIS

Condition	Possible Cause	Correction
Engine overheats	• Loose or broken water pump belt	Adjust or replace.
	• Not enough coolant	Check coolant level and add as necessary.
	• Faulty thermostat	Replace.
	• Faulty water pump	Replace.
	• Dirty or bent radiator fins	Clean or remedy.
	• Coolant leakage on cooling system	Repair.
	• Defective cooling fan motor or thermo switch	Check and replace as necessary.
	• Plugged radiator	Check and replace radiator as necessary.
	• Faulty radiator cap	Replace.
	• Maladjusted ignition timing	Adjust.
	• Dragging brakes	Adjust brake.
	• Slipping clutch	Adjust or replace.

MAINTENANCE

COOLANT

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the overflow is collected in the reservoir tank.
When the system cools down, the coolant is drawn back into the radiator.

The cooling system has been filled at the factory with a quality coolant that is either 50/50 mixture of water and GOLDEN CRUISER 1200 (ehylene glycol antifreeze.) or 30/70 mixture of water and GOLDEN CRUISER 1200..
The 50/50 mixture coolant solution provides freezing protection to –36°C (–33°F), the 30/70 mixture coolant solution provides freezing protection to –16°C (3°F).

When changing the engine coolant, use mixture of 50% water and 50% GOLDEN CRUISER 1200 for the market where ambient temperature falls lower than –16°C (3°F) in winter and mixture of 70% water and 30% GOLDEN CRUISER 1200 for the market where ambient temperature doesn't fall lower than –16°C (3°F).

ANTI-FREEZE PROPORTIONING CHART

Freezing temperature	°C	–16	–36
	°F	3	–33
Antifreeze/Anti-corrosion coolant concentration	%	30	50
Ratio of compound to cooling water	ltr.	1.47/3.43	2.45/2.45
	US pt.	3.11/7.25	5.18/5.18
	Imp. pt.	2.58/6.03	4.31/4.31

COOLANT CAPACITY	
Engine, radiator and heater	About 4.3 liters (9.1/7.5 US/Imp pt.)
Reservoir tank	About 0.6 liters (1.3/1.1 US/Imp pt.)
Total	About 4.9 liters (10.0/8.6 US/Imp pt.)

NOTE:

- **Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ethylene glycol antifreeze (Antifreeze/Anticorrosion coolant) should be used for the purpose of corrosion protection and lubrication.**

COOLANT LEVEL

Coolant Level

To check level, lift hood and look at "see-through" water reservoir tank.
It is not necessary to remove radiator cap to check coolant level.

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

When engine is cool, check coolant level in reservoir tank. A normal coolant level should be between "FULL" and "LOW" marks on reservoir tank.

If coolant level is below "LOW" mark, remove reservoir tank cap and add proper coolant to tank to bring coolant level up to "FULL" mark. Then, reinstall cap.

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.**

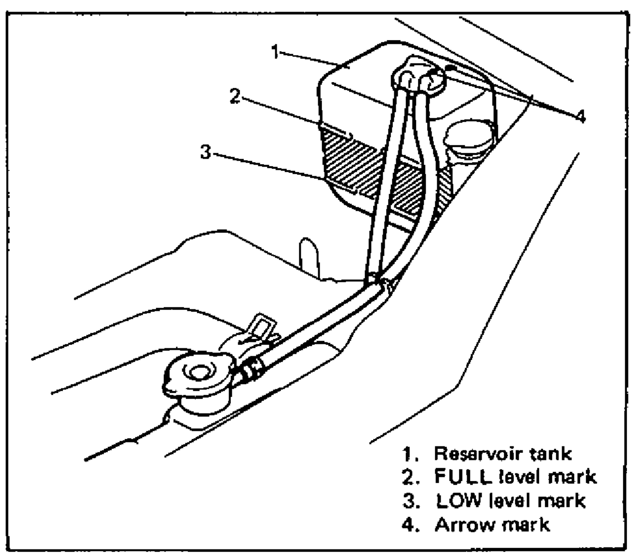


Fig. 6B-8

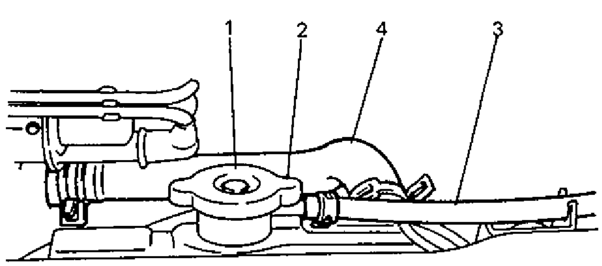
COOLING SYSTEM SERVICE

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

Cooling system should be serviced as follows.

1. Check cooling system for leakage or damage.
2. Wash radiator cap and filler neck with clean water by removing radiator cap when engine is cold.
3. Check coolant for proper level and freeze protection.
4. Using a pressure tester, check system and radiator cap for proper pressure holding capacity 0.9 kg/cm^2 (12.8 psi, 90 kPa). If replacement of cap is required, use proper cap specified for this vehicle.
5. Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
6. Clean frontal area of radiator core.

NOTE:
After installing radiator cap to radiator, make sure that its ear is aligned with reservoir tank hose as shown in figure. If not, turn cap more to align its ear with hose.



1. Radiator cap
2. Ear
3. Reservoir tank hose
4. Inlet hose

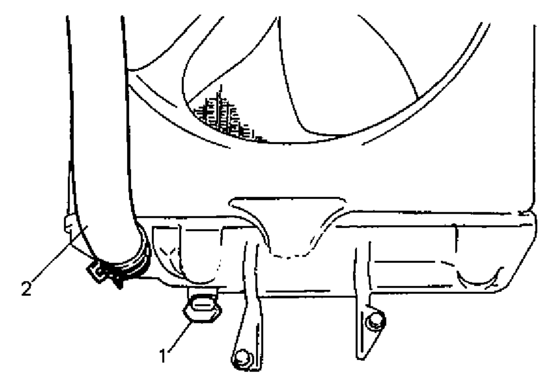
Fig. 6B-9 Installation of Radiator Cap

COOLING SYSTEM FLUSH AND REFILL

1. Remove radiator cap when engine is cool:
   Turn cap slowly to the left until it reaches a "stop" (Do not press down while turning it.) Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it to the left.

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

2. With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).
3. Stop engine and open radiator drain plug to drain coolant.



1. Drain plug
2. Outlet hose

Fig. 6B-10 Radiator Drain Plug

4. Close drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
5. Repeat steps 3 and 4 several times until drained liquid is nearly colorless.
6. Drain system and then close radiator drain plug tightly.
7. Disconnect hose from water reservoir tank. Remove tank and pour out any fluid. Scrub and clean inside of tank with soap and water. Flush it well with clean water and drain. Reinstall tank and hose.

8. Add proper coolant of GOLDEN CRUISER 1200 (good quality ethylene glycol anti-freeze) and water to radiator and tank.
   Fill radiator to the base of radiator filler neck and reservoir tank to "FULL" level mark. Reinstall reservoir tank cap, aligning the arrow marks on the tank and cap.
9. Run engine, with radiator cap removed, until radiator upper hose is hot.
10. With engine idling, add coolant to radiator until level reaches the bottom of filler neck. Install radiator cap, making sure that the ear of cap lines up with reservoir tank hose.

WATER PUMP BELT TENSION

> **WARNING:**
> **Disconnect negative cable at battery before checking and adjusting belt tension.**

1. Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to page 6B-12 for procedure.
2. Check belt for tension. Belt is in proper tension when it deflects 6 to 8 mm (0.24 – 0.32 in.) under thumb pressure (about 10 kg or 22 lb.).

Belt tension specification	6 – 8 mm (0.24 – 0.32 in.) as deflection

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

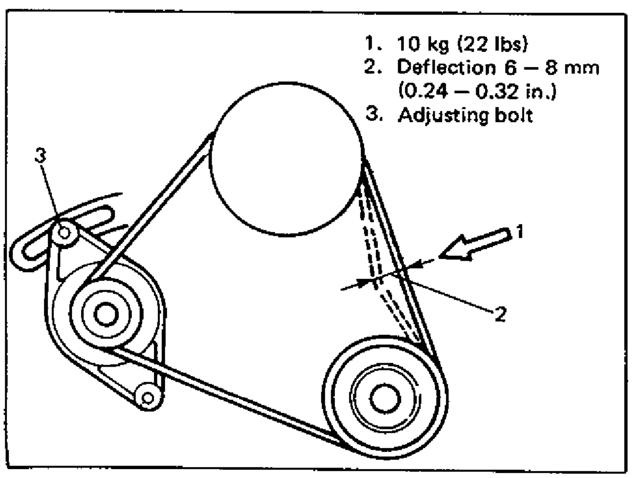


Fig. 6B-11

3. If belt is too tight or too loose, adjust it to proper tension by displacing alternator position.

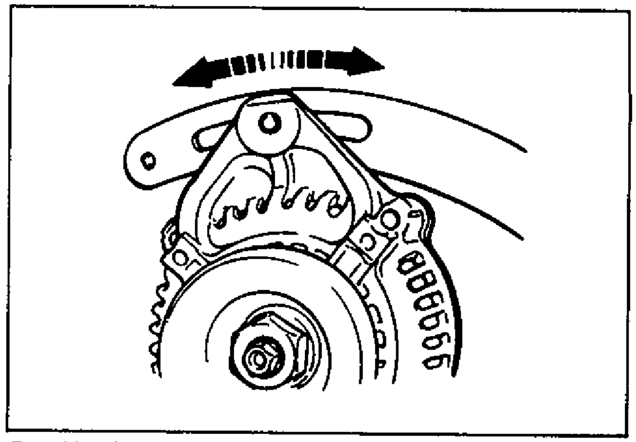


Fig. 6B-12

4. Tighten alternator adjusting bolt and pivot bolts.
5. Connect negative cable at battery terminal.

ON CAR SERVICE

WARNING:
- **Check to make sure that cooling water temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cord from battery terminal before removing any part.**

COOLANT DRAINING

1. Remove radiator cap.
2. Loosen drain plug on radiator to drain coolant.

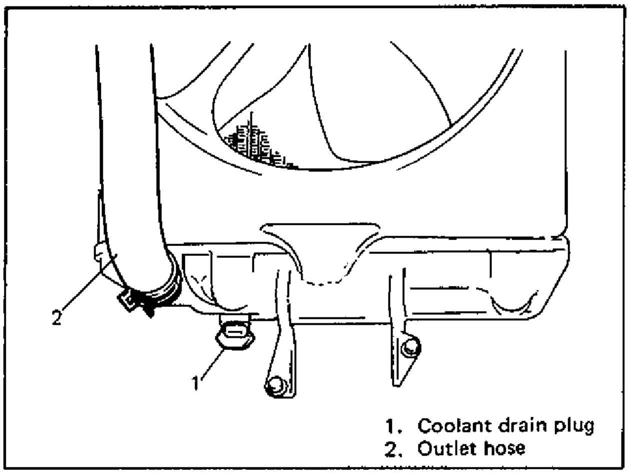


Fig. 6B-13

3. After draining coolant, be sure to tighten drain plug securely.
4. Fill cooling system. (Refer to pages 6B-6 & 6B-7.)

COOLING WATER PIPES OR HOSES

REMOVAL

1. Drain cooling system.
2. To remove these pipes or hoses, loosen screw on each pipe or hose clip and pull hose end off.

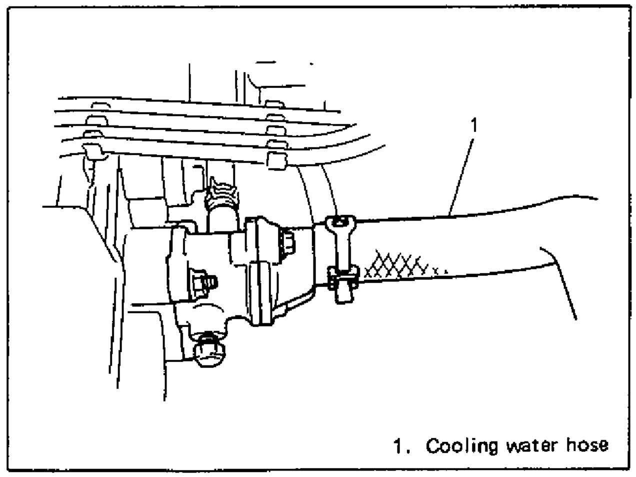


Fig. 6B-14

INSTALLATION

Install removed parts in reverse order of removal procedure, noting the following.
- Tighten each clamp bolt securely.
- Refill cooling system with proper coolant, referring to description on COOLANT on pages 6B-6 and 6B-7.

THERMOSTAT

REMOVAL

1. Disconnect negative cable at battery.
2. Drain cooling system and tighten drain plug.
3. Disconnect thermostat cap from thermostat case.

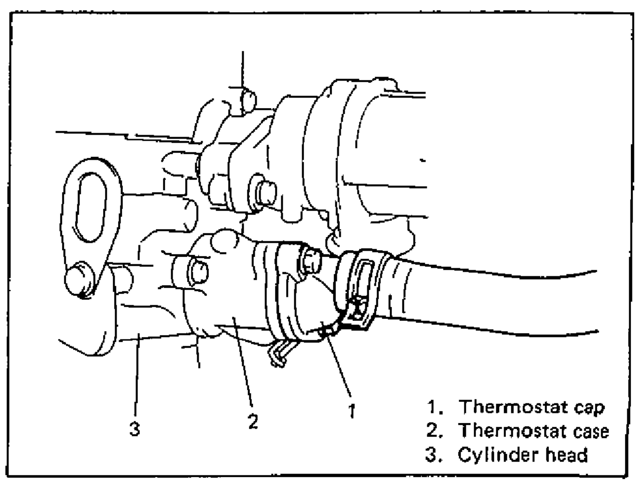


Fig. 6B-15

4. Remove thermostat.

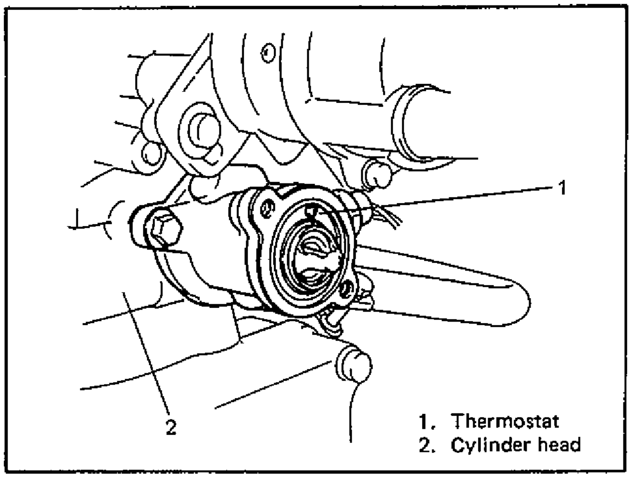


Fig. 6B-16

INSPECTION

1. Make sure that air bleed valve of thermostat is clear. Should this valve be clogged, engine would tend to overheat.

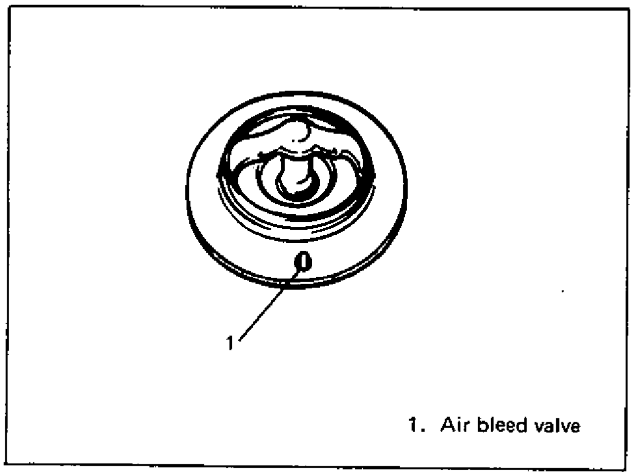


Fig. 6B-17 Air Bleed Valve of Thermostat

2. Check to make sure that valve seat is free from foreign matters which would prevent valve from seating tight.
3. Check thermostatic movement of wax pellet as follows:
   - Immerse thermostat in water, and heat water gradually.
   - Check that valve starts to open at specific temperature.
   - If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if re-used, will bring about overcooling or overheating tendency.

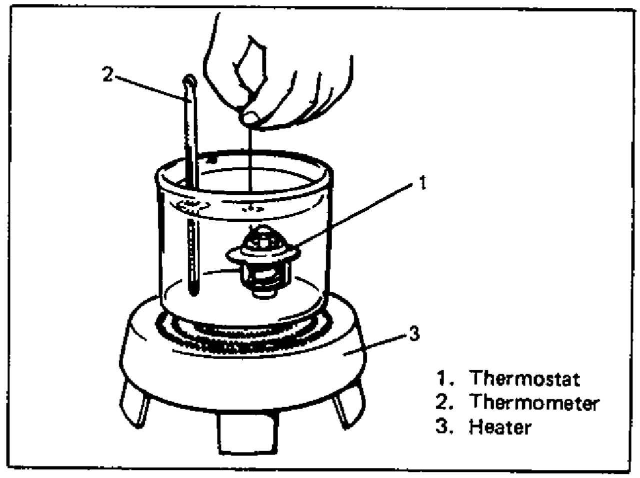


Fig. 6B-18 Checking Thermostat Valve Operation

INSTALLATION

1. Install thermostat to intake manifold as shown in Fig. 6B-19.

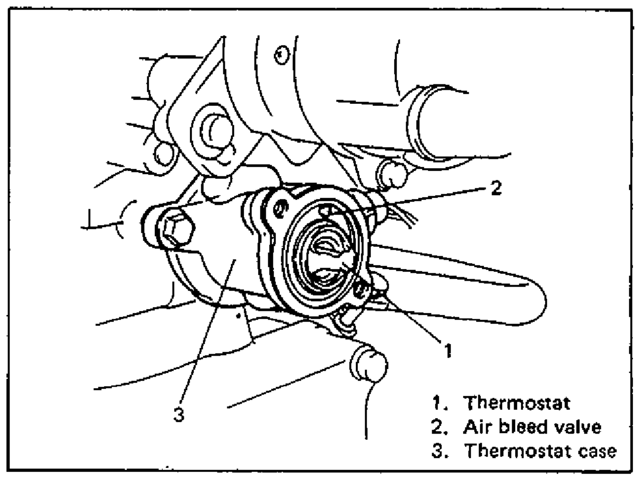


Fig. 6B-19

2. Install new gasket and thermostat cap to thermostat case.
3. Fill cooling system.
4. Connect negative cable.
5. After installation, check each part for leakage.

WATER PUMP BELT

REMOVAL

1. Disconnect negative cable at battery.
2. Loosen drive belt adjusting bolt and mounting bolts.
   When servicing vehicle equipped with air conditioner, remove compressor drive belt before removing water pump belt.

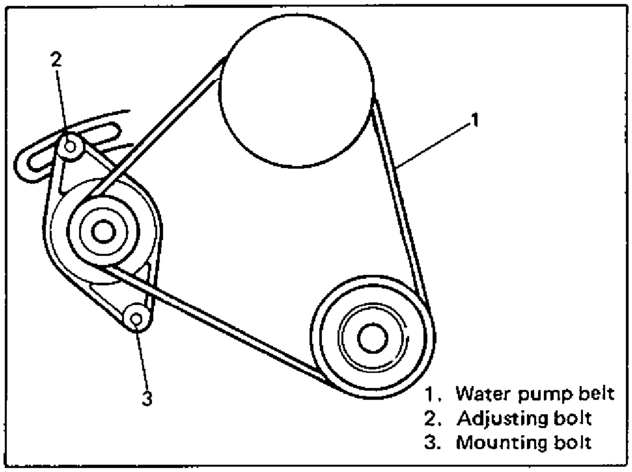


Fig. 6B-20

3. Slacken belt by displacing generator and then remove it.

INSTALLATION

1. Install belt to water pump pulley, crankshaft pulley and generator pulley.
   When servicing vehicle equipped with air conditioner, install compressor drive belt, too.
2. Adjust belt tension.
3. Tighten water pump belt adjusting bolt and mounting bolts.
4. Connect negative cable at battery.

WATER PUMP BELT TENSION INSPECTION AND ADJUSTMENT

For this inspection or adjustment, refer to WATER PUMP BELT TENSION on page 6B-9.

FAN THERMO SWITCH

REMOVAL

1. Disconnect negative cable at battery.
2. Drain cooling system.
3. Disconnect coupler of thermo switch lead wire.
4. Remove thermo switch from thermostat case.

INSTALLATION

Reverse removal procedure.
After installation, check for leakage.

INSPECTION

1. Connect an ohmmeter to the thermo switch.
2. Immerse the switch in water, and heat water gradually.
3. Check that the switch turns "ON" or "OFF" according to the below specification. If the switch is faulty, replace it.

Fan thermo switch functional spec. ± 5°C (9° F)		
Switch for thermostat	"A"	"B"
Temp. at switch "ON" (Continuity)	More than 93°C (199°F)	More than 98°C (208°F)
Temp. at switch "OFF" (No continuity)	Less than 88°C (190°F)	Less than 93°C (199°F)

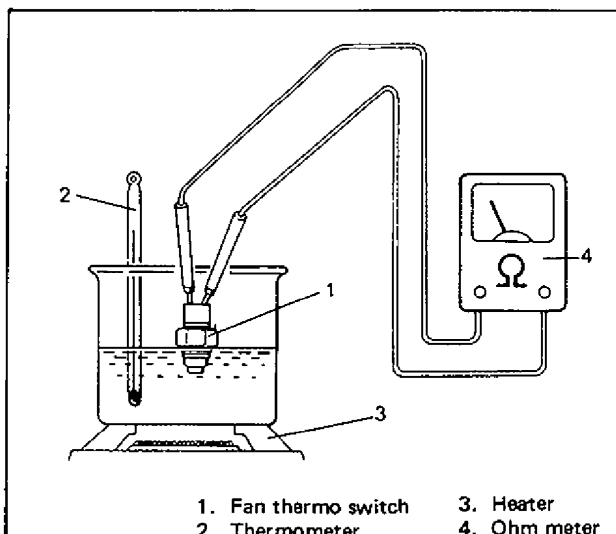


Fig. 6B-21 Checking Fan Thermo Switch

Tightening torque for fan thermo switch	N·m	kg-m	lb-ft
	10 – 20	1.0 – 2.0	7.5 – 14.0

RADIATOR

REMOVAL

1. Disconnect negative cable at battery.
2. Drain cooling system by loosening drain plug of radiator.
3. Disconnect coupler of cooling fan motor lead wire.
4. Disconnect radiator inlet and outlet hoses, and rèservoir tank hose.

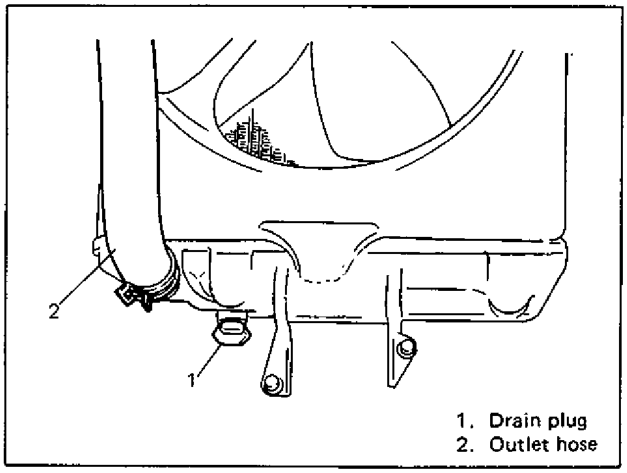


Fig. 6B-22 Radiator of M/T Car

5. With automatic transmission (A/T) car, disconnect additional 2 fluid hoses from radiator. Place some container under radiator to receive A/T fluid which will flow out when hose is disconnected.

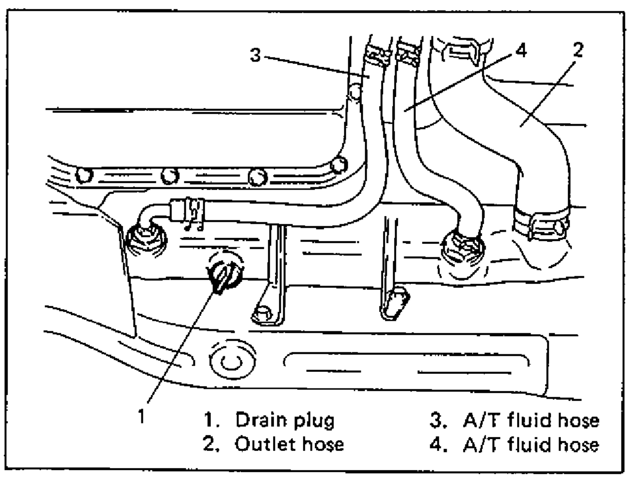


Fig. 6B-23 Radiator of A/T Car

6. Remove radiator and cooling fan motor.

INSPECTION

Check radiator for leakage or damage. Straighten bent fins, if any.

CLEAN

Clean frontal area of radiator cores.

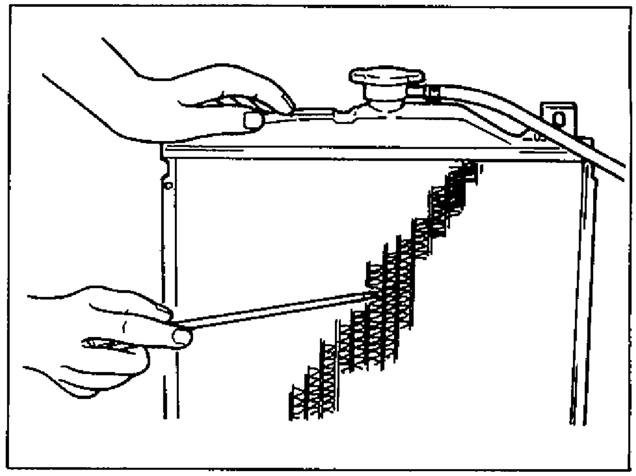


Fig. 6B-24

INSTALLATION

Reverse removal procedures.

NOTE:

- **Refill cooling system with proper coolant referring to COOLANT section on pages 6B-6 and 6B-7.**
- **With automatic transmission car, fill A/T fluid up to specified level. (For procedure to check A/T fluid and its level, refer to SECTION 7B.)**
- **After installation, check each joint for leakage.**

WATER PUMP

1. Disconnect negative cable at battery.
2. Drain cooling system.
3. Remove water pump belt, pump pulley and engine right side under cover.
4. Remove crankshaft pulley, referring to section 6A.

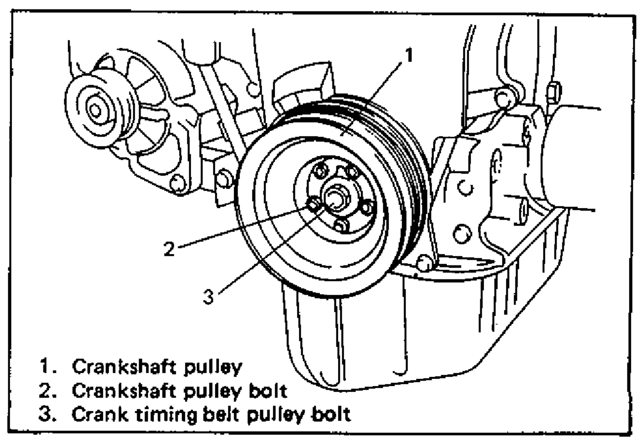


Fig. 6B-25

5. Remove timing belt outside cover.
6. Remove tensioner and timing belt.

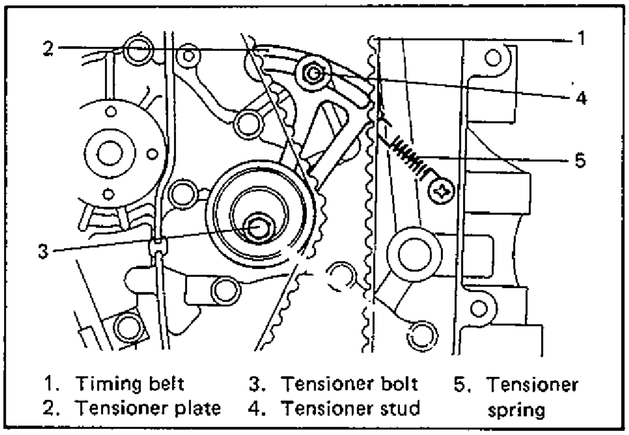


Fig. 6B-26

7. Remove water pump assembly.

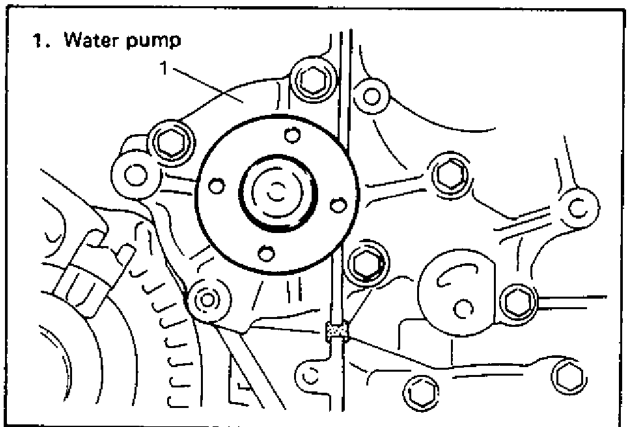


Fig. 6B-27

INSPECT

NOTE:

Do not disassemble water pump.

If any repair is required on pump, replace it as assembly.

Rotate water pump by hand to check for smooth operation.

If pump does not rotate smoothly or makes abnormal noise, replace it.

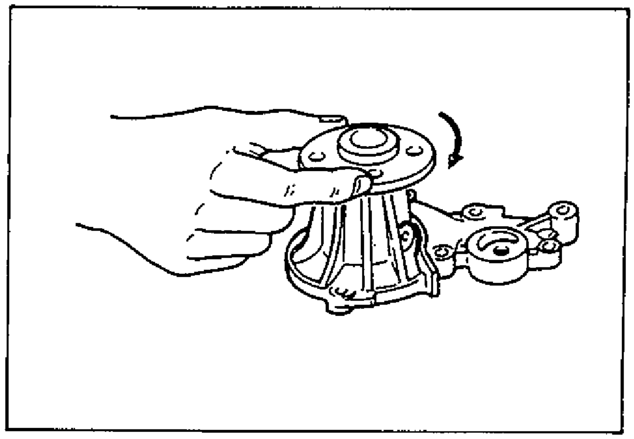


Fig. 6B-28 Checking Water Pump

INSTALLATION

1. Install new pump gasket to cylinder block.
2. Install water pump to cylinder block.

Tightening torque for bolts & nuts	10 – 13 N·m 1.0 – 1.3 kg-m 7.5 – 9.0 lb-ft

3. After installing water pump, install rubber seal between water pump and oil pump.

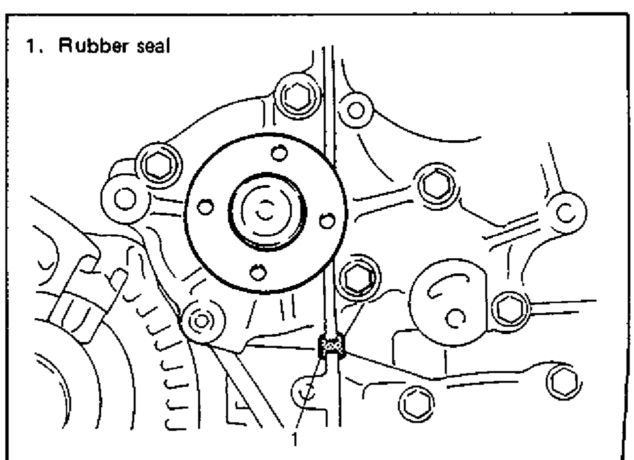


Fig. 6B-29

4. Install belt tensioner plate, tensioner, tensioner spring, timing belt and timing belt outside cover.

NOTE:
- **Special care must be used when installing belt tensioner and timing belt. Be sure to refer to SECTION 6A of this manual.**
- **Torque each bolt and nut to specification.**

5. Install crankshaft pulley, water pump pulley, pump drive belt and engine right side under cover.
6. Adjust water pump belt tension. (Refer to page 6B-9.)
7. Connect negative cable at battery.
8. Fill cooling system.
9. After installation, check each part for leakage.

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Ethylene glycol anti-freeze	GOLDEN CRUISER 1200 (Anti-freeze/Anti-corrosion coolant)	Additive to engine cooling system for improving cooling efficiency and for protection against rusting.

SECTION 6C

ENGINE FUEL (2WD)

CONTENTS

GENERAL DESCRIPTION 6C-2
Fuel System 6C-2
Fuel Tank and Fuel Pump 6C-3
Fuel Filter 6C-3
Fuel Filler Cap 6C-4
ON CAR SERVICE 6C-5
Fuel Lines 6C-5
Fuel Pipe 6C- 6
Fuel Filler Cap 6C- 7
Fuel Filter 6C- 7
Fuel Tank 6C- 8
Fuel Level Gauge 6C-10
Fuel Pump 6C-11

CAUTION:
AMONG THE CARS OF THIS MODEL, THERE ARE THOSE EQUIPPED WITH A CATALYTIC CONVERTER AND THOSE WITHOUT ONE DEPENDING ON STATUTORY REGULATIONS OF EACH COUNTRY. FOR THOSE WITH A CATALYTIC CONVERTER, BE SURE TO USE UNLEADED FUEL ONLY. USE OF LEADED AND/OR LOW LEAD FUEL CAN RESULT IN ENGINE DAMAGE AND REDUCE THE EFFECTIVENESS OF THE EMISSION CONTROL SYSTEM.

GENERAL DESCRIPTION

FUEL SYSTEM

The main components of the fuel system are fuel tank, fuel pump, fuel filter and fuel level gauge and it includes three lines; fuel feed line, fuel return line and fuel vapor line.
For the details of fuel vapor flow, refer to SECTION 6J "ENGINE EMISSION CONTROL" (for carburetor model).
For the details of fuel flow and fuel vapor flow, refer to SECTION 6E "ELECTRONIC FUEL INJECTION SYSTEM" and SECTION 6J1 "ENGINE EMISSION CONTROL" respectively (for Electronic Fuel Injection model).

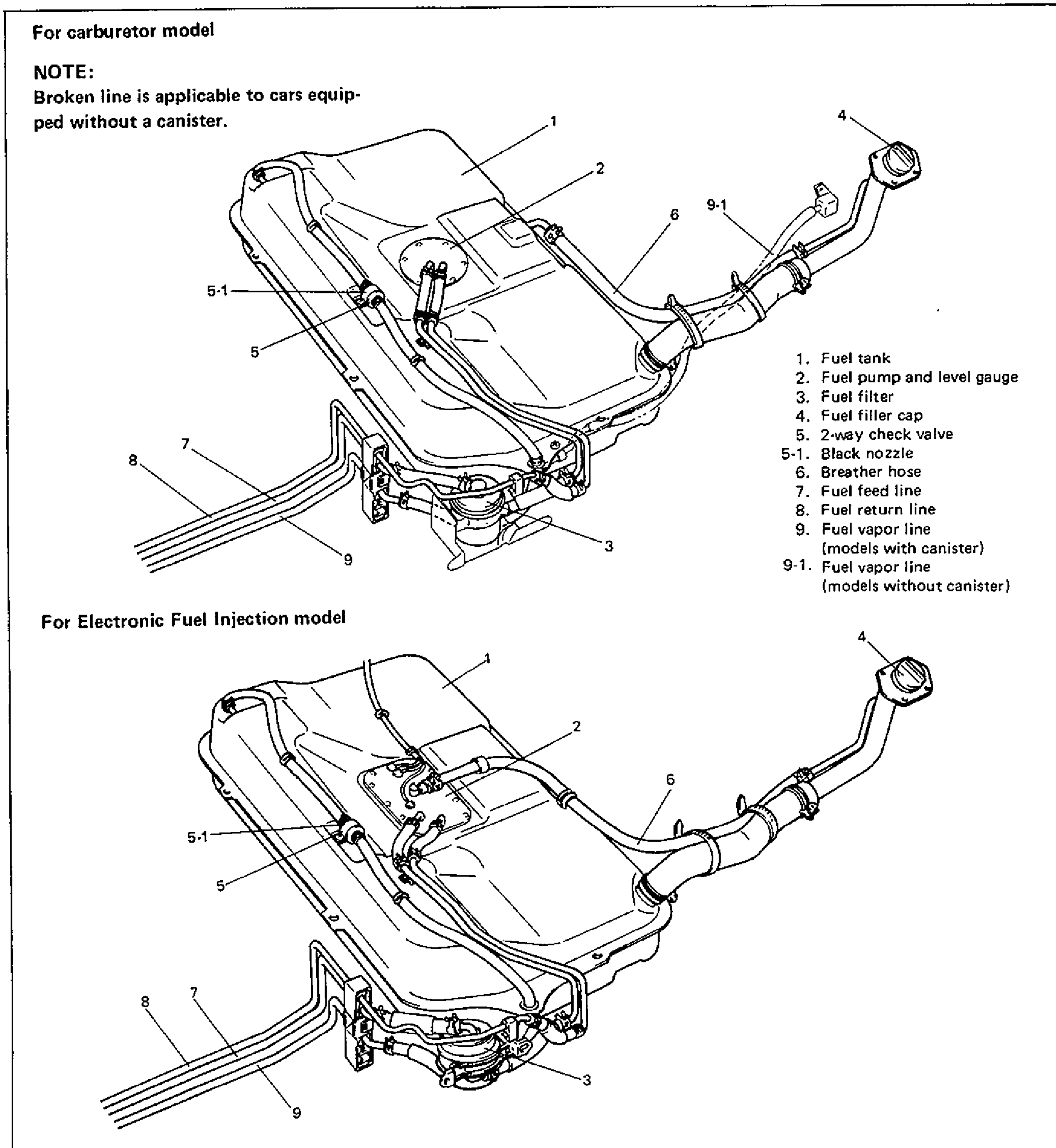


Fig. 6C-1 Fuel System

FUEL TANK AND FUEL PUMP

The fuel tank is located under the rear of the car. The fuel pump and fuel level gauge are installed on the upper part of fuel tank. Whenever servicing the fuel level gauge or the fuel pump, the fuel tank must be removed from the body.

NOTE:
For fuel pump of Electronic Fuel Injection model, refer to SECTION 6E.

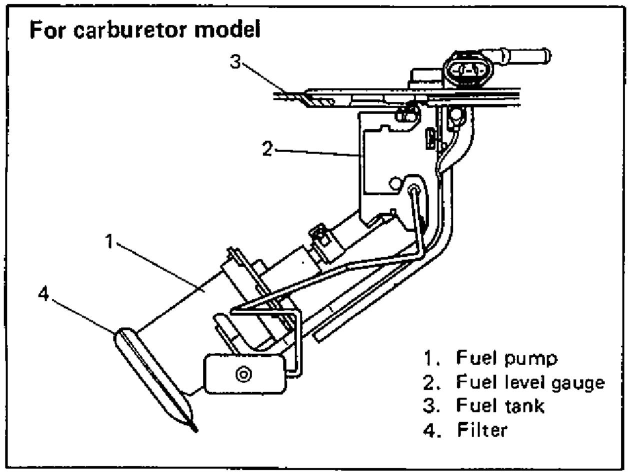


Fig. 6C-2 Fuel Pump and Level Gauge

The fuel pump (carburetor model) is a low pressure type electromagnetic pump. It is installed in the fuel tank as outlined previously.
When the engine starts running and the generator generating electricity, the current from its L terminal flows through the fuel pump relay to run the fuel pump.

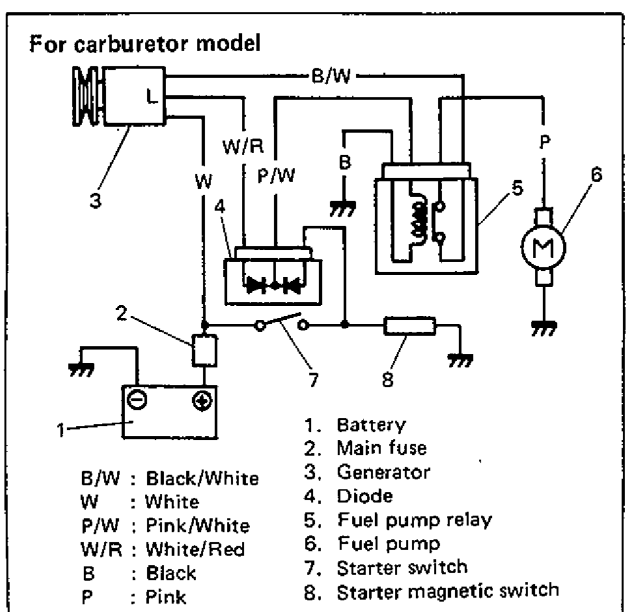


Fig. 6C-2-1

FUEL FILTER

The fuel filter is located in front of fuel tank as shown in Fig. 6C-1.
As it can't be disassembled, it must be replaced as an assembly.

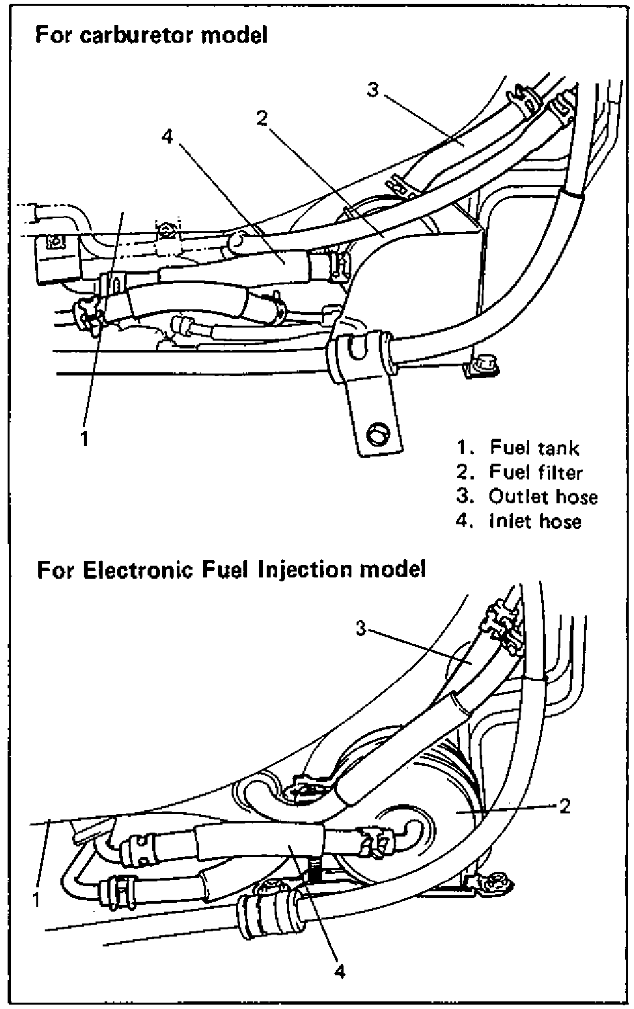


Fig. 6C-3 Fuel Filter

FUEL FILLER CAP

NOTE:
There are three types of filler cap.
One of the three is used depending on regulations of each country.
Described here is the one way valve type and two way valve type.

One Way Valve Type

A ratchet tightening device on the threaded fuel filler cap reduces the chances of incorrect installation, which would prevent sealing fuel vapors. After the gasket on fuel filler cap and the filler neck flange contact, the ratchet produces a loud clicking noise, indicating the seal has been set.
This cap has a vacuum relief valve inside.
When the pressure in the fuel tank becomes negative (vacuum), the vacuum is usually relieved by the two-way check valve which is included in the fuel vapor line. Only when the vacuum becomes high especially the vacuum relief valve opens.

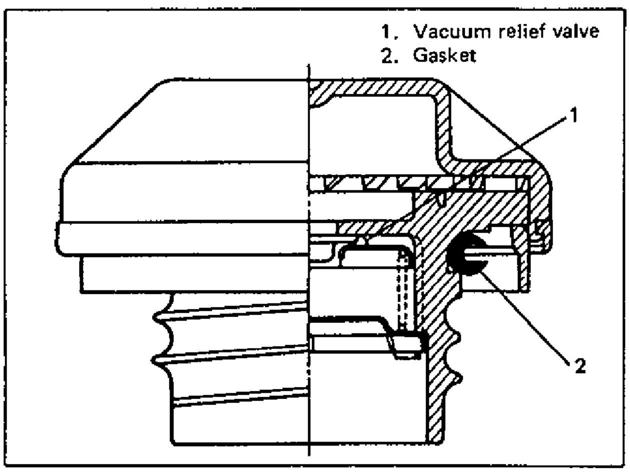


Fig. 6C-4 Fuel Filter Cap Cross-Section (One Way Valve Type)

Two Way Valve Type

This cap has a ratchet tightening device, a pressure relief valve and a vacuum relief valve inside. If the pressure of fuel vapor in the fuel tank should exceed that for which fuel system is designed, the pressure relief valve opens to relieve the pressure.
The vacuum relief valve opens to relieve the vacuum created in the fuel tank.

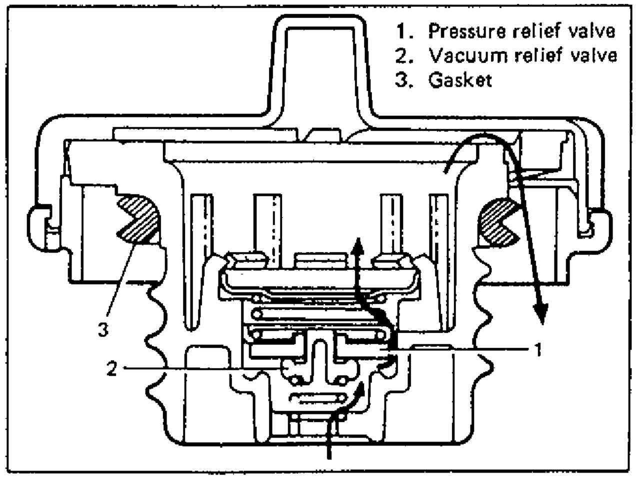


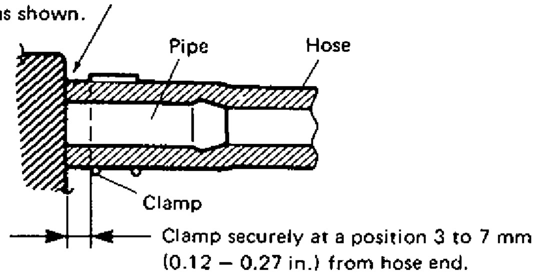
Fig. 6C-5 Fuel Filler Cap Cross-Section (Two Way Valve Type)

ON CAR SERVICE

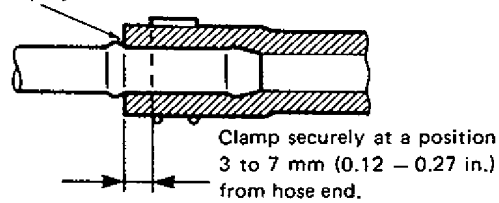
WARNING:
Before attempting service of any type on fuel system, following cautions should be always observed.

- **Disconnect negative cable at battery.**
- **DO NOT smoke, and place "NO SMOKING" signs near work area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).**
- **Wear safety glasses.**
- **To relieve fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.**
- **As fuel feed line is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel feed line, make sure to relieve fuel pressure according to procedure described on p. 6-3 (for Electronic Fuel Injection model).**
- **A small amount of fuel may be released after the fuel line is disconnected. In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.**
- **Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to the following.**

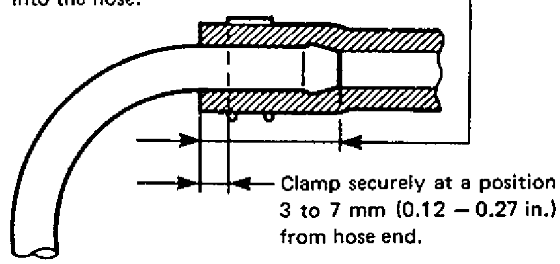
With short pipe, fit hose as far as it reaches pipe joint as shown.



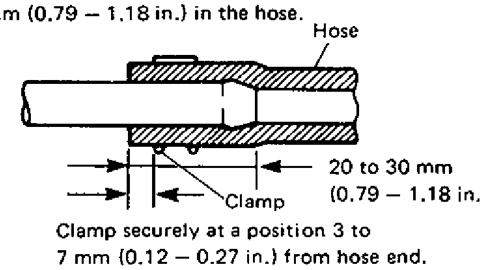
With following type pipe, fit hose as far as its peripheral projection as shown.



With bent pipe, fit hose as far as its bent part as shown or till pipe is about 20 to 30 mm (0.79 – 1.18 in.) into the hose.



With straight pipe, fit hose till pipe is about 20 to 30 mm (0.79 – 1.18 in.) in the hose.



CAUTION:
When installing fuel hose, make sure that it has no twist or kink.

FUEL LINES

Due to the fact that fuel feed line is under high pressure, use special care when servicing it (for Electronic Fuel Injection model).

INSPECT

Visually inspect fuel lines for evidence of fuel leakage, hose crack and deterioration, or damage. Make sure all clamps are secure.
Replace parts as needed.

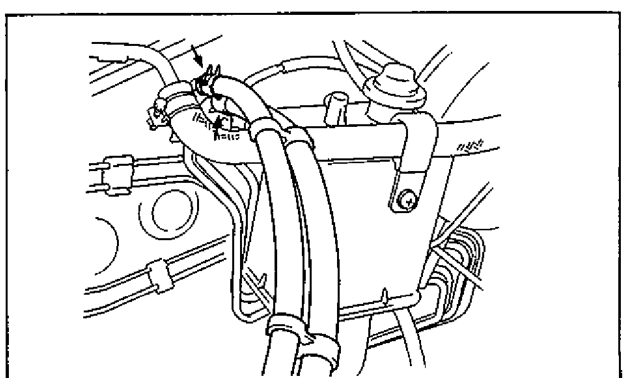


Fig. 6C-5 Fuel Lines Inspection (for Electronic Fuel Injection model)

FUEL PIPE

REMOVE OR DISCONNECT

1. Relieve fuel pressure in fuel feed line according to procedure on p. 6-3 (for Electronic Fuel Injection model).
2. Negative cable at battery.
3. Fuel hose from fuel pipe at the front and rear of each fuel pipe.

> **WARNING:**
> **A small amount of fuel may be released after fuel hose is disconnected. In order to reduce the chance of personal injury, cover hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.**

4. Brake pipe from pipe joint referring to SECTION 5.
5. Pipe cover from body.
6. Put clamp position mark on body and pipes so that clamps can be installed on original position.
7. Pipes with clamp from body.

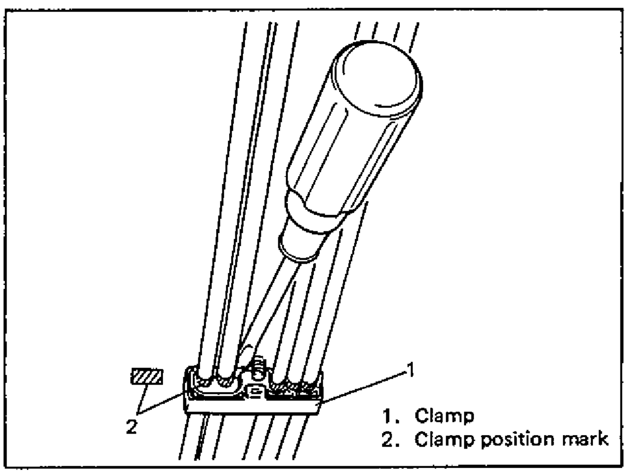


Fig. 6C-6 Detaching Clamp with Pipes

8. Clamp from pipes.

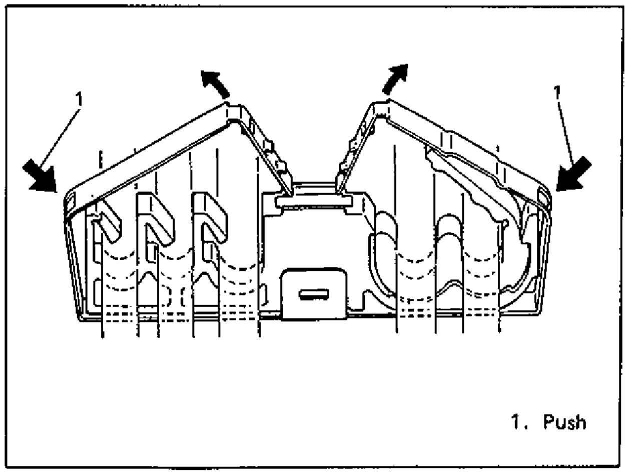


Fig. 6C-7 Removing Clamp

INSTALL OR CONNECT

1. Clamps to marked position on pipes.
   If clamp is deformed or its claw is bent or broken, replace it with new one.
2. Pipes with pipe clamp to body.

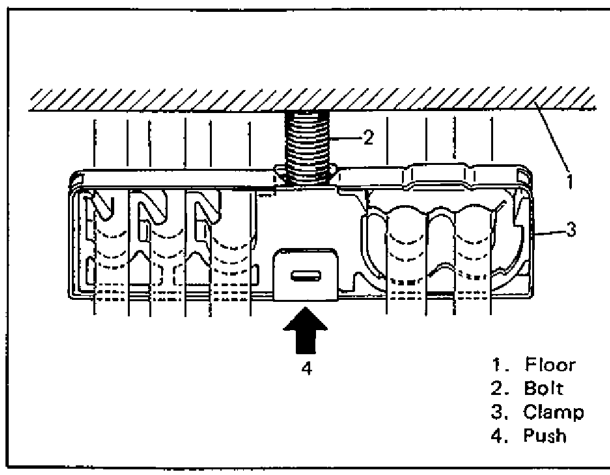


Fig. 6C-8 Installing Clamp

3. Pipe cover to body. Be sure to use new nuts.
4. Fuel hoses to fuel pipes.
5. Brake pipe joints referring to SECTION 5.
6. Start engine and check for fuel leaks (for carburetor model).
   With engine "OFF" and ignition switch "ON", check for fuel leaks (for Electronic Fuel Injection model).
7. Bleed air in brake system referring to SECTION 5.

FUEL FILLER CAP

Remove cap, and check gasket for even filler neck imprint, and deterioration or any damage. If gasket is in malcondition, replace cap.

NOTE:
- **If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in critical malfunction of system.**
- **There are three types of filler cap as shown below. Which one is used depends on regulations of each country.**

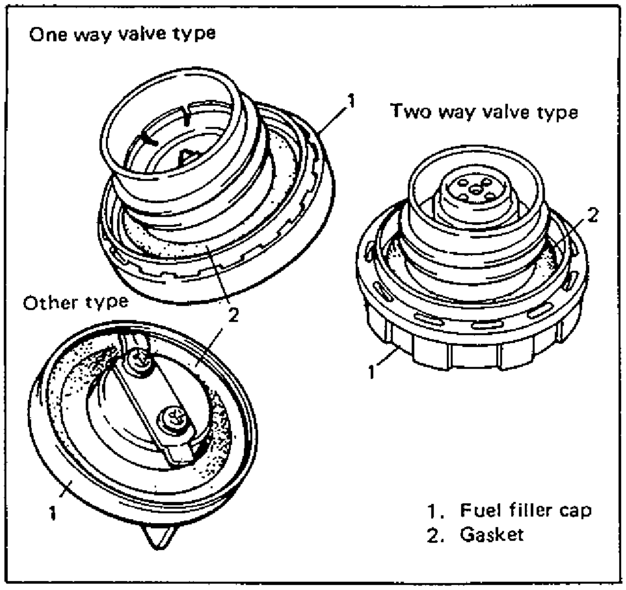


Fig. 6C-9 Fuel Filler Cap

FUEL FILTER

> WARNING:
> **A small amount of fuel may be released after fuel hose is disconnected. In order to reduce the chance of personal injury, cover hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.**

[For Carburetor Model]

REMOVE OR DISCONNECT
1. Negative cable at battery.
2. Hoist car.
3. Place fuel container under fuel filter.
4. Parking brake cable clamp bolt from car body.
5. Filter bracket from car body.

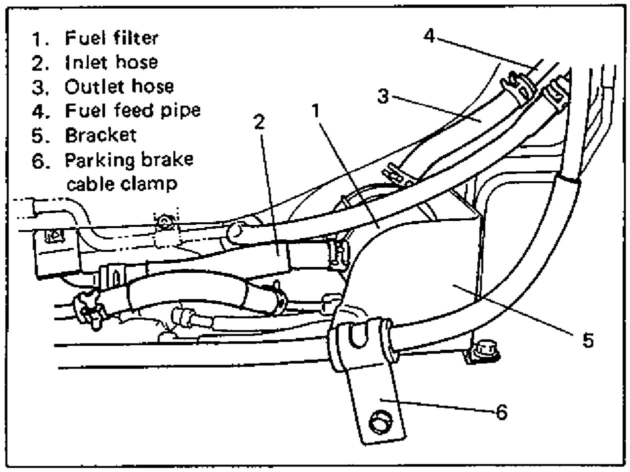


Fig. 6C-10 Disconnecting Hoses

6. Bracket from fuel filter.
7. Outlet hose and inlet hose from filter.

INSTALL OR CONNECT
1. Inlet hose, outlet hose and bracket to filter. Clamp hoses securely.

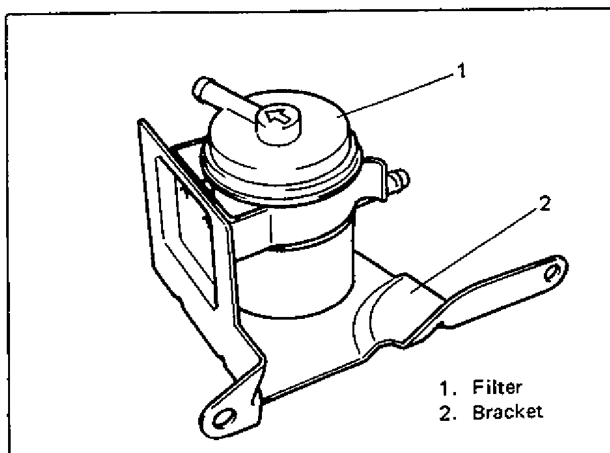


Fig. 6C-10-1 Installing Filter Bracket

2. Filter bracket to car body.
3. Parking brake cable clamp to car body.
4. Negative cable to battery.
5. Start engine and check for fuel leaks.

[For Electronic Fuel Injection Model]

REMOVE OR DISCONNECT

1. Relieve fuel pressure in fuel feed line according to procedure described on p. 6-3.
2. Negative cable at battery.
3. Hoist car.
4. Place fuel container under fuel filter.
5. Inlet hose from fuel filter.
6. Fuel filter outlet hose from fuel feed pipe.

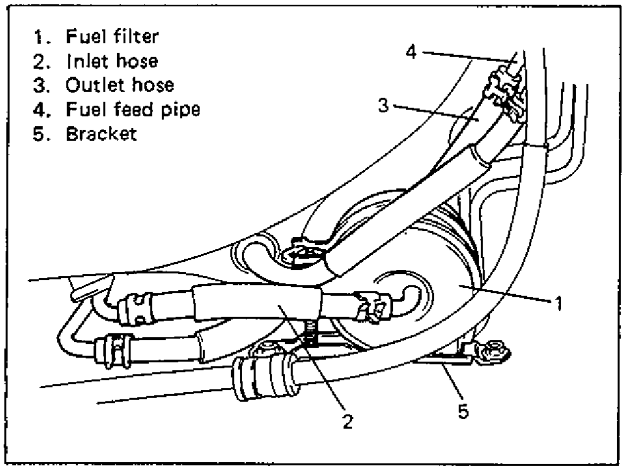


Fig. 6C-11 Disconnecting Hoses

7. Fuel filter with outlet hose from body.
8. Outlet hose and bracket from fuel filter.

INSTALL OR CONNECT

1. Filter bracket to filter.
   Be sure to align match marks on filter and bracket before tightening bracket bolt.

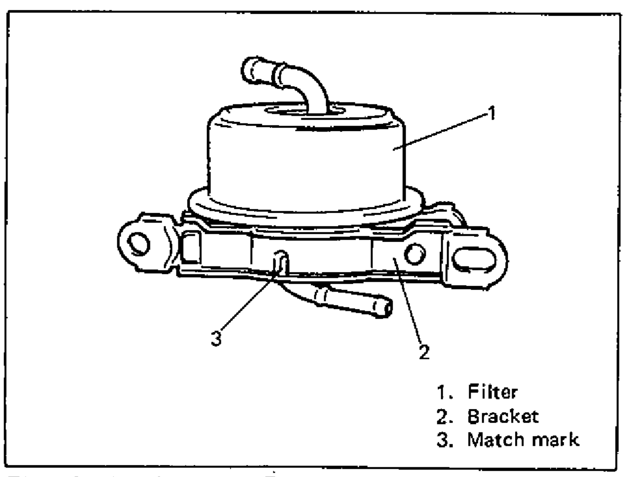


Fig. 6C-11-1 Installing Filter Bracket

2. Outlet hose to fuel filter outlet pipe.
3. Filter with outlet hose to body.
4. Outlet and inlet hoses.
   Clamp hoses securely.
5. Negative cable to battery.
6. With engine "OFF" and ignition switch "ON", check for fuel leaks.

FUEL TANK

REMOVE OR DISCONNECT

1. Relieve fuel pressure in fuel feed line according to procedure described on p. 6-3 (for Electronic Fuel Injection model).
2. Negative cable at battery.
3. Rear seat cushion referring to SECTION 9.
4. Fuel level gauge and fuel pump lead wire couplers, and detach wire tape.

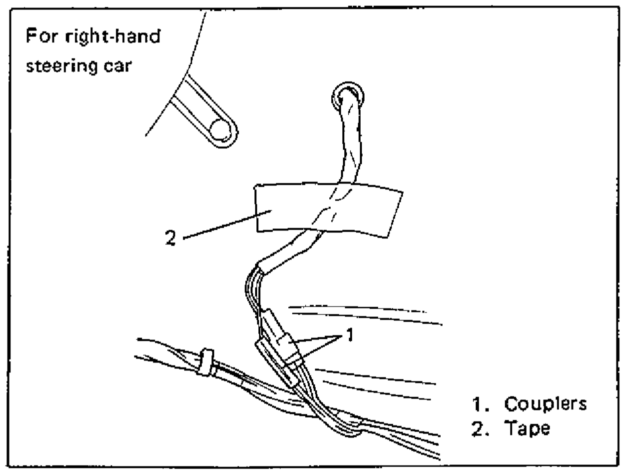


Fig. 6C-12 Disconnecting Couplers

5. Hoist car.
6. Fuel filler hose from fuel tank and breather hose from filler neck.

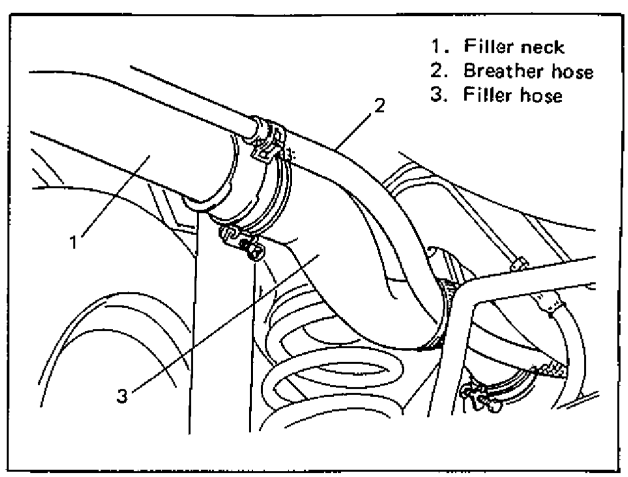


Fig. 6C-13 Breather and Filler Hoses

7. As fuel tank has no drain plug, drain fuel tank by pumping fuel out through fuel tank filler. Use hand operated pump device to drain fuel tank.

> **CAUTION:**
> **Never drain or store fuel in an open container to avoid possibility of fire or explosion.**

8. Fuel hoses from filter and pipes.

> **WARNING:**
> **A small amount of fuel may be released after the fuel hose is disconnected. In order reduce the chance of personal injury, cover the hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.**

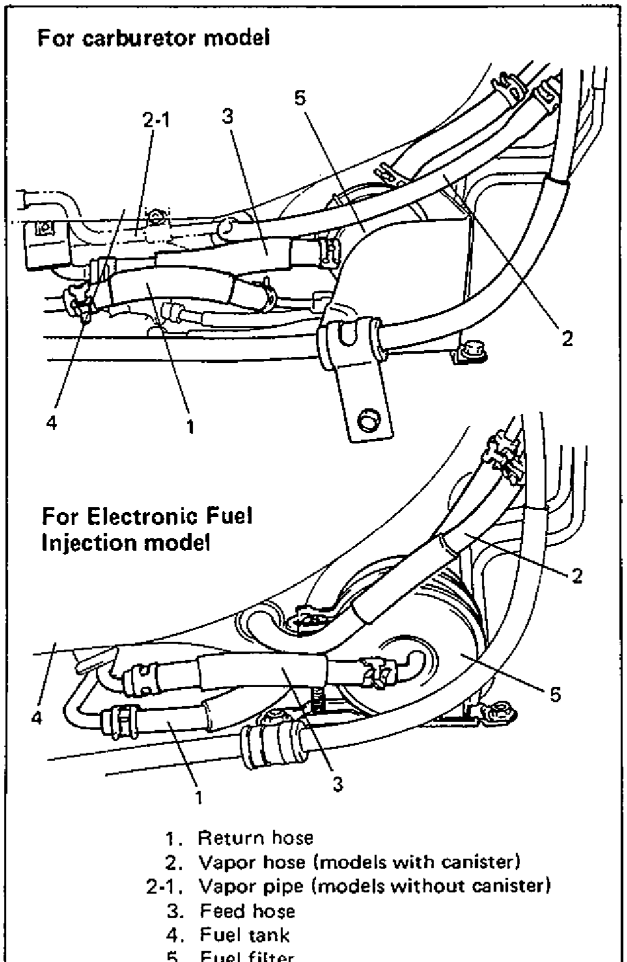


Fig. 6C-14 Disconnecting Hoses

9. Fuel tank from car.

INSPECT

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump and level gauge gasket for leaks, visually inspect fuel tank for leaks and damage.
Replace any damaged or malconditioned parts.

FUEL TANK PURGING PROCEDURE

> **CAUTION:**
> **This purging procedure will NOT remove all fuel vapor. Do not attempt any repair on tank using heat or flame as an explosion resulting in personal injury could occur.**

Following procedure is used for purging fuel tank.

1. After removing fuel tank, remove all hoses, 2-way check valve, fuel pump and fuel level gauge from fuel tank.
2. Drain all remaining fuel from tank.
3. Move tank to flushing area.
4. Fill tank with kerosene or trichloro ethylene, and agitate vigorously and drain. Repeat this washing until inside of tank is clean.
   Replace tank if its inside is rusty.
5. Completely flush out remaining fluid after washing.

INSTALL OR CONNECT

1. Fuel pump and fuel level gauge to fuel tank. Use new gasket.
2. 2-way check valve to fuel tank directing its black nozzle toward fuel tank. Refer to Fig. 6C-1.
3. Fuel hoses and pipes to fuel tank as shown in Fig. 6C-1. Clamp hoses and wire harness securely.
4. Fuel breather hose to fuel tank.
5. Fuel tank to car.
6. Fuel filler hose to tank and breather hose to filler neck as shown in Fig. 6C-13 and clamp them securely.
7. Fuel hoses to filter and pipes as shown in Fig. 6C-10 or 11 and clamp them securely.
8. Fuel pump and level gauge couplers. Fix its wire with tape as shown in Fig. 6C-12.
9. Rear seat cushion referring to SECTION 9.
10. Negative cable to battery.
11. Start engine and check for fuel leaks (for carburetor model). With engine "OFF" and ignition switch "ON", check for fuel leaks (for Electronic Fuel Injection model).

FUEL LEVEL GAUGE (For Carburetor Model)

REMOVE OR INSTALL

Note the following when installing fuel level gauge to fuel tank.

1. Using solder, connect wiring harness to terminal of fuel level gauge securely at such position as shown below.

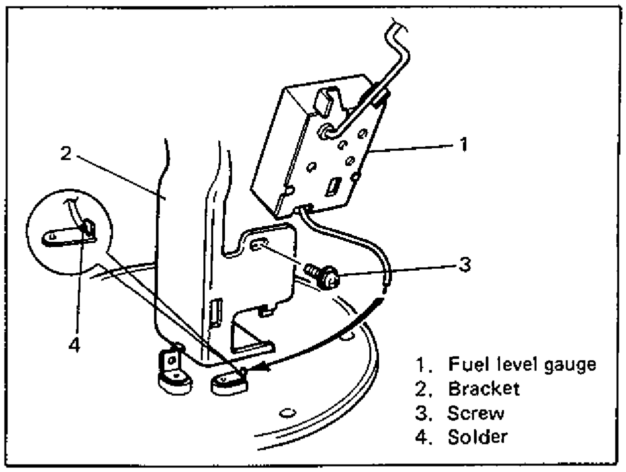


Fig. 6C-15

2. Check that float height "A" (distance between mating surface and center of float arm) is specified value when float is lowered fully (when arm contacts stopper). Adjust it as necessary.

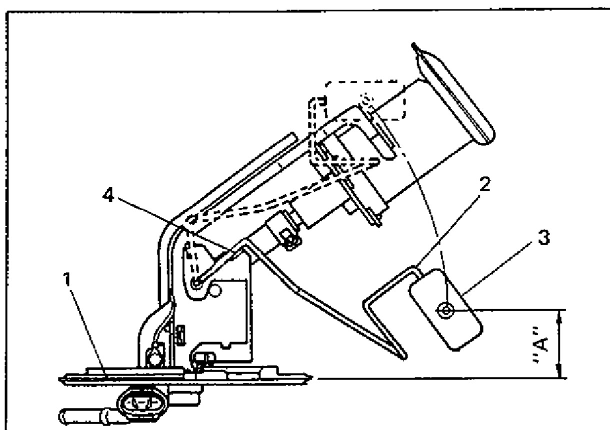


Fig. 6C-15-1

FUEL PUMP (For Carburetor Model)

REMOVE OR INSTALL

Install fuel pump and pump case according to following procedure.

NOTE:
Use care so as not to allow dust to enter case. (Dust in pump case will cause pump to lock.)

1. Install seal ring and case to pump.

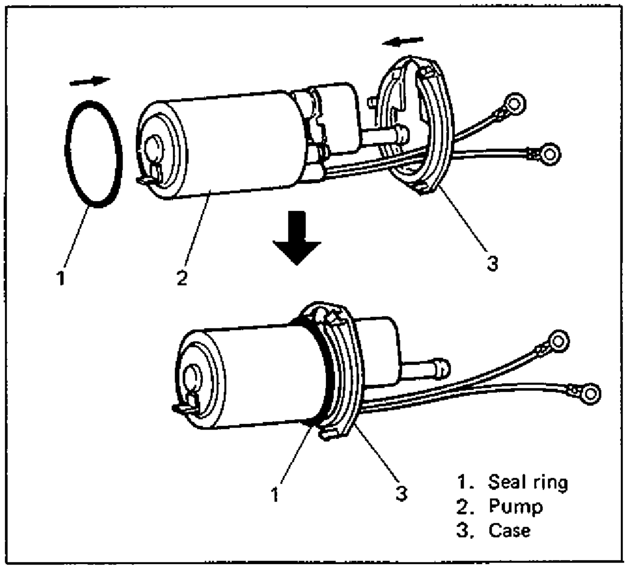


Fig. 6C-16

2. Install pump in filter comp. For this installation, align hole in filter comp. ("A" in figure below) with pump projecting part ("B").

NOTE:
- **Do not grip filter. There is a protector inside of it and if it breaks, its broken piece will get into pump and cause pump to lock.**
- **Do not fit pump projecting part "B" into groove ("C") in filter comp.**

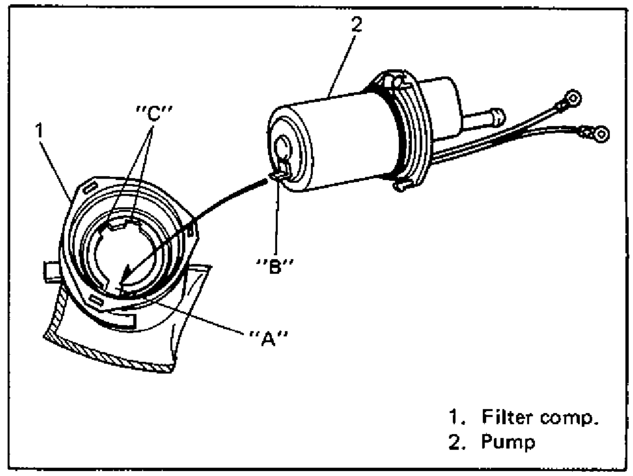


Fig. 6C-16-1

3. Install case to filter comp. making sure that they fit each other securely.

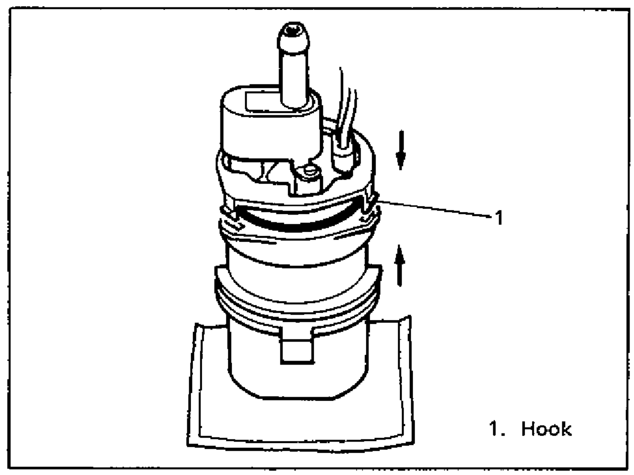


Fig. 6C-16-2

SECTION 6D

CARBURETOR

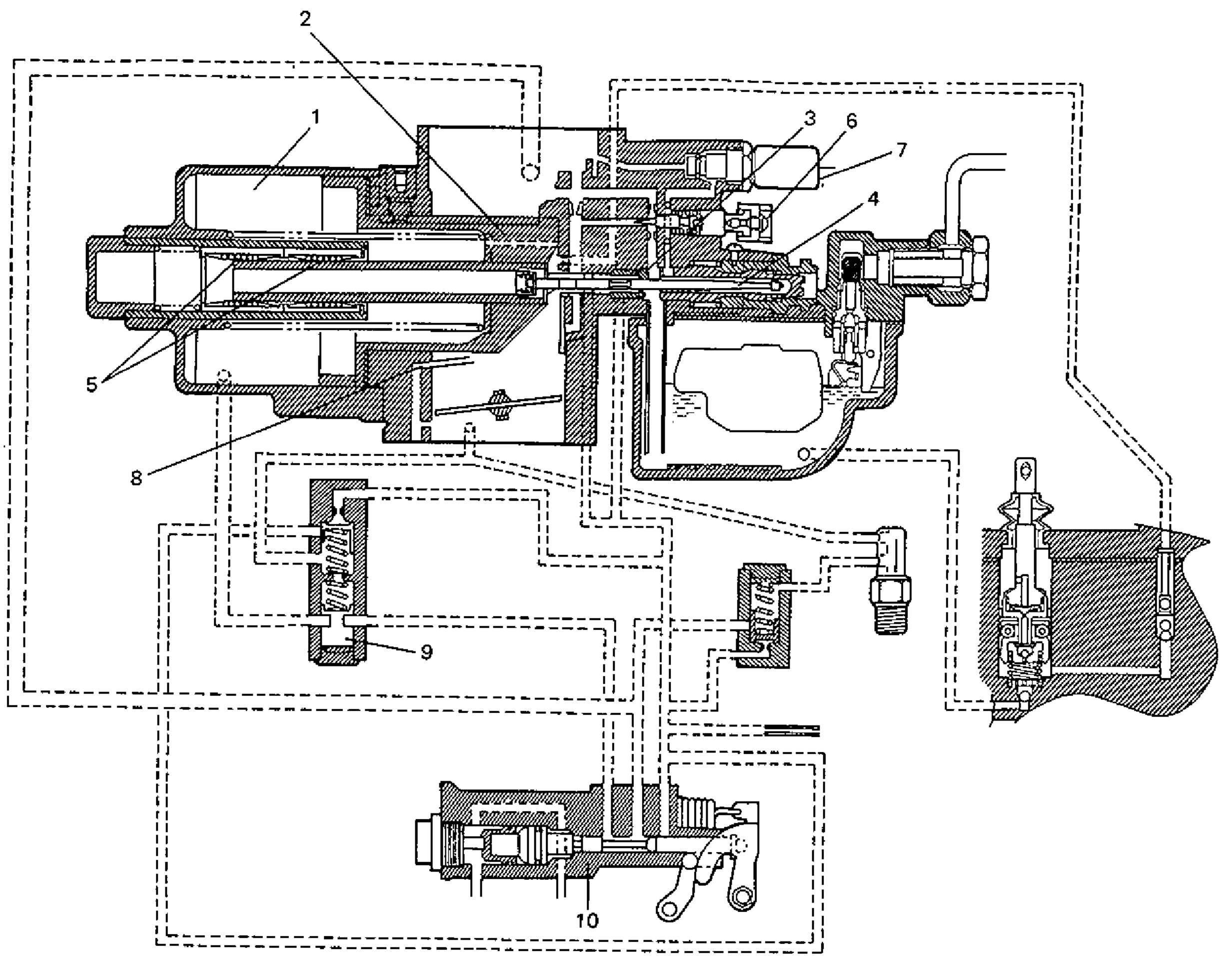
CONTENTS

GENERAL DESCRIPTION 6D- 2
OPERATION 6D- 4
Piston Valve System 6D- 4
Float System 6D- 4
Metering Needle 6D- 5
Fast Idle 6D- 5
Cold Enrichment 6D- 5
Acceleration Pump System 6D- 6
Unloader System 6D- 6
Idle up System 6D- 6
OPERATING OF EACH SYSTEM 6D- 8
When Starting Cold Engine 6D- 8
After Combustion 6D- 9
When Restarting Engine After
Warm-up 6D-10
When Engine is Medium Warm 6D-11
When Idling 6D-12
When Driving at Medium Speed 6D-13
When Throttle is Fully Open 6D-14
DIAGNOSIS 6D-15
ON CAR SERVICE 6D-19
Accelerator Cable Play 6D-19
Float Level 6D-19
Idle Speed and Idle Mixture 6D-20
Idle Up 6D-21
Fast Idle 6D-24
TVSV Inspection 6D-25
BVSV Inspection 6D-25
Unloader System 6D-26
Accelerator Pump 6D-26
Suction Piston 6D-27
Cold Enrichment Compensator 6D-27
Fuel Cut System 6D-28
REMOVE AND INSTALLATION 6D-29
UNIT REPAIR OVERHAUL 6D-29
SPECIAL TOOL 6D-33

GENERAL DESCRIPTION

This carburetor is of one-barrel, variable-venturi type.

In the carburetor, there are one throttle valve and one suction piston and the fuel supply passage remains almost the same throughout the start, low speed and high speed driving conditions. The speed of the air flow is maintained almost constant by varying the section of the venturi automatically to the amount of air required by the engine. The gas flow is regulated by the annular clearance between the metering needle and jet controlled in accordance with the piston movement, thus a proper air/fuel mixture ratio is obtained.



1. Suction chamber
2. Suction piston
3. Main jet
4. Metering needle
5. Linear ball bearing
6. Idle mixture adjusting screw
7. Fuel cut solenoid valve
8. Fuel trap tube
9. Piston breaker
10. Cold enrichment compensator

Fig. 6D-1

FUNCTION OF EACH PART

1) Suction chamber, suction piston and suction spring
   When engine is started, piston moves up to determine sectional area of venturi so that air flow speed at venturi is kept constant.

2) Main jet and metering needle
   Annular clearance between main jet and metering needle determines amount of fuel to be supplied for proper air/fuel mixture ratio required by engine.

3) Linear ball bearing
   This is used to reduce sliding resistance of piston so that piston operates properly to improve accuracy of fuel flow.

4) Mixture adjusting screw
   This is used to adjust air/fuel mixture ratio at engine idling.

5) Fuel cut solenoid valve
   When ignition switch is turned to "OFF" position, the valve also turns OFF to let fuel passage and air passage ON, whereby a large amount of air is bled into fuel passage to cut off fuel (to prevent run-on).

6) Fuel inlet tube
   Through this tube, fuel in float chamber is led to main jet.

7) Fuel trap tube
   At engine idle speed, fuel collected (or puddled) under suction piston is led through this tube to underside of throttle valve and is atomized by intake air so that idle speed is stabilized.

8) Breaker piston
   At engine start, breaker piston lets air bypass to suction chamber and at the same time, increases fuel amount by aligning cut in metering needle with main jet.
   As vacuum pressure rises after engine start, piston closes bypass and piston valve restores its normal operation.

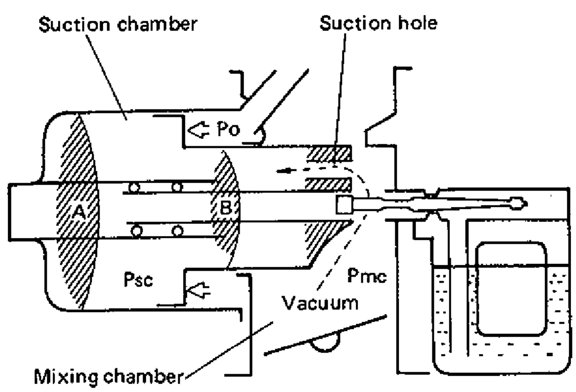
9) Cold enrichment compensator
   With the help of wax which expands and contracts according to engine cooling water temperature, cold enrichment rod controls the amount of air bled to main jet starting immediately after engine start till and after it is warmed up. Also with the help of wax, first idle cam automatically controls throttle valve opening to warmed-up condition of engine.

10) Unloader
   If overrich air-fuel mixture is fed at engine start, by the driver's push on the throttle valve to wide open, unloader forces suction piston to open as it is linked with the throttle valve. Then fresh air is drawn into intake manifold so that excessively rich mixture is leaned out.

OPERATION

PISTON VALVE SYSTEM

1) When engine starts, vacuum produced in mixing chamber is transmitted to suction chamber through suction hole in suction piston.
2) If the same vacuum is applied, vacuum effect is larger on larger sectional area. Since sectional area of piston on suction chamber side (A in figure) is larger than that on mixing chamber side (B), piston moves toward suction chamber.

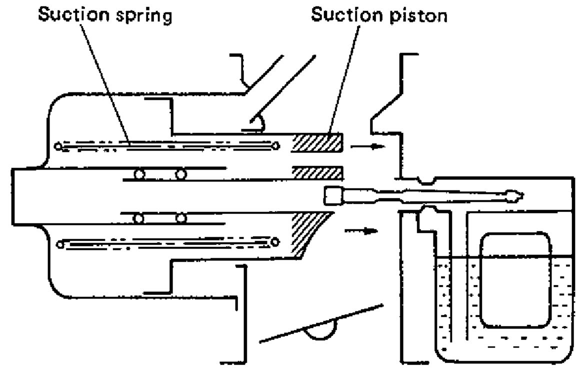


Force (Fp) = Area difference (A − B) x Pressure (Po − Psc)

Pmc = Psc

Fig. 6D-2

3) On the back of piston, however, there are suction springs which push piston toward mixing chamber.
4) Therefore, piston stands still where vacuum and spring force are balanced.
   Piston stands still where Fp = Fs

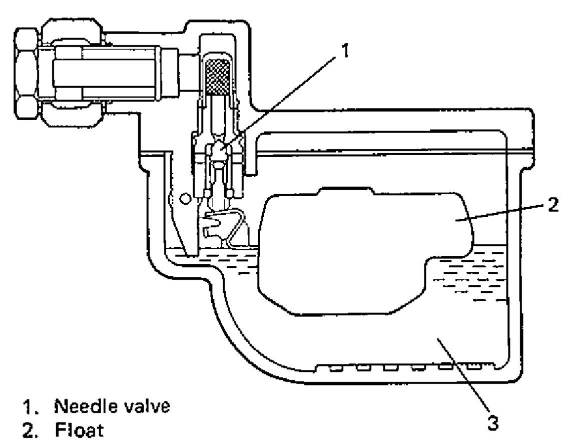


Spring force to push piston (Fs)
Fs = Primary load + Spring constant x piston lift as installed
↑
Spring force with piston closed

Fig. 6D-3

FLOAT SYSTEM

The float is designed to maintain fuel in the chamber at a constant level at all times.
Fuel pumped out under pressure from the fuel pump passes through the float needle valve and on into the float chamber. With the float movement caused by its buioyancy, the needle valve opens and closes to control fuel at a constant level.

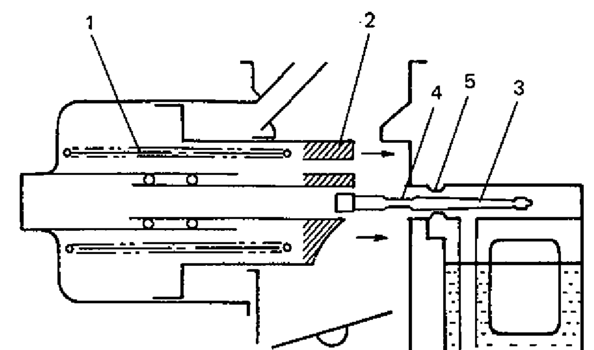


1. Needle valve
2. Float
3. Float chamber

Fig. 6D-4

METERING NEEDLE

The metering nendle attached to the piston valve increases and decreases the amount of intake fuel by varying its annular clearance with the main jet according to movement of the piston valve.
When starting the engine at a low temperature, the cut in the metering needle is aligned with the main jet so that the air/fuel mixture is made richer and starting ability improved.

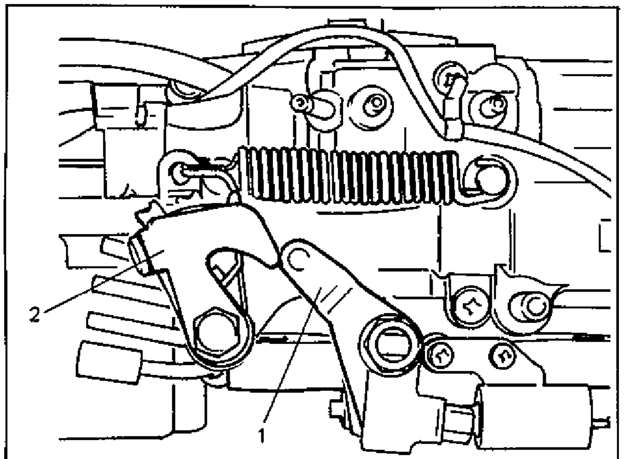


1. Suction spring
2. Suction piston
3. Metering needle
4. Cut in metering needle
5. Main jet

Fig. 6D-5

FAST IDLE

As the thermo wax is contracted at a low temperature, the fast idle cam contacts with the cam lever. As a result, the throttle valve provides an optimum throttle opening for the low temperature. As the engine gets warmer and the engine coolant temperature rises, the thermo wax expands, cam and cam lever get out of contact and the throttle valve closes.

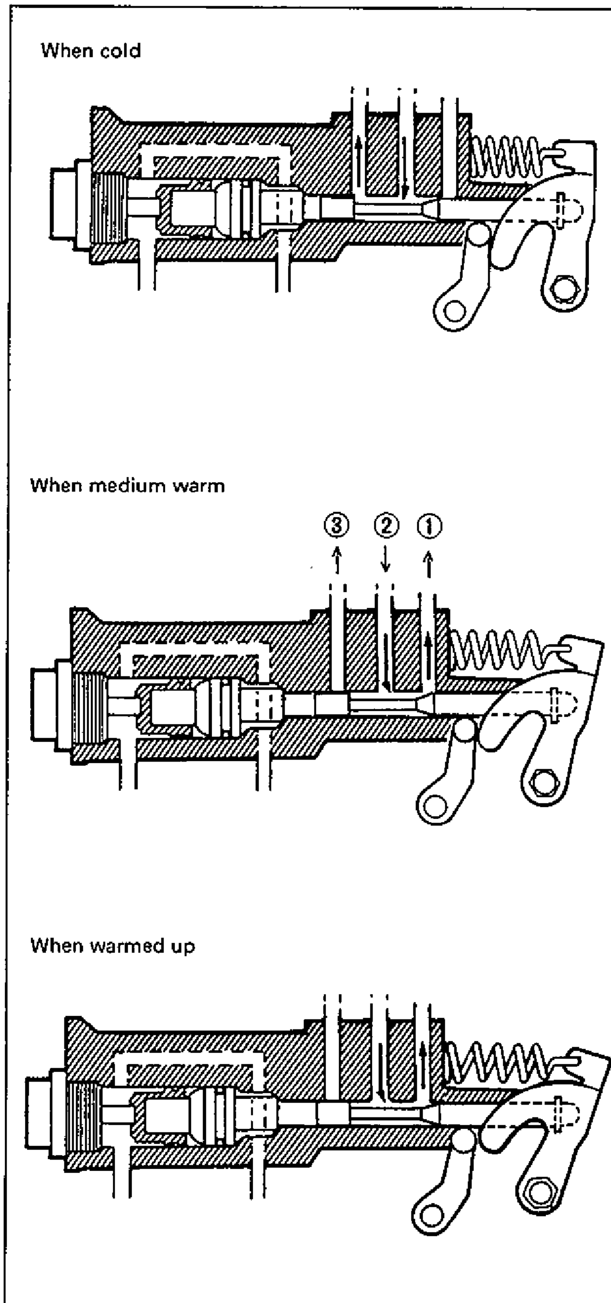


1. Fast idle cam lever
2. Fast idle cam

Fig. 6D-6

COLD ENRICHMENT

As the thermo wax in the cold enrichment expands and contracts according to the coolant temperature, opening of each air port varies with it as shown below, whereby air to the piston breaker, amount of main air bleed and fast idle opening are controlled respectively.



① : To breaker piston
② : From air horn
③ : To air bleed

Fig. 6D-7

ACCELERATION PUMP SYSTEM

When the accelerator pedal is depressed quickly during idling or low speed driving and the throttle valve is opened, the acceleration pump operates to supply enough fuel for such quick acceleration. When the throttle valve is opened by depressing the accelerator pedal, the pump cam pushes down the pump arm, whereby the diaphragm pushes the inlet check ball (resulting in the fuel passage closure). Then the fuel in the pump chamber passes through the outlet check ball and pump jet and injected into the venturi on the primary side.

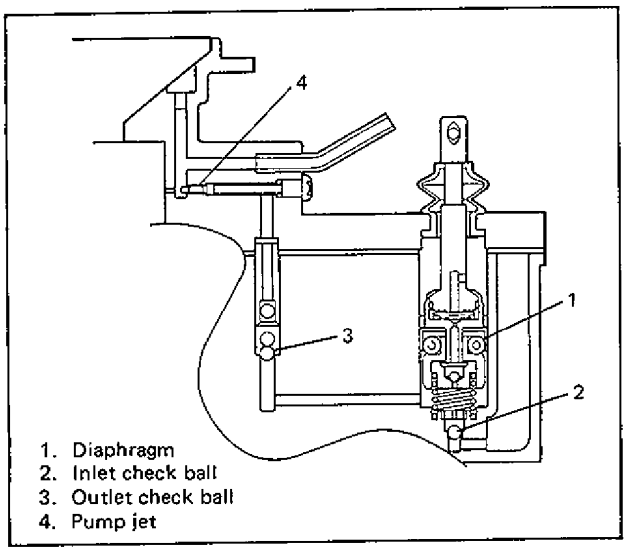


Fig. 6D-8

UNLOADER SYSTEM

During the engine warm up acceleration after the engine start, the suction piston is opened by unloader lever when the throttle valve is opened. In this way, too rich mixture is prevented to attain smooth acceleration.

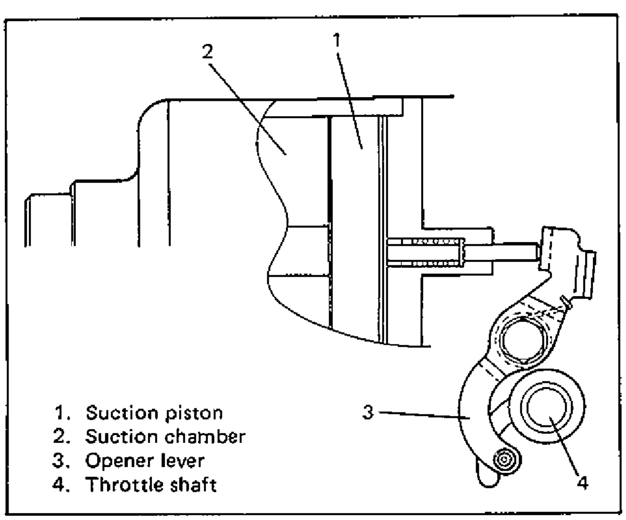
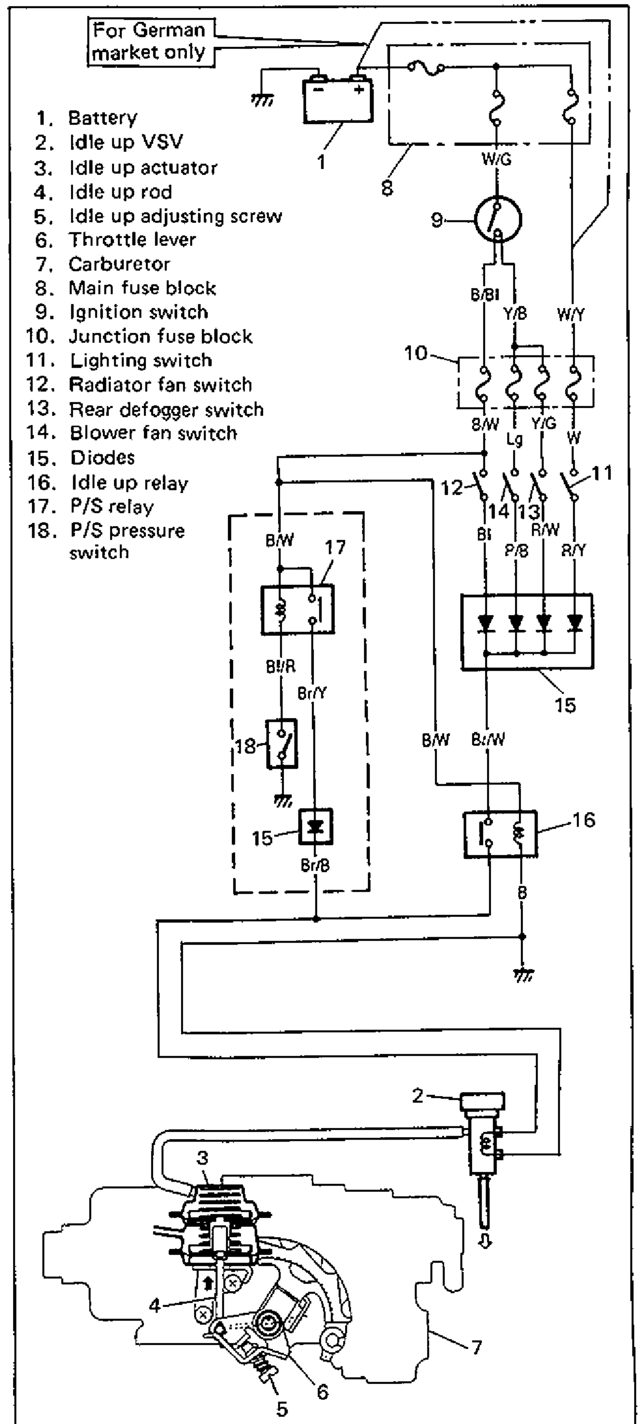


Fig. 6D-9

IDLE UP SYSTEM

For Manual Transmission

This system operates when an electric load and/ or a power steering assist load is applied to the engine, to open the throttle valve a little so that the engine idle speed is stabilized.



NOTE:
Circuit enclosed with broken line (– – – –) is applicable to vehicles equipped with P/S system.

Fig. 6D-10-1 Idle Up System for Manual Transmission Model

In the normal idling state, the idle up VSV opens the vacuum passage and the vacuum through it pulls the diaphragm of the actuator and idle up rod.
When at least one of the following loads is applied to the engine, a voltage is applied to the idle up VSV to actuate it. Then the vacuum passage is closed and the passage for the atmospheric pressure opens.

- Headlight and small light
- Blower fan
- Engine radiator cooling fan
- Rear defogger
- Power steering assist load (when P/S hydraulic pressure is high)

The atmospheric pressure pushes the diaphragm of the actuator and rod, thereby the throttle lever is pushed down lower than the normal idle speed position. As a result, the idle up function is provided.

When no load is applied, the VSV free from any voltage turns OFF and opens the vacuum passage. Then the vacuum pulls the diaphragm of the actuator and rod to release the throttle lever from the idle up state.

For Automatic Transmission

This system operates when the selector lever is shifted to "R", "D", "2" or "L" range or the power steering assist load is applied to the engine, to open the throttle valve a little so that the engine idle speed is stabilized.

1. Battery
2. Idle up VSV
3. Idle up actuator
4. Idle up rod
5. Idle up adjusting screw
6. Throttle lever
7. Carburetor
8. Main fuse block
9. Ignition switch
10. Junction fuse block
11. Inhibitor switch
12. Starting motor
13. Idle up relay
14. P/S relay
15. P/S pressure switch

NOTE:
Circuit enclosed with broken line (- - - - -) is applicable to vehicles equipped with P/S system.

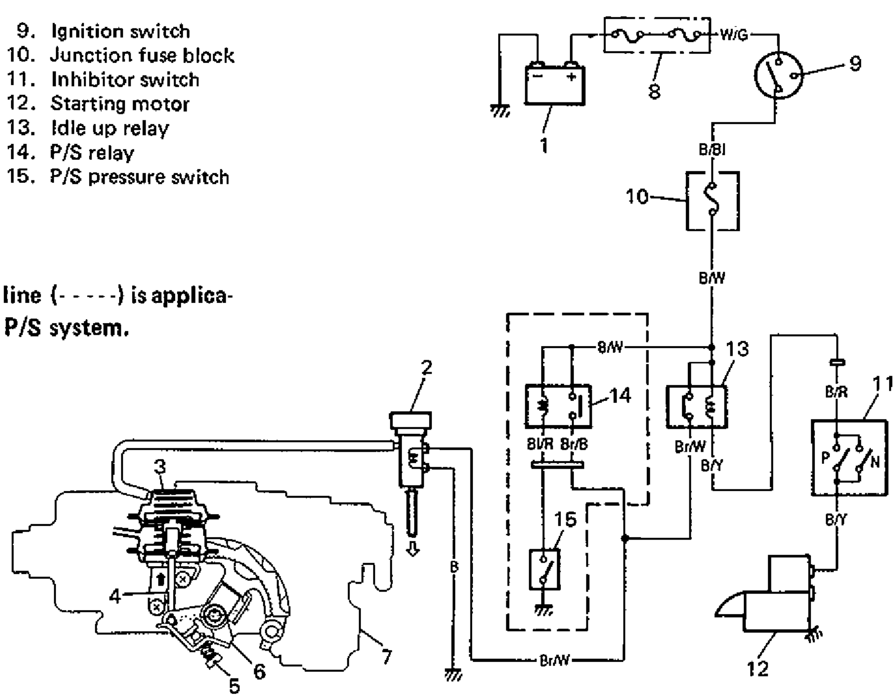


Fig. 6D-10-2 Idle Up System for Automatic Transmission Models

This system, as a whole, is quite similar to that of the M/T model. As the carburetor idle up mechanism is the same as that of the M/T model, refer to its description for the M/T model.
The requirement for the idle up function differs from that for the M/T model. The idle up system for the A/T model operates when either of the following conditions is met.

- The selector lever is in "R", "D", "2" or "L" range, or
- The power steering assist is at work and the P/S hydraulic pressure is high.

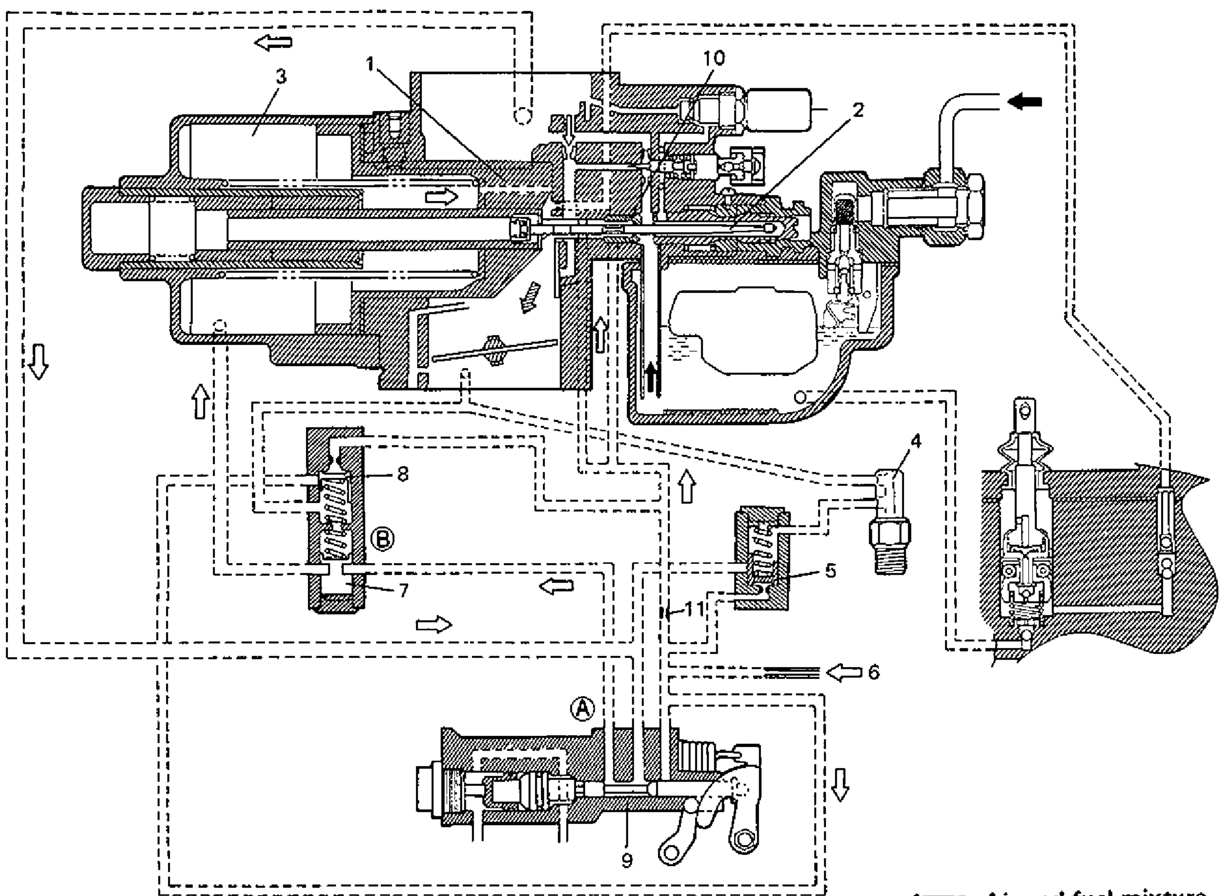
The selector lever position is detected by the inhibitor switch. When both "P" and "N" switches of the inhibitor switch are open, it is judged that the selector lever is at "R", "D", "2" or "L" position and a voltage is applied to the idle up VSV to provide the idle up function. Also, when the P/S hydraulic pressure is high and the P/S pressure switch is cloged, a voltage is applied to the idle up VSV to provide idle up function.

OPERATION OF EACH SYSTEM

WHEN STARTING COLD ENGINE

(at cranking)

1) The bypass Ⓐ (in the figure below) of the cold enrichment compensator is open because the thermo wax is not expanded. The breaker piston does not operate under the vacuum pressure at engine cranking and the passage Ⓑ is also open. As the vacuum pressure in the suction chamber increases little in this state, the suction piston does not lift. Also, with the cut in the metering needle aligned with the main jet, more fuel is supplied than in the normal state.
2) As the thermo wax is cold and not expanded, the air metered at the cold enrichment rod and bleeds into the main air-bleed decreases, resulting in richer air/fuel mixture ratio. (The amount of bleeding air varies with the temperature.)
3) The No. 1 and No. 2 breakers as well as the power valve are closed and no air bleeding takes place.
4) The throttle valve opens to the fast idle opening (The throttle opening varies with the temperature.)



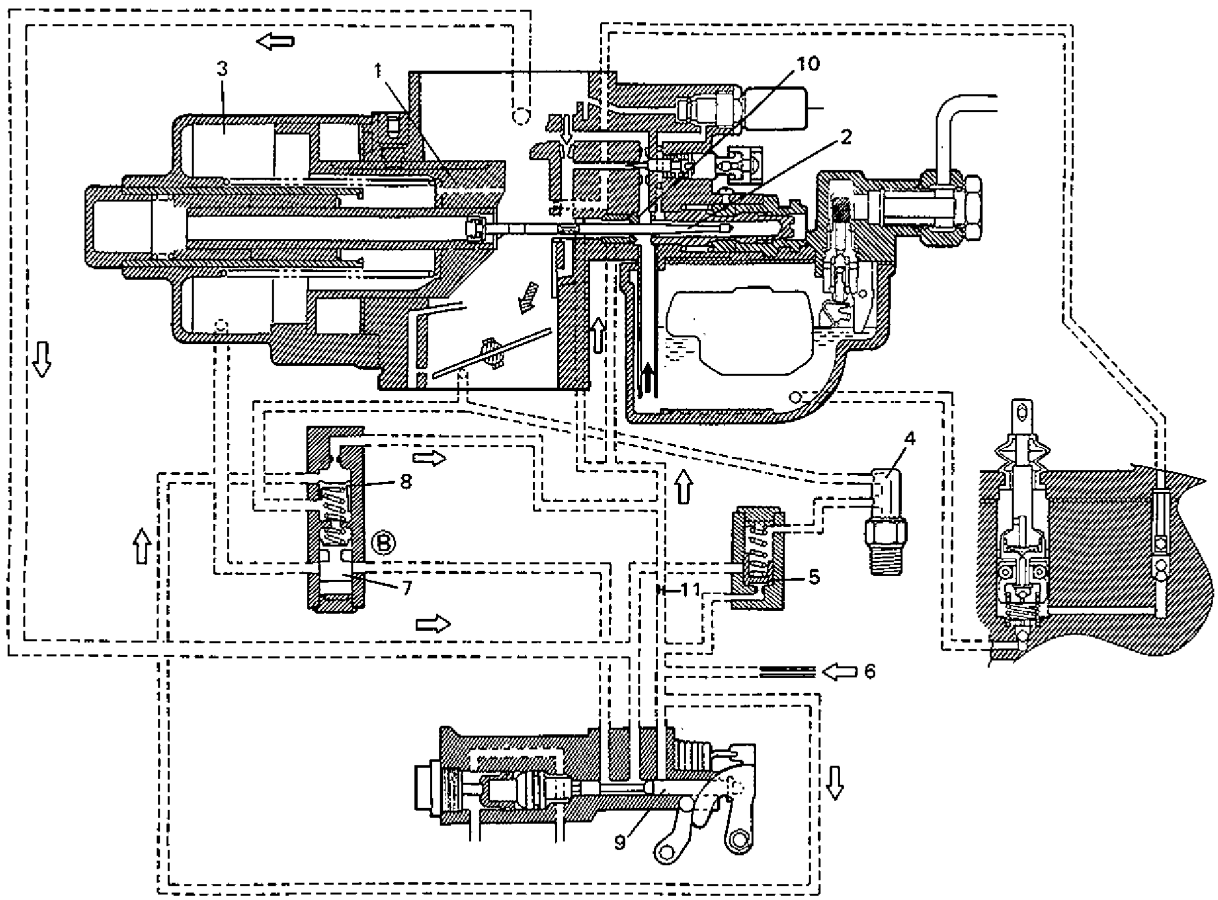
Air and fuel mixture
Bleed air
Fuel

1. Suction piston
2. Metering needle
3. Suction chamber
4. BVSV
5. No. 2 breaker
6. No. 1 breaker
7. Breaker piston
8. Power valve
9. Cold enrichment compensator
10. Main jet
11. Main air bleed

Fig. 6D-11

AFTER COMBUSTION

1) The vacuum pressure generated by combustion causes the breaker piston to operate to close its passage Ⓑ (in the figure below). Then the suction piston lifts to move the metering needle. As a result, its cut gets out of alignment with the main jet.
2) The vacuum pressure generated by combustion also causes the primary breaker to open and the amount of bleeding air increases.
3) When the temperature in the engine room exceeds 15°C (engine warmed up), BVSV passage opens and the vacuum pressure is applied to the No. 2 breaker to increase the amount of bleeding air.
4) The throttle valve opens to the fast idle opening because the thermo wax is not expanded.



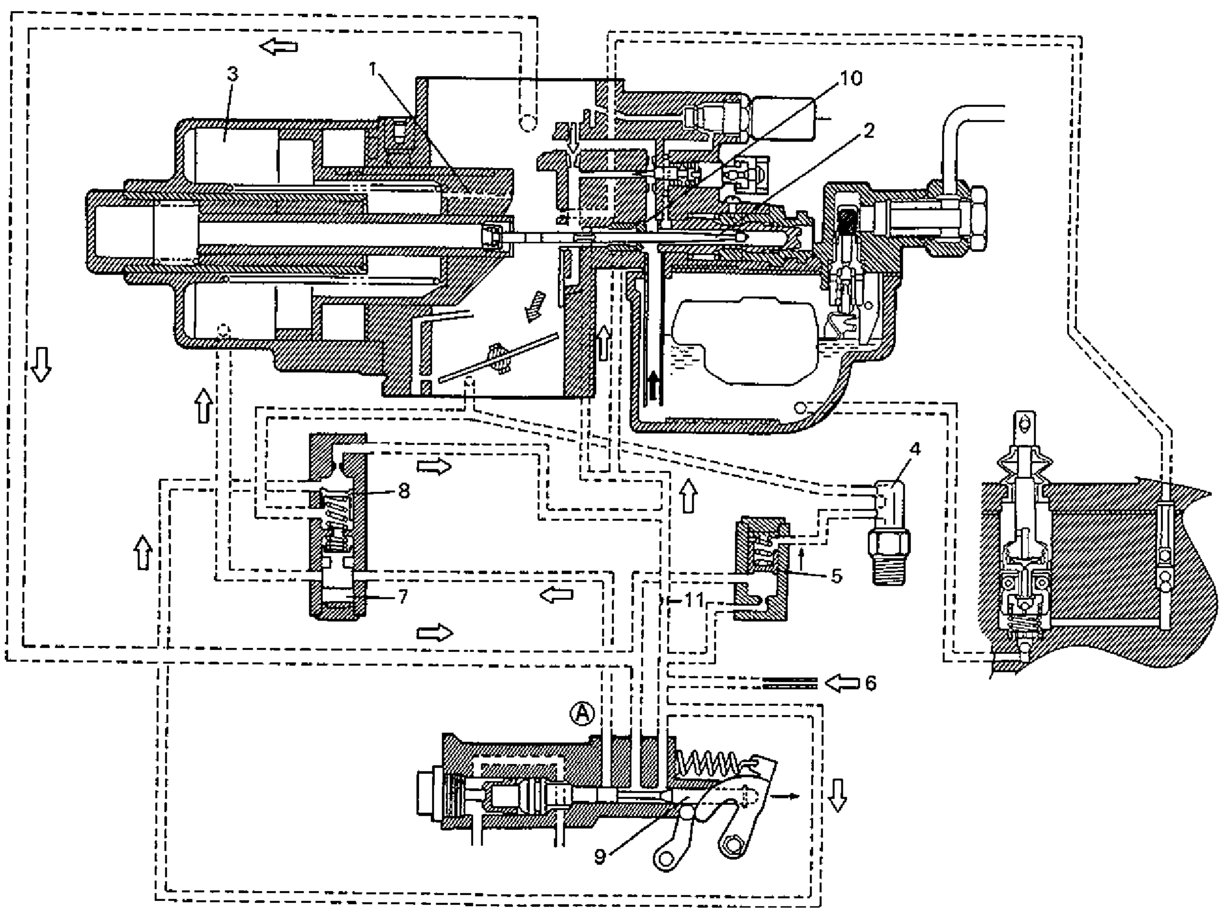
1. Suction piston
2. Metering needle
3. Suction chamber
4. BVSV (Bimetal Vacuum Switching Valve)
5. No. 2 breaker
6. No. 1 breaker
7. Breaker piston
8. Power valve
9. Cold enrichment compensator
10. Main jet
11. Main air bleed

Air and fuel mixture
Bleed air
Fuel

Fig. 6D-12

WHEN RESTARTING ENGINE AFTER WARM-UP

1) When restarting the engine which is warmed up, the thermo wax is expanded and the cold enrichment rod closes the bypass Ⓐ (in the figure below).
   At cranking, the suction piston immediately lifts to move the metering needle, whose cut consequently gets out of alignment with the main jet and thus no fuel increase takes place. The air bleeding into the main-bleed increases to adjust the air/fuel mixture optimum for the warm engine.
2) The throttle valve opens to the idle opening because the wax is expanded.



1. Suction piston
2. Metering needle
3. Suction chamber
4. BVSV (Bimetal Vacuum Switching Valve)
5. No. 2 breaker
6. No. 1 breaker
7. Breaker piston
8. Power valve
9. Cold enrichment compensator
10. Main jet
11. Main air bleed

Air and fuel mixture
Bleed air
Fuel

Fig. 6D-13

WHEN ENGINE IS MEDIUM WARM

1) The thermo wax expands with rise of the engine coolant temperature and pushes the cold enrichment rod to allow more air to bleed.
2) The power valve opens and when the temperature in the engine room exceeds the temperature specified for BVSV (i.e., 15°C), the vacuum pressure is applied to the No. 2 breaker and thus the amount of bleeding air increases.
3) According to expansion of the thermo wax, the throttle valve closes from the fast idle opening to the idle opening.

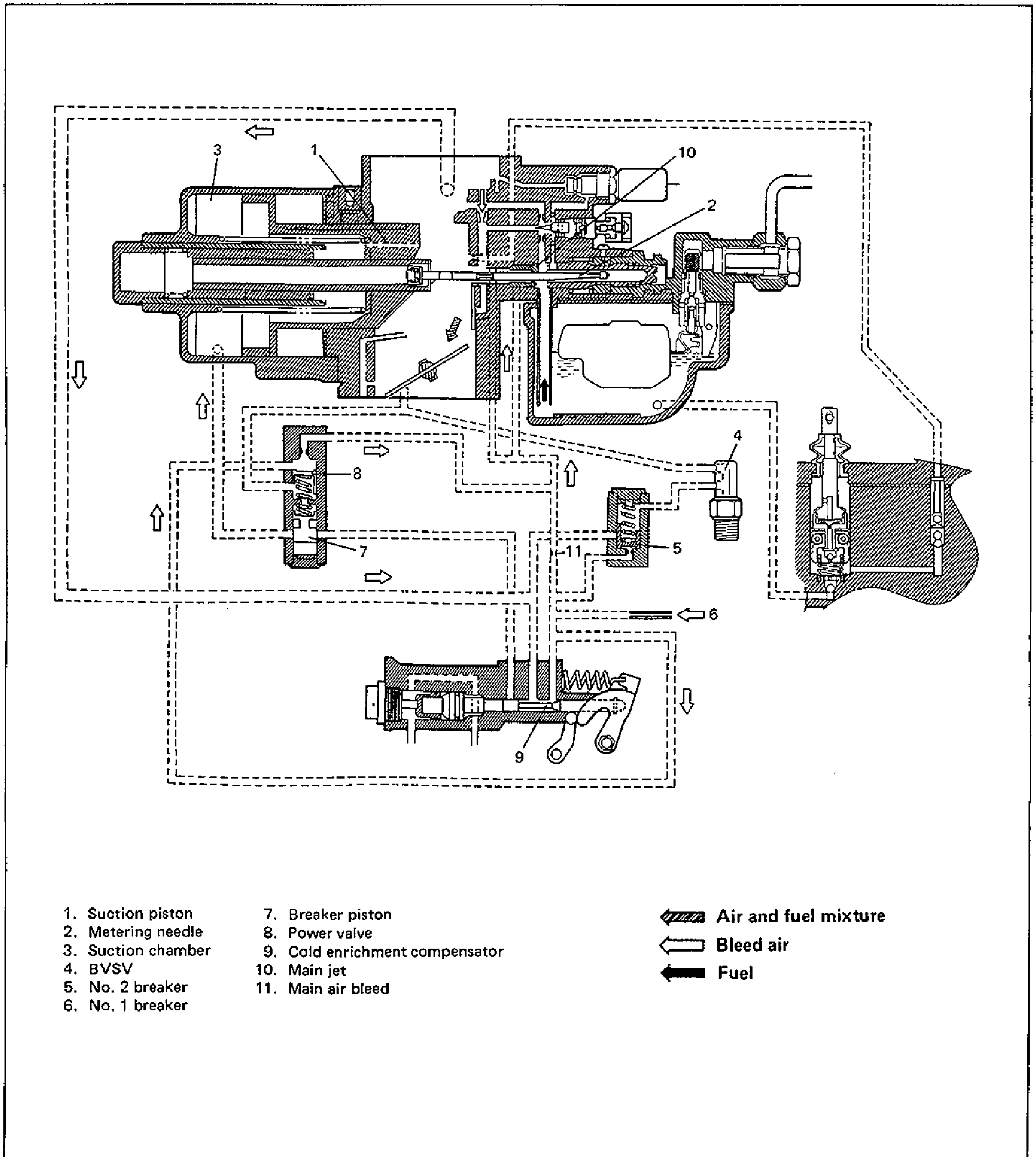


Fig. 6D-14

WHEN IDLING

(with engine warmed up)

1) The thermo wax is fully expanded, the cold enrichment rod opens its passage fully and the mount of bleeding air is controlled by the main air-bleed.
2) The throttle opens to the idle opening because the thermo wax is expanded.
3) The No. 1 and No. 2 breaker valves as well as the power valve open to allow more air to bleed.
4) The fuel trap tube guides the fuel flowing along the suction piston to underside of the throttle valve to stabilize idling.

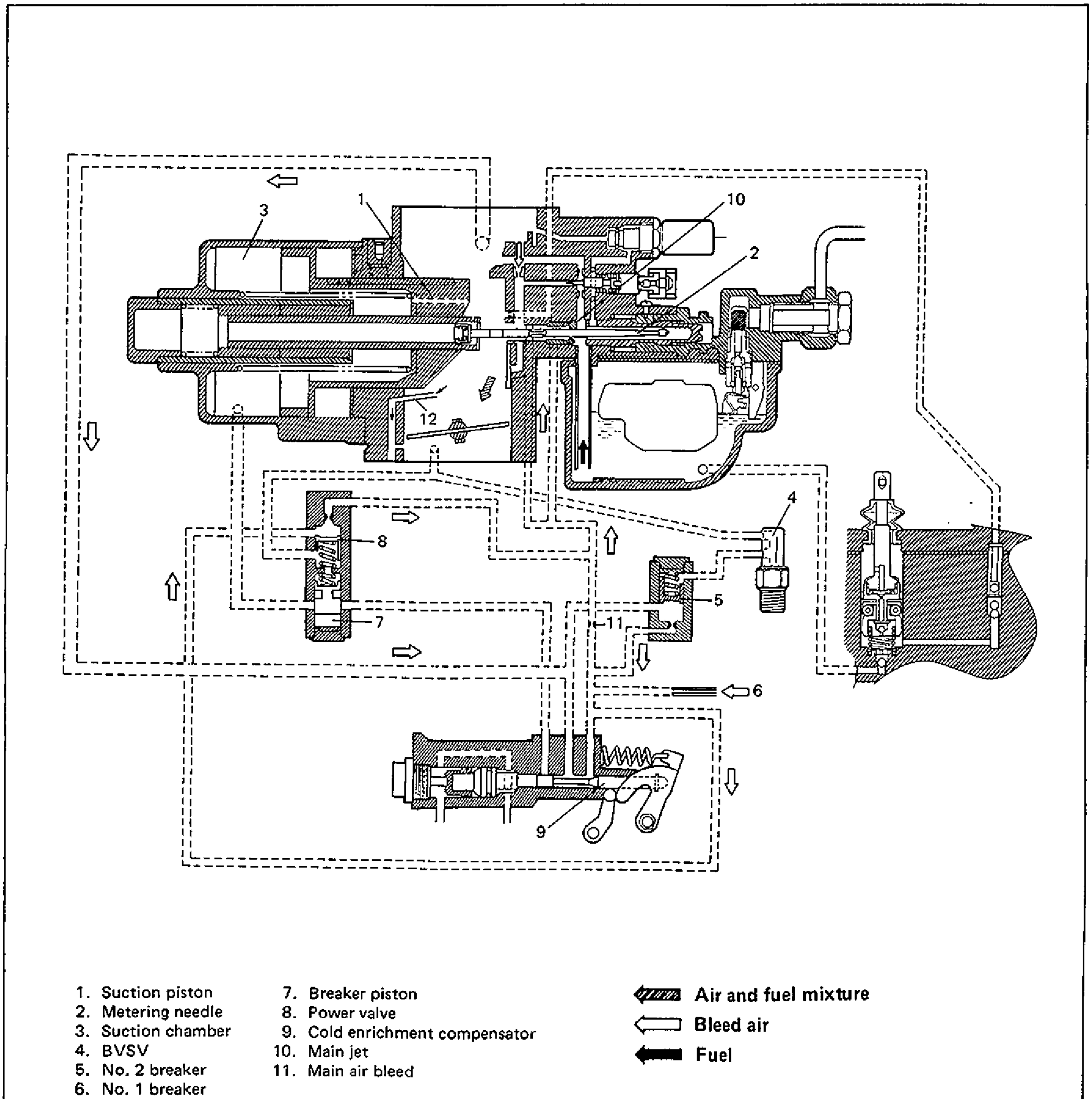
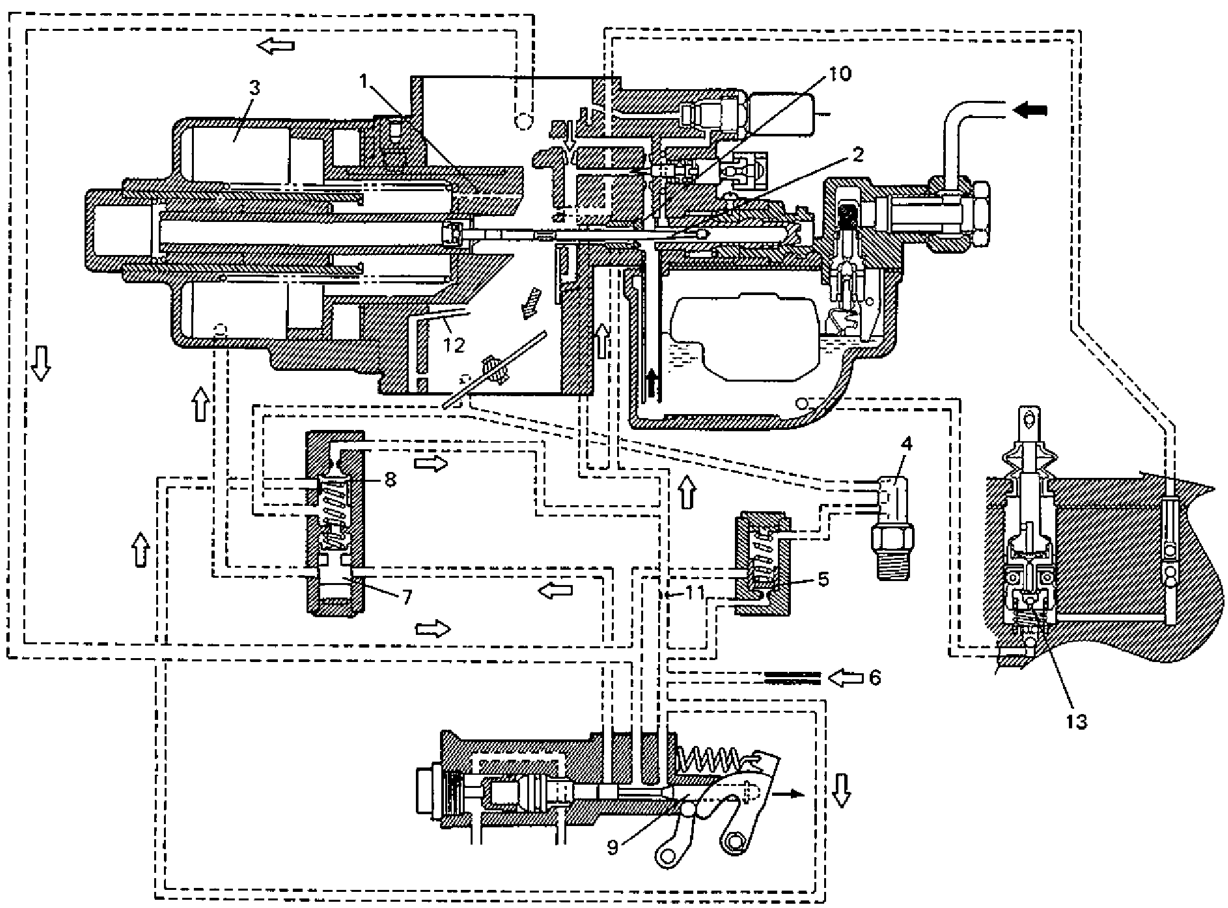


Fig. 6D-15

WHEN DRIVING AT MEDIUM SPEED

1) As the throttle opens, the engine speed increases, the amount of intake air also increases and the suction piston lifts according to the amount of incoming air.
   Then the annular clearance between the needle and the main jet varies to supply proper amount of fuel for the specified air/fuel mixture ratio.
2) The breaker piston and the power valve open and close the passage according to the vacuum pressure in the suction pipe.
3) When the accelerator pedal is depressed, the acceleration pump which is mechanically connected with the pedal increases the fuel flow.



1. Suction piston
2. Metering needle
3. Suction chamber
4. BVSV
5. No. 2 breaker
6. No. 1 breaker
7. Breaker piston
8. Power valve
9. Cold enrichment compensator
10. Main jet
11. Main air bleed
12. Fuel trap tube
13. Acceleration pump

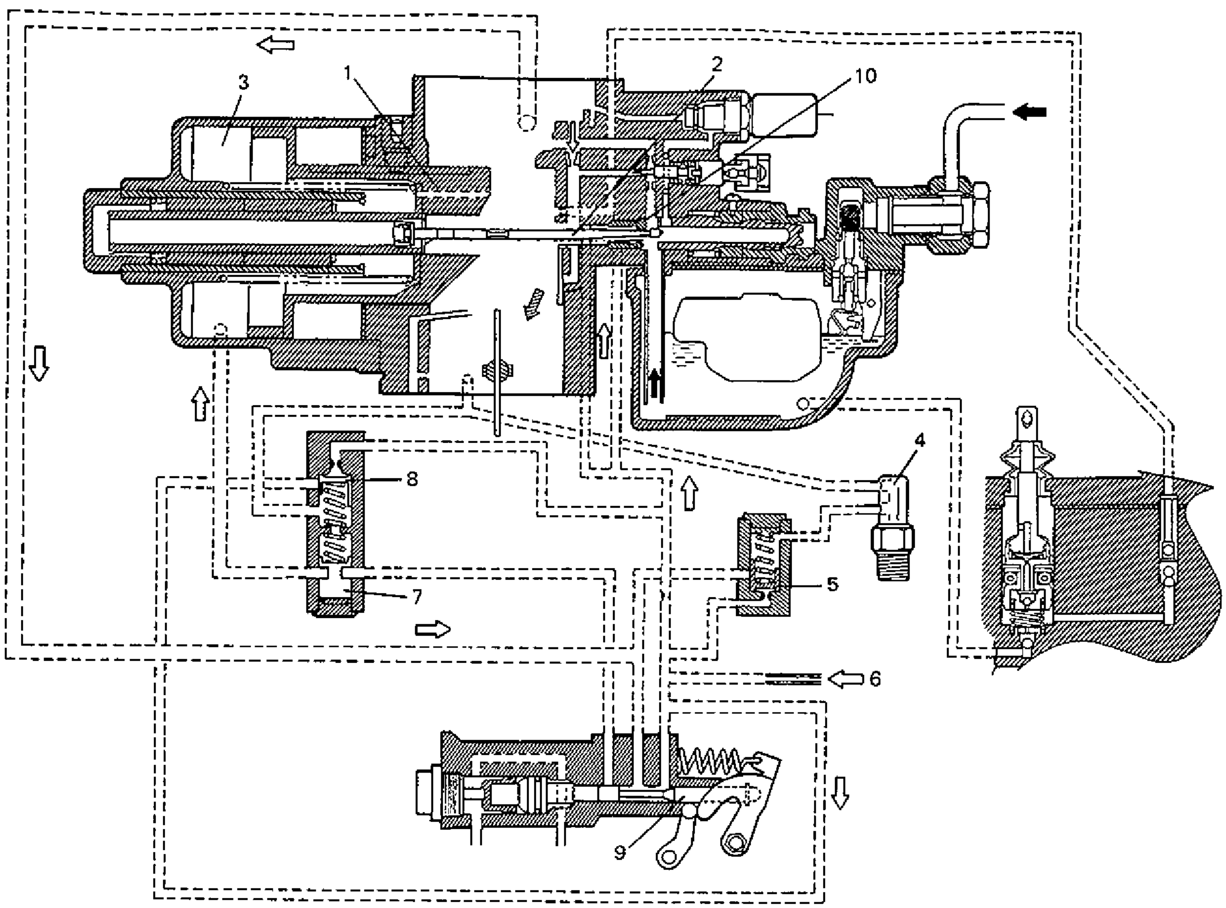
Air and fuel mixture
Bleed air
Fuel

Fig. 6D-16

WHEN THROTTLE IS FULLY OPEN

(Full load)

1) As the throttle valve is opened fully, the vacuum pressure in the suction pipe lowers, the No. 1 and No. 2 breaker valves as well as the power valve close the passages and the amount of bleeding air decreases. As a result, the air/fuel mixture enriches to the output air/fuel mixture ratio.



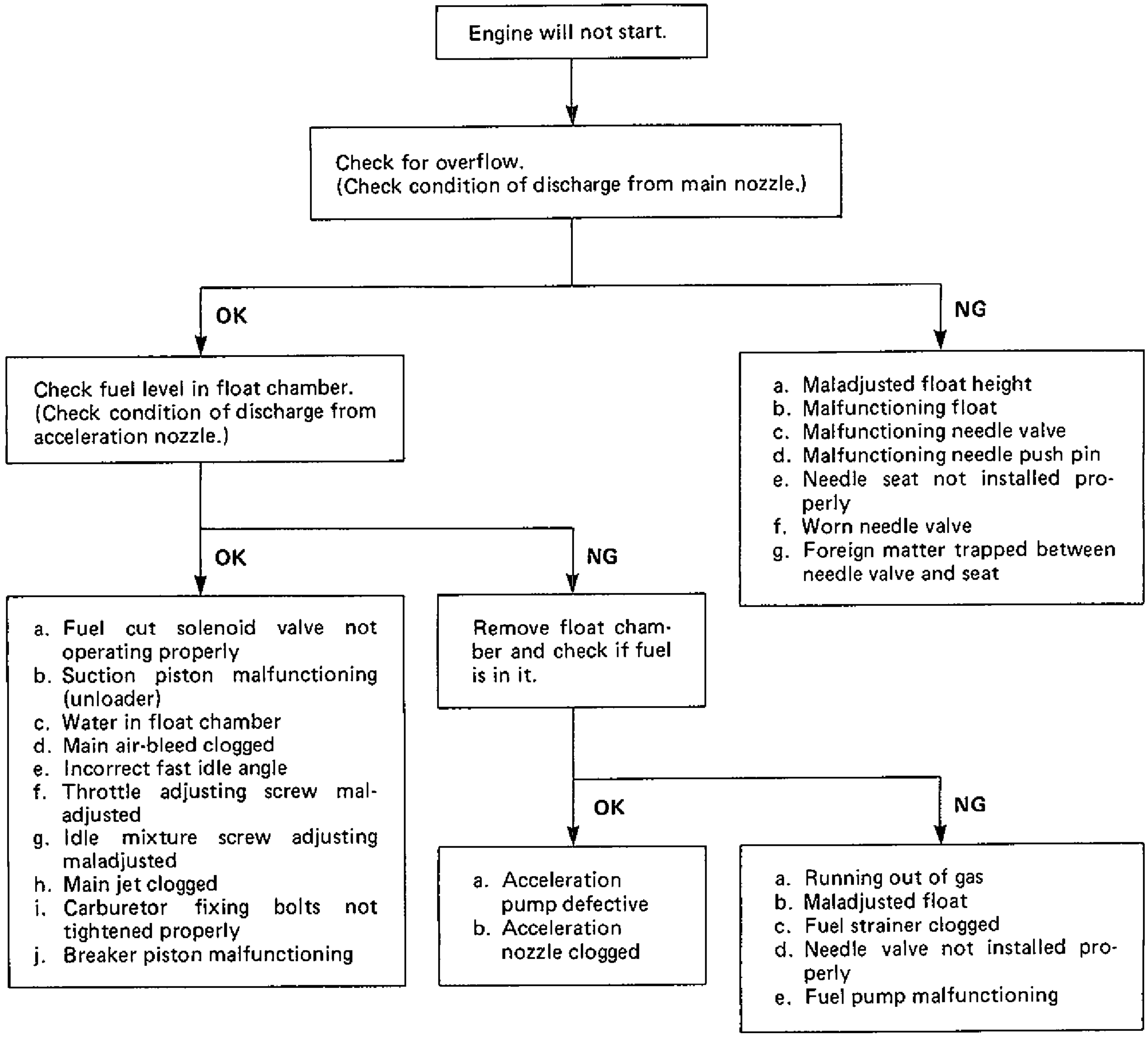
1. Suction piston
2. Metering needle
3. Suction chamber
4. BVSV
5. No. 2 breaker
6. No. 1 breaker
7. Breaker piston
8. Power valve
9. Cold enrichment compensator
10. Main jet

Air and fuel mixture
Bleed air
Fuel

Fig. 6D-17

DIAGNOSIS

Condition	Possible Cause	Correction
Hard starting (when ambient temperature is low or engine is cold)	• Cold enrichment rod stuck	Replace.
	• Secondary breaker valve stuck	Replace.
	• Incorrect fast idle opening	Adjust.
	• Fuel pump malfunctioning	Check.
Poor performance at idling and low speed	• Pilot screw out of adjustment	Adjust.
	• Throttle adjusting screw out of adjustment	Adjust.
	• Jet clogged or loosened	Wash, air blow.
	• Leakage from carburetor installing face (Gasket damaged, fixing bolts loosened)	Replace, retighten.
	• Throttle valve not returning properly (Interference of throttle valve, link system not operating properly)	Correct, replace.
	• Air leakage from throttle shaft	Replace.
	• Air leakage from main body mating surface (Gasket damaged, fixing screws loosened, mating surface distorted)	Replace, correct.
	• Poor auto-choke function (Incorrect fast idle opening, unloader lever or rod deformed)	Adjust.
	• Fuel pump malfunctioning	Check.
Poor performance at medium and high speed	• Main jet clogged or loosened	Wash, air blow, retighten.
	• Main air jet clogged or loosened	Wash, air blow, retighten.
	• Piston valve not operating properly (Vacuum pressure passage clogged, defective diaphragm)	Wash, air blow.
	• Power air jet clogged	Wash, air blow.
	• Needle jet clogged	Wash, air blow.
	• Insufficient fuel flow into float chamber (Filter or needle valve clogged)	Wash, air blow.
	• Fuel pump malfunctioning	Check.
Poor acceleration	• Main jet clogged or loosened	Wash, air blow, retighten.
	• Poor discharge of acceleration pump (Pump nozzle clogged, outlet check valve not operating properly)	Wash, air blow, correct, replace.
	• Piston valve not operating properly	Wash, air blow.
	• Power jet clogged	Wash, air blow.
Overflow	• Leakage from valve seat (Worn needle valve, deformed or cracked float)	Replace.


Engine will not start.
Check for overflow.
(Check condition of discharge from main nozzle.)
OK
NG
Check fuel level in float chamber.
(Check condition of discharge from acceleration nozzle.)
a. Maladjusted float height
b. Malfunctioning float
c. Malfunctioning needle valve
d. Malfunctioning needle push pin
e. Needle seat not installed properly
f. Worn needle valve
g. Foreign matter trapped between needle valve and seat
OK
NG
a. Fuel cut solenoid valve not operating properly
b. Suction piston malfunctioning (unloader)
c. Water in float chamber
d. Main air-bleed clogged
e. Incorrect fast idle angle
f. Throttle adjusting screw maladjusted
g. Idle mixture screw adjusting maladjusted
h. Main jet clogged
i. Carburetor fixing bolts not tightened properly
j. Breaker piston malfunctioning
Remove float chamber and check if fuel is in it.
OK
NG
a. Acceleration pump defective
b. Acceleration nozzle clogged
a. Running out of gas
b. Maladjusted float
c. Fuel strainer clogged
d. Needle valve not installed properly
e. Fuel pump malfunctioning

Poor performance at idling and low speed

OK

Throttle adjusting screw maladjusted

Measure CO

High CO measurement

a. Idle mixture adjust clogged
b. Main air-bleed clogged
c. Cold enrichment rod malfunctioning
d. Wax malfunctioning
e. Mixture adjusting screw maladjusted

Low CO measurement

a. Fuel cut solenoid valve not operating properly
b. Foreign matter in float chamber
c. Main jet clogged
d. Carburetor fixing bolts not tightened properly
e. Suction piston not operating properly
f. Vacuum hose not connected properly
g. Pilot adjusting screw maladjusted

Run-on

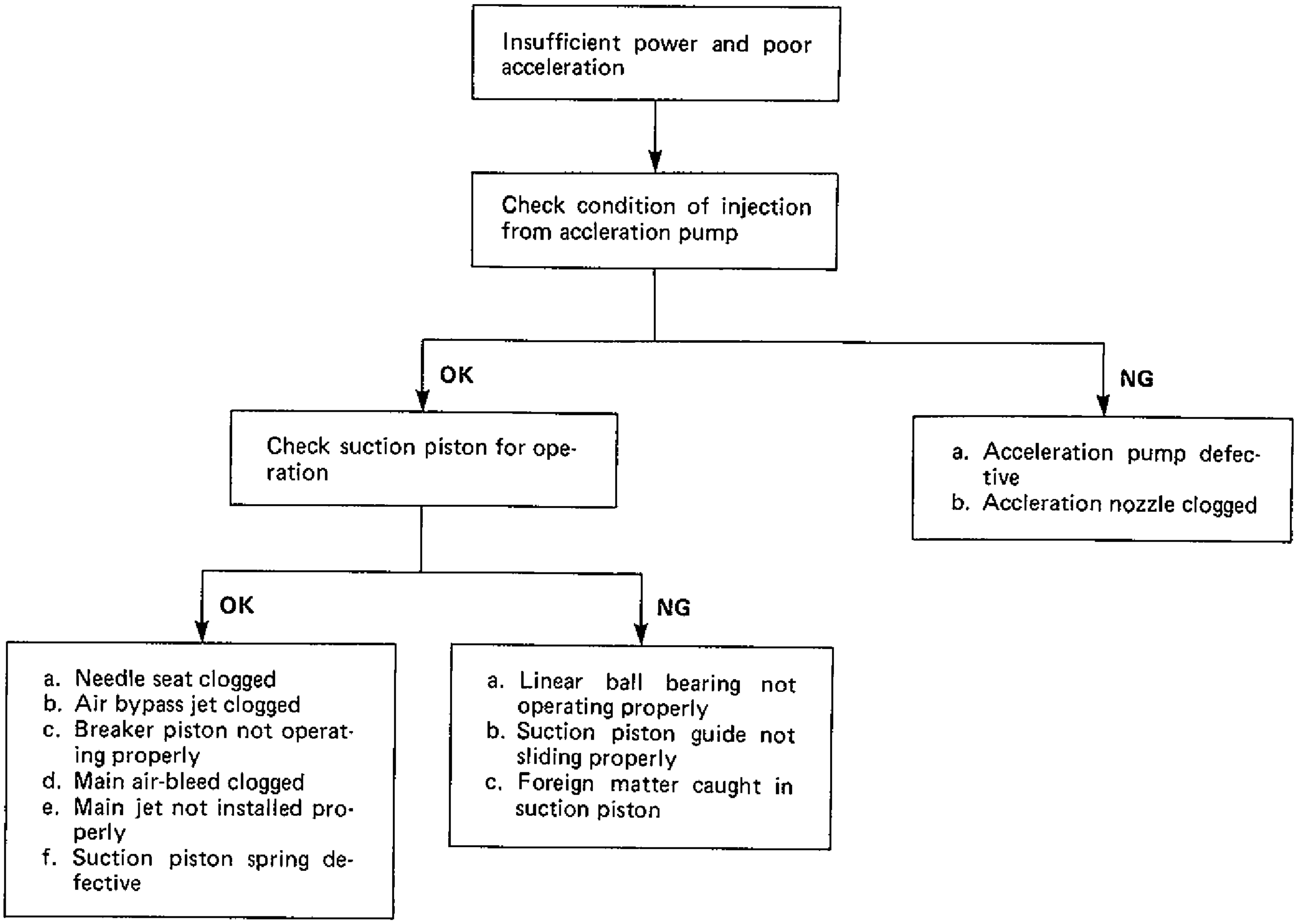
Check fuel cut solenoid valve for operation

OK

a. Idle CO faulty
b. Dash pot not operating properly
c. Fuel cut port clogged
d. Wax malfunctioning
e. Throttle not returning properly

NG

a. Fuel cut solenoid valve defective


Insufficient power and poor acceleration
Check condition of injection from accleration pump
OK
NG
Check suction piston for operation
a. Acceleration pump defective
b. Accleration nozzle clogged
OK
NG
a. Needle seat clogged
b. Air bypass jet clogged
c. Breaker piston not operating properly
d. Main air-bleed clogged
e. Main jet not installed properly
f. Suction piston spring defective
a. Linear ball bearing not operating properly
b. Suction piston guide not sliding properly
c. Foreign matter caught in suction piston

ON CAR SERVICE

ACCELERATOR CABLE PLAY

Check accelerator cable for play and adjust if necessary.

1) After confirming the carburetor and coolant are cold and engine is not running, depress accelerator pedal fully and release it. In such state, cable play "A" should be 13 – 17 mm (0.52 – 0.67 in.) If not within specification, adjust by loosening lock nut.

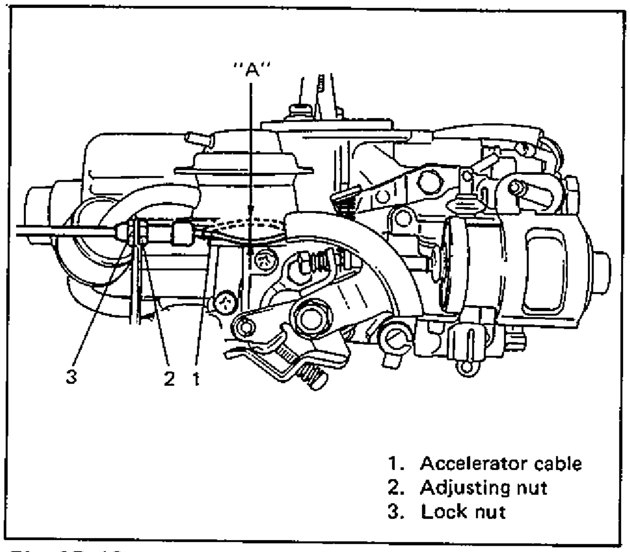


Fig. 6D-18

2) To check cable play after engine is warmed up, confirm that engine is running at specified idle speed first, then stop it and check cable play. It should be within 7 ~ 11 mm (0.27 ~ 0.43 in.).

FLOAT LEVEL

> **WARNING:**
> **Float level inspection and adjustment must be performed in well-ventilated place where no fire is used around.**

INSPECTION

1) Remove carburetor assembly from intake manifold (See corresponding description of Carburetor Removal).
2) Disconnect link rod from accelerator pump lever.
3) Remove accelerator pump lever bolt.
4) Remove float chamber screws.

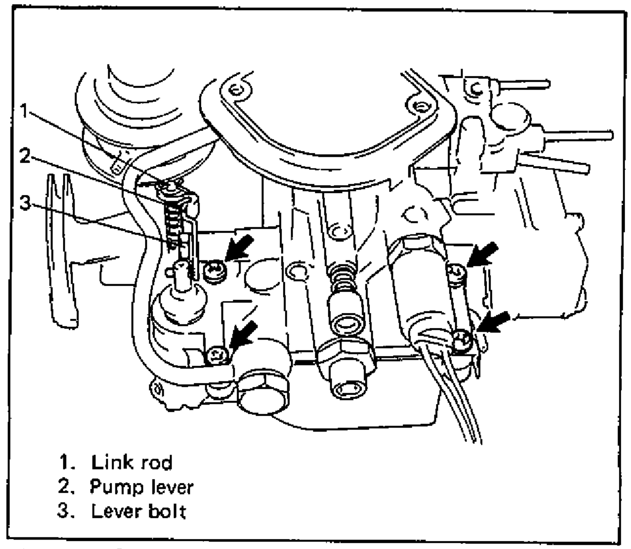


Fig. 6D-19

5) Check float height "H" as shown below.

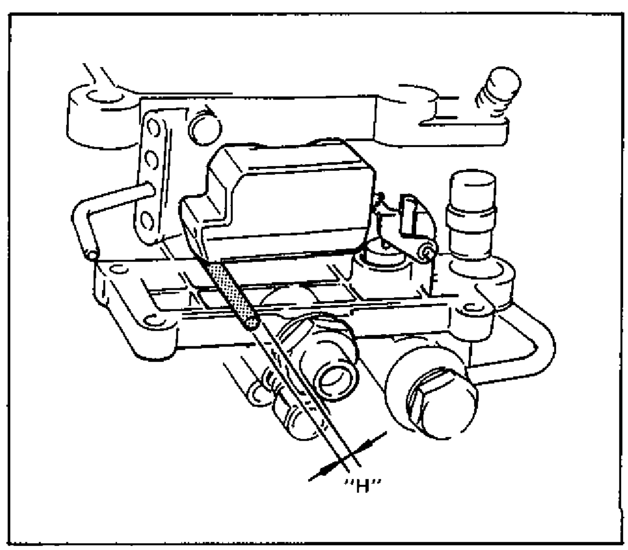


Fig. 6D-20

NOTE:
- Check float height with float weight applied to needle valve.
- Height "H" should not include gasket.
- As a gauge for checking height "H", use something whose thickness measurement is the same as specified "H" measurement (for example, a drill or a screw but not its thread part) after confirming thickness with vernier calipers.

Float height "H"	4.3 mm (0.169 in.)

6) If float height is not within specification, adjust by bending neck "B" of float.

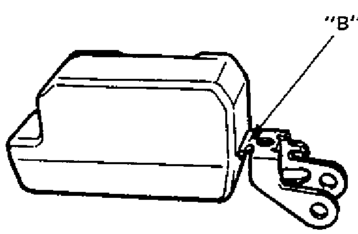


Fig. 6D-21

7) Check needle valve for wear and dust. Also, check to ensure that no fuel is in float by shaking it.

After installing carburetor to intake manifold, start engine and check each part for fuel leakage or air entry.

IDLE SPEED AND IDLE MIXTURE

NOTE:
This check requires use of external tachometer.

As preliminary steps, check to be sure that:
- Coolant temperature is within below indicated range.

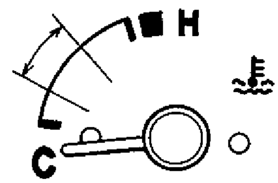


Fig. 6D-22

- All accessories (wipers, heater, lights, etc.) are out of service.
- Ignition timing is within specification.
- Air cleaner has been properly installed and is in good condition.
- Engine valve clearance is within specification.
- Parking brake is pulled fully.
- Selector lever is in "P" range. (For A/T)
- Drive wheels are blocked. (For A/T)

NOTE:
A/T: For Automatic Transmission

[Idle speed and idle mixture adjustment]
Adjust idle speed and idle mixture according to the following procedure.

1) Adjust idle speed to 900 r/min (rpm) by repositioning (turning) idle speed adjusting screw.
2) With engine idling at 900 r/min (rpm), turn idle mixture adjusting screw to the right or left and set it where the highest engine speed is obtained. (This is the best idle position).
3) Perform above 1) and 2) once again, and then readjust idle speed to 830 r/min (rpm) with idle mixture adjusting screw.
4) Upon completion of the work so far, readjust engine idle speed to the below specification by turning idle speed adjusting screw slowly.

NOTE:
For the car equipped with second air valve, remove plug from second air hose and connect that hose to air cleaner case.

All cars of this model are now shipped with their CO% factory adjusted as follows.

Engine idle mixture CO%		1.0 ± 0.5
Engine idle speed (r/min)	Manual transmission	800 ± 50
	Automatic transmission (When selector lever is in "P" or "N" range)	

In countries where there are statutory requirements for exhaust gas (CO%), be sure to adjust idle mixture adjusting screw so that CO% indicated on exhaust gas tester will be as specified in above table.
Special tool (09913-18010) is necessary to turn idle mixture adjusting screw.

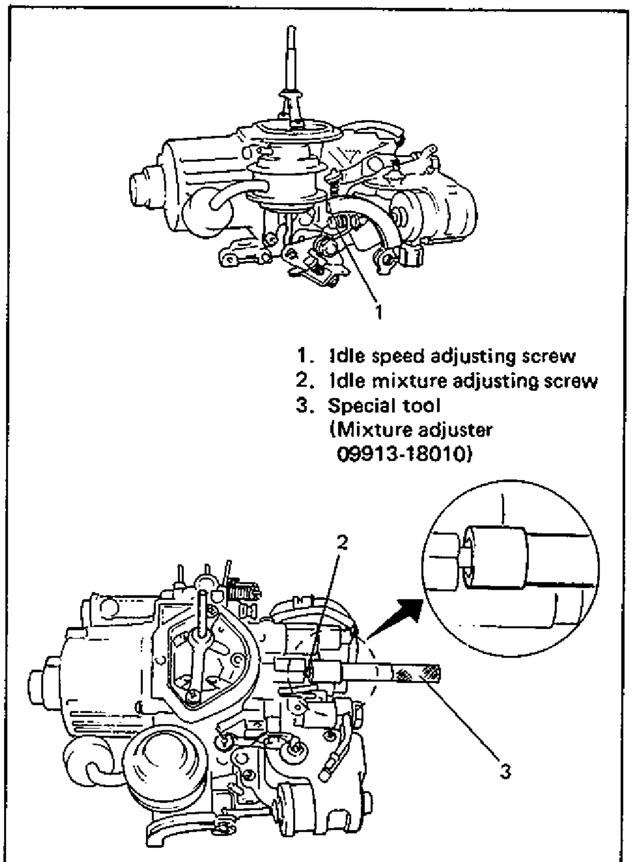


Fig. 6D-23

IDLE UP (For Manual transmission)

INSPECTION

1) Adjust idle speed to specification by referring to **Idle Speed and Idle Mixture** and maintain engine at that speed.
2) Turn ON headlight and check that engine idle speed is within specification below.

Engine idle speed when idle up system is operated (Headlight turns ON)	800 ± 50 r/min

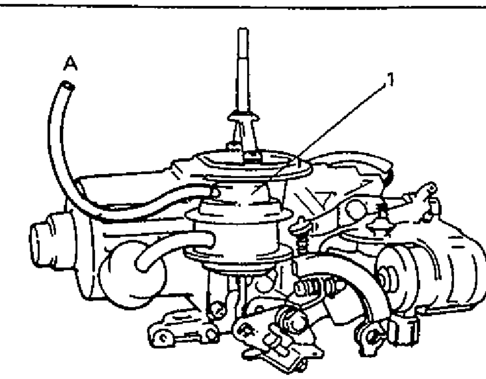
3) Turn OFF headlight and turn steering wheel fully and while holding it there lightly, check that actuator rod pushes down throttle lever a little further than the ordinary idle speed position. (If equipped with P/S system.)
4) If found faulty, check following parts individually according to each procedure.

VSV (Vacuum Switching Valve)

1) Make sure that headlight, small light, engine cooling fan, heater fan and rear defogger (if equipped) are all turned OFF.
2) Disconnect VSV vacuum hoses from gas filter and actuator. Turn ignition switch ON.
3) By blowing air into hose disconnected from intake manifold, make sure there is continuity between these hoses.
4) Apply electric loads described in step 1) indivisually and check that there is no air continuity between these hoses.
5) If found defective in above steps 3) and 4), repair or replace hoses, wiring harness or VSV.

Actuator

1) Disconnect vacuum hose from actuator to VSV at VSV side.
2) Pull actuator rod all the way up and close end of hose with finger.
3) In the state of 2), take hand off rod. If actuator rod stays up, it is normal. If defective, replace.



1. Idle up actuator
A: Stop up a hole

Fig. 6D-24-1

ADJUSTMENT

If VSV, actuator, hose wiring harness and battery capacity are normal and yet idle up speed is not attained, adjust as follows.

1) Warm up engine.
2) Turn ON headlight. Engine speed in this state should be within specification below.
   If not within specification, adjust with idle up adjusting screw.

Engine idle speed when idle up system in operation (Headlight turns ON)	800 ± 50 r/min

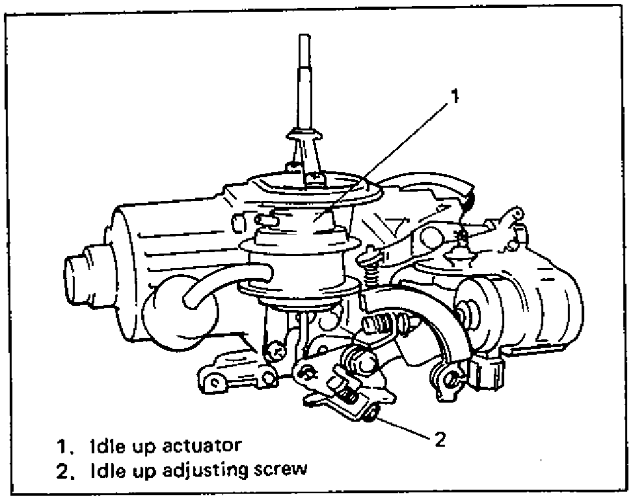


Fig. 6D-24-2

IDLE UP (For Automatic transmission)

Inspection

1. Adjust idle speed to specification and maintain engine at that speed.
2) Shift selector lever to each of "R", "D", "2" and "L" ranges and check that engine idle speed is within specification below.

Engine idle speed when idle up system is operated (at D range)	700 – 750 r/min

3) Shift selector lever to "P" range and turn steering wheel fully and while holding it there lightly, check that actuator rod pushes down throttle lever a little further than the ordinary idle speed position. (If equipped with P/S system.)
4) If found faulty, check following parts individually according to each procedure.

[VSV and its circuit] (For car without P/S system)

1) Make sure that selector lever is shifted to "P" range.
2) Disconnect VSV vacuum hoses from gas filter and actuator.
3) Turn ignition switch to "ON" position.
4) By blowing air into hose disconnected from actuator, make sure there is continuity between these hoses. Then, shift selector lever to "N" range and also check to make sure that there is continuity between these hoses.
5) Shift selector lever to "R" range, by blowing air into the hose disconnected from actuator, make sure that there is no continuity between hoses. Also, with selector lever shifted to "D", "2" and "L" ranges, check to make sure that there is no continuity between these hoses in each range. If found faulty in steps 4) and 5), proceed to following checks.
6) With ignition switch at "OFF" position, disconnect lead wire coupler from VSV.
7) Turn ignition switch to "ON" position.
8) Connect voltmeter to coupler terminals. Shift selector lever to "P" and then "N" ranges and check that voltmeter indicates 0V in each range. Also, shift selector lever to "R". "D", "2" and "L" ranges and check that voltmeter indicates about 12V in each range.

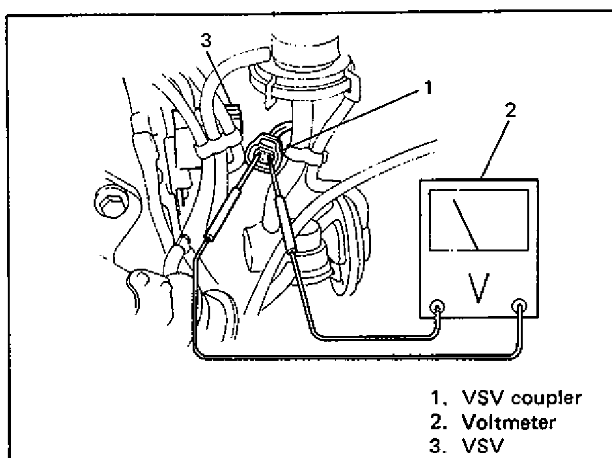


Fig. 6D-25-1

9) If found faulty in step 8), inspect shift lever switch and its circuit by referring to description of inhibiter switch inspection of "AUTOMATIC TRANSMISSION" section.
10) If found faulty in above step 9), replace inhibiter switch or wire harness.
11) If found faulty in steps 4) and 5) checks and yet it is proved in step 8) that VSV electric circuit is in good condition, replace VSV.
12) After checking, be sure to reconnect disconnected couplers and vacuum hoses.

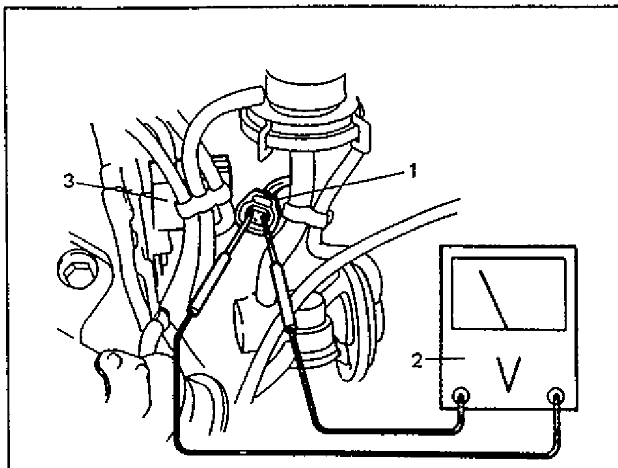
VSV and its Circuit (For car with P/S system)

1) Make sure that selector lever is shifted to "P" range.
2) Disconnect VSV vacuum hose from actuator. Disconnect VSV lead wire coupler.
3) Start engine and check that air is drawn into disconnected hose. If not, disconnect VSV vacuum hose from gas filter, check parts in hose to VSV to hose unit for air continuity and leakage and replace defective parts.
4) If air is drawn into disconnected hose, connect vacuum hose to actuator and check that actuator rod is pulled up at the moment of connection. If not, replace actuator.
5) Disconnect VSV vacuum hose from actuator and gas filter and check that air continuity between vacuum hoses is as described in following table.

	Air between vacuum hoses	VSV voltage
When selector lever at "P" or "N"	Continued	0V
When selector lever at "R", "D", "2" or "L"	Discontinued	12V
* When force is applied to steering wheel	Discontinued	12V
* When hands are off steering wheel	Continued	0V

* : Selector lever should be at "P" position.

If air continuity is not as described in above table, disconnect VSV lead coupler, connect voltmeter to coupler terminal and check voltage in each condition.



1. VSV coupler
2. Voltmeter
3. VSV

Fig. 6D-25-2

If measured voltage is as specified, replace VSV. If not, check electric circuit according to following procedure and referring to Fig. 6D-10-2.

6) If selector lever is in one of those ranges and VSV voltage is not as specified, check start-up circuit including inhibiter switch, idle up relay and wiring and correct or replace as necessary.
7) If VSV voltage is not as specified when steering wheel is under force or released, check P/S pressure switch, P/S relay and wiring and repair or replace as necessary.
8) After checking, be sure to reconnect disconnected couplers and vacuum hoses.

[Actuator]

1) Disconnect vacuum hose from actuator to VSV at VSV side.
2) Pull actuator rod all the way up and close end of hose with finger.
3) In the state of 2), take finger off rod. If actuator rod stays up, it is in good condition. If defective, replace.

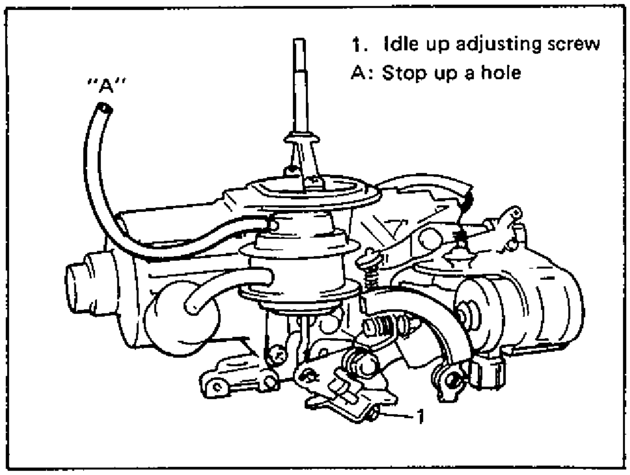


Fig. 6D-26

Adjustment

If idle up system is normal and yet idle up speed is not attained, adjust as follows.

1. Check to be sure that:
- Engine idle speed with selector lever shifted to "P" or "N" range is as specified.
- Parking brake is pulled fully and drive wheels are blocked.
2. Engine speed with selector lever shifted to "D", "2", "L" or "R" range should be within specification. (See p. 6D-22)
   If not within specification, adjust with idle up adjusting screw.

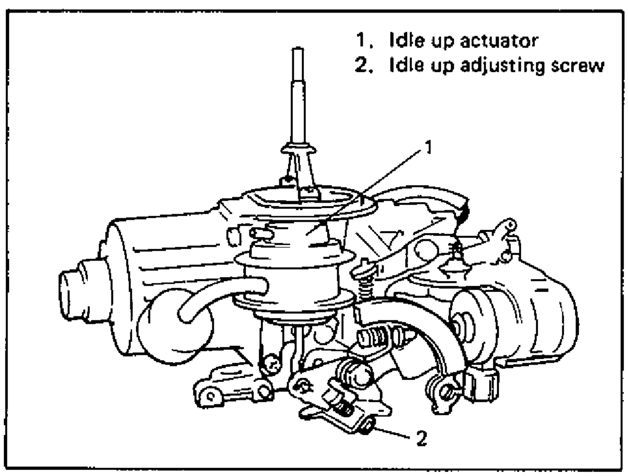


Fig. 6D-27

FAST IDLE

INSPECTION

1) Start engine and warm it up to normal operating temperature.
2) After warming up, check to ensure that engine is running at specified idle speed.
3) Stop engine and remove air cleaner case.
4) Make auxiliary cam hold roller of fast idle cam lever.

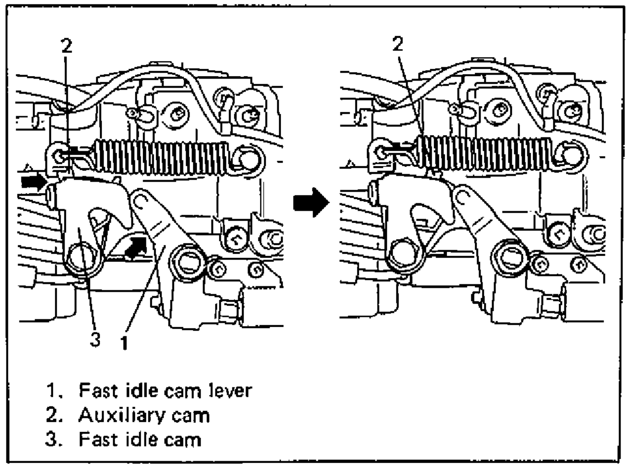


Fig. 6D-28

5) Start engine without depressing accelerator pedal and check that fast idle speed is within specification given below. If out of specification, adjust to specification by turning fast idle speed adjusting screw.

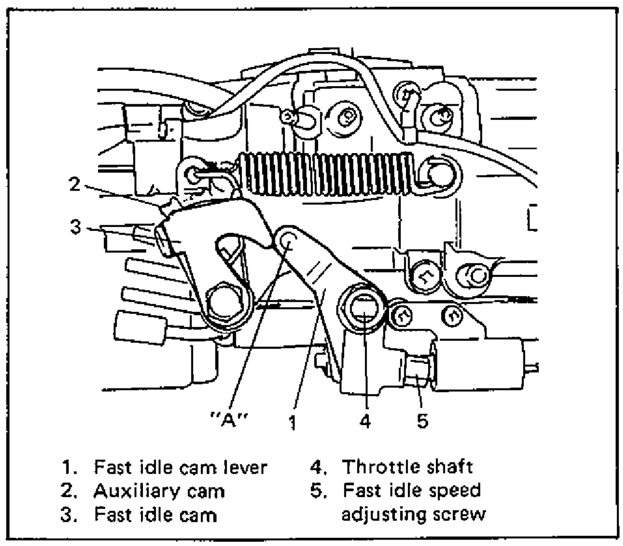


Fig. 6D-29

Fast idle speed	3,800 – 4800 r/min (rpm)

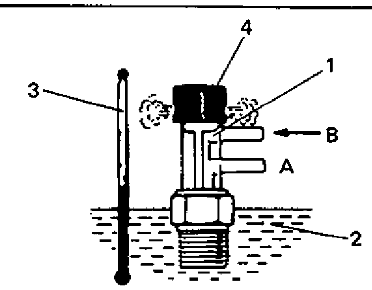
6) After inspection and adjustment, depress accelerator pedal a little. This allows roller "A" to be released from auxiliary cam and specified idle speed is resumed.
7) Install air cleaner case.

TVSV (Thermal Vacuum Switching Valve)

INSPECTION

NOTE:
For the rough check of operation, TVSV can be checked by warming up or cooling down engine without being removed from intake manifold. Check procedure is the same as the following except items 1), 2) and 5).

1) Drain coolant when engine is cold.
2) Disconnect vacuum hoses and remove TVSV from intake manifold.
3) While keeping TVSV cool (below 15°C (59°F), blow nozzle "B". Air should not come out of nozzle "A" but it should come out through filter. Next, blow nozzle "A", then air should not come out at all. Replace defective TVSV.

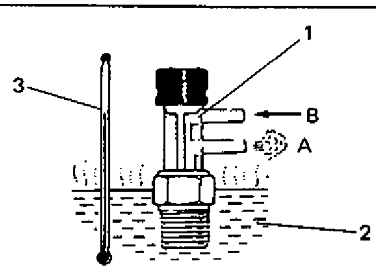


"A" : To intake manifold
"B" : To fast idle cam opener

1. TVSV (Thermal Vacuum Switchin Valve)
2. Cool water
3. Thermometer
4. Filter

Fig. 6D-30

4) While keeping TVSV warm (above 25°C (77°F)) in hot water, blow nozzle "B". Air should come out of nozzle "A".
If defective, replace TVSV.



1. TVSV (Thermal Vacuum Switching Valve)
2. Hot water
3. Thermometer
4. Heater

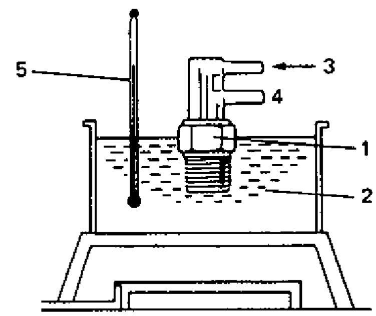
Fig. 6D-31

5) Reinstall TVSV to intake manifold. Before installing, wind sealing tape on its thread.
6) Connect vacuum hoses.

BVSV (Bimetal Vacuum Switching Valve)

INSPECTION

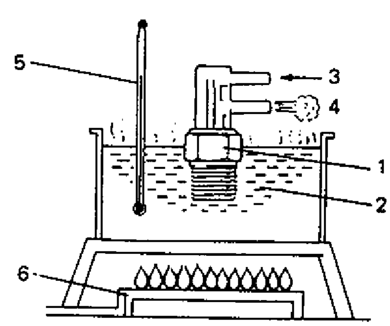
1) Remove BVSV from air cleaner case.
2) While keeping BVSV cool (below 15°C (59°F)), blow nozzle "3". Air should not come out of nozzle "4". If defective, replace BVSV.



1. BVSV
2. Cold water
3. Blow air (nozzle)
4. "No air" (nozzle)
5. Thermometer

Fig. 6D-32

3) While keeping BVSV warm (above 25°C (77°F)) in hot water, blow nozzle "3". Air should come out of nozzle "4". If defective replace BVSV.



1. BVSV
2. Hot water
3. Blow air (nozzle)
4. Air (nozzle)
5. Thermometer
6. Heater

Fig. 6D-33

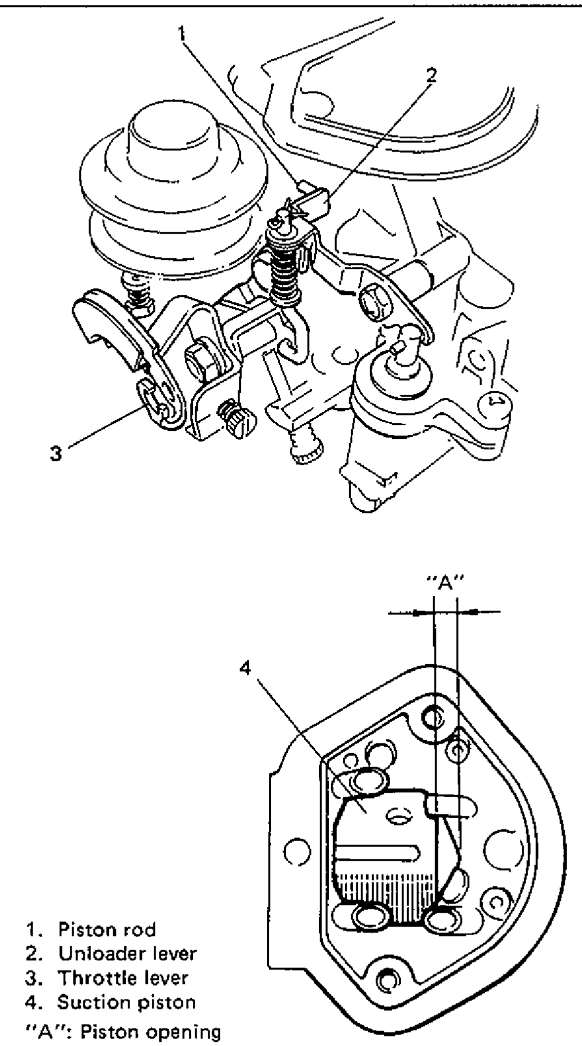
UNLOADER SYSTEM

INSPECTION

This inspection must be performed when engine is cool (at lower than 25°C or 77°F water temperature) and not running.

1) Remove air cleaner case.
2) Make sure that suction piston is fully closed.
3) Open throttle valve fully. If suction piston opening is within below specification, unloader system is in good condition.

Suction piston opening "A" specification	2.5 mm or more (0.10 in. or more)



1. Piston rod
2. Unloader lever
3. Throttle lever
4. Suction piston

"A": Piston opening

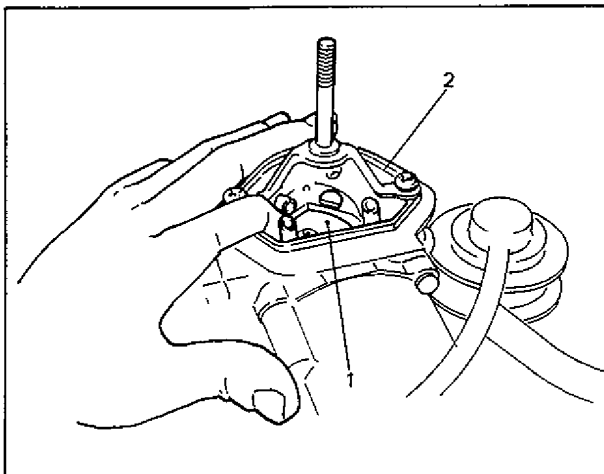
Fig. 6D-34

If found faulty, adjust to specification by bending unloader lever "2" in above figure.

ACCELERATOR PUMP

INSPECTION

1) Disconnect negative battery cord from battery.
2) Remove air cleaner case.
3) Depress accelerator pedal a few times and check that fuel jumps out of pump nozzle.



1. Pump nozzle
2. Carburetor

Fig. 6D-35

If fuel does not come out, check if fuel pump diaphragm has a hole or breakage, check ball is stuck or passage is clogged.
Correct, clean or replace if defective.

Pump Stroke

1) Warm up engine to normal operating temperature.
2) Stop engine and remove air cleaner.
3) Using vacuum pump gauge, apply −50 cmHg vacuum to idle up and throttle positioner diaphragms simultaneously.
4) Depress accelerator pedal all the way from idle position and take measurement of pump stroke. Pump stroke should be within specification. If measured stroke is out of specification, adjust it by bending rod.

Pump stroke specification	5.0 – 5.4 mm (0.197 – 0.212 in.)

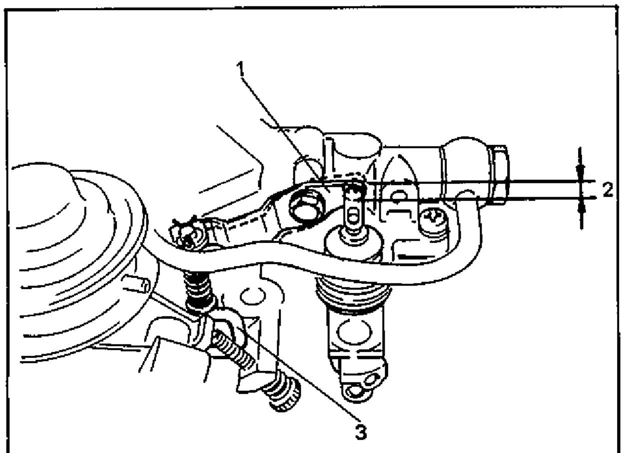


Fig. 6D-36

SUCTION PISTON

INSPECTION

Inspect suction piston for operation as follows.

1) Stop engine.
2) Remove air cleaner case.
3) Check piston for smooth slide with a finger as shown. Also check to ensure that piston returns to the original position smoothly and for sure when released from finger.

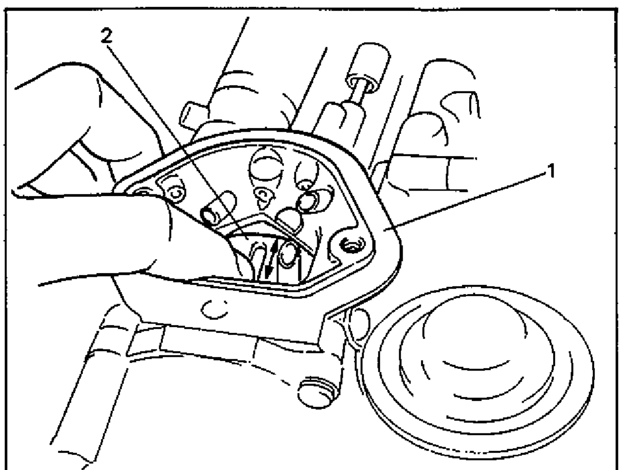


Fig. 6D-37

4) Start engine and warm it up to normal operating temperature. With engine running at specified idle speed, check to ensure that clearance "A" between the end of piston and carburetor bore wall is within specification given below.

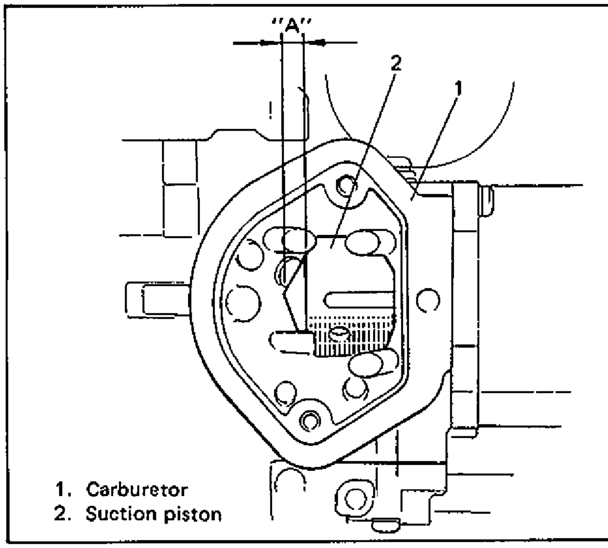


Fig. 6D-38

Clearance "A"	3.0 – 4.0 mm (0.119 – 0.157 in.)

COLD ENRICHMENT COMPENSATOR

INSPECTION

1) Remove cold enrichment compensator ass'y from carburetor. (For removal, refer to p. 6D-29.)
2) Soak compensator ass'y in ice water for about 10 minutes as shown below and measure distance "A" as indicated in figure below.
3) After measurement of above 2), heat water to 80°C (176°F) and measure distance "B" as indicated in figure below.
4) If difference between "A" and "B" measured in 2) and 3) respectively is within the range as given below, wax and enrichment rod in compensator are in good condition.

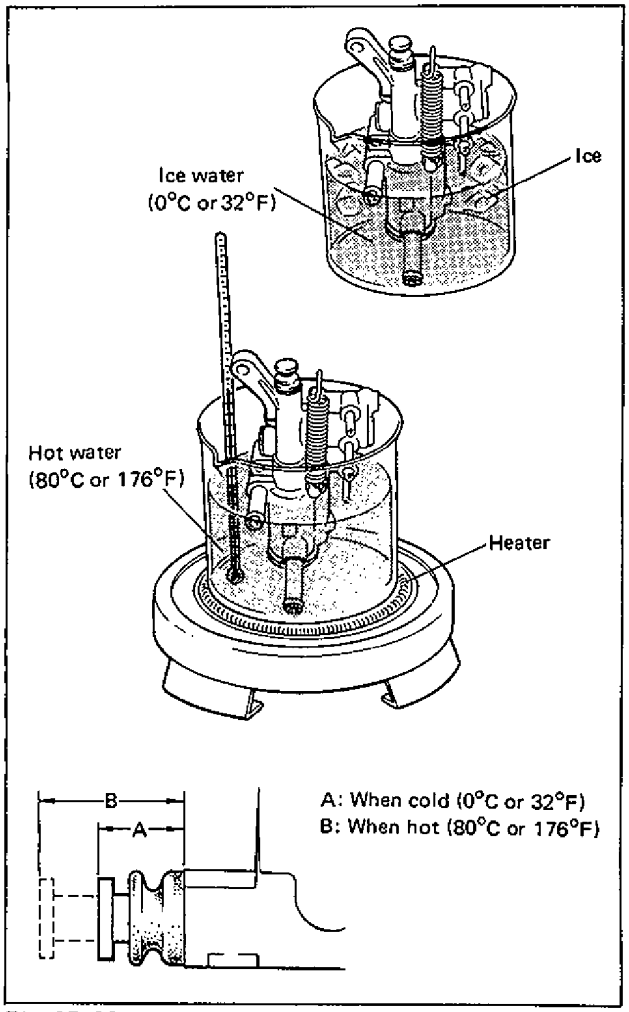


Fig. 6D-39

B – A = 2.9 – 4.1 mm (0.115 – 0.161 in.)

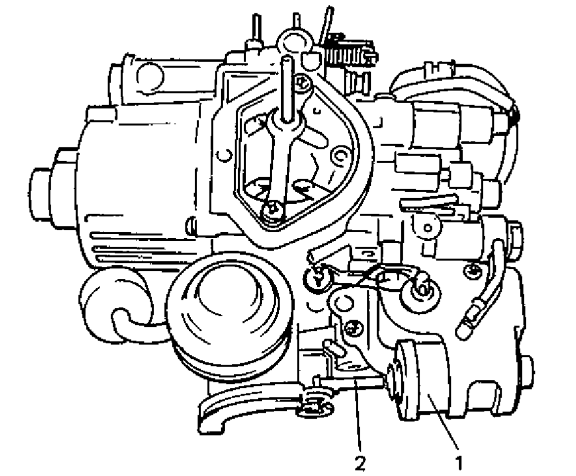
Replace compensator if found defective through above checks.
Never tighten or loosen screw at the end of enrichment rod.

FUEL CUT SYSTEM

INSPECTION

NOTE:
There are two fuel cut solenoids (solenoid No. 1 and No. 2).

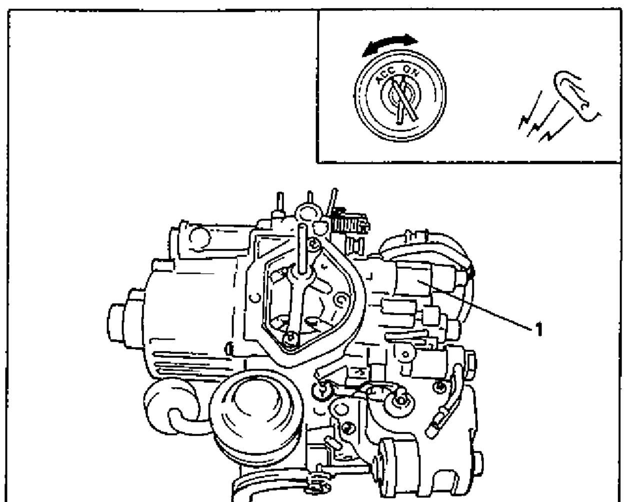
1) Fuel Cut Solenoid No. 1
   Check to ensure that fuel cut solenoid No. 1 push rod is fixed (expanded) when ignition switch key is turned "ON" (without starting engine).



1. Fuel cut solenoid No. 1
2. Push rod

Fig. 6D-40

2) Fuel Cut Solenoid No. 2
   Check to ensure that fuel cut solenoid No. 2 makes "clicking" sound when ignition switch key is turned "ON" and "OFF" (without starting engine).



1. Fuel cut solenoid No. 2

Fig. 6D-40-1

If anything faulty was found in steps 1) or 2), check connector for proper connection. Also, check by using a voltmeter if electric current is obtained at the coupler of solenoid lead wire when ignition key is turned "ON". Correct or replace if defective.

REMOVAL AND INSTALLATION

REMOVAL

1) After making sure that engine is cold, relieve fuel pressure as follows.
   1. Place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), set parking brake, and block drive wheels.
   2. Disconnect coupler from fuel pump relay.
   3. Remove fuel filler cap to relieve fuel vapor pressure in fuel tank and then reinstall it.
   4. Start engine and run it till it stops for lack of fuel. Repeat cranking engine 2 – 3 times of about 3 seconds each time to dissipate fuel pressure in lines.
2) Disconnect negative battery cord from battery.
3) Drain coolant.
4) Remove air cleaner case from carburetor.
5) Disconnect coupler of carburetor solenoid coil lead wire.
6) Disconnect fuel inlet hose from carburetor inlet pipe.
7) Disconnect water inlet and outlet hoses from carburetor.
8) Disconnect accelerator cable from carburetor.
9) Disconnect distributor vacuum advance hose from carburetor.
10) Disconnect vacuum hoses from idle up actuator and throttle positioner.
11) Disconnect other vacuum hoses from carburetor.
12) Check all around carburetor for any other parts required to be removed or disconnected for removal or carburetor and remove or disconnect whatever necessary.
13) Then remove carburetor from intake manifold.

WARNING:
Removal or disassembly of carburetor must be carried out in well-ventilated place where no fire is used around.

INSTALLATION

Install in the reverse order of removal.

NOTE:
Upon completion of installation, be sure to check each part for evidence of fuel leakage and for proper operation. If defective, correct.

UNIT REPAIR OVERHAUL

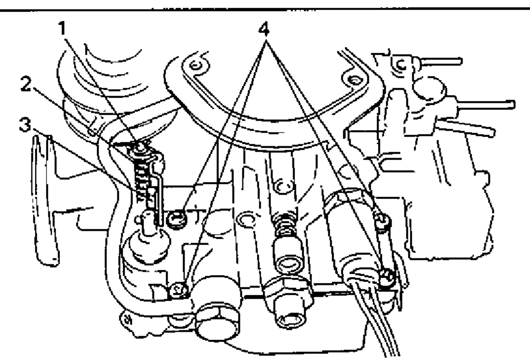
This section outlines procedure to be used for overhauling carburetor as removed from engine.

NOTE:
- **Be sure to replace gaskets as well as worn or damaged parts.**
- **While disassembling and assembling carburetor, use special care not to deform levers on throttle valve shaft or cause damage to any other parts.**
- **Don't disassemble solenoid valve and each actuator.**

WARNING:
When servicing carburetor, keep lighted cigarette and any other fire off near carburetor as it contains gasoline.

FLOAT AND FLOAT CHAMBER

1) Disconnect link rod from accelerator pump lever.
2) Remove accelerator pump lever bolt.
3) Remove float chamber screws.
4) Remove float.

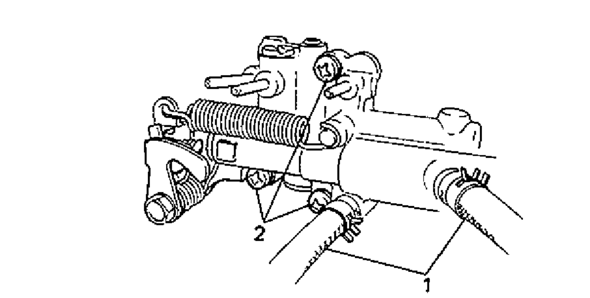


1. Accelerator pump lever link rod
2. Accelerator pump lever
3. Pump lever bolt
4. Float chamber screw

Fig. 6D-41

COLD ENRICHMENT COMPENSATOR

1) Drain coolant and disconnect water hoses and vacuum hoses from compensator.
2) Loosen compensator screws.
3) Remove compensator.



1. Water hose
2. Compensator screw

Fig. 6D-42

NOTE:
- **Don't loosen or tighten screw "A" indicated in the figure below.**
- **Compensator is an ass'y and so disassembly is prohibited. If defective, replace as an ass'y.**

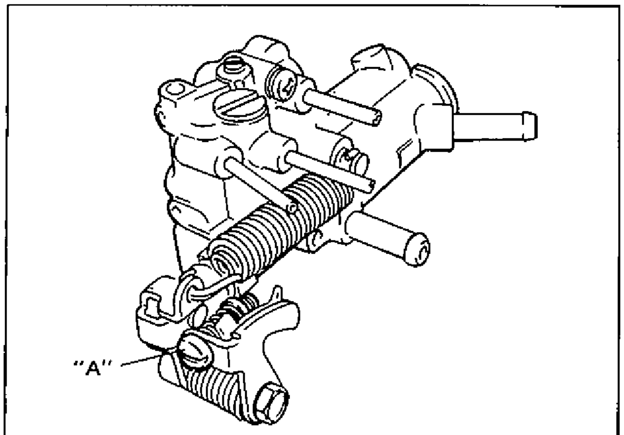


Fig. 6D-43

CLEANING

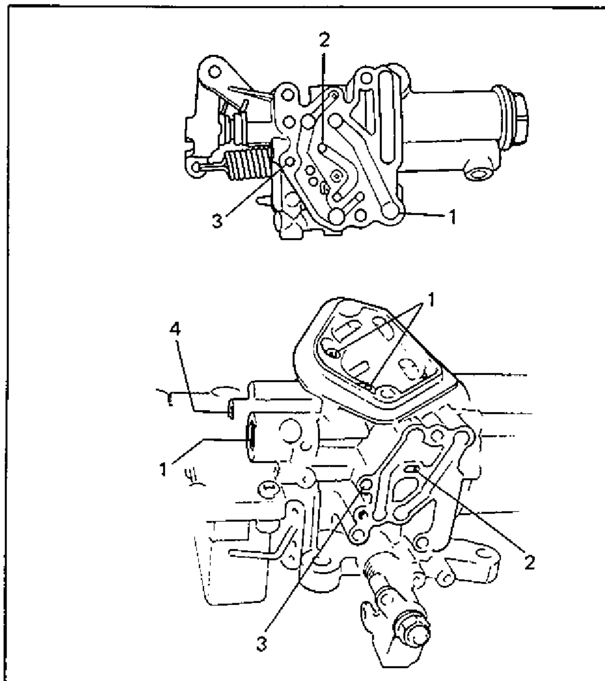
NOTE:

1) Don't immerse following parts in carburetor cleaner.
- **Fuel cut solenoid valve**
- **Accelerator pump piston**
- **Throttle positioner and idle-up actuator**
- **Rubber parts and gaskets**
- **Thermo-wax (cold enrichment compensator)**

2) Don't put drills or wires into fuel passages and metering jets for cleaning. It causes damages in passages and jets.

1) Wash below listed items in carburetor cleaner and then clean them by blowing compressed air.
- All air bleed hole.
- Needle valve, valve seat and filter, and float.

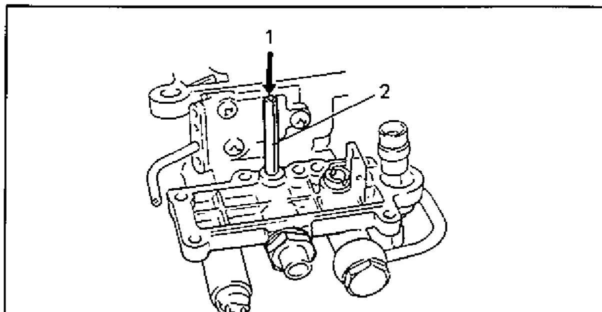
2) Blow compressed air into all passages to clean.
3) Clean bottom of float chamber.



1. Air passage
2. Vacuum passage
3. Main air bleed hole
4. Idle mixture adjusting screw hole

Fig. 6D-44

4) When cleaning metering needle and main jet, remove float chamber and then blow them with compressed air through fuel inlet tube.



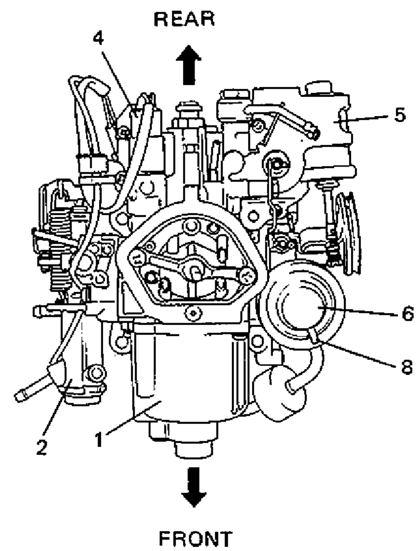
1. Blow air
2. Fuel inlet tube

Fig. 6D-45

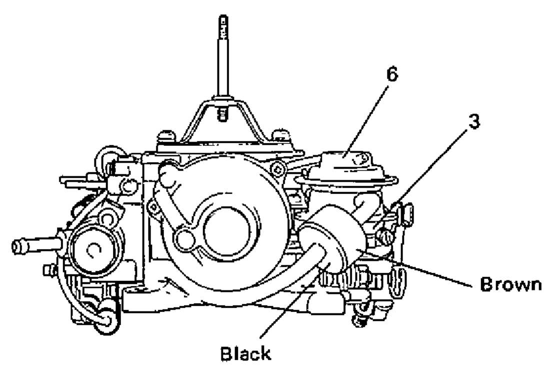
OTHERS

For installation and layout of each lever and linkage of carburetor refer to following figures.

Top view



Front side view



Left side view

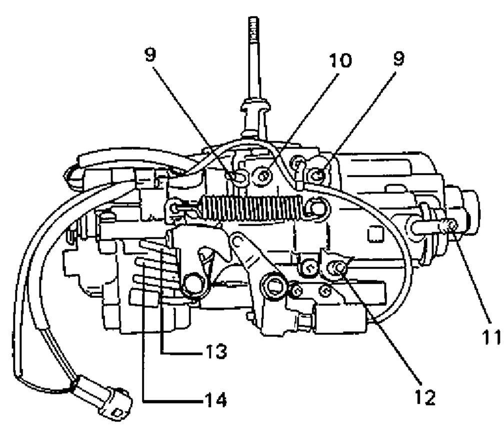
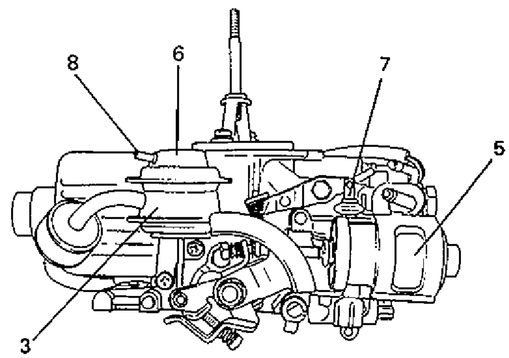
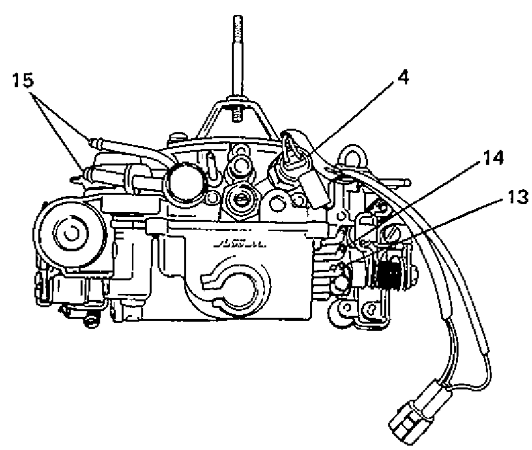


Fig. 6D-46

Right side view



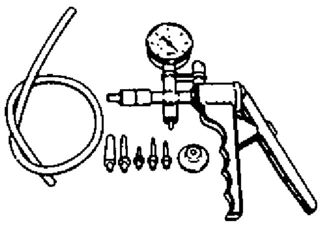
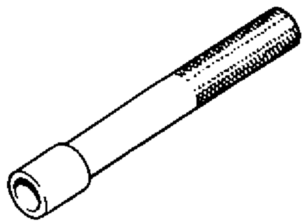
Rear view



1. Suction piston
2. Cold enrichment compensator
3. Throttle positioner
4. Fuel cut solenoid valve
5. Fuel cut solenoid
6. Idle up opener
7. Acceleration pump
8. To VSV
9. To VCV No. 1
10. To BVSV
11. To water pump
12. To intake manifold
13. To TWSV
14. To distributor
15. To fuel hose

Fig. 6D-46-1

SPECIAL TOOL

	
09917-47910 Vacuum pump gauge	09913-18010 Carburetor adjuster

SECTION 6E

ELECTRONIC FUEL INJECTION SYSTEM

(Single-point Throttle Body Fuel Injection System)

NOTE:
Whether following systems (parts) are used in the particular car or not depends on specifications. Be sure to bear this in mind when performing service work.
- **Shift-up indicator light control system (Shift-up indicator light).**

CONTENTS

GENERAL DESCRIPTION 6E- 3
AIR AND FUEL DELIVERY SYSTEM .. 6E- 6
Fuel Pump 6E- 7
Throttle Body 6E- 8
Fuel Injector 6E- 9
Fuel Pressure Regulator 6E- 9
Air Valve 6E-10
ISC Solenoid Valve 6E-11
ELECTRONIC CONTROL SYSTEM 6E-12
Electronic Control Module (ECM)... 6E-16
Pressure Sensor (PS) 6E-18
Throttle Position Sensor (TPS) 6E-18
Air Temperature Sensor (ATS) 6E-19
Water Temperature Sensor (WTS) ... 6E-19
Oxygen Sensor 6E-19
Vehicle Speed Sensor 6E-20
Crank Angle Sensor 6E-20
Ignition Fail Safe Signal 6E-20
Enginen Start Signal 6E-20
"R", "D", "2" or "L" Range Signal (A/T model only) 6E-21
Electric Load Signal 6E-21
Air-Conditioner Signal (Car with air-conditioner only) 6E-21
Battery Voltage 6E-21
Power Steering Signal (If equipped) .. 6E-21
Diagnosis Switch Terminal 6E-21
Test Switch Terminal 6E-21
Fuel Injection Control System 6E-22
Fuel Pump Control System 6E-26
ISC Solenoid Valve Control System ... 6E-27
EGR Control System 6E-28
Shift Up Indicator Light Control System (If equipped) 6E-29
ESA (Electronic Spark Advance) Control System 6E-30
DIAGNOSIS 6E-32
Precautions in Diagnosing Troubles in Electronic Fuel Injection System 6E-32
DIAGNOSTIC FLOW CHART 6E-35
Diagnostic Code Table 6E-36
A-1 ECM Power and Ground Circuit Check 6E-37
A-2 "CHECK ENGINE" Light Circuit Check 6E-38
A-3 "CHECK ENGINE" Light Circuit Check 6E-39
Code No. 13 Oxygen Sensor Circuit ... 6E-40
Code No. 14 WTS Circuit 6E-41
Code No. 15 WTS Circuit 6E-42
Code No. 21 TPS Circuit 6E-43
Code No. 22 TPS Circuit 6E-44
Code No. 23 ATS Circuit 6E-45
Code No. 25 ATS Circuit 6E-46

Code No. 24 Vehicle Speed Sensor Circuit 6E-47
Code No. 31 PS Circuit 6E-48
Code No. 32 PS Circuit 6E-49
Code No. 41 Ignition Fail Safe Signal Circuit 6E-50
Code No. 42 Crank Angle Sensor Circuit 6E-51
Code No. 51 EGR System (California spec. model only) 6E-52
Trouble Diagnosis 6E-53
B-1 Fuel Injector and Its Circuit Check 6E-57
B-2 Fuel Pump and Its Circuit Check 6E-59
B-3 Fuel Pressure Check 6E-60
B-4 ISC Solenoid Valve Control System Check 6E-62
B-5 Engine Start Signal Check 6E-64
B-6 "R", "D", "2" or "L" Range Signal Check (A/T model only) 6E-64
Inspection of ECM and Its Circuits 6E-65
Voltage Check 6E-65
Resistance Check 6E-68

ON CAR SERVICE 6E-69
General 6E-69
Accelerator Cable Adjustment 6E-69
Idle Speed/ISC Duty Adjustment 6E-69

AIR AND FUEL DELIVERY SYSTEM 6E-71
Fuel Pressure Inspection 6E-71
Fuel Pump (On car inspection, removal, inspection and installation) 6E-73
Throttle Body (On car inspection, removal, disassembly, cleaning, assembly and installation) 6E-74
Air Valve (Inspection) 6E-77
Fuel Injector (On car inspection, removal, inspection and installation) 6E-78

ELECTRONIC CONTROL SYSTEM 6E-80
ECM (Removal and installation) 6E-80
PS (Inspection) 6E-81
TPS (Inspection, adjustment, removal and installation) 6E-82
ATS (Removal, inspection and installation) 6E-84
WTS (Removal, inspection and installation) 6E-84
Oxygen Sensor (Removal and installation 6E-85
Vehicle Speed Sensor (Inspection) 6E-85
Main Relay (Inspection) 6E-86
Fuel Pump Relay (Inspection) 6E-87
Fuel Injector Resistor (Inspection) 6E-87
Fuel Cut Operation (Inspection) 6E-87
ISC Solenoid Valve (Inspection) 6E-88
EGR Control System 6E-89
System Inspection 6E-89
Vacuum Hose Inspection 6E-89
EGR Valve Inspection 6E-89
EGR Modulator Inspection 6E-90
VSV Inspection 6E-90
Shift Up Indicator Light Control System (If equipped) 6E-91
System Inspection 6E-91
Shift Up Indicator Light and Its Circuit Inspection 6E-92
Power Steering VSV (If equipped) 6E-93

SPECIAL TOOLS 6E-94

RECOMMENDED TORQUE SPECIFICATIONS 6E-94

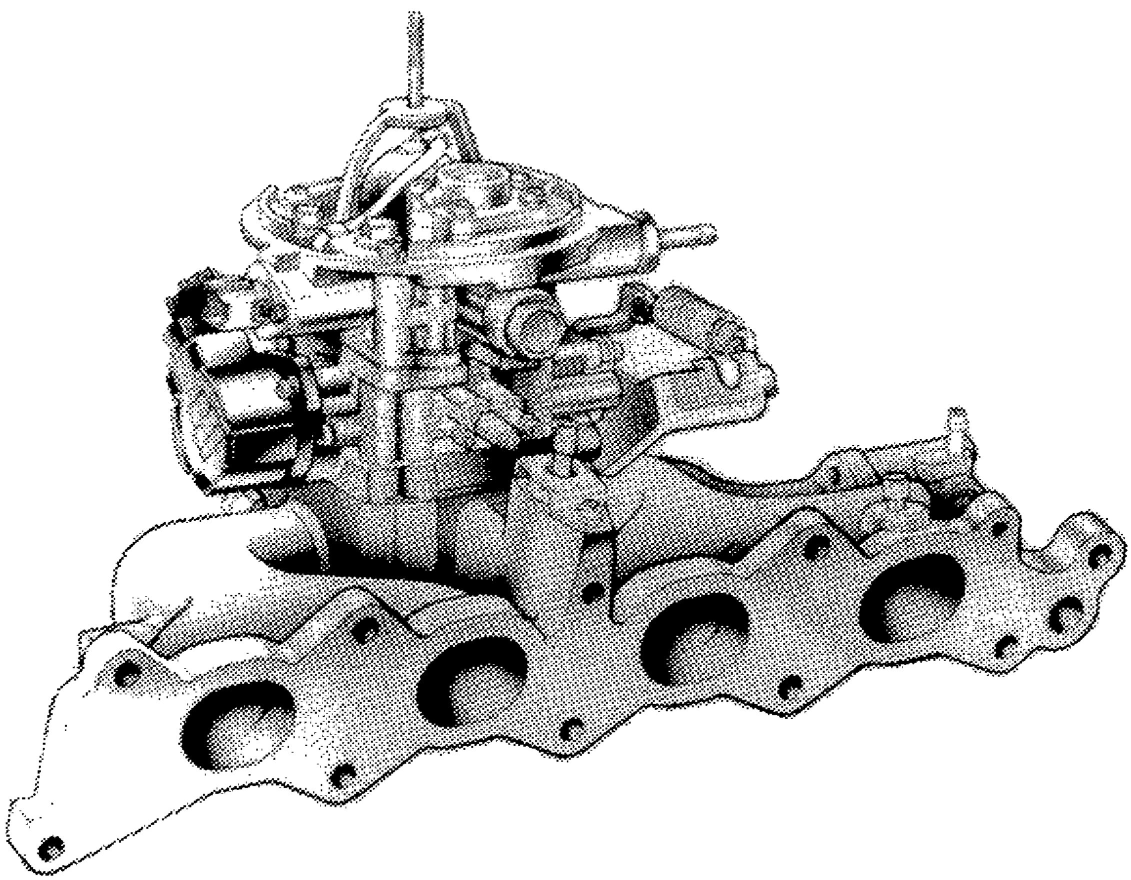
GENERAL DESCRIPTION

The Electronic Fuel Injection system in this car supplies the combustion chambers with air/fuel mixture of optimized ratio under widely varying driving conditions. It uses the single-point throttle body injection system which injects fuel into the throttle body through one injector.

This system has 2 major sub-systems: air/fuel delivery system and electronic control system. Air/fuel delivery system includes fuel pump, throttle body, etc.. Electronic control system includes ECM, various sensors and controlled devices.

This section explains the system related to the electronic fuel injection as well as such functions of ECM as listed below.

- EGR control system
- Shift-up indicator light control system (If equipped)
- Throttle valve opening signal output for A/T
- ESA (Electronic Spark Advance) system



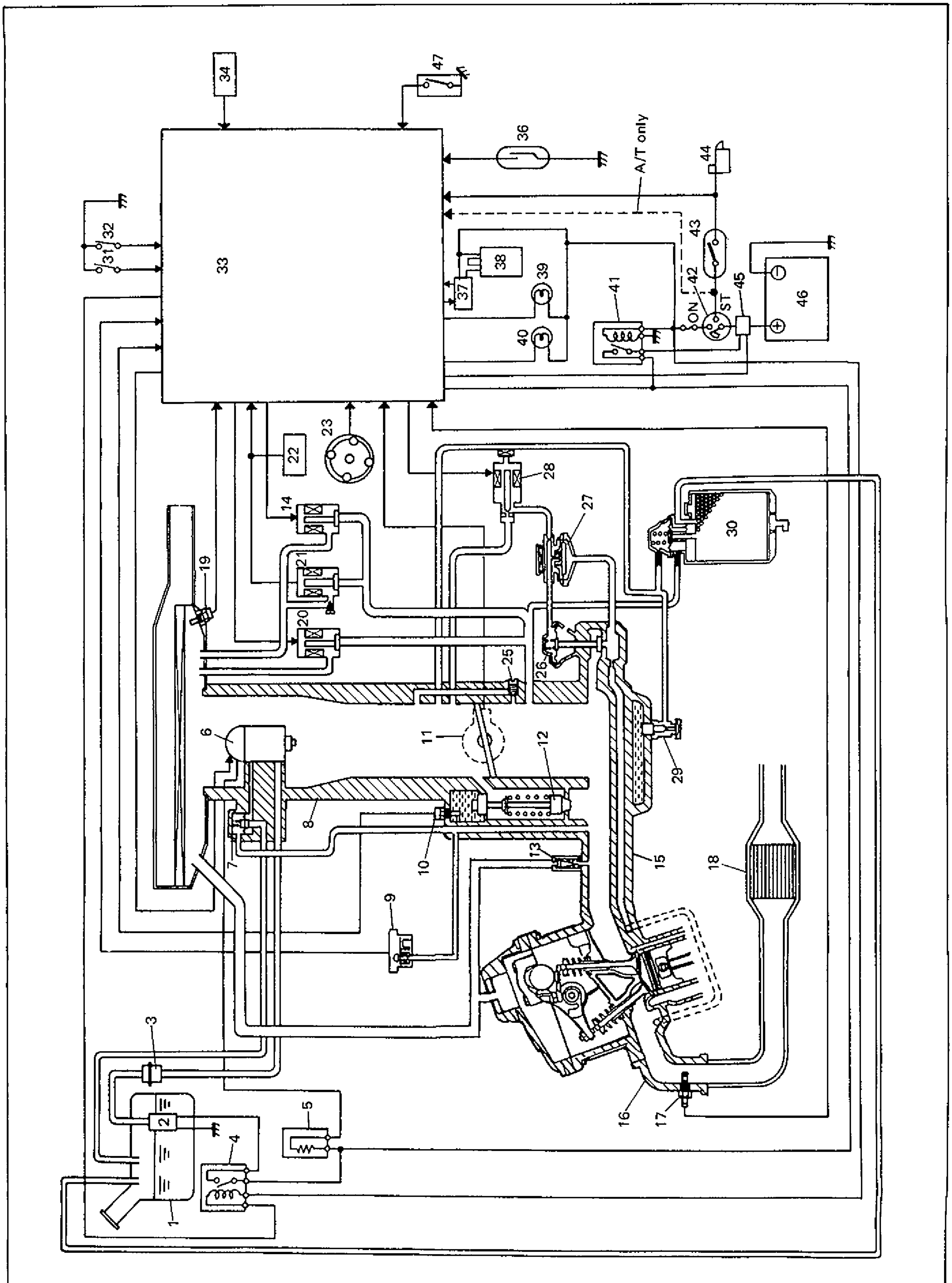


Fig. 6E-1 Electronic Fuel Injection System

1. Fuel tank
2. Fuel pump
3. Fuel filter
4. Fuel pump relay
5. Fuel injector resistor
6. Fuel injector
7. Fuel pressure regulator
8. Throttle body
9. Pressure sensor
10. WTS
11. TPS
12. Air valve
13. PCV valve
14. Power steering VSV (if equipped)
15. Intake manifold
16. Exhaust manifold
17. Oxygen sensor
18. Three-way catalyst
19. ATS
20. ISC solenoid valve
21. Air-conditioner VSV (if equipped)
22. Air-conditioner amplifier (if equipped)
23. CAS (in distributor)
24. Blank
25. Idle speed adjusting screw
26. EGR valve
27. EGR modulator
28. EGR VSV
29. BVSV
30. Charcoal canister
31. Diagnosis switch terminal
32. Test switch terminal
33. ECM
34. Electric load signal
    - Radiator fan
    - Heater blower
    - Rear window defogger (if equipped)
    - Stop light
    - Headlight or small light
35. Blank
36. Vehicle speed sensor
37. Igniter
38. Ignition coil
39. "CHECK ENGINE" light
40. Shift-up indicator light (if equipped)
41. Main relay
42. Main switch
43. Clutch switch (if equipped) or inhibiter switch (A/T)
44. Starter magnetic switch
45. Main fuse
46. Battery
47. Power steering pressure switch (if equipped)

AIR AND FUEL DELIVERY SYSTEM

The main components of this system are fuel tank, fuel pump, fuel filter, throttle body (including fuel injector, fuel pressure regulator and air valve), fuel feed line, fuel return line, air cleaner and ISC solenoid valve.

The fuel in the fuel tank is pumped up by the fuel pump, filtered by the fuel filter and fed under pressure to injector installed in throttle body. As the fuel pressure applied to the fuel injector (the fuel pressure in the fuel feed line) is always kept a certain amount higher than the pressure in the intake manifold by the fuel pressure regulator, the fuel is injected into the throttle body in conic dispersion when the injector opens according to the injection signal from ECM. The fuel relieved by the fuel pressure regulator returns through the fuel return line to the fuel tank.

The injected fuel is mixed with the air which has been filtered through the air cleaner in the throttle body. The air/fuel mixture is drawn through clearance between throttle valve and bore and idle bypass passage into intake manifold. Then the intake manifold distributes the air/fuel mixture to each combustion chamber.

When the engine is cold, the air is drawn through air valve bypassing the throttle valve into the intake manifold.
When ISC solenoid valve opens according to the signal from ECM, the air is drawn through hose bypassing the throttle valve into the intake manifold.

For the structure and operation of the fuel tank and filter, refer to SECTION 6C "ENGINE FUEL".

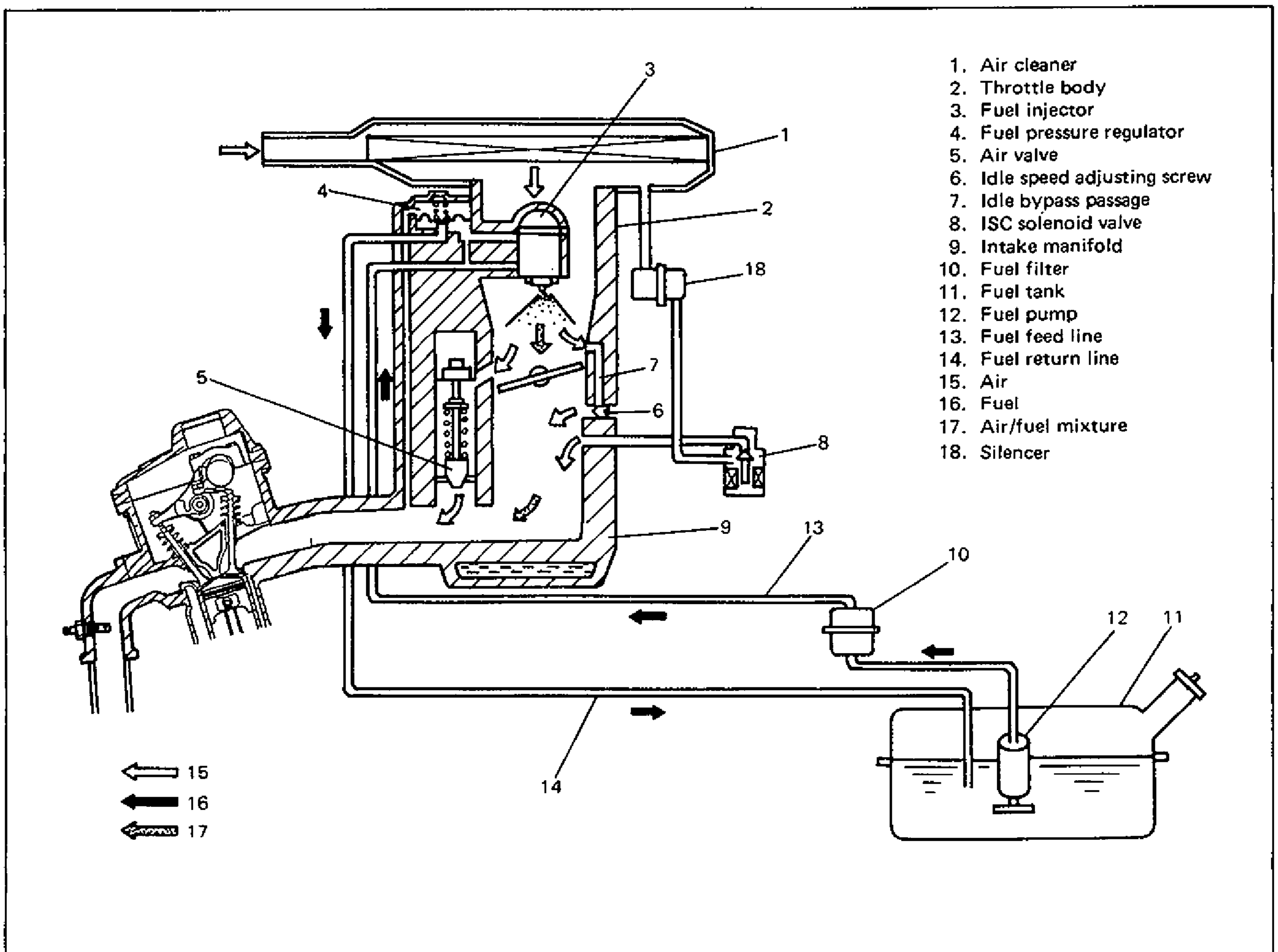


Fig. 6E-3 Air and Fuel Delivery System

FUEL PUMP

The electric fuel pump located in the fuel tank consists of armature, magnet, impeller, brush, check valve, etc.. The ECM controls its ON/OFF operation as described under "Fuel Pump Control System" included in later part of this section.

Operation

When power is supplied to the fuel pump, the motor in the pump runs and so does the impeller. This causes a pressure difference to occur between both sides of the impeller as there are many gooves around it. Then the fuel is drawn through the inlet port, and with its pressure increased it is discharged through the outlet port.
The fuel pump also has a check valve to keep some pressure in the fuel feed line even when the fuel pump is stopped.

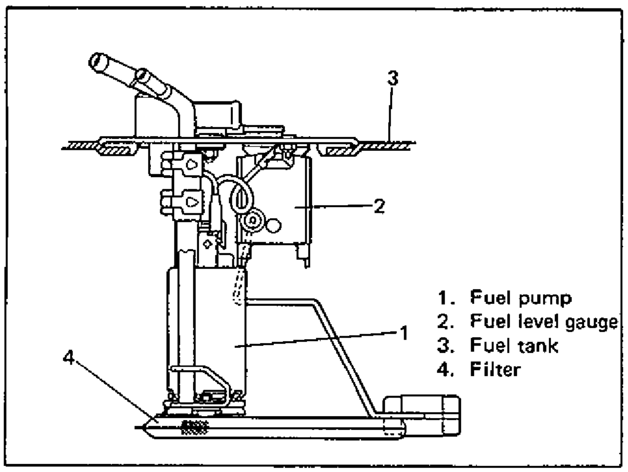


Fig. 6E-4 Fuel Pump Mounting

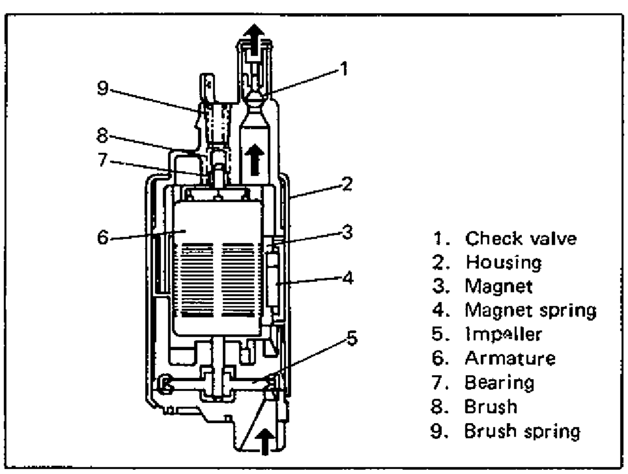
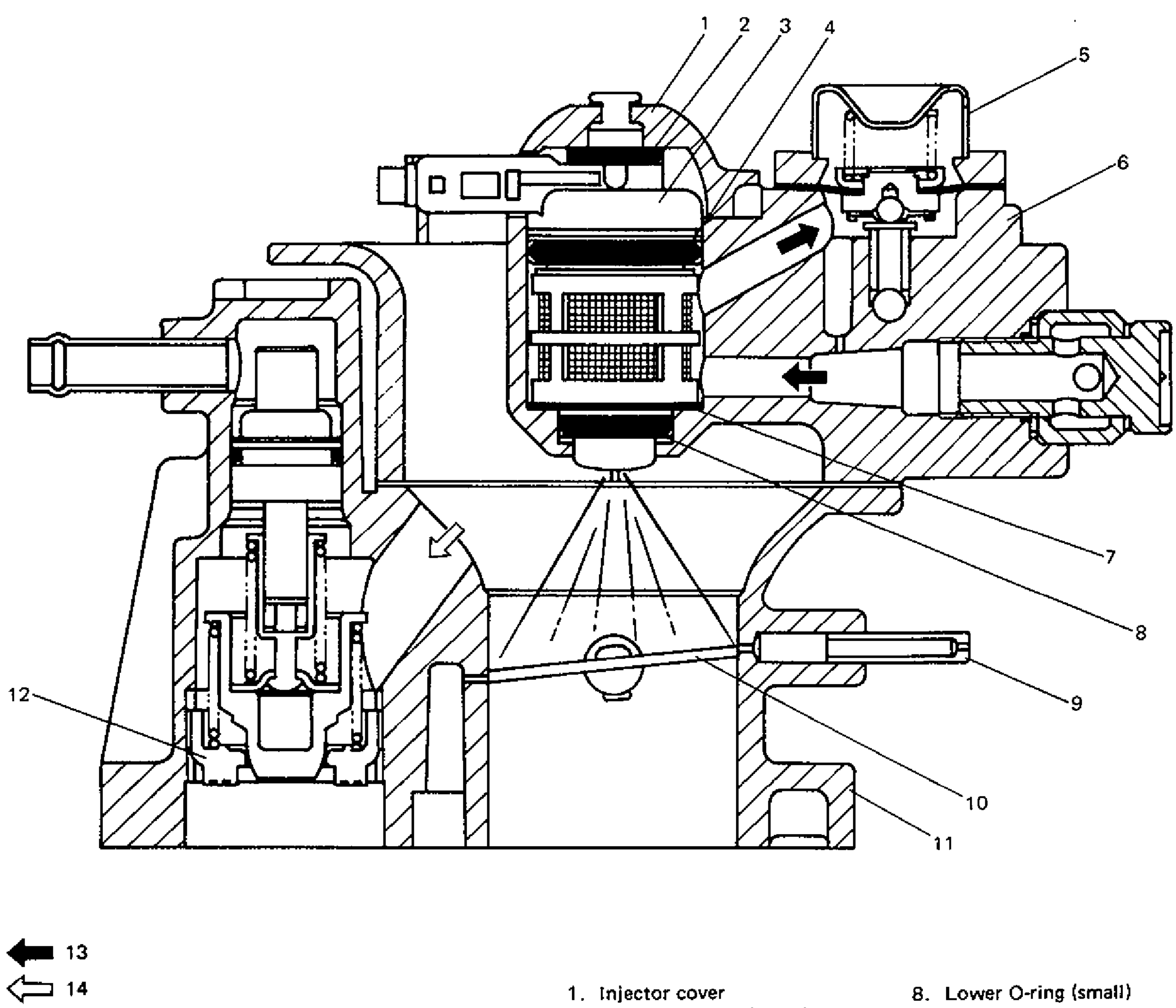


Fig. 6E-5 Fuel Pump Cross-Section

THROTTLE BODY

The throttle body consists of the main bore, air and/or fuel passage, vacuum passage (for pressure sensor, ignition timing vacuum advancer, evaporative emission control system and EGR system), air induction passage and the following parts.

- Fuel injector which injects fuel according to the signal from ECM.
- Fuel pressure regulator which maintains the fuel pressure to the injector a certain amount higher than the pressure in the intake manifold.
- Throttle valve which is interlocked with the accelerator pedal and controls the amount of the air/fuel mixture drawn into the combustion chamber.
- Air valve which supplies the bypass air when engine is cold.
- Idle speed adjusting screw which controls the amount of bypass air to adjust engine idle speed.
- TPS which detects the throttle valve opening and sends a signal to ECM.



1. Injector cover
2. Upper insulator (small)
3. Fuel injector
4. Upper O-ring (large)
5. Fuel pressure regulator
6. Upper body
7. Lower insulator (large)
8. Lower O-ring (small)
9. Vacuum nozzle
10. Throttle valve
11. Lower body
12. Air valve
13. Fuel
14. Air

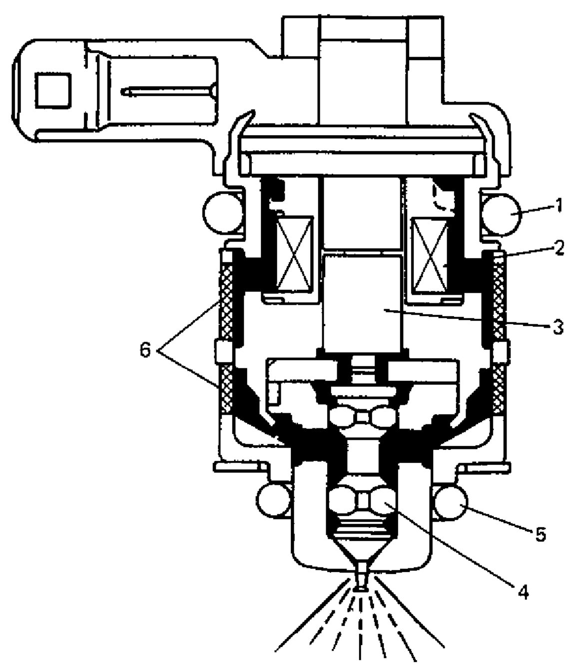
Fig. 6E-6 Throttle Body Cross-Section

FUEL INJECTOR

It is an electromagnetic type injection nozzle which injects fuel in the throttle body bore according to the signal from ECM.

Operation

When the solenoid coil of the injector is energized by ECM, it becomes an electromagnet and attracts the plunger. At the same time, the needle valve which is incorporated with the plunger opens and the injector which is under the fuel pressure injects fuel in conic dispersion. As the lift stroke of the needle valve of the injector is set constant, the amount of fuel injected at one time is determined by the length of time during which the solenoid coil is energized (injection time).

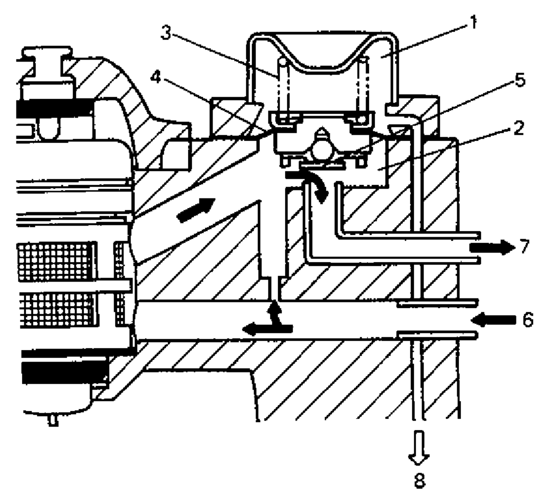


1. O-ring (large)
2. Coil
3. Plunger
4. Needle valve
5. O-ring (small)
6. Filter

Fig. 6E-7 Fuel Injector Cross-Section

FUEL PRESSURE REGULATOR

The fuel pressure regulator is diaphragm-operated relief valve consisting of diaphragm, spring and valve. It keeps the fuel pressure applied to the injector 1.8 kg/cm^2 (180 kPa, 25.6 psi) higher than that in the intake manifold at all times.
The pressure applied to the chamber "A" of fuel pressure regulator is intake manifold pressure and that to the chamber "B" is fuel pressure. When the fuel pressure rises more than 1.8 kg/cm^2 (180 kPa, 25.6 psi) higher than the intake manifold pressure, the fuel pushes the valve in the regulator open and excess fuel returns to the fuel tank via the return line.



1. Chamber "A"
2. Chamber "B"
3. Spring
4. Diaphragm
5. Valve
6. From fuel pump
7. To fuel tank
8. Intake manifold pressure (vacuum)

Fig. 6E-8 Pressure Regulator Cross-Section

AIR VALVE

The air valve consists of thermo-wax, springs and valve.

When the engine is cold, it sends the air into the intake manifold without letting it pass through the throttle valve to increase the engine speed, and thus the engine is warmed up.

Operation

When the engine is cold (or engine cooling water is lower than about 80°C (176°F)), the thermo-wax contracts.

In this state, the valve opens by the spring force, allowing the air to be drawn into the intake manifold. Thus the amount of intake air increases even when the throttle valve is at the idle position and the engine speed rises to the fast idle state which is higher than the idle speed.

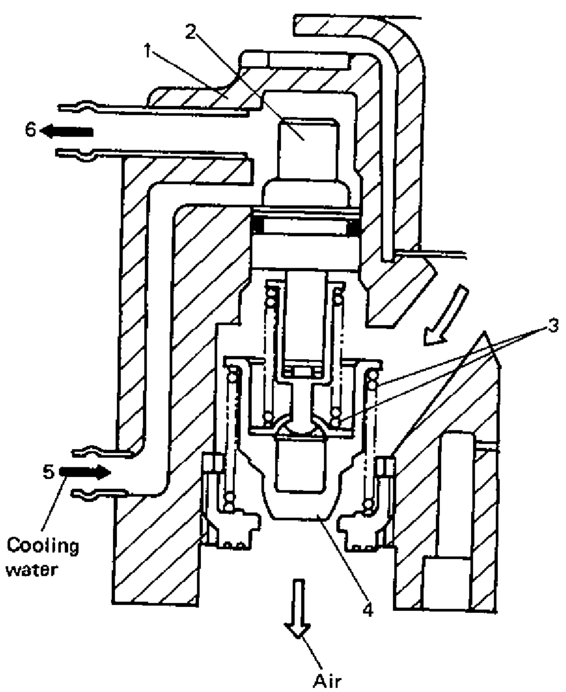


Fig. 6E-9 Opening Air Valve

As the engine is warmed up, the thermo-wax expands gradually, then the piston pushes down the valve gradually, and the amount of air passing through the air valve decreases and so does the engine speed. When the engine cooling water temperature reaches about 80°C (176°F), the valve is fully closed and the engine speed is back to the normal idle speed.

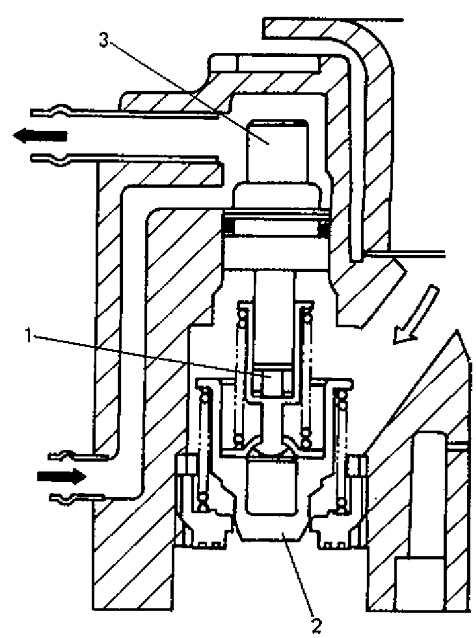


Fig. 6E-10 Closing Air Valve

ISC (Idle Speed Control) SOLENOID VALVE

The ISC solenoid valve opens and closes air by-pass passage according to the signal from ECM. When it opens, the air is supplied to the intake manifold.

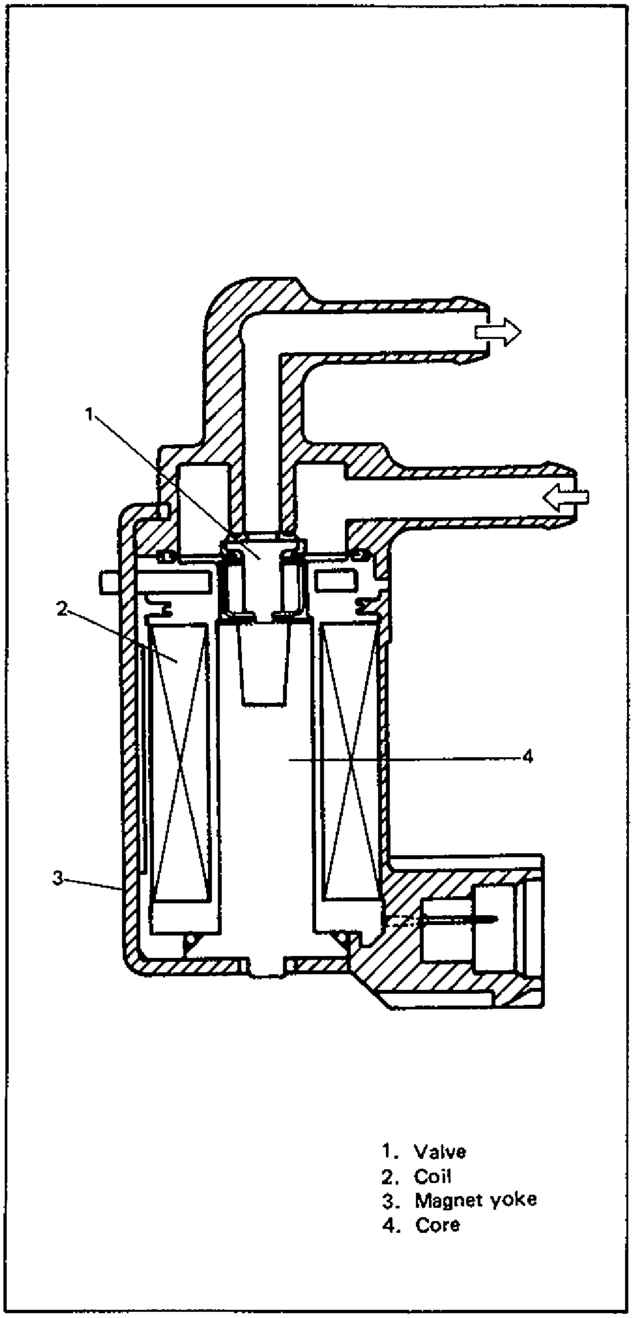


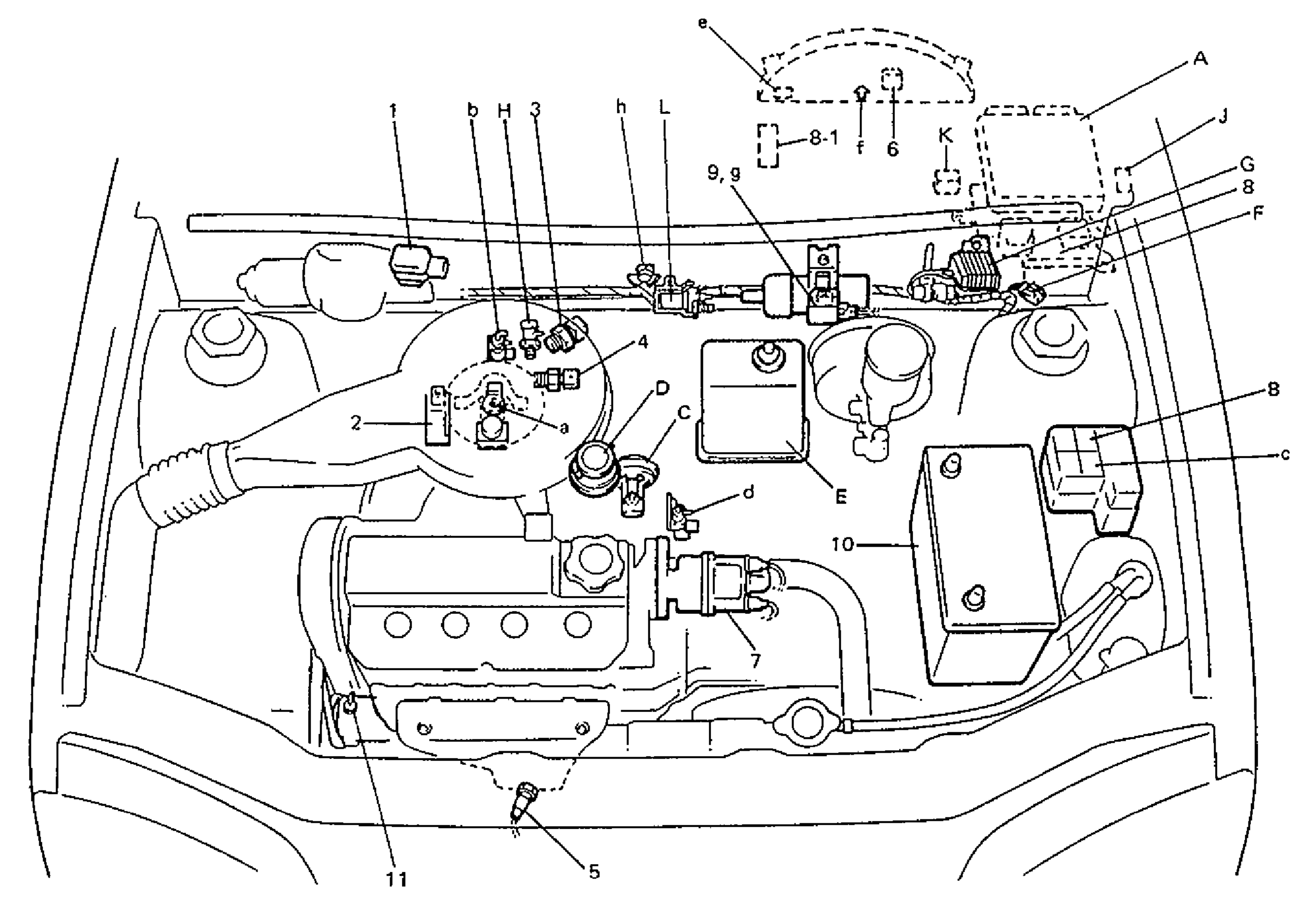
Fig. 6E-10-1 ISC Solenoid Valve Cross-Section

ELECTRONIC CONTROL SYSTEM

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

- Fuel injection control system
- ISC solenoid valve control system
- Fuel pump control system
- EGR control system
- Shift-up indicator light control system (If equipped)
- ESA (Electronic Spark Advance) system

Also, with A/T model ECM sends throttle valve opening signal to A/T control module to control A/T.



INFORMATION SENSORS
1. Pressure sensor
2. TPS
3. ATS
4. WTS
5. Oxygen sensor
6. VSS
7. CAS (in distributor)
8. Diagnosis switch terminal on junction/fuse block (Not for Germany spec. model)

8-1. Diagnosis switch (Germany spec. model only)

9. Igniter (power unit)
10. Battery
11. P/S pressure switch (If equipped)

CONTROLLED DEVICES
- a : Fuel injector
- b : ISC solenoid valve
- c : Fuel pump relay
- d : EGR VSV
- e : "CHECK ENGINE" light
- f : Shift-up indicator light (if equipped)
- g : Igniter (Power unit)
- h : P/S VSV (if equipped)

OTHER
- A : ECM
- B : Main relay
- C : EGR valve
- D : EGR modulator
- E : Canister
- F : Monitor coupler
- G : Injector resistor
- H : BVSV
- J : Electric load diode
- K : Serial data coupler (Assembly line diag. link)
- L : A/C VSV (if equipped)

Fig. 6E-11 Parts Location

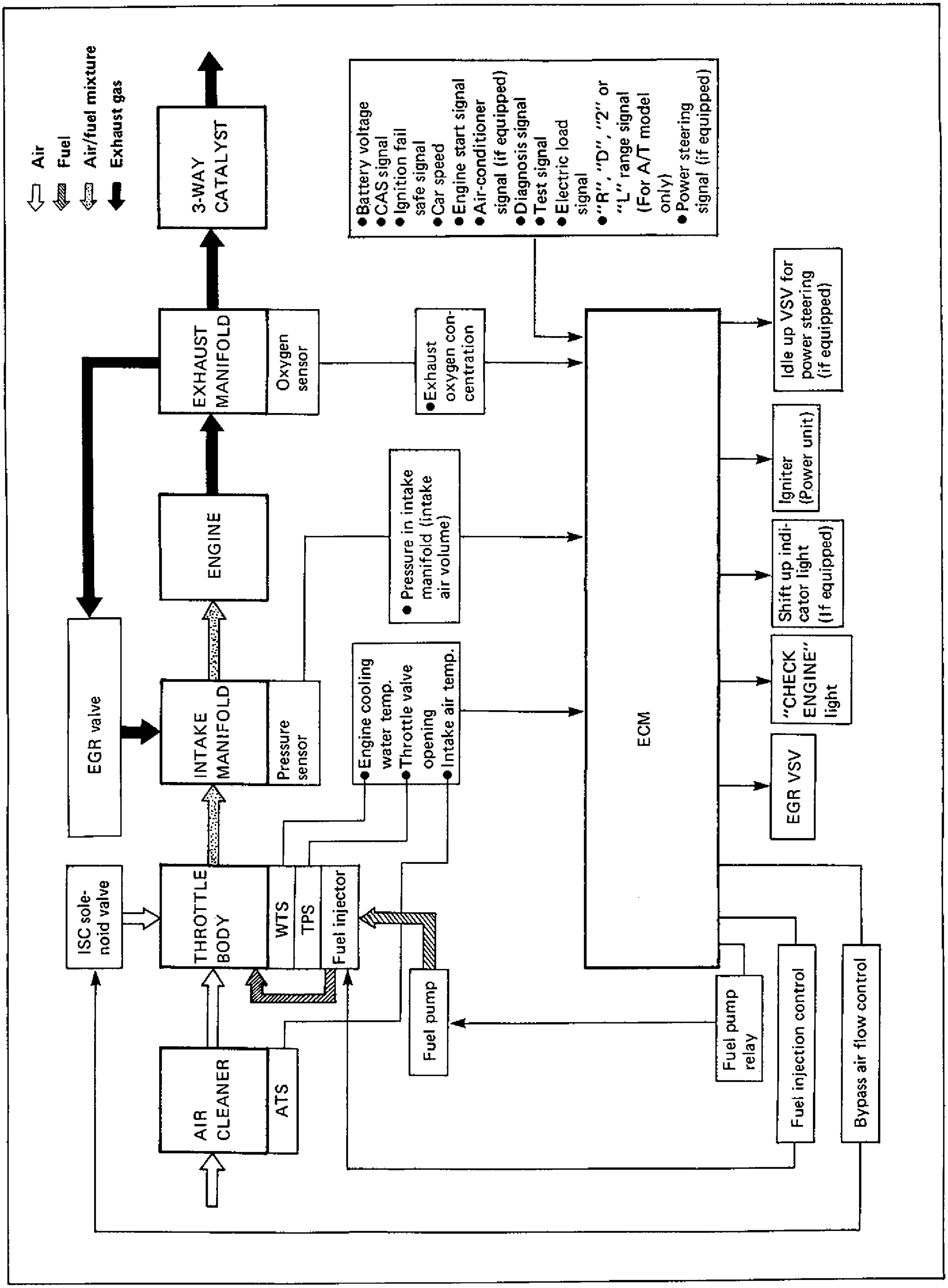


Fig. 6E-12 System Schematic

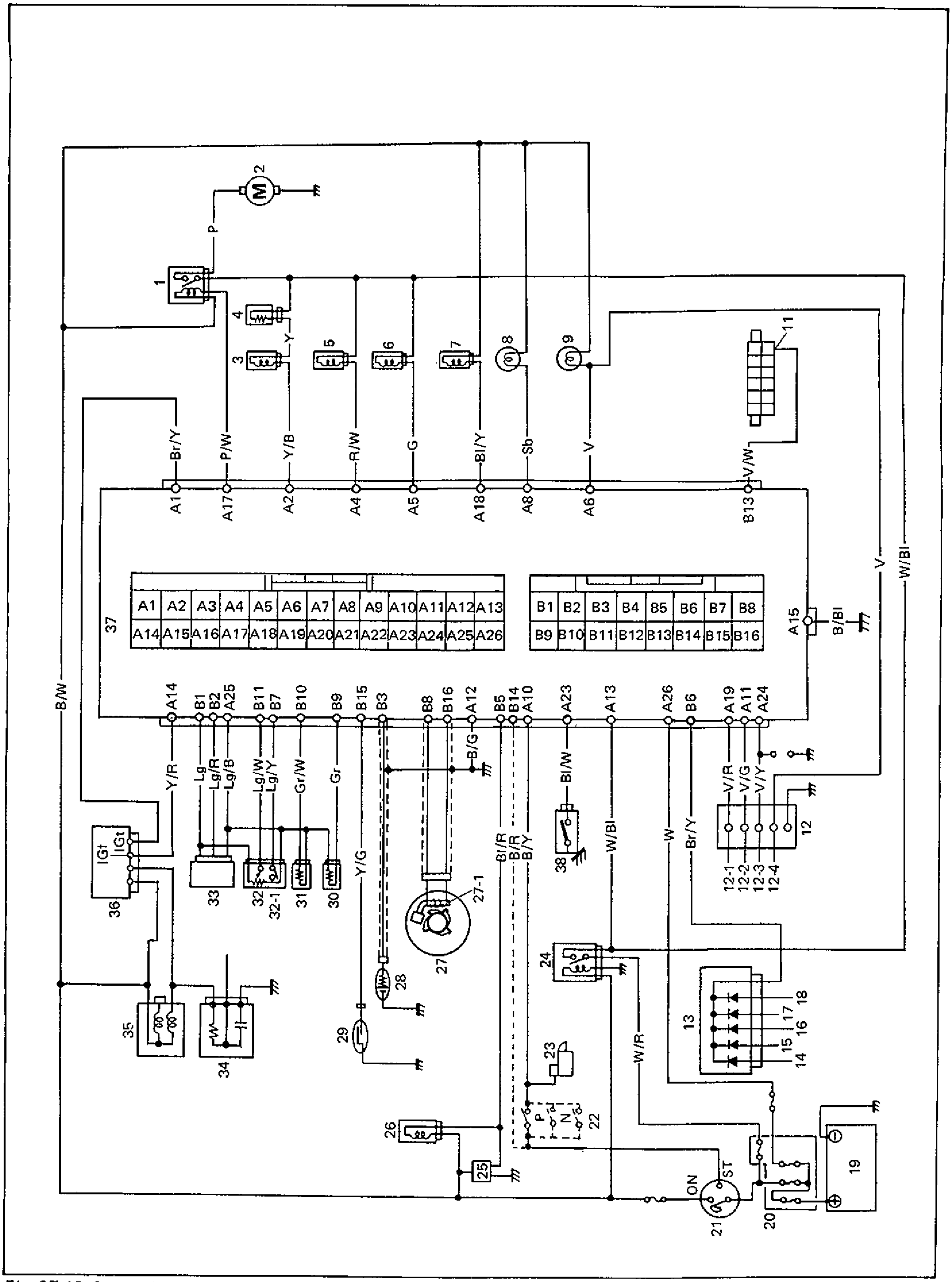


Fig. 6E-13 System Wiring Diagram

1. Fuel pump relay
2. Fuel pump
3. Fuel injector
4. Resistor
5. ISC solenoid valve
6. EGR VSV
7. Power steering VSV for idle up (if equipped)
8. Shift-up indicator light (if equipped)
9. "CHECK ENGINE" light
10. Blank
11. Serial data terminal (Assembly line diag. link)
12. Moniter coupler
12-1. Duty output terminal
12-2. Test switch terminal
12-3. Diag. switch terminal
12-4. Diag. output terminal
13. Diode
14. To radiator fan switch
15. To heater blower switch
16. To stop light switch
17. To lighting switch
18. To rear window defogger switch (if equipped)
19. Battery
20. Main fuse box
21. Main switch
22. Clutch switch (M/T, if equipped) or inhibiter switch (A/T)
23. Starter magnetic switch
24. Main relay
25. Air-conditioner amplifier (if equipped)
26. Air-conditioner VSV (if equipped)
27. Distributor
27-1. Crank angle sensor
28. Oxygen sensor
29. Vehicle speed sensor
30. Air temp. sensor
31. Water temp. sensor
32. Throttle position sensor
32-1. Idle switch
33. Pressure sensor
34. Noise suppressor
35. Ignition coil
36. Ignitor
37. ECM
38. Power steering pressure switch (if equipped)

Wire color

B : Black
B/Bl : Black/Blue
B/G : Black/Green
B/R : Black/Red
B/W : Black/White
B/Y : Black/Yellow
Bl/R : Blue/Red
Bl/Y : Blue/Yellow
Br : Brown
Br/B : Brown/Black
Br/R : Brown/Red
Br/W : Brown/White
Br/Y : Brown/Yellow
G : Green
Gr : Gray
Gr/W : Gray/White
Lg : Lightgreen
Lg/B : Lightgreen/Black
Lg/R : Lightgreen/Red
Lg/W : Lightgreen/White
Lg/Y : Lightgreen/Yellow
P : Pink
P/W : Pink/White
R/W : Red/White
Sb : Skyblue
V : Violet
V/G : Violet/Green
V/R : Violet/Red
V/W : Violet/White
V/Y : Violet/Yellow
W : White
W/Bl : White/Blue
W/R : White/Red
Y : Yellow
Y/B : Yellow/Black
Y/G : Yellow/Green
Y/R : Yellow/Red

Electronic 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, 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, ISC solenoid valve, fuel pump relay, etc. but also self-diagnosis function and fail-safe function as described in the following section.

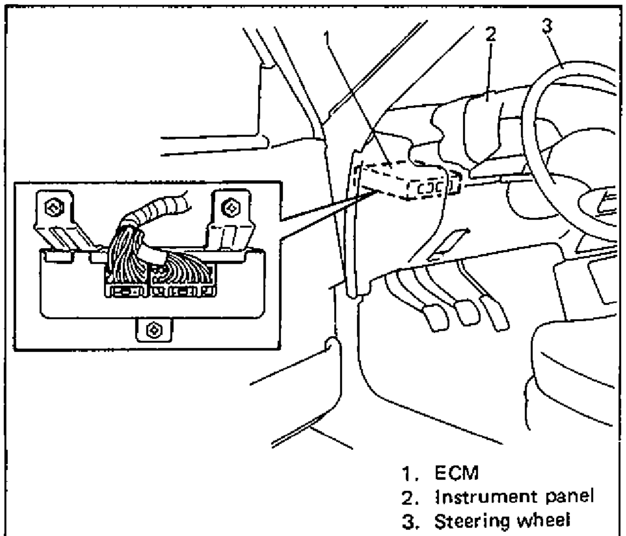


Fig. 6E-15 ECM Location

Self-diagnosis function

ECM diagnoses troubles which may occur in the area including the following parts when the ignition switch is ON and the engine is running, and indicates the result by turning on or flashing "CHECK ENGINE" light.

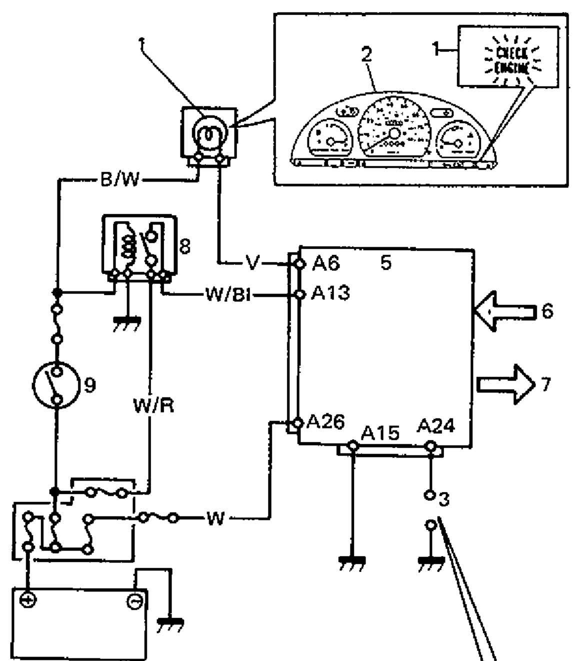
- Oxygen sensor
- Water temp. sensor
- Throttle position sensor
- Air temp. sensor
- Pressure sensor
- Ignition fail safe signal
- Vehicle speed sensor
- EGR system (For California spec. vehicle only)
- CPU (Central Processing Unit) of ECM
- CAS

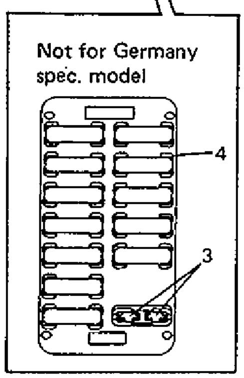
ECM and "CHECK ENGINE" light operate as follows.

- "CHECK ENGINE" light lights when the ignition switch is turned ON (but the engine at stop) with the diagnosis switch terminal ungrounded regardless of the condition of Electronic Fuel Injection system. This is only to check the "CHECK ENGINE" light turns OFF.
- If the above areas of Electronic Fuel Injection system is free from any trouble after the engine start (while engine is running), "CHECK ENGINE" light turns OFF.
- When ECM detects a trouble which has occurred in the above areas, it makes "CHECK ENGINE" light turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the trouble area in ECM back-up memory.
  (The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to ECM is shut off for 60 seconds or longer.)
  ECM also indicates trouble area in memory by means of flashing of "CHECK ENGINE" light at the time of inspection (i.e. when diagnosis switch terminal is grounded and ignition switch is turned ON).

NOTE:

- **When a trouble occurs in the above areas except EGR system and disappears soon while the diagnosis switch terminal is ungrounded and the engine is running, "CHECK ENGINE" light lights and remains ON as long as the trouble exists but it turns OFF when the normal condition is restored.**
- **When it is EGR system where a trouble occurs, even if it is only a temporary one and disappears soon, "CHECK ENGINE" light remains ON till the ignition switch is turned OFF. (For California spec. car only)**
- **Only ignition circuit trouble (code No. 41) is not stored in back-up memory of ECM. (in other words, even if ECM has detected a trouble in ignition circuit, once ignition switch is turned OFF, code No. 41 will not be indicated even when diagnosis switch terminal is grounded and ignition switch is turned ON.). Therefore, to check diagnostic code when engine fails to start, crank engine and then ground diagnostic switch terminal with ignition switch ON.**

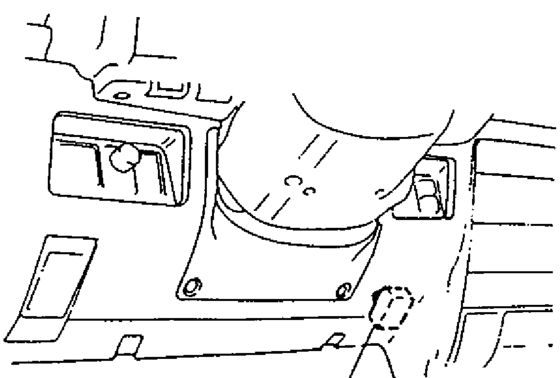




1. "CHECK ENGINE" light
2. Cluster
3. Diagnosis switch terminals
4. Junction/fuse block
5. ECM
6. Sensed information
7. Output
8. Main relay
9. Ignition switch

NOTE:

Germany spec. model is not provided with a diagnosis switch terminal in the fuse box but instead a diagrosis switch is installed to the underside of the instrument panel as shown below.



1. Diagnosis switch

Fig. 6E-16 "CHECK ENGINE" Light Circuit

Fail-safe function

Even when a trouble has occurred in such area of Electronic Fuel Injection system that includes the following parts and a failure signal is sent to ECM, control over the injector, ISC solenoid valve and others is maintained on the basis of the standard signals and/or back-up program prestored in the ECM while ignoring that failure signal and/or CPU. This function is called "fail-safe function". Thus, with this function, a certain level of engine performance is available even when some failure occurs in such area and disability in running is avoided.

- Water temp. sensor
- Throttle position sensor
- Vehicle speed sensor
- Air temp. sensor
- Pressure sensor
- CPU in ECM

Pressure (intake manifold absolute pressure) Sensor (PS)

This sensor senses pressure change in the intake manifold and converts it into voltage change. It consists of a semi-conductor type pressure converting element which converts a pressure change into an electrical change and an electronic circuit which amplifies and corrects the electric change.
The ECM sends a 5-volt reference voltage to the pressure sensor. As the manifold pressure changes, the electrical resistance of the sensor also changes. By monitoring the sensor output voltage, ECM knows the manifold pressure (intake air volume).

