SUZUKI

SF413

SERVICE MANUAL

SUZUKI
Caring for Customers
99500-63B01-01E
(英)

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: GA, GL, GLX, GS

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.

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 publication approval. The right is reserved to make changes at any time without notice.

NOTE:

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

SUZUKI MOTOR CORPORATION

TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

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RELATED SERVICE MANUAL

MANUAL NAME	MANUAL NO.	APPLICABILITY
SF413 Supplementary Service Manual for Electronic Fuel injection model	99501-63B01	Vehicles before body Nos. listed below and also equipped with electronic fuel injection system.
SF413 Supplementary Service Manual for Sedan	99501-63B10	Sedan type vehicles before body Nos. listed below.
SF413 Supplementary Service Manual for 4WD model	99501-63B20	Vehicles before body Nos. listed below and also equipped with 4WD system.
SF413 Supplementary Service Manual	99501-63B30	All models (hatch back, sedan, 4WD and electronic fuel injection models) of and after body Nos. listed below. For European/Australian markets (X)JSAEAA35S00140001(X) (X)JSAEAB35S00140001(X) (X)JSAEAF35S00140001(X) (X)JSAEAH35S00140001(X) For Other markets AA34S-200001 AB34S-200001 AF34S-200001
NOTE: **If necessary information is not found in this supplement, refer to above supplements and SF413 Service Manual.**		
SF413 Supplementary Service Manual for Convertible	99501-63B40	Convertible
NOTE: **If necessary information is not found in this supplement, refer to above supplements and SF413 Service Manual.**		

NOTE:
For SF413GTi model, use SF413 GTi Service Manual.

SECTION 0A

GENERAL INFORMATION

CONTENTS

GENERAL INFORMATION

VEHICLE IDENTIFICATION

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

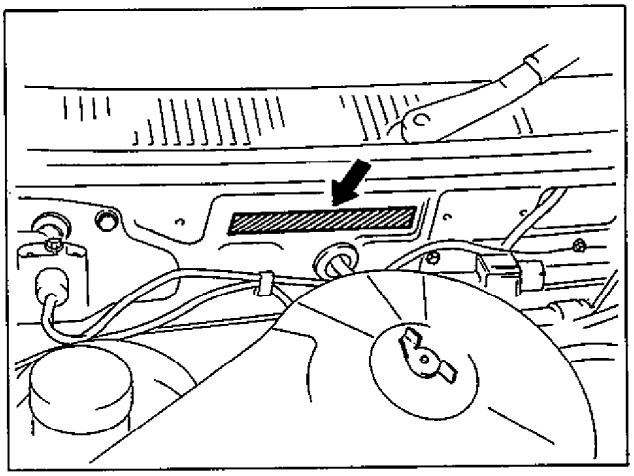
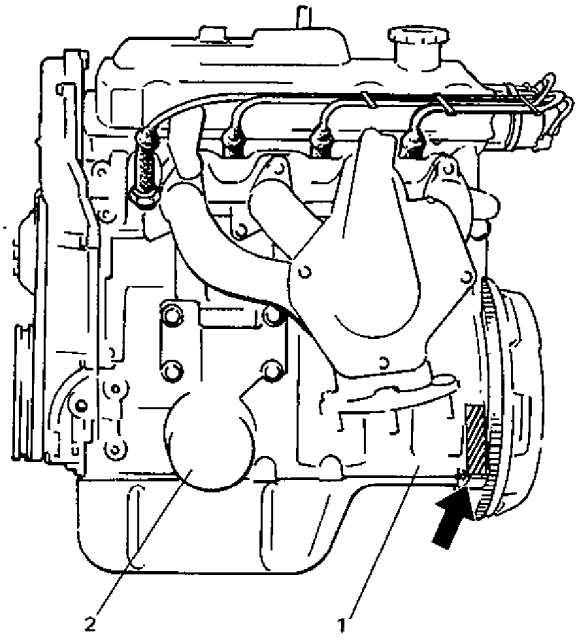


Fig. 0A-1 Vehicle Identification Number Location

ENGINE AND TRANSMISSION IDENTIFICATION

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

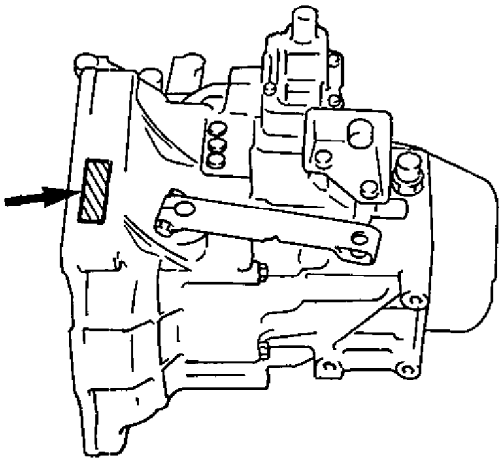
Engine Identification Number Location



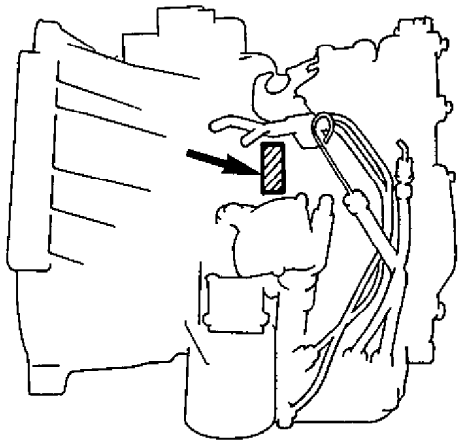
1. Cylinder block
2. Oil filter

Fig. 0A-2 Engine Identification Number Location

Transmission Identification Number Location



Manual Transmission



Automatic Transmission

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.

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.

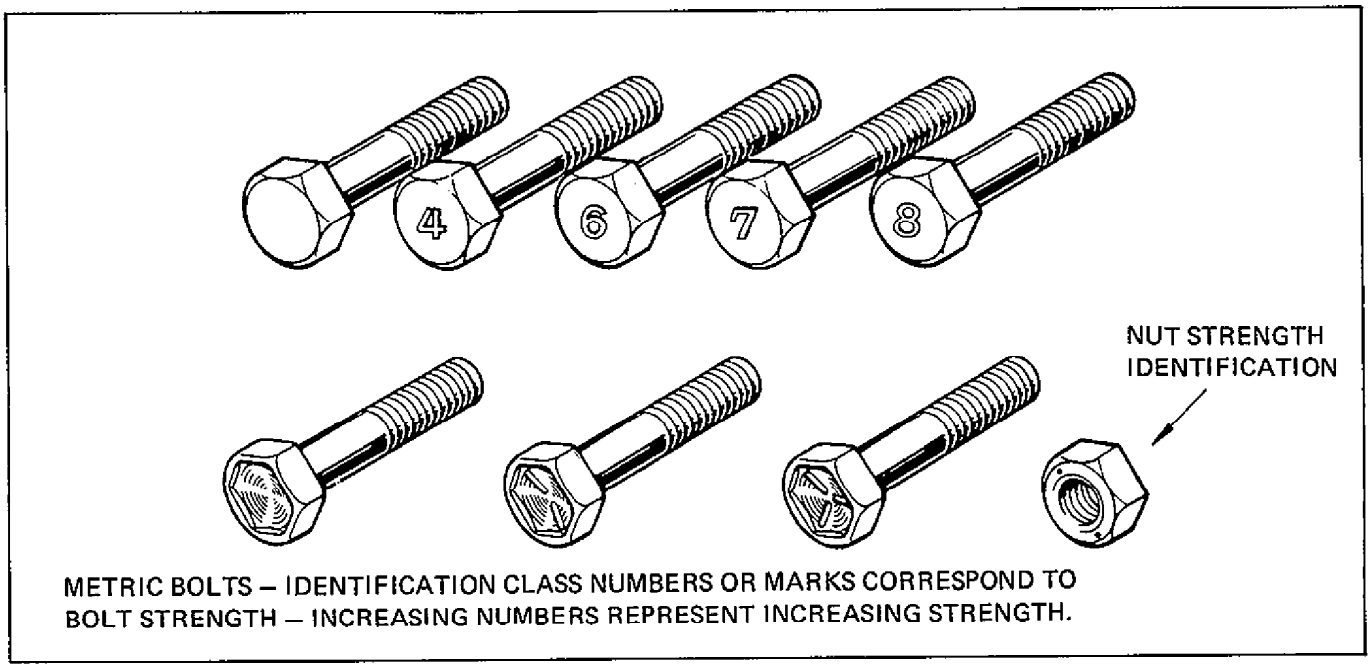


Fig. 0A-4 Bolt Strength Markings

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 below chart.**
- **The below chart is applicable only where the fastened parts are made of steel or light alloy.**

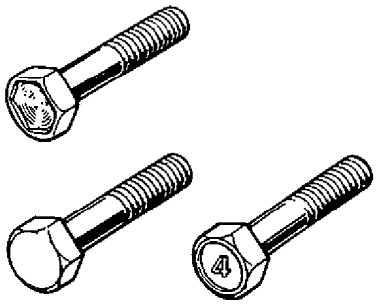
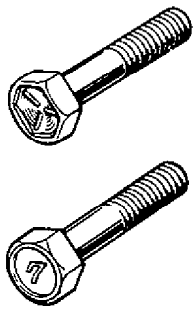
STRENGTH / THREAD DIAMETER (mm)	 Conventional bolt "4T" bolt			 "7T" bolt		
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
4	1 – 2	0.1 – 0.2	0.7 – 1.5	1.5 – 3.0	0.15 – 0.30	1.0 – 2.2
5	2 – 4	0.2 – 0.4	1.5 – 3.0	3 – 6	0.3 – 0.6	2.0 – 4.5
6	4 – 7	0.4 – 0.7	3.0 – 5.0	8 – 12	0.8 – 1.2	6.0 – 8.5
8	10 – 16	1.0 – 1.6	7.0 – 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:

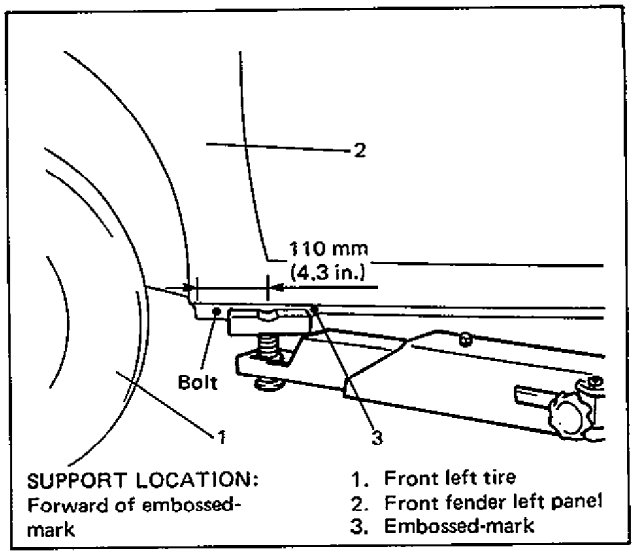


Fig. 0A-6 Front Support Location

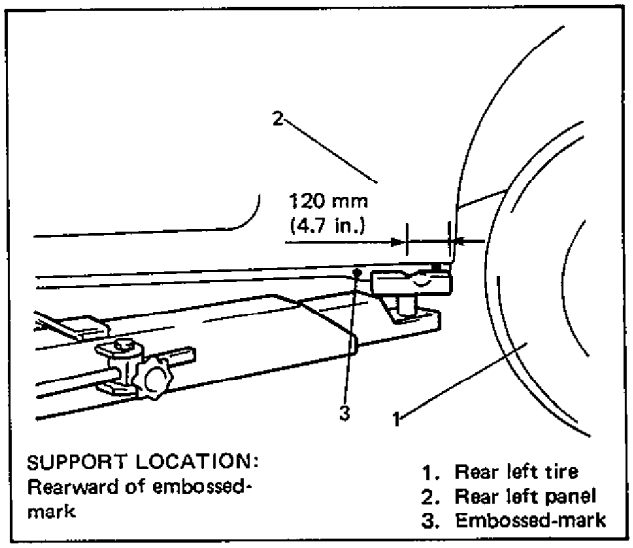


Fig. 0A-7 Rear Support Location

When using floor jack:

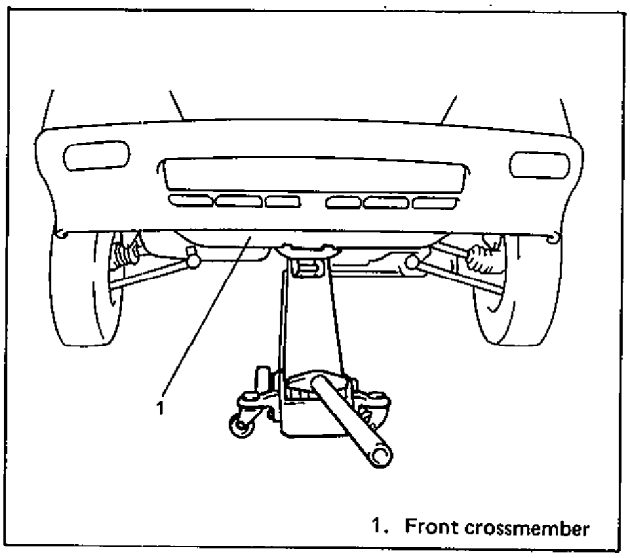


Fig. 0A-8 Front Support Location

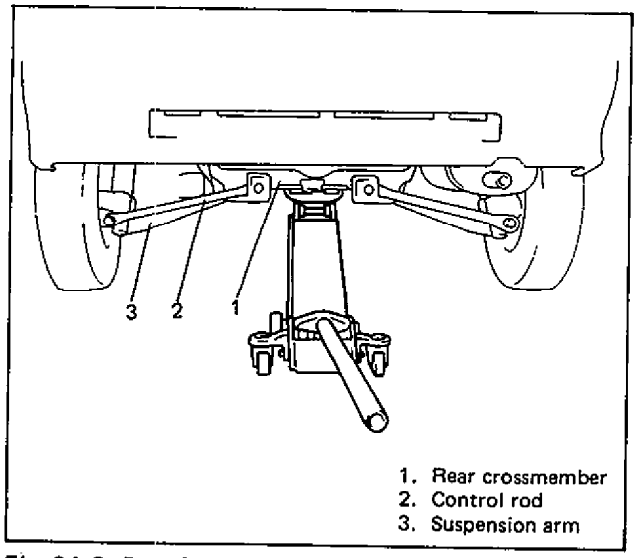


Fig. 0A-9 Rear Support Location

SECTION 0B

MAINTENANCE AND LUBRICATION

CONTENTS

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 Engine oil filter	API Grade SD, SE or SF	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 pipes and mountings (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. Carburetor choke system (if equipped)		–	–	–	I	–	–	–	I
3-2. Air cleaner filter element	Paved-road	–	–	–	R	–	–	–	R
	Dusty condition	Refer to "Severe Driving Condition" schedule							
3-3. Engine idle speed & idle mixture		(I)	I	–	I	–	I	–	I
3-4. Fuel tank, cap & lines (Deterioration, leakage, damage)		–	–	–	I	–	–	–	I
3-5. Fuel filter		–	–	–	*R	–	–	–	R
4. EMISSION CONTROL SYSTEM									
4-1. PCV (Positive Crankcase Ventiration) Valve		–	–	–	I	–	–	–	I
4-2. Charcoal canister .... (if equipped)		–	–	–	–	–	–	–	I
4-3. Fuel cut 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

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. Clutch (For manual transmission) pedal free travel		I	I	I	I	I	I	I	I
6-2. Tires/wheel discs (wear, damage, rotation)		I	I	I	I	I	I	I	I
6-3. Drive axle boots (breakage, damage)		I	I	I	I	I	I	I	I
6-4. Suspension system (Tightness, damage, rattle, breakage)		I	I	I	I	I	I	I	I
6-5. Steering system (tightness, damage, breakage, rattle)		I	I	I	I	I	I	I	I
6-6. Transmission oil (Manual) (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/shaft		I	I	I	I	I	I	I	I

NOTES:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

"L" : Lubricate

Item 3-3 (1) is applicable only to the 10,000 km inspection.

** This is a recommended maintenance item.*

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
F – Leaded fuel use

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
– – – – – F	Spark plugs	R	Every 10,000 km (6,000 miles) or 6 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

**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.

		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
Valve lash (gap A) specification	Intake	0.13 – 0.17 mm (0.0051 – 0.0067 in.)	0.23 – 0.27 mm (0.009 – 0.011 in.)
	Exhaust	0.16 – 0.20 mm (0.0063 – 0.0079 in.)	0.26 – 0.30 mm (0.0102 – 0.0118 in.)

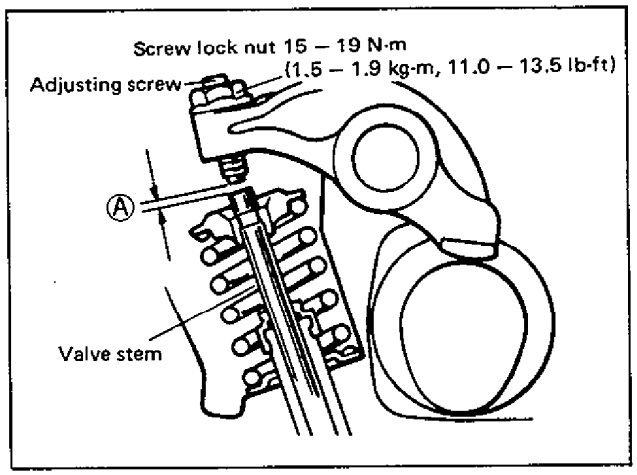


Fig. 0B-1-1

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.

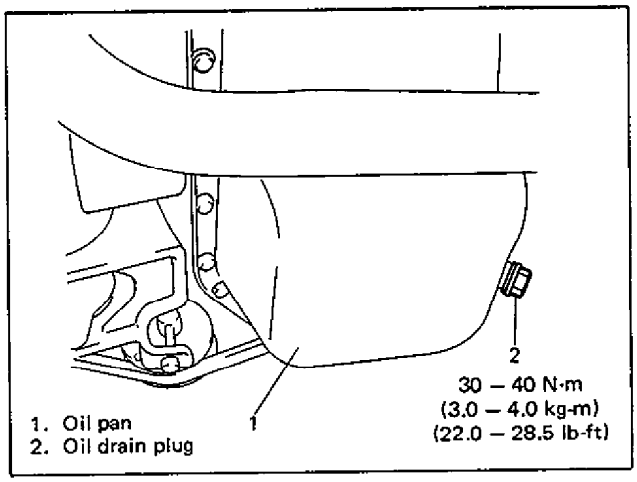


Fig. 0B-1-2

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

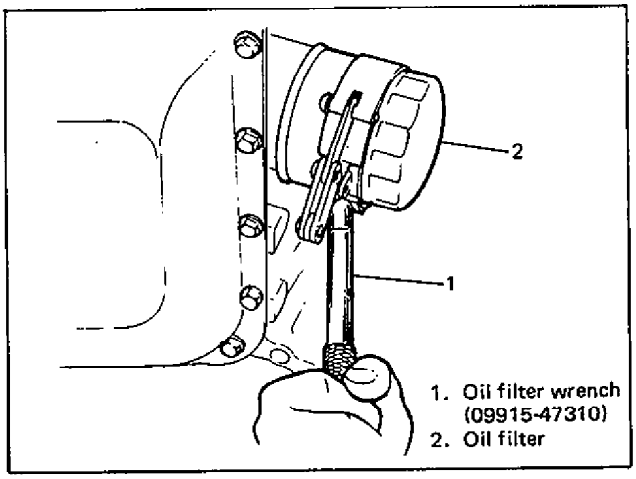


Fig. 0B-1-3

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.

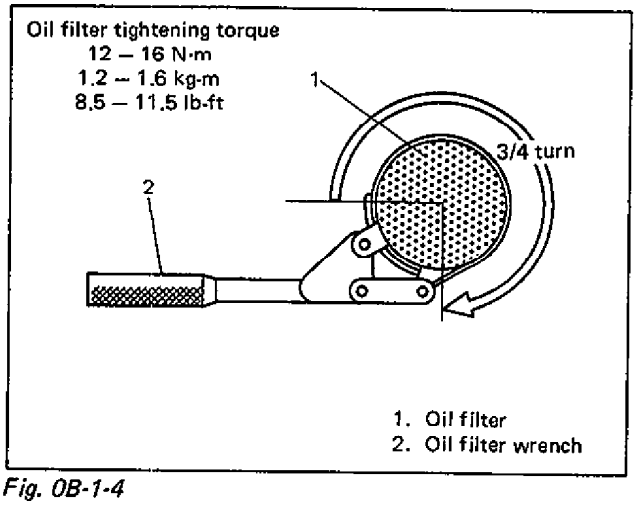


Fig. 0B-1-4

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.
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.

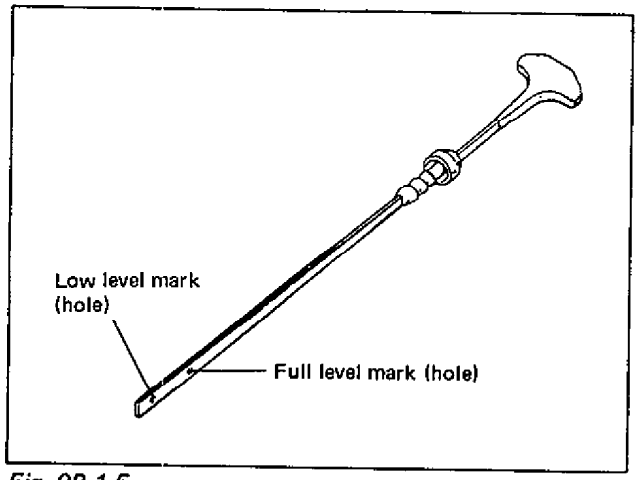


Fig. 0B-1-5

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.

It is recommended to use engine oil of SE, SF or SF/CC class.

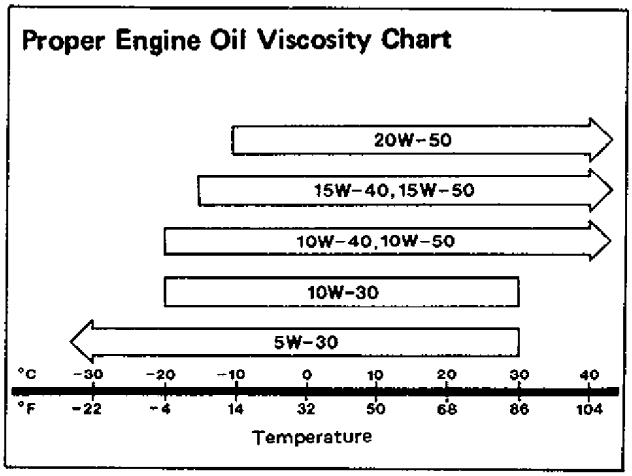


Fig. 0B-1-5-1

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.

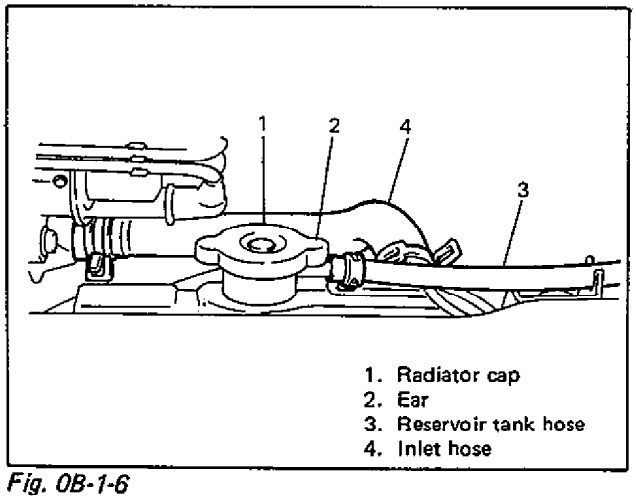


Fig. 0B-1-6

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/cm² (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.

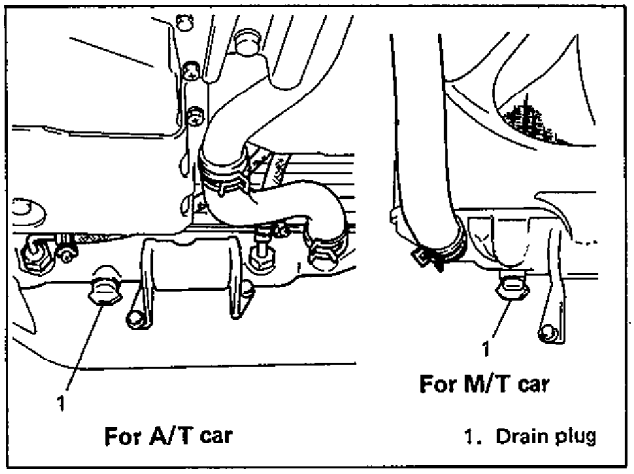


Fig. 0B-1-7

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.

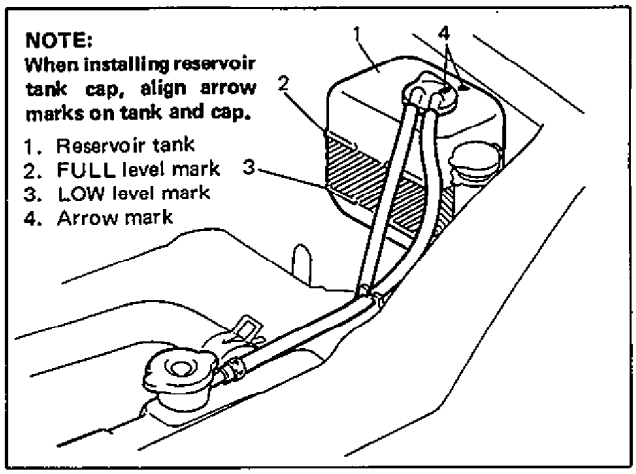


Fig. 0B-1-8

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 of this manual for COOLANT CAPACITY.

1-6
Exhaust Pipes and Mountings Inspection

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

When carrying out periodic maintenance, or 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 (p. 6K-2) 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 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.

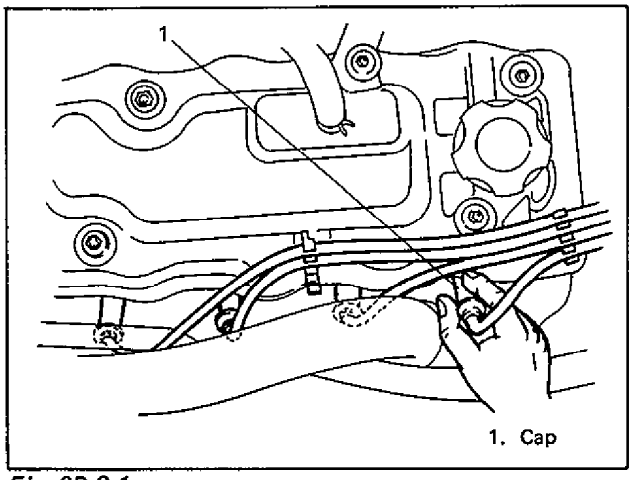


Fig. 0B-2-1

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

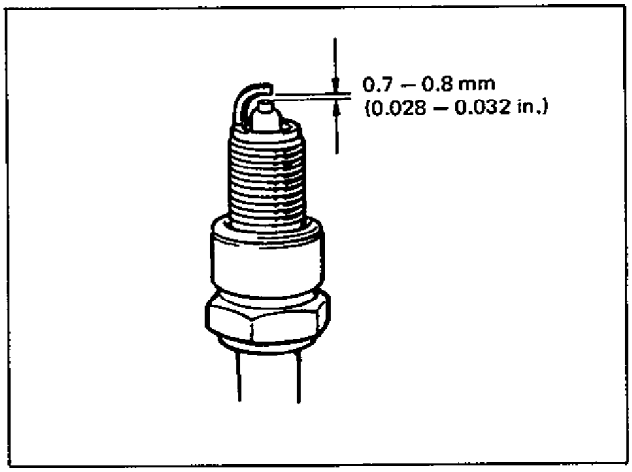


Fig. 0B-2-2

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

PLUG SPECIFICATION

Maker	Heat range Standard type
NGK	BP6ES (BPR6ES)
Nippon Denso	W20EP-U (W20EPR-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 as in parenthesis. 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.

Tightening torque for spark plug	N·m	kg-m	lb-ft
	25 – 30	2.5 – 3.0	18.0 – 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) 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 by using a circuit tester (special tool 09900-25002). Refer to p. 6F-3 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.

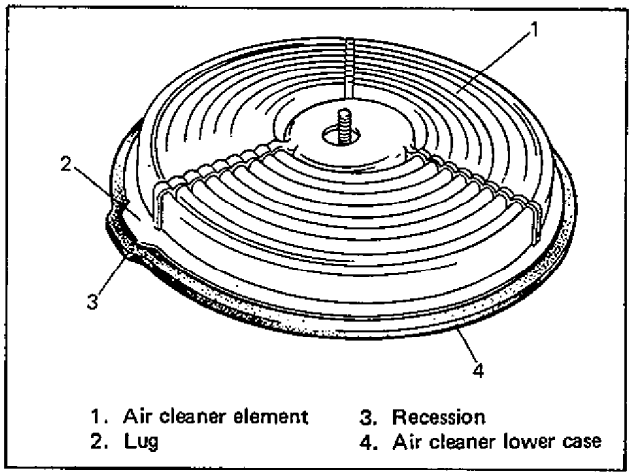
[Replacement]
1) Disconnect high tension cords from spark plugs, ignition coil and distributor.
2) Connect new high tension cords and clamp them securely. DO NOT push cords for connection. Push boots.

FUEL

3-1
Carburetor Choke System Inspection
1) Remove air cleaner case, and lubricate rotating parts.
2) Check choke for proper operation, referring to ON CAR SERVICE of SECTION 6D.

3-2
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.

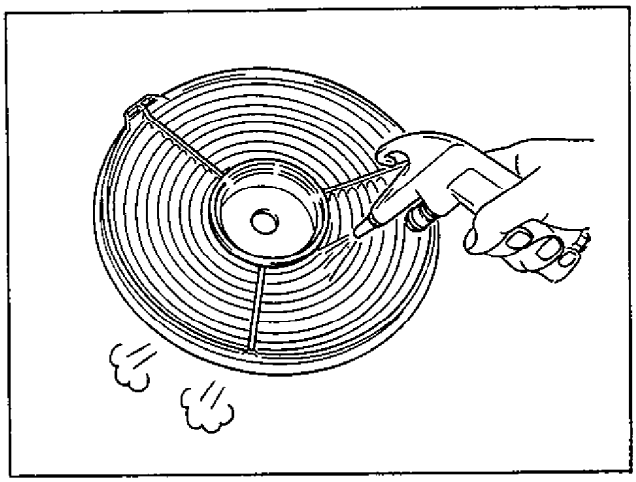


Fig. 0B-3-2

3-3
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 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.

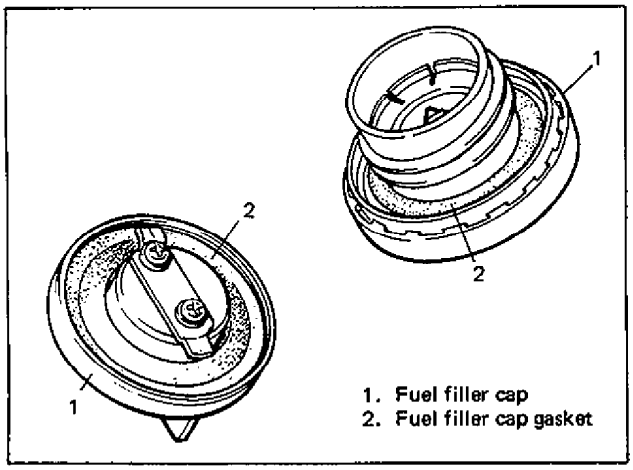


Fig. 0B-3-3

3-5
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.

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

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 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 for procedures to check charcoal canister.

4-3

Fuel Cut System Inspection

Check fuel cut system. Refer to ON CAR SERVICE of SECTION 6D and 6J for procedures to check fuel cut system.

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 p. 15 of SECTION 6J for inspection procedure.

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.

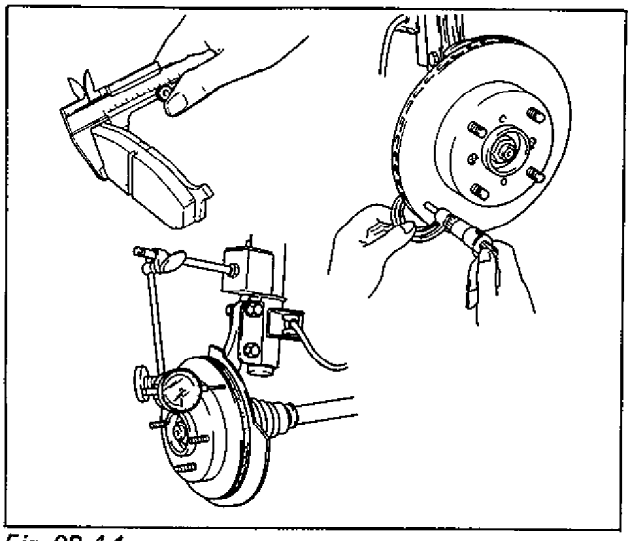


Fig. 0B-4-1

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.

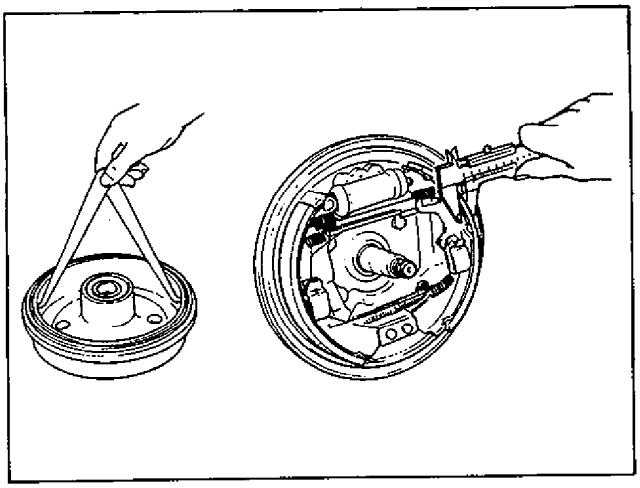


Fig. 0B-4-2

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.

Brake fluid	Specification
	DOT3 or SAE J1703

For the details, refer to ON-CAR SERVICE (page 5-48) 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. 5-19 and 5-20 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. 5-18) 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
Clutch Pedal Free Travel Inspection

Check clutch pedal free travel. Refer to SECTION 7C for procedure to check and adjust it.

6-2
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.

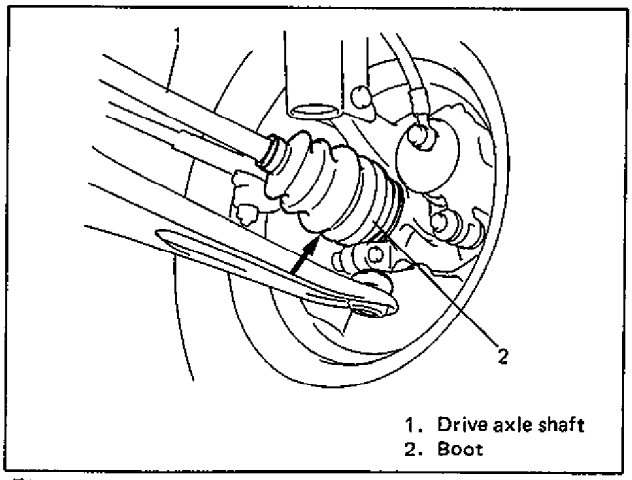
[Wheel Bearing Inspection]

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

6-3
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.

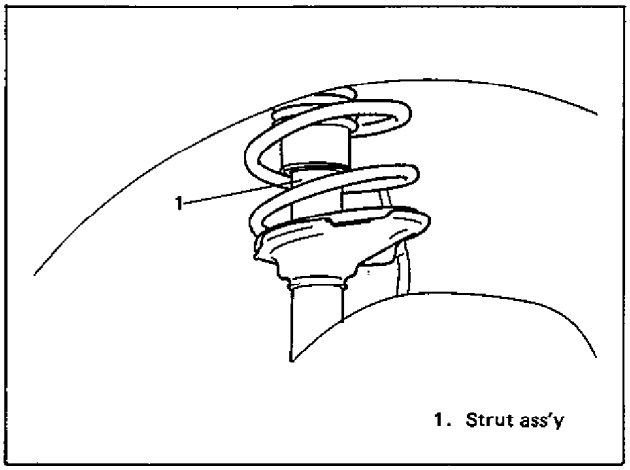


1. Drive axle shaft
2. Boot

Fig. 0B-5-1

6-4
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.



1. Strut ass'y

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.

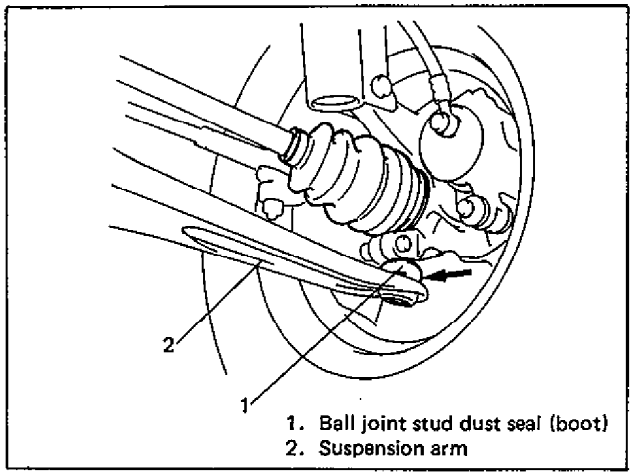


Fig. 0B-5-3

6-5
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.)

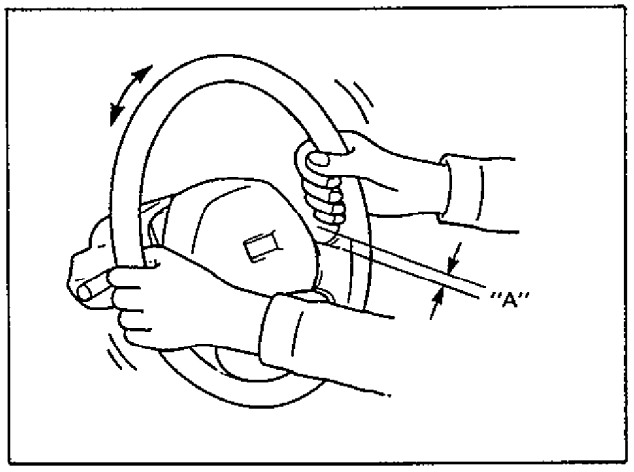


Fig. 0B-5-4

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.

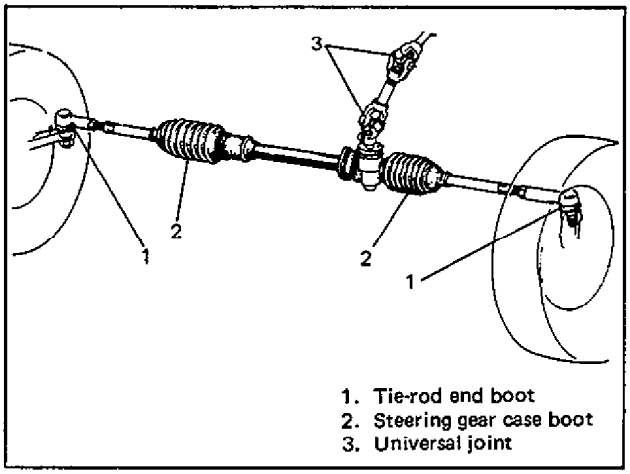


Fig. 0B-5-5

6-6
Transmission (Manual) 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 (p. 7A-7) 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 (p. 7A-7) 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, Gear Shift Control Lever and Shaft Lubrication
Wipe off dirt 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 shaft 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 YOUR 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, inverstigate 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 YOUR 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 or SF (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	Automatic transmission fluid DEXRON-II
Gear shift control lever and shaft	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Door hinges	Engine oil
Hood latch assembly	Engine oil
Key lock cylinder	Spray lubricant

Fig. 0B-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

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.

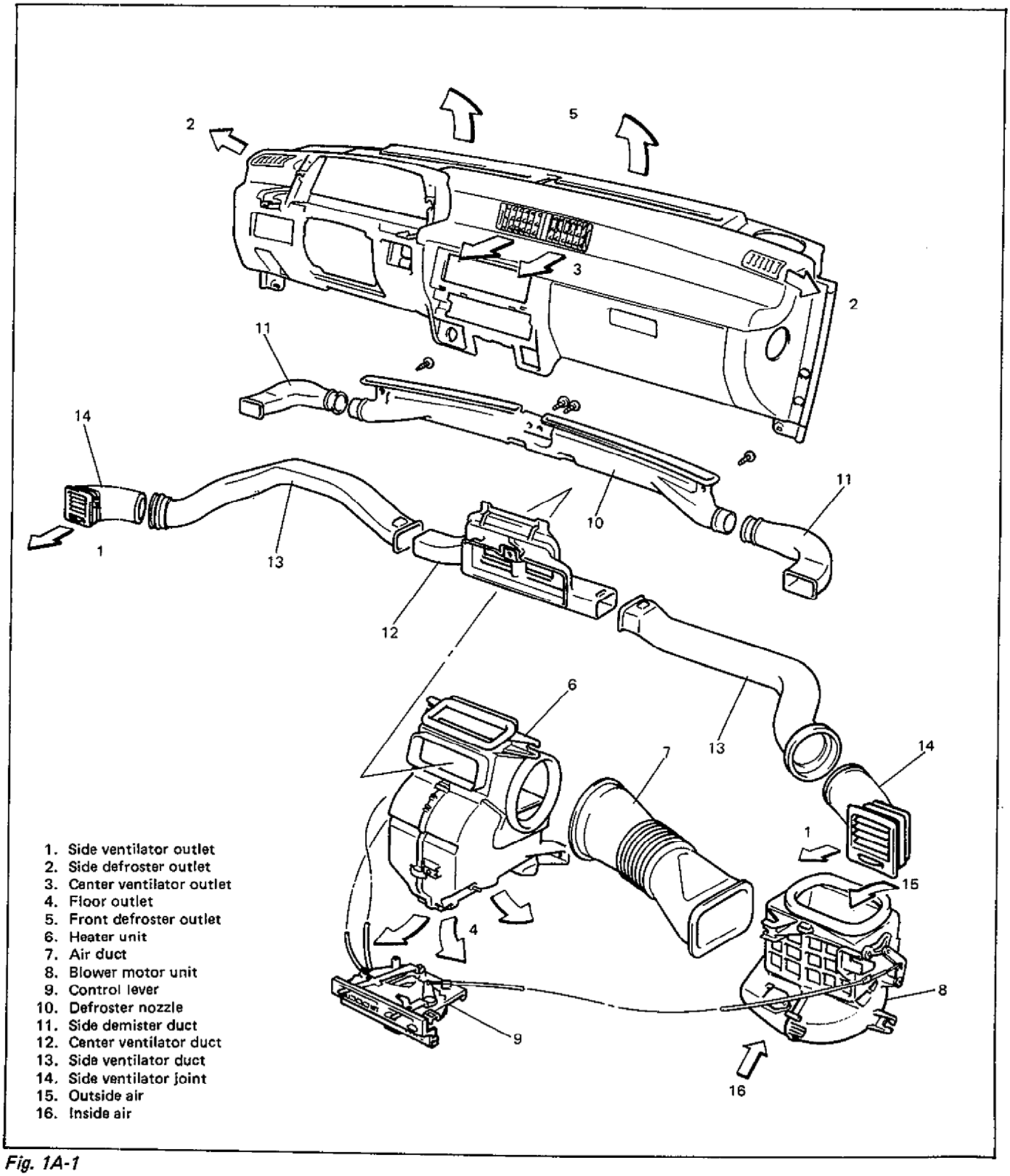
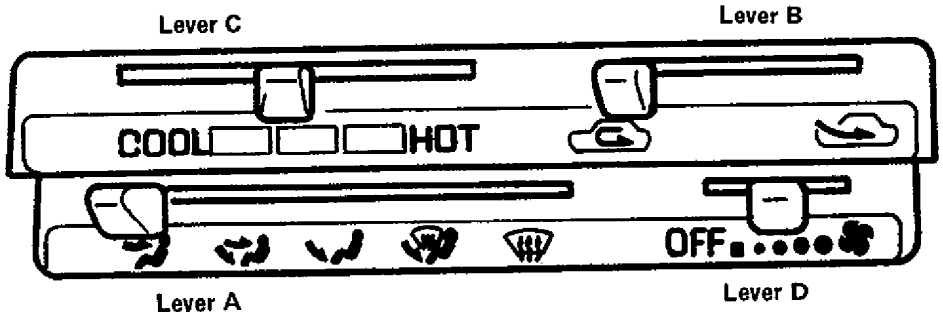


Fig. 1A-1

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

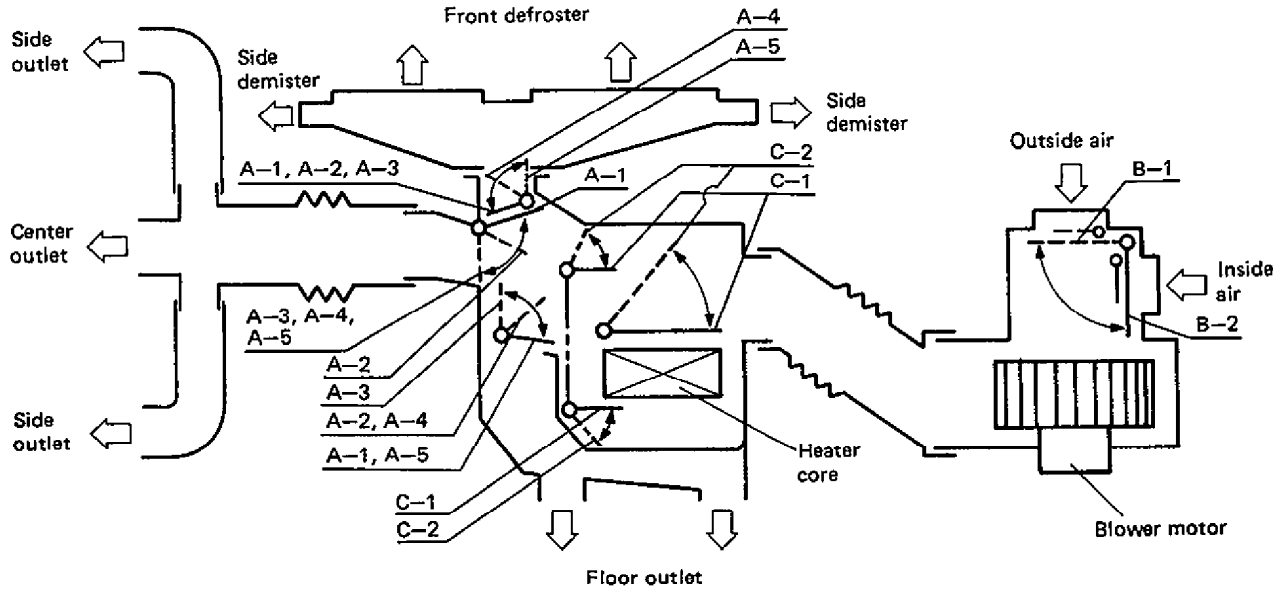


Fig. 1A-2

DIAGNOSIS

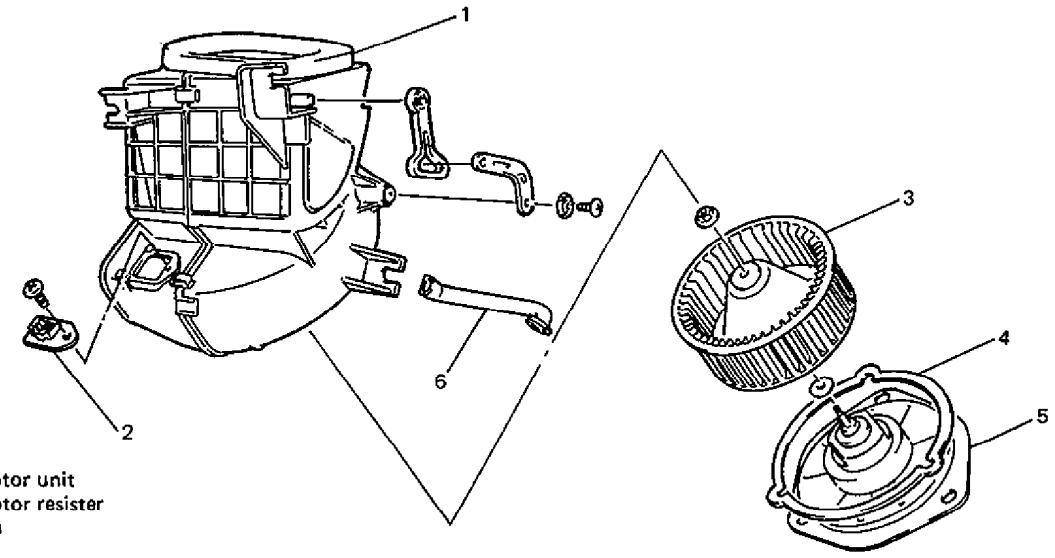
Trouble	Possible cause	Remedy
Heater blower won't work even when its switch is ON.	Blower fuse blown	Replace fuse to check for short.
	Blower register faulty	Check continuity.
	Blower motor faulty	Replace motor.
	Wiring or grounding faulty	Repair as necessary.
Incorrect temperature output	Control cables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

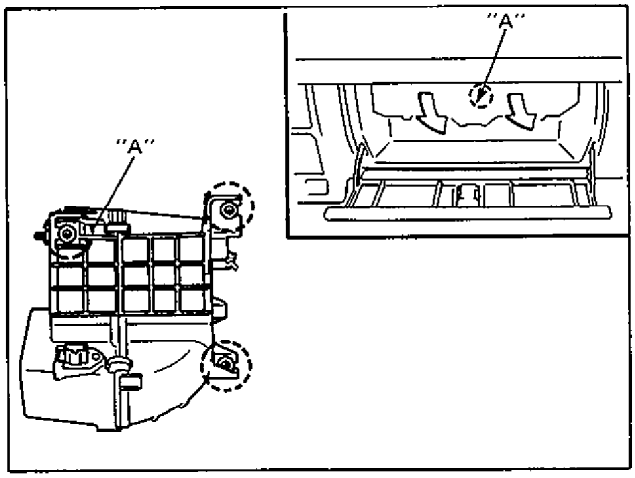


Fig. 1A-4

5) Remove blower motor.

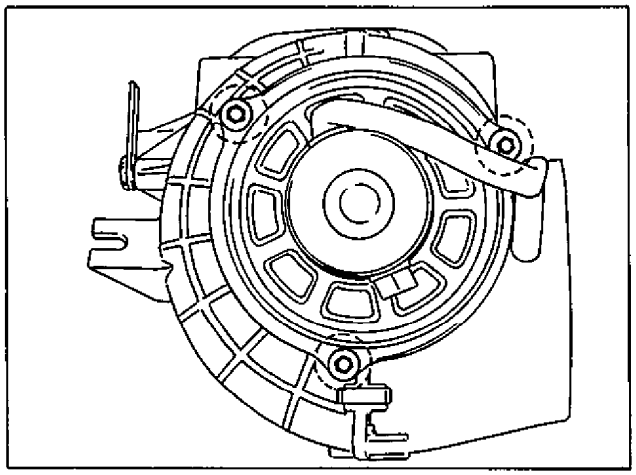


Fig. 1A-5

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.

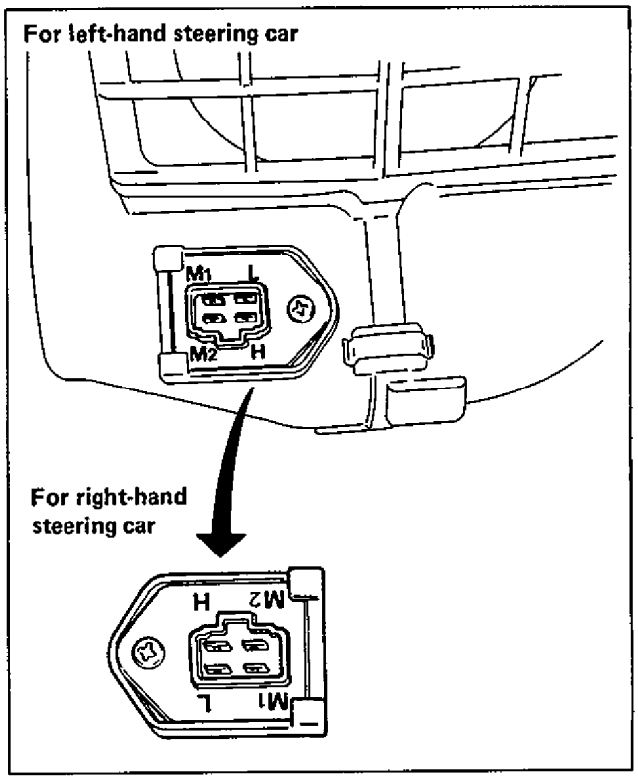


Fig. 1A-6

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.

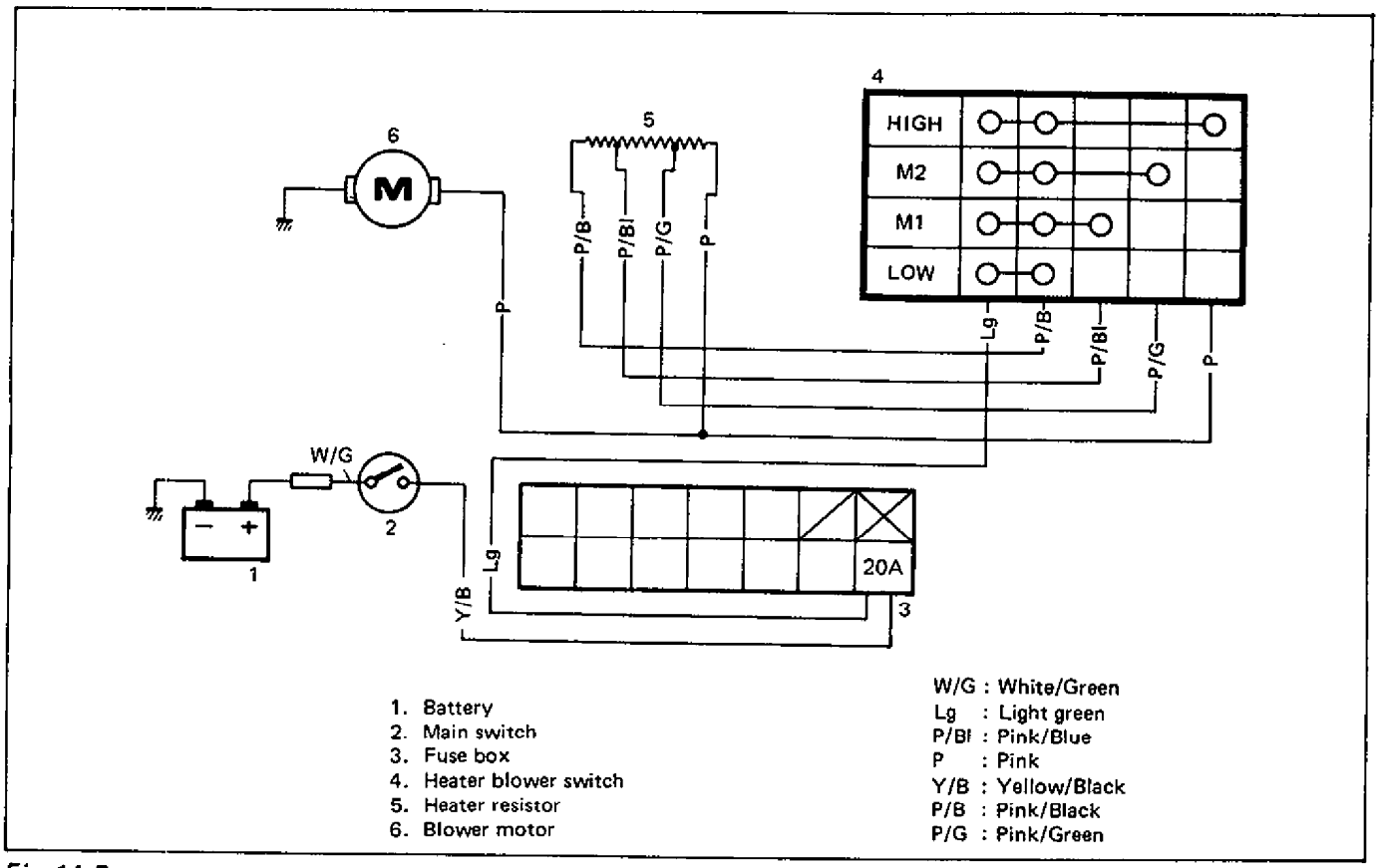


Fig. 1A-7

INSTALLATION

Install in the reverse order of removal.

HEATER CONTROL CABLES

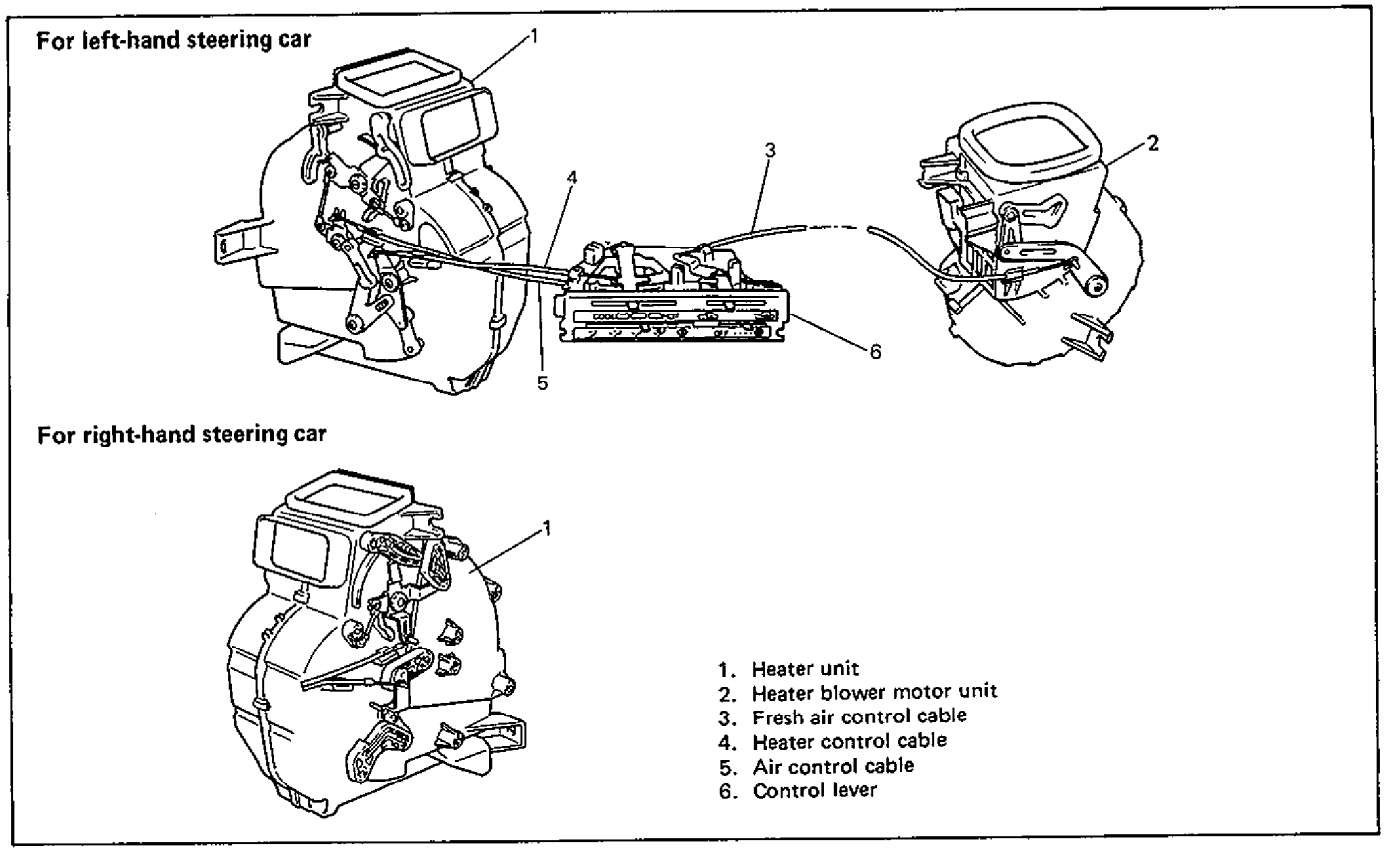


Fig. 1A-8

REMOVAL

1) Remove conslole box.
2) Remove ashtray and ashtray upper plate.
3) Remove cigarette lighter.
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.

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.

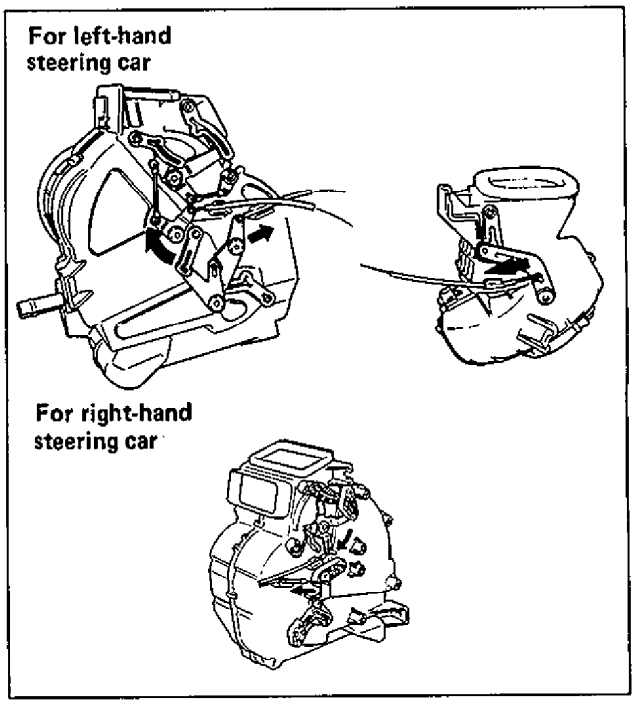
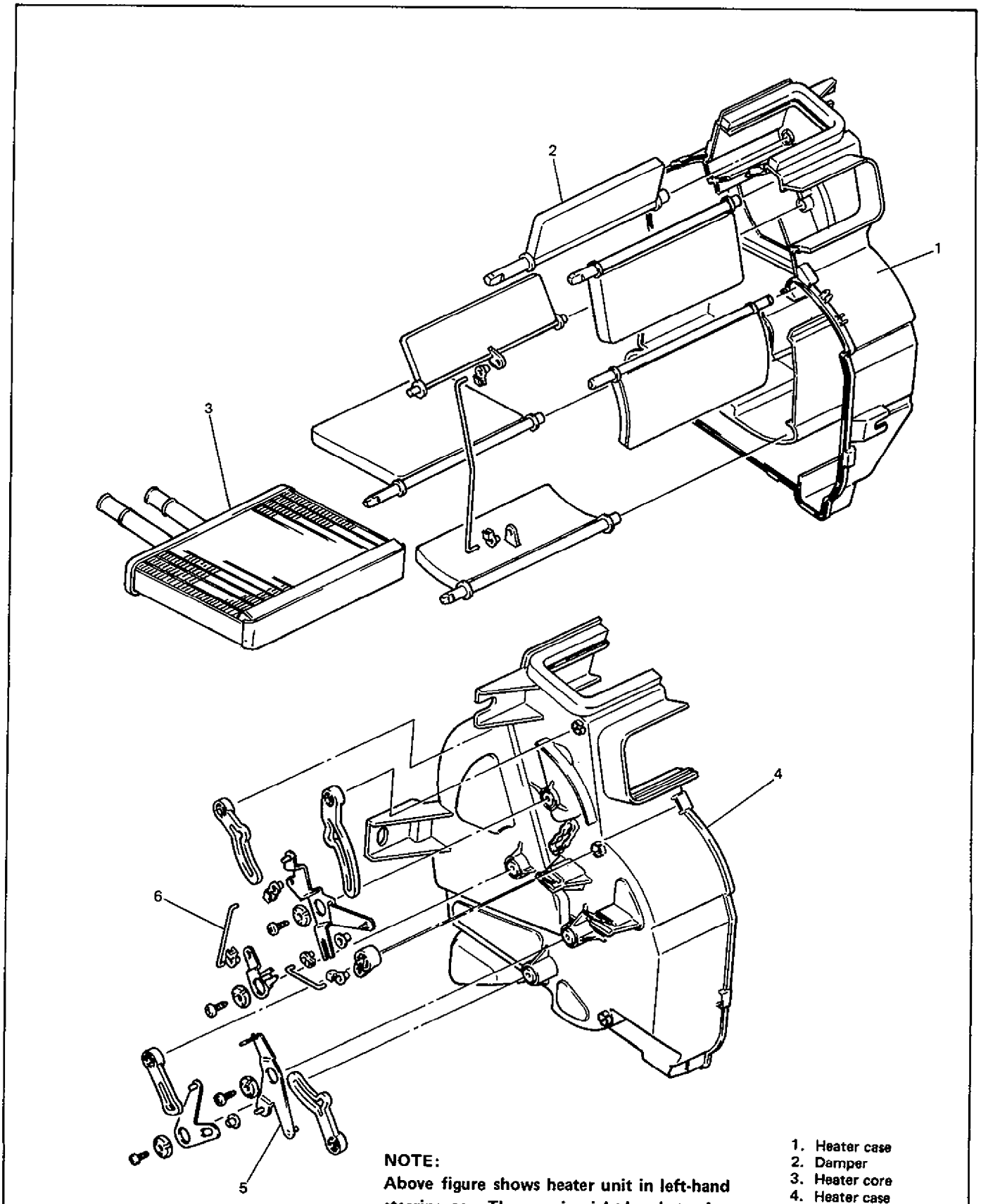


Fig. 1A-9

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 console box.
3) Disconnect wires and cables from heater and blower unit.
4) Remove steering wheel, steering column unit and steering joint upper bolt. (Refer to p. 3C-5)
5) Disconnect speedometer cable and remove speedometer ass'y.
6) Remove speaker garnish (R, L) and center cover.
7) Remove instrument panel member mounting bolts.
8) Remove instrument panel together with instrument panel member.

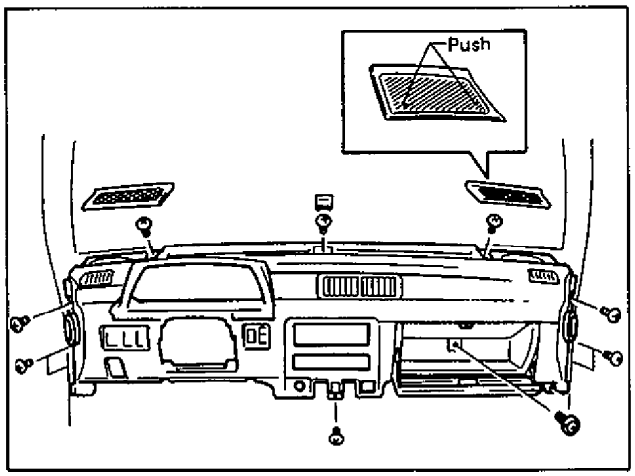


Fig. 1A-11

9) Remove heater unit.

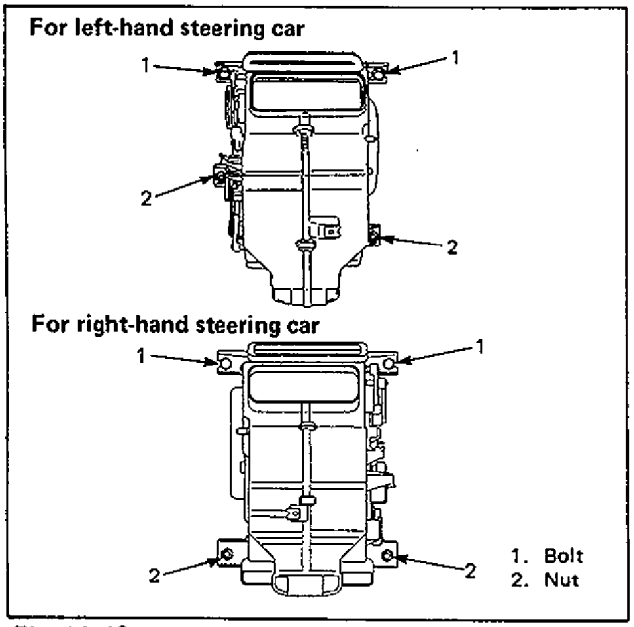


Fig. 1A-12

10) Remove heater unit clips and screws to separate heater unit.

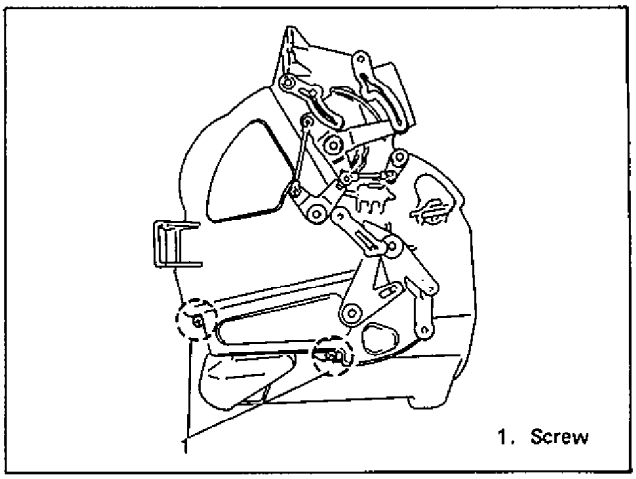


Fig. 1A-13

11) Pull out heater core from unit.

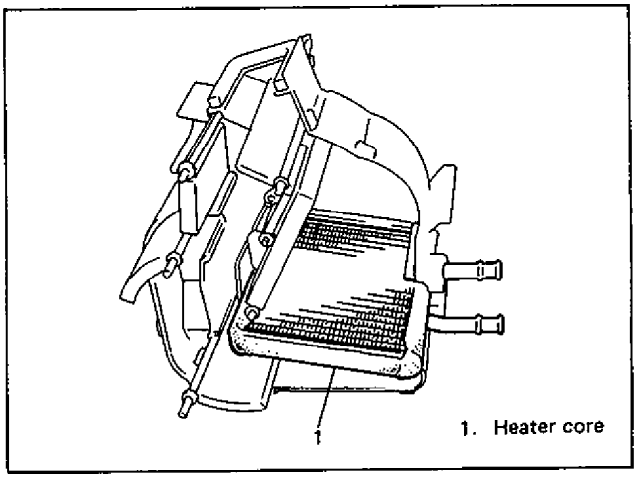


Fig. 1A-14

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.)**

SECTION 2

BUMPERS AND SHEET METAL

CONTENTS

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

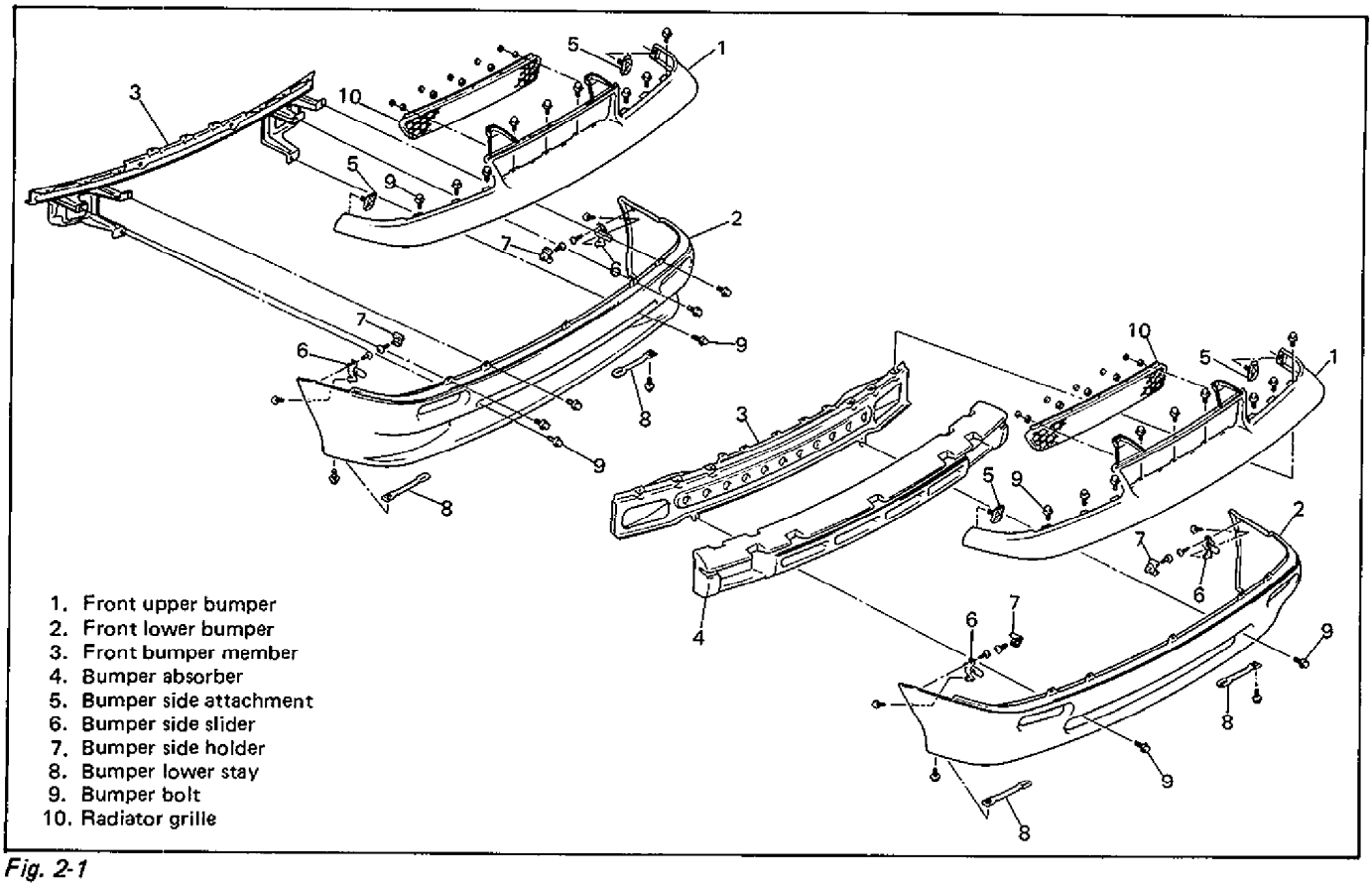


Fig. 2-1

REMOVAL

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

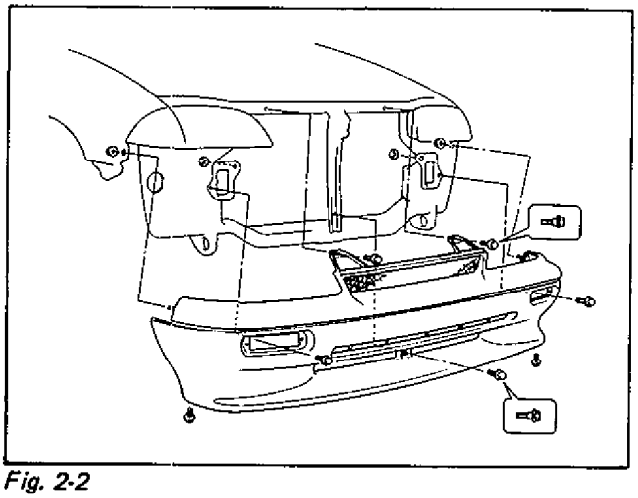


Fig. 2-2

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

INSTALLATION

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

REAR BUMPER

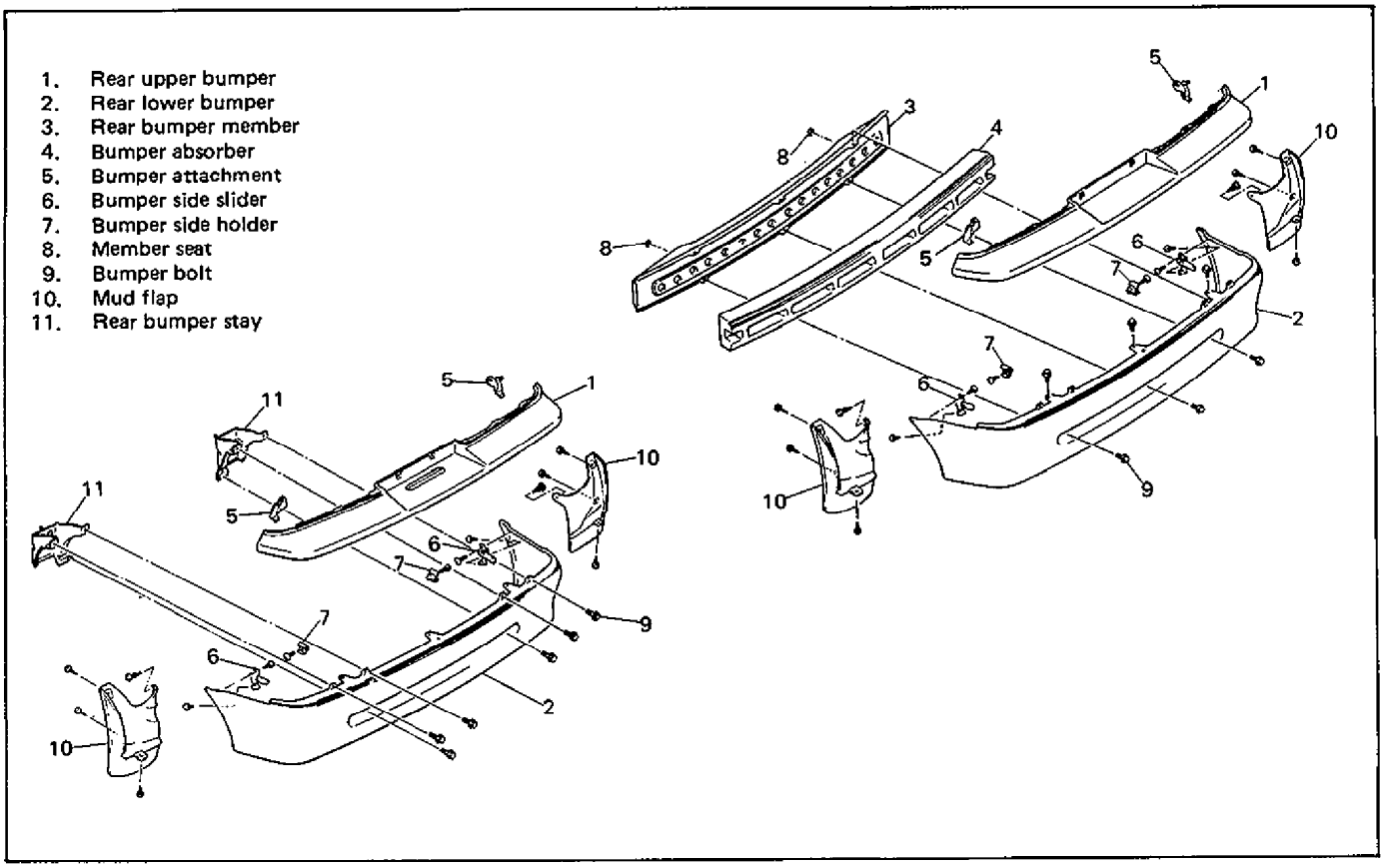


Fig. 2-3

REMOVAL

1) Remove rear combination light fitting screws and mud flaps,
2) Remove bumper fitting bolts and nuts shown in Fig. 2-4.

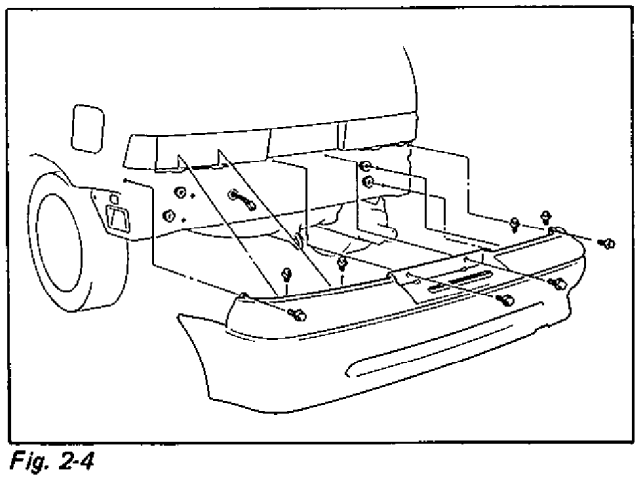


Fig. 2-4

3) Temporarily install rear combination lights in position with screws.
4) Slide bumper (with bumper member or stays) backward to remove it.
   If equipped with license and back up lights, disconnect coupler of these lights lead wire.

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.

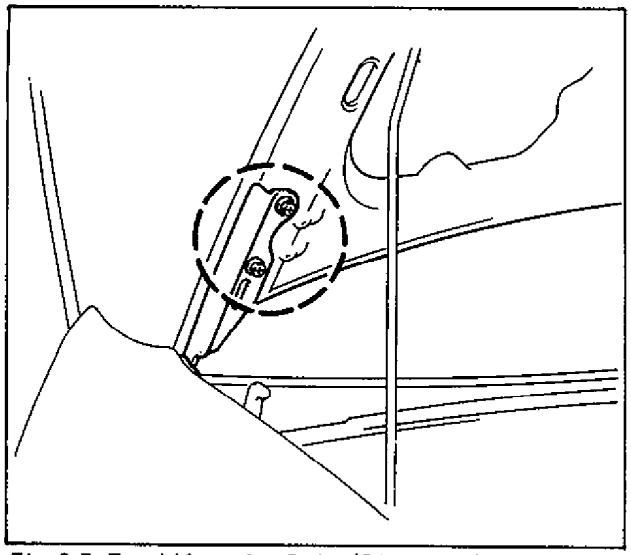


Fig. 2-5 Food Mounting Bolts (Right Side)

ADJUSTMENT

A. Fore-and-aft and right-and-left adjustment

Slacken four mounting bolts for adjustment.

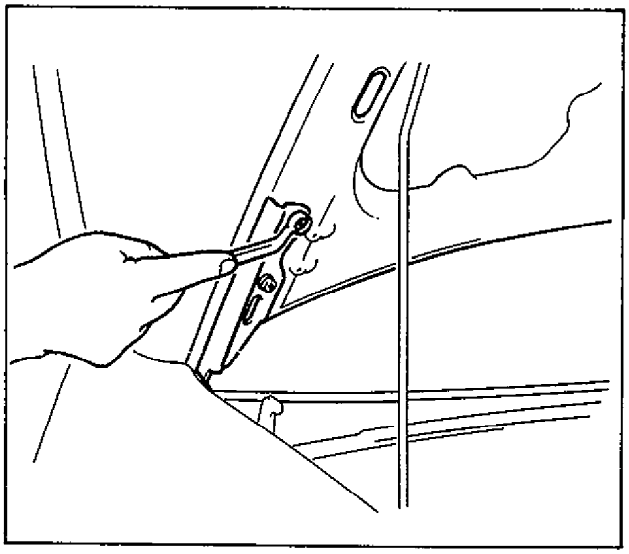


Fig. 2-6 Hood Mounting Bolts (Right Side)

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.

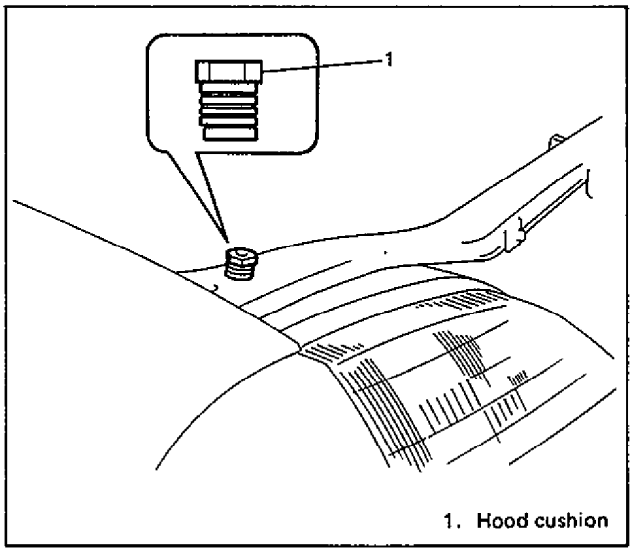


Fig. 2-7 Vertical Hood Adjustment

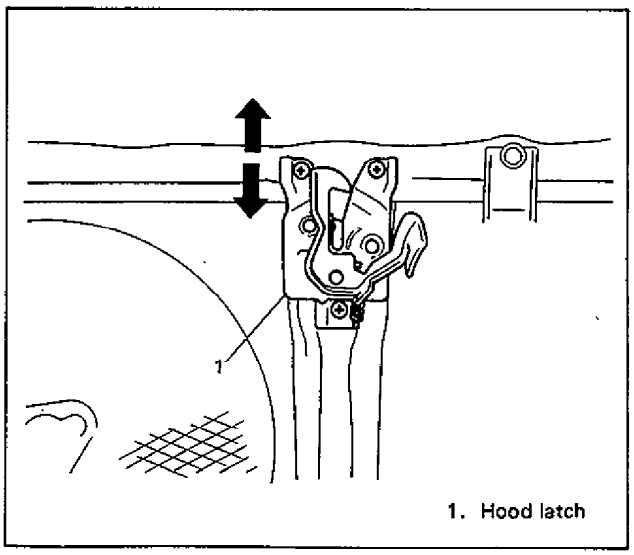


Fig. 2-8 Hood Latch Adjustment

FRONT FENDER

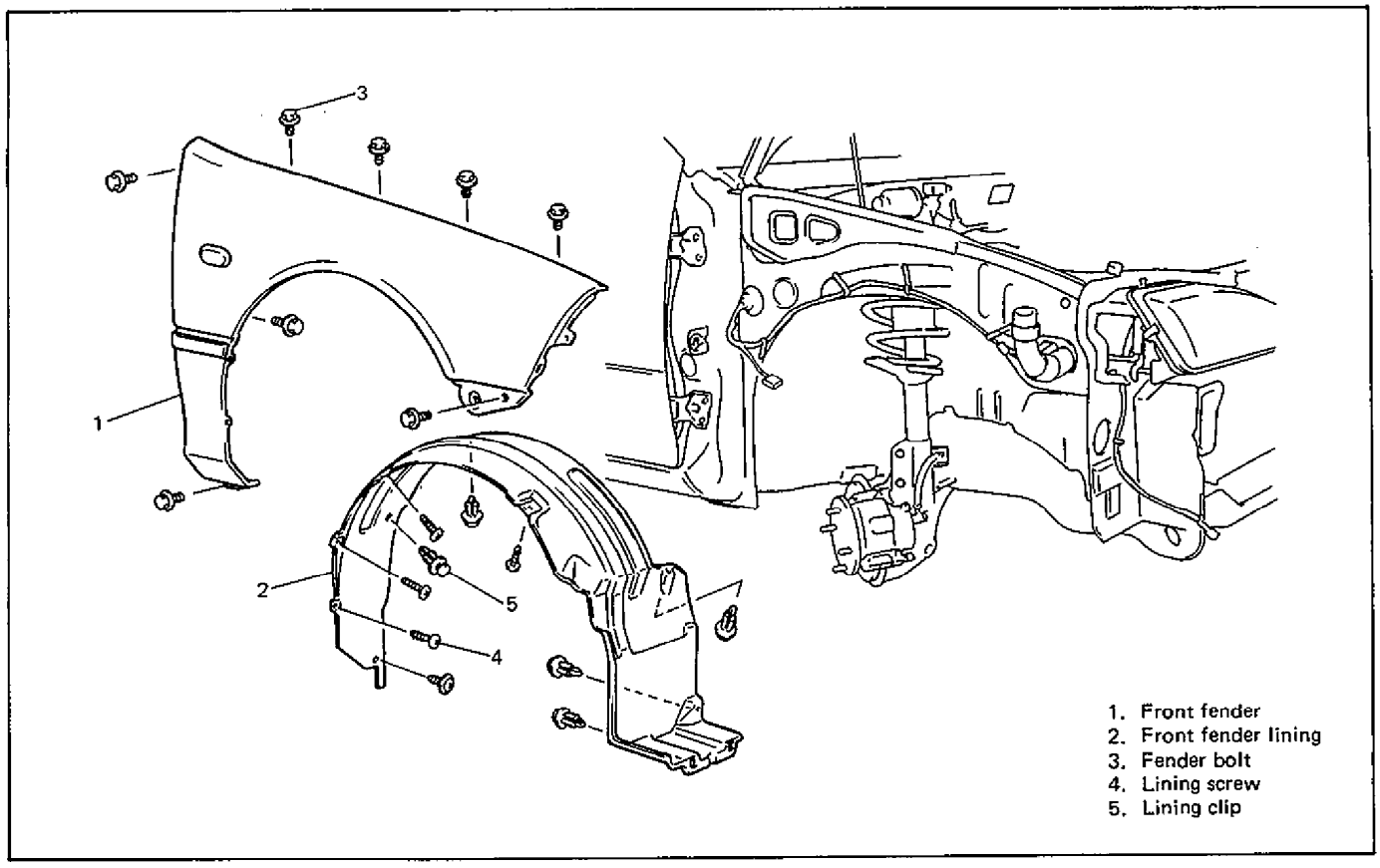


Fig. 2-9

REMOVAL

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

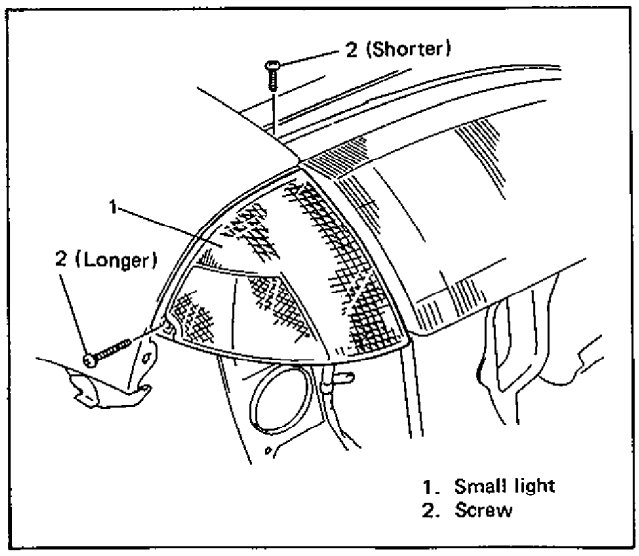


Fig. 2-10 Removing Small Light

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.

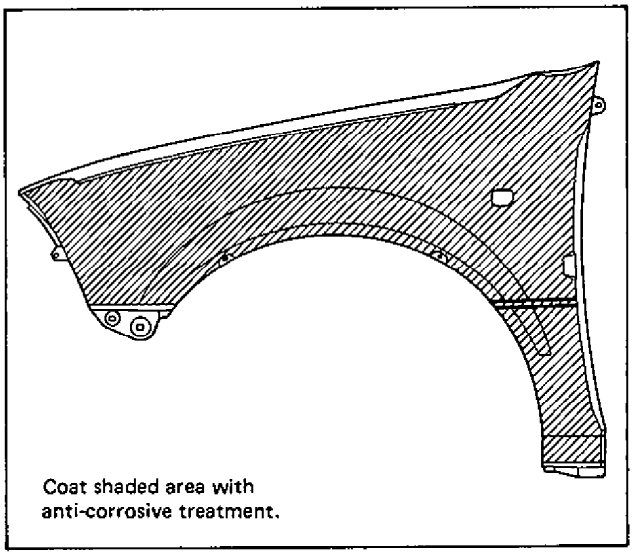


Fig. 2-11 Replacement Fender

SECTION 3

STEERING, SUSPENSION, WHEELS AND TIRES

CONTENTS

GENERAL DESCRIPTION

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.

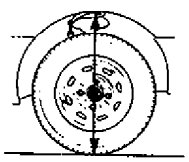
GENERAL DIAGNOSIS CHART B

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.	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 shock absorber action.	Replace shock absorber.
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.	Replace strut.
Suspension Bottoms	1. Overloaded.	Check loading.
	2. Faulty struts.	Replace strut.
	3. Incorrect broken or sagging sprints.	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 or mounting.	Replace struts 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.

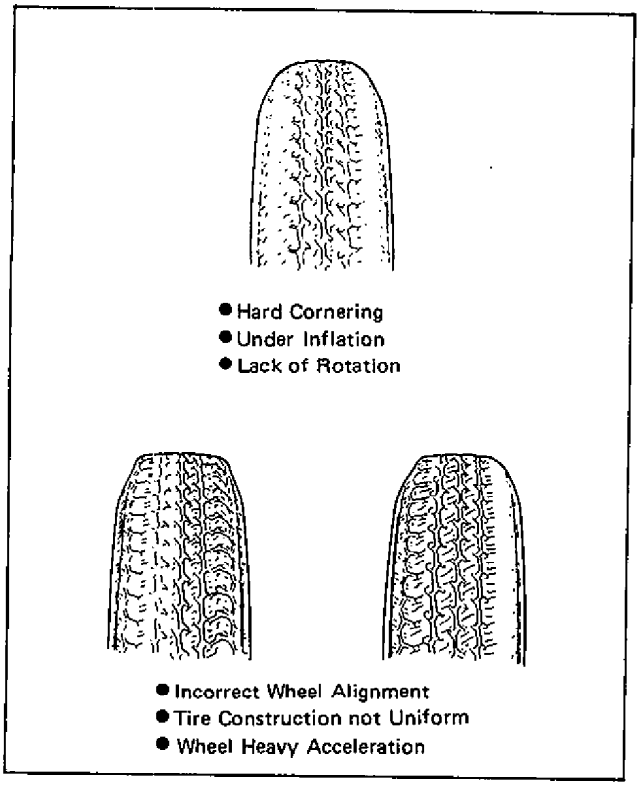


Fig. 3-1 Tire Wear Diagnosis

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.

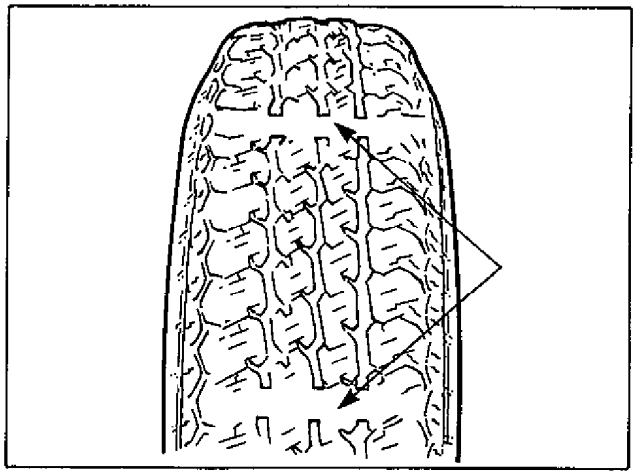


Fig. 3-2 Tire Wear Indicator

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.

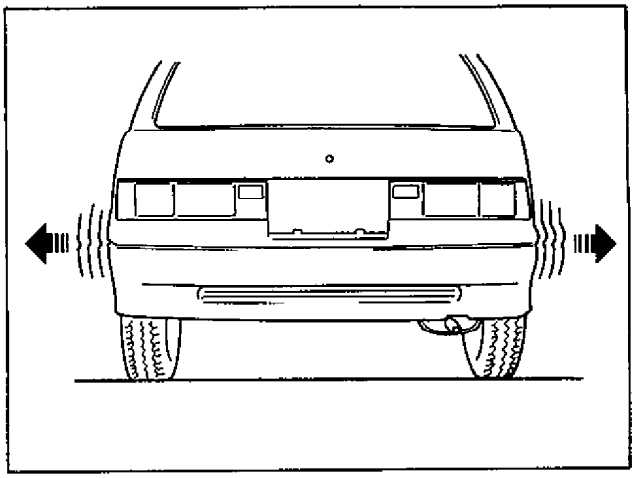


Fig. 3-3 Radial Tire Waddle

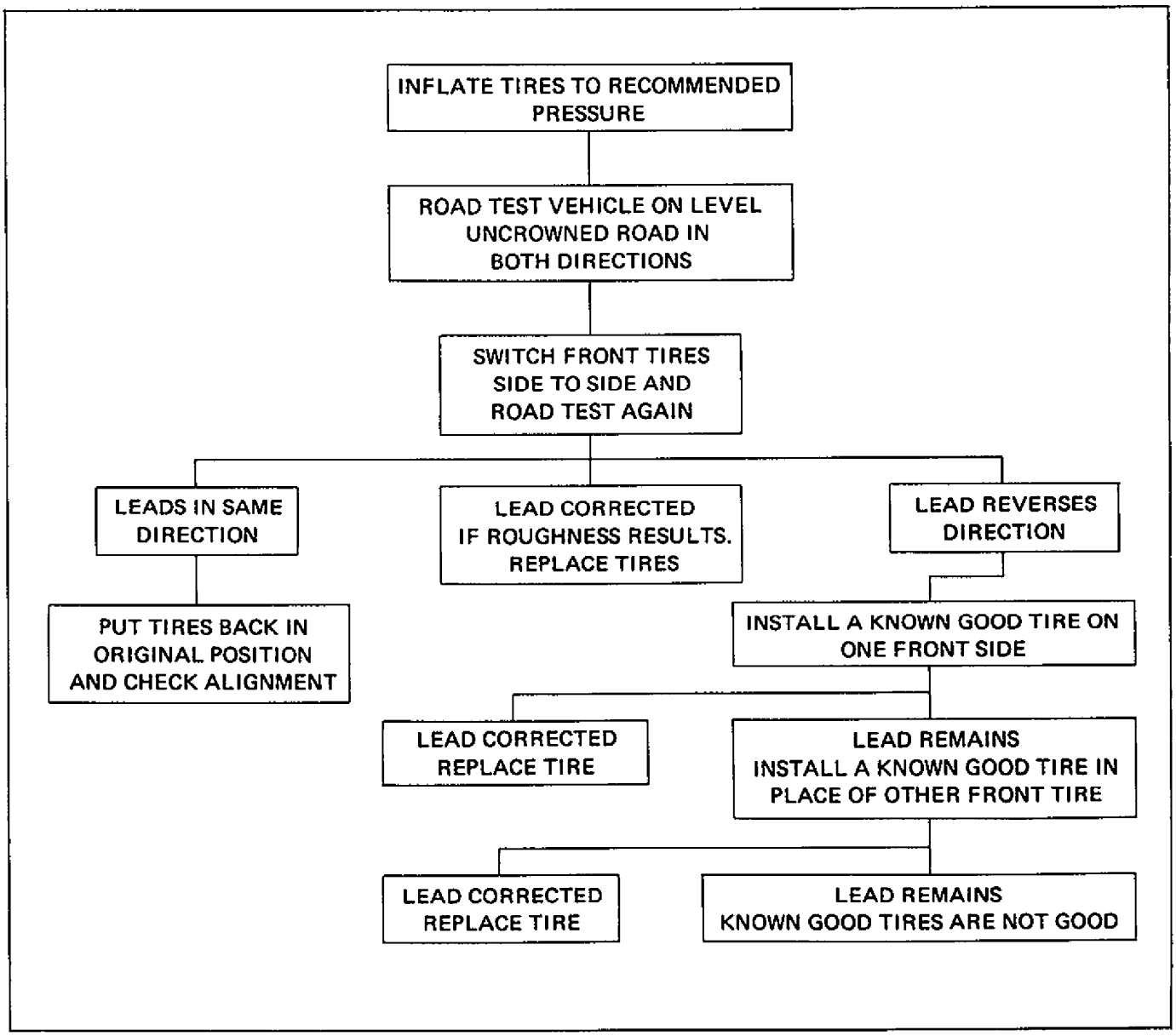


Fig. 3-4 Lead Diagnosis

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.

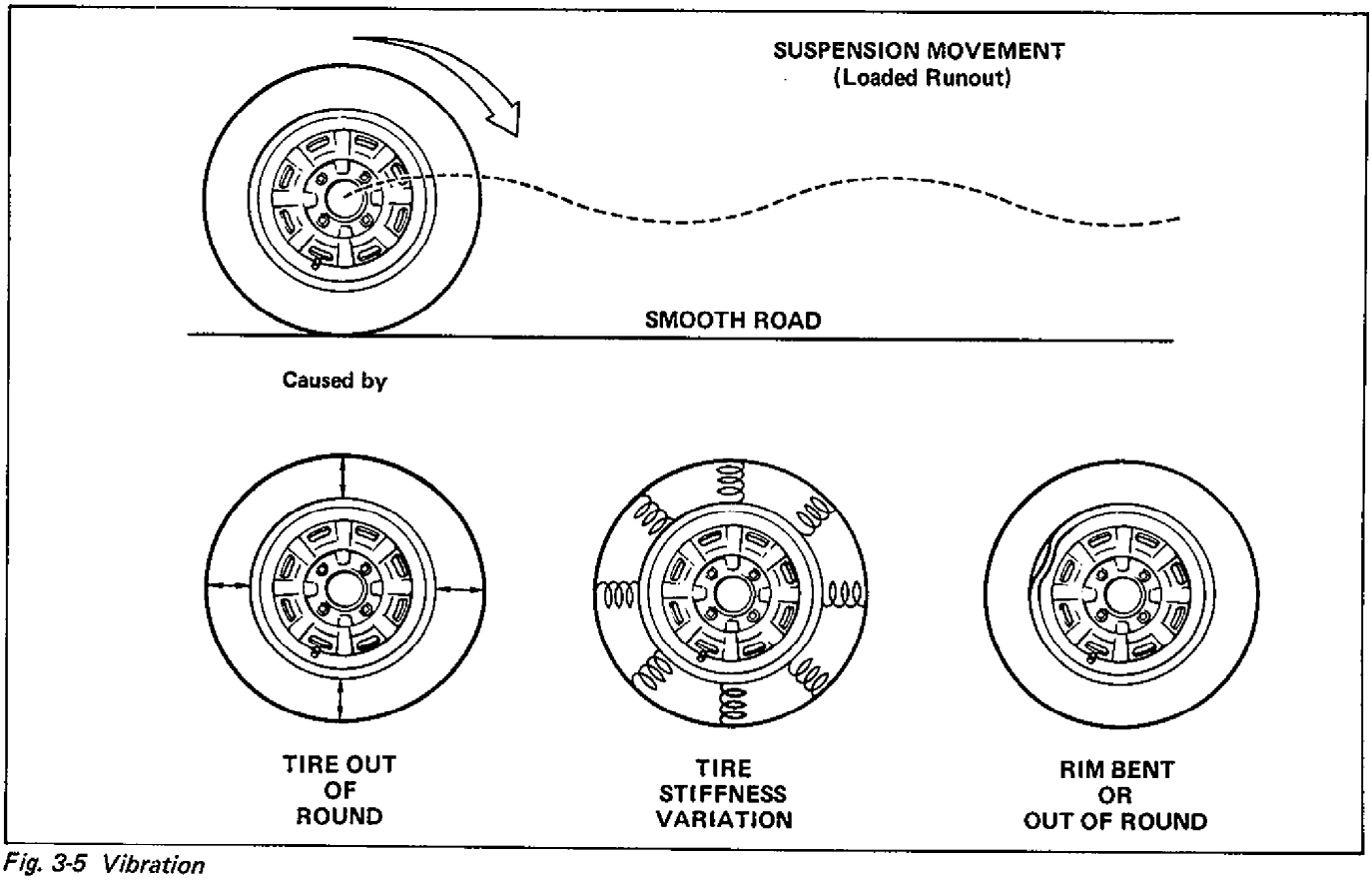


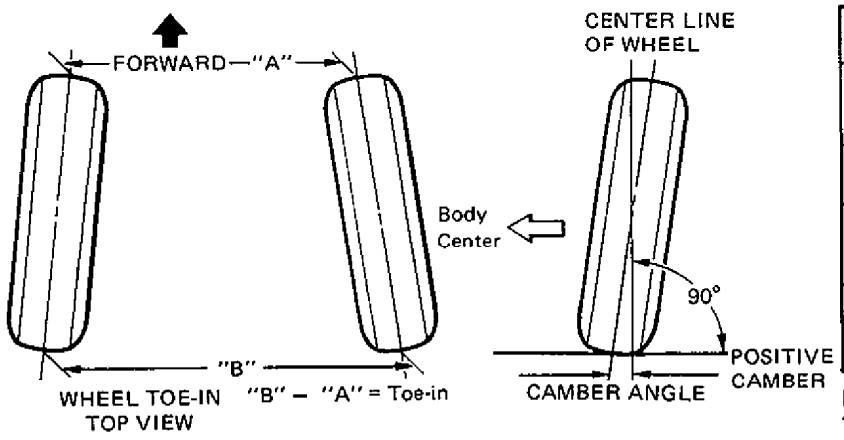
Fig. 3-5 Vibration

SECTION 3A

FRONT END ALIGNMENT

CONTENTS

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.

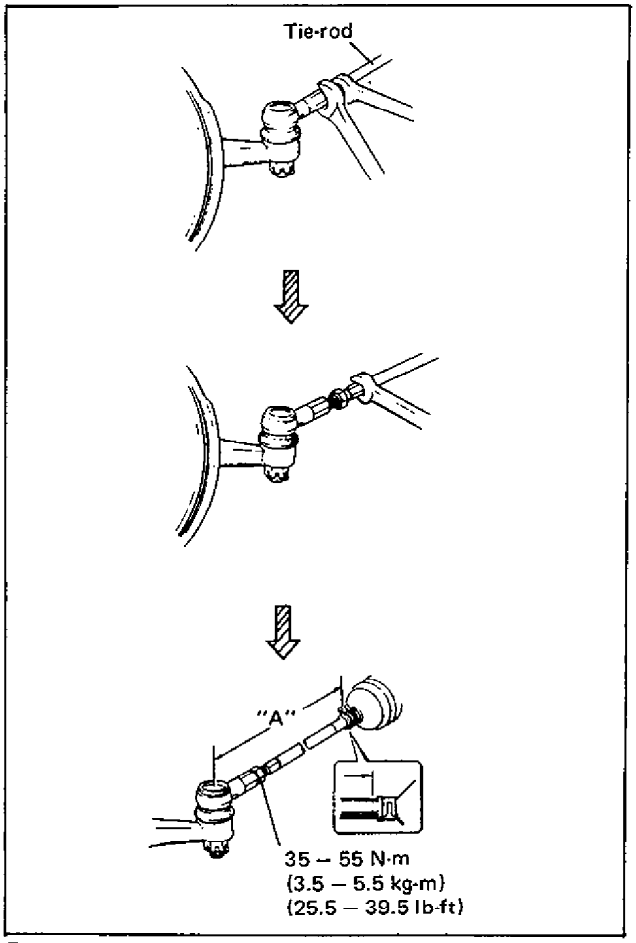


Fig. 3A-2 Toe-Adjustment

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.

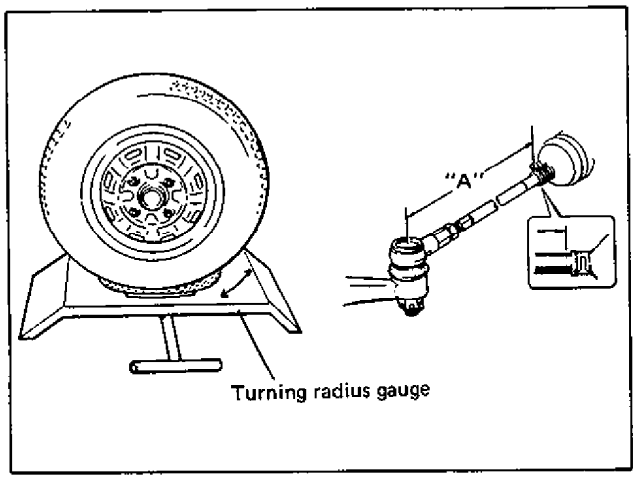


Fig. 3A-3 Steering Angle Inspection

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

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.

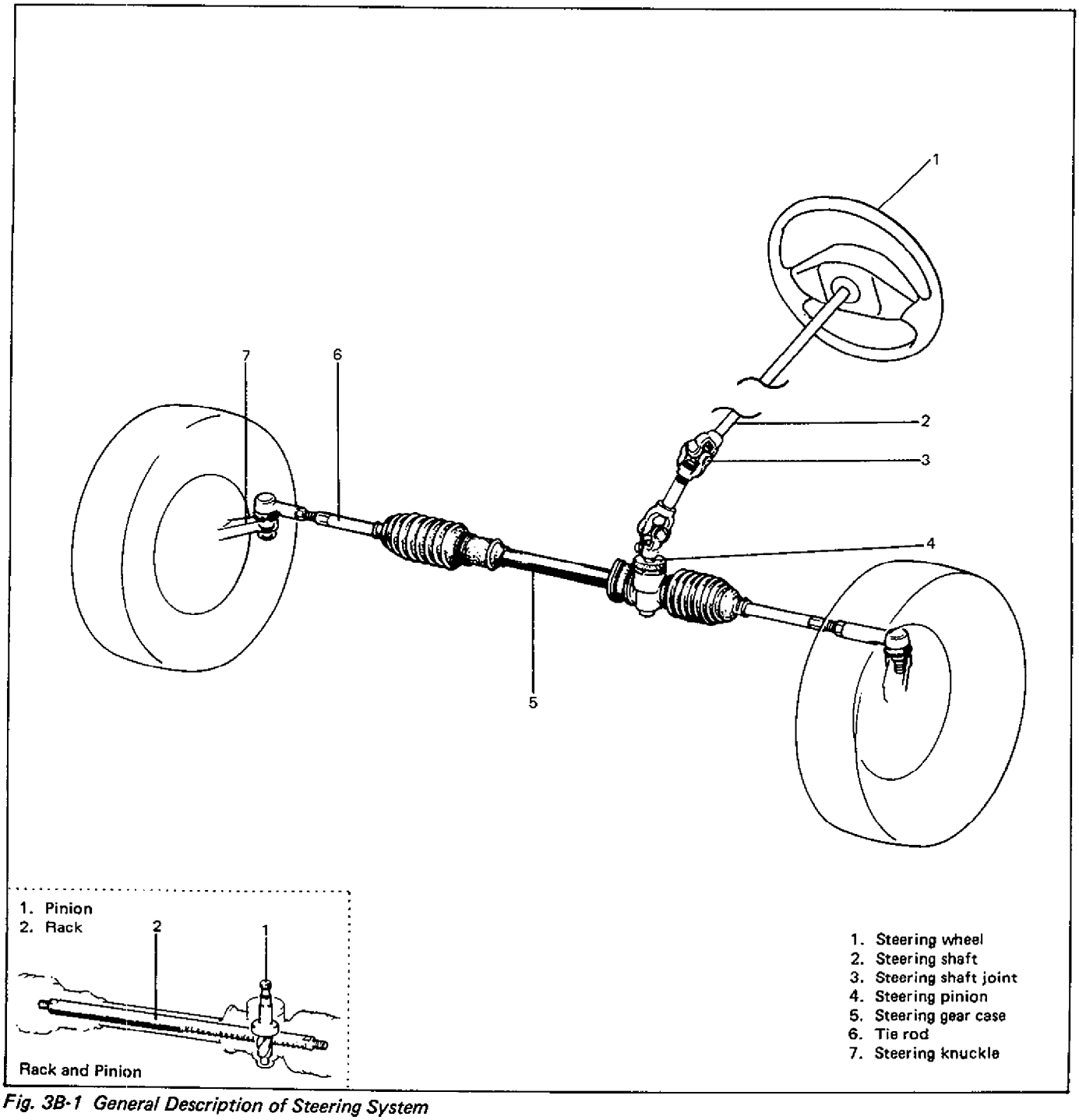


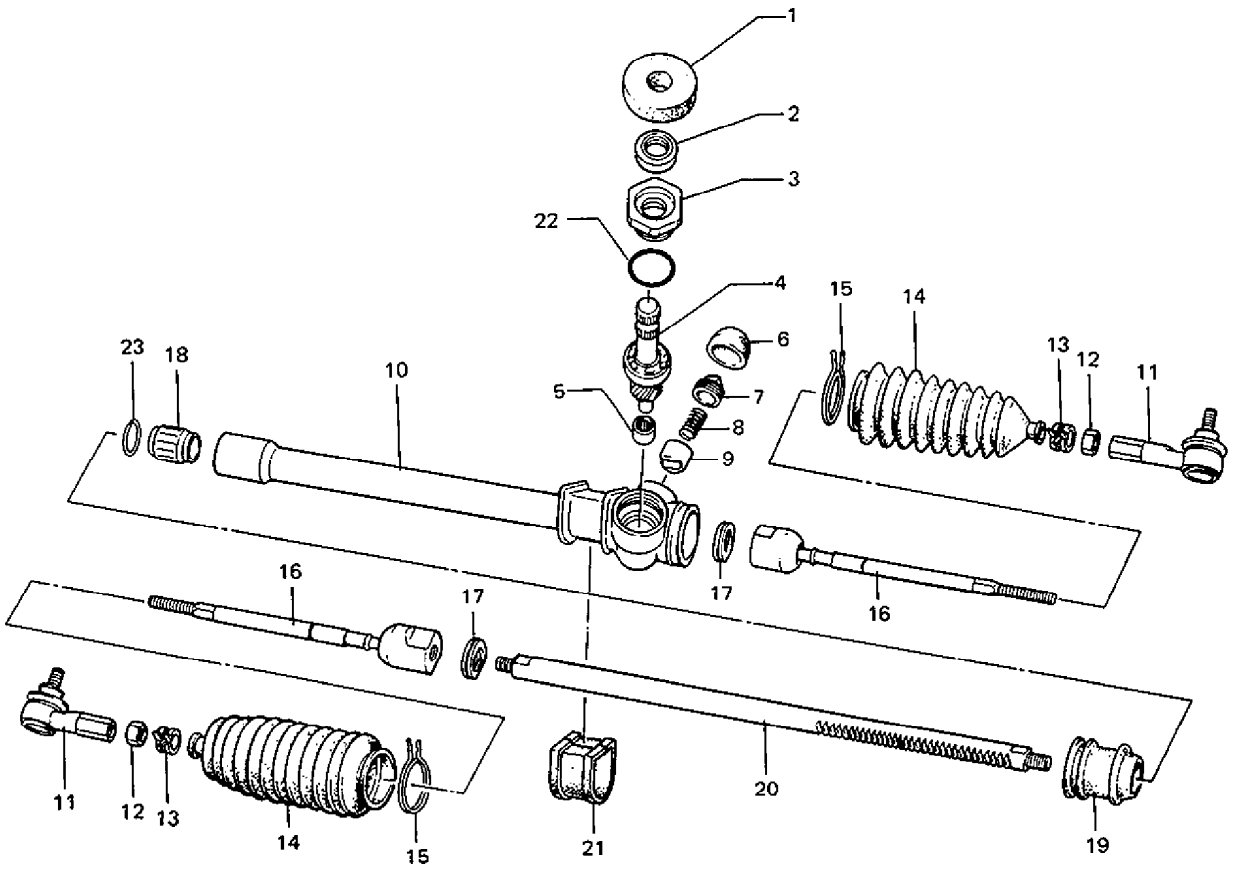
Fig. 3B-1 General Description of Steering System

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.

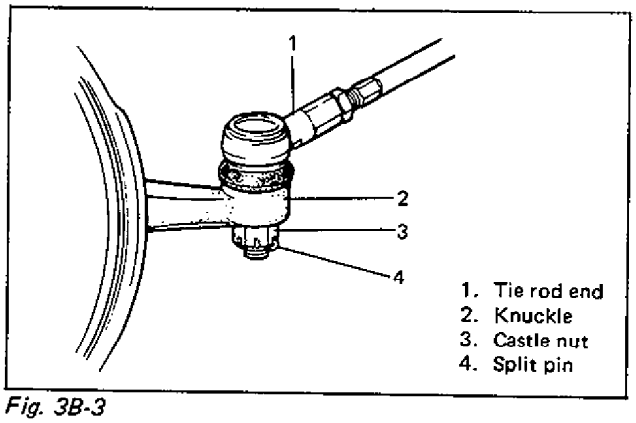


Fig. 3B-3

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

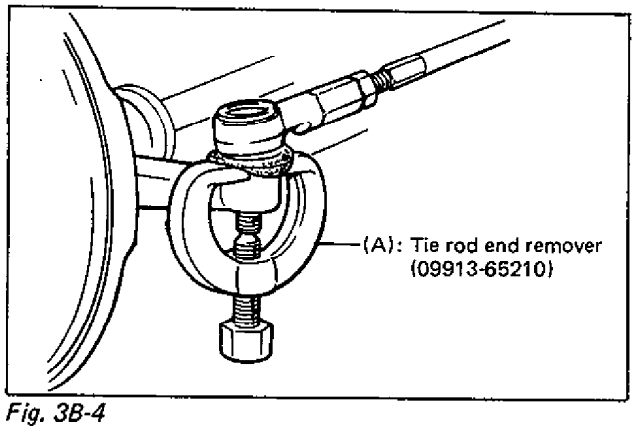


Fig. 3B-4

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.

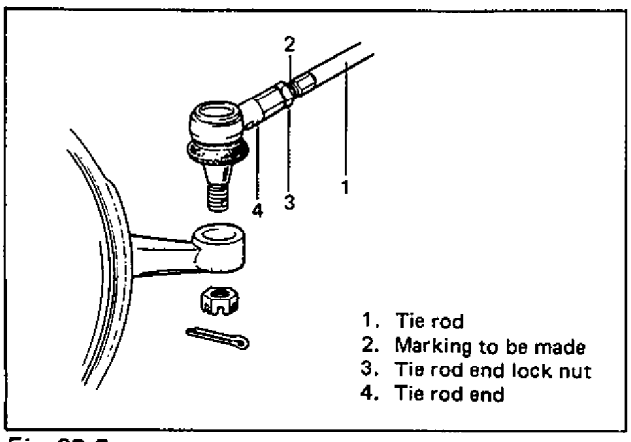


Fig. 3B-5

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.

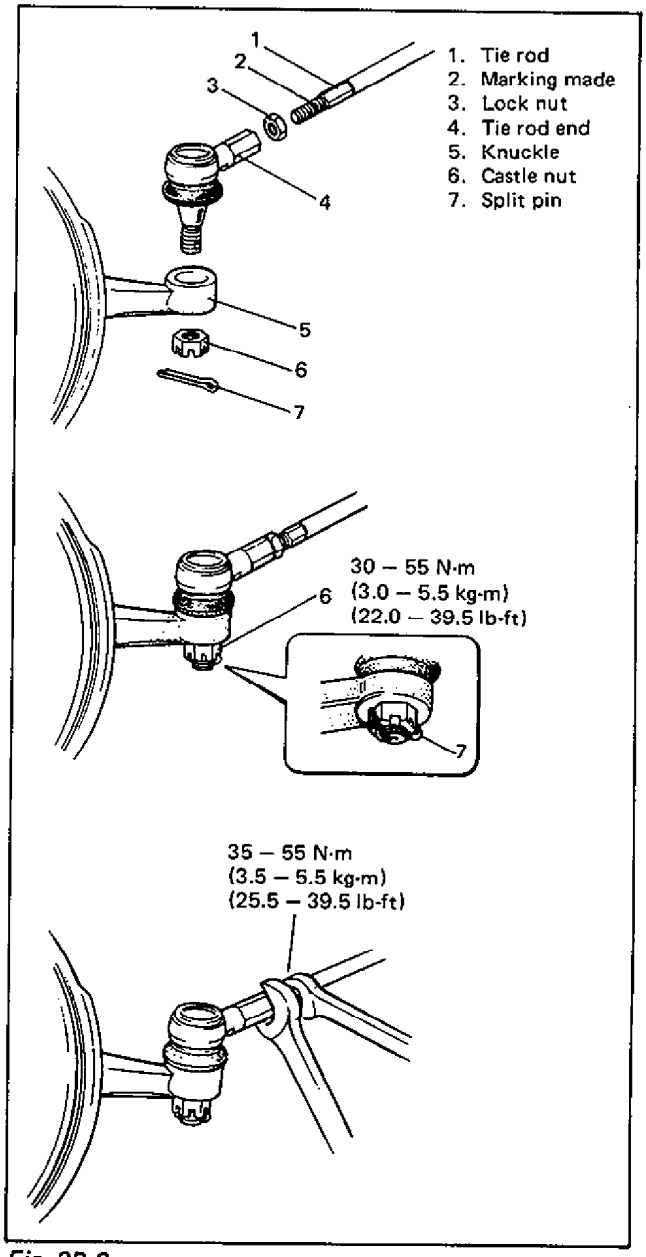


Fig. 3B-6

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.

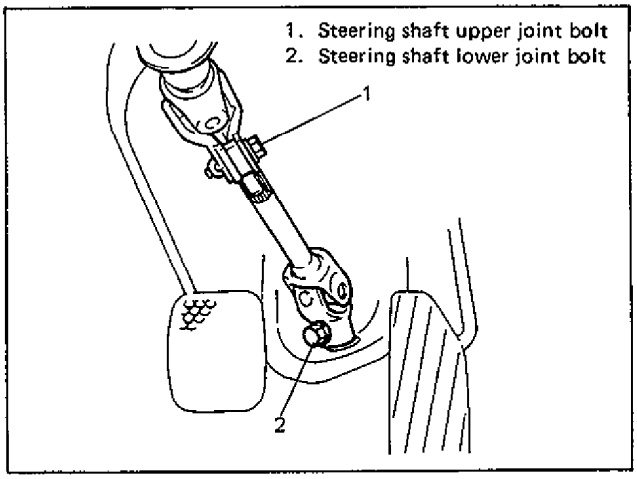


Fig. 3B-7

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

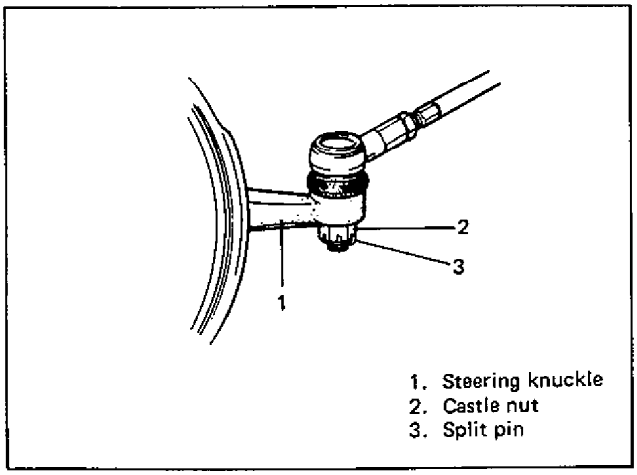


Fig. 3B-8

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

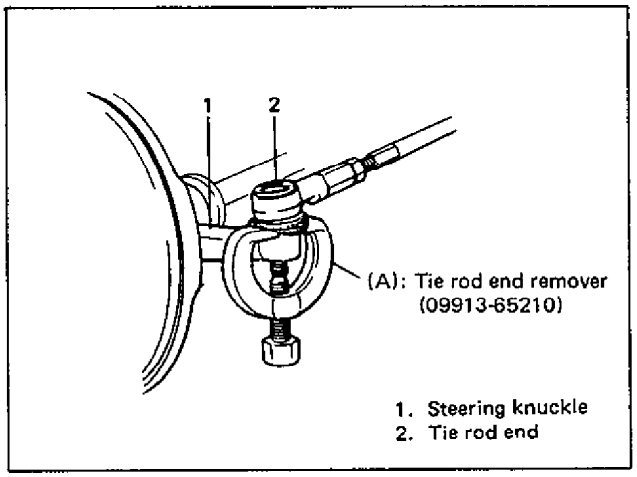


Fig. 3B-9

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

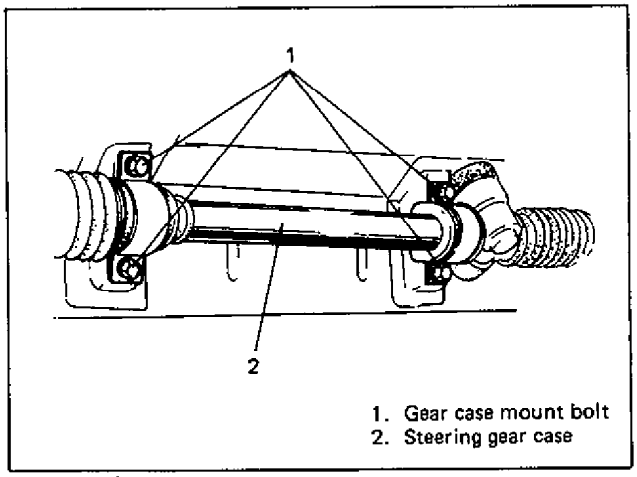


Fig. 3B-10

INSTALLATION

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

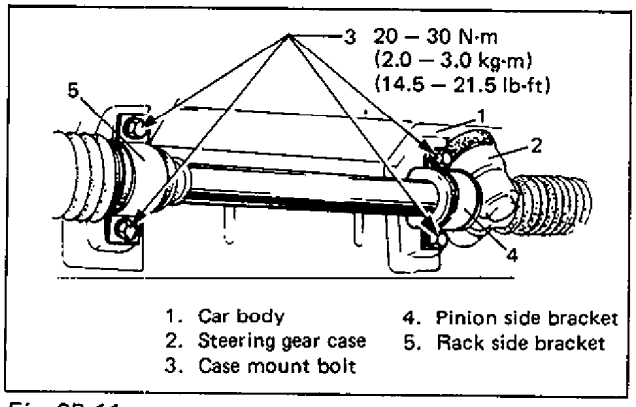


Fig. 3B-11

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.

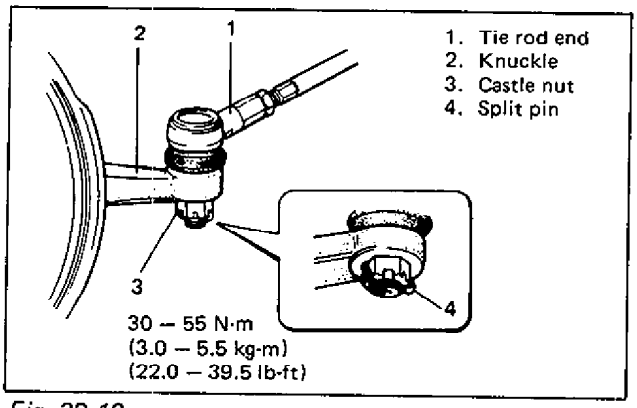


Fig. 3B-12

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).

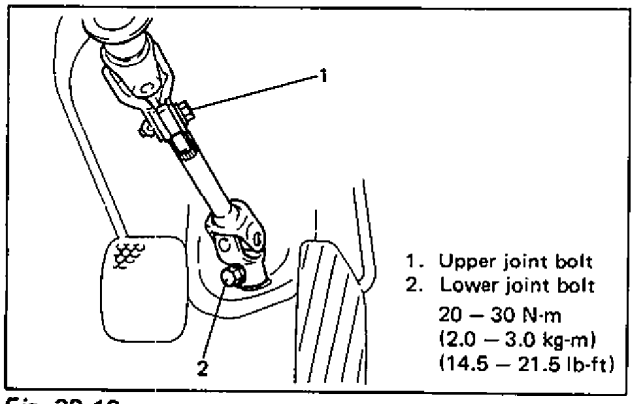


Fig. 3B-13

5) Reinstalll cover removed previously to steering shaft joint.

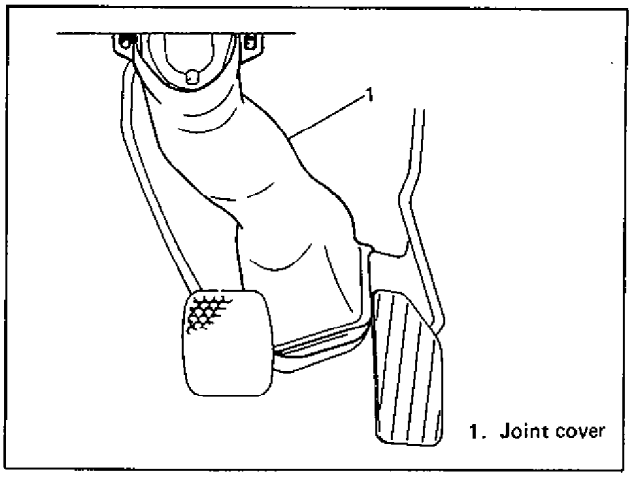


Fig. 3B-14

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.

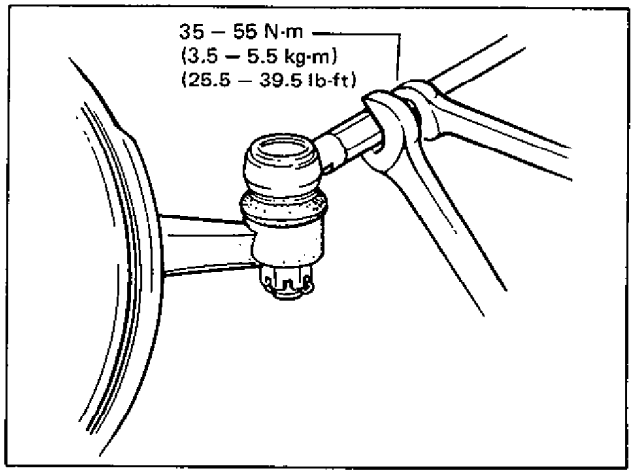


Fig. 3B-15

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.

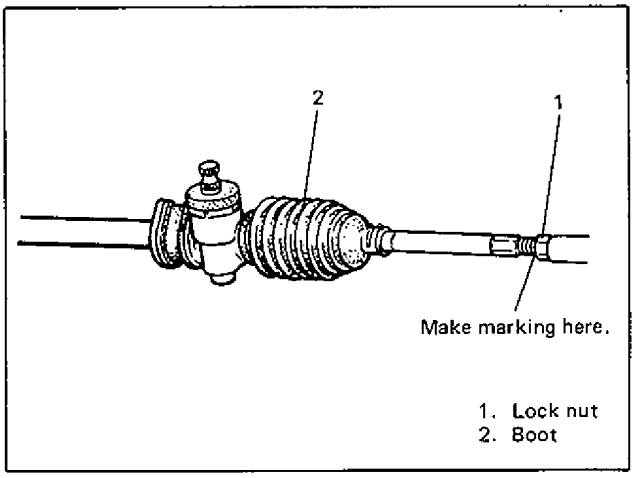


Fig. 3B-16

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

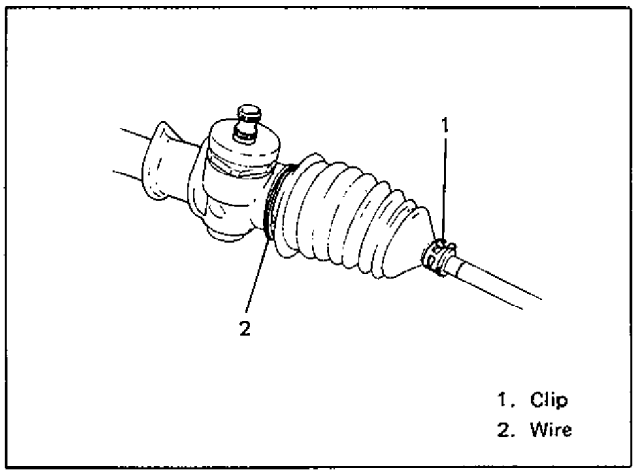


Fig. 3B-17

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

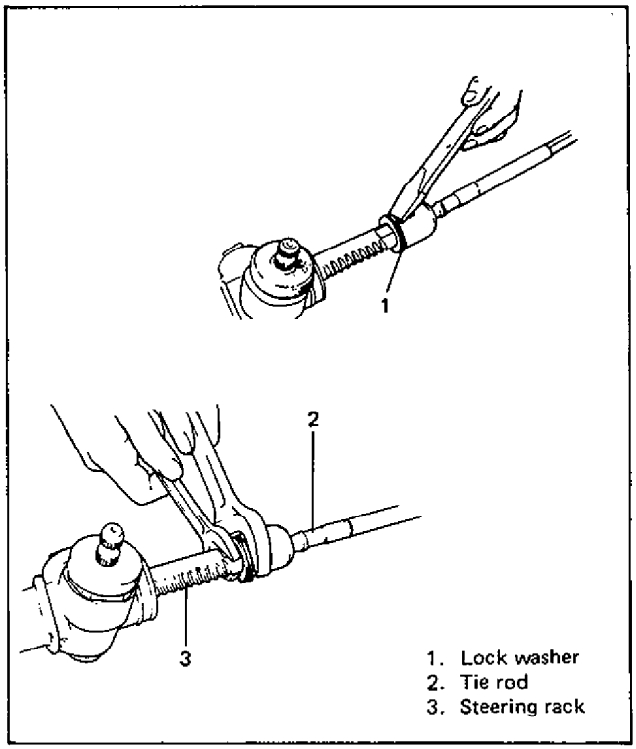


Fig. 3B-18

INSTALLATION

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

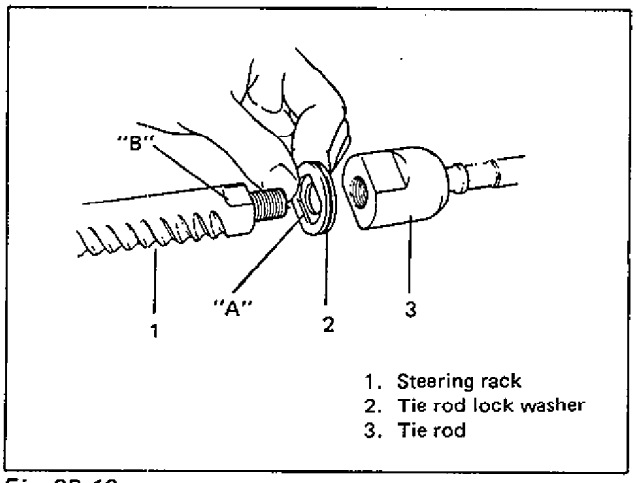


Fig. 3B-19

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.

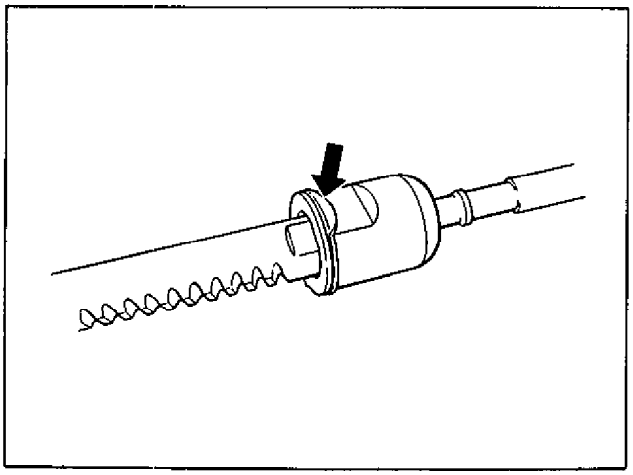


Fig. 3B-20

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.

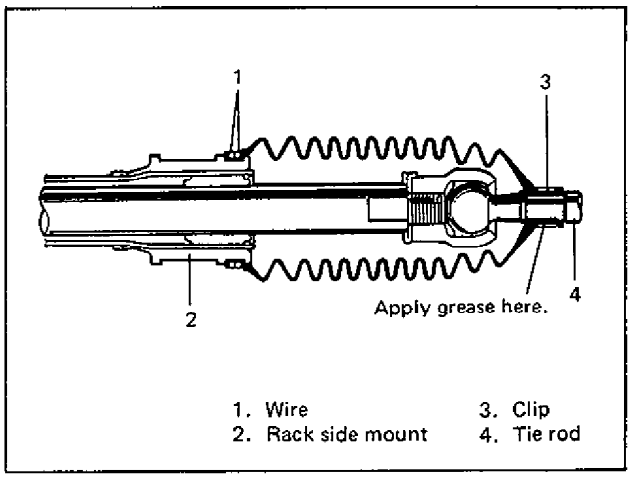


Fig. 3B-21

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.

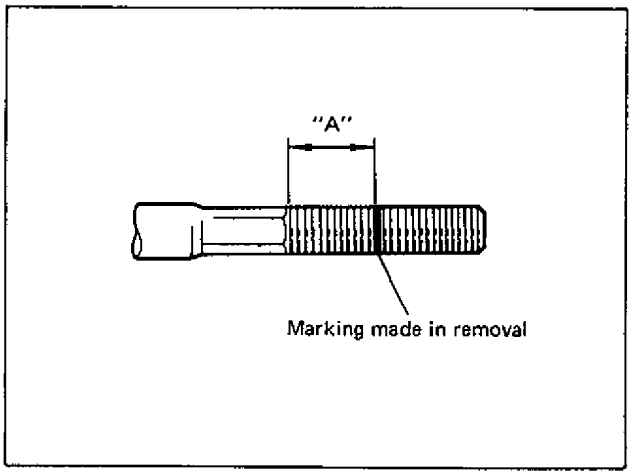


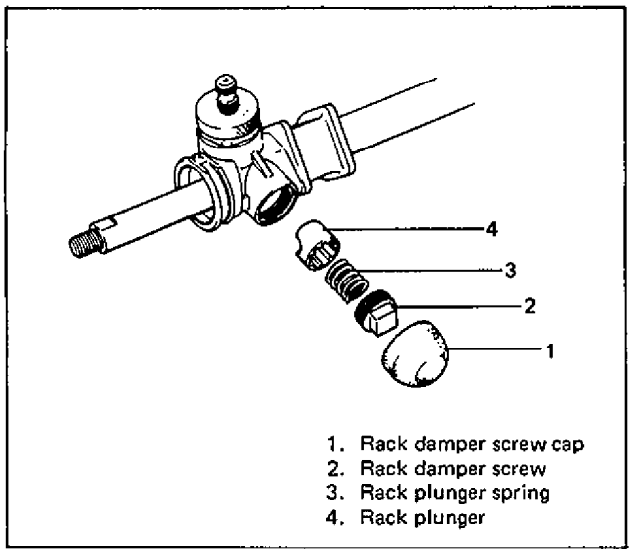
Fig. 3B-22

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.

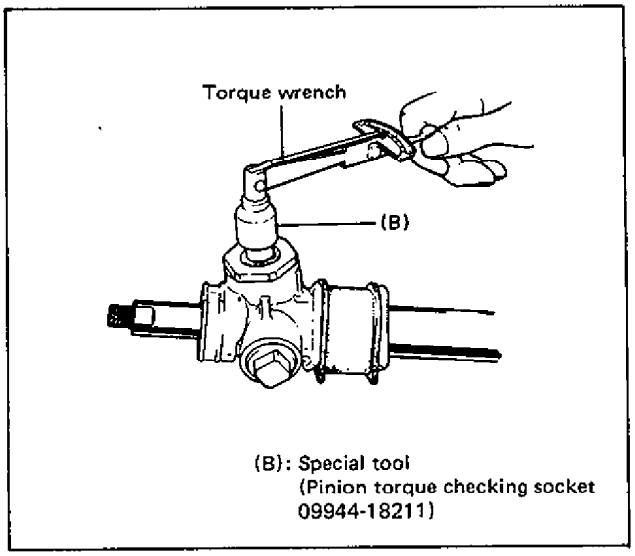


1. Rack damper screw cap
2. Rack damper screw
3. Rack plunger spring
4. Rack plunger

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.



(B): Special tool
(Pinion torque checking socket
09944-18211)

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).

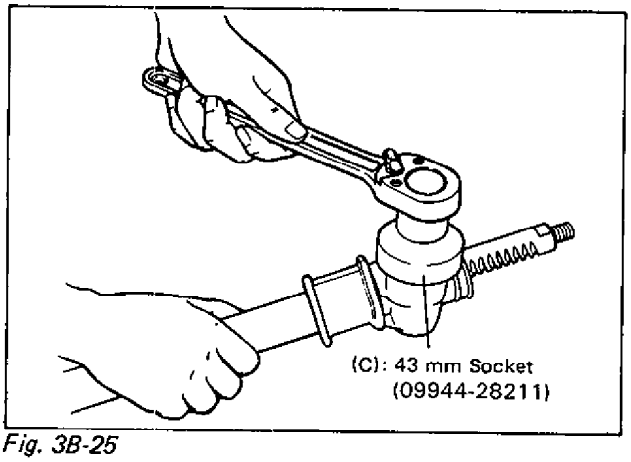


Fig. 3B-25

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

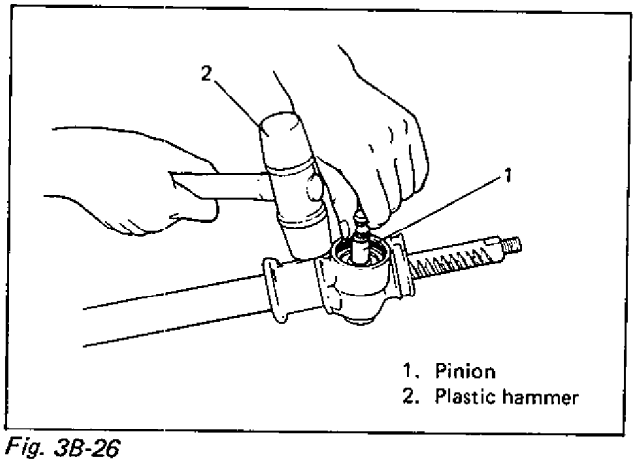


Fig. 3B-26

5) Remove pinion assembly.

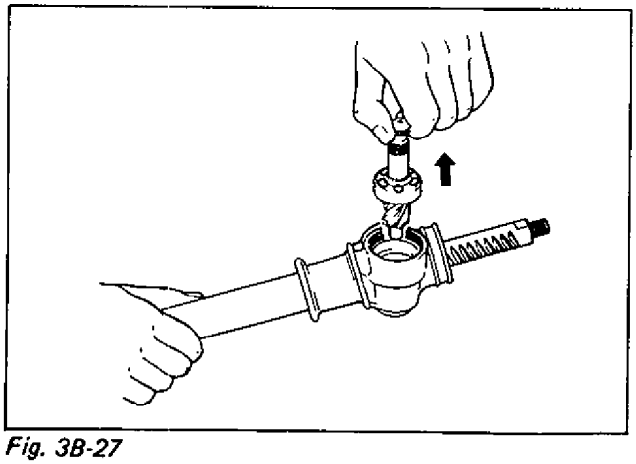


Fig. 3B-27

INSTALLATION

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

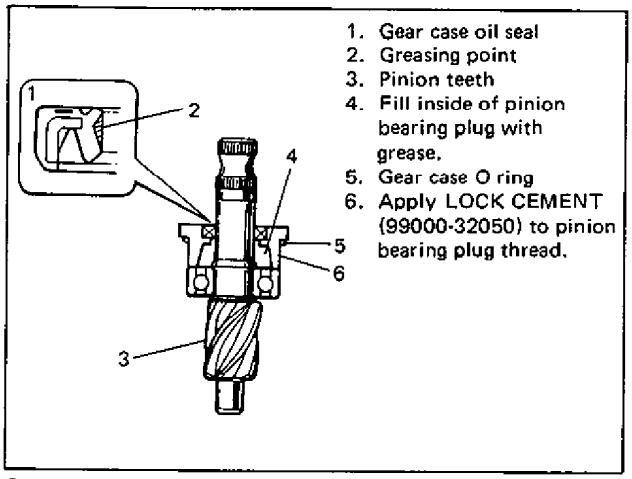


Fig. 3B-28

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

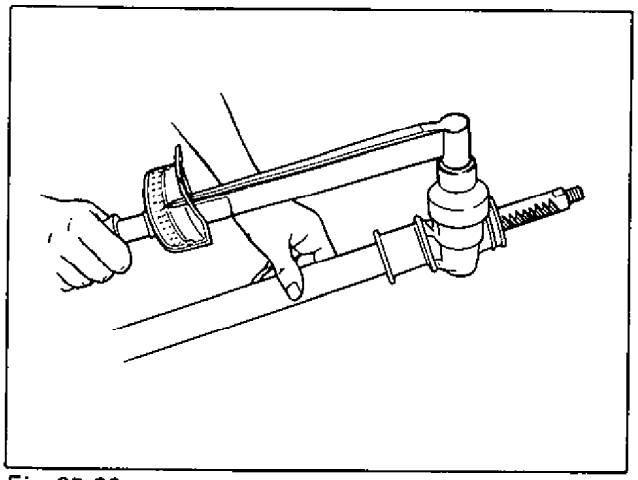


Fig. 3B-29

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.

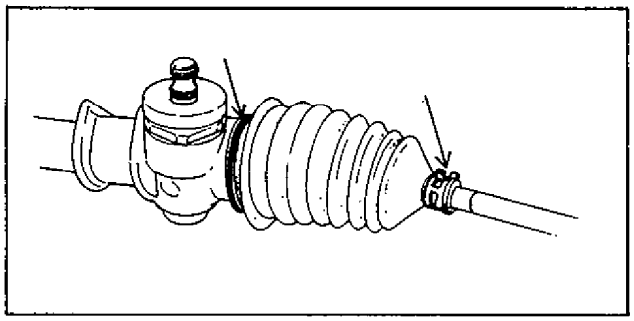


Fig. 3B-30

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.

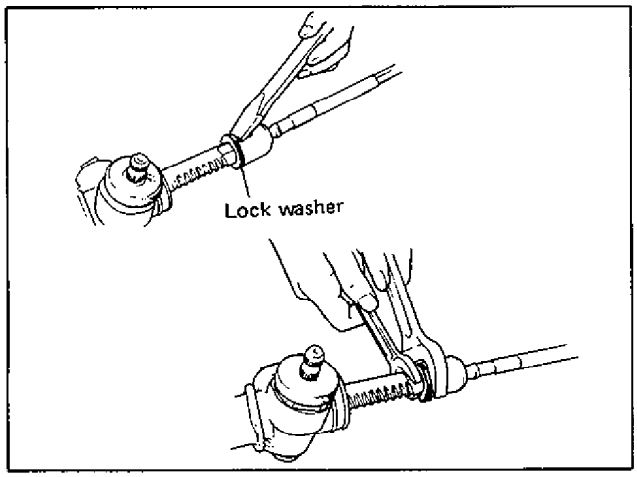


Fig. 3B-31

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.

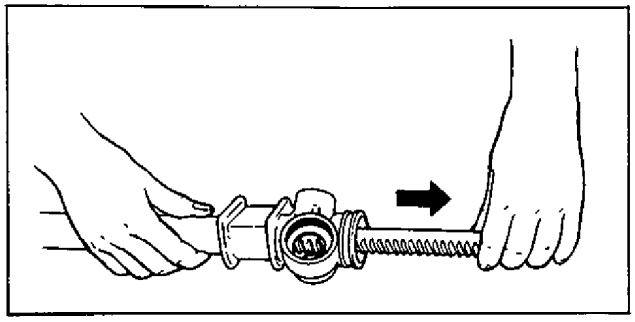


Fig. 3B-32

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.

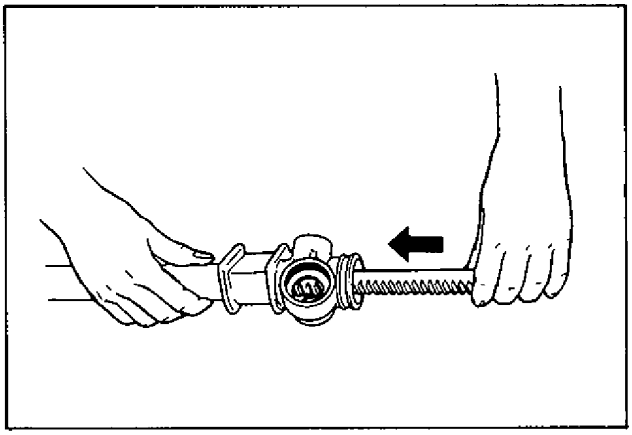


Fig. 3B-33

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.

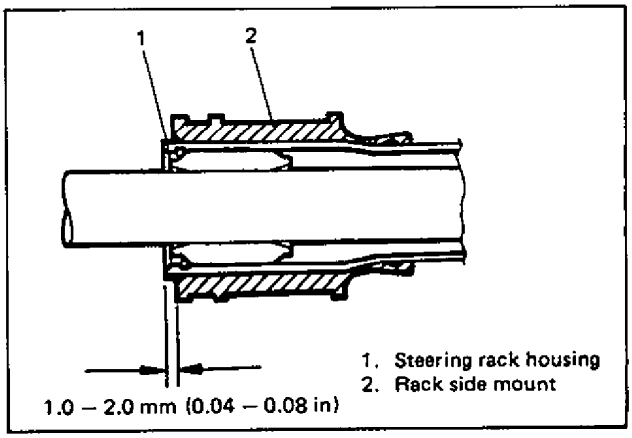


Fig. 3B-34

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.

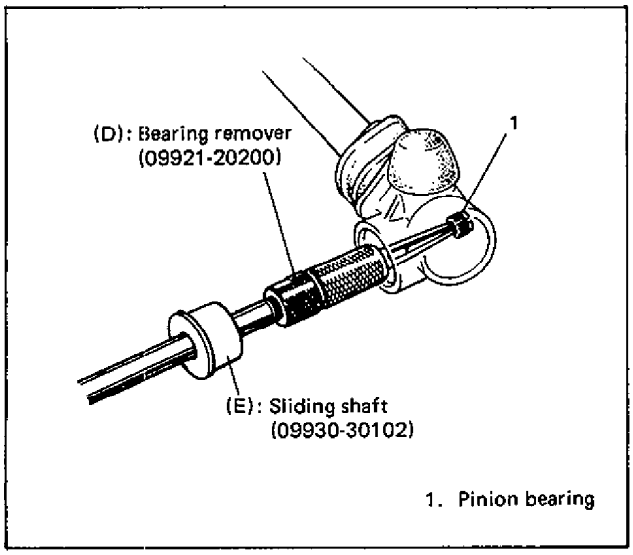


Fig. 3B-35

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.

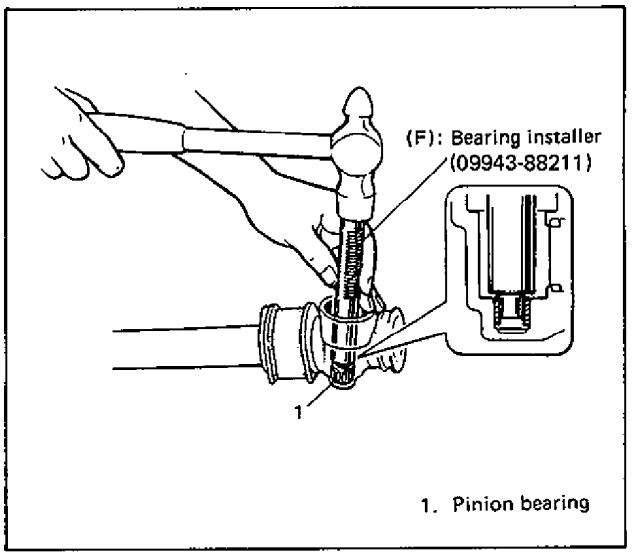


Fig. 3B-36

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.

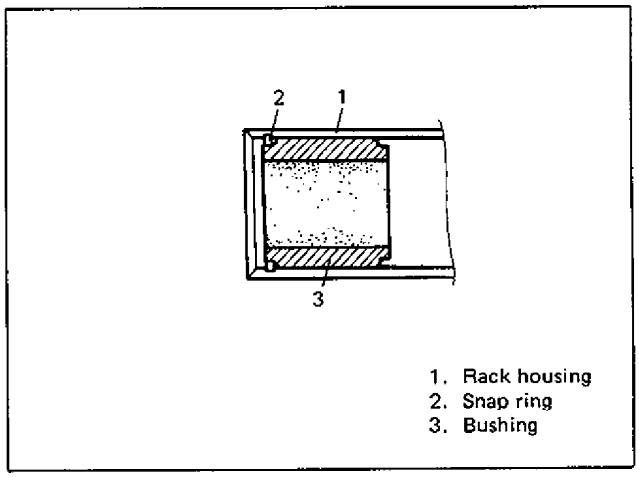


Fig. 3B-37

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

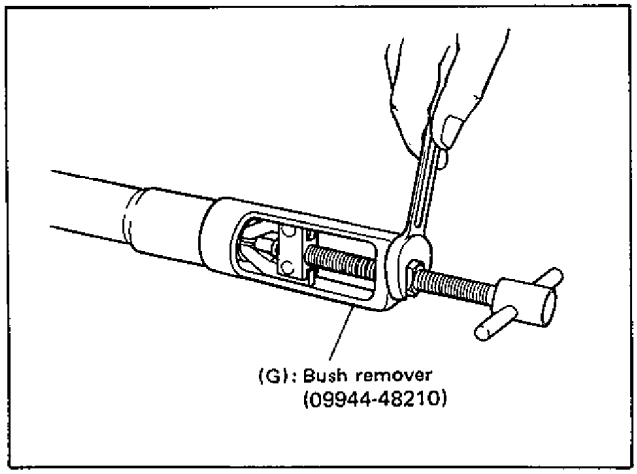


Fig. 3B-38

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.

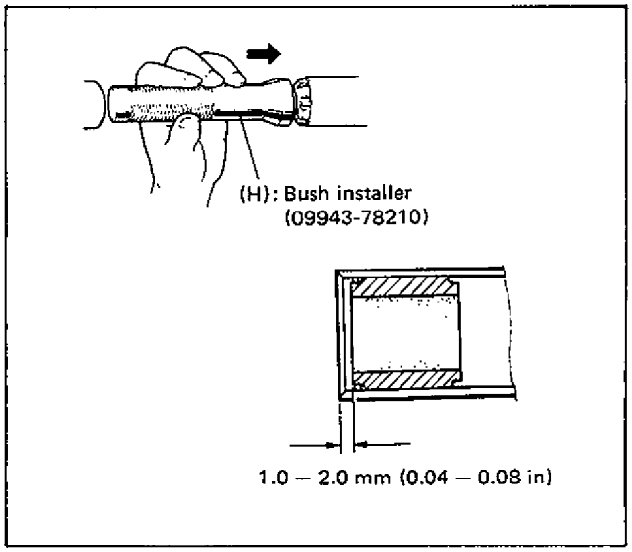


Fig. 3B-39

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.

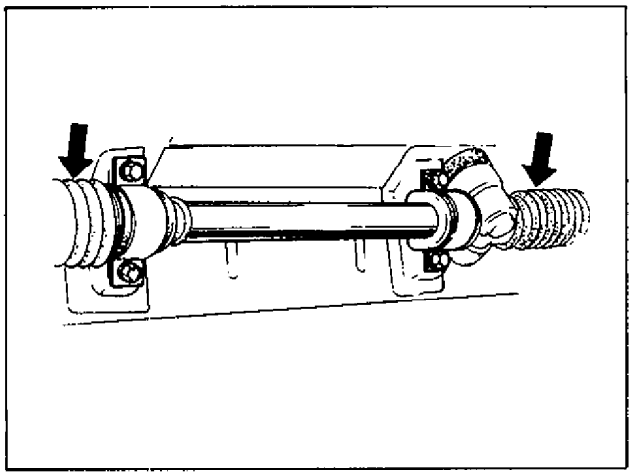


Fig. 3B-40

TIE ROD END BOOTS

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

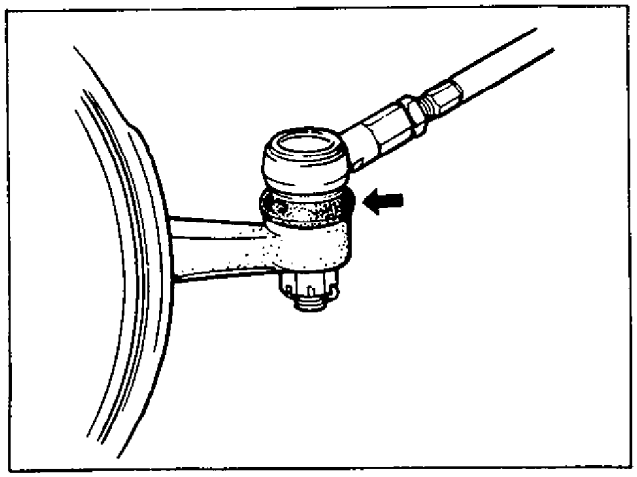


Fig. 3B-41

STEERING SHAFT JOINT

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

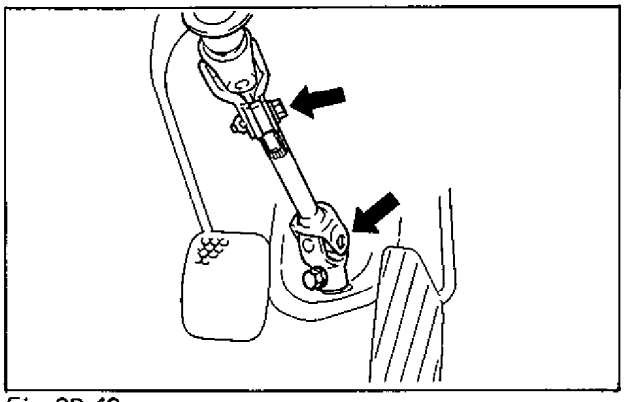


Fig. 3B-42

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.

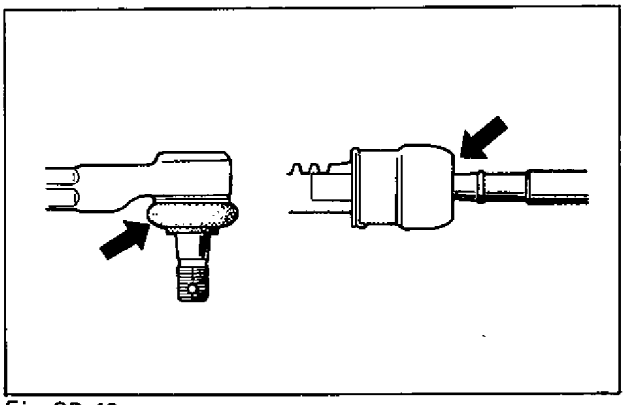


Fig. 3B-43

RACK PLUNGER

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

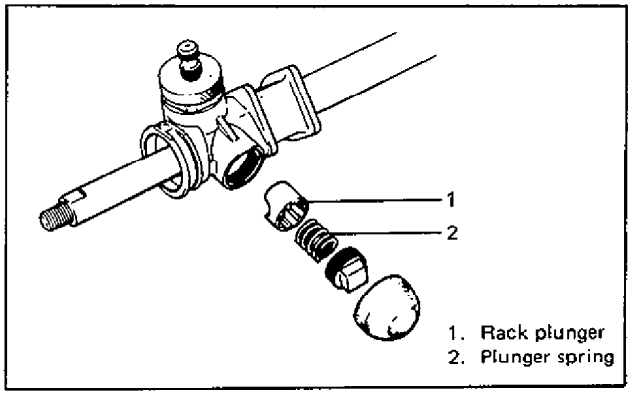


Fig. 3B-44

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.

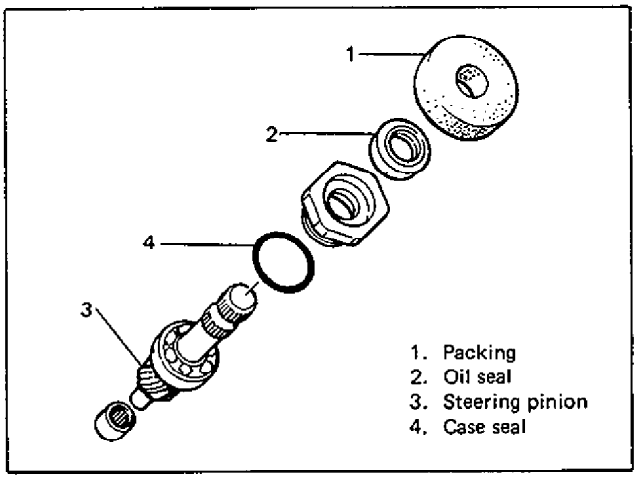


Fig. 3B-45

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.

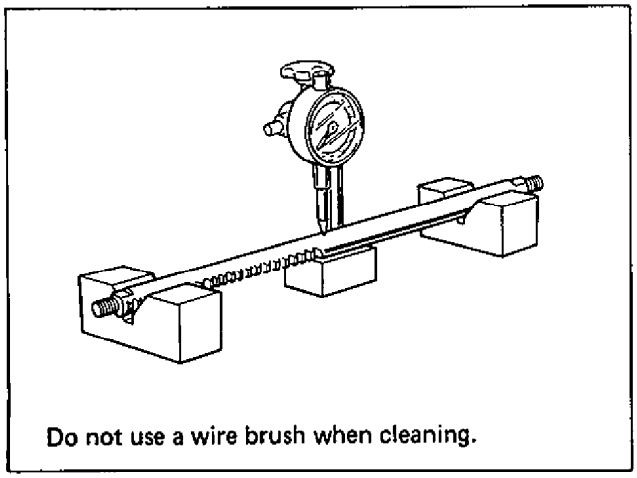


Fig. 3B-46

STEERING RACK BUSHING

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

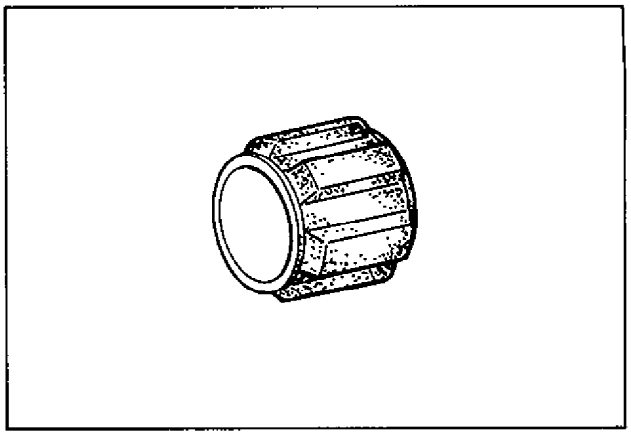


Fig. 3B-47

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.)

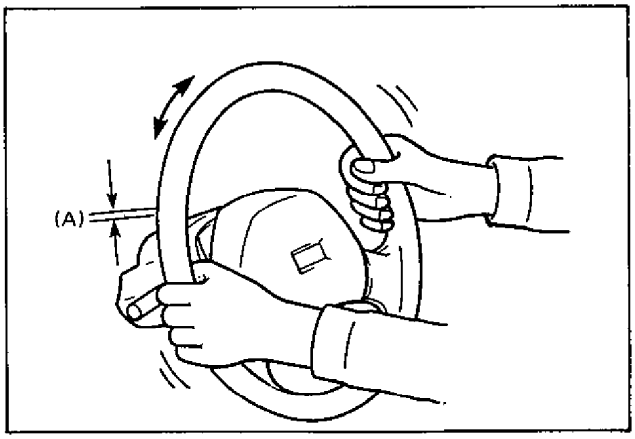


Fig. 3B-48

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

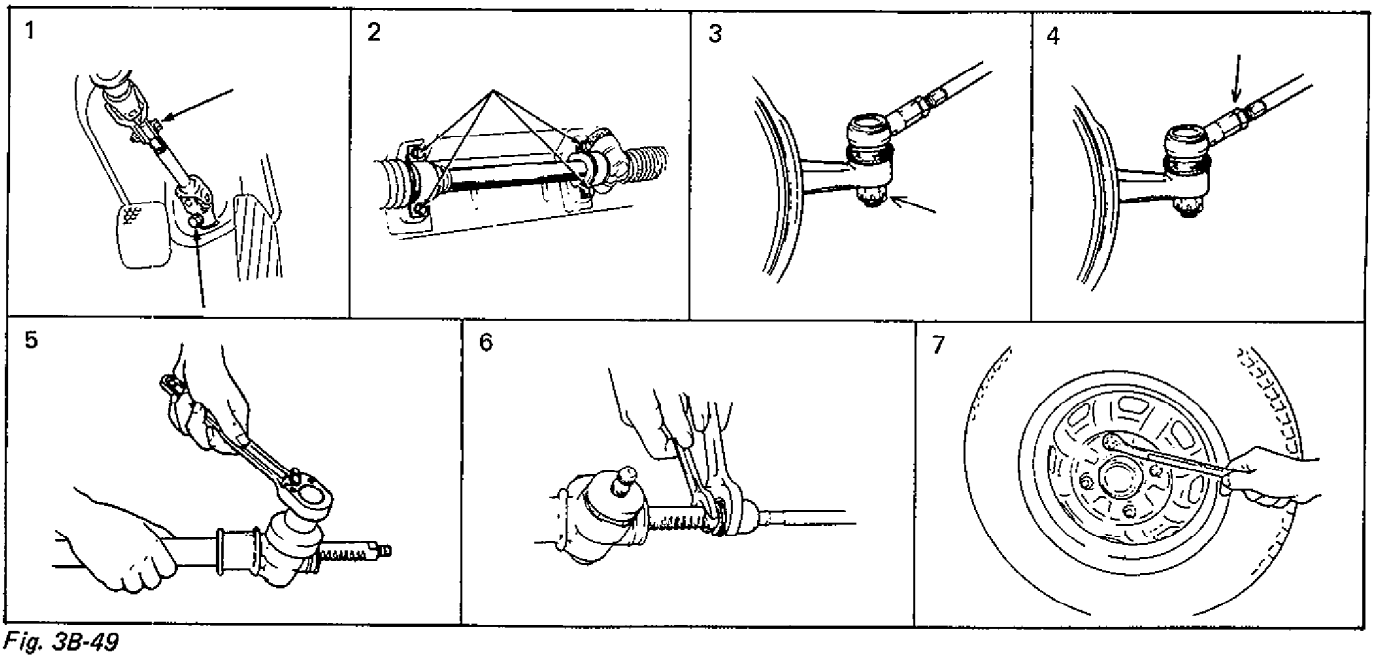


Fig. 3B-49

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

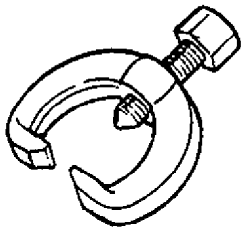
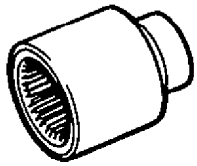
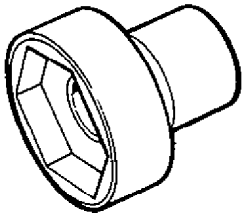
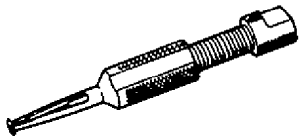
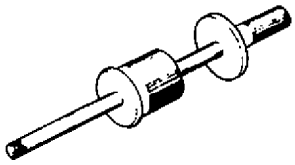
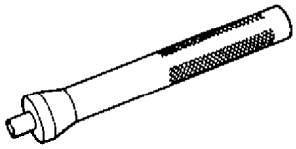
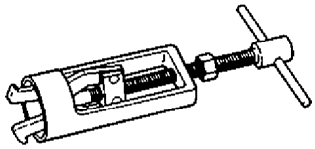
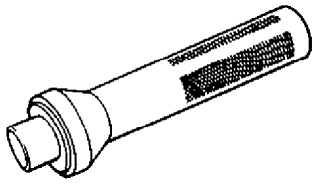
 09913-65210 Tie-rod end remover	 09944-18211 Pinion torque checking socket	 09944-28211 43 mm Socket (Pinion bearing plug remover)	 09921-20200 Pinion bearing remover
 09930-30102 Sliding shaft	 09943-88211 Pinion bearing installer	 09944-48210 Rack bush remover	 09943-78210 Rack bush installer

Fig. 3B-50

SECTION 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

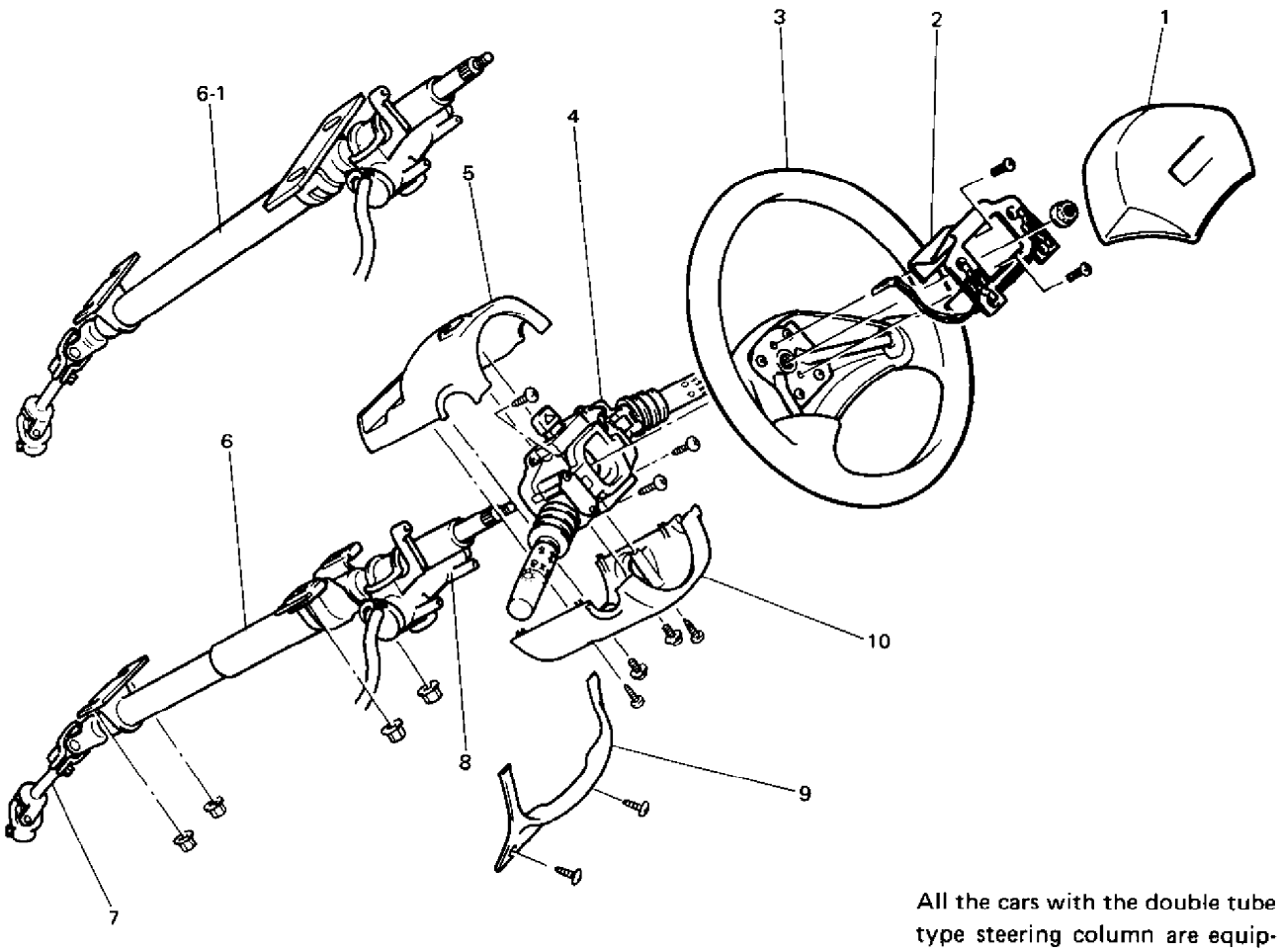
GENERAL DESCRIPTION

There are two types of steering column for this car. They are double tube type and single tube type. Which type to be used varies with countries.

Illustrations show double tube type only, but the same removal and installation procedures are used for single tube type.

Both types of column may be easily removed and installed. For installation, it is important that only the specified screws, bolts, and nuts be used as designated and that they are tightened to the specified torque.

When 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 with the double tube type column.



All the cars with the double tube type steering column are equipped with the steering lock.
As for the cars with the single tube type steering column, whether equipped with the steering lock or not depends on the specifications.

1. Steering wheel pad
2. Steering wheel bumper
3. Steering wheel
4. Combination switch assembly
5. Steering column upper cover
6. Steering column assembly (Double tube type)
6-1. Steering column assembly (Single tube type)
7. Steering shaft lower joint
8. Steering lock assembly
9. Steering column under cover
10. Steering column lower cover

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

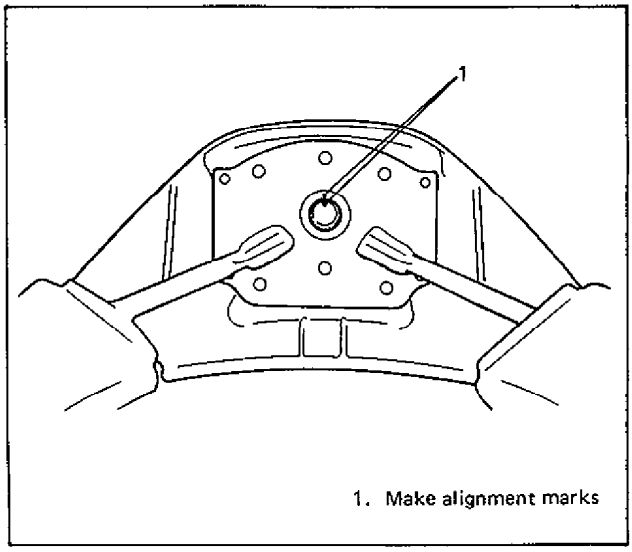


Fig. 3C-2

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

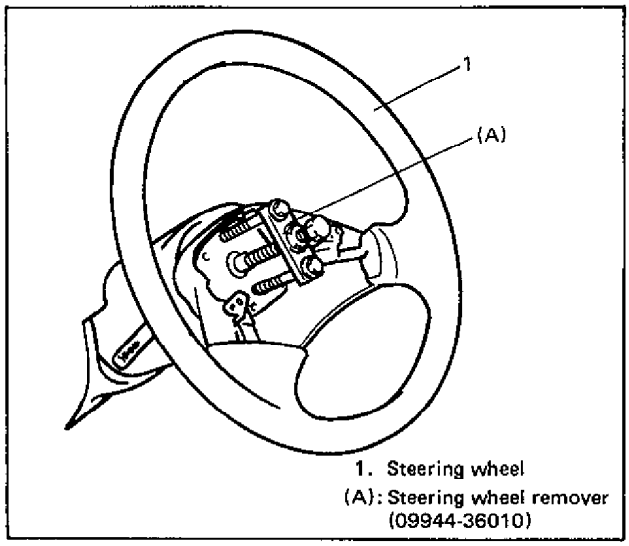


Fig. 3C-3

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.

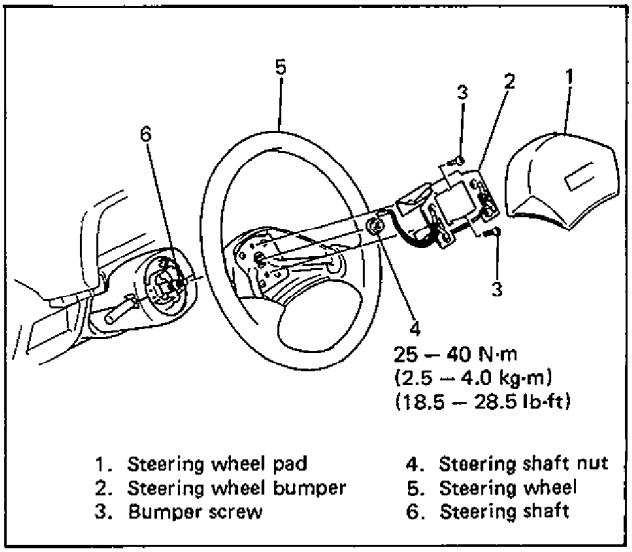


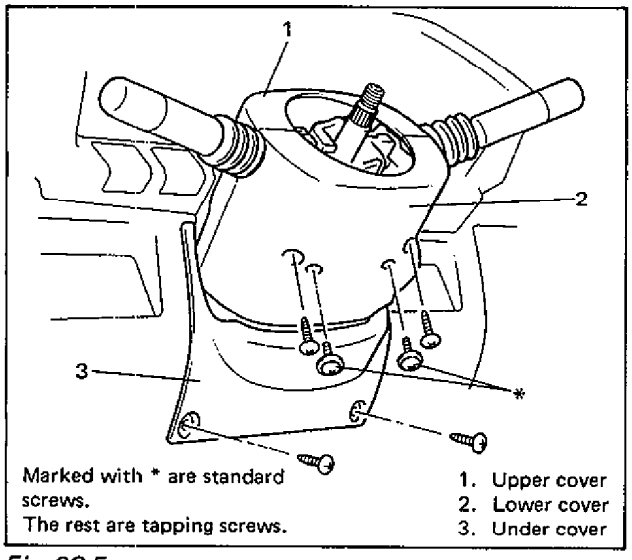
Fig. 3C-4

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).



Marked with * are standard screws.
The rest are tapping screws.

1. Upper cover
2. Lower cover
3. Under cover

Fig. 3C-5

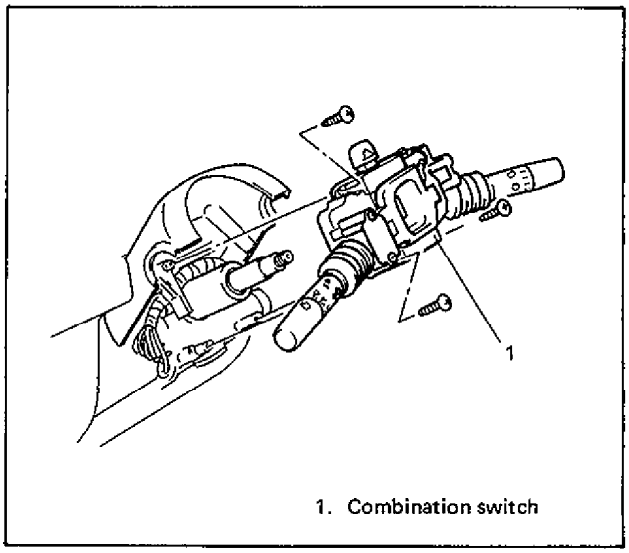
4) Disconnect lead wire from combination switch at coupler.
5) Loosen wire bands.
6) Remove combination switch assembly from steering column.

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.



1. Combination switch

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.

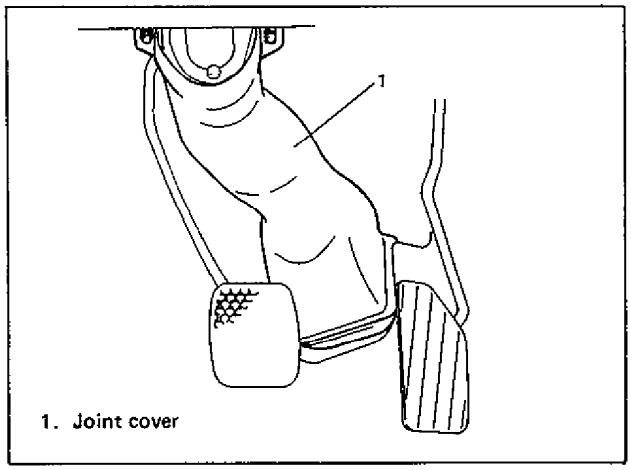


Fig. 3C-7

6) Remove steering shaft joint upper side bolt.

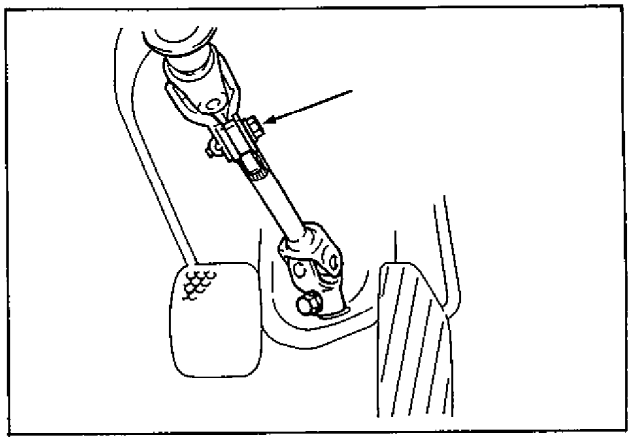


Fig. 3C-8

7) Remove steering column mount nuts.

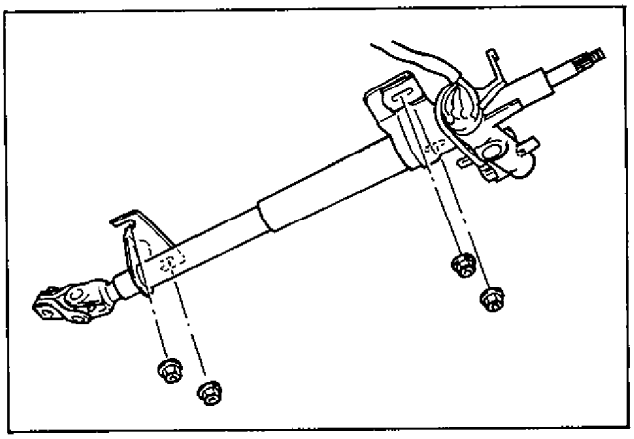


Fig. 3C-9

8) Remove steering column assembly.

NOTE:
- **Don't separate double tube type steering column assembly into steering column and shaft. If column or shaft is defective replace as an assembly.**
- **Single tube type steering column assembly can be separated into steering column and shaft.**

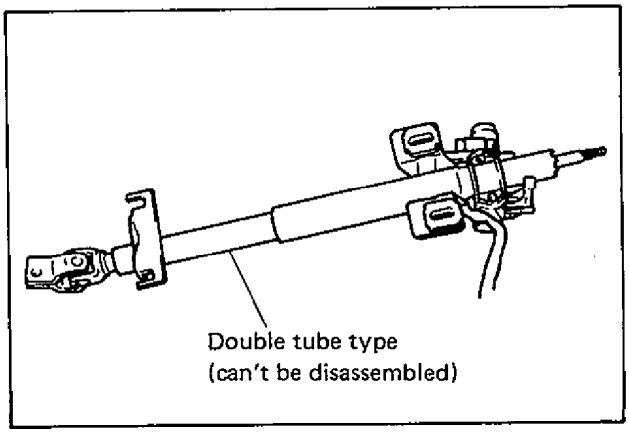


Fig. 3C-10 Steering Column Assembly

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.

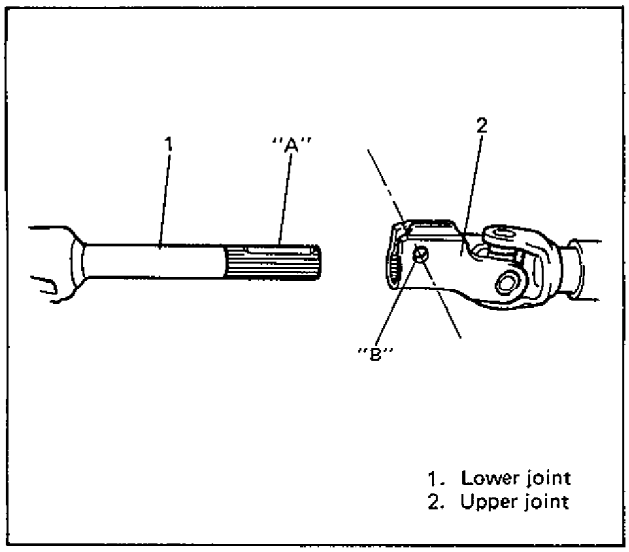


Fig. 3C-11

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.

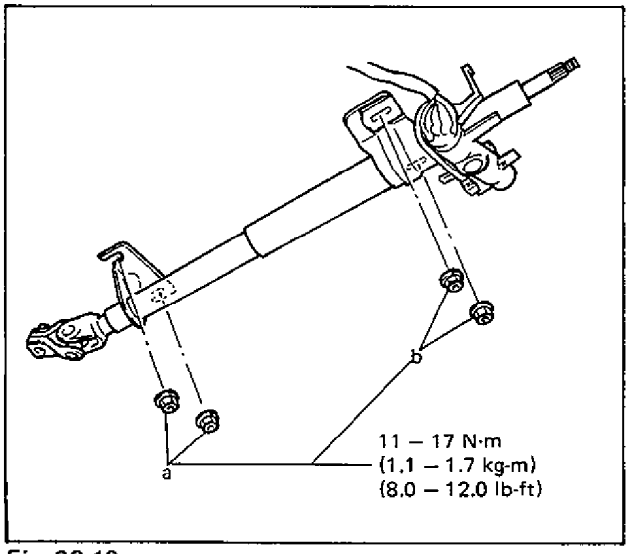


Fig. 3C-12

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

NOTE:
After tightening column nuts, bolt 1 should be tightened.

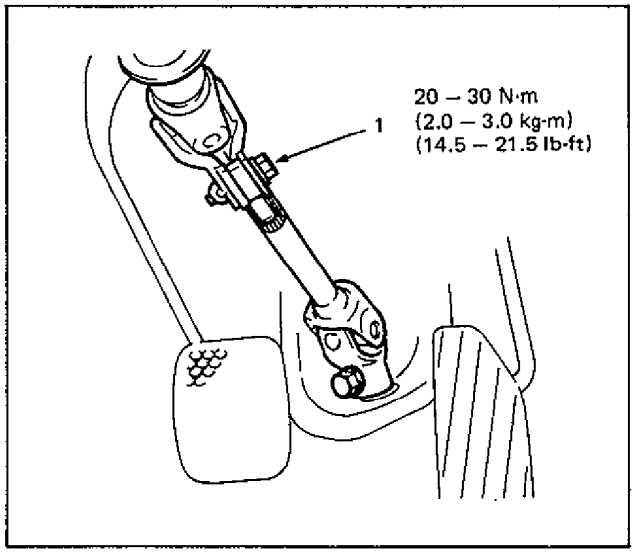


Fig. 3C-13

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.

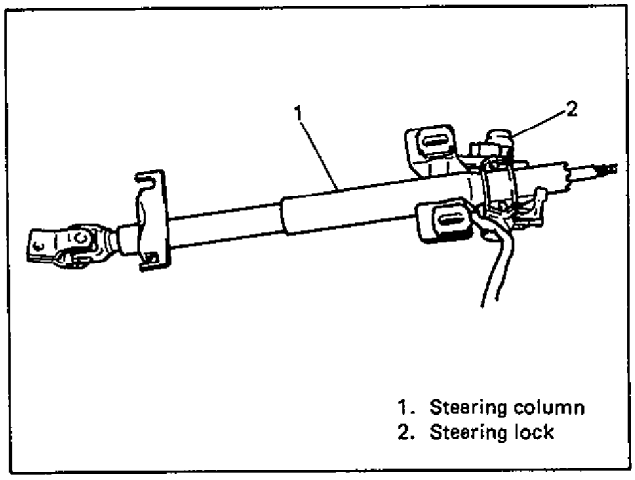


Fig. 3C-14

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.

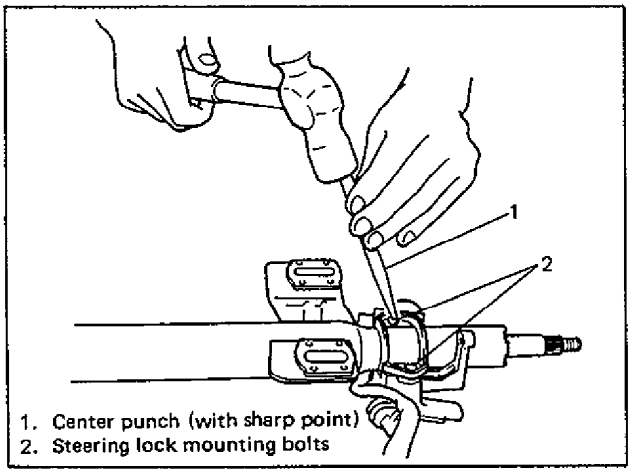


Fig. 3C-15

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.

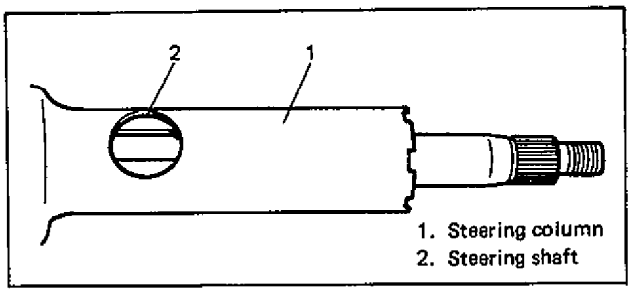


Fig. 3C-16

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.

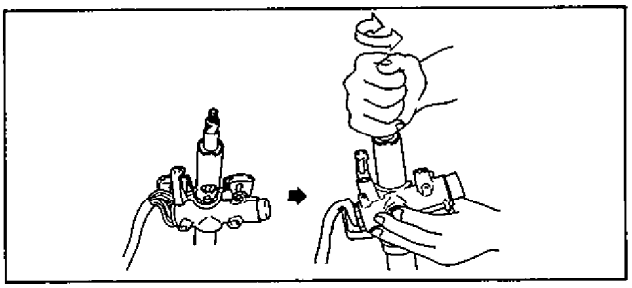


Fig. 3C-17

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

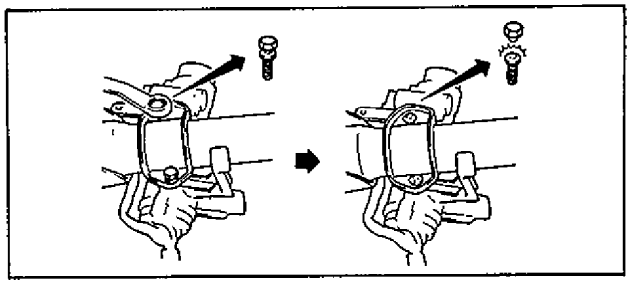


Fig. 3C-18

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.

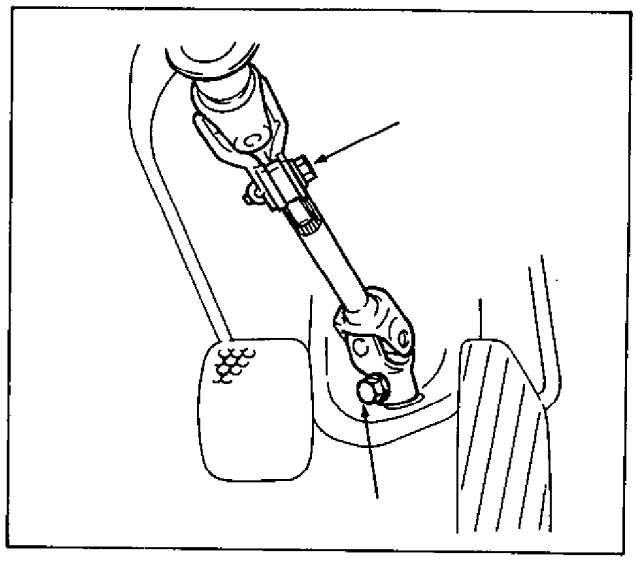


Fig. 3C-19

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.

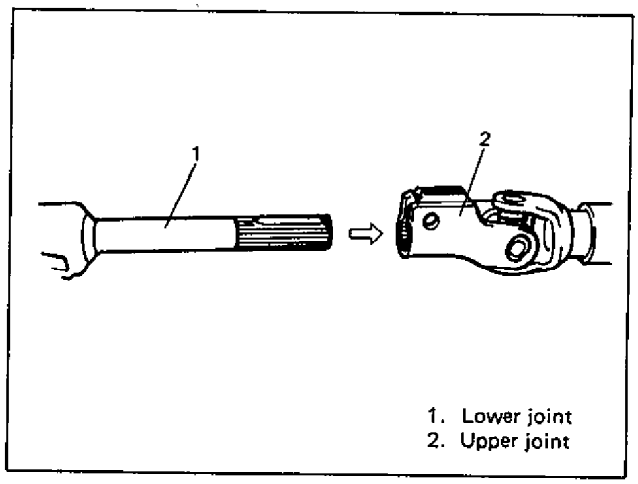


Fig. 3C-20

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.

In such a case, following Step 1) through 4) should be performed for double tube type steering column and 3) through 5) for single tube type 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.

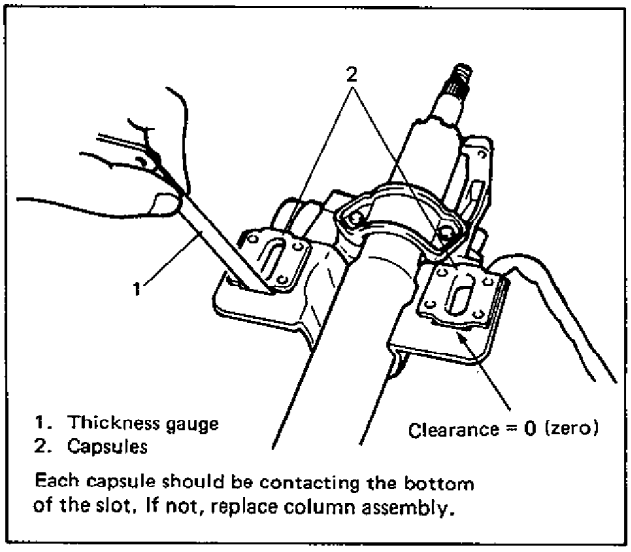


Fig. 3C-21 Checking Steering Column

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

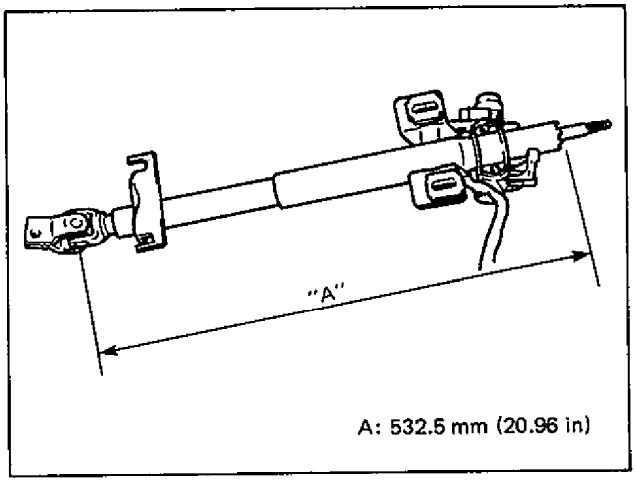


Fig. 3C-22

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.

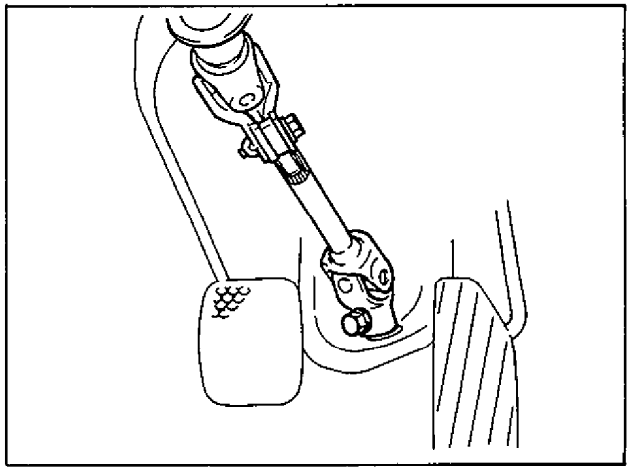


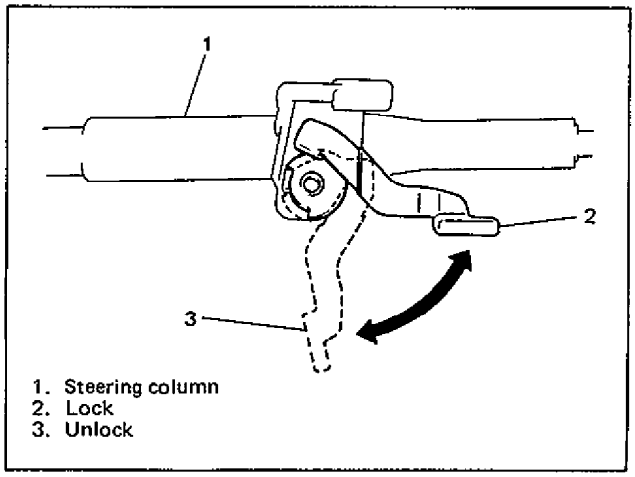
Fig. 3C-23

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).



1. Steering column
2. Lock
3. Unlock

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

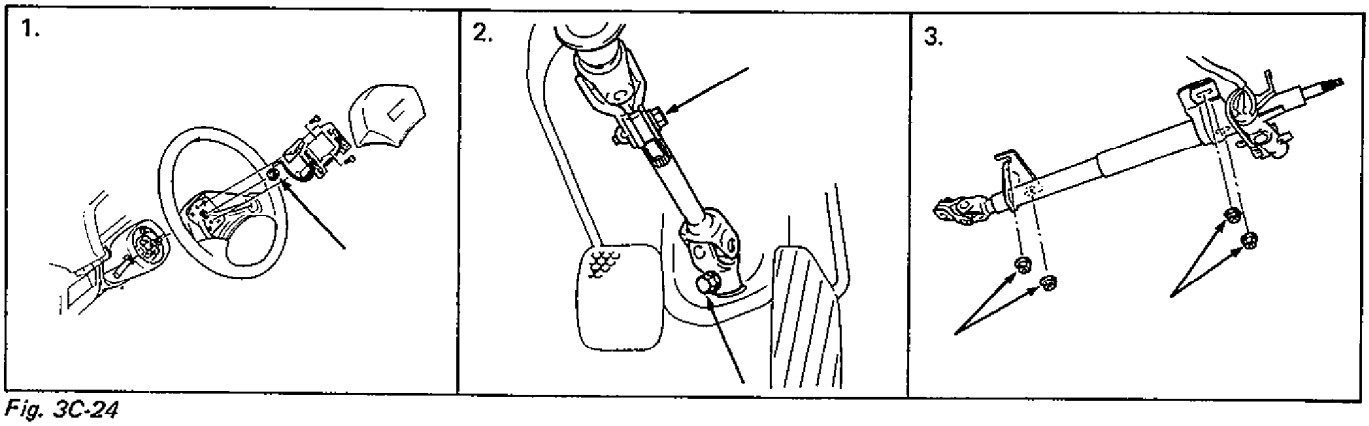
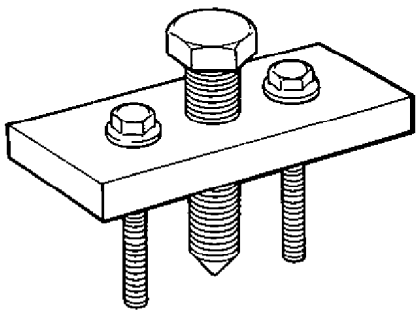


Fig. 3C-24

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 DECRIPTION

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.

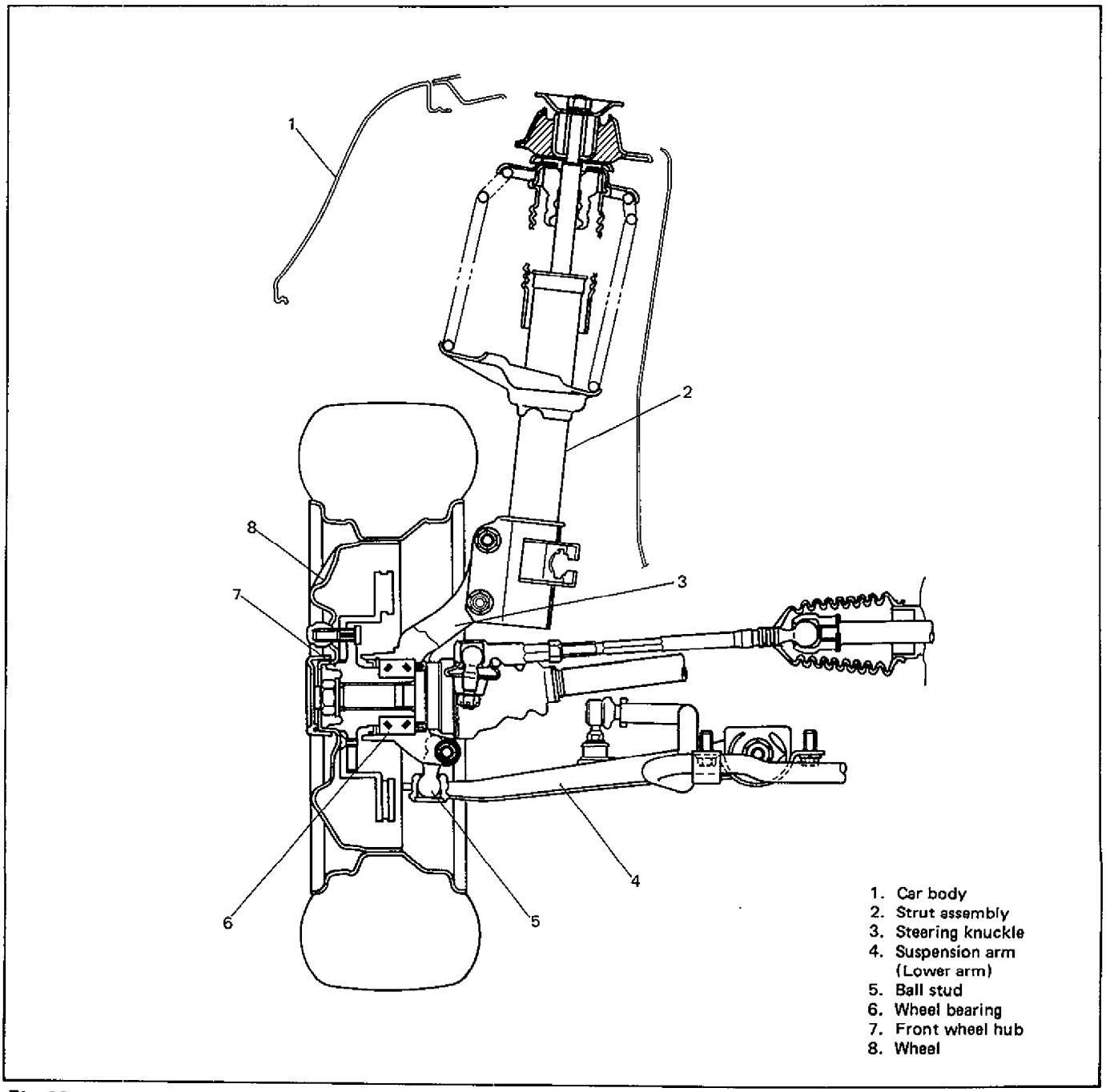
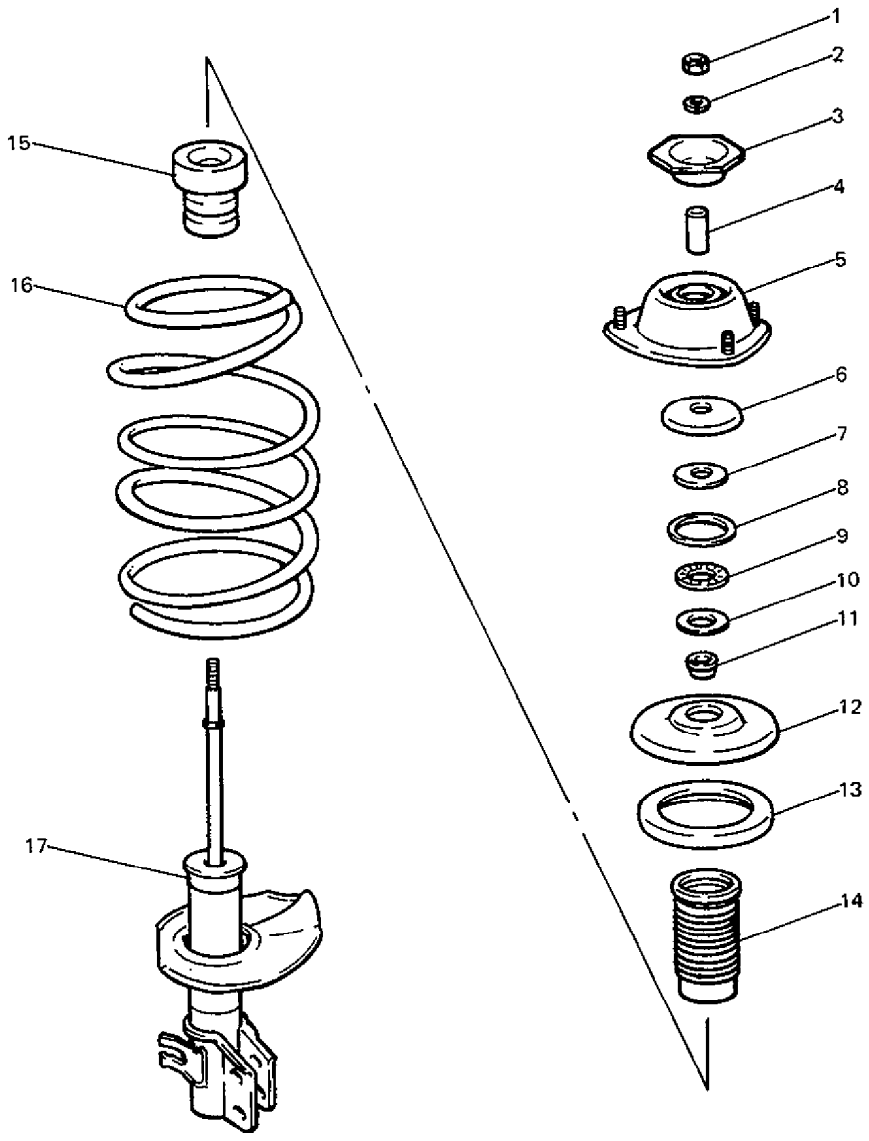


Fig. 3D-1



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.

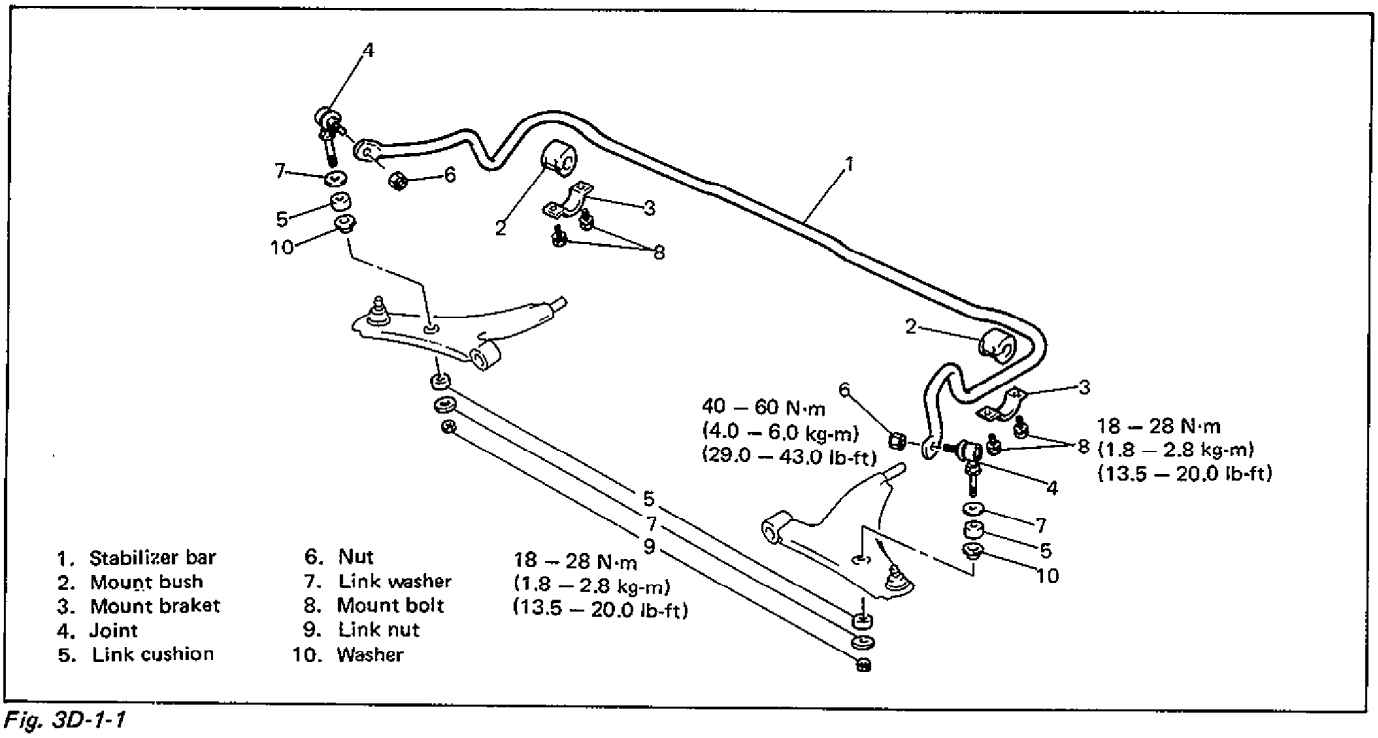


Fig. 3D-1-1

"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.

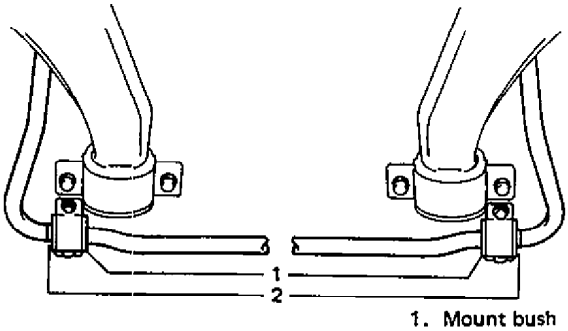


Fig. 3D-1-2

"B"

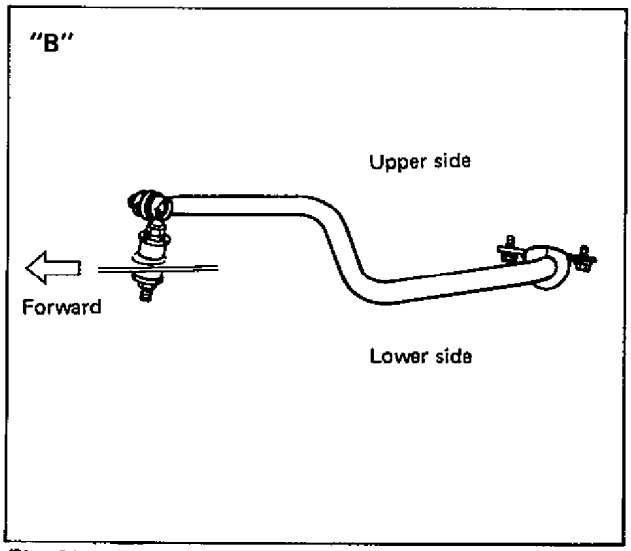


Fig. 3D-1-3

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.

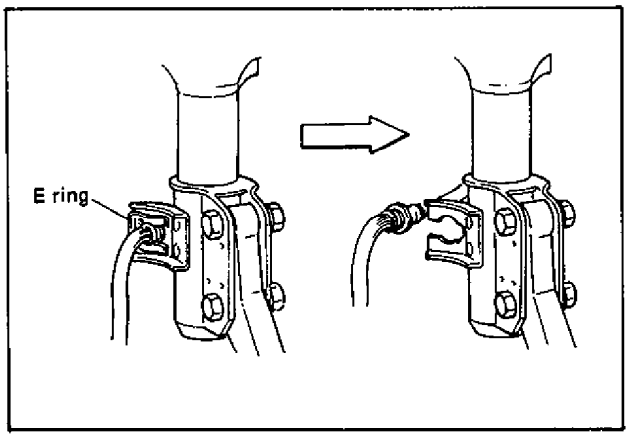


Fig. 3D-2-1

4) Remove strut bracket bolts.

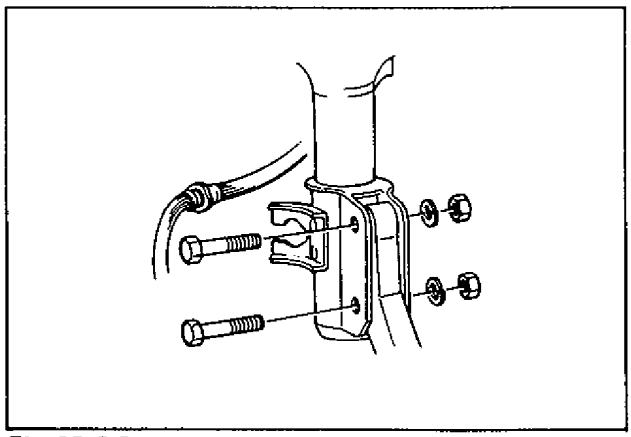


Fig. 3D-2-2

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

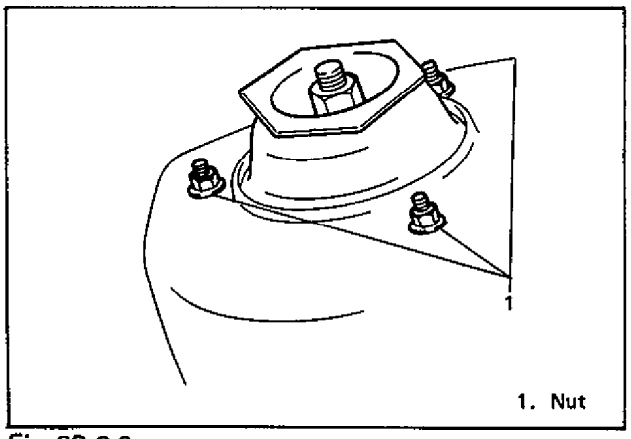


Fig. 3D-2-3

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.

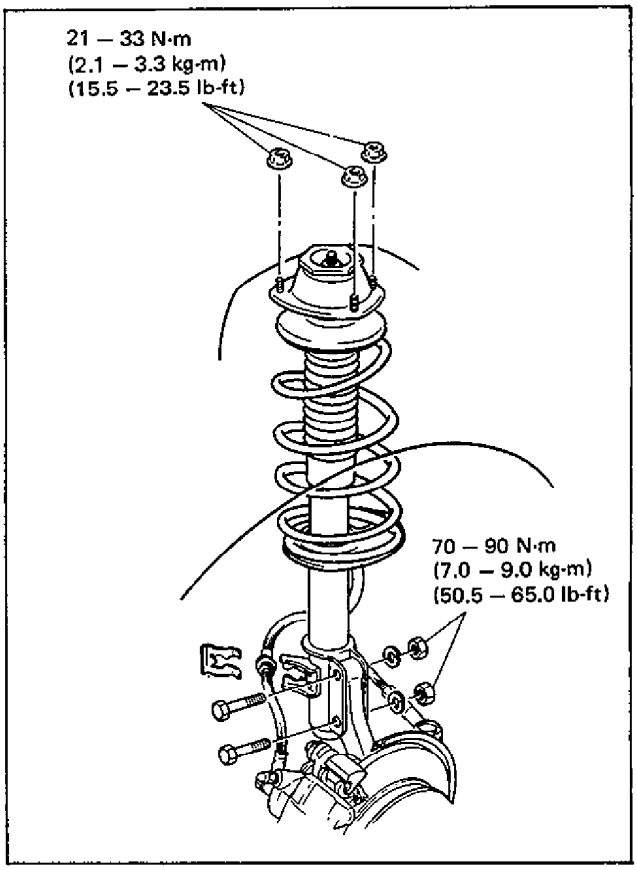


Fig. 3D-2-4

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

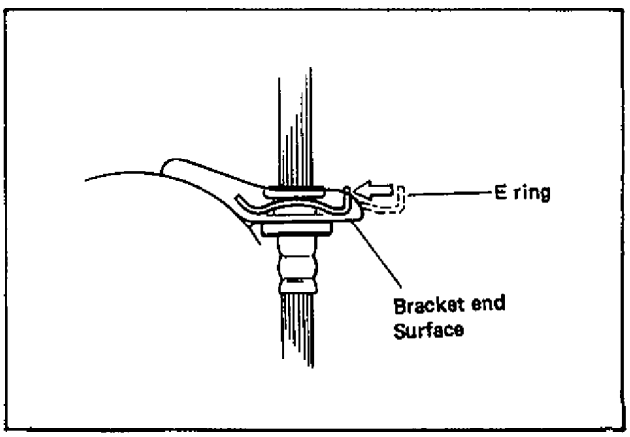


Fig. 3D-2-5

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.

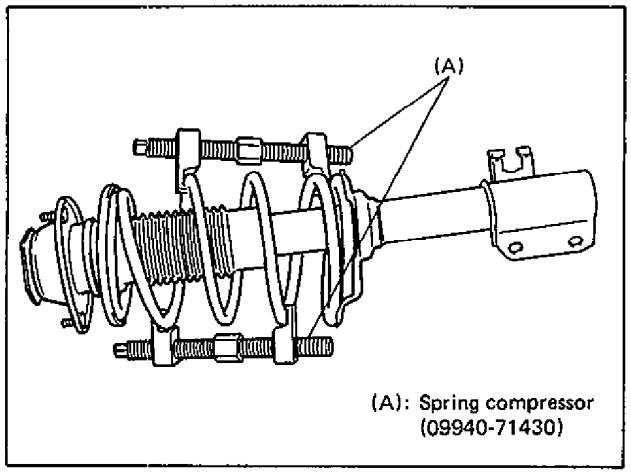


Fig. 3D-3-1

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

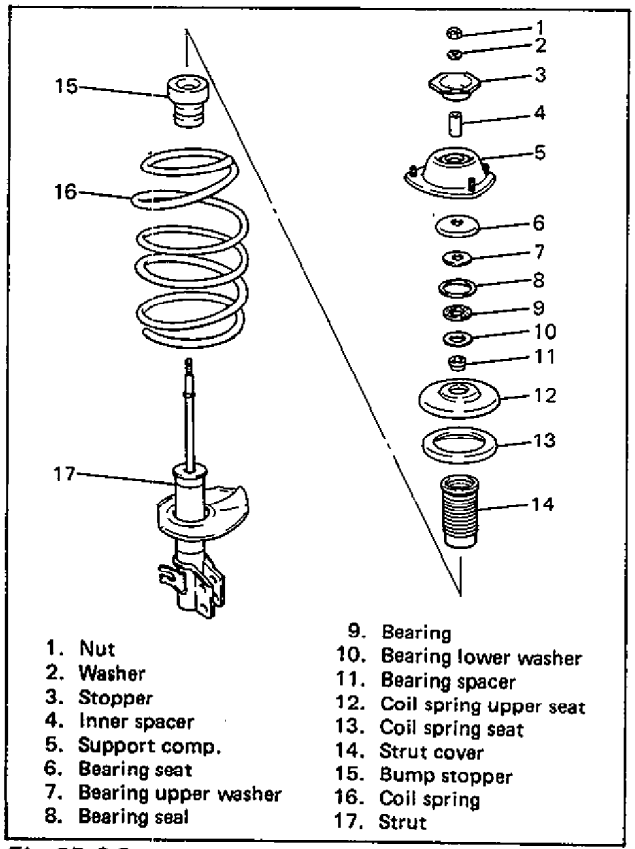


Fig. 3D-3-2

ASSEMBLY

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

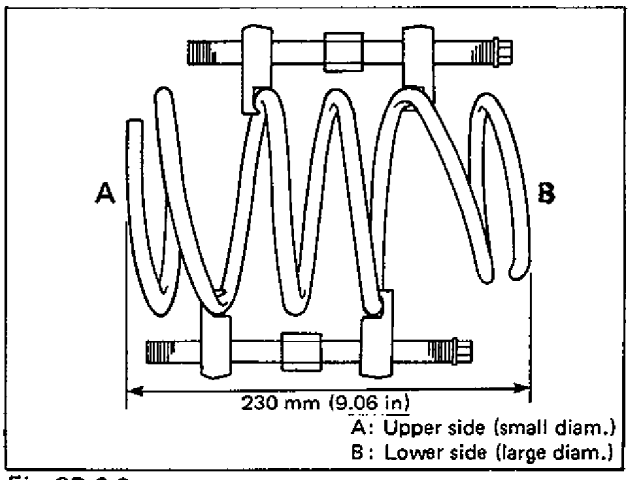


Fig. 3D-3-3

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

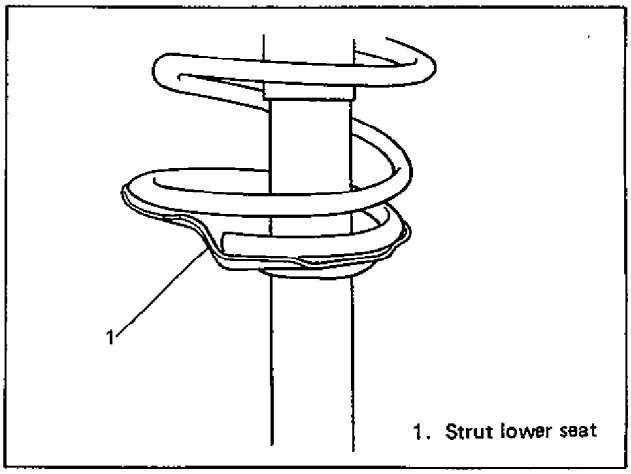
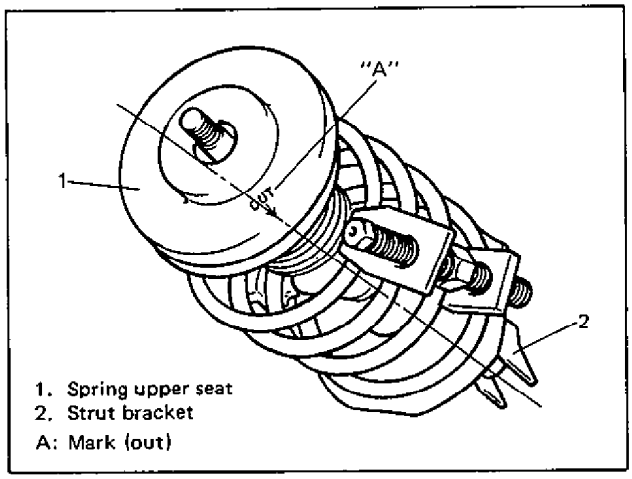


Fig. 3D-3-4

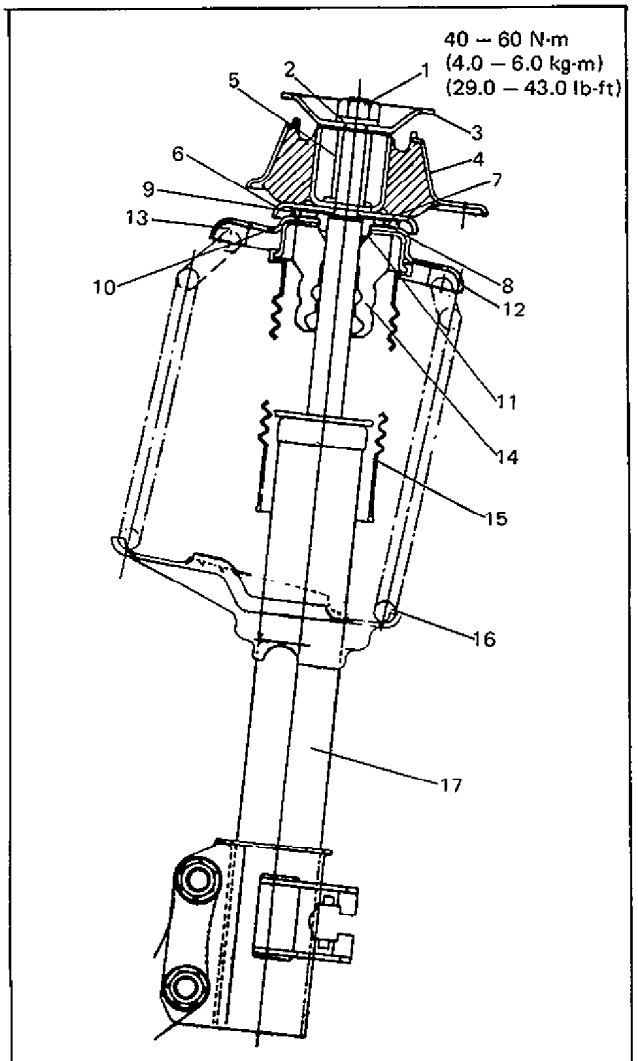
3) Install bump stopper onto strut rod. For installing direction, refer to the figure at the left.
4) Pull strut rod as far up as possible and use care not to allow it to retract into strut.
5) Install spring seat, bearing spacer and strut cover to spring upper seat and then install strut bracket with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



1. Spring upper seat
2. Strut bracket

A: Mark (out)

Fig. 3D-3-5



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

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.

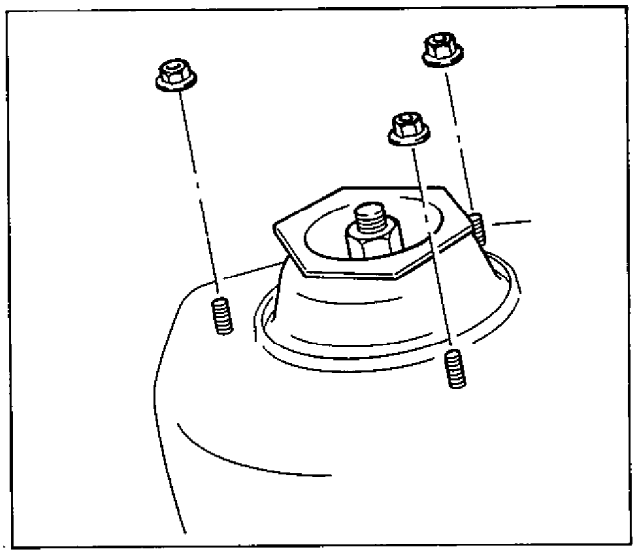


Fig. 3D-3-7

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.

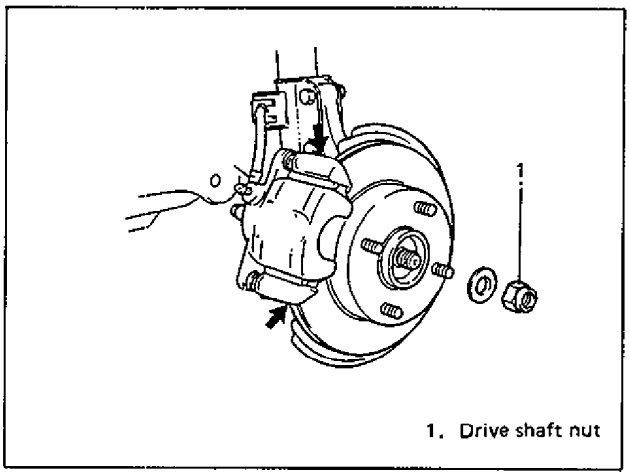


Fig. 3D-4-1

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

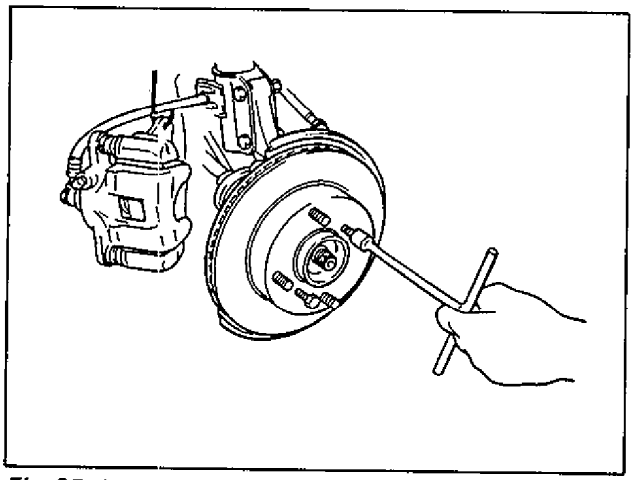


Fig. 3D-4-2

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

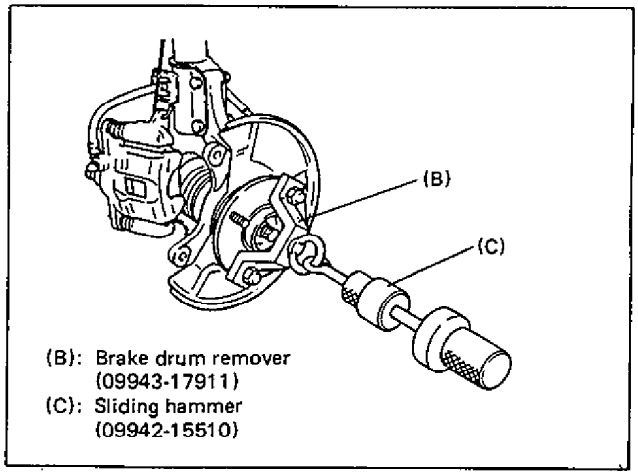


Fig. 3D-4-3

9) Remove hub bolts.

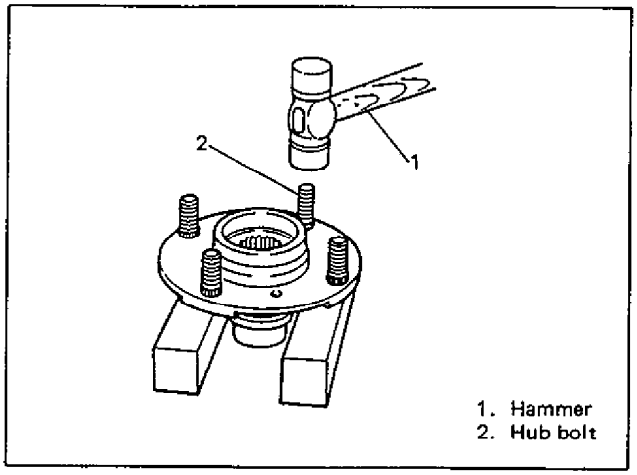


Fig. 3D-4-4

10) Remove wheel bearing inner race.

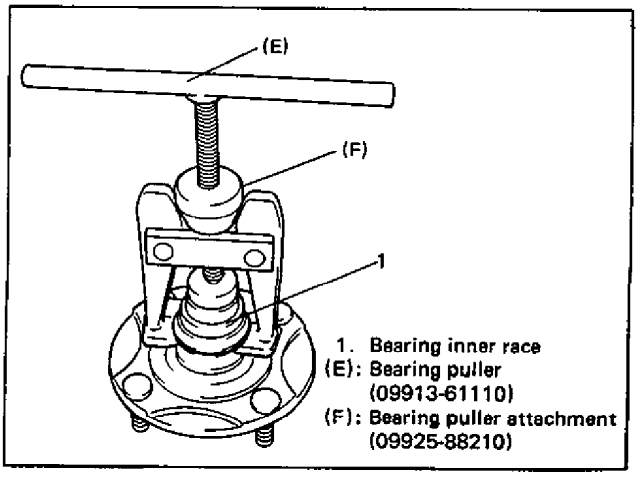


Fig. 3D-4-5

INSTALLATION

Install Hub Bolts

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

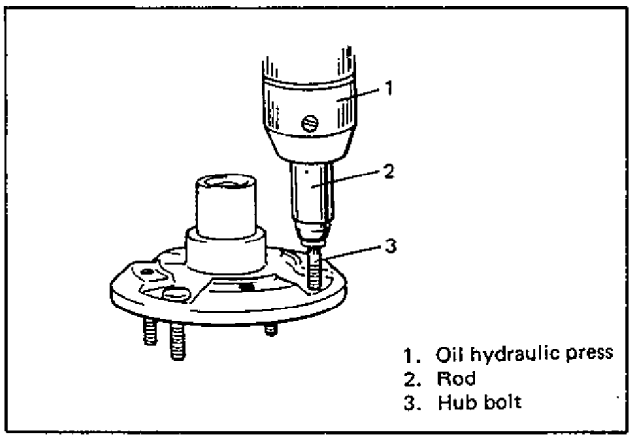


Fig. 3D-4-6

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

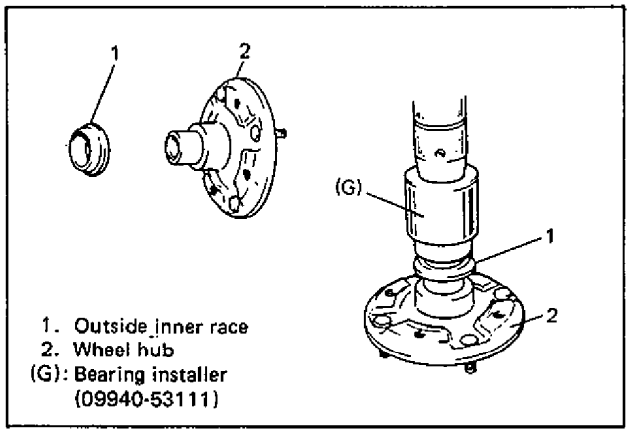


Fig. 3D-4-7

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

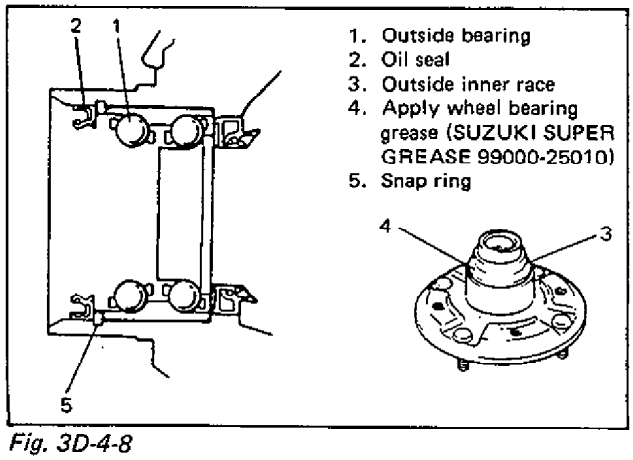


Fig. 3D-4-8

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

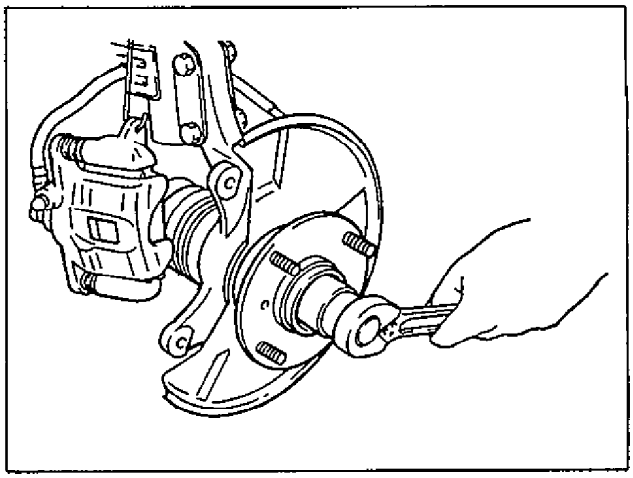


Fig. 3D-4-9

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.

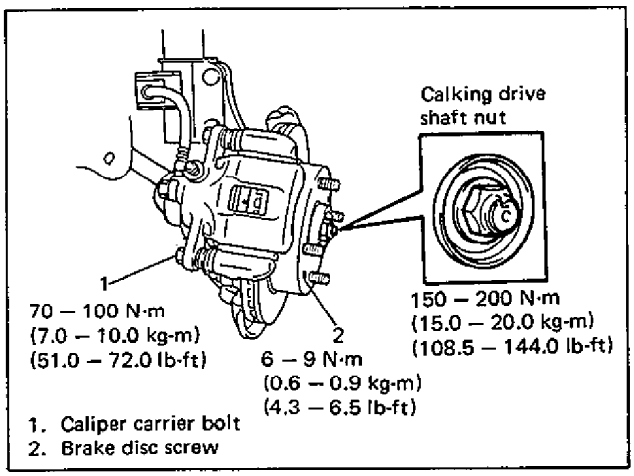


Fig. 3D-4-10

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.

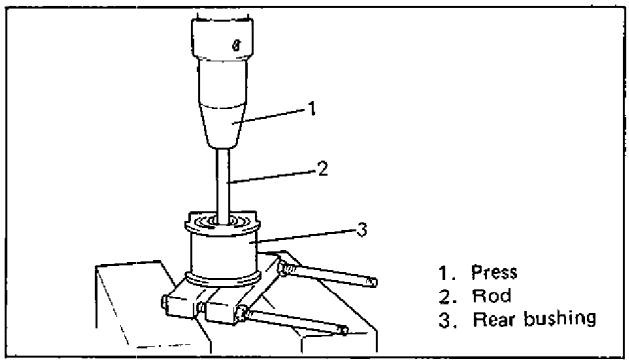


Fig. 3D-5-1

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".

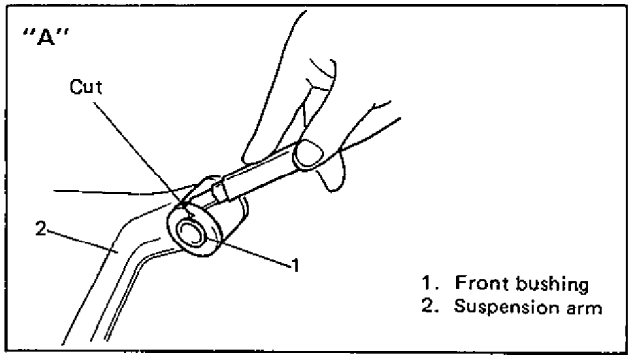


Fig. 3D-5-2

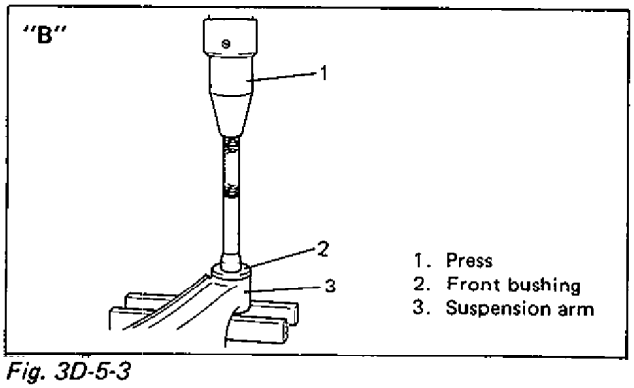


Fig. 3D-5-3

INSTALLATION

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

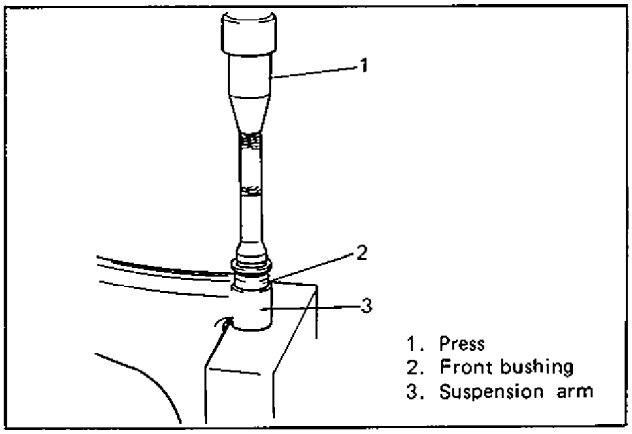


Fig. 3D-5-4

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

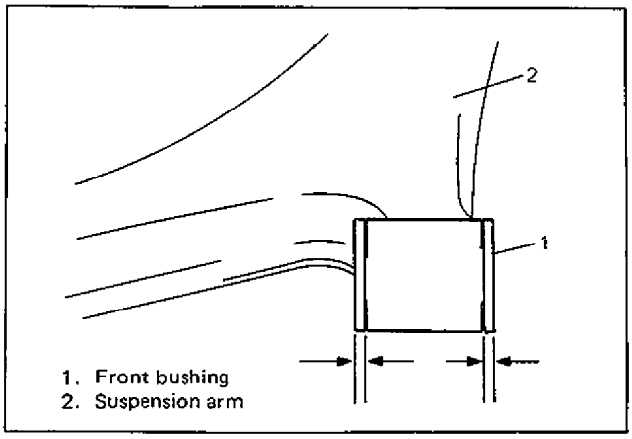


Fig. 3D-5-5

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".

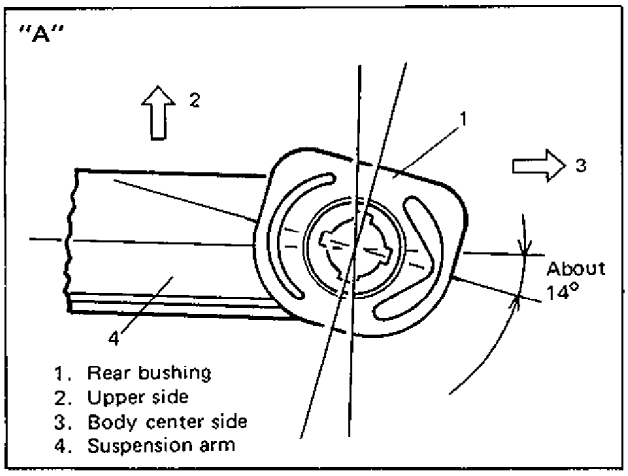


Fig. 3D-5-6

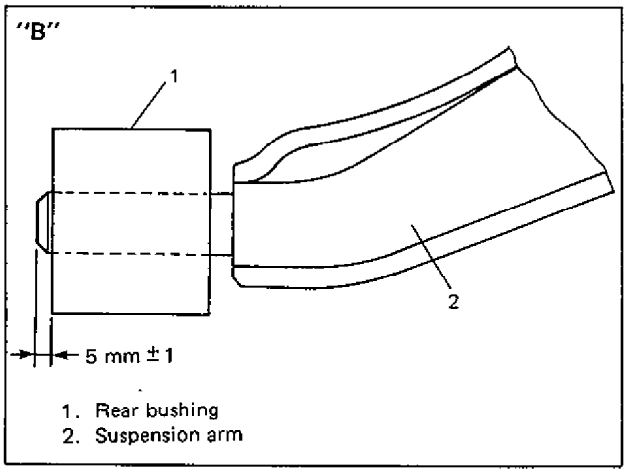


Fig. 3D-5-7

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.

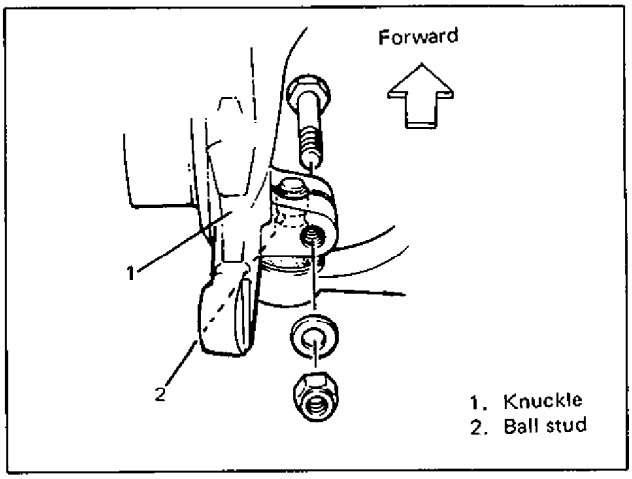


Fig. 3D-5-8

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.

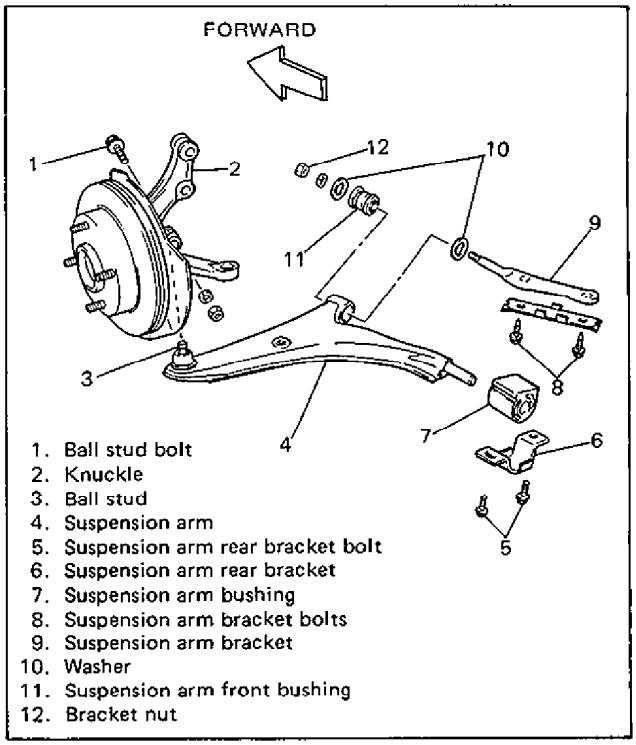


Fig. 3D-5-9

6. REMOVE AND INSTALL KNUCKLE/BEARING

REMOVAL

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

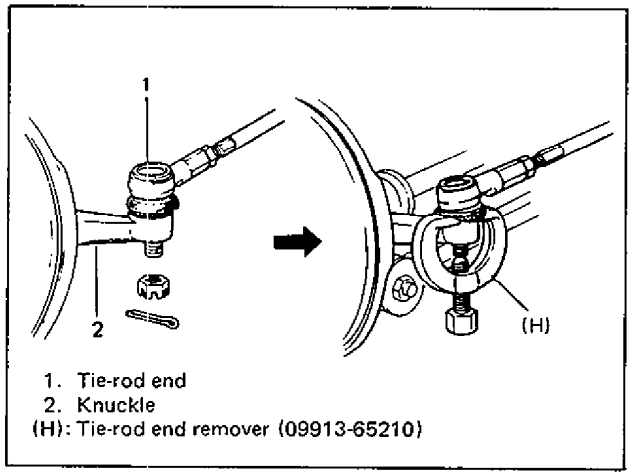


Fig. 3D-6-1

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

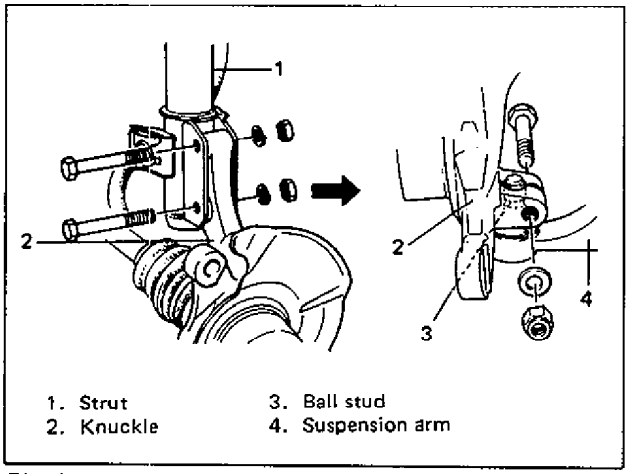


Fig. 3D-6-2

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.

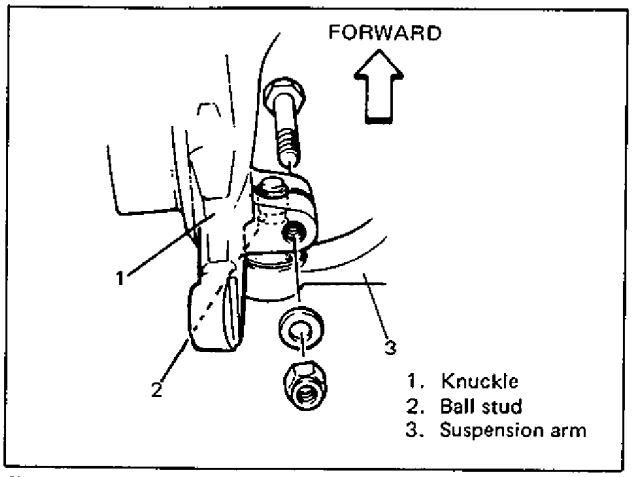


Fig. 3D-6-3

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

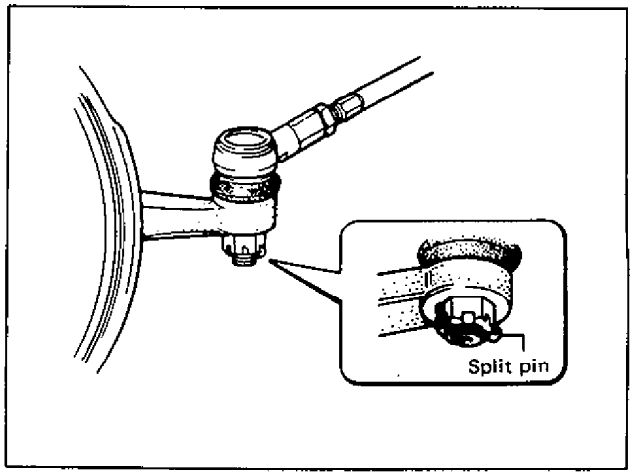
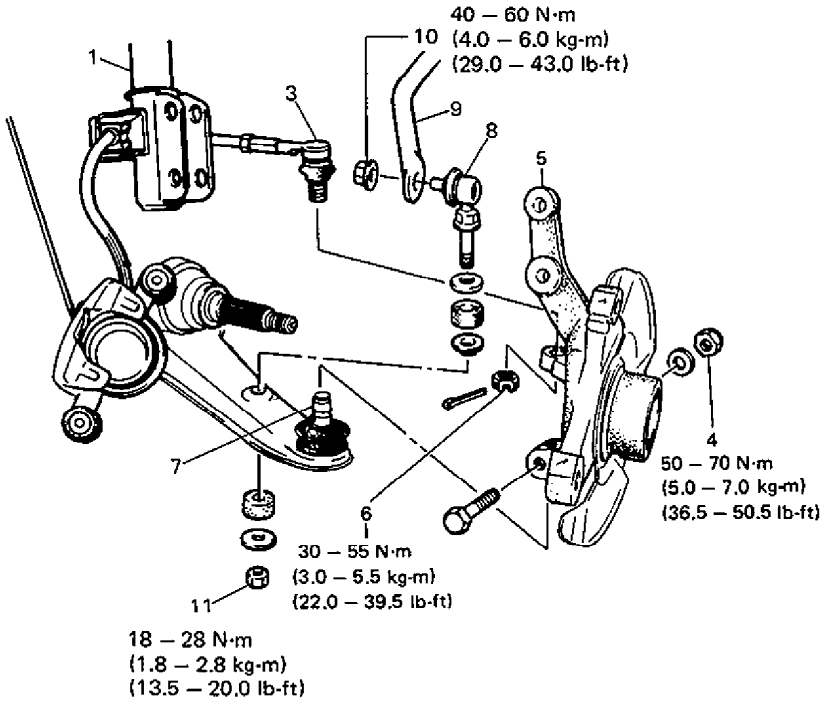
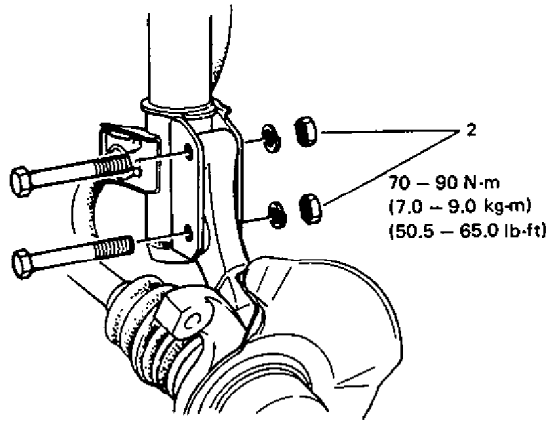


Fig. 3D-6-4

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.





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, inside oil seal and inside bearing in that order.

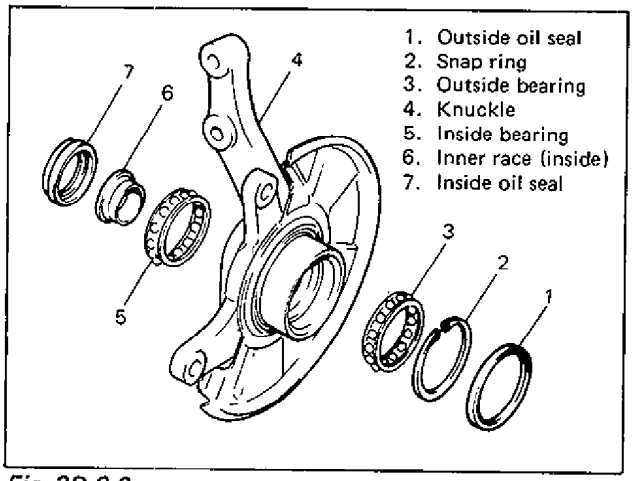


Fig. 3D-6-6

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

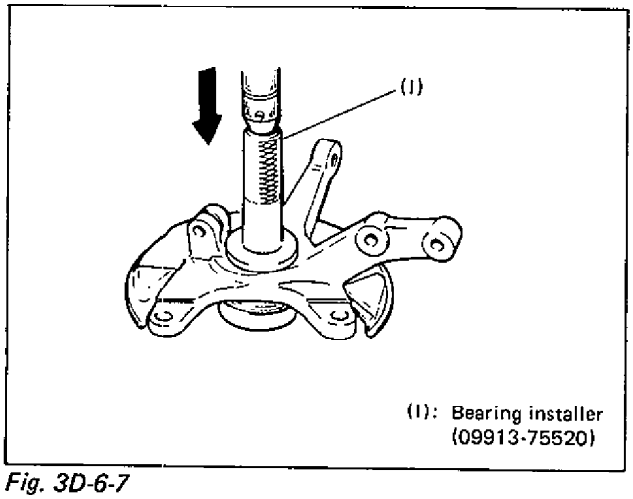


Fig. 3D-6-7

INSTALL OIL SEALS, SNAP RING AND WHEEL BEARING

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

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

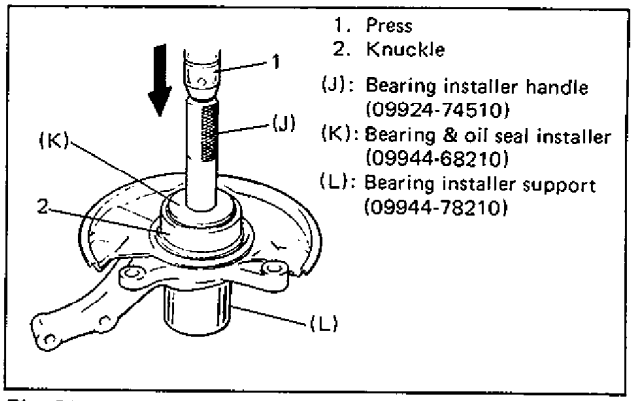


Fig. 3D-6-8

- After greasing (litchic grease) bearing outer race, bearings, inner race 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).

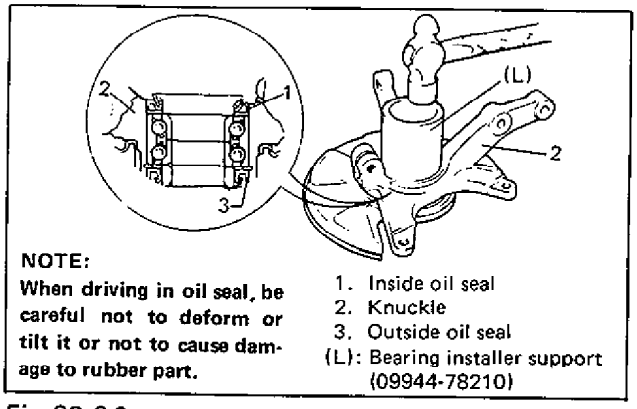


Fig. 3D-6-9

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.

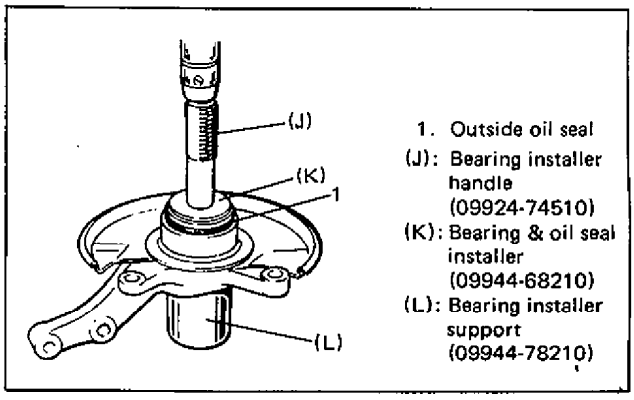


Fig. 3D-6-10

7. FRONT SUSPENSION INSPECTION

STABILIZER BAR AND/OR BUSHING

Bar

Inspect for damage or deformation. If defective, replace.

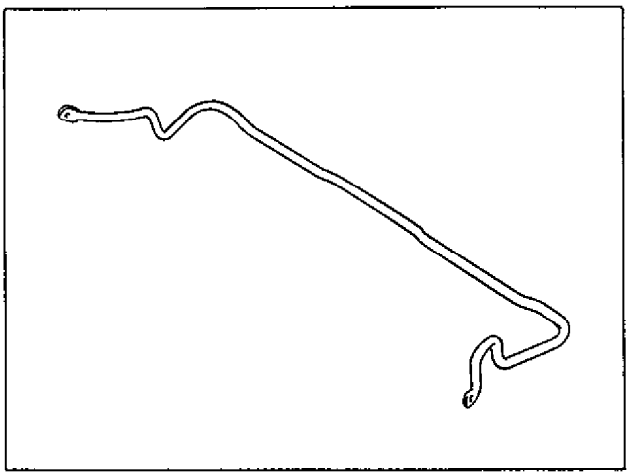


Fig. 3D-7-1

Bushing

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

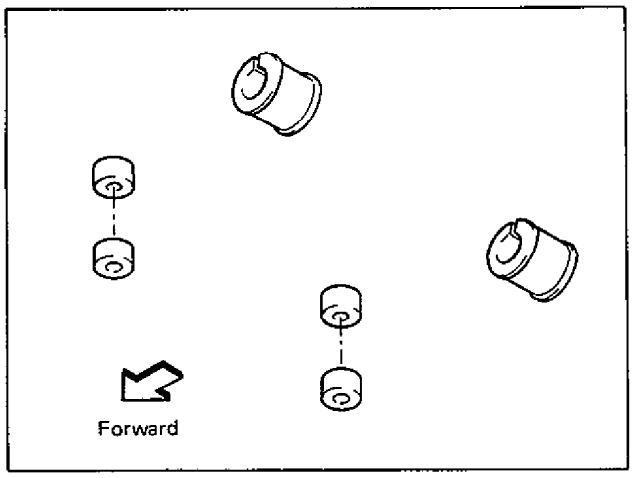


Fig. 3D-7-2

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.

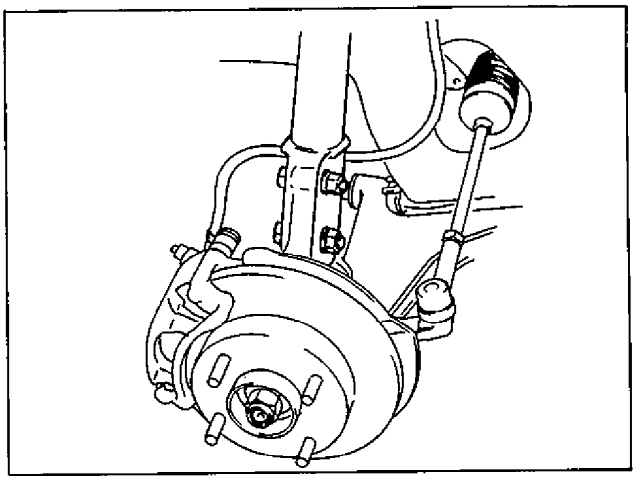


Fig. 3D-7-3

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.

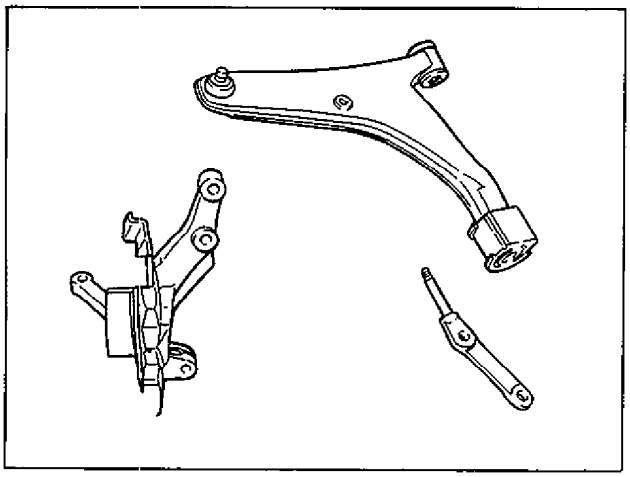


Fig. 3D-7-4

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.

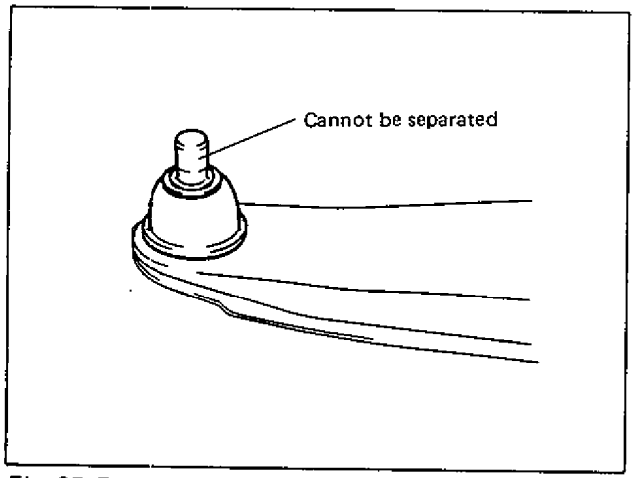


Fig. 3D-7-5

SUSPENSION ARM BUSHING

Inspect for damage, wear or deterioration.

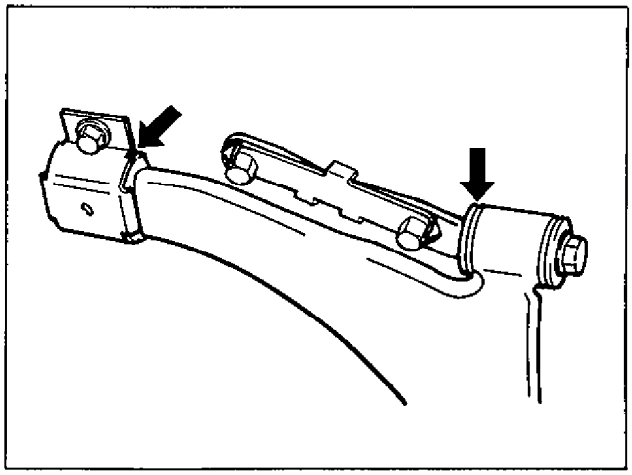


Fig. 3D-7-6

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.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	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.

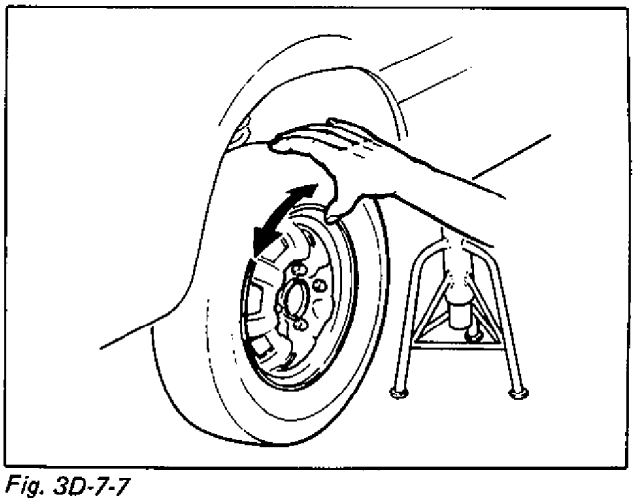


Fig. 3D-7-7

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

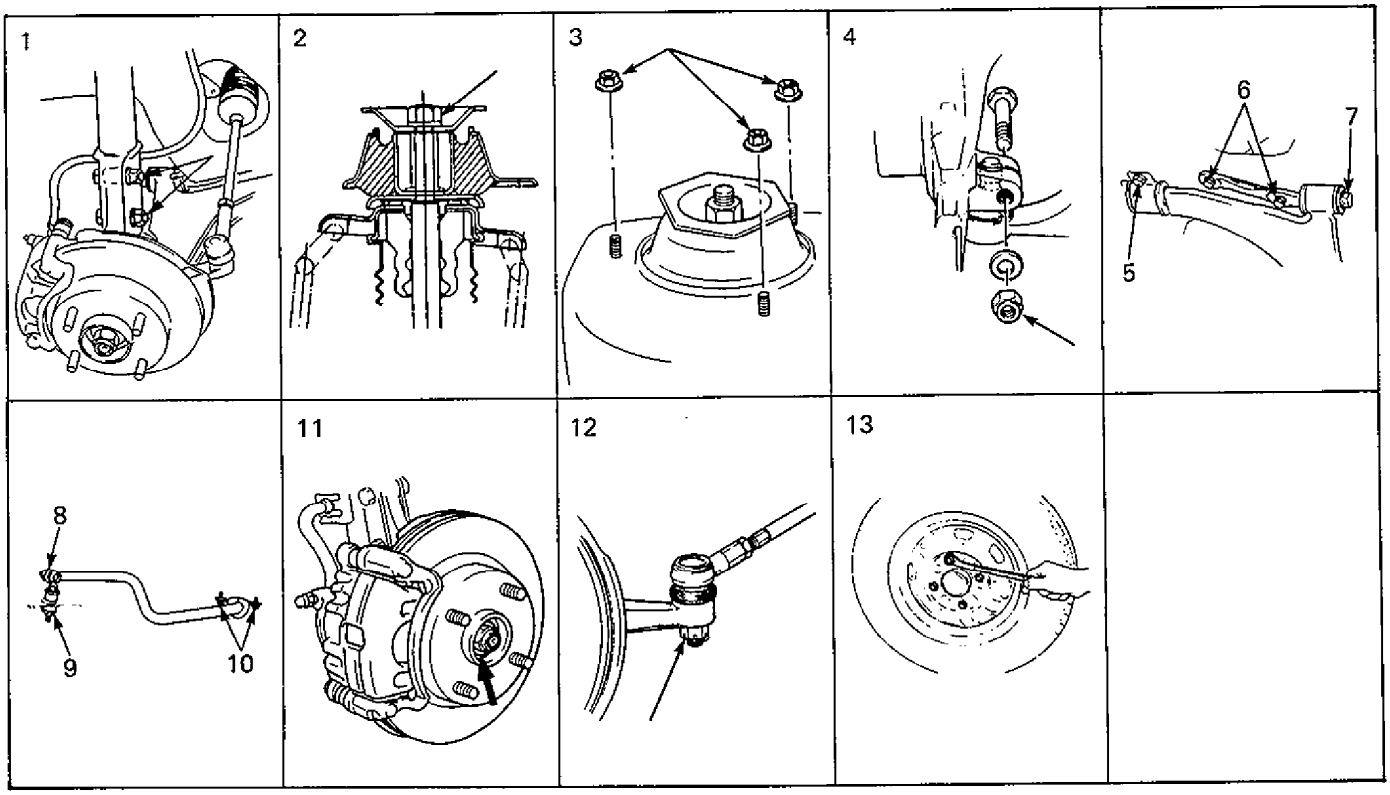


Fig. 3D-7-8

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

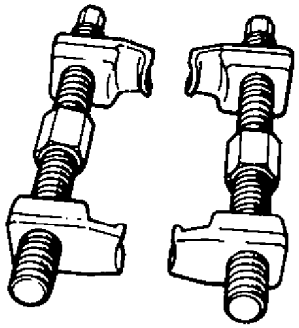
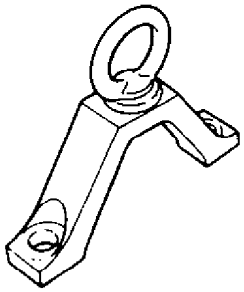
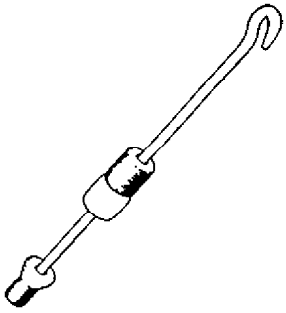
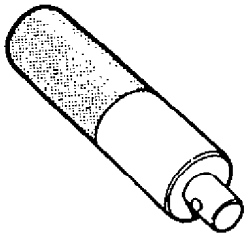
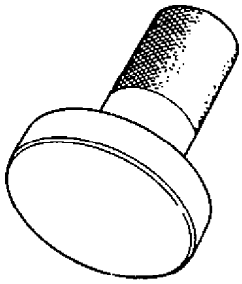
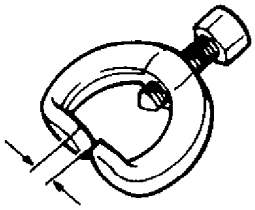
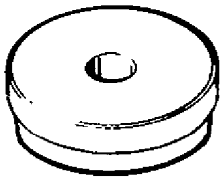
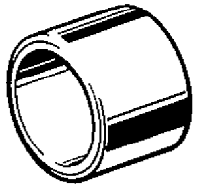
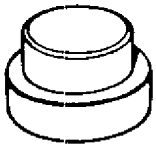
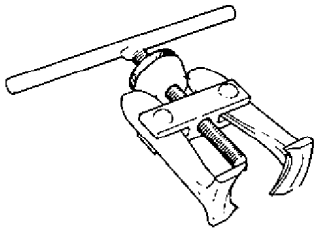
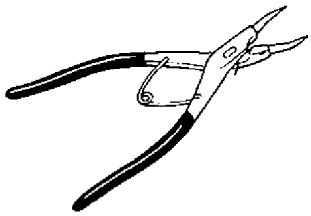
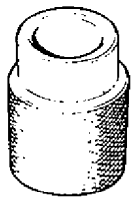
 09940-71430 Spring compressor	 09943-17911 Front wheel bub remover (Brake drum remover)	 09942-15510 Sliding hammer	 09924-74510 Bearing installer handle
 09913-75520 Bearing installer	 09913-65210 Tie-rod end remover	 09944-68210 Bearing & oil seal installer	 09944-78210 Bearing installer support
 09925-88210 Bearing puller attachment	 09913-61110 Bearing puller	 09900-06108 Snap ring pliers (closing type)	 09940-53111 Bearing installer

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

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.

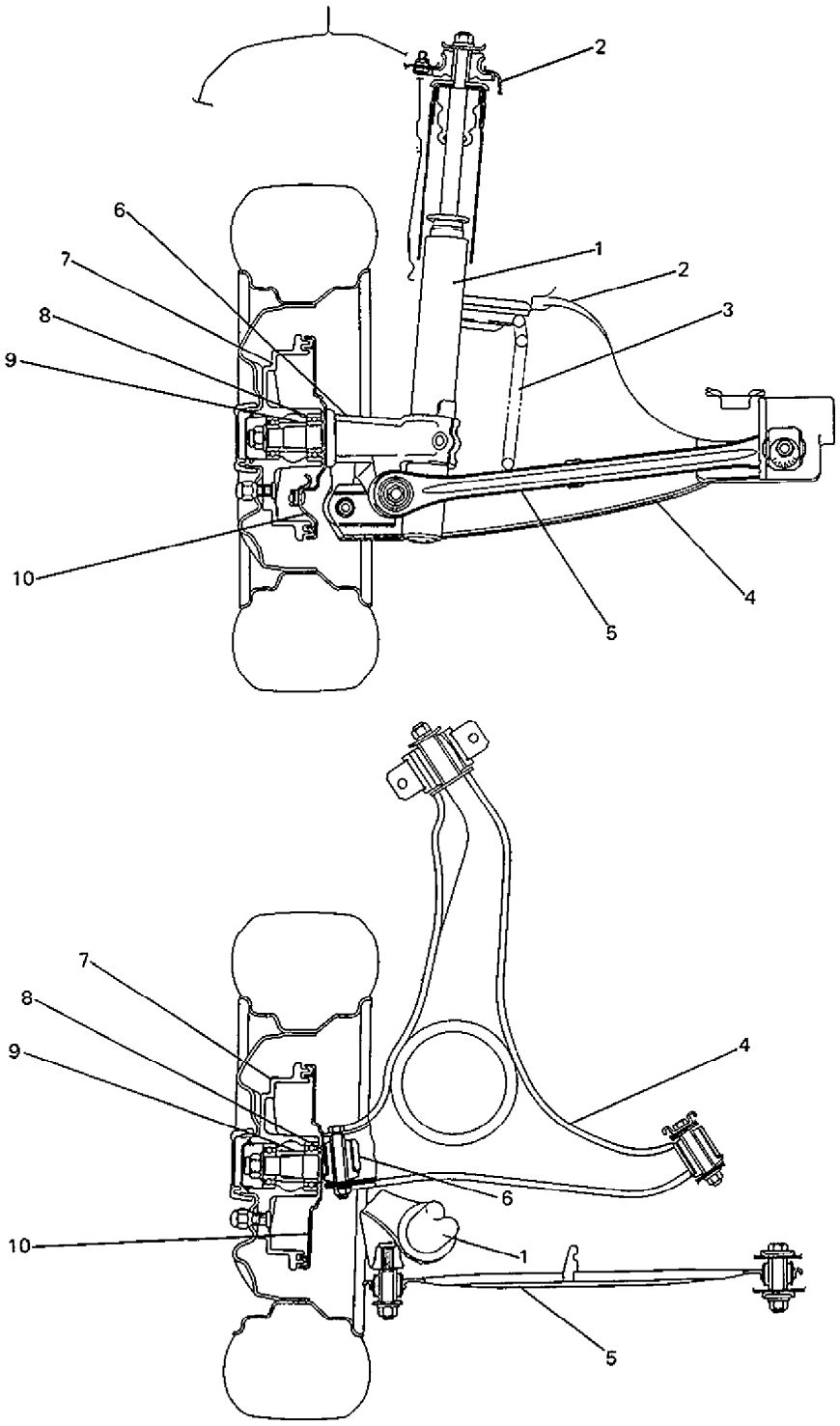


Fig. 3E-1

ON-CAR SERVICE

(REMOVE AND INSTALL)

CONTROL ROD

REMOVAL

1) Hoist car and remove wheel.
2) Disconnect brake flexible hose from control rod.

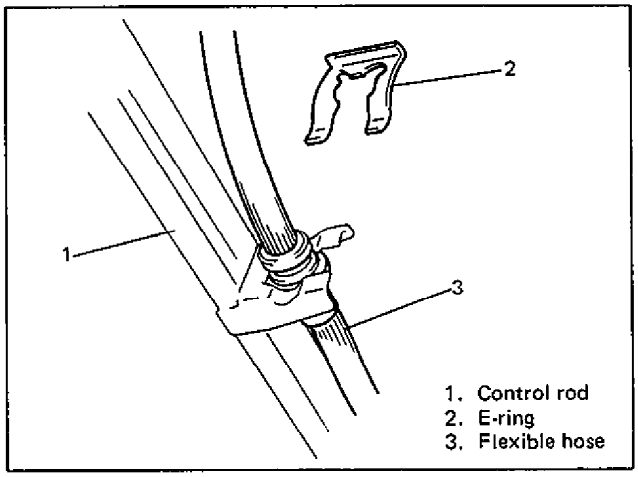


Fig. 3E-2

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.

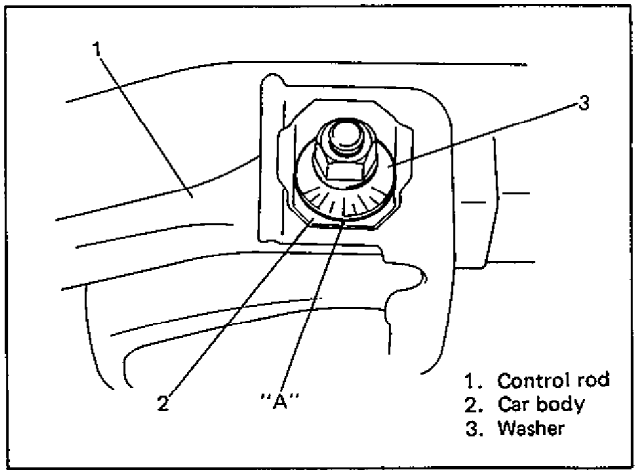


Fig. 3E-3

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.

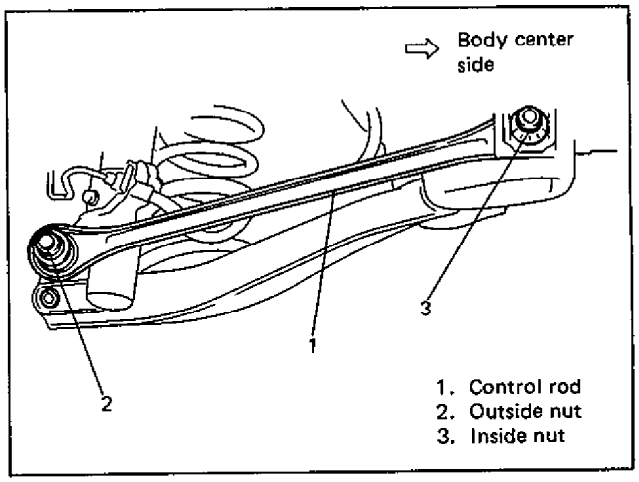


Fig. 3E-4

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.

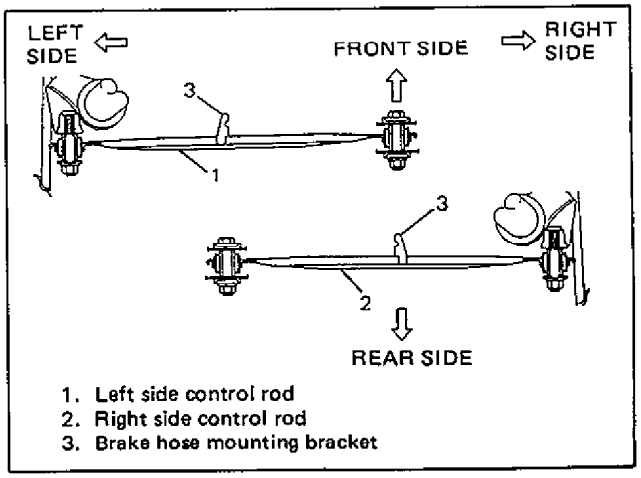


Fig. 3E-5

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

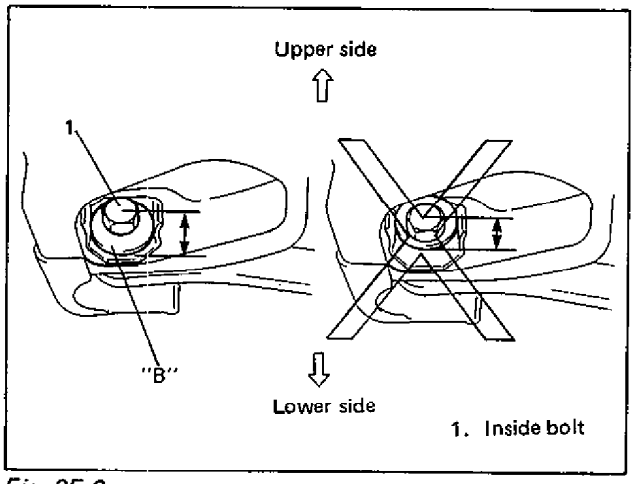


Fig. 3E-6

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.

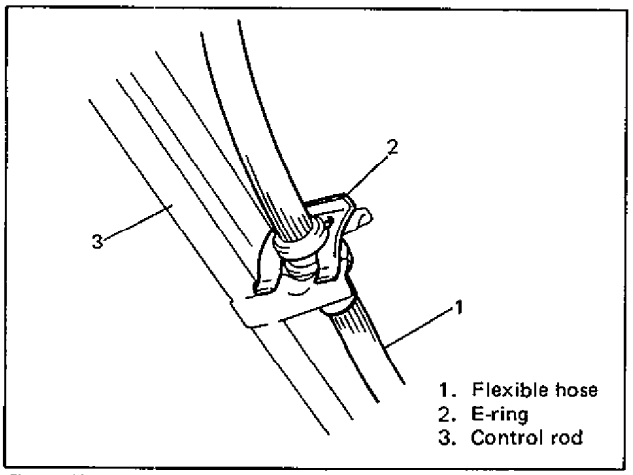


Fig. 3E-7

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.

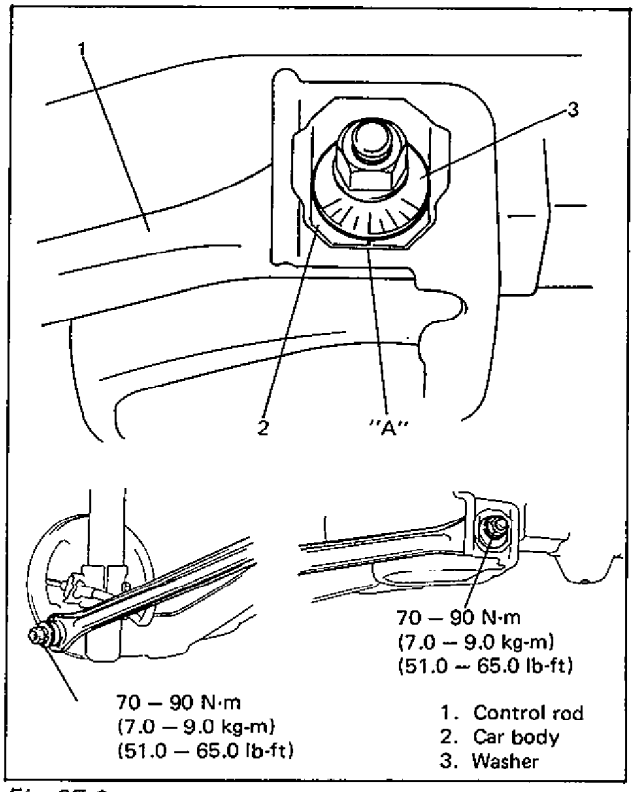


Fig. 3E-8

8) Check rear toe and ajust it as necessary. For check and adjustment procedures, Refer to p. 3E-16.

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).

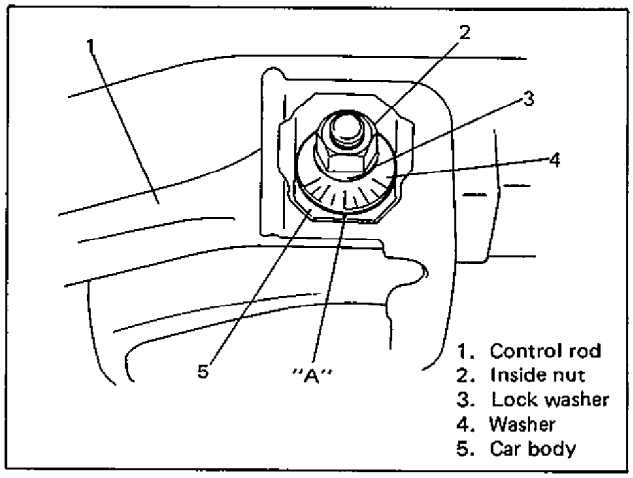


Fig. 3E-9

3) Remove outside (wheel side) of control rod from rear knuckle stud bolt.

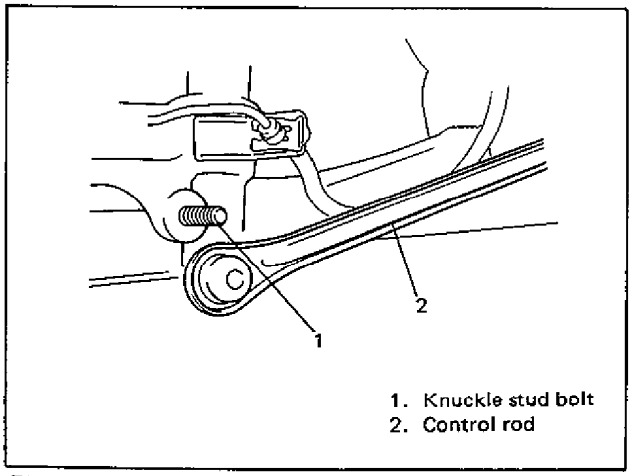


Fig. 3E-10

4) Loosen rear mount nut of suspension arm.

NOTE:
But don't remove bolt.

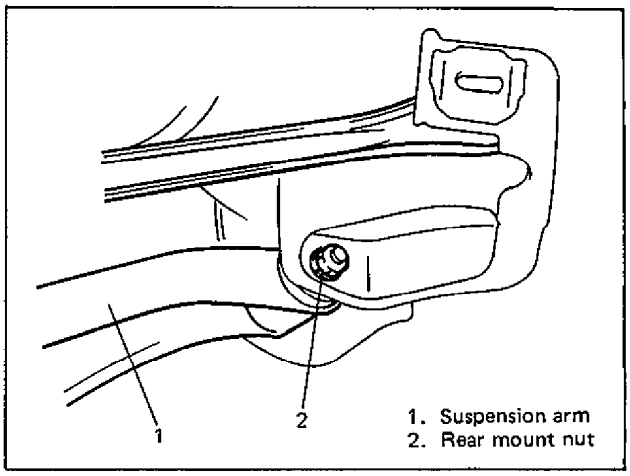


Fig. 3E-11

5) Loosen front nut of suspension arm.

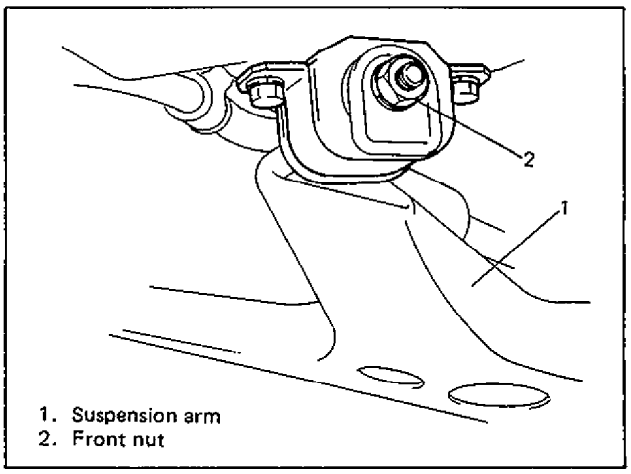


Fig. 3E-12

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.

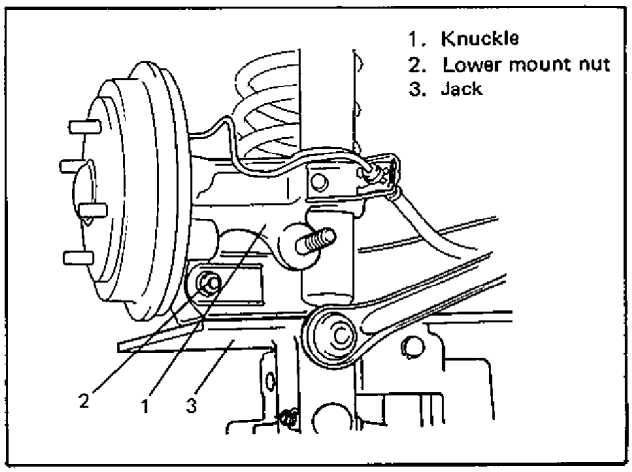


Fig. 3E-13

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

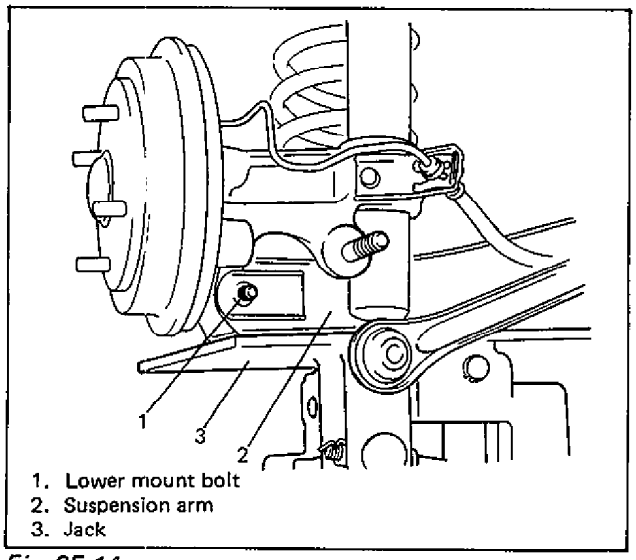


Fig. 3E-14

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.

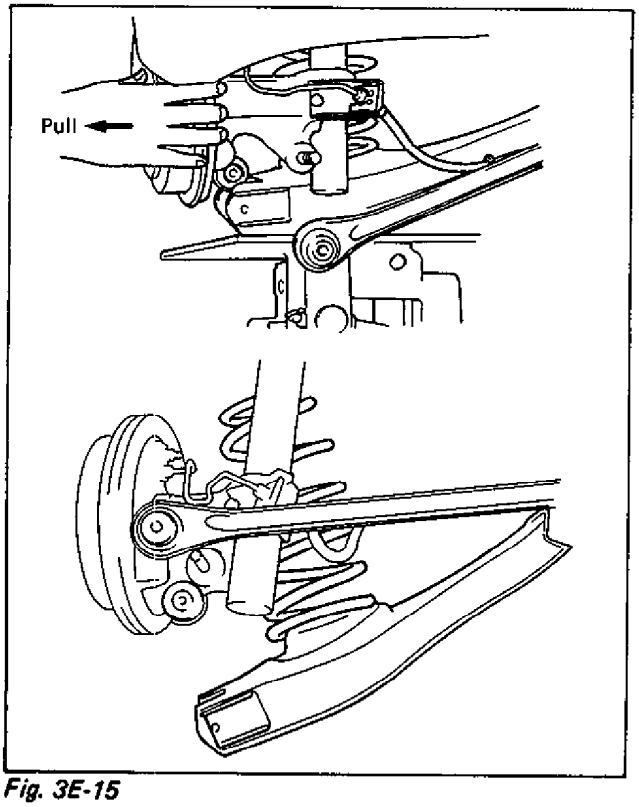


Fig. 3E-15

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

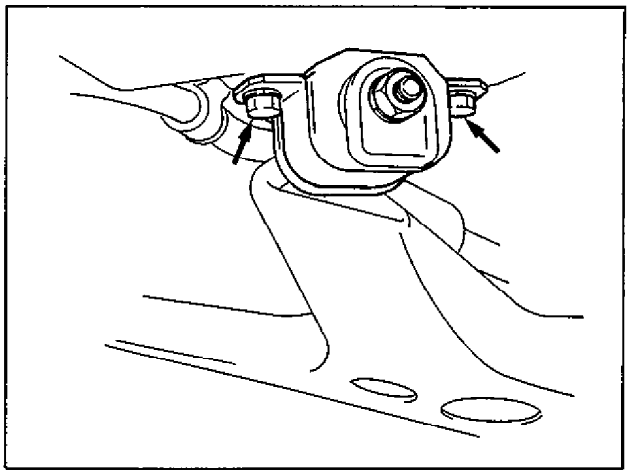


Fig. 3E-16

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.

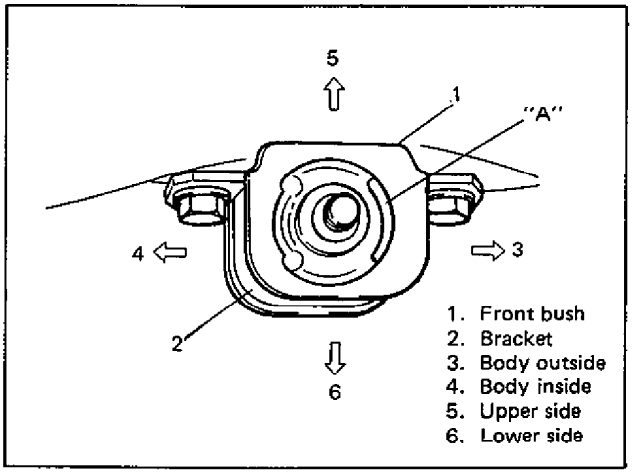


Fig. 3E-17

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.

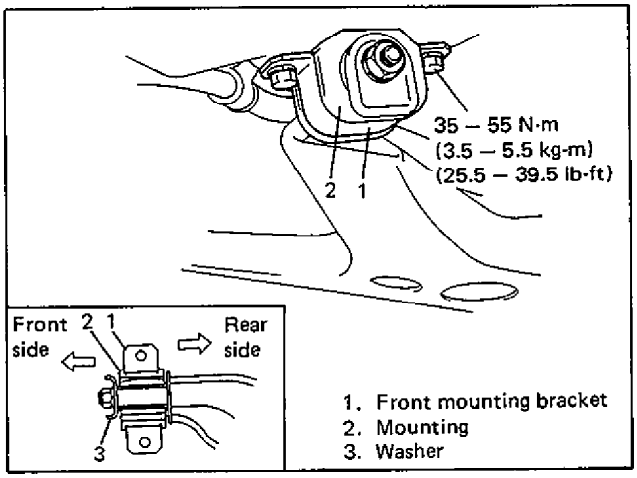


Fig. 3E-18

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.

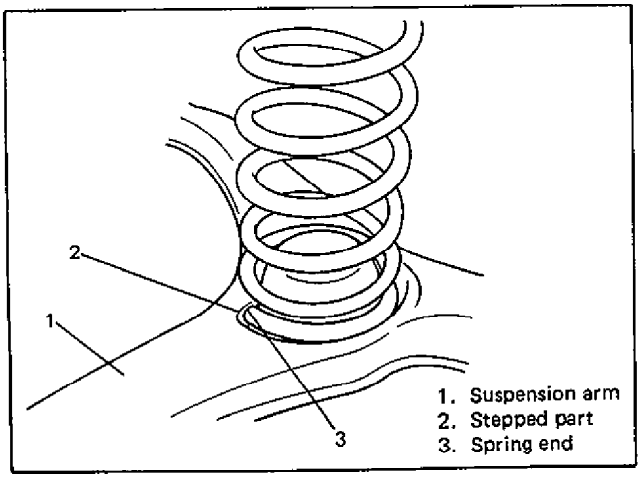


Fig. 3E-19

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

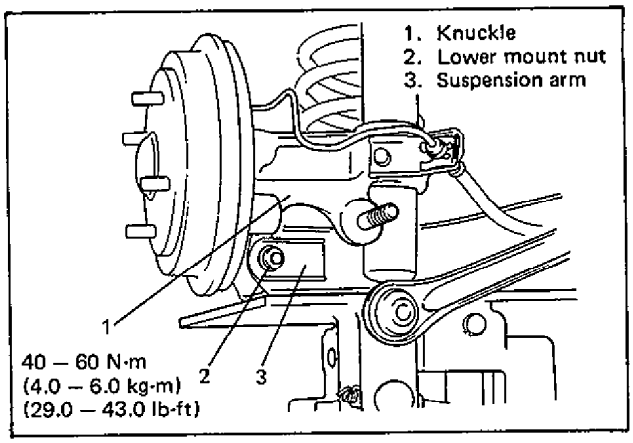


Fig. 3E-20

6) Remove jack from under suspension arm.
7) Install both inside and outside of control rod. When installing its inside bolt, refer to Control Rod INSTALLATION 2) on p. 3E-4.
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.

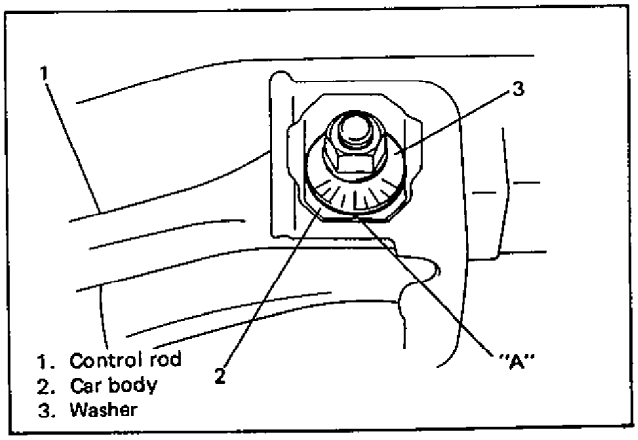


Fig. 3E-21

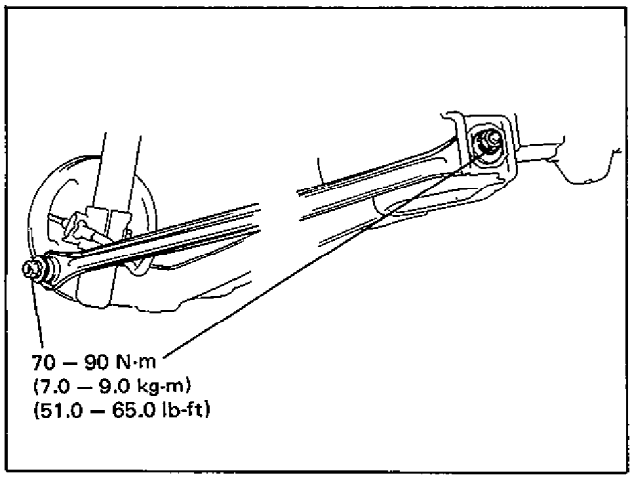


Fig. 3E-22

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.

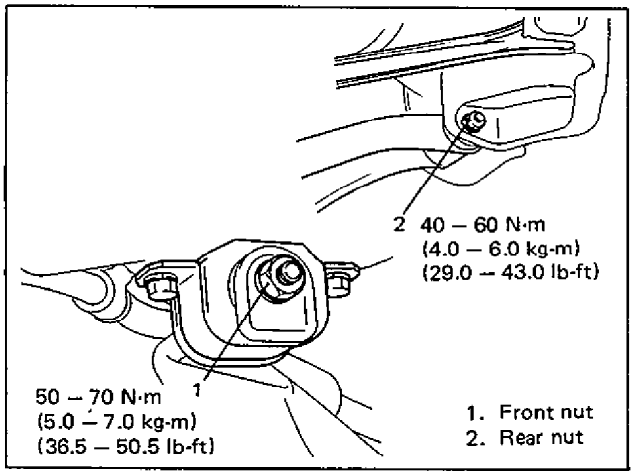


Fig. 3E-23

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

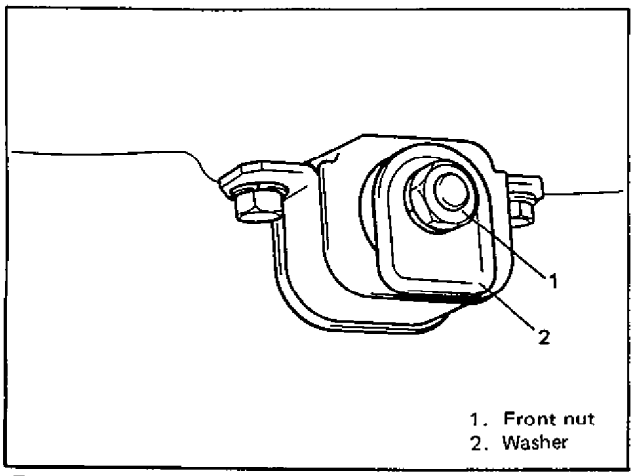


Fig. 3E-23-1

13) Check rear toe and adjust it as necessary. For check and adjustment procedures, refer to p. 3E-16.

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.

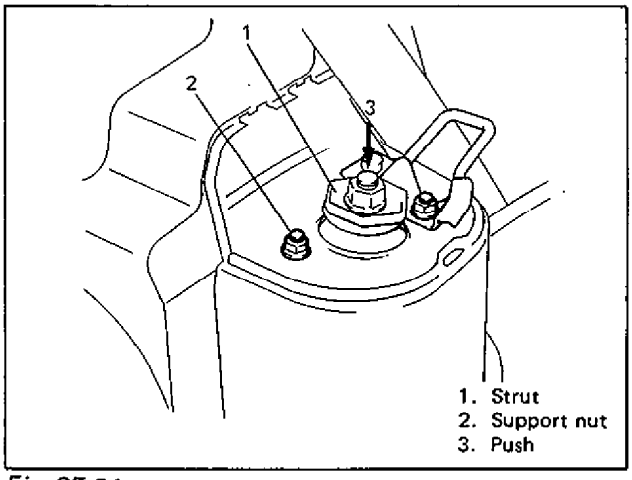


Fig. 3E-24

4) Remove strut lower mount bolt.

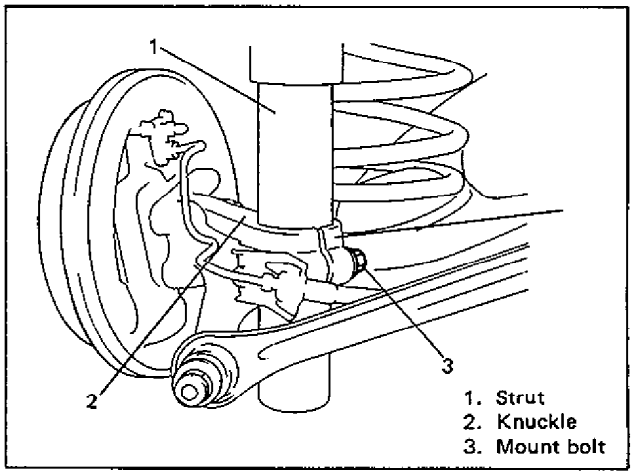


Fig. 3E-25

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.

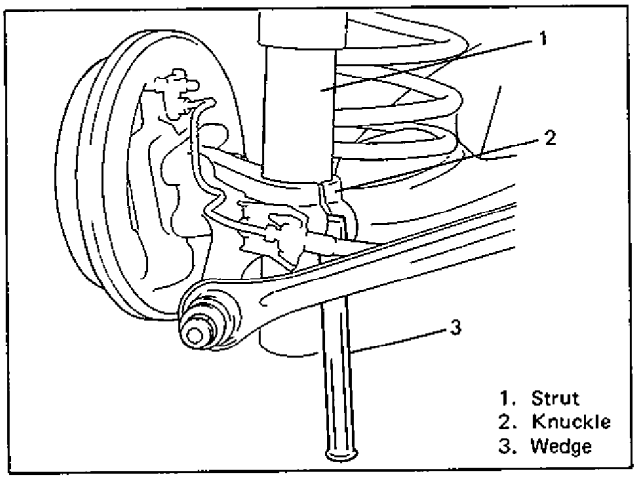


Fig. 3E-26

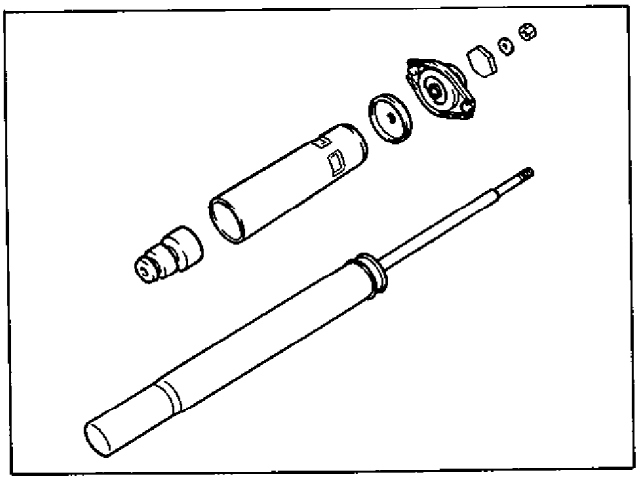


Fig. 3E-27

INSTALLATION

1) Make strut short by pushing it.

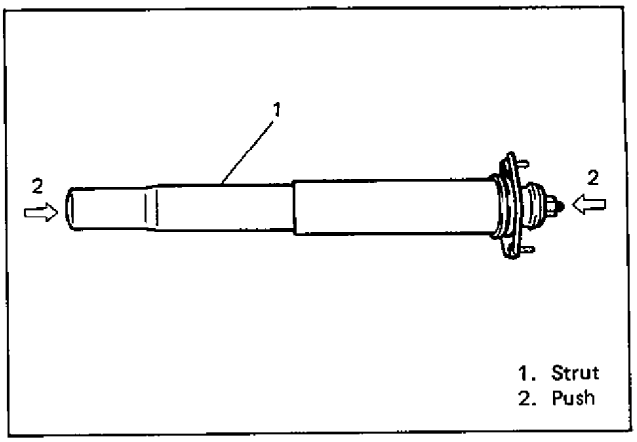


Fig. 3E-28

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.