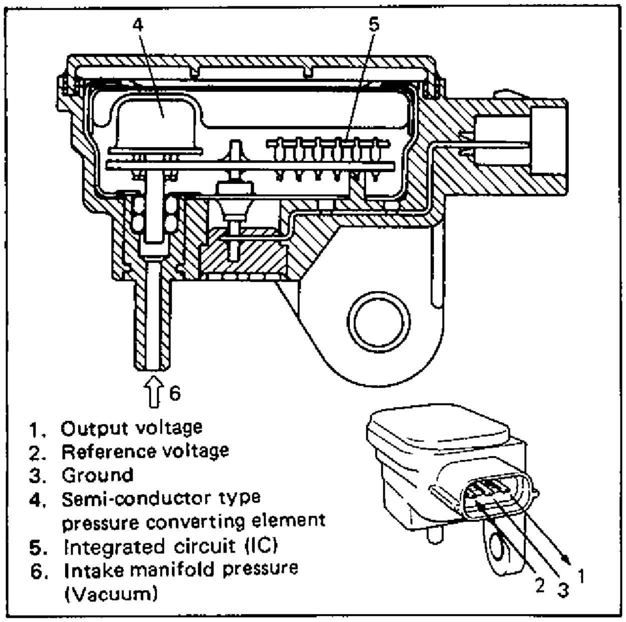


Fig. 6E-17 Pressure Sensor

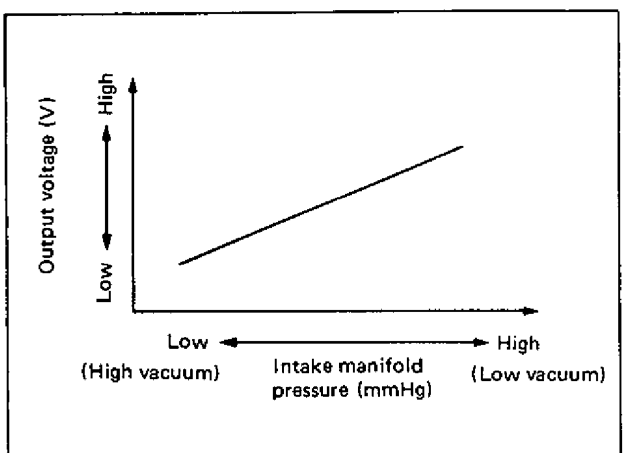


Fig. 6E-18 Output Characteristic

ECM uses the voltage signal from the pressure sensor as one of the signals to control fuel injector, ISC solenoid valve, shift-up indicator light and EGR VSV.

Throttle Position Sensor (TPS)

The throttle position sensor consisting of a contact point (idle switch) and a potentiometer is connected to the throttle valve shaft on the throttle body, and detects the throttle valve opening.
The throttle opening in the idle state is detected by means of the contact point which turns ON in that state.
But beyond that the full opening is detected by the potentiometer as follows.
A 5-volt reference voltage is applied to the sensor from ECM and as its brush moves over the print resistance according to the throttle valve opening, the output voltage varies accordingly.
By monitoring the ON/OFF signal and sensor output voltage, ECM detects the throttle valve opening.

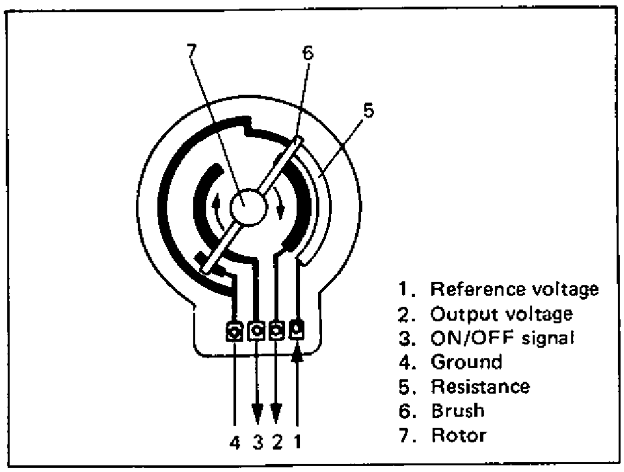


Fig. 6E-20 Throttle Position Sensor

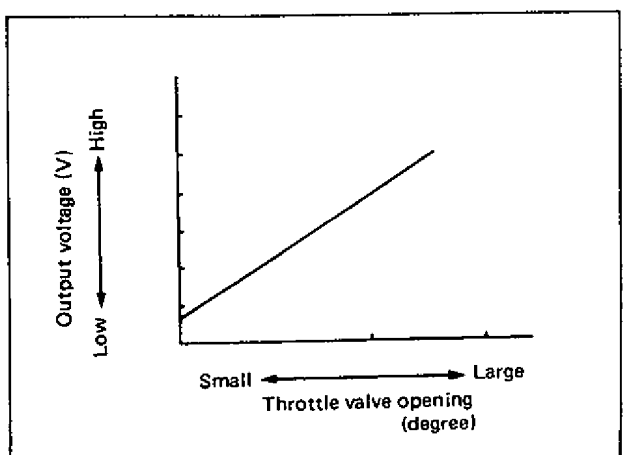


Fig. 6E-21 Output Characteristic

ECM uses the signal from TPS as one of the signals to control fuel injector, ISC solenoid valve and EGR VSV.

Air Temperature Sensor (ATS)

Located at the side of air cleaner case, this sensor constantly measures the temperature of the air entering there and converts a change in the air temperature into that in resistance through its thermister. That is, as air temperature lowers, resistance increases and as it rises, resistance decreases. As air density of the intake air varies with variation in temperature, ECM, by monitoring the resistance, adjusts the amount of fuel injection according to the air temperature.

Water Temperature Sensor (WTS)

Located at the side of throttle body, this sensor measures the temperature of the engine cooling water and converts its change into that in resistance through the thermister like the air temperature sensor.

That is, as cooling water temperature lowers, resistance increases and as it rises, resistance decreases.

By monitoring the resistance of the water temperature sensor, ECM detects the engine cooling water temperature and that affects most systems under the control of ECM.

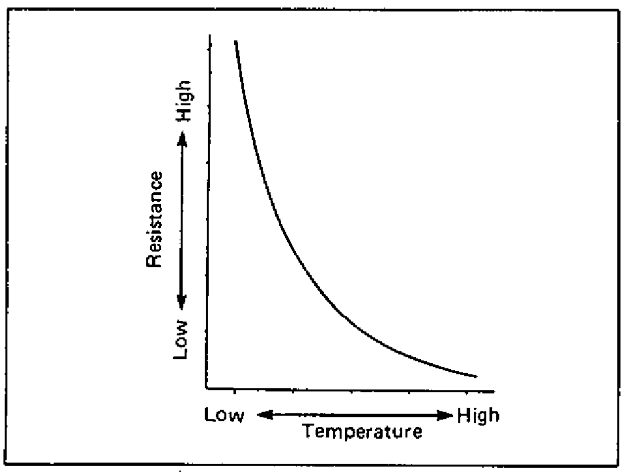


Fig. 6E-22 Air/Water Temperature Sensor Characteristic

Oxygen Sensor

The oxygen sensor is located on the exhaust manifold to detect the concentration of oxygen in the exhaust gases. It consists of the zirconia element (with thin platinum surface coating) which generates electromotive force, lead wire which draws out the electromotive force and cover and housing which protect the zirconia element from damage.

The zirconia element, by its property, generates the electromotive force when a difference in oxygen concentration exists between its faces. As its temperature rises, the change of the electromotive force is amplified by catalytic reaction of the platinum. The oxygen sensor makes use of this property. As atmosphere is introduced into the oxygen sensor, the inside of the zirconia element is exposed to the atmosphere and outside to exhaust gases. Thus the difference in concentration between the inside and the outside of the zirconia element varies with the oxygen concentration in the exhaust gases.

The large concentration difference results in about 1V of the electromotive force and small difference results in about 0V. To put in other words, if the amount of oxygen in the exhaust gases is less (air-fuel mixture is richer than the stoichiometric mixture), about 1V of electromotive force is generated and if more (air-fuel mixture is leaner than the stoichiometric mixture), almost none is generated.

In this way, the oxygen sonsor detects whether the oxygen concentration is high or low (or the mixture is leancer or richer than the stoichiometric mixture).

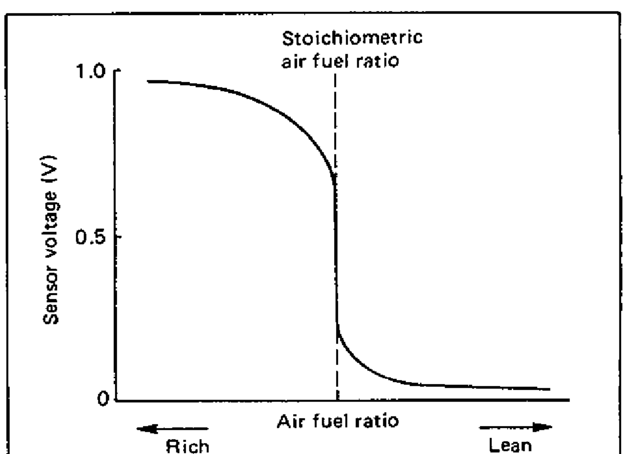


Fig. 6E-23 Output Characteristic

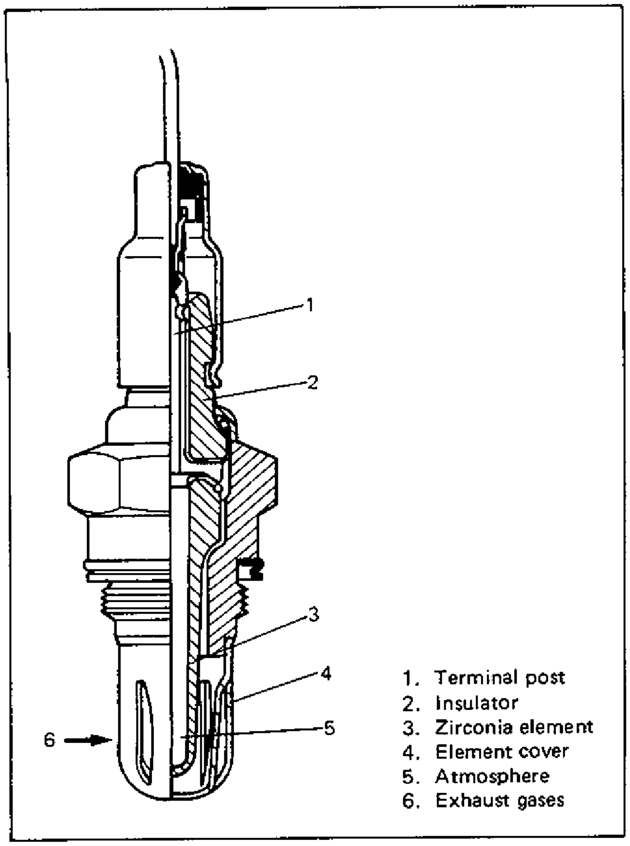


Fig. 6E-24 Oxygen Sensor

Vehicle Speed Sensor

The speed sensor consisting of the lead switch and magnet is built in the speedometer. As the magnet turns with the speedometer cable, its magnetic force causes the lead switch to turn ON and OFF. Such ON/OFF frequency increases or decreases in proportion with the car speed and is sent to ECM as pulse signals.

ECM uses it as one of the signals to control the ISC solenoid valve and shift-up indicator light.

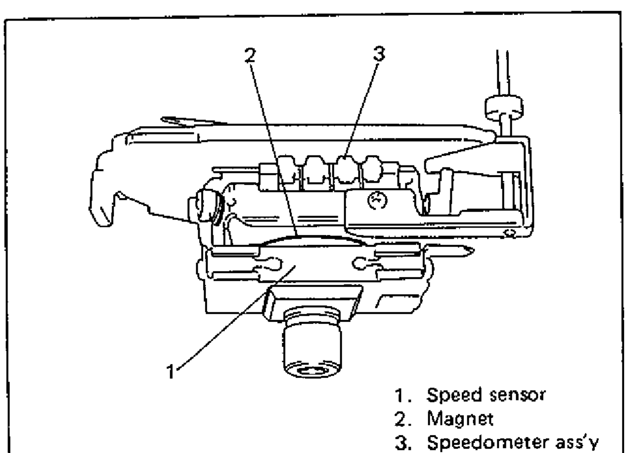


Fig. 6E-25 Vehicle Speed Sensor

Crank Angle Sensor (CAS)

The crank angle sensor located in the distributor consists of the signal generator (pick-up coil and magnet) and signal rotor.

As the signal rotor turns, AC voltage is generated in the pick-up coil which varies in pulsatory way as shown below. This pulse signal (4 pluses/ revolution) is sent to ECM where it is used to calculate the engine speed and also as one of the signals to control various devices.

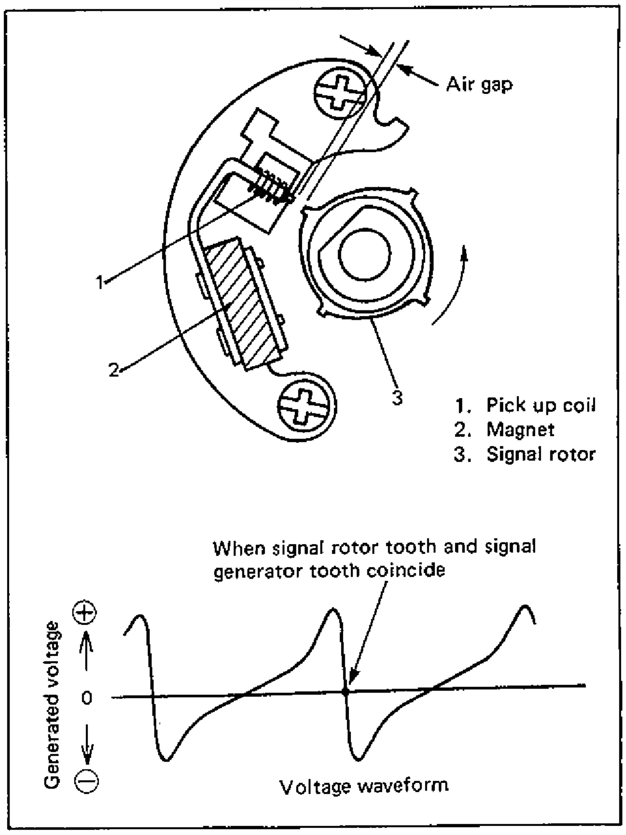


Fig. 6E-25-1 CAS

Ignition Fail Safe Signal

This signal is sent from the igniter.

Monitoring this signal, ECM detects whether the ignition spark is emitted or not and stops injector operation when this signal is not inputted.

Engine Start Signal

This signal is sent from the engine starter circuit. Receiving it, ECM judges whether the engine is cranking or not and uses it as one of the signals to control the fuel injector and fuel pump relay.

"R", "D", "2" or "L" Range Signal (A/T model only)

This signal is sent from inhibiter switch, ECM judges whether A/T is in one of the "R", "D", "2" and "L" ranges or otherwise (i.e. in "P" or "N" range) and uses it as one of the signals to control the fuel injector and ISC solenoid valve.

Electric Load Signal

This signal is sent from each circuit of head & small (or clearance) lights, heater fan, radiator fan, stop light and rear window difogger.
ECM uses it as one of the factors for controlling ISC solenoid valve operation.

Air-Conditioner Signal (Car with air-conditioner only)

This signal is sent from the air-conditioner circuit. ECM detects whether the air-conditioner is operating or not through the signal and uses it as one of the signals for controlling ISC solenoid valve operation.

Battery Voltage

The fuel injector is driven by its solenoid coil based upon the ECM output signal.
There is some delay called as "Ineffective injection time", which doesn't provide fuel, between ECM signal and valve action.
As the ineffective injection time depends on the battery voltage, ECM takes voltage information to compensate it in fuel injection time.

Power Steering Signal (Car with power steering)

This signal is sent from the power steering pressure switch. The power steering pressure switch is installed on the power steering pump body. The switch turns ON when the oil pressure is higher than 15 – 20 kg/cm^2 (215 – 285 psi).
The turning of the steering wheel causes increased oil pressure.
ECM uses it for controlling idle up VSV operation.

Diagnosis Switch Terminal

There are two diagnosis switch terminals; one included in the junction/fuse block and the other in the monitor coupler in the engine room. When either diagnosis switch terminal is grounded, a diagnosis signal is fed to ECM which then outputs self-diagnosis code and at the same time output ISC duty through duty output terminal.

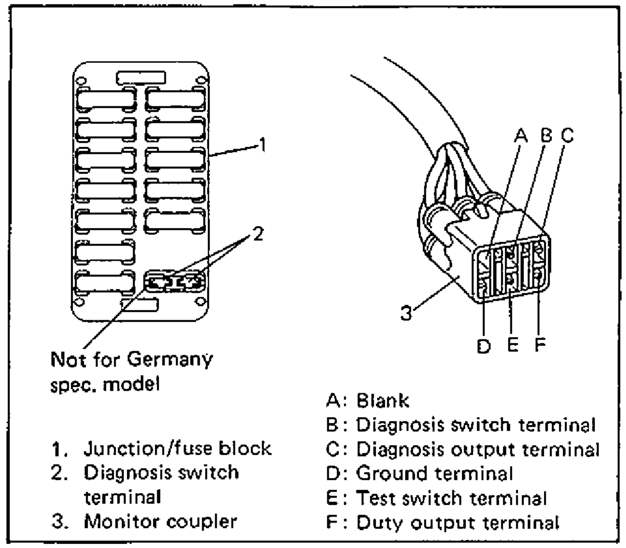


Fig. 6E-26 Diagnosis and Test Switch Terminals

NOTE:
Germany spec. model is not provided with a diagnosis switch terminal in the fuse box but instead a diagnosis switch is installed to the underside of the instrument panel as shown below.

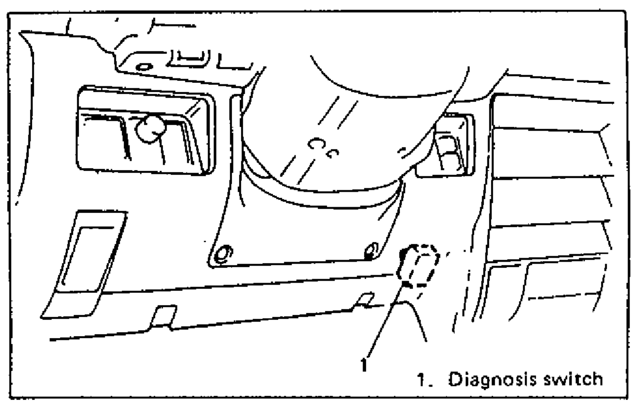


Fig. 6E-26-1 Diagnosis Switch (Germany Spec. Model Only)

Test Switch Terminal

The test switch terminal is included in the monitor coupler.
When this terminal is grounded, ECM fix the ignition timing to initial one.
When both test switch terminal and diagnosis switch terminal are grounded, ECM outputs A/F duty through the A/F duty output terminal.

FUEL INJECTION CONTROL SYSTEM

In this system, ECM controls the time (amount) and timing of the fuel injection from the fuel injector into the throttle body according to the signals from the various sensors so that suitable air/fuel mixture is supplied to the engine in each driving condition.

Injection Timing

Thre are two types of injection timing. One is "synchronous injection" in which injection is synchronous with the CAS signal and the other is "asynchronous injection" in which injection takes place independently of the CAS signal.

- **Synchronous injection**

  Normally, the injector injects fuel at every CAS signal. But when the engine cooling water temperature is low immediately after its start, the injection time for one ignition cycle is divided into some and injection takes place accordingly.

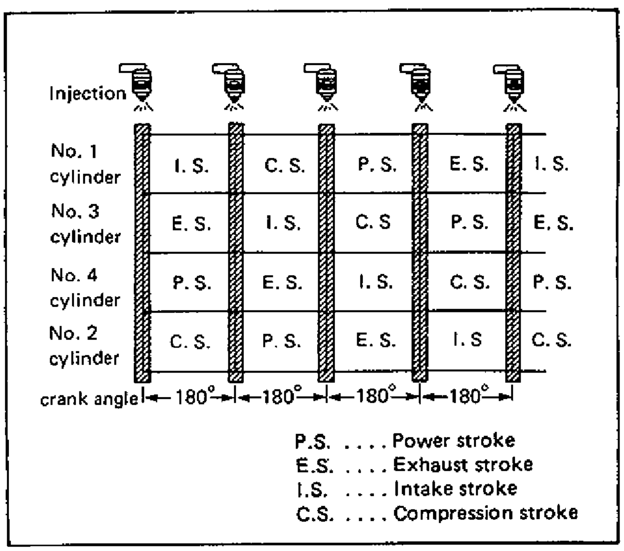


Fig. 6E-27 Synchronous Injection

- **Asynchronous injection**

  When the throttle valve is opened from its idle position, the injector injects fuel in addition to synchronous injection independently of the CAS signal.

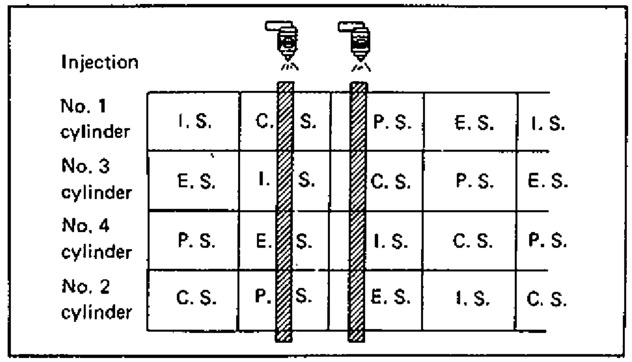


Fig. 6E-28 Asynchronous Injection

Injection Time (amount of injection)

The factors to determine the injection time are the basic injection time which is calculated on the basis of the engine speed and the intake manifold pressure (amount of the intake air) and various compensations which are determined according to the signals from various sensors that detect the state of the engine and driving conditions.

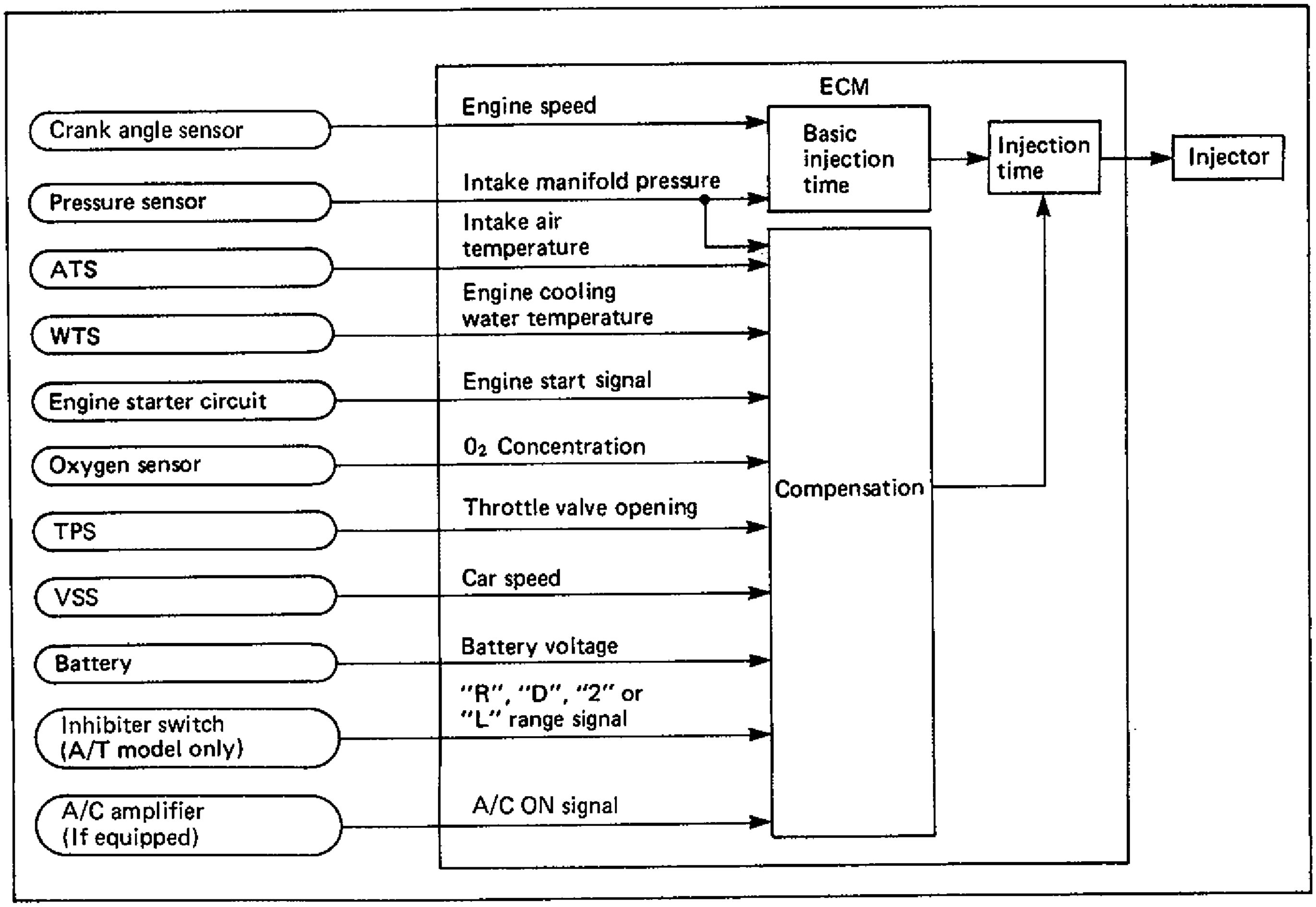


Fig. 6E-29 Parameter Diagram for Fuel Injection Control System

Intake air temperature compensation

As the intake air volume varies with the temperature, it is compensated for its temperature.

Enriching compensation while engine starting

In order to improve starting performance, enriching compensation at start is carried out.

Enriching compensation after engine start

For a certain time after the engine is started, air/fuel mixture enriching compensation is made so as to stabilize the engine speed. The amount of compensation varies depending on the engine cooling water temperature and it is the largest immediately after the engine start and after that, it reduces gradually.

Enriching compensation while warming up

When the engine is cold, enriching compensation is made to ensure good driveability till the engine cooling water temperature reaches the specified level. The amount to enrich the air/fuel mixture is decreased as the temperature rises.

Power enriching compensation

To ensure smooth acceleration and good driveability under the high load driving condition, enriching compensation is carried out when the throttle valve opening is larger than specification.

Enriching compensation when accelerating

To ensure smooth acceleration, enriching compensation is carried out when the intake manifold pressure varies by more than a specified amount druring acceleration. The amount of compensation is determined according to the engine cooling water temperature and how much the intake manifold pressure varies.

Leaning compensation when decelerating

To obtain a proper air/fuel mixture ratio during deceleration, leaning compensation is carried out when the intake manifold pressure varies by more than a specified amount during deceleration.

Battery voltage compensation

A power voltage drop delays the mechanical operation of the injector. Then the actual injection time becomes shorter for the time that electricity is supplied to the injector. To compensate this, the electricity supply time is made longer when the voltage is lower.

Base air/fuel ratio compensation

The air/fuel ratio may vary due to such factors as variation in each engine itself and aging. To compensate such variation, feed back compensation is used and base air/fuel mixture ratio is adjusted to a proper level for feed back compensation.

Fuel cut

Fuel injection stops (with operation of the injector prevented) when decelerating (i.e. when the throttle valve is at idle position and the engine speed is high), so that unburned gas will not be exhausted and it starts again when above conditions are not met.

The fuel injection also stops when the engine speed exceeds about 6,800 r/min to prevent over-run which affects the engine adversely and it starts again when the engine speed reduces to less than about 6,600 r/min.

Leaning compensation when EGR valve is operating

To ensure proper air/fuel mixture ratio even while EGR valve is open, leaning compensation is carried out when EGR VSV is ON.

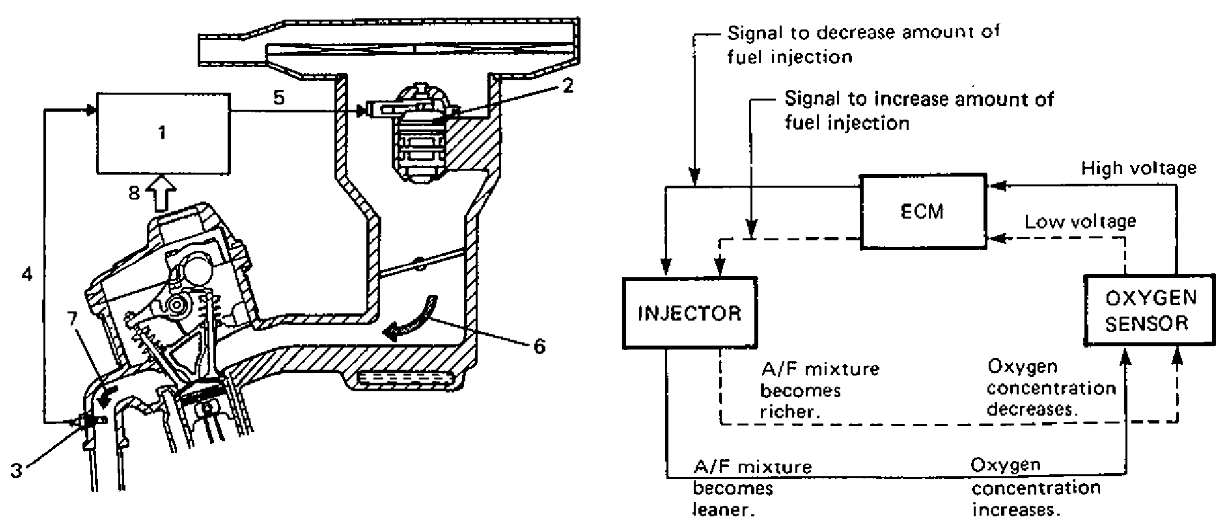
Air/fuel ratio feed back compensation

It is necessary to keep the air/fuel mixture close to the theoretical air/fuel ratio (14.7) to obtain efficient performance of the 3-way catalyst and high clarification rate of CO, HC and NOx in the exhaust gas. For that purpose, ECM operates as follows. It first compares the signal from the oxygen sensor with a specified reference voltage and if the signal is higher, it detects that the air/fuel ratio is richer than the theoretical air/fuel ratio and reduces fuel. On the other hand, if the signal is lower, it detects that the air/fuel ratio is leaner and increases fuel. By repeating these operations, it adjusts the air/fuel ratio closer to the theoretical air/fuel ratio.

1) When oxygen concentration in the exhaust gas is low, that is, when the air/fuel ratio is smaller than the theoretical air/fuel ratio (fuel is richer), electromotive force of the oxygen sensor increases and a rich signal is sent to ECM.
2) Upon receipt of the rich signal, ECM decreases the amount of fuel injection, which causes oxygen concentration in the exhaust gas to increase and electromotive force of the oxygen sensor to decrease. Then a lean signal is sent to ECM.
3) As ECM increases the amount of fuel injection according to the lean signal, oxygen concentration in the exhaust gas decreases and the situation is back to above 1).

This control process, however, will not take place under any of the following conditions.

- At engine start and when fuel injection is increased after engine start
- When engine cooling water temperature is low
- When highly loaded and fuel injection is increased
- At fuel cut
- When oxygen sensor is cold
- When engine is running at high speed (higher than about 4000 r/min).



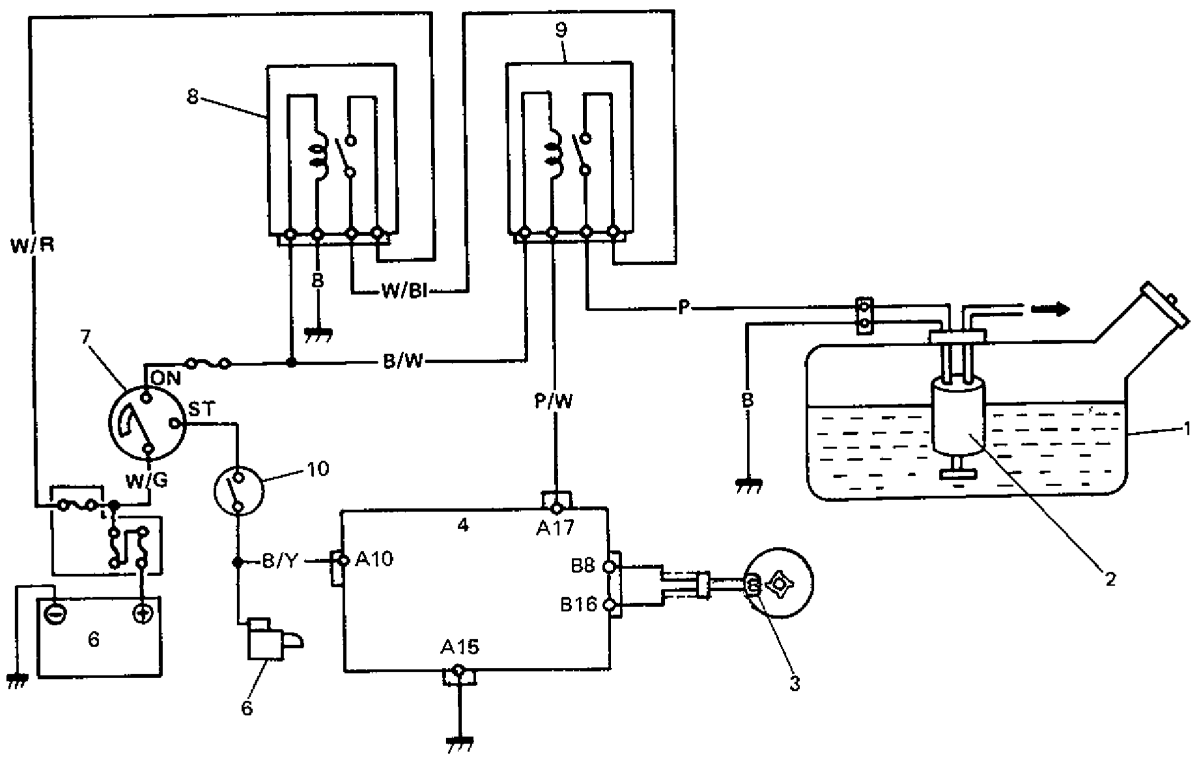
1. ECM
2. Injector
3. Oxygen sensor
4. Voltage signal
5. Injection signal
6. Air/fuel mixture
7. Exhaust gas
8. Sensed information

Fig. 6E-30 A/F Ratio Feed Back Compensation

FUEL PUMP CONTROL SYSTEM

ECM controls ON/OFF operation of the fuel pump by turning it ON via the fuel pump relay under any of the following conditions.

- For 2 seconds after ignition switch ON.
- While cranking engine (while engine start signal is inputted to ECM).
- While CAS signal is inputted to ECM



1. Fuel tank
2. Fuel pump
3. CAS
4. ECM
5. Starter
6. Battery
7. Main switch
8. Main relay
9. Fuel pump relay
10. Inhibiter switch (A/T model only) or Clutch switch (if equipped)

Fig. 6E-31 Fuel Pump Circuit

ISC SOLENOID VALVE CONTROL SYSTEM

This system controls the bypass air flow by means of ECM and ISC solenoid valve for the following three purposes.

- To keep the engine idle speed as specified at all times
  The engine idle speed can vary due to following reasons.
  - * Load applied to engine (when electric load is applied, automatic transmission is shifted to "R", "D" "2" or "L" range, air-conditioner is turned ON, etc.)
  - * Variation in atmospheric pressure
  - * Change in engine itself with passage of time
  - * Other factors causing idle speed to change
- To improve starting performance of engine
- To compensate air/fuel mixture ratio when decelerating (Dash-pot effect)

Operation

ISC solenoid valve opens the bypass air passage when it is turned ON by ECM and closes it when turned OFF.
ECM detects the engine condition by using signals from various sensors and switches and while repeating ON and OFF cycle of ISC solenoid valve at a certain rate (12 times a second), it controls bypass air flow by increasing and decreasing its ON time within a cycle.

While the engine is cranking, ECM keeps ISC solenoid valve ON so as to obtain better start of the engine. After the engine has started, it reduces ON time gradually to maintain the idle speed as specified.

When the accelerator pedal is depressed (throttle valve is at other than idle position), ECM keeps ISC solenoid valve ON. When decelerating, on the other hand, it reduces its ON time gradually (thereby reducing the bypass air flow gradually) to adjust air/fuel mixture to an optimum ratio for combustion.

When the car is at a stop, the throttle valve is at the idle position and the engine is running, ECM controls the bypass air flow by increasing or decreasing ON time of ISC solenoid valve so that the engine speed is kept at a specified idle speed.

With an air-conditioner equipped car, when the air-conditioner is ON, a certain amount of the bypass air is supplied by the air-conditioner VSV independently of this system. The bypass air supplied by this system is used for fine control to keep the idle speed as specified.

Engine idle speed specifications at engine normal operating temperature are as follows.

(Unit: r/min)

		Air-conditioner OFF	Air-conditioner ON
M/T model		800 ± 50	900 ± 50
A/T model	At "P" or "N" range	900 ± 50	900 ± 50

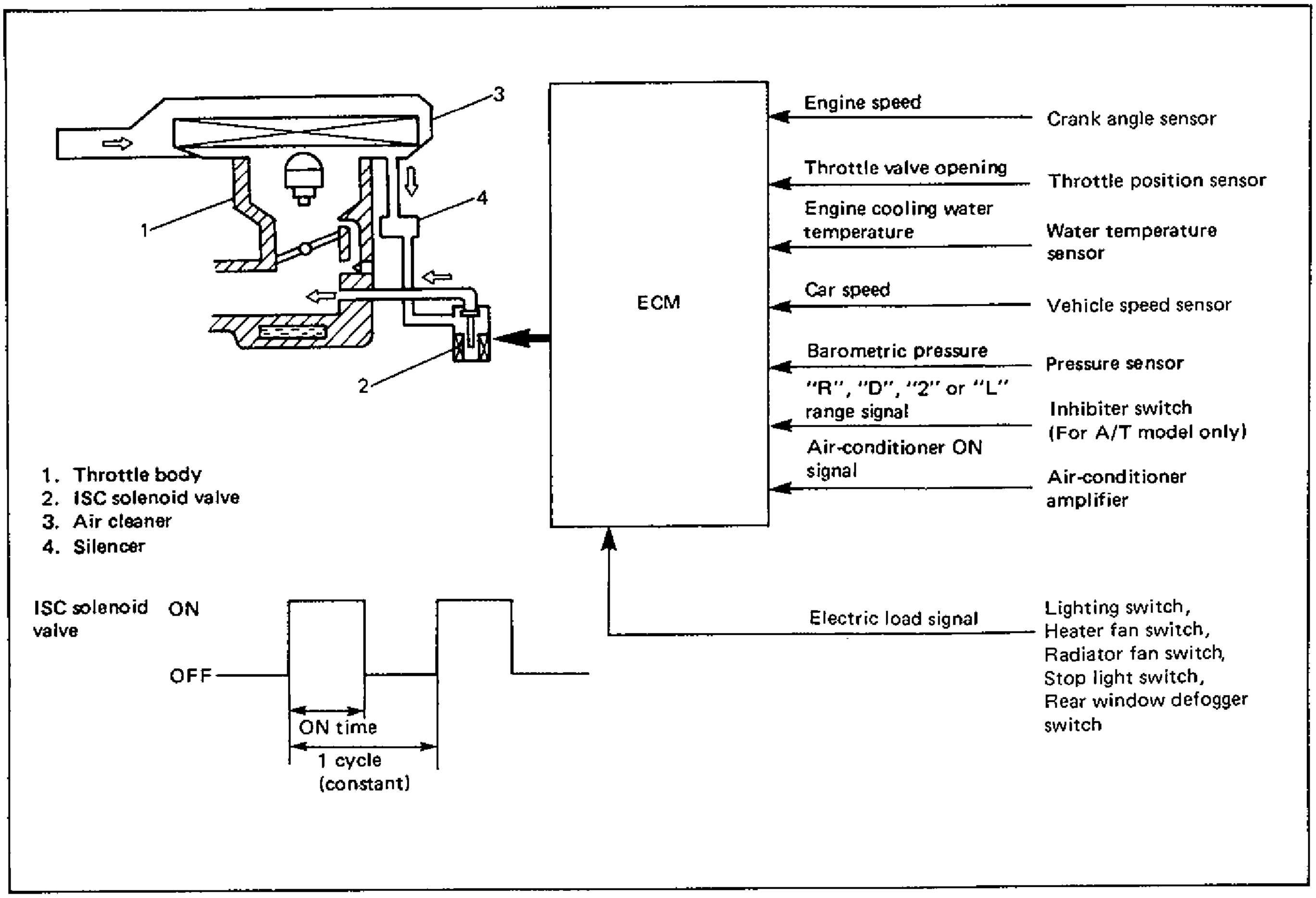


Fig. 6E-32 ISC Solenoid Valve Control System

EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM

This system controls the formation of NOx emission by recirculating the exhaust gas into the combustion chamber through the intake manifold.
The EGR valve is controlled by EGR modulator and VSV controlled by ECM according to signals from various sensors.
The diaphragm mounted in the EGR modulator is operated by back pressure of the exhaust gas to open and close the valve. By this opening and closing action of the valve, the EGR modulator controls the vacuum transmitted to the EGR valve.
Under a low load condition such as low speed driving, the exhaust pressure is low. In this state, the diaphragm in the EGR modulator is pushed down by the spring force and the modulator valve opens to allow the air into the vacuum passage from the outside.
As a result, the vacuum transmitted to the EGR valve becomes smaller and so does the opening of the EGR valve.
Thus, less amount of exhaust gas is recirculated to the intake manifold.

Under a high load condition such as high speed driving, on the other hand, the exhaust pressure is high. By the high exhaust pressure, the diaphragm in the modulator is pushed up and closes its valve. As the air does not enter the vacuum passage in this state, the vacuum transmitted to the EGR valve grows larger and so does the opening of the EGR valve.
Thus, larger amount of exhaust gas is recirculated to the intake manifold.
Under any one of the following conditions, ECM closes the vacuum passage of VSV. In this state, as the vacuum is not transmitted to the EGR valve, it remains closed.

- When engine cooling water temperature is low.
- When throttle valve is at idle position.
- When engine is running under high load.
- When intake manifold pressure is low.

Other than the above, EGR valve opens and closes in accordance with the EGR modulator operation.

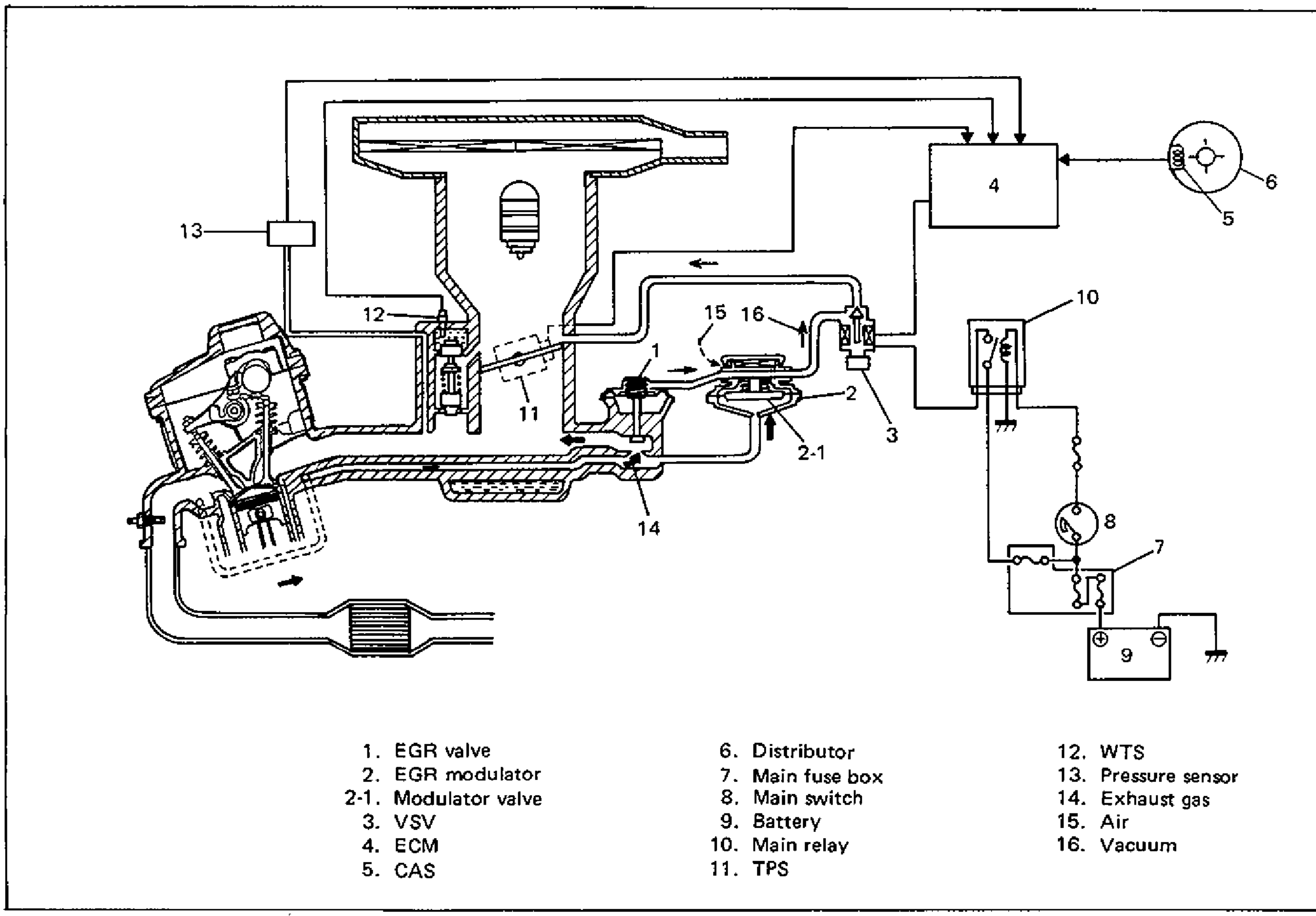


Fig. 6E-33 EGR System

SHIFT-UP INDICATOR LIGHT CONTROL SYSTEM (If equipped)

This system is intended for economical driving by using proper gear positions. When the following conditions are all met, it turns ON the shift-up indicator light included in the meter cluster, but for 5 seconds at the longest, so as to urge the driver to shift up the gear.

- Car speed is higher than 5 km/h (3.1 mile/h)
- Both idle switch and wide open switch are OFF
- Engine speed is higher than a specified speed (The specified engine speed varies with the intake manifold pressure and engine cooling water temperature.)

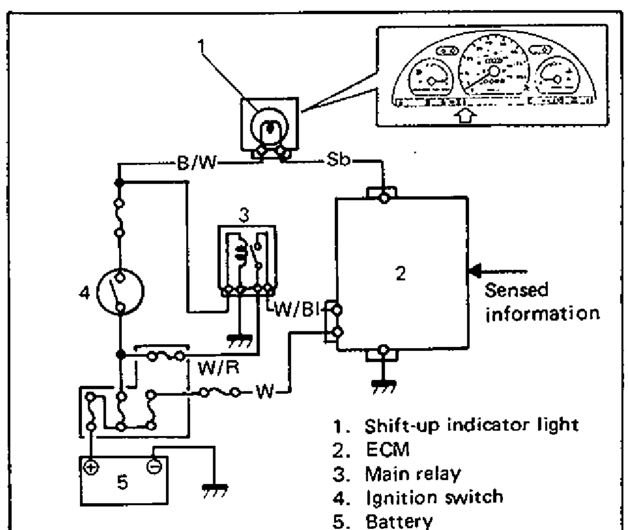


Fig. 6E-34 System Circuit

ESA (ELECTRONIC SPARK ADVANCE) CONTROL SYSTEM

This system controls electronically the time of electric current flow to ignition primary coil as well as ignition timing.

ECM judges the engine condition by using signals from various sensors, selects the most suitable electric current flow time and ignition timing for that engine condition from among those pre-stored in its memory and sends an ignition signal to the igniter (power unit).

Control of this system includes three different types as follows.

- Ignition timing control at engine start
- Ignition timing control after engine start
- Electric current flow time control

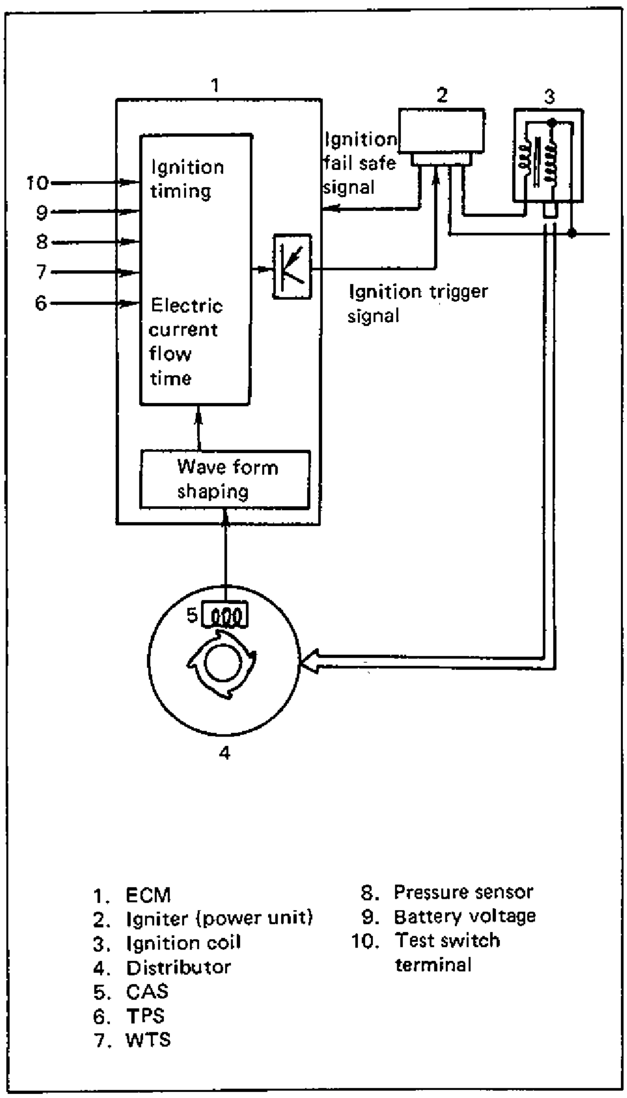


Fig. 6E-36 System Diagram

Ignition Timing Control at Engine Start

To obtain better starting performance of the engine at the engine start (when the engine speed is lower than 500 r/min.) ESA system sets the ignition timing to the initial ignition timing (5° BTDC).

Ignition Timing Control After Engine Start

The ignition timing after the engine start is determined as follows so that the spark occurs at the most suitable timing for each engine condition.

Ignition timing	=	Initial ignition timing	+	Basic ignition advance	+	Various compensating advance

When the idle swith is ON, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed, water temperature compensating advance and compensating advance for idle speed stability to the initial ignition timing.

When the idle switch is OFF, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed and intake manifold pressure and water temperature compensating advance to the initial ignition timing.

- **Water temperature compensating advance**
  This compensation is added according to the signal from the water temperature sensor which detects the engine cooling water temperature. The amount of compensation is larger when the engine cooling water temperature is lower and smaller when higher.

- **Compensating advance for idle speed stability**
  This compensation is carried out to stabilize the engine idle speed.

Electric Current Flow Time Control

To stabilize the secondary voltage generated in the ignition coil to a proper level, ESA system controls the time of primary current flow to the ignition coil.

NOTE:

The ignition timing is controlled by ECM as described above. Therefore, when checking or adjusting the ignition timing, the ignition timing must be fixed to the initial one by grounding the test switch terminal.

DIAGNOSIS

ECM has a system self-diagnosis function as described previously (p. 6E-16).
Investigate where the trouble is by referring to "Diagnostic Flow Chart" and "Diagnostic Code" in this section.

PRECAUTIONS IN DIAGNOSING TROUBLES IN ELECTRONIC FUEL INJECTION SYSTEM

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC CODE]

- Before identifying diagnostic code indicated by "CHECK ENGINE" light, don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse.
  Such disconnection will erase memorized trouble in ECM memory.
- If abnormality or malfunction lies in two or more areas, "CHECK ENGINE" light indicates applicable codes three times each.
  And flashing of these codes is repeated as long as diagnosis switch terminal is grounded (spare fuse is connected or diagnosis switch turned ON) and ignition switch is held at ON position.
- Take a note of diagnostic code indicated first.

[INTERMITTENT TROUBLES]

- There are cases where "CHECK ENGINE" light indicates a diagnostic code representing a trouble which occurred only temporarily and has gone. In such case, it may occur that good parts are replaced unnecessarily. To prevent such an accident, be sure to follow instructions given below when checking by using "Diagnostic Flow Chart".
  * When trouble can be identified, that is, it is not an intermittent one:
    Check sensor (actuator), wires and each connection and if they are all in good condition, substitute a known-good ECM and recheck.
  * When trouble can not be identified but "CHECK ENGINE" light indicates a trouble code:
    Diagnose trouble by using that code No. and if sensor (actuator), wires and each connection are all in good condition, erase diagnostic code in ECM memory. Then conduct a test run and check what "CHECK ENGINE" light indicates. Only when it indicates trouble code again, substitute a known-good ECM and check again.
    If it indicates not trouble code but normal code No. 12, it means that an intermittent trouble did occur and has gone. In this case, check wires and connections carefully again.

[NOTES ON SYSTEM CIRCUIT INSPECTION]

- Intermittent trobles
  Most intermittent problems are caused by faulty electrical connections or wiring.
  Perform careful check of suspect circuits for:
  – Poor mating of coupler halves, or terminals not fully seated in coupler body (backed out).
  – Improperly formed or damaged terminals. All coupler terminals in problem circuit should be carefully reformed to increase contact tension.
  – Poor terminal to wire connection.
- Never connect any tester (voltmeter, ohmmeter, or whatever) to ECM when its coupler is disconnected. Attempt to do it may cause damage to ECM.
- Never connect an ohmmeter to ECM with its coupler connected to it. Attempt to do it may cause damage to ECM 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 there is a question "Are couplers connected properly?" in FLOW CHART, check male half of terminal for bend and female half for excessive opening, terminal for poor locking (losseness), corrosion, dust, etc.
- When connecting a probe of ohmmeter, voltmeter, etc. to coupler terminal, be sure to connect it from wire harness side of coupler.

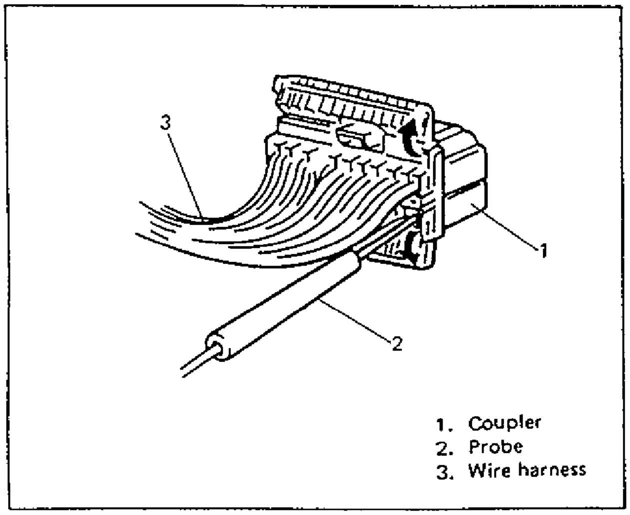


Fig. 6E-38 Connecting Meter Probe

- 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 or force its female terminal open for connection.
  In case of such coupler as shown below, connect probe as shown below to avoid opening female terminal.
  Never connect probe where male terminal is supposed to fit.

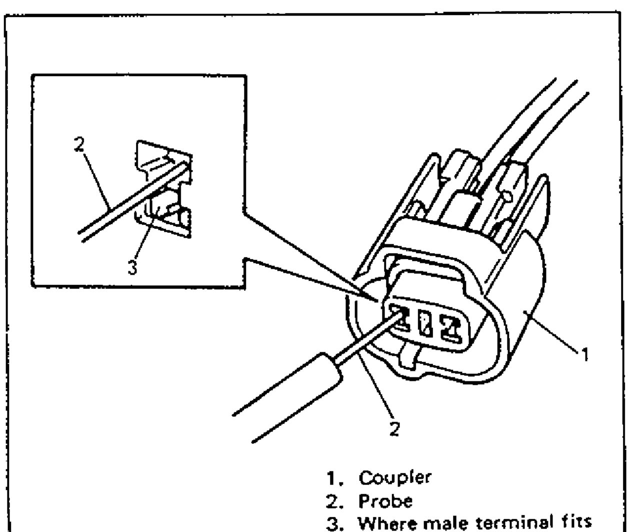


Fig. 6E-39 Connecting Meter Probe

- 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.

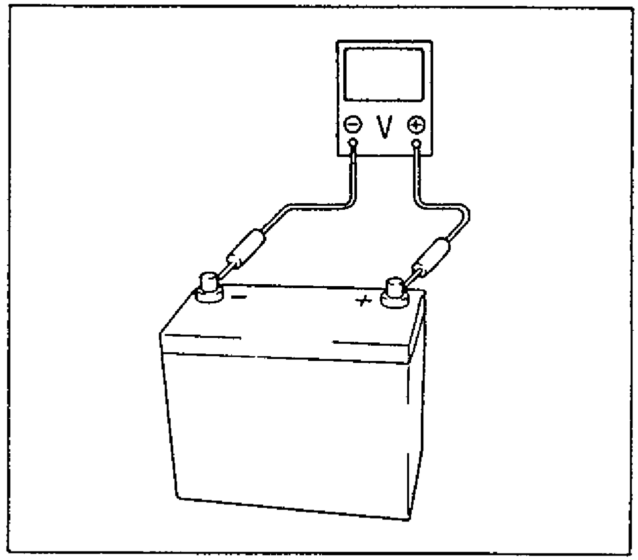


Fig. 6E-40 Checking Battery Voltage

- When checking voltage at each terminal of the coupler which is connected to ECM, be sure to connect negative probe to body ground and using service wire, connect ECM case to body ground as shown in Fig. 6E-41. Any other way is prohibited even by accident.
  Applying probes of voltmeter improperly may cause the sensor or ECM to be shorted and damaged.

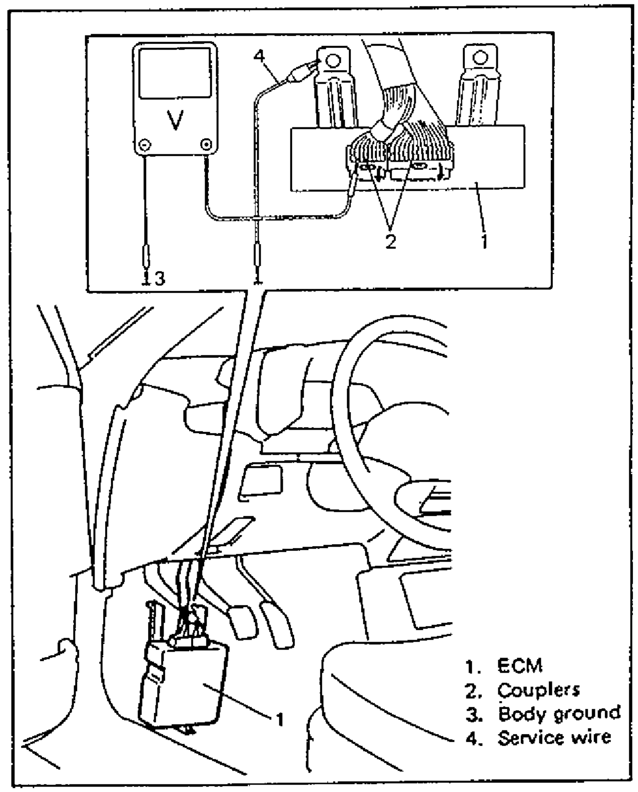


Fig. 6E-41 Checking Voltage

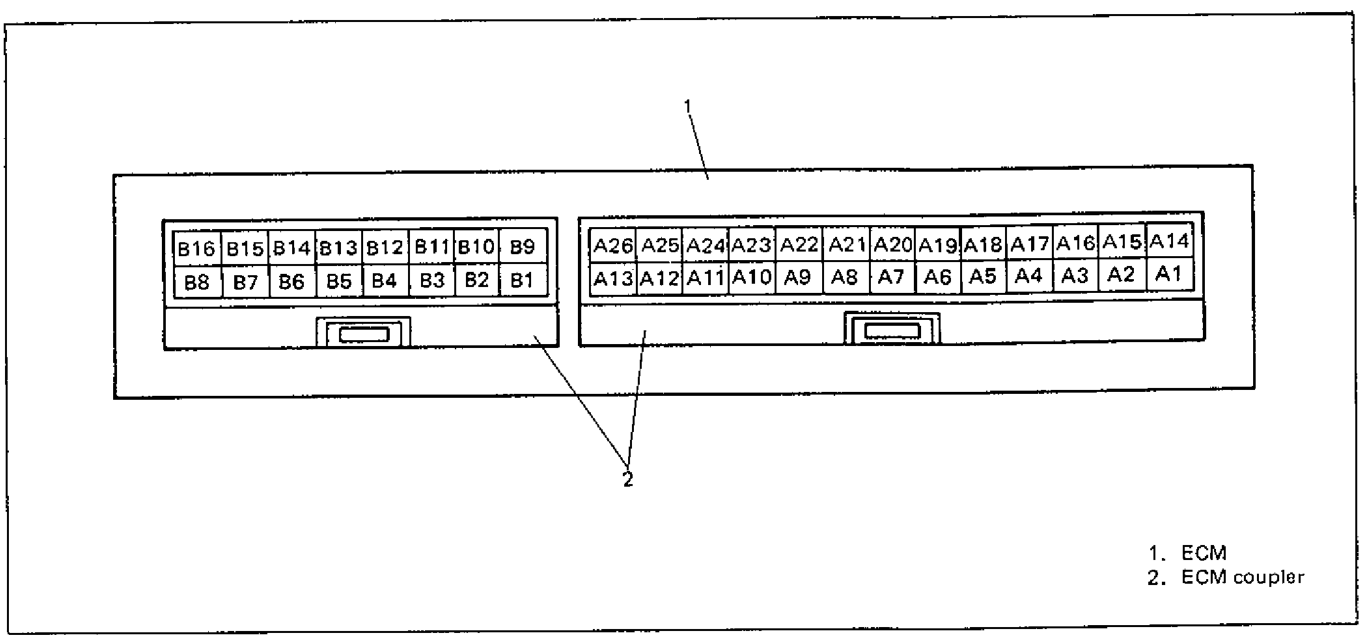
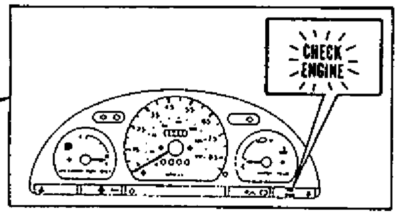


Fig. 6E-41-1 ECM Coupler Terminals

DIAGNOSTIC FLOW CHART

START

Does "CHECK ENGINE" light turn ON when ignition switch is turned ON (without starting engine.)?



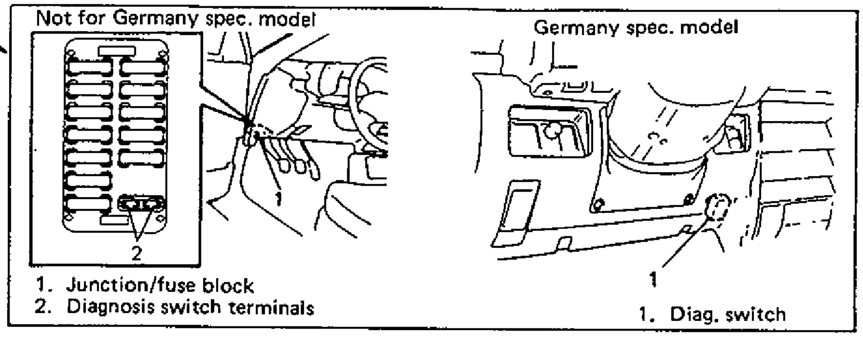
YES → Proceed to chart A-2. ("CHECK ENGINE" light circuit check.)

NO → Does engine start?
- YES → Proceed to chart A-2. ("CHECK ENGINE" light circuit check.)
- NO → Proceed to chart A-1. (ECM power and ground circuit check.)

YES

Connect spare fuse to diagnosis switch terminal (grounding) and observe "CHECK ENGINE" light. (For Germany spec. model, turn diag. switch ON.).

NOTE:
If engine fails to start, crank it for 2 seconds and then while keeping ignition switch ON (Don't turn it OFF) connect spare fuse to diagnosis switch terminal or turn diag. switch ON.



Remains ON → Proceed to chart A-3. ("CHECK ENGINE" light circuit check.)

Flashes

Is diagnostic code No. 12 indicated?

YES → Are engine basic parts described in SECTION 6 "ENGINE DIAGNOSIS" in good condition?
- YES → Proceed to "TROUBLE DIAGNOSIS" (p. 6E-53) Check Electronic Fuel Injection system parts that are not indicated by self-diagnosis function.
- NO → Repair or replace.

NO

Check and repair according to flow chart corresponding to that code No.

1. Disconnect spare fuse from diagnosis switch terminal or turn diag. switch OFF.
2. Disconnect battery negative cable for 60 sec. to erase diagnostic code stored in ECM memory and reconnect it.
3. Warm up engine to normal operating temperature.
4. Connect spare fuse to diagnosis switch terminal or turn diag. switch ON.
5. Is diagnostic code No. 12 indicated then?

NO → START

YES

Disconnect spare fuse from diagnosis switch terminal or turn diag. switch OFF.

Is trouble corrected?

NO → START

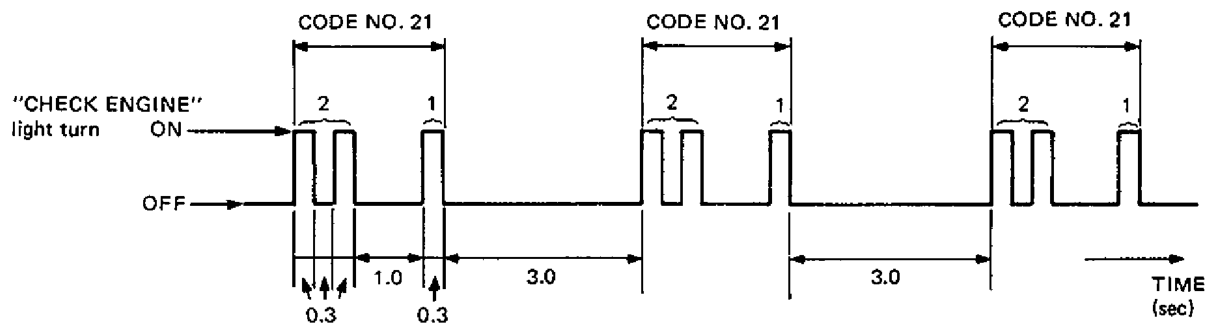
YES

END

Fig. 6E-42 Diagnostic Flow Chart for Electronic Fuel Injection System

DIAGNOSTIC CODE TABLE

EXAMPLE: THROTTLE POSITION SENSOR FAILURE (CODE NO. 21)

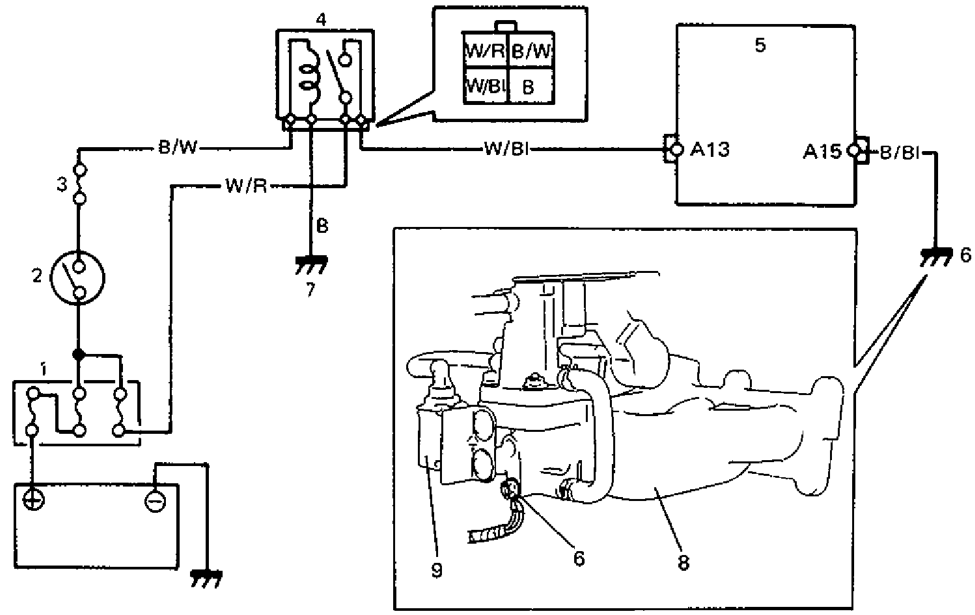


DIAGNOSTIC CODE		DIAGNOSTIC AREA	DIAGNOSIS
NO.	MODE		
12	1 2	Normal	This code appears when none of the other codes (Below codes) are identified.
13	1 3	Oxygen sensor	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
14	1 4	Water temperature sensor	
15	1 5		
21	2 1	Throttle position sensor	
22	2 2		
23	2 3	Air temperature sensor	
25	2 5		
24	2 4	Vehicle speed sensor	
31	3 1	Pressure sensor	
32	3 2		
41	4 1	Ignition fail safe signal	
42	4 2	Crank angle sensor	
51	5 1	EGR system (California spec. model only)	
ON		ECM	ECM failure

Fig. 6E-43 Diagnostic Code Table

A-1 ECM POWER AND GROUND CIRCUIT CHECK

("CHECK ENGINE" LIGHT DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)

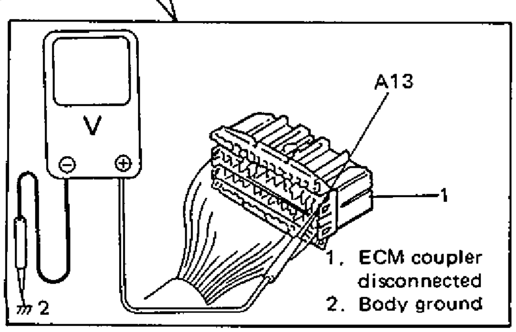


1. Main fuse box
2. Ignition switch
3. Circuit fuse
4. Main relay
5. ECM
6. ECM ground
7. Ground
8. Intake manifold
9. ISC solenoid valve

Fig. 6E-44 ECM Power and Ground Circuit

Is operation of main relay heard at ignition switch ON?

- YES → Is 15A main fuse in good condition?
  - YES → 1. Disconnect ECM coupler with ignition switch OFF. 2. Is battery voltage aplied to A13 terminal at ignition switch ON?



To be continued

  - NO → Repair and replace.
- NO → Are main and circuit fuses in good condition?
  - YES → Is main relay in good condition? (Check main relay referring to p. 6E-86.)
    - YES →
      - Poor relay-to-coupler connection,
      - "B/W" wire open,
      - "B" wire open or
      - Poor "B" wire grounding.
    - NO → Replace.
  - NO → Repair and replace.

Continued

YES

- Poor "A13" or "A15" connection,
- "B/Bl" wire open or
- Poor "B/Bl" wire grounding.

If wire and connections are OK, substitute a known-good ECM and recheck.

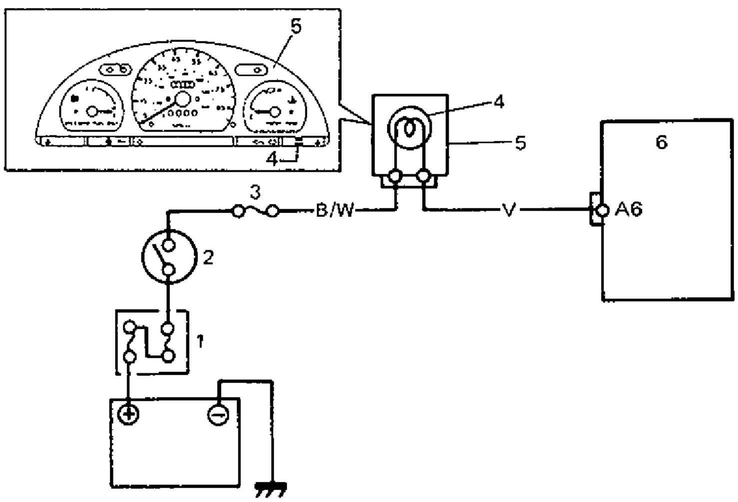
NO

- "W/R" wire open,
- Poor relay-to-coupler connection or
- "W/Bl" wire open.

If wire and connection are OK, check main relay referring to p. 6E-86.

Fig. 6E-45 Diagnostic Flow Chart A-1 for ECM Power and Ground Circuit

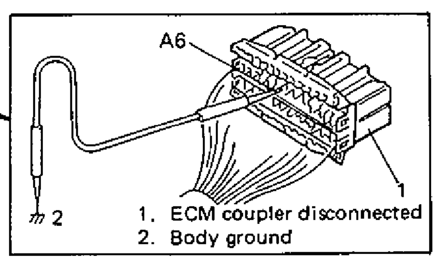
A-2 "CHECK ENGINE" LIGHT CIRCUIT CHECK
("CHECK ENGINE" LIGHT DOES NOT LIGHT BUT ENGINE STARTS.)



1. Main fuse
2. Ignition switch
3. Circuit fuse
4. "CHECK ENGINE" light
5. Combination meter
6. ECM

Fig. 6E-46 "CHECK ENGINE" Light Circuit

1. With ignition switch turned OFF, disconnect coupler from ECM.
2. Body-ground terminal "A6" in couper disconnected.
3. Does "CHECK ENGINE" light turn ON at ignition switch ON?



NO → Bulb burned out, "V" wire circuit open or "B/W" wire circuit open.

YES ↓

Is coupler connected to ECM properly?

NO → Poor connection.

YES ↓

Substitute a known-good ECM and recheck.

Fig. 6E-47 Diagnostic Flow Chart A-2 for "CHECK ENGINE" Light Circuit

A-3 "CHECK ENGINE" LIGHT CIRCUIT CHECK

("CHECK ENGINE" LIGHT DOESN'T FLASH OR JUST REMAINS ON EVEN WITH SPARE FUSE CONNECTED TO DIAGNOSIS SWITCH TERMINAL.)

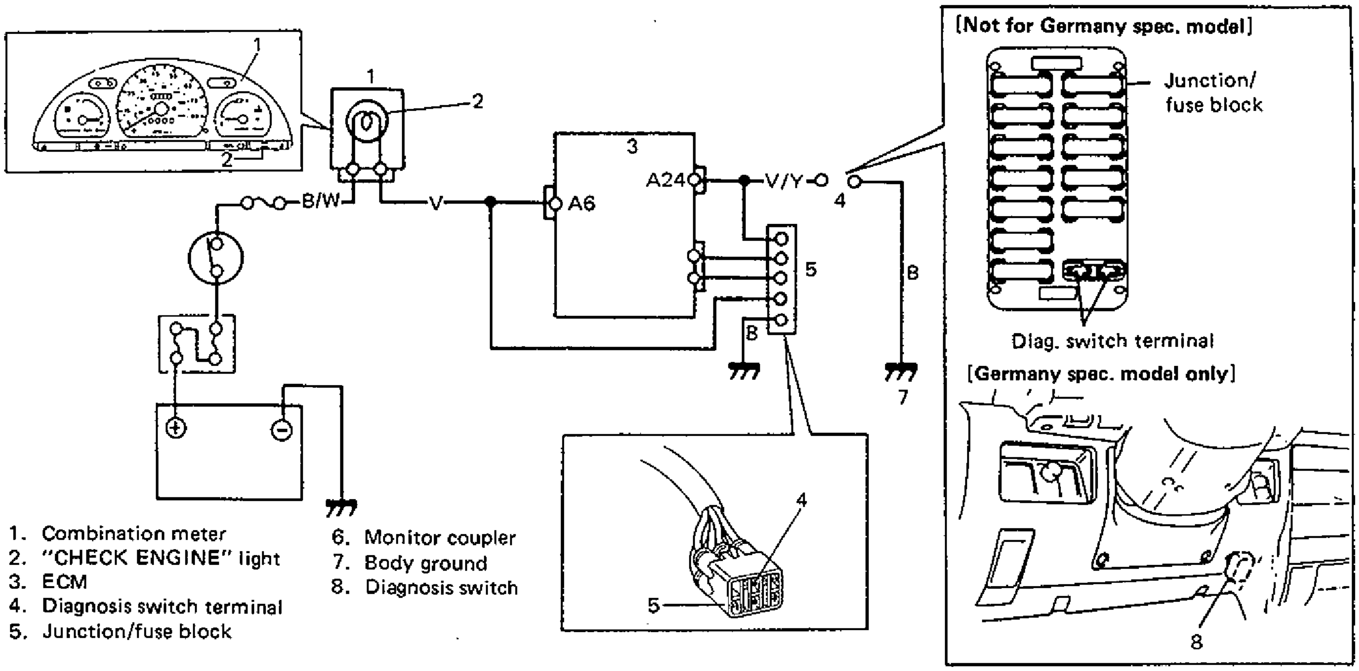


Fig. 6E-48 "CHECK ENGINE" Light Circuit

1. Disconnect ECM coupler "A" with ignition switch turned OFF.
2. Does "CHECK ENGINE" light turn ON at ignition switch ON?

→ YES: "V" wire circuit shorted to ground.

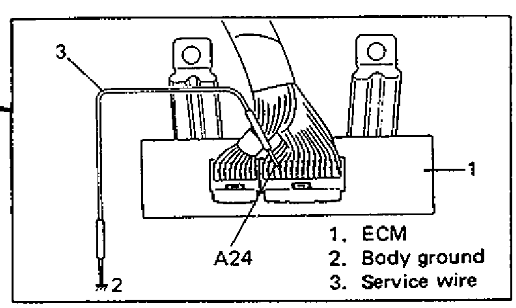
↓ NO

Is coupler "A" (terminal "A24") connected to ECM properly?

→ NO: Poor connection.

↓ YES

1. Using service wire, ground terminal "A24" with coupler connected to ECM.
2. Does "CHECK ENGINE" light flash at ignition switch ON?



→ YES: Spare fuse open, faulty diagnosis switch, "V/Y" wire circuit open or poor "B" wire grounding.

↓ NO

Substitute a known-good ECM and recheck.

Fig. 6E-49 Diagnositc Flow Chart A-3 for "CHECK ENGINE" Light Circuit

CODE NO. 13 OXYGEN SENSOR CIRCUIT (SIGNAL VOLTAGE DOESN'T CHANGE)

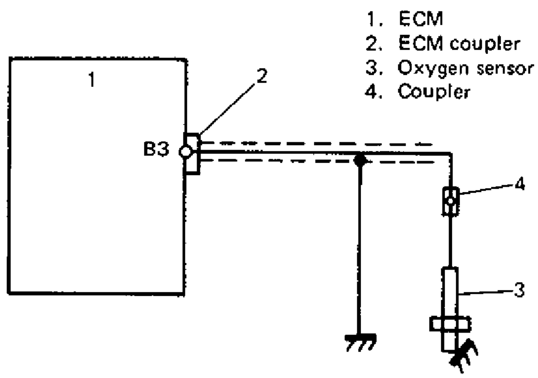
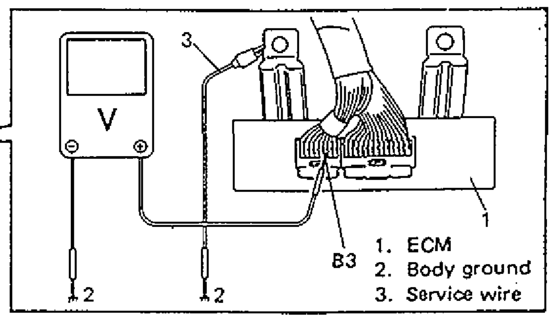


Fig. 6E-50 Oxygen Sensor Circuit

NOTE:

- **Before diagnosing trouble according to flow chart given below, check to make sure that following system and parts other than Electronic Fuel Injection system are in good condition.**
  - **Air cleaner (clogged)**
  - **Vacuum leaks (air inhaling)**
  - **Spark plugs (contamination, gap)**
  - **High-tension cords (crack, deterioration)**
  - **Distributor rotor or cap (wear, crack)**
  - **Ignition timing**
  - **Engine compression**
  - **Any other system and parts which might affect A/F mixture or combustion.**
- **If code No. 13 and another code No. are indicated together, the latter has priority. Therefore, check and correct what is represented by that code No. first and then proceed to the following check.**
- **Be sure to use a voltmeter with high impedance (MΩ/V minimum) or digital type voltmeter for accurate measurement.**

1. Remove ECM and connect couplers to ECM.
2. Warm up engine to normal operating temperature.
3. Connect voltmeter between "B3" terminal of ECM coupler and body ground.
4. Maintain engine speed at 2000 r/min. After 60 seconds, check voltmeter.



0V
- Wire between sensor and ECM open or
- Poor connection. If wire and connection are OK, replace oxygen sensor and recheck.

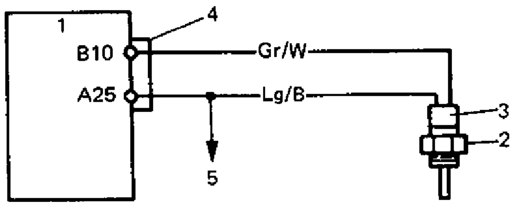
Remains unchanged at below 0.45V.
- Maintain engine speed at 2000 r/min. After 60 sec., disconnect vacuum hose from pressure sensor and check voltmeter. Is voltage 0.45V or more?
  - NO: Faulty oxygen sensor.
  - YES: Poor B3 connection or lean A/F mixture.
    - Check pressure sensor, WTS, ATS, fuel pressure and injector.
    If all above are OK, check ECM and its circuit referring to p. 6E-65.

Remains unchanged at above 0.45V.
- Poor B3 connection or rich A/F mixture.
  - Check TPS, clogged pressure sensor hose, pressure sensor, ATS, WTS, fuel pressure and injector.
  If all above are OK, check ECM and its circuit referring to P. 6E-65.

Deflects between above and below 0.45V repeatedly.
- Oxygen sensor and its circuit (Air/fuel ratio feed back system) are in good condition. Intermittent trouble or faulty ECM. Recheck referring to "intermittent trouble" on p. 6E-32.

Fig. 6E-51 Diagnostic Flow Chart for Code No. 13

CODE NO. 14 WTS (WATER TEMPERATURE SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH)

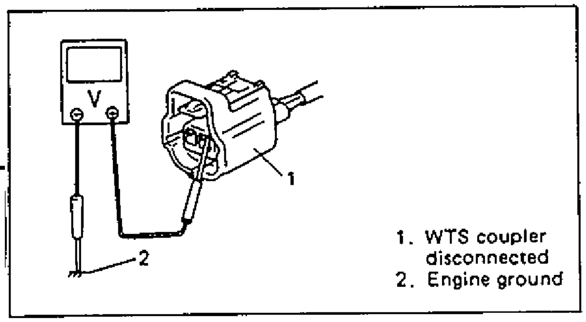


1. ECM
2. WTS
3. WTS coupler
4. ECM coupler
5. To other sensors

Fig. 6E-52 WTS Circuit

NOTE:
When Code Nos. 14, 23 and 32 are indicated together, it is possible that "Lg/B" wire is open or A25 terminal connection is poor.

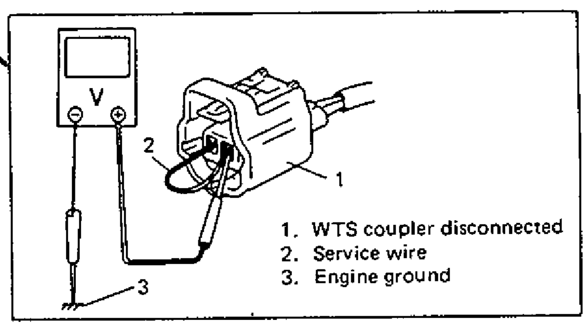
1. Disconnect WTS coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "Gr/W" wire terminal of WTS coupler.
   Is it about 4 – 5V?



YES / **NO**

NO: "Gr/W" wire open, poor B10 connection or "Gr/W" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES:
1. Using service wire, connect WTS coupler terminals.
2. Check voltage at "Gr/W" wire terminal of WTS coupler with ignition switch ON.
   Is it below 0.15V?

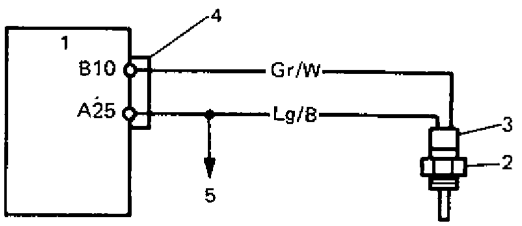


NO: "Lg/B" wire open or poor A25 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES: Poor WTS-to-WTS coupler connection or faulty WTS.
If connection and WTS are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on Fig. 6E-32.

Fig. 6E-53 Diagnostic Flow Chart for Chart for Code No. 14

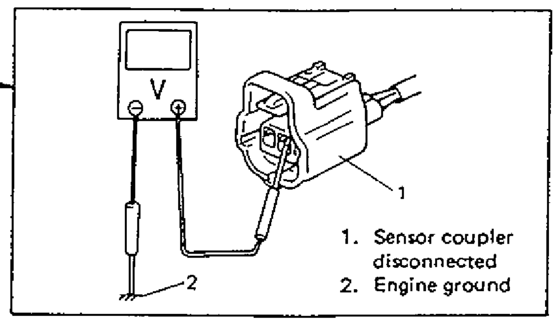
CODE NO. 15 WTS (WATER TEMPERATURE SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)



1. ECM
2. WTS
3. Coupler
4. ECM coupler
5. To other sensors

Fig. 6E-54 WTS Circuit

1. Disconnect WTS coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Gr/W" wire terminal of WTS coupler 4V or more?



YES → Check WTS referring to P. 6E-84. Is it in good condition?

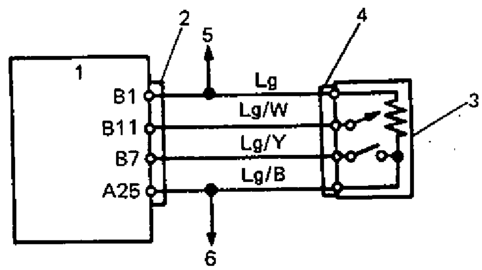
NO → "Gr/W" wire shorted to "Lg/B" wire or ground circuit. If wire is OK, substitute a known-good ECM and recheck.

Check WTS: **YES** → Intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-32.

Check WTS: **NO** → Faulty WTS.

Fig. 6E-55 Diagnostic Flow Chart for Code No. 15

CODE NO. 21 TPS (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE HIGH)



1. ECM
2. ECM coupler
3. TPS
4. TPS coupler
5. To PS
6. To other sensors

NOTE:
Be sure to turn OFF ignition switch for this check.

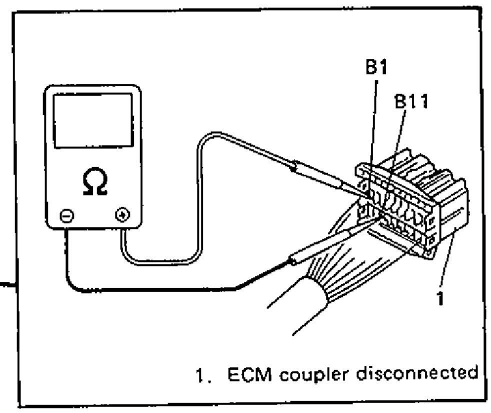
Fig. 6E-58 TPS Circuit

1. Disconnect TPS coupler.
2. Check TPS referring to P. 6E-82.
   Is it in good condition?

↓ NO → Faulty TPS.

↓ YES

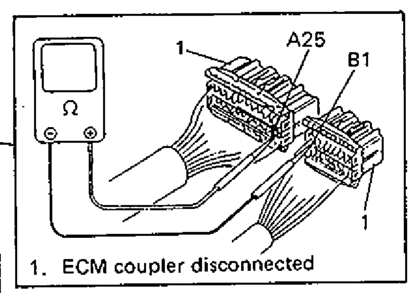
1. Disconnect ECM coupler.
2. With TPS coupler disconnected, is there continuity between ECM coupler terminals B1 and B11?



↓ YES → "Lg" wire shorted to "Lg/W" wire.

↓ NO

1. Disconnect PS coupler.
2. Connect TPS coupler.
3. Is resistance between ECM coupler terminals B1 and A25 4.37 – 8.13 kΩ?

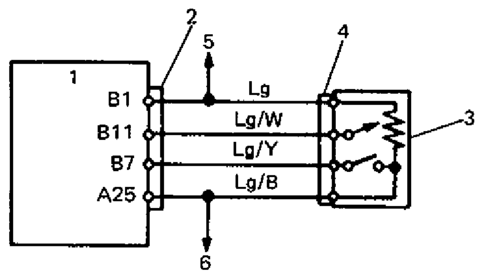


↓ YES → Poor A25 connection, poor B15 connection or "Lg/W" wire open.
If connection and wire are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on P. 6E-32.

↓ NO → "Lg/B" wire open or poor TPS-to-"Lg/B" wire connection.

Fig. 6E-59 Diagnostic Flow Chart for Code No. 21

CODE NO. 22 TPS (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW)

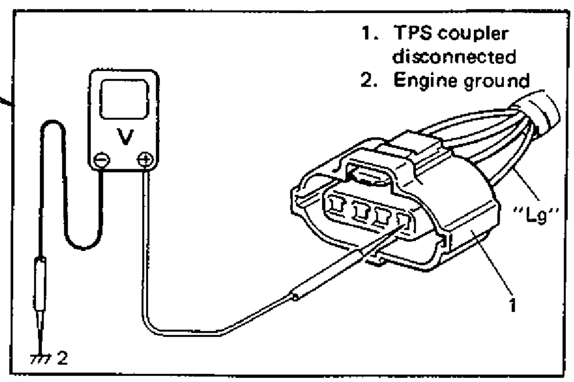


1. ECM
2. ECM coupler
3. TPS
4. TPS coupler
5. To PS
6. To other sensors

Fig. 6E-60 TPS Circuit

NOTE:
When Code Nos. 22 and 31 are indicated together, it is possible that "Lg" wire is open or B1 terminal connection is poor.

1. Disconnect TPS coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Lg" wire terminal of TPS coupler about 4 – 5V?



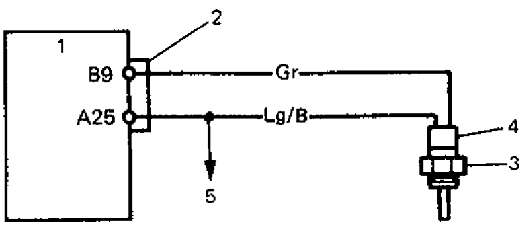
YES → Check TPS referring to p. 6E-82. Is it in good condition?

- **YES** → "Lg" wire open, "Lg/W" wire shorted to ground circuit or poor TPS-to-TPS coupler connection. If wire and connections are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-32.
- **NO** → Faulty TPS.

NO → "Lg" wire open, "Lg" wire shorted to ground circuit or "Lg/B" wire or poor B1 connection. If wire and connection are OK, substitute a known-good ECM and recheck.

Fig. 6E-61 Diagnostic Flow Chart for Code No. 22

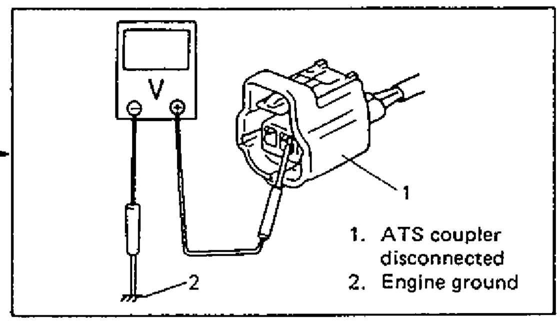
CODE NO. 23 ATS (AIR TEMPERATURE SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH)



1. ECM
2. ECM coupler
3. ATS
4. ATS coupler
5. To ther sensors

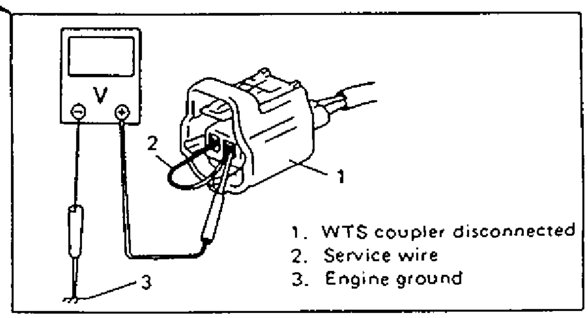
Fig. 6E-62 ATS Circuit

1. Disconnect ATS coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "Gr" wire terminal of ATS coupler.
   Is it about 4 – 5V?



YES ↓

1. Using service wire, connect ATS coupler terminals.
2. Check voltage at "Gr" wire terminal of ATS coupler with ignition switch ON.
   Is it below 0.15V?

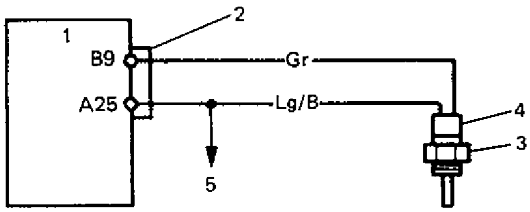


- **YES**: Faulty ATS or poor ATS-to-ATS coupler connection.
  If ATS and connection are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on P. 6E-32.
- **NO**: "Lg/B" wire open or poor A25 connection.
  If wire and connection are OK, substitute a known-good ECM and recheck.

NO (from first step): "Gr" wire open, poor B9 connection or "Gr" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.

Fig. 6E-63 Diagnostic Flow Chart for Code No. 23

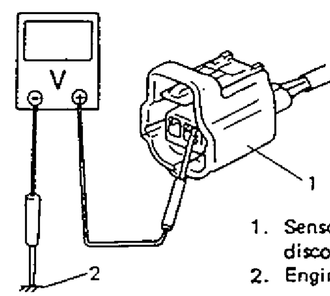
CODE NO. 25 ATS (AIR TEMPERATURE SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)



1. ECM
2. ECM coupler
3. ATS
4. ATS coupler
5. To other sensors

Fig. 6E-64 ATS Circuit

1. Disconnect ATS coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Gr" wire terminal of ATS coupler 4V or more?



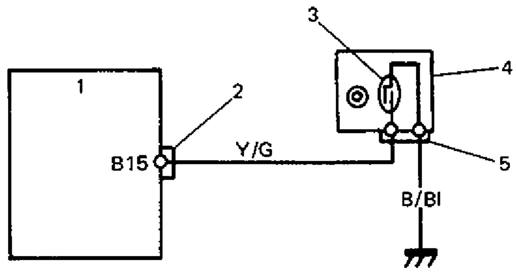
YES → Check ATS referring to p. 6E-84. Is it in good condition?

- **YES** → Intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-32.
- **NO** → Faulty ATS.

NO → "Gr" wire shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.

Fig. 6E-65 Diagnostic Flow Chart for Code No. 25

CODE NO. 24 VEHICLE SPEED SENSOR CIRCUIT (SPEED SENSOR SIGNAL NOT INPUTTED ALTHOUGH FUEL IS KEPT CUT AT LOWER THAN 4000 r/min FOR LONGER THAN 4 SECONDS)



1. ECM
2. ECM coupler
3. Speed sensor
4. Speedometer
5. Coupler

NOTE:
Be sure to turn OFF ignition switch for this check.

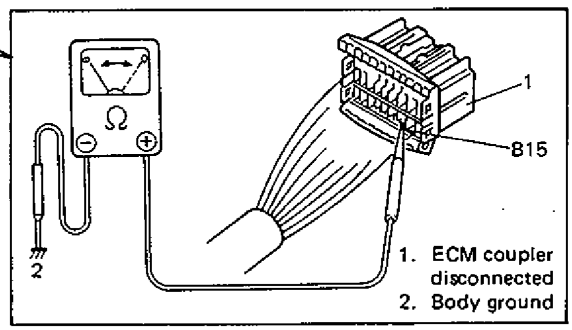
Fig. 6E-66 Speed Sensor Circuit

Does speedometer indicate car speed?

NO → Speedometer cable broken.

YES ↓

1. Disconnect ECM coupler with ignition switch OFF.
2. Connect ohmmeter between "B15" terminal of ECM coupler and body ground.
3. Hoist front end of car and lock front right tire.
4. Turn front left tire slowly.
   Does ohmmeter indicator deflect between 0 and ∞ a few times while tire is turned one revolution?



YES → Poor B15 connection. If connection is OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-32.

NO ↓

Check speed sensor referring to p. 6E-85. Is it in good condition?

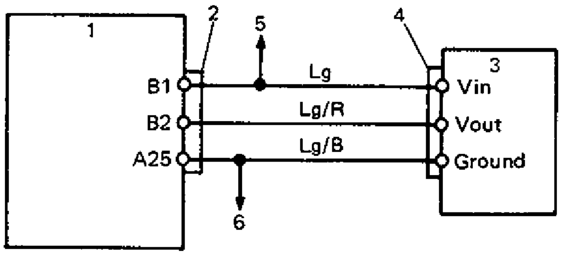
NO → Faulty speed sensor.

YES ↓

"Y/G" wire open, "B/Bl" wire open, poor coupler-to-meter connection or poor "B/Bl" wire ground.

Fig. 6E-67 Diagnostic Flow Chart for Code No. 24

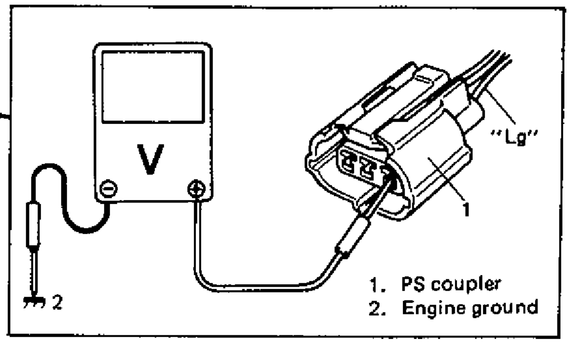
CODE NO. 31 PS (PRESSURE SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW – LOW PRESSURE – HIGH VACUUM)



1. ECM
2. ECM coupler
3. PS
4. PS coupler
5. To TPS
6. To other sensors

Fig. 6E-68 PS Circuit

1. Disconnect PS coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Lg" wire terminal of PS coupler about 4 – 5V?



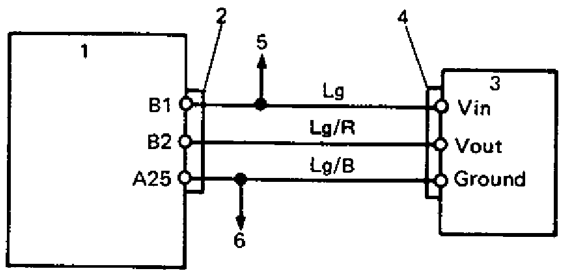
YES → Check PS referring to p. 6E-81. Is it in good condition?

- **YES** → "Lg/R" wire shorted to ground circuit or poor PS-to-PS coupler connection. If wire and connections are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-32.
- **NO** → Faulty PS.

NO → "Lg" wire open, "Lg" wire shorted to ground circuit or poor B1 connection. If wire and connection are OK, substitute a known-good ECM and recheck.

Fig. 6E-69 Diagnostic Flow Chart for Code No. 31

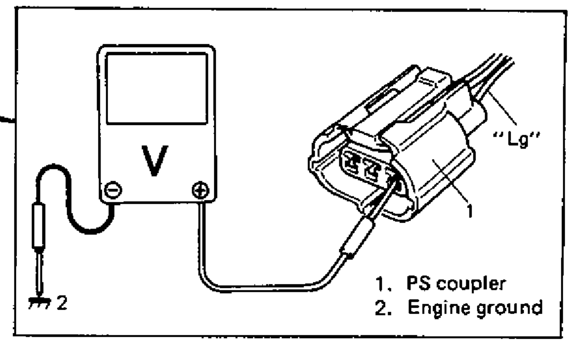
CODE NO. 32 PS (PRESSURE SENSOR) CIRCUIT (SIGNAL VOLTAGE HIGH – HIGH PRESSURE – LOW VACUUM)



1. ECM
2. ECM coupler
3. PS
4. PS coupler
5. To TPS
6. To other sensors

Fig. 6E-70 PS Circuit

1. Disconnect PS coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Lg" wire terminal of PS coupler about 4 – 5V?



YES → Check PS referring to p. 6E-81. Is it in good condition?

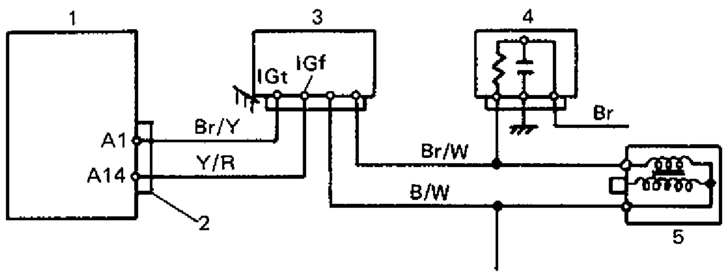
- **YES** → "Lg" wire shorted to "Lg/R" wire, "Lg/B" wire open, poor A25 connection, poor B2 connection, "Lg/R" wire open or poor PS-to-"Lg/B" wire connection. If wires and connections are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-32.
- **NO** → Faulty PS.

NO → "Lg" wire shorted to power circuit. If wire is OK, substitute a known-good ECM and recheck.

NOTE:
When battery voltage is applied to "Lg" wire, it is possible that PS is also faulty.

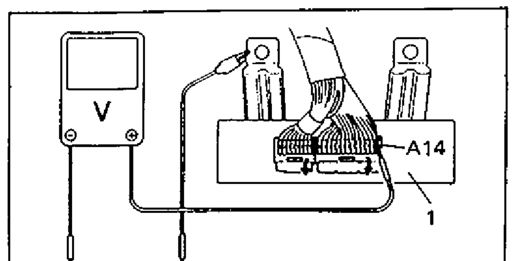
Fig. 6E-71 Diagnostic Flow Chart for Code No. 32

CODE NO. 41 IGNITION FAIL SAFE SIGNAL CIRCUIT (IGNITION FAIL SAFE SIGNAL NOT INPUTTED)



1. ECM
2. ECM coupler
3. Igniter (power unit)
4. Noise suppressor
5. Ignition coil

Fig. 6E-72 Ignition Fail Safe Signal Circuit



1. ECM

Check ignition spark referring to SECTION 6F.
Is it in good condition?

NO

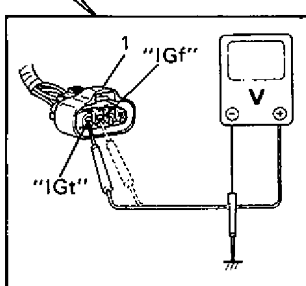
1. Disconnect igniter coupler.
2. Connect analog type voltmeter between "IGt" terminal of igniter coupler and engine ground.
3. Is voltage pulse output within 0 – 5V while engine cranking?

NO

"Br/Y" wire open or poor A1 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES

1. Check following parts referring to SECTION 6F.
   - Ignition coil
   - Noise suppressor
   - Wire harnesses and couplers
2. If all above are OK, replace igniter.



1. Igniter coupler

YES

1. Remove ECM.
2. Is 0 – 2V or 4 – 5V voltage obtained between A14 terminal (IGf) and ground when ignition switch is ON?
   Also, does voltage at engine cranking vary from that at ignition switch ON?

NO

1. Disconnect igniter coupler.
2. Is about 5V voltage obtained between "IGf" terminal of igniter coupler and ground when ignition switch is ON?

NO

"Y/R" wire open or poor A14 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES

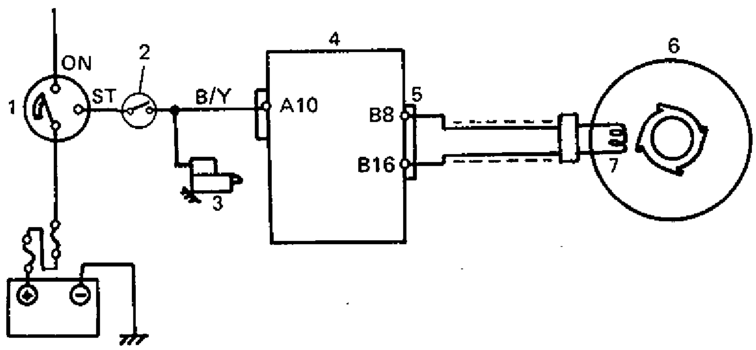
Poor "IGf" connection of igniter or faulty igniter.

YES

Substitute a known good ECM and recheck.

Fig. 6E-72-1 Diagnostic Flow Chart for Code No. 41

CODE NO. 42 CRANK ANGLE SENSOR (CAS) CIRCUIT (SENSOR SIGNAL NOT INPUTTED FOR 2 SECONDS AT ENGINE CRANKING)



1. Main switch
2. Inhibiter switch (A/T model only) or Clutch switch (If equipped)
3. Starter
4. ECM
5. ECM coupler
6. Distributor
7. CAS

Fig. 6E-73 CAS Circuit

NOTE:
If starter circuit is open (i.e., start signal circuit is OK but starter fails to run), code No. 42 is stored in memory at ignition switch ON or starter switch ON, even though CAS is in good condition.
When starter motor fails to run and code No. 42 appears, check starter circuit first.

Check signal rotor air gap referring to SECTION 6F.
Is it in good condition?

- **NO** → Mal-adjusted air gap.
- **YES** ↓

Check crank angle sensor referring to SECTION 6F.
Is it in good condition?

- **NO** → Faulty crank angle sensor.
- **YES** ↓

Check engine start signal circuit referring to Diagnostic flow chart B-5.
Is it in good condition?

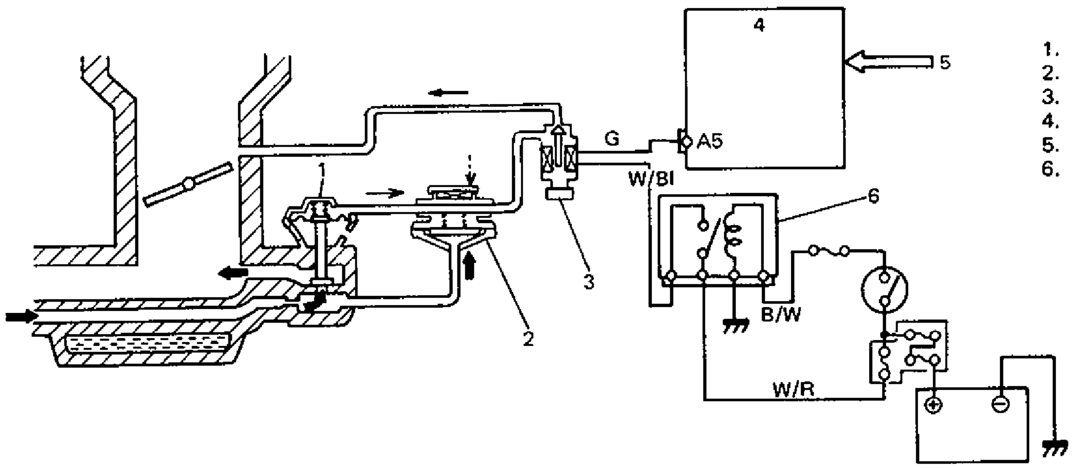
- **NO** → "B/Y" wire open or poor coupler connection.
- **YES** ↓

Open wire between sensor and ECM, poor B8 connection, poor B16 connection or sensor wires shorted to each other.
If wires and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-32.

Fig. 6E-73-1 Diagnostic Flow Chart for Code No. 42

CODE NO. 51 EGR SYSTEM (FAULTY EGR SYSTEM)

For California spec. model only



1. EGR valve
2. EGR modulator
3. VSV
4. ECM
5. Sensed information
6. Main relay

Fig. 6E-74 EGR System

Check EGR system referring to p. 6E-89. Is it in good condition?

- YES → Intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-32.
- NO ↓

Check vacuum hose, EGR valve and EGR modulator referring to p. 6E-90. Are they in good condition?

- NO →
  - Vacuum hose misconnection, leakage, clog or deterioration,
  - Faulty EGR valve or
  - Faulty EGR modulator.
- YES ↓

Check VSV referring to p. 6E-90. Is it in good condition?

- NO → Faulty VSV.
- YES ↓
  - "G" wire open,
  - "G" wire shorted to ground,
  - Poor VSV coupler connection or
  - Poor A5 connection.

  If wire and connection are OK, substitute a known-good ECM and recheck.

Fig. 6E-75 Diagnostic Flow Chart for Code No. 51 (California Spec. Model Only)

TROUBLE DIAGNOSIS

This section describes trouble diagnosis of Electronic Fuel Injection system parts whose trouble is not indicated by the self-diagnosis function.

When diagnostic code No. 12 is indicated by the self-diagnosis function and assuredly those engine basic parts as described in "ENGINE DIAGNOSIS" are all in good condition, check below Electronic Fuel Injection system parts which may be a possible cause for each symptom of the engine.

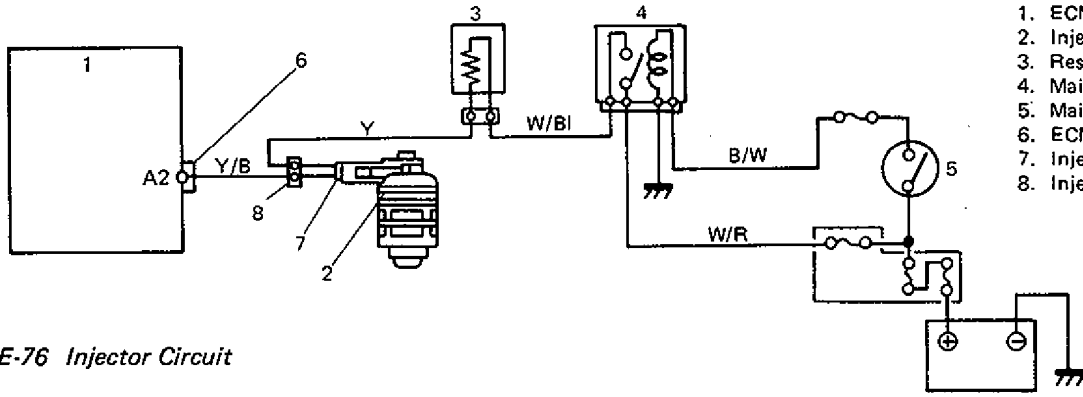
<table>
<tr><th>SYMPTOM</th><th>POSSIBLE CAUSE</th><th>INSPECTION</th></tr>
<tr><td rowspan="8">Hard or no starting (Engine cranks OK)</td><td>• Shortage of fuel in fuel tank</td><td></td></tr>
<tr><td>• Injector or its circuit faulty</td><td>Diagnostic flow chart B-1</td></tr>
<tr><td>• Faulty fuel pump or its circuit open</td><td>Diagnostic flow chart B-2</td></tr>
<tr><td>• Fuel pressure out of specification</td><td>Diagnostic flow chart B-3</td></tr>
<tr><td>• Faulty air valve</td><td>See p. 6E-77</td></tr>
<tr><td>• Engine start signal not to fed</td><td>Diagnostic flow chart B-5</td></tr>
<tr><td>• Poor performance of ATS, WTS or pressure sensor</td><td>See p. 6E-84 or 6E-81</td></tr>
<tr><td>• Faulty ECM</td><td>See p. 6E-65</td></tr>
<tr><td colspan="3">NOTE:
• If engine doesn't start at all, perform fuel injector and its circuit check first. (Advance to "Diagnostic Flow Chart B-1".)
• If engine is hard to start only when it is cold, check air valve first.</td></tr>
<tr><td rowspan="9">Engine fails to idle</td><td>• Shortage of fuel in fuel tank</td><td></td></tr>
<tr><td>• Faulty ISC solenoid valve control system</td><td>Diagnostic flow chart B-4</td></tr>
<tr><td>• Maladjusted idle speed adjusting screw</td><td>See p. 6E-69</td></tr>
<tr><td>• Faulty air valve</td><td>See p. 6E-77</td></tr>
<tr><td>• Faulty EGR system</td><td>See p. 6E-89</td></tr>
<tr><td>• Fuel pressure out of specification</td><td>Diagnostic flow chart B-3</td></tr>
<tr><td>• Faulty injector</td><td>Check injector for resistance and injection condition (Refer to p. 6E-78)</td></tr>
<tr><td>• Poor performance of ATS, WTS or pressure sensor</td><td>See p. 6E-84 or 6E-81</td></tr>
<tr><td>• Faulty ECM</td><td>See p. 6E-65</td></tr>
<tr><td colspan="3">NOTE:
• If engine fails to idle only when it is cold, check air valve.
• With A/T model, if engine stops only when shifted to "R", "D", "2" or "L" range in extremely cold environment, check if "R", "D", "2" or "L" range signal is inputted to ECM first. (Diagnostic flow chart B-6)</td></tr>
</table>

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Improper engine idle speed	• Maladjusted accelerator cable play • Clogged pressure sensor vacuum passage • Faulty ISC solenoid valve control system • Faulty air-conditioner VSV control system (if equipped) • Faulty power steering VSV (if equipped) • Faulty idle switch (in TPS) • Maladjusted idle speed adjusting screw • Faulty air valve • Fuel pressure out of specification • Poor performance of ATS, WTS or pressure sensor • Faulty ECM	See p. 6E-69 Check vacuum hose and filter Diagnostic flow chart B-4 See section 1B See p. 6E-93 See p. 6E-82 See p. 6E-69 See p. 6E-77 Diagnostic flow chart B-3 See p. 6E-84 or 6E-81 See p. 6E-65
NOTE: • **With engine warmed up, if engine idle speed is high and ISC solenoid valve is not heard to operate, check accelerator cable play, idle switch and ISC solenoid valve control system in that order.** • **If engine idle speed lowers below specification only when electric load is applied (e.g. headlight ON), check ISC solenoid valve control system first.**		
Engine has no or poor power	• Maladjusted accelerator cable play • Faulty EGR system • Fuel pressure out of specification (Low fuel pressure) • Poor performance of TPS, ATS, WTS or pressure sensor • Faulty ECM	See p. 6E-69 See p. 6E-89 Diagnostic flow chart B-3 See p. 6E-82, 6E-84 or 6E-81 See p. 6E-65
Engine hesitates when accelerating	• Clogged pressure sensor vacuum passage • Faulty EGR system • Fuel pressure out of specification (Low fuel pressure) • Poor performance of TPS, ATS or WTS pressure sensor • Faulty ECM	Check vacuum hose and filter See p. 6E-89 Diagnostic flow chart B-3 See p. 6E-82, 6E-84 or 6E-81 See p. 6E-65
Surges (Variation in car speed is felt although accelerator pedal is not operated)	• Variable fuel pressure (Clogged fuel filter, faulty fuel pressure regulator, etc.) • Poor performance of pressure sensor • Faulty ECM	Diagnostic flow chart B-3 See p. 6E-81 See p. 6E-65

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Poor gasoline mileage	• High idle speed	Refer to item "Improper engine idle speed" previously outlined
	• Fuel pressure out of specification or fuel leakage	Diagnostic flow chart B-3
	• Poor performance of TPS, ATS or WTS	See p. 6E-82 or 6E-84
	• Faulty ECM	See p. 6E-65
Excessive hydrocarbon (HC) emission	• Engine not at normal operating temperature	
	• Clogged air cleaner	
	• Faulty ignition system	See section 6F
	• Vacuum leaks	
	• Low compression	See section 6
	• Lead contamination of catalytic converter	Check for absence of filler neck restrictor
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• A/F feed back compensation fails	
	– Faulty TPS	See p. 6E-82
	– Poor performance of WTS or pressure sensor	See p. 6E-84 or 6E-81
	• Poor performance of ATS	See p. 6E-84
	• Faulty injector	See p. 6E-78
	• Faulty ECM	See p. 6E-65
Excessive carbon monoxide (CO)	• Engine not at normal operating temperature	
	• Clogged air cleaner	
	• Faulty ignition system	See section 6F
	• Low compression	See section 6
	• Lead contamination of catalytic conveter	Check for absence of filler neck restrictor
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• A/F feed back compensation fails	
	– Faulty TPS	See p. 6E-82
	– Poor performance of WTS or pressure sensor	See p. 6E-84 or 6E-81
	• Poor performance of ATS	See p. 6E-84
	• Faulty injector	See p. 6E-78
	• Faulty ECM	See p. 6E-65

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Excessive nitrogen oxides (NOx) emission	• Improper ignition timing	See section 6F
	• Lead contamination of catalytic converter	Check for adsence of filler neck restrictor
	• Faulty EGR system	See p. 6E-89
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• A/F feed back compensation fails	
	– Faulty TPS	See p. 6E-82
	– Poor performance of WTS or pressure sensor	See p. 6E-84 or 6E-81
	• Poor performance of ATS	See p. 6E-84
	• Faulty injector	See p. 6E-78
	• Faulty ECM	See p. 6E-65

B-1 FUEL INJECTOR AND ITS CIRCUIT CHECK (ENGINE NOT STARTING)



1. ECM
2. Injector
3. Resistor
4. Main relay
5. Main switch
6. ECM coupler
7. Injector sub coupler
8. Injector coupler

Fig. 6E-76 Injector Circuit

Is fuel injected from injector at ignition switch ON (not cranking)?

- YES → "Y/B" wire shorted to ground or faulty injector. If wire and injector are OK, check to make sure that resistance of resistor and injector is as specified respectively and then substitute a known-good ECM and recheck.
- NO → Is fuel injected from injector at engine cranking? (Refer to p. 6E-78 for checking).
  - YES → Check injector for leaks. (Refer to p. 6E-78 for checking). Is it in good condition?
    - NO → Faulty fuel injector.
    - YES → Injector and its circuit in good condition.
  - NO → Using sound scope, check injector for operating sound at engine cranking. Is it detected?
    - YES → Check fuel pump and fuel pressure. (Proceed to DIAGNOSTIC FLOW CHART B-2 and B-3.).
    - NO → 1. Desconnect injector coupler with ignition switch OFF. 2. Is resistance of injector 0.5 – 1.5 Ω (at 20°C, 68°F)?

To be continued

Continued

↓ YES

1. Disconnect resistor coupler with ignition switch OFF.
2. Is resistance of resistor 1.9 – 2.1 Ω (at 20°C, 68°F).

↓ NO

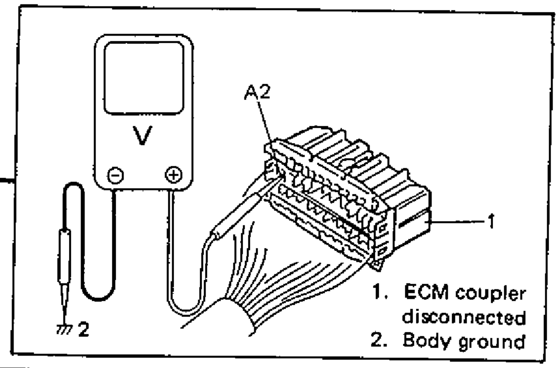
Faulty injector, open sub wire or poor sub coupler connection.

↓ YES (from resistor check)

1. Connect injector coupler and resistor coupler with ignition switch OFF.
2. Disconnect ECM coupler.
3. Is battery voltage applied to ECM coupler A2 at ignition switch ON?

↓ NO (from resistor check)

Faulty resistor.



↓ YES

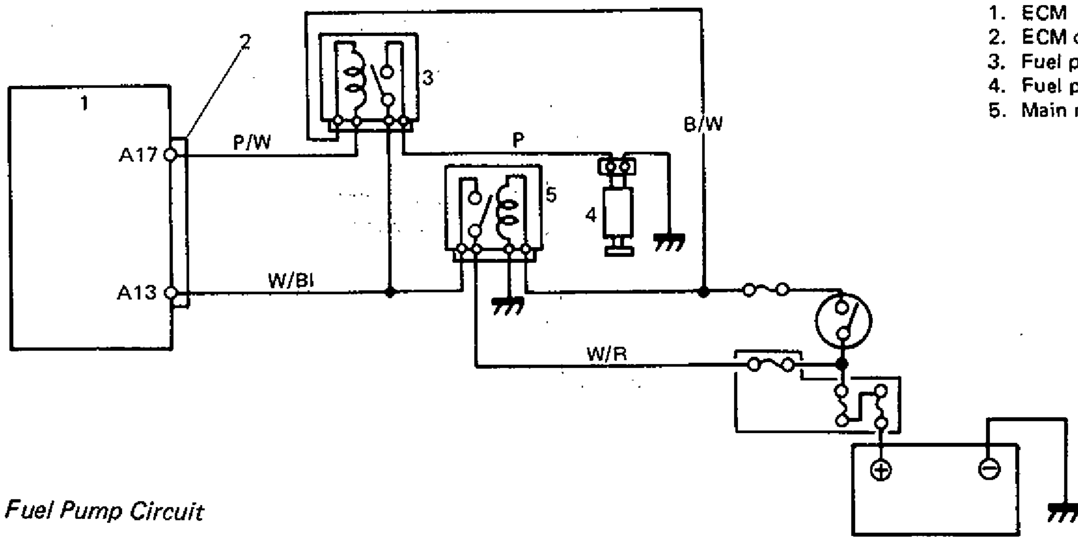
Poor A2 connection.
If connection is OK, substitute a known-good ECM and recheck.

↓ NO

"Y" wire open, "Y/B" wire open, poor resistor coupler connection or poor injector coupler connection.

Fig. 6E-77 Diagnostic Flow Chart B-1 for Injector and Its Circuit

B-2 FUEL PUMP AND ITS CIRCUIT CHECK



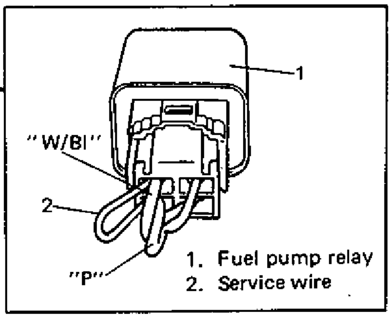
1. ECM
2. ECM coupler
3. Fuel pump relay
4. Fuel pump
5. Main relay

Fig. 6E-78 Fuel Pump Circuit

Is fuel pump heard to operate for 2 sec. after ignition switch ON?

- **YES** → Fuel pump circuit in good condition.
- **NO** ↓

1. Remove fuel pump relay from main fuse box.
2. Using service wire, connect "P" and "W/BI" wire terminals.
3. Is fuel pump heard to operate at ignition switch ON?



- **NO** → "P" wire open, poor fuel pump coupler connection or faulty fuel pump.
- **YES** ↓

Check fuel pump relay referring to p. 6E-87.
Is it in good condition?

- **NO** → Faulty fuel pump relay.
- **YES** ↓

Poor relay coupler connection, "P/W" wire open or poor A17 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

NOTE:
Before substituting a known-good ECM, check to make sure that resistance of coil in relay is as specified.

Fig. 6E-79 Diagnostic Flow Chart B-2 for Fuel Pump and Its Circuit Check

B-3 FUEL PRESSURE CHECK

1. Fuel pump
2. Fuel filter
3. Throttle body
4. Fuel injector
5. Fuel pressure regulator
6. Special tool (Fuel pressure gauge & 3-way joint)
7. Fuel feed line
8. Fuel return line

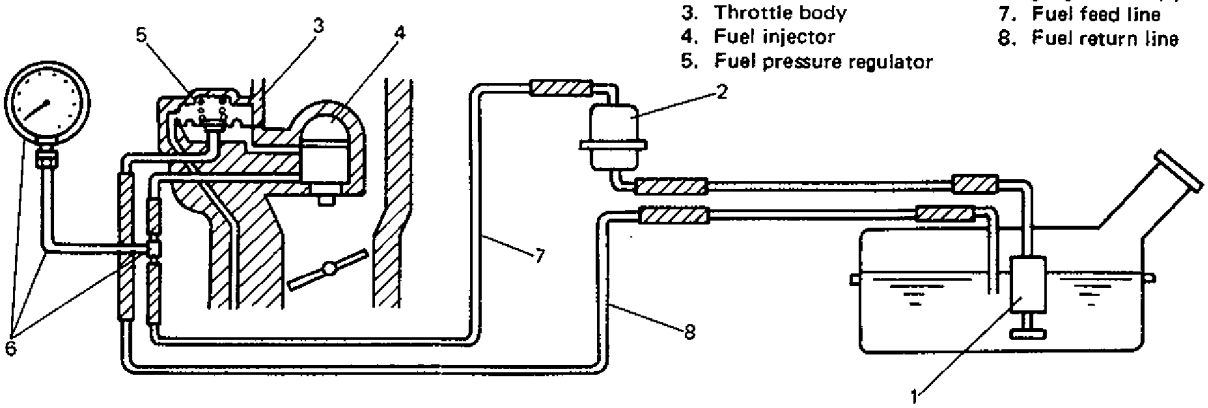


Fig. 6E-80 Fuel Pressure Check

1. Install fuel pressure gauge referring to p. 6E-71.
2. Operate fuel pump for 10 sec. according to procedure described on p. 6E-72.
   Is fuel pressure then 1.6 – 2.1 kg/cm^2 (160 – 210 kPa, 22.7 – 29.9 psi)? Also, is 0.9 kg/cm^2 (90 kPa, 12.8 psi) or higher fuel pressure retained for 1 minute after fuel pump is stopped?

NO →

- No pressure
  To ① on next page
- Pressure within spec. but not retained
  To ② on next page
- Low pressure
  To ③ on next page
- High pressure
  To ④ on next page

YES ↓

1. Start engine and warm it up to normal operating temperature.
2. Keep it to specified idle speed.
   Is fuel pressure then 0.9 – 1.4 kg/cm^2 (90 – 140 kPa, 12.8 – 20.0 psi)?

YES ↓

Normal fuel pressure.

NO ↓

- Clogged vaccum passage for fuel pressure regulator or
- Faulty fuel pressure regulator.

Fig. 6E-81 Diagnostic Flow Chart B-3 for Fuel Pressure (1)

B-3 FUEL PRESSURE CHECK (continued)

① NO PRESSURE

With fuel pump operated and fuel return hose blocked by pinching it, is fuel pressure applied?

- NO: Shortage of fuel or fuel pump or its circuit defective (Refer to "Diangostic Flow Chart B-2).
- YES: Faulty fuel pressure regulator

② PRESSURE WITHIN SPEC. BUT NOT RETAINED

Is there fuel leakage from fuel feed line hose, pipe or their joint?

- YES: Fuel leakage from hose, pipe or joint.
- NO:
  1. Disconnect fuel return hose from throttle body and connect new return hose to it.
  2. Insert the other end of new return hose into approved gasoline container.
  3. Check again if specified pressure is retained. While doing so, does fuel come out of return hose?

  - YES: Faulty fuel pressure regulator.
  - NO:
    - Fuel leakage from injector,
    - Fuel leakage from between injector and throttle body,
    - Faulty fuel pump (faulty check valve in fuel pump) or
    - Fuel leakage from fuel pressure regulator diaphragm.

③ LOW PRESSURE

1. Operate fuel pump.
2. With fuel return hose blocked by pinching it, check fuel pressure. Is it 2.0 kg/cm^2 (200 kPa, 28.4 psi) or more?

- NO:
  - Clogged fuel filter,
  - Restricted fuel feed hose or pipe,
  - Faulty fuel pump or
  - Fuel leakage from hose connection in fuel tank.
- YES: Faulty fuel pressure regulator

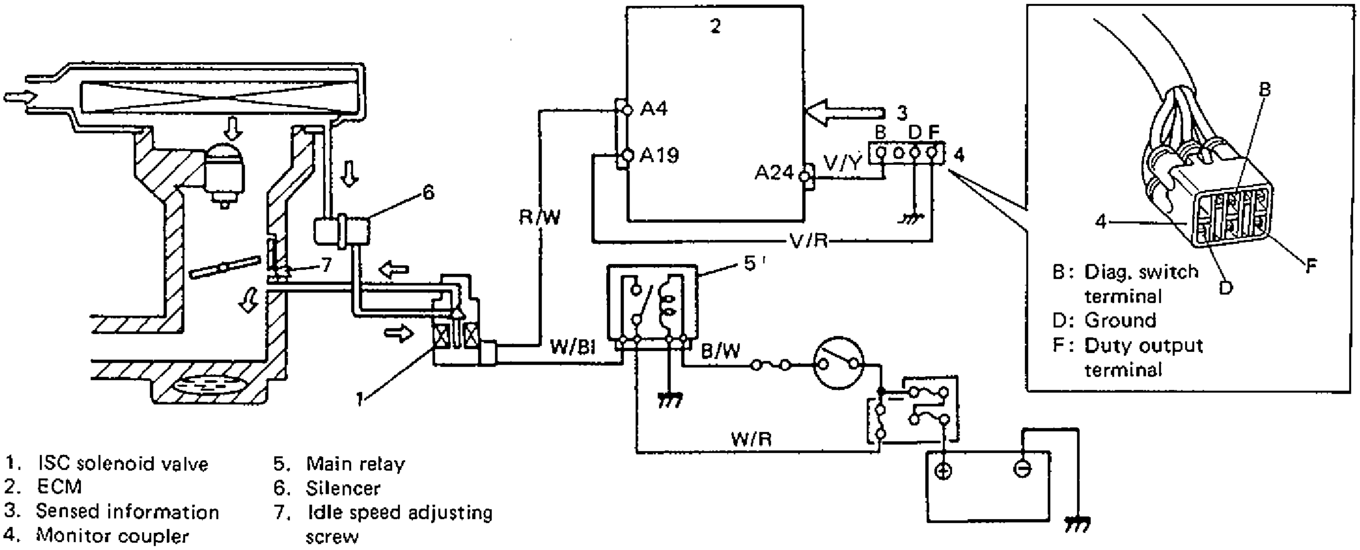
④ HIGH PRESSURE

1. Disconnect fuel return hose from throttle body and connect new return hose to it.
2. Insert the other end of new return hose into approved gasoline container.
3. Operate fuel pump. Is specified fuel pressure obtained then?

- NO: Faulty fuel pressure regulator.
- YES: Restricted fuel return hose or pipe.

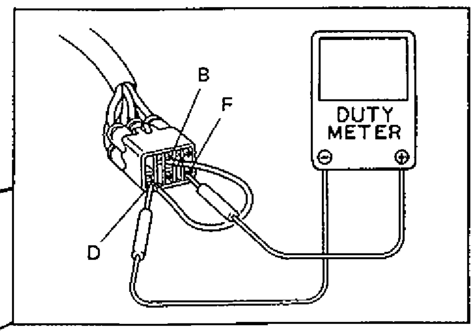
Fig. 6E-81-1 Diagnostic Flow Chart B-3 for Fuel Pressure (2)

B-4 ISC SOLENOID VALVE CONTROL SYSTEM CHECK



1. ISC solenoid valve
2. ECM
3. Sensed information
4. Monitor coupler
5. Main relay
6. Silencer
7. Idle speed adjusting screw

Fig. 6E-82 ISC Solenoid Valve Circuit



1. Warm up engine to normal operating temperature and keep it idle.
2. Using service wire, ground diagnosis switch terminal.
3. Is diagnostic code No. 12 indicated?

NO → Go back to "Diagnostic Flow Chart" on p. 6E-35.

YES → Check idle speed and ISC duty referring to p. 6E-69. Are they within specification?

NO →
- High idle speed To ① on next page.
- Low idle speed To ② on next page.
- Idle speed is within specification but duty is not.
  1. Adjust ISC duty to specification.

  NOTE:
  - **When ON duty of ISC is close to 0% (but close to 100% with such duty meter that indicates OFF duty, in other words, when ISC is almost fully closed), check that air intake system is free from vacuum leakage and adjust it.**
  - **If duty remains unchanged even when adjusting screw is turned, check duty output terminal circuit.**

  2. Proceed to next step.

YES → Is engine idle speed kept at specified speed even with headlights turned ON?

NO → Proceed to system circuit check ③ on next page.

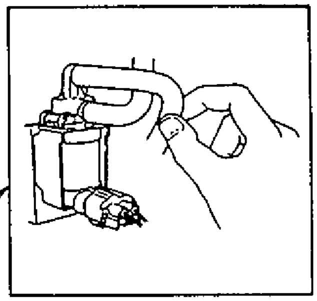
YES → System is in good condition.

Fig. 6E-82-1 Diagnostic Flow Chart B-4 for ISC Solenoid Valve Control System (1)

B-4 ISC SOLENOID VALVE CONTROL SYSTEM CHECK (Continued)

① HIGH IDLE SPEED

1. Block ISC solenoid valve hose by pinching it.
2. Does engine speed reduce then?



YES → Check ISC solenoid valve for its resistance and operation. (Refer to p. 6E-88.) Is it in good condition?

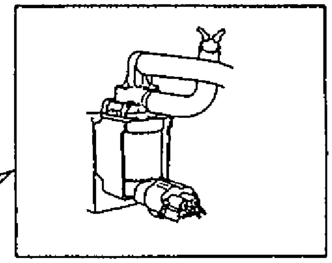
- **YES** → Check idle switch and its circuit. Are they in good condition?
  - **YES** → "R/W" wire shorted to ground. If wire is OK, substitute a known-good ECM and recheck.
  - **NO** →
    - Faulty idle switch,
    - Maladjusted TPS installation angle,
    - Wire open or
    - Poor connection.
- **NO** → Faulty ISC solenoid valve.

NO →
1. Check that air intake system (including A/C VSV and P/S VSV) is free from vacuum leakage.
2. Adjust duty and idle speed referring to p. 6E-69.

NOTE:
If not adjustable with idle speed adjusting screw, check air valve.

② LOW IDLE SPEED

1. Disconnect ISC hose from air cleaner case.
2. Then, is air drawn into it?



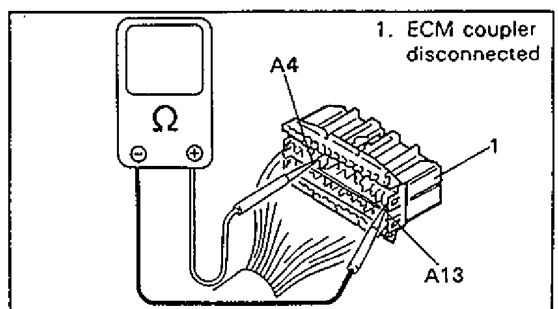
NO → Check ISC solenoid valve for its resistance and operation. (Refer to p. 6E-88.) Is it in good condition?

- **YES** →
  - Clogged ISC hose,
  - "R/W" wire open or
  - Poor coupler connections.

  If all above are OK, substitute a known-good ECM and recheck.
- **NO** → Faulty ISC solenoid valve.

YES → Adjust duty and idle speed referring to p. 6E-69.

③ SYSTEM CIRCUIT CHECK



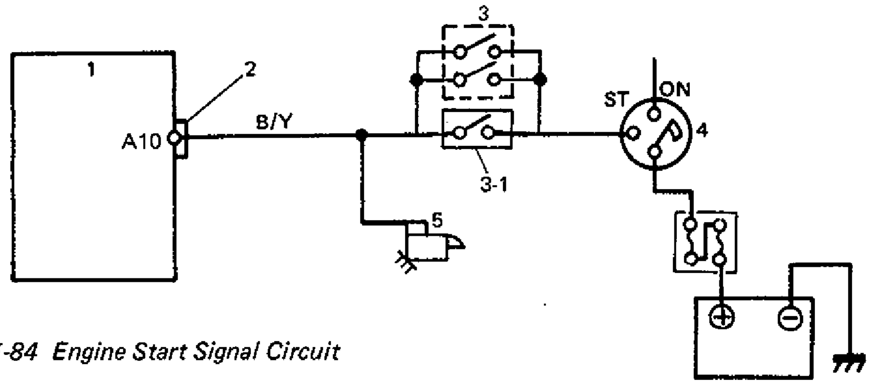
1. Disconnect ECM couplers with ignition switch OFF.
2. Is resistance between A4 and A13 30 – 33 Ω?.

YES → Poor coupler connection. If connection is OK, substitute a known-good ECM and recheck.

NO →
- Faulty ISC solenoid
- Poor coupler connection or
- Open wire harness

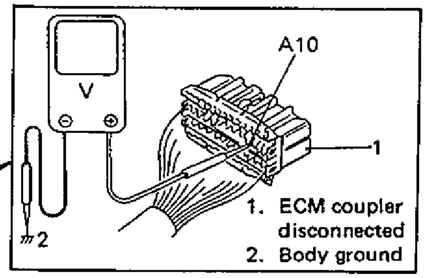
Fig. 6E-82-2 Diagnostic Flow Chart B-4 for ISC Solenoid Valve Control System (2)

B-5 ENGINE START SIGNAL CHECK



1. ECM
2. ECM coupler
3. Inhibiter switch (A/T model only)
3-1. Clutch switch (If equipped.)
4. Main switch
5. Starter

Fig. 6E-84 Engine Start Signal Circuit



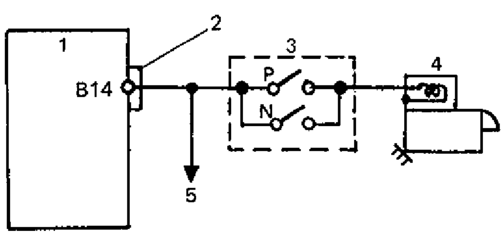
1. With ignition switch OFF, disconnect "A" coupler (right side coupler) from ECM.
2. Is 6 – 12V voltage applied to A10 terminal of coupler only when cranking engine ?

YES → Engine start signal circuit is in good condition.

NO → ●Wire open, ●Poor connection or ●Faulty clutch switch (M/T) or shift switch (A/T).

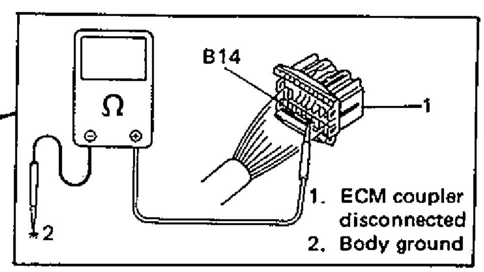
Fig. 6E-85 Engine Start Signal Check

B-6 "R", "D", "2" OR "L" RANGE SIGNAL CHECK (A/T MODEL ONLY)



1. ECM
2. ECM coupler
3. Inhibiter switch
4. Starter
5. To starter switch

Fig. 6E-86 "R", "D", "2" or "L" Range Signal Circuit



1. With ignition switch OFF, disconnect "B" coupler (16P coupler) from ECM.
2. Check continuity between B14 terminal and body ground under each condition given in below table.

Selector lever in "P" or "N" range position	Continuity
Selector lever in "R", "D", "2" or "L" range position	No continuity

Is check result satisfactory?

YES → Signal circuit is in good condition.

NO → ●Wire open, ●Poor connection or ●Faulty inhibiter switch.

Fig. 6E-87 "R", "D", "2" or "L" Range Signal Check (A/T Model Only)

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.**

Voltage Check

1. Remove ECM from body referring to p. 6E-80.
2. Connect ECM couplers to ECM.
3. Using service wire, ground ECM case.
4. 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.

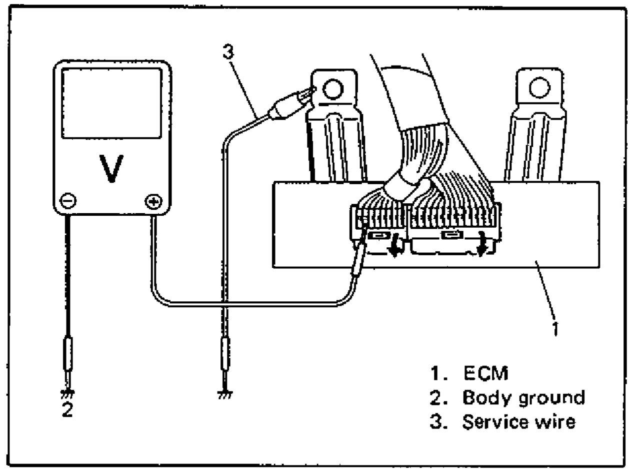


Fig. 6E-88 Checking Voltage

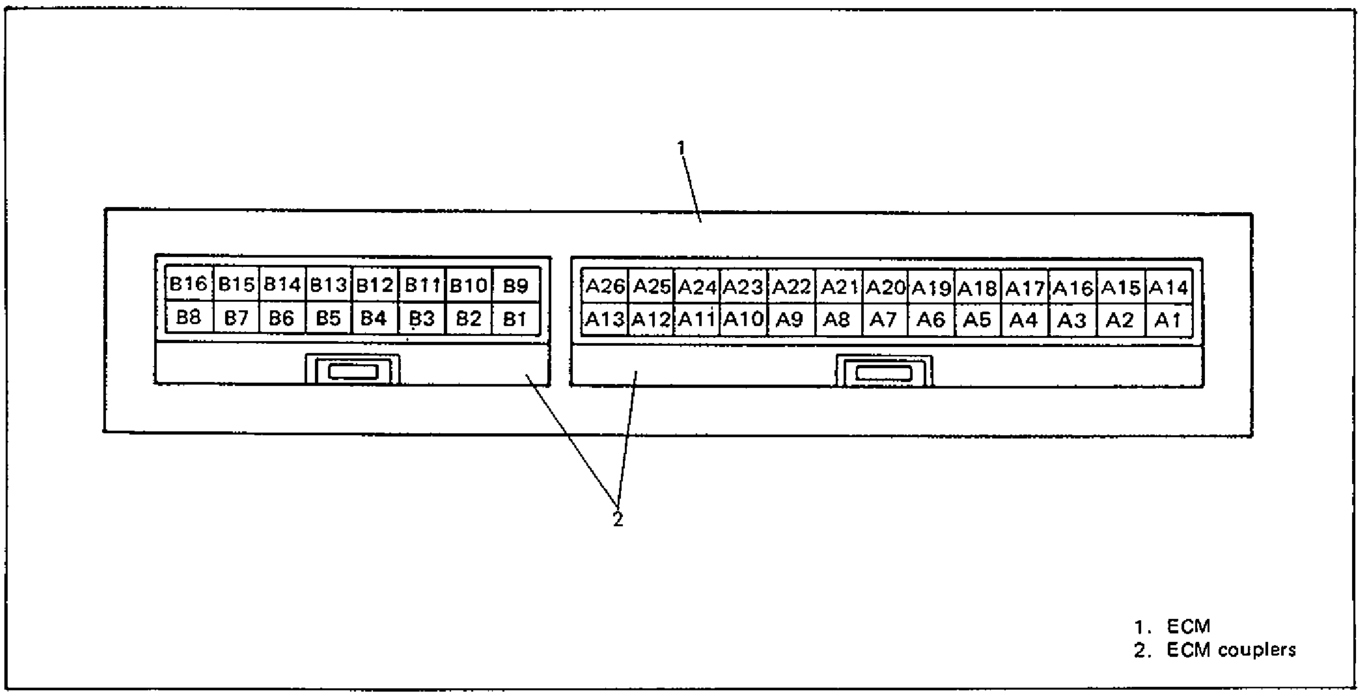


Fig. 6E-89 ECM Coupler Terminals

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Ignition trigger signal	——	——
A2	Injector	10 – 14V	Ignition switch ON
A3	Blank	——	——
A4	ISC solenoid valve	0.9 – 1.5V	Ignition switch ON
A5	EGR VSV	10 – 14V	Ignition switch ON
A6	"CHECK ENGINE" light	1.1 – 2.0V	Ignition switch ON
		10 – 14V	When engine running
A7	Blank	——	——
A8	Shift-up indicator light (if equipped)	1 – 2V	Ignition switch ON
		10 – 14V	When engine running
A9	Blank	——	——
A10	Engine start switch (Engine start signal)	6 – 12V	While engine cranking
		0V	Other than above
A11	Test switch terminal	10 – 14V	Ignition switch ON
A12	Ground	0V	Ignition switch ON
A13	Power source	10 – 14V	Ignition switch ON
A14	Ignition fail safe signal	——	——
A15	Ground	0V	Ignition switch ON
A16	Blank	——	——
A17	Fuel pump relay	0.5 – 1.8V	For 2 seconds after ignition switch ON
		10 – 14V	After the above time
A18	P/S VSV (if equipped)	10 – 14V	Ignition switch ON
A19	Duty output terminal	0V	Ignition switch ON
A20	Blank	——	——
A21, A22	Blank	——	——
A23	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.
A24	Diagnosis switch terminal	10 – 14V	Ignition switch ON
A25	Ground for sensors	0V	Ignition switch ON
A26	Power source for back-up circuit	10 – 14V	Ignition switch ON and OFF

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B1	Power source of sensor (PS and TPS)	4.75–4.25V	Ignition switch ON
B2	Pressure sensor	3.5 – 4.1V	Ignition switch ON Barometric pressure: 760 mmHg
B3	Oxygen sensor	Indicator deflection repeated between over and under 0.45V	While engine running at 2,000 r/min for 1 minute or longer after warmed up
B4	Blank	——	——
B5	A/C circuit (if equipped)	10 – 14V	Ignition switch ON
		0 – 0.6V	While engine running at idle speed and A/C ON
B6	Electric load signal	0V	Ignition switch ON Headlight, small light, heater fan, radiator fan, stop light and rear window defogger all turned OFF
		10 – 14V	Ignition switch ON Headlight, small light, heater fan, radiator fan, stop light or rear window defogger turned ON
B7	Idle switch (in TPS)	0V	Ignition switch ON Throttle valve at idle position
		10 – 14V	Ignition switch ON Throttle valve opens larger than idle position
B8	Crank angle sensor (positive)	0.4 – 0.8V	Ignition switch ON
B9	Air temp. sensor	2.0 – 2.7V	Ignition switch ON Sensor ambient temp. (Intake air temp.): 20°C (68°F)
B10	Water temp. sensor	0.45–0.85V	Ignition switch ON Engine cooling water temp.: 80°C (176°F)
B11	Throttle position sensor	0.18–1.03V	Ignition switch ON Throttle valve at idle position
		3.27–4.58V	Ignition switch ON Throttle valve at full open position
B12	Blank	——	——
B13	Serial data terminal	4 – 5V	Ignition switch ON
B14 (A/T model only)	Inhibiter switch ("R", "D", "2" or "L" range signal)	0V	Ignition switch ON, Selector lever in "P" or "N" range position
		10 – 14V	Ignition switch ON, Selector lever in "R", "D", "2" or "L" range position
B15	Vehicle speed sensor	Indicator deflection repeated 0V and 10 – 14V	Ignition switch ON Front left tire turned slowly with front right tire locked
B16	Crank angle sensor (negative)	0.4 – 0.8V	Ignition switch ON

Resistance Check

1. Disconnect ECM couplers from ECM with ignition switch OFF.

> **CUATION:**
> **Never touch terminals of ECM itself or connect voltmeter or ohmmeter.**

2. Check resistance between each terminal of couplers disconnected.

> **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 below table represents that when parts temperature is 20°C (68°F).**

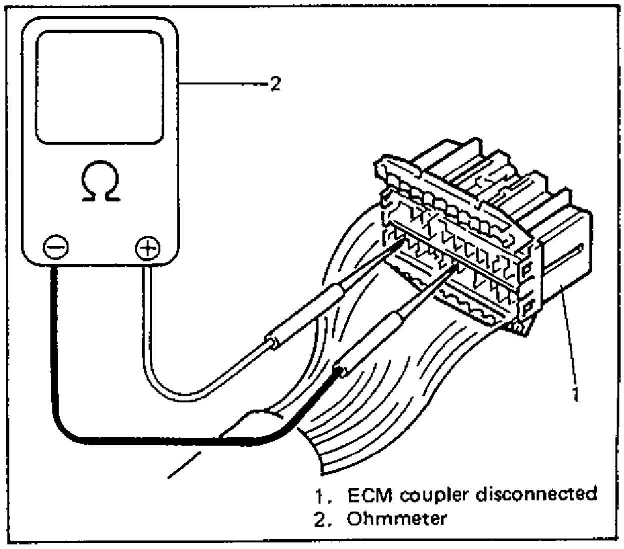


Fig. 6E-90 Checking Resistance

TERMINALS	CIRCUIT	NORMAL RESISTANCE	CONDITION	
A2 – A13	Injector and resistor	2.4 – 3.6 Ω	——	
A4 – A13	ISC solenoid valve	30 – 33 Ω	——	
A5 – A13	EGR VSV	33 – 39 Ω	——	
A11 – Body ground	Test switch terminal	Continuity	Test switch terminal grounded	
		∞ (Infinity)	Test switch terminal ungrounded	
A15 – Body ground	ECM ground	Continuity	——	
A17 – A18	Fuel pump relay and power steering VSV (if equipped)	89 – 123 Ω	——	
A24 – Body ground	Dia. switch terminal	Continuity	Diag. switch terminal grounded	
		∞ (Infinity)	Diag. switch terminal ungrounded	
B7 – A25	Idle switch in TPS	Continuity	Throttle valve at idle position	
		∞ (Infinity)	Throttle valve opens larger than idle position	
B8 – B16	Crank angle sensor	140 – 180 Ω	——	
B9 – A25	ATS	2.21 – 2.69 kΩ	Intake air temp. 20°C (68°F)	
B10 – A25	WTS	290 – 354 Ω	Engine cooling water temp. 80°C (176°F)	
B11 – A25	TPS	0.20–11.42 kΩ	Throttle valve at idle position	With pressure sensor coupler disconnected
		3.03–17.08 kΩ	Throttle valve at full open position	
B15 – Body ground	Vehicle speed sensor	Ohmmeter indicator deflects between 0 and ∞	Front left tire turned slowly with front right tire locked	

ON CAR SERVICE

GENERAL

When hoses have been disconnected and system's component removed for service, be sure to reinstall component properly, and route and connect hose correctly after service. Refer to Emission Control Information Label for proper connection of hoses.

ACCELERATOR CABLE ADJUSTMENT

Check accelerator cable for play and adjust if necessary.

Cable play should be within specification. If out of specification, loosen accelerator cable lock nut and adjust by turning adjusting nut. Be sure to tighten lock nut securely after adjustment.

Accelerator cable play	3 – 5 mm (0.12 – 0.20 in.)

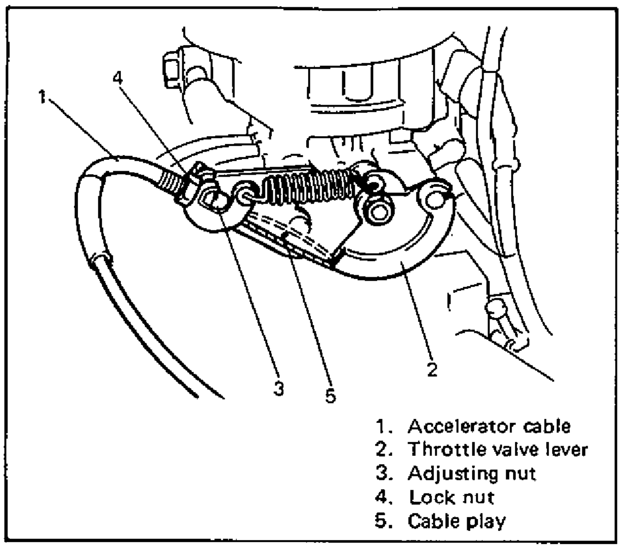


Fig. 6E-91 Accelerator Cable Play

IDLE SPEED/ISC DUTY ADJUSTMENT (INCLUDING AIR-CONDITIONER VSV ADJUSTMENT)

Before idle speed/ISC duty and adjustment, make sure to the following.

- Lead wires and hoses of Electronic Fuel Injection and engine emission control systems are connected securely.
- Accelerator cable has some play, that is, it is not tight.
- Ignition timing is within specification.
- All of electrical loads except ignition are switched off.
- Air-conditioner is OFF, if equipped.
- Air cleaner has been properly installed and is in good condition.

After above items are all confirmed, check idle speed and ISC duty as follows.

NOTE:

Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake and block drive wheels.

1. Warm up engine to normal operating temperature.
2. Set tachometer
3. Using service wire, ground "Diagnosis switch terminal" in monitor coupler so that ECM outputs ISC duty through "Duty output terminal" and make sure that "CHECK ENGINE" light indicate diagnostic code No. 12.

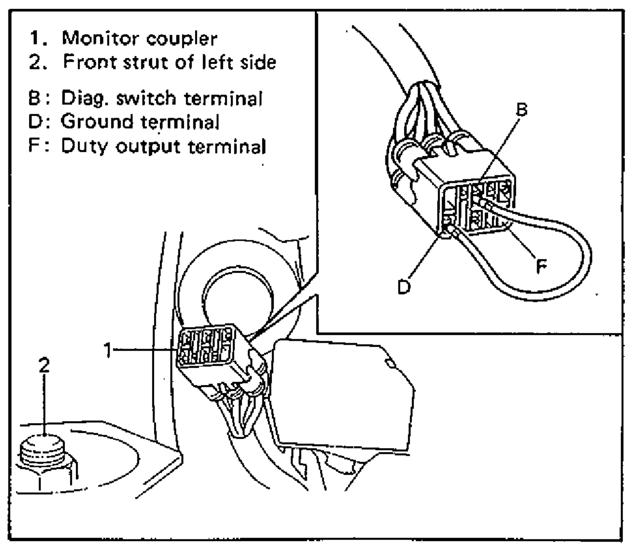


Fig. 6E-92 Grounding Diag. Switch Terminal

4. Connect duty meter between "Duty output terminal" and "Ground terminal" of monitor coupler.

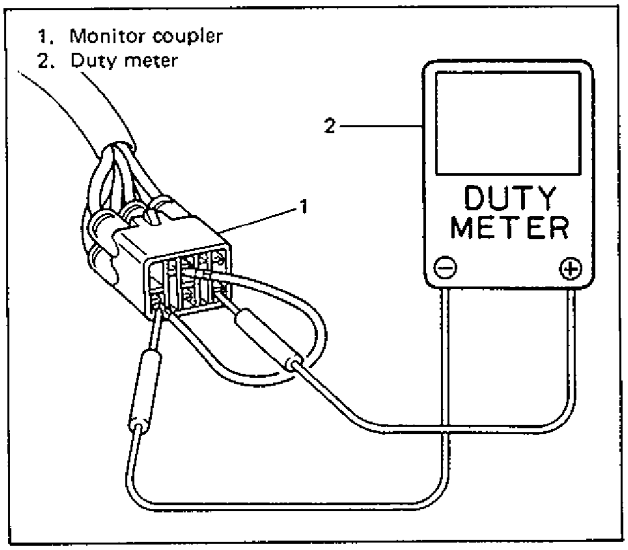


Fig. 6E-92-1 Connecting Duty Meter

5. Check to ensure that idle speed and ISC duty conform to specifications respectively. If ISC duty and/or idle speed is not within specified range, adjust it by turning idle speed adjusting screws.

	ENGINE IDLE SPEED	ISC DUTY AT SPECIFIED IDLE SPEED
M/T MODEL	800 ± 50 r/min	30 ± 5% (ON duty meter indication) or 4.2 ± 0.7V when battery voltage is 14V
A/T MODEL	900 ± 50 r/min	

NOTE:
ISC duty can be checked by using analog type voltmeter. ISC duty to voltage relation is as follows.

ON DUTY METER INDICATION (%)	OFF DUTY METER INDICATION (%)	VOLTMETER INDICATION (V)
0	100	0
25	75	0.25 x V_B
35	65	0.35 x V_B
100	0	V_B

- **"OFF DUTY METER" is such duty meter that indicates approx. 100% when terminal voltage is approx. "0V".**
- **"V_B" represents battery voltage while engine of vehicle being checked is running.**

NOTE:
When using duty meter which indicates OFF duty, adjust so that it indicates 70%. Then ISC duty (ON duty) is adjusted to above specified value (30%).

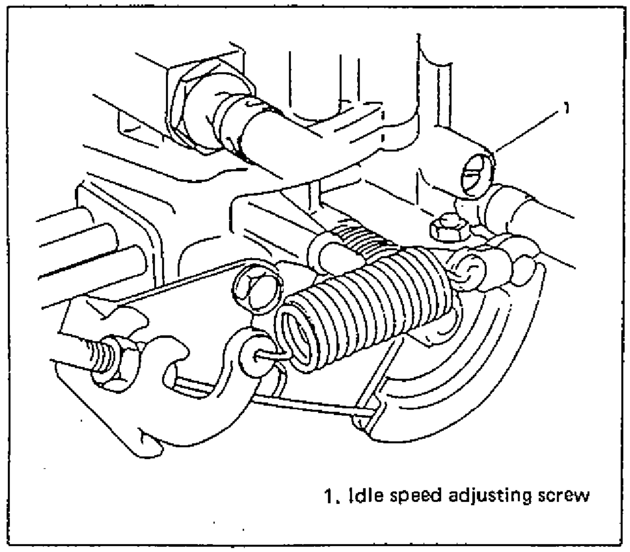


Fig. 6E-93 Idle Speed Adjusting Screw

6. Upon completion of adjustment, install adjusting screw cap to throttle body.
7. This step is for checking and/or adjusting engine idle speed and ISC duty when air-conditioner is working.
   With cars without air conditioner, advance to steps 8. With air-conditioner equipped ones, follow procedure described below.
   1) Turn air-conditioner switch ON and set heater blower switch to high (max.) speed position. Then check that air-conditioner is working.
   2) Check to ensure that idle speed and ISC duty conform to specifications respectively.

NOTE:
Specified values used for this inspection and adjustment vary depending on types of ECM as listed in tables below. Types of ECM can be identified by the last number of ECM part No.

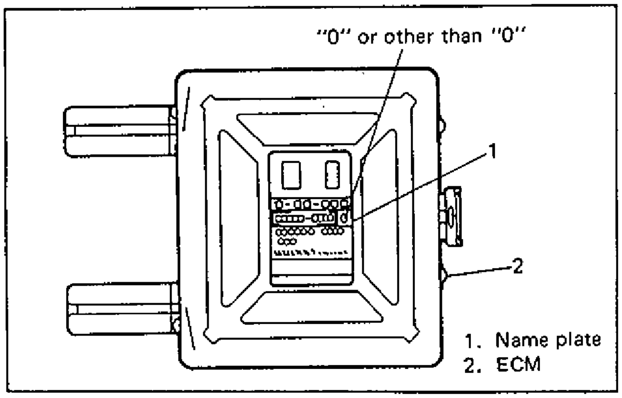


Fig. 6E-93-1

When ECM part No. ends with "0"

	IDLE SPEED WITH A/C ON AND DIAG. SWITCH TERMINAL GROUNDED	ISC DUTY
M/T MODEL	800 ± 50 r/min	10 – 20% (ON duty meter indication) or 1.4 – 2.8V when battery voltage is 14V
A/T MODEL	900 ± 50 r/min	

When ECM part No. ends with No. other than "0"

	IDLE SPEED WITH A/C ON AND DIAG. SWITCH TERMINAL GROUNDED	ISC DUTY
ALL MODELS	900 ± 50 r/min	20% (ON duty meter indication) or 2.8V when battery voltage is 14V

3) If idle speed and/or ISC duty is not within specified range, adjust it by turning adjusting screw of air-conditioner VSV.

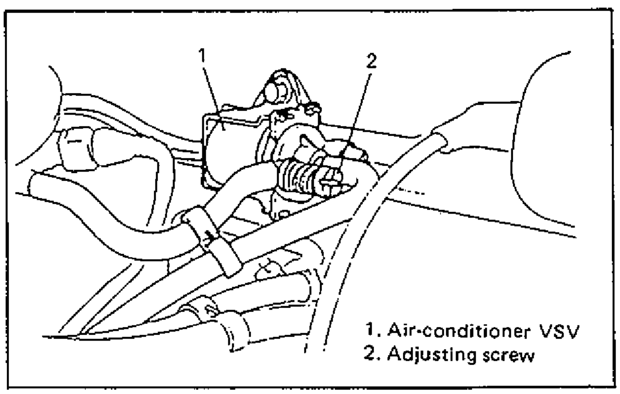


Fig. 6E-94 Adjusting Screw for Air-Con. VSV

8. Upon completion of adjustment, disconnect service wire from monitor coupler and install cap to monitor coupler.
9. Check that specified idle speed is obtained with A/C ON and "Diag. switch terminal" ungrounded. (Car equipped with A/C only)

ALL MODELS	IDLE SPEED WITH A/C ON AND DIAG. SWITCH TERMINAL UNGROUNDED
	900 ± 50 r/min

AIR AND FUEL DELIVERY SYSTEM

FUEL PRESSURE INSPECTION

1. Relieve fuel pressure according to procedure described in Section 6.
2. Separate air cleaner assembly from throttle body and shift its position.
3. Disconnect fuel feed hose from throttle body.

> **CAUTION:**
> **A small amount of fuel may be released after fuel line is disconnected.**
> **In order to reduce chance of personal injury, cover fitting to be disconnected with a shop cloth. Place that cloth in an approved container when disconnection is completed.**

4. Connect special tool (fuel pressure gauge, hose & 3-way joint) between throttle body and fuel feed hose, and clamp hoses securely to ensure no leaks occur during checking.

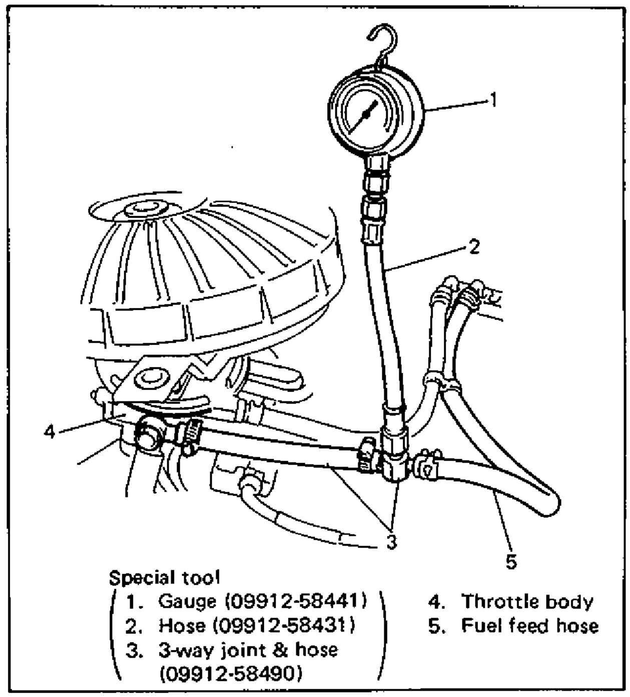


Fig. 6E-95 Connecting Fuel Pressure Gauge

5. Install air cleaner assembly to throttle body and cylinder head cover.
6. Start engine and warm it up to normal operating temperature.

   If engine doesn't start, operate fuel pump according to following procedure.

   1) Remove fuel pump relay from main fuse box after disconnecting its coupler and then reconnect coupler to fuel pump relay.

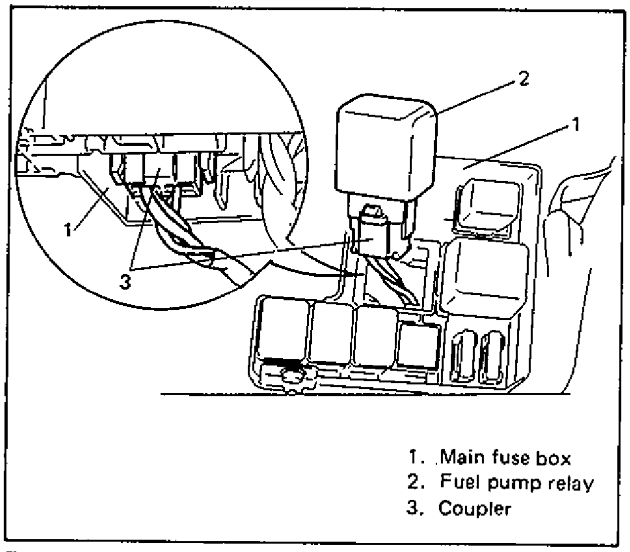


Fig. 6E-96 Removing Fuel Pump Relay

   2) To operate fuel pump, connect Pink and White/Blue wire terminals by using service wire and then turn ON ignition switch.

NOTE:
Check that battery voltage is 11V or more before operating fuel pump.

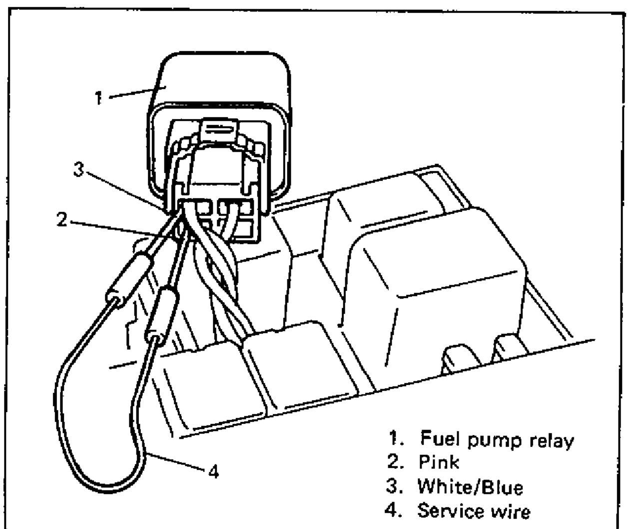


Fig. 6E-97 Operating Fuel Pump

7. Measure fuel pressure under each of the following conditions.

CONDITION	FUEL PRESSURE
At specified idle speed	0.9 – 1.4 kg/cm^2 90 – 140 kPa 12.8 – 20.0 psi
With fuel pump operating and engine at stop	1.6 – 2.1 kg/cm^2 160 – 210 kPa 22.7 – 29.9 psi
Within 1 min. after engine (fuel pump) stop (Pressure reduces as time passes)	Over 0.9 kg/cm^2 90 kPa 12.8 psi

If measured pressure doesn't satisfy specification, refer to "Diagnostic Flow Chart B-3" and check each possibly defective part. Replace if found defective.

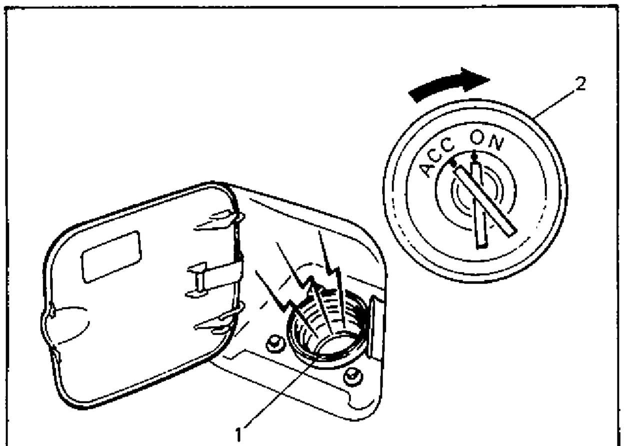
8. Relieve fuel pressure according to procedure described in Section 6.
9. Remove fuel pressure gauge, hose & 3-way joint after removing air cleaner assembly.
10. Connect fuel feed hose to throttle body and clamp it securely.
11. Install air cleaner assembly.
12. With engine "OFF" and ignition switch "ON", check for fuel leaks.

FUEL PUMP

Fuel Pump On-Car Inspection

> **WARNING:**
> **When fuel filler cap is removed in any procedure, work must be done with no smoking, in a well-ventilated area and away from any open flames.**

1. Remove filler cap and turn ON ignition switch. Then fuel pump operating sound should be heard from fuel filler for about 2 seconds and stop. Be sure to reinstall fuel filler cap after checking.



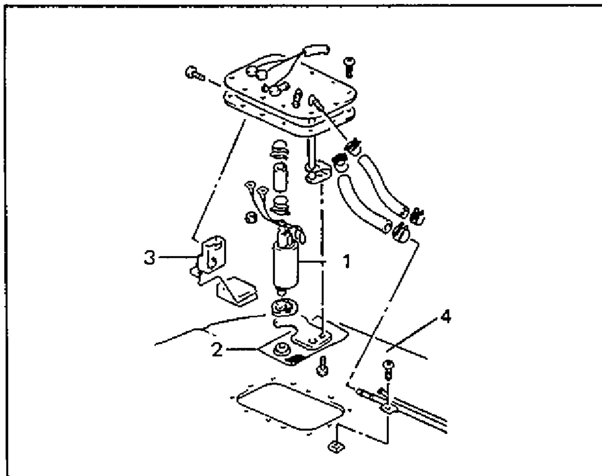
1. Fuel filler
2. Ignition switch

Fig. 6E-98 Checking Fuel Pump

If above check result is not satisfactory, advance to "Diagnostic Flow Chart B-2".

Removal

1. Remove fuel tank from body according to procedure described in section 6C and remove fuel pump & level gauge from fuel tank.



1. Fuel pump
2. Filter
3. Fuel level gauge
4. Fuel tank

Fig. 6E-99 Removing Fuel Pump & Level Gauge

2. Remove fuel pump from its bracket.

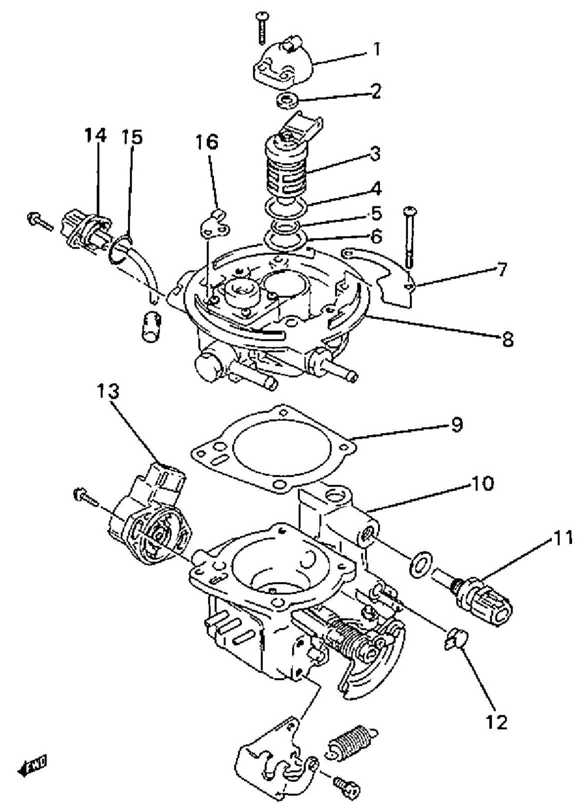
Inspection

Check fuel pump filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in fuel tank.

Installation

1. Install fuel pump to its bracket.
2. Install fuel pump & level gauge to fuel tank and then install fuel tank to body according to procedure described in section 6C.

THROTTLE BODY

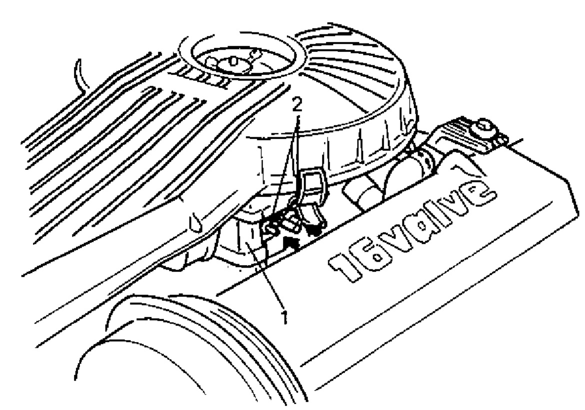


1. Injector cover
2. Upper insulator
3. Fuel injector
4. Upper O-ring
5. Lower O-ring
6. Lower insulator
7. Plate
8. Throttle upper body
9. Gasket .
10. Throttle lower body
11. WTS
12. Idle speed adjusting screw cap
13. TPS
14. Injector sub wire coupler
15. O ring
16. Clamp

Fig. 6E-100 Throttle Body Parts Identification

On-Car Inspection

- Check that throttle valve lever moves smoothly.
- Vacuum passage inspection.
  With fingers placed against vacuum nozzles (2 or 3 pcs), increase engine speed a little and check that vacuum is applied.



1. Throttle body
2. Vacuum nozzles

Fig. 6E-101 Checking Vacuum Passage

Removal

1. Relieve fuel pressure according to procedure described in Section 6.
2. Disconnect battery negative cable at battery.
3. Remove air cleaner assembly referring to section 6A.
4. Drain cooling system.
5. Disconnect following wire harness couplers:
   - TPS
   - Fuel injector
   - WTS
6. Disconnect following hoses from throttle body.
   - Fuel feed and return hoses
   - Engine cooling water hoses
   - Vacuum hoses
7. Disconnect accelerator cable from throttle valve lever and cable bracket.

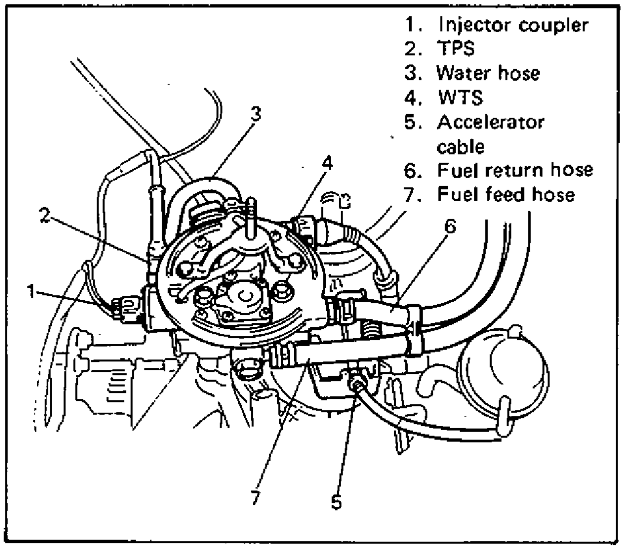


Fig. 6E-102 Disconnecting Couplers and Hoses

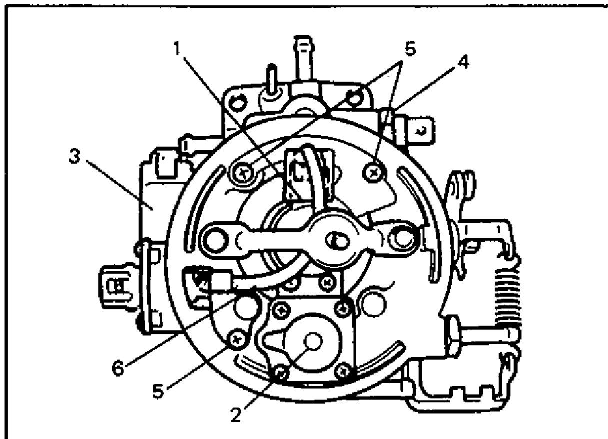


Fig. 6E-103 Disassembling Throttle Body

8. Remove throttle body from intake manifold.

Disassembly

NOTE:

- **Be sure not to remove either fuel pressure regulator or air valve from throttle body. They are factory adjusted precisely.**
- **Be sure to replace gaskets and O rings as well as worn or damaged parts.**
- **While disassembling and assembling throttle body, use special care not to deform levers on throttle valve shaft or cause damage to any other parts.**

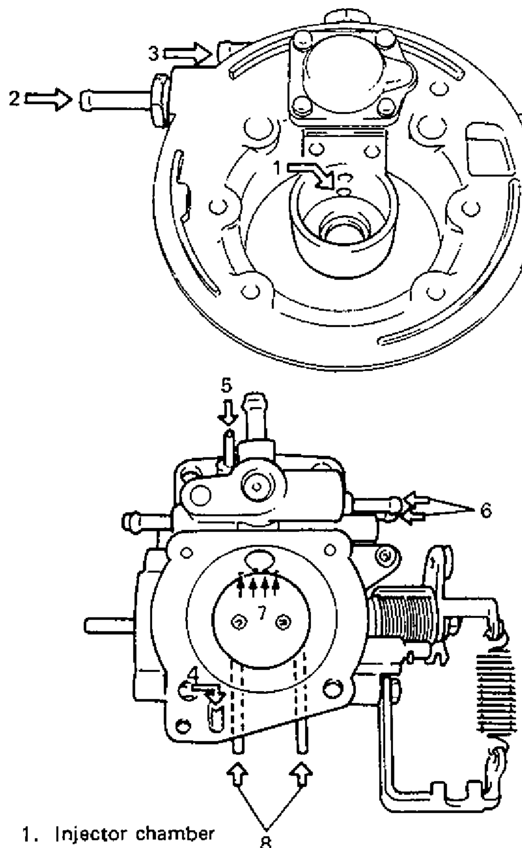
1. Remove fuel injector from throttle body according to procedure described on p. 6E-79.
2. Remove TPS.
3. Remove WTS.
4. After removing screws, separate upper and lower bodies.

Cleaning

Clean below passages and fuel injector chamber by blowing compressed air.

NOTE:

- **TPS, fuel pressure regulator, fuel injector, air valve, WTS, other components containing rubber (resin) or throttle valve shaft seal must not be placed in a solvent or cleaner bath. Chemical reaction will cause these parts to swell, harden or get distorted.**
- **Don't put drills or wires into passages for cleaning. It causes damage in passages.**

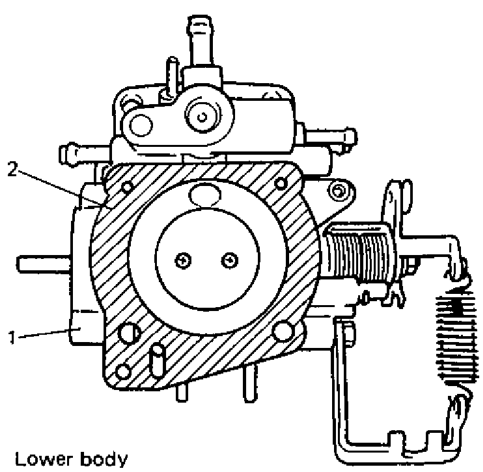


1. Injector chamber
2. Fuel return passage
3. Fuel feed passage
4. Vacuum passage for fuel pressure regulator
5. Vacuum passage for PS
6. Air passage
7. Air induction passage
8. Vacuum passage

Fig. 6E-104 Cleaning Passage

Assembly

1. Install new gasket to lower body.



1. Lower body
2. Gasket

Fig. 6E-105 Installing Gasket

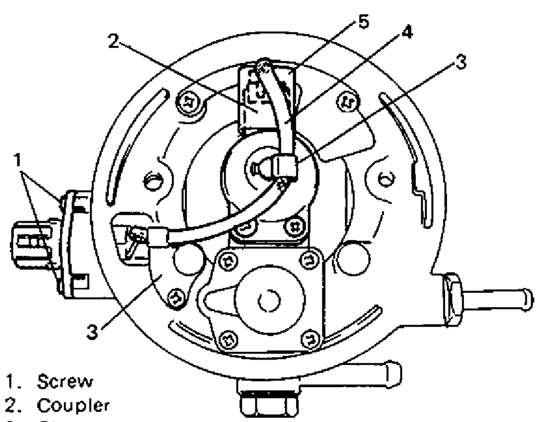
2. Install upper body on gasket, using care not to cause gasket to slip out of place.
3. Tighten screws indicated by "5" in Fig. 6E-103 to specified torque.

Tightening torque of screw	N·m	kg-m	lb-ft
	2.9 – 4.1	0.29–0.41	2.1 – 2.9

4. Install WTS according to procedure described on p. 6E-84.
5. Install TPS according to procedure described on p. 6E-82.
6. Install fuel injector according to procedure described on p. 6E-79.
7. Install injector subwire to throttle body.
   Use new O ring.
   Tighten subwire coupler screw to specified torque.

Tightening torque of screw	N·m	kg-m	lb-ft
	1.6 – 2.4	0.16–0.24	1.2 – 1.7

Connect injector coupler to injector securely, cover injector coupler with coupler cover and with wire tube pushed against injector coupler, clamp sub wire.



1. Screw
2. Coupler
3. Clamp
4. Sub wire
5. Coupler cover

Fig. 6E-106 Clamping Sub Wire

Installation

1. Clean mating surfaces and install throttle body gasket to intake manifold. Use new gasket.

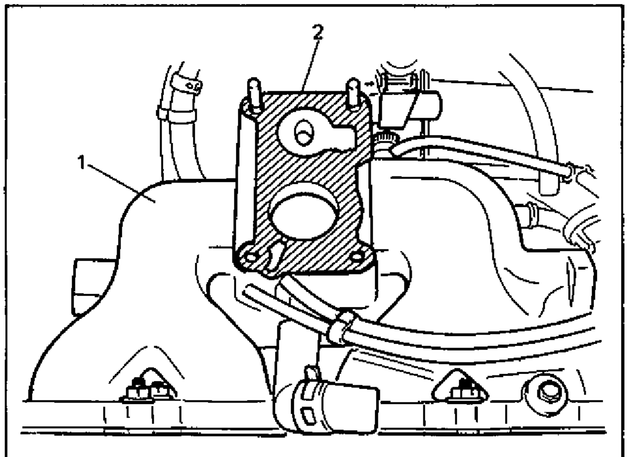


Fig. 6E-107 Gasket Installation

2. Install throttle body to intake manifold and tighten bolts and nuts to specified torque.

Tightening torque for throttle body bolts & nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.0 – 20.0

3. Install accelerator cable to throttle valve lever and cable bracket.
   Adjust cable play to specification according to procedure described on p. 6E-69.
4. Connect fuel, cooling water and vacuum hoses to throttle body, and clamp securely.
5. Connect TPS injector and WTS coupler securely.
6. Refill cooling system referring to section 6B.
7. Connect negative cable at battery.
8. With engine "OFF" and ignition switch "ON", check for fuel leaks around fuel line connection.
9. Install air cleaner assembly referring to section 6A.
10. Upon completion of installation, start engine and check for fuel leaks and engine cooling water leaks.

AIR VALVE

Inspection

1. Remove throttle body assembly from intake manifold as previously outlined.
2. Separate upper and lower bodies.
3. Remove WTS from lower body.
4. Immerse air valve of throttle body in water as shown below. Check visually that air valve closes gradually as water temperature rises and closes fully at higher than about 80°C, 176°F.

NOTE:
- **Be very careful to prevent water from entering throttle body bore.**
- **Be very careful never to put throttle body parts except air valve thermo wax in water or expose them to water splash.**

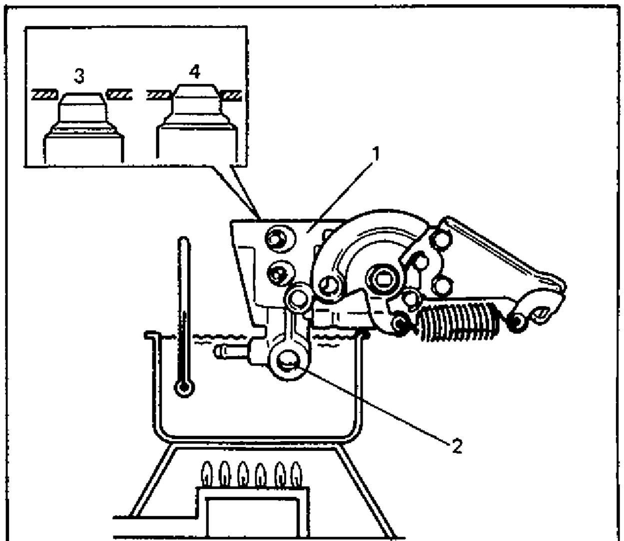


Fig. 6E-108 Inspection Air Valve

If check result is not satisfactory, replace.

5. Install WTS according to procedure described on p. 6E-84.
6. Put upper and lower bodies together and tighten its screws to specified torque.
   Use new gasket between lower and upper bodies.
7. Install throttle body assembly to intake manifold as previously outlined.

FUEL INJECTOR

On-Car Inspection

1. With battery negative cable disconnected, disconnect injector coupler.
2. Connect ohmmeter to each injector terminal and measure resistance.

Resistance of injector	0.5 – 1.5 Ω at 20°C (68°F)

If resistance is out of specification, replace fuel injector.

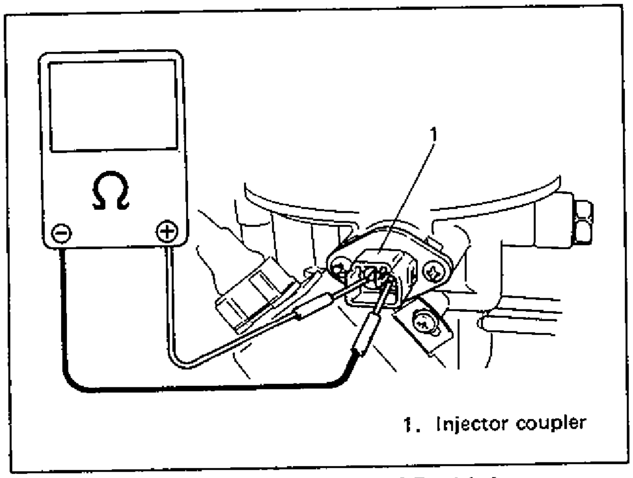


Fig. 6E-109 Checking Resistance of Fuel Injector

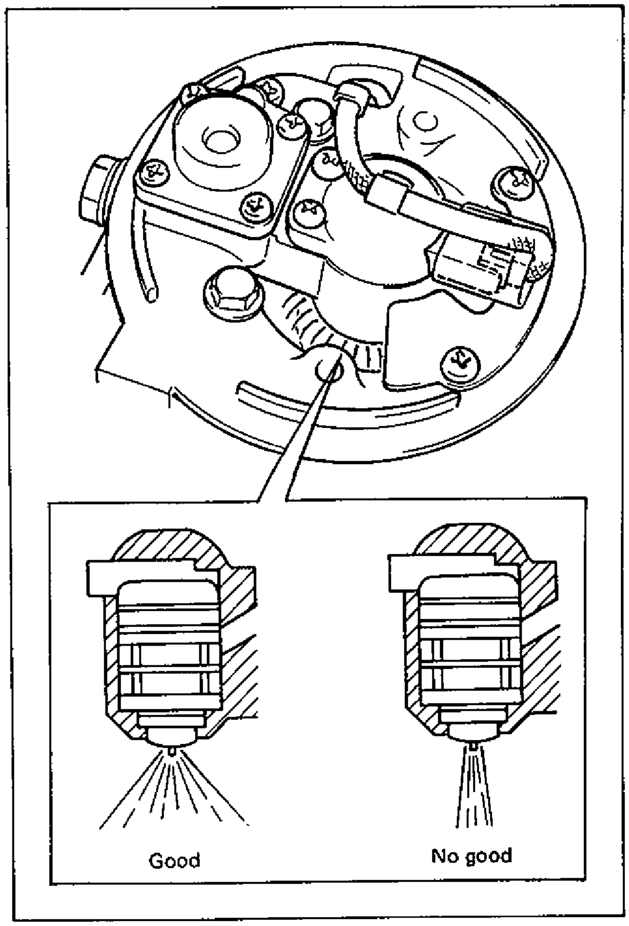


Fig. 6E-110 Checking Fuel Injection

3. Connect injector coupler.
4. Remove air cleaner assembly without disconnecting ATS coupler.
5. Check that fuel is injected out in conical shape from fuel injector when cranking or running engine.

   If no fuel is injected, check wiring harness for continuity and couplers for proper connection referring to "Diagnostic Flow Chart B-1".
   If fuel is not injected out in conical shape, replace injector.
6. Check injector for fuel leakage after injection is stopped (i.e., after cranking or engine stop). Replace if leakage exists.

Fuel leakage	Less than 1 drop/min.

7. Install air cleaner assembly.

Removal

NOTE:
Use care when handling fuel injector especially not to damage filter and its needle.
Also, because injector is an electrical component, it should not be immersed in any type of liquid solvent or cleaner, or it may get damaged.

1. Relieve fuel pressure according to procedure described in Section 6.
2. Disconnect battery negative cable at battery.
3. Remove air cleaner assembly referring to section 6A.
4. Remove air cleaner mounting stay for throttle body.
5. Remove injector cover and upper insulator. Then open claws of injector after removing coupler cover and disconnect coupler from it.

NOTE:
Use care not to break claws by opening them too far outward.

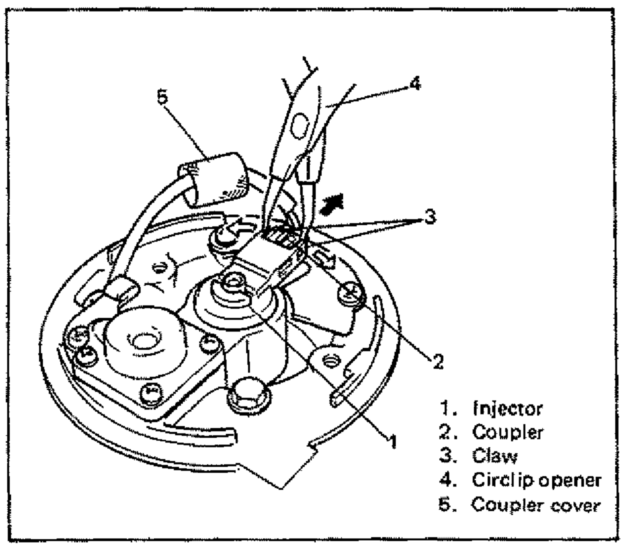


Fig. 6E-111 Disconnecting Coupler

6. Remove injector from throttle body.

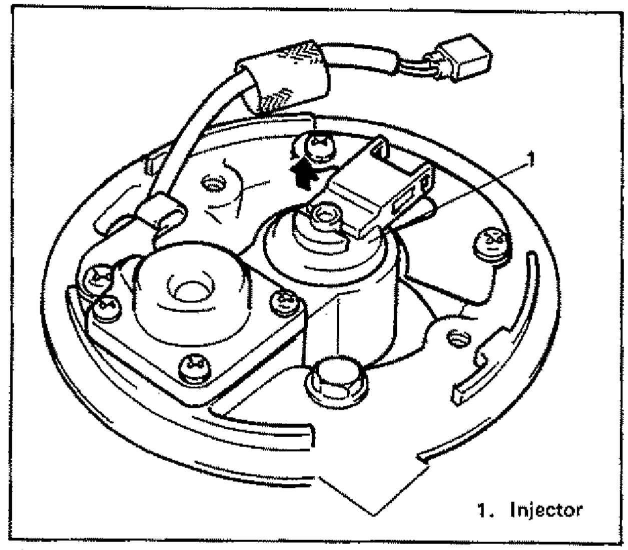


Fig. 6E-112 Removing Injector

Inspection
Check fuel injector filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in fuel lines and fuel tank.

Installation
1. Apply thin coat of spindle oil or gasoline to new upper and lower O-rings, install lower O-ring to injector cavity and upper O-ring to injector.
2. Install new lower insulator to injector cavity.

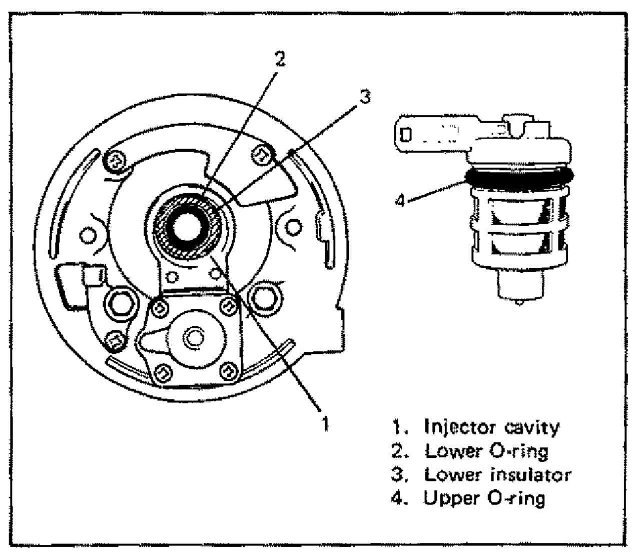


Fig. 6E-113 Installing O-rings and Insulator

3. Install injector by pushing it straight into fuel injector cavity.
   Never turn injector while pushing it.
4. Install new upper insulator and new injector cover, and tighten cover screw to specified torque.

Tightening torque for injector cover screw	N·m	kg-m	lb-ft
	2.9 – 4.1	0.29–0.41	2.1 – 2.9

5. Connect injector coupler to injector, facing its lug side upward and cover its coupler with coupler cover, and with wire tube pushed against injector coupler, clamp sub wire.

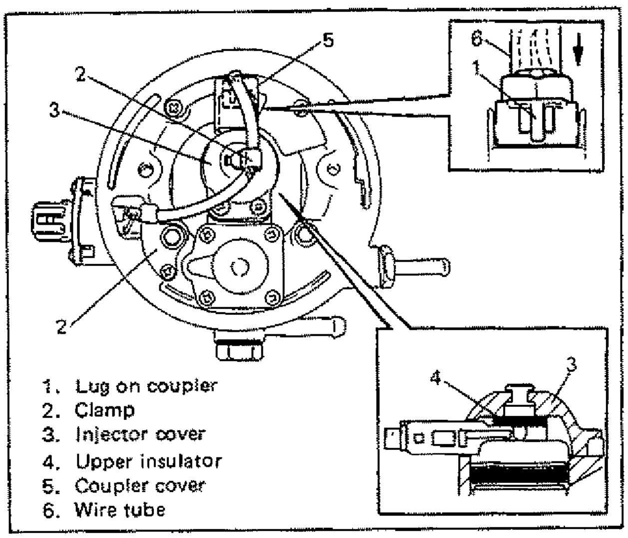


Fig. 6E-114 Clamping Sub Wire

6. Connect battery negative cable at battery.
7. With engine "OFF" and ignition switch "ON", check for fuel leaks.
8. Install air cleaner mounting stay as shown below.

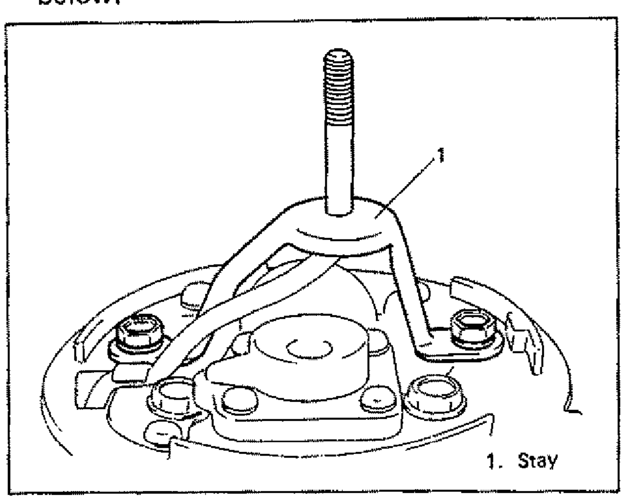


Fig. 6E-115 Installing Stay

9. Install air cleaner assembly referring to section 6A.

ELECTRONIC CONTROL SYSTEM

ELECTRONIC 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 at battery.
2. Lower junction/fuse block after removing its bolts.
3. Disconnect couplers from ECM while releasing coupler lock.
4. Remove ECM from body.

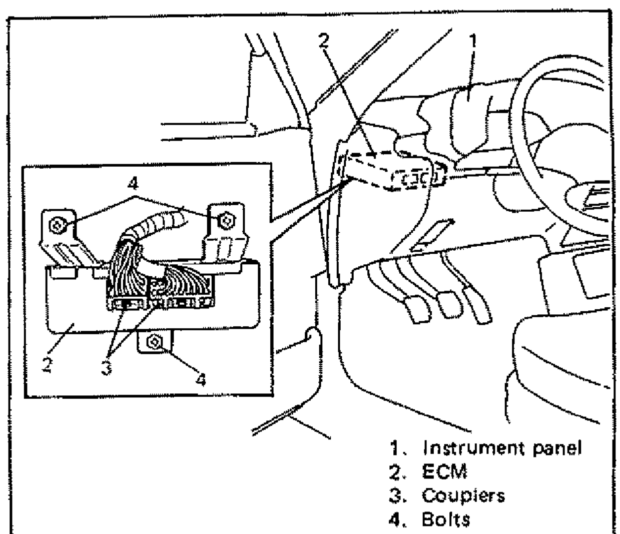


Fig. 6E-116 Removing ECM

Installation

1. Install ECM to body.
2. Connect couplers to ECM securely.
3. Fix junction/fuse block with bolts.
4. Connect battery negative cable at battery.

PRESSURE SENSOR (PS)

Output Voltage Check

1. Remove ECM according to previously outlined.
2. Connect couplers to ECM securely.
3. With coupler connected to ECM, connect digital type voltmeter as shown below and check that ECM supply voltage 4.75 – 5.25V is applied to coupler terminal B1.
4. Check output voltage at coupler terminal B2. Note that it varies with atmospheric pressure and altitude.
   Also, start engine, if it can, and check if output voltage varies.

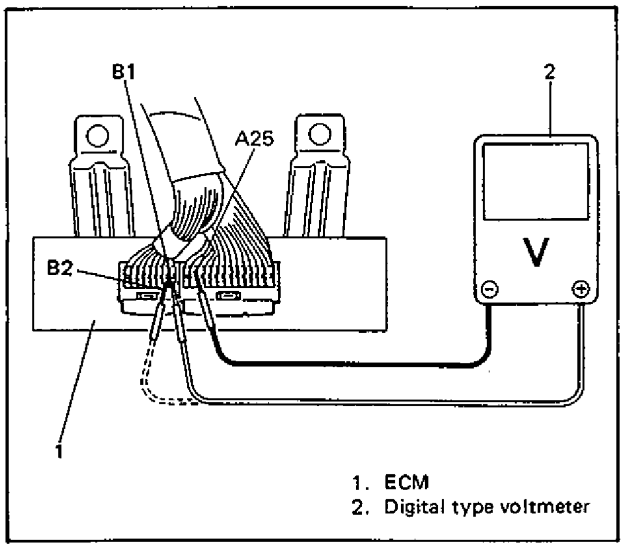


Fig. 6E-117 Checking PS and Its Circuit

Output voltage (ECM supply voltage 4.75 – 5.25V, ambient temp. 10 – 40°C, 50 – 104°F)

ALTITUDE (Referance)		BAROMETRIC PRESSURE	OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	(V)
0	0	760	3.5 – 4.1
1 000	305	733	3.4 – 4.0
2 000	610	707	3.2 – 3.8
3 000	914	682	3.1 – 3.7
4 000	1 219	658	3.0 – 3.6
5 000	1 524	634	2.9 – 3.5
6 000	1 829	611	2.8 – 3.3
7 000	2 133	589	2.7 – 3.2
8 000	2 438	567	2.6 – 3.1
9 000	2 743	546	2.5 – 3.0
10 000	3 048	526	2.4 – 2.9

NOTE:

Note that atmospheric pressure varies depending on weather conditions as well as altitude.
Take that into consideration when performing above check.

If check result is not satisfactory in previous step 3 or 4, check PS and its circuit according to Diagnostic Flow Chart for Code No. 31.

NOTE:

If output voltage does not vary when engine is started, it is possible that vacuum hose and/or filter are clogged. Clean them.
Another possibility is that filter in PS is clogged from freezing. If it is suspected, leave it at room temperature (20°C, 68°F) for a while and recheck.

5. Upon completion of checking, install ECM and connect ECM coupler securely.

PS Individual Check

1. Disconnect PS vacuum hose from filter.
2. Disconnect coupler from PS.
3. Remove PS.
4. Arrange 3 new 1.5V batteries in series (check that total voltage is 4.5 – 5.0V) and connect its positive terminal to "Vin" terminal of sensor and negative terminal to "Ground" terminal. Then check voltage between "Vout" and "Ground".
   Also, check if voltage reduces when vacuum is applied up to 40 cmHg by using vacuum pump.

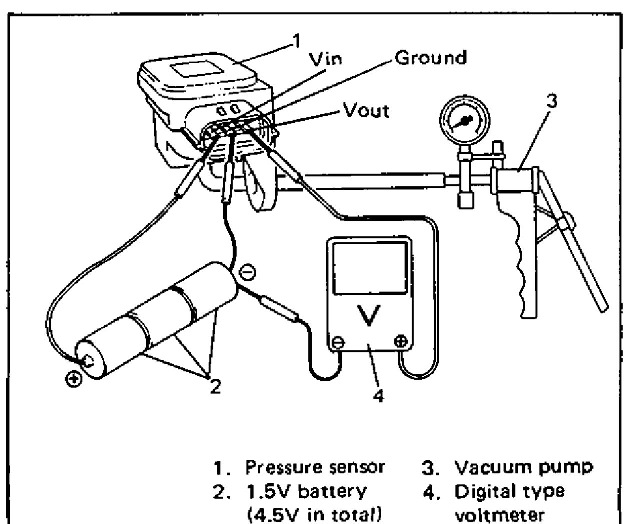


Fig. 6E-118 Checking PS

Output voltage (Vin voltage 4.5 – 5.0V, abmient temp. 20 – 30°C, 68 – 86°F)

ALTITUDE (Reference)		BAROMETRIC PRESSURE	OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	(V)
0 – 2 000	0 – 610	760 – 707	2.9 – 4.2
2 001 – 5 000	611 – 1 524	Under 707 over 634	2.7 – 4.0
5 001 – 8 000	1 525 – 2 438	Under 634 over 567	2.5 – 3.8
8 001 – 10 000	2 439 – 3 048	Under 567 over 526	2.0 – 3.3

If check result is not satisfactory, replace PS.

5. Install PS and connect vacuum hose securely.
6. Connect PS coupler securely.

THROTTLE POSITION SENSOR (TPS)

Inspection

1. Disconnect negative cable at battery.
2. Remove air cleaner assembly referring to section 6A.
3. Disconnect coupler from TPS.
4. Using ohmmeter, check resistance between terminals under each condition given in below table.

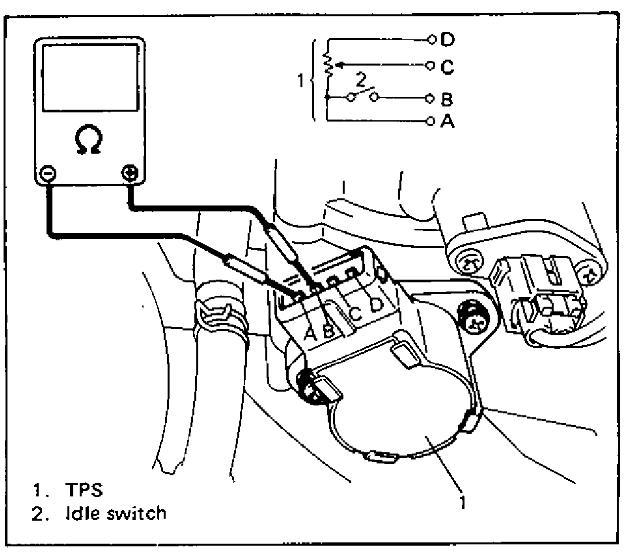


Fig. 6E-126 Checking TPS

TERMINALS	CONDITION	RESISTANCE
Between A and B terminals (Idle switch)	When throttle lever-to-stop screw clearance is 0.3 mm (0.012 in.)	0 – 5 kΩ
	When throttle lever-to-stop screw clearance is 0.9 mm (0.035 in.)	∞
Between A and D terminals	———	4.37 – 8.13 kΩ
Between A and C terminals	Throttle valve is at idle position	0.20 – 11.42 kΩ
	Throttle valve is fully opened	3.03 – 17.08 kΩ
The resistance between A and C should increase as throttle valve opens larger.		

If idle switch check result is not satisfactory, adjust installation angle of TPS and if found defective in the other check, replace TPS.

5. Connect TPS coupler securely.
6. Install air cleaner assembly referring to section 6A.
7. Connect battery negative cable to battery.

Adjustment

1. Disconnect battery negative cable, remove air cleaner assembly and disconnect TPS coupler.
2. Insert 0.6 mm (0.024 in) thickness gauge between throttle stop screw and throttle lever.

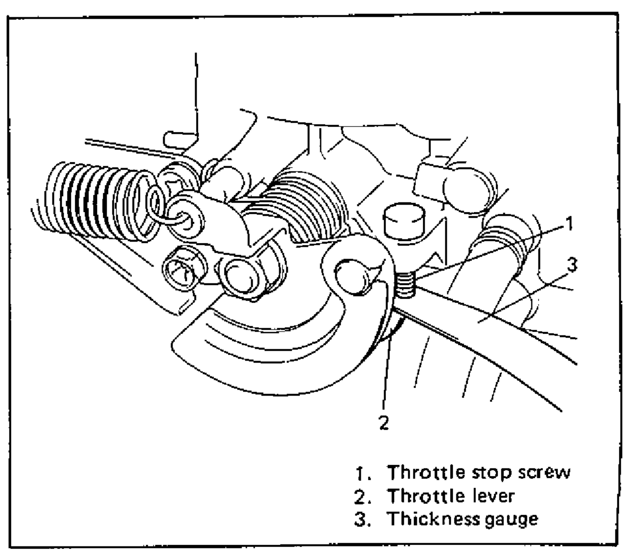


Fig. 6E-127 Inserting Thickness Gauge

3. Loosen TPS screws.
4. Connect ohmmeter between A and B terminals.
5. First, turn TPS counterclockwise fully and then clockwise gradually to find position where ohmmeter reading changes from 0 (zero, continuity) to ∞ (no continuity).
   Then fix TPS at that position by tightening screws to specified torque.

	N·m	kg-m	lb-ft
Tightening torque of TPS screw	1.6 – 2.4	0.16–0.24	1.2 – 1.7

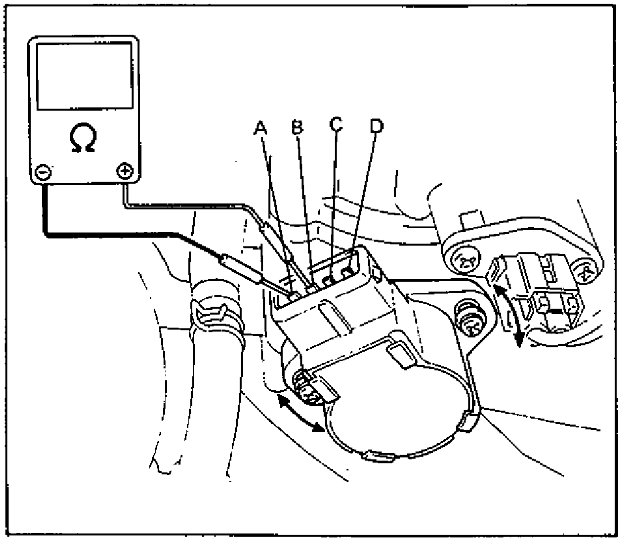


Fig. 6E-128 Adjusting Installation Angle

6. Check that there is no continuity between terminals A and B when 0.9 mm (0.035 in) thickness gauge is inserted.
7. Check that there is continuity between terminals A and B when 0.3 mm (0.012 in) thickness gauge is inserted.

   If check result is unsatisfactory in steps 6 and 7, it means that installation angle of TPS is not adjusted properly. Therefore, start all over again from step 1.

> **CAUTION:**
> **As throttle stop screw is factory adjusted precisely, don't remove or adjust it.**

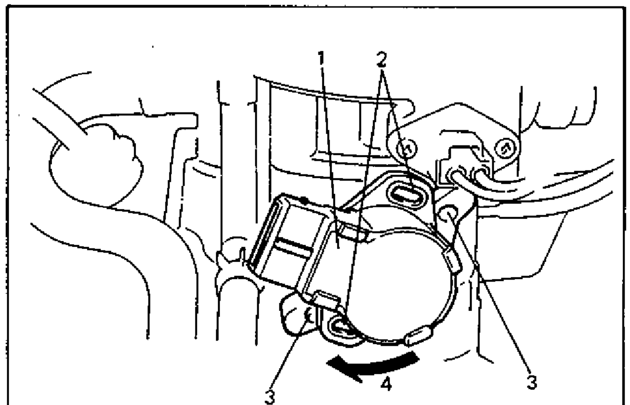
8. Connect coupler to TPS securely, install air cleaner assembly and connect battery negative cable.

Removal

1. Disconnect battery negative cable at battery.
2. Remove air cleaner assembly referring to section 6A.
3. Disconnect coupler from TPS.
4. Remove TPS from throttle body.

Installation

1. Install TPS to throttle body.
   Fit TPS to throttle body in such way that its adjusting holes are a little away from TPS screw holes as shown in Fig. 6E-129 and turn TPS clockwise so that those holes align.
   Then hand-tighten TPS screws.



1. TPS
2. TPS adjusting holes
3. TPS screw holes
4. Turn TPS after fitting and align holes.

Fig. 6E-129 Installing TPS

2. Adjust installation angle of TPS according to procedure described in item "Adjustment".
3. Connect coupler to TPS securely.
4. Install air cleaner assembly referring to section 6A.
5. Connect battery negative cable to battery.

AIR TEMPERATURE SENSOR (ATS)

Removal

1. Disconnect battery negative cable at battery.
2. Disconnect coupler from ATS.
3. Remove ATS and gasket from air cleaner case.

Inspection

Immerse temperature sensing part of ATS in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown in Fig. 6E-131, replace ATS.

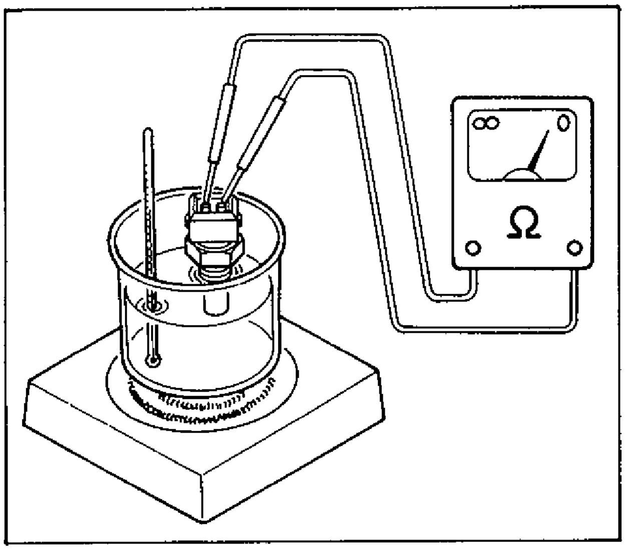


Fig. 6E-130 Checking ATS

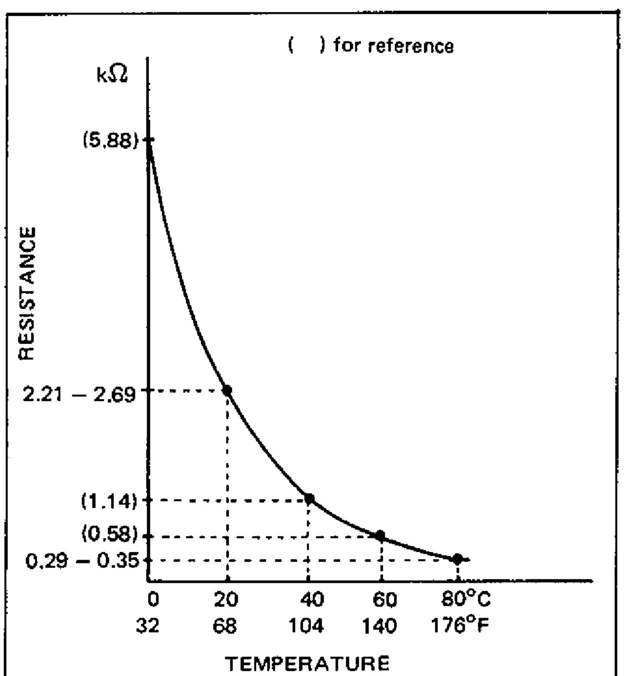


Fig. 6E-131 ATS and WTS Characteristic

Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of ATS and air cleaner case.
- Tighten ATS to specified torque.

Tightening torque for ATS	N·m	kg-m	lb-ft
	13 – 17	1.3 – 1.7	9.5 – 12.0

- Connect ATS coupler securely.

WATER TEMPERATURE SENSOR (WTS)

Removal

1. Disconnect battery negative cable at battery.
2. Remove air cleaner assembly referring to section 6A.
3. Remove radiator cap to relieve engine cooling water pressure and install it.

> **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.**

4. Disconnect coupler from WTS.
5. Remove WTS and gasket from throttle body.

NOTE:
Cooling water, although small amount, may be released then. Cover WTS with shop cloth so that released water is absorbed on it.

Inspection

Check resistance of WTS variable with temperature by using the same checking method as ATS.
For WTS characteristic, refer to Fig. 6E-131.
If found defective, replace.

Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of WTS and throttle body.
- Check gasket for damage and replace if necessary.

- Tighten WTS to specified torque.

Tightening torque for WTS	N·m	kg-m	lb-ft
	20 – 30	2.0 – 3.0	14.5 – 21.5

- Connect coupler to WTS securely.

OXYGEN SENSOR

Removal

WARNING:
To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.

1. Disconnect negative cable from battery.
2. Disconnect counler of oxygen sensor and release its wire harı.ess from clamps.
3. Remove oxygen sensor from exhaust manifold.

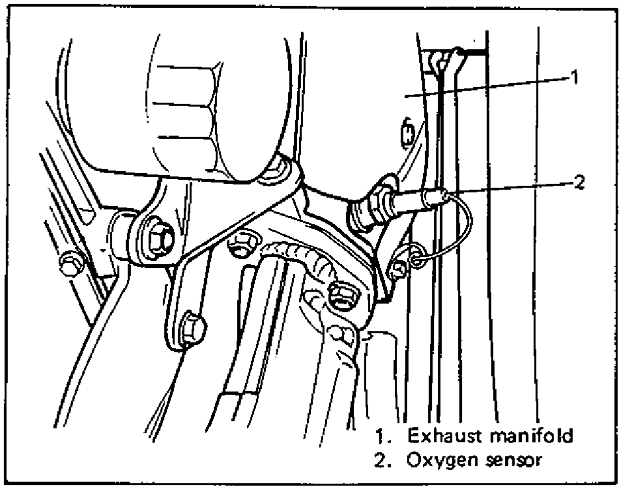


Fig. 6E-132 Removing Oxygen Sensor

Installtion

Reverse removal procedure noting the following.

- Tighten oxygen sensor to specified torque.

Tightening torque for oxygen sonsor	N·m	kg-m	lb-ft
	45 – 55	4.5 – 5.5	33.0 – 39.5

- Connect coupler of oxygen sensor and clamp wire harness securely.
- After installing oxygen sensor, start engine and check that no exhaust gas leakage exists.

VEHICLE SPEED SENSOR

Inspection

1. Disconnect negative cable at battery.
2. Remove combination meter from instrument panel.
3. Connect ohmmeter between "VSS" terminal and "GND" 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.

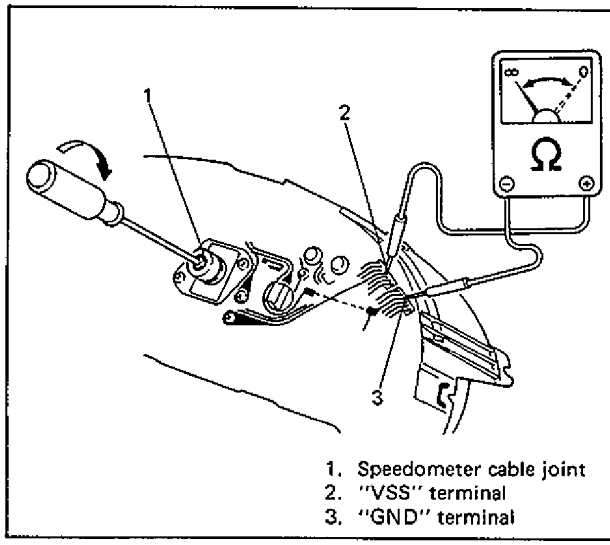


Fig. 6E-133 Checking Speed Sensor

Replace speedometer if check result is not satisfactory.

4. Install combination meter to instrument panel.
5. Connect negative cable to battery.

MAIN RELAY

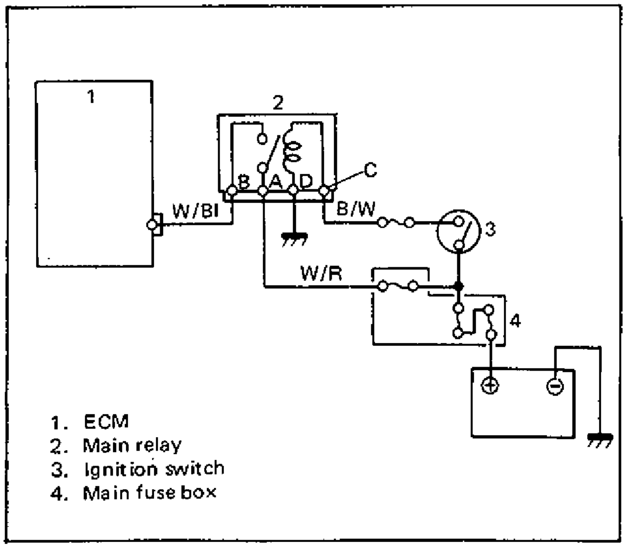


Fig. 6E-134 Main Relay Circuit

Inspection

1. Disconnect negative cable at battery.
2. Remove main relay from main fuse box after disconnecting its coupler.

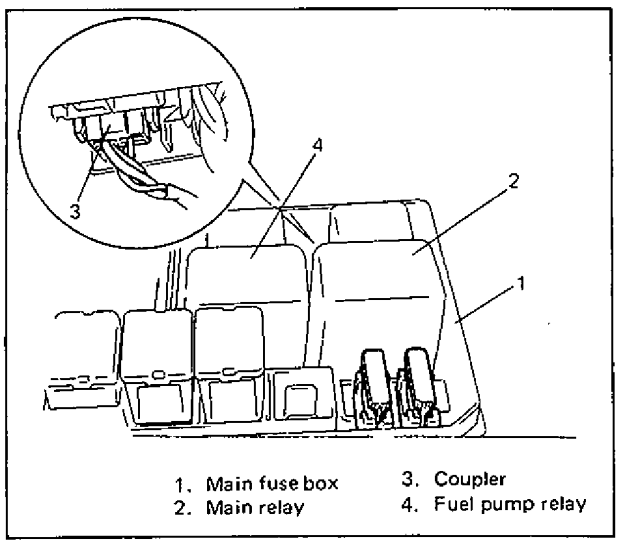


Fig. 6E-135 Removing Main Relay

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.

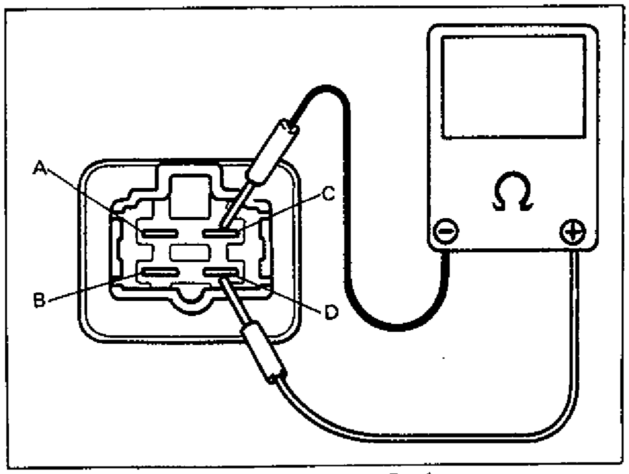


Fig. 6E-136 Checking Main Relay Resistance

TERMINALS	RESISTANCE
Between A and B	∞ (infinity)
Between C and D	56 – 84 Ω

4. Check that there is continuity between terminals "A" and "B" when battery is connected to terminals "C" and "D".

   If found defective, replace.

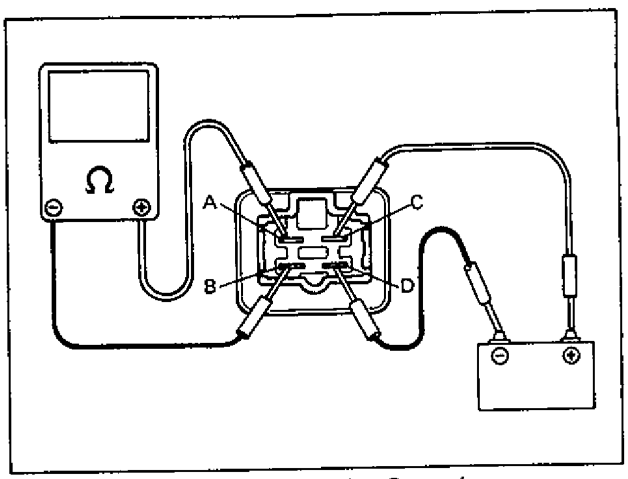


Fig. 6E-137 Checking Main Relay Operation

FUEL PUMP RELAY

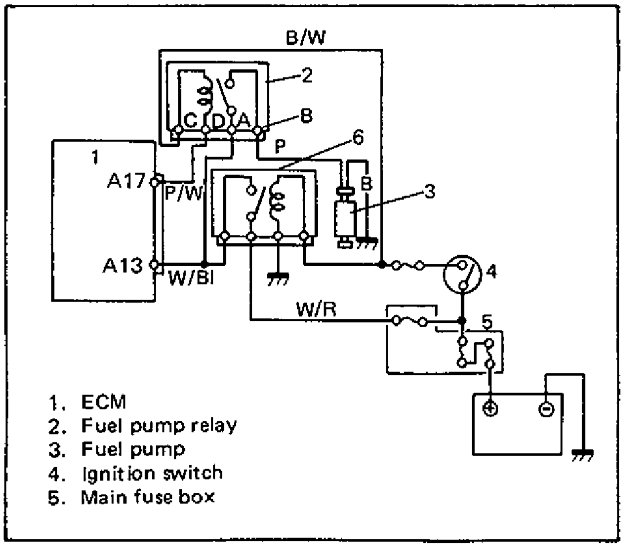


Fig. 6E-138 Fuel Pump Circuit

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 defective, replace.

FUEL INJECTOR RESISTOR

Inspection

1. With ignition switch OFF, disconnect resistor coupler.
2. Check resistor for resistance.

Resistance of fuel injector resistor	1.9 – 2.1 Ω

If check result is not satisfied, replace.

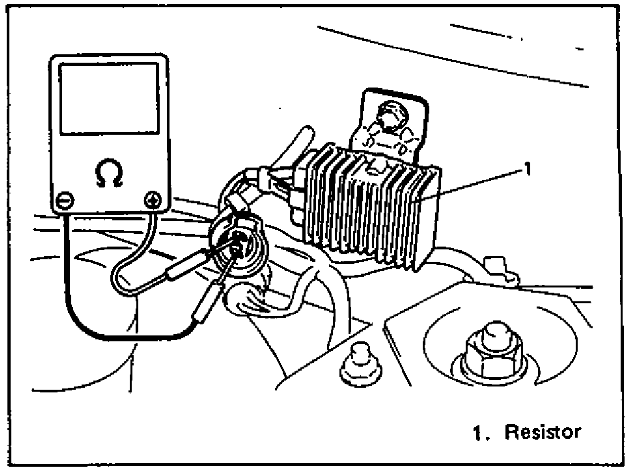


Fig. 6E-139 Checking Resistor

FUEL CUT OPERATION

Inspection

NOTE:

Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range), A/C is OFF and that parking brake lever is pulled all the way up.

1. Warm up engine to normal operating temperature.
2. While listening to sound of injector by using sound scope or such, increase engine speed to higher than 3,000 r/min.
3. Check to make sure that sound to indicate operation of injector stops when throttle valve is closed instantly and it is heard again when engine speed is reduced to less than about 2,000 r/min.

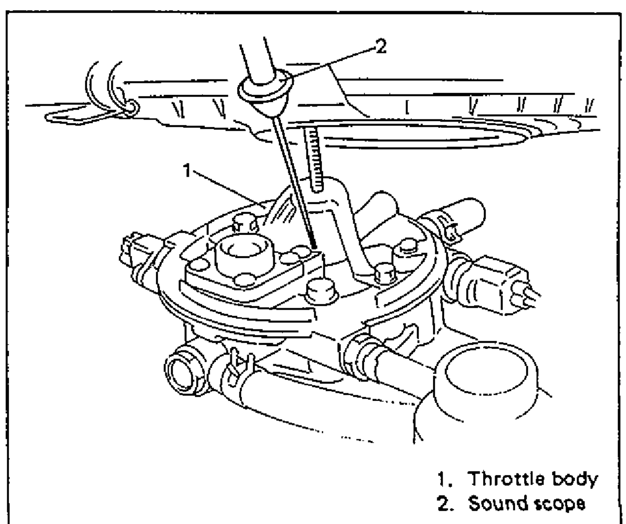


Fig. 6E-140 Checking Fuel Cut

ISC SOLENOID VALVE

Inspection

1. With ignition switch "OFF", disconnect ISC solenoid valve coupler.
2. Check resistance between each two terminals of ISC solenoid valve.

Resistance of ISC solenoid valve	30 – 33 Ω

If it is within specification, proceed to next operation check. If not, replace.

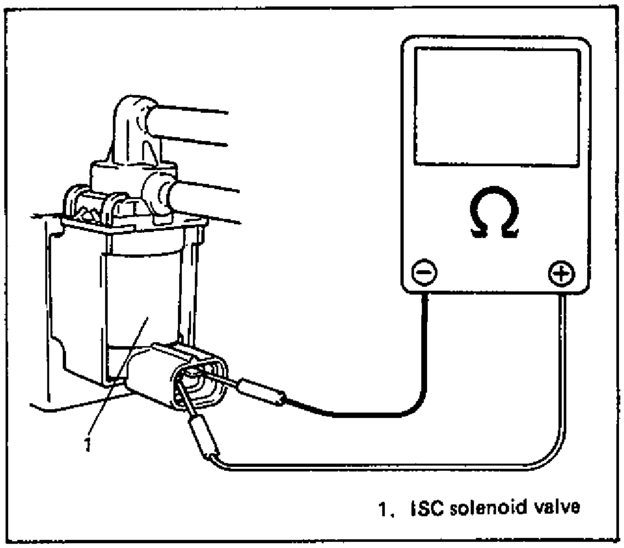


Fig. 6E-141 Checking Resistance

3. Warm up engine to normal operating temperature.
4. With engine running and ISC solenoid valve coupler disconnected, disconnect ISC solenoid valve hose of underside as shown below. In this state, check that air is not drawn into the ISC solenoid valve.

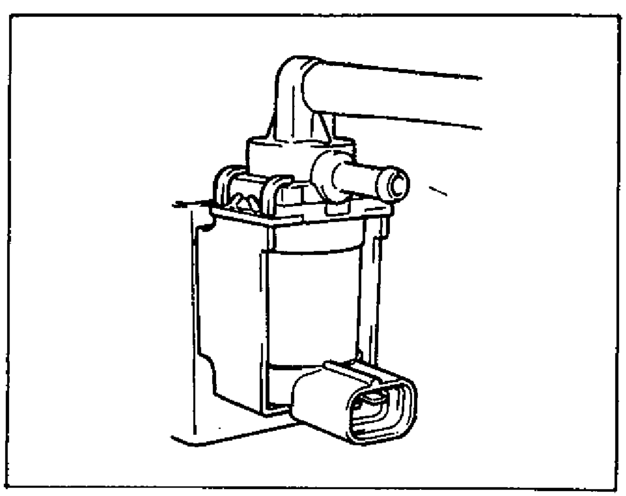


Fig. 6E-142 Checking ISC Solenoid Valve (1)

5. Under above condition, connect 12V-battery to ISC solenoid valve terminals and check that air is drawn into the ISC solenoid valve.

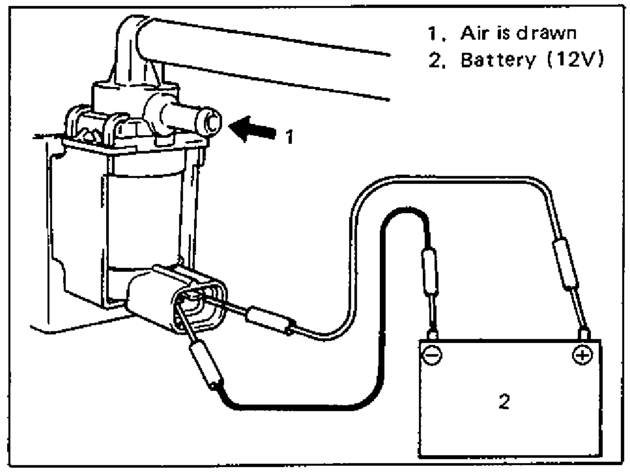


Fig. 6E-143 Checking ISC Solenoid Valve (2)

If check result is not satisfactory, replace ISC solenoid valve.

6. Connect hose and coupler securely.

EGR CONTROL SYSTEM

System Inspection

NOTE:

Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range) and that parking brake lever is pulled all the way up.

1. When engine is cool (cooling water temperature is below 40°C, 104°F), start engine and race it, and check that EGR valve diaphragm is not operating in this state.

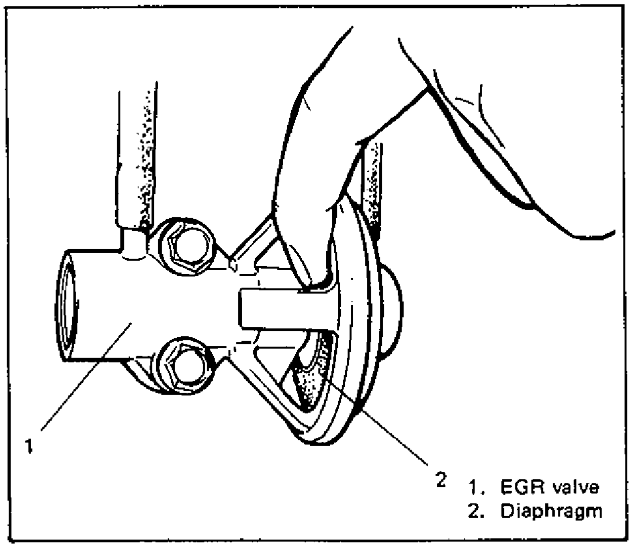


Fig. 6E-144 Checking EGR Valve Diaphragm

2. Warm up engine to normal operating temperature and race it after warming up. Then check to be sure that diaphragm moves toward 1 in Fig. 6E-145 during acceleration and toward 2 during deceleration.

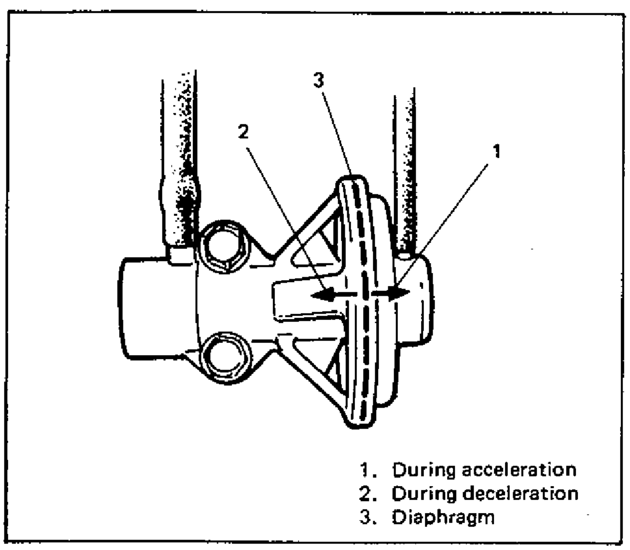


Fig. 6E-145 Movement of EGR Valve Diaphragm

If EGR valve fails to operate properly, check vacuum hoses, EGR valve, EGR modulator and VSV.

3. Keep engine running at idle speed and open EGR valve by hand, and engine should either stop or reduce its speed. If neither occurs, EGR passage is clogged. Clean it.

Vacuum Hose Inspection

Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

EGR Valve Inspection

1. Disconnect vacuum hose from EGR modulator.
2. Connect vacuum pump gauge to its hose.
3. Check that EGR valve diaphragm moves smoothly and that it is held at the same position when 20 cmHg vacuum is applied to EGR valve.

   If diaphragm doesn't move smoothly, or it isn't held at the same position, replace EGR valve.

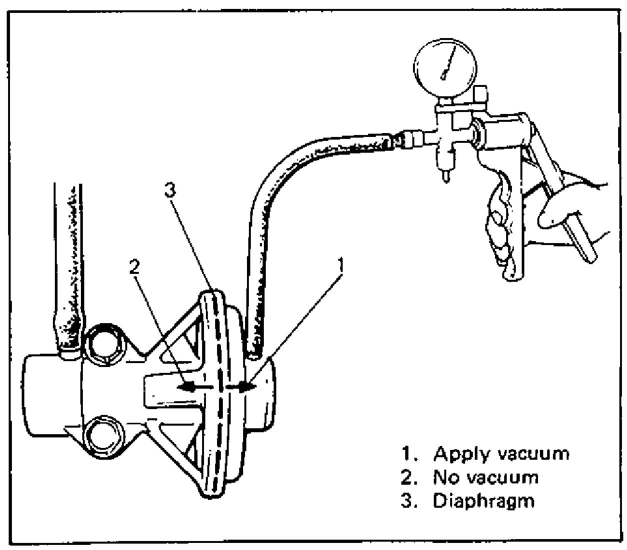


Fig. 6E-146 Checking EGR Valve

4. After checking, be sure to connect vacuum hose.

EGR Modulator Inspection

1. Check filter for contamination and damage. Using compressed air, clean filter.

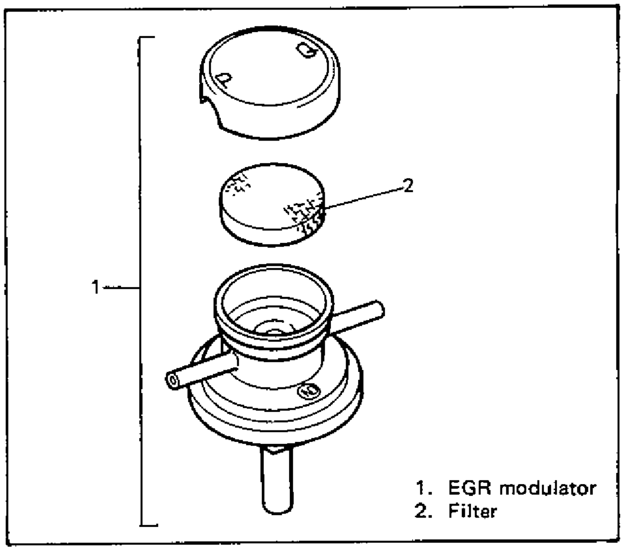


Fig. 6E-147 Filter of EGR Modulator

2. Remove EGR modulator and plug nozzle with finger. Blow air into another nozzle and check that air passes through to air filter side freely.

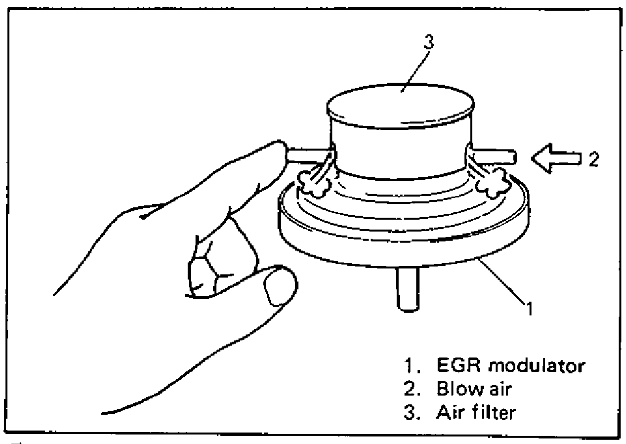


Fig. 6E-148 Checking EGR Modulator (1)

3. Connect vacuum pump gauge to nozzle "P" and plug nozzle "Q" with finger.
   While blowing air into nozzle "A", operate vacuum pump gauge and check that vacuum is applied to modulator.
   Then stop blowing nozzle "A" and check that vacuum pump gauge indicates "0" (zero).
   If check result is not satisfactory, replace EGR modulator.

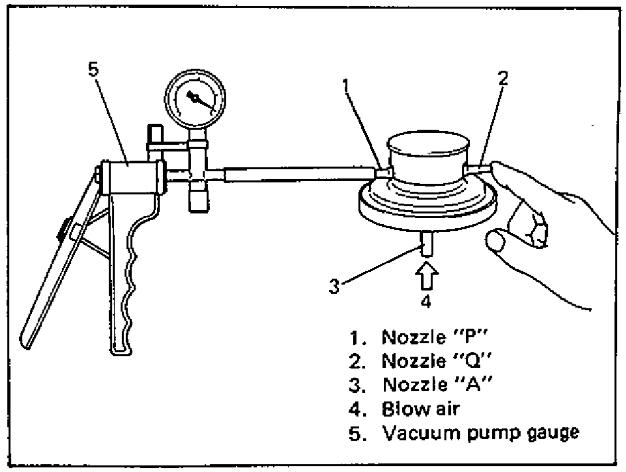


Fig. 6E-149 Checking EGR Modulator (2)

4. After checking, install modulator and connect hoses securely. Refer to emission control information label for connection.

VSV (Vacuum Switching Valve) Inspection

1. With ignition switch OFF, disconnect coupler from VSV.
2. Check resistance between two terminals of VSV.

Resistance of EGR VSV	33 – 39 Ω

If resistance is as specified, proceed to next operation check. If not, replace.

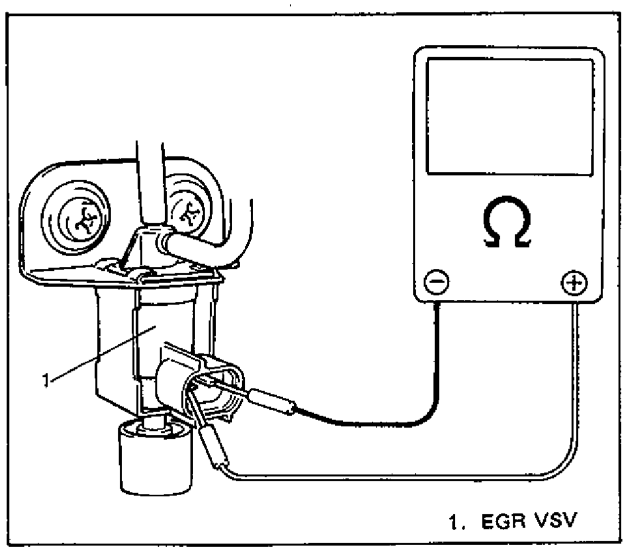


Fig. 6E-150 Checking Resistance

3. Disconnect vacuum hoses from EGR modulator and throttle body.
4. Blow into nozzle "A". Air should come out of filter and not out of nozzle "B".

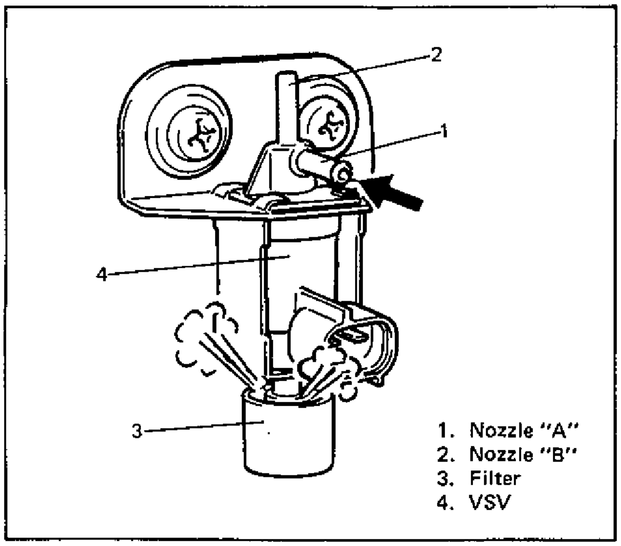


Fig. 6E-151 Checking VSV (1)

5. Connect 12V-battery to VSV terminals. In this state, blow nozzle "A".
   Air should come out of nozzle "B" and not out of filter.

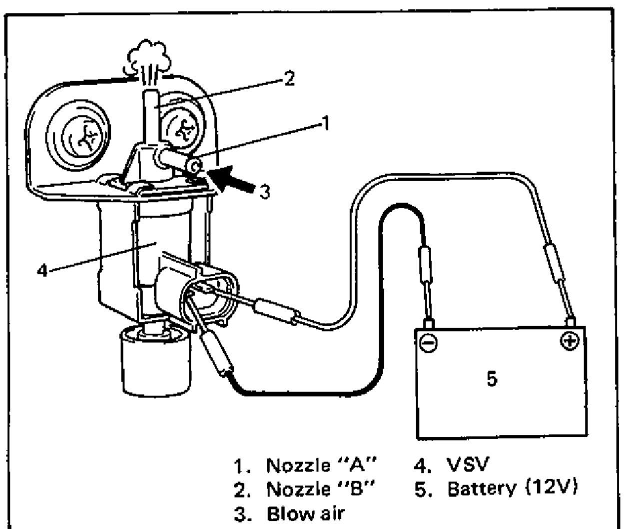


Fig. 6E-152 Checking VSV (2)

If check result is not as described above, replace VSV.

6. Connect VSV coupler securely.
7. Connect vacuum hose securely.

SHIFT-UP INDICATOR LIGHT CONTROL SYSTEM (If equipped)

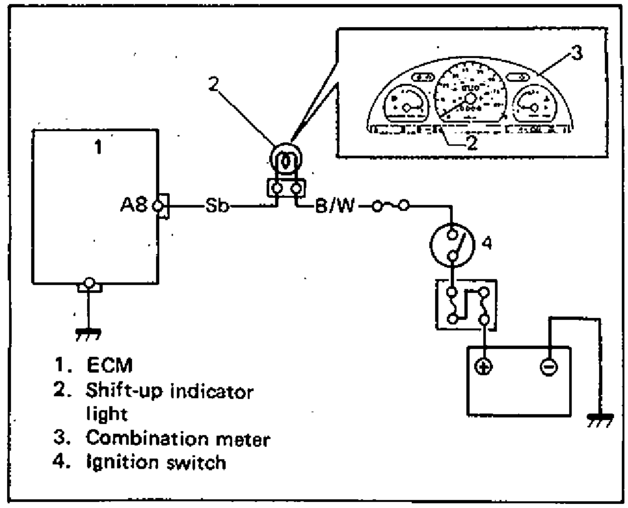


Fig. 6E-153 System Circuit

System Inspection

> **CAUTION:**
> **This check requires test drive. Use special care for safety when driving.**

1. Turn ignition switch ON, and shift-up indicator light should light.
   If not, cause may be burned bulb, open wire, poor connection or faulty ECM. Proceed to "Shift up indicator light and its circuit inspection".
2. Start engine, and shift-up indicator light should go off.
   If not, cause may be shorted wire to ground or faulty ECM.
3. Warm up engine to normal operating temperature.
4. With gear shift lever in low gear position, increase engine speed. When it exceeds 1,600 r/min. shift-up indicator light should light for 5 seconds at the longest.
   If it doesn't light, check speed sensor, WTS and pressure sensor. If they are all in good conditon, substitute a known good ECM for existing one.

Shift-up Indicator Light and Its Circuit (If equipped)

Inspection

1. With ignition switch OFF, disconnect ECM coupler from ECM.
2. Turn ignition switch ON, and shift-up indicator light should not light.
   If it light, wire is shorted to ground.
3. Ground A8 terminal of disconnected ECM coupler by using service wire.

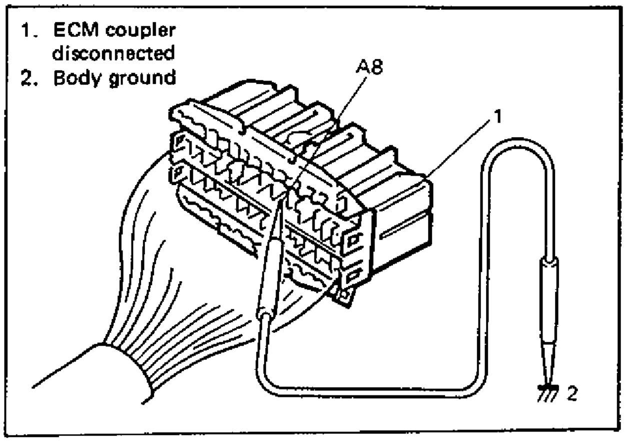


Fig. 6E-154 Checking Indicator Light

And then shift up indicator light should light. If not, cause may be burned bulb, open wire or poor connection. Repair or replace as necessary.

4. Connect coupler to ECM securely.

POWER STEERING VSV (If equipped)

Inspection

1. With ignition switch OFF, disconnect coupler from VSV.
2. Check resistance between two terminals of VSV.

Resistance of power steering VSV	33 – 39 Ω

If resistance is as specified, proceed to next operation check. If not, replace.

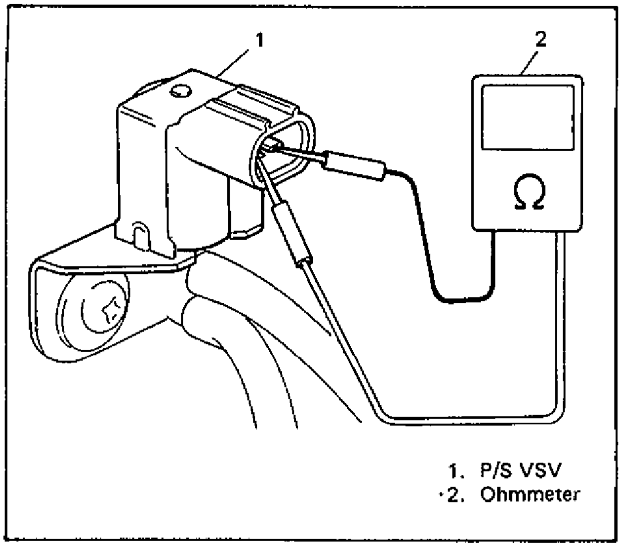


Fig. 6E-158 Checking Resistance

3. Disconnect vacuum hoses from 3-way joints.
4. With coupler disconnected, blow into hose "A". Air should not come out of hose "B".

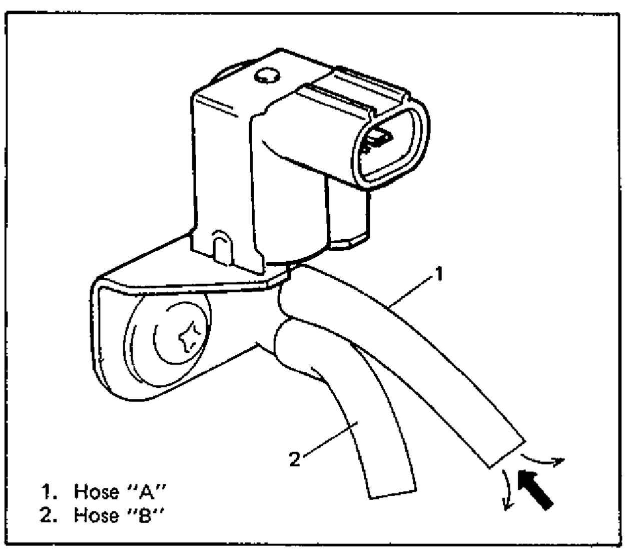


Fig. 6E-159 Checking VSV (1)

5. Connect 12V-battery to VSV terminals. In this state, below hose "A".
   Air should come out of hose "B".

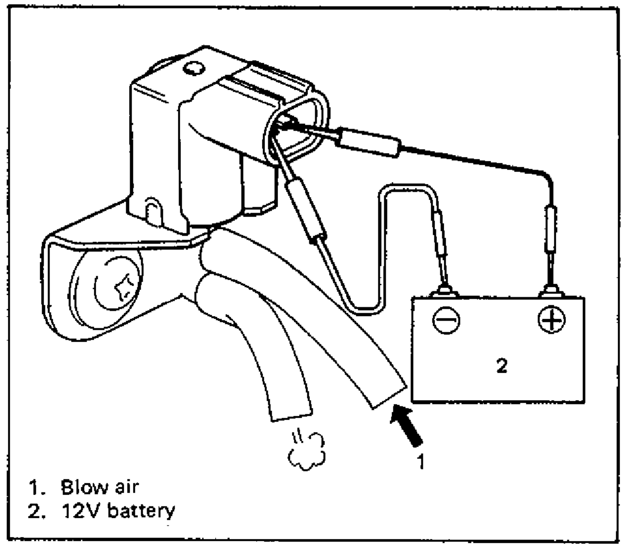
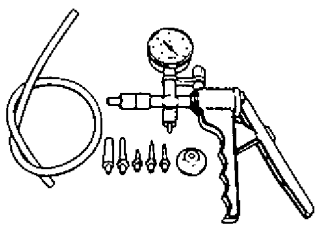


Fig. 6E-160 Checking VSV (2)

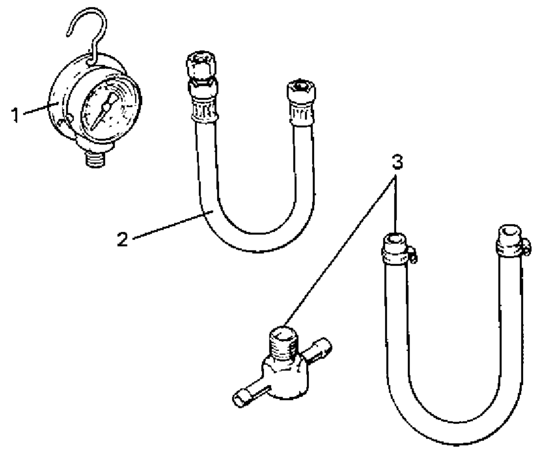
If check result is not as described, replace VSV.

6. Install vacuum hoses to 3-way joints.
7. Connect VSV coupler securely.

SPECIAL TOOLS



09917-47910
Vacuum pump gauge



1. Fuel pressure gauge
   09912-58441
2. Pressure hose
   09912-58431
3. 3-way joint & hose
   09912-58490

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Throttle body mounting bolt and nut	18 – 28	1.8 – 2.8	13.5 – 20.0
Throttle upper and lower body screw	2.9 – 4.1	0.29 – 0.41	2.1 – 2.9
Fuel injector sub wire coupler screw	1.6 – 2.4	0.16 – 0.24	1.2 – 1.7
Fuel injector cover screw	2.9 – 4.1	0.29 – 0.41	2.1 – 2.9
TPS mounting screw	1.6 – 2.4	0.16 – 0.24	1.2 – 1.7
ATS	13 – 17	1.3 – 1.7	9.5 – 12.0
WTS	20 – 30	2.0 – 3.0	14.5 – 21.5
Oxygen sensor	45 – 55	4.5 – 5.5	33.0 – 39.5

SECTION 6F

IGNITION SYSTEM

CONTENTS

GENERAL DESCRIPTION 6F-2
Conventional Type Ignition System (for Carburetor Model) 6F-2
ESA Type Ignition System (for Electronic Fuel Injection Model) 6F-3
DIAGNOSIS 6F-4
ON CAR SERVICE 6F-5
Ignition Spark Test 6F-5
High Tension Cords 6F-5
Spark Plugs 6F-6
Ignition Coil 6F-6
Noise Suppressor 6F-7
Distributor (for ESA Type) 6F-7
Distributor (for Conventional Type) ... 6F-8
Ignition Timing 6F- 9
DISTRIBUTOR UNIT (FOR ESA TYPE IGNITION SYSTEM) 6F-11
Dismounting 6F-11
Remounting 6F-11
DISTRIBUTOR UNIT (FOR CONVENTIONAL TYPE IGNITION SYSTEM) ... 6F-12
Dismounting 6F-12
Disassembly 6F-12
Inspection 6F-14
Reassembly 6F-14
Remounting 6F-15
SPECIAL TOOLS 6F-15

GENERAL DESCRIPTION

There are two types of ignition system in this model: One is Conventional Type Ignition System for carburetor model and the other is Electronic Spark Advance (ESA) type Ignition System for Electronic Fuel Injection model.

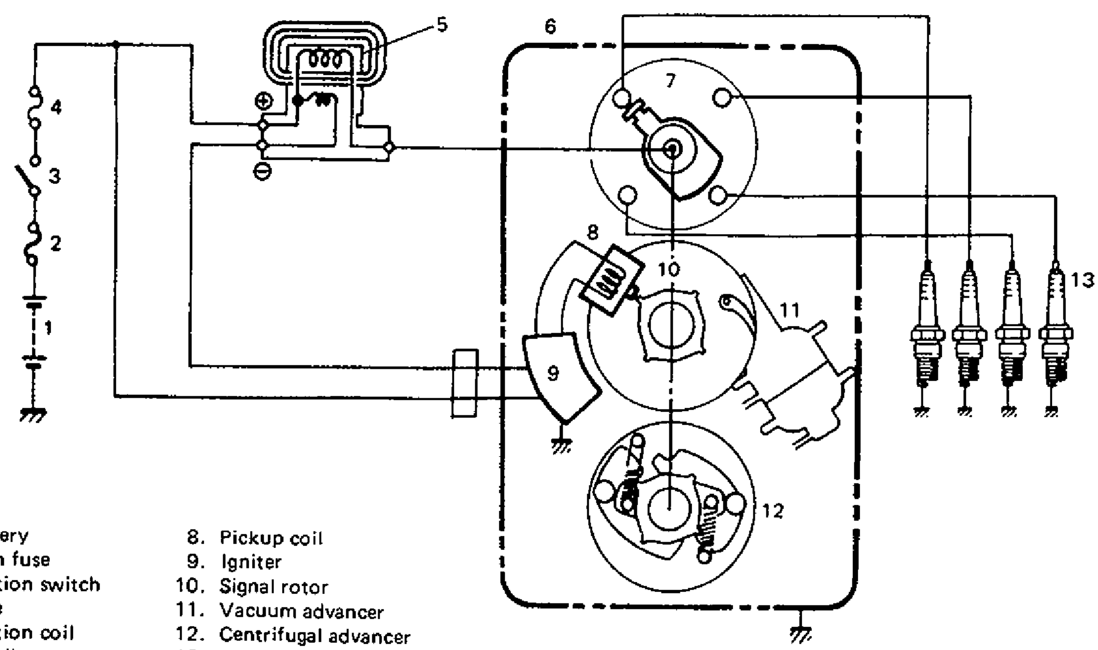
CONVENTIONAL TYPE IGNITION SYSTEM (FOR CARBURETOR MODEL)

(Fig. 6F-1)

The basic components of this ignition system are ignition coil, distributor, high-tension cords and spark plugs and those of the distributor are signal generator (signal rotor and pickup coil), igniter, rotor, cap, vacuum advancer and a centrifugal advancer.