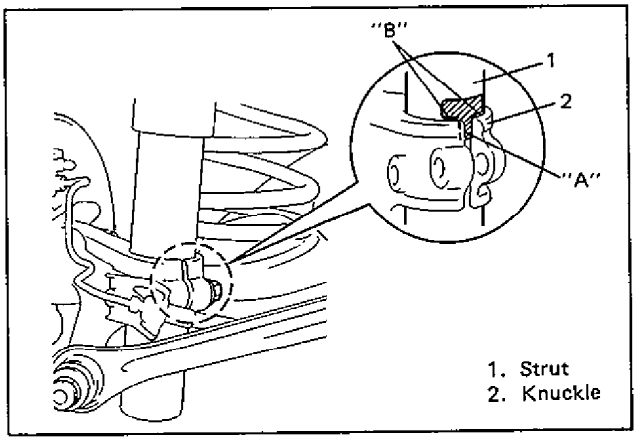


Fig. 3E-29

3) Tighten strut lower mount bolt to specified torque.

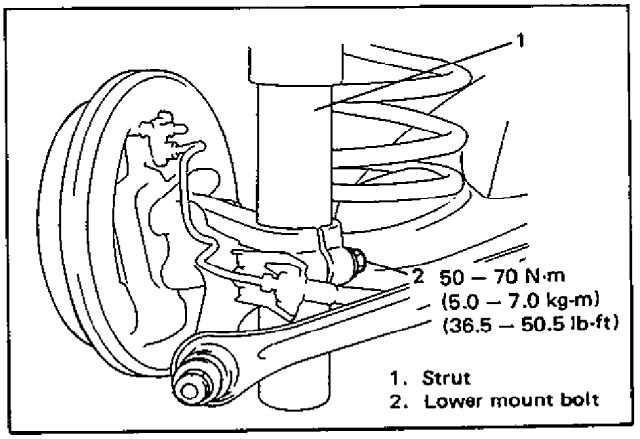


Fig. 3E-30

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.

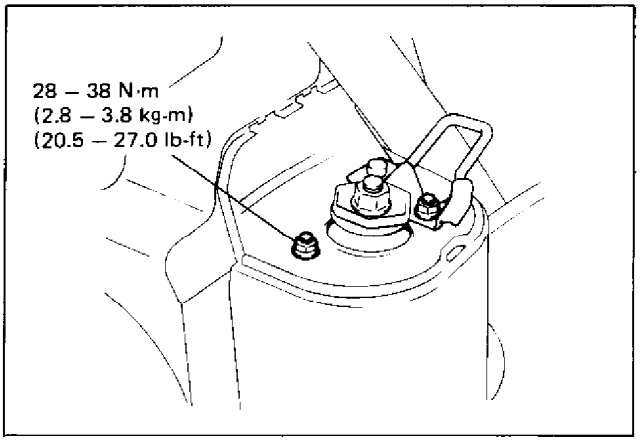


Fig. 3E-31

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

REAR SUSPENSION KNUCKLE

REMOVAL

1) Perform Steps 1) to 7) of brake drum REMOVAL on page 5-35.
2) Disconnect brake hose bracket from knuckle.

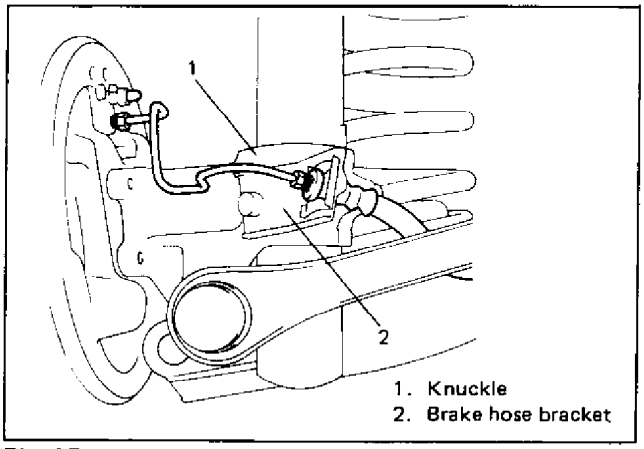


Fig. 3E-32

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

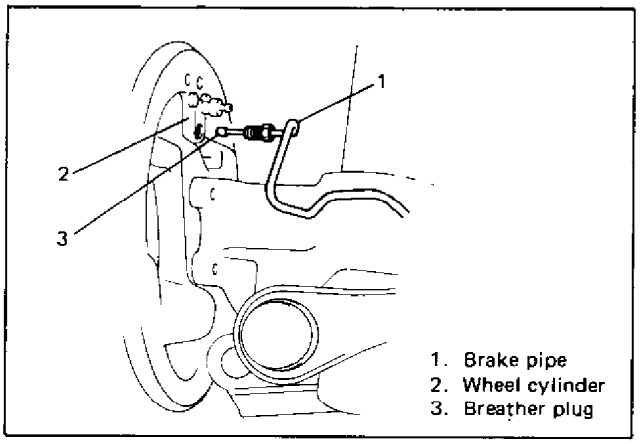


Fig. 3E-33

4) Remove brake back plate from knuckle.

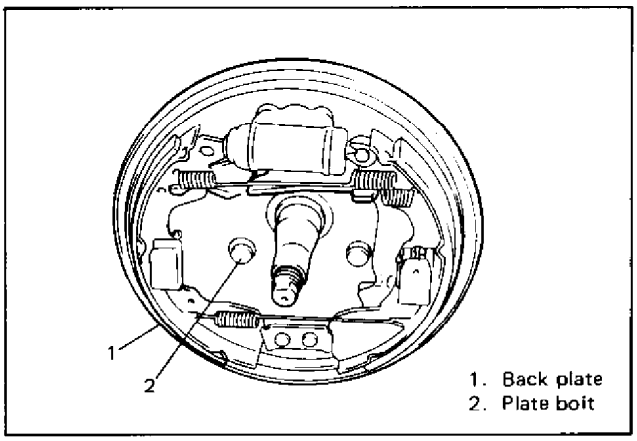


Fig. 3E-34

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.
7) Remove outside (wheel side) of control rod from rear knuckle stud bolt.

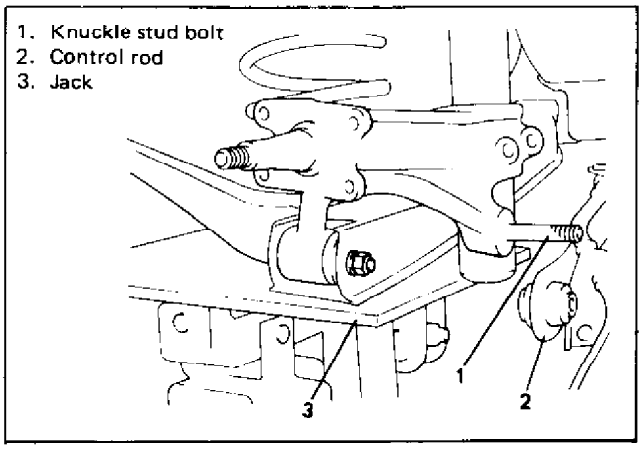


Fig. 3E-35

8) Remove strut lower mount bolt.

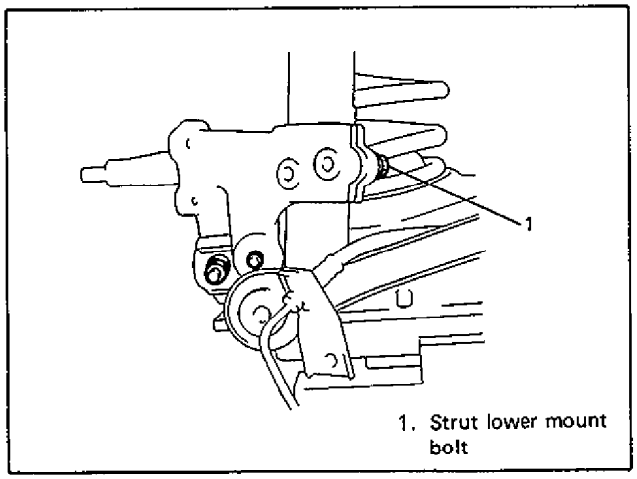


Fig. 3E-36

9) Remove knuckle lower mount bolt.

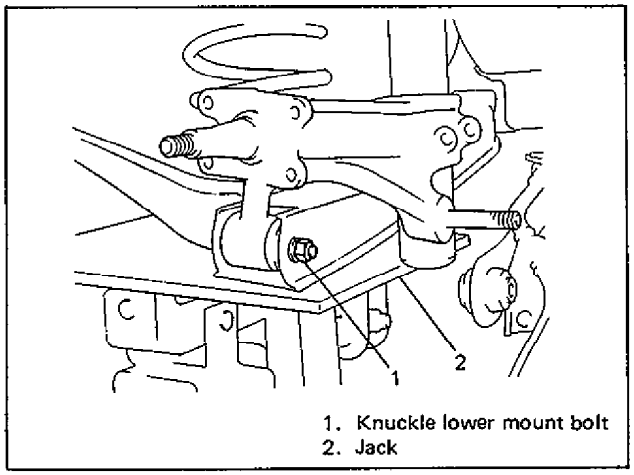


Fig. 3E-37

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.

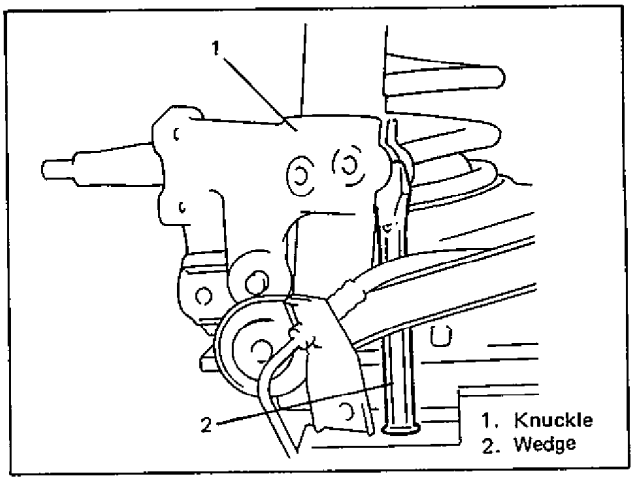


Fig. 3E-38

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.

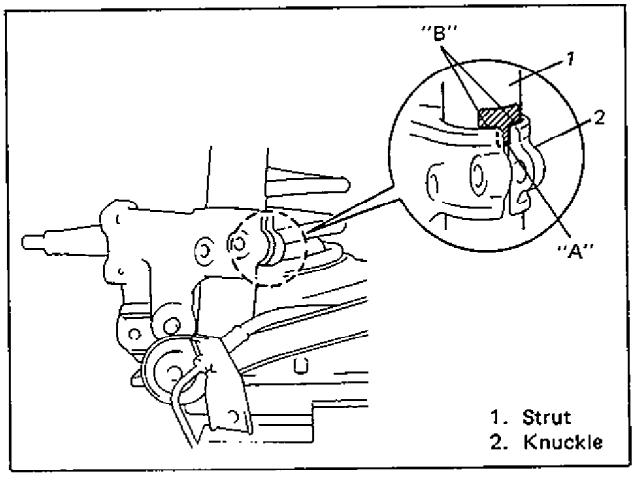


Fig. 3E-39

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

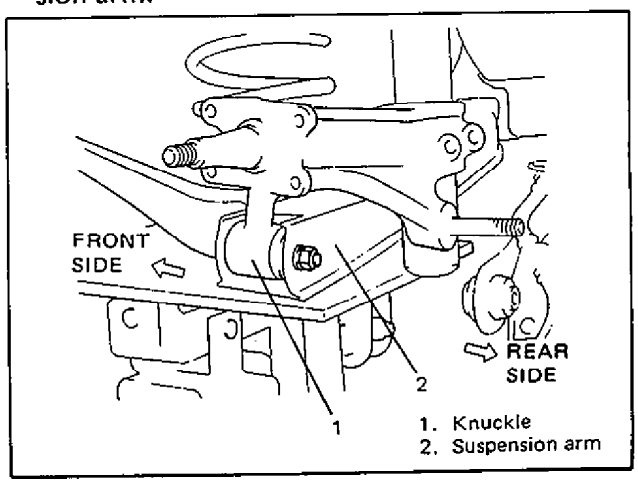


Fig. 3E-40

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.

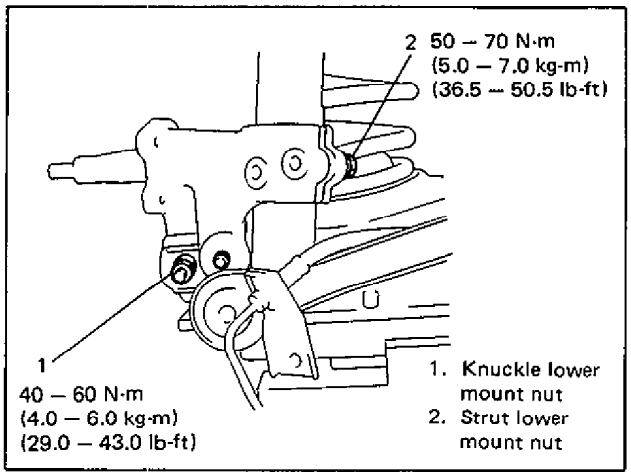


Fig. 3E-41

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

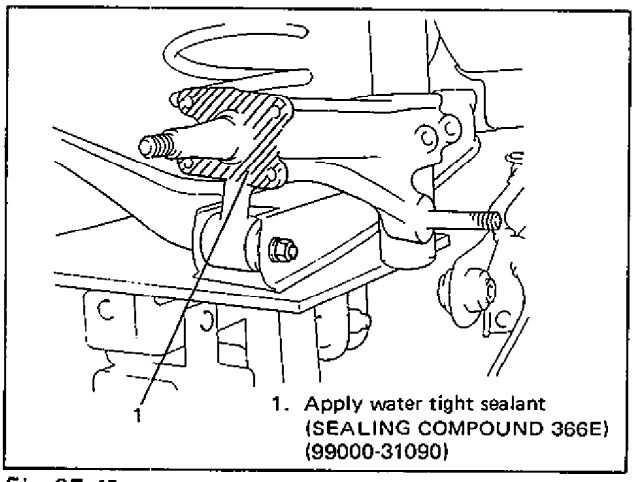


Fig. 3E-42

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

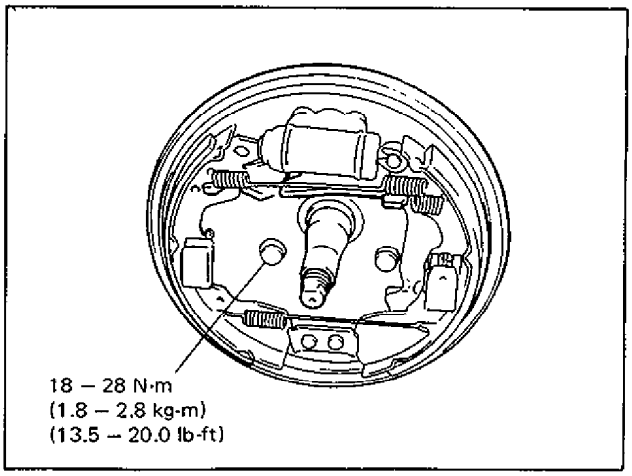


Fig. 3E-43

9) Install brake hose bracket to knuckle.
10) Tighten brake pipe flare nut to specified torque and install breather plug cap taken off from pipe back to breather plug.

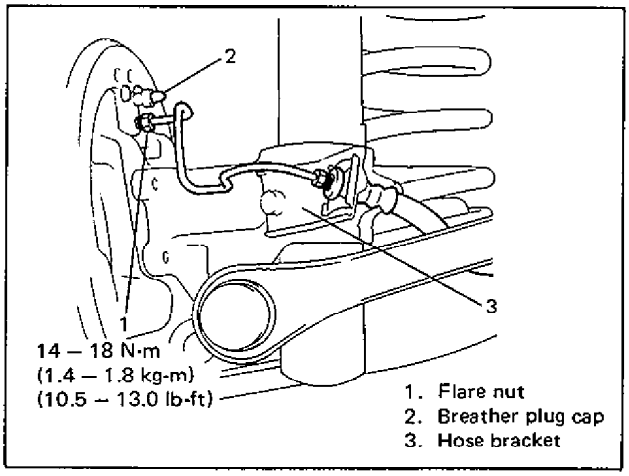


Fig. 3E-44

11) Install brake drum (Refer to Steps 1) to 7) of its INSTALLATION on p. 5-37 of this manual).
12) Install control rod and control rod nuts (inside & outside) and tighten them to such extent that they can be turned by hand.
13) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see p. 5-19.)
14) 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. 5-18.)

15) Tighten parking brake lever cover screws.
16) Install wheel and tighten wheel nuts to specified torque. (Refer to Fig. 3E-53.)
17) Check to ensure that brake drum is free from dragging and proper braking is obtained.
18) Lower hoist.
19) 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.
20) Perform brake test (foot brake and parking brake).
21) Check each installed part for fluid leakage.

WHEEL BEARING

REMOVAL

1) Perform Steps 1) to 7) of brake drum REMOVAL on p. 5-35.
2) Remove wheel bearing.

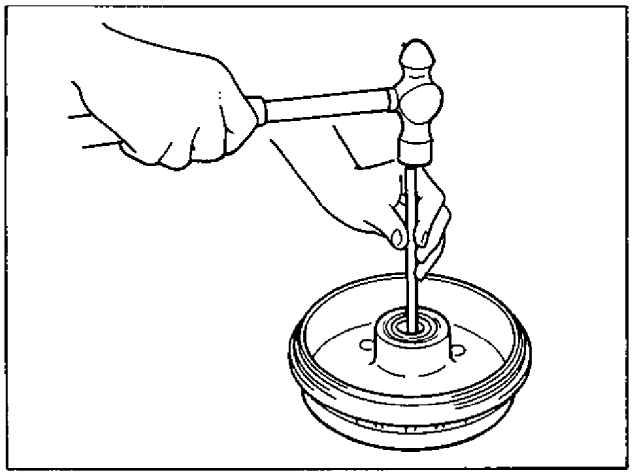


Fig. 3E-45 Removing

INSTALLATION

1) Install bearing.
When installing bearings:
- Refer to Fig. 3E-46-1 for installing direction of spacer.
- Direct both inner bearing and outer bearing sealed side outward.
- Fill space indicated by "A" in figure with bearing grease as much as 40% of space capacity.

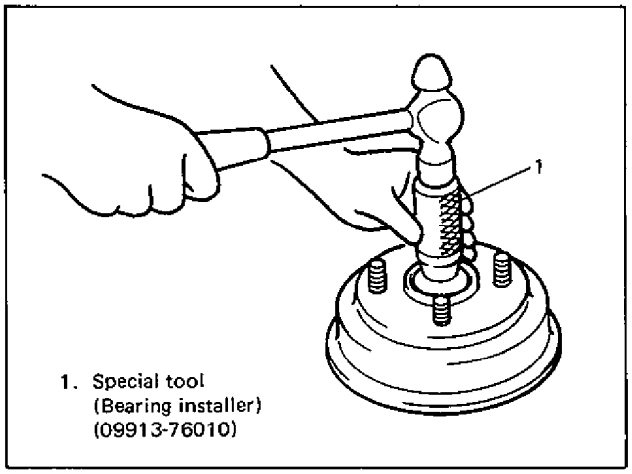


Fig. 3E-46 Fitting

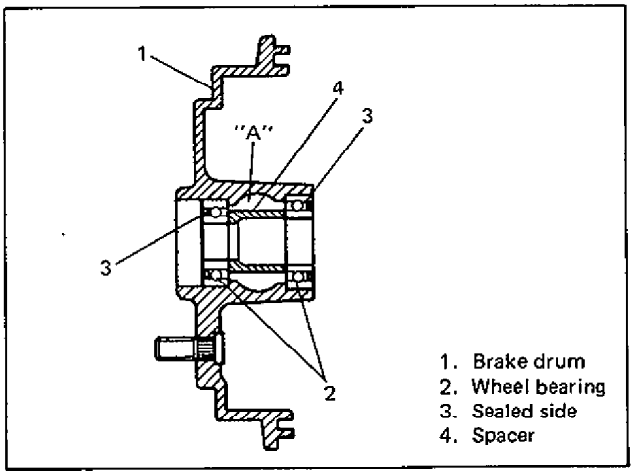


Fig. 3E-46-1

2) Install brake drum and wheel. (Refer to Steps 1) to 11) of BRAKE DRUM INSTALLATION on p. 5-37).

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.

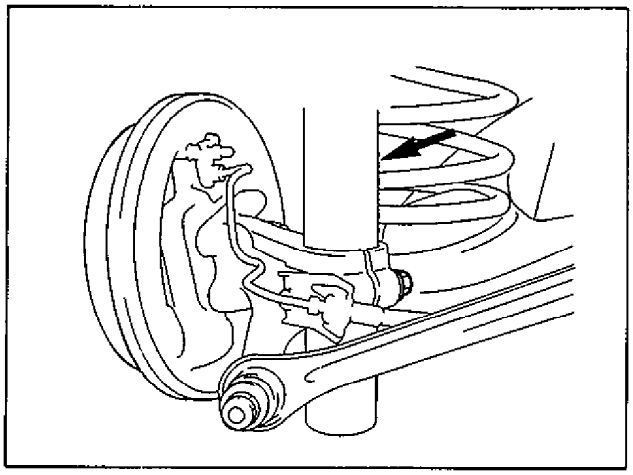


Fig. 3E-47

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.

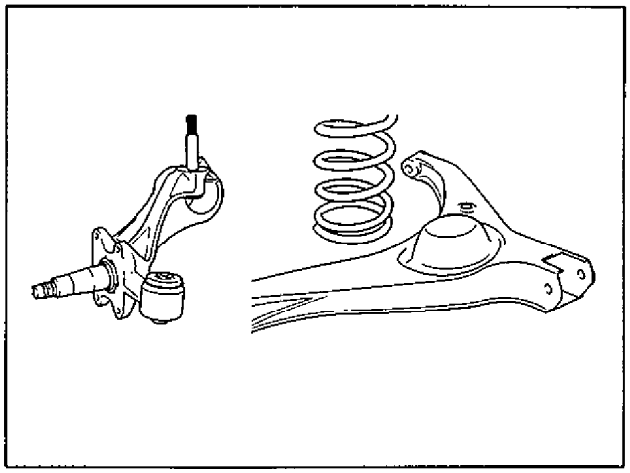


Fig. 3E-47-1

Replace any defective part.

CONTROL ROD

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

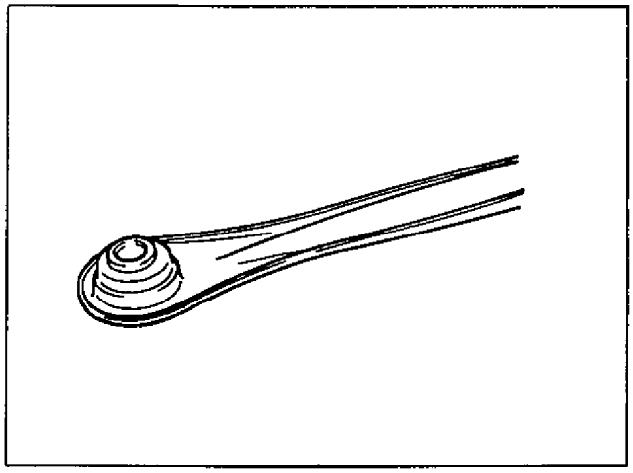


Fig. 3E-47-2

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.

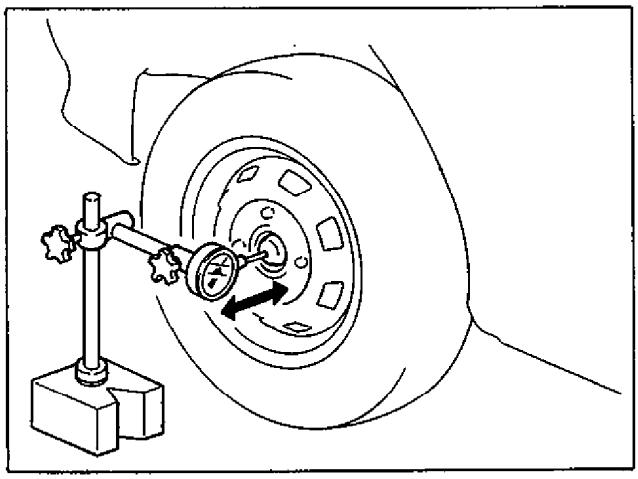


Fig. 3E-48

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

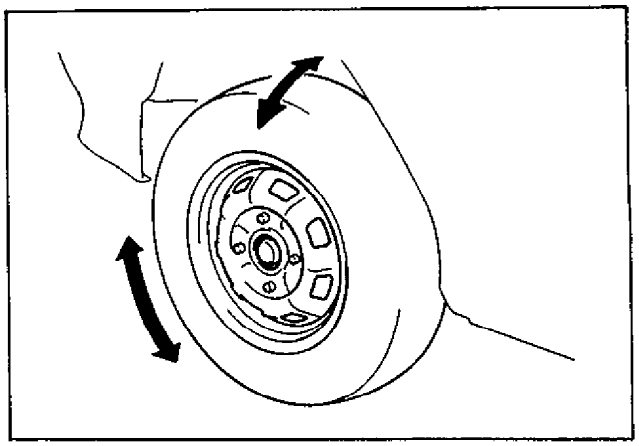


Fig. 3E-49

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.).

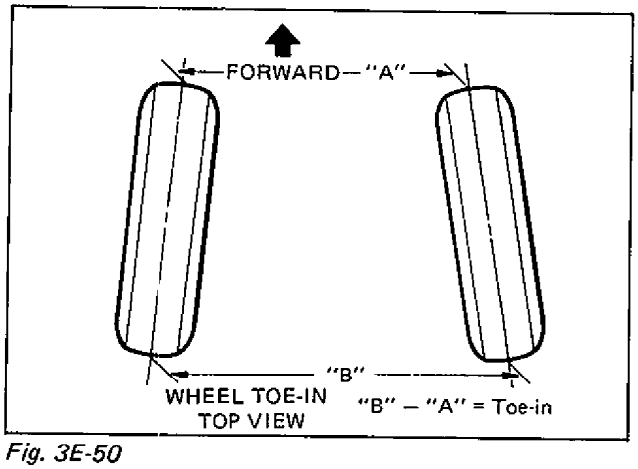


Fig. 3E-50

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.)

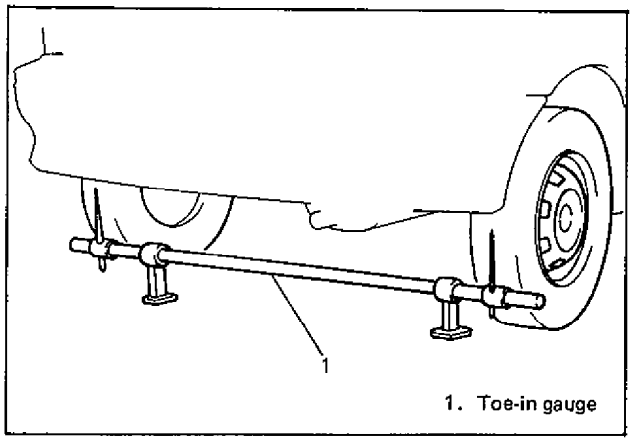


Fig. 3E-51

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.

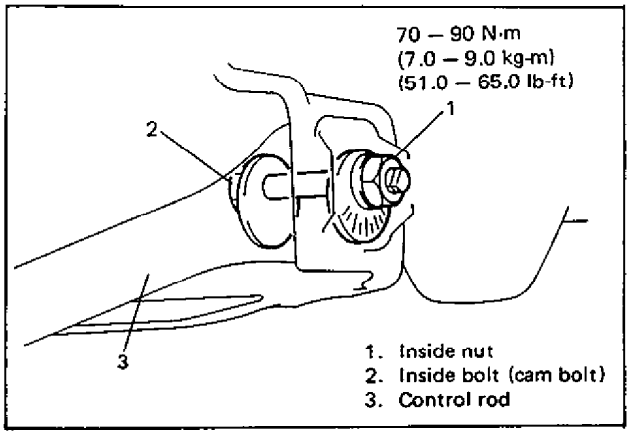


Fig. 3E-52

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 axle nut	80 – 120	8.0 – 12.0	58.0 – 86.5
11. Wheel nut	50 – 70	5.0 – 7.0	36.5 – 50.5

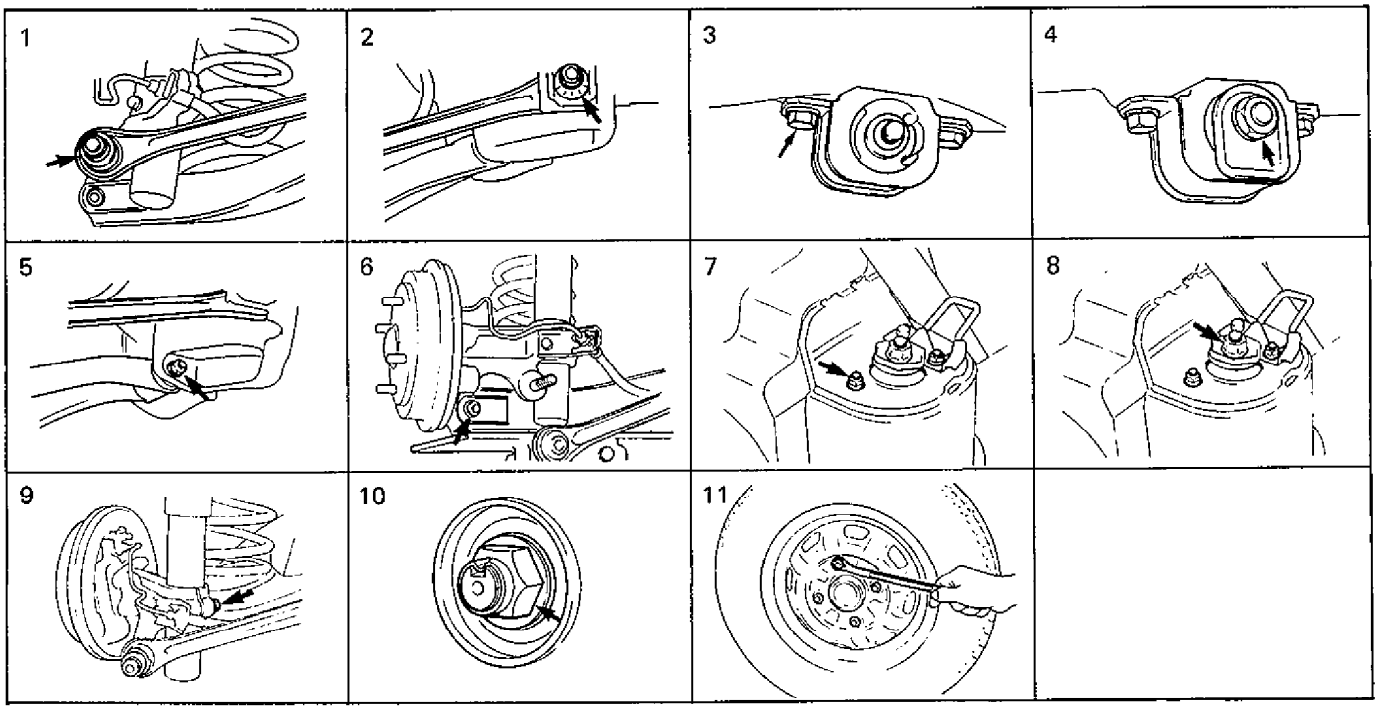
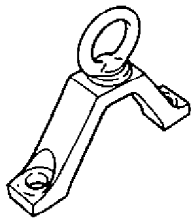
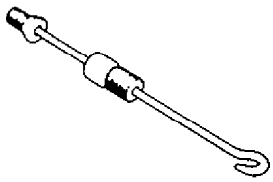
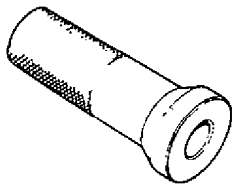


Fig. 3E-53

REQUIRED SERVICE MATERIALS

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

SPECIAL TOOLS

1  09943-17911 Brake drum remover	2  09942-15510 Sliding hammer	3  09913-76010 Rear wheel bearing installer

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

GENERAL DESCRIPTION

TIRES

This car is equipped with the following tire.
155/70R13
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 wheel is the following steel wheel.
13 x 4½J

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/cm^2	psi
160	1.6	23
180	1.8	26
200	2.0	29
220	2.2	32
240	2.4	35
260	2.6	38
280	2.8	41
300	3.0	44

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.

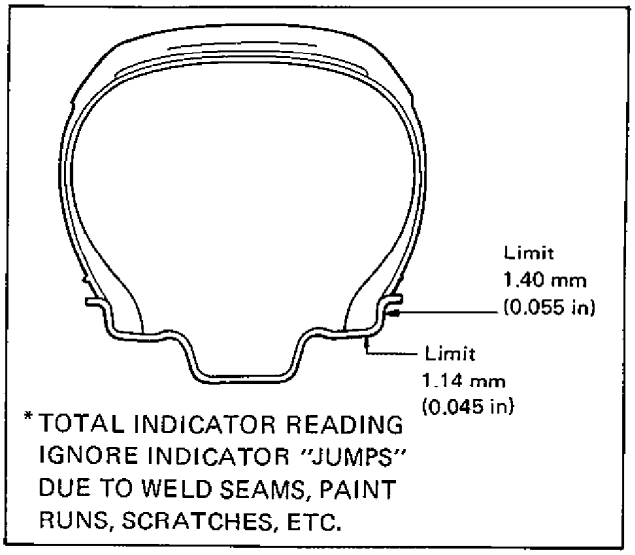


Fig. 3F-2 Wheel Runout

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

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.

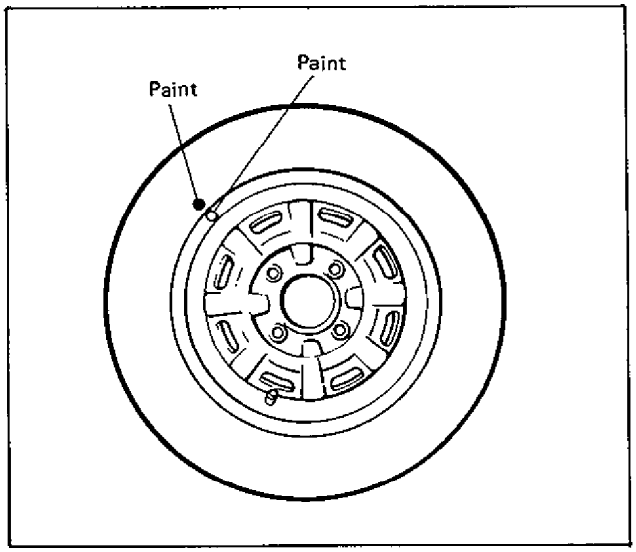


Fig. 3F-3 Matched Tires and Wheels

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.

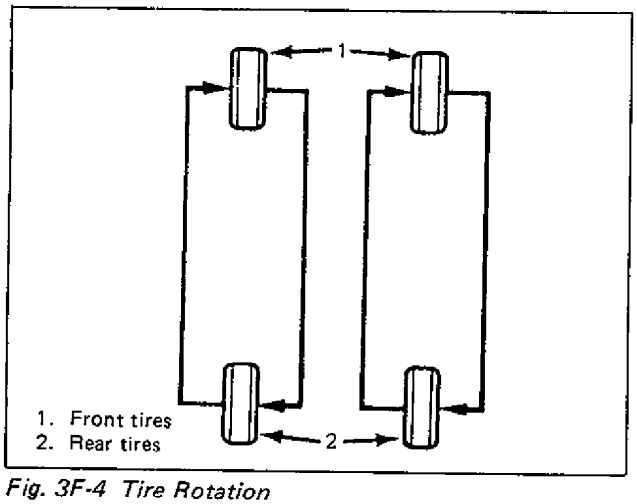


Fig. 3F-4 Tire Rotation

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

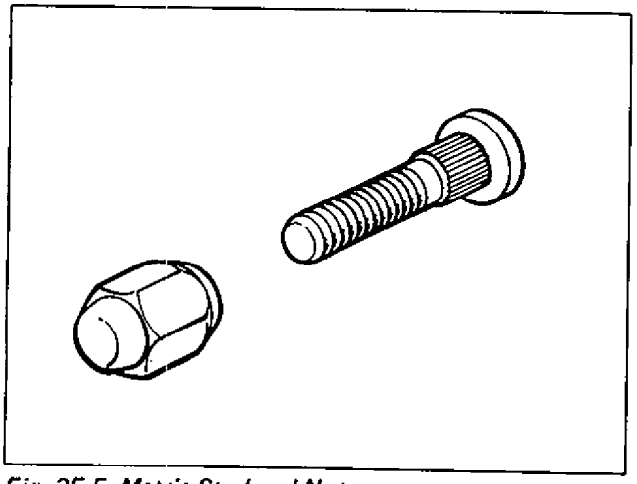


Fig. 3F-5 Metric Stud and Nut

WHEEL REMOVAL

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

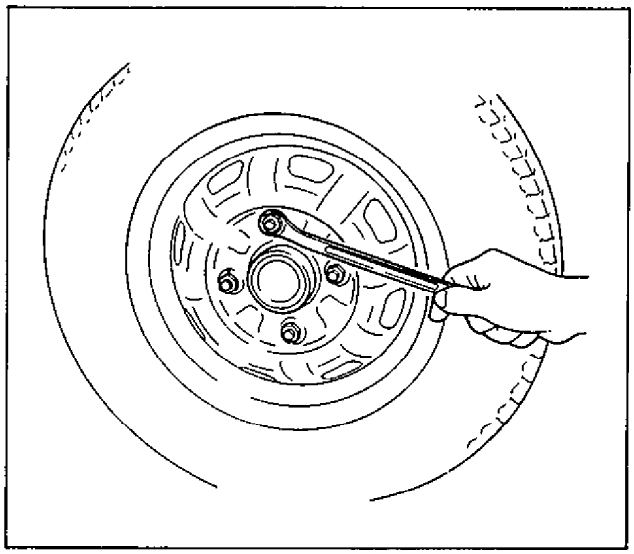


Fig. 3F-6

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 drum or disc, Fig. 3F-7.

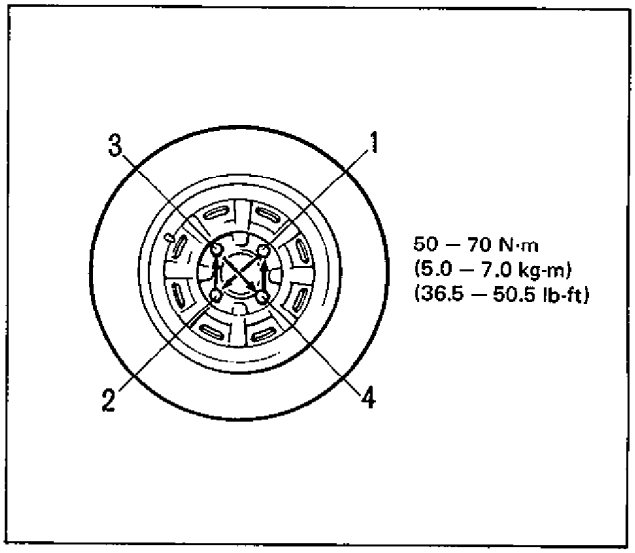


Fig. 3F-7 Wheel Nut Tightening Sequence

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.

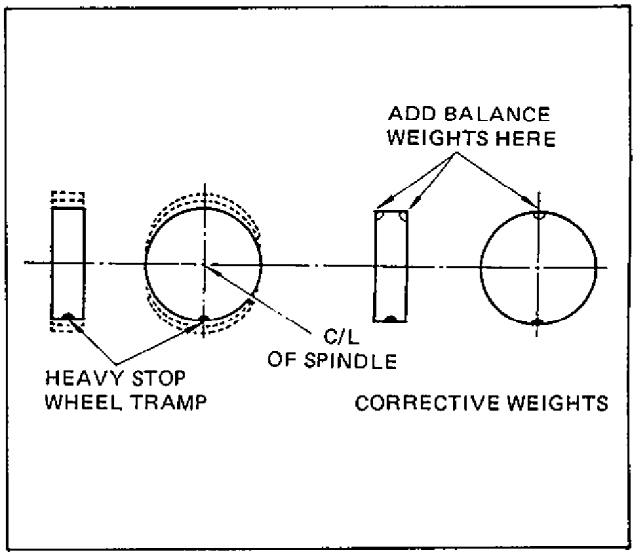


Fig. 3F-8 Static Unbalance Correction

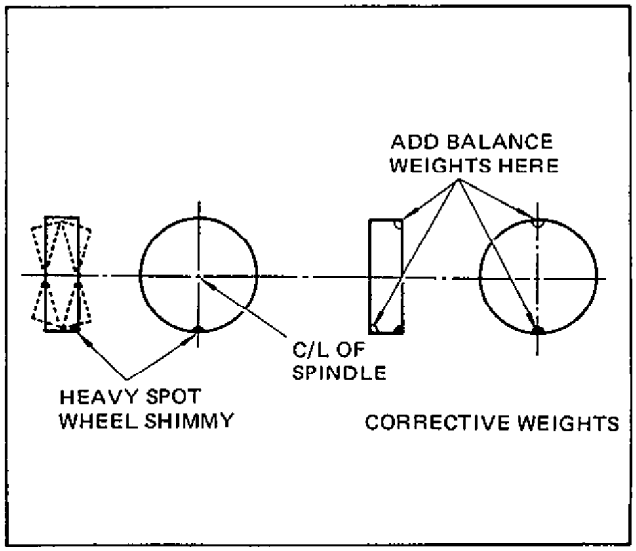


Fig. 3F-9 Dynamic Unbalance Correction

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)

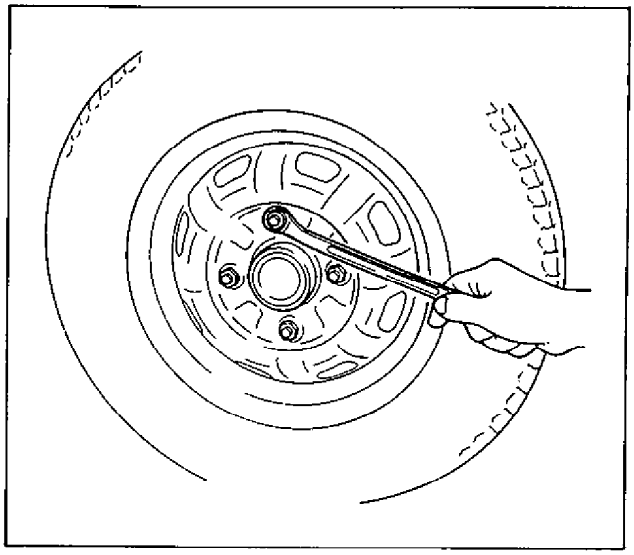


Fig. 3F-10

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

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.

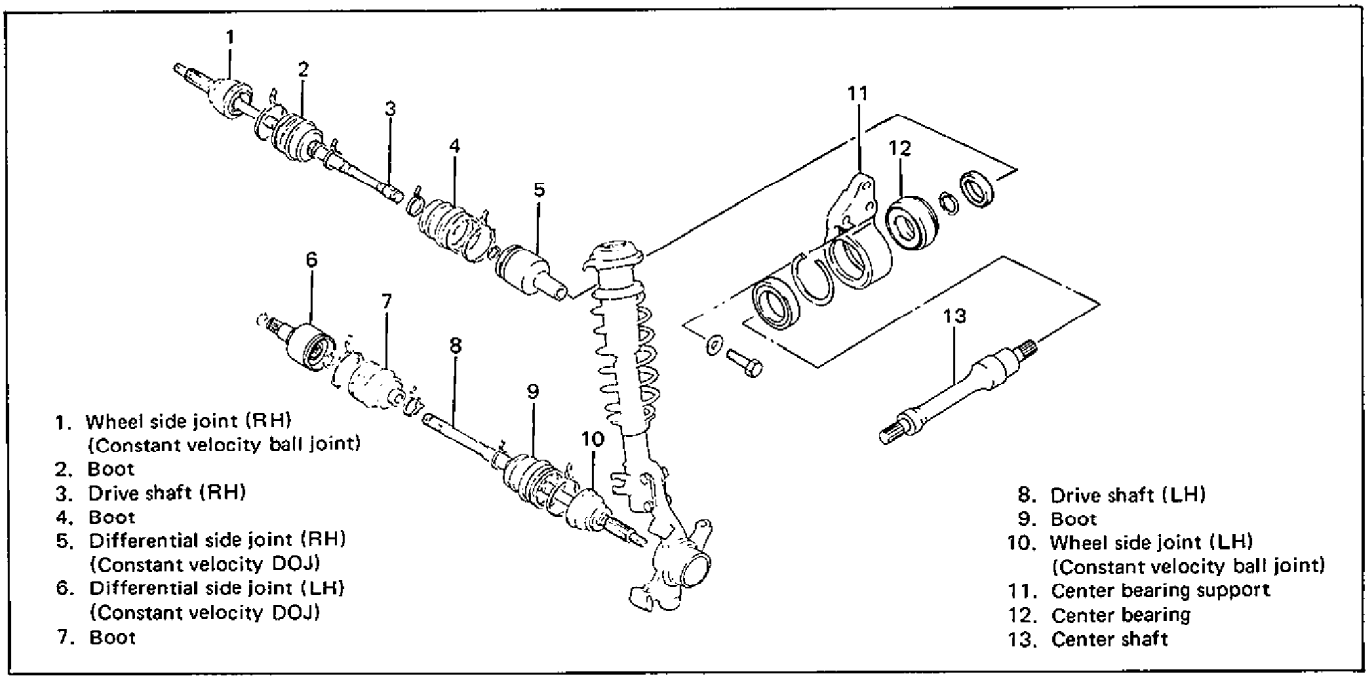
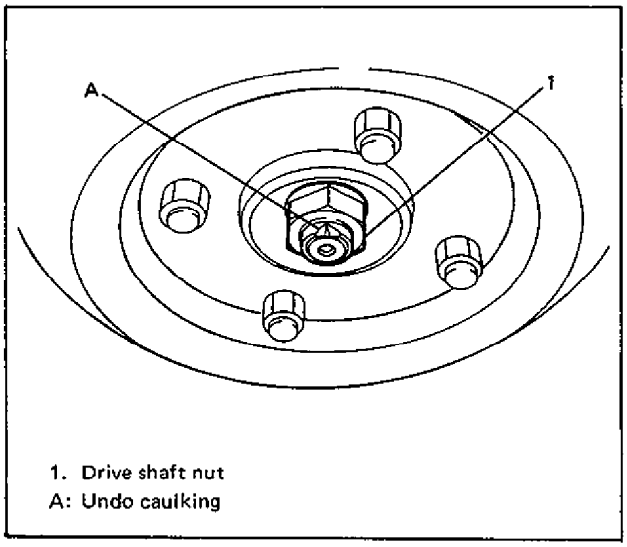


Fig. 4-1 Front Drive Shaft Assembly

REMOVAL (Left Side Shaft)

ON FLOOR

Undo caulking and remove drive shaft nut and washer.

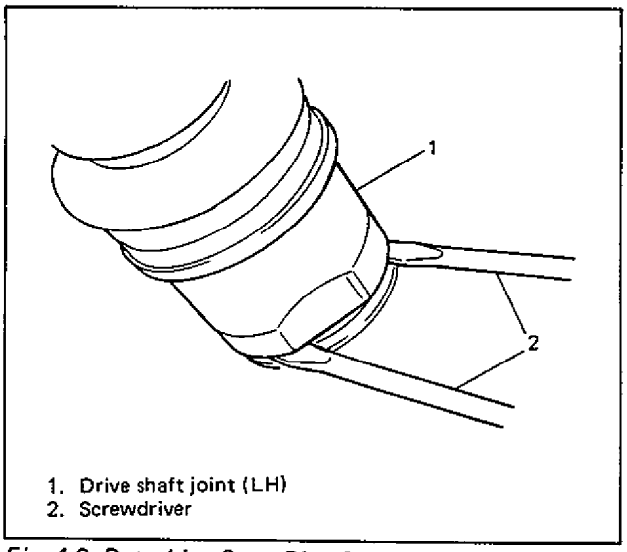


1. Drive shaft nut
A: Undo caulking

Fig. 4-2 Removing Drive Shaft Nut

ON LIFT

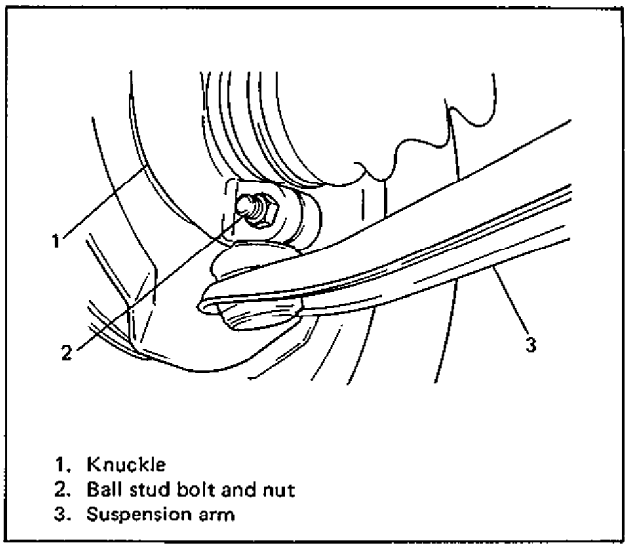
1. Drain transmission oil.
2. By using large size screwdrivers, pull out drive shaft joint so as to release snap ring fitting of joint spline at differential side.



1. Drive shaft joint (LH)
2. Screwdriver

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.



1. Knuckle
2. Ball stud bolt and nut
3. Suspension arm

Fig. 4-4 Detaching Suspension Arm from Knuckle

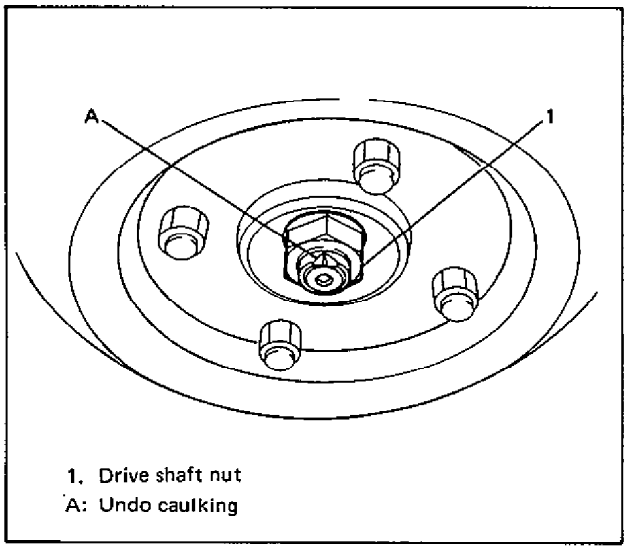
5. To remove drive shaft assembly, pull out inboard joint from differential side and then wheel side joint from steering knuckle.

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.

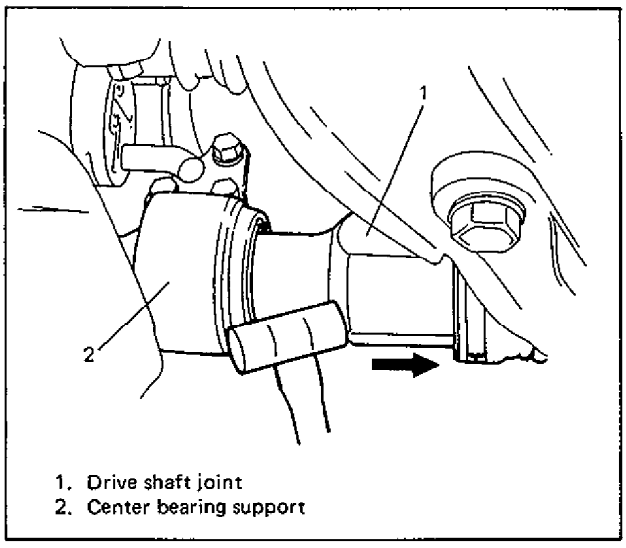


1. Drive shaft nut
A: Undo caulking

Fig. 4-5

ON LIFT

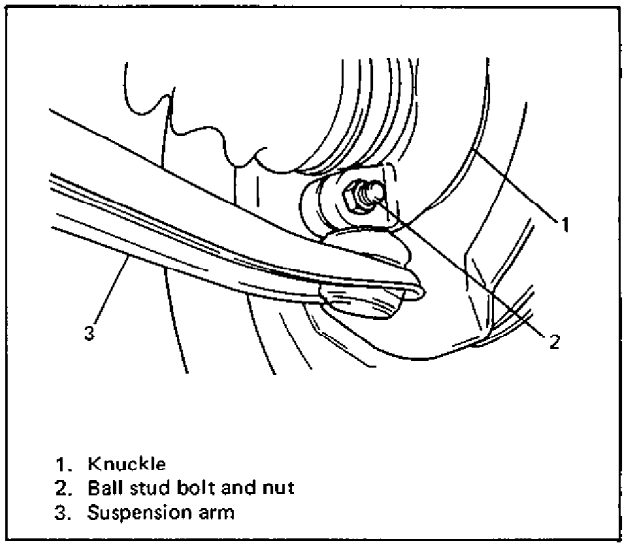
1. By using plastic hammer, drive out drive shaft joint so as to release snap ring fitting of joint spline at center shaft.



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.



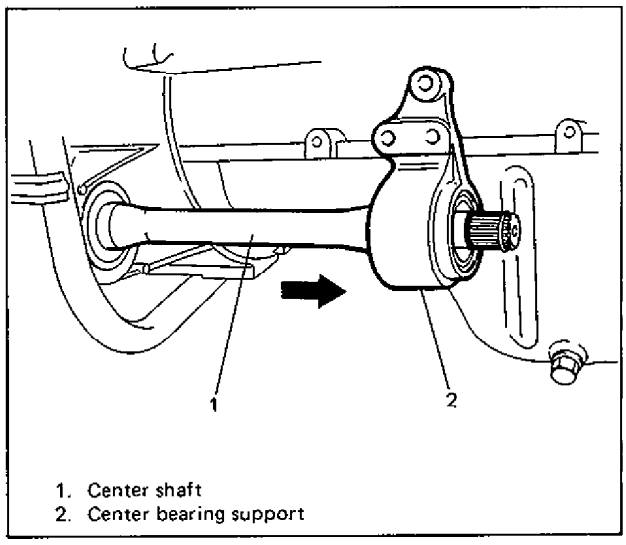
1. Knuckle
2. Ball stud bolt and nut
3. Suspension arm

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.

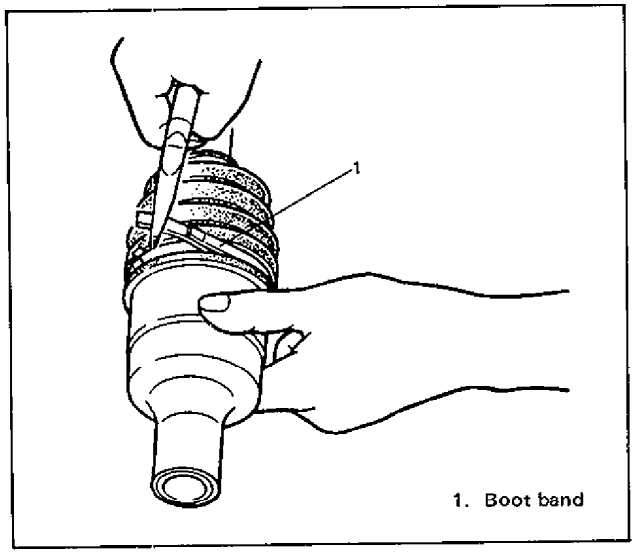


Fig. 4-9

2. Slide boot toward the center of shaft and remove snap ring from outer race, then take shaft out of outer race.

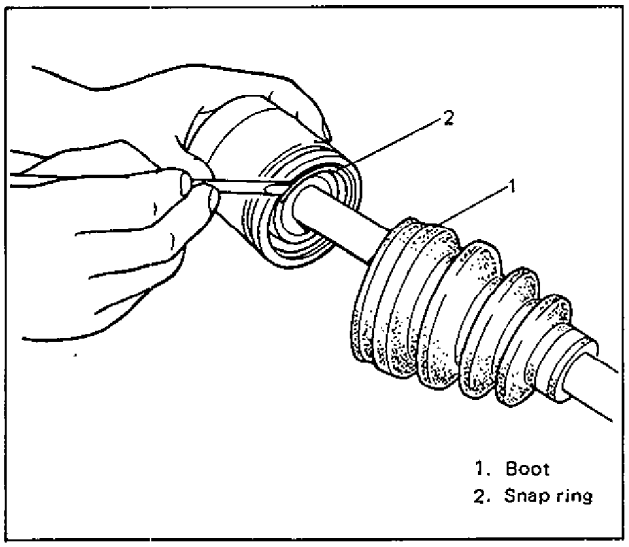


Fig. 4-10

3. Wipe off grease and remove circlip used to fix cage by using special tool (A).

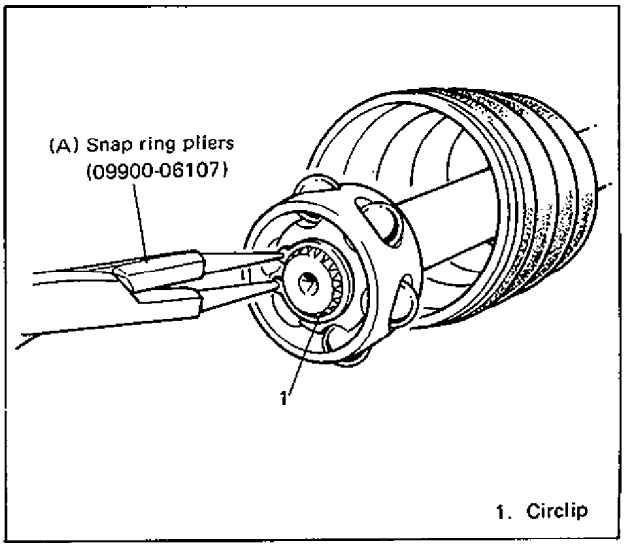


Fig. 4-11

4. Draw away cage and boot from shaft.

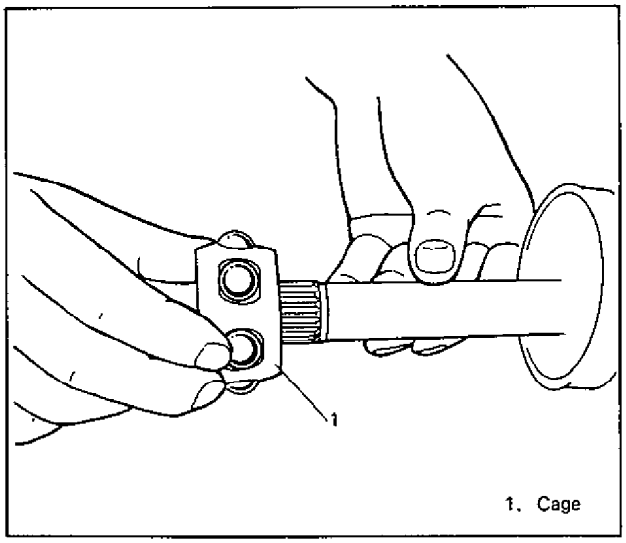


Fig. 4-12

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.

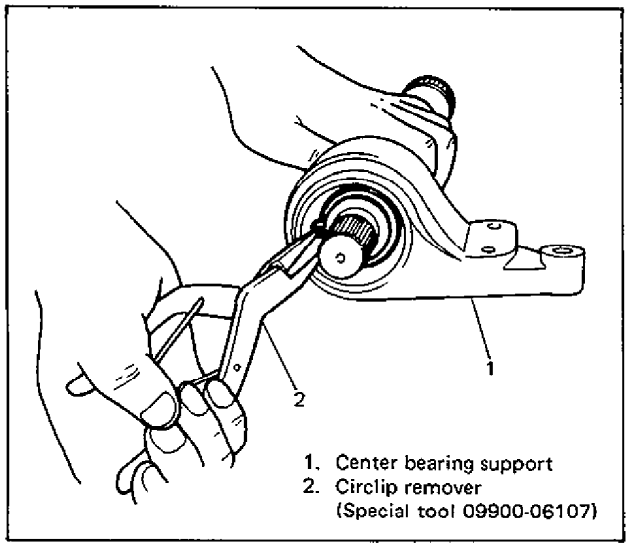


Fig. 4-13

3. By using hydraulic press, draw out center shaft from center bearing.

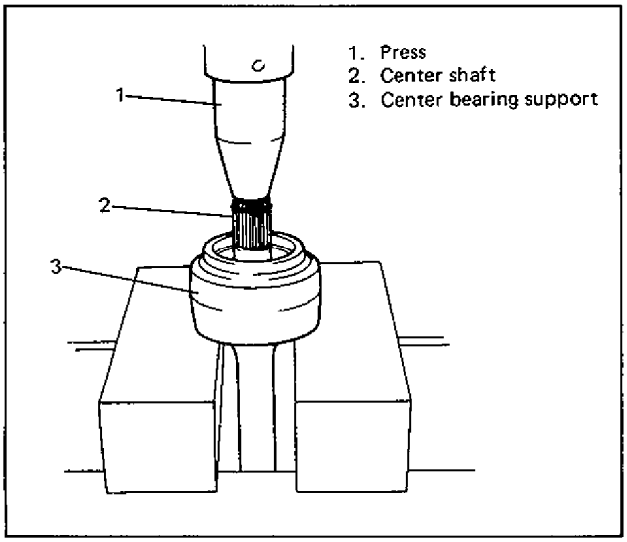


Fig. 4-14

4. Remove left side oil seal from center bearing support.
5. Remove bearing support circlip.

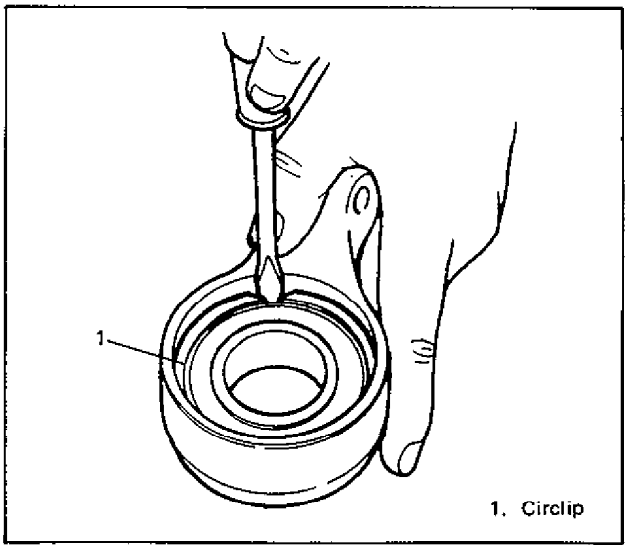


Fig. 4-15

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.

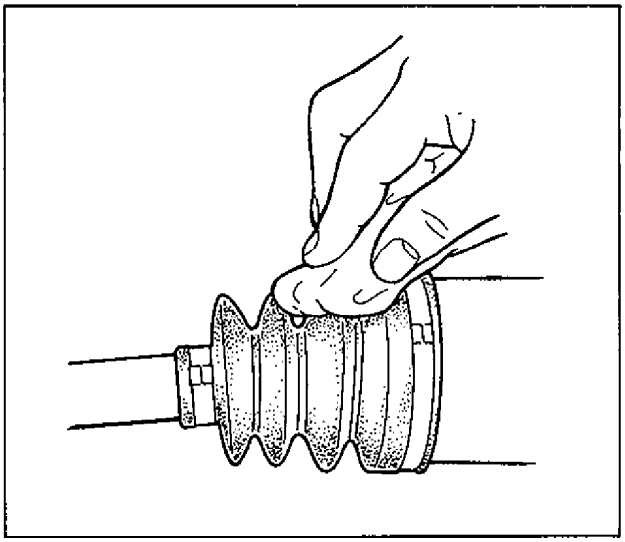


Fig. 4-16

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

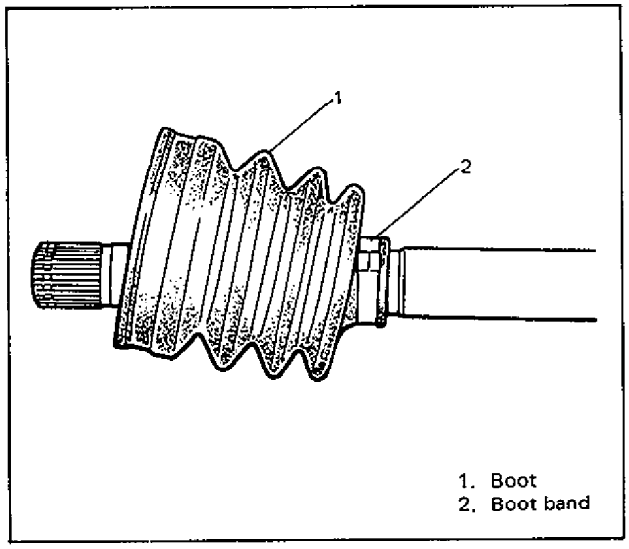


Fig. 4-17

4. Install cage to shaft.

CAUTION:
Install cage directing smaller outside diameter side to shaft end.

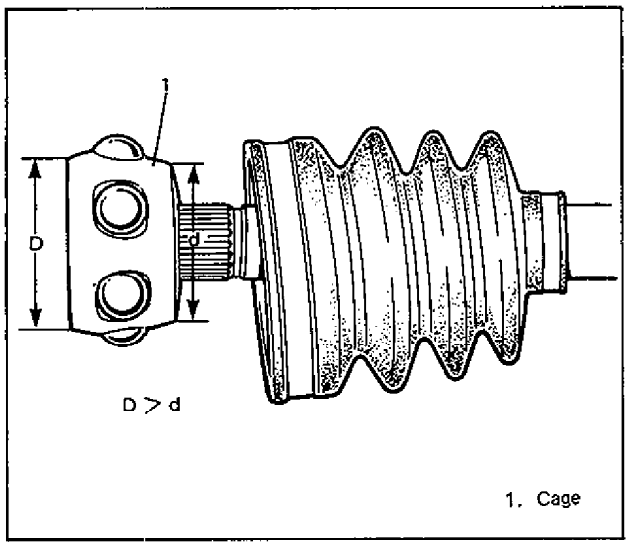


Fig. 4-18

5. Install circlip by using special tool (A).

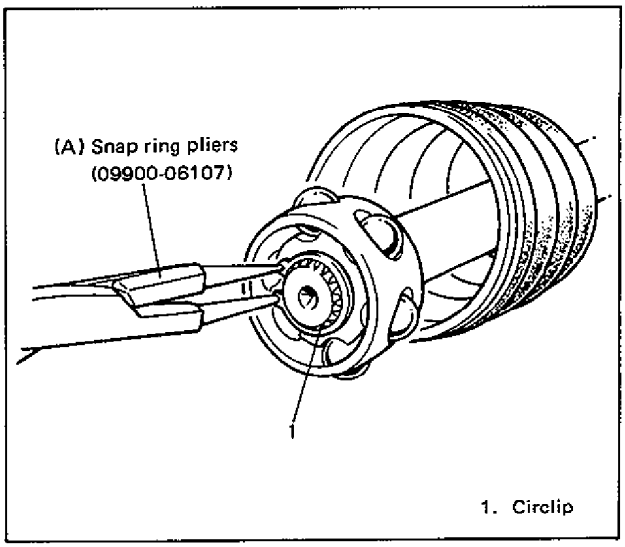


Fig. 4-19

6. Apply 30 – 40 g (1.06 – 1.41 oz) SUZUKI SUPER GREASE H (C.V. joint grease) to entire surface of cage.

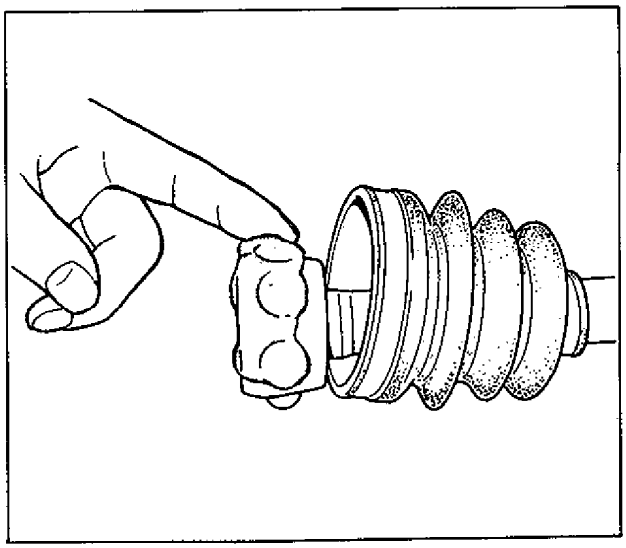


Fig. 4-20

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.

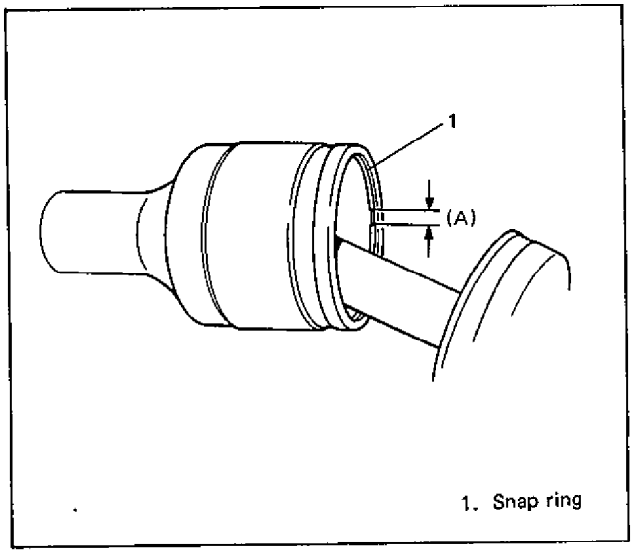


Fig. 4-21

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.

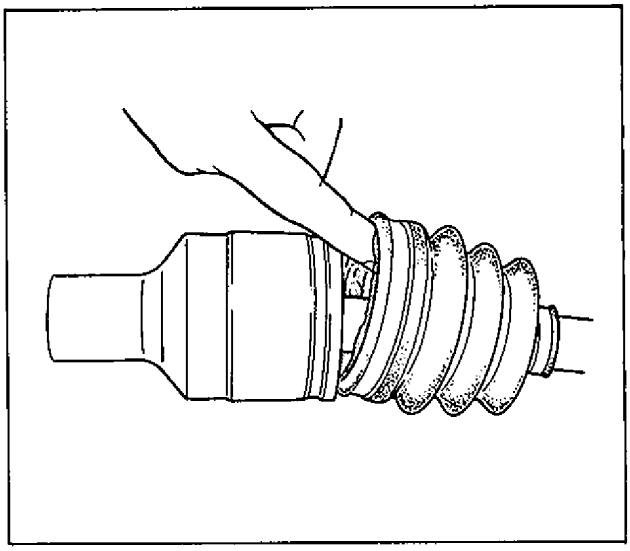


Fig. 4-22

9. When fixing boot to outer race with boot band, adjust so that measurements (A) and (B) become as indicated in figure below.

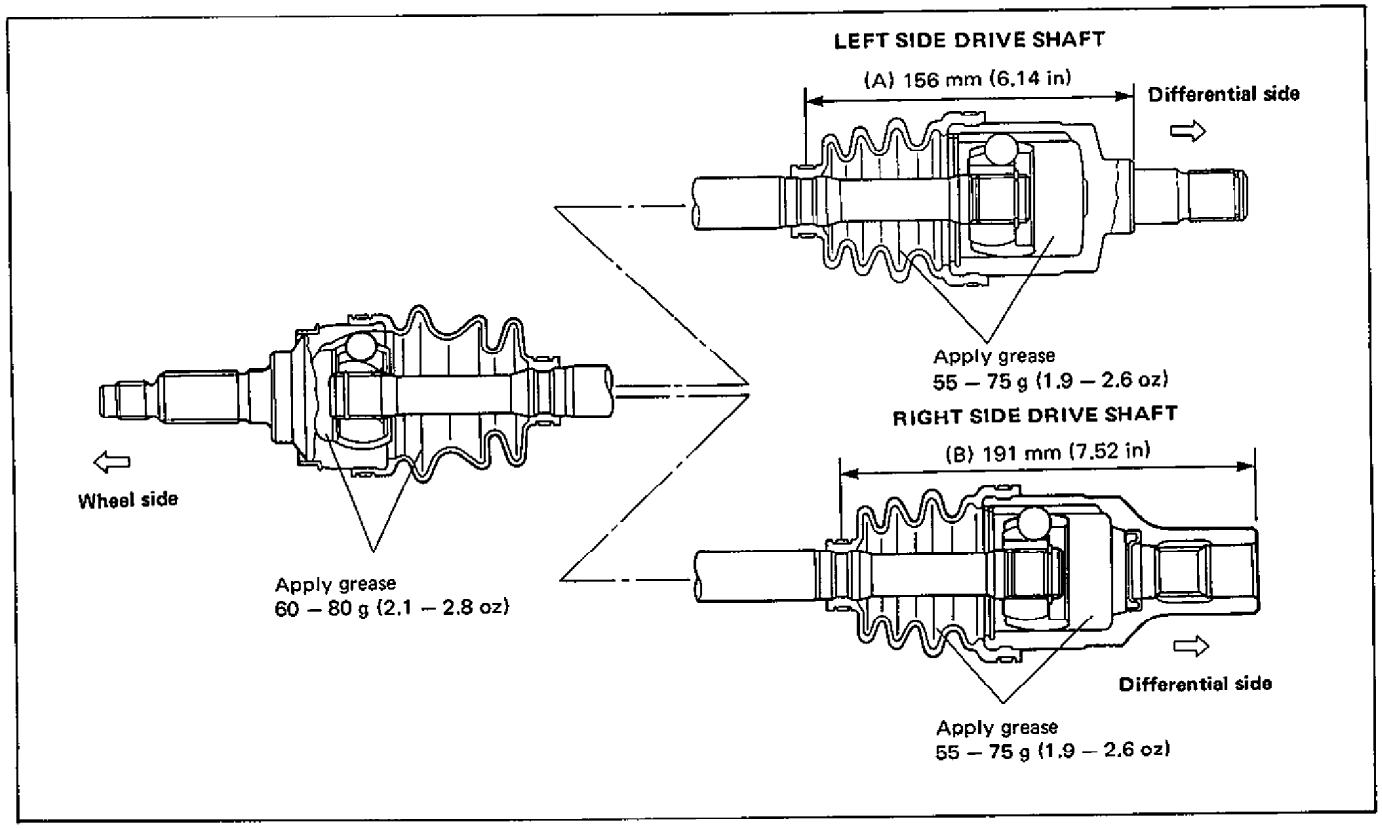


Fig. 4-23

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.

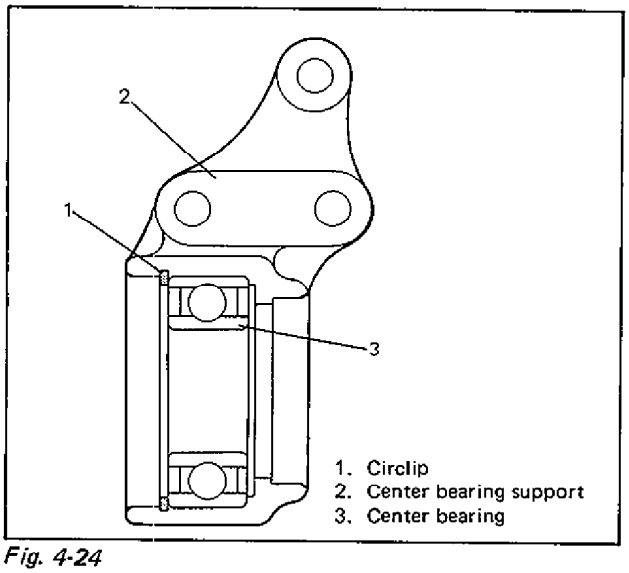


Fig. 4-24

- When installing left side oil seal, use care so that it is in proper direction by referring to below figure.

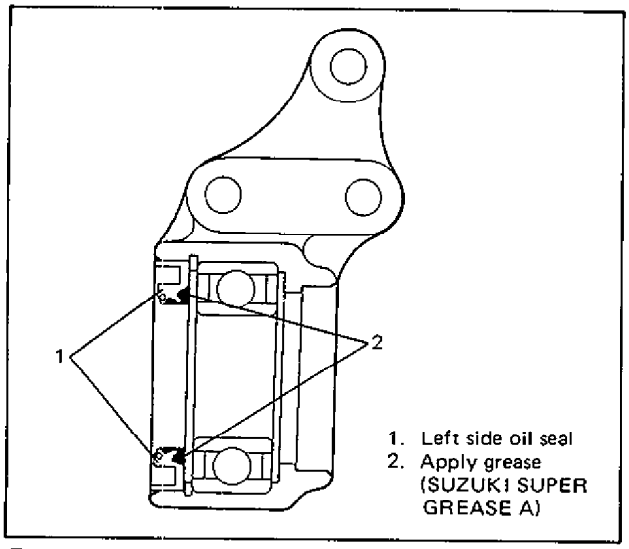


Fig. 4-25

- After press-fitting center shaft from left side oil seal side, fit circlip into groove in shaft securely.

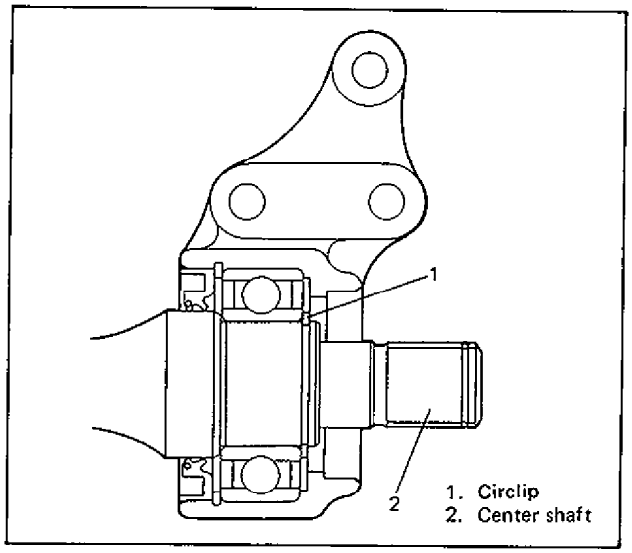


Fig. 4-26

- When installing right side oil seal, use care so that it is in proper direction by referring to below figure.

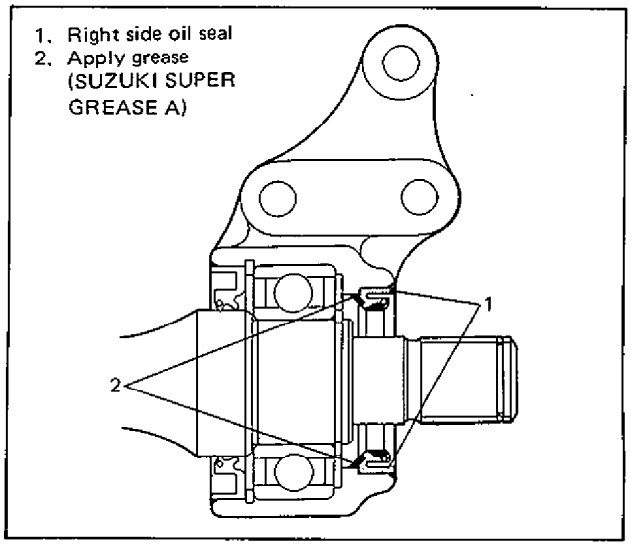


Fig. 4-27

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.

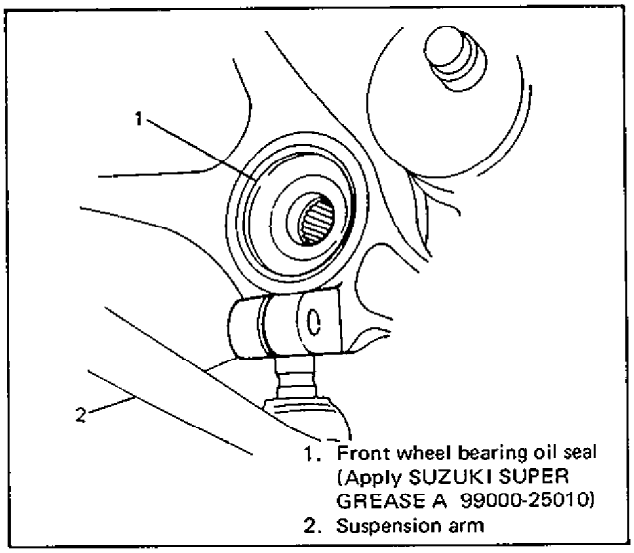


Fig. 4-28 Lubricating Oil Seal with Grease

- 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	18 – 23	1.8 – 2.3	13.5 – 16.5
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

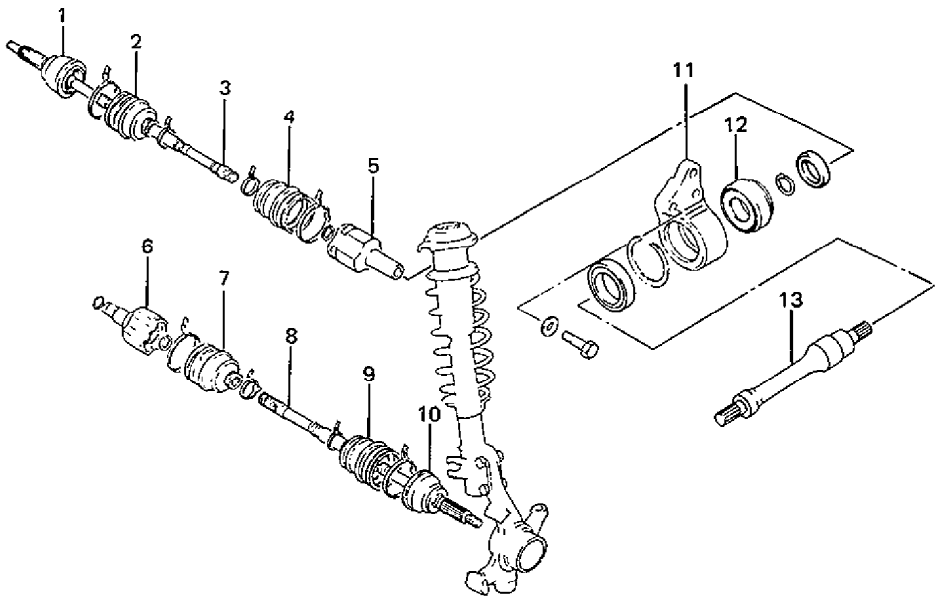
FRONT DRIVE SHAFT (Tripod Joint Type)

NOTE:
This type of front drive shaft is used for automatic transmission models.

CONTENTS

GENERAL DESCRIPTION

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 velosity ball joint)
11. Center bearing support
12. Center bearing
13. Center shaft

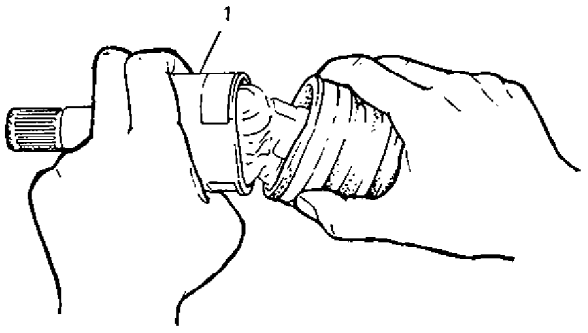
Fig. 4A-1 Front Drive Shaft Assembly

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.

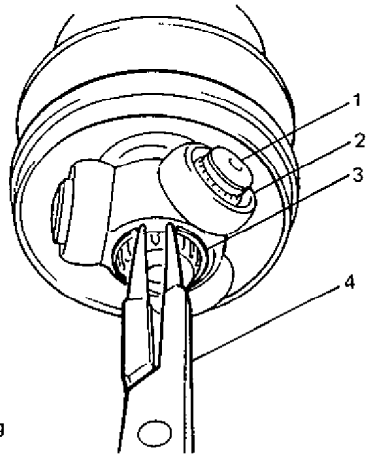


1. Tripod joint housing

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.



1. Spider
2. Bearing
3. Circlip
4. Special tool
   Snap ring pliers 09900-06107)

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 (80 g tube) to wheel side joint and yellow one (130 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.

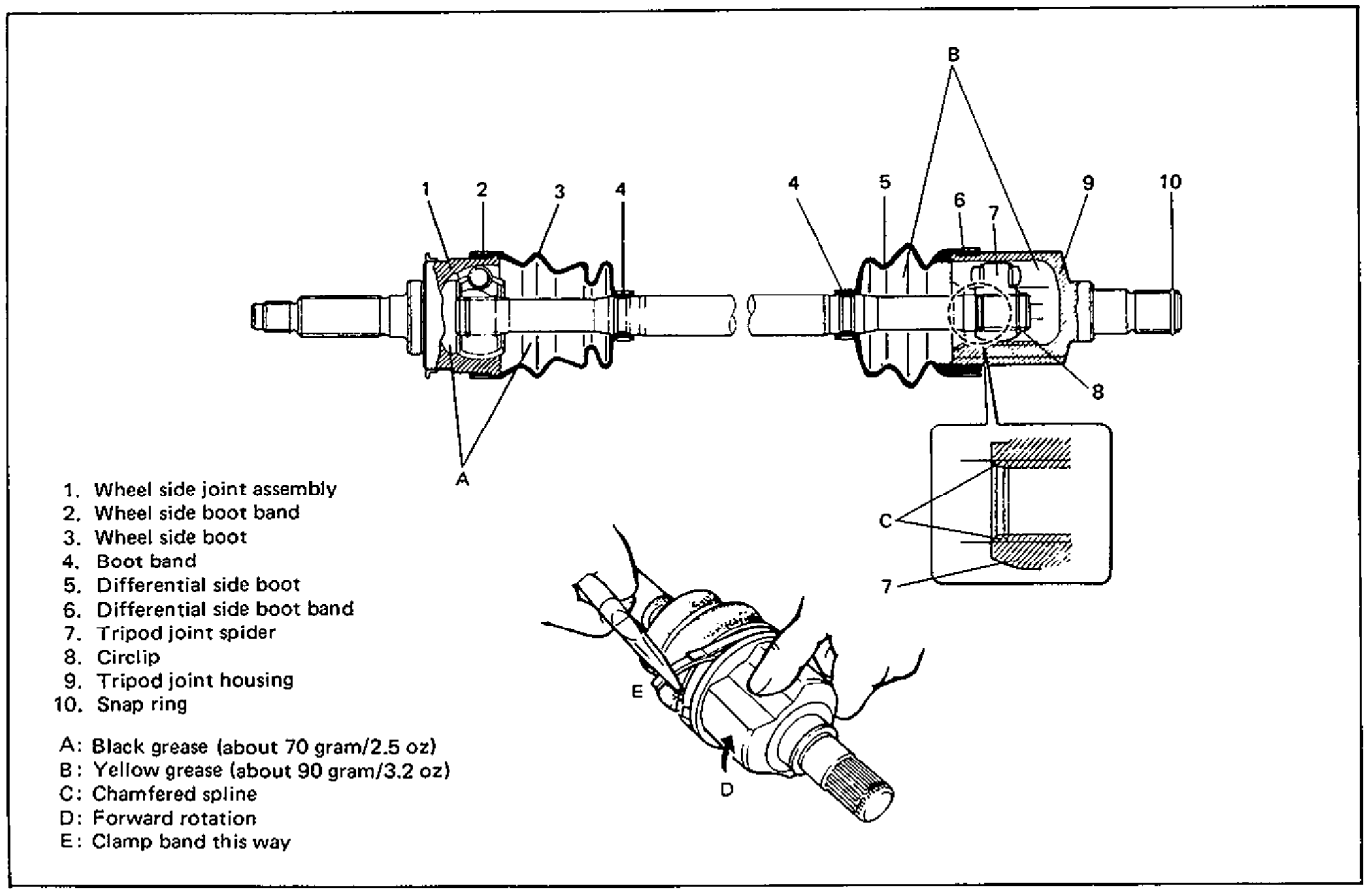


Fig. 4A-4 Assembling Front Drive Shaft

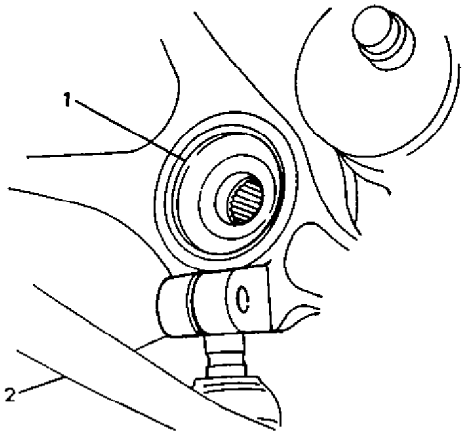
REASSEMBLY (Center Shaft and Center Bearing Support)

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. In serting 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. ROOM TEMPERATURE LEVEL CHECK first, and then NORMAL OPERATING TEMPERATURE LEVEL CHECK, referring to p. 7B-46.

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

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) 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.

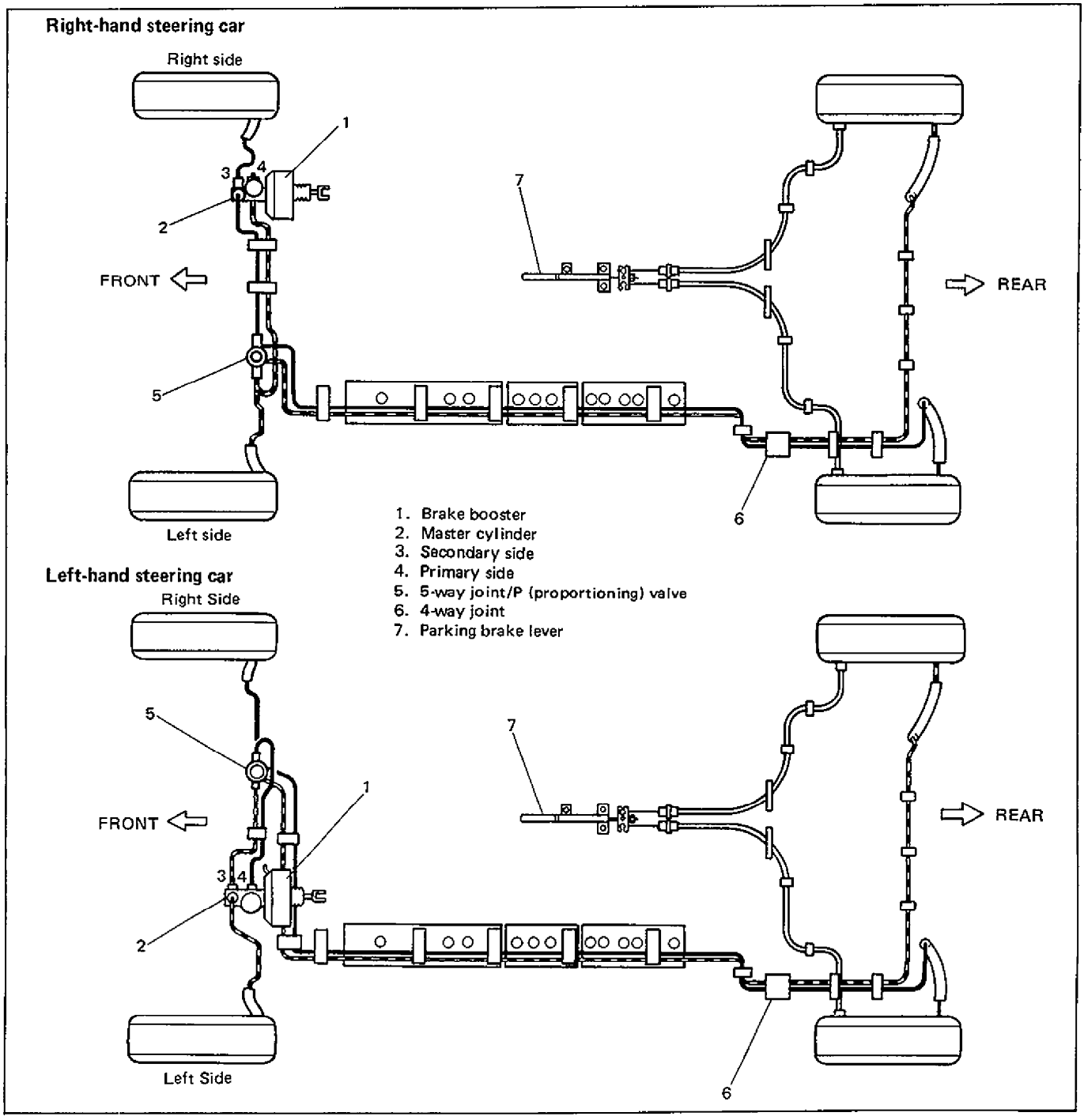


Fig. 5-1

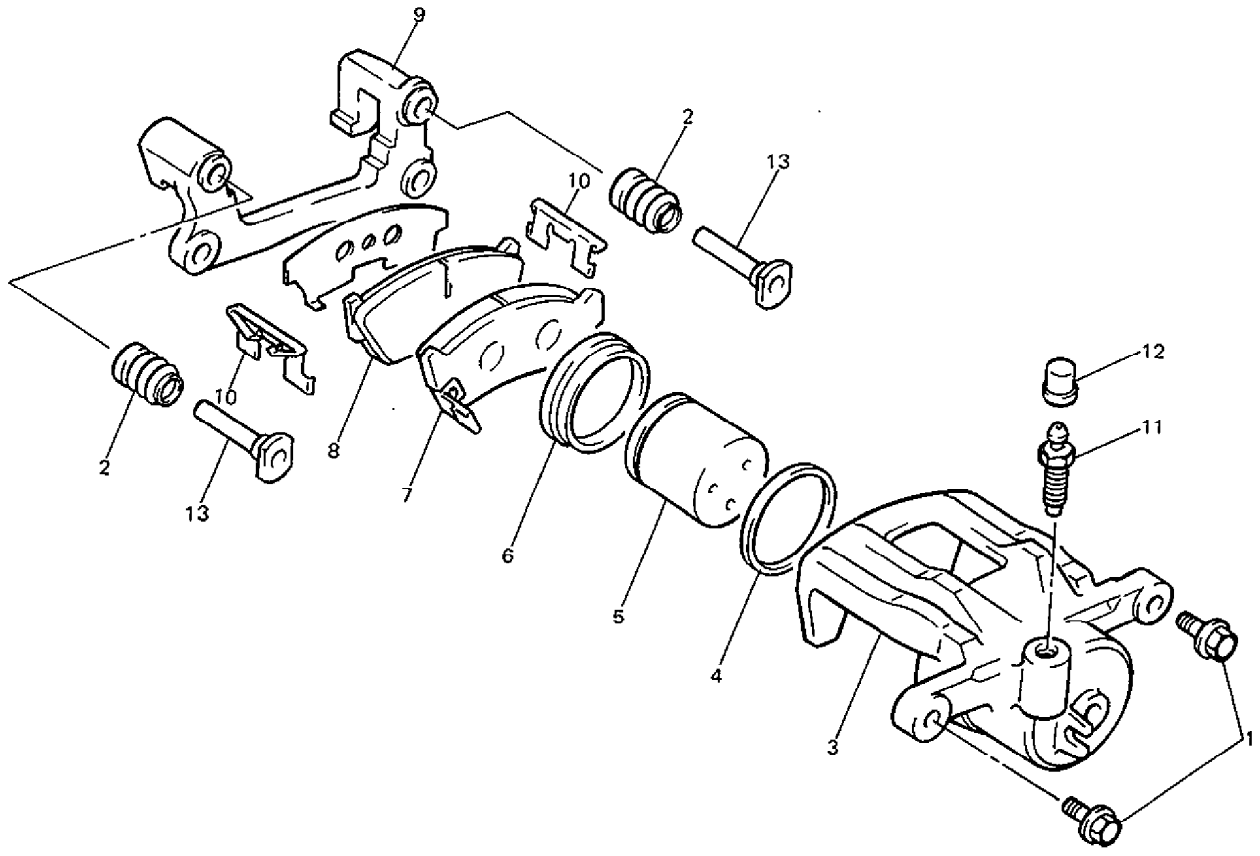
DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

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

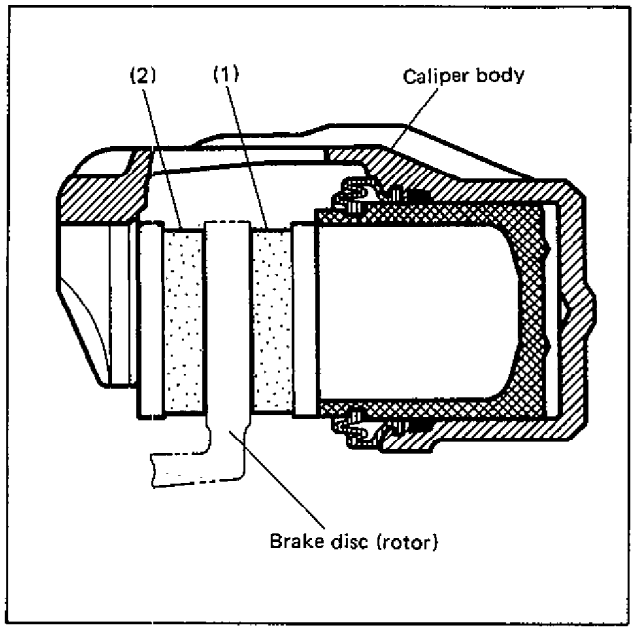


Fig. 5-3

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.

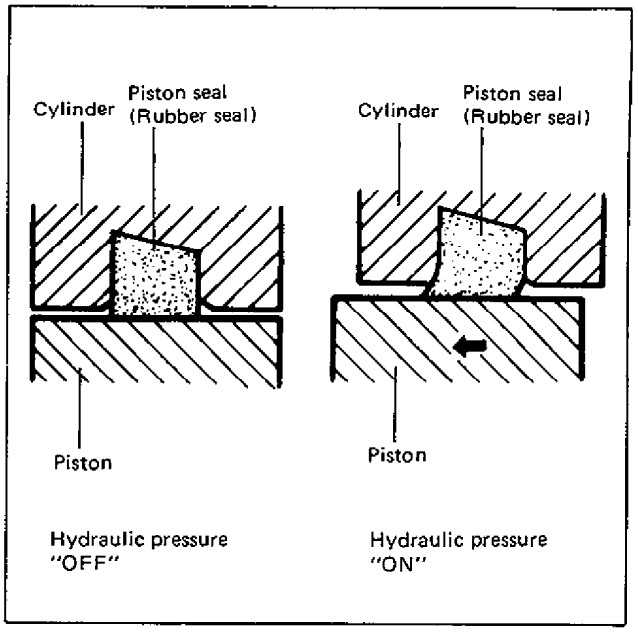


Fig. 5-4

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

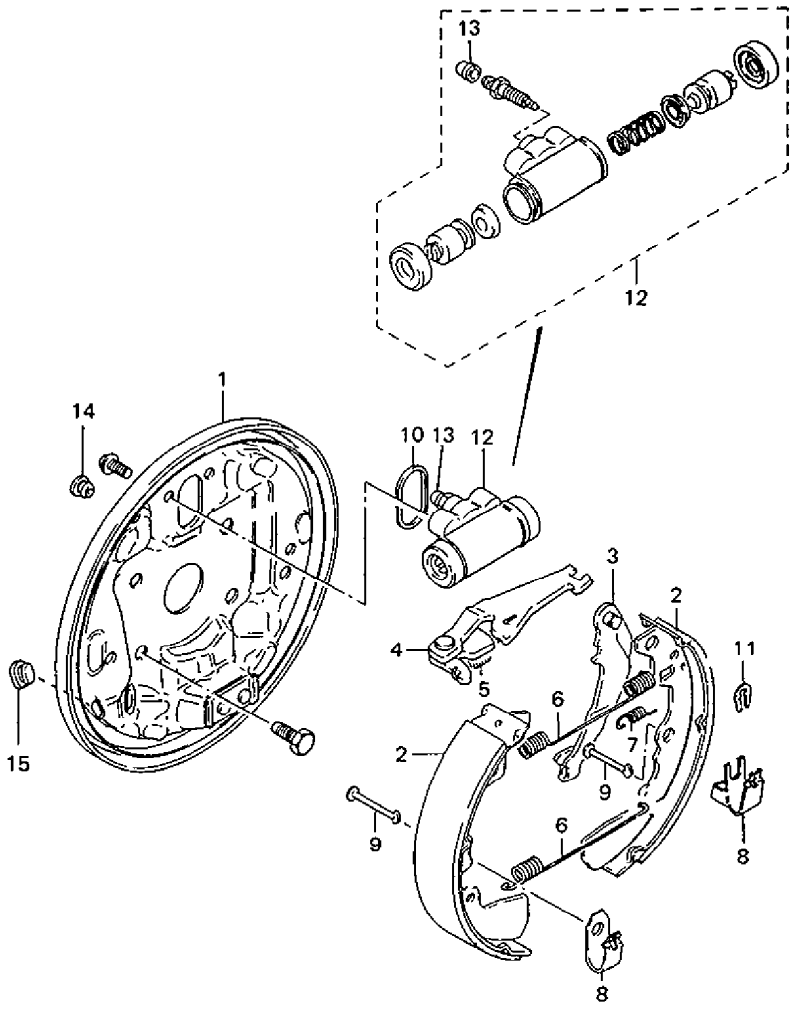
The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times. For details, refer to OPERATION in the next page.

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. Packing
11. Parking lever retainer
12. Wheel cylinder
13. Bleeder plug cap
14. Rubber plug
15. 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.

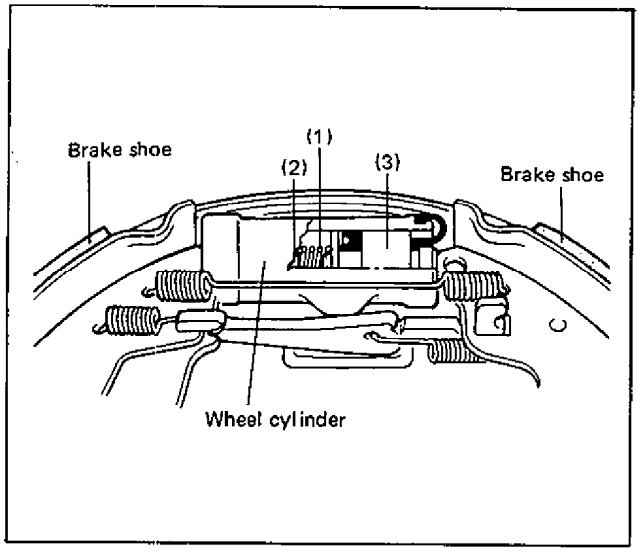


Fig. 5-6

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.

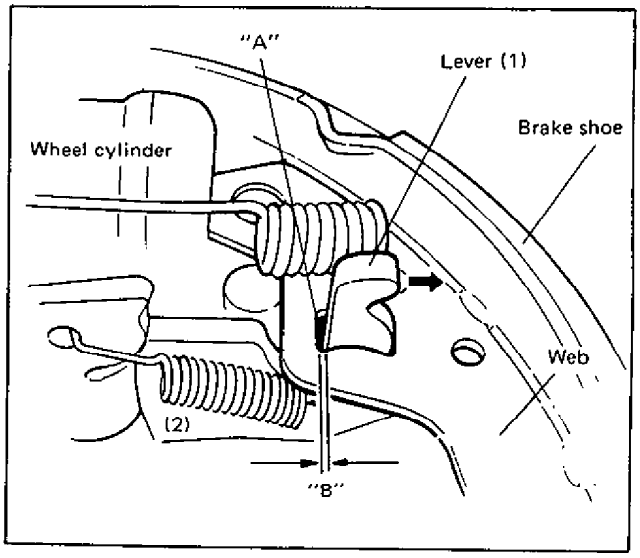


Fig. 5-7

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 0.18 mm (0.007 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.

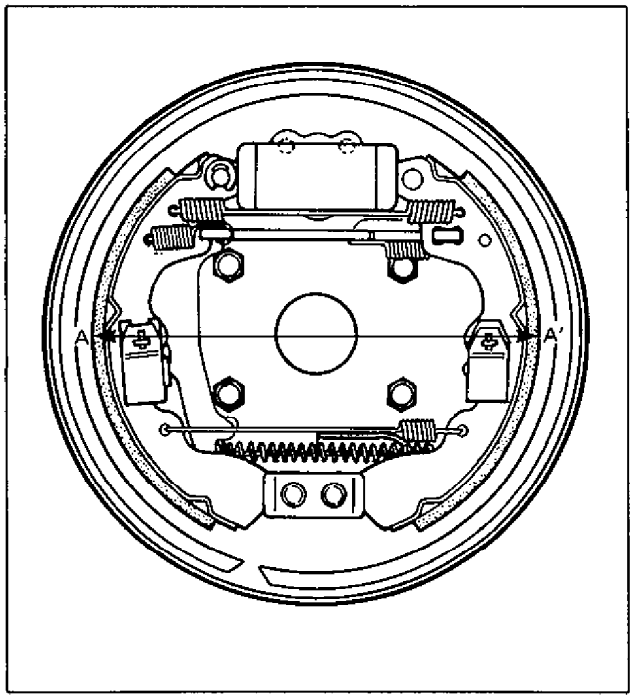


Fig. 5-8

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.

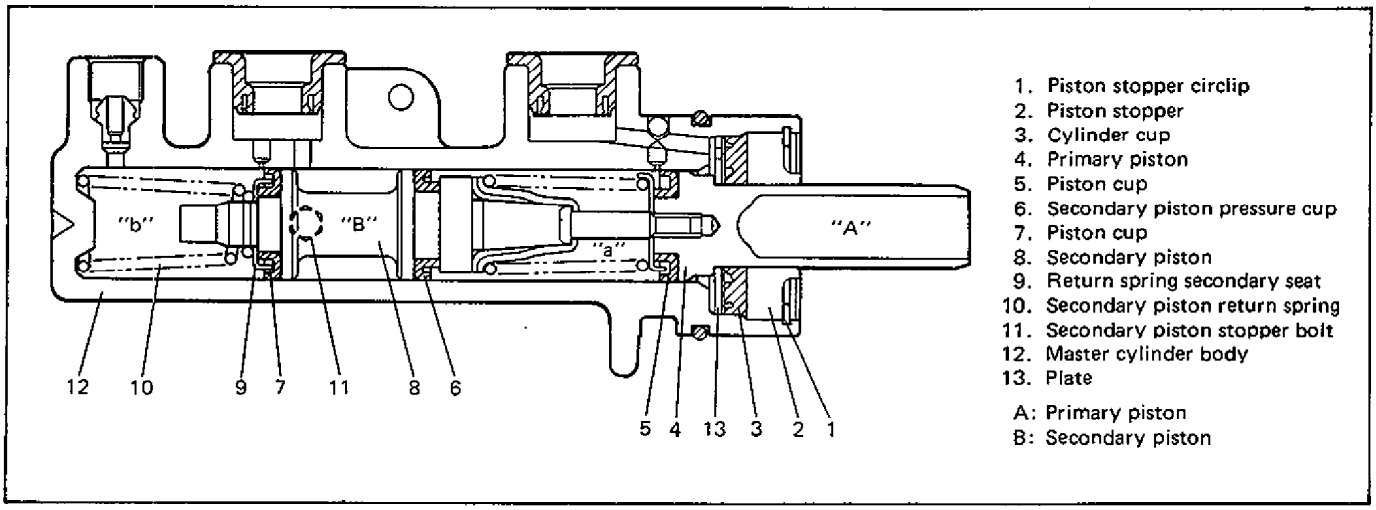


Fig. 5-9

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".

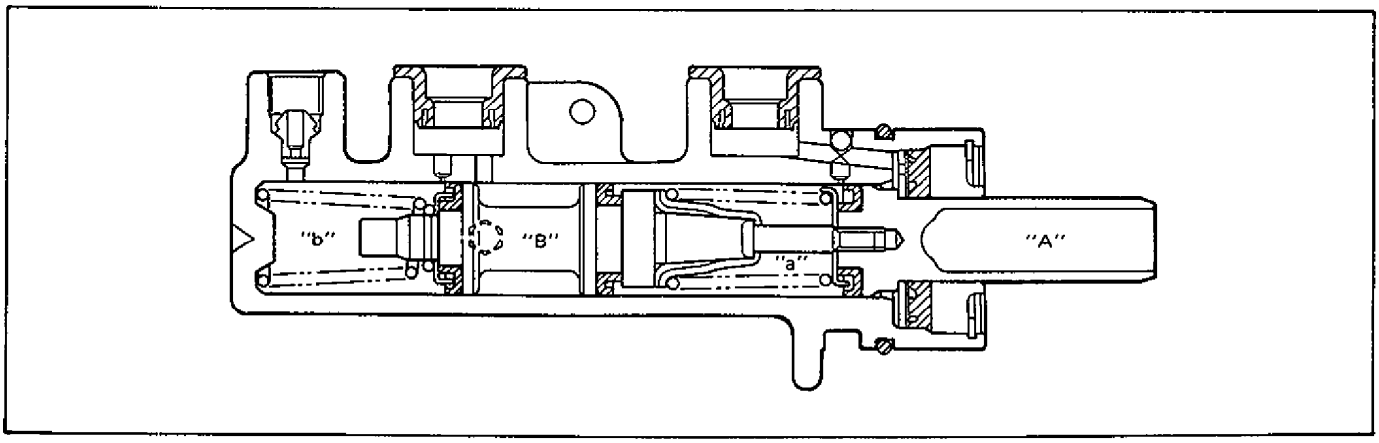


Fig. 5-10

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).

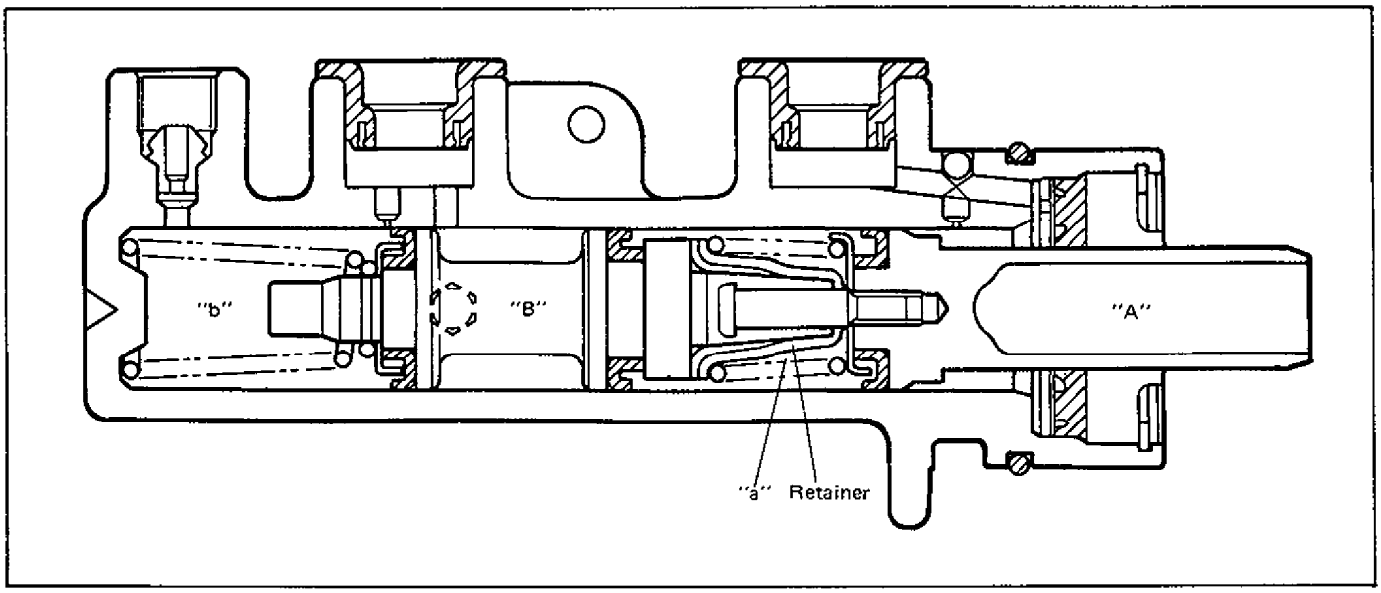


Fig. 5-11

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.

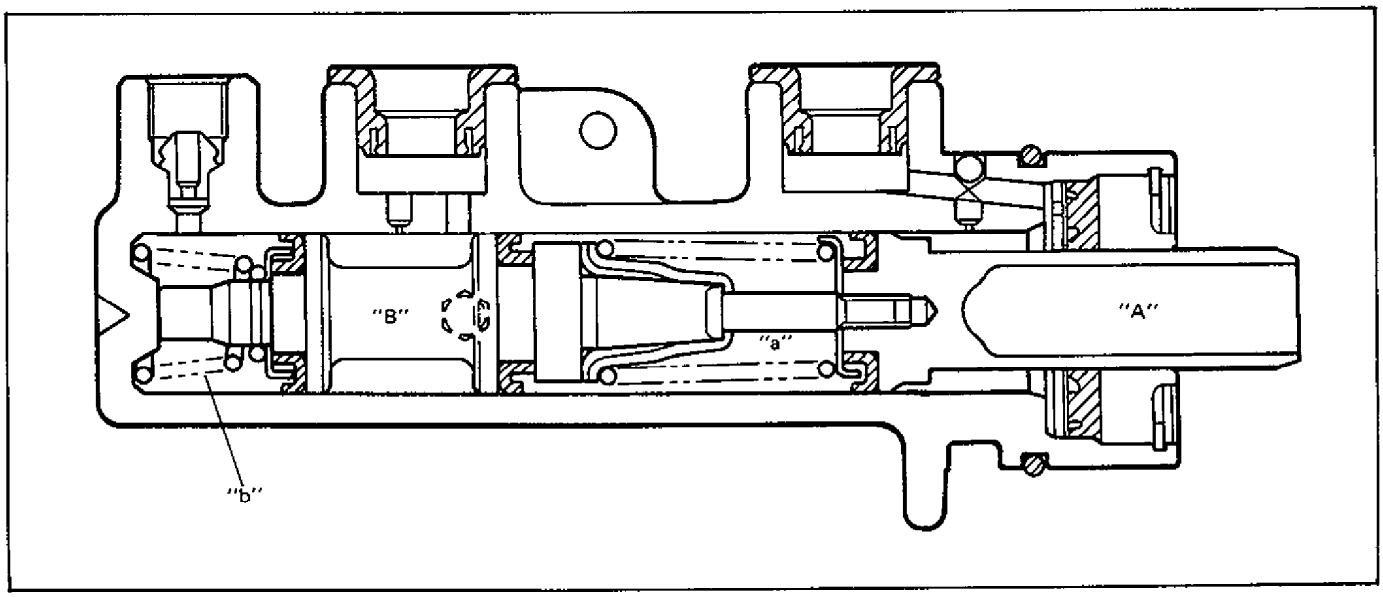


Fig. 5-12

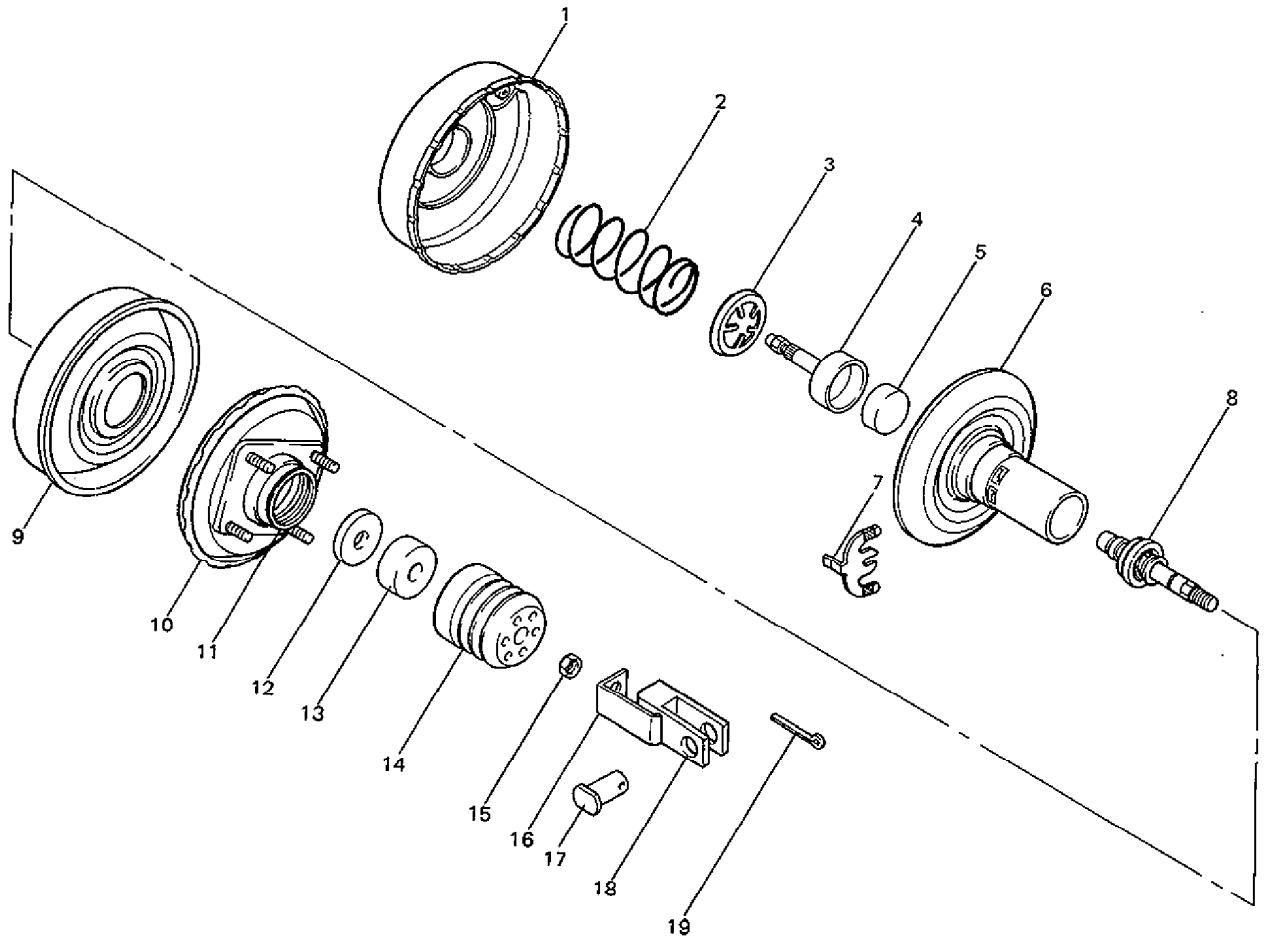
BOOSTER ASSEMBLY

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

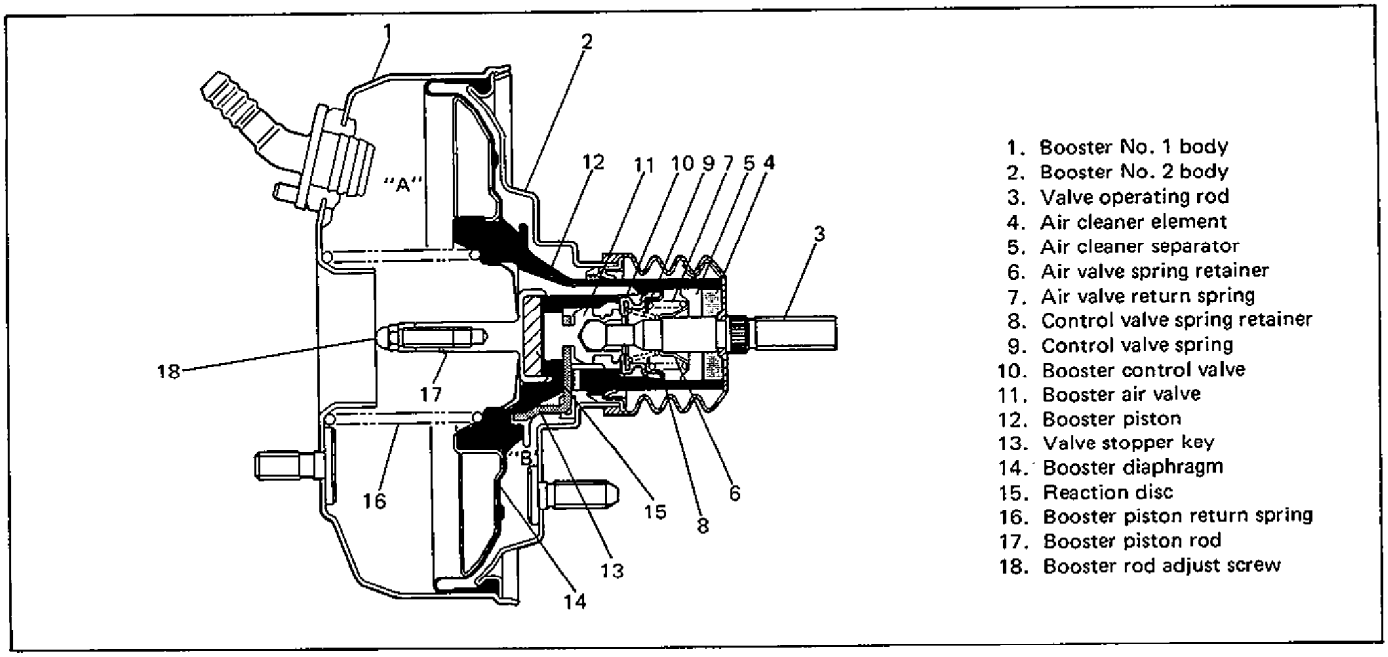


Fig. 5-14 Vacuum Booster Assembly

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.

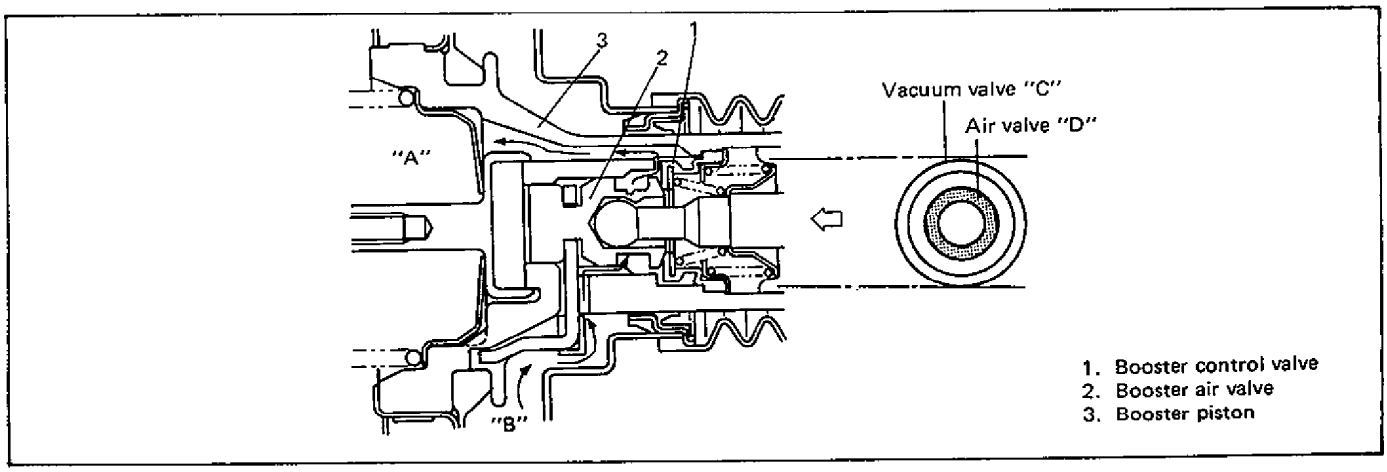


Fig. 5-15

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.

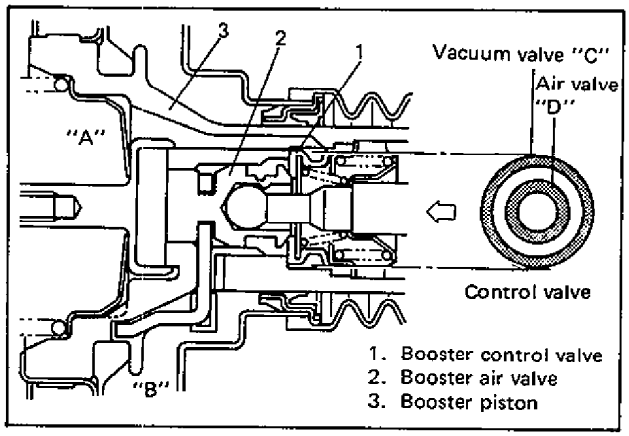


Fig. 5-16

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.

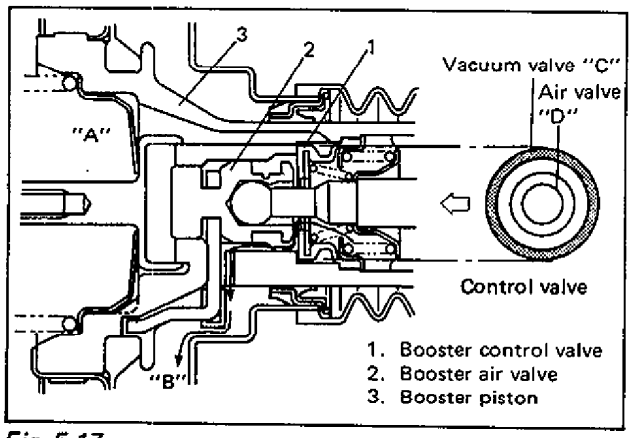


Fig. 5-17

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".**

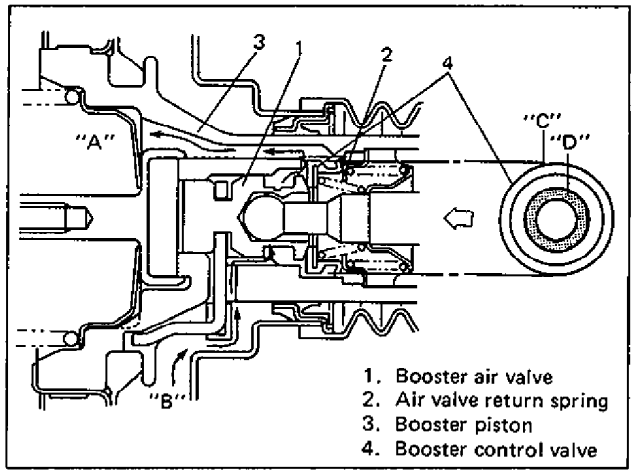


Fig. 5-18

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.

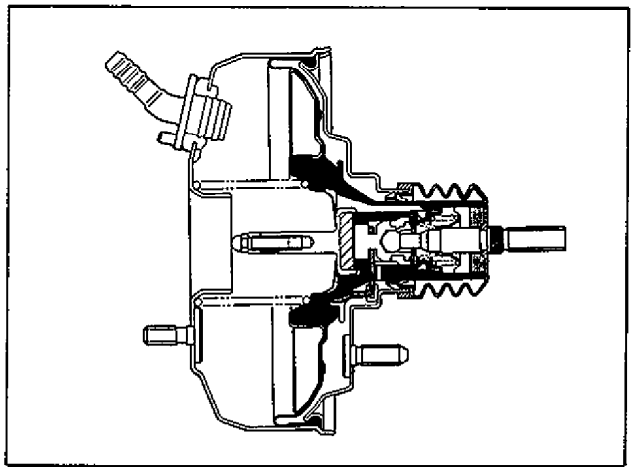


Fig. 5-19

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.
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.

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 vehicle:
Height of brake pedal is normal if it is as high as clutch pedal.
For left-hand steering vehicle:
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 5-55.
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 return cushion (shown as "A" in figure) is within 0.5 – 1.0 mm (0.02 – 0.04 in.). Then tighten lock nut to specified torque.

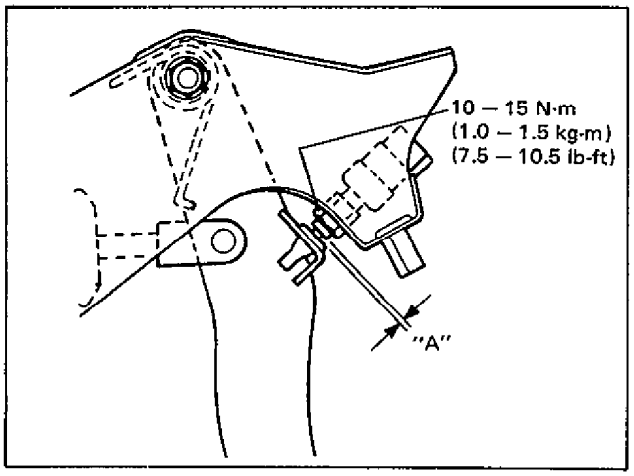


Fig. 5-20

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.).

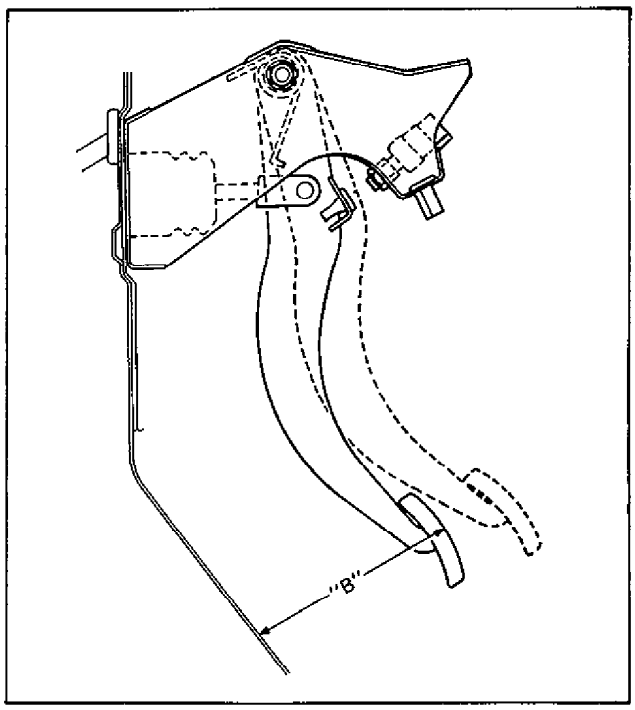


Fig. 5-21

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 5-43 for brake shoe inspection.
- See page 5-19 for bleeding brake system.
- Remove brake drums for adjuster inspection. (See page 5-35.) 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 5-16 of this section, even when it is more than 60 mm (2.36 in.).

Amount of brake shoe wear can be checked as follows.

1) Hoist car and remove wheel.
2) Remove rubber plug from brake back plate.
3) By using mirror and light, visually check brake shoe lining for thickness. If lining thickness "A" is found less than below specified wear limit, replace with new brake shoes.

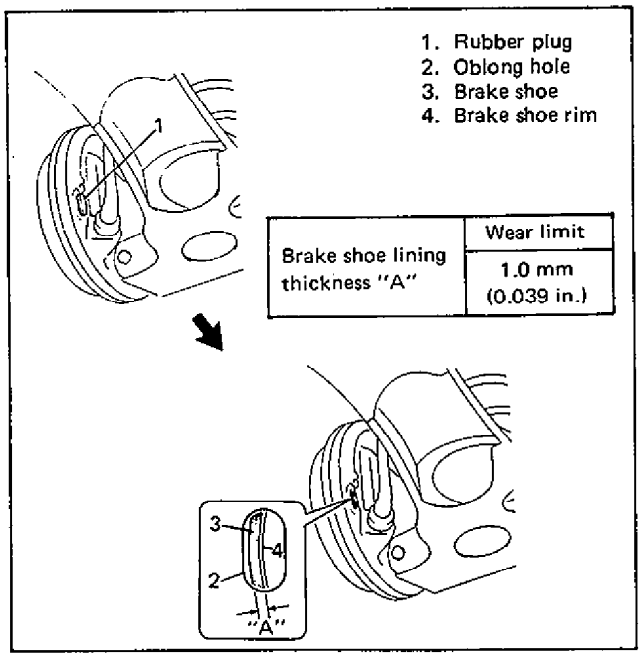


Fig. 5-22

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.

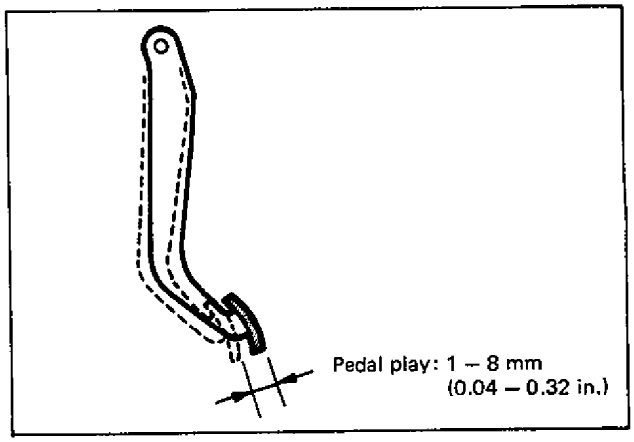


Fig. 5-23

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.

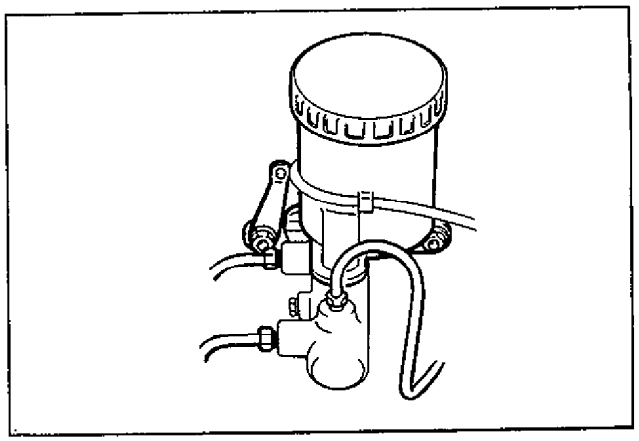


Fig. 5-24

8. DISC INSPECTION

Refer to page 5-34 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.

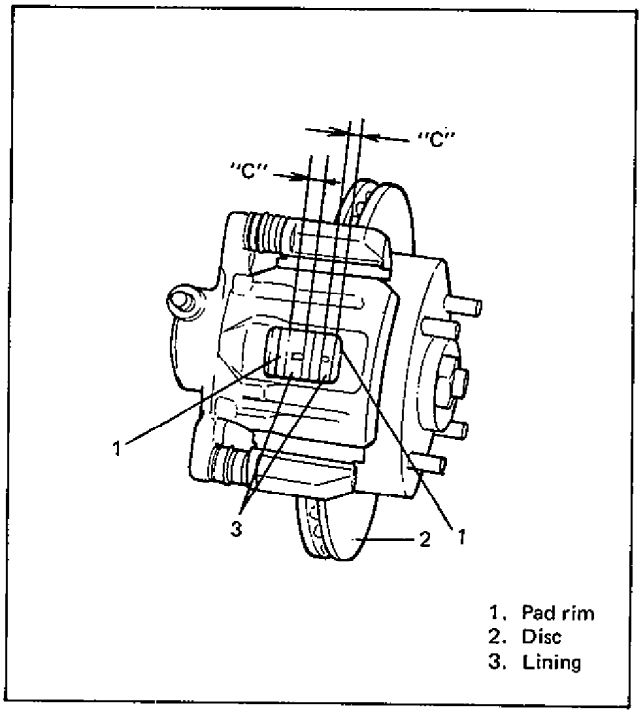


Fig. 5-25

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.

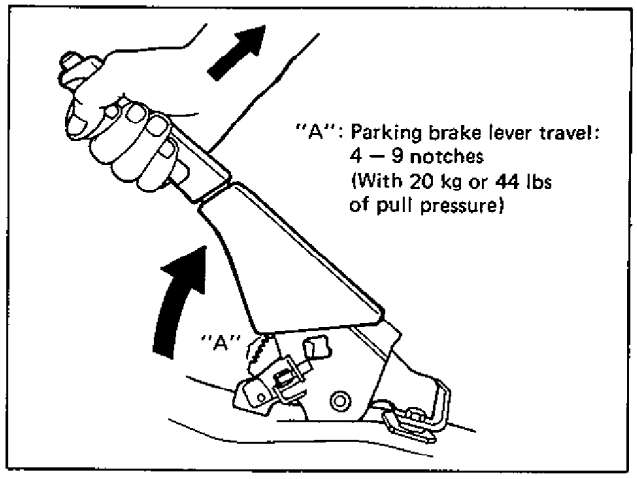


Fig. 5-26

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

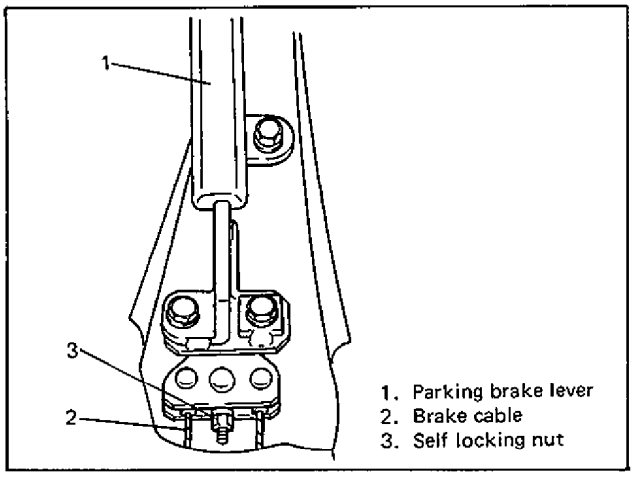


Fig. 5-27

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.

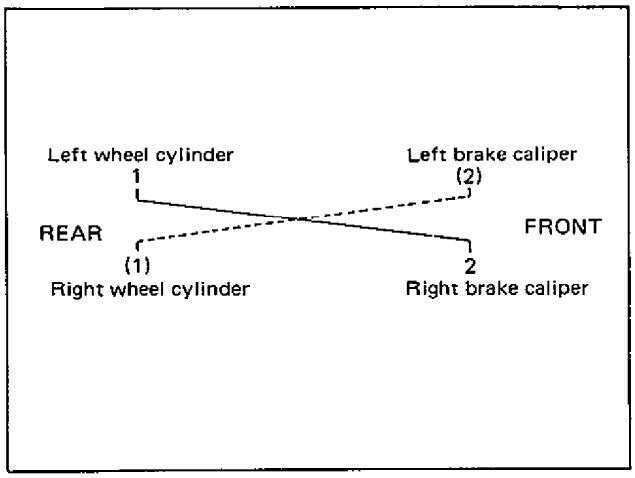


Fig. 5-28

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.

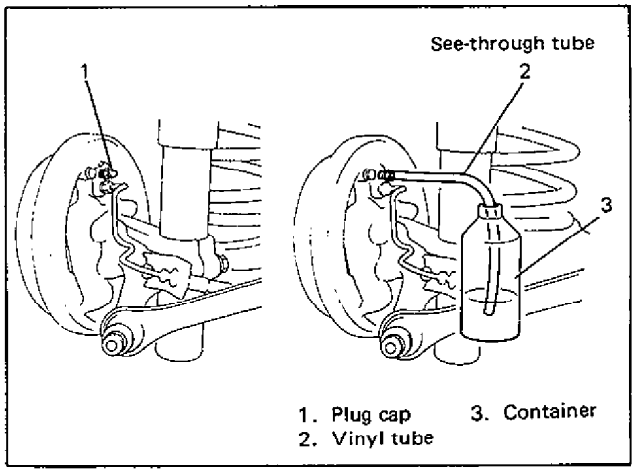


Fig. 5-29

3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.

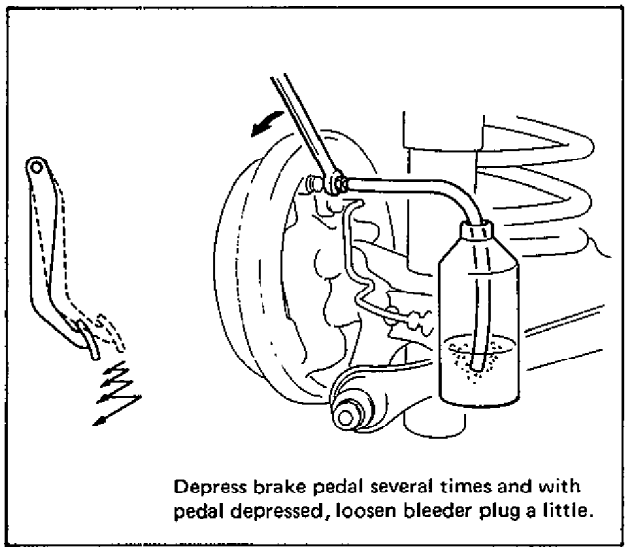


Fig. 5-30

4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.

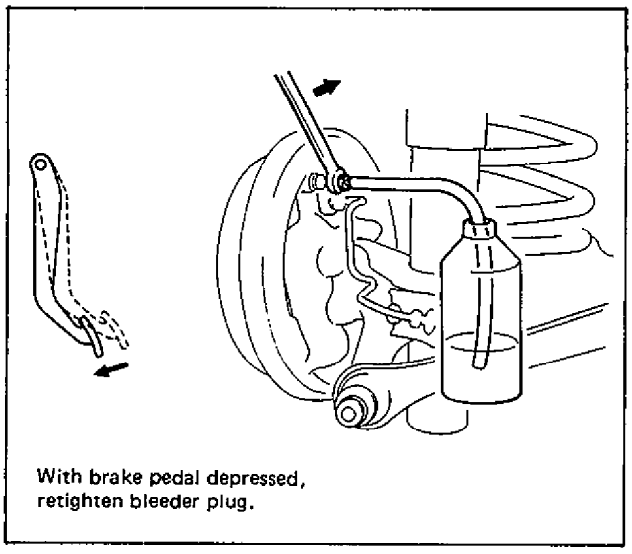


Fig. 5-31

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 5-60.)
7) Then attach bleeder plug cap.

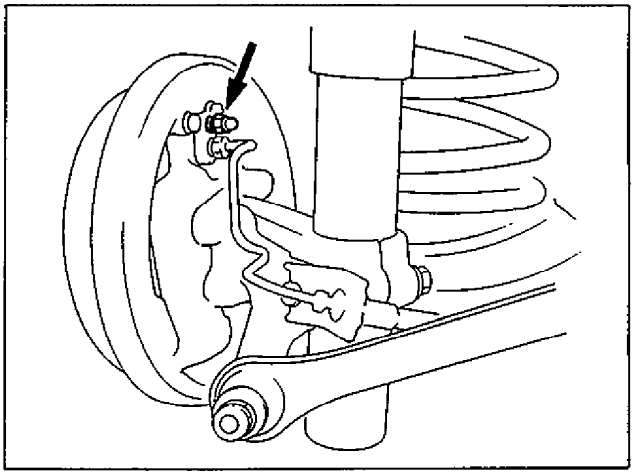


Fig. 5-32

8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.

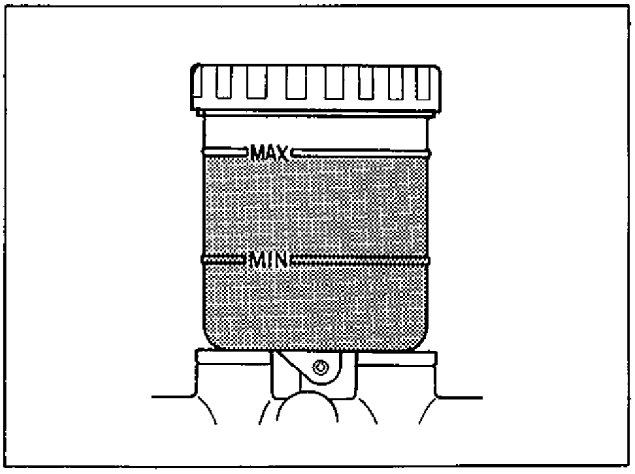


Fig. 5-33

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.

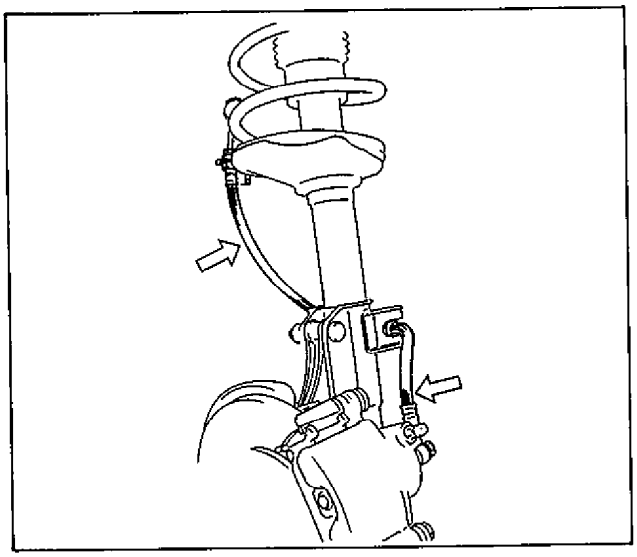


Fig. 5-34

PIPE

Inspect the tube for damage, cracks, dents and corrosion. If any defect is fount, replace it.

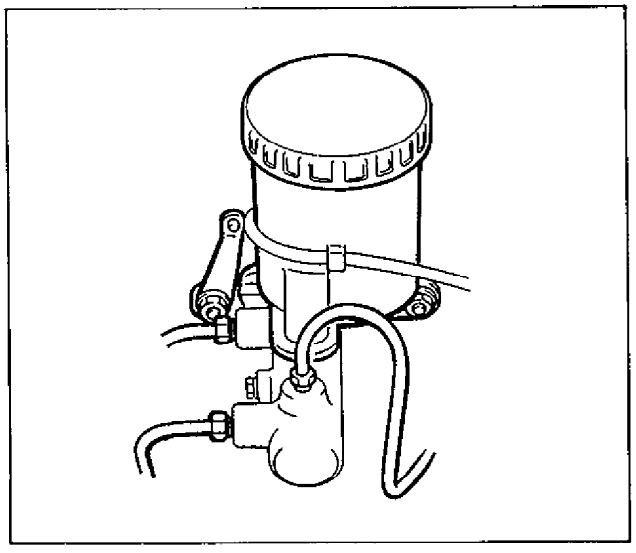


Fig. 5-35

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.

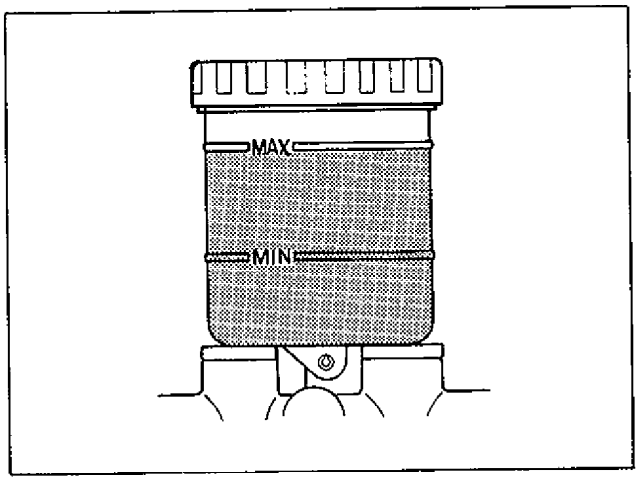


Fig. 5-36

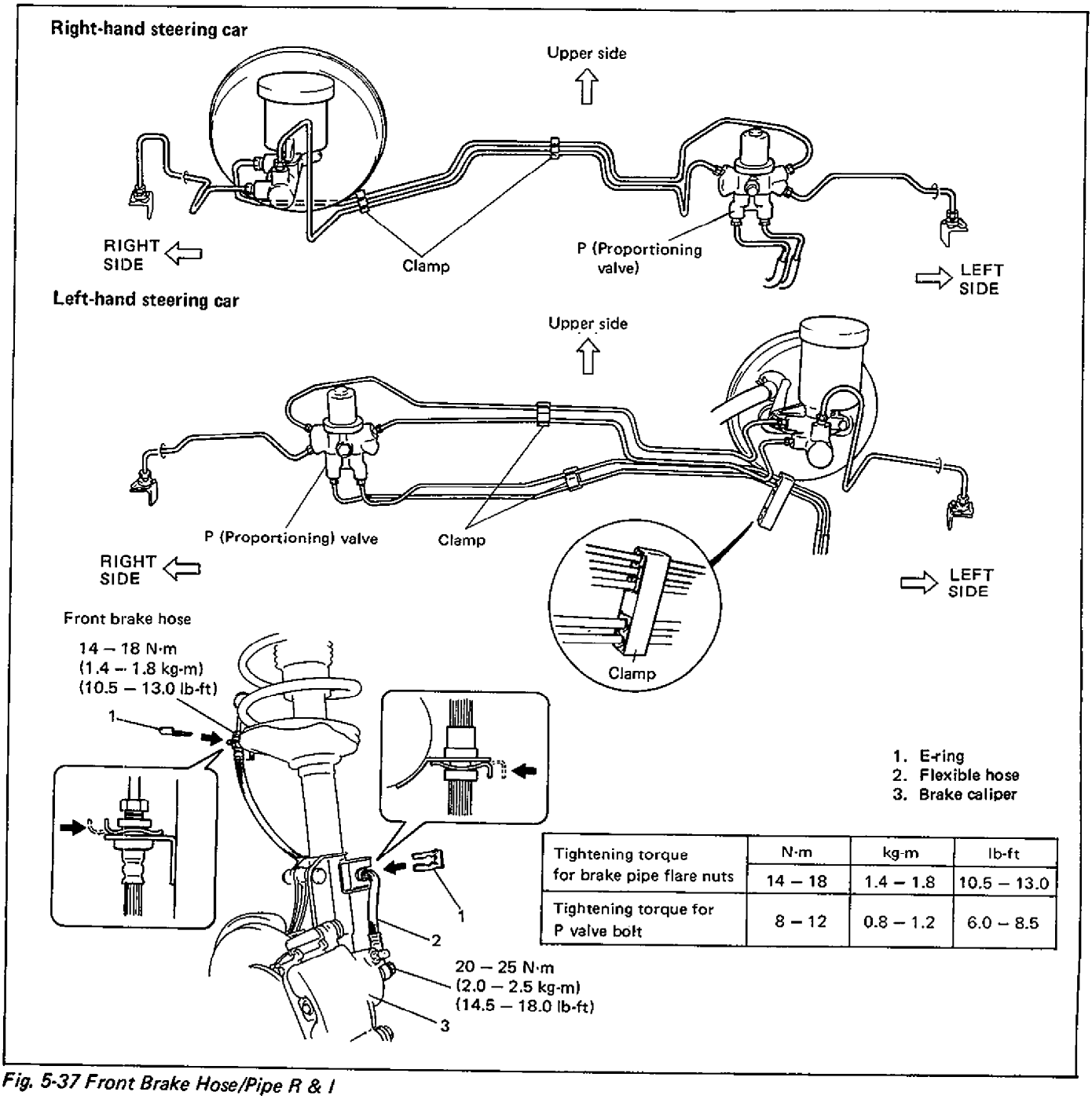
CAUTION:

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.
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.