When the distributor shaft rotates, the magnetic flux passing through the pickup coil varies due to the change in air gap between the pickup coil and the signal rotor. As a result, the alternating current voltage is induced in the pickup coil.
The voltage induced, turns "ON" and "OFF" the igniter which switches "OFF" the ignition coil primary current. Thus, the high voltage is induced in the secondary winding of ignition coil and ignition spark are generated at the spark plugs.
The spark advance is produced by the vacuum advance which operates based on the engine vacuum and centrifugal advance.

Conventional Type Ignition System



1. Battery
2. Main fuse
3. Ignition switch
4. Fuse
5. Ignition coil
6. Distributor
7. Distributor rotor
8. Pickup coil
9. Igniter
10. Signal rotor
11. Vacuum advancer
12. Centrifugal advancer
13. Spark plug

Fig. 6F-1 Ignition Circuit Diagram for Conventional Type Ignition System

ESA TYPE IGNITION SYSTEM (FOR ELECTRONIC FUEL INJECTION MODEL) (Fig. 6F-2)

This system has two functions as follows.

- Ignition timing control
- Electric current flow time control

These controls are performed by the Electronic (Engine) Control Module (ECM). ECM judges the engine condition by using signals from various sensors, selects the most suitable electric current flow time and ignition timing for that engine condition from among those prestored in its memory and sends an ignition signal to the igniter (power unit).

Ignition Timing Control

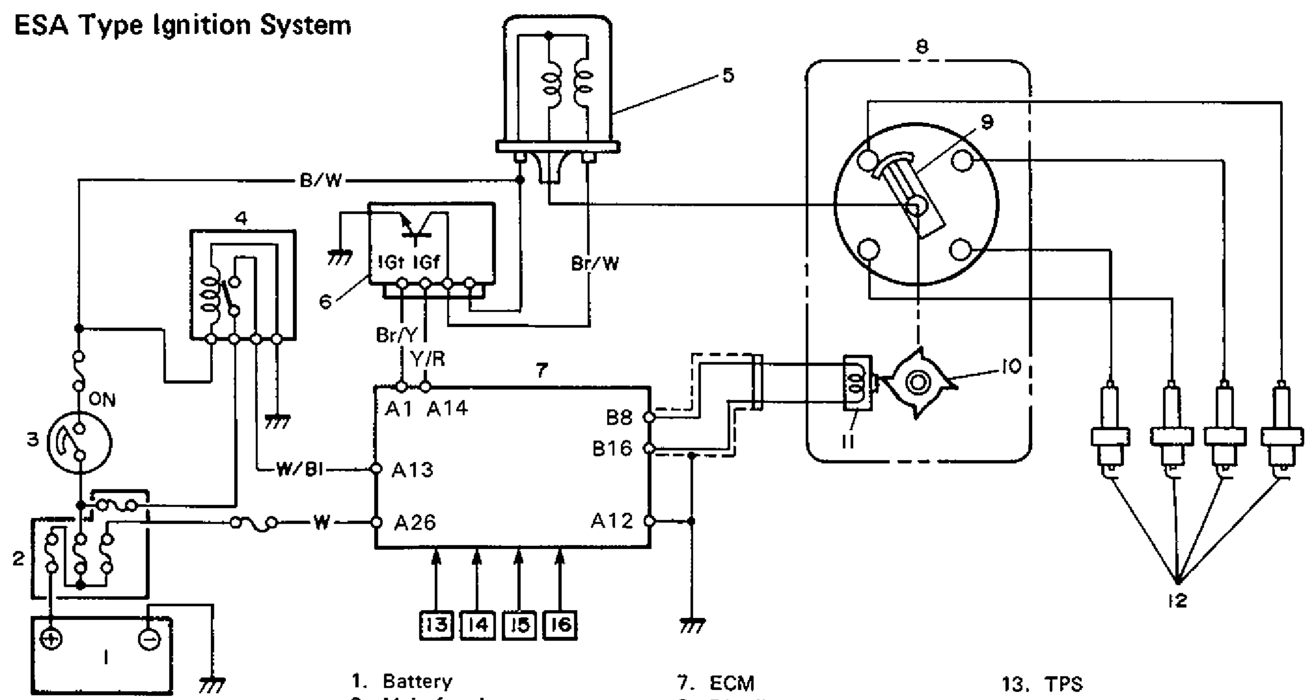
To obtain better starting performance of the engine at the engine start (when the engine speed is lower than 500 r/min.) ESA system sets the ignition timing to the initial ignition timing (5° BTDC).

The ignition timing after the engine start is determined as follows so that the spark occurs at the most suitable timing for each engine condition.

Ignition timing	=	Initial ignition timing	+	Basic ignition advance	+	Various compensating advance

Electric Current Flow Time Control

To stabilize the secondary voltage generated in the ignition coil to a proper level, ESA system controls the time of primary current flow to the ignition coil.



1. Battery
2. Main fuse box
3. Ignition switch
4. Main relay
5. Ignition coil
6. Igniter (Power unit)
7. ECM
8. Distributor
9. Distributor rotor
10. Signal rotor
11. CAS
12. Spark plug
13. TPS
14. WTS
15. Pressure sensor
16. Test switch terminal

Fig. 6F-2 Ignition Circuit Diagram for ESA Type Ignition System

DIAGNOSIS

Condition	Possible cause	Correction
Engine cranks, but will not start or hard to start	**No spark**	
	• Blown fuse for ignition coil	Replace
	• Loose connection or disconnection of lead wire or high-tension cord(s)	Connect securely
	• Faulty high-tension cord(s)	Replace
	• Faulty spark plug(s)	Adjust, clean or replace
	• Cracked rotor or cap	Replace
	• Faulty pickup coil or igniter (Conventional type)	Replace
	• Maladjusted signal rotor air gap (ESA type)	Adjust
	• Faulty ignition coil	Replace
	• Faulty noise suppressor	Replace
	• Faulty CAS (ESA type)	Replace
	• Faulty igniter (ESA type)	Replace
	• Faulty ECM (ESA type)	Replace
	Maladjusted ignition timing	Adjust
Poor fuel economy or engine performance	• Incorrect ignition timing	Adjust
	• Faulty spark plug(s)	Adjust, clean or replace
	• Faulty ECM (ESA type)	Replace

SELF-DIAGNOSIS

(ESA Ignition system only)

1. To insure correct diagnosis, check to confirm that battery voltage is within standard value when engine is standstill.
2. Turn ON ignition switch and make sure that "CHECK ENGINE" light lights.
3. If engine will not start but cranking is possible, crank it for more than 3 seconds.
4. While ignition switch is ON, ground diagnosis switch terminal in moniter coupler and then read diagnostic code (observe "CHECK ENGINE" light).

DIAGNOSTIC CODE NO. 41

ECM indicates that no ignition fail safe signal is inputted while engine is running or being cranked.
Diagnose trouble according to "Diagnostic Flow Chart for Code No. 41" in Section 6E.

DIAGNOSTIC CODE NO. 42

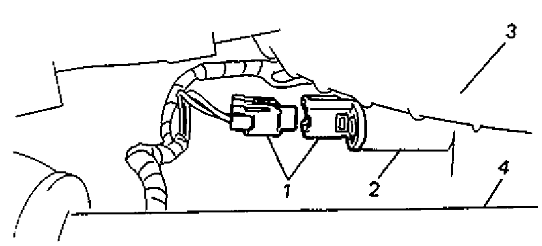
ECM indicates that no CAS signal is inputted for more than 2 seconds while engine is being cranked.
Diagnose trouble according to "Diagnostic Flow Chart for Code No. 42" in Section 6E.

ON CAR SERVICE

IGNITION SPARK TEST

1. Disconnect injector coupler at throttle body side. (Electronic fuel injection model only.)

> WARNING:
> **(Electronic fuel injection model only)**
> **Without disconnection of injector coupler, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.**



1. Injector coupler
2. Throttle body
3. Air cleaner case
4. Cylinder head cover

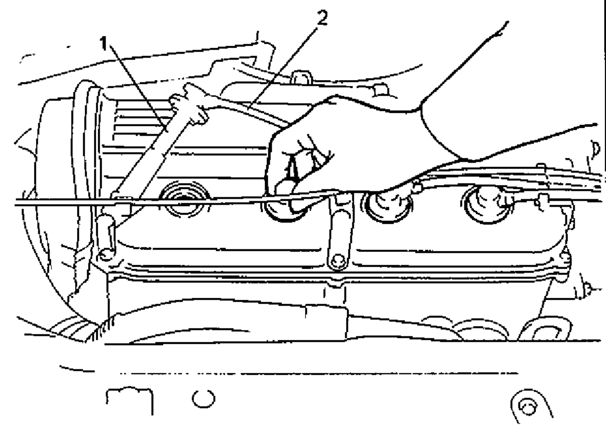
Fig. 6F-3 Disconnecting Injector Coupler

2. Remove spark plugs and connect them to high tension cords, and then ground spark plugs.
3. Crank engine and check if each spark plug sparks.
4. If no spark is emitted, inspect high tension cords, spark plugs, ignition coil, distributor, etc.

HIGH TENSION CORDS

1. Remove high tension cord at ignition coil while gripping its cap.
2. Remove distributor cap installed with high tension cords.
3. Remove high tension cord clamp from cylinder head cover.
4. Pull out high tension cords from spark plugs while gripping each cap.

> CAUTION:
> - **Removal of high tension cords together with clamps will be recommended so as not to damage their inside wire (resistive conductor).**
> - **For the same reason, pull out each connection by gripping cap portion.**

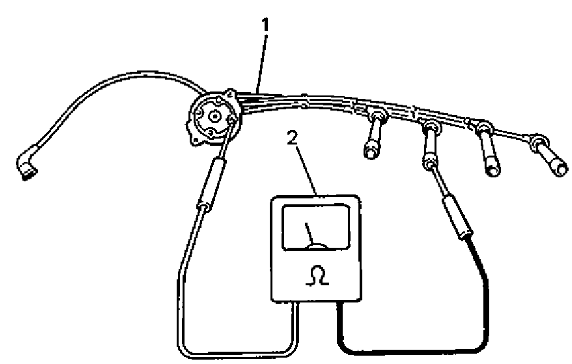


1. Cap
2. High tension cord

Fig. 6F-4 Removing High Tension Cord

5. Measure resistance of high tension cord by using ohmmeter.

High tension cord resistance	10 – 22 kΩ/m 3.0 – 6.7 kΩ/ft



1. High tension cord
2. Ohmmeter

Fig. 6F-5 Measuring High Tension Cord Resistance

6. If resistance exceeds specification, inspect distributor terminal and replace high tension cord(s) and/or distributor cap as required.

CAUTION:
- **Never attempt to use metal conductor high tension cords as replacing parts.**
- **Insert each cap portion fully when installing high tension cords.**

SPARK PLUGS

1. Pull out high tension cords by gripping their caps and then remove spark plugs.
2. Inspect them for:
   - Electrode wear
   - Carbon deposits
   - Insulator damage
3. If any abnormality is found, adjust air gap, clean with spark plug cleaner or replace them with specified new plugs.

Maker	Standard type
NGK	BKR6E (BK6E)
NIPPONDENSO	K20PR-U (K20P-U)
Spark plug gap "A"	0.7 – 0.8 mm (0.028 – 0.031 in.)

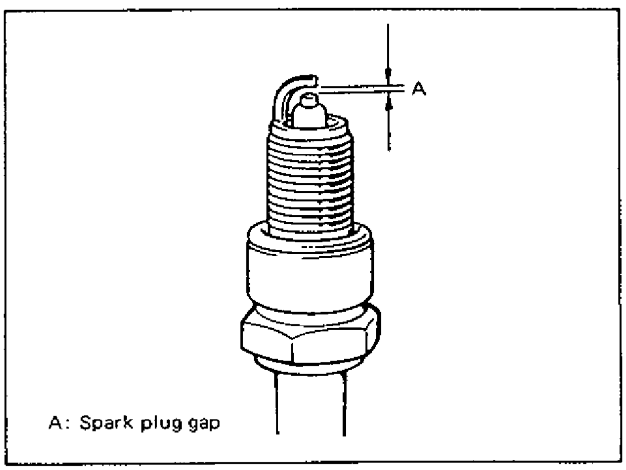


Fig. 6F-6 Checking Spark Plug Gap

As can be seen in the above table, two kinds of spark plugs are used in this car, one with R mark and the other without R mark which is indicated in parentheses, depending on countries. Look at the label attached to the car. If originally equipped plugs were with R-mark, plugs with R mark should be used for replacement.

4. Install spark plugs and torque them to specification.

	N·m	kg-m	lb-ft
Spark plug tightening torque	25 – 30	2.5 – 3.0	18.0 – 21.5

5. Install high tension cords securely by gripping their caps.

IGNITION COIL

1. Pull out high tension cord by gripping its cap.
2. Disconnect ignition coil coupler.
3. Measure primary and secondary coil resistances.

		Ignition coil resistance (at 20°C, 68°F)	
ESA Type	North America spec. vehicle	Primary	1.12 – 1.38 Ω
		Secondary	11.4 – 15.5 kΩ
	Other spec. vehicle	Primary	1.33 – 1.63 Ω
		Secondary	10.7 – 14.5 kΩ
Conventional Type		Primary	1.08 – 1.32 Ω
		Secondary	22.1 – 29.9 kΩ

4. If resistance is out of specification, replace coil with new one.

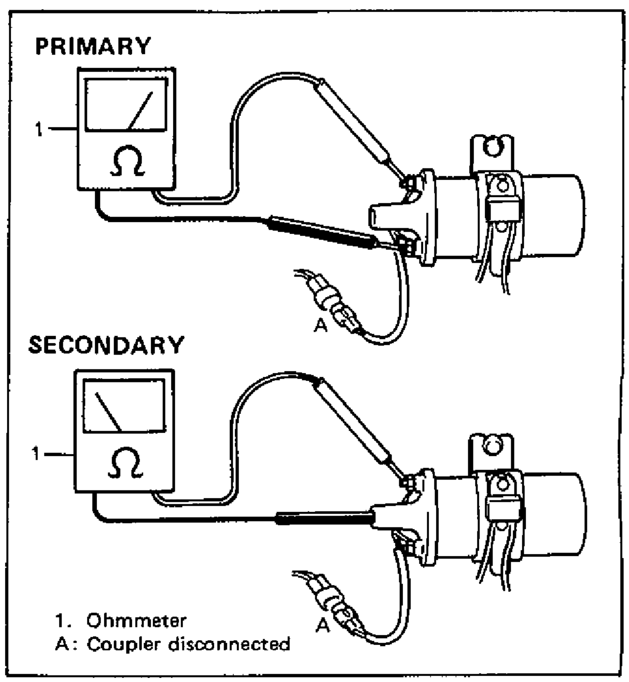


Fig. 6F-7 Measuring Ignition Coil Resistance of ESA Type

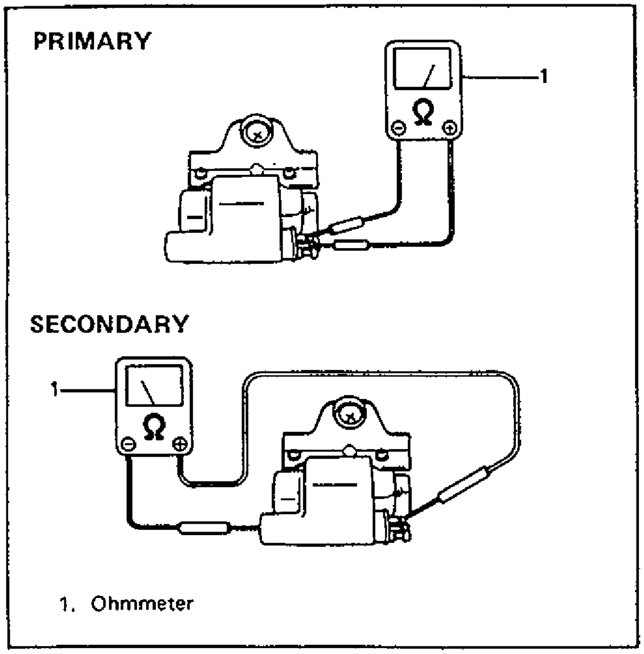


Fig. 6F-8 Measuring Ignition Coil Resistance of Conventional Type

NOISE SUPPRESSOR

1. Disconnect coupler of noise suppressor.
2. Using ohmmeter, check to be sure that condenser is not conductive and resister has resistance of about 2.2 kΩ.
3. If check result is not satisfactory, replace noise suppressor.

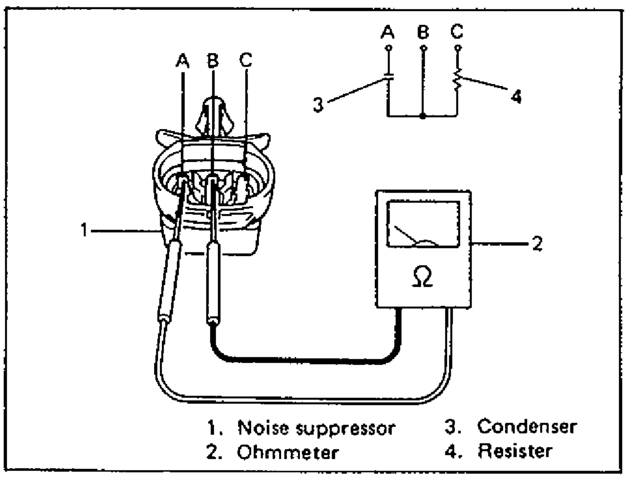


Fig. 6F-9 Checking Noise Suppressor

DISTRIBUTOR (FOR ESA TYPE)

Distributor Cap and Rotor

Check cap and rotor for crack and their terminals for corrosion and wear. Replace as necessary.

Signal Rotor Air Gap

1. Remove distributor cap and rotor.
2. Using thickness gauge, measure air gap, between signal rotor tooth and generator.

Signal rotor air gap	about 0.2 mm (about 0.008 in.)

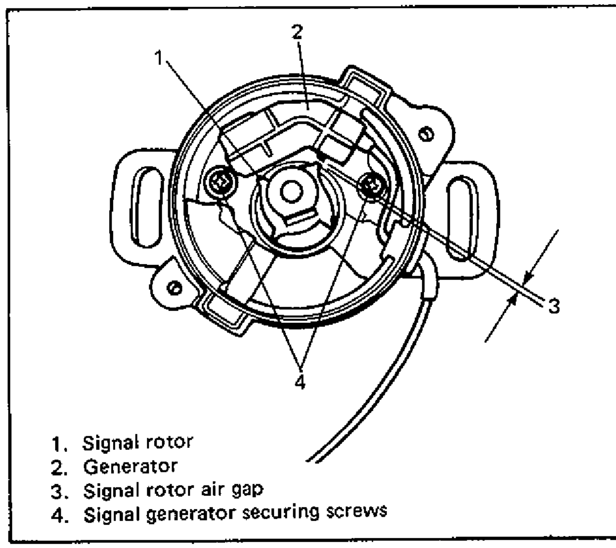


Fig. 6F-10 Checking Air Gap

3. If gap is out of specification, loose signal generator securing screws.
   Using blade (–) screw driver, move generator and adjust gap to specification.
   After adjustment, tighten securing screws and recheck gap.

NOTE:
Check to make sure that signal generator tooth is free from any metal particles.

4. Install distributor cap.

Pickup Coil Resistance

1. Disconnect distributor lead coupler.
2. Measure resistance of pickup coil by using ohmmeter.
3. If resistance is out of specification, replace signal generator as follows.

Pickup coil resistance (at 20°C, 68°F)	160 ± 20 Ω

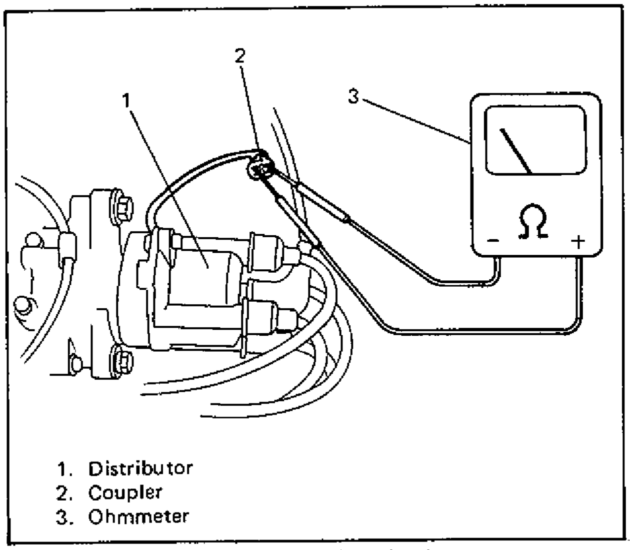


Fig. 6F-11 Measuring Pickup Coil Resistance

4. Remove distributor cap and rotor.
5. Remove signal generator securing screws and lead wire clamp screws.
6. Replace signal generator.
7. Adjust signal rotor air gap to specification as previously outlined.
8. Install rotor, distributor cap seal and cap.

DISTRIBUTOR (FOR CONVENTIONAL TYPE)

Centrifugal Advancer

1. Remove distributor cap.
2. Turn rotor counterclockwise by using fingers and release it. Rotor should return clockwise smoothly by spring force.
3. Also check if shaft is excessively loose.
4. Replace distributor housing assembly if any abnormality is found.

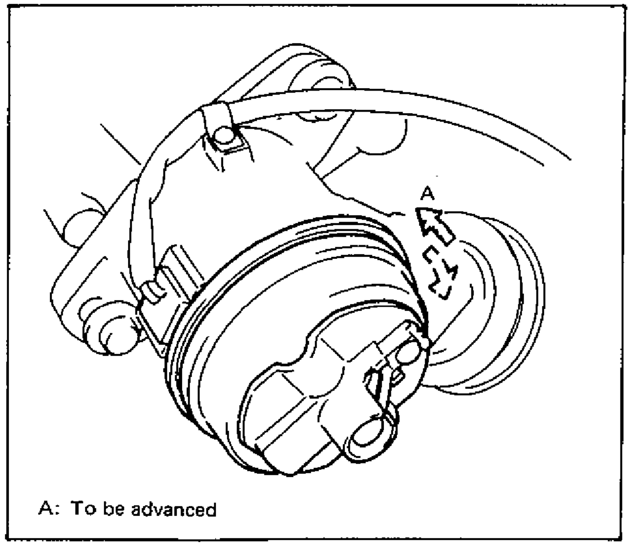


Fig. 6F-12 Checking Centrifugal Advancer

Vacuum advancer

1. Remove distributor cap, rotor and cover.
2. Disconnect vacuum hose and connect vacuum pump gauge to vacuum controller.
3. Apply about 400 mmHg vacuum and release it, then check to make sure that breaker assembly moves smoothly.
4. If any abnormality is found, replace vacuum controller or breaker assembly.

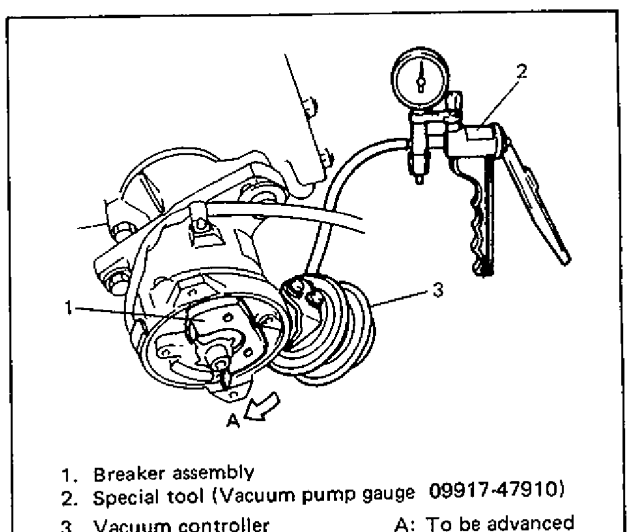


Fig. 6F-13 Checking Vacuum Advancer

IGNITION TIMING

NOTE:

Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake.

INSPECTION AND ADJUSTMENT (FOR ESA TYPE IGNITION SYSTEM)

1. Start engine and warm it up to normal operating temperature.
2. Make sure that all of electrical loads expect ignition are switched off.
3. Check to be sure that idle speed is within specification.
4. Set timing light to No. 1 high tension code.
5. Remove monitor coupler cap beside ignition coil.
6. Connect D and E terminals of monitor coupler by using service wire so that ignition timing is fixed on initial one.

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.

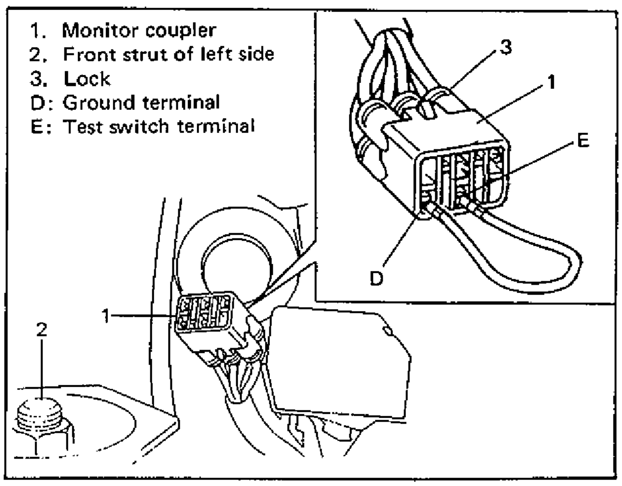


Fig. 6F-14 Fixing Ignition Timing

7. Using timing light, check that timing is within specification.

For ESA type ignition system:

Initial Ignition Timing (Test switch terminal grounded)	5 ± 1° BTDC at specfied idle speed

Ignition order	1 – 3 – 4 – 2

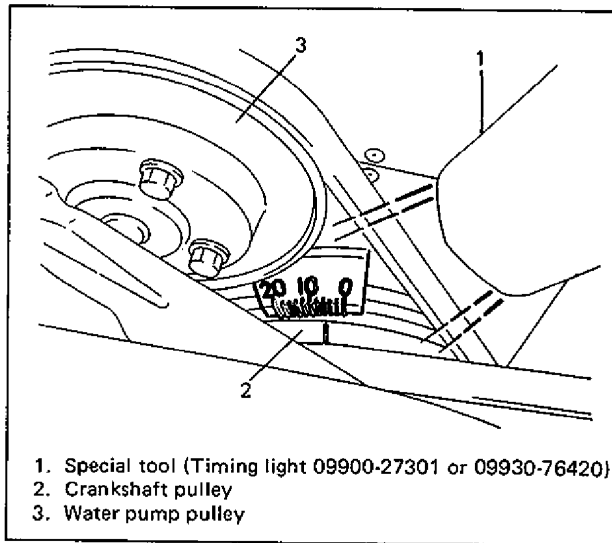


Fig. 6F-15 Checking Ignition Timing

8. If ignition timing is out of specification, loosen flange bolts, adjust timing by turning, distributor assembly while engine is running, and then tighten bolts.

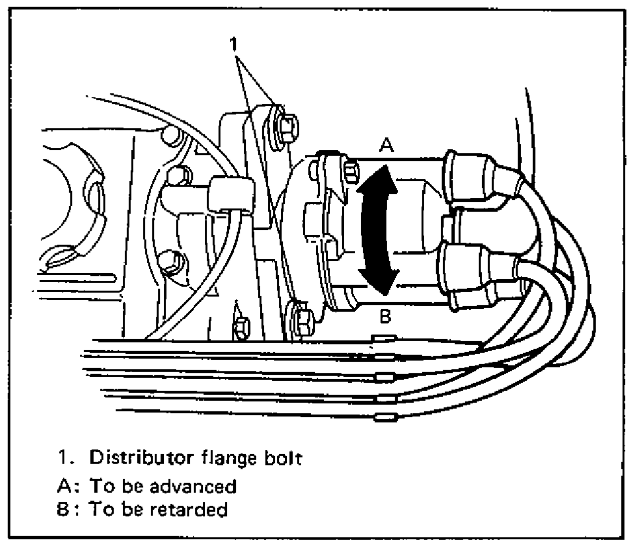


Fig. 6F-16 Adjusting Ignition Timing

9. After tightening distributor flange bolts, recheck that ignition timing is within specification.
10. After checking and/or adjusting Initial Ignition Timing, disconnect service wire from monitor coupler.

11. With engine idling (test switch terminal ungrounded, idle switch ON and car stopped), check that ignition timing is about 12° BTDC. (Constant variation within a few degrees from 12° indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
    If above check results are not satisfactory, check TPS (Idle switch), test switch terminal circuit and ECM.

INSPECTION AND ADJUSTMENT (FOR CONVENTIONAL TYPE IGNITION SYSTEM)

1. Start engine and warm it up to normal operating temperature.
2. Make sure that all of electrical loads except ignition are switched off.
3. Check to be sure that idle speed is within specification.
4. Set timing light to No. 1 high tension cord.
5. Disconnect vacuum hose at gas filter on intake manifold and plug gas filter.

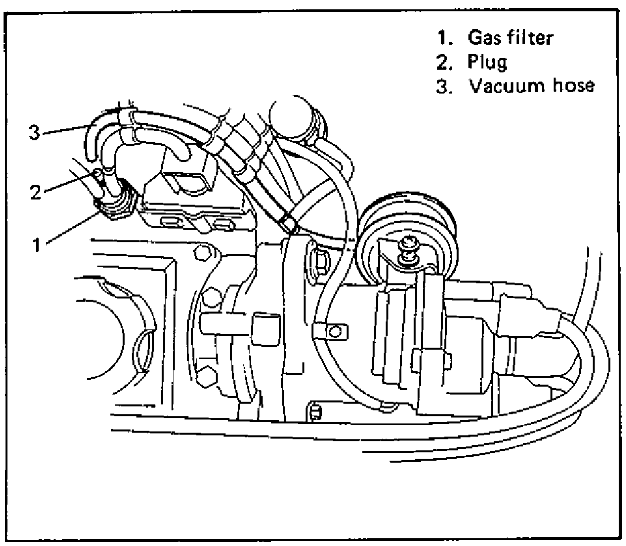


Fig. 6F-17 Plugging Gas Filter

6. Using timing light, check that initial ignition timing is within specification.

IGNITION TIMING SPECIFICATION		
Idle speed	Initial (Vacuum disconnected)	Advanced (Vacuum connected)
800 ± 50 r/min	2 ± 1° BTDC	6 ± 1° BTDC

Ignition order	1 – 3 – 4 – 2

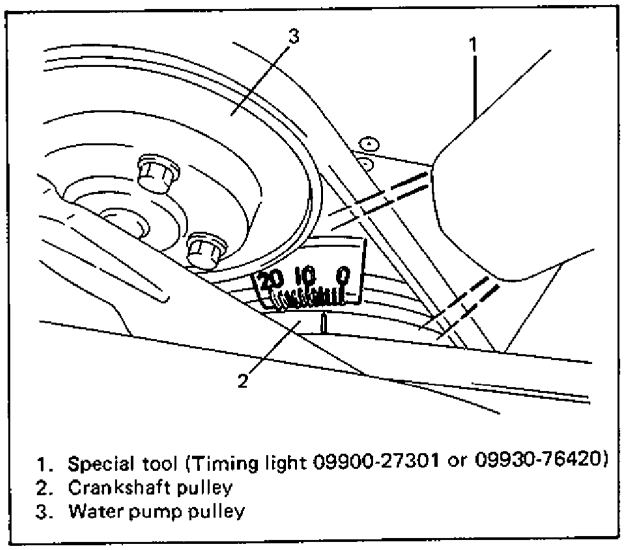


Fig. 6F-18 Checking Ignition Timing

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.

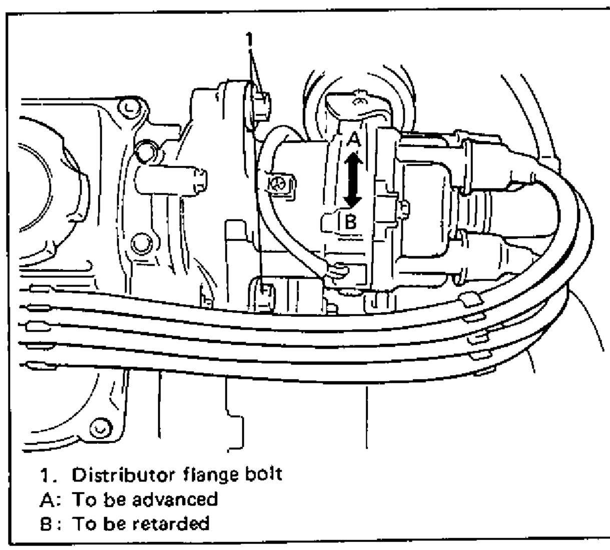


Fig. 6F-19 Adjusting Ignition Timing

8. After tightening distributor flange bolts, recheck that ignition timing is within specification.
9. Connect vacuum hose as it was and make sure that advanced timing is within specification.

DISTRIBUTOR UNIT (FOR ESA TYPE IGNITION SYSTEM)

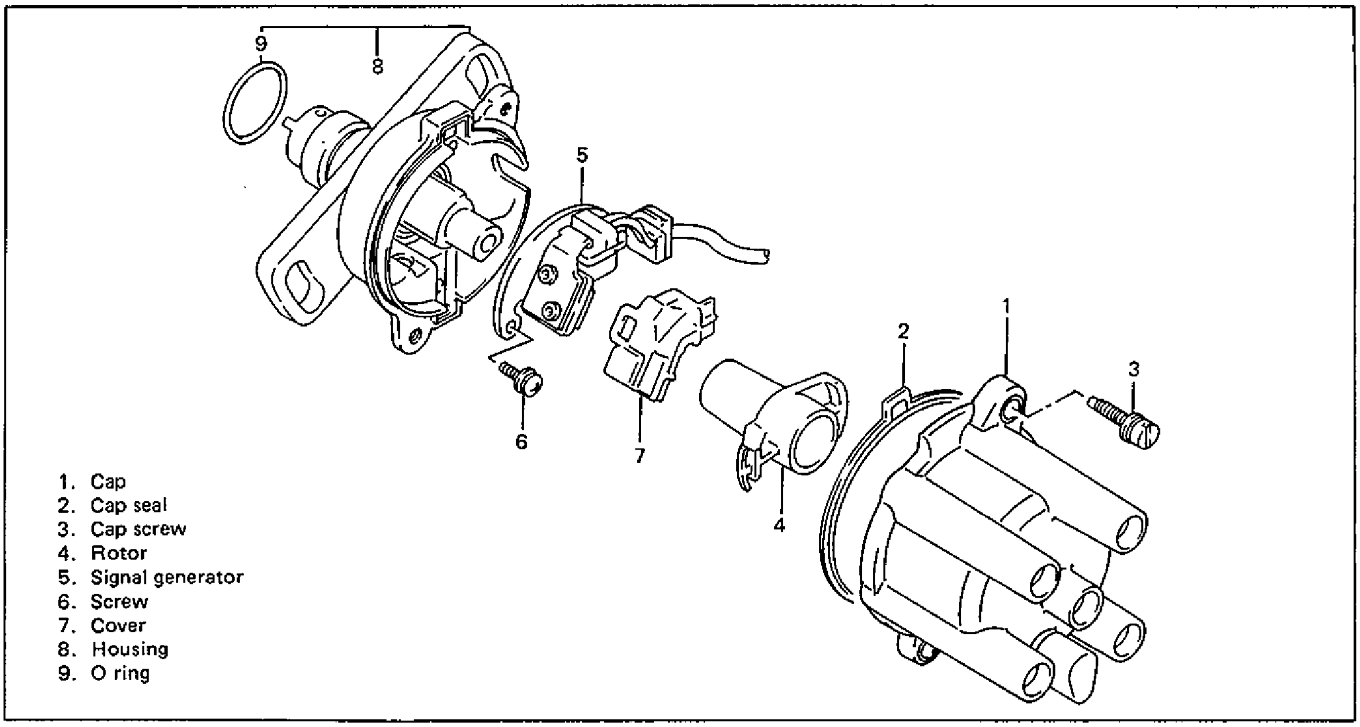


Fig. 6F-20 Distributor Components for ESA Type Ignition System

DISMOUNTING

1. Disconnect distributor lead coupler.
2. Remove distributor cap screws and cap.
3. Remove distributor flange bolts.
4. Pull out distributor housing assembly.

REMOUNTING

NOTE:
- **Before installing distributor, check to make sure that its O ring is in good condition.**
- **If new O ring is installed, apply oil.**

1. Install distributor without cap to camshaft. Fit the dogs of distributor coupling into the slots of camshaft, when installing. The dogs of distributor coupling are offset. Therefore, if the dogs can not be fitted into the slots, turn the distributor shaft by 180 degree and try again.
2. *Lightly* install flange bolts and prepare for ignition timing adjustment.
3. Check to make sure that rotor is in good condition.
4. Inspect distributor cap and clean or replace as required.
5. Make sure that distributor cap seal is placed properly and install cap, and then fasten it with screws.
6. Connect distributor lead coupler.

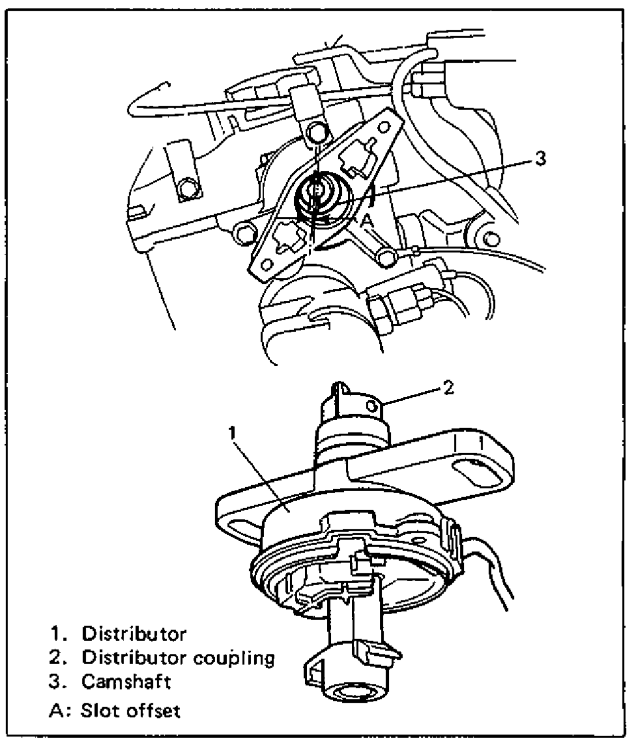


Fig. 6F-21 Camshaft Slot and Coupling

DISTRIBUTOR UNIT
(FOR CONVENTIONAL TYPE IGNITION SYSTEM)

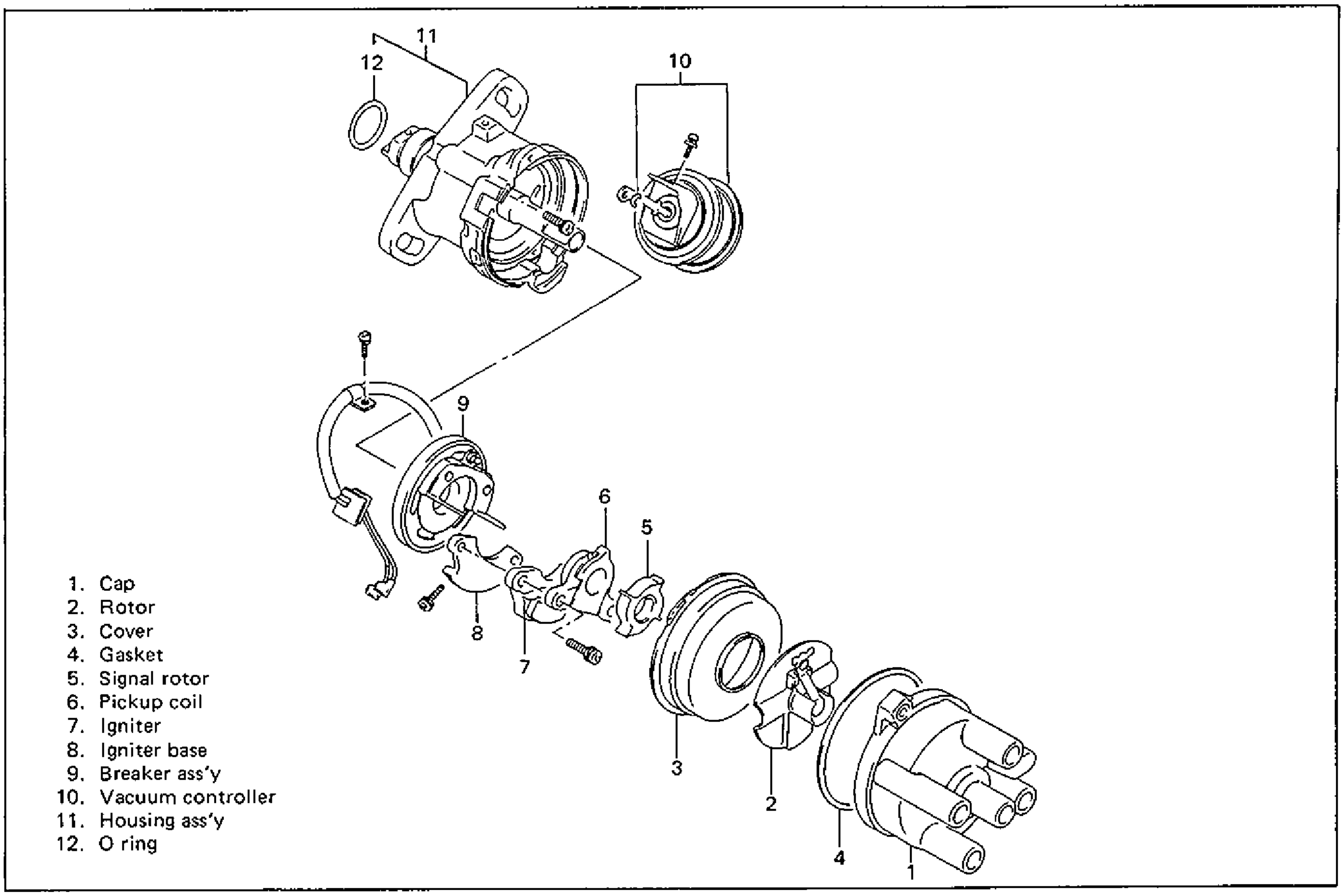


Fig. 6F-22 Distributor Components for Conventional Type Ignition System

DISMOUNTING

1. Disconnect distributor lead coupler.
2. Disconnect vacuum hose at vacuum controller.
3. Remove distributor cap screw and cap.
4. Remove distributor flange bolts.
5. Pull out distributor housing assembly.

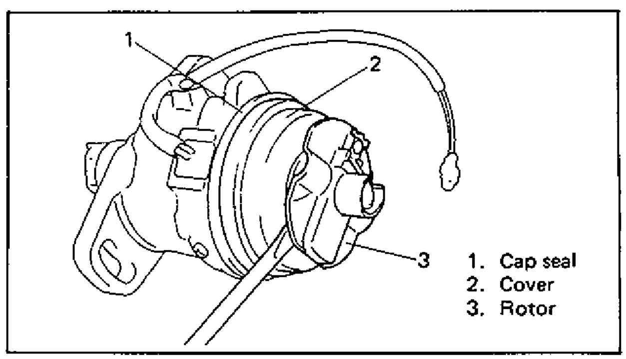


Fig. 6F-23

DISASSEMBLY

1. Remove distributor cap, if it has been assembled with housing.
2. Draw out rotor and remove cover with gasket.
3. Using screwdrivers, draw out signal rotor.

NOTE:
When drawing out signal rotor, be careful so that screwdrivers don't damage igniter and pickup coil.

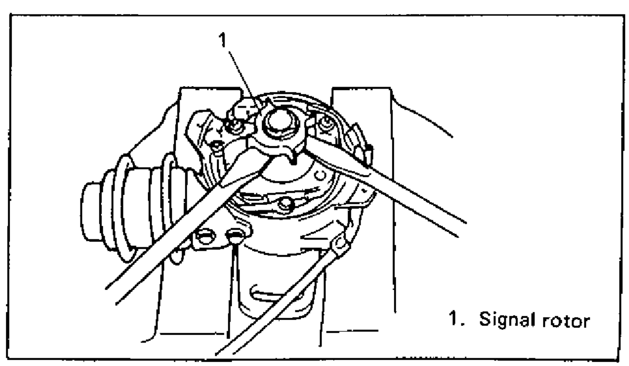


Fig. 6F-24

4. Disconnect lead wires at igniter terminals. Remove igniter fastening screws and take out igniter with pickup coil.

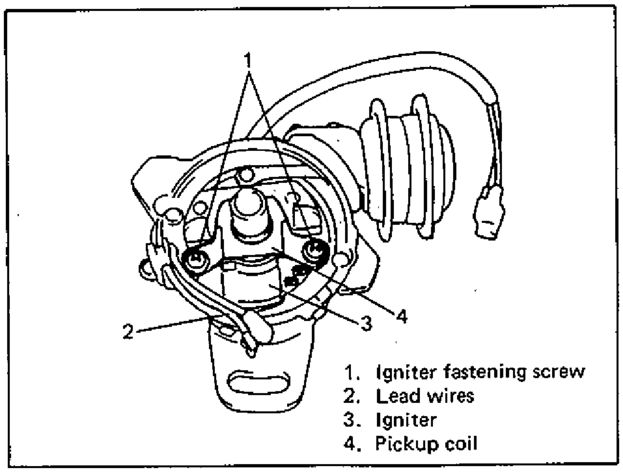
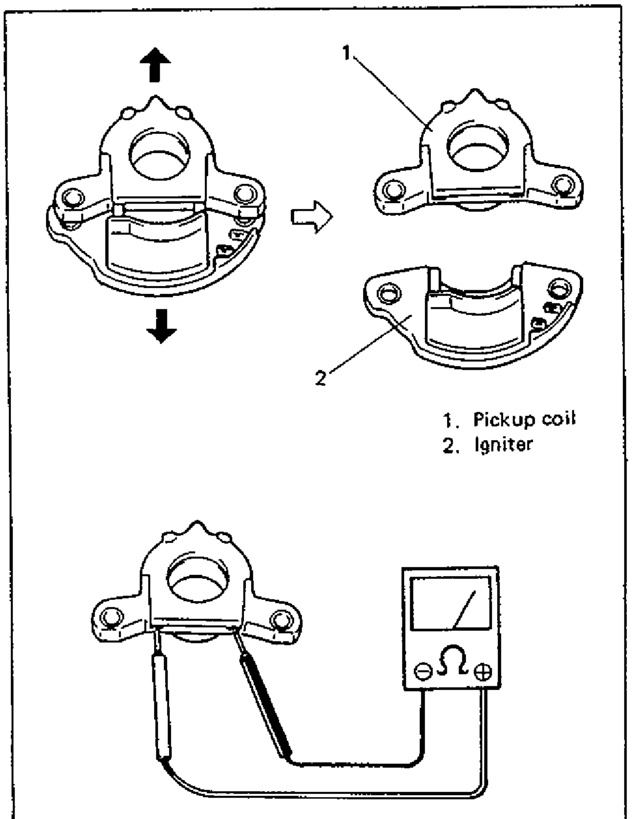


Fig. 6F-25

NOTE:
Igniter and pickup coil can be separated as shown below.



Pickup coil resistance	425 – 505 Ω

Fig. 6F-26

5. Remove igniter base screw and then take out igniter base.

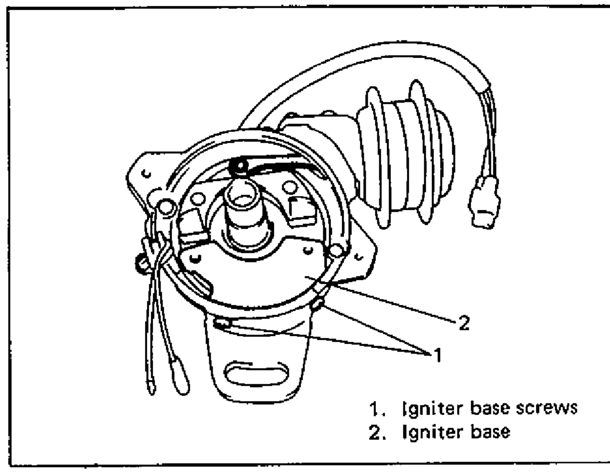


Fig. 6F-27

6. Remove E-ring and screws and then pull out vacuum controller from housing.

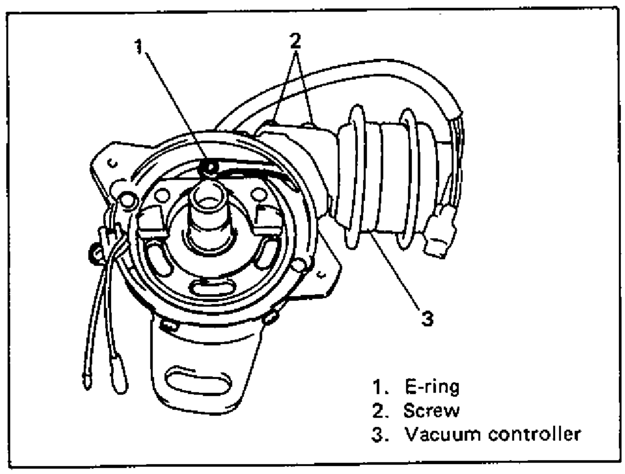


Fig. 6F-28

7. Remove breaker screws and then remove breaker ass'y.

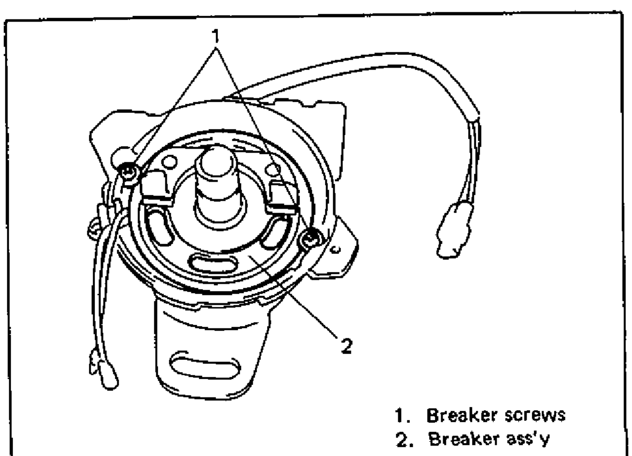


Fig. 6F-29

8. Remove rotor shaft screw and then remove rotor shaft.

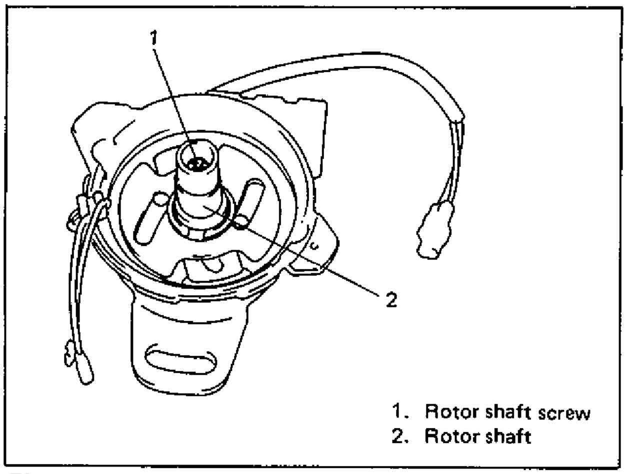


Fig. 6F-30

INSPECTION

Centrifugal Advancer

1. Check advancer for rust or abnormal wear.
2. Check shaft for looseness by turning it by hand.
3. If any abnormality is found in the above inspection, replace as housing assembly.

NOTE:

If rust is found in housing inner parts, check breather holes in housing and distributor cap.

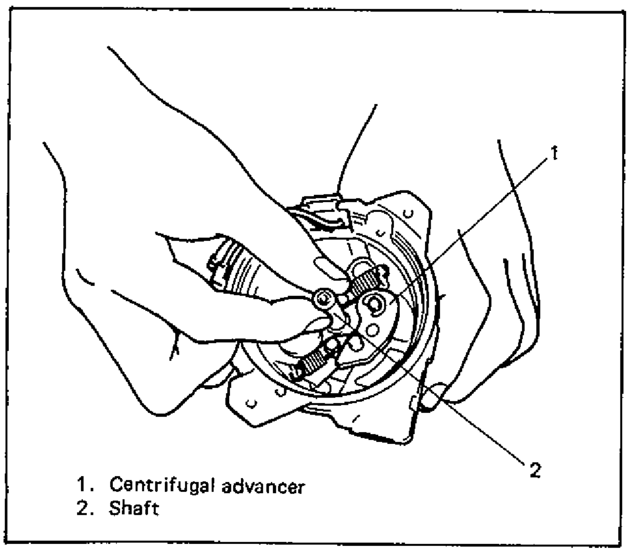


Fig. 6F-31 Checking Centrifugal Advancer

Breaker

Check breaker bearing for smooth rotation. If any abnormality is found, replace it. Do not wash or disassemle it.

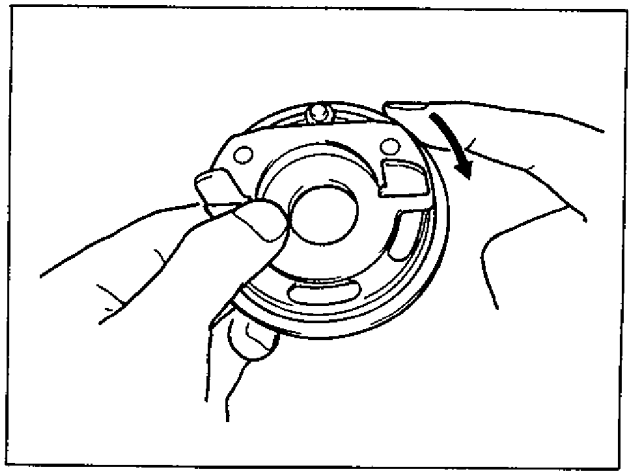


Fig. 6F-32 Checking Breaker

REASSEMBLY

Judging from faulty conditions noted before disassembly and what is found through inspection after disassembly, prepare replacing parts and reassemble distributor by reversing removal procedure.

NOTE:

- **When installing pickup coil, use screws with lock washer and washer.**
- **Check to make sure that pickup coil magnet is free from any metal particles.**
- **When installing signal rotor, press-fit it with pin inserted in it into rotor shaft in such direction as shown below.**

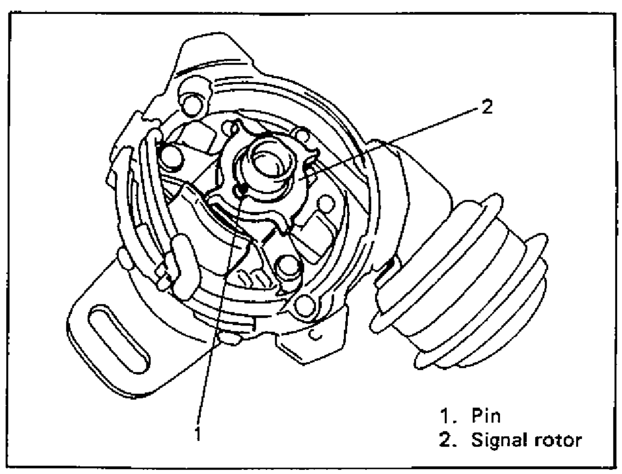


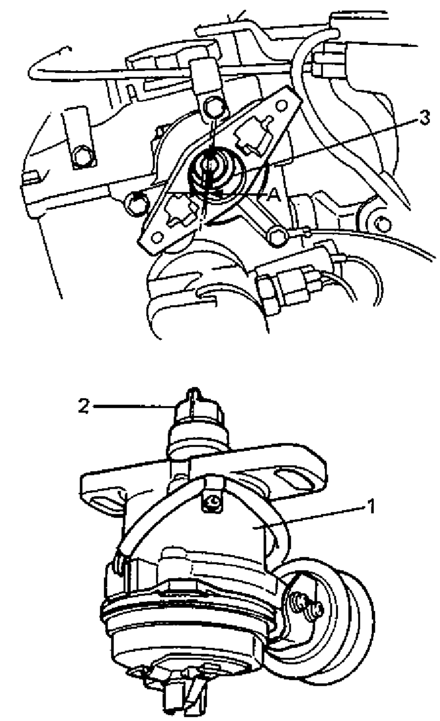
Fig. 6F-33

REMOUNTING

NOTE:

- **Before installing distributor, check to make sure that its O ring is in good condition.**
- **If new O ring is installed, apply oil.**

1. Install distributor without cap to camshaft. Fit the dogs of distributor coupling into the slots of camshaft, when installing. The dogs of distributor coupling are offset. Therefore, if the dogs can not be fitted into the slots, turn the distributor shaft by 180 degree and try again.
2. Lightly install flange bolts and prepare for ignition timing adjustment.
3. Check to make sure that rotor is in good condition.
4. Inspect distributor cap and clean or replace as required.
5. Make sure that distributor cap gasket is placed properly and install cap, and then fasten it with screws.
6. Connect distributor lead coupler.

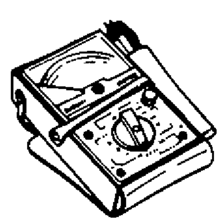
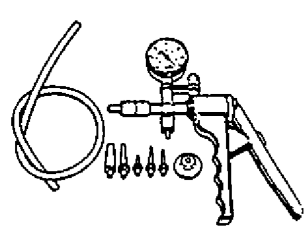
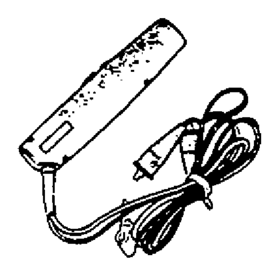
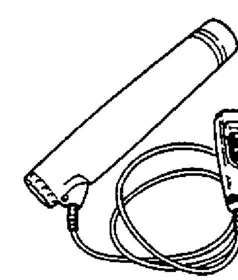


1. Distributor
2. Distributor coupling
3. Camshaft

A: Slot offset

Fig. 6F-34 Camshaft Slot and Coupling

SPECIAL TOOLS

			
09900-25002 Pocket tester	09917-47910 Vacuum pump gauge	09900-27301 Timing light (DC 12V)	09930-76420 Timing light (Dry cell type)

SECTION 6G

CRANKING SYSTEM (0.8 and 1.0 kW type)

NOTE:
Four types of starting motors are used for this model. They are 0.8, 1.0, 1.2 and 1.4 kW types. Whick one is used depends on specifications. For its identification, a label in one of following colors indicative of each type is attached to starting motor itself. For 1.2 and 1.4 kW type starting motor, refer to Section 6G1.

Label color	Red (NIPPONDENSO)	Green	White	Red (MITSUBISHI)
OUT PUT (kW)	0.8	1.0	1.2	1.4

CONTENTS

GENERAL DESCRIPTION 6G- 1
Cranking Circuit 6G- 1
Starting Motor 6G- 1
DIAGNOSIS 6G- 5
UNIT REPAIR OVERHAUL 6G- 6
Dismounting and Remounting 6G- 6
Convertional Type Starting Motor 6G- 7
Magnetic switch assembly 6G- 7
Motor assembly 6G- 8
Reduction Type Starting Motor 6G-10
Reduction system 6G-10
Inspection and Correction 6G-11
Armature 6G-11
Yoke 6G-13
Brush 6G-13
Brush holder 6G-13
Overrunning clutch 6G-13
Shaft and bush 6G-13
Performance Test 6G-14
Pull-in test 6G-14
Hold-in test 6G-14
Pinion return test 6G-14
No-load performance test 6G-14

GENERAL DESCRIPTION

CRANKING CIRCUIT

The cranking circuit consists of the battery, starting motor, ignition switch, and related electrical wiring. These components are connected electrically as shown in Fig. 6G-1. Only the starting motor will be covered in this section.

STARTING MOTOR

Two types of starting motor are employed in this model depending on specification, namely a conventional type and a reduction type.

Both of them consist of yoke assembly, armature assembly, overrunning clutch assembly, magnetic switch assembly, drive end frame (housing), rear end frame (commutator end housing), brush holder and drive lever.

In addition to those component assemblies, the reduction type has reduction gear assembly which is combined with shock absorber mechanism.

In the circuit shown in Fig. 6G-1, the magnetic switch coils are magnetized when the ignition switch is closed. The resulting plunger and pinion drive lever movement causes the pinion to engage the engine flywheel gear and the magnetic switch main contacts to close, and cranking takes place. When the engine starts, the pinion overrunning clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.

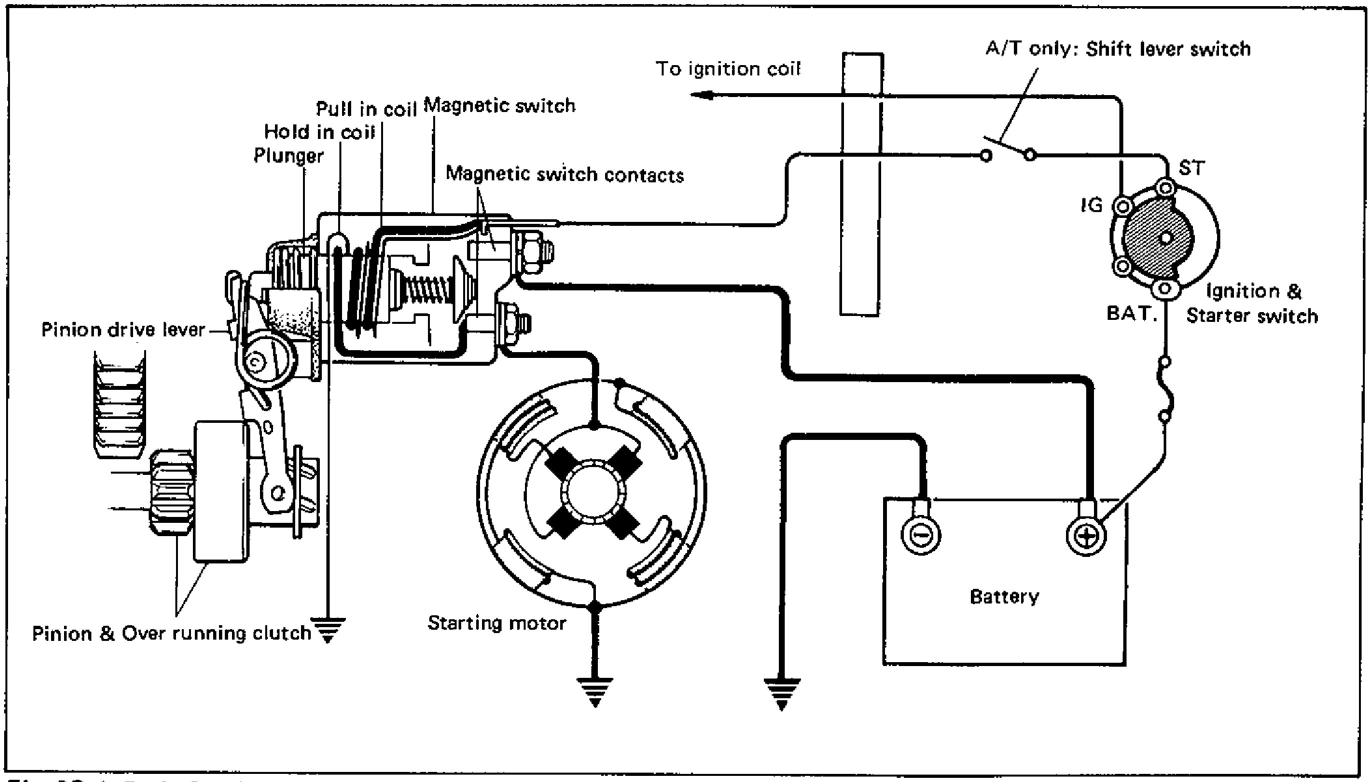
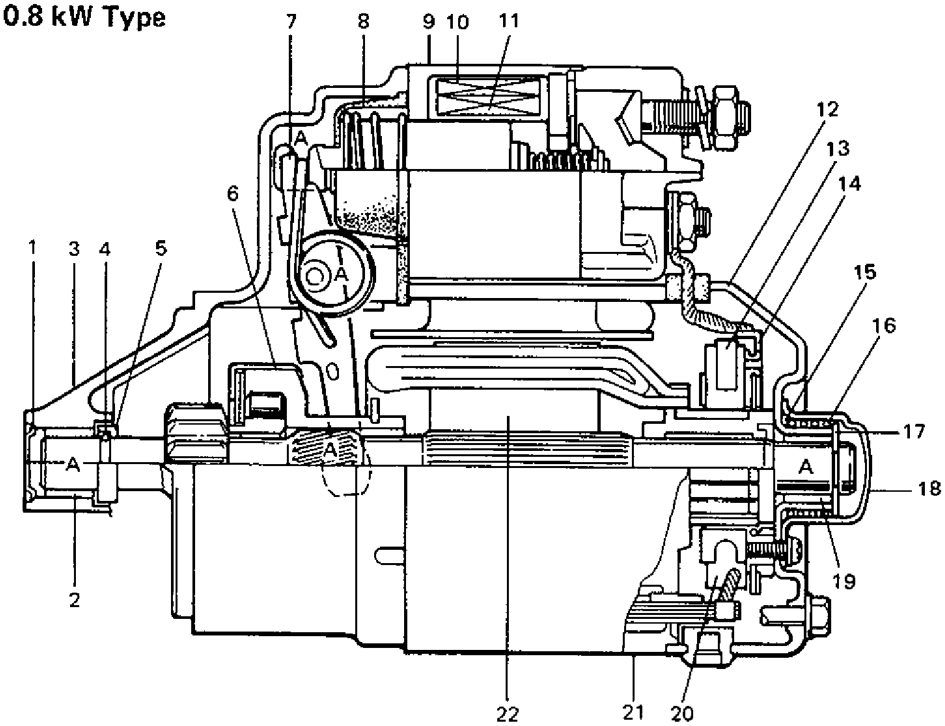


Fig. 6G-1 Basic Cranking Circuit

SPECIFICATIONS

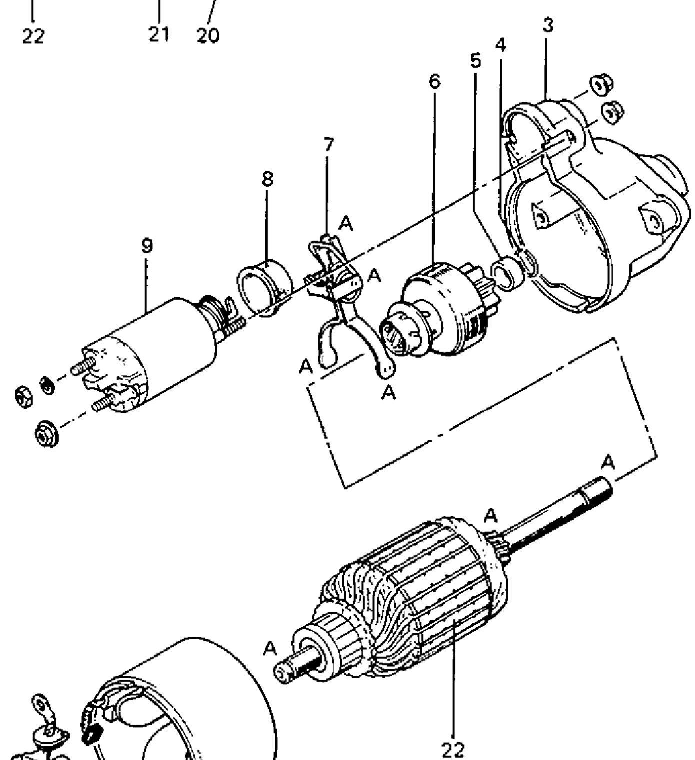
ITEM		CONVENTIONAL TYPE		REDUCTION TYPE	
Voltage		12 volts		←	
Output		0.8kW		1.0 kW	
Rated time		30 seconds		←	
Rotation		Clockwise viewed from pinion side		←	
Brush length		16 mm (0.630 in)		14 mm (0.551 in)	
Number of pinion teeth		8		←	
Performance		Condition	Guarantee	Condition	Guarantee
Around at 20°C (68°F)	No load	11V	50A maximum 5,000 r/min. minimum	11.5V	90A maximum 3,000 r/min. minimum
	Load	9.5V 0.7 kg-m	270A maximum 1,200 r/min. minimum	8.7V 230A	0.78 kg-m minimum 1,000 r/min. minimum
	Lock	7.7V	600A maximum 1.3 kg-m (9.4 lb-ft) minimum	2.5V	310A maximum 0.87 kg-m (6.3 lb-ft) minimum
Magnetic switch pull-in operation		8 volts maximum at 20°C (68°F)		←	

For 0.8 kW Type



1. Cover
2. Bush
3. Drive housing assembly
4. Snap ring
5. Pinion stop ring
6. Overrunning clutch assembly
7. Pinion drive lever
8. Boot
9. Magnetic switch
10. Hold-in coil
11. Pull-in coil
12. Commutator end housing assembly
13. Brush spring
14. Brush holder assembly
15. End cap gasket
16. Armature brake spring
17. Armature plate
18. Commutator end cap
19. Bush
20. Brush
21. Yoke assembly
22. Armature
23. Housing bolt

A: Apply grease



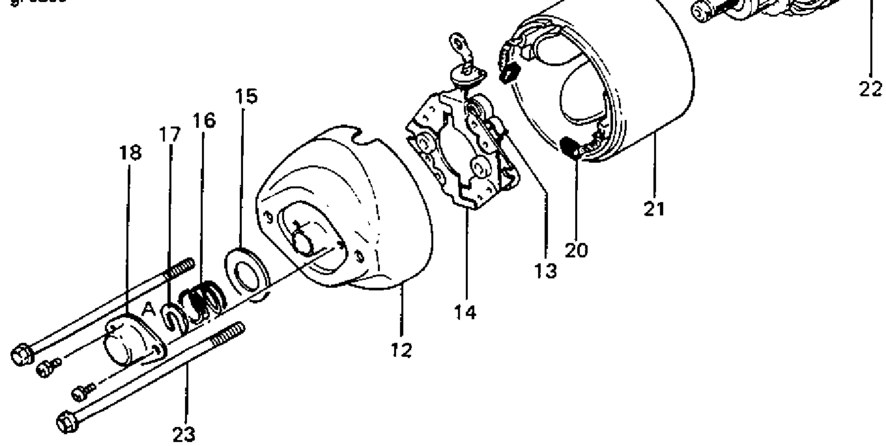
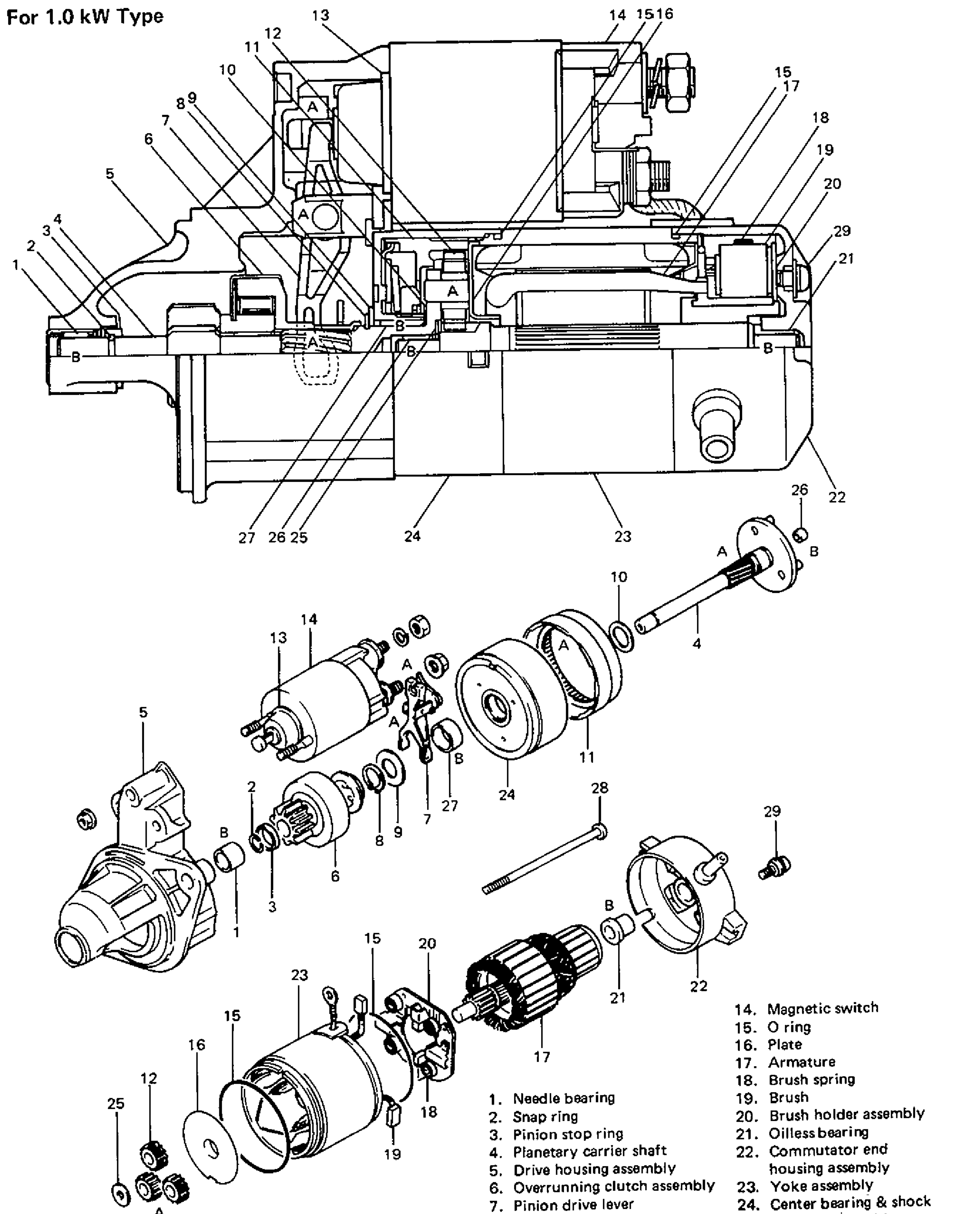


Fig. 6G-2 Conventional Type Starting Motor

For 1.0 kW Type



1. Needle bearing
2. Snap ring
3. Pinion stop ring
4. Planetary carrier shaft
5. Drive housing assembly
6. Overrunning clutch assembly
7. Pinion drive lever
8. Circlip
9. Washer
10. Washer
11. Internal gear
12. Planetary gear
13. Boot
14. Magnetic switch
15. O ring
16. Plate
17. Armature
18. Brush spring
19. Brush
20. Brush holder assembly
21. Oilless bearing
22. Commutator end housing assembly
23. Yoke assembly
24. Center bearing & shock absorber assembly
25. Washer
26. Oilless bearing
27. Oilless bearing
28. Housing bolt
29. Screw with O ring

A: Apply grease
B: DO NOT wash nor lubricate. Spare parts have been lubricated.

Fig. 6G-3 Reduction Type Starting Motor

DIAGNOSIS

Possible symptoms due to starting system trouble would be as follows.

- Starting motor does not run (or runs slowly)
- Starting motor runs but fails to crank engine
- Abnormal noise is heard

Proper diagnosis must be made to determine exactly where the cause of each trouble lies ..... in battery, wiring harness, (including starting motor switch), starting motor or engine.

Do not remove motor just because starting motor does not run. Check following items and narrow down scope of possible causes.

- Condition of trouble
- Tightness of battery terminals (including ground cable connection on engine side) and starting motor terminals
- Discharge of battery

Condition	Possible Cause	Correction
Motor not running	**No operating sound of magnetic switch**	
	1. Shift lever switch is not in P or N, or not adjusted (A/T)	Shift in P or N, or adjust switch
	2. Battery run down	Recharge battery
	3. Battery voltage too low due to battery deterioration	Replace battery
	4. Poor contact in battery terminal connection	Retighten or replace
	5. Loose grounding cable connection	Retighten
	6. Fuse set loose or blown off	Tighten or replace
	7. Poor contacting action of ignition switch	Replace
	8. Lead wire coupler loose in place	Retighten
	9. Open-circuit between ignition switch and magnetic switch	Repair
	10. Open-circuit in pull-in coil	Replace magnetic switch
	11. Poor sliding of plunger	Replace
Motor not running	**Operating sound of magnetic switch heard**	
	1. Battery run down	Recharge battery
	2. Battery voltage too low due to battery deterioration	Replace battery
	3. Loose battery cable connections	Retighten
	4. Burnt main contact point, or poor contacting action of magnetic switch	Replace magnetic switch
	5. Brushes are seating poorly or worn down	Repair or replace
	6. Weakened brush spring	Replace
	7. Burnt commutator	Replace
	8. Poor grounding of field coil	Repair
	9. Layer short-circuit of armature	Replace
	10. Crankshaft rotation obstructed	Repair

Condition	Possible Cause	Correction
Starting motor running but too slow (small torque)	**If battery and wiring are satisfactory, inspect starting motor**	
	1. Insufficient contact of magnetic switch main contacts	Replace
	2. Layer short-circuit of armature	Replace
	3. Disconnected, burnt or worn commutator	Repair or replace
	4. Poor grounding of field coil	Repair
	5. Worn brushes	Replace
	6. Weakened brush springs	Replace spring
	7. Burnt or abnormally worn end bushings	Replace
Starting motor running, but not cranking engine	1. Worn pinion tip	Replace over-running clutch
	2. Poor sliding of over-running clutch	Replace
	3. Over-running clutch slipping	Replace
	4. Worn teeth of ring gear	Replace flywheel
	5. Shock absorber slipping (Reduction type)	Replace
Noise	1. Abnormally worn bush	Replace
	2. Worn pinion or worn teeth of ring gear	Replace pinion or flywheel
	3. Poor sliding of pinion (failure in return movement)	Repair or replace
Starting motor does not stop running	1. Fused contact points of magnetic switch	Replace
	2. Short-circuit between turns of magnetic switch coil (layer short-circuit)	Replace
	3. Failure of returning action in ignition switch	Replace

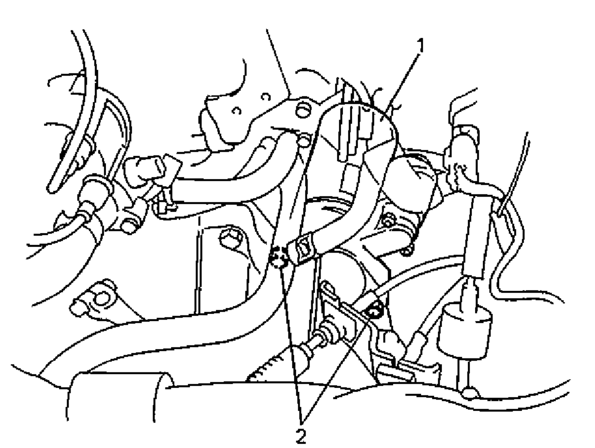
UNIT REPAIR OVERHAUL

For overhauling of starting motor, it is recommended that component parts should be cleaned thoroughly. However, yoke assembly, armature coil, overrunning clutch assembly, magnetic switch assembly, rubber or plastic parts and center bearing & shock absorber assembly of reduction type motor are NOT ALLOWED to be washed in degreasing tank or with grease dissolving solvent. Those parts should be cleaned by blowing air and wiping with cloth.

DISMOUNTING AND REMOUNTING

1. Disconnect negative (−) battery lead at battery.
2. Disconnect magnetic switch lead wire and battery cable from starting motor terminals.
3. Remove 2 mounting bolts.
4. Remove starting motor.
5. To remount, reverse above procedure.

Tightening torque for starting motor mounting bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



1. Starting motor
2. Bolt

Fig. 6G-4 Starting Motor Mounting

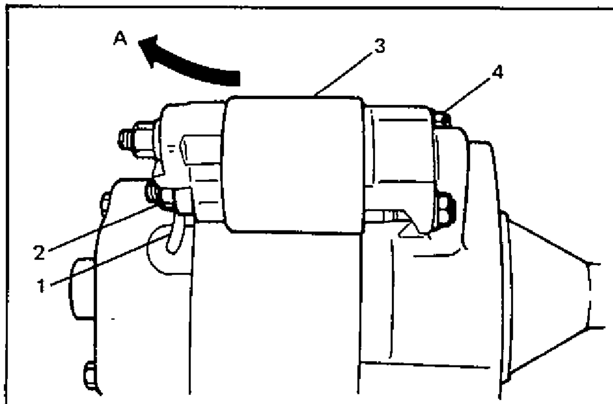
CONVENTIONAL TYPE STARTING MOTOR

MAGNETIC SWITCH ASSEMBLY

Removal

1. Remove nut and disconnect lead wire from magnetic switch.
2. Remove 2 nuts and then take out magnetic switch by pulling up its rear portion so as to inside hook is disconnected from drive lever.

> CAUTION:
> **Do not disassemble magnetic switch. Replace it as assembly, when required.**



1. Lead wire
2. Nut
3. Magnetic switch
4. Nut

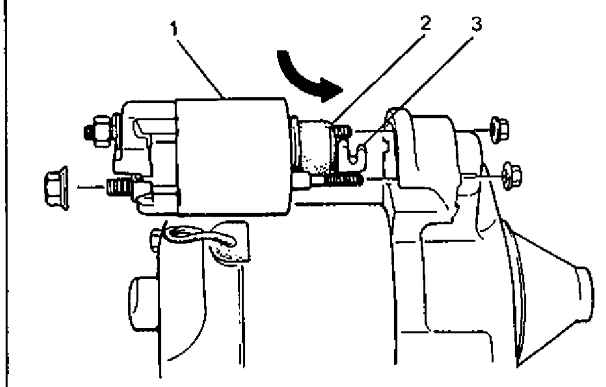
A: Pull up to disconnect hook

Fig. 6G-5 Removing Magnetic Switch

Installation

1. Replace magnetic switch or its boot with new one, if required, then apply grease to hook.
2. Hook switch plunger with drive lever and then fasten switch assembly with nuts.
3. Connect lead wire as it was and then check switch for operation.

NOTE:
- **Before installing nuts, make sure that plunger hook is connected with drive lever without fail.**
- **Face boot breather down.**



1. Magnetic switch
2. Boot (Face breather down)
3. Plunger hook (Apply grease)

Fig. 6G-6 Installing Magnetic Switch

MOTOR ASSEMBLY

Disassembly

1. Remove magnetic switch.
2. Remove 2 screws, then take off commutator end cap, armature plate and brake spring.

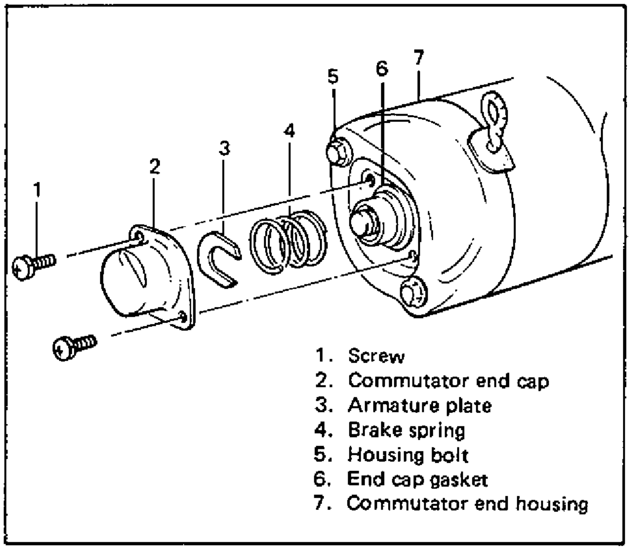


Fig. 6G-7 Removing Armature Plate

3. Remove housing bolts (through bolts) and then pull out commutator end housing.
4. Using long nose pliers, pull out brushes and then remove brush holder.

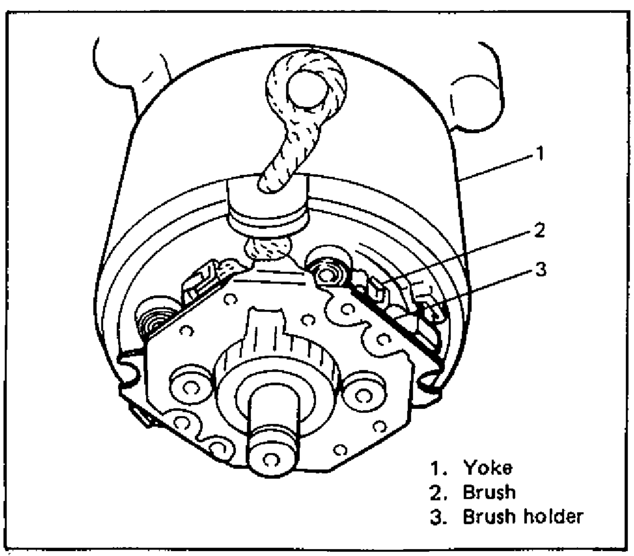


Fig. 6G-8 Removing Brush Holder

5. Remove yoke, armature and drive lever.

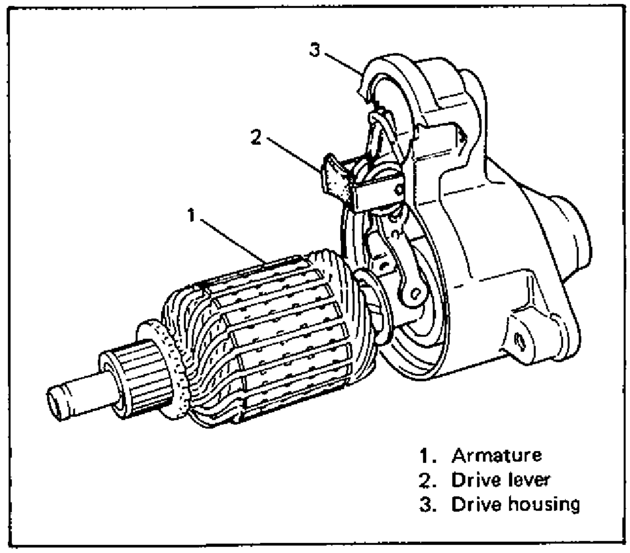


Fig. 6G-9 Removing Armature

6. Remove armature snap ring by using snap ring pliers assisted with screwdriver, then pull out pinion stop ring and overrunning clutch.

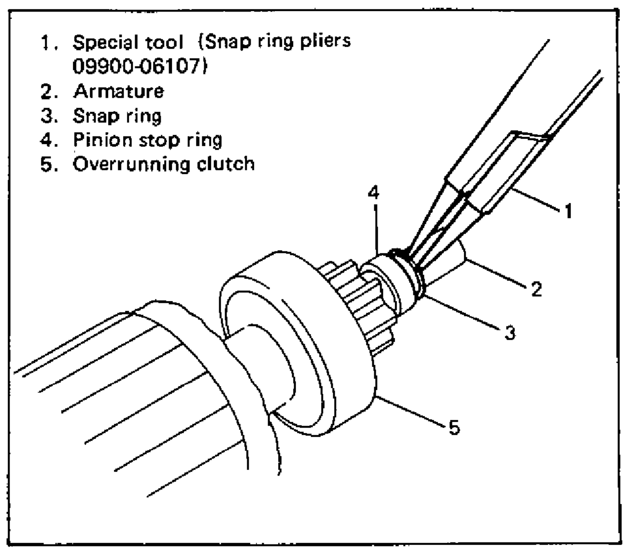


Fig. 6G-10 Removing Snap Ring

Reassembly

1. Inspect component parts as outlined in INSPECTION AND CORRECTION and replace or correct them as necessary.
2. Before installing overrunning clutch, apply grease as shown in below figure and then fasten stop ring with snap ring.

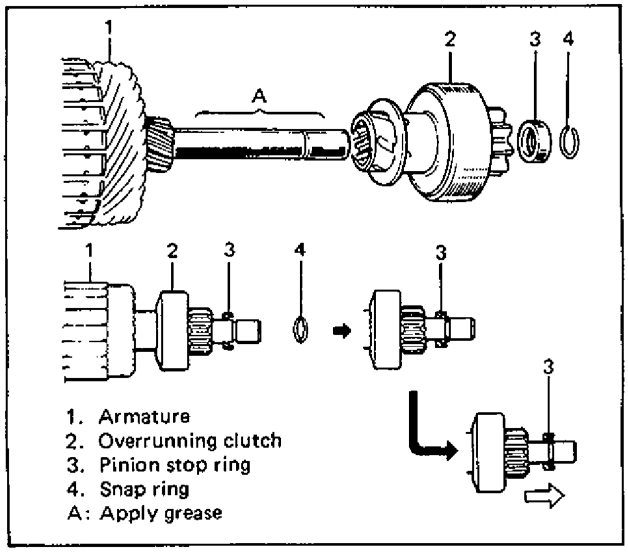


Fig. 6G-11 Installing Overrunning Clutch

3. Apply grease to drive lever and combine it with armature. Then assemble them with drive housing.

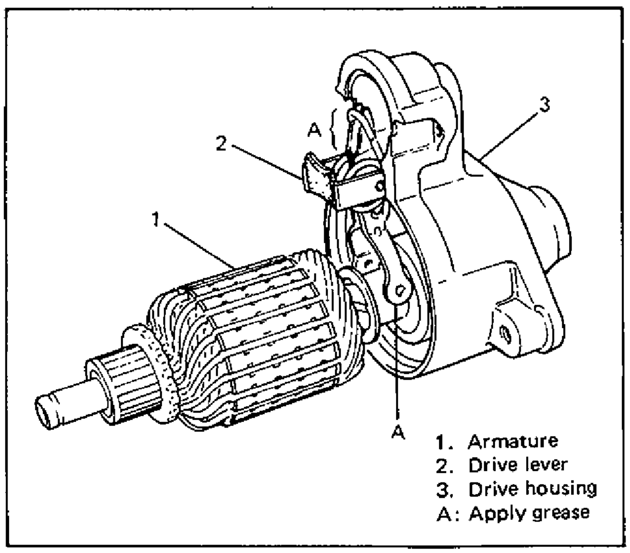


Fig. 6G-12 Installing Armature

4. Install yoke and brush holder, then set 4 brushes with their springs.

NOTE:

- **When installing brushes, make sure that brushes and commutator have been degreased thoroughly.**
- **Check to confirm that brush parts do not have unnecessary contacts with others.**

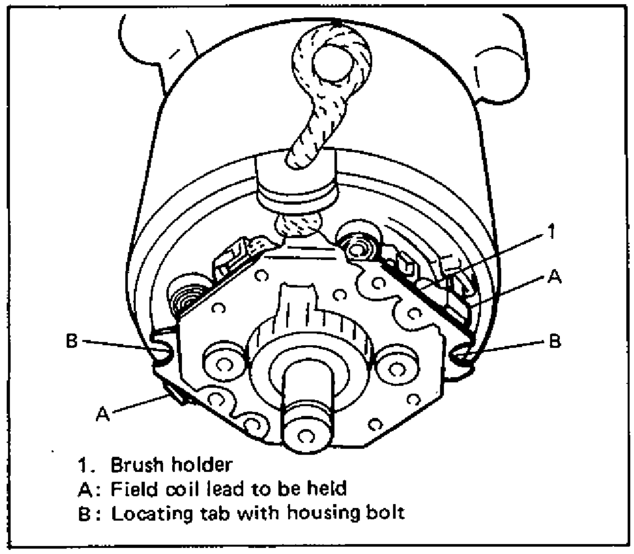


Fig. 6G-13 Installing Brush Holder

5. Install commutator end housing applied with grease in its bush inside.
6. Place gasket, brake spring, then install armature plate securely, and then install end cap applied with grease about 40% of its room.
7. Install magnetic switch.

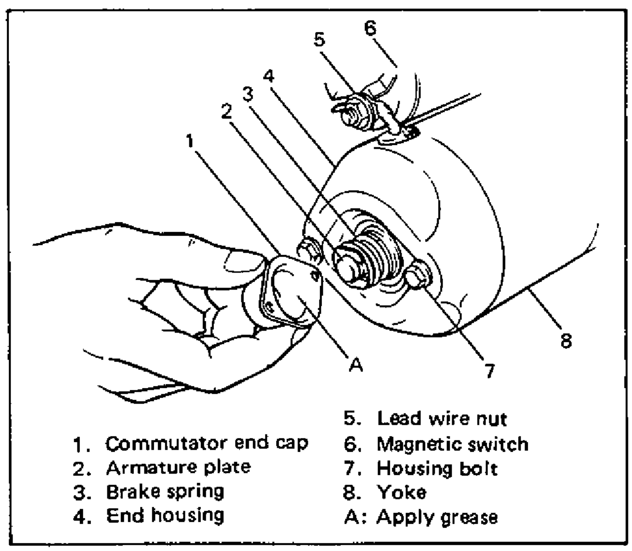


Fig. 6G-14 Installing Commutator End Cap

8. Check to make sure that motor functions properly connected with battery.

REDUCTION TYPE STARTING MOTOR

A reduction type starting motor has a planetary gear reduction system which reduces armature revolutions and transmits a higher torque to the pinion. It is more compact, lighter in weight and provides higher output than a conventional type starting motor.

Given here is a description on its reduction system which is the main difference compared with the conventional type. For the rest, refer to description on the conventional type starting motor as the same servicing procedures are applicable commonly.

REDUCTION SYSTEM

Disassembly

1. Remove magnetic switch.
2. Remove housing bolts, then remove motor assembly with end housing, reduction gear assembly (center bearing & shock absorber) with overrunning clutch and drive lever.

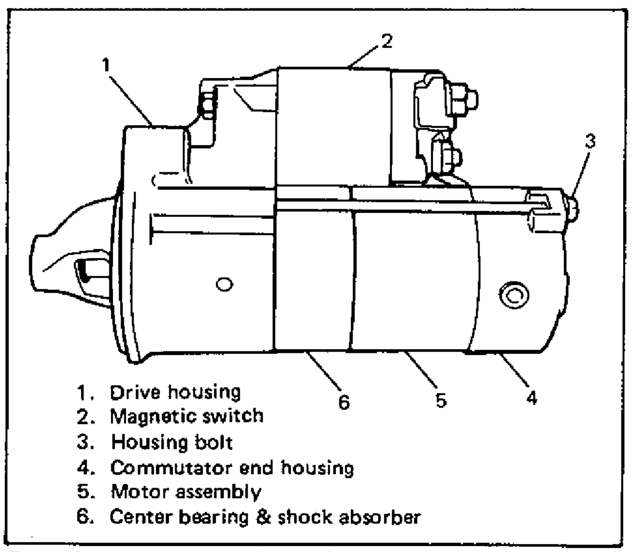


Fig. 6G-15 Reduction Type Starting Motor

3. To overhaul reduction gear assembly, remove plate, planetary gears and washer.

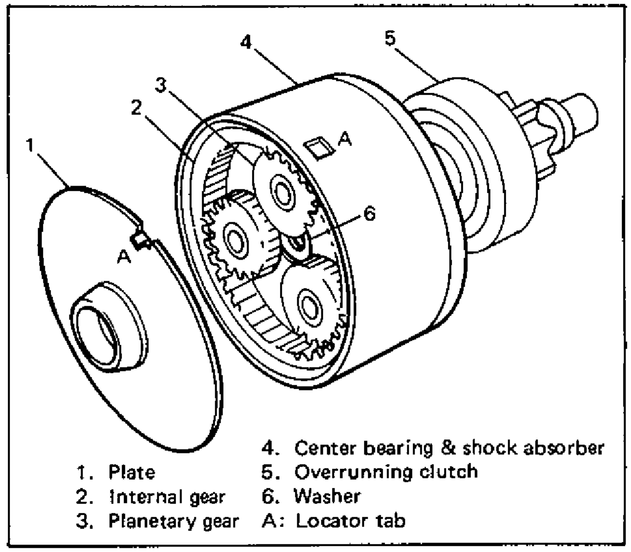


Fig. 6G-16 Reduction Gear Assembly

4. Remove snap ring, then pull out pinion stop ring and overrunning clutch.

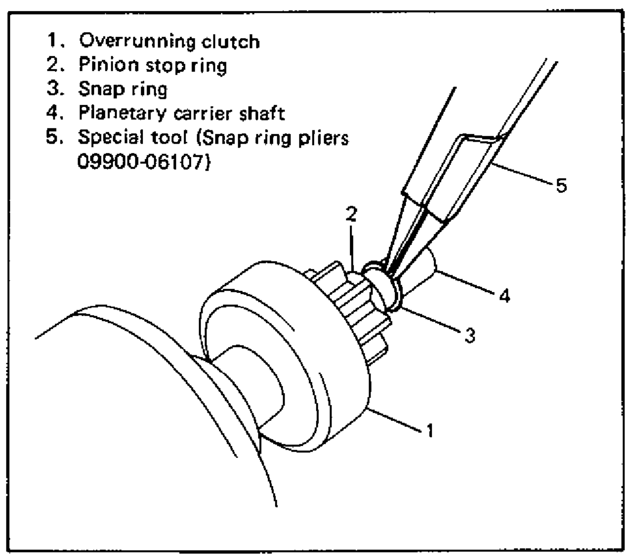


Fig. 6G-17 Removing Overrunning Clutch

5. Using special tool, remove circlip, then take out planetary carrier shaft from center bearing & shock absorber.

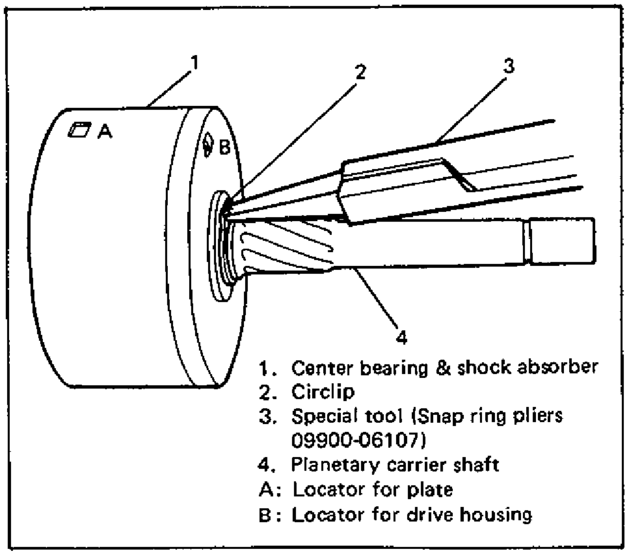


Fig. 6G-18 Removing Circlip

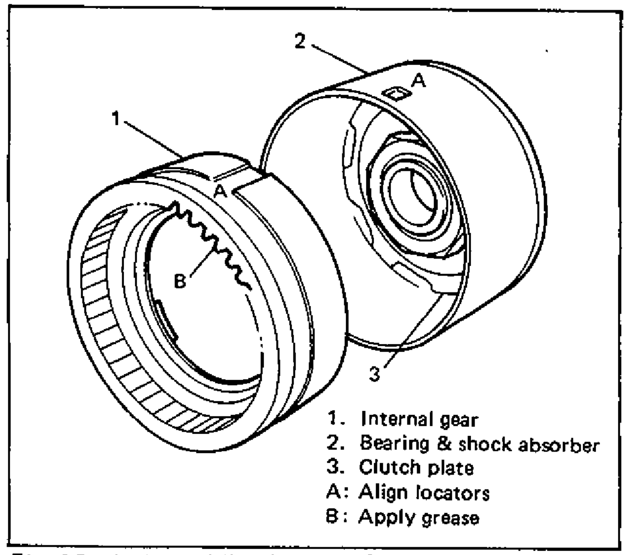


Fig. 6G-19 Assembling Internal Gear

Reassembly

1. Inspect component parts and replace with new ones as necessary.
2. Assemble motor and magnetic switch in reverse order of removal applying grease to specified portions in Fig. 6G-3.
3. Torque each bolt and nut to specification.

NOTE:

- **Install O rings without fail.**
- **When assembling motor parts, make sure locators are aligned each other.**

> CAUTION:
> - **Washing, adjusting and disassembling of shock absorber (clutch plate) are not allowed.**
> - **New needle bearing and oilless bearings have been lubricated when they are supplied as spare parts. DO NOT wash with grease dissolving solvent nor lubricate them with other lubricant.**

INSPECTION AND CORRECTION

ARMATURE

Ground

Between commutator segment and armature core should be insulated. Use ohmmeter for inspection.

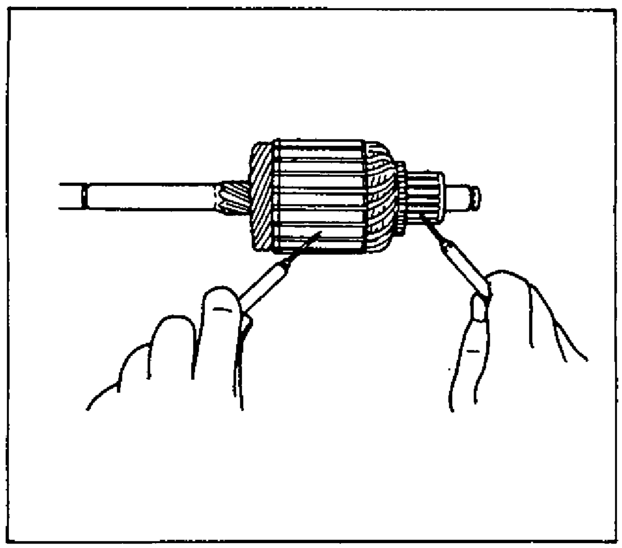


Fig. 6G-20 Checking Coil Ground

Open Circuit

Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and armature must be replaced.

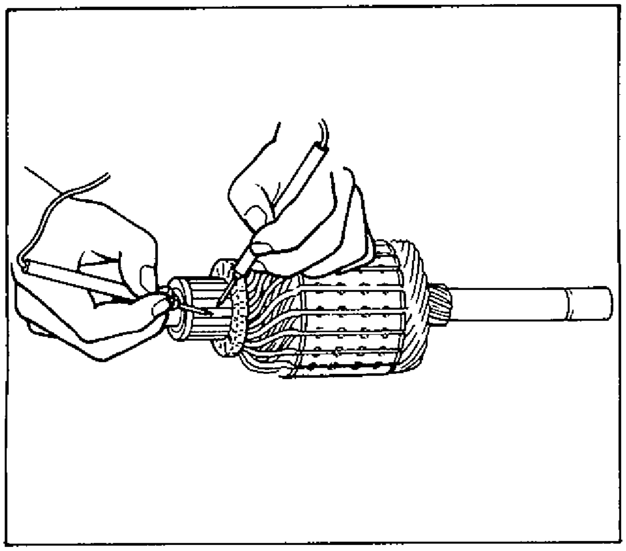


Fig. 6G-21 Checking Open Circuit

Commutator Run-out

Check commutator for run-out with armature supported on V brocks. Correct it by using lathe, if required.

Commutator run-out Service limit (maximum value)	0.8 kW	1.0 kW
	0.4 mm 0.015 in	0.05 mm 0.002 in

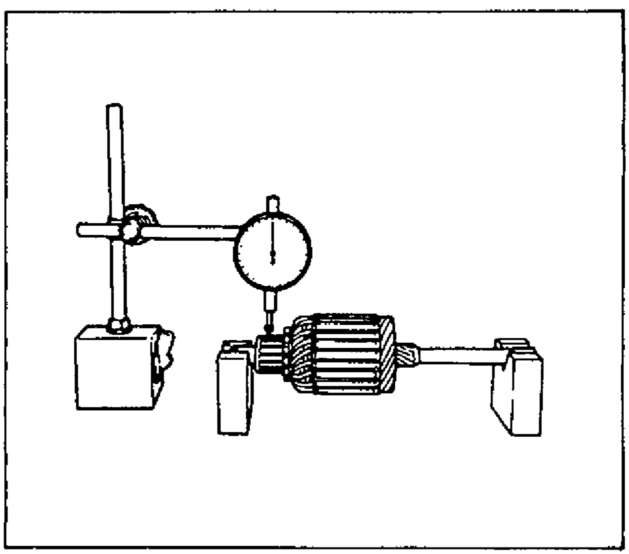


Fig. 6G-22 Checking Commutator Run-Out

Commutator Diameter

Check for wear and replace armature if diameter is below limit.

Commutator diameter Service limit (minimum value)	0.8 and 1.0 kW
	27 mm 1.063 in

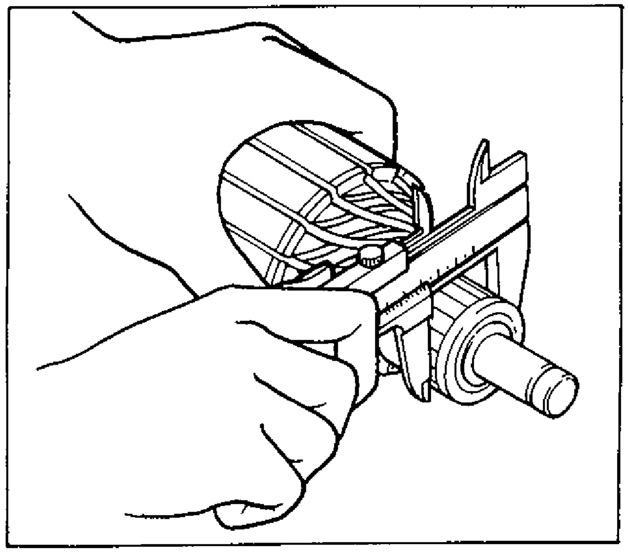
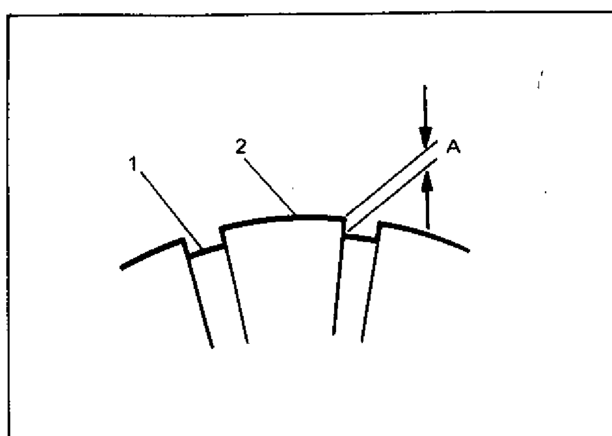


Fig. 6G-23 Checking Commutator Diameter

Commutator Surface

Correct and clean surface by using # 400 emery cloth. Also check mica depth and correct it as required.

Commutator mica depth A service limit (minimum value)	0.8 and 1.0 kW
	0.2 mm 0.008 in



1. Mica insulator
2. Commutator segment
A: Mica depth

Fig. 6G-24 Checking Mica Depth

YOKE

Check field coil for continuity. There should be continuity between brush and yoke body.

BRUSH

Measure length of brushes and replace them as necessary.

Brush length service limit (minimum value)	0.8 kW	1.0 kW
	10.7 mm 0.421 in	9.0 mm 0.354 in

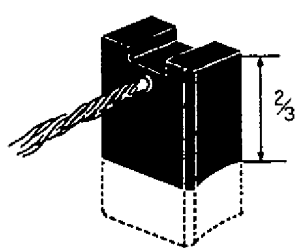


Fig. 6G-25 Checking Brush Length

BRUSH HOLDER

Check brush springs for rust or breakage. Also check brush holder for rust and positive plates for insulation. Replace it as assembly, if required.

OVERRUNNING CLUTCH

Inspect one way clutch for free rotation in A direction and locked up in the other way round. Also check pinion for abnormal wear and replace it as assembly, if required.

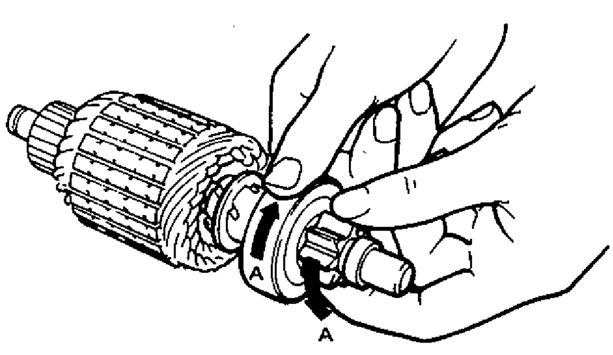


Fig. 6G-26 Checking Overrunning Clutch

SHAFT AND BUSH (FOR 0.8kW ONLY)

Measure clearance between shaft and bush and replace bush, if it exceeds limit.

NOTE:

- **Use adequate drive handle for bush removal and installation.**
- **After press-fitting bush, ream it and obtain 0.05 mm of oil clearance against shaft.**
- **Caulk cover if front bush is replaced.**
- **Lubricate bush with grease.**

Bush-to-shaft clearance service limit A – B	0.8 kW only
	0.2 mm 0.008 in

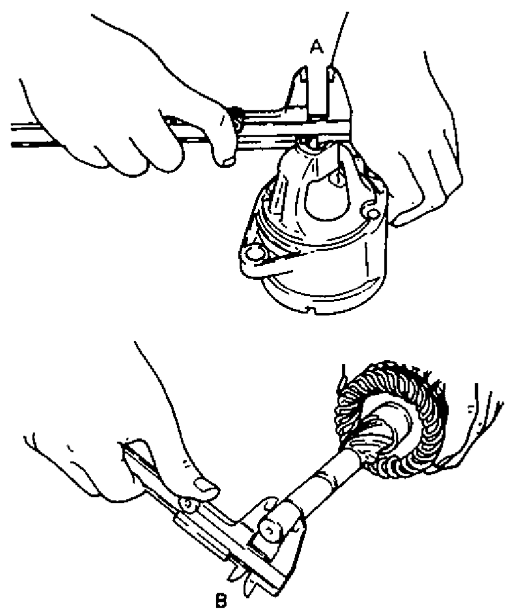


Fig. 6G-27 Measuring Bush-to-Shaft Clearance

PERFORMANCE TEST

> **CAUTION:**
> **Each test must be performed within 3 – 5 seconds to avoid coil from burning.**

PULL-IN TEST

Connect test leads as shown below and check that pinion (overrunning clutch) jumps out. If it does not, replace magnetic switch.

NOTE:
Before testing, disconnect field coil lead from terminal M.

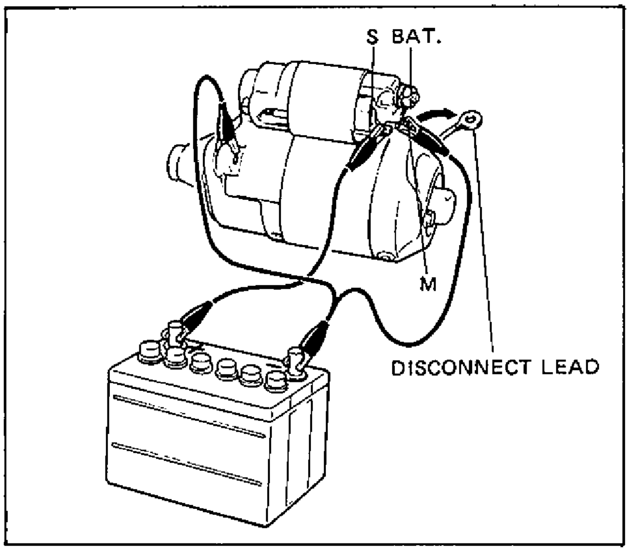


Fig. 6G-28 Checking Pull-in Coil

HOLD-IN TEST

While connected as the above with pinion out, disconnect negative lead from terminal M and check that pinion remains out. If not, replace magnetic switch.

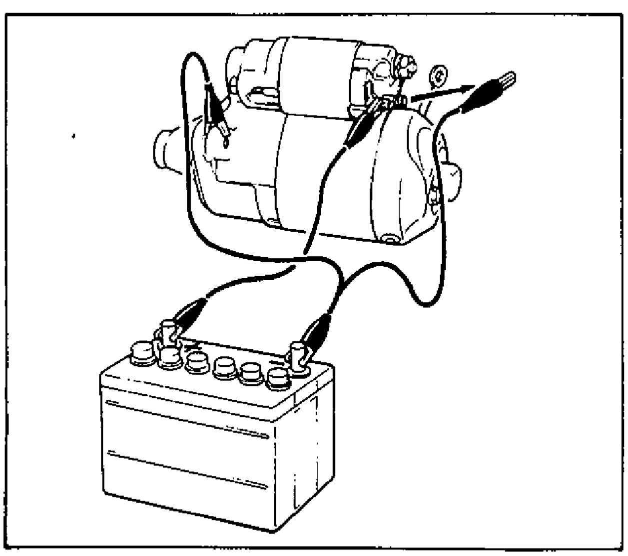


Fig. 6G-29 Checking Hold-in Coil

PINION (PLUNGER) RETURN TEST

As a next step to the above, disconnect negative lead and check to make sure that pinion returns inward quickly.

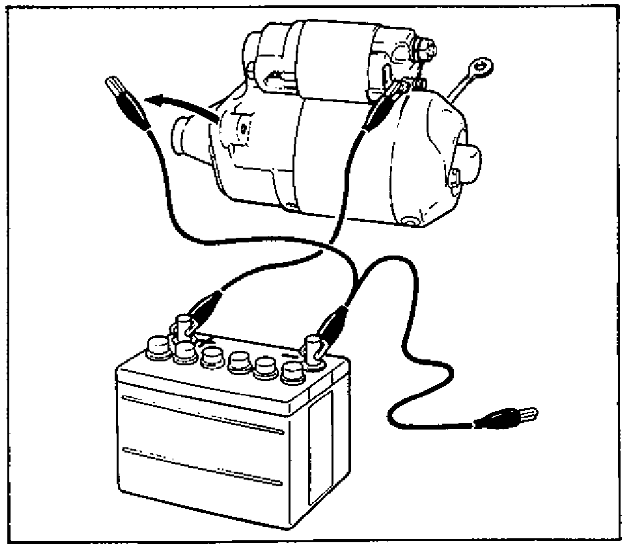


Fig. 6G-30 Checking Pinion Return

NO-LOAD PERFORMANCE TEST

Connect test leads as follows and check that motor runs without fail with pinion moved out. Also check that ammeter indicates specified current.

Type	0.8 kW	1.0 kW
No load current	Within 50A at 11V	Within 90A at 11.5V

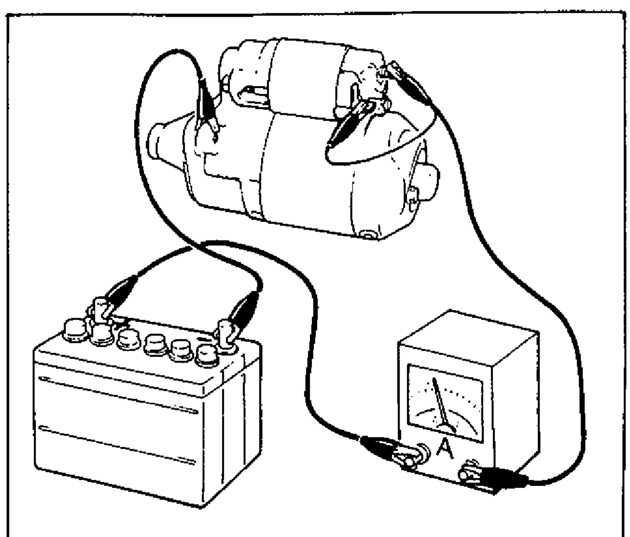


Fig. 6G-31 Checking No-load Performance

SECTION 6G1

CRANKING SYSTEM

(1.2 kW and 1.4 kW type)

NOTE:
Before checking and servicing starting motor, be sure to read NOTE on the first page of Section 6G of this manual.

CONTENTS

GENERAL DESCRIPTION 6G1- 1
  Cranking Circuit 6G1- 1
  Starting Motor 6G1- 2
DIAGNOSIS 6G1- 3
ON VEHICLE SERVICE 6G1- 4
  Remove and Install Starting Motor . . 6G1- 4
STARTING MOTOR REPAIR 6G1- 5
  Remove and Install Magnetic Switch 6G1- 5
  Remove and Install Motor Brush.... 6G1- 6
  Remove and Install Armature/Yoke . 6G1- 7
  Remove and Install Over-Running Clutch 6G1- 8
STARTING MOTOR INSPECTION ... 6G1-11
SPECIFICATIONS 6G1-16

GENERAL DESCRIPTION

CRANKING CIRCUIT

The cranking circuit consists of the battery, starting motor, ignition switch, and related electrical wiring. These components are connected electrically as shown in Fig. 6G1-1. Only the starting motor will be covered in this portion.

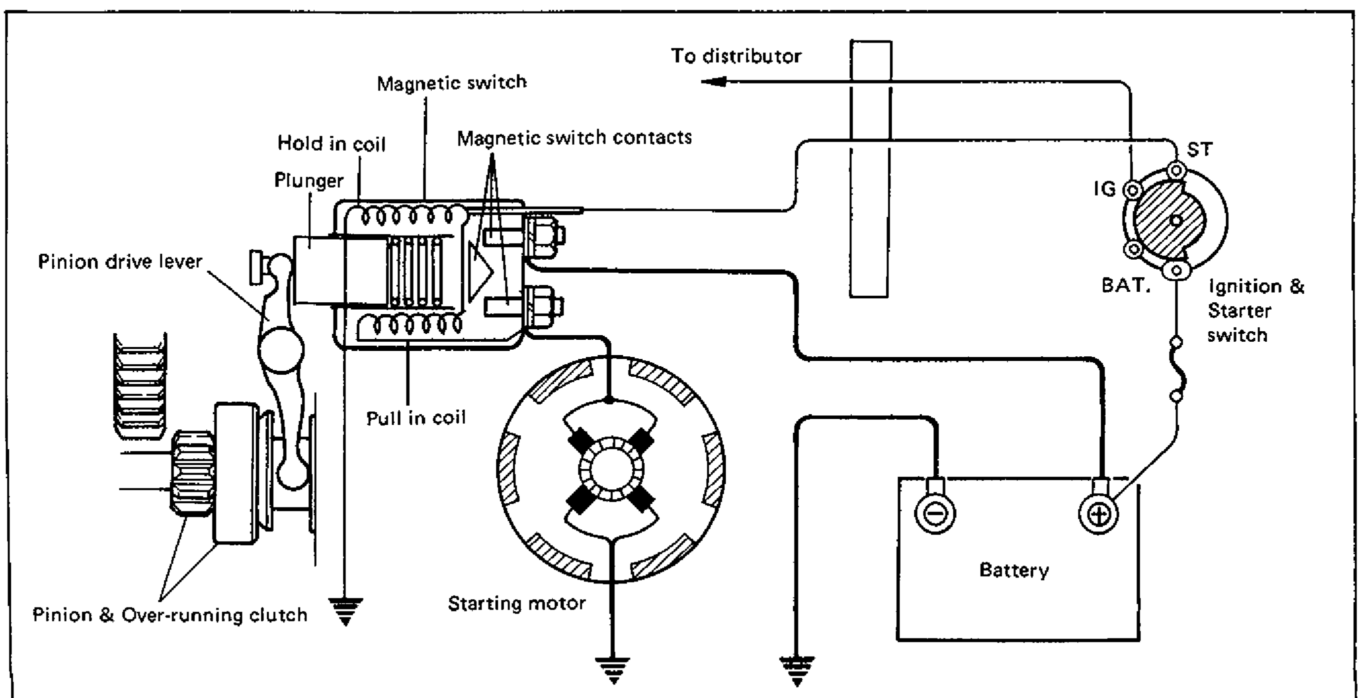


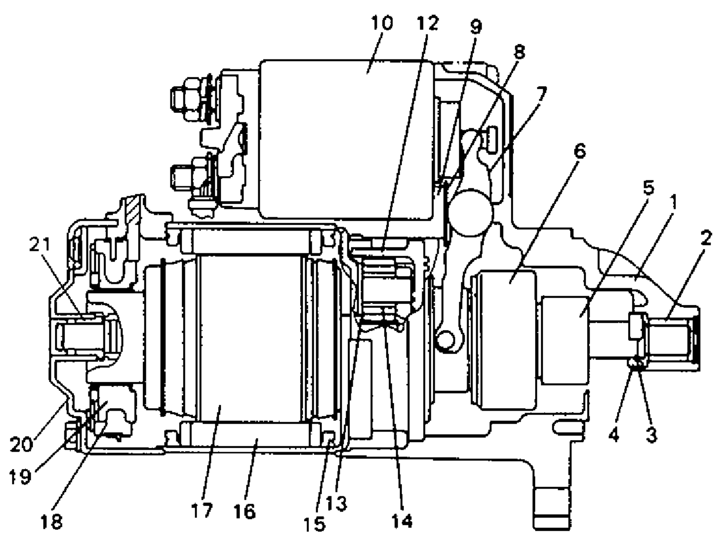
Fig. 6G1-1 Cranking Circuit

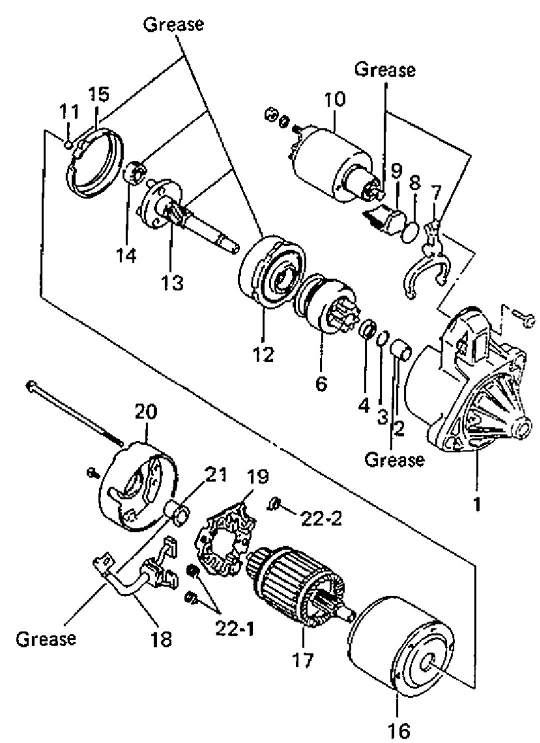
STARTING MOTOR

The starting motor consists of parts shown in Fig. 6G1-2 and has permanent magnets mounted in starting motor yoke (frame).
The magnetic switch assembly and parts in the starting motor are enclosed in the housings so that they will be protected against possible dirt and water splash.
In the circuit shown in Fig. 6G1-1, the magnetic (motor) switch coils are magnetized when the ignition switch is closed. The resulting plunger and pinion drive lever movement causes the pinion to engage the engine flywheel gear and the magnetic switch main contacts to close, and cranking takes place. When the engine starts, the pinion over-running clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.

NOTE:

- **Make sure to apply grease before assembly where so indicated in the figure below.**
- **The two types of starting motors are different only in length, weight of the armature/yoke and their output but the same description of structure, procedures of disassembly, assembly and inspection is applicable. For specifications, refer to the last page of this section.**





NOTE:
Use SUZUKI SUPER GREASE A (99000-25010) where greasing is indicated.

1. Front housing
2. Bush
3. Ring
4. Stop ring
5. Pinion gear
6. Over-running clutch
7. Lever
8. Plate
9. Seal rubber
10. Magnetic switch
11. Ball
12. Internal gear
13. Gear shaft ass'y
14. Idle gear
15. Packing
16. Yoke
17. Armature
18. Brush
19. Brush holder
20. Rear bracket
21. Rear bush

22-1. Brush spring (For 1.2 kW type)
22-2. Brush spring (For 1.4 kW type)

Fig. 6G1-2

DIAGNOSIS

Possible symptoms due to starting system trouble are:

- Starting motor does not run (or runs slowly),
- Starting motor runs but fails to crank engine, or
- Abnormal noise is heard.

Proper diagnosis must be made to determine exactly where the cause of each trouble lies . . . . in battery, wiring harness, (including starting motor switch), starting motor or engine.

Don't remove motor just because starting motor does not run. Check following items and narrow down scope of possible causes.

1) Condition of trouble
2) Tightness of battery terminals (including ground cable connection on engine side) and starting motor terminals.
3) Discharge of battery
4) Mounting of starting motor

Condition	Possible Cause	Correction
Motor not running.	**No operating sound of magnetic switch**	
	1. Battery run down.	Recharge battery.
	2. Battery voltage too low due to battery deterioration.	Replace battery.
	3. Poor contact in battery terminal connection.	Retighten or replace.
	4. Loose grounding cable connection.	Retighten.
	5. Fuse set loose or blown off.	Tighten or replace.
	6. Poor contacting action of ignition switch.	Replace.
	7. Lead wire socket loose in place.	Retighten.
	8. Open-circuit between ignition switch and magnetic switch.	Repair.
	9. Open-circuit in pull-in coil.	Replace magnetic switch.
	10. Poor sliding of plunger and/or pinion.	Repair.
	Operating sound of magnetic switch heard.	
	1. Battery run down.	Recharge battery.
	2. Battery voltage too low due to battery deterioration.	Replace battery.
	3. Loose battery cable connections.	Retighten.
	4. Burnt main contact point, or poor contacting action of magnetic switch.	Replace magnetic switch.
	5. Brushes are seating poorly or worn down.	Repair or replace.
	6. Weakened brush spring.	Replace.
	7. Burnt commutator.	Replace.
	8. Layer short-circuit of armature.	Replace.

Condition	Possible Cause	Correction
Starting motor running but too slow (small torque).	**If battery and wiring are satisfactory, inspect starting motor.**	
	1. Insufficient contact of magnetic switch main contacts.	Replace.
	2. Layer short-circuit of armature.	Replace.
	3. Disconnected, burnt or worn commutator.	Repair or replace.
	4. Worn brushes.	Replace brush.
	5. Weakened brush springs.	Replace spring.
	6. Burnt or abnormally worn end bushings.	Replace bushing.
Starting motor running, but not cranking engine.	1. Worn pinion tip.	Replace over-running clutch.
	2. Poor sliding of over-running clutch.	Repair.
	3. Clutch slipping (idling).	Replace over-running clutch.
	4. Worn teeth of ring gear.	Replace flywheel.
Noise	1. Abnormally worn bush.	Replace bush.
	2. Worn pinion or worn teeth of ring gear.	Replace pinion or flywheel.
	3. Poor sliding of pinion (failure in return movement).	Repair or replace.
	4. Worn internal or idle gear teeth.	Replace.
	5. Lock of oil in each part.	Lubricate.
Starting motor does not stop running.	1. Fused contact points of magnetic switch.	Repair or replace.
	2. Short-circuit between turns of magnetic switch coil (layer short-circuit).	Replace.
	3. Failure of returning action in ignition switch.	Replace.

ON VEHICLE SERVICE

Starting motors do not require lubrication except during overhaul. When the motor is disassembled for any reason, lubricate as shown in Fig. 6G1-2.

REMOVAL AND INSTALLATION

STARTING MOTOR

Use following procedure to remove starter:

1) Disconnect negative battery lead at battery.
2) Disconnect magnetic switch lead wire and battery cable from starting motor terminals.
3) Remove two starting motor mount bolts.
4) Remove starting motor.
5) To install, reverse the above procedure.

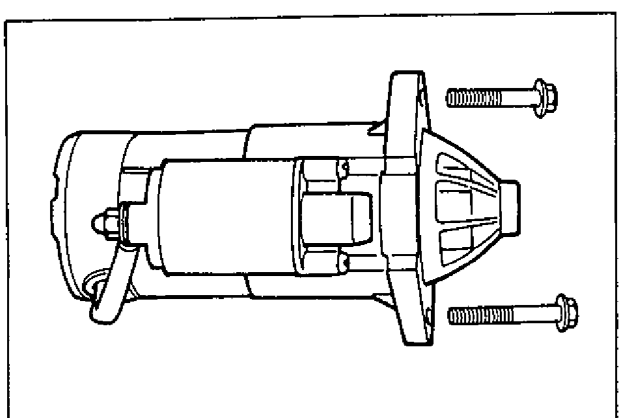


Fig. 6G1-3 Starting Motor Mounting

STARTING MOTOR REPAIR

MAGNETIC SWITCH

REMOVAL

NOTE:

Before disassembling starting motor, be sure to put match mark as shown in the figure below so that any possible mistake can be avoided.

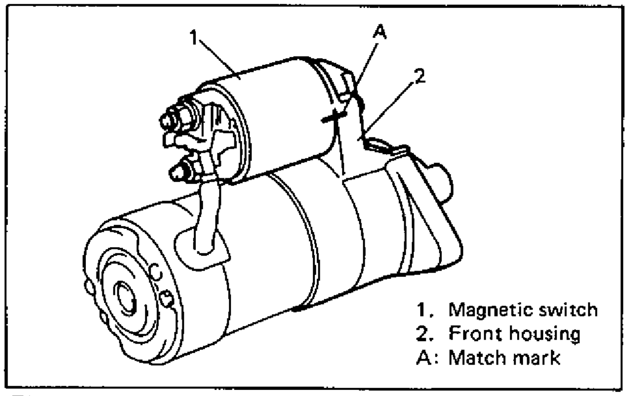


Fig. 6G1-4

1) Disconnect wire (switch to motor) from magnetic switch terminal.

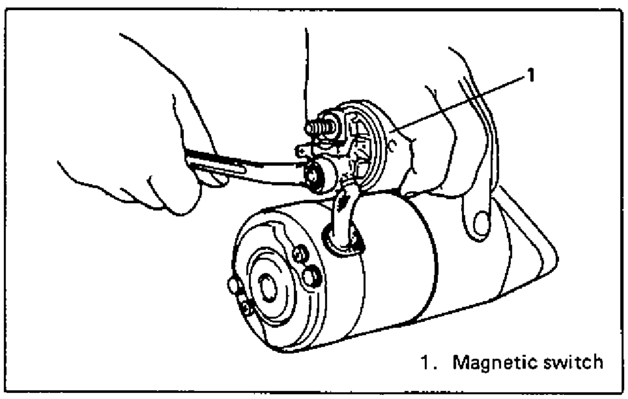


Fig. 6G1-5

2) Remove magnetic switch assembly.

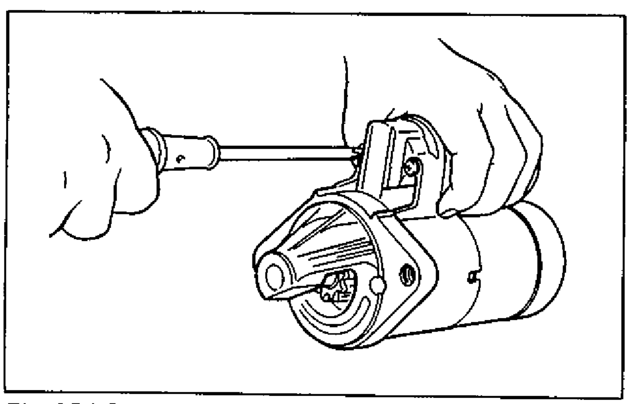


Fig. 6G1-6

NOTE:

Don't disassemble this switch. If defective, replace as a complete assembly.

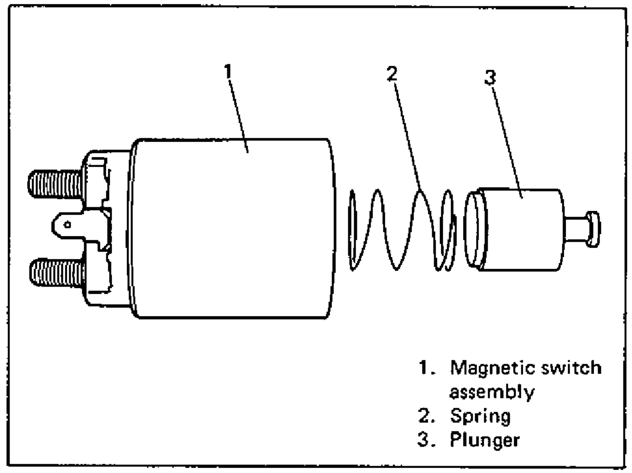


Fig. 6G1-7

INSTALLATION

Before installation, inspect plunger joint for wear and replace defective parts.

1) Apply grease. (Refer to Fig. 6G1-2)
2) Install switch assembly into front housing, referring to figure below especially for its vertical direction. And then tighten screws.

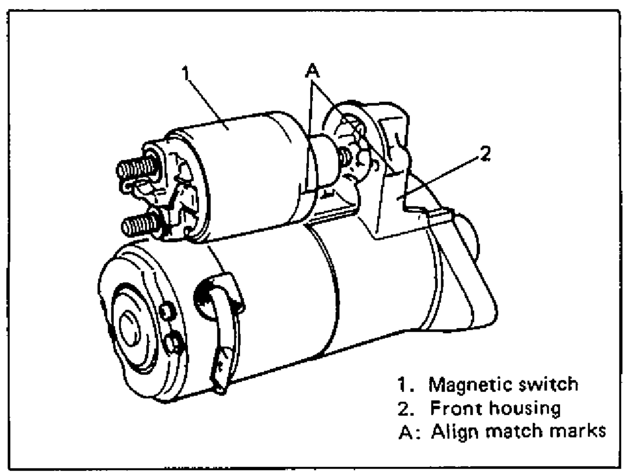


Fig. 6G1-8

3) Connect wire from motor to magnetic switch terminal.
4) Check switch for operation. (See page 6G1-15)

MOTOR BRUSH

REMOVAL

1) Remove rear bracket.

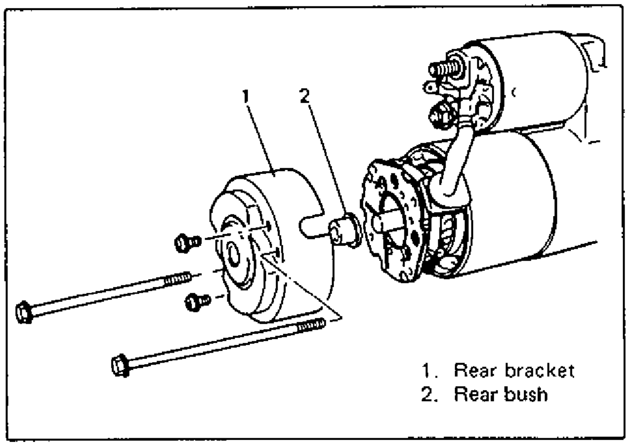


Fig. 6G1-9

2) Remove brush holder and brushes.

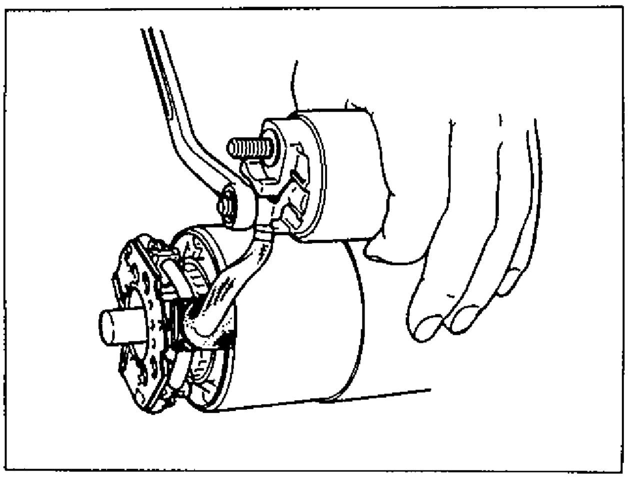


Fig. 6G1-10

INSTALLATION

Install in reverse order of REMOVAL, noting the following.

1) Apply grease. (Refer to Fig. 6G1-2.)
2) Install brush holder to armature while pushing 4 brushes outward.

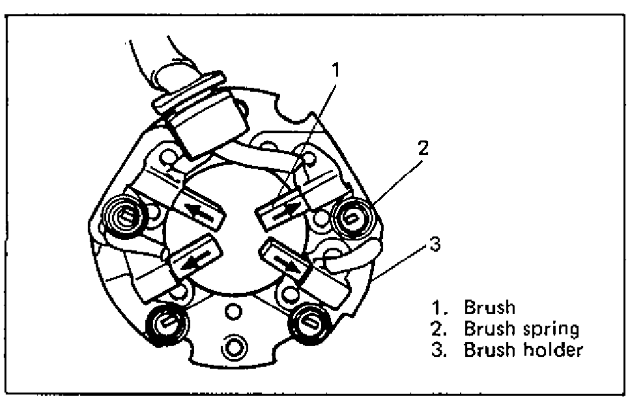


Fig. 6G1-11

3) Install rear bracket.
4) Check motor for operation. (See page 6G1-15.)

REAR BUSH (BEARING)

REMOVAL

1) Remove rear bracket.
2) Remove rear bracket cap, and then remove rear bush.

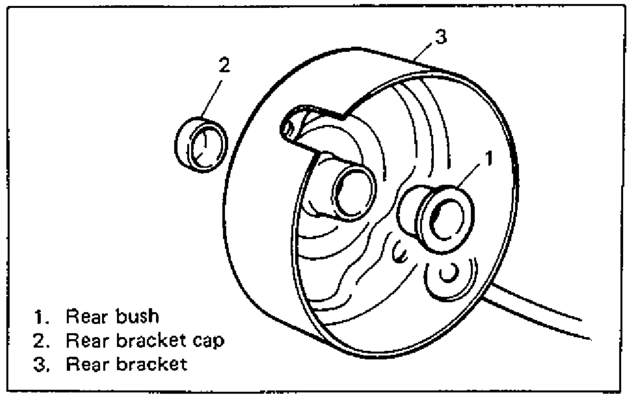


Fig. 6G1-12-1

INSTALLATION

1) Install rear bush as shown below.

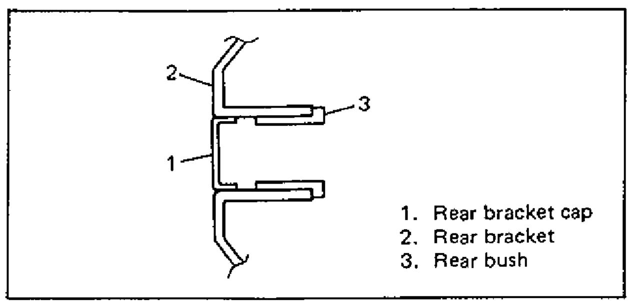


Fig. 6G1-12-2

2) Install rear bracket cap as shown above.
3) Apply grease. (Refer to Fig. 6G1-2.)
4) Install rear bracket.

ARMATURE/YOKE

REMOVAL

NOTE:

Before disassembling starting motor, be sure to put match marks at two locations (A & B) as shown in figure below so that any possible mistake can be avoided.

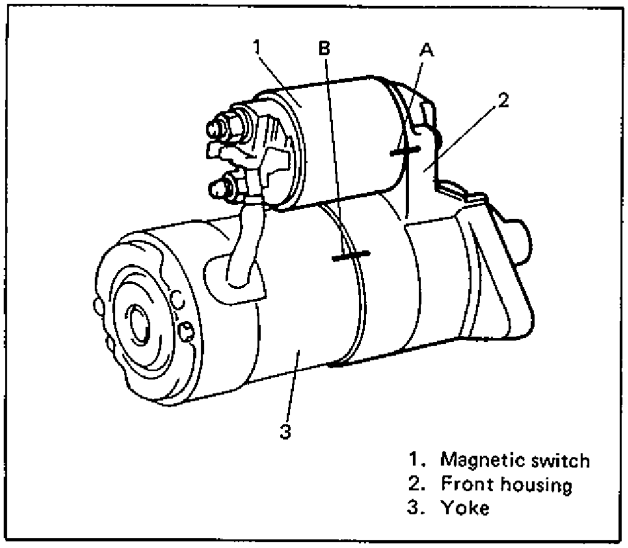


Fig. 6G1-13

1) Remove magnetic switch. (Refer to page 6G1-5.)
2) Remove brush holder. (Refer to page 6G1-6.)
3) Remove armature and yoke.

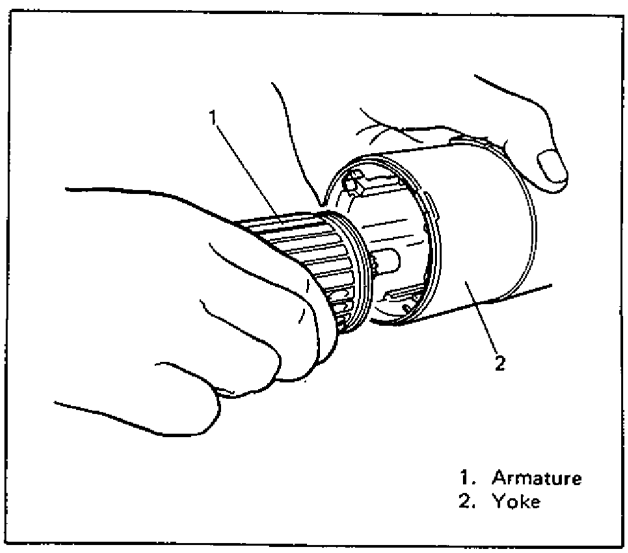


Fig. 6G1-14

INSTALLATION

Install in reverse order of REMOVAL, noting the following.

1) Apply grease. (Refer to Fig. 6G1-2.)

NOTE:

If ball of armature shaft came out when removed, be sure to apply grease to ball and put it back in.

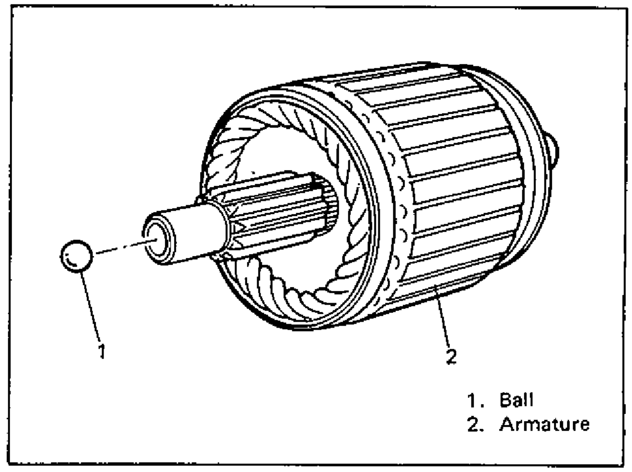


Fig. 6G1-15

2) Install armature into yoke.

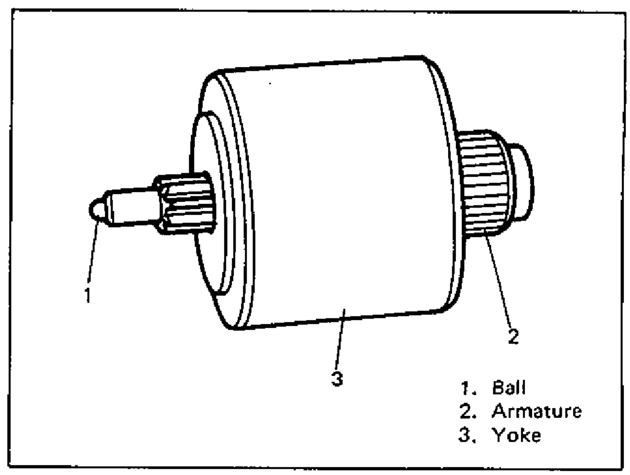


Fig. 6G1-16

3) Install yoke and armature into front housing while aligning match mark "B" provided before disassembly.
4) Install brush holder. (Refer to page 6G1-6.)
5) Install magnetic switch. (Refer to page 6G1-5.)
6) Carry out PERFORMANCE TEST referring to page 6G1-15 in this section.

OVER-RUNNING CLUTCH

REMOVAL

NOTE:

Before disassembling starting motor, be sure to put match marks at two locations (A & B) as shown in figure below so that any possible mistake can be avoided.

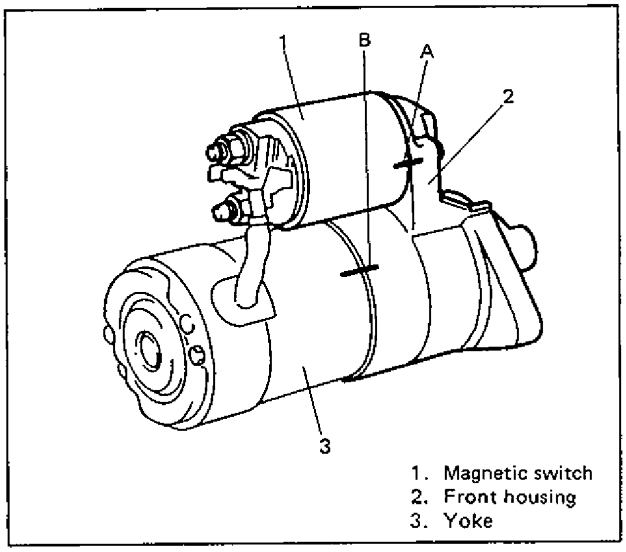


Fig. 6G1-17

1) Remove magnetic switch assembly. (For details, refer to steps 1) and 2) of MAGNETIC SWITCH REMOVAL described on page 6G1-5.)
2) Remove rear bracket.
3) Remove brush holder and brushes.

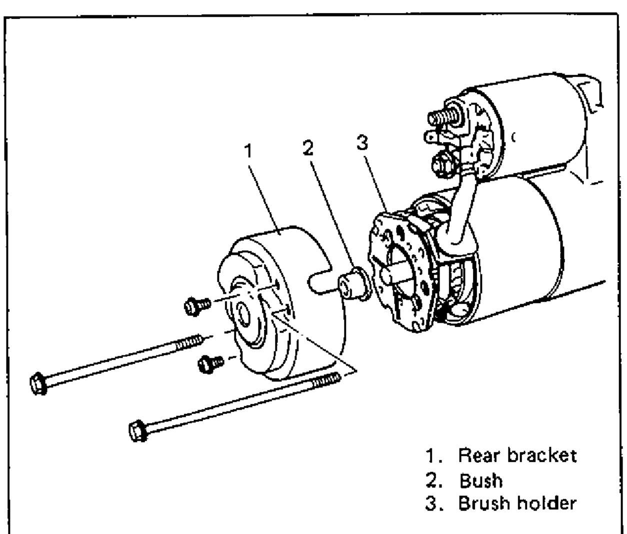


Fig. 6G1-18

4) Remove yoke and armature.

5) Remove packing and idle gears.

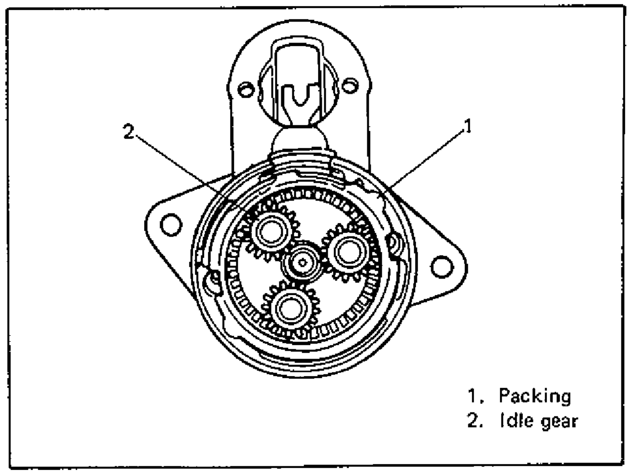


Fig. 6G1-19

6) Remove seal rubber and plate.

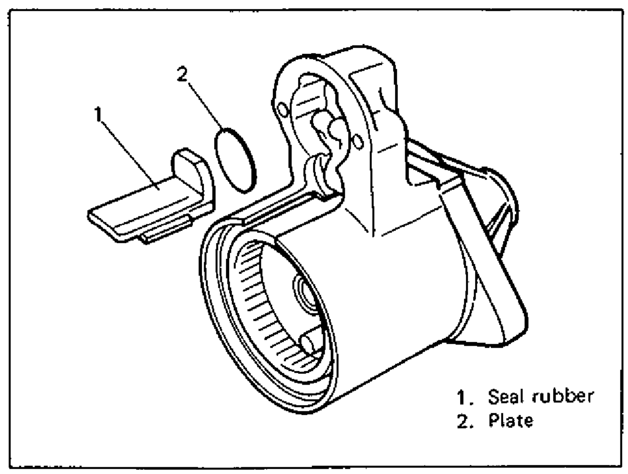


Fig. 6G1-20

7) Remove shaft assembly with lever.

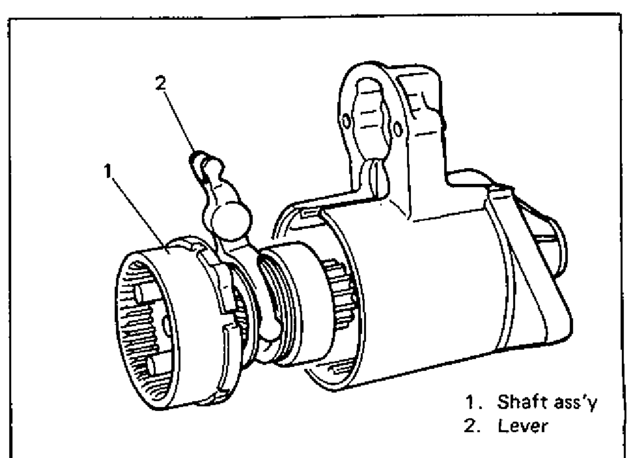
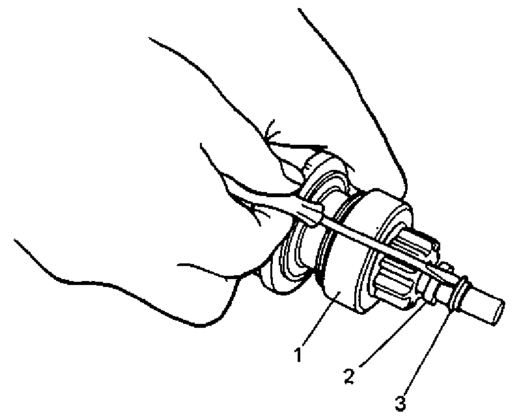


Fig. 6G1-21

8) Remove over-running clutch by removing rings.



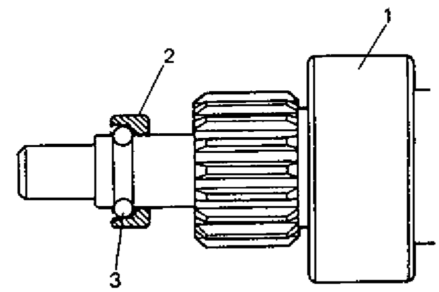
1. Over-running clutch assembly
2. Stop ring
3. Ring

Fig. 6G1-22

INSTALLATION

Install in reverse order of REMOVAL, noting the following.

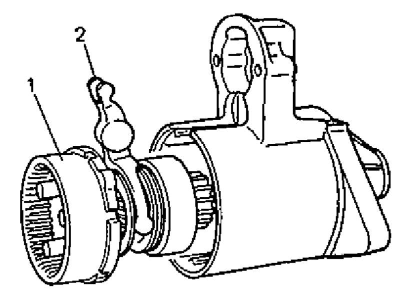
1) Apply grease. (Refer to Fig. 6G1-2.)
2) Install over-running clutch assembly to gear shaft, using care for installing direction of gear shaft stop ring.



1. Over-running clutch
2. Stop ring
3. Ring

Fig. 6G1-23

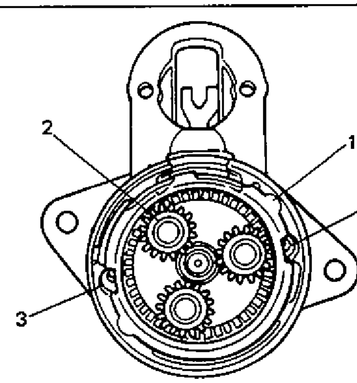
3) Insert shaft ass'y into front housing with lever positioned as shown below.



1. Shaft ass'y
2. Lever

Fig. 6G1-24

4) Install packing so that cuts in packing align with holes for through bolt in front housing.



1. Packing.
2. Idle gear
3. Bolt hole

Fig. 6G1-25

5) Install plate and seal rubber to front housing.

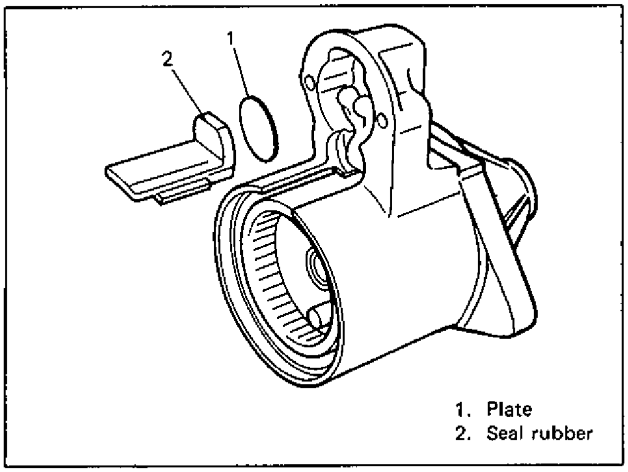


Fig. 6G1-26

6) Apply grease to ball and install ball into shaft hole.

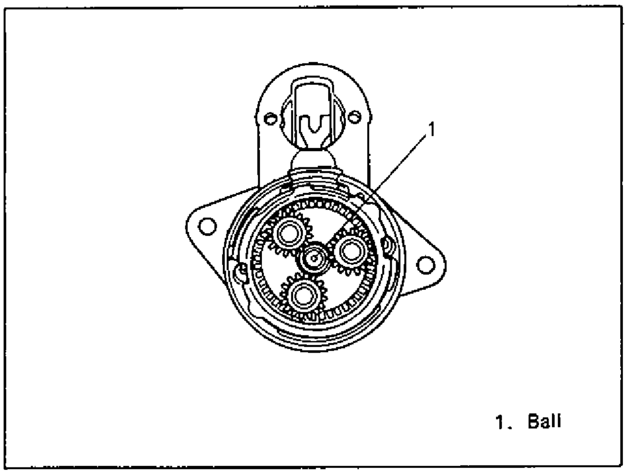


Fig. 6G1-27

7) Install yoke and armature to front housing by aligning match marks provided before removal.

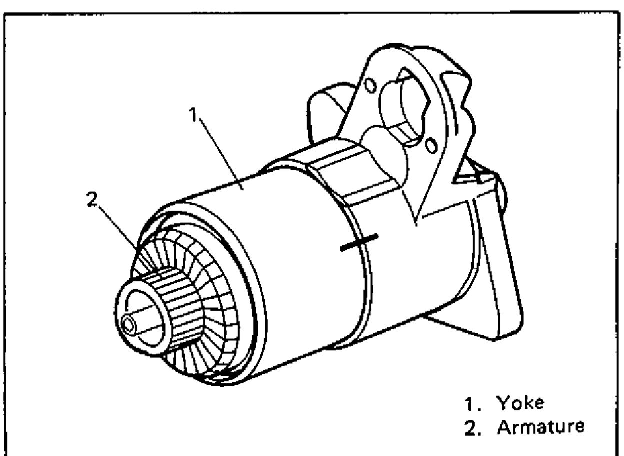


Fig. 6G1-28

8) Install brushes and brush holder. (For details, refer to steps 1) to 4) of BRUSH INSTALLATION on page 6G1-6.)
9) Tighten rear bracket bolts and brush holder screws.
10) Install magnetic switch assembly and connect wire (switch to motor) to switch terminal. (For details, refer to steps 1) to 3) of MAGNETIC SWITCH INSTALLATION on page 6G1-5.)

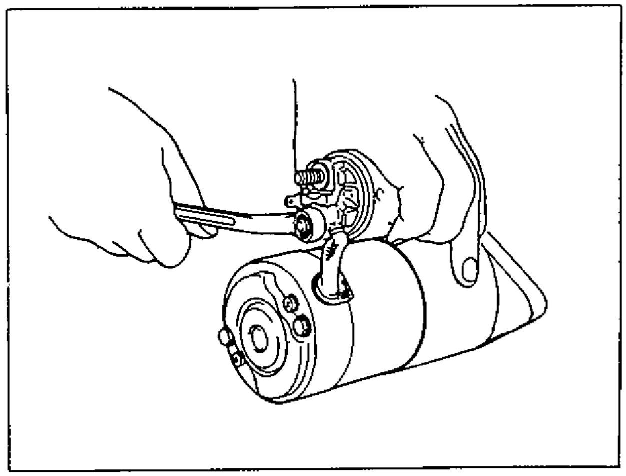


Fig. 6G1-29

11) Upon completion of assembly, carry out PERFORMANCE TEST referring to page 6G1-15 in this section.

STARTING MOTOR INSPECTION

1. INSPECT ARMATURE

Inspect commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.

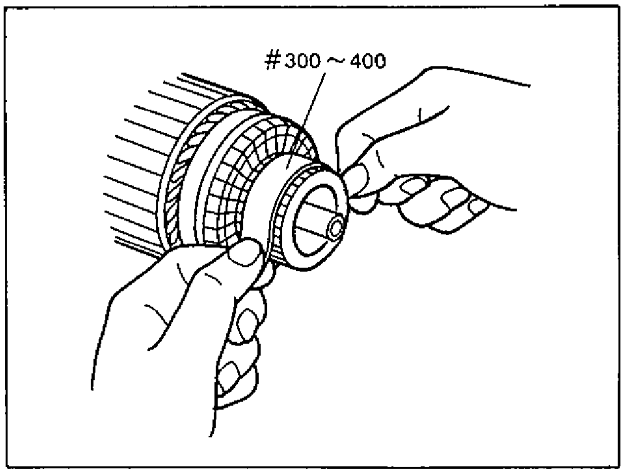


Fig. 6G1-30

Check commutator for uneven wear. If deflection of dial gauge pointer exceeds limit, repair or replace.

NOTE:
Below specification presupposes that armature is free from bend. Bent shaft must be replaced.

	Standard	Limit
Commutator out of round	0.05 mm (0.0019 in.) or less	0.4 mm (0.015 in.)

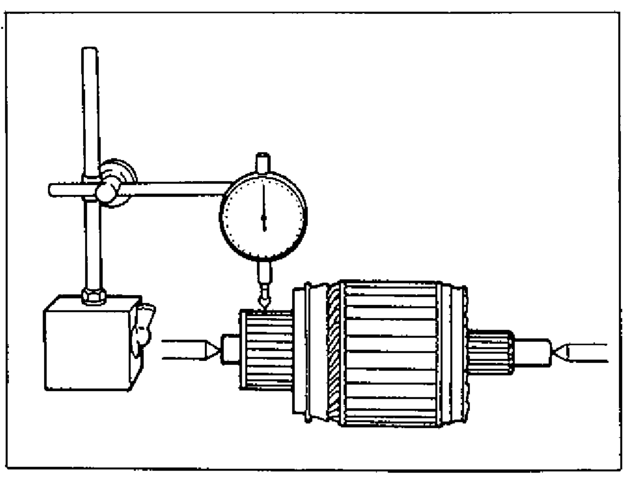


Fig. 6G1-31

Inspect commutator for wear. If below limit, replace armature.

	Standard	Limit
Commutator outside diameter	29.4 mm (1.16 in.)	28.8 mm (1.13 in.)

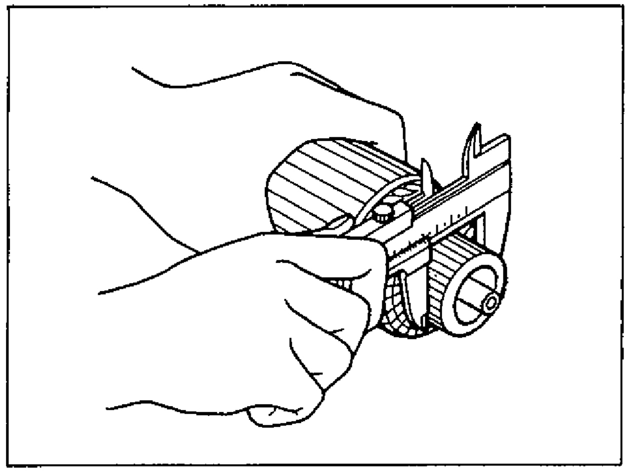


Fig. 6G1-32

Inspect commutator for insulator depth. Correct or replace if below limit.

	Standard	Limit
Commutator insulator depth	0.5 – 0.8 mm (0.0196 – 0.0314 in.)	0.2 mm (0.0078 in.)

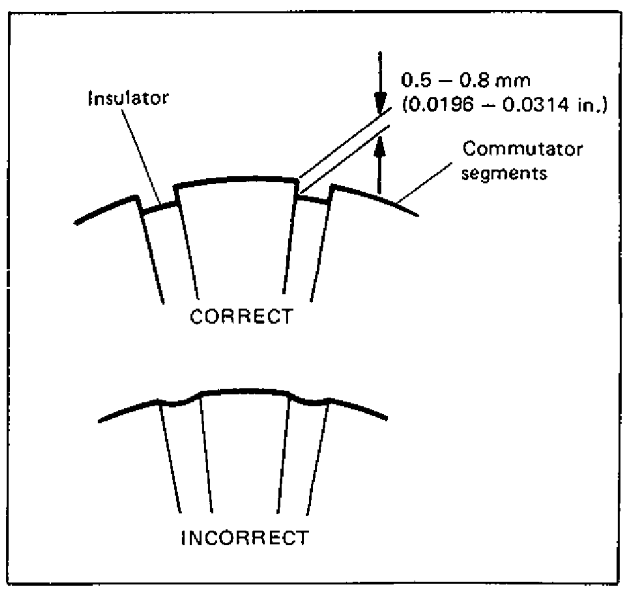


Fig. 6G1-33

Ground Test

Check commutator and armature core. If there is continuity, armature is grounded and must be replaced.

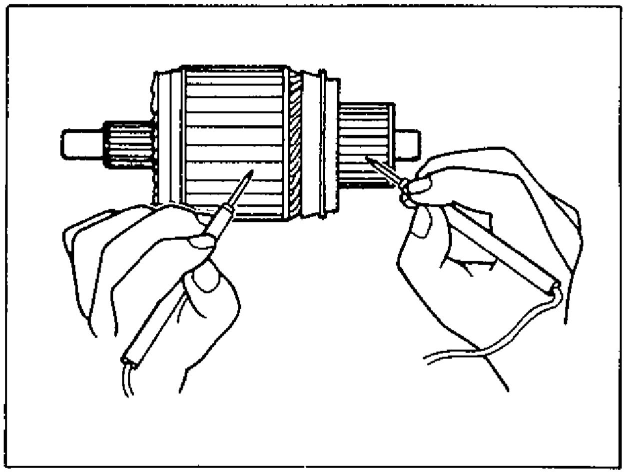


Fig. 6G1-34

Open Circuit Test

Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and armature must be replaced.

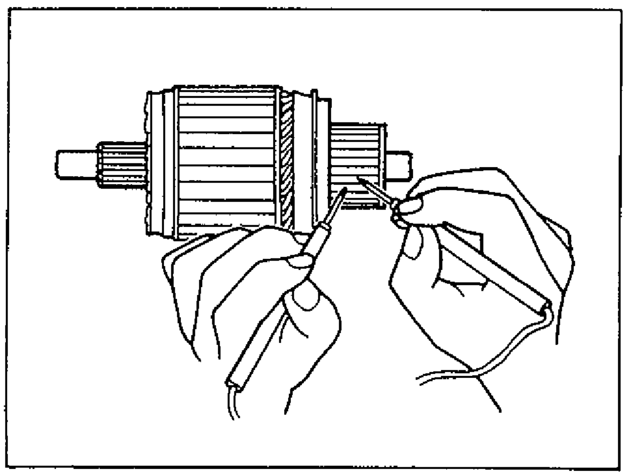


Fig. 6G1-35

2. INSPECT PLUNGER

Inspect plunger for wear. Replace if necessary.

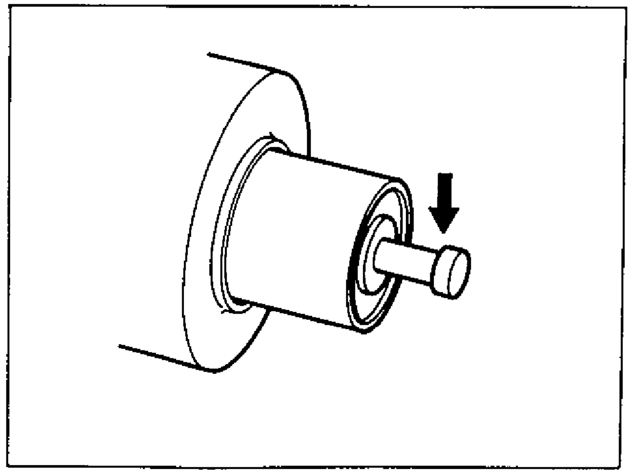


Fig. 6G1-36

3. INSPECT BRUSH

- Check brushes for wear. If below limit, replace brush.

	Standard	Limit
Brush length	17.5 mm (0.69 in.)	12 mm (0.47 in.)

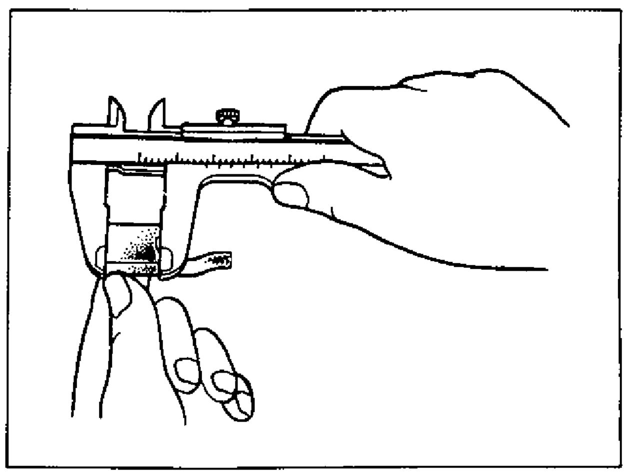


Fig. 6G1-37

- Install brushes to each brush holder and check for smooth movement.

4. INSPECT BRUSH HOLDER AND SPRING

Check movement of brush in brush holder. If brush movement within brush holder is sluggish, check brush holder for distortion and sliding faces for contamination.

Clean or correct as necessary.

Check for continuity across insulated brush holder (positive side) and grounded brush holder (negative side).

If continuity exists, brush holder is grounded due to defective insulation and should be replaced.

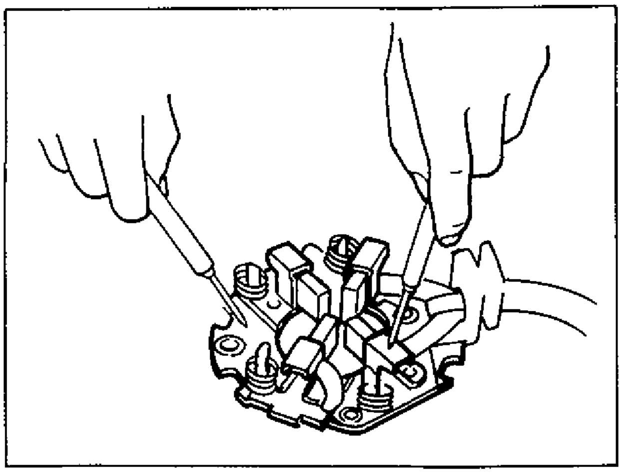


Fig. 6G1-38

Inspect brush springs for wear, damage or other abnormal conditions. Replace if necessary.

Brush spring tension (with brush holder removed from commutator.)	Standard	Limit
	2.1 kg (4.63 lb)	0.7 kg (1.54 lb)

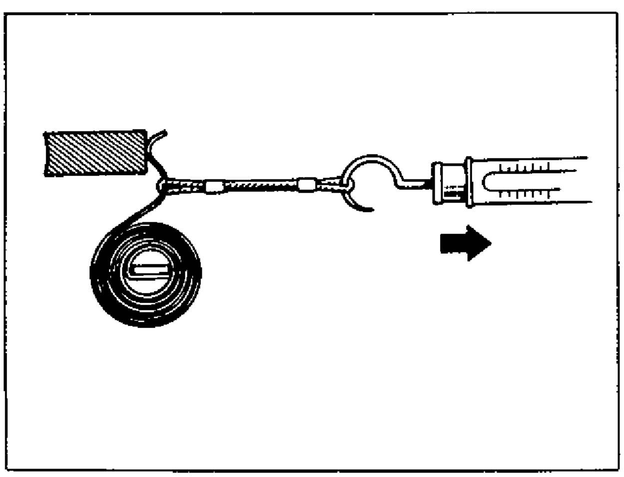


Fig. 6G1-39

5. INSPECT PINION AND OVER-RUNNING CLUTCH

Inspect pinion for wear, damage or other abnormal conditions. Check that clutch locks up when turned in direction of drive and rotates smoothly in reverse direction. Replace if necessary.

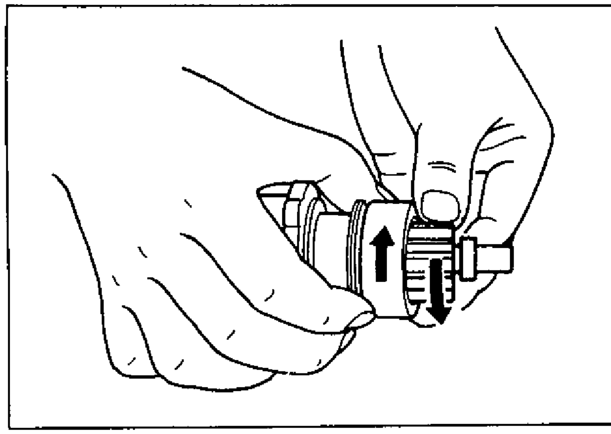


Fig. 6G1-40

Inspect spline teeth for wear or damage. Replace if necessary. Inspect pinion for smooth movement.

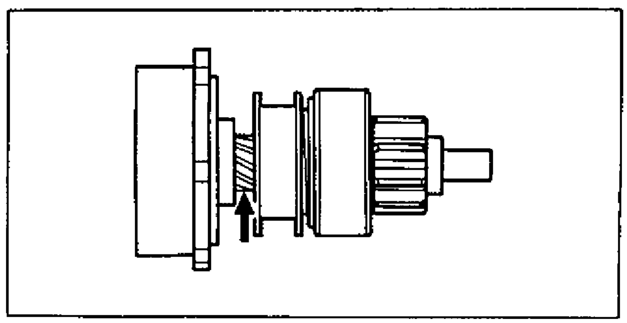


Fig. 6G1-41

6. INSPECT ARMATURE SHAFT BUSHES

Inspect bushes for wear or damage. Replace if necessary.

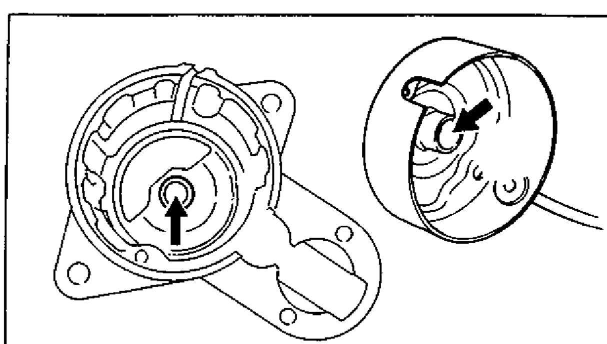


Fig. 6G1-42

7. INSPECT MAGNETIC SWITCH

Push in plunger and release it. The plunger should return quickly to its original position. Replace if necessary.

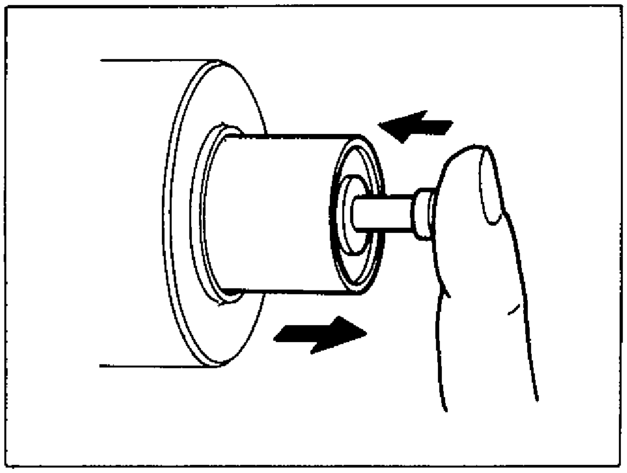


Fig. 6G1-43

Pull-In Coil Open Circuit Test

Check for continuity across magnetic switch 'S' terminal and 'M' terminal. If no continuity exists, coil is open and should be replaced.

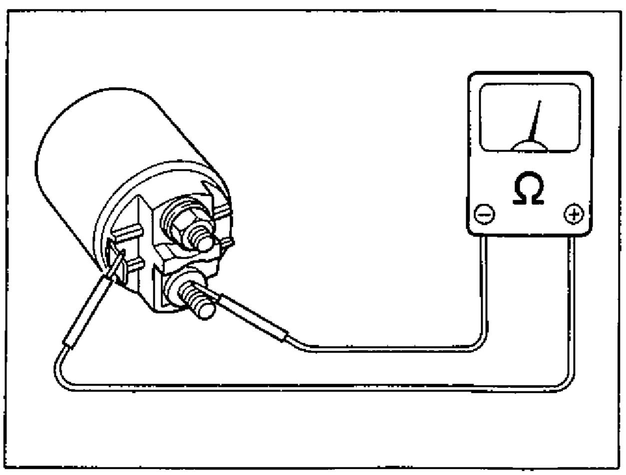


Fig. 6G1-44

Hold In Coil Open Circuit Test

Check for continuity across magnetic switch 'S' terminal and coil case. If no continuity exists, coil is open and should be replaced.

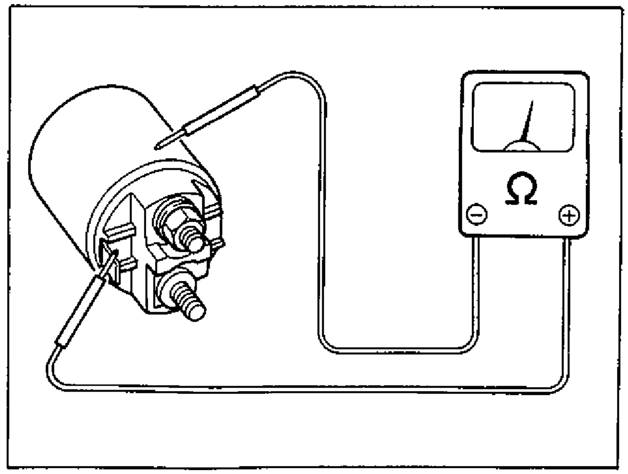


Fig. 6G1-45

8. INSPECT GEARS

Inspect internal gear and idle gears for wear, damage or other abnormal conditions. Replace if necessary.

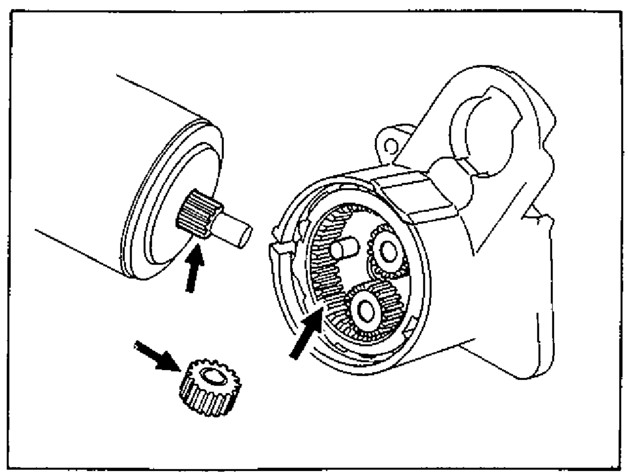


Fig. 6G1-46

9. PERFORMANCE TEST

> **CAUTION:**
> **These test must be performed within 3 – 5 seconds to avoid burned coil.**

1) Pull-In Test

Connect battery to magnetic switch as shown. Check that plunger and pinion move outward. If plunger and pinion don't move, replace magnetic switch.

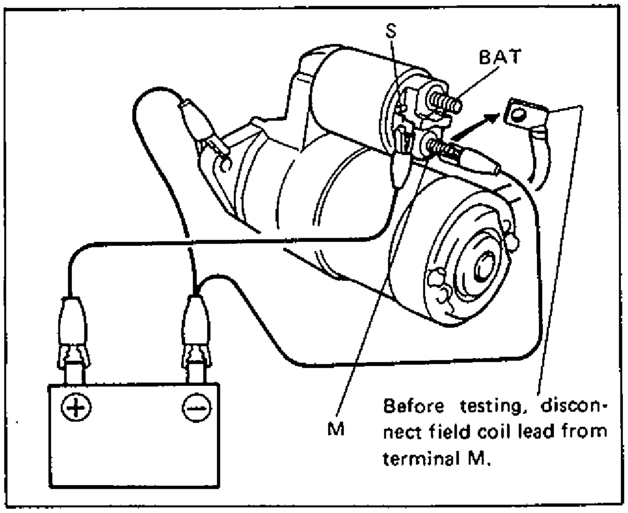


Fig. 6G1-47

2) Hold-In Test

While connected as above with plunger out, disconnect negative lead from terminal 'M'. Check that plunger and pinion remain out. If plunger and pinion return inward, replace magnetic switch.

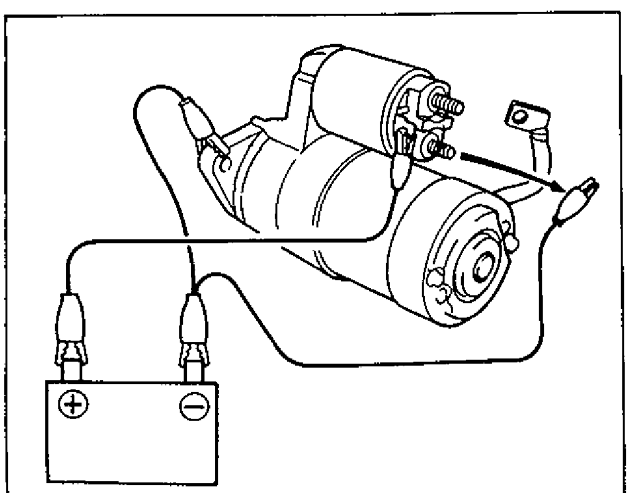


Fig. 6G1-48

3) Check Plunger and Pinion Return

Disconnect negative lead from switch body. Check that plunger and pinion return inward. If plunger and pinion don't return, replace magnetic switch.

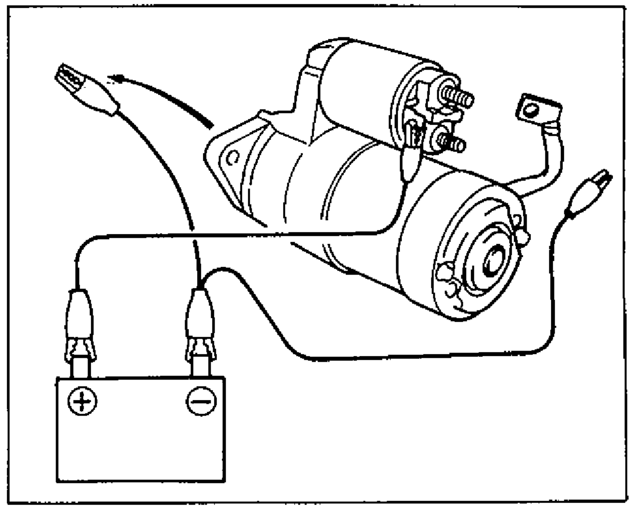


Fig. 6G1-49

4) No-Load Performance Test

a) Connect battery and ammeter to starter as shown.
b) Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter indicates specified current.

Specified current
50 – 75A at 11V

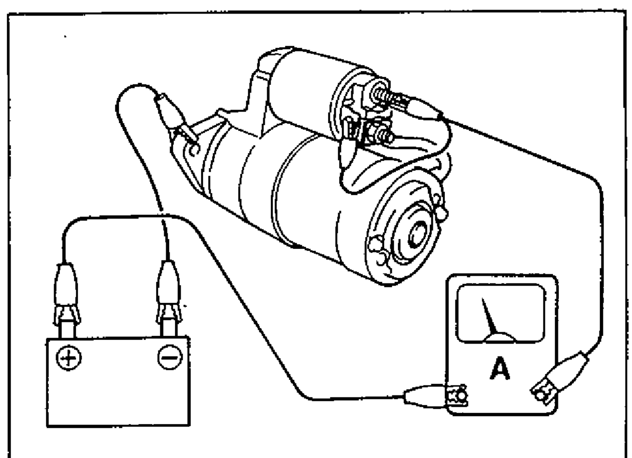


Fig. 6G1-50

SPECIFICATIONS

Voltage	12 volts
Output	1.2 kW
	*1.4 kW
Rating	30 seconds
Direction of rotation	Clockwise as viewed from pinion side
Brush length	17.5 mm (0.69 in.)
Number of pinion teeth	8
No-load characteristic	50 – 75A maximum at 11.0 volts, 3,000 r/min (rpm) minimum
	*50 – 75A maximum at 11.0 volts, 2,900 r/min (rpm) minimum
Load characteristic	300A maximum at 7.7 volts, 0.93 kg-m torque, 850 r/min (rpm) minimum
	*300A at 7.7 volts, 1.06 kg-m torque, 930 r/min (rpm) minimum
Locked rotor current	780A maximum at 4.0 volts, 1.9 kg-m minimum
	*980A maximum at 4.0 volts, 2.6 kg-m minimum
Magnetic switch operating voltage	8 volts maximum

NOTE:
Data marked with asterisk (*) is applicable to power steering system equipped car.

SECTION 6H

CHARGING SYSTEM

CONTENTS

BATTERY 6H- 1
GENERAL DESCRIPTION 6H- 1
GENERAL INFORMATION 6H- 2
ON-CAR SERVICE 6H- 4
Jump Starting in Case of Emergency 6H- 4
GENERATOR 6H- 6
GENERAL DESCRIPTION 6H- 6
DIAGNOSIS 6H- 8
UNIT REPAIR OVERHAUL 6H-10
Dismounting and Remounting 6H-11
Disassembly 6H-11
Reassembly 6H-12
Inspection and Correction 6H-13

BATTERY

GENERAL DESCRIPTION

The battery has three major functions in the electrical system. First, it is a source of electrical energy for cranking the engine. Second, it acts as a voltage stabilizer for the electrical system. And third, it can, for a limited time, provide energy when the electrical load exceeds the output of the generator.

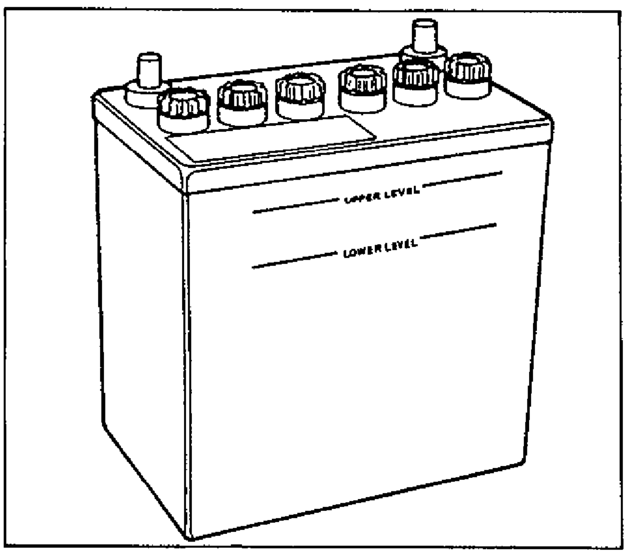


Fig. 6H-1

The battery mounted in each car is one of the following two types, depending on specification.

38B20R TYPE

Rated capacity	28 AH/5HR, 12 Volts
Electrolyte	2.5 L (5.28/4.4 US/Imp pt)
Electrolyte S.G.	1.28 when fully charged at 20°C (68°F)

55B24R TYPE

Rated capacity	38 AH/5HR, 12 Volts
Electrolyte	2.8 L (5.92/4.93 US/Imp pt)
Electrolyte S.G.	1.28 when fully charged at 20°C (68°F)

GENERAL INFORMATION

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.

CARRIER AND HOLD-DOWN

The battery carrier and hold-down clamp should be clean and free from corrosion before installing the battery. The carrier should be in good condition so that it will support the battery securely and keep it level. Make certain there are no parts in carrier before installing the battery. To prevent the battery from shaking in its carrier, the hold-down bolts should be tight but not overtightened.

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.

CARE OF THE BATTERY

38B20R and 55B24R TYPE

(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; and try to keep the battery fully charged at all times.

(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. The inability of the starter motor to crank the engine is often due to the rust formation in the battery cable connection. Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.

(3) Be always in the know as to the state of charge of the battery.
The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an inexpensive instrument for measuring the specific gravity (S.G.) of the battery electrolyte. Why measure the S.G.? Because the S.G. of the electrolyte is indicative of the state of charge.

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, an expensive instrument used generally in the service shops but not recommendable to the user of the car.

At 20°C of battery temperature (electrolyte temperature):

The battery is in FULLY CHARGED STATE if the electrolyte S.G. is 1.280.

The battery is in HALF CHARGED STATE if the S.G. is 1.220.

The battery is in NEARLY DISCHARGED STATE if the S.G. is 1.150 and is in danger of freezing.

What if the battery temperatures not 20°C (68°F)? Since the S.G. varies with temperature, you have to correct your S.G. reading (taken with your hydrometer) to the value at 20°C, and apply the corrected S.G. value to the three-point guide stated above. This manner of correction needs a chart showing the relation between S.G. and temperature. There is a simpler way: refer to the graph given below, which tells you the state of charge for a range of S.G. value and a range of temperature.

How to use the temperature-corrected state-of-charge graph.
Suppose your S.G. reading is 1.28 and the battery temperature is –5°C (23°F). Locate the intersection of the –5°C line and the 1.28 S.G. line. The intersection is "A". It is in the zone for CHARGED STATE (shaded area in the graph). How much is the battery charged? To find out the answer, draw a line parallel to the zone demarcation line, extending it to the right, and see where this line crosses the percentage scale. In the present example, the line crosses at, say, 85% point. The battery is 85% fully charged.

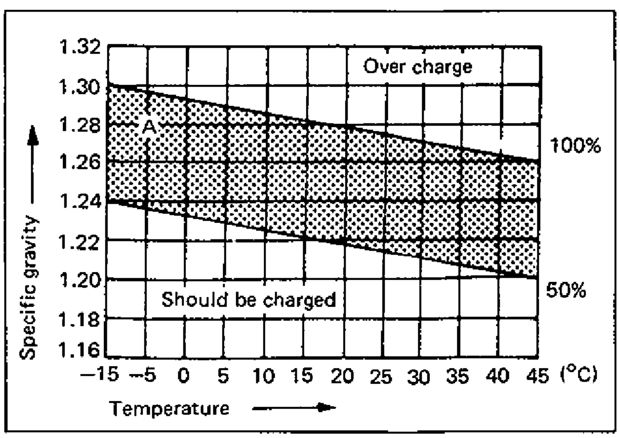


Fig. 6H-2

ON-CAR SERVICE

JUMP STARTING IN CASE OF EMERGENCY

WITH AUXILIARY (BOOSTER) BATTERY

> CAUTION:
> **If car 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.**
> - **Never expose battery to open flame or electric spark. Batteries generate gas which is flammable and explosive.**
> - **Remove rings, watches, and other jewelry. Wear approved eye protection.**
> - **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.**
> - **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.**
> - **Batteries should always be kept out of reach of children.**

1. Set parking brake and place automatic transmission in PARK (NEUTRAL on manual transmission). Turn off ignition, turn off lights and all other electrical loads.
2. Check electrolyte level. If it is below low level line, add distilled water.
3. Attach end of one jumper cable to positive terminal of booster battery and the other end of the same cable to positive terminal of discharged battery. (Use 12-volt battery only to jump start engine).
4. Attach one end of the remaining negative cable to negative terminal of booster battery, and the other end to a solid engine ground (such as exhaust manifold) at least 45 cm (18 in) away from battery of vehicle being started.

> WARNING:
> **Do not connect negative cable directly to negative terminal of dead battery.**

5. Start engine of vehicle with booster battery and turn off electrical accessories. Then Start engine of the vehicle with discharged battery.
6. Disconnect jumper cables in the exact reverse order.

WITH CHARGING EQUIPMENT

> CAUTION:
> **When jump starting engine with charging equipment, be sure equipment used is 12-volt and negative ground. Do not use 24-volt charging equipment. Using such equipment can cause serious damage to electrical system or electronic parts.**

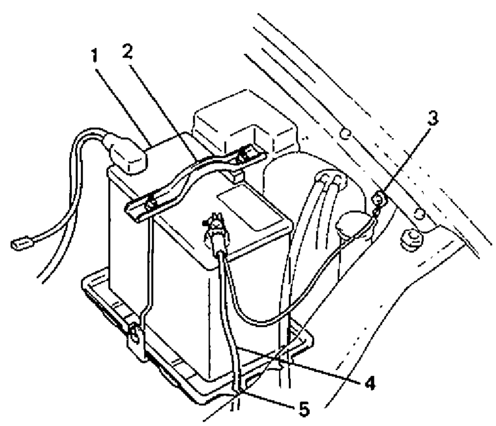
REMOVE AND REPLACE

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. To remove or replace battery, always disconnect negative cable first, then positive cable.

BATTERY CABLES

Connect battery cables as shown in figure below and make sure to properly tighten all terminals.



1. Battery
2. Retainer (Band)
3. Body ground bolt
4. Ground cable
5. Clamp

Fig. 6H-3 Installing Battery

GENERATOR

GENERAL DESCRIPTION

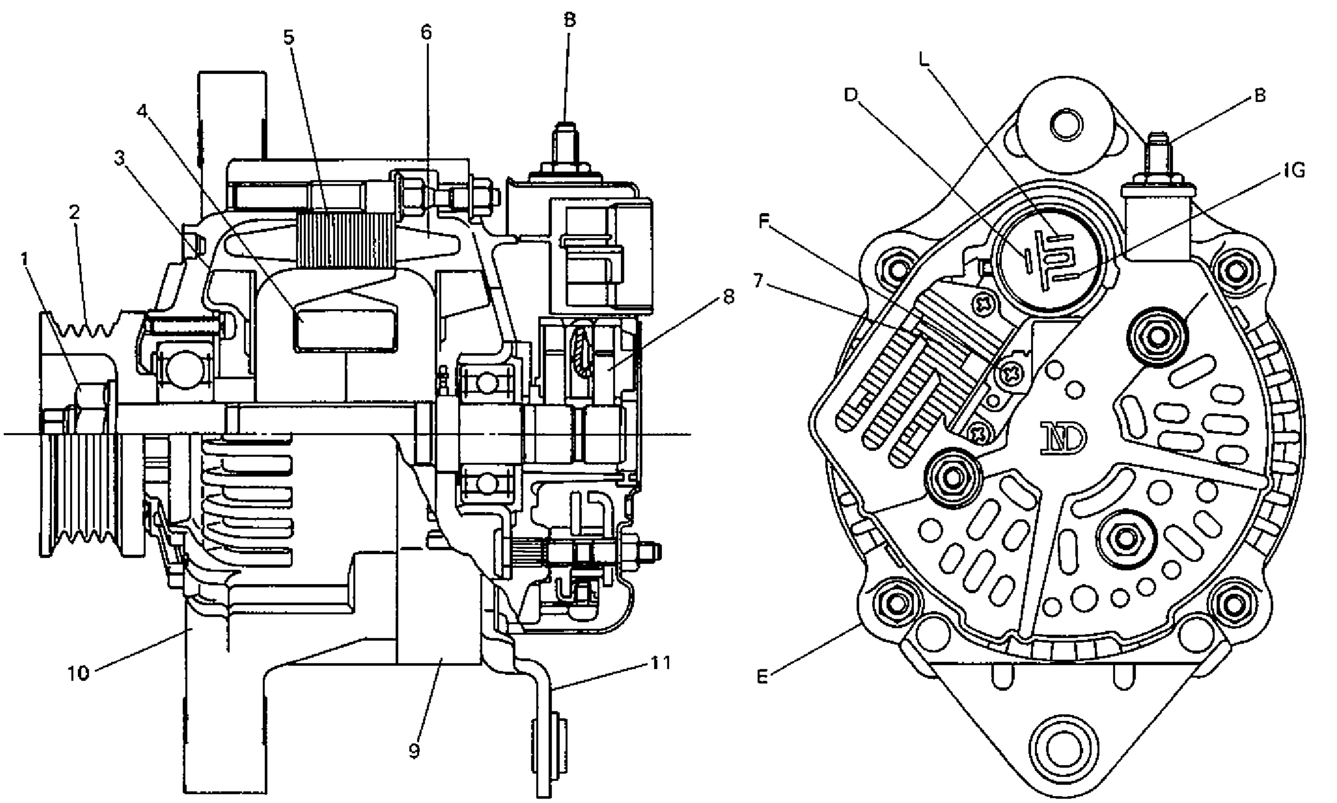
The basic charging system is the IC integral regulator charging system. The internal components are connected electrically as shown in Fig. 6H-5.

The generator features a solid state regulator that is mounted inside the generator. All regulator components are enclosed into a solid mold, and this unit along with the brush holder assembly is attached to the slip ring and frame. The generator voltage setting cannot be adjusted.

The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long period of attention-free service.

The stator windings are assembled on the inside of a laminated core that forms part of the generator frame. A rectifier bridge connected to the stator windings contains six diodes, and electrically changes the stator A.C. voltages to a D.C. voltage which appears at the generator output terminal. The neutral diodes serve to convert the voltage fluctuation at the neutral point to direct current for increasing the generator output.

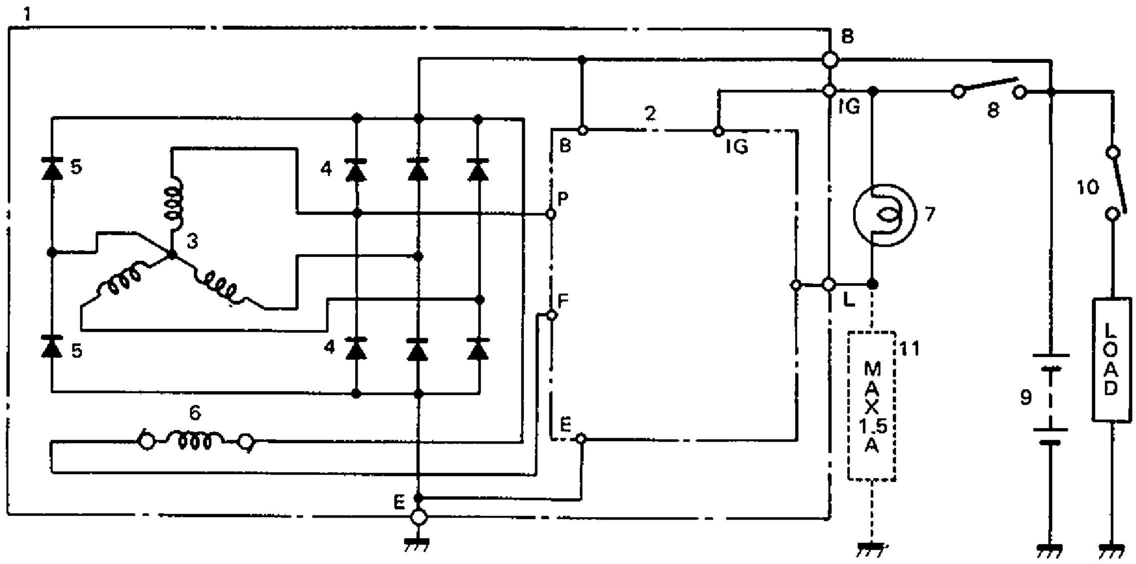
A condenser mounted in the regulator assembly protects the diodes from high voltage pulses and suppresses radio noise.



1. Pulley nut
2. Pulley
3. Rotor fan
4. Field coil
5. Stator core
6. Stator coil
7. Regulator
8. Brush
9. Rear end frame
10. Drive end frame
11. Stay

F : Field coil terminal
D : Dummy terminal
L : Lamp terminal
B : Generator output (Battery terminal)
IG : Ignition terminal
E : Ground

Fig. 6H-4 Generator Cutaway



1. Generator with regulator ass'y
2. I.C. regulator
3. Stator coil
4. Rectifier diode
5. Neutral point diode
6. Field coil (rotor coil)
7. Charge indicator light
8. Ignition switch
9. Battery
10. Load switch
11. L terminal load (Fuel pump relay)

NOTE:
Part shown in broken line (11. terminal load) is applicable to cars equipped with carburetor.

Fig. 6H-5 Generator Schematic

SPECIFICATIONS

Rated voltage	12V	Permissible ambient temperature	–30 to 90°C (–22 to 194°F)
Maximum output	55A (Hot at 13.5V)	Polarity	Negative ground
Permissible max. speed	18,000 r/min.	Rotation	Clockwise viewed from pulley side
No-load speed	1,100 r/min.		
Setting voltage	14.2 to 14.8V (5,000 r/min. 10A 25°C/77°F)		

DIAGNOSIS

To avoid generator damage, always follow precautions shown below.

> **CAUTION:**
> - **Do not mistake polarities of IG terminal and L terminal.**
> - **Do not create a short circuit between IG and L terminals. Always connect these terminals through a lamp.**
> - **Do not connect any load between L and E.**
> - **When connecting a charger or a booster battery to vehicle battery, refer to section describing battery charging.**

Trouble in charging system will show up as one or more of following conditions:

1. Faulty indicator lamp operation.
2. An undercharged battery as evidenced by slow cranking or indicator clear with red dot.
3. An overcharged battery as evidenced by excessive spewing of electolyte from vents.

Noise from generator may be caused by a loose drive pulley, loose mounting bolts, worn or dirty bearings, defective diode, or defective stator.

FAULTY INDICATOR LAMP OPERATION

Symptom	Possible cause	Correction
Charge light does not light with ignition ON and engine off	• Fuse blown • Light burned out • Wiring connection loose • IC regulator faulty	Check fuse Replace light Tighten loose connections Replace IC regulator
Charge light does not go out with engine running (battery requires frequent recharging)	• Drive belt loose or worn • Battery cables loose, corroded or worn • IC regulator or alternator faulty • Wiring faulty	Adjust or replace drive belt Repair or replace cables Check charging system Repair wiring

UNDERCHARGED BATTERY

This condition, as evidenced by slow cranking or indicator clear with red dot can be caused by one or more of the following conditions even though indicator lamp may be operating normally. Following procedure also applies to cars with voltmeter and ammeter.

1. Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
2. Check drive belt for proper tension.
3. If battery defect is suspected, refer to Battery section.
4. Inspect wiring for defects. Check all connections for tighteness and cleanliness, battery cable connections at battery, starter and ignition ground cable.
5. Connect voltmeter and ammeter as shown at the right.

   Voltmeter
   Set between generator B terminal and ground.

   Ammeter
   Set between generator B terminal and battery (+) terminal.

6. Measure current and voltage.

No-load Check
Run engine from idling up to 2,000 r/min. and read meters.

NOTE:

- **Consideration should be taken that voltage differs somewhat with regulator case temperature.**
- **Discharged battery does not fit for this test. Before testing, make sure that battery is fully charged.**

CAUTION:
While engine is running, do not disconnect battery terminal. It may cause damage to electronic parts.

Standard current	10 A maximum
Standard voltage	14.2 – 14.8 V at 25°C, 77°F

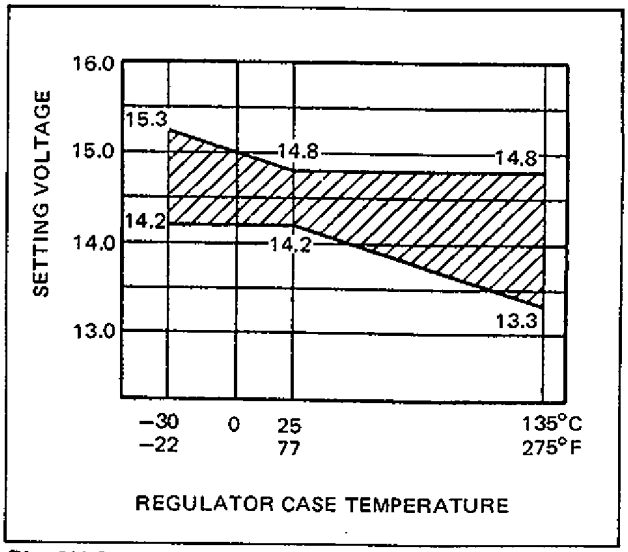


Fig. 6H-6 Temperature Characteristic

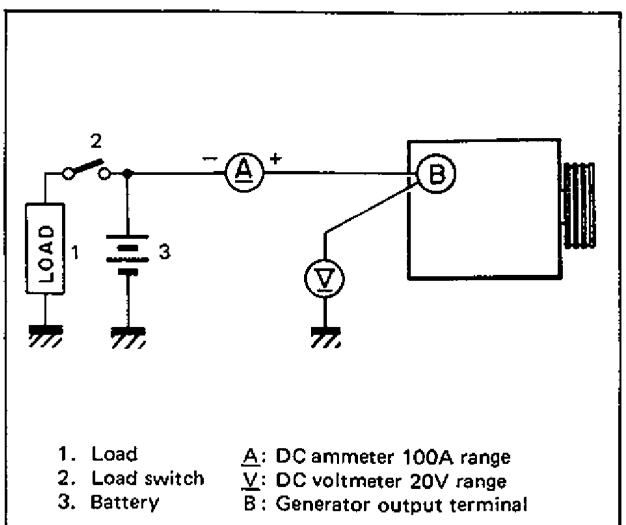


Fig. 6H-7 Measuring Generator Output

Higher voltage
If voltage is higher than standard value, replace IC regulator.

Lower voltage
If voltage is below standard, proceed to following check.

Ground F terminal and start engine, then measure voltage at B terminal.

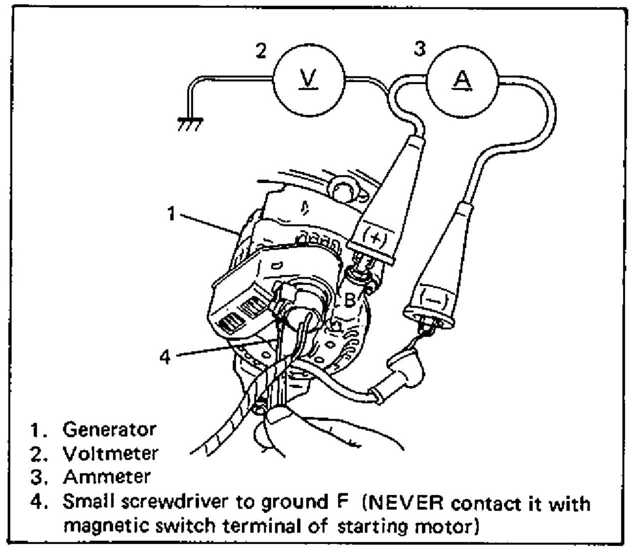


Fig. 6H-8 Checking Generator

If voltage rises above standard, it is considered that generator itself is good but IC regulator has been damaged.

If voltage is below standard, generator itself has problem.

Load Check
Run engine at 2,000 r/min. and turn on headlights and heater fan. Measure current and if it is less than 20A, repair or replace generator.

OVERCHARGED BATTERY

1. To determine battery condition, refer to Battery section.
2. If obvious overcharge condition exists as evidenced by excessive spewing of electrolyte, proceed to disassembly section of generator service and check field windings for grounds and shorts. If problem exists, replace rotor and then check to make sure that output voltage is within specification.

UNIT REPAIR OVERHAUL

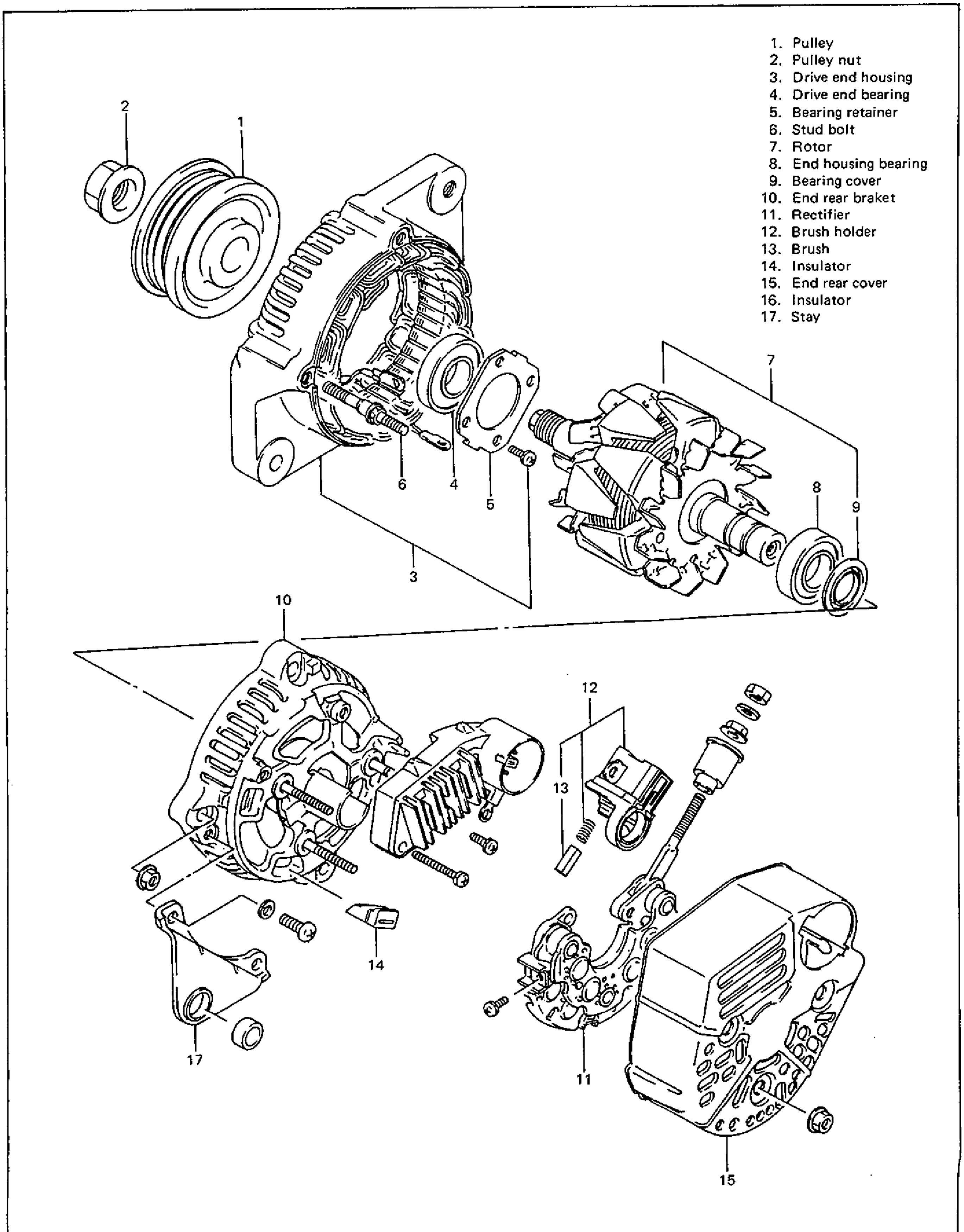


Fig. 6H-9 Generator Exploded View

DISMOUNTING AND REMOUNTING

1. Disconnect negative (–) lead at battery.
2. Disconnect B terminal and coupler.
3. Remove generator cover bolt.
4. Remove generator drive belt adjusting bolt.
5. Remover cover.
6. Remove mounting bolts and then take out generator assembly.
7. To remount, reverse above procedure giving specified tension to drive belt.

NOTE:
For belt tension refer to SECTION 6B.

Tightening torque	N·m	kg-m	lb-ft
● Mounting bolts ● Adjuster bolts	18 – 28	1.8 – 2.8	13.0 – 20.0
Generator cover bolts	4 – 7	0.4 – 0.7	3.0 – 5.0
B terminal outer nut	6 – 10	0.6 – 1.0	4.5 – 7.0

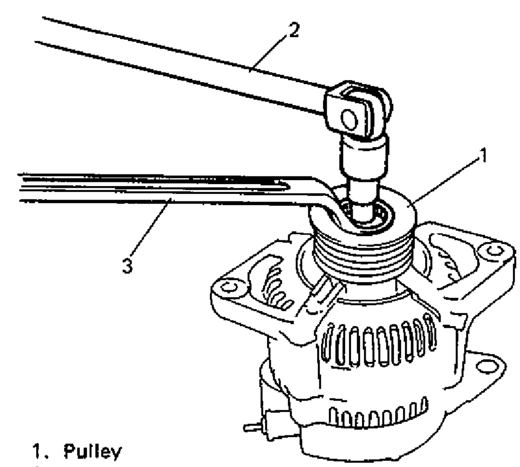


Fig. 6H-10 Removing Pulley Nut

DISASSEMBLY

1. Hold shaft by using hexagonal box wrench and remove pulley nut, and then pull out pulley.

CAUTION:
- **To hold shaft, use hexagonal box. Duodecimal box may cause slipping and cousequential shaft or tool damage.**
- **Do not attempt to hold pulley by using vise or pipe wrench so as not to distort it.**

2. Remove B terminal nut and insulator.
3. Remove 3 screws and take off rear end cover.
4. Remove 2 screws, then pull out brush holder assembly.
5. Remove 3 screws and then take out IC regulator.
6. Remove 4 screws and then take out rectifier.

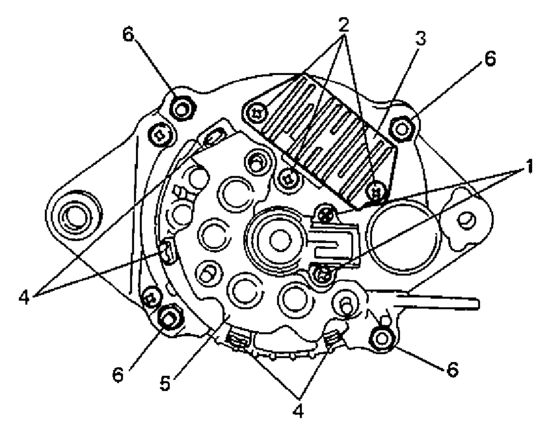


Fig. 6H-11 Removing Rectifier

7. Remove 4 nuts, and then drive out rear end frame with rotor tapping shaft lightly by using plastic hammer.

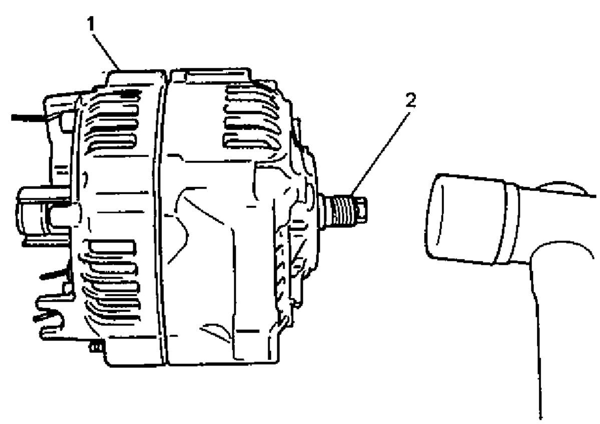


Fig. 6H-12 Removing Rear End Frame

8. Separate rear end frame from rotor tapping frame evenly by using plastic hammer.

> **CAUTION:**
> **Do not hit shaft at slip ring side, when separating rotor and rear end frame.**

9. Use bearing puller to remove end housing bearing.

> **CAUTION:**
> **Care must be exercised so as not to distort cooling fan blade while applying puller.**

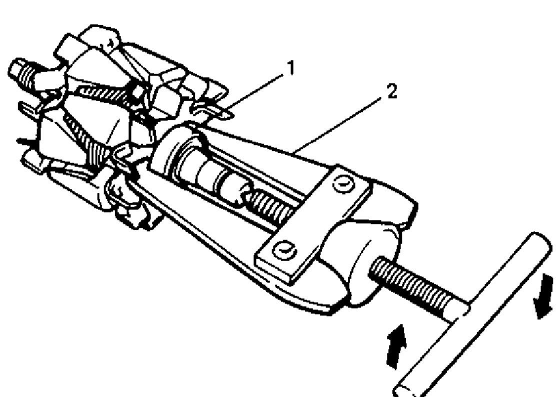


Fig. 6H-13 Removing Rear Bearing

10. Remove 4 screws, retainer plate and then drive out drive end bearing.

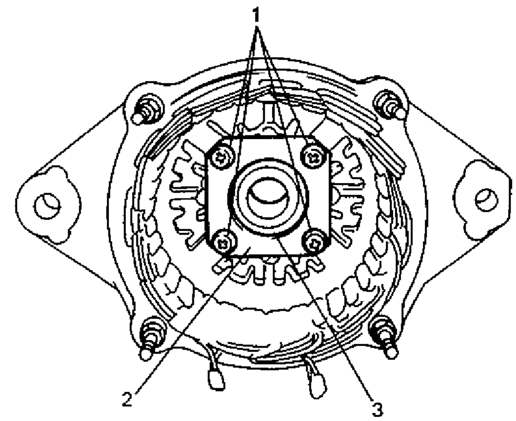


Fig. 6H-14 Removing Front Bearing

REASSEMBLY

Judging from faulty conditions noted before disassembly and what is found through inspection after disassembly, prepare replacing parts and reassemble generator by reversing removal procedure.

NOTE:
When installing brush holder assembly, make sure that brushes and slip rings have been degreased thoroughly.

> **CAUTION:**
> - **When installing rectifier, check to confirm that stator leads have enough clearance with cooling fan blades.**
> - **Care should be taken not to overtighten B terminal insulator nut.**

Tightening torque	N·m	kg-m	lb-ft
Stud bolts	7 – 8.8	0.7–0.88	5.5 – 6.0
●Frame bolts and nuts ●B terminal inner nut	4 – 5	0.4 – 0.5	3.0 – 3.5
Pulley nut	95–130	9.5–13.0	69.0 – 94.0

INSPECTION AND CORRECTION

ROTOR

Ground

Between slip rings and rotor core should be insulated. Use ohmmeter for inspection.

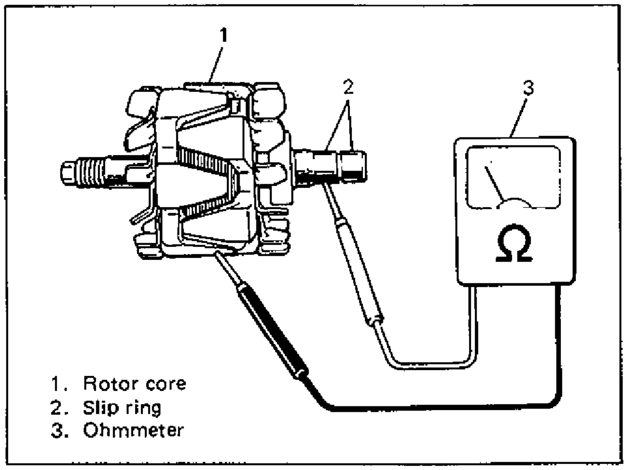


Fig. 6H-15 Checking Field Coil Insulation

Open Circuit

Check continuity and resistance of field coil by applying ohmmeter probes to slip rings. If resistance is out of specification, replace rotor.

Field coil resistance	2.8 – 3.0 Ω

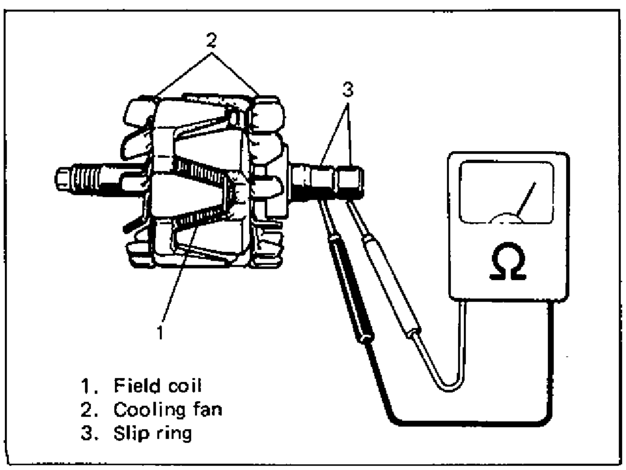


Fig. 6H-16 Checking Field Coil Continuity

FAN

Make sure that fan blades are all in good condition.

BEARING

Check for smooth rotation by hand.

STATOR

Ground

Using ohmmeter, check to make sure that stator coil is insulated from core.

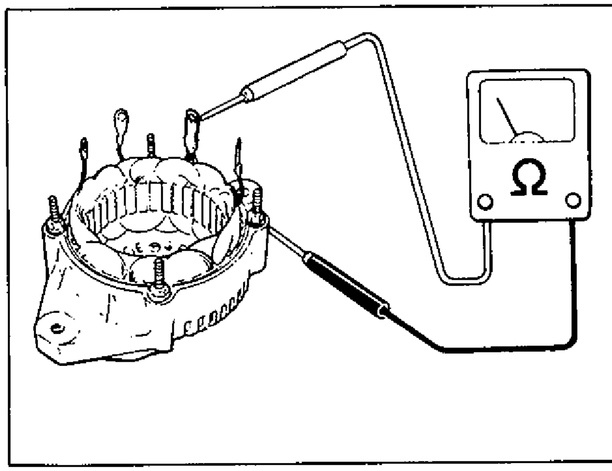


Fig. 6H-17

Open Circuit

Check continuity between neutral point A and each phase B.

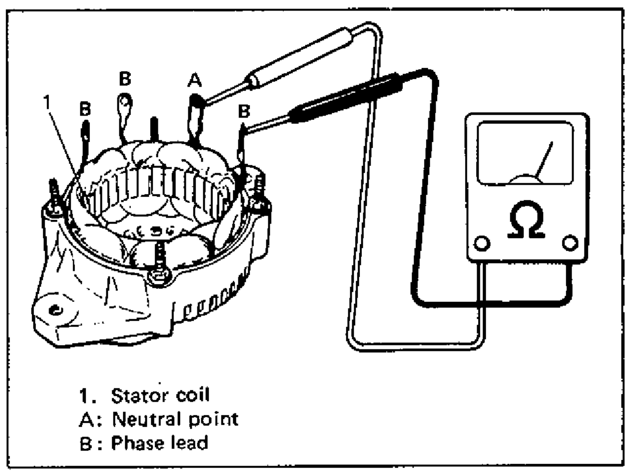


Fig. 6H-18 Checking Stator Coil

DRIVE END BEARING

Before remove it, check for smooth rotation by hand.

RECTIFIER

Using kΩ range ohmmeter, check continuity between B terminal and ground. Put a tester probe to terminal B and the other probe to ground, then swap two probes. Only one direction should have continuity and the other should be infinity. If not, replace rectifier assembly.

CAUTION:
Do not use 500V megger for testing rectifier. It will cause to damage diodes in rectifier.

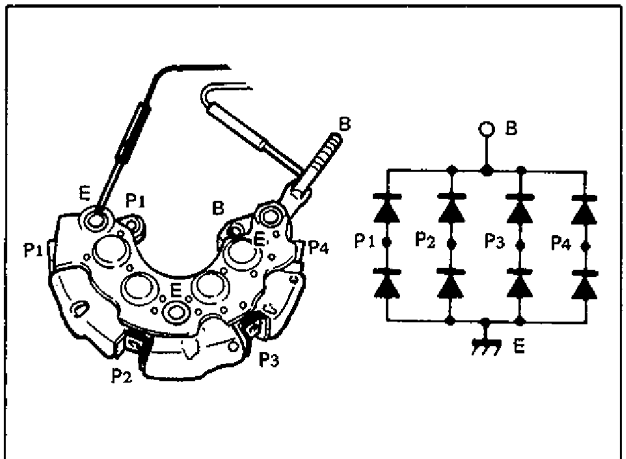


Fig. 6H-19 Checking Rectifier

CONDENSER

Use condenser tester to check condition of condenser.

Condenser capacity	0.5 μF

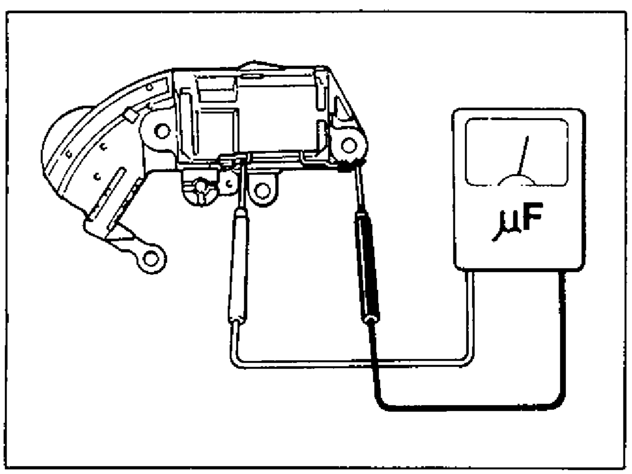


Fig. 6H-20 Checking Condenser

BRUSH

Check each brush for wear by measuring its length as shown. If brush is found worn down to service limit, replace brush with holder.

Brush length service limit (minimum value)	4.5 mm (0.18 in)

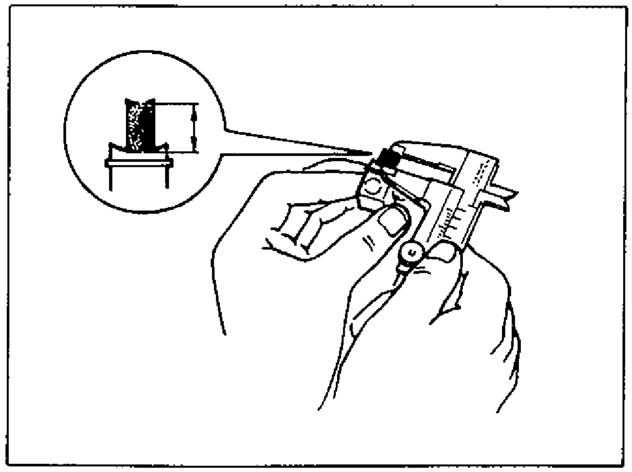


Fig. 6H-21 Checking Brush Length

SECTION 6J

EMISSION CONTROLS

(Carburetor model)

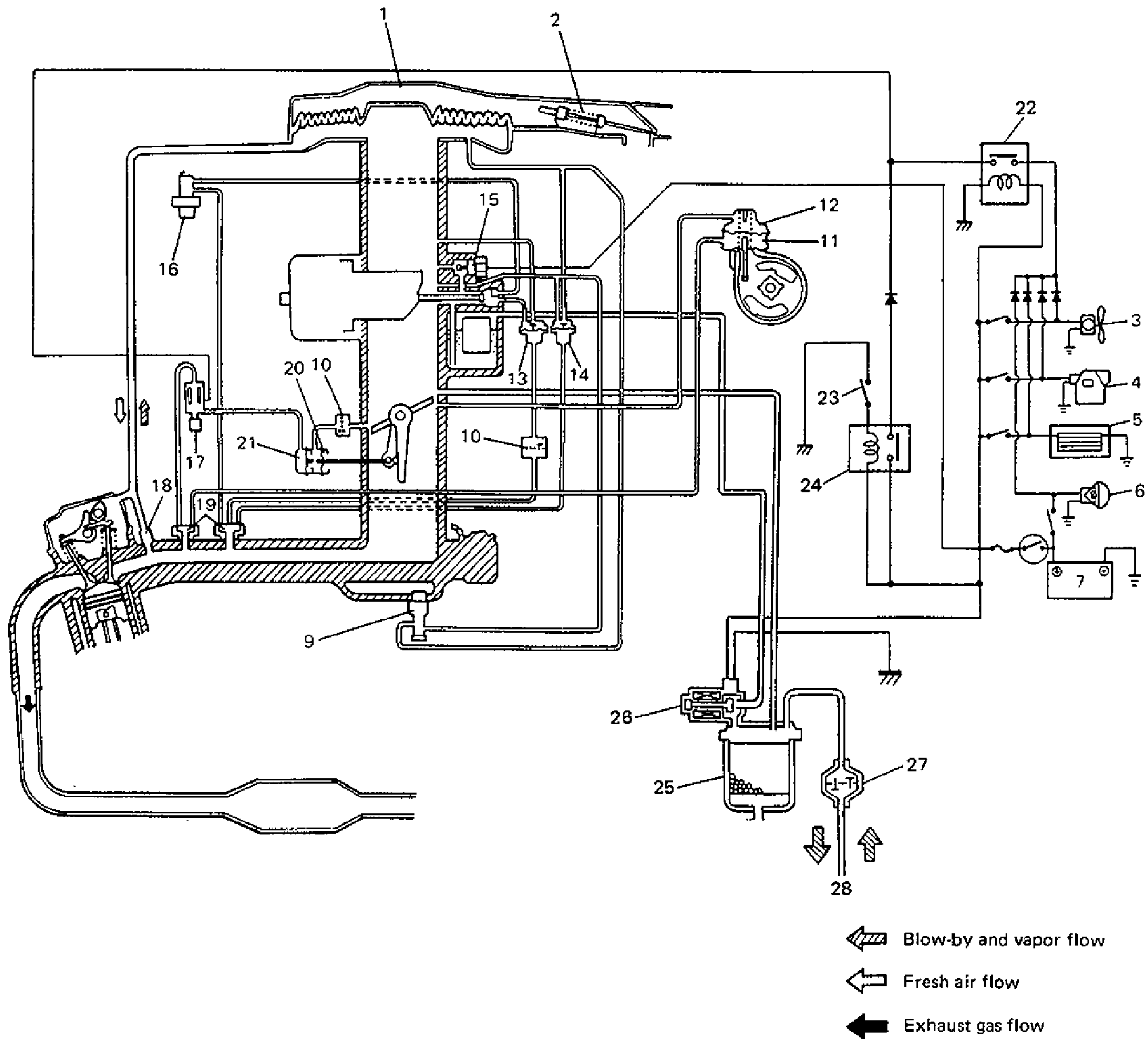
CONTENTS

GENERAL DESCRIPTION 6J- 1
1. Positive Crankcase Ventilation (PCV) System 6J- 4
2. Throttle Positioner System 6J- 5
3. Intake Air Temperature Control System 6J- 6
4. Evaporative Emission Control System 6J- 7
ON CAR SERVICE 6J- 8
General 6J- 8
PCV System 6J- 8
Throttle Positioner System 6J- 9
Intake Air Temperature Control System 6J-10
Evaporative Emission Control System 6J-11

GENERAL DESCRIPTION

This section describes operation of the above four systems and inspection of their component parts.
As for each item except 1 and 2, whether it is provided or not depends on specifications which vary among countries.

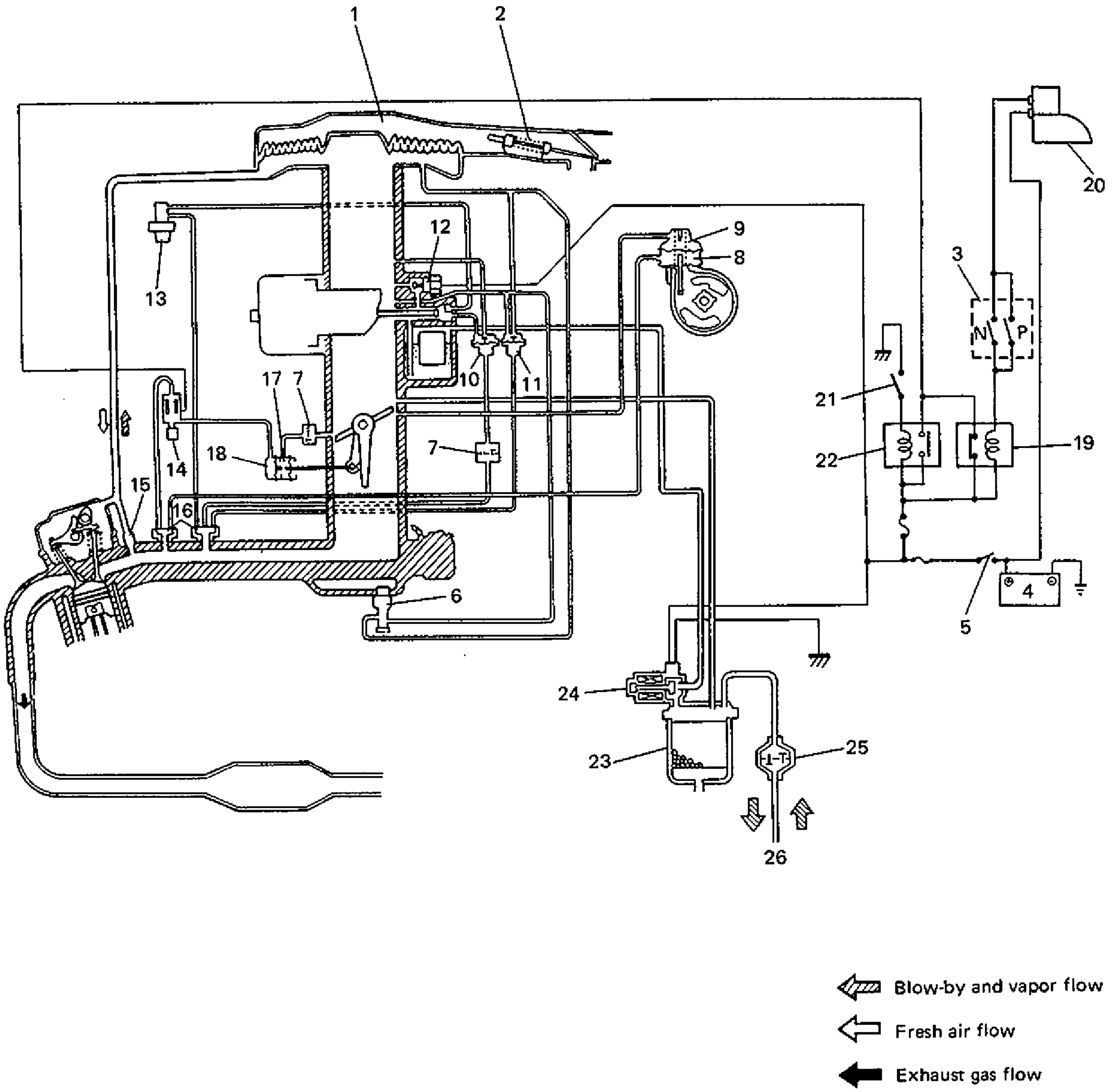
FOR VEHICLE WITH MANUAL TRANSMISSION



1. Air cleaner
2. Thermo sensor
3. Cooling fan motor
4. Heater motor
5. Rear defogger
6. Headlight
7. Battery
8. Main switch
9. TVS (Thermal Vacuum Switching) valve
10. VTV (Vacuum Transmitting Valve)
11. Vacuum advancer (sub)
12. Vacuum advancer (main)
13. VCV (Vacuum Control Valve) No. 1
14. VCV No. 2
15. Fuel cut solenoid
16. BVSV
17. VSV (Vacuum Switching Valve)
18. PCV (Positive Crankcase Ventilation) valve
19. Gas filter
20. Throttle positioner
21. Idle up actuator
22. Idle up relay
23. P/S pressure switch (If equipped)
24. P/S relay (If equipped)
25. Charcoal canister
26. OVCV (Outer Vent Control Valve)
27. 2-way check valve
28. To fuel tank

Fig. 6J-1

FOR VEHICLE WITH AUTOMATIC TRANSMISSION



1. Air cleaner
2. Thermo sensor
3. Inhibitor switch
4. Battery
5. Main switch
6. TVS (Thermal Vacuum Switching) valve
7. VTV (Vacuum Transmitting Valve)
8. Vacuum advancer (sub)
9. Vacuum advancer (main)
10. VCV (Vacuum control Valve) No. 1
11. VCV No. 2
12. Fuel cut solenoid
13. BVSV
14. VSV (Vacuum Switching Valve)
15. PCV (Positive Crankcase Ventilation) valve
16. Gas filter
17. Throttle positioner
18. Idle up actuator
19. Idle up relay
20. Starting motor
21. P/S pressure switch (If equipped)
22. P/S relay (If equipped)
23. Charcoal canister
24. OVCV (Outer Vent Control Valve)
25. 2-way check valve
26. To fuel tank

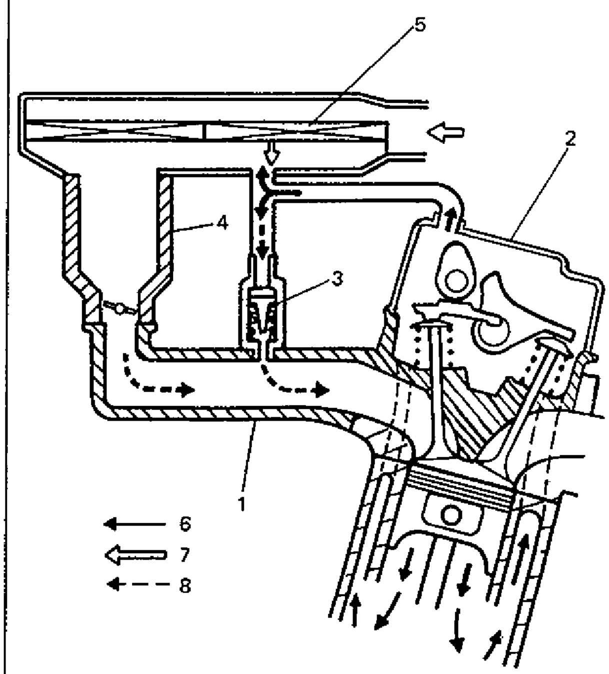
Fig. 6J-2

1. POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

The term "blow-by gas" stands for the compressed gas and exploded gas which blow through cylinder-to-piston clearance, which contain a large amount of unburned gases such as CO and HC. The PCV (Positive Crankcase Ventilation) system is provided to prevent the blow-by gas from being emitted into atmosphere and it operates as follows.

When the vacuum in the intake manifold is low (throttle valve open), the PCV valve is wide open due to its spring force. Thus a large amount of the blow-by gas is drawn into the intake manifold.

On the other hand, when the vacuum in the manifold is high, the PCV valve opening is limited due to the high vacuum. Thus the amount of the blow-by gas drawn into the intake manifold is small.

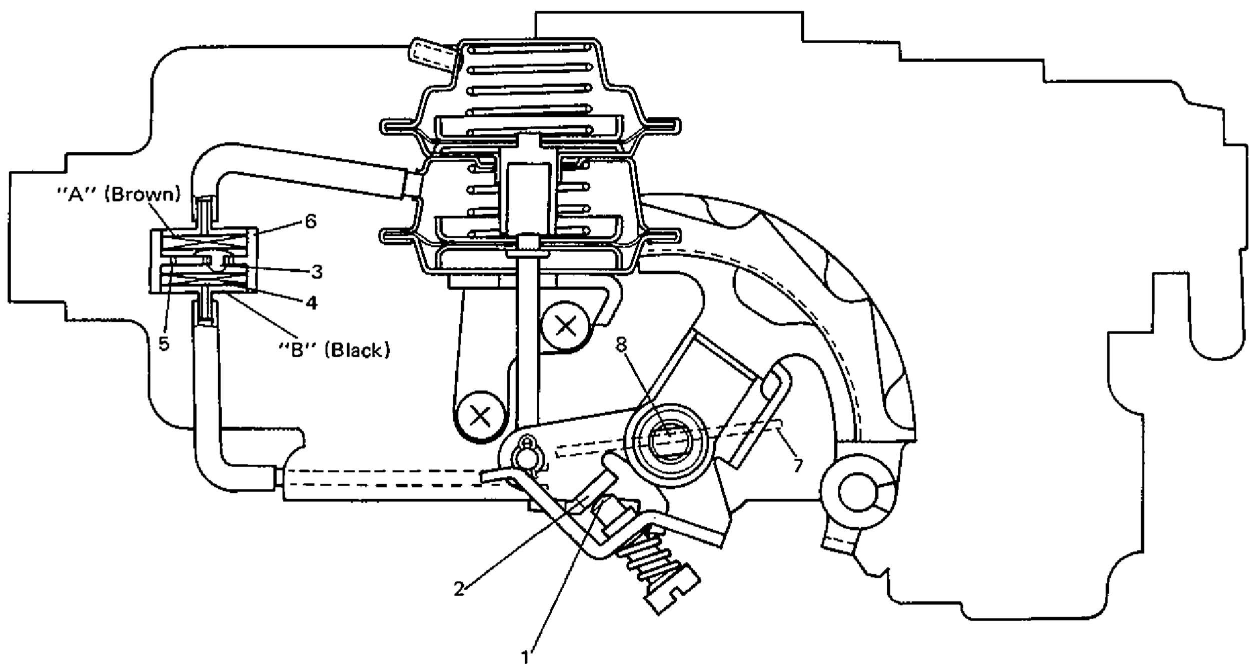


1. Intake manifold
2. Cylinder head cover
3. PCV valve
4. Carburetor body
5. Air cleaner
6. Blow-by gas
7. Fresh air
8. Blow-by gas and fresh air mixture

Fig. 6J-3 PCV System Operation

2. THROTTLE POSITIONER SYSTEM

This system prevents the throttle valve from returning to the idle position immediately when the accelerator pedal is released suddenly, thereby preventing inefficient combustion due to too rich air fuel mixture and reducing the amount of unburned hydrocarbon (HC).



1. Screw end
2. Positioner lever
3. Check valve
4. Filter
5. Orifice
6. VTV (Vacuum Transmitting Valve)
7. Throttle valve
8. Throttle shaft

Fig. 6J-4

System Operation

When the cooling water temperature is above 80°C (176°F), the sudden release of the accelerator pedal causes the throttle positioner lever which is on the throttle shaft to contact the screw head of the positioner. As the intake manifold vacuum is high in this state, the VTV check valve closes momentarily and the air with pressure close to the atmospheric pressure is closed up between the diaphragm of the throttle positioner and VTV. Consequently the throttle valve is held at the position of that moment. However, immediately after that, the check valve starts to open and close and this allows the throttle valve to return gradually to its specified idle position.

The engine speed when the throttle valve is held is approximately 1,450 – 1,750 r/min (rpm).

3. INTAKE AIR TEMPERATURE CONTROL SYSTEM

(Applicable to vehicle equipped with thermo-wax in the air cleaner case)

This system helps to improve fuel vaporization by controlling the temperature of the intake air almost at a constant level automatically regardless of driving conditions and outside temperature, to distribute the mixture to each cylinder evenly and to stabilize the air/fuel mixture ratio.

In the air cleaner case, there is a thermo wax which senses the temperature of the intake air and connected to the thermo wax are a rod and damper.
When the temperature of the intake air is low, this wax moves the damper through the rod to close the fresh air passage. Then the air warmed up in the exhaust manifold is drawn into the engine.

As the temperature of the intake air to which the thermo wax is exposed rises, the thermo wax moves the damper so that it opens the passage of the fresh air and closes that of the warm air.

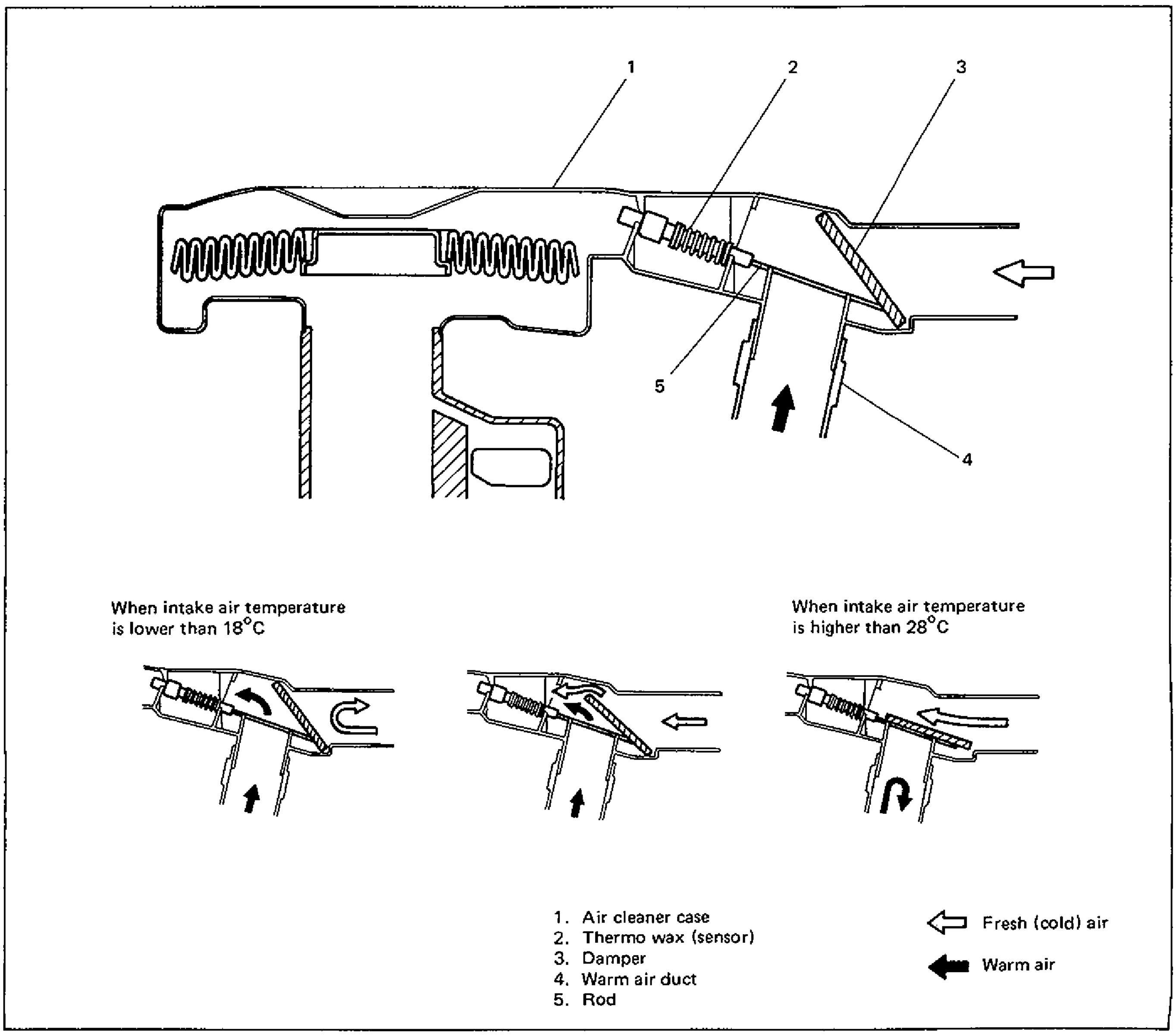


Fig. 6J-5

4. EVAPORATIVE EMISSION CONTROL SYSTEM

NOTE:
Applicable to the vehicle equipped with canister.

An evaporative emission control system is used to prevent emission of fuel vapors from the vehicle fuel system.
The system allows evaporating fuel vapors to be stored.
This is accomplished by venting the fuel tank and carburetor float chamber through a vapor storage canister containing activated charcoal.
The major system components are vapor storage canister, outer vent control valve (OVCV) and 2 way check valve.
The fuel vapor from the fuel tank is led into the canister and stored there.
The fuel vapor from the carburetor float chamber is also stored in the canister when the ignition switch is "OFF" and the temperature of the OVCV is 60°C or higher.
When the engine runs and throttle valve opens, the fuel vapor stored in the canister is drawn into the carburetor together with fresh air. Also, in this state, the OVCV closes and the passage to the canister closes, whereby the fuel vapor in the float chamber is drawn through the carburetor to the engine (combustion chamber).
The OVCV opens and closes the passage according to the temperature it senses by means of the shape memory effect alloy spring as follows.

Ignition switch / OVCV temperature	ON	OFF
60°C (140°F) or higher	CLOSE	OPEN
50°C (122°F) or lower	CLOSE	CLOSE

The 2-way check valve is provided to keep the pressure in the fuel tank constant. When the pressure in the fuel tank becomes positive and reaches its specified value, it opens the valve to let the vapor flow into the charcoal canister. On the other hand, when the pressure in the fuel tank becomes negative and reaches its specified value, it opens the valve to let the air flow into the fuel tank.

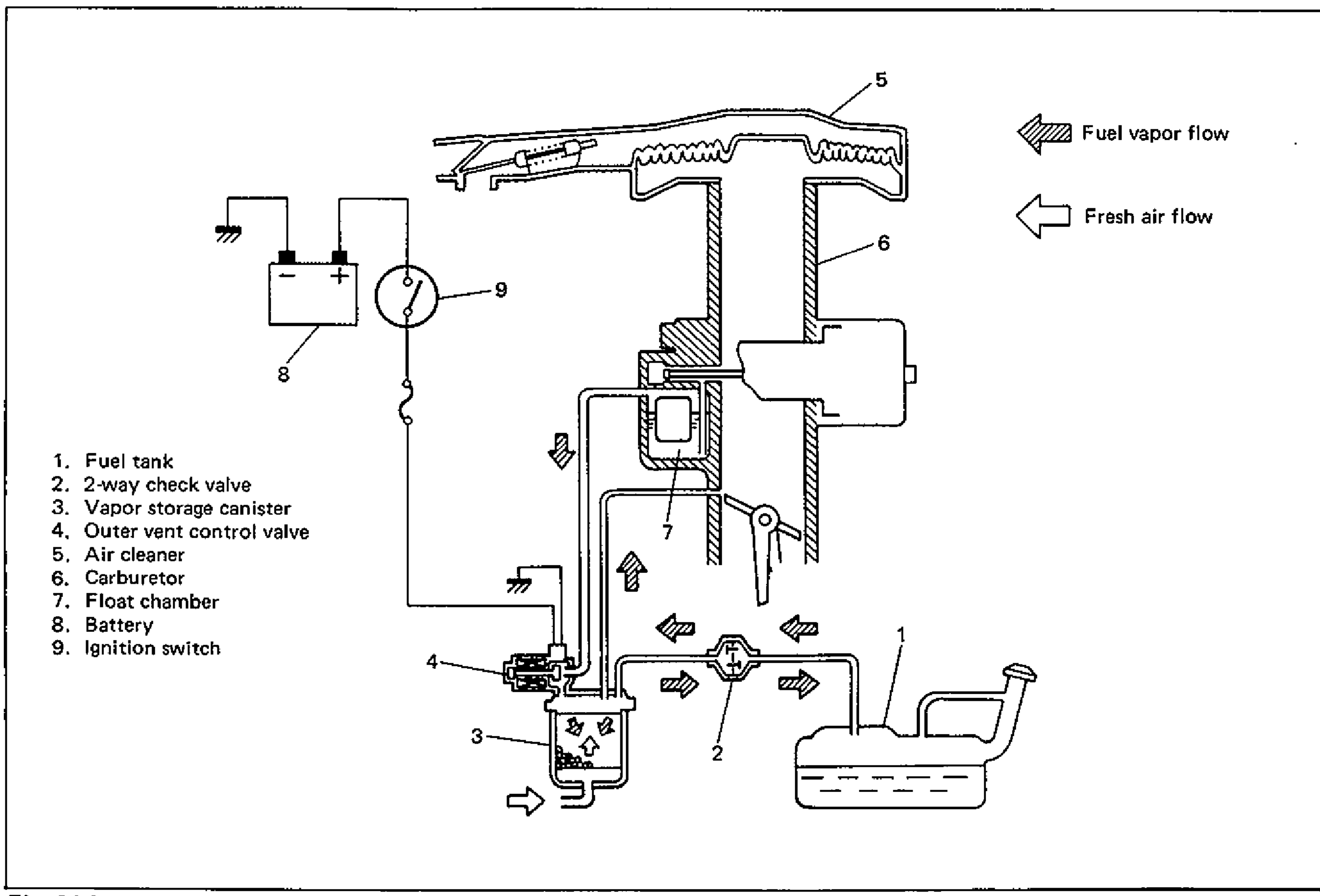


Fig. 6J-6

ON CAR SERVICE

GENERAL

When the emission control hoses are disconnected and the system's component is removed for service, reinstall the component properly, and routed and connect hoses correctly after service. Refer to Fig. 6J-1 and 6J-2 for proper routing of hoses.

PCV SYSTEM

NOTE:
Be sure to check that there is no obstruction in PCV valve or its hoses before adjusting engine idle speed, for obstructed PCV valve or hose hampers its accurate adjustment.

PCV HOSE INSPECTION

Check hoses for connection, leakage, clog, and deterioration. Replace as necessary.

PCV valve

1. Disconnect PCV hoses at PCV valve.
2. Run engine at idle.
3. Place your finger over end of PCV valve to check for vacuum. If there is no vacuum, check for clogged valve. Replace as necessary.

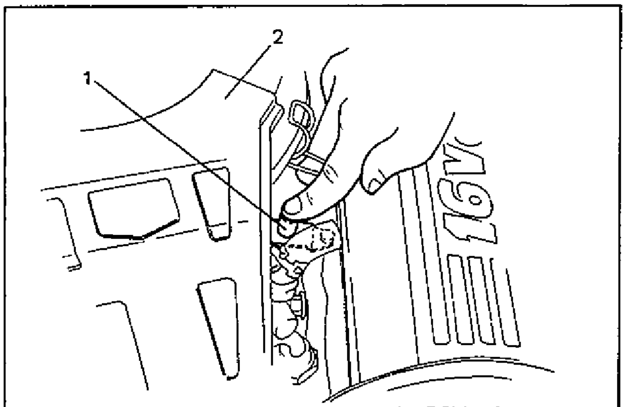


Fig. 6J-7 Checking Vacuum

4. After checking vacuum, stop engine and check PCV valve for sticking.
   With engine stopped, connect a proper size hose to PCV valve for inspection.
   Blow air into that hose and check that air flows with difficulty from cylinder head side to intake manifold side. If air flows without difficulty, valve is stuck in "Open" position. Replace PCV valve.

> WARNING:
> **Do not suck air through PCV valve. Petroleum substances inside the valve and fuel vapor inside the intake manifold are harmful.**

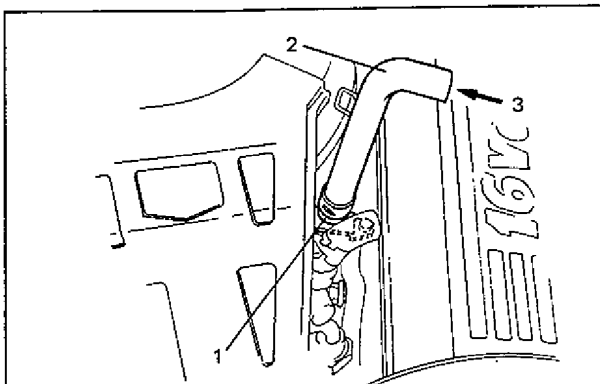


Fig. 6J-8 Checking PCV Valve for Sticking

5. After removing hose, connect PCV hose and clamp securely.

THROTTLE POSITIONER SYSTEM

Checking Positioner System

1) Start engine and warm it up enough.
2) Confirm that engine is at specified idle speed.
3) Depress accelerator pedal and keep engine speed at 2,500 r/min (rpm).
4) Take foot off accelerator pedal and check for the following.
   Engine speed remains within 1,400 – 1,800 r/min (rpm) which is a little higher than specified idle speed for a short time and then gradually decreases back to specified idle speed.

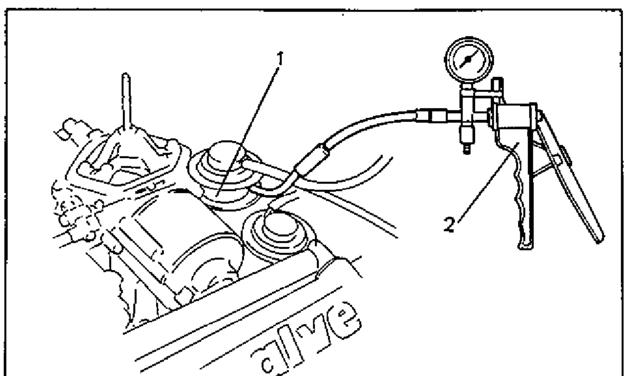
If found faulty, check following parts according to each procedure.

VACUUM HOSE

Check hose for breakage, pin-hole or damage and also for secure connection. If found defective, replace or repair.

THROTTLE POSITIONER

1) Disconnect vacuum hose from VTV (Vacuum Transmitting Valve).
2) Connect vacuum pump gauge (special tool) to above disconnected hose.
3) Using vacuum pump, apply vacuum of –40 cmHg to diaphragm in positioner and check for the following. Diaphragm rod moves smoothly and it is held at the same position when vacuum pump is stopped. If rod doesn't move smoothly or is not held as described above, replace positioner.



1. Throttle positioner
2. Special tool (vacuum pump gauge) (09917-47910)

Fig. 6J-9

VTV (Vacuum Transmitting Valve)

1) Remove air cleaner case and VTV.
2) Connect vacuum pump gauge (special tool) to black side of VTV and close "A" side with finger as shown in Fig. 6J-10.
3) Keep pumping until vacuum pump gauge indicates –50 cmHg. When pumping is stopped, check to ensure that pump gauge indicator stays constant.
4) Remove finger from "A" side and observe how long it takes before vacuum falls to –20 cmHg from –40 cmHg. Time spent should be within 1 – 6 seconds.
   If found defective in step 3) or 4), replace VTV.