Tightening torque for brake pipe flare nuts	N·m	kg-m	lb-ft
	14 – 18	1.4 – 1.8	10.5 – 13.0
Tightening torque for P valve bolt	8 – 12	0.8 – 1.2	6.0 – 8.5

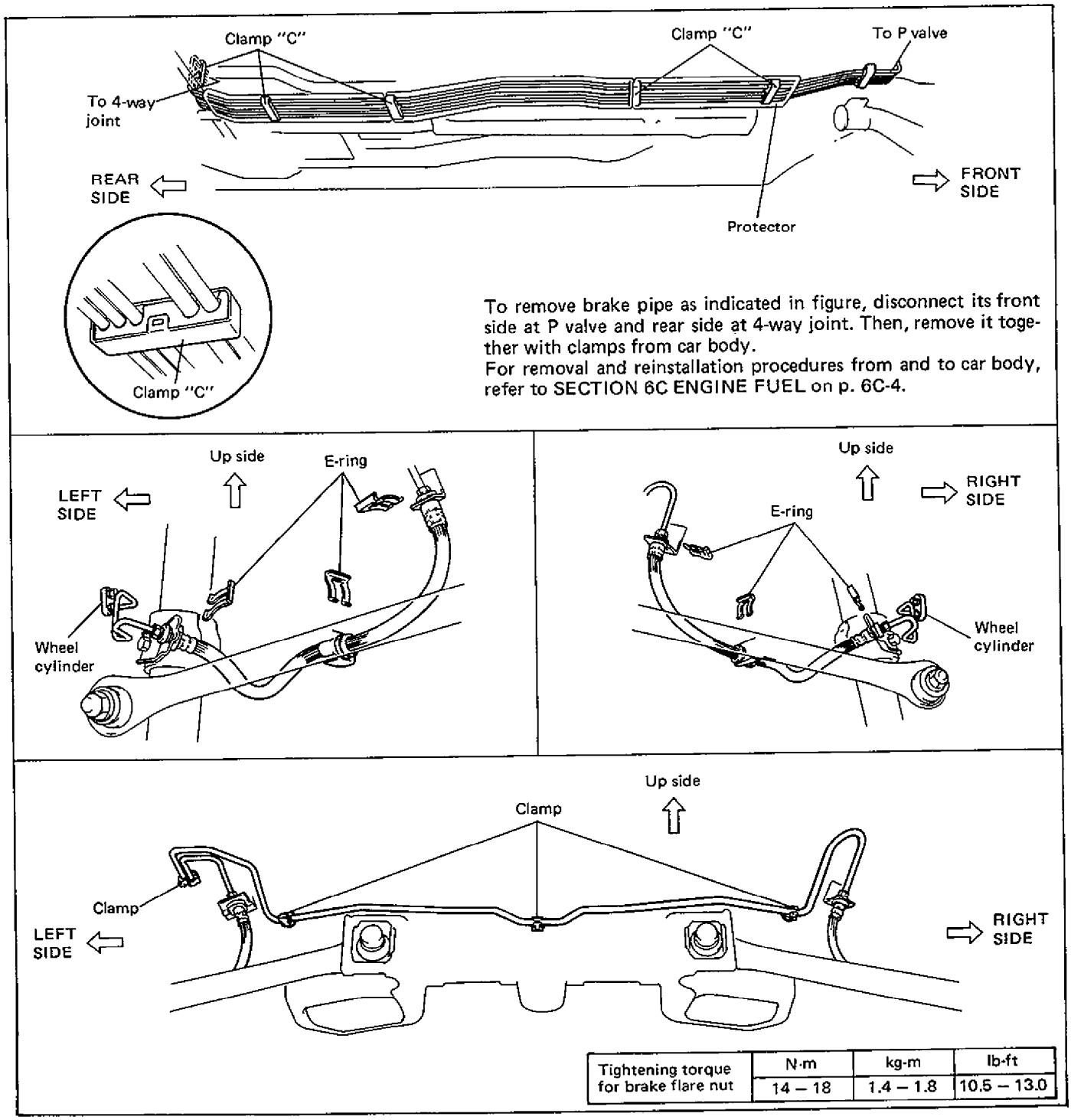
Fig. 5-37 Front Brake Hose/Pipe R & I

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.



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 5-18).
3) Check brake drum for dragging and brake system for proper performance.

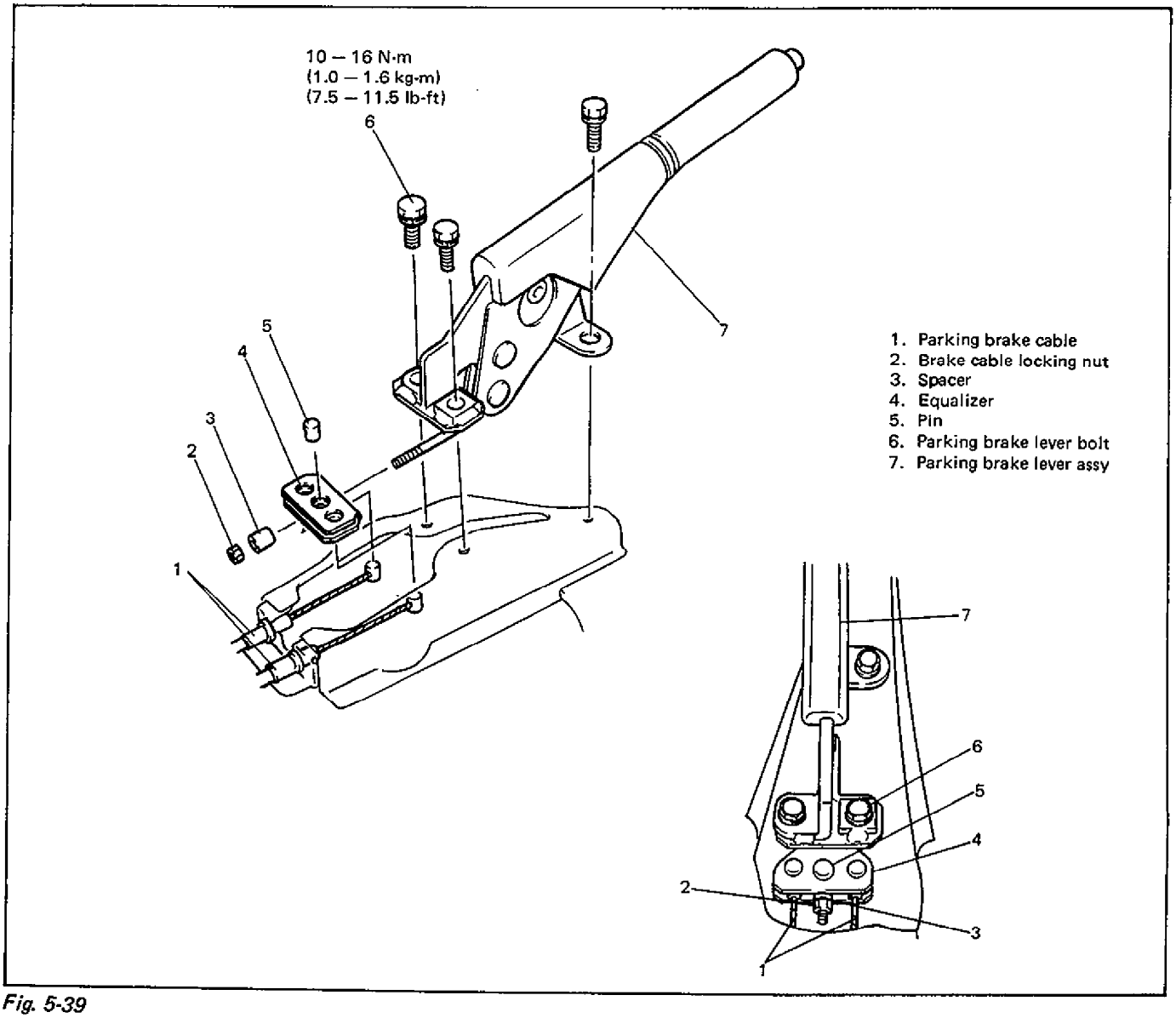


Fig. 5-39

2. REMOVE AND INSTALL PARKING BRAKE CABLE

REMOVAL

1) Remove brake drum. (Refer to steps 1) to 7) of BRAKE DRUM REMOVAL of this section, page 5-35.)
2) Disconnect parking brake cable from brake shoe lever. (Refer to steps 2) & 3) of BRAKE SHOE REMOVAL of this section, page 5-39.)
3) Disconnect brake cable from brake back plate. (Refer to step 4) of BRAKE BACK PLATE REMOVAL section, page 5-41.)

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 5-24.)

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.

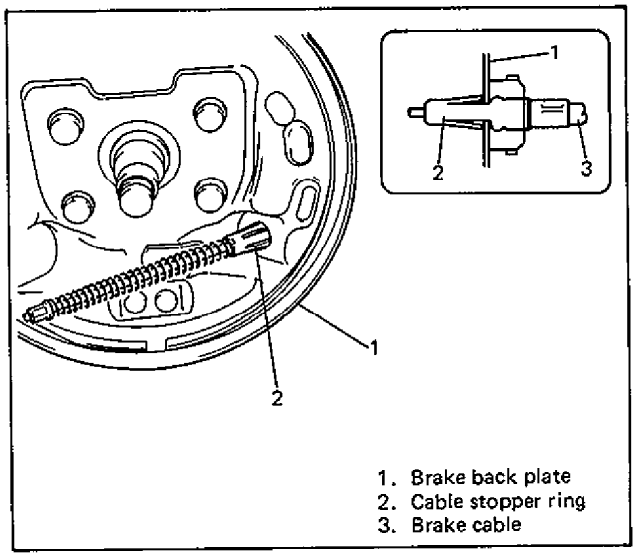


Fig. 5-40

2) Install brake cable spring and nipple end to parking brake shoe lever securely as shown below.

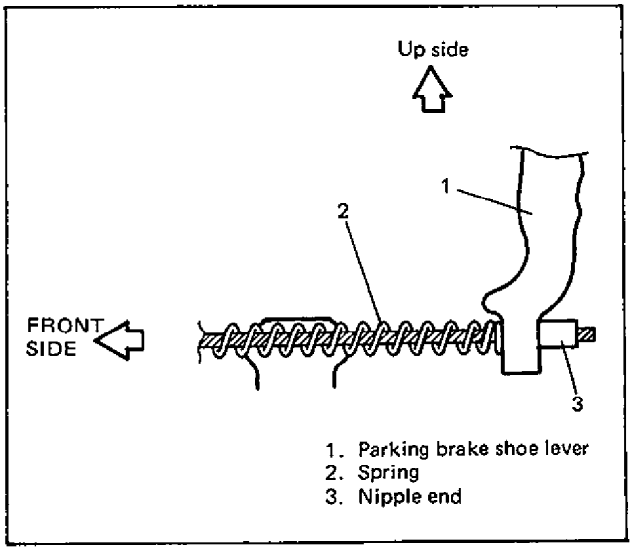


Fig. 5-41

3) For brake shoe installation, refer to steps 1) and 2) of BRAKE SHOE INSTALLATION of this section, page 5-39.
4) For brake drum installation, refer to steps 1) and 7) of BRAKE DRUM INSTALLATION of this section, page 5-37.
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 5-24.
7) Upon completion of installation, adjust cable. (Refer to PARKING BRAKE INSPECTION AND ADJUSTMENT of this section, page 5-18.) Then check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

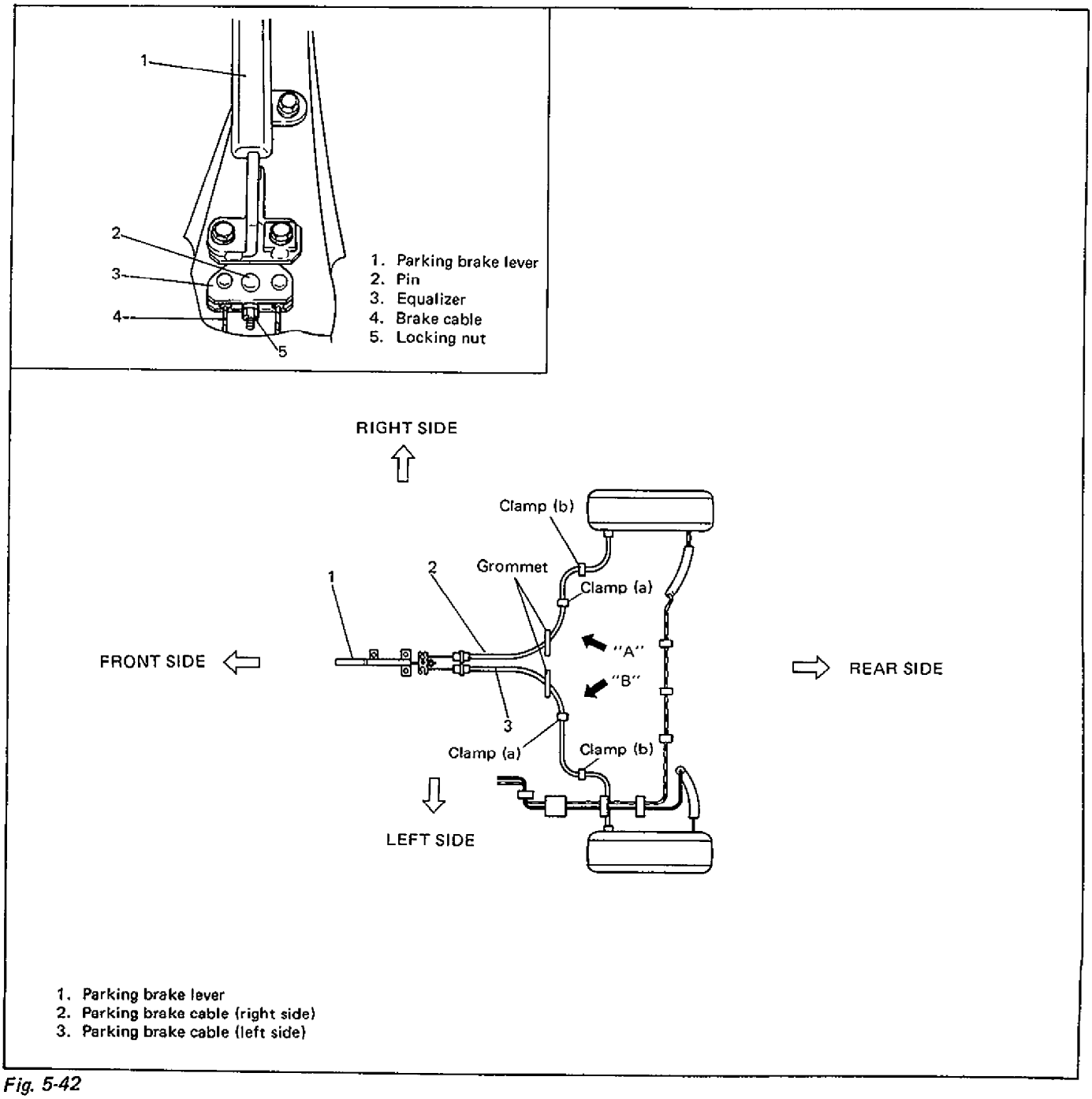


Fig. 5-42

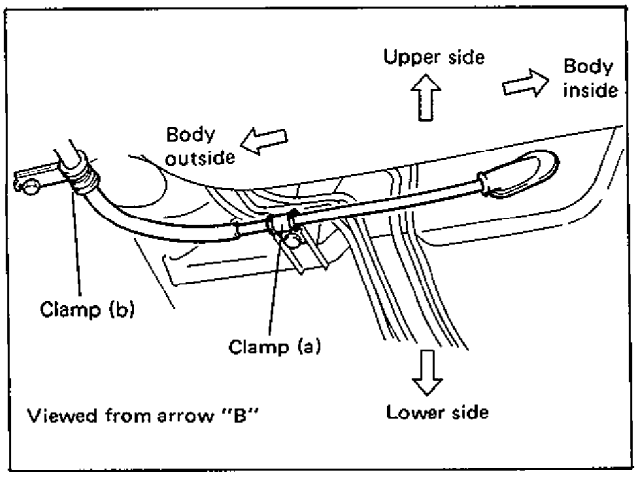


Fig. 5-43

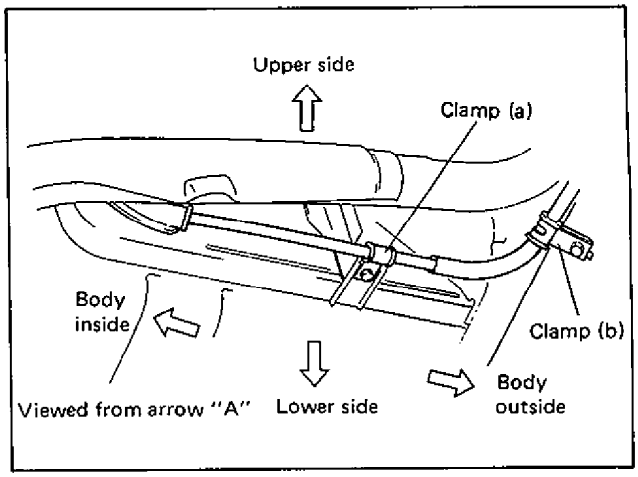


Fig. 5-44

DISC BRAKE R & I

1. REMOVE AND INSTALL PAD (SHOE & LINING)

REMOVAL

1) Hoist car and remove wheel.
2) Remove caliper pin bolts.

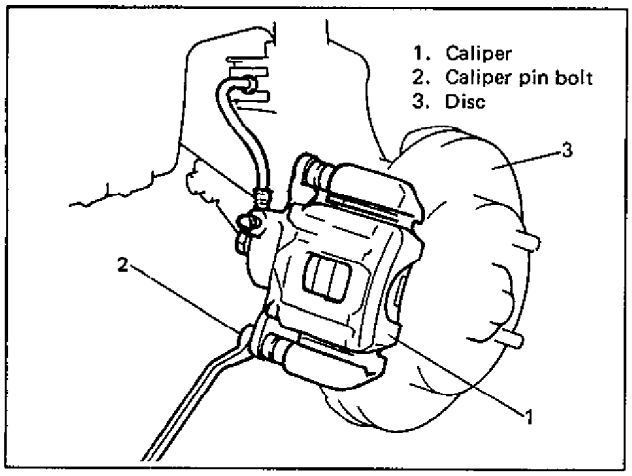


Fig. 5-45

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.

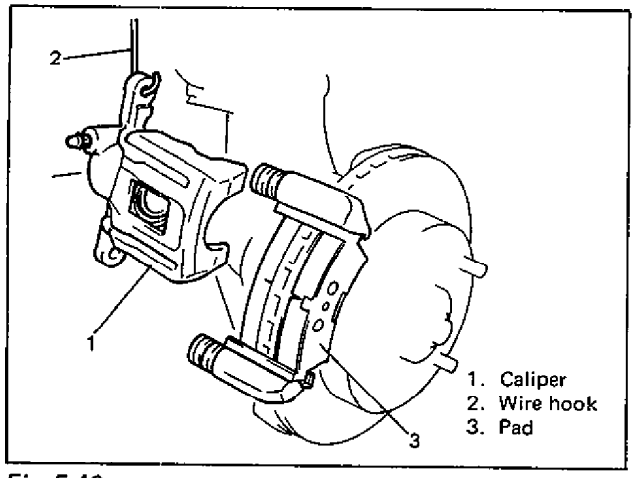


Fig. 5-46

4) Remove pads.

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Install pad clips and pads.

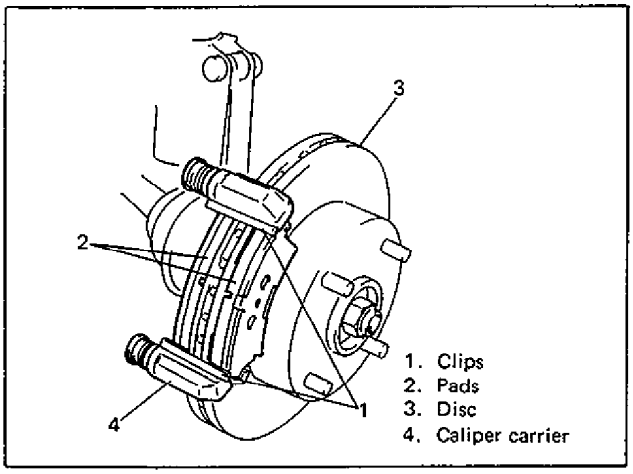


Fig. 5-47

2) Install caliper and torque caliper pin bolts to specification.

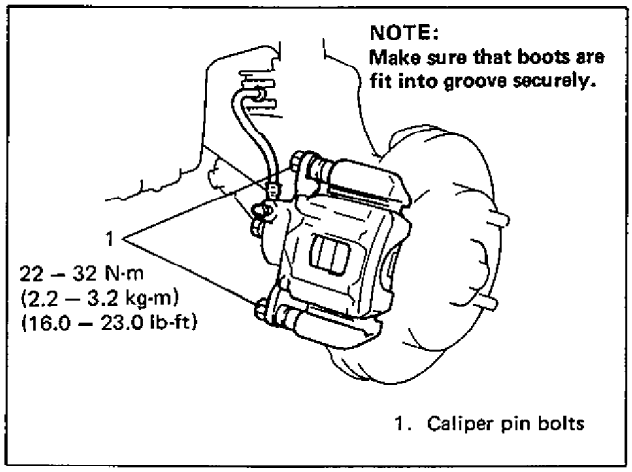


Fig. 5-48

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.

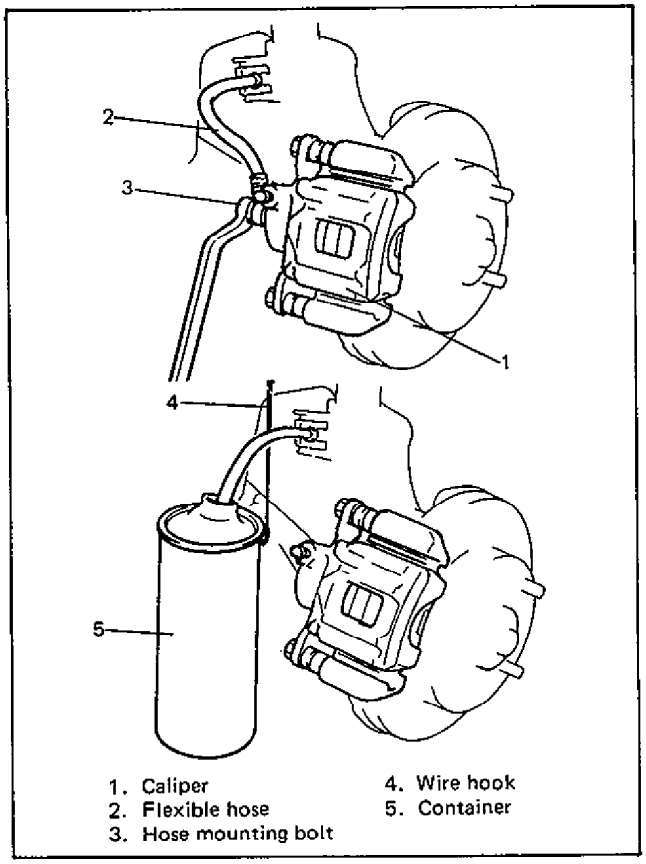


Fig. 5-49

3) Remove caliper pin bolts.

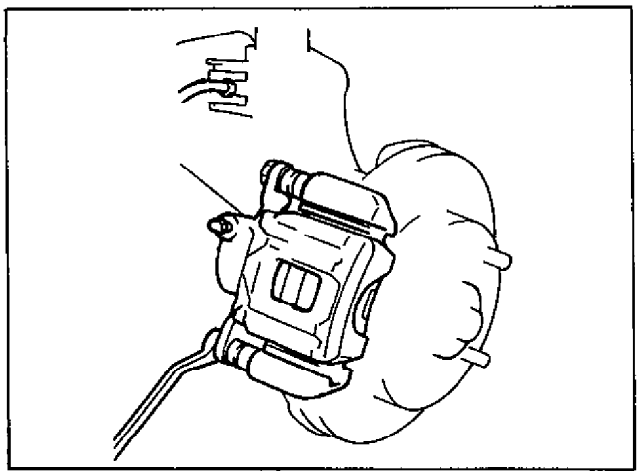


Fig. 5-50

4) Remove caliper from carrier.

INSTALLATION

1) Install caliper to caliper carrier.
2) Torque caliper pin bolts to specification.

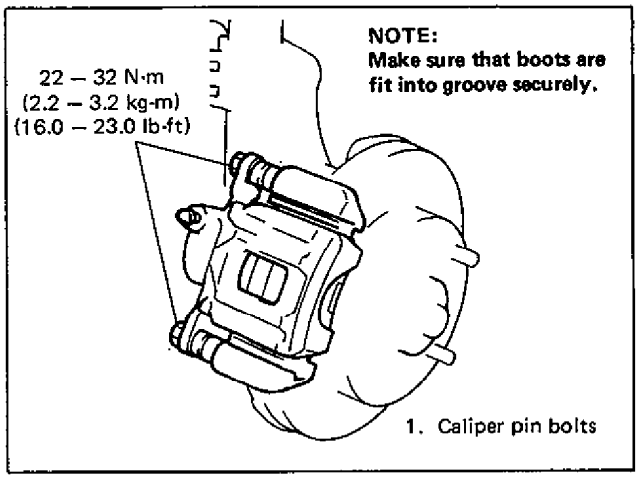


Fig. 5-51

3) Install brake flexible hose as shown and torque hose mounting bolt to specification.

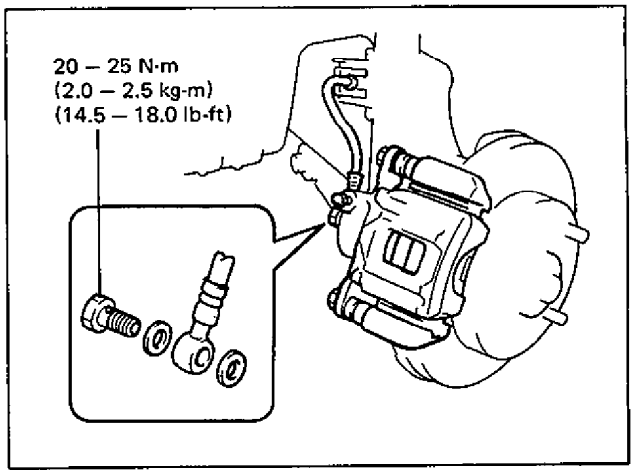


Fig. 5-52

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.

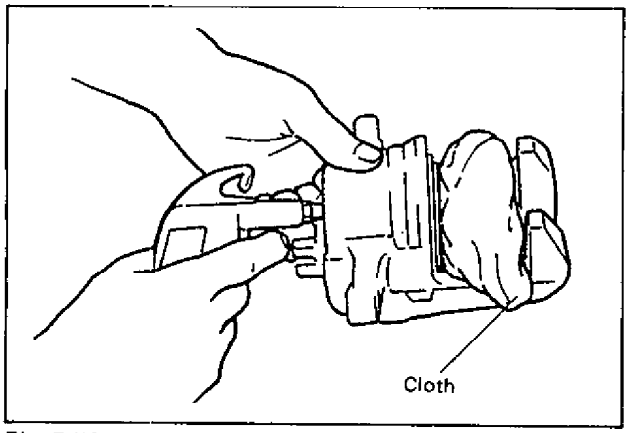


Fig. 5-53

2) Remove piston seal using a thin blade like a thickness gauge, etc.

NOTE:
Be careful not to damage inside (bore side) of cylinder.

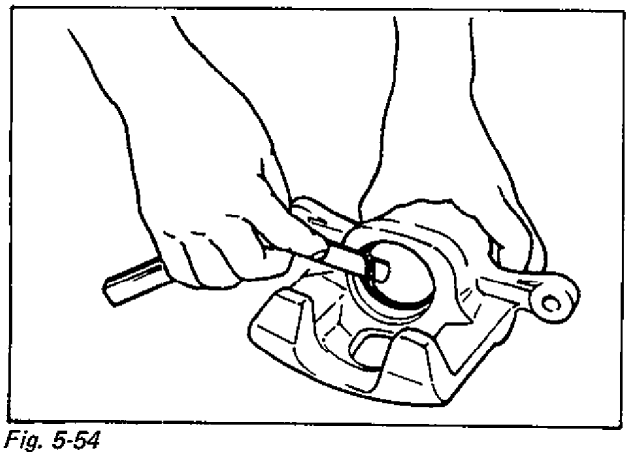


Fig. 5-54

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.

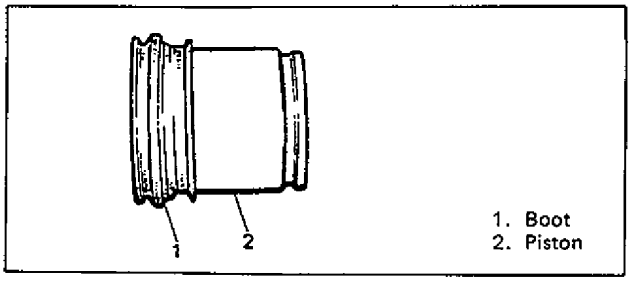


Fig. 5-55

2) Fit boot as it is in above figure into boot groove in cylinder with fingers.

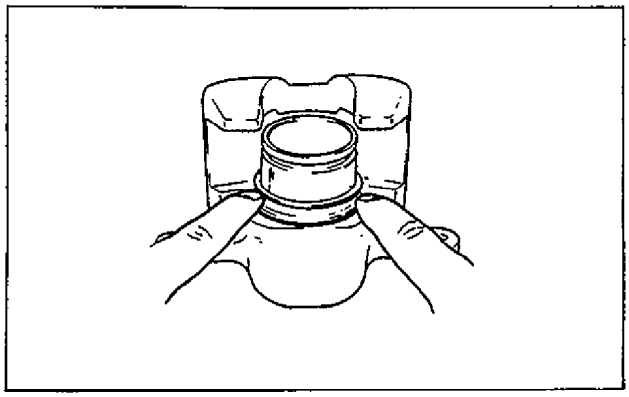


Fig. 5-56

3) Insert piston into cylinder by hand and fit boot in boot groove in piston.

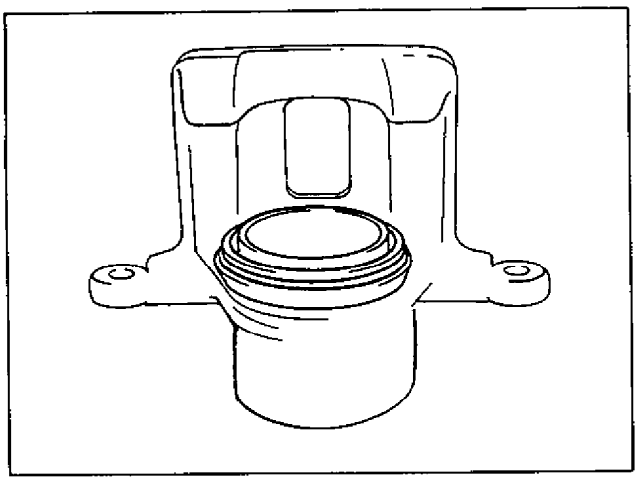


Fig. 5-57

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.

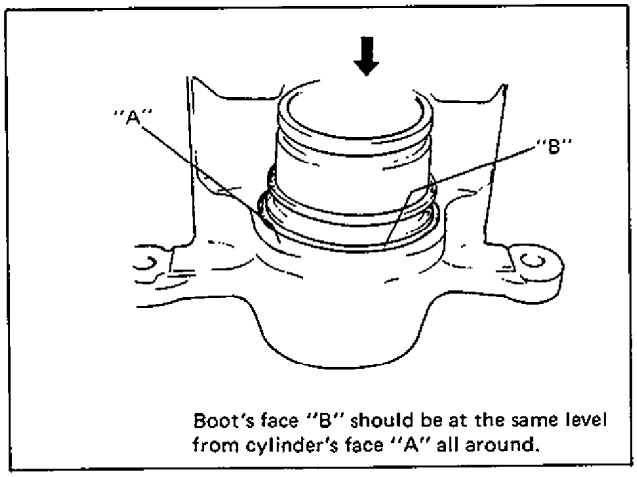


Fig. 5-58

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).

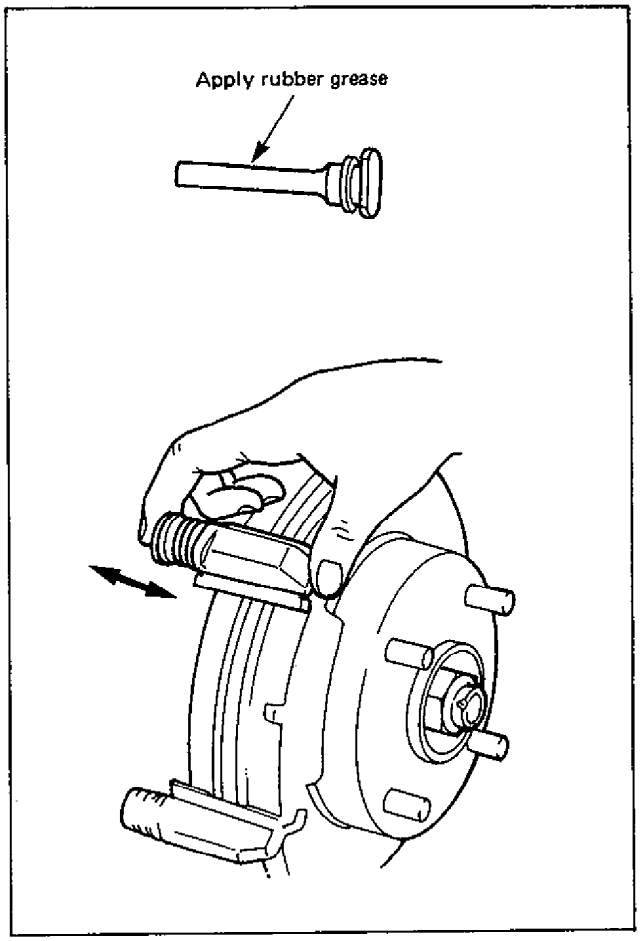


Fig. 5-59

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.

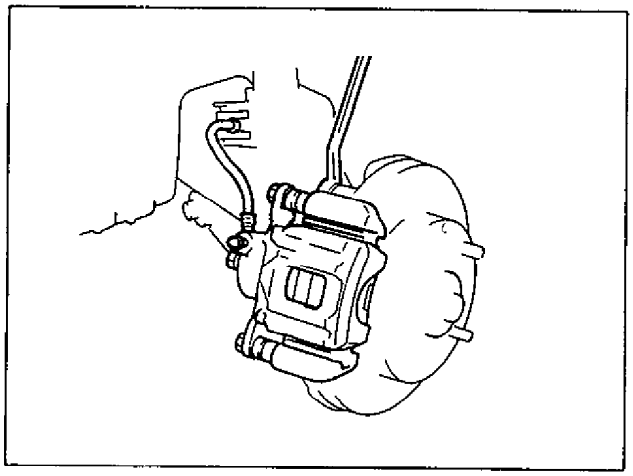


Fig. 5-60

3) Remove brake disc screws (2 pcs).

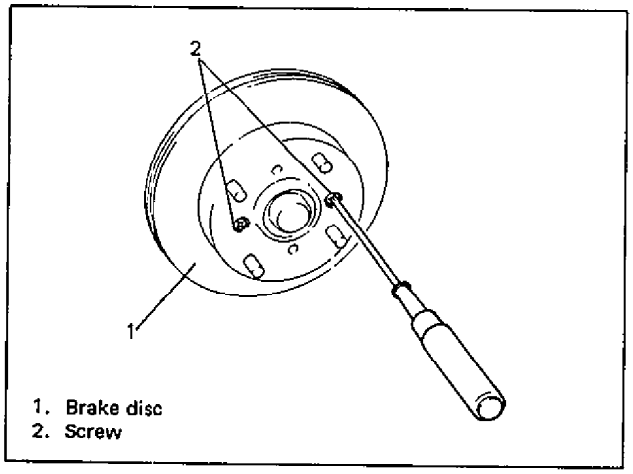


Fig. 5-61

4) Pull brake disc off by using 8 mm bolts (2 pcs).

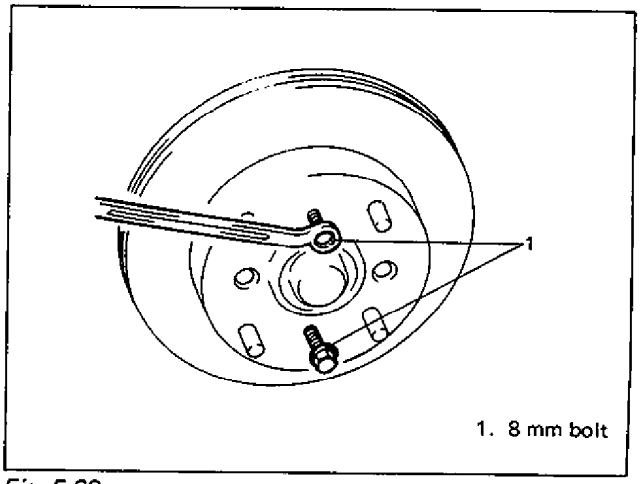


Fig. 5-62

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.

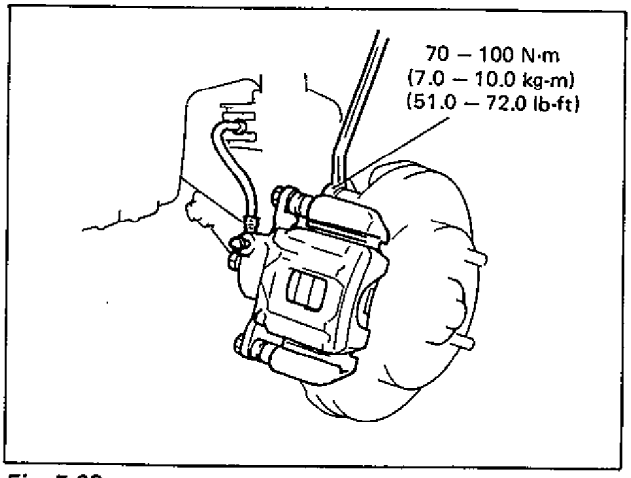


Fig. 5-63

4) Torque front wheel nuts to specification. (Refer to Fig. 5-149)
5) Upon completion of installation, perform brake test.

DISC BRAKE INSPECTION

1. INSPECT BRAKE PAD LINING

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

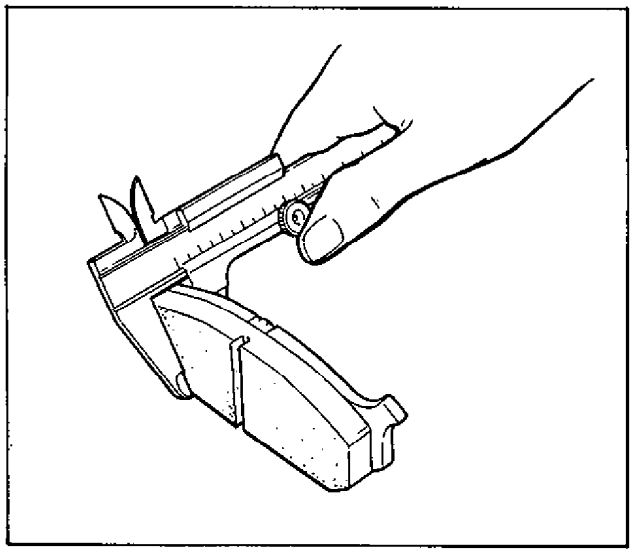


Fig. 5-64

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.

For Ventilated disc type

	Standard	Limit
Pad thickness (lining + pad rim)	15.0 mm (0.590 in.)	8.0 mm (0.315 in.)

For Solid disc type

	Standard	Limit
Pad thickness (lining + pad rim)	14.0 mm (0.551 in.)	8 mm (0.315 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).

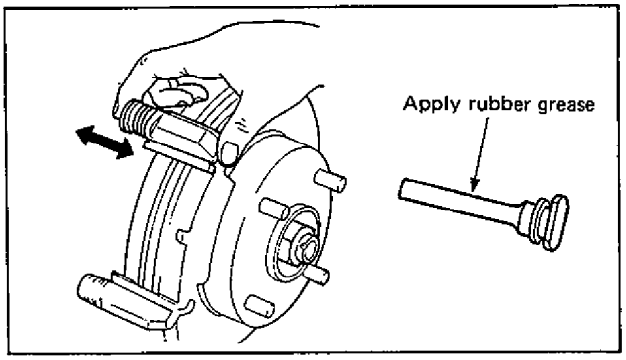


Fig. 5-65

Bush Dust Boot and Cylinder Boot

Check boots for breakage, crack and damage. If defective, replace.

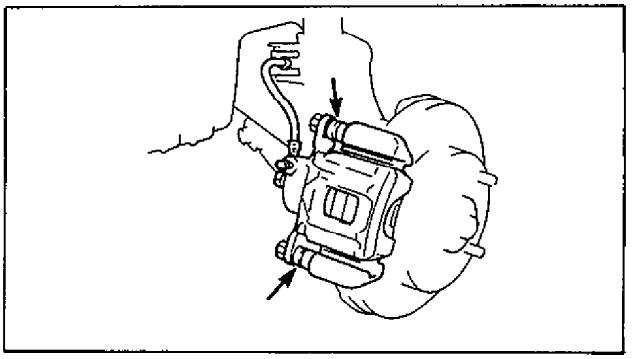


Fig. 5-66

Piston Seal

Excessive or uneven wear of pad lining may indicate unsmooth return of the piston. In such a case, replace rubber seal.

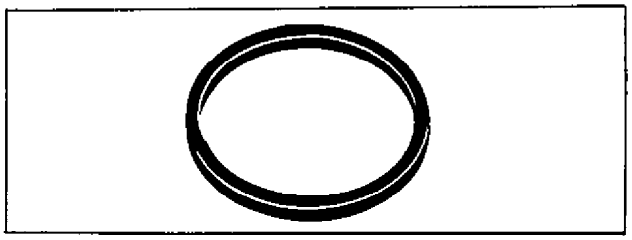


Fig. 5-67

3. INSPECT BRAKE DISC

Before this inspection, brake pads must be removed (according to steps 1) to 4) on page 5-28).

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.

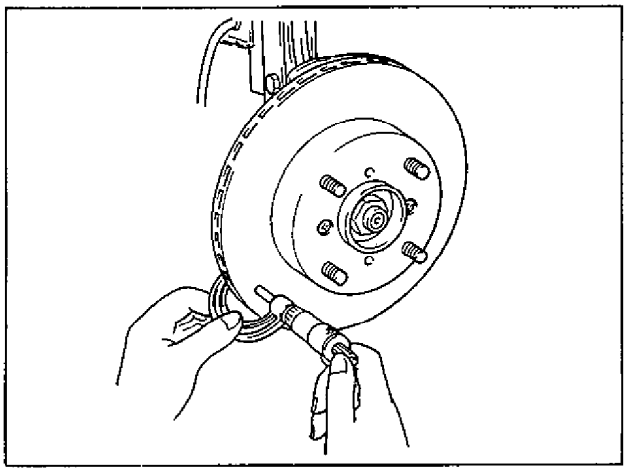


Fig. 5-68

For Ventilated disc type

	Standard	Limit
Disc thickness	17 mm (0.67 in.)	15 mm (0.59 in.)

For Solid disc type

	Standard	Limit
Disc thickness	12 mm (0.47 in.)	10 mm (0.39 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.

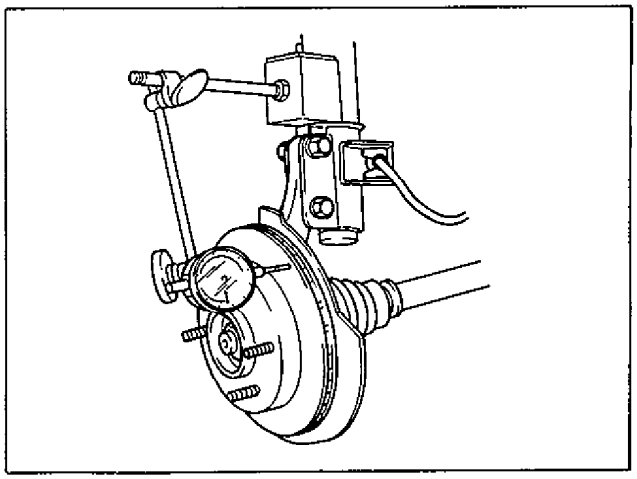


Fig. 5-69

DRUM AND COMPONENTS R & I

1. REMOVE AND INSTALL BRAKE DRUM

REMOVAL

1) Hoist car and remove wheel.

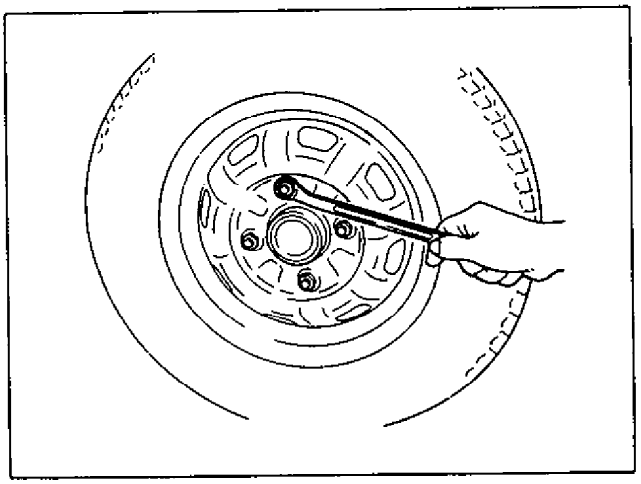


Fig. 5-70

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).

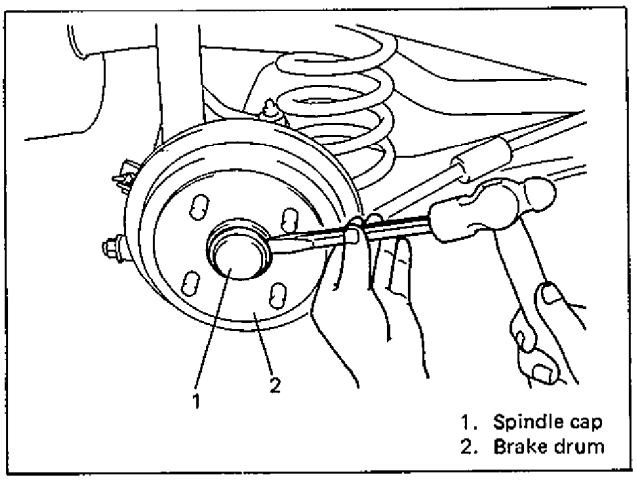


Fig. 5-71

3) Uncalk spindle nut and remove spindle nut and washer.

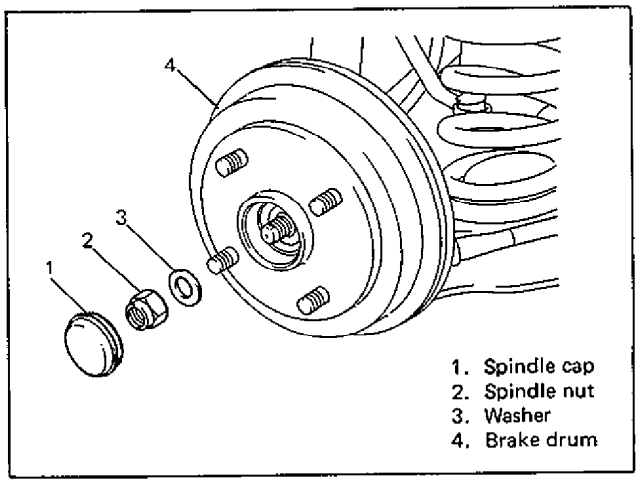


Fig. 5-72

4) Release parking brake lever.

5) Remove parking brake lever cover screws and loosen parking brake cable locking nut.

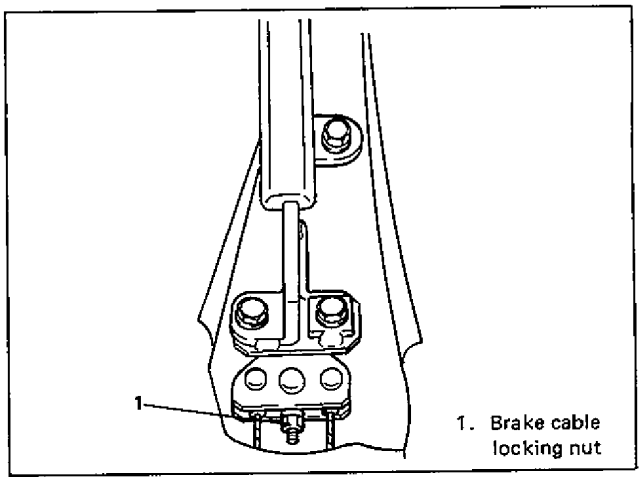


Fig. 5-73

6) 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.

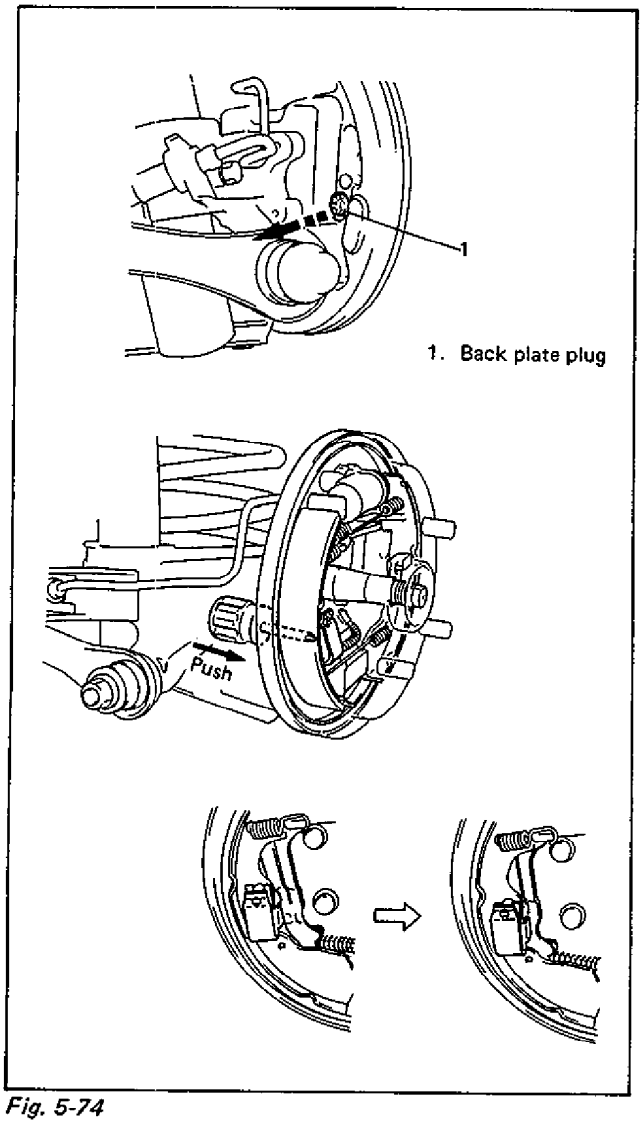


Fig. 5-74

7) Pull brake drum off by using special tools.

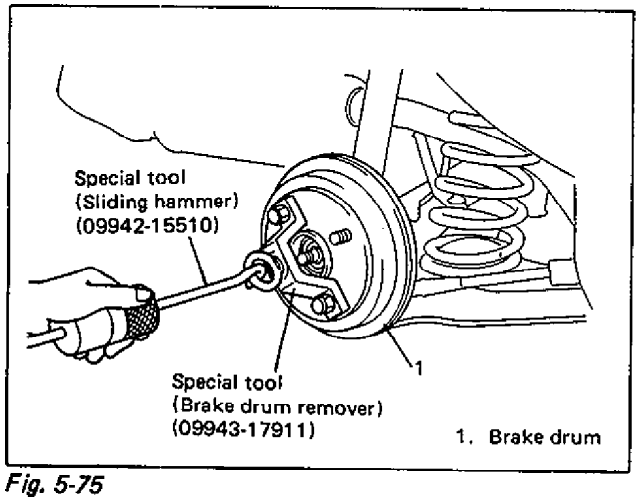


Fig. 5-75

8) Remove wheel stud bolt by using hydraulic press.

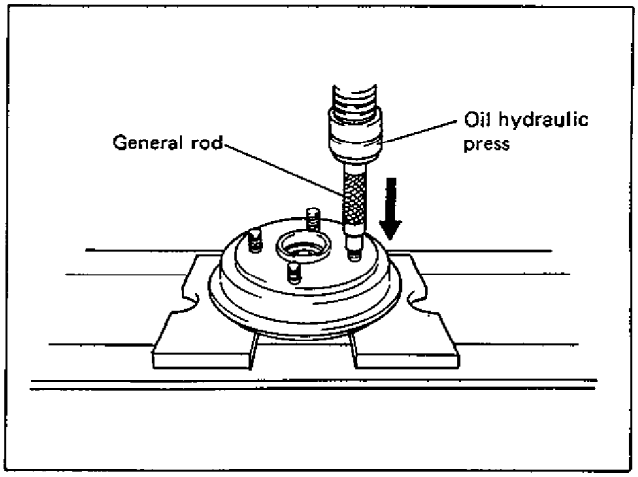


Fig. 5-76

9) Insert new stud in drum hole and rotate it slowly to assure serrations are aligned with those made by replaced bolt.

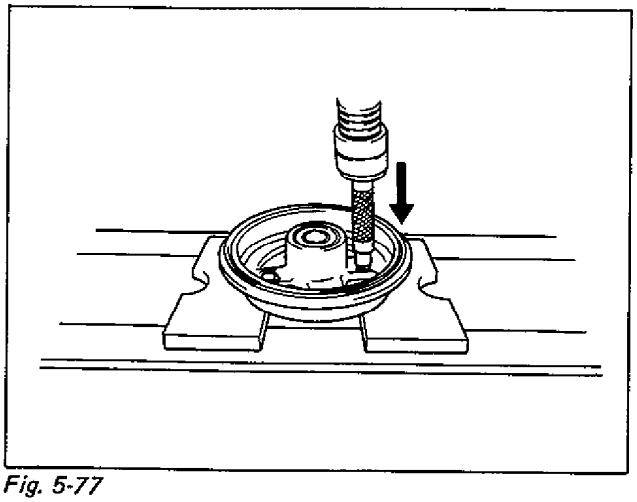


Fig. 5-77

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.

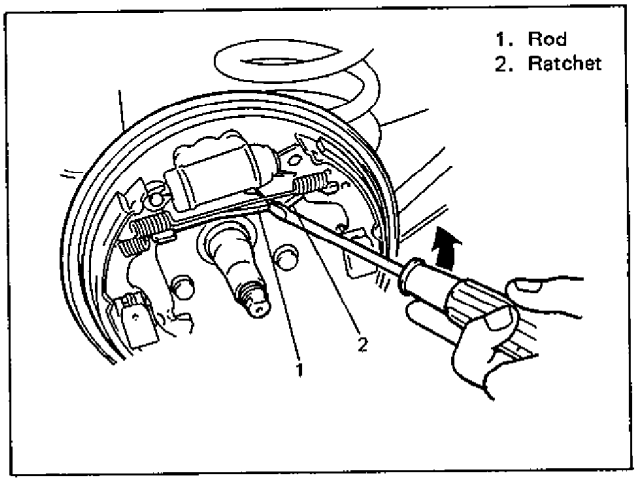


Fig. 5-78

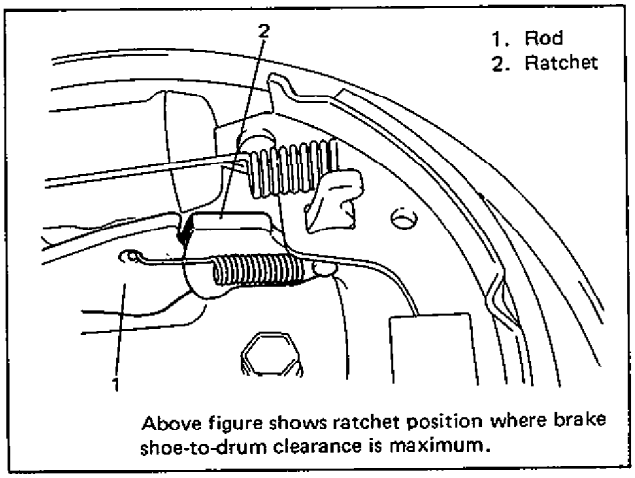


Fig. 5-79

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.)

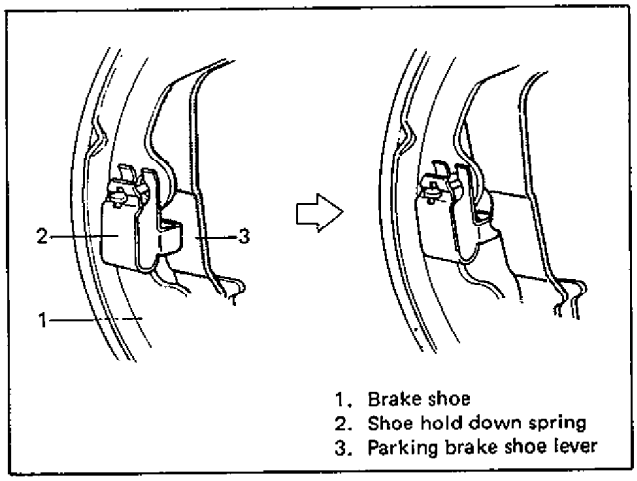


Fig. 5-80

3) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.
4) Install washer and new spindle nut.
5) Tighten spindle nut to specified torque.

NOTE:
Removed spindle nut should be replaced with new one.

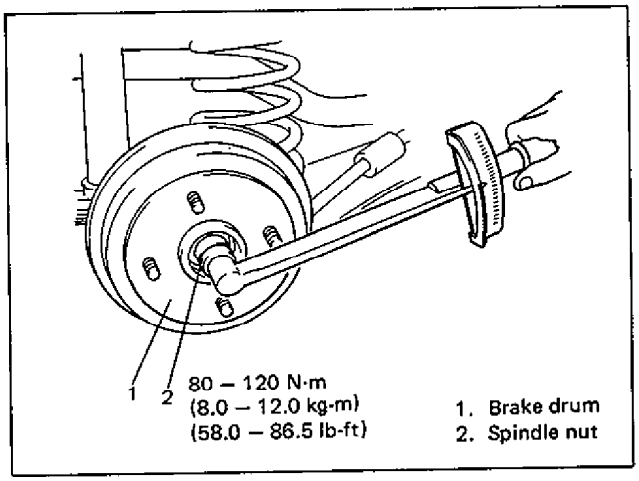


Fig. 5-81

6) Calk spindle nut as shown.

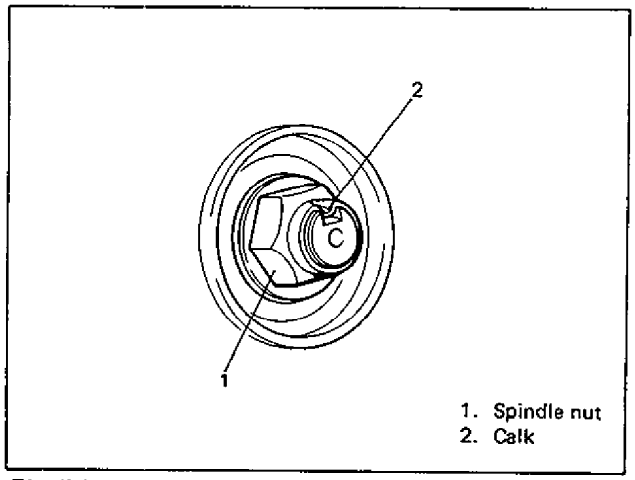


Fig. 5-82

7) 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.**

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 5-18.)
9) Tighten parking brake lever cover screws.
10) Install wheel and tighten wheel nuts to specified torque.

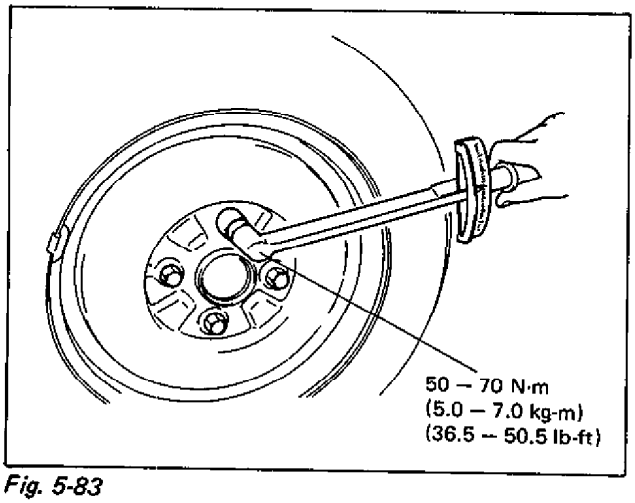


Fig. 5-83

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).

2. REMOVE AND INSTALL BRAKE SHOE

REMOVAL

1) Perform steps 1) to 7) of brake drum REMOVAL.
2) Remove shoe hold down springs by turning shoe hold down pins as shown.

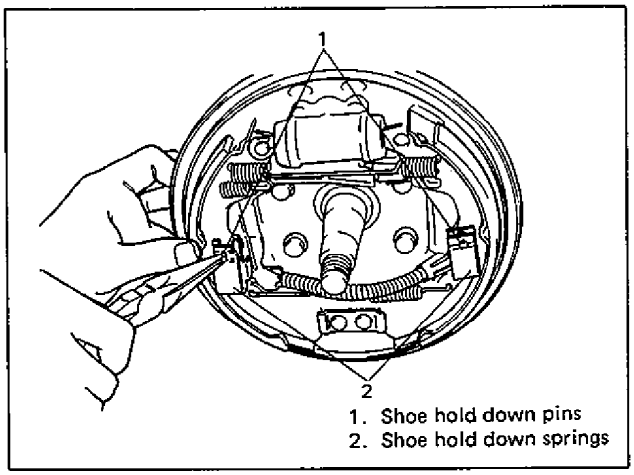


Fig. 5-84

3) Disconnect parking brake shoe lever from parking brake cable and remove brake shoes.

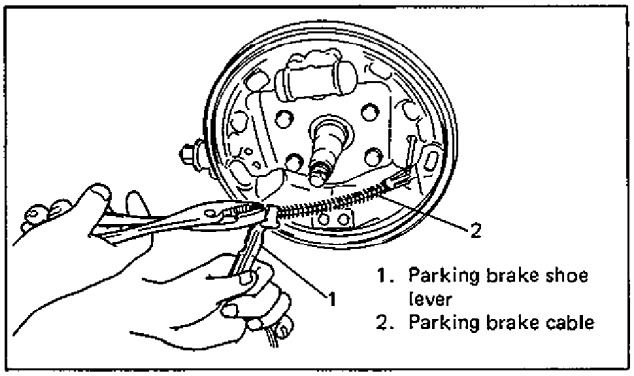


Fig. 5-85

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

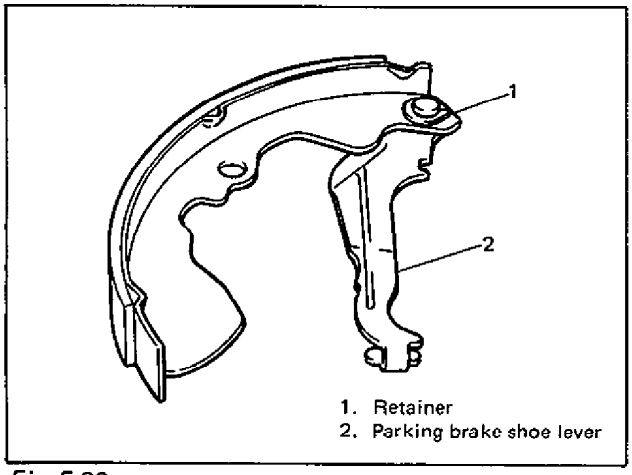


Fig. 5-86

INSTALLATION

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

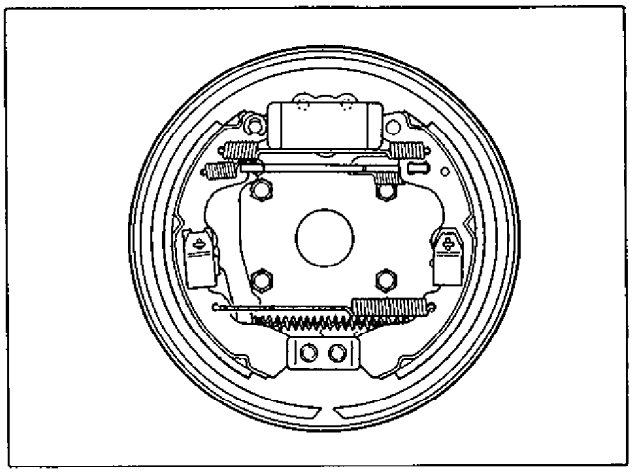


Fig. 5-87

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

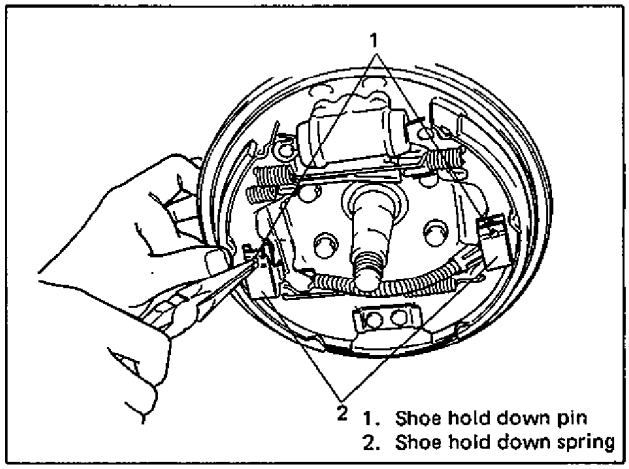


Fig. 5-88

3) For procedure hereafter, refer to steps 1) to 11) of BRAKE DRUM INSTALLATION on page 5-37.

3. REMOVE AND INSTALL WHEEL CYLINDER

REMOVAL

1) Perform steps 1) to 7) 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.

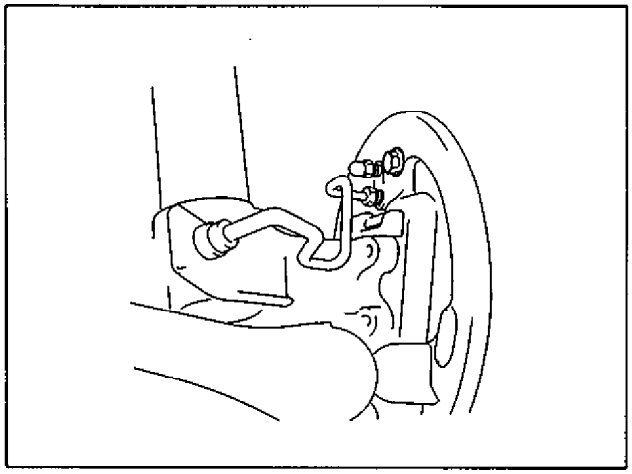


Fig. 5-89

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.

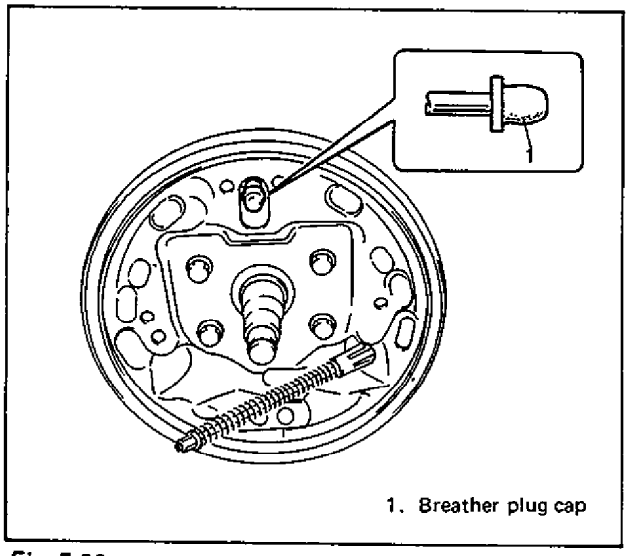


Fig. 5-90

INSTALLATION

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

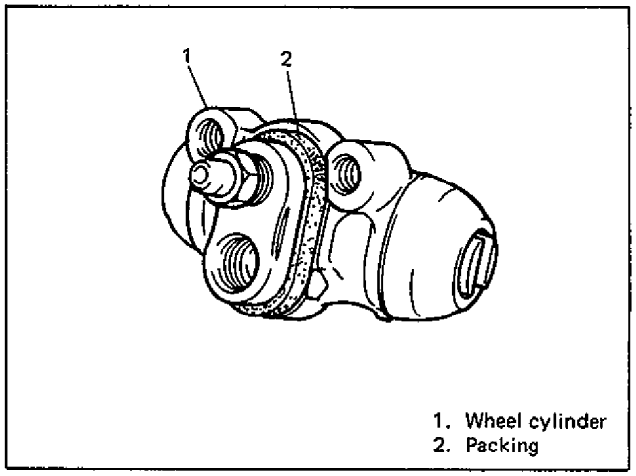


Fig. 5-91

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.

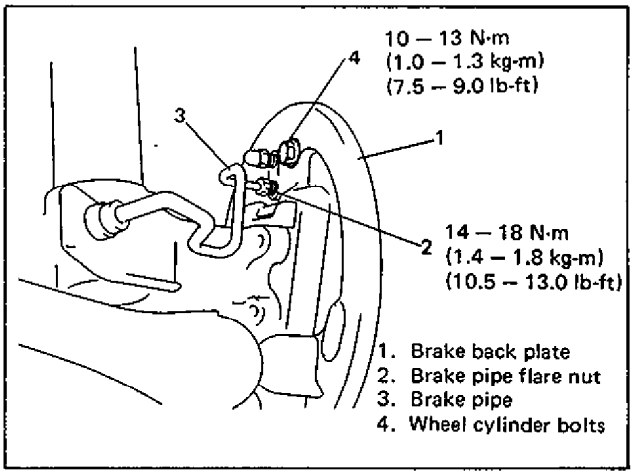


Fig. 5-92

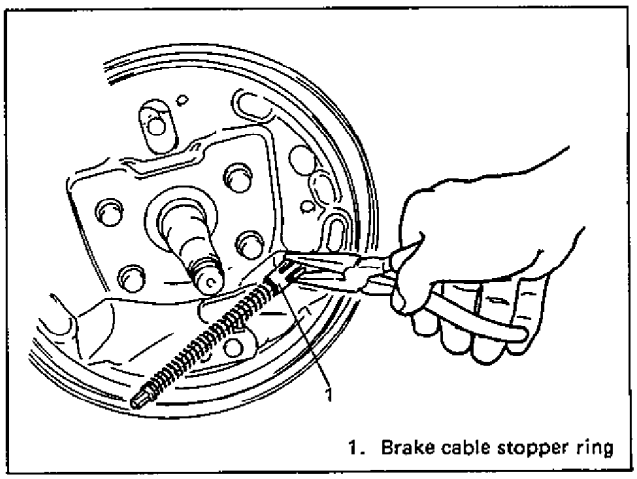
4) Install breather plug cap taken off from pipe back to breather plug.

5) Install brake shoes, referring to steps 1) and 2) of its INSTALLATION on page 5-39.
6) Install brake drum. (Refer to steps 1) to 7) of its INSTALLATION on page 5-37 of this section.
7) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see page 5-19.)
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 5-18.)
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

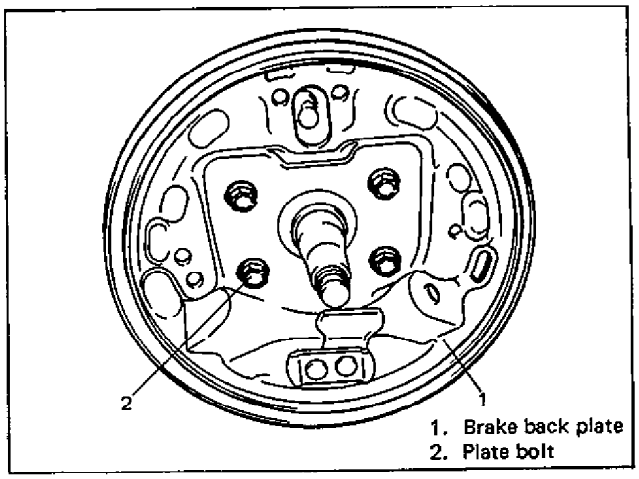
1) Perform steps 1) to 7) of brake drum REMOVAL on page 5-35 and 5-36.
2) Perform steps 2) and 3) of brake shoe REMOVAL on page 5-39.
3) Perform steps 3) and 4) of wheel cylinder REMOVAL on page 5-40.
4) Remove cable from brake back plate by squeezing parking brake cable stopper ring.



1. Brake cable stopper ring

Fig. 5-93

5) Remove brake back plate.



1. Brake back plate
2. Plate bolt

Fig. 5-94

INSTALLATION

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

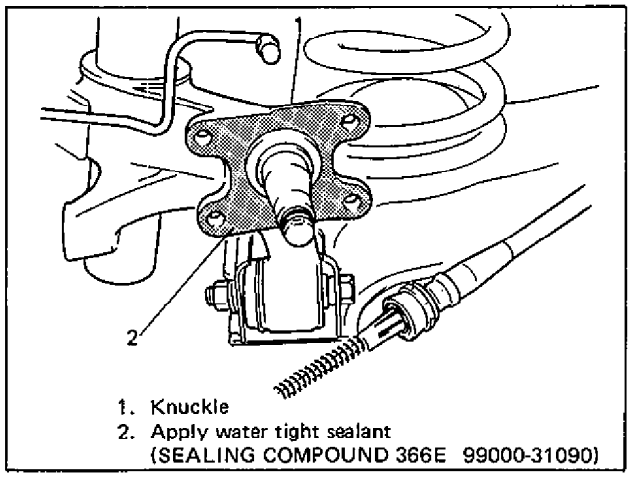


Fig. 5-95

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

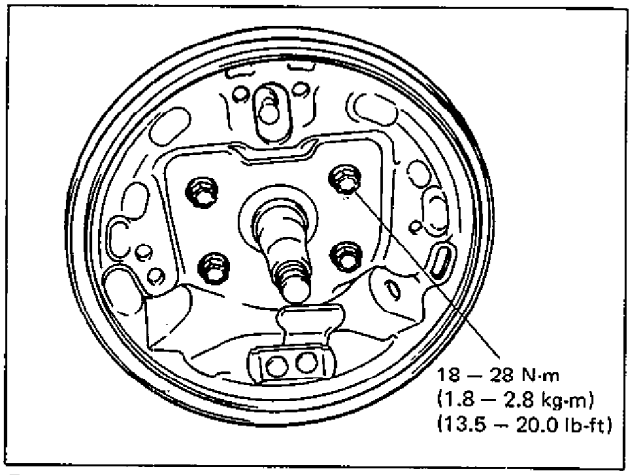


Fig. 5-96

3) Install parking brake cable to brake back plate.

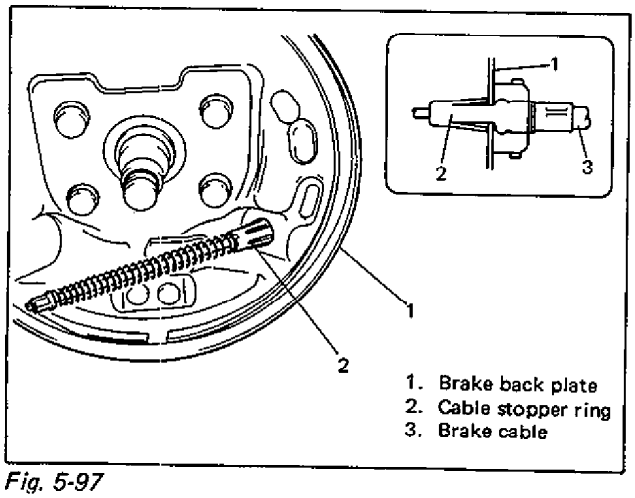


Fig. 5-97

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 5-40 of this section.)

5) For procedure hereafter, refer to steps 5) to 12) of wheel cylinder INSTALLATION on page 5-41.

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	180 mm (7.09 in.)	182 mm (7.16 in.)

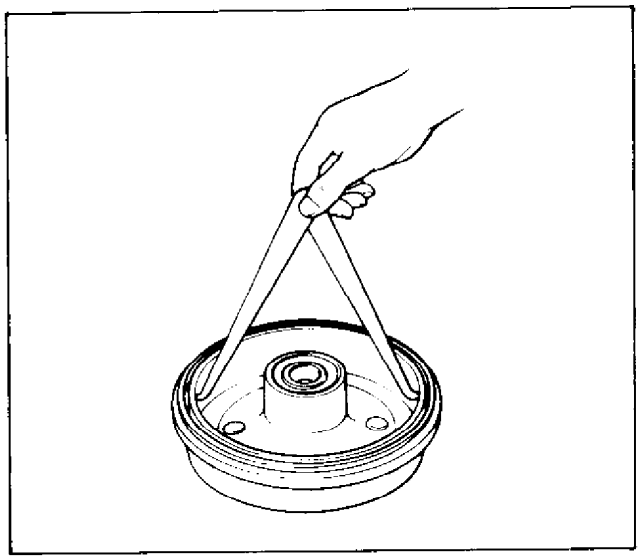


Fig. 5-98

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.)

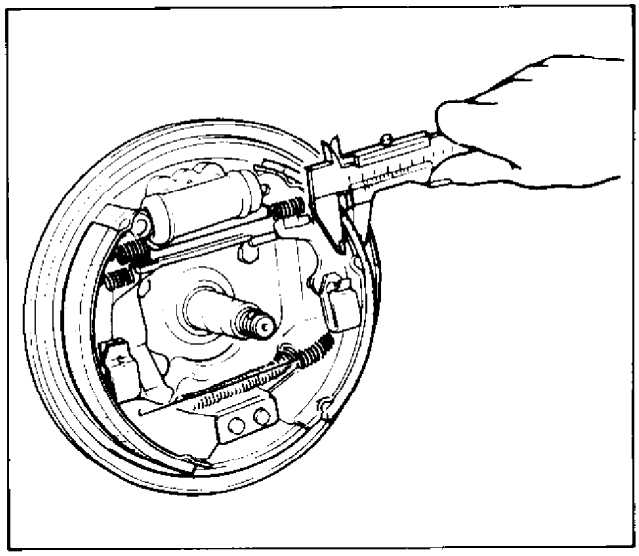


Fig. 5-99

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.

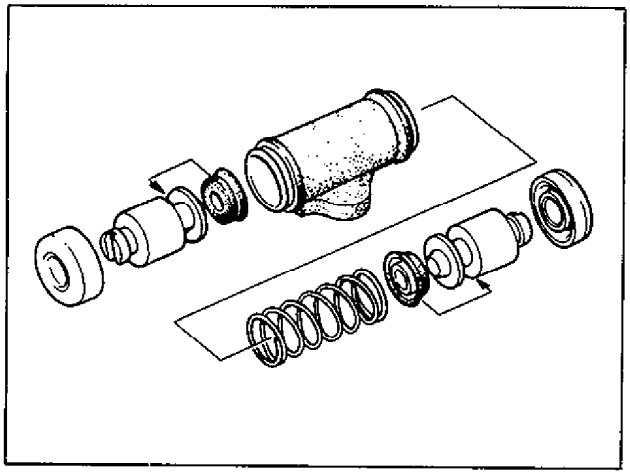


Fig. 5-100

4. INSPECT BRAKE STRUT

Inspect ratchet of strut for wear or damage.

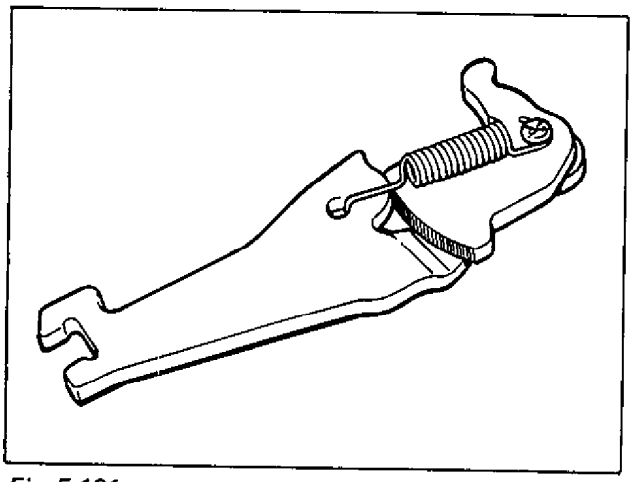


Fig. 5-101

5. INSPECT SPRINGS

Inspect for damage or weakening.
Inspect each part with arrow for rust. If found defective, replace.

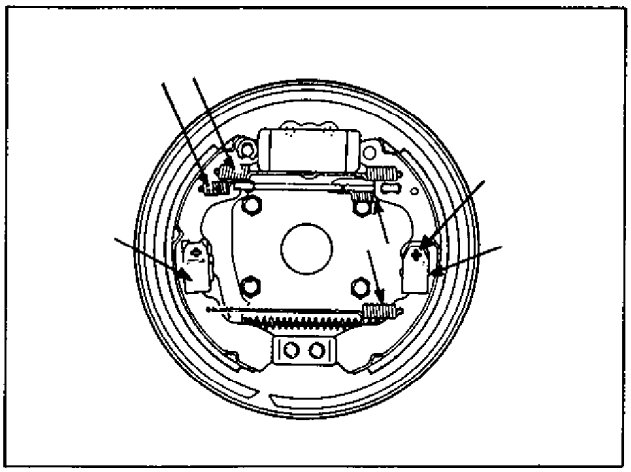


Fig. 5-102

6. INSPECT PARKING SHOE LEVER

Inspect brake shoe lever for free movement against brake shoe web. If defective, correct or replace.

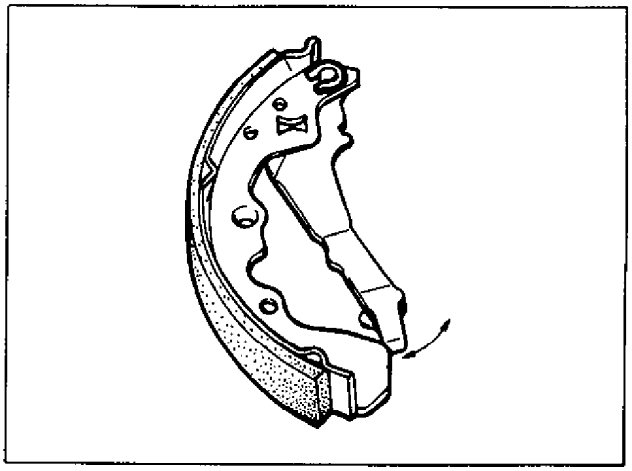


Fig. 5-103

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.

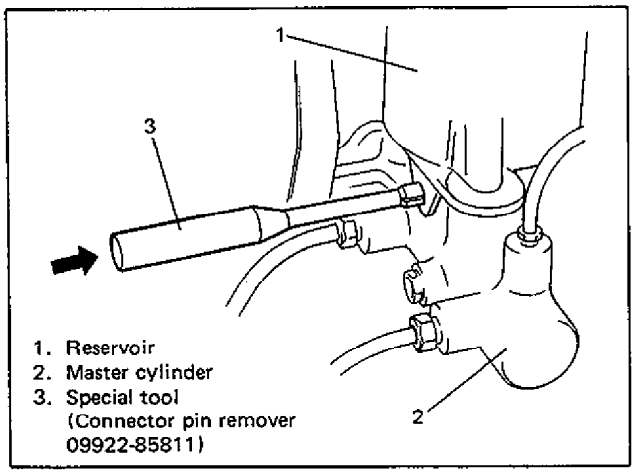


Fig. 5-104

5) Remove reservoir.

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

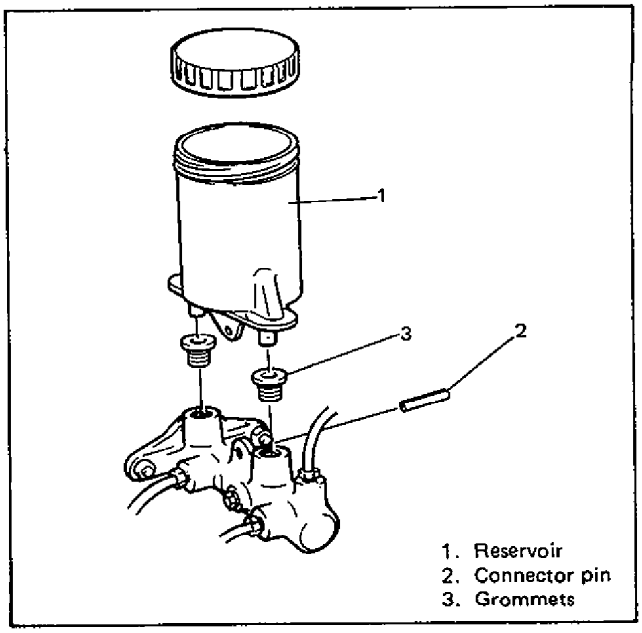


Fig. 5-105

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.

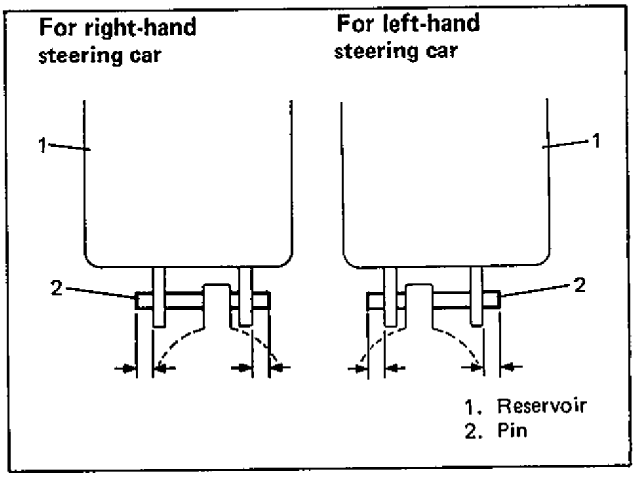


Fig. 5-106

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

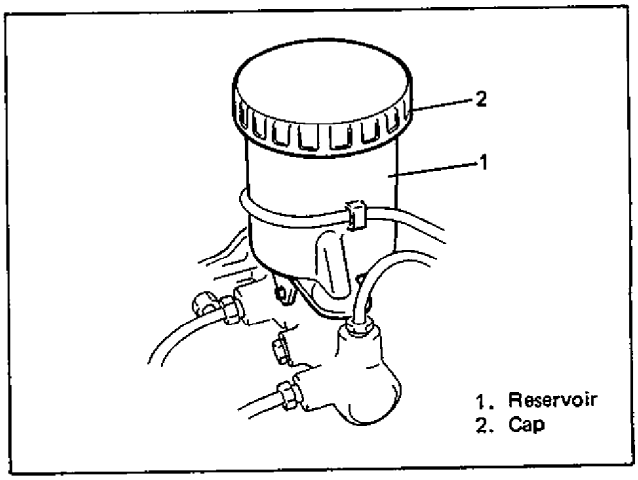


Fig. 5-107

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 5-56).**

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 5-19 and 5-20).

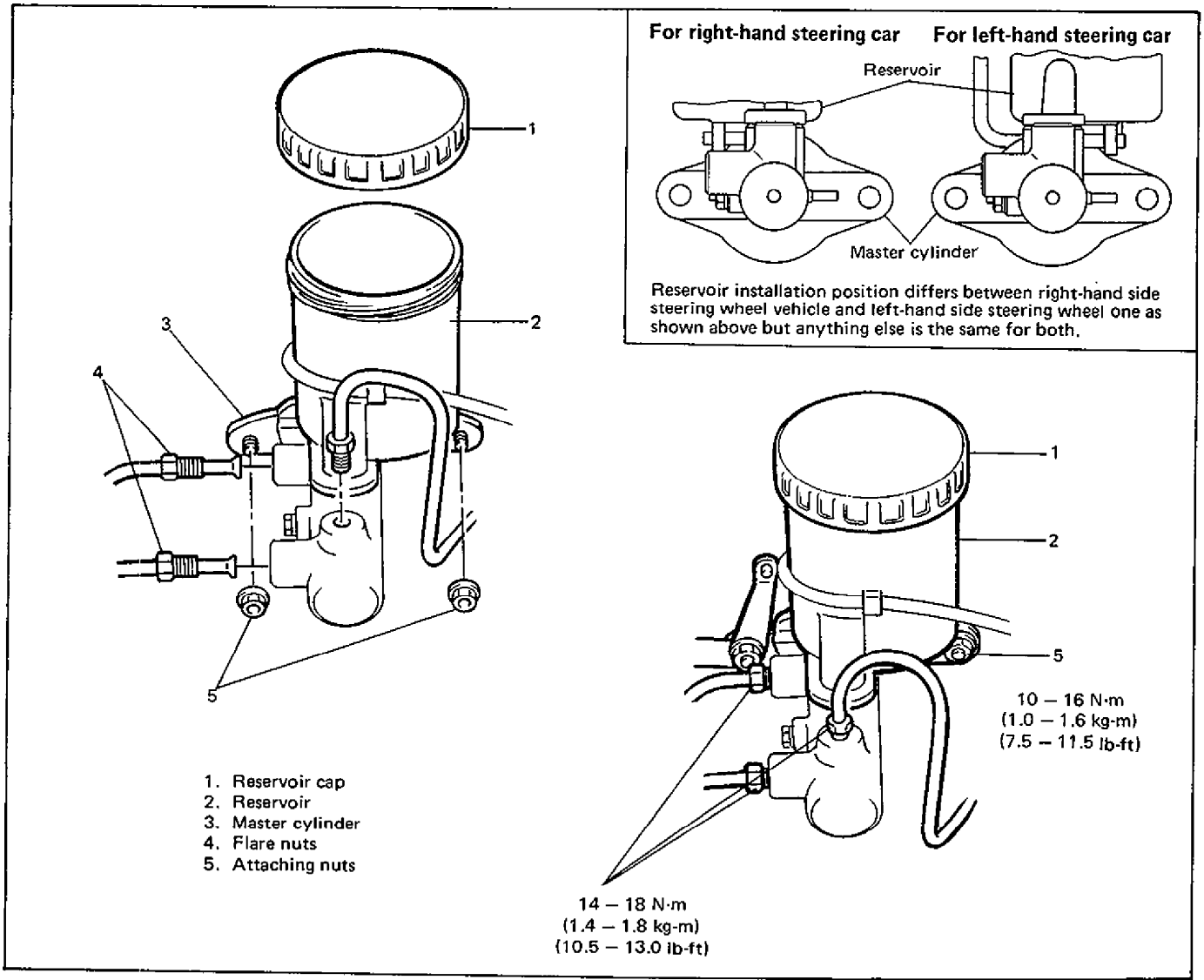


Fig. 5-108 Master Cylinder Repair - A

3. DISASSEMBLE AND ASSEMBLE MASTER CYLINDER

DISASSEMBLY

1) Remove circlip.
2) Remove primary piston.

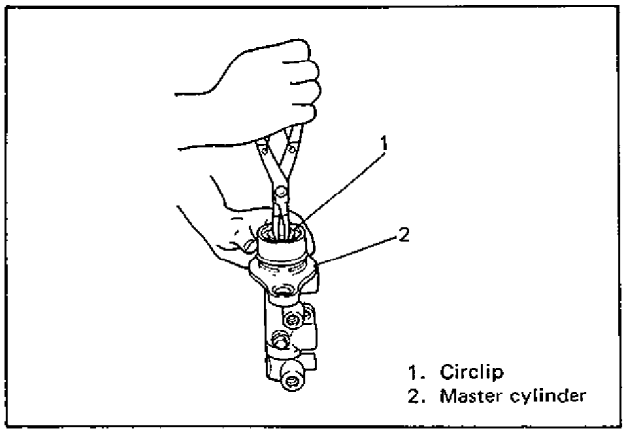


Fig. 5-109

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.

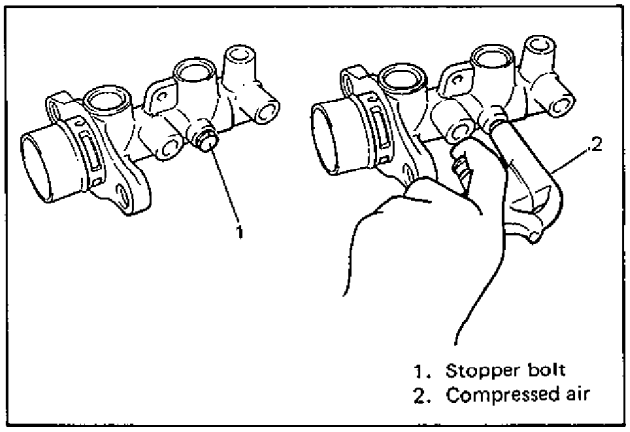


Fig. 5-110

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.

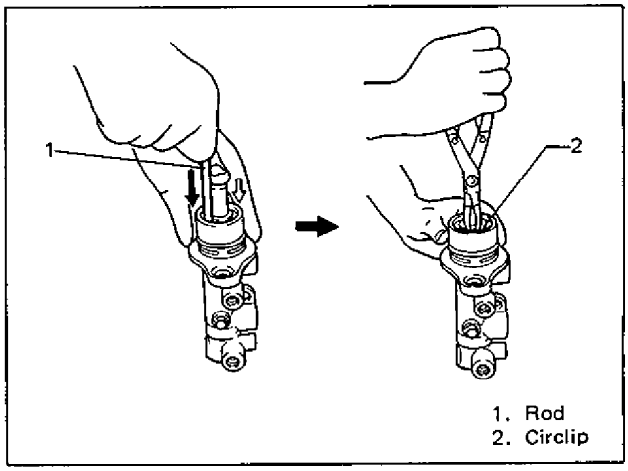


Fig. 5-111

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 5-46.

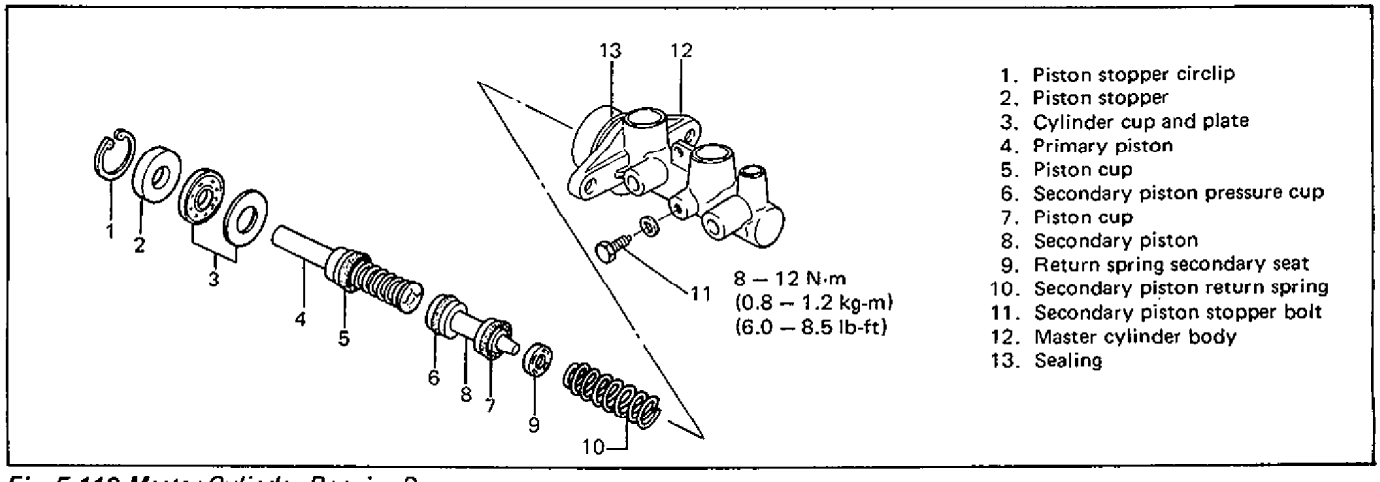


Fig. 5-112 Master Cylinder Repair - B

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.**

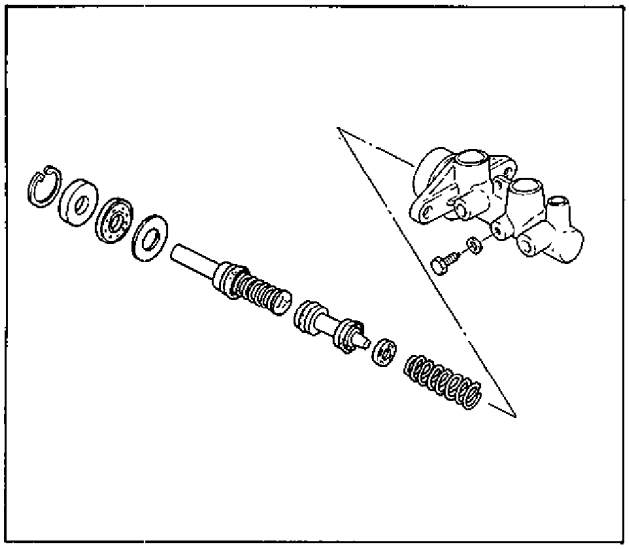


Fig. 5-113

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.

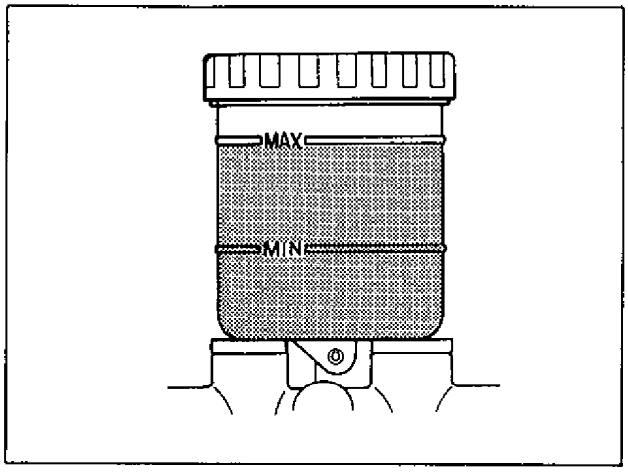


Fig. 5-114

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 5-46.
2) Disconnect vacuum hose from booster.
3) Disconnect push rod clevis from brake pedal arm.
4) Remove attaching nuts and then booster as shown.

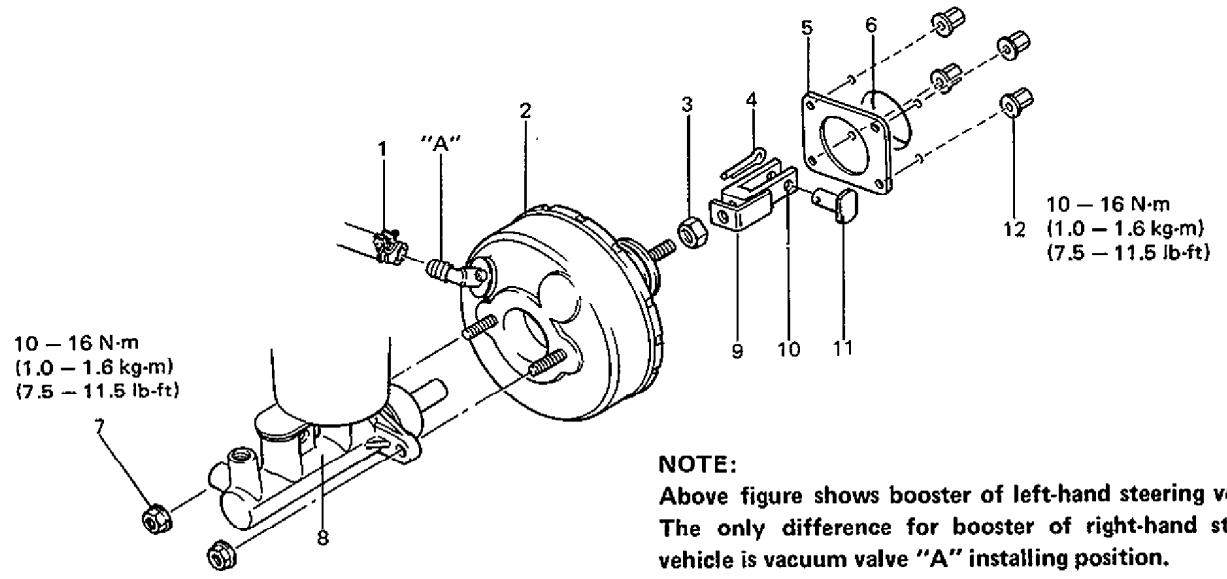
INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and master cylinder piston with special tool. (See page 5-56.)**
- **Check length of push rod clevis. (See page 5-55.)**

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 5-46.)
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 5-19 and 5-20.)
9) After installing, check pedal height and play. (See pages 5-16 and 5-17.)
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

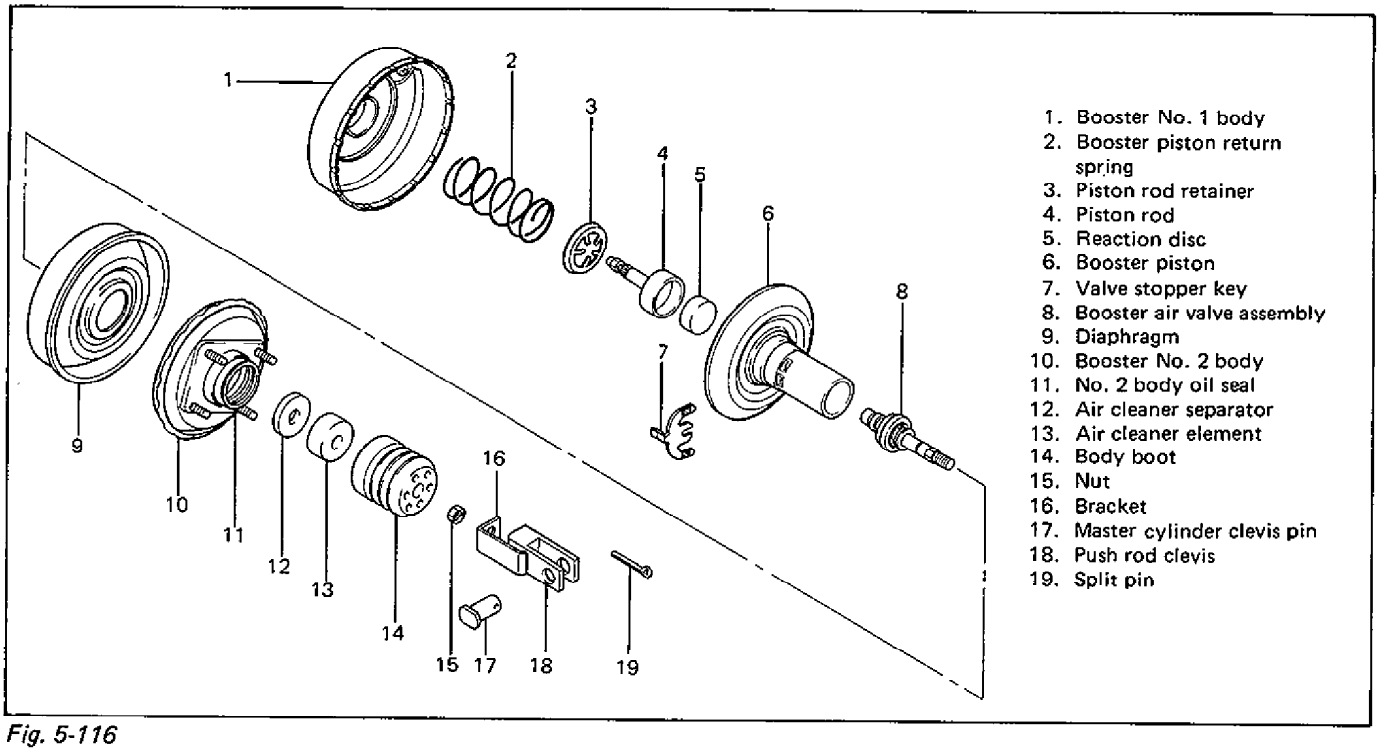


Fig. 5-116

DISASSEMBLY

1) Remove push rod clevis and nut.

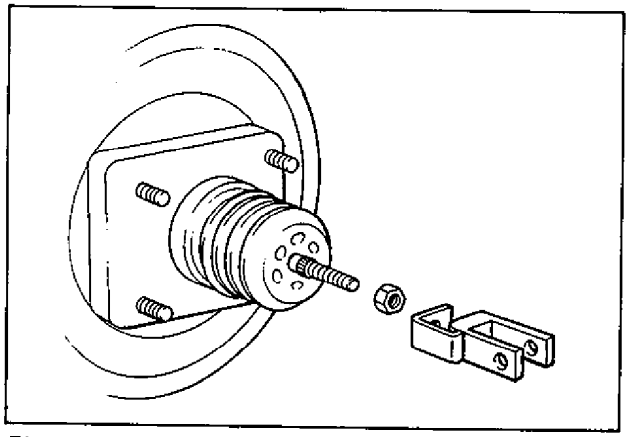


Fig. 5-117

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.**

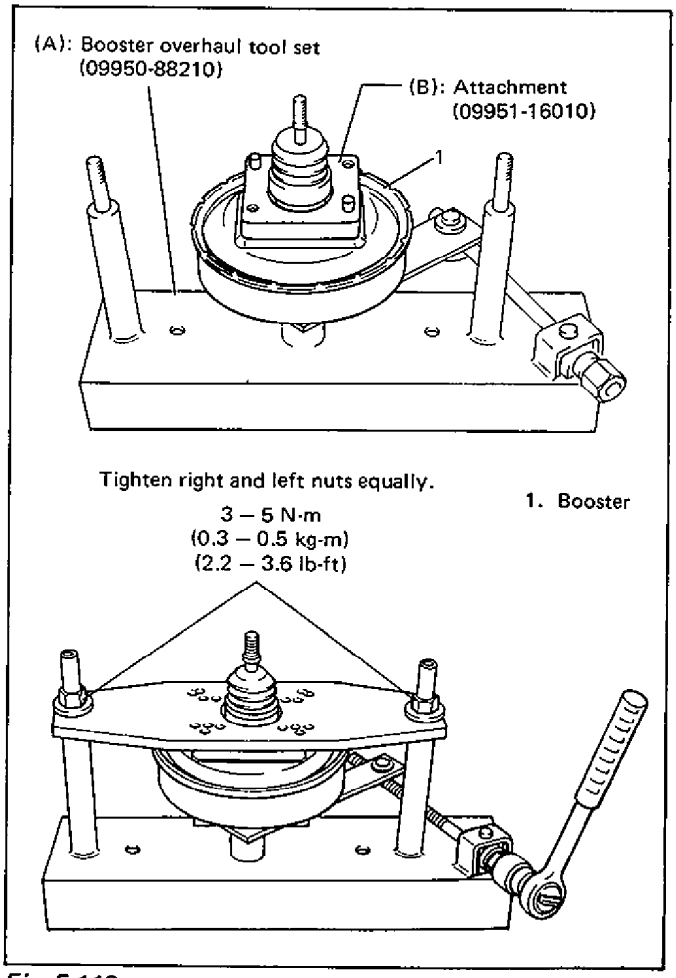


Fig. 5-118

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.

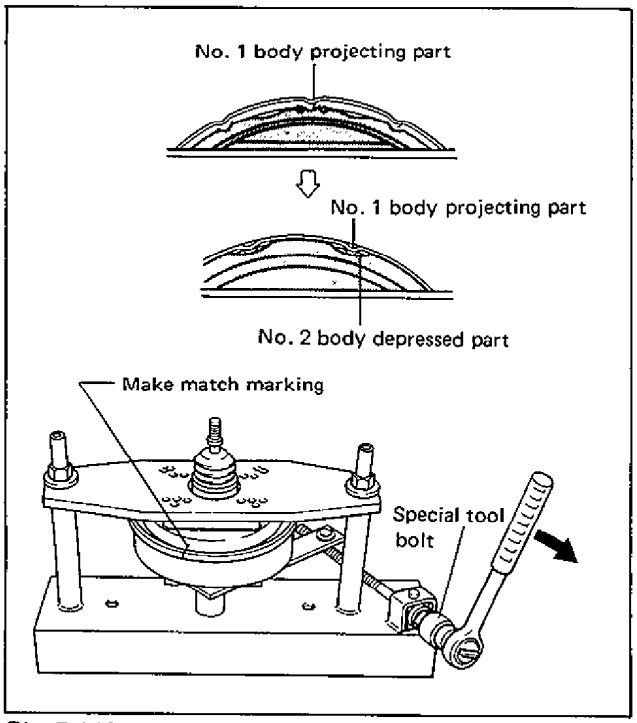


Fig. 5-119

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.

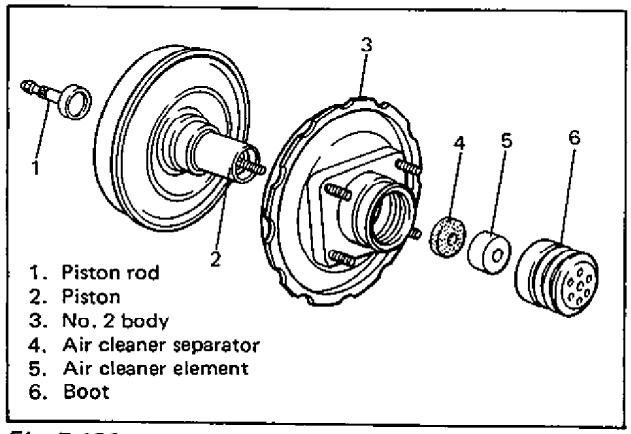


Fig. 5-120

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.

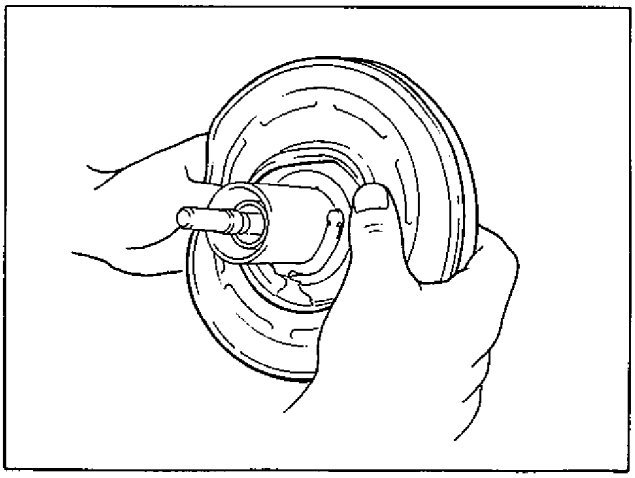


Fig. 5-121

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.

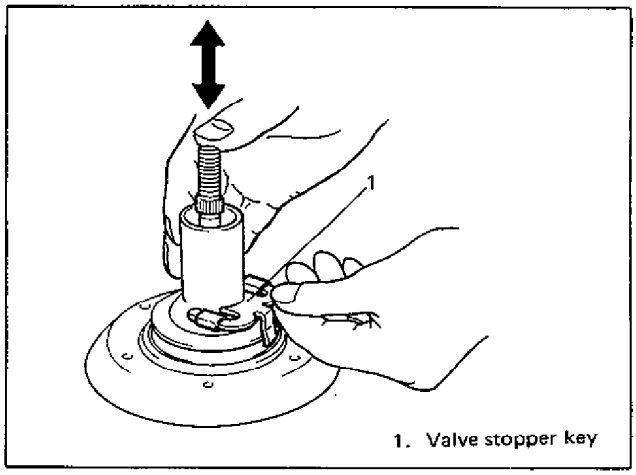


Fig. 5-122

NOTE:
Booster air valve assembly can't be disassembled.

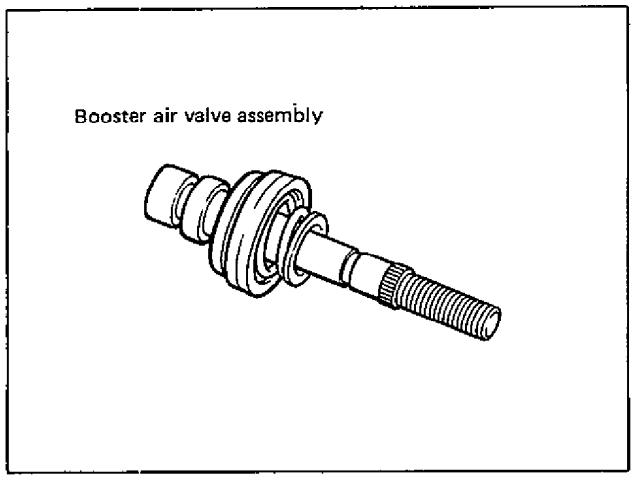


Fig. 5-123

8) Remove reaction disc from booster piston rod.

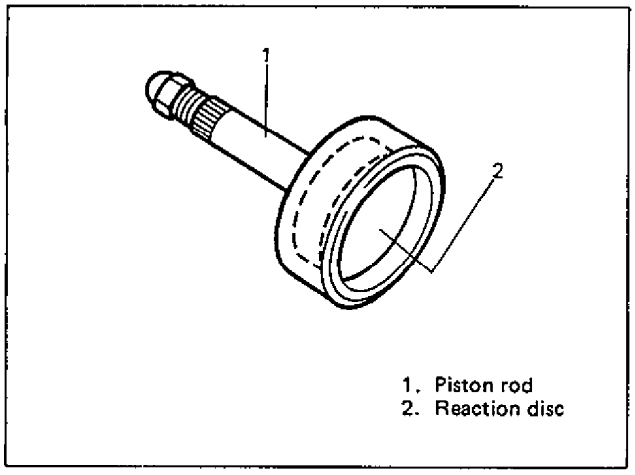


Fig. 5-124

9) Remove oil seal from booster No. 2 body with special tools as shown.

NOTE:
Removed oil seal must not be reused.

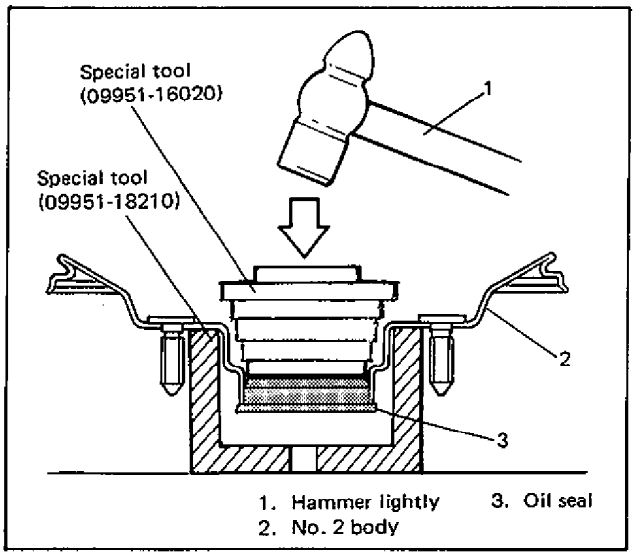


Fig. 5-125

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).

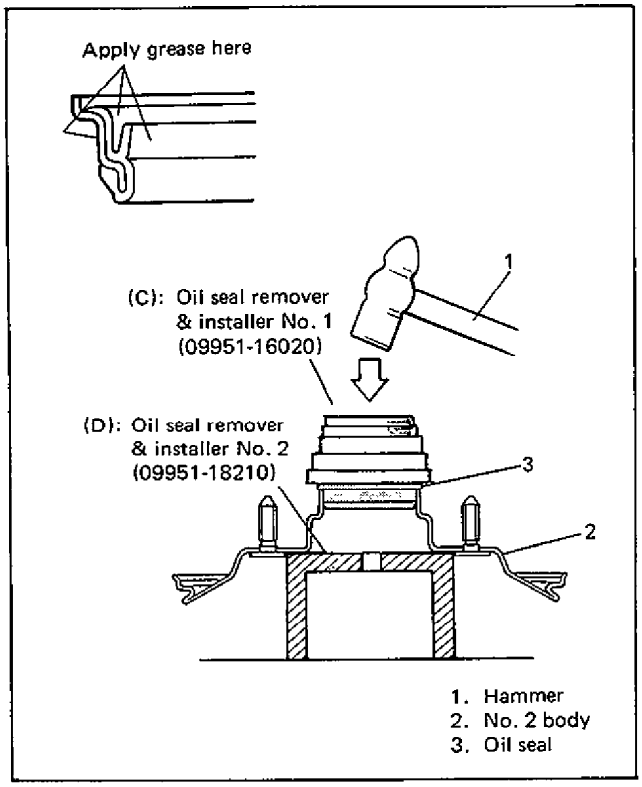


Fig. 5-126

2) Install booster air valve assembly to booster piston. Before installation, apply grease as shown.

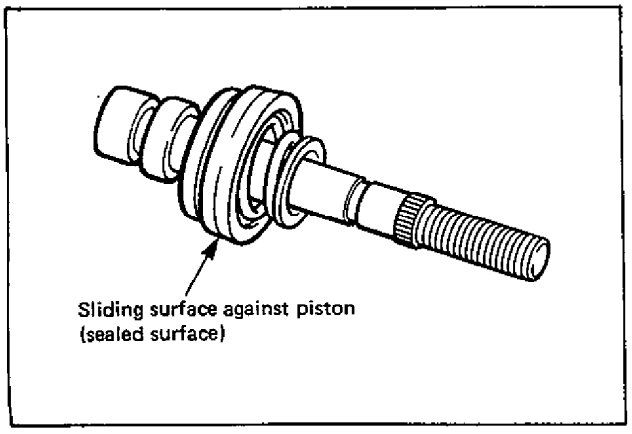


Fig. 5-127

3) Compress air valve assembly and insert valve stopper key.

NOTE:

Don't compress air valve assembly forcibly.

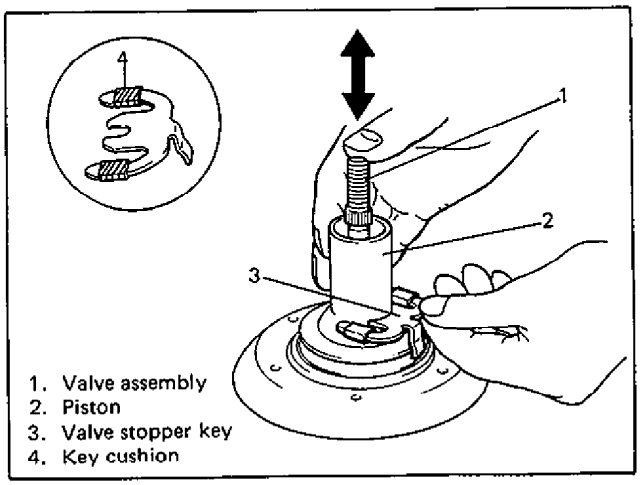


Fig. 5-128

4) Install diaphragm to booster piston by hand.

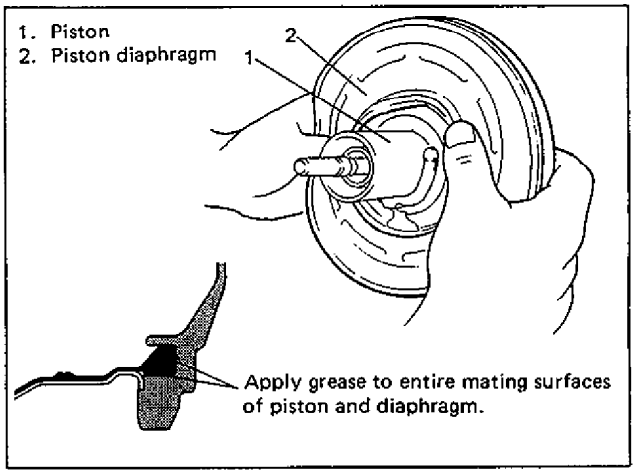


Fig. 5-129

5) Install booster piston to booster No. 2 body.

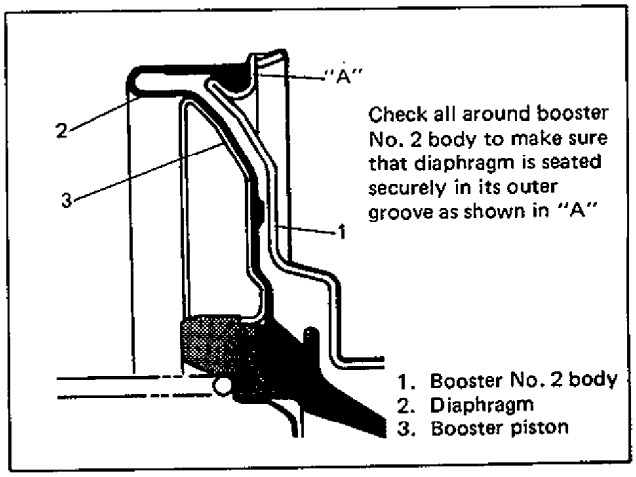


Fig. 5-130

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.

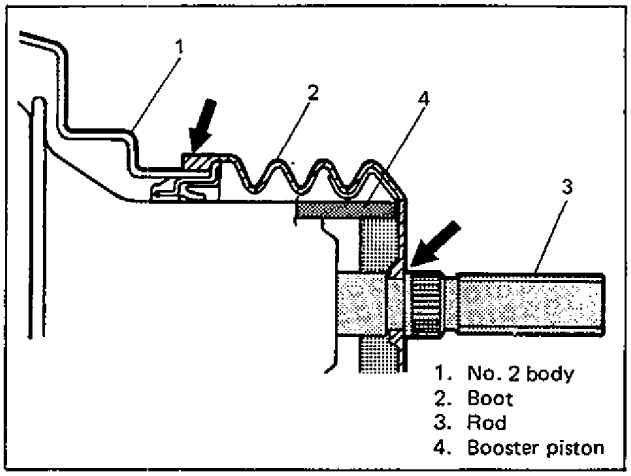


Fig. 5-131

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.

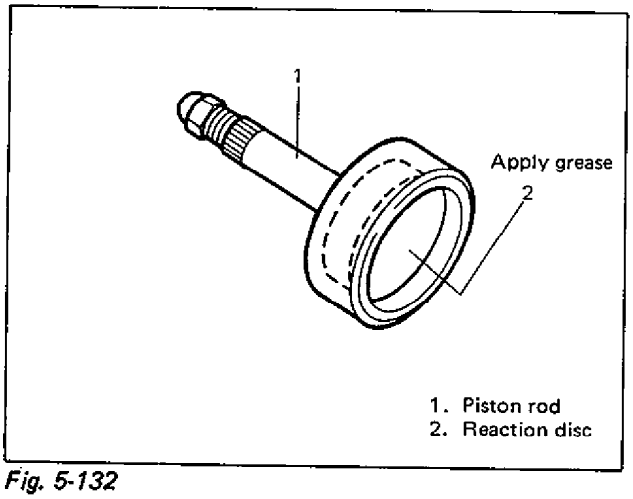


Fig. 5-132

9) Place No. 1 body on special tool (A).

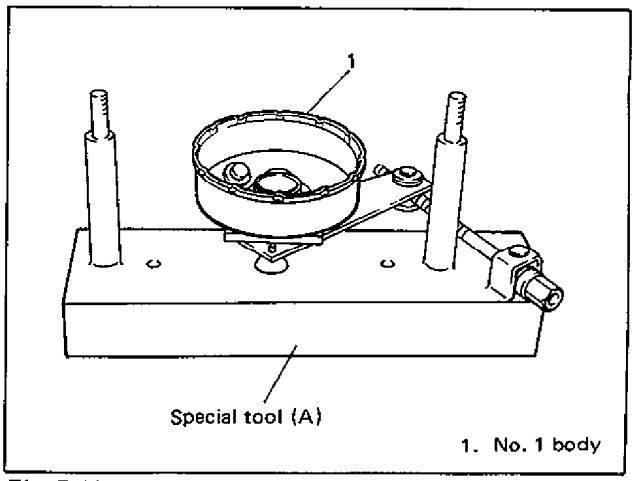


Fig. 5-133

10) Install piston rod, rod retainer and piston return spring to booster piston as shown below. Then install them to booster No. 1 body.

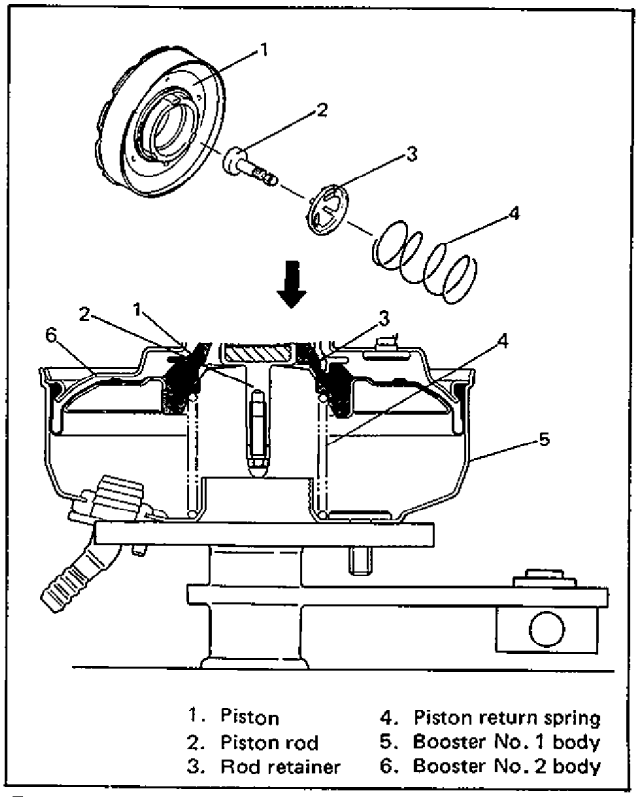


Fig. 5-134

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.

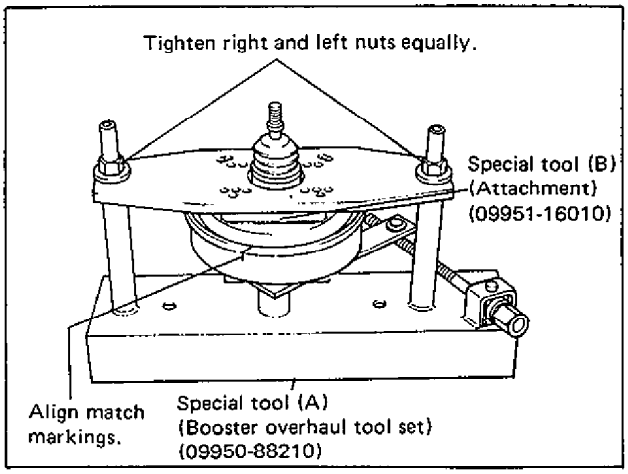


Fig. 5-135

12) Turn special tool bolt counterclockwise until No. 1 body projecting part comes to mid-position of No. 2 body depressed parts as shown.

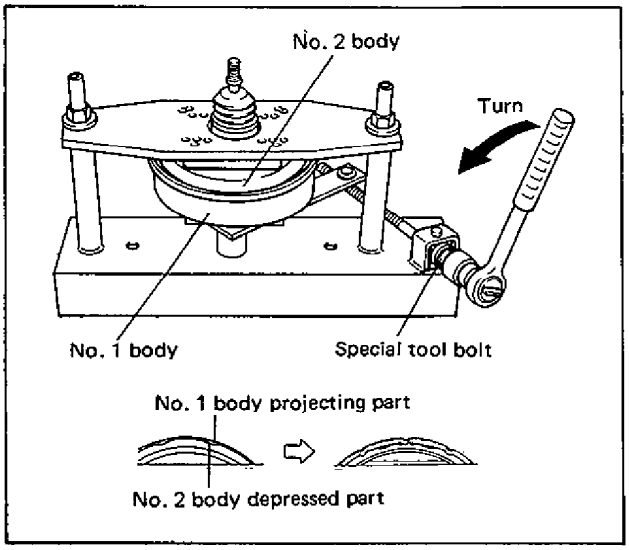


Fig. 5-136

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.

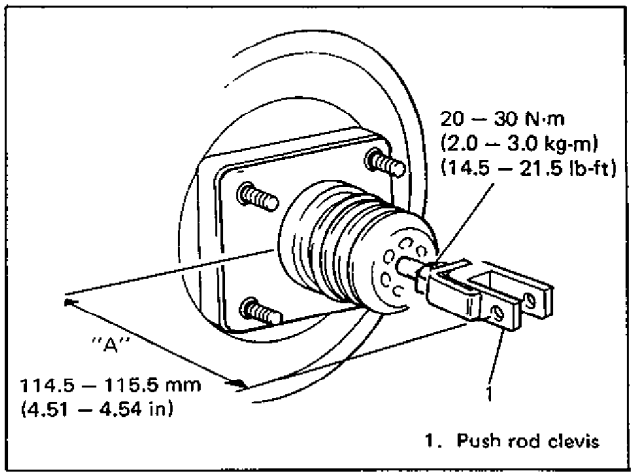


Fig. 5-137

NOTE:
Whenever booster was disassembled, make sure to check clearance between piston rod and master cylinder piston after reassembly. (For details, refer to page 5-56.)

15) For installation of booster, see steps 1) to 10) of its INSTALLATION on page 5-49.

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.

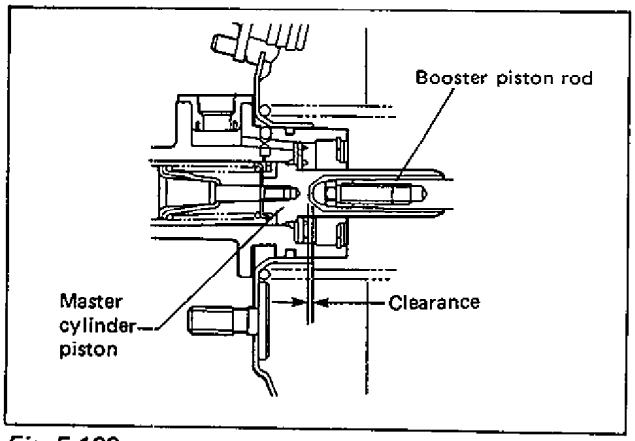


Fig. 5-138

- 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.

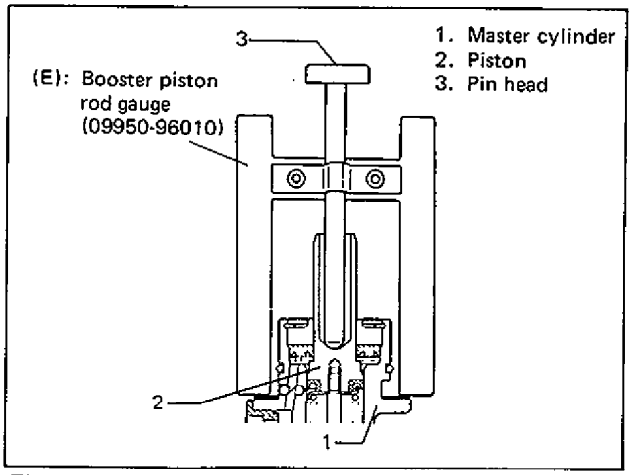


Fig. 5-139

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.

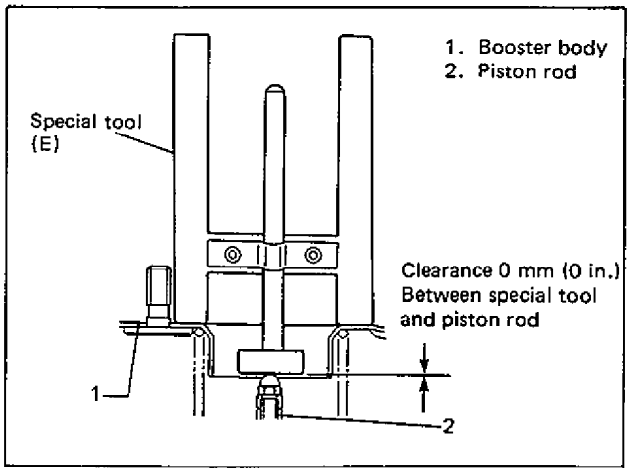


Fig. 5-140

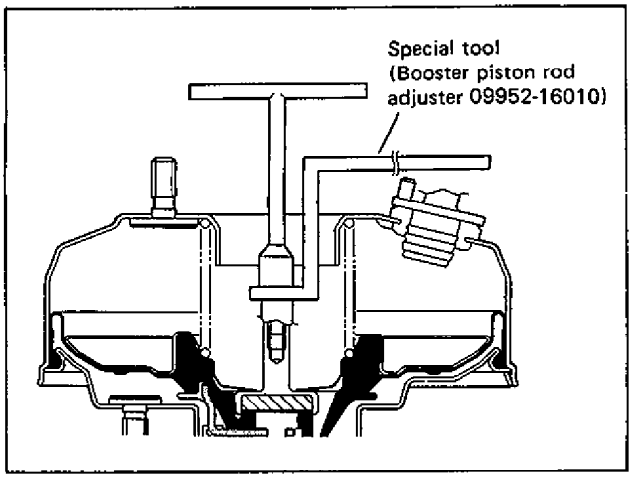


Fig. 5-141

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.

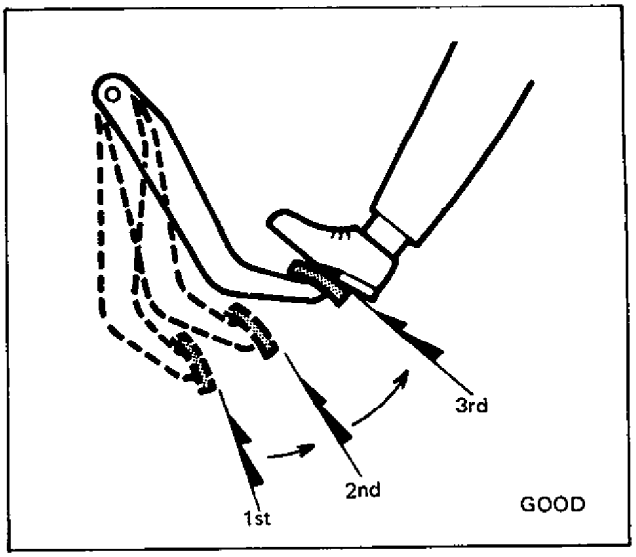


Fig. 5-142

4) If pedal travel doesn't change, air tightness isn't obtained.

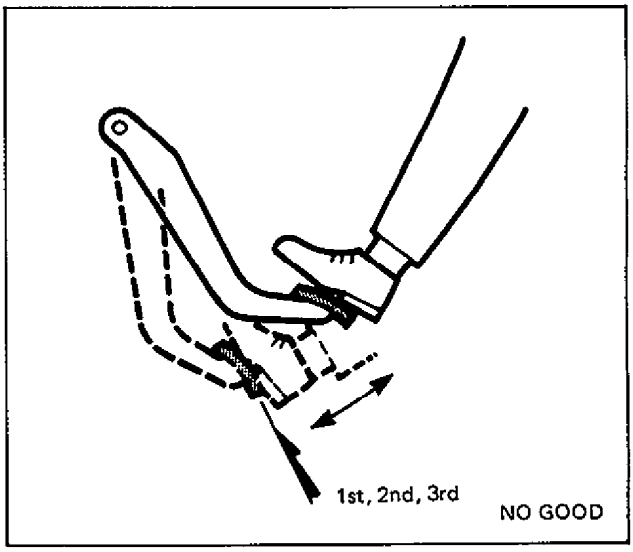


Fig. 5-143

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.

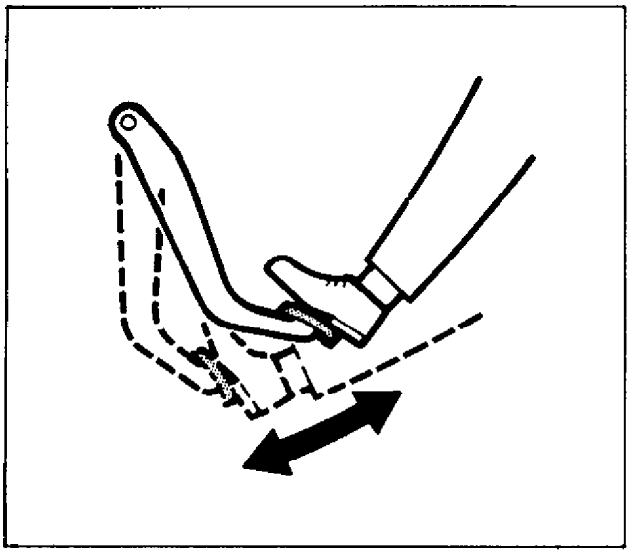


Fig. 5-144

2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.

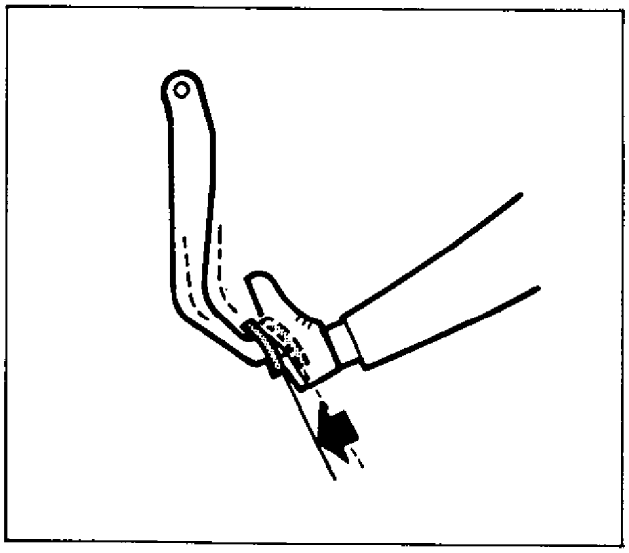


Fig. 5-145

Check Air Tightness Under Load

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.

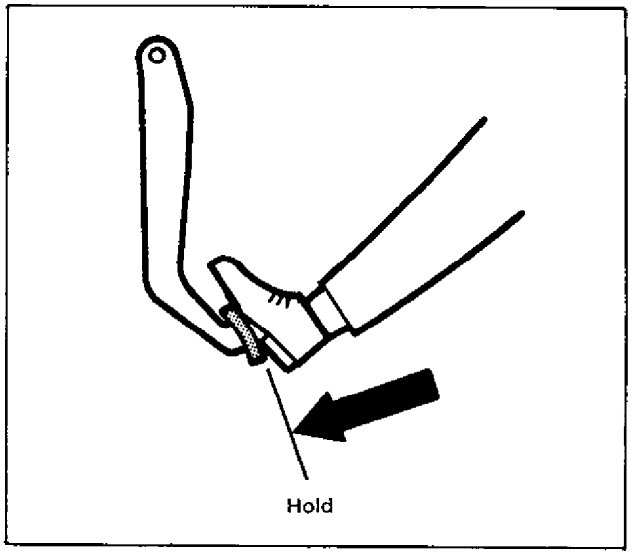


Fig. 5-146

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.

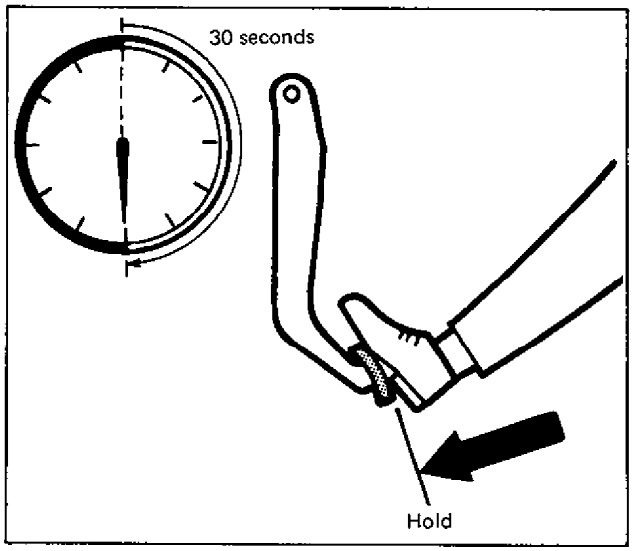


Fig. 5-147

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.

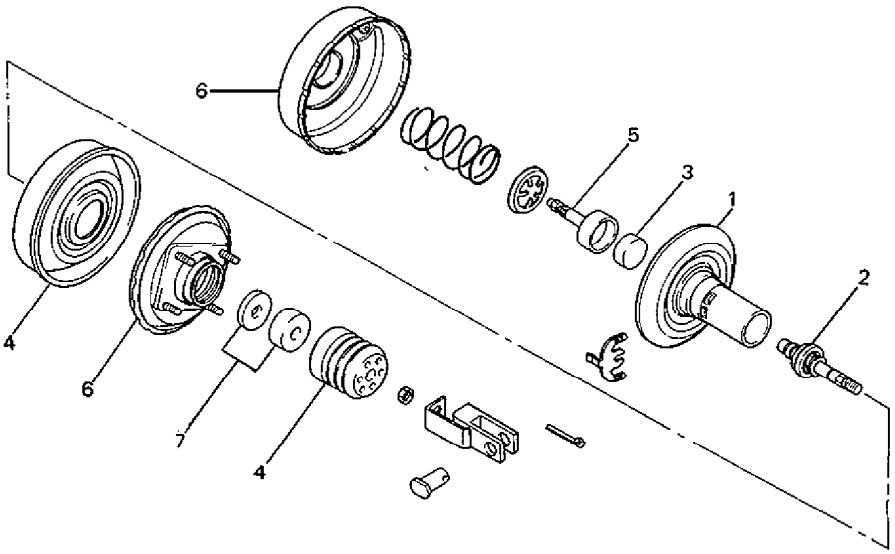


Fig. 5-148

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. Proportioning valve bolt				
8. Brake pipe flare nut		14 – 18	1.4 – 1.8	10.5 – 13.0
9. Brake pedal shaft nut		18 – 28	1.8 – 2.8	13.5 – 20.0
10. Rear spindle nut		80 – 120	8.0 – 12.0	58.0 – 86.5
11. Brake bleeder plug	(Front caliper)	7 – 10	0.7 – 1.0	5.5 – 7.5
	(Rear cylinder)			
12. Wheel nut		50 – 70	5.0 – 7.0	36.5 – 50.5
13. Front drive shaft nut		150 – 200	15.0 – 20.0	108.5 – 144.5

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.

SPECIAL TOOLS

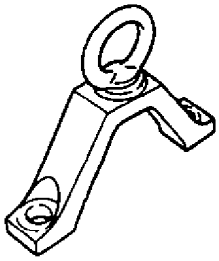
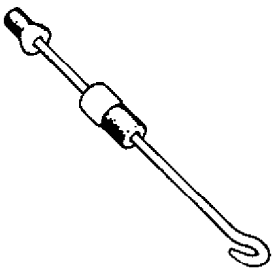
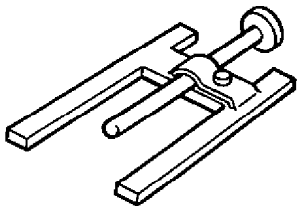
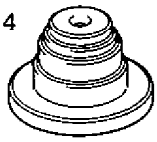
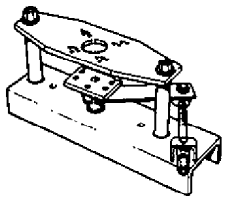
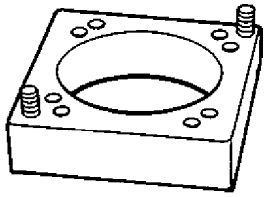
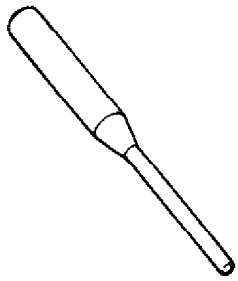
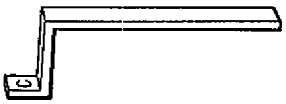
1  09943-17911 Brake drum remover (Front wheel hub remover)	2  09942-15510 Sliding hammer	3  09950-96010 Booster piston rod gauge	4  No. 1 09951-16020  No. 2 09951-18210 Booster No. 2 body Oil seal remover & Installer No. 1, No. 2
5  09950-88210 Booster overhaul tool set	6  09950-78210 Flare nut wrench (10 mm)	7  09951-16010 Booster overhaul attachment	8  09922-85811 Connector pin remover
9  09952-16010 Booster piston rod adjuster			

Fig. 5-150

SECTION 6

ENGINE

CONTENTS

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.

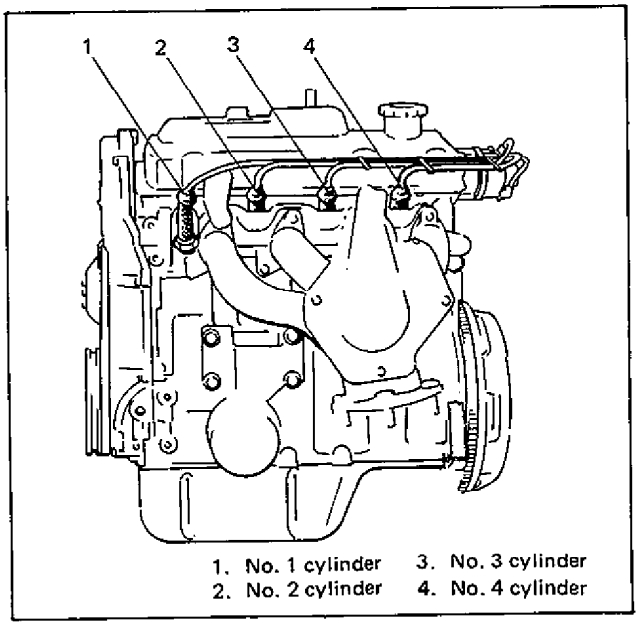


Fig. 6-1 Cylinder Numbers

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 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.

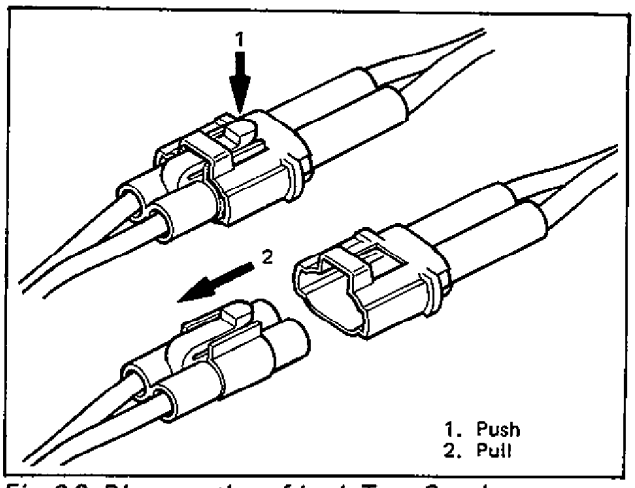


Fig. 6-2 Disconnection of Lock Type Coupler

PRECAUTIONS ON FUEL LINE SERVICE

- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- 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.

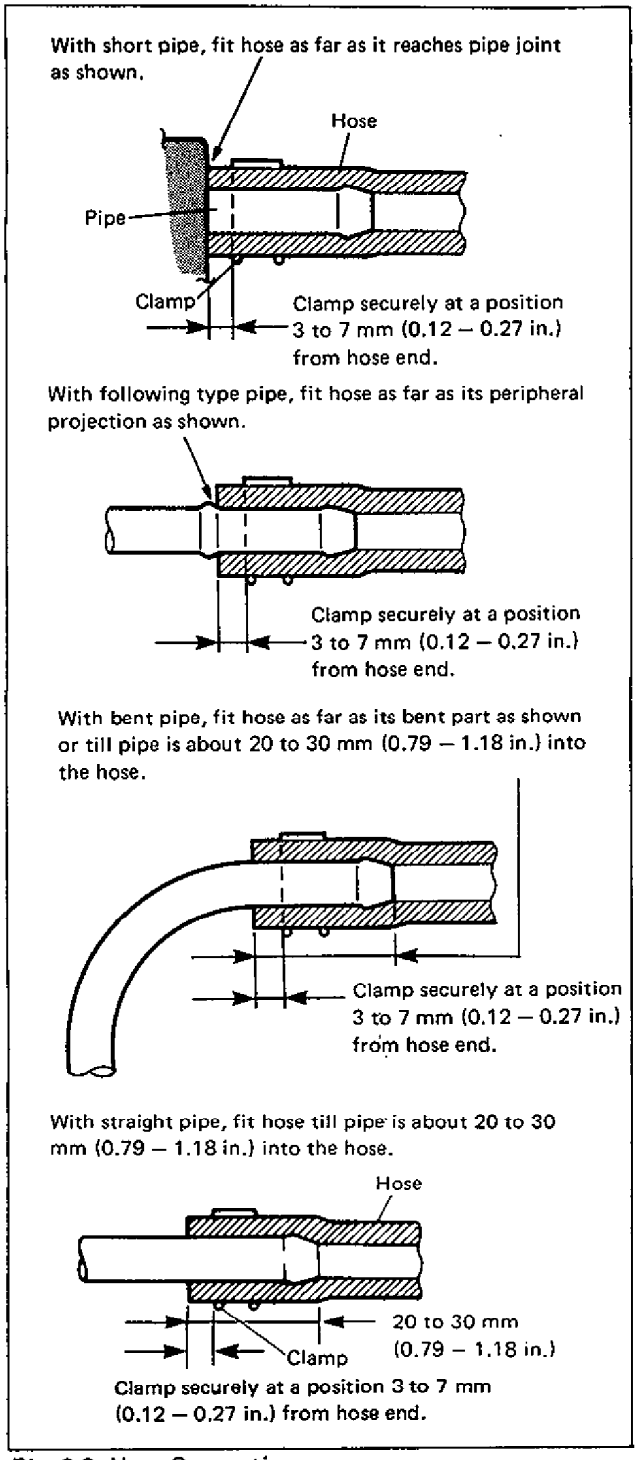


Fig. 6-3 Hose Connection

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
	• Maladjusted signal rotor air gap	Adjust
	• Faulty generator assembly 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
	• Carburetor choke will not work properly	Check and adjust
	• Improper adjustment of float level	Adjust
	• Malfunctioning fuel cut solenoid valve	Check solenoid valve for operation. Replace if necessary.
	• Carburetor out of adjustment	Adjust
	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
	Others	
	• Broken valve timing belt	Replace
	• Malfunctioning PCV valve	Replace

Condition	Possible Cause	Correction
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 or carburetor gasket	Replace gasket
	• Malfunction of choke system	Adjust or replace
	• Fuel pump will not work properly	Replace
	• Clogged carburetor jets	Clean
	Low compression	Previously outlined
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect securely
	• Malfunctioning EGR valve	Check and replace as necessary
	• Dragging brakes	Repair or replace
	• Slipping clutch	Adjust or replace
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

Condition	Possible Cause	Correction
	Fuel system out of order	
	• Shortage of fuel in fuel tank	Refill
	• Clogged air cleaner element	Clean or replace
	• Leaky manifold, throttle body, or cylinder head gasket	Replace
	• Clogged carburetor jets	Clean
	• Improper float level	Adjust
	• Malfunctioning of choke system	Adjust or replace
	• Malfunctioning fuel cut solenoid valve	Replace
	Engine overheating	Refer to "Overheating" section
	Low compression	Previously outlined
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect securely
	• Malfunctioning EGR valve	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
	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	Adjust
	• Clogged carburetor jets	Clean
	• Loosen manifold and carburetor bolts and nuts	Retighten
	• Malfunctioning accelerator pump	Check and replace as necessary
	Engine overheating	Refer to "Overheating" section
	Low compression	Previously outlined
	Others	
	• Malfunctioning EGR valve	Check and replace as necessary

Condition	Possible Cause	Correction
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	Adjust
	Others	
	• Malfunctioning EGR valve	Check and replace as necessary
	• Leaky vacuum hoses	Repair or replace
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 or carburetor gaskets	Replace
	• Clogged carburetor jets	Clean
	• Improper adjustment of float level	Adjust
	• Malfunctioning fuel pump	Replace
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect securely
	• Excessive combustion chamber deposits	Remove carbon
	• Malfunctioning EGR valve	Check and replace as necessary

Condition	Possible Cause	Correction
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 repair
	• Blown cylinder head gasket	Replace
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	Repair or replace
	• Improper float level	Adjust
	• Dirty or clogged carburetor jets	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 mechanical and vacuum advancers in distributor	Check and repair or replace
	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	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**	
	• Improper valve lash	Adjust
	• Worn valve stem and guide	Replace
	• Weak or broken valve spring	Replace
	• Warped or bent valve	Replace
	• Worn rocker arm	Replace
	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

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, TVSV and vacuum hoses)**
- **Evaporative emission control system (charcoal canister and vacuum hoses)**
- **Pulse air control system (2nd air valve, pipe and hose)**

GENERAL DESCRIPTION

ENGINE

The engine is a water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit with its S.O.H.C. (Single overhead camshaft) valve mechanism arranged for "V"-type valve configuration.