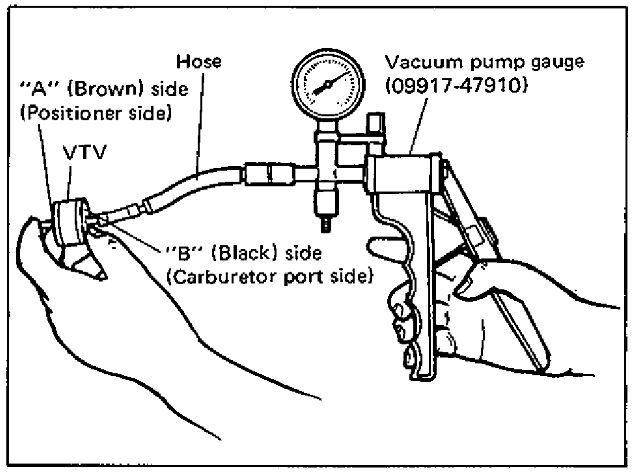


Fig. 6J-10

5) Connect vacuum pump gauge to "A" side and close black side with finger. Repeat step 3). Then remove finger from black side and check to ensure that gauge indicator moves back immediately.
   If found defective, replace VTV.

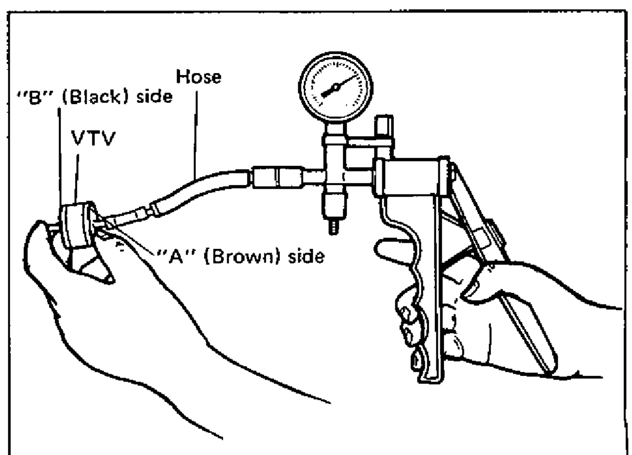


Fig. 6J-11

INTAKE AIR TEMPERATURE CONTROL SYSTEM

CHECKING PROCEDURE

1. Remove air cleaner upper case.

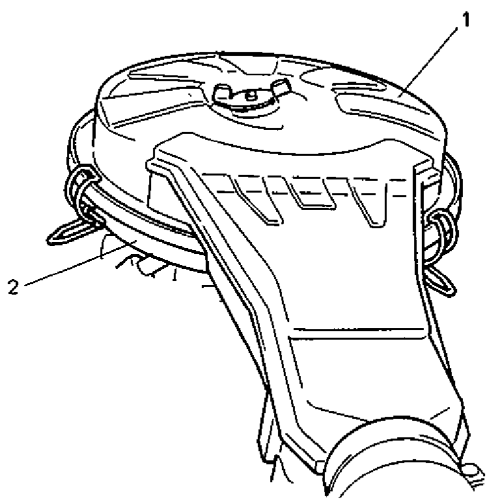


Fig. 6J-12 Air Cleaner

2. Blow cool air to thermo-wax by using a hair drier and check that damper opens warm air duct and closes cold air duct.

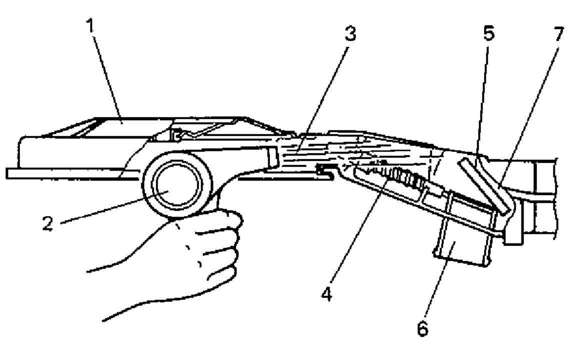


Fig. 6J-13 Fully Open Damper

3. Next, blow warm air to thermo-wax with drier and check that damper closes warm air duct and opens cold air duct.

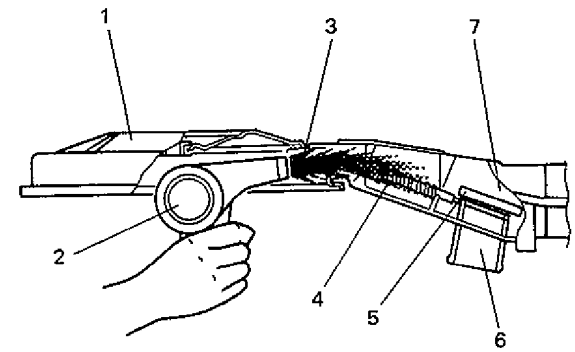


Fig. 6J-14 Closed Damper

4. If damper operation is found faulty in steps 2 and 3, don't remove thermo-wax and damper but replace air cleaner case ass'y as a whole.
5. Reinstall air cleaner upper case.

EVAPORATIVE EMISSION CONTROL SYSTEM

CHECKING EVAPORATIVE EMISSION CONTROL SYSTEM

Hoses

Visually inspect hoses and pipe for cracks, damage, or excessive bends, and hose connection for tightness.

Canister

> **WARNING:**
> **DO NOT SUCK nozzles on canister.**
> **Fuel vapor inside the canister is harmful.**

1) Disconnect negative cable at battery.
2) Disconnect 3 hoses from canister.
3) Remove canister.
4) Remove OVCV from canister.
5) With pipes C and D closed with fingers, blow air into pipe A strongly, and air should come out from pipe B.
6) When air is blown into pipe B, air should not pass through pipe A, C or D.
7) When air is blown into pipe C, air should come out from pipe A, B and D.

If operation differs from above description, canister must be replaced.

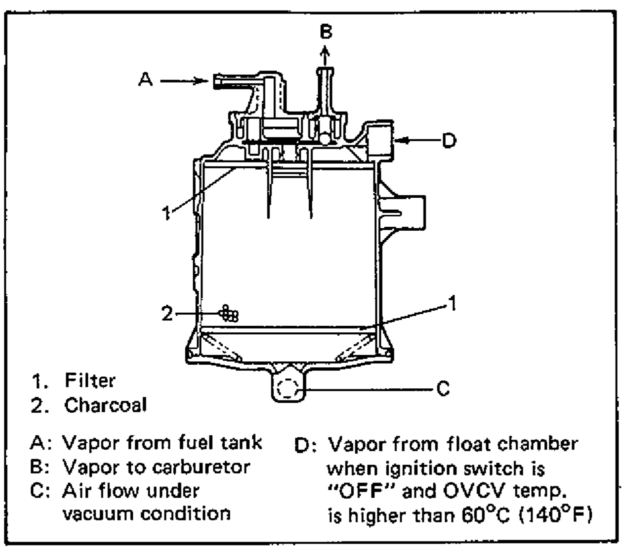


Fig. 6J-15

8) Install OVCV to canister.

Tightening torque for OVCV bolt	N·m	kg-m	lb-ft
	4.4 – 6.6	0.44 – 0.66	3.5 – 4.5

9) Install canister and connect hoses and battery negative cable.

Valve

> **WARNING:**
> **DO NOT SUCK air through hoses or pipes on this system. Fuel vapor inside the canistar, the fuel tank or the float chamber is harmful.**

1) After warm up engine (when OVCV themperature has risen over 60°C (140°F)), disconnect outer vent No. 2 hose at vacuum pipe side.
2) Blow air into outer vent No. 2 hose gradually and check that it flows through when ignition switch is at "OFF" position and doesn't when at "ON" position (but with engine not running).

If operation differs from above description, canister must be replaced.

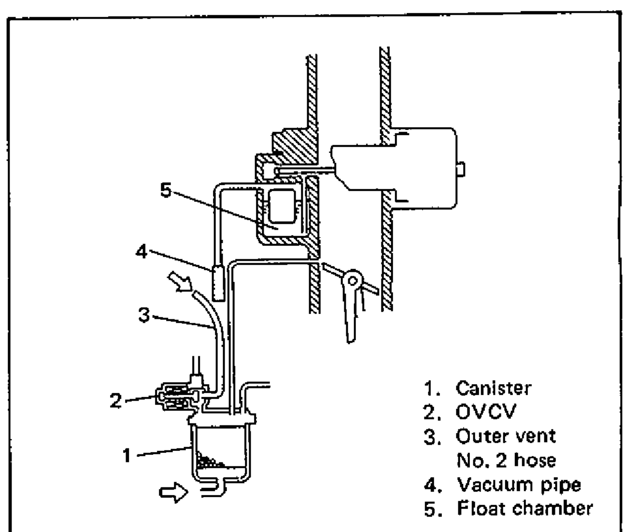


Fig. 6J-16

2-way check valve

Removal

1. Remove fuel tank from body according to procedure described in section 6C.
2. Remove 2-way check valve from fuel tank.

Inspection

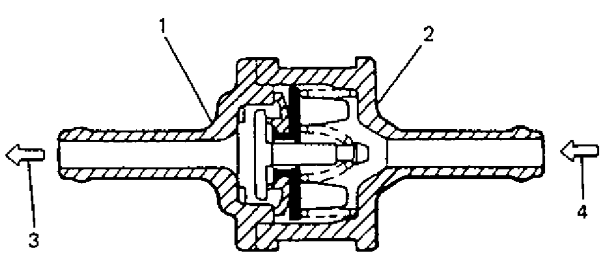
1. Blow hard from fuel tank side (black side of check valve), and air should pass through valve smoothly and come out from its orange side.
2. Blow only softly from orange side, and air should come out from black side.
3. If air doesn't pass through valve in step 1 or hard blow is required in step 2, replace 2-way check valve.

> **WARNING:**
> **DO NOT SUCK air through 2-way check valve. Fuel vapor inside the valve is harmful.**

Installation

Reverse removal sequence to install 2-way check valve.

When connecting check valve between hoses, refer to below figure for installing direction.



1. Orange side
2. Black side
3. To canister
4. From fuel tank

Fig. 6J-17 2-Way Check Valve

SECTION 6J1

EMISSION CONTROLS

(Electronic fuel Injection model)

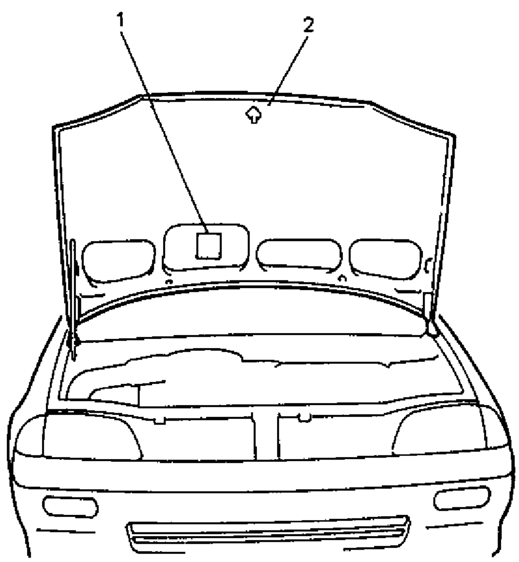
CONTENTS

GENERAL DESCRIPTION 6J1-2
Emission Control Information Label (If equipped, refer to it when servicing) 6J1-2
Positive Crankcase Ventilation (PCV) System 6J1-2
Evaporative Emission Control System 6J1-3
Three-Way Catalyst 6J1-4
Air/Fuel Ratio Feed Back Compensation .... Refer to SECTION 6E
DIAGNOSIS .... Refer to SECTION 6 and SECTION 6E
ON CAR SERVICE 6J1-4
General 6J1-4
PCV System 6J1-4
Evaporative Emission Control System 6J1-5
Air/Fuel Ratio Feed Back Compensation (Oxygen sensor) .... Refer to SECTION 6E

GENERAL DESCRIPTION

EMISSION CONTROL INFORMATION LABEL (If equipped)

The emission Control Information Label is located under hood, if equipped.
The label contains important emission specifications and setting procedures.
When servicing the engine or emission systems, the Emission Control Information Label should be checked for up-to-date information.

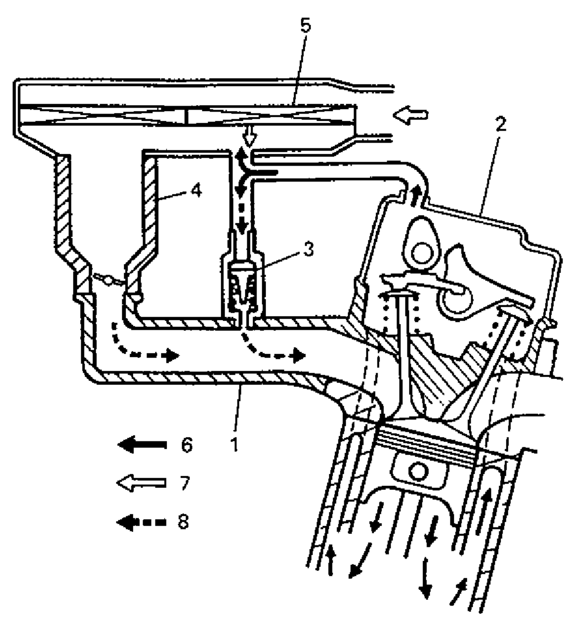


1. Emission control information label
2. Hood

Fig. 6J1-1 Emission Control Information Label (if equipped)

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

The term "blow-by gas" stands for the compressed gas and exploded gas which blow through cylinder-to-piston clearance, which contain a large amount of unburned gases such as CO and HC. The PCV (Positive Crankcase Ventilation) system is provided to prevent the blow-by gas from being emitted into atmosphere and it operates as follows.
When the vacuum in the intake manifold is low (throttle valve open), the PCV valve is wide open due to its spring force. Thus a large amount of the blow-by gas is drawn into the intake manifold.
On the other hand, when the vacuum in the manifold is high, the PCV valve opening is limited due to the high vacuum. Thus the amount of the blow-by gas drawn into the intake manifold is small.



1. Intake manifold
2. Cylinder head cover
3. PCV valve
4. Throttle body
5. Air cleaner
6. Blow-by gas
7. Fresh air
8. Blow-by gas and fresh air mixture

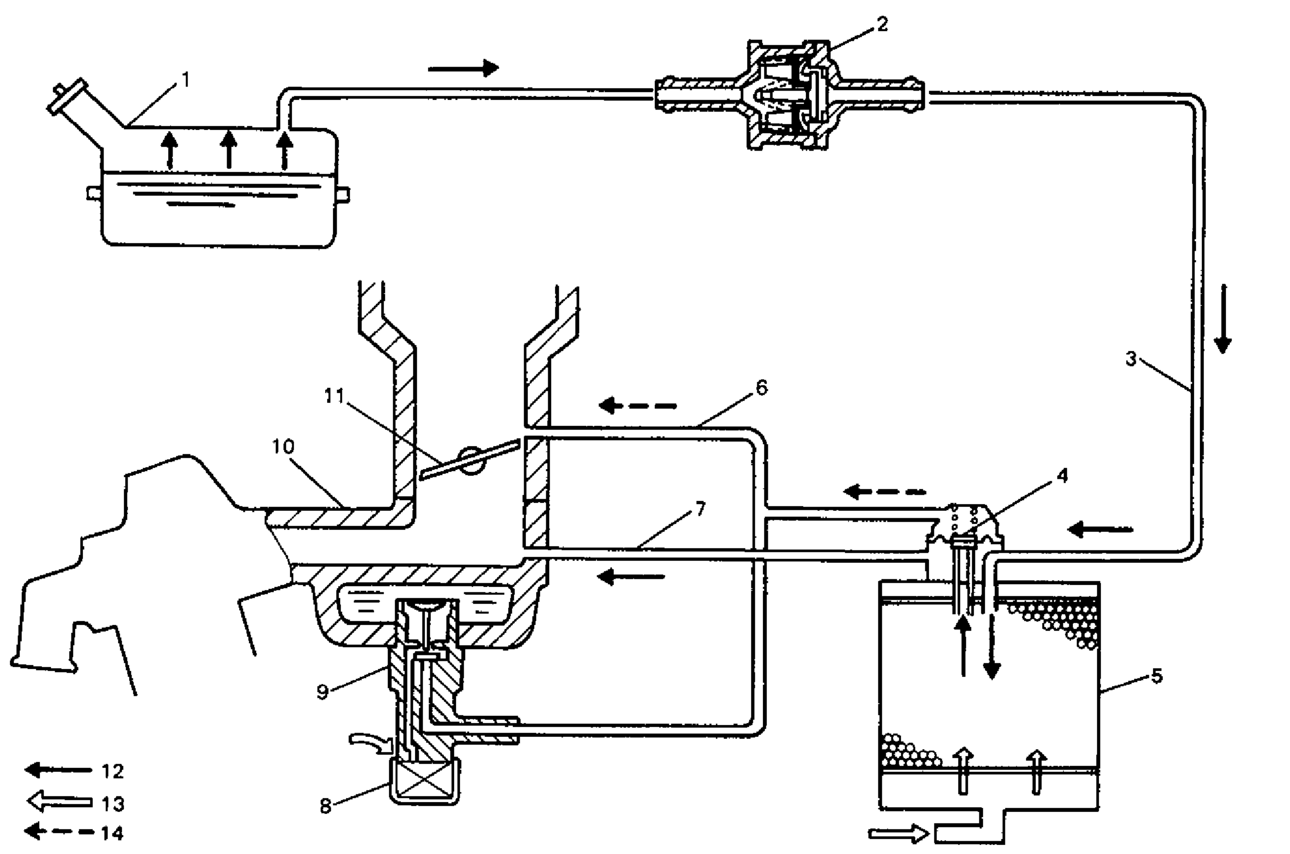
Fig. 6J1-2 PCV System Operation

EVAPORATIVE EMISSION CONTROL SYSTEM

An evaporative emission control system is used to prevent emission of fuel vapor.
The vapor generated in the fuel tank while driving or the engine at a stop passes through a 2-way check valve and enters the charcoal canister where the charcoal absorbs and stores the fuel vapor.
Only when the following conditions are all satisfied, throttle body vacuum is applied to canister purge control valve and the valve opens.

- Engine is running.
- Engine cooling water temperature is high. (Engine is warmed up)
- Throttle valve opens larger than idle position.

As a result, fuel vapor in the canister is sucked into intake manifold through purge control valve and purge line.
In this state, the canister is purged or cleaned by air drawn through the filter at the bottom of the canister.
When engine cooling water temperature is low, the vacuum signal line communicates with atmosphere through BVSV.
Therefore, throttle body vacuum is not applied to purge control valve, and the valve is closed. In this state, the canister is not purged.
The 2-way check valve is provided to keep the pressure in the fuel tank constant. When the pressure in the fuel tank becomes positive and reaches its specified value, it opens the valve to let the vapor flow into the charcoal canister. On the other hand, when the pressure in the fuel tank becomes negative and reaches its specified value, it opens the valve to let the air flow into the fuel tank.

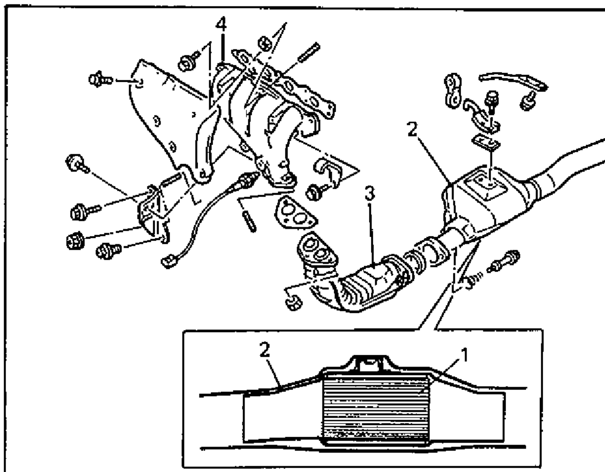


1. Fuel tank
2. 2-way check valve
3. Fuel vapor line
4. Purge control valve
5. Charcoal canister
6. Vacuum signal line
7. Purge line
8. Filter
9. BVSV
10. Intake manifold
11. Throttle valve
12. Fuel vapor
13. Air
14. Vacuum

Fig. 6J1-3 Evaporative Emission Control System

THREE-WAY CATALYST

The three-way catalyst is provided in the exhaust system (exhaust No. 2 pipe). The function of the catalyst is to reduce the emission of CO, HC and NOx in the exhaust gas by oxidizing or converting them into CO_2, H_2O and N_2 respectively.



1. Three-way catalyst
2. Exhaust No. 2 pipe
3. Exhaust No. 1 pipe
4. Exhaust manifold

Fig. 6J1-4 Catalytic Converter

ON CAR SERVICE

GENERAL

When the emission control hoses are disconnected and the system's component is removed for service, reinstall the component properly, and route and connect hoses correctly after service.

PCV SYSTEM

NOTE:

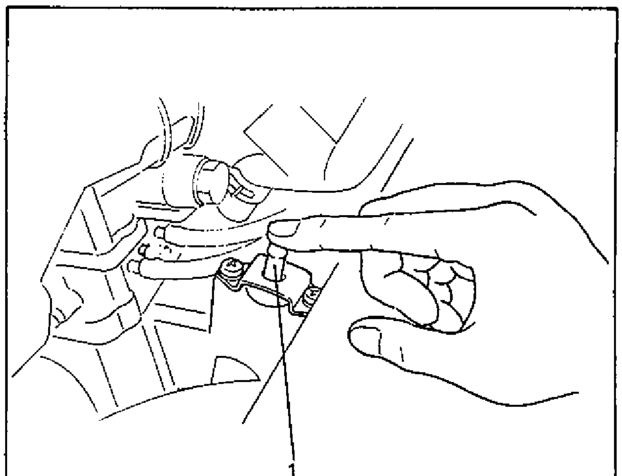
Be sure to check that there is no obstruction in PCV valve or its hoses before adjusting engine idle speed, for obstructed PCV valve or hose hampers its accurate adjustment.

PCV HOSE INSPECTION

Check hoses for connection, leakage, clog, and deterioration. Replace as necessary.

PCV VALVE INSPECTION

1. Disconnect PCV hose from PCV valve.
2. Run engine at idle.
3. Place your finger over end of PCV valve to check for vacuum. If there is no vacuum, check for clogged valve. Replace as necessary.



1. PCV valve

Fig. 6J1-5 Checking Vacuum

4. After checking vacuum, stop engine and check PCV valve for sticking.
   With engine stopped, connect a proper size hose to PCV valve for inspection.
   Blow air into the hose and check that air flows with difficulty from cylinder head side to intake manifold side. If air flows without difficulty, valve is stuck in "Open" position. Replace PCV valve.

WARNING:
Do not suck air through PCV valve. Petroleum substances inside the valve and fuel vapor inside the intake manifold are harmful.

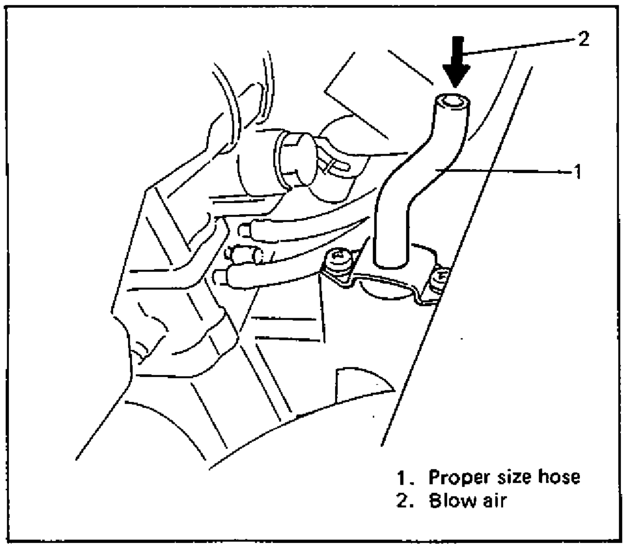


Fig. 6J1-6 Checking PCV Valve for Sticking

5. After removing the hose, connect PCV hose and clamp securely.

EVAPORATIVE EMISSION CONTROL SYSTEM

SYSTEM HOSE INSPECTION

Check hoses for connection, leakage, obstruction and deterioration. Replace as necessary.

CHARCOAL CANISTER INSPECTION

1. Disconnect hoses from canister.

WARNING:
DO NOT SUCK nozzles on canister. Fuel vapor inside canister is harmful.

2. When air is blown into "TANK" nozzle, air should come out from air nozzle located at the bottom of canister.

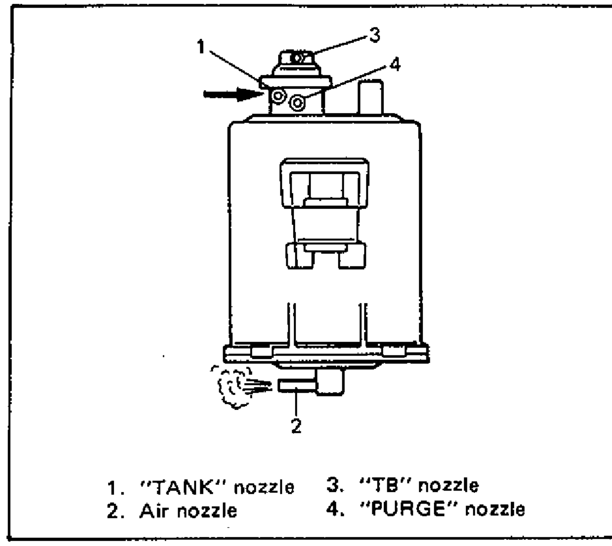


Fig. 6J1-7 Blowing "TANK" Nozzle

3. When air is blown into "PURGE" nozzle, no air should come out from other three nozzles due to closing of purge control valve.

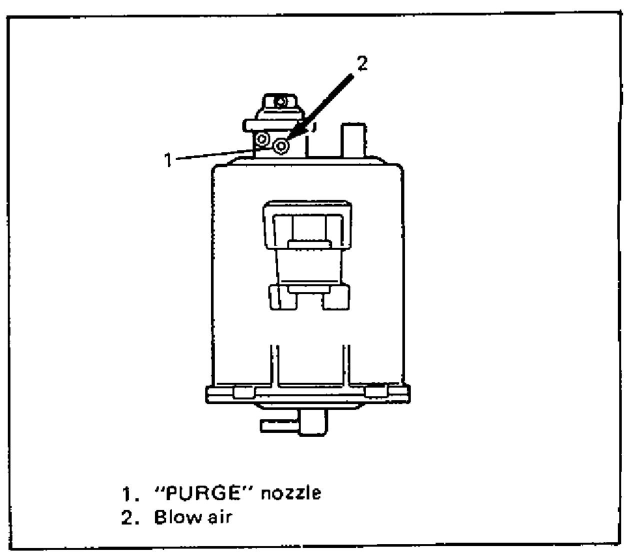


Fig. 6J1-8 Blowing "PURGE" Nozzle

4. When air is blown into "PURGE" nozzle while applying more than 80 mmHg vacuum to "TB" nozzle, air should come out from "TANK" nozzle and air nozzle located at the bottom of canister.

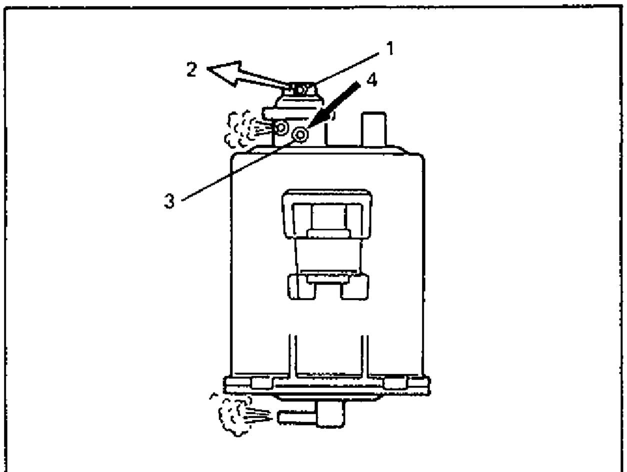


Fig. 6J1-9 Blowing "PURGE" Nozzle with Vacuum Applied to "TB" Nozzle

If operation differs from above description, charcoal canister must be replaced.

5. Connect hoses to canister.

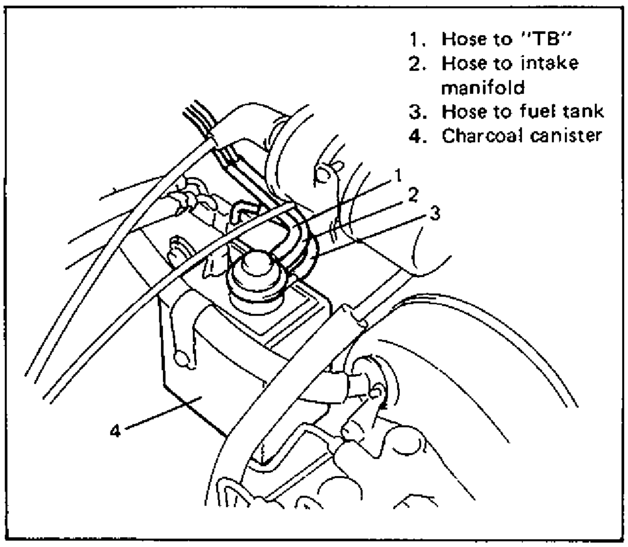


Fig. 6J1-10 Connecting Hoses

BI-METAL VACUUM SWITCHING VALVE (BVSV) INSPECTION

NOTE:

For the rough check of the operation, BVSV can be checked by warming up or cooling down the engine without being removed from the intake manifold.

The check procedure is the same as the following except items 1, 2 and 5.

1. Drain cooling system when engine is cold.
2. Remove ISC solenoid valve bracket from intake manifold and remove BVSV from intake manifold.
3. While keeping BVSV cool (below 45°C (113°F)), blow nozzle. Air should come out of filter.

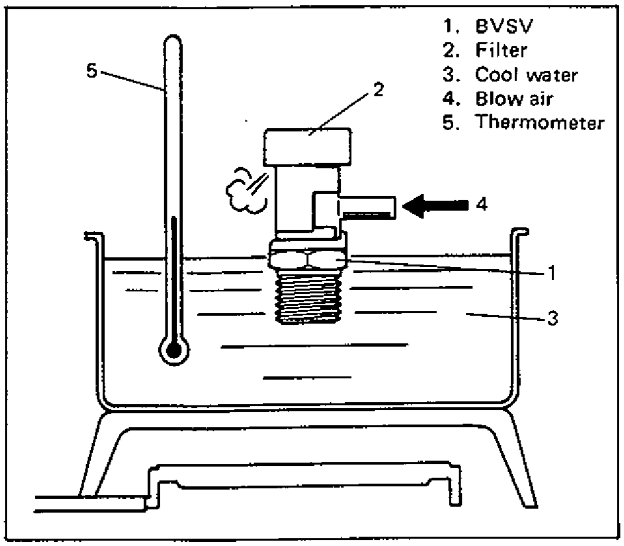


Fig. 6J1-11 Checking BVSV (1)

4. While keeping BVSV warm (above 60°C (140°F)) in hot water, blow nozzle. Air should not come out of filter.

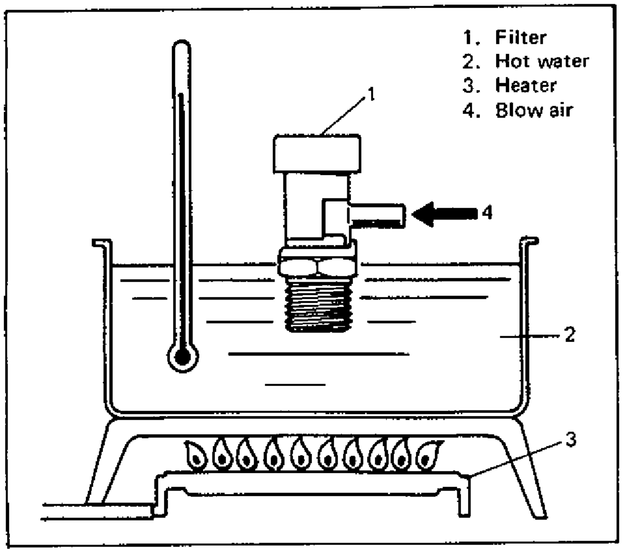


Fig. 6J1-12 Checking BVSV (2)

5. Reinstall BVSV to intake manifold. Before installing, wind sealing tape on its thread. Install ISC solenoid valve bracket to intake manifold.
6. Connect BVSV vacuum hose.

2-WAY CHECK VALVE

Removal

1. Remove fuel tank from body according to procedure described in section 6C.
2. Remove 2-way check valve from fuel tank.

Inspection

1. Blow hard from fuel tank side (black side of check valve), and air should pass through valve smoothly and come out from its orange side.
2. Blow only softly from orange side, and air should come out from black side.
3. If air doesn't pass through valve in step 1 or hard blow is required in step 2, replace 2-way check valve.

> **WARNING:**
> **DO NOT SUCK air through 2-way check valve. Fuel vapor inside the valve is harmful.**

Installation

Reverse removal sequence to install 2-way check valve.

When connecting check valve between hoses, refer to below figure for installing direction.

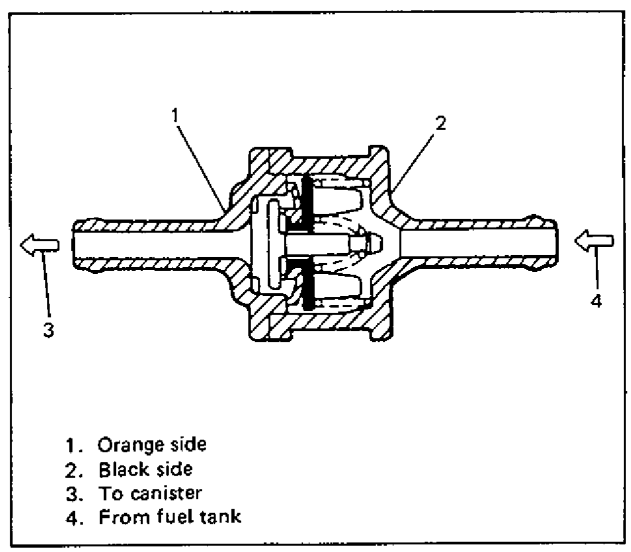


Fig. 6J1-13 2-Way Check Valve

SECTION 6K

EXHAUST SYSTEM

CONTENTS

GENERAL DESCRIPTION 6K-1
MAINTENANCE 6K-2
ON CAR SERVICE 6K-2

NOTE:
Whether being equipped with catalytic converter or not depends on regulations of each country.

GENERAL DESCRIPTION

The exhaust system consists of an exhaust manifold, an exhaust No. 1 pipe, an exhaust No. 2 pipe, a muffler, a tail pipe, and seals and gasket etc., and fuel injection model has the catalytic converter in the exhaust No. 2 pipe.
The catalytic converter is an emission control device added to the exhaust system to lower the level of Hydrocarbon (HC), Carbon Monoxide (CO) and Oxides of Nitrogen (NOx) in the exhaust gas.

The catalyst in the catalytic converter is of "Three way" type.

CAUTION:
Be sure to use UNLEADED FUEL for the catalytic converter equipped vehicle. Use of LEADED FUEL will affect performance of the catalytic converter adversely to a great extent.

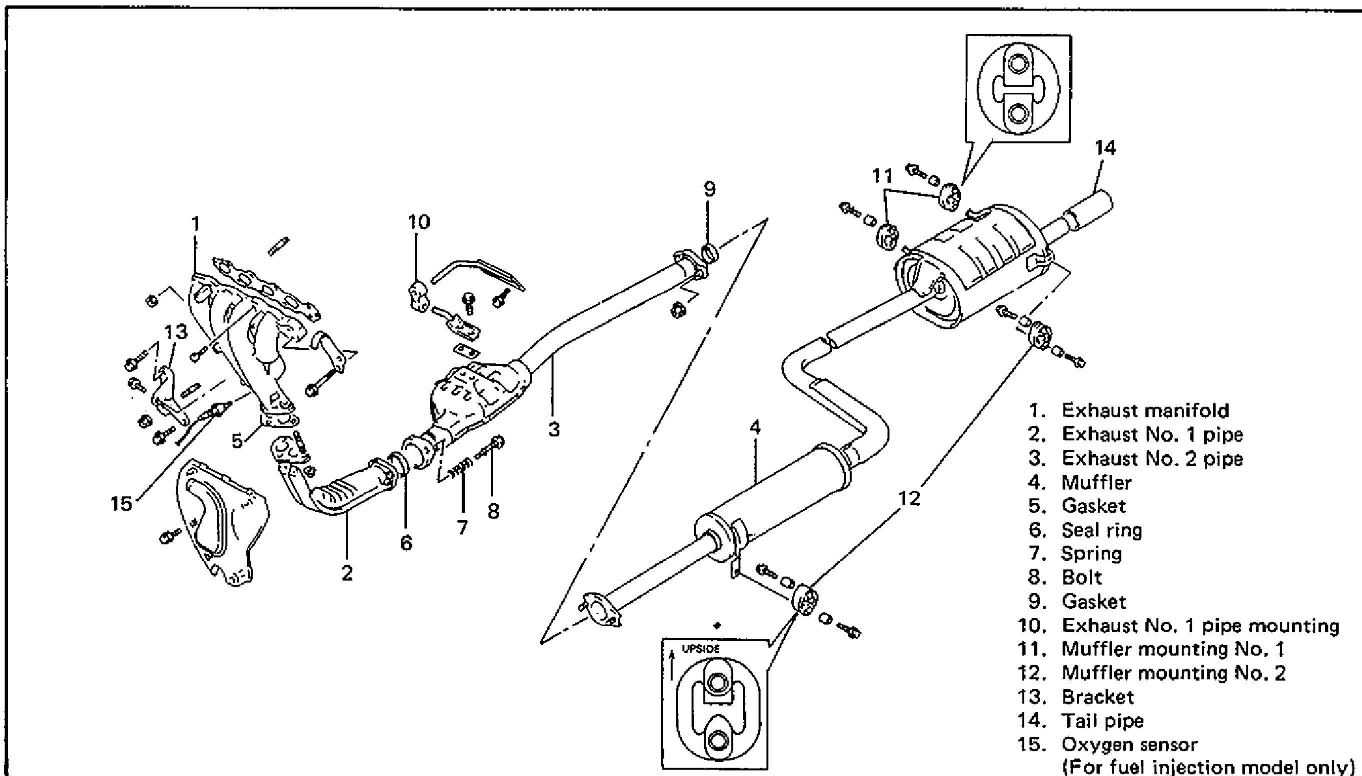


Fig. 6K-1 Exhaust System

MAINTENANCE

> **WARNING:**
> **To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.**

At every interval of periodic maintenance service, and when car is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connection, dent and damage.
  If bolts or nuts are loosened, tighten them to specified torque. Refer to "ON CAR SERVICE" for torque data.
- Check nearby body areas for damaged, missing, or mispositioned part, open seam, hole, loose connection or any other defect which could permit exhaust fumes to seep into car.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

ON CAR SERVICE

- Refer to Section 6A for removal and installation procedures of exhaust manifold.
- For replacement of exhaust No. 1 pipe, exhaust No. 2 pipe, muffler, tail pipe or any part used to mount or connect them, be sure to hoist car and observe WARNING given at the left of this page.

> **CAUTION:**
> **As exhaust No. 2 pipe has catalytic converter in it, it should not be exposed to any impulse. Be careful not to drop it or hit it against something.**

- When exhaust manifold is removed, check gaskets and seal for deterioration or damage. Replace them as necessary.
- Tighten bolts and nuts to specified torques when reassembling.
  Refer to Fig. 6K-2 for location of bolts and nuts.
- There are two types of muffler mounting.
  Refer to Fig. 6K-1 for their correct use.

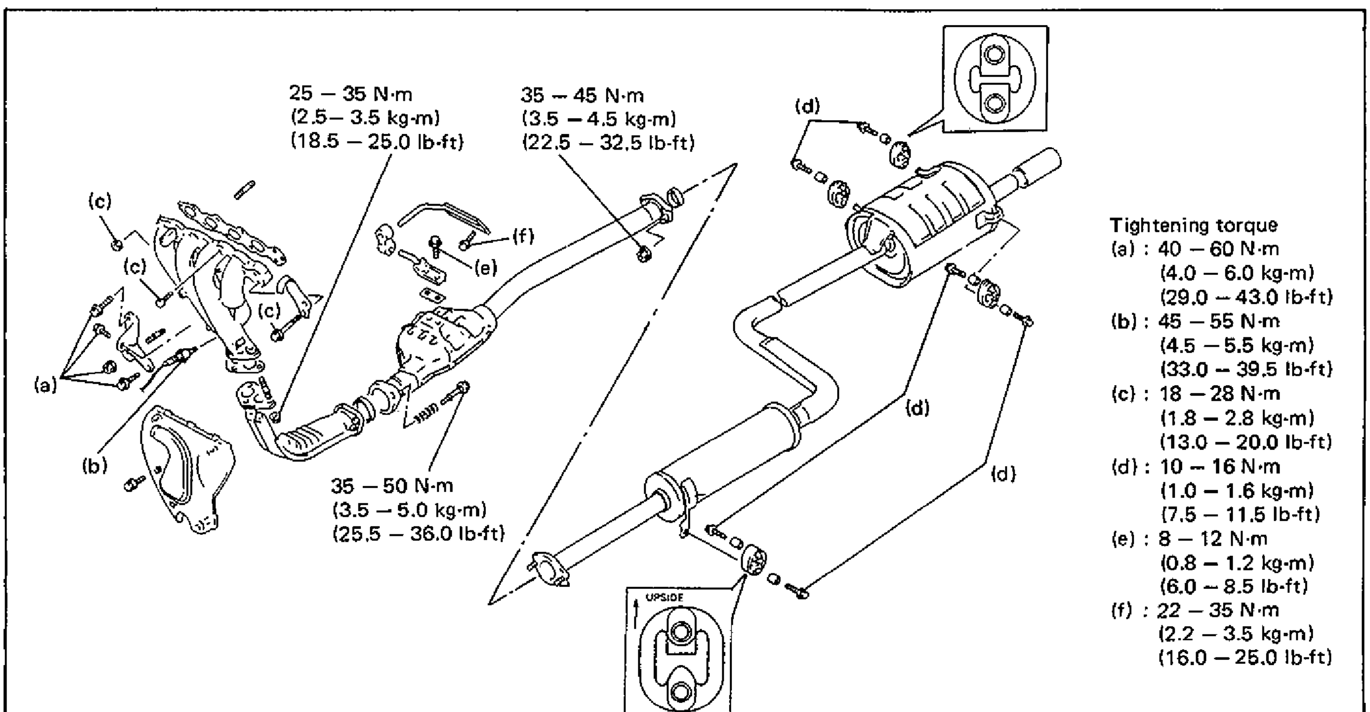


Fig. 6K-2 Recommended Torque Specification

SECTION 7A

MANUAL TRANSMISSION

CONTENTS

GENERAL DESCRIPTION 7A- 1
DIAGNOSIS 7A- 6
ON-CAR SERVICE 7A- 7
- Oil Change 7A- 7
- Differential Side Oil Seal 7A- 7
- Gear Shift Control 7A- 9
- Speedometer Driven Gear 7A-10

UNIT REPAIR OVERHAUL 7A-11
- Dismounting of Transmission 7A-11
- Remounting 7A-12
- Disassembling Unit 7A-13
- Sub Assembly Service 7A-16
  - Right case 7A-16
  - Left case 7A-17
  - Input shaft assembly 7A-17
  - Countershaft assembly 7A-20
  - Gear shifter 7A-24
  - Differential assembly 7A-25
- Assembling Unit 7A-27
  - Differential to left case 7A-27
  - Fifth gears.................... 7A-29
  - Gear shift & select shaft assembly . 7A-32

RECOMMENDED TORQUE SPECIFICATIONS 7A-34
REQUIRED SERVICE MATERIALS .. 7A-35
SPECIAL TOOLS 7A-35

GENERAL DESCRIPTION

CONSTRUCTION AND SERVICING

The transmission provides five forward speeds and one reverse speed by means of three synchronizers and three shafts — input shaft, countershaft and reverse gear shaft. All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.

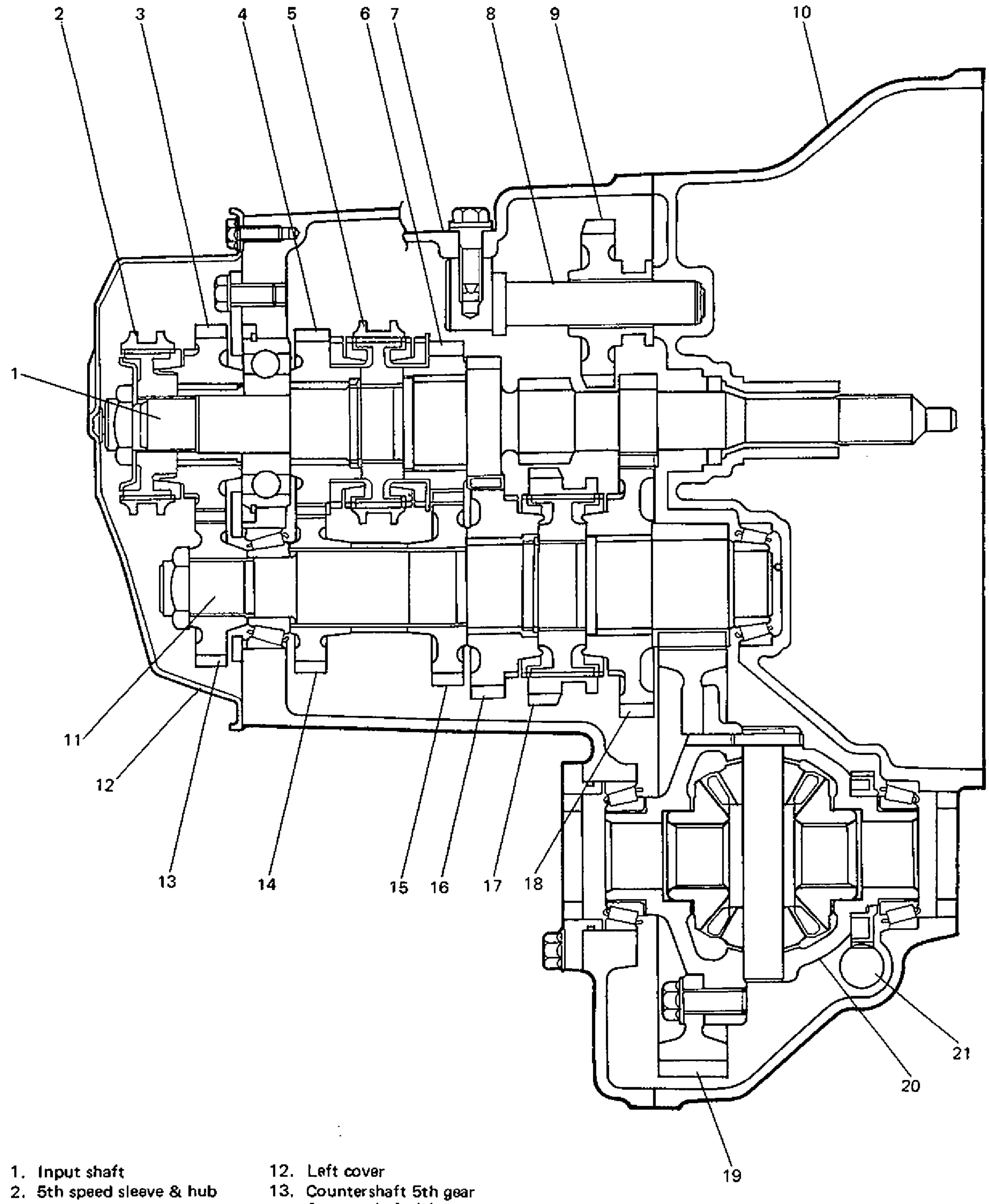
The low speed synchronizer is mounted on counter shaft and engaged with counter shaft first gear or second gear, while the high speed synchronizer is done on input shaft and engaged with input shaft third gear or fourth gear.

The fifth speed synchronizer on input shaft is engaged with input shaft fifth gear mounted on the input shaft.

The countershaft turns the final gear and differential assembly, thereby turning the front drive shafts which are attached to the front wheels.

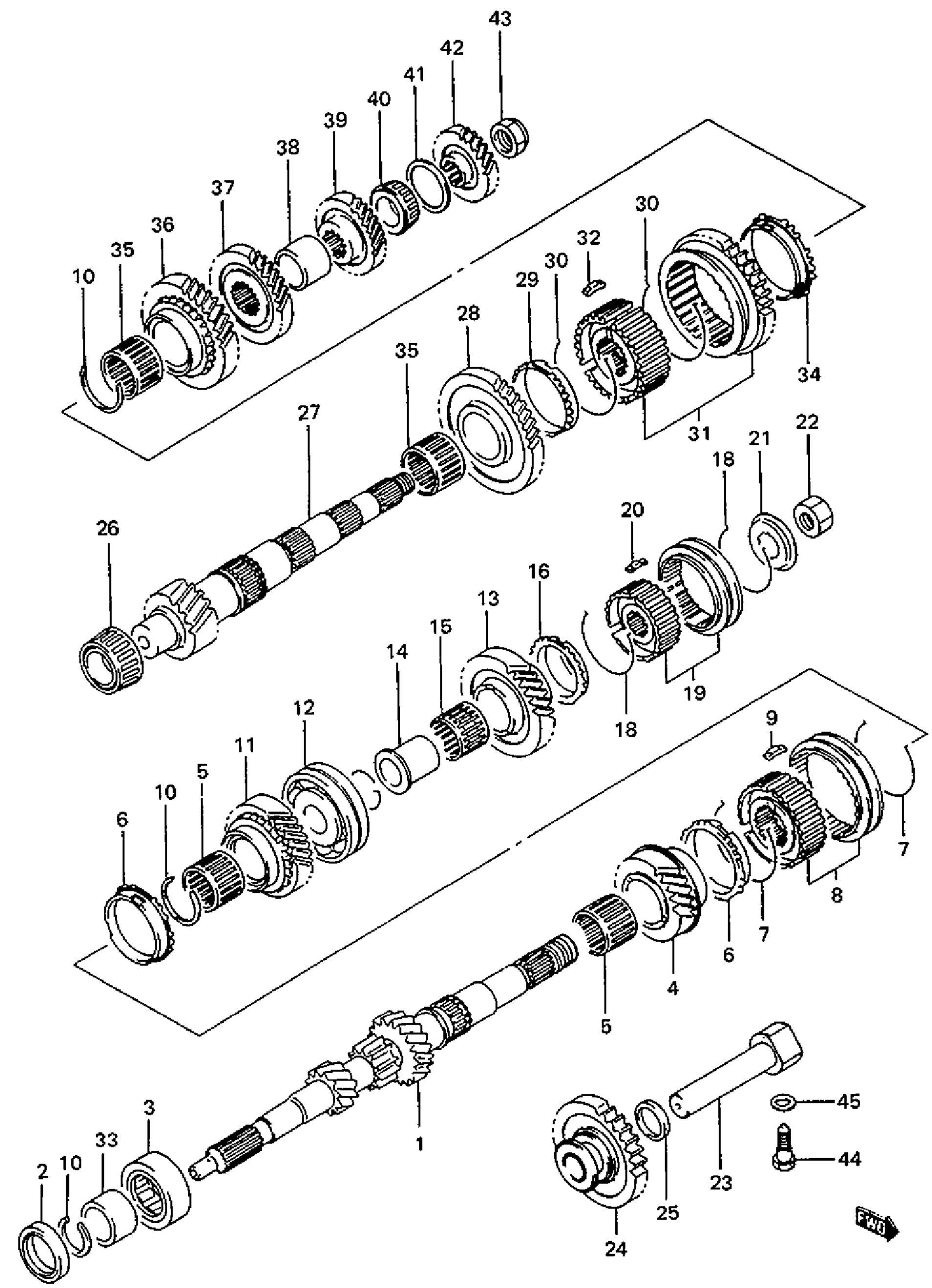
For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transmission case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

Further, care must be taken to adjust preload of counter shaft taper roller bearings. New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.



1. Input shaft
2. 5th speed sleeve & hub
3. Input shaft 5th gear
4. Input shaft 4th gear
5. High speed sleeve & hub
6. Input shaft 3rd gear
7. Left case
8. Reverse (REV) gear shaft
9. Reverse (REV) idler gear
10. Right case
11. Countershaft
12. Left cover
13. Countershaft 5th gear
14. Countershaft 4th gear
15. Countershaft 3rd gear
16. Countershaft 2nd gear
17. Low speed sleeve & hub
18. Countershaft 1st gear
19. Final gear
20. Differential case
21. Speedometer driven gear

Fig. 7A-1 Manual Transmission Cutaway



1. Input shaft
2. Oil seal
3. Input shaft R bearing
4. Input shaft 3rd gear
5. 3rd & 4th gear bearing
6. High speed synchronizer ring
7. High speed synchronizer spring
8. High speed sleeve & hub
9. High speed synchronizer key
10. Circlip
11. Input shaft 4th gear
12. Input shaft L bearing
13. Input shaft 5th gear
14. 5th gear spacer
15. 5th gear bearing
16. 5th speed synchronizer ring
17. Blank
18. 5th synchronizer spring
19. 5th speed sleeve & hub
20. 5th synchronizer key
21. 5th synchronizer hub plate
22. Nut
23. Reverse (REV) gear shaft
24. Reverse (REV) idler gear
25. Reverse (REV) shaft washer
26. Countershaft R bearing
27. Countershaft
28. Countershaft 1st gear
29. 1st gear synchronizer ring
30. Low speed synchronizer spring
31. Low speed sleeve & hub
32. Low speed synchronizer key
33. Spacer
34. 2nd gear synchronizer ring
35. 1st & 2nd gear bearing
36. Countershaft 2nd gear
37. Countershaft 3rd gear
38. 3rd & 4th gear spacer
39. Countershaft 4th gear
40. Countershaft L bearing
41. Bearing set shim
42. Countershaft 5th gear
43. Countershaft nut
44. Reverse shaft bolt
45. Washer

Fig. 7A-2 Manual Transmission Exploded View

GEAR SHIFT MECHANISM

The gear shifting control system consists of following main parts. Movement of gear shift control lever is transmitted to gear shift & select shaft through gear shift and gear select cables.

1. Gear shift cable
2. Gear select cable
3. Gear select lever
4. Gear sihft lever
5. 5th & reverse gear shift cam
6. High speed shift fork
7. Low speed gear sihft fork
8. 5th gear shift fork
9. Reverse gear shift lever
10. 5th & reverse gear shift guide shaft
11. 5th & reverse gear shift shaft
12. Gear shift & select shaft
13. 5th-reverse gear shift lock guide bolt
14. Speed meter driven gear
15. Gear shift interlock bolt
16. Gear shift & select lever
17. Low speed gear shift shaft
18. High speed gear shift shaft

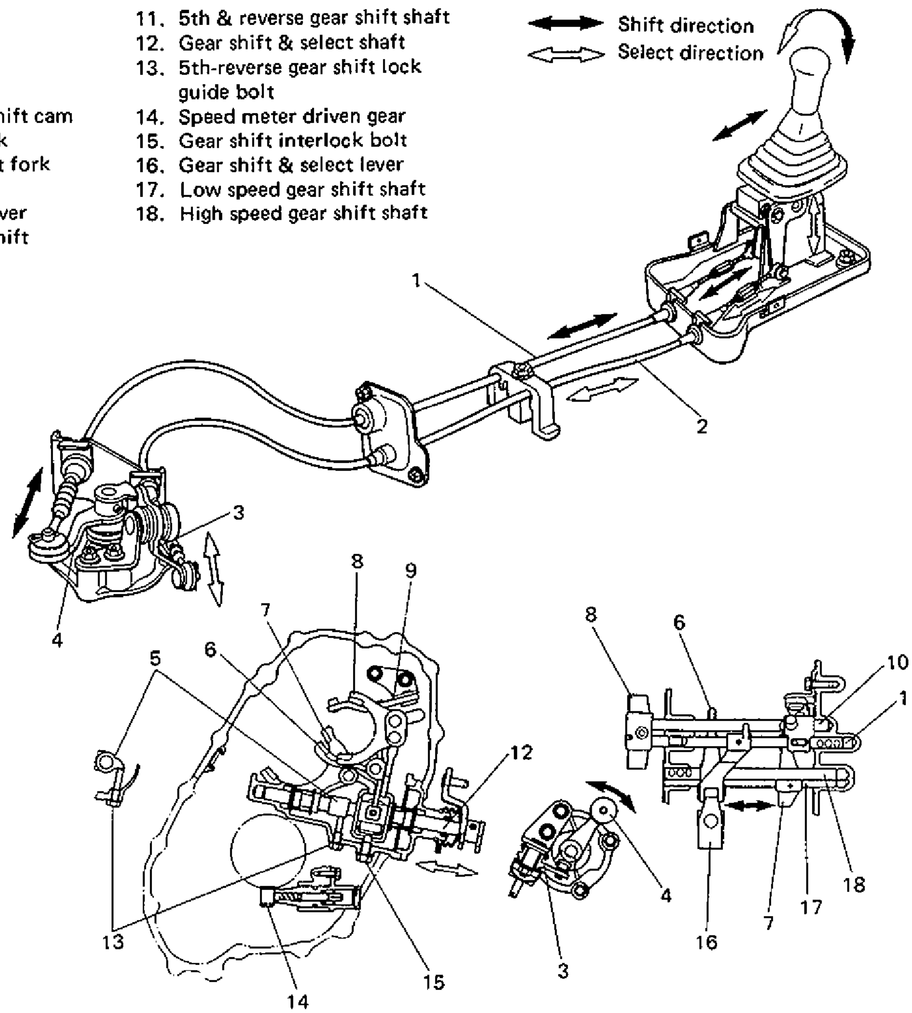


Fig. 7A-3 Gear Shifting Mechanism

5TH & REVERSE GEAR SHIFT CAM

5th & reverse gear shift cam, cam guide return spring and 5th to reverse interlock guide bolt are provided to prevent the gear from being directly shifted from 5th to reverse.

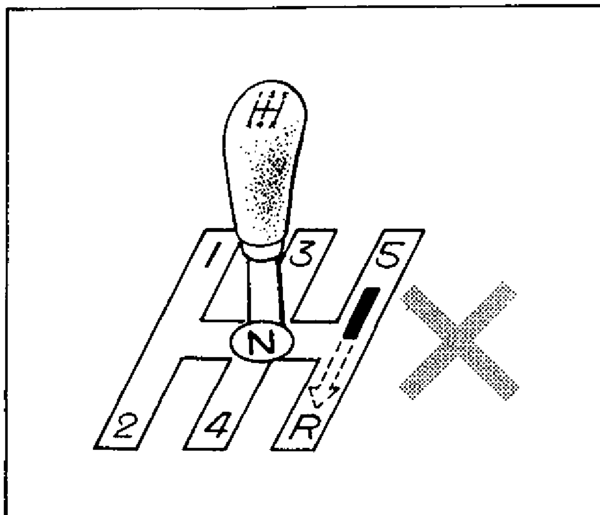
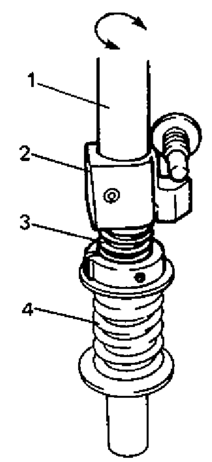


Fig. 7A-4 Gear Shifting Pattern

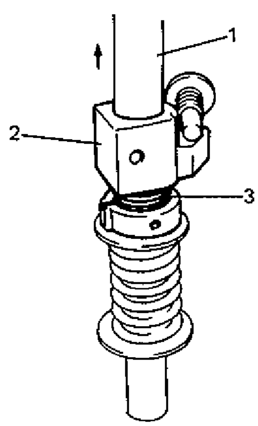
1. When shift lever is at neutral position between 3rd and 4th gear, shift cam is under guide bolt and can turn freely clockwise (to 3rd gear) and counterclockwise (to 4th gear).



1. Shift & select shaft
2. Shift cam
3. Return spring (expanded)
4. Reverse select spring (expanded)

Fig. 7A-5 Neutral of 3rd – 4th Position

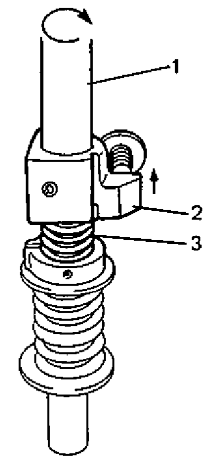
2. When shift lever is shifted toward the right from neutral position, shift and select shaft moves up but shift cam is restricted by guide bolt and return spring is contracted.



1. Shift & select shaft
2. Shift cam
3. Reverse select spring (contracted)

Fig. 7A-6 Neutral of 5th – REV Position

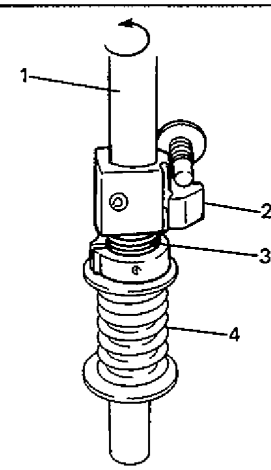
3. When shift lever is shifted to 5th gear, shift & select shaft turns clockwise letting shift cam off from guide bolt and pushed up by return spring. In this state, movement of shift cam is restricted by guide bolt and therefore, gear-shift to reverse is not attainable.



1. Shift & select shaft
2. Shift cam
3. Reverse select spring (contracted)

Fig. 7A-7 Shifted in 5th Speed

4. When shift lever is shifted from neutral position between 5th gear and reverse gear to reverse gear, shift cam turns counterclockwise to a tain reverse gear.



1. Shift & select shaft
2. Shift cam
3. Return spring (contracted)
4. Reverse select spring (contracted)

Fig. 7A-8 Shifted in Reverse

DIAGNOSIS

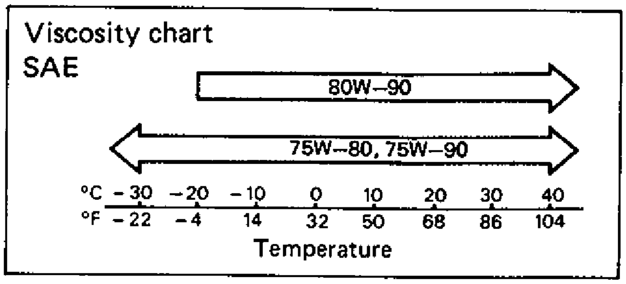
Condition	Possible cause	Correction
Gears slipping out of mesh	• Worn shift fork shaft	Replace
	• Worn shift fork or synchronizer sleeve	Replace
	• Weak or damaged locating springs	Replace
	• Worn bearings on input shaft or countershaft	Replace
	• Worn chamfered tooth on sleeve and gear	Replace sleeve and gear
Hard shifting	• Inadequate lubricant	Replenish
	• Improper clutch pedal free travel	Replace clutch arm or master cylinder
	• Distorted or broken clutch disc	Replace
	• Damaged clutch pressure plate	Replace clutch cover
	• Worn synchronizer ring	Replace
	• Worn chamfered tooth on sleeve or gear	Replace sleeve or gear
	• Worn gear shift control shaft joint bush	Replace
	• Distorted shift shaft	Replace
Noise	• Inadequate or insufficient lubricant	Replenish
	• Damaged or worn bearing(s)	Replace
	• Damaged or worn gear(s)	Replace
	• Damaged or worn synchronizer parts	Replace

ON-CAR SERVICE

OIL CHANGE

1. Before changing or inspecting oil, be sure to stop engine and lift car horizontally.
2. With car lifted up, check oil level and leakage. If leakage exists, correct it.
3. Drain old oil and fill new specified oil as in the following table by specified amount (up to level hole).
4. Torque drain and level/filler plugs as specified below. Apply sealant to drain plug before installation.

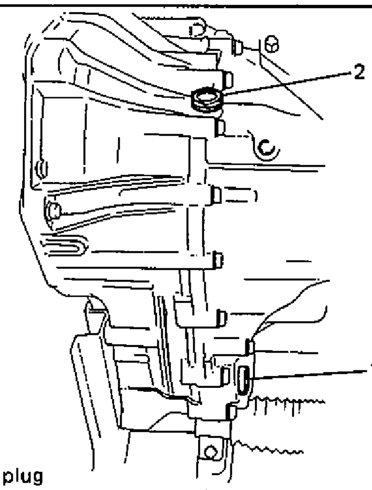
NOTE:
- It is recommended to use API GL-4 SAE 75W-90 gear oil.
- **Whenever car is hoisted for any other service work than oil change, also be sure to check for oil leakage.**



Oil specification	API GL-4 or API GL-5 For SAE classification, refer to above viscosity chart.

Oil capacity	2.2 liters 4.7/3.9 US/Imp. pt

Tightening torque	N·m	kg-m	lb-ft
Filler/level plug	36 – 54	3.6 – 5.4	26.5 – 39.0
Drain plug	25 – 30	2.5 – 3.0	18.5 – 21.5



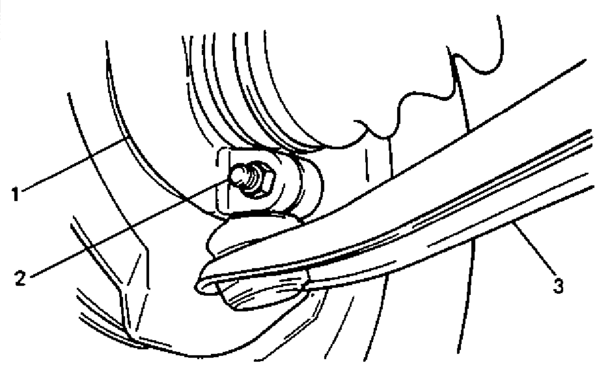
1. Oil drain plug (Apply sealant for installation.)
2. Oil level/filler plug

Fig. 7A-9 Changing Transmission Oil

DIFFERENTIAL SIDE OIL SEAL

REPLACEMENT

1. Lift up car and drain transmission oil.
2. Remove ball stud bolt and nut, and then separate suspension arm from knuckle.



1. Knuckle
2. Ball stud bolt and nut
3. Suspension arm

Fig. 7A-10 Detaching Suspension Arm from Knuckle

3. • In case of left side oil seal removal:
By using large size screwdrivers, pull out left side drive shaft joint so as to release snap ring fitting of joint spline at differential side. Remove bearing retainer.

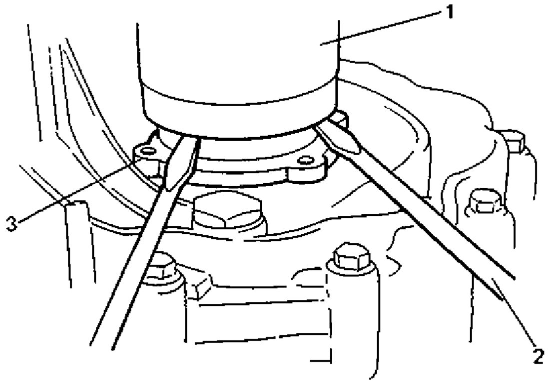


Fig. 7A-11 Detaching Left Side Drive Shaft Joint from Differential Gear

- In case of right side oil seal removal:
After removing center bearing support bolts, pull out center drive shaft from differential gear.

4. Pushing knuckle portion outward, detach drive shaft at differential side.
5. Remove oil seal and install a new one until it becomes flush with case surface by using special tool and hammer.

NOTE:
When install oil seal, face its spring side inward.

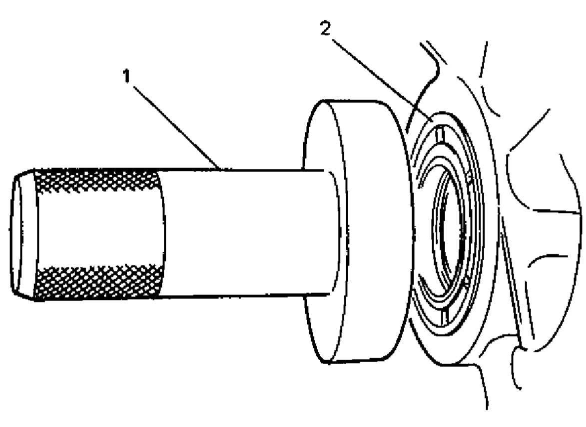


Fig. 7A-12 Installing Differential Side Oil Seal

6. Apply grease to oil seal lip and at the same time check drive shaft where oil seal contacts and make sure of its smoothness.
7. Insert left side drive shaft joint or center drive shaft to differential gear.
With right side drive shaft, install center bearing support.

Tightening torque of support bolt	N·m	kg·m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

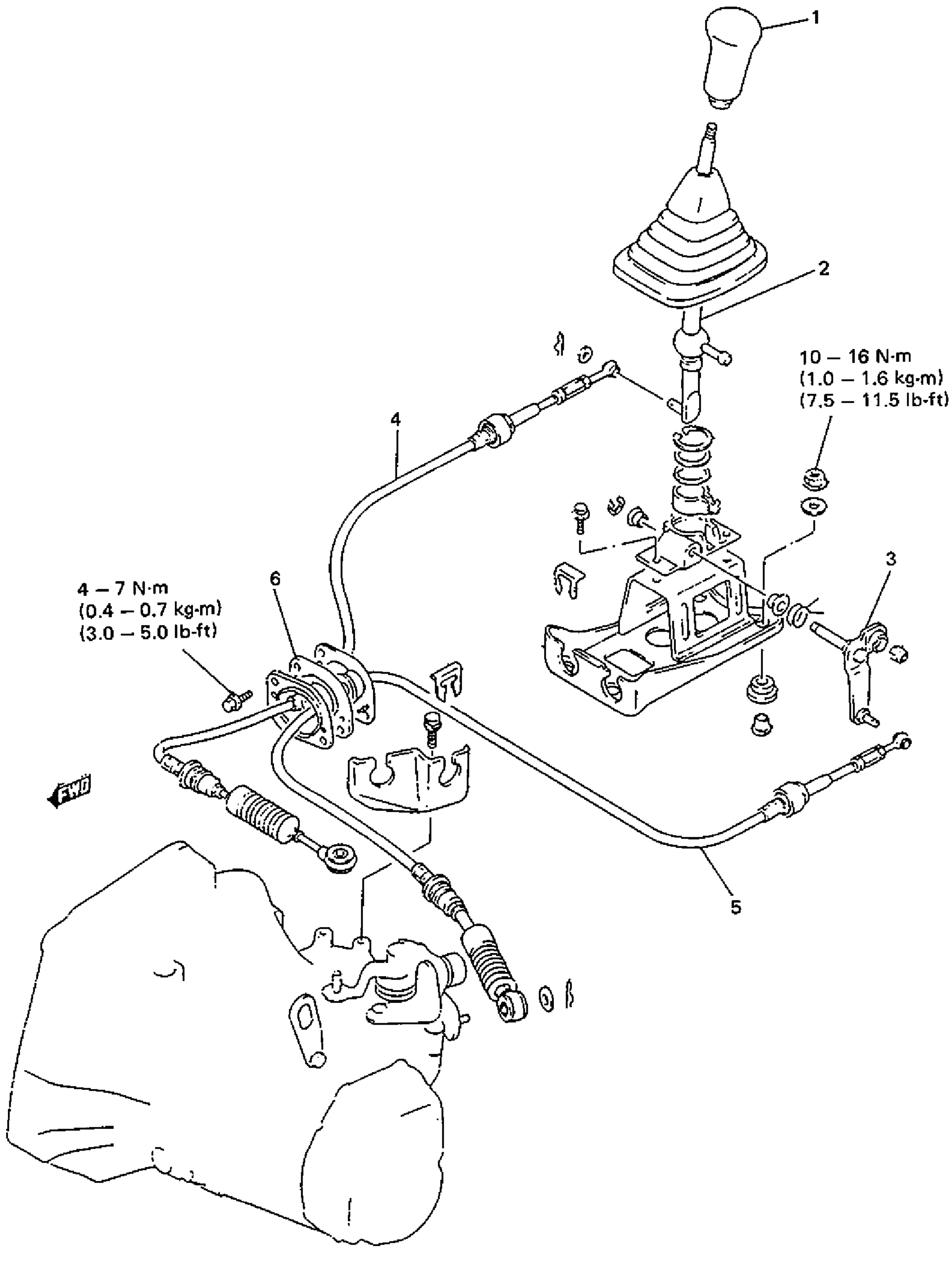
CAUTION:
- **Be careful not to scratch oil seal lip with drive shaft joint while inserting.**
- **Make sure to insert drive shaft joint fully and seat its snap ring as it was.**
- **Do not hit joint boot with hammer or the like. Nothing but hands is allowed to use when inserting joint.**

8. Connect ball stud with knuckle and fasten with bolt to specification.

Tightening torque	N·m	kg·m	lb-ft
Ball stud bolt and nut	50 – 70	5.0 – 7.0	36.5 – 50.5

9. Fill transmission oil as specified and make sure that oil has been sealed with oil seal.

GEAR SHIFT CONTROL



1. Gear shift control lever knob
2. Gear shift control lever
3. Gear shift control arm
4. Gear shift control cable
5. Gear select control cable
6. Gear shift control guide

Fig. 7A-13 Gear Shift Control Components

REMOVAL

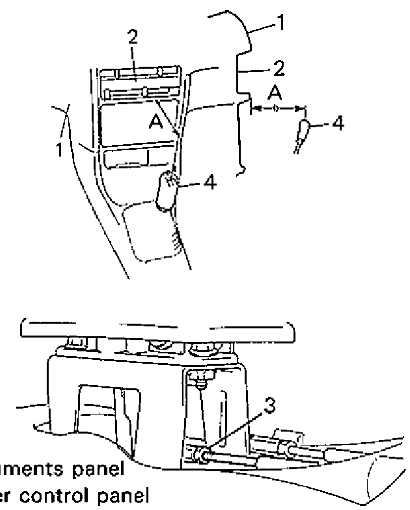
1. Remove console box and E-ring.
2. Remove shift control and select control cables.
3. Remove gear control guide.

INSTALLATION

Reverse removal procedure for installation and note as follows.

- Adjustment of shift cable.
  With shift lever in NEUTRAL position, adjust shift cable adjusting nut so that distance "A" between edge of instrument panel and center of shift knob measured as shown below is 215 mm.

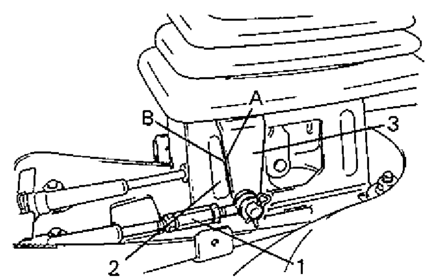
A: 215 mm (8.5 in.)
at shift lever neutral position



1. Instruments panel
2. Heater control panel
3. Shift cable adjusting nut
4. Control lever knob

Fig. 7A-14

- Adjustment of select cable.
  With shift lever in NEUTRAL position, adjust select cable adjusting nut so that front side end surface (A) of select arm and rear side line of rib (B) are aligned.



1. Select cable adjusting nut
2. Rib
3. Select arm

Fig. 7A-15

SPEEDOMETER DRIVEN GEAR

REMOVAL

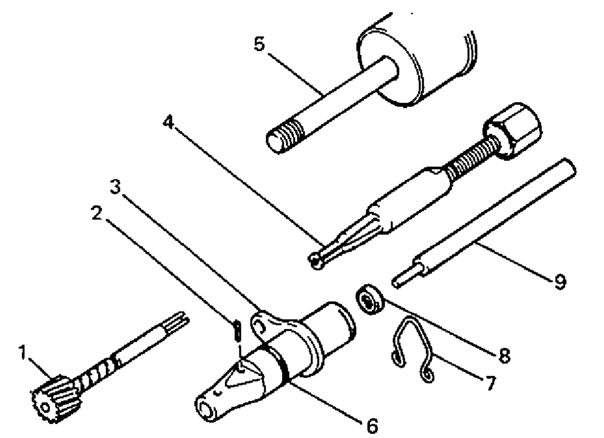
1. Pull up speedometer cable boot, pull out speedometer case clip and then disconnect speedometer cable from case.
2. Remove bolt and pull out speedometer driven gear case assembly by hand.
3. Using pin remover of 2.8 – 3.0 mm (0.11 in) diameter, drive out spring pin and then take out speedometer driven gear.
4. Remove oil seal by using special tools (Bearing remover and sliding hammer) holding flat portion of driven gear case by soft jawed vise.

INSTALLATION

1. Apply grease to a new oil seal and install it to case bore up to the bottom with its spring side facing down. Valve guide remover may be used for installation.
2. Check driven gear for abnormal wear or distortion and insert good one into case after applying oil.
3. Install spring pin supporting flat portion of case by wood block, and then make sure that gear rotates smoothly.
4. Check O-ring and case surface for their flawlessness, apply oil to O-ring and then install case assembly to transmission.
5. Connect cable, set case clip and boot as they were.

CAUTION:
- Do not compress oil seal excessively so as to prevent its distortion.
- Never hit driven gear and gear case.
- While inserting case assembly into transmission, rotate driven gear by using small screwdriver so that gear will mesh smoothly.
- Never push or hit slit portion of case when installing it to transmission.

Tightening torque for case bolt	N·m	kg-m	lb-ft
	4 – 7	0.4 – 0.7	3.0 – 5.0



1. Speedometer driven gear
2. Spring pin
3. Driven gear case
4. Special tool (Bearing remover 09917-58010)
5. Special tool (Sliding shaft 09930-30102)
6. O ring
7. Case clip
8. Oil seal
9. Special tool (Valve guide remover 09916-46010)

Fig. 7A-16 Speedometer Driven Gear

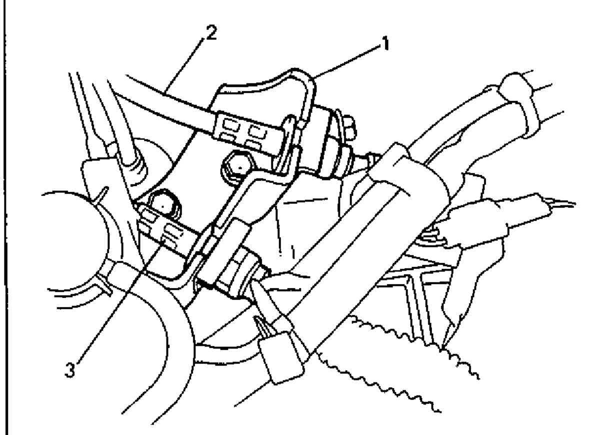
6. Make sure that oil level is as specified.

UNIT REPAIR OVERHAUL

DISMOUNTING OF TRANSMISSION

UNDER HOOD

1. Disconnect battery ground cable and then remove battery and its tray.
2. Remove clutch operating cylinder from M/T.
3. Remove E-ring, shift and select cables from control cable bracket.



1. Transmission cable bracket
2. Select control cable
3. Gear shift control cable

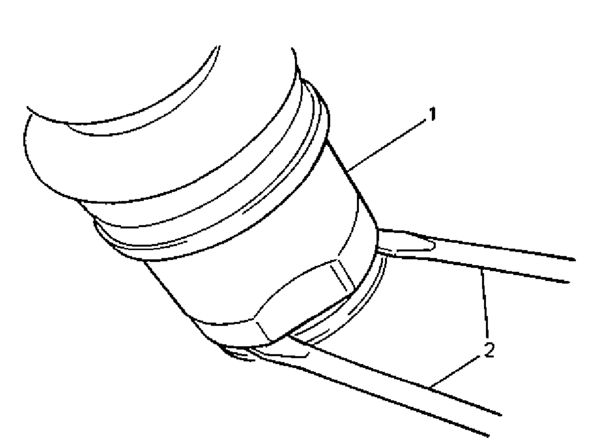
Fig. 7A-18 Removing Rear Portion

4. Undo wiring harness clamps and couplers.
5. Take off speedometer cable boot, speedometer case clip and then speedometer cable from case.
6. Remove transmission fastening bolts.
7. Remove starter taking out its 2 bolts. Starting motor plate should also come down.
8. Hook chain between engine and strut support and prevent engine from being declined excessively at removal of mounting supports.

ON LIFT

1. Drain transmission oil.
2. Remove left front wheel and left side fender apron extension.
3. Remove exhaust pipe No.1 and No.2.

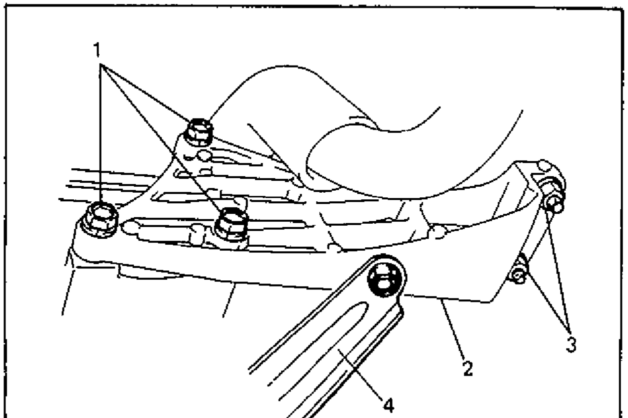
4. Remove transmission lower stiffener and clutch housing lower plate.
5. Remove ball stud bolt and nut from right and left knuckles, then disconnect each suspension arm.
6. By using large size screwdrivers, pull out left drive shaft joints at differential side so as to release snap ring fitting of joint.



1. Drive shaft joint (LH)
2. Screwdriver

Fig. 7A-19 Detaching Snap Ring From Differential

7. Remove transmission to engine bolt and nut.
8. Support transmission with transmission jack.
9. Remove engine rear torque bush bolt and engine rear mounting bracket.
10. Remove center bearing support bolts and then draw out center shaft from differential side gear.
11. Remove engine mounting LH bracket and its stiffener.



1. Bolt
2. Engine mounting LH bracket
3. Nut
4. Stiffener

Fig. 7A-20 Removing LH Mounting Bracket

12. Check all around transmission for any other parts required to be removed or disconnected for removal of transmission and remove or disconnect whatever necessary.
13. Pull transmission out so as to disconnect input shaft from clutch disc and then lower it.

REMOUNTING

For remounting, reverse dismounting procedure. Use specified torque as given below.

Tightening torque	N·m	kg-m	lb-ft
• Transmission to engine bolts and nuts • Engine rear mounting bracket bolts • Engine mounting LH bracket bolts • Center bearing support bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
Engine mounting LH bracket nuts	50 – 60	5.0 – 6.0	36.5 – 43.0
Ball stud bolt and nut	50 – 70	5.0 – 7.0	36.5 – 50.5
Extension rod nut	25 – 40	2.5 – 4.0	18.5 – 28.5
Gear shift control shaft bolt and nut	15 – 20	1.5 – 2.0	11.0 – 14.5
Exhaust pipe to manifold nuts	25 – 35	2.5 – 3.5	18.5 – 25.0

- When installing engine mounting LH bracket bolt (upper side), apply sealant (SUZUKI BOND NO. 1215) to thread part.
- Push in each drive shaft joint fully so as to snap ring of shaft engages with differential gear.

NOTE:
Apply grease to gear shift control shaft bushes, however, DO NOT lubricate extension rod bush.

CAUTION:
- **Care should be taken not to scratch oil seal lip with drive shaft while raising transmission.**
- **Do not hit drive shaft joint with hammer when installing it into differential gear.**

- Set each clamp for wiring securely.
- If clutch operating cylinder has been replaced or disconnected from clutch hose, bleed air from system and check clutch pedal free travel. (Refer to SECTION 7C1).

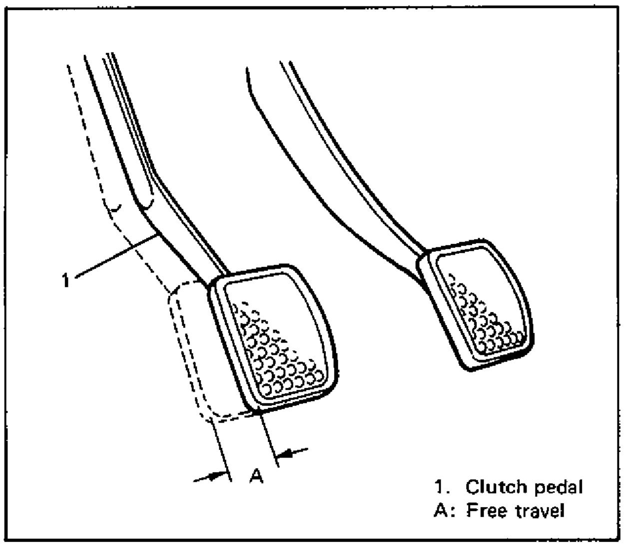


Fig. 7A-21 Adjusting Clutch Play

- Fill transmission with oil as specified.
- Connect battery and check function of engine, clutch and transmission.

DISASSEMBLING UNIT

1. Remove gear shift interlock bolt and 5th to REV interlock guide bolt from transmission case.
2. Remove gear shift & select shaft assembly.

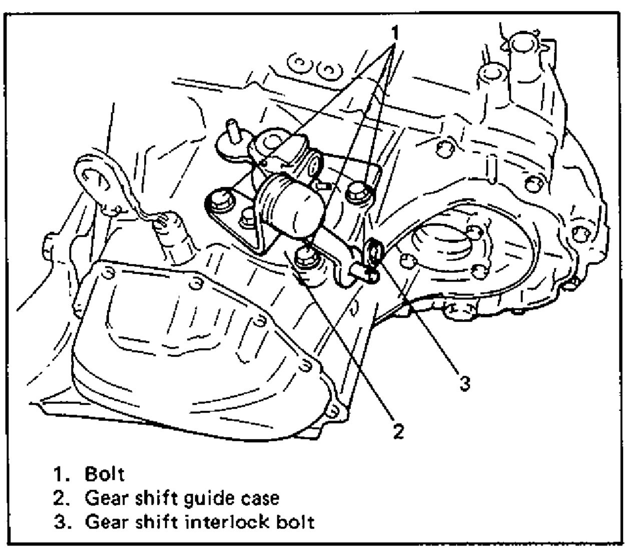


Fig. 7A-22

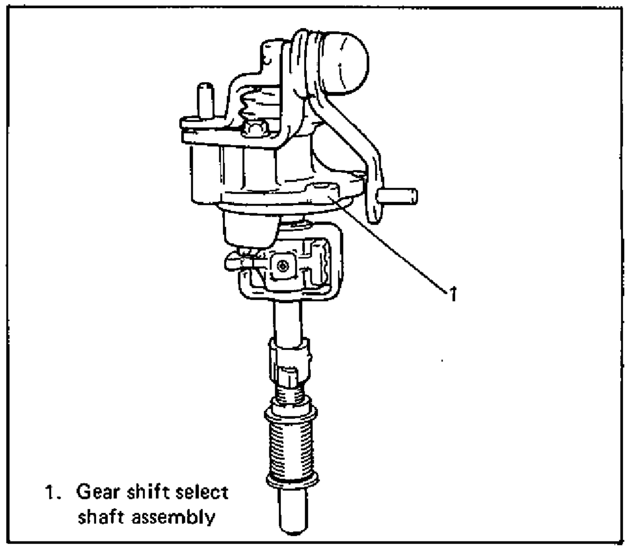


Fig. 7A-23

3. Remove transmission side cover.

> **CAUTION:**
> **Care should be taken not to distort side cover when it is removed from left case.**

4. Engage gear double meshing to loosen counter shaft and input shaft nuts.
5. Remove shaft nuts and then hub plate.

NOTE:
Do not hammer when loosening nuts.

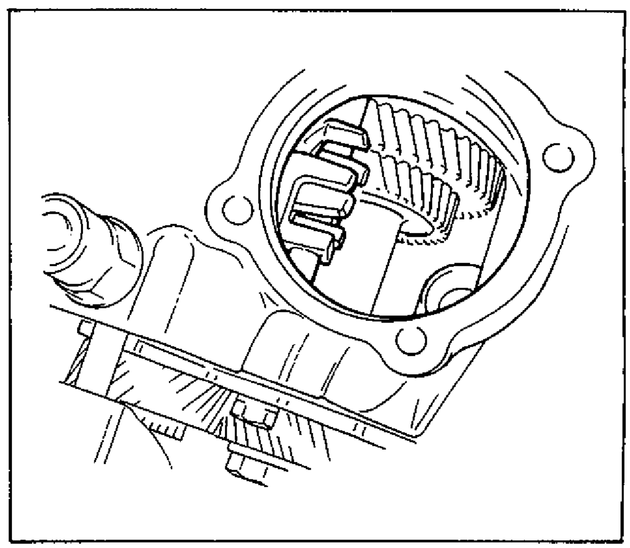


Fig. 7A-24

6. Remove 5th shift fork plug and guide ball.
7. Remove circlip and C-ring.

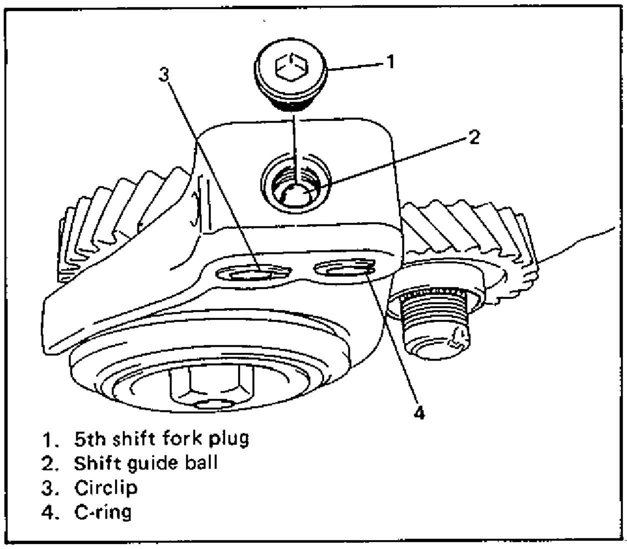


Fig. 7A-25

8. Remove gear shift fork, sleeve & hub assembly, synchronizer ring and 5th gear all together. Gear puller is required for this work.

CAUTION:
Be carefull not to pinch synchronizer ring spring when removing.

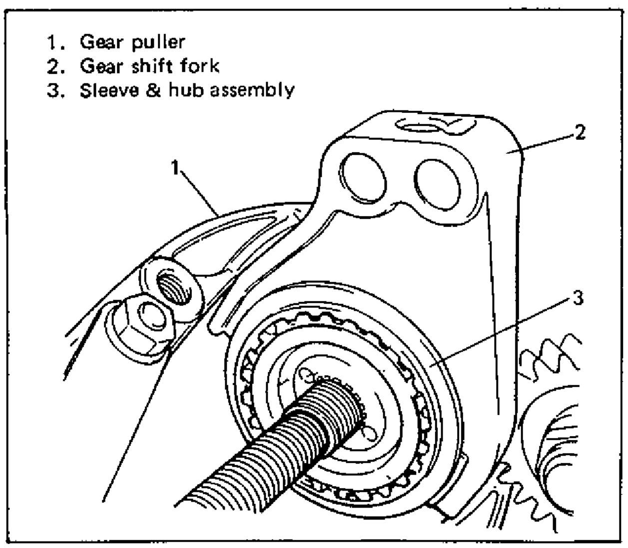


Fig. 7A-26 Removing Sleeve & Hub Assembly

9. Remove counter shaft 5th gear. Gear puller would be necessary if spline fitting of counter shaft 5th gear is tight.
10. Remove screws and take off left case plate, and then bearing set shim.

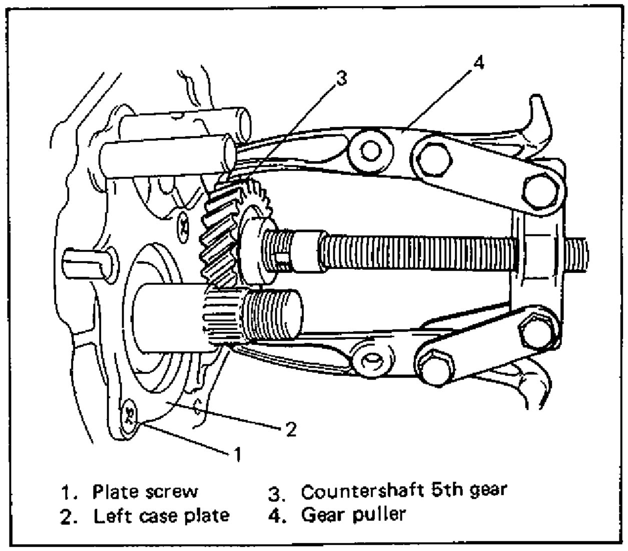


Fig. 7A-27 Removing 5th Gear and Left Case Plate

11. Remove C-ring of input shaft bearing.
12. Remove 3 gear shift fork shaft bolts with washers, then take out locating springs and steel balls.
13. Remove back up light switch and differential side bearing retainer.

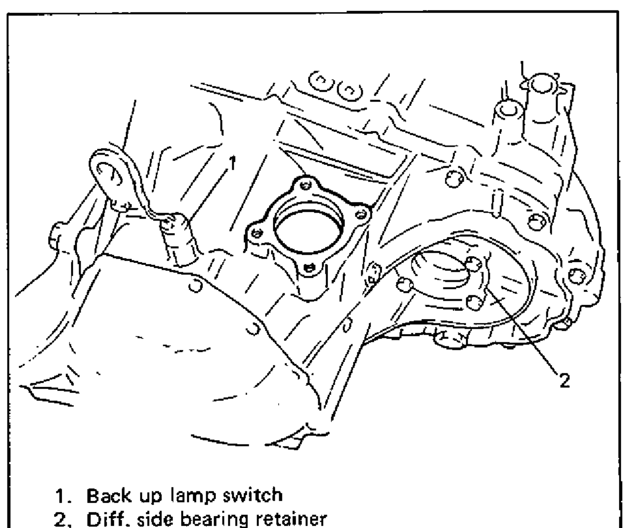
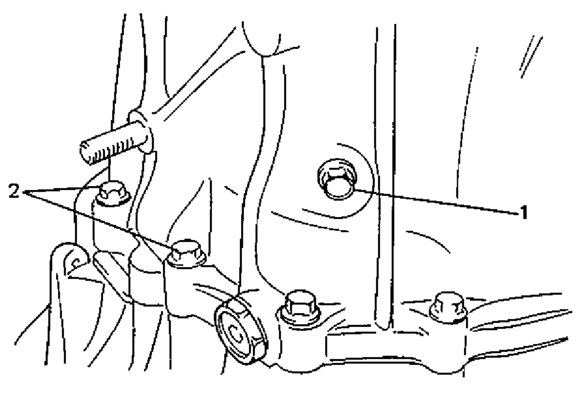


Fig. 7A-28

14. Remove reverse shaft bolt with washer.
15. Remove transmission case outside bolts and clutch housing bolts.

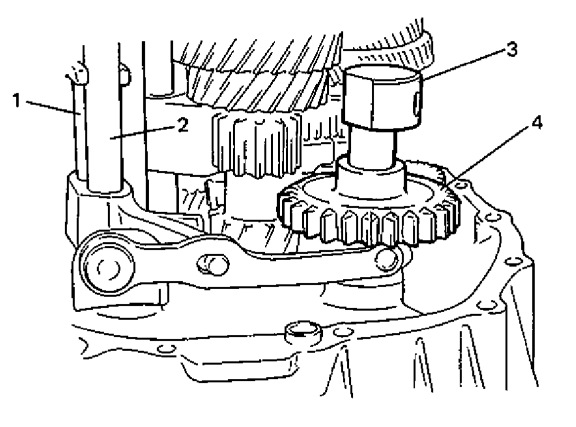


1. Transmission case bolt
2. Reverse shaft bolt

Fig. 7A-29 Removing Case Bolts

16. Tapping left case flanges with plastic hammer, remove left case.
17. Pull out reverse gear shaft, then take off reverse idler gear.
18. Pull out 5th & reverse (REV) gear shift guide shaft together with 5th & reverse (REV) gear shift shaft.

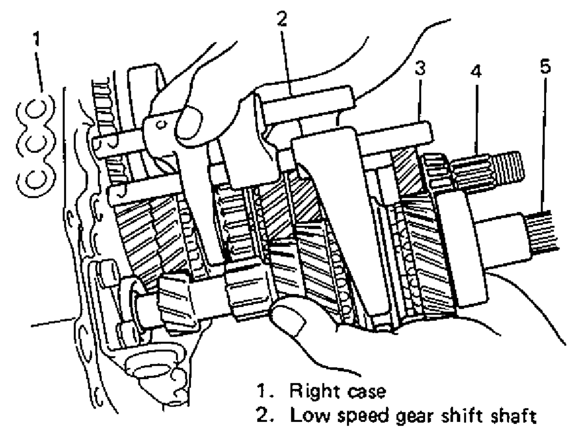
NOTE:
When removing 5th & REV gear shift shaft and guide shaft, push up high speed gear shift shaft and shift it to 4th to facilitate removal of 5th & REV shifter.



1. 5th & REV gear shift shaft
2. 5th & REV gear shift guide shaft
3. Reverse gear shaft
4. Reverse idler gear

Fig. 7A-30 Removing Reverse Idler Gear

19. Tapping input shaft end with plastic hammer, push it out as assembly from case a little, then take out input shaft assembly, counter shaft assembly, high speed gear shift shaft and low speed gear shift shaft all at once.

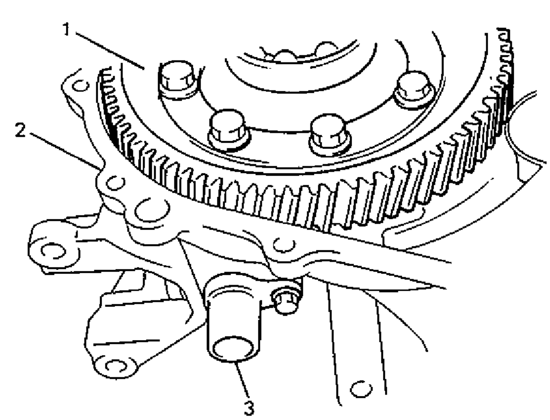


1. Right case
2. Low speed gear shift shaft
3. High speed gear shift shaft
4. Countershaft assembly
5. Input shaft assembly

Fig. 7A-31 Removing Input and Counter Shafts

20. Remove countershaft left bearing cup from left case.
21. Remove differential side left oil seal also from left case.
22. Remove differential gear assembly from right case.
23. Remove bolt and then pull out speedometer driven gear case with gear.

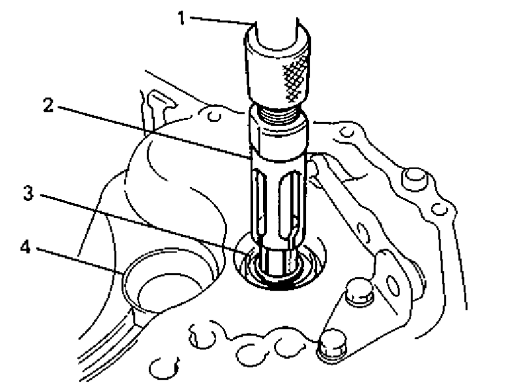
CAUTION:
Be careful not to damage speedometer driven gear case when removing it.



1. Differential assembly
2. Transmission right case
3. Speedometer driven gear case assembly

Fig. 7A-32 Removing Differential Assembly

24. Remove input bearing stopper bolt and plate.
25. Remove input shaft right bering and oil seal by using special tool.
26. Remove input shaft oil seal by using special tools (combination of bearing remover and sliding shaft).
27. Also pull out countershaft right bearing cup by using special tool.



1. Special tool (Sliding shaft 09930-30102)
2. Special tool (Bearing remover 09923-74510)
3. Input shaft oil seal
4. Countershaft R bearing cup (For removal, use bearing remover 09941-64511 with sliding shaft)

Fig. 7A-33 Removing Input Shaft Oil Seal

28. Take out magnet from case.
29. Remove differential side R oil seal from right case.

SUB ASSEMBLY SERVICE

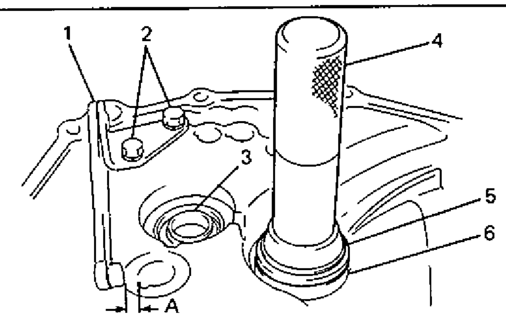
RIGHT CASE

1. If reverse gear shift lever has been removed, fasten it with 2 bolts after applying thread lock cement.
2. Install input shaft oil seal facing its spring side upward. Use special tool and hammer for installation and apply grease to oil seal lip.
3. Install countershaft R bearing cup by using special tools and hammer.

NOTE:

- **When installing reverse gear shift lever, set distance A between lever end and shaft bore to be 5 mm (0.2 in).**
- **Distance A can be measured by installing reverse gear shaft provisionally.**
- **When A is 5 mm (0.2 in), clearance between reverse idler gear groove and shift lever end will be 1 mm (0.04 in).**

Tightening torque for reverse gear shift lever bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



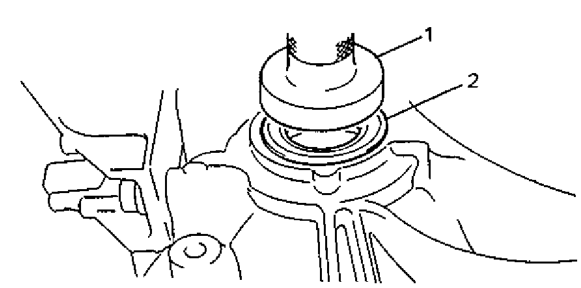
1. Reverse gear shift lever
2. Bolt (Apply thread lock 1322 99000-32110)
3. Input shaft oil seal
4. Special tool (Installer attachment 09913-75820)
5. Special tool (Bearing outer race installer 09924-84510-004)
6. Countershaft R bearing cup

A: Distance 5 mm/0.2 in

Fig. 7A-34 Installing Reverse Gear Shift Lever

4. Install differential side R oil seal until it becomes flush with case surface by using special tool with hammer, and then apply grease to its lip.

NOTE:
Face diff. side oil seal spring side inward.



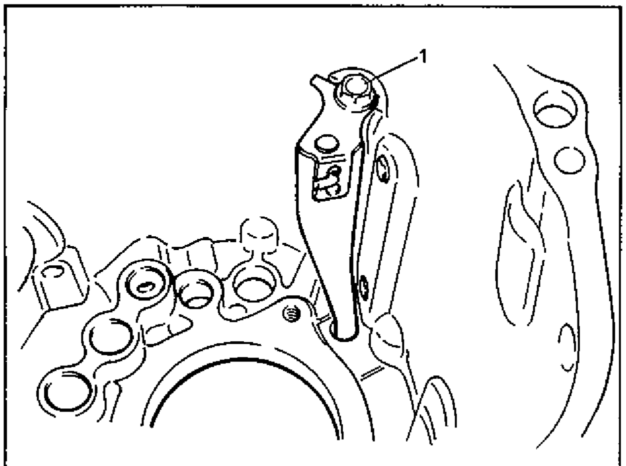
1. Special tool (Bearing installer 09913-85210)
2. Differential side R oil seal

Fig. 7A-35 Installing Gear Shift Shaft

LEFT CASE

1. If input oil gutter has been removed, install it with bolt applied with thread lock cement.

Tightening torque for oil gutter bolt	N·m	kg-m	lb-ft
	4 – 7	0.4 – 0.7	3.0 – 5.0

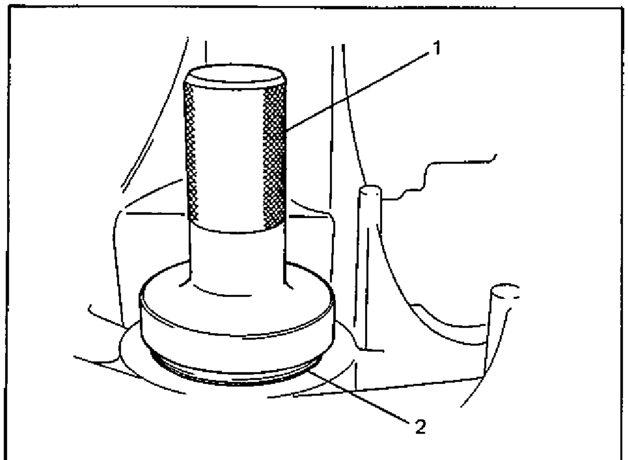


1. Oil gutter bolt (Apply thread lock 1322 99000-32110)

Fig. 7A-36 Installing Oil Gutter

2. Install differential side L oil seal until it becomes flush with case surface by using special tool with hammer, and then apply grease to its lip.

NOTE:
Face oil seal spring side inward.



1. Special tool (Bearing installer 09913-85210)
2. Differential side L oil seal

Fig. 7A-37 Installing Differential Side L Oil Seal

3. Install countershaft L bearing cup into case bore by tapping it with plastic hammer lightly.

INPUT SHAFT ASSEMBLY

Disassembly

1. Remove input shaft R bearing speacer and circlip.
2. Drive out 5th gear spacer, L bearing and 4th gear all at once by using puller and press.

CAUTION:

- **To avoid gear tooth from being damaged, support it at flat side of bearing puller.**
- **Stop press work in the middle way and take out 5th gear bush to prevent it from being compressed and then continue to remove bearing with gear.**

1. Input shaft
2. 5th gear spacer
3. L bearing
4. 4th gear
5. Bearing puller (Place flat side up)

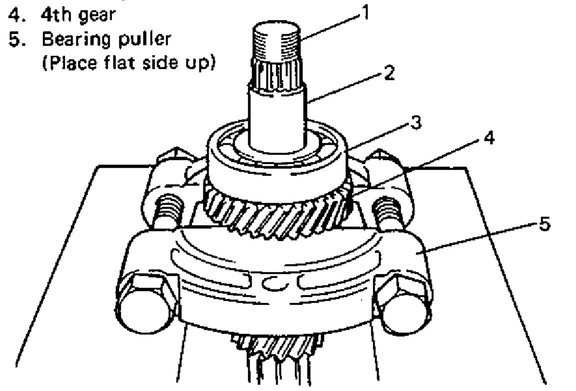
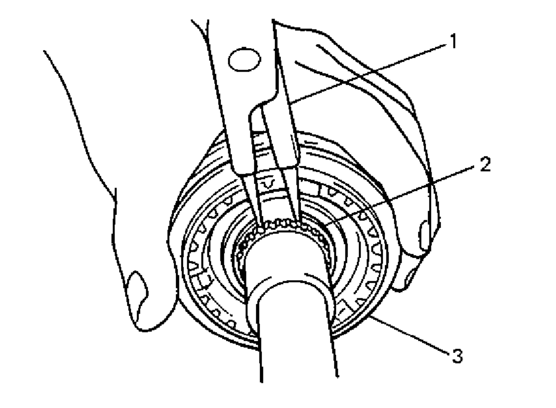


Fig. 7A-38 Removing Input Shaft L Bearing

3. Take out 4th gear needle bearing and high speed synchronizer ring.
4. Using special tool, remove circlip.

NOTE:
For smooth removal of circlip, it is recommended to correct tool tips to be flat.



1. Special tool (Snap ring pliers 09900-06107)
2. Circlip
3. High speed synchronizer sleeve

Fig. 7A-39 Removing Circlip

5. Drive out high speed synchronizer sleeve & hub assembly together with 3rd gear by using puller and press.

CAUTION:
Make sure to use flat side of puller to avoid causing damage to 3rd gear tooth.

1. Input shaft
2. High speed synchronizer sleeve & hub assembly
3. 3rd gear
4. Puller (Place flat side up)

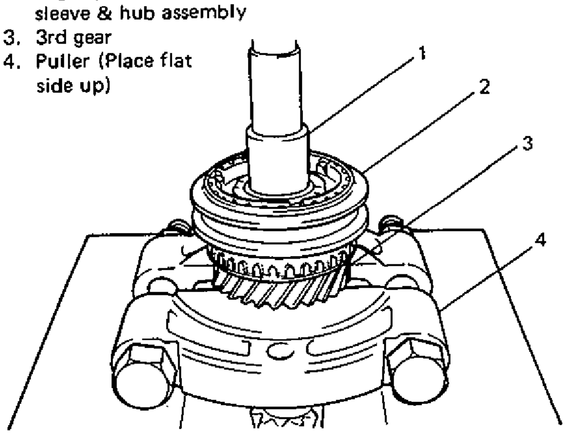


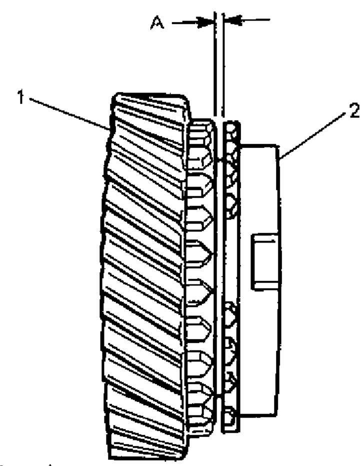
Fig. 7A-40 Removing High Speed Sleeve & Hub

6. Take out 3rd gear needle bearing from shaft.
7. Disassemble synchronizer sleeve & hub assembly.

Inspection and Reassembly

1. Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2. If synchronizer parts need to be repaired, check clearance A between ring and gear, each chamfered tooth of gear, ring and sleeve, then determine parts replacement.

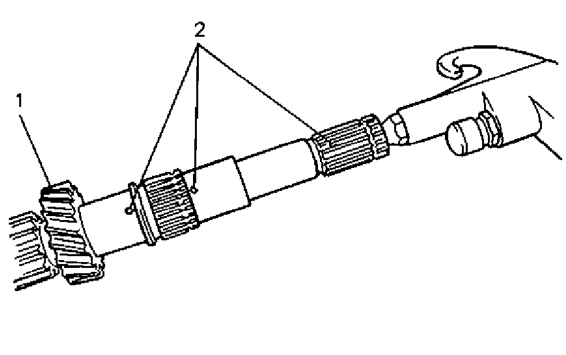
Standard clearance A	Service limit
1.0 – 1.4 mm 0.039 – 0.055 in	0.5 mm 0.019 in



1. Gear
2. Synchronizer ring
A: Minimum 0.5 mm/0.019 in

Fig. 7A-41 Checking Gear and Synchronizer Ring

3. To ensure lublication, air blow oil holes and make sure that they are free from any obstruction.



1. Input shaft
2. Oil hole

Fig. 7A-42 Air Checking Oil Holes

4. Fit high speed synchronizer sleeve to hub, insert 3 keys in it and then set springs as illustrated below.

NOTE:

- **No specific direction is assigned to high speed synchronizer sleeve or each key but it is assigned as assembly.**
- **Size of high speed synchronizer sleeve, hub, keys and springs is between those of low speed and 5th speed ones.**

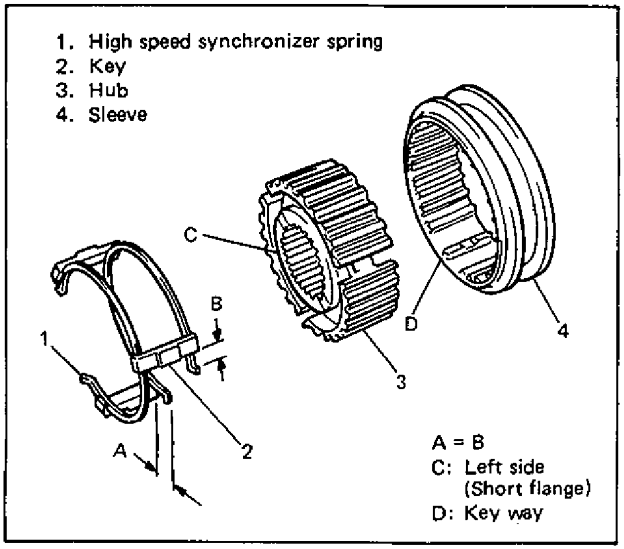


Fig. 7A-43 Assembling High Speed Sleeve & Hub

5. Install input shaft R bearing speacer and circlip.
6. Install 3rd gear needle bearing, apply oil to it, then install 3rd gear and synchronizer ring.
7. Drive in high speed sleeve & hub assembly by using special tool and hammer.

NOTE:

- **While press-fitting sleeve & hub, make sure that synchronizer ring key slots are aligned with keys in sleeve & hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.**
- **Needle bearings and synchronizer rings for 3rd and 4th are identical respectively.**

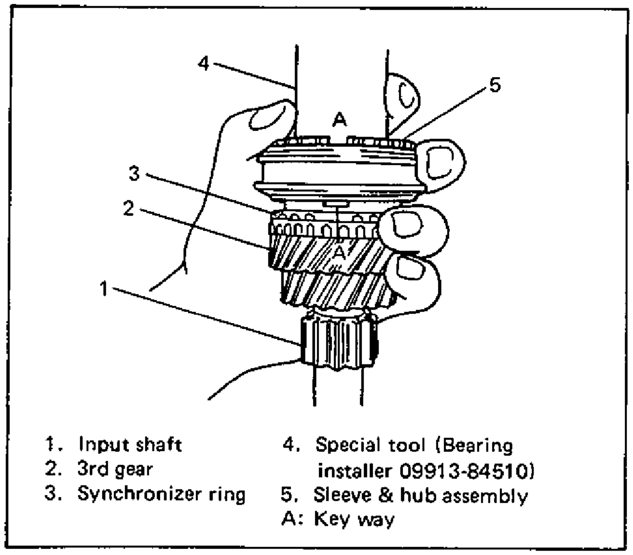


Fig. 7A-44 Press-fitting High Speed Sleeve & Hub

8. Install circlip, needle bearing, apply oil to bearing, then install synchronizer ring and 4th gear.

CAUTION:
Confirm that circlip is installed in groove securely.

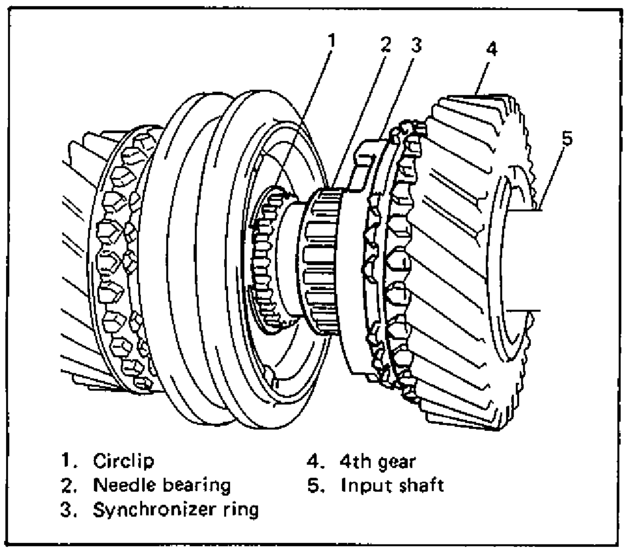
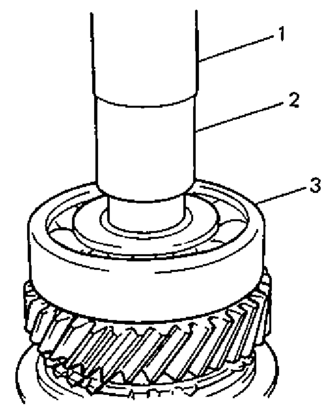


Fig. 7A-45 Installing Circlip

9. Press-fit L bearing by using special tool and hammer.
10. Using the same special tool, drive in 5th gear spacer.

> **CAUTION:**
> **To prevent 5th gear spacer from being distorted because of excessive compression, do not press-fit it with L bearing at once.**



1. Special tool (Bearing installer 09913-80112)
2. 5th gear spacer
3. L bearing (Install it first)

Fig. 7A-46 Press-fitting L Bearing and Spacer

COUNTERSHAFT ASSEMBLY

Disassembly

1. Drive out L bearing cone with 4th gear by using puller and press.

> **CAUTION:**
> - **Use puller and press that will bear at least 5 ton (11.000 lb) safely.**
> - **To avoid tooth damage, support 4th gear at flat side of puller.**

1. Countershaft
2. L bearing cone
3. 4th gear
4. Puller (Place flat side up)

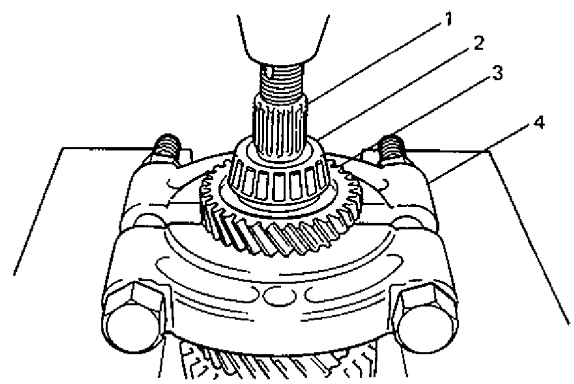


Fig. 7A-47 Removing Countershaft 4th Gear

2. Apply puller to 2nd gear and drive out 3rd & 4th gear spacer together with 2nd gear by using press. Needle bearing would come out with 2nd gear.

> **CAUTION:**
> **If compression exceeeds 5 ton (11,000 lb), release compression once, reset puller support and then continue press work again.**

1. Countershaft
2. 3rd & 4th gear spacer
3. 3rd gear
4. 2nd gear
5. Puller (Place flat side up)

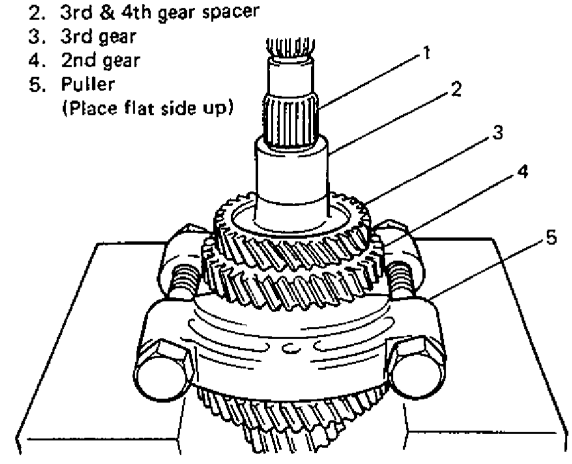


Fig. 7A-48 Removing Spacer and 3rd Gear

3. Take out 2nd synchronizer ring.
4. Using special tool, remove circlip.

NOTE:
Correct tool tips to be flat to facilitate removal of circlip.

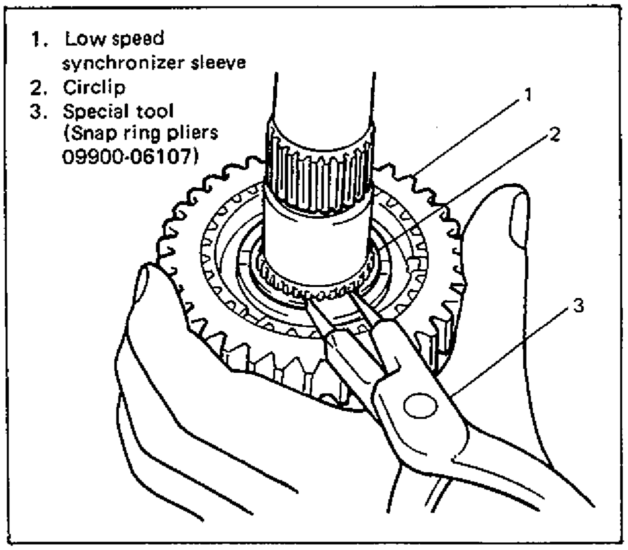


Fig. 7A-49 Removing Circlip

5. Apply puller to 1st gear and drive out low speed synchronizer sleeve & hub assembly with gear by using press.

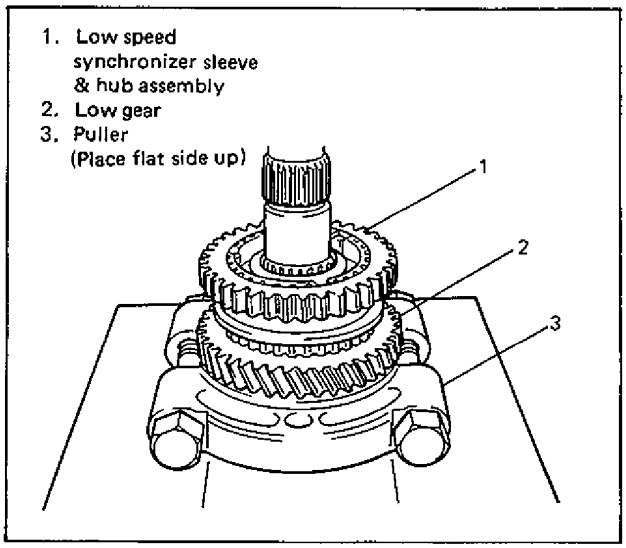


Fig. 7A-50 Removing Low Speed Sleeve & Hub

6. Disassemble synchronizer sleeve & hub assembly.
7. Take out needle bearing from shaft.
8. Remove R bearing cone by using puller, metal stick and press.

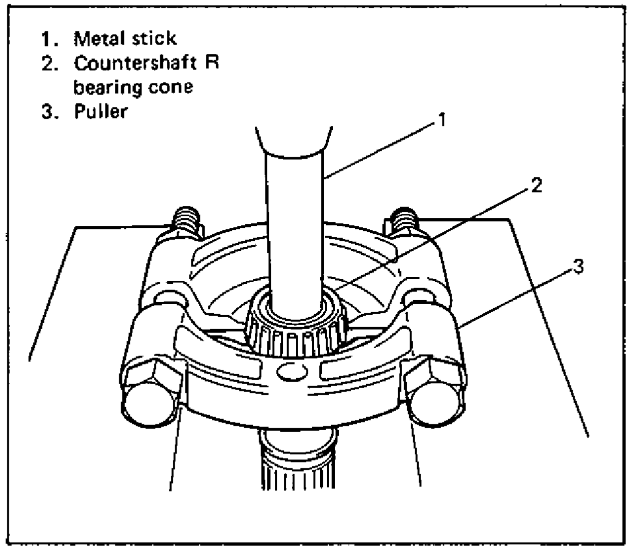


Fig. 7A-51 Removing Countershaft R Bearing Cone

Inspection and Reassembly

1. Clean all components thoroughly, inspect them and replace with new ones as necessary.
2. If synchronizer parts need to be repaired, check clearance A between ring and gear, each chamfered tooth of gear, ring and sleeve, then determine parts replacement.

Standard clearance A	Service limit
1.0 – 1.4 mm 0.039 – 0.055 in	0.5 mm 0.019 in

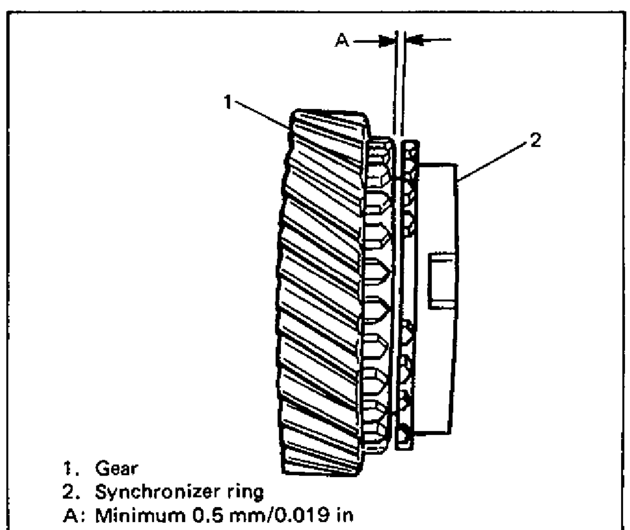


Fig. 7A-52 Checking Gear and Synchronizer Ring

3. To ensure lublication, air blow oil holes and make sure that they are free from any obstraction.

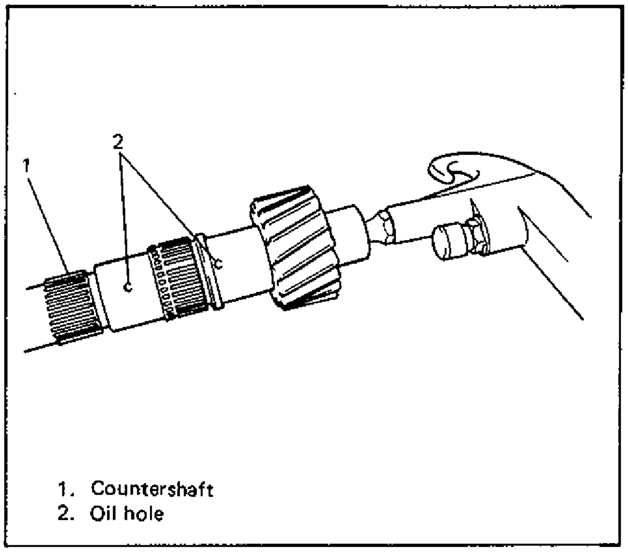


Fig. 7A-53 Air Checking Oil Holes

4. Fit high speed synchronizer sleeve to hub, insert 3 keys in it and then set springs as illustrated below.

NOTE:

- **No specific direction is assigned to low speed synchronizer hub or each key but it is assigned as assembly.**
- **Size of low speed synchronizer keys and springs are the largest compared with those of high speed and 5th speed ones.**

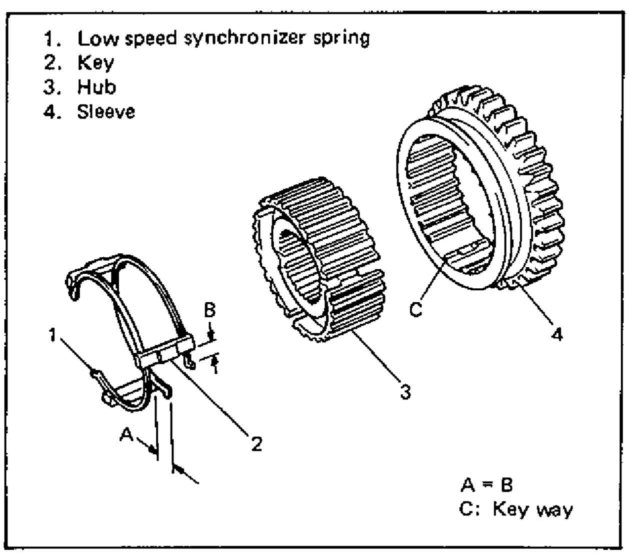


Fig. 7A-54 Assembling Low Speed Sleeve & Hub

5. Install R bearing cone by using special tool and hammer.

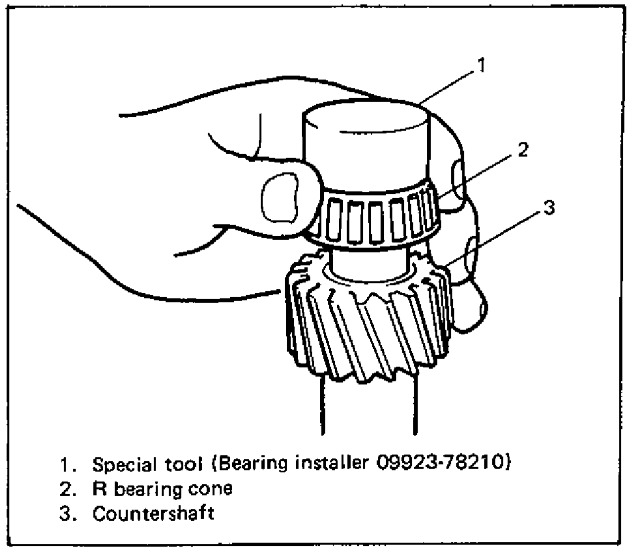


Fig. 7A-55 Press-fitting R Bearing Cone

6. Install needle bearing, apply oil to it, then install 1st gear and 1st gear synchronizer ring.

NOTE:

- **Key slot width of 1st synchronizer ring is smaller than that of 2nd synchronizer ring. Distinguish the difference properly.**
- **Needle bearings for 1st and 2nd gear are identical.**

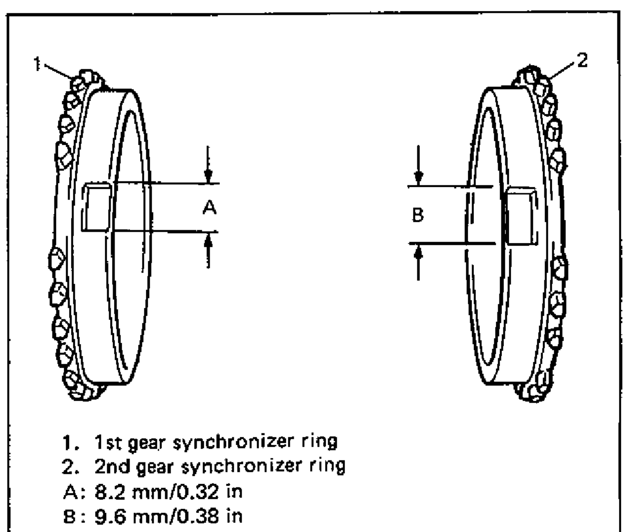


Fig. 7A-56 Difference of 1st and 2nd Rings

7. Drive in low speed sleeve & hub assembly by using special tool and hammer.

NOTE:

- **Support shaft with special tool as illustrated below so that retainer of bearing cone will be free from compression.**
- **Make sure that synchronizer ring key slots are aligned with keys while press-fitting sleeve & hub assembly.**
- **Check free rotation of 1st gear after press-fitting sleeve & hub assembly.**

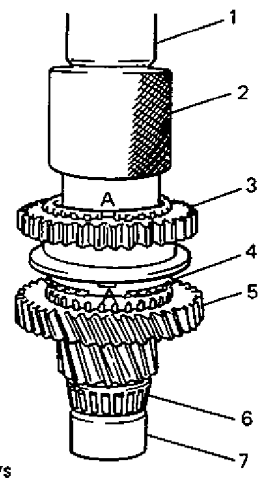


Fig. 7A-57 Press-fitting Low Speed Sleeve & Hub

8. Install circlip, needle bearing, apply oil to bearing, then install 2nd gear synchronizer ring and 2nd gear.

CAUTION:
Confirm that circlip is installed in groove securely.

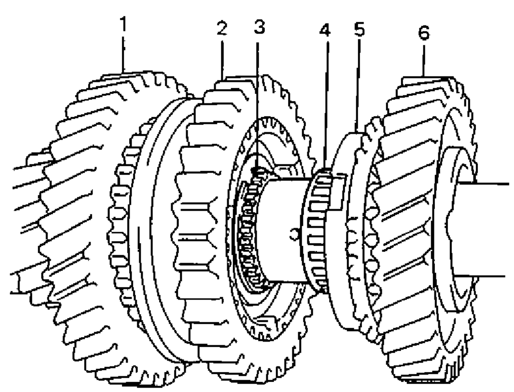


Fig. 7A-58 Installing Circlip

9. Press-fit 3rd gear and spacer by using special tool and press.

NOTE:
It is recommended to press-fit spacer and 3rd gear first, and then 4th gear later separately so that countershaft will not be compressed excessively.

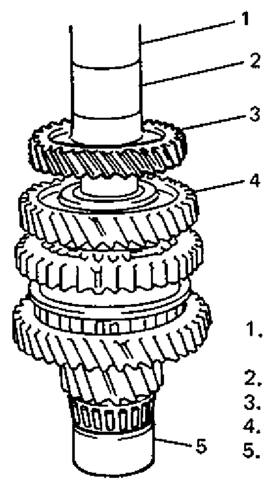


Fig. 7A-59 Press-fitting 3rd Gear and Spacer

10. Press-fit 4th gear by using the same procedure as the above.
11. Install L bearing cone by using special tool and hammer.

NOTE:
For protection of bearing cone, always support shaft with special tool as illustrated.

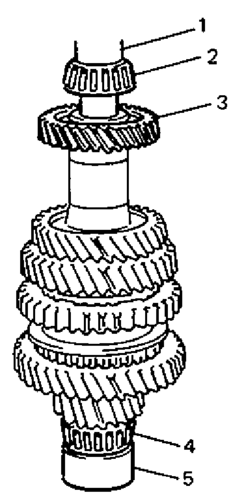


Fig. 7A-60 Press-fitting L Bearing Cone

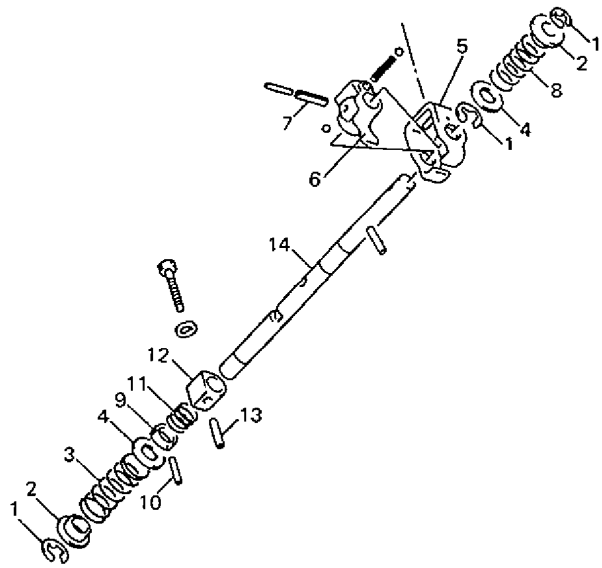
GEAR SHIFTER

Gear Shift & Select Shaft Assembly

1. To disassemble component parts, use special tools (spring pin remover 4.5 mm 09922-85811, 6 mm 09925-78210) and 2.8 – 3.0 mm (0.11 in) pin remover in addition.
2. Clean all parts thoroughly, inspect them and replace with new ones as required.
3. Assemble component parts by reversing removal procedure.

NOTE:

- **When driving in spring pins, prevent shaft from being bent by supporting it with wood block.**
- **Assemble 5th & REV gear shift cam by winding cam guide return spring, and then drive in spring pin.**
- **Locate low speed select spring (Blue – Lower position) and reverse select spring (Red – Upper position) correctly.**



1. E-ring
2. Select spring guide
3. Low speed select spring (Blue)
4. Washer
5. Gear shift interlock plate
6. Gear shift & select lever
7. Spring pin (Double: Apply spring pin remover 6 mm 09925-78210)
8. Reverse select spring (Red)
9. 5th & REV gear shift cam guide
10. Spring pin (Apply spring pin remover of 2.8 – 3.0 mm/0.11 in diameter)
11. Cam guide return spring
12. 5th & REV gear shift cam
13. Spring pin (Apply spring pin remover 4.5 mm 09922-85811)
14. Gear shift & select shaft

Fig. 7A-61 Gear Shift & Select Shaft Assembly

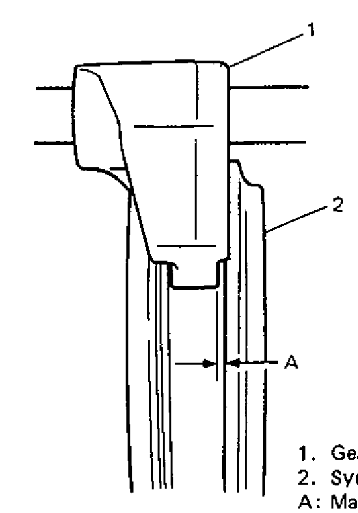
High Speed and Low Speed Gear Shift Shafts

1. Before disassembling shift shaft assemblies, determine necessity of parts replacement by checking them for abnormal wear or distortion. Use feeler gauge for checking clearance A between sleeve and shift fork.

NOTE:

For correct judgement of parts replacement, carefully inspect contact portion of fork and sleeve.

Maximum clearance A	1.0 mm/0.039 in



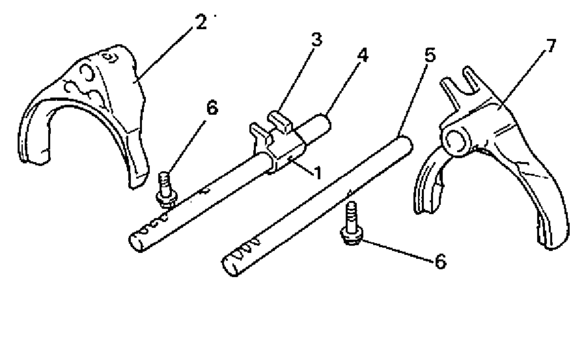
1. Gear shift fork
2. Synchronizer sleeve
A: Max. 1.0 mm/0.039 in

Fig. 6A-62 Checking Sleeve-to-Fork Clearance

2. Disassemble component parts by using spring pin remover 4.5 mm (09922-85811) and hammer.
3. Assemble shift shafts as shown below while making sure that component parts are in proper order.

NOTE:

- **Correct shaft surface by using oil stone, if any scratch or dent is found.**
- **Support shaft with wood blocks when driving in spring pins.**



1. Spring pin (Apply spring pin remover 09922-85811)
2. Low speed gear shift fork
3. Low speed gear shift yoke
4. Low speed gear shift shaft
5. High speed gear shift shaft
6. Bolt
7. High speed gear shift fork

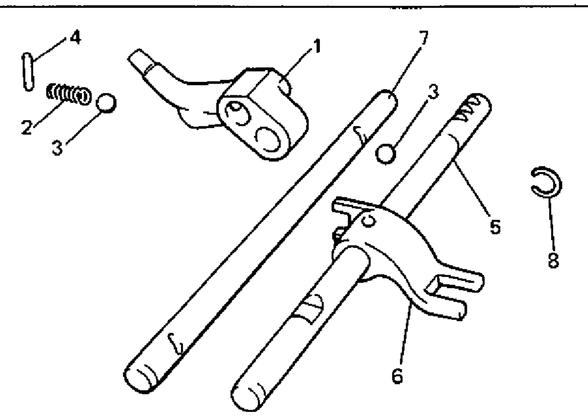
Fig. 7A-63 Assembling Low and High Speed Shifters

5th & REV Gear Shifter

1. Disassemble component parts by using spring pin remover 4.5 mm (09922-85811) and hammer.
2. Replace or correct parts as required and assemble shafts making sure that component parts are in proper order as shown below.

NOTE:

Install 2 steel balls in reverse gear shift arm without fail.



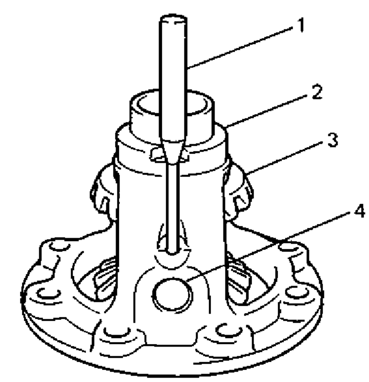
1. Reverse gear shift arm
2. Reverse gear shift arm spring
3. Steel ball
4. Spring pin
5. 5th & REV gear shift shaft
6. 5th & REV gear shift yoke
7. 5th & REV gear shift guide shaft
8. C-ring

Fig. 7A-64 Assembling 5th & REV Shifter

DIFFERENTIAL ASSEMBLY

Disassembly

1. Using special tool, remove R bearing.
2. Take out speedometer drive gear.
3. Remove L bearing by using puller while supporting its center shaft as described above.
4. Support differential case with soft jawed vise and remove 8 final gear bolts then take out final gear.
5. Using special tool and hammer, drive out differential side pinion shaft pin and then disassemble component parts.



1. Special tool (Spring pin remover 09922-85811)
2. Differential case
3. Differential gear
4. Differential pinion shaft

Fig. 7A-65 Removing Spring Pin

Adjustment and Reassembly

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly. Make sure that all parts are clean.

1. Assemble differential gear and measure thrust play of differential gear as follows.

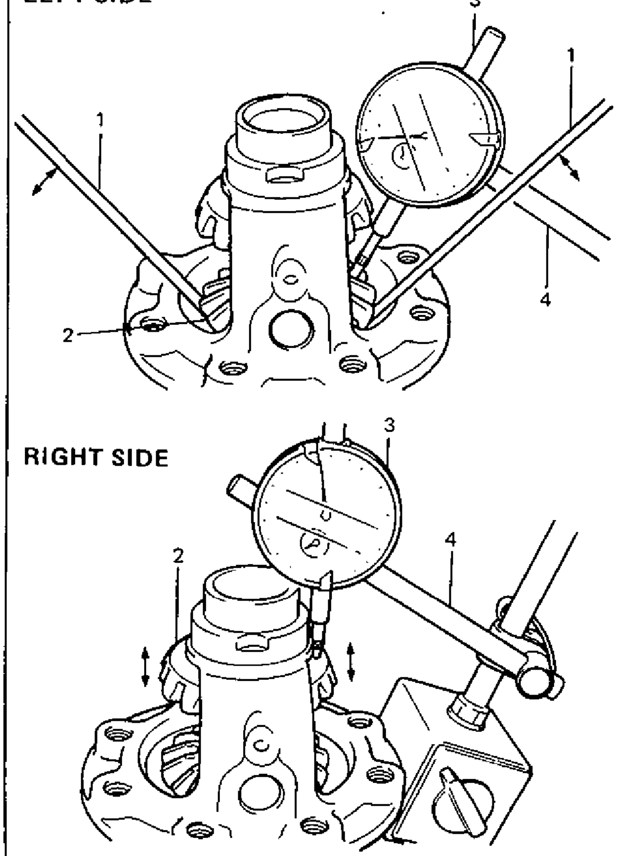
Left side

- 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 similer procedure to the above, set dial gauge tip to gear shoulder.
- Move gear up and down by hand and read dial gauge.

Diff. gear thrust play specification	0.05 – 0.33 mm 0.002 – 0.013 in



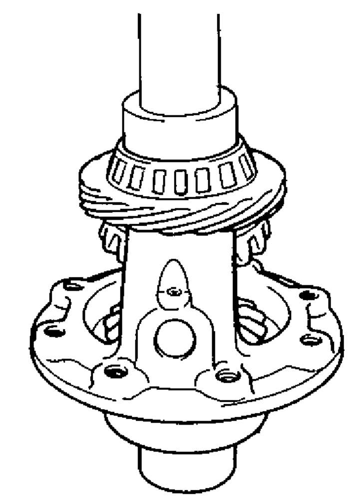
1. Screwdriver
2. Differential gear
3. Special tool (Dial gauge 09900-20606)
4. Special tool (Magnetic stand 09900-20701)

Fig. 7A-66 Measuring Gear Thrust Play

2. If thrust play is out of specification, select suitable thrust washer from amoung following available sizes, install it and check again that specified gear play is obtained.

Available thrust washer thickness	0.9, 0.95, 1.0, 1.05, 1.1, 1.15 and 1.2 mm 0.035, 0.037, 0.039, 0.041, 0.043, 0.045, and 0.047 in

3. Drive in spring pin from right side till it is flush with differential case surface.
4. Press-fit L bearing by using special tool and copper hammer.
5. Install speedometer drive gear, support differential assembly as illustrated so as to L bearing is floating, and then press-fit R bearing like L bearing in Step 4.



1. Special tool (Bearing installer 09951-76010)
2. Differential side R bearing
3. Speedometer drive gear
4. Differential side pinion shaft pin
5. Differential case
6. Differential side L bearing
7. Special tool (Bush remover 09951-16060)

Fig. 7A-67 Press-fitting Differential Side Bearing

6. Hold differential assembly with soft jawed vise, install final gear and then tighten it with 8 bolts to specified torque.

CAUTION:
Use of any other bolts than specified ones is prohibited.

	N·m	kg-m	lb-ft
Tightening torque for final gear bolts	80 – 100	8.0–10.0	58.0 – 72.0

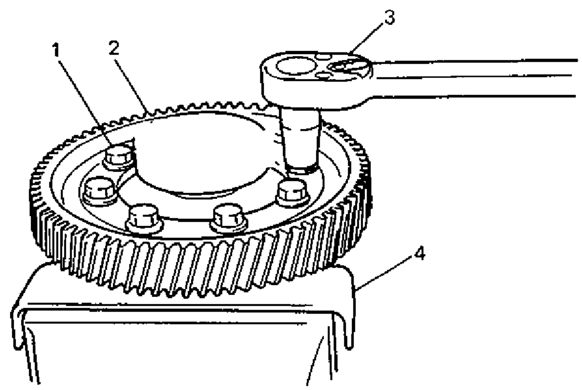


Fig. 7A-68 Tightening Final Gear Bolts

ASSEMBLING UNIT

DIFFERENTIAL TO LEFT CASE

1. Install differential assembly into right case.
2. Measure clearance "A" (between diffrential side face and side bearing outer race) and "B" (bearing retainer).

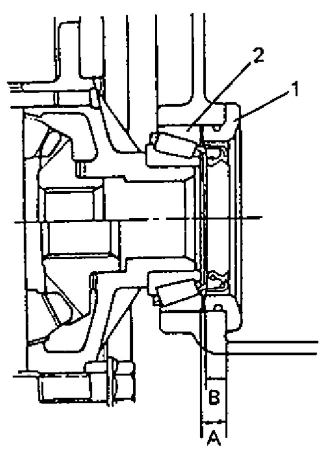


Fig. 7A-69

3. Select the shim referring to the following table.

Clearance A – B (mm)	Thickness of bearing shim to be installed (mm)
0.496 – 0.515	0.60
0.516 – 0.545	0.63
0.546 – 0.575	0.66
0.576 – 0.605	0.69
0.606 – 0.635	0.72
0.636 – 0.665	0.75
0.666 – 0.695	0.78
0.696 – 0.725	0.81
0.726 – 0.755	0.84
0.756 – 0.785	0.87
0.786 – 0.815	0.90
0.816 – 0.845	0.93
0.846 – 0.875	0.96
0.876 – 0.905	0.99
0.906 – 0.935	1.02
0.936 – 0.065	1.05
0.966 – 0.995	1.08
0.996 – 1.025	1.11
1.026 – 1.055	1.14
1.056 – 1.085	1.17
1.086 – 1.115	1.20
1.116 – 1.145	1.23
1.146 – 1.175	1.26
1.176 – 1.205	1.29
1.206 – 1.236	1.32

Available shim thickness	0.2, 0.3, 0,35, 0.5, 0.6, 0.63, 0.66, 0.69, 0.72, 0.75, 0.78, 0.81, 0.84, 0.87, 0.9 and 1.15 mm 0.008, 0.011, 0.013, 0.019, 0.023, 0.024, 0.025, 0.027, 0.028, 0.029, 0.030, 0.031, 0.033, 0.034, 0.035 and 0.045 in

4. Insert speedometer driven gear case assembly applied with oil to its O ring and gear, then tighten it with bolt.

CAUTION:
- **While inserting case assembly into transmission, turn final gear by hand slightly so that gear can mesh easily.**
- **Never push or hit slit portion of case when inserting it. Such attempt may cause case to break.**

Tightening torque for case bolt	N·m	kg-m	lb-ft
	4 – 7	0.4 – 0.7	3.0 – 5.0

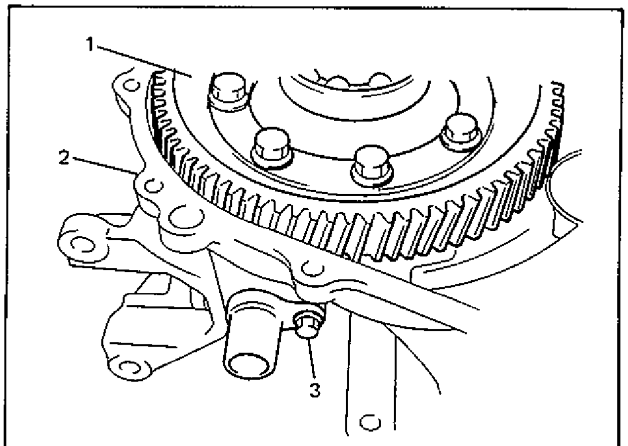


Fig. 7A-70 Installing Differential Assembly

5. Join input shaft, countershaft, low speed gear shift shaft and high speed gear shift shaft assemblies all together, then install them into right case.

NOTE:
- **Input shaft R bearing on shaft can be installed into right case by tapping shaft with plastic hammer.**
- **Check to make sure that counter shaft is engaged with final gear while installing.**

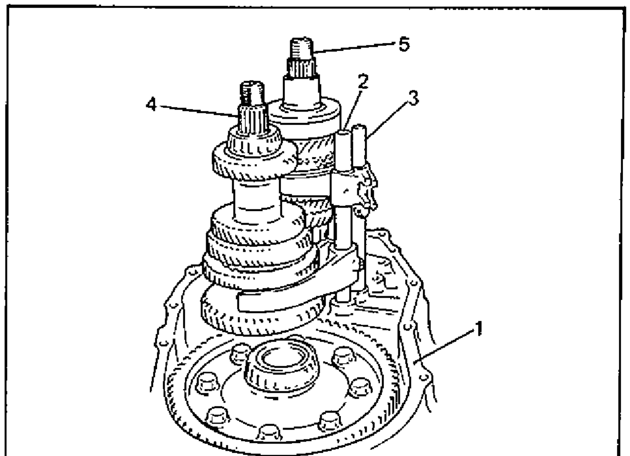


Fig. 7A-71 Installing Input Shaft and Countershaft

6. Install 5th & REV gear shift shaft with 5th & REV gear shift guide shaft into right case. Reverse gear shift arm has to be joined with reverse gear shift lever at the same time.

NOTE:
- **Make sure that washer has been installed on shaft above the gear.**
- **Check to confirm that reverse gear shift lever end has clearance 0.5 ~1.0 mm (0.02~0.04 in.) to idler gear groove.**

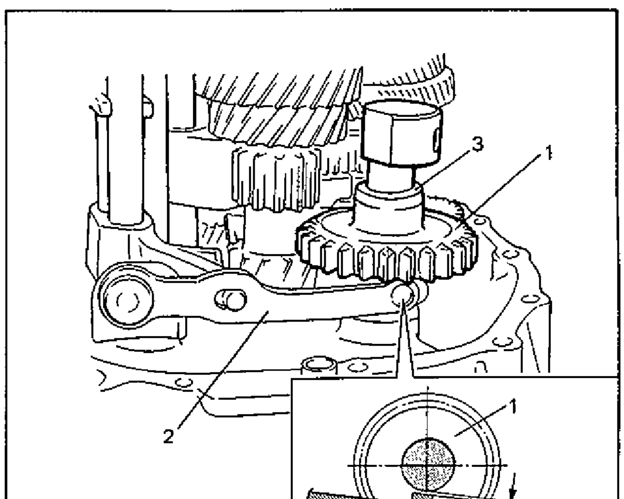
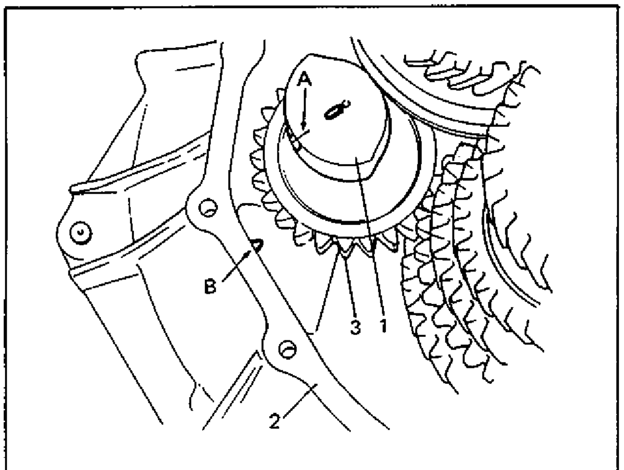


Fig. 7A-72 Installing 5th & REV Shifter

7. Make reverse idler gear with reverse gear shift lever, insert reverse gear shaft into case through idler gear and then align A in shaft with B in case.

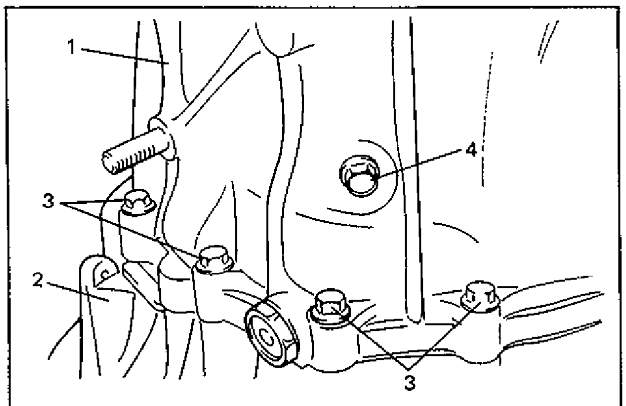


1. Reverse gear shaft
2. Right case
3. Reverse idler gear
A: Align with B

Fig. 7A-73 Aligning Reverse Gear Shaft

8. Clean mating surfaces of both right and left cases, coat mating surface of left case with sealant evenly then mate it with right case.
9. Tighten transmission case bolts to specified torque.
10. Install reverse shaft bolt and tighten it.
11. Install bolts (clutch housing side) and tighten them to specification.

Tightening torque	N·m	kg-m	lb-ft
Case bolt	15 – 22	1.5 – 2.2	11.0 – 15.5
Reverse shaft bolt	18 – 28	1.8 – 2.8	13.5 – 20.0



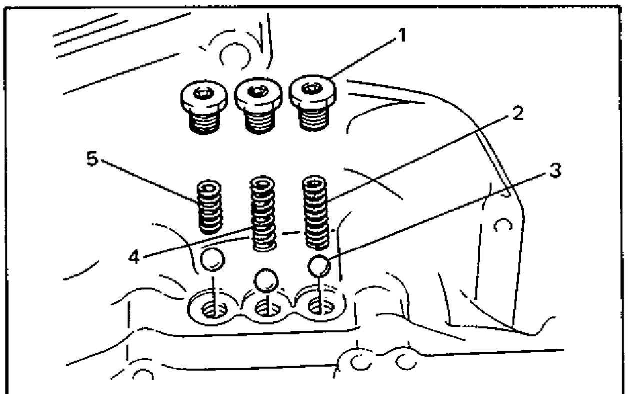
1. Left case (Coat mating surface with sealant Suzuki bond No. 1215 99000-31110)
2. Right case
3. Case bolt
4. Reverse shaft bolt

Fig. 7A-74 Fastening Case Bolts

12. Check locating springs for deterioration and replace with new ones as necessary.
13. Install steel ball and locating spring for respective gear shift shaft and tighten with bolt.

REF No. (Fig.7A-75)	Locating spring free length	Standard	Service limit
2	Low speed	53.1 mm 2.091 in	50.5 mm 1.988 in
4	High speed	46.1 mm 1.815 in	44.0 mm 1.732 in
5	5th & reverse	29.8 mm 1.173 in	28.5 mm 1.122 in

Tightening torque for gear shift fork shaft bolts	N·m	kg-m	lb-ft
	10 – 16	1.0 – 1.6	7.5 – 11.5

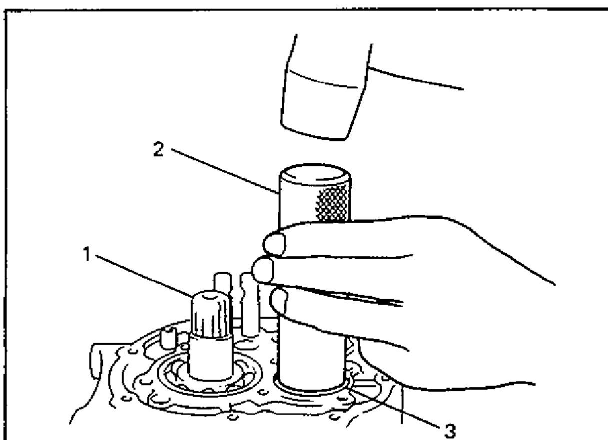


1. Gear shift fork shaft bolt
2. Low speed locating spring
3. Steel ball
4. High speed locating spring
5. 5th & reverse locating spring

Fig. 7A-75 Installing Locating Springs

FIFTH GEARS

1. To seat countershaft LH bearing outer race to bearing cone, tap outer race by using special tool and plastic hammer.



1. Input shaft
2. Special tool (Bearing installer 09913-84510)
3. LH bearing outer race

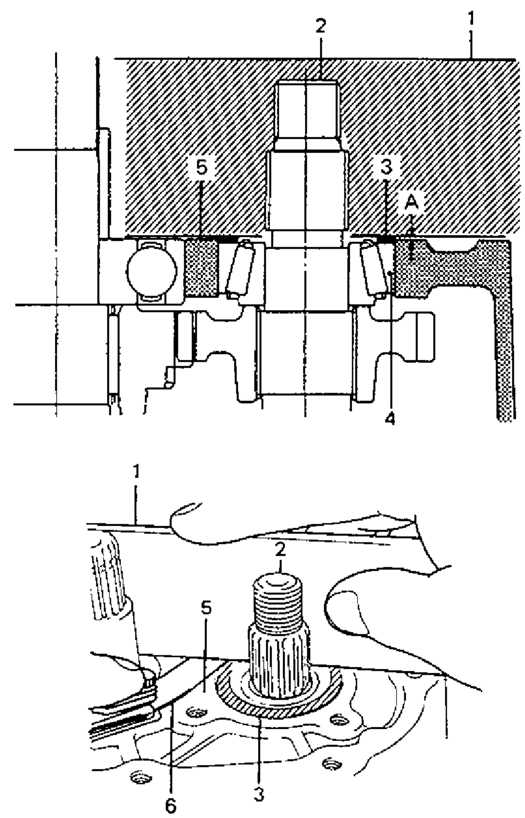
Fig. 7A-76 Seating Counter Shaft L Bearing Cup

2. Put a shim on bearing outer race provisionally, place straight edge over it and compress it by hand through straight edge, and then measure A (Clearance between case surface and straight edge) by using feeler gauge.
3. By repeating above step, select a suitable shim which adjusts clearance A to specification and put it on bearing outer race.

NOTE:
Insert 0.1 mm (0.004 in) feeler to know whether or not a shim fulfills specification quickly.

Clearance A: Shim protrusion	0.08 – 0.12 mm 0.0032 – 0.0047 in

Available shim thickness	0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0, 1.05, 1.1 and 1.15 mm 0.021, 0.023, 0.025, 0.027, 0.029, 0.031, 0.033, 0.035, 0.037, 0.039, 0.041, 0.043 and 0.045 in



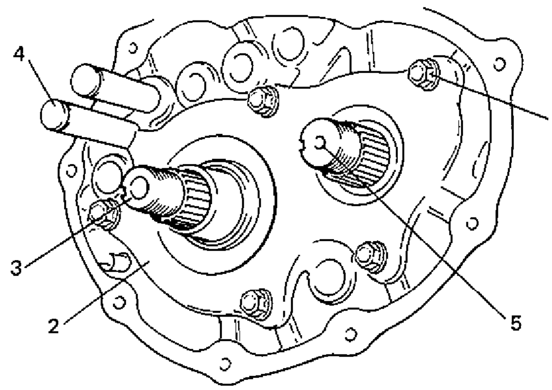
1. Straight edge
2. Countershaft
3. Bearing set shim
4. Bearing outer race
5. Case surface
6. Feeler gauge
A: Shim protrusion

Fig. 7A-77 Selecting Bearing Set Shim

4. Place left case plate inserting its end in groove of shift guide shaft and then tighten it with 5 bolts applied with thread lock cement.

NOTE:
After tightening bolts, make sure that counter shaft can be rotated by hand feeling some load.

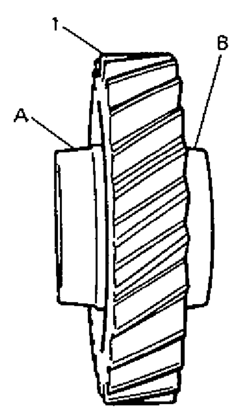
Tightening torque for left case plate bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



1. Bolt (Apply thread lock 1322 99000-32110)
2. Left case plate
3. Input shaft
4. 5th & REV gear shift guide shaft
5. Countershaft

Fig. 7A-78 Fastening Left Case Plate Screw

5. Install 5th gear to counter shaft facing machined boss A inward.



1. Countershaft 5th gear
A: Machined boss (Inside)
B: No machining (Outside)

Fig. 7A-79 Counter Shaft 5th Gear

6. Install needle bearing to input shaft, apply oil then install 5th gear.

7. Engage gear double meshing to tighten countershaft nut and tighten it to specification.

Tightening torque for countershaft nut	N·m	kg-m	lb-ft
	60 – 80	6.0 – 8.0	43.5 – 57.5

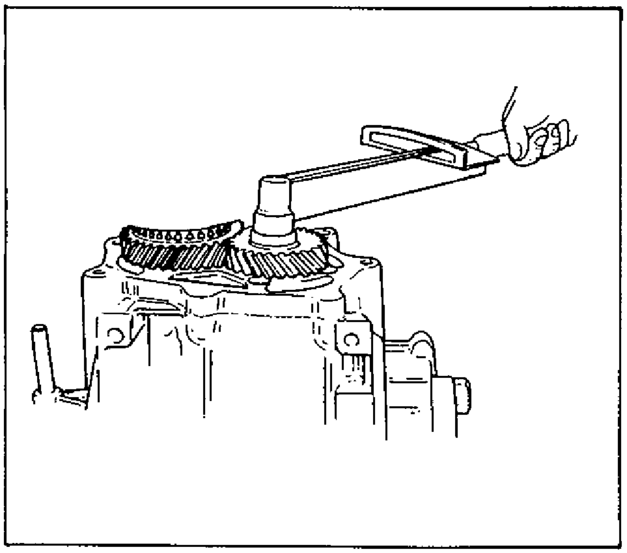


Fig. 7A-80 Tightening Countershaft Nut

8. Assemble 5th speed synchronizer sleeve and hub with keys and springs.

NOTE:
Short side C in keys, long boss D in hub and chamfered spline F in sleeve should face inward (5th gear side).

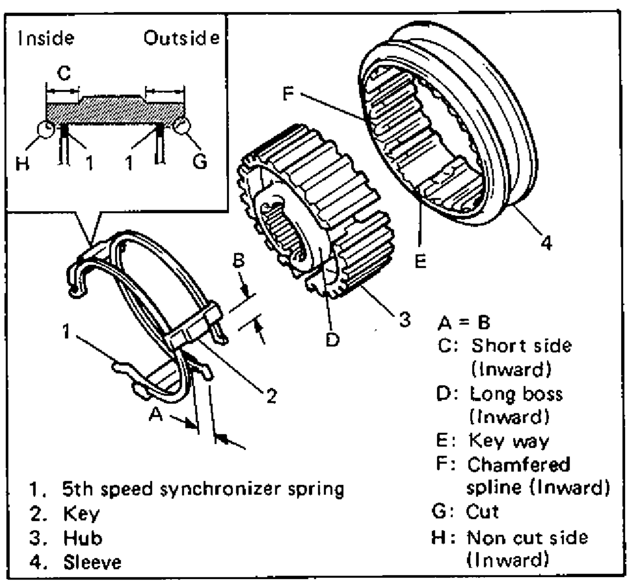


Fig. 7A-81 Assembling 5th Speed Sleeve & Hub

9. Install synchronizer ring to input shaft 5th gear.
10. Fit 5th gear shift fork to sleeve & hub assembly and install them into input shaft, gear shift shaft and gear shift guide shaft at once aligning hub depression A, shaft mark B and synchronizer key C.

NOTE:
Long boss of hub faces inward (gear side).

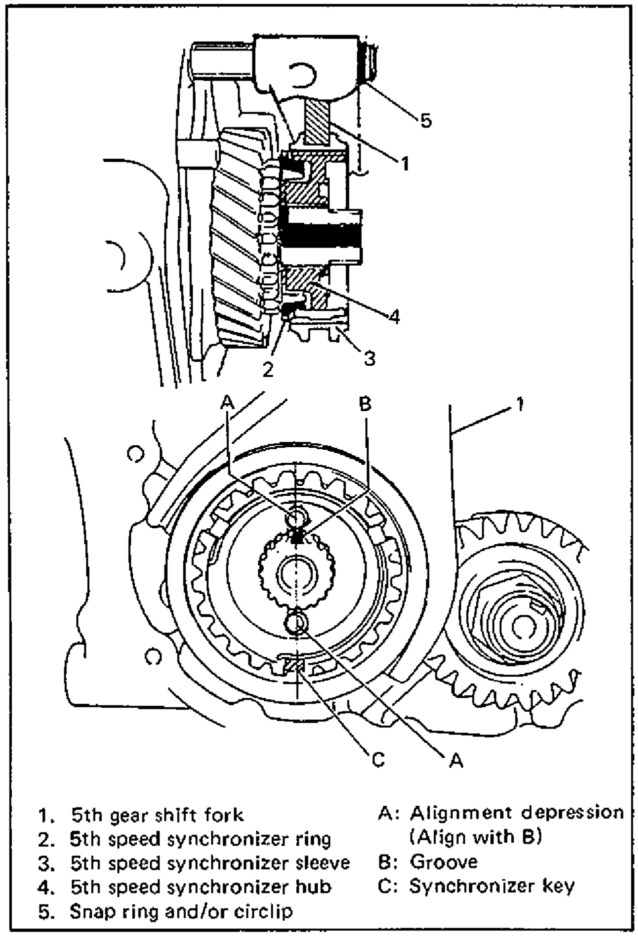


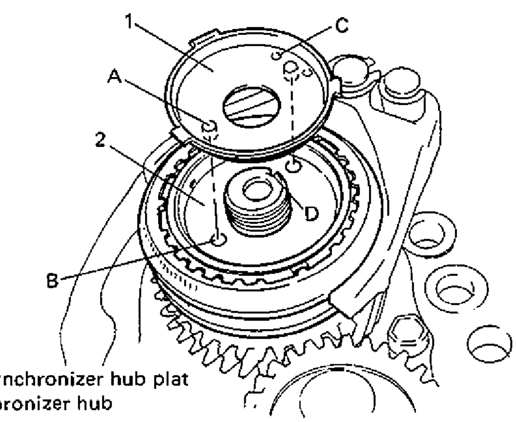
Fig. 7A-82-1 Installing 5th Speed Sleeve & Hub

11. Install steel ball, tighten shift fork plug applied with thread lock cement.

CAUTION:
- **Coat shift fork plug with thread lock cement reasonably. If it is done to much, exceess may interfere in ball movement and cause hard shift to 5th speed.**
- **Make sure circlip is installed in shaft groove securely.**

Tightening torque for 5th shift fork plug	N·m	kg-m	lb-ft
	8 – 10	0.8 – 1.0	6.0 – 7.0

12. Install 5th synchronizer hub plate to synchronizer hub by positioning it so that its lugs **A** fit into their depression **B** in synchronizer hub and its 2 small holes **C** come on the same side as cut **D** in input shaft.



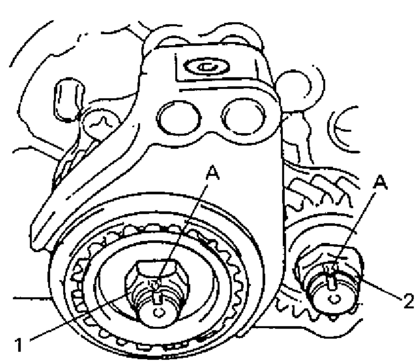
1. 5th synchronizer hub plat
2. Synchronizer hub
A: Lug
B: Alignment depression
C: Small hole
D: Cut

Fig. 7A-82-2

13. Tighten input shaft nut to specification.

Tightening torque input shaft nut	N·m	kg-m	lb-ft
	60 – 80	6.0 – 8.0	43.5 – 57.5

14. Caulk input shaft nut and counter shaft nut with caulking tool.

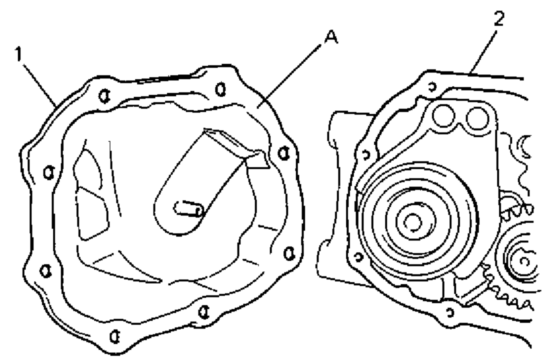


1. Input shaft nut
2. Counter shaft nut
A: Caulking

Fig. 7A-83

15. Clean mating surface of both left case and left cover, coat mating surface A with sealant evenly, mate it with left case and then tighten with bolts.

Tightening torque for left cover bolts	N·m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5



1. Left cover
2. Left case
A: Apply sealant (Suzuki bond No. 1215 99000-31110)

Fig. 7A-84 Installing Side Cover

GEAR SHIFT & SELECT SHAFT ASSEMBLY

1. If gear shift guide case has been disassembled or replaced, tighten bolts as specified below.
2. Clean mating surface of guide case and coat it with sealant evenly.

Tightening torque	N·m	kg-m	lb-ft
5th to REV interlock guide bolt	18 – 28	1.8 – 2.8	13.5 – 20.0

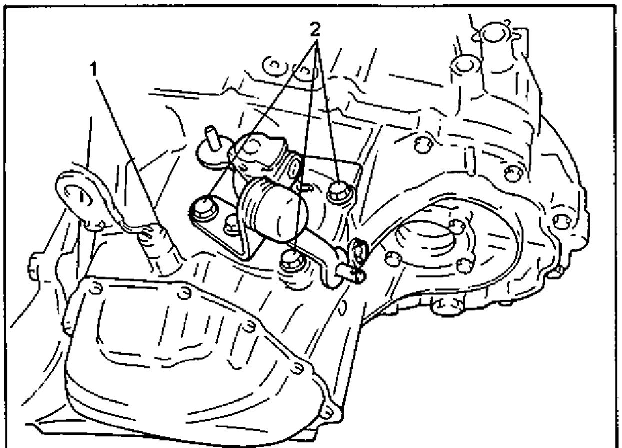
3. Install gear shift & select shaft assembly into transmission.
4. Install gear shift interlock bolt with washer and tighten it to specification.

NOTE:
When installing gear shift & select shaft assembly, position gear in neutral so that gear shift interlock plate will go in smoothly.

Tightening torque	N·m	kg-m	lb-ft
Gear shift interlock bolt	18 – 28	1.8 – 2.8	13.5 – 20.0

5. Place wiring harness clamp bracket and fasten it together with gear shift guide case.
6. Install back up light switch and clamp its lead.
7. Tighten gear case bolts to specified torque.

Tightening torque	N·m	kg-m	lb-ft
Gear shift guide case bolts	15 – 22	1.5 – 2.2	11.0 – 15.5
Back up light switch	16 – 23	1.6 – 2.3	12.0 – 16.5



1. Back up light switch
2. Gear shift guide case bolt

Fig. 7A-85

8. Check input shaft for rotation in each gear position.
9. Also confirm function of back up light switch in reverse position by using ohmmeter.

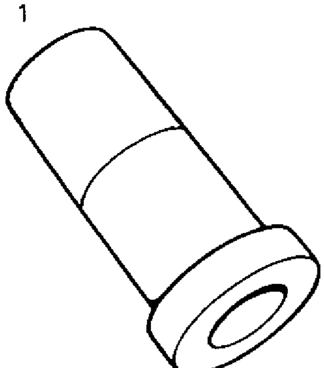
RECOMMENDED TORQUE SPECIFICATIONS

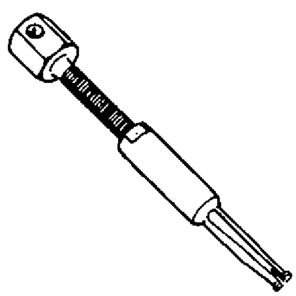
Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Oil filler/level plug	36 – 54	3.6 – 5.4	26.5 – 39.0
2. Oil drain plug	25 – 30	2.5 – 3.0	18.5 – 21.5
3. Housing nuts for control housing	18 – 28	1.8 – 2.8	13.5 – 20.0
4. Speedometer driven gear case bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
5. Transmission to engine bolt and nuts	40 – 60	4.0 – 6.0	29.0 – 43.0
6. Engine rear mounting bracket bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
7. Engine mounting LH bracket bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
8. Exhaust pipe to manifold nuts	25 – 35	2.5 – 3.5	18.5 – 25.0
9. Center bearing support bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
10. Reverse gear shift lever bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
11. Oil gutter bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
12. Transmission case bolts	15 – 22	1.5 – 2.2	11.0 – 15.5
13. Reverse shaft bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
14. Left case plate bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
15. Counter shaft nut	60 – 80	6.0 – 8.0	43.5 – 57.5
16. Input shaft nut	60 – 80	6.0 – 8.0	43.5 – 57.5
17. 5th shift fork plug	8 – 10	0.8 – 1.0	6.0 – 7.5
18. Left cover bolts	8 – 12	0.8 – 1.2	6.0 – 8.5
19. 5th to REV interlock guide bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
20. Gear shift interlock bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
21. Gear shift guide case bolts	15 – 22	1.5 – 2.2	11.0 – 15.5
22. Back up light switch	16 – 23	1.6 – 2.3	12.0 – 16.5

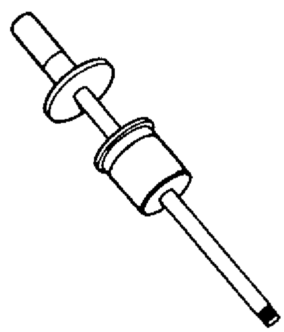
REQUIRED SERVICE MATERIALS

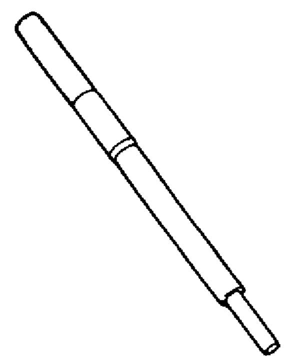
MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Oil seal lips • Gear shift control lever • Gear shift control shaft bushes
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Oil drain plug • Gear shift shaft bolt • Mating surface of transmission case • Mating surface of side cover
Thread lock cement	THREAD LOCK 1322 (99000-32110)	• Control lever knob • Reverse gear shift lever bolts • Oil gutter bolt • Left case plate screws

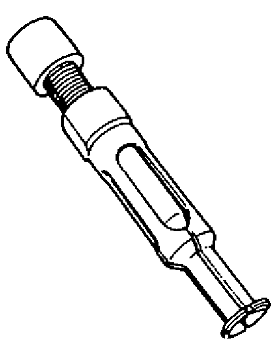
SPECIAL TOOLS

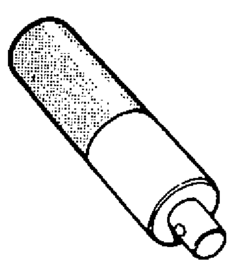
1

09913-85210
Bearing installer

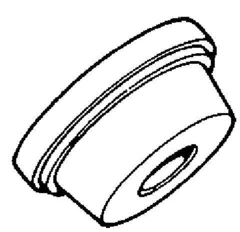
2

09917-58010
Bearing installer

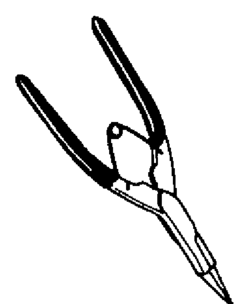
3

09930-30102
Sliding shaft

4

09916-46010
Valve guide remover

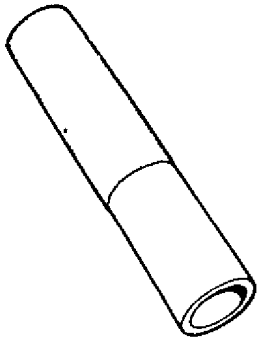
5

09923-74510
Bearing remover

6

09913-75820
Installer attachment

7

09924-84510-004
Bearing installer adapter (C)

8

09900-06107
Snap ring pliers
(Opening type)

9

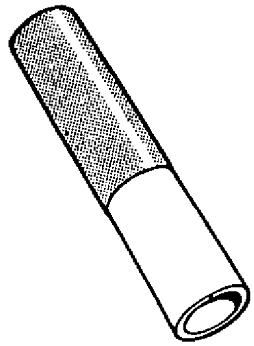


09913-84510
Bearing installer

10

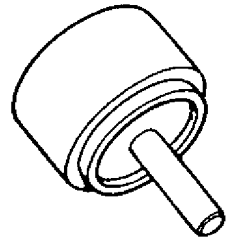
09927-08210
Output shaft remover

11



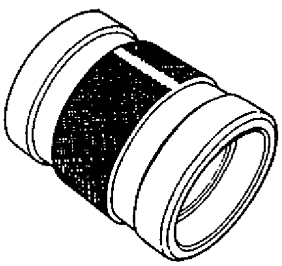
09913-80112
Bearing installer

12



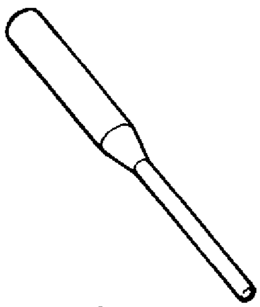
09923-78210
Bearing installer

13



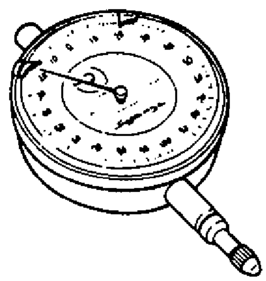
09940-54910
Bearing installer

14



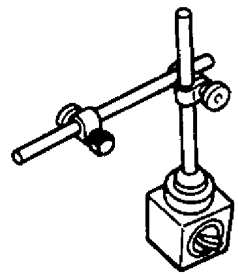
09922-85811
Spring pin remover
4.5 mm

15



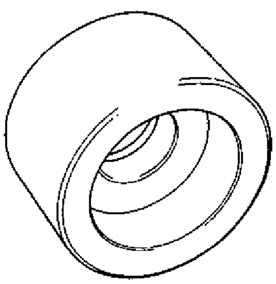
09900-20606
Dial gauge

16



09900-20701
Magnetic stand

17



09951-16060
Bush remover

SECTION 7B

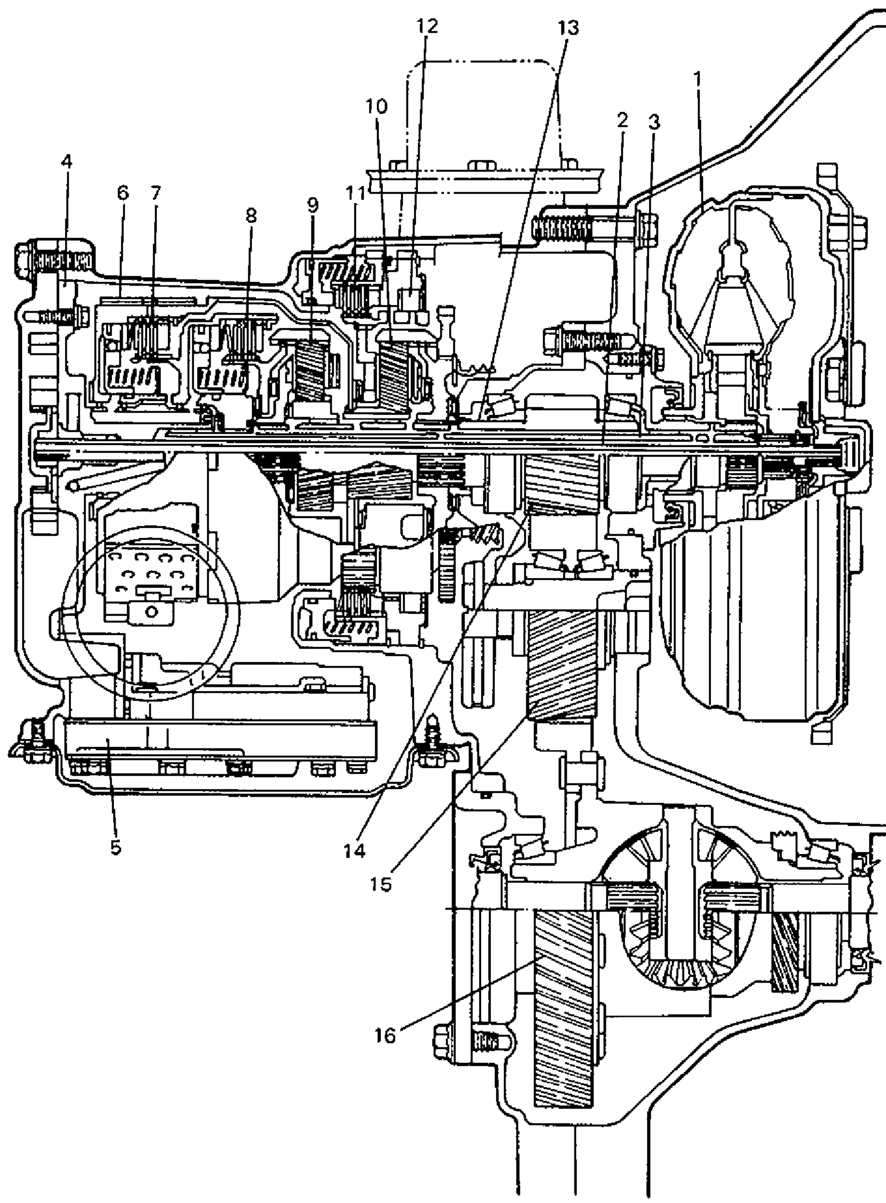
AUTOMATIC TRANSMISSION

CONTENTS

GENERAL DESCRIPTION 7B- 2
Specifications 7B- 3
Operation of Clutch 7B- 4
Operation of Components 7B- 4
Torque Converter 7B- 5
Power Flow 7B- 6
Hydraulic Control System 7B-12
Oil pump 7B-12
Valve body 7B-13
Governor valve 7B-18
Hydraulic circuit 7B-19
Hydraulic ports in transmission case 7B-27
Chart of transmission shifts 7B-28
Selector Lever Shift Mechanism 7B-28
Select pattern 7B-28
Brake Interlock System (If equipped) 7B-29
Steering lock 7B-29
Shift lock solenoid 7B-29
Manual release 7B-30
TROUBLE DIAGNOSIS 7B-31
Transmission Unit 7B-31
Systematic trouble shooting 7B-31
Flow chart 7B-35
ON-CAR SERVICE 7B-40
Maintenance Service 7B-41
Fluid level 7B-41
Lluid change intervals 7B-41
Changing fluid 7B-42
Oil cooler hoses 7B-42
Stall Test 7B-42
Line Pressure Test 7B-43
Governor Pressure Test 7B-44
Time Lag Test 7B-45
Road Test 7B-45
Engine Brake Test 7B-45
"P" Range Test 7B-46
Selector Lever 7B-46
Select Cable 7B-46
Inhibitor Switch 7B-47
Kick-down Switch 7B-47
Brake Interlock system (If equipped) 7B- 48
Shift lock solenoid 7B- 48
Interlock cable 7B- 48
Stop light switch 7B- 49
System inspection 7B- 49
TRANSMISSION UNIT REPAIR OVERHAUL 7B- 50
Precautions for Disassembly and Assembly 7B- 50
Inspection of Parts and Correction .. 7B- 51
Disassembled View of Automatic Transmission 7B- 52
Disassembly 7B- 57
Torque Converter 7B- 66
Oil Pump 7B- 67
Direct Clutch 7B- 70
Forward Clutch 7B- 73
Second Brake 7B- 76
Rear Planetary Ring Gear Ass'y 7B- 77
Output Gear 7B- 78
Idle Gear 7B- 78
Valve Body 7B- 81
Governor Ass'y 7B- 85
Differential 7B- 86
One-way Clutch 7B- 86
Planetary Gear 7B- 87
Planetary Ring Gear 7B- 87
Parking Lock Pawl 7B- 87
Bearing 7B- 87
Inhibitor Switch 7B- 88
Kick Down Solenoid 7B- 88
Vacuum Diaphragm 7B- 88
Assembly 7B- 88
Installation of Bearings and Races .. 7B-106
RECOMMENDED TORQUE SPECIFICATIONS 7B-107
REQUIRED SERVICE MATERIALS 7B-107
SPECIAL TOOLS 7B-108

GENERAL DESCRIPTION

The automatic transmission consists of a 3-gear full automatic transmission, a differential and a fluid torque converter which is of 3-element, 1-stage and 2-phase type. The components of the speed change system are, two planetary gear sets, two disc type clutches, a band type brake, a disc type brake and a one-way clutch. There are six selector lever positions (P, R, N, D, 2 and L) which allow the driver to select the desired gear by shifting the selector lever manually.



1. Torque converter
2. Oil pump shaft
3. Input shaft
4. Oil pump
5. Valve body
6. Second brake
7. Direct clutch
8. Forward clutch
9. Front planetary gear
10. Rear planetary gear
11. First reverse brake
12. One-way clutch
13. Output shaft
14. Output gear
15. Idle gear
16. Differential

Fig. 7B-1

SPECIFICATIONS

Item			Specifications
Torque converter	Type		3-element, 1-stage, 2-phase
	Stall torque ratio		2.3
Oil pump	Type		Internal gear type oil pump
	Drive system		Engine drive
Speed change system	Type		Three forward gear and one reverse gear planetary gear type
	Shift positions		"P" range — Transmission in neutral, output shaft locked and engine start possible
			"R" range — Reverse
			"N" range — Transmission in neutral, engine start possible
			"D" range — Forward 1st gear ↔ 2nd gear ↔ 3rd gear, gear shift possible in arrow direction
			"2" range — Forward 1st gear → 2nd gear ← 3rd gear Fixed to 2nd gear
			"L" range — Forward 1st gear ← 2nd gear ← 3rd gear Fixed to 1st gear
	Transmission gear ratio	1st (low) gear	2.841
		2nd (second) gear	1.541
		3rd (top) gear	1.000
		Reverse gear	2.400
	Control elements		Wet, multiple-plate type clutch .... 2 sets
			Band type brake .... 1 set
			Wet, multiple-plate type brake .... 1 set
			One-way clutch .... 1 set
	Wheel reduction ratio		3.450
Lubrication	Type of lubrication system		Forced lubrication by oil pump pressure
Cooling	Type of cooling system		Radiator assisted cooling (water cooled)
Fluid in use			DEXRON®-II

OPERATION OF CLUTCH

Part name	Function
Direct clutch	Controls transmission of rotation of input shaft to sun gear
Forward clutch	Controls transmission of rotation of input shaft to front planetary ring gear
Second brake band	Locks up or releases sun gear
First reverse brake	Lock up or release rear planetary carrier
One-way clutch	Fixes rotation of rear planetary carrier to one direction

OPERATION OF COMPONENTS

Shift position \ Component		Direct clutch	Forward clutch	One-way clutch	Second brake band	First reverse brake	Parking lock pawl
P		–	–	–	–	○	○
R		○	–	–	–	○	–
N		–	–	–	–	–	–
D	1st gear	–	○	○	–	–	–
	2nd gear	–	○	–	○	–	–
	3rd gear	○	○	–	–	–	–
2	2nd gear	–	○	–	○	–	–
L	1st gear	–	○	–	–	○	–

○ : Engaged — : Released

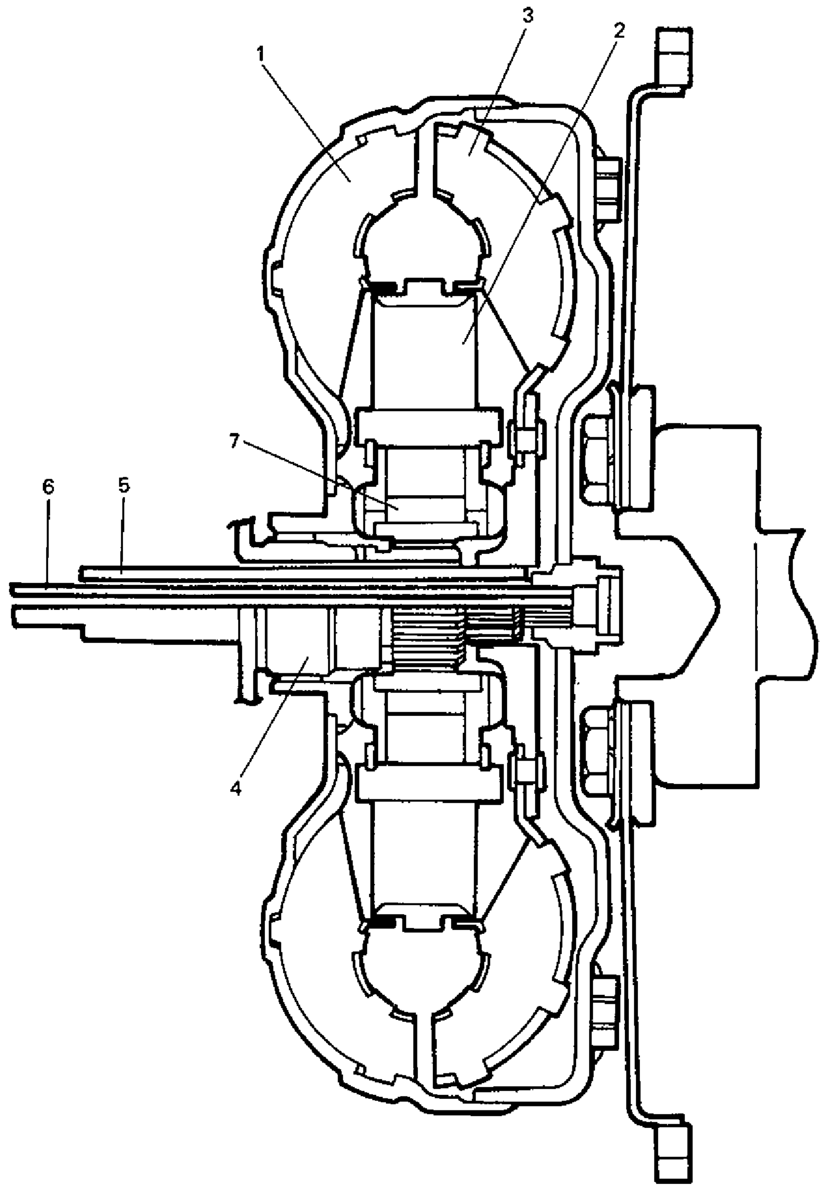
TORQUE CONVERTER

The torque converter consisting of a pump impeller, turbine runner and stator is so constructed that is cannot be disassembled.

The pump impeller is connected to the crankshaft through the drive plate and spline fitted to the impeller is the oil pump shaft which drivers the oil pump.

The stator is installed to the torque converter housing through the one-way clutch. The turbine runner and the input shaft are spline fitted to transmit the power.

For operation of the torque converter, refer to SERVICE HANDBOOK (Automatic Transmission Basic Manual, 99520-02050-012 or 99520-02051-011).



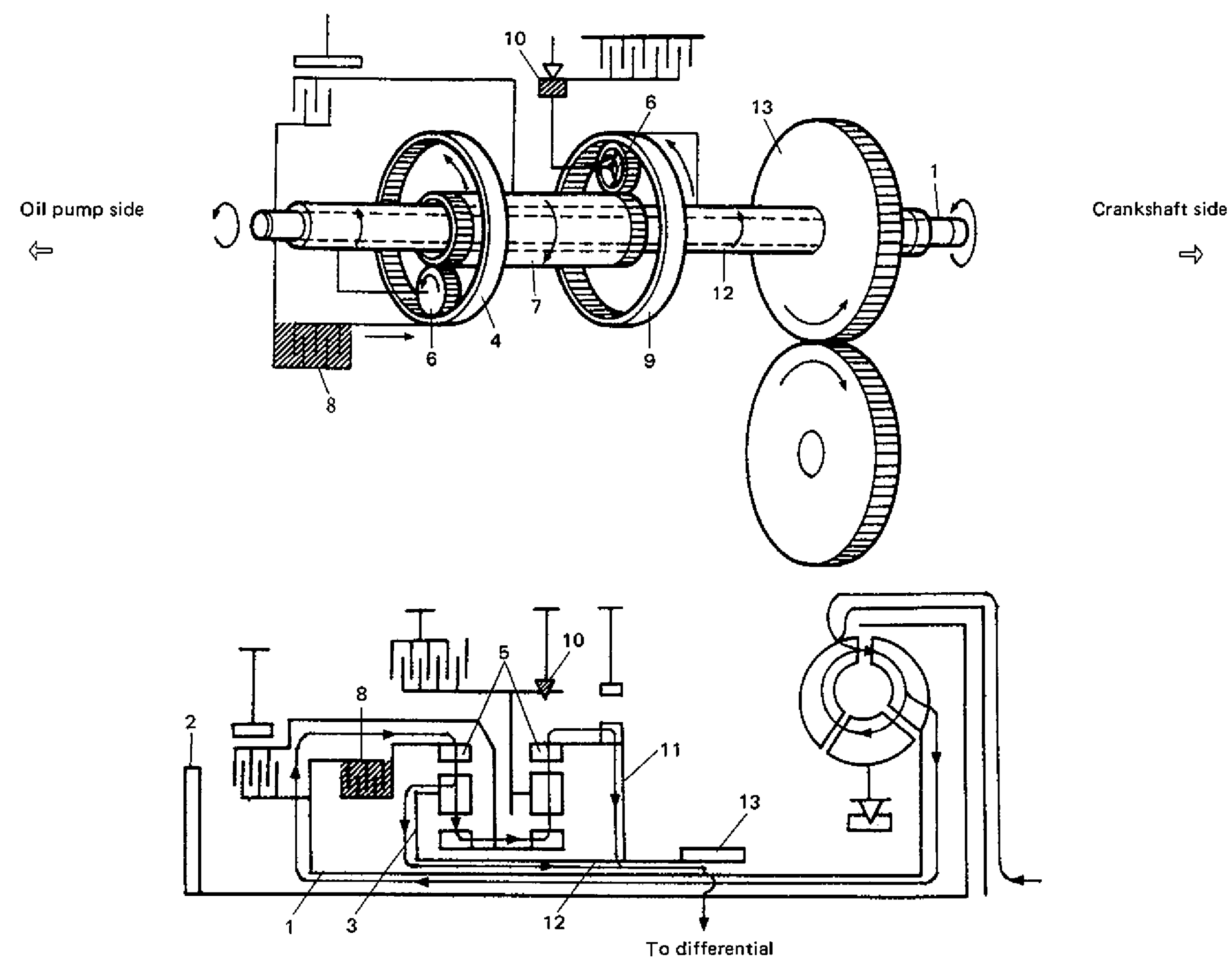
1. Pump impeller
2. Stator
3. Turbine runner
4. Converter housing
5. Input shaft
6. Oil pump shaft
7. One-way clutch

Fig. 7B-2

POWER FLOW

1ST GEAR IN "D" RANGE

As oil pressure is applied to the forward clutch, the input shaft gets engaged with the internal gear of the front planetary gear and its revolution is tranmitted directly to the internal gear and then through the front planetary carrier to the output shaft as counterclockwise revolution. On the other hand, the sun gear which is engaged with the pinion gear of the front planetary gear turns clockwise and transmits its revolution to the pinion gear of the rear planetary gear. Then the rear planetary carrier tries to turn clockwise but it is prevented from turning by the one-way clutch. As a result, the pinion turns on its axis and this causes the internal gear of the rear planetary gear and then the output shaft to turn counterclockwise.



1. Input shaft
2. Oil pump
3. Front planetary carrier
4. Front planetary ring gear
5. Internal gear
6. Pinion gear
7. Sun gear
8. Forward clutch
9. Rear planetary ring gear
10. One-way clutch
11. Rear planetary ring gear ass'y
12. Output shaft
13. Output gear

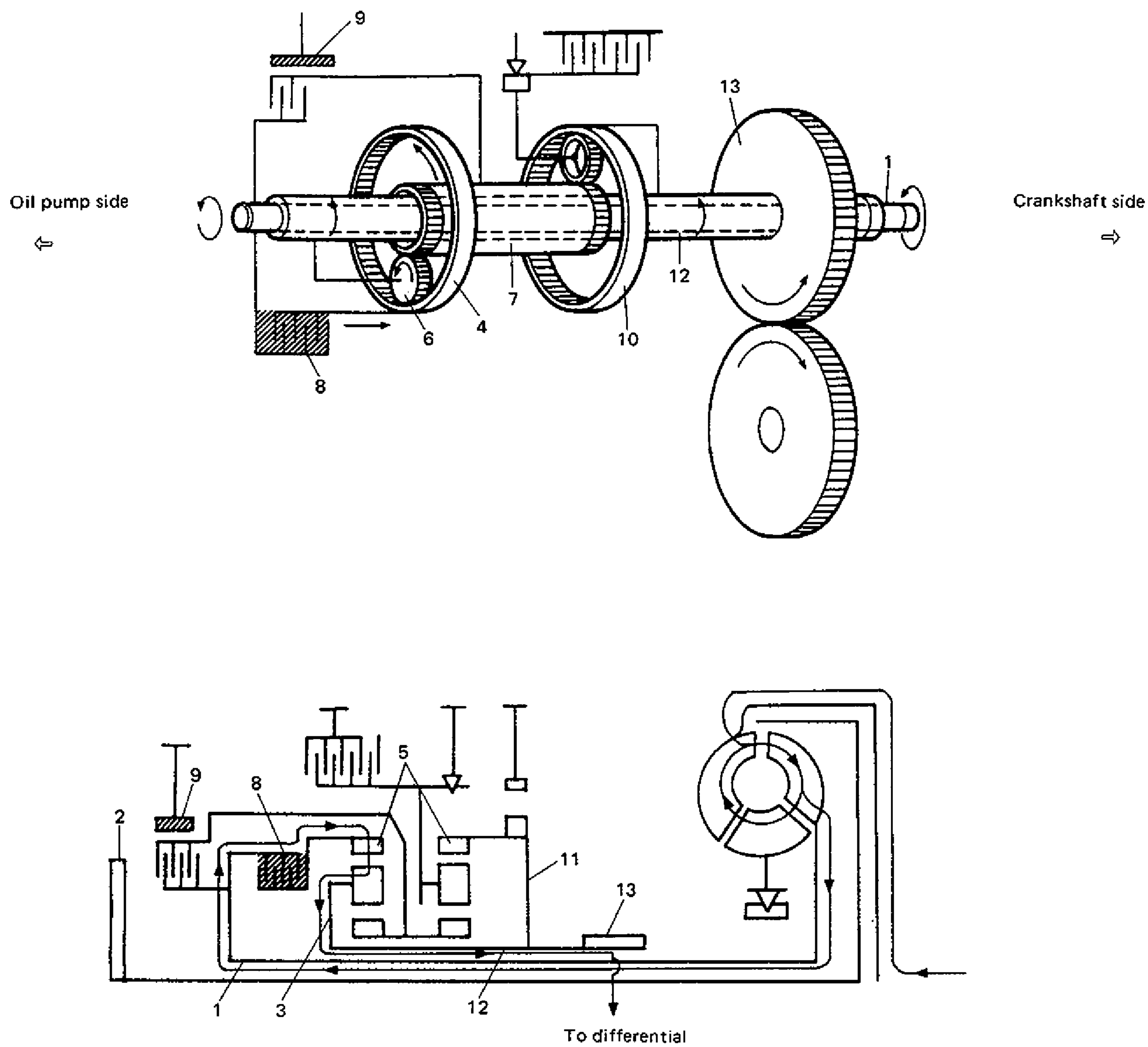
Fig. 7B-3-1

NOTE:

- **The front planetary gear is the one to which the power is transmitted earlier and the rear planetary gear later.**
- **The turning direction of each gear and shaft is determined by the view from the oil pump side and so on.**

2ND GEAR IN "D" RANGE, "2" RANGE

As oil pressure is applied to the forward clutch, the input shaft and the internal gear of the front planetary gear are engaged. This allows the revolution of the input shaft to be transmitted directly to the internal gear, causing the front planetary carrier to turn counterclockwise. In this state, the sun gear which is engaged with the pinion gear of the front planetary gear should turn clockwise but actually it cannot because it is locked by the second brake band. As a result, the pinion gear of the front planetary gear turns around the sun gear. Therefore, the front planetary gear and then the output shaft turn counterclockwise.

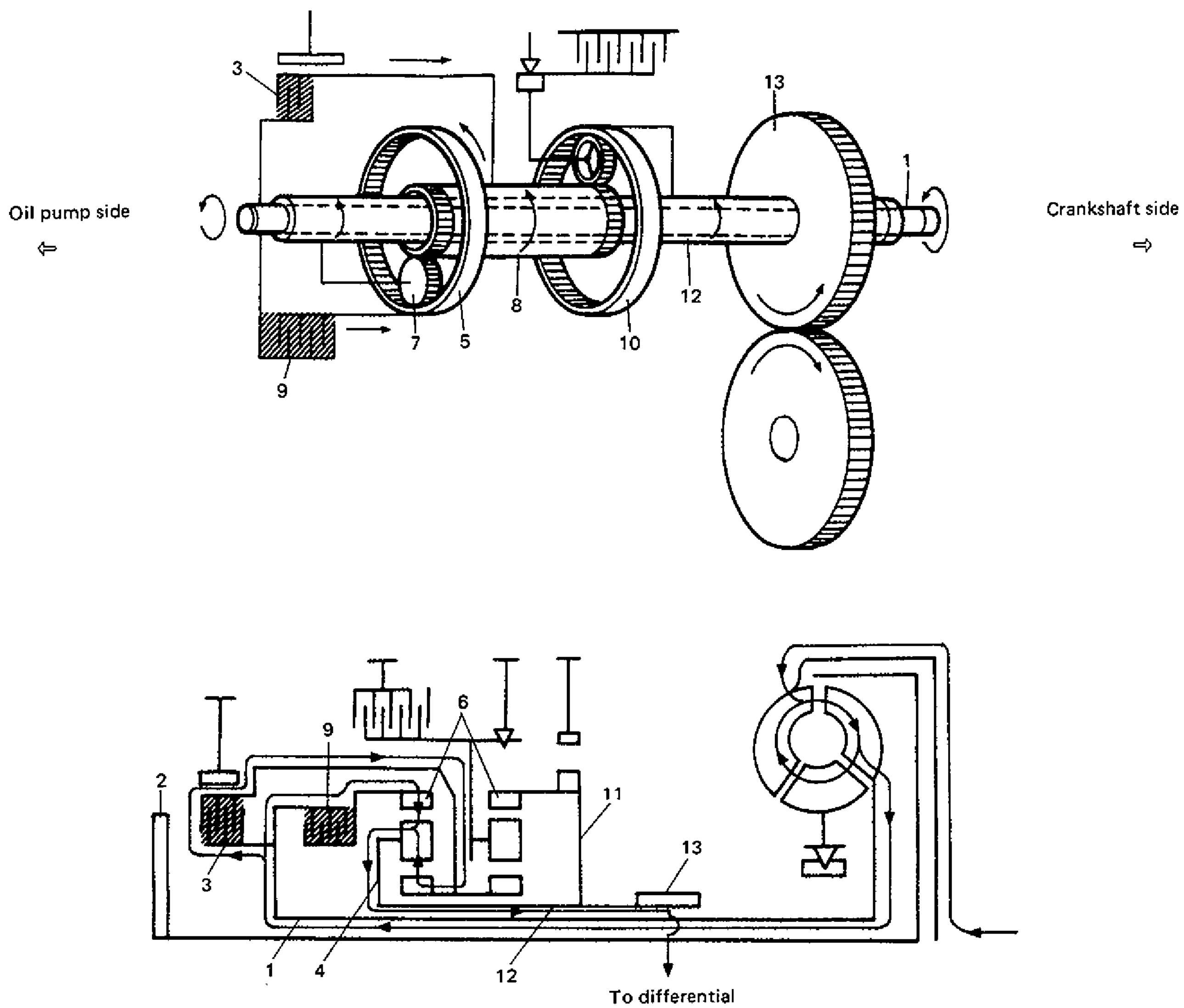


1. Input shaft
2. Oil pump
3. Front planetary carrier
4. Front planetary ring gear
5. Internal gear
6. Pinion gear
7. Sun gear
8. Forward clutch
9. Second brake band
10. Rear planetary ring gear
11. Rear planetary ring gear ass'y
12. Output shaft
13. Output gear

Fig. 7B-3-2

3RD GEAR IN "D" RANGE

As oil pressure is applied to the forward clutch and the direct clutch, the input shaft gets engaged with the internal gear of the front planetary gear and the sun gear. In other words, the input shaft is directly connected to the planetary gear unit itself. As a result, the pinion gear of the front planetary gear is locked and thus the input shaft revolution is transmitted directly to the output shaft.

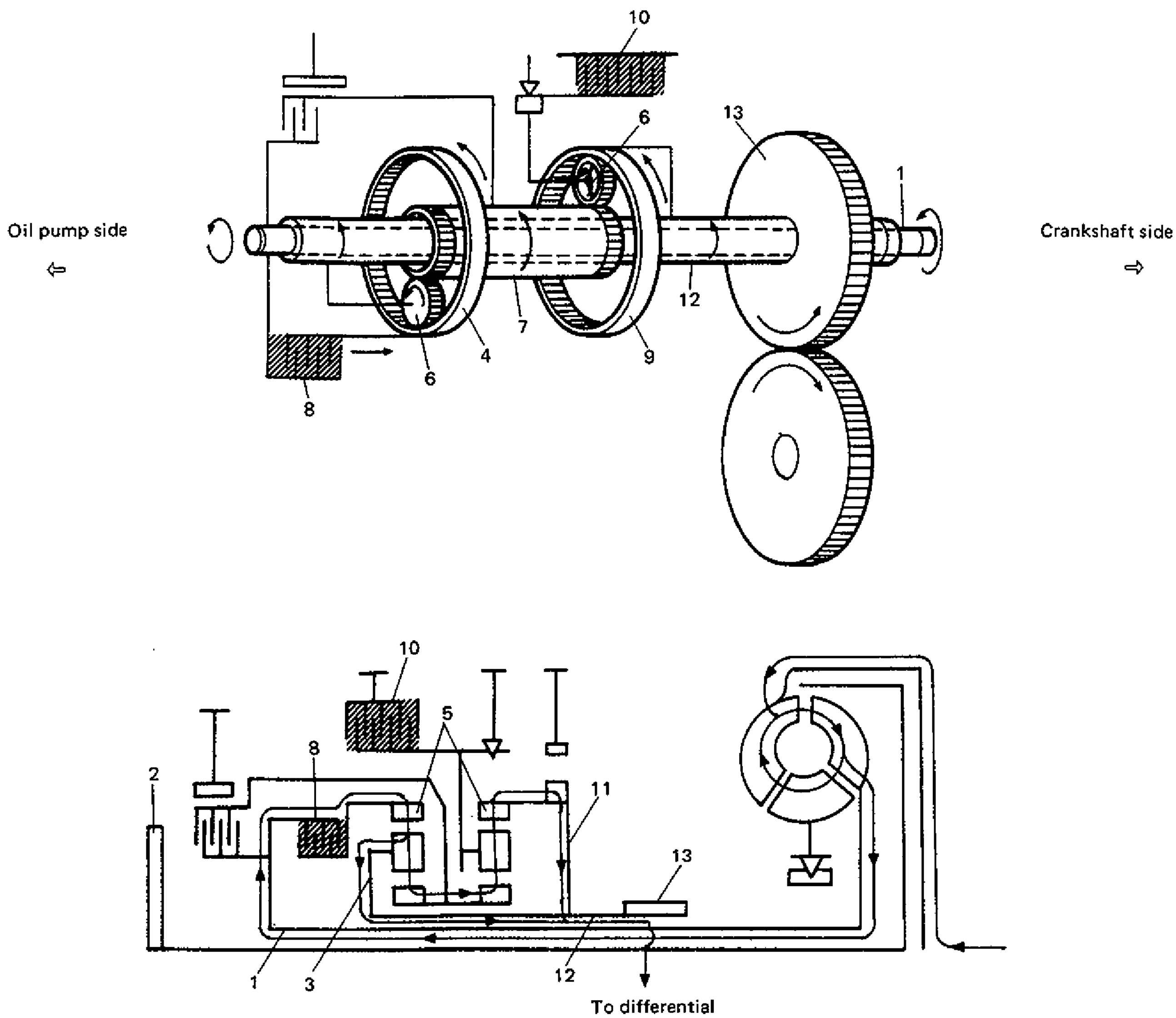


1. Input shaft
2. Oil pump
3. ·Direct clutch
4. Front planetary carrier
5. Front planetary ring gear
6. Internal gear
7. Pinion gear
8. Sun gear
9. Forward clutch
10. Rear planetary ring gear
11. Rear planetary ring gear ass'y
12. Output shaft
13. Output gear

Fig. 7B-3-3

"L" RANGE

The torque flow from the engine is the same as at the 1st gear in "D" range, but in this range, the first reverse brake, under oil pressure, interrupts counterclockwise revolution of the rear planetary ring gear ass'y which occurs when the engine brake is applied. In other words, when driving in "D" range, the clockwise revolution of the rear planetary ring gear ass'y is stopped by means of the one-way clutch, but when the engine brake is applied, the reverse torque (counterclockwise) from the output shaft acts to prevent the one-way clutch from operating and the rear planetary carrier idles. This puts the first reverse brake into operation so as to hold the rear planetary carrier stationary.
Thus powerful engine braking is provided.

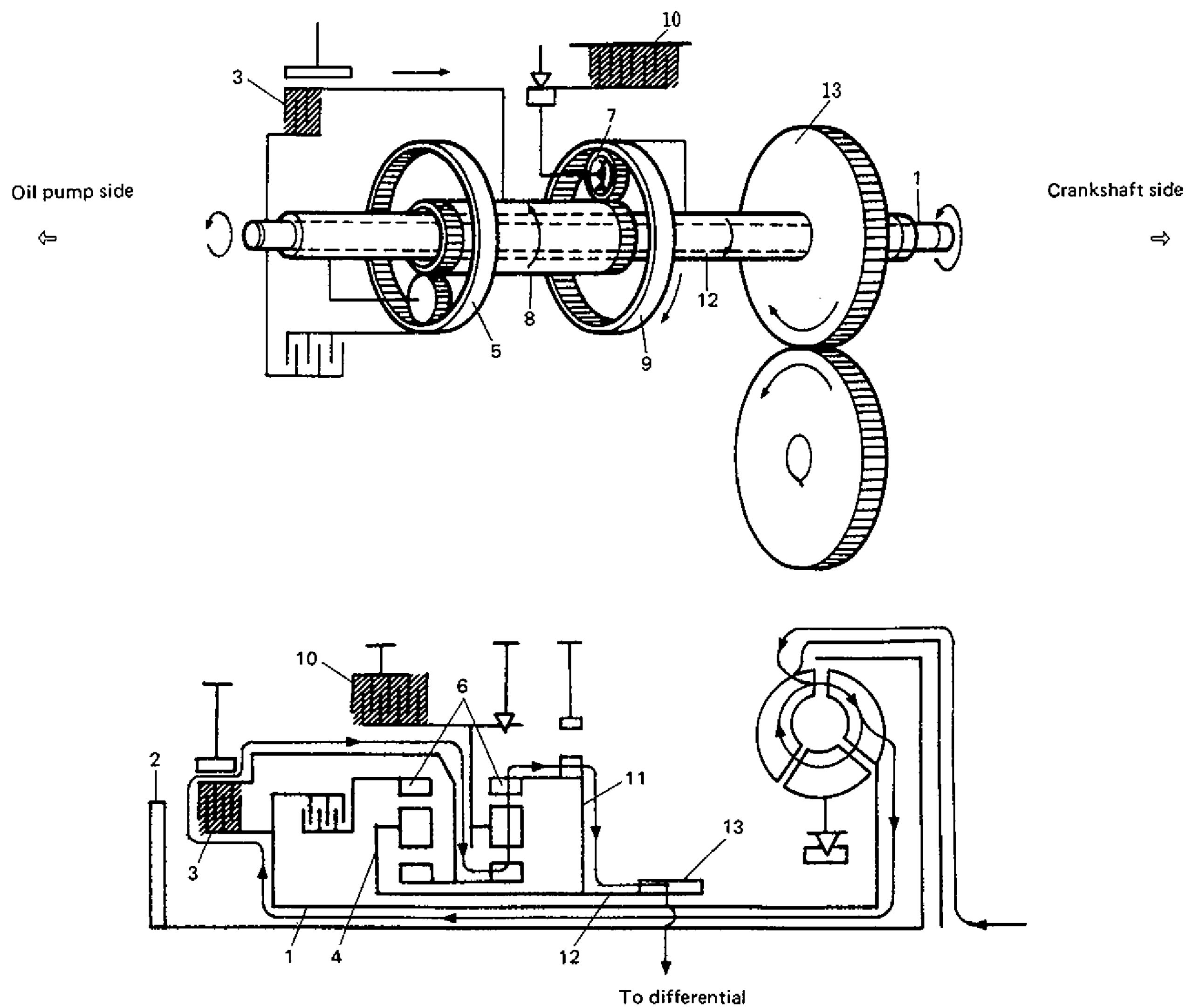


1. Input shaft
2. Oil pump
3. Front planetary carrier
4. Front planetary ring gear
5. Internal gear
6. Pinion gear
7. Sun gear
8. Forward clutch
9. Rear planetary ring gear
10. First reverse brake
11. Rear planetary ring gear
12. Output shaft
13. Output gear

Fig. 7B-3-4

"R" RANGE

As oil pressure is applied to the direct clutch, the input shaft is engaged with the sun gear of the planetary gear and transmits its revolution to the sun gear directly. On the other hand, as the first reverse brake is also at work, the rear planetary ring gear ass'y is held stationary. In this state, the pinion gear does not turn around the sun gear but rotates clockwise on its axis and causes the internal gear and then the output shaft to turn clockwise, thereby the car moves rearward.



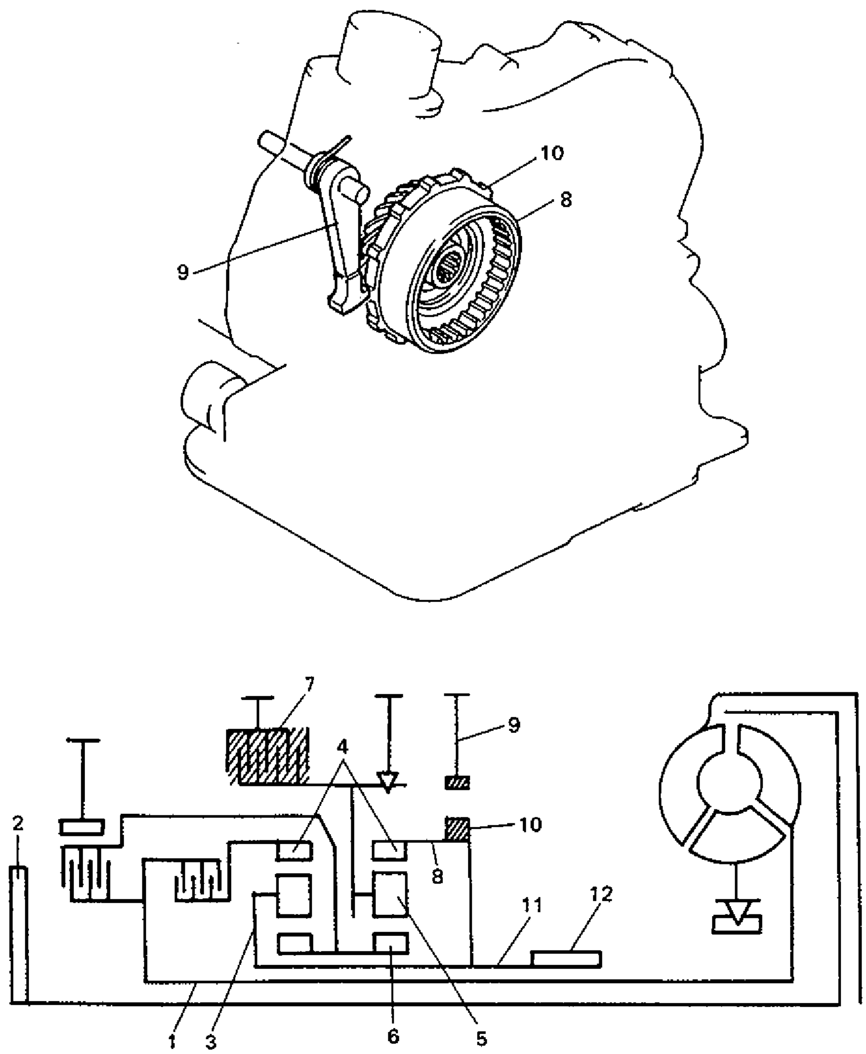
1. Input shaft
2. Oil pump
3. Direct clutch
4. Front planetary carrier
5. Front planetary ring gear
6. Internal gear
7. Pinion gear
8. Sun gear
9. Rear planetary ring gear
10. First reverse brake
11. Rear planetary ring gear ass'y
12. Output shaft
13. Output gear

Fig. 7B-3-5

"N" OR "P" RANGE

As the forward clutch and direct clutch are released, the engine torque is not transmitted from the input shaft to the output shaft.

In the "P" range, the output gear is locked mechanically by the parking pawl and thereby the internal gear of the rear planetary gear and the front planetary carrier are locked. Also, the rear planetary carrier is locked by the first reverse brake. Thus, all the gears are locked and therefore the car is held at a stop.



1. Input shaft
2. Oil pump
3. Front planetary carrier
4. Internal gear
5. Pinion gear
6. Sun gear
7. First reverse brake
8. Rear planetary ring gear ass'y
9. Parking pawl
10. Parking gear
11. Output shaft
12. Output gear

Fig. 7B-3-6 (showing "P" range)

HYDRAULIC CONTROL SYSTEM

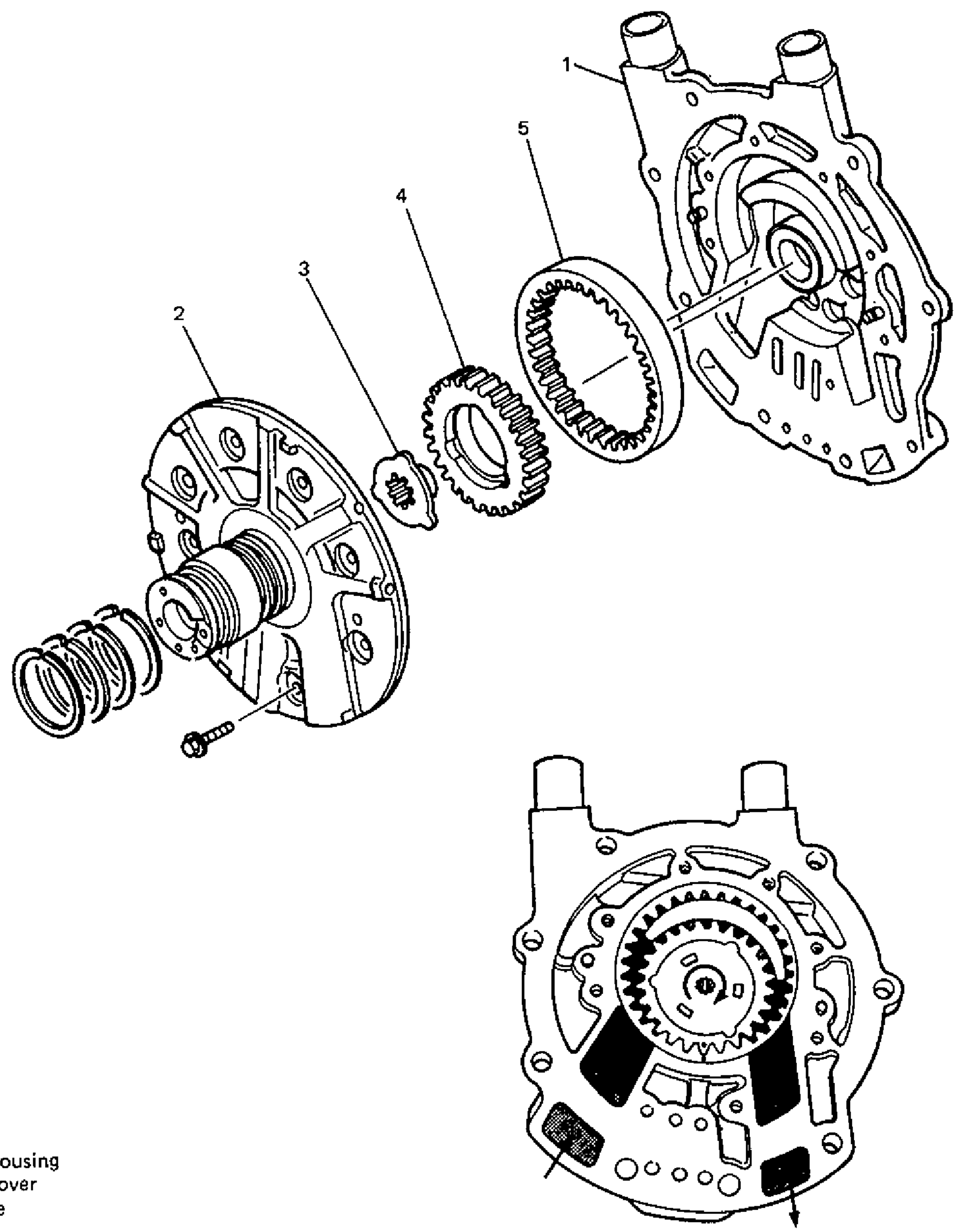
OIL PUMP

The oil pump is of the internal gear type. It feeds fluid to the torque converter, lubricates each part of the transmission and delivers oil pressure to operate each clutch and brake.

The drive flange and oil pump shaft are fitted to the oil pump drive gear. And the other end of the oil pump shaft is connected to the pump impeller of the torque converter so that the oil pump is driven by the engine.

NOTE:

- **When towing a car after an accident or for any other reason, be sure to lift the front wheels, or poor lubrication of transmission will result because the oil pump does not operate while being towed.**
- **If the car has to be towed with its front wheels on the ground, be sure to observe the following.**
  1. Towing speed should not exceed 30 km/h.
  2. Towing distance should be within 50 km.

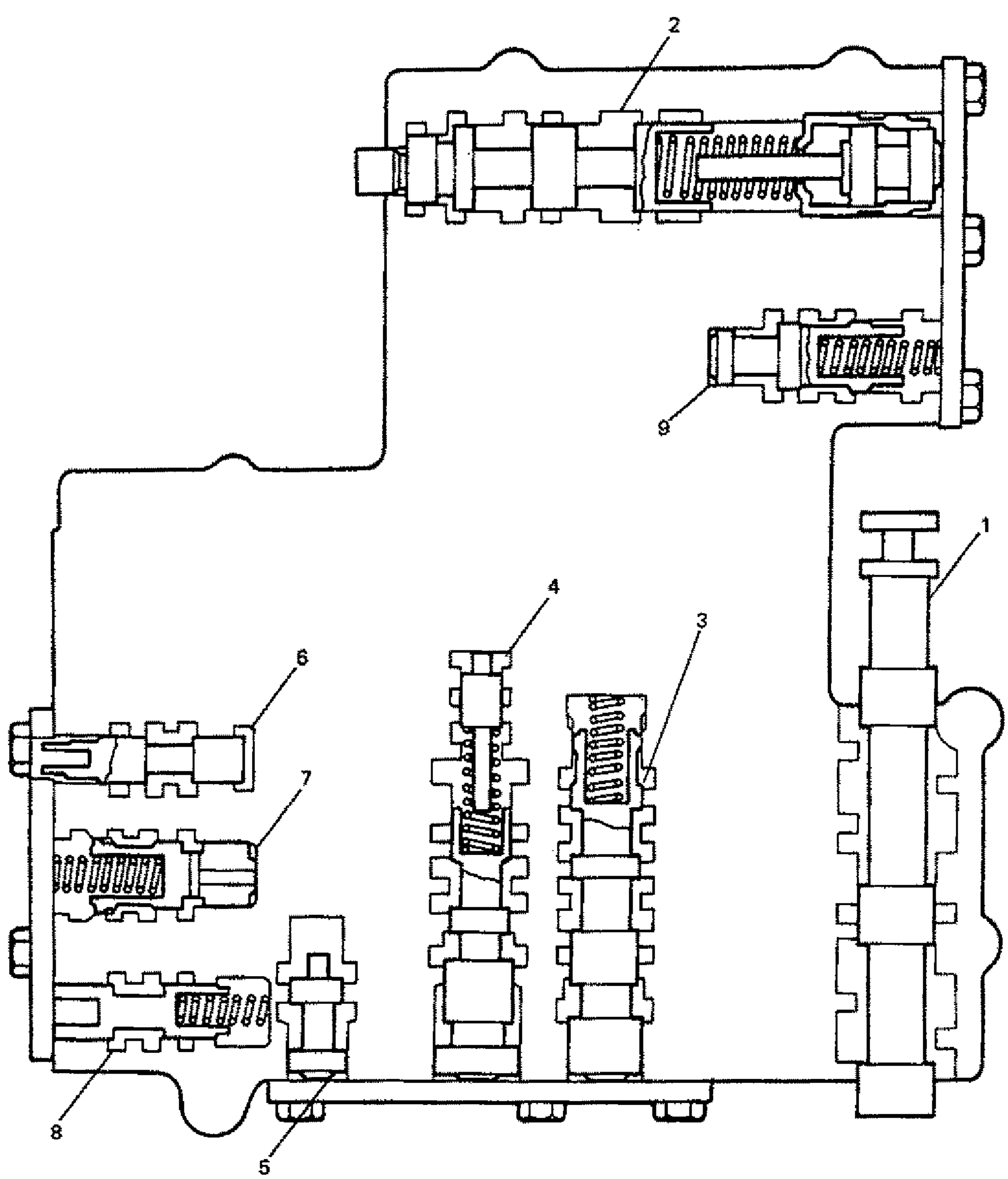


1. Oil pump housing
2. Oil pump cover
3. Drive flange
4. Drive gear
5. Driven gear

Fig. 7B-4-1

VALVE BODY

The valve body with built-in valves to control oil pressure is located in the oil pan. These valves are connected through oil passages.



1. Manual valve
2. Pressure regulator valve
3. 1 — 2 shift valve
4. 2 — 3 shift valve
5. Pressure modifier valve
6. Vacuum throttle valve
7. Throttle back-up valve
8. Down shift solenoid valve
9. Second lock valve

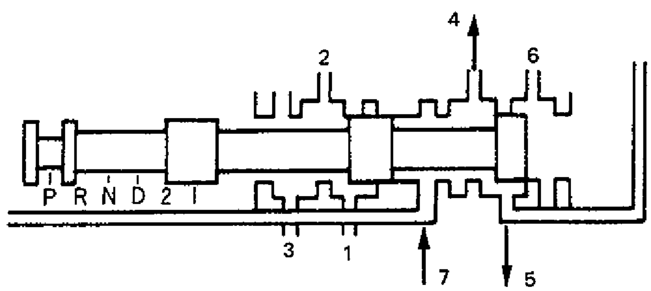
Fig. 7B-4-2

Valves in Valve Body

Valve name	Function
Manual valve	Delivers line pressure to each circuit according to each selector lever position.
Pressure regulator valve	Regulates line pressure according to driving conditions.
Vacuum throttle valve	Regulates throttle pressure according to throttle condition.
1 — 2 shift valve	Automatically executes 1 — 2 sihft.
2 — 3 shift valve	Automatically executes 2 — 3 shift.
Pressure modifier valve	Regulates line pressure according to car speed.
Throttle back-up valve	Minimizes operation delay when shifted to "L" or "2" range.
Down shift solenoid valve	Changes line pressure passage according to opening of accelerator pedal.
Second lock valve	Assists 1 — 2 shift valve when in 2nd gear of "2" range.

Manual Valve

The manual valve is connected with the selector lever directly through the calbe. It delivers the lene pressure to each circuit according to each selector lever position.



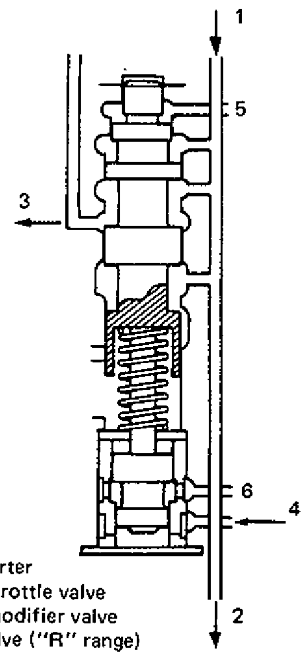
	1	2	3	4	5	5
P				○	○	
R				○	○	○
N						
D	○	○	○			
2	○	○		○		
L	○			○	○	

1. To secondary governor valve
   To 1 — 2 shift valve
   To forward clutch
2. To second lock valve
3. To second lock valve
   To 2 — 3 shift valve
4. To down shift solenoid valve
5. To 1 — 2 shift valve
6. To pressure regulator valve
   To 2 — 3 shift valve
7. From oil pump

Fig. 7B-4-3 Manual Valve (when in "P" range)

Pressure Regulator Valve

To regulate the line pressure properly to meet the driving conditions, the pressure regulator valve repeats the drain according to the pressures applied to it. The pressures are: the line pressure generated in the oil pump, the throttle pressure (downward) from the pressure modifier valve, the throttle pressure from the vacuum throttle valve and the line pressure (upward) from the spring and manual valve.



1. From oil pump
2. To manual valve
3. To torque converter
4. From vacuum throttle valve
5. From pressure modifier valve
6. From manual valve ("R" range)

Fig. 7B-4-4

Vacuum Throttle Valve

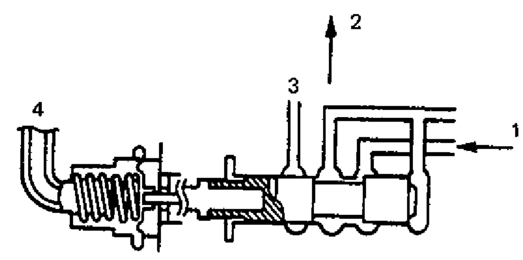
(Numbers in the description below correspond to reference numbers in the figure which follows.)

The vacuum throttle valve generates the throttle pressure and regulates it properly to meet the throttle condition.

When the vacuum pressure of the intake manifold is low, the force of the control modulator to push down the rod grows. As a result, the throttle pressure 2 is hard to be drained through 3 and the throttle pressure is regulated high.

On the other hand, when the vacuum pressure of the intake manifold is high, the situation is reverse and the throttle pressure is regulated low.

In other words, the vacuum throttle valve regulates the throttle pressure between the line pressure and drain.



1. From oil pump
2. To pressure modifier valve, 2 – 3 shift valve, pressure regulator valve
3. To throttle back-up valve (drain)
4. Vacuum (intake manifold)

Fig. 7B-4-5

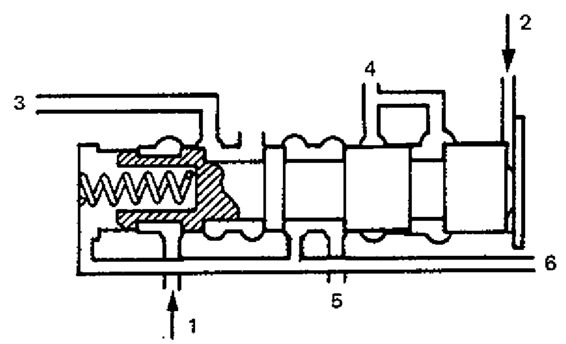
1 – 2 Shift Valve

(Numbers in the descriptions below correspond to reference numbers in the figure which follows.)

The 1 – 2 shift valve controls the 1 – 2 or 2 – 1 shift of the transmission by changing the hydraulic circuit according to governor pressure produced by the governor valve, line pressure and spring force. In "D" range, as the governor pressure increases, the 1 – 2 shift valve moves to the felt and the line pressure is applied through 3 to the second lock valve which then applies oil pressure to the second brake band to keep the transmission at 2nd gear. As governor pressure lowers, on the other hand, the valve moves to the right and the line pressure to the second lock valve is drained. Thus, the transmission downshifts from 2nd to 1st gear.

In case of kickdown, line pressure is applied to 4 from the downshift solenoid valve, which then moves the valve to the right and the transmission downshifts to 1st gear.

In "L" range, oil pressure is applied from the manual valve through 5 to 6. In addition, oil pressure 1 and spring force act on the valve to push it to the right hard so that the transmission is held at 1st gear.



1. From manual valve
2. From governor valve
3. To second lock valve
4. To downshift solenoid valve
5. From manual valve ("L" range)
6. From 5 ("L" range)

Fig. 7B-4-6

2 – 3 Shift Valve

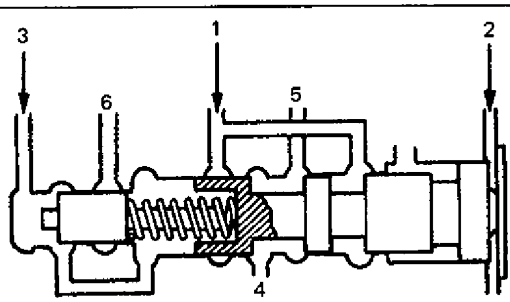
(Numbers in the description below correspond to reference numbers in the figure which follows.)

The 2 – 3 shift valve controls 2 – 3 or 3 – 2 shift of the transmission by changing the oil pressure circuit according to governor pressure, line pressure, throttle pressure and spring force.

As the governor pressure increases, the 2 – 3 shift valve is pushed to the left to allow the line pressure 1 to pass to 4. This causes the direct clutch to be engaged and the second brake band released. As a result, the transmission upshifts to 3rd gear.

On the other hand, as the governor pressure lowers, the valve moves to the right and the line pressure 4 is applied through 5 to the manual valve and drained. Thus the transmission downshifts to 2nd gear.

In case of kickdown, line pressure is applied from the downshift solenoid valve to 6 to move the valve to the right, causing the transmission to downshift to 2nd gear.



1. From manual valve
2. From governor valve
3. From vacuum throttle valve
4. To direct clutch, second brake band (release side)
5. To manual valve (drain)
6. From kickdown solenoid valve

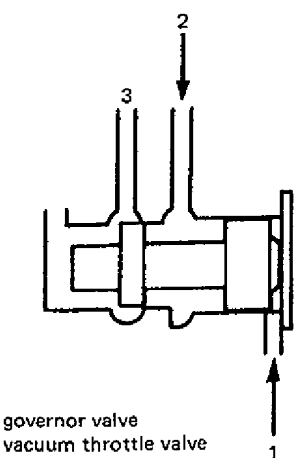
Fig. 7B-4-7

Pressure Modifier Valve

(Numbers in the description below correspond to reference numbers in the figure which follows.)

The pressure modifier valve controls the line pressure by opening and closing the throttle pressure passage according to the governor pressure.

As the governor pressure 1 increases, the pressure modifier valve is pushed to the left and the throttle pressure 2 passes through 3 to the pressure regulator valve to lower the line pressure. When the governor pressure lowers, the valve moves to the right and closes the passage of the throttle pressure to the pressure regulator valve, and thus the line pressure increases.



1. From governor valve
2. From vacuum throttle valve
3. To pressure regulator valve

Fig. 7B-4-8

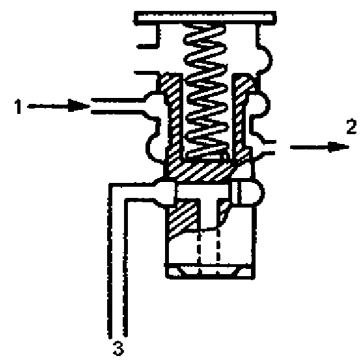
Throttle Back-up Valve

(Numbers in the description below correspond to reference nembers in the figure which follows.)

The throttle back-up valve controls the throttle pressure properly for each range by changing drain of the throttle pressure 1 according to the spring force (downward) and the line pressure (upward) 2 and 3.

When the selector lever is shifted from "D" to "2" and "L", the line pressure acts on 2 and the throttle pressure 1 increases. Then the line pressure and throttle pressure applied to the vacuum throttle valve also increase to minimize operation delay of each functional part.

In "L" range, when the transmission downshifts from 2nd gear to 1st, the line pressure acts on 2 and 3 and then the throttle pressure 1 is drained from the upper part of the valve. Consequently, the line pressure and throttle pressure applied to the vacuum throttle valve lowers and the transmission shift takes place slightly later and thus smoothly.



1. From vacuum throttle valve
2. From manual valve
3. From 1 – 2 shift valve

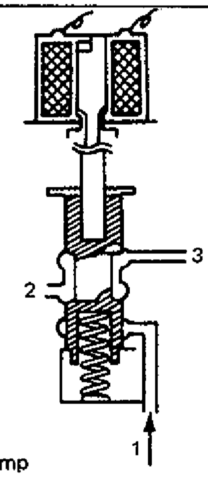
Fig. 7B-4-9

Downshift Solenoid Valve

(Numbers in the description below correspond to reference numbers in the figure which follows.)

When the accelerator pedal is depressed more than 7/8 of its stroke, the solenoid rod overcomes the spring force and pushes down the downshift solenoid valve. The line pressure 1 passes through 2 and acts on the 1 – 2 shift valve and 2 – 3 shift valve. In this way the passage of the line pressure is changed and a downshift of the transmission takes place.

In "2" or "L" range, the line pressure applied to 2 will not change even when the solenoid operates, because the same line pressure is applied to 3 as that to 1.



1. From oil pump
2. To 1 – 2 shift valve, 2 – 3 shift valve
3. From manual valve

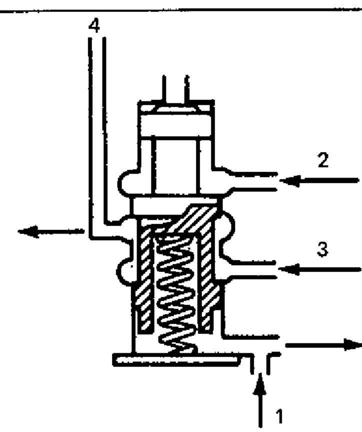
Fig. 7B-4-10

Second Lock Valve

(Numbers in the description below correspond to reference numbers in the figure which follows.)

The second lock valve is under the line pressure from the manual valve and from 1 – 2 shift valve applied to 1 and 2 and to 3 respectively. Also the line pressure is applied to the second brake band from 4.

At 2nd gear in "D" range, oil pressure is applied to 4 from 3 but in "2" range, the area differential pressure of the valve overcomes the spring force because of the line pressure from 2 and thereby the valve moves down. Then the oil pressure from 2 is applied to 4 regardless of that from 3. Thus the transmission is held at 2nd gear regardless of operation of the 1 – 2 shift valve.



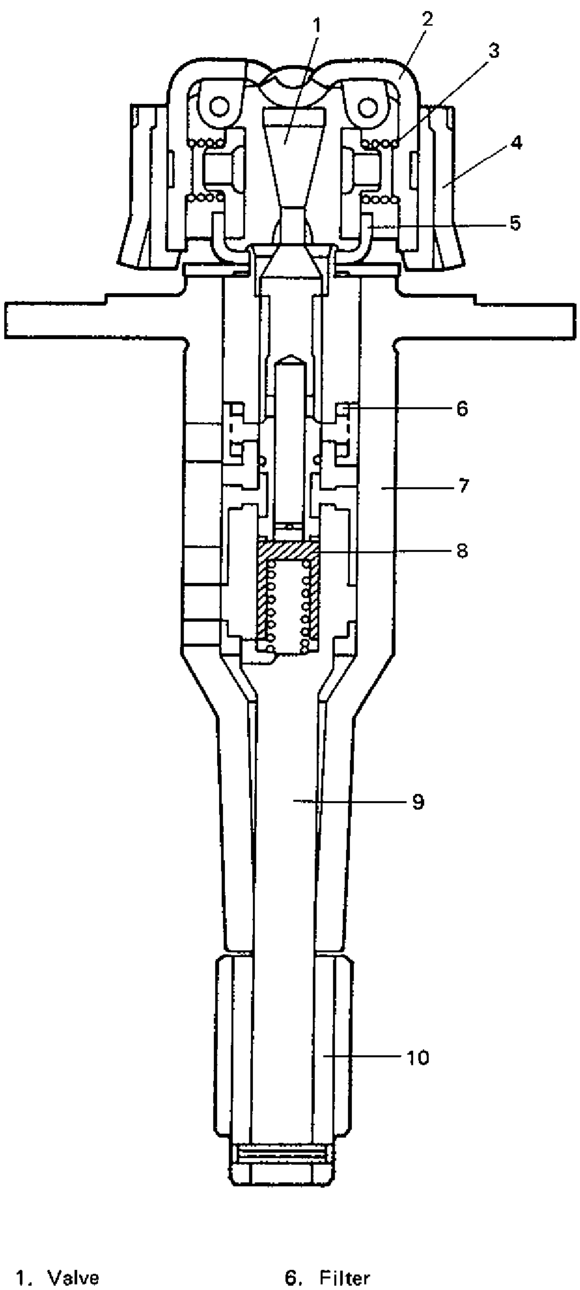
1. From manual valve (in "D" range only)
2. From manual valve
3. From 1 – 2 shift valve
4. To second brake band

Fig. 7B-4-11

GOVERNOR VALVE

The governor valve controls the transmission shift by producing governor pressure according to the car speed and applying it to the 1 – 2 shift valve and 2 – 3 shift valve.

Its main components are: primary weight, secondary weight, governor valve body, governor shaft, governor driven gear and governor sleeve which is fixed to the transmission case.



1. Valve
2. Secondary weight
3. Secondary spring
4. Primary weight
5. Stopper
6. Filter
7. Sleeve
8. Plunger
9. Governor shaft
10. Driven gear

Fig. 7B-4-12

When the car speed is low, the force to push down the valve F in the figure below (under the influence of the centrifugal force of the weight and spring force) is smaller than the plunger spring force K. Therefore, the valve does not move down so much as to open the port for the line pressure and no governor pressure is generated.

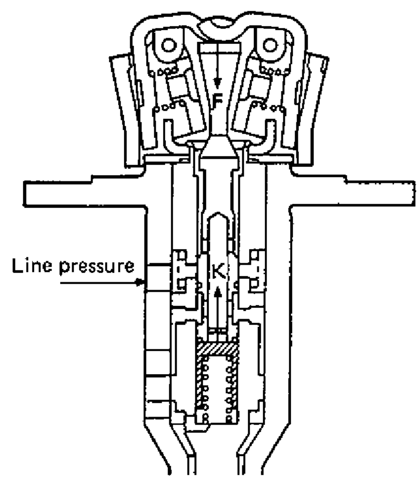
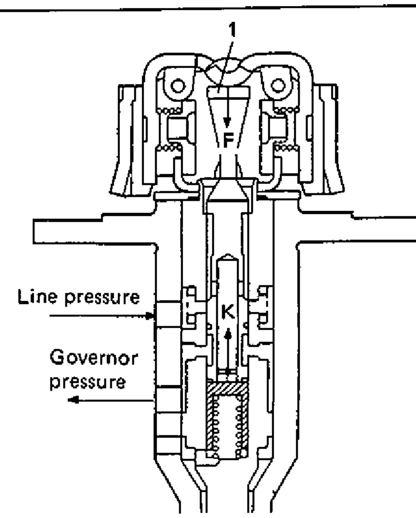


Fig. 7B-4-13

As the car speed increases, F grows large enough to push down the valve. Once the car speed reaches a certain speed (break point), the port opens and the valve starts regulating the governor pressure. At the break point, the primary weight contacts the stopper and provides no effect to F any more. Beyond this point, the higher the car speed rises, the greater F grows but the governor pressure is controlled properly by repeated drain.



1. Valve

Fig. 7B-4-14

HYDRAULIC CIRCUIT

"D" RANGE, 1ST GEAR

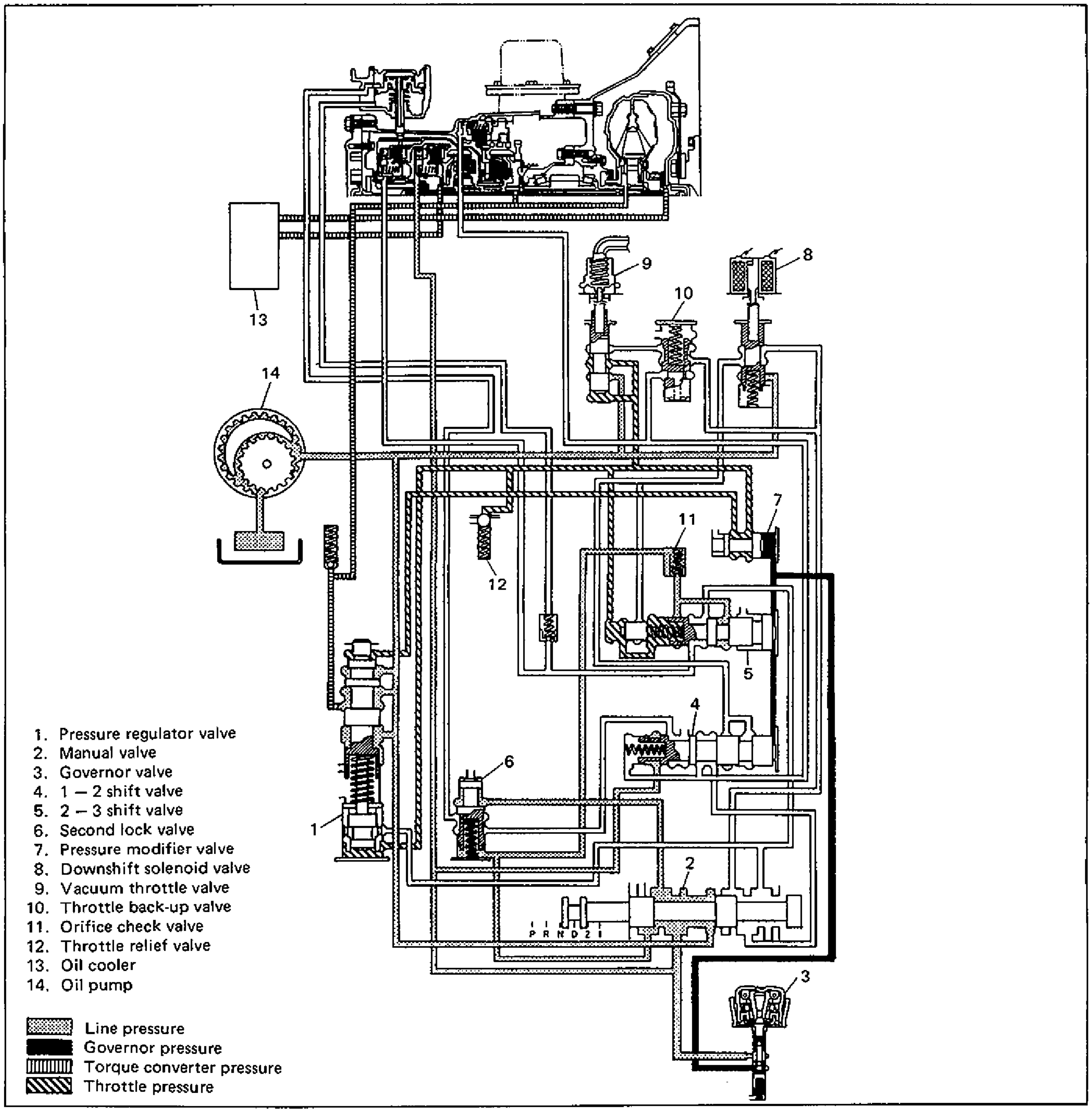


Fig. 7B-5-1

The line pressure generated by the oil pump at the engine start is regulated by the pressure regulator valve and sent to the manual valve. A part of it acts on the forward clutch which is then engaged to shift the transmission to 1st gear. As the car speed increases and the governor pressure rises, the throttle pressure is applied to the pressure regulator valve, causing the regulated line pressure through the pressure modifier valve to lower. A part of the line pressure sent to the pressure regulator valve joins the torque converter pressure and is delivered to the torque converter.

"D" RANGE, 2ND GEAR

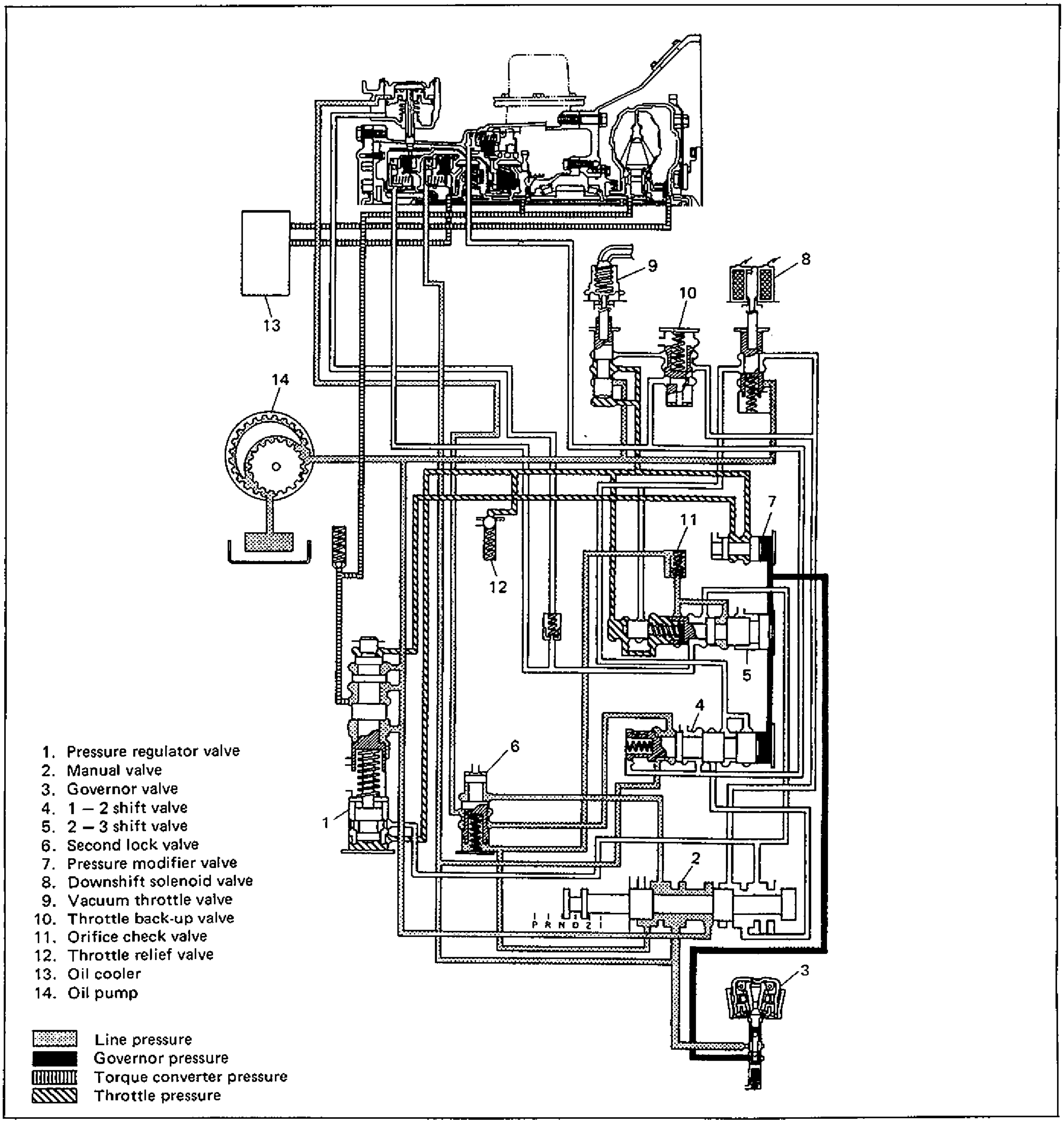
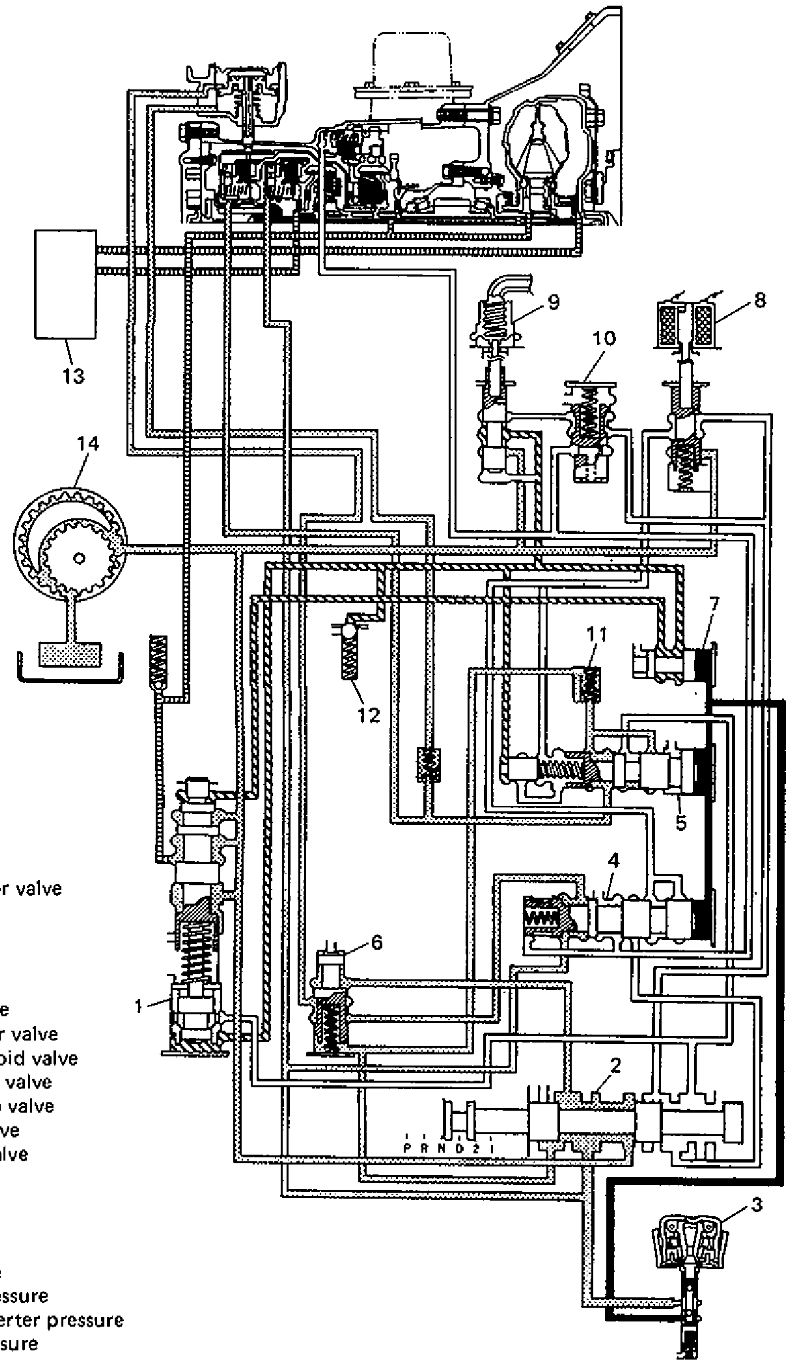


Fig. 7B-5-2

At 1st gear in "D" range, when the car speed rises higher and so does the governor pressure, the line pressure from the manual valve passes through the 1 – 2 shift valve to the second lock valve to actuate the second brake band. Thus the transmission upshifts to 2nd gear.