The single overhead camshaft is mounted over the cylinder head; it is driven from crankshaft through timing belt, and no push rods are provided in the valve train system.

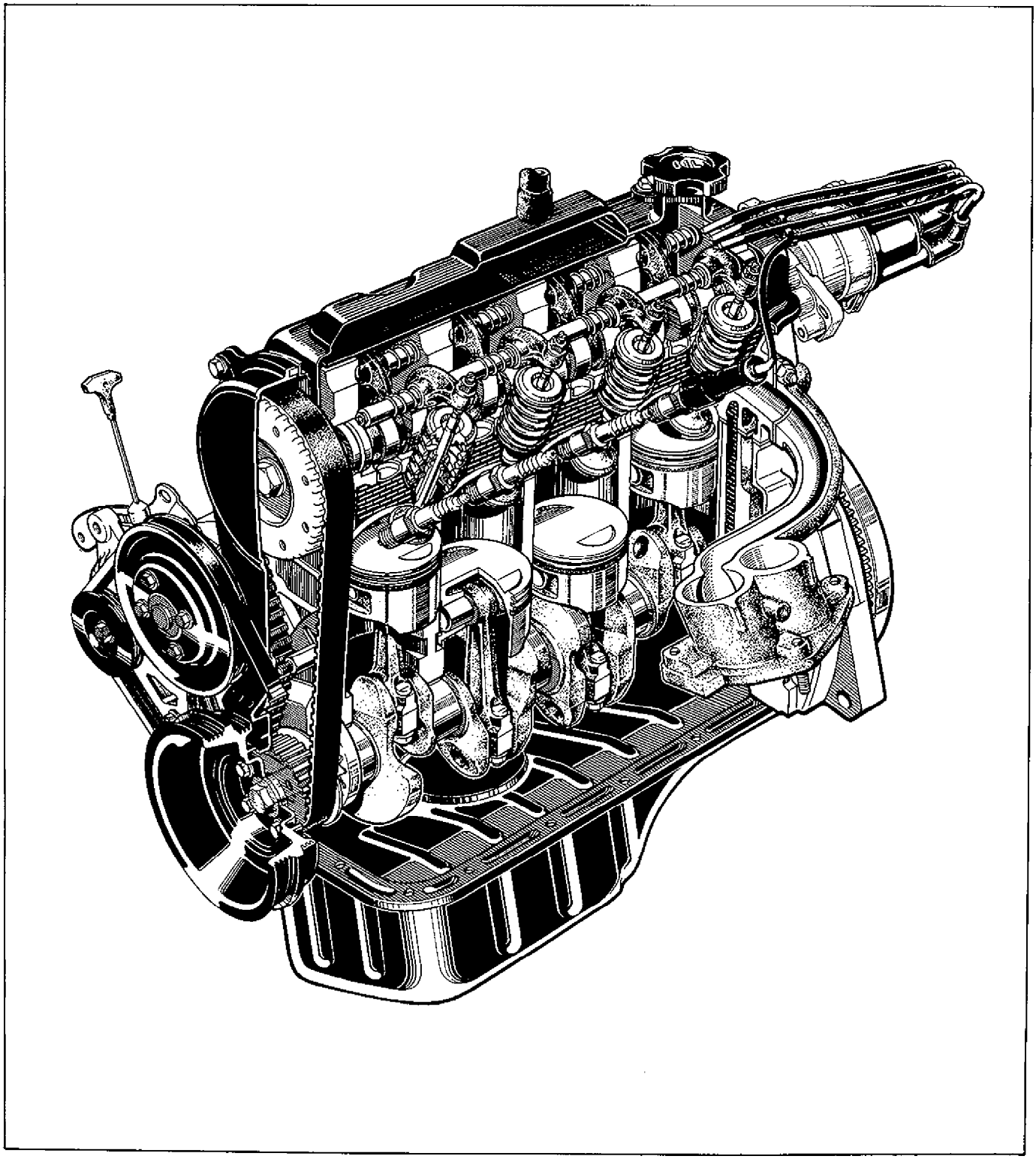


Fig. 6A-1 Engine Construction

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 the cylinder head and lubricates rocker arms, valves and camshaft, etc., after passing through the internal oilway of rocker arm shafts.

An oil relief valve is provided on oil pump. This valve starts relieving oil pressure when the pressure comes over about 3.0 kg/cm^2 (42.7 psi, 300 kPa). Relieved oil drains back to oil pan.

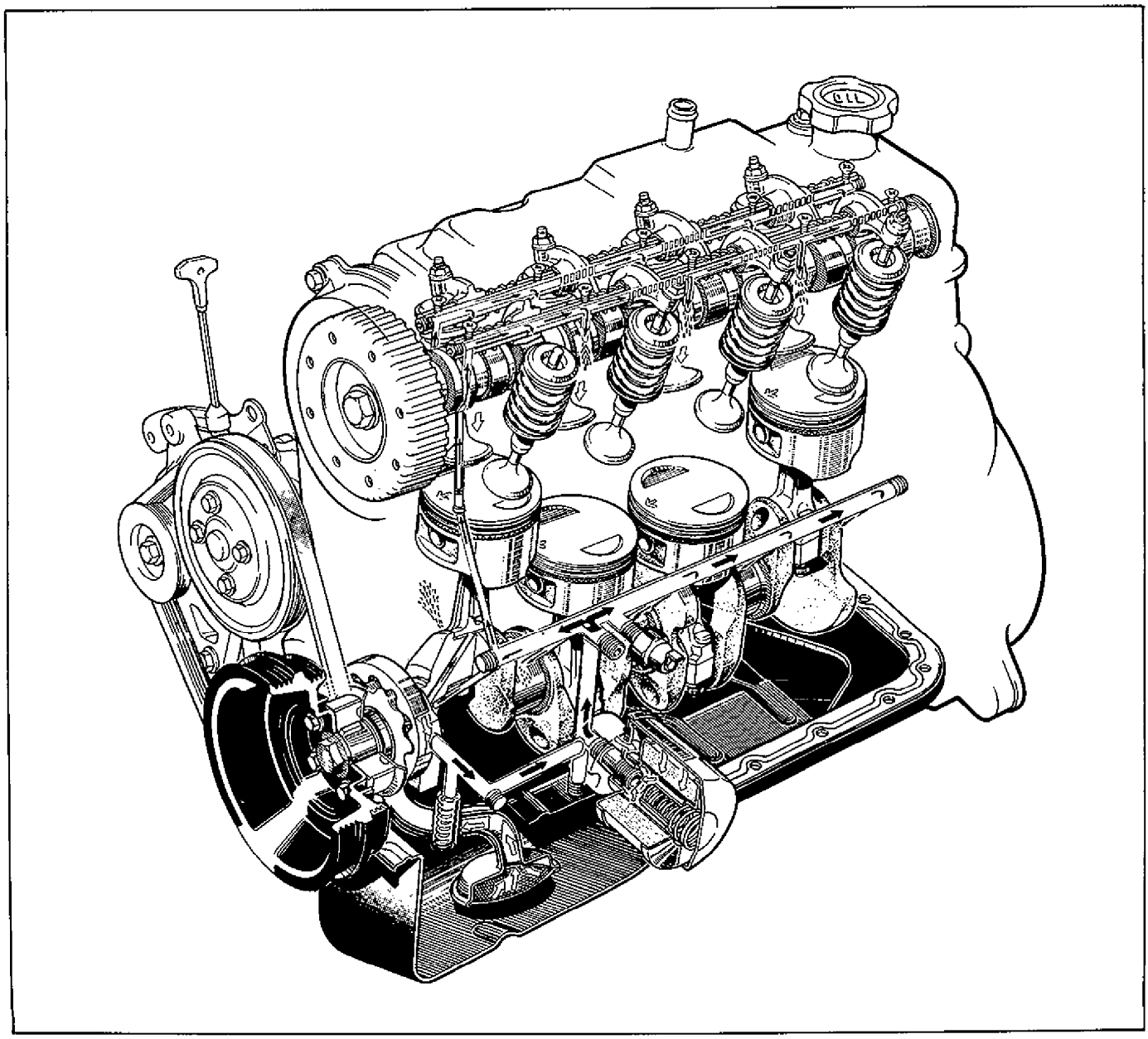


Fig. 6A-2 Engine Lubrication

CYLINDER HEAD AND VALVE TRAIN

The cylinder head is made of cast aluminum alloy and has four combustion chambers arranged in-line. Each combustion chamber has an intake and an exhaust ports.
Moreover, as shown in Figure 6A-3, the air induction nozzle is provided near each intake valve. During intake stroke of the engine air/fuel mixture enters into the combustion chamber from carburetor through intake manifold and intake valve. At the same time, air flows to the air induction nozzle through carburetor and air induction passage in the intake manifold, and jets into the combustion chamber.

The air jetted into the combustion chamber accelerates the mixture swirl to improve the combustion efficiency.

A single overhead camshaft driven by the crankshaft through the timing belt is mounted on the cylinder head.
The camshaft has eight cams, and each cam operates the intake or exhaust valve through rocker arm. The valve lash can be adjusted by turning the adjusting screw on the rocker arm after loosening the lock nut.

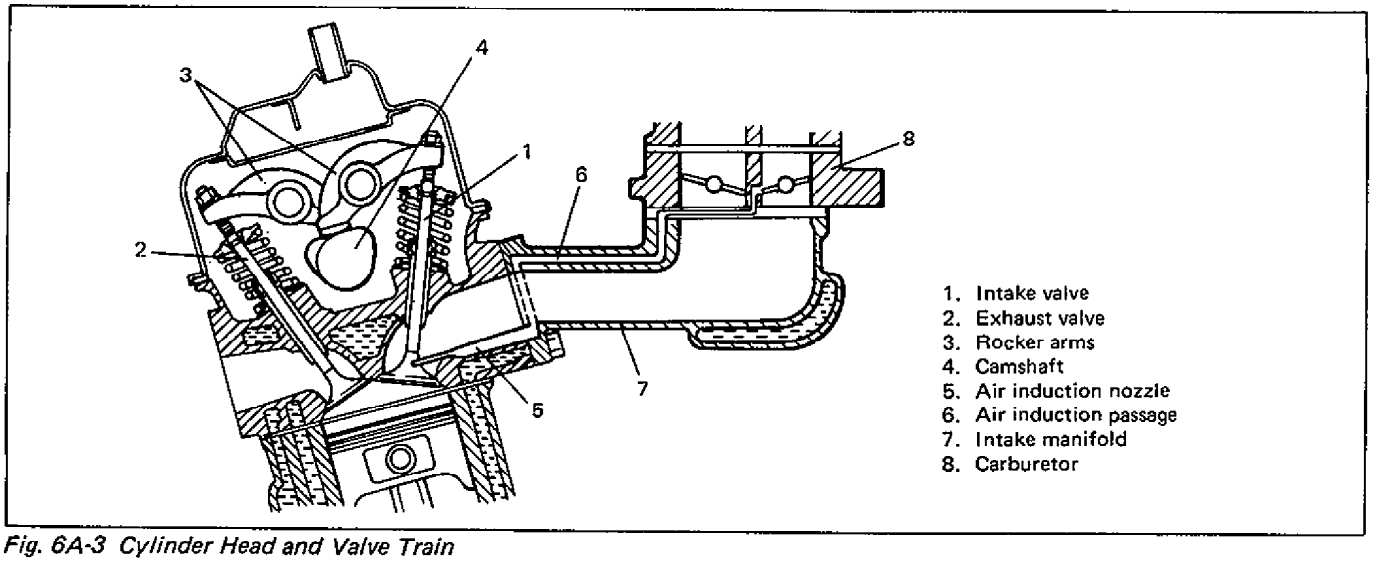


Fig. 6A-3 Cylinder Head and Valve Train

CYLINDER BLOCK

The cylinder block is made of cast aluminum alloy and has 4 cylinders arranged "In-Line". A cylindrical cast iron sleeve is intalled 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.
One of two compression rings is the top ring whose outer surface is either nitriding treated or hard chromium plated for the purpose of improvement in abrasion resistance, and the other is the 2nd ring.
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 press fit in the connecting rods. The connecting rods are made of forged steel, and the rod bearings are of precision insert type.

ON CAR SERVICE

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 and disconnect distributor wire harness at coupler.
4. Install special tool (Compression gauge) into spark plug hole.

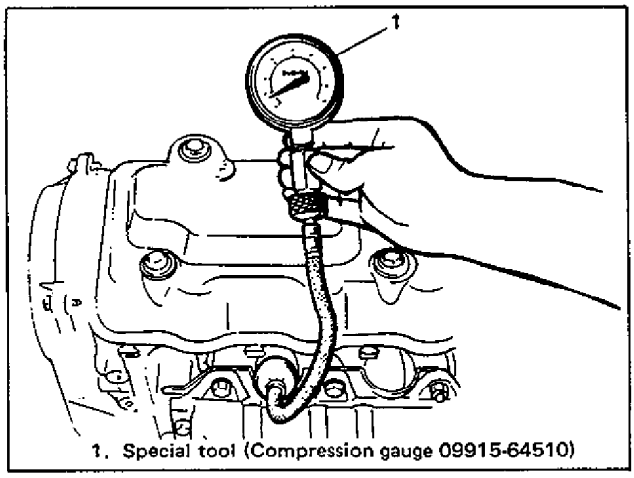


Fig. 6A-4 Installing Compression Gauge

5. 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.
6. Crank engine with fully charged battery, and read the highest pressure on compression gauge.

	Compression pressure
Standard	14.0 kg/cm² (199.0 psi, 1400 kPa)/400 r/min
Limit	11.0 kg/cm² (156.4 psi, 1100 kPa)/400 r/min
Max. difference between any two cylinders	1.0 kg/cm² (14.2 psi, 100 kPa)/400 r/min

7. Carry out steps 4 through 6 on each cylinder to obtain four readings.
8. After checking, 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.
2. Disconnect vacuum hoses from VSV of idle up and connect the special tools (Vacuum gauge and vacuum gauge hose joint) to the hose disconnected.

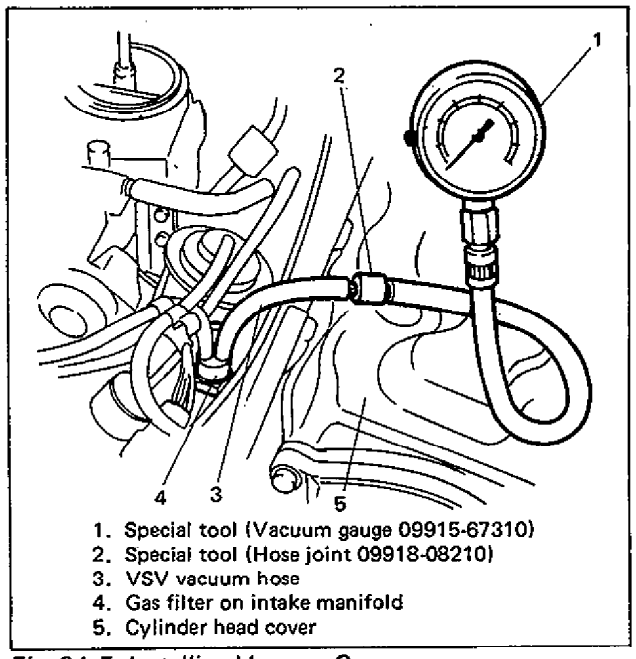


Fig. 6A-5 Installing Vacuum Gauge

3. Run the engine at the specified idling speed (see section 6D), and read the vacuum gauge. The vacuum should be within the specification.

Vacuum specification	40 – 50 cm Hg (15.7 – 19.7 in.Hg) at specified idle speed

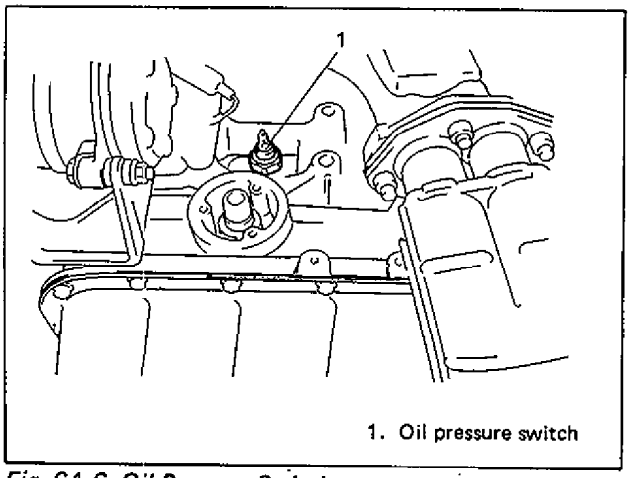
4. After checking, remove the hose joint and the vacuum gauge, and connect the vacuum hose to VSV securely.

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.
- **Oil leaks.**
  If leak is found, repair it.

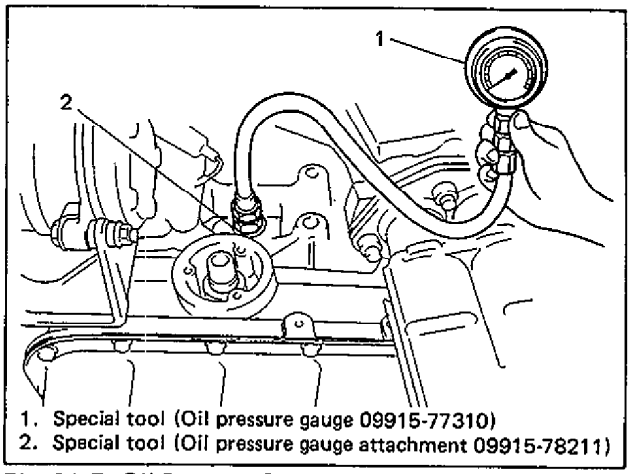
1. Using special tool (Oil filter wrench), remove oil filter.
2. After removing oil filter, remove oil pressure switch from cylinder block.



1. Oil pressure switch

Fig. 6A-6 Oil Pressure Switch

3. Install special tool (Oil pressure gauge) to vacated threaded hole.



1. Special tool (Oil pressure gauge 09915-77310)
2. Special tool (Oil pressure gauge attachment 09915-78211)

Fig. 6A-7 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 3,000 r/min and measure oil pressure.

Oil pressure specification	3.0 – 4.2 kg/cm^2 42.7 – 59.7 psi at 3,000 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.

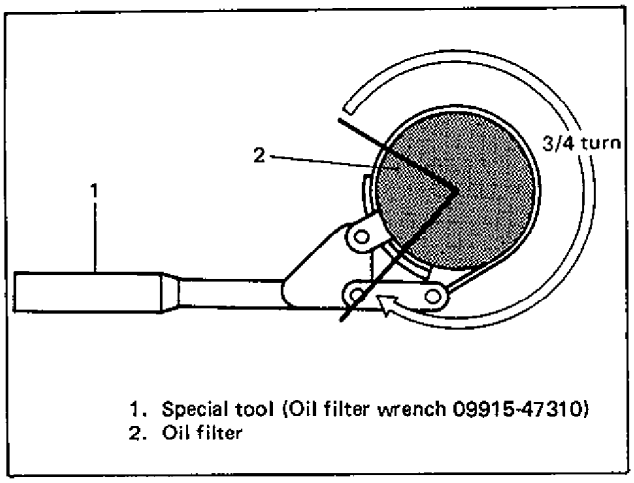
Tightening torque for oil pressure switch	N·m	kg-m	lb-ft
	12 – 15	1.2 – 1.5	9.0 – 10.5

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.



1. Special tool (Oil filter wrench 09915-47310)
2. Oil filter

Fig. 6A-8 Tightening Oil Filter

CAUTION:
To prevent oil leakage, make sure that oil filter is tight, but do not overtighten it.

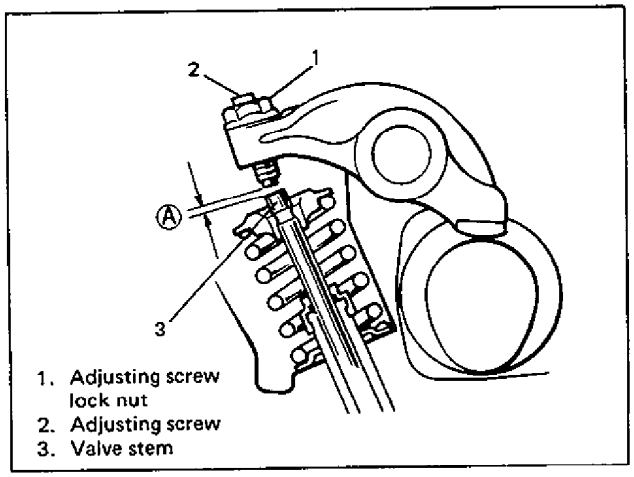
11. After installing oil filter, start engine and check oil filter for oil leakage.

VALVE LASH

VALVE LASH SPECIFICATIONS

Valve lash refers to the gap between the rocker arm adjusting screw and valve stem. Use a thickness gauge to measure this gap Ⓐ.

		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
Valve lash (gap A) specification	Intake	0.13 – 0.17 mm (0.0051 – 0.0067 in)	0.23 – 0.27 mm (0.009 – 0.011 in)
	Exhaust	0.16 – 0.20 mm (0.0063 – 0.0079 in)	0.26 – 0.30 mm (0.0102 – 0.0118 in)

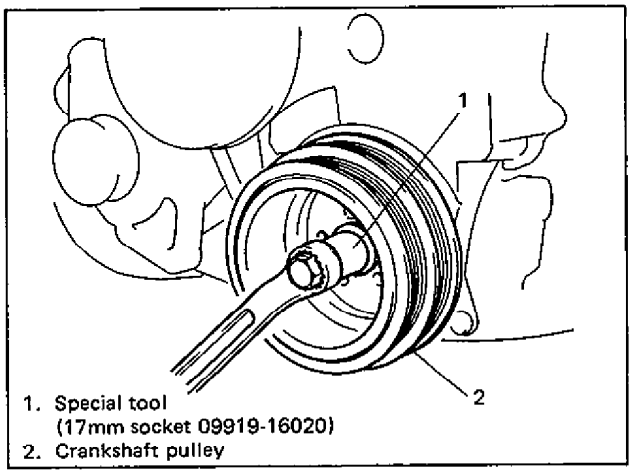


1. Adjusting screw lock nut
2. Adjusting screw
3. Valve stem

Fig. 6A-9 Valve Lash

CHECKING AND ADJUSTING PROCEDURES

1. Remove cylinder head cover, referring to item "Cylinder head cover" in this section.
2. Using special tool (17 mm socket), turn crankshaft pully clockwise until "V" mark (in white paint) on pulley aligns with "0" (zero) calibrated on timing belt cover.



1. Special tool (17mm socket 09919-16020)
2. Crankshaft pulley

Fig. 6A-10 Aligning Marks

3. 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 lashes at valves ①, ②, ⑤, and ⑦.

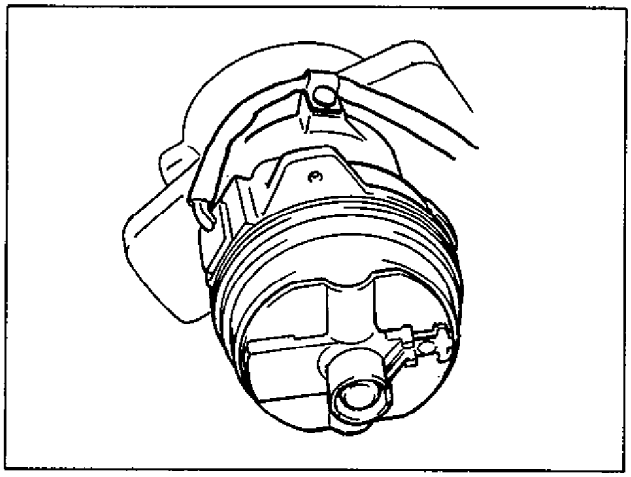


Fig. 6A-11 Checking Rotor Position

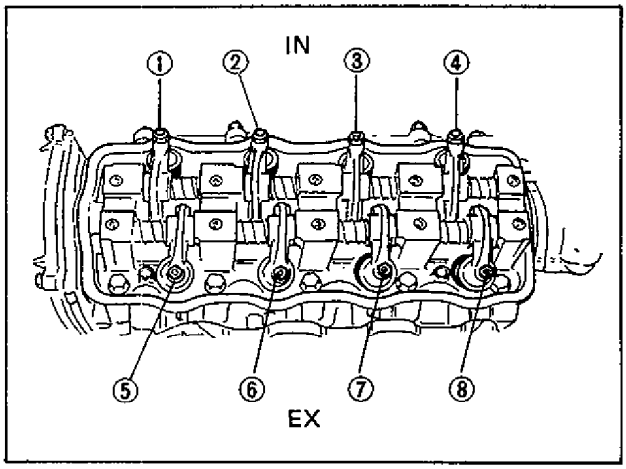


Fig. 6A-12 Valve Identification

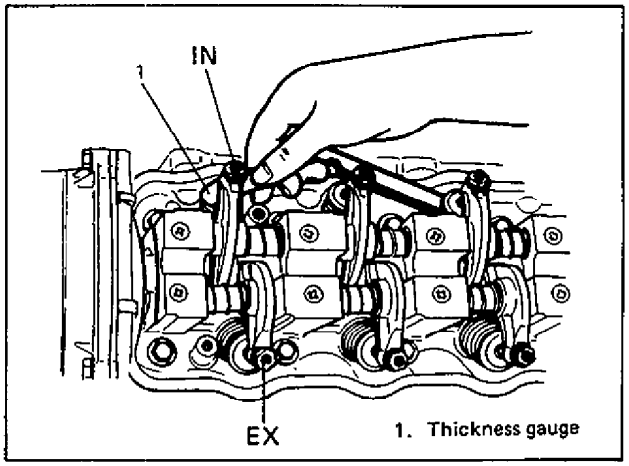


Fig. 6A-13 Checking Valve Lashes

4. 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.

Tightening torque for adjusting screw lock nut	N·m	kg-m	lb-ft
	15 – 19	1.5 – 1.9	11.0 – 13.5

5. 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.
6. After checking and adjusting all valves, install cylinder head cover, distributor cap and air cleaner assembly.

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 3 clamps.

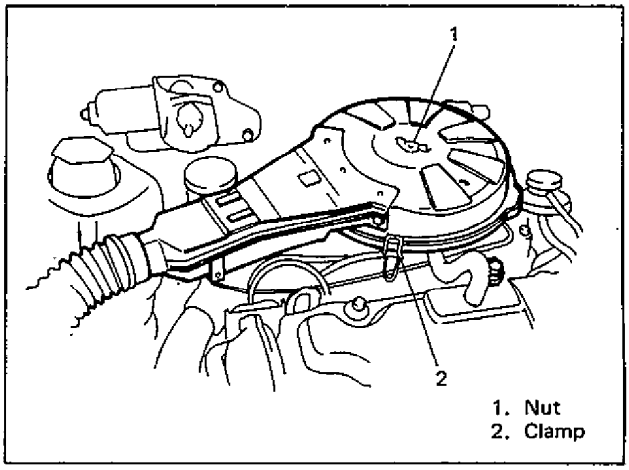


Fig. 6A-14 Removing Upper Case

2. Air cleaner element.

INSPECT
Check air cleaner element for dirt.

CLEAN
Blow off dust by compressed air from air outlet side of element.

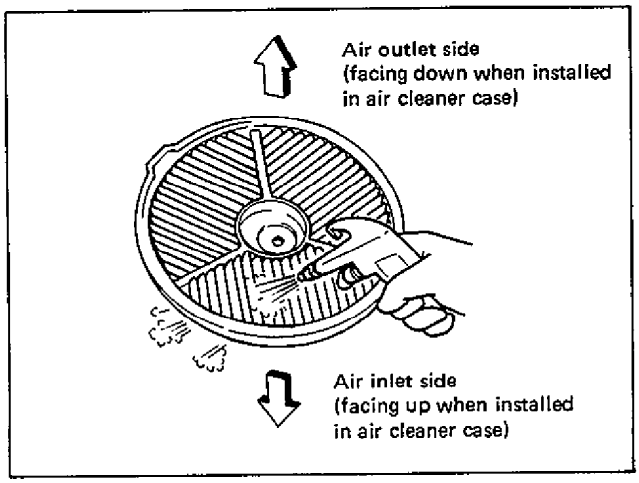


Fig. 6A-15 Cleaning Air Cleaner Element

INSTALL OR CONNECT
1. Air cleaner element to its lower case.
   Fit the lug of element to the recession of lower case as shwon in below figure.

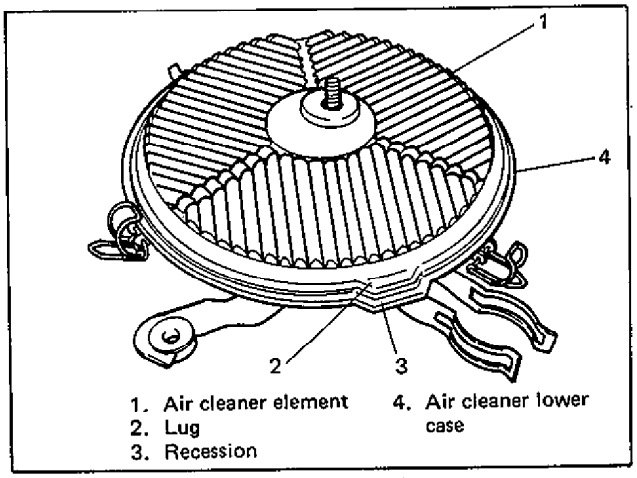


Fig. 6A-16 Installing Air Cleaner Element

2. Air cleaner upper case.
   Tighten case nut and clamps securely.

AIR CLEANER ASSEMBLY

REMOVE OR DISCONNECT
1. Negative cable at battery.
2. EGR modulator (if equipped).
3. Air suction guide, warm air hose, PCV hose and other hoses from air cleaner case.
4. Air cleaner assembly.

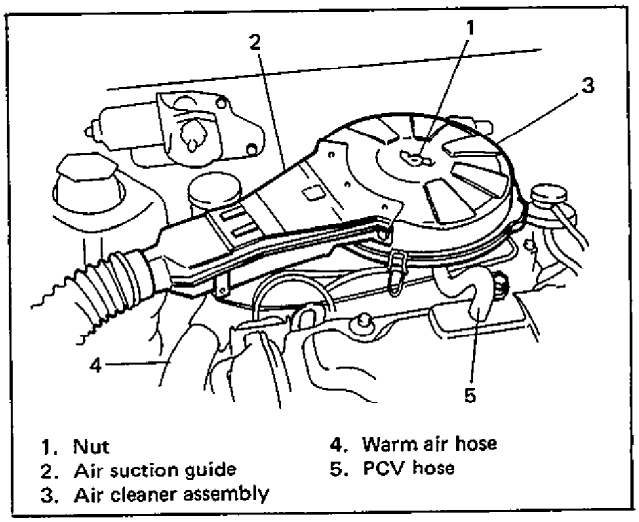


Fig. 6A-17 Removing Air Cleaner Assembly

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.

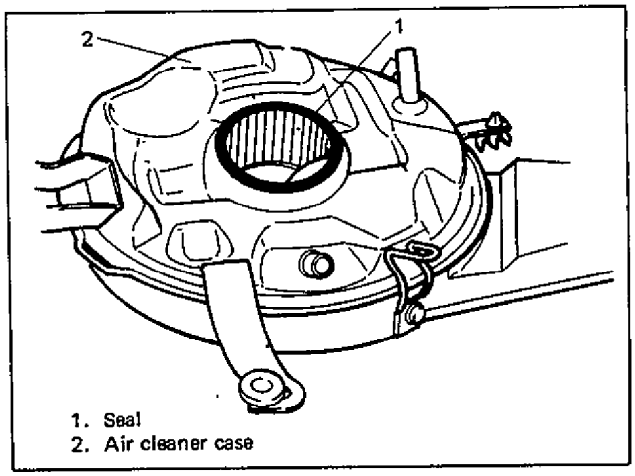


Fig. 6A-18 Air Cleaner Case Seal

- Clamp hoses 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 hose from cylinder head cover.
5. Cylinder head cover bolts and seal washers.
6. Cylinder head cover from cylinder head.

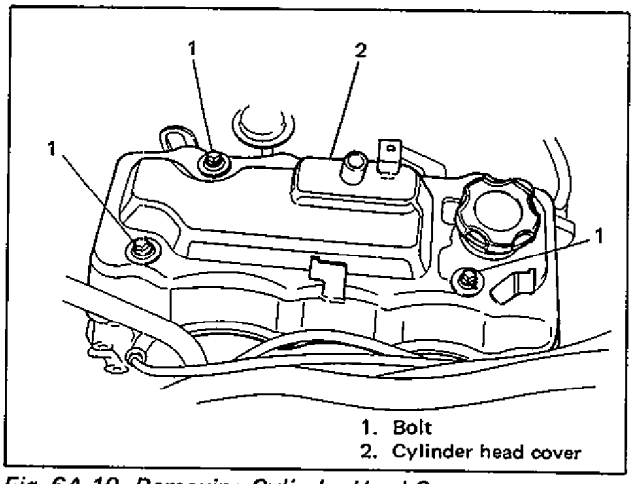


Fig. 6A-19 Removing Cylinder Head Cover

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.
   Before installing seal washers, check each one for deterioration or damage, and replace as necessary.
   Tighten cover bolts to specified torque.

Tightening torque for cover nut	N·m	kg-m	lb-ft
	4 – 5	0.4 – 0.5	3.0 – 3.5

3. High-tension cord clamps to cylinder head cover.
4. PCV hose to cylinder head cover.
5. Air cleaner assembly as previously outlined.
6. Negative cable at battery.

CARBURETOR AND INTAKE MANIFOLD

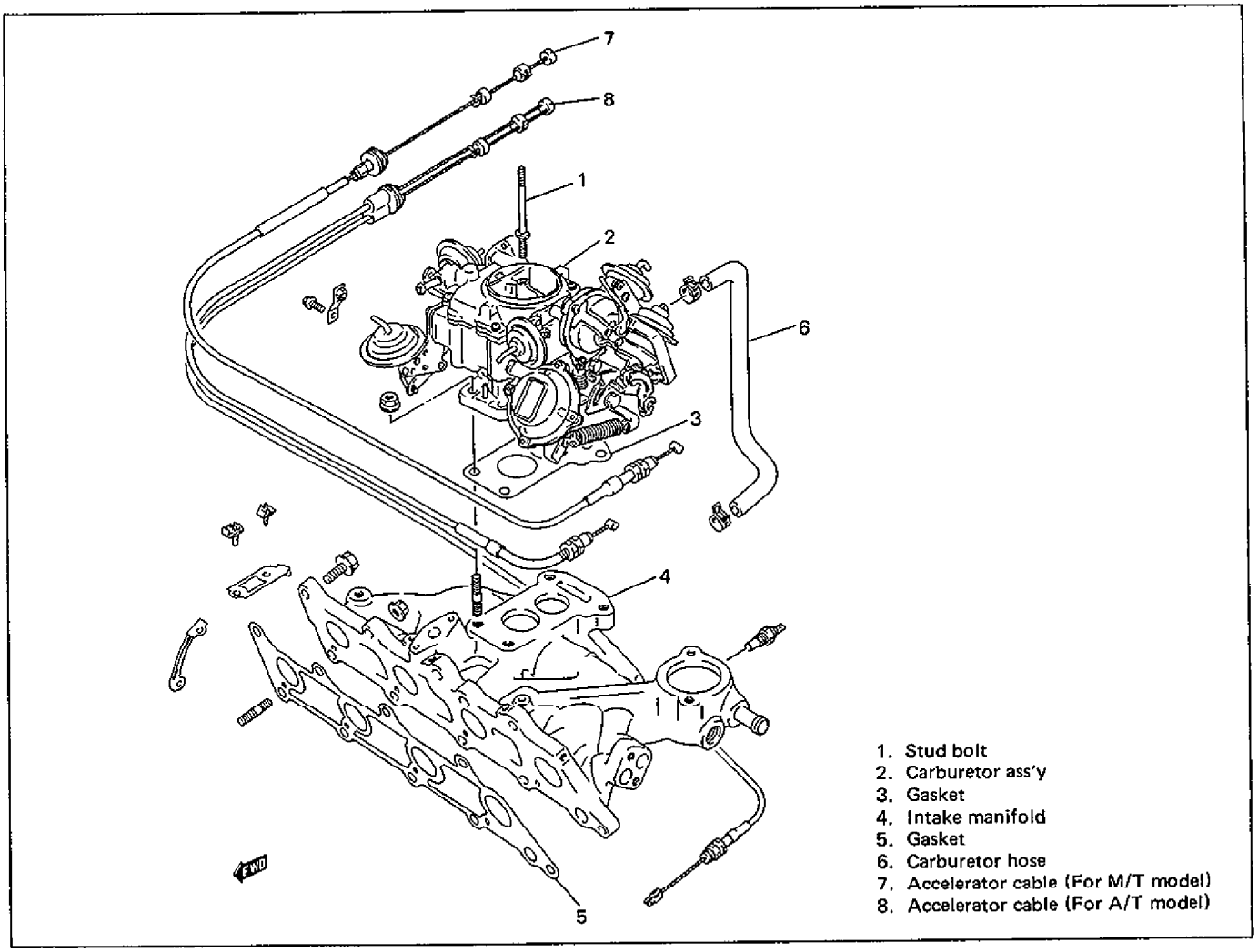


Fig. 6A 20 Carburetor and Intake Manifold

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.

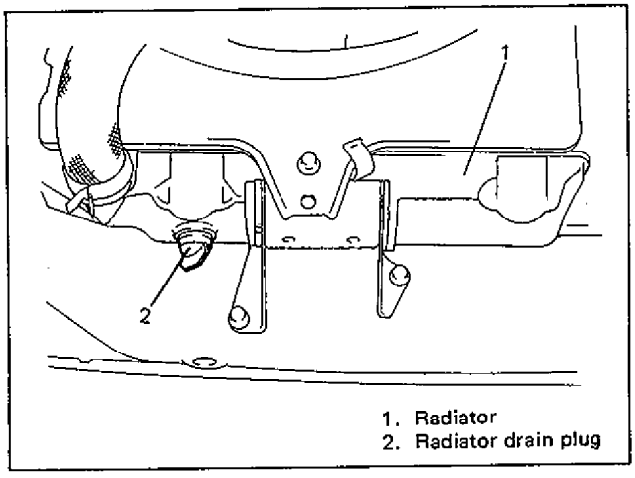


Fig. 6A-21 Radiator Drain Plug

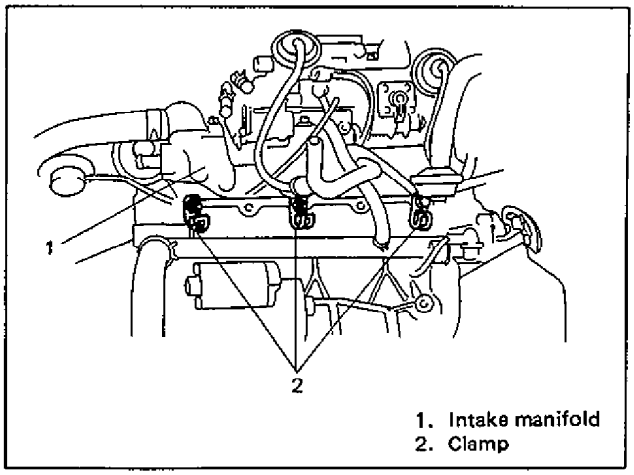
3. Air cleaner assembly as previously outlined.

4. Accelerator cable from carburetor.
5. Following electric lead wires:
   - Carburetor (auto choke, fuel cut solenoid valve and/or bowl vent valve wires).
   - Throttle position sensor (for A/T).
   - Water temperature gauge unit.
   - Radiator cooling fan switch.
6. Fuel feed and return hoses.
   Before disconnecting hose, remove fuel filler cap to release the pressure in fuel tank and reinstall it.
7. Second air pipe (if equipped).
8. Following hoses:
   - PCV hose from PCV valve.
   - Water hoses from intake manifold and carburetor.
   - Brake booster hose from brake booster.
   - VSV hose from gas filter and idle up actuator.
   - Distributor vacuum advance hose from distributor.
   - Canister hose and purge hose from pipes (If equipped).
9. Other jointed parts from carburetor and intake manifold, if any.
10. 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.
   - Install clamps as shown in Fig. 6A-22, and tighten bolts and nuts to specification.

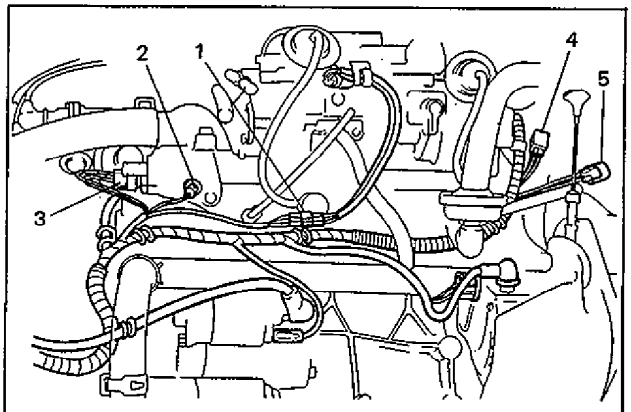
Tightening torque for bolts and nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



1. Intake manifold
2. Clamp

Fig. 6A-22 Clamps

3. PCV hose to PCV valve.
4. Vacuum hoses.
5. Water hoses.
6. Fuel return and feed hoses to pipes.
7. Electric lead wires.



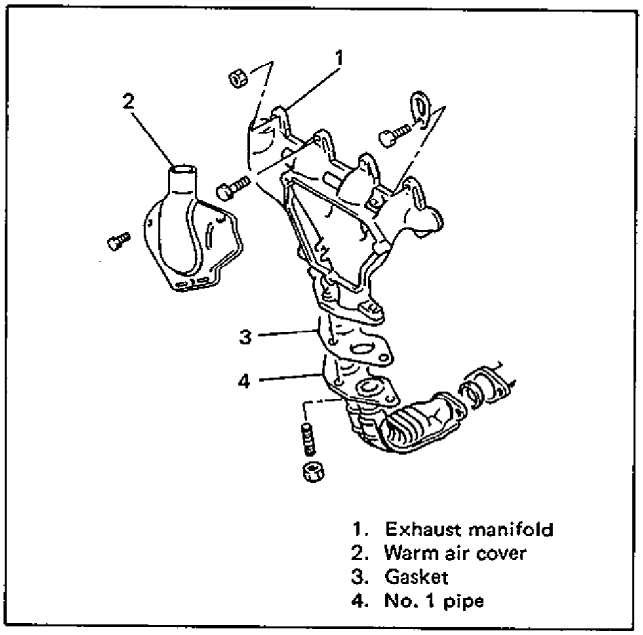
1. To carburetor solenoid
2. To water temp. gauge unit
3. To radiator fan motor switch
4. To throttle position sensor (For A/T model)
5. To idle up VSV

Fig. 6A-23 Connecting Couplers

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.

EXHAUST MANIFOLD

WARNING:
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

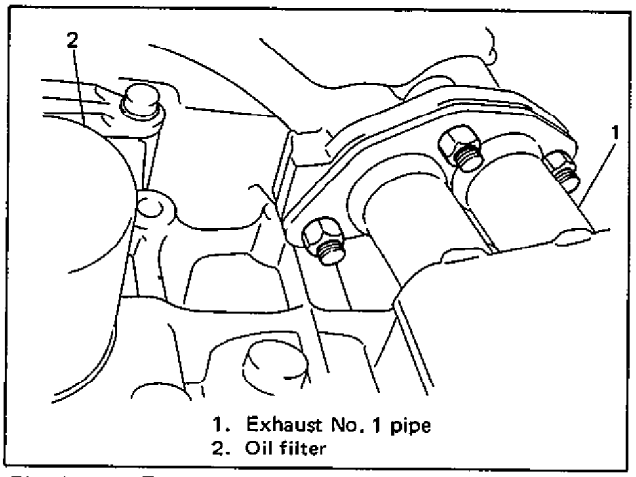


1. Exhaust manifold
2. Warm air cover
3. Gasket
4. No. 1 pipe

Fig. 6A-24 Exhaust Manifold, No. 1 Pipe, etc.

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Second air pipe.
3. Warm air cover on exhaust manifold.
4. Exhaust No. 1 pipe from exhaust manifold.



1. Exhaust No. 1 pipe
2. Oil filter

Fig. 6A-25 Exhaust No. 1 Pipe

5. 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 nut	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

4. Warm air cover to exhaust manifold.
5. Second air pipe.
6. Negative cable at battery.
7. Check exhaust system for exhaust gas leakage.

TIMING BELT AND BELT TENSIONER

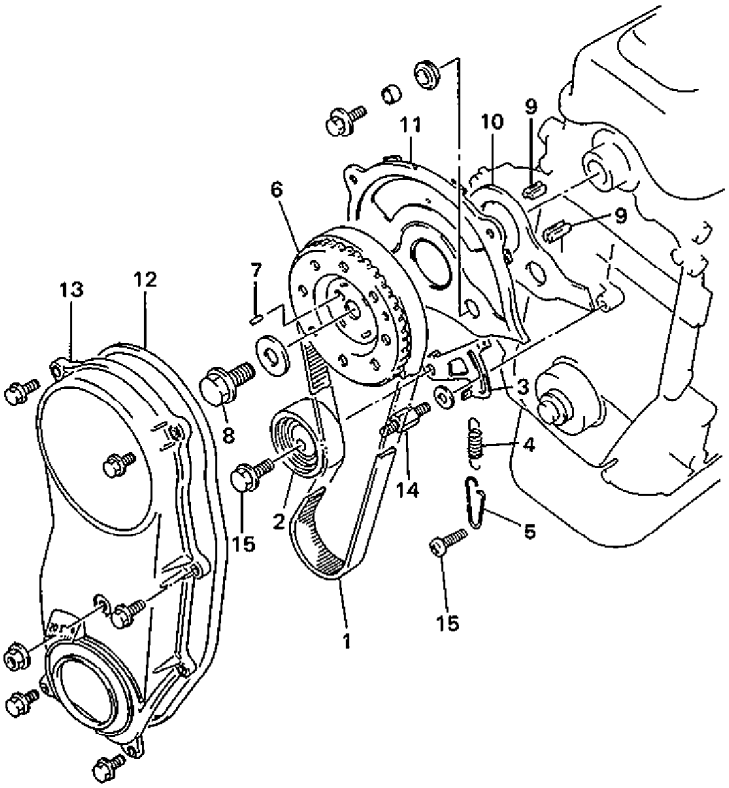


Fig. 6A-26 Timing Belt, Tensioner and Camshaft Timing Pulley, etc.

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Hoist car.
3. Fender apron extension on right side.
   Remove clip after pushing center pin.

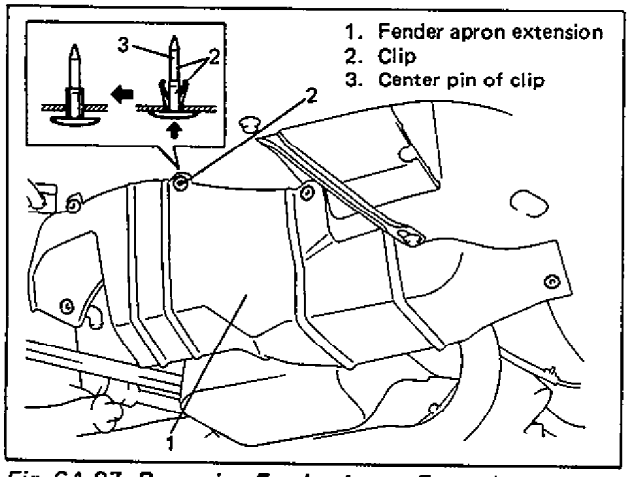


Fig. 6A-27 Removing Fender Apron Extension

4. Water pump belt and its pulley.
   Loosen generator pivot bolts and its adjusting bolt and remove water pump belt.
5. Remove crankshaft pulley bolts.
6. With crankshaft locked, remove crankshaft timing belt pulley bolt by using special tool (17 mm socket).
7. Crankshaft pulley.

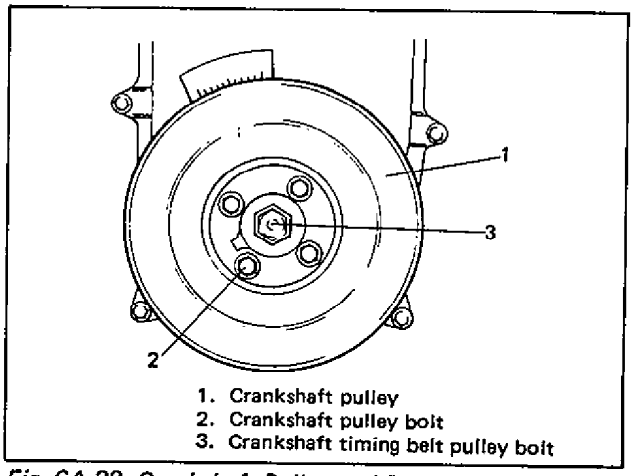


Fig. 6A-28 Crankshaft Pulley and Pulley Bolts

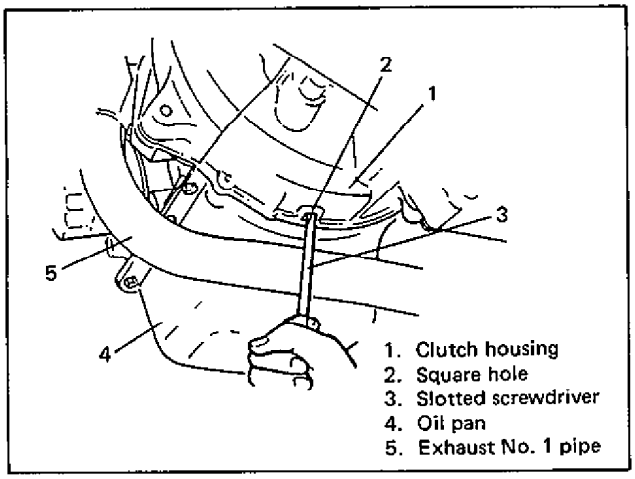


Fig. 6A-29 Locking Crankshaft for M/T model

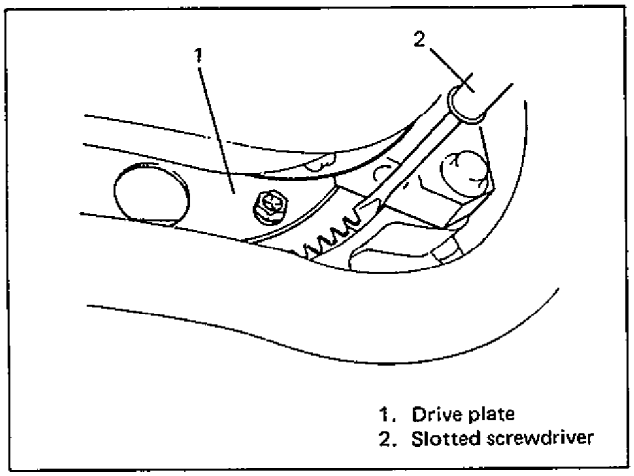


Fig. 6A-30 Locking Crankshaft for A/T model

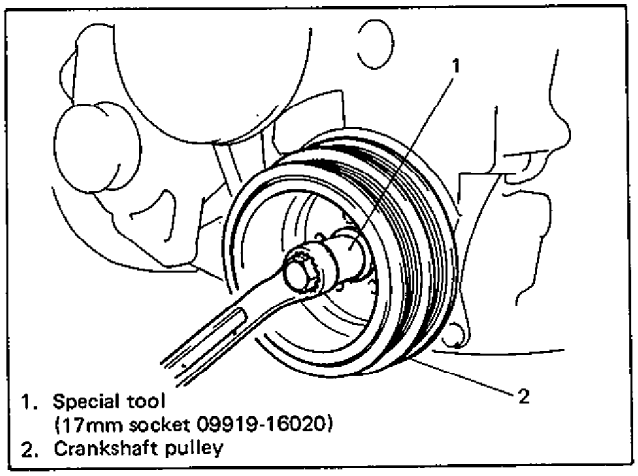


Fig. 6A-31 Loosening Timing Belt Pulley Bolt

8. Second air pipe (if equipped).

9. Timing belt outside cover.
10. Loosen tensioner bolt and stud, and remove the belt from crank timing belt pulley and camshaft pulley after pushing up the tensioner plate fully by finger as shown Figure 6A-32.

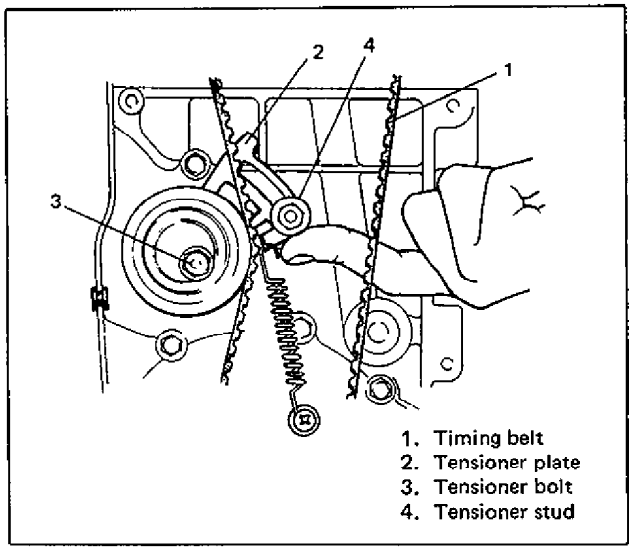


Fig. 6A-32 Removing the Timing Belt

CAUTION:
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.

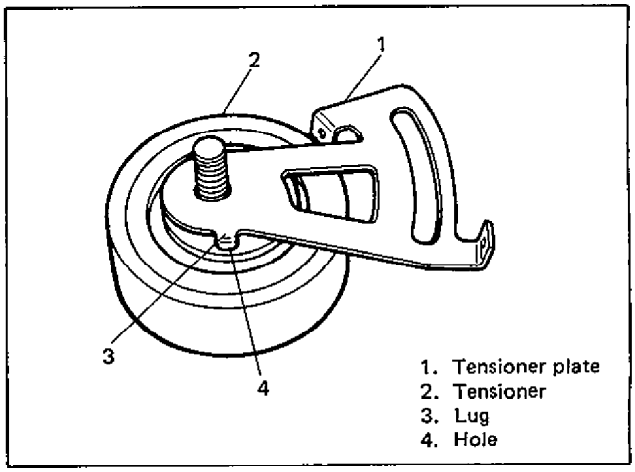


Fig. 6A-33 Lug and Hole

2. Tensioner, tensioner plate and spring:
   Do not tighten the tensioner bolt and stud by wrench yet. Hand tighten only at this time.
   Be sure that the plate movement in arrow direction as shown in Figure 6A-34 causes the same directional movement of the tensioner. If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert the plate lug into tensioner hole.

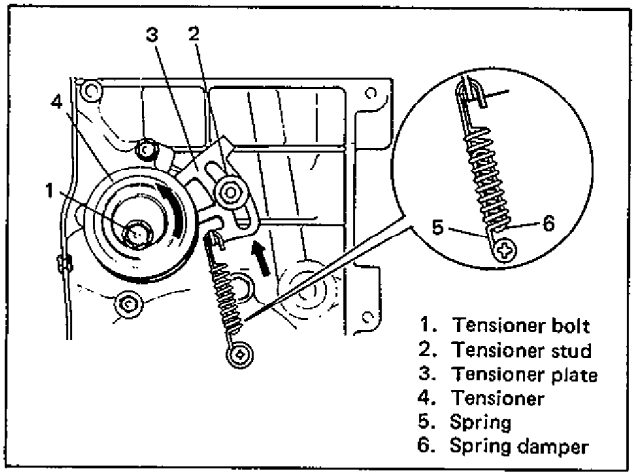


Fig. 6A-34 Tensioner Installation

3. Before installing the timing belt to camshaft pulley and crank timing belt pulley, remove cylinder head cover.

   After removing cylinder head cover, loosen all the valve adjusting screws on intake and exhaust rocker arms all the way after loosening each lock nut (Fig. 6A-35).
   This is to permit the free rotation of camshaft and the reason is; when installing the timing belt to both pulleys, the belt should be correctly tensed by the tensioner spring force. If the camshaft does not rotate freely, the belt will not be correctly tensed by the tensioner.

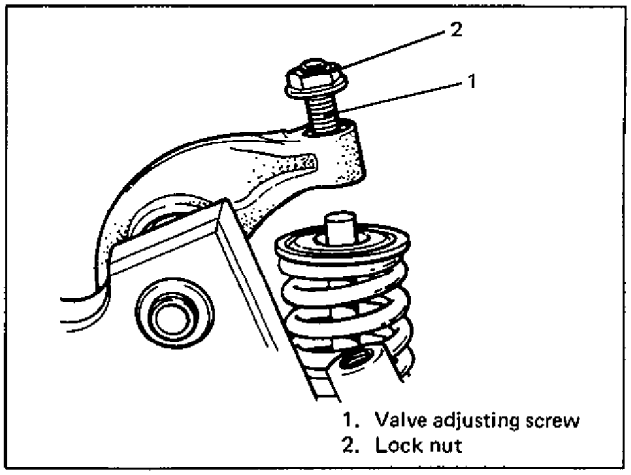


Fig. 6A-35 Valve Adjusting Screw and Lock Nut

4. After loosening all the valve adjusting screws all the way, turn the camshaft pulley clockwise and align the timing mark on camshaft pulley with "V" mark on the belt inside cover as shown in Figure 6A-36.

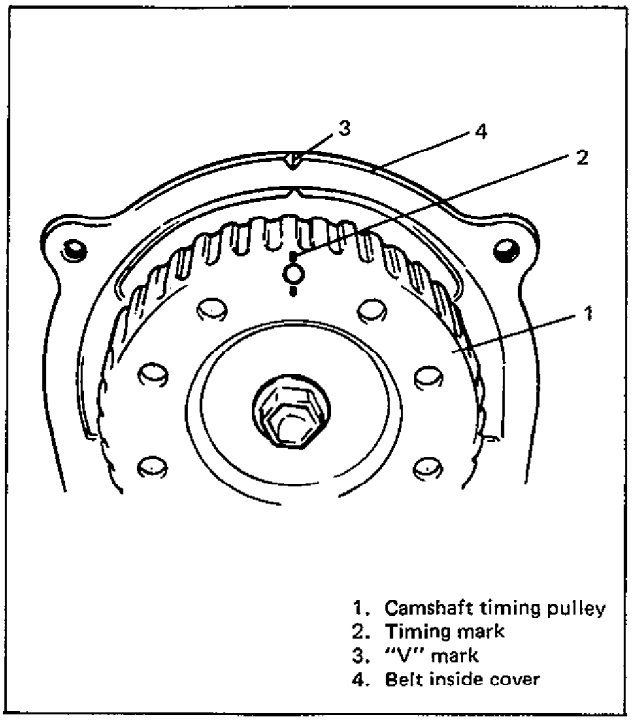
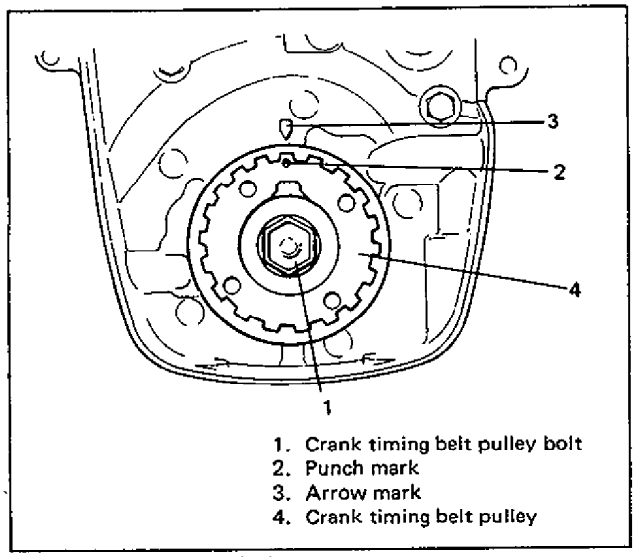


Fig. 6A-36 Timing Marks

5. Turn the crankshaft clockwise, fitting 17 mm wrench to crank timing belt pulley bolt, and align the punch mark on timing belt pulley with the arrow mark on oil pump as shown in Figure 6A-37.



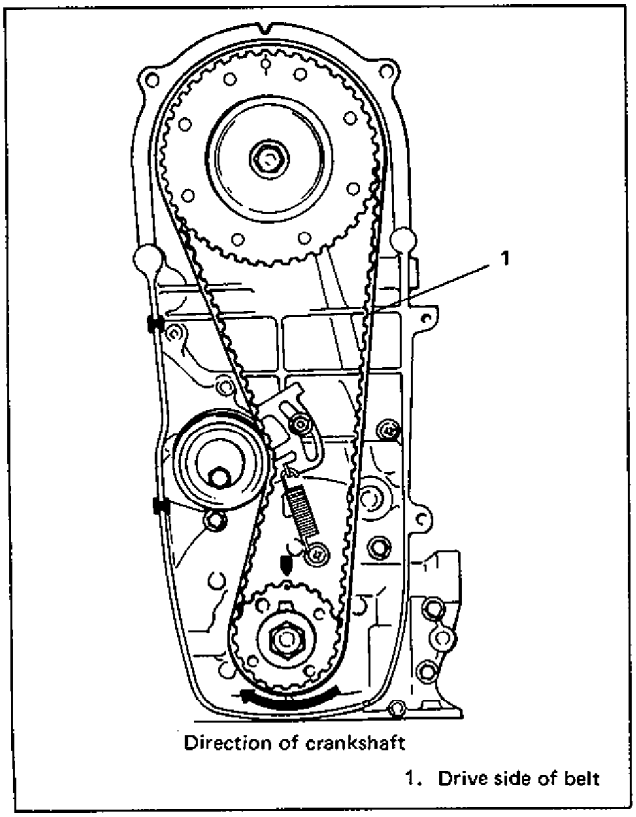
1. Crank timing belt pulley bolt
2. Punch mark
3. Arrow mark
4. Crank timing belt pulley

Fig. 6A-37 Timing Marks

6. With 4 marks aligned, install the timing belt on two pulleys in such a way that the drive side of belt is free of any slack, and with tensioner plate pushed up by finger.

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.**

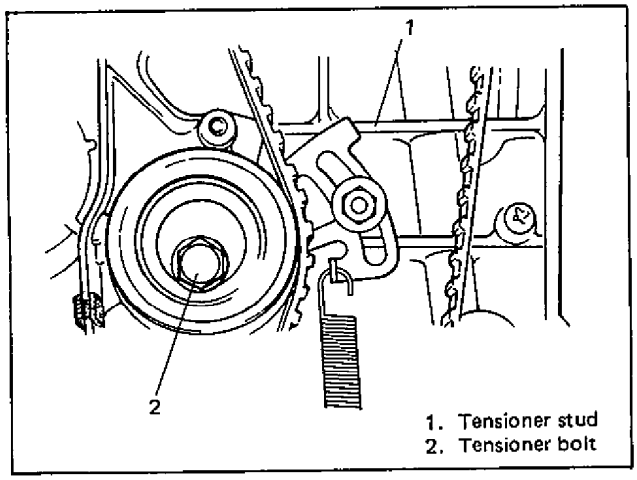


1. Drive side of belt

Fig. 6A-38 Installing Timing Belt

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 4 marks are matched.

	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	24 – 30	2.4 – 3.0	17.5 – 21.5



1. Tensioner stud
2. Tensioner bolt

Fig. 6A-39 Tensioner Bolt and Stud

7. Timing belt outside cover.
   Before installing, make sure that seal is between water pump and oil pump case and another between water pump and cylinder head.

	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 install crankshaft pulley. With crankshaft locked as shown in Figure 6A-29 or 6A-30, tighten crankshaft pulley bolts and timing belt pulley bolt.

	N·m	kg-m	lb-ft
Tightening torque for crankshaft pulley bolts	9 – 12	0.9 – 1.2	7.0 – 8.5
Tightening torque for timing belt pulley bolt	125 – 135	12.5 – 13.5	90.5 – 97.5

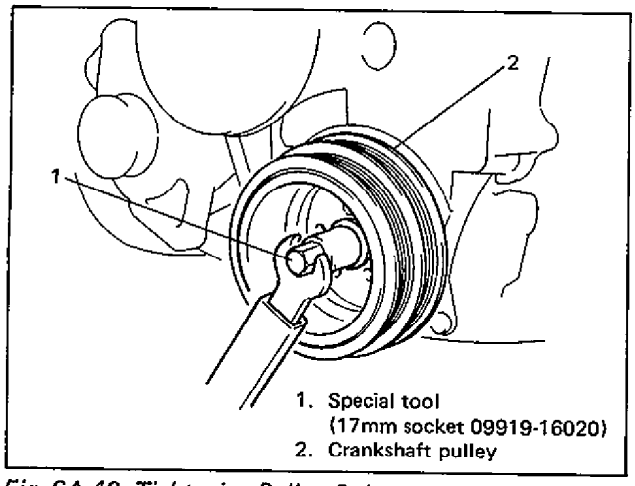


Fig. 6A-40 Tightening Pulley Bolt

9. Adjust intake and exhaust valve lashes.
   Refer to Section "Valve Lash" in this section for procedure to adjust valve lash.
10. Water pump pulley and water pump belt.
    Adjust the belt tension to the specification.
    Refer to Section "6B" for procedure to adjust the belt tension.
11. Cylinder head cover and air cleaner assembly.
12. Fender apron extension of right side.
13. Negative cable at battery.

OIL PAN AND OIL PUMP STRAINER

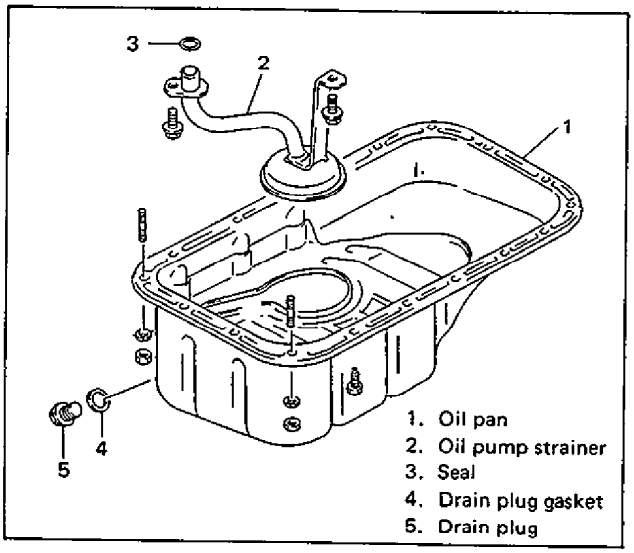


Fig. 6A-41 Oil Pan and Oil Pump Strainer

REMOVE OR DISCONNECT

1. Hoist car.
2. Drain engine oil by removing drain plug.

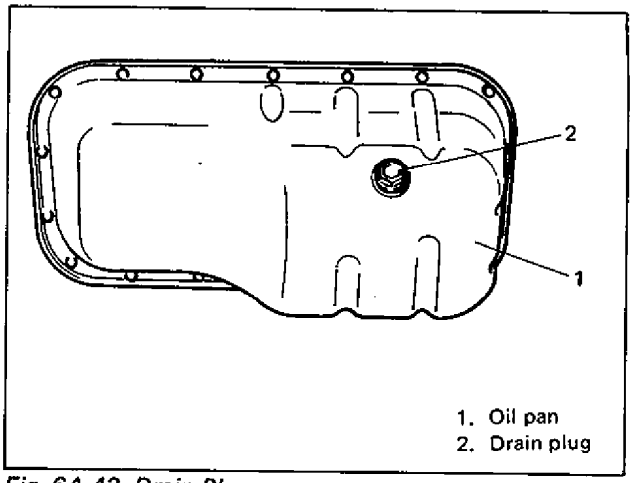


Fig. 6A-42 Drain Plug

3. Clutch housing (torque converter housing for A/T) lower plate.
4. Oil pan from cylinder block.
5. Oil pump strainer.

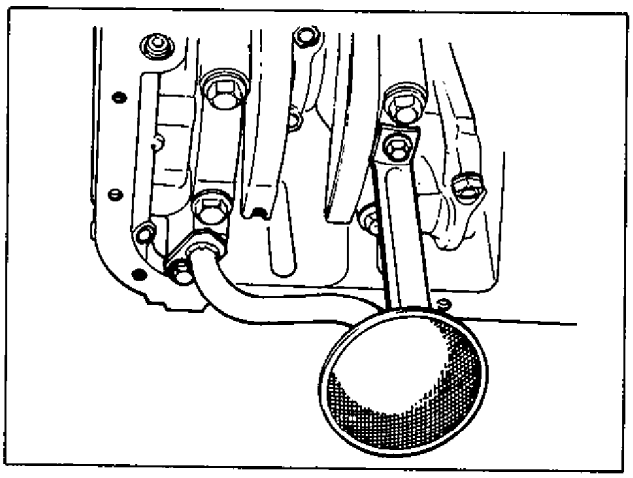


Fig. 6A-43 Oil Pump Strainer

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-44.
   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

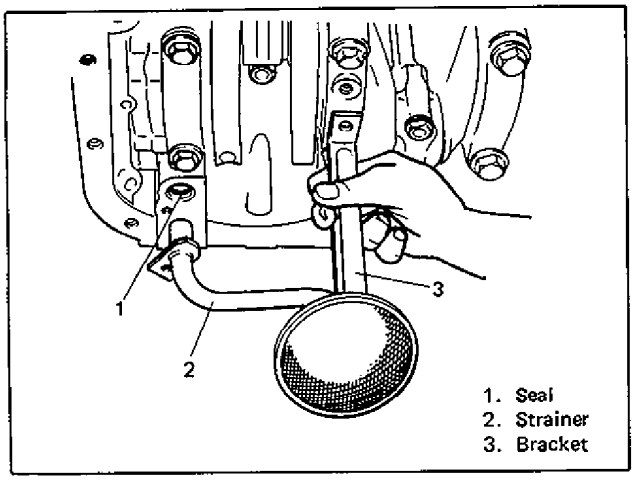


Fig. 6A-44 Installing Seal and Strainer

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-45.

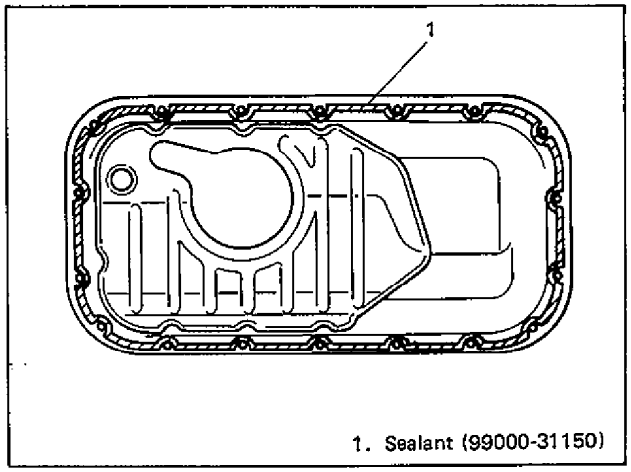


Fig. 6A-45 Applying Sealant to Oil Pan

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.

Tightening torque for drain plug	N·m	kg-m	lb-ft
	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, referring to item "ENGINE OIL CHANGE" in Section 0B.

OIL PUMP

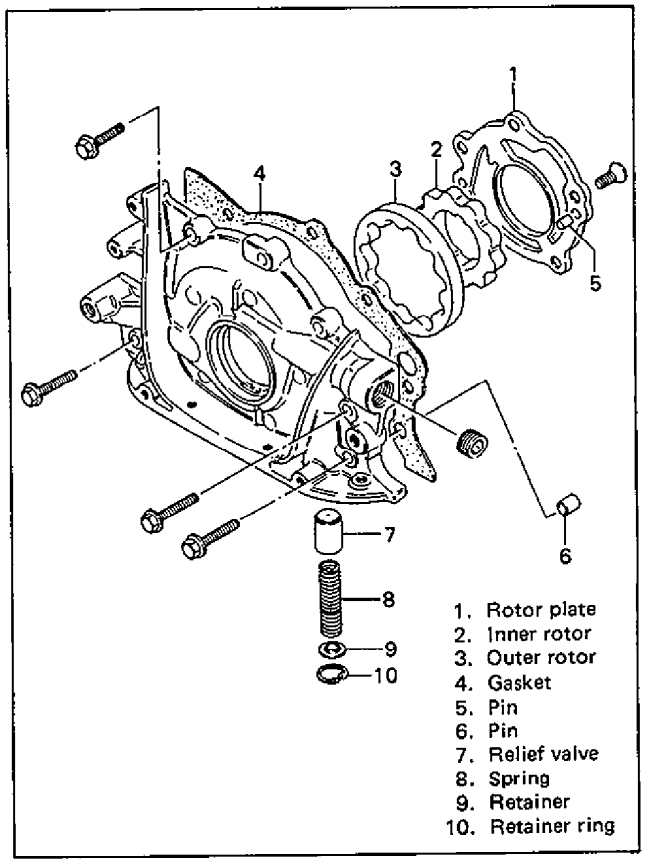


Fig. 6A-46 Oil Pump

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Hoist car.
3. Drain engine oil.
4. Water pump belt, pulley, generator and its bracket.
5. Crankshaft pulley, timing belt outside cover, timing belt and tensioner as previously outlined.
6. Engine oil level gauge.

7. Crankshaft timing belt pulley and timing belt guide.

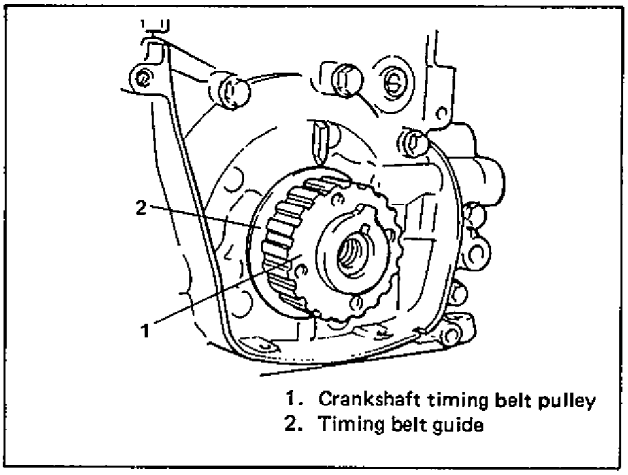


Fig. 6A-47 Crankshaft Timing Belt Pulley

8. Oil pan and oil pump strainer as previously outlined.
9. Oil pump assembly after removing 7 bolts securing pump.

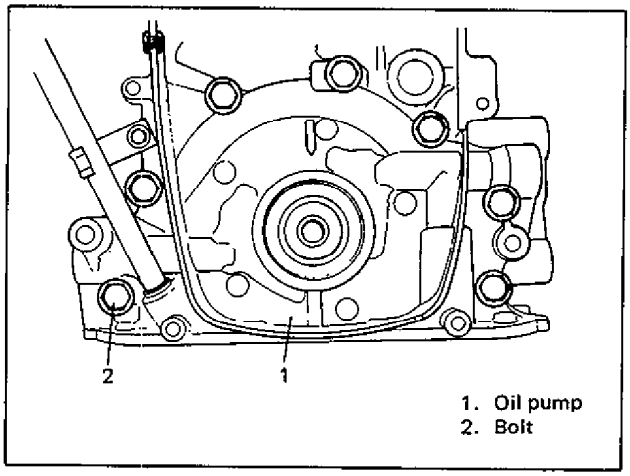


Fig. 6A-48 Oip Pump Assembly

DISASSEMBLE

1. Oil level gauge guide from oil pump.
   After removing guide bolt, pull out guide from oil pump.

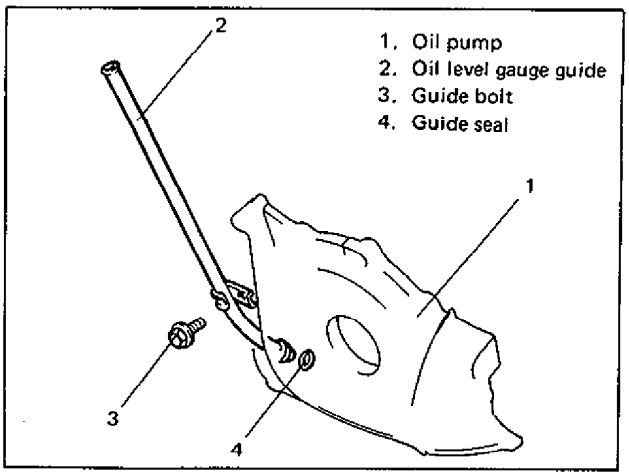


Fig. 6A-49 Oil Level Gauge Guide

2. Rotor plate:

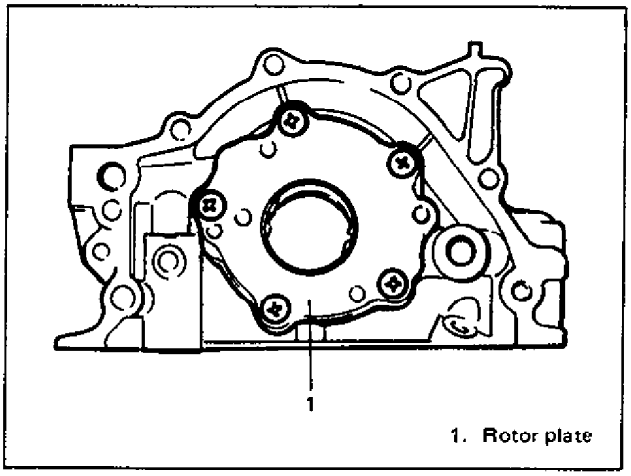


Fig. 6A-50 Rotor Plate

3. Outer rotor and inner rotor:

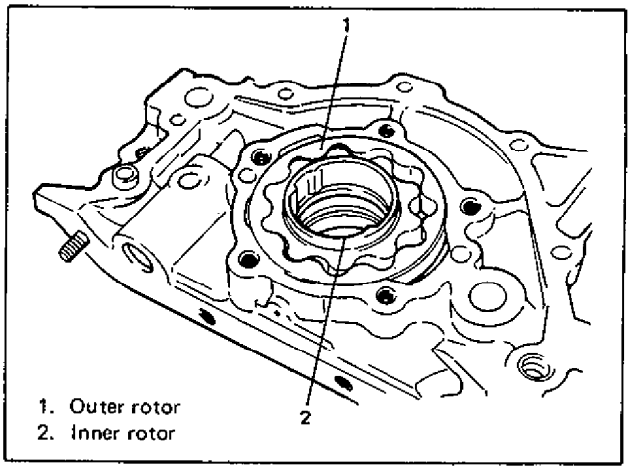


Fig. 6A-51 Outer Rotor and Inner Rotor

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.)

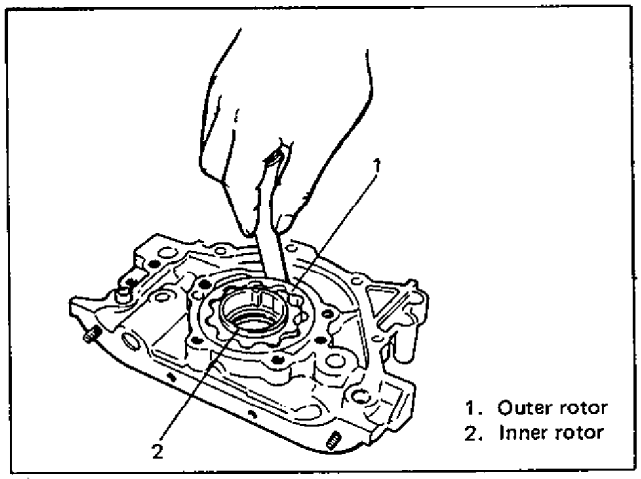


Fig. 6A-52 Measuring Radial Clearance

- **Side clearance**
  Using straight edge and thickness gauge, measure side clearance.

Limit on side clearance	0.15 mm (0.0059 in.)

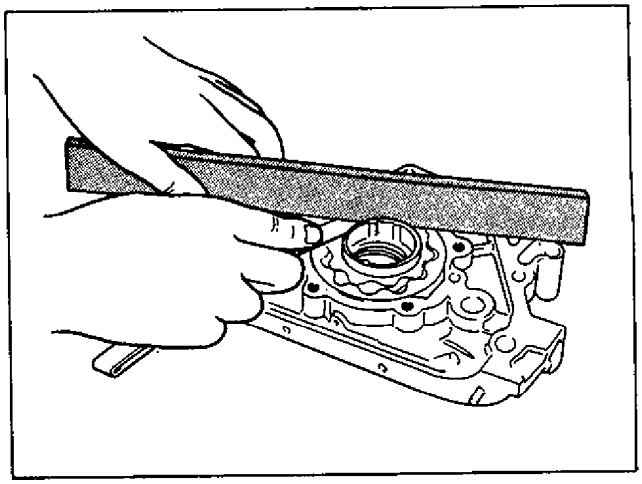


Fig. 6A-53 Measuring Side Clearance

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.
   Refer to Fig. 6A-49 for guide seal.

INSTALL OR CONNECT

1. Two oil pump pins and oil pump gasket to cylinder block.
   Use a new gasket.

2. To prevent oil seal lip from being damaged or upturned when installing oil pump to crankshaft, fit special tool (Oil seal guide) to crankshaft, and apply engine oil to special tool.

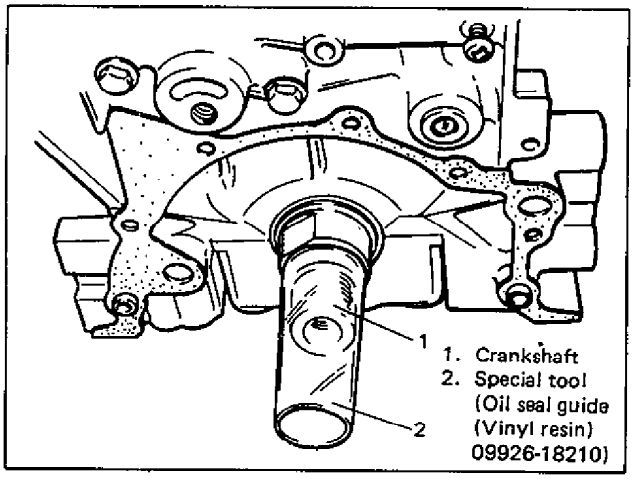


Fig. 6A-54 Special Tool (Oil Seal Guide) Installation

3. Oil pump to crankshaft and cylinder block:
Among 7 oil pump bolts, 4 No. 1 bolts are shorter than 3 No. 2 bolts in length. Install the No. 1 and No. 2 bolts at the location shown in Figure 6A-55, and tighten them to the specified torque.
After installing oil pump, check to be sure that the oil seal lip is not upturned, and then remove the special tool.

Tightening torque for oil pump bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

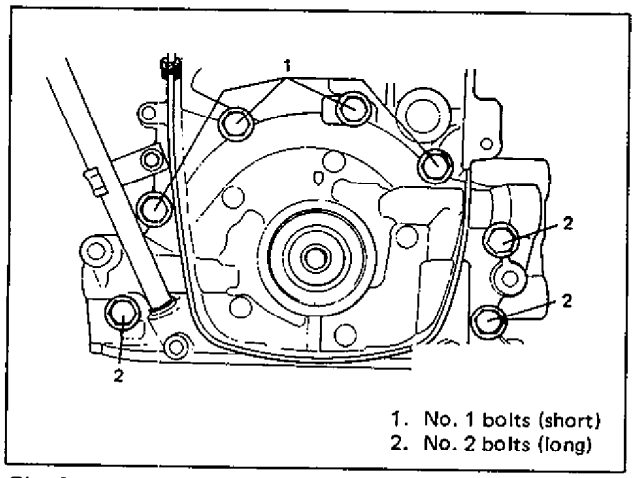


Fig. 6A-55 Oil Pump Bolts

4. Rubber seal between oil pump and water pump.

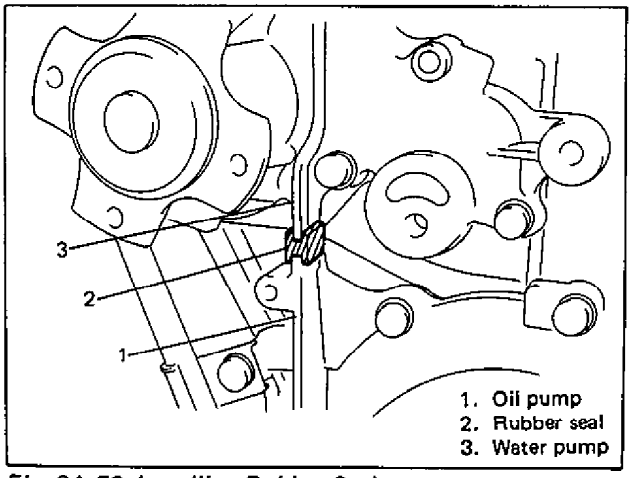


Fig. 6A-56 Installing Rubber Seal

5. 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.

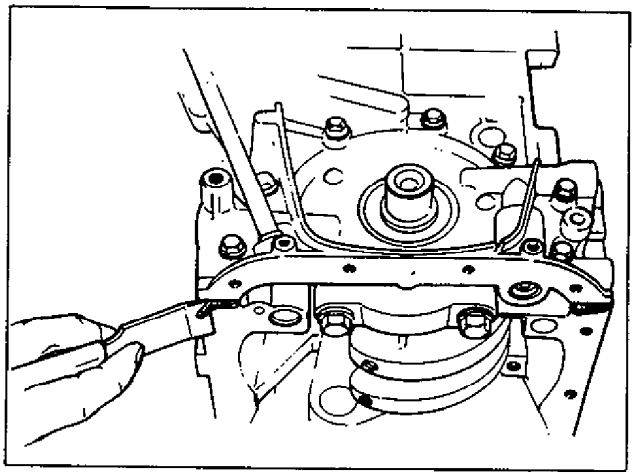


Fig. 6A-57 Cutting Edge of Gasket

6. Timing belt guide, key, and crankshaft timing belt pulley.
Refer to Fig. 6A-58 for proper installation of these parts.
Install timing belt guide in such a way that its concave side faces oil pump.
With crankshaft locked, tighten crankshaft timing belt pulley bolt to specified torque.

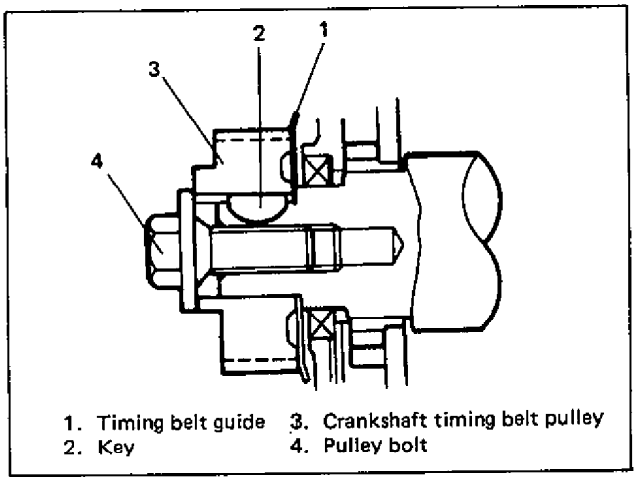


Fig. 6A-58 Installing Guide, Key and Pulley

7. Timing belt, tensioner, and other parts as previously outlined.
8. Adjust intake and exhaust valve lashes.
9. Adjust water pump belt tension.
10. Refill engine oil.
11. Negative cable at battery.
12. After completing installation, check oil pressure by running engine.

ROCKER ARMS, ROCKER ARM SHAFTS AND CAMSHAFT

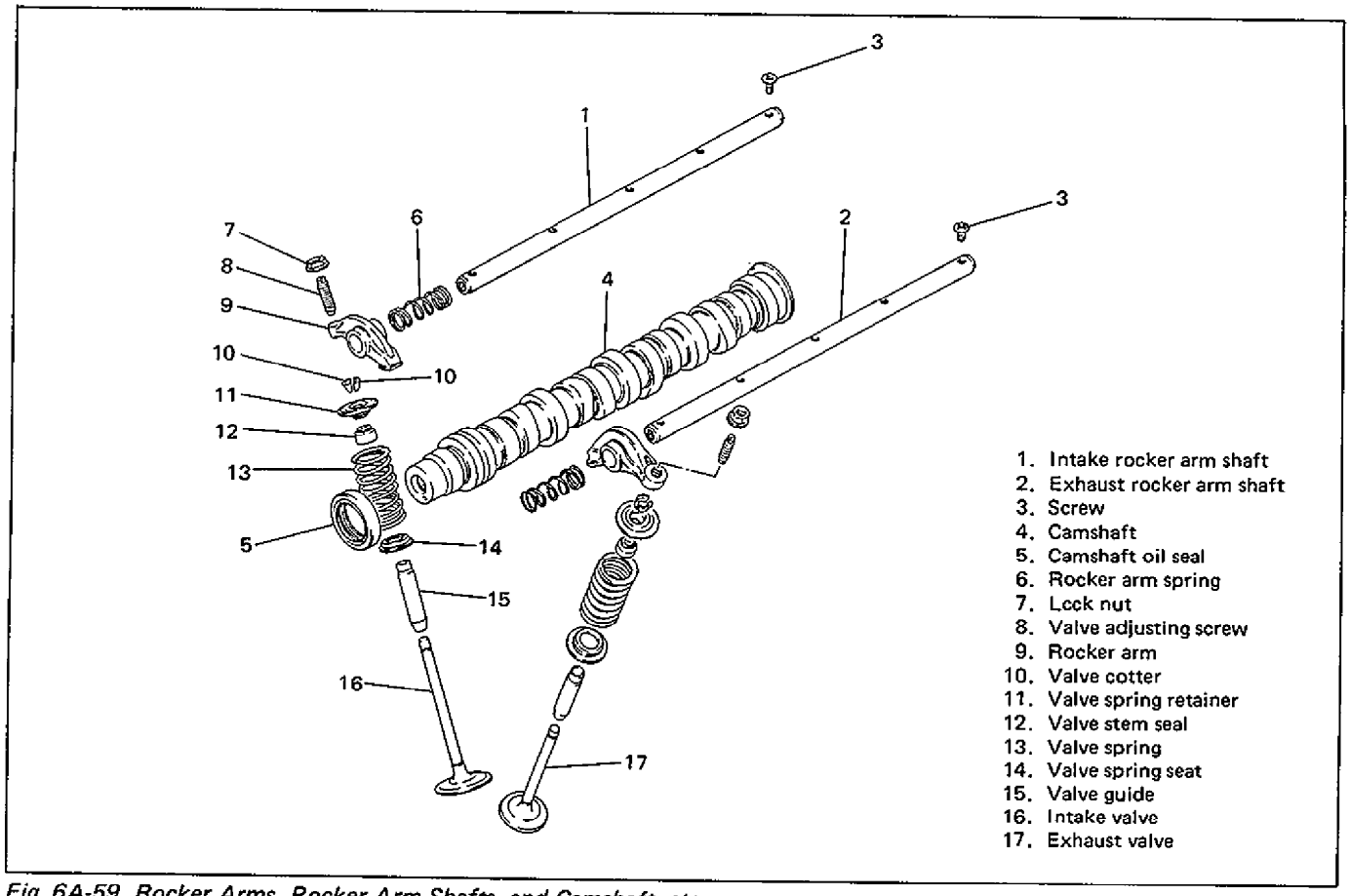


Fig. 6A-59 Rocker Arms, Rocker Arm Shafts, and Camshaft, etc.

Remove or disconnect

1. Negative cable at battery and battery.
2. Cylinder head cover as previously outlined.
3. Distributor 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.
5. Rocker arm shaft screws.

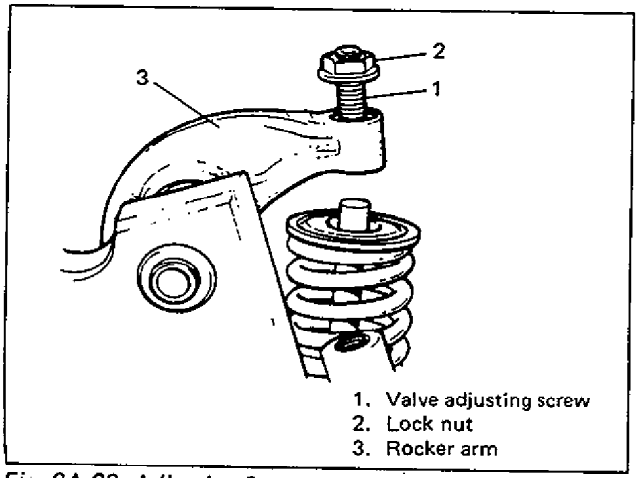


Fig. 6A-60 Adjusting Screw and Lock Nut

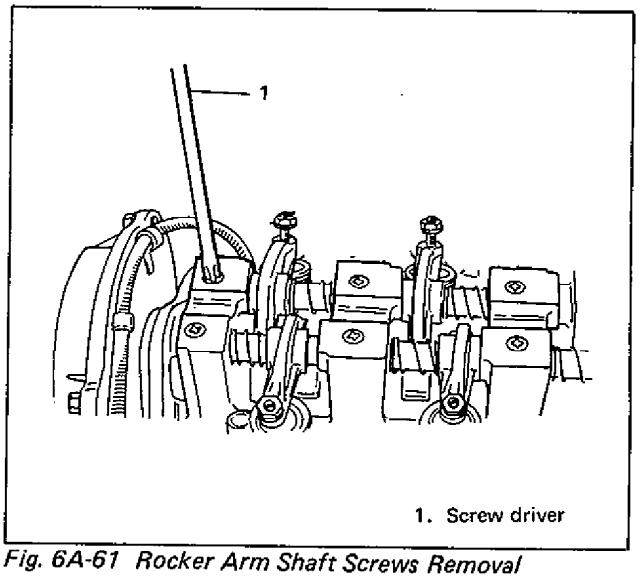


Fig. 6A-61 Rocker Arm Shaft Screws Removal

6. Intake and exhaust rocker arm shafts, and then, rocker arms and springs.

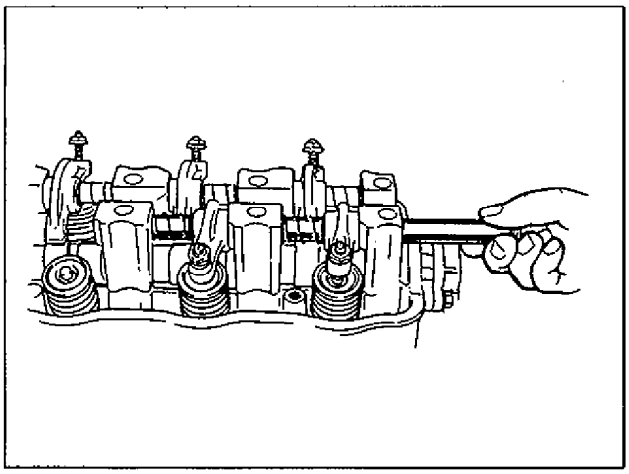


Fig. 6A-62 Rocker Arm Shaft Removal

7. Crankshaft pulley, timing belt outside cover and timing belt as previously outlined.
8. Camshaft timing belt pulley.
   Insert propersize rod into hole of camshaft to lock camshaft, and loosen pulley bolt.

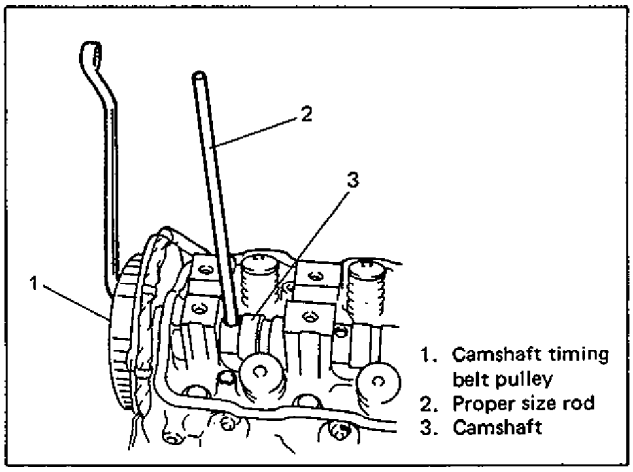


Fig. 6A-63 Locking Camshaft

9. Distributor case from cylinder head.

10. Camshaft from cylinder head.

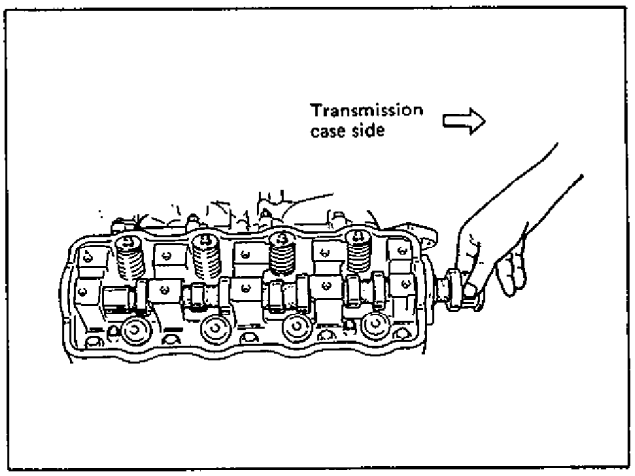


Fig. 6A-64 Camshaft Removal

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.

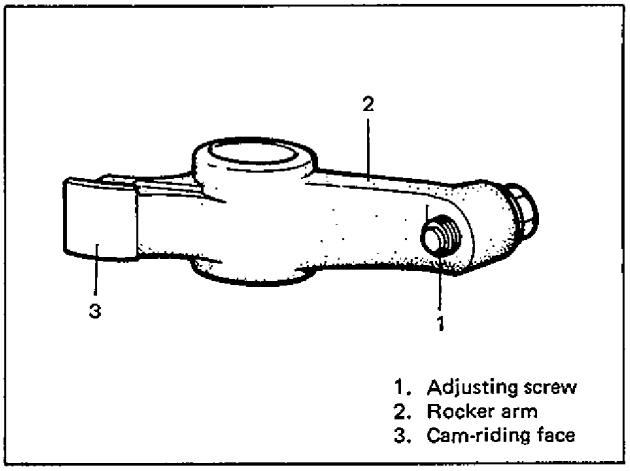


Fig. 6A-65 Adjusting Screw and Rocker Arm

- **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	0.12 mm (0.004 in.)

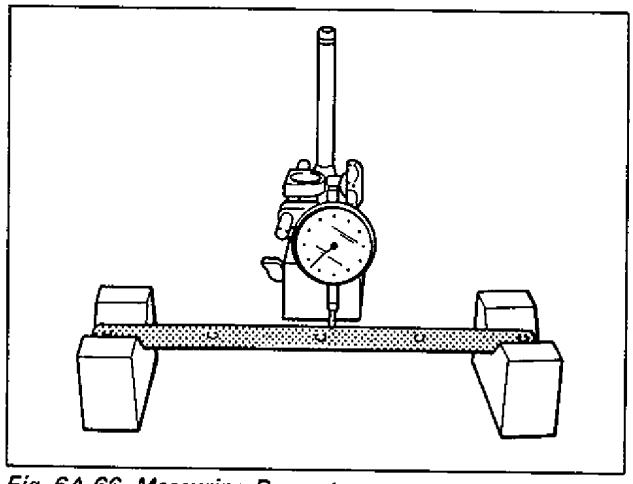


Fig. 6A-66 Measuring Runout

- **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.	16.000 – 16.018 mm (0.629 – 0.630 in.)	–
Rocker arm Shaft dia.	15.973 – 15.988 mm (0.628 – 0.629 in.)	–
Arm-to-Shaft clearance	0.012 – 0.045 mm (0.0005 – 0.0017 in.)	0.09 mm (0.0035 in.)

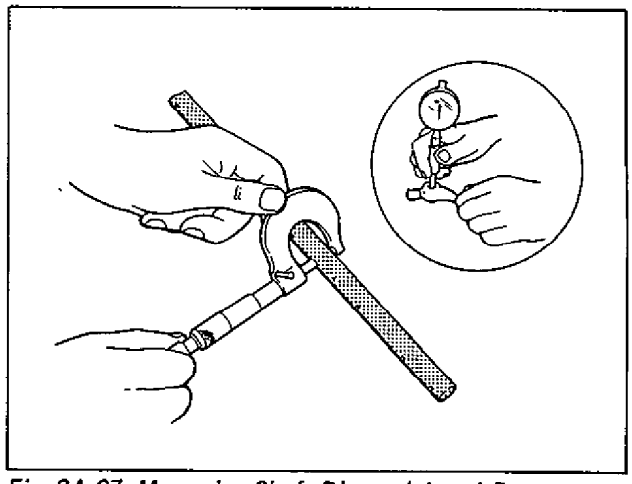


Fig. 6A-67 Measuring Shaft Dia. and Arm I.D.

- **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	38.136 mm (1.5014 in.)	38.036 mm (1.4975 in.)
Exhaust cam	38.136 mm (1.5014 in.)	38.036 mm (1.4975 in.)

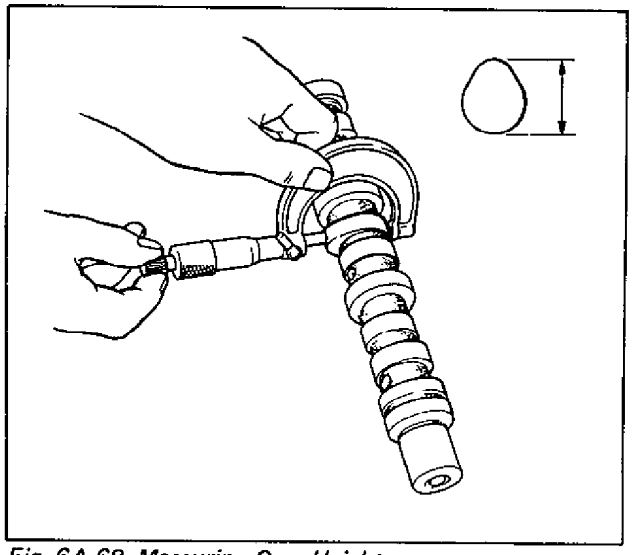


Fig. 6A-68 Measuring Cam Height

- **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.)

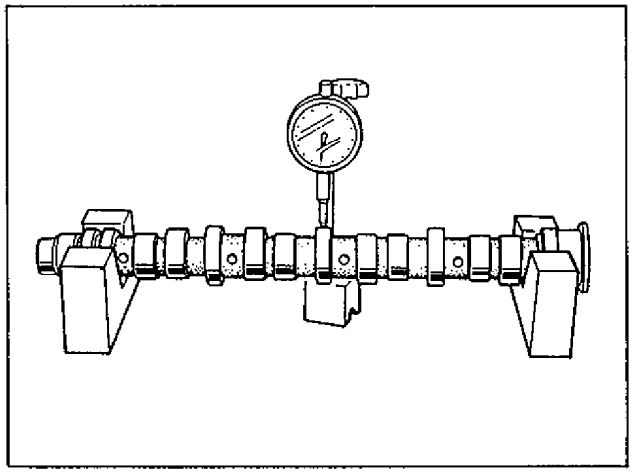


Fig. 6A-69 Camshaft Runout Measurement

- **Camshaft journal wear.**
  Measure the journal diameter in two directions at four places to obtain four readings on each journal (Figure 6A-70), and measure the journal bores in cylinder head with a bore gauge, producing four readings on each (Figure 6A-71).
  Subtract the journal diameter measurement from the journal bore measurement to determine the journal clearance.
  If the journal clearance exceeds the limit, replace the camshaft, and as necessary, cylinder head, too.

	Standard	Limit
Journal clearance limit	0.050 – 0.091 mm (0.0020 – 0.0036 in.)	0.15 mm (0.0059 in.)

	Camshaft journal dia.	Journal bore dia.
Ⓐ	44.125 – 44.150 mm (1.7372 – 1.7381 in.)	44.200 – 44.216 mm (1.7402 – 1.7407 in.)
Ⓑ	44.325 – 44.350 mm (1.7451 – 1.7460 in.)	44.400 – 44.416 mm (1.7480 – 1.7486 in.)
Ⓒ	44.525 – 44.550 mm (1.7530 – 1.7539 in.)	44.600 – 44.616 mm (1.7560 – 1.7565 in.)
Ⓓ	44.725 – 44.750 mm (1.7609 – 1.7618 in.)	44.800 – 44.816 mm (1.7638 – 1.7644 in.)
Ⓔ	44.925 – 44.950 mm (1.7687 – 1.7697 in.)	45.000 – 45.016 mm (1.7716 – 1.7723 in.)

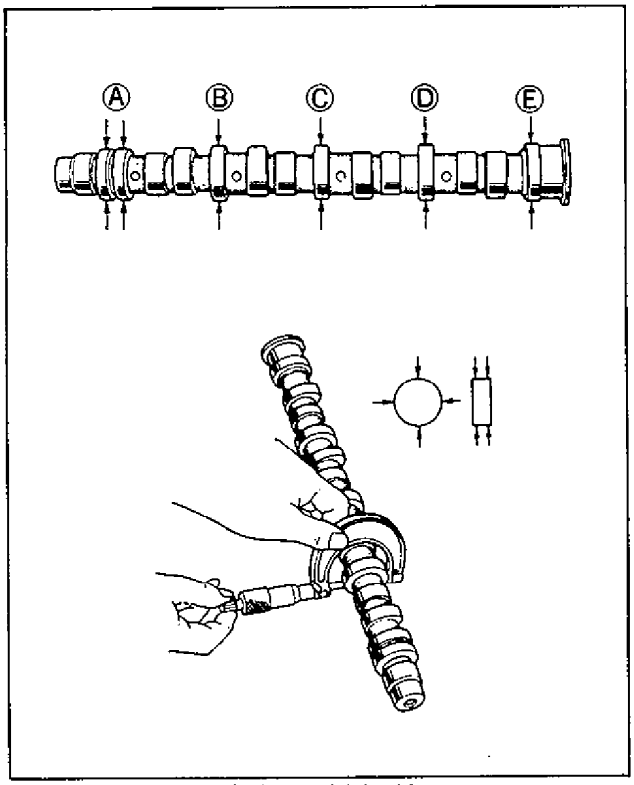


Fig. 6A-70 Camshaft Journal Dia. Measurement

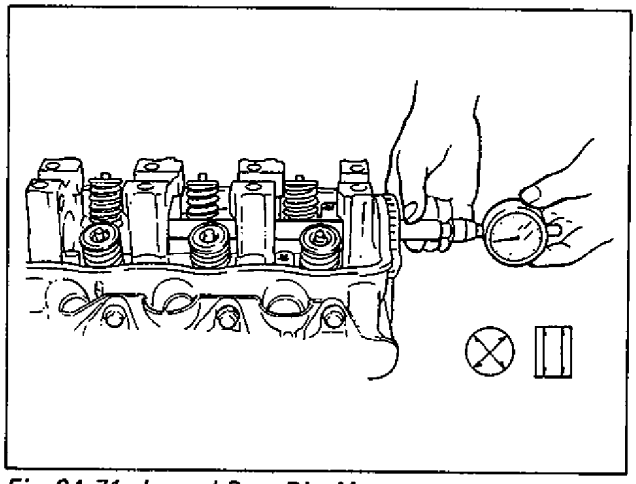


Fig. 6A-71 Journal Bore Dia. Measurement

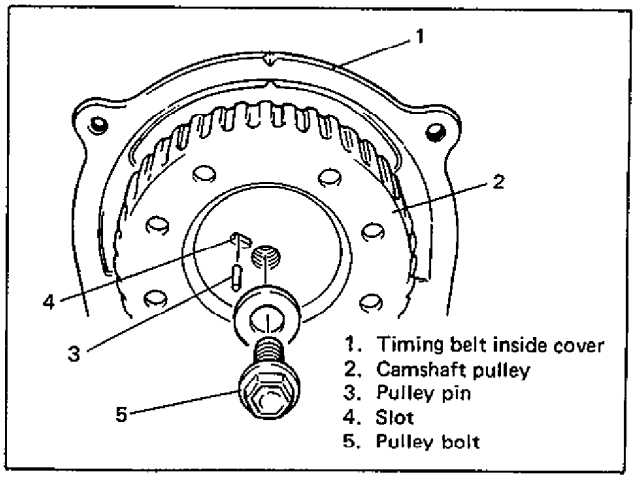


Fig. 6A-73 Pulley Pin, Slot and Pulley Bolt

Install or connect

1. Apply engine oil to cams and journals on camshaft, and oil seal on cylinder head.
2. Camshaft to cylinder head from transmission case side.

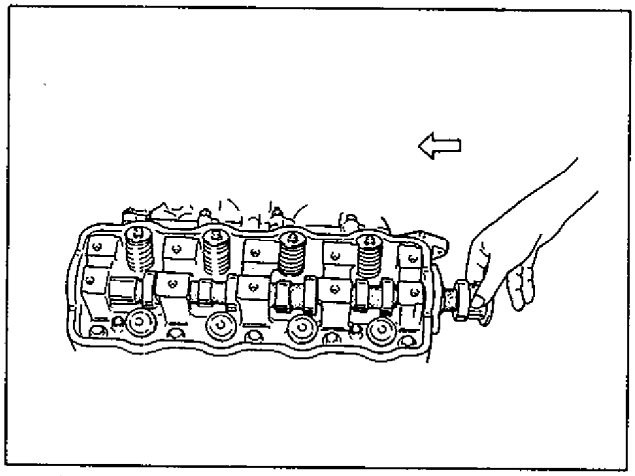


Fig. 6A-72 Camshaft Installation

3. Distributor case to cylinder head.
   Use a new gasket.
4. Camshaft timing belt pulley.
   Fit pulley pin on camshaft into slot on camshaft pulley. With camshaft locked, tighten the pulley bolt to the specified torque.

Tightening torque for pulley bolt	56 – 64 N·m 5.6 – 6.4 kg-m 41.0 – 46.0 lb-ft

5. Apply engine oil to rocker arms and rocker arm shafts.
6. Rocker arms, springs and rocker arm shafts.
   The two rocker arm shafts are different.
   To distinguish between the two, the dimensions of their stepped ends differ as shown in Figure 6A-74. Install the intake rocker arm shaft, facing its stepped end to camshaft pulley side, and the exhaust rocker arm shaft, facing its stepped end to distributor side.

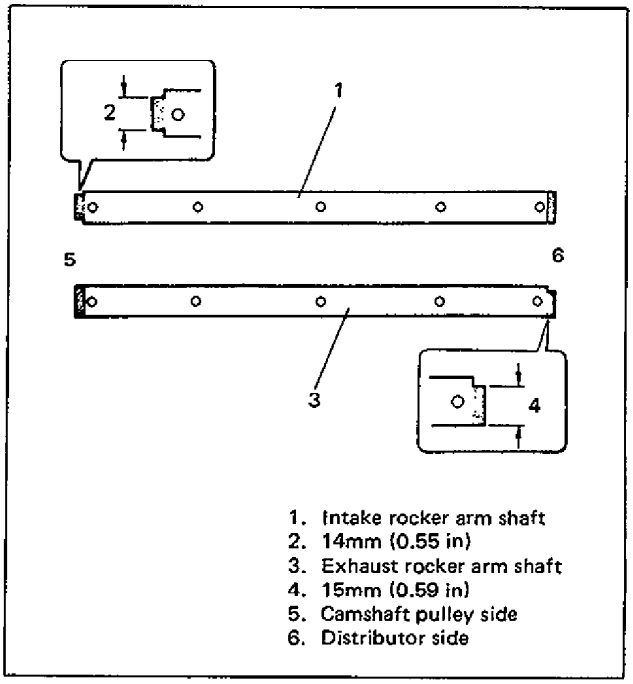


Fig. 6A-74 Rocker Amr Shafts Installation

7. After installing rocker arms springs, and rocker arm shafts as shown in Figure 6A-75, tighten the rocker arm shaft screws to the specified torque.

Tightening torque for rocker arm shaft screws	9 – 12 N·m 0.9 – 1.2 kg-m 7.0 – 8.5 lb-ft

8. Distributor to camshaft and its case.
   Refer to section 6F for installation.
9. Belt tensioner, timing belt, outside cover, crankshaft pulley and water pump belt, etc., as previously outlined.
10. Adjust all intake and exhaust valve lashes as previously outlined.
11. Cylinder head cover and air cleaner assembly.
12. Negative cable at battery.
13. Adjust ignition timing.
    Refer to section 6F for adjustment.

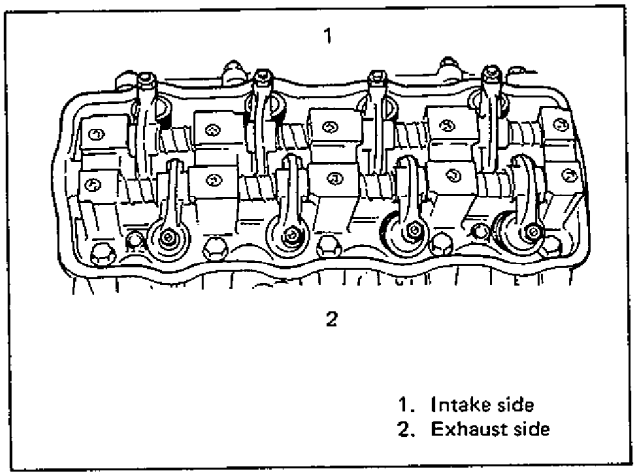


Fig. 6A-75 Rocker Arms, Springs, Rocker Arm Shafts and Screws Installation

VALVES AND CYLINDER HEAD

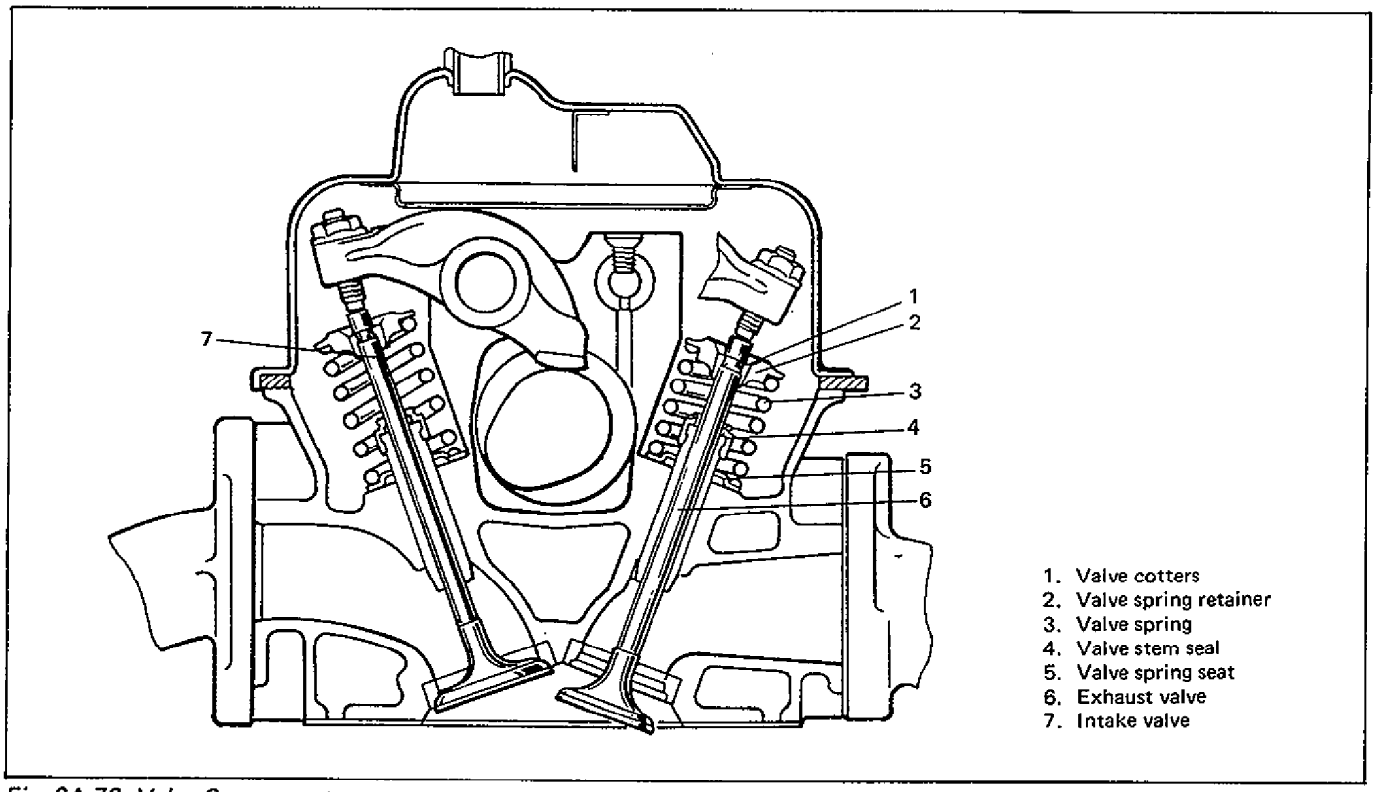


Fig. 6A-76 Valve Components

Remove or disconnect

1. Negative cable at battery.
2. Drain coolant.
3. Air cleaner, cylinder head cover and distributor.
4. Accelerator cable at carburetor.
5. Vacuum hoses and coolant hoses from carburetor and intake manifold.
6. Electric lead wires at carburetor and intake manifold.
7. Fuel feed and return hoses.
8. Second air pipe. (if equipped)
9. Crankshaft pulley, timing belt outside cover, timing belt tensioner and timing belt as previously outlined.
10. Exhaust No. 1 pipe from exhaust manifold.
11. Loosen all valve adjusting screw lock nuts and turn adjusting screws back all the way to allow all valves to close.
12. Cylinder head bolts.
13. Cylinder head with the carburetor, intake manifold and exhaust manifold.

DISASSEMBLY

1. For ease in servicing cylinder head, remove intake manifold with carburetor and exhaust manifold from cylinder head.
2. Remove camshaft timing belt pulley, timing belt inside cover, rocker arm shafts, rocker arms, springs and camshaft as previously outlined.
3. Using special tool (Valve lifter), compress the valve springs and then remove valve cotters by using special tool (Forceps).
   Refer to Figure 6A-77 and 6A-78.

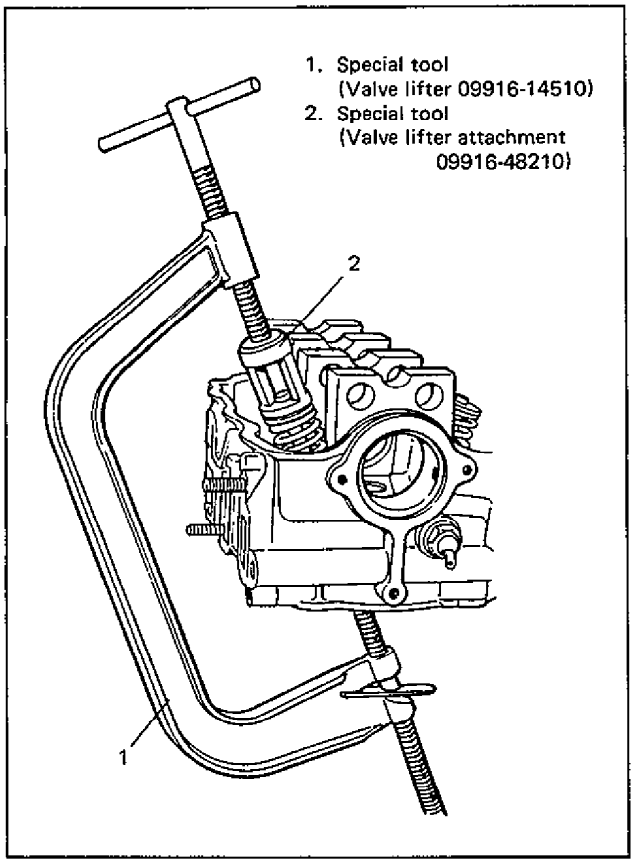


Fig. 6A-77 Special Tool (Valve Lifter) Installation

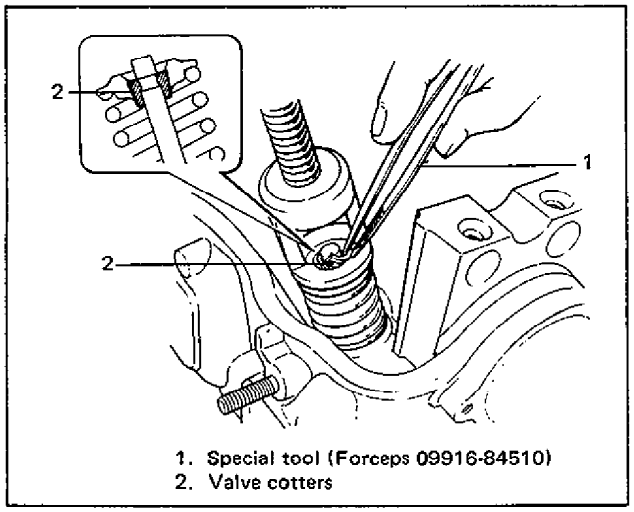


Fig. 6A-78 Special Tool (Forceps) and Valve Cotters

4. Release the special tool, and remove spring retainer and valve spring.
5. Remove valve from combustion chamber side.
6. 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.

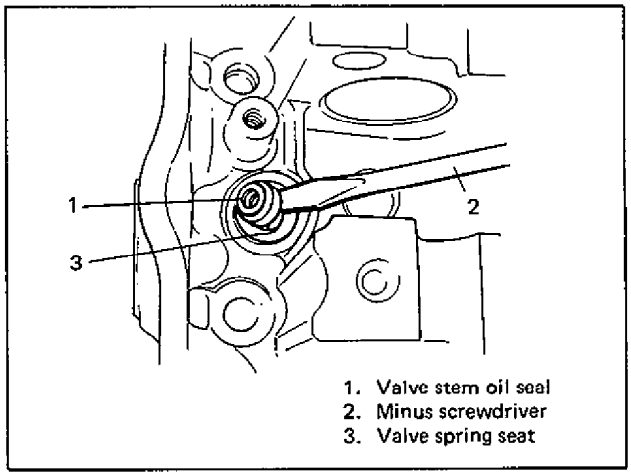


Fig. 6A-79 Valve Stem Oil Seal Removal

7. Using special tool (Valve guide remover), drive the valve guide out from combustion chamber side to valve spring side (Figure 6A-80).

NOTE:
Do not reuse the valve guide disassembled. Be sure to use new valve guide (Oversize) when assembling.

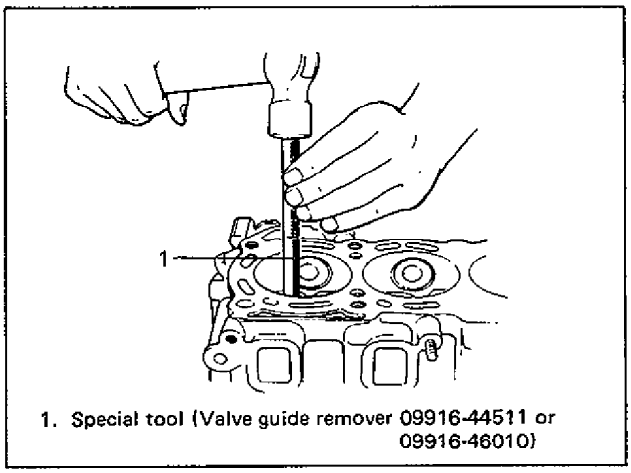


Fig. 6A-80 Valve Guide Removal

8. 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	6.965 – 6.980 mm (0.2742 – 0.2748 in.)	–
	Ex	6.950 – 6.965 mm (0.2737 – 0.2742 in.)	–
Valve guide I. D.	In	7.000 – 7.015 mm (0.2756 – 0.2761 in.)	–
	Ex	7.000 – 7.015 mm (0.2756 – 0.2761 in.)	–
Stem-to-guide clearance	In	0.020 – 0.050 mm (0.0008 – 0.0019 in.)	0.07 mm (0.0027 in.)
	Ex	0.035 – 0.065 mm (0.0014 – 0.0025 in.)	0.09 mm (0.0035 in.)

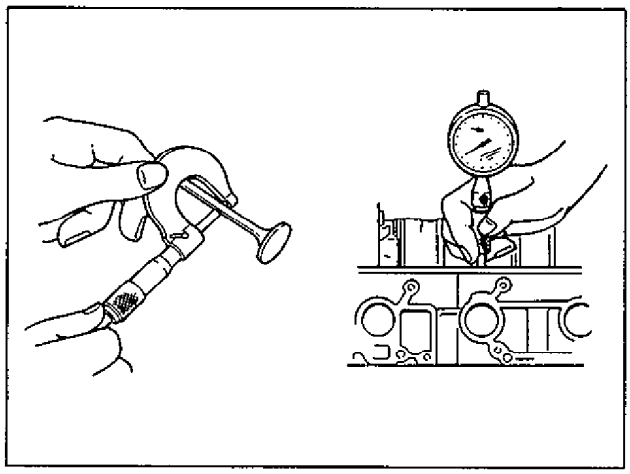


Fig. 6A-81 Valve Stem Dia. and Valve Guide I.D. Measurement

If bore gauge is not available, check end deflection of valve stem in place with a dial gauge rigged.

Move stem end in the directions ① and ② to measure the end deflection.

If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit	In	0.14 mm (0.005 in.)
	Ex	0.18 mm (0.007 in.)

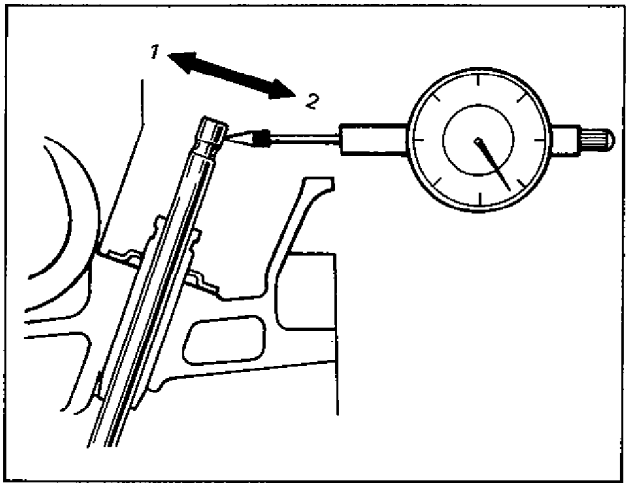
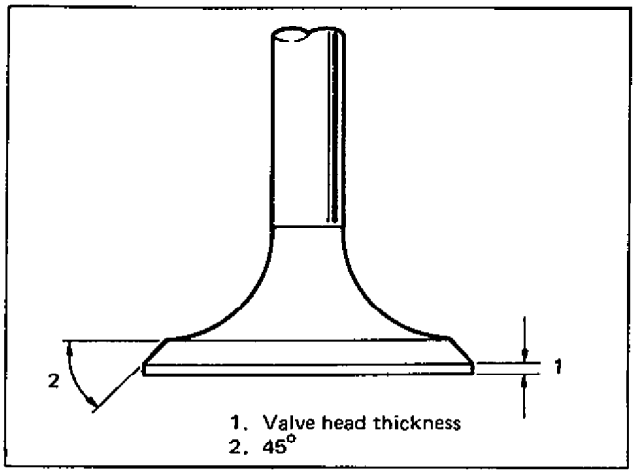


Fig. 6A-82 Valve Stem end Deflection Measurement

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	
1.0 mm (0.039 in.)	In	0.6 mm (0.023 in.)
	Ex	0.7 mm (0.027 in.)



1. Valve head thickness
2. 45°

Fig. 6A-83 Valve head Thickness

- Check end face of each valve stem for wear. This face meets rocker arm intermittently in operation, and might become concaved or otherwise irregular. As necessary, smoothen end face with an oil stone and, if this grinding removes end stock by as much as 0.5 mm (0.0196 in.) (as measured from the original face), replace valve.

Limit on stock allowance of valve stem end face	0.5 mm (0.019 in.)

- 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.)

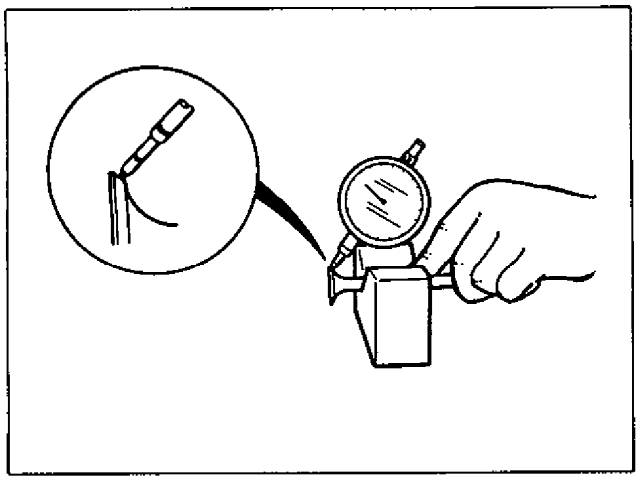


Fig. 6A-84 Radial Runout Measurement

- 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	1.3 – 1.5 mm (0.0512 – 0.0590 in.)
	Ex	

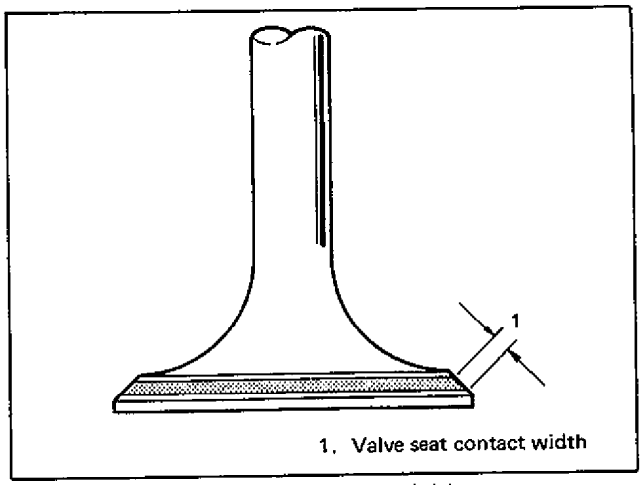


Fig. 6A-85 Valve Seating Contact Width

- 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 seat cutters to make three cuts in order illustrated in Figure 6A-87. Three cutters must be used: the first for making the 15° angle, the second for making the 75° angle and the last for making the 45° seat angle. The third cut must be made to produce desired seat width.

Seat width for exhaust valve seat	1.3 – 1.5 mm (0.0512 – 0.0590 in.)

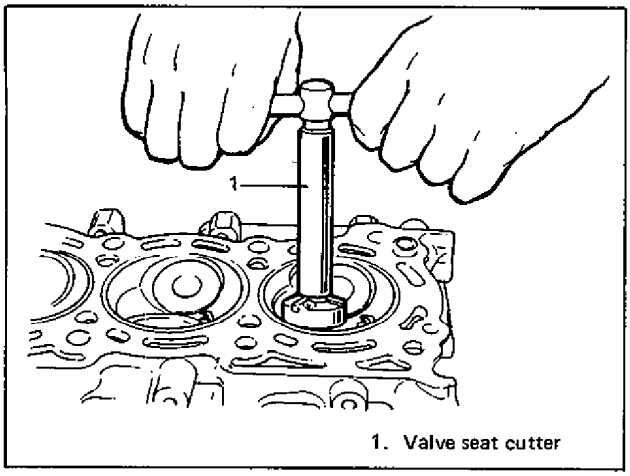


Fig. 6A-86 Valve Seat Cutting

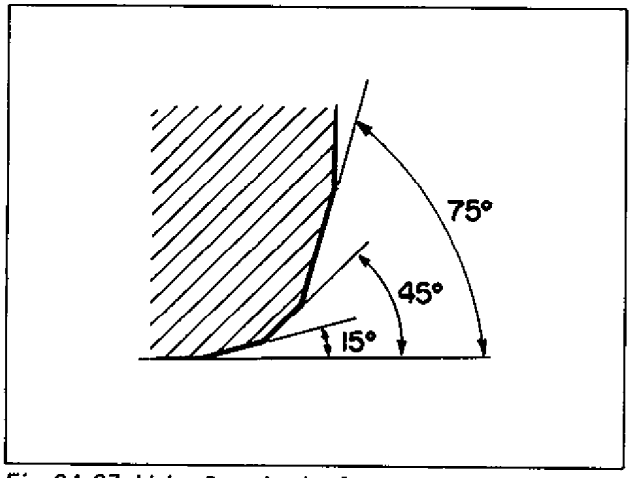


Fig. 6A-87 Valve Seat Angles for Exhaust Valve

2. INTAKE VALVE SEAT: The cutting sequence is the same as for exhaust valve seats but the second angle (60°) differs.

Seat width for intake valve seat	1.3 – 1.5 mm (0.0512 – 0.0590 in.)

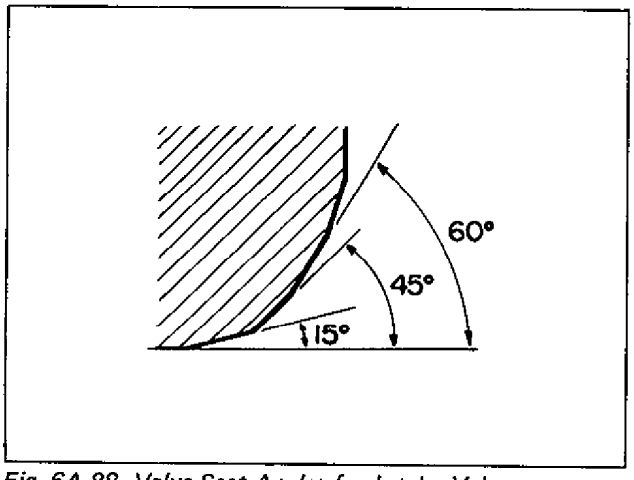


Fig. 6A-88 Valve Seat Angles for Intake Valve

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.)

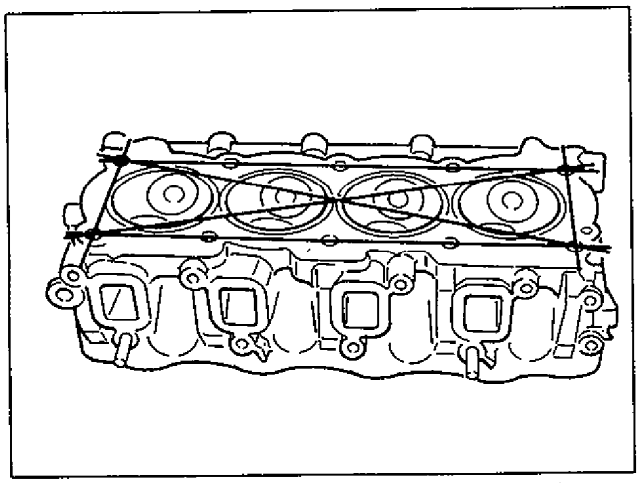


Fig. 6A-89 Locations for Measurement of Distortion

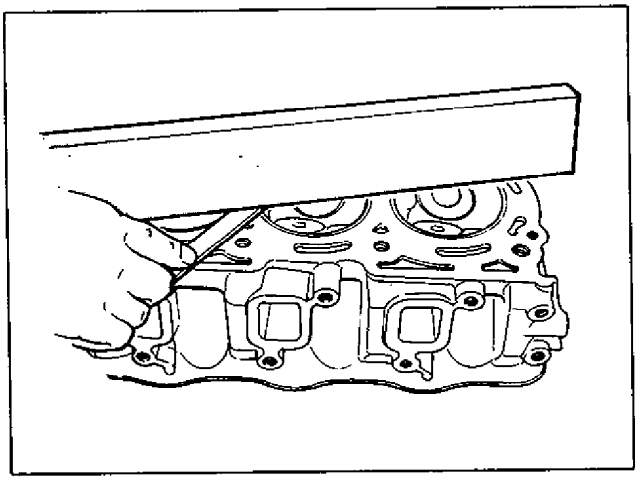


Fig. 6A-90 Surface Measurement

- 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.)

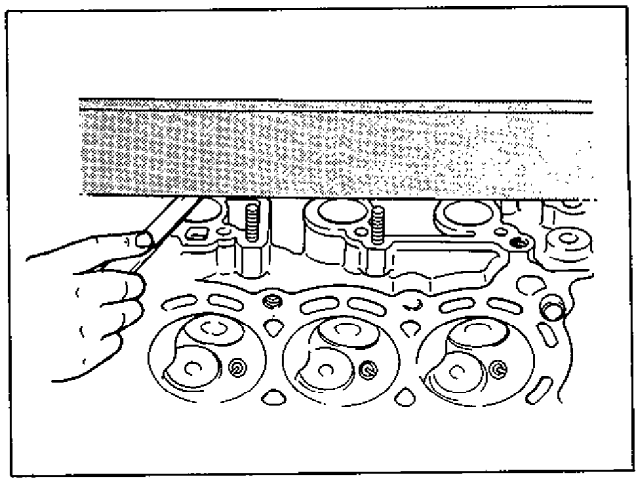


Fig. 6A-91 Measuring Surface of Intake Manifold Seating Face

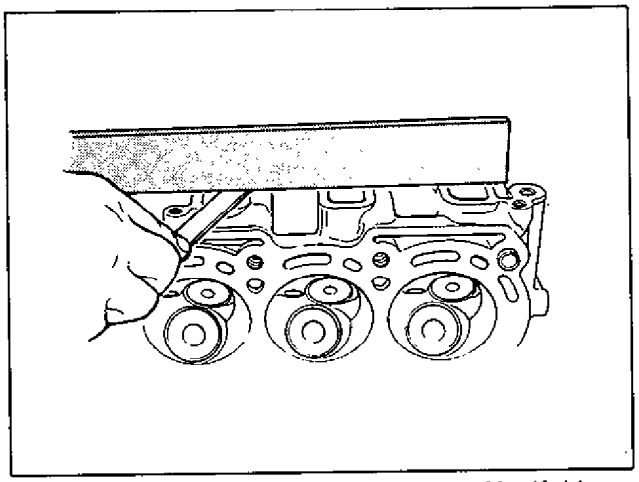


Fig. 6A-92 Measuring Surface of Exhaust Manifold Seating Face

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	49.3 mm (1.9409 in.)	48.1 mm (1.8937 in.)
Valve spring preload	24.8 – 29.2 kg for 41.5 mm (54.7 – 64.3 lb/ 1.63 in)	22.8 kg for 41.5 mm (50.2 lb/ 1.63 in)

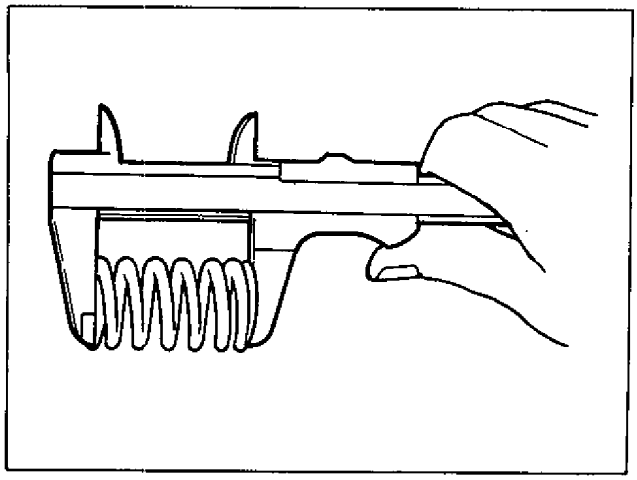


Fig. 6A-93 Measuring Free Length of Spring

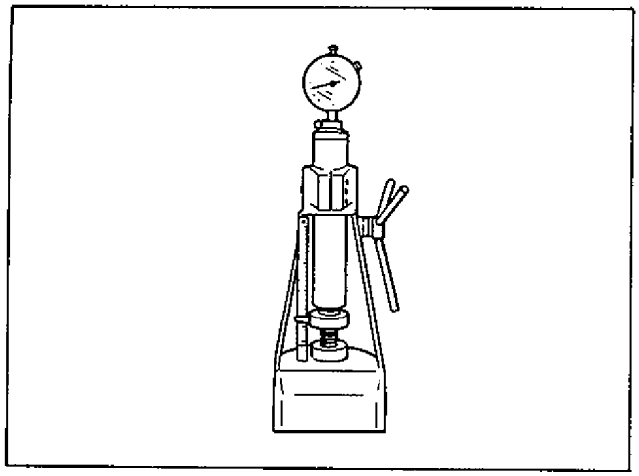


Fig. 6A-94 Measuring Spring Preload

- 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.)

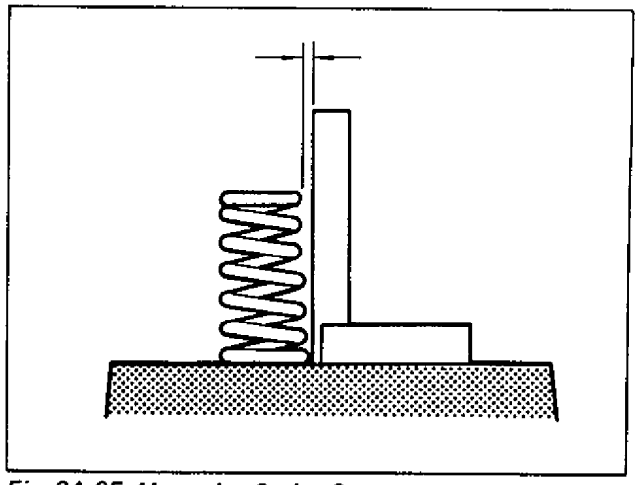


Fig. 6A-95 Measuring Spring Squareness

ASSEMBLY

1. Before installing valve guide into cylinder head, ream guide hole with special tool (12 mm reamer) to remove burrs and make it truly round.

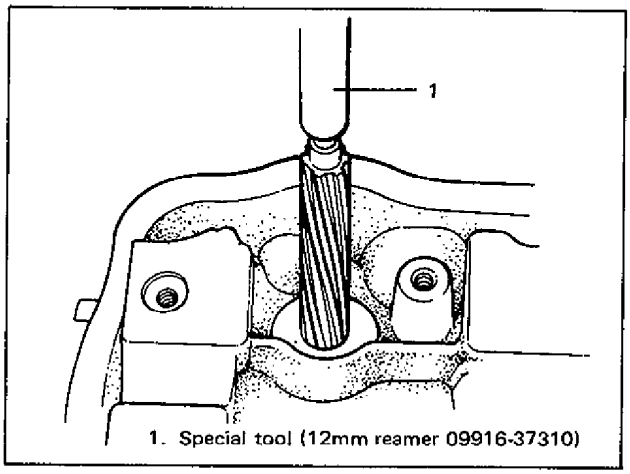
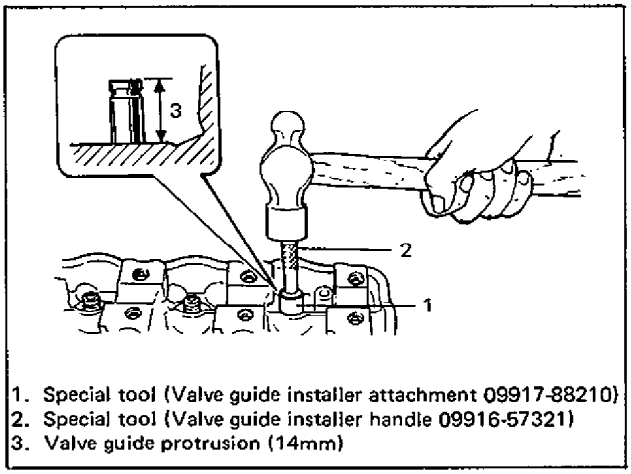


Fig. 6A-96 Reaming Guide Hole

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. Refer to Fig. 6A-97.
   Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head.
   After installing, make sure that valve guide protrudes by 14 mm (0.55 in.) from cylinder head (Fig. 6A-97).

NOTE:
- **Do not reuse valve guide once disassembled. Install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

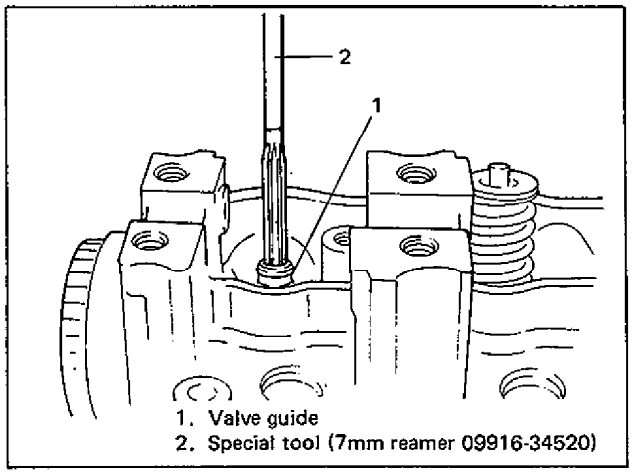
Valve guide oversize	0.03 mm (0.0012 in.)
Valve guide protrusion (In and Ex)	14 mm (0.55 in.)



1. Special tool (Valve guide installer attachment 09917-88210)
2. Special tool (Valve guide installer handle 09916-57321)
3. Valve guide protrusion (14mm)

Fig. 6A-97 Valve Guide Installation

3. Ream valve guide bore with special tool (7 mm reamer).
   After reaming, clean the bore.



1. Valve guide
2. Special tool (7mm reamer 09916-34520)

Fig. 6A-98 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 09917-98210)
2. Valve stem seal

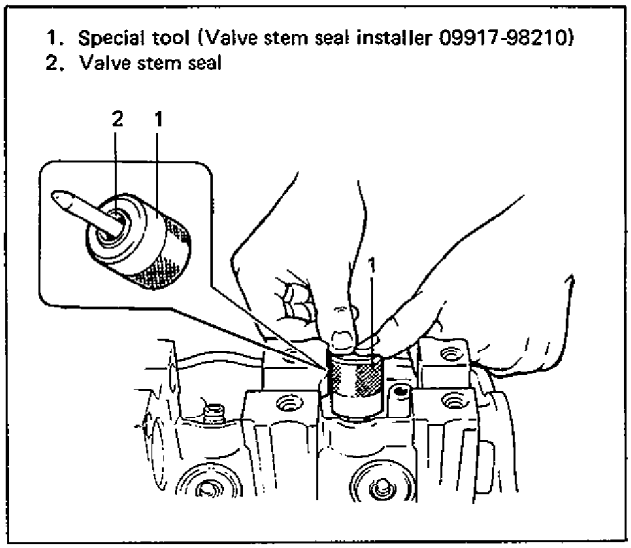


Fig. 6A-99 Valve Stem Seal Installation

6. Valve to valve guide.
   Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore, and valve stem.

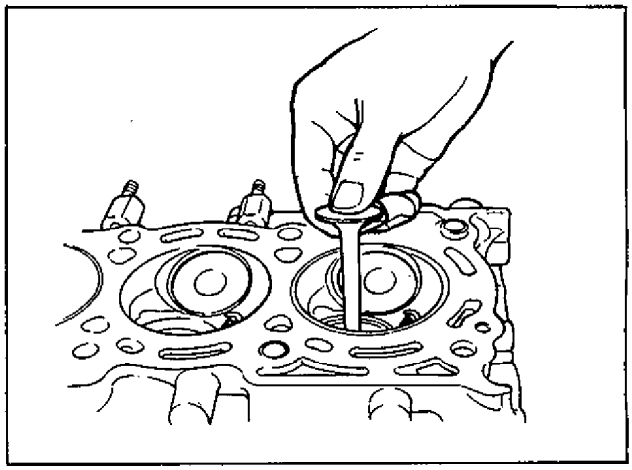


Fig. 6A-100 Valve Installation

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).

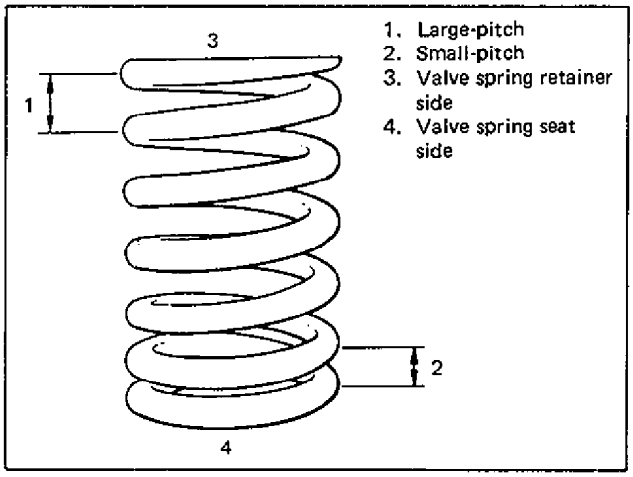


Fig. 6A-101 Installing Valve Spring

8. Using special tool (Valve lifter), compress valve spring and fit two valve cotters into groove provided on the valve stem.

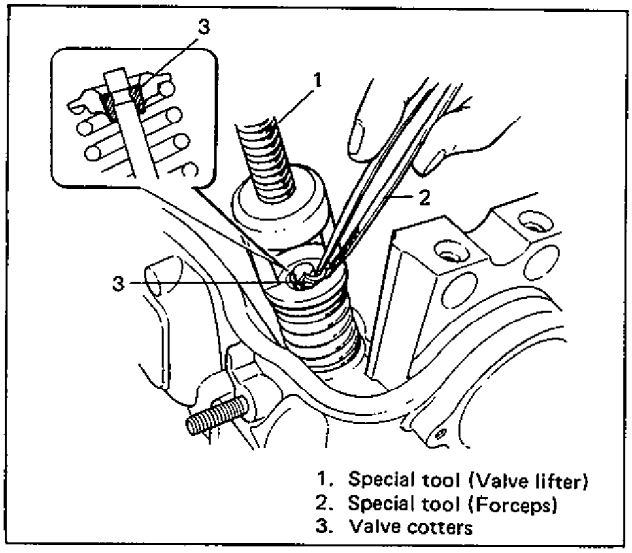


Fig. 6A-102 Valve Cotters Installation

9. Rocker arm shafts, rocker arms, springs and camshaft as previously outlined.
10. Intake manifold, exhaust manifold and distributor to cylinder head.

INSTALL OR CONNECT

1. Cylinder head gasket.
   Install new head gasket as shown in Fig. 6A-103 in such a way that "TOP" mark provided on the gasket comes on top side (toward cylinder head) and on crankshaft pulley side.

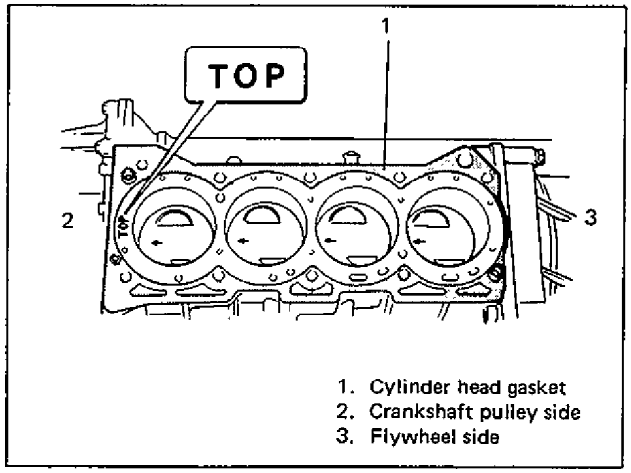


Fig. 6A-103 Cylinder Head Gasket Installation

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
	70 – 75	7.0 – 7.5	51.0 – 54.0

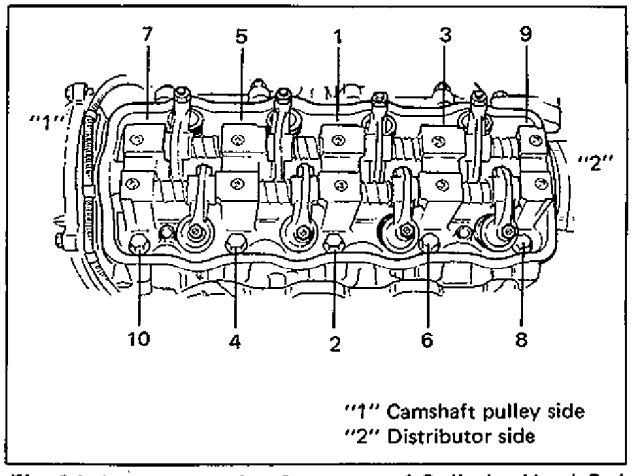


Fig. 6A-104 Tightening Sequence of Cylinder Head Bolts

3. Rubber seal between water pump and cylinder head.

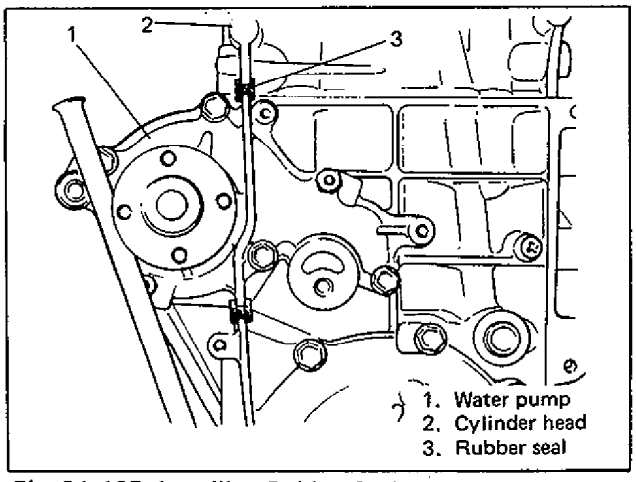


Fig. 6A-105 Installing Rubber Seal

4. Timing belt as previously outlined.
5. Distributor to cylinder head. See section 6F for installation.
6. Reverse removal procedure for installation of remainder.
7. Adjust intake and exhaust valve lashes as previously outlined.
8. Adjust water pump belt. Refer to section 6B for adjusting procedure.
9. Adjust accelerator cable play according to procedure described in section 6D.
10. Refill cooling system, referring to section 6B.
11. Negative cable at battery.
12. Adjust ignition timing. Refer to section 6F for adjustment.
13. 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.

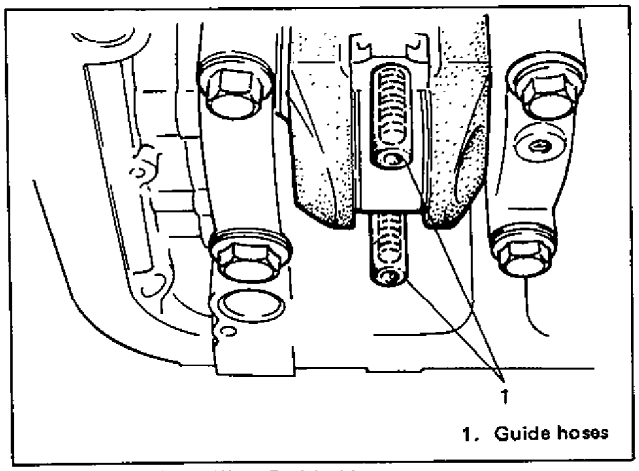


Fig. 6A-106 Installing Guide Hoses

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.
   Fit piston and connecting rod assembly to special tool (Piston pin remover and installer) as shown in Fig. 6A-107 and Fig. 6A-108, and then press piston pin out of connecting rod by using arbor press.

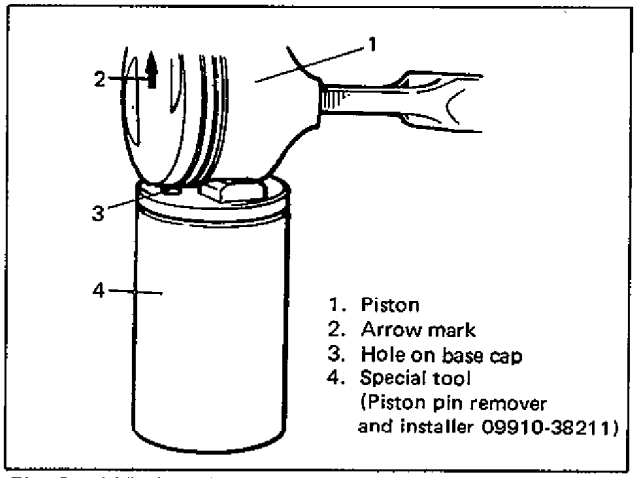


Fig. 6A-107 Installing Piston to Special Tool

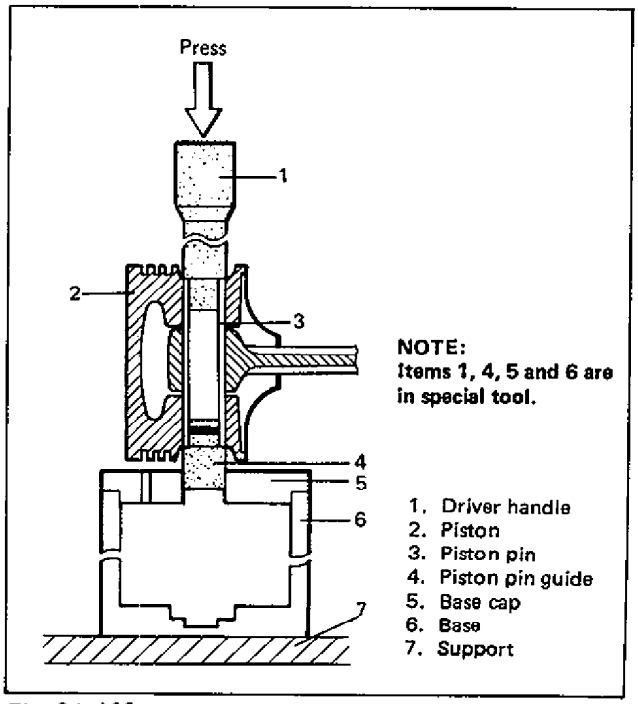


Fig. 6A-108 Removing Piston Pin

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	74.15 mm (2.9193 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.

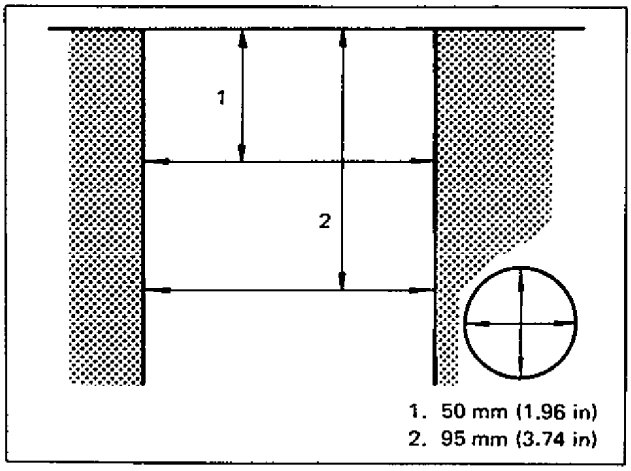


Fig. 6A-109 Positions to be Measured

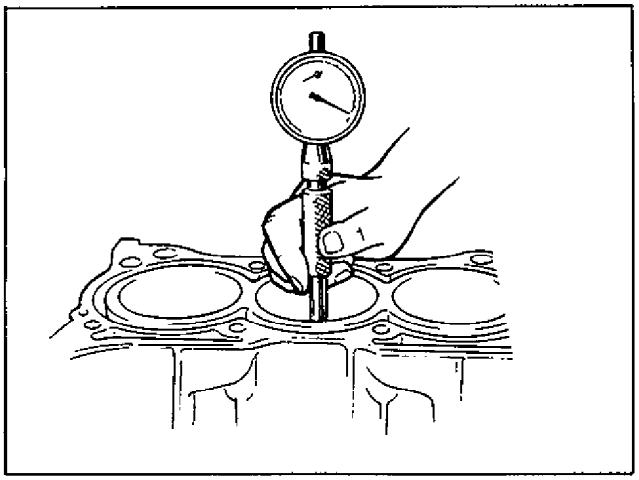


Fig. 6A-110 Measuring Cylinder Bore with Cylinder Gauge

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	73.970 – 73.990 mm (2.9122 – 2.9129 in.)
	Oversize: 0.25 mm (0.0098 in.)	74.220 – 74.230 mm (2.9220 – 2.9224 in.)
	0.50 mm (0.0196 in.)	74.470 – 74.480 mm (2.9319 – 2.9322 in.)

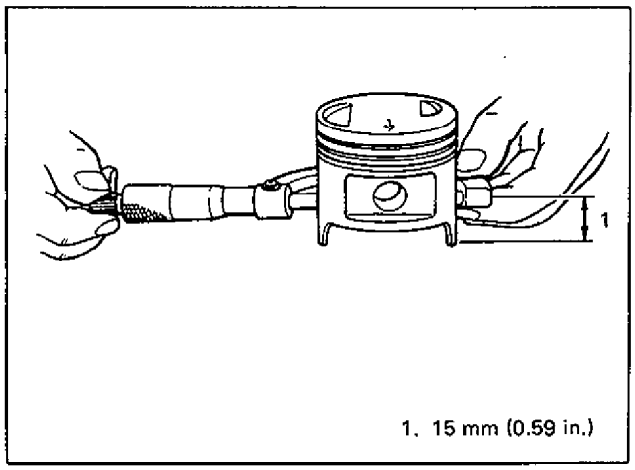


Fig. 6A-111 Measuring Piston Diameter with Micrometer

- 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.)

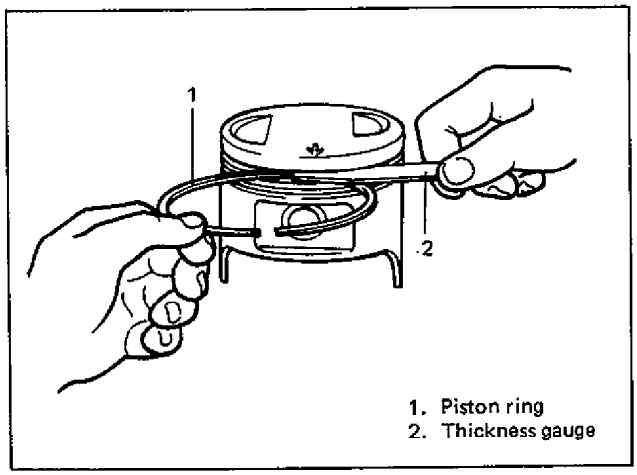


Fig. 6A-112 Measuring Ring Groove Clearance

Piston Pin

- Piston pin must be fitted into piston bore with an easy finger push at normal room temperature.
- Check piston pin and piston bore for wear or damage. If pin or piston bore is badly worn or damaged, replace pin or piston, or both.

Piston Rings

To measure end gap, insert piston ring into cylinder bore as shown in Fig. 6A-113 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 – 0.30 mm (0.0079 – 0.0118 in.)	0.7 mm (0.0275 in.)
	2nd ring	0.20 – 0.30 mm (0.0079 – 0.0118 in.)	0.7 mm (0.0275 in.)
	Oil ring	0.20 – 0.70 mm (0.0079 – 0.0275 in.)	1.8 mm (0.0708 in.)

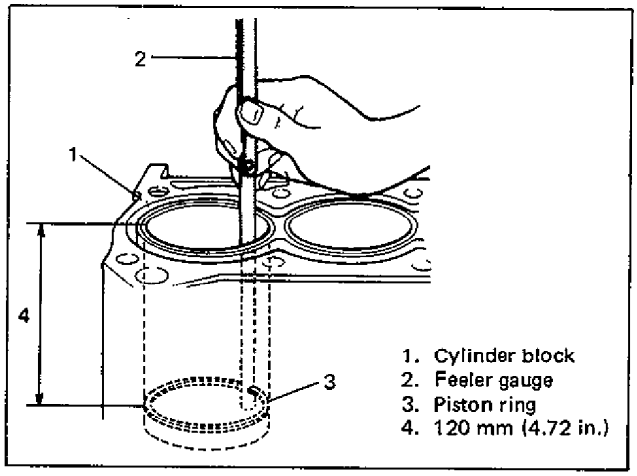


Fig. 6A-113 Measuring Piston Ring End Gap

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.)

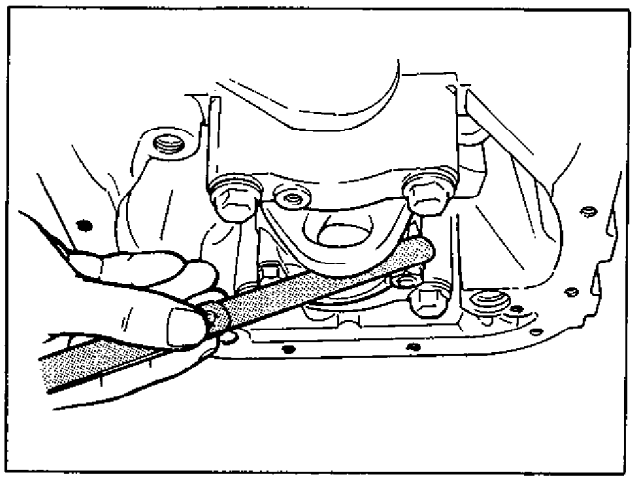


Fig. 6A-114 Measuring Side Clearance

- 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	41.982 – 42.000 mm (1.6529 – 1.6535 in.)
0.25 mm (0.0098 in.) undersize	41.732 – 41.750 mm (1.6430 – 1.6437 in.)

Out-of-round and taper limit	0.01 mm (0.0004 in.)

- Rod bearing:
  Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.
  Two kinds of rod bearing are available; standard size bearing and 0.25 mm undersize bearing. To distinguish them, 0.25 mm undersize bearing has the stamped number (US 025) on its backside as indicated in Fig. 6A-115, but standard size one has no number.

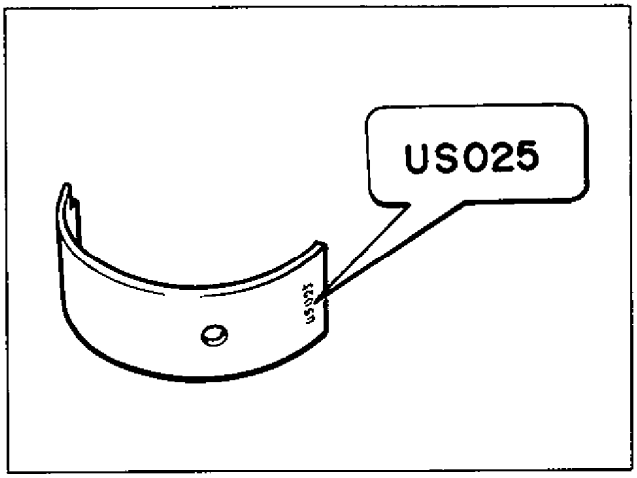
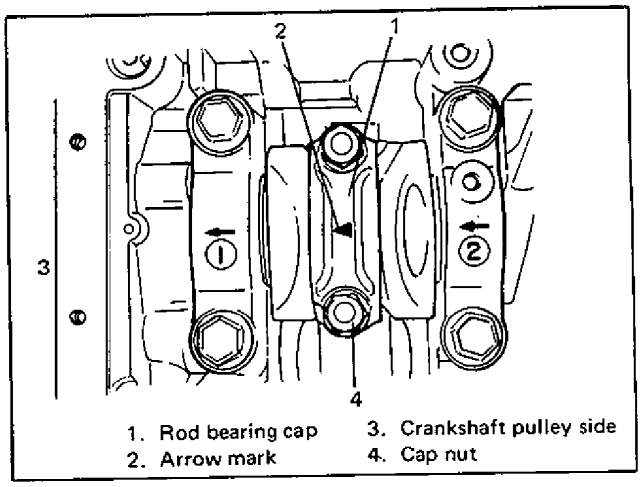


Fig. 6A-115 0.25 mm Undersize Bearing

- 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-116. 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

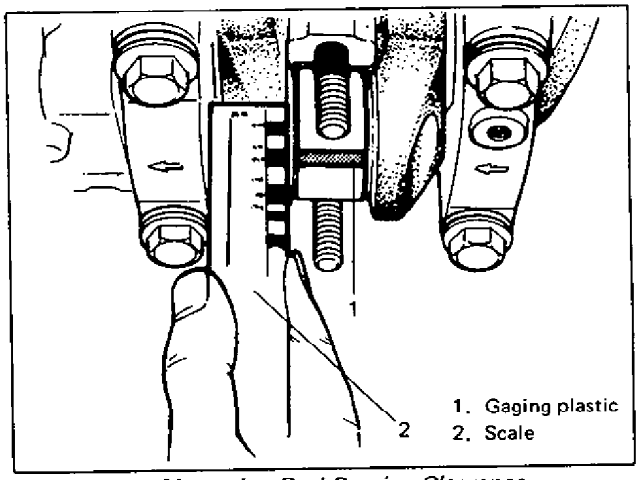


1. Rod bearing cap
2. Arrow mark
3. Crankshaft pulley side
4. Cap nut

Fig. 6A-116 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.)



1. Gaging plastic
2. Scale

Fig. 6A-117 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.

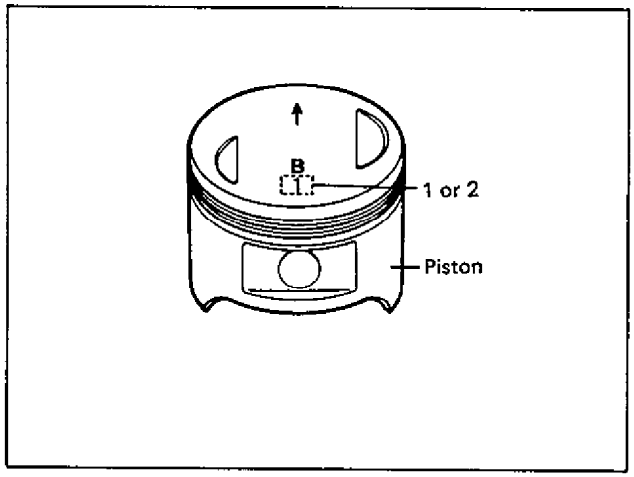


Fig. 6A-118

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.

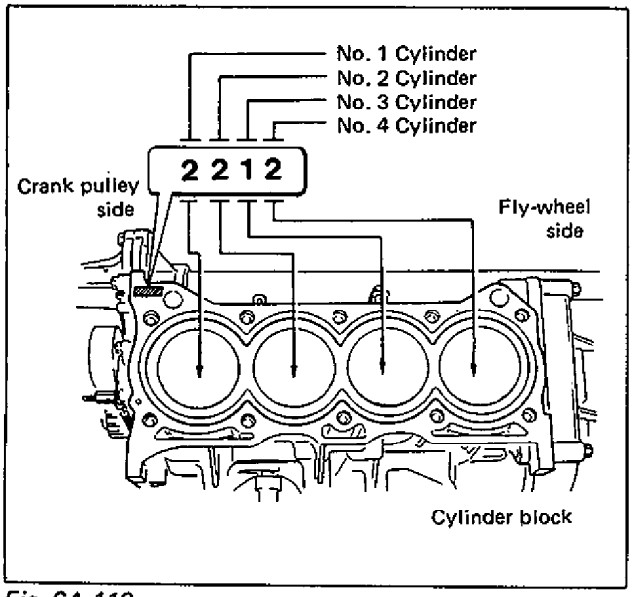


Fig. 6A-119

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.

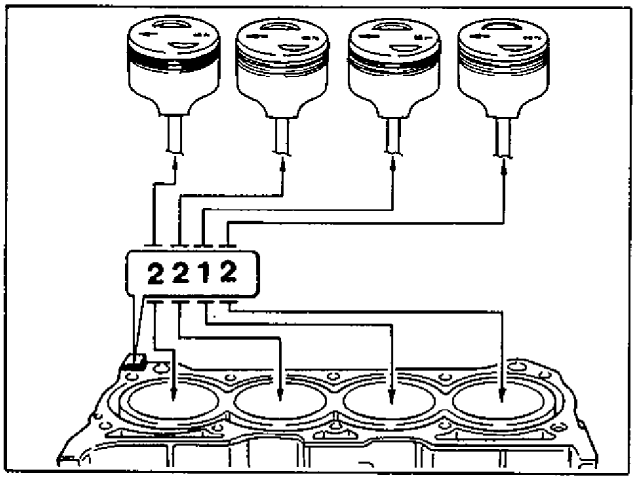


Fig. 6A-120 Piston-to-cylinder Orientation

Piston		Cylinder		Piston-to-Cylinder Clearance
Number at the top (mark)	Outside diameter	Number (mark)	Bore diameter	
1	73.98–73.99 mm (2.9126–2.9130 in.)	1	74.01–74.02 mm (2.9138–2.9142 in.)	0.02–0.04 mm (0.0008–0.0015 in.)
2	73.97–73.98 mm (2.9122–2.9126 in.)	2	74.00–74.01 mm (2.9134–2.9138 in.)	0.02–0.04 mm (0.0008–0.0015 in.)

Also, a letter A, B or C is stamped on piston head but ordinarily it is not necessary to discriminate each piston by this letter.

1. Connecting rod to piston:
   After applying engine oil to piston pin holes in piston and connecting rod, fit connecting rod to piston as shown in Fig. 6A-121.

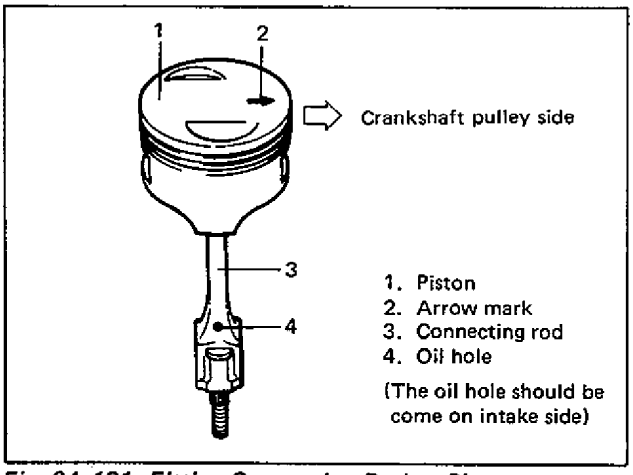


Fig. 6A-121 Fitting Connecting Rod to Piston

2. Piston pin to piston and connecting rod:
   Place piston onto special tool (Piston pin remover and installer) as shown in Fig. 6A-122 and 6A-123, and press piston pin into piston and connecting rod.

   Press piston pin until line marked on the driver handle is flush with flat surface of piston (Fig. 6A-124).

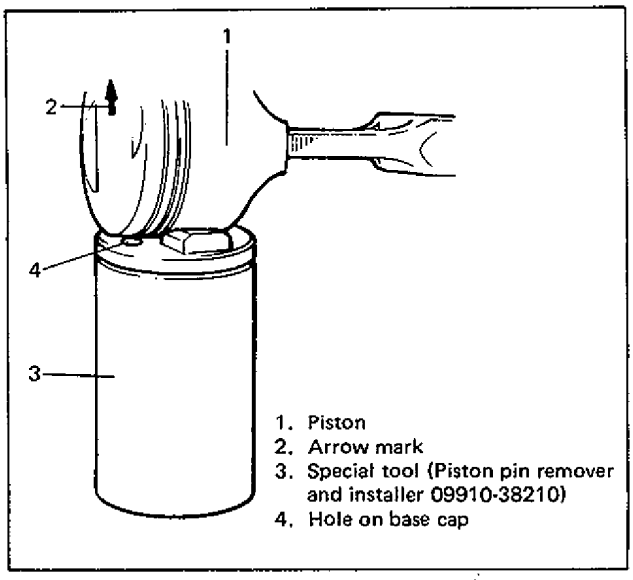


Fig. 6A-122 Fitting Piston to Special Tool

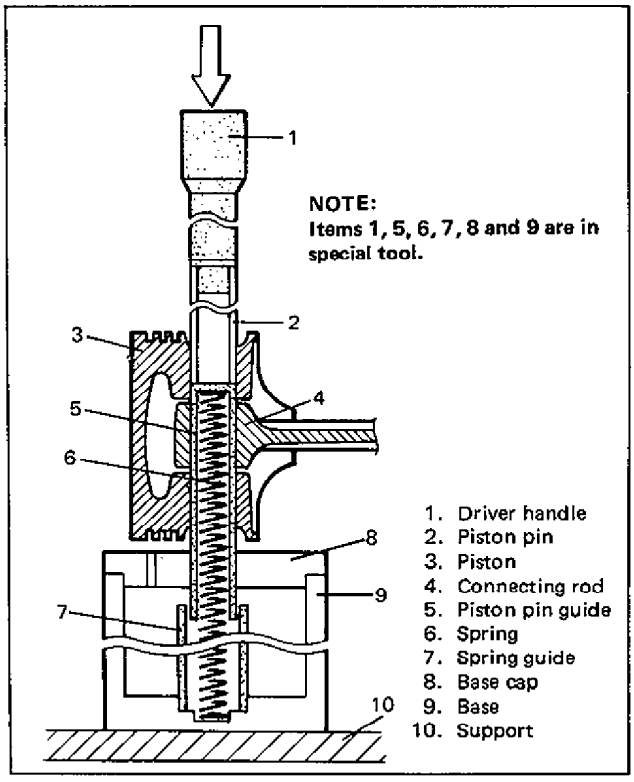


Fig. 6A-123 Installing Piston Pin

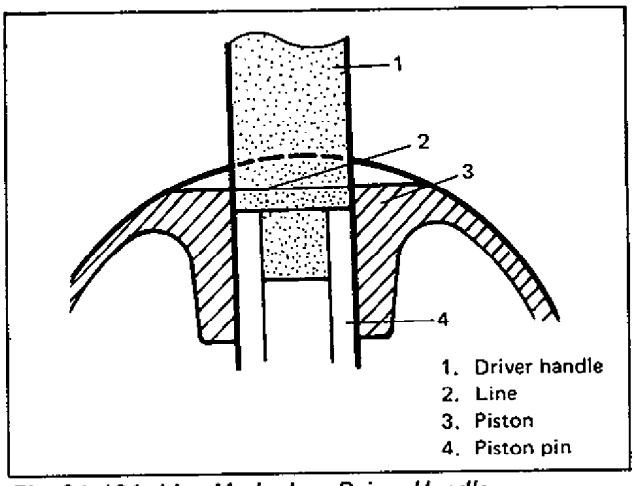


Fig. 6A-124 Line Marked on Driver Handle

3. Piston rings to piston:
- As indicated in Fig. 6A-125, 1st and 2nd rings have "R" or "T" mark. When installing these piston rings to piston, direct marked side of each ring toward top of piston.

NOTE:
There are 2 types of 1st ring, marked and unmarked. When installing a new unmarked 1st ring, it is not necessary to distinguish its top from bottom (i.e., either side can face upward) but when reinstalling a used one, be sure to distinguish its top from bottom as it was installed before removal and direct topside upward.

- 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 Fig. 6A-125.
- When installing oil ring, install spacer first and then two rails.

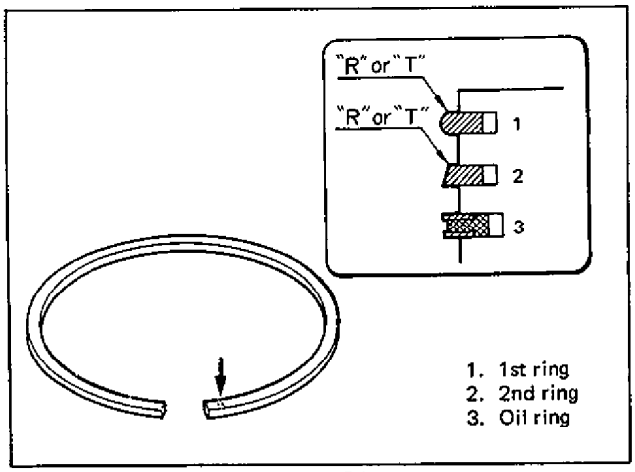


Fig. 6A-125 Installing Piston Rings

4. After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in Fig. 6A-126.

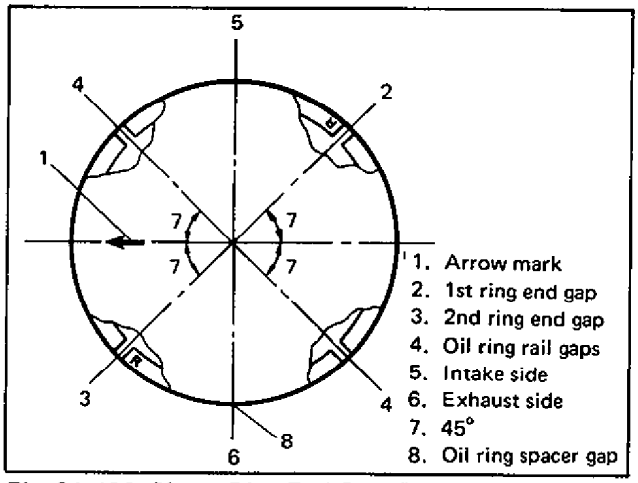


Fig. 6A-126 Piston Ring End Gaps Positions

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.

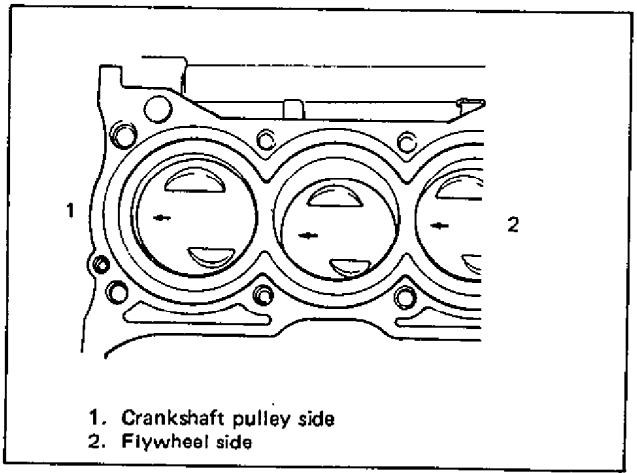


Fig. 6A-127 Direction of Arrow Mark on Piston Head

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.

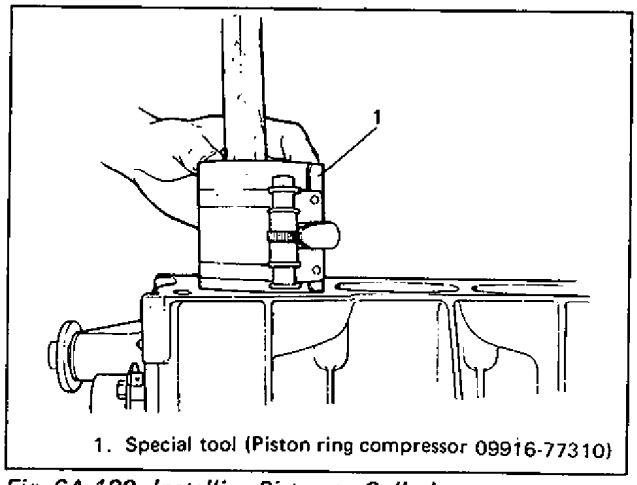


Fig. 6A-128 Installing Piston to Cylinder

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

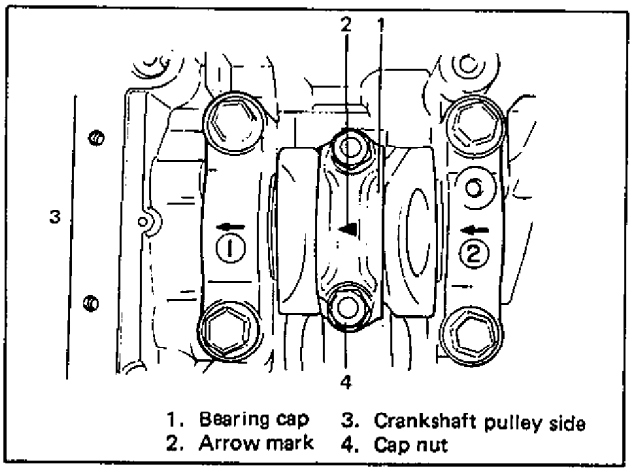


Fig. 6A-129 Installing Bearing Cap

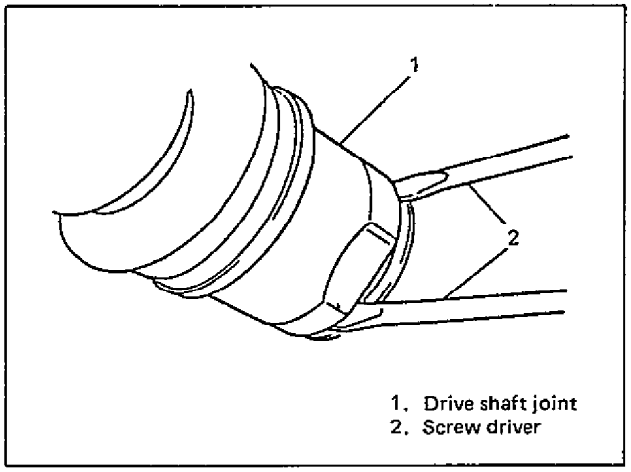
6. Reverse removal procedure for installation of remainder, as previously outlined.
7. Adjust intake and exhaust valve lashes as previously outlined.
8. Adjust water pump belt tension. See section 6B for adjustment.
9. Adjust accelerator cable play. See section 6D for adjustment.
10. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in section 0B.
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

DISMOUNTING

1. Disconnect ground cable at battery.
2. Remove engine hood panel.
3. Remove battery and battery tray.
4. Remove intake air duct and air cleaner case assembly.
5. Disconnect each lead wire at coupler.
6. Undo wiring harness clamps.
7. Take off speedometer cable boot, speedometer case clip and then cable from case.
8. Disconnect accelerator cable.
9. • Disconnect select cable and oil pressure control cable from transmission. (For A/T model)
   • Disconnect clutch cable from transmission. (For M/T model)
10. Drain coolant.
11. Disconnect cooling water hose from thermostat case.
12. Disconnect high-tension cord from ignition coil.
13. Disconnect air purge hoses and canister hose from hose joint. (If equipped)
14. Remove canister. (If equipped)
15. Disconnect fuel feed and return hose at joint of dash panel side.
    Before disconnecting hose, remove fuel filler cap to release the pressure in fuel tank and reinstall it.
16. Disconnect brake booster vacuum hose from booster.
17. Disconnect heater hoses (inlet & outlet) at joint of dash panel side.
18. Remove alternator assembly. (for right-hand steering car)
19. Hoist car and drain transmission fluid.
20. Remove exhaust pipe bolts to set its flange free from exhaust manifold.
21. Disconnect oil cooler hoses from radiator and hold them upright.
22. Disconnect radiator outlet hose from radiator.
23. 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 of for this procedure.



1. Drive shaft joint
2. Screw driver

Fig. 6A-130 Detaching Snap Ring from Differential

24. Remove ball stud bolts and nuts from both side knuckles and detach suspension arms and then pull out both drive shaft joints from differential.
25. Remove radiator lower mounting bolts.
26. • Disconnect engine rear torque rod bracket from transmission case. (For A/T model)
    • Gear shift control shaft and extension rod from transmission. (For M/T model)
27. Lower hoist.
28. Remove radiator.

NOTE:
With air conditioner equipped car, removal of its parts is necessary in addition to above procedure.

29. Support engine and transmission with lifting device.

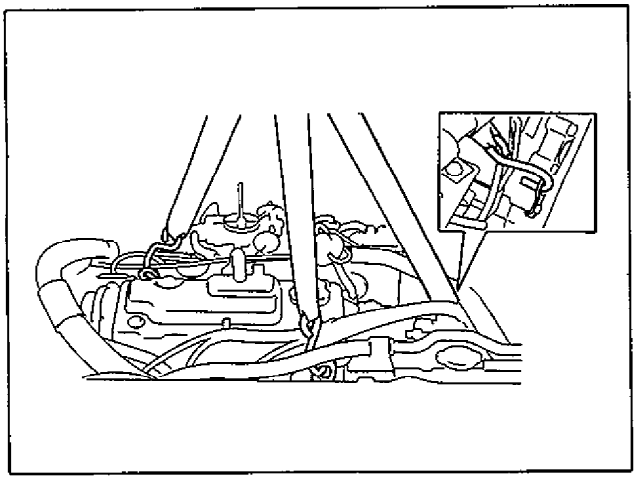


Fig. 6A-131

30. • Remove engine rear mounting nut. (For A/T model)
    • Remove engine rear mounting. (For M/T model)
31. Remove two bolts of right side mounting bracket and left side bracket.

NOTE:
Before lifting engine with transmission, recheck to ascertain all hoses, electric wires and cables are disconnected from engine and transmission.

32. Hoist engine with transmission from car body.

REMOUNTING

1. Lower engine with transmission into engine compartment, but do not remove lifting device.
2. • Install engine rear mounting to body. (For M/T model)
    • Install engine rear mounting nut. (For A/T model)
3. Install transmission left side mounting bracket.
4. Install 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.

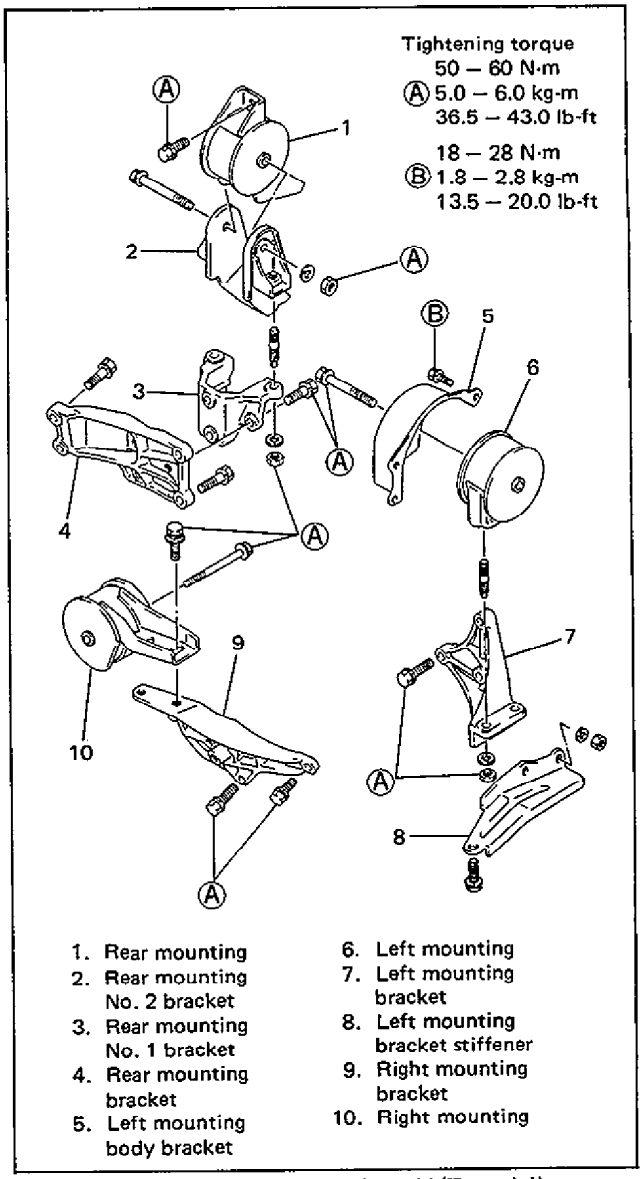


Fig. 6A-132 Engine Mounting (For M/T model)

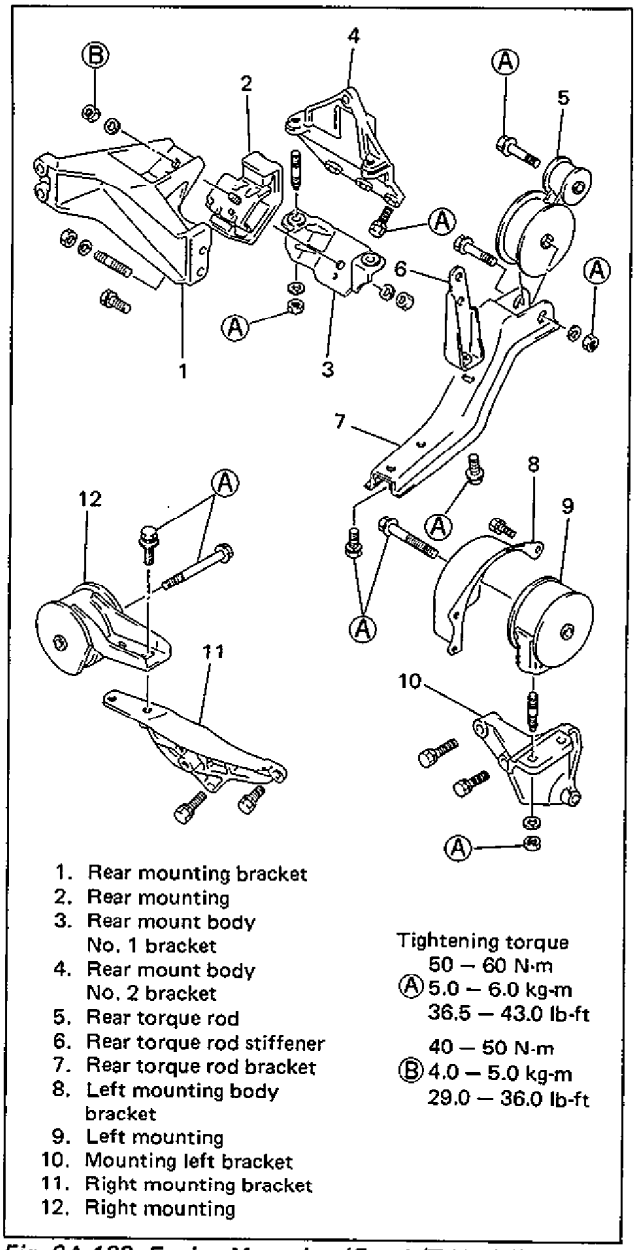


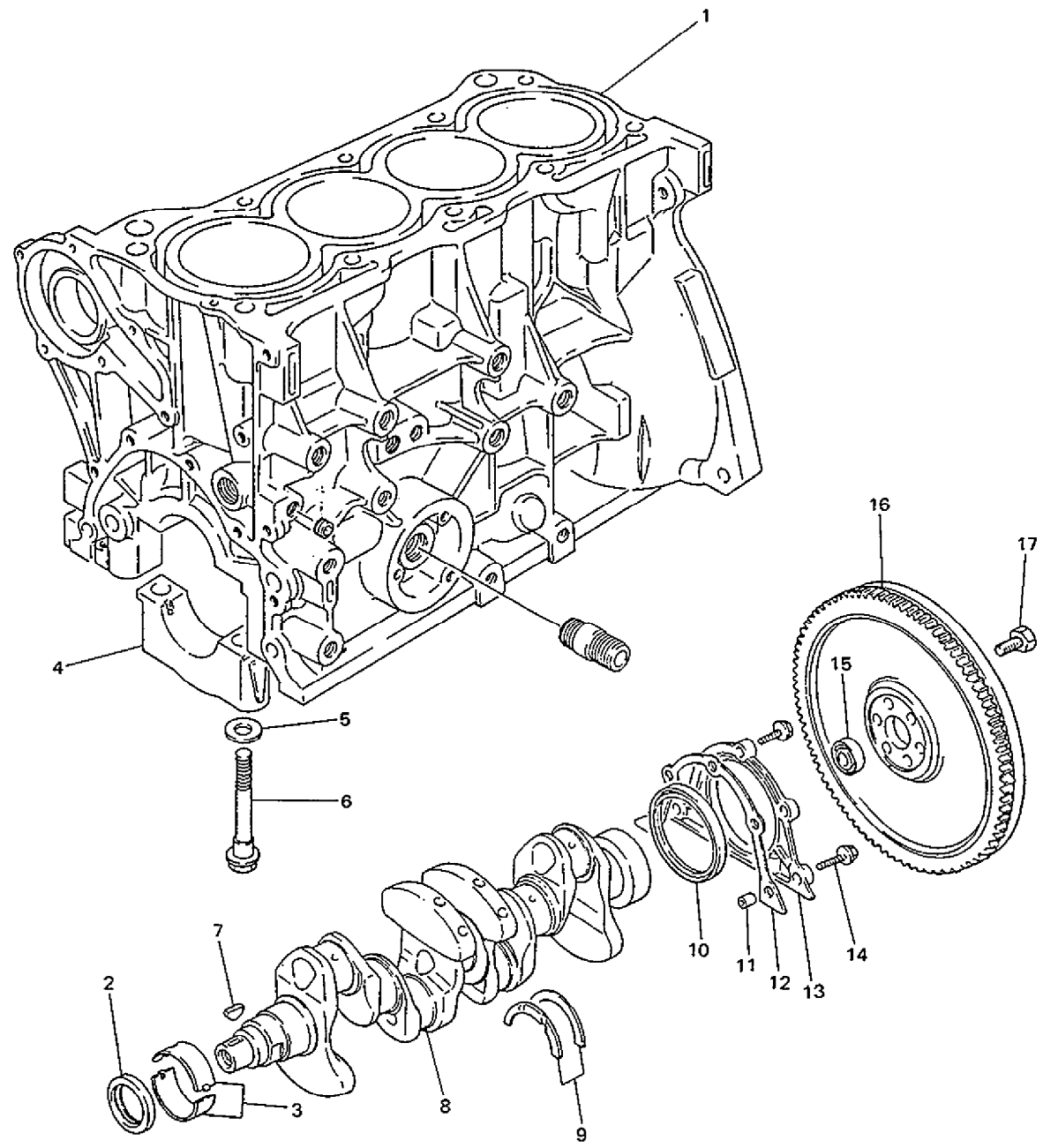
Fig. 6A-133 Engine Mounting (For A/T Model)

6. Remove lifting device.
7. Push in each drive shaft joint fully so that snap ring engages with differential gear.

CAUTION:
- **Care should be taken not to scratch oil seal lip with drive shaft while inserting drive shaft joint into transmission.**
- **Do not hit drive shaft joint with hammer when installing it.**

8. Reverse removal procedures for installation of remainder.
9. Adjust clutch pedal free travel, referring to SECTION 7C. (For M/T model)
   Adjust gear select cable and oil pressure control cable, referring to SECTION 7B. (For A/T model)
10. Adjust accelerator cable play, referring to SECTION 6D.
11. Refill transmission with gear oil. (A/T fluid for A/T model), referring to SECTION 0B.
12. Refill engine with engine oil, referring to SECTION 0B.
13. Refill cooling system, referring to SECTION 6B.
14. 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

Fig. 6A-134 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.)

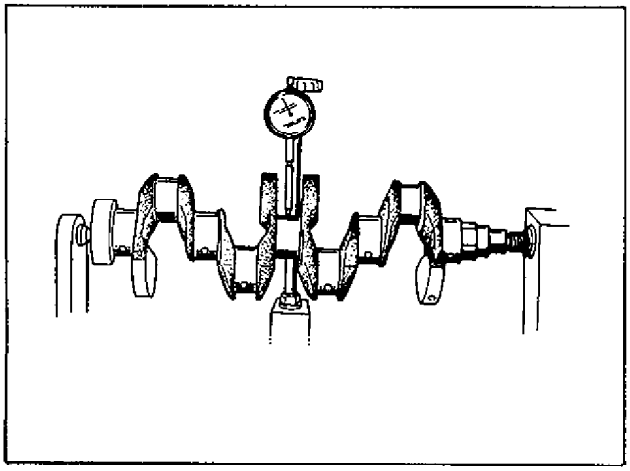


Fig. 6A-135 Measuring Runout

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.)

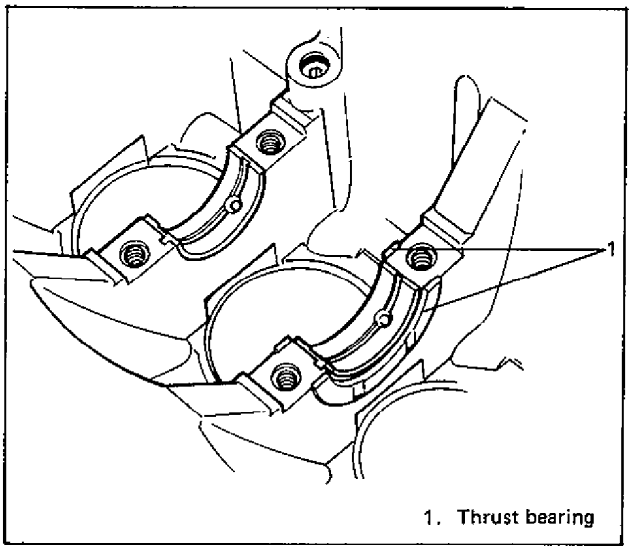


Fig. 6A-136 Thrust Bearings

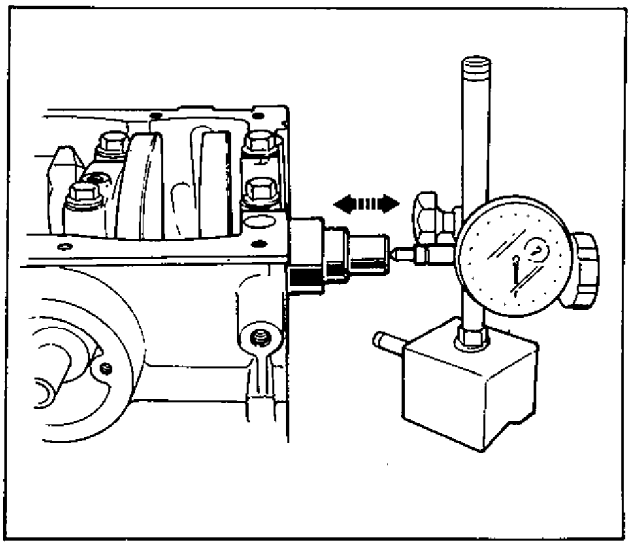


Fig. 6A-137 Measuring Thrust Play of Crankshaft

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.)

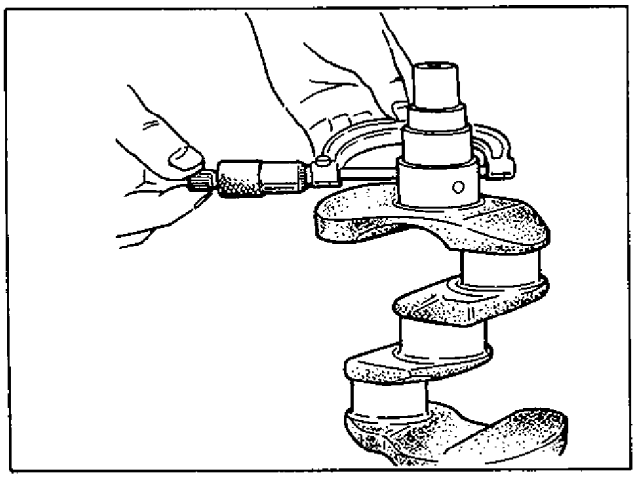


Fig. 6A-138 Checking Uneven Wear

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.

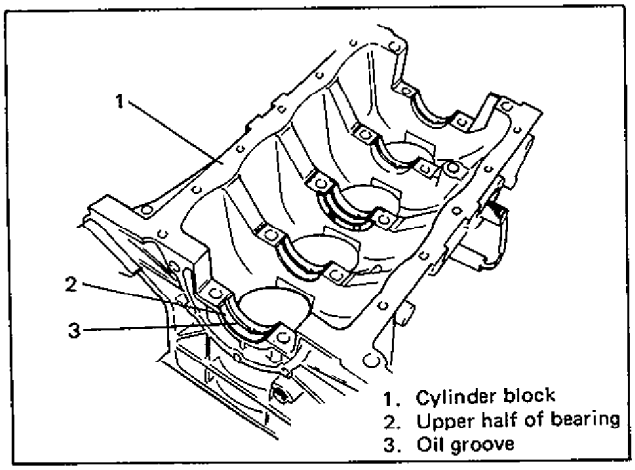


Fig. 6A-139 Upper Half of Bearing Installation

- 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

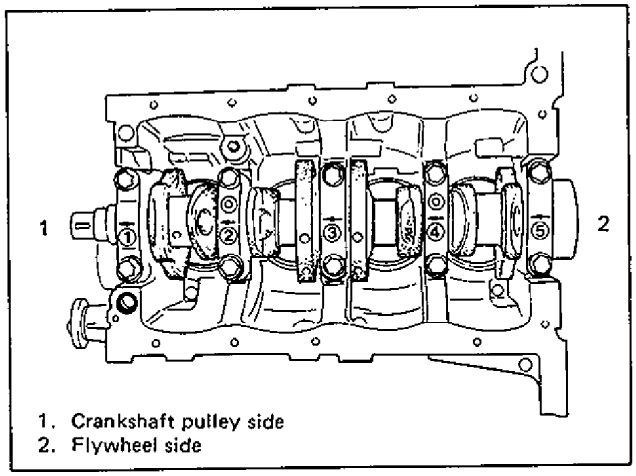


Fig. 6A-140 Bearing Caps Installation

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 re-grind 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.)

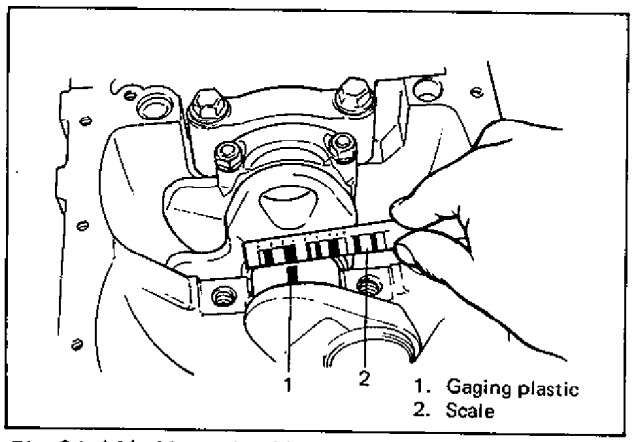


Fig. 6A-141 Measuring Main Bearing Clearance

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-142, 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	44.994 – 45.000 mm (1.7714 – 1.7716 in.)
2	44.988 – 44.994 mm (1.7712 – 1.7714 in.)
3	44.982 – 44.988 mm (1.7710 – 1.7712 in.)

The first, second, third, fourth and fifth (left to right) stamped numerals represent journal diameters at bearing caps "1", "2", "3", "4" and "5" respectively.
For example, in Fig. 6A-142, the first (leftmost) numeral "3" indicates that journal dia. at bearing cap "1" is within 44.982 – 44.988 mm, and second one "1" indicates that journal dia. at cap "2" is within 44.994 – 45.000 mm.

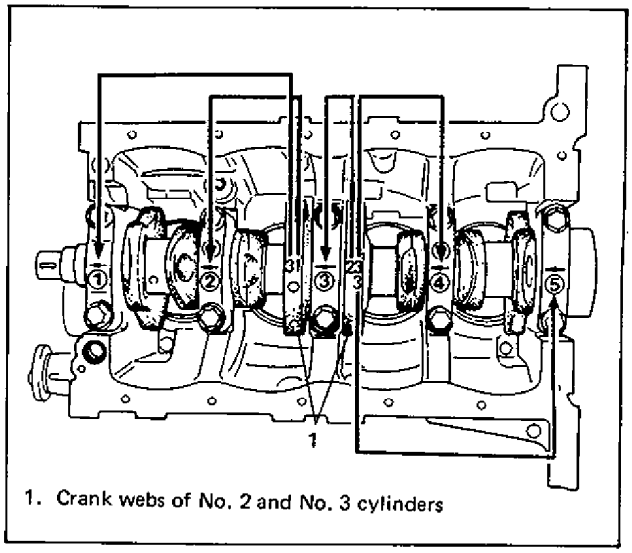


Fig. 6A-142 Stamped Numerals on Crank Webs of No. 2 and No. 3 Cylinders

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	49.000 – 49.006 mm (1.9292 – 1.9294 in.)
B	49.006 – 49.012 mm (1.9294 – 1.9296 in.)
C	49.012 – 49.018 mm (1.9296 – 1.9298 in.)

The first, second, third, fourth and fifth (left to right) stamped alphabets represent cap bore diameters of bearing caps "1", "2", "3", "4" and "5", respectively.
For example, in Fig. 6A-143, the first (leftmost) alphabet "B" indicates that cap bore dia. of bearing cap "1" is within 49.006 – 49.012 mm, and the fifth (rightmost) alphabet "A" indicates that cap bore dia. of cap "5" is within 49.000 – 49.006 mm.

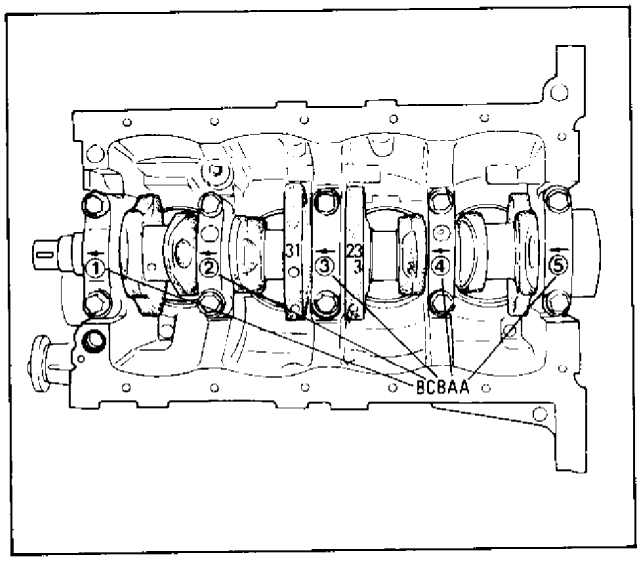


Fig. 6A-143 Stamped Alphabets on Cylinder Block

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-144.
   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.)

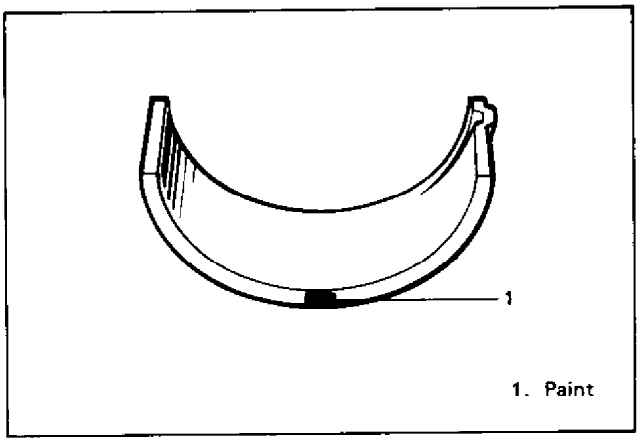


Fig. 6A-144 Paint on Standard Bearing

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-145.
  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.)

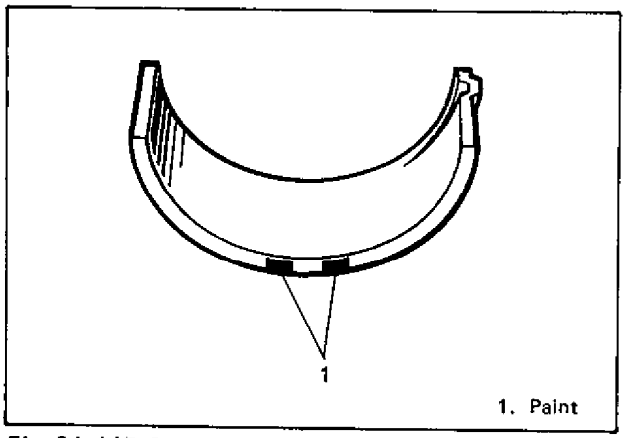


Fig. 6A-145 Paints on Undersize Bearing

- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.

1. Regrind journal to following finished diameter.

Finished diameter	44.732 – 44.750 mm (1.7612 – 1.7618 in.)

2. Using micrometer, measure reground journal diameter. Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
3. Using journal diameter measured above and alphabets stamped on mating surface of cylinder block, select an undersize bearing by referring to table given below.
   Check bearing clearance with newly selected undersize bearing.

		Measured journal diameter		
		44.744 – 44.750 mm (1.7616 – 1.7618 in.)	44.738 – 44.744 mm (1.7614 – 1.7616 in.)	44.732 – 44.738 mm (1.7612 – 1.7614 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.

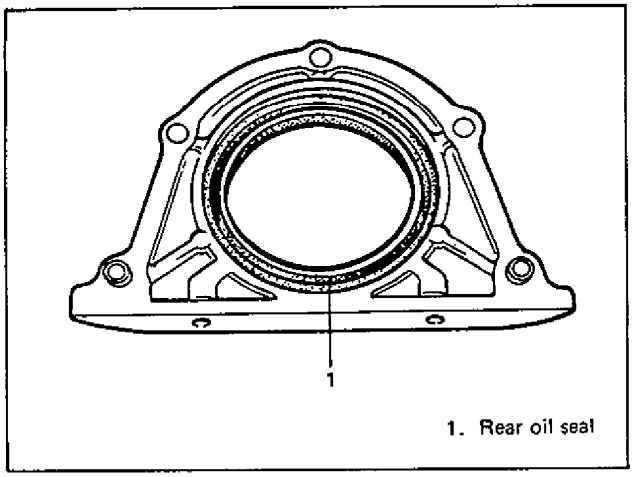


Fig. 6A-146 Rear Oil Seal

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.)

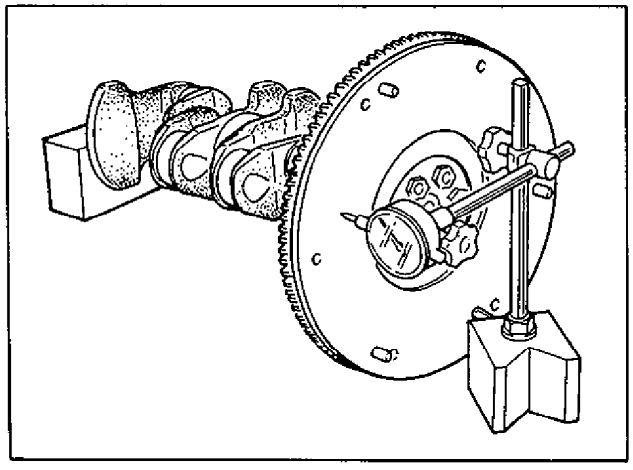


Fig. 6A-147 Measuring Runout

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.)

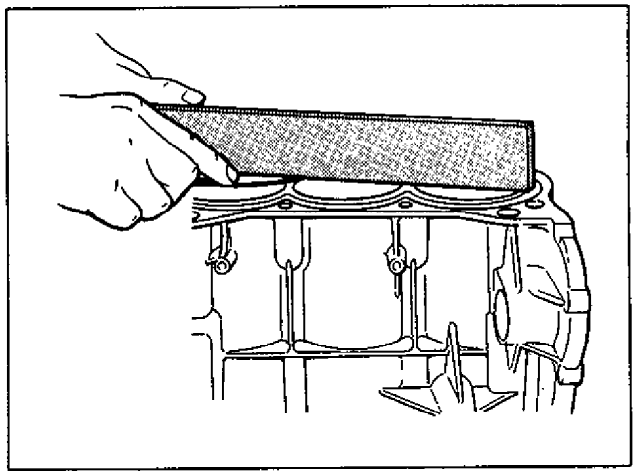


Fig. 6A-148 Checking Surface

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	74.220 – 74.230 mm (2.9220 – 2.9224 in.)
O/S 0.50	74.470 – 74.480 mm (2.9318 – 2.9322 in.)

3. Using micrometer, measure piston diameter.

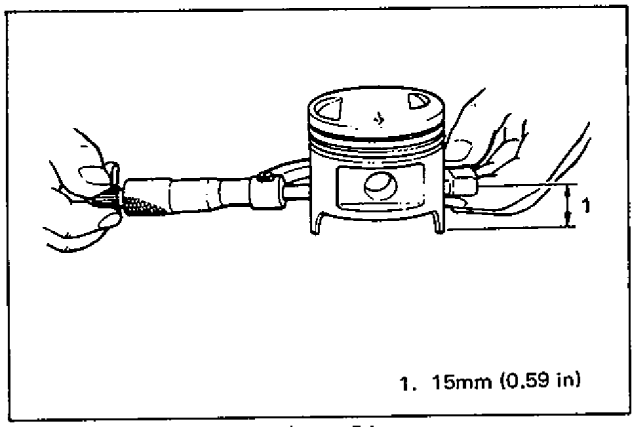


Fig. 6A-149 Measuring Piston Diameter

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.

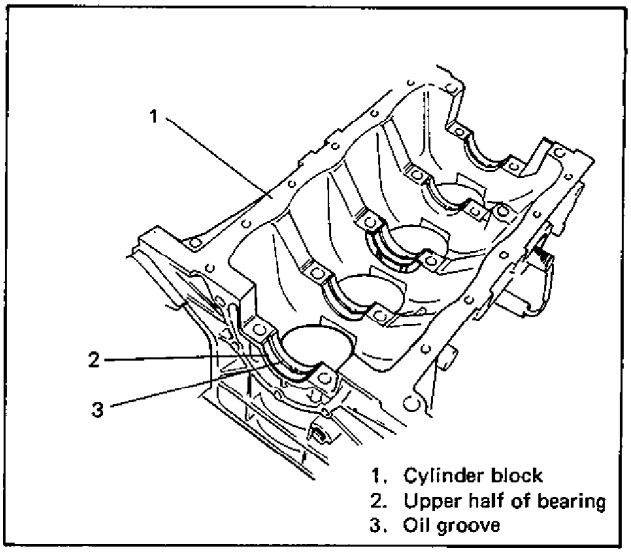


Fig. 6A-150 Installing Bearing Half with Oil Groove

2. Thrust bearings to cylinder block between No. 2 and No. 3 cylinders. Face oil groove sides to crank webs.

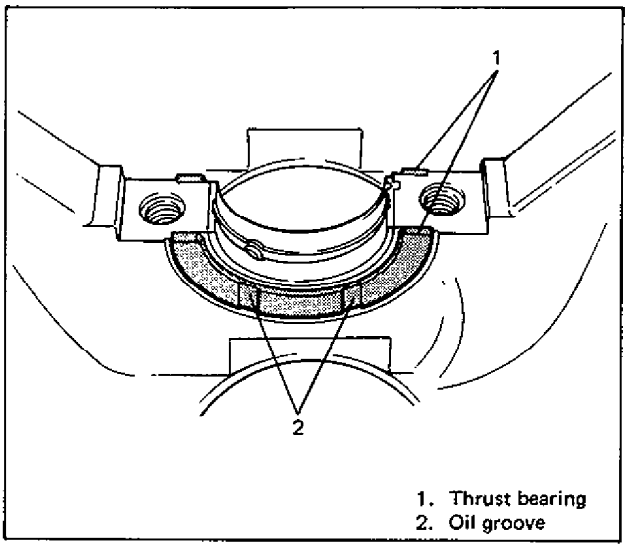


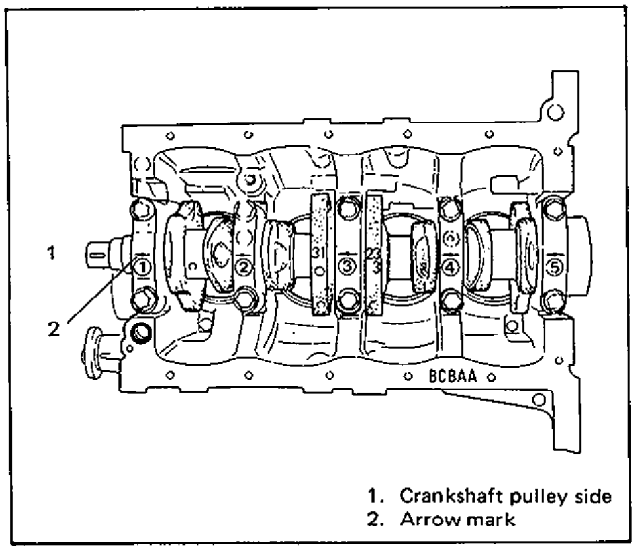
Fig. 6A-151 Installing Thrust Bearings

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-152 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
	10 – 13	1.0 – 1.3	7.5 – 9.0

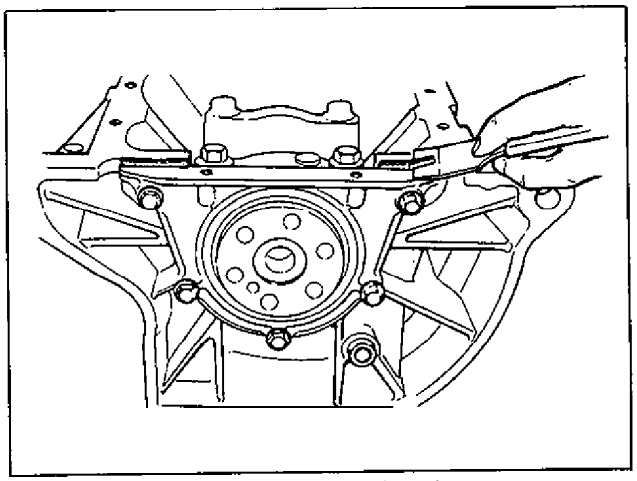
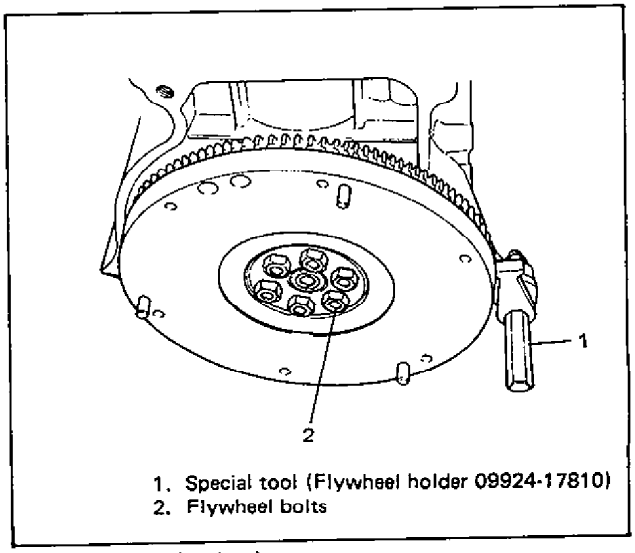


Fig. 6A-153 Cutting Off Edges of Gasket

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
	57 – 65	5.7 – 6.5	41.5 – 47.0



1. Special tool (Flywheel holder 09924-17810)
2. Flywheel bolts

Fig. 6A-154 Flywheel

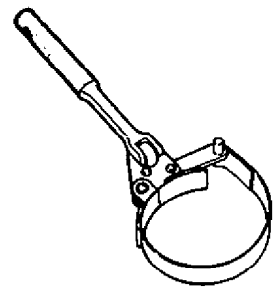
8. Pistons and connecting rods as previously outlined.
9. Oil pump strainer and oil pan.
10. Cylinder head assembly to cylinder block.

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.

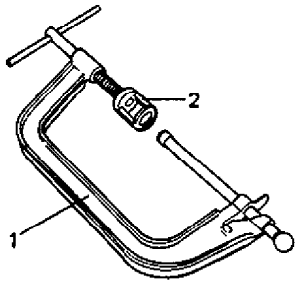
- **Tighten cylinder head bolts to specified torque as previously outlined and loosen them once till tightening torque becomes "zero". And then torque them to specification again.**

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

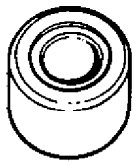


09915-47310
Oil filter wrench

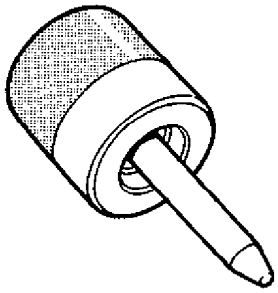


1. 09916-14510
   Valve lifter
2. 09916-48210
   Valve lifter attachment

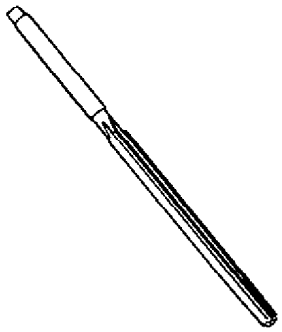
09916-44511 or
09916-46010
Valve guide remover



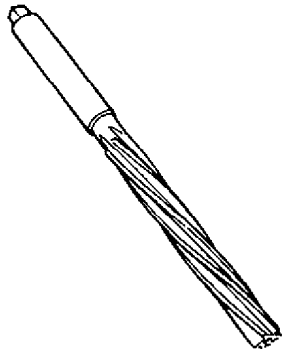
09917-88210
Valve guide installer



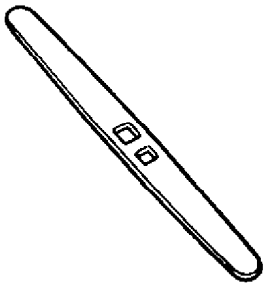
09917-98210
Valve stem seal installer



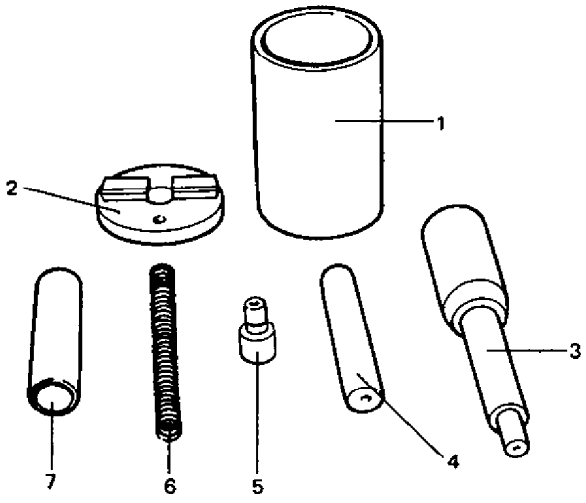
09916-34520
Reamer (7 mm)



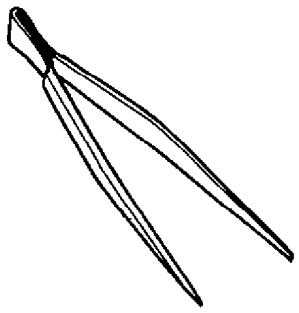
09916-37310
Reamer (12 mm)



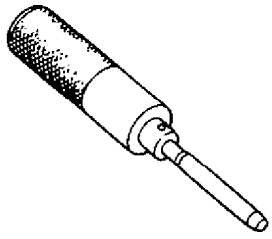
09916-34541
Reamer handle



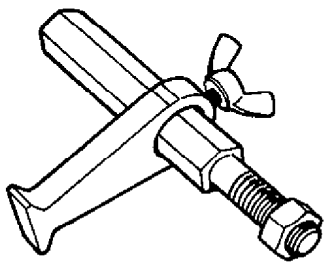
09910-38211
Piston pin remover and installer
1. Base
2. Base cap
3. Driver handle
4. Piston pin guide for installation
5. Piston pin guide for removal
6. Spring
7. Spring guide



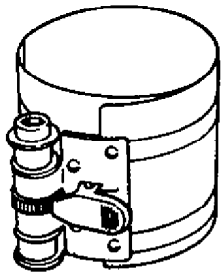
09916-84510
Forceps



09916-57321
Valve guide installer handle

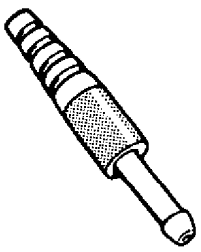


09924-17810
Flywheel holder

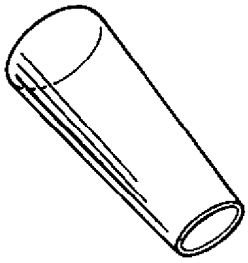


09916-77310
Piston ring compressor

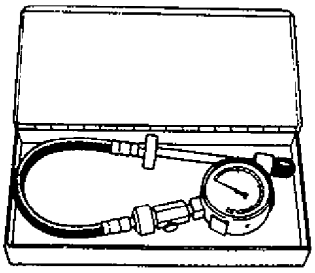
Fig. 6A-155-1



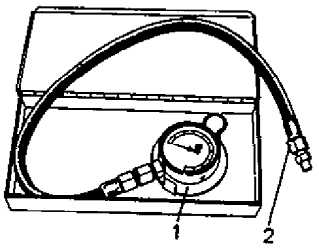
09918-08210
Vacuum gauge hose joint



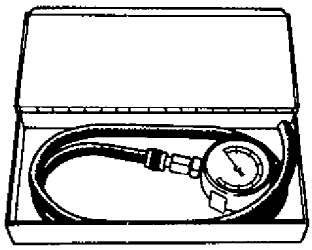
09926-18210
Oil seal guide (Vinyl resin)



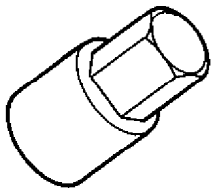
09915-64510
Compression gauge



1. 09915-77310
   Oil pressure gauge
2. 09915-78211
   Oil pressure gauge
   attachment



09915-67310
Vacuum gauge



09919-16020
17mm socket

Fig. 6A-155-2

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND NO. 1207C (99000-31150)	• Mating surfaces of cylinder block and oil pan.

RECOMMENDED TORQUE SPECIFICATIONS

System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Engine	Cylinder head bolt	70 – 75	7.0 – 7.5	51.0 – 54.0
	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	9 – 12	0.9 – 1.2	7.0 – 8.5
	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	57 – 65	5.7 – 6.5	41.5 – 47.0
	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	4 – 5	0.4 – 0.5	3.0 – 3.5
	Valve adjusting screw lock nut	15 – 19	1.5 – 1.9	11.0 – 13.5
	Exhaust No. 1 pipe nut	40 – 60	4.0 – 6.0	29.0 – 43.0
	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	125 – 135	12.5 – 13.5	90.5 – 97.5
	Timing belt tensioner bolt	24 – 30	2.4 – 3.0	17.5 – 21.5
	Timing belt tensioner stud	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil pump rotor plate screw	8 – 13	0.8 – 1.3	6.0 – 9.0
	Engine mounting & bracket bolt and nut	Refer to Fig. 6A-132 and 6A-133		

SECTION 6B

ENGINE COOLING

CONTENTS

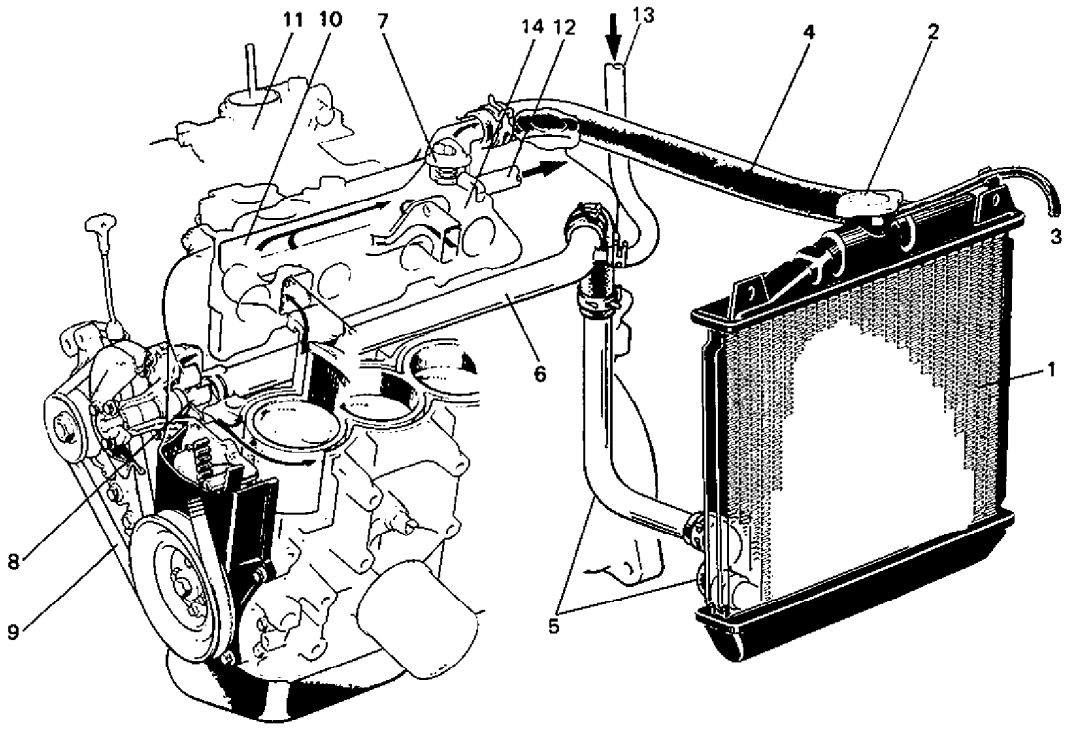
GENERAL DESCRIPTION

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
2. Radiator cap
3. To water reservoir tank
4. Radiator inlet hose
5. Radiator outlet hose & pipe
6. Water intake pipe
7. Thermostat
8. Water pump
9. Water pump drive belt
10. Intake manifold
11. Carburetor
12. Heater inlet hose (Optional)
13. Heater outlet hose (Optional)

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/cm² (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/cm² (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.

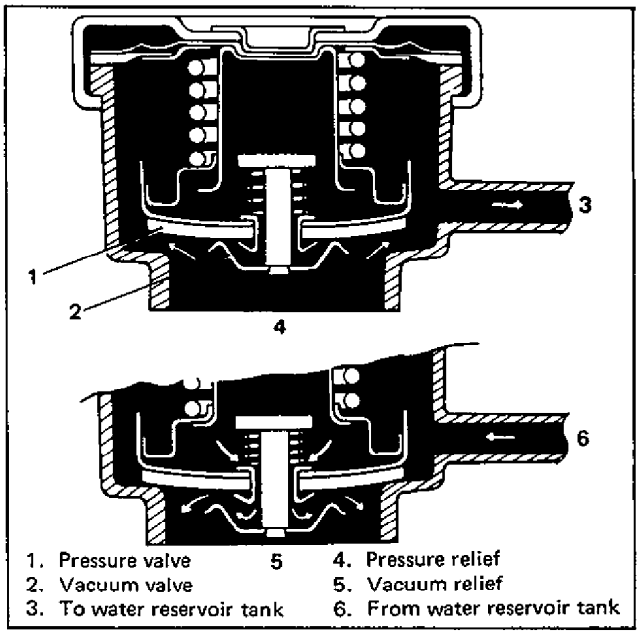


Fig. 6B-2 Pressure Type Radiator Cap

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.

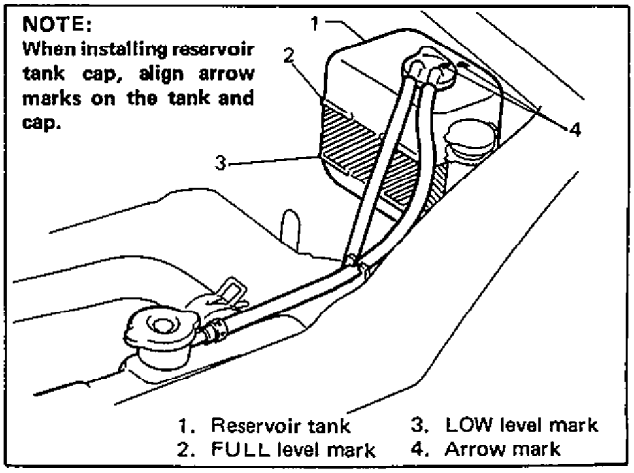


Fig. 6B-3 Water Reservoir Tank

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.

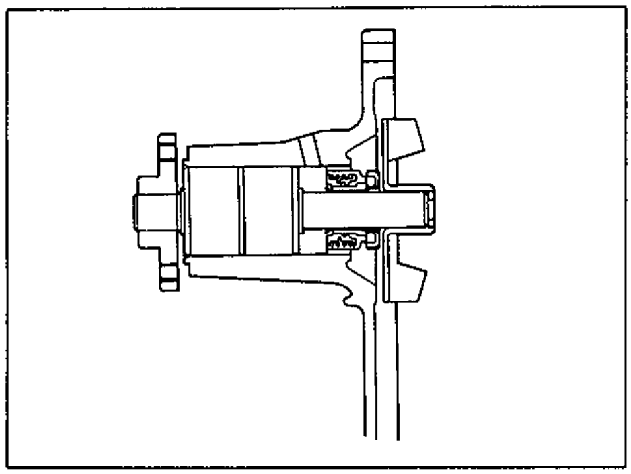


Fig. 6B-4 Water Pump

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.

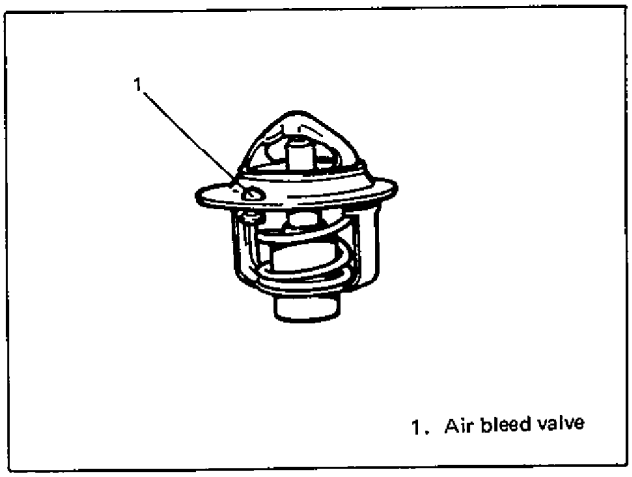


Fig. 6B-5 Thermostat

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.

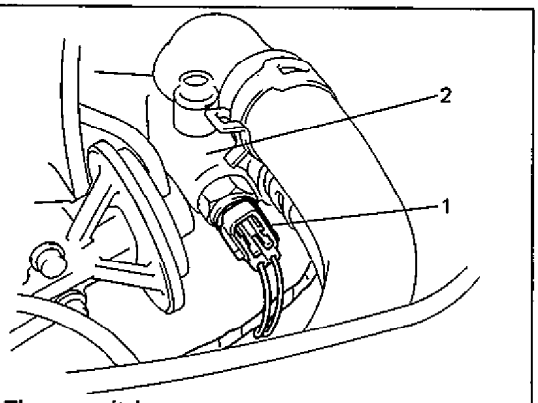
Thermostat functional spec. ± 2.8°C (5.0°F)		
Thermostat	"A"	"B"
Temp. at which valve begins to open	82°C (179°F)	88°C (190°F)
Temp. at which valve become fully open	95°C (203°F)	100°C (212°F)

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.

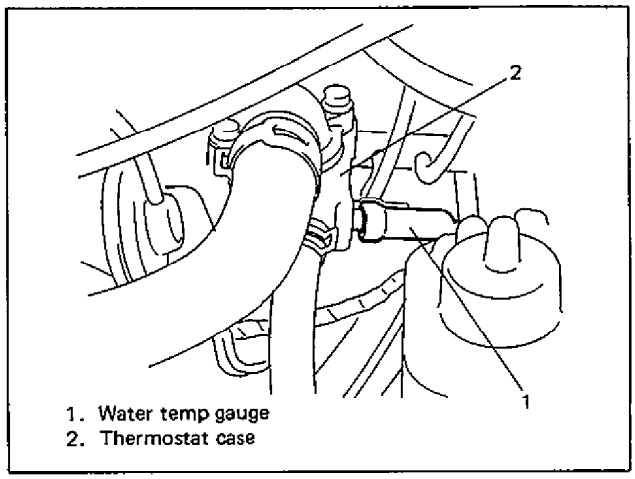


1. Thermo switch
2. Intake manifold

Fig. 6B-6 Thermo Switch

WATER TEMP GAUGE

A water temp gauge is located at intake manifold. This gauge activates a temp. meter guage 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.	1.41/3.29	2.35/2.35
	US pt.	2.98/6.95	4.96/4.96
	Imp. pt.	2.48/5.79	4.13/4.13

COOLANT CAPACITY	
Engine, radiator and heater	About 4.1 liters (8.6/7.2 US/Imp pt.)
Reservoir tank	About 0.6 liters (1.3/1.1 US/Imp pt.)
Total	About 4.7 liters (9.9/8.3 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.**

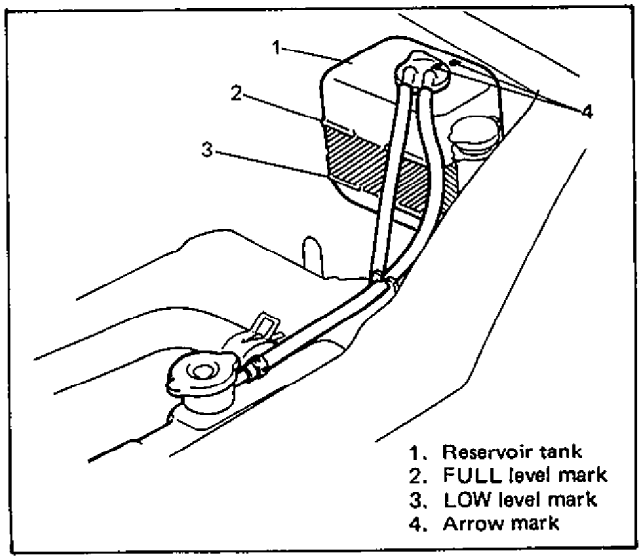


Fig. 6B-8

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/cm² (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.

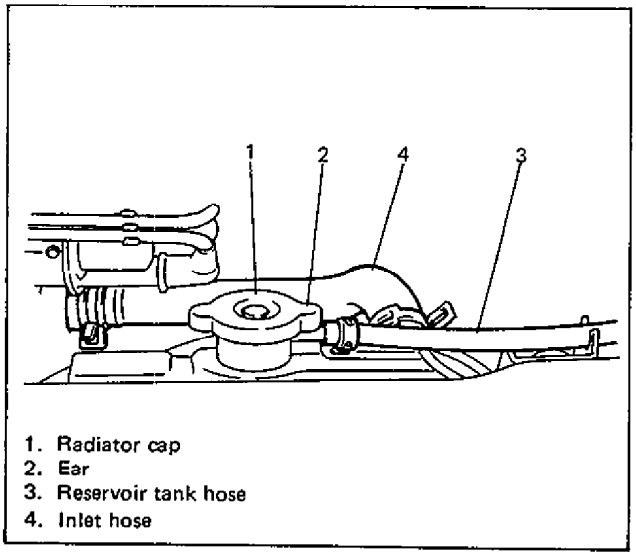


Fig. 6B-9 Installation of Radiator Cap

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.

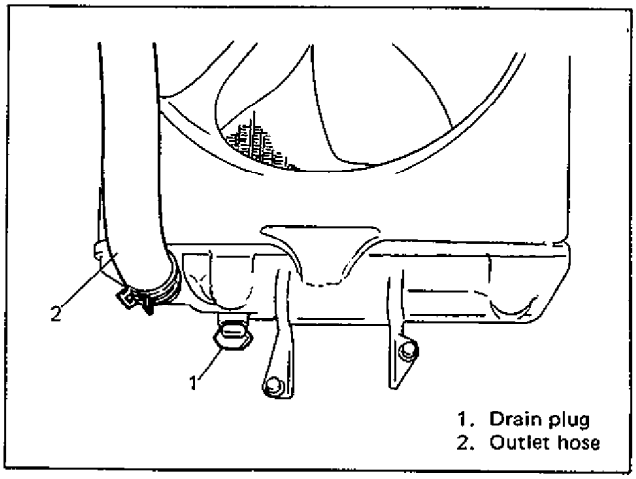


Fig. 6B-10 Radiator Drain Plug

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.).

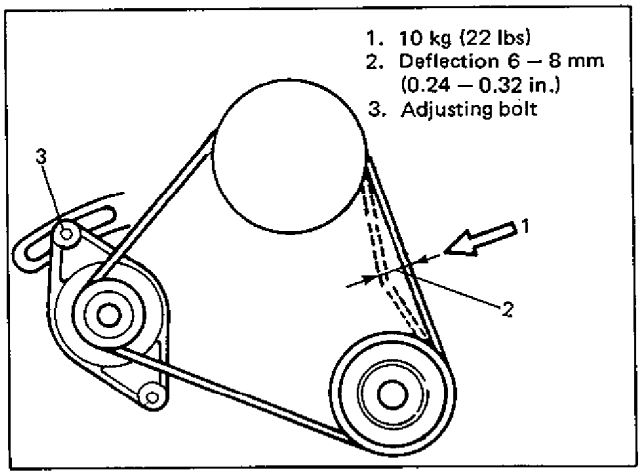


Fig. 6B-11

3. If belt is too tight or too loose, adjust it to proper tension by displacing alternator position.

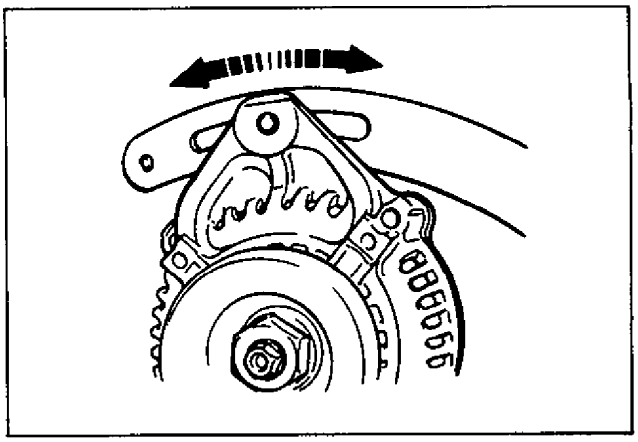


Fig. 6B-12

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.

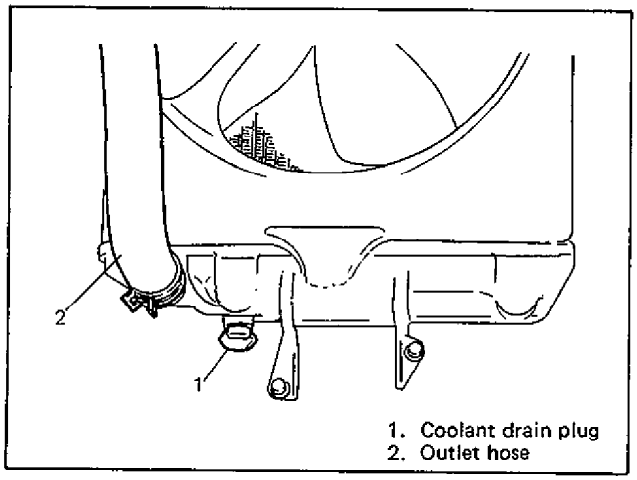


Fig. 6B-13

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.

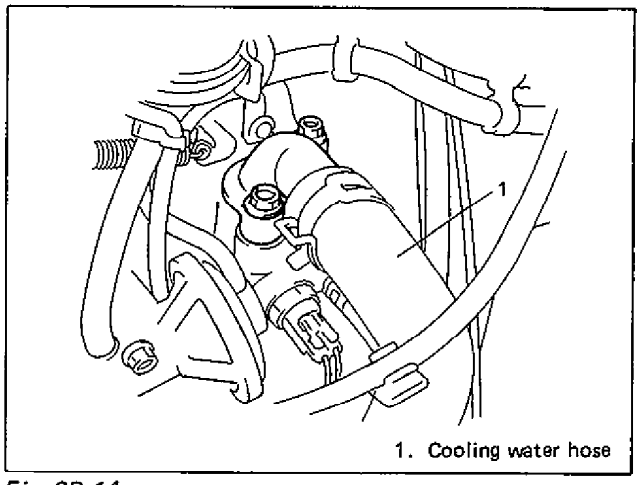


Fig. 6B-14

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 intake manifold.

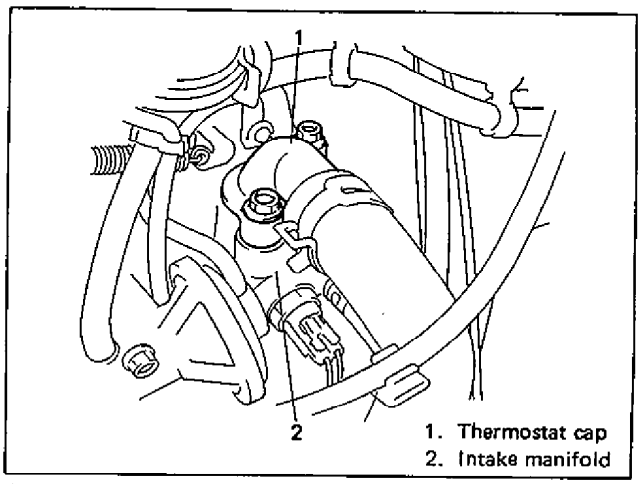


Fig. 6B-15

4. Remove thermostat.

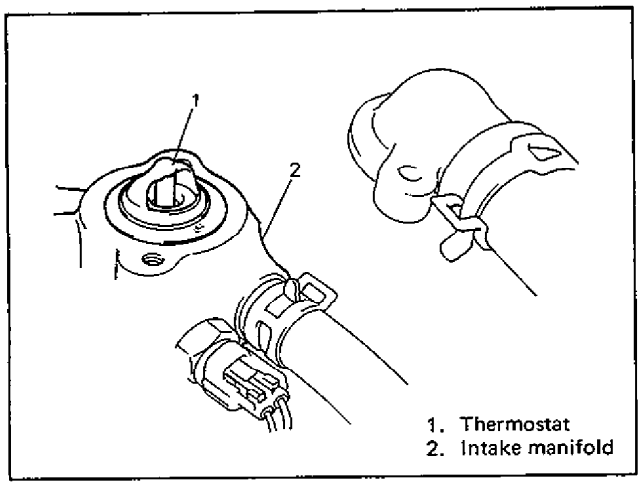


Fig. 6B-16

INSPECTION

1. Make sure that air bleed valve of thermostat is clear. Should this valve be clogged, engine would tend to overheat.

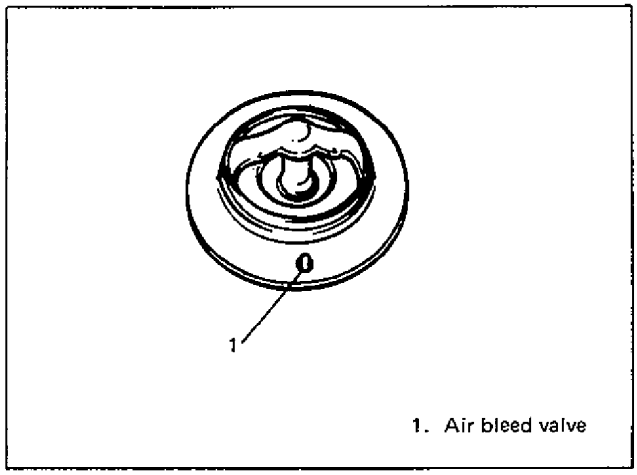


Fig. 6B-17 Air Bleed Valve of Thermostat

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.

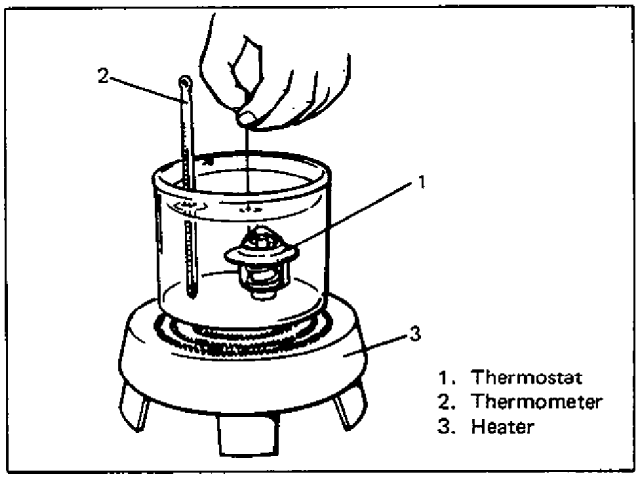


Fig. 6B-18 Checking Thermostat Valve Operation

INSTALLATION

1. Install thermostat to intake manifold as shown in Fig. 6B-19.

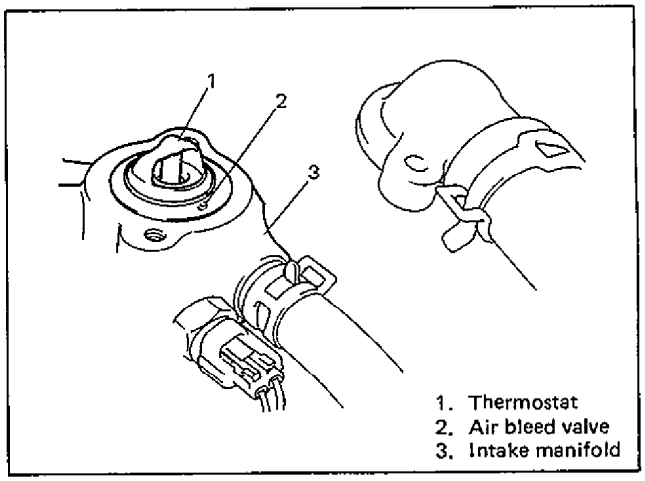


Fig. 6B-19

2. Install new gasket and thermostat cap to intake manifold.
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.

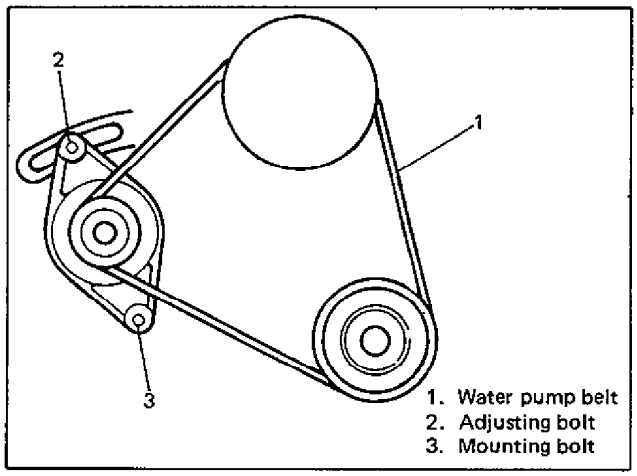


Fig. 6B-20

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 intake manifold.

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)

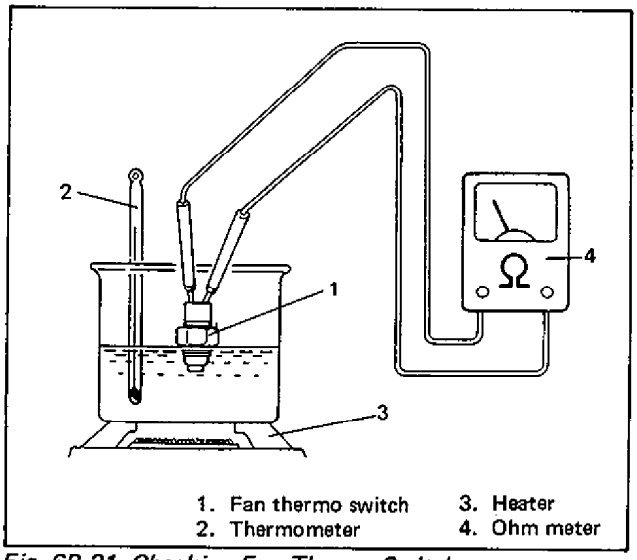


Fig. 6B-21 Checking Fan Thermo Switch

Tighting torque for fan thermo switch	10—14 N·m 1.0—1.4 kg-m 7.5—10.0 lb-ft

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 reservoir tank hose.

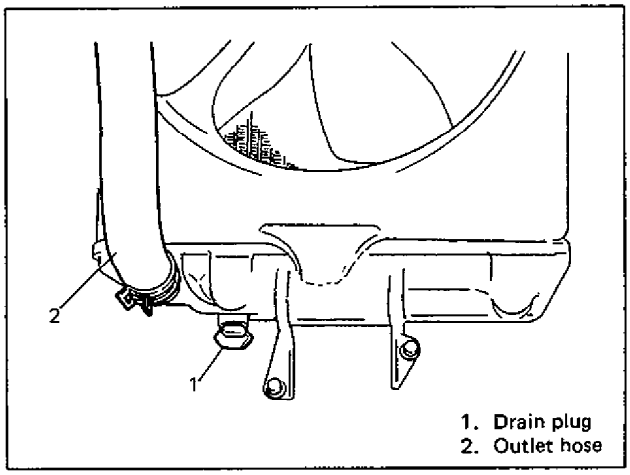


Fig. 6B-22 Radiator of M/T Car

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.

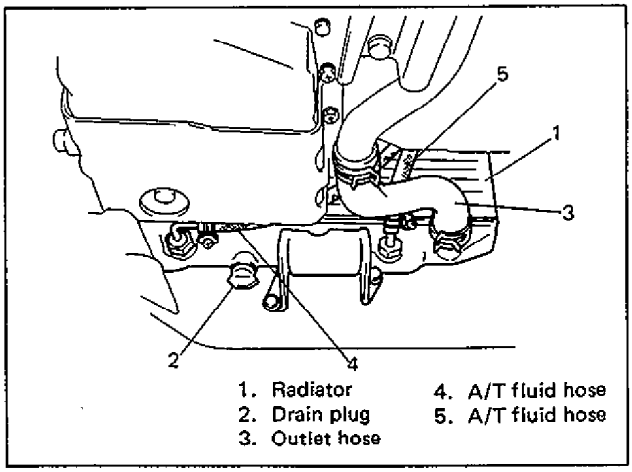


Fig. 6B-23 Radiator of A/T Car

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.

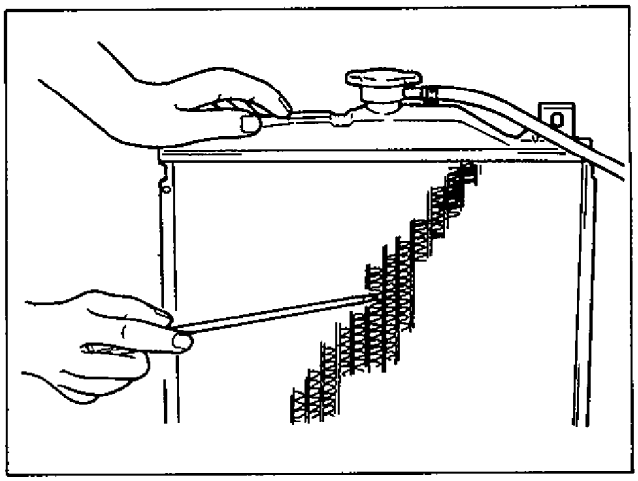


Fig. 6B-24

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 by removing 4 pulley bolts.

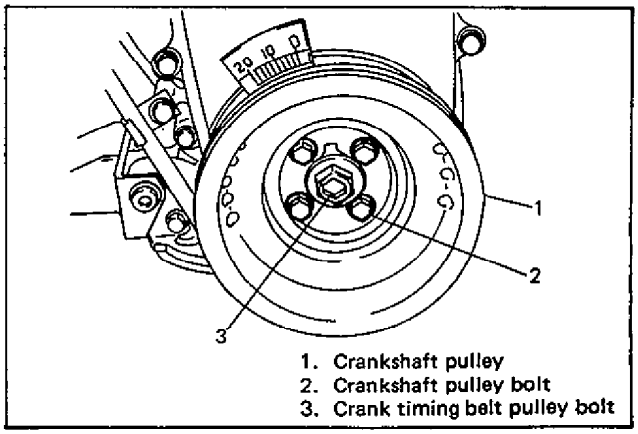


Fig. 6B-25

5. Remove timing belt outside cover.
6. Remove tensioner and timing belt.

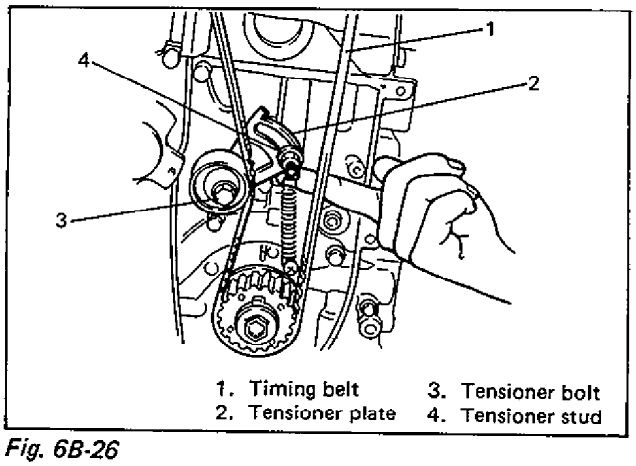


Fig. 6B-26

7. Remove water pump assembly.

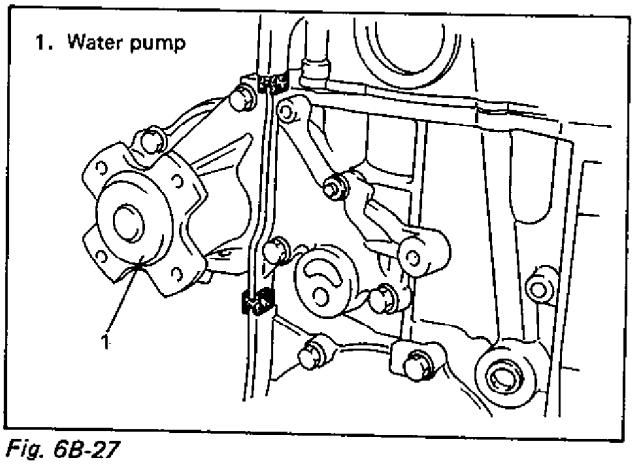


Fig. 6B-27

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.

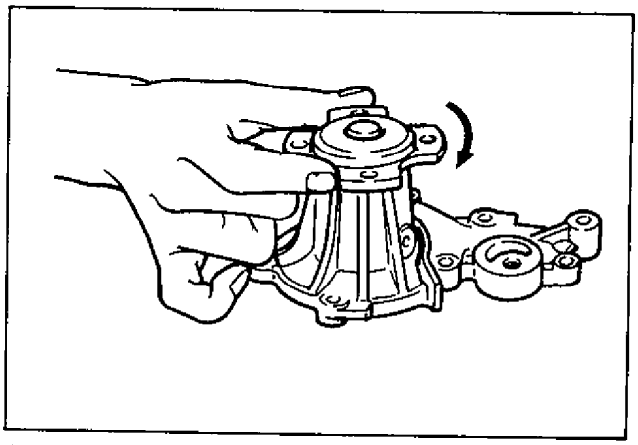


Fig. 6B-28 Checking Water Pump

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, and another between water pump and cylinder head.

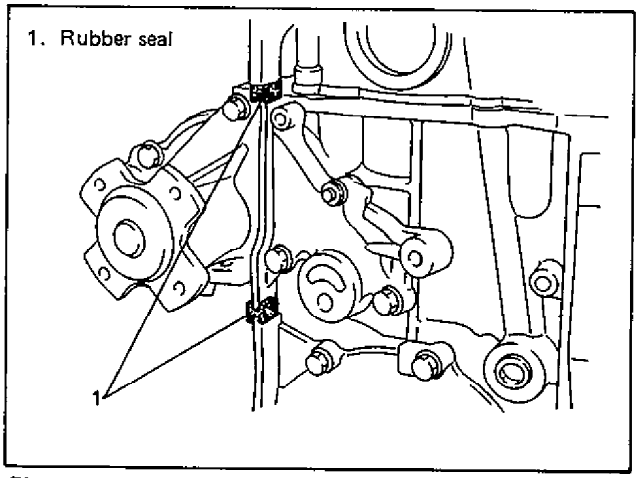


Fig. 6B-29

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

CONTENTS

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".

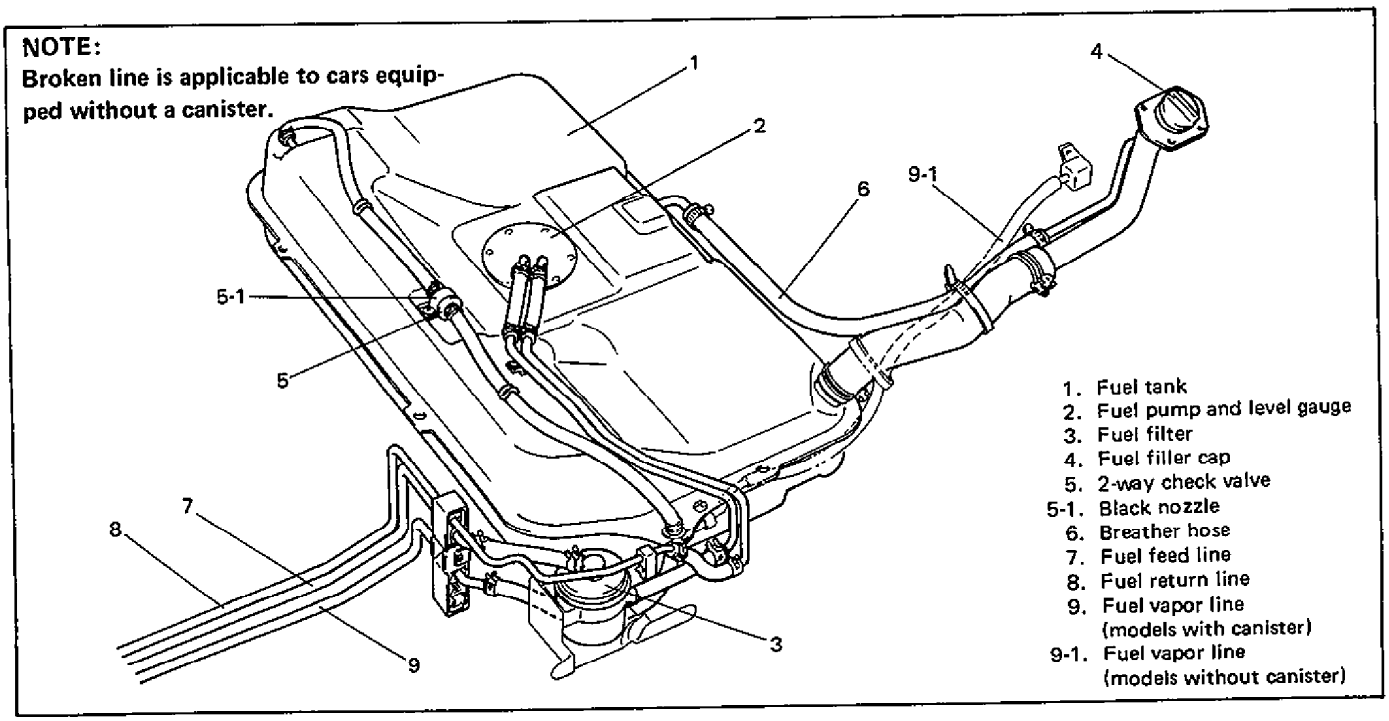


Fig. 6C-1 Fuel System

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.

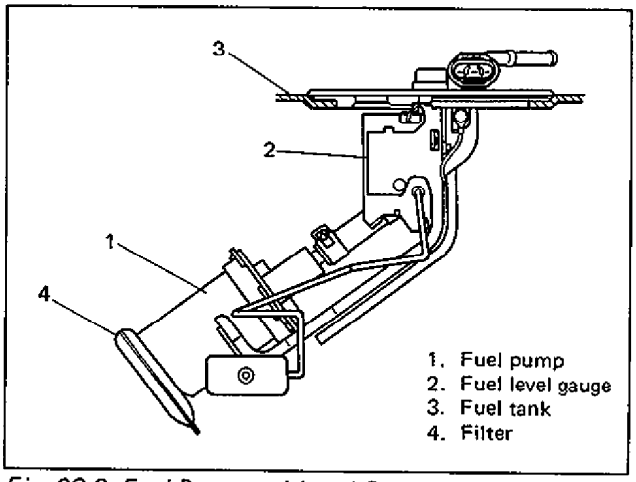


Fig. 6C-2 Fuel Pump and Level Gauge

The fuel pump 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.

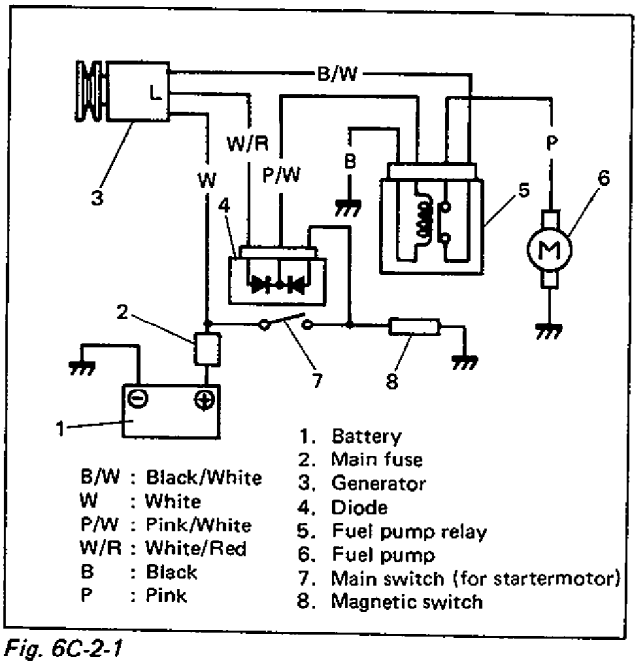


Fig. 6C-2-1

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.

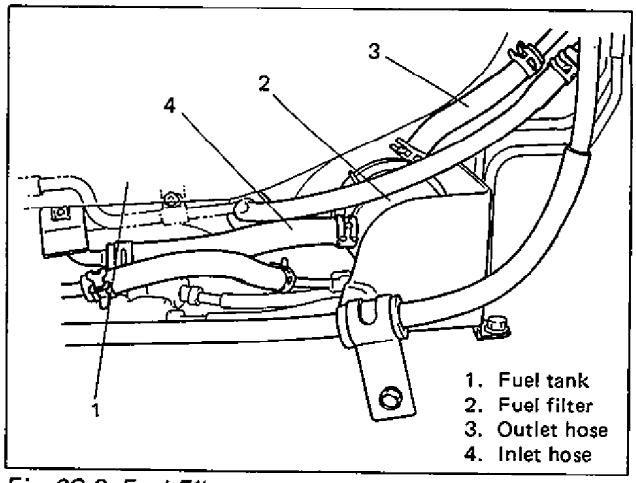


Fig. 6C-3 Fuel Filter

FUEL FILLER CAP

NOTE:

Either of two types of filler cap is used depending on regulations of each country.

Described here is the one with a vacuum relief valve.

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.

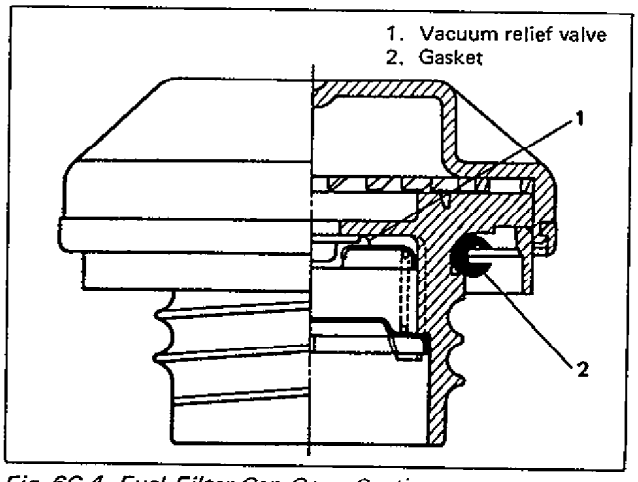


Fig. 6C-4 Fuel Filter Cap Cross-Section

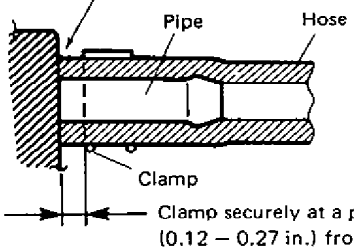
ON CAR SERVICE

WARNING:

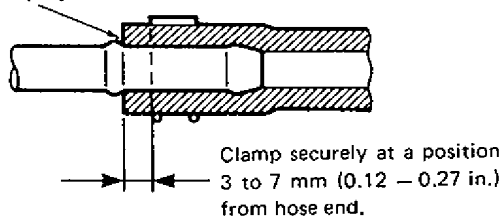
Before attempting service of any type on fuel system, following cautions should be always observed.

- **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.**
- **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.**

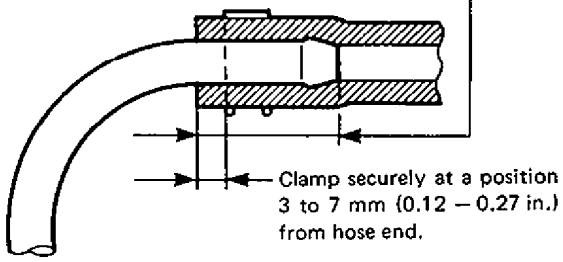
With short pipe, fit hose as far as it reaches pipe joint as shown.



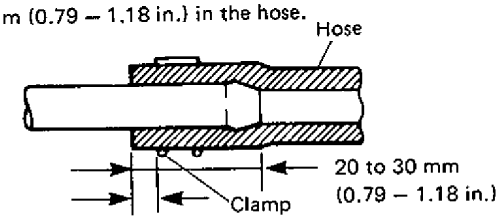
With following type pipe, fit hose as far as its peripheral projection as shown.



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.



FUEL LINES

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.

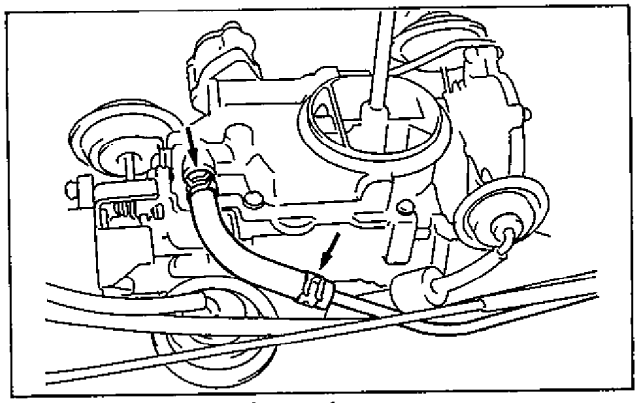


Fig. 6C-5 Fuel Lines Inspection

FUEL PIPE

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. 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.

3. Brake pipe from pipe joint referring to SECTION 5.
4. Pipe cover from body.
5. Put clamp position mark on body and pipes so that clamps can be installed on original position.
6. Pipes with clamp from body.

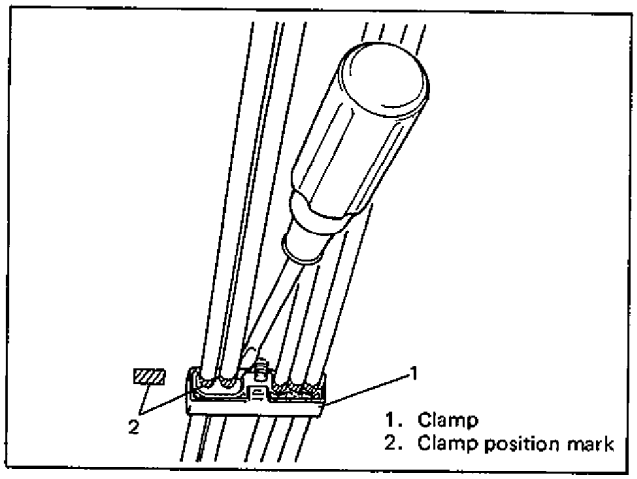


Fig. 6C-6 Detaching Clamp with Pipes

7. Clamp from pipes.

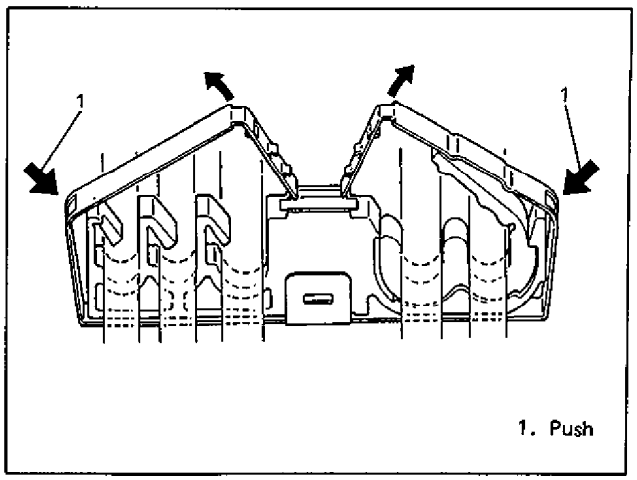


Fig. 6C-7 Removing Clamp

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.

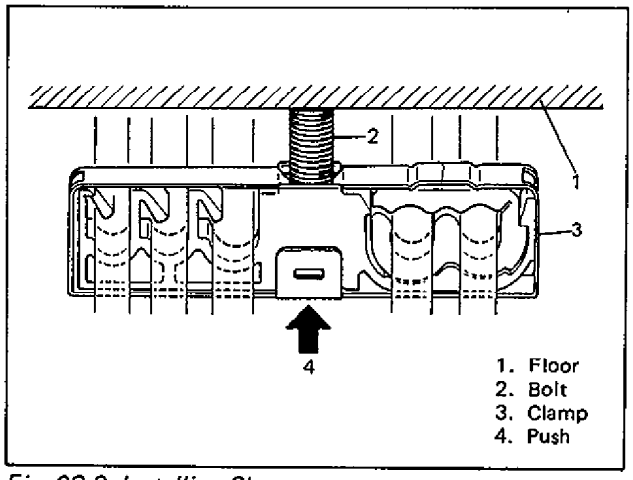


Fig. 6C-8 Installing Clamp

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.
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 can 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 two types of filler cap as shown below. Which one is used depends on regulations of each country.**

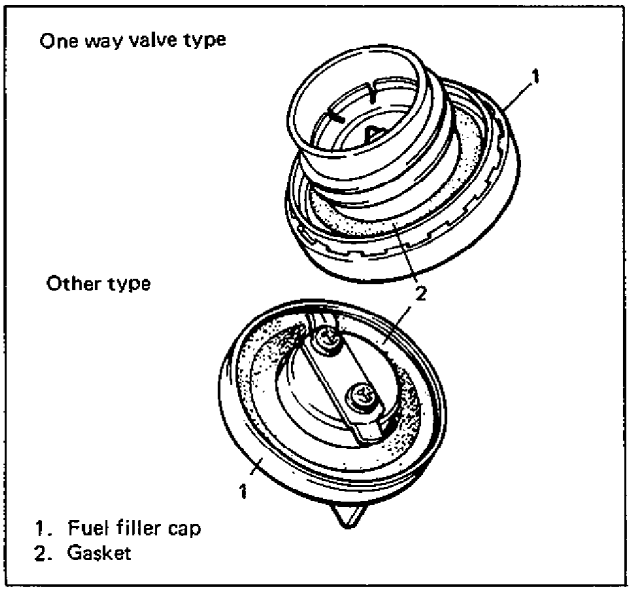


Fig. 6C-9 Fuel Filler Cap

FUEL FILTER

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.

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.

5. Filter bracket from car body.

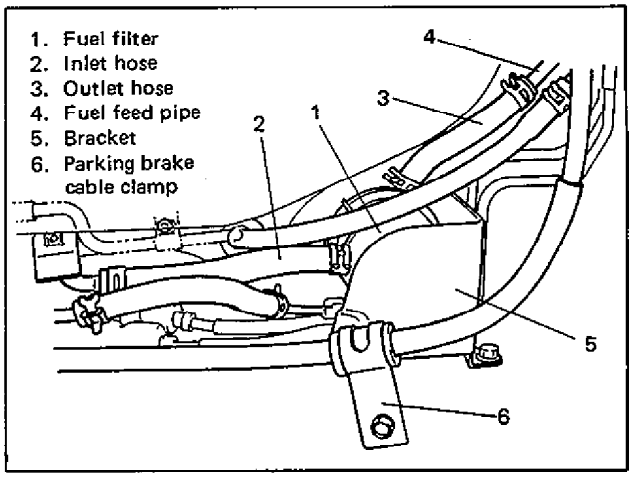


Fig. 6C-10 Disconnecting Hoses

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.

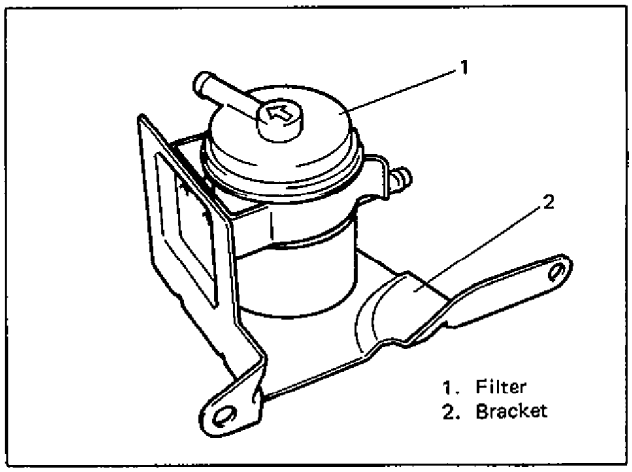


Fig. 6C-11 Installing Filter Bracket

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.

FUEL TANK

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Rear seat cushion referring to SECTION 9.
3. Fuel level gauge and fuel pump lead wire couplers, and detach wire tape.

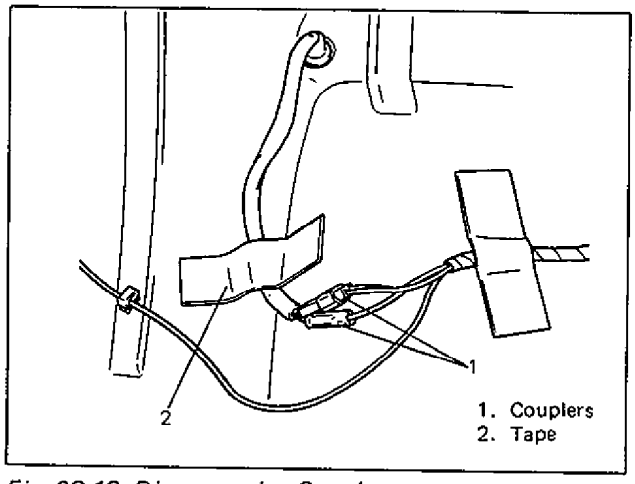


Fig. 6C-12 Disconnecting Couplers

4. Hoist car.
5. Fuel filler hose from fuel tank and breather hose from filler neck.

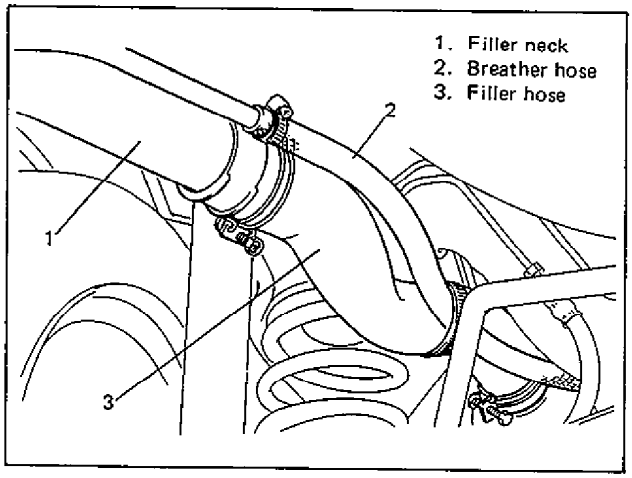


Fig. 6C-13 Breather and Filler Hoses

6. 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.

7. 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.

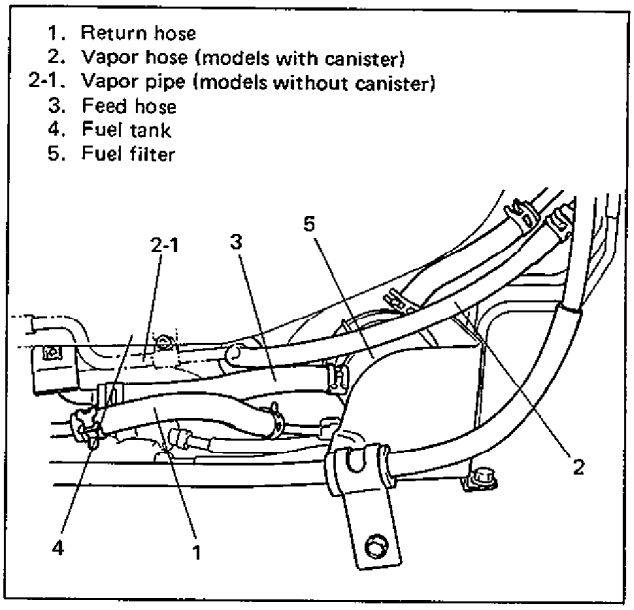


Fig. 6C-14 Disconnecting Hoses

8. 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 warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean.
   Replace tank if its inside is rusty.
5. Completely flush out remaining water after washing.

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-14 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.

FUEL LEVEL GAUGE

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.

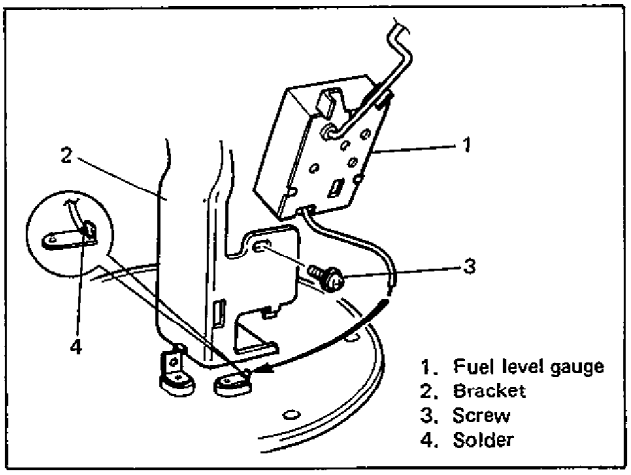


Fig. 6C-15

2. For float adjustment, place pump bracket flat on a level base as shown below and adjust so that distance between base surface and center of float arm becomes 29.5 mm (1.16 in.) when float is lowered fully (when arm contacts stopper).

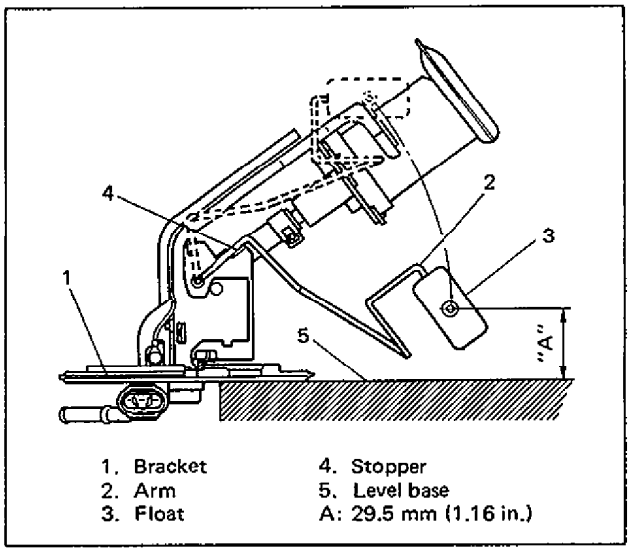


Fig. 6C-15-1

FUEL PUMP

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.

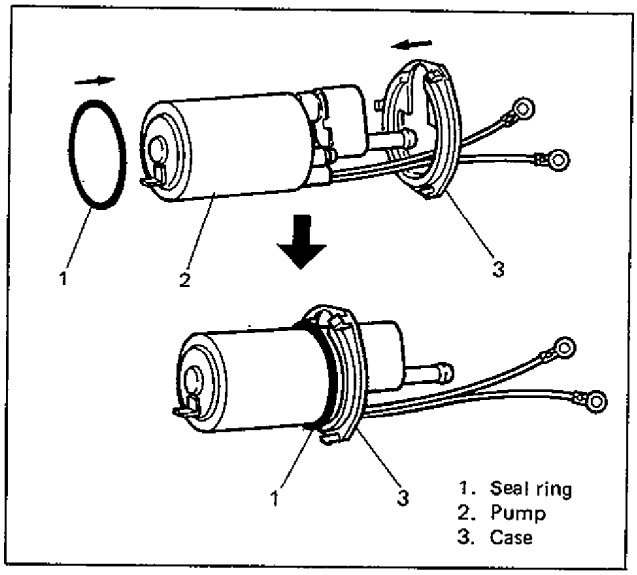


Fig. 6C-16

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.**

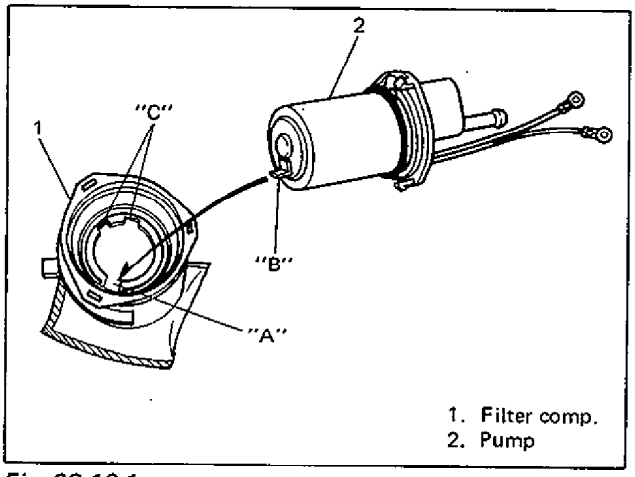


Fig. 6C-16-1

3. Install case to filter comp. making sure that they fit each other securely.

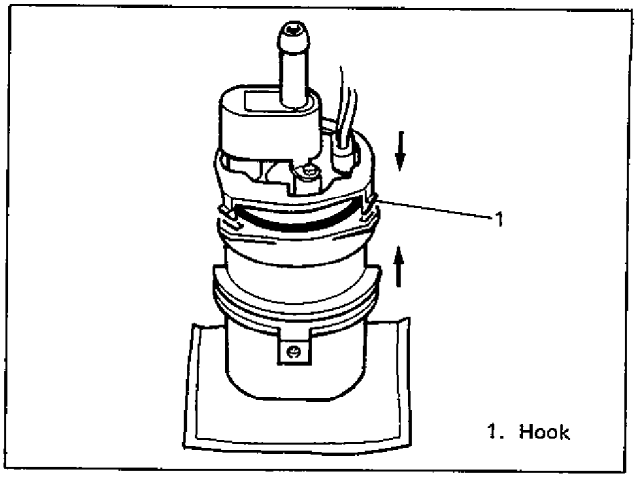


Fig. 6C-16-2

SECTION 6D

CARBURETOR

CONTENTS

NOTE:
For general description and maintenance service of bowl vent valve and throttle positioner, refer to SECTION 6J EMISSION CONTROLS.

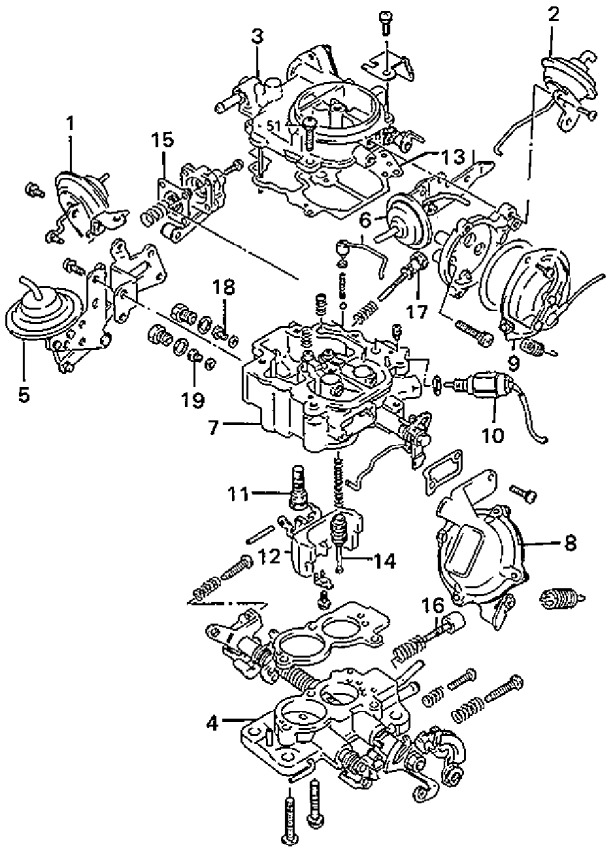
GENERAL DESCRIPTION

This carburetor is a 2-barrel downdraft type having a primary system and a secondary system.
The primary system operates under normal driving condition, and the secondary system operates under high speed, high load driving condition.
In the primary system, a choke valve is incorporated.

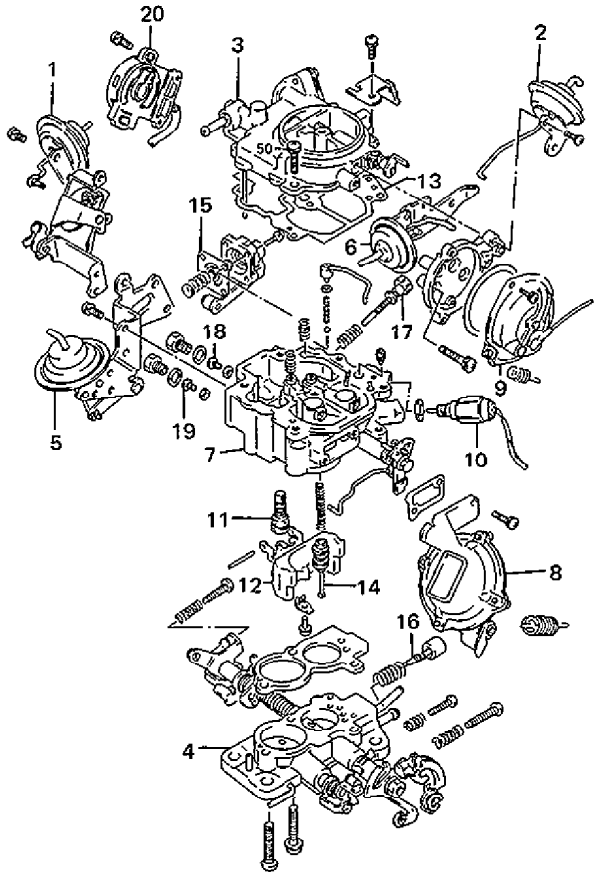
NOTE:
The following variations in system or parts are used depending on specifications and as required by regulations of each country.

- **Air vent solenoid valve — Equipped and not equipped.**
- **Throttle sensor — Automatic transmission**

FOR MANUAL TRANSMISSION



FOR AUTOMATIC TRANSMISSION



1. Throttle positioner
2. Fast idle cam opener
3. Float chamber cover
4. Throttle body
5. Idle up actuator
6. Choke opener
7. Float chamber
8. Secondary actuator
9. Choke bimetal case
10. Fuel cut solenoid valve
11. Needle valve
12. Float
13. Gasket
14. Power piston
15. Acceleration pump diaphragm
16. Idle mixture adjusting screw
17. Idle speed adjusting screw
18. Primary main jet
19. Secondary main jet
20. Throttle sensor

Fig. 6D-1

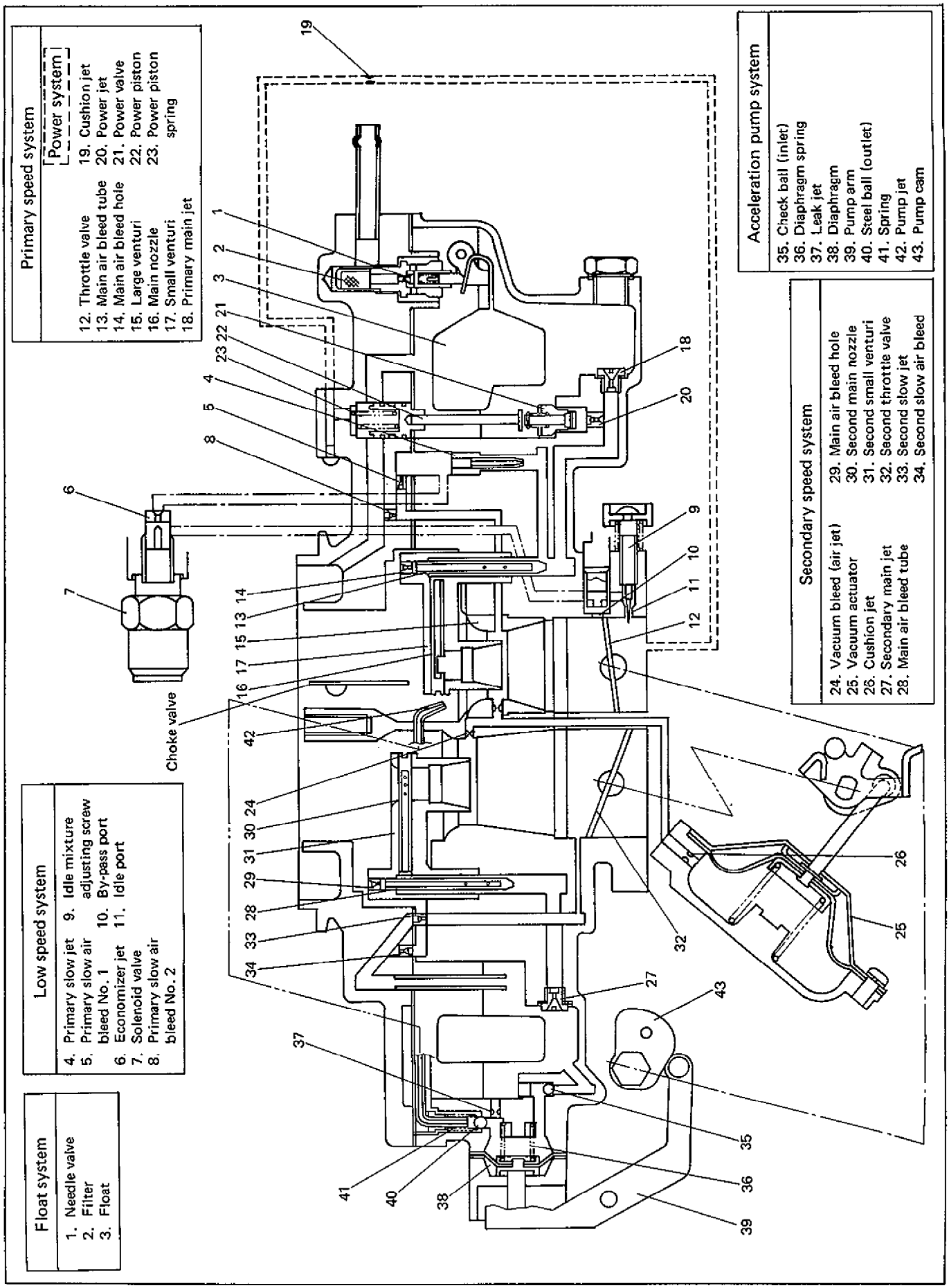

Primary speed system
Power system
12. Throttle valve
13. Main air bleed tube
14. Main air bleed hole
15. Large venturi
16. Main nozzle
17. Small venturi
18. Primary main jet
19. Cushion jet
20. Power jet
21. Power valve
22. Power piston
23. Power piston spring
Acceleration pump system
35. Check ball (inlet)
36. Diaphragm spring
37. Leak jet
38. Diaphragm
39. Pump arm
40. Steel ball (outlet)
41. Spring
42. Pump jet
43. Pump cam
Secondary speed system
24. Vacuum bleed (air jet)
25. Vacuum actuator
26. Cushion jet
27. Secondary main jet
28. Main air bleed tube
29. Main air bleed hole
30. Second main nozzle
31. Second small venturi
32. Second throttle valve
33. Second slow jet
34. Second slow air bleed
Low speed system
4. Primary slow jet
5. Primary slow air bleed No. 1
6. Economizer jet
7. Solenoid valve
8. Primary slow air bleed No. 2
9. Idle mixture adjusting screw
10. By-pass port
11. Idle port
Float system
1. Needle valve
2. Filter
3. Float
Choke valve

Fig. 6D-1-1

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 into the float chamber. With the float movement caused by its buoyancy, the needle valve opens and closes to control fuel at a constant level.

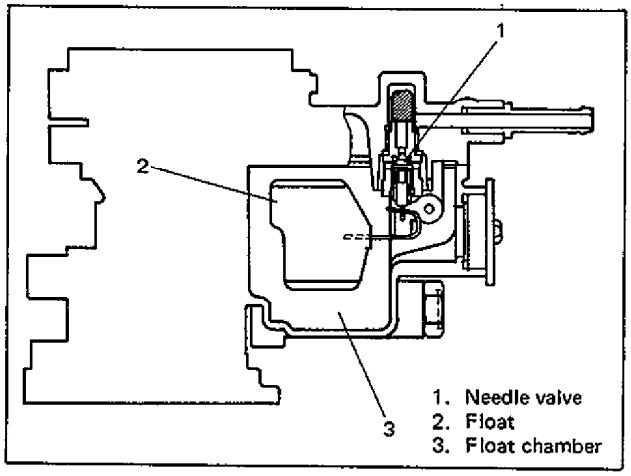


Fig. 6D-2

PRIMARY SYSTEM

PRIMARY SLOW SYSTEM

This system incorporates a solenoid valve which opens the system circuit when the ignition key is ON and closes when OFF.
Fuel coming through the primary main jet is metered by the primary slow jet and mixed with the air metered by the slow air bleed hole No. 1.
The mixture passes through the economizer jet, is further mixed with the air coming through the slow air bleed No. 2 and is discharged through the bypass port and the idle port located near the primary throttle valve.
While idling, the mixture is discharged mainly through the idle port and mixed with the air in the main bore. Therefore, the mixture ratio is adjusted by the idle mixture adjusting screw. That is, tightening it makes the mixture leaner and loosening it makes richer.

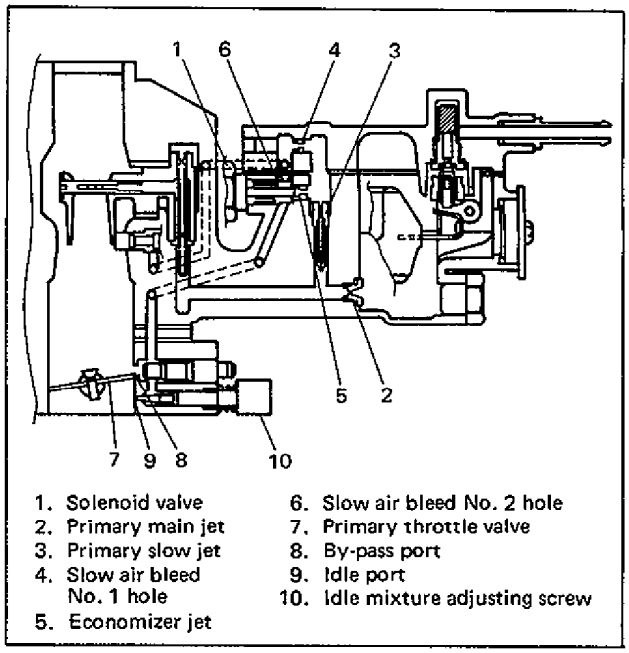


Fig. 6D-3

PRIMARY MAIN SYSTEM

There are two fuel lines.
Ordinarily, the fuel metered by the primary main jet is mixed in the primary main air bleed tube with the air metered by the main air bleed hole and sprayed out into the venturi through the main nozzle.
Under high load conditions, as the vacuum in the intake manifold falls, the power piston spring pushes down the power piston which causes the power valve to open the fuel passage. Then the fuel in the float chamber is metered by the power jet (refer to Fig. 6D-1-1) and passes through the same passage as described above. The mixture sprayed out into the venturi through the main nozzle is even richer than the above described mixture.