In case of kickdown, the line pressure passes through the downshift solenoid valve and causes the 1 – 2 shift valve to move to the right. As a result, the line pressure to the second lock valve is drained and the second brake band is released. Thus the transmission downshifts from 2nd to 1st gear.

"D" RANGE, 3RD GEAR



1. Pressure regulator valve
2. Manual valve
3. Governor valve
4. 1 – 2 shift valve
5. 2 – 3 shift valve
6. Second lock valve
7. Pressure modifier valve
8. Downshift solenoid valve
9. Vacuum throttle valve
10. Throttle back-up valve
11. Orifice check valve
12. Throttle relief valve
13. Oil cooler
14. Oil pump

Line pressure
Governor pressure
Torque converter pressure
Throttle pressure

Fig. 7B-5-3

At 2nd gear in "D" range, when the car speed increases further, the governor pressure rises higher and the 2 – 3 shift valve moves to the left. Then the line pressure from the manual valve passes the 2 – 3 shift valve and releases the second brake and actuates the direct clutch. As a result, the transmission upshifts from 2nd gear to 3rd.

In case of kickdown, the line pressure passes through the downshift solenoid valve and moves the 2 – 3 shift valve to the right. Then the line pressure applied to the second brake release side and direct clutch is drained from the manual valve and the transmission downshifts from 3rd to 2nd gear.

"2" RANGE

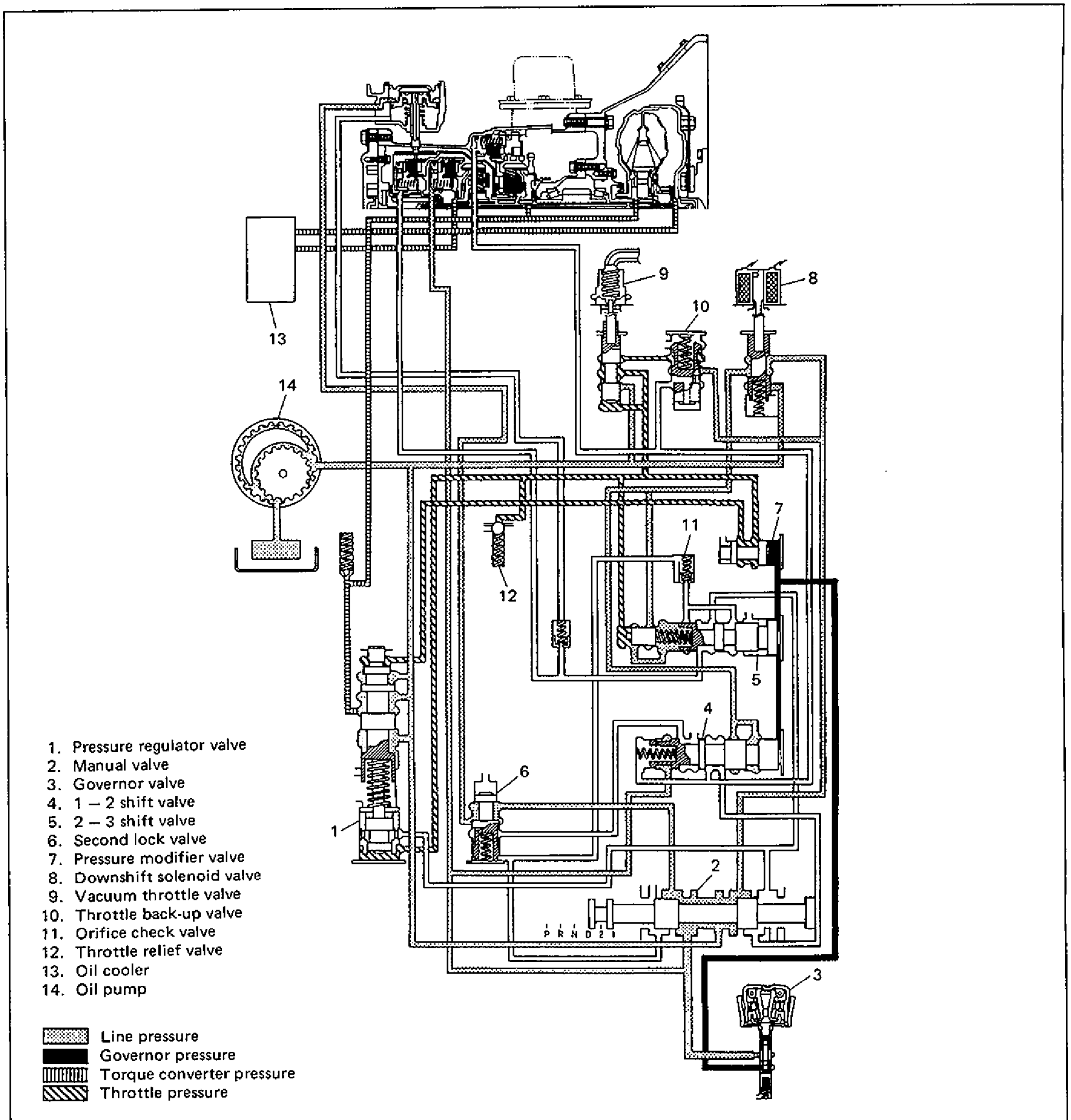


Fig. 7B-5-4

When a part of the line pressure delivered from the pressure regulator valve to the manual valve acts on the forward clutch, the clutch gets engaged. Also, the line pressure from the manual valve passes through the second lock valve to actuate the second brake band. As a result, the transmission shifts to 2nd gear. It will not shift to 3rd gear even when the car speed increases and the governor pressure rises high because the 2 – 3 shift valve is under the line pressure from the down shift solenoid valve. The 1 – 2 shift valve operation does not affect gear shift in "2" range, either. Thus, the transmission is kept at 2nd gear.

"L" RANGE

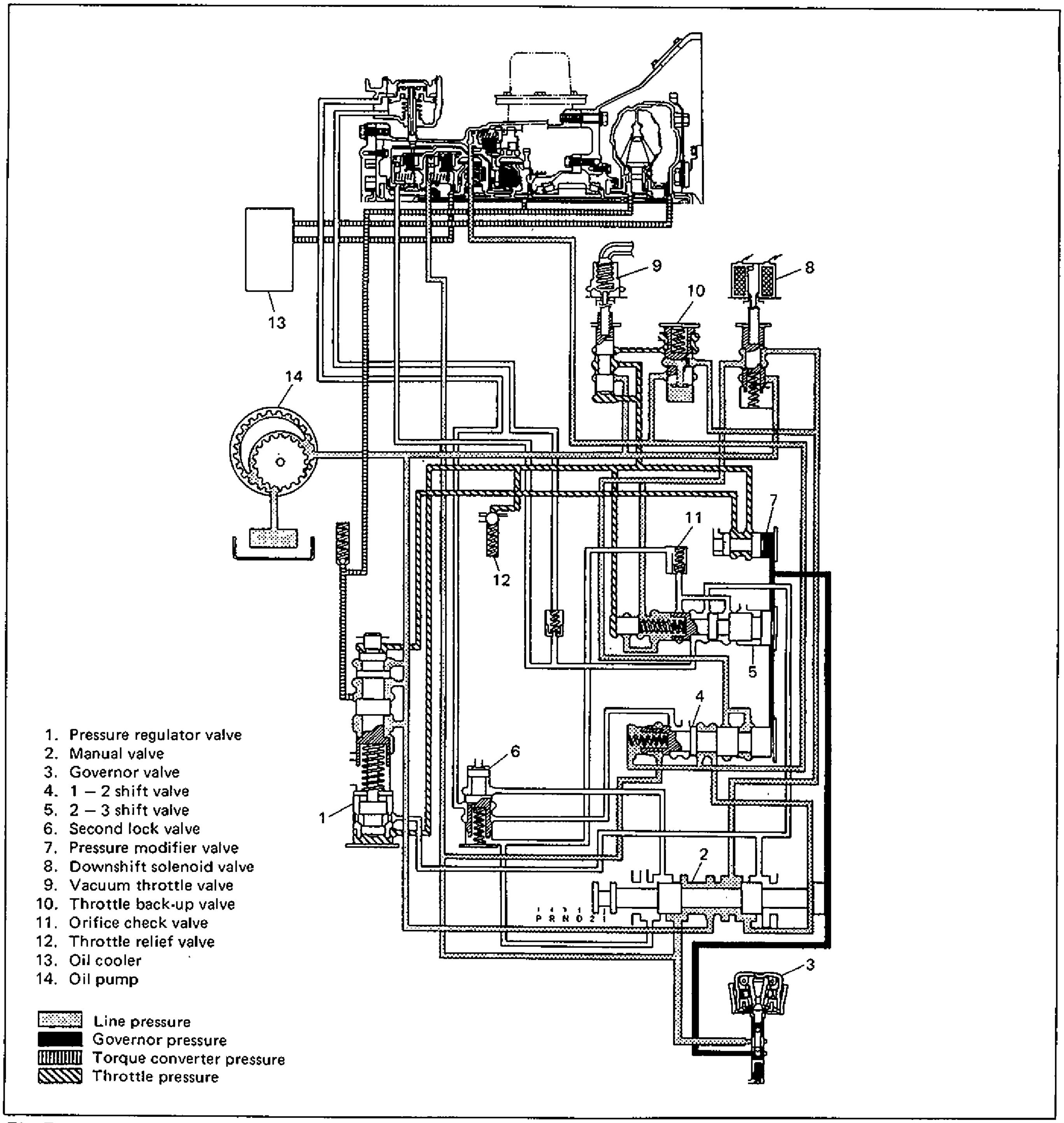
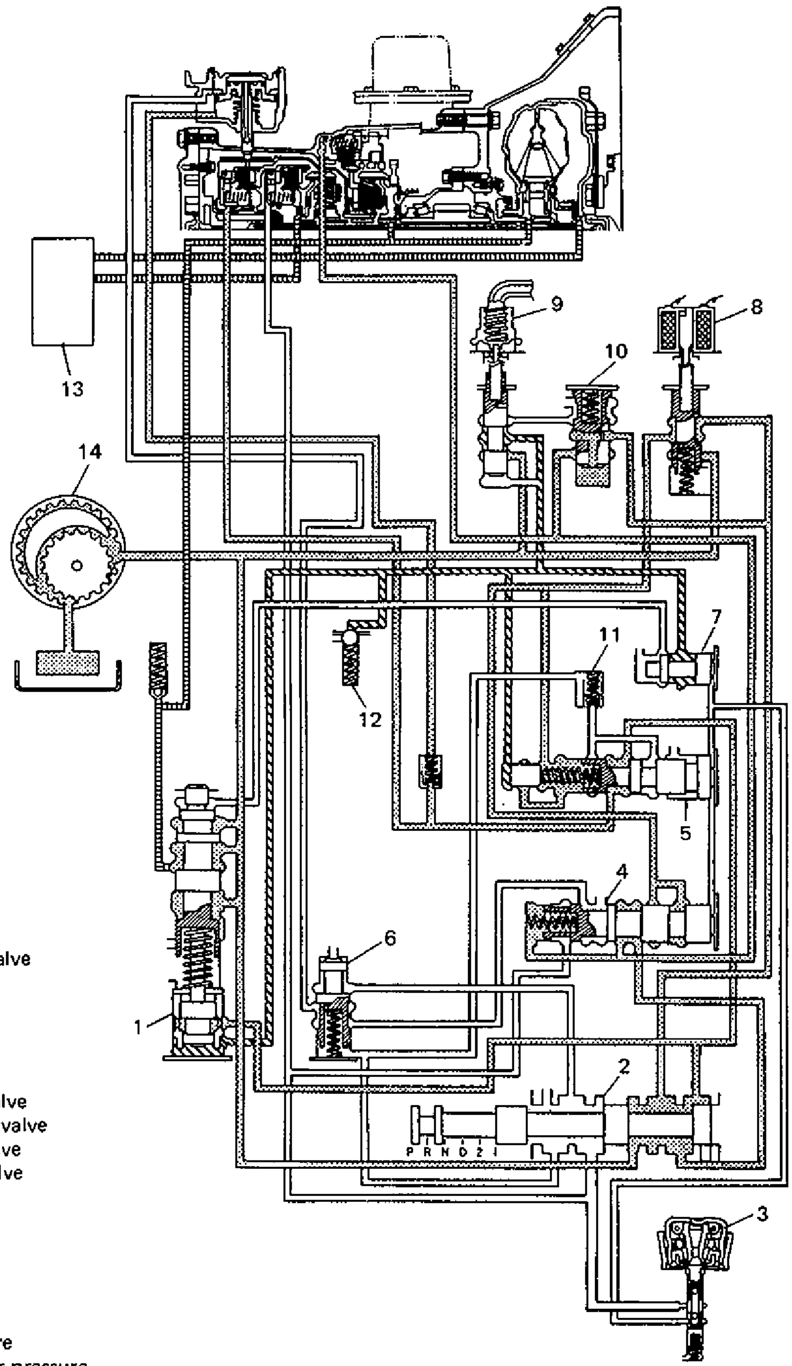


Fig. 7B-5-5

When a part of the line pressure delivered from the pressure regulator valve to the manual valve acts on the forward clutch, the clutch gets engaged. Also, the line pressure delivered from the manual valve to the 1 — 2 shift valve acts on the reverse brake, causing the transmission to downshift to 1st gear. It will not upshift to 2nd gear even when the governor pressure rises high because the line pressure from the downshift solenoid valve and manual valve is applied in the right (in the figure above) direction.

"R" RANGE



1. Pressure regulator valve
2. Manual valve
3. Governor valve
4. 1 – 2 shift valve
5. 2 – 3 shift valve
6. Second lock valve
7. Pressure modifier valve
8. Downshift solenoid valve
9. Vacuum throttle valve
10. Throttle back-up valve
11. Orifice check valve
12. Throttle relief valve
13. Oil cooler
14. Oil pump

Line pressure
Governor pressure
Torque converter pressure
Throttle pressure

Fig. 7B-5-6

The line pressure regulated by the pressure regulator valve is delivered through the manual valve to the 1 – 2 shift valve, 2 – 3 shift valve, etc. The line pressure delivered to the 1 – 2 shift valve causes the first reverse brake to operate and that to the 2 – 3 shift valve causes the second brake band to be released so that the direct clutch operates.

"N" RANGE

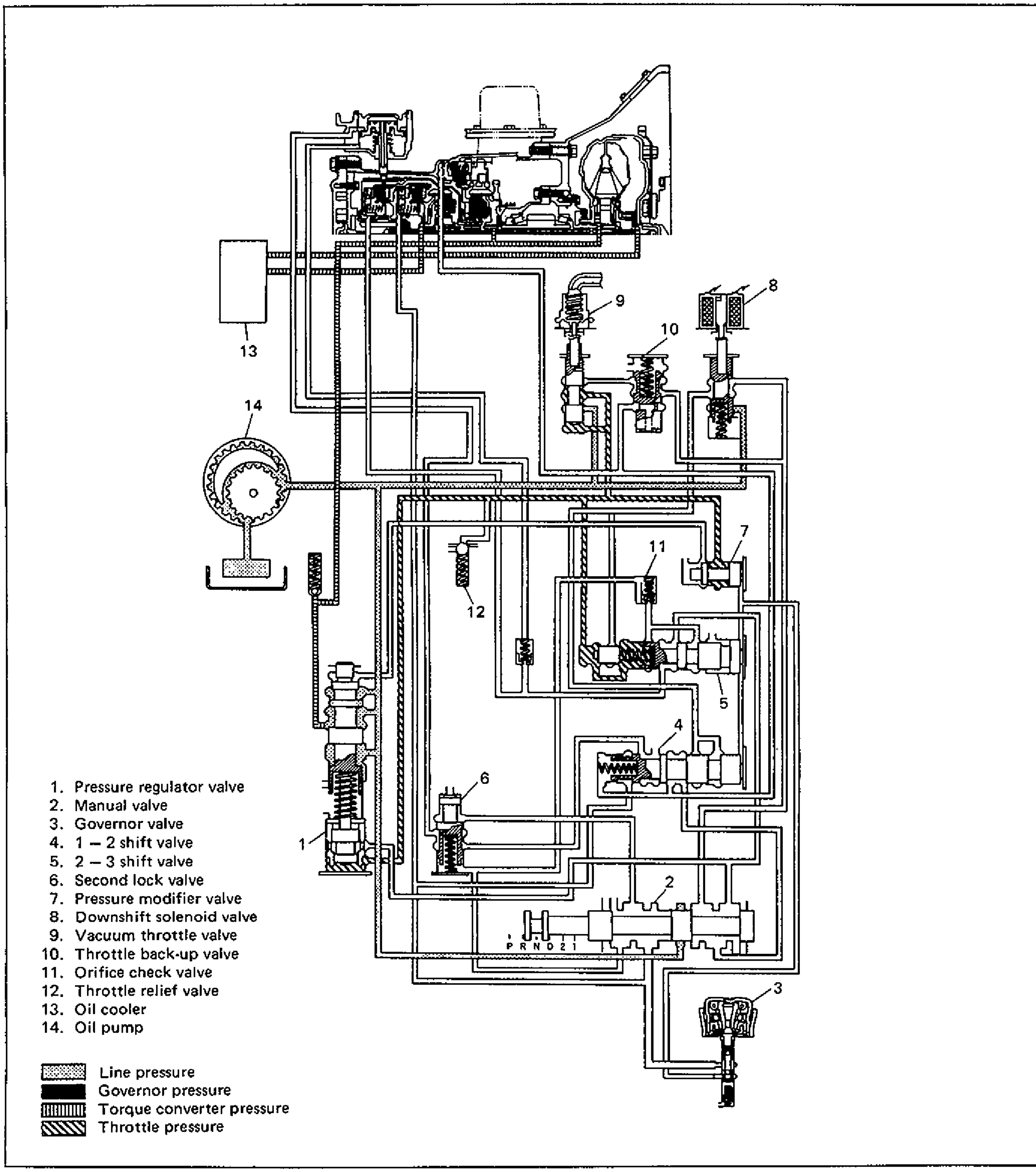


Fig. 7B-5-7

The line pressure regulated by the pressure regulator valve is delivered to the manual valve but not any farther because the manual valve closes all its ports out to other valves.

"P" RANGE

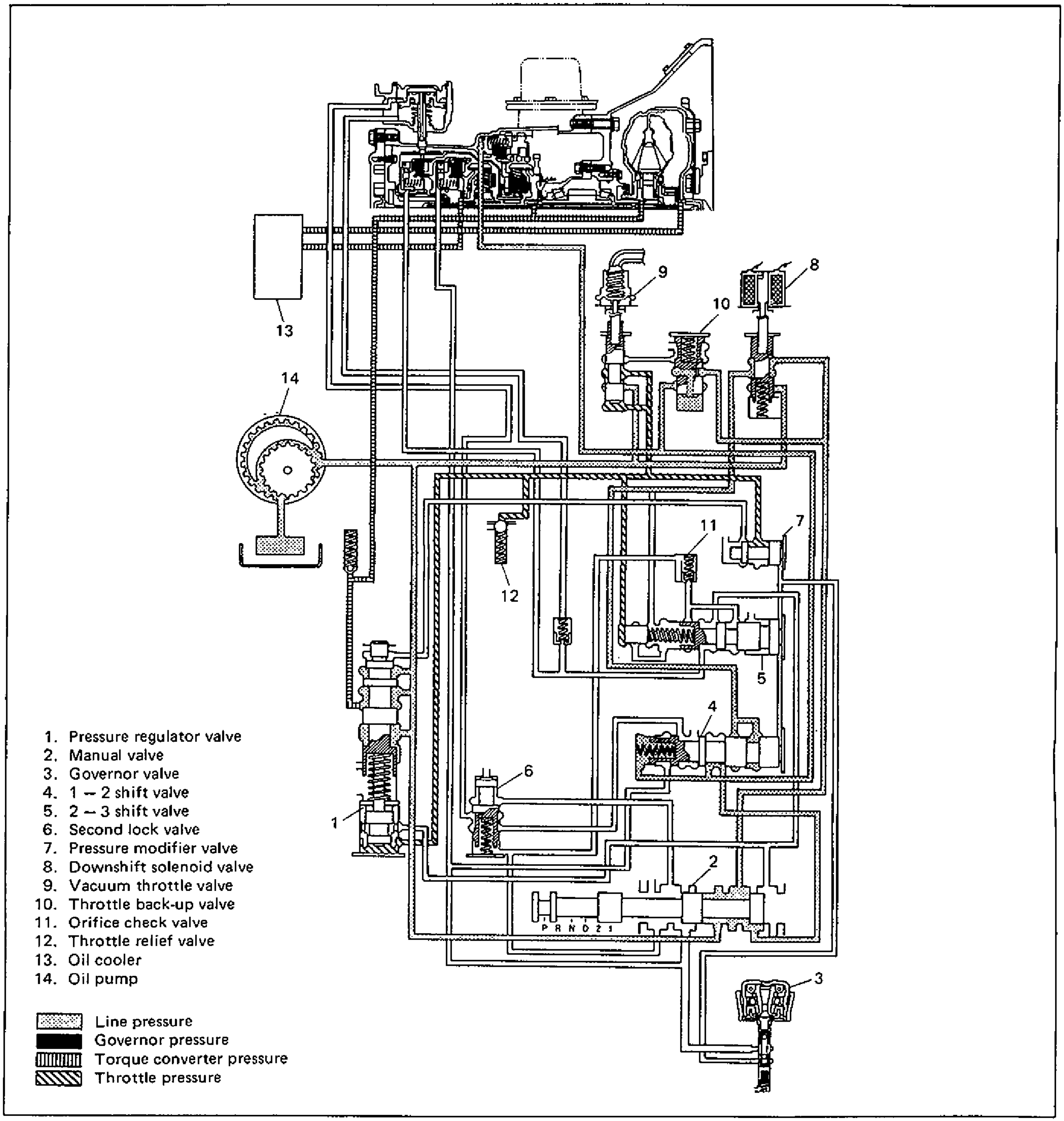
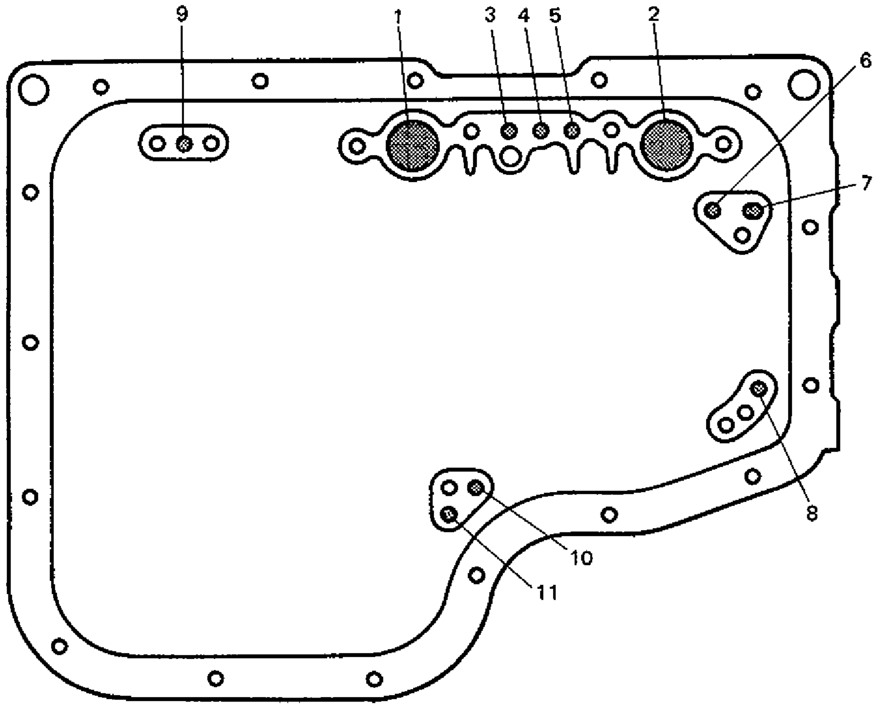


Fig. 7B-5-8

A part of the line pressure regulated by the pressure regulator valve is applied to the manual valve. After passing through the manual valve, it passes through the 1 — 2 shift valve and actuates the first reverse brake. The output gear is locked mechanically by the parking pawl.

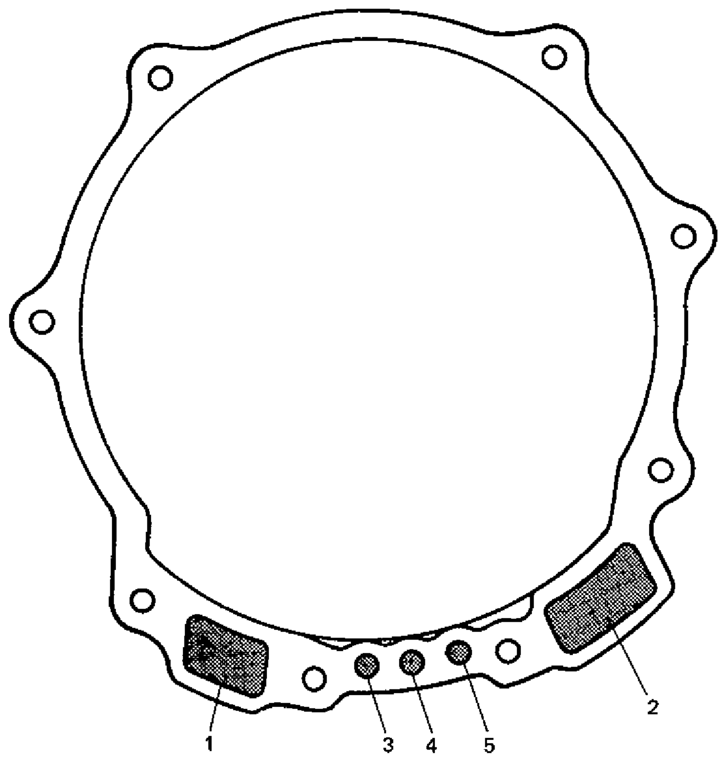
HYDRAULIC PORTS IN TRANSMISSION CASE

Oil pan installing side



1. Oil pump (out)
2. Oil pump (in)
3. Torque converter
4. Forward clutch
5. Direct clutch
6. Band servo (release)
7. Band servo (engage)
8. Low & reverse brake
9. For line pressure detection
10. Governor (out)
11. Governor (in)

Oil pump installing side



1. Oil pump (out)
2. Oil pump (in)
3. Torque converter
4. Forward clutch
5. Direct clutch

Fig. 7B-6

CHART OF TRANSMISSION SHIFTS

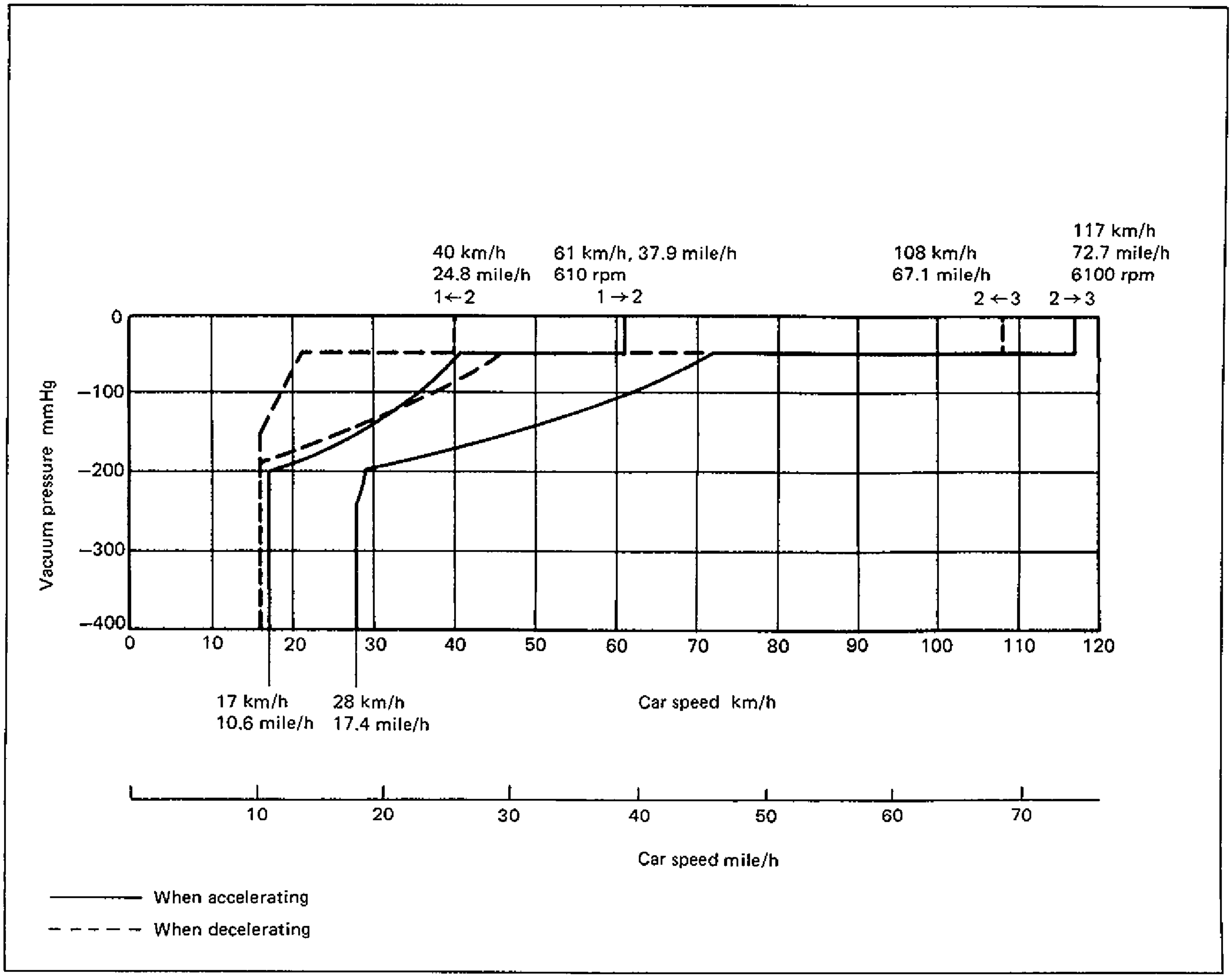


Fig. 7B-7-1

SELECTOR LEVER SHIFT MECHANISM

SELECT PATTERN

The selector lever is 6-position, floor select type. It is so designed that "N" and "D" ranges which are most frequently used can be selected freely.

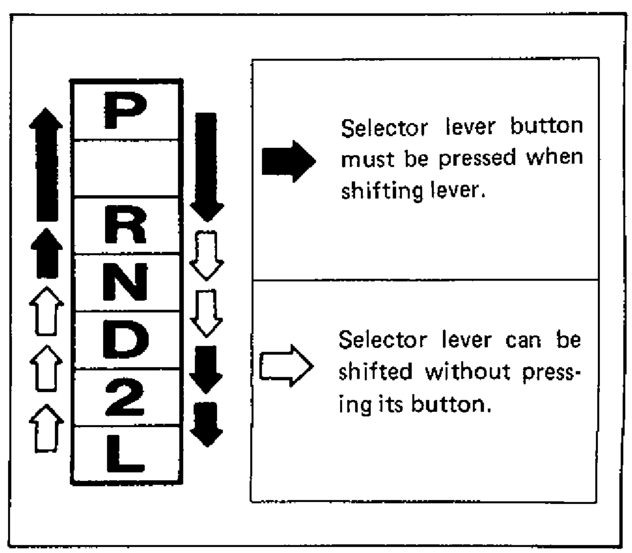


Fig. 7B-7-2

BRAKE INTERLOCK SYSTEM (If equipped)

This system is so designed that selector lever cannot be shifted from "P" range position unless the ignition switch is turned to "ON" and brake pedal is depressed. Also, ignition key cannot be pulled out of key hole unless select lever is in "P". These mechanism are as follows.

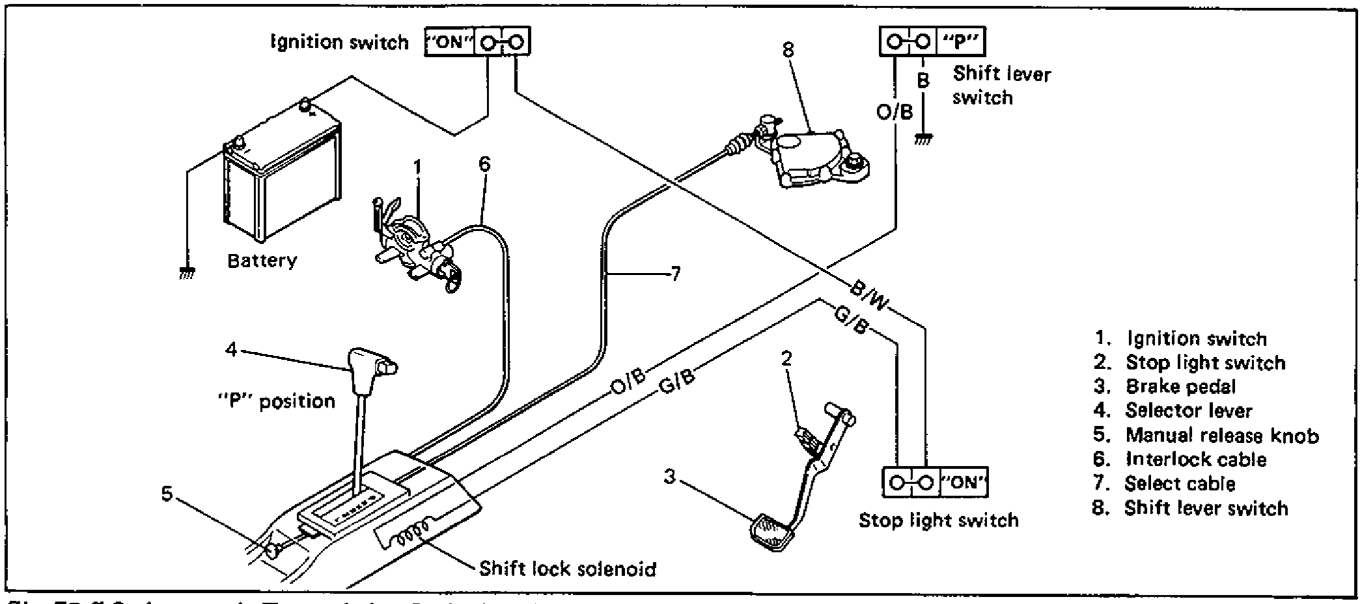


Fig. 7B-7-3 Automatic Transmission Brake Interlock System Circuit

STEERING LOCK

When selector lever is in position other than "P", lock lever interrupts key cylinder to turn to "LOCK" position, thus steering is kept to be operated free. However, when selector lever is shifted in "P", lock lever is released, thus allowing ignition key to be removed and then steering is locked.

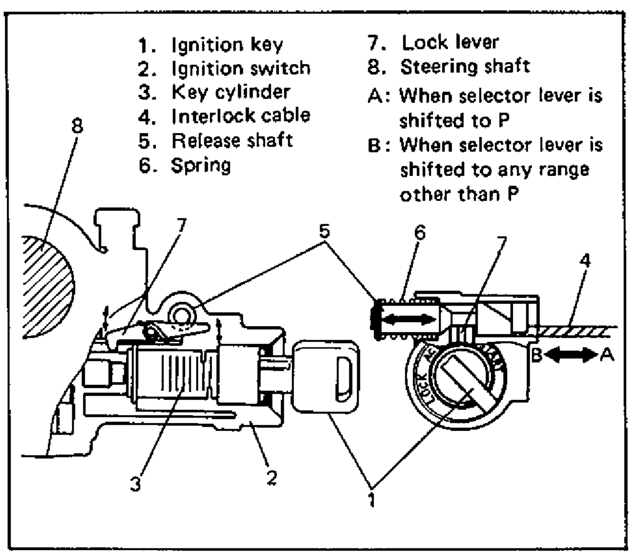


Fig. 7B-7-4 Ignition Switch Lock Mechanism

SHIFT LOCK SOLENOID

Unless ignition key is turned to "ON" and brake pedal is depressed, selector lever is kept in "P" by interruption of lock plate which is pushed by solenoid spring. However, when key is switched to "ON" and brake pedal is depressed, lock plate is turned back by solenoid magnetic force, thus allowing selector lever to be shifted.

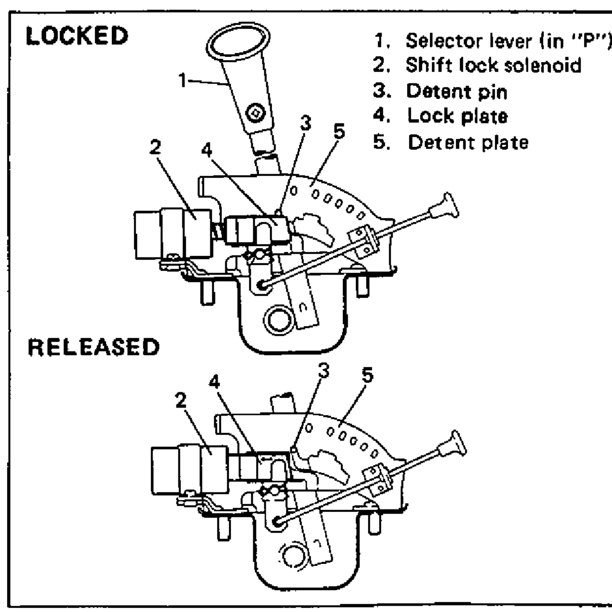


Fig. 7B-7-5

MANUAL RELEASE

As an auxiliary device, manual release is equipped. Without ignition key, shift lock can be released by pulling release knob.

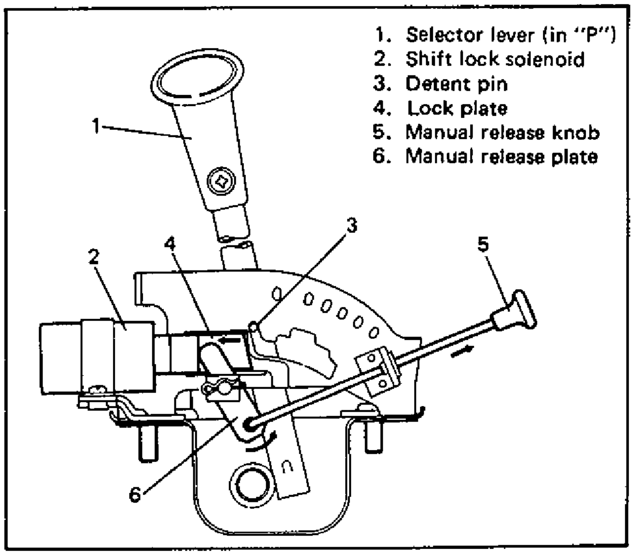


Fig. 7B-7-6 Manual Release

TROUBLE DIAGNOSIS

TRANSMISSION UNIT

SYSTEMATIC TROUBLE SHOOTING

Before performing troubleshooting for mechanical function described hereafter, make sure to check each of the following.

1. Engine coolant temperature is at normal operating temperature.
2. Engine idle speed is within specification.
3. Transmission fluid level is between FULL and LOW marks on oil level gauge at normal operating temperature of transmission fluid.
4. Accelerator cable, and select cable are adjusted properly.
5. Electric circuit of gear shift control system is free from break, coupler disconnection and poor contact.

Condition		Possible cause	Correction
Transmission fluid	Low fluid level	• Fluid leakage from fluid filler tube • Exterior fluid leakage	Add fluid to specified level. Repair.
	Fluid leakage from transmission case mating surfaces	• Fluid level too high • Breather hose clogged	Take out fluid to specified level. Repair.
	Fluid leakage from transmission case	• Manual select shaft defective • O-ring of fluid filler tube defective • Oil pressure gauge plug loosen • O-ring of electric connector defective	Replace. Replace O-ring. Tighten plug. Replace.
	Low hydraulic pressure	• Low fluid level • Oil pump strainer clogged • Leakage from hydraulic pressure circuit • Pressure regulator valve faulty	Add fluid to specified level. Wash strainer. Repair. Repair valve body.
	High hydraulic pressure	• Pressure regulator valve faulty	Repair valve body.

Condition		Possible cause	Correction
Starting	No starting in any drive range	• Low A/T fluid level	Add fluid to specified level.
		• Worn oil pump	Replace.
		• Oil pump seizure	Replace.
		• Regulator valve stuck	Replace.
		• Oil strainer clogged	Wash strainer.
		• Planetary gear seizure, damaged	Replace.
		• Hydraulic pressure leak to forward clutch due to worn oil pump bushing.	Replace.
		• Hydraulic pressure leak to forward clutch due to worn or damaged input shaft seal ring	Replace.
		• Internal fault of torque converter	Replace.
		• Manual valve defective	Replace.
	Poor starting at 1st gear of "D" range, excessive slippage	• Hydraulic pressure leak to forward clutch due to worn oil pump bushing	Replace.
		• Hydraulic pressure leak fo forward clutch due to worn or damaged input shaft seal ring	Replace.
		• Slippery forward clutch	Replace.
		• One-way clutch defective	Replace.
	No starting in "L" range, excessive slippage	• Hydraulic pressure leak to forward clutch due to worn oil pump bushing	Replace.
		• Hydraulic pressure leak to forward clutch due to worn or damaged input shaft seal ring	Replace.
		• Slippery first reverse brake disc	Replace.
		• Damaged O-ring of fast reverse brake piston	Replace.
	No starting in "R" range, excessive slippage	• Hydraulic pressure leak to direct clutch due to worn or damaged oil pump seal ring	Replace.
		• Worn direct clutch bushing	Replace
		• Worn direct clutch	Replace

Condition		Possible cause	Correction
Gear shift	1st to 2nd gear shift poor, excessive slippage	• Regulator valve stuck	Replace.
		• Second brake band defective	Replace.
		• Second brake piston O-ring damaged	Replace.
		• 1 – 2 shift valve stuck	Replace.
		• Control modulator defective	Replace.
	2nd to 3rd gear shift poor, excessive slippage	• Hydraulic pressure leak to direct clutch due to worn or damaged oil pump cover seal ring	Replace.
		• Worn direct clutch bushing	Replace.
		• Slippery direct clutch	Replace.
		• 2 – 3 shift valve stuck	Replace.
		• Foreign matter caught in direct clutch piston check ball	Replace.
		• Control modulator defective	Replace.
	Poor starting in "D" range	• Regulator valve stuck	Replace.
		• Hydraulic pressure leak to forward clutch due to worn oil pump bushing	Replace.
		• Hydraulic pressure leak to forward clutch due to worn or damaged input shaft seal ring	Replace.
		• Forward clutch not operating properly	Replace.
	Poor starting in "R" range, judder	• Hydraulic pressure leak to direct clutch due to worn or damaged oil pump cover seal ring	Replace.
		• Worn direct clutch bushing	Replace.
	Excessive shock in 1 – 2 upshift	• Regulator valve stuck	Replace.
		• One-way clutch defective	Replace.
		• Second brake piston defective	Replace.
	Excessive shock in 2 – 3 upshift	• Regulator valve stuck	Replace.
		• Forward clutch piston defective	Replace.

Condition		Possible cause	Correction
Noise	Abnormal noise when starting (tapping)	• Hydraulic pressure leak to forward clutch due to worn oil pump bushing	Replace.
	Abnormal noise when starting (rubbing)	• Low A/T fluid level	Add fluid to specified level.
	Abnormal noise in "P" and "N" ranges	• Low A/T fluid level • Oil pump seizure	Add fluid to specified level. Replace.
	Abnormal noise from differential	• Differential gear tooth chipped • Differential pinion shaft seizure	Replace. Replace.
Others	Speedometer not indicating properly	• Worn speedometer drive gear	Replace.
	Steering wheel heavy when turning	• Differential seizure	Replace.

FLOW CHART

Abnormal noise

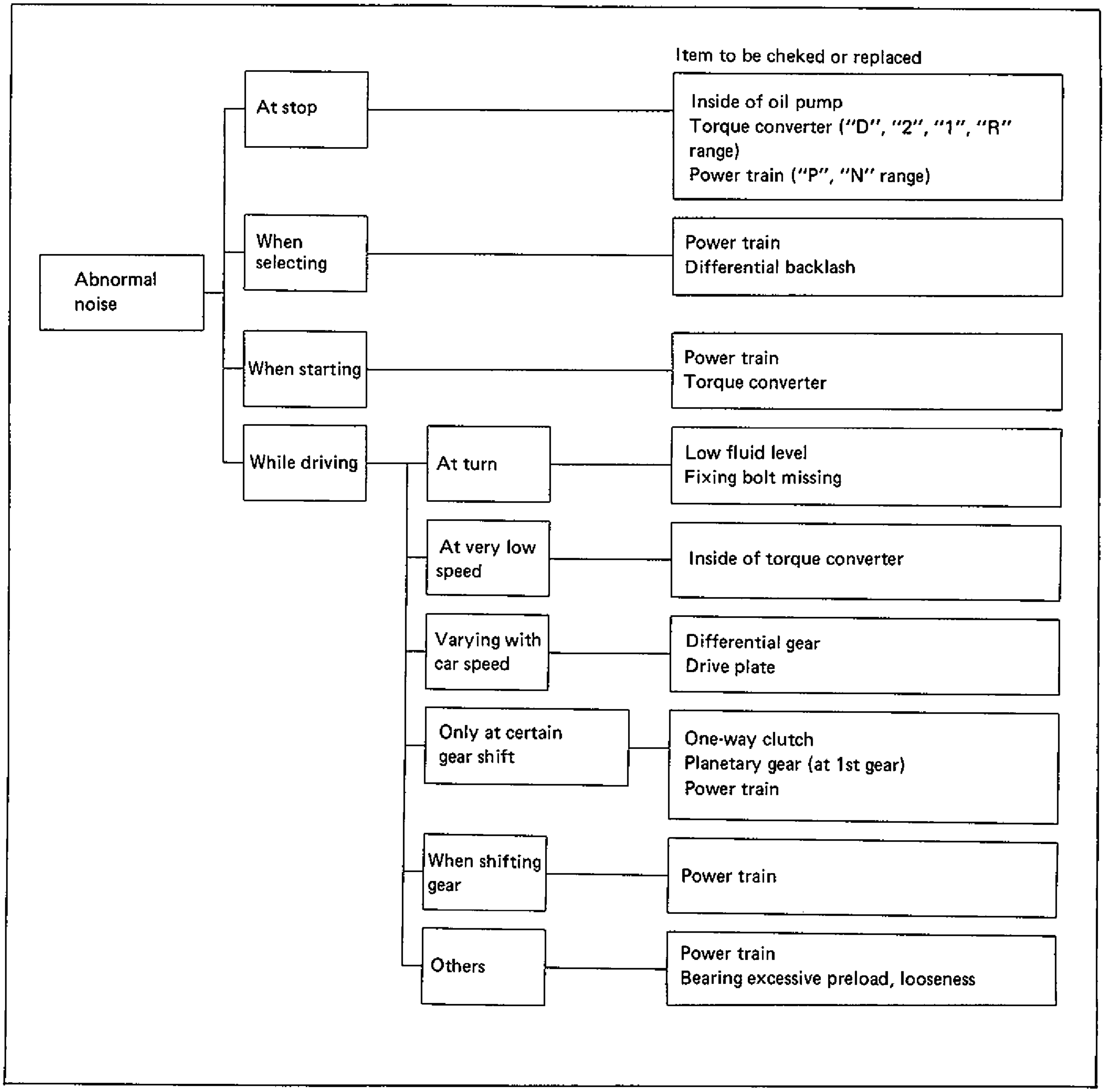


Fig. 7B-8-1

INSPECTION OF POWER TRAIN

- Clutch and brake for overheat
- Clutch and brake for clearance
- Thrust bearign and bearing race for damage
- Component parts for damage
- Gear teeth for nick, scratch, chip

Start at 2nd gear

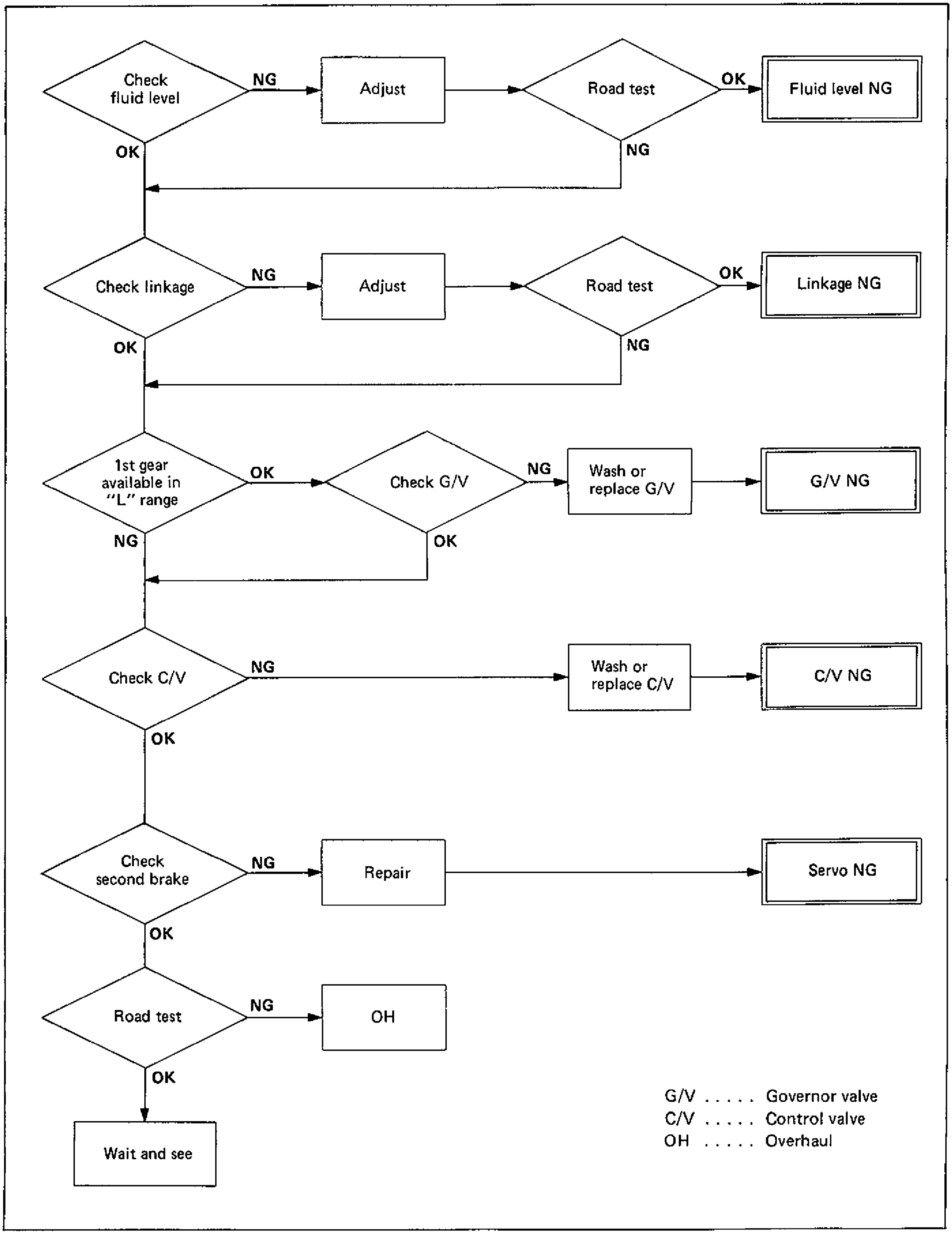
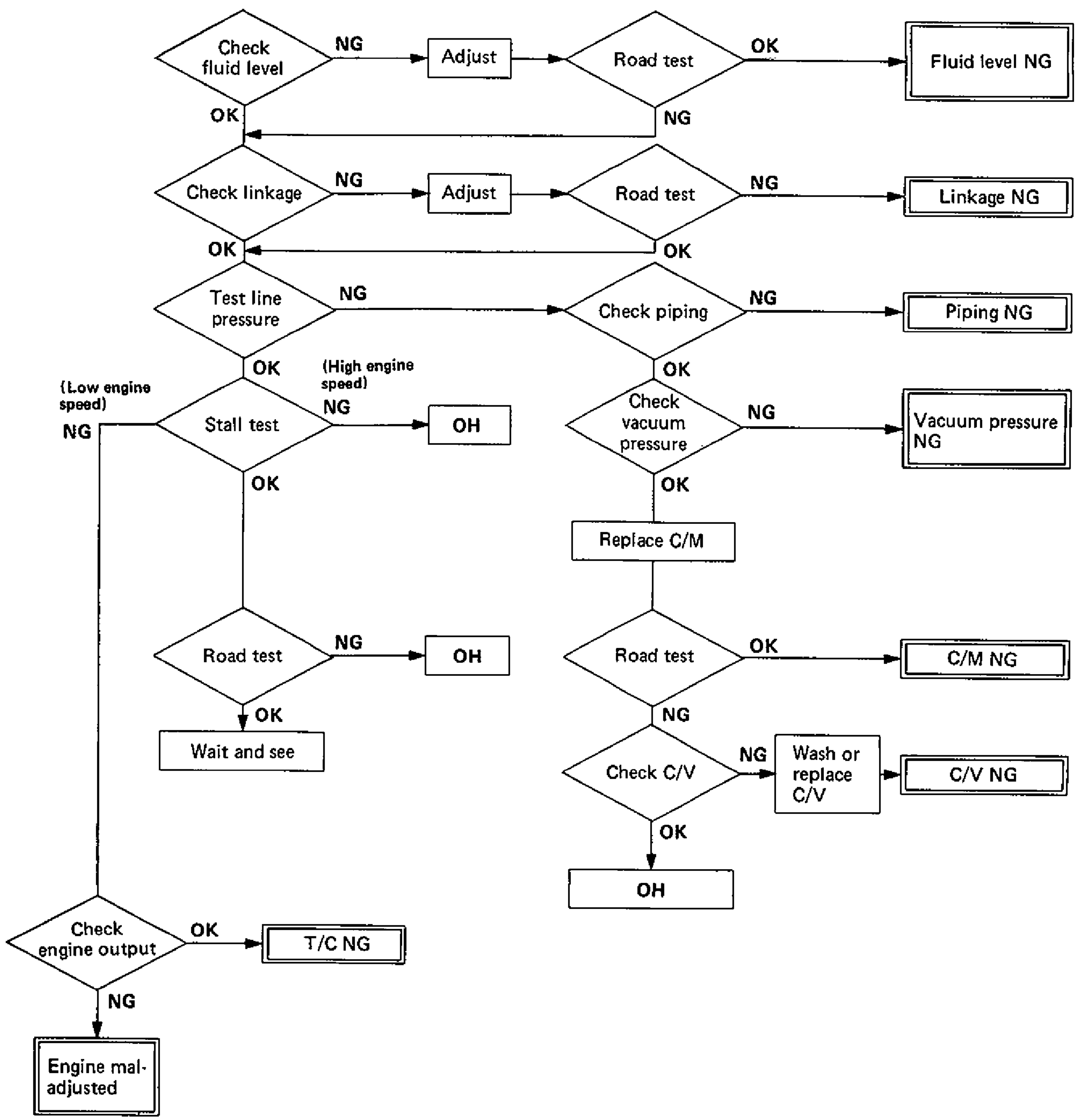


Fig. 7B-8-2

EXCESSIVE SHOCK AT GEAR SHIFT



T/C ..... Torque converter
C/M ..... Control modulator
C/V ..... Control valve
OH ..... Overhaul

Fig. 7B-8-3

SLIPS WHEN SHIFTING GEAR AND WHEN STARTING, UNABLE TO RUN, CAR MOVES IN "N" RANGE, UNABLE TO RUN IN "R"

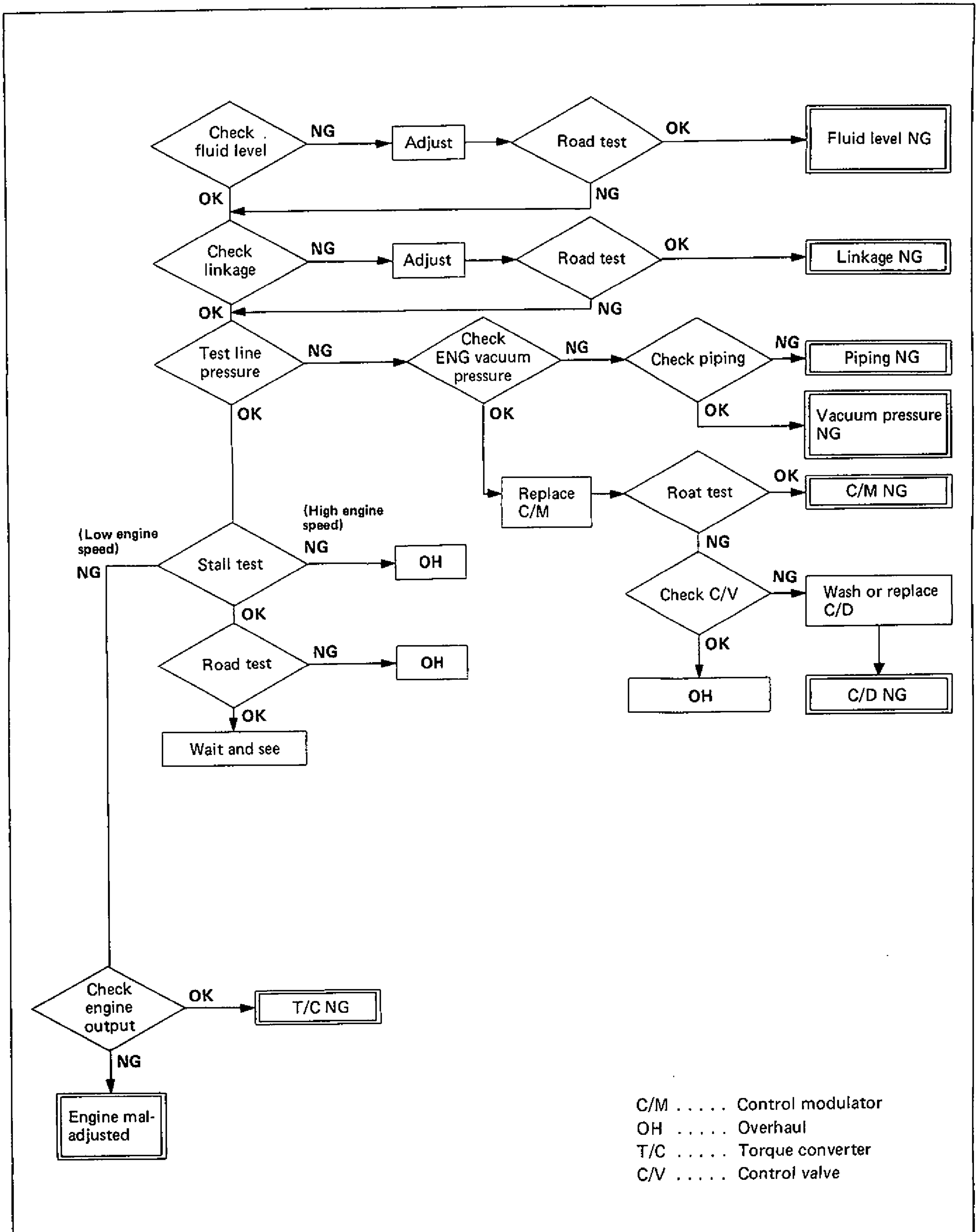
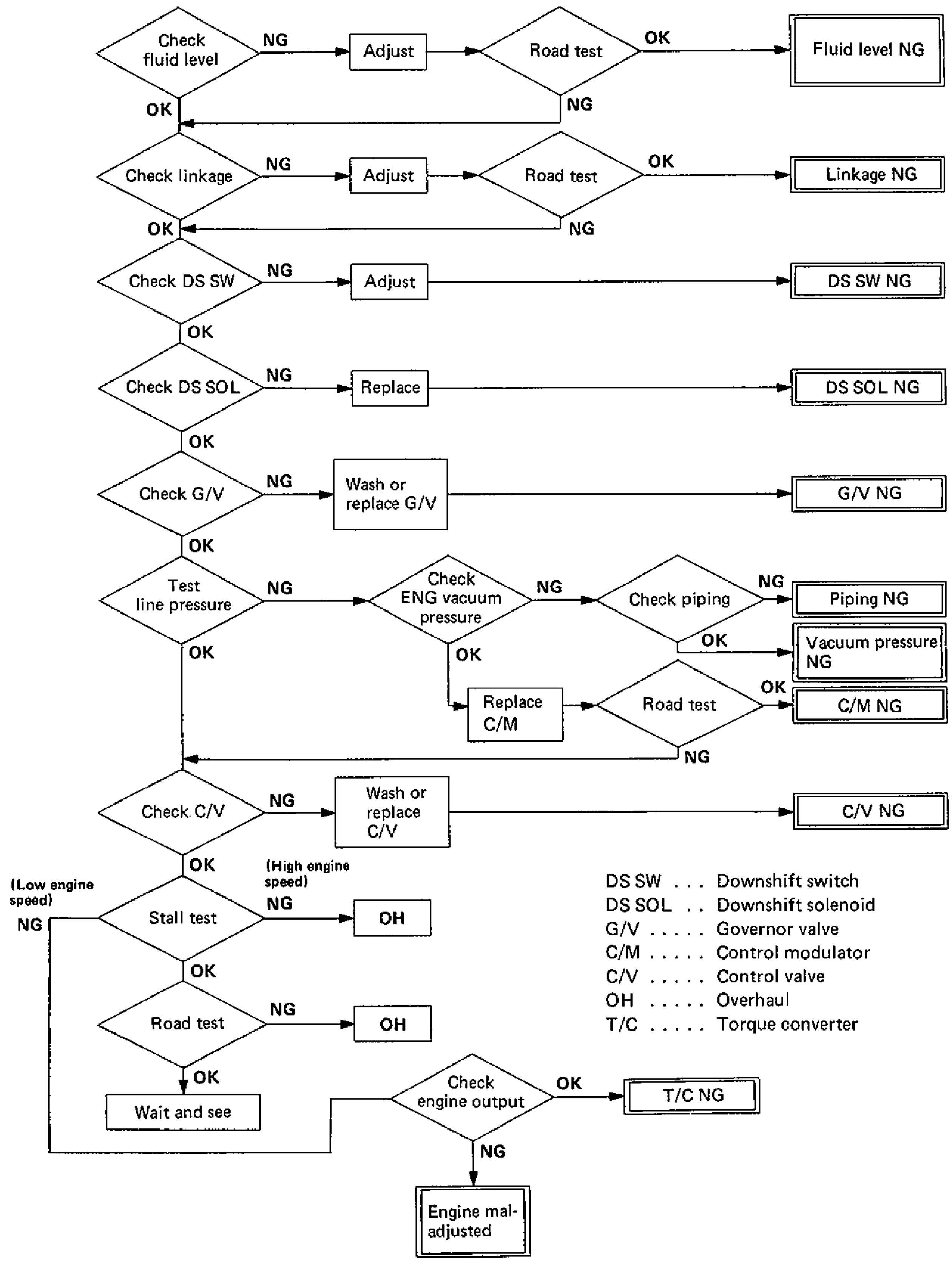


Fig. 7B-8-4

NO GEAR SHIFT, HIGH GEAR SHIFT POINT



DS SW . . . Downshift switch
DS SOL . . Downshift solenoid
G/V . . . . . Governor valve
C/M . . . . . Control modulator
C/V . . . . . Control valve
OH . . . . . Overhaul
T/C . . . . . Torque converter

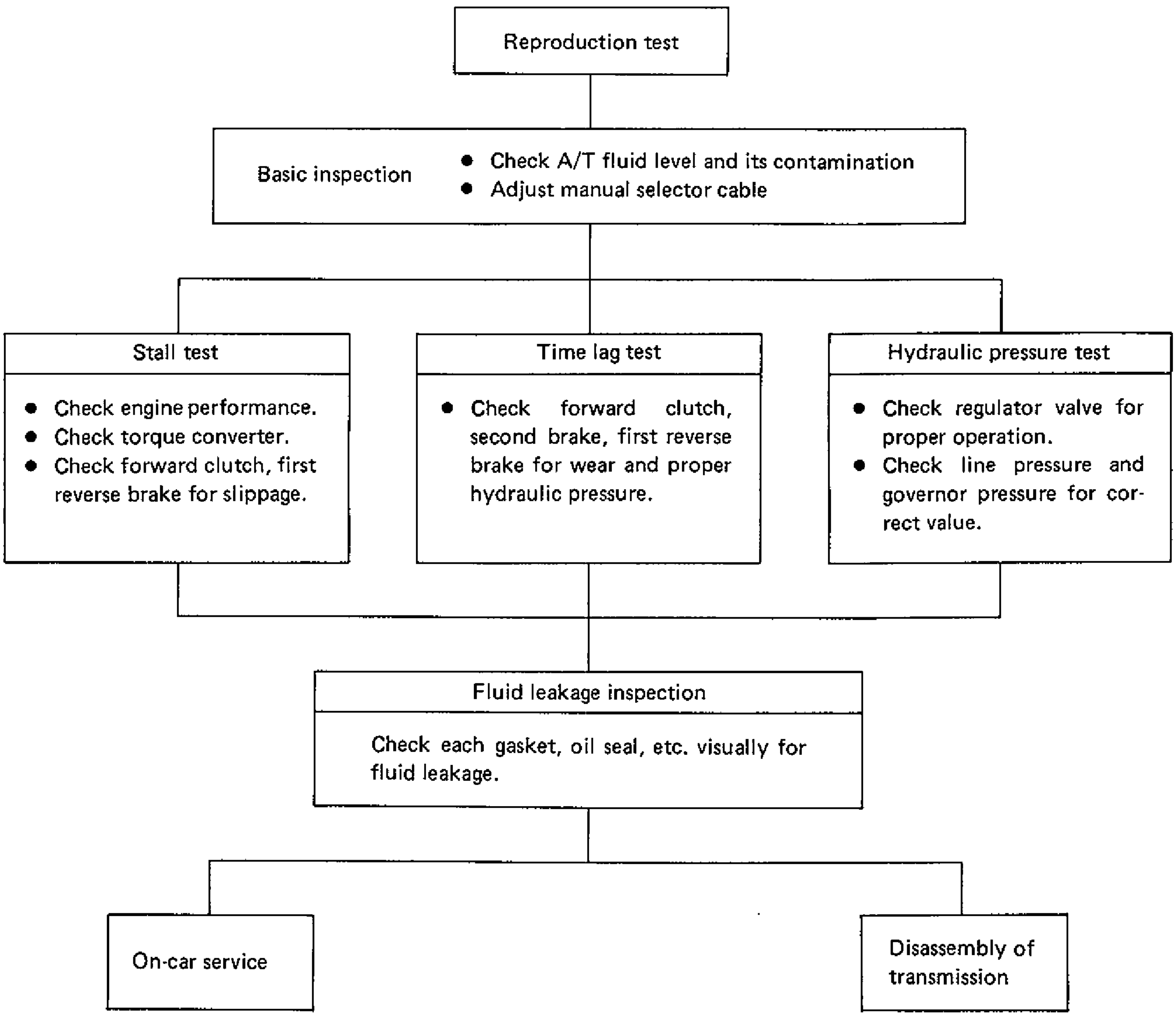
Fig. 7B-8-5

ON CAR SERVICE

Before disassembling the automatic transmission for servicing, be sure to perform an on-car test first to investigate where the cause of the trouble lies and determine whether disassembly is necessary or not.
Disassembly without taking the above step may not only hinder later investigation of the cause but also induce a secondary failure.
The main presumable causes for the automatic transmission failure are as follows.

- Inspection or adjustment not performed properly
- Poor engine performance
- Faulty hydraulic control system
- Mechanical fault in transmission

To make an inference of the cause accurately, get as much information from the user as possible about the trouble, perform a reproduction test by using the collected information so as to have good and thorough understanding of the trouble condition.



MAINTENANCE SERVICE

FLUID LEVEL

Hot Level Check at Normal Operating Temperature

Be sure to check fluid level at every engine oil change. As automatic transmission is designed to operate at normal operating temperature which is 60°C – 70°C (140°F – 158°F) of fluid temperature, perform fluid level check when its temperature is within the above temperature range.

To raise fluid temperature from its ordinary temperature (about 20°C or 68°F) to normal operating temperature, warm up engine by running it at idle speed for about 5 minutes.

1. Place car on level surface.
2. Apply parking brake and block car wheels.
3. With selector lever in P position, start engine. But DO NOT RACE ENGINE.
4. Run engine at idle speed and move selector lever through each range and put it in P position again.
5. With engine running at idle, remove oil level gauge from oil filler tube and wipe off oil level gauge with clean lint free cloth.

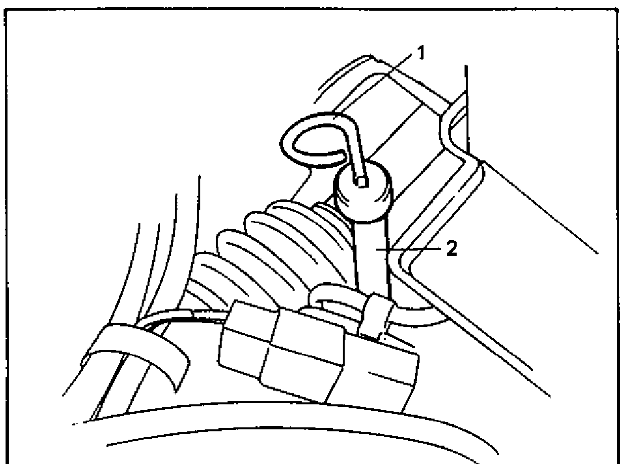


Fig. 7B-9-1 Oil Level Gauge and Oil Filler Tube

6. Reinsert oil level gauge all the way into oil filler tube.
7. Take out oil level gauge and check fluid level on it, which should be between FULL and LOW marks. If level is below LOW mark, add fluid to bring level to FULL mark.

NOTE:
When adding fluid, use care not to overfill. Overfilling can cause foaming and loss of fluid through vent. Then slippage and transmission failure can result.

Fluid specification
DEXRON®-II automatic transmission fluid

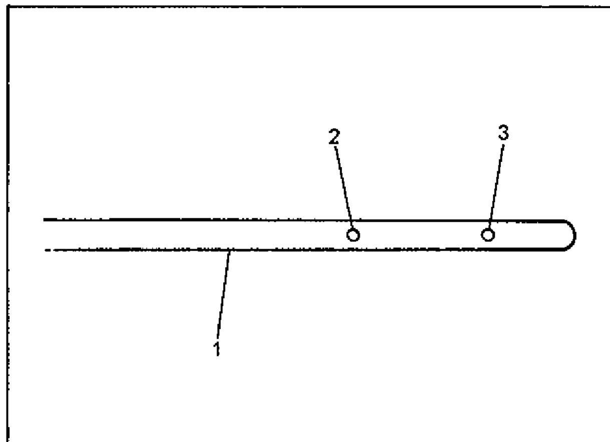


Fig. 7B-9-2 Fluid Level Gauge

FLUID CHANGE INTERVALS

Under normal driving conditions, change transmission fluid every 160,000 km (100,000 miles). However, if the car is usually used under one or more of following severe conditions, change fluid every 20,000 km (12,000 miles).

For Canadian market, however, use 25,000 km (15,000 miles) interval for transmission fluid change.

Severe Conditions

- In heavy city traffic where outside temperature regularly reaches 32°C (90°F).
- In very hilly or mountainous areas.
- Commercial use, including taxi, police car and delivery service.

CHANGING FLUID

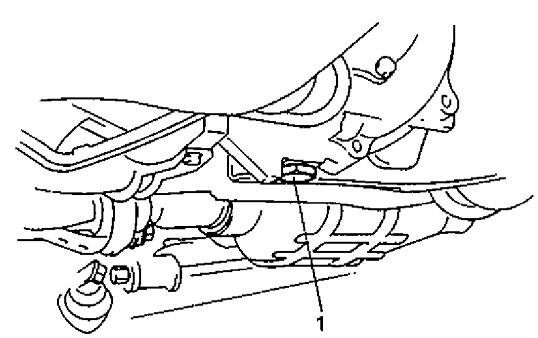
1. Raise car.
2. With transmission cooled off, remove drain plug and drain fluid.
3. Install drain plug gasket and drain plug to case, and tighten drain plug to specification.

	N·m	kg-m	lb-ft
Tightening torque for drain plug	40 – 55	4.0 – 5.5	29.0 – 39.5

4. Remove oil level gauge from oil filler tube and add about the same amount of new fluid as drained amount through oil filler tube. Be sure to use DEXRON®-II.

Fluid capacity	
When fluid is drained from drain plug hole	2.0 liters 4.2/3.5 US/Imp. pt.
When overhauling (assembled with new torque converter)	5.1 liters 10.8/9.0 US/Imp. pt.

NOTE:
Draining or refilling volume of fluid may vary depending on draining time, temperature, etc.



1. Drain plug

Fig. 7B-9-3 Drain Plug

5. Check fluid level according to procedure described under FLUID LEVEL on previous page. When it is too low, add fluid as also described there.

OIL COOLER HOSES

Rubber hoses for oil cooler should be replaced every 36 months or 60,000 km (36,000 miles), when replacing it, be sure to note the following. For Canadian market, however, use 48 months or 75,000 km (45,000 miles) interval for replacement. Also, when replacing them, be sure to note the following.

- Insert hose as far as its limit mark.
- Check for fluid leakage after replacing.
- Confirm fluid level at normal operating temperature.

STALL TEST

This test is to check overall performance of automatic transmission and engine by measuring stall speed at D, 2, L and R ranges. Be sure to perform this test only when transmission fluid is at normal operating temperature and its level is between FULL and LOW marks.

CAUTION:
- **Do not run engine at stall more than 5 seconds continuously, for fluid temperature may rise excessively high.**
- **After performing stall test, be sure to leave engine running at idle for longer than 30 seconds before another stall test.**

1. Apply parking brake and block car wheels.
2. Install tachometer.
3. Start engine with selector lever shifted to P.
4. Depress brake pedal fully.
5. Shift selector lever to D and depress accelerator pedal fully while watching tachometer. Read engine rpm quickly when it has become constant (stall speed).
6. Release accelerator pedal immediately after stall speed is checked.
7. In the same way, check stall speed at 2, L and R ranges.
8. Stall speed should be within following specification.

Stall speed	2,250 – 2,550 r/min

9. Possible causes for out-of-specification stall speed are as follows. Check each part which is suspected to be the cause.

Stall speed measured	Possible causes
Lower than specifica-cation in every range	•Engine output insufficient •Torque converter defective
Higher than specifica-tion in D range (normal in 2, L and R ranges)	•Slipper one-way clutch
Higher than specifica-tion in D, 2 and L ranges (normal in R range)	•Slippery forward clutch
Higher than specifica-tion only in R range	•Slippery direct clutch •Slippery first reverse brake
Higher than R and L ranges (normal in D and 2 ranges)	•Slippery first reverse brake
Higher than specifica-tion in every range	•Low line pressure

LINE PRESSURE TEST

This test is to check oil pressure system for operation by measuring oil pressure in oil pressure line. Make sure to perform this test only when transmission fluid is at normal operating temperature.

NOTE:

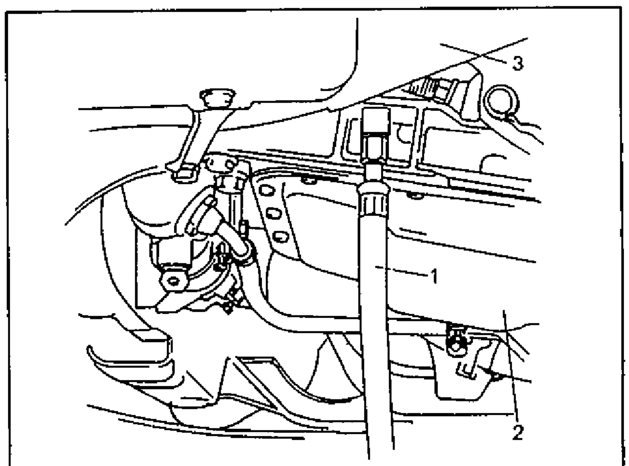
- **Make sure that transmission fluid level is between FULL and LOW marks on oil level gauge at normal operating temperature of fluid.**
- **Check that transmission is free from fluid leakage.**

1. With engine at stop, remove plug and connect oil pressure gauge to plug hole.
2. Install tachometer.
3. Apply parking brake and block car wheels.
4. With selector lever shifted to P, start engine.
5. Depress brake pedal fully.
6. Shift selector lever to D and check oil pressure with engine running at idling speed and at stall speed respectively.
7. Repeat the same check as in step 6 with selector lever shifted to other ranges.

CAUTION:
Do not run engine at stall more than 5 seconds continuously, or fluid temperature may rise excessively high.

8. If line pressure is within respective specification in table below, oil pressure system is in good condition.

Condition		Line pressure
At specified idle speed	R range	$5.0-7.0$ kg/cm^2 $71.5-99.5$ psi $500-700$ kPa
	D range	$3.0-4.0$ kg/cm^2 $43.0-56.5$ psi $300-400$ kPa
	2 range	$6.0-12.0$ kg/cm^2 $85.3-170.6$ psi $600-1200$ kPa
At specified stall speed	R range	$17.0-20.0$ kg/cm^2 $242.0-284.0$ psi $1700-2000$ kPa
	D range	$9.0-11.0$ kg/cm^2 $128.0-156.0$ psi $900-1100$ kPa
	2 range	$8.0-12.0$ kg/cm^2 $113.8-170.6$ psi $800-1200$ kPa



1. Special tool (Oil pressure gauge set 09925-37810)
2. Oil pan
3. Left tire house

Fig. 7B-9-4 Checking Line Pressure

9. Possible causes for out-of-specification line pressure are as follows. Check each part which is suspected to be the cause.
10. Reinstall plug and tighten it to specification.

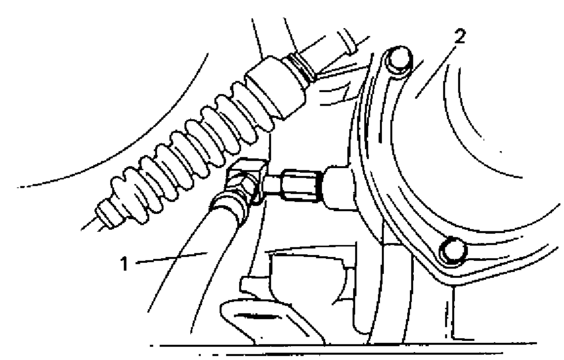
Tightening torque for case plug	N·m	kg-m	lb-ft
	$6-9$	$0.6-0.9$	$4.5-6.5$

Line pressure	Possible causes
Higher than specification in D and R ranges	• Control modulator defective • Control modulator pipe defective
Lower than specification in D and R ranges	• Oil pump defective • Regulator valve defective • Control modulator defective • Control modulator pipe defective • Fluid leakage from oil pressure system • Vacuum throttle valve defective
Lower than specification in D and 2 ranges	• Forward clutch oil pressure system fluid leakage • D range oil pressure system fluid leakage • 2 range oil pressure system fluid leakage
Lower than specification only in 2 range	• Throttle back up valve defective • Second brake oil pressure system fluid leakage
Lower than specification only in R range	• Direct clutch oil pressure system fluid leakage • 1st – reverse brake oil pressure system fluid leakage • R range oil pressure system oil leakage
Line pressure unchanged at both idle speed and stall speed (except 2 range)	• Pressure regulator valve or throttle valve not operating properly • Vacuum hose disconnected • Oil strainer clogged

GOVERNOR PRESSURE TEST

1. Install ATM pressure gauge to governor pressure check port in transmission case.
2. Hoist car.
3. Start engine and warm it up fully.
4. Shift selector lever to D range, increase car speed gradually and measure governor pressure at about 30 km/h car speed.
5. Similarly, measure governor pressure at about 55 km/h and 85 km/h car speeds respectively.

Car speed (km/h)	Governor pressure (kg/cm^2)
30	0.8 – 1.4
55	1.5 – 2.2
85	2.5 – 3.4



1. Special tool (Oil pressure gauge set 09925-37810)
2. Governor cover

Fig. 7B-9-5

Test result	Possible cause
If measured governor pressure is not within specification.	• Leakage from line pressure circuit • Leakage from governor pressure circuit • Defective governor

TIME LAG TEST

This test is to check conditions of clutch, reverse brake and oil pressure. "Time lag" means time elapsed since selector lever is shifted with engine idling till shock is felt.

1) With chocks placed before and behind front and rear wheels respectively, depress brake pedal.
2) Start engine.
3) With stop watch ready, shift selector lever from "N" to "D" range and measure time from that moment till shock is felt.
4) Similarly measure time lag by shifting selector lever from "N" to "R" range.

Specification for time lag	"N" → "D"	Less than 1.0 sec.
	"N" → "R"	Less than 1.4 sec.

NOTE:
- **When repeating this test, be sure to wait at at least 1 minute after selector lever is shifted back to "N" range.**
- **Engine should be warmed up fully for this test.**

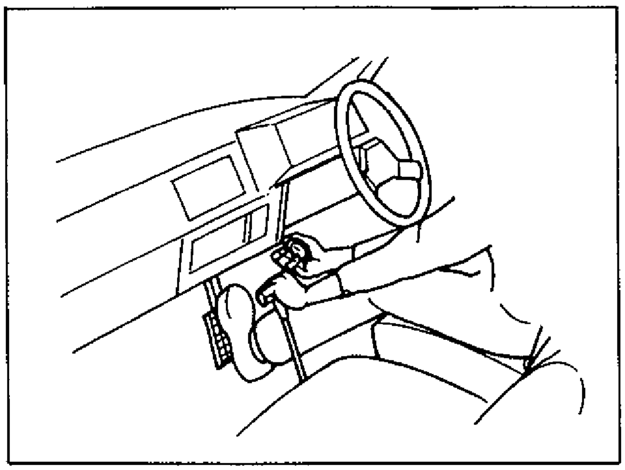


Fig. 7B-9-6 Time Lag Test

Test result	Possible causes
When "N" → "D" time lag exceeds specification	• Low line pressure • Worn forward clutch
When "N" → "R" rime lag exceeds specification	• Low line pressure • Worn direct clutch • Worn first reverse brake

ROAD TEST

This test is to check if upshift and downshift take place at specified speeds while actually driving car on a level road.

> WARNING:
> - **Carry out test in very little traffic area to prevent an accident.**
> - **Test requires 2 persons, a driver and a tester.**

1) Warm up engine.
2) With engine running at idle, shift selector lever to D.
3) Accelerate car speed by depressing accelerator pedal gradually.
4) While driving in "D" range, check if gear shift occurs properly as shown in Gear Shift Diagram (Fig. 7B-7-1).

Test result	Possible cause
When 1 → 2 upshift fails to occur	1 – 2 shift valve stuck
When 2 → 3 upshift fails to occur	2 – 3 shift valve stuck
When gear shift point is incorrect	1 – 2 or 2 – 3 shift valve not operating properly

ENGINE BRAKE TEST

> WARNING:
> **Before test, make sure that there is no car behind so as to prevent rear-end collision.**

1. While driving car in 3rd gear of D range, shift selector lever down to 2 range and check if engine brake operates.
2. In the same way as in step 1, check engine brake for operation when selector lever is shifted down to L range.
3. If engine brake fails to operate in above tests, possible causes for such failure are as follows. Check each part which is suspected to be the cause.

Condition	Possible cause
Fails to operate when shifted down to 2 range	Second brake defective
Fails to operate when shifted down to L range	1st-reverse brake defective

"P" RANGE TEST

1) Stop car on a slope, shift selector lever to P range and at the same time apply parking brake.
2) After stopping engine, depress brake pedal and release parking brake.
3) Then, release brake pedal gradually and check that car remains stationary.

> WARNING:
> **Before test, check to make sure no one is around car or down on a slope and keep watchful for safety during test.**

SELECTOR LEVER

INSPECTION

Check selector lever for smooth and clear-cut movement and position indicator for correct indication.

For operation of selector lever, refer to figure below.

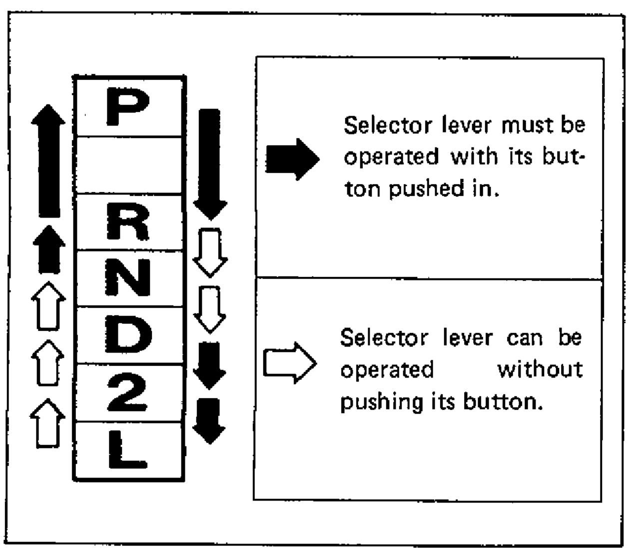


Fig. 7B-9-7

SELECT CABLE

REMOVAL

1. Console box, if equipped.
2. Parking brake lever cover and shift control lever cover.
3. Select indicator.
4. Select cable from selector lever and then from floor bracket.
5. Select cable from transmission.
6. Select cable from dash panel.

INSTALLATION

Install select cable by reversing removal procedure. Apply grease to pin and cable joint. Adjusting procedure is as follows.

ADJUSTMENT

1. Before tightening cable end nut, shift selector lever to N.
2. Also shift manual shift lever to N.

NOTE:
There should be clearance between nut and cable joint in this state.

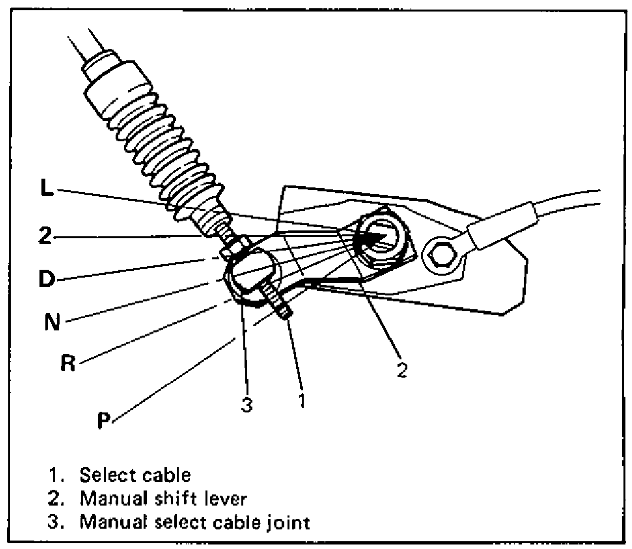
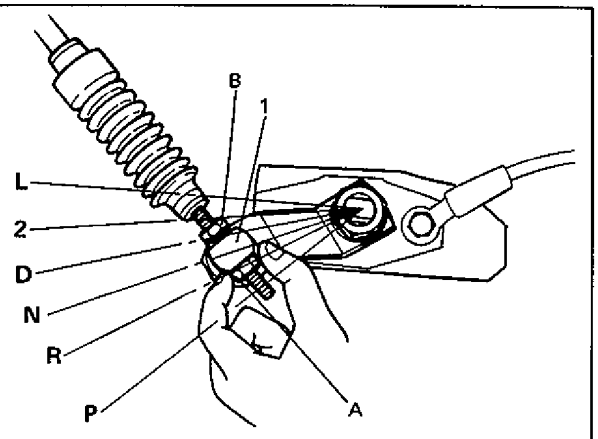


Fig. 7B-9-8 Shifting Manual Selector and Manual Shift Lever to N

3. Turn nut A by hand till it contacts manual select cable joint. Then tighten nut B with wrench.



1. Manual select cable joint
A: Align with cable joint
B: Tighten with wrench

Fig. 7B-9-9 Fastening Cable End Nuts

4. After select cable was installed, check for the following.
   - Push car with selector lever shifted to P. Car should not move.
   - Car can not be driven in N.
   - Car can be driven in D, 2 and L.
   - Car can be backed in R.

INHIBITOR SWITCH

INSPECTION

1) Apply parking brake.
2) With foot brake depressed, check to make sure that turning ON ignition key will start engine only when selector lever is in P and N ranges and NOT in any other range.
3) Check to make sure that back-up lights light only when selector lever is in R range and NOT in any other range.
4) If above check results are not satisfactory, disconnect coupler of inhibitor switch and with tester connected to harness side coupler, check continuity between terminals in each range as follows.

	Black/ Yellow	Black/ Red	Yellow	Red
P	O—	—O		
R			O—	—O
N	O—	—O		

5) If continuity exists as indicated in above table, replace switch. If not, correct wiring of that range.

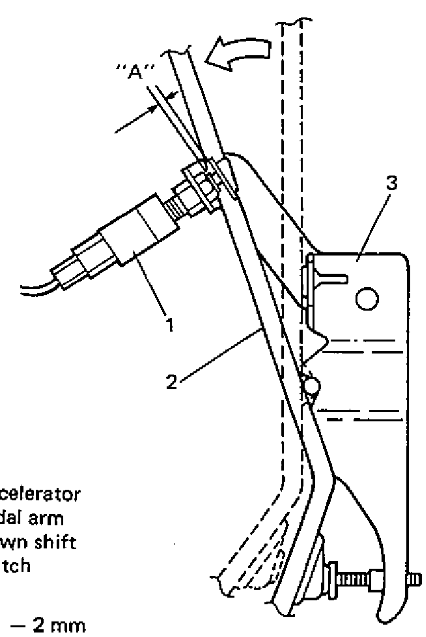
KICK-DOWN SWITCH

INSPECTION

1) Disconnect connector of kick-down switch and check continuity according to how much accelerator pedal is depressed in its stroke by using circuit tester.

Accelerator pedal stroke depressed	Continuity
Less than 7/8	Does not exist (OFF)
More than 7/8	Exists (ON)

2) Adjust kick-down switch so that adjustment margin ("A" in figure below) becomes 1 to 2 mm when throttle is open fully.



1. Accelerator pedal arm
2. Down shift switch

"A": 1 – 2 mm (0.040 – 0.078 in)

Fig. 7B-9-10

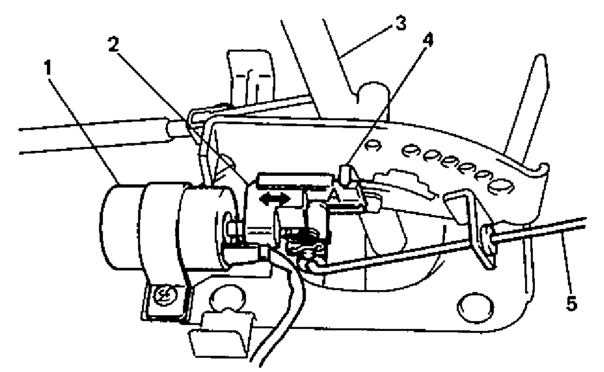
BRAKE INTERLOCK SYSTEM (If equipped)

SHIFT LOCK SOLENOID

1. Remove console box, parking brake lever cover, shift control lever cover, and then select indicator.
2. Replace shift lock solenoid.
3. Install indicator and covers as they were.

NOTE:

- **Shift selector lever to "L" to facilitate work.**
- **Apply grease to sliding portion and make sure that lock plate slides smoothly when manual release knob is pulled and released.**
- **Check that detent pin is locked at "P" position by lock plate.**
- **Check to confirm that lock plate is pulled in when ignition key is turned to "ON", so allowing detent pin to be pushed down.**



1. Shift lock solenoid assembly
2. Lock plate
3. Selector lever (in P)
4. Detent pin
5. Manual release rod

A: Apply grease

Fig. 7B-9-11

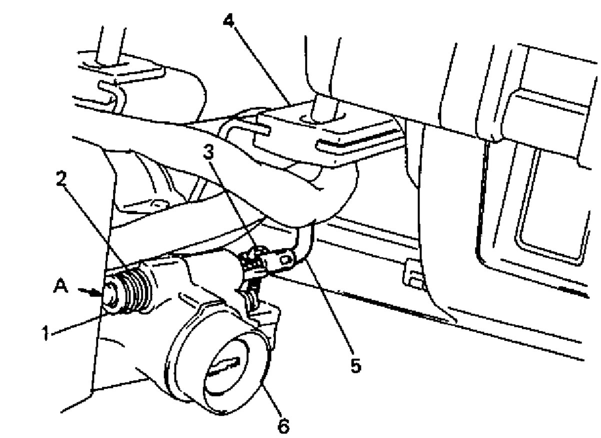
INTERLOCK CABLE

Removal and Installation

1. Remove steering column cover and column hole cover by removing their fastening screws.
2. Remove interlock cable clamp screw located at steering lock.
3. Push in release shaft A fully and disconnect cable end.

NOTE:

- **Removal of steering column nuts may extend head clearance of clamp screw and allow easy removal/installation.**
- **If necessary, hand-make very short screwdriver for this removal/installation.**
- **Do not remove release shaft E ring.**



1. Release shaft E ring (DO NOT remove it)
2. Release shaft spring
3. Clamp screw
4. Steering column
5. Interlock cable
6. Steering lock

A: Push in for disconnection/reconnection of cable

Fig. 7B-9-12

4. With console box and parking brake lever cover removed, take out cable by loosening nut and removing clip in manual selector.
5. To install a new cable, reverse removal procedure.

Adjustment

1. With cable nuts A and B loosened, shift selector lever to "P".
2. While pulling outer cable in arrow C direction in figure all the way, align nut B with bracket and tighten lock nut A.

NOTE:

- **When outer cable is pulled in arrow C direction, release shaft spring in steering lock should be depressed fully.**
- **Make sure that ignition key can be turned from "ACC" to "LOCK" and removed from key cylinder when selector lever is in "P".**
- **Make also sure that key can not be turned to "LOCK" when selector lever is in any other than "P".**

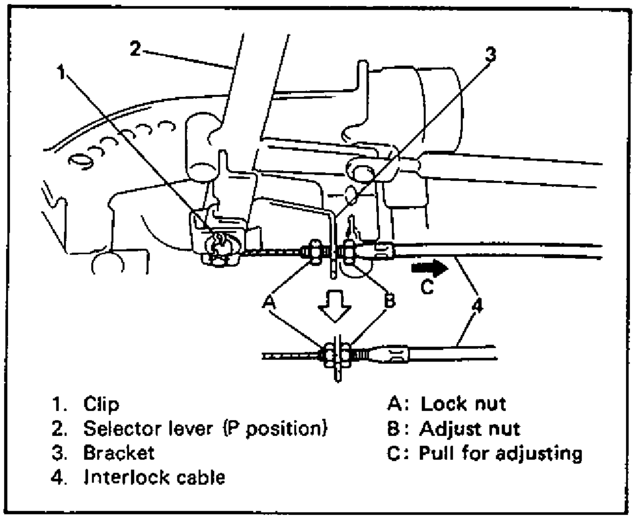


Fig. 7B-9-13

STOP LIGHT SWITCH

Removal and Installation

1. Remove negative battery cable from battery.
2. Remove steering joint cover to gain access to stop light switch.
3. Disconnect stop light switch electrical connector.
4. Remove stop light switch from pedal bracket.
5. To install stop light switch, reverse removal procedure.

Adjustment

Adjustment should be made as follows when installing stop light switch.

Pull up brake pedal toward you and while holding it there, adjust switch position so that clearance between the end of thread and brake pedal contact plate (shown as "A" in figure) is within 0.5 – 1.0 mm (0.02 – 0.04 in.). Then tighten lock nut to the specified torque.

Tightening torque for stop light switch nut	10 – 15 N·m 1.0 – 1.5 kg-m 7.5 – 10.5 lb-ft

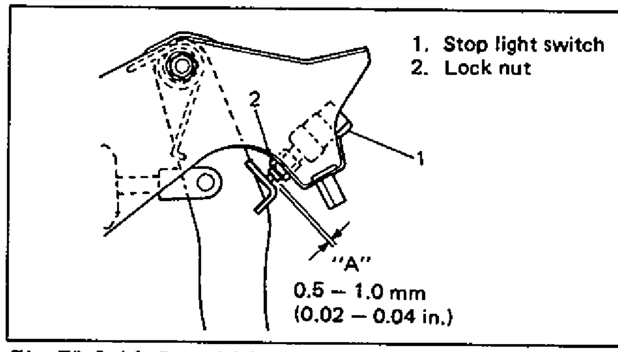


Fig. 7B-9-14 Stop Light Switch

SYSTEM INSPECTION

1. Check to make sure that selector lever cannot be moved to any other range from "P" range position when ignition switch key is at "ACC" or "LOCK" position or it is removed from keyhole of ignition switch.
2. Shift selector lever to "P" range position and check for the following.
   - Ignition key can be turned between "LOCK" and "ACC" positions back and forth and also it can be removed from ignition switch.
   - When manual release knob is operated, selector lever can be shifted from "P" range position to any other range regardless of brake pedal operation or ignition switch key position.
   - When ignition switch is turned "ON" and brake pedal is depressed, selector lever can be shifted from "P" range position to any other range.
3. With selector lever shifted to any position other than "P" range, check that ignition key cannot be turned between "ACC" and "LOCK" positions in either direction and it cannot be removed from ignition switch unless it is at "LOCK" position.

TRANSMISSION UNIT REPAIR OVERHAUL

PRECAUTIONS FOR DISASSEMBLY AND ASSEMBLY

As the automatic transmission consists of high precision components, be sure to observe following precuations in their handling during disassembly and assembly.

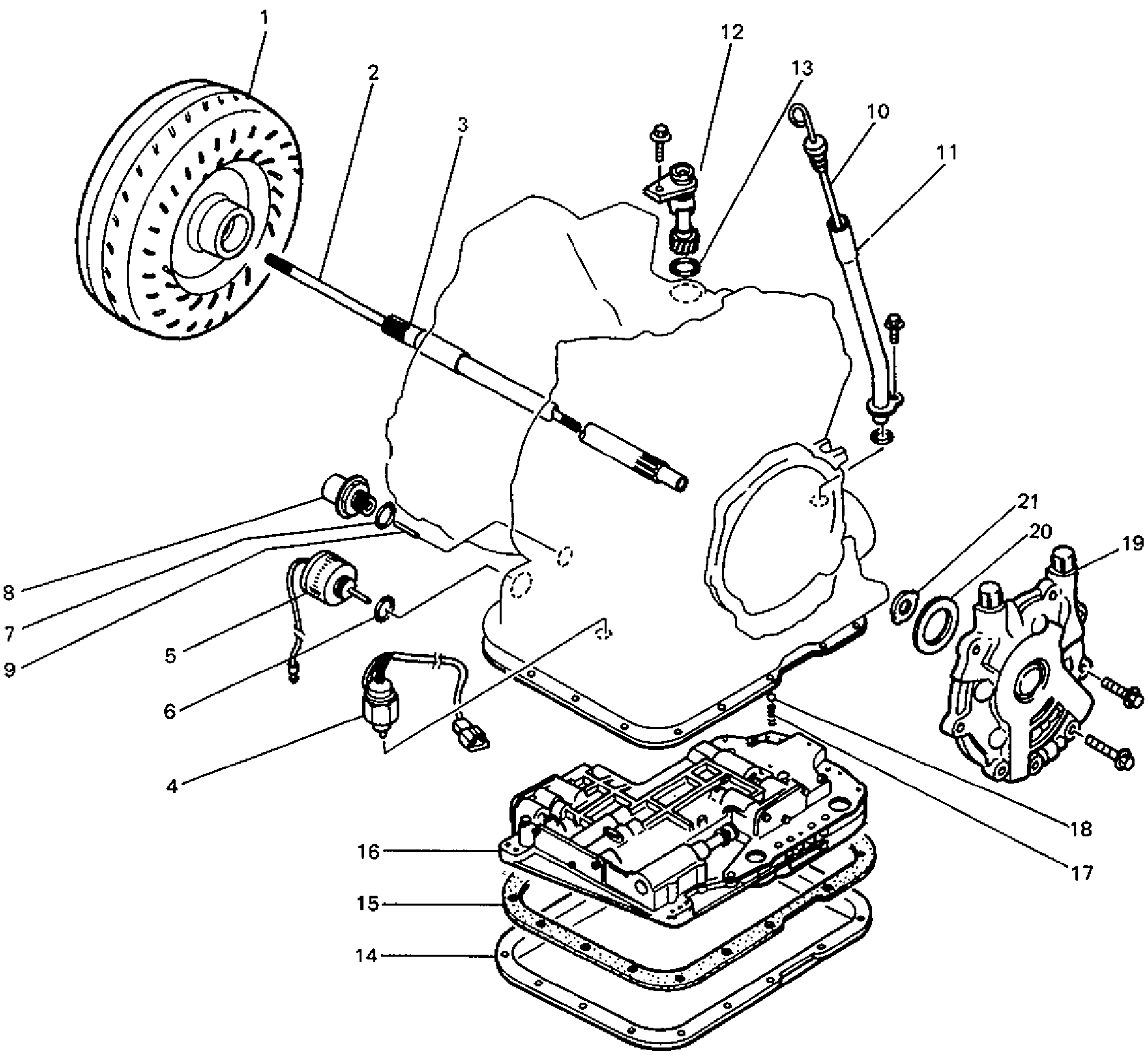
- For any service work which requires disassembly, select a clean place free from dirt and dust.
- Place a rubber mat on the working table to protect parts against damage.
- Do not use regular working gloves or rag (cloth). (Nylon cloth and paper towel are useable.)
- To separate the case joint, do not pry with a screwdriver or the like but tap the case lightly with a plastic hammer.
- Before disassembly, be sure to wash off dirt or anything on the transmission thoroughly so that no such matter will get into the transmission during disassembly and assembly.
- Wash disassembled parts in Automatic transmission fluid (referred to as A/T fluid hereinafter) or kerosene and blow air into the fluid passage to make sure it is not clogged. (Be careful not to allow A/T fluid or kerosene to get on the brake skin including face.)
  However, the disc, low band, resin washer and rubber part must be washed in A/T fluid.
- Be sure to replace each gasket, oil seal and O-ring with a new one.
- Apply A/T fluid to the sliding part and rotating part before assembly.
- When using a new disc and brake band, immerse them in A/T fluid for longer than 2 hours.
- For service materials, do not use anything other than those listed below.
- For procedures of removal and installation of the automatic transmission from and to the car body, refer to SECTION 6A.

Service materials	Use
Automatic Transmission Fluid [DEXRON-II] (99000-22760)	Applied to rotating part, sliding part and disc before assembly.
SUZUKI SUPER GREASE C (99000-25030)	Used to retain thrust bearing, bearing race, thrust washer and ball.
SUZUKI BOND 1216 (99000-31160)	Used for case housing adhesion.

INSPECTION OF PARTS AND CORRECTION

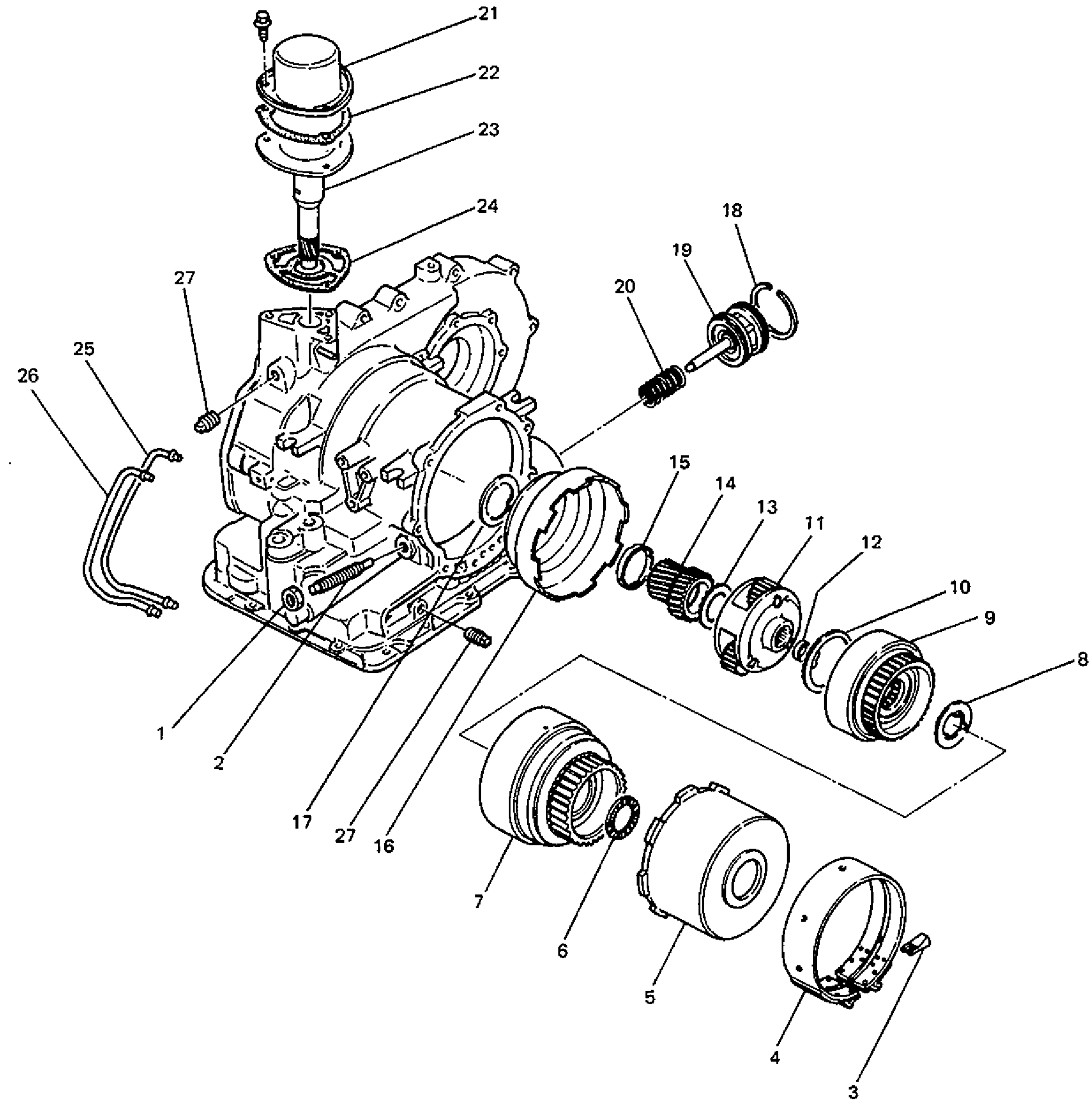
Part	Check for	Correction
Cast part, machine processed part	• Small scratch, burr • Deep scratch, groove • Clogged fluid passage • Scratched installing surface, residual gasket • Crack	Remove with oil stone. Replace. Pass air or wire through passage and wash. Remove with oil stone or replace. Replace.
Bearing	• Unsmooth rotation • Streak, pitching, scratch or crack	Replace. Replace.
Bushing, thrust washer	• Scratch, burr, wear or burn	Replace.
Oil seal, gasket	• Scratched or hardened seal ring • Worn seal ring at its periphery and side • Worn piston seal ring, oil seal, gasket	Replace. Replace. Replace.
Gear	• Scratch, burr • Excessively worn tooth	Correct with oil stone or replace. Replace.
Spline part	• Scratch, burr, torsion	Correct with oil stone or replace.
Snap ring	• Wear, scratch, deformation • No tightening margin	Correct with oil stone Replace.
Thread	• Burr • Damage	Correct with oil stone. Replace.
Spring	• Permanent set, burn	Replace.
Clutch disc, brake disc	• Wear, burn, plate warp, crack, distortion, damaged claw	Replace.
Clutch plate, brake plate	• Wear, burn, warp, distortion, damaged claw	Replace.
Seal surface (where lip contacts)	• Scratch, rough surface, stepped wear • Foreign matter cautht	Replace. Repair.

DISASSEMBLED VIEW OF AUTOMATIC TRANSMISSION



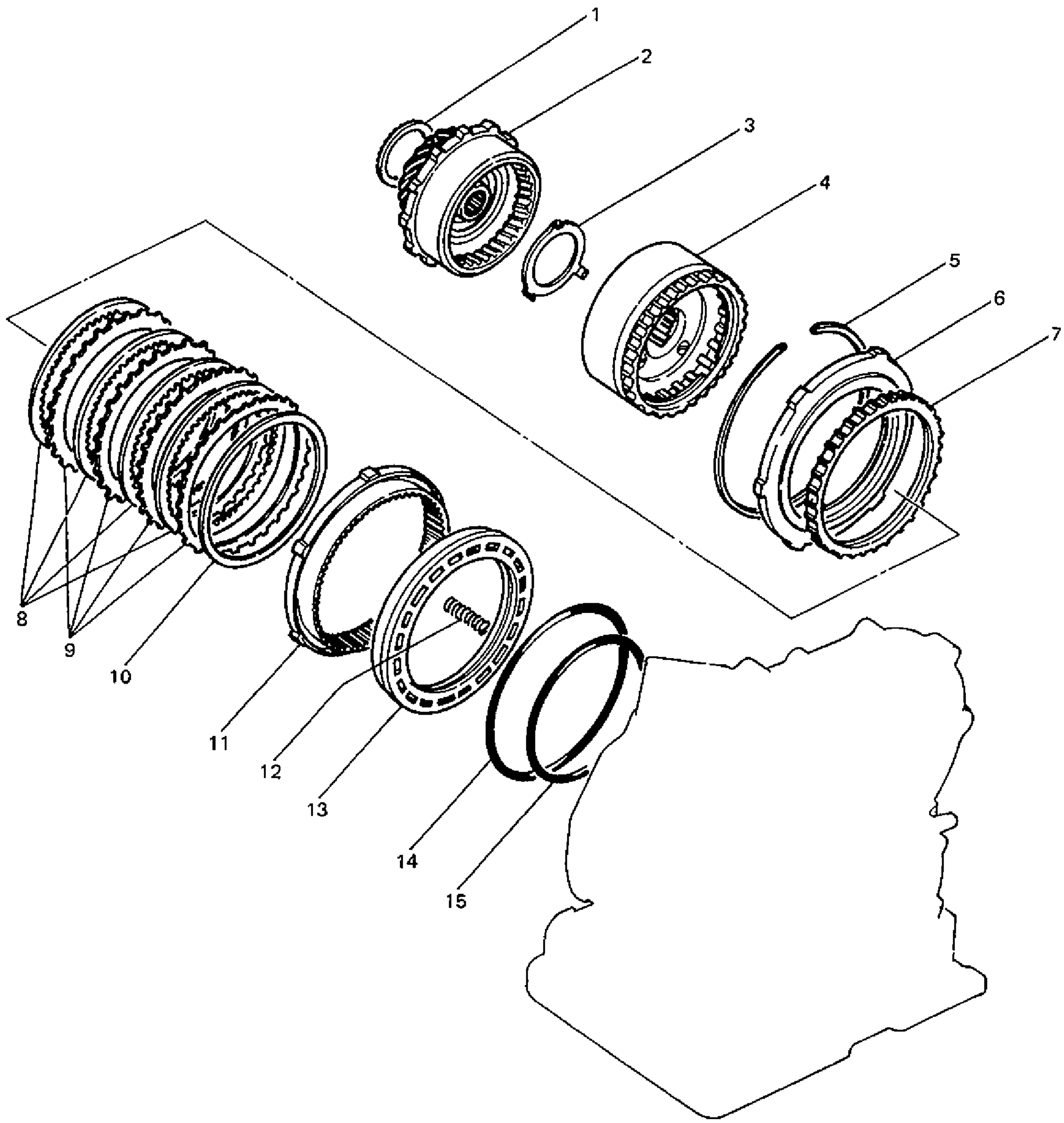
1. Torque converter	8. Control modulator	15. Oil pan gasket
2. Oil pump shaft	9. Modulator rod	16. Control valve ass'y
3. Input shaft	10. Oil level gauge	17. Detent spring
4. Inhibitor switch	11. Oil filler tube	18. Steel ball
5. Kick down solenoid	12. Speedometer driven gear	19. Oil pump
6. O-ring	13. O-ring	20. Thrust washer
7. O ring	14. Oil pan	21. Bearing race

Fig. 7B-10-1



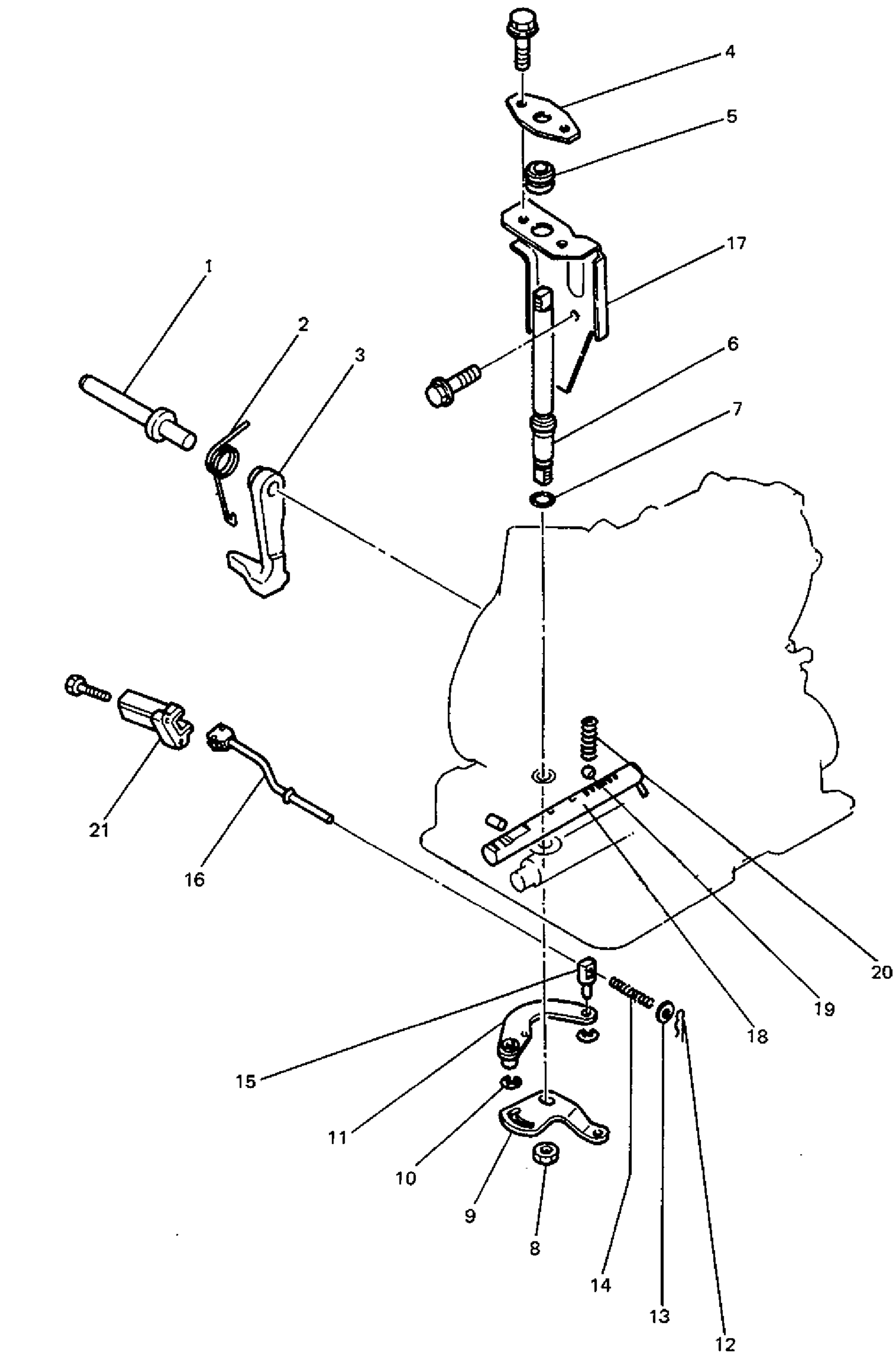
1. Anchor nut
2. Anchor bolt
3. Band pin
4. Brake band
5. Direct clutch ass'y
6. Bearing
7. Forward clutch ass'y
8. Bearing
9. Front planetary ring gear ass'y
10. Bearing
11. Front planetary carrier
12. Sleeve
13. Bearing
14. Sun gear
15. Sun gear spacer
16. Connecting shell
17. Bearing
18. Snap ring
19. Servo piston
20. Spring
21. Governor cover
22. Cover gasket
23. Governor
24. Governor gasket
25. Governor inner pipe
26. Governor outer pipe
27. Plug

Fig. 7B-10-2



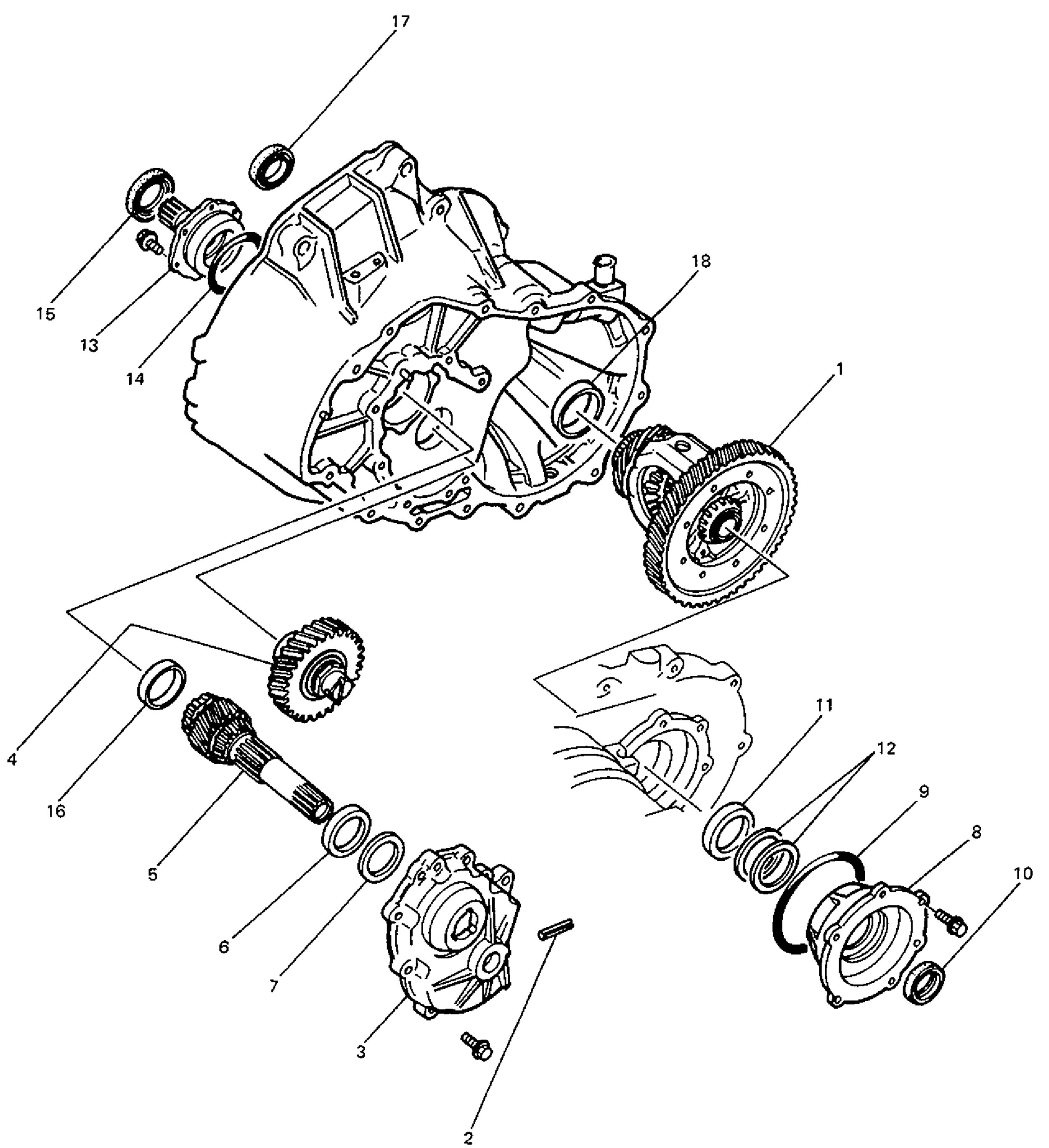
1. Bearing
2. Rear planetary ring gear ass'y
3. Bearing
4. Rear planetary carrier ass'y
5. Snap ring
6. One-way clutch
7. Retaining plate
8. Clutch disc
9. Clutch plate
10. Cushion plate
11. First reverse brake flange
12. Spring
13. First reverse piston
14. O-ring
15. O-ring

Fig. 7B-10-3



1. Parking pawl shaft	8. Lock nut	15. Parking joint
2. Return spring	9. Manual plate	16. Parking rod
3. Parking lock pawl	10. E-ring	17. Rod bracket
4. Plate	11. Parking lever	18. Control rod
5. Bushing	12. Snap pin	19. Steel ball
6. Manual shaft	13. Washer	20. Spring
7. O-ring	14. Spring	21. Actuator support

Fig. 7B-10-4

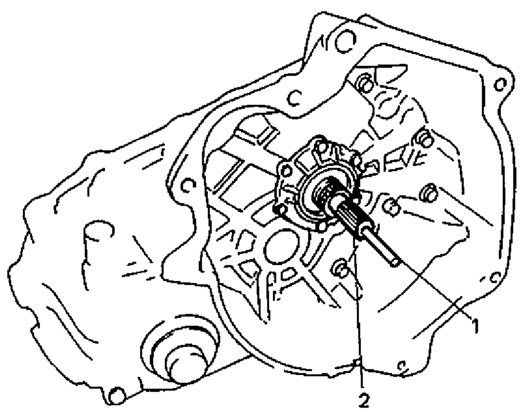


1. Differential ass'y	7. Shim	13. Bearing cover
2. Pin	8. Side bearing housing cover	14. O-ring
3. Bearing housing cover	9. O-ring	15. Oil seal
4. Idle gear ass'y	10. Oil seal	16. Outer race
5. Output gear ass'y	11. Outer race	17. Oil seal
6. Outer race	12. Shim	18. Outer race

Fig. 7B-10-5

DISASSEMBLY

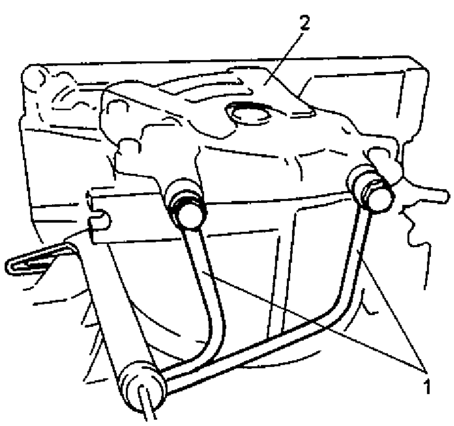
1) Remove torque converter.
2) Pull out oil pump shaft and input shaft.



1. Oil pump shaft
2. Input shaft

Fig. 7B-11-1

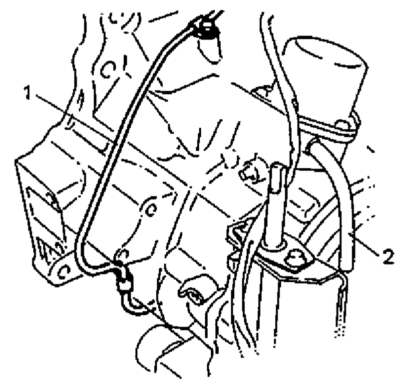
3) Remove mounting brackets.
4) Disconnect cooler hose joints.



1. Cooler hose joint
2. Oil pump

Fig. 7B-11-2

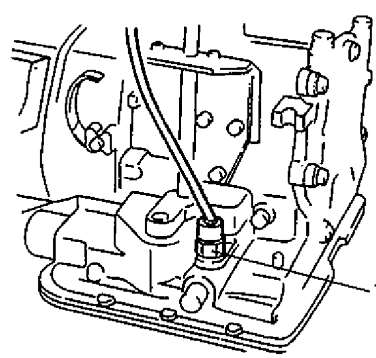
5) Disconnect control modulator pipe and breather hose.



1. Modulator pipe
2. Breather hose

Fig. 7B-11-3

6) Remove inhibitor switch.

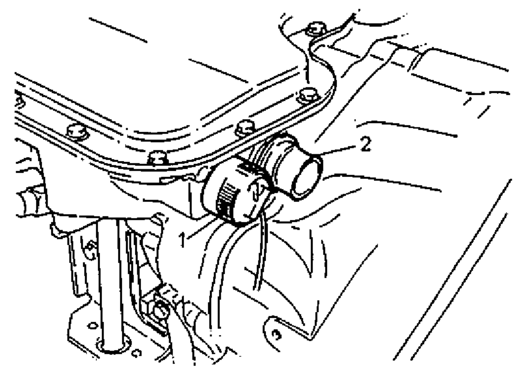


1. Inhibitor switch

Fig. 7B-11-4

7) Remove kick down solenoid by turning it by hand and then remove O-ring.

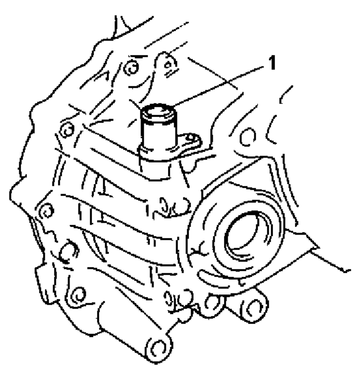
8) Remove control modulator by turning it by hand and then remove O-ring and modulator rod.



1. Kick down solenoid
2. Control modulator

Fig. 7B-11-5

9) Disconnect oil filler tube.
10) Remove speedometer driven gear.



1. Speedometer driven gear

Fig. 7B-11-6

11) With oil pan side facing up, remove oil pan fixing bolts and remove oil pan by tapping its outer rim with a plastic hammer.

CAUTION:
- **Do not hammer hard. Oil pan may get deformed.**
- **Do not pry oil pan off by inserting a screwdriver or the like into joint.**

12) Remove oil pan gasket and then magnet from oil pan.

NOTE:
- **Be sure to remove gasket on mating surface completerly.**
- **Clean thoroughly so that no remnant of gasket will be in oil pan.**

13) Remove valve body fixing bolts (as shown below) and then remove valve body ass'y.

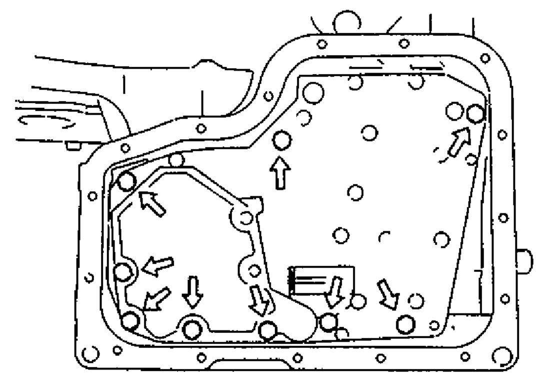
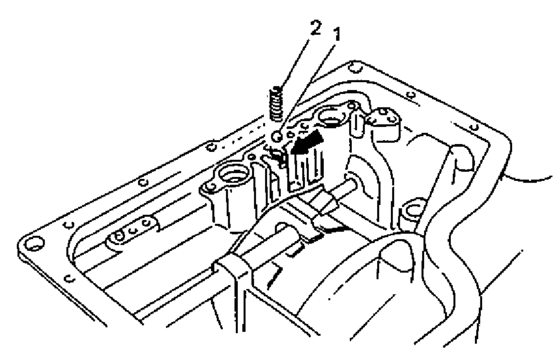


Fig. 7B-11-7

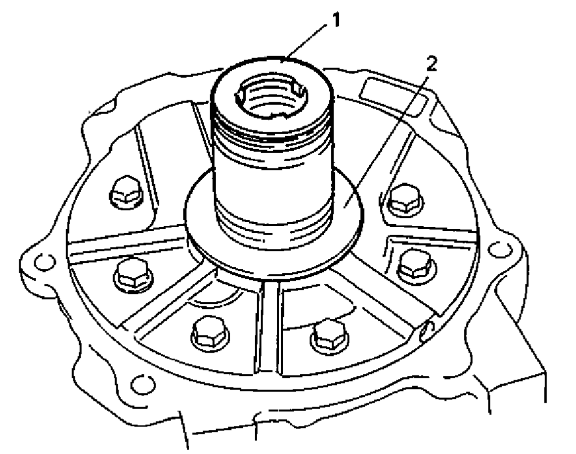
14) Take out spring and steel ball.



1. Steel ball
2. Spring

Fig. 7B-11-8

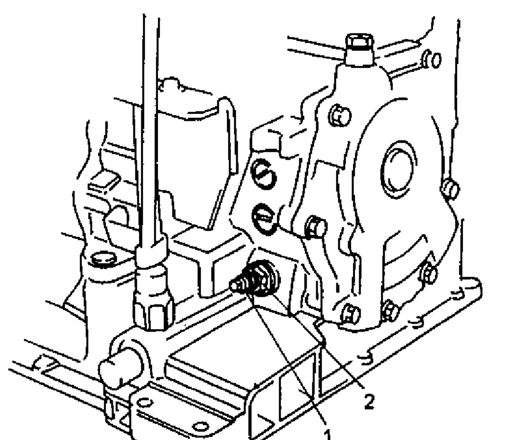
15) Remove oil pump fixing bolt, oil pump ass'y and gasket. Then remove forward clutch bearing race and direct clutch washer from oil pump ass'y.



1. Bearing race
2. Washer

Fig. 7B-11-9

16) Loosen anchor nut and anchor bolt.

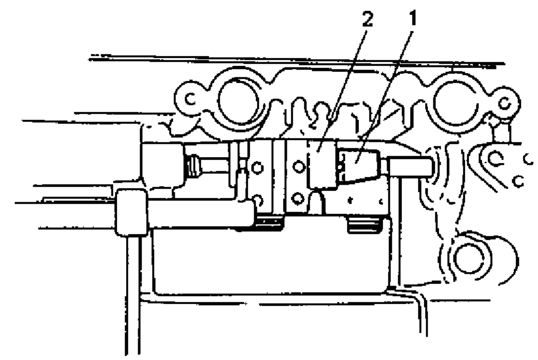


1. Anchor bolt
2. Anchor nut

Fig. 7B-11-10

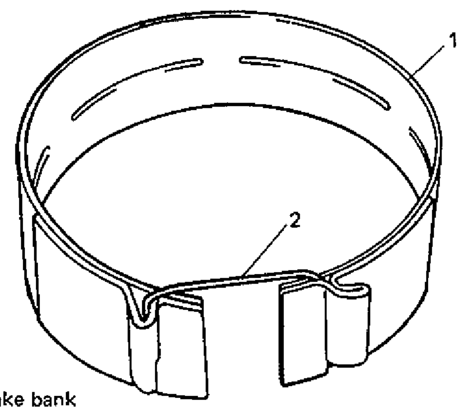
17) Remove second brake band pin and then second brake band.

CAUTION:
Keep brake band in proper state by using wire or the like. Should its opening be opened wider, crack may occur in its fusing.



1. Brake band pin
2. Second brake band

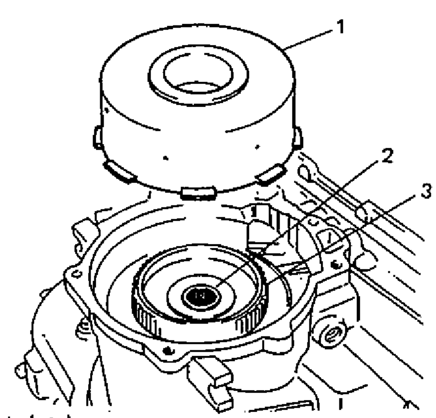
Fig. 7B-11-11



1. Brake bank
2. Wire

Fig. 7B-11-12

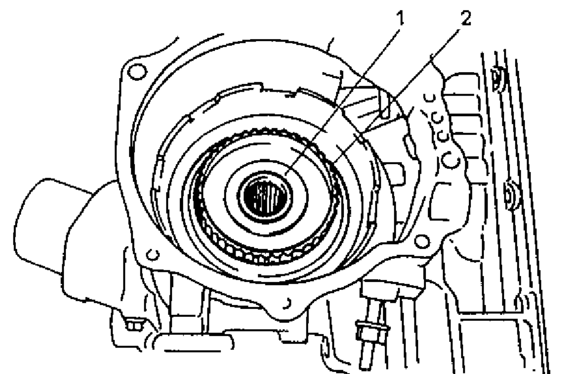
18) Remove direct clutch ass'y, bearing and forward clutch ass'y.



1. Direct clutch
2. Bearing
3. Forward clutch

Fig. 7B-11-13

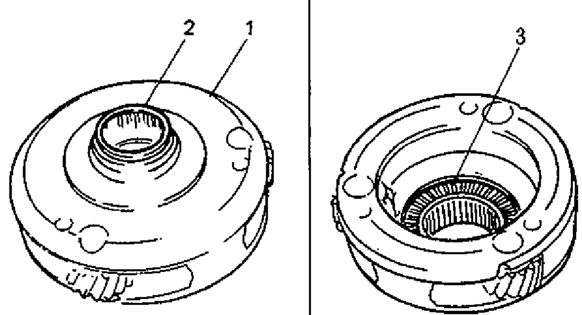
19) Remove bearing and front planetary ring gear ass'y and then remove bearing from ring gear ass'y.



1. Bearing
2. Planetary ring gear

Fig. 7B-11-14

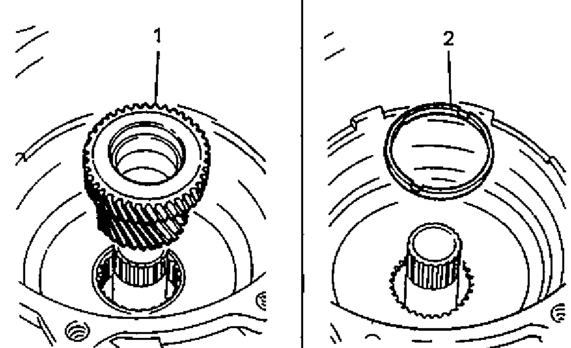
20) Remove front planetary carrier and then remove sleeve and bearing from carrier.



1. Front planetary carrier
2. Sleeve
3. Bearing

Fig. 7B-11-15

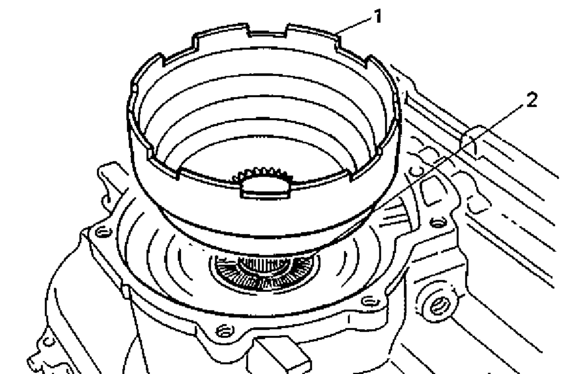
21) Remove sun gear and spacer bushing.



1. Sun gear
2. Spacer bushing

Fig. 7B-11-16

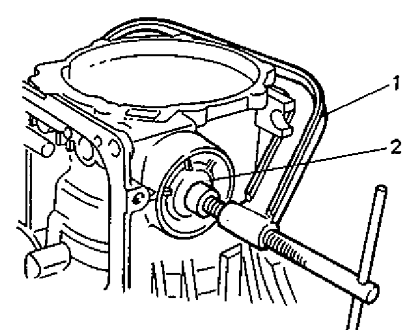
22) Remove connecting shell and bearing.



1. Connecting shell
2. Bearing

Fig. 7B-11-17

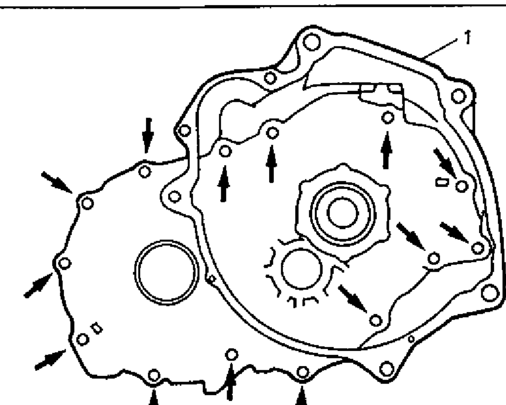
23) Using special tool, remove snap ring and band servo piston.



1. Special tool
   (Valve lifter 09916-14510)
2. Band servo piston

Fig. 7B-11-18

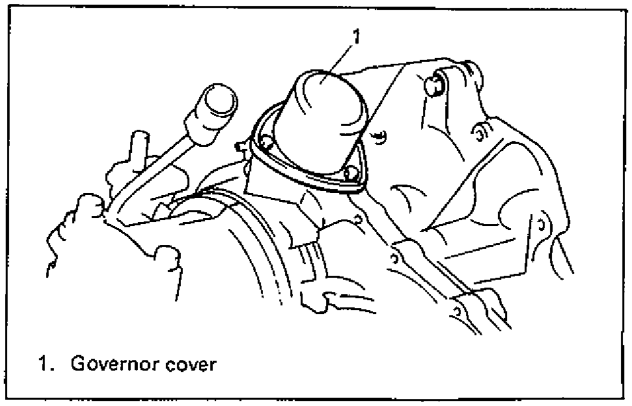
24) After removing transmission case fixing bolts, remove case by lifting it up.



1. Transmission case

Fig. 7B-11-19

25) Remove governor cover, cover gasket, governor ass'y and governor gasket.

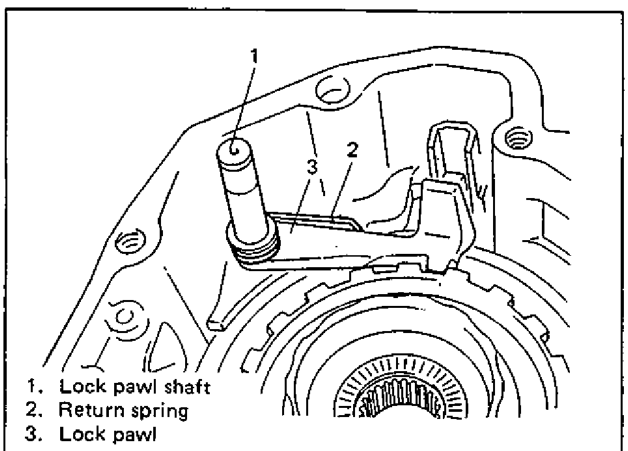


1. Governor cover

Fig. 7B-11-20

26) Disconnect governor inner and outer pipes. These parts should be removed unless absolutely necessary.

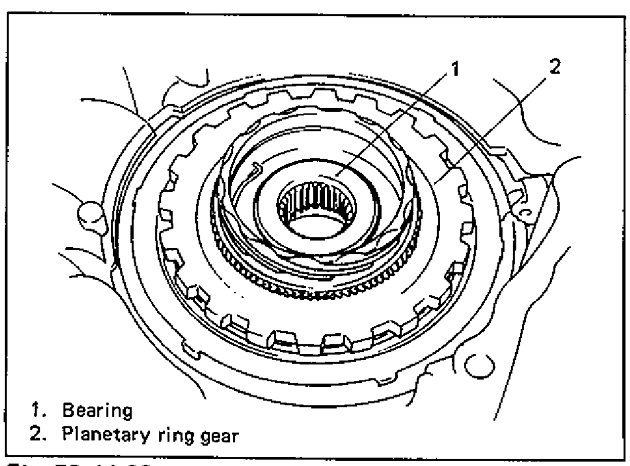
27) Pull out parking lock pawl shaft and remove return spring and lock pawl.



1. Lock pawl shaft
2. Return spring
3. Lock pawl

Fig. 7B-11-21

28) Remove bearing and rear planetary ring gear ass'y.

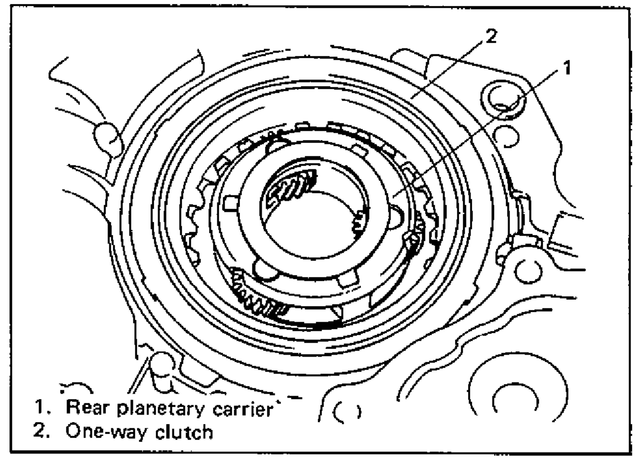


1. Bearing
2. Planetary ring gear

Fig. 7B-11-22

29) Remove bearing from planetary ring gear ass'y.

30) Remove rear planetary carrier ass'y.

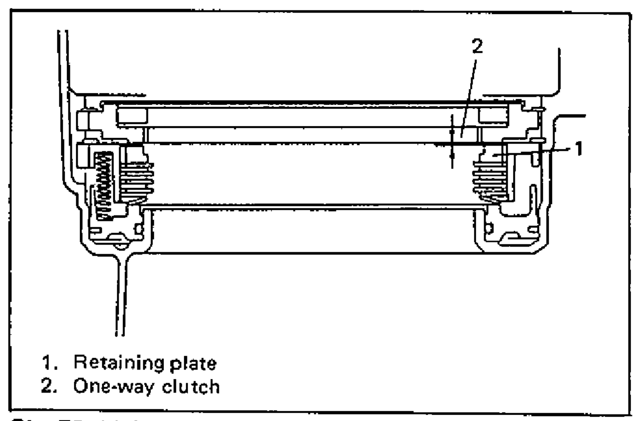


1. Rear planetary carrier
2. One-way clutch

Fig. 7B-11-23

31) Using thickness gauge, measure clearance between retaining plate and one-way clutch all around.

Clearance between plate and one-way clutch	0.8 – 1.05 mm (0.032 – 0.041 in)



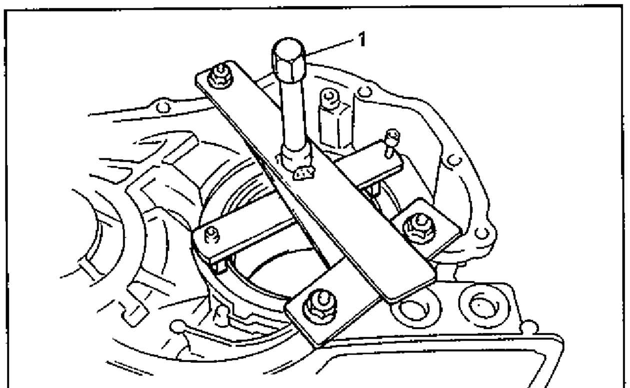
1. Retaining plate
2. One-way clutch

Fig. 7B-11-24

- If measured value is not within above specification, replace retaining plate and adjust.

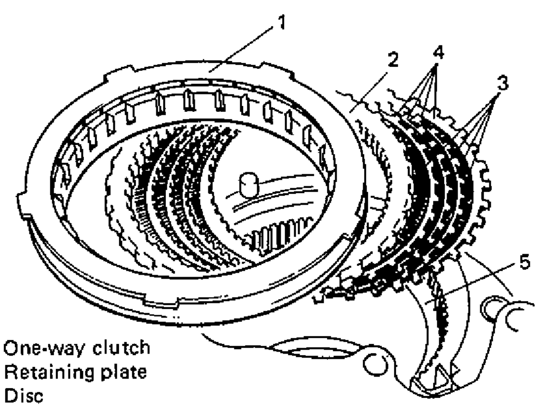
Available retaining plate thickness	1.6, 1.8, 2.0, 2.2, 2.4, 2.6, 4.6, 4.8, 5.0, 5.2 5.4 and 5.6 mm
	0.063, 0.071, 0.079, 0.087, 0.094, 0.102, 0.181, 0.189, 0.197, 0.205, 0.213 and 0.221 in

32) Using special tool, remove snap ring and then remove one-way clutch, retaining plate, discs, plates and cushion plate.



1. Special tool
(Spring compressor No. 5 09926-98360)

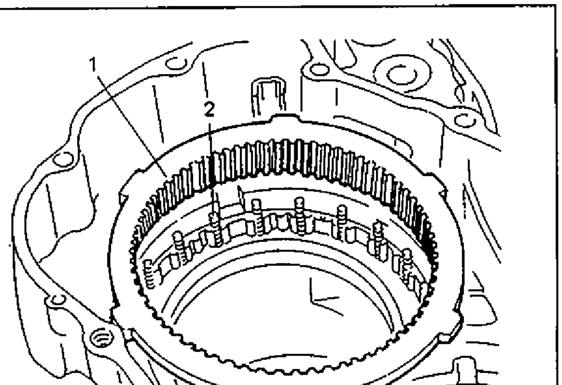
Fig. 7B-11-25



1. One-way clutch
2. Retaining plate
3. Disc
4. Plate
5. Cushion plate

Fig. 7B-11-26

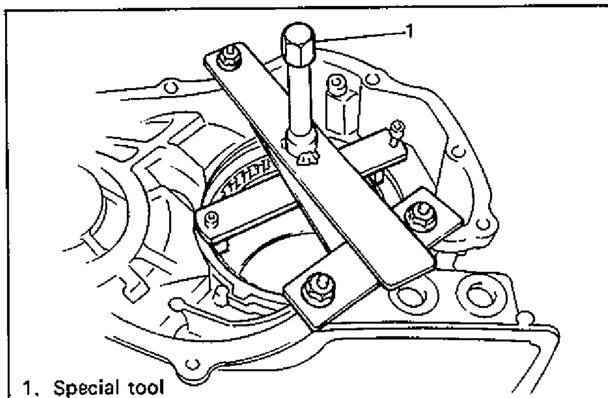
33) Remove first reverse brake flange and return springs.



1. Flange
2. Spring

Fig. 7B-11-27

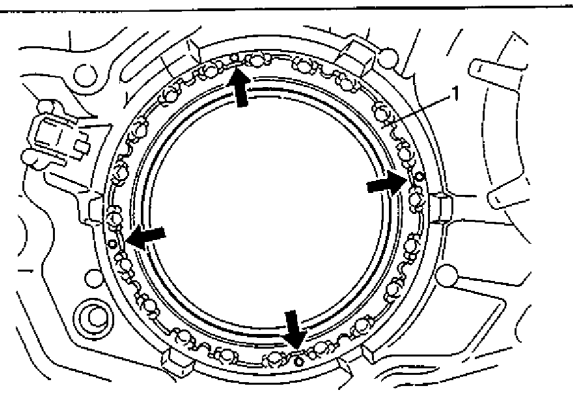
34) Using special tool, remove piston.



1. Special tool
(Spring compressor No. 5
09926-98360)

Fig. 7B-11-28

NOTE:
Install bolts of special tool into bolt holes as shown in figure.



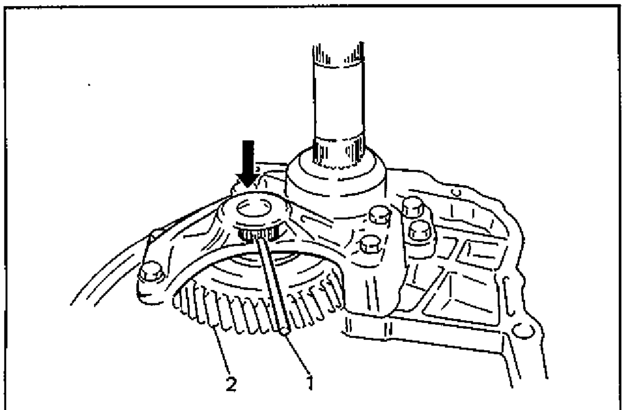
1. First reverse piston

Fig. 7B-11-29

35) Remove outer and inner O-rings from first reverse brake piston.

36) Remove differential ass'y.

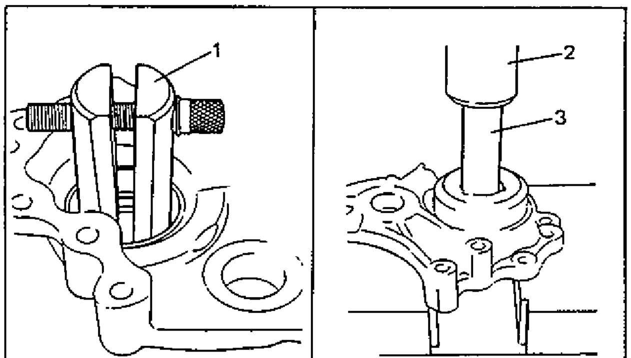
37) Remove arrow marked bolts in figure below and then remove spring pin by using punch (outer diameter: 4 mm/0.157 in.).



1. Spring pin
2. Idle gear ass'y

Fig. 7B-11-30

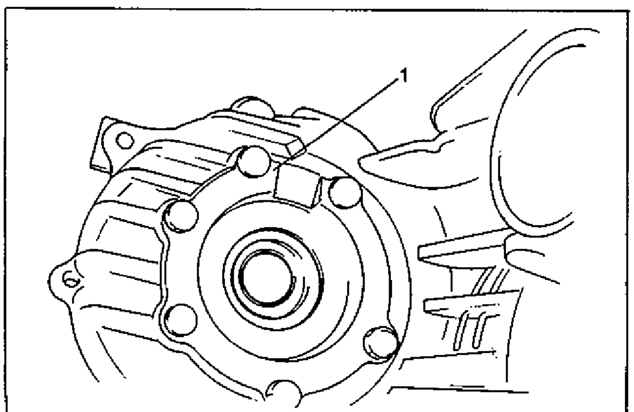
38) After removing bearing housing cover fixing bolts, remove bearing housing cover, output gear and idle gear by tapping idle gear with plastic hammer from converter housing side.
39) Using special tool and hydraulic press, remove bearing outer race.



1. Special tool (Bearing outer race remover 09944-96010)
2. Jig
3. Hydraulic press

Fig. 7B-11-31

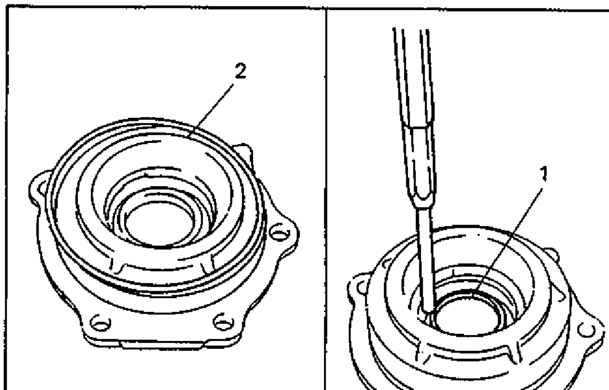
40) Remove shim from bearing housing cover.
41) Remove side bearing housing by removing its fixing bolts.



1. Side bearing housing

Fig. 7B-11-32

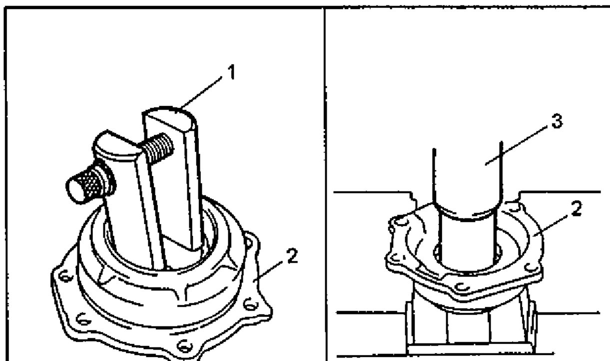
42) Remove O-ring and oil seal from side bearing housing.



1. Oil seal
2. O-ring

Fig. 7B-11-33

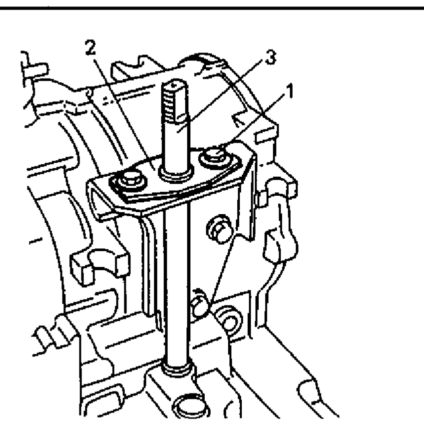
43) Using special tool and hydraulic press, remove bearing outer race from side bearing housing and then remove adjusting shim.



1. Special tool (Outer race remover 09944-96010)
2. Side bearing housing
3. Hydraulic press

Fig. 7B-11-34

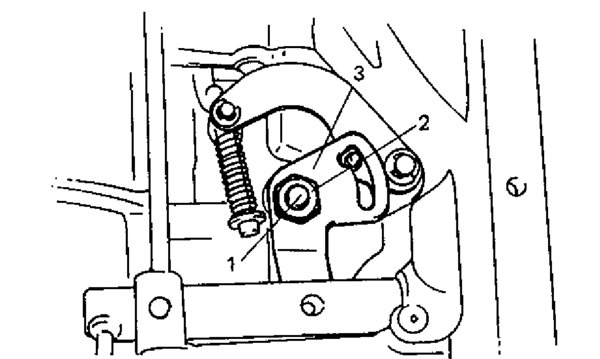
44) After removing bolts as shown in figure below, remove plate.



1. Bolt
2. Plate
3. Manual shaft

Fig. 7B-11-35

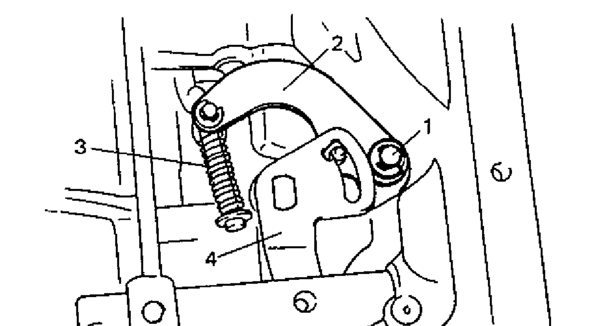
45) Remove rubber bushing from plate.
46) Remove manual shaft by removing nut and tapping its end lightly with a plastic hammer and then remove O-ring from shaft.



1. Manual shaft
2. Nut
3. Manual plate

Fig. 7B-11-36

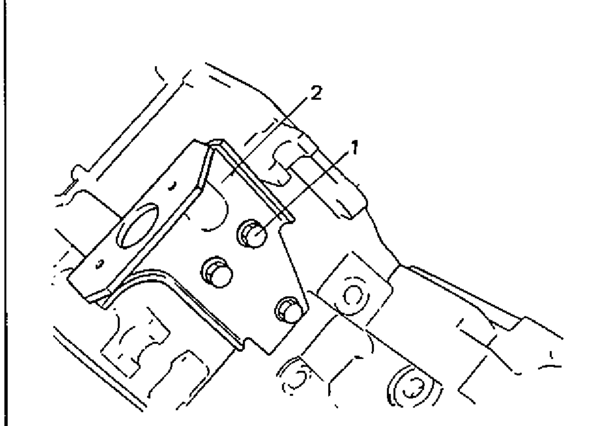
47) Remove manual plate.
48) After removing E-ring, remove parking lever and parking rod together.



1. E-ring
2. Parking lever
3. Parking rod
4. Manual plate

Fig. 7B-11-37

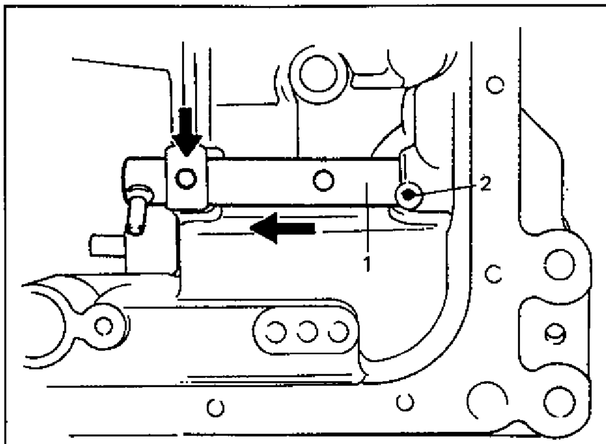
49) Remove rod bracket by removing its fixing bolts.



1. Bolt
2. Rod bracket

Fig. 7B-11-38

50) Using a punch or the like, remove spring pin from control rod (from this side of figure below toward the other side) and while pressing arrow marked hole with finger, slide control rod till its hole aligns with above said hole.



1. Control rod
2. Pin hole

Fig. 7B-11-39

51) After taking out steel ball and detent spring from above said hole, remove control rod.

52) Remove actuator support by removing bolts with hexagon wrench.

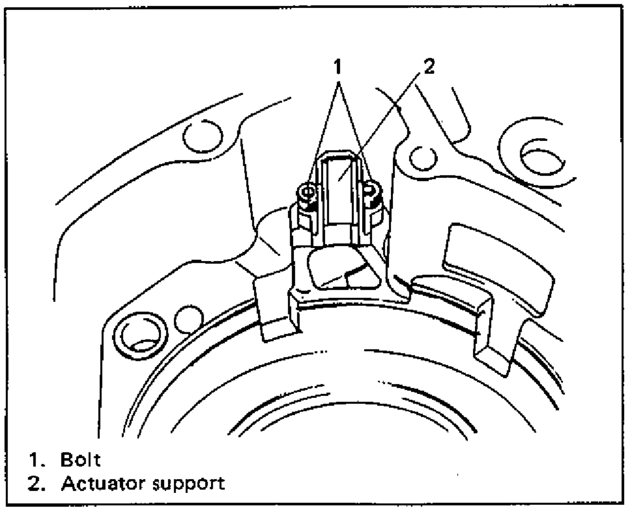


Fig. 7B-11-40

53) Remove magnet plug and packing.

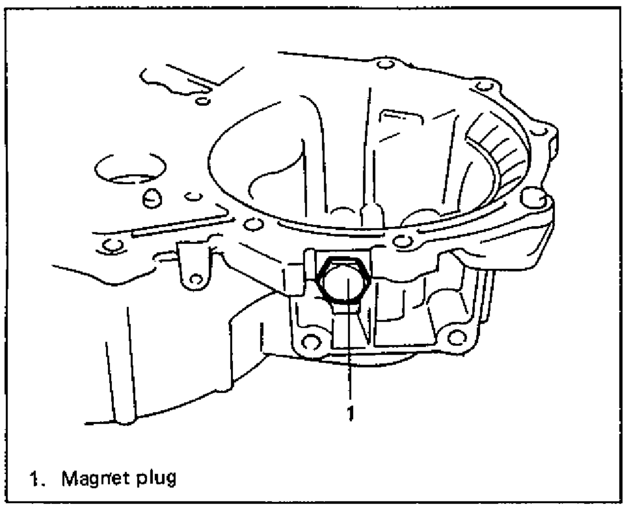


Fig. 7B-11-41

54) Remove bearing cover by removing its fixing bolts and using a plastic hammer.

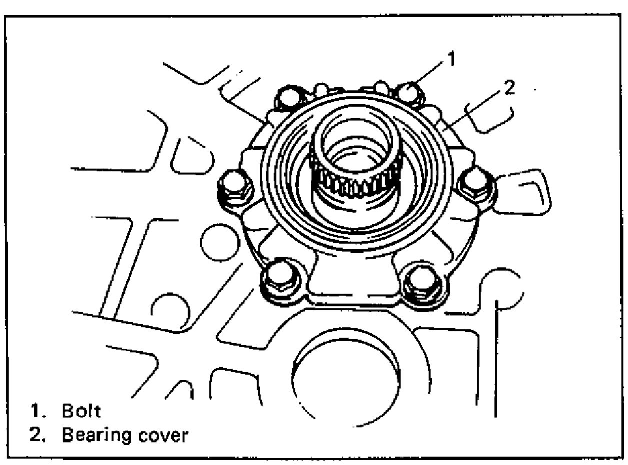


Fig. 7B-11-42

55) Remove O-ring and oil seal.

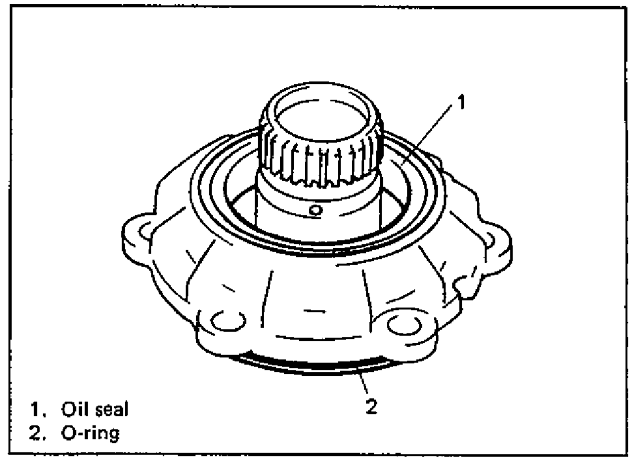


Fig. 7B-11-43

56) Using special tool and hydraulic press, remove outer race from bearing cover.

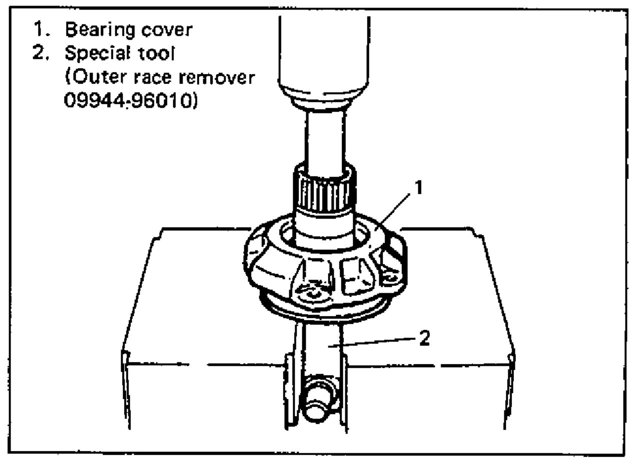


Fig. 7B-11-44

57) Remove oil seal from converter housing.

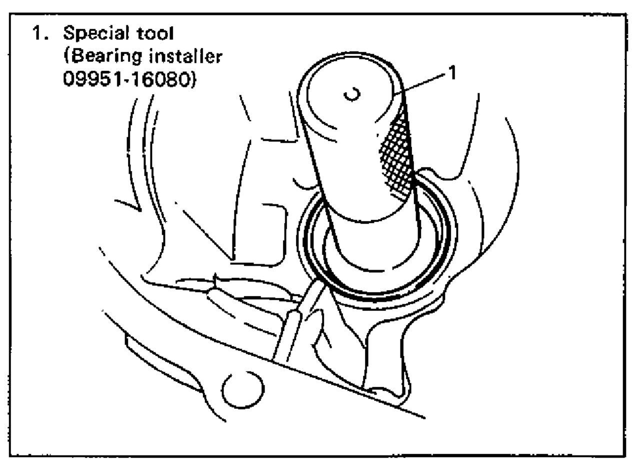
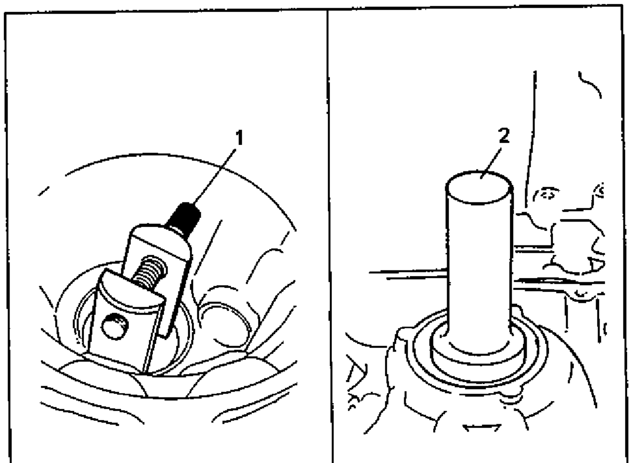


Fig. 7B-11-45

58) Using special tool, remove bearing outer race from converter housing.



1. Special tool (Outer race remover (09944-96010)
2. Special tool (Bearing installer 09951-16080)

Fig. 7B-11-46

TORQUE CONVERTER

Inspection

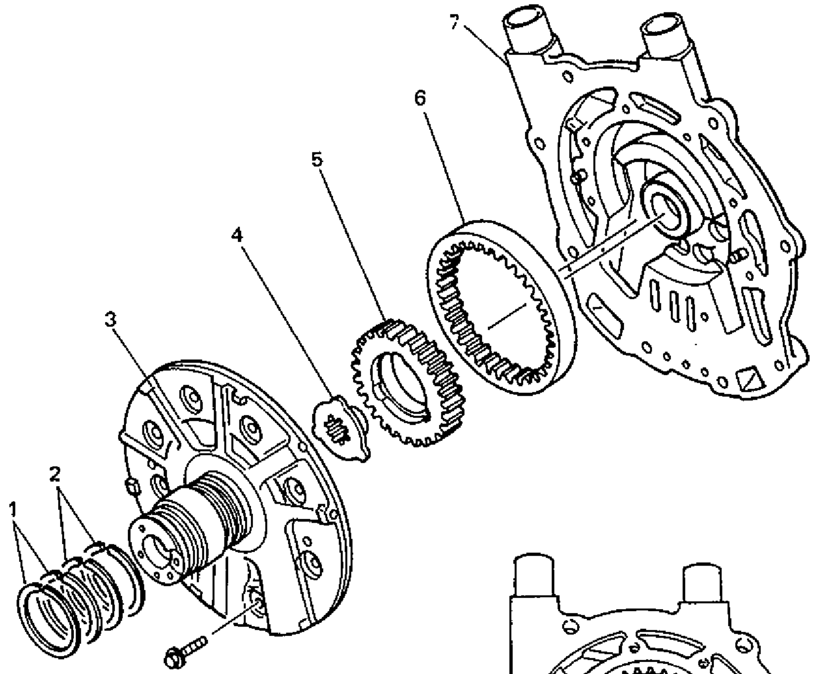
1. Check outside of torque converter for damage and crack, and replace if any.
2. If pressed mark is found on torque converter boss, correct it with sand paper or oil stone.
3. Check torque converter bush for scratch and wear, and replace if any.

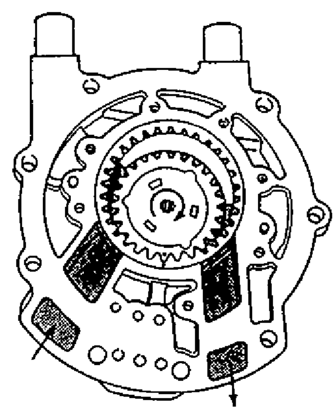
Cleaning

1. Drain A/T fluid from torque converter.
2. Fill about 0.5 liters of kerosene.
3. Wash inside of torque converter by shaking it well and then drain kerosene.
4. Repeat above steps 2 and 3 a few times. Use new kerosene each time.
5. Fill in about 1 liter of A/T fluid.
6. Wash inside of torque converter by shaking it well and drain A/T fluid.
7. Repeat above steps 5 and 6.

> CAUTION:
> **Kerosene, if left in torque converter, will affect performance of A/T adversely. Be sure to perform steps 5 to 7 to prevent it.**

OIL PUMP



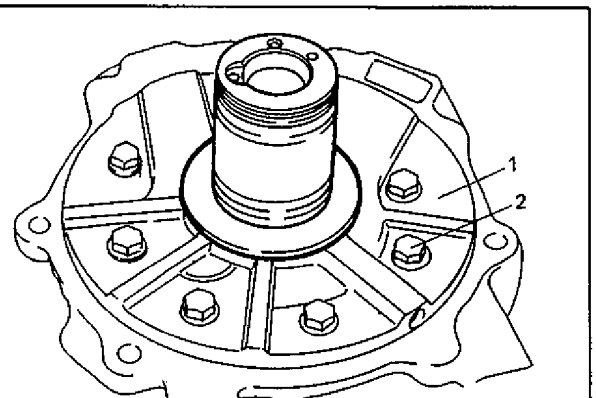


1. Seal ring (smaller in outside diameter)
2. Seal ring (larger in outside diameter)
3. Oil pump cover
4. Oil pump flange
5. Drive gear
6. Driven gear
7. Oil pump body ass'y

Fig. 7B-12-1

Disassembly

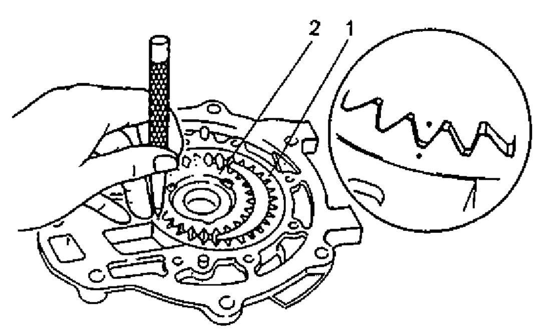
1) After removing seal ring, remove oil pump cover by removing its fixing bolts.



1. Oil pump cover
2. Bolt

Fig. 7B-12-2

2) Remove oil pump flange.
3) Punch match mark on drive gear and driven gear and then remove each gear.



1. Driven gear
2. Drive gear

Fig. 7B-12-3

Inspection

- Side clearance of both gear.
  Using a straightedge and a thickness gauge, measure side clearance between gear and pump body.

	Standard	Limit
Gear side clearance	0.02 – 0.04 mm 0.0008 – 0.0015 in	0.08 mm 0.0031 in

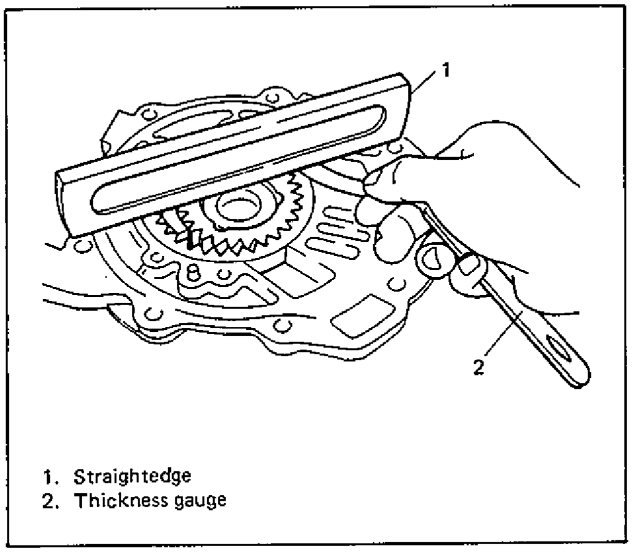


Fig. 7B-12-4

- Tip clearance of both drive and driven gears.
  Measure radial clearance between gear tooth and crescent.
  If clearance exceeds its limit, replace gear.

	Standrd	Limit
Gear tooth tip clearance	0.14 – 0.21 mm 0.0056 – 0.0082 in	0.25 mm 0.0098 in

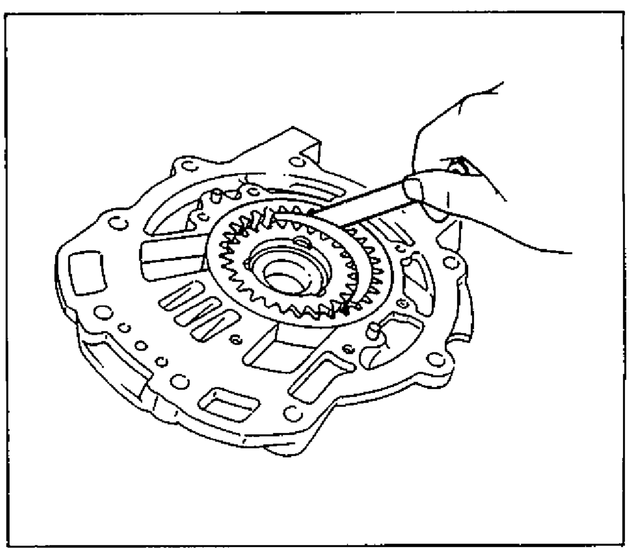


Fig. 7B-12-5

- Body clearance of driven gear.
  Push driven gear to one side of body. Using a thickness gauge, measure clearance between driven gear and body.
  If clearance exceeds its limit, replace driven gear.

	Standard	Limit
Driven gear-to-body clearance	0.05 – 0.20 mm 0.0020 – 0.0079 in	0.25 mm 0.0098 in

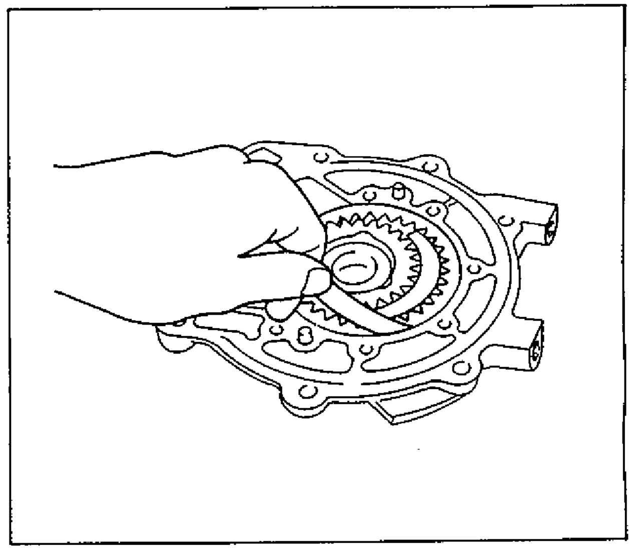


Fig. 7B-12-6

Clearance of pump body oil seal

	Standard	Limit
Seal clearance	0.04 – 0.16 mm 0.0016 – 0.0062 in	0.40 mm 0.0157 in

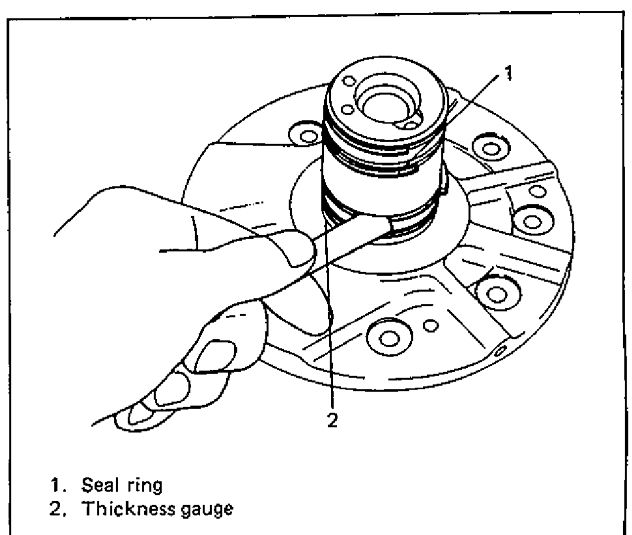
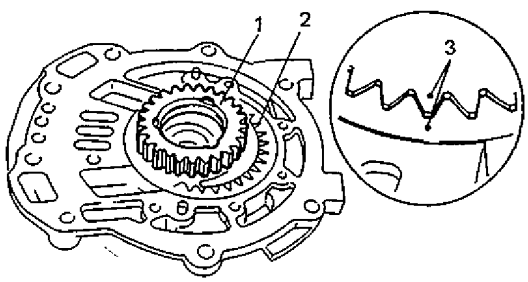


Fig. 7B-12-7

Check for wear, damage or cracks.
Replace oil seal if necessary and apply grease to its lip portion slightly when it is installed.

Assembly

1) Install driven gear and drive gear to oil pump body by aligning their punched marks.

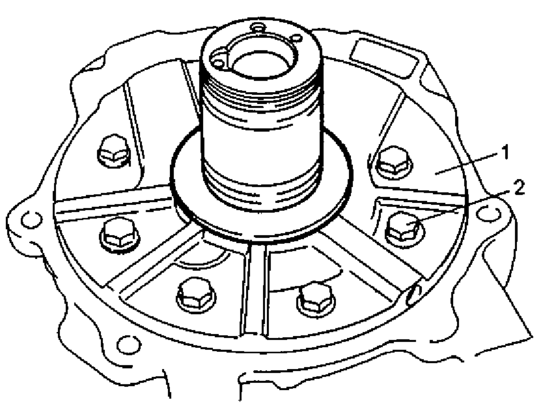


1. Drive gear
2. Driven gear
3. Punch marks

Fig. 7B-12-8

2) Install oil pump flange.
3) Install oil pump cover by aligning knock pin on oil pump body and tighten its fixing bolts to specified torque.

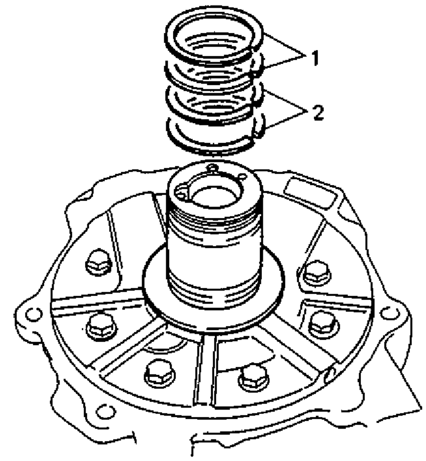
Tightening torque for oil pump cover bolts	N·m	kg-m	lb-ft
	11 – 14	1.1 – 1.4	8.0 – 10.0



1. Oil pump cover
2. Bolt

Fig. 7B-12-9

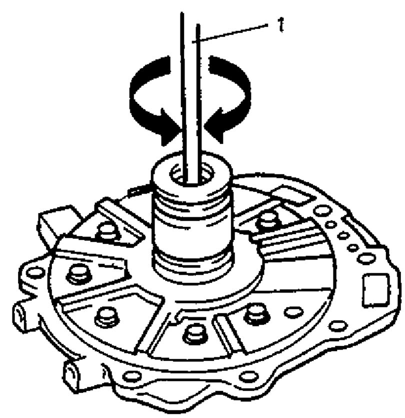
4) Install seal ring.



1. Seal ring (smaller in outside diameter)
2. Seal ring (larger in outside diameter)

Fig. 7B-12-10

5) Install oil pump shaft to oil pump and check to make sure that shaft turns smoothly.



1. Oil pump shaft

Fig. 7B-12-11

DIRECT CLUTCH

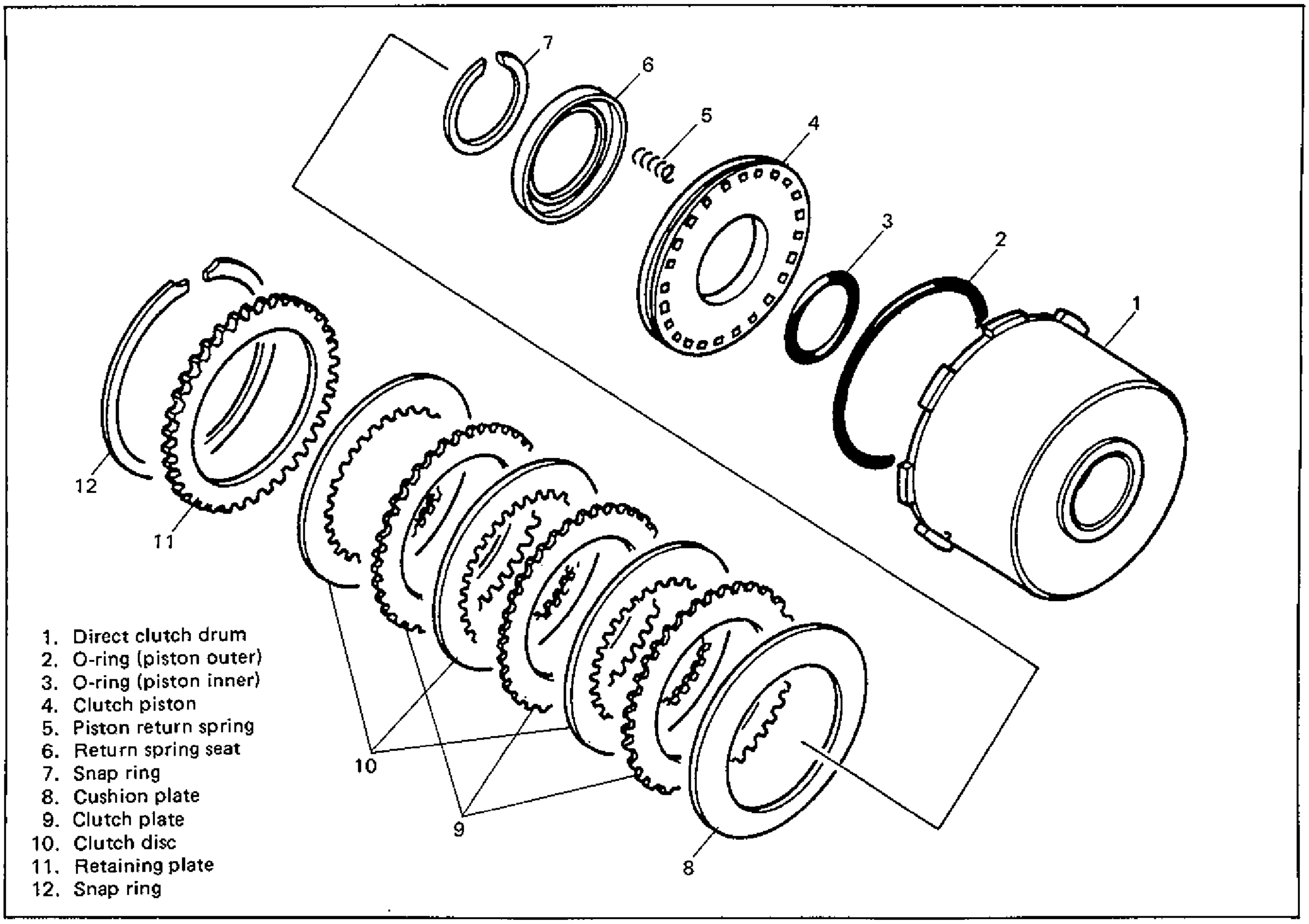


Fig. 7B-13-1

Disssaembly

1) After removing snap ring, remove retaining plate, clutch discs, clutch plates and cushion plate.

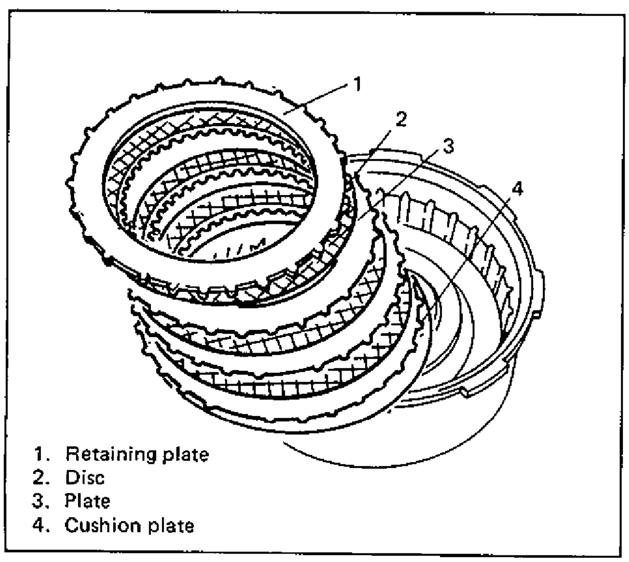


Fig. 7B-13-2

2) Using special tool, push down spring seat and remove snap ring.

NOTE:

Be careful not to push down spring seat more than necessary.

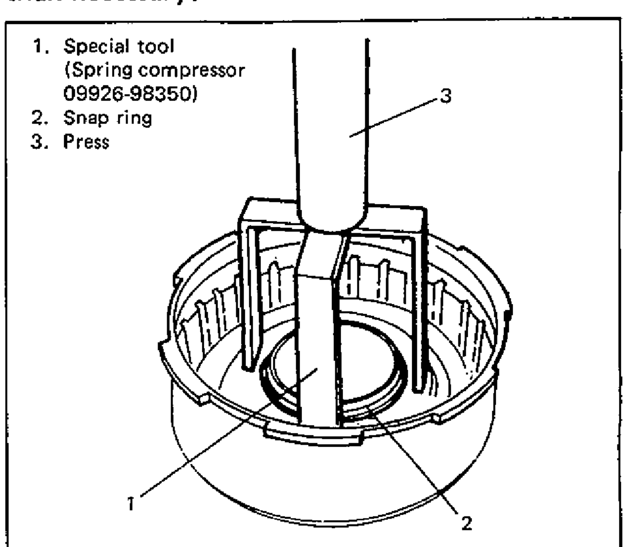


Fig. 7B-13-3

3) Take out spring seat and return springs.

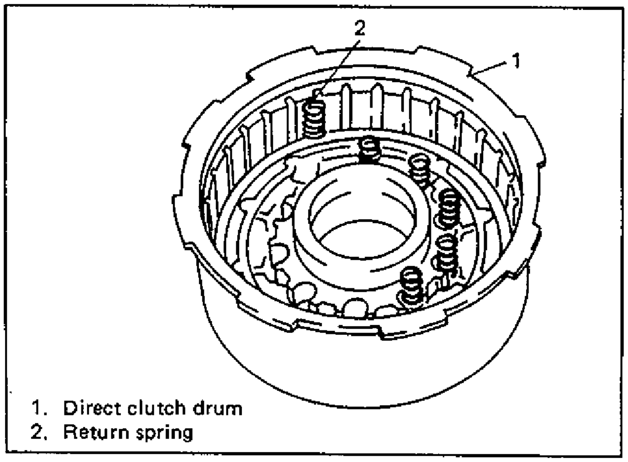


Fig. 7B-13-4

4) Blow air into fluid hole in drum and remove piston. (Close other holes.)

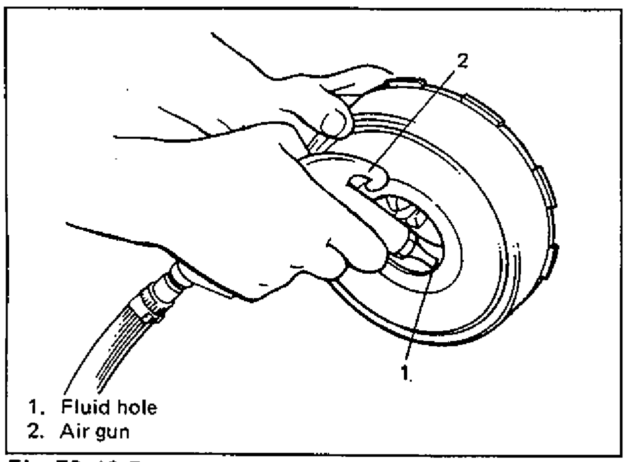


Fig. 7B-13-5

5) Remove piston outer O-ring and inner O-ring.

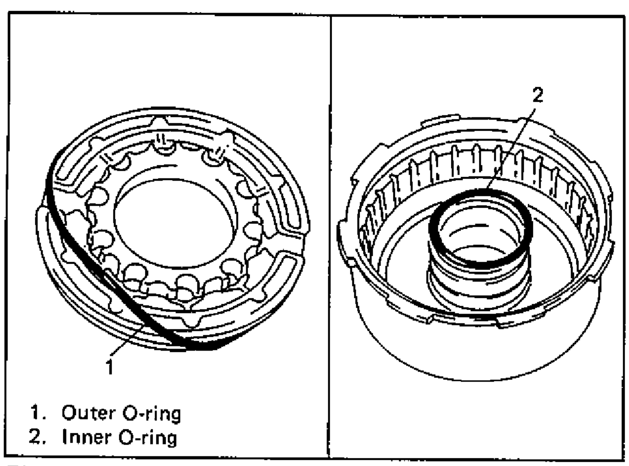


Fig. 7B-13-6

Inspection

Piston return spring

- Measure free length of spring and if it not as specified below, replace spring.

Standard length of spring A	26.2 mm (1.031 in)

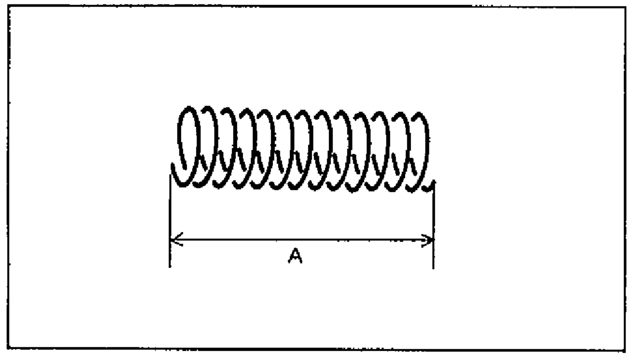


Fig. 7B-13-7

- Also, check other components for damage and wear, and replace if found faulty.

Assembly

For reassembly, reverse disassembly procedure, noting following points.

1) Replace each O-ring with a new one and install it to piston after appling A/T fluid to it.
2) When installing piston, check to make sure that O-ring is installed securely.
3) Make sure that cushion plate is installed in proper direction and that clutch plates and clutch discs are installed in correct order.

NOTE:
When using a new clutch disc, be sure to immerse it in A/T fluid for at least 2 hours beforehand.

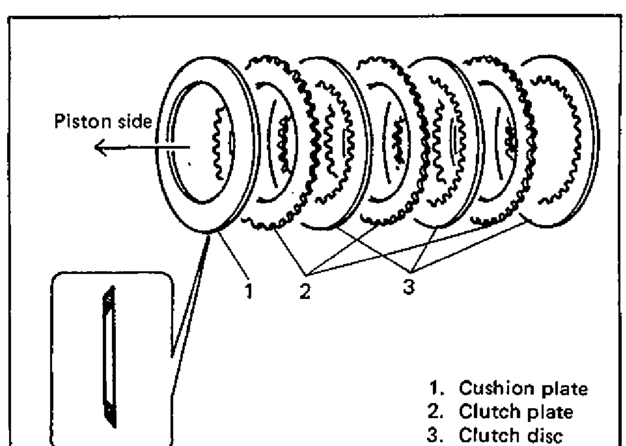


Fig. 7B-13-8

4) Install retaining plate (with its stepped side facing up).

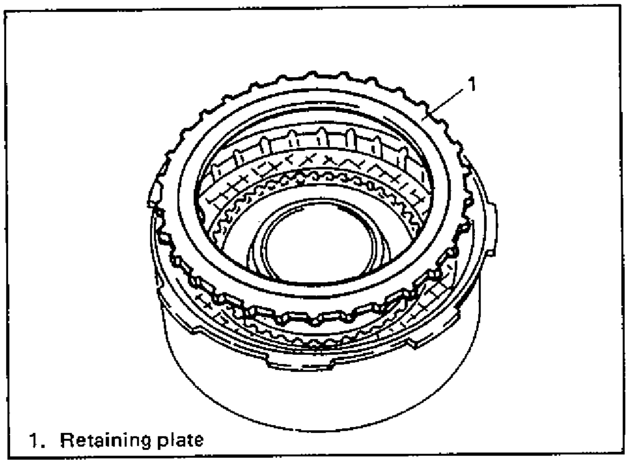


Fig. 7B-13-9

5) Measure clearance between snap ring and retaining plate.

Standard value of clearance	1.6 – 1.8 mm (0.063 – 0.070 in)

If measured clearance is not as specified above, adjust by replacing retaining plate.

Available retaining plate thickness	4.0, 4.2, 4.4, 4.6, 4.8 and 5.0 mm
	0.157, 0.165, 0.173, 0.181, 0.189 and 0.197 in

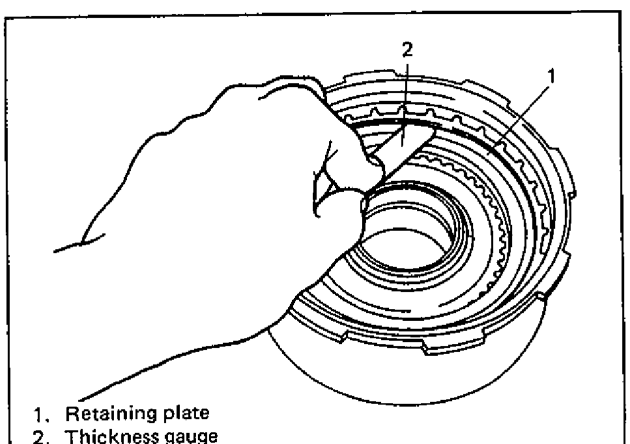


Fig. 7B-13-10

6) Install direct clutch to oil pump and check that retaining plate moves when air is blown into fluid hole as shown below.

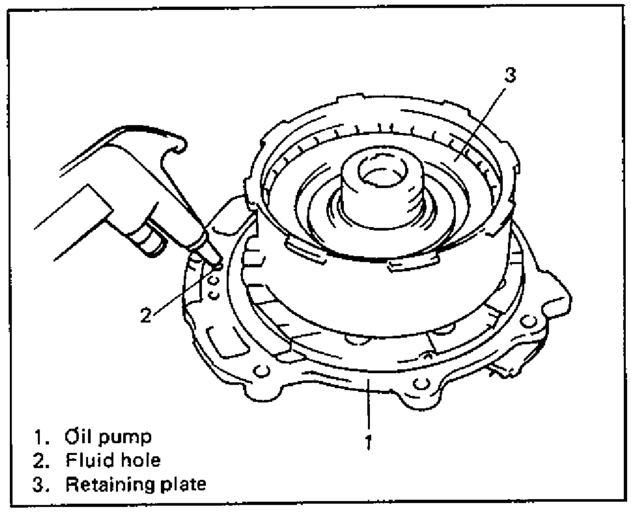
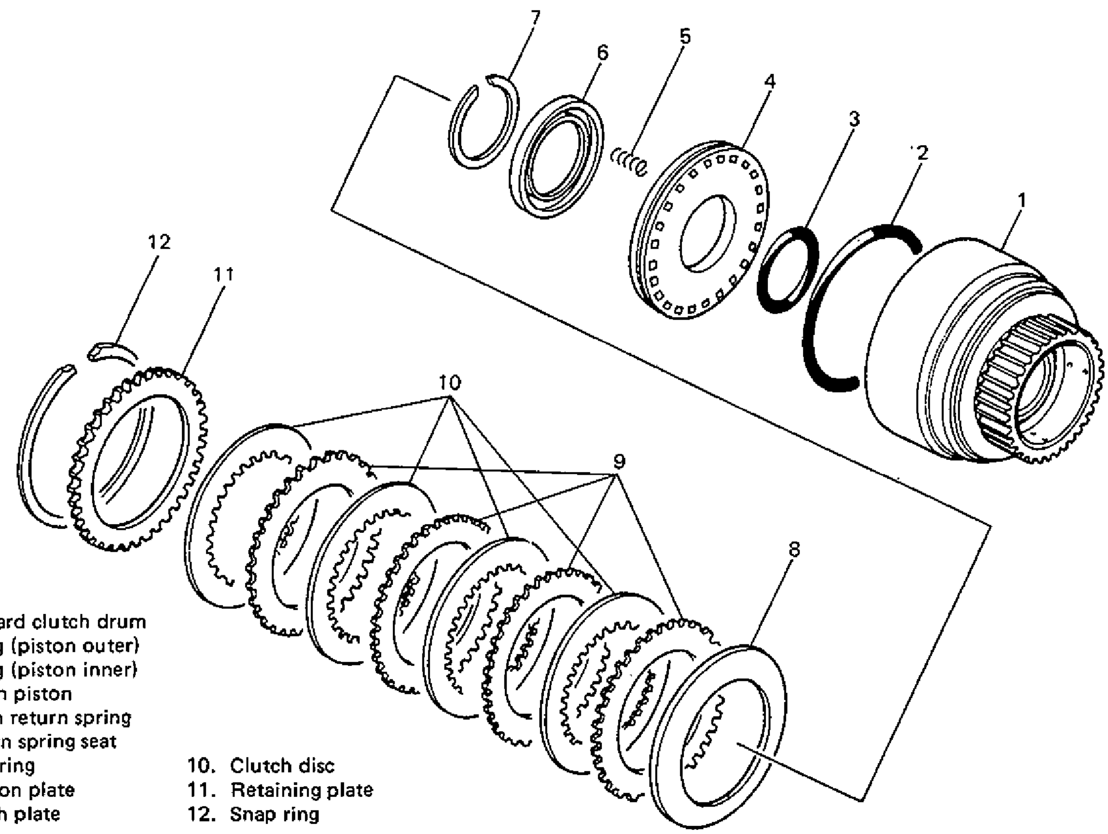


Fig. 7B-13-11

FORWARD CLUTCH

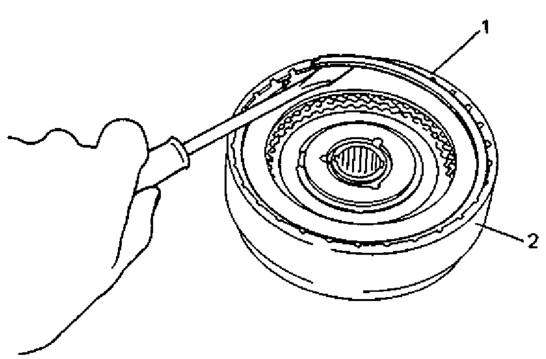


1. Forward clutch drum
2. O-ring (piston outer)
2. O-ring (piston inner)
4. Clutch piston
5. Piston return spring
6. Return spring seat
7. Snap ring
8. Cushion plate
9. Clutch plate
10. Clutch disc
11. Retaining plate
12. Snap ring

Fig. 7B-14-1

Disassembly

1) After remvoing snap ring, remove retaining plate, clutch discs, clutch plates and cushion plate.



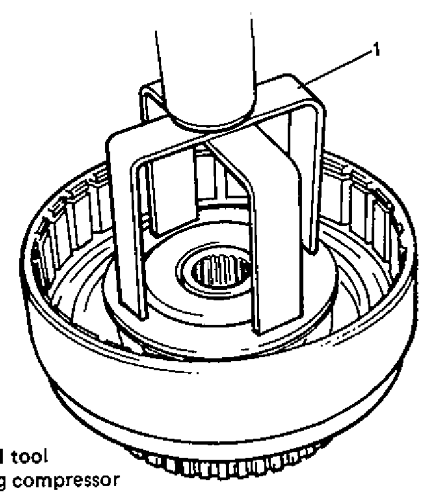
1. Snap ring
2. Forward clutch ass'y

Fig. 7B-14-2

2) Using special tool, push down spring seat and remove snap ring.

NOTE:

Be careful not to push down spring seat more than necessary.



1. Special tool (Spring compressor 09926-98350)

Fig. 7B-14-3

3) Take out spring seat and return springs.

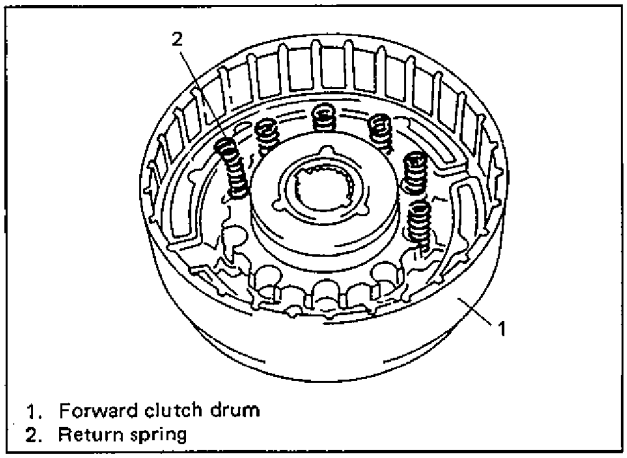


Fig. 7B-14-4

4) Blow air into fluid hole in drum and remove piston.

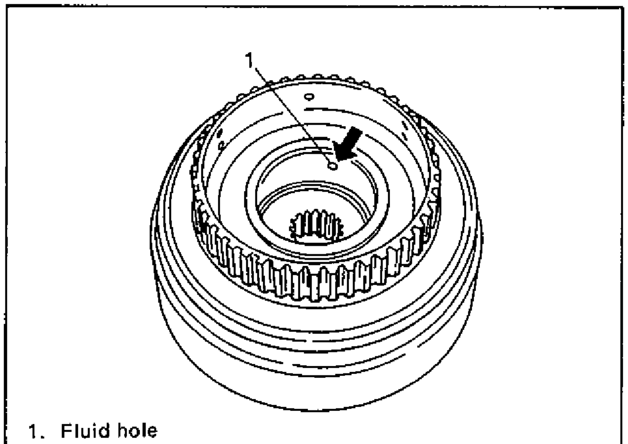


Fig. 7B-14-5

5) Remove piston outer O-ring and inner O-ring.

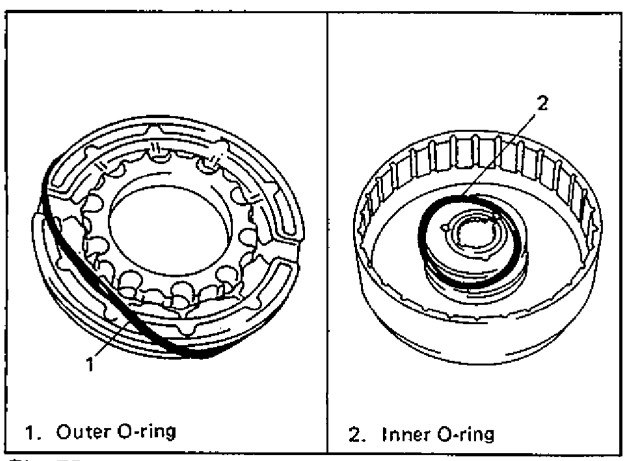


Fig. 7B-14-6

Inspection

Piston return spring

- Measure free length of spring and if it is not as specified below, replace spring.

Standard length of spring B	26.2 mm (1.031 in)

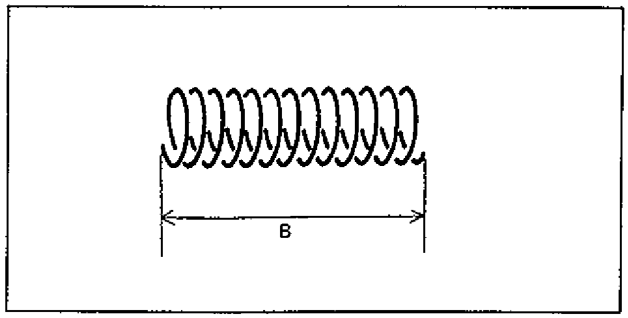


Fig. 7B-14-7

- Also, check other components for damage and wear, and replace any faulty part.

Assembly

For reassembly, reverse disassembly procedure, noting following points.

1) Replace each O-ring with a new one and install it to piston after applying A/T fluid to it.
2) When installing piston, check to make sure that O-ring is installed securely.
3) Make sure that cushion plate is installed in proper direction and that clutch plates and clutch discs are installed in correct order.

NOTE:

When using a new clutch disc, be sure to immerse it in A/T fluid for at least 2 hours beforehand.

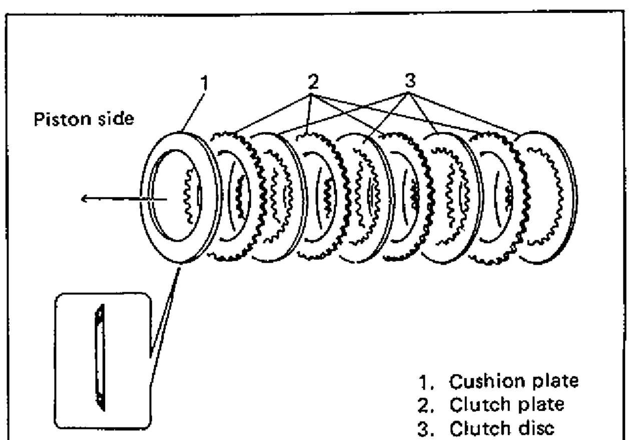
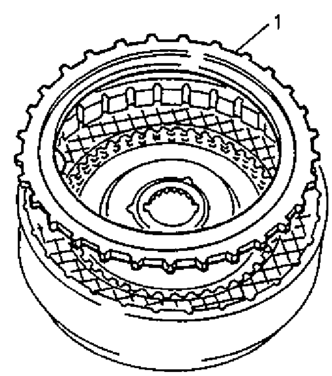


Fig. 7B-14-8

4) Install retaining plate (with its stepped side facing up).



1. Retaining plate

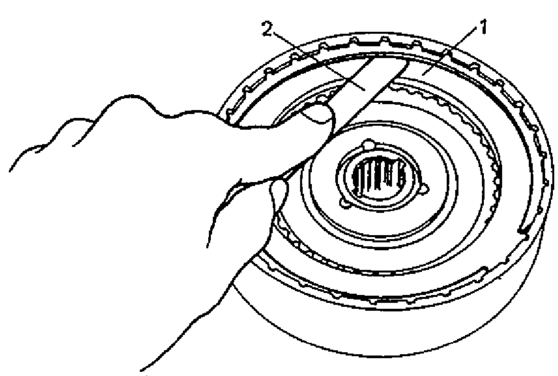
Fig. 7B-14-9

5) Measure clearance between snap ring and retaining plate.

Standard value of clearance	0.8 – 1.0 mm (0.032 – 0.039 in)

If measured clearance is not as specified above, adjust by retaining plate.

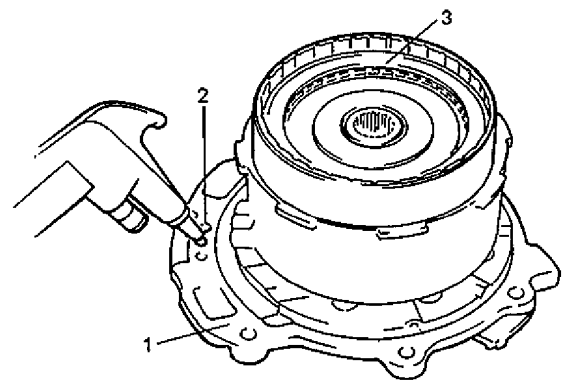
Available retaining plate thickness	4.8, 5.0, 5.2, 5.4, 5.6 and 5.8 mm
	0.189, 0.197, 0.205, 0.213, 0.221 and 0.229 in



1. Retaining plate
2. Thickness gauge

Fig. 7B-14-10

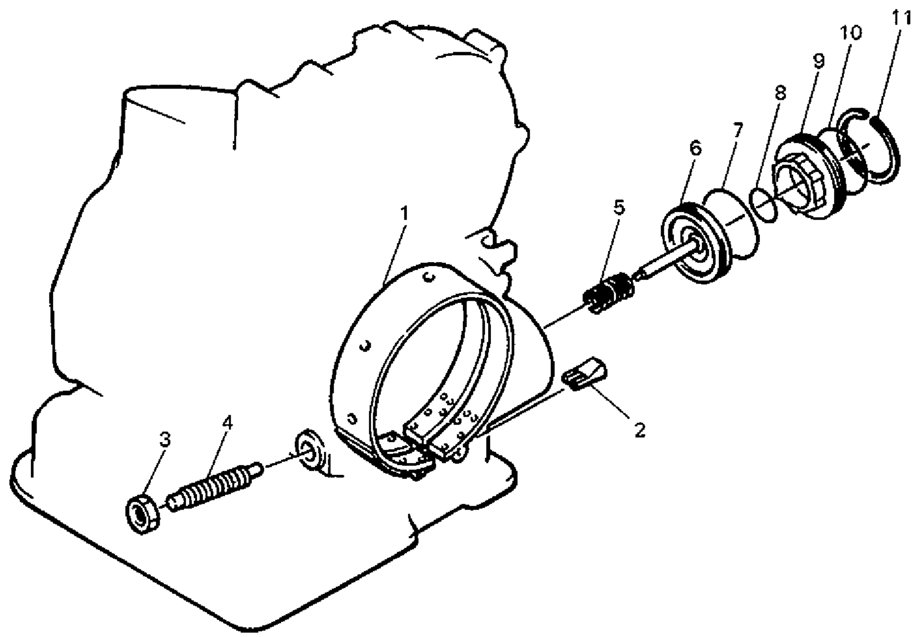
6) Install direct clutch and forward clutch to oil pump and check that retaining plate moves when air is blown into fluid hole as shown below.



1. Oil pump
2. Fluid hole
3. Retaining plate

Fig. 7B-14-11

SECOND BRAKE



1. Second brake band
2. Band strut
3. Anchor nut
4. Anchor bolt
5. Spring
6. Piston
7. Piston O-ring (outer)
8. Piston O-ring (inner)
9. Piston cover
10. Cover O-ring
11. Snap ring

Fig. 7B-15-1

Inspection

Second brake band

Check second brake band for damage, wear and discoloration and replace if check result is not satisfactory.

NOTE:

When using a new second brake band, immerse it in A/T fluid for at least 2 hours beforehand.

Second brake piston

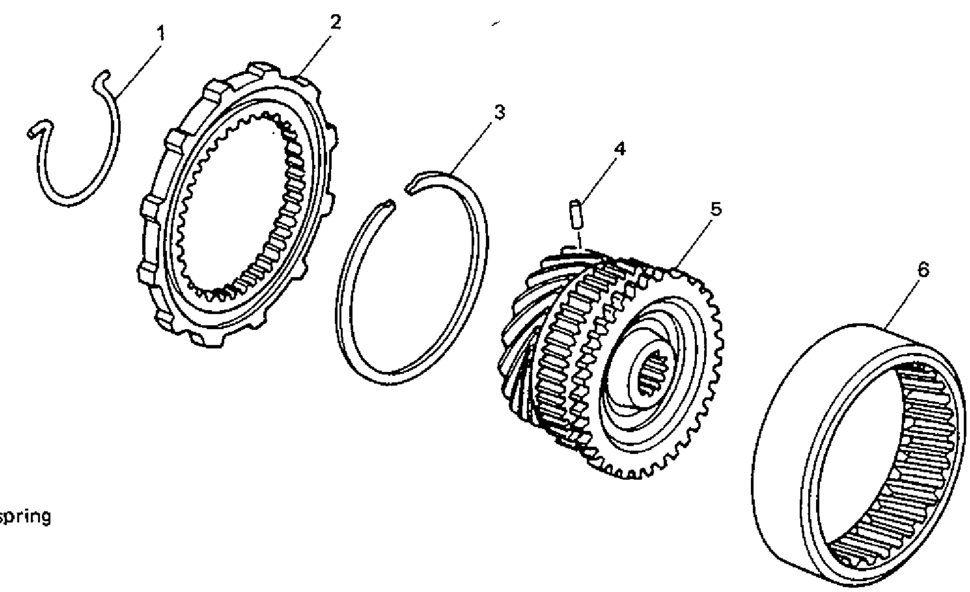
Check piston and O-ring for damage and wear, and replace if found faulty.

Return spring

Measure free length of spring and if it is not as specified below, replace spring.

Free length of spring	45.5 mm (1.791 in)

REAR PLANETARY RING GEAR ASS'Y

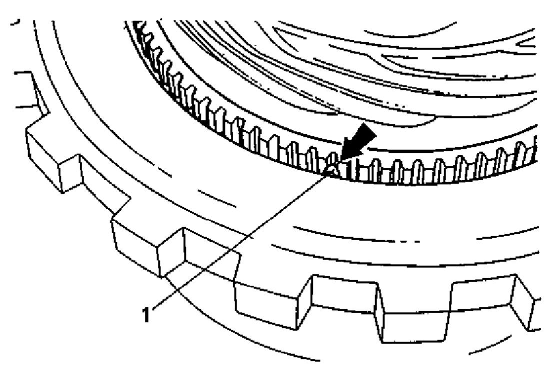


1. Parking gear spring
2. Parking gear
3. Snap ring
4. Roller pin
5. Planetary ring gear flange
6. Ring gear

Fig. 7B-16-1

Disassembly

1) Remove parking gear spring.
2) Pull out roller pin by using a punch or the like and remove parking gear.



1. Roller pin

Fig. 7B-16-2

3) Remove snap ring and then remove planetary ring gear flange.

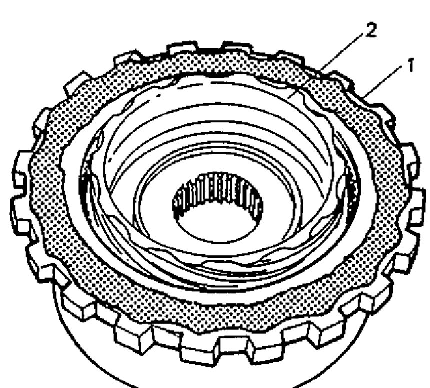
Inspection

Check each component for damage and wear and replace any faulty part.

Assembly

For reassembly, reverse disassembly procedure of ring gear ass'y, noting following point.

1) When installing parking gear to flange, be sure to bring its smaller inside diameter side toward flange.



1. Parking gear
2. Ring gear flange

Fig. 7B-16-3

OUTPUT GEAR

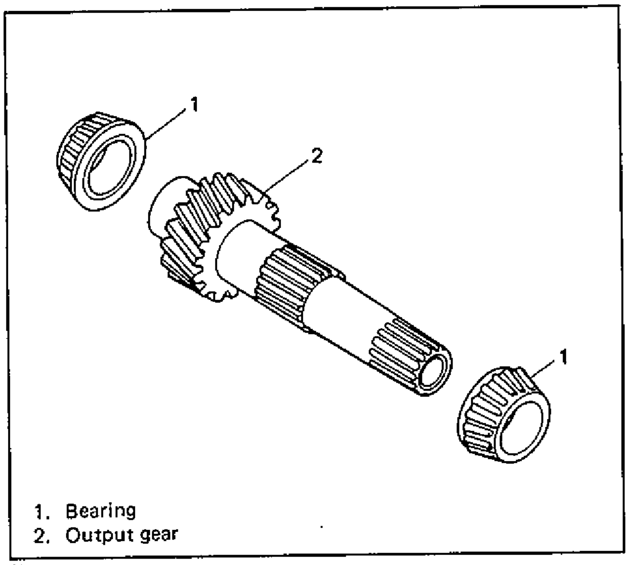


Fig. 7B-17-1

Disassembly

Using puller and hydraulic press, remove bearing.

Assembly

Using special tool, install new bearing to output gear.

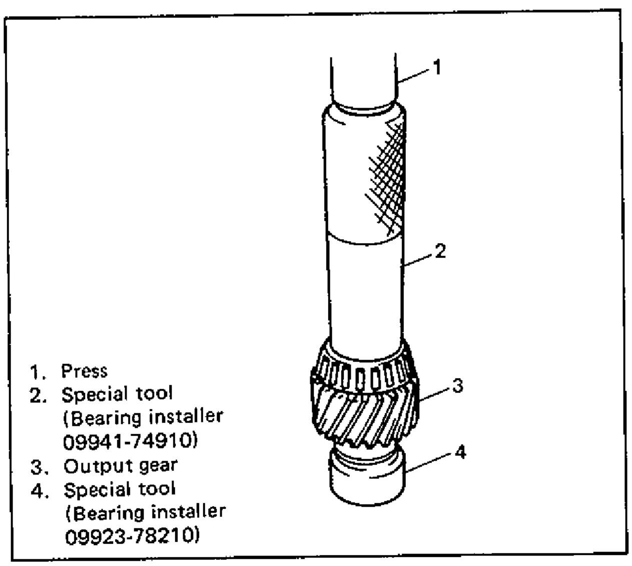


Fig. 7B-17-2

IDLE GEAR

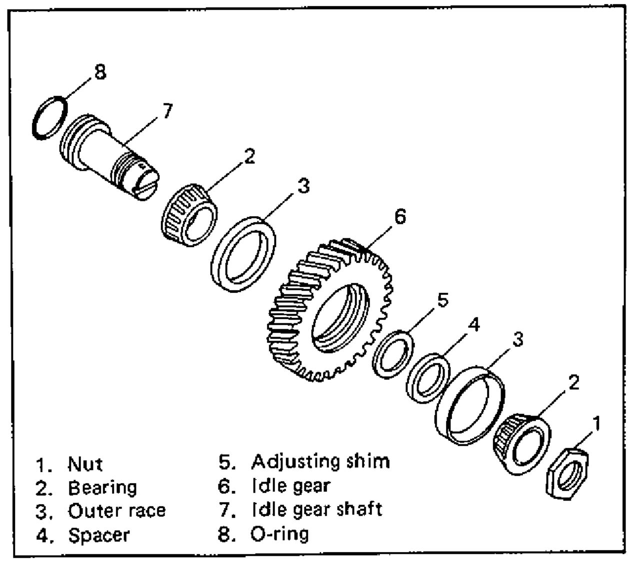


Fig. 7B-18-1

Disassembly

1) With special tool held between jaws of vise, set idle gear ass'y onto it.

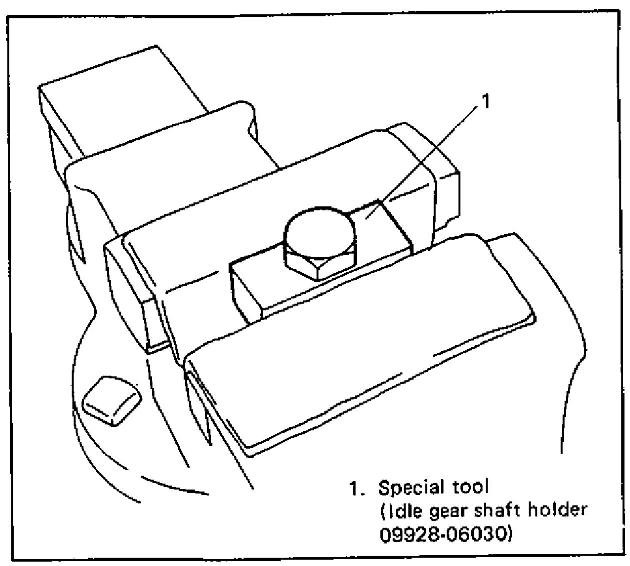
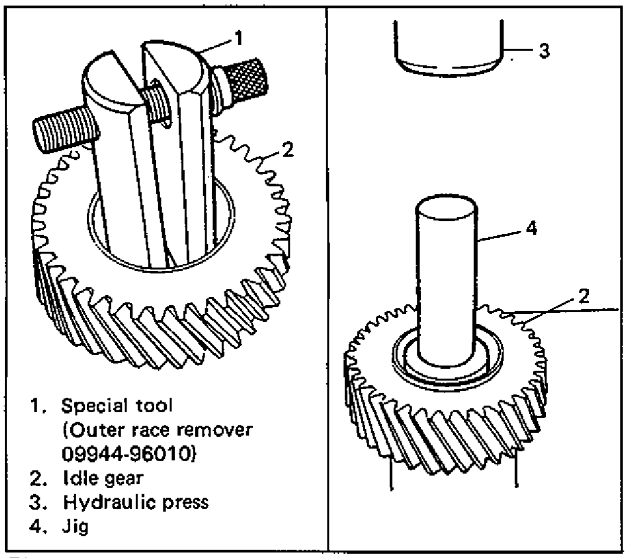


Fig. 7B-18-2

2) Remove nut, bearing, idle gear, shim, spacer, bearing and O-ring in that order. (Refer to Fig. 7B-18-1)

3) Using special tool and hydraulic press, remove bearing outer race.



1. Special tool (Outer race remover 09944-96010)
2. Idle gear
3. Hydraulic press
4. Jig

Fig. 7B-18-3

Inspection

- Check bearing for smooth rotation. If not, replace both bearing and outer race.

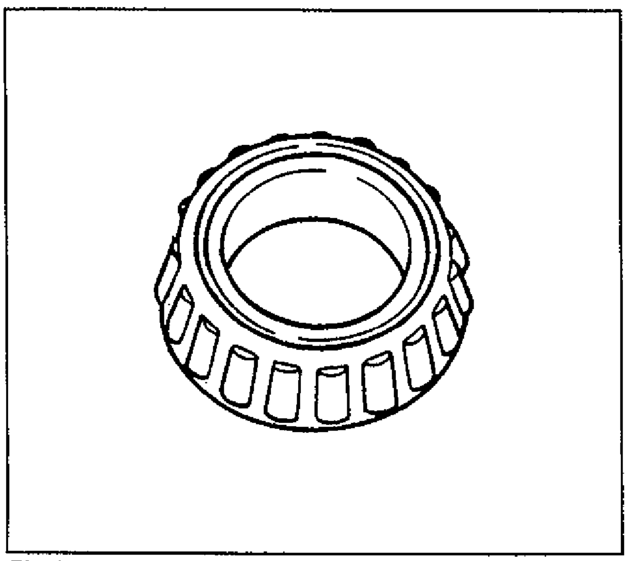
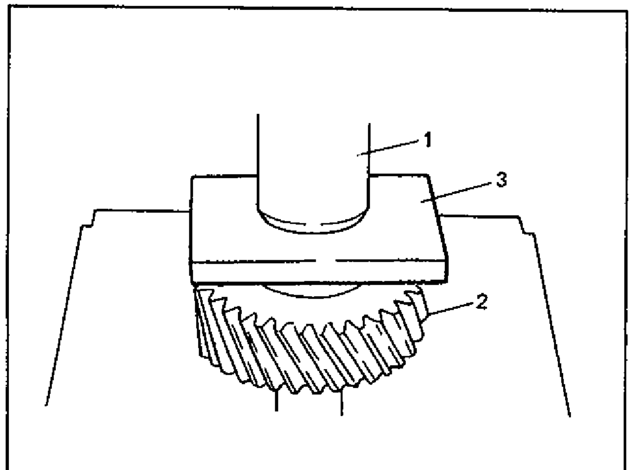


Fig. 7B-18-4

- Check idle gear for damage and wear and replace if check result is not satisfactory.

Assembly

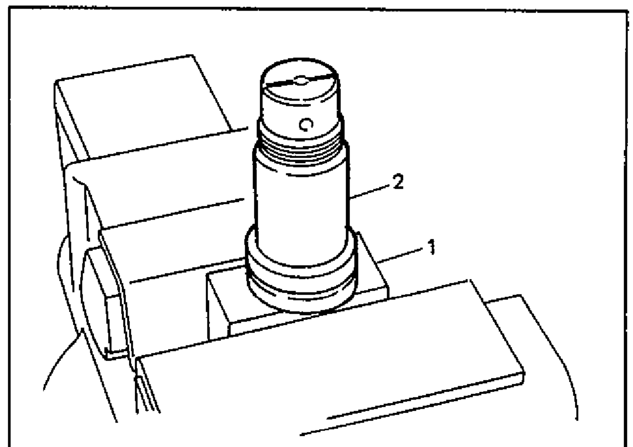
1) Using hydraulic press as shown below, install bearing outer race.



1. Hydraulic press
2. Idle gear
3. Jig

Fig. 7B-18-5

2) With special tool held between jaws of vise, set idle gear shaft onto it.



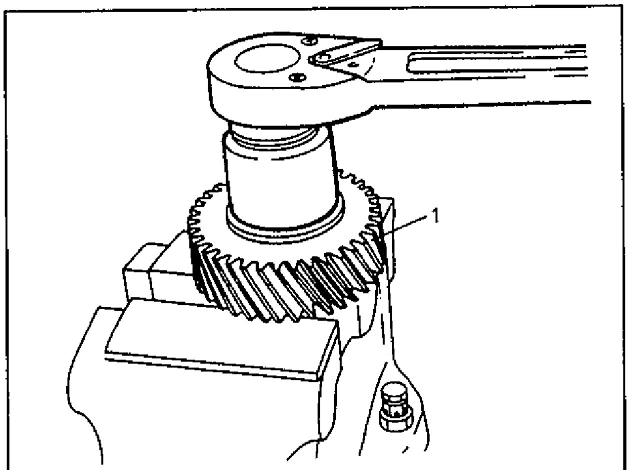
1. Special tool (Idle gear shaft holder 09928-06030)
2. Idle gear shaft

Fig. 7B-18-6

3) Install O-ring, bearing, spacer, shim, idle gear, bearing and nut in that order and tighten nut to lower limit of specified tightening torque.

Tightening torque for idle shaft nut	N·m	kg·m	lb-ft
	130–180	13.0–18.0	94.5–130.0

NOTE:
Be sure to use a new O-ring.

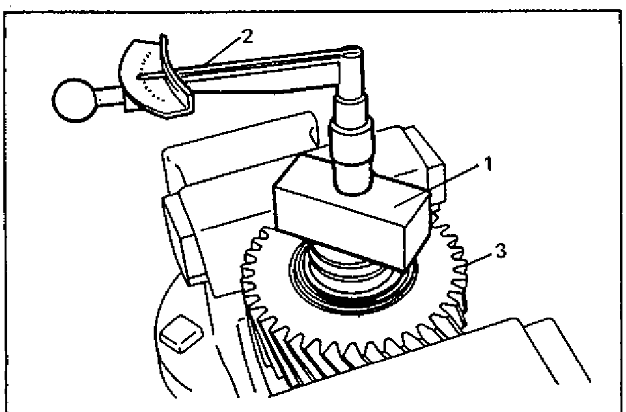


1. Idle gear ass'y

Fig. 7B-18-7

4) Fix idle gear with vise and measure preload.

Preload	N·m	kg·m	lb-ft
	0.03 – 0.90	0.003 – 0.090	0.022 – 0.650



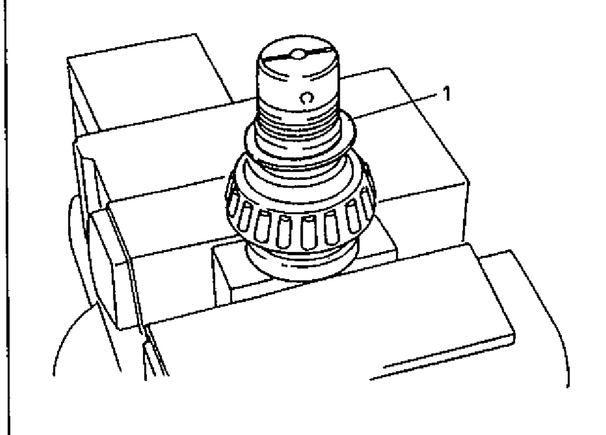
1. Special tool (Idle gear shaft holder 09928-06030)
2. Torque wrench (0 – 15 kg-cm)
3. Idle gear ass'y

Fig. 7B-18-8

5) If preload is not within specification, retighten nut within specified torque and measure preload again.
6) If preload is not within specification again, adjust preload by replacing adjusting shim(s).

CAUTION:
- **Increase in shim thickness will reduce preload.**
- **Do not use more than 7 shims.**

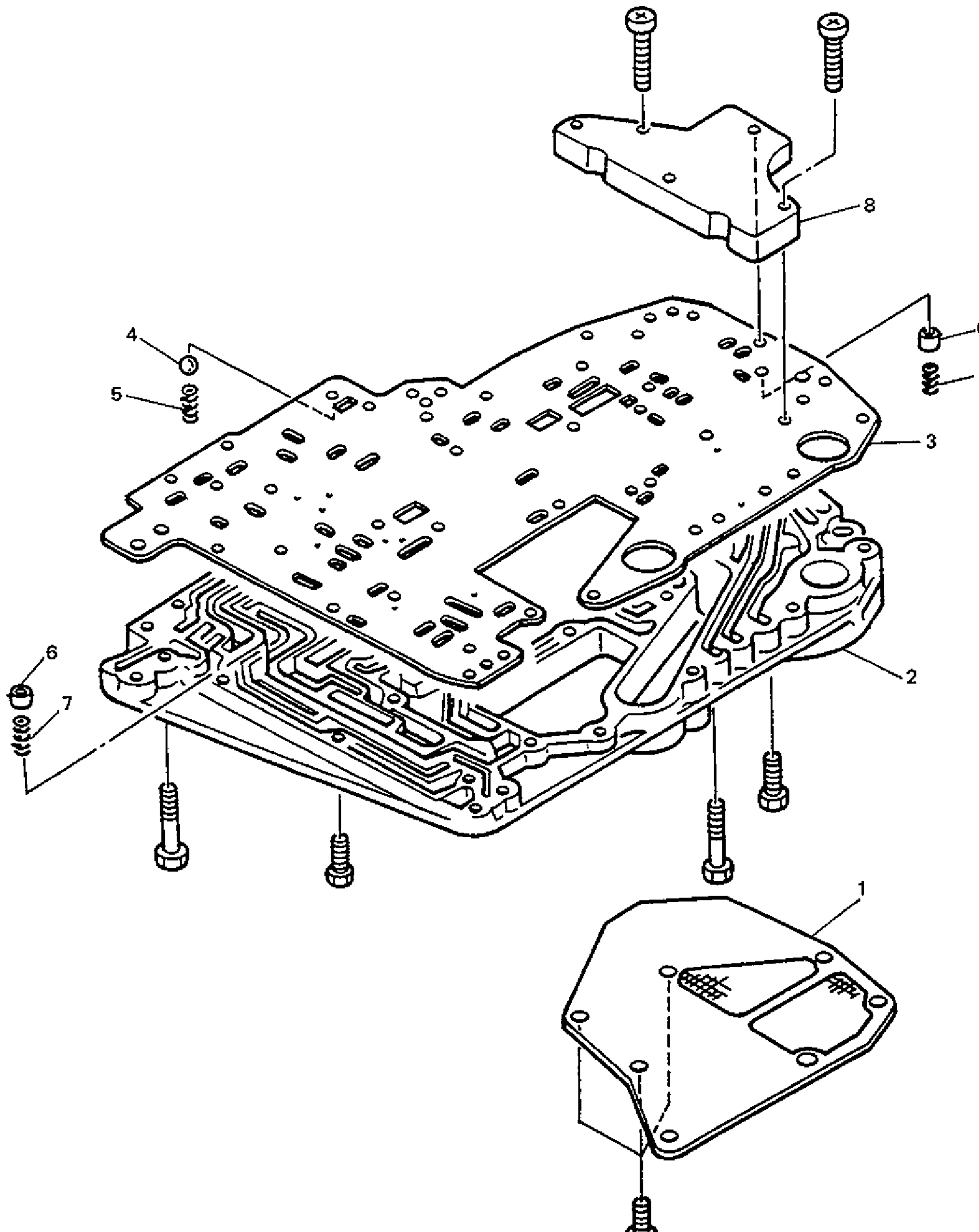
Available shim thickness	0.10, 0.12, 0.14, 0.16, 0.20 and 0.50 mm
	0.0039, 0.0047, 0.0055, 0.0063, 0.0078 and 0.0196 in



1. Shim

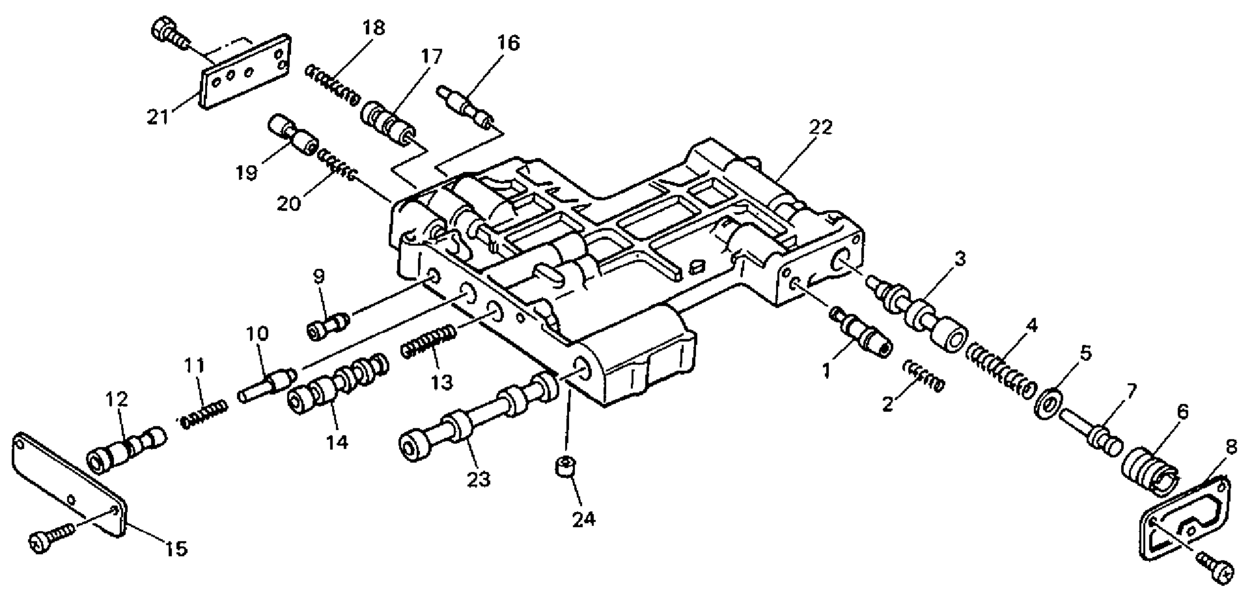
Fig. 7B-18-9

VALVE BODY



1. Oil strainer
2. Lower valve body
3. Separate plate
4. Check ball
5. Throttle relief spring
6. Orifice check valve
7. Orifice check spring
8. Upper valve sub-body

Fig. 7B-19-1

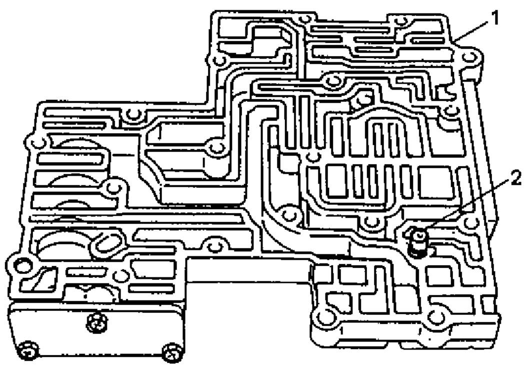


1. Second lock valve
2. Second lock spring
3. Pressure regulator valve
4. Pressure regulator spring
5. Pressure regulator spring seat
6. Pressure regulator sleeve
7. Pressure regulator plug
8. Regulator valve side plate
9. Pressure modifier valve
10. 2 — 3 shift plug
11. 2 — 3 shift spring
12. 2 — 3 shift valve
13. 1 — 2 shift spring
14. 1 — 2 shift valve
15. Shift valve side plate
16. Vacuum throttle valve
17. Throttle back-up valve
18. Throttle back-up spring
19. Downshift solenoid valve
20. Down shift solenoid spring
21. Upper valve body
22. Upper valve body
23. Manual valve
24. Orifice check valve

Fig. 7B-19-2

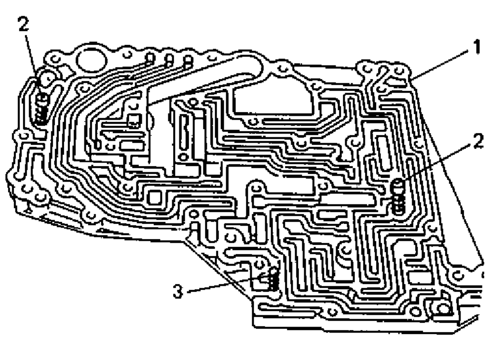
Disassembly

> **CAUTION:**
> **When clutch and brake band are seized, make sure to disassemble and service control valve.**



1. Upper valve body
2. Orifice check valve

Fig. 7B-20-1



1. Lower valve body
2. Orifice check valve + spring
3. Check ball + spring

Fig. 7B-20-2

After removing each plate, remove springs and valves. (Refer to Fig. 7B-19-2.)

Inspection

Control valve

- Check each valve for smooth movement.
- Check each valve for damage and foreign matter caught in it.

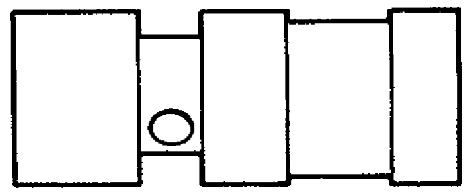


Fig. 7B-20-3

Valve spring

Measure free length and outside diameter of each spring and replace spring whose measured value is not as specified below.

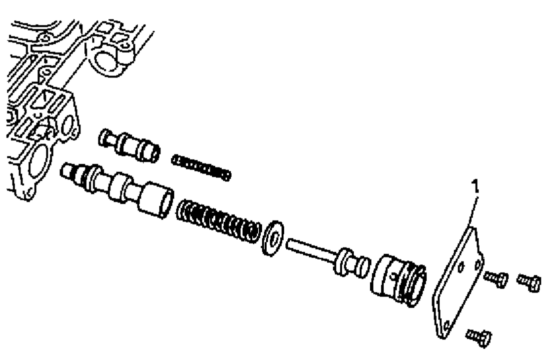
Spring name	Outside diameter	Free length
Down shift solenoid spring	5.55 mm (0.2185 in)	21.90 mm (0.8622 in)
Throttle back-up spring	7.30 mm (0.2874 in)	36.00 mm (1.4173 in)
1 – 2 shift spring	6.60 mm (0.2598 in)	32.00 mm (1.2598 in)
2 – 3 shift spring	7.30 mm (0.2874 in)	33.20 mm (1.3070 in)
Pressure regulator spring	11.70 mm (0.4606 in)	43.00 mm (1.6929 in)
Second lock spring	5.55 mm (0.2185 in)	33.50 mm (1.3188 in)
Orifice check spring	5.00 mm (0.1968 in)	15.50 mm (0.6102 in)
Throttle relief spring	7.00 mm (0.2755 in)	11.20 mm (0.4409 in)

Assembly

1) After installing each valve, spring, etc., install each plate and tighten each bolt to specified torque.

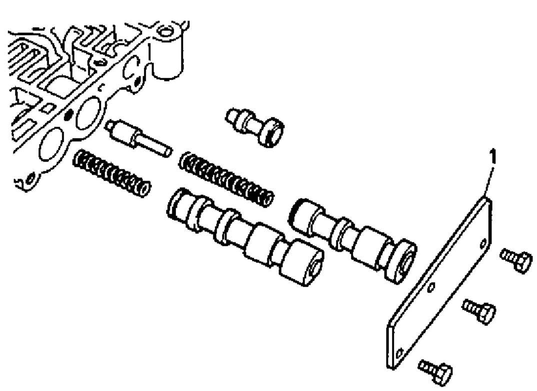
	N·m	kg-m	lb-ft
Regulator valve side plate	2.5 – 3.5	0.25 – 0.35	1.85 – 2.50
Shift valve side plate			
Throttle valve side plate			

> **CAUTION:**
> - **Before installing valve, be sure to apply A/T fluid.**
> - **Make sure to wash valve, valve body and strainer thoroughly and dry them with compressed air.**



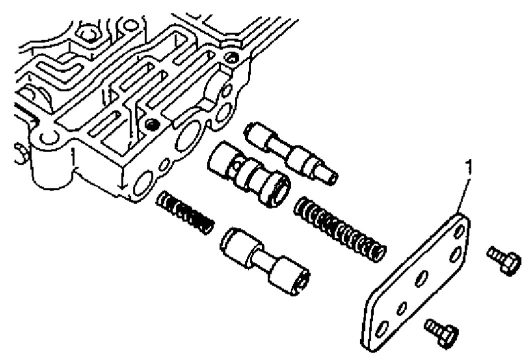
1. Regulator valve side plate

Fig. 7B-20-4



1. Shift valve side plate

Fig. 7B-20-5

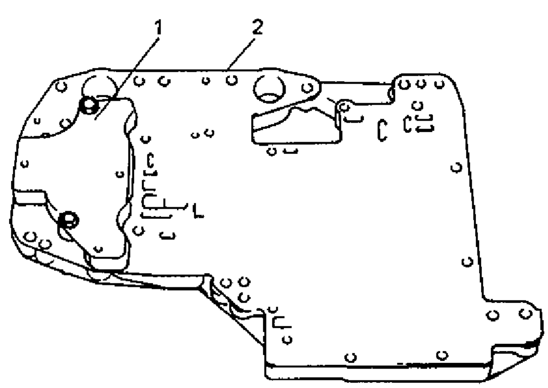


1. Throttle valve side plate

Fig. 7B-20-6

2) Install orifice check valve and orifice check spring, and then check ball and throttle relief spring.
3) After installing separate plate to lower valve body, install upper sub-body and tighten bolts to specified torque.

Tightening torque for sub-body	N·m	kg-m	lb-ft
	2.5–3.5	0.25–0.35	1.85 – 2.50



1. Upper sub-body
2. Lower body

Fig. 7B-20-7

4) Install lower body to upper body and tighten bolts to specified torque.

Lower valve body bolt tightening torque		N·m	kg-m	lb-ft
	1.	2.5 – 3.5	0.25–0.35	1.85 – 2.50
	2.	5.0 – 7.0	0.50–0.70	3.65 – 5.05

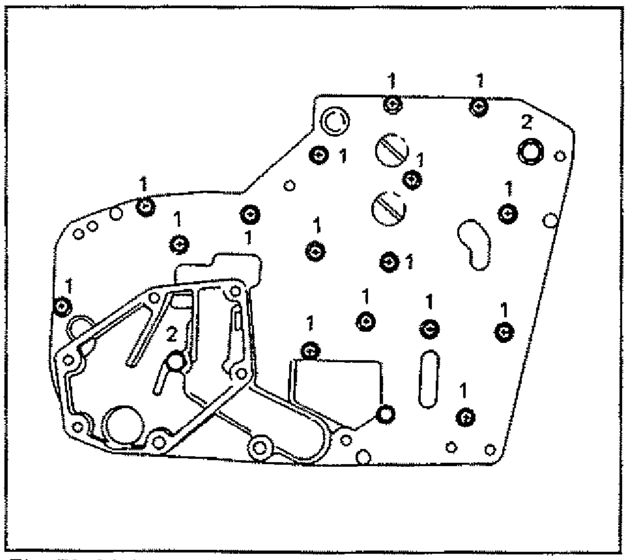
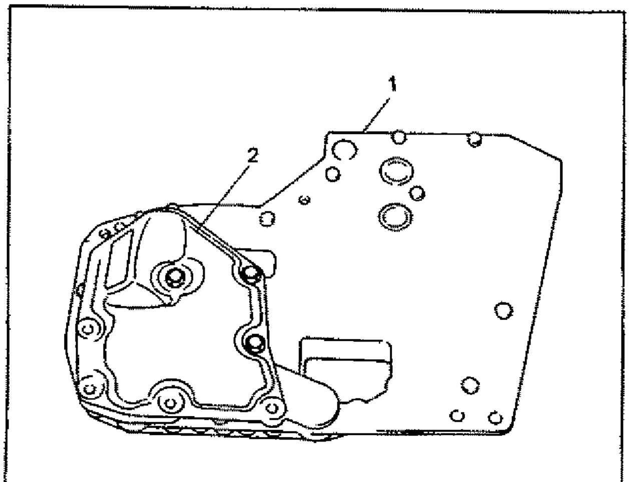


Fig. 7B-20-8

5) Install oil strainer and tighten bolts to specified torque.

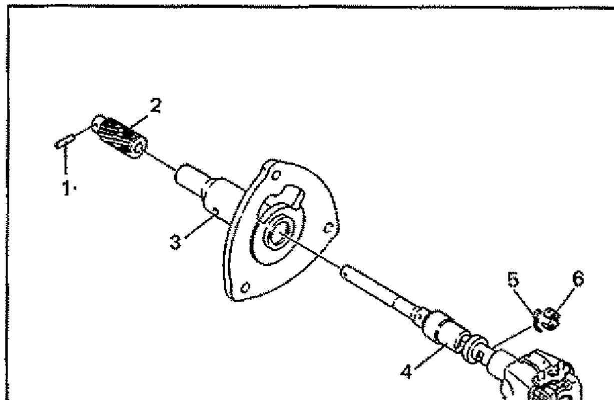
Tightening torque for oil strainer fixing bolt	N·m	kg-m	lb-ft
	3.0 – 4.0	0.3 – 0.4	2.20 – 2.85



1. Lower valve body
2. Oil strainer

Fig. 7B-20-9

GOVERNOR ASS'Y



1. Roller pin
2. Governor driven gear
3. Governor sleeve
4. Governor shaft
5. Filter clamp
6. Governor filter

Fig. 7B-21-1

Disassembly
Pull out roller pin and remove each component.

Inspection
Check following items.
- Governor driven gear for damage and wear
- Governor filter for damage or clog
- Governor valve for damage

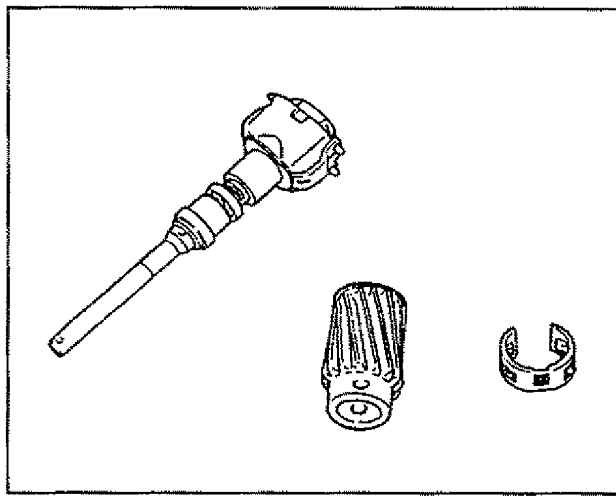
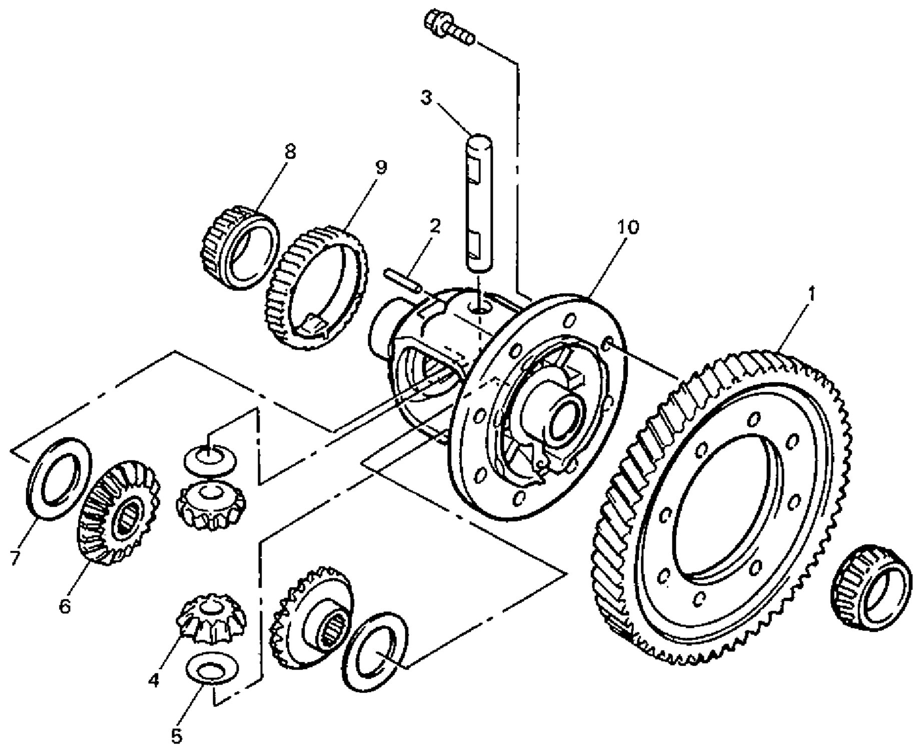


Fig. 7B-21-2

Assembly
For reassembly of governor ass'y, reverse disassembly procedure.

DIFFERENTIAL



1. Differential gear
2. Knock pin
3. Pinion shaft
4. Pinion gear
5. Washer
6. Final gear
7. Washer
8. Differential side bearing
9. Speedometer drive gear
10. Gear case

Fig. 7B-22-1

Inspection

- Check each gear for damage and wear, bearing for damage, wear and smooth rotation and replace any defective part.

ONE-WAY CLUTCH

Inspection

Check that one-way clutch turns smoothly and in one direction only.

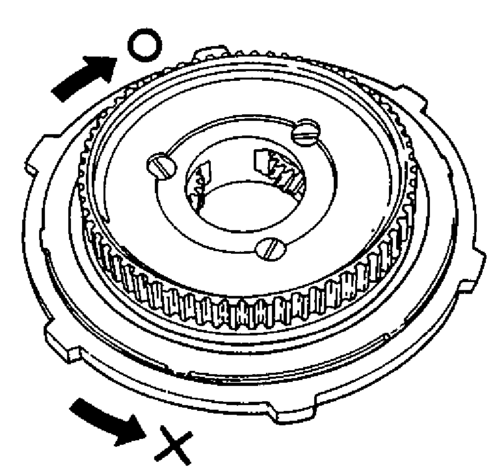


Fig. 7B-23-1

PLANETARY GEAR

Inspection

- Measure clearance between pinion washer and planetary carrier. It should be within following specification.

Pinion washer to planetary carrier clearance	0.2 – 0.7 mm (0.0080 – 0.0275 in)

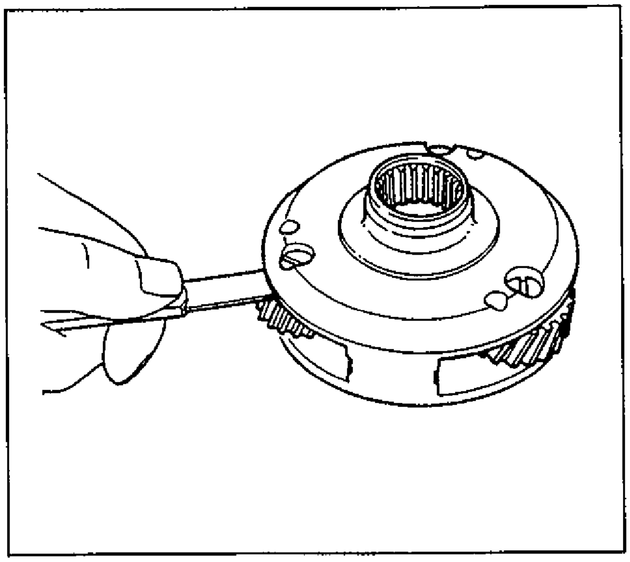


Fig. 7B-24-1

- Check each gear for damage, discoloration and smooth rotation without abnormal noise.

PLANETARY RING GEAR

Inspection

Check tooth surface for abnormal wear and damage.

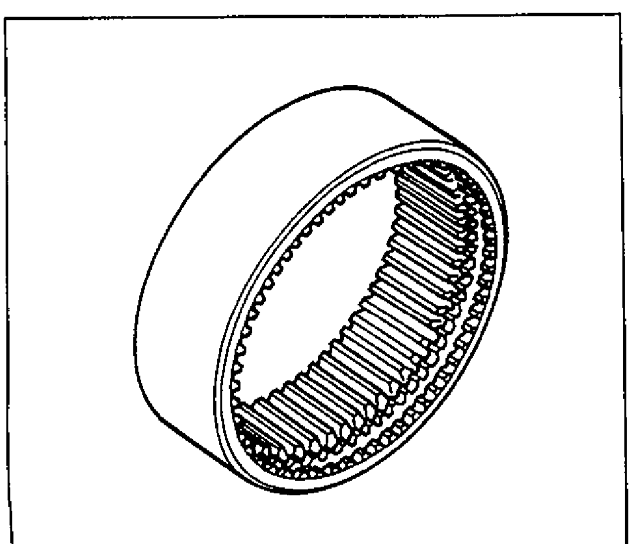


Fig. 7B-25-1

PARKING LOCK PAWL

Inspection

Check parking lock pawl for damage and wear.

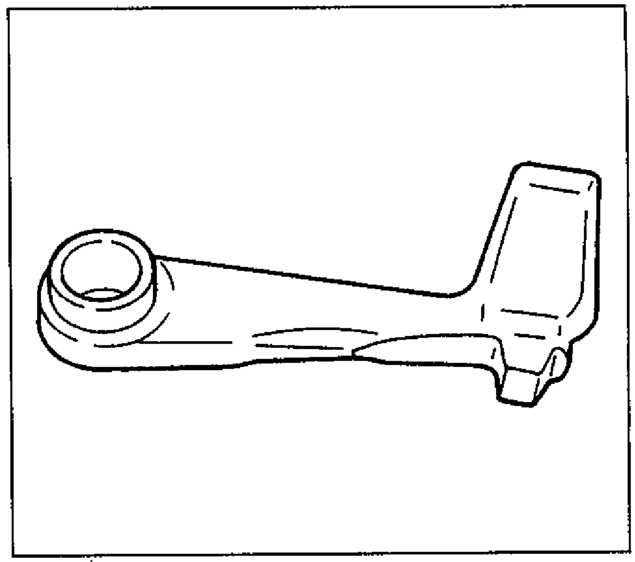


Fig. 7B-26-1

BEARING

Inspection

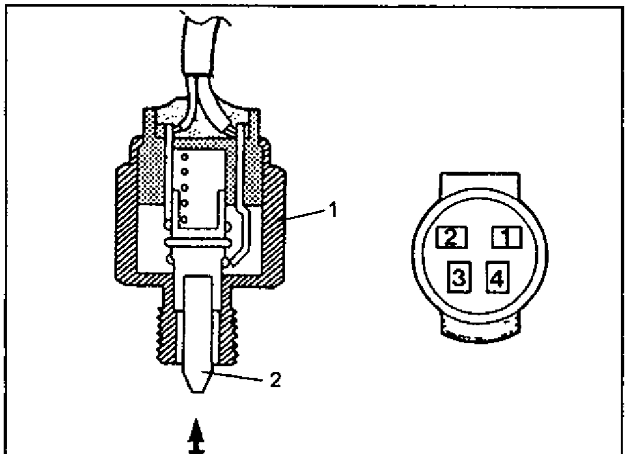
Turn bearing by hand and check that it turns smoothly without restriction or abnormal noise.