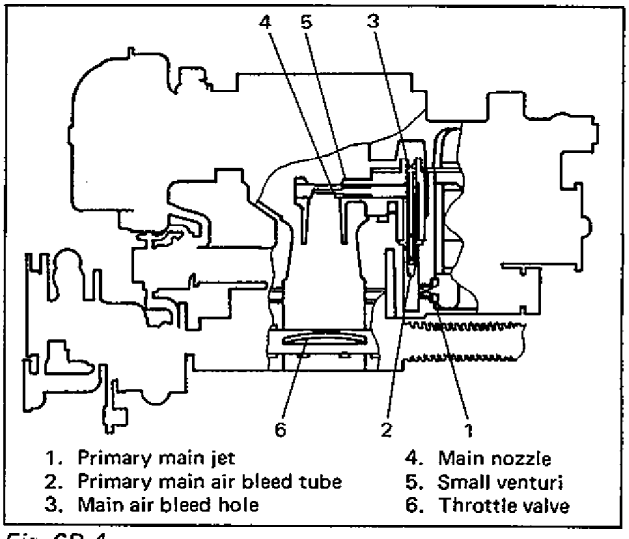


Fig. 6D-4

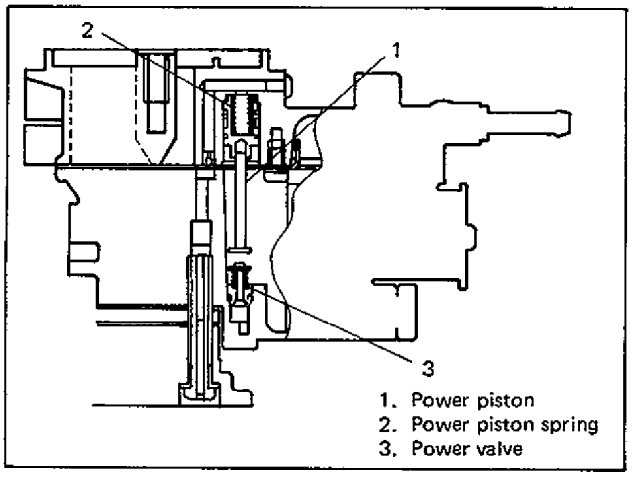


Fig. 6D-5

SECONDARY SYSTEM

SECONDARY SLOW SYSTEM

This system operates during the transition period from the primary main system to the secondary main system. When the primary throttle valve is open nearly 48° and the vacuum in "A" as shown in the following figure exceeds −40 mmAq, the diaphragm pulls up the rod.

In this state, the secondary throttle valve is ready to open at any time when the primary throttle valve opens further.

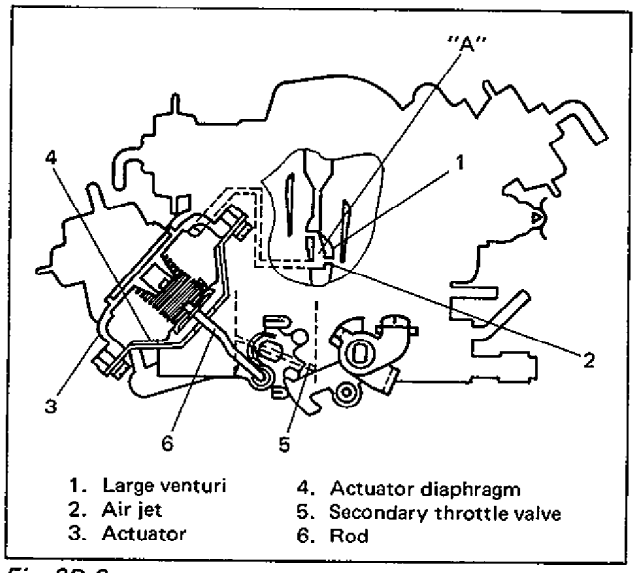


Fig. 6D-6

When the primary throttle valve opening exceeds 48° and the secondary valve starts to open, fuel from the float chamber is mixed with the air coming through and metered at the slow air bleed hole. Then the mixture is metered at the slow jet and sprayed out through the by-pass port.

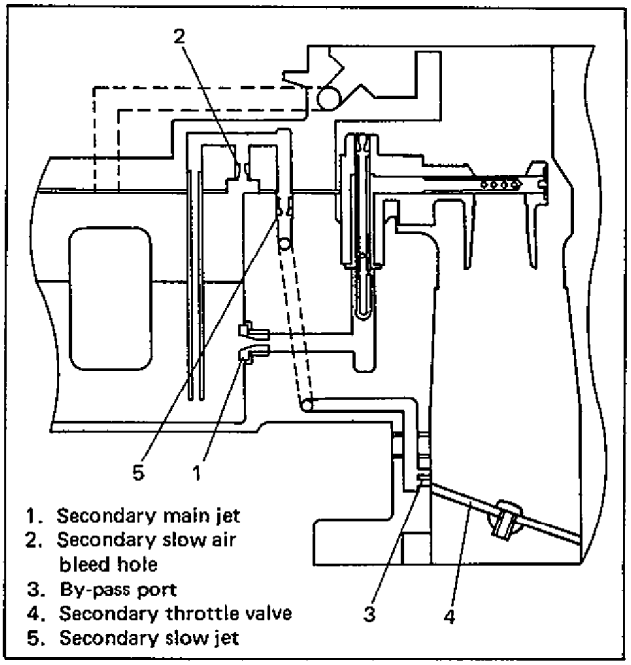


Fig. 6D-7

SECONDARY MAIN SYSTEM

When the primary throttle valve opening is wider than when the slow system operates (when the accelerator pedal is depressed), the diaphragm is pulled further up due to the increased vacuum. Then the secondary throttle valve opens in accordance with the operation of the primary throttle valve. In this state, the fuel in the float chamber is metered by the secondary main jet, mixed in the main air bleed tube with the air metered by the main air bleed hole and sprayed out into the small venturi through the secondary main nozzle.

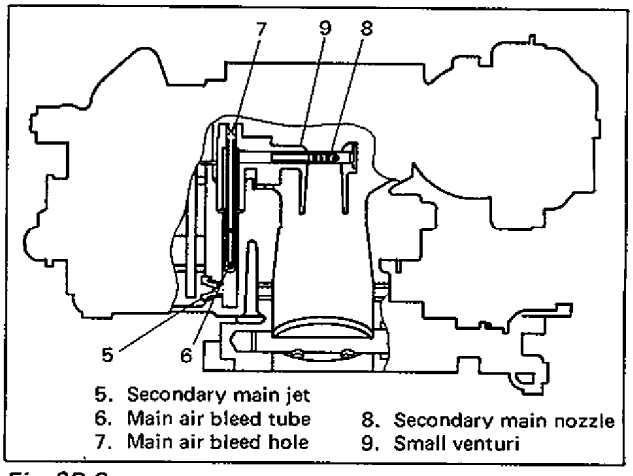


Fig. 6D-8

ACCELERATION PUMP SYSTEM

When the accelerator pedal is depressed quickly during idling or low speed driving, the throttle valve opens but cannot discharge enough fuel for quick acceleration. Then the acceleration pump operates to add extra fuel.

When the accelerator pedal is depressed, the throttle valve opens and moves the pump cam, thereby the pump arm is also moved to push the pump diaphragm. This causes the inlet check ball to close the inlet. Then the fuel in the pump chamber passes through the steel ball outlet and pump jet and is discharged into the primary side venturi.

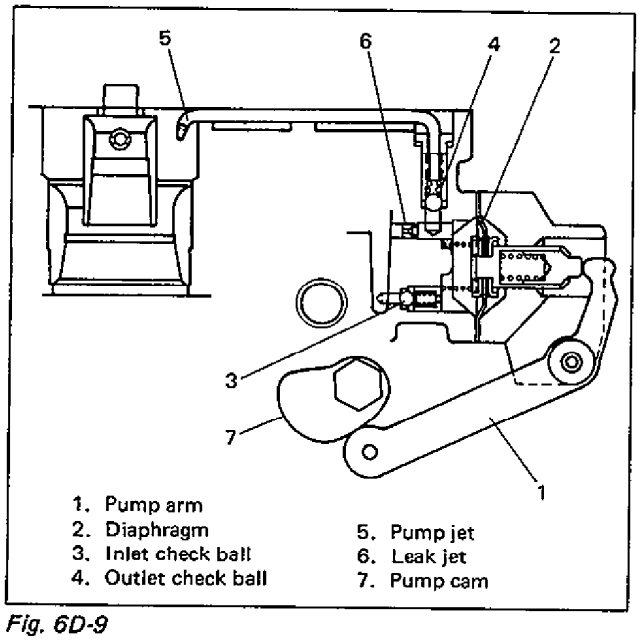


Fig. 6D-9

CHOKE SYSTEM

(For Auto Choke Type Vehicle)

The main component parts of the choke system are; inner parts of the choke case, choke opener, fast idle cam and fast idle cam opener.

Choke Case Inner Parts

The below figure shows components in the choke case.

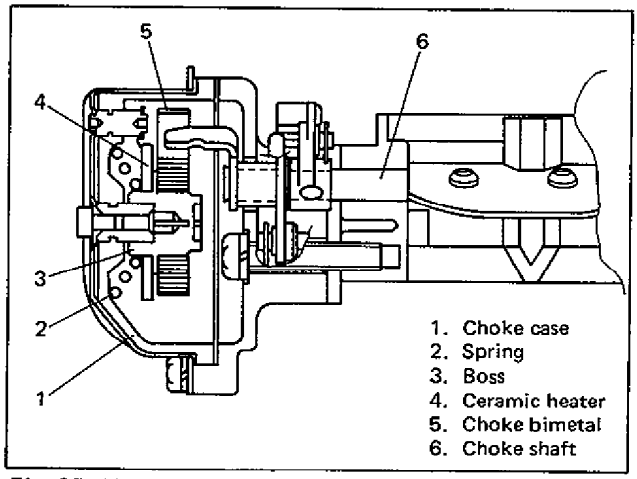


Fig. 6D-10

- Ceramic heater

  The ceramic heater is fixed by the spring force.

  When the engine is started, about 14V voltage generated in the alternator heats the ceramic heater, whose heat then warms up the bimetal through the boss as shown above.

  In the cold weather, the heater temperature rises as the electricity flows but once it reaches the preset temperature, heater resistance increases quickly to prevent excessive consumption of electricity (as the amperage is set low).

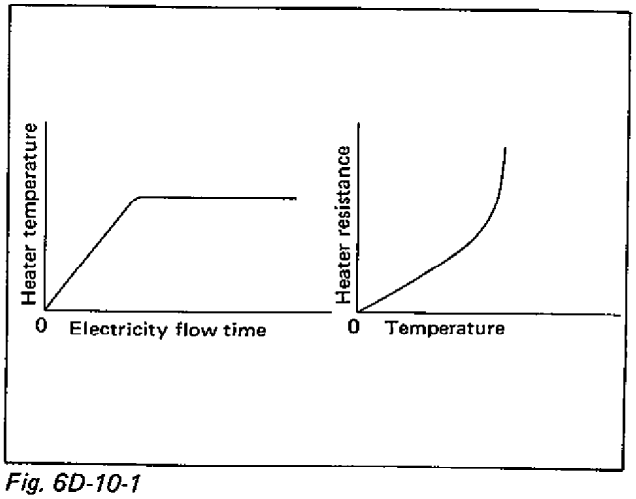


Fig. 6D-10-1

- Choke bimetal
  The bimetal controls the choke valve closure according to the temperature it senses. At a low temperature, it applies force to close the choke valve and at a high temperature, it causes the choke valve to open.

Choke opener

When the engine starts to run, the intake manifold vacuum is applied to the diaphragm of the choke opener. Then the diaphragm makes the choke valve open to the preset opening.
For further information, refer to AFTER ENGINE START on the next page.

Fast idle cam

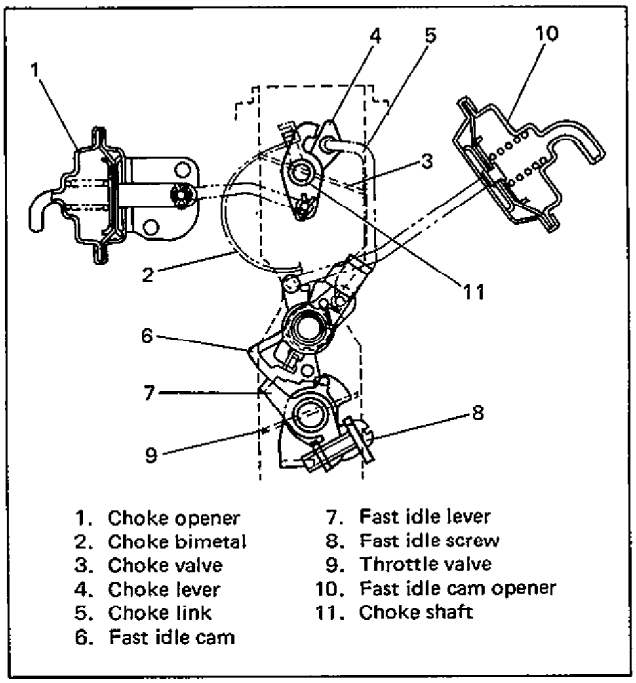
As the fast idle cam is interlocked with the choke valve through the link, it keeps the fast idle lever positioned at the first step of the fast idle cam when the choke valve is closed. This causes the idle lever to open the throttle valve for the optimum opening so as to help the engine start and maintain the engine idle speed properly while the engine is being warmed.

Fast idle cam opener

Generally, the warmer the engine becomes, the higher the engine speed rises. To prevent an excessively high engine speed, the fast idle cam opener is provided.
When the engine cooling water temperature reaches the preset level, a vacuum is applied to this opener. Then its diaphragm pulls the rod to force the fast idle cam into the third step position so as to automatically prevent the engine speed from rising higher. (Refer to Fig. 6D-13.)

AT COLD ENGINE START

When the engine is cold, the choke bimetal is contracted and therefore applies force in such a direction as to close the choke valve which is connected to the fast idle cam through the choke shaft, choke lever and choke link. When the choke is closed fully, the fast idle cam turns counterclockwise till the fast idle lever is in its first step position and thus opening of the primary throttle valve is kept suitable for the engine condition then.



1. Choke opener
2. Choke bimetal
3. Choke valve
4. Choke lever
5. Choke link
6. Fast idle cam
7. Fast idle lever
8. Fast idle screw
9. Throttle valve
10. Fast idle cam opener
11. Choke shaft

Fig. 6D-11

IMMEDIATELY AFTER ENGINE START

When the engine starts to run, the intake manifold vacuum increases. Then the diaphragm of the choke opener operates to force the choke valve to open a little to prevent air/fuel mixture from getting excessively rich.

Also a jet is provided between the choke opener and intake manifold. This is to prevent the choke valve from opening quickly as it would result in an unstable engine speed.

With working of these parts, the choke valve is opened forcibly but gradually.

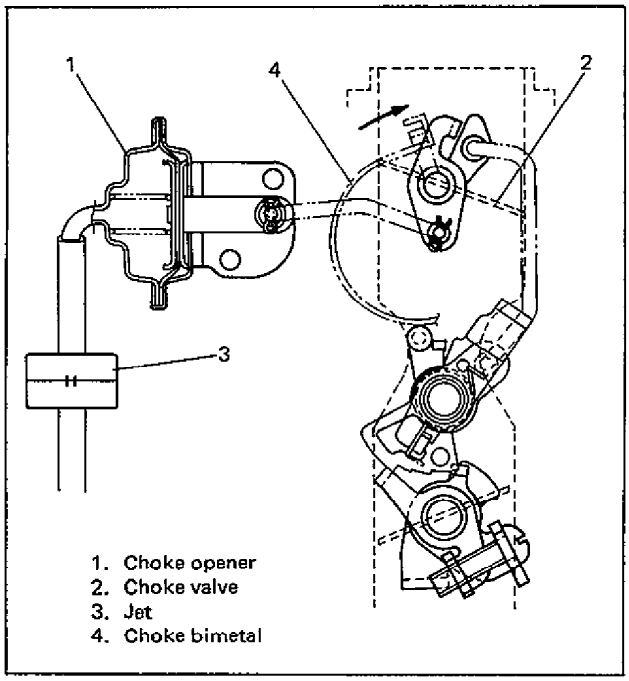


Fig. 6D-12

RELEASE OF CHOKE

As the engine becomes warmer, the bimetal expands and applies force to the choke valve to open gradually till it is full open.

FAST IDLE CAM OPENER OPERATION

If the accelerator pedal is not depressed, the engine speed increases as the engine becomes warmer. However, when the water temperature exceeds about 15°C (59°F), TVSV (Thermal Vacuum Switching Valve) opens the passage between the fast idle cam opener and intake manifold, thereby the manifold vacuum is applied to the diaphragm of the idle cam opener. As the diaphragm pulls up the rod in this state, the positions of the fast idle cam and idle lever change and at the same time, the throttle valve closes a little to decrease the engine speed to about 400 r/min. higher than the specified idle speed.

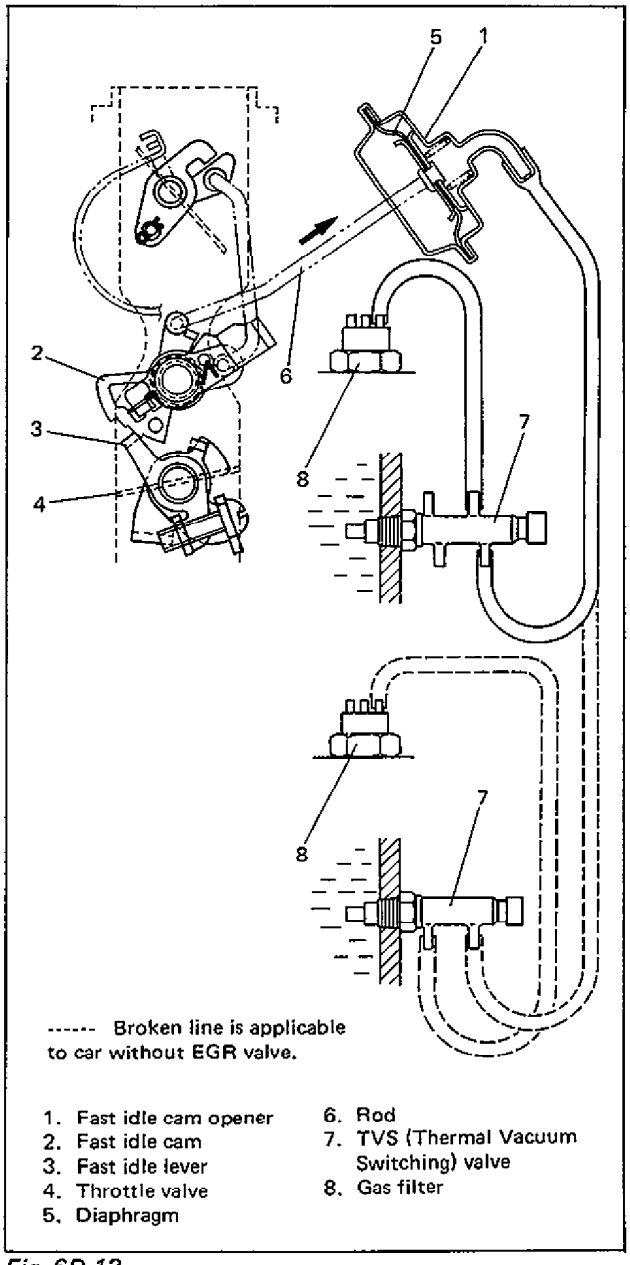


Fig. 6D-13

SUMMARY OF CHOKE SYSTEM OPERATION

- From cold engine start till warmed up
  The description here covers the state in which the accelerator pedal is depressed fully before the engine start and it is released later.
  - A: When the engine is started, the choke opener operates to open the choke valve to the specified opening which provides a stable engine speed.
  - B: As the bimetal is heated by the ceramic heater, the choke valve opens gradually and thus the engine speed increases gradually as the engine is warmed up.
  - C: When the engine becomes warmer and the engine water temperature reaches the preset temperature, the fast idle cam opener operates to set the fast idle cam to its 3rd step position as shown below, thereby increase in the engine speed is prevented.

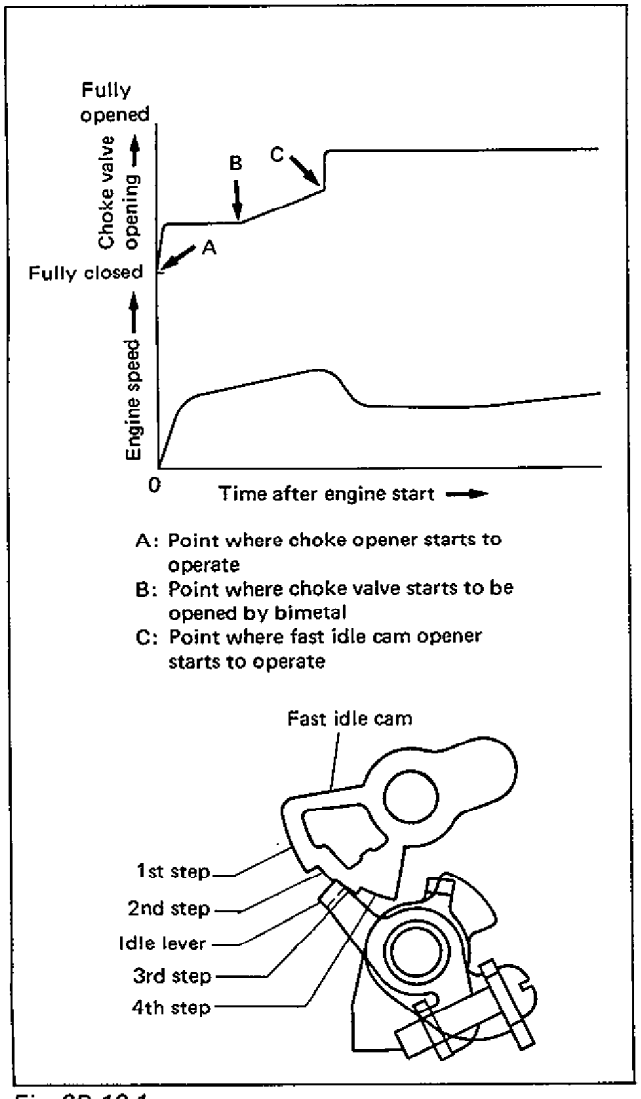


Fig. 6D-13-1

- Choke valve opening and fast idle cam operation from cold engine start (at a temperature lower than 15°C or 59°F) through vehicle running till fully warmed up
  - A: Depressing the accelerator pedal before the engine start sets the fast idle cam to the 1st step position as shown below.
  - B: When the engine is started, the choke opener operates to open the choke valve to the specified opening. Depressing the accelerator pedal in this state sets the fast idle cam to the 2nd step position.
  - C: When the water temperature exceeds 15°C (59°F), the fast idle cam opener forces the fast idle cam into the 3rd step position.
  - D: Depressing the accelerator pedal while the choke valve opens wider sets the fast idle cam to the 4th step position.
  - E: When the engine water temperature reaches the normal operating temperature, the fast idle cam is set to the 5th step position which is represented by "E" in the graph below. Then the throttle valve opening is as specified for idle speed.

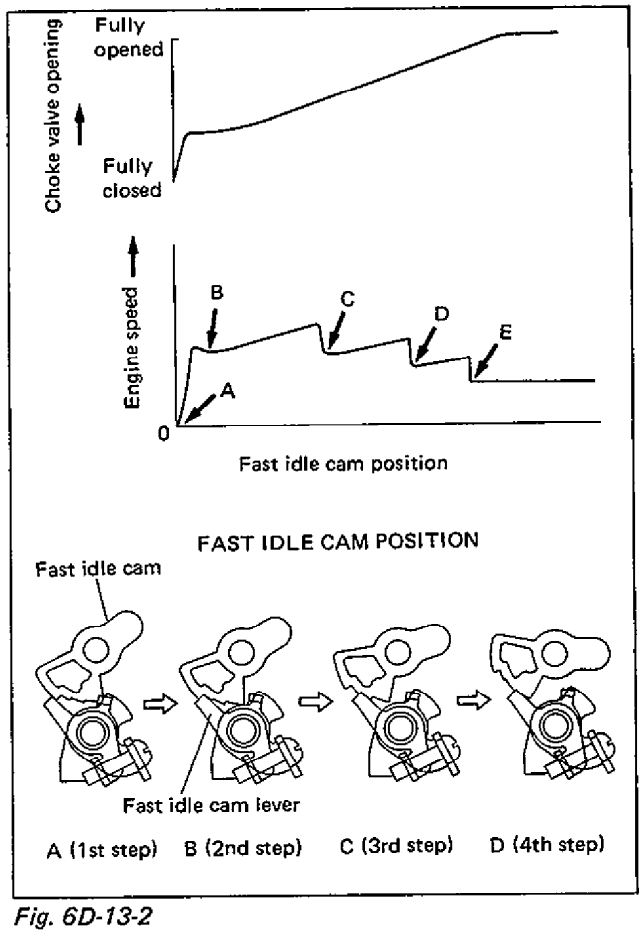


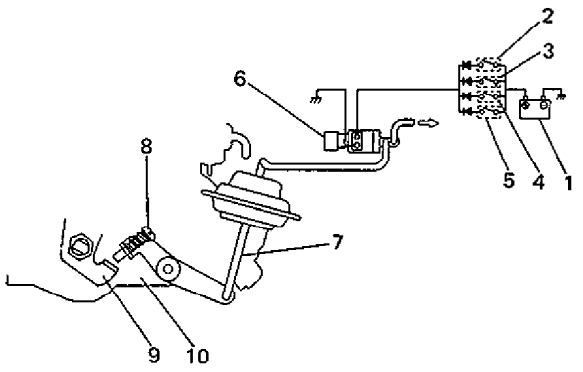
Fig. 6D-13-2

IDLE UP SYSTEM

The structure of this system is as shown below. The system operates to stabilize the engine idle speed when one of the following electric circuits is ON. By using this system, the engine idle speed can be decreased under ordinary conditions.

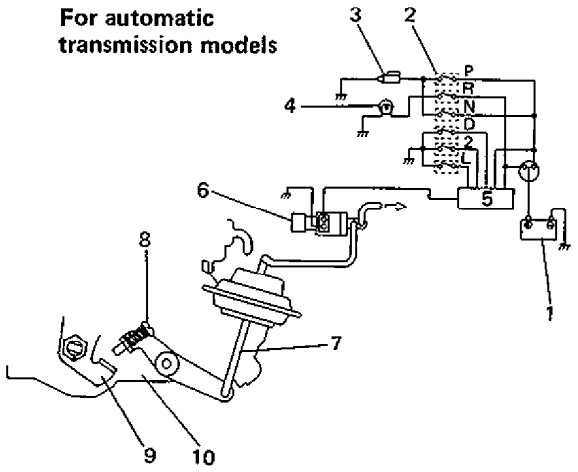
① Headlight and small light
② Heater fan
③ Engine cooling fan
④ Rear defogger

For manual transmission models



1. Battery
2. Headlight and small light switch
3. Heater fan switch
4. Engine cooling fan switch
5. Rear window defogger switch (optional)
6. VSV (Vacuum Switching Valve)
7. Idle up rod
8. Idle up adjusting screw
9. Throttle lever
10. Carburetor

For automatic transmission models



1. Battery
2. Shift lever switch
3. Starter motor
4. Back up light
5. Automatic transmission controller
6. VSV (Vacuum Switching Valve)
7. Idle up rod
8. Idle up adjusting screw
9. Throttle lever
10. Carburetor

NOTE:
Automatic transmission type car doesn't have system which allows engine to idle up by means of electric circuits. Idle up system of automatic transmission type car operates when selector lever is shifted to one of R, D, 2 and L ranges. For its data, refer to p. 6D-15 of this manual.

Fig. 6D-14

When the electric load of one of the above circuits is transmitted to the VSV (Vacuum Switching Valve) through a signal, the VSV opens the vacuum passage. Then vacuum from the intake manifold pulls up the diaphragm of the idle up actuator. In accordance with the diaphragm movement, the idle up rod and the idle up lever move and push down the throttle lever a little further than the ordinary idle speed position, thereby opening the throttle valve by the amount corresponding to the throttle lever movement (about 1.5°), which results in the idle up state. (When headlight switch turns on, engine runs at 650 – 750 r/min.).

When the VSV stops operating (no electric load from the above circuits), air is introduced into the idle up actuator. Then the diaphragm and the rod move down and the idle up lever leaves the throttle lever to release the idle up state. The idle up engine speed is adjusted by turning the idle up adjusting screw.

ON CAR SERVICE

ACCELERATOR CABLE PLAY

APPLICABLE TO CAR EQUIPPED WITH AUTOMATIC CHOKE TYPE CARBURETOR

Check accelerator cable for play and adjust if necessary.

1) After confirming that carburetor and coolant are cold, choke valve is fully closed 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.

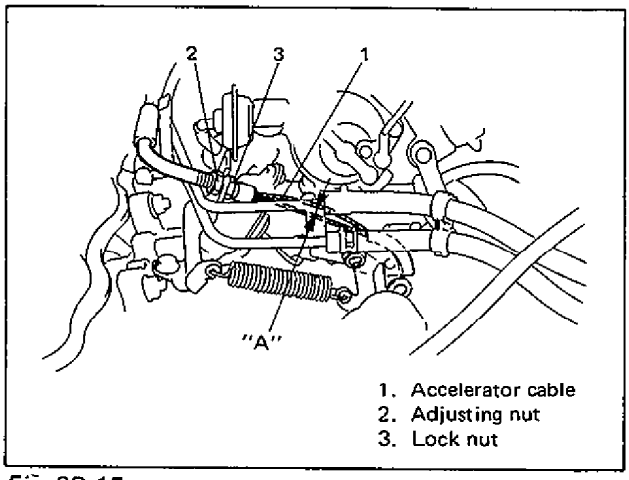


Fig. 6D-15

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

A mirror and light may be necessary for this work. Fuel level in float chamber should be within "A" range as shown in figure below.

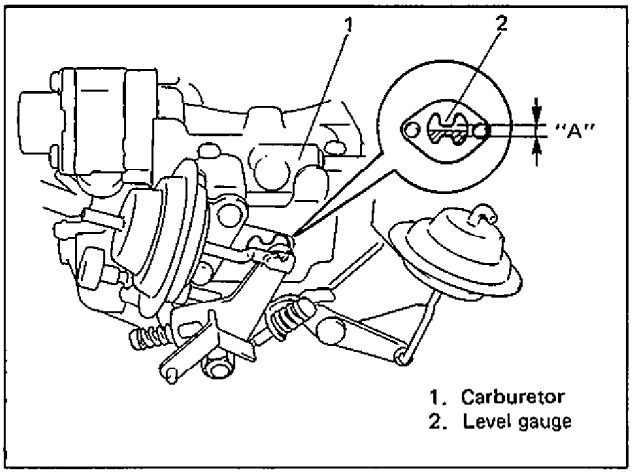


Fig. 6D-16

ADJUSTMENT

If fuel level is not within specification, remove carburetor assembly from intake manifold (see corresponding description of Carburetor Removal) and then remove carburetor air horn (upper cover).

1) Re-check float height "H" as shown in Fig. 6D-17.

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 (such as a drill) after confirming its thickness with vernier calipers.**
- **There are two types of float height "H", each of which corresponding to the float shape (Type-1 or Type 2). Be sure to check the float shape first and use whichever "H" appropriate for it.**

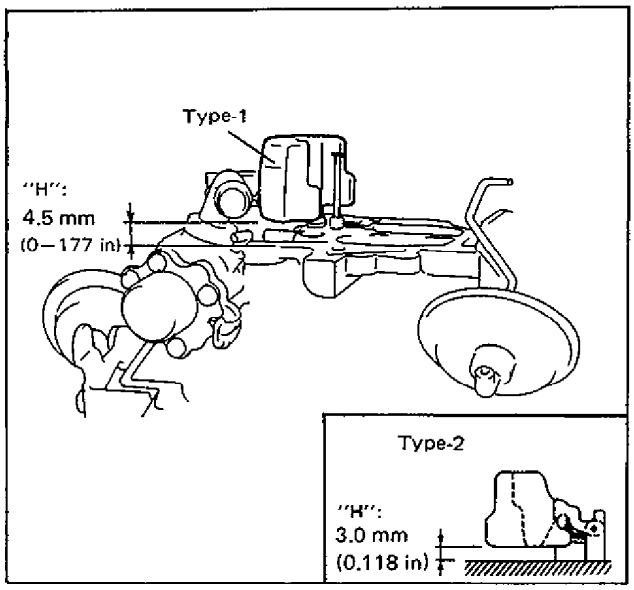


Fig. 6D-17

2) If float height is not within specification, adjust by bending necks "B" of float.

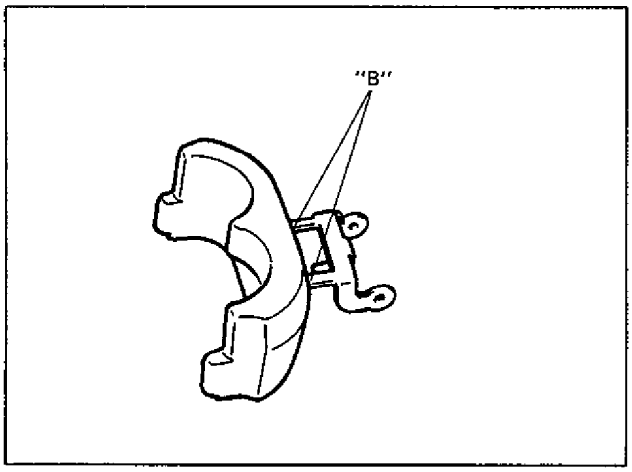


Fig. 6D-18

3) 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. Also, check each link system and each part, referring to corresponding description in ON CAR SERVICE section for details.

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.

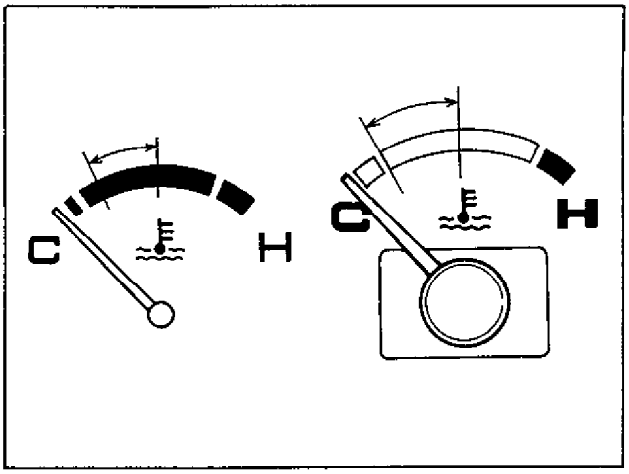


Fig. 6D-19

- Choke valve is at full-open position.
- 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]

NOTE:
The data marked with an asterisk (*) given below are applicable to cars equipped with Automatic transmission.

Adjust idle speed and idle mixture according to the following procedure.
If car to be inspected or/and adjusted is equipped with second air valve, disconnect second air hose from air cleaner and plug it first.

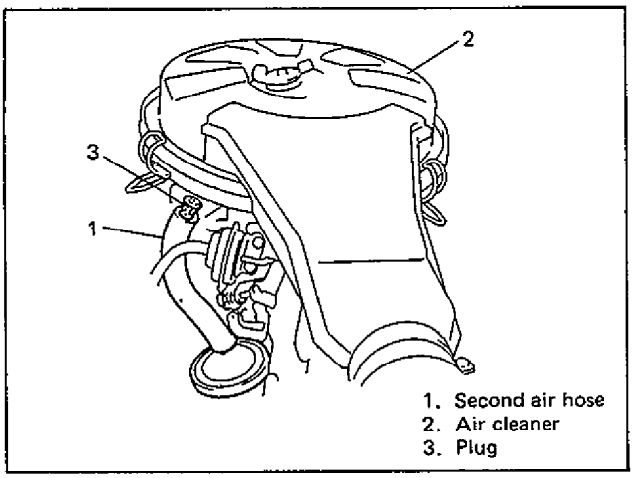


Fig. 6D-19-1

1) Adjust idle speed to 900 (*950) r/min (rpm) by repositioning (turning) idle speed adjusting screw.
2) With engine idling at 900 (*950) 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 (*880) 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 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	700 ± 50
	Engine idle speed r/min (When selector lever is in "P" or "N" range)	* 850 ± 50

Data for cars with second air valve		
Engine idle mixture CO(%)	With second air hose blank plugged	1.0 ± 0.5
	Ordinary condition	Less than 0.2
Engine idle speed (r/min)	Manual transmission	700 ± 50
	Engine idle speed r/min (When selector lever is in "P" or "N" range)	* 850 ± 50

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.

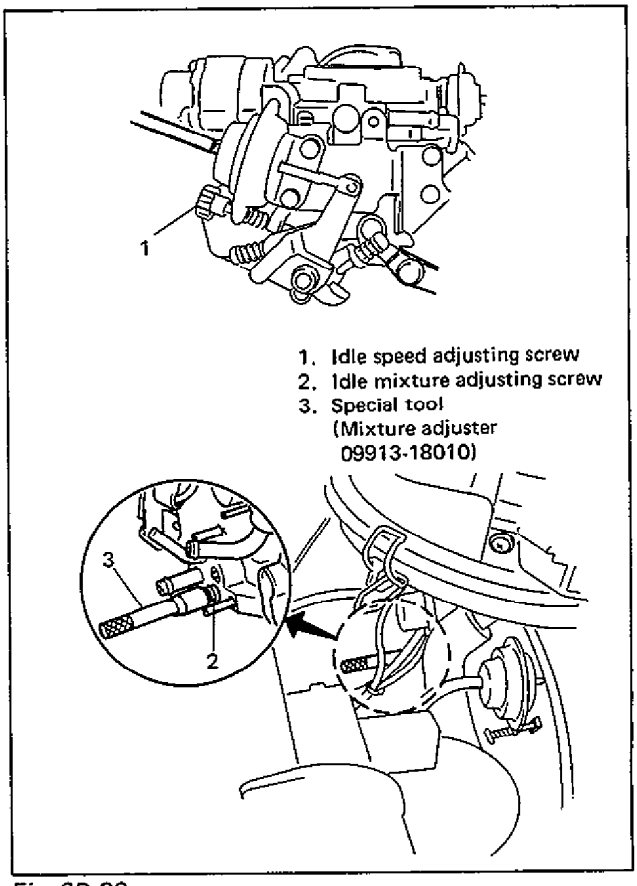


Fig. 6D-20

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 head light. If engine idle speed keeps at specified idle speed, that proves normal function of idle up.

   If found faulty, check following parts individually according to each procedure.

VSV (Vacuum Switching Valve)

1) Make sure that head light, 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.
3) By blowing air into hose disconnected from intake manifold, make sure there is no continuity between these hoses.
4) Turn ON head light and by blowing air into hose disconnected from intake manifold, make sure that there is continuity between hoses.

   If found defective in above steps 3) and 4), replace hoses, wiring harness or VSV.

Actuator

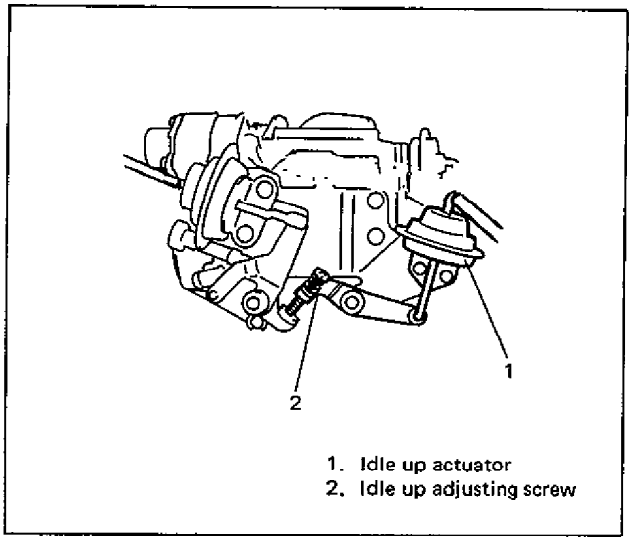
1) Disconnect hose from actuator.
2) Pull actuator rod by hand all the way up and apply finger to the joint from which actuator hose has been disconnected.
3) In the state of 2), take hand off rod. If actuator rod stays up, it is normal. If defective, replace.

ADJUSTMENT

If VSV, actuator, hose wiring harness and battery capacity are normal and yet idle up speed is not attained, adjust as follows.

1) Start engine.
2) Turn ON head light. Engine speed in this state should be within 650 – 750 r/min (rpm). If not within specification, adjust with idle up adjusting screw.

Engine idle speed when idle up system is operated	700 ± 50 r/min



1. Idle up actuator
2. Idle up adjusting screw

Fig. 6D-21

IDLE UP (For Automatic transmission)

Inspection

1. Adjust idle speed to specification and maintain engine at that speed.
2. When selector lever is shifted to each "R", "D", "2" and "L" range, if engine speed keeps at below specified idle speed, that proves normal function of idle up.

Engine idle speed when shift lever is shifted to "R", "D", "2" or "L" range	700 ± 50 r/min

If found faulty, check following parts individually according to each procedure.

[VSV and its circuit]

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 no continuity between these hoses. Then, shift selector lever to "N" range and also check to make sure that there is no 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 continuity between hoses. Also, with selector lever shifted to "D", "2" and "L" ranges, check to make sure that there is 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.

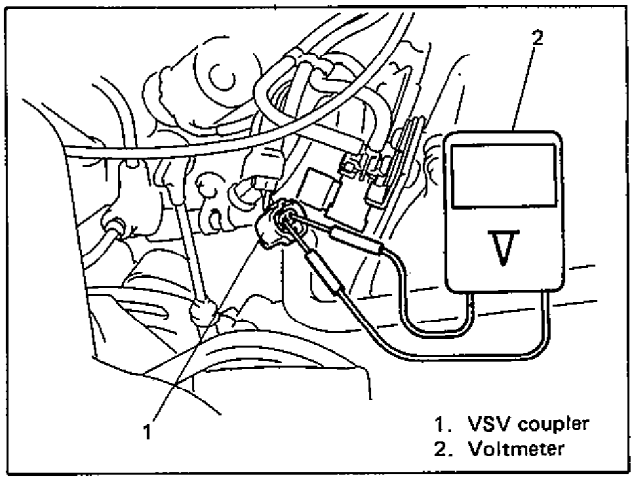


Fig. 6D-22

9) If found faulty in step 8), inspect shift lever switch and its circuit by referring to description of shift lever switch inspection of "AUTOMATIC TRANSMISSION" section.
10) If found faulty in above step 9), replace shift lever switch or wire harness.
    If found faulty in step 8), and yet it is proved in step 9) that shift lever switch and wire harness are in good condition, replace AT controller 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.

[Actuator]

1) Disconnect hose from actuator.
2) Pull actuator rod with finger all the way up and apply finger to the joint from which actuator hose has been disconnected.
3) In the state of 2), take finger off rod. If actuator rod stays up, it is in good condition. If defective, replace.

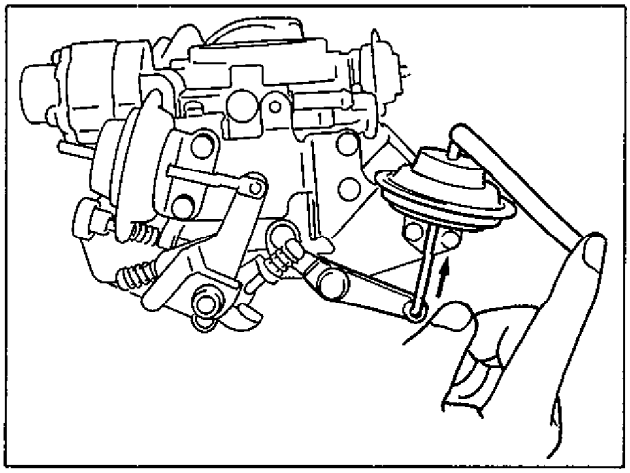


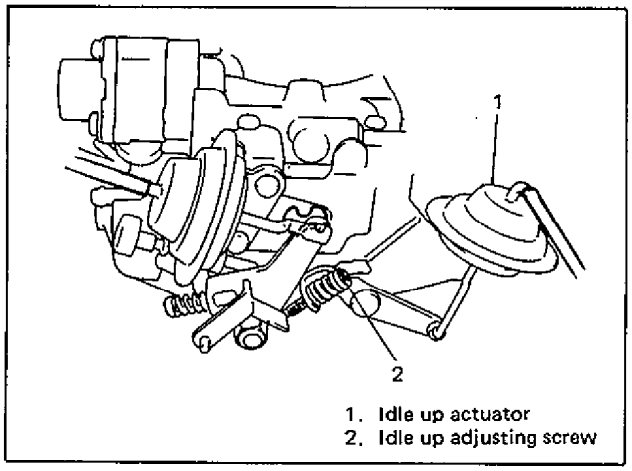
Fig. 6D-22-1

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-15)
   If not within specification, adjust with idle up adjusting screw.



1. Idle up actuator
2. Idle up adjusting screw

Fig. 6D-22-2

CHOKE SYSTEM

Inspection

1) Depress accelerator pedal fully and release it. Then remove air cleaner case.
2) Check to ensure that choke valve is fully closed when engine is cold and ambient temperature is below 20°C (68°F).
   Then check choke valve for smooth operation by pushing choke valve lightly with finger.

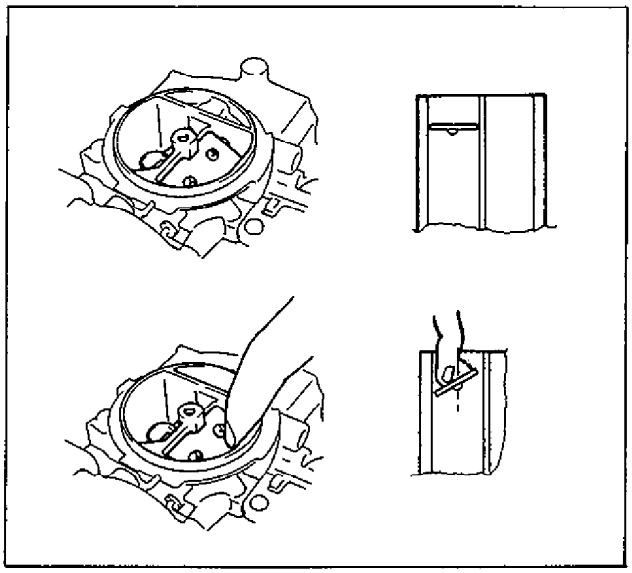


Fig. 6D-23

3) Disconnect vacuum hose from fast idle cam opener and close disconnected hose end with finger.
4) After steps 2) & 3), start and run engine at idle speed.
   And immediately, visually check for clearance between choke valve and carburetor body (indicated as "A" in figure). If valve is open slightly from its fully closed position, vacuum control parts are in good condition.
5) Connect vacuum hose to opener and check that choke valve-to-carburetor body clearance "A" has increased bigger than when checked in step 4).

NOTE:
When engine is warm, clearance "A" becomes larger, varying with temperatures.

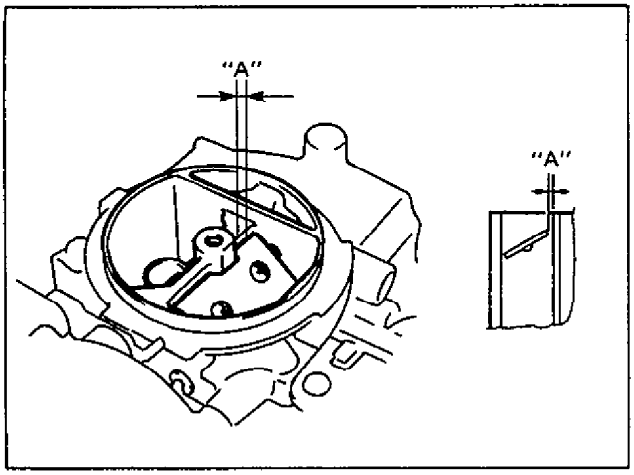


Fig. 6D-24

6) Stop engine. After installing air cleaner case, start engine again and warm it up fully.
Then race it a few times (so that its speed becomes about 3,000 r/min).
7) Stop engine when it is warmed up and remove air cleaner case again, and then check to ensure that choke valve is fully open.

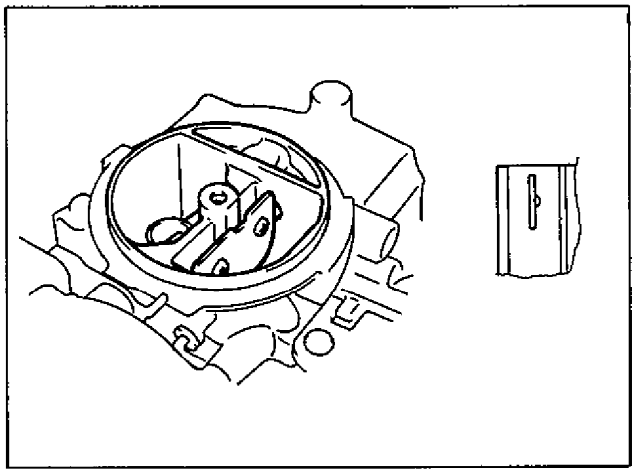


Fig. 6D-25

8) If nothing was found faulty in the above check, install air cleaner case.
9) If step 4) check result is unsatisfactory, check following parts (choke opener and jet) according to each procedure.
10) If choke valve is not open fully in step 7) check, cause may be poor connection of bimetal lead cord connector, disconnection in lead cord or defect in bimetal assembly. Repair or replace defective part.

Choke opener (Water temperature must be below 25°C or 77°F)
a. Disconnect hose from choke opener jet.
b. Connect vacuum pump gauge (special tool) to disconnected hose.
c. Confirm the following.
- When −40 cmHg vacuum is applied by using vacuum pump gauge, clearance "A" is within 1.6 − 1.8 mm (0.063 − 0.070 in.) [1.8 − 2.1 mm (0.07 − 0.08 in) for car equipped with catalyst]
- When pumping is stopped, gauge indicator remains at −40 cmHg position.

If both are checked all right, parts between choke opener and choke valve are in good condition, but if not, correct or replace.

To correct clearance, bend lever "B" as shown.

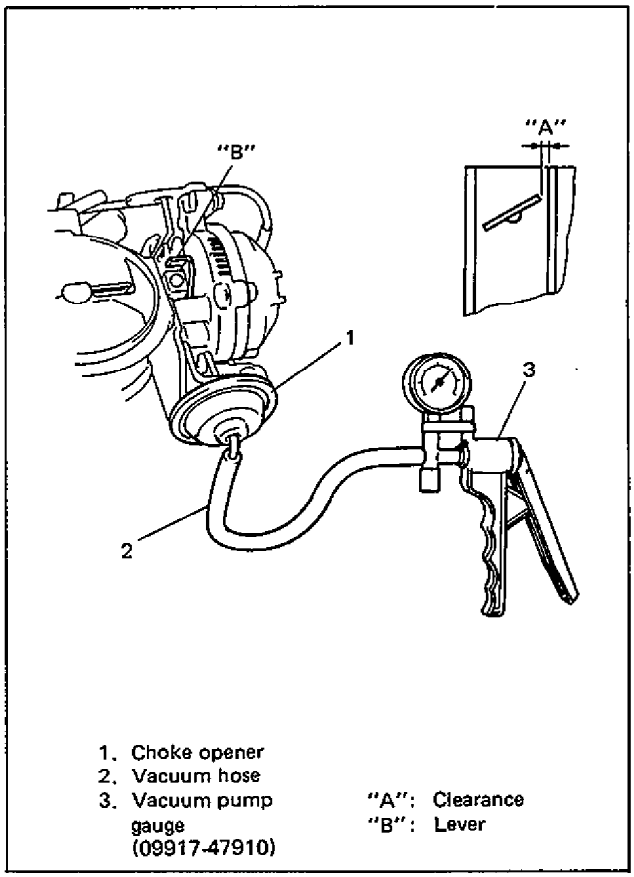


Fig. 6D-26

Jet

a. Remove jet with vacuum hose.
b. Close one side of jet with finger as shown and apply −50 cmHg vacuum by means of vacuum pump. Then check that vacuum is relieved gradually when finger is taken off. Replace if defective.

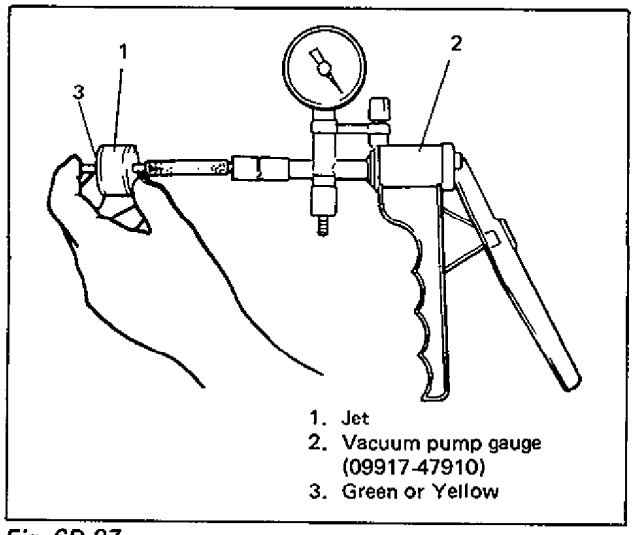


Fig. 6D-27

Fast idle cam opener

With engine stopped, connect vacuum pump (special tool) to fast idle cam opener. Apply −40 cmHg vacuum to opener and check that choke valve-to-carburetor body clearance "A" is within such range as specified below.
Also check that diaphragm remains at the same position when pump operation is stopped and that diaphragm rod returns to its original position smoothly when vacuum hose is disconnected from pump. Replace opener if check result is not satisfactory.

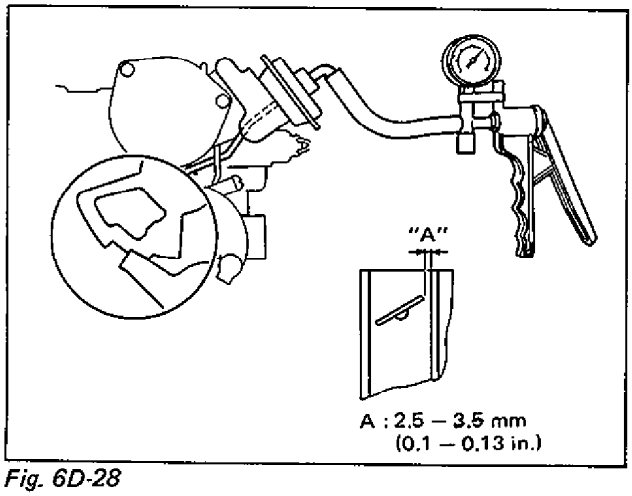


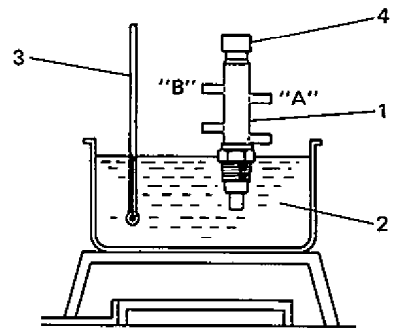
Fig. 6D-28

TVS (Thermal Vacuum Switching) Valve

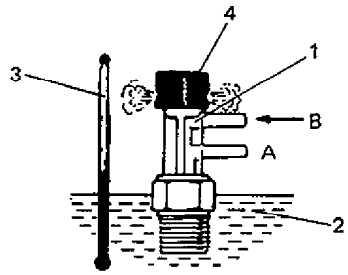
NOTE:
For the rough check of the operation, TVSV can be checked by warming up or cooling down the engine without being removed from the intake manifold.
The check procedure is the same as the following except item 1), 2) and 5).

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.

TVSV for car with EGR valve



TVSV for car without EGR valve



"A" : To intake manifold
"B" : To fast idle cam opener

1. TVS (Thermal Vacuum Switching) valve
2. Cool water
3. Thermometer
4. Filter

Fig. 6D-29

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 TVS valve.

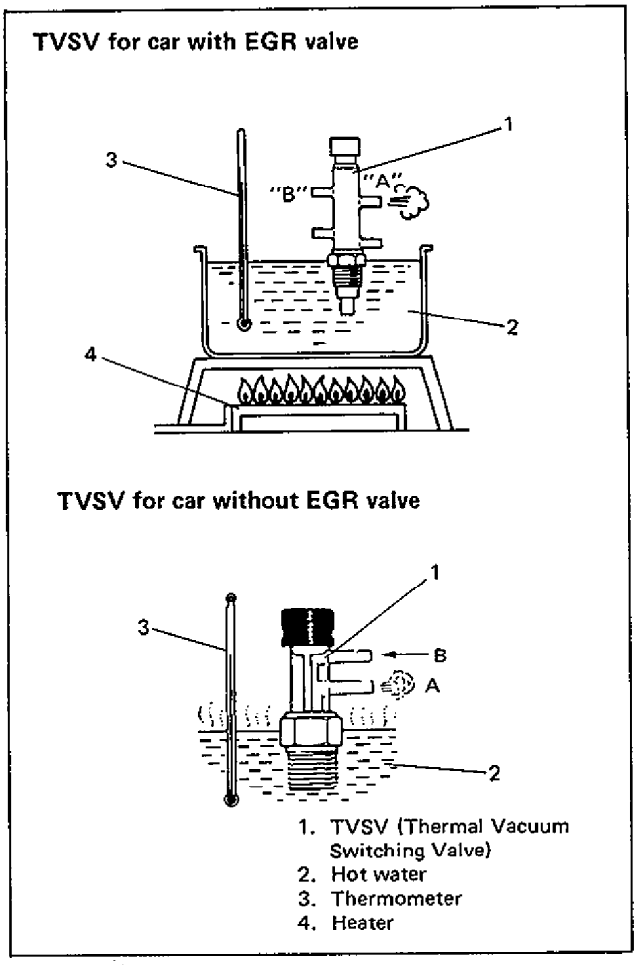


Fig. 6D-30

5) Reinstall TVSV to intake manifold. Before installing, wind sealing tape on its thread.
6) Connect vacuum hoses.

FAST IDLE

1) Depress accelerator pedal and release it.
2) With air cleaner case removed, make sure that choke valve is fully closed. (Coolant temperature must be below 25°C or 77°F.)
3) Start engine and immediately read engine tachometer. If reading is 1,200 – 1,800 r/min (rpm), fast idle speed is normal.

NOTE:
Condition for above fast idle speed data is that fast idle lever is positioned at 3rd step of fast idle cam as shown in Fig. 6D-31. When reading engine speed, check that fast idle lever is thus positioned.

Adjustment

If above inspection result is unsatisfactory, adjust to specification by turning fast idle adjusting screw.

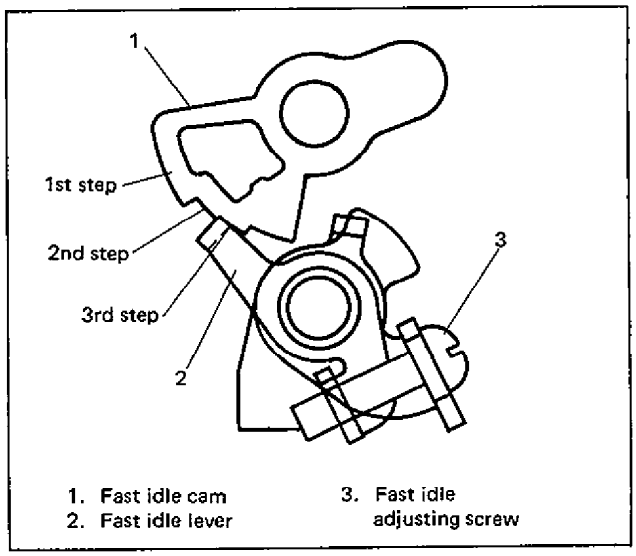


Fig. 6D-31

Fast idle speed (at less than 25°C or 77°F water temperature	1,200 – 1,800 r/min (rpm)

SECONDARY DIAPHRAGM

INSPECTION

1) Remove air cleaner case and carburetor from intake manifold.
2) Remove secondary diaphragm assembly from carburetor.
3) Push rod fully toward diaphragm with finger as shown in figure. Then with vacuum passage (hole) in mating surface with carburetor closed with finger, take off finger from rod.
4) Check that rod stays as it was pushed toward diaphragm even after finger is taken off.

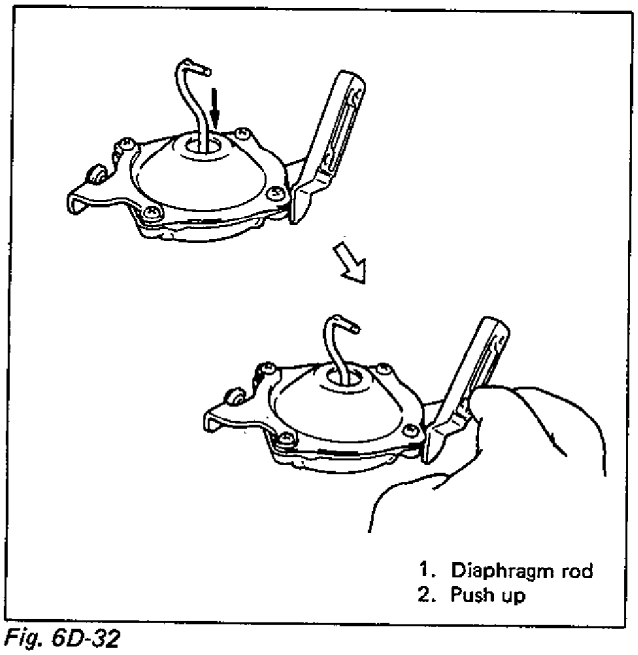


Fig. 6D-32

5) After confirming the above, remove finger closing vacuum passage and check that rod returns to its original position smoothly on finger removal.
6) If check result is not satisfactory in either step 4) or step 5), replace secondary diaphragm assembly.

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 choke valve is fully closed.
3) Open throttle valve fully. If choke valve opening is within below specification, unloader system is in good condition.

Choke valve opening "A" specification	2.0 – 2.5 mm (0.08 – 0.10 in.)

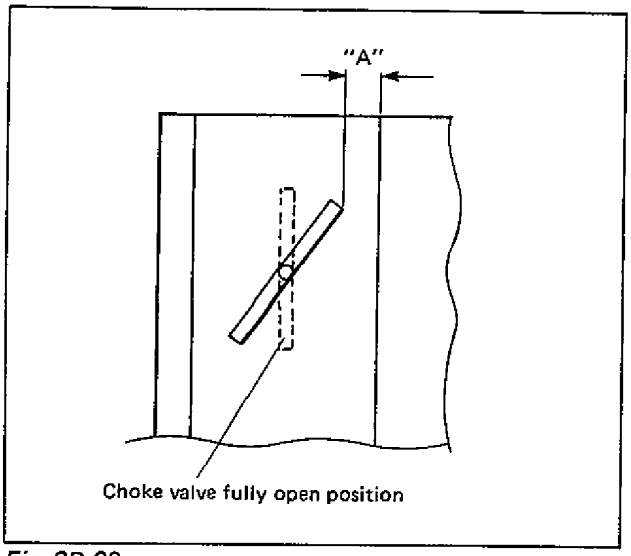


Fig. 6D-33

FUEL CUT SYSTEM

INSPECTION

NOTE:
If car is equipped with catalytic converter, use checking procedure described in SECTION 6J of this manual (p. 6J-20).

1) Check to ensure that carburetor fuel cut solenoid makes "clicking" sound when ignition switch key is turned "ON" and "OFF" (without starting engine).

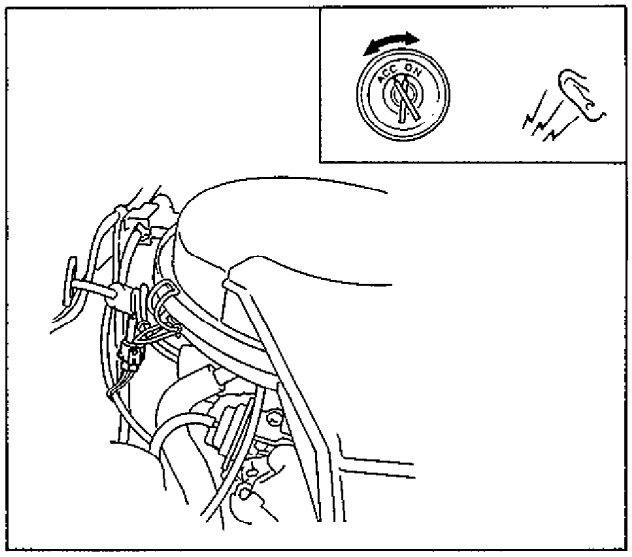


Fig. 6D-34

2) Warm up engine to normal operating temperature.
   With engine running at idle speed, check to ensure that disconnecting lead wire from solenoid at coupler causes engine to stop.

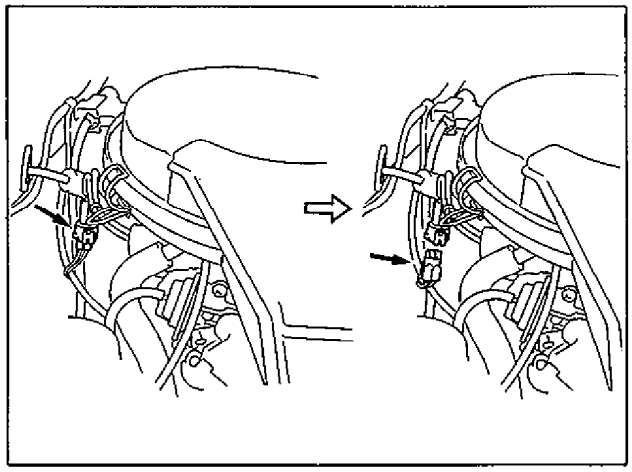


Fig. 6D-35

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.

ACCELERATOR PUMP

INSPECTION

1) Remove the air cleaner case.
2) Make sure that fuel comes out of pump discharge nozzle when accelerator pedal is depressed.

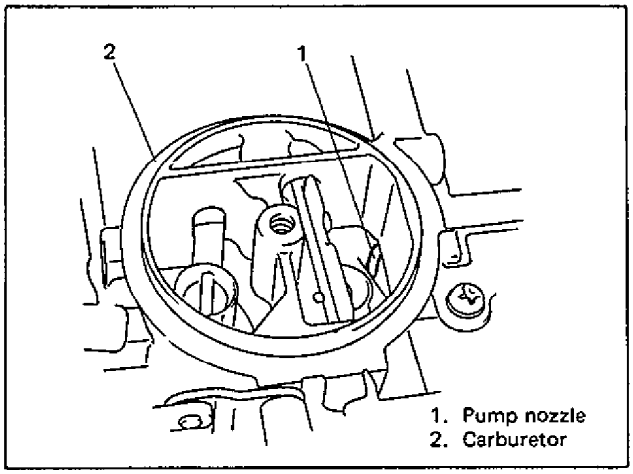


Fig. 6D-36

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.

THROTTLE SENSOR (For Automatic transmission)

INSPECTION

Described below is an easy inspection procedure which does not require removal of carburetor from engine.

1) Stop engine.
2) Disconnect throttle sensor lead wire coupler.
3) Check for continuity by connecting ohmmeter between black lead wire (L1 terminal in figure below) of sensor (switch) side coupler from which throttle sensor lead wire coupler was disconnected and other terminals (L2, L3 and L4 in figure below) respectively.

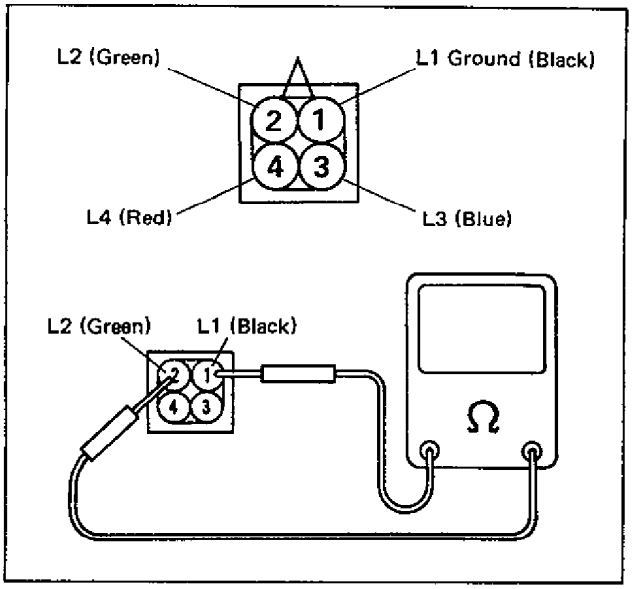


Fig. 6D-36-1

4) While opening choke valve, move throttle lever so that cam lever is positioned in the 1st step of fast idle cam.

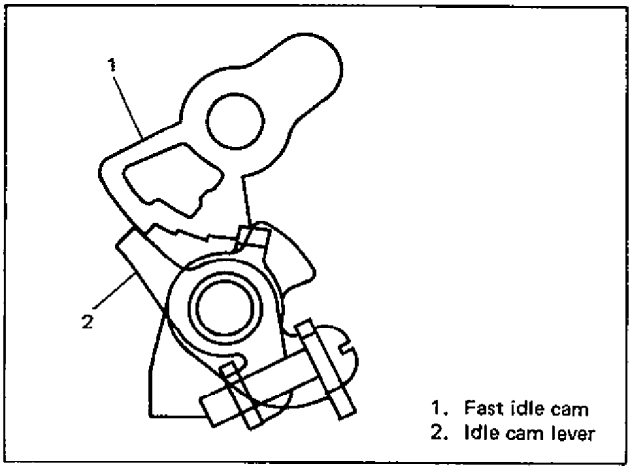


Fig. 6D-36-2

5) Depress accelerator pedal fully and release it and then check if there is continuity (referred to as ON hereunder) or isn't (OFF hereunder). Each check should prove as follows.
   - L1 to L4 ... OFF
   - L1 to L2 ... ON
   - L1 to L3 ... ON
6) Next, depress accelerator pedal fully and while keeping it depressed (i.e., throttle valve is open fully), check for continuity in each combination of terminals.
   Each check should prove as follows.
   - L1 to L4 ... ON
   - L1 to L2 ... OFF
   - L1 to L3 ... OFF
7) If check results in steps 5) and 6) are not satisfactory, replace sensor.

Reference:

Figure below represents throttle sensor switch operation relational to opening angle of primary throttle valve.

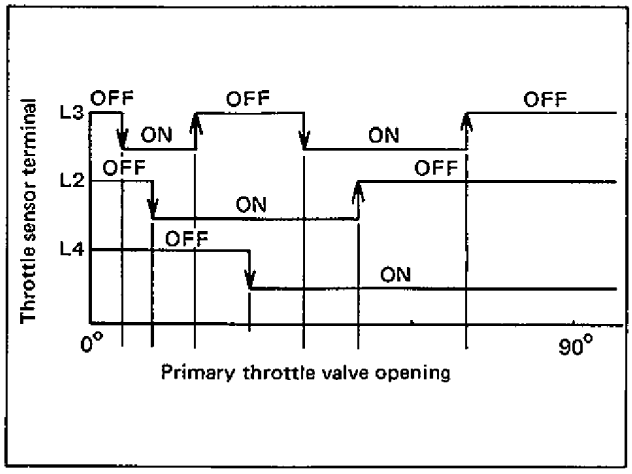


Fig. 6D-36-3

REMOVAL

1) Disconnect negative cable at battery.
2) Remove air cleaner case.
3) Disconnect coupler of sensor lead wire.
4) Remove throttle sensor.

INSTALLATION

1) Before installing throttle sensor to carburetor, check sensor itself as follows.
   Connect ohmmeter between terminals of sensor coupler as shown in Fig. 6D-36-1 (L1 to L4, L1 to L2 and L1 to L3) and check for continuity in each connection while turning sensor lever. Whether continuity occurs (ON) or not (OFF) should follow each pattern in Fig. 6D-36-3.

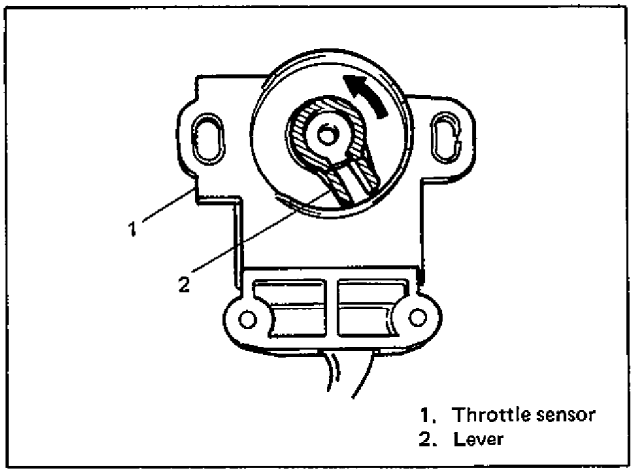


Fig. 6D-36-4

2) Install sensor to carburetor with lug on carburetor ("B" in figure below) fitted to slot in sensor lever. Tighten screws only to such extent as to allow sensor to move.

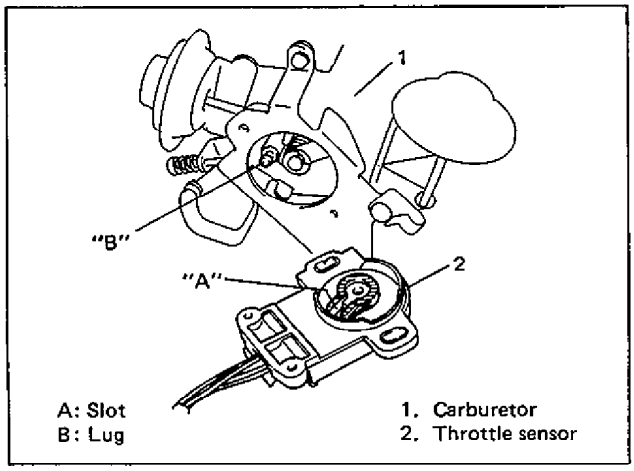


Fig. 6D-36-5

3) While opening choke valve, move throttle lever so that cam lever is positioned in the 2nd step of fast idle cam.

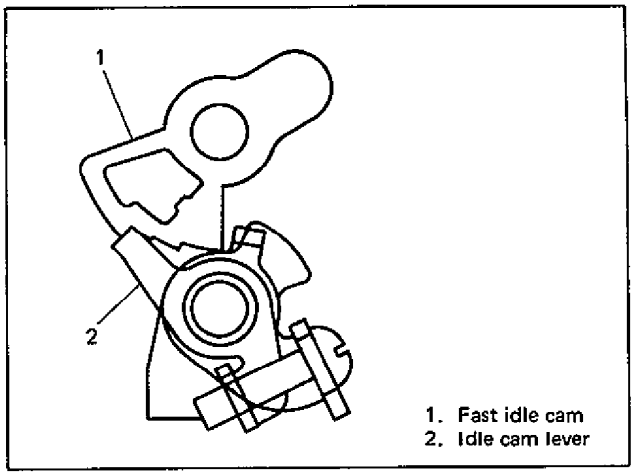


Fig. 6D-36-6

4) Connect ohmmeter between terminals [L1 (Black) and L2 (Green) in figure below] of throttle sensor coupler.

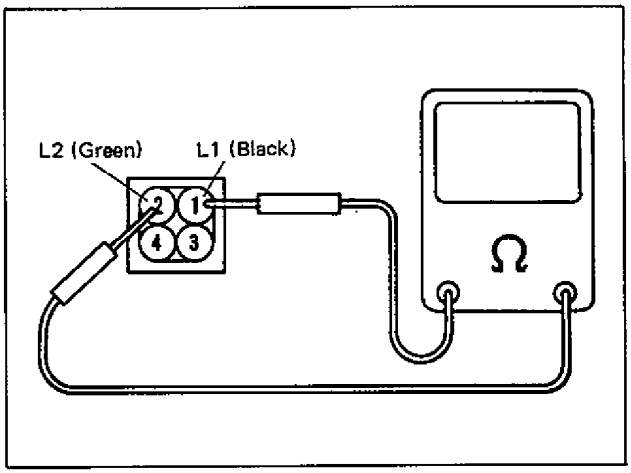


Fig. 6D-36-7

5) After steps 3) and 4), move throttle sensor in arrow direction as shown below till continuity occurs between above connected terminals and at that position fix throttle sensor with screws.

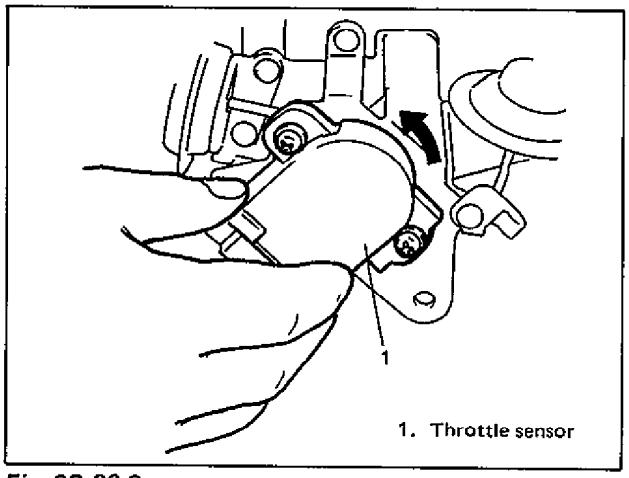


Fig. 6D-36-8

6) Disconnect ohmmeter from coupler and connect it to coupler of wiring harness.
7) Turn throttle sensor adjusting screw one half turn clockwise (180°) and at that position, apply paint to adjusting screw head.

CAUTION:
Make sure not to turn adjusting screw more that necessary. Turning it excessively will cause variable speed point of automatic transmission to change.

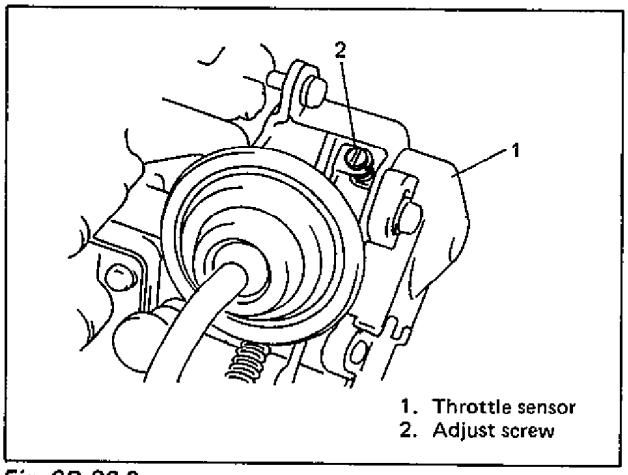


Fig. 6D-36-9

8) Install air cleaner case and connect hoses.
9) Connect negative cable at battery.

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 cable from battery.
3 Remove air cleaner case from carburetor.
4 Disconnect coupler of solenoid coil and bimetal lead wires.
   (If equipped with CATALITIC CONVERTER disconnect coupler of fuel cut solenoid valve, bimetal and air vent solenoid valve lead wires.)
   With automatic transmission model, in addition to the above, disconnect coupler of throttle angle sensor lead wire.
5 Disconnect fuel inlet hose from carburetor.
6 Disconnect accelerator cable from carburetor.
7 Disconnect distributor vacuum advance hose from carburetor.
8 Disconnect vacuum hoses from idle up actuator, fast idle cam opener and throttle positioner.
9 Disconnect purge and vacuum hoses from canister (if equipped with canister).
10 Disconnect fuel feed pipe bracket from intake manifold.

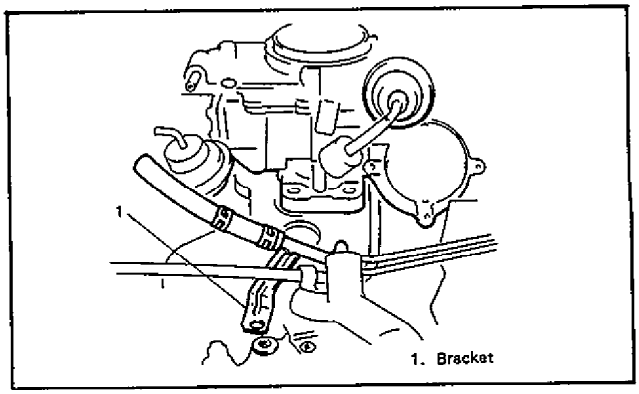


Fig. 6D-37

11 Check all around carburetor for any other parts required to be removed or disconnected for removal of carburetor and remove or disconnect whatever necessary.
12 Then remove carburetor from intake manifold.

WARNING:
Removal or disassembly of carburetor must be carried out in a 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.

DISASSEMBLY

1) Remove choke shaft rod clip and disconnect rod from joint lever.

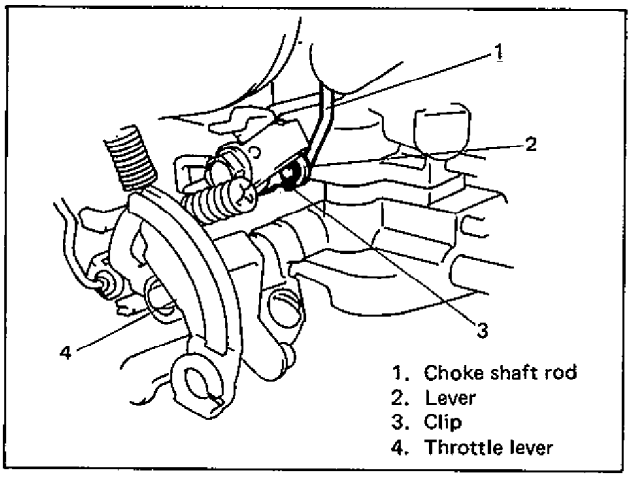


Fig. 6D-38

2) Remove fast idle cam opener rod clip and disconnect rod from lever.

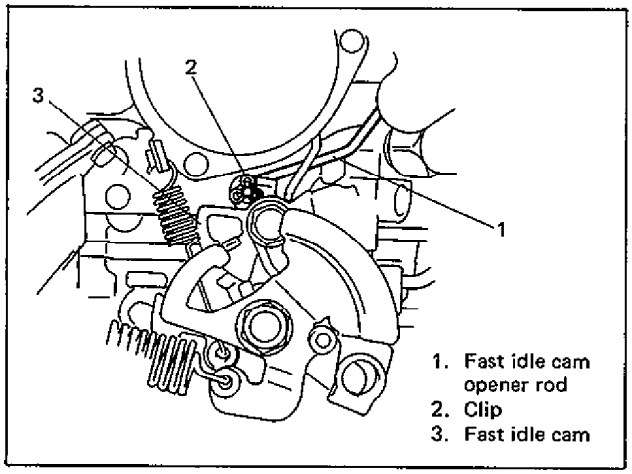


Fig. 6D-39

3) Remove spring from bimetal case bracket.

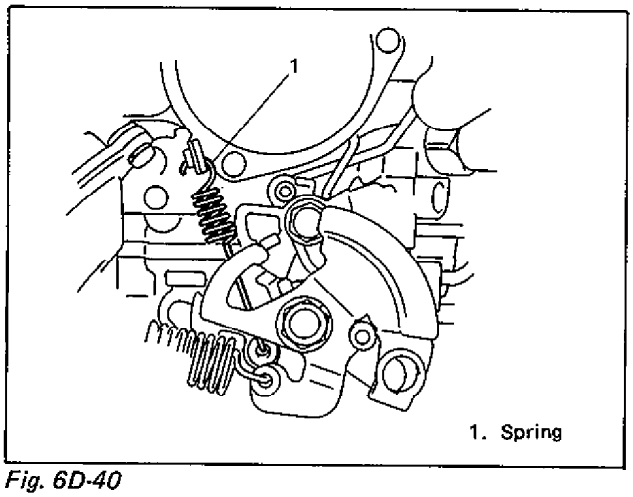


Fig. 6D-40

4) Remove 6 screws.

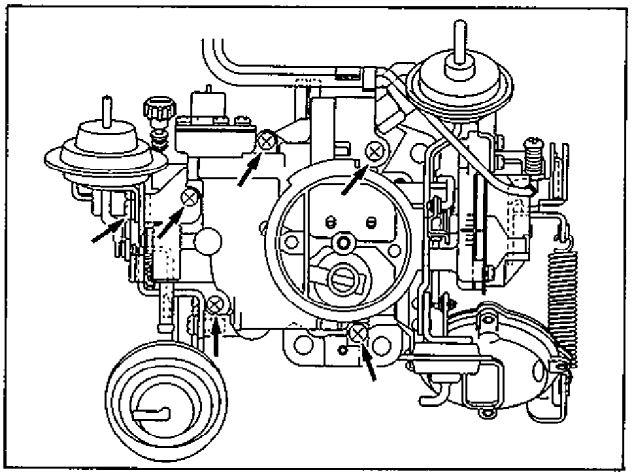


Fig. 6D-41

5) Remove float chamber upper cover from float chamber.

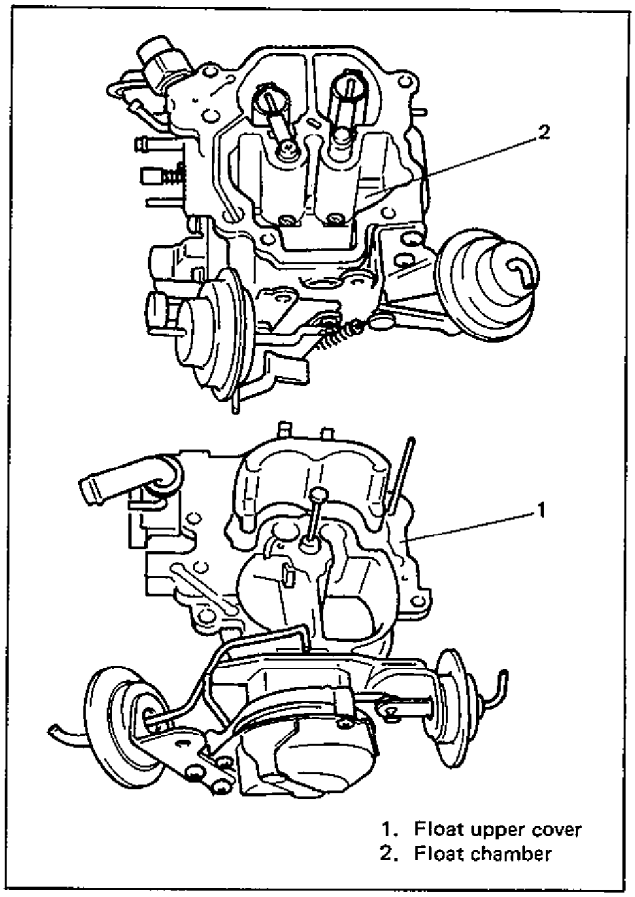


Fig. 6D-42

6) Remove float and needle valve.

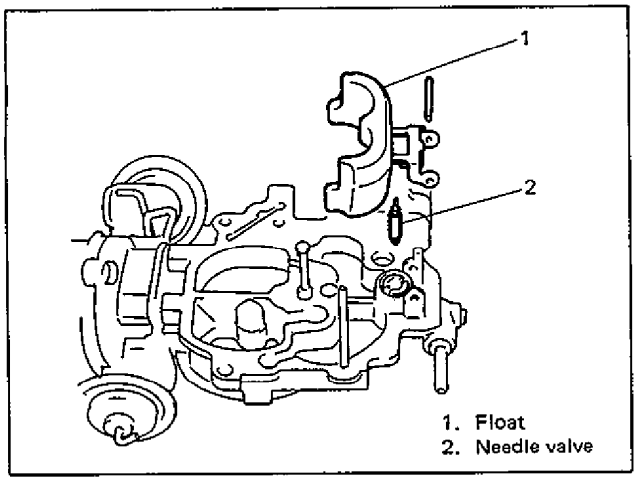


Fig. 6D-43

CLEANING

1) Wash below listed items and then clean them by blowing compressed air.
   - All air bleed holes and fuel jets.
   - Needle valve, valve seat and filter, and float.
2) Blow compressed air into all passages to clean.
3) Clean bottom of float chamber.

NOTE:

1. Don't immerse following parts in carburetor cleaner.
   - **Fuel cut solenoid valve.**
   - **Secondary diaphragm, choke opener, idle-up actuator and accelerator pump diaphragm.**
   - **Gaskets.**
   - **Bimetal assembly.**
   - **Throttle sensor (For A/T)**
   - **Bowl vent valve (if equipped).**

2. Don't put drills or wires into fuel passages and metering jets for cleaning. It causes damage in passages and jets.

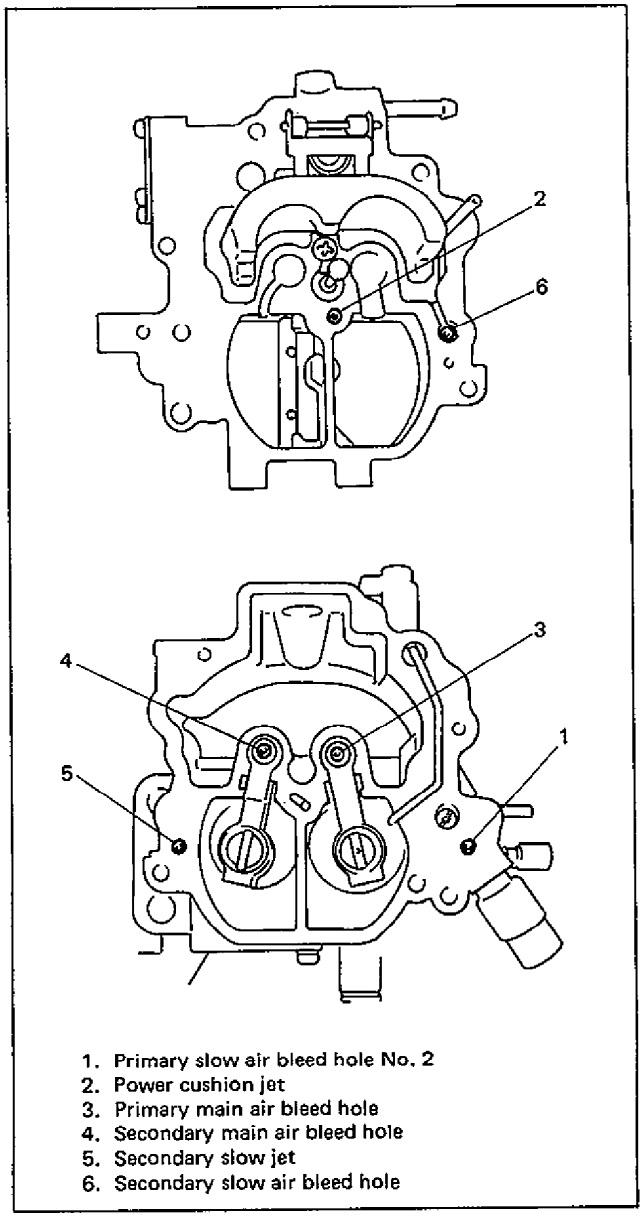


Fig. 6D-44

INSPECTION

1) Check choke valve and throttle valves for smooth operation.
2) Check needle valve and valve seat for wear.
3) Check float height.
4) Check to ensure that no fuel is in float by shaking it.

ASSEMBLY

PRIMARY AND SECONDARY MAIN JETS

Each jet has its jet number stamped on its head. When reinstalling them, refer to below figure for their proper positions.

NOTE:

- **When replacing jet, be sure to use one with the same number as the one being replaced.**
- **Number (size) of primary main jet should be smaller than that of secondary main jet.**

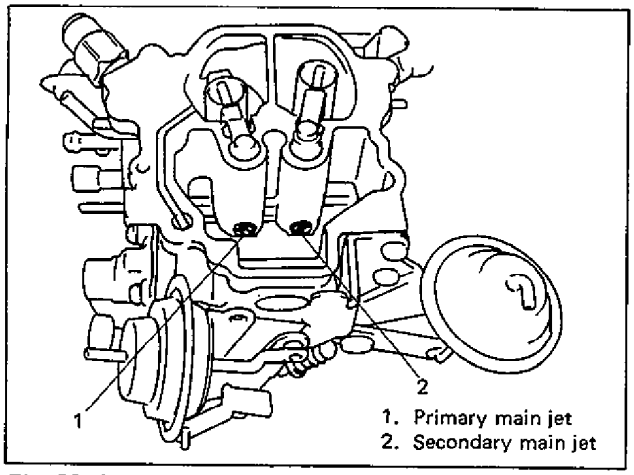


Fig. 6D-45

FLOAT CHAMBER COVER

1) Install gasket on carburetor body.

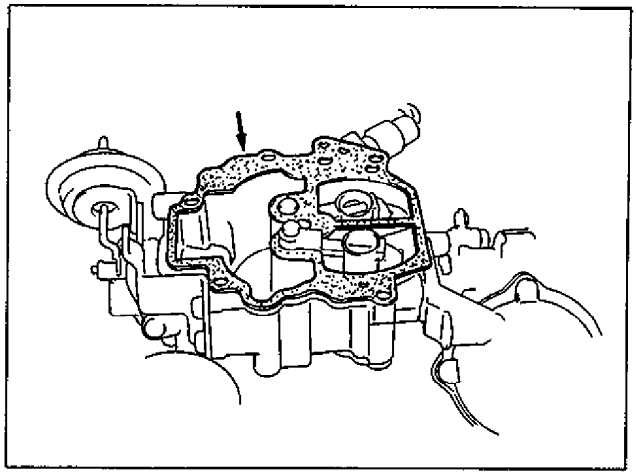


Fig. 6D-46

2) Install float chamber cover on gasket, using care not to cause gasket to slip out of place.
3) Tighten screws indicated in figure below.

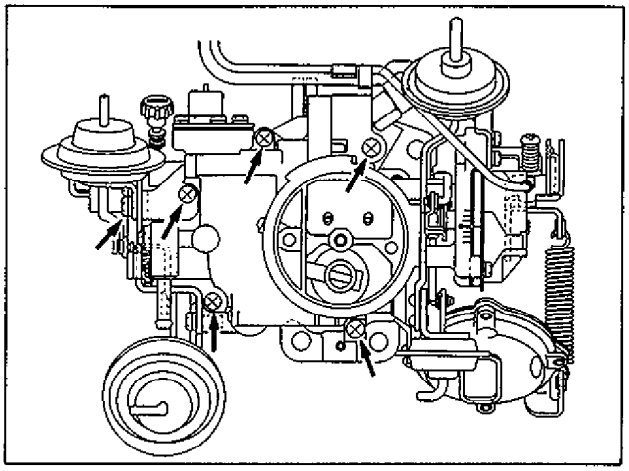


Fig. 6D-47

BIMETAL CASE

When installing bimetal case to carburetor, be sure to align line on bimetal case ("A" in figure) and embossed line on carburetor ("B").

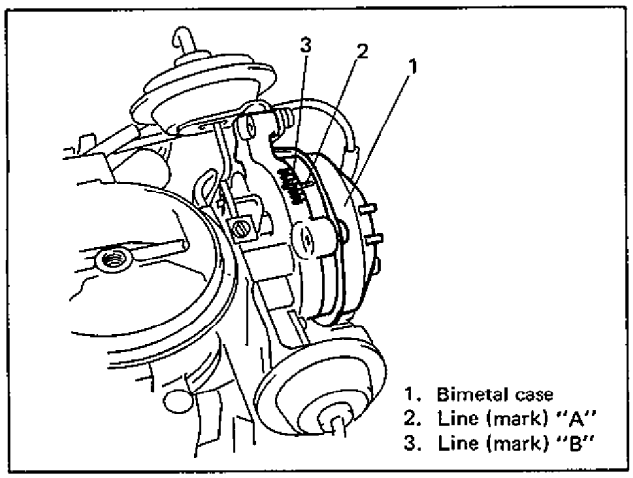


Fig. 6D-48

For assembly hereafter, reverse disassembly procedure.

For installation of any other parts than those described here, refer to figures under OTHERS (p. 6D-30, 31) in this section.

Install carburetor to intake manifold upon completion of carburetor assembly. After installation, check each carburetor system for operation.

OTHERS

For installation and layout of each lever and linkage of carburetor, refer to following figures.

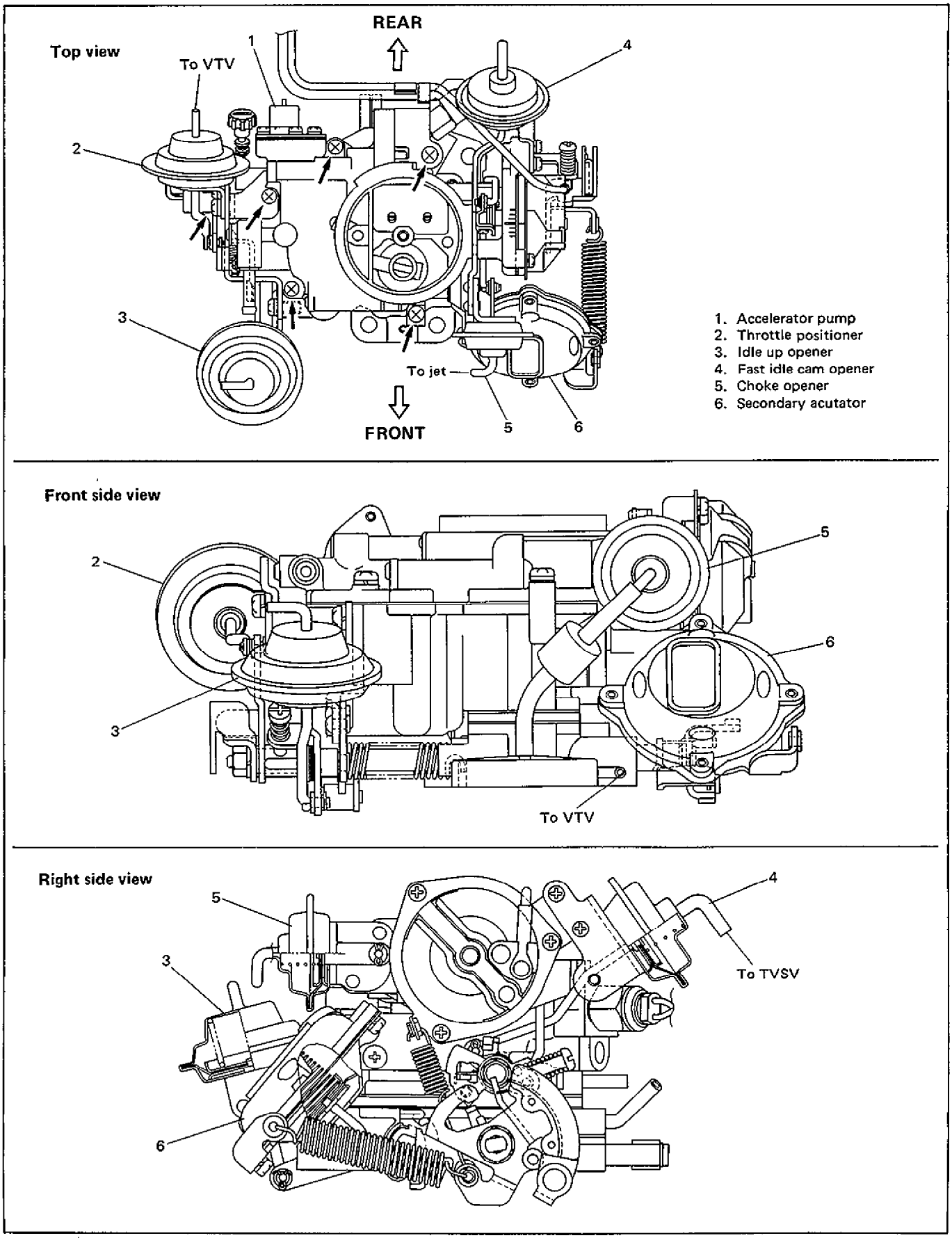
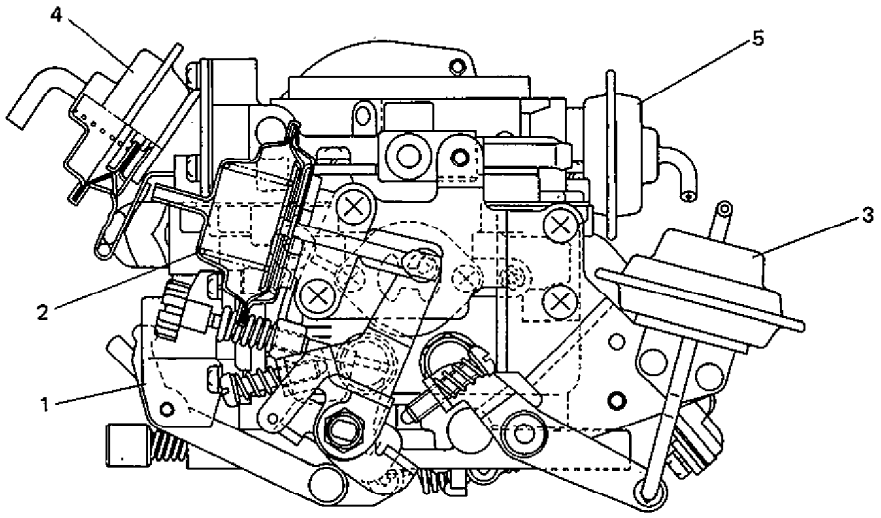
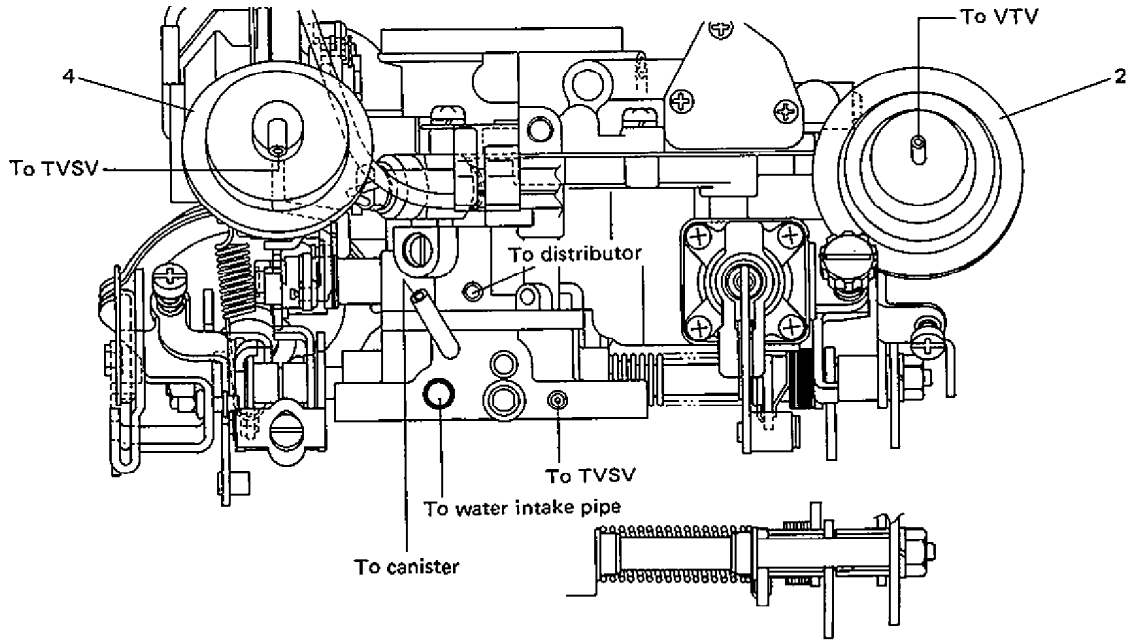


Fig. 6D-49

Left side view



Rear view



Underside view

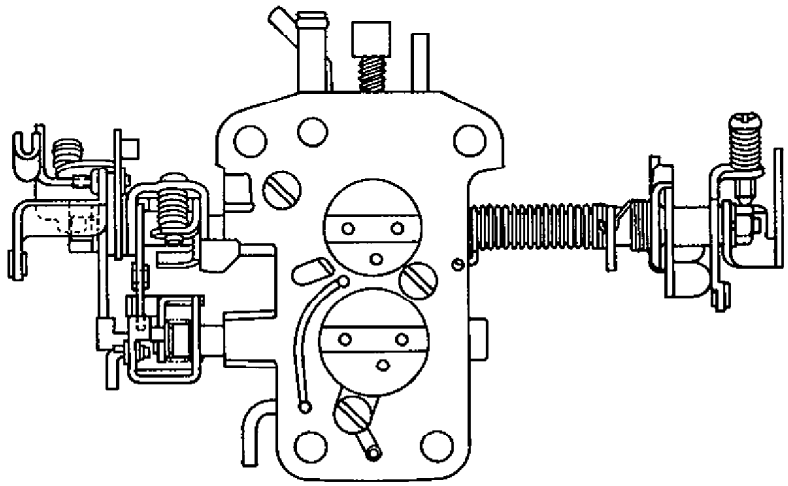
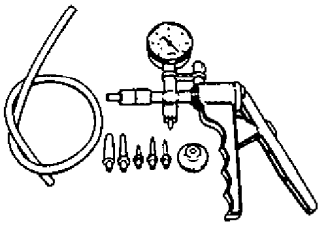
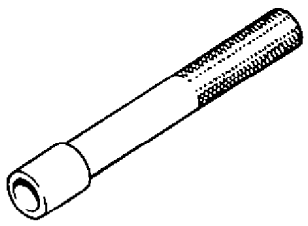


Fig. 6D-50

SPECIAL TOOL

	
09917-47910 Vacuum pump gauge	09913-18010 Carburetor adjuster

SECTION 6F

IGNITION SYSTEM

CONTENTS

GENERAL DESCRIPTION

This car uses solid state ignition system.

The basic components of the ignition system are ignition coil, distributor and spark plugs and those of the distributor are signal generator (signal rotor and pickup coil), igniter, rotor, cap, vacuum advancer and 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 sparks are generated at the spark plugs.

The spark advance is produced by the vacuum advancer which operates based on the engine vacuum and centrifugal advancer.

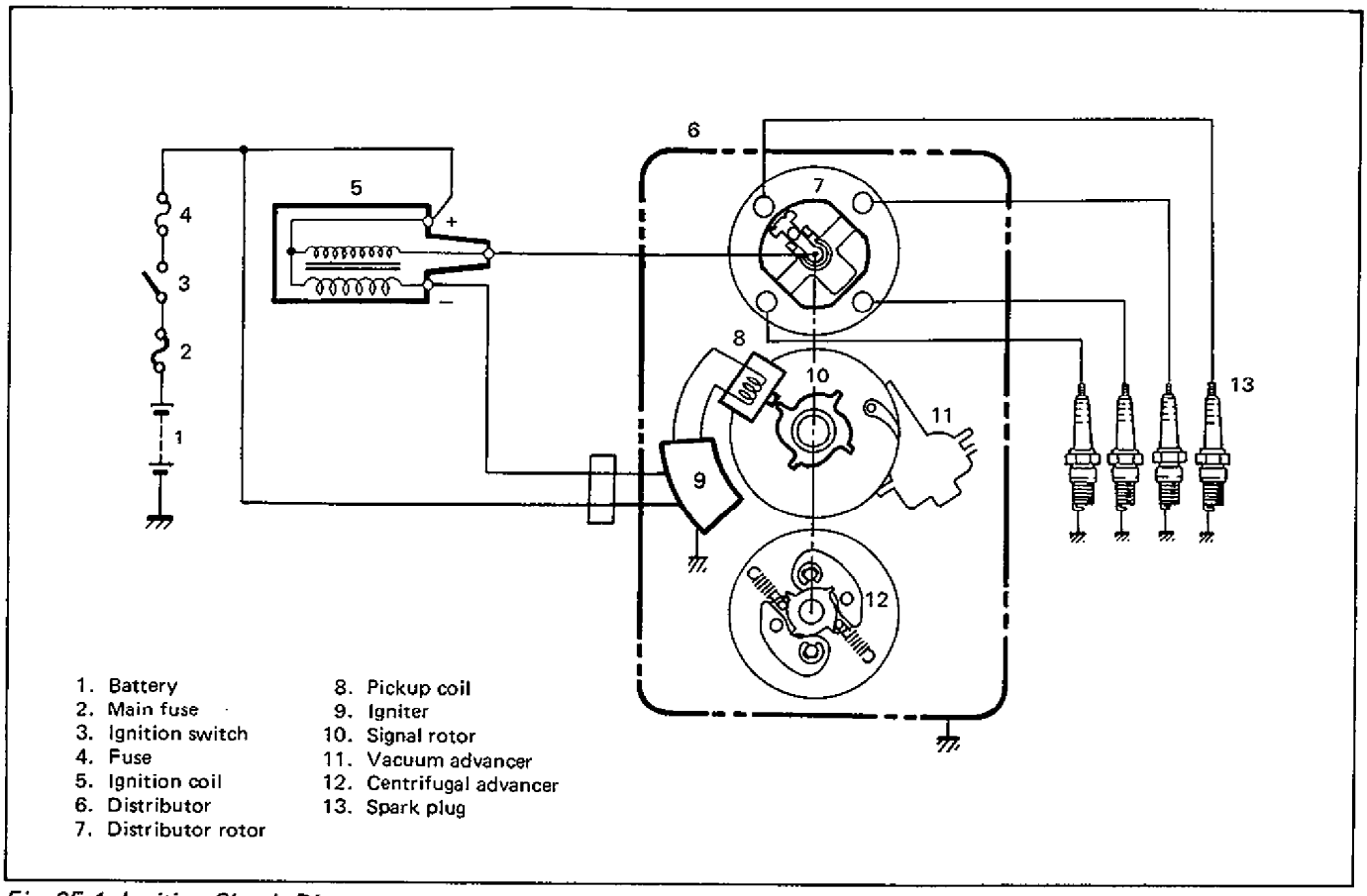


Fig. 6F-1 Ignition Circuit Diagram

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 wires 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 signal generator or igniter	Replace
	• Faulty ignition coil	Replace
	• Faulty noise suppressor(s)	Replace
	Maladjusted ignition timing	Adjust
Poor fuel economy or engine performance	• Incorrect ignition timing	Adjust
	• Faulty spark plug(s)	Adjust, clean or replace

ON-CAR SERVICE

POWER SUPPLY

For ignition coil

1. Remove ignition coil cap and check to make sure that coil terminals have battery voltage with ignition switch on.
2. If no voltage or low voltage is found, check fuse, couplers and wiring harness.

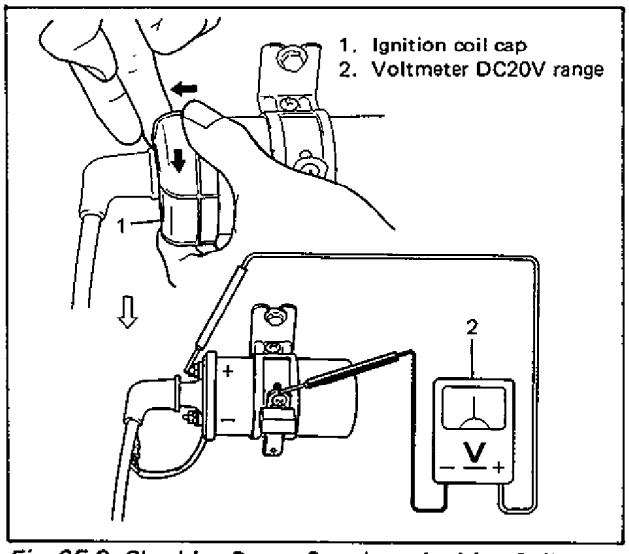


Fig. 6F-2 Checking Power Supply to Ignition Coil

For distributor

1. Disconnect distributor lead coupler, turn on ignition switch and check to make sure that coupler terminals have battery voltage.
2. If no voltage or low voltage is found, check wiring harness and coupler.

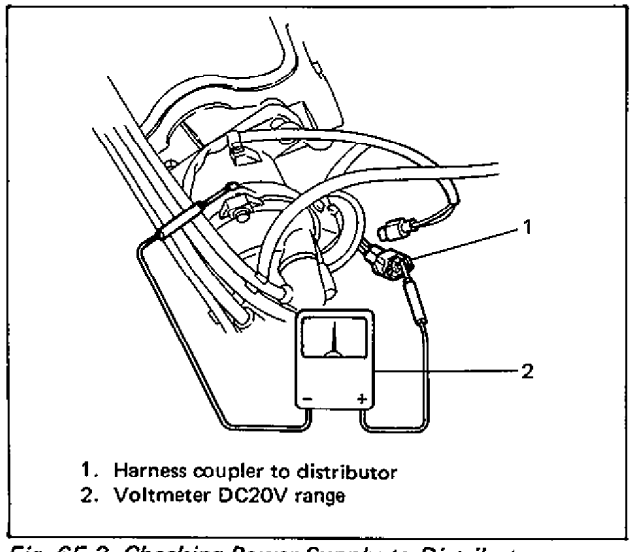


Fig. 6F-3 Checking Power Supply to Distributor

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.**

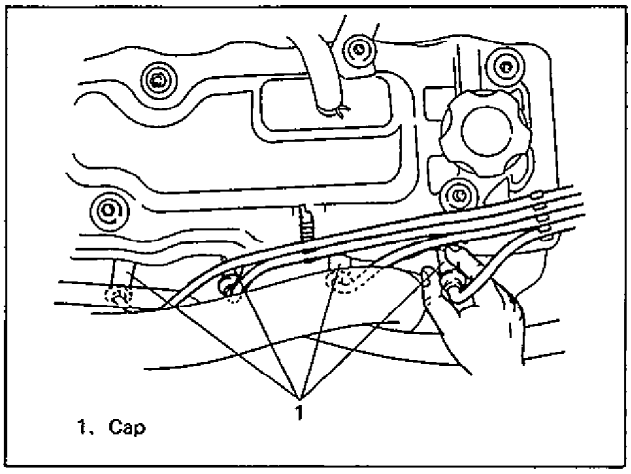


Fig. 6F-4 Removing High Tension Cord

5. Measure resistance of high tension cord by using ohmmeter.

High tension cord resistance	10 – 22 kΩ/m (3 – 6.7 kΩ/ft)

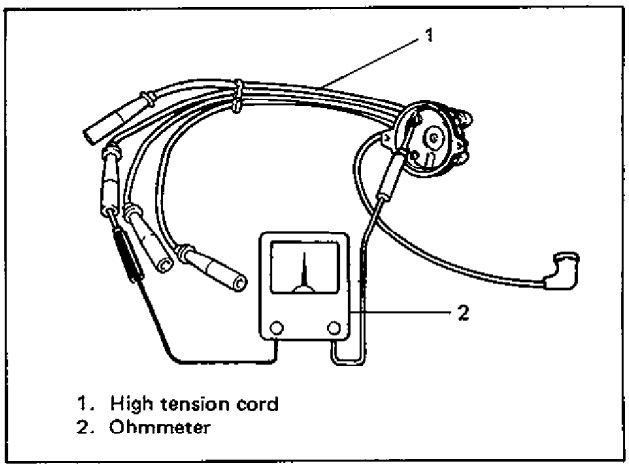


Fig. 6F-5 Measuring High Tension Cord Resistance

6. If resistance exceeds specification, inspect distributor cap terminals 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.
   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.

Spark plug type	NGK	BPR6ES (BP6ES)
	NIPPON DENSO	W20EPR-U (W20EP-U)
Air gap A	0.7 – 0.8 mm (0.028 – 0.031 in.)	

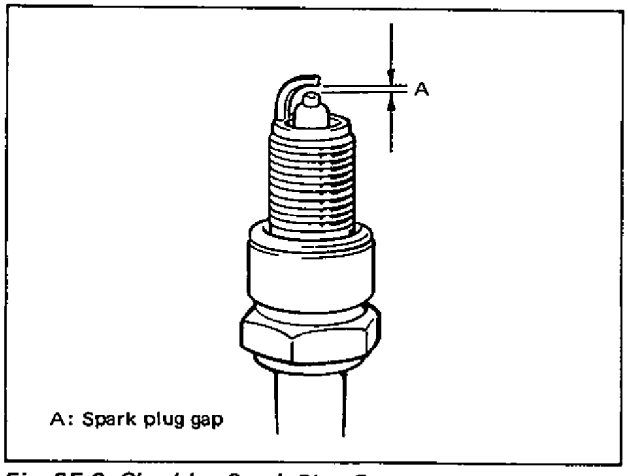


Fig. 6F-6 Checking Spark Plug Gap

4. Install spark plugs and torque them to specification.

Spark plug tightening torque	N·m	kg-m	lb-ft
	25 – 30	2.5 – 3.0	18.0 – 21.5

5. Install high tension cords securely by gripping their caps.

IGNITION COIL

1. Remove ignition coil cap.
2. Pull out high tension cord by gripping its cap.
3. Disconnect ignition coil lead coupler.
4. Measure primary and secondary coil resistances.

Ignition coil resistance (Cold)	Primary	1.08 – 1.32 Ω
	Secondary	12.7 – 17.3 kΩ

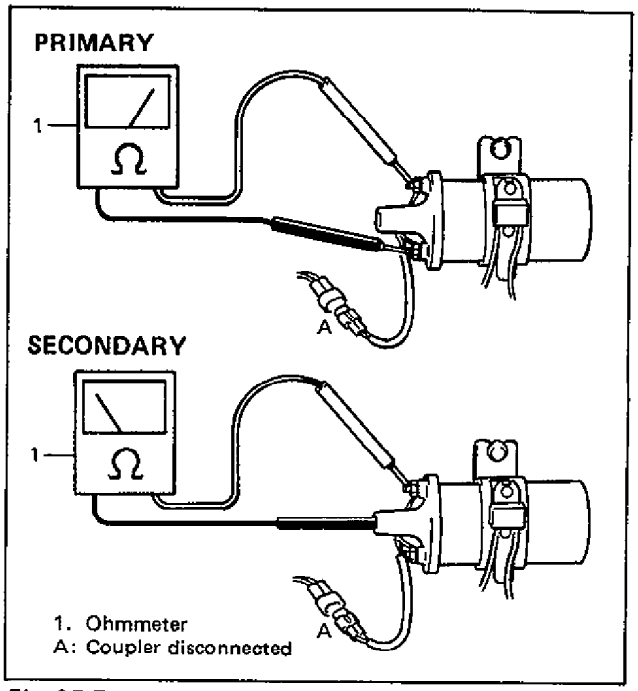


Fig. 6F-7 Measuring Ignition Coil Resistance

5. If resistance is out of specification, replace coil with new one.

DISTRIBUTOR

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.

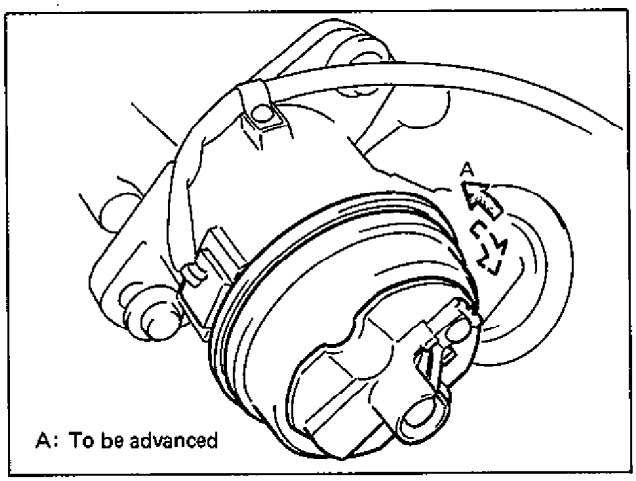


Fig. 6F-8 Checking Centrifugal Advancer

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.

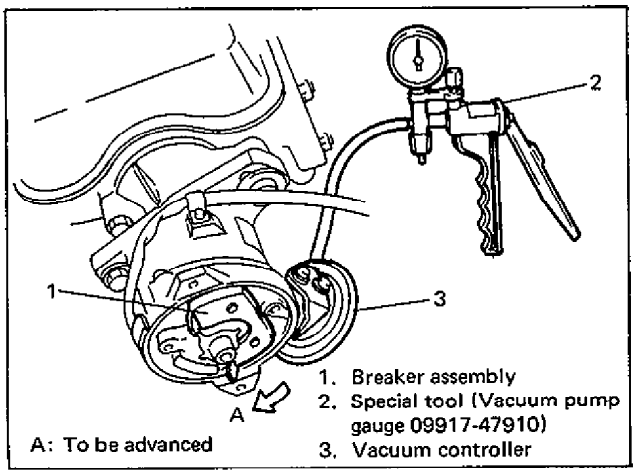


Fig. 6F-9 Checking Vacuum Advancer

IGNITION TIMING

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. If r/min is out of specification, adjust it by turning idle speed adjusting screw in carburetor.
4. Set timing light to No. 1 high tension cord and inspect or adjust timing as described below.
5. Read ignition timing by using timing light and check that timing is within specification.

NOTE:
To check ignition timing for automatic transmission, use selector position P.

Ignition timing specification	
Manual transmission model	6 ± 1° BTDC at 700 ± 50 r/min
Automatic transmission model	6 ± 1° BTDC at 850 ± 50 r/min

Ignition order	1 – 3 – 4 – 2

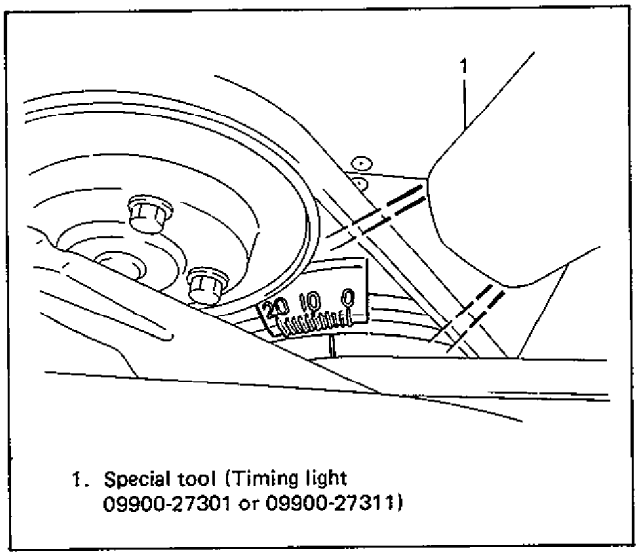


Fig. 6F-10 Checking Ignition Timing

6. When required, loosen flange bolts, adjust timing by turning distributor assembly while engine is running, and then tighten bolts.

NOTE:
After tightening distributor flange bolts, recheck that ignition timing is within specification.

Tightening torque for distributor flange bolts	N·m	kg-m	lb-ft
	10 – 16	1.0 – 1.6	7.0 – 11.5

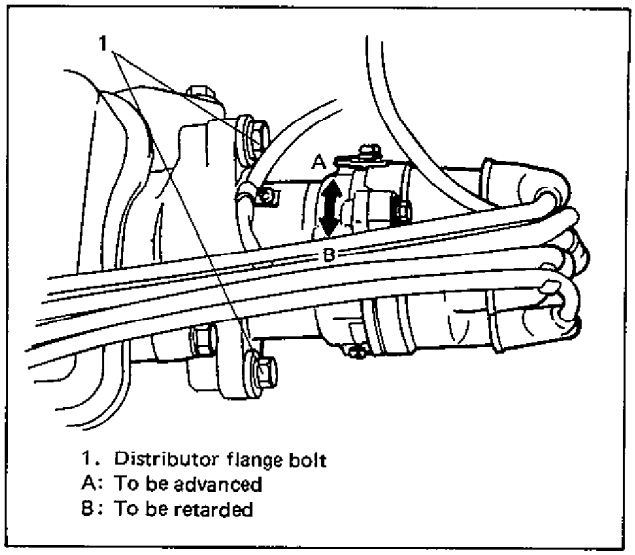


Fig. 6F-11 Adjusting Ignition Timing

DISTRIBUTOR UNIT

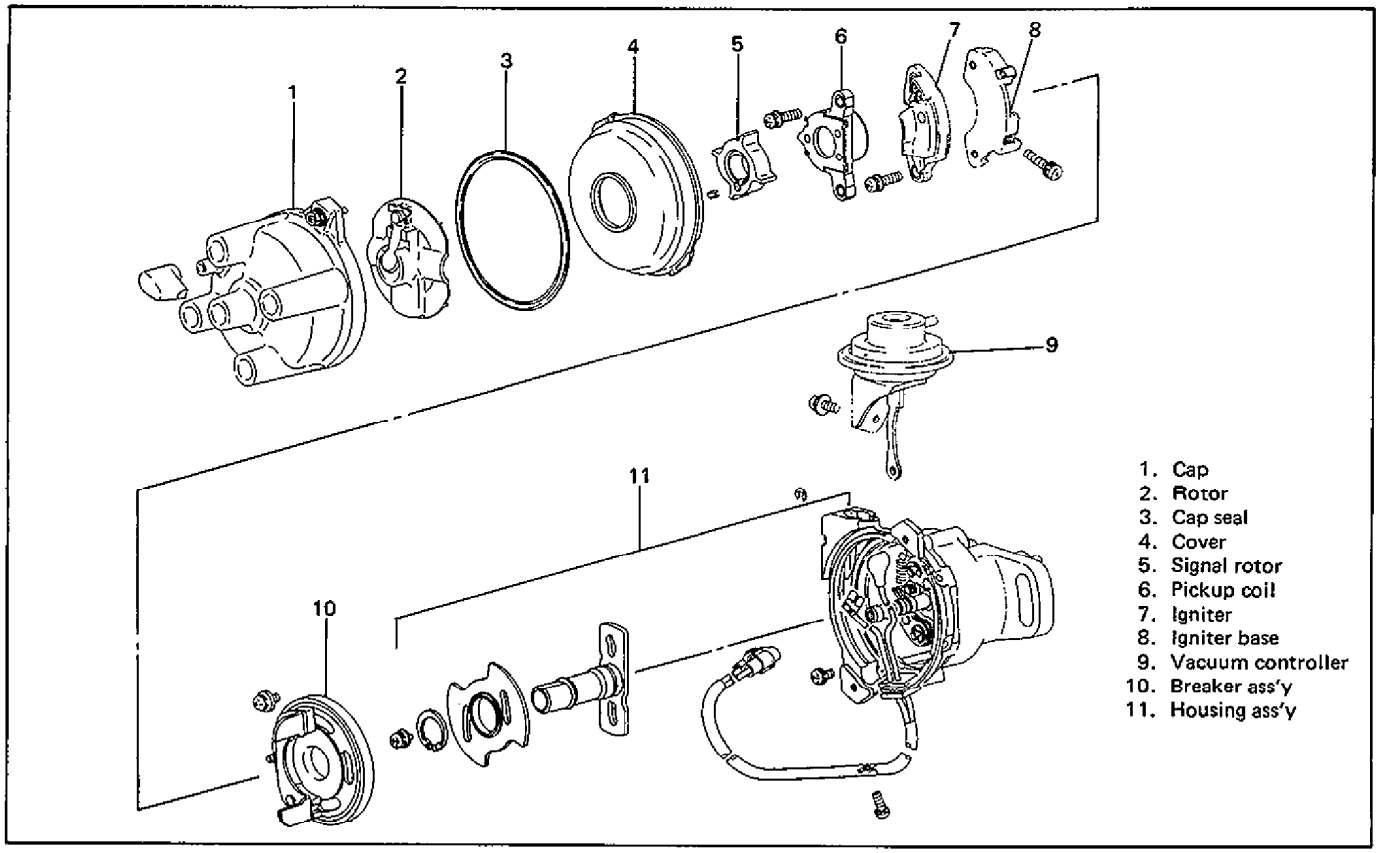


Fig. 6F-12 Distributor Components

REMOVAL

1. Disconnect distributor lead coupler.
2. Disconnect vacuum hose at vacuum controller.
3. Remove distributor cap screws and cap.
4. Remove distributor flange bolts.
5. Pull out distributor housing assembly.

DISASSEMBLY

1. Remove distributor cap, if it has been assembled with housing.
2. Draw out rotor and remove cover with cap seal.

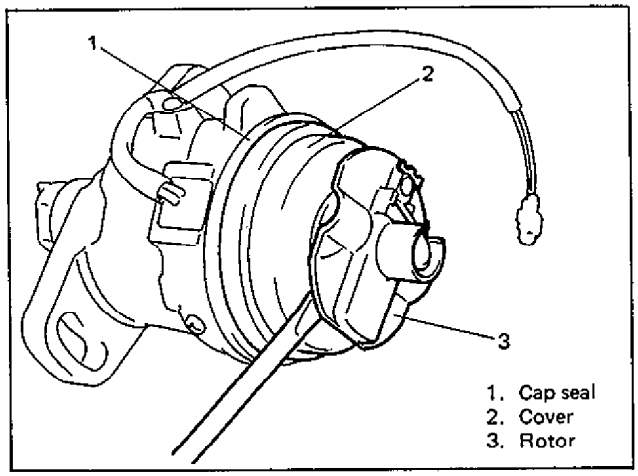


Fig. 6F-13

3. Using screwdrivers, draw out signal rotor as shown below.

NOTE:
When drawing out signal rotor, be careful so that screwdrivers don't damage igniter and pickup coil.

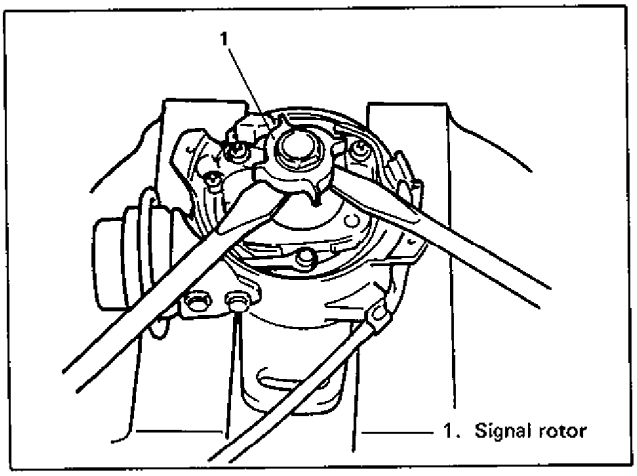


Fig. 6F-14

4. Disconnect lead wires at igniter terminals. Remove igniter fastening screws and take out igniter with pickup coil.

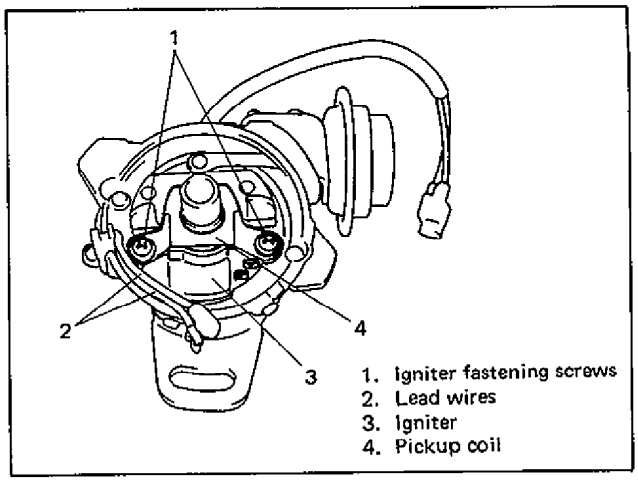


Fig. 6F-15

NOTE:
Igniter and pickup coil can be separated as shown below.

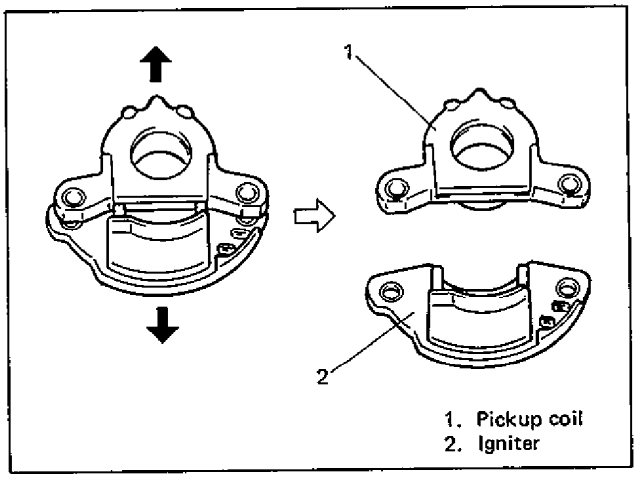


Fig. 6F-15-1

5. Remove igniter base screws and then take out igniter base.

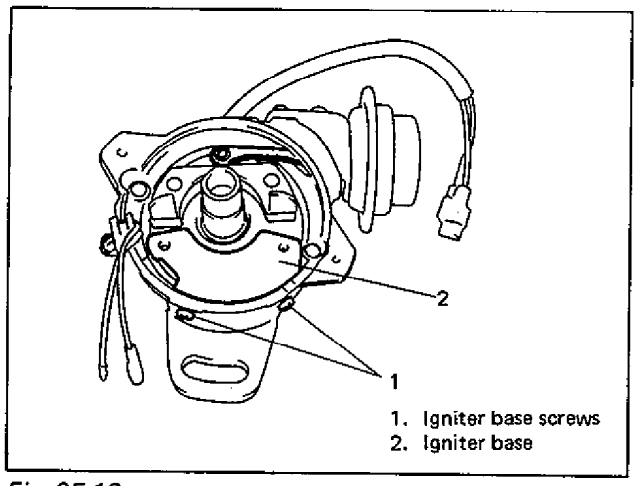


Fig. 6F-16

6. Remove E-ring and screws and then pull out vacuum controller from housing.

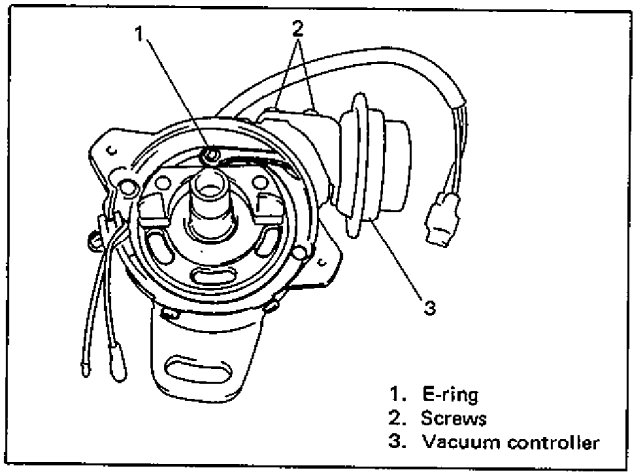


Fig. 6F-17

7. Remove breaker screws and then remove breaker ass'y.

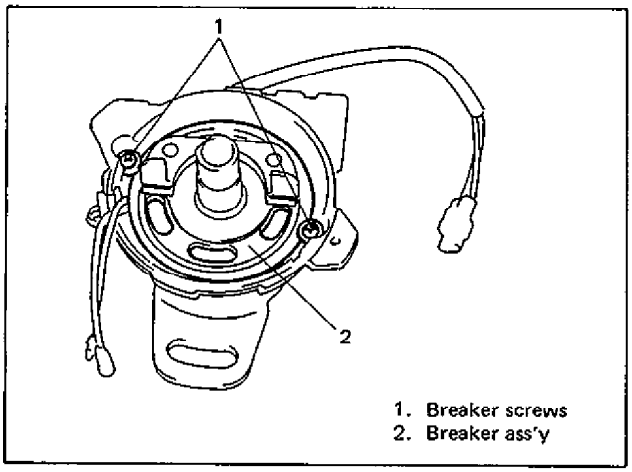


Fig. 6F-18

8. Remove rotor shaft screw and then remove rotor shaft.

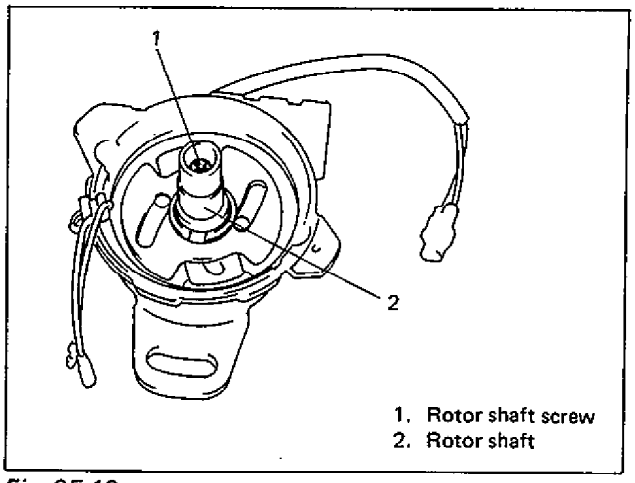


Fig. 6F-19

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.

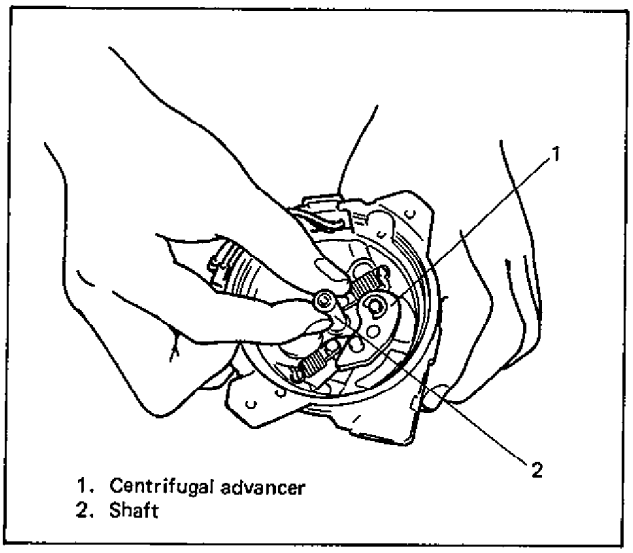


Fig. 6F-20 Checking Centrifugal Advancer

Breaker

Check breaker bearing for smooth rotation. If any abnormality is found, replace it. Do not wash or disassemble it.

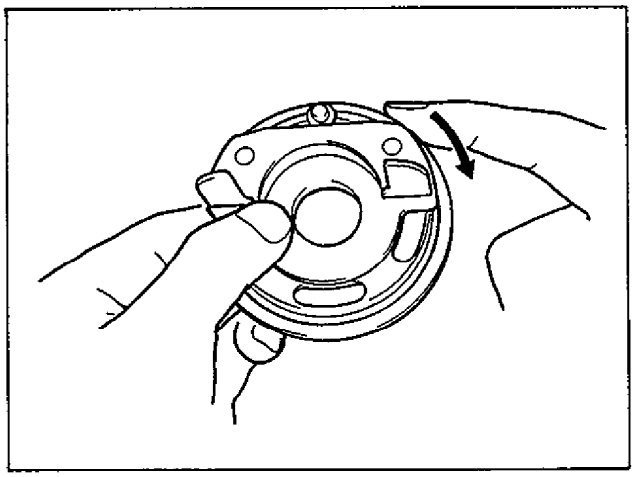


Fig. 6F-21 Checking Breaker

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.**

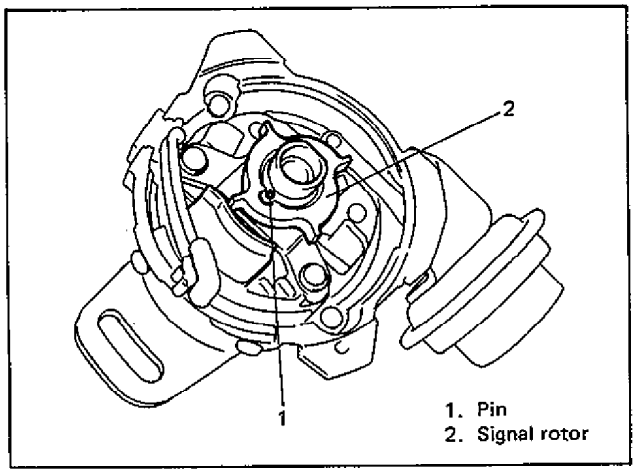


Fig. 6F-22

INSTALLATION

1. If distributor case has been removed or replaced, install it with new gasket and fasten with bolts.
2. Turn crankshaft and align timing pulley mark (TDC of No. 1 cylinder compression stroke) to outside cover mark.

NOTE:

TDC of No. 1 cylinder compression stroke can be verified by checking camshaft with cylinder head cover removed, or checking offset side of camshaft end coupling slot.

Tightening torque for distributor case bolts	N·m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5

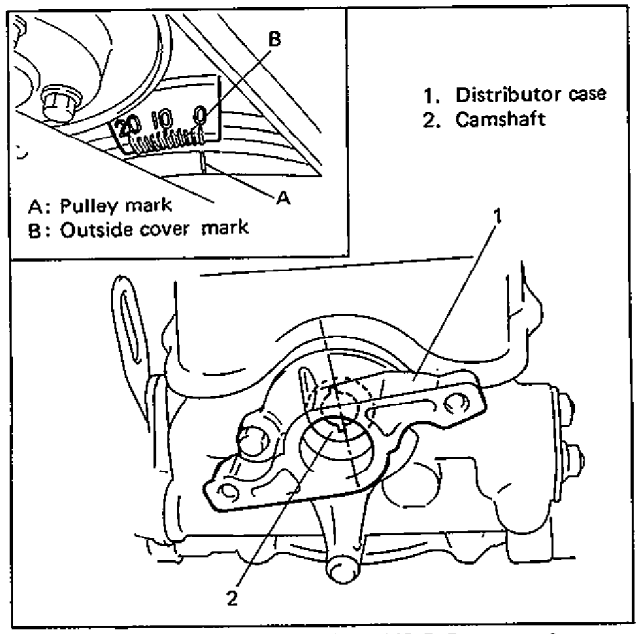


Fig. 6F-23 Aligning Camshaft to TDC Compression

3. Align distributor coupling with housing mark.
4. Install distributor to case by mating its coupling with camshaft slot.

NOTE:

- **Before installing distributor, check to make sure that its O ring is in good condition.**
- **If new O ring is installed, apply oil.**
- **If coupling does not mate with camshaft slot, turn distributor with rotor slightly.**

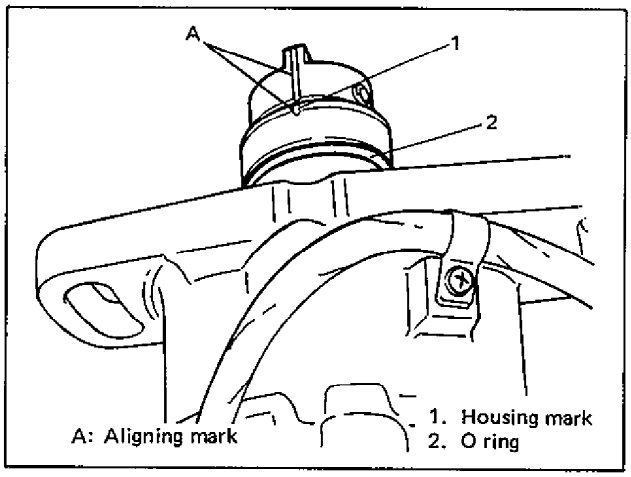
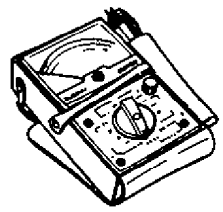
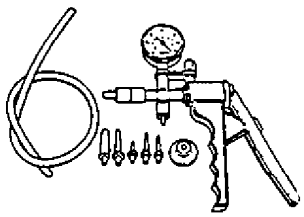
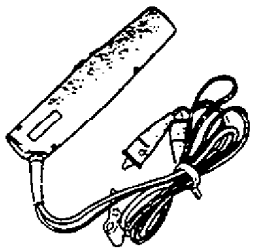
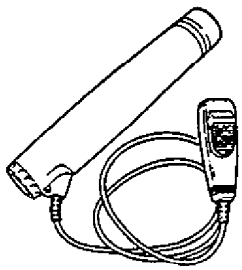


Fig. 6F-24 Aligning Distributor Coupling

5. Lightly install flange bolts and prepare for ignition timing adjustment.
6. Check to make sure that rotor is in good condition and inserted in shaft securely.
7. Inspect distributor cap and clean or replace as required.
8. Make sure that distributor cap seal is placed properly and install cap, and then fasten it with screws.
9. Connect vacuum hose with vacuum controller.
10. Connect distributor lead coupler.
11. Check and adjust ignition timing within specification (refer to p. 6F-5).

SPECIAL TOOLS

			
09900-25002 Pocket tester	09917-47910 Vacuum pump gauge	09900-27301 Timing light (DC 12V)	09900-27311 Timing light (Dry cell type)

SECTION 6G

CRANKING SYSTEM (0.8,0.9 and 1.0 kW type)

NOTE:
Four types of starting motors are used for this model. They are, 0.8, 0.9, 1.0 and 1.2kW types. Which 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 1.2kW type starting motor, refer to Section 6G1.

Label color	Red	Yellow	Green	Blue
OUT PUT (kW)	0.8	0.9	1.0	1.2

CONTENTS

GENERAL DESCRIPTION

CRANKING CIRCUIT

The cranking circuit consists of the battery, starting motor, ignition switch, and related electrical wiring. These components are connected electrically 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.