INHIBITOR SWITCH

Inspection

Using circuit tester, check for continuity between terminals according to following table.

Terminal	1	2	3	4
Wire color	Black/ Yellow	Black/ Red	Yellow	Red
With rod in			O—	—O
With rod out	O—	—O		



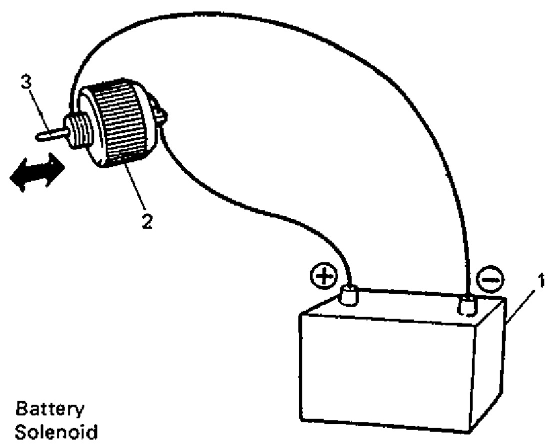
1. Switch
2. Rod

Fig. 7B-27-1

KICK DOWN SOLENOID

Inspection

Connect harness of kick down solenoid to positive (⊕) terminal of battery and its thread to negative (⊖) terminal. Check solenoid rod for operation with and without electricity applied. (Rod should come out when electricity is applied.)



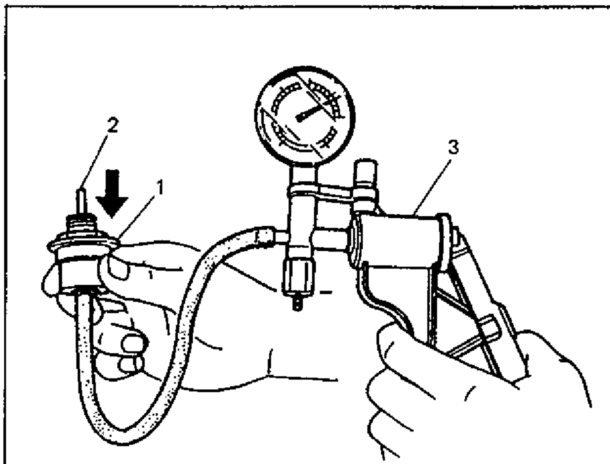
1. Battery
2. Solenoid
3. Rod

Fig. 7B-28-1

VACUUM DIAPHRAGM

Inspection

With vacuum pump gauge and diaphragm rod connected to vacuum diaphragm, apply vacuum and check that rod draws in and vacuum is maintained.

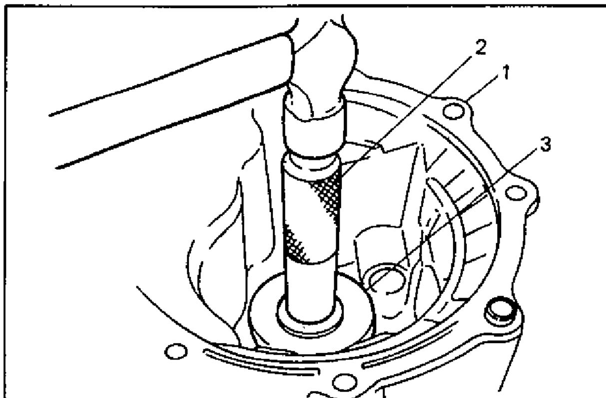


1. Vacuum diaphragm
2. Rod
3. Vacuum pump gauge

Fig. 7B-29-1

ASSEMBLY

1) Using special tool, install bearing outer race to converter housing.



1. Converter housing
2. Special tool (Bearing installer handle 09924-74510)
3. Special tool (Attachment 09926-88310)

Fig. 7B-30-1

2) Using special tool, install a new oil seal to converter housing.

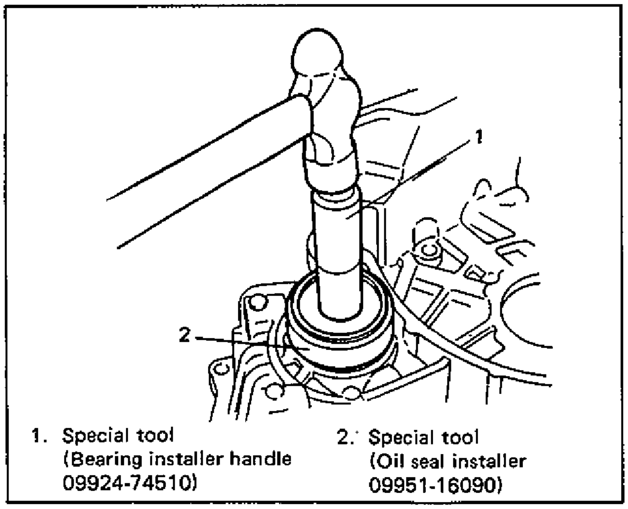


Fig. 7B-30-2

3) Using special tool and hydraulic press, install bearing outer race to bearing cover.

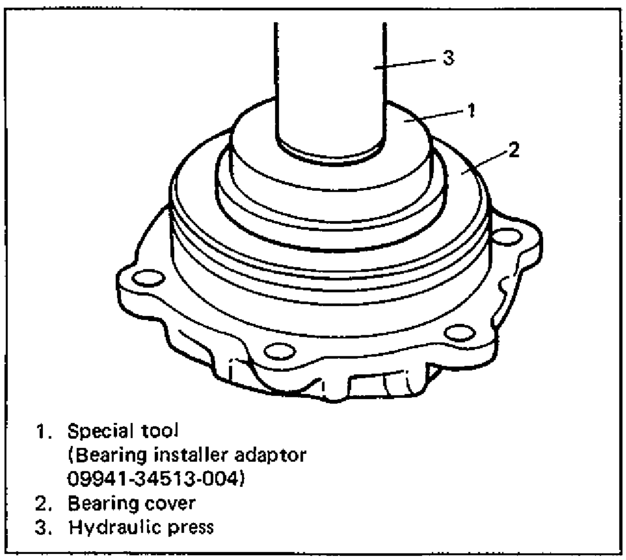


Fig. 7B-30-3

4) Using special tool, install new oil seal to bearing cover.

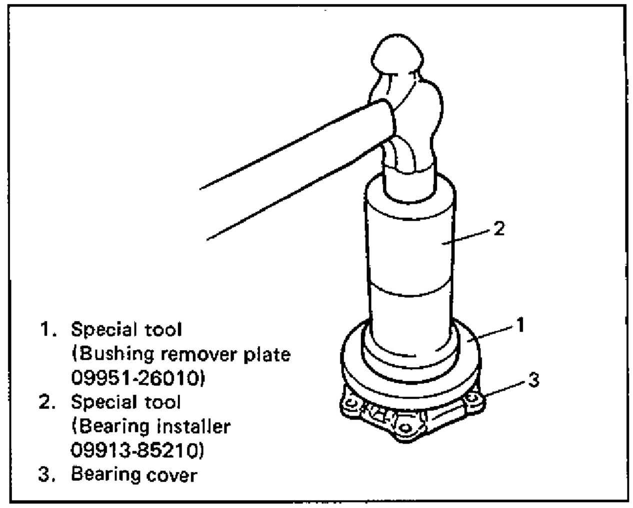


Fig. 7B-30-4

5) Install new O-ring to bearing cover.

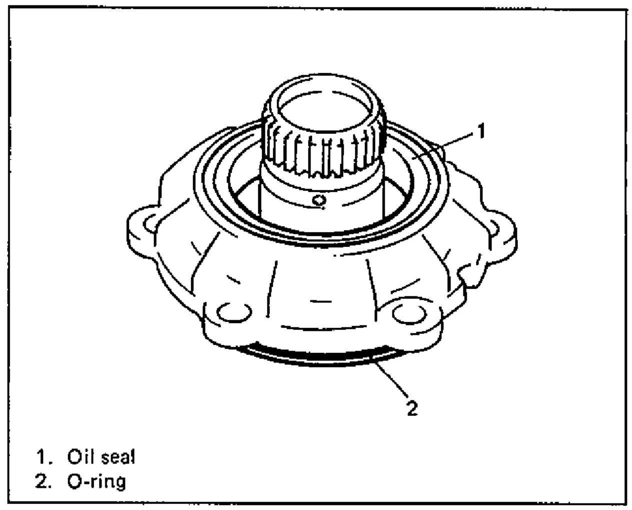


Fig. 7B-30-5

6) Install bearing cover to converter housing by aligning their match marks as shown below and tighten fixing bolts to specified torque.

Tightening torque for bearing cover bolt	N·m	kg-m	lb-ft
	11 – 14	1.1 – 1.4	8.0 – 10.0

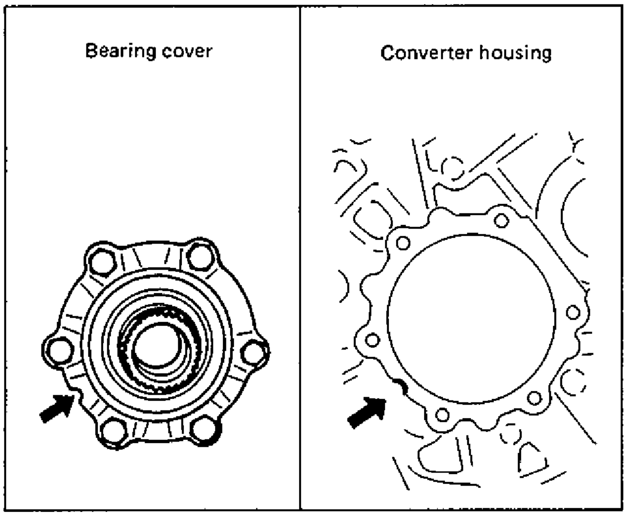


Fig. 7B-30-6

7) Install new packing and magnet plug and tighten it to specified torque.

Tightening torque for magnet plug	N·m	kg-m	lb-ft
	40 – 55	4.5 – 5.5	29.0 – 39.5

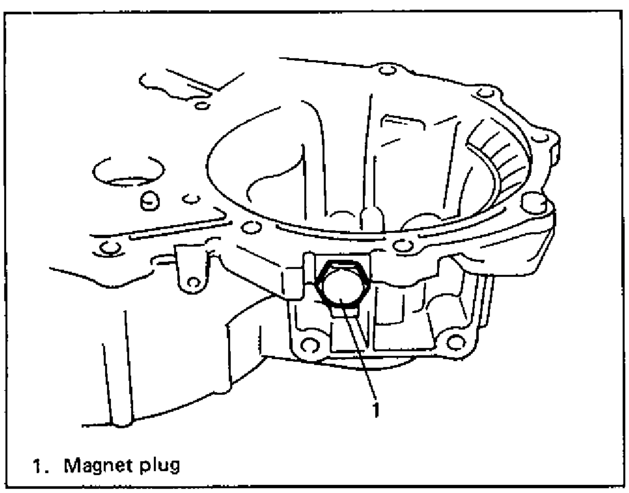


Fig. 7B-30-7

8) Adjust shim for output gear and measure preload.

- Install output gear to converter housing and then install bearing outer race and shim.
- With special tool placed on end surface of converter housing, measure dimension "A" with dial depth gauge as shown in figure below.

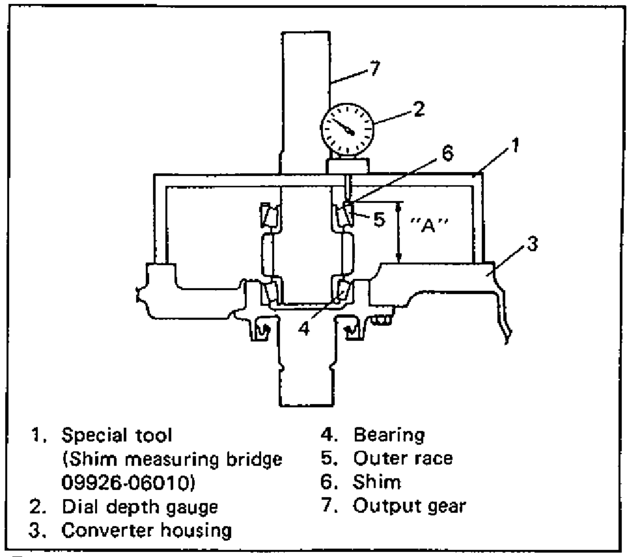


Fig. 7B-30-8

- Using straightedge and dial depth gauge, measure dimension "B" of bearing housing cover.

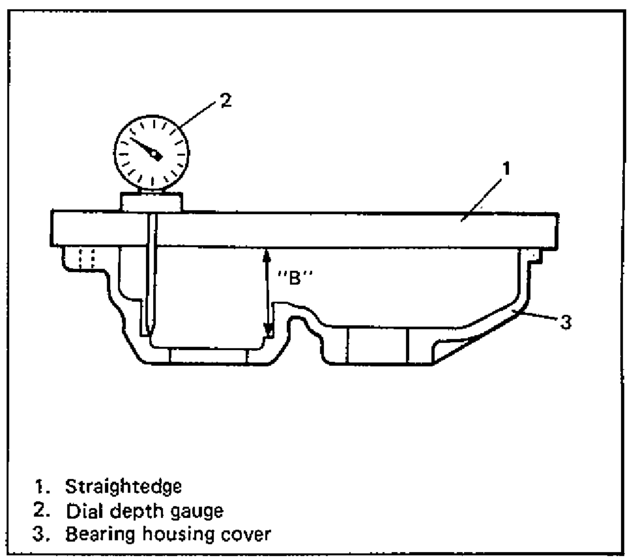


Fig. 7B-30-9

- Subtract dimension "B" from "A" and if that difference is not within following specification, adjust by replacing shim(s).

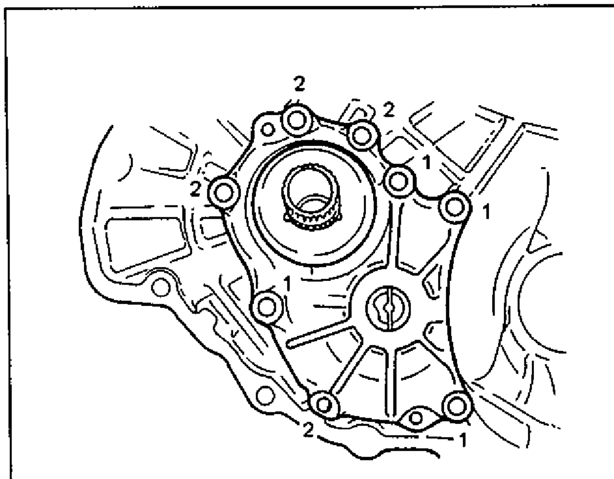
Standard value	0.02 – 0.04 mm (0.0008 – 0.0015 in)

Available shim thickness	0.10, 0.12, 0.14, 0.16, 0.20 and 0.5 mm
	0.0039, 0.0047, 0.0055, 0.0063, 0.0078 and 0.0196 in

CAUTION:
Do not use more than 7 shims.

- Fit shim(s) and bearing outer race and install it to converter housing.

Tightening torque for housing cover fixing bolt	N·m	kg-m	lb-ft
	19 – 26	1.9 – 2.6	14.0 – 18.5

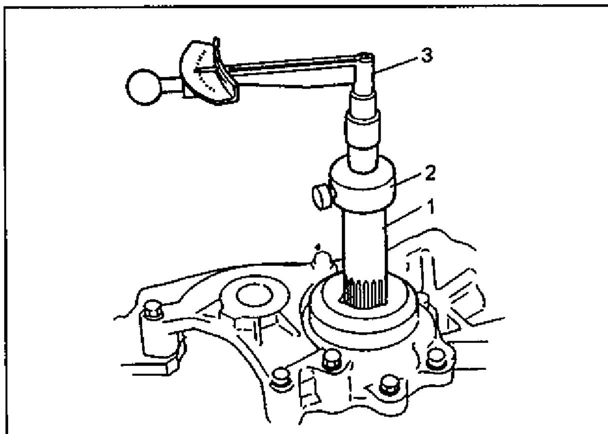


1. Bolt (longer)
2. Bolt (shorter)

Fig. 7B-30-10

- Using special tool as shown below, measure preload and if measured value is not within following specification, replace shim(s) again.

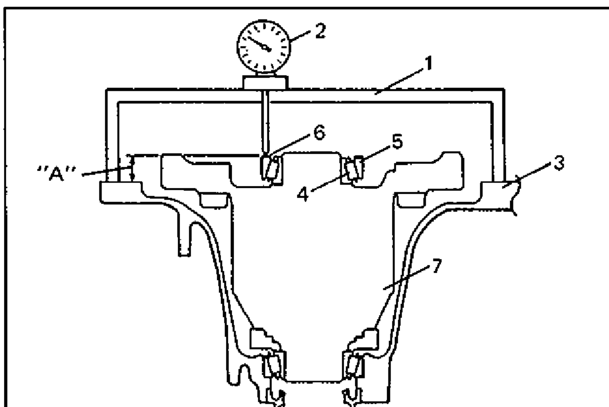
	N·m	kg-m	lb-ft
Output gear preload	0.03 – 0.9	0.003 – 0.09	0.022 – 0.650



1. Output gear
2. Special tool (Output gear preload adaptor 09928-06040)
3. Torque wrench (0 – 15 kg-cm)

Fig. 7B-30-11

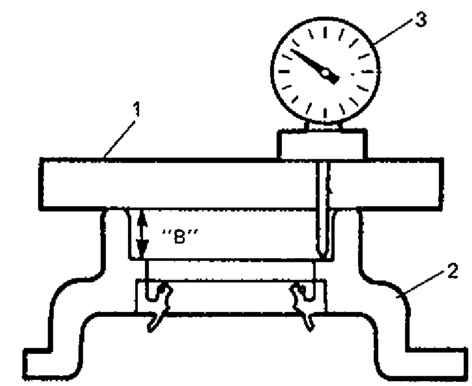
9) Adjust differential side bearing shim(s) and measure preload.
   - Install differential to converter housing and then fit bearing outer race and shim(s).
   - With special tool placed on end surface of converter housing, measure dimension "A" by using dial depth gauge as shown below.



1. Special tool (Shim measuring bridge 09926-06010)
2. Dial depth gauge
3. Converter housing
4. Bearing
5. Outer race
6. Shim
7. Differential

Fig. 7B-30-12

- Using straightedge and dial depth gauge, measure dimension "B" of side bearing housing cover as shown below.



1. Straightedge
2. Housing cover
3. Dial depth gauge

Fig. 7B-30-13

- Subtract "B" from "A" and if that difference is not within following specification, adjust by replacing shim(s).

A – B standard value	0.15 – 0.17 mm (0.0060 – 0.0065 in)

Available shim thickness	0.10, 0.12, 0.14, 0.16, 0.20 and 0.50 mm
	0.0039, 0.0047, 0.0055, 0.0063, 0.0078 and 0.0196 in

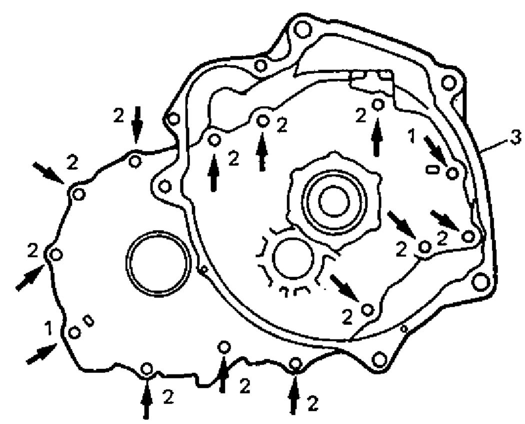
CAUTION:
Make sure to use within 5 shims.

- Fit shim and outer race to side bearing housing cover and install it to transmission case.

	N·m	kg-m	lb-ft
Tightening torque	19 – 26	1.9 – 2.6	14.0 – 18.5

- Install transmission case to converter housing.

	N·m	kg-m	lb-ft
Tightening torque	30 – 47	3.0 – 4.7	22.0 – 33.5

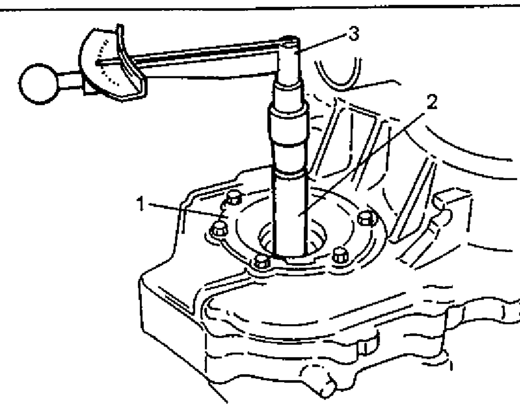


1. Bolt (longer)
2. Bolt (shorter)

Fig. 7B-30-14

- Using special tool as shown below, measure preload and if measured value is not within following specification, replace shim(s).

	N·m	kg-m	lb-ft
Preload	2.1 – 2.9	0.21 – 0.29	1.55 – 2.10



1. Side bearing housing cover
2. Special tool
(Differential preload adaptor 09928-06020)
3. Torque wrench

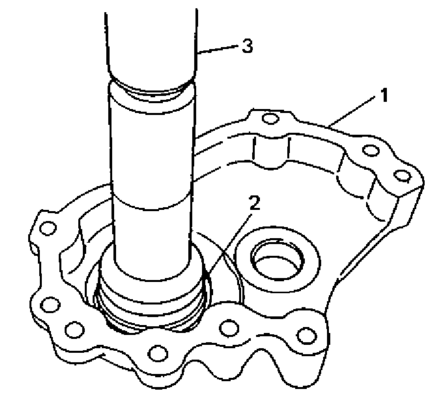
Fig. 7B-30-15

10) Install output gear and idle gear.

NOTE:
When installing idle gear, use care to position its hole properly so that pin can be installed to shaft.

11) After fitting shim selected in step 8) to bearing housing, install outer race by using hydraulic press as shown below.

CAUTION:
When replacing output gear bearing, also replace outer race.

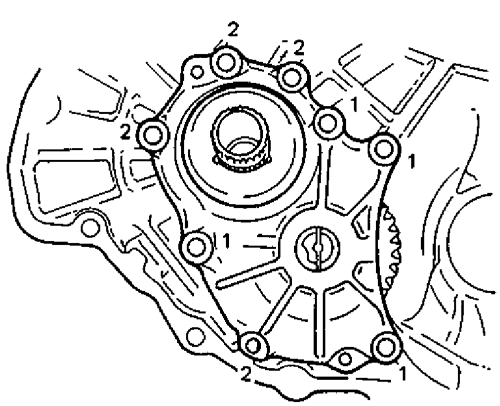


1. Housing cover
2. Special tool (Bearing installer adaptor 09941-34513-004)
3. Hydraulic press

Fig. 7B-30-16

12) Install housing cover and tighten bolts to specified torque.

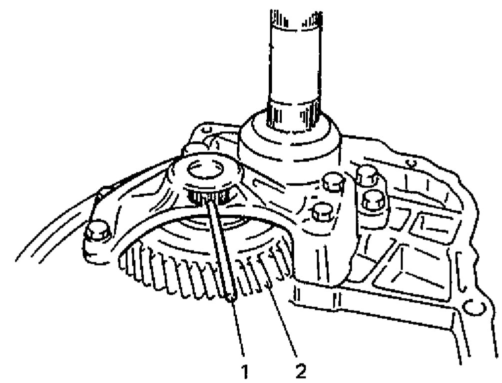
Tightening torque	N·m	kg-m	lb-ft
	19 – 26	1.9 – 2.6	14.0 – 18.5



1. Bolt (longer)
2. Bolt (shorter)

Fig. 7B-30-17

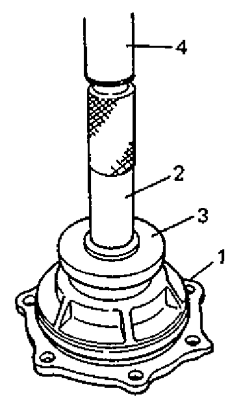
13) With pin holes in idle gear aligned, install new spring pin.



1. Spring pin
2. Idle gear ass'y

Fig. 7B-30-18

14) Fit shim(s) selected in step 9) to side bearing housing and then using hydraulic press as shown below, install outer race.



1. Housing
2. Special tool (Bearing installer handle 09924-74510)
3. Special tool (Attachment 09926-88310)
4. Hydraulic press

Fig. 7B-30-19

15) Using special tool, install new oil seal to bearing housing.

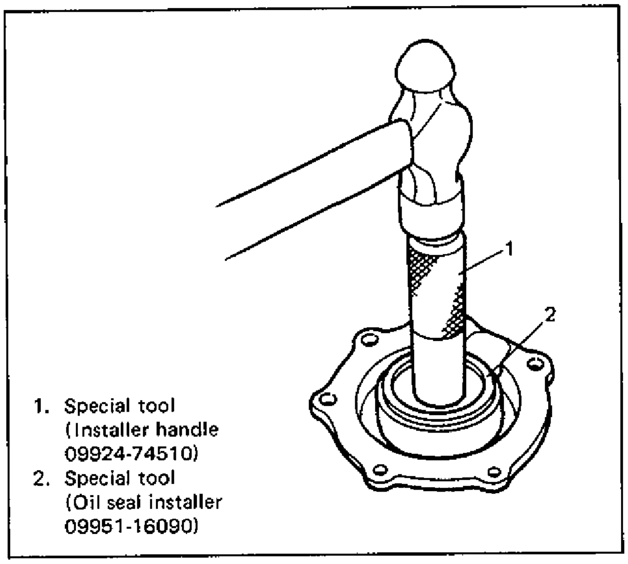


Fig. 7B-30-20

16) After fitting new O-ring to bearing housing, install it so that arrow pointed parts match each other.

Tightening torque	N·m	kg-m	lb-ft
	19 – 26	1.9 – 2.6	14.0 – 18.5

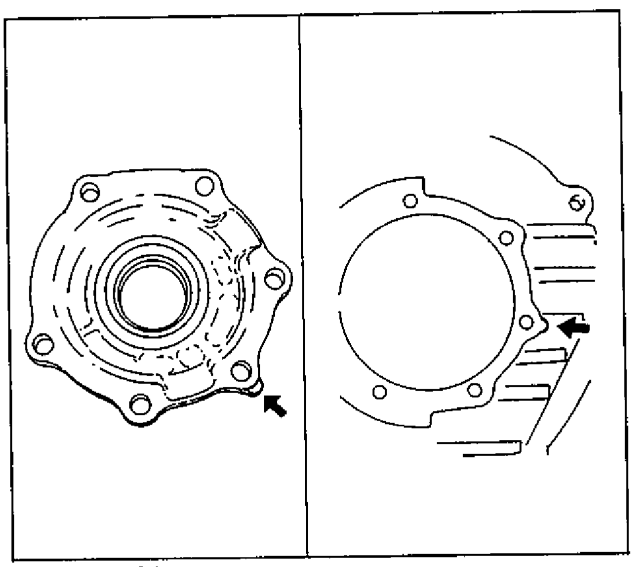


Fig. 7B-30-21

17) Install actuator support and tighten bolts to specified torque.

Tightening torque for actuator support	N·m	kg-m	lb-ft
	12 – 16	1.2 – 1.6	9.0 – 11.5

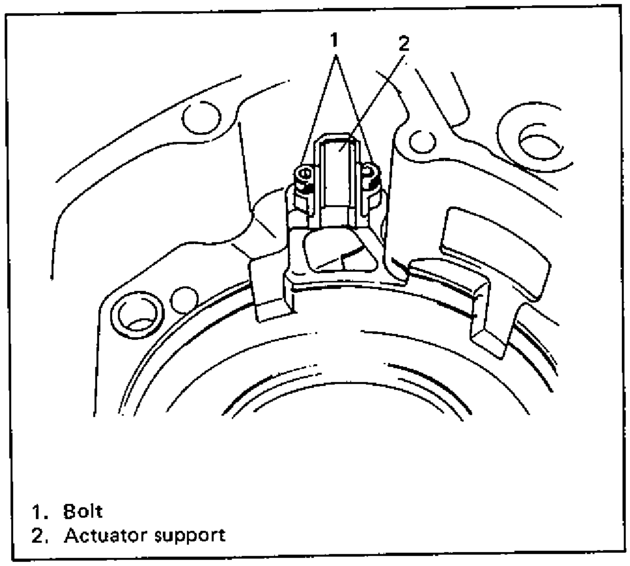


Fig. 7B-30-22

18) Install rod bracket.

Tightening torque for rod bracket	N·m	kg-m	lb-ft
	19 – 26	1.9 – 2.6	14.0 – 18.5

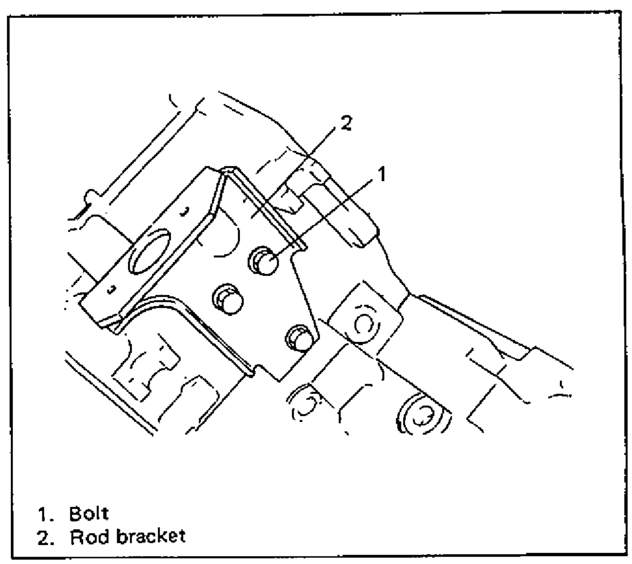
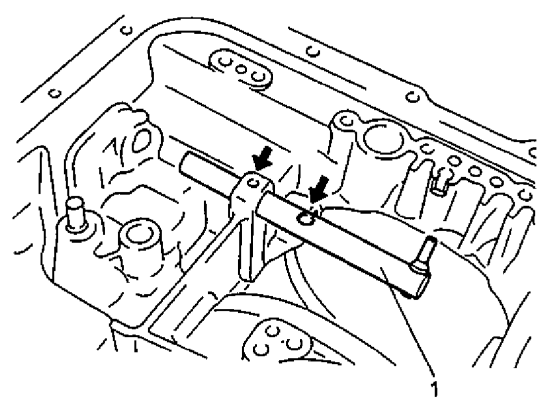


Fig. 7B-30-23

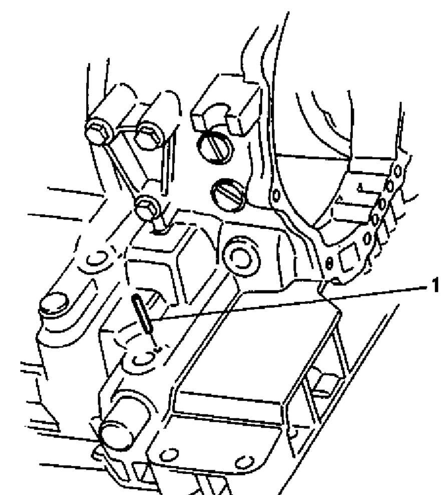
19) Insert control rod till holes as shown in figure below align and then install detent spring and steel ball.



1. Control rod

Fig. 7B-30-24

20) With spring compressed, push in rod and install roller pin.



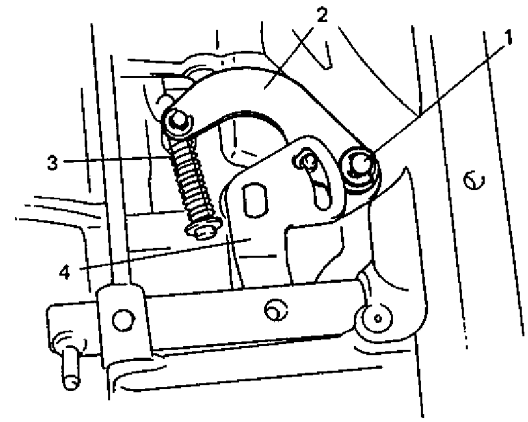
1. Roller pin

Fig. 7B-30-25

21) Apply sealant into roller pin hole.

22) Install parking lever and parking rod as a unit to transmission case and then fit E-ring.

23) Install manual plate.



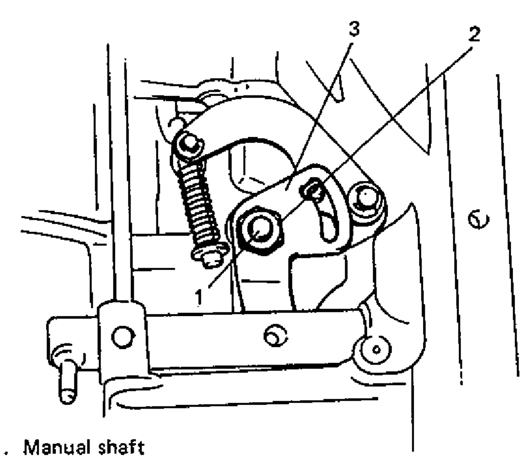
1. E-ring
2. Parking lever
3. Parking rod
4. Manual plate

Fig. 7B-30-26

24) After fitting new O-ring to manual shaft, install it to case and tighten nut on manual plate side to specified torque.

NOTE:
When tightening nut, place a piece of wood between case and parking rod to prevent manual plate from being distorted.

Tightening torque for manual shaft nut	N·m	kg-m	lb-ft
	30 – 40	3.0 – 4.0	22.0 – 29.0

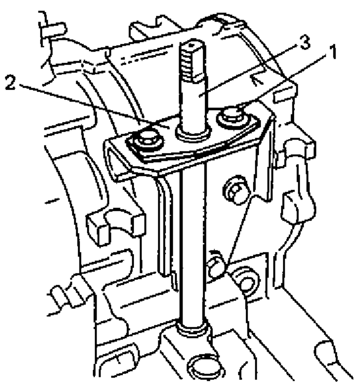


1. Manual shaft
2. Nut
3. Manual plate

Fig. 7B-30-27

25) With rubber bushing fitted to plate, install plate to case.

Tightening torque for plate	N·m	kg-m	lb-ft
	6.0 – 9.0	0.6 – 0.9	4.5 – 6.5



1. Bolt
2. Plate
3. Manual shaft

Fig. 7B-30-28

- Turn manual shaft and check that manual plate, control rod and parking lever operate smoothly.

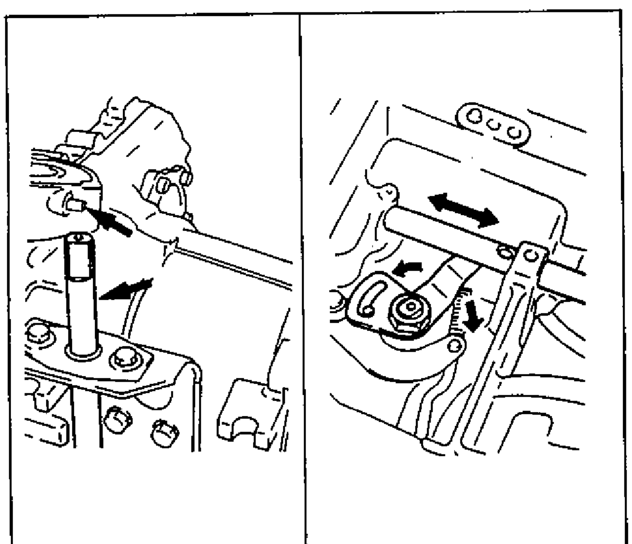
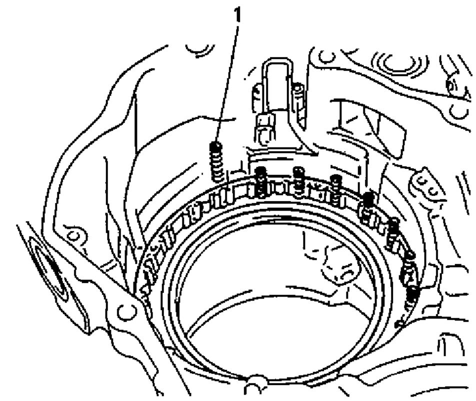


Fig. 7B-30-29

26) With new outer and inner O-rings fitted to first reverse brake piston, install piston.

> **CAUTION:**
> **Check to make sure that O-rings are installed securely.**

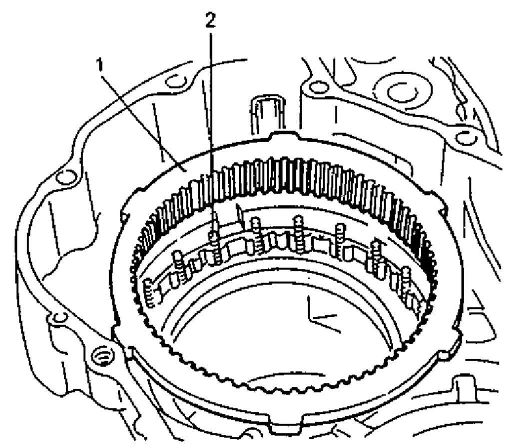
27) Install piston return springs.



1. Return spring

Fig. 7B-30-30

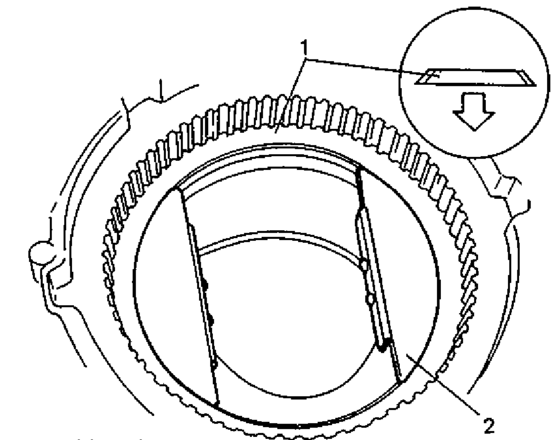
28) Install first reverse brake flange.



1. Flange
2. Spring

Fig. 7B-30-31

29) Install cushion plate with its convex side facing up and set special tool to prevent inner race of one-way clutch from dropping, as shown below.



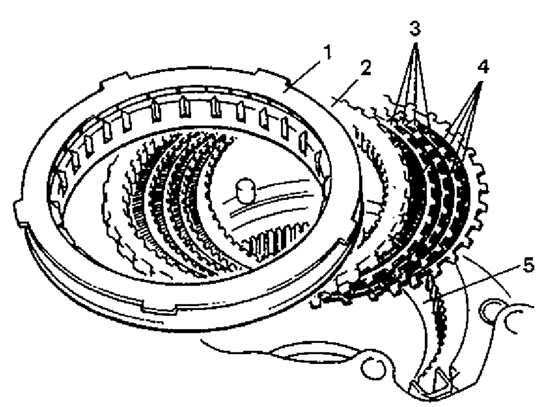
1. Cushion plate
2. Special tool
   (Cushion plate centering holder
   09927-76020)

Fig. 7B-30-32

30) Install 4 clutch plates and 4 clutch discs in that order and then retaining plate (with stepped side facing up) and one-way clutch (with bushing side facing down.)

NOTE:

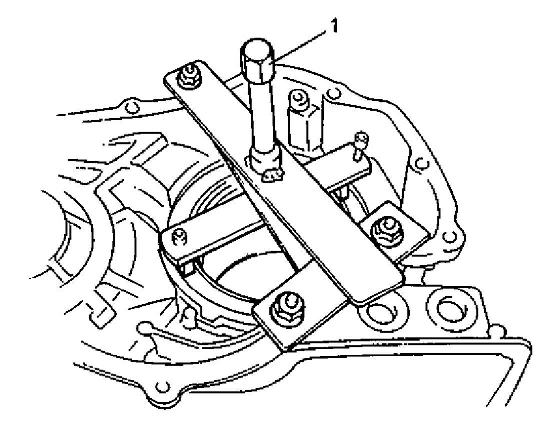
Be sure to use retaining plate selected in step 31) of Transmission Unit Disassembly.



1. One-way clutch
2. Retaining plate
3. Disc
4. Plate
5. Cushion plate

Fig. 7B-30-33

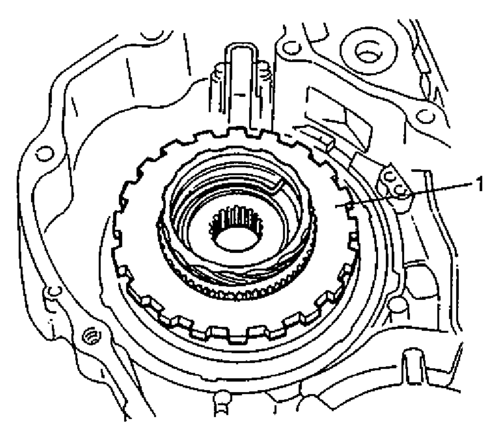
31) Using special tool, install snap ring.



1. Special tool
   (Spring compressor No. 5
   09926-98360)

Fig. 7B-30-34

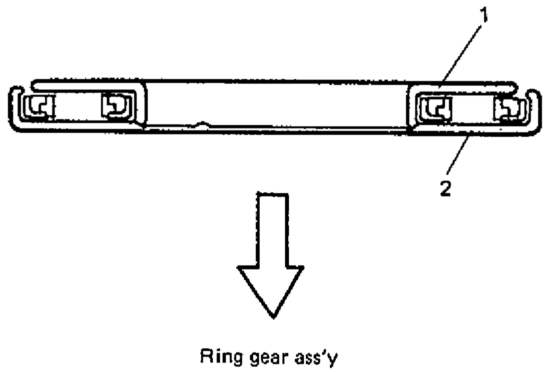
32) Install rear planetary carrier ass'y.
33) Install bearing to rear planetary ring gear ass'y so that its black part faces toward rear carrier and then install ring gear ass'y.



1. Ring gear ass'y

Fig. 7B-30-35

34) Install bearing to ring gear ass'y so that its plate side faces toward ring gear ass'y.



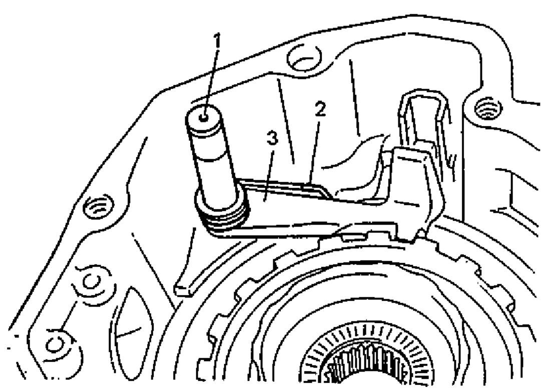
1. Race
2. Plate

Fig. 7B-30-36

35) Install parking lock pawl, return spring and lock pawl shaft and fit hook of spring onto lock pawl shaft.

NOTE:

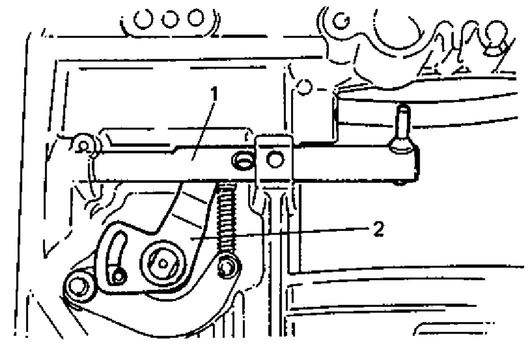
Be sure not to have spring caught. Also, check that lock pawl shaft can be turned by hand after installation.



1. Lock pawl shaft
2. Spring
3. Lock pawl

Fig. 7B-30-37

Check to make sure that lock pawl engages with parking gear securely when turning manual shaft to "P" range.



1. Control rod
2. Manual plate

Fig. 7B-30-38

36) Connect outer and inner governor pipes, if they have been removed.

37) After installing new governor gasket, install governor ass'y so that arrow pointed parts in figure below match each other.

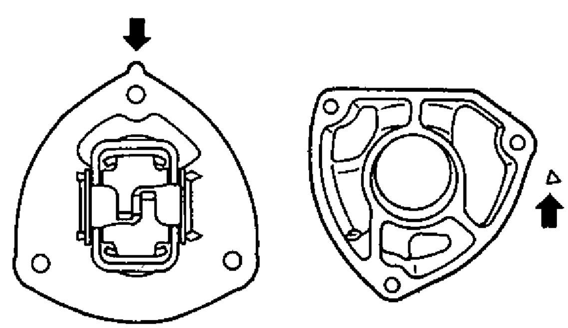


Fig. 7B-30-39

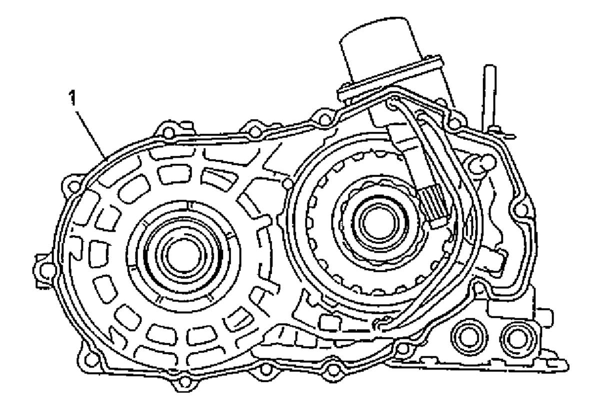
38) After installing new cover gasket, install governor cover so that its clip faces toward manual shaft.

39) Tighten cover bolts to specified torque.

Tightening torque for cover bolt	N·m	kg-m	lb-ft
	8 – 11	0.8 – 1.1	6.0 – 7.5

40) Install differential ass'y.

41) Clean mating surfaces of converter housing and transmission case and apply thin and even coat of sealant to them.

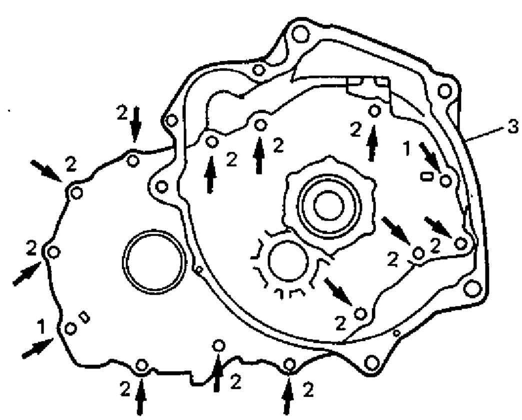


1. Apply sealant (SUZUKI BOND NO. 1216)

Fig. 7B-30-39-1

Then install transmission case and tighten bolts to specified torque.

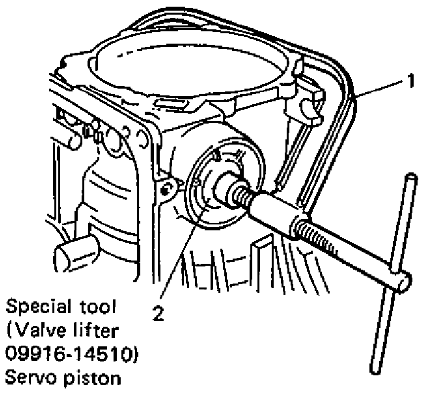
Tightening torque for transmission case fixing bolt	N·m	kg-m	lb-ft
	30 – 47	3.0 – 4.7	22.0 – 33.5



1. Bolt (longer)
2. Bolt (shorter)
3. Transmission case

Fig. 7B-30-40

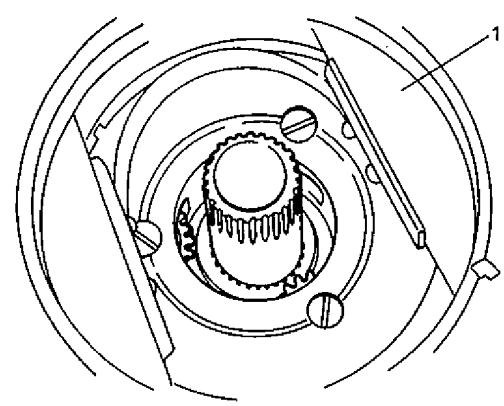
42) With spring fitted to band servo piston ass'y, install it to transmission case. Then using special tool, install snap ring.



1. Special tool (Valve lifter 09916-14510)
2. Servo piston

Fig. 7B-30-41

43) Remove special tool from transmission case.

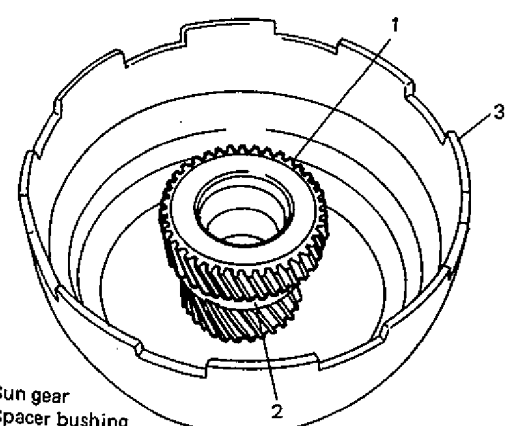


1. Special tool (Cushion plate centering holder 09927-76020)

Fig. 7B-30-42

44) Install bearing with its black part facing up.

45) With spacer bushing fitted to sun gear, install it to connecting shell.



1. Sun gear
2. Spacer bushing
3. Connecting shell

Fig. 7B-30-43

46) Install connecting shell.

47) Install bearing and new sleeve to front planetary carrier, and then install front planetary carrier.

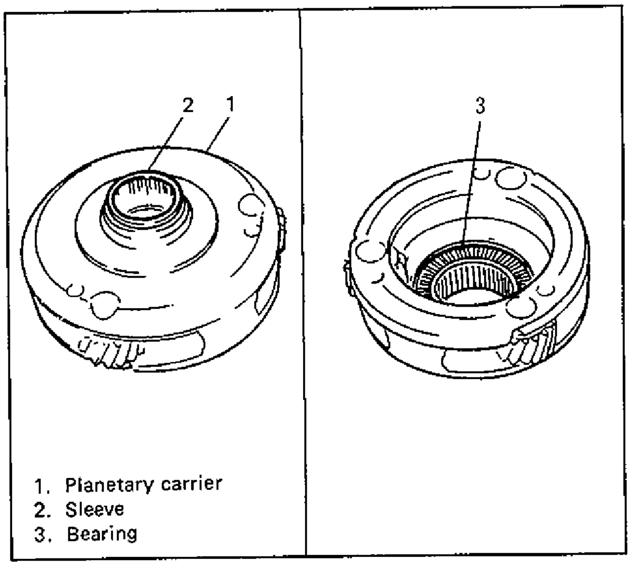


Fig. 7B-30-44

48) Install bearing to front planetary ring gear with black part facing up, and then install planetary ring gear.
49) Install bearing so that its plate side faces toward planetary ring gear.

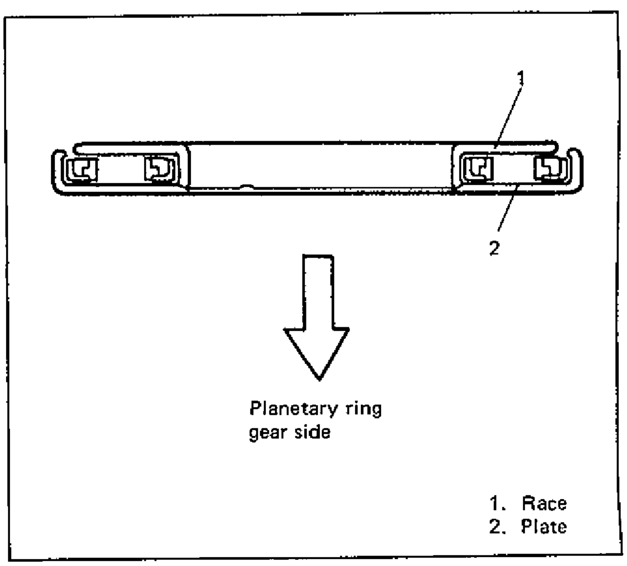


Fig. 7B-30-45

50) Install forward clutch and direct clutch.

> **CAUTION:**
> **Be careful not to cause damage to sleeve of planetary carrier.**

51) After installing second brake band, install band pin between brake band and rod of servo piston.

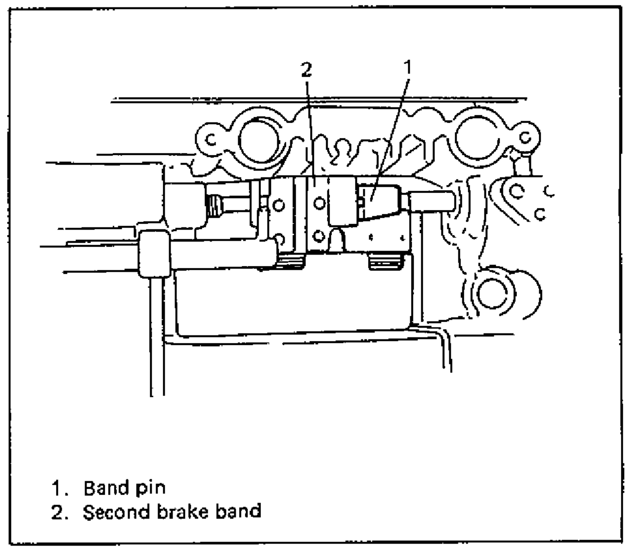


Fig. 7B-30-46

52) Tighten anchor bolt and anchor nut temporarily.
53) Measure end play.

NOTE:
"End play" means clearance such as T_1 and T_2 as shown in figure below.

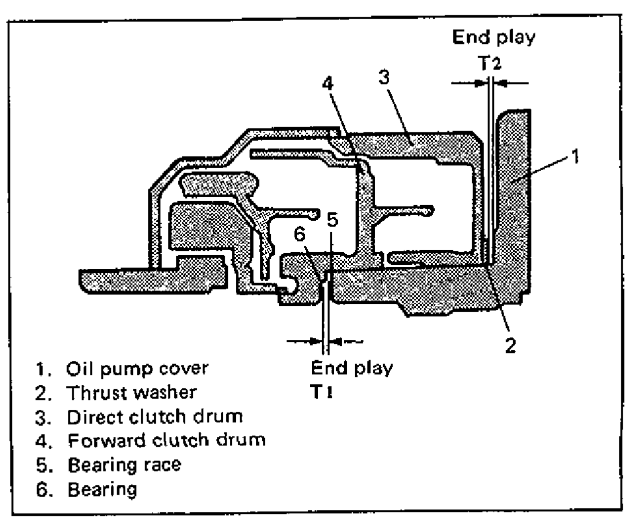
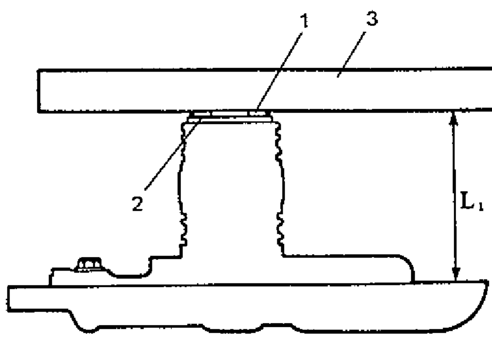


Fig. 7B-30-47

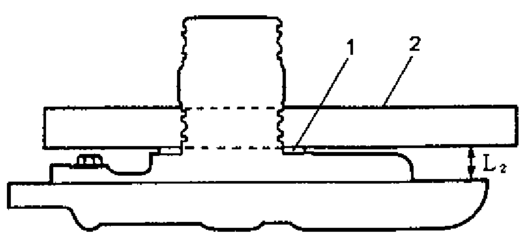
- After installing bearing race and bearing to oil pump, place straightedge and measure dimension "L_1" in figure below by using vernier calipers.



1. Bearing
2. Bearing race
3. Straightedge

Fig. 7B-30-48

- After installing thrust washer to oil pump, place straightedge and measure dimension "L_2".

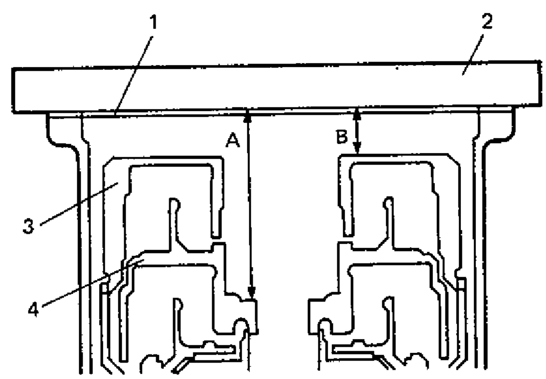


1. Thrust washer
2. Straightedge

Fig. 7B-30-49

- Install gasket to case. With straightedge placed as shown below, measure dimension "A" which is depth from top surface of gasket to forward clutch drum bearing installation surface and obtain "L_3" by using following equation.
  $L_3 = A - 0.1$
- Next, measure dimension "B" which is depth from top surface of gasket to direct clutch drum thrust washer installation surface and obtain "L_4" by using following equation.
  $L_4 = B - 0.1$

NOTE:
0.1 in above equations corresponds to contraction margin of gasket.



1. Gasket
2. Straightedge
3. Direct clutch drum
4. Forward clutch drum

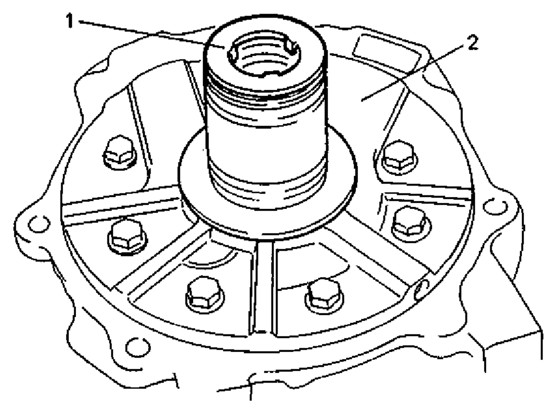
Fig. 7B-30-50

- End plays T_1 and T_2 are obtained as follows.
  $T_1 = L_3 - L_1$
  $T_2 = L_4 - L_2$
  Check T_1 and T_2 thus obtained with specification given below. If either one is not as specified, adjust it by replacing bearing race and thrust washer.

End play T_1 standard value ($T_1 = L_3 - L_1$)	0.25 – 0.50 mm (0.0099 – 0.0196 in)

End play T_2 standard value ($T_2 = L_4 - L_2$)	0.50 – 0.80 mm (0.0197 – 0.0314 in)

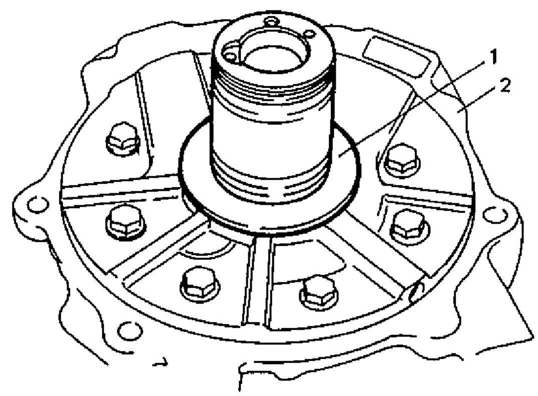
Available bearing race thickness	1.2, 1.4, 1.6, 1.8, 2.0 and 2.2 mm	
	0.047, 0.055, 0.063, 0.071, 0.079 and 0.087 in	



1. Bearing race
2. Oil pump

Fig. 7B-30-51

Available thrust washer thickness	1.3, 1.5, 1.7, 1.9, 2.1, 2.3, 2.5 and 2.7 mm
	0.051, 0.059, 0.067, 0.075, 0.083, 0.091, 0.099 and 0.106 in



1. Thrust washer
2. Oil pump

Fig. 7B-30-52

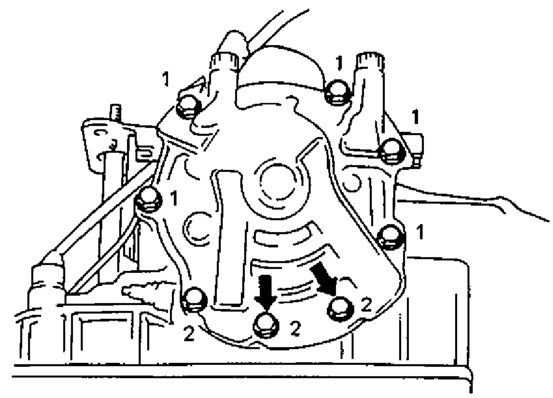
54) Install bearing race and thrust washer to oil pump.

NOTE:
Be sure to use properly selected bearing race and thrust washer.

55) After installing gasket to case, install oil pump. Then tighten bolts to specified torque.

Tightening torque for oil pump fixing bolt	N·m	kg·m	lb-ft
	15 – 27	1.5 – 2.7	11.0 – 19.5

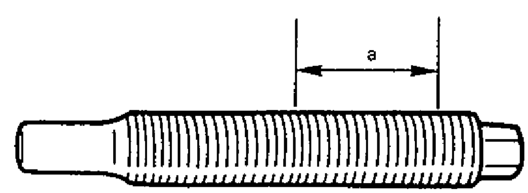
NOTE:
Be sure to apply sealant to arrow pointed screws in figure below before installation.



1. Bolt (shorter)
2. Bolt (longer)

Fig. 7B-30-53

56) Loosen nut till it comes as far as tip end of anchor bolt and apply sealant to part "a" as shown in figure below.



a: Apply sealant
(SUZUKI BOND No. 1216 99000-31160)

Fig. 7B-30-54

57) After tightening anchor bolt to specified torque, turn back exactly 2 rotations.

Tightening torque for anchor bolt	N·m	kg-m	lb-ft
	12 – 15	1.2 – 1.5	9.0 – 10.5

58) With anchor nut installed, fix bolt and tighten nut to specified torque.

Tightening torque for anchor nut	N·m	kg-m	lb-ft
	56 – 82	5.6 – 8.2	41.0 – 59.0

59) Fit steel ball and spring as shown in figure below.

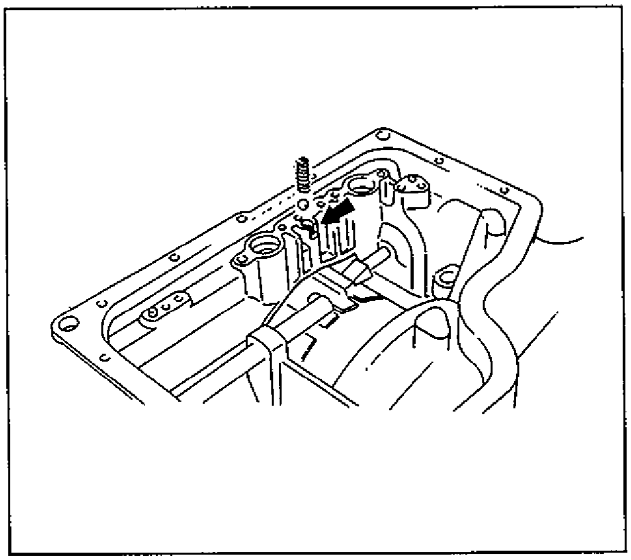


Fig. 7B-30-55

60) Install control valve ass'y so that lug of control rod fits to recess in manual valve and tighten bolts to specified torque.

Tightening torque for control valve fixing bolt	N·m	kg-m	lb-ft
	8 – 11	0.8 – 1.1	6.0 – 7.5

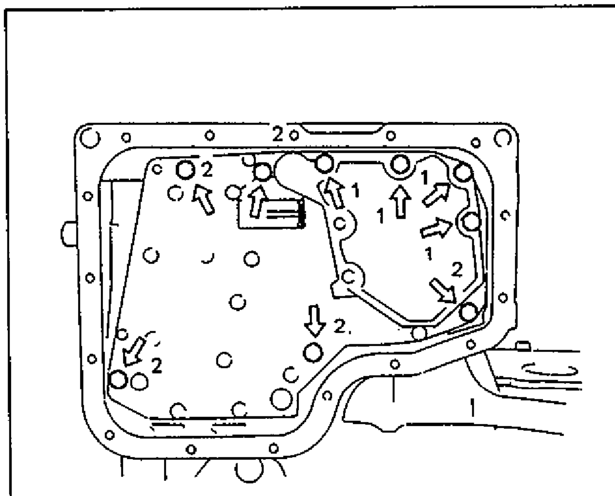


Fig. 7B-30-56

61) With new gasket attached to gasket, install oil pan.

Tightening torque for oil pan fixing bolt	N·m	kg-m	lb-ft
	6 – 9	0.6 – 0.9	4.5 – 6.5

NOTE:
Be sure to remove old gasket on mating surface of oil pan completely.

62) Install speedometer driven gear and tighten bolt to specified torque.

Tightening torque	N·m	kg-m	lb-ft
	6 – 8	0.6 – 0.8	4.5 – 5.5

63) After installing new O-ring to oil filler tube, connect tube and then install level gauge to tube.

Tightening torque for tube bolts	N·m	kg-m	lb-ft
	6 – 8	0.6 – 0.8	4.5 – 5.5

64) Using special tool, measure dimension "A" of modulator rod.

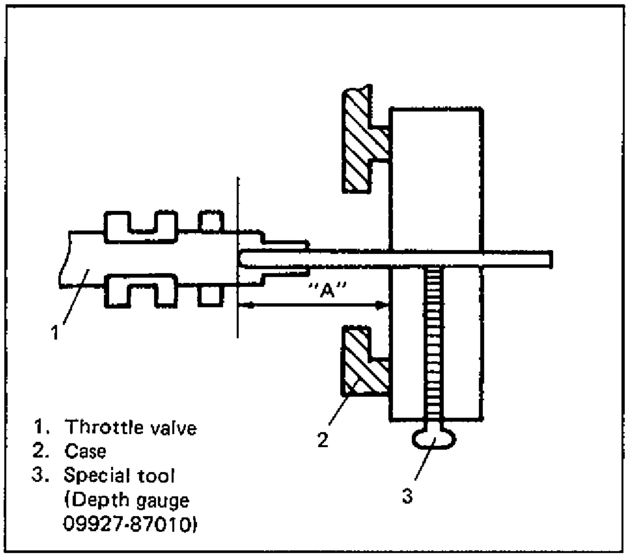


Fig. 7B-30-57

- Find applicable dimension "A" of modulator rod in following table and determine rod length.

Dimension "A"	Rod length
Less than 27.05 mm (1.06 in)	29.5 mm (1.16 in)
27.05 – 27.55 mm (1.06 – 1.08 in)	30.0 mm (1.18 in)
27.55 – 28.05 mm (1.08 – 1.10 in)	30.5 mm (1.20 in)
28.05 – 28.55 mm (1.10 – 1.12 in)	31.0 mm (1.22 in)
More than 28.55 mm (1.12 in)	31.5 mm (1.24 in)

65) After installing new O-ring and modulator rod, install control modulator by turning by hand.

NOTE:
Be sure to install properly selected rod.

66) After installing new O-ring, install kick down solenoid by turning by hand.

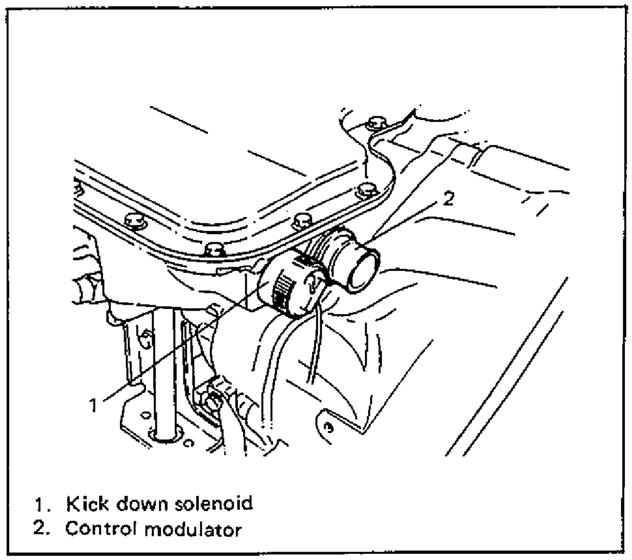


Fig. 7B-30-58

67) Apply sealant to thread of inhibitor switch, install it and tighten it to specified torque.

	N·m	kg-m	lb-ft
Tightening torque for inhibitor switch	19 – 26	1.9 – 2.6	14.0 – 18.5

68) Connect breather hose and control modulator pipe.

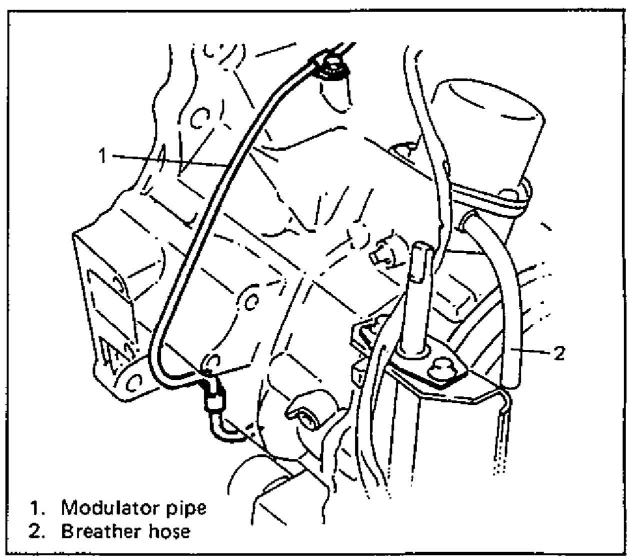


Fig. 7B-30-59

69) Install cooler hose joint.

	N·m	kg-m	lb-ft
Tightening torque for joint bolts	17.5–20.0	1.75–2.0	13.0 – 14.0

70) Install mount brackets and tighten bolts to specified torque.

	N·m	kg-m	lb-ft
Tightening torque for mount bracket No. 1 bolt	30 – 47	3.0 – 4.7	22.0 – 33.5
Tightening torque mount bracket No. 2 bolt	38 – 53	3.8 – 5.3	27.5 – 38.0

71) Install input shaft and oil pump shaft.

72) After installing torque converter, measure distance "A" between end surface of torque converter and converter housing.

NOTE:

After draining fluid from torque converter or installing new torque converter, fill about 1.5 liters (3.17/2.64 US/Imp pt) into torque converter first, and then insall it.

Dimension "A"	More than 21.1 mm (0.83 in)

If measured value is not as specified above, reinstall torque converter.

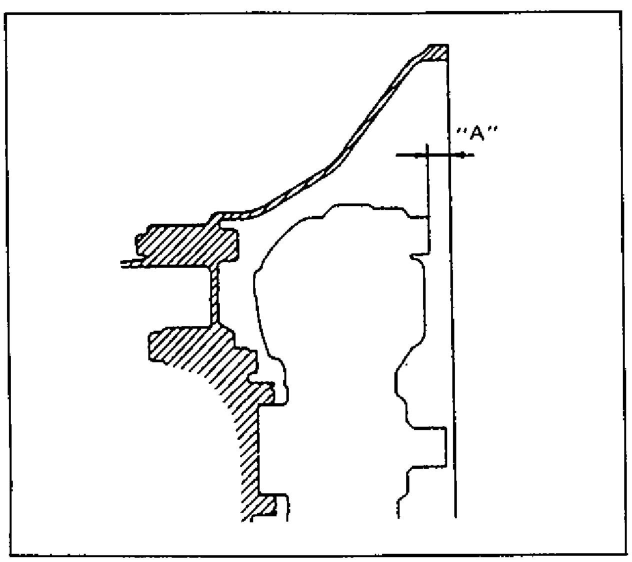
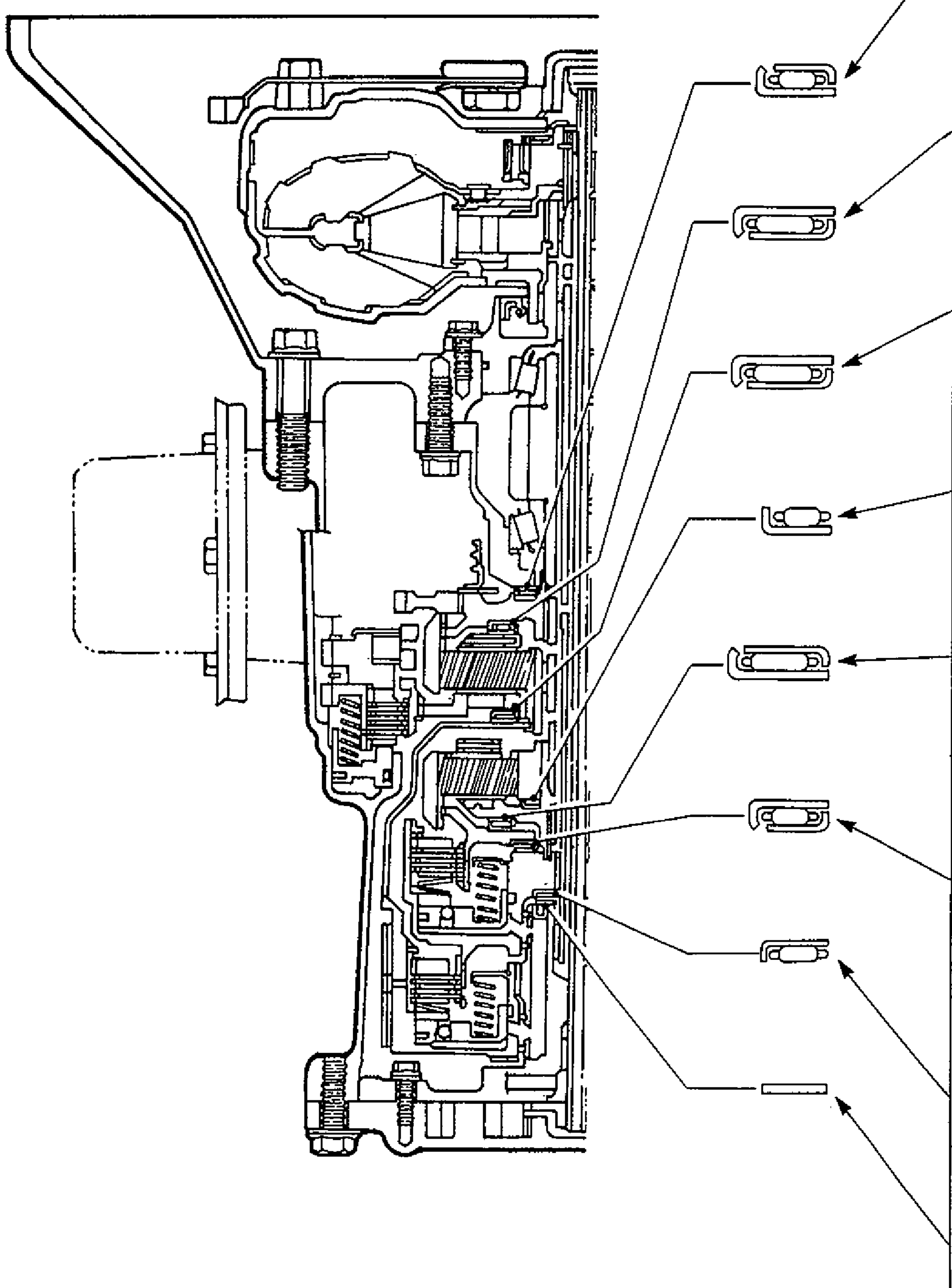


Fig. 7B-30-60

INSTALLATION OF BEARINGS AND RACES



	Bearing race	Needle bearing	Bearing with race: Black race	Bearing with race: Black plate	Bearing with race: Black race	Needle bearing	Bearing with race: Black race	Bearing with race: Black race	Bearing with race: Black race	Bearing with race: Black plate
Outside diameter	φ41.0 mm (φ1.61 in)	φ42.0 mm (φ1.65 in)	φ53.0 mm (φ2.09 in)	φ53.0 mm (φ2.09 in)	φ70.0 mm (φ2.76 in)	φ47.0 mm (φ1.85 in)	φ70.0 mm (φ2.76 in)	φ70.0 mm (φ2.76 in)	φ53.0 mm (φ2.09 in)	φ53.0 mm (φ2.09 in)
Inside diameter	φ23.0 mm (φ0.90 in)	φ24.1 mm (φ0.95 in)	φ34.7 mm (φ1.34 in)	φ33.8 mm (φ1.33 in)	φ48.7 mm (φ1.92 in)	φ30.1 mm (φ1.19 in)	φ48.7 mm (φ1.92 in)	φ48.7 mm (φ1.92 in)	φ34.7 mm (φ1.34 in)	φ33.8 mm (φ1.33 in)

Fig. 7B-31-1

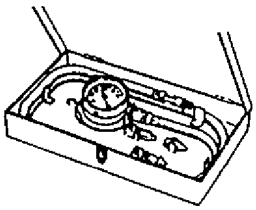
RECOMMENDED TORQUE SPECIFICATIONS

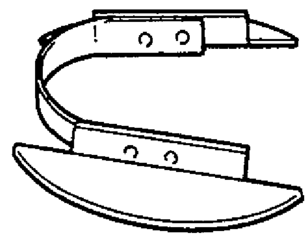
Fastening part		N·m	kg-m	lb-ft
1. Magnet plug		40 – 55	4.0 – 5.5	29.0 – 39.5
2. Bearing housing cover bolt		19 – 26	1.9 – 2.6	14.0 – 18.5
3. Side bearing housing cover bolt				
4. Rod bracket bolt				
5. Manual shaft nut		30 – 40	3.0 – 4.0	22.0 – 29.0
6. Governor cover bolt		8 – 11	0.8 – 1.1	6.0 – 7.5
7. Transmission case bolt		30 – 47	3.0 – 4.7	22.0 – 33.5
8. Oil pump bolt		15 – 27	1.5 – 2.7	11.0 – 19.5
9. Oil pump cover bolt		11 – 14	1.1 – 1.4	7.5 – 10.0
10. Anchor bolt		12 – 15	1.2 – 1.5	9.0 – 10.5
11. Anchor nut		56 – 82	5.6 – 8.2	41.0 – 59.0
12. Valve body bolt		8 – 11	0.8 – 1.1	6.0 – 7.5
13. Lower body fixing bolt	8 mm	2.5 – 3.5	0.25 – 0.35	1.85 – 2.50
	10 mm	5 – 7	0.5 – 0.7	3.65 – 5.05
14. Oil strainer bolt		3 – 4	0.3 – 0.4	2.20 – 2.85
15. Oil pan bolt		6 – 9	0.6 – 0.9	4.5 – 6.5
16. Speedometer driven gear bolt		6 – 8	0.6 – 0.8	4.5 – 5.5
17. Inhibitor switch		19 – 26	1.9 – 2.6	14.0 – 18.5
18. Mounting bracket bolt	No. 1	30 – 47	3.0 – 4.7	22.0 – 33.5
	No. 2	38 – 53	3.8 – 5.3	27.5 – 38.0

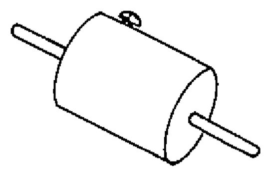
REQUIRED SERVICE MATERIALS

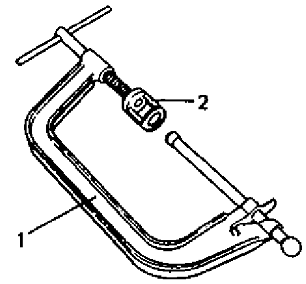
MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Automatic transmission fluid	DEXRON®-II	• Automatic transmission • Parts lubrication when installing
Sealant	SUZUKI BOND NO. 1216 (99000-31160)	• Control rod, pin hole • Governor pipe, connected part • Transmission case, mating surface • Oil pump fixing bolt, seating surface (as specified) • Anchor bolt, installed part • Inhibitor switch, installed part
Lithium grease	SUZUKI SUPER GREASE C (99000-25030)	Retaining parts in place when assembling
	SUZUKI SUPER GREASE A (99000-25010)	Cable ends
Water tight sealant	SUZUKI SEALING COMPOUND 366E (99000-31090)	Select cable fastening portion with dash panel

SPECIAL TOOLS

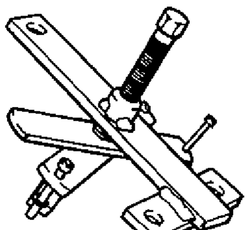
1

Oil pressure gauge set
09925-37810

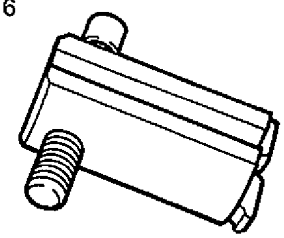
2

Cushion plate centering holder
09927-76020

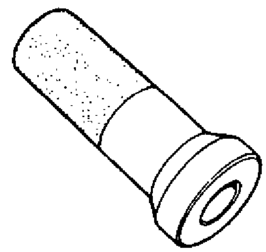
3

Depth gauge
09927-87010

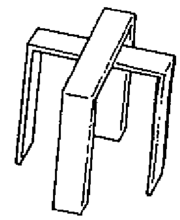
4


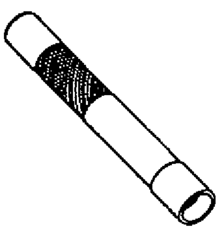
Valve lifter
09916-14510

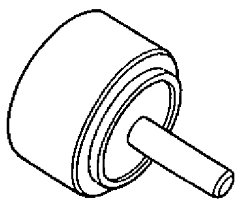
5

Spring compressor No. 5
09926-98360

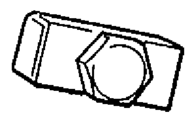
6

Bearing outer race remover
09944-96010

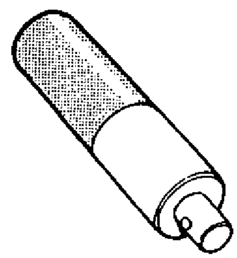
7

Bearing installer
09951-16080

8

Spring compressor No. 4
09926-98350

9

Bearing installer
09941-74910

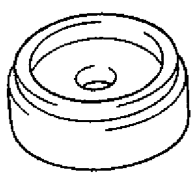
10

Bearing installer
09923-78210

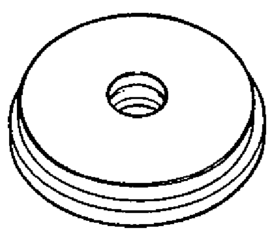
11

Idle gear holder
09928-06030

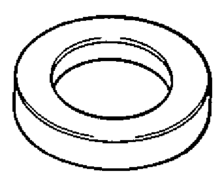
12

Bearing installer handle
09924-74510

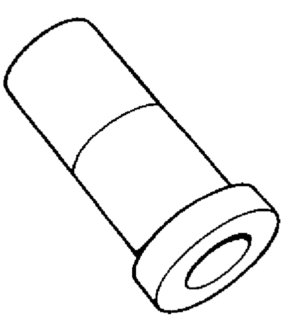
13

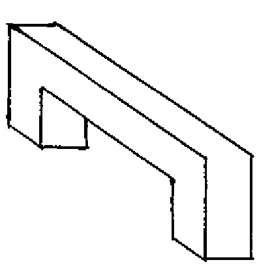
Bearing installer attachment
09926-88310

14

Oil seal installer
09951-16090

15

Bearing installer adaptor
09941-34513-004

16

Differential bushing remover plate
09951-26010

17

Bearing installer
09913-85210

18

Shim measuring bridge
09926-06010

19

Output gear preload adaptor
09928-06040

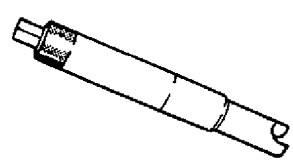
20

Preload adaptor
09928-06020

Fig. 7B-32

SECTION 7C1

CLUTCH

CONTENTS

GENERAL DESCRIPTION 7C1- 1
DIAGNOSIS 7C1- 4
ON CAR SERVICE 7C1- 5
Inspect and Adjust Clutch Pedal 7C1- 5
Clutch Fluid Pipe and Hose 7C1- 6
Clutch Master Cylinder 7C1- 8
Disassembly and Assembly Clutch Master Cylinder 7C1- 9
Clutch Operating Cylinder 7C1-10
Disassembly and Assembly Clutch Operating Cylinder 7C1-11
Inspect Fluid 7C1-12
UNIT REPAIR OVERHAUL 7C1-13
Clutch Cover, Clutch Disc and Flywheel 7C1-13
Clutch Release System 7C1-15
RECOMMENDED TORQUE SPECIFICATIONS 7C1-18
REQUIRED SERVICE MATERIALS .. 7C1-18
SPECIAL TOOLS 7C1-19

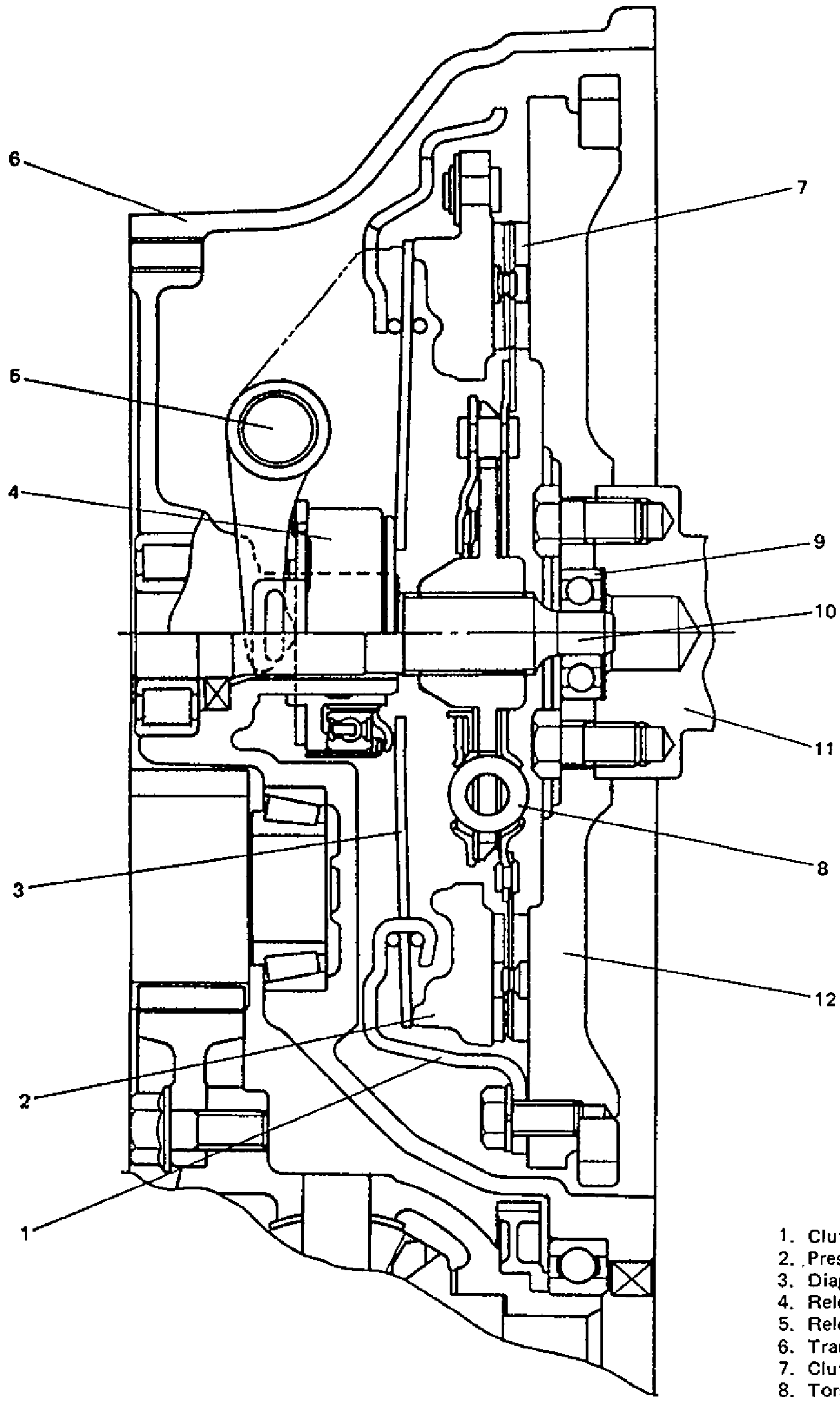
GENERAL DESCRIPTION

The clutch is a hydraulically controlled diaphragm spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapered fingers pointing inward.

The disc, carrying four torsional coil springs, is positioned on the transmission input shaft with an involute spline fit.

The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch release bearing is held back. This is the engaged condition of the clutch.

Depressing the clutch pedal causes the release bearing to advance and pushes on the tips of the tapered fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transmission input shaft.



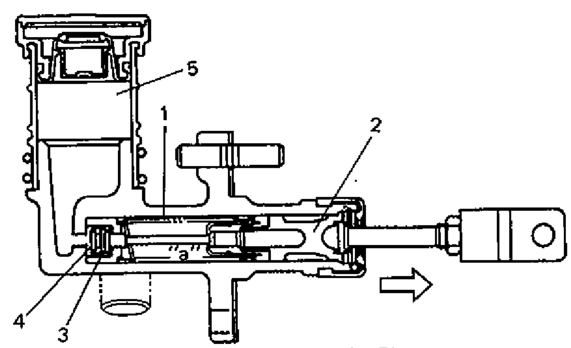
1. Clutch cover
2. Pressure plate
3. Diaphragm spring
4. Release bearing
5. Release shaft
6. Transmission right case
7. Clutch disc
8. Torsional spring
9. Input shaft bearing
10. Input shaft
11. Crankshaft
12. Flywheel

Fig. 7C1-1 Clutch Cutaway

CLUTCH MASTER CYLINDER

WHEN NOT OPERATING

As the piston is pushed to the right as shown in the figure below by the return spring force, no hydraulic pressure is generated in the chamber "a". The spring force also compresses the seal cup spring, opening the oil passage between the reservoir and the chamber "a".

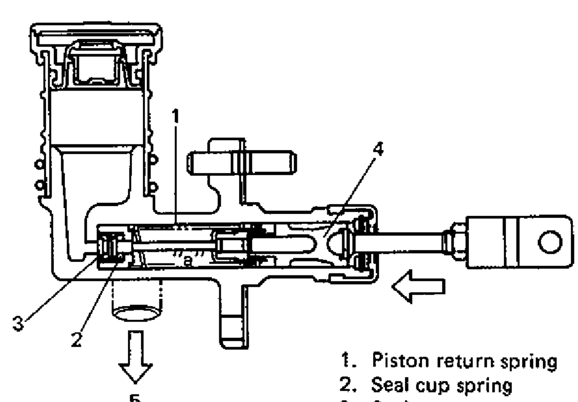


1. Piston return spring
2. Piston
3. Seal cup spring
4. Seal cup
5. Reservoir

Fig. 7C1-2-1

WHEN OPERATING

Depressing the clutch pedal causes the piston to move to the left as shown in the figure below, thereby the piston return spring is compressed. Then the seal cup, by its own spring force, closes the oil passage between the reservoir and the chamber "a". Immediately after this closure, hydraulic pressure is generated in the chamber "a" and it is applied to the operating cylinder on the transmission.



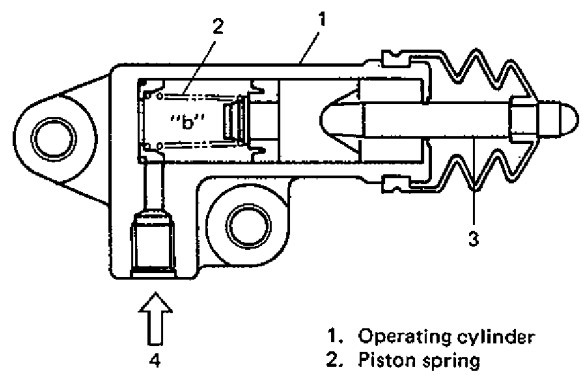
1. Piston return spring
2. Seal cup spring
3. Seal cup
4. Piston
5. To operating cylinder

Fig. 7C1-2-2

OPERATING CYLINDER

When the operating cylinder is not operating, the push rod is pushed against the release arm only by the piston spring force.

When it is operating, the hydraulic pressure from the clutch master cylinder is applied to the chamber "b". Then the piston pushes the push rod to move the clutch release arm, causing the clutch disc to operate.



1. Operating cylinder
2. Piston spring
3. Push rod
4. Hydraulic pressure from master cylinder

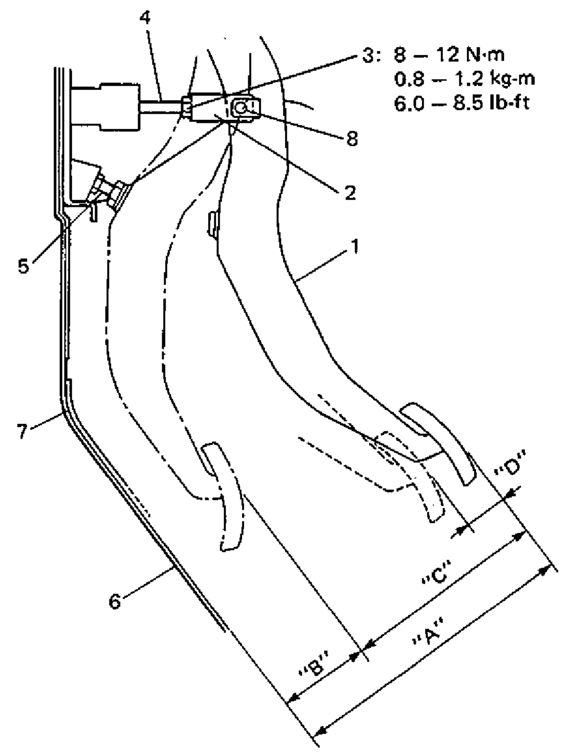
Fig. 7C1-2-3

DIAGNOSIS

Condition	Possible Cause	Correction
Slipping	• Improper clutch pedal free travel.	Replace clutch arm or master cylinder.
	• Worn on oily clutch disc facing.	Replace disc.
	• Warped disc, pressure plate or flywheel surface.	Replace disc, clutch cover or flywheel.
	• Weakened diaphragm spring.	Replace clutch cover.
	• Master cylinder piston or seal cup not returning.	Repair master cylinder.
Dragging clutch	• Improper clutch pedal free travel.	Replace clutch arm or master cylinder.
	• Weakened diaphragm spring, or worn spring tip.	Replace clutch cover.
	• Rusted input shaft splines.	Lubricate.
	• Damaged or worn splines of transmission input shaft.	Replace input shaft.
	• Excessively wobbly clutch disc.	Replace disc.
	• Clutch facings broken or dirty with oil.	Replace disc.
	• Fluid leakage.	Repair or replace.
Clutch vibration	• Glazed (glass-like) clutch facings.	Repair or replace disc.
	• Clutch facings dirty with oil.	Replace disc.
	• Release bearing slides unsmoothly on input shaft bearing retainer.	Lubricate or replace input shaft bearing retainer.
	• Wobbly clutch disc, or poor facing contact.	Replace disc.
	• Weakened torsion springs in clutch disc.	Replace disc.
	• Clutch disc rivets loose.	Replace disc.
	• Distorted pressure plate or flywheel surface.	Replace clutch cover or flywheel.
	• Weakened or loosened engine mounting bolt or nut.	Retighten or replace mounting.
Noisy clutch	• Worn or broken release bearing.	Replace release bearing.
	• Input shaft front bearing worn down.	Replace input shaft bearing.
	• Excessive rattle of clutch disc hub.	Replace disc.
	• Cracked clutch disc.	Replace disc.
	• Pressure plate and diaphragm spring rattling.	Replace clutch cover.
Grabbing clutch	• Clutch disc facings soaked with oil.	Replace disc.
	• Clutch disc facings excessively worn.	Replace disc.
	• Rivet heads showing out of facing.	Replace disc.
	• Weakened torsion springs.	Replace disc.

ON CAR SERVICE

INSPECT AND ADJUST CLUTCH PEDAL



1. Clutch pedal arm
2. Clutch master cylinder clevis
3. Clevis lock nut
4. Cylinder push rod
5. Pedal stopper bolt
6. Dash panel
7. Floor carpet
8. Clevis pin

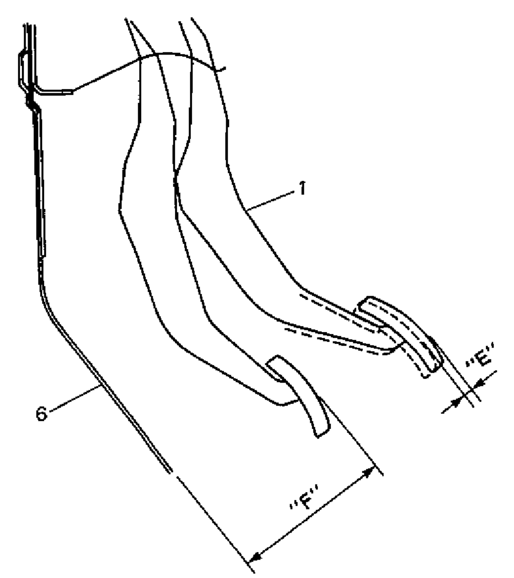


Fig. 7C1-3-1

CLUTCH PEDAL FREE HEIGHT "A"

1) Check "A" for conformance to below specification.

Clutch pedal height "A"	Left hand steering car	185 – 195 mm (7.30 – 7.65 in)
	Right hand steering car	182 – 192 mm (7.20 – 7.55 in)

2) If "A" is not within specification, adjust it by loosening clevis lock nut and turning push rod.
3) Be sure to tighten lock nut to specification after adjustment.

CLUTCH PEDAL DISTANCE "C"

1) Depress clutch pedal till pedal arm contacts stopper bolt and measure height "B" as shown. Then calculate "A" to "B" difference "C" and check it for conformance to below specification.

Clutch pedal distance "C"	Left hand steering car	130 – 140 mm (5.15 – 5.50 in)
	Right hand steering car	127 – 137 mm (5.00 – 5.35 in)

2) If "C" is not within specification, correct it by adjusting height of stopper bolt.

CLUTCH PEDAL FREE TRAVEL "D"

1) Depress clutch pedal, stop the moment clutch resistance is felt, and measure how much pedal has moved (clutch pedal free travel) as represented by "D" in figure. Then check its conformance to below specification.

Clutch pedal free travel "D"	7 – 14 mm (0.30 – 0.55 in)

2) If "D" is not within specification, check pedal arm and master cylinder and replace defective part.

CYLINDER PUSH ROD PLAY "E"

1) Press clutch pedal gradually with finger, stop when slight increase of resistance is felt and measure how much pedal has moved (push rod play) as respresented by "E" in figure. Then check its conformance to below specification.

Push rod play "E"	Max. 3 mm (0.12 in)

2) If "E" is not within specification, replace clevis pin or pedal arm.

PEDAL TO DASH PANEL CLEARANCE WHEN CLUTCH DISENGAGED "F"

1) Pull up parking brake fully and start engine.
2) Depress clutch pedal and shift gear into "1st" gear.
3) Release clutch pedal gradually, stop immediately before clutch is engaged and measure distance between clutch pedal surface and dash panel surface which is represented by "F" in figure.

Clutch pedal clearance "F"	75 mm (2.95 in) or more

4) If "F" is not within specification, it is possible that air is trapped in this system. If suspected so, bleed air.
   Upon completion of above inspection and adjustment, start engine and check clutch for proper operation.

CLUTCH FLUID PIPE AND HOSE

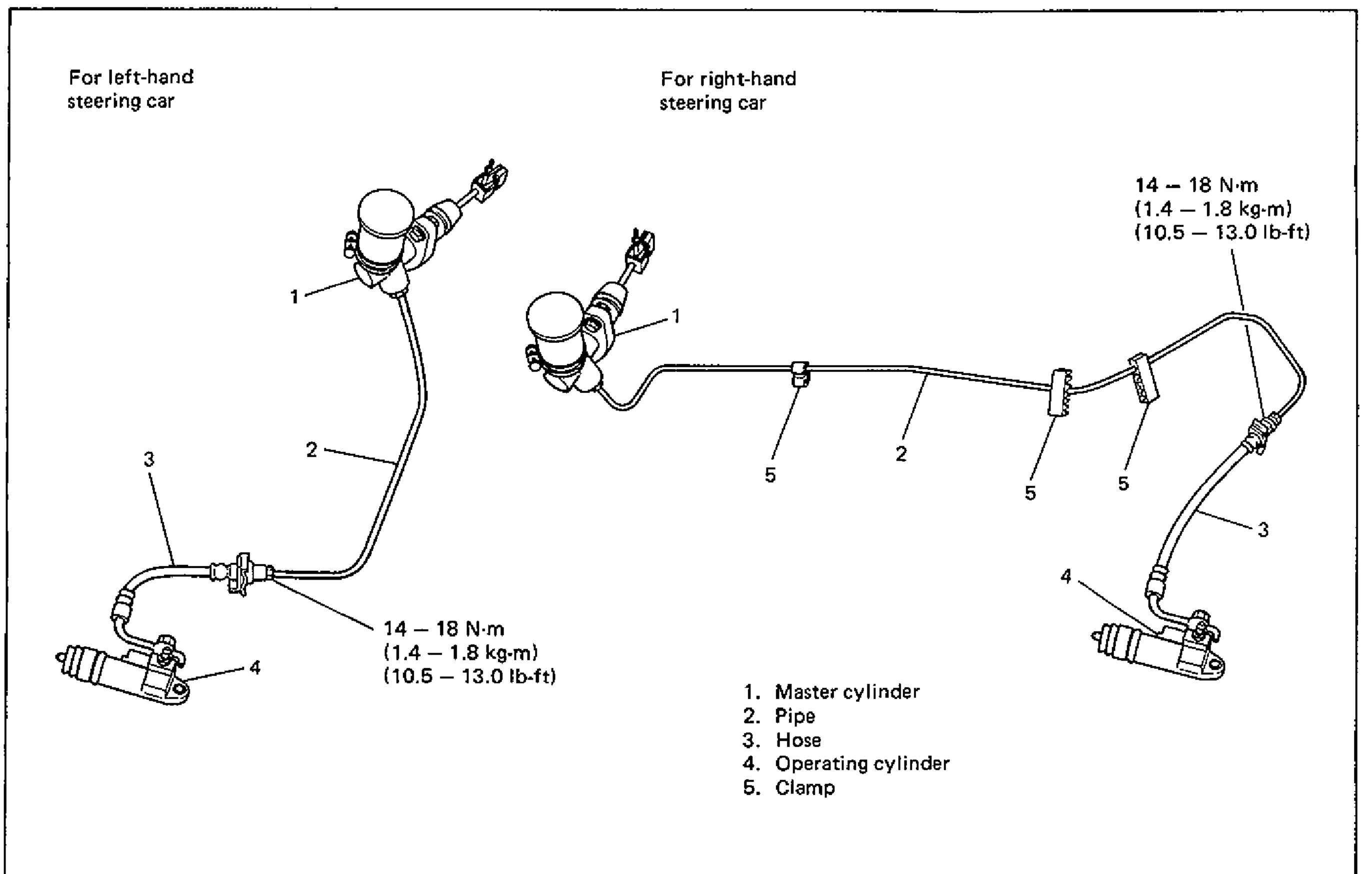


Fig. 7C1-4-1

REMOVAL

NOTE:
Do not allow fluid to get on painted surface.

1) Remove dust and dirt from each joint of hose and pipe to be disconnected and clean around reservoir cap.
2) Take out fluid with syringe or such.
3) Disconnect fluid pipe from hose.

NOTE:
To disconnect pipe from hose, separate them by using flare nut wrench and spanner so as not to kink them.

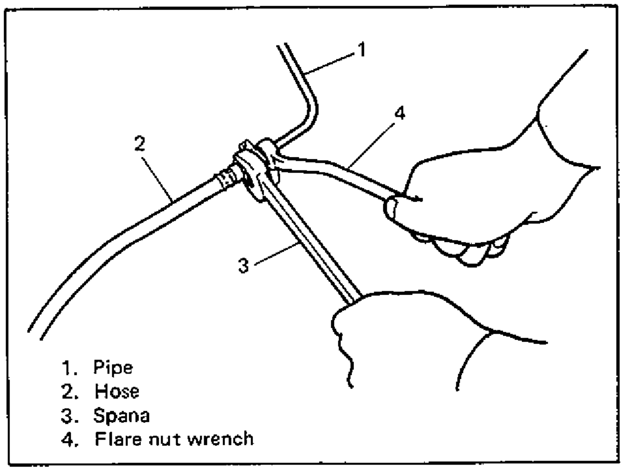


Fig. 7C1-4-2

INSPECTION

Check pipe and hose for dent, kink, crack, dirt and dust. Replace if check result is not satisfactory.

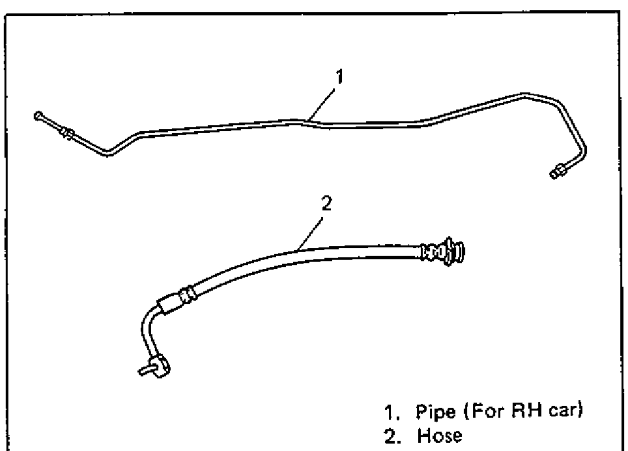


Fig. 7C1-4-3

INSTALLATION

Reverse removal sequence noting following points.

NOTE:
- **For air bleeding of master cylinder alone, it must be removed from car body. (For procedures of removal and installation of master cylinder ass'y and air bleeding, refer to CLUTCH MASTER CYLINDER section.)**
- **Do not allow fluid to get on painted surface.**
- **Do not allow pipe and hose to contact hard against car body or other parts.**
- **Install each clamp securely.**
- **For installation angle of each hose, refer to Fig. 7C1-4-1.**
- **Install E-ring securely as shown below.**

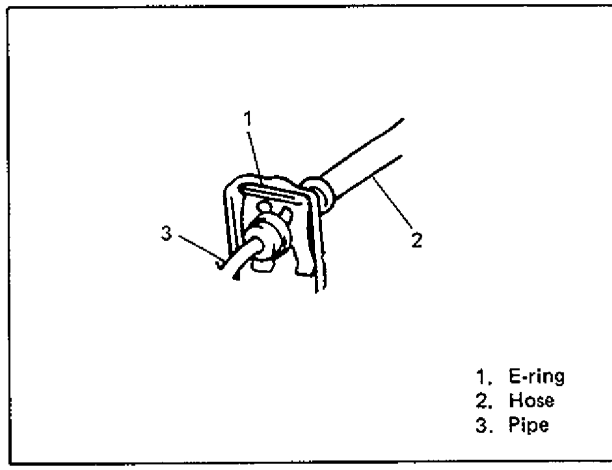


Fig. 7C1-4-4

- **After installation, check clutch pedal free travel and bleed air from system.**
- **Check fluid leakage.**
- **Add fluid close to MAX level of reservoir.**

CLUTCH MASTER CYLINDER

REMOVAL

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Remove push rod clevis pin.
3) Disconnect fluid pipe from master cylinder.

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

4) Remove master cylinder attaching nuts.
5) Remove master cylinder ass'y and gasket.

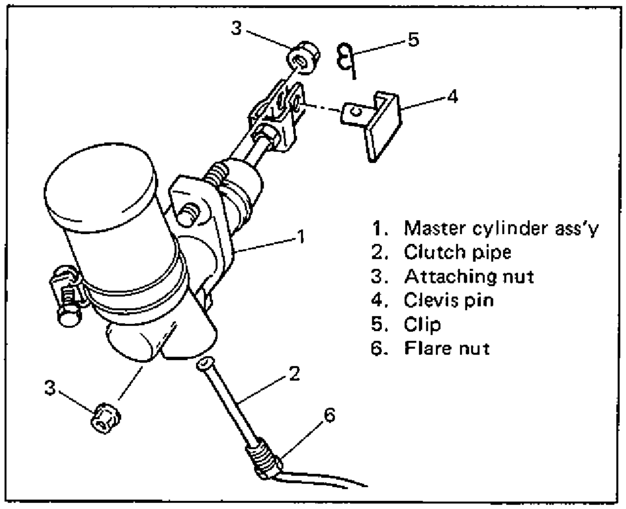


Fig. 7C1-5-1

INSTALLATION

1) To bleed air from master cylinder itself, tilt it as shown below and add fluid into it.

NOTE:
After bleeding air from master cylinder, plug pipe hole in it to prevent fluid from spilling out of it till pipe is connected.

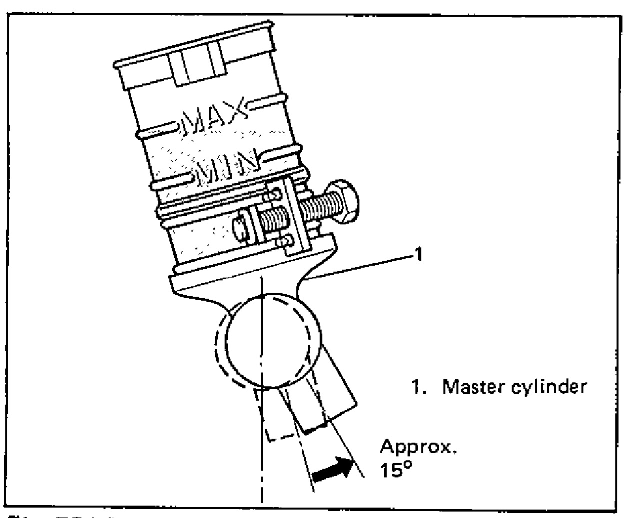


Fig. 7C1-5-2

2) Install master cylinder ass'y and new gasket to body, attaching nuts and push rod clevis pin.

NOTE:
Do not reuse gasket.

3) Torque attaching nuts to specification.
4) Connect fluid pipe and torque flare nut to specification.

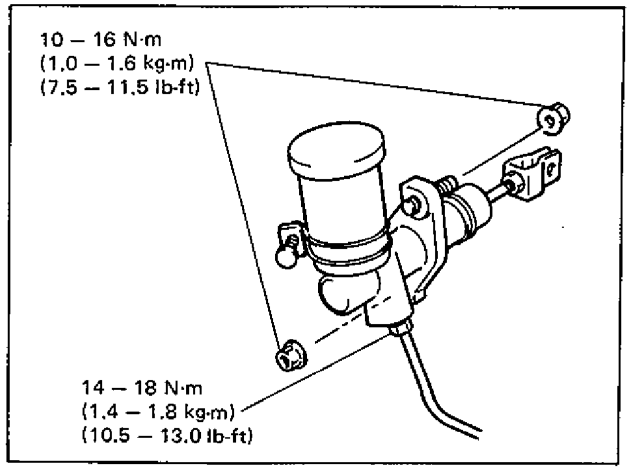


Fig. 7C1-5-3

5) Install push rod clevis pin.
6) Fill reservoir with specified brake fluid and check fluid leakage.
7) After installation, bleed air from system and check clutch pedal free travel. (Refer to BRAKE section for air bleed procedure.)

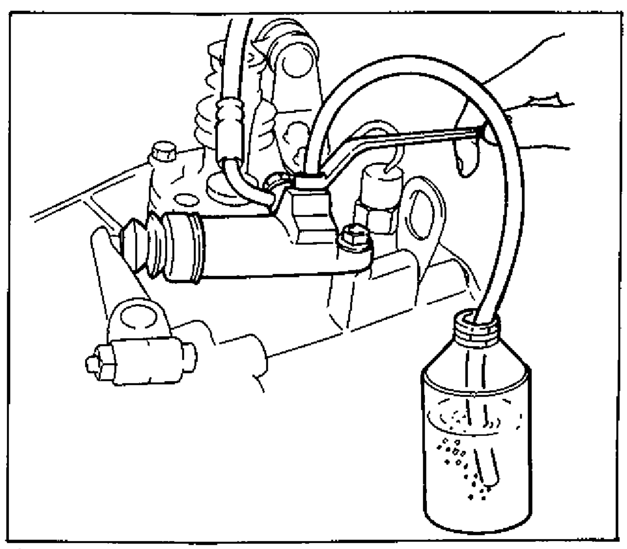


Fig. 7C1-5-4

DISASSEMBLY AND ASSEMBLY CLUTCH MASTER CYLINDER

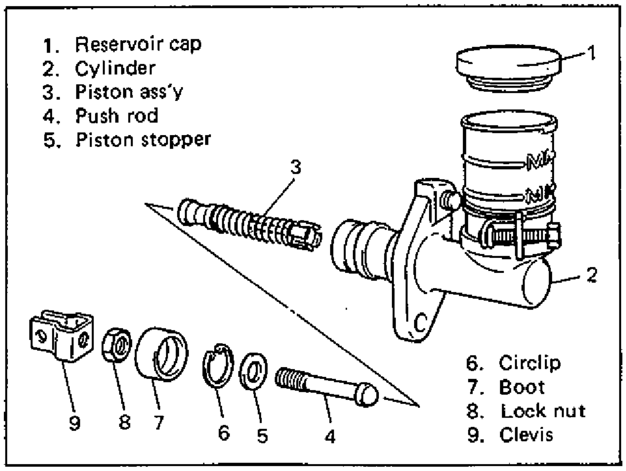


Fig. 7C1-6-1 Component Parts Of Master Cylinder

DISASSEMBLY

1) Remove boot and then circlip with piston pushed in.

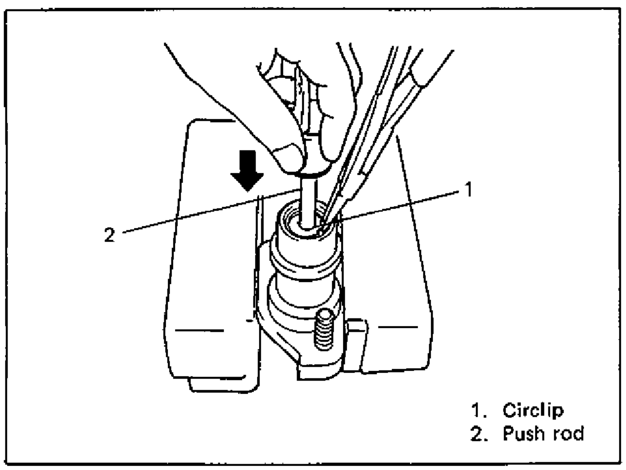


Fig. 7C1-6-2

2) Blow compressed air gradually into hole for pipe connection to remove piston ass'y, using care to prevent it from jumping out.

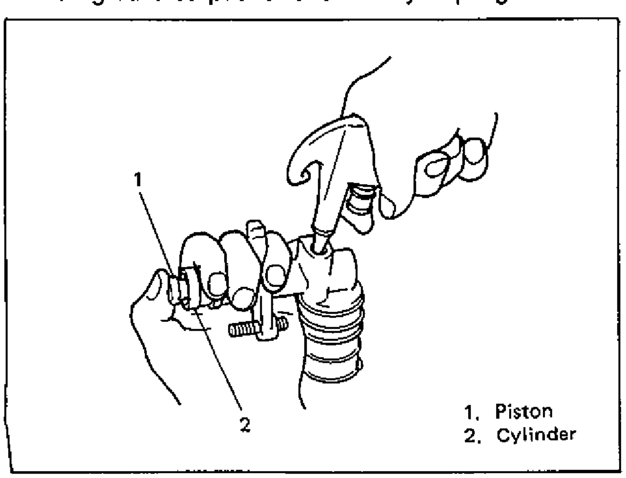


Fig. 7C1-6-3

INSPECTION

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:

- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston ass'y and circlip.**

Inspect cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:

Polishing bore of cylinder with cast aluminum body with anything abrasive is prohibited, as damage to cylinder bore may occur.

Rinse cylinder in clean brake fluid. Shake excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept away from cylinder bore surfaces.

ASSEMBLY

NOTE:

Before installation, wash each part in specified brake fluid.

1) Apply brake fluid to inside of piston ass'y and cylinder body.
2) Install piston ass'y into cylinder.
3) With piston pushed down, install circlip as shown below. And install boot.

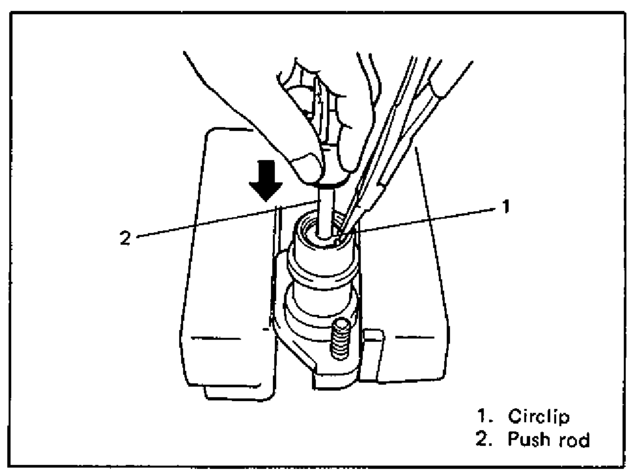


Fig. 7C1-6-4

4) For installation of master cylinder to car body, refer to INSTALLATION described previously.

CLUTCH OPERATING CYLINDER

REMOVAL

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

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Disconnect fluid hose from operating cylinder.
3) Remove operating cylinder attaching bolts and operating cylinder.

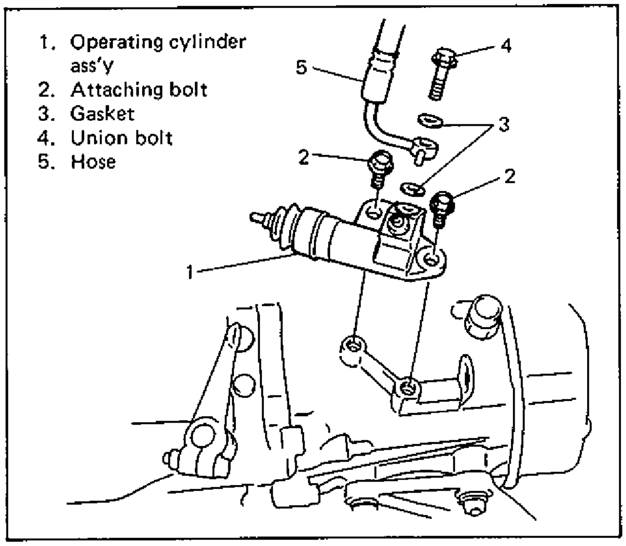


Fig. 7C1-7-1

INSTALLATION

1) For air bleeding of master cylinder alone, it must be removed from car body.
(For procedures of removal and installation of master cylinder ass'y and air bleeding, refer to CLUTCH MASTER CYLINDER section.)
2) Apply small amount of grease to rod tip.

NOTE:
Don't allow any grease to be on boot.

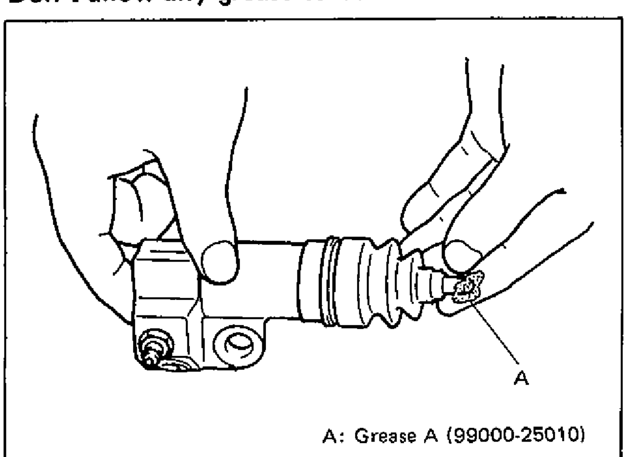


Fig. 7C1-7-2

3) Install clutch operating cylinder and torque attaching bolts to specification.
4) Connect clutch fluid hose and torque union bolt to specification.

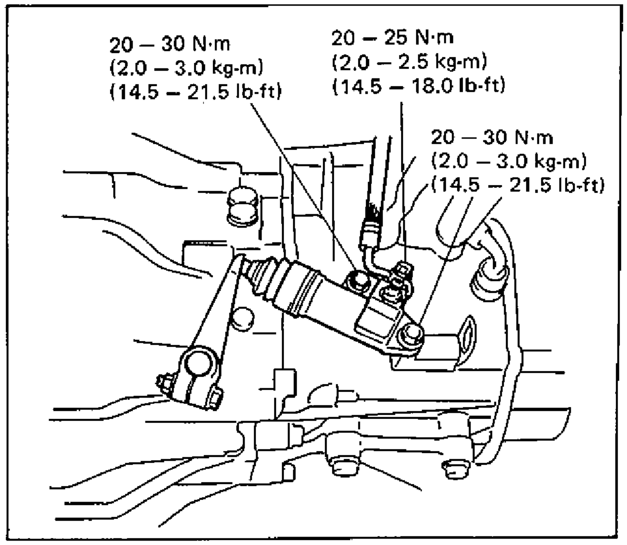


Fig. 7C1-7-3

5) Fill reservoir with specified brake fluid and check for fluid leakage.
6) Bleed air from system and check clutch pedal free travel. (Refer to BRAKE section for air bleed procedure.)

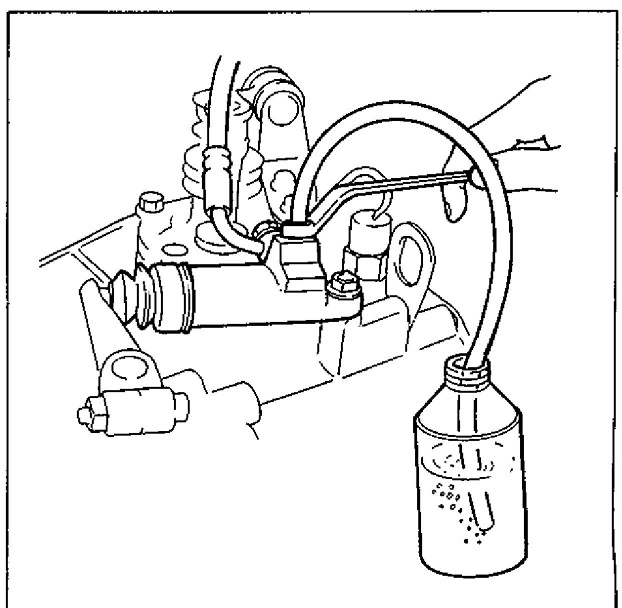


Fig. 7C1-7-4

DISASSEMBLY AND ASSEMBLY CLUTCH OPERATING CYLINDER

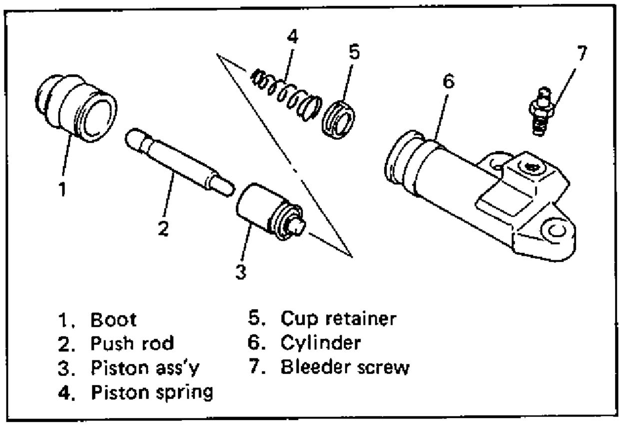


Fig. 7C1-8-1

DISASSEMBLY

1) Remove boot and then push rod.
2) Remove piston by blowing compressed air into bolt hole where hose was connected, using care to prevent it from jumping out.

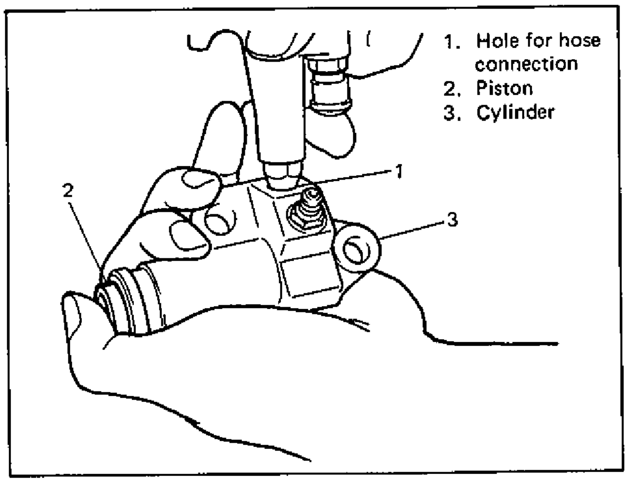


Fig. 7C1-8-2

INSPECTION

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:
- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston cups.**

Inspect cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:
Polishing bore of cylinder with anything abrasive is prohibited, as damage to cylinder bore may occur.

Rinse cylinder in clean brake fluid. Shake excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept away from cylinder bore surfaces.

ASSEMBLY

NOTE:
Before installation, wash each part in specified brake fluid.

1) Assemble piston referring to Fig. 7C1-8-1.
2) Apply brake fluid to piston ass'y and inside of cylinder.
3) Install piston ass'y into cylinder. When inserting it, be careful not to cause damage to lip of piston cup.

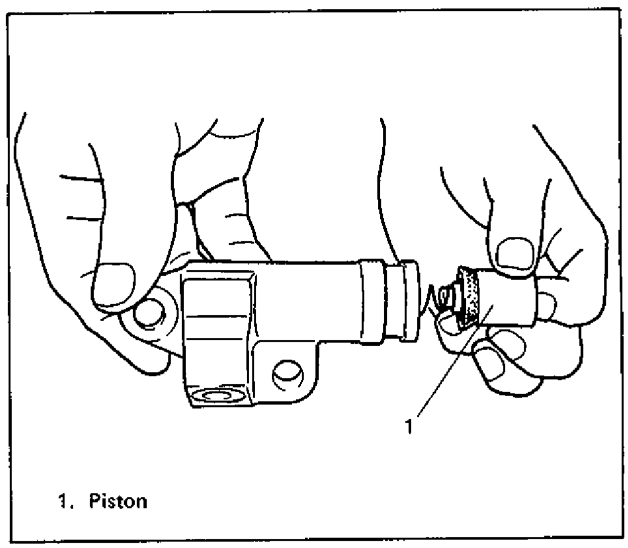


Fig. 7C1-8-3

4) Install boot and push rod.
5) For installation of operating cylinder to car body, refer to CYLINDER INSTALLATION described previously.

INSPECT FLUID

Fluid level should be always between MIN and MAX lines on reservoir. If fluid decreases quickly, check for leakage, repair leaky point, if any, and add fluid up to MAX level.

NOTE:
Brake fluid damages painted surface badly. Should it get on painted surface, remove it immediately and clean surface thoroughly.

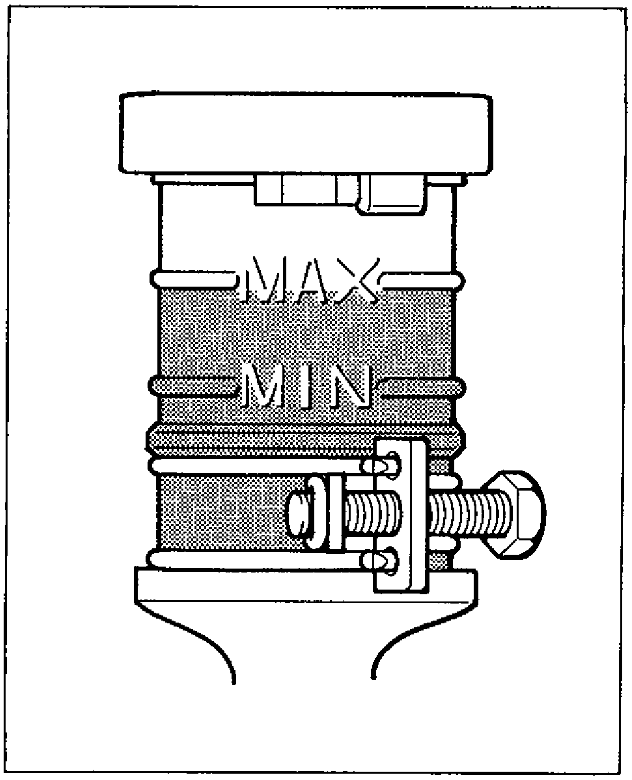


Fig. 7C1-9

NOTE:
- **Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use container which has been used for mineral oil or which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic clutch system and water will mix with brake fluid, lowering fluid boiling point. Keep all fluid containers capped to prevent contamination.**
- **Make sure not to use fluid whose container cap was first opened more than a year ago.**

UNIT REPAIR OVERHAUL

CLUTCH COVER, CLUTCH DISC AND FLYWHEEL

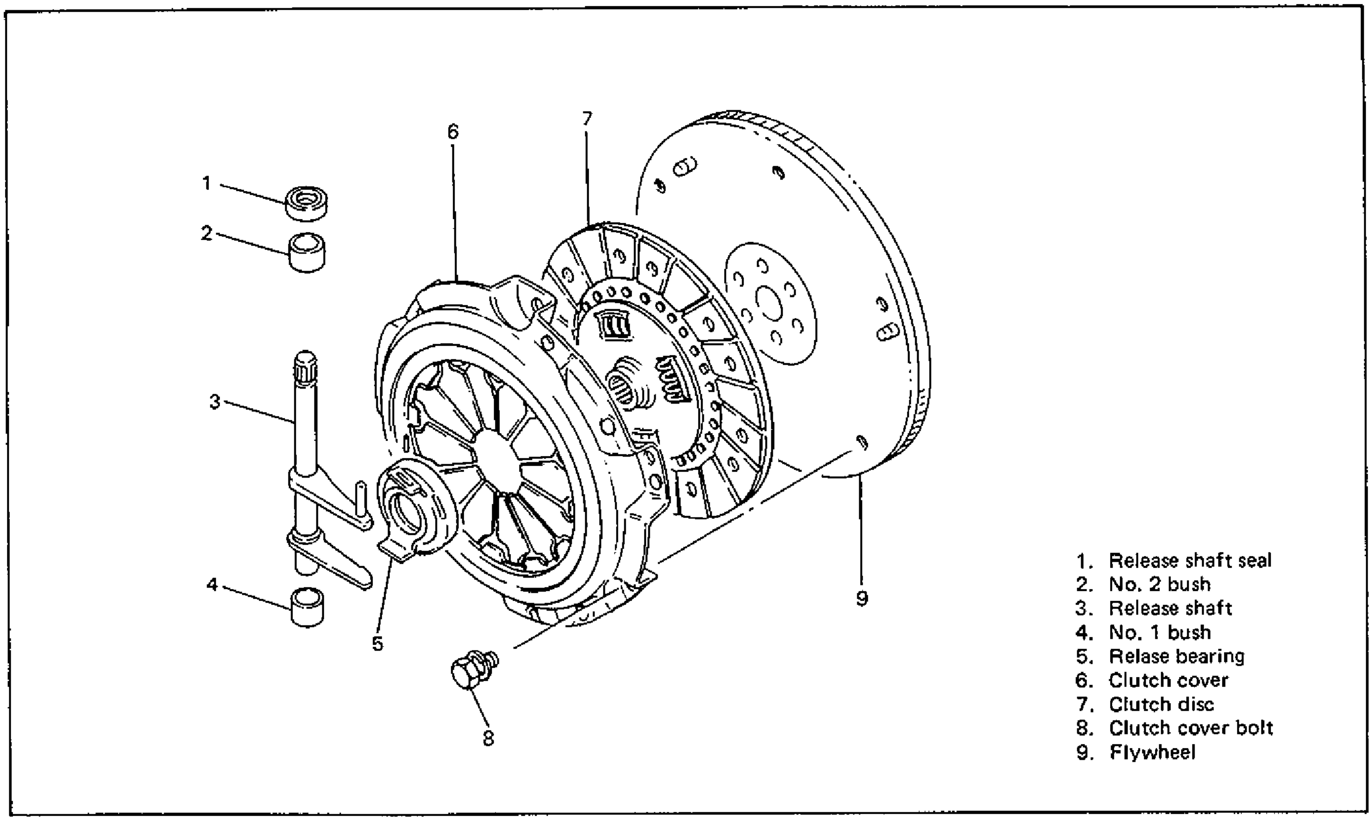


Fig. 7C1-10-1 Clutch Exploded View

DISMOUNTING AND REMOUNTING

Refer to SECTION 7A.

REMOVAL

1) Hold flywheel stationary with special tool and remove clutch cover bolts, clutch cover and clutch disc.

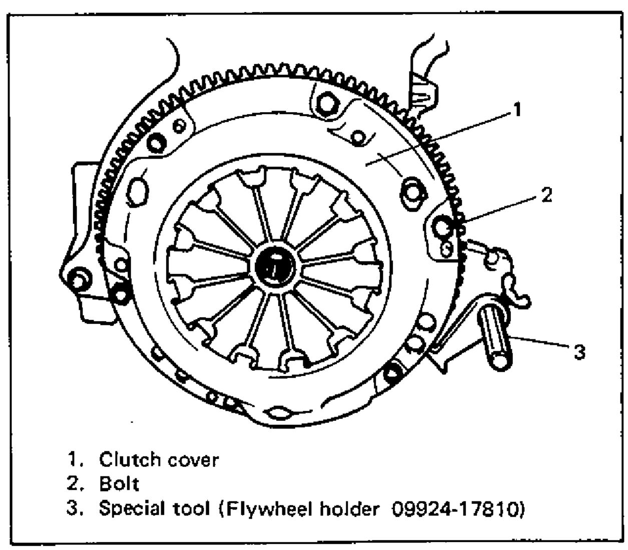


Fig. 7C1-10-2 Removing Clutch Cover

2) Remove flywheel.

INSPECTION

Input Shaft Bearing

Check bearing for smooth rotation and replace it if abnormality is found.

Clutch Disc

1) Measure depth of rivet head depression, i.e. distance between rivet head and facing surface. If depression is found to have reached service limit at any of holes, replace disc assembly.

	Standard	Service limit
Rivet head depth	1.3 mm (0.05 in)	0.5 mm (0.02 in)

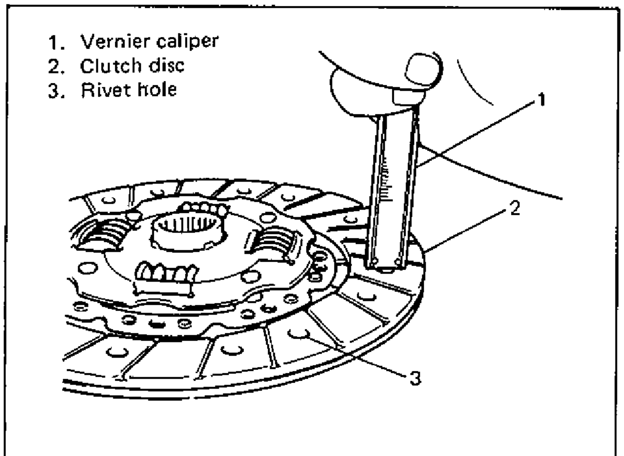


Fig. 7C1-10-3 Measuring Rivet Head Depth

2) If hardened facing surface or adherance of grease on it is found, replace disc.
3) Replace disc if spline is worn, rivet is loosened, torsion spring is weakened or broken.
4) Also replace disc if surface deflection exceeds 1 mm.

Clutch Cover

1) Check diaphragm spring for abnormal wear or damage.
2) Inspect pressure plate for wear or heat spots.
3) If abnormality is found, replace it as assembly. Do not disassemble it into diaphragm and pressure plate.

Flywheel

Check surface contacting clutch disc for abnormal wear or heat spots. Replace or repair as required.

INSTALLATION

NOTE:

Before assembling, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

1) Install flywheel to crankshaft and tighten bolts to specification.

	N·m	kg·m	lb-ft
Tightening torque for flywheel bolts	75 – 80	7.5 – 8.0	54.5 – 57.5

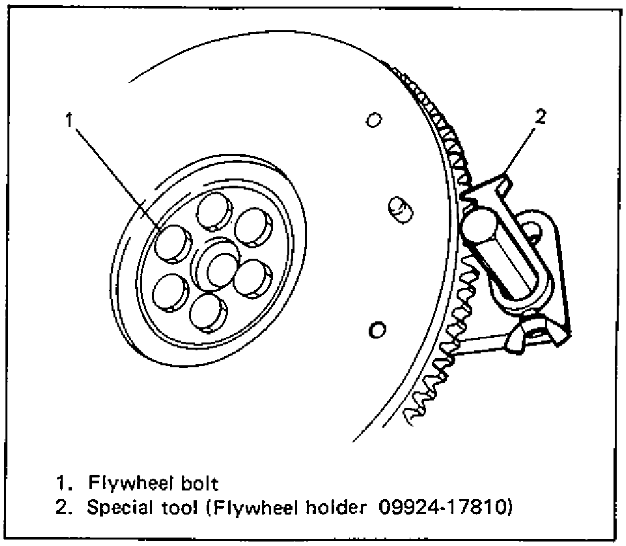


Fig. 7C1-10-4 Installing Flywheel

2) When replacing new input shaft bearing, install input shaft to flywheel by using special tool.

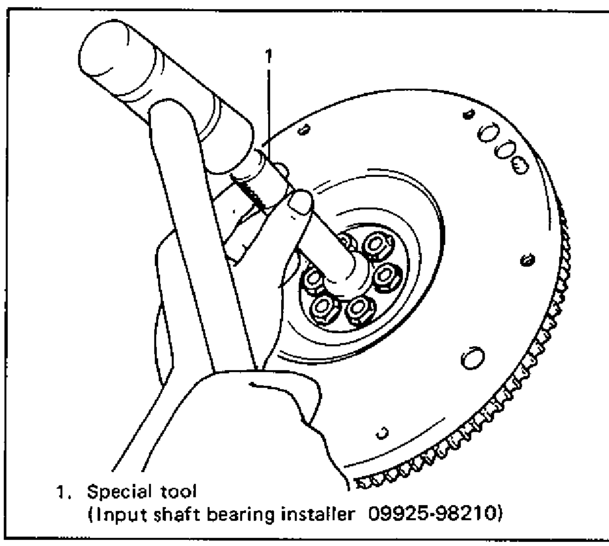
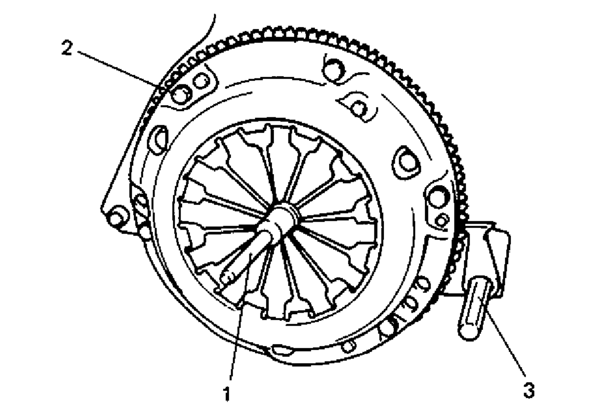


Fig. 7C1-10-5 Installing Input Shaft Bearing

3) Aligning clutch disc with flywheel center by using special tool, install clutch cover and bolts. Then tighten bolts to specification.

NOTE:
- **While tightening clutch cover bolts, compress clutch disc with special tool (clutch center guide) by hand so that disc is centered.**
- **Tighten cover bolts little by little evenly in diagonal order.**
- **Be sure not to allow oil to get on clutch disc facing.**

Tightening torque for clutch cover bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

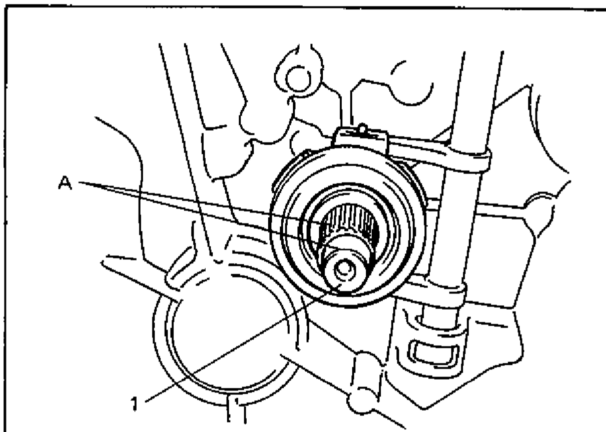


1. Special tool (Clutch center guide 09923-36320)
2. Clutch cover bolt
3. Special tool (Flywheel holder 09924-17810)

Fig. 7C1-10-6 Installing Clutch Disc and Cover

4) Slightly apply grease to input shaft, then join transmission assembly with engine. Refer to SECTION 7A for remounting procedure.

NOTE:
Turn crankshaft a little through flywheel gear while inserting transmission input shaft to clutch disc until splines mesh.



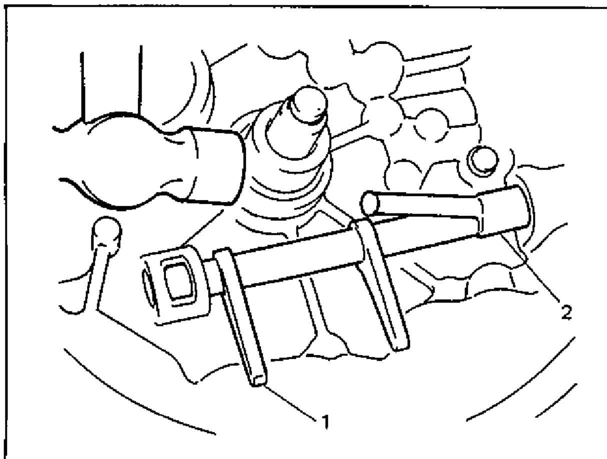
1. Input shaft
A: Slightly apply grease (Suzuki super grease I 99000-25210)

Fig. 7C1-10-7 Lubricating Input Shaft

CLUTCH RELEASE SYSTEM

REMOVAL

1) Take out release bearing by turning release shaft.
2) Remove release arm by loosening its bolt.
3) Drive out No. 2 bush by using special tool and hammer. Release shaft seal will also be pushed out.



1. Release shaft
2. Special tool (Bush remover 09922-46010)

Fig. 7C1-11-1 Removing Release Shaft Bush No. 2

4) Remove release shaft.
5) For removal of No. 1 bush, tap it by using M16 x 1.5 tap.

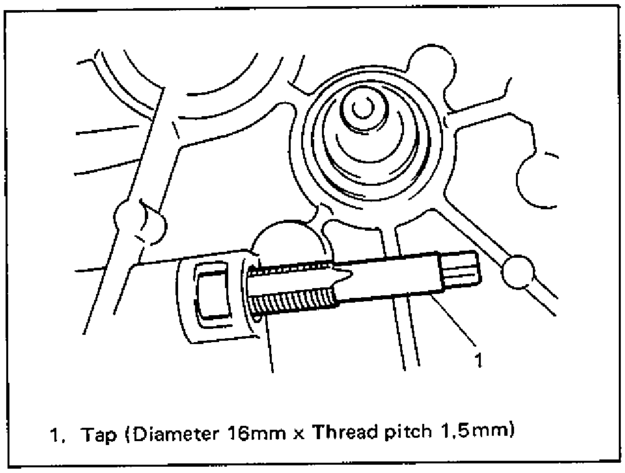


Fig. 7C1-11-2 Tapping Bush No. 1

6) Leaving tap in No. 1 bush, screw in joint pipe over tap, join sliding shaft with joint pipe, and then drive out bush.

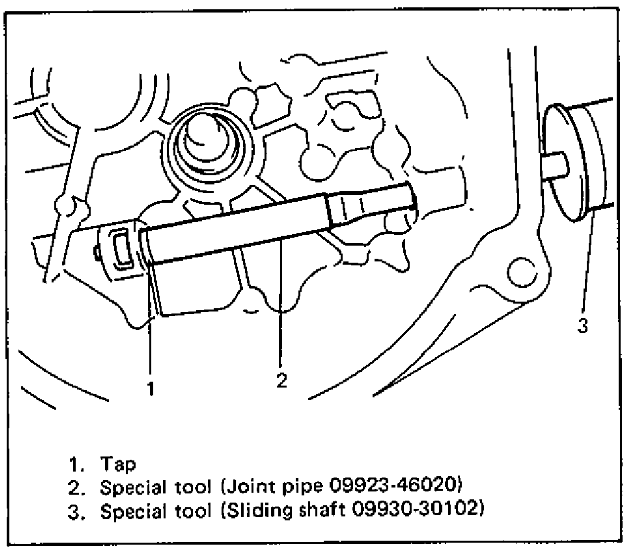


Fig. 7C1-11-3 Removing Bush No. 1

INSPECTION

1) Check clutch release bearing for smooth rotation.
2) Inspect smoothness of release bearing retaining portion of transmission case and correct or replace right case as necessary.
3) Check sliding part of release shaft for wear and damage.
4) Check sliding part of release arm for wear and damage.

CAUTION:
Do not wash release bearing. Washing may cause grease leakage and consequential bearing damage.

INSTALLATION

1) Drive in a new No. 1 bush by using adequate drive handle and hammer and then apply grease to bush inside.

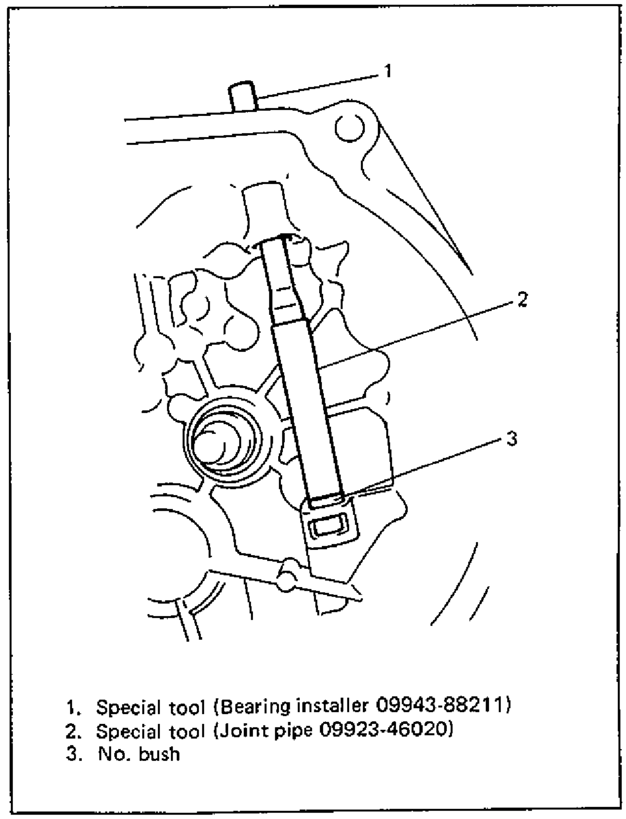
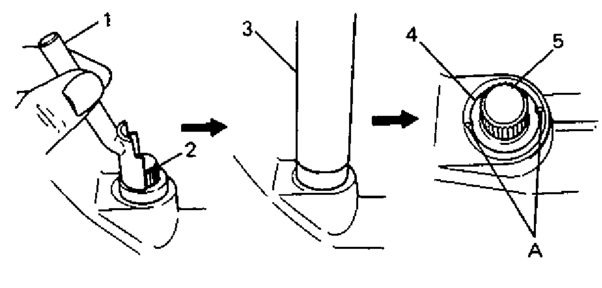


Fig. 7C1-11-4 Installing Bush No. 1

2) Install release shaft.
3) Apply grease to No. 2 bush inside and press-fit it by using the same special tool as in removal.

NOTE:
Check release shaft for smooth movement.

4) Coat grease to shaft seal and then install it till it is flush with case surface. Use special tool for this installation and face seal lip downward (inside).
5) Caulk seal at A by using caulking tool and hammer.

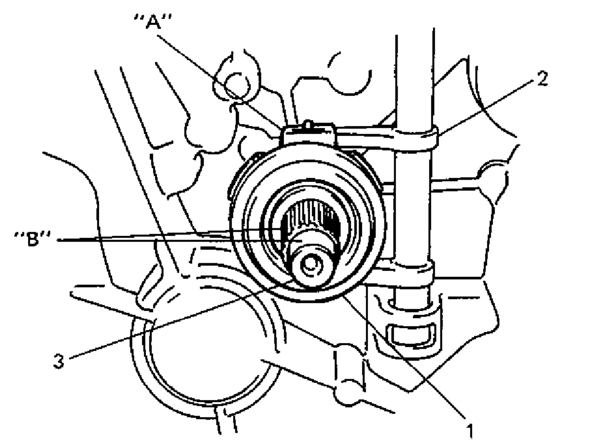


1. Special tool (Bush remover 09925-48210)
2. No. 2 bush (Apply Suzuki super grease A 99000-25010)
3. Special tool (Bearing installer 09925-98221)
4. Shaft seal (Apply Suzuki super grease A)
5. Release shaft

A: Caulking

Fig. 7C1-11-5 Installing Bush No. 2 and Shaft Seal

6) Apply grease to sliding surfaces "A" of release shaft arm and release bearing and install release bearing.
7) Apply small amount of grease to input shaft spline and front end "B" as well.



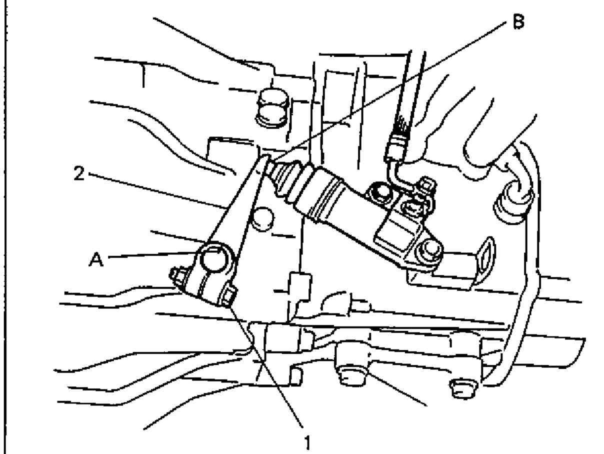
1. Release bearing
2. Release shaft arm
3. Input shaft

A: Apply grease sufficiently (Suzuki super grease A 99000-25010)
B: Slightly apply grease (Suzuki super grease I 99000-25210)

Fig. 7C1-11-6 Lubricating Release System and Input Shaft

8) Set release arm to release shaft aligning their punch marks, then tighten bolt.
9) If clutch operating cylinder has been removed or replaced, install it with 2 bolts.

Tightening torque	N·m	kg-m	lb-ft
Release arm bolt	10 – 16	1.0 – 1.6	7.5 – 11.5
Operation cylinder bolts	18 – 28	1.8 – 2.8	13.5 – 20.0



1. Release arm bolt
2. Release arm

A: Align punch marks
B: Apply grease (Suzuki super grease A 99000-25010)

Fig. 7C1-11-7 Installing Clutch Release Arm

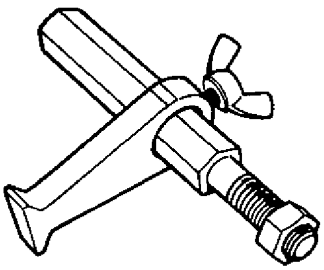
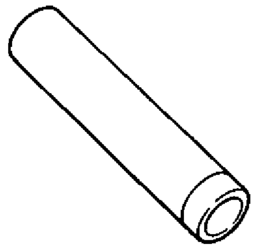
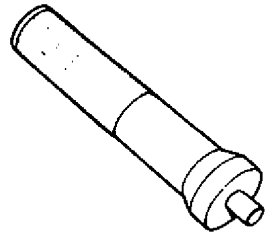
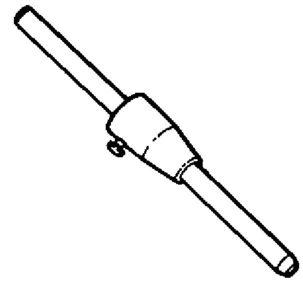
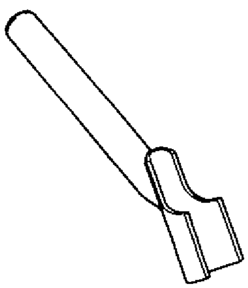
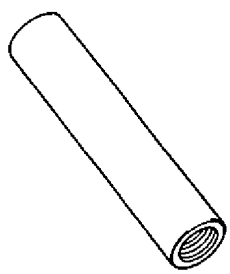
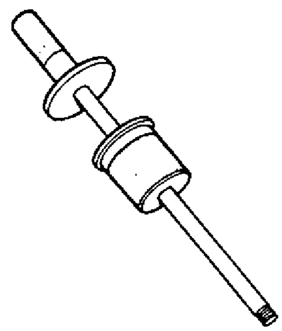
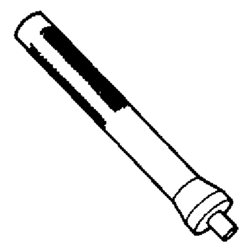
RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Flare nut	14 – 18	1.4 – 1.8	10.5 – 13.0
2. Master cylinder nut	10 – 16	1.0 – 1.6	7.5 – 11.5
3. Flywheel bolts	75 – 80	7.5 – 8.0	54.5 – 57.5
4. Clutch cover bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
5. Release arm bolt	10 – 16	1.0 – 1.6	7.5 – 11.5
6. Operating cylinder bolt	20 – 30	2.0 – 3.0	14.5 – 21.5
7. Clutch hose union bolt	20 – 25	2.0 – 2.5	14.5 – 18.0

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Clutch master cylinder clevis pin. • Release shaft bushes and seal. • Release shaft arm. • Push rod tip of operating cylinder.
	SUZUKI SUPER GREASE I (99000-25210)	Input shaft spline and front end.
Clutch fluid (Brake fluid)	DOT3 or SAE J1703	• Clutch reservoir. • Clutch master cylinder. • Clutch operating cylinder.

SPECIAL TOOLS

1  09924-17810 Flywheel holder	2  09925-98221 Bearing installer	3  09925-98210 Input shaft bearing installer	4  09923-36320 Clutch center guide
5  09922-46010 Bush remover	6  09923-46020 Joint pipe	7  09930-30102 Sliding shaft	8  09943-88211 Bearing installer

SECTION 8

BODY ELECTRICAL SYSTEM

CONTENTS

GENERAL DESCRIPTION 8- 1
Wiring 8- 1
BODY ELECTRICAL SYSTEM 8- 2
Fuses 8- 2
Switches 8- 4
INSTRUMENTS AND GAUGES 8- 6
Combination Meter Wiring 8- 6
Trouble Diagnosis 8- 7
Fuel Level Meter and Gauge Unit 8- 8
Water Temperature Meter and Gauge Unit 8- 9
Oil Pressure Light 8-11
Brake Fluid Level Warning Light 8-12
Seat Belt Warning Light/Buzzer (For Canadian spec. only) 8-13
Main Switch Key Remainder Warning Buzzer For European Spec. (If equipped) 8-15
Main Switch Key Remainder Warning Buzzer For Canadian Spec. 8-16
Light Remainder Warning Buzzer For European Spec. (If equipped) 8-17
Light Remainder Warning Buzzer and Interior (Dome) Light For Canadian Spec. 8-18
ON CAR SERVICE 8-19
Lighting Systems 8-19
Cigar Lighter and Radio (Optional) 8-28
Interior (Dome) Light 8-28
Windshield wipers and Washer 8-29
Rear Window Defogger (If equipped) 8-35
Daytime Running Light Control System For European Spec. (If equipped) 8-38
Daytime Running Light Control System For Canadian Spec. 8-40
Headlight Beam Leveling System (If equipped) 8-43
Central Locking System (If equipped) [Power Door Lock System (If equipped)] 8-44
Power Window Control System 8-46
Wiring Harness 8-47
Grounding Points 8-49
Wiring Diagram .... Wiring diagrams are attached at the end of this manual.

GENERAL DESCRIPTION

The body electrical components of this car are designed to operate on 12 volts power supplied by the battery. The electrical system utilizes negative ground polarity.

WIRING

All body low voltage wires are insulated. The insulation is color coded for identification of individual body circuit.

BODY ELECTRICAL SYSTEM

FUSES

The main fuse block is located on the fender apron panel in the engine room and junction/fuse block is installed to underside of instrument cover panel.
The designation and location of each fuse are shown below.

> **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 equipments including main switch.**

MAIN FUSE BLOCK CIRCUIT

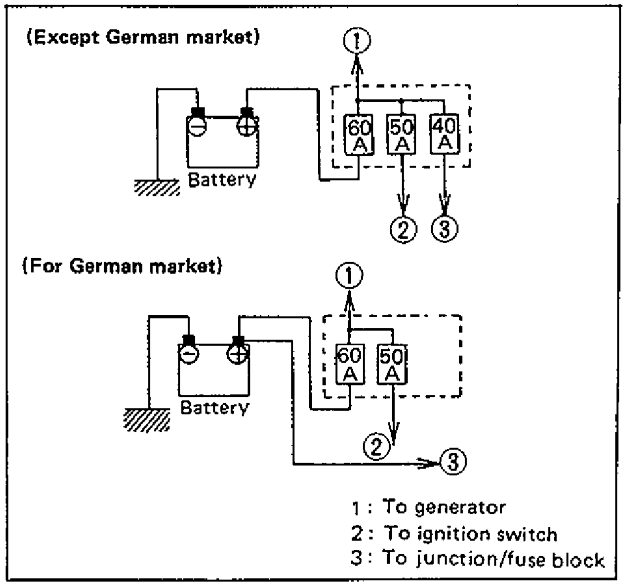
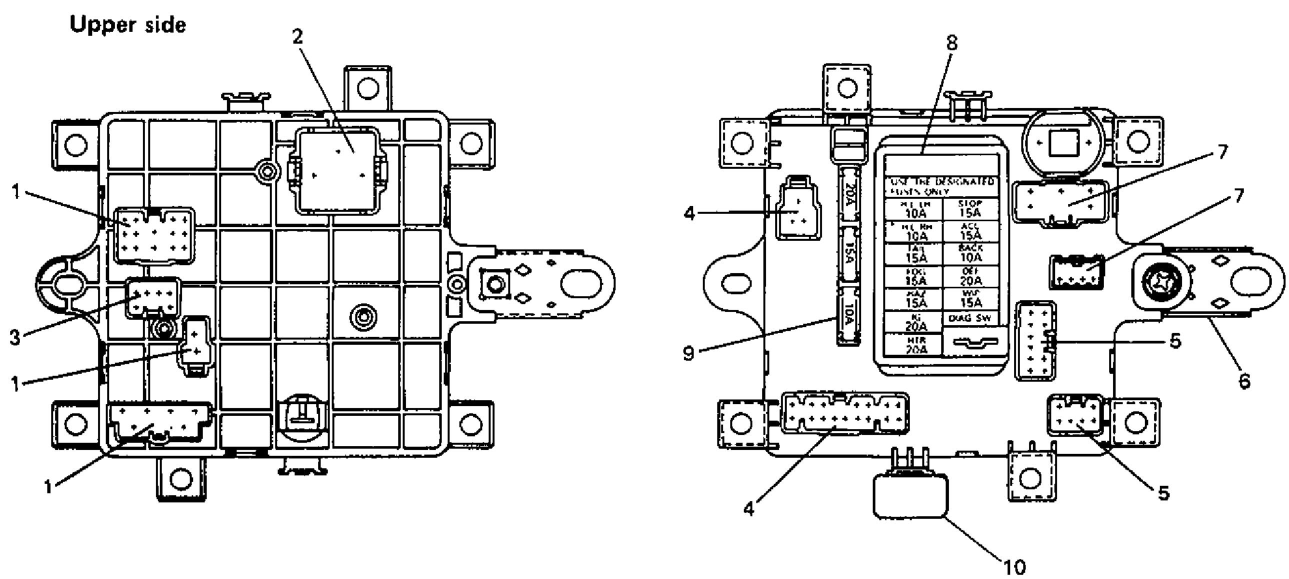


Fig. 8-1 Main Fuse Block Circuit

JUNCTION/FUSE BLOCK CIRCUIT AND FUSE BLOCK DESIGNATIONS



1. To main wiring harness No. 1
2. Turn signal relay
3. To floor wiring harness No. 3
4. To instrument panel wiring harness No. 2
5. To turn signal/dimmer switch
6. Grounding bracket
7. To main switch
8. Fuse block
9. Spare fuses
10. Power door lock fuse (If equipped)

Fig. 8-2-1

NOTE:
For German market fuse box, refer to right figure.

1	2	3	4	5	6	7
10A HEAD R	10A HEAD L	10A STOP	10A DOME	10A SMALL	10A TAIL R	10A TAIL L
8	9	10	11	12	13	14
20A IG.	20A HEATER	20A REAR DEF.	15A WIPER WASHER	10A TURN BACK	15A HAZARD	15A ACC
15						
15A FRONT FOG						

Fig. 8-2-2

JUNCTION/FUSE BLOCK CIRCUIT AND COLOR CODES

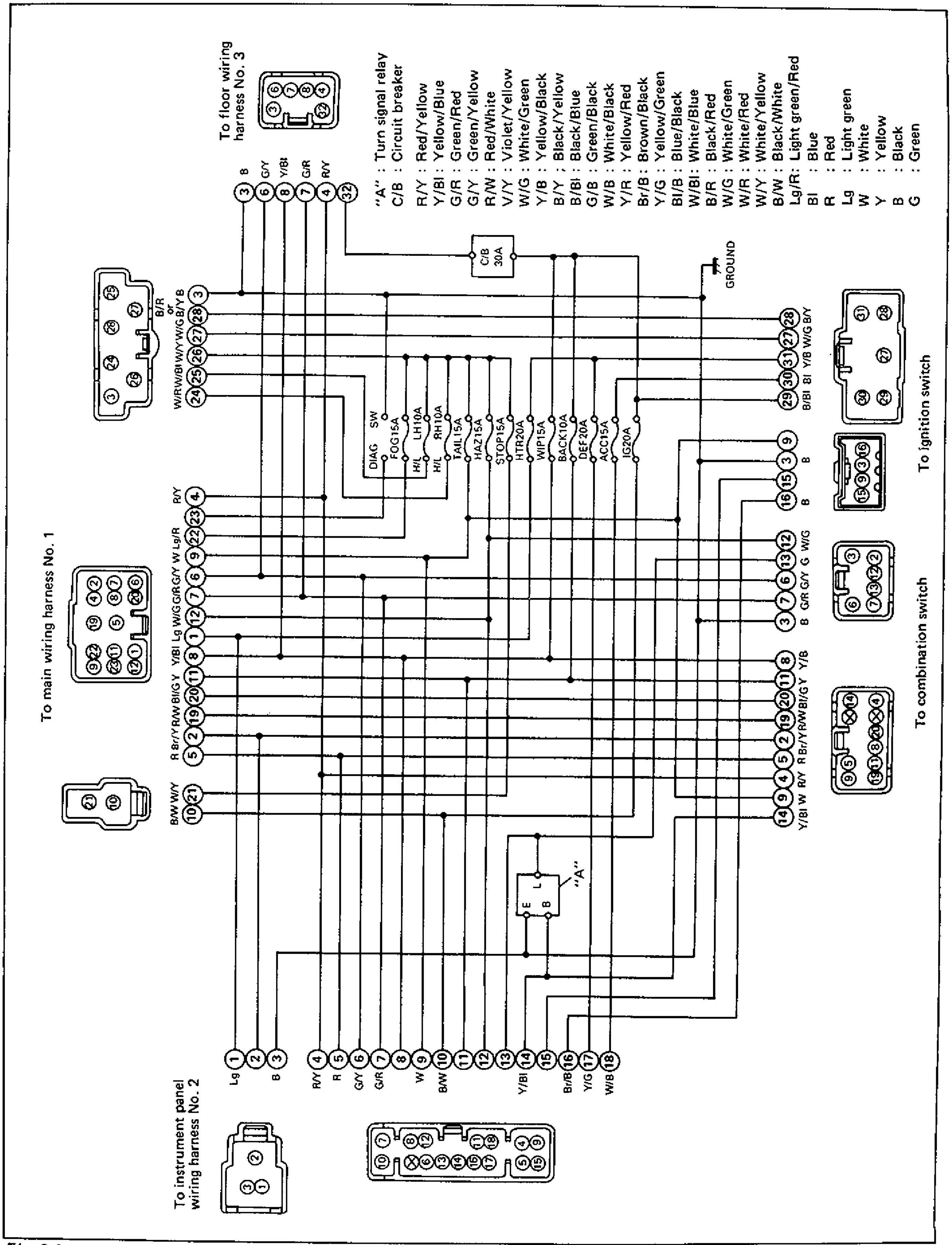


Fig. 8-3

SWITCHES

IGNITION SWITCH

Inspection

Remove or disconnect following parts.

1) Battery (—) cable.
2) Ignition switch lead wire connectors from junction/fuse block.

Checking continuity between terminals

Use a circuit tester to check the continuity at each switch position. If any continuity is not obtained, replace ignition switch.

Key	Position \ Wire color	W/G	Bl	B/Bl	Y/B	B/Y	B	B
OUT	LOCK	O						
IN	ACC	O	O					
	ON	O	O	O	O			
	START	O		O		O	O	O

ACC : Accessory
B/Bl : Black/Blue
W/G : White/Green
Y/B : Yellow/Black
B : Black
Bl : Blue
B/Y : Black/Yellow

Fig. 8-4 Continuity Check

Removal

Remove steering column referring to Section 3C-3 of this manual. And then remove steering lock/ignition switch from steering column, referring to Section 3C.

Installation

Install steering lock/ignition switch and steering column referring to Section 3C of this manual.

NOTE:

When installing steering column, special care must be used for tightening sequence and each torque.

COMBINATION SWITCH

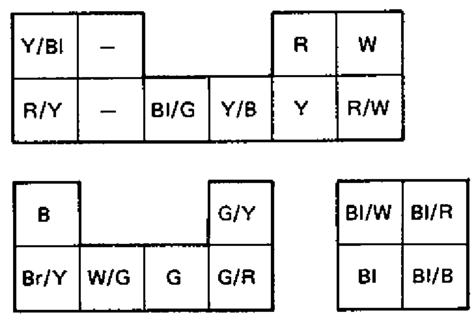
Combination switch incorporates lighting turn signal, hazard warning light dimmer, passing light, and wiper/washer switches.

Inspection

Remove or disconnect following parts.

1) Battery (—) cable.
2) Combination switch lead wire connectors from junction/fuse block (or main wiring harness No. 1).

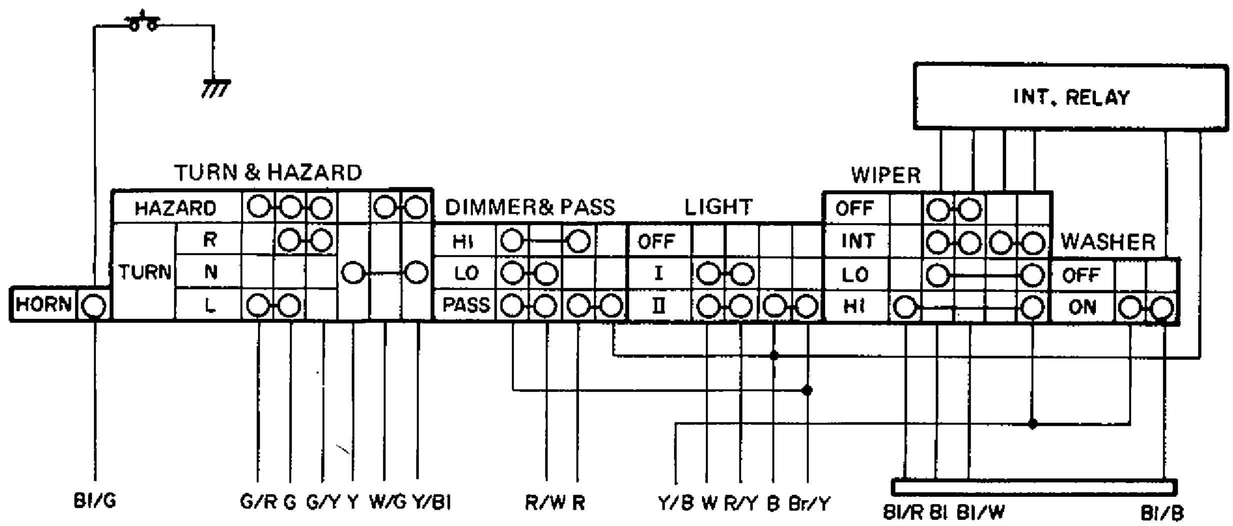
Combination switch couplers



B : Black
Bl : Blue
Bl/B : Blue/Black
Bl/R : Blue/Red
Bl/W : Blue/White
Bl/G : Blue/Green
Br/Y : Bronw/Yellow
G : Green
G/Y : Green/Yellow
G/R : Green/Red
R : Red
R/W : Red/White
R/Y : Red/Yellow
Y : Yellow
Y/Bl : Yellow/Blue
Y/B : Yellow/Black
W : White
W/G : White/Green

Fig. 8-5

Continuity between terminals



B : Black
Bl : Blue
Bl/B : Blue/Black
Bl/G : Blue/Green
Bl/R : Blue/Red
Bl/W: Blue/White
Br/Y: Brown/Yellow
G : Green
G/R : Green/Red
G/Y : Green/Yellow
R : Red
R/W : Red/White
R/Y : Red/Yellow
W : White
W/G : White/Green
Y : Yellow
Y/B : Yellow/Black
Y/Bl : Yellow/Blue

Fig. 8-6

Bl/G, horn lead wire, produces no continuity inside turn signal switch.

Removal/Installation

For removal/installation of combination switch, refer to Section 3C of this manual.

NOTE:

Some cars are not provided with INTERMITTENT position depending on specifications.

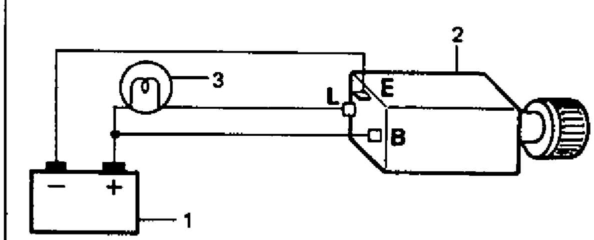
ILLUMINATION CONTROLLER

Some cars are not provided with this device depending on specifications.

Inspection

Use a bulb to wire as illustrated below.

Make sure that illumination controller knob is turned clockwise to brighten test light and counterclockwise to darken it.

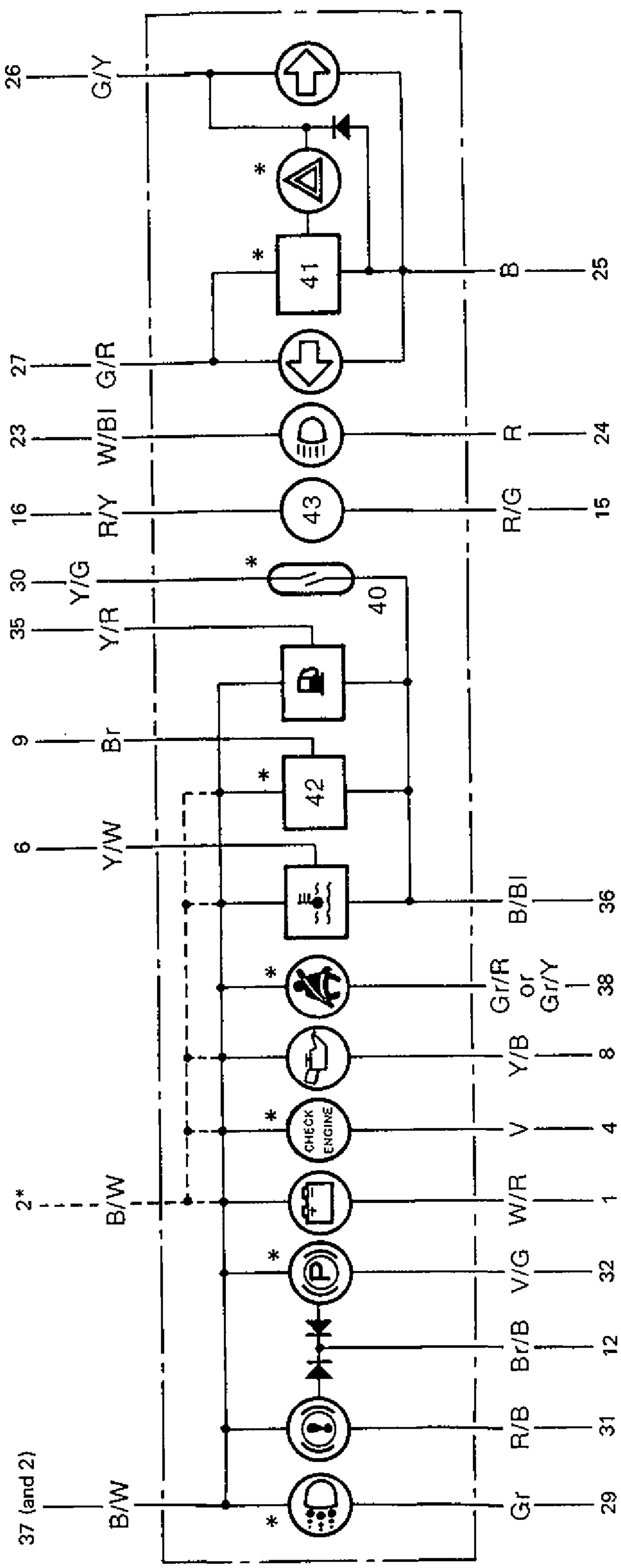


1. Battery
2. Illumination controller
3. Test light (12V, 3.4W)

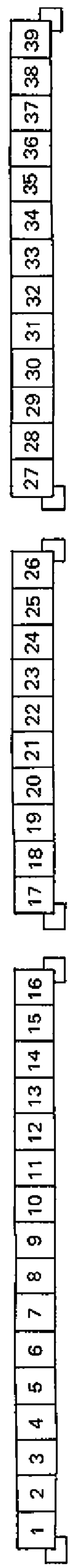
Fig. 8-7

INSTRUMENTS AND GAUGES

COMBINATION METER WIRING



NOTE:
- **Whether equipped with * (asterisk) marked parts or not depend on car specification.**
- **Terminal position (Combination meter side)**



1. To generator
2. To ignition switch
3. Blank
4. To ECM
5. Blank
6. To water temperature gauge unit
7. Blank
8. To oil pressure switch
9. To ignition coil ⊖ (for car with tachometer)
10. ⎤Blank
11. ⎦
12. To ignition
13. ⎤Blank
14. ⎦
15. To illumination controller
16. To lighting switch
17. 18, 19, 20, 21, 22. Blank
23. To fuse block
24. To dimmer switch
25. To ground (or earth)
26. To turn signal switch (Right)
27. To turn signal switch (Left)
28. Blank
29. To DRL controller
30. To ECM
31. To brake fluid level switch and parking brake switch
32. To parking brake switch
33. ⎤Blank
34. ⎦
35. To fuel gauge unit
36. To ground
37. To ignition switch
38. To seat belt switch (Left)
39. Blank
40. Speed sensor
41. Hazard circuit
42. Tachometer
43. Illumination

Fig. 8-8 Combination Meter Wiring

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Fuel level meter shows no operation.	Meter fuse blown Fuel meter faulty Fuel level gauge unit faulty Wiring or grounding faulty	Replace fuse to check for short. Check meter. Check gauge unit. Repair.
Water temperature meter shows no operation.	Meter fuse blown Water temperature meter faulty Water temperature gauge unit faulty Wiring or grounding faulty	Replace fuse to check for short. Check meter. Check gauge unit. Repair.
Oil pressure light shows no lighting.	Light fuse blown Bulb burnt out Oil pressure switch faulty Wiring or grounding faulty	Replace fuse to check for short. Replace bulb. Check switch. Repair.
Brake warning light (parking brake light) shows no lighting.	Light fuse blown Bulb burnt out Brake fluid level switch faulty Wiring or grounding faulty	Replace fuse to check for short. Replace bulb. Check warning switch. Repair.
Seat belt warning light/ buzzer show no lighting/ sounding. (Applicable to car equipped with light/ buzzer)	Light fuse blown Bulb burnt out Buzzer faulty (no sounding) Wiring or grounding faulty	Replace fuse to check for short. Replace bulb. Replace buzzer. Repair.

FUEL LEVEL METER AND GAUGE UNIT

DESCRIPTION OF CIRCUIT

The fuel level meter circuit consists of the fuel level meter installed inside the combination meter and the fuel level gauge installed to the fuel tank.

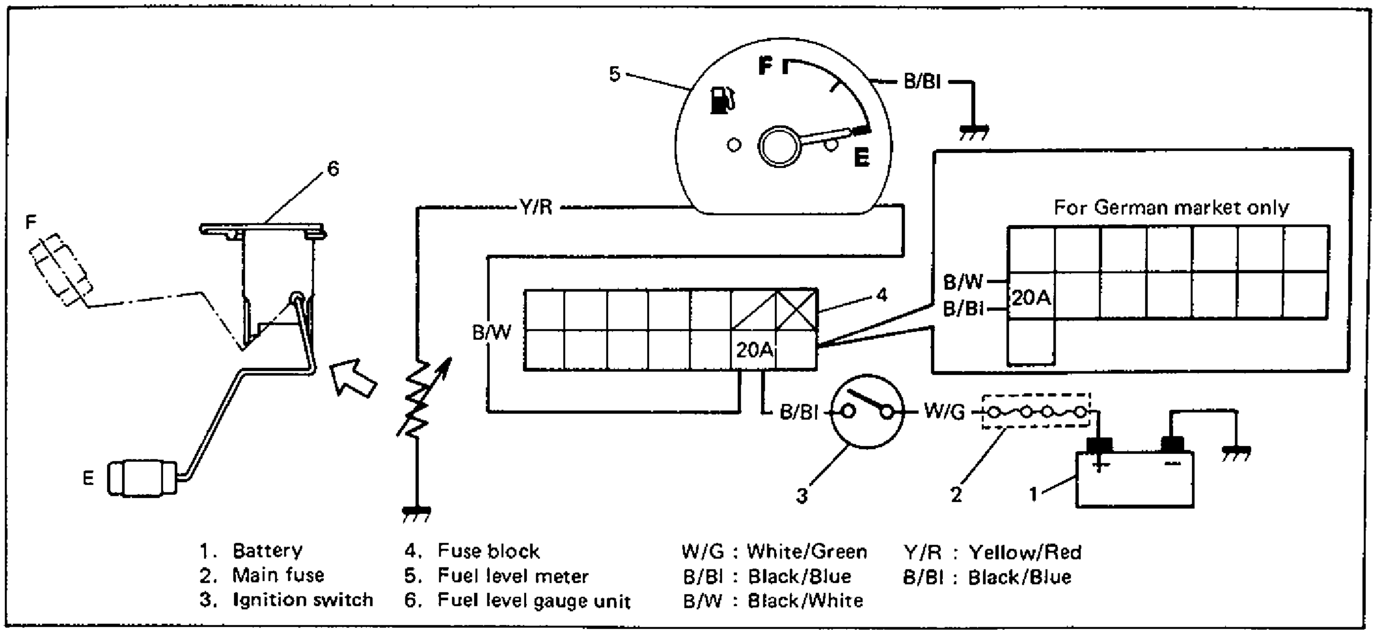


Fig. 8-9

Current flowing through the meter coil is changed to control the meter pointer. That is, when fuel is full, the fuel level gauge unit resistance is decreased with more current flowing into the meter coil, causing the meter pointer to point at the "F" position.

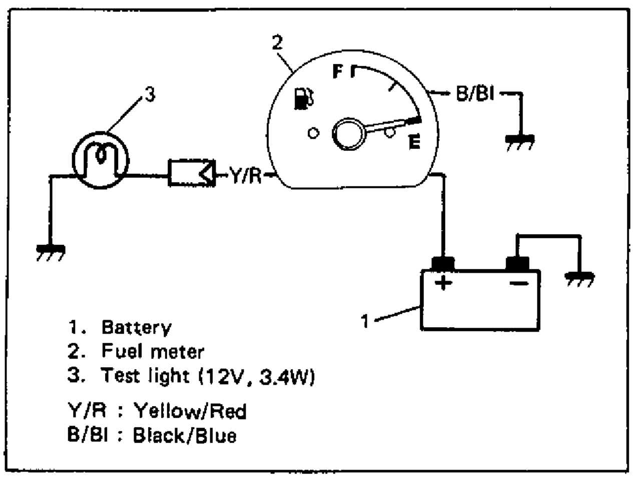


Fig. 8-10 Checking Fuel Level Meter

INSPECTION

FUEL LEVEL METER

1) Remove rear seat.
2) Disconnect Y/R (Yellow/Red) lead wire going to gauge unit.
3) Use a bulb (12V 3.4W) in position to ground above lead wire as illustrated.
4) Turn ignition switch ON.
   Make sure that bulb is lighted with meter pointer fluctuating several seconds thereafter.
   If meter is faulty, replace.

GAUGE UNIT

Use an ohmmeter to confirm that resistance of level gauge unit changes with change of float position. Float position-to-resistance relationship can be plotted in a graph as shown below.

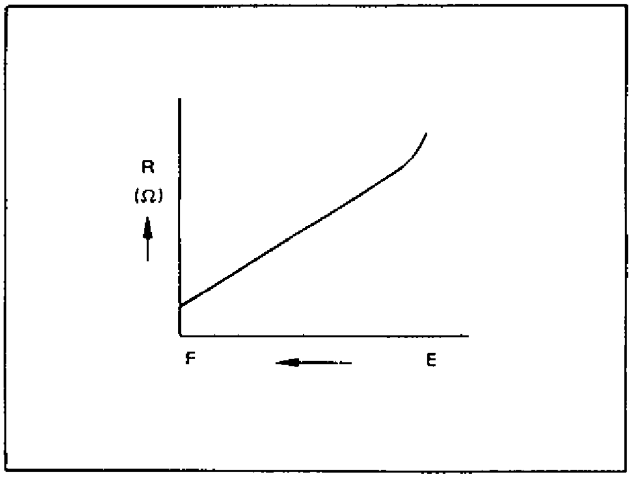


Fig. 8-11 Resistance-Fuel Level Relationship

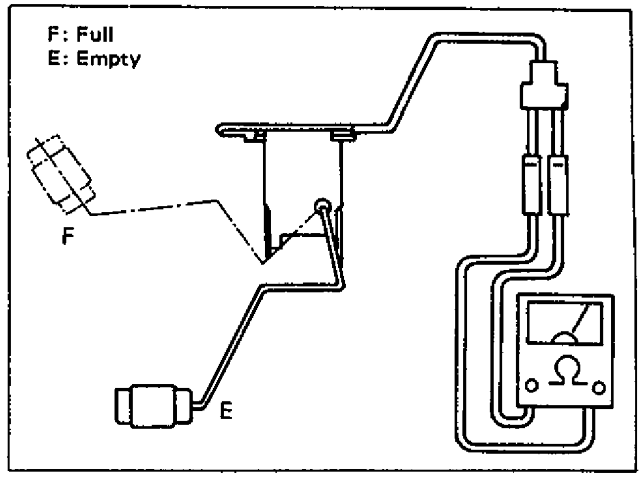


Fig. 8-12 Checking Fuel Gauge Unit

Position	Resistance
E	120 ± 8 Ω
F	3 ± 2 Ω
1/2	32.5 ± 4 Ω

WATER TEMPERATURE METER AND GAUGE UNIT

DESCRIPTION OF CIRCUIT

The water temperature meter is located in the instrument panel and its gauge unit on the inlet manifold. This circuit is as shown below.

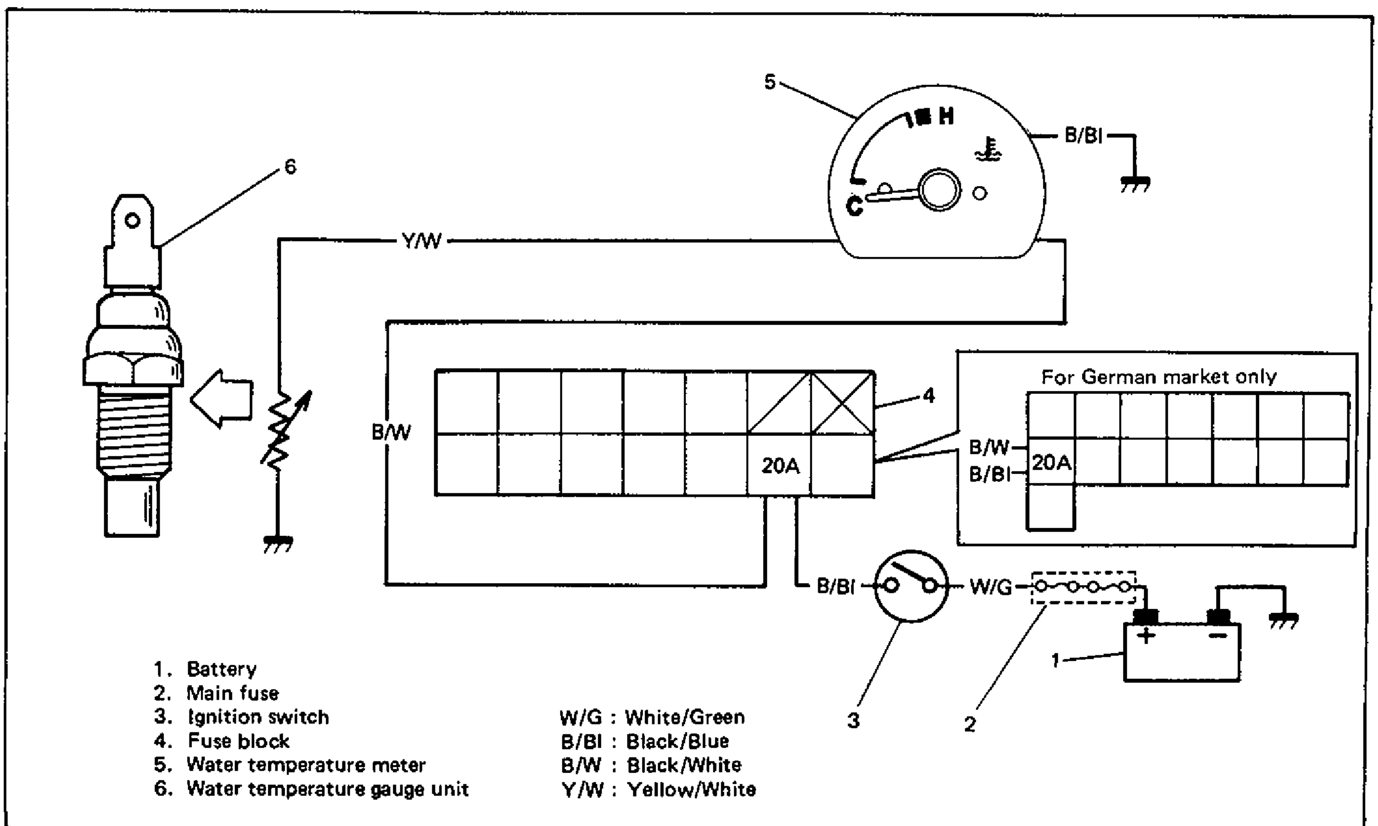


Fig. 8-13 Water Temperature Gauge Circuit

The gauge unit shows different resistance values depending on the coolant temperature. This causes a current flowing through the temperature meter coil to change, controlling the meter pointer. That is, when the coolant temperature rises, the gauge unit resistance is decreased with more current flowing through the meter coil, thus allowing the meter pointer to move away from the "C" position.

INSPECTION

WATER TEMPERATURE METER

1. Disconnect Y/W (Yellow/White) lead wire going to gauge unit installed to intake manifold.
2. Use a bulb (12V 3.4W) in position to ground above wire as illustrated.
3. Turn ignition switch ON. Confirm that bulb is lighted with meter pointer fluctuating several seconds thereafter.
   If meter is faulty, replace.

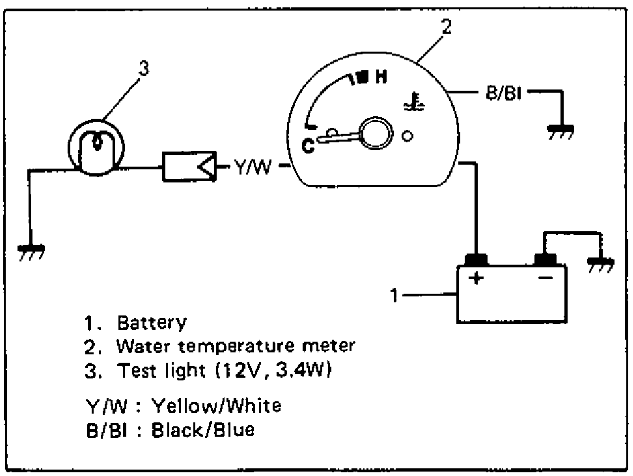


Fig. 8-14 Checking Water Temperature Meter

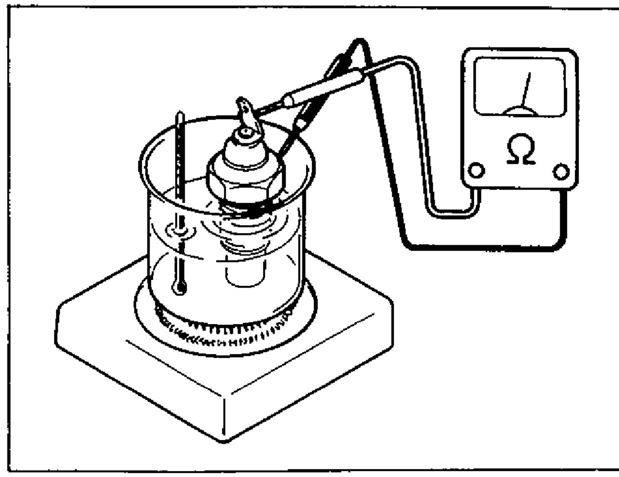


Fig. 8-15 Checking Temperature Gauge Unit

GAUGE UNIT

Warm up gauge unit. Check that its resistance reduces as its temperature rises. Temperature-to-resistance relationship can be plotted in a graph as shown below.

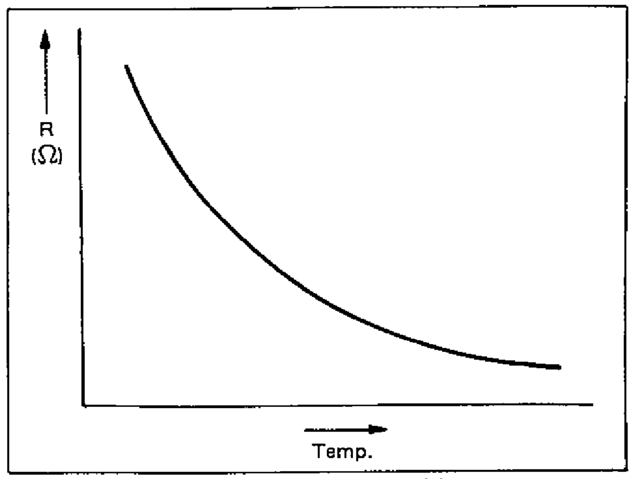


Fig. 8-16 Resistance-Temp. Relationship

Temperature	Resistance
50°C (122°F)	133.9 ~ 178.9 Ω
80°C (176°F)	47.5 ~ 56.8 Ω
100°C (212°F)	26.2 ~ 29.3 Ω

Temperature	Resistance
50°C (122°F)	189.4 ~ 259.6 Ω
80°C (176°F)	66.3 ~ 84.5 Ω
100°C (212°F)	36.0 ~ 43.8 Ω

NOTE:
There are 2 types of gauge unit. For replacement, check which type has been used and make sure to use a new one of the same type.

OIL PRESSURE LIGHT

DESCRIPTION OF CIRCUIT

The oil pressure circuit consists of the oil pressure switch installed to the cylinder block and the light (warning light) inside the combination meter.

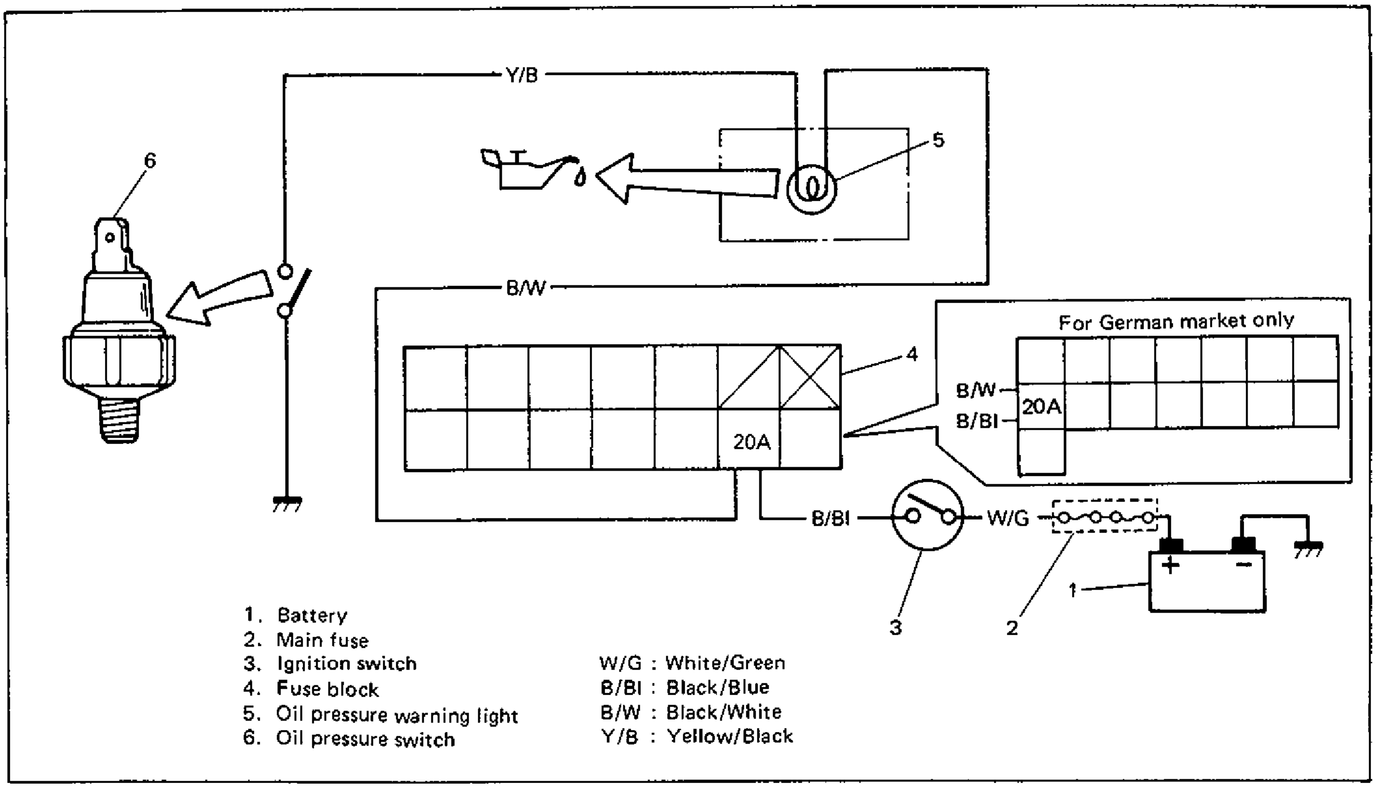


Fig. 8-17 Oil Pressure Switch Circuit

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.

INSPECTION

OIL PRESSURE SWITCH

Use an ohmmeter to check switch continuity.

During Engine Running	No continuity obtained ($\infty\ \Omega$)
At Engine Stop	Continuity obtained ($0\ \Omega$)

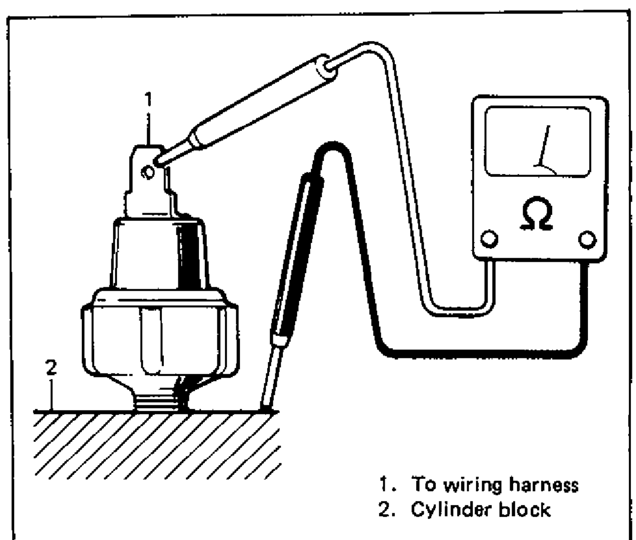


Fig. 8-18 Checking Oil Pressure Switch

BRAKE FLUID LEVEL WARNING LIGHT

DESCRIPTION OF CIRCUIT

The brake fluid level warning light circuit consists of a brake fluid level switch installed in the master cylinder reservoir, and the light (brake fluid level warning light) inside the combination meter. Also, this circuit is additionally provided with the parking brake switch which warns that the parking brake is applied.

For European Markets

1. Battery
2. Main fuse
3. Ignition switch
4. Fuse block
5. Brake fluid level warning light
6. Parking brake indicator light
7. Parking brake switch
8. Brake fluid level switch
9. Junction block

B: Black
B/Bl: Black/Blue
B/W: Black/White
Br/B: Brown/Black
R/B: Red/Black
V/G: Violet/Green
W/G: White/Green.

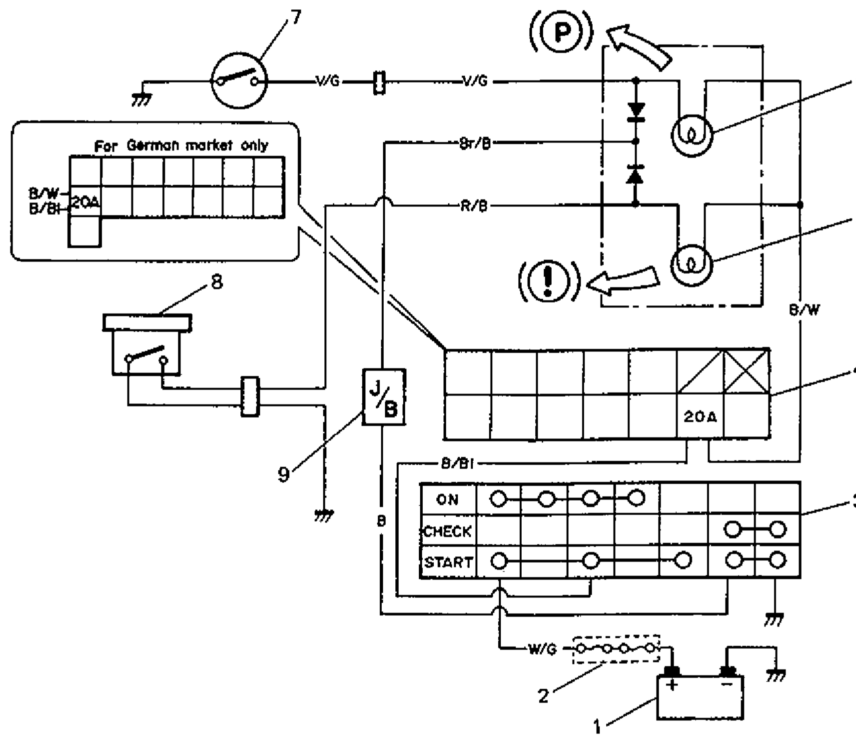


Fig. 8-19-1 Brake Warning Circuit

For Other Markets

1. Battery
2. Main fuse
3. Ignition switch
4. Fuse block
5. Brake fluid level warning/ parking brake indicator light
6. Parking brake switch
7. Brake fluid level switch
8. Junction block

B: Black
B/Bl: Black/Blue
B/W: Black/White
Br/B: Brown/Black
R/B: Red/Black
W/G: White/Green

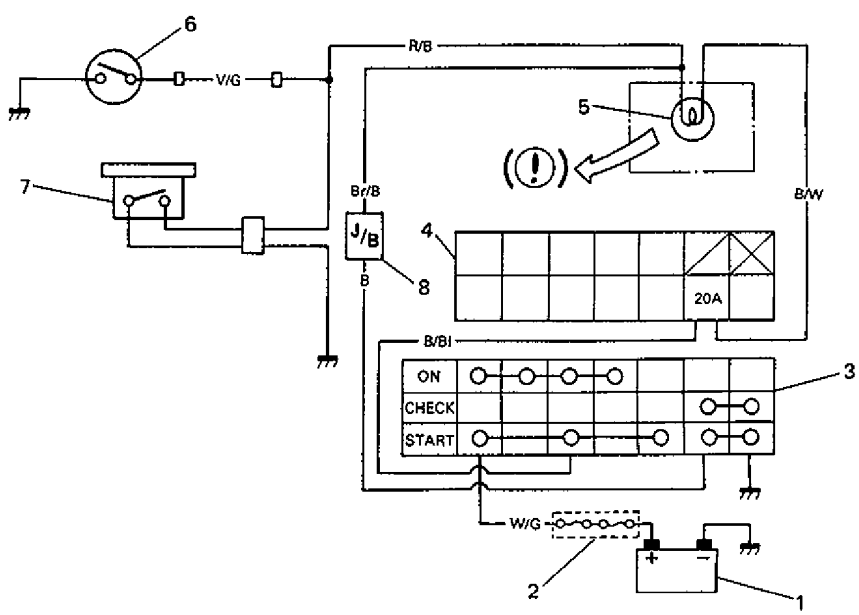


Fig. 8-19-2 Brake Warning Circuit

OPERATION OF WARNING LIGHT

1. Warning light comes on when engine is stopped while ignition switch is turned on and parking brake is applied.
2. For bulb check, check that warning light comes on briefly during engine start regardless of brake fluid level position and parking brake operation.
3. After starting engine, release parking brake. If light goes off, brake fluid level is adequate.

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

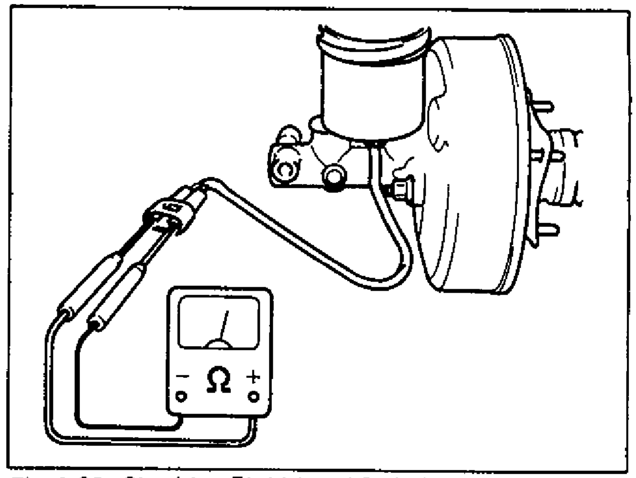


Fig. 8-20 Checking Fluid Level Switch

SEAT BELT WARNING LIGHT/BUZZER (For Canadian spec. only)

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, the light goes OFF and the buzzer stops sounding whether the seat belt is worn or not.

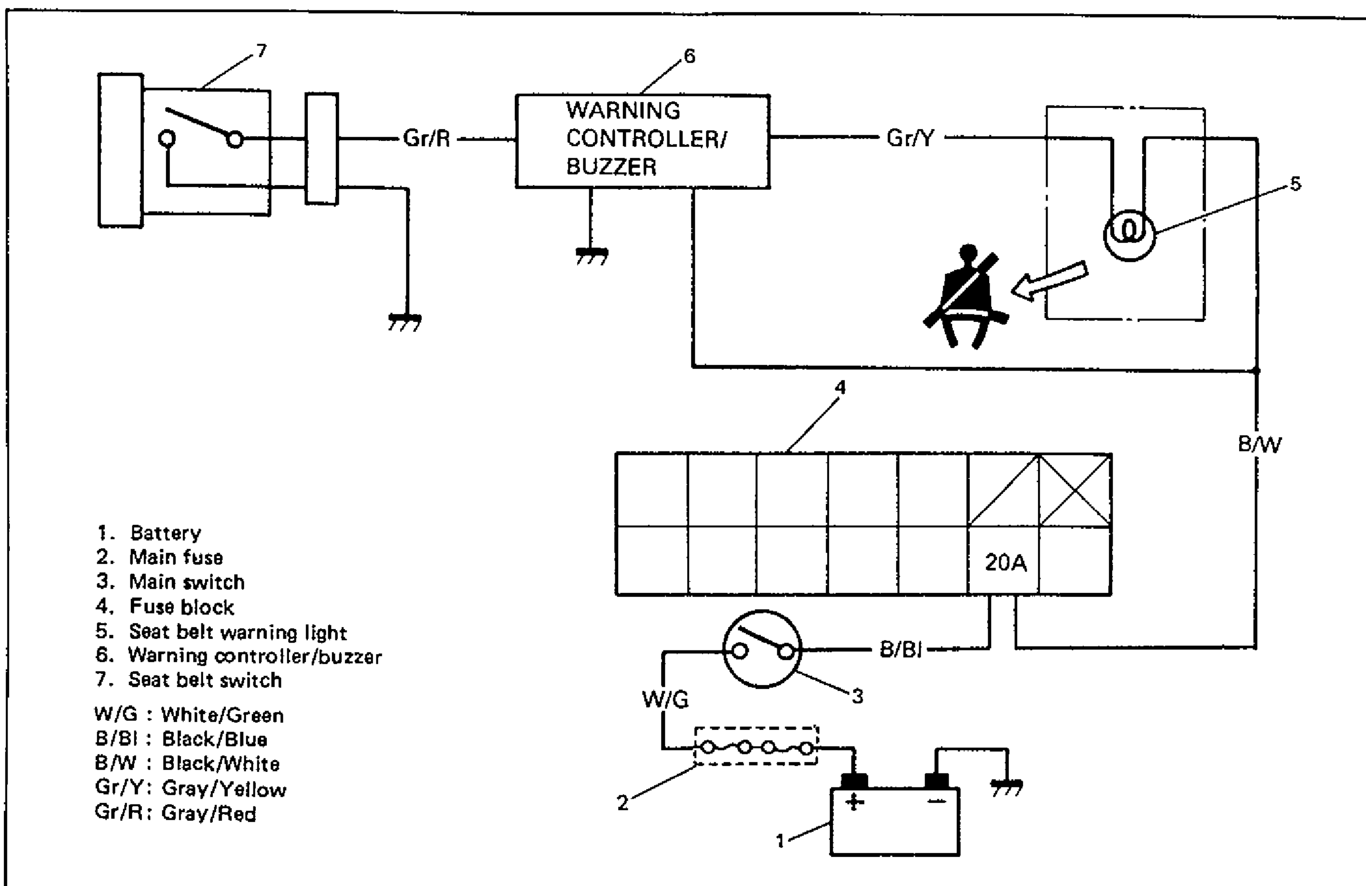


Fig. 8-21-1 Seat Belt Warning System Circuit

INSPECTION

When warning light/buzzer fails to 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 terminals are disconnected and reconnected. If check result is not satisfactory, replace.

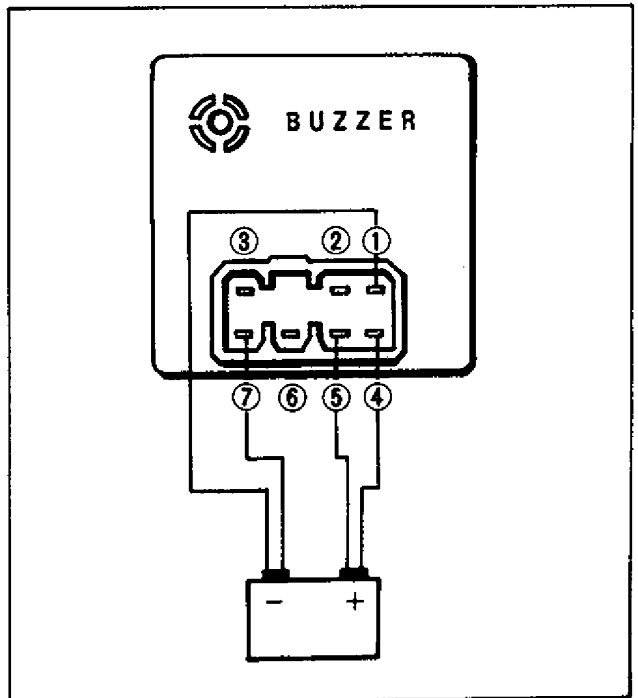


Fig. 8-21-2 Checking Warning Controller/Buzzer

MAIN SWITCH KEY REMAINDER WARNING BUZZER FOR EUROPEAN SPEC. (If equipped)

DESCRIPTION OF CIRCUIT

The main switch key remainder warning buzzer circuit is a system to sound the buzzer if the driver leaves the car with the main switch key inserted so as to urge him to take it out.

INSPECTION

If main switch key remainder warning buzzer does not sound, use its wiring diagram in figure below as reference to check buzzer, wiring, etc.

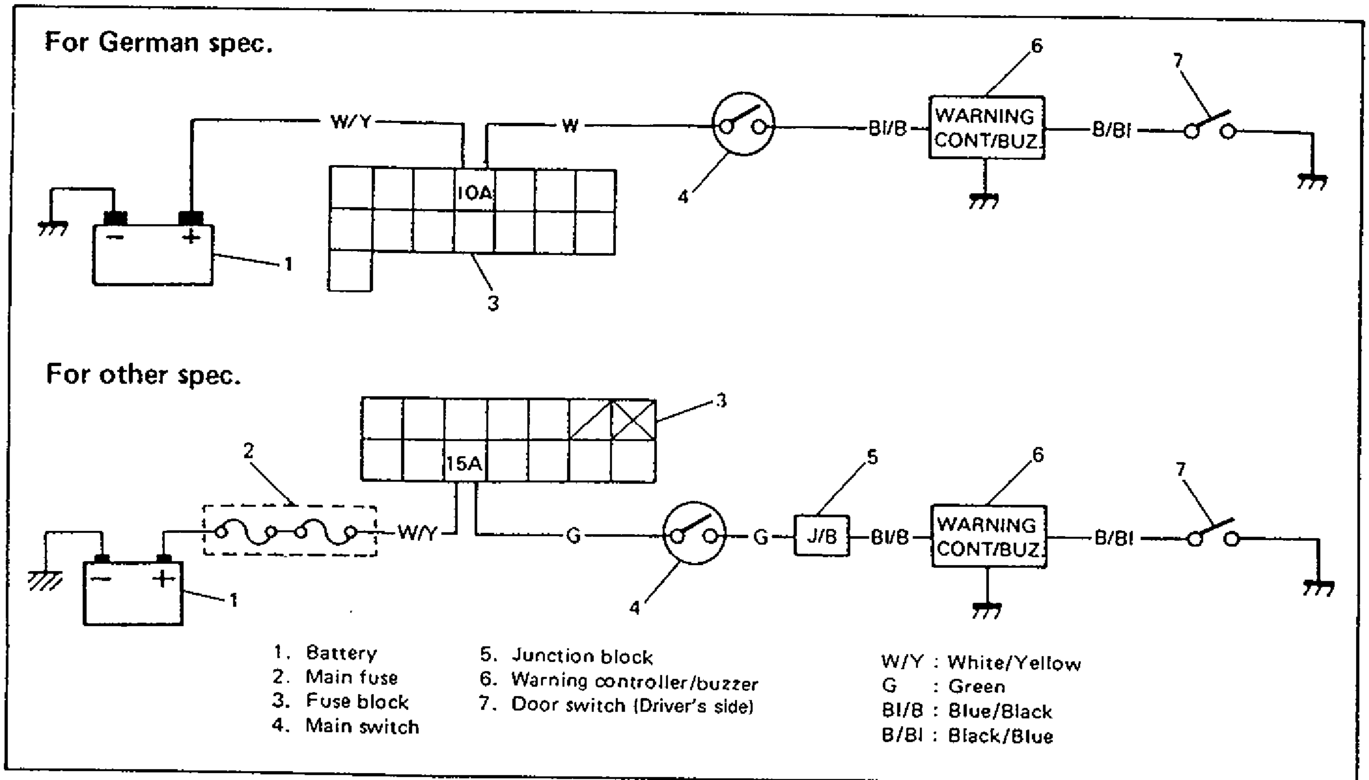


Fig. 8-21-3 Main Switch Key Remainder Warning Buzzer Circuit

INSPECTION OF WARNING CONTROLLER/ BUZZER

With positive (+) terminal of battery connected to terminal ⑥ of controller and negative (–) one to ④, also connect negative (–) one to ③ as shown in figure.

If buzzer emits buzzing sound then, controller is in good condition. If not, replace.

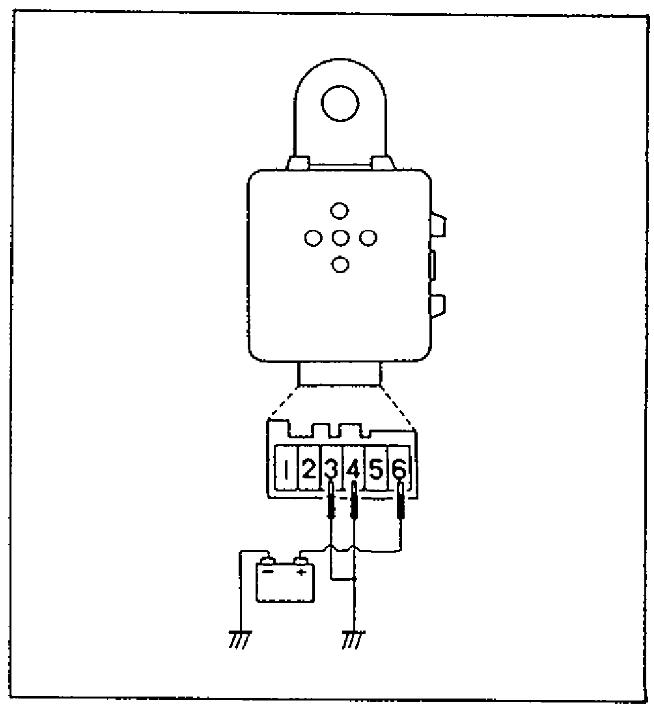


Fig. 8-21-4 Checking Warning Controller/Buzzer

MAIN SWITCH KEY REMAINDER WARNING BUZZER FOR CANADIAN SPEC.

DESCRIPTION OF CIRCUIT

The main switch key remainder warning buzzer circuit is a system to sound the buzzer if the driver leaves the car with the main switch key inserted so as to urge him to take it out.

INSPECTION

If main switch key remainder warning buzzer does not sound, use its wiring diagram in figure below as reference to check buzzer, wiring, etc.

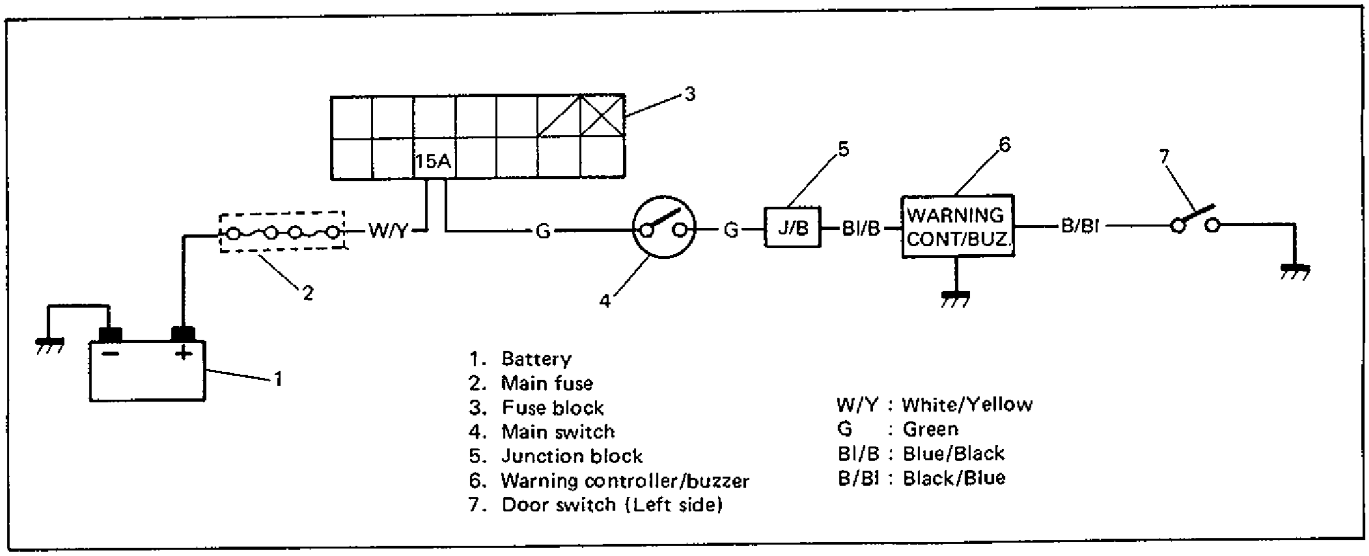


Fig. 8-21-5 Main Switch Key Warning Buzzer Circuit

INSPECTION OF WARNING CONTROLLER/ BUZZER

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.

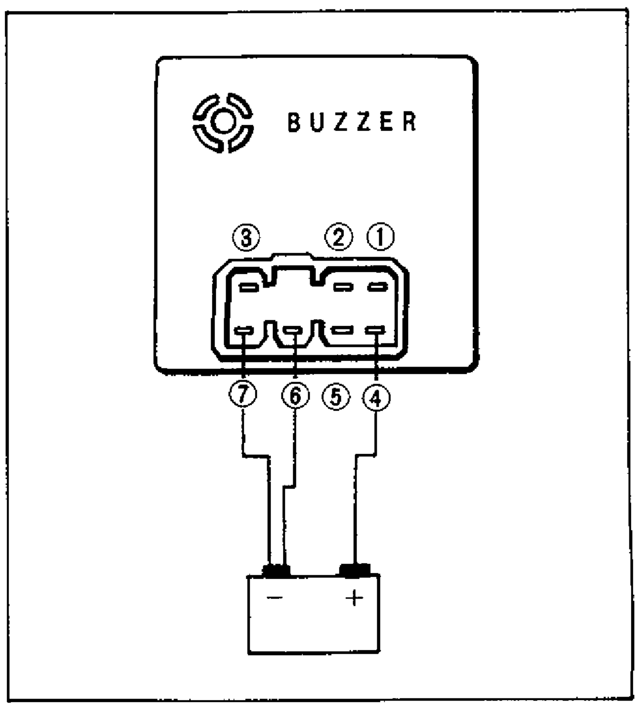


Fig. 8-21-6 Checking Warning Controller/Buzzer

LIGHT REMAINDER WARNING BUZZER FOR EUROPEAN SPEC. (If equipped)

DESCRIPTION OF CIRCUIT

The light warning buzzer circuit is a systèm to sound the buzzer when ignition switch turns OFF and door switch (driver's side) turns ON (i.e. driver's side door opens) while lighting switch turns still ON, warning driver to turn off the lights.

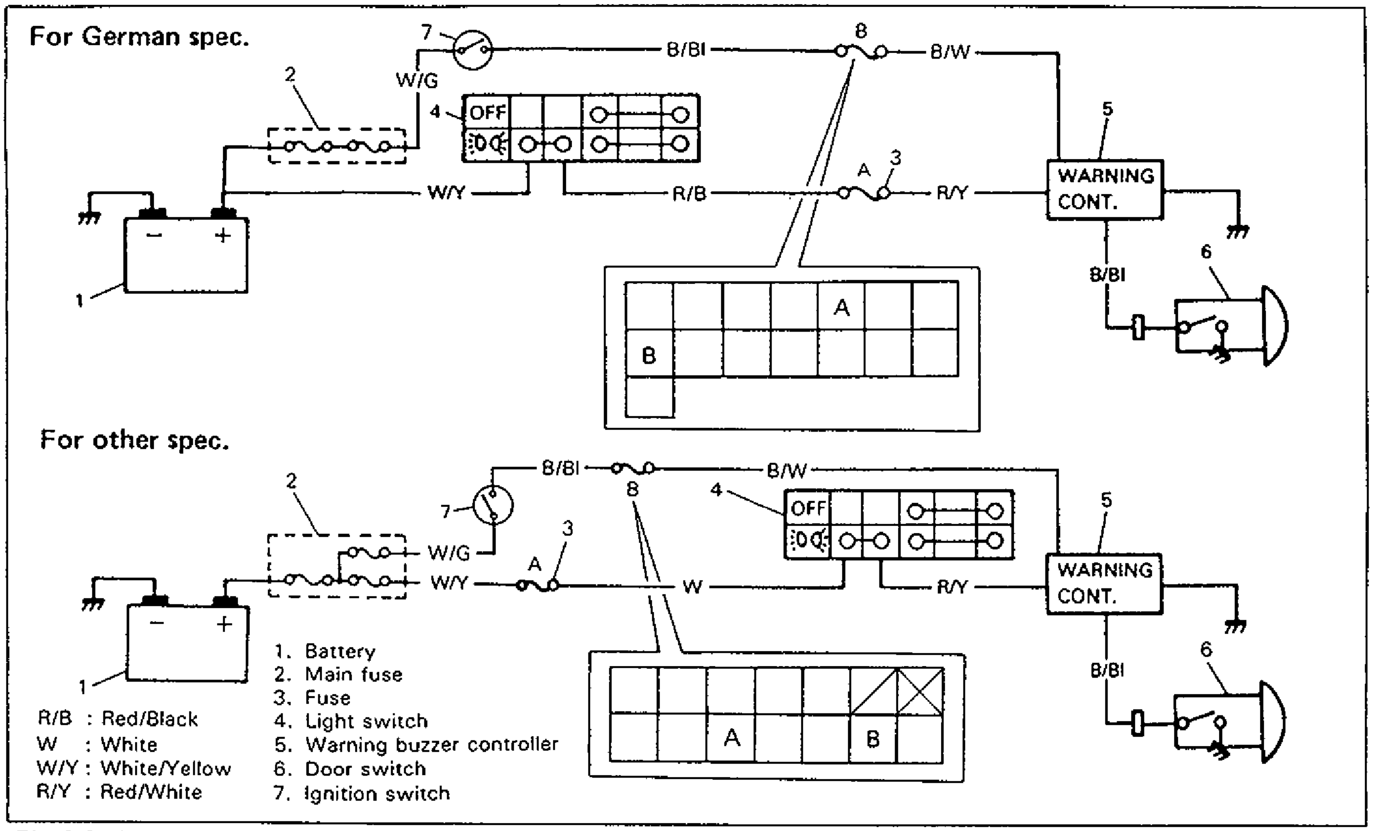


Fig. 8-21-7

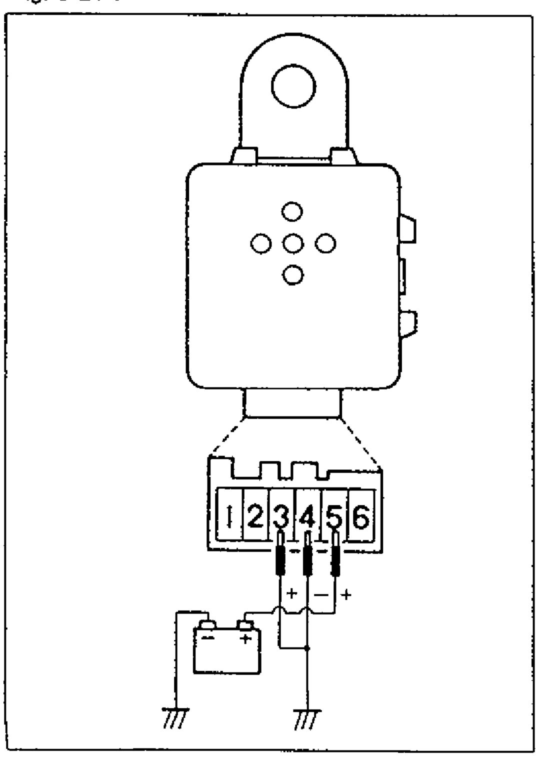


Fig. 8-21-8

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

First, connect positive (+) terminal of battery to terminal ⑤ of controller and negative (−) one to ③ and ④.
If buzzer emits buzzing sound then, controller is in good condition. If not, replace.

LIGHT REMAINDER WARNING BUZZER AND INTERIOR (DOME) LIGHT FOR CANADIAN SPEC.

The light remainder warning buzzer circuit is a system designed to sound the buzzer if the driver opens the door (driver's side) while the lights (headlight and small light) are still on, warning him to turn off the lights.

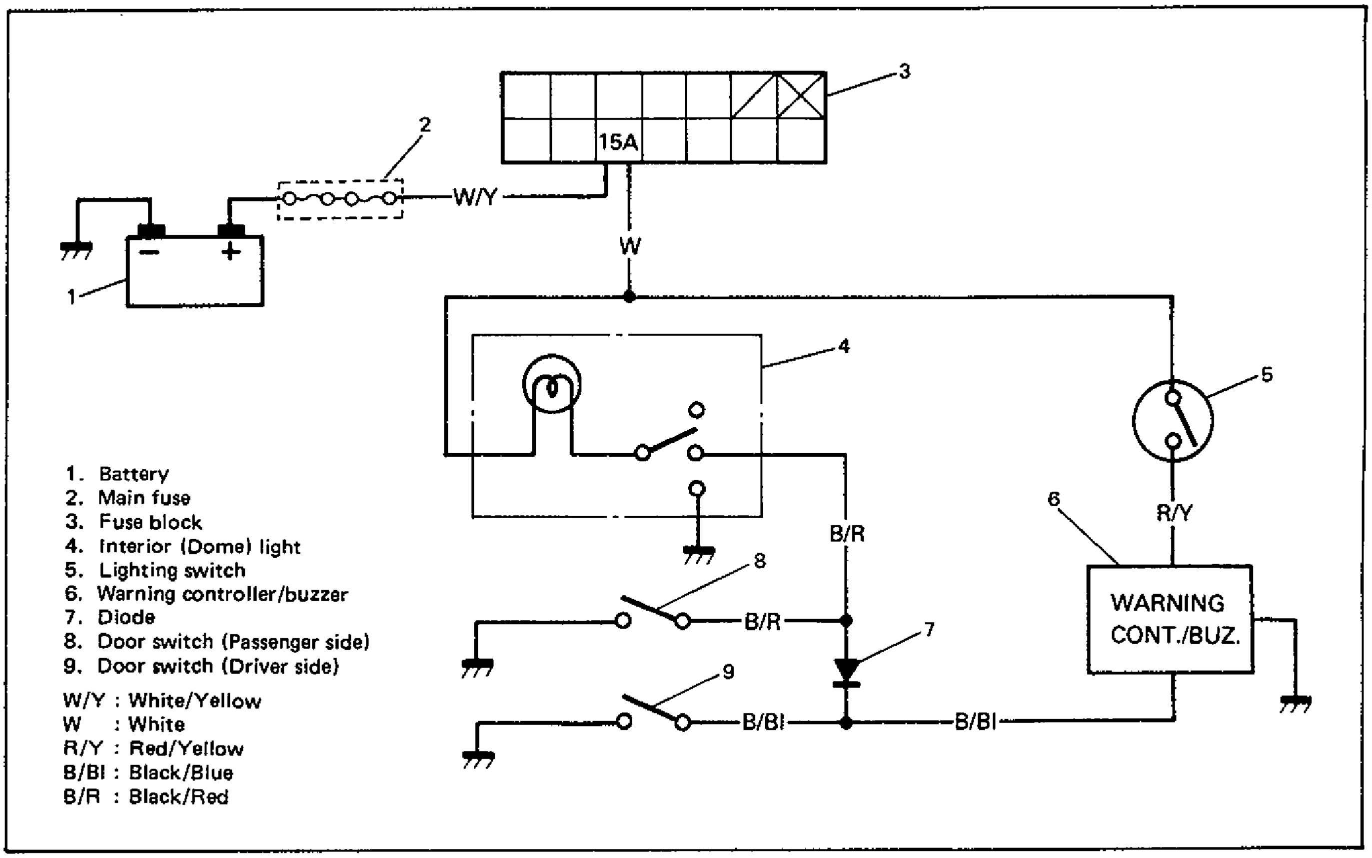


Fig. 8-21-9 Light Remainder Warning Buzzer and Interior Light Circuit

INSPECTION

If light remainder warning buzzer does not sound or interior light shows no lighting, use the above circuit diagram as reference to check buzzer, wiring, etc.

INSPECTION OF WARNING CONTROLLER/ BUZZER

First, connect positive (+) terminal of battery to terminals ② and ⑤ of controller and negative (–) one to ⑦ and then disconnect connection to terminal ⑤.

If buzzer emits buzzing sound then, controller is in good condition. If not, replace.

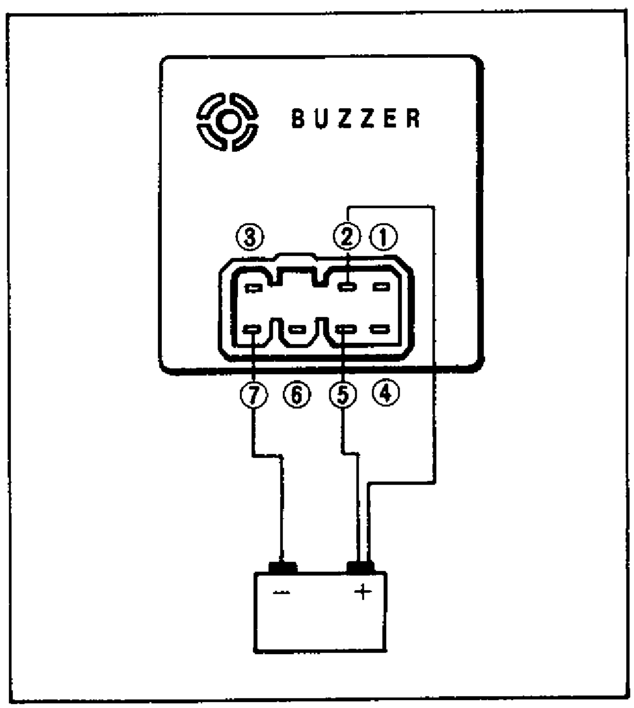


Fig. 8-21-10 Checking Warning Controller/Buzzer

ON CAR SERVICE

LIGHTING SYSTEMS

HEADLIGHTS

WIRING CIRCUIT

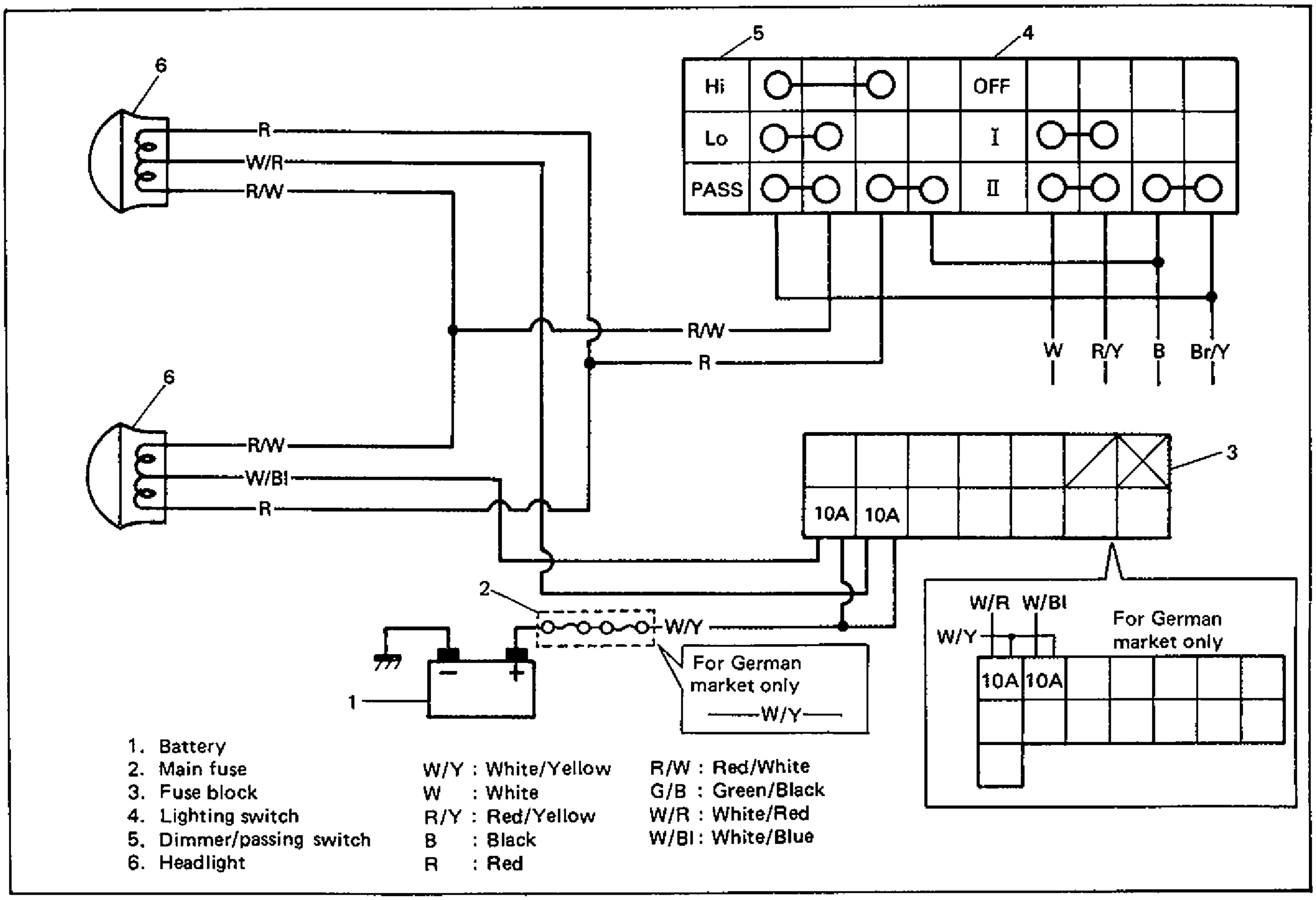


Fig. 8-22 Headlights Circuit

When the headlights are lighted, the small light system is also lighted. 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.	Light burnt out Fuse blown Socket, wiring or grounding faulty	Replace light. Replace fuse. Repair as necessary.
Headlights do not light.	Main fuse and/or fuses blown Lighting and dimmer switches faulty Wiring or grounding faulty	Replace main fuse and/or fuses to check for short. Check switches. Repair as necessary.
Only one beam ("Hi" or "Lo") does not light.	Lighting or dimmer switch faulty	Check switch.

INSPECTION

1) Check lighting and dimmer switches for each terminal-to-terminal continuity.
   Refer to "SWITCHES" Section.
2) Headlight is grounded at right panel, left panel and junction/fuse block.

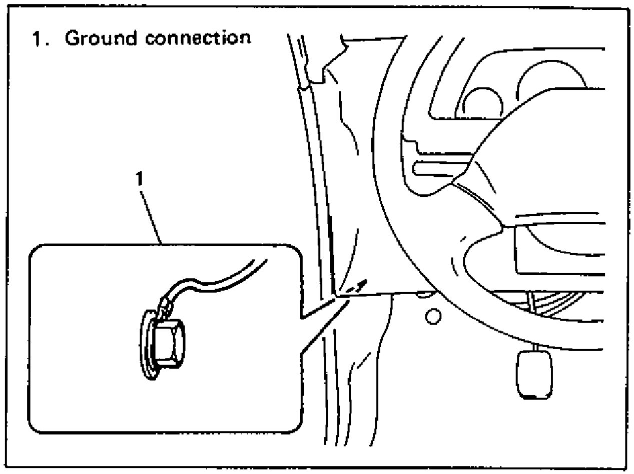


Fig. 8-23

SETTING HEADLIGHT BEAMS

(Standard Procedure)

Before setting headlight beams, adjust air pressure of each tire as specified respectively. Bounce each corner of car 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.

Inspection (Except for Canadian spec. car)

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.

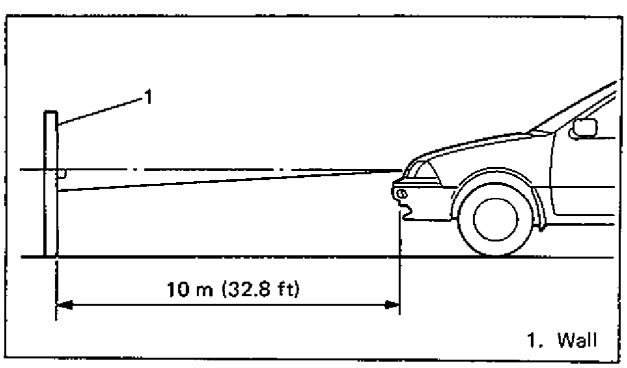
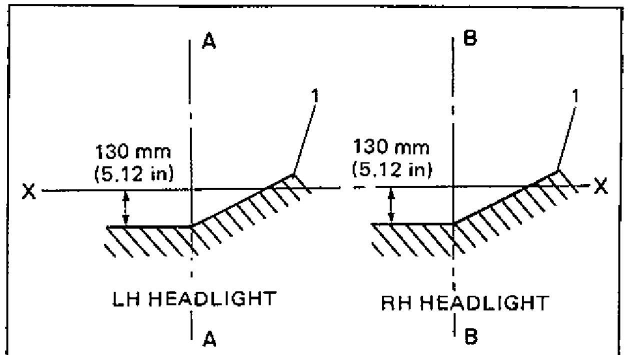


Fig. 8-24-1

2) Light headlights (low beam) and check their beams projected on the wall. They should correspond to shadowed portion in figure below.

NOTES:

- **The beam adjustment should be carried out with one driver (75 kg or 165 lb) aboard.**
- **When servicing headlight beam leveling system equipped car, set its leveling switch to "0" with ignition ON.**



1. Cutline (boundary line)
X – X: Horizontal center line of headlights
A – A: Vertical center line of left headlight
B – B: Vertical center line of right headlight

NOTE:
This figure is applicable to left-hand steering car.
Figure should be turned over for right-hand steering car.

Fig. 8-24-2

Inspection (For Canadian spec. car)

Unless otherwise obligated by local regulations, align headlight beams according to following procedure.

1) Place a blank wall 7.6 m (25 ft) ahead of car.

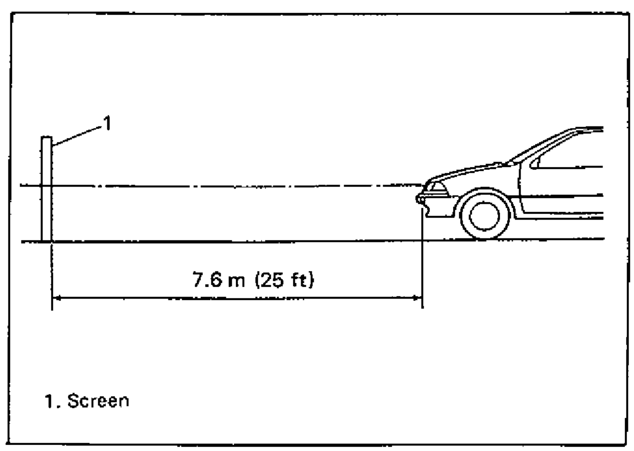


Fig. 8-25-1

2) Check to see if hot spot (high intensity zone) of each main (low) beam axis falls as illustrated below.

NOTE:
Beam aligment should be carried out with one driver (68 kg, 150 lb) aboard.

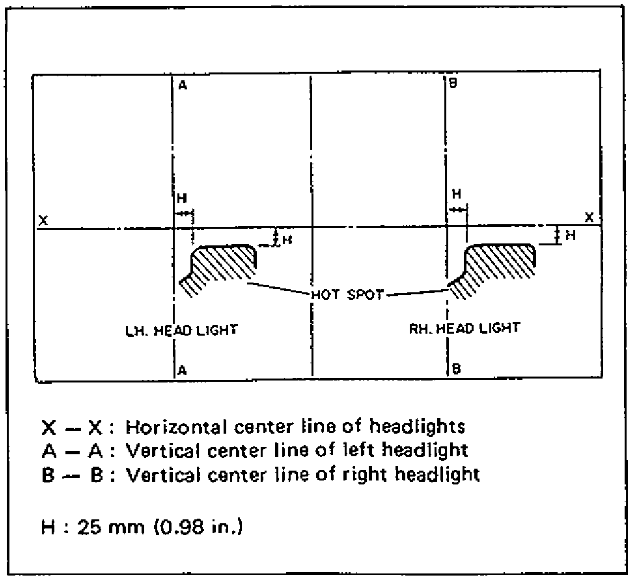


Fig. 8-25-2

HEADLIGHT ADJUSTMENT

When adjusting headlight beam (vertical and horizontal), turn adjusting bolts.

Except for Canadian spec. car

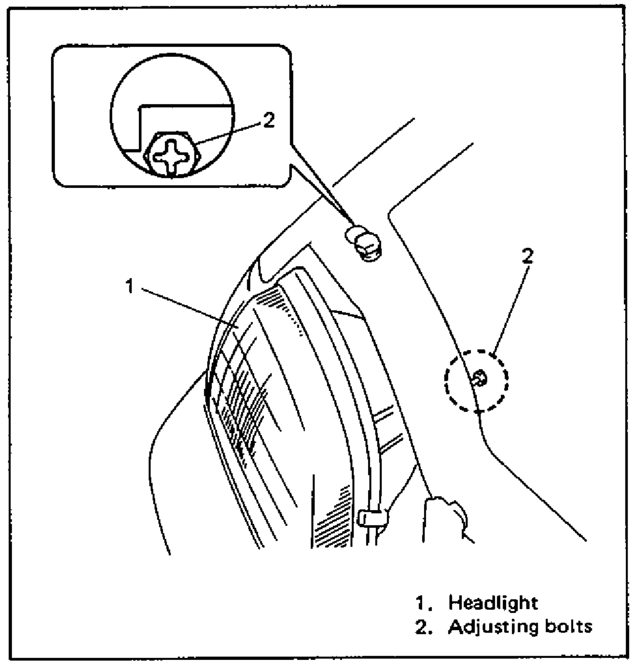


Fig. 8-26-1

For Canadian spec. car

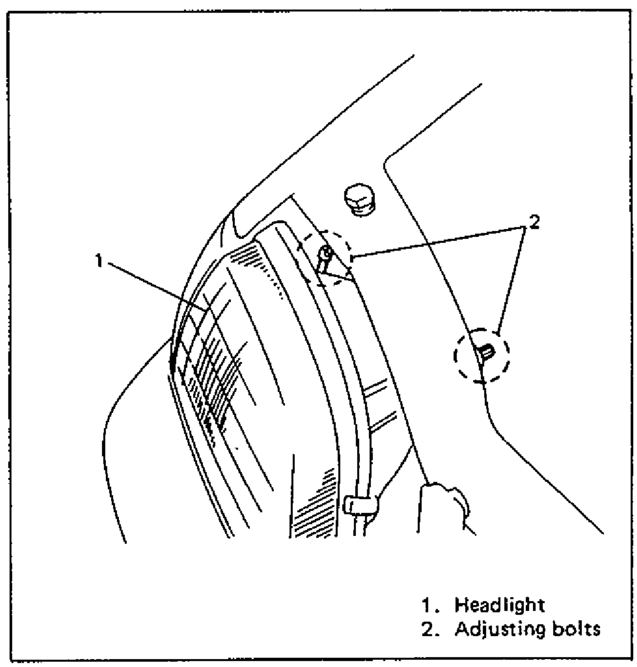


Fig. 8-26-2

DIM-DIP SYSTEM (For England only)

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 below with engine running and lighting switch set to small light position.

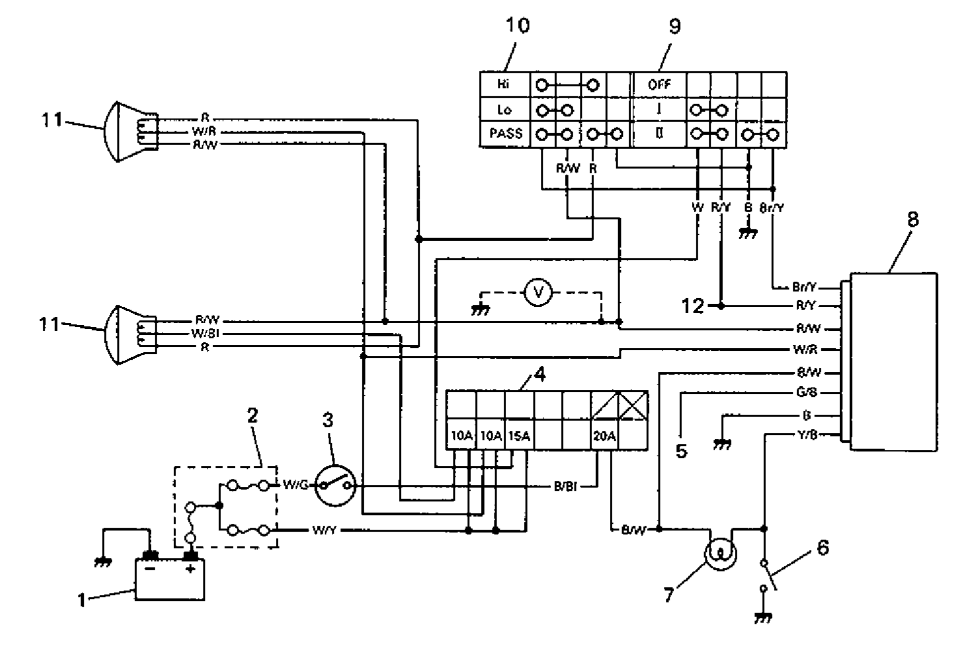
If measured voltage is out of specification (about 6V), replace controller.

If controller is in good condition (i.e., measured voltage is about 6V), check wiring, etc. while referring to below 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.



1. Battery
2. Main fuse
3. Ignition switch
4. Fuse box
5. To rear fog switch and light
6. Oil pressure switch
7. Oil pressure light
8. Dim-dip controller
9. Lighting switch
10. Dimmer/passing switch
11. Headlight
12. To small, illumination and tail

B : Black
B/Bl : Black/Blue
B/W : Black/White
Br/Y : Brown/Yellow
G/B : Green/Black
R : Red
R/W : Red/White
R/Y : Red/Yellow
W : White
W/Bl : White/Blue
W/G : White/Green
W/Y : White/Yellow
W/R : White/Red
Y/B : Yellow/Black

Fig. 8-27 Dim-Dip System Circuit

TURN SIGNAL AND HAZARD WARNING LIGHT

WIRING CIRCUIT

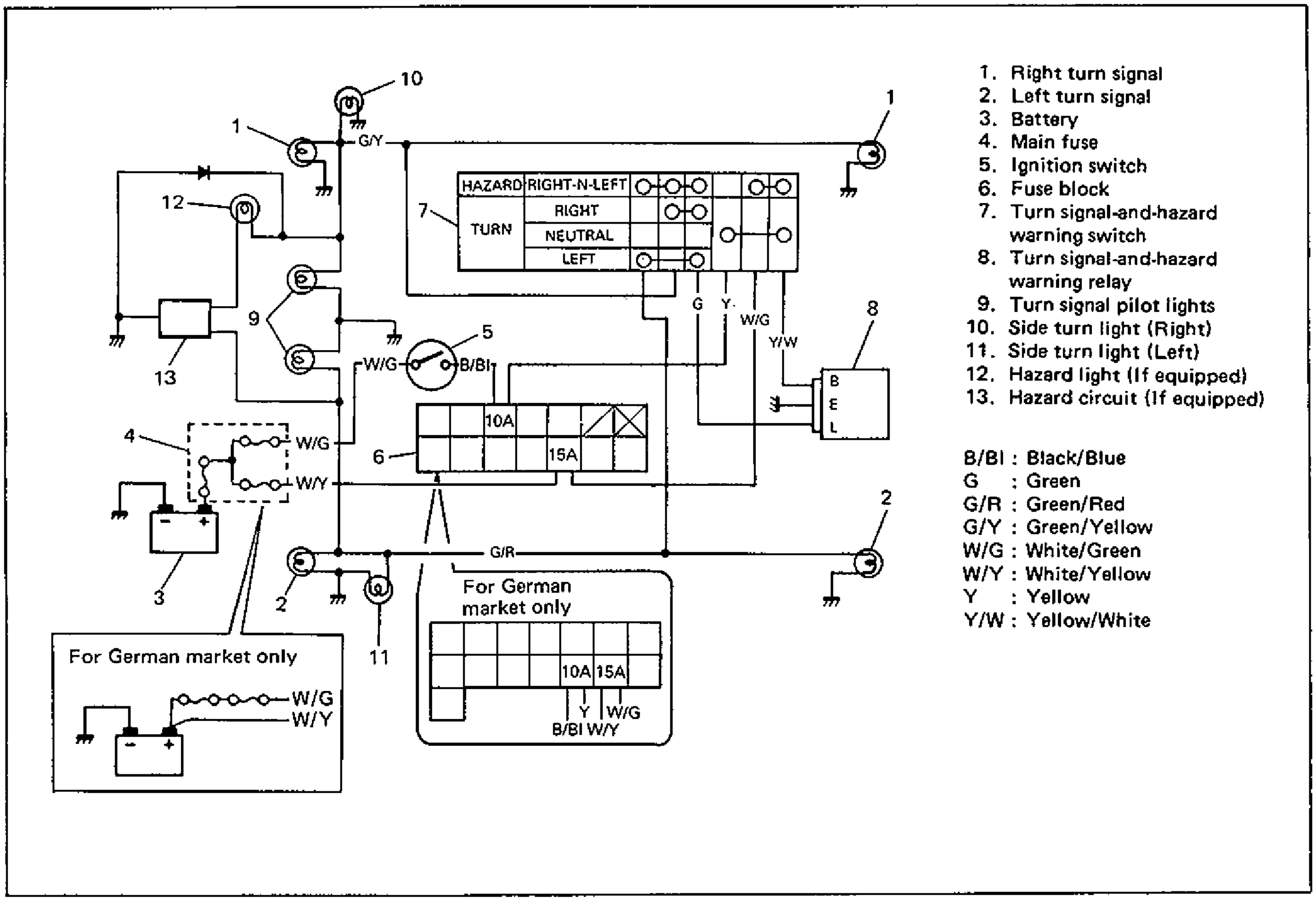


Fig. 8-28 Turn Signal Hazard Warning Circuit

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Flash rate high or one side only flashes	1. Faulty ground	Repair.
	2. Wrong bulb	Replace.
	3. One of light bulbs burnt out on right or left side of front or rear side	Replace.
	4. Defective turn signal-and-hazard warning relay	Replace.
	5. Open circuit or high resistance existing between turn signal-and-hazard warning switch and lights on one side	Repair.
No flashing	1. Blown fuse on turn signal-and-hazard warning circuit	Replace.
	2. Open circuit or high resistance existing between battery and switch	Repair.
	3. Defective relay	Replace.
	4. Open circuit or high resistance existing between switch and relay.	Repair.
	5. Defective relay.	Replace.
Flash rate too slow	1. Supply voltage too low	Recharge battery.
	2. Defective relay	Replace.

INSPECTION

1. Check turn signal-and-hazard warning switch for each terminal-to-terminal continuity.
   Refer to "SWITCHES" Section.
2. Turn signal should be grounded at each side of front fender apron.

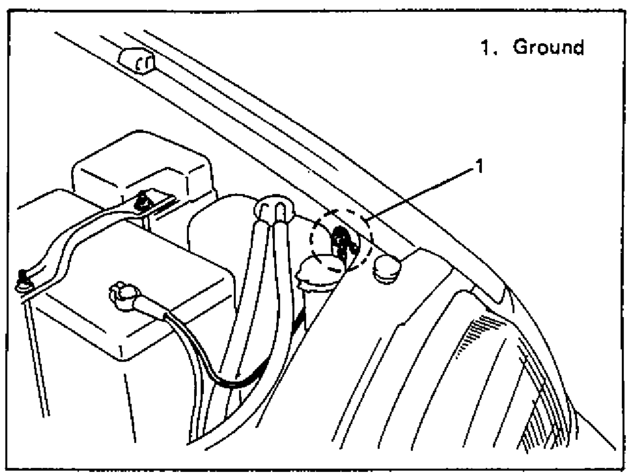


Fig. 8-29

BACK-UP LIGHTS

WIRING CIRCUIT

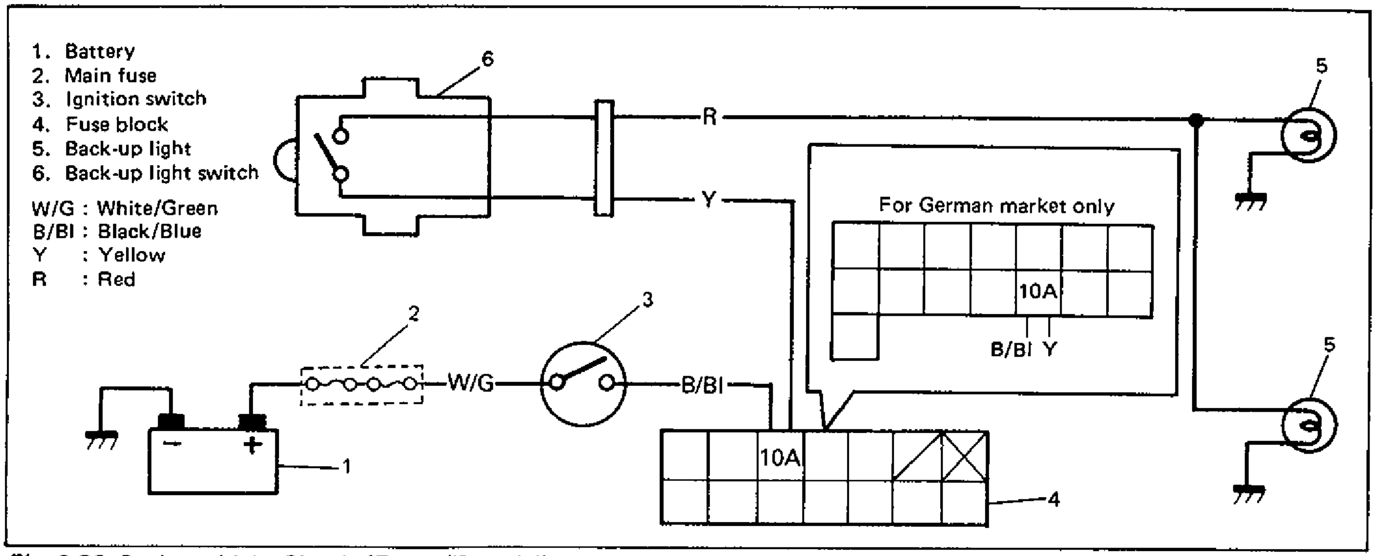


Fig. 8-30 Back-up Light Circuit (For M/T model)

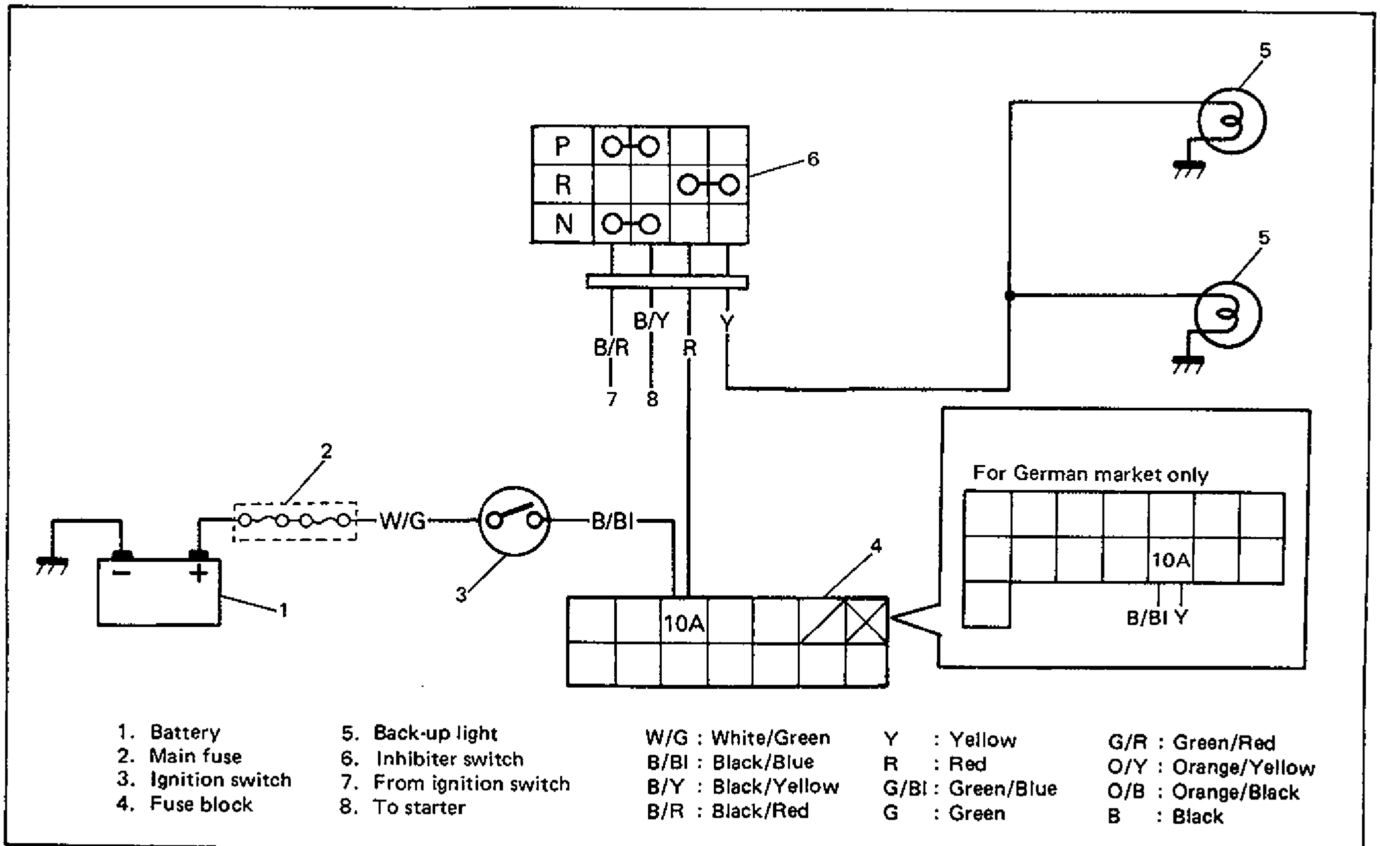


Fig. 8-31 Back-up Light Circuit (For A/T model)

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Back-up lights do not light.	Fuse blown	Replace fuse to check for short.
	Back-up light switch or inhibiter switch faulty	Check switch.
	Wiring or grounding faulty	Repair as necessary.

STOP LIGHTS

WIRING CIRCUIT

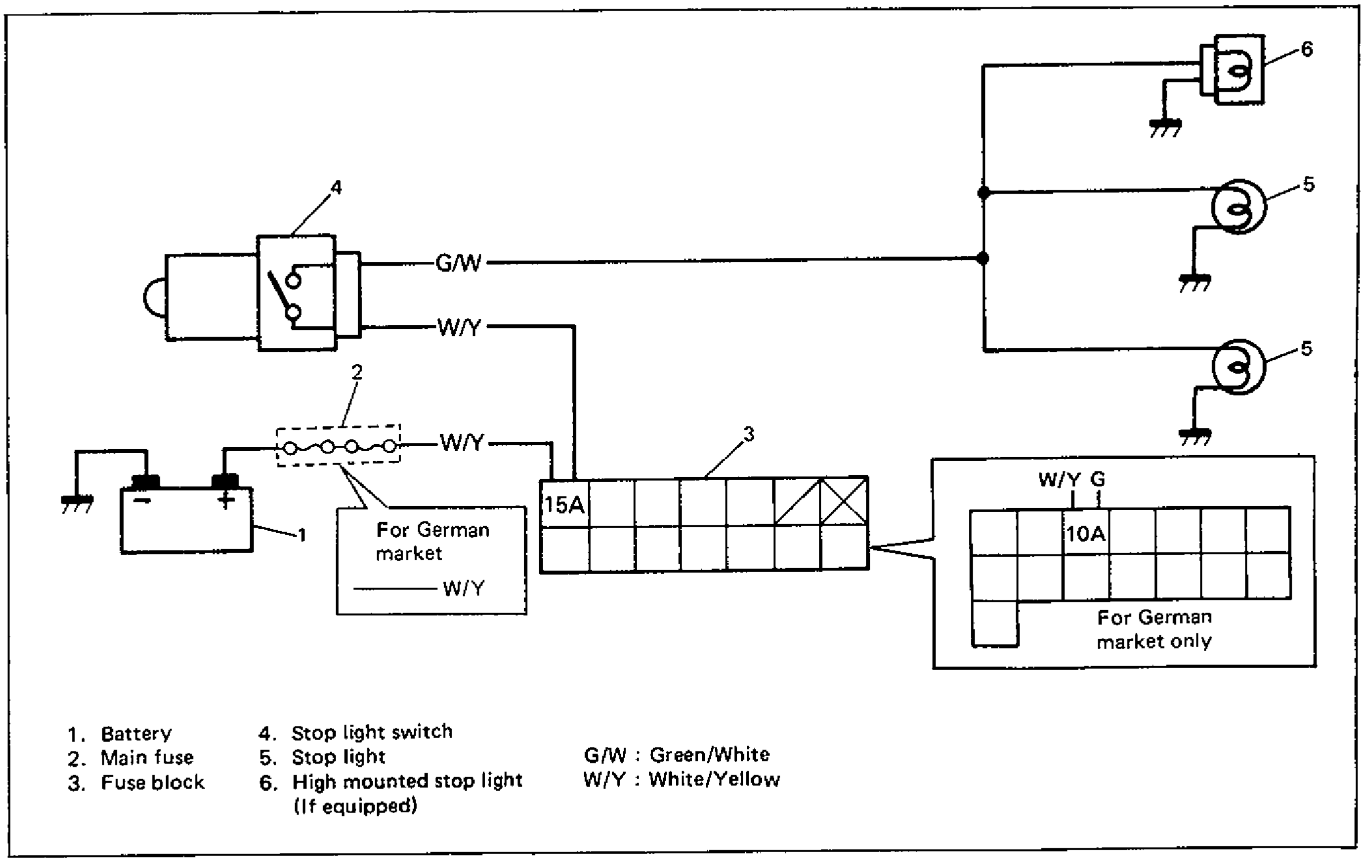


Fig. 8-32

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Stop lights do not light.	Fuse blown Stop light switch faulty Wiring or grounding faulty	Replace fuse to check for short. Adjust or replace switch. Repair as necessary.
Stop lights stay on.	Stop light switch faulty	Adjust or replace switch.

SMALL, TAIL AND LICENSE LIGHT

WIRING CIRCUIT (Except German market)

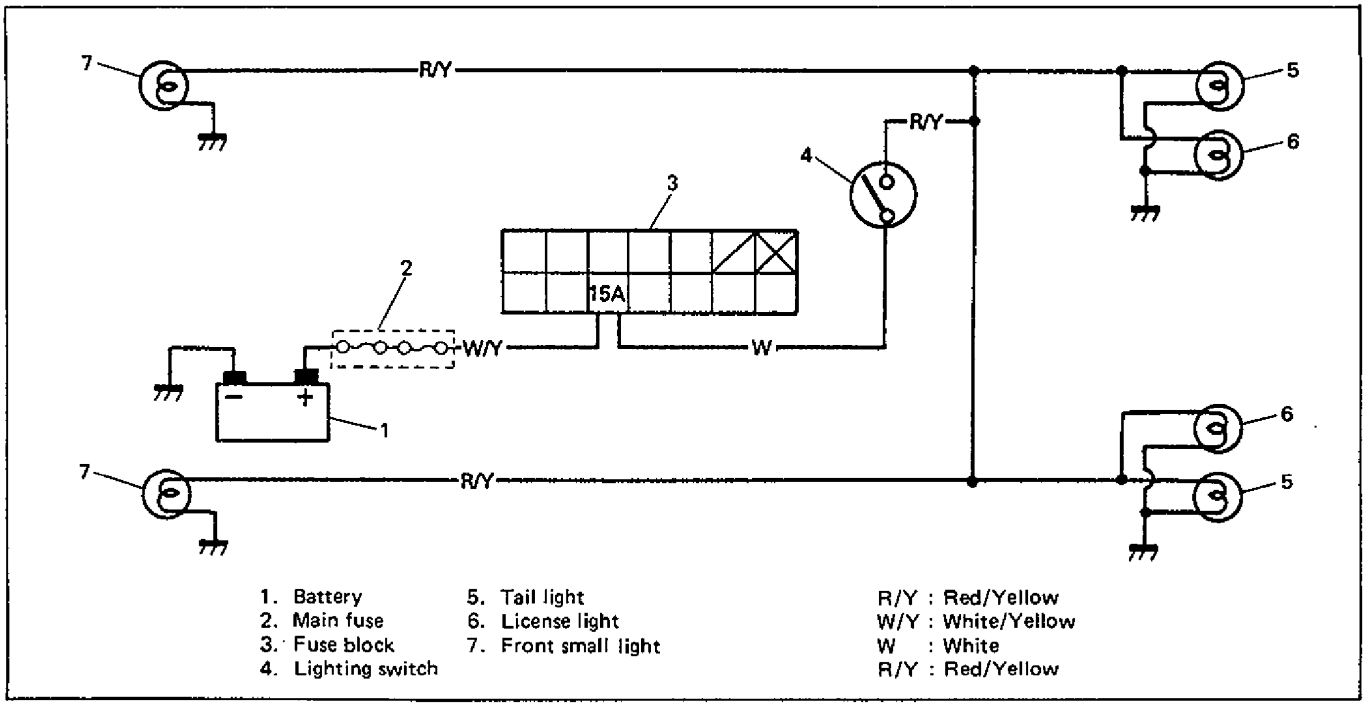


Fig. 8-33-1

WIRING CIRCUIT (For German market)

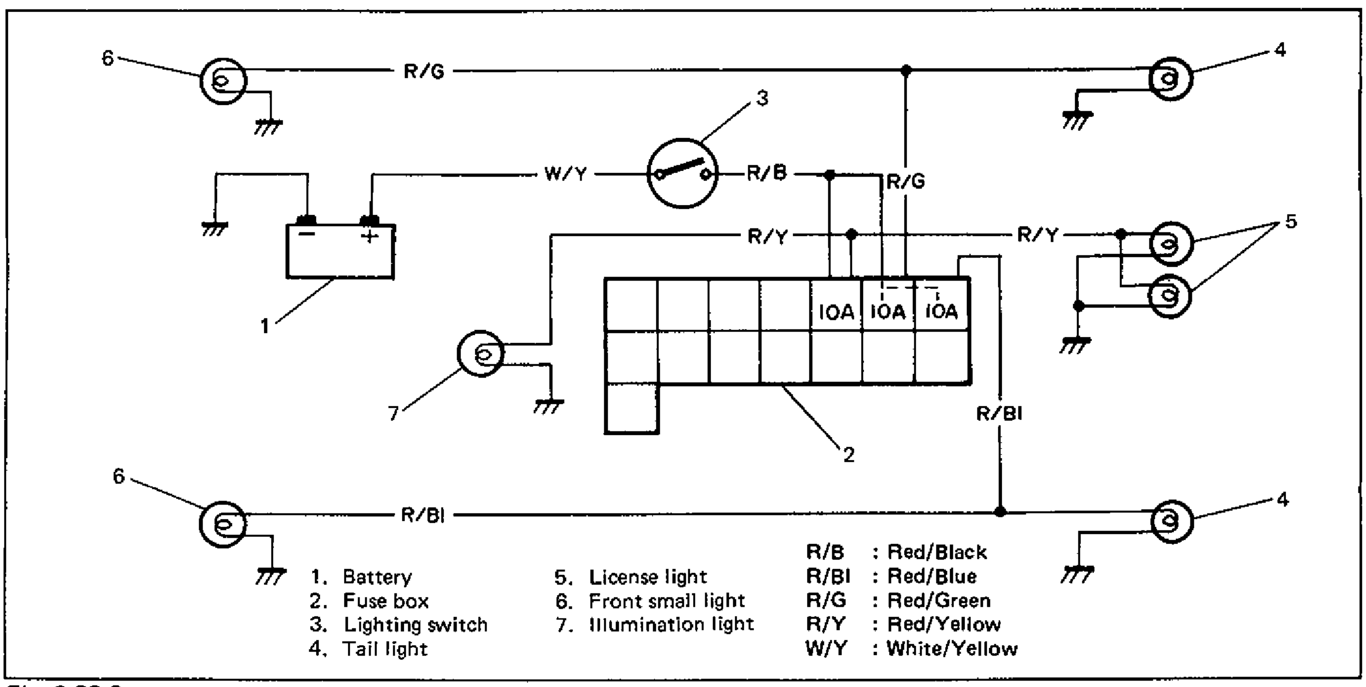


Fig. 8-33-2

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Lights do not light.	Main fuse and/or fuses blown	Replace fusible link and/or fuses to check for short.
	Lighting switch faulty	Check switch.
	Wiring or grounding faulty	Repair as necessary.

CIGAR LIGHTER AND RADIO (OPTIONAL)

WIRING CIRCUIT

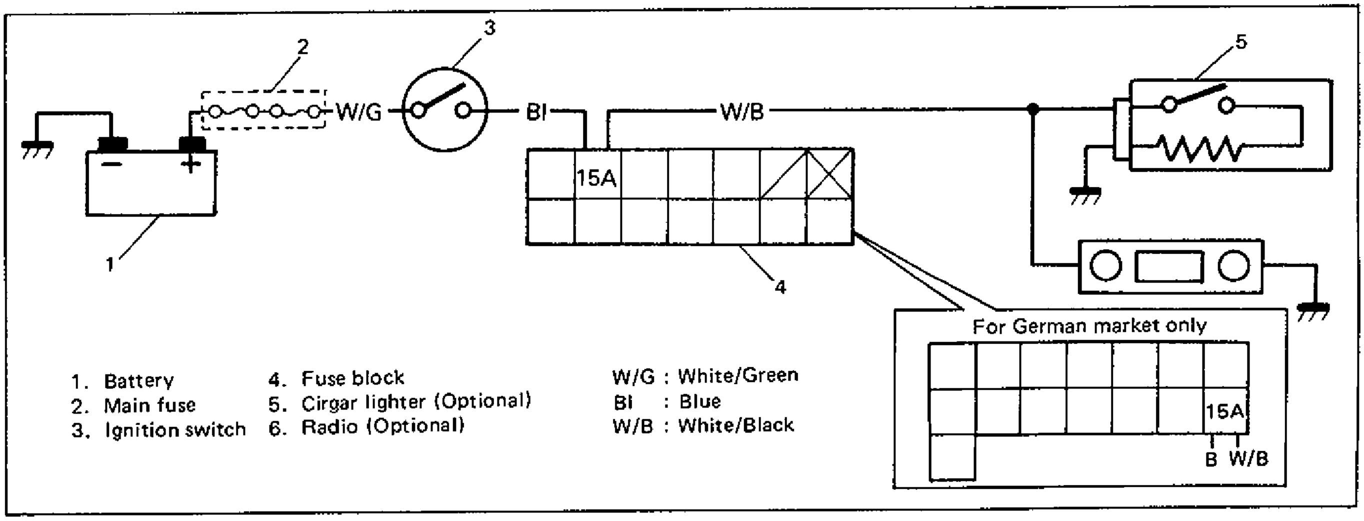


Fig. 8-34

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Cigar lighter (radio) does not work.	Fuse blown Main switch faulty Wiring or grounding faulty	Replace fuse to check for short. Check switch. Repair as necessary.

INTERIOR (DOME) LIGHT

WIRING CIRCUIT

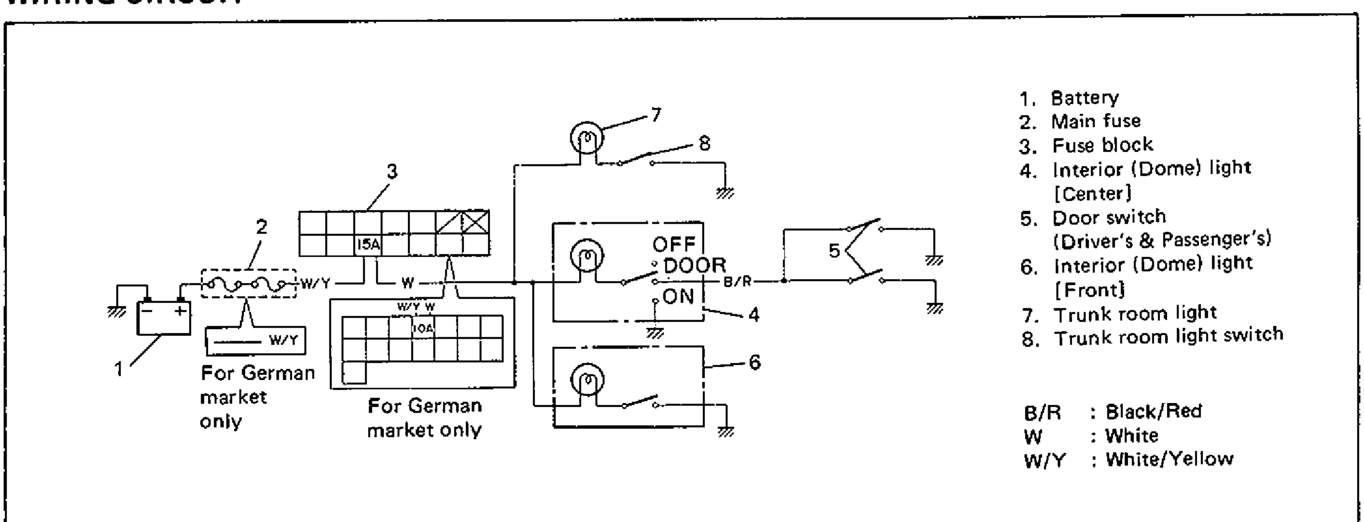


Fig. 8-35 Interior Light Circuit

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Interior light does not light.	Fuse blown Switch faulty Wiring or grounding faulty	Replace fuse to check for short. Check switch Repair as necessary

WINDSHIELD WIPERS AND WASHER

The windshield wiper is either 2-speed type or 3-speed type, depending on specifications and the windshield washer is equipped with a separate-type washer pump.

The washer tank is located inside of the front part of the left front fender. It has washer pumps for the front and rear respectively.

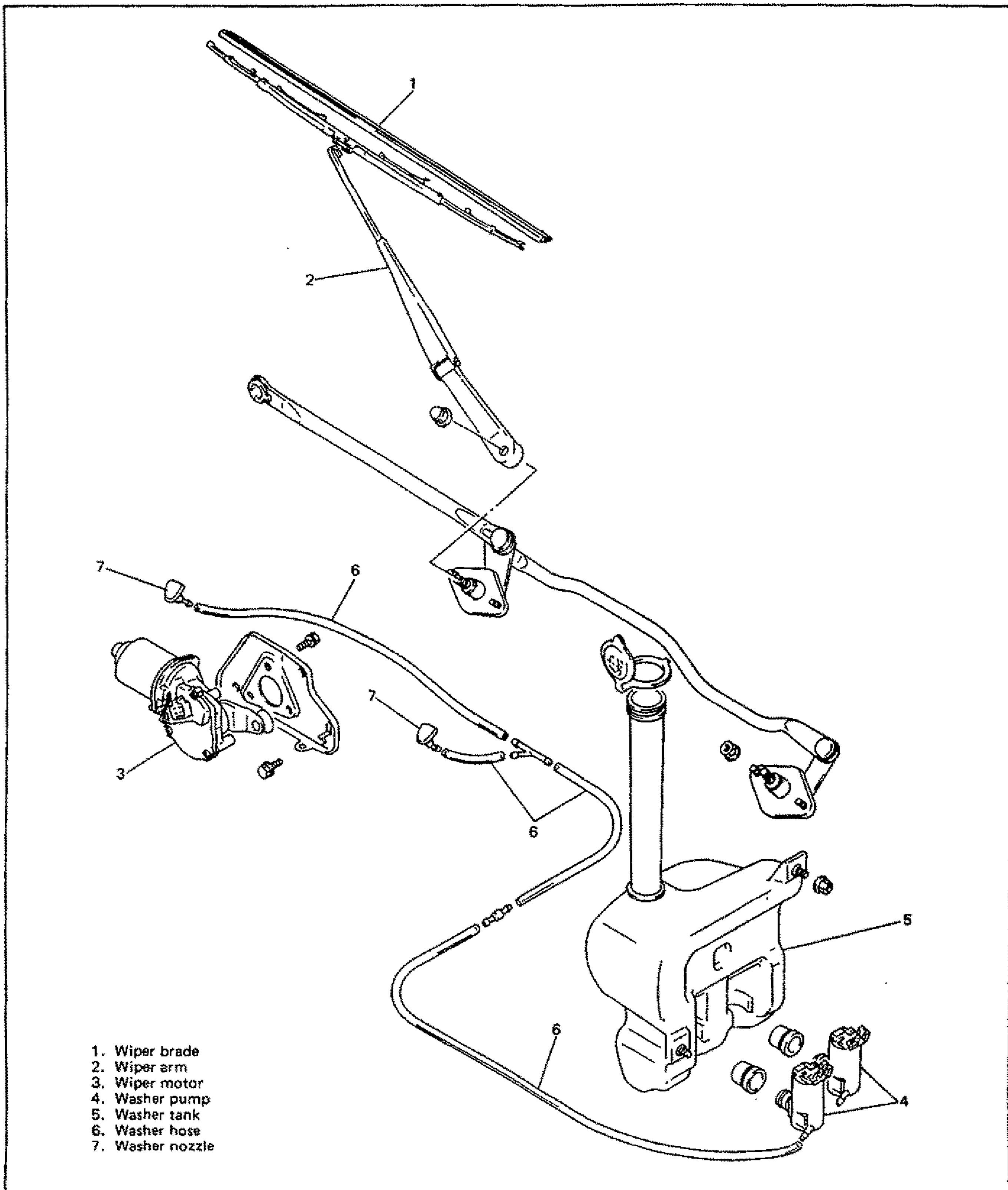


Fig. 8-36 Windshield Wiper and Washer

DESCRIPTION OF CIRCUIT

WINDSHIELD WIPER CIRCUIT

The circuit is designed so that when the wiper switch is turned OFF the wiper blades automatically return to their specified level rest positions.

In Fig. 8-37, when the wiper switch is turned ON with the ignition switch ON, current is supplied continuously from the battery (via lead Y/B – 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 cam on the shaft of its output gear.

The cam serves to connect the contact P_0 to the contacts P_1. Although the cam 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 indipendent of this cam rotation. When the wiper switch is turned OFF (the switch is set to the OFF position) with the blades positoned 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/B – contact P_2 – contact P_0 – lead Bl/W – switch (OFF position) – lead Bl or Bl/R) to the motor.

Therefore, 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 cam 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 level rest positions.

INTERMITTENT WIPER RELAY CIRCUIT

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/B 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/B, 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 cam 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.

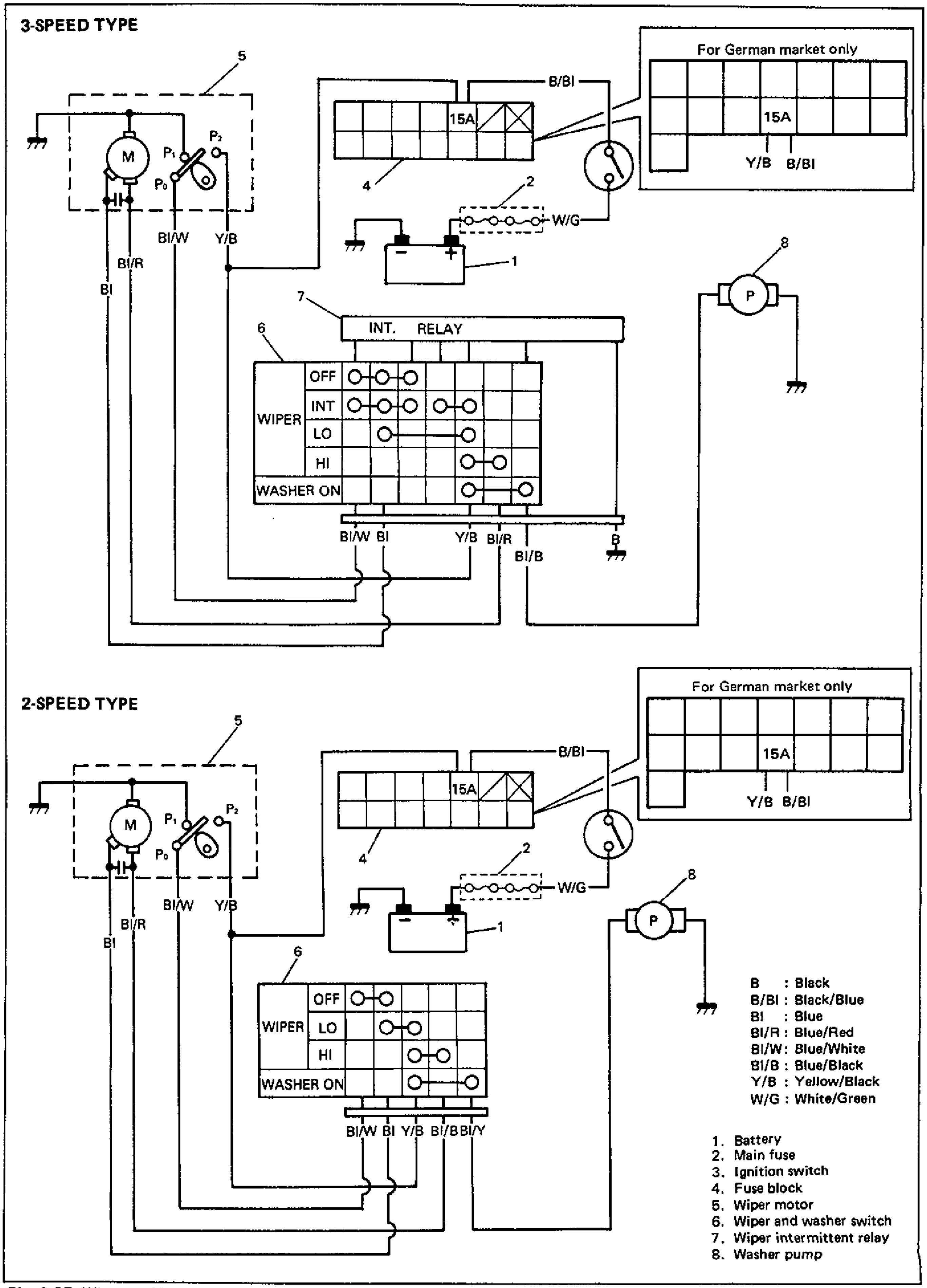


Fig. 8-37 Wiper and Washer Wiring Circuit

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.

INSPECTION

A. WIPER/WASHER SWITCH

Use a circuit tester to check switch for each terminal-to-terminal continuity.

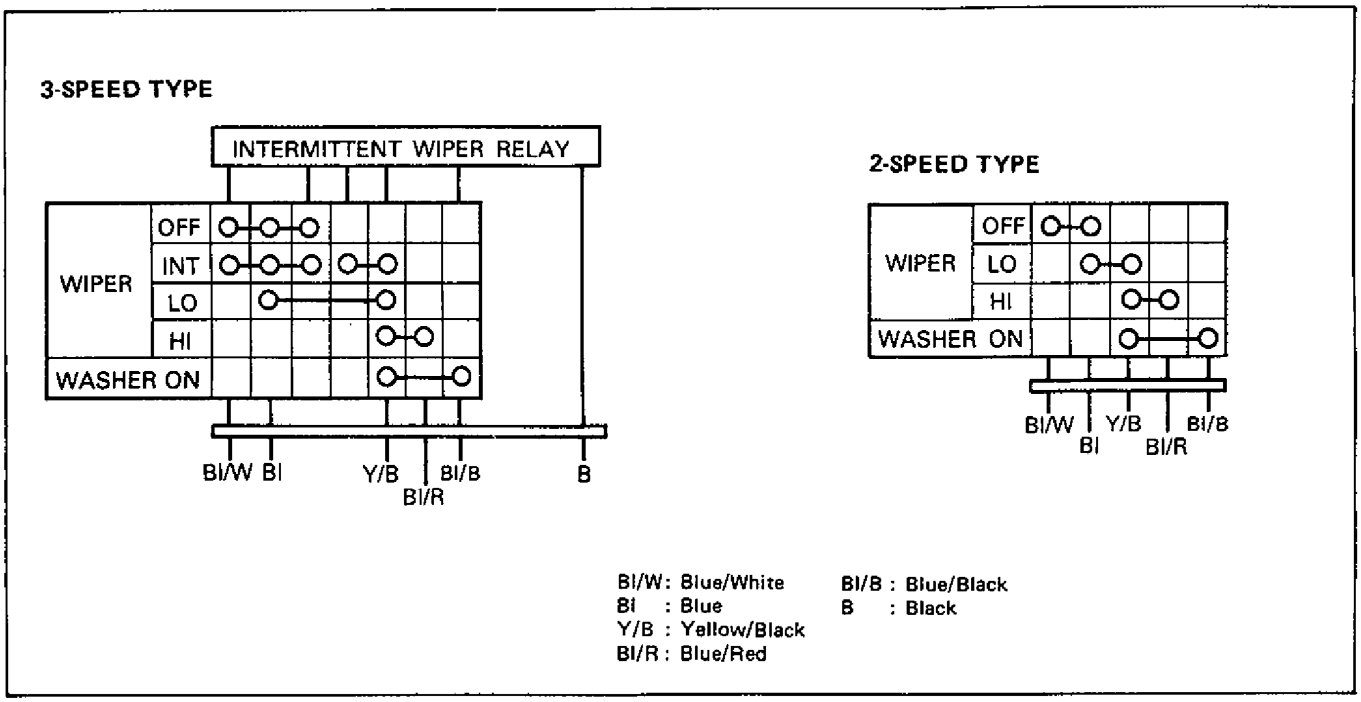


Fig. 8-38

B. WIPER MOTOR

1) As illustrated below, use a 12V battery to connect its (+) terminal to Blue terminal, and its (–) terminal to Black lead wire. Then motor should rotate at a low revolution speed of 45 to 55 rpm. As for high speed check, connect battery (+) terminal to Blue/Red terminal, and its (–) terminal to Black lead wire. Then motor should rotate at a high revolution speed of 68 to 78 rpm.

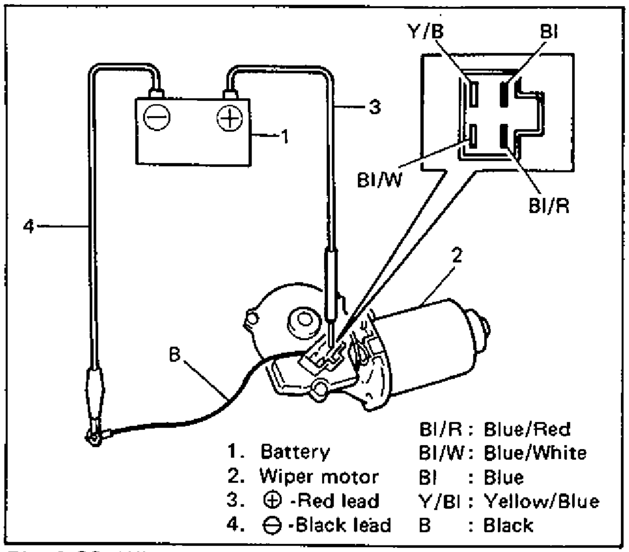


Fig. 8-39 Wiper Motor Test

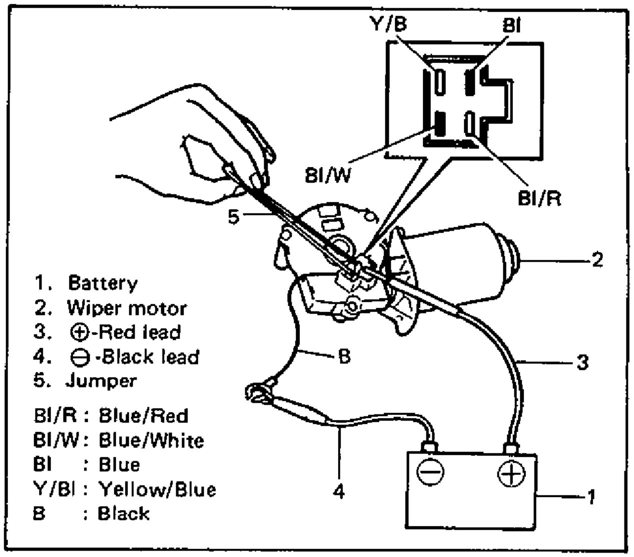


Fig. 8-40 Checking

2) TESTING AUTOMATIC STOP ACTION

Connect battery (+) terminal to motor Yellow/Black terminal, and (–) terminal to Black lead wire 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 coincide with start position. Stop motor again and again by using 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 wire continuity. If continuity is poor, check brush-to-commutator contact area for proper condition.

If that area is fouled, use a cloth damped with gasoline to clean. When surface of the area is coarse or burnt, use a sandpaper to smooth it.

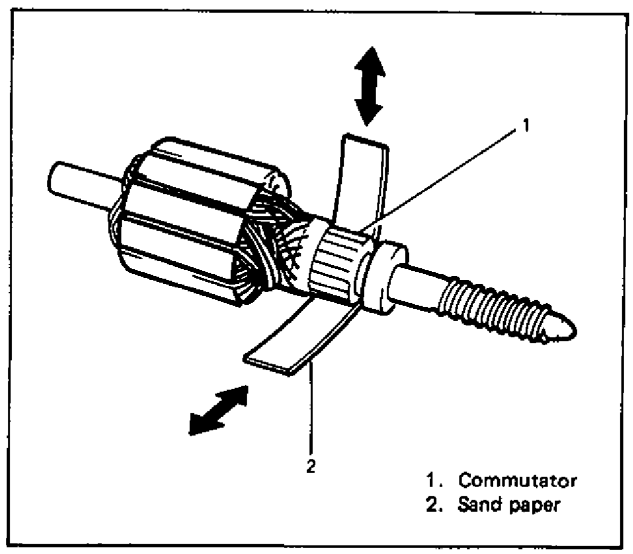


Fig. 8-41 Resurfacing Commutator

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.

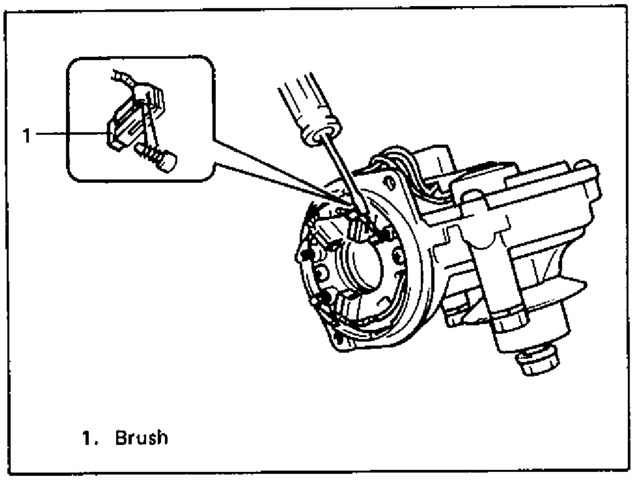


Fig. 8-42 Assembling Brushes

When assembling wiper motor cover, be careful of its notch position which serves as a guide for proper assembly.

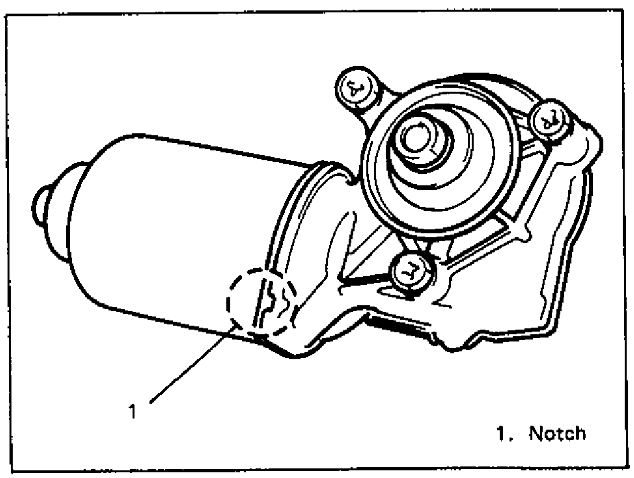


Fig. 8-43

C. WASHER PUMP

Connect battery (+) and (–) terminals to pump (+) and (–) terminals respectively to check pumping rate.

[WASHER PUMP REMOVAL]

1) Disconnect battery (–) cable.
2) Remove front fender lining (LH).
3) Remove washer tank fitting nuts.
4) Disconnect pump lead wires and hoses.
5) Remove washer tank.
6) Remove pump from tank.

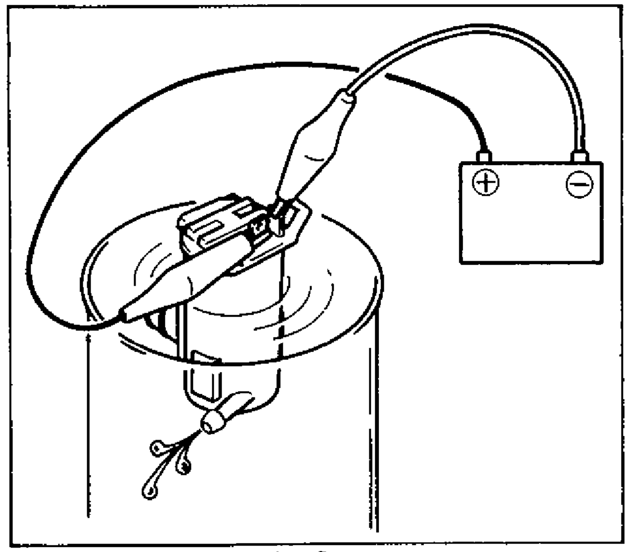


Fig. 8-44 Checking Washer Pump

D. INTERMITTENT WIPER RELAY (Optional)

1. Disconnect wiper & washer switch coupler.
2) Connect (+) cord and (–) cord of 12V battery to coupler terminals as shown below.
3. Turn intermittent switch to "OFF" position. If an operating sound is heard from relay, it is at work properly.

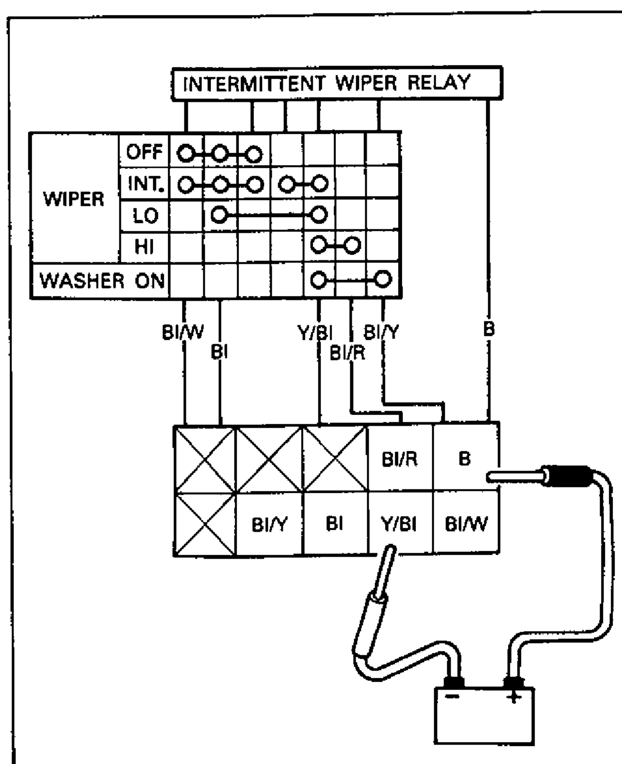


Fig. 8-45 Checking Int. Relay Operation Sound

REAR WINDOW DEFOGGER (If equipped)

The 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.

WIRING DIAGRAM

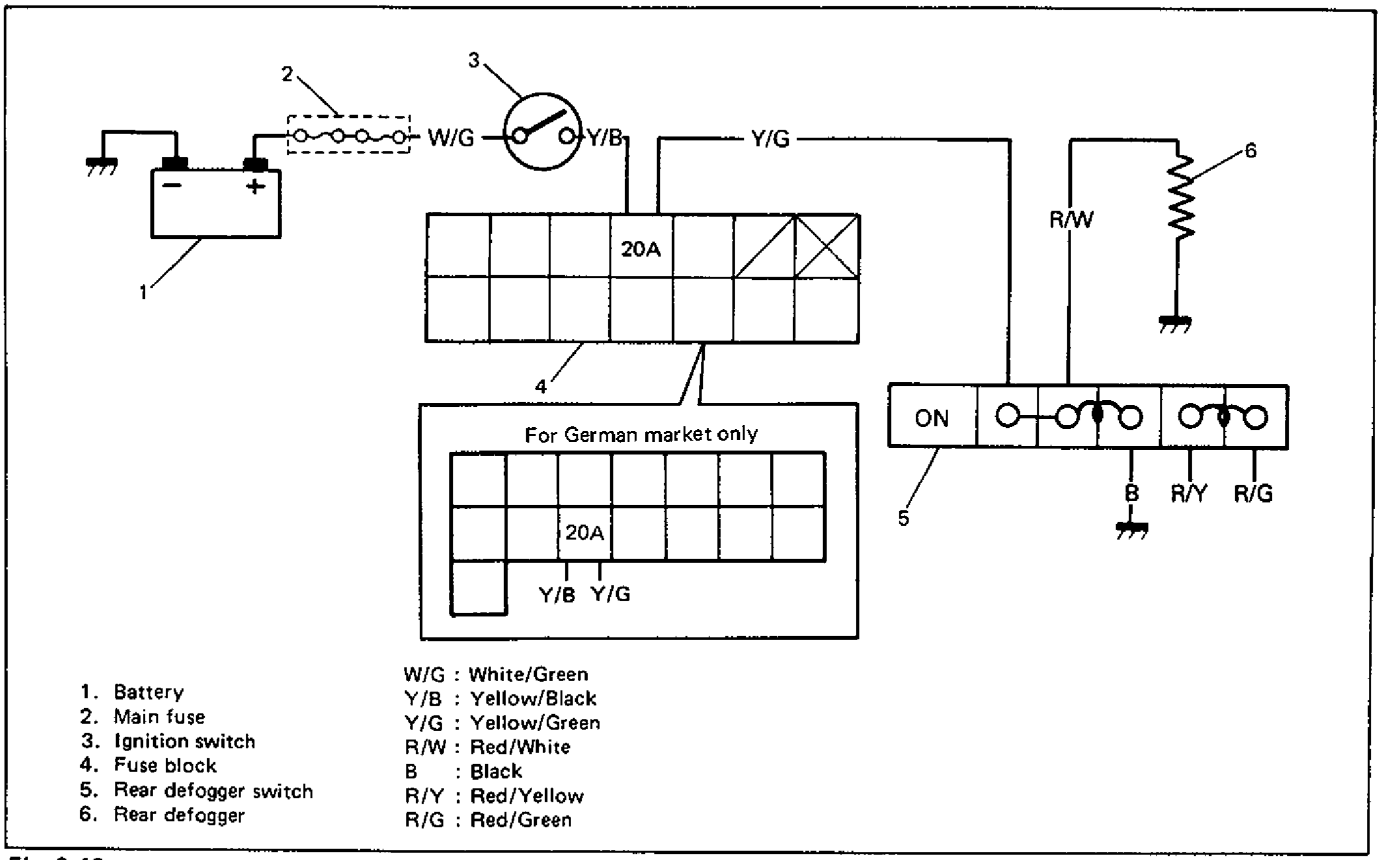


Fig. 8-46

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Defogger won't work.	Defogger switch faulty Defogger heat wire faulty Wiring or grounding faulty	Check switch. Check heat wire. Repair as necessary.

INSPECTION

DEFOGGER SWITCH

Use a circuit tester to check defogger switch for continuity.

	Yellow/ Green	Red/ White	Black	Black (Red/ Green)	Red/ Yellow
OFF		O	O	O	O
ON	O	O	O	O	O

Fig. 8-47

If switch has no continuity between terminals, replace.

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 abrassive-containing glass cleaner.**
- **When measuring wire voltage, use a tester with negative probe wrapped with a tin foil which should be held cown on wire by finger pressure.**

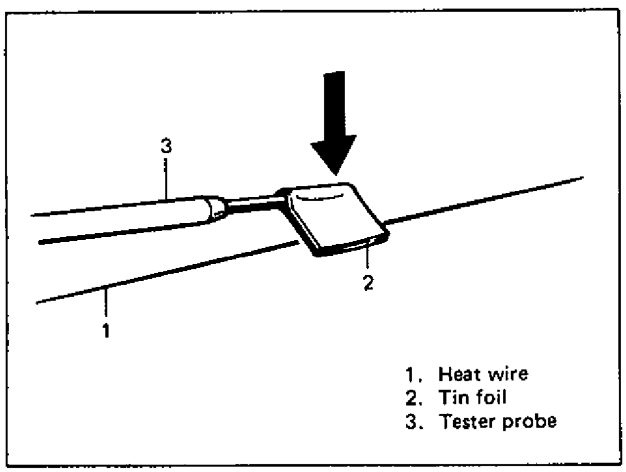


Fig. 8-48

1. Checking wire damage
   a. Turn ignition switch ON.
   b. Turn defogger switch ON.
   c. Use a voltmeter to check voltage at the center of each heat wire, as shown below.

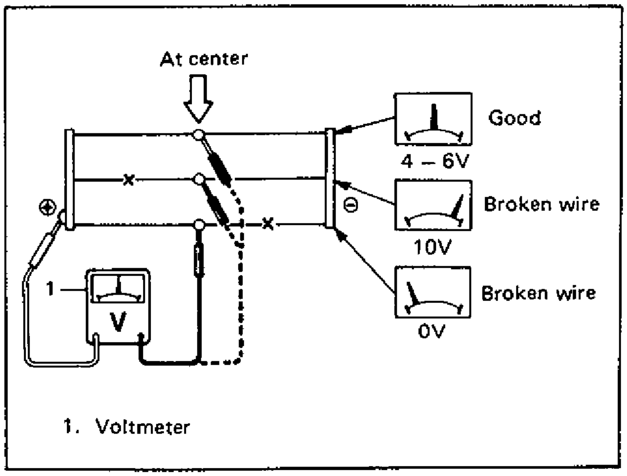


Fig. 8-49

Voltage	Criteria
Approx. 5V	Good (No break in wire)
Approx. 10V or 0V	Broken wire

If measured voltage is 10V, wire must be damaged between its center and positive end. If voltage is zero, wire must be damaged between its center and ground.

2. Locating damage in wire
   a. Touch voltmeter positive (+) lead to heat wire positive terminal end.
   b. Touch voltmeter negative (–) lead with a foil strip to heat wire positive terminal end, then move it along wire to negative terminal end.
   c. The place where voltmeter fluctuates from zero to several volts is where there is damage.

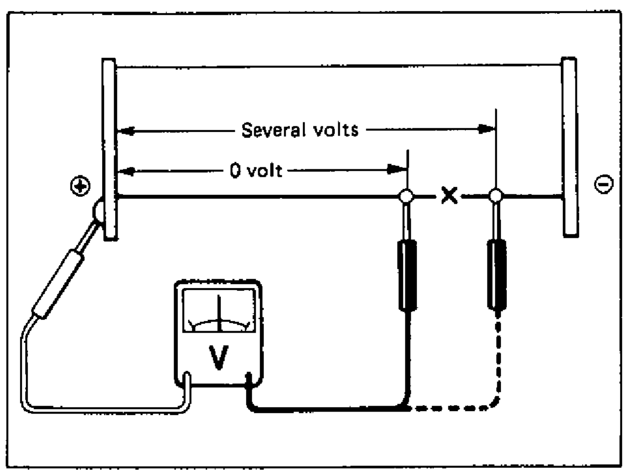


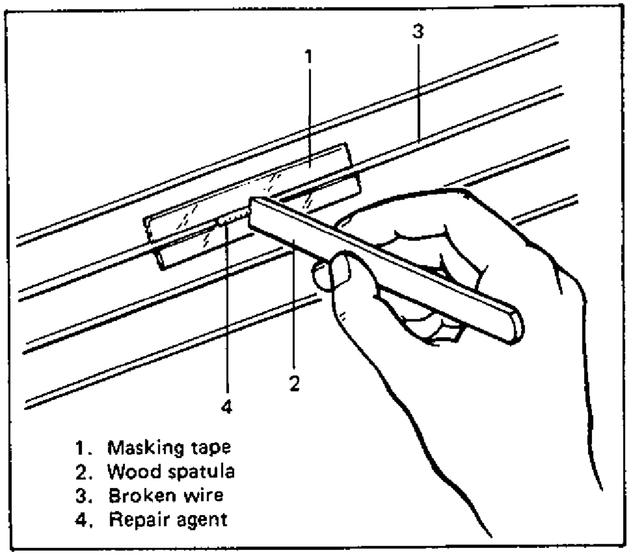
Fig. 8-50

NOTE:
If heat wire is free from damage, voltmeter should indicate 12V at heat wire positive terminal end and its indication should decrease gradually toward zero at the other terminal (ground).

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.



1. Masking tape
2. Wood spatula
3. Broken wire
4. Repair agent

Fig. 8-51

3. Apply commercially-available repair agent with a fine-tip brush.
4. Two to three minutes later, remove masking tape previously applied.
5. Leave repaired heat wire as it is for at least 24 hours before operating defogger again.

INSTALLATION

When installing rear window defogger (optional), have following parts available.

- Back window glass
- Defogger switch
- Defogger lead wires (positive and negative wire)

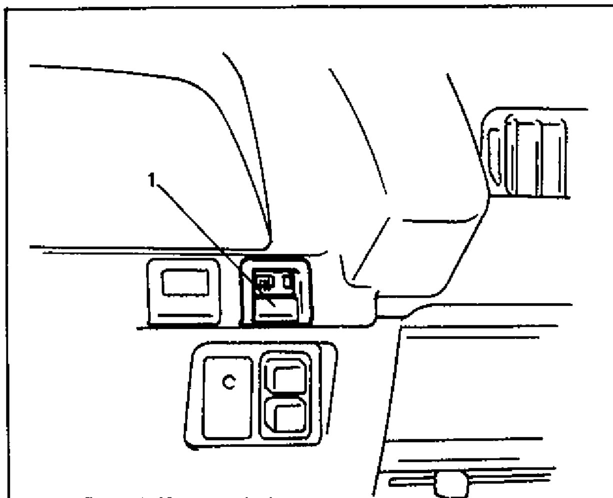
REMOVAL

Remove back window glass.
(For removal procedure, refer to Body Service section.)

INSTALLATION

Before installing, disconnect negative battery cable.

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.



1. Rear deffoger switch

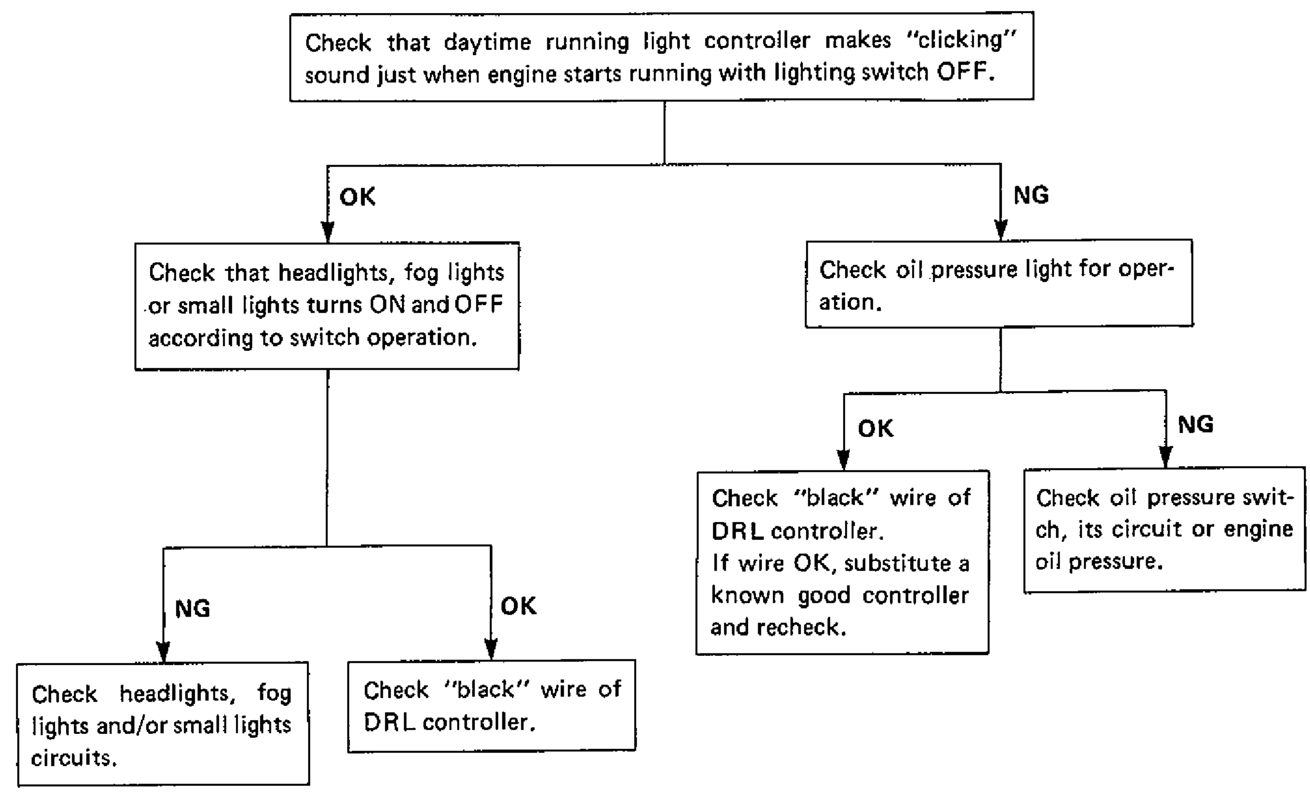
Fig. 8-52

DAYTIME RUNNING LIGHT (DRL) CONTROL SYSTEM FOR EUROPEAN SPEC. (If equipped)

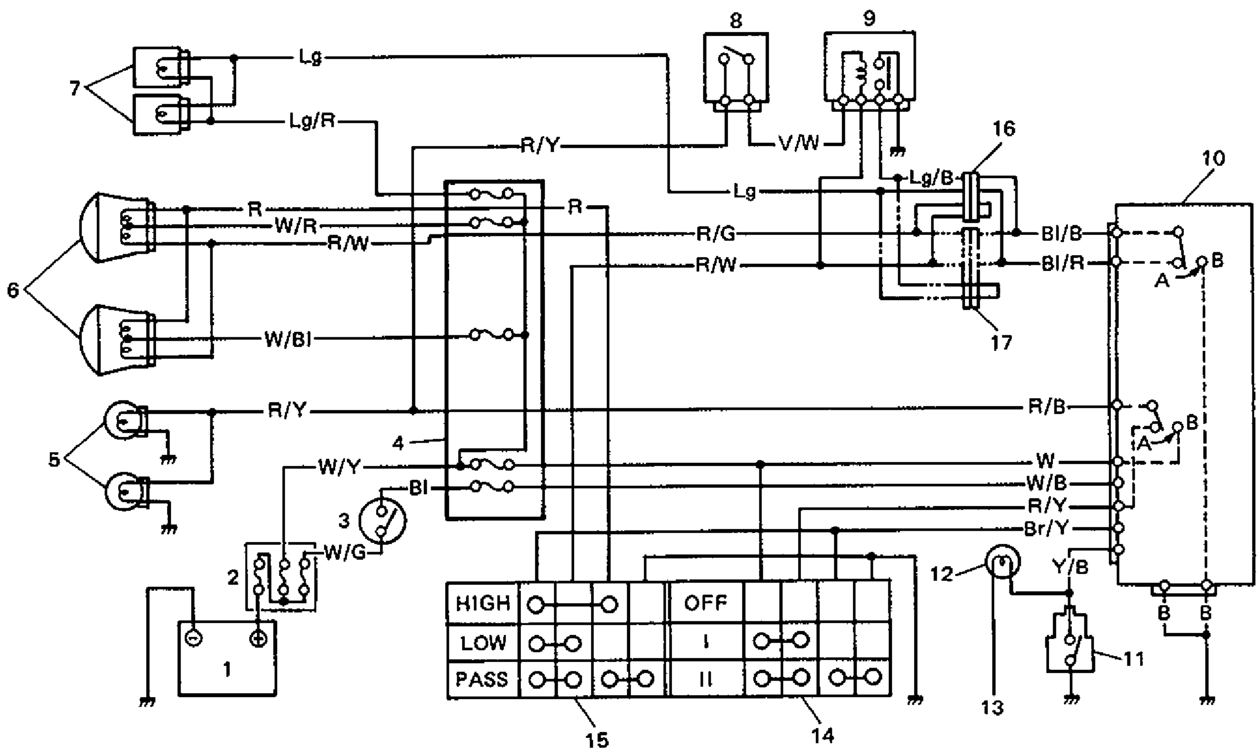
With this system, low beam of headlights (or front fog lights instead of headlights, if equipped) and small lights turn ON when engine is started and they turn OFF when it is stopped.
This system is so designed that lighting switch has a priority. That is, when lighting switch is set to the small light position while engine is running and this system is at work (headlights (or fog lights) and small lights are ON), only small lights remain ON and headlights (or fog lights) turn OFF.

Diagnostic Flow Chart

When a trouble has occurred in this system, check it according to the following flow chart.



NOTE:
- **Daytime running light controller is located under instrument panel at the right of steering column.**
- **NG: No Good**



1. Battery
2. Main fuse box
3. Ignition switch
4. Junction/fuse block
5. Small lights
6. Headlights
7. Front fog lights (if equipped)
8. Front fog light switch (if equipped)
9. Front fog light relay (if equipped)
10. DRL controller
11. Engine oil pressure switch
12. Oil pressure light
13. To ignition switch
14. Lighting switch
15. Dimmer switch
16. For car equipped with fog lights serving for DRL system.
17. For car equipped with headlights serving for DRL system.

A: Engine OFF or lighting switch ON

B: Engine running with lighting switch OFF

Fig. 8-53 DRL Circuit

DAYTIME RUNNING LIGHT (D.R.L.) CONTROL SYSTEM FOR CANADIAN SPEC.

GENERAL DESCRIPTION

If equipped with this system, the headlights light, though dimmer than the low beam, when the following three conditions are all met. Also, D.R.L. indicator light in the combination meter comes ON at the same time.

Conditions for D.R.L. system operation
1. The engine is running.
2. The parking brake is not applied.
3. The lighting switch is at either "OFF" or "clearance light" position.

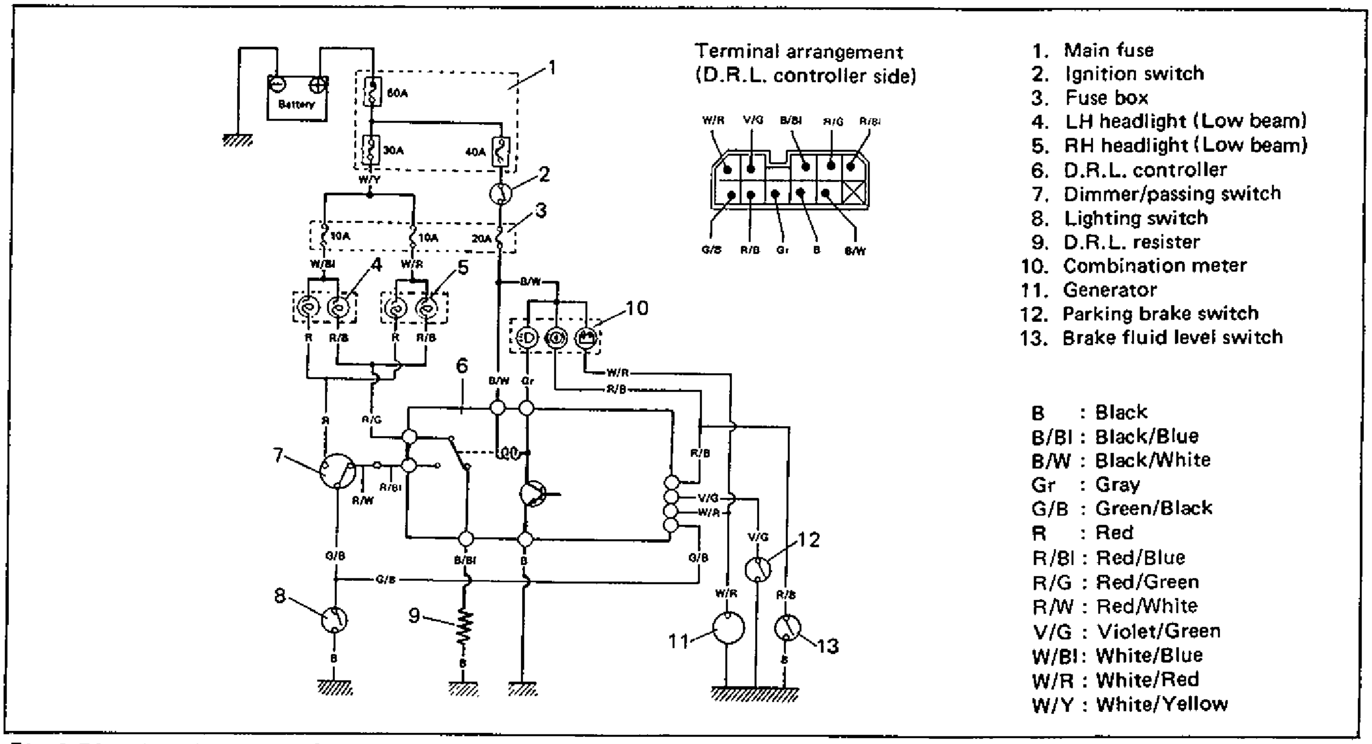


Fig. 8-53-1 D.R.L. System Circuit

NOTE:
- **D.R.L. controller is located under instrument panel at the left of steering column.**
- **D.R.L. resistor is located inside front fender LH panel at fender apron panel.**

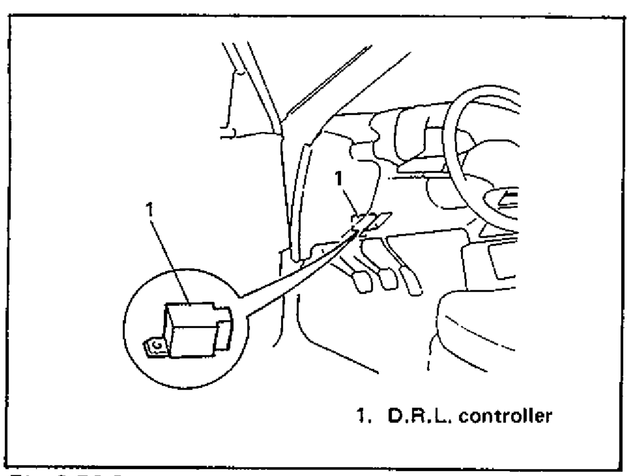


Fig. 8-53-2

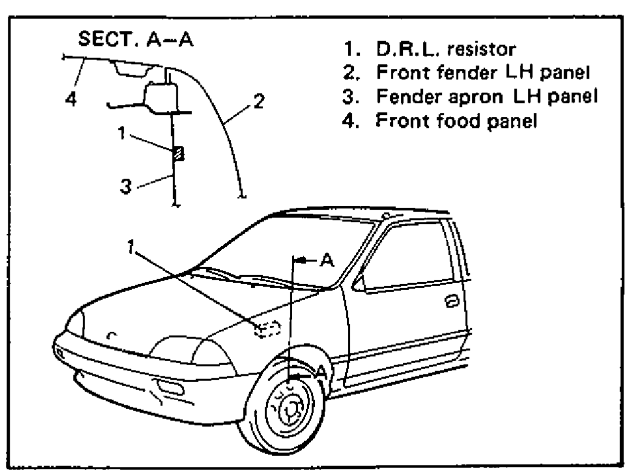
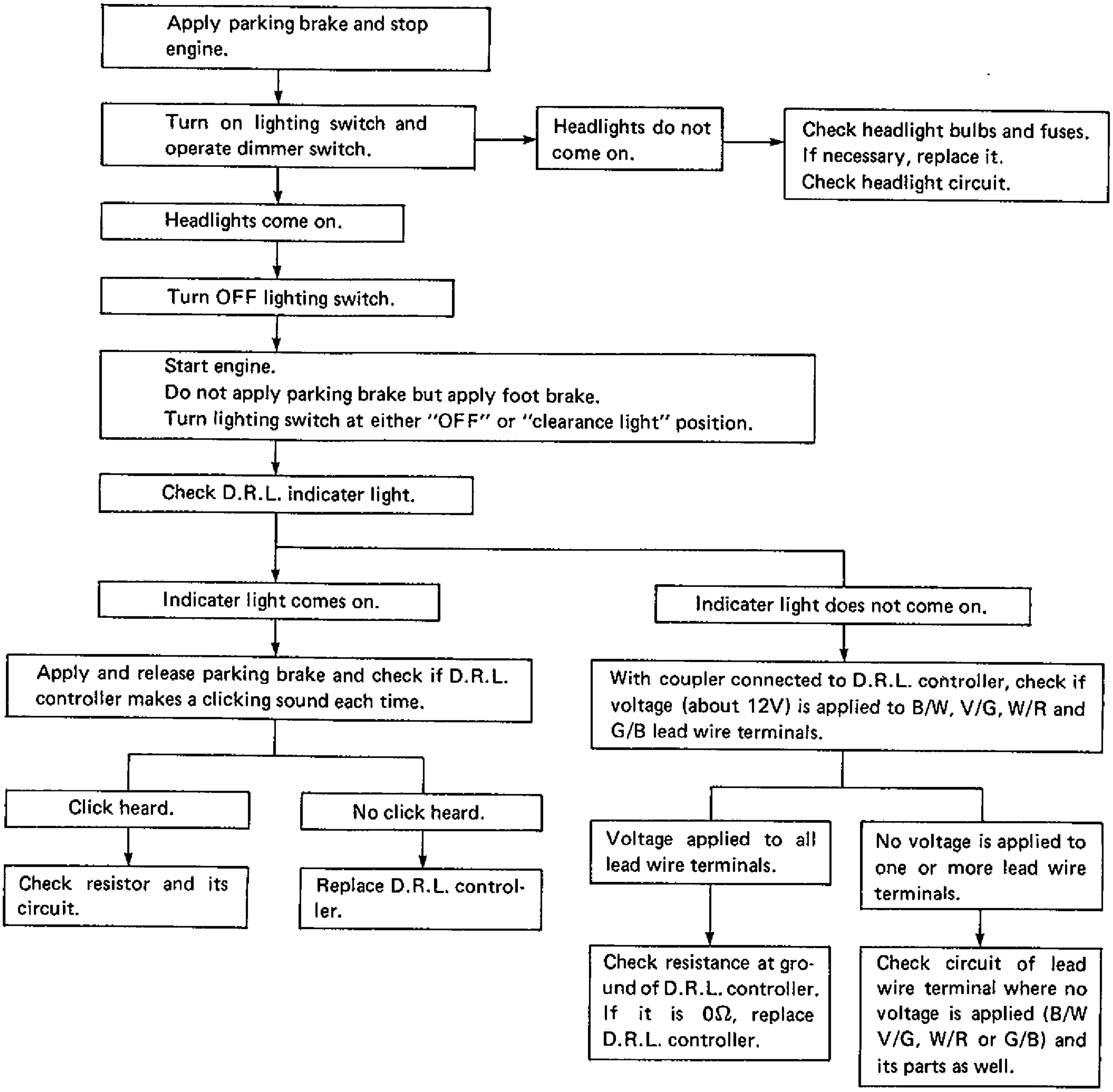


Fig. 8-53-3

TROUBLE DIAGNOSIS

When a trouble has occurred in this system, check it by using the following flow chart 1) or trouble-diagnosis chart 2) depending on symptom.

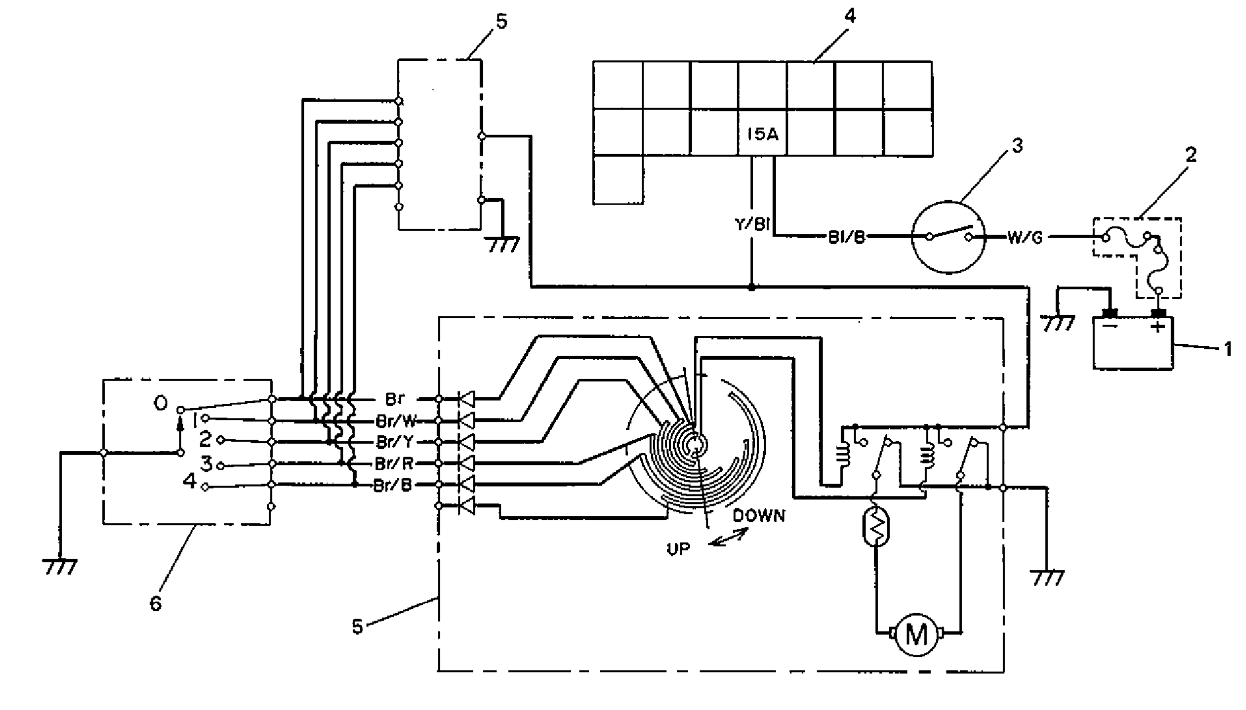
1) D.R.L. system does not operate.



2) D.R.L. system fails to stop.

Trouble	Possible cause	Correction
D.R.L. system remains operating even after engine stop.	D.R.L. controller faulty. W/R circuit faulty.	Replace controller. Repair.
D.R.L. system remains operating even after parking brake applied.	Parking brake switch faulty. V/G circuit faulty.	Replace switch. Repair.
D.R.L system remains operating even after lighting switch turned ON.	Lighting switch faulty. G/B circuit or its ground faulty.	Repair or replace switch. Repair.

HEADLIGHT BEAM LEVELING SYSTEM (If equipped)



1. Battery
2. Main fuses
3. Ignition switch
4. Fuse block
5. Actuater
6. Control switch

Br : Brown
Br/W: Brown/White
Br/Y: Brown/Yellow
Br/R: Brown/Red
Br/B : Brown/Black
Bl/B : Blue/Black
Y/Bl : Yellow/Blue
W/G : White/Green

Fig. 8-54 Headlight Beam Leveling Circuit

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Headlights do not move.	• Fuse blown • Leveling switch faulty • Supply voltage too low	• Check circuit and replace fuse. • Check switch or replace it as • Recharge or replace battery.
Headlight does not move. (Right or Left)	• Socket, wiring or grounding faulty • Do not operate actuater • Car body around headlight deformed • Headlight ass'y itself deformed	• Repair as necessary. • Replace headlight ass'y. • Repair body. • Replace headlight ass'y.

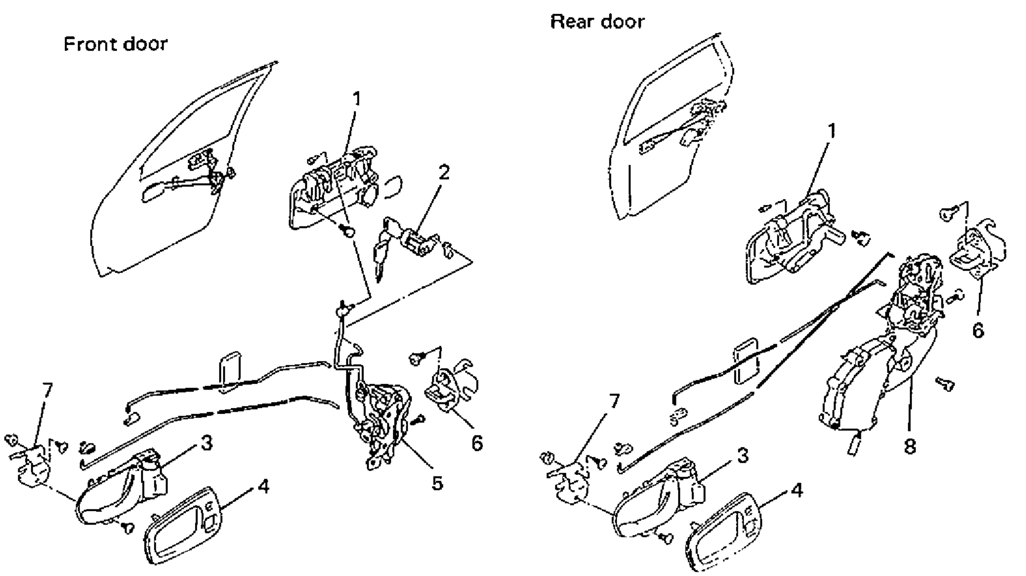
CENTER LOCKING SYSTEM (If equipped) [POWER DOOR LOCK SYSTEM (If equipped)]

GENERAL

All the side doors can be locked and unlocked simultaneously by using the key in the front right or left side door lock. Also, they can be locked and unlocked by pushing the driver's side door lock lever reaward.

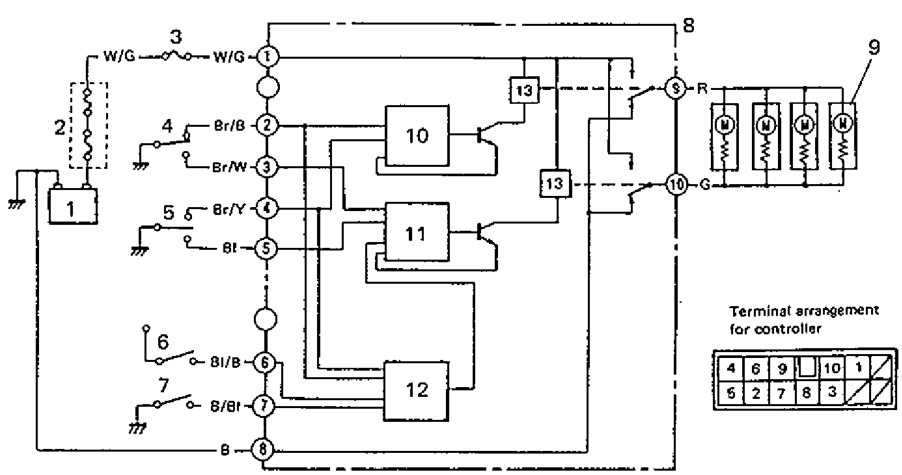
NOTE:

Using the key or moving the lock lever on the passenger's side door locks or unlocks that particular door only.



1. Outer handle
2. Key lock cylinder
3. Inside handle
4. Inside handle bezel
5. Front door latch assembly (with key/knob switch and actuator)
6. Latch striker
7. Inside handle bracket
8. Rear door latch assembly

Fig. 8-55 Front and Rear Door Lock Assembly



1. Battery
2. Main fuse
3. Fuse
4. Drivers side key/knob switch
5. Passenger's side key switch
6. Main switch
7. Driver's side door switch
8. Door lock controller
9. Actuator
10. Lock timer
11. Unlock timer
12. Key confine prevention
13. Relay

Fig. 8-56 Power Door Lock Circuit

REMOVAL AND INSTALLATION

Refer to SECTION 9 "BODY SERVICE".

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
None of door lock actuators operates.	• Fuse blown	Repair circuit and replace fuse.
	• Open circuit between battery and controller	Repair circuit.
	• Open circuit between controller and ground	Repair circuit.
	• Defective key switch or lever switch	Replace switch.
	• Defective actuators	Replace actuators.
	• Defective controller	Replace controller.
One or more of door lock actuators fail to operate.	• Open circuit between controller and actuator	Repair circuit
	• Defective actuator	Replace actuator.
	• Door lock actuator or door lock component is out of place	Repair.

POWER DOOR LOCK CONTROLLER LOCATION

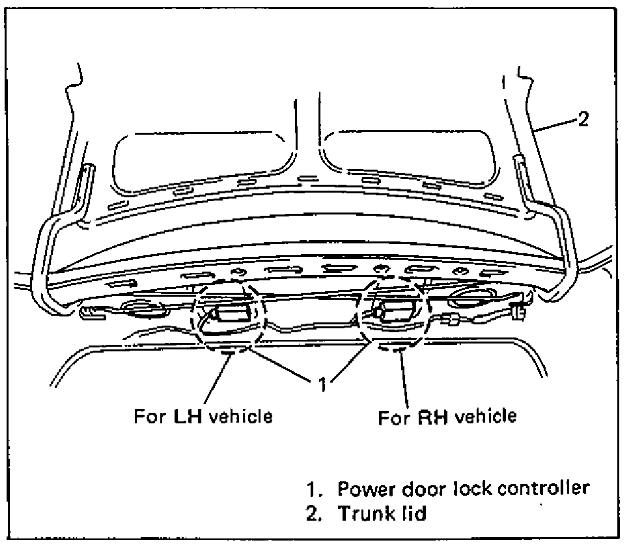


Fig. 8-57 Power Door Lock Controller Location

POWER WINDOW CONTROL SYSTEM

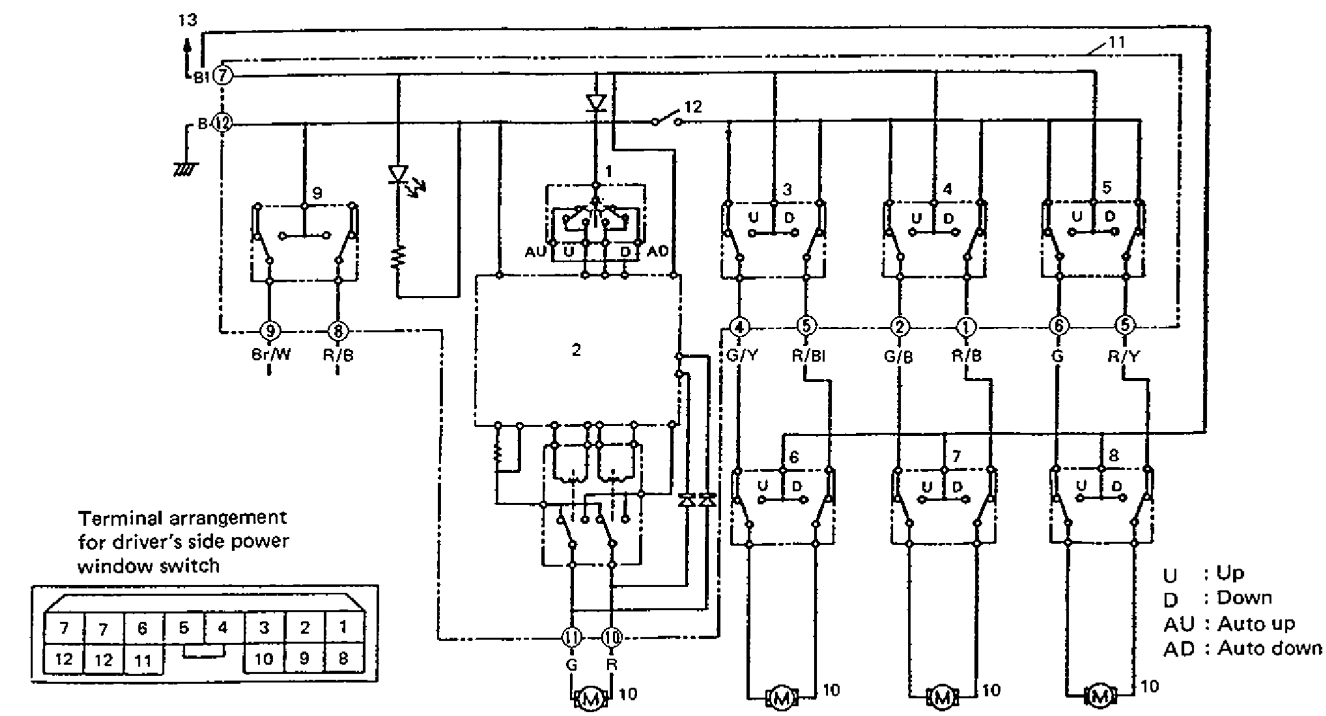
GENERAL DESCRIPTION

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 wiring diagram.

NOTE:
Canadian specification car is not equipped with auto-up device.

WIRING DIAGRAM



1. Auto switch
2. Auto circuit
3. Passenger's side power window main switch
4. Rear right side power window main switch
5. Rear left side power window main switch
6. Passenger's side power window assistant switch
7. Rear right side power window assistant switch
8. Rear left side power window assistant switch
9. Door lock switch
10. Actuator
11. Driver's side power window switch
12. Window lock switch
13. From battery

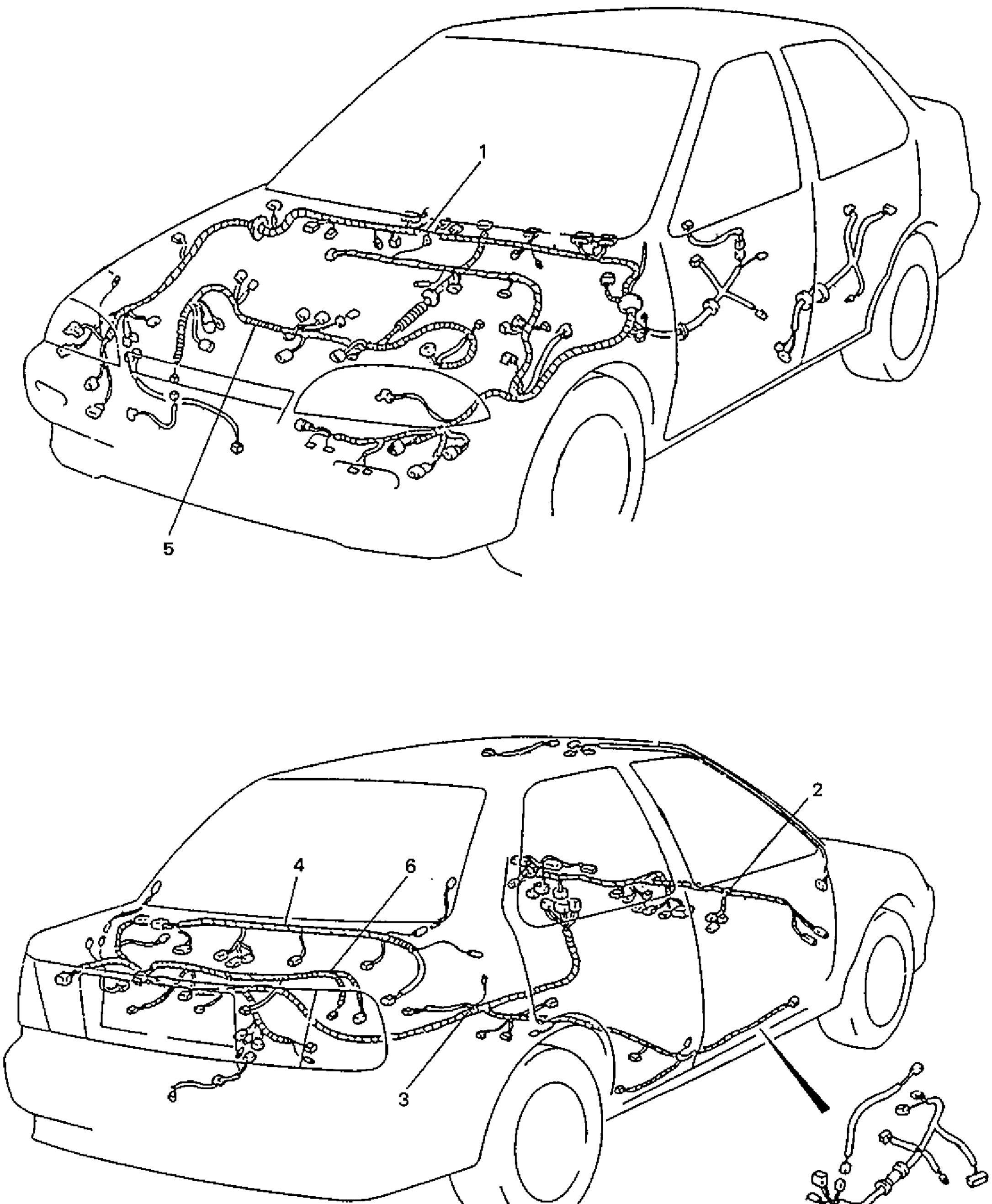
Fig. 8-58

Trouble Diagnosis

Condition	Possible cause	Correction
All power window motors do not operate.	• Main fuse and/or fuses blown • Wiring or grounding faulty	Replace main fuse and/or fuses to check for short. Repair as necessary.
Some switches do not operate.	• Wiring or socket faulty • Window lock switch faulty	Repair as necessary. Replace.
Only one actuator does not faulty.	• Wiring or socket faulty • Actuator faulty	Repair as necessary. Replace.

WIRING HARNESS ROUTING

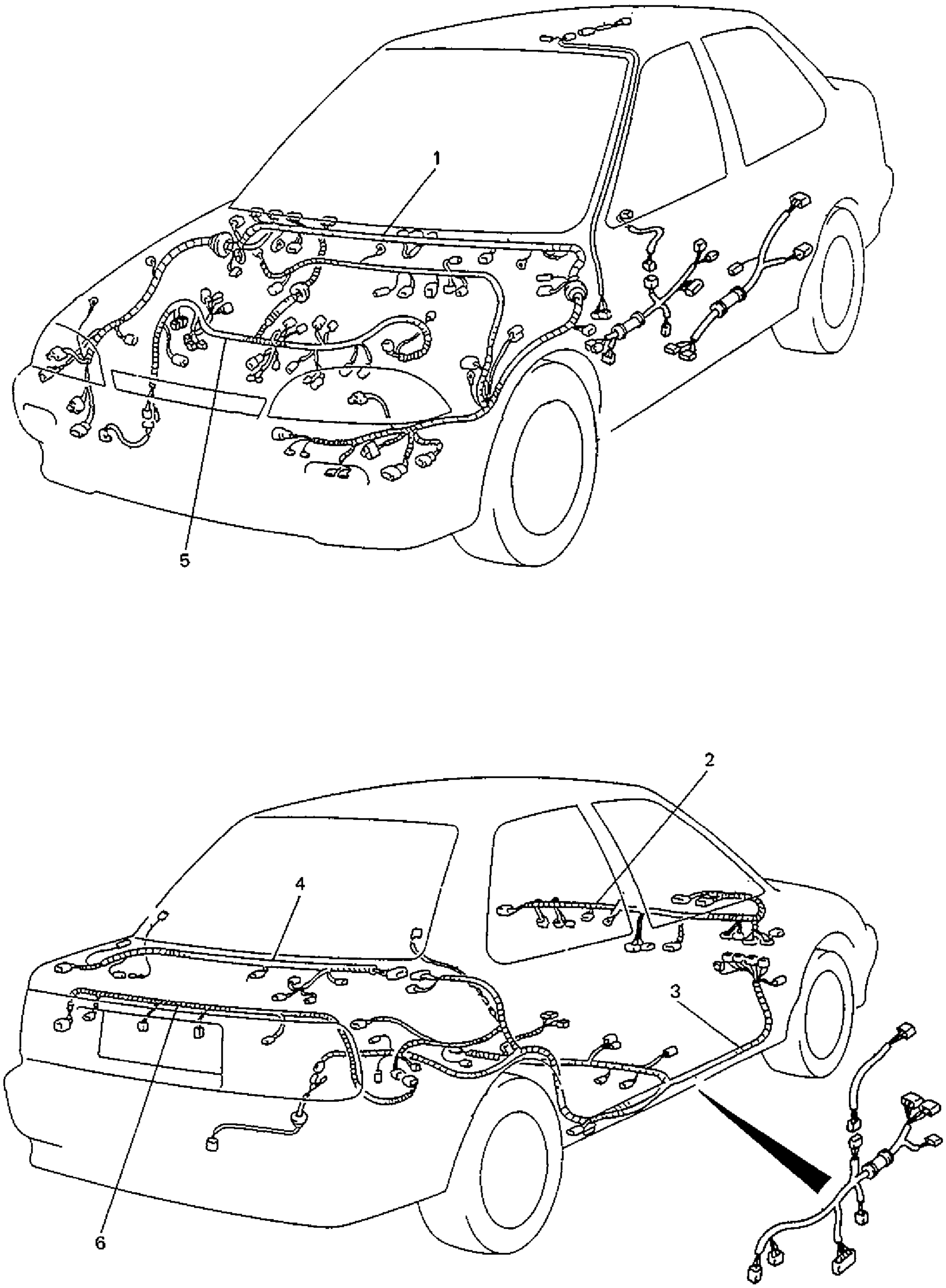
For left hand steering car



1. Main wiring harness No. 1
2. Instrument panel wiring harness No. 2
3. Floor wiring harness No. 3
4. Trunk room wiring harness No. 4
5. Engine wiring harness No. 5
6. Trunk lid wiring harness No. 7

Fig. 8-59

For right hand steering car



1. Main wiring harness No. 1
2. Instrument panel wiring harness No. 2
3. Floor wiring harness No. 3
4. Trunk room wiring harness No. 4
5. Engine wiring harness No. 5
6. Trunk lid wiring harness No. 7

Fig. 8-60

GROUNDING POINTS

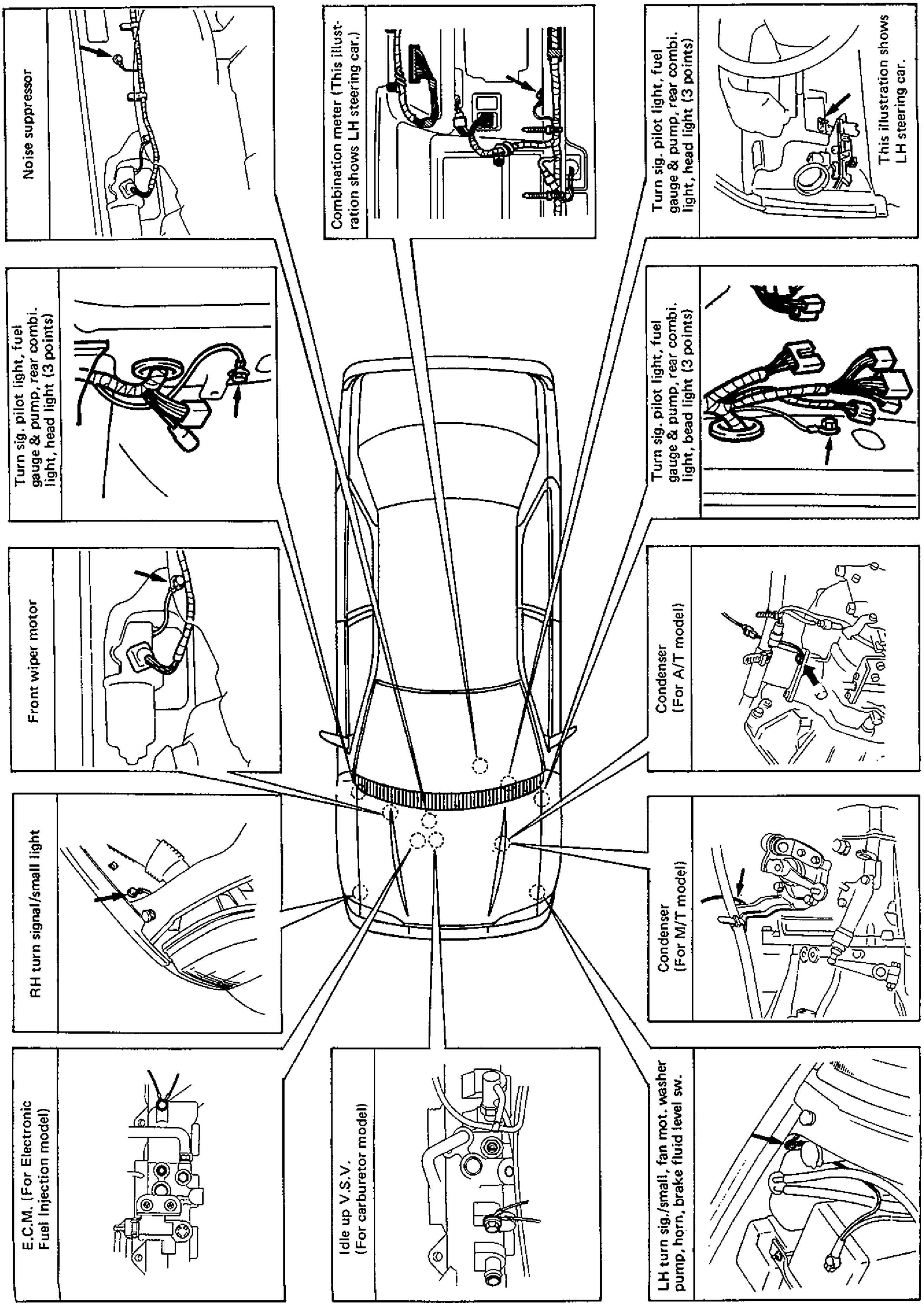


Fig. 8-61 Grounding Points

GROUNDING POINTS

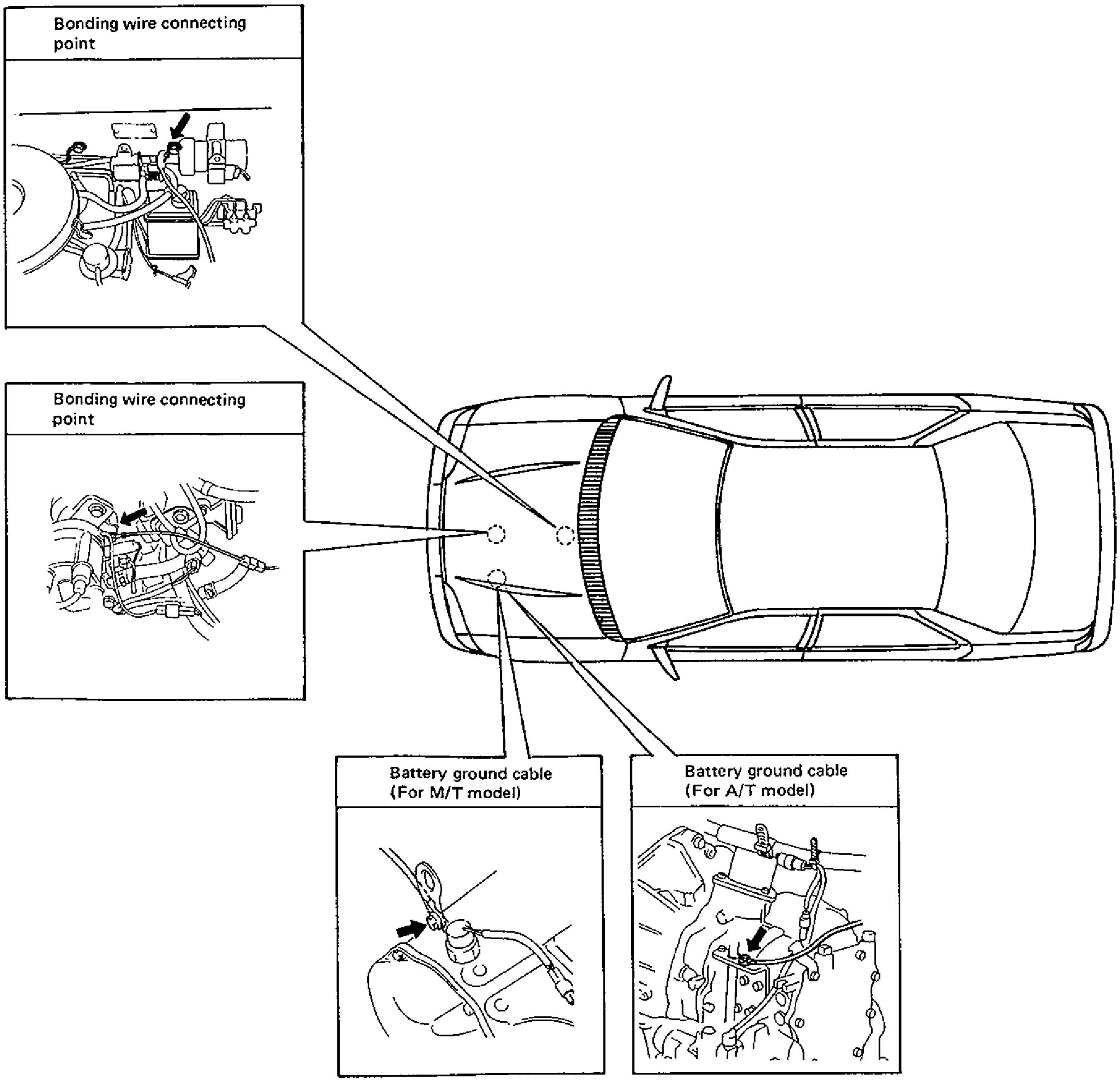


Fig. 8-62

SECTION 9

BODY SERVICE

CONTENTS

ON CAR SERVICE 9- 2
FRONT DOOR 9- 2
Door Glass 9- 2
Door Window Regulator 9- 4
Front Door Lock 9- 5
Front Door Assembly 9- 7
REAR DOOR 9- 9
Door Glass 9- 9
Door Window Regulator 9-11
Rear Door Lock 9-12
Rear Door Assembly 9-12
WINDSHIELD 9-13
TRUNK LID 9-19
Rear Garnish 9-21
BACK WINDOW 9-21
SEATS 9-24
Front Seat 9-24
Rear Seat 9-24
Rear Seat Cushion 9-25
Rear Seatback 9-25
SEAT BELTS 9-25
FLOOR CARPET 9-28
Front Floor Carpet 9-28
Luggage Floor Carpet 9-28
ROOF LINING 9-29
ANTI-CORROSION TREATMENT 9-30
Metal Replacement Parts Finishing 9-31
Seeler Application Areas 9-32
Undercoating Application Areas 9-35
Anti-Corrosion Compound and Chip Resistant Material Application Areas ... 9-37
Plastic Parts Finishing 9-38
UNDERBODY DIMENSIONS 9-39
BODY DIMENSIONS 9-40
SIDE MOLDINGS (OPTIONAL) 9-43
KEY CODING 9-43
Key Usage and Identification 9-43

ON CAR SERVICE

FRONT DOOR

1. Door panel
2. Door trim
3. Door trim cover
4. Door open stop
5. Door hinge
6. Door sealing cover
7. Door glass
8. Outer weatherstrip
9. Inner weatherstrip
10. Glass bottom channel
11. Door rear sash
12. Window regulator

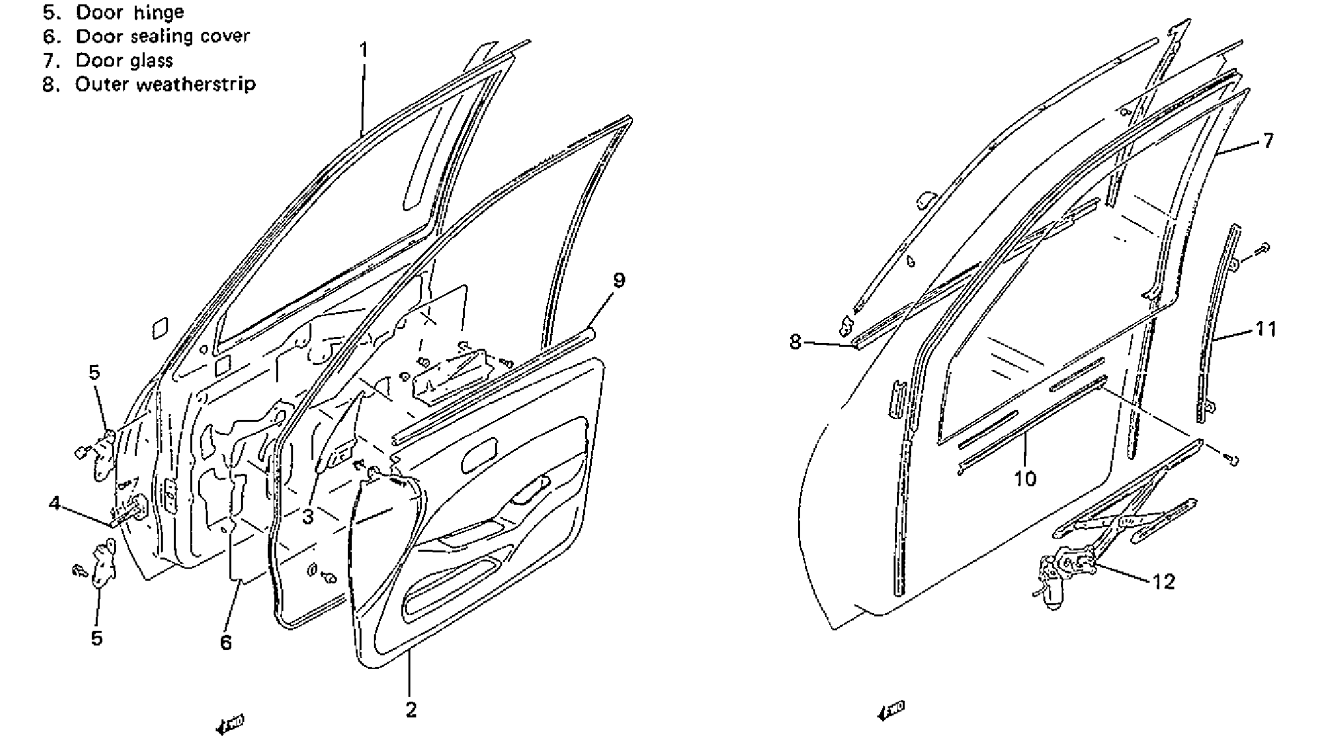


Fig. 9-1 Front Door Assembly

DOOR GLASS

REMOVAL

Remove following parts.

1) Inside handle bezel.
2) Trim mounting screws.
3) Door trim cover.
4) Door trim, and power window switch lead wire at coupler.

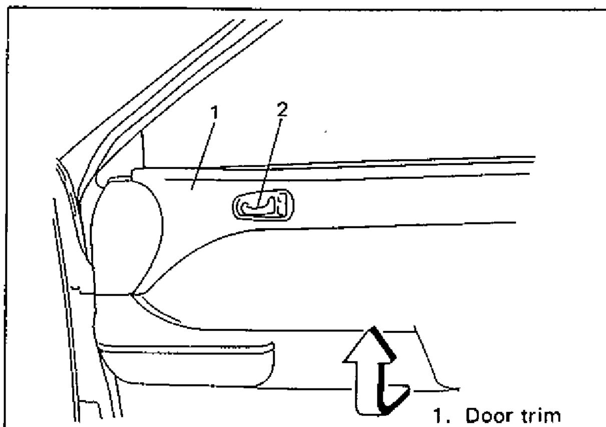


Fig. 9-3 Removing Door Trim

5) Door trim bracket.

6) Door sealing cover.
7) Door outside weatherstrip.
8) Glass bottom channel attaching screws.

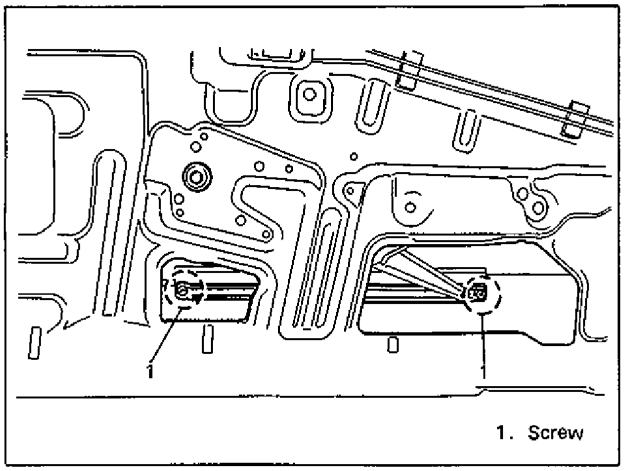


Fig. 9-4

9) Take out door glass together with bottom channel.
10) Detach glass from bottom channel.

INSTALLATION

Reverse the removal sequence to install door glass noting the following points:

1) When installing glass to bottom channel, coat channel with soap water and tap it with a plastic hammer.
   Glass-fitted position of bottom channel is as shown below.

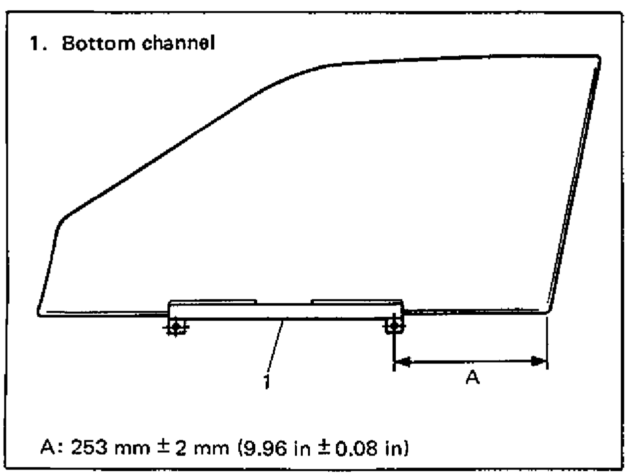


Fig. 9-5

2) Adjust equalizer of window regulator so that measurements A and B in Fig. 9-7 are equal to each other.

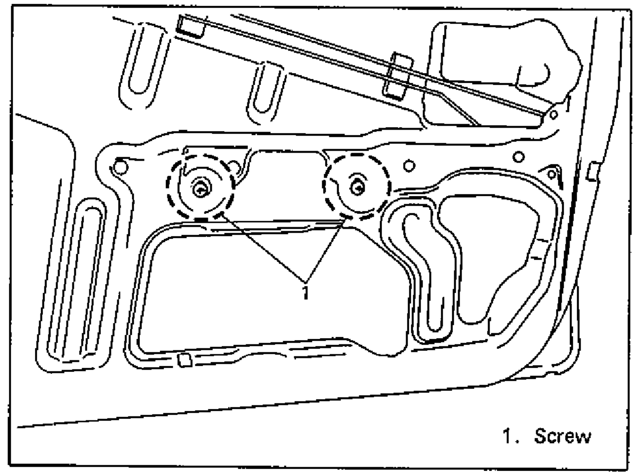


Fig. 9-6 Adjusting Equalizer

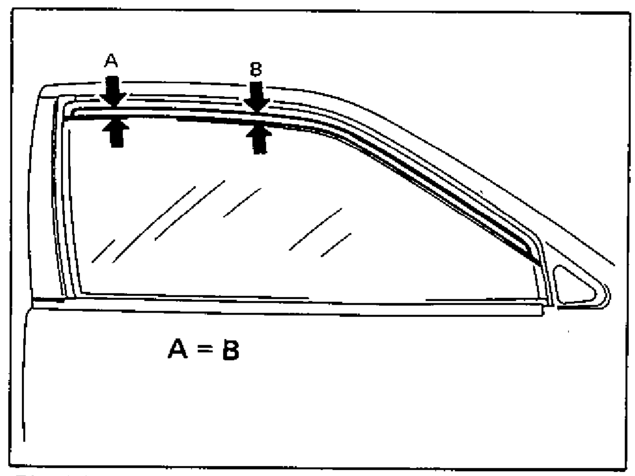


Fig. 9-7

3) Securely seal door sealing cover with adhesive.

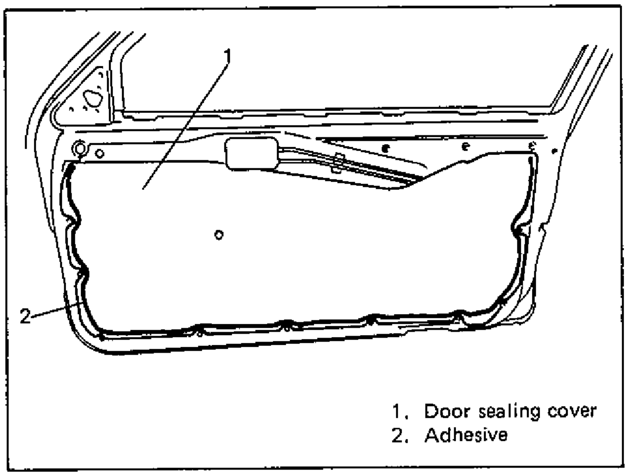


Fig. 9-8

DOOR WINDOW REGULATOR

REMOVAL

Remove following parts.

1) Door glass. (See previous section.)
2) Door trim bracket.
3) Power window motor lead wire at coupler.
4) Door window regulator attaching screws (six pcs.) Take out regulator through hole "A".

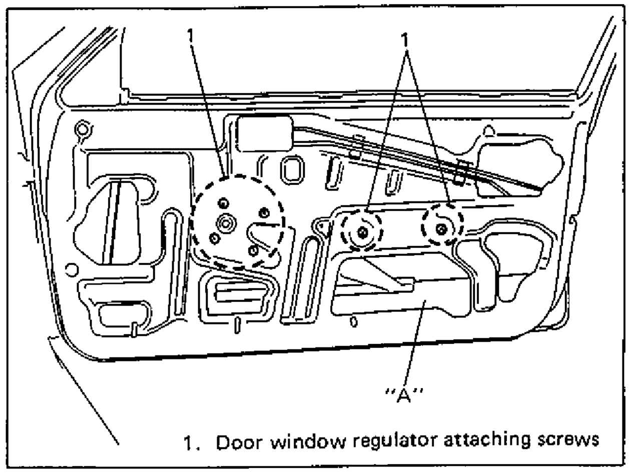


Fig. 9-10

INSPECTION

a. Check gear for wear or damage.
b. Check spring for weakened condition.

INSTALLATION

Reverse removal sequence to install door window regulator.

1) Apply multi-purpose grease to sliding parts.

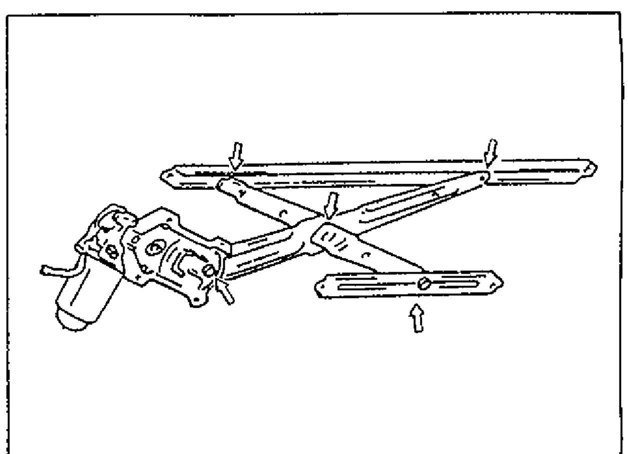


Fig. 9-11 Greasing Sliding Points

FRONT DOOR LOCK

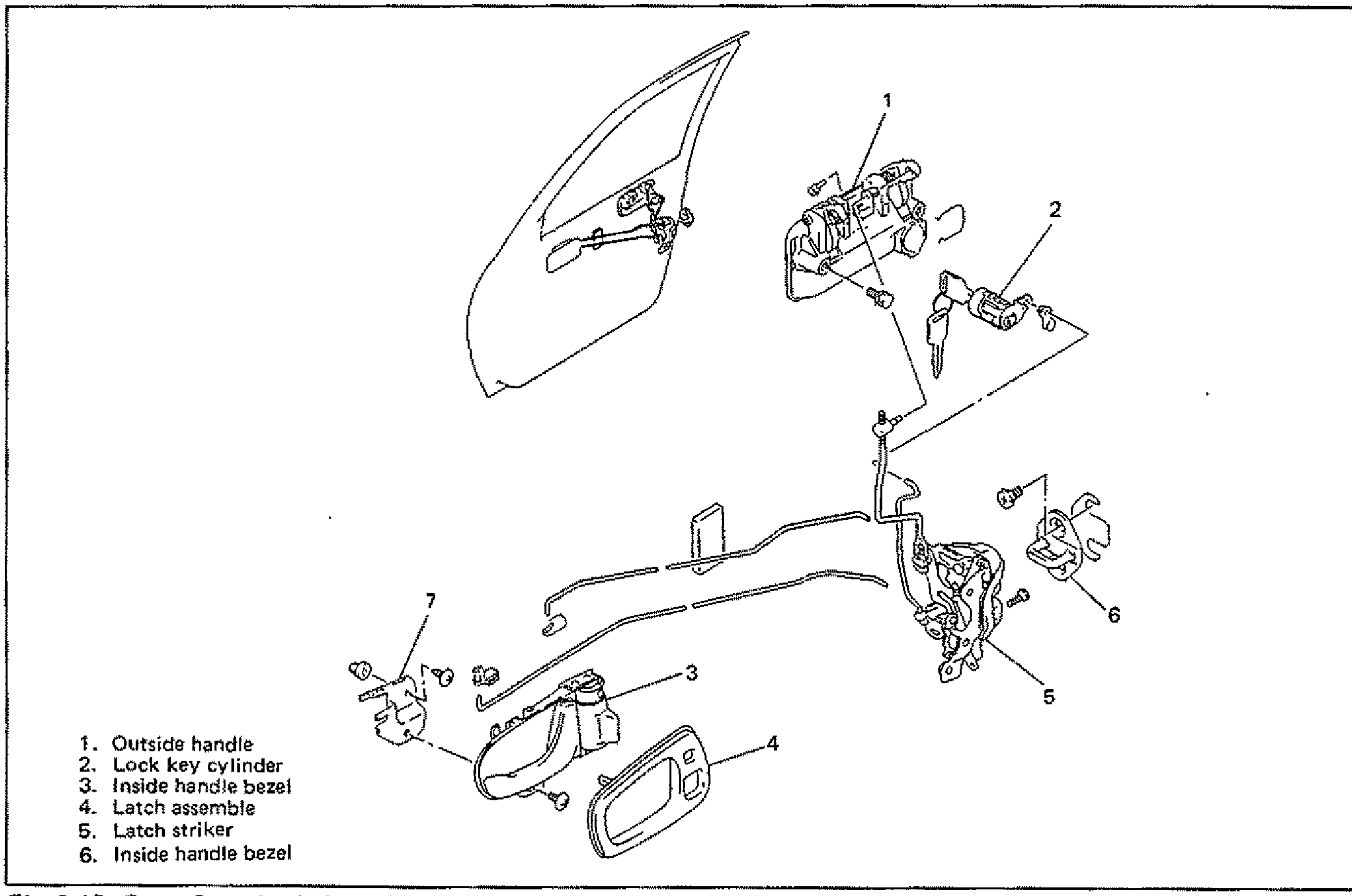


Fig. 9-12 Front Door Lock Assembly

REMOVAL

Remove following parts.

1) Inside handle bezel.
2) Trim mounting screws.
3) Door trim cover.
4) Door trim, and power window switch lead wire at coupler.

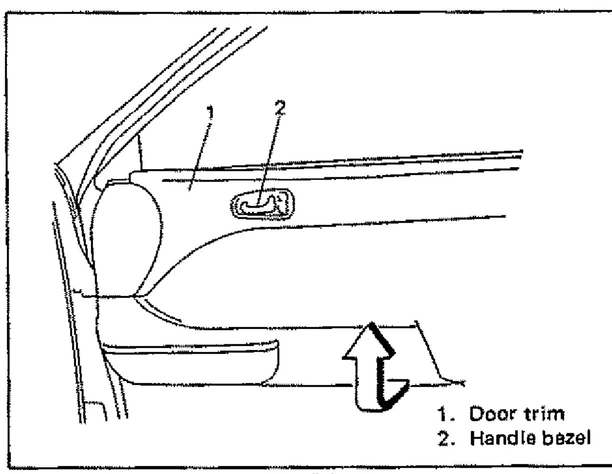


Fig. 9-14 Removing Door Trim

5) Door trim bracket.

6) Door sealing cover.
7) Front door rear sash.
8) Door inside handle and door latch ass'y.
   After disconnecting each joint of control link, remove door inside handle, door locking motor lead wire (if equipped) and door latch ass'y.

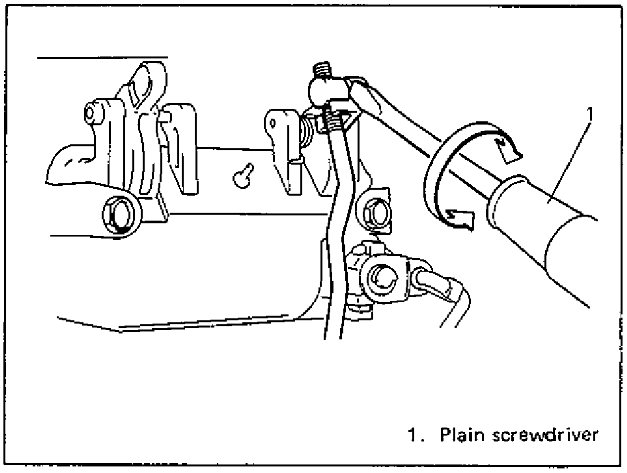


Fig. 9-15 Disconnecting Door Opening Control Link

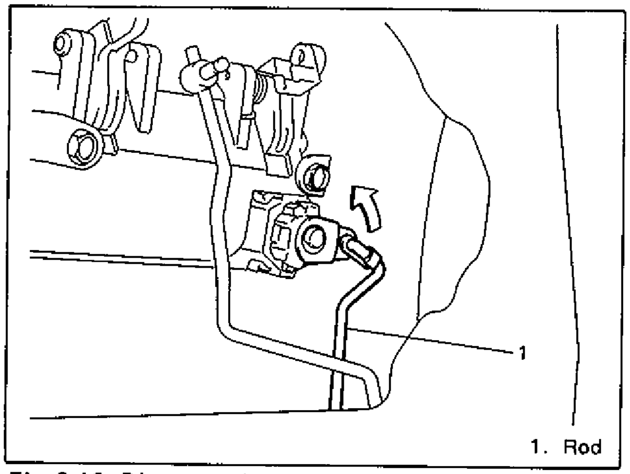


Fig. 9-16 Disconnecting Rod

INSTALLATION

Reverse removal sequence for installation while using care for following items.

1) Door outside opening rod
   When installing opening rod 1 to outside handle 2, turn joint 3 to adjust distance "A" to 0 to 2 mm (0 to 0.08 in.) as shown below.

NOTE:

Do not push down opening link 6 when adjusting and installing opening rod.

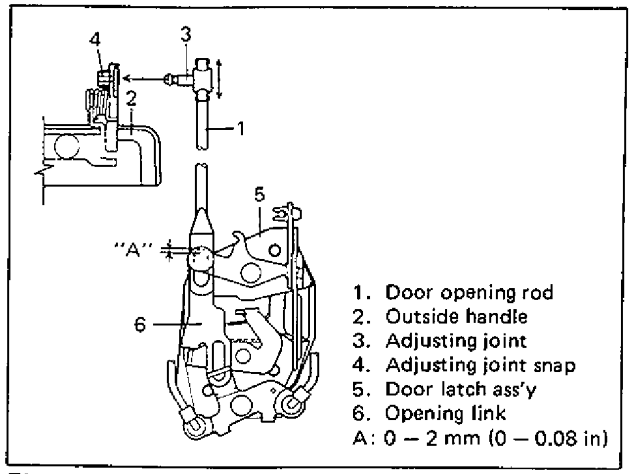


Fig. 9-17

2) Door latch striker
   Move door latch striker up and down so that its shaft 3 approximately aligns with the center of groove "C" of door latch.

NOTE:

Striker should be placed level and moved vertically. Do not adjust door latch.

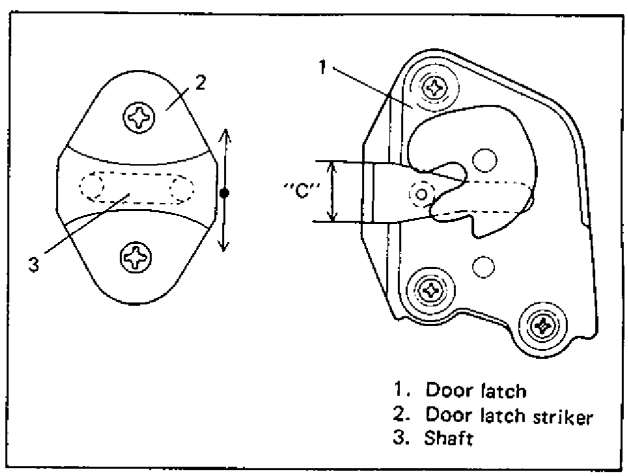


Fig. 9-18

Move door latch striker sideways to adjust to 0 mm (0 in.) the door surface-to-body surface difference with door closed.

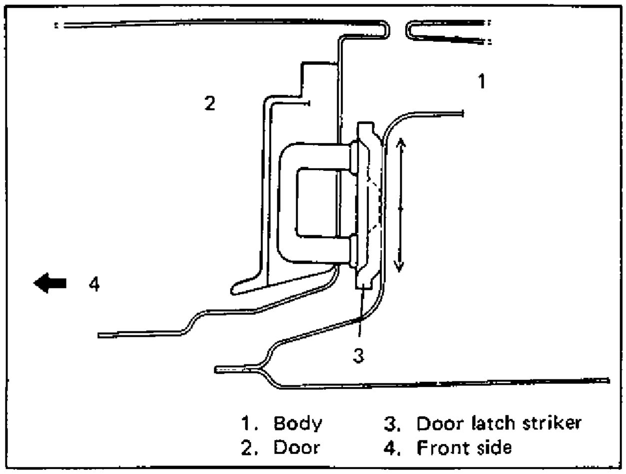


Fig. 9-19

In order to correctly obtain door striker position in fore-and-aft direction, increase or decrease number of spacers inserted between body and striker to adjust it. Dimension "D" should be adjusted to 12.6 to 14.6 mm (0.50 to 0.57 in.).

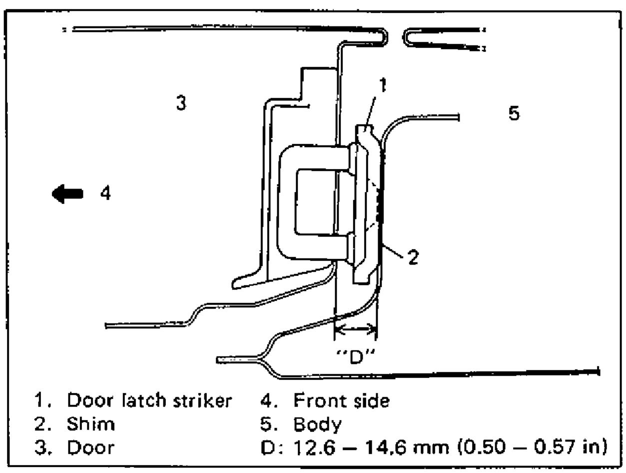


Fig. 9-20

NOTE:
Apply oil or grease to striker joints periodically.

FRONT DOOR ASSEMBLY

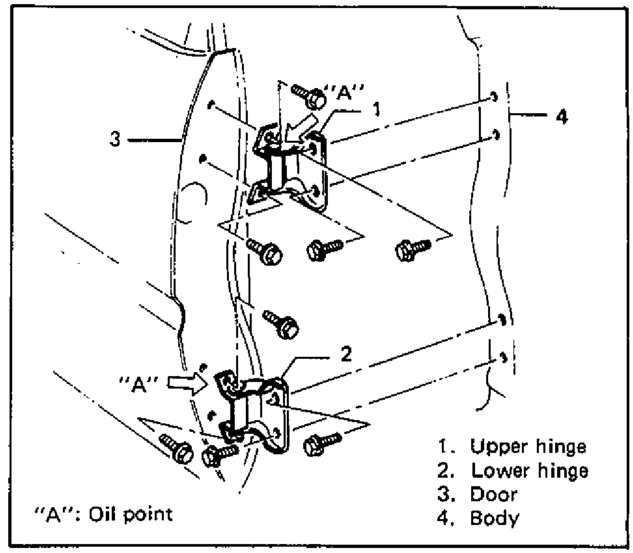


Fig. 9-21

REMOVAL

1) Remove stopper pin upward by tapping it with hammer.

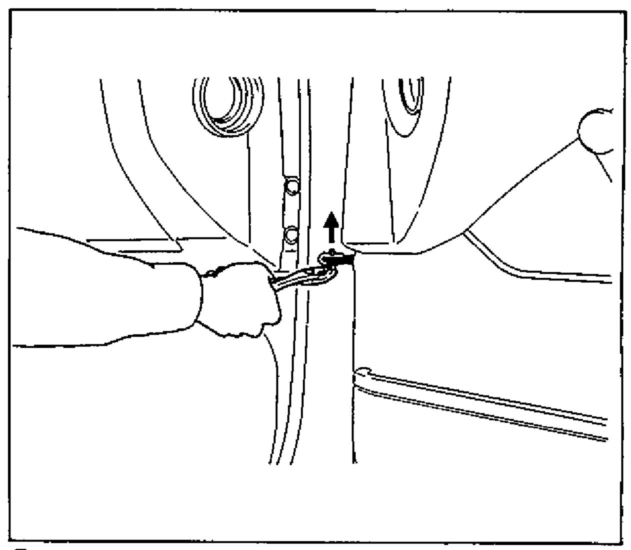


Fig. 9-22

2) Using a jack, support door panel with a piece of wood placed between jack and panel.
3) Remove door ass'y by loosening hinge mounting bolts.

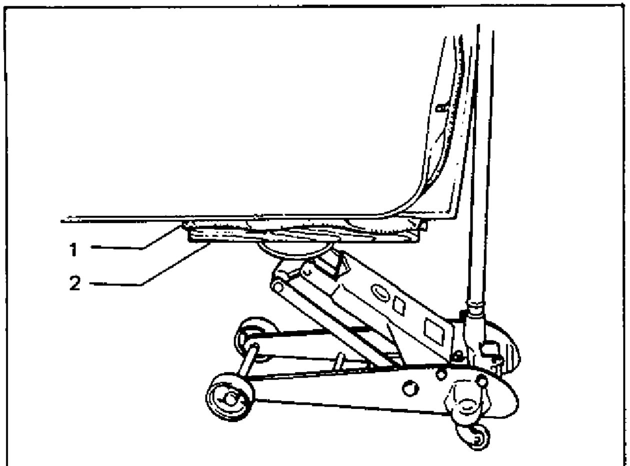


Fig. 9-23

INSTALLATION

Reverse removal sequence to install front door.

- When weatherstrip is hardened, water leak may develop. In such case, replace it with new one.
- After installing, adjust door latch striker position by referring to FRONT DOOR LOCK INSTALLATION section so that door is positioned correctly.

REAR DOOR

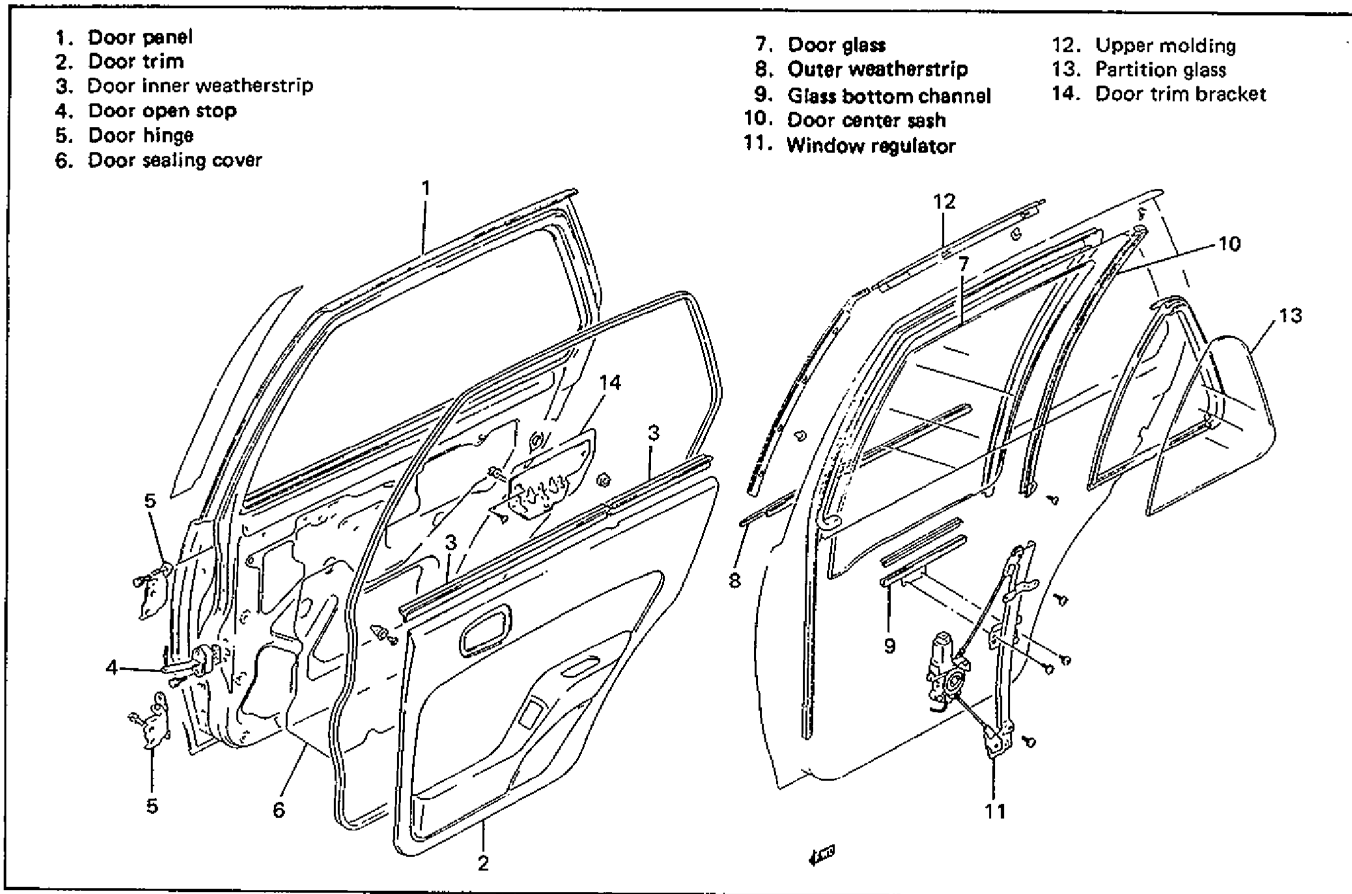


Fig. 9-25 Rear Door Assembly

DOOR GLASS (AND/OR PARTITION GLASS)

NOTE:

For door glass removal, perform steps 1) to 11) described below but skip step 9).

For partition glass removal, perform steps 1) through 9).

REMOVAL

Remove following parts.

1) Inside handle bezel.
2) Trim mounting screw.
3) Door trim.
4) Door trim bracket.
5) Door sealing cover.
6) Detach rear part of glass run from center sash.

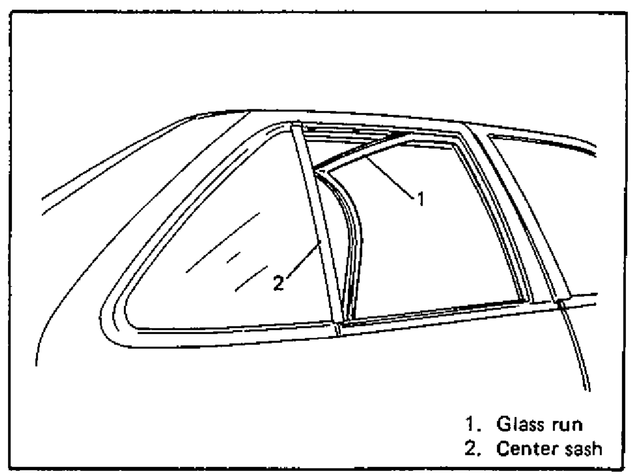


Fig. 9-27

7) Door outer weatherstrip. Lower window fully. Then, turn off outer weatherstrip as shown.

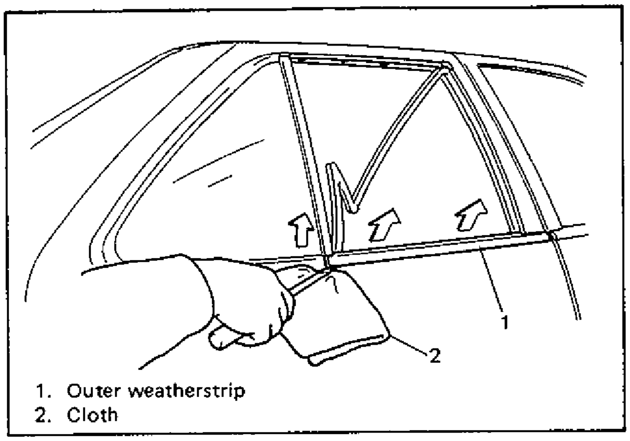


Fig. 9-28

8) Door center sash 3 (by removing two screws 1 with door glass lowered all the way down).

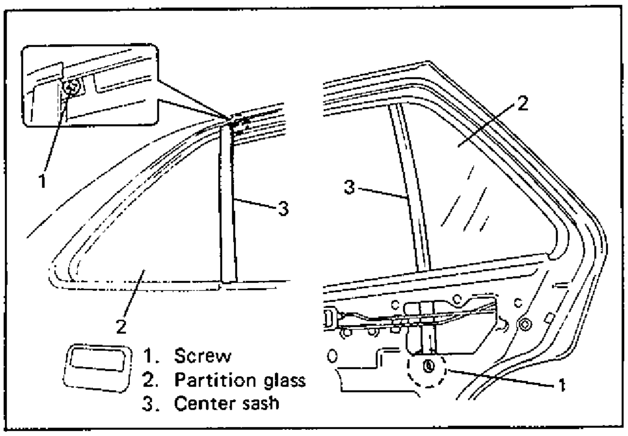


Fig. 9-29

9) Partition glass.
Slide to front to remove it.

10) Glass fitting screws. Then, take out door glass together with bottom channel.

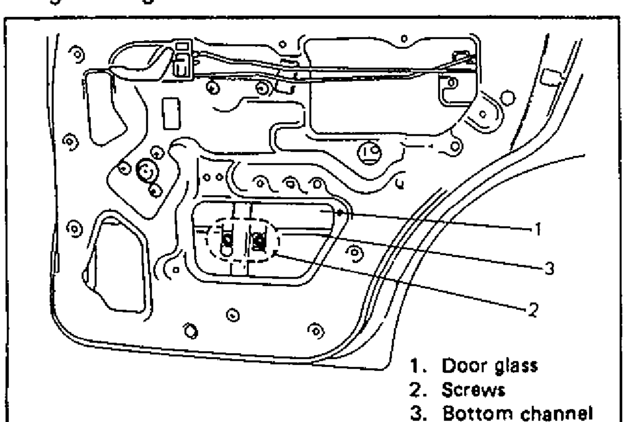


Fig. 9-30

11) Detach glass from bottom channel.

INSTALLATION

Reverse removal sequence to install door glass. However, be careful of following points.

1) When installing glass to bottom channel, coat channel with soap water and tap it with a plastic hammer. Glass-fitted position of bottom channel is as shown below.

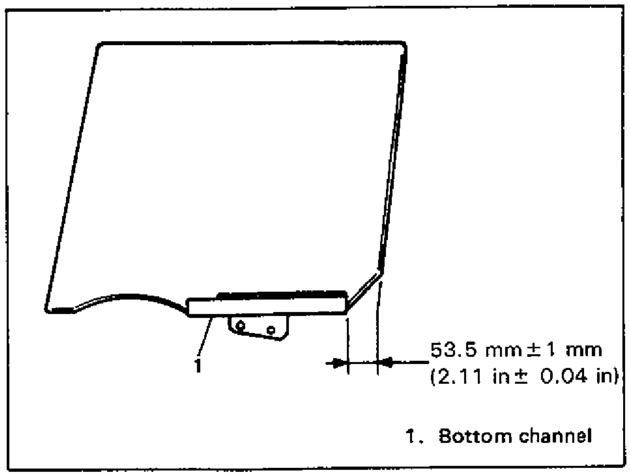


Fig. 9-31

2) Securely seal door sealing cover with adhesive.

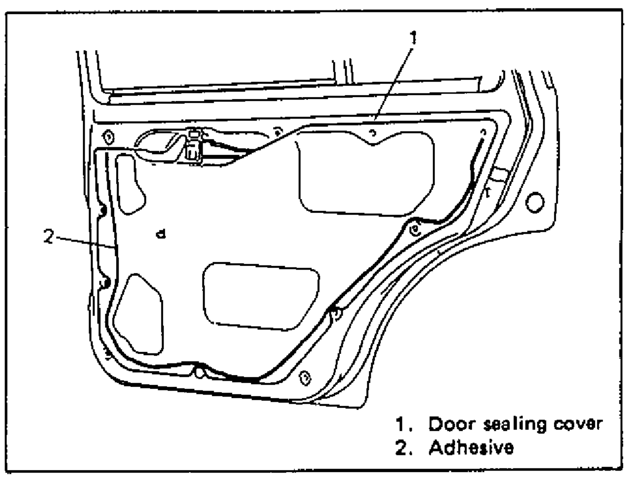


Fig. 9-32

DOOR WINDOW REGULATOR

REMOVAL

Remove following parts.

1) Door glass. (See previous section.)
2) Door trim bracket.
3) Power window motor lead wire at coupler.
4) Door window regulator attaching screws (six pcs.) Take out regulator through hole "A".

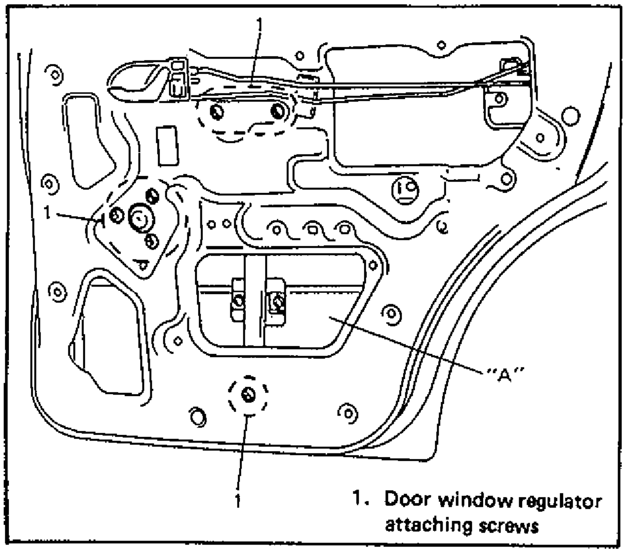


Fig. 9-34

INSPECTION

a. Check gear for wear or damage.

INSTALLATION

Reverse removal sequence to install door window regulator noting following points.

1) Apply multi-purpose grease to sliding parts.

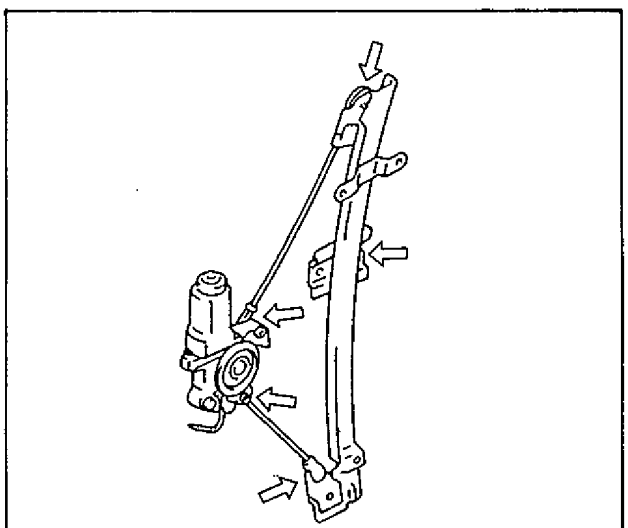


Fig. 9-35 Greasing Sliding Points

2) Adjust door window regulater according to following procedure.
   a. Loosen six screws shown below.
   b. Raise window fully with regulator handle.
   c. Tighten four screws ①.
   d. Lower window.
   e. Tighten two screws ②.

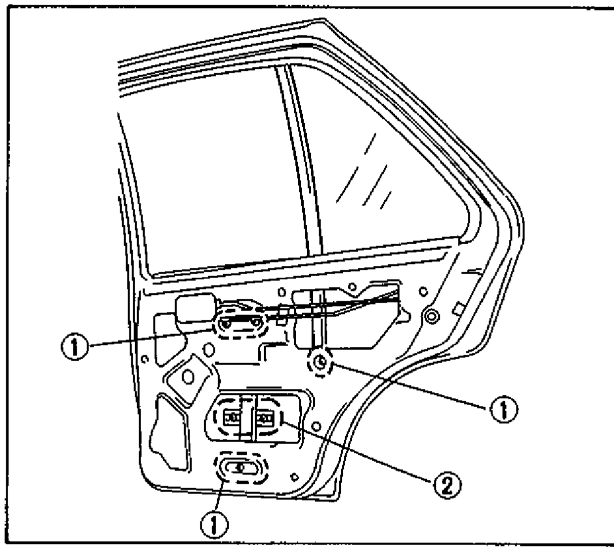


Fig. 9-36 Adjusting Door Wondow Regulater

REAR DOOR LOCK

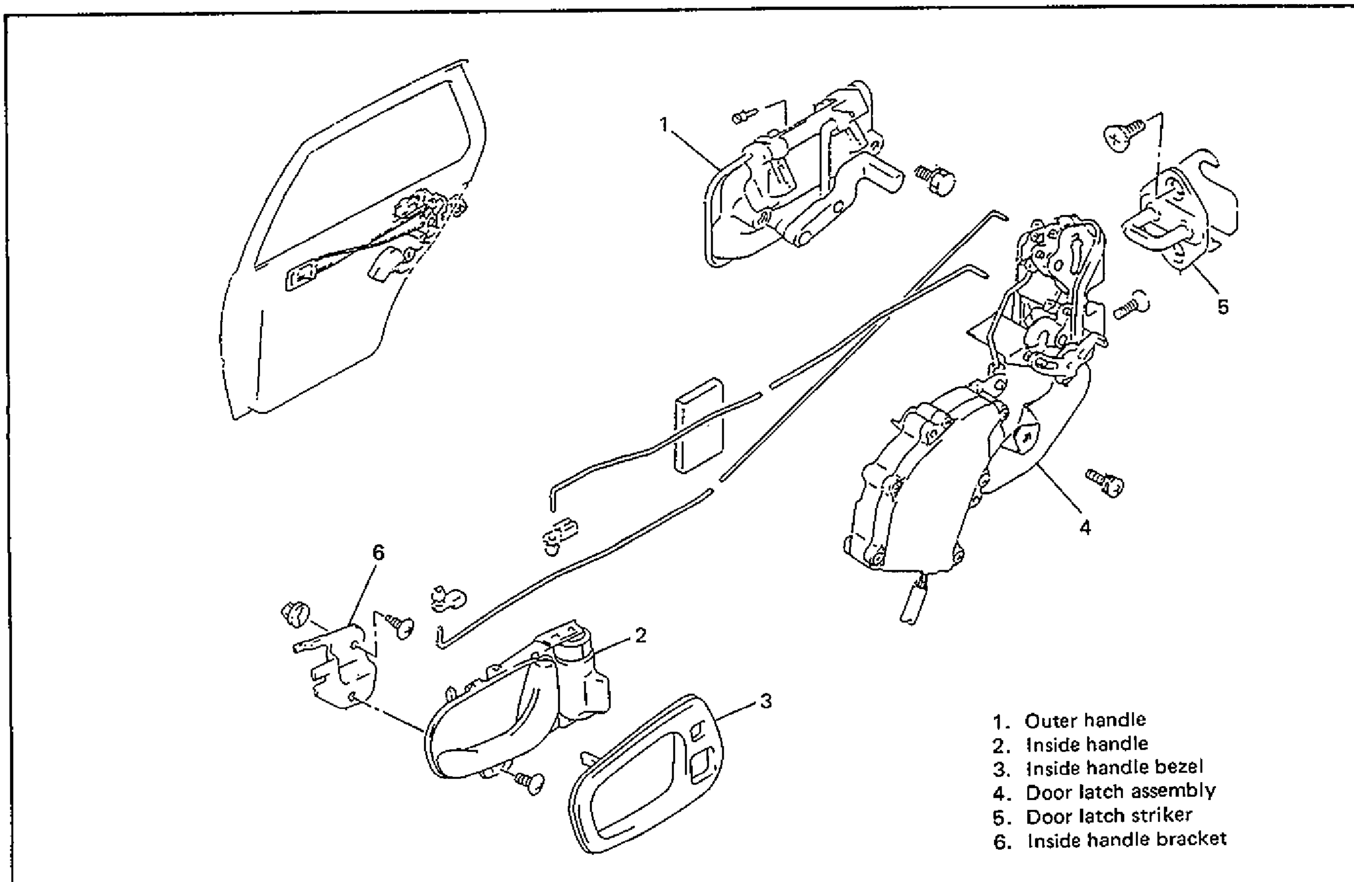


Fig. 9-37 Rear Door Lock Assembly

REMOVAL

Remove following parts.

1) Inside handle bezel.
2) Trim mounting screw.
3) Door trim.
4) Door trim bracket.
5) Door sealing cover.
6) Door latch ass'y with door inside handle.
7) Door latch ass'y.

INSTALLATION

Reverse removal sequence to install rear door lock.

REAR DOOR ASSEMBLY

REMOVAL/INSTALLATION

Follow procedures for Front Door removal/ installation in this section.

WINDSHIELD

The windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For window glass replacement, it is important to use an adhesive which provides sufficient adhesion strength and to follow the proper procedure.

> **CAUTION:**
> **Described here is the glass replacement by using one component urethane adhesive to be used with primer in combination. Each adhesive has its own drying and setting time and must be handled and used in a certain specific procedure. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.**

Use an adhesive of above mentioned type which has following property.

Shearing strength	40 kg/cm² or more (569 lb/in²)

Adhesive materials and tools required for removal and installation

- One component urethane adhesive and primers used in combination (For one sheet of window glass).
  Adhesive (600 g (21.2 oz.))
  Primer for glass (20 g (0.7 oz.))
  Primer for body (20 g (0.7 oz.))
  Primer for urethan (moulding)(20g(0.7 oz.))
- Eyeleteer
- Piano string
- Brush for primer application (3 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

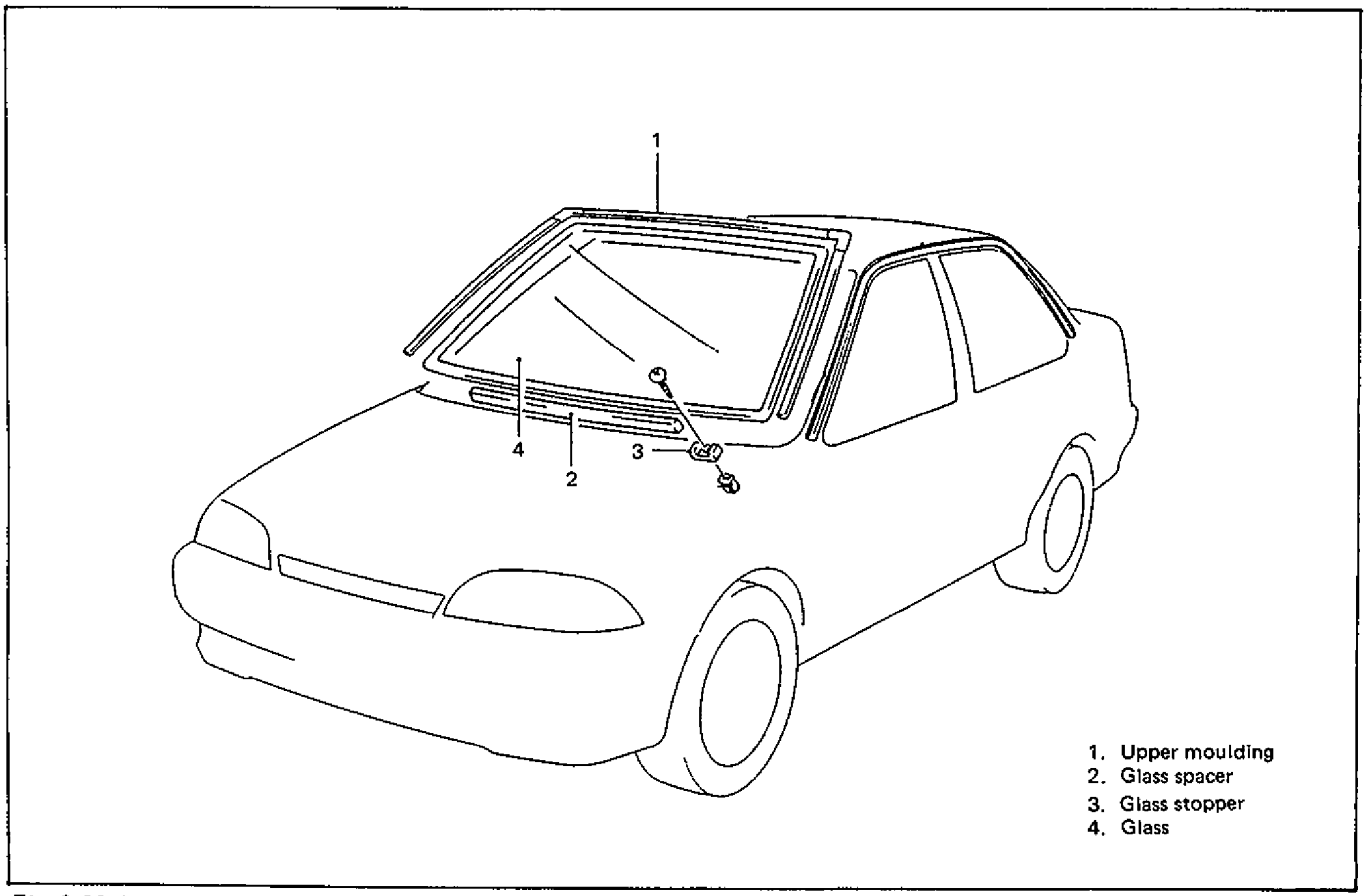


Fig. 9-39 Windshield

REMOVAL

1) Clean both inside and outside of glass and arount it.
2) Remove wiper arms, garnish and stoppers.
3) Remove moulding and moulding joints by cutting with knife.
4) Using tape, cover body surface around glass to prevent any damage.
5) Remove room mirror, sunshades, and front pillar trims (right & left).
6) Drill hole with eyeleteer through adhesive and let piano string through it.

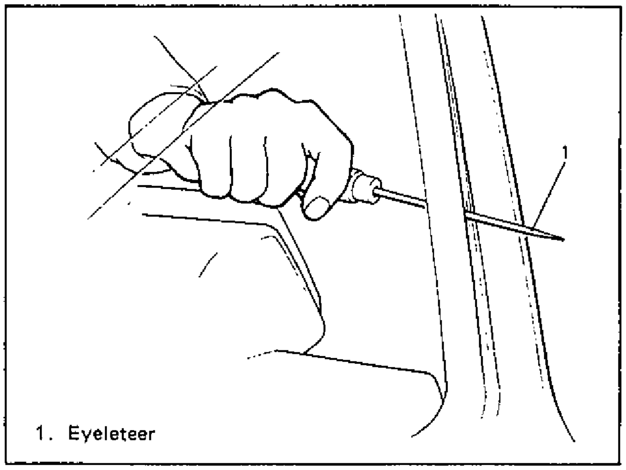


Fig. 9-41

7) Cut adhesive all around front glass with piano string.

NOTE:
Use piano string as close to glass as possible so as to prevent damage to body.

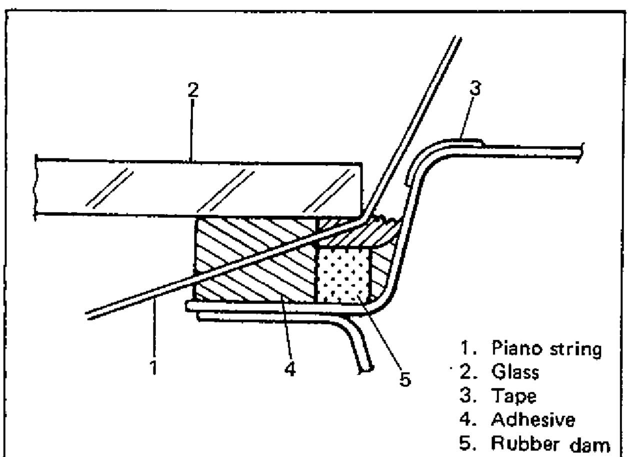


Fig. 9-42

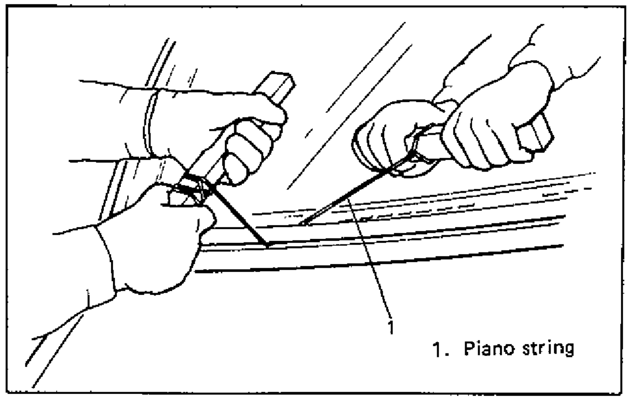


Fig. 9-43

8) Using knife, smooth adhesive remaining on body side so that it is 1 – 2 mm thick all around.

NOTE:
Before using knife, clean it with alcohol or the like to remove oil from it.

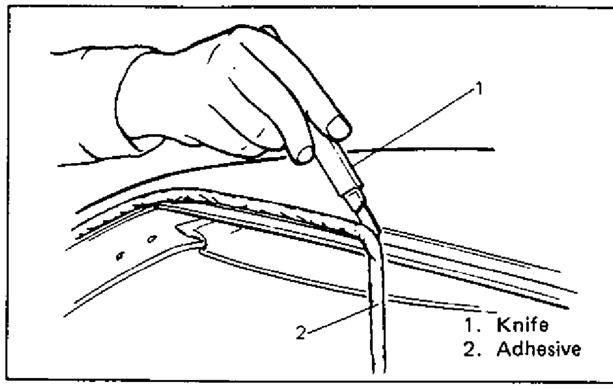


Fig. 9-44

9) When re-using glass, remove adhesive from glass, using care not to damage primer coated surface.

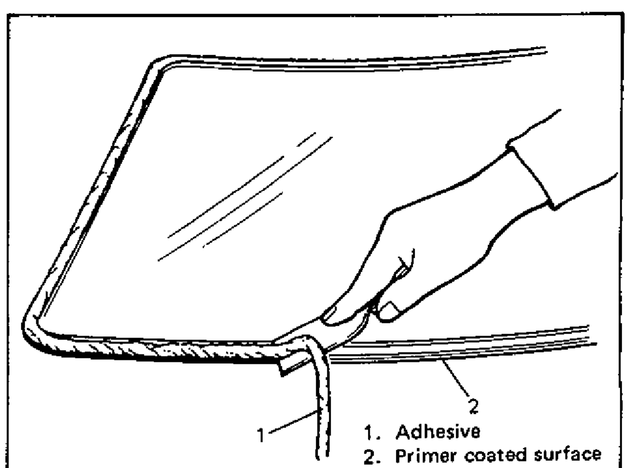
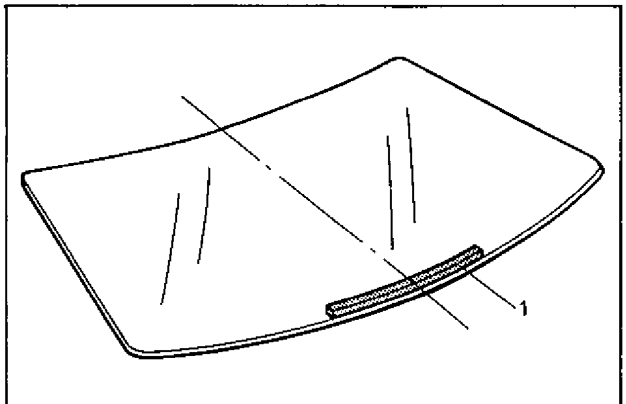


Fig. 9-45

INSTALLATION

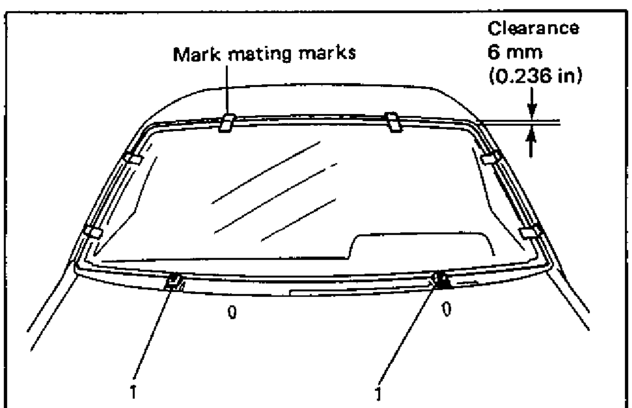
1) Using cleaning solvent, clean window frame (body) where glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Install stoppers (2 pcs) to lower side of window frame (body).
3) Peel paper from one side of new glass spacer and attach that lower side to windshield glass.



1. Glass spacer

Fig. 9-46

4) Install new upper moulding to glass. Warming moulding for over half an hour at 35°C (95°F) temperature will facilitate work.
5) To determine installing position of glass to body, position glass against body so that clearance between upper end of glass and body is about 6 mm (0.236 in) and clearances between each side end (right & left) of glass and body are even. Then mark mating marks on glass and body as shown below. Upper clearance can be adjusted by moving stoppers position.



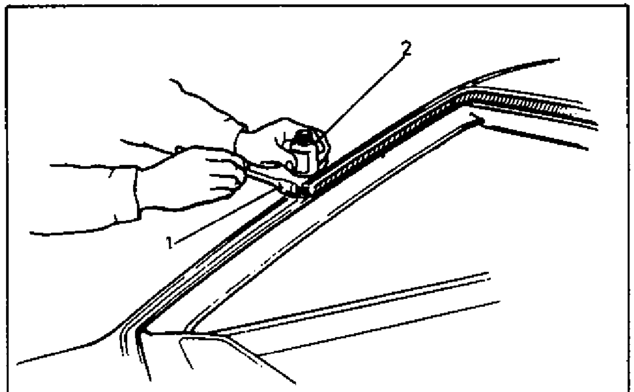
1. Glass stopper

Fig. 9-47

6) Using new brush, apply sufficient amount of primer for body along body surface where window is to be adhered.

NOTE:

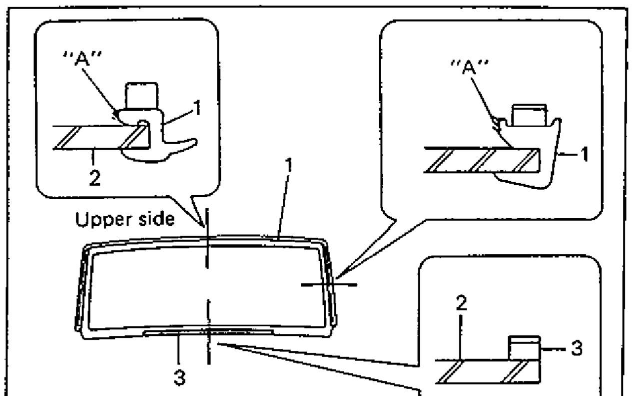
Be sure to refer to maker's instruction for proper handling and drying time.



1. New brush
2. Primer for body

Fig. 9-48

7) Clean glass surface to be adhered to window with clean cloth. If cleaning solvent is used, let it dry for more than 10 minutes.
8) Clean moulding surface "A" with clean cloth. (Refer to below figure.)



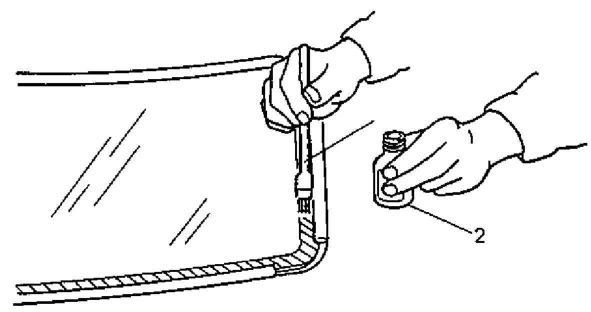
1. Moulding
2. Glass
3. Glass spacer

Fig. 9-49

9) Using new brush, apply sufficient amount of primer for glass along glass surface to be adhered to window.

NOTE:

- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not touch primer coated surface.**



1. New brush
2. Primer for glass

Fig. 9-50

10) Using new brush, apply sufficient amount of primer for moulding (Urethane) to surface "A" as shown in Fig. 9-49.

NOTE:
- **Be sure to refer to maker's instruciton for proper handling and drying time.**
- **Do not touch primer coated surface.**

11) Apply adhesive referring to Fig. 9-51.

NOTE:
- **Start from bottom side of glass.**
- **Be careful not to damage primer.**
- **Height of adhesive applied to lower side should be higher than that of other three sides.**
- **Press glass against body quickly after adhesive is applied.**
- **Use of rubber sucker grip is helpful to hold and carry glass after adhesive is applied.**

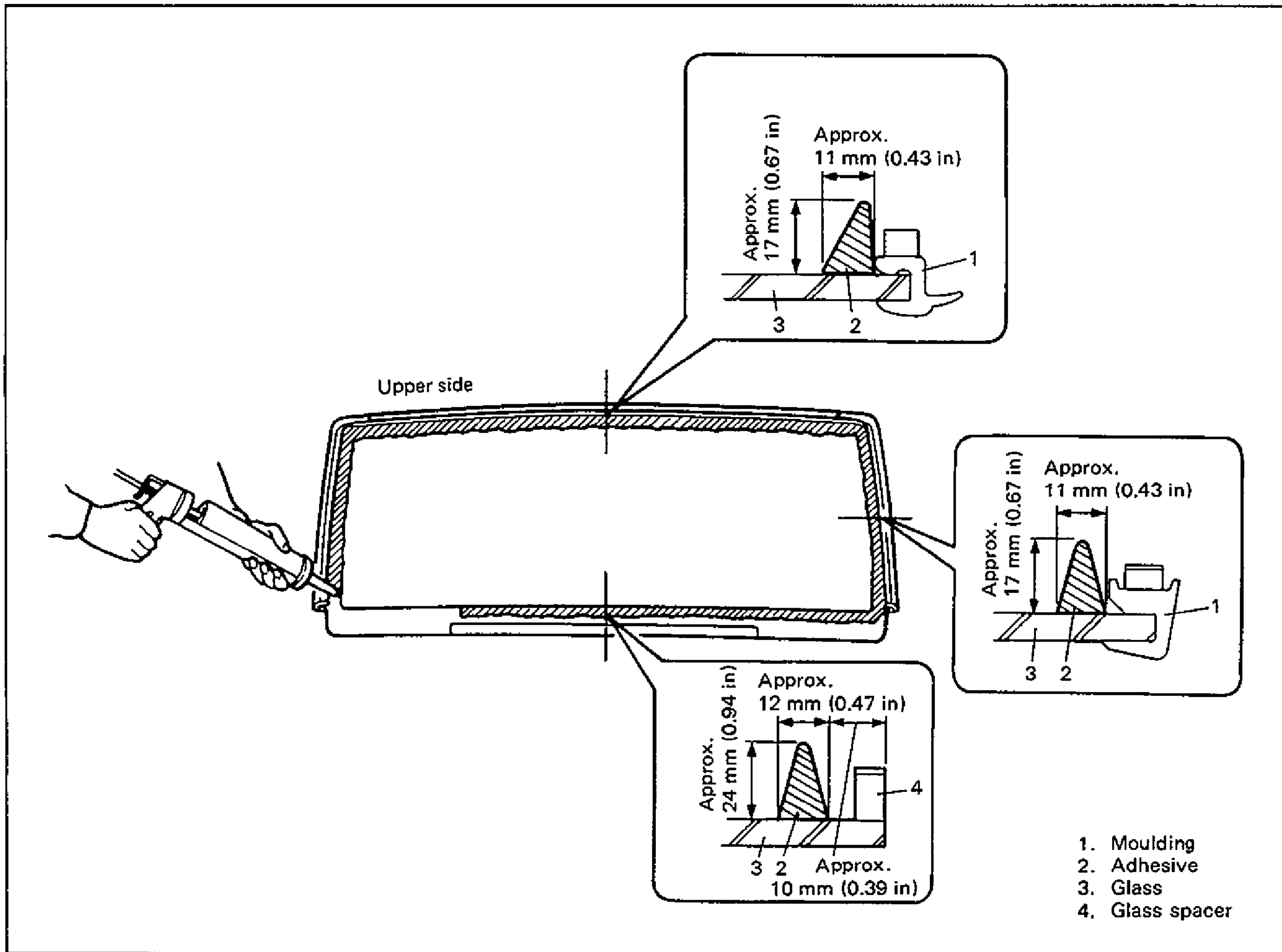


Fig. 9-51 Application of Adhesive

12) Peel remaining paper from moulding and glass spacer.
13) Holding rubber sucker grips, place glass onto body by aligning mating marks marked in step 4) and press it.

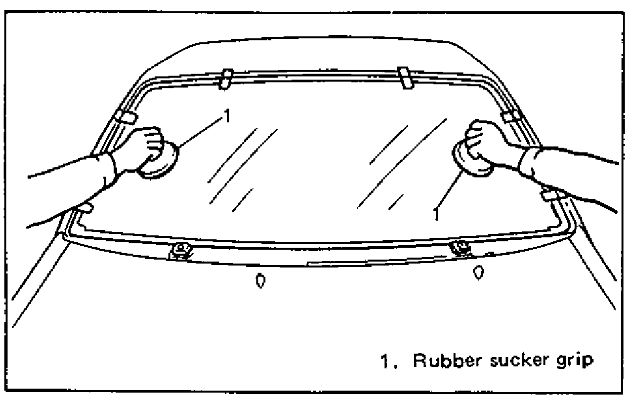


Fig. 9-52-1

14) Check for water leakage by pouring water over window through hose. If leakage is found, dry window and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

NOTE:
- **Do not use high pressure water.**
- **Do not blow compressed air directly at adhesive applied part when drying.**
- **Do not use infrared lamp or the like for drying.**

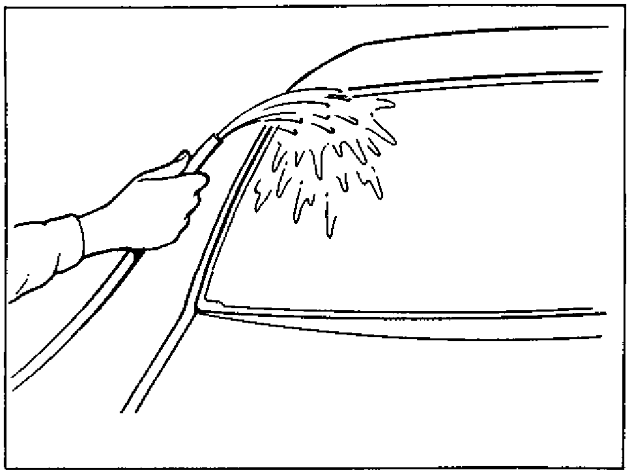


Fig. 9-52-2

CAUTION:
Upon completion of installation, note the following.

- Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.
- If moulding is not securely in place, hold it down with a tape until adhesive is completely set.
- Each adhesive has its own setting time. Be sure to refer to maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.
- Refrain from driving till adhesive is completely set so as to ensure proper and sufficient adhesion.

TRUNK LID

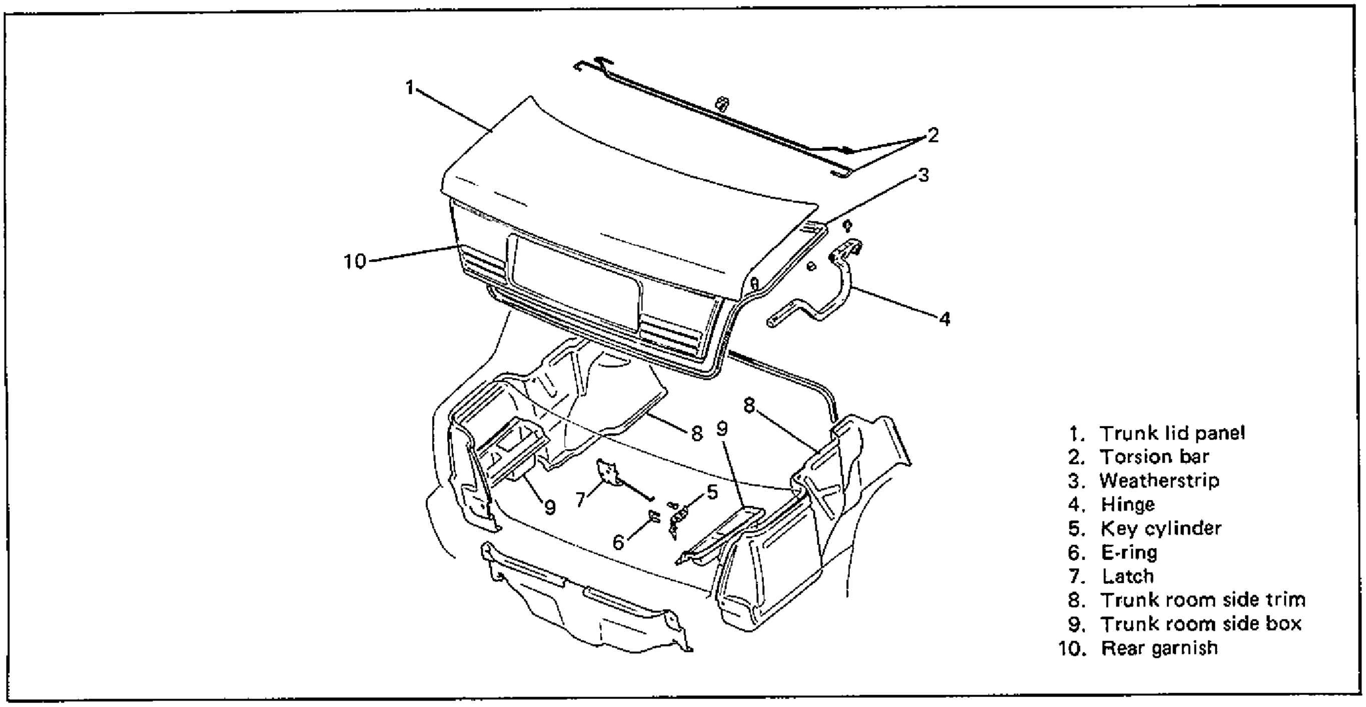


Fig. 9-53

REMOVAL

1) Disconnect trunk lid opener wire.

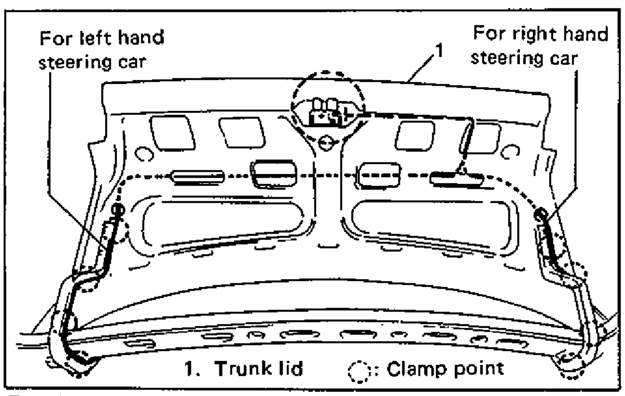


Fig. 9-54

2) Disconnect harness coupler and clamps.

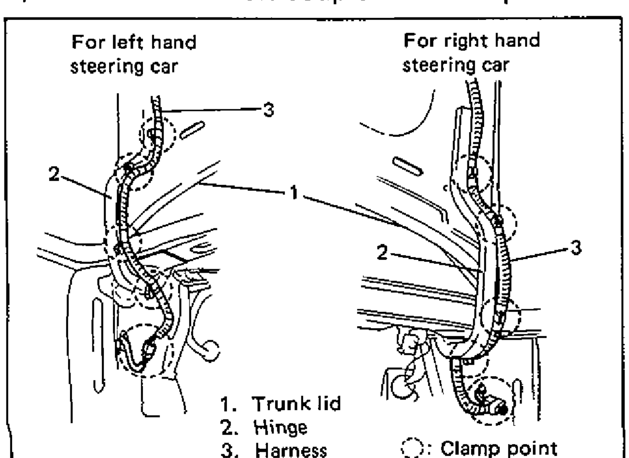


Fig. 9-55

3) Remove trunk lid attaching bolts, and trunk lid.

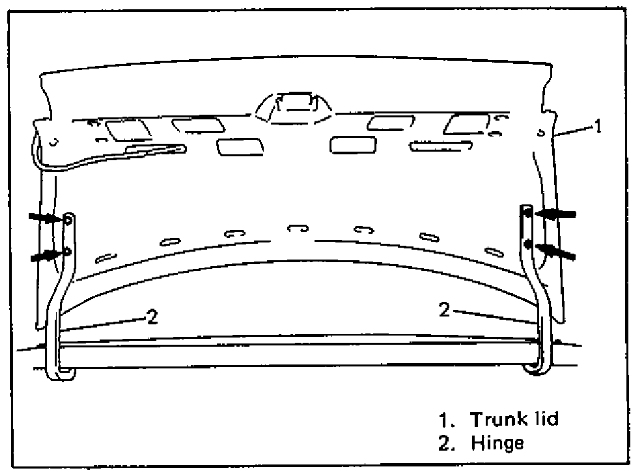


Fig. 9-56

NOTE:
Handle removed trunk lid carefully. Dropping it can cause damage to itself and car body.

4) Remove rear cushion. (Refer to REAR CUSHION section.)
5) Remove side back pads. (Right & Left)

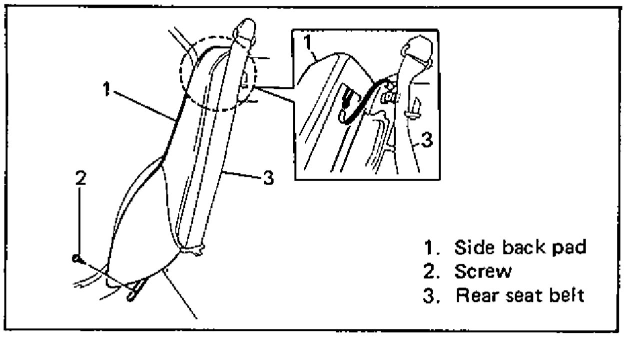


Fig. 9-57 Side Back Pad Removal

6) Remove shelf.
7) Remove trunk room light switch.
8) Unclamp torsion bars.

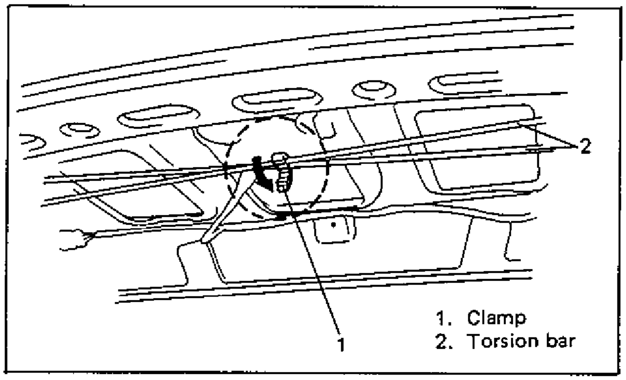


Fig. 9-58

9) Open trunk lid fully and remove torsion bars.

NOTE:
Keep an eye on trunk lid which closes without torsion bars.

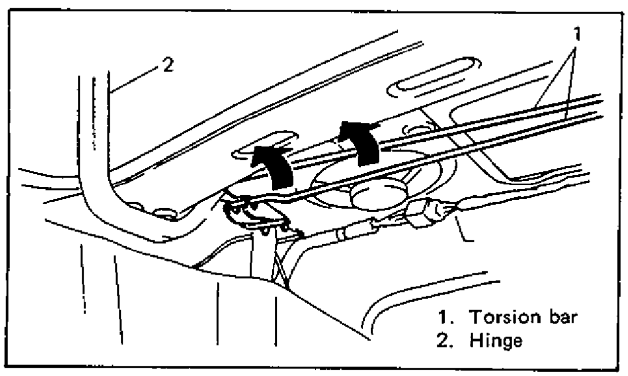


Fig. 9-59

10) Remove hinge attaching bolts and take out trunk lid hinges.

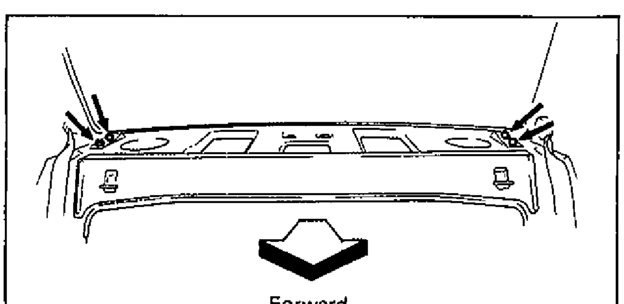


Fig. 9-60

INSTALLATION

Reverse removal sequence noting following point.

1) Trunk lid latch striker.
   - Adjust trunk lid latch striker so that strike shaft approxmately aligns with the center of groove of trunk lid latch.

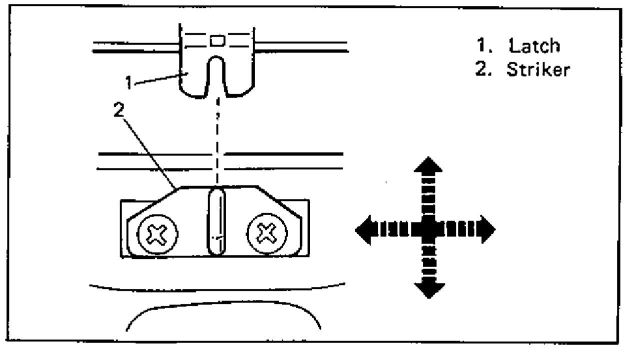


Fig. 9-61

2) Torsion bar (spring)
   - If trunk lid springs up too quickly or would not remain open when opened, trunk lid operation can be adjusted by bending the end of each torsion bar as shown below.

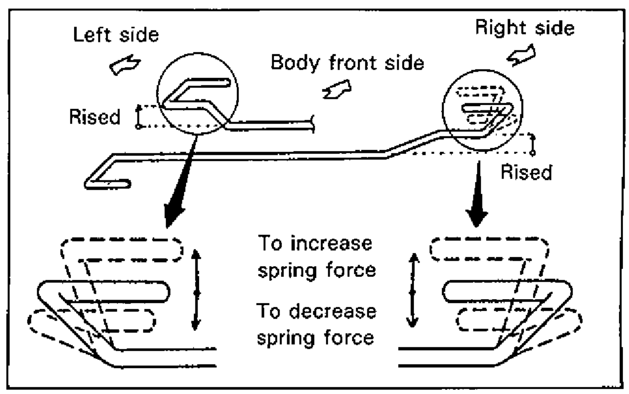


Fig. 9-61-1 Adjusting Torsion Bars

   - Use a vise and pliers to hold the torsion bar securely when bending it.

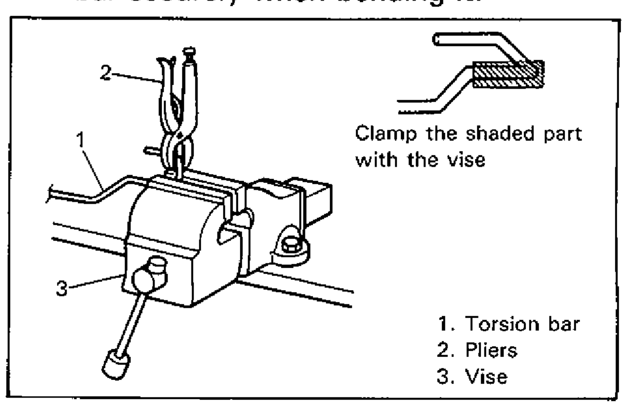


Fig. 9-61-2

NOTE:
Be careful not to confuse the right and left of torsion bar.

REAR GARNISH

REMOVAL AND INSTALLATION

Remove clips and nuts as shown below for rear garnish removal and install them for its reinstallation.

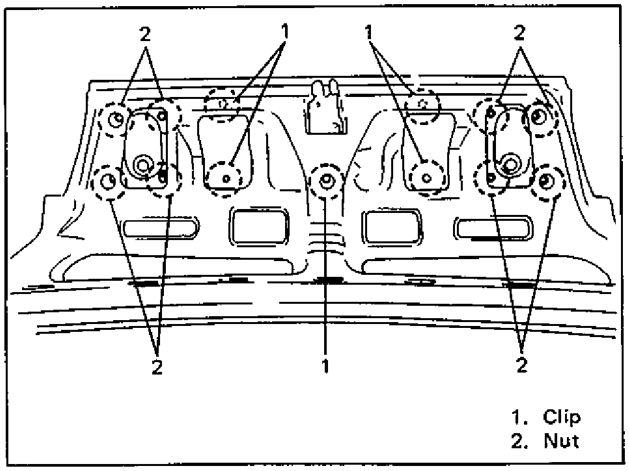


Fig. 9-62

BACK WINDOW

Back window glass is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For back window glass replacement, it is important to use an adhesive which provides sufficient adhesion strength and to follow the proper procedure.

> CAUTION:
> **Described here is the glass replacement by using one component urethane adhesive to be used with primer in combination. Each adhesive has its own drying and setting time and must be handled and used in a certain specific procedure. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.**

Use an adhesive of above mentioned type which has following property.

Shearing strength	40 kg/cm² or more (569 lb/in²)

Adhesive materials and tools required for removal and installation

- One component urethane adhesive and primers used in combination (For one sheet of window glass).
  Adhesive (410 g (14.5 oz.))
  Primer for glass (20 g (0.7 oz.))
  Primer for body (20 g (0.7 oz.))
  Primer for urethane (moulding) (20g(0.7 oz.))
- Eyeleteer
- Piano string
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

NOTE:
Wear gloves when removing and installing glass. Use care not to cause damage to heating wire for defroster (if equipped).

REMOVAL

1) Clean both inside and outside of glass and around it.
2) Remove lower moulding and spacers.
3) Remove upper moulding by cutting with knife.
4) Using tape, cover body surface around back window glass to prevent any damage.
5) Remove rear pillar inner trims, rear parcel shelf (if necessary), and high mounted stop lamp, if equipped.
6) Drill hole with eyeleteer through adhesive and let piano string through it.
7) Cut adhesive all around glass with piano string (refer to front window section).

NOTE:
Use piano string as close to glass as posible so as to prevent damage to body.

8) Using knife, smooth adhesive remaining on body side so that it is 1 – 2 mm thick all around.

NOTE:
Before using knife, clean it with alcohol or the like to remove oil from it.

9) When re-using glass, remove adhesive from glass, using care not to damage primer coated surface.

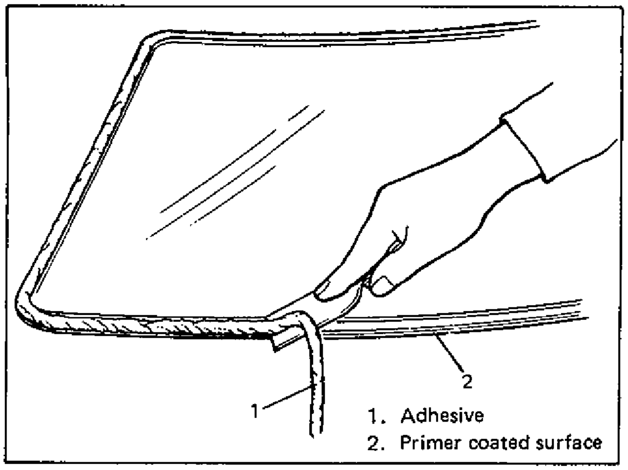


Fig. 9-63

INSTALLATION

1) Using cleaning solvent, clean window edge where window glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Install spacers (2 pcs.) to lower side of back window.
3) Install new back window upper moulding to glass. (Don't peel off paper of moulding at this stage). Warming mouldings for over half an hour at 35°C (95°F) temperature will facilitate work.
4) To determine installing position of glass to body, position glass against body so that clearance between upper end to glass and body is about 4 mm (0.157 in) and clearances between each side end (right & left) of glass and body are even. Then mark matchmarks on glass and body as shown below. Upper clearance can be adjusted by moving spacers position.

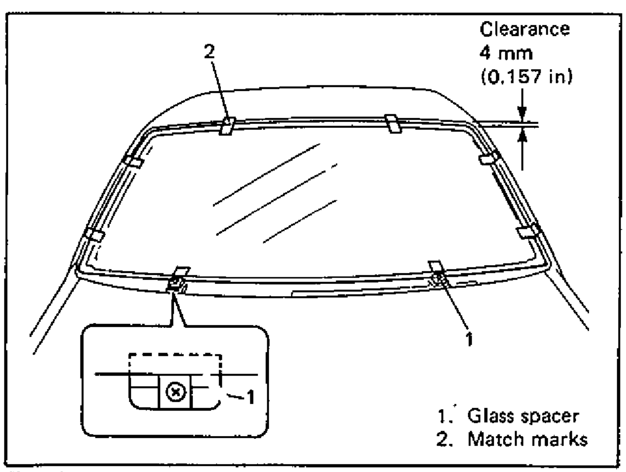


Fig. 9-64

5) Using new brush, apply sufficient amount of primer for body along body surface where window is to be adhered.

NOTE:
Be sure to refer to maker's instruction for proper handling and drying time.

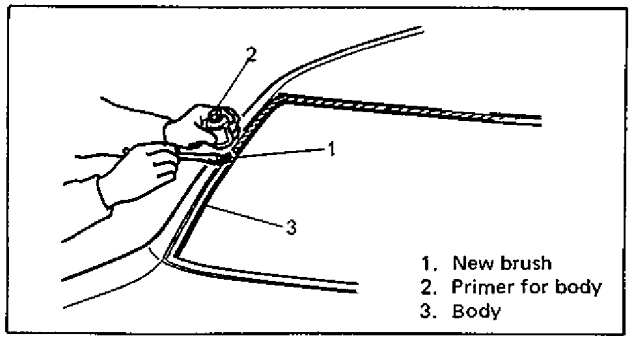


Fig. 9-65

6) Clean glass surface to be adhered to window with clean cloth. If cleaning solvent is used, let it dry for more than 10 minutes.
7) Clean moulding surface "A" with clean cloth. (Refer to figure below.)

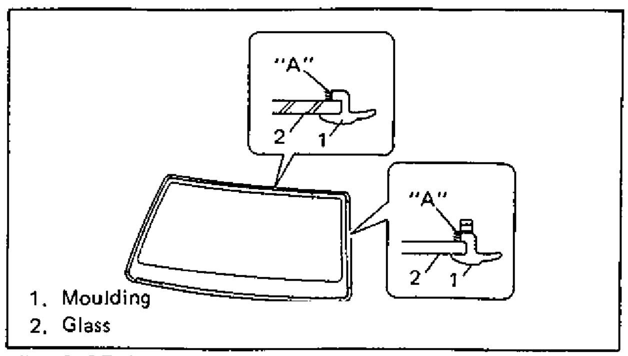


Fig. 9-65-1

8) Using new brush, apply sufficient amount of primer for glass along glass surface to be adhered to window.

NOTE:
- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not touch primer coated surface.**

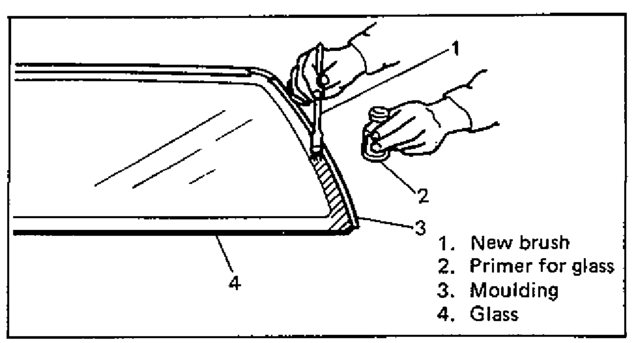


Fig. 9-66

9) Using new brush, apply sufficient amount of primer for moulding (Urethane) to surface "A" as shown in Fig. 9-65-1.

NOTE:
- **Be sure to refer to maker's instruciton for proper handling and drying time.**
- **Do not touch primer coated surface.**

10) Apply adhesive as shown below.

NOTE:
- **Start from bottom side of glass.**
- **Height of applied adhesive should exceed that of moulding.**
- **Adhesive should be applied evenly especially in height.**
- **Be careful not to damage primer.**
- **Press glass against body quickly after adhesive is applied.**
- **Use of rubber sucker grips is helpful to hold and carry glass after adhesive is applied.**
- **When applying adhesive to "B" marked part in figure, use match mark as a guide and keep away from spacer.**

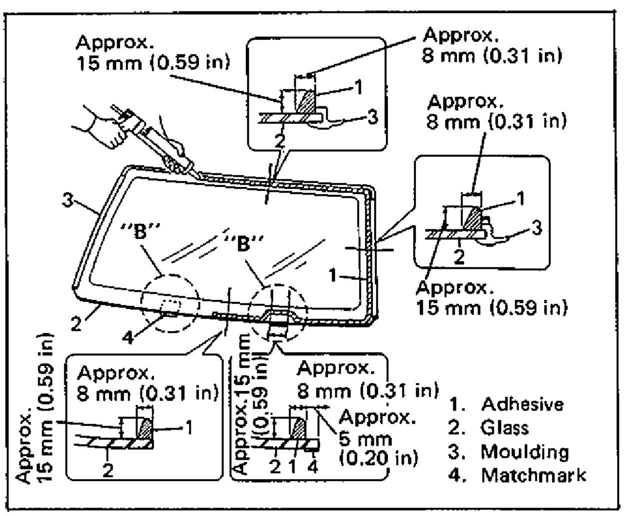


Fig. 9-67

11) Peel paper from mouldings.
12) Holding rubber sucker grips, place glass onto body by aligning mating matchmarks in step 4) and press it.

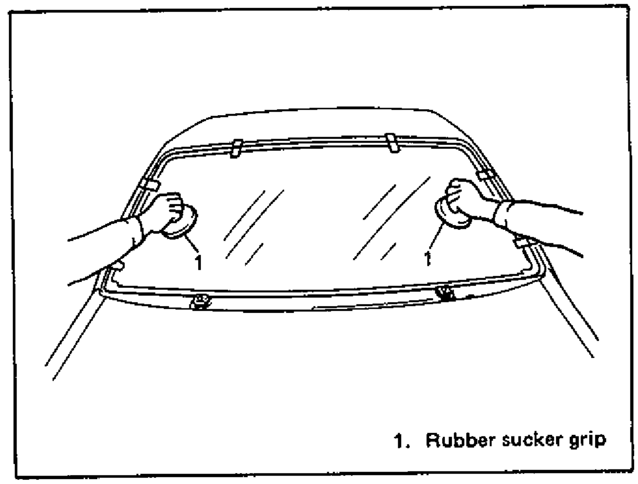


Fig. 9-68

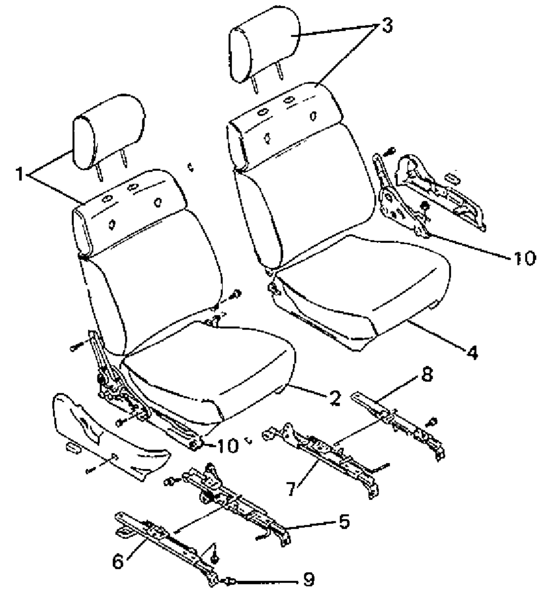
13) Remove matchmarks.
14) Install new back window lower mouldings.
15) Check for water leakage by pouring water over window through hose. If leakage is found, dry window and fill leaky point with adhesive. If water still leaks even after that, remove glass and start the installation procedure all over again.

NOTE:
- **Do not use high pressure water.**
- **Do not blow compressed air directly at adhesive applied part when drying.**
- **Do not use infrared lamp or the like for drying.**

CAUTION:
Upon completion of installation, note the following.
- **Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.**
- **If moulding is not securely in place, hold it down with a tape until adhesive is completely set.**
- **Each adhesive has its own setting time. Be sure to refer to maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.**
- **Refrain from driving till adhesive is completely set so as to ensure proper and sufficient adhesion.**

SEATS

FRONT SEAT



1. Right front seat back assembly
2. Right front seat cushion assembly
3. Left front seat back assembly
4. Left front seat cushion assembly
5. Right front seat inside adjuster
6. Right front seat outside adjuster
7. Left front seat inside adjuster
8. Left front seat outside adjuster
9. Adjuster bolt
10. Seat reclining control assembly

Fig. 9-69 Front Seat Assembly

REMOVAL

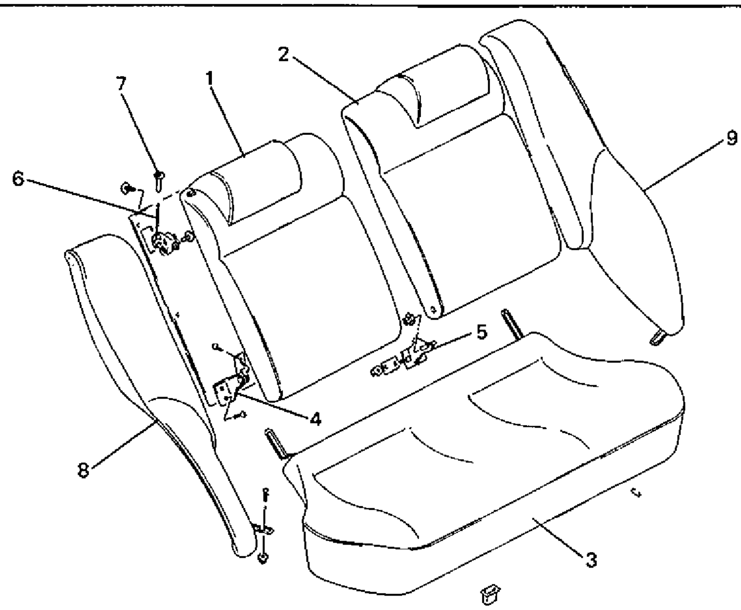
1) Remove five seat rail mounting bolts. Then, remove seat ass'y with seat rail.
2) Disassemble and repair seat as necessary.

INSTALLATION

Reverse removal procedure to install front seat. Torque to specifications, as given at the right.

Tightening torque	N·m	kg-m	lb-ft
● Seat mounting bolt (8 mm) ● Reclining device tightening bolt and nut (8 mm) Seat mounting bolt (10 mm)	15 – 20	1.5 – 2.0	11.0 – 14.0

REAR SEAT



1. Right rear seat back
2. Left rear seat back
3. Rear seat cushion
4. Rear seat back hinge
5. Rear seat back center hinge
6. Seat back lock
7. Seat back lock knob
8. Right rear seat side back pad
9. Left rear seat side back pad

Fig. 9-70 Rear Seat Assembly

REAR SEAT CUSHION

REMOVAL

1) Raise the front portion of seat cushion to remove rear seat cushion.

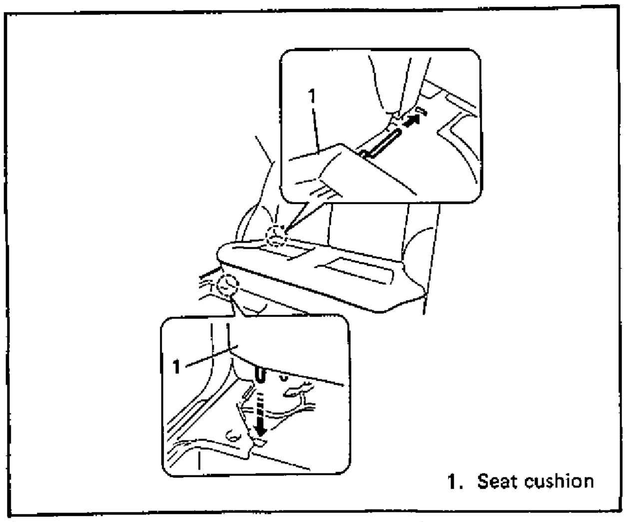


Fig. 9-71 Rear Seat Cushion Removal

INSTALLATION

Reverse removal procedure to install rear seat cushion.

REAR SEATBACK

REMOVAL

Remove seatback by removing its fitting nuts and screws.

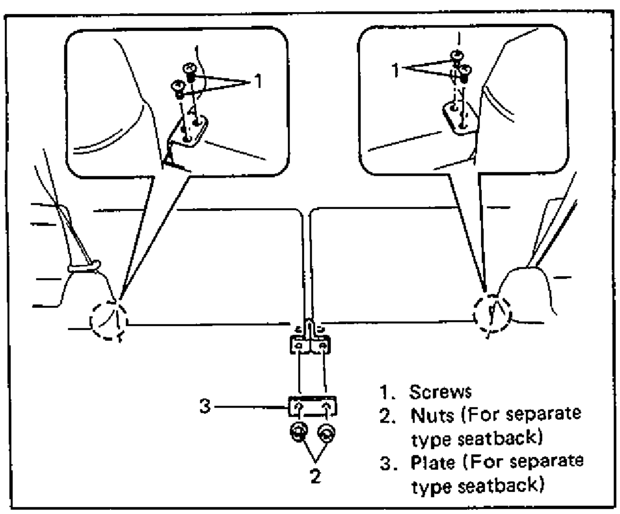


Fig. 9-72

INSTALLATION

Reverse removal procedure to install rear seatback.

SEAT BELTS (Fig. 9-73) (If equipped)

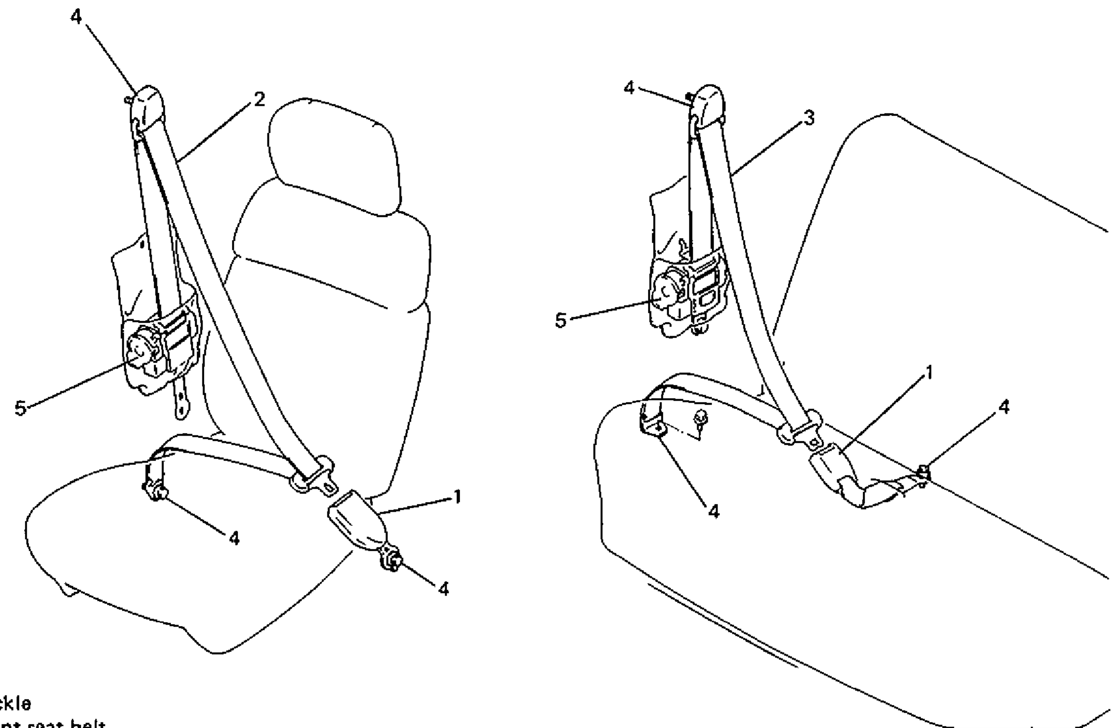
DESCRIPTION

Different types of seat-belt are used depending of regulations of each country.
They are Emergency Locking Retractor (ELR) type, Emergency and Auto Locking Retractor (ALR) and 2-point of 3-point non-retractor type (without retractor).

ELR : Locks the seat belt (to prevent the webbing from being pulled out of the retractor any further) as soon as any one of the following specified conditions is detected.
The conditions are the speed at which the webbing is pulled out of the retractor, acceleration or deceleration of the car speed and inclination.

ALR: Automatically locks when the webbing is pulled out from the retractor and allowed to retract even a little.
Then the webbing can not be pulled out any further, unless it is wound all the way back into the retractor, which releases the lock and allows the webbing to be pulled out.

> WARNING:
> **If replacing seat belt is necessary, replace buckle and ELR (ALR or webbing) together as a set. This is for the reason of ensuring locking of tongue plate with buckle.**
> **If these parts are replaced individually, such a locking condition may become unreliable. For this reason, Suzuki will supply only the spare buckle and ELR (ALR or webbing) in a set part.**



1. Buckle
2. Front seat belt
3. Rear seat belt
4. Anchor bolt
5. Retractor ass'y

NOTE: **This illustration shows ELR (Emergency Locking Retractor) type seat belt.**

Fig. 9-73 Front and Rear Seat Belt Assemblies

SERVICING SEAT BELTS

Before servicing or replacing seat belts, refer to following precautionary items.

1) Seat belts should be normal relative to strap retractor and buckle portions.
2) Keep sharp edges and damaging objects away from belts.
3) Avoid bending or damaging any portion of belt buckle or latch plate.
4) Do not bleach or dye belt webbing. (Use only mild soap and lukewarm water to clean it.)
5) When installing a seat belt anchor bolt, start bolt by hand to prevent cross-threading.
6) Do not attempt any repairs on retractor mechanisms or retractor covers. Replace defective assemblies with new replacement parts.
7) Keep belts dry and clean at all times.
8) If there exist any parts in question, replace such parts.
9) Replace belts whose webbing is cut or otherwise damaged.
10) Do not put anything into trim panel opening which seat belt webbing passes through.

REMOVAL AND INSTALLATION

Refer to above figure to remove and install front and rear seat belts.

NOTE:

Be sure to tighten seat belt anchor bolts to below specified torque.

Seat belt anchor bolt should have an unified fine thread (7/16—20 UNF). Under no circumstances should any different sized or metric screw threads be used.

	N·m	kg-m	lb-ft
Tightening torque for seat belt anchor bolt	40 – 50	4.0 – 5.0	29.0 – 36.0

INSPECTION

Seat belts and attaching parts can affect the vital components and systems of a car.

Therefore, they should be inspected carefully and replaced with genuine pars only.

1) Seat belt
   Its webbing or strap should be free from damage.
2) Retractor
   It should lock webbing when pulled quickly.
   The front seat belt retractor should pass the above inspection and should lock webbing even when titled (approx. 15°) toward the fore and aft or right and left directions.
3) Anchor bolt
   Anchor bolts should be toqued to specification.
4) Belt latch
   It should be secure when latched.
5) Warning system (If equipped)
   Check driver's seat belt strap switch.

For the details of seat belt warning system, refer to the section "ELECTRICAL SYSTEM".

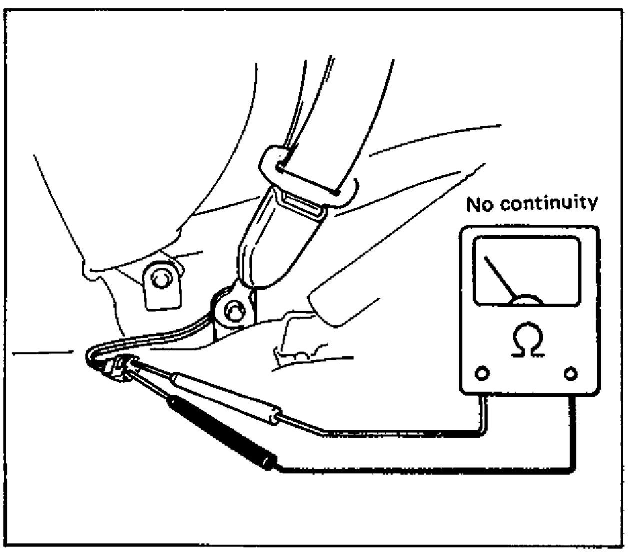


Fig. 9-74 Belt Latch "ON" Check

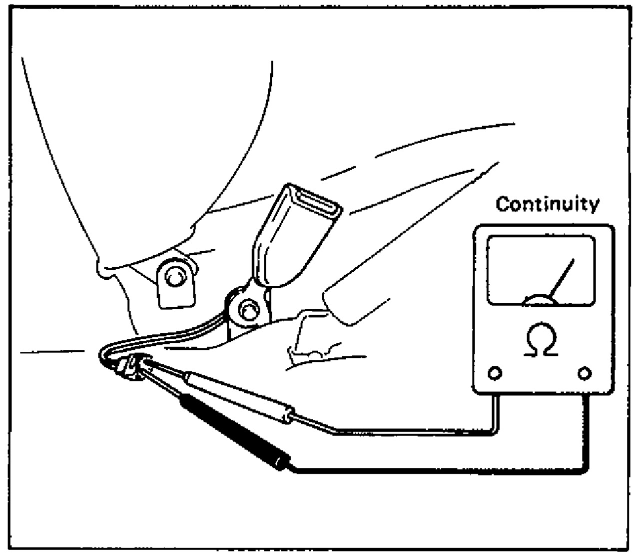
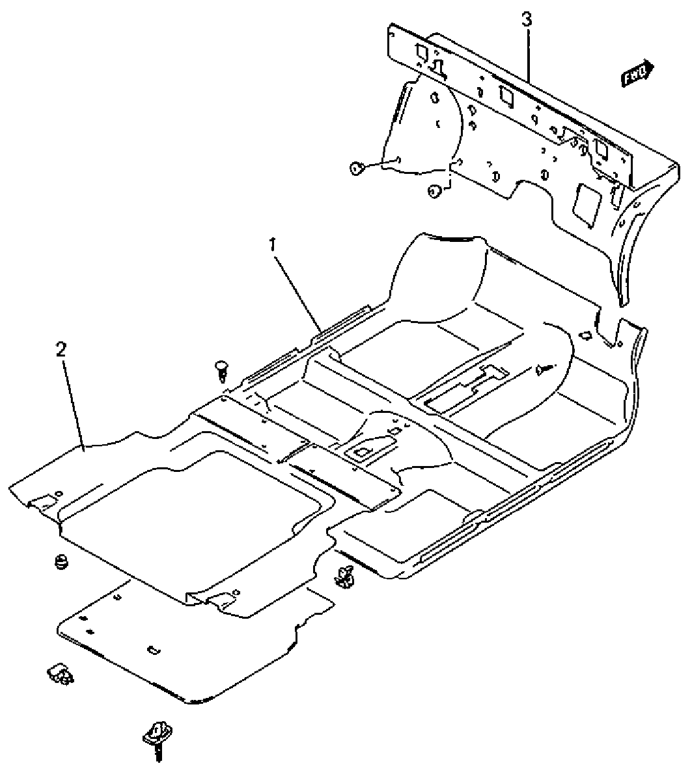


Fig. 9-75 Belt Latch "OFF" Check

FLOOR CARPET



1. Front floor carpet
2. Luggage floor carpet
3. Dash panel insulation

Fig. 9-76 Front and Rear Floor Carpets

FRONT FLOOR CARPET

REMOVAL

Remove following parts:

1) Front and rear seat cushions.
2) Sest belt anchorage hooks.
3) Sill scuffs.
4) Dash side trims.
5) Rear side trims.
6) Console box, gear shift lever cover and parking brake lever cover.
7) Front floor carpet.

INSTALLATION

Reverse removal sequence to install front floor carpet.

LUGGAGE FLOOR CARPET

Luggage floor carpet is fixed to floor with clips.

REMOVAL

Detach clips, using care not to pull up carpet with force and break clips.

INSTALLATION

Reverse removal sequence to install luggage floor carpet.

ROOF LINING

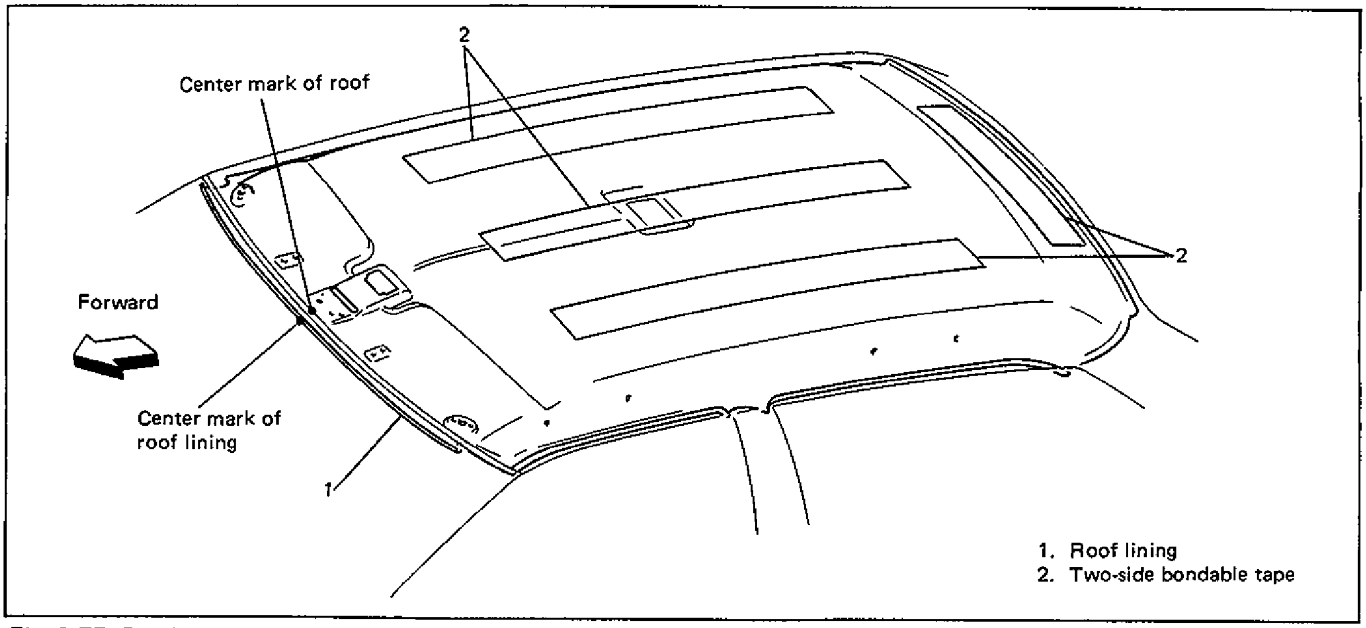


Fig. 9-77 Roof Lining

REMOVAL

Remove following parts:
1) Inside rear view mirror.
2) Sunshade assembly.
3) Dome lamps.
4) Assist grips.
5) Door weatherstrips.
6) Pillar trims.
7) Roof lining.

INSTALLATION

1) Peel off paper of each two-side bondable tape.
2) Have front end part of roof lining caught at fore-front of ceiling.

NOTE:
As there are center marks on roof lining and ceiling, be sure to align them.

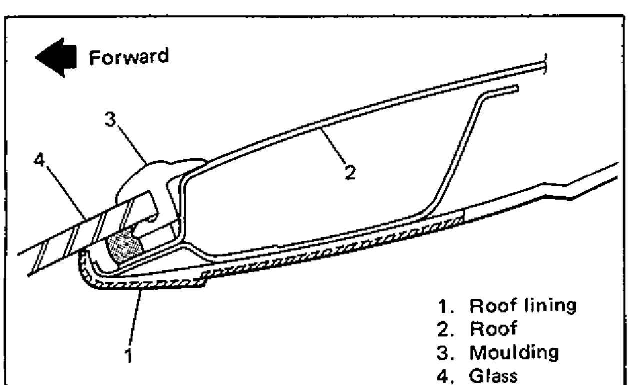


Fig. 9-78

3) Hold front end part of roof lining securely and attach rest of it to ceiling toward rear.

NOTE:
If it is not attached neatly, try it again but in such case, make sure to use new two-side bondable tapes.

4) Install following parts.
   - Inside rear view mirror
   - Sunshade assembly
   - Dome lamps
   - Door weatherstrips
   - Pillar trims
   - Assist grips

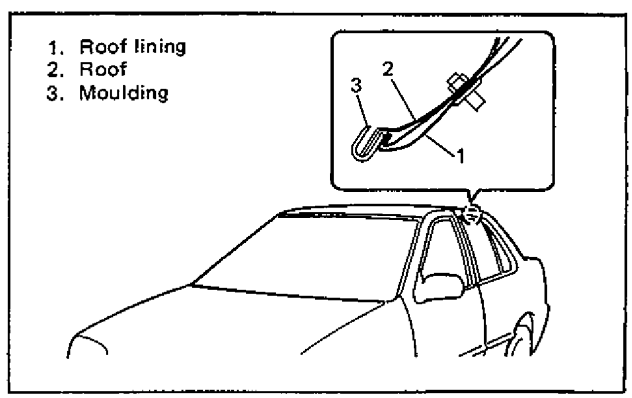


Fig. 9-79

ANTI-CORROSION TREATMENT

Steel sheets used for cars are provided with corrosion resistance on its either side or both sides as rust proof treatment. These corrosion resistance steel sheet materials are called one or two-side galvanized steel sheets. They are selected for their rust protection property and further given various types of treatment depending on where they are used as described below.

1) Steel sheets are treated with cathodic electro-primer which is excellent in corrosion resistance.
2) Rust proof wax coatings are applied to door, front hood and side sill insides where moisture is liable to stay.
3) Vinyl coating or asphalt coating is applied to body underside and wheel housing inside.
4) Chip resistant material is applied to side sill and door outside bottom areas to protect painted surface from damage due to flying stones.
5) Sealer is applied to door hem, engine compartment steel sheet-to-steel sheet joint, and the like portions to prevent water penetration which results in rust occurrence.

When replacing panel or repairing collision damage, leaving related area untreated as it is in any operation which does disturb any rust proof treatment described above will allow corrosion in that area. Therefore, it is important in any repair operation to properly recoat surface of related area.

Accordingly, it is the essential function of any repair operation to correctly recoat the related surfaces of the relevant area.

All metal panels are coated with metal conditioners and primer coating during car production. Following repair and/or replacement parts installation, every accessible bare metal surface should be cleaned and coated with rust proof primer. Perform this operation prior to application of sealer, rust proof wax coating and chip resistant material.

Sealer is applied to specific joints of a car during production. It prevents dust from entering car and serves also as an anticorrosive barrier. Sealer is applied to door and hood hem areas and between panels as well. Correct and reseal originally-sealed joints if damaged. Reseal attaching joints of a new replacement panel and reseal hem area of a replacement door or hood.

Use a quality sealer to seal flanged joints, overlap joints and seams. Sealer must have flexible characteristics and paintability after it's applied to repair areas.

For sealer to fill open joints, use caulking material. Select a sealer according to place and purpose of a specific use. Observe manufacturer's label-stated instructions when using sealer.

In many cases, repaired places require color painting. If so, follow ordinary techniques specified for finish preparation, color painting and undercoating build-up.

Rust proof wax, a penetrative compound, is applied to metal-to-metal surfaces (door, front hood and side sill insides) where it is difficult to use ordinary undercoating material for coating. Therefore, when selecting rust proof wax, it may be one of such penetrative type.

During undercoating (vinyl coating or asphalt coating) application, care should be taken that sealer is not applied to engine-related parts and shock absorber mounting or rotating parts. Following undercoating, make sure that body drain holes are kept open.

anticorrosive materials.

1) Clean and prepare metal surface.
2) Apply primer.
3) Apply sealer (all joints sealed originally).
4) Apply chip-resistant material (side sill and door outside bottom areas).
5) Apply color in areas where color is required such as hem flanges, exposed joints and under body components.
6) Apply anticorrosive compound (penetrative wax).
7) Apply undercoating (rust proof material).

If original galvanization or other anticorrosive material on interior and underbody panel surfaces is burnt during welding or heating operation, affected surfaces must be cleaned.
Burnt residues should be removed carefully when affected area is in box-type construction or in such shape as to limit access to interior surfaces. Generally, following method works out satisfactorily in removing such residues.

NOTE:
Standard shop practices, particularly eye protection, should be followed during performance of above-listed operations to avoid personal injury.

Scrape any accessible area. If affected area is enclosed by sheet metals and a standard putty knife or scraper cannot reach there, try to use a more flexible scraper. Compressed air can remove most residues and is useful in cleaning enclosed areas. However, this type of operation absolutely requires eye protection.

METAL REPLACEMENT PARTS FINISHING

Metal replacement parts (or assemblies) are coated with electro-deposition primer. For proper adhesion of paint, following finish process (refinish steps) becomes necessary.

1) Use wax or grease-removing solvent to clean each part.
2) Use a wet or dry sand-paper (No. 400) to polish panel lightly. Do not polish it forcibly to produce any scratch. Clean each part again.
3) If factory-applied primer coating is cut through to bare metal, apply metal conditioner to bare metal exposed to open air. As for the method of use of the metal conditioner, follow directions on its container.
4) Apply primer-surfacer to the part completely dry before starting sand-paper polishing. As for drying time, follow directions advised on primer-surfacer container.
5) Use a wet or dry sand-paper (No. 400) and water to polish panel lightly.
6) Wash part gain.
7) Apply color coating to part.
8) Different paints demand different drying methods. Hence, follow directions advised on pertinent paint container.
9) When laquer coating (quick-drying paint coating) is applied, dry coated surface and polish it with compound.
   In the case of melamine or acrylic coating, compound polishing can be omitted after drying.
10) In the case of lacquer coating, wax should not be applied to coated surface until surface has dried completely (for approx. two months).

Before replacing exterior parts or assemblies, check paint conditions of all covered or hidden interior surfaces. If any rust scale is found at these places, proceed as follows:

1) Use a proper wire brush, adhesive or liquid rust removing agent to remove rust. As for method of use, follow directions advised for respective materials.
2) If necessary, wash parts with detergent, rinse, and dry them.
3) Before installing exterior body parts, apply anticorrosive compound to all cleaned surfaces of exterior body parts. Also, apply anticorrosive compound to inner surfaces of exterior body parts to be installed.

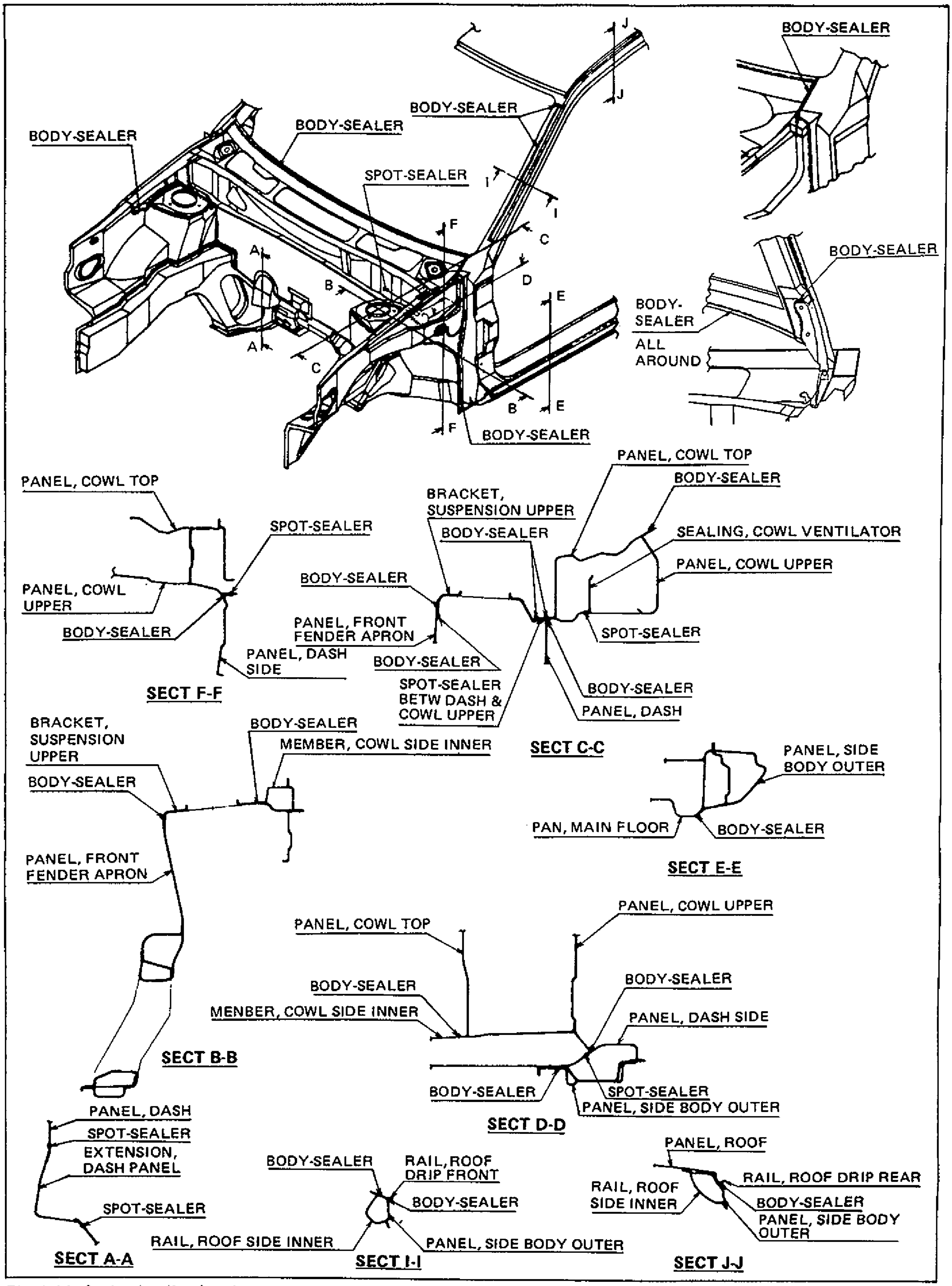


Fig. 9-80 Sealer Application Areas

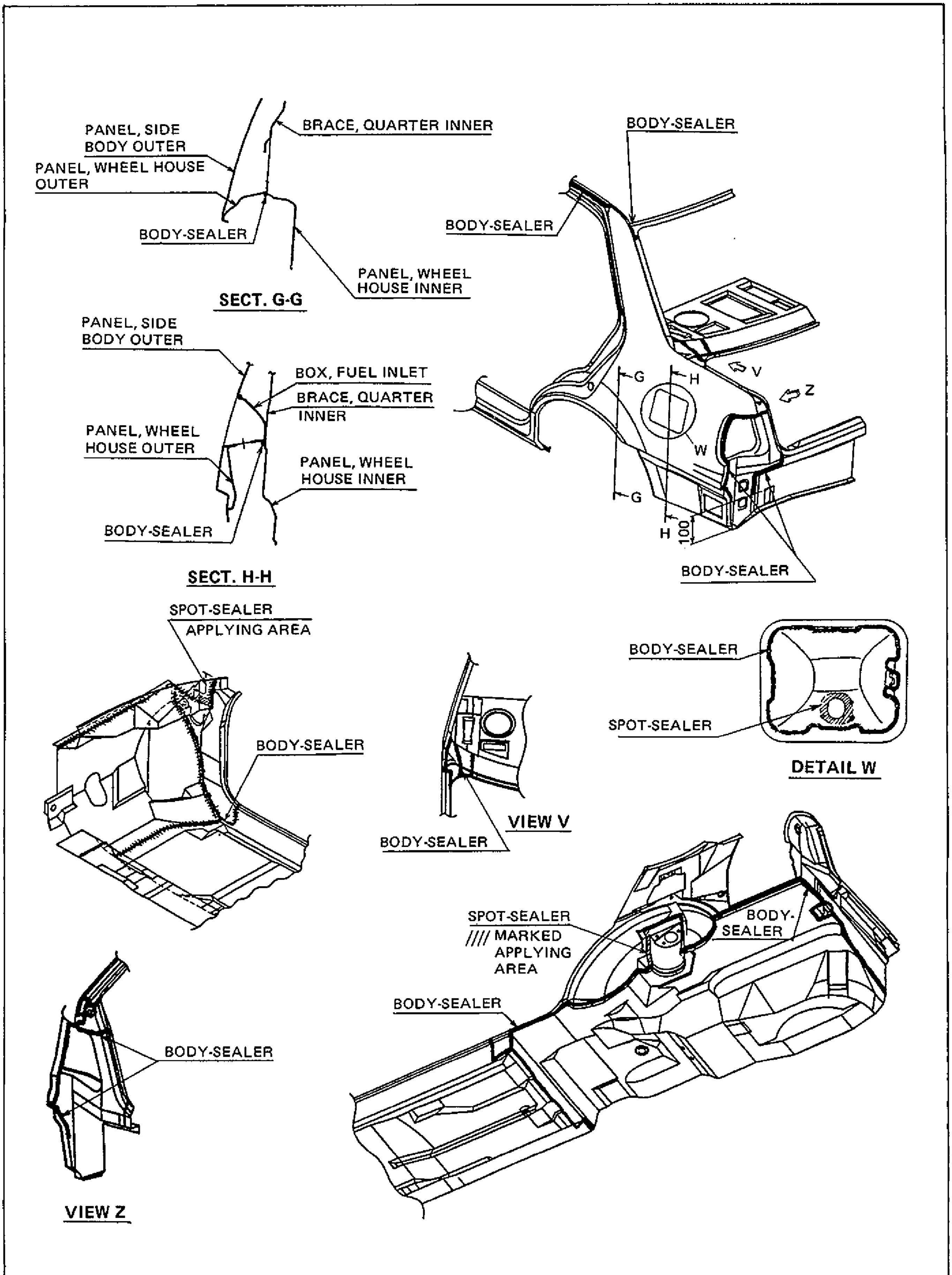


Fig. 9-81 Sealar Application Areas

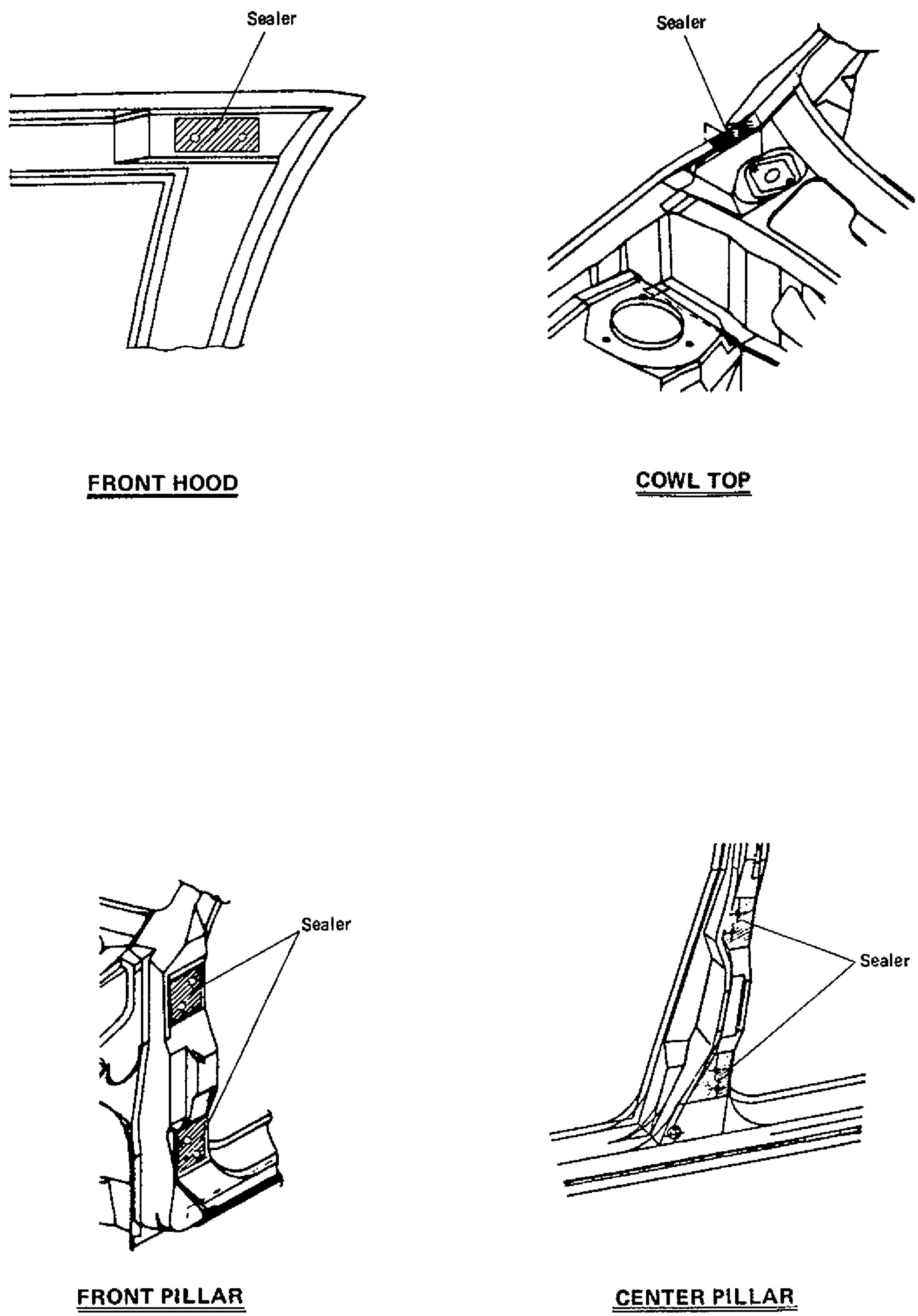


Fig. 9-82 Sealer Application Areas

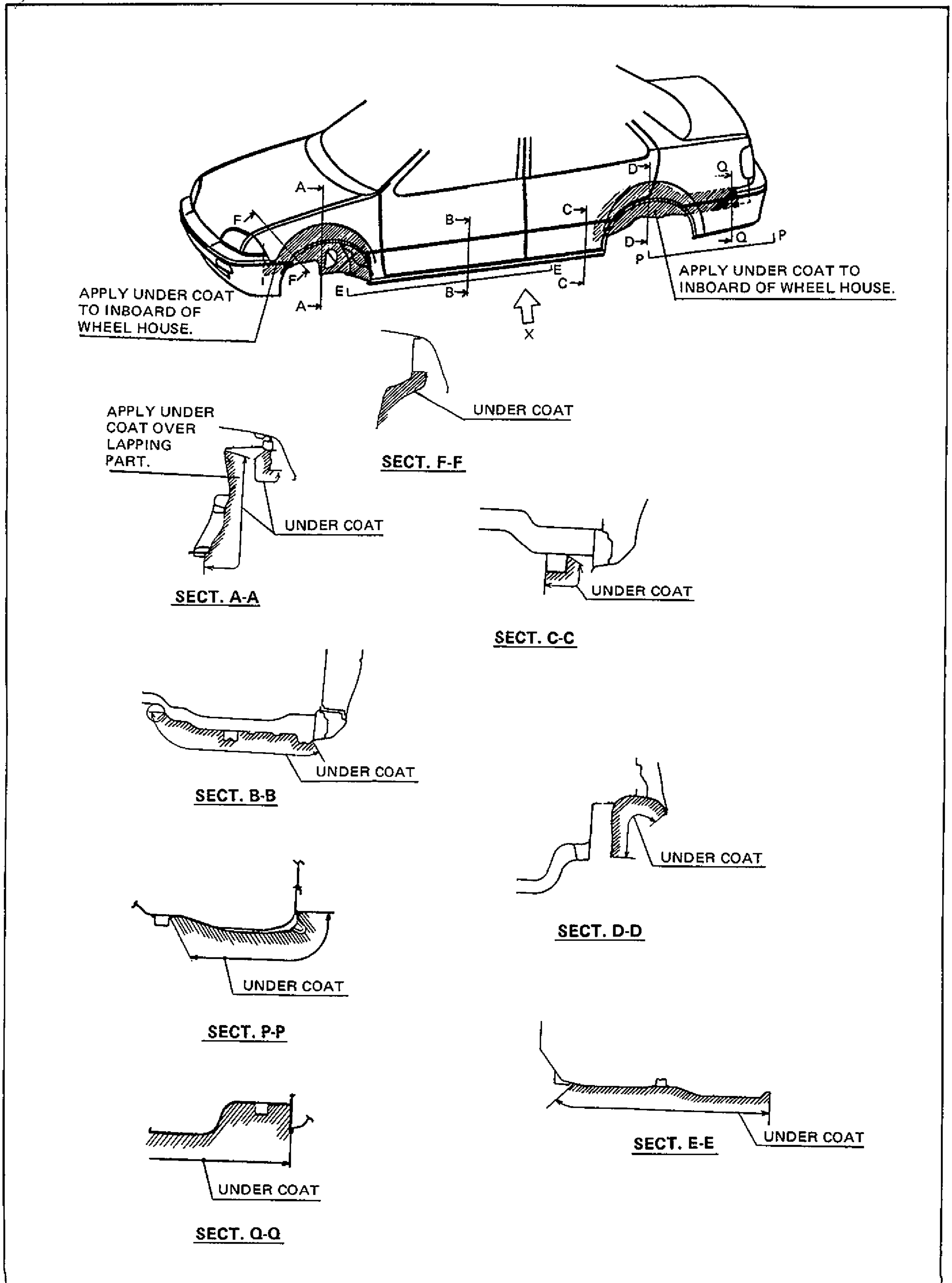


Fig. 9-83-1 Undercoating Application Areas

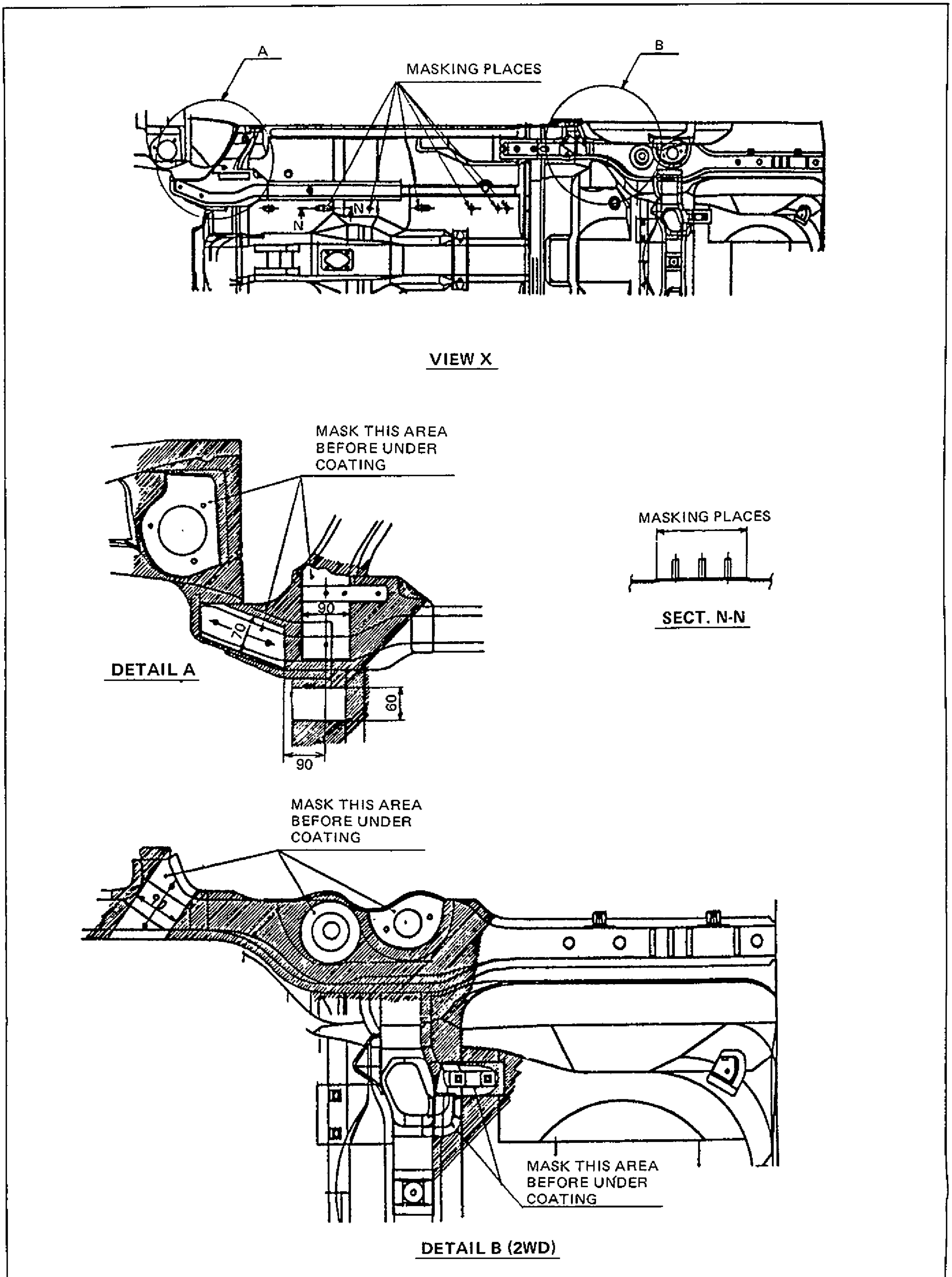


Fig. 9-83-2 Undercoating Application Areas

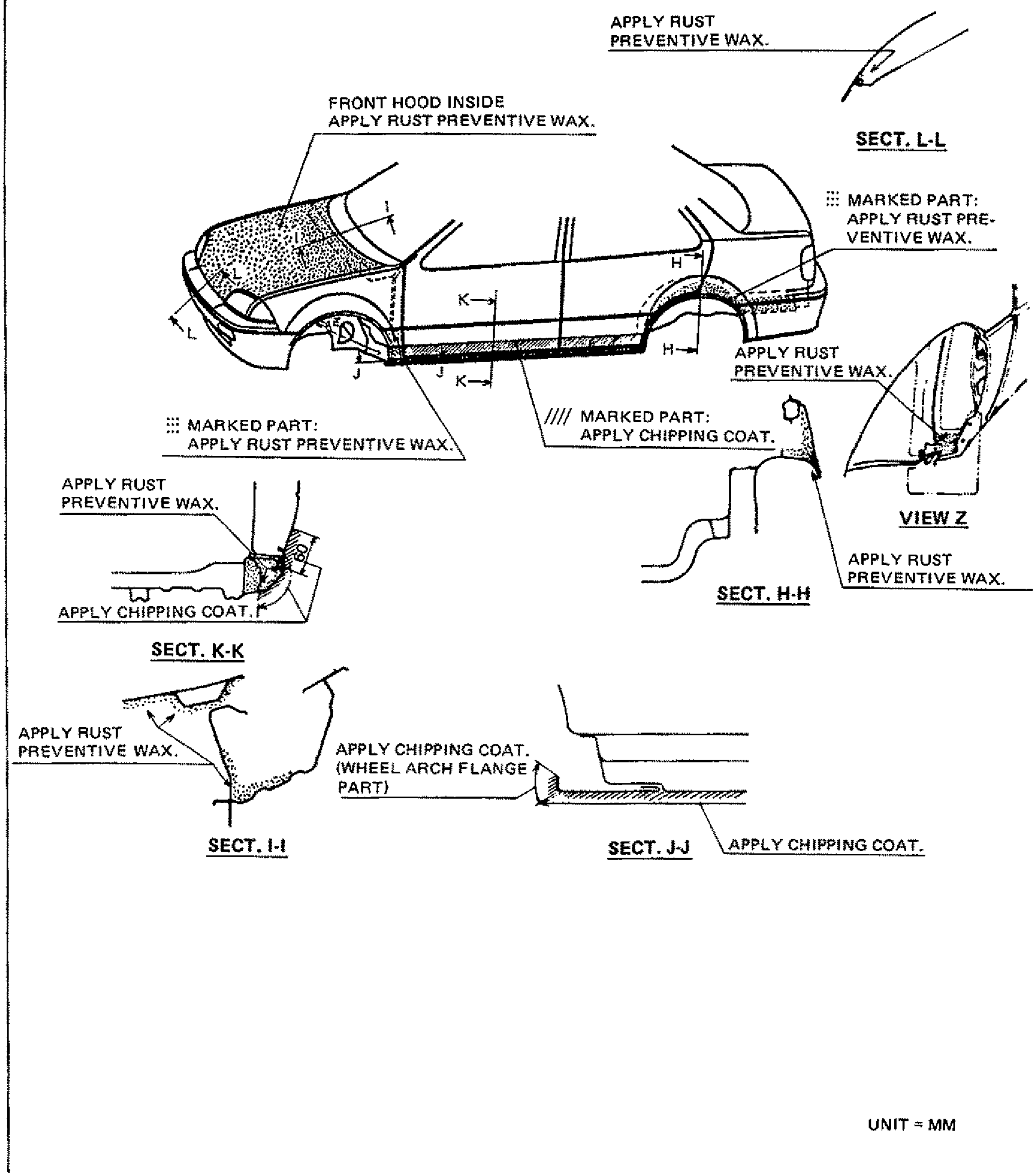


Fig. 9-84 Application of anti-Corrosion Compound and Chip Resistant Material

PLASTIC PARTS FINISHING

Paintable plastic parts are ABS plastic parts.

Painting

Rigid or hard ABS plastic needs no primer coating.

General acrylic lacquers can be painted properly over hard ABS plastic in terms of adherence.

1) Use cleaning solvent for paint finish to wash each part.
2) Apply conventional acrylic color lacquer to part surface.
3) Follow lacquer directions for required drying time. (Proper drying temperature range is 60 to 70°C)

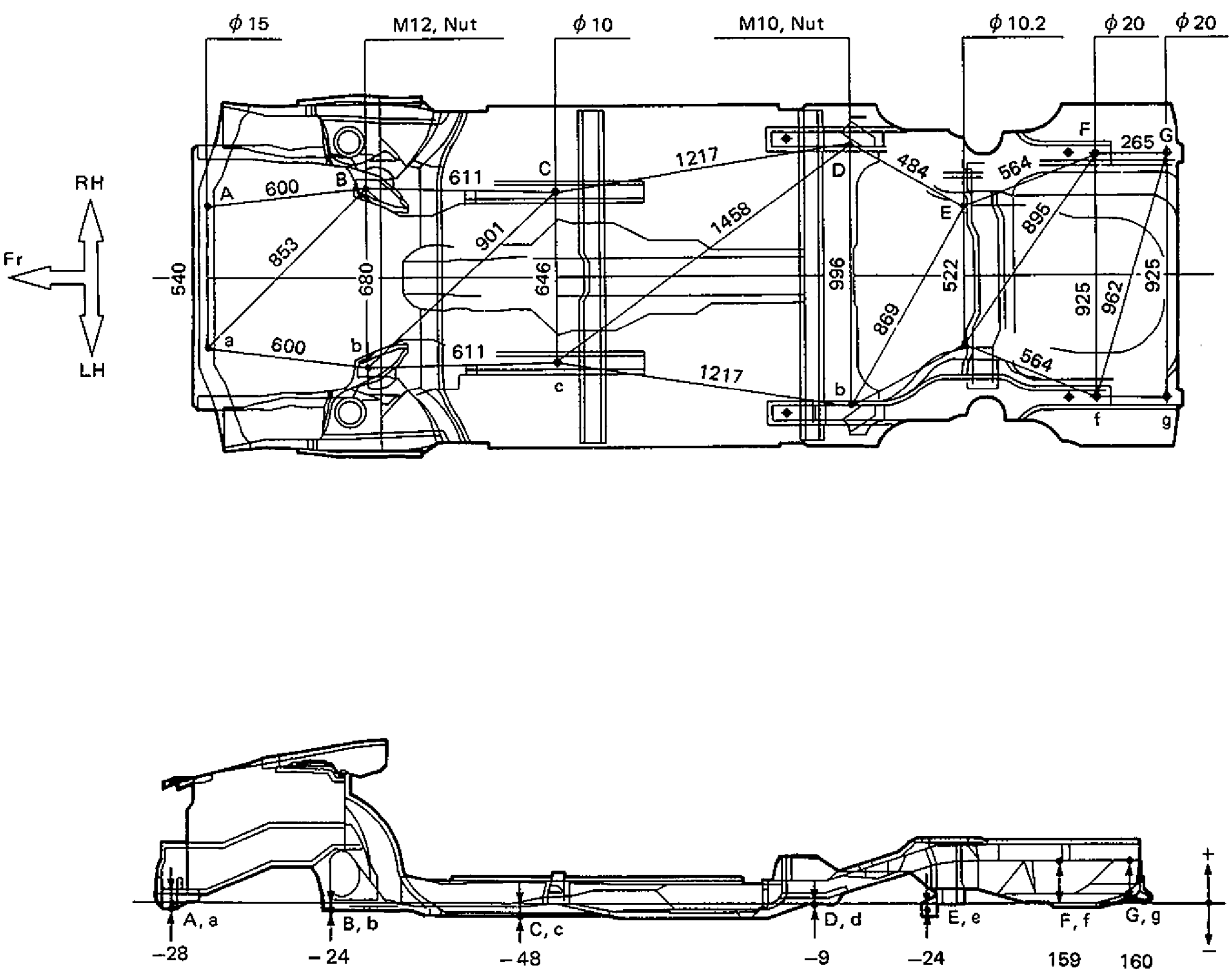
Reference

Plastic parts employ not only ABS (Acrylonitrile Butadiene Styrene) plastic but also polypropylene, vinyl, or the like plastic. Burning test method to identify ABS plastic is described below.

1) Use a sharp blade to cut off a plastic sliver from the part at its hidden backside.
2) Hold sliver with pincers and set it on fire.
3) Carefully observe condition of the burning plastic.
4) ABS plastic must raise readily distinguishable black smoke while burning with its residue suspended in air temporarily.
5) Polypropylene must raise no readily distinguishable smoke while burning.

UNDERBODY DIMENSIONS

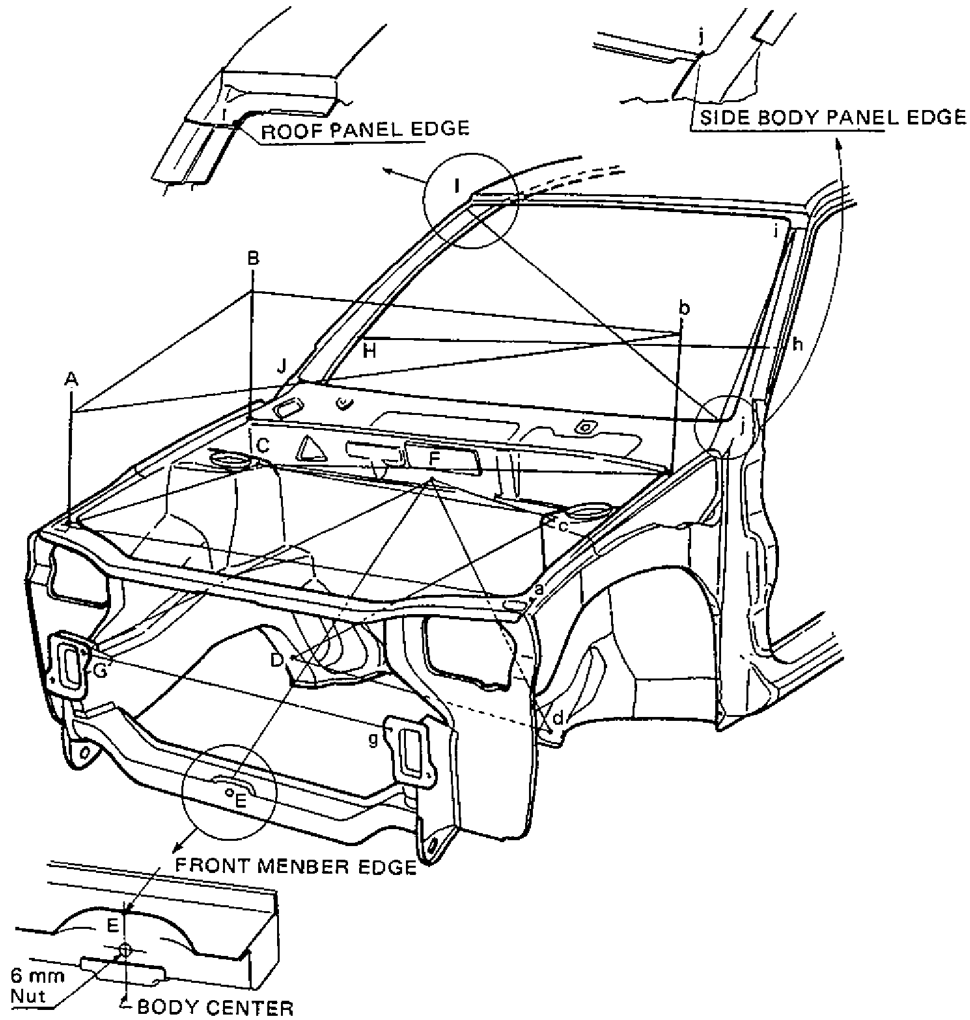
Each underbody component affects strength of car itself as well as wheel alignment (toe-in, camber, caster). It is essential, therefore, to check underbody carefully and perform welding properly, if necessary for its correction or replacement. When damage is found in sealing or rust proof treatment, it is mandatory to correct it properly. For sealing and rust proof treatment, refer to "ANTI-CORROSION TREATMENT" section.



- ALL DIMENSIONS ARE METRIC (UNIT: MM)
- ALL CONTROL POINTS ARE SYMMETRICAL SIDE TO SIDE
- ALL TOLERANCES ARE ± 3 MM

Fig. 9-85 Underbody Dimensions

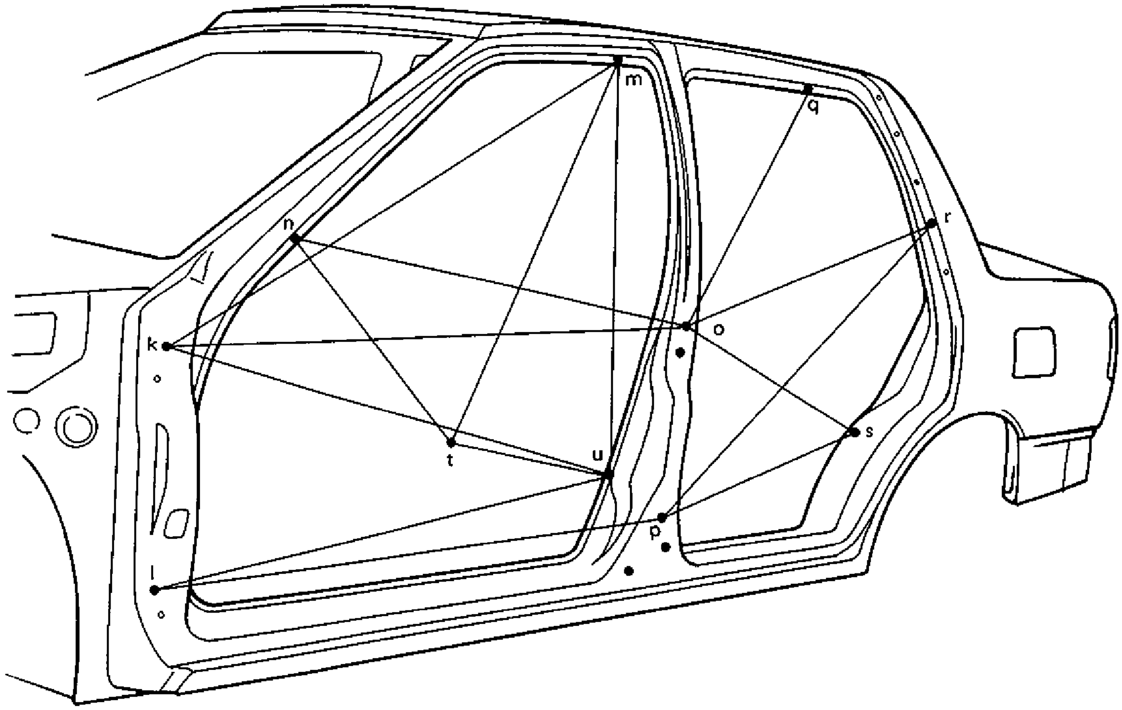
BODY DIMENSIONS



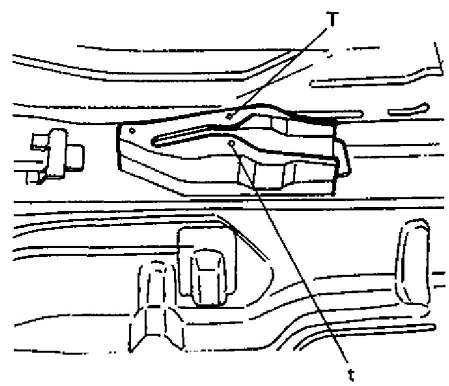
MEASUREMENT POSITION	HOLE DIAMETER mm (in)	MEASUREMENT POSITION	HOLE DIAMETER mm (in)
A, a, B, b	φ6 (φ0.236)	G, g	φ10 (0.394)
C, c	φ9 (φ0.354)	H, h	φ6.5 (0.256)
D, d, F	φ7 (φ0.275)		

MEASUREMENT POSITION	LENGTH mm (in)	MEASUREMENT POSITION	LENGTH mm (in)
A – a	1 242 (48.90)	E – F	827 (32.59)
A – b	1 386 (54.57)	F – c	464 (18.27)
A – C	471 (18.54)	F – d	589 (23.19)
A – B	582 (22.91)	F – G	852 (33.54)
B – b	1 273 (50.12)	G – g	842 (33.15)
C – c	908 (35.75)	H – h	1 253 (49.33)
C – b	1 101 (43.35)	I – j	1 316 (51.81)
D – c	950 (37.40)	i – j	712 (28.03)
D – d	782 (30.79)		

Fig. 9-86 Body Dimensions



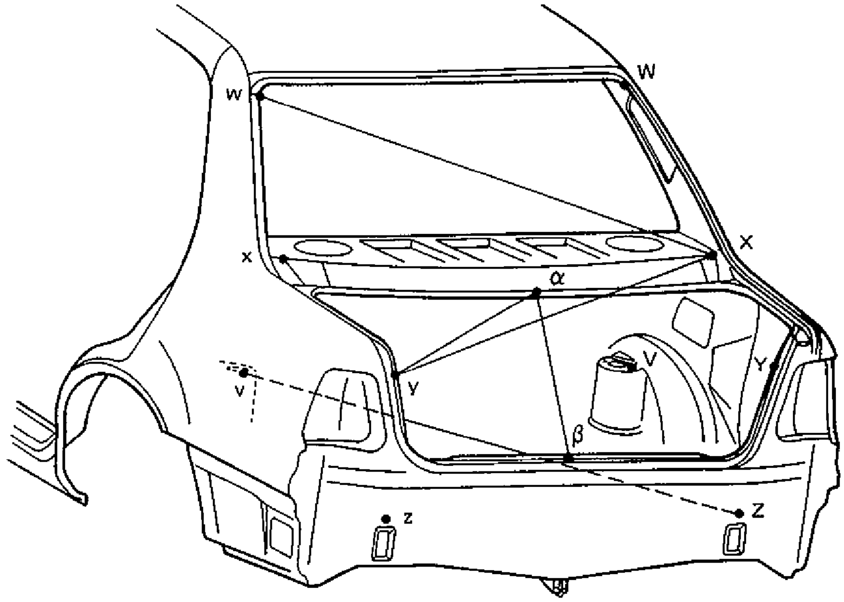
MEASUREMENT POSITION	HOLE DIAMETER mm (in)
k, l, o, p, t	ϕ8 (ϕ0.315)
m, n, q, s	ϕ6.5 (ϕ0.256)
r	ϕ5.2 (ϕ0.205)



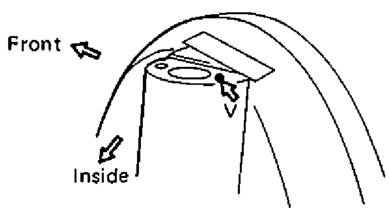
Above figure shows where parking brake is installed.

MEASUREMENT POSITION	LENGTH mm (in)	MEASUREMENT POSITION	LENGTH mm (in)
k – m	1 167 (45.94)	n – t	1 088 (42.83)
k – o	1 053 (41.46)	o – q	708 (27.87)
k – u	978 (38.50)	o – r	981 (38.62)
l – u	954 (37.56)	o – s	649 (25.55)
l – p	1 043 (41.06)	p – r	1 131 (44.53)
m – t	1 043 (41.06)	p – s	637 (25.08)
m – u	814 (32.05)	t – u	646 (25.43)
n – o	826 (32.52)		

Fig. 9-87 Body Dimensions

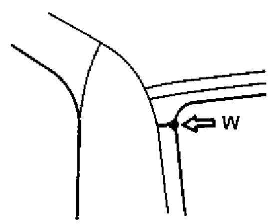


V, v: Center of hole where rear end of absorber is installed.

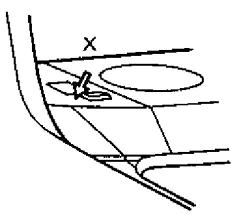


V, v
ϕ 9.3 mm
(ϕ 0.366 in)

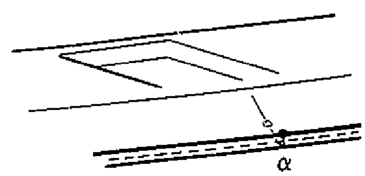
W, w: Stepped part of rear pillar.



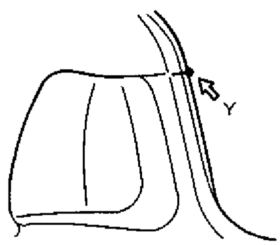
X, x: Rear parcel side stepped hole.



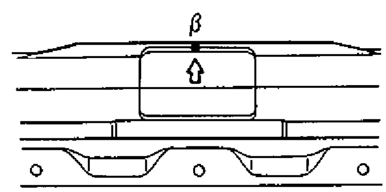
α : Rear waist flange edge (Body center)



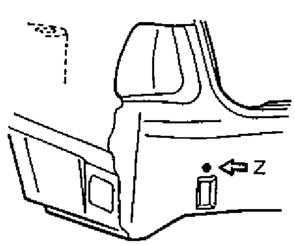
Y, y: Stepped part of corner rear fender.



β : Center of hole in lock striker storage (Body center)



Z, z: Center of hole where rear bumper is installed.



Z, z:
ϕ 14 mm
(ϕ 0.551 in)

MEASUREMENT POSITION	LENGTH mm (in)
v – Z	1 195 (47.05)
w – X	1 165 (45.87)
X – y	1 191 (46.89)
y – α	577 (22.72)
α – β	410 (16.14)

Fig. 9-88 Body Dimensions

SIDE MOLDING (OPTIONAL)

INSTALLATION

1) Bonding surfaces should be cleaned thoroughly.
2) Follow illustrated bonding positions to install side moldings.
3) If adequate adhesive force is not available, use urethane adhesive.

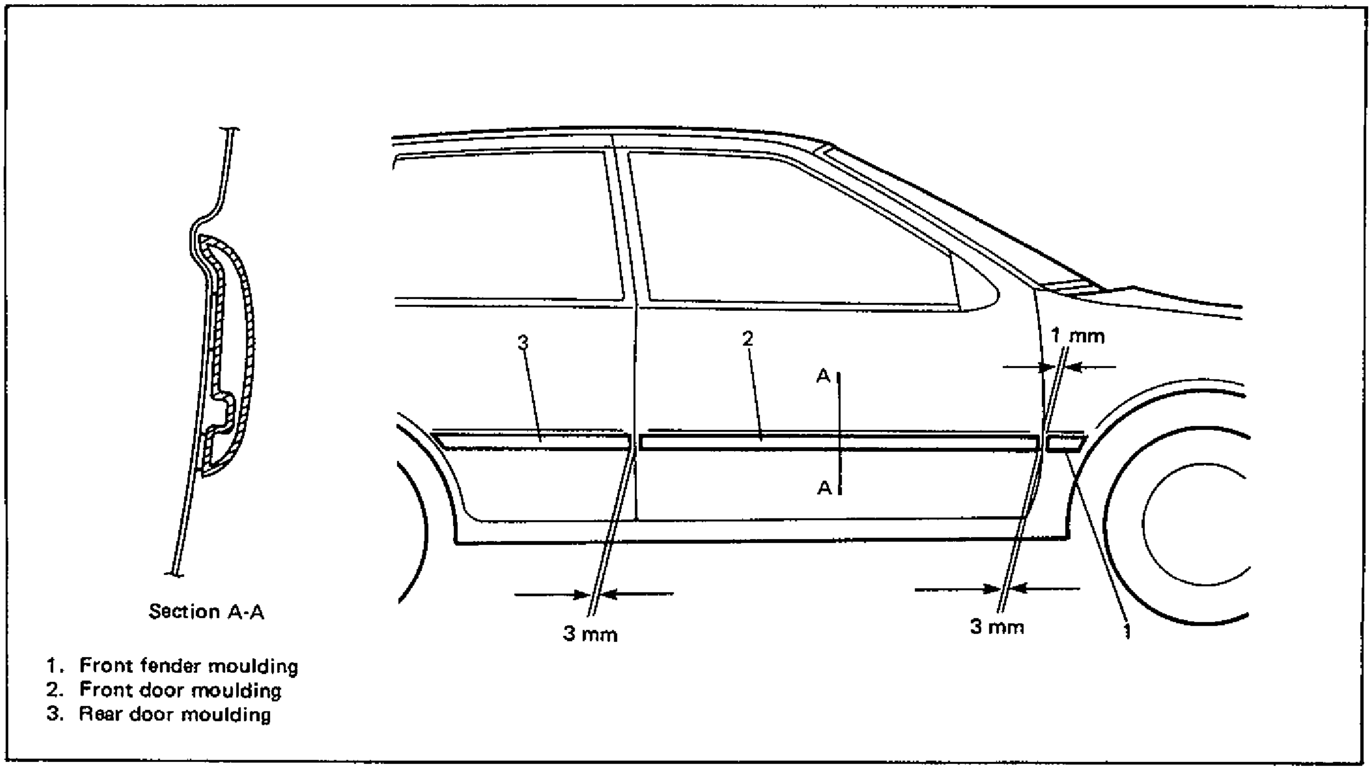


Fig. 9-89 Molding Location

KEY CODING

KEY USAGE AND IDENTIFICATION

One key is used for ignition, door and trunk lock cylinder. Keys are cut on both edges to make them reversible.

Key identification is obtained from five character key code stamped on key code tag or on the keys. Using this key code, key code cutting combination can be determined from a code list (available to owners of key cutting equipement from suppliers).

If key codes are not available from records or tags, key code can be obtained from the right hand door lock cylinder (if lock has not been replaced). Lock cylinders supplied by the factory as service parts are unmarked.

If original key is available, key code cutting combination can be determined by laying key.

IGNITION SWITCH LOCK CYLINDER

Removal/Installation

See section 3C, STEERING WHEEL AND COLUMN.

ELECTRICAL DIAGNOSIS

For ignition switch electrical troubleshooting, see Section 8, BODY ELECTRICAL SYSTEM.

GROUP 2

SUZUKI

SF416

SUPPLEMENTARY SERVICE MANUAL
FOR FOUR-WHEEL DRIVE MODEL

FOREWORD

This SUPPLEMENTARY SERVICE MANUAL (GROUP 2) is a supplement to GROUP 1 and has prepared for four-wheel drive (4WD) model.

When servicing 4WD model, consult this GROUP first. And for any item or description not contained in this GROUP, refer to GROUP 1.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials (lubricants, 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. The right is reserved to make changes at any time without notice.

SUZUKI MOTOR CORPORATION

TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

GROUP 2

TABLE OF CONTENTS	SECTION
GENERAL INFORMATION	
Maintenance and Lubrication	0B
FRONT DRIVE SHAFT	4
PROPELLER SHAFT	4B
REAR DRIVE SHAFT	4C
ENGINE	
Engine Mechanical	6A
Engine Fuel	6C
Engine Exhaust	6K
TRANS.	
Manual Transmission	7A
Transfer	7D
Differential (Front & Rear)	7E
BODY ELECTRICAL SYSTEM	8
BODY SERVICE	9

SECTION 0B

MAINTENANCE AND LUBRICATION

NOTE:
For the descriptions (items) not found in this section, refer to Section 0B or 0B1 of GROUP 1.

CONTENTS

MAINTENANCE SCHEDULE 0B-1
MAINTENANCE SERVICE 0B-2
Chassis and Body 0B-2

MAINTENANCE SCHEDULE

NOTE:
Following items are added to 2WD maintenance schedule (SECTION 0B and 0B1 of GROUP 1).

NORMAL CONDITION SCHEDULE

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 48,000 miles (80,000 km) mileage. Beyond 48,000 miles (80,000 km), 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									
1. Transmission oil		I	R	I	R	I	R	I	R
2. Rear differential oil		I	R	I	R	I	R	I	R

NOTES:
"R" : Replace or change
"I" : Inspect and correct or replace if necessary

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the car 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 below chart.

Severe condition code

A — Repeated short trips
B — Driving on rough and/or muddy roads
C — Driving on dusty roads
D — Driving in extremely cold weather and/or salted roads
E — Repeated short trips in extremely cold weather

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
— B C D — —	Propeller shafts	I	Every 6000 miles (10000 km) or 6 months

NOTES:
"R" : Replace or change "I": Inspect and correct or replace if necessary

MAINTENANCE SERVICE

CHASSIS AND BODY

1. Transmission Oil Inspection and Change

[Inspection]
1) Inspect transmission and transfer cases for evidence of oil leakage.
   Repair leaky point if any.
2) Make sure that car is placed level for oil level check.
3) Remove level plug of transmission.
4) Check oil level.
   Oil level can be checked roughly by means of filler/level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified oil up to level hole.
   For specified oil, refer to description of oil change under ON-CAR SERVICE of SECTION 7A in GROUP 2.

[Change]
1) Place the car level and drain oil by removing drain plug.
2) Apply sealant to drain plug and tighten drain plug to specified torque.
3) Pour specified oil up to level hole.
4) Tighten filler plug to specified torque.
   For recommended oil, its amount and tightening torque data, refer to ON-CAR SERVICE of SECTION 7A in GROUP 2.

2. Differential Oil Inspection and Change

[Inspection]
1) Inspect rear differential case for evidence of oil leakage.
   Pepair leaky point, if any.
2) Make sure that the vehicle is placed level for oil level check.
3) Remove level plug of differential. 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 as given in SECTION 7E.

[Change]
Place the vehicle level and drain oil by removing drain plug. Pour specified amount of specified oil as shown in p. 7E-2 and tighten drain plug and filler plug to specified torque.

For location of oil drain plug and level plug of differential and their tightening torque, refer to ON-CAR SERVICE in SECTION 7E.

Propeller Shaft Inspection (severe conditions)

- Check propeller shaft joints for wear, play and damage. If any defect is found, replace.
- Check propeller shaft center support for biting of foreign matter, crack, abnormal noise and damge. If any defect is found, replace.

SECTION 4

FRONT DRIVE SHAFT

NOTE:
For the descriptions (items) not found in this section, refer to the same section of GROUP 1.

CONTENTS

GENERAL DESCRIPTION 4-1
REASSEMBLY (Drive Shaft) 4-1

GENERAL DESCRIPTION

A constant velocity ball joint is used on the wheel side of front drive shaft and a constant velocity double offset joint (DOJ) on the differential side.

REASSEMBLY (Drive Shaft)

When fixing boot to outer race with boot band, adjust so that measurement (A) becomes as indicated in figure below.

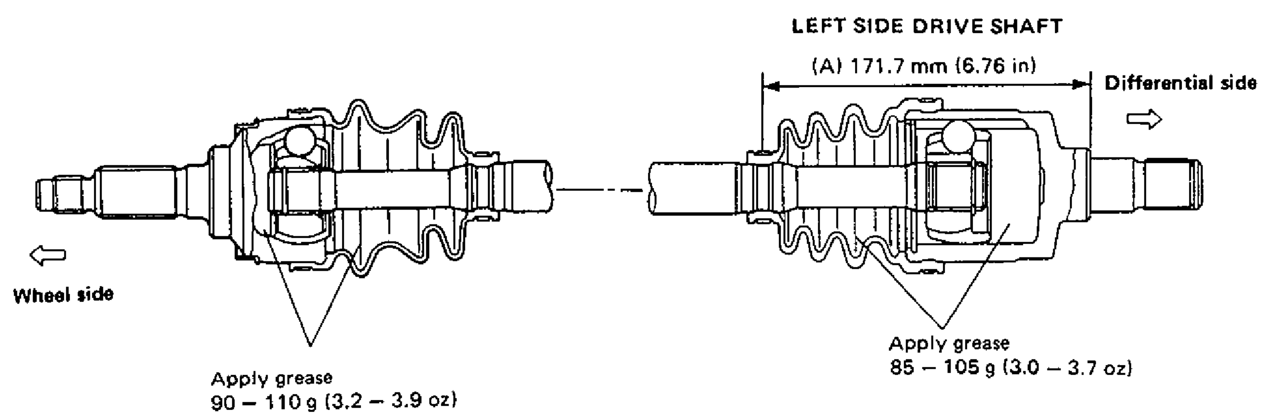


Fig. 4-1

SECTION 4B

PROPELLER SHAFTS

CONTENTS

GENERAL DESCRIPTION 4B-1
ON CAR SERVICE 4B-2
Removal 4B-2
Installation 4B-3
Inspection 4B-3
TORQUE SPECIFICATIONS 4B-4
REQUIRED SERVICE MATERIAL 4B-4

GENERAL DESCRIPTION

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

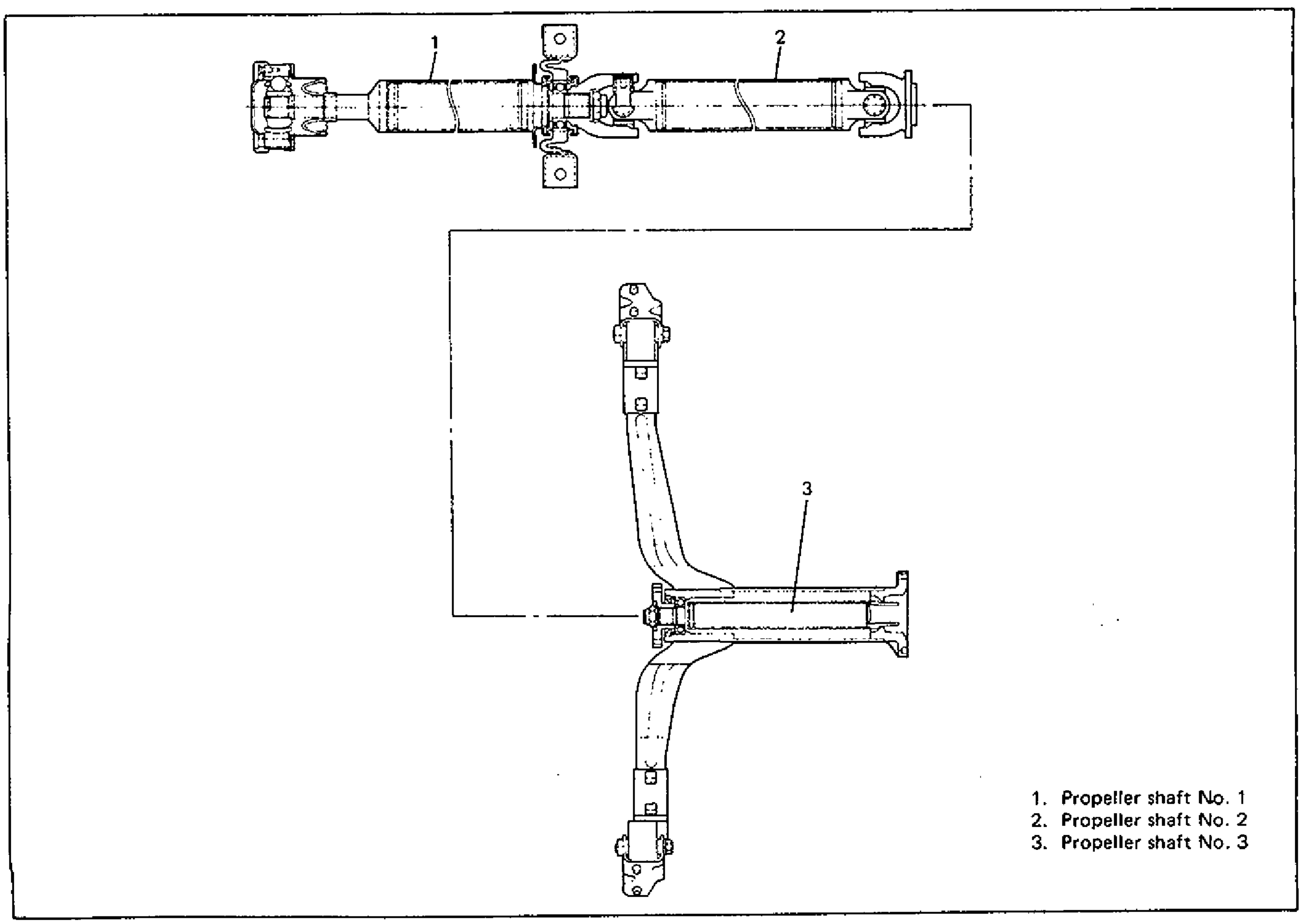
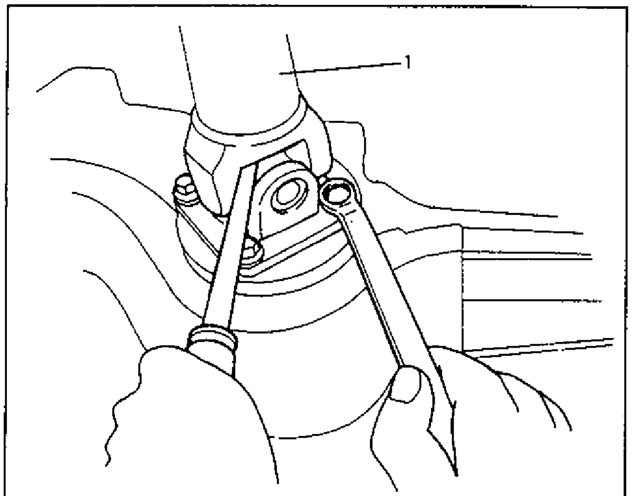


Fig. 4B-1

ON CAR SERVICE

REMOVAL (No. 1 & No. 2 Shaft)

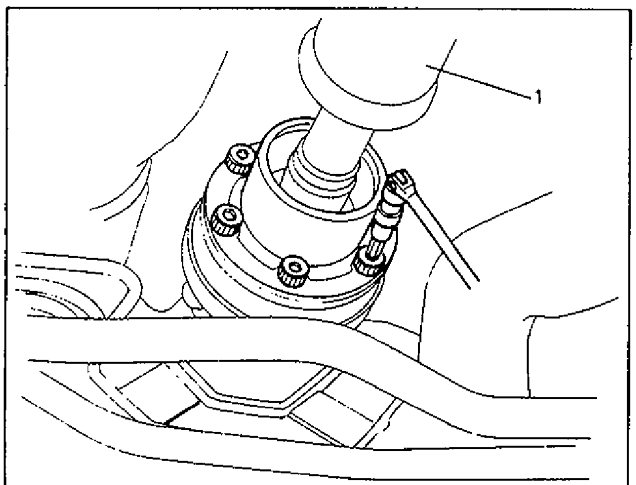
1) Hoist car.
2) Separate No. 2 propeller shaft No. 3 propeller shaft.



1. Propeller shaft No. 2

Fig. 4B-2

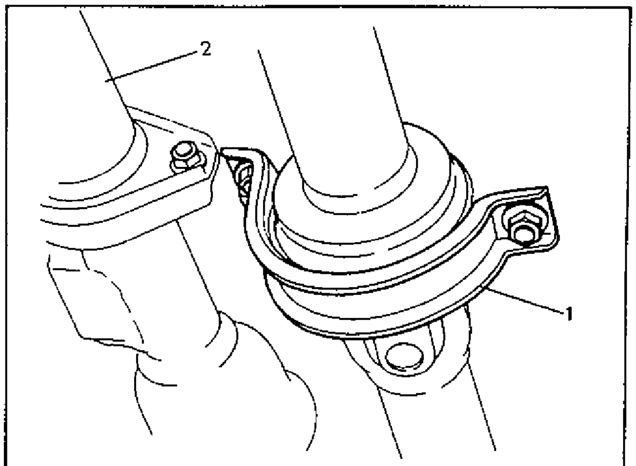
3) Remove No. 1 propeller shaft from transmission case flange.



1. Propeller shaft No. 1

Fig. 4B-3

4) Remove propeller shaft center support bracket from car body. (Bracket and No. 1 & No. 2 shaft are removed in one without separation.) Use care not to drop it.

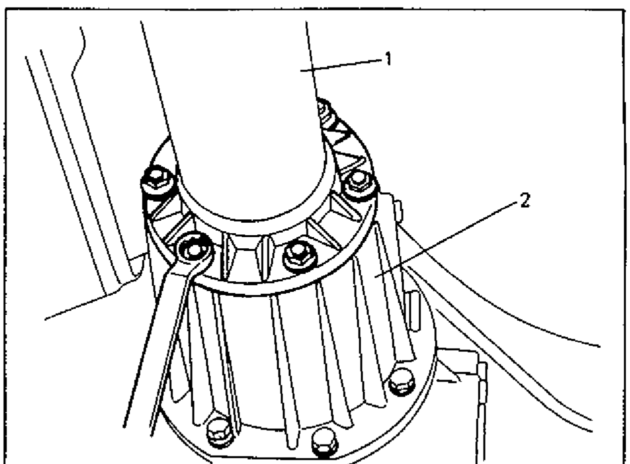


1. Propeller shaft center support
2. Muffler

Fig. 4B-4

REMOVAL (No. 3 Shaft)

1) Hois car.
2) Remove muffler and then separate No. 2 propeller shaft from No. 3 propeller shaft.
3) Remove No. 3 propeller shaft outer tube from viscous coupling case.



1. Propeller shaft No. 3 outer tube
2. Viscous coupling case

Fig. 4B-5

4) Remove No. 3 propeller shaft front mount member nuts from right & left mounts.

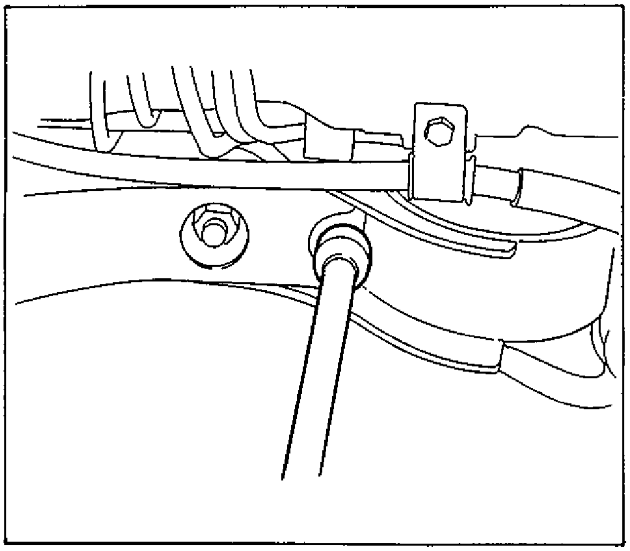


Fig. 4B-6

5) Remove propeller shaft No. 3.

> **CAUTION:**
> **When removing, use care so that No. 3 propeller shaft front member does not contact fuel pipes.**

INSTALLATION

Paying attention to the following, install in the reverse order of REMOVAL.

- For installation of bolts and nuts, refer to "A" and tighten to specified torque.
- Apply sealant to mating surface of No. 3 propeller shaft and viscous coupling.

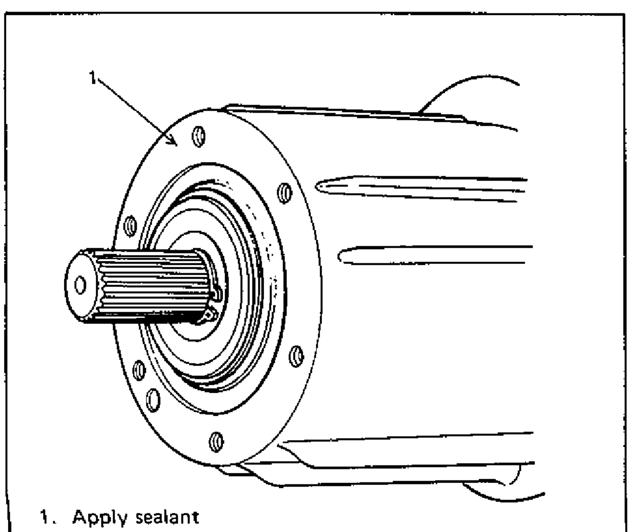


Fig. 4B-7

INSPECTION

1) Check propeller shaft connecting bolts for looseness. If looseness is found, tighten to specified torque.

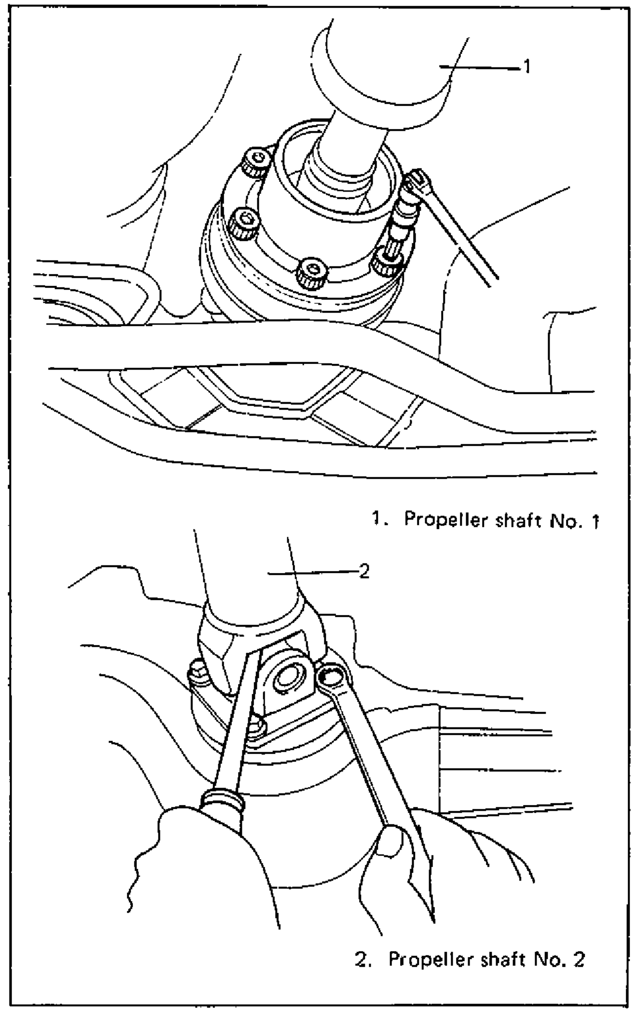


Fig. 4B-8

2) Check propeller shaft joints for wear, play and damage. If any defect is found, replace.
3) Check propeller shaft center support for biting of foreign matter, crack, abnormal noise and damage. If any defect is found, replace.

TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Center bracket nuts	44 – 66	4.4 – 6.6	32.0 – 47.5
2. Propeller shaft No. 1 bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
3. Propeller shaft No. 2 bolts	27 – 37	2.7 – 3.7	20.0 – 26.5
4. Propeller shaft No. 3 front member nuts	44 – 66	4.4 – 6.6	32.0 – 47.5
5. Propeller shaft No. 3 to viscous case bolts	20 – 31	2.0 – 3.1	14.5 – 22.0

REQUIRED SERVICE MATERIAL

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	Matching surfaces of propeller shaft No. 3 and viscous case

SECTION 4C

REAR DRIVE SHAFT

CONTENTS

GENERAL DESCRIPTION 4C-1
ON CAR SERVICE 4C-2
Drive Shaft Assembly 4C-2
RECOMMENDED TORQUE SPECIFICATIONS 4C-5

GENERAL DESCRIPTION

This drive shaft uses equal velocity ball joints which transmit the driving force smoothly even at an angle change.

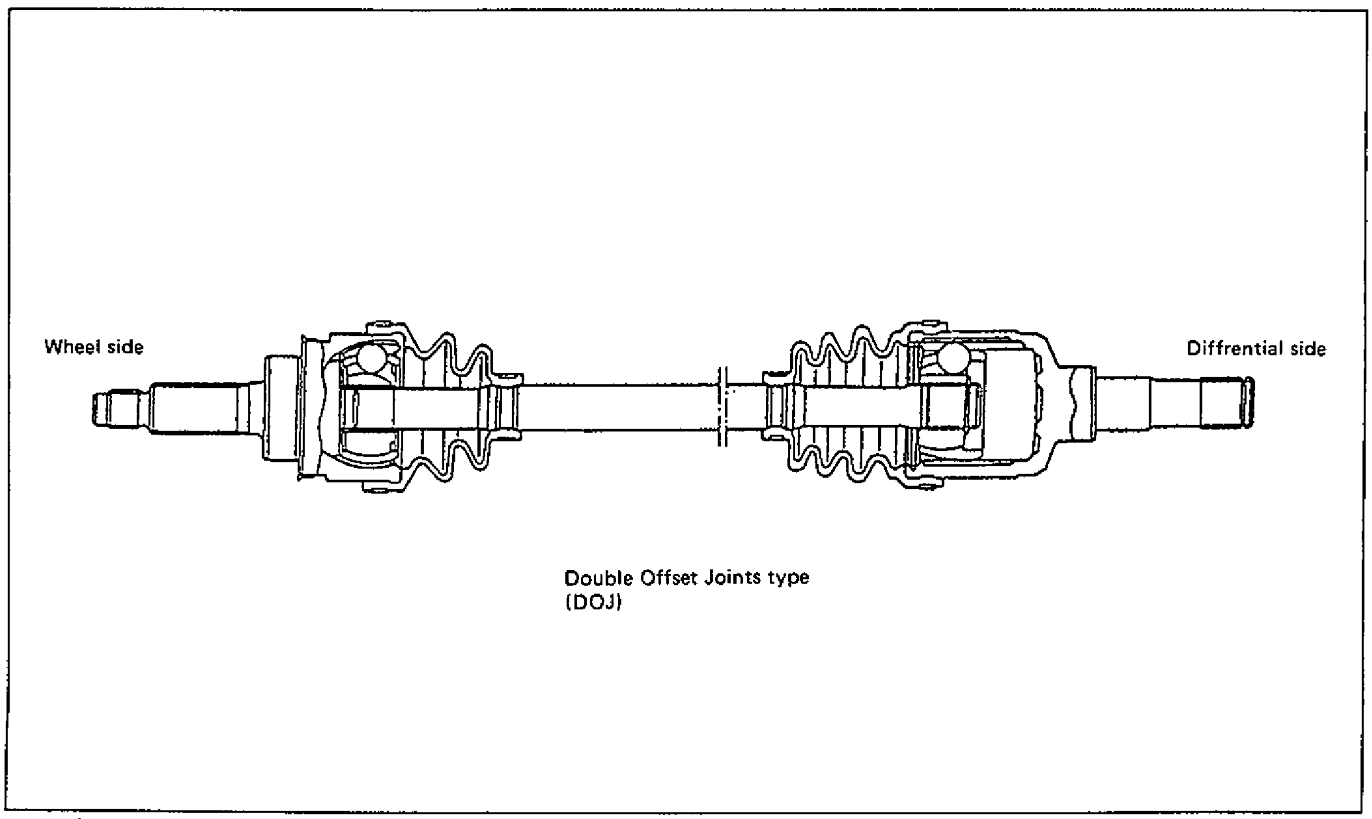


Fig. 4C-1

ON CAR SERVICE

DRIVE SHAFT ASSEMBLY

REMOVAL

1. Remove caulking of spindle nut and then remove spindle nut (30 mm) and washer.

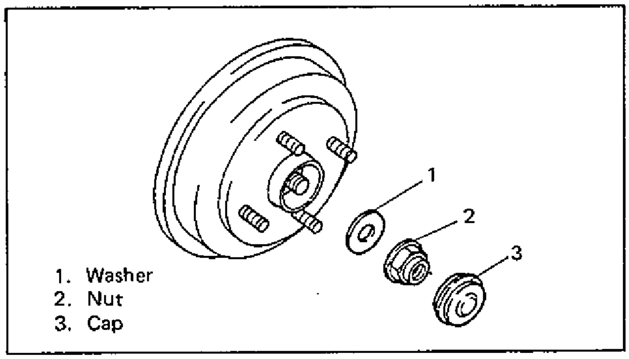


Fig. 4C-2

2. Dismount tire and drain differential oil.

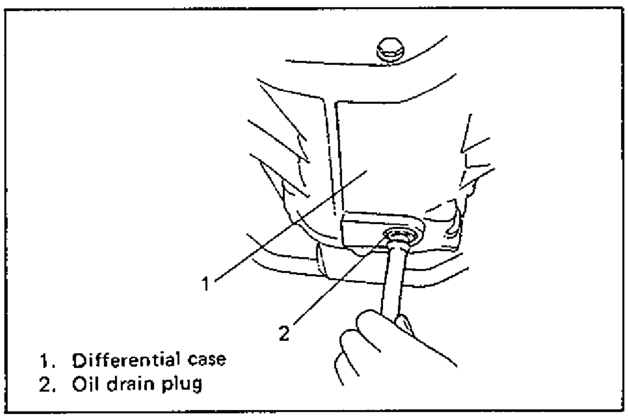


Fig. 4C-3

3. Pull out drive shaft joint and remove snap ring from differential side joint spline.
4. Place jack under suspension arm to prevent it from lowering.

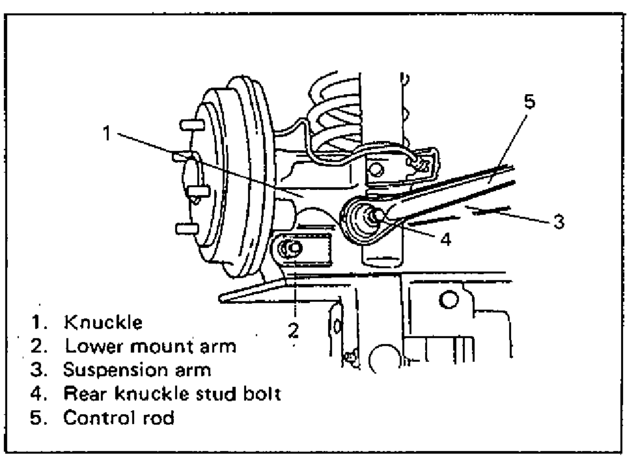


Fig. 4C-4

5. Disconnect brake hose from control rod.

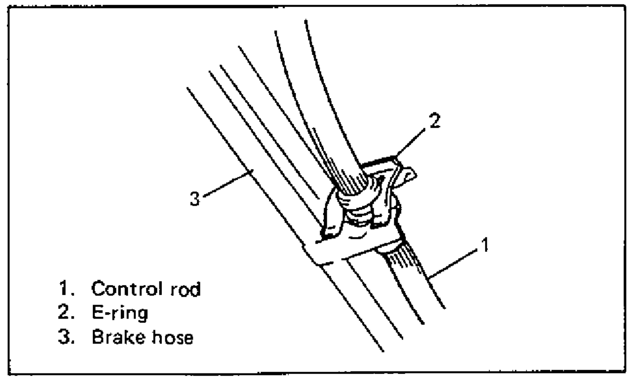


Fig. 4C-5

6. Remove control rod from rear knuckle stud bolt.
7. After removing strut lower mount bolt, pull strut out of rear knuckle by pulling it from above.

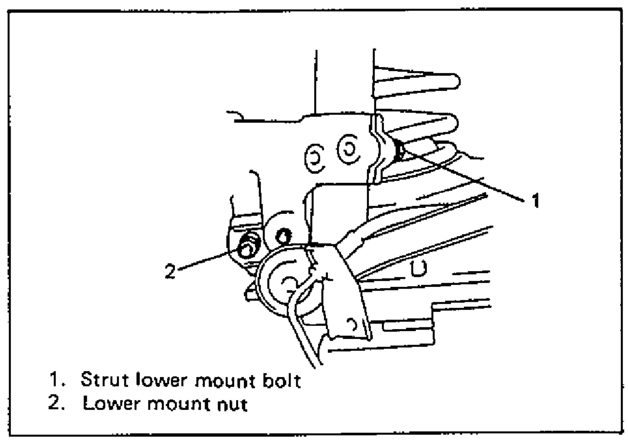


Fig. 4C-6

8. Remove lower mount nut.

NOTE:
Be careful not to pull brake hose or have it pinched.

9. Remove drive shaft assembly.

DISASSEMBLY

NOTE:

- **Wheel side joint can't be disassembled. Disassemble differential side joint when replacing wheel side boot.**
- **When replacing boot, use care not to damage it.**

1. Remove diffrential side boot band and then remove joint housing.

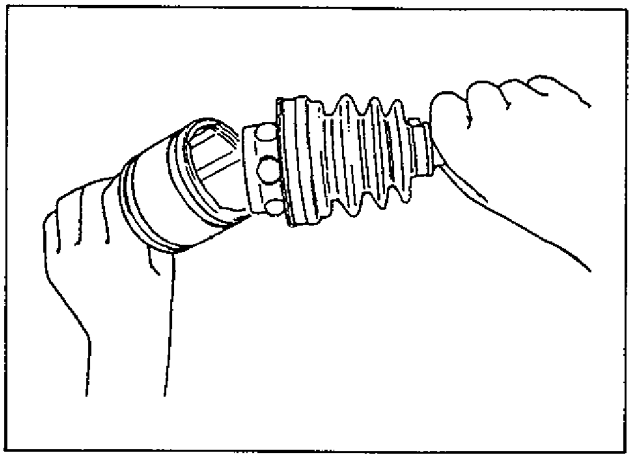


Fig. 4C-7

2. Using snap ring pliers, remove circlip and then take out ball joint.

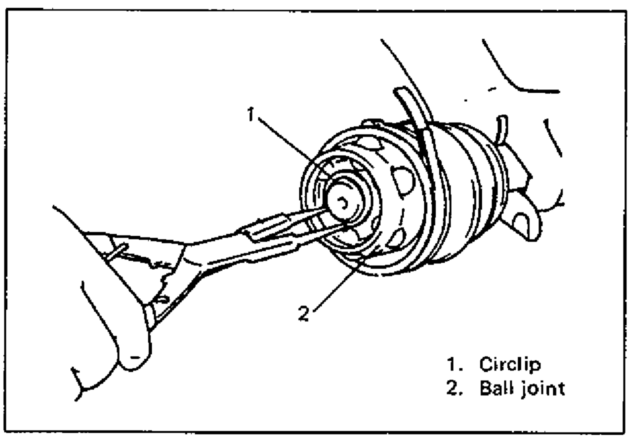


Fig. 4C-8

3. Remove diffrential side and shaft side boots from shaft.

INSPECTION

1. Check boots for damage and deterioration.
2. Check circlip, snap ring and boot band for breakage, deformation and any faulty condition and replace, if any.

ASSEMBLY

For assembly, reverse disassembly procedure, noting following points.

- Before reassembly, check that necessary parts have been replaced. For that, check where defect exists before disassembly and visually inspect disassembled parts carefully. Also, after washing disassembled joint housing in kerosene or the like, dry it completely by blowing air and clean boot with cloth.
- Apply ample amount of joint grease to wheel side joint and inside of boot.
- Install wheel side boot to shaft.
- Fill inside of boot with joint grease and then fix it with boot band.
- Install diffrential side boot to shaft and apply ample amount of grease to joint and inside of boot.
- After installing double offset joint to shaft, fix it with circlip.
- With differential side boot silled with grease, install joint assembly.
- Fix boot to joint assembly with boot band.

INSTALLATION

For installation, reverse removal procedure noting following points.

- Connect brake hose to control rod properly.

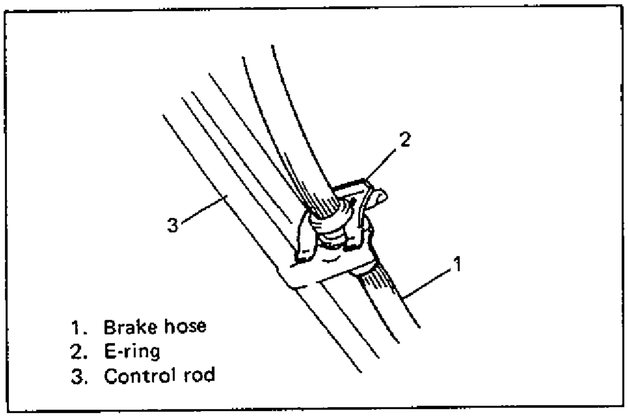


Fig. 4C-9

- Install strut to knuckle.
  Fit lug "A" on strut into opening in knuckle and push down strut till "B" marked parts of strut contact upper end of knuckle as shown below.

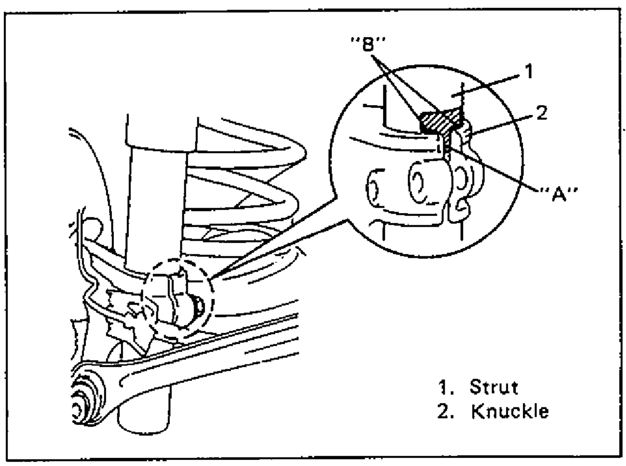


Fig. 4C-10

- Caulk spindle nut as shown below.

NOTE:

Replace spindle nut with a new one.

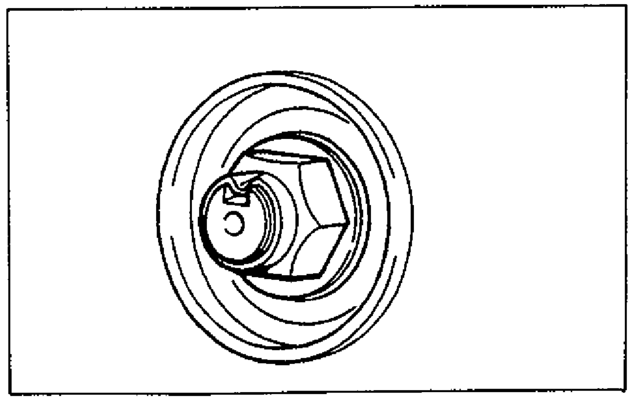
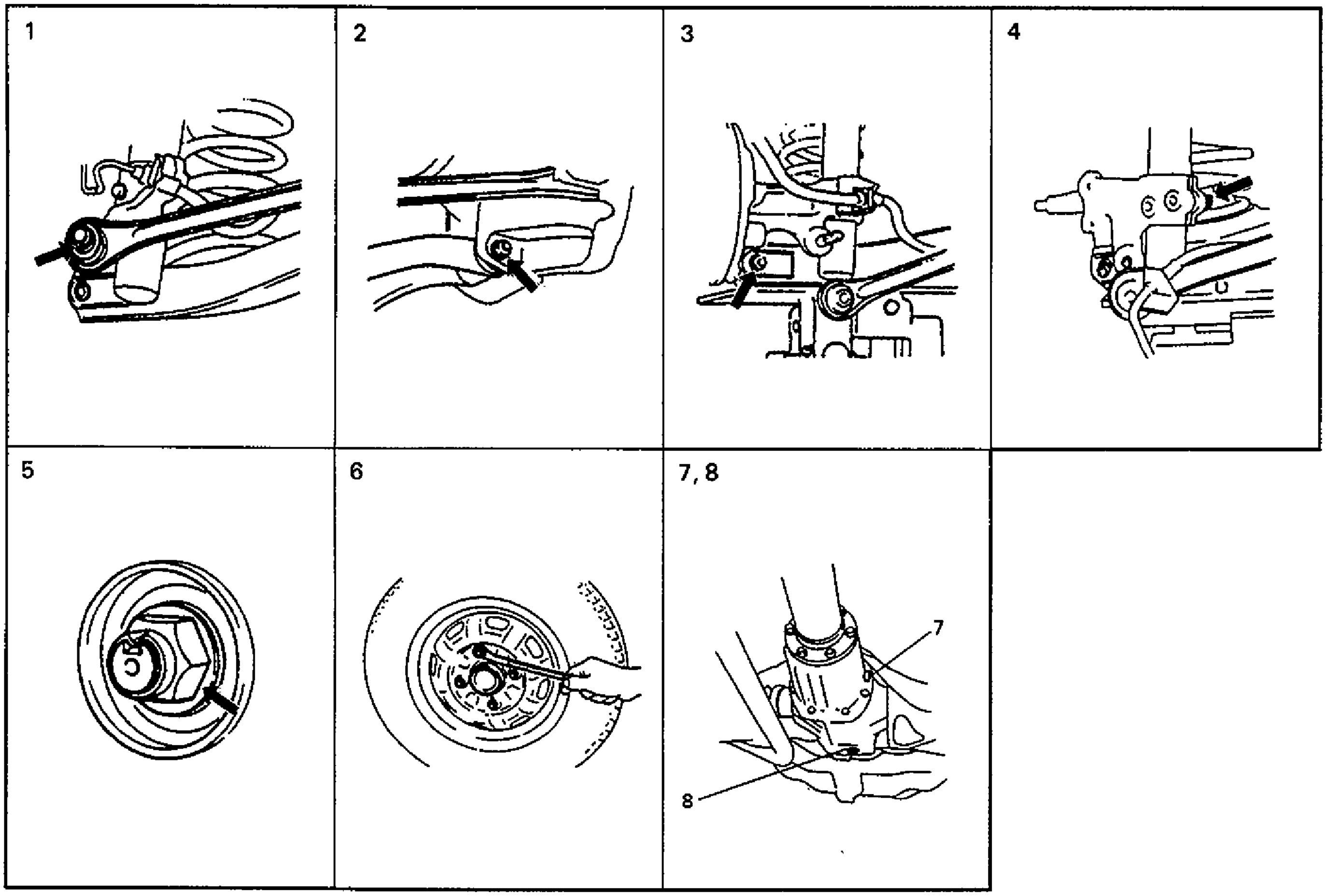


Fig. 4C-11

- Fill differential oil. (Refer to Section 7E.)

RECOMMENDED TORQUE SPECIFICATIONS

Fastener	Tightening torque		
	N·m	kg-m	lb-ft
1. Control rod nut (wheel nut)	70 – 90	7.0 – 9.0	51.0 – 65.0
2. Suspension arm rear nut	40 – 60	4.0 – 6.0	29.0 – 43.0
3. Knuckle arm lower mount nut	40 – 60	4.0 – 6.0	29.0 – 43.0
4. Strut lower mount bolt	50 – 70	5.0 – 7.0	36.5 – 50.5
5. Rear spindle nut	150 – 200	15.0 – 20.0	108.5 – 144.5
6. Wheel nut	50 – 70	5.0 – 7.0	36.5 – 50.5
7. Oil level plug	18 – 28	1.8 – 2.8	13.5 – 20.0
8. Oil drain plug	18 – 28	1.8 – 2.8	13.5 – 20.0



SECTION 6A

ENGINE MECHANICAL

NOTE:
For the descriptions (items) not found in this section, refer to the same section of GROUP 1.

CONTENTS

UNIT REPAIR OVERHAUL 6A-1
Engine Assembly 6A-1

UNIT REPAIR OVERHAUL

ENGINE ASSEMBLY

DISMOUNTING

1. Relieve fuel pressure according to procedure described on p. 6-3 in GROUP 1.
2. Remove battery cables at battery.
3. Remove engine hood panel.
4. Drain cooling system.
5. Remove battery and battery tray.
6. Remove air cleaner assembly.
7. Remove radiator with cooling fan.
8. Remove accelerator cable.
9. Remove electronic wire harness.
10. Disconnect clutch cable from transmission.
11. Disconnect shift and select cables from transmission.
12. Disconnect heater hoses.
13. Disconnect vacuum hoses.
14. Disconnect fuel hoses.
15. Remove exhaust pipe.
16. Remove front wheels.
17. Remove splash cover.
18. Remove stabilizer.
19. By using large size screwdrivers, pull out left drive shaft joint at differential side and right drive shaft joint at drive intermediate shaft so as to release snap ring fitting.
    Refer to SECTION 4.
20. Remove ball stud bolts and nuts from both side knuckles and detach suspension arms and then pull out both drive shaft joints from differential.
21. Separate propeller shaft No. 1 from transfer.
22. Support engine and remove engine mounting bolts and nuts.
23. Lower engine with transmission.

REMOUNTING

Reverse dismounting procedure for remounting and note follows.

- Tighten bolts and nuts to specified torque.

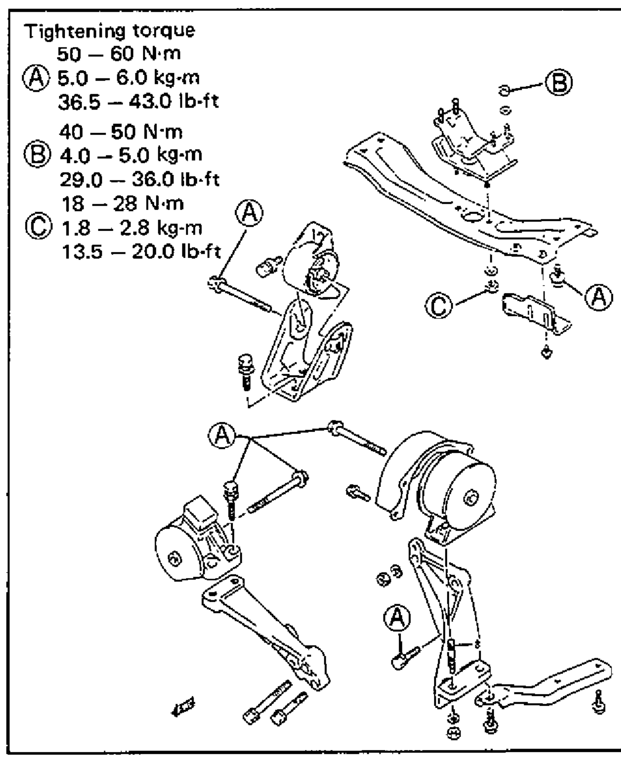


Fig 6A-1 Engine Mounting

- Upon completion of installation, verify that there is no fuel leakage, water leakage or exhaust gas leakage at each connection.

SECTION 6C

ENGINE FUEL

NOTE:
For the descriptions (items) not found in this section, refer to the same section of GROUP 1.

CONTENTS

GENERAL DESCRIPTION 6C-1
Fuel System 6C-1
Fuel Pump 6C-2
Fuel Level Gauge 6C-2

ON CAR SERVICE 6C-3
Fuel Tank 6C-3

CAUTION:
AMONG THE CARS OF THIS MODEL, THERE ARE THOSE EQUIPPED WITH A CATALYTIC CONVERTER AND THOSE WITHOUT ONE DEPENDING ON STATUTORY REGULATIONS OF EACH COUNTRY. FOR THOSE WITH A CATALYTIC CONVERTER, BE SURE TO USE UNLEADED FUEL ONLY. USE OF LEADED AND/OR LOW LEAD FUEL CAN RESULT IN ENGINE DAMAGE AND REDUCE THE EFFECTIVENESS OF THE EMISSION CONTROL SYSTEM.

GENERAL DESCRIPTION

FUEL SYSTEM

The main components of the fuel system are fuel tank, fuel pump, circulation pump, fuel filter and main fuel level gauge, sub fuel level gauge and it includes three lines; fuel feed line, fuel return line and fuel vapor line.

Whether equipped with a canister in the fuel vapor line or not depends on the vehicle specifications.

Because the fuel tank of a four-wheel drive vehicle is configured in two sections, a circulation pump is provided inside the sub-tank so that fuel can be transferred from the sub-tank to the main tank. This prevents fuel from being left in one tank.

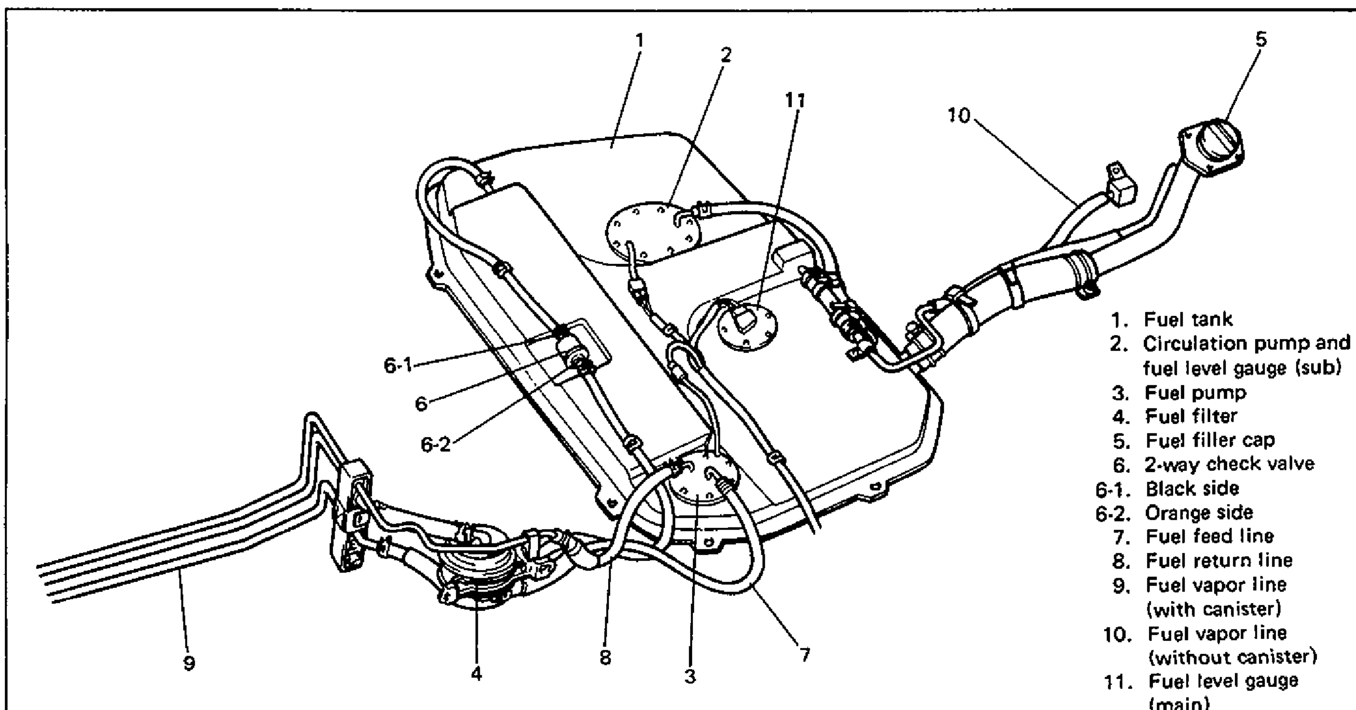


Fig. 6C-1 Fuel System

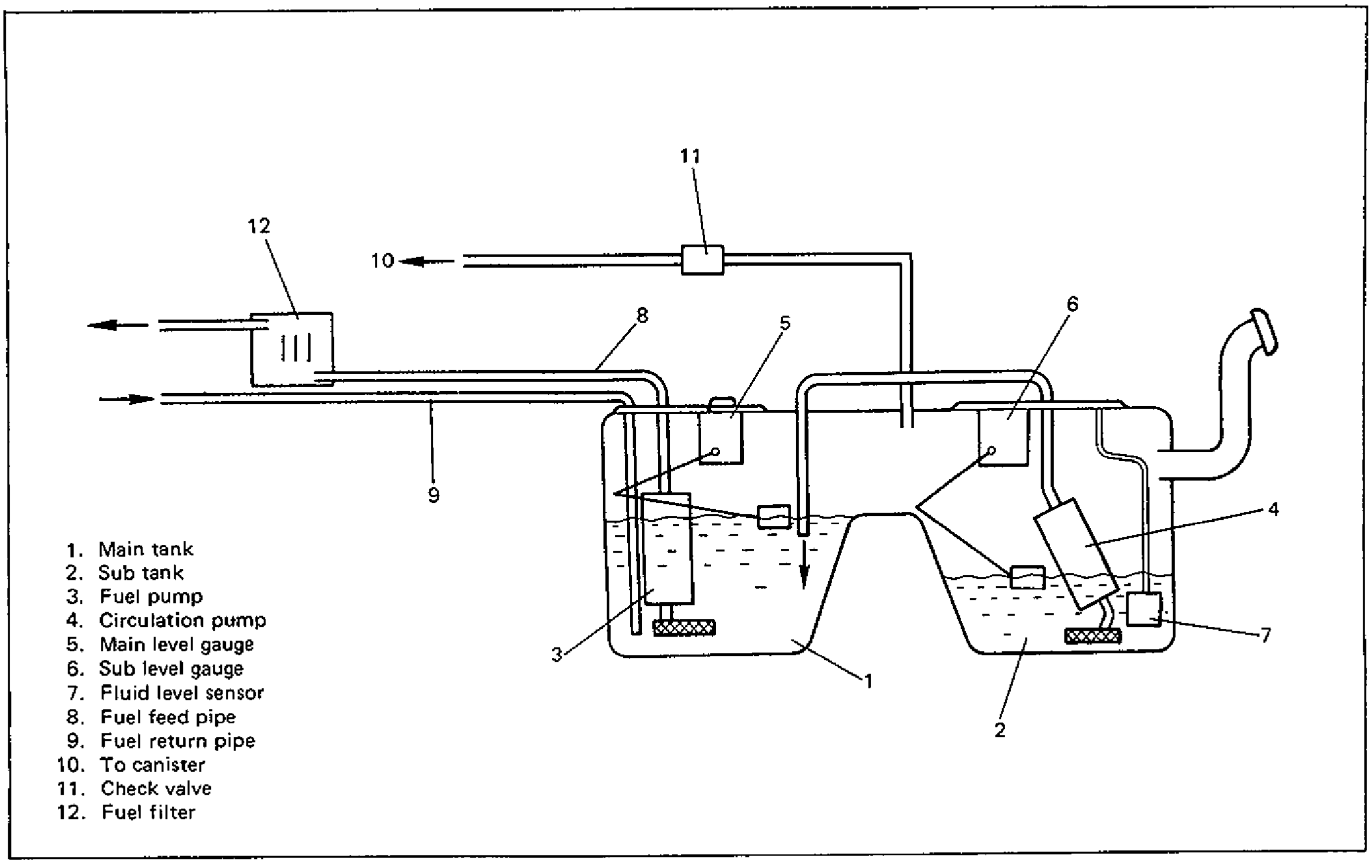


Fig. 6C-2 Fuel Lines

FUEL PUMP

The fuel pump and circulation pump are both housed inside the tank. When the fuel level rises above the fluid level sensor, the circulation pump operates when the ignition switch is turned on, and the fuel in the sub-tank is supplied to the main tank. The fuel pump operates simultaneously with the startup of the engine, so that fuel is supplied to the engine. When the level of fuel in the sub-tank drops below the operation level of the fluid level sensor, the relay operates, and the circulation pump stops. If, because of the swaying of the car or for other reasons, fuel spills from the main tank back into the sub-tank, raising the level there above the sensor level the circulation pump begins to operate again.

FUEL LEVEL GAUGE

The fuel meter indication is displayed by means of compound resistance value deriving from two fuel level gauges connected in series. In other words, the value indicated or the meter is the averaged value of the fuel level in the main tank and that in the sub-tank.

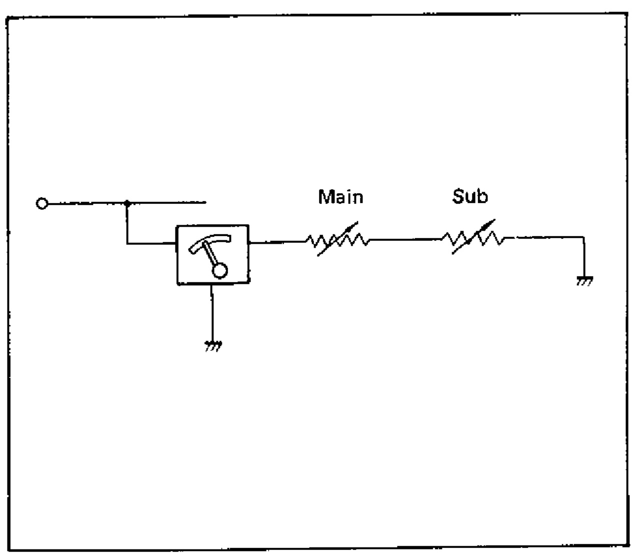


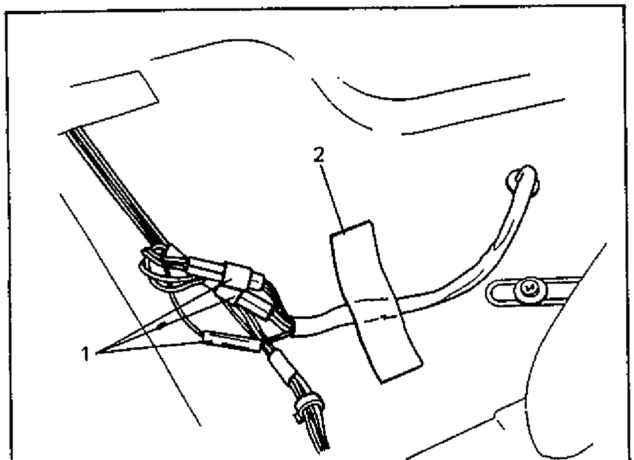
Fig. 6C-3

ON CAR SERVICE

FUEL TANK

REMOVE OR DISCONNECT

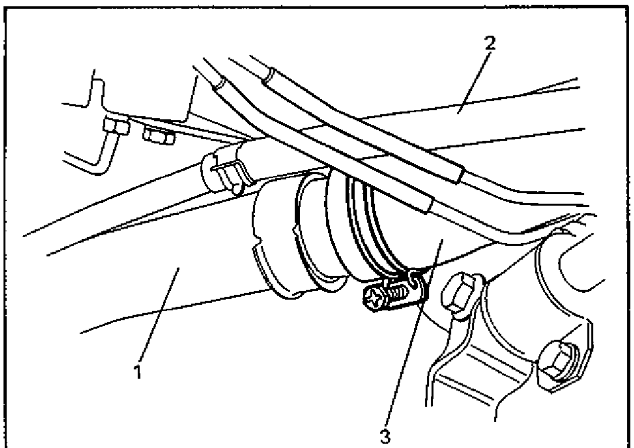
1. Relieve fuel pressure in fuel feed line according to procedure described on p. 6-3 in GROUP 1.
2. Negative cable at battery.
3. Rear seat cushion referring to SECTION 9.
4. Fuel level gauge (main & sub), fuel pump and circulation pump lead wire couplers, and detach wire tape.



1. Couplers
2. Tape

Fig. 6C-4 Disconnecting Couplers

5. Hoist car.
6. Fuel filler hose and breather hose from filler neck.



1. Filler neck
2. Breather hose
3. Filler hose

Fig. 6C-5 Breather and Filler Hoses

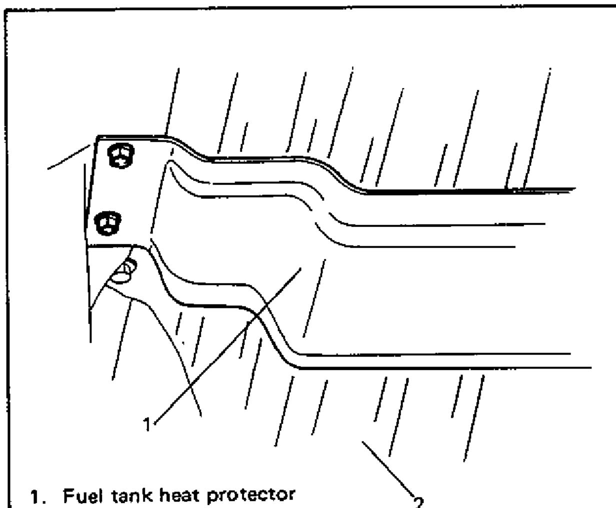
7. As fuel tank has no drain plug, drain fuel tank by pumping fuel out through fuel tank filler.
   Use hand operated pump device to drain fuel tank.

> **CAUTION:**
> **Never drain or store fuel in an open container to avoid possibility of fire or explosion.**

8. Fuel hoses from filter and pipes.

> **WARNING:**
> **A small amount of fuel may be released after the fuel hose is disconnected. In order reduce the chance of personal injury, cover the hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.**

9. Propeller shaft No. 3, refer to Section 4B.
10. After draining rear differential oil, viscous coupling case from rear differential case.
11. Fuel tank heat protector from body.



1. Fuel tank heat protector
2. Fuel tank

Fig. 6C-6

12. Fuel tank from car.

INSTALLATION

Reverse removal procedure for installation.

SECTION 6K

EXHAUST SYSTEM

CONTENTS

GENERAL DESCRIPTION 6K-1
MAINTENANCE 6K-2
ON CAR SERVICE 6K-2

NOTE:
The catalytic converter is provided or not depending on specification.

GENERAL DESCRIPTION

The exhaust system consists of an exhaust manifold, an exhaust pipe, a muffler, and seals and gaskets etc., and fuel injection model has the catalytic converter in the exhaust pipe.

The catalytic converter is an emission control device added to the exhaust system to lower the levels of Hydrocarbon (HC), Carbon Monoxide (CO), (and Oxides of Nitrogen (NOx)) pollutants in the exhaust gas.

THE CATALYTIC CONVERTER REQUIRES USE OF UNLEADED FUEL ONLY.

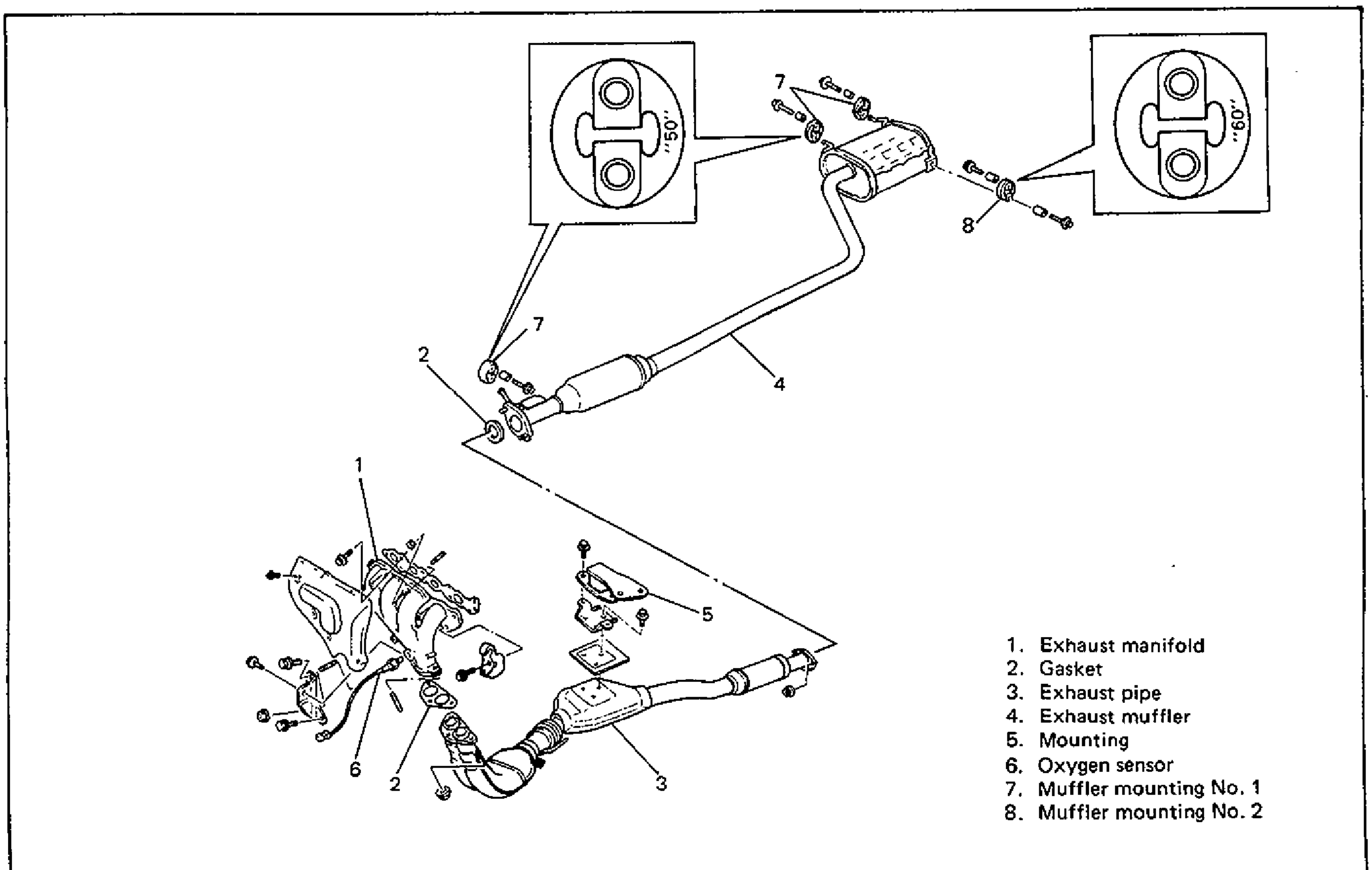


Fig. 6K-1 Exhaust System

MAINTENANCE

WARNING:
To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

At every interval of periodic maintenance service, and when car is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connection, dent and damage.
  If bolts or nuts are loosened, tighten them to specified torque. Refer to "ON CAR SERVICE" for torque data.
- Check nearby body areas for damaged, missing, or mispositioned part, open seam, hole, loose connection or any other defect which could permit exhaust fumes to seep into car.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

ON CAR SERVICE

- Refer to Section 6A of SF416 SERVICE MANUAL for removal and installation procedures of exhaust manifold.
- For replacement of center pipe, muffler, tail pipe or any part used to mount or connect them, be sure to hoist car and observe WARNING given at the left of this page.

CAUTION:
As exhaust pipe has catalytic converter in it, it should not be exposed to any impulse. Be careful not to drop it or hit it against something.

- When exhaust manifold is removed, check gaskets and seal for deterioration or damage. Replace them as necessary.
- Tighten bolts and nuts to specified torques when reassembling.
  Refer to Fig. 6K-2 for location of bolts and nuts.
- There are two types of muffler mounting.
  Refer to Fig. 6K-1 for their correct use.

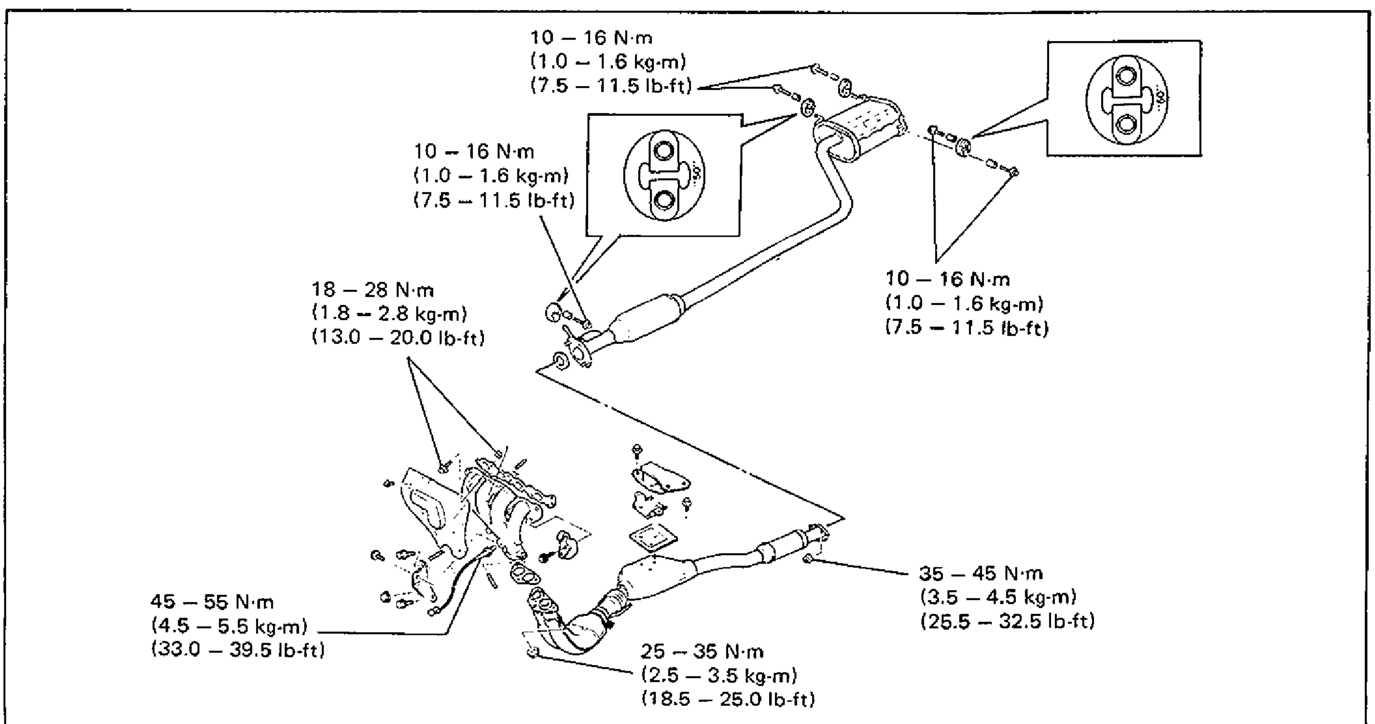


Fig. 6K-2 Recommended Torque Specification

SECTION 7A

MANUAL TRANSMISSION

NOTE:
For the descriptions (items) not found in this section, refer to the same section of GROUP 1.

CONTENTS

GENERAL DESCRIPTION 7A-1
ON-CAR SERVICE 7A-4
Oil Change 7A-4
UNIT REPAIR OVERHAUL 7A-5
Dismounting of Transmission 7A-5
Remounting 7A-6
Removal of Transfer Ass'y & Differential 7A-6

GENERAL DESCRIPTION

CONSTRUCTION AND SERVICING

The transmission provides five forward speeds and one reverse speed by means of three synchronizers and three shafts — input shaft, countershaft and reverse gear shaft. All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.

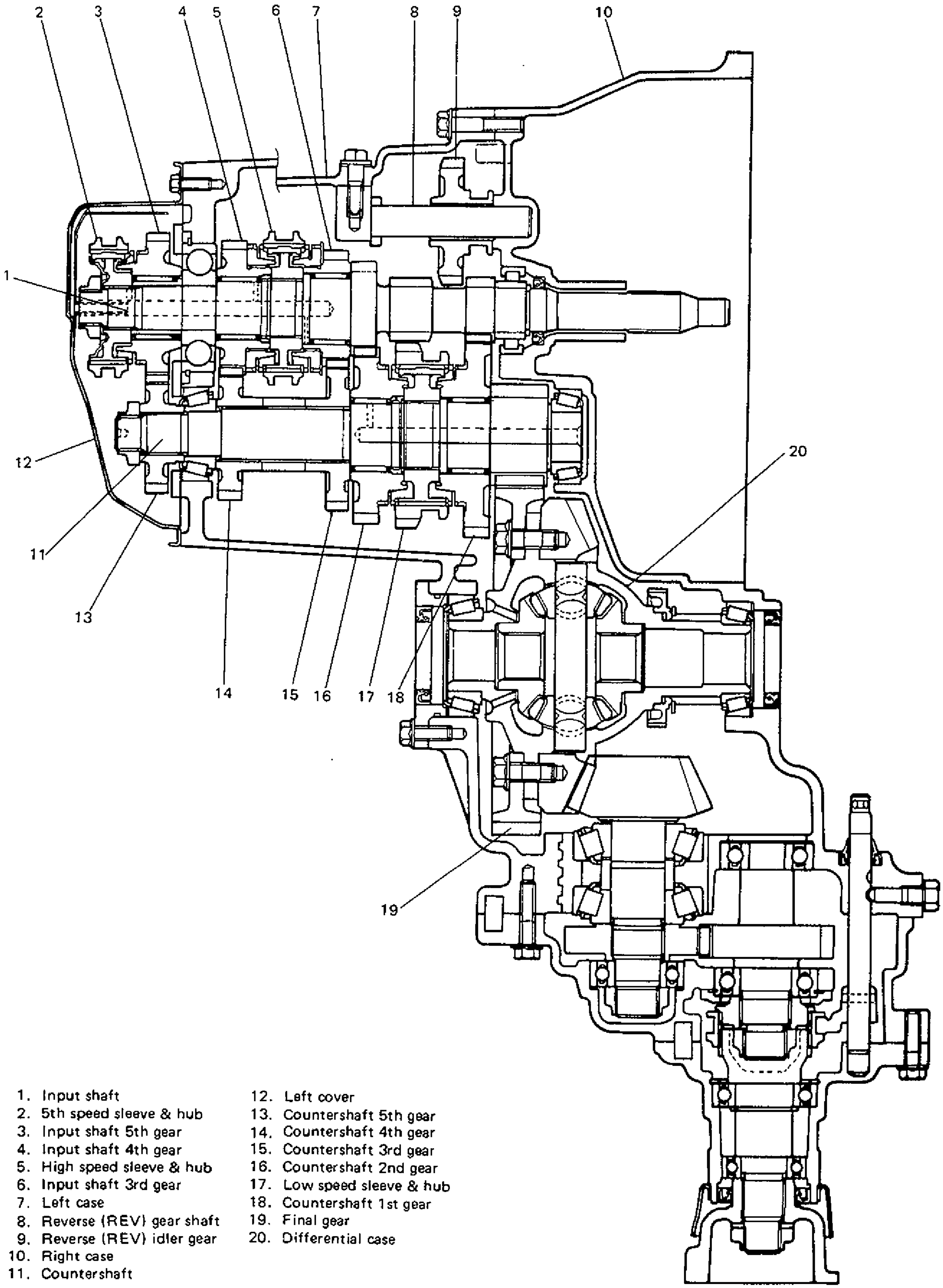
The low speed synchronizer is mounted on counter shaft and engaged with counter shaft first gear or second gear, while the high speed synchronizer is done on input shaft and engaged with input shaft third gear or fourth gear.

The fifth speed synchronizer on input shaft is engaged with input shaft fifth gear mounted on the input shaft.

The countershaft turns the final gear and differential assembly, thereby turning the front drive shafts which are attached to the front wheels.

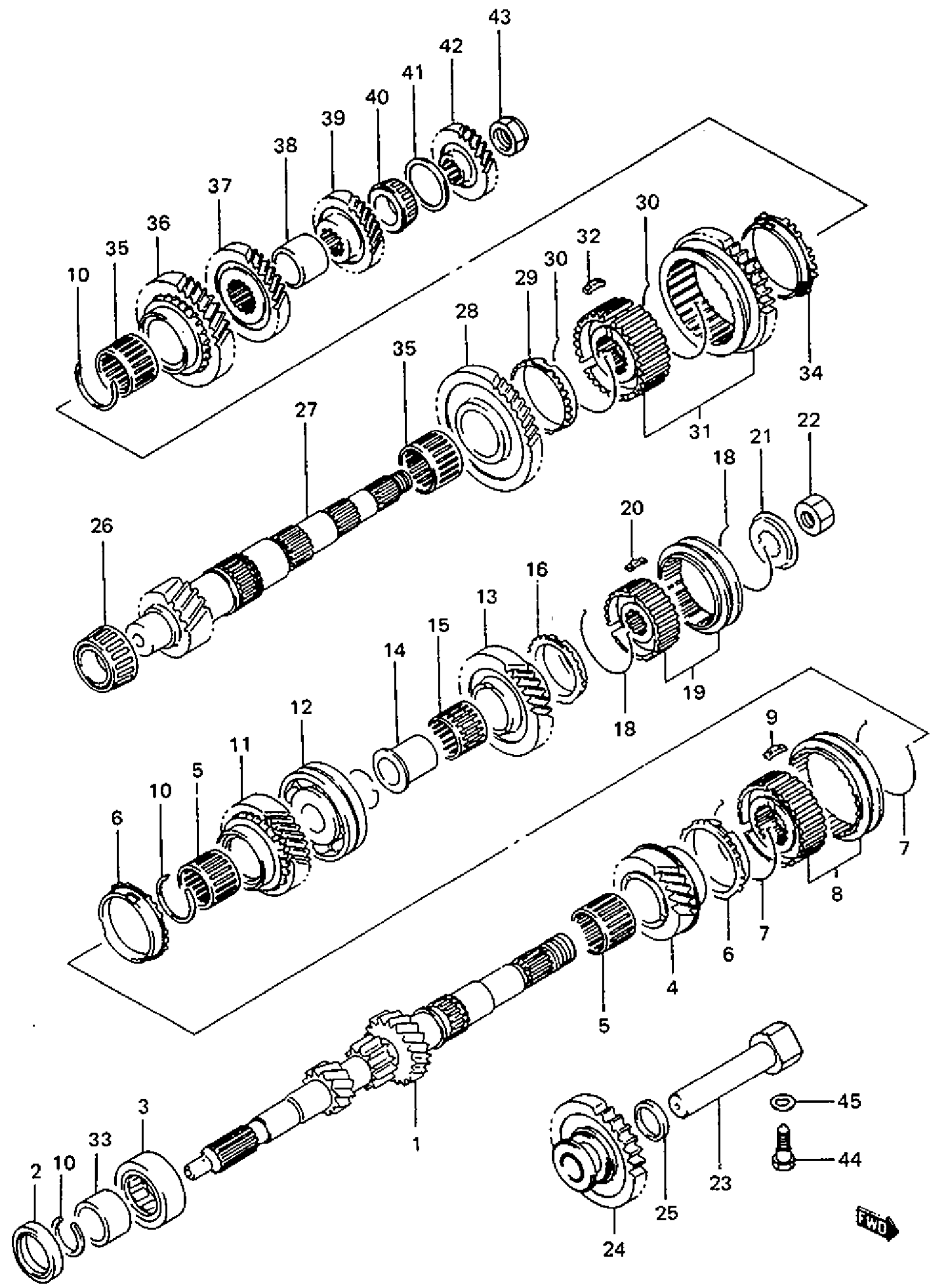
For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transmission case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

Further, care must be taken to adjust preload of counter shaft taper roller bearings. New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.



1. Input shaft
2. 5th speed sleeve & hub
3. Input shaft 5th gear
4. Input shaft 4th gear
5. High speed sleeve & hub
6. Input shaft 3rd gear
7. Left case
8. Reverse (REV) gear shaft
9. Reverse (REV) idler gear
10. Right case
11. Countershaft
12. Left cover
13. Countershaft 5th gear
14. Countershaft 4th gear
15. Countershaft 3rd gear
16. Countershaft 2nd gear
17. Low speed sleeve & hub
18. Countershaft 1st gear
19. Final gear
20. Differential case

Fig. 7A-1 Manual Transmission Cutaway



1. Input shaft
2. Oil seal
3. Input shaft R bearing
4. Input shaft 3rd gear
5. 3rd & 4th gear bearing
6. High speed synchronizer ring
7. High speed synchronizer spring
8. High speed sleeve & hub
9. High speed synchronizer key
10. Circlip
11. Input shaft 4th gear
12. Input shaft L bearing
13. Input shaft 5th gear
14. 5th gear spacer
15. 5th gear bearing
16. 5th speed synchronizer ring
17. Blank
18. 5th synchronizer spring
19. 5th speed sleeve & hub
20. 5th synchronizer key
21. 5th synchronizer hub plate
22. Nut
23. Reverse (REV) gear shaft
24. Reverse (REV) idler gear
25. Reverse (REV) shaft washer
26. Countershaft R bearing
27. Countershaft
28. Countershaft 1st gear
29. 1st gear synchronizer ring
30. Low speed synchronizer spring
31. Low speed sleeve & hub
32. Low speed synchronizer key
33. Spacer
34. 2nd gear synchronizer ring
35. 1st & 2nd gear bearing
36. Countershaft 2nd gear
37. Countershaft 3rd gear
38. 3rd & 4th gear spacer
39. Countershaft 4th gear
40. Countershaft L bearing
41. Bearing set shim
42. Countershaft 5th gear
43. Countershaft nut
44. Reverse shaft bolt
45. Washer

Fig. 7A-2 Manual Transmission Exploded View

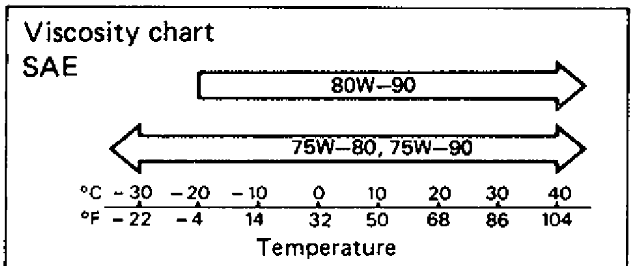
ON-CAR SERVICE

OIL CHANGE

1. Before changing or inspecting oil, be sure to stop engine and lift car horizontally.
2. With car lifted up, check oil level and leakage. If leakage exists, correct it.
3. Drain old oil and fill new specified oil as in the following table by specified amount (up to level hole).
4. Torque drain and level/filler plugs as specified below. Apply sealant to drain plug before installation.

NOTE:

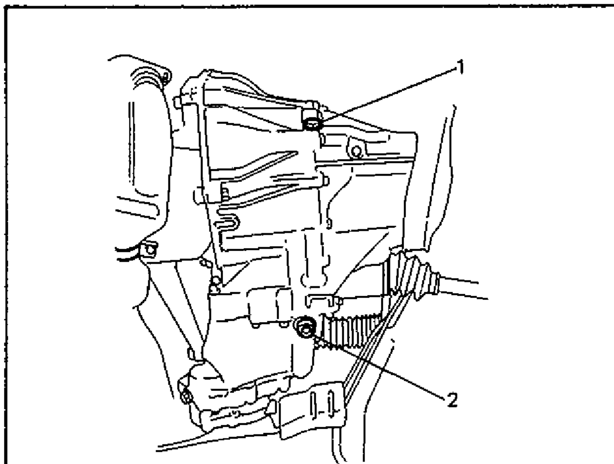
- **It is recommended to use API GL-4 SAE 75W-90 gear oil.**
- **Whenever car is hoisted for any other service work than oil change, also be sure to check for oil leakage.**



Oil specification	API GL-4 or API GL-5 For SAE classification, refer to above viscosity chart.

Oil capacity	4.1 liters 8.7/7.2 US/Imp. pt

Tightening torque	N·m	kg-m	lb-ft
Filler/level plug	36 – 54	3.6 – 5.4	26.5 – 39.0
Drain plug	25 – 30	2.5 – 3.0	18.5 – 21.5



1. Oil drain plug
   (Apply sealant for installation.)
2. Oil level/filler plug

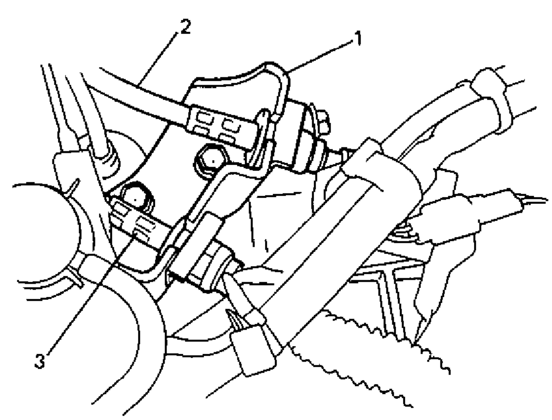
Fig. 7A-9 Changing Transmission Oil

UNIT REPAIR OVERHAUL

DISMOUNTING OF TRANSMISSION

UNDER HOOD

1. Disconnect battery ground cable and then remove battery and its tray.
2. Disconnect clutch operating cylinder from M/T.
3. Remove E-ring, shift and select cables from control cable bracket.



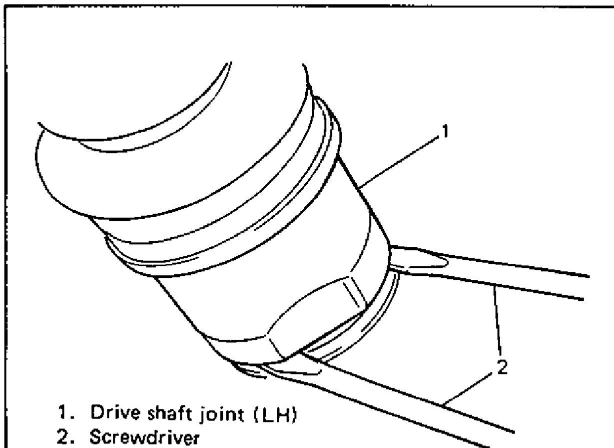
1. Transmission cable bracket
2. Select control cable
3. Gear shift control cable

Fig. 7A-18 Removing Rear Portion

4. Undo wiring harness clamps and couplers.
5. Take off speedometer cable boot, speedometer case clip and then speedometer cable from case.
6. Remove radiator outlet pipe.
7. Remove starter motor.

ON LIFT

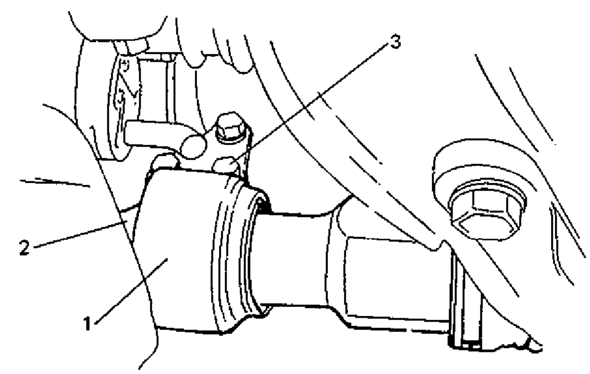
1. Drain transmission oil.
2. Remove left side fender apron extension.
3. Remove exhaust pipe from exhaust manifold.
4. Remove clutch housing lower plate.
5. Remove ball stud bolt and nut from right and left knuckles, then disconnect each suspension arm.
6. By using large size screwdrivers, pull out left drive shaft joints at differential side so as to release snap ring fitting of joint.



1. Drive shaft joint (LH)
2. Screwdriver

Fig. 7A-19 Detaching Snap Ring From Differential

7. Remove center bearing support mounting bolts and center drive shaft.



1. Center support
2. Center drive shaft
3. Bolt

Fig. 7A-20

8. Support engine by using hoist.
9. Remove transmission stiffener.
10. Remove transmission to engine bolt and nut.
11. Remove engine rear mounting bracket bolt.
12. Support transmission with transmission jack.
13. Remove engine mounting LH bracket and its stiffener.
14. Check all around transmission for any other parts required to be removed or disconnected for removal of transmission and remove or disconnect whatever necessary.
15. Pull transmission out so as to disconnect input shaft from clutch disc and then lower it.

REMOUNTING

For remounting, reverse dismounting procedure.
Use specified torque as given below.

Tightening torque	N·m	kg-m	lb-ft
• Transmission to engine bolts and nuts • Engine rear mounting bracket bolts • Engine mounting LH bracket bolts • Center bearing support bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
Engine mounting LH bracket nuts	50 – 60	5.0 – 6.0	36.5 – 43.0
Ball stud bolt and nut	50 – 70	5.0 – 7.0	36.5 – 50.5
Extension rod nut	25 – 40	2.5 – 4.0	18.5 – 28.5
Gear shift control shaft bolt and nut	15 – 20	1.5 – 2.0	11.0 – 14.5
Exhaust pipe to manifold bolts	40 – 50	4.0 – 5.0	29.0 – 36.0
Exhaust pipe to muffler mounting nuts	35 – 45	3.5 – 4.5	25.5 – 32.5

- When installing engine mounting LH bracket bolt (upper side), apply sealant (SUZUKI BOND NO. 1215) to thread part.
- Push in each drive shaft joint fully so as to snap ring of shaft engages with differential gear.

NOTE:
Apply grease to gear shift control shaft bushes, however, DO NOT lubricate extension rod bush.

CAUTION:
- **Care should be taken not to scratch oil seal lip with drive shaft while raising transmission.**
- **Do not hit drive shaft joint with hammer when installing it into differential gear.**

- Set each clamp for wiring securely.
- If clutch operating cylinder has been replaced or disconnected from clutch hose, bleed air from system and check clutch pedal free travel. (Refer to SECTION 7C1).

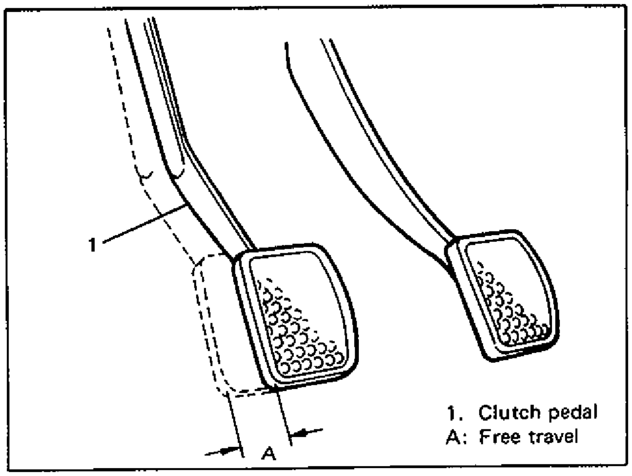


Fig. 7A-21 Adjusting Clutch Play

- Fill transmission with oil as specified.
- Connect battery and check function of engine, clutch and transmission.

REMOVAL OF TRANSFER & DIFFERENTIAL

1. Remove differential side bearing retainer.

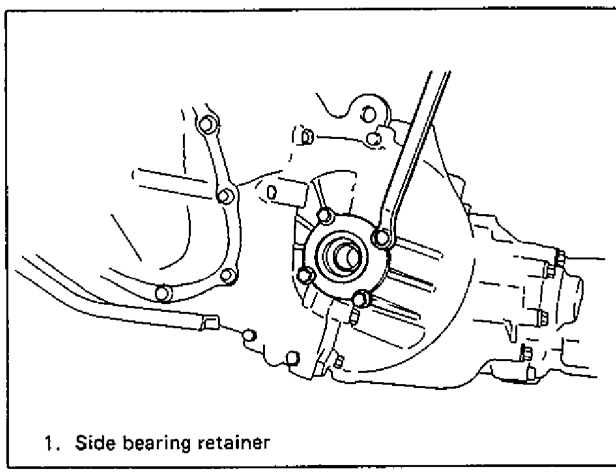


Fig. 7A-21-1

2. Remove speedometer driven gear case.
3. Remove transfer assembly & differential from M/T.

CAUTION:
Be careful not to damage gear teeth surface.

For servicing of transfer assembly & differential, refer to SECTION 7D.

Reverse removal procedure for installation.

SECTION 7D

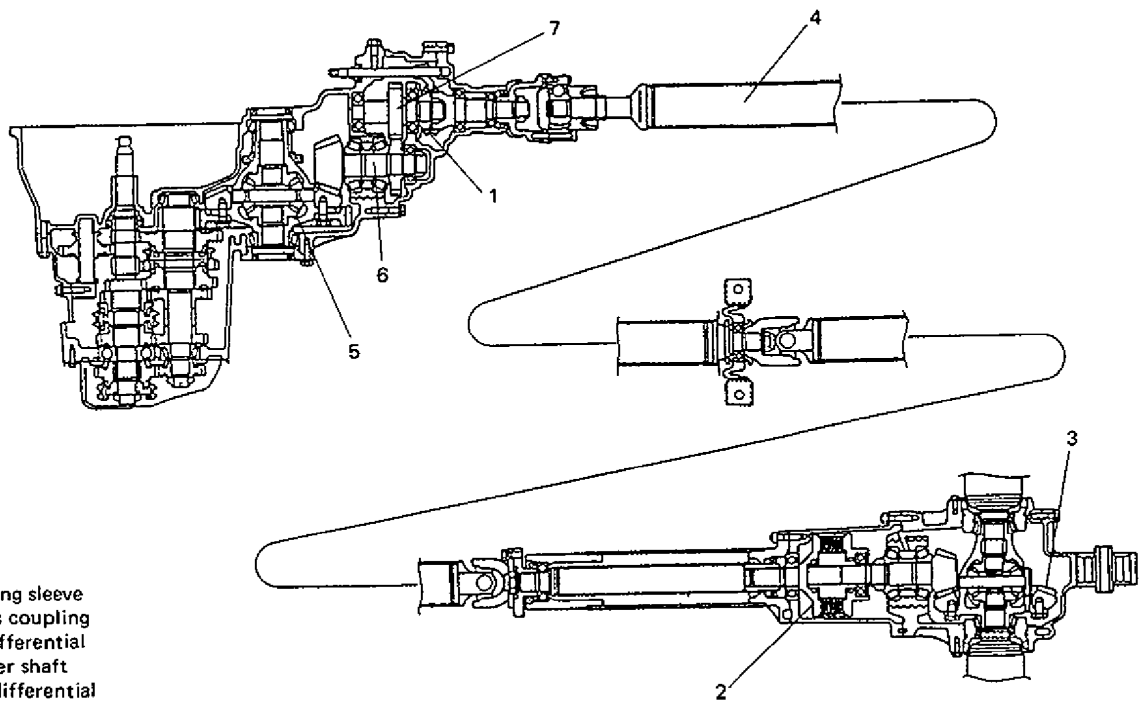
TRANSFER

CONTENTS

GENERAL DESCRIPTION 7D- 2
Viscous Coupling 7D- 3
ON CAR SERVICE 7D- 5
Precaution in Servicing 7D- 5
Switchin from 4WD to 2WD 7D- 5
Transfer Assembly 7D- 6
Disassembly 7D- 6
Assembly 7D- 8
Bevel Pinion Shim Adjustment (Bevel pinion bearing shim adjustment) 7D- 8
Bevel Pinion Shim Adjustment (Mounting distance adjustment) 7D-10
Drive Bevel Gear Backlash Adjustment and Side Bearing Preload Adjustment 7D-12
Inspection of Gear Tooth Surface Contact 7D-13
RECOMMENDED TORQUE SPECIFICATIONS 7D-14
SPECIAL TOOLS 7D-15
REQUIRED SERVICE MATERIALS 7D-15

GENERAL DESCRIPTION

This transfer uses a full-time 4WD system in which a viscous coupling is installed in front of rear differential so that optimum amount of drive force is distributed to the front and rear wheels according to the driving conditions. Also, a 2WD to 4WD selector lever is installed to the front transfer case to improve serviceability.



1. Switching sleeve
2. Viscous coupling
3. Rear differential
4. Propeller shaft
5. Front differential
6. Output pinion
7. Driven gear

Fig. 7D-1

VISCOUS COUPLING

The full-time 4WD model car is equipped with a viscous coupling which transmits optimum driving force to the rear wheels to make the car 4WD without anything done by the driver. This takes place as soon as a revolution difference occurs between the front and rear wheels due to road conditions and driving conditions.

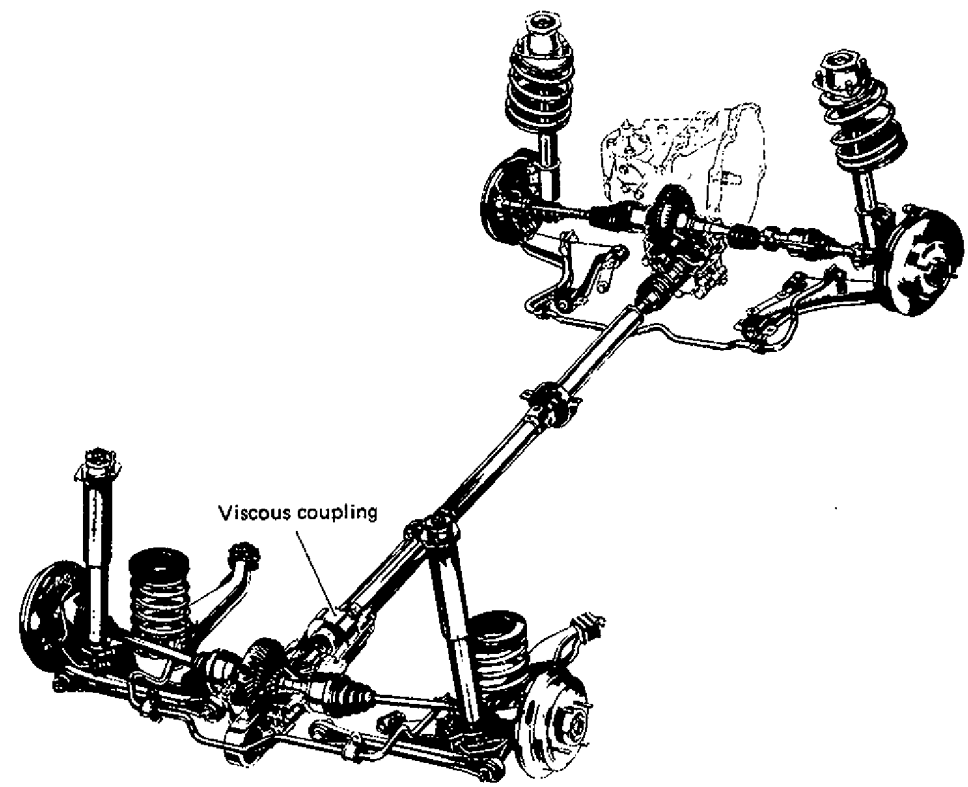


Fig. 7D-2

FEATURES OF VISCOUS COUPLING

- The structure is simple and is free from maintenance.
- It is designed lightweight and compact.
- Stable driving is assured as optimum driving force is transmitted to the rear wheels automatically according to driving conditions.
- Premature locking of the rear wheels is prevented when the brake is applied.
- As the front wheels and rear wheels are not connected directly, no "tight corner brake phenomenon" occurs.

The viscous coupling consists of a housing, hub, outer plates, inner plates, wire & bearing and oil seal. The housing is joined to the propeller shaft and hub to the bevel pinion of the rear differential. The outer plates are fitted to the housing and inner plates to the hub, and they are arrayed alternately with a space inbetween, where silicon oil with high viscosity is filled. When a revolution speed difference occurs between inner plates and outer plates, driving force is conveyed to the rear wheels through viscosity resistance of silicon oil. And the larger the difference is, the more driving force is conveyed.

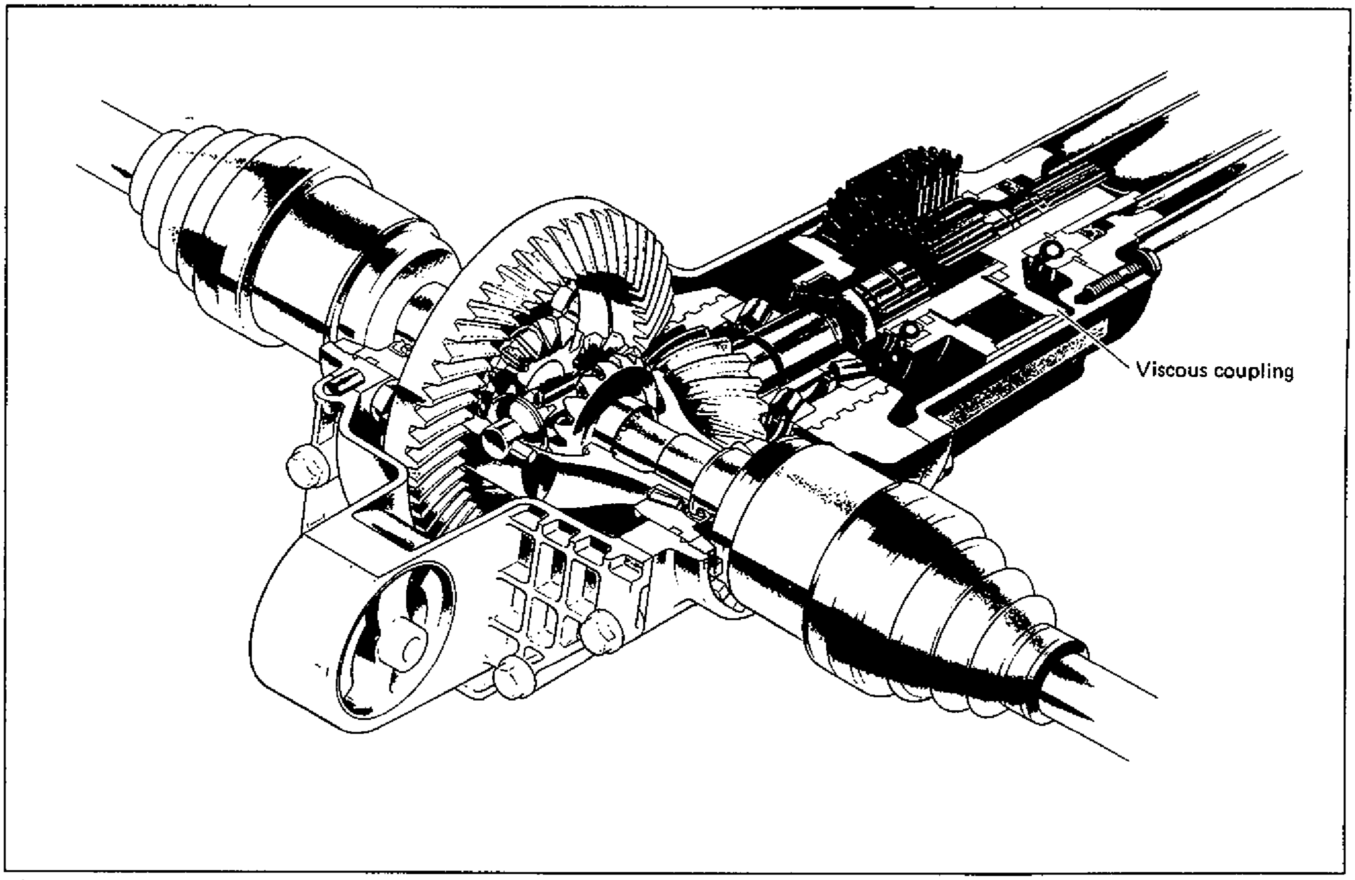


Fig. 7D-3

ON CAR SERVICE

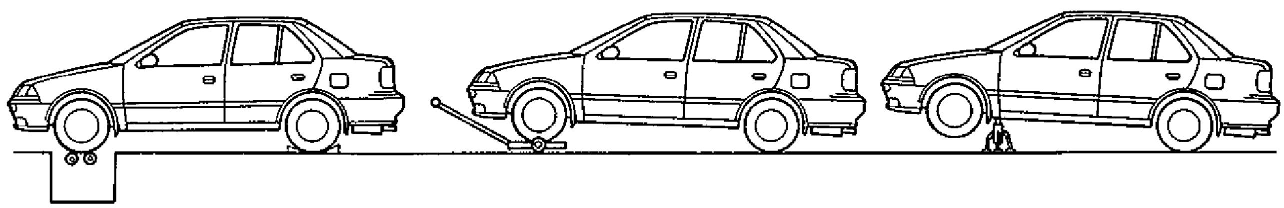
PRECAUTION IN SERVICING (FULL-TIME 4WD)

When performing any of the following types of work, it is necessary to make the car as front wheel drive by cutting transmission of driving force to the rear wheels.

Testing following items
- Speedometer
- Chassis dynamo
- Brake
- Wheel balance (on car type)

Towing car with front or rear wheels lifted up

Driving front wheels which are jacked up



SWITCHING FROM 4WD TO 2WD

Set 4WD/2WD selector lever located at lower side of transfer driven case to 2WD.

1. Loosen transfer lock bolt.
2. Push in shift fork shaft fully.
3. With shift fork shaft pushed in, tighten transfer lock bolt.

Tightening torque for transfer lock bolt	N·m	kg-m	lb-ft
	15 – 22	1.5 – 2.2	11.0 – 15.5

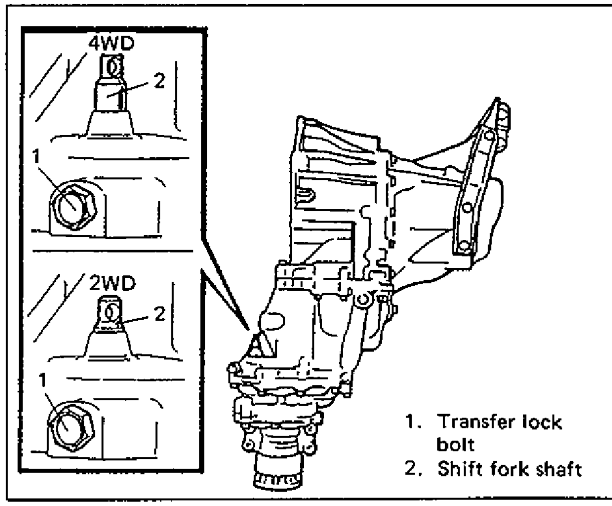


Fig. 7D-4

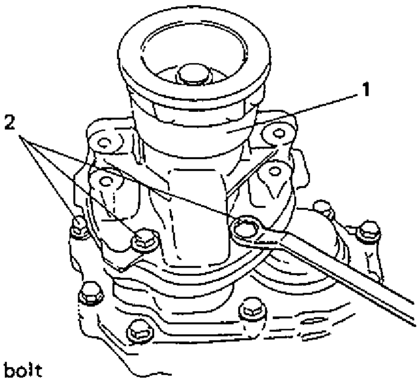
NOTE:
- **If shift fork shaft is hard to move, try to move it while turning it to the right and left little by little. Do the same when setting back to 4WD after servicing car.**
- **Upon completion of servicing, always set shift fork shaft back to 4WD.**

For removal of transmission unit, disassembly of internal structure of transmission and removal of transfer assembly, refer to Section 7A.

TRANSFER ASSEMBLY

DISASSEMBLY

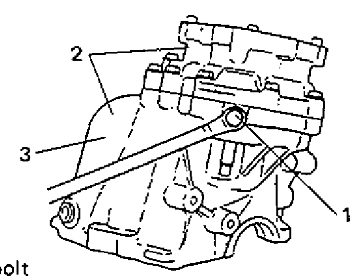
1. Remove output case bolts.



1. Output case
2. Output case bolt

Fig. 7D-5

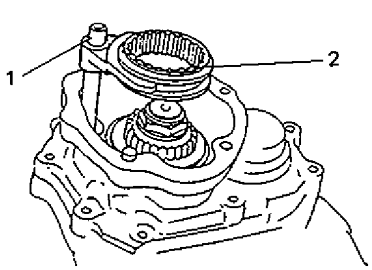
2. Remove transfer lock bolt from rear case.



1. Transfer lock bolt
2. Driven case
3. Rear case

Fig. 7D-6

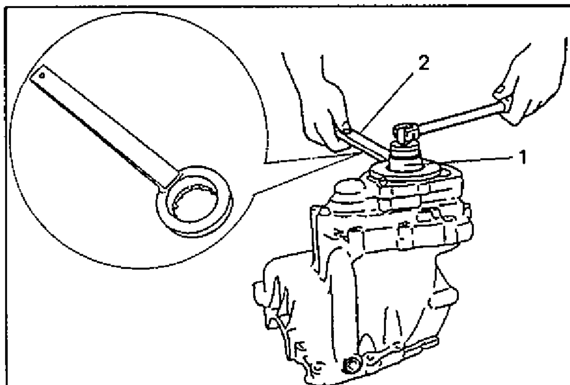
3. Remove shift frok shaft and then sleeve.



1. Shift fork shaft
2. Sleeve

Fig. 7D-7

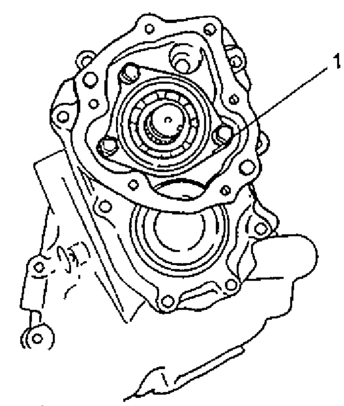
4. Remove caulking of driven gear nut, loosen nut as shown below and remove clutch dog.



1. Box (30 mm)
2. Special tool (Bevel pinion holder 09927-25411)

Fig. 7D-8

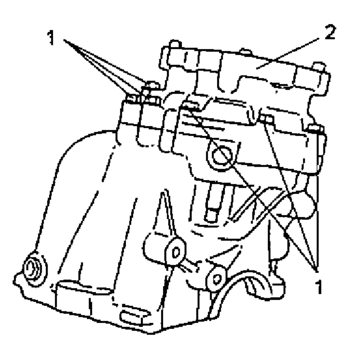
5. Remove driven gear plate and then circlip of ball bearing.



1. Driven gear plate

Fig. 7D-9

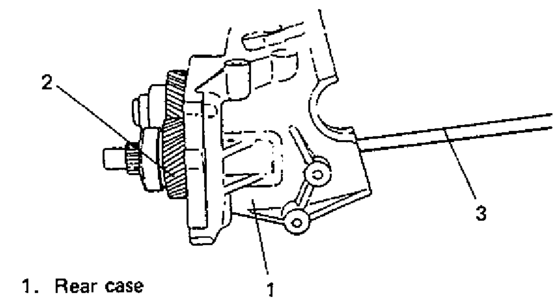
6. Loosen driven case bolt and remove driven case.



1. Driven case bolt
2. Driven case

Fig. 7D-10

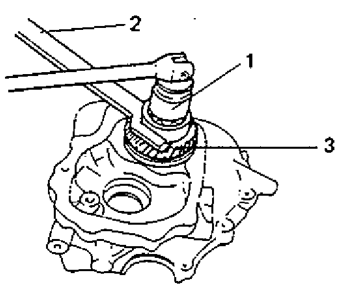
7. Drive driven gear out of rear case.



1. Rear case
2. Driven gear
3. Bar (rod)

Fig. 7D-11

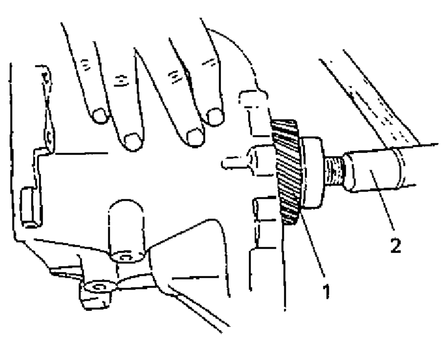
8. Using special tool, hold drive gear securely and loosen output pinion nut.



1. Output pinion nut (30 mm)
2. Special tool (Bevel pinion holder 09927-76030)
3. Drive gear

Fig. 7D-12

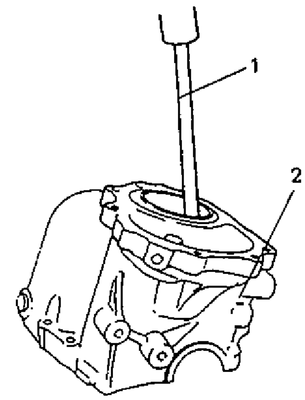
9. Drive out output pinion with plastic hammer.



1. Output pinion
2. Plastic hammer

Fig. 7D-13

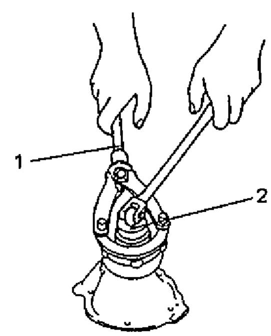
10. Drive pinion bearing outer race out of rear case.



1. Bar (rod)
2. Rear case

Fig. 7D-14

11. Remove caulking of output shaft nut and loosen it with flange fixed as shown below.



1. Special tool (Rotor holder 09930-40113)
2. Box (30 mm)

Fig. 7D-15

12. Remove output shaft bearing circlip.

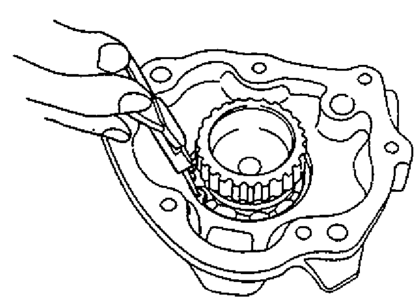


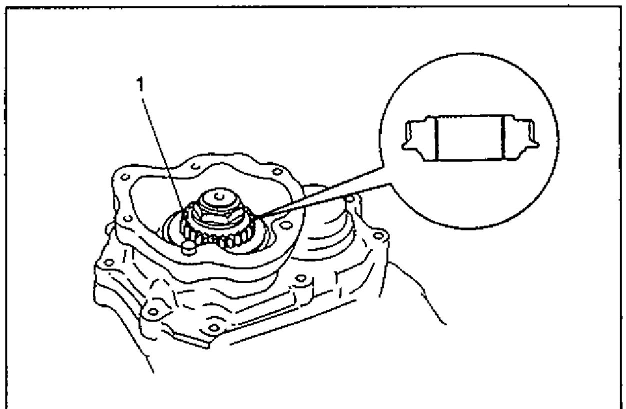
Fig. 7D-16

13. Using plastic hammer, drive out output shaft bearing.

ASSEMBLY

Reverse disassembly procedure, noting following points.

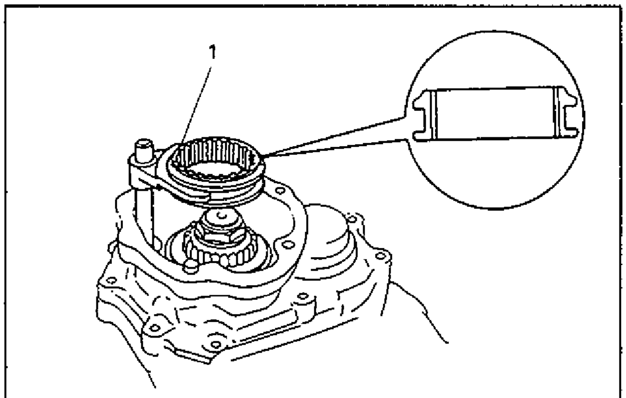
- Apply SUZUKI Bond No. 1215 to mating surface of case before assembly.
- Make sure to put clutch dog with right side up as shown below.



1. Clutch dog

Fig. 7D-17

- Make sure to put clutch sleeve with right side up as shown below.



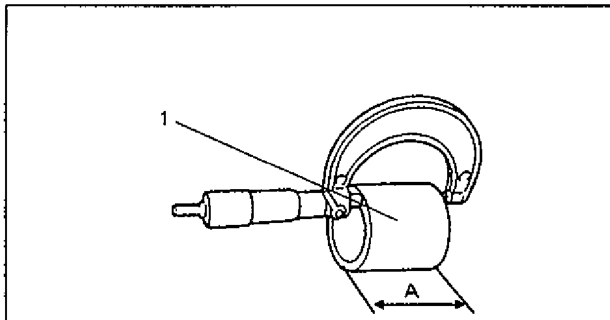
1. Clutch sleeve

Fig. 7D-18

BEVEL PINION SHIM ADJUSTMENT

(Bevel pinion bearing shim adjustment)

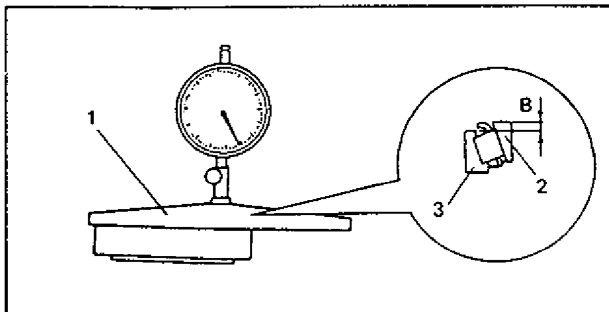
1. Measure drive pinion spacer length A.



1. Spacer

Fig. 7D-19

2. Measure level difference B between outer race and inner race of bevel pinion bearing (at both front and rear).
   Level difference at front bearing B +
   Level difference at rear bearing B′ = C



1. Special tool (Dial depth gauge 09922-77240)
2. Outer race
3. Inner race

Fig. 7D-20

3. Measure dimension D of differential carrier.
   C + D = E
   Measured level difference = E − A

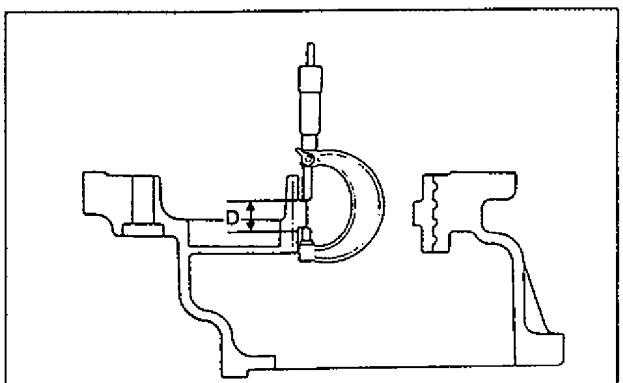
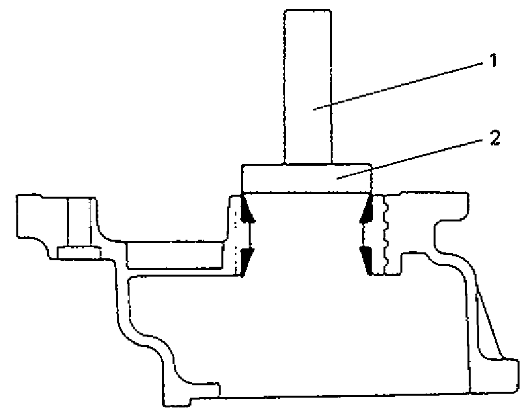


Fig. 7D-21

4. Using following table, select necessary shim(s).

Measured level difference \ Shim to use	0.60	0.63	0.66	0.69	0.72	0.75	0.78	0.81	0.84	0.87	0.30
0.976 – 1.005	●										●
1.006 – 1.035		●									●
1.036 – 1.065			●								●
1.066 – 1.095				●							●
1.096 – 1.125					●						●
1.126 – 1.155						●					●
1.156 – 1.185							●				●
1.186 – 1.215								●			●
1.216 – 1.245									●		●
1.246 – 1.275										●	●
1.276 – 1.305	●●										
1.306 – 1.335	●	●									
1.336 – 1.365	●		●								
1.366 – 1.395	●			●							
1.396 – 1.425	●				●						
1.426 – 1.455	●					●					
1.456 – 1.485	●						●				
1.486 – 1.515	●							●			
1.516 – 1.545	●								●		
1.546 – 1.575	●									●	
1.576 – 1.605		●								●	
1.606 – 1.635			●							●	
1.636 – 1.665				●						●	

5. Press-fit bevel pinion bearing and outer race into rear case.

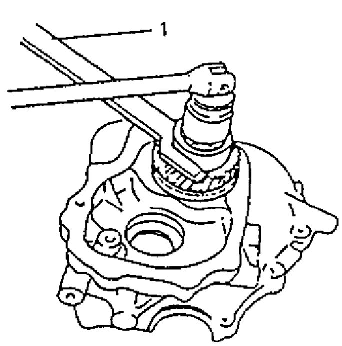


1. Special tool (Bearing & oil seal installer handle 09924-74510)
2. Special tool (Oil seal installer 09951-16090)

Fig. 7D-22

6. Place bearing, spacer and shim(s) on bevel pinion dummy of special tool (Bevel pinion dummy set) and tighten bevel pinion nut to specified torque.

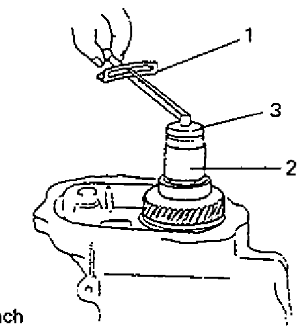
Tightening torque for bevel pinion	N·m	kg-m	lb-ft
	90–150	9.0–15.0	65.5–108.0



1. Special tool (Drive shaft holder 09921-29410)

Fig. 7D-23

7. Using torque wrench, measure preload.



1. Torque wrench
2. Box (30 mm)
3. Special tool (Adaptor socket 09915-24550)

Fig. 7D-24

Standard value of preload	5 – 13 kg-cm 0.37 – 1.08 lb-ft

NOTE:

- **Apply thin coat of gear oil to bearing before measurement.**
- **Also before measuring preload, turn taper bearing a few times to ensure its good fitting.**

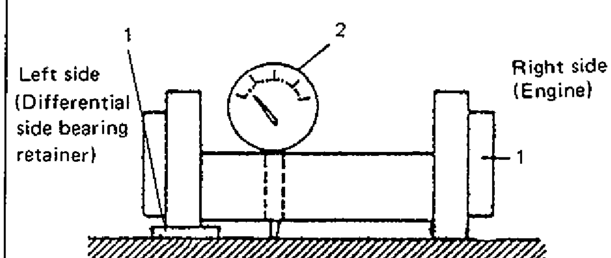
BEVEL PINION SHIM ADJUSTMENT

(Mounting distfance adjustment)

1. Place bevel pinion adjuster on surface plate as shown and set dial gauge to "0".

NOTE:

As bearing size is different between right and left, use shim supplied in bevel pinion dummy set under smaller size bearing as shown below.



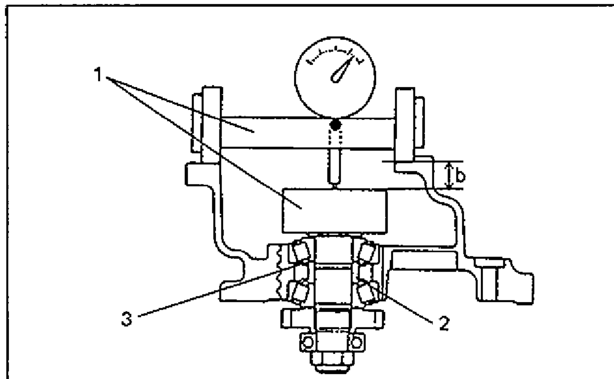
1. Special tool (Bevel pinion dummy set 09922-77270)
2. Dial gauge

Fig. 7D-25

2. Set bevel pinion dummy, bevel pinion and bevel pinion adjuster on differential carrier. Tighten dummy pinion nut to specified torque which is 90 – 150 N·m (9.0 – 15.0 kg-m, 65.5 – 108.0 lb-ft).

NOTE:

Before setting bevel pinion dummy, adjust bevel pinion bearing shim as described previously.



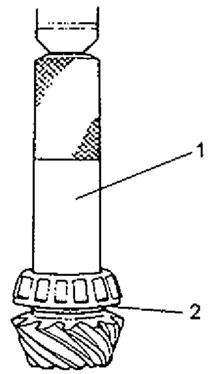
1. Special tool (Bevel pinion dummy set 09922-77270)
2. Drive pinion spacer
3. Bevel pinion bearing shim

Fig. 7D-26

3. Measure dimension b in figure by reading dial gauge.
4. Using following table, select necessary shim(s).

Shim to use / Measured level difference Dimension b	0.60	0.63	0.66	0.69	0.72	0.75	0.78	0.81	0.84	0.87	0.30
0.586 – 0.615	●										
0.616 – 0.645		●									
0.646 – 0.675			●								
0.676 – 0.705				●							
0.706 – 0.735					●						
0.736 – 0.765						●					
0.766 – 0.795							●				
0.796 – 0.825								●			
0.826 – 0.855									●		
0.856 – 0.885										●	
0.886 – 0.915	●										●
0.916 – 0.945		●									●
0.946 – 0.975			●								●
0.976 – 1.005				●							●
1.006 – 1.035					●						●
1.036 – 1.065						●					●
1.066 – 1.095							●				●
1.096 – 1.125								●			●
1.126 – 1.155									●		●
1.156 – 1.185										●	●
1.186 – 1.215	●●										
1.216 – 1.245	●	●									

5. Press-fit bearing into bevel pinion bearing.

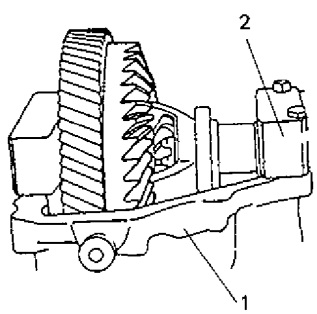


1. Special tool (Bearing installer 09913-84510)
2. Mounting distance adjusting shim

Fig. 7D-27

DRIVE BEVEL GEAR BACKLASH ADJUSTMENT AND SIDE BEARING PRELOAD ADJUSTMENT

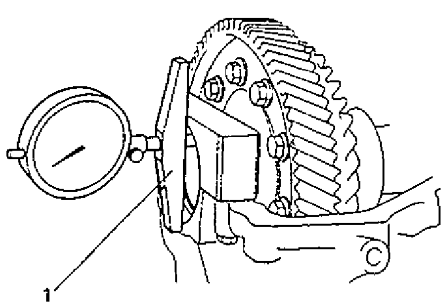
1. Using special tool, install differential assembly into rear case.



1. Rear case
2. Special tool (Gear holder tool 09927-56030)

Fig. 7D-28

2. Using depth gauge, measure depth A down to bearing outer race and obtain difference with dimension B of bearing retainer; A – B = C.



1. Special tool (Dial depth gauge 09922-77240)

Fig. 7D-29

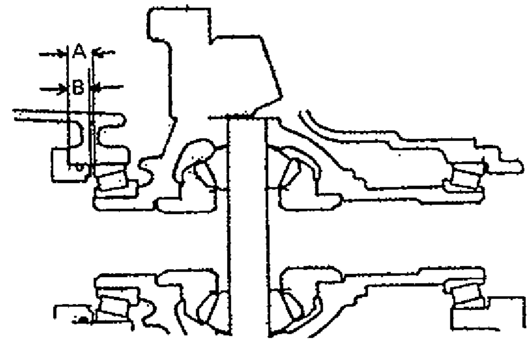


Fig. 7D-29-1

3. Calculate shim thickness to be inserted into differential side bearing.
   Shim thickness = C + (0.1 to 0.5) mm
   (0.004 to 0.019 in.)
4. Select shim(s) to fit within calculated value.
5. Install bevel pinion to case.

Available shims	0.30, 0.87, 0.84, 0.81, 0.78, 0.75, 0.72, 0.69, 0.66, 0.63 and 0.60 mm 0.012, 0.034, 0.033, 0.032, 0.031, 0.029, 0.028, 0.027, 0.026, 0.025 and 0.024 in.

6. Adjust the driving bevel gear backlash by adding or taking off shims in bearing gap of the left and right cases (stopper) so as to obtain the specified value for the backlash.
7. To measure drive bevel gear backlash, set dial gauge at right angle to bevel gear tooth, fix drive bevel pinion and rear dial gauge while moving bevel gear.

Drive gear backlash	0.10 – 0.18 mm (0.004 – 0.007 in.)

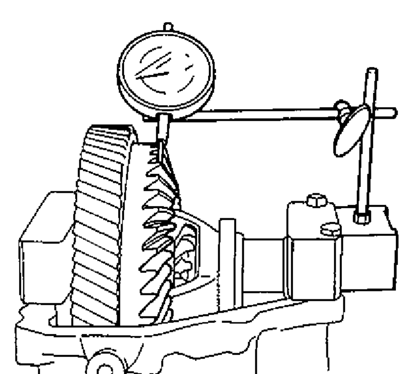


Fig. 7D-30

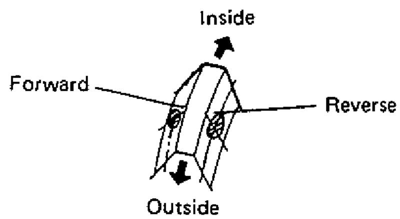
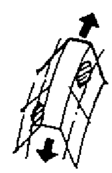
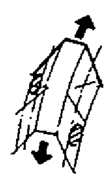
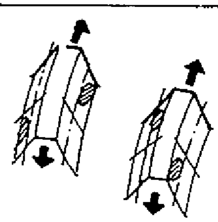
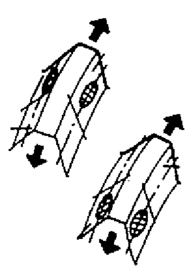
8. With bevel gear installed, measure starting torque by using differential preload adjusting tool. If bevel pinion starting torque and side bearing starting torque with bevel gear installed (bevel pinion bearing + side bearing preload) is within standard value, side bearing preload is satisfactory.

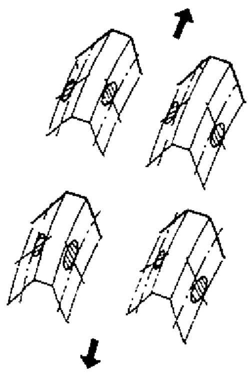
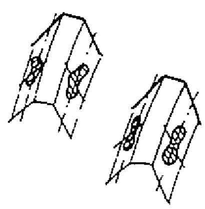
Side bearing preload standard value	Measured bevel pinion preload + 3 – 5 kg-cm (0.217 – 0.361 lb-ft)

INSPECTION OF GEAR TOOTH SURFACE CONTACT

Upon completion of assembly, apply red lead paste to tooth surface of drive bevel gear and turn it by hand to check its contact with drive bevel pinion. Adjust if check result is not statisfactory.

NOTE:
Apply red lead paste all around bevel gear but not so much as to become sticky.

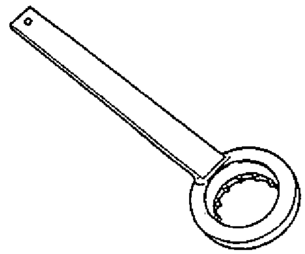
<table>
<tr><th></th><th>Tooth surface contact</th><th>Possible cause and correction</th></tr>
<tr><td>Correct</td><td>
</td><td>Both forward and reverse contacts should occur a little toward inside from the center.</td></tr>
<tr><td rowspan="2">Poor shim adjustment</td><td></td><td>Forward contact occurs toward outside and reverse contact toward inside from the center and both at higher position. In such case, bevel pinion shim is too thin.
Correction: Adjust shim thickness by increasing it.</td></tr>
<tr><td></td><td>Forward contact occurs toward inside and reverse contact toward outside from the center and both at lower position. In such case, bevel pinion shim is too thick.
Correction: Adjust shim thickness by reducing it.</td></tr>
<tr><td rowspan="2">Defect in part(s)</td><td></td><td>When tooth contacts occur as shown at the left, proper rear case offset (18 mm) is not obtained.
Correction: Replace rear case (rear case, right case and left case assembly).</td></tr>
<tr><td></td><td>When tooth contacts are deviated toward inside or outside of gear, possible causes are as follows.
• Drive bevel gear or drive bevel pinion defective.
• Poor squareness of rear case.
• Rear case surface where gear is installed is defective.
Correction: Replace defective part as an assembly.</td></tr>
</table>

	Tooth surface contact	Possible cause and correction
Defect in part(s)		When tooth contacts occur as shown at the left, gear itself is defective. Correction: Replace drive bevel gear and drive bevel pinion as a set.
		When contact is not oval in shape, gear itself is defective. Abnormal contact is also caused by nick in tooth surface or faulty condition of differential case at its drive bevel gear mounting part. Correction: Replace drive bevel gear and drive bevel pinion as a set and differential gear case as well, if found defective.

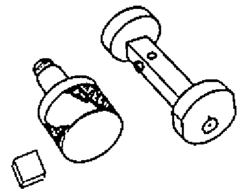
RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
Output shaft nut	80 – 100	8.0 – 10.0	58.0 – 72.0
Output pinion nut	90 – 150	9.0 – 15.0	65.5 – 108.0
Bearing plate bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
Output flange nut	80 – 100	8.0 – 10.0	58.0 – 72.0
Driven case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
Output case bolt			

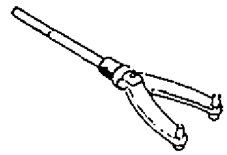
SPECIAL TOOLS



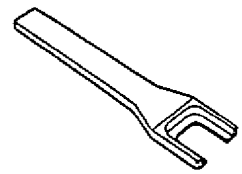
09927-25411
Bevel pinion holder



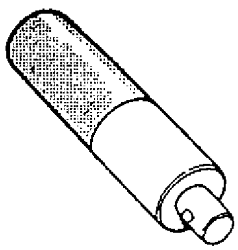
09922-77270
Bevel pinion dummy set



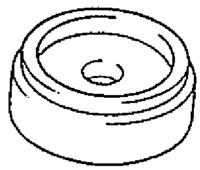
09930-40113
Rotor holder



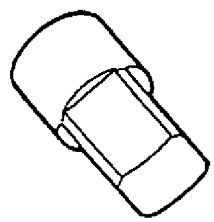
09927-76030
Bevel pinion holder



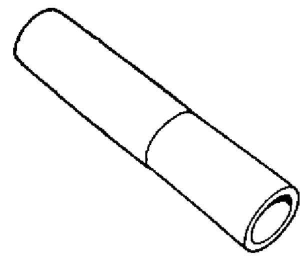
09924-74510
Bearing & oil seal installer handle



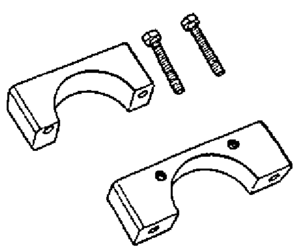
09951-16090
Oil seal installer



09915-24550
Adapter socket



09913-84510
Bearing installer



09927-56030
Gear holder tool

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Mating surface of transmission and transfer cases • Mating surface of transfer output and driven cases

SECTION 7E

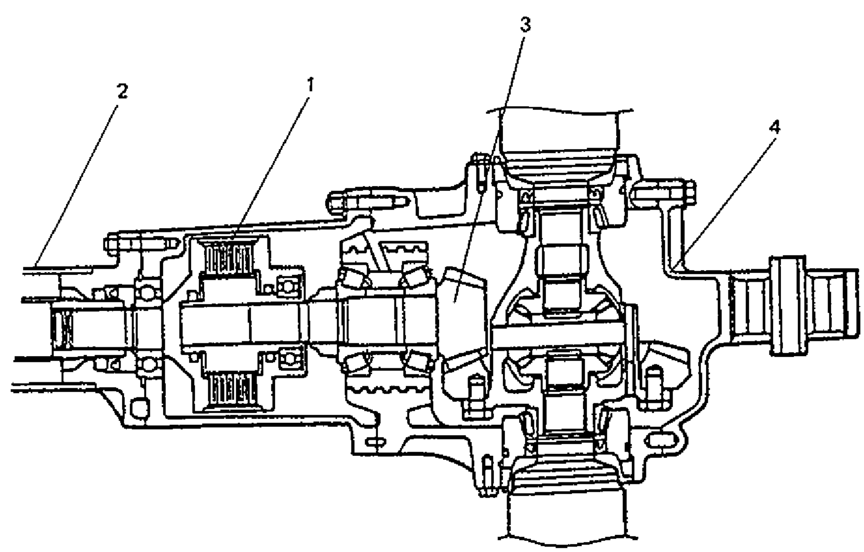
DIFFERENTIAL

CONTENTS

GENERAL DESCRIPTION 7E- 1
ON CAR SERVICE 7E- 2
Differential Oil Change 7E- 2
Front Diffrential 7E- 2
Rear Differential 7E- 3
Bevel Pinion Shim Admustment (Bevel pinion bearing shim adjustment) 7E- 7
Bevel Pinion Shim Adjustment (Mounting Distance Adjustment) 7E- 8
Drive Bevel Gear Backlash Adjustment and Side Bearing Preload Adjustment 7E- 9
Inspection of Gear Tooth Surface Contact 7E-10
RECOMMENDED TORQUE SPECIFICATIONS 7E-11
SPECIAL TOOLS 7E-12
REQUIRED SERVICE MATERIALS 7E-12

GENERAL DESCRIPTION

For the rear differential, a hypoid gear is used and a viscous coupling is provided in front of it.



1. Viscous coupling
2. Propeller shaft No. 3
3. Bevel pinion
4. Rear differential

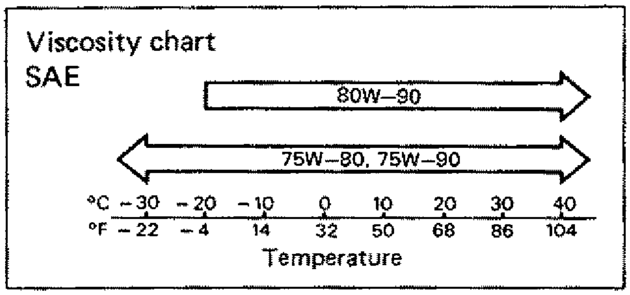
Fig. 7E-1

ON CAR SERVICE

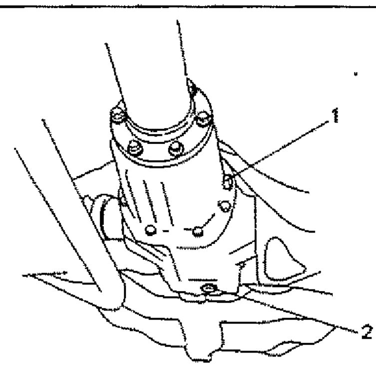
DIFFERENTIAL OIL CHANGE

Fill specified gear oil up to mouth of oil level plug.

NOTE:
- **It is highly recommended to use API GL-5 SAE 75W-90 hypoid gear oil.**
- **Whenever car is hoisted for any other service work than oil change, also be sure to check for oil leakage.**



Oil capacity	1.1 liters 2.4/2.0 US/Imp. pt



1. Oil level plug
2. Drain plug

Fig. 7E-2

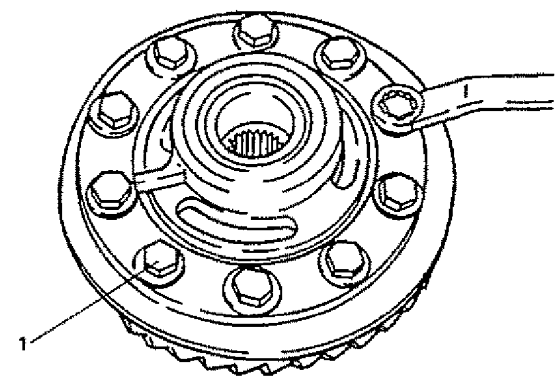
Tightening torque for oil drain plug	N·m	kg-m	lb-ft
	12 – 22	1.2 – 2.2	9.0 – 15.5

FRONT DIFFERENTIAL

DISASSEMBLY

For removal of differential assembly, refer to Section 7A.

1. Remove differential side bearing.
2. Remove circlip and then speedometer drive gear.
3. Remove final gear bolts (10 pcs.), final gear and bevel gear.



1. Final gear bolt

Fig. 7E-3

ADJUSTEMENT AND ASSEMBLY

Before disassembly, check each part for wear and damage. Replace any defective part with new one. Clean all disassembled parts and reassemble by reversing disassembly procedure.

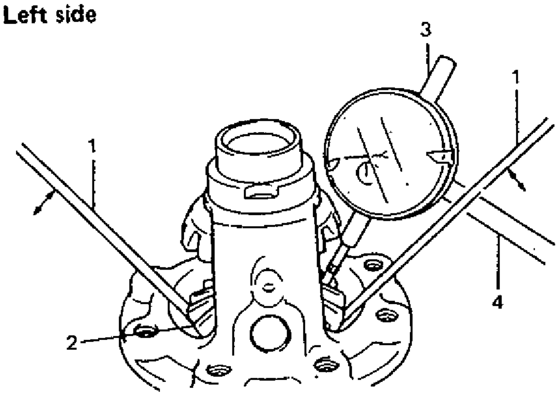
1. After assembling differential gear, measure its play in thrust direction.

Left Side
- Apply pointed end of dial gauge to gear thread as shown below.
- While moving gear up and down with two large slotted screwdrivers, read dia gauge.

Right Side
- Apply pointed end of dial gauge to gear shoulder as shown below.
- While moving gear up and down with fingers, read dial gauge.

Play in thrust direction	0.03 – 0.31 mm (0.001 – 0.012 in.)

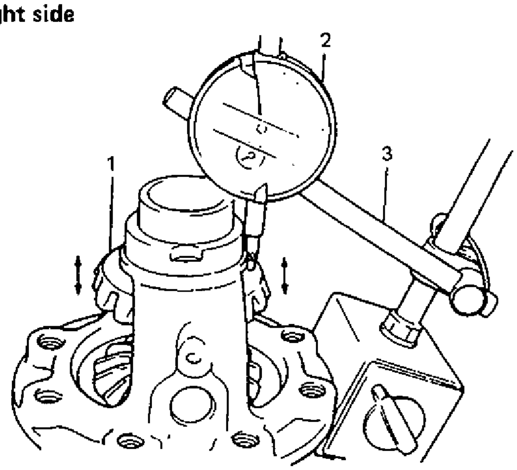
Left side



1. Slotted screwdriver
2. Differential gear
3. Special tool (Dial gauge 09900-20606)
4. Special tool (Magnet stand 09900-20701)

Fig. 7E-4

Right side



1. Differential gear
2. Special tool (Dial gauge 09900-20606)
3. Special tool (Magnet stand 09900-20701)

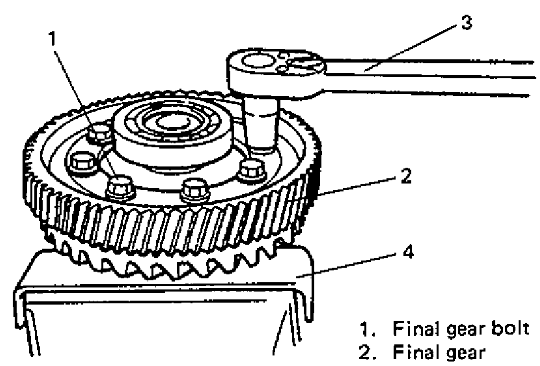
Fig. 7E-5

2. If measured play in thrust direction is not within specified range, insert thrust washer of suitable thickness from among available ones listed below. Measure play again to make sure it is within specification.

Available thrust washer thickness	0.9, 0.95, 1.0, 1.05, 1.1, 1.15 and 1.2 mm 0.035, 0.037, 0.039, 0.041, 0,043, 0,045 and 0,047 in.

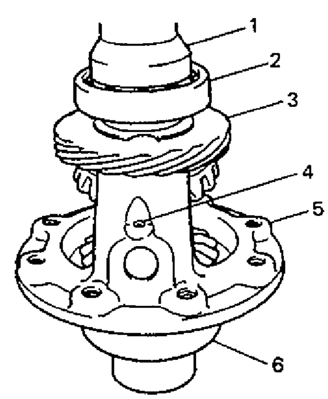
3. Install left bearing.
4. Install speedometer drive gear and right bearing. When press-fitting right bearing, use such appropriate tool as not to apply load to left bearing.
5. Install final gear and tighten its fixing bolts (8 pcs.) to specified torque.

Tightening torque for final gear fixing bolt	N·m	kg-m	lb-ft
	80 – 90	8.0 – 9.0	58.0 – 65.0



1. Final gear bolt
2. Final gear
3. Torque wrench
4. Aluminum plate

Fig. 7E-6



1. Special tool (Bearing installer 09951-76010)
2. Right differential side bearing
3. Speedometer drive gear
4. Differential case
5. Left differential side bearing
6. Special tool (Bush remover 09951-16060)

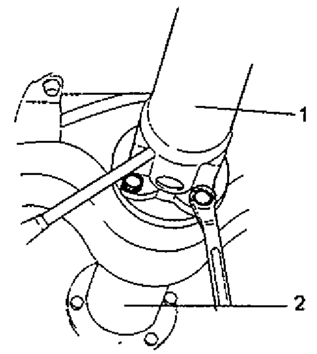
Fig. 7E-7

REAR DIFFERENTIAL

REMOVAL

1. Remove rear drive shaft. (Refer to Section 4C.)
2. Remove exhaust muffler. (Refer to Section 6K.)

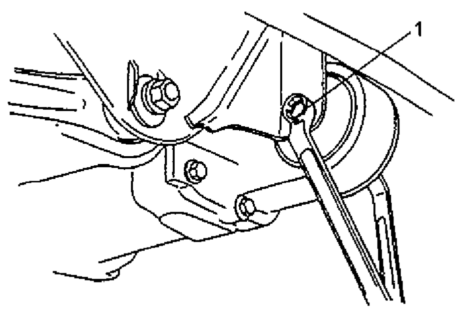
3. Remove propeller shafts No. 2 to No. 3 fixing bolts.



1. Propeller shaft No. 2
2. Propeller shaft No. 3

Fig. 7E-8

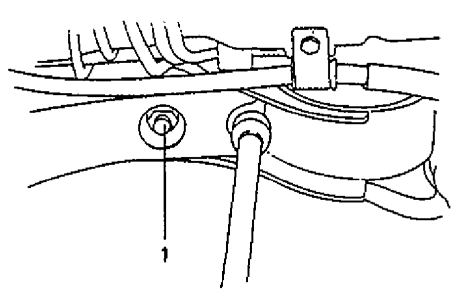
4. Place jack so that differential assembly will not tilt.
5. Remove differential mounting bracket nut.



1. Differential mounting bracket nut

Fig. 7E-9

6. Remove differential mounting nuts and then remove differential viscous coupling propeller shaft No. 3 assembly.



1. Differential mounting nut

Fig. 7E-10

7. Remove viscous coupling case and propeller shaft No. 3 from differential.

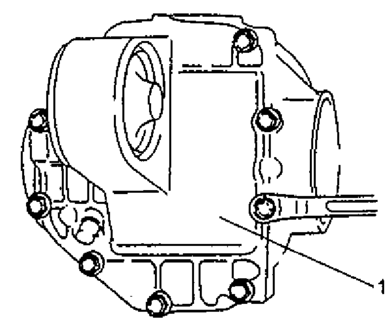
INSTALLATION

For installation, reverse removal procedure, noting following points.

- When installing rear drive shaft, refer to Section 4C and tighten to specified torque.

DISASSEMBLY

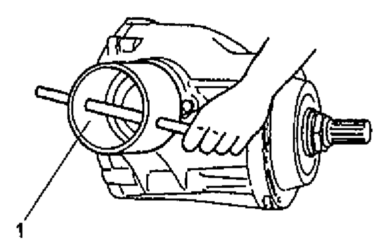
1. Remove rear cover.



1. Rear cover

Fig. 7E-11

2. Remove differential side bearing stopper and then remove differential side bearing retainer.



1. Special tool (Differential side bearing adjuster wrench 09923-58520)

Fig. 7E-12

3. Using some appropriate rod, drive out differential side bearing assembly.

NOTE:
When driving out differential side bearing, be very careful not to cause damage to tooth surface of bevel gear.

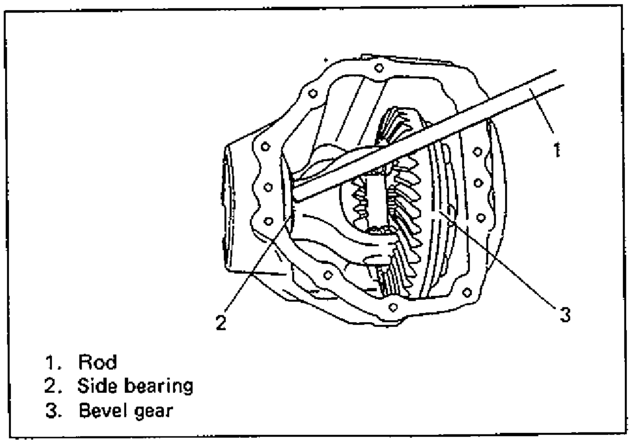


Fig. 7E-13

4. Remove bevel gear assembly.
5. Remove caulking of bevel pinion nut and loosen it as shown below.

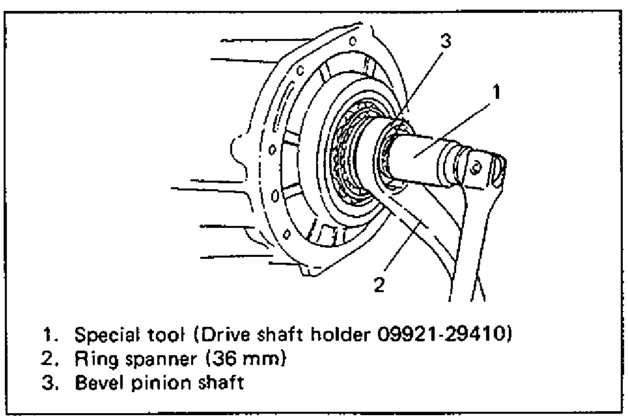


Fig. 7E-14

6. Drive out bevel pinion with plastic hammer.
7. Pull out bearing from bevel pinion.

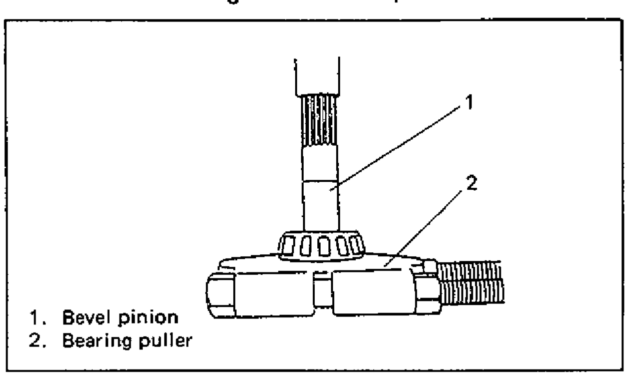


Fig. 7E-15

8. Using some appropriate rod, drive out outer bevel pinion bearing.

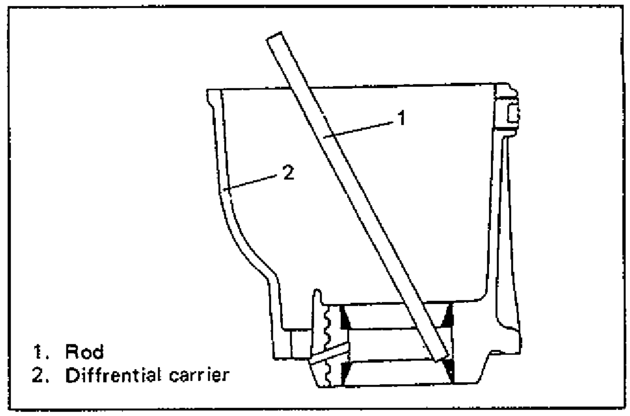


Fig. 7E-16

9. Remove bevel gear bolts.

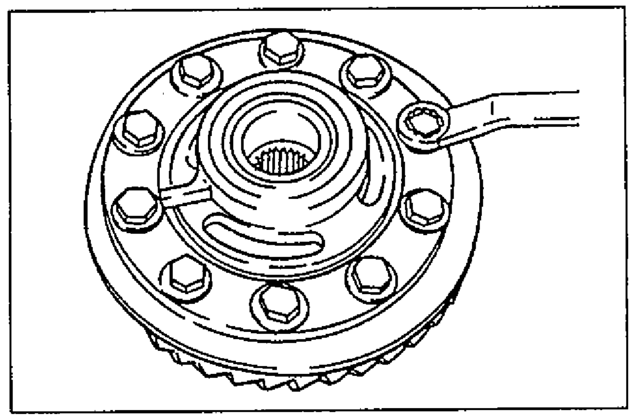


Fig. 7E-17

10. Remove differential side bearing.
11. Remove differential side pinion shaft pin.
12. Remove pinion shaft.

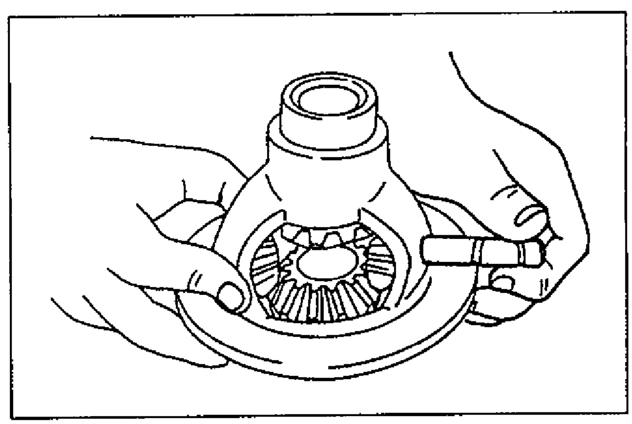


Fig. 7E-18

13. Remove side pinion and side gear.

NOTE:
Be sure to keep washers for side gear and spring washers separately from other shims.

ASSEMBLY

For assembly, reverse disassembly procedure noting following points.

- Tighten bevel pinion nut to specified torque and measure preload of bevel pinion bearing to check that it is within its standard value range.

Tighteing torque for bevel pinion nut	N·m	kg-m	lb-ft
	90 – 150	9.0–15.0	65.5–108.0

Standard value of preload	5 – 13 kg-cm (4.4 – 11.2 lb-in)

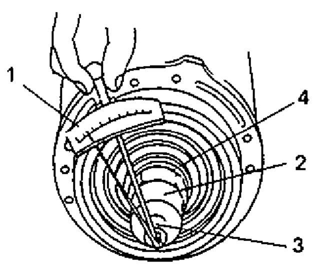


Fig. 7E-19

- Install side gear washer and spring washer in correct order, also making sure that spring washer is in correct direction.

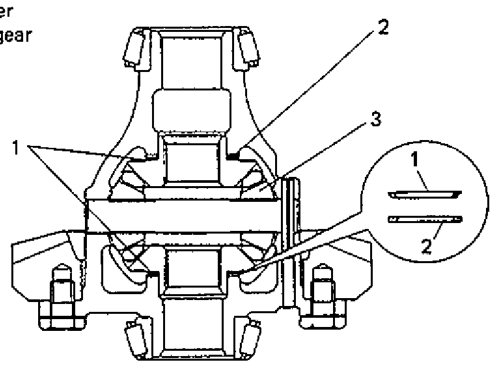


Fig. 7E-20

- Tighten bevel gear bolt to specified torque.

Tightening torque for bevel gear bolt	N·m	kg-m	lb-ft
	65 – 80	6.5 – 8.0	47.5 – 57.5

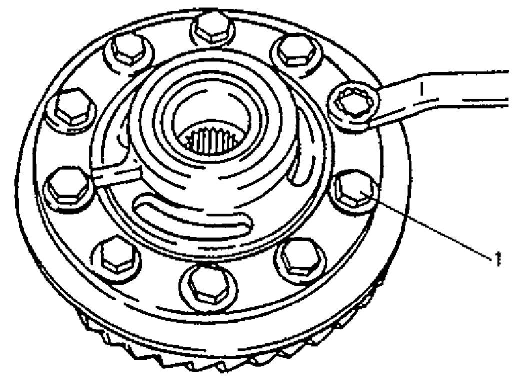


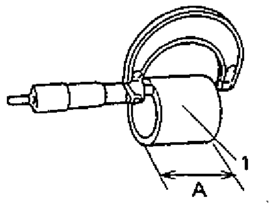
Fig. 7E-21

- Apply SUZUKI Bond No. 1215 to mating surface of case before installing it.

BEVEL PINION SHIM ADJUSTMENT

(Bevel pinion bearing shim adjustment)

1. Measure drive pinion spacer length A.

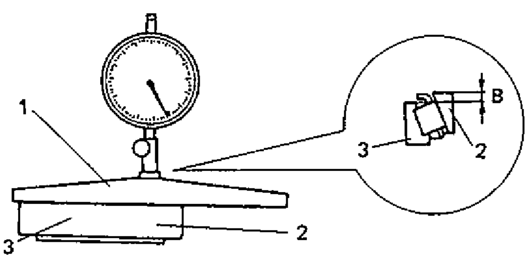


1. Spacer

Fig. 7E-22

2. Measure level difference B between outer race and inner race of bevel pinion bearing (at both front and rear).

   Level difference at front bearing B + Level diffrence at rear bearing B = B′

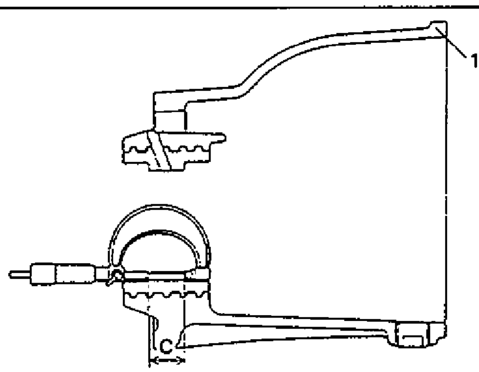


1. Special tool (Dial depth gauge 09922-77240)
2. Outer race
3. Inner race

Fig. 7E-23

3. Meaure dimension C of diffrential carrier.

   B′ + C = D



1. Rear differential carrier

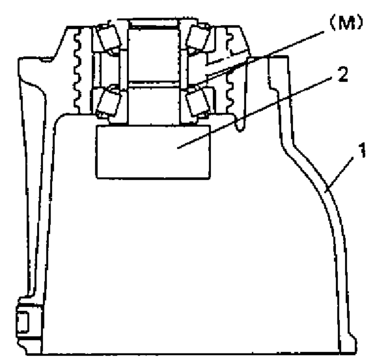
Fig. 7E-24

4. Calculate thickness of shim to be inserted into (M) in figure below.

   Shim thickness = (D—A—0.1) ±0.015 (mm)

5. Select necessary shim(s) so that thickness will be within above calculated value.

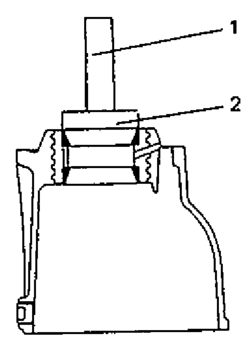
Available shim thickness	0.30, 0.87, 0.84, 0.81, 0.78, 0.75, 0.72, 0.69, 0.66, 0.63 and 0.60 mm 0.012, 0.034, 0.033, 0.032, 0.031, 0.029, 0.028, 0.027, 0.026, 0.025 and 0.024 in.



1. Rear differential carrier
2. Special tool (Bevel pinion dummy set 09922-77280)

Fig. 7E-25

6. Press-fit bevel pinion bearing and outer race into differential carrier.

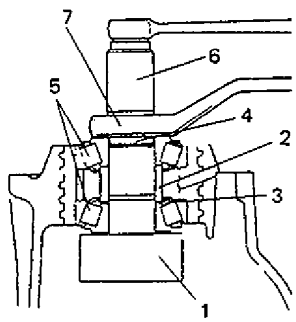


1. Special tool (Bearing & oil seal installer handle 09924-74510)
2. Special tool (Oil seal installer 09951-16090)

Fig. 7E-26

7. Place bearing, spacer and shim(s) on bevel pinion dummy of special tool (Bevel pinion dummy set) and tighten bevel pinion nut to specified torque.

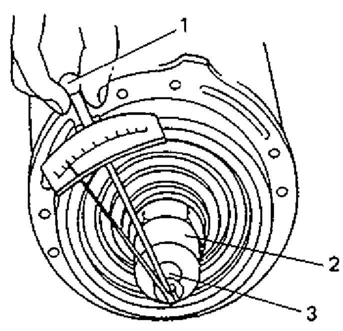
Tightening torque for bevel pinion nut	N·m	kg-m	lb-ft
	90–150	9.0–15.0	65.5–108.0



1. Special tool (Bevel pinion dummy set 09922-77280)
2. Spacer
3. Shim
4. Bevel pinion nut
5. Bevel pinion bearing
6. Special tool (Drive shaft holder 09921-29410)
7. Ring wrench (36 mm)

Fig. 7E-27

8. Using torque wrench, measure starting torque.



1. Torque wrench
2. Special tool (Drive shaft holder 09921-29410)
3. Special tool (Adaptor socket 09915-24550)

Fig. 7E-28

Standard value of preload	5 – 13 kg·cm (4.4 – 11.2 lb-in)

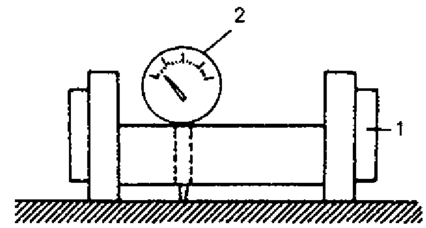
NOTE:

- **Apply thin coat of gear oil to bearing before measurement.**
- **Also before measuring preload, turn taper bearing a few times to ensure its good fitting.**
- **Preload can be adjusted, if only a little, by adjusting tightening torque of bevel pinion (but only within its specified range).**

BEVEL PINION SHIM ADJUSTMENT

(Mounting distance adjustment)

1. Place bevel pinion adjuster on surface plate as shown and set dial gauge to "0".



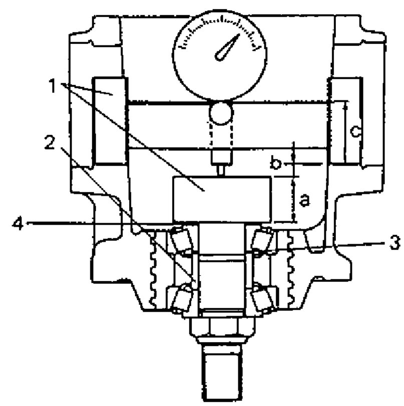
1. Special tool (Bevel pinion adjuster)
2. Dial gauge

Fig. 7E-29

2. Set bevel pinion dummy, bevel pinion and bevel pinion adjuster on differential carrier. Tighten dummy pinion nut to specified torque which is 90 – 150 N·m (9.0 – 15.0 kg-m, 65.5 – 108.0 lb-ft).

NOTE:

Before setting bevel pinion dummy, adjust bevel pinion bearing shim as described previously.

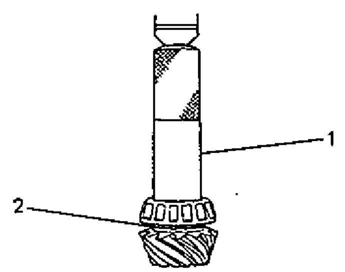


1. Special tool (Bevel pinion dummy)
2. Special tool (Bevel pinion adjuster)
3. Drive pinion spacer
4. Bevel pinion shim

Fig. 7E-30

3. Measure dimension b in figure by reading dial gauge.
4. Calculate thickness of shim to be inserted into (4) in figure above.
   Shim thickness = (a + b + c) − 8.0 ± 0.02
   = b ± 0.02 mm
   a + c: Measurement of special tool (mounting distance) which is 80 mm
   b: Reading on dial gauge
5. Select necessary shim(s) so that thickness will be within above calculated value.

Available shim thickness	0.30, 0.87, 0.84, 0.81, 0.78, 0.75, 0.72, 0.69, 0.66, 0.63 and 0.60 mm 0.012, 0.034, 0.033, 0.032, 0.031, 0.029, 0.028, 0.027, 0.026, 0.025 and 0.024 in.

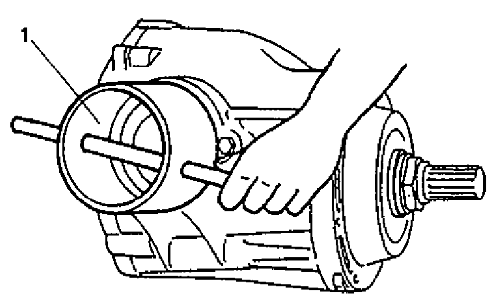


1. Special tool (Bearing installer 09913-84510)
2. Shim

Fig. 7E-31

DRIVE BEVEL GEAR BACKLASH ADJUSTMENT AND SIDE BEARING PRELOAD ADJUSTMENT

1. Using special tool, tighten bearing retainer.



1. Special tool (Differential side bearing adjuster wrench No. 2 09923-58520)

Fig. 7E-32

2. To measure drive bevel gear backlash, set dial gauge at right angle to bevel gear tooth, fix drive bevel pinion and read dial gauge while moving bevel gear.

Drive bevel gear backlash	0.1 − 0.2 mm (0.004 − 0.008 in.)

Tightening torque for retainer stopper bolt	N·m	kg-m	lb-ft
	9 − 13	0.9 − 1.3	7.0 − 9.0

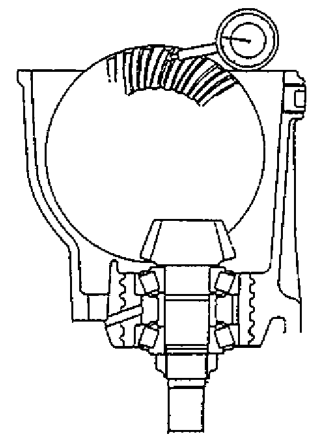


Fig. 7E-33

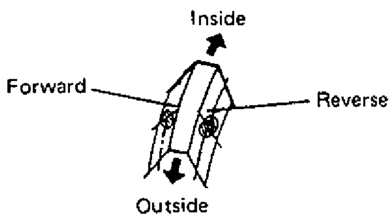
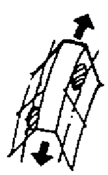
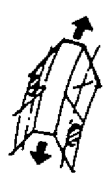
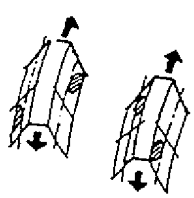
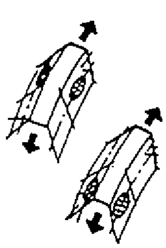
3. With bevel gear installed, measure starting torque by using differential preload adjusting tool. If bevel pinion starting torque and side bearing starting torque with bevel gear installed (bevel pinion bearing + side bearing preload) is within standard value, side bearing preload is satisfactory.

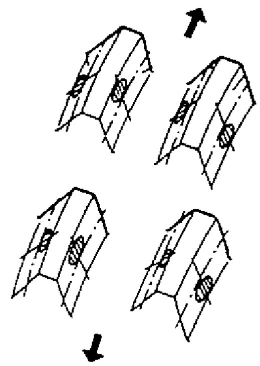
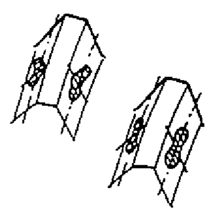
Side bearing preload standard value	Measured bevel pinion preload + 4 kg·cm 3.5 lb-in)

INSPECTION OF GEAR TOOTH SURFACE CONTACT

Upon completion of assembly, apply red lead paste to tooth surface of drive bevel gear and turn it by hand to check its contact with drive bevel pinion. Adjust if check result is not satisfactory.

NOTE:
Apply red lead paste all around bevel gear but not so much as to become sticky.

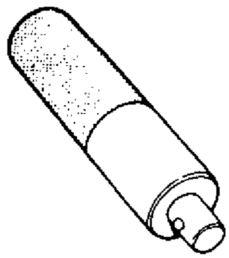
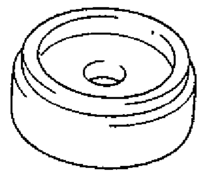
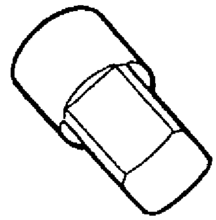
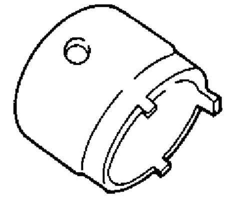
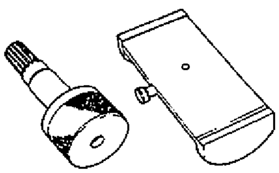
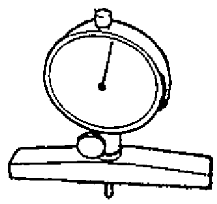
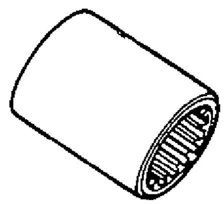
	Tooth surface contact	Possible cause and correction
Correct		Both forward and reverse contacts should occur a little toward inside from the center.
Poor shim adjustment		Forward contact occurs toward outside and reverse contact toward inside from the center and both at higher position. In such case, bevel pinion shim is too thin. Correction: Adjust thim thickness by increasing it.
		Forward contact occurs toward inside and reverse contact toward outside from the center and both at lower position. In such case, bevel pinion shim is too thick. Correction: Adjust shim thickness by reducing it.
Defect in part(s)		When tooth contacts occur as shown at the left, proper differential carrier offset (18 mm) is not obtained. Correction: Replace differential carrier.
		When tooth contacts are deviated toward inside or outside of gear, possible causes are as follows. • Drive bevel gear or drive bevel pinion defective. • Poor squareness of differential carrier. • Differential carrier surface where gear is installed is defective. Correction: Replace defective part as an assembly.

	Tooth surface contact	Possible cause and correction
Defect in part(s)		When tooth contacts occur as shown at the left, gear itself is defective. Correction: Replace drive bevel gear and drive bevel pinion as a set.
		When contact is not oval in shape, gear itselt is defective. Abnormal contact is also caused by nick in tooth surface or faulty condition transmission case at its drive bevel gear mounting part. Correction: Replace drive bevel gear and drive bevel pinion as a set and differential gear case as well, if found defective.

RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg·m	lb-ft
Rear differential oil drain plug	12 – 22	1.2 – 2.2	9.0 – 15.5
Bevel pinion nut	90 – 150	9.0 – 15.0	65.5 – 108.0
Bevel gear bolt	65 – 80	6.5 – 8.0	47.5 – 57.5
Differential mount bolt	40 – 60	4.0 – 6.0	29.0 – 43.0

SPECIAL TOOLS

 09924-74510 Bearing & oil seal installer	 09951-16090 Oil seal installer	 09915-24550 Adapter socket	 09923-58520 Differential side bearing adjuster No. 2
 09922-77280 Bevel pinion adjuster set	 09922-77240 Dial depth gauge	 09921-29410 Drive shaft holder	

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND No. 1215 (99000-31110)	• Mating surface of differential carrier and rear cover • Mating surface of differential carrier and viscous case • Mating surface of viscous case and propeller shaft No. 3

SECTION 8

BODY ELECTRICAL SYSTEM

NOTE:
For the descriptions (items) not found in this section, refer to the same section of GROUP 1.

CONTENTS

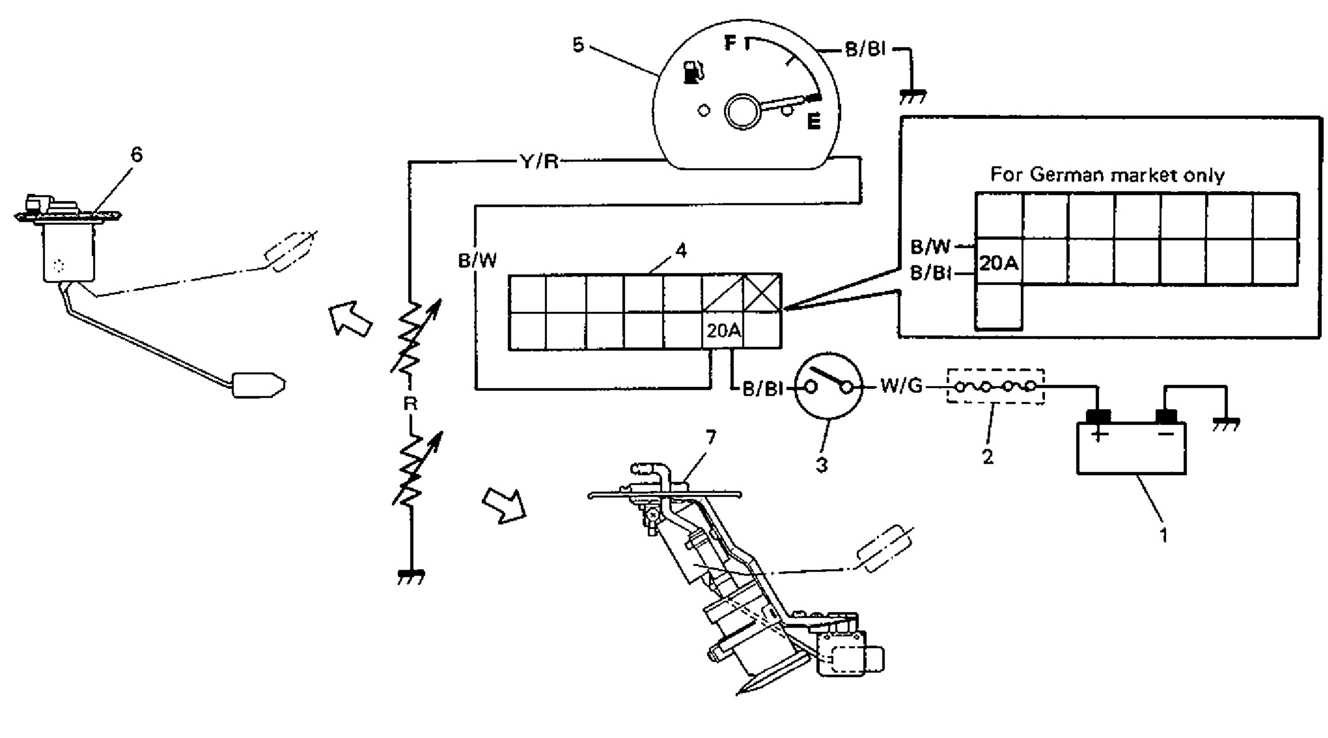
INSTRUMENTS AND GAUGES 8-1
Fuel Level Meter and Gauge Unit 8-1
Wiring Diagram .... Wiring diagrams are attached at the end of this manual.

INSTRUMENTS AND GAUGES

FUEL LEVEL METER AND GAUGE UNIT

DESCRIPTION OF CIRCUIT

The fuel level meter circuit consists of the fuel level meter installed inside the combination meter and the fuel level gauge installed to the fuel tank.



1. Battery
2. Main fuse
3. Ignition switch
4. Fuse block
5. Fuel level meter
6. Fuel level gauge No. 1 unit
7. Fuel level gauge No. 2 unit

W/G : White/Green
B/Bl : Black/Blue
B/W : Black/White
Y/R : Yellow/Red
R : Red

Fig. 8-1

INSPECTION

GAUGE UNIT

Use an ohmmeter to confirm that resistance of level gauge unit changes with change of float position. Float position-to-resistance relationship can be plotted in a graph as shown below.

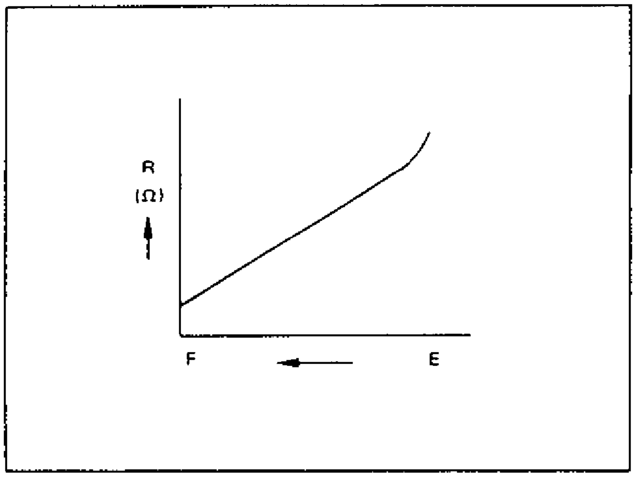


Fig. 8-2 Resistance-Fuel Level Relationship

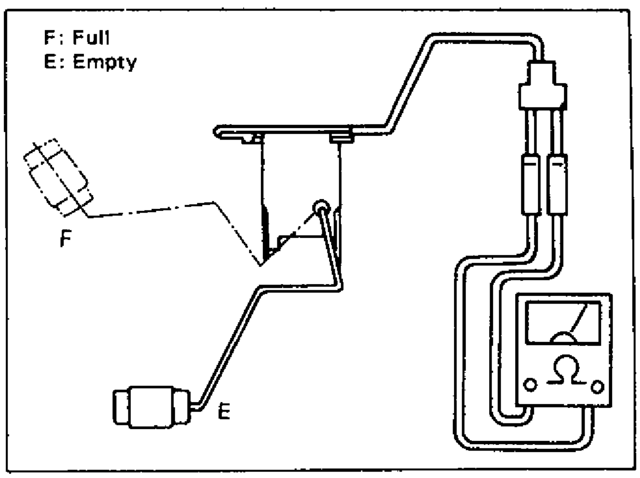


Fig. 8-3 Checking Fuel Gauge Unit

- Fuel level gauge No. 1

Position	Resistance
E	47.5 – 53.5 Ω
F	1.0 – 2.5 Ω

- Fuel level gauge No. 2

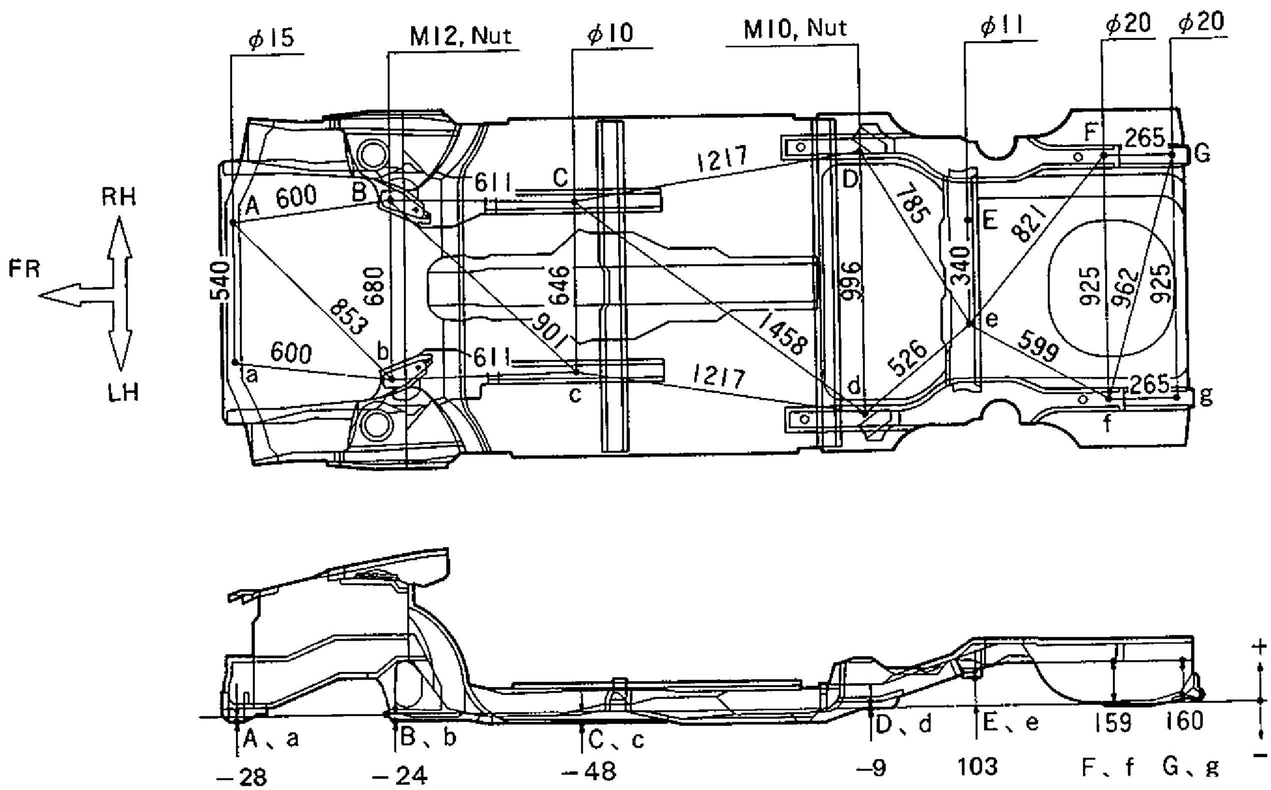
Position	Resistance
E	66.5 – 72.5 Ω
F	1.0 – 2.5 Ω

SECTION 9

BODY SERVICE

NOTE:
For the descriptions (items) not found in this section, refer to the same section of GROUP 1.

UNDERBODY DIMENSIONS



- ALL DIMENSIONS ARE METRIC (UNIT: MM)
- ALL CONTROL POINTS ARE SYMMETRICAL SIDE TO SIDE
- ALL TOLERANCES ARE ± 3 MM

Fig. 9-1 Underbody Dimensions — 4WD Model

WIRING DIAGRAM

CONTENTS

1. WIRING DIAGRAMS FOR FUEL INJECTION MODEL
   GERMAN SPEC. VEHICLE
      M/T 1-1
      A/T 1-2
   CANADIAN SPEC. VEHICLE
      M/T 1-3
      A/T 1-4
   VEHICLE WITH DRL SYSTEM (NOT FOR CANADA)
      M/T 1-5
      A/T 1-6
   OTHER SPEC. VEHICLE
      M/T 1-7
      A/T 1-8

2. WIRING DIAGRAMS FOR CARBURETOR MODEL
      M/T 2-1
      A/T 2-2

WIRING DIAGRAM FOR FUEL INJECTION MODEL

1-1 GERMAN SPEC. VEHICLE WITH M/T

NOTE: The part with (*) are provided or not depending on specifications.
REMARQUE: Les pièces marquées d'un (*) sont (seraient) fournies, mais elle ne seraient pas conformees aux spécifications.
NOTA: Die Teile mit einem (*) sind geliefert (mogen geliefert sein), aber sie mögen nicht auf Voranschlagen passen.

WIRE COLOR

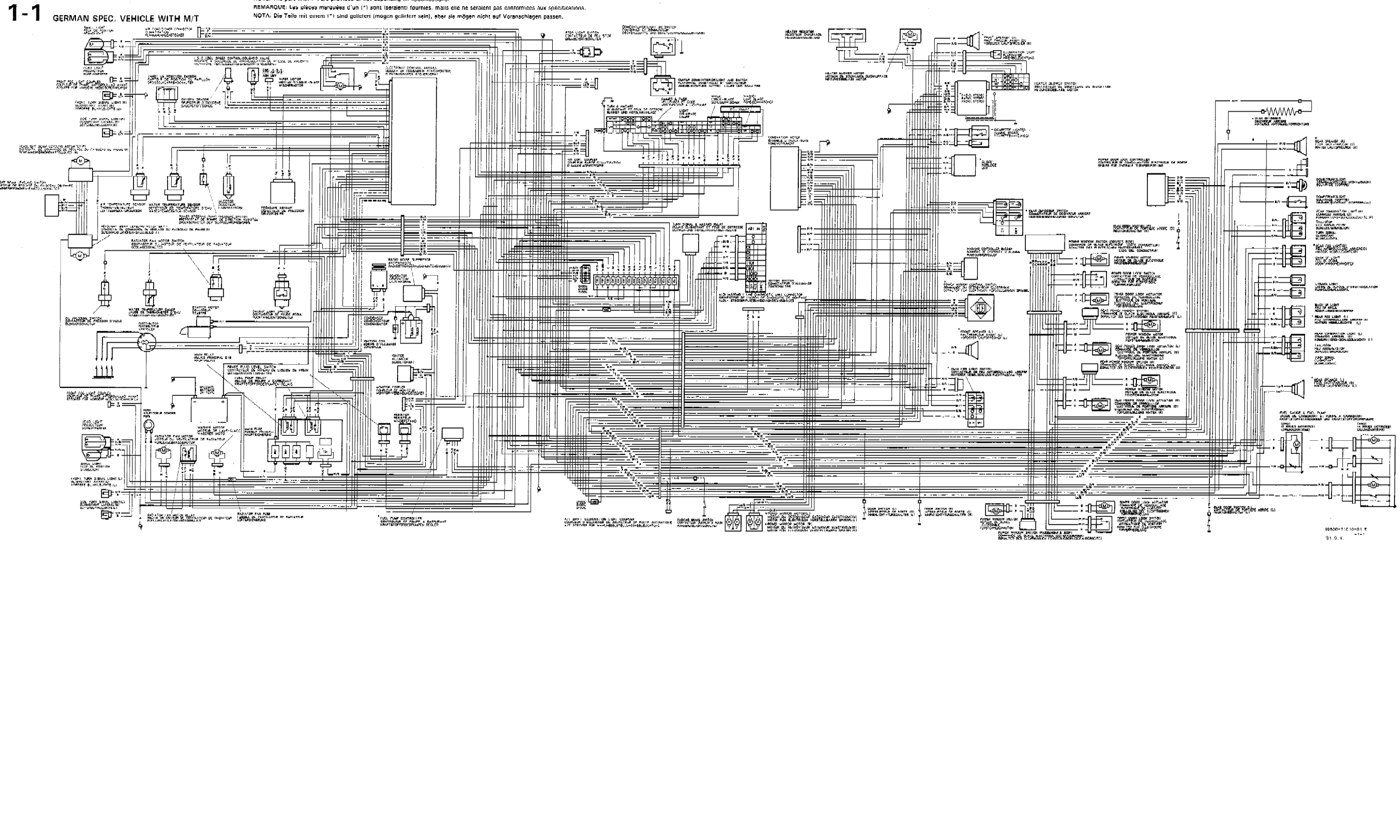
B	Black
Bl	Blue
Br	Brown
G	Green
Gr	Gray
Lbl	Light blue
Lg	Light green
O	Orange
R	Red
W	White
Y	Yellow
P	Pink
V	Violet
B/Bl	Black with Blue tracer
B/G	Black with Green tracer
B/R	Black with Red tracer
B/W	Black with White tracer
B/Y	Black with Yellow tracer
Bl/B	Blue with Black tracer
Bl/G	Blue with Green tracer
Bl/R	Blue with Red tracer
Bl/W	Blue with White tracer
Bl/Y	Blue with Yellow tracer
Br/B	Brown with Black tracer
Br/R	Brown with Red tracer
Br/W	Brown with White tracer
Br/Y	Brown with Yellow tracer
G/B	Green with Black tracer
G/Bl	Green with Blue tracer
G/R	Green with Red tracer
G/W	Green with White tracer
G/Y	Green with Yellow tracer
Gr/B	Gray with Black tracer
Gr/W	Gray with White tracer
Gr/R	Gray with Red tracer
Gr/Y	Gray with Yellow tracer
Lg/B	Light green with Black tracer
Lg/R	Light green with Red tracer
Lg/W	Light green with White tracer
Lg/Y	Light green with Yellow tracer
O/B	Orange with Black tracer
O/Bl	Orange with Blue tracer
O/G	Orange with Green tracer
O/R	Orange with Red tracer
O/W	Orange with White tracer
O/Y	Orange with Yellow tracer
P/B	Pink with Black tracer
P/Bl	Pink with Blue tracer
P/G	Pink with Green tracer
V/G	Violet with Green tracer
V/W	Violet with White tracer
V/Y	Violet with Yellow tracer
R/B	Red with Black tracer
R/Bl	Red with Blue tracer
R/G	Red with Green tracer
R/W	Red with White tracer
R/Y	Red with Yellow tracer
W/B	White with Black tracer
W/Bl	White with Blue tracer
W/G	White with Green tracer
W/R	White with Red tracer
W/Y	White with Yellow tracer
Y/B	Yellow with Black tracer
Y/Bl	Yellow with Blue tracer
Y/G	Yellow with Green tracer
Y/R	Yellow with Red tracer
Y/W	Yellow with White tracer

CODE DES COULEURS

B	Noir
Bl	Bleu
Br	Brun
G	Vert
Gr	Gris
Lbl	Bleu clair
Lg	Vert clair
O	Orange
R	Rouge
W	Blanc
Y	Jaune
P	Rose
V	Violet
B/Bl	Noir avec filet bleu
B/G	Noir avec filet vert
B/R	Noir avec filet rouge
B/W	Noir avec filet blanc
B/Y	Noir avec filet jaune
Bl/B	Bleu avec filet noir
Bl/G	Bleu avec filet vert
Bl/R	Bleu avec filet rouge
Bl/W	Bleu avec filet blanc
Bl/Y	Bleu avec filet jaune
Br/B	Brun avec filet noir
Br/R	Brun avec filet rouge
Br/W	Brun avec filet blanc
Br/Y	Brun avec filet jaune
G/B	Vert avec filet noir
G/Bl	Vert avec filet bleu
G/R	Vert avec filet rouge
G/W	Vert avec filet blanc
G/Y	Vert avec filet jaune
Gr/B	Gris avec filet noir
Gr/W	Gris avec filet blanc
Gr/R	Gris avec filet rouge
Gr/Y	Gris avec filet jaune
Lg/B	Vert clair avec filet noir
Lg/R	Vert clair avec filet rouge
Lg/W	Vert clair avec filet blanc
Lg/Y	Vert clair avec filet jaune
O/B	Orange avec filet noir
O/Bl	Orange avec filet bleu
O/G	Orange avec filet vert
O/R	Orange avec filet rouge
O/W	Orange avec filet blanc
O/Y	Orange avec filet jaune
P/B	Rose avec filet noir
P/Bl	Rose avec filet bleu
P/G	Rose avec filet vert
V/G	Violet avec filet vert
V/W	Violet avec filet blanc
V/Y	Violet avec filet jaune
R/B	Rouge avec filet noir
R/Bl	Rouge avec filet bleu
R/G	Rouge avec filet vert
R/W	Rouge avec filet blanc
R/Y	Rouge avec filet jaune
W/B	Blanc avec filet noir
W/Bl	Blanc avec filet bleu
W/G	Blanc avec filet vert
W/R	Blanc avec filet rouge
W/Y	Blanc avec filet jaune
Y/B	Jaune avec filet noir
Y/Bl	Jaune avec filet bleu
Y/G	Jaune avec filet vert
Y/R	Jaune avec filet rouge
Y/W	Jaune avec filet blanc

KABELFARBEN

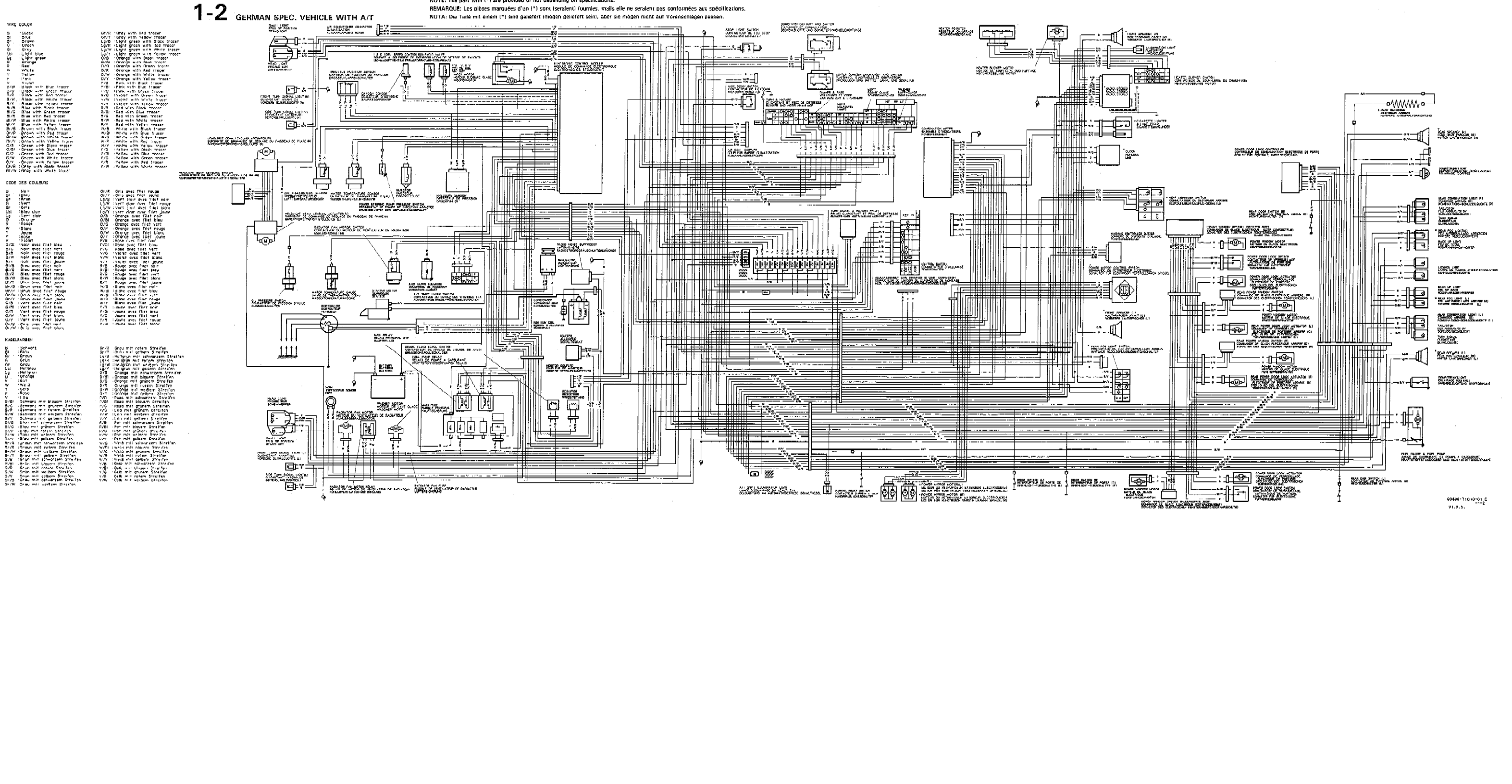
B	Schwarz
Bl	Blau
Br	Braun
G	Grün
Gr	Grau
Lbl	Hellblau
Lg	Hellgrün
O	Orange
R	Rot
W	Weiß
Y	Gelb
P	Rosa
V	Lila
B/Bl	Schwarz mit blauem Streifen
B/G	Schwarz mit grünem Streifen
B/R	Schwarz mit rotem Streifen
B/W	Schwarz mit weißem Streifen
B/Y	Schwarz mit gelbem Streifen
Bl/B	Blau mit schwarzem Streifen
Bl/G	Blau mit grünem Streifen
Bl/R	Blau mit rotem Streifen
Bl/W	Blau mit weißem Streifen
Bl/Y	Blau mit gelbem Streifen
Br/B	Braun mit schwarzem Streifen
Br/R	Braun mit rotem Streifen
Br/W	Braun mit weißem Streifen
Br/Y	Braun mit gelbem Streifen
G/B	Grün mit schwarzem Streifen
G/Bl	Grün mit blauem Streifen
G/R	Grün mit rotem Streifen
G/W	Grün mit weißem Streifen
G/Y	Grün mit gelbem Streifen
Gr/B	Grau mit schwarzem Streifen
Gr/W	Grau mit weißem Streifen
Gr/R	Grau mit rotem Streifen
Gr/Y	Grau mit gelbem Streifen
Lg/B	Hellgrün mit schwarzem Streifen
Lg/R	Hellgrün mit rotem Streifen
Lg/W	Hellgrün mit weißem Streifen
Lg/Y	Hellgrün mit gelbem Streifen
O/B	Orange mit schwarzem Streifen
O/Bl	Orange mit blauem Streifen
O/G	Orange mit grünem Streifen
O/R	Orange mit rotem Streifen
O/W	Orange mit weißem Streifen
O/Y	Orange mit gelbem Streifen
P/B	Rosa mit schwarzem Streifen
P/Bl	Rosa mit blauem Streifen
P/G	Rosa mit grünem Streifen
V/G	Lila mit grünem Streifen
V/W	Lila mit weißem Streifen
V/Y	Lila mit gelbem Streifen
R/B	Rot mit schwarzem Streifen
R/Bl	Rot mit blauem Streifen
R/G	Rot mit grünem Streifen
R/W	Rot mit weißem Streifen
R/Y	Rot mit gelbem Streifen
W/B	Weiß mit schwarzem Streifen
W/Bl	Weiß mit blauem Streifen
W/G	Weiß mit grünem Streifen
W/R	Weiß mit rotem Streifen
W/Y	Weiß mit gelbem Streifen
Y/B	Gelb mit schwarzem Streifen
Y/Bl	Gelb mit blauem Streifen
Y/G	Gelb mit grünem Streifen
Y/R	Gelb mit rotem Streifen
Y/W	Gelb mit weißem Streifen



WIRING DIAGRAM FOR FUEL INJECTION MODEL

1-2 GERMAN SPEC. VEHICLE WITH A/T

NOTE: The part with (*) are provided or not depending on specifications.
REMARQUE: Les pièces marquées d'un (*) sont (seraient) fournies, mais elle ne seraient pas conformées aux spécifications.
NOTA: Die Teile mit einem (*) sind geliefert (mögen geliefert sein), aber sie mögen nicht auf Voranschlagen passen.



WIRING DIAGRAM FOR FUEL INJECTION MODEL

1-3 CANADIAN SPEC. VEHICLE WITH M/T

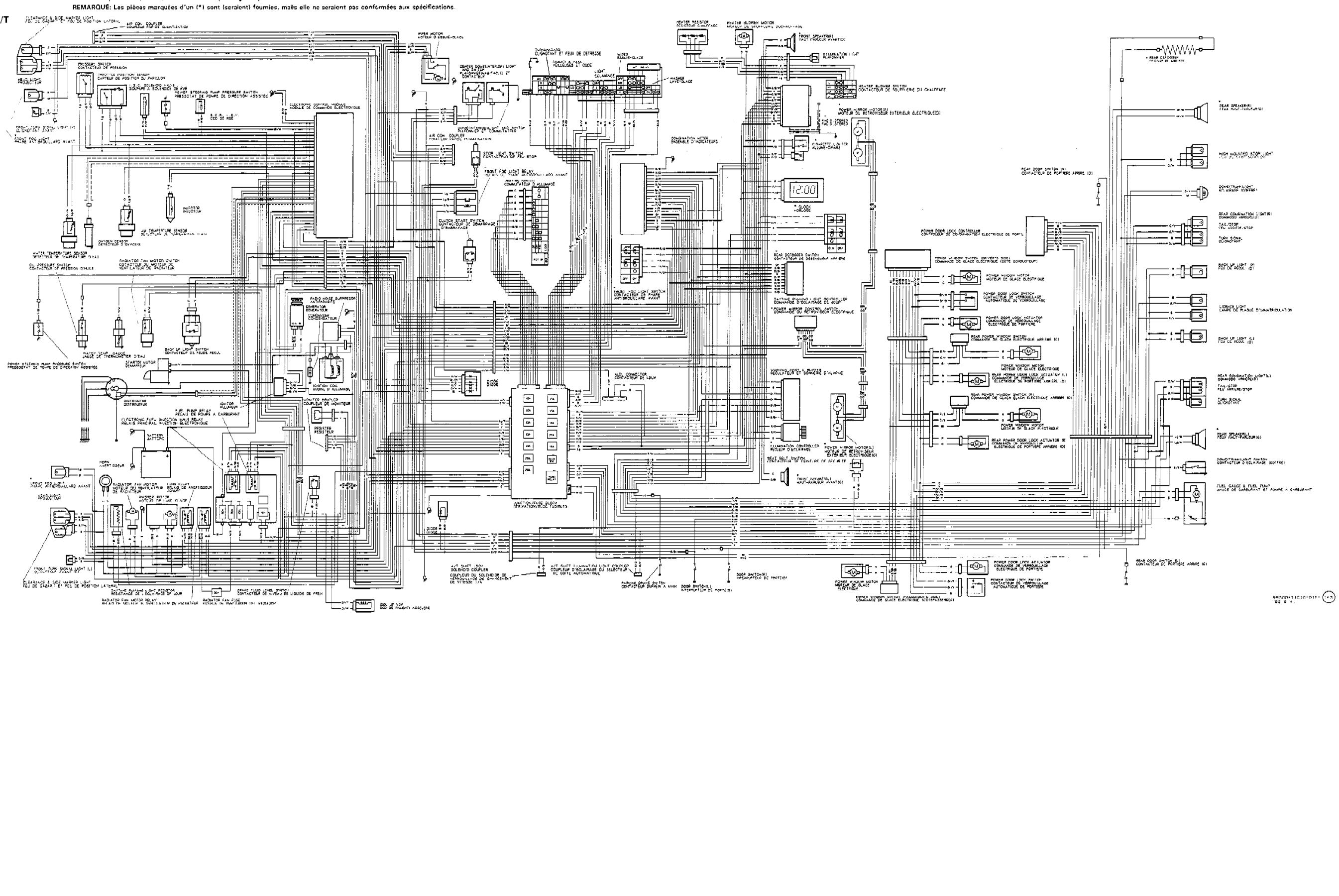
NOTE: The part with (*) are provided or not depending on specifications.
REMARQUE: Les pièces marquées d'un (*) sont (seraient) fournies, mails elle ne seraient pas conformées aux spécifications.

WIRE COLOR

B	Black	Gr/R	Gray with Red tracer
Bl	Blue	Gr/Y	Gray with Yellow tracer
Br	Brown	Lg/B	Light green with Black tracer
G	Green	Lg/R	Light green with Red tracer
Gr	Gray	Lg/W	Light green with White tracer
Lbl	Light blue	Lg/Y	Light green with Yellow tracer
Lg	Light green	O/B	Orange with Black tracer
O	Orange	O/Bl	Orange with Blue tracer
R	Red	O/G	Orange with Green tracer
W	White	O/R	Orange with Red tracer
Y	Yellow	O/W	Orange with White tracer
P	Pink	O/Y	Orange with Yellow tracer
V	Violet	P/B	Pink with Black tracer
B/Bl	Black with Blue tracer	P/Bl	Pink with Blue tracer
B/G	Black with Green tracer	P/G	Pink with Green tracer
B/R	Black with Red tracer	V/G	Violet with Green tracer
B/W	Black with White tracer	V/W	Violet with White tracer
B/Y	Black with Yellow tracer	V/Y	Violet with Yellow tracer
Bl/B	Blue with Black tracer	R/B	Red with Black tracer
Bl/G	Blue with Green tracer	R/Bl	Red with Blue tracer
Bl/R	Blue with Red tracer	R/G	Red with Green tracer
Bl/W	Blue with White tracer	R/W	Red with White tracer
Bl/Y	Blue with Yellow tracer	R/Y	Red with Yellow tracer
Br/B	Brown with Black tracer	W/B	White with Black tracer
Br/R	Brown with Red tracer	W/Bl	White with Blue tracer
Br/W	Brown with White tracer	W/G	White with Green tracer
Br/Y	Brown with Yellow tracer	W/R	White with Red tracer
G/B	Green with Black tracer	W/Y	White with Yellow tracer
G/Bl	Green with Blue tracer	Y/B	Yellow with Black tracer
G/R	Green with Red tracer	Y/Bl	Yellow with Blue tracer
G/W	Green with White tracer	Y/G	Yellow with Green tracer
G/Y	Green with Yellow tracer	Y/R	Yellow with Red tracer
Gr/B	Gray with Black tracer	Y/W	Yellow with White tracer
Gr/W	Gray with White tracer		

CODE DES COULEURS

B	Noir	Gr/R	Gris avec filet rouge
Bl	Bleu	Gr/Y	Gris avec filet jaune
Br	Brun	Lg/B	Vert clair avec filet noir
G	Vert	Lg/R	Vert clair avec filet rouge
Gr	Gris	Lg/W	Vert clair avec filet blanc
Lbl	Bleu clair	Lg/Y	Vert clair avec filet jaune
Lg	Vert clair	O/B	Orange avec filet noir
O	Orange	O/Bl	Orange avec filet bleu
R	Rouge	O/G	Orange avec filet vert
W	Blanc	O/R	Orange avec filet rouge
Y	Jaune	O/W	Orange avec filet blanc
P	Rose	O/Y	Orange avec filet jaune
V	Violet	P/B	Rose avec filet noir
B/Bl	Noir avec filet bleu	P/Bl	Rose avec filet bleu
B/G	Noir avec filet vert	P/G	Rose avec filet vert
B/R	Noir avec filet rouge	V/G	Violet avec filet vert
B/W	Noir avec filet blanc	V/W	Violet avec filet blanc
B/Y	Noir avec filet jaune	V/Y	Violet avec filet jaune
Bl/B	Bleu avec filet noir	R/B	Rouge avec filet noir
Bl/G	Bleu avec filet vert	R/Bl	Rouge avec filet bleu
Bl/R	Bleu avec filet rouge	R/G	Rouge avec filet vert
Bl/W	Bleu avec filet blanc	R/W	Rouge avec filet blanc
Bl/Y	Bleu avec filet jaune	R/Y	Rouge avec filet jaune
Br/B	Brun avec filet noir	W/B	Blanc avec filet noir
Br/R	Brun avec filet rouge	W/Bl	Blanc avec filet bleu
Br/W	Brun avec filet blanc	W/G	Blanc avec filet vert
Br/Y	Brun avec filet jaune	W/R	Blanc avec filet rouge
G/B	Vert avec filet noir	W/Y	Blanc avec filet jaune
G/Bl	Vert avec filet bleu	Y/B	Jaune avec filet noir
G/R	Vert avec filet rouge	Y/Bl	Jaune avec filet bleu
G/W	Vert avec filet blanc	Y/G	Jaune avec filet vert
G/Y	Vert avec filet jaune	Y/R	Jaune avec filet rouge
Gr/B	Gris avec filet noir	Y/W	Jaune avec filet blanc
Gr/W	Gris avec filet blanc		



WIRING DIAGRAM FOR FUEL INJECTION MODEL

1-4 CANADIAN SPEC. VEHICLE WITH A/T

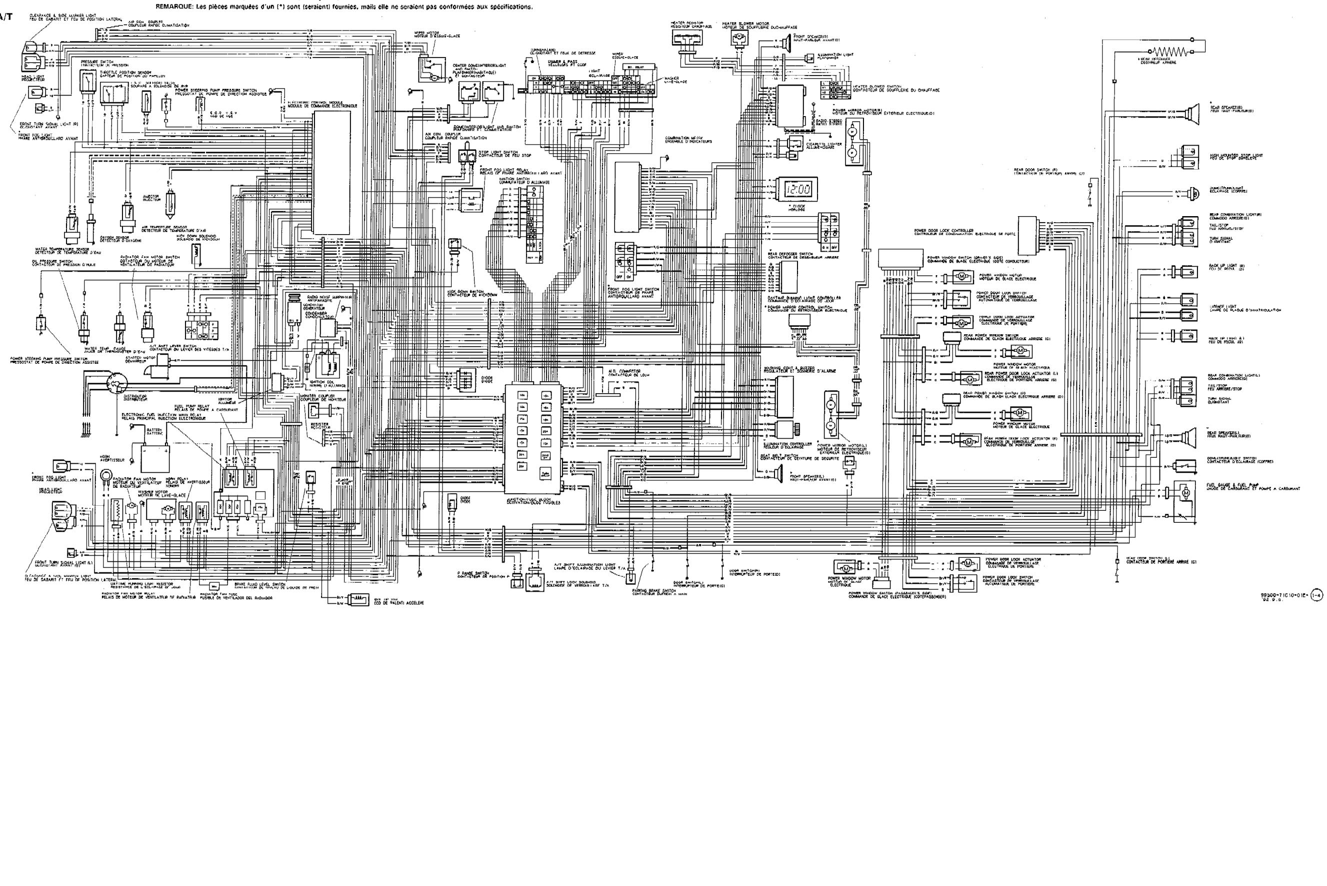
NOTE: The part with (*) are provided or not depending on specifications.
REMARQUE: Les pièces marquées d'un (*) sont (seraient) fournies, mais elle ne seraient pas conformées aux spécifications.

WIRE COLOR

B	Black	Gr/R	Gray with Red tracer
Bl	Blue	Gr/Y	Gray with Yellow tracer
Br	Brown	Lg/B	Light green with Black tracer
G	Green	Lg/R	Light green with Red tracer
Gr	Gray	Lg/W	Light green with White tracer
Lbl	Light blue	Lg/Y	Light green with Yellow tracer
Lg	Light green	O/B	Orange with Black tracer
O	Orange	O/Bl	Orange with Blue tracer
R	Red	O/G	Orange with Green tracer
W	White	O/R	Orange with Red tracer
Y	Yellow	O/W	Orange with White tracer
P	Pink	O/Y	Orange with Yellow tracer
V	Violet	P/B	Pink with Black tracer
B/Bl	Black with Blue tracer	P/Bl	Pink with Blue tracer
B/G	Black with Green tracer	P/G	Pink with Green tracer
B/R	Black with Red tracer	V/G	Violet with Green tracer
B/W	Black with White tracer	V/W	Violet with White tracer
B/Y	Black with Yellow tracer	V/Y	Violet with Yellow tracer
Bl/B	Blue with Black tracer	R/B	Red with Black tracer
Bl/G	Blue with Green tracer	R/Bl	Red with Blue tracer
Bl/R	Blue with Red tracer	R/G	Red with Green tracer
Bl/W	Blue with White tracer	R/W	Red with White tracer
Bl/Y	Blue with Yellow tracer	R/Y	Red with Yellow tracer
Br/B	Brown with Black tracer	W/B	White with Black tracer
Br/R	Brown with Red tracer	W/Bl	White with Blue tracer
Br/W	Brown with White tracer	W/G	White with Green tracer
Br/Y	Brown with Yellow tracer	W/R	White with Red tracer
G/B	Green with Black tracer	W/Y	White with Yellow tracer
G/Bl	Green with Blue tracer	Y/B	Yellow with Black tracer
G/R	Green with Red tracer	Y/Bl	Yellow with Blue tracer
G/W	Green with White tracer	Y/G	Yellow with Green tracer
G/Y	Green with Yellow tracer	Y/R	Yellow with Red tracer
Gr/B	Gray with Black tracer	Y/W	Yellow with White tracer
Gr/W	Gray with White tracer		

CODE DES COULEURS

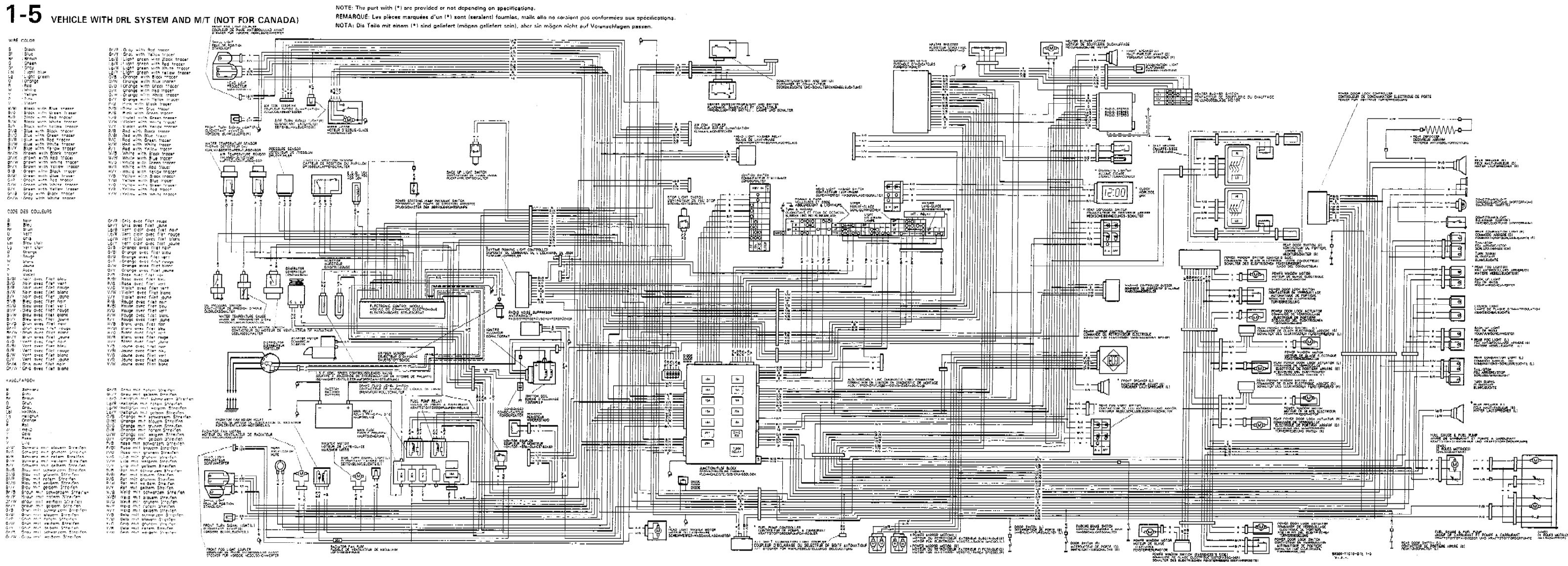
B	Noir	Gr/R	Gris avec filet rouge
Bl	Bleu	Gr/Y	Gris avec filet jaune
Br	Brun	Lg/B	Vert clair avec filet noir
G	Vert	Lg/R	Vert clair avec filet rouge
Gr	Gris	Lg/W	Vert clair avec filet blanc
Lbl	Bleu clair	Lg/Y	Vert clair avec filet jaune
Lg	Vert clair	O/B	Orange avec filet noir
O	Orange	O/Bl	Orange avec filet bleu
R	Rouge	O/G	Orange avec filet vert
W	Blanc	O/R	Orange avec filet rouge
Y	Jaune	O/W	Orange avec filet blanc
P	Rose	O/Y	Orange avec filet jaune
V	Violet	P/B	Rose avec filet noir
B/Bl	Noir avec filet bleu	P/Bl	Rose avec filet bleu
B/G	Noir avec filet vert	P/G	Rose avec filet vert
B/R	Noir avec filet rouge	V/G	Violet avec filet vert
B/W	Noir avec filet blanc	V/W	Violet avec filet blanc
B/Y	Noir avec filet jaune	V/Y	Violet avec filet jaune
Bl/B	Bleu avec filet noir	R/B	Rouge avec filet noir
Bl/G	Bleu avec filet vert	R/Bl	Rouge avec filet bleu
Bl/R	Bleu avec filet rouge	R/G	Rouge avec filet vert
Bl/W	Bleu avec filet blanc	R/W	Rouge avec filet blanc
Bl/Y	Bleu avec filet jaune	R/Y	Rouge avec filet jaune
Br/B	Brun avec filet noir	W/B	Blanc avec filet noir
Br/R	Brun avec filet rouge	W/Bl	Blanc avec filet bleu
Br/W	Brun avec filet blanc	W/G	Blanc avec filet vert
Br/Y	Brun avec filet jaune	W/R	Blanc avec filet rouge
G/B	Vert avec filet noir	W/Y	Blanc avec filet jaune
G/Bl	Vert avec filet bleu	Y/B	Jaune avec filet noir
G/R	Vert avec filet rouge	Y/Bl	Jaune avec filet bleu
G/W	Vert avec filet blanc	Y/G	Jaune avec filet vert
G/Y	Vert avec filet jaune	Y/R	Jaune avec filet rouge
Gr/B	Gris avec filet noir	Y/W	Jaune avec filet blanc
Gr/W	Gris avec filet blanc		



WIRING DIAGRAM FOR FUEL INJECTION MODEL

1-5 VEHICLE WITH DRL SYSTEM AND M/T (NOT FOR CANADA)

NOTE: The part with (*) are provided or not depending on specifications.
REMARQUE: Les pièces marquées d'un (*) sont (seralent) foumlas, mails elle ne seraient pas conformées aux spécifications.
NOTA: Die Teile mit einem (*) sind geliefert (mögen geliefert sein), aber sie mögen nicht auf Voranschlagen passen.



WIRING DIAGRAM FOR FUEL INJECTION MODEL

1-6 VEHICLE WITH DRL SYSTEM AND A/T (NOT FOR CANADA)

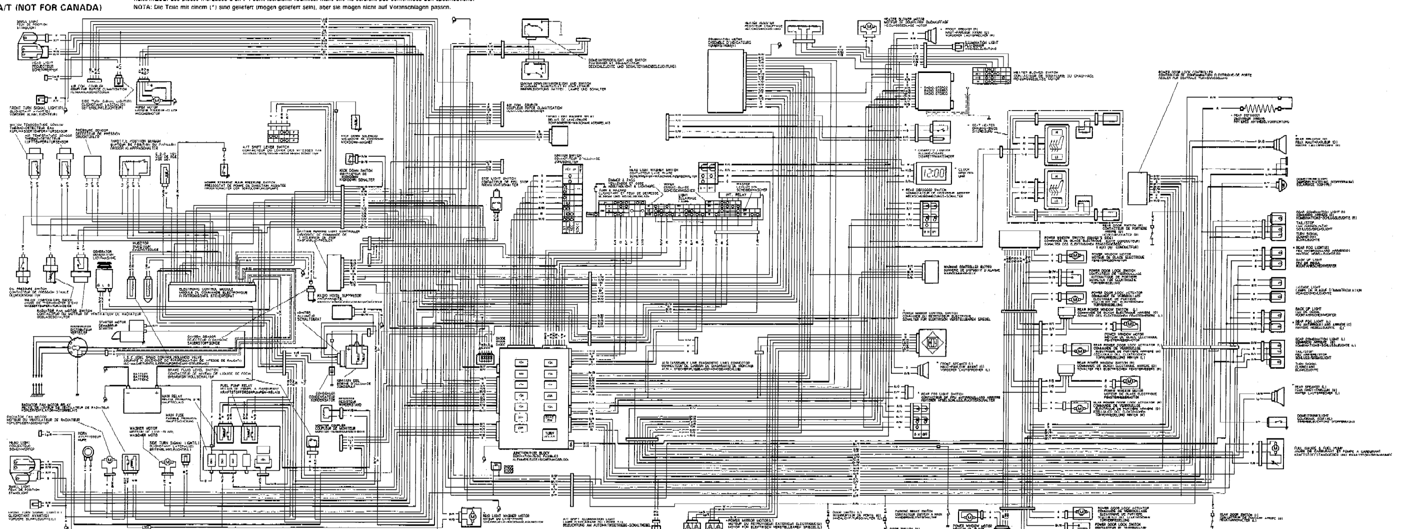
NOTE: The part with (*) are provided or not depending on specifications.
REMARQUE: Les pieces marquées d'un (*) sont (seraient) fournies, mails elle ne seraient pas conformees aux specifications.
NOTA: Die Teile mit einem (*) sind geliefert (mogen geliefert sein), aber sie mögen nicht auf Voranschlagen passen.

WIRE COLOR

B	Black
Bl	Blue
Br	Brown
G	Green
Gr	Gray
Lbl	Light blue
Lg	Light green
O	Orange
R	Red
W	White
Y	Yellow
P	Pink
V	Violet
B/Bl	Black with Blue tracer
B/G	Black with Green tracer
B/R	Black with Red tracer
B/W	Black with White tracer
B/Y	Black with Yellow tracer
Bl/B	Blue with Black tracer
Bl/G	Blue with Green tracer
Bl/R	Blue with Red tracer
Bl/W	Blue with White tracer
Bl/Y	Blue with Yellow tracer
Br/B	Brown with Black tracer
Br/R	Brown with Red tracer
Br/W	Brown with White tracer
Br/Y	Brown with Yellow tracer
G/B	Green with Black tracer
G/Bl	Green with Blue tracer
G/R	Green with Red tracer
G/W	Green with White tracer
G/Y	Green with Yellow tracer
Gr/B	Gray with Black tracer
Gr/W	Gray with White tracer
Gr/R	Gray with Red tracer
Gr/Y	Gray with Yellow tracer
Lg/B	Light green with Black tracer
Lg/R	Light green with Red tracer
Lg/W	Light green with White tracer
Lg/Y	Light green with Yellow tracer
O/B	Orange with Black tracer
O/Bl	Orange with Blue tracer
O/G	Orange with Green tracer
O/R	Orange with Red tracer
O/W	Orange with White tracer
O/Y	Orange with Yellow tracer
P/B	Pink with Black tracer
P/Bl	Pink with Blue tracer
P/G	Pink with Green tracer
V/G	Violet with Green tracer
V/W	Violet with White tracer
V/Y	Violet with Yellow tracer
R/B	Red with Black tracer
R/Bl	Red with Blue tracer
R/G	Red with Green tracer
R/W	Red with White tracer
R/Y	Red with Yellow tracer
W/B	White with Black tracer
W/Bl	White with Blue tracer
W/G	White with Green tracer
W/R	White with Red tracer
W/Y	White with Yellow tracer
Y/B	Yellow with Black tracer
Y/Bl	Yellow with Blue tracer
Y/G	Yellow with Green tracer
Y/R	Yellow with Red tracer
Y/W	Yellow with White tracer

CODE DES COULEURS

KABELFARBEN



WIRING DIAGRAM FOR FUEL INJECTION MODEL

1-7 OTHER SPEC. VEHICLE WITH M/T

NOTE:
- The part with (*) are provided or not depending on specifications.
- ------ : Except Australian market

REMARQUE:
- Les pièces marquées d'un (*) sont (seraient) fournies, mais elles ne seraient pas conformées aux spécifications.
- — — — : Seul L'Australie

NOTA:
- Die Teile mit einem (*) sind geliefert (mögen geliefert sein), aber sie mögen nicht auf Vorschlagen passen.
- —·—·— : Australien ausgenommen

WIRE COLOR

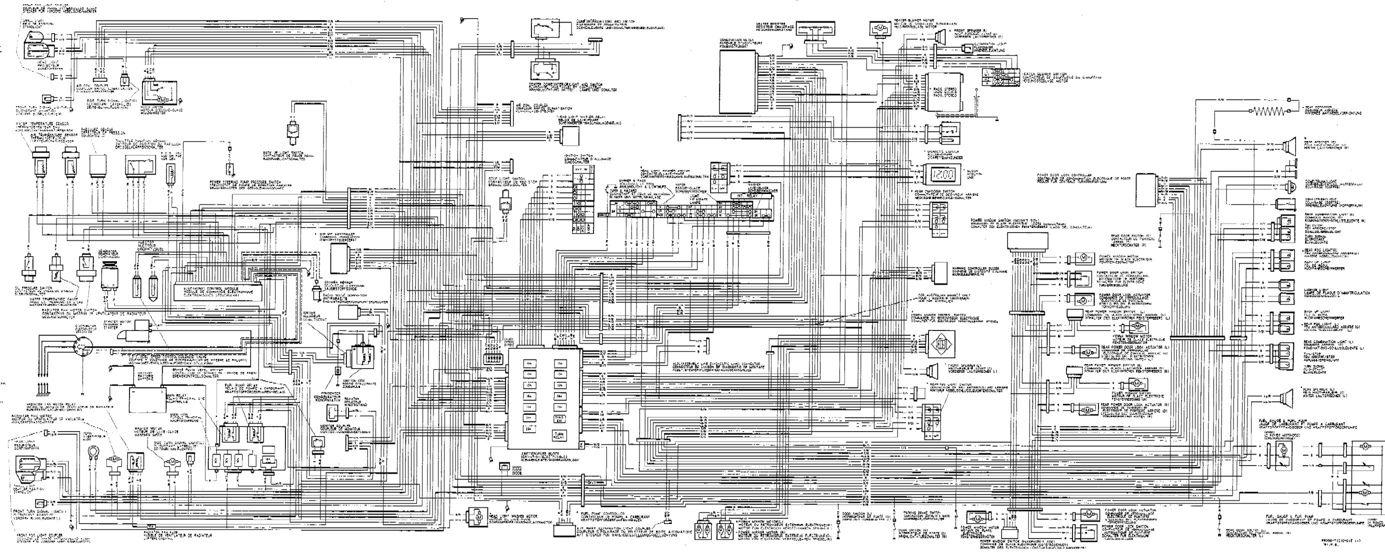
B	: Black	Gr/R	: Gray with Red tracer
Bl	: Blue	Gr/Y	: Gray with Yellow tracer
Br	: Brown	Lg/B	: Light green with Black tracer
G	: Green	Lg/R	: Light green with Red tracer
Gr	: Gray	Lg/W	: Light green with White tracer
Lbl	: Light blue	Lg/Y	: Light green with Yellow tracer
Lg	: Light green	O/B	: Orange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

CODE DES COULEURS

B	: Noir	Gr/R	: Gris avec filet rouge
Bl	: Bleu	Gr/Y	: Gris avec filet jaune
Br	: Brun	Lg/B	: Vert clair avec filet noir
G	: Vert	Lg/R	: Vert clair avec filet rouge
Gr	: Gris	Lg/W	: Vert clair avec filet blanc
Lbl	: Bleu clair	Lg/Y	: Vert clair avec filet jaune
Lg	: Vert clair	O/B	: Orange avec filet noir
O	: Orange	O/Bl	: Orange avec filet bleu
R	: Rouge	O/G	: Orange avec filet vert
W	: Blanc	O/R	: Orange avec filet rouge
Y	: Jaune	O/W	: Orange avec filet blanc
P	: Rose	O/Y	: Orange avec filet jaune
V	: Violet	P/B	: Rose avec filet noir
B/Bl	: Noir avec filet bleu	P/Bl	: Rose avec filet bleu
B/G	: Noir avec filet vert	P/G	: Rose avec filet vert
B/R	: Noir avec filet rouge	V/G	: Violet avec filet vert
B/W	: Noir avec filet blanc	V/W	: Violet avec filet blanc
B/Y	: Noir avec filet jaune	V/Y	: Violet avec filet jaune
Bl/B	: Bleu avec filet noir	R/B	: Rouge avec filet noir
Bl/G	: Bleu avec filet vert	R/Bl	: Rouge avec filet bleu
Bl/R	: Bleu avec filet rouge	R/G	: Rouge avec filet vert
Bl/W	: Bleu avec filet blanc	R/W	: Rouge avec filet blanc
Bl/Y	: Bleu avec filet jaune	R/Y	: Rouge avec filet jaune
Br/B	: Brun avec filet noir	W/B	: Blanc avec filet noir
Br/R	: Brun avec filet rouge	W/Bl	: Blanc avec filet bleu
Br/W	: Brun avec filet blanc	W/G	: Blanc avec filet vert
Br/Y	: Brun avec filet jaune	W/R	: Blanc avec filet rouge
G/B	: Vert avec filet noir	W/Y	: Blanc avec filet jaune
G/Bl	: Vert avec filet bleu	Y/B	: Jaune avec filet noir
G/R	: Vert avec filet rouge	Y/Bl	: Jaune avec filet bleu
G/W	: Vert avec filet blanc	Y/G	: Jaune avec filet vert
G/Y	: Vert avec filet jaune	Y/R	: Jaune avec filet rouge
Gr/B	: Gris avec filet noir	Y/W	: Jaune avec filet blanc
Gr/W	: Gris avec filet blanc		

KABELFARBEN

B	: Schwarz	Gr/R	: Grau mit rotem Streifen
Bl	: Blau	Gr/Y	: Grau mit gelbem Streifen
Br	: Braun	Lg/B	: Hellgrün mit schwarzem Streifen
G	: Grün	Lg/R	: Hellgrün mit rotem Streifen
Gr	: Grau	Lg/W	: Hellgrün mit weißem Streifen
Lbl	: Hellblau	Lg/Y	: Hellgrün mit gelbem Streifen
Lg	: Hellgrün	O/B	: Orange mit schwarzem Streifen
O	: Orange	O/Bl	: Orange mit blauem Streifen
R	: Rot	O/G	: Orange mit grünem Streifen
W	: Weiß	O/R	: Orange mit rotem Streifen
Y	: Gelb	O/W	: Orange mit weißem Streifen
P	: Rosa	O/Y	: Orange mit gelbem Streifen
V	: Lila	P/B	: Rosa mit schwarzem Streifen
B/Bl	: Schwarz mit blauem Streifen	P/Bl	: Rosa mit blauem Streifen
B/G	: Schwarz mit grünem Streifen	P/G	: Rosa mit grünem Streifen
B/R	: Schwarz mit rotem Streifen	V/G	: Lila mit grünem Streifen
B/W	: Schwarz mit weißem Streifen	V/W	: Lila mit weißem Streifen
B/Y	: Schwarz mit gelbem Streifen	V/Y	: Lila mit gelbem Streifen
Bl/B	: Blau mit schwarzem Streifen	R/B	: Rot mit schwarzem Streifen
Bl/G	: Blau mit grünem Streifen	R/Bl	: Rot mit blauem Streifen
Bl/R	: Blau mit rotem Streifen	R/G	: Rot mit grünem Streifen
Bl/W	: Blau mit weißem Streifen	R/W	: Rot mit weißem Streifen
Bl/Y	: Blau mit gelbem Streifen	R/Y	: Rot mit gelbem Streifen
Br/B	: Braun mit schwarzem Streifen	W/B	: Weiß mit schwarzem Streifen
Br/R	: Braun mit rotem Streifen	W/Bl	: Weiß mit blauem Streifen
Br/W	: Braun mit weißem Streifen	W/G	: Weiß mit grünem Streifen
Br/Y	: Braun mit gelbem Streifen	W/R	: Weiß mit rotem Streifen
G/B	: Grün mit schwarzem Streifen	W/Y	: Weiß mit gelbem Streifen
G/Bl	: Grün mit blauem Streifen	Y/B	: Gelb mit schwarzem Streifen
G/R	: Grün mit rotem Streifen	Y/Bl	: Gelb mit blauem Streifen
G/W	: Grün mit weißem Streifen	Y/G	: Gelb mit grünem Streifen
G/Y	: Grün mit gelbem Streifen	Y/R	: Gelb mit rotem Streifen
Gr/B	: Grau mit schwarzem Streifen	Y/W	: Gelb mit weißem Streifen
Gr/W	: Grau mit weißem Streifen		



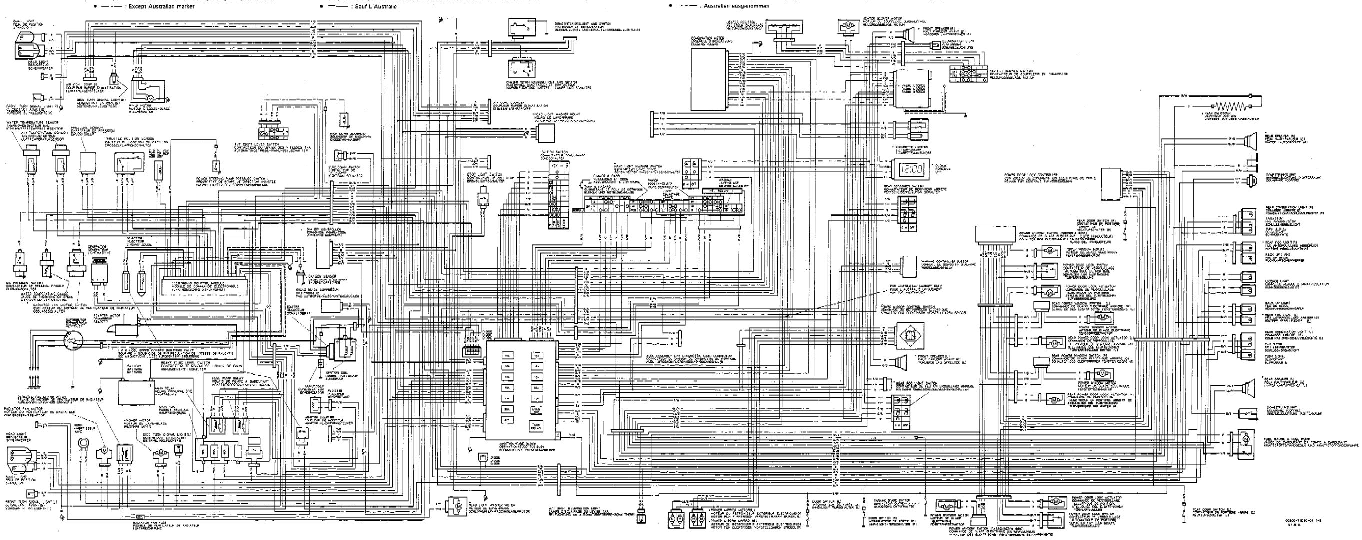
WIRING DIAGRAM FOR FUEL INJECTION MODEL

1-8 OTHER SPEC. VEHICLE WITH A/T

NOTE:
- The part with (*) are provided or not depending on specifications.
- — - — : Except Australian market

REMARQUE:
- Les pièces marquées d'un (*) sont (seraient) fournies, mais elle ne seraient pas conformées aux specifications.
- — - — : Sauf L'Australie

NOTA:
- Die Teile mit einem (*) sind geliefert (mögen geliefert sein), aber sie mogen nicht auf Voranschlagen passen.
- - - - — : Australien ausgenommen



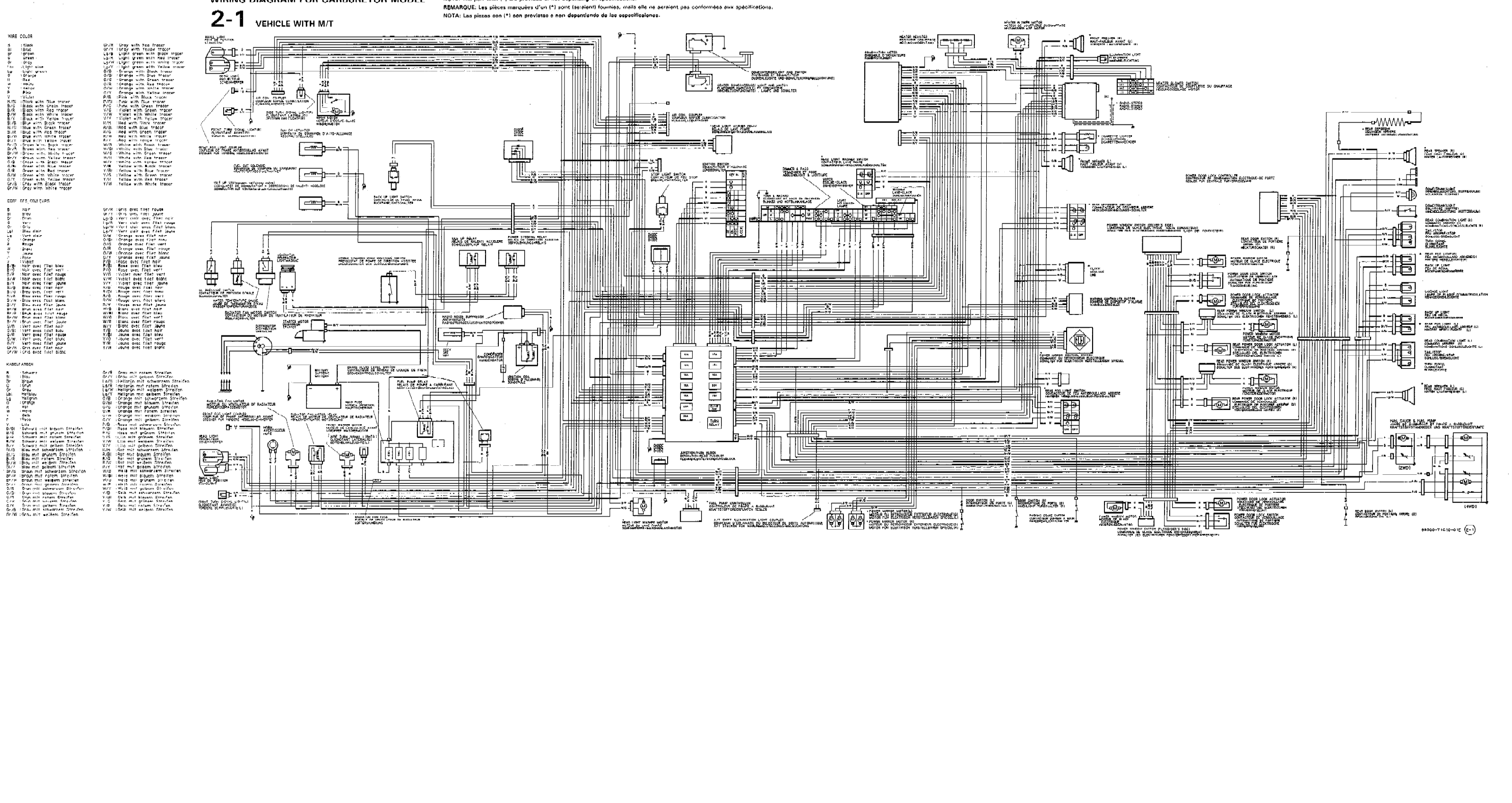
WIRING DIAGRAM FOR CARBURETOR MODEL

NOTE: The part with (*) are provided or not depending on specifications.

REMARQUE: Les pièces marquées d'un (*) sont (seraient) fournies, mails elle ne seraient pas conformées aux spécifications.

NOTA: Las piezas con (*) son provistas o non dependiendo de las especificaciones.

2-1 VEHICLE WITH M/T



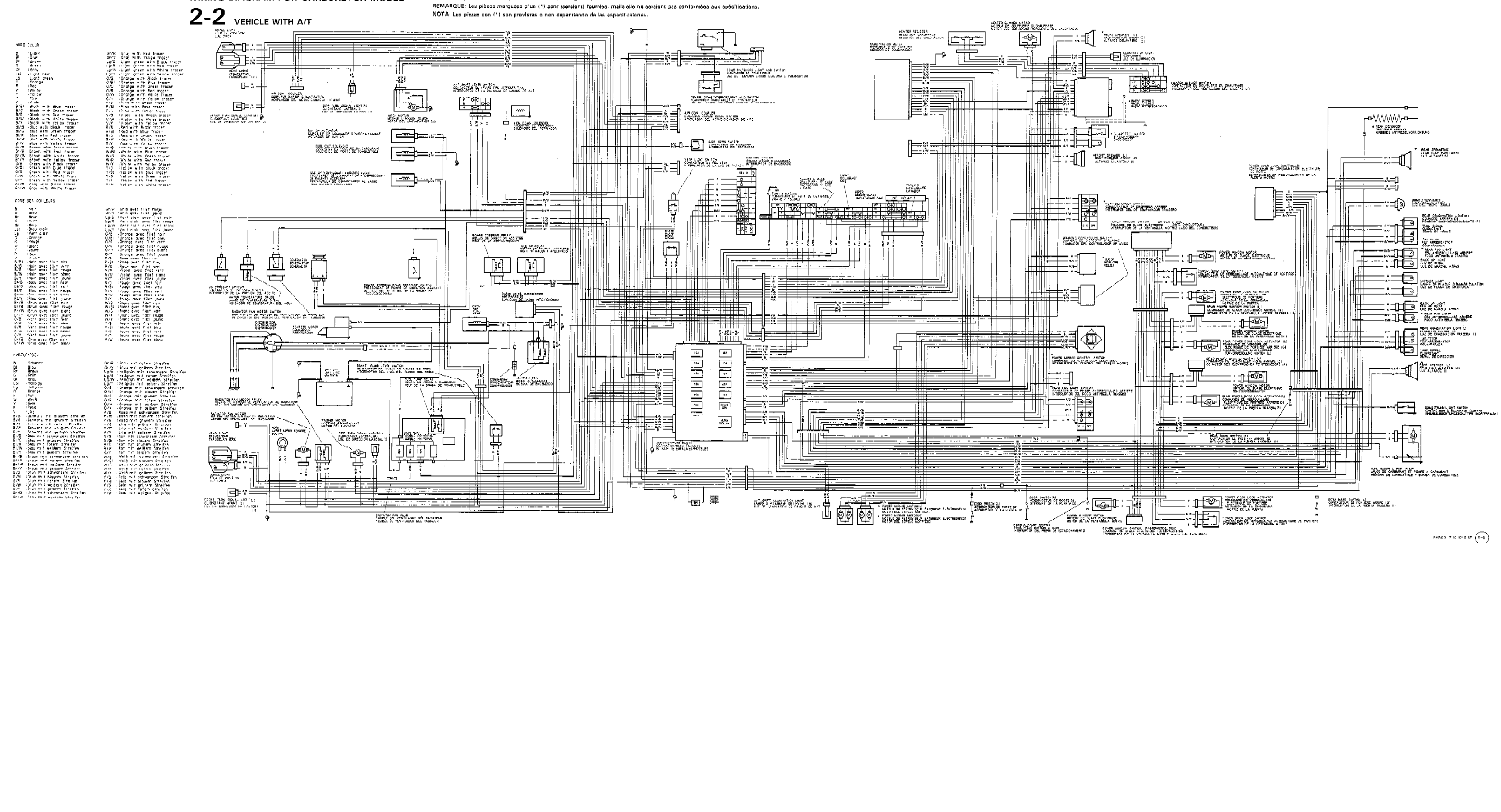
WIRING DIAGRAM FOR CARBURETOR MODEL

2-2 VEHICLE WITH A/T

NOTE: The part with (*) are provided or not depending on specifications.

REMARQUE: Les pièces marquées d'un (*) sont (seraient) fournies, mails elle ne seraient pas conformées aux spécifications.

NOTA: Las piezas con (*) son provistas o non dependiendo de las especificaciones.



Prepared by

SUZUKI MOTOR CORPORATION

TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

1st Ed. August, 1991

Printed in Japan

Printing: Feb. 1993 900

SUZUKI MOTOR CORPORATION

Printed in Japan (TK)