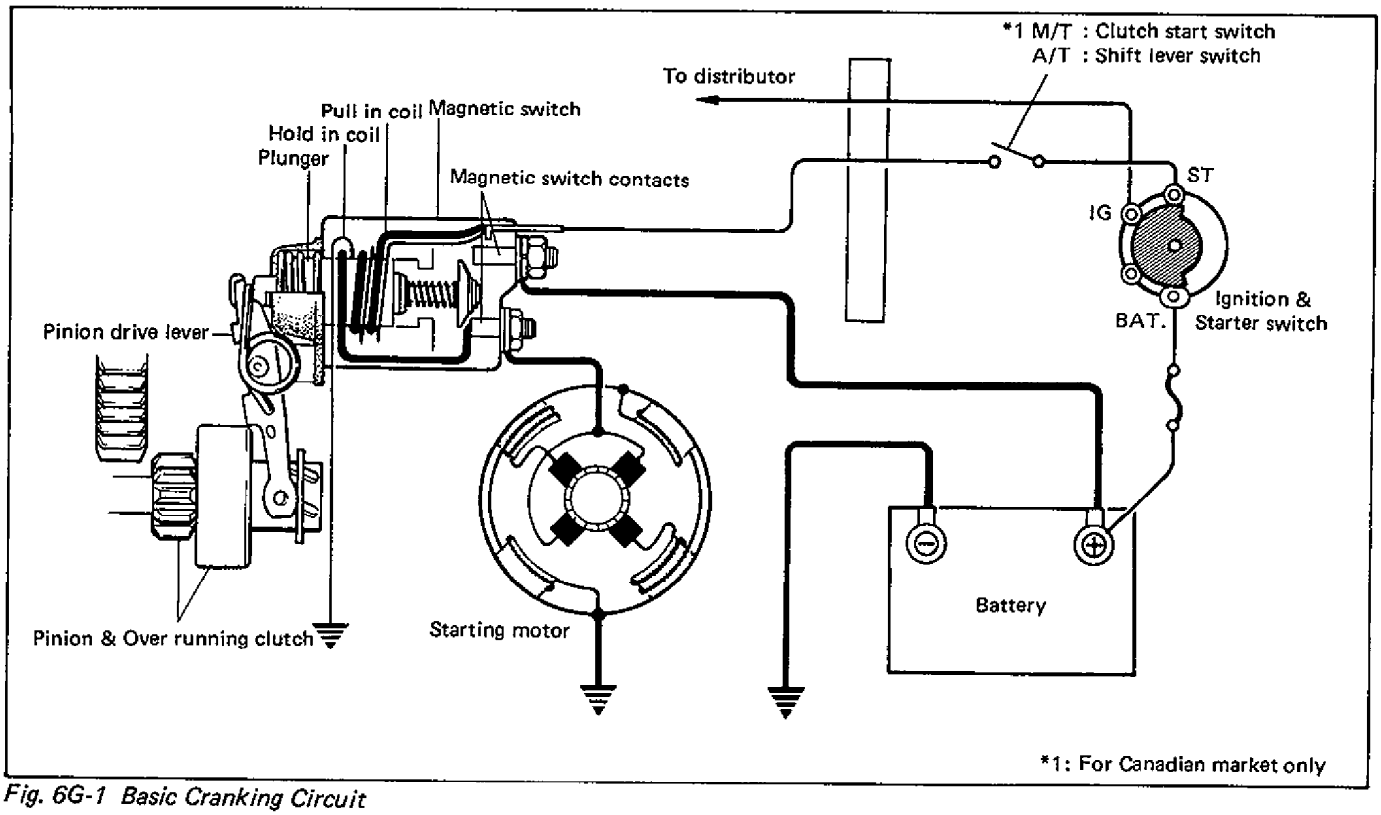


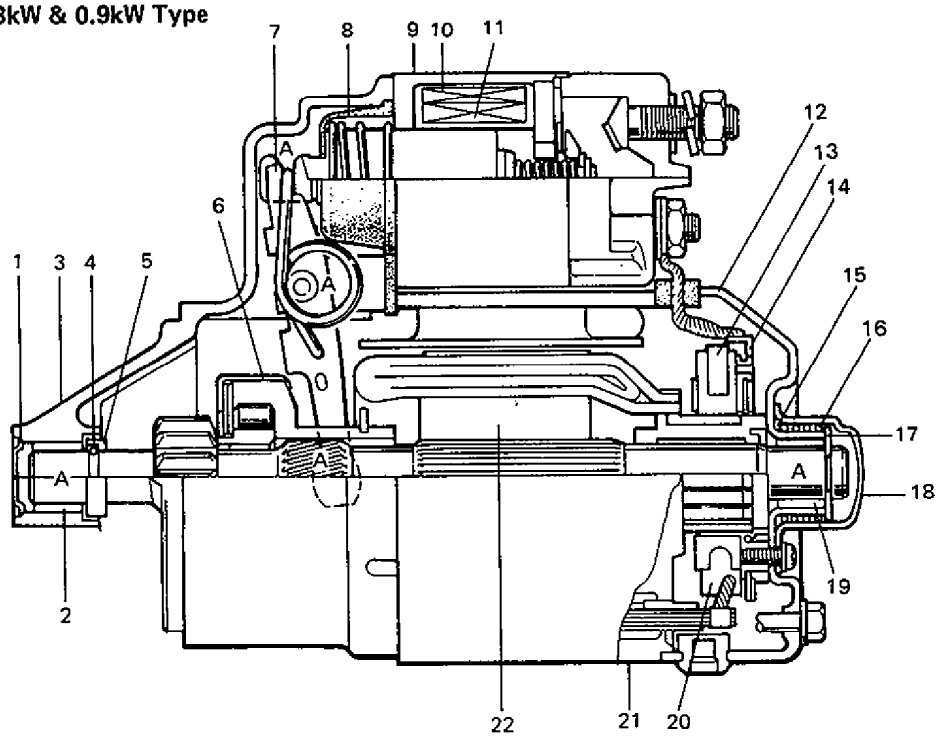
Fig. 6G-1 Basic Cranking Circuit

SPECIFICATIONS

ITEM		CONVENTIONAL TYPE		REDUCTION TYPE	
Voltage		12 volts		←	
Output		0.8kW [*0.9kW]		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[*1,300] 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*
			*680A maximum 1.6 kg-m (11.6 lb-ft) minimum		
Magnetic switch pull-in operation		8 volts maximum at 20°C (68°F)		←	

*: For 0.9kW Type

For 0.8kW & 0.9kW Type



1. Cover
2. Bush (Bearing: For 0.9kW type)
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 (Bearing: For 0.9kW type)
20. Brush
21. Yoke assembly
22. Armature
23. Housing bolt

A: Apply grease

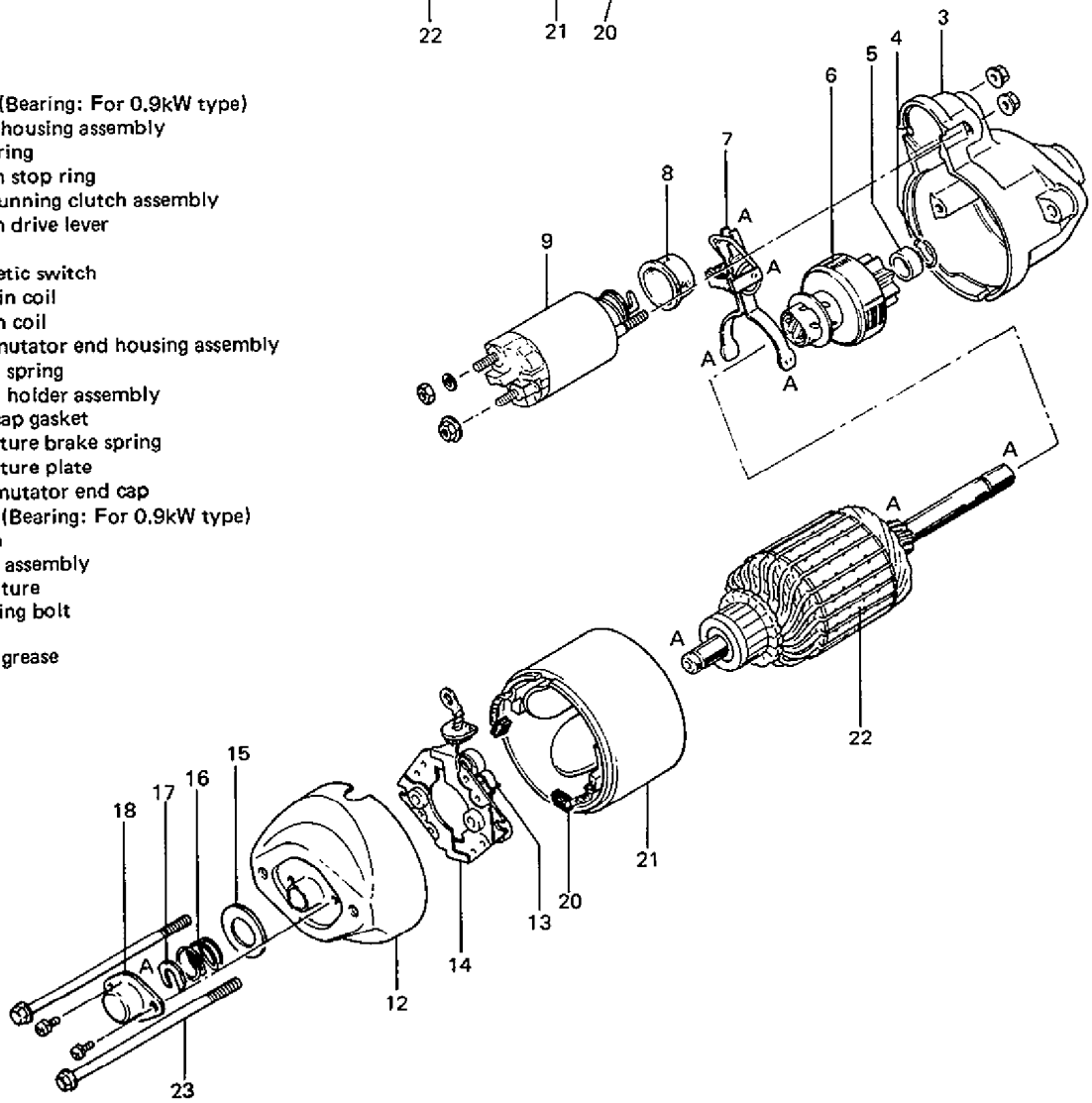


Fig. 6G-2 Convertional Type Starting Motor

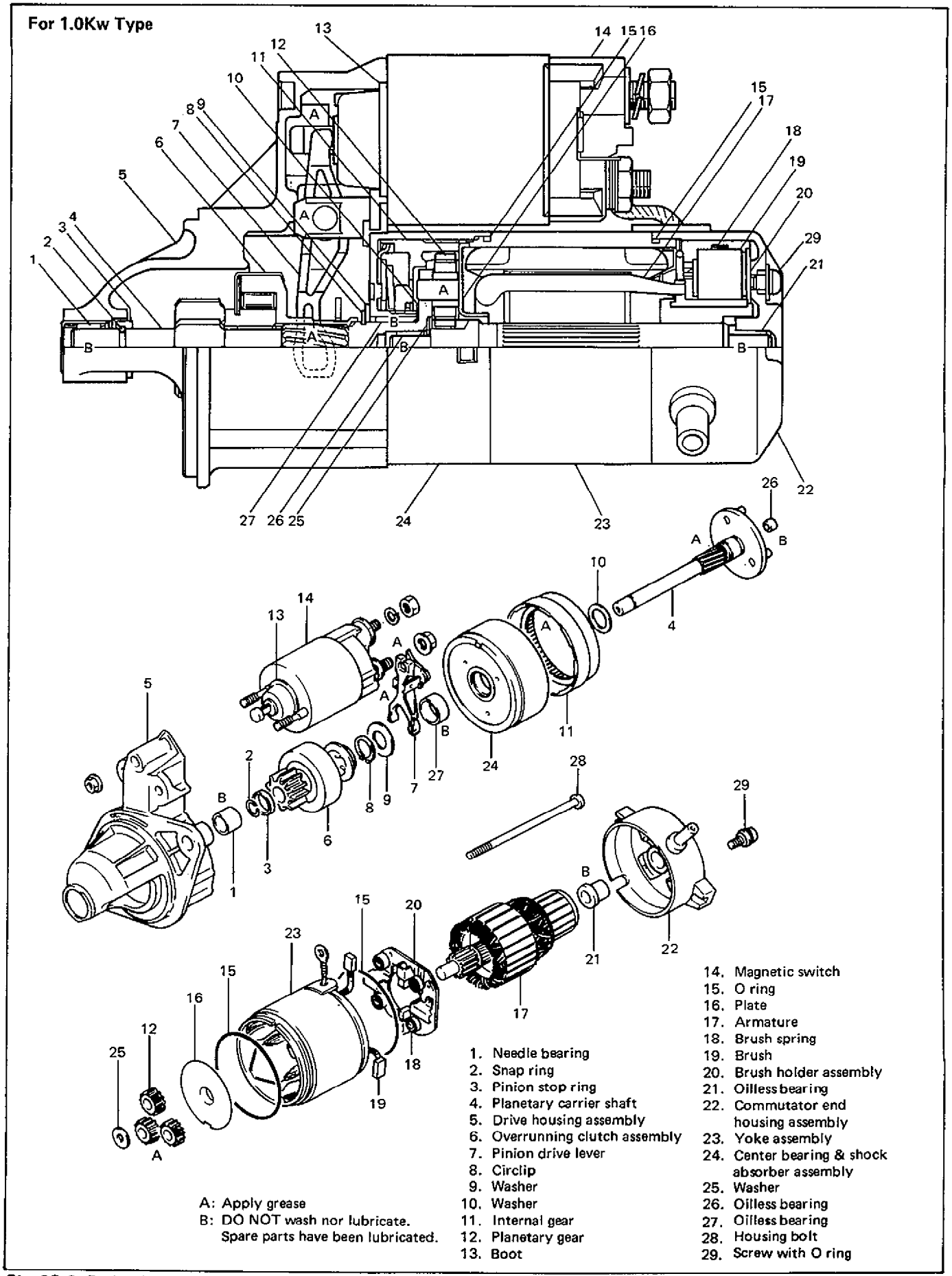


Fig. 6G-3 Reduction Type Starting Motor

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

*1: For Canadian market only

Condition	Possible Cause	Correction
Motor not running	**No operating sound of magnetic switch**	
	1. Clutch pedal is not depressed fully or clutch start switch is not adjusted (M/T) *1	Depress clutch pedal or adjust clutch start switch
	2. Shift lever switch is not in P or N, or not adjusted (A/T)	Shift in P or N, or adjust switch
	3. Battery run down	Recharge battery
	4. Battery voltage too low due to battery deterioration	Replace battery
	5. Poor contact in battery terminal connection	Retighten or replace
	6. Loose grounding cable connection	Retighten
	7. Fuse set loose or blown off	Tighten or replace
	8. Poor contacting action of ignition switch	Replace
	9. Lead wire coupler loose in place	Retighten
	10. Open-circuit between ignition switch and magnetic switch	Repair
	11. Open-circuit in pull-in coil	Replace magnetic switch
	12. 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

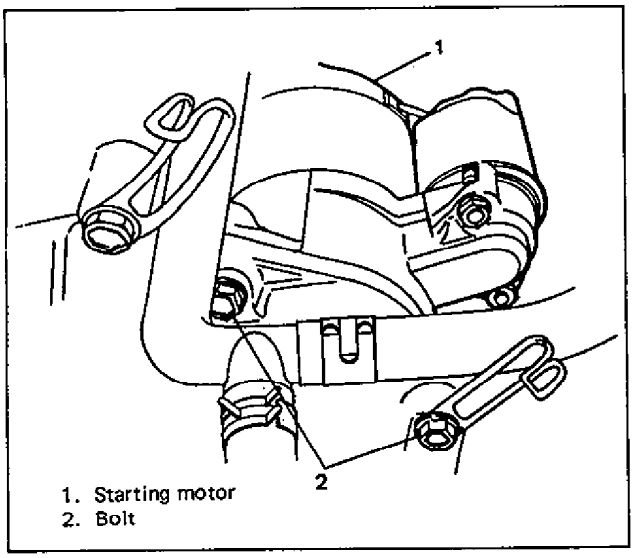


Fig. 6G-4 Starting Motor Mounting

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.

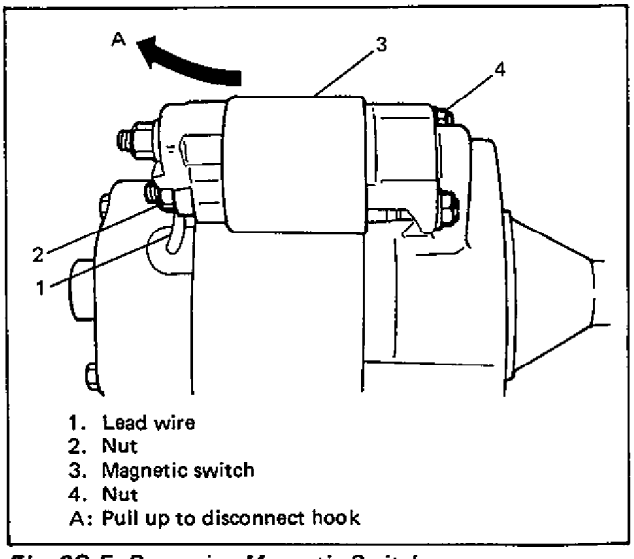


Fig. 6G-5 Removing Magnetic Switch

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.**

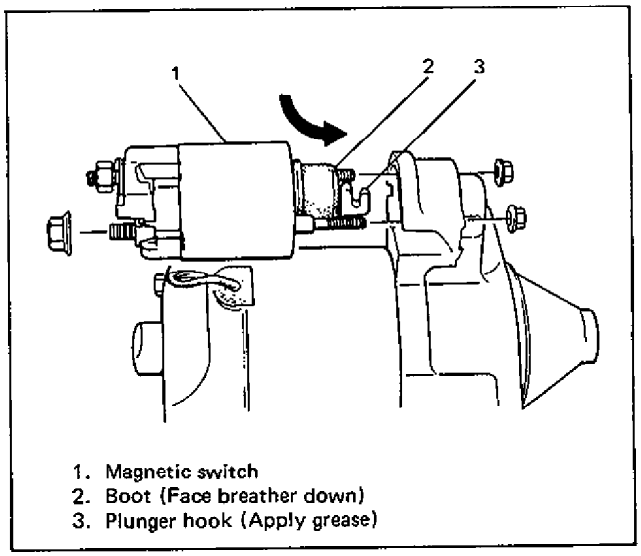


Fig. 6G-6 Installing Magnetic Switch

MOTOR ASSEMBLY

Disassembly

1. Remove magnetic switch.
2. Remove 2 screws, then take off commutator end cap, armature plate and brake spring.

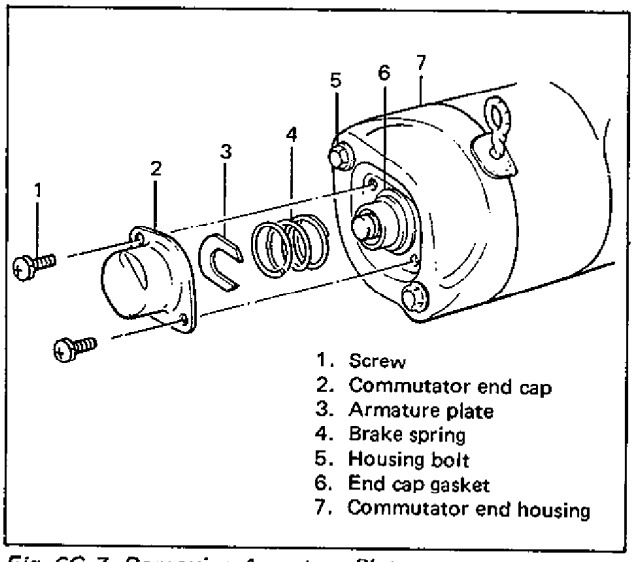


Fig. 6G-7 Removing Armature Plate

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.

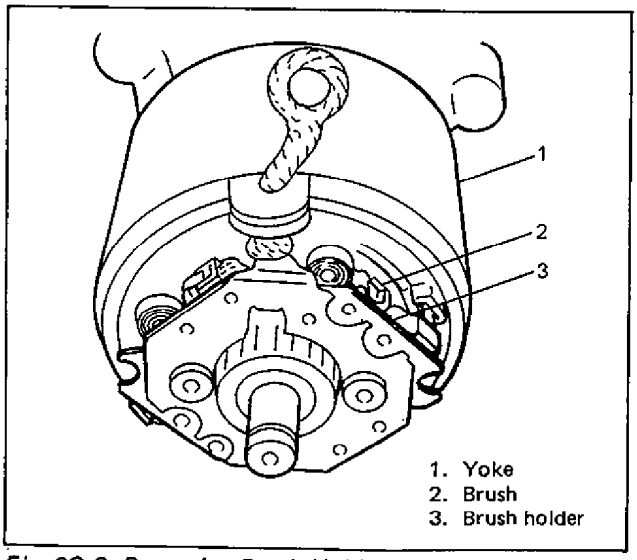


Fig. 6G-8 Removing Brush Holder

5. Remove yoke, armature and drive lever.

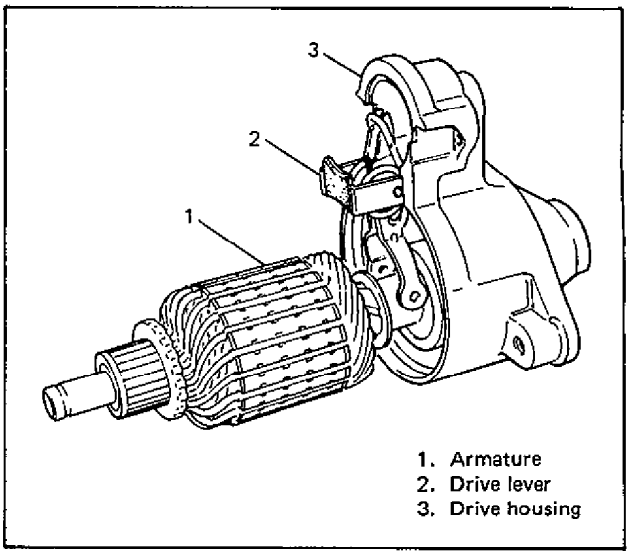


Fig. 6G-9 Removing Armature

6. Remove armature snap ring by using snap ring pliers assisted with screwdriver, then pull out pinion stop ring and overrunning clutch.

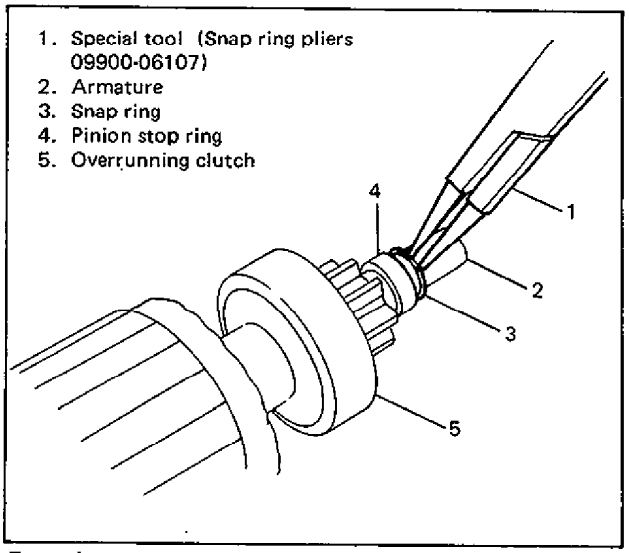


Fig. 6G-10 Removing Snap Ring

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.

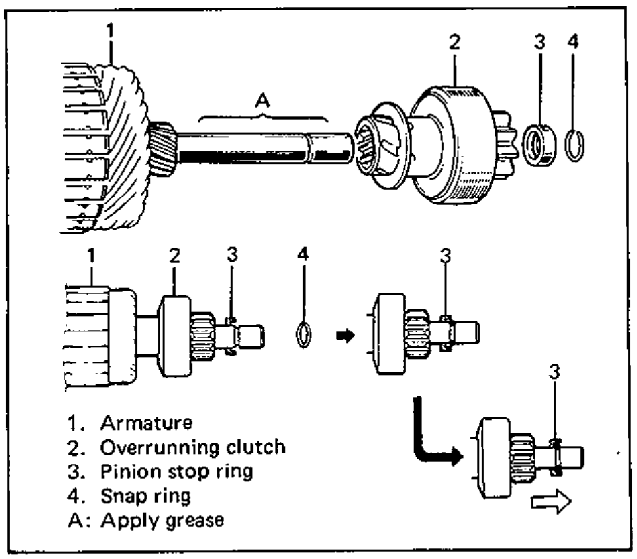


Fig. 6G-11 Installing Overrunning Clutch

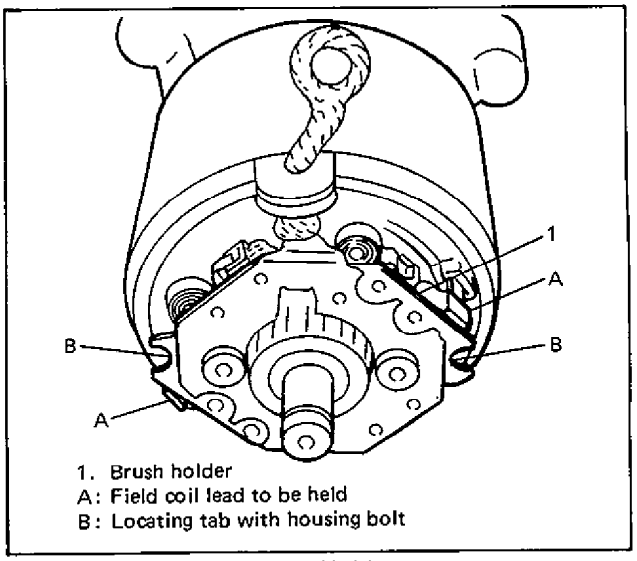


Fig. 6G-13 Installing Brush Holder

3. Apply grease to drive lever and combine it with armature. Then assemble them with drive housing.

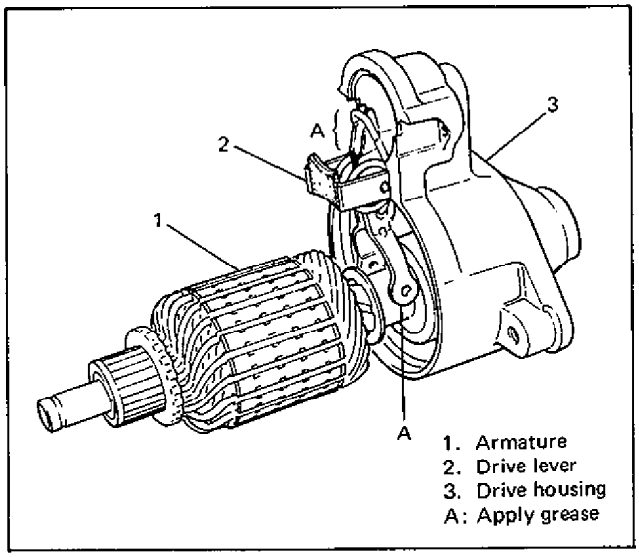


Fig. 6G-12 Installing Armature

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.**

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.

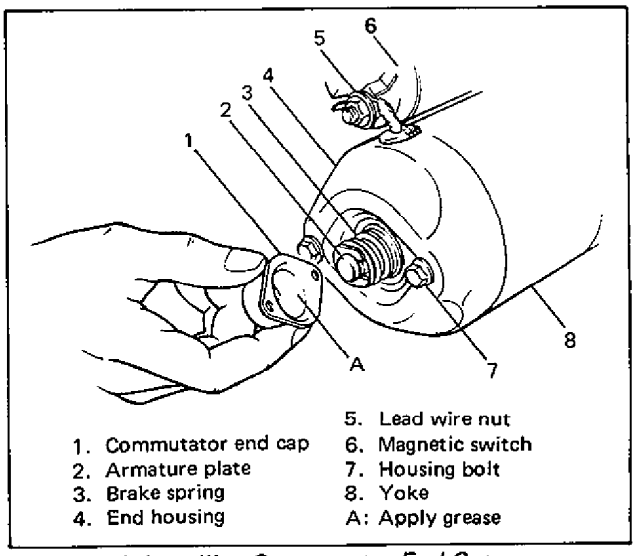


Fig. 6G-14 Installing Commutator End Cap

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.

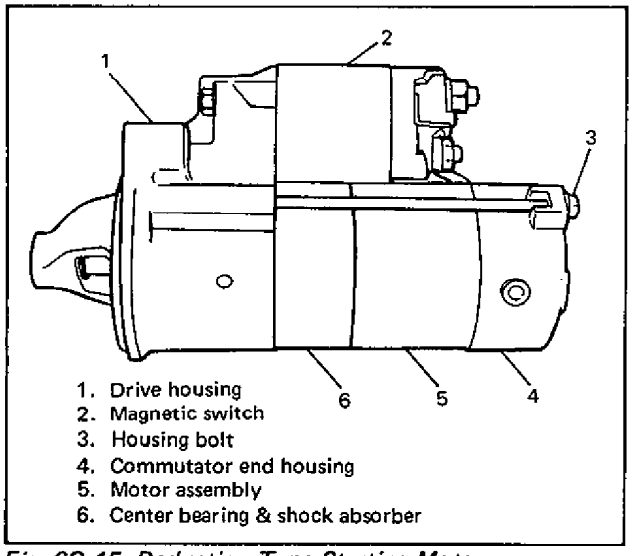


Fig. 6G-15 Reduction Type Starting Motor

3. To overhaul reduction gear assembly, remove plate, planetary gears and washer.

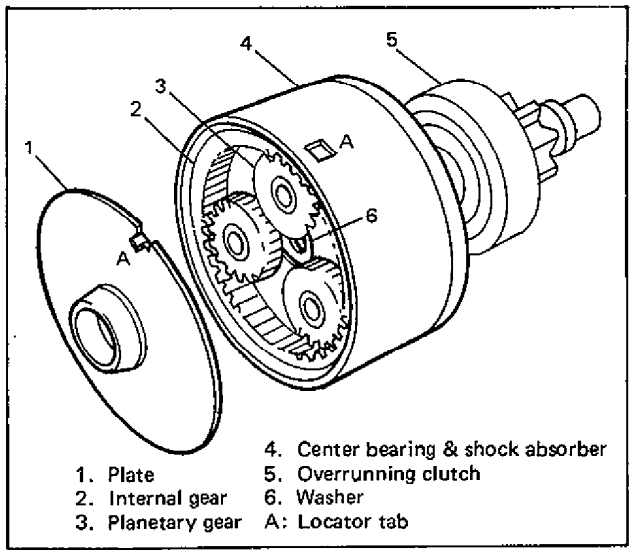


Fig. 6G-16 Reduction Gear Assembly

4. Remove snap ring, then pull out pinion stop ring and overrunning clutch.

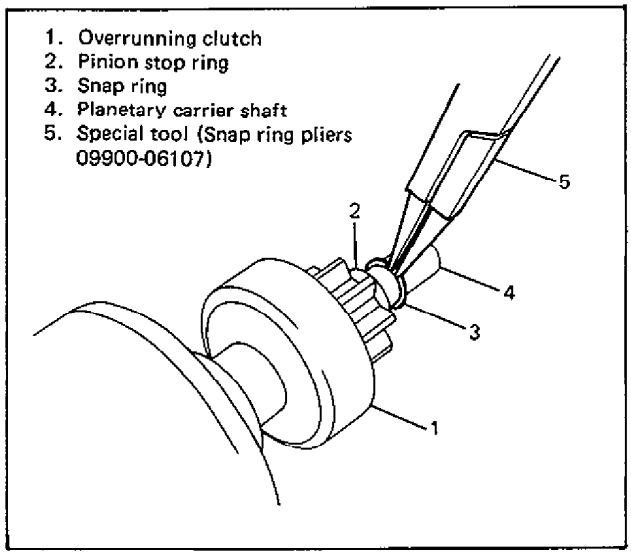


Fig. 6G-17 Removing Overrunning Clutch

5. Using special tool, remove circlip, then take out planetary carrier shaft from center bearing & shock absorber.

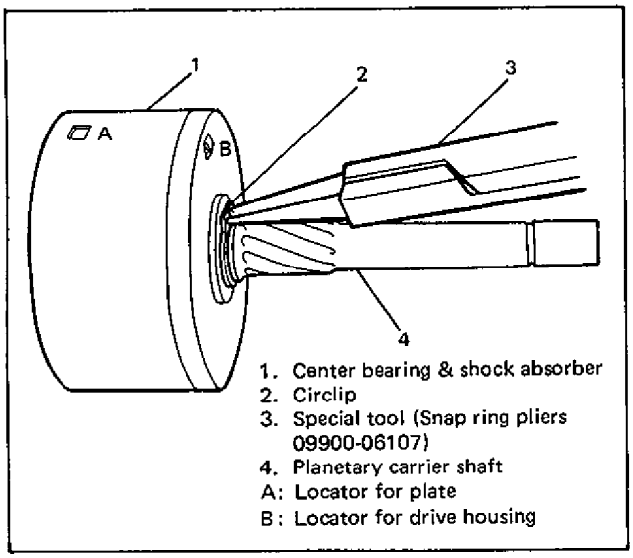


Fig. 6G-18 Removing Circlip

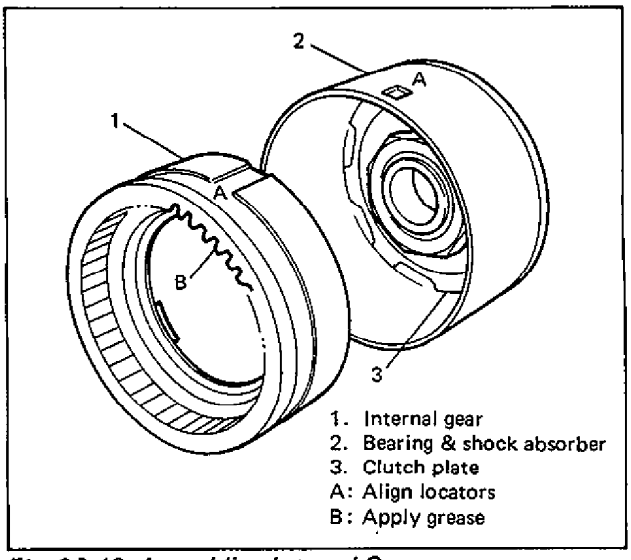


Fig. 6G-19 Assembling Internal Gear

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.

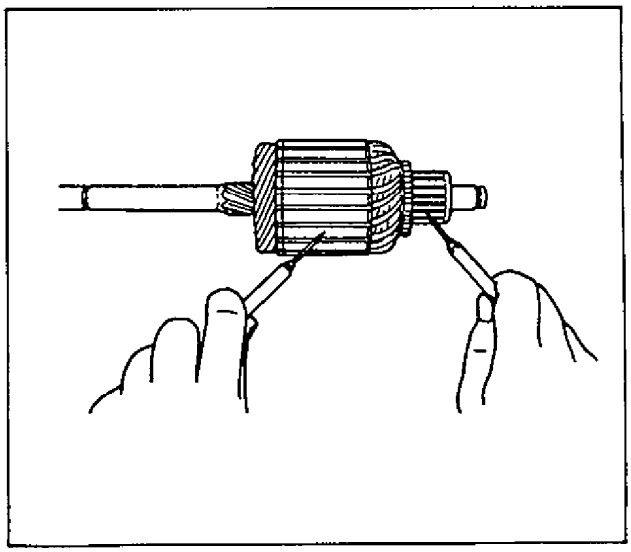


Fig. 6G-20 Checking Coil Ground

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.

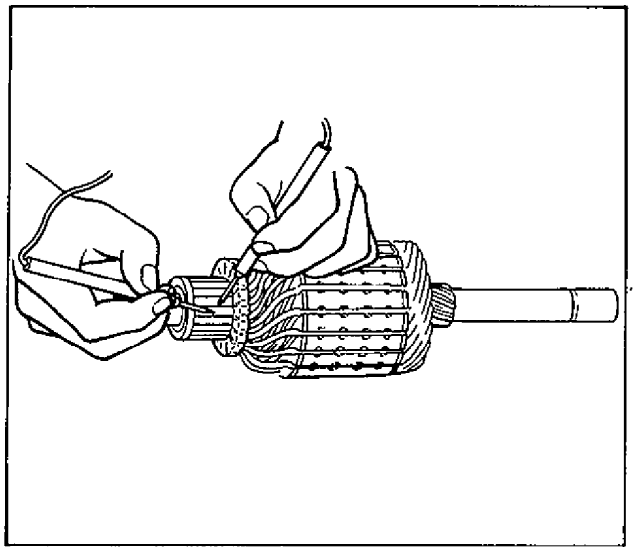


Fig. 6G-21 Checking Open Circuit

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)	0.8kW 0.9kW	1.0 kW
	0.4 mm 0.015 in	0.05 mm 0.002 in

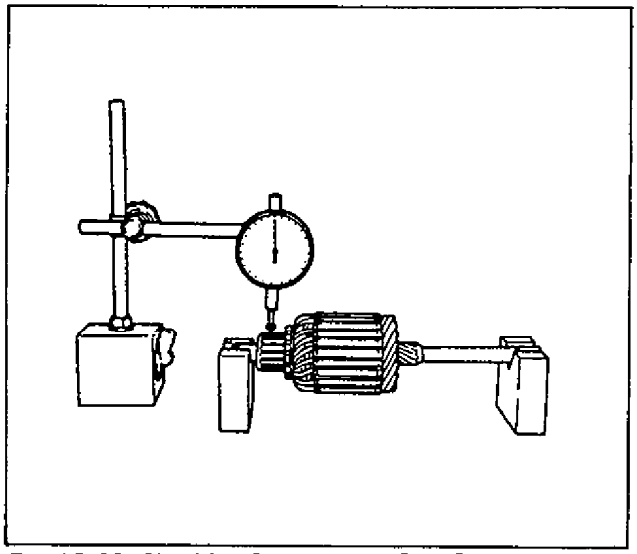


Fig. 6G-22 Checking Commutator Run-Out

Commutator Diameter

Check for wear and replace armature if diameter is below limit.

Commutator diameter Service limit (minimum value)	0.8, 0.9 and 1.0kW
	27 mm 1.063 in

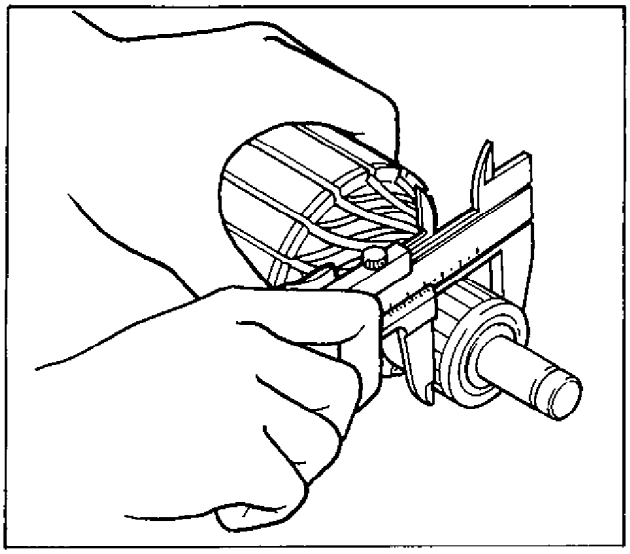


Fig. 6G-23 Checking Commutator Diameter

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, 0.9 and 1.0kW
	0.2 mm 0.008 in

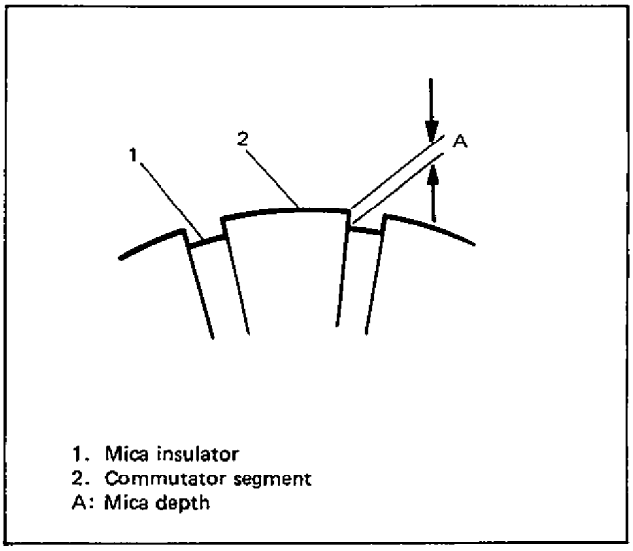


Fig. 6G-24 Checking Mica Depth

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.

	0.8kW 0.9kW	1.0 kW
Brush length service limit (minimum value)	10.7 mm 0.421 in	9.0 mm 0.354 in

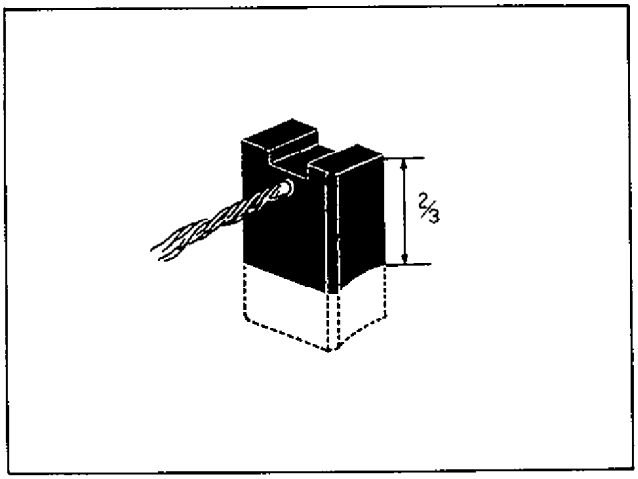


Fig. 6G-25 Checking Brush Length

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.

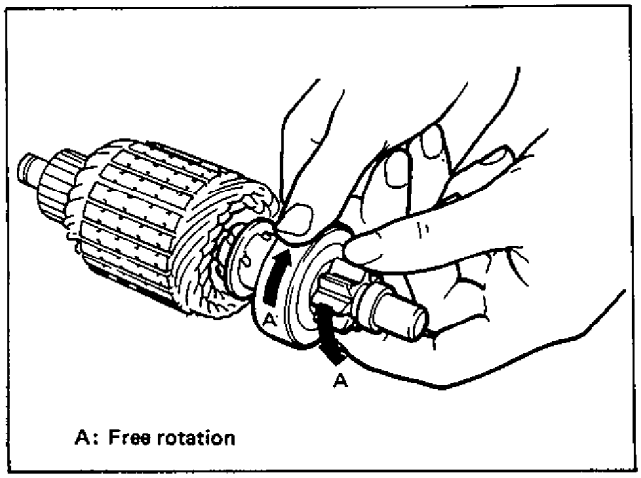


Fig. 6G-26 Checking Overrunning Clutch

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.**

	0.8 kW only
Bush-to-shaft clearance service limit A — B	0.2 mm 0.008 in

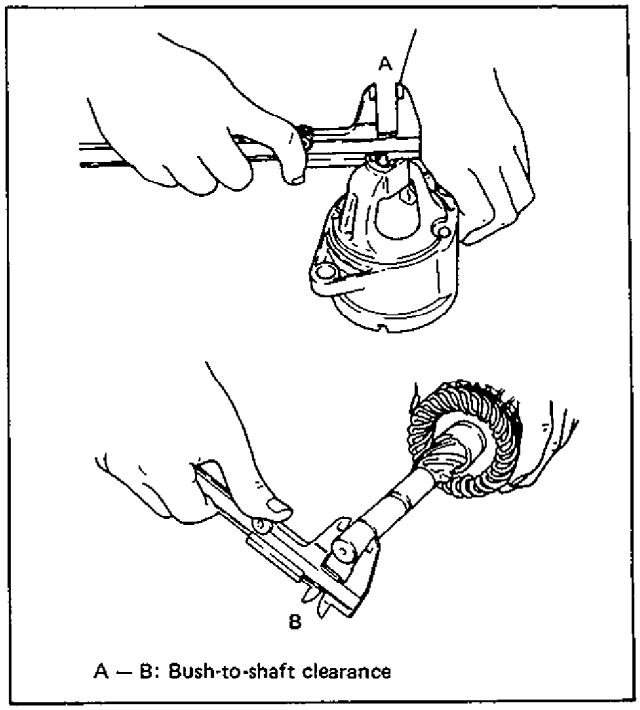


Fig. 6G-27 Measuring Bush-to-Shaft Clearance

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.

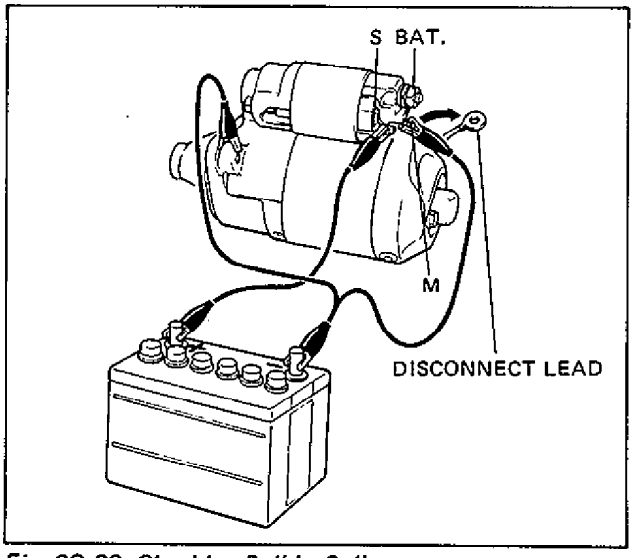


Fig. 6G-28 Checking Pull-in Coil

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.

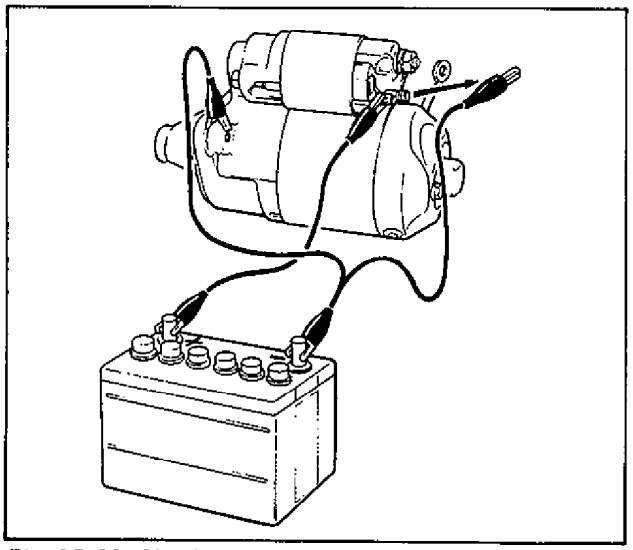


Fig. 6G-29 Checking Hold-in Coil

PINION (PLUNGER) RETURN TEST

As a next step to the above, disconnect negative lead and check to make sure that pinion returns inward quickly.

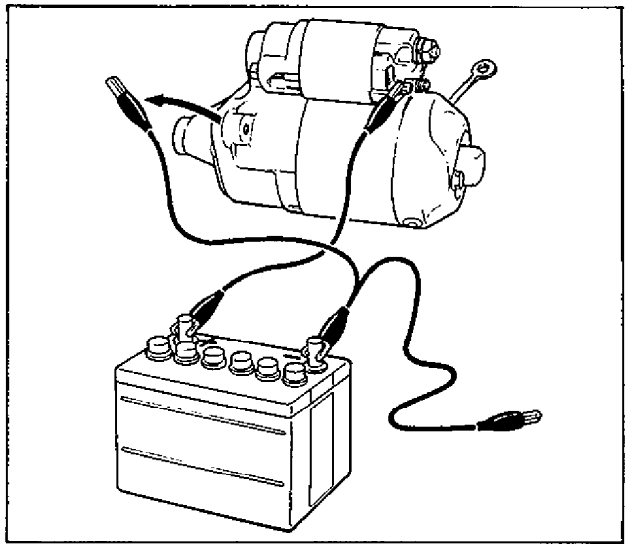


Fig. 6G-30 Checking Pinion Return

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	0.8kW 0.9kW	1.0 kW
No load current	Within 50A at 11V	Within 90A at 11.5V

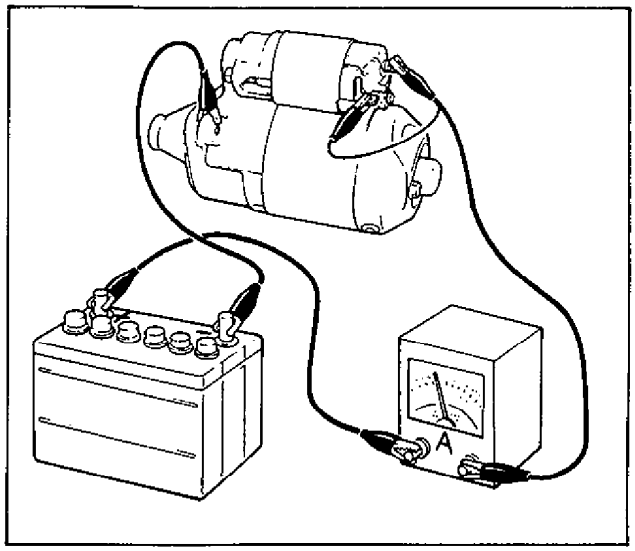


Fig. 6G-31 Checking No-load Performance

SECTION 6G1

CRANKING SYSTEM (1.2 kW 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

Refer to GENERAL DESCRIPTION in Section 6G as it is also applicable to this section. Given below are specifications for 1.2kW type cranking system.

SPECIFICATIONS

ITEM		SPECIFICATION	
Type		Reduction type	
Voltage		12 volts	
Output		1.2kW	
Rated time		30 seconds	
Direction of rotation		Clockwise viewed from pinion side	
Brush length		17.5 mm (0.69 in)	
Number of pinion teeth		8	
Performance		Condition	Guarantee
Around at 20°C (68°F)	No load	11V	90A maximum 3,000 r/min. minimum
	Load	7.7V 0.93 kg-m	300A maximum 850 r/min. minimum
	Lock	4V	780A maximum 1.9 kg-m minimum
Magnetic switch pull-in operation		8 volts maximum at 20°C (68°F)	

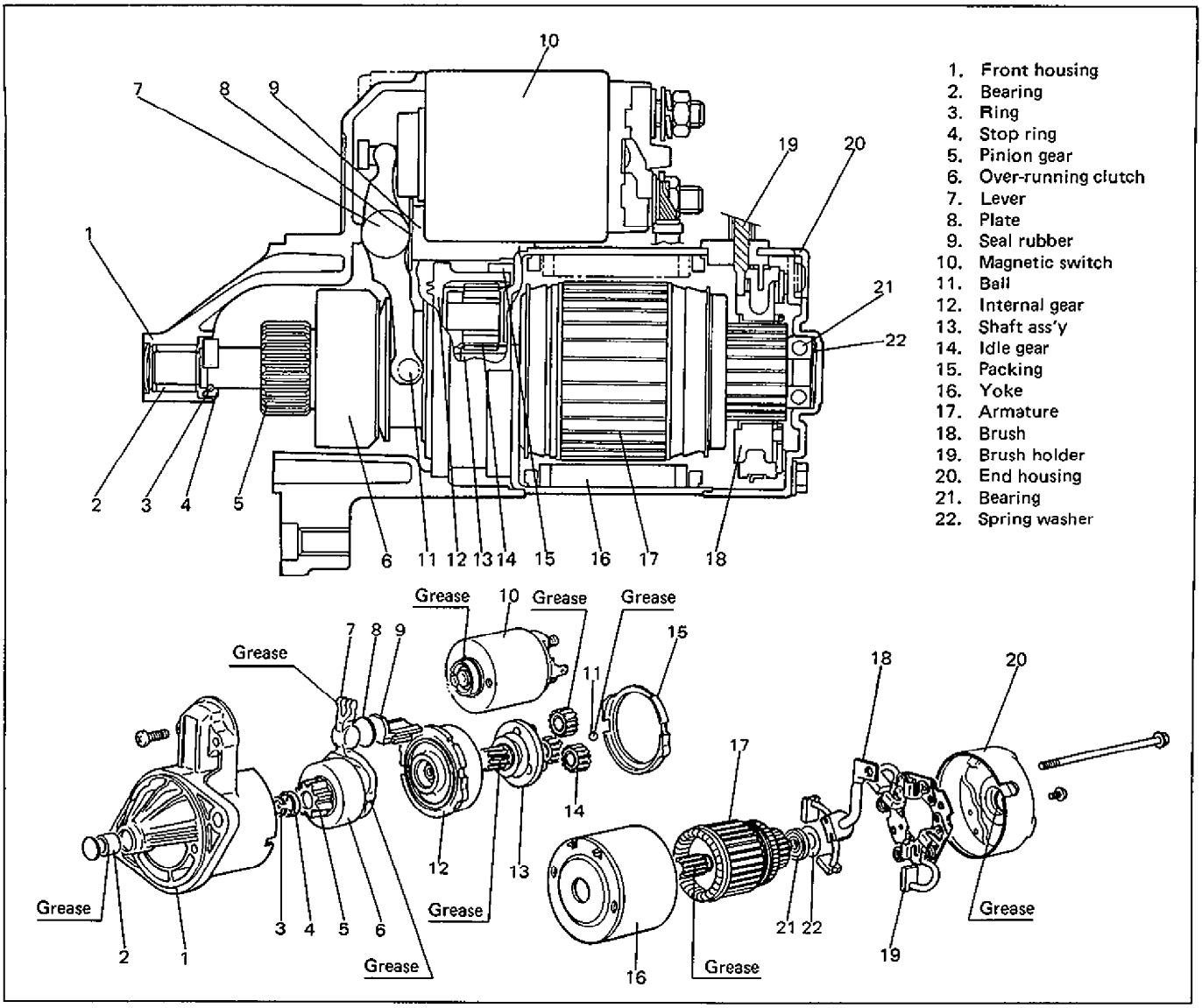


Fig. 6G-1-1 Starter Motor

DIAGNOSIS

Refer to DIAGNOSIS in Section 6G as the same content is applicable to this section.

UNIT REPAIR OVERHAUL

For dismounting and remounting procedures, refer to Seciton 6G of this manual.

NOTE:

Before diassembling starting motor, be sure to put match marks at two locations (A & B) as shown in figure 6G1-1-1 so that any possible mistake can be avoided.

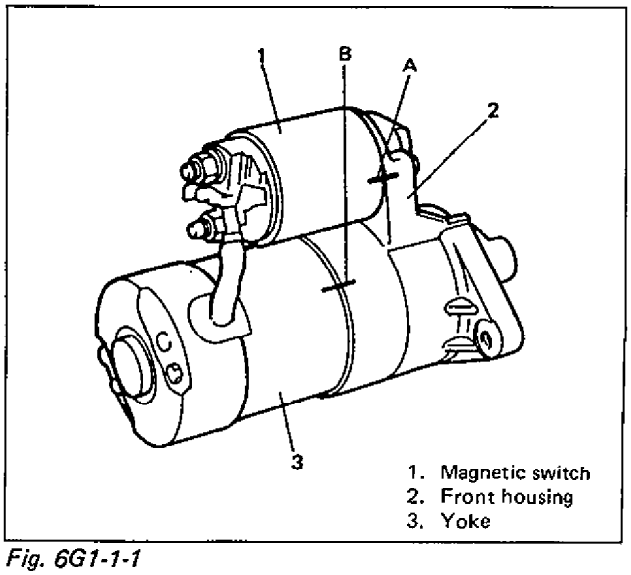


Fig. 6G1-1-1

MAGNETIC SWITCH ASSEMBLY

Removal

1. Disconnect wire (switch to motor) from magnetic switch terminal.

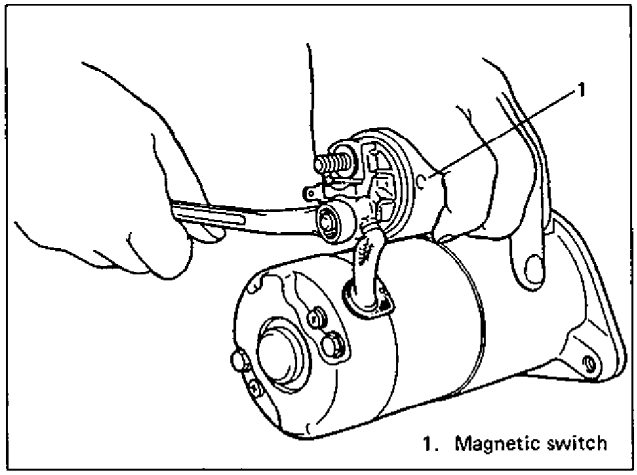


Fig. 6G1-2

2. Remove magnetic switch assembly.

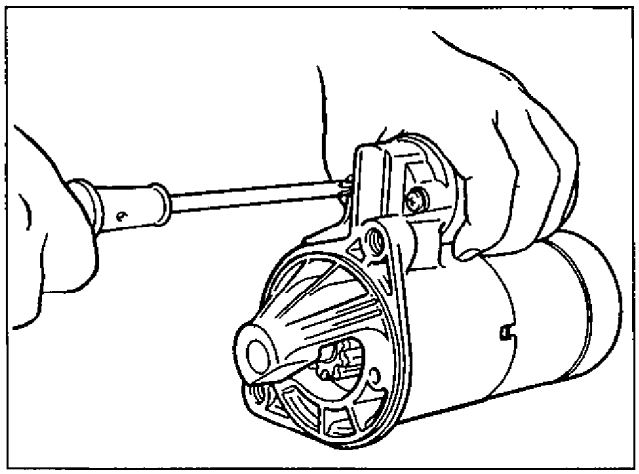


Fig. 6G1-3

CAUTION:
Do not disassemble magnetic switch. Replace it as assembly when required.

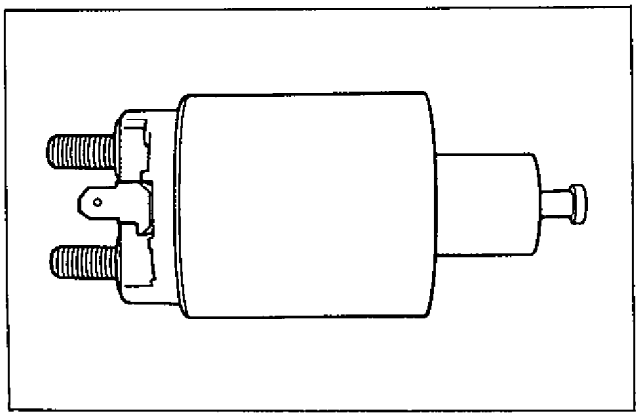


Fig. 6G1-4

Installation

Before installation, inspect plunger joint for wear and replace defective parts.

1. Apply grease. (Refer to Fig. 6G1-1)
2. Install switch assembly into front housing, referring to below figure especially for its vertical direction. And then tighten nuts.

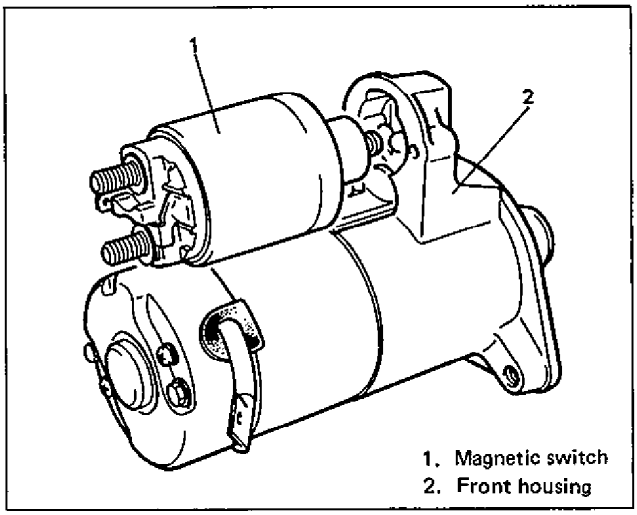


Fig. 6G1-5

3. Connect wire from motor to magnetic switch terminal.

MOTOR BRUSH

Removal

1. Remove commutator end housing.

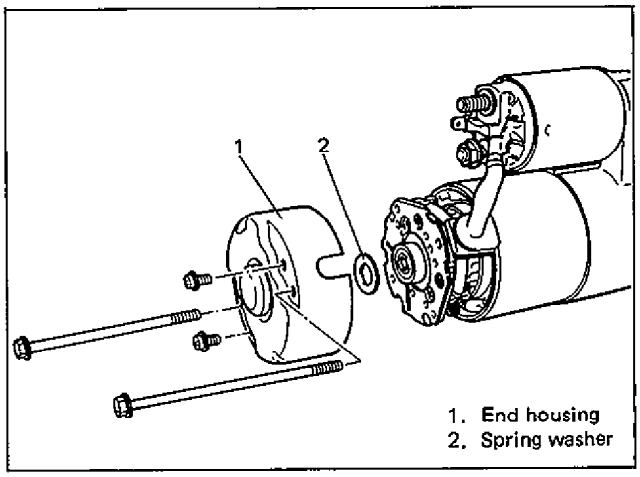


Fig. 6G1-6

2. Remove brush holder and brushes.

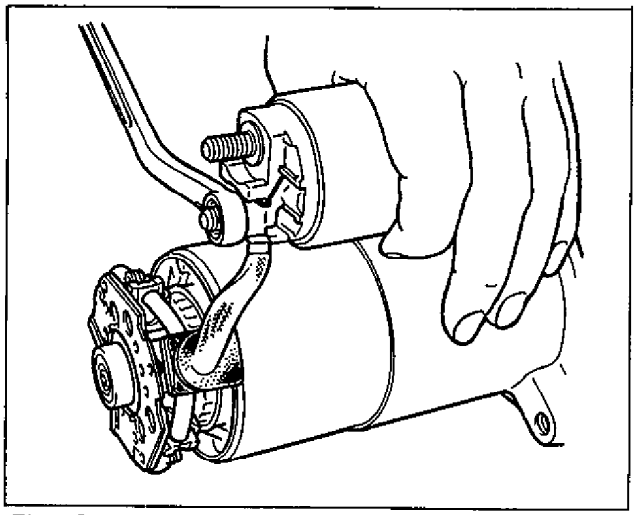


Fig. 6G1-7

Installation

Install in reverse order of REMOVAL, noting the following.

1. Apply grease. (Refer to Fig. 6G1-1)
2. Fit spring washer between commutator end housing and shaft as shown below.

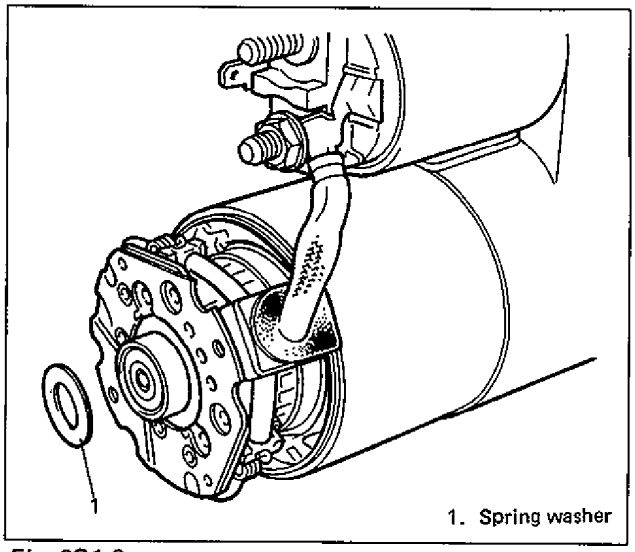


Fig. 6G1-8

ARMATURE

Removal

1. Remove magnetic switch.
2. Remove brush holder.
3. Remove armature.

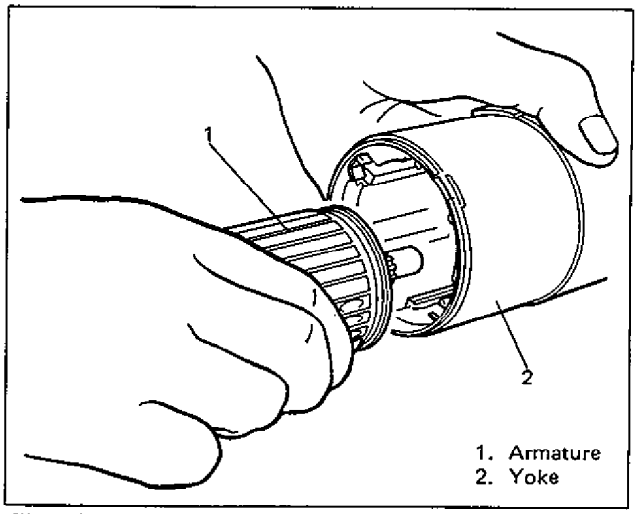


Fig. 6G1-9

Installation

Install in reverse order of REMOVAL, noting the following.

1. Apply grease. (Refer to Fig. 6G1-1)

NOTE:

If ball of armature shaft bearing came out when removed, be sure to apply grease to ball and put it back in.

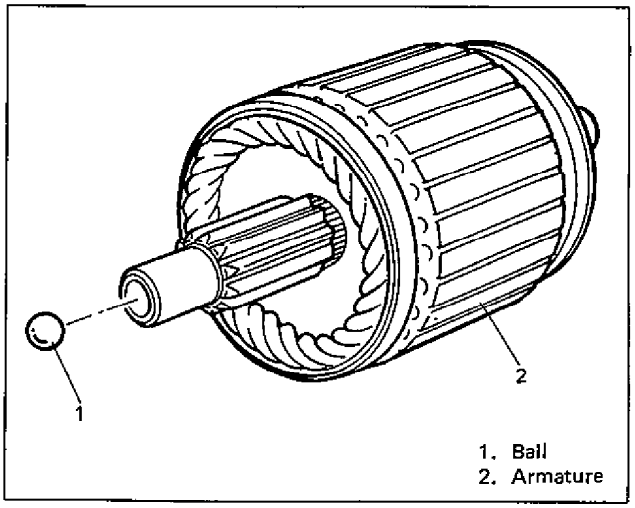


Fig. 6G1-10

OVER-RUNNING CLUTCH

Removal

1. Remove armature.
2. Remove yoke from front housing.

NOTE:

Provide match marks on yoke and front housing before removing yoke.

3. Remove packing and idle gears.

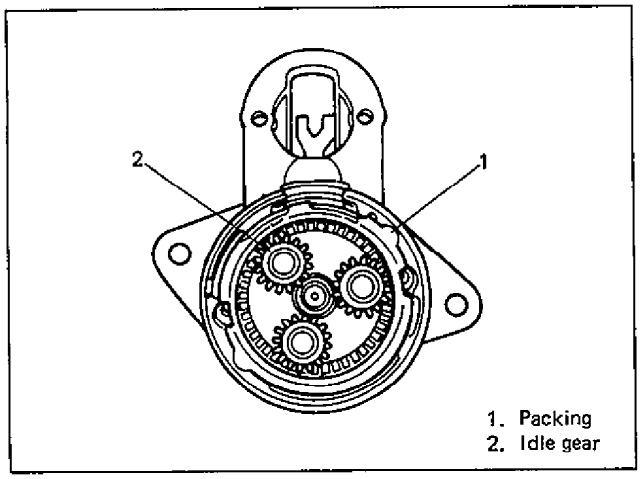


Fig. 6G1-11

4. Remove seal rubber and plate.

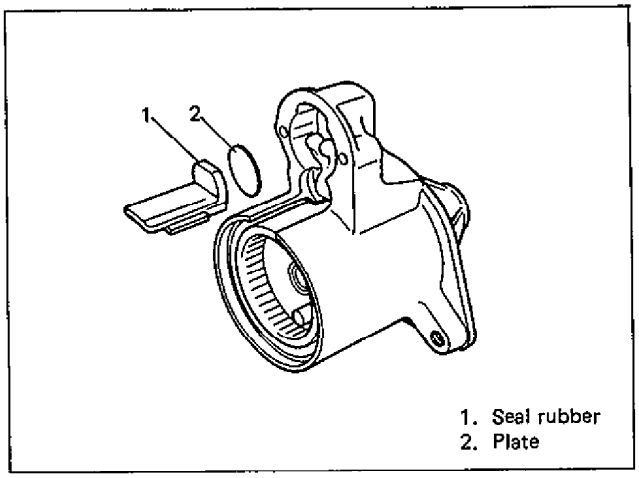


Fig. 6G1-12

5. Remove shaft assembly with lever.

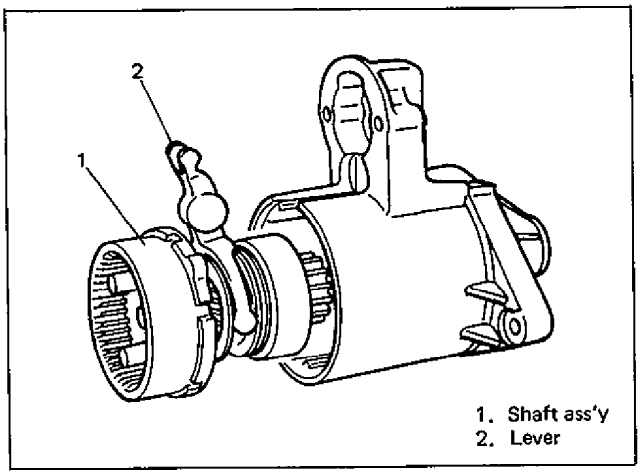


Fig. 6G1-13

6. Remove over-running clutch by removing rings.

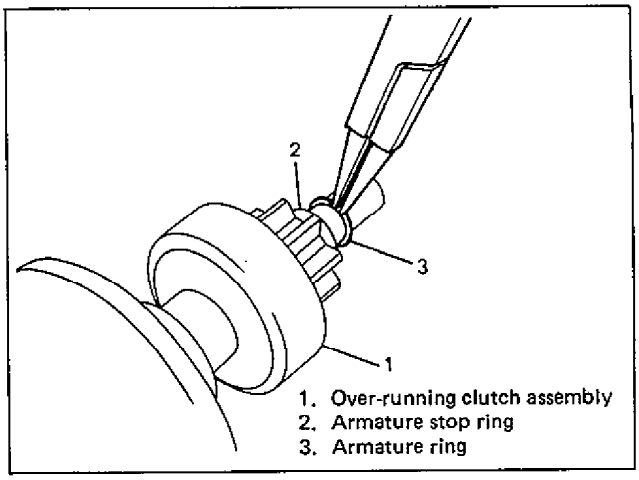


Fig. 6G1-14

Installation

Install in reverse order of REMOVAL, noting the following.

1. Apply grease. (Refer to Fig. 6G1-1)
2. Install over-running clutch assembly to armature shaft, using care for installing direction of armature stop ring.

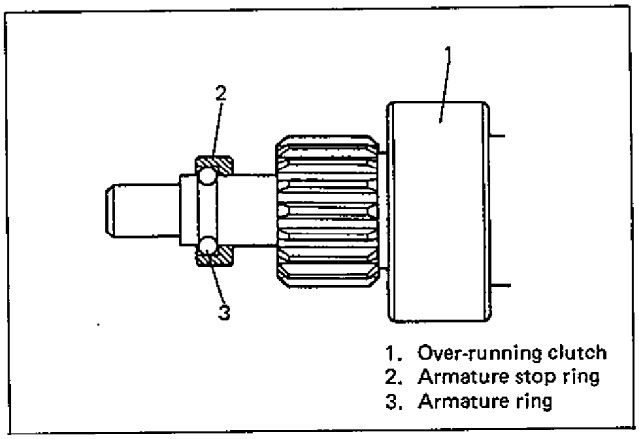


Fig. 6G1-15

3. Insert shaft assembly into front housing with lever positioned as shown below.

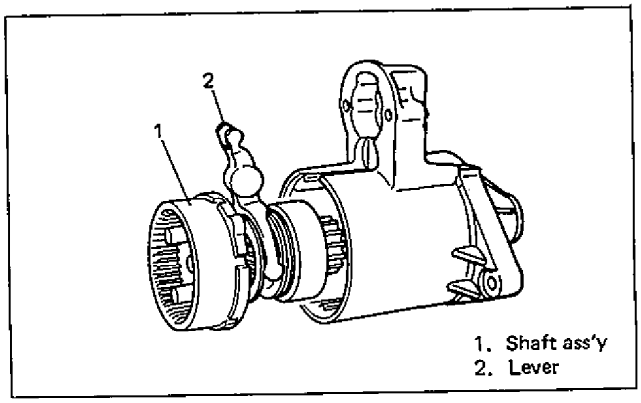


Fig. 6G1-16

4. Install packing so that cuts in packing align with holes for through bolt in front housing.

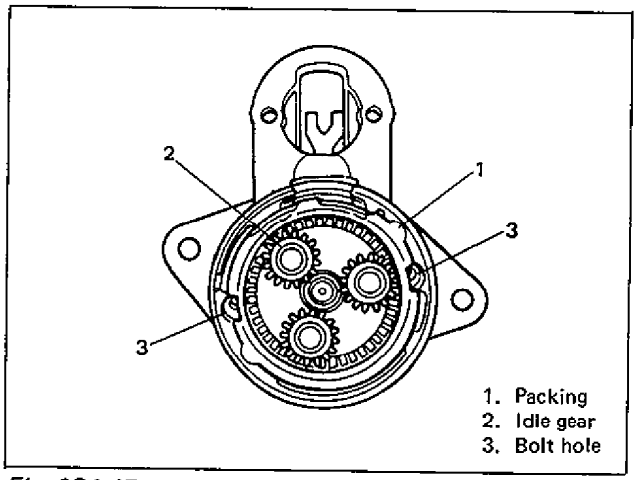


Fig. 6G1-17

5. Install plate and seal rubber to front housing.

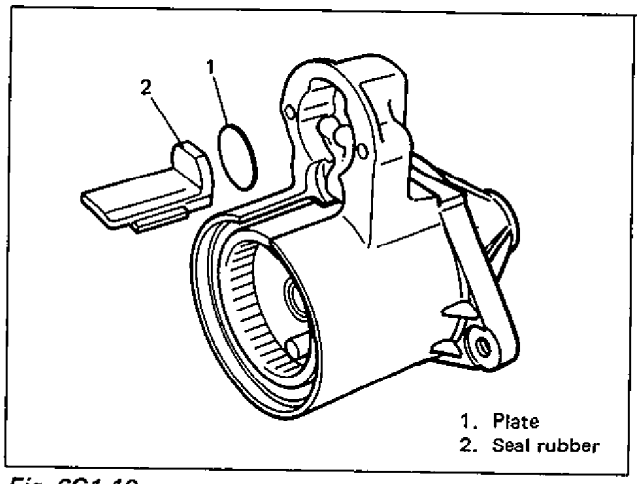


Fig. 6G1-18

6. Apply grease to ball and install ball into shaft hole.

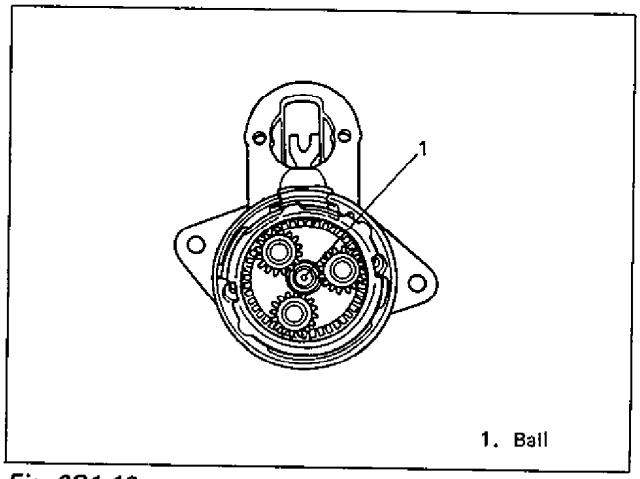


Fig. 6G1-19

7. Install yoke and armature to front housing by aligning match marks provided before removal.
8. Install brushes and brush holder. (For details, refer to Fig. 6G1-8.)
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 6G1-3.)

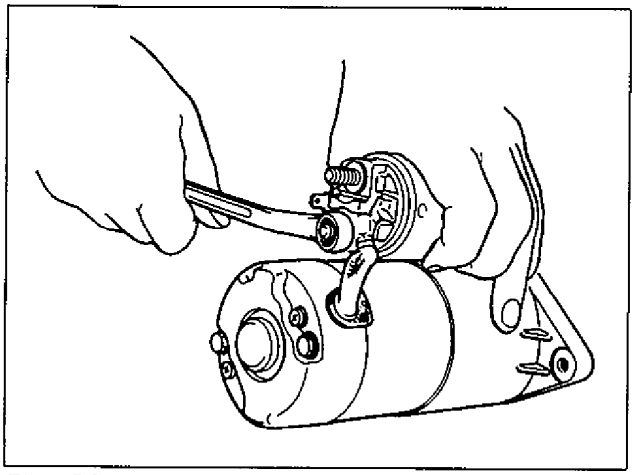


Fig. 6G1-20

11. Uppon completion of assembly, carry out PERFORMANCE TEST referring to page 6G1-11 in this section.

INSPECTION AND CORRECTION

ARMATURE

Inspect commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.

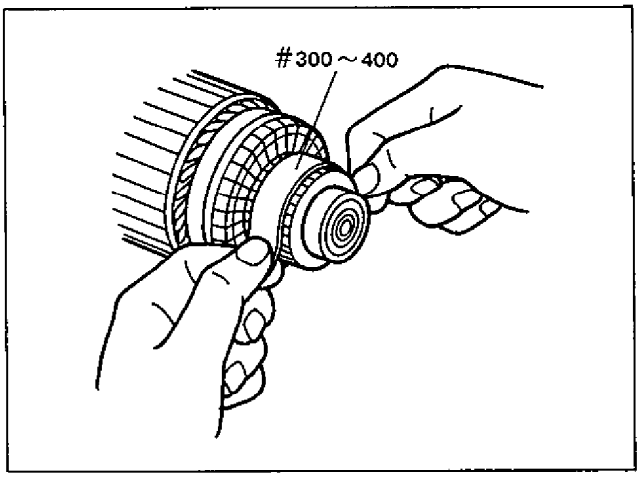


Fig. 6G1-21

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.

	Limit
Commutator run-out service limit (maximum value)	0.1 mm (0.004 in.)

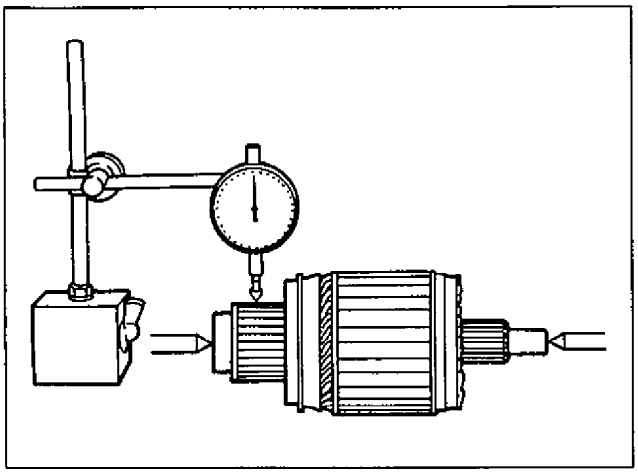


Fig. 6G1-22

Inspect commutator for wear. If below the limit, replace armature.

	Limit
Commutator diameter service limit (minimum value)	28.6 mm (1.12 in.)

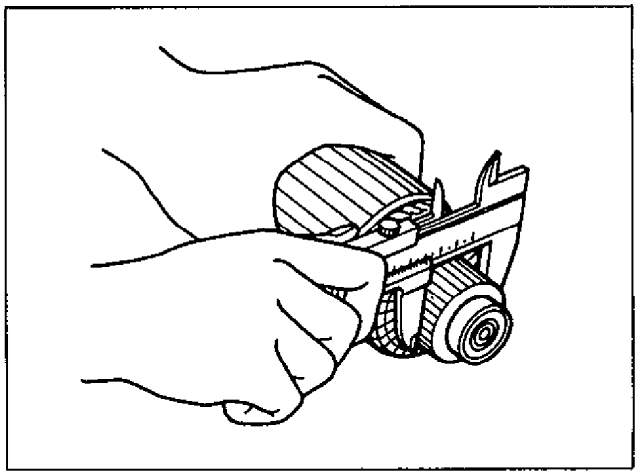


Fig. 6G1-23

Inspect commutator for mica depth. Correct or replace if below the limit.

	Limit
Commutator mica depth A service limit (minimum value)	0.2 mm (0.008 in.)

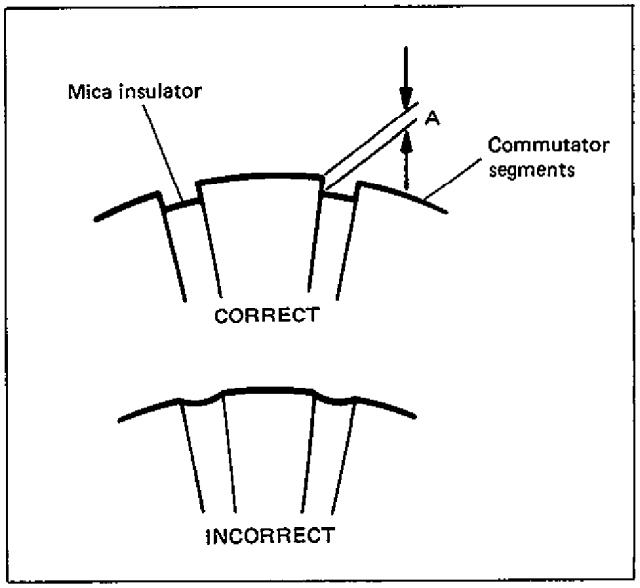


Fig. 6G1-24

Ground

Check commutator and armature core. If there is continuity, armature si grounded and must be replaced.

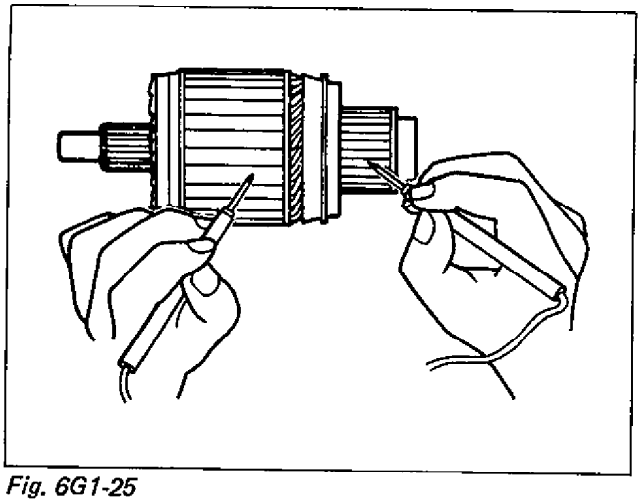


Fig. 6G1-25

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.

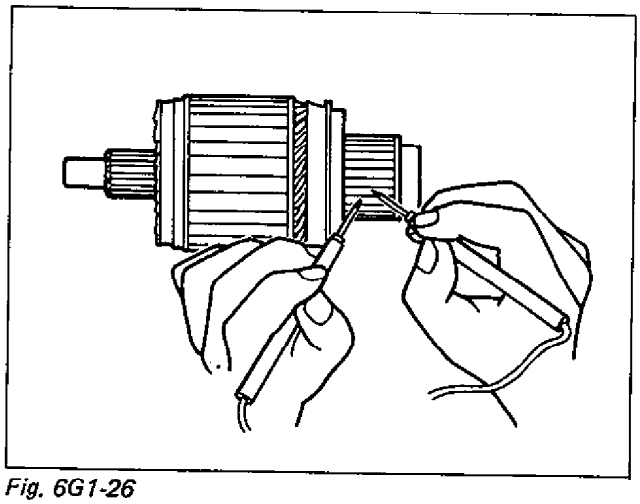


Fig. 6G1-26

PLUNGER

Inspect plunger for wear. Replace if necessary.

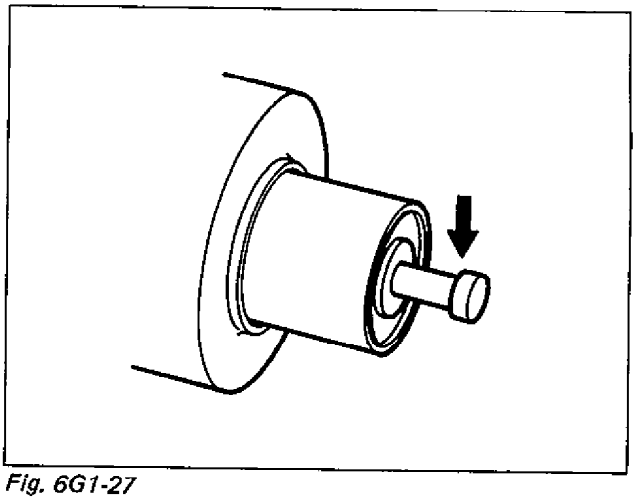


Fig. 6G1-27

BRUSH

Check brushes for wear. If below the limit, replace brush.

	Standard	Limit
Brush length	17.5 mm (0.69 in.)	12 mm (0.47 in.)

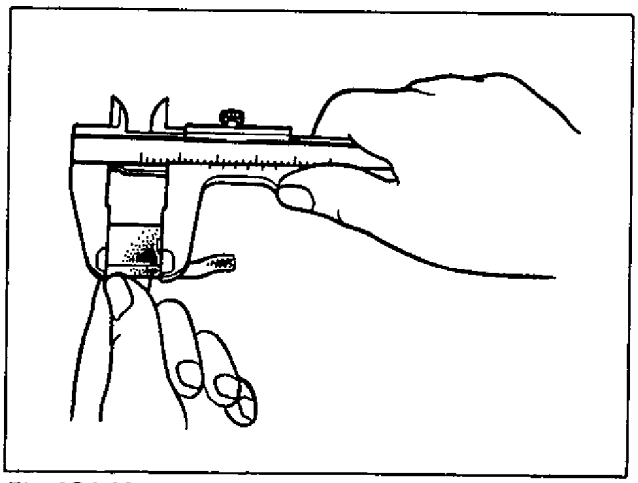


Fig. 6G1-28

Install brushes to each brush holder and check for smooth movement.

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.

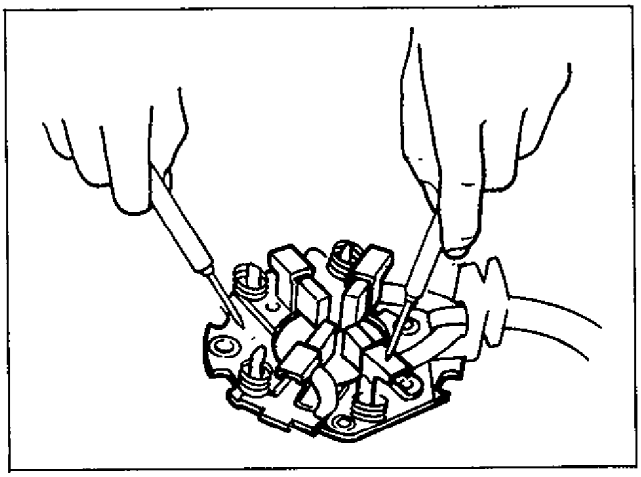


Fig. 6G1-29

Inspect brush springs for wear, damage or other abnormal conditions. Replace if necessary.

	Standard	Limit
Brush spring tension	1.9 kg (4.19 lb)	0.7 kg (1.54 lb)

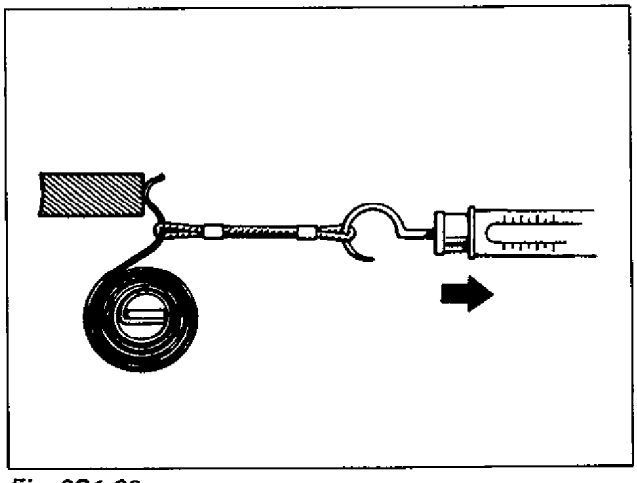


Fig. 6G1-30

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.

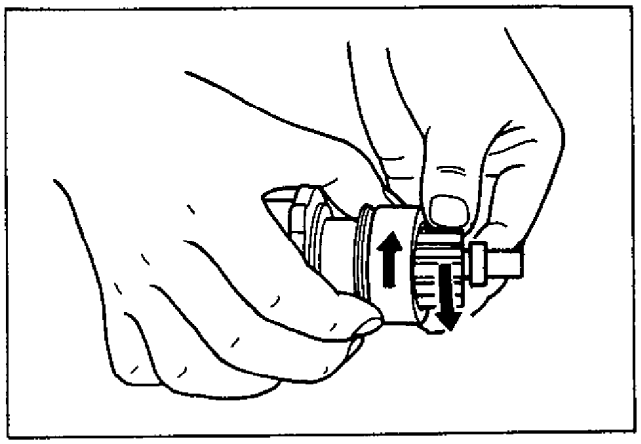


Fig. 6G1-31

Inspect spline teeth for wear or damage. Replace if necessary. Inspect pinion for smooth movement.

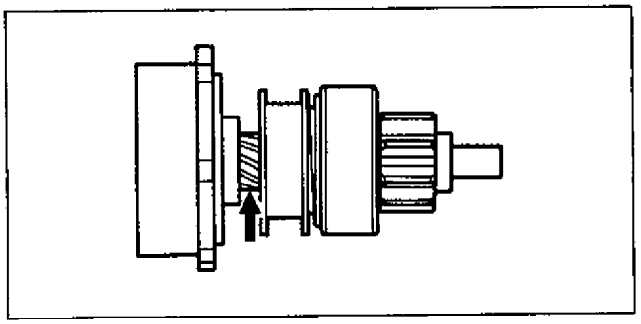


Fig. 6G1-32

ARMATURE SHAFT BEARING

Inspect bearings for wear or damage. Replace if necessary.

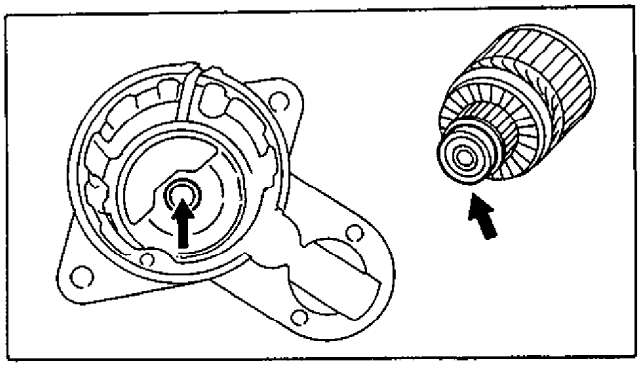


Fig. 6G1-33

MAGNETIC SWITCH

Push in plunger and release it. It should return quickly to its original position. Replace if necessary.

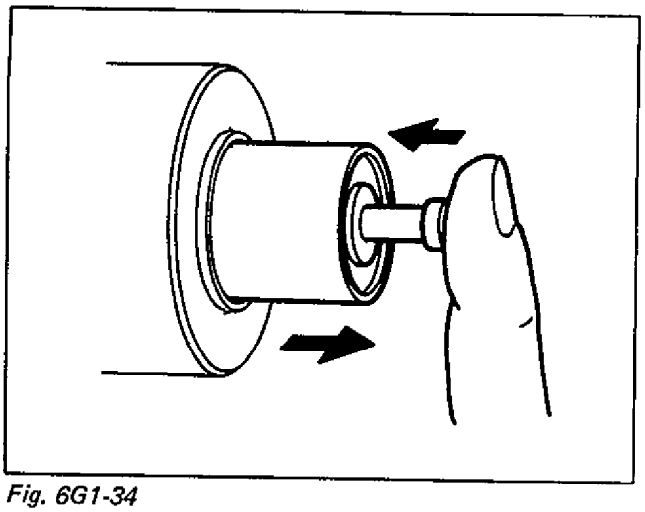


Fig. 6G1-34

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.

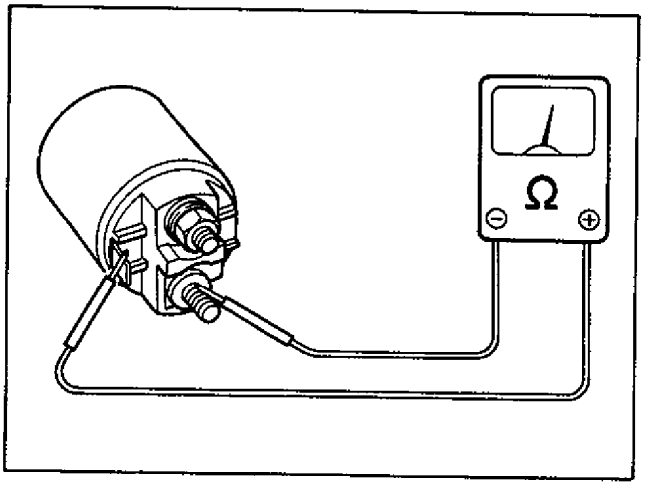


Fig. 6G1-35

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.

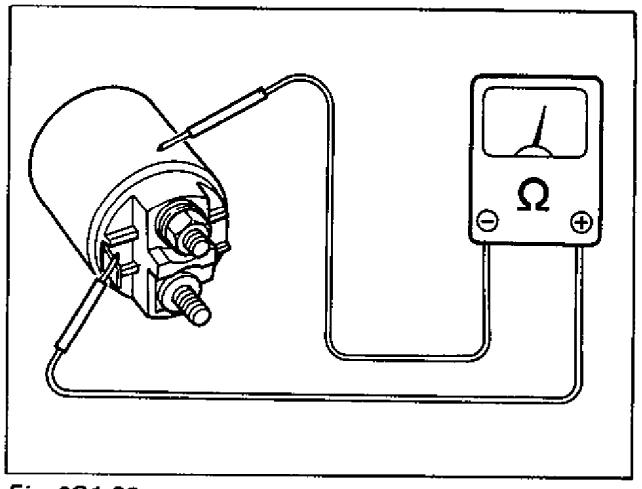


Fig. 6G1-36

GEARS

Inspect internal gear and idle gear for wear, damage or other abnormal conditions. Replace if necessary.

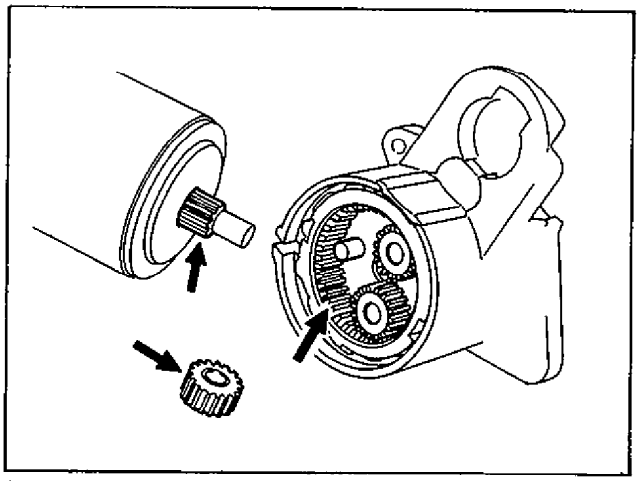


Fig. 6G1-37

PERFORMANCE TEST

CAUTION:
These test must be performed within 3 – 5 seconds to avoid burning out coil.

Pull-In Test

Connect battery to magnetic switch as shown.
Check that plunger moves outward.
If plunger does not move, replace magnetic switch.

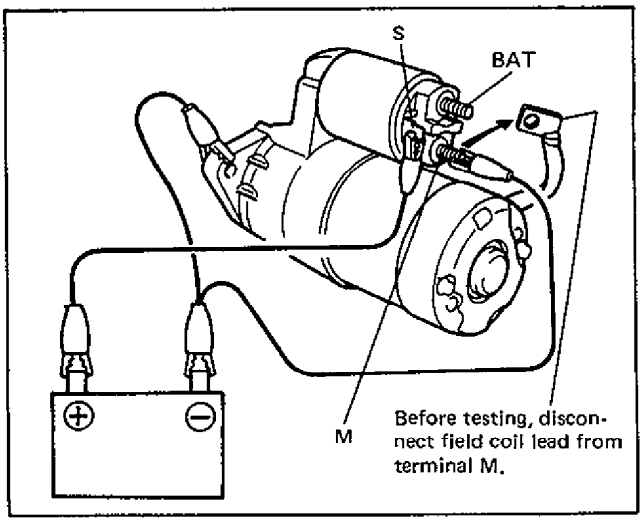


Fig. 6G1-38

Hold-In Test

While connected as above with plunger out, disconnect negative lead from terminal 'M'.
Check that plunger remains out.
If plunger returns inward, replace magnetic switch.

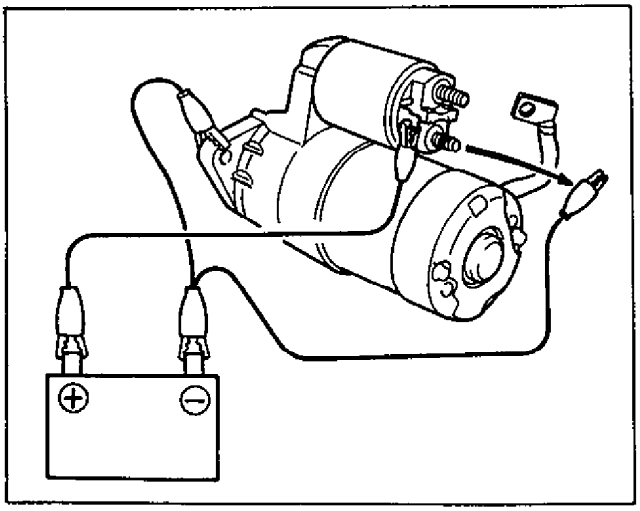


Fig. 6G1-39

Check Plunger Return

Disconnect negative lead from switch body.
Check that plunger returns inward.
If plunger does not return, replace magnetic switch.

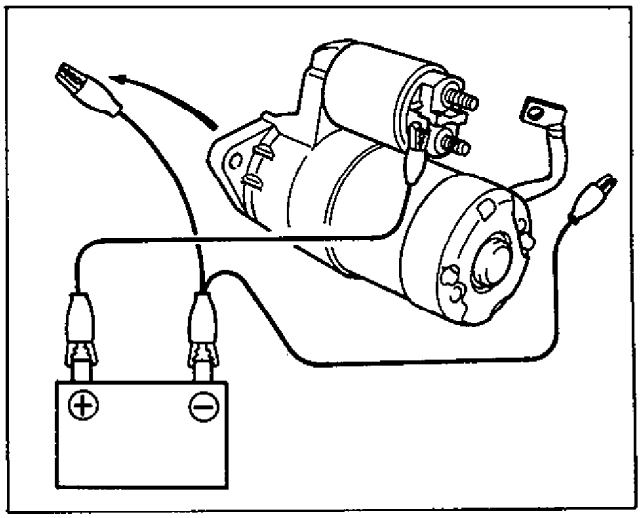


Fig. 6G1-40

No-Load Performance Test

1. Connect battery and ammeter to starter as shown.
2. Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter reads specified currect.

Specified current
Less than 90A at 11V

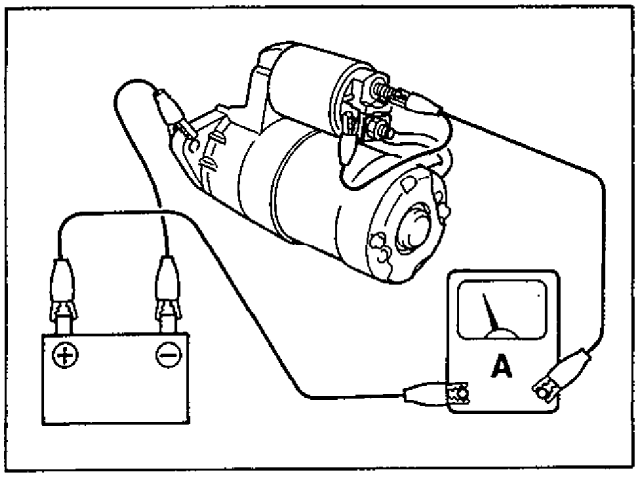


Fig. 6G1-41

SECTION 6H

CHARGING SYSTEM

CONTENTS

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.

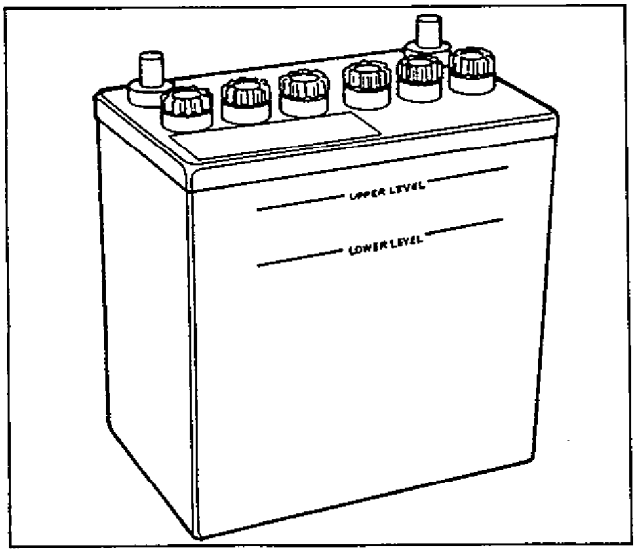


Fig. 6H 1

The battery mounted in each car is one of the following three 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)

55B24R(S) MF TYPE

Rated capacity	38 AH/5HR, 12 Volts

The 55B24R(S)-MF type battery is completely sealed, except for six small vent holes in the top. These vent holes allow the small amount of gas produced in the battery to escape. This sealed battery has a built-in temperature compensated indicator in the top of the battery.

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

55B24R (S) MF TYPE

BUILT-IN INDICATOR

This sealed battery has built-in temperature compensated indicator in its top, which indicates charged state of battery. When checking indicator, make sure that battery top is clean. Light may be needed in some poorly-lit areas.

In normal operation, two possible indications are as follows.

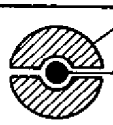
1		OK
2		CHARGING NECESSARY

Fig. 6H-2 Battery Indicator

Clear with Red Dot

This means discharged battery. In this case, charge battery till indication changes to blue with red dot. When recharging battery, also check electrical system as well as charging system. Correct whatever found defective.

If battery feels hot, 52°C (125°F) or higher, or if violent gassing or spewing of electrolyte through vent hole occurs while charging battery, discontinue charging or reduce charging rate.

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.

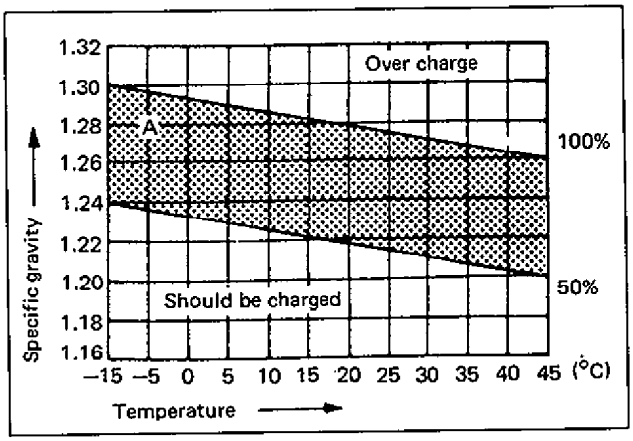


Fig. 6H-3

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, take proper measures as follows.
   Sealed type battery (with built-in indicator): Replace battery.
   Other than the above battery: 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 that is providing jump start and turn off electrical accessories. Then start engine of the vehicle with discharged battery.
6. Reverse connecting procedure exactly when disconnecting jumper cables. Negative cable must be disconnected from engine that was jump started first.

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.

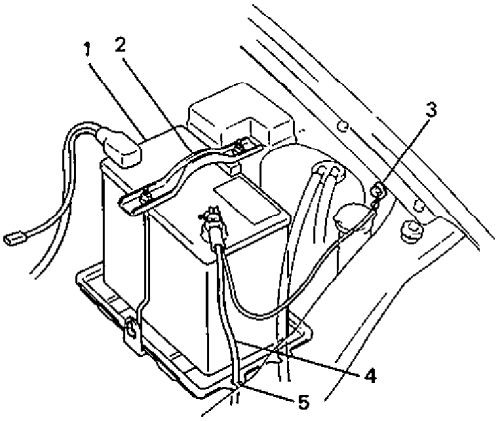
REMOVE AND REPLACE

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-4 Installing Battery

GENERATOR

GENERAL DESCRIPTION

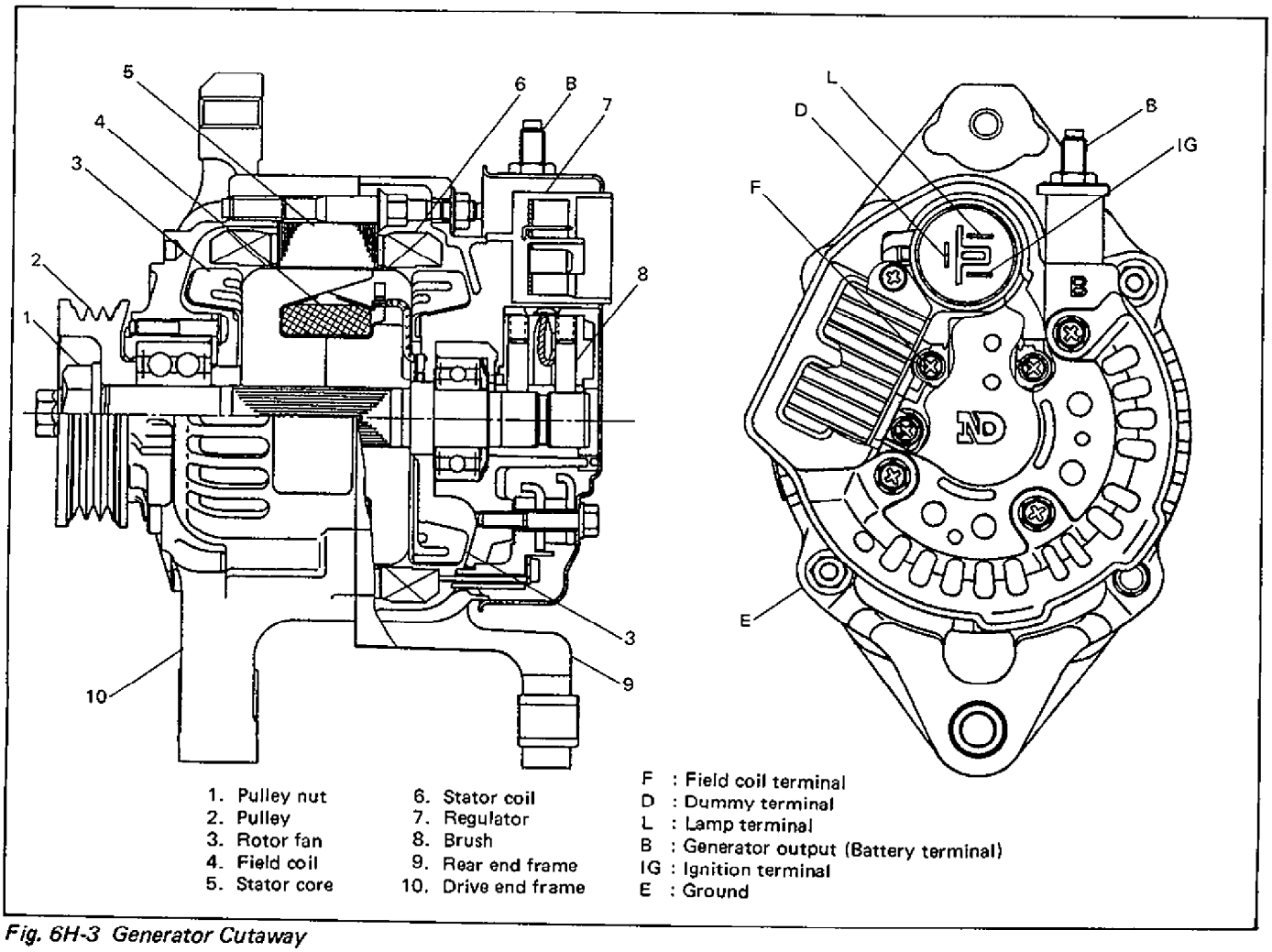
The basic charging system is the IC integral regulator charging system. The internal components are connected electrically as shown in Fig. 6H-4.

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.

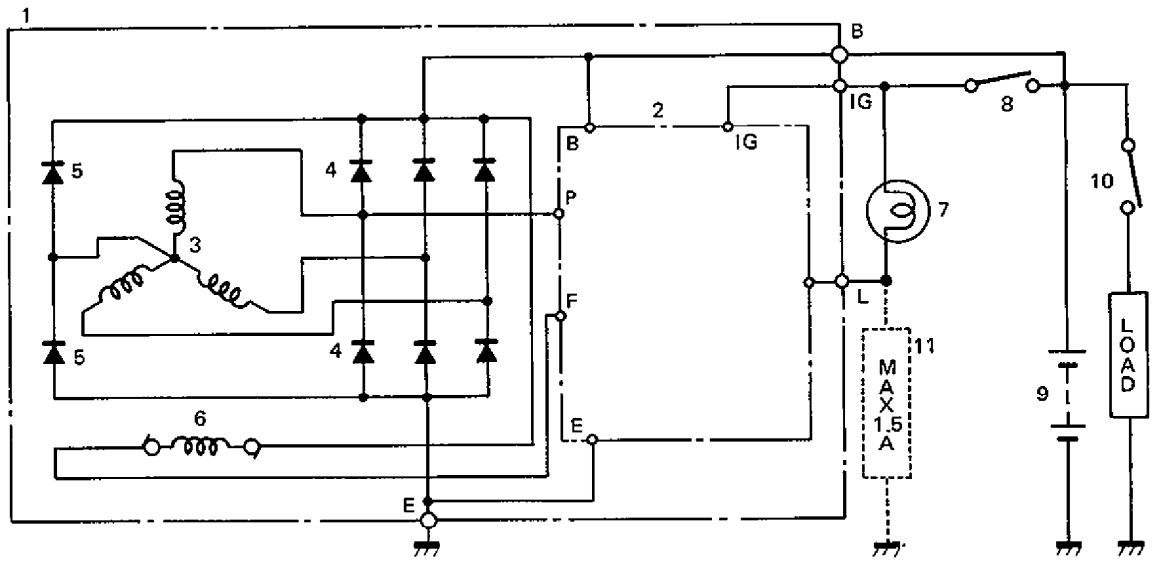
A condenser mounted in the regulator assembly protects the diodes from high voltages and suppresses radio noise.



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

F : Field coil terminal
D : Dummy terminal
L : Lamp terminal
B : Generator output (Battery terminal)
IG : Ignition terminal
E : Ground

Fig. 6H-3 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 (Carburetor bimetal heater)

NOTE:
Part shown in broken line (11. terminal load) is applicable to cars equipped with carburetor.

Fig. 6H-4 Generator Schematic

SPECIFICATIONS

Rated voltage	12V	Permissible ambient temperature	–30 to 90° C –22 to 194° F
Maximum output	50A (Hot at 13.5V)	Polarity	Negative ground
Permissible max. speed	18,000 r/min.	Rotation	Clockwise viewed from pulley side
No-load speed	1,110 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.**
  (However, with carburetor equipped car, a load of 1.5A or less can be connected provided that neither inductive nor capacitive load such as a relay coil should be connected to L terminal.)
- **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	Check fuse
	• Light burned out	Replace light
	• Wiring connection loose	Tighten loose connections
	• IC regulator faulty	Replace IC regulator
Charge light does not go out with engine running (battery requires frequent recharging)	• Drive belt loose or worn	Adjust or replace drive belt
	• Battery cables loose, corroded or worn	Repair or replace cables
	• IC regulator or alternator faulty	Check charging system
	• Wiring faulty	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

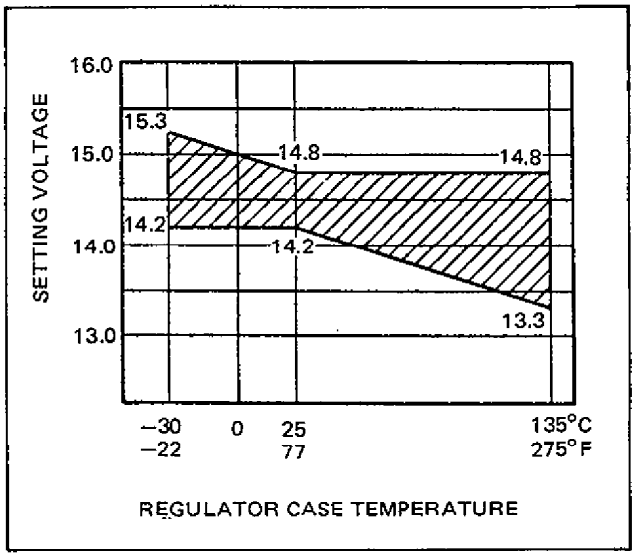


Fig. 6H-5 Temperature Characteristic

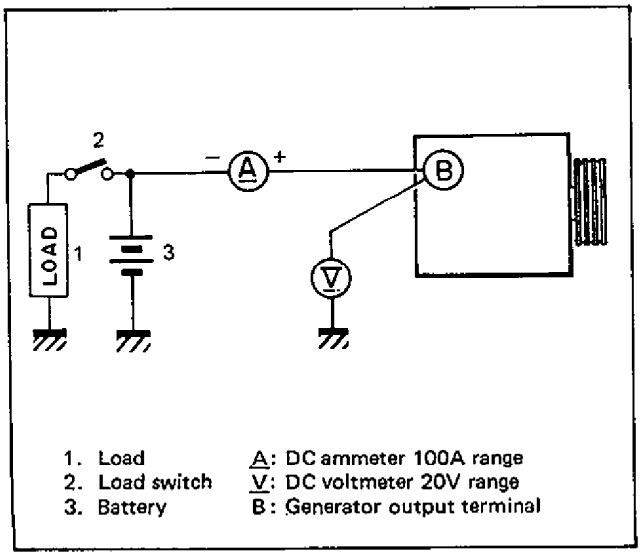


Fig. 6H-6 Measuring Generator Output

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.

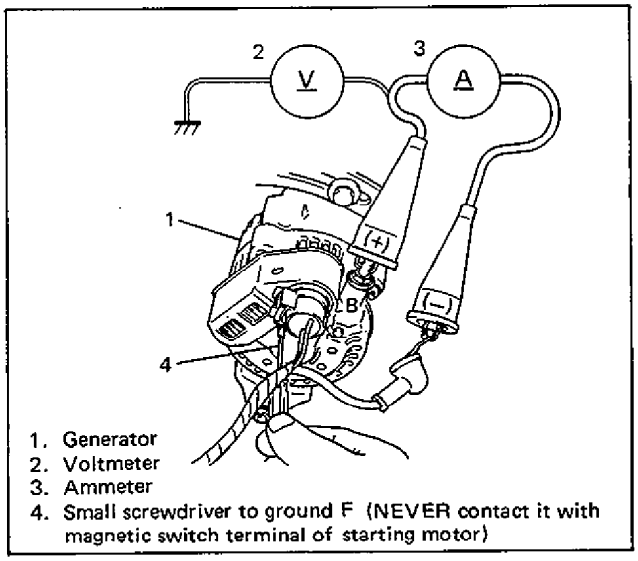


Fig. 6H-7 Checking Generator

If voltage rises above standard, it is considered that generator itself is good but IC regulator has been damaged.

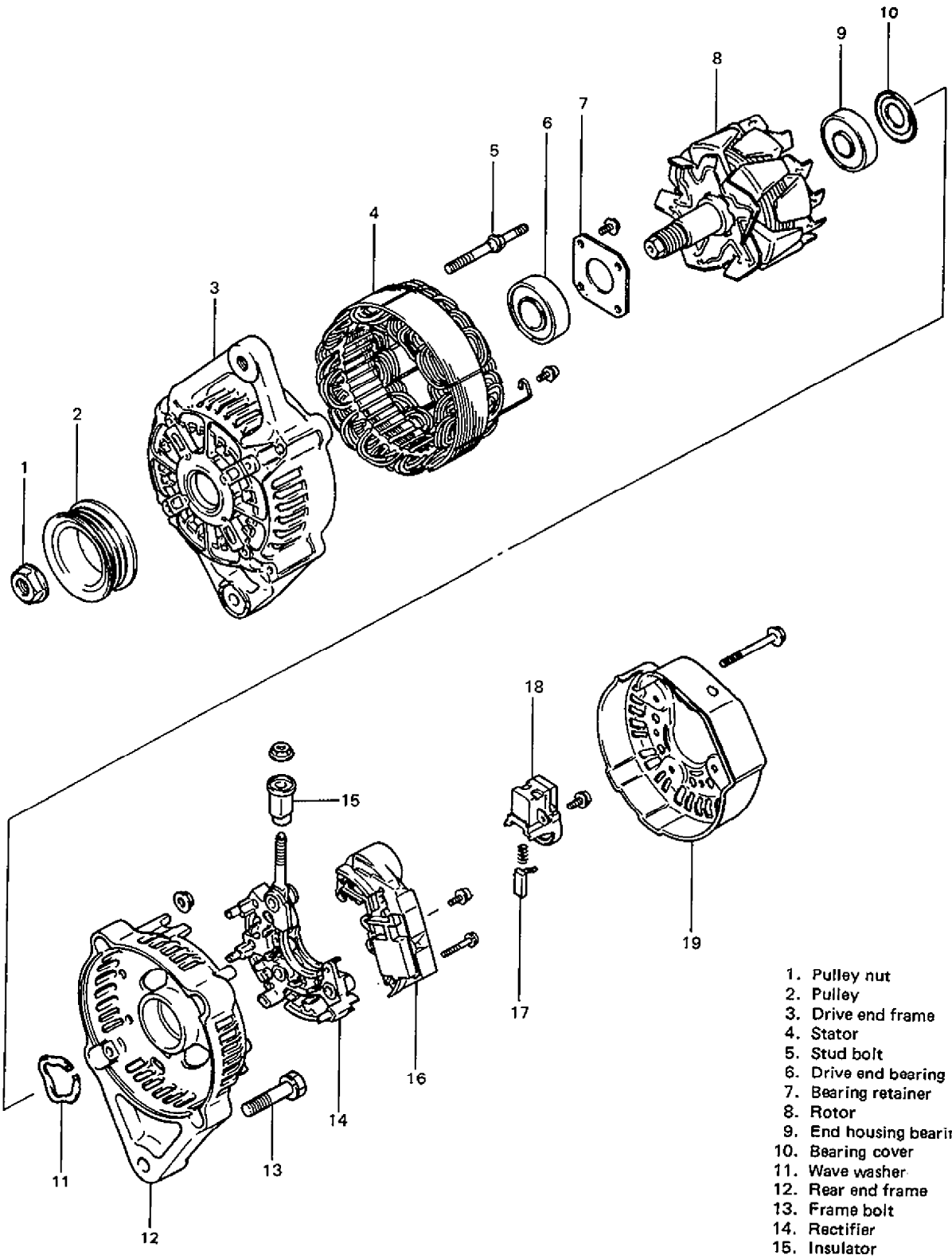
If voltage is below standard, generator itself has problem.

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



1. Pulley nut
2. Pulley
3. Drive end frame
4. Stator
5. Stud bolt
6. Drive end bearing
7. Bearing retainer
8. Rotor
9. End housing bearing
10. Bearing cover
11. Wave washer
12. Rear end frame
13. Frame bolt
14. Rectifier
15. Insulator
16. Regulator
17. Brush
18. Brush holder
19. Rear end cover

Fig. 6H-8 Generator Exploded View

DISMOUNTING AND REMOUNTING

1. Disconnect negative (—) lead at battery.
2. Disconnect B terminal and coupler.
3. Remove drive belt adjuster arm and take off belt.
4. Remove mounting bolt and nut then take out generator assembly.
5. To remount, reverse above procedure giving specified tension to drive belt.

NOTE:
Generator cover may remain at mounting bracket when generator is dismounted.

Tightening torque	N·m	kg-m	lb-ft
• Bracket bolts and nut • 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

Drive belt deflection under 10 kg pressure	6 – 8 mm 0.24 – 0.31 in

CAUTION:
When installing new drive belt, give deflection of 5 – 7 mm (0.20 – 0.27 in).

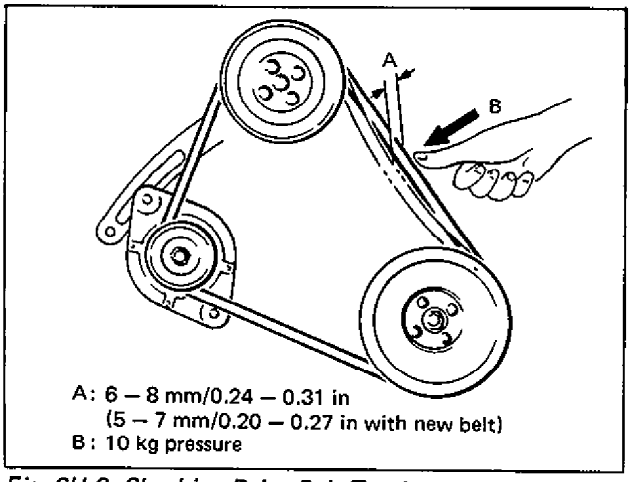


Fig. 6H-9 Checking Drive Belt Tension

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.**

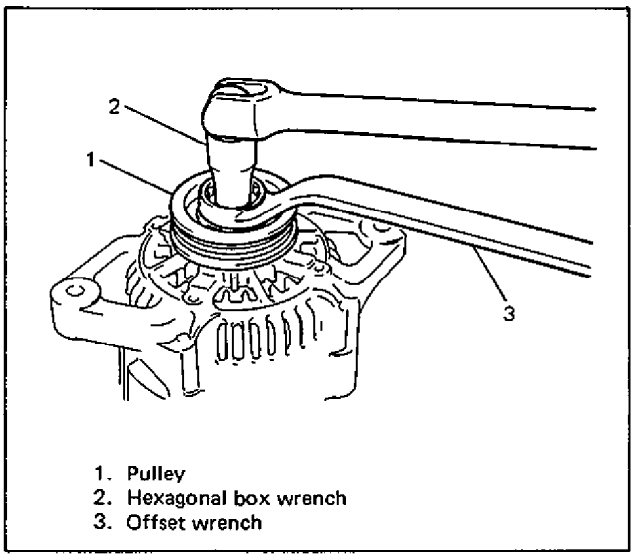


Fig. 6H-10 Removing Pulley Nut

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, stretch stator coil leads and then take out rectifier.

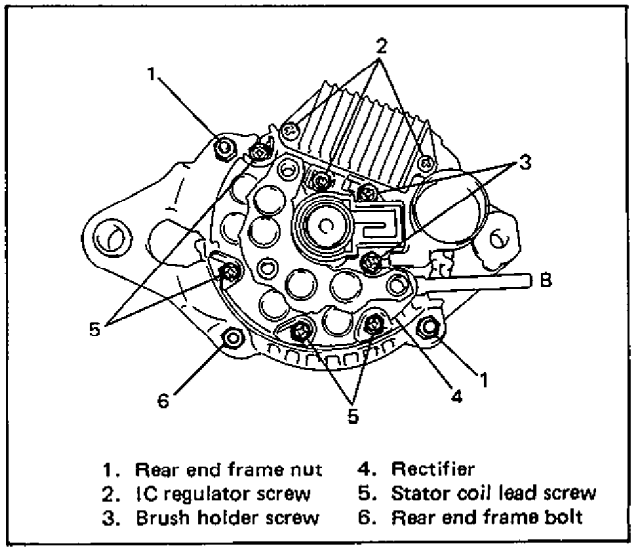


Fig. 6H-11 Removing Rectifier

7. Remove rear end frame bolts and nuts, and then drive out rear end frame with rotor tapping shaft lightly by using plastic hammer.

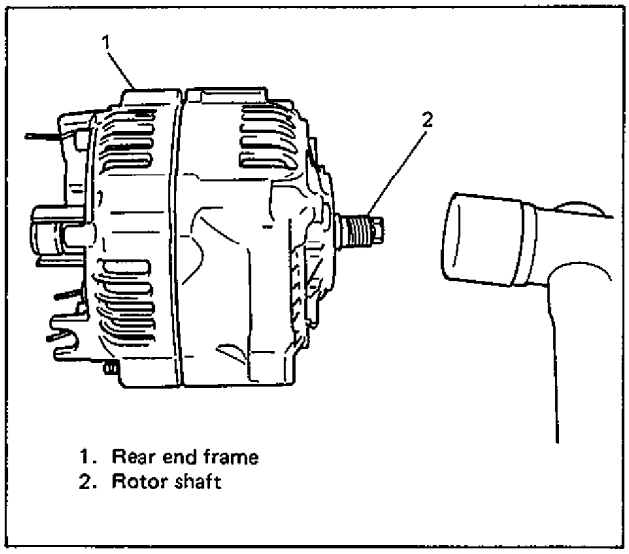


Fig. 6H-12 Removing Rear End Frame

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.

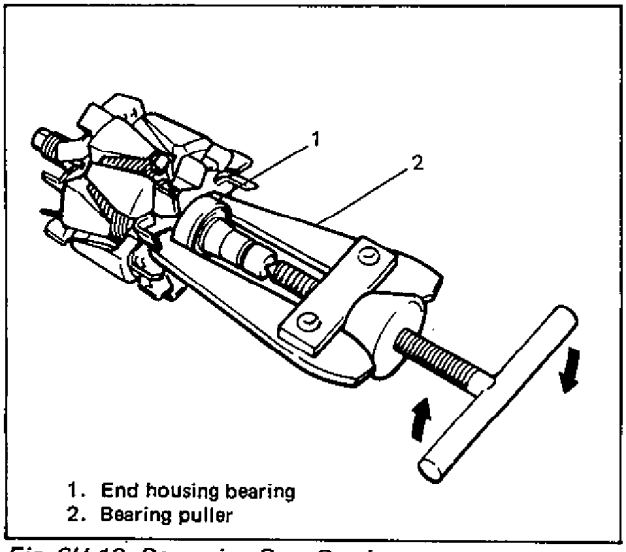


Fig. 6H-13 Removing Rear Bearing

10. Remove 4 screws, retainer plate and then drive out drive end bearing.

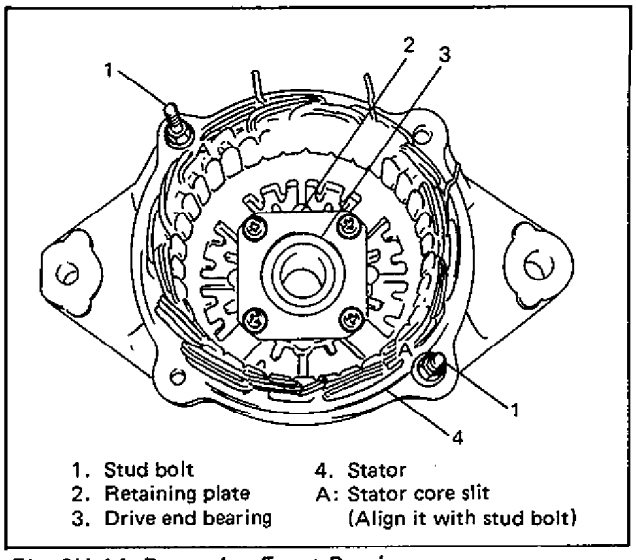


Fig. 6H-14 Removing Front Bearing

11. If required, remove stud bolts and then pull out stator.

NOTE:
Heating drive end frame may facilitate removal of stator.

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:
- **Align stator slits with stud bolts when inserting stator coil assembly into drive end frame.**
- **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.

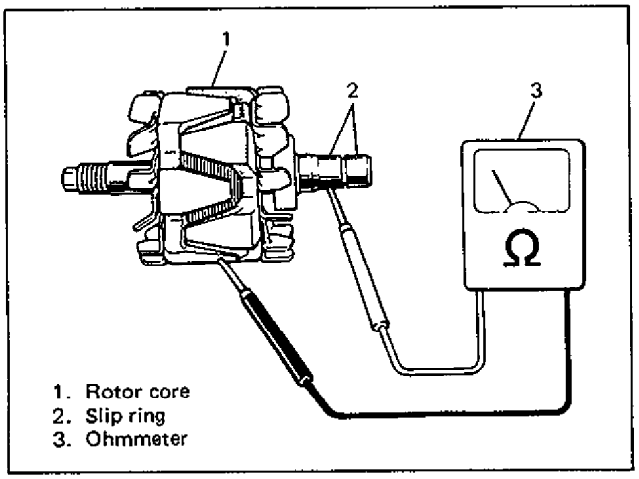


Fig. 6H-15 Checking Field Coil Insulation

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

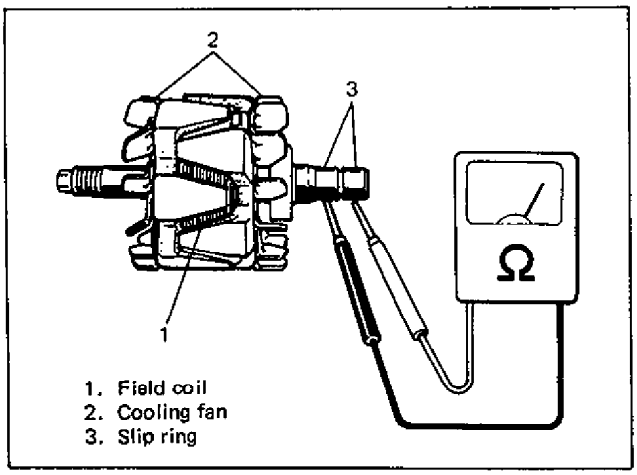


Fig. 6H-16 Checking Field Coil Continuity

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.

Open Circuit

Check continuity between neutral point A and each phase B.

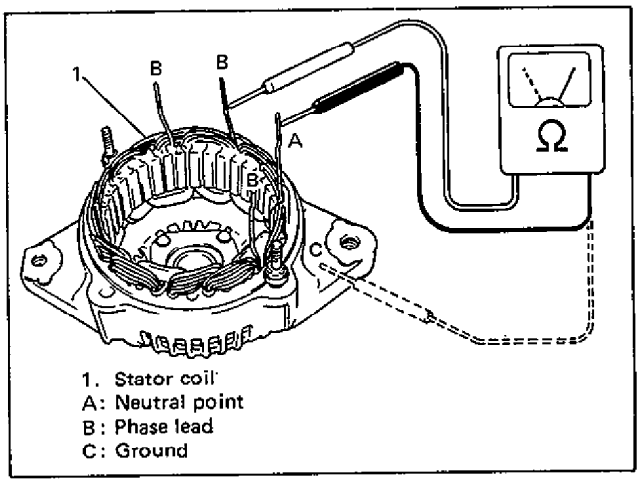


Fig. 6H-17 Checking Stator Coil

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.

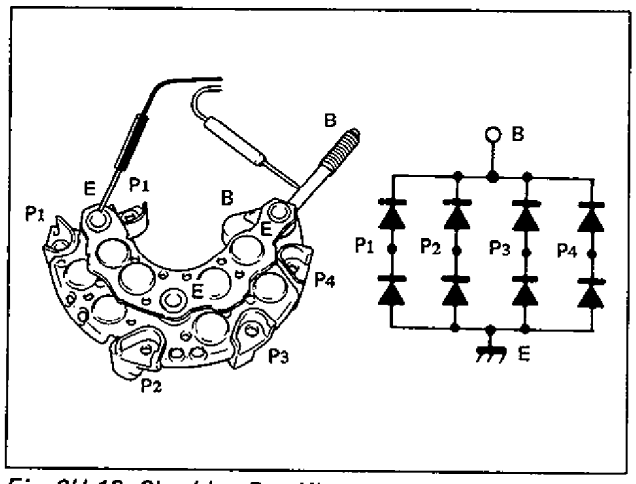


Fig. 6H-18 Checking Rectifier

CONDENSER

Use condenser tester to check condition of condenser.

Condenser capacity	0.5 μF

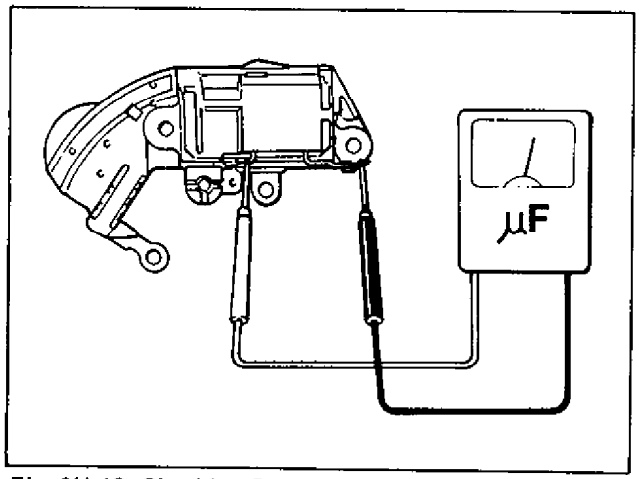


Fig. 6H-19 Checking Condenser

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

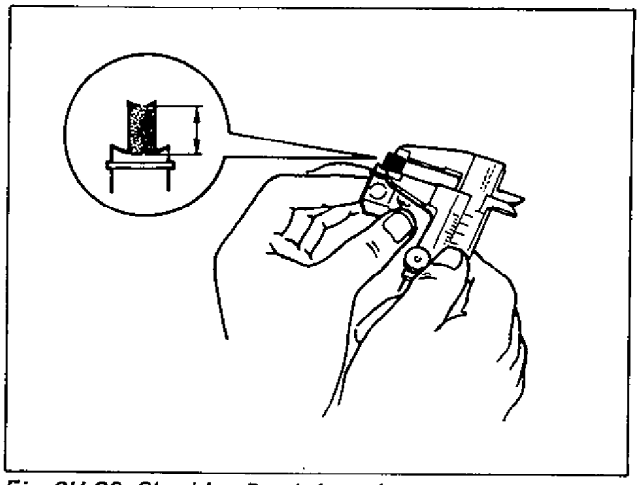


Fig. 6H-20 Checking Brush Length

SECTION 6J

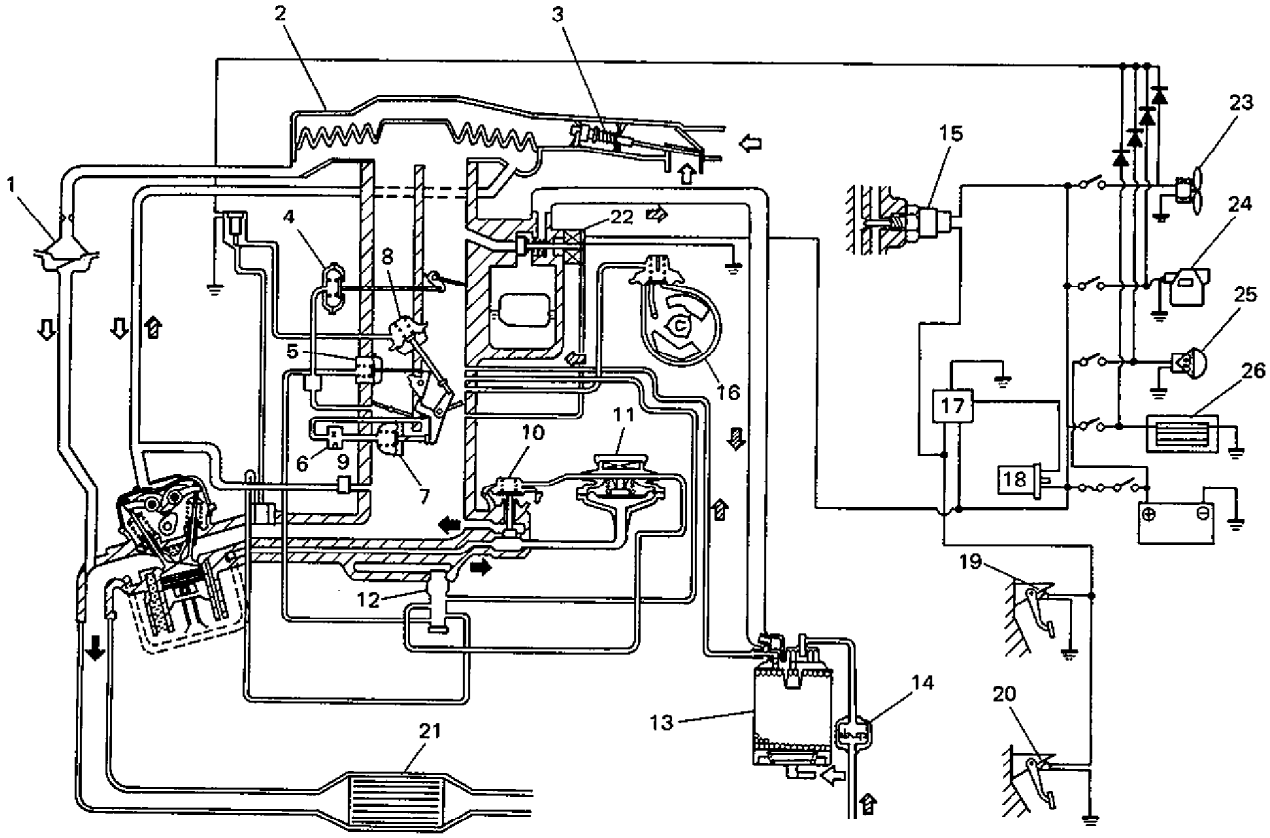
EMISSION CONTROLS

CONTENTS

GENERAL DESCRIPTION

This section describes operation of the above nine 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



Blow-by and vapor flow

Fresh air flow

Exhaust gas flow

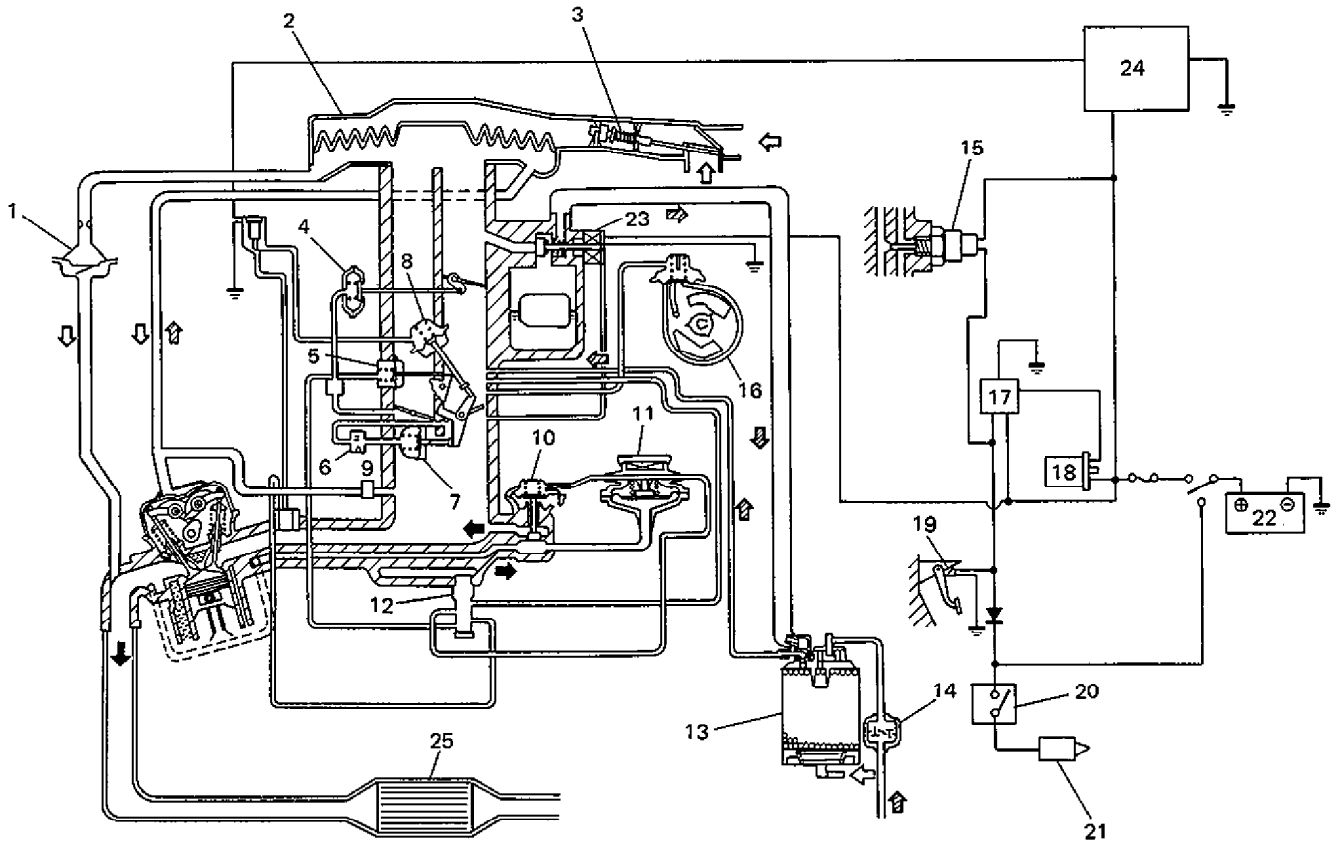
NOTE:

The asterisk (*) mark in front of the reference number of each part name means that whether that part is provided or not depends on regulations of each country.

* 1. Second air valve
2. Air cleaner
* 3. Thermo sensor
4. Choke opener
5. Fast idle cam opener
6. VTV (Vacuum Transmitting valve)
7. Throttle positioner
8. Idle up
9. PCV (Positive Crankcase Ventilation valve)
*10. EGR (Exhaust Gas Recirculation)
*11. EGR modulator
*12. TVS (Thermal Vacuum switching) valve
*13. Charcoal canister
*14. 2-way check valve
*15. Fuel cut solenoid valve
16. Distributor
*17. Fuel controller
18. Ignition coil
*19. Accelerator low switch
*20. Clutch switch
*21. Catalyst
*22. Bowl vent solenoid valve
23. Cooling for motor
*24. Heater motor
25. Head light
*26. Rear defogger

Fig. 6J-1

FOR VEHICLE WITH AUTOMATIC TRANSMISSION



NOTE:
The asterisk (*) mark in front of the reference number of each part name means that whether that part is provided or not depends on regulations of each country.

* 1. Second air valve
2. Air cleaner
* 3. Thermo sensor
4. Choke opener
5. Fast idle cam opener
6. VTV (Vacuum Transmitting Valve)
7. Throttle positioner
8. Idle up
9. PCV (Positive Crankcase Ventilation Valve)
*10. EGR (Exhaust Gas Recirculation)
*11. EGR modulator
*12. TVS (Thermal Vacuum Switching) valve
*13. Charcoal canister
*14. 2-way check valve
*15. Fuel cat solenoid valve
16. Distributor
*17. Fuel controller
18. Ignition coil
*19. Accelerator low switch
20. Shift switch (P & N range)
21. Starter motor
22. Battery
*23. Bowl vent solenoid valve
24. Automatic transmission controller
*25. Catalyst

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.

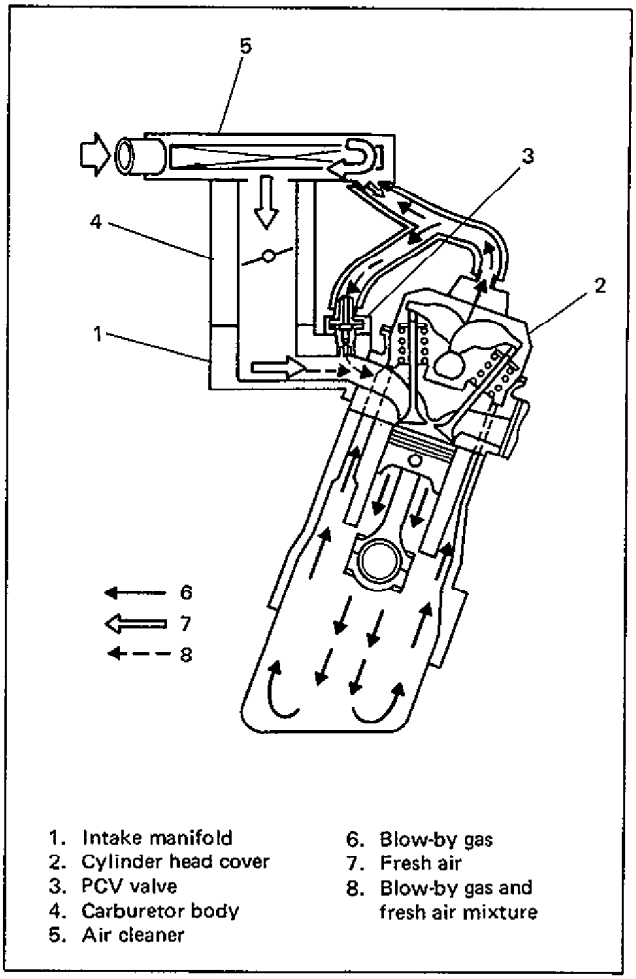


Fig. 6J-3 PCV System Operation

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).

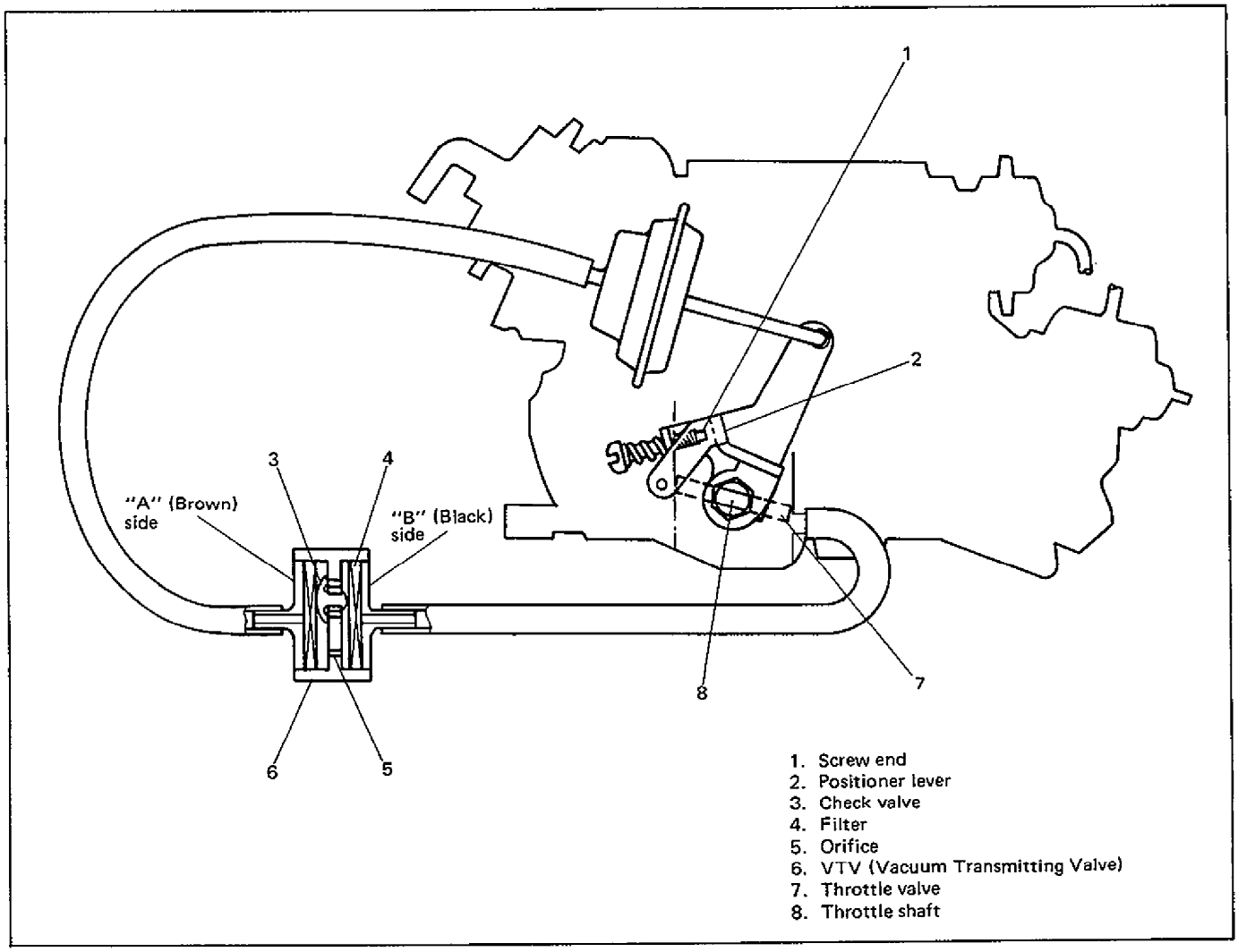


Fig. 6J-4

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 coses that of the warm air.

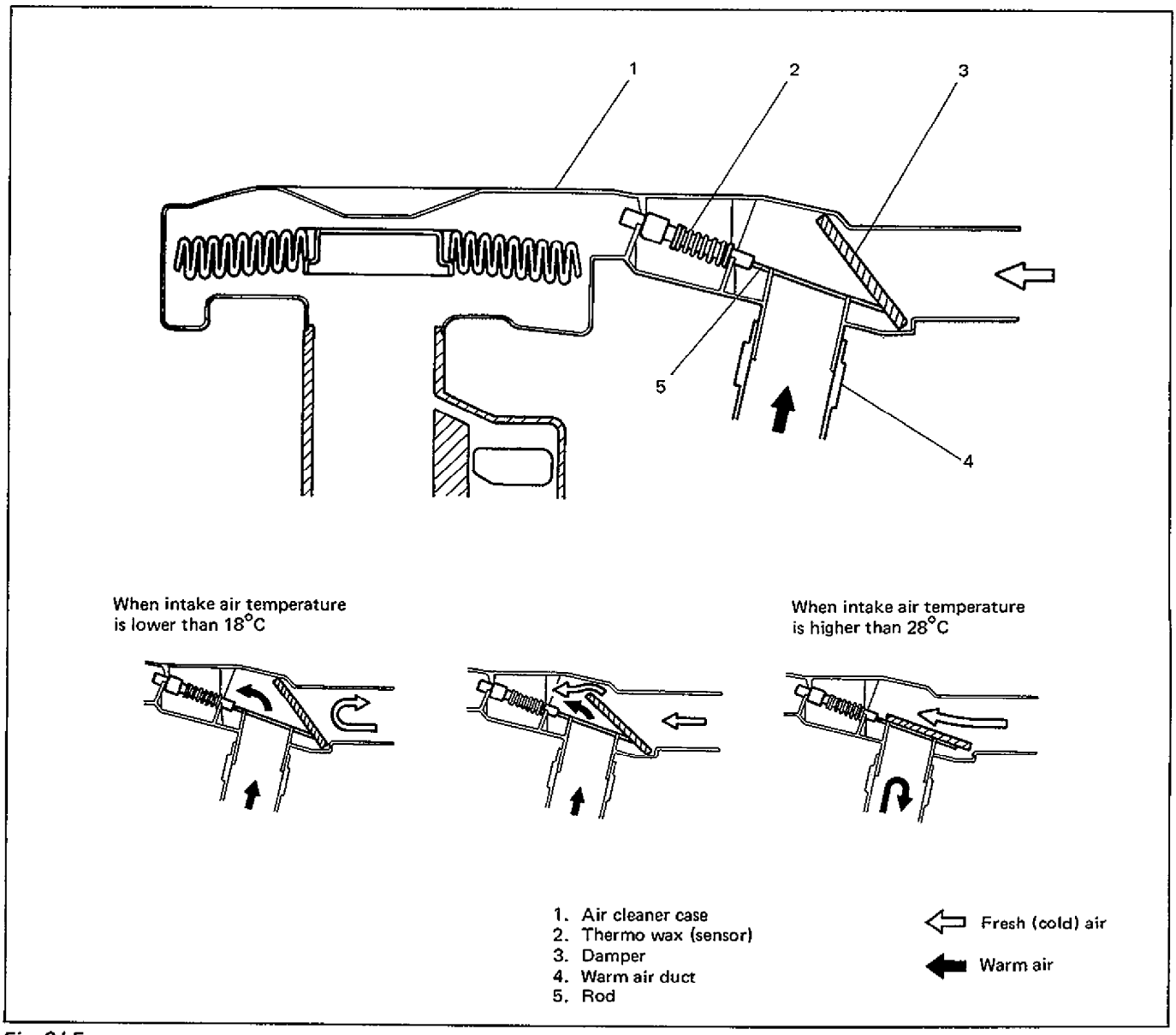


Fig. 6J-5

4. EXHAUST GAS RECIRCULATION (EGR with EGR Modulator) SYSTEM

NOTE:
Applicable to the vehicle equipped with EGR and EGR modulator on the intake manifold.

This system controls the formation of NOx emission by recirculating the exhaust gas into the combustion chamber through the intake manifold.
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.
When the coolant temperature is low, the vacuum passage of the EGR valve is closed by the Thermal Vacuum Switching Valve (TVSV) on the intake manifold. In this state, as the vacuum is not transmitted to the EGR valve, it remains closed.
On the other hand, when the coolant temperature is normal, the TVSV is opened. So the EGR valve opens and closes in accordance with the EGR modulator operation.

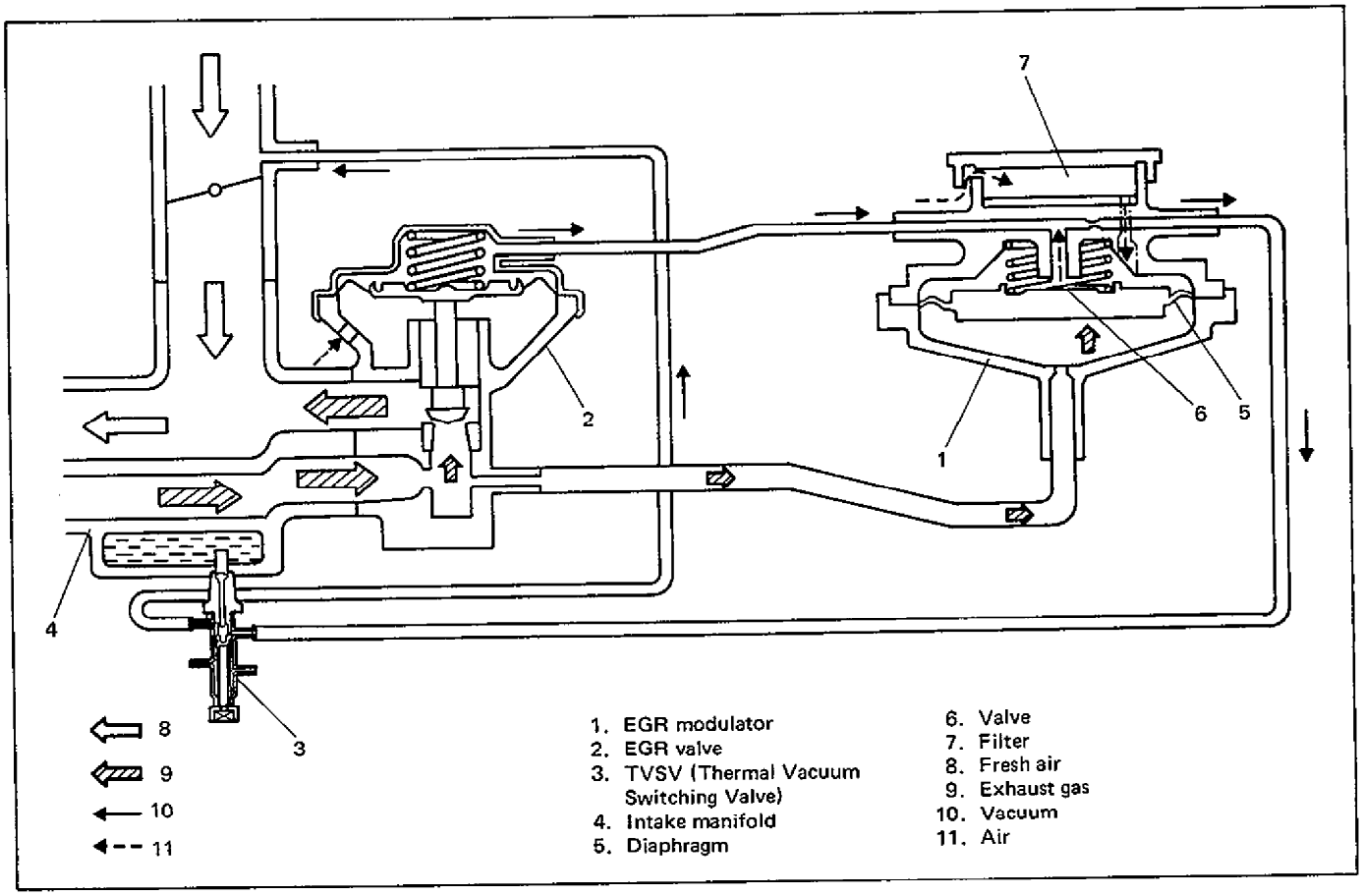


Fig. 6J-6

5. PULSE AIR CONTROL SYSTEM

NOTE:
Applicable to the vehicle equipped with pulse air control on exhaust manifold.

This system serves to reduce HC and CO emission by supplying secondary air into the exhaust manifold.
In the second air valve, there is a reed valve. When the exhaust gas pressure is low, the reed valve opens and lets the air flow from the air cleaner into the exhaust manifold. When the exhaust gas pressure is high, the reed valve closes by the high exhaust gas pressure and prevents backflow of the exhaust gas. Thus, the pulsatile secondary air is supplied into the exhaust manifold.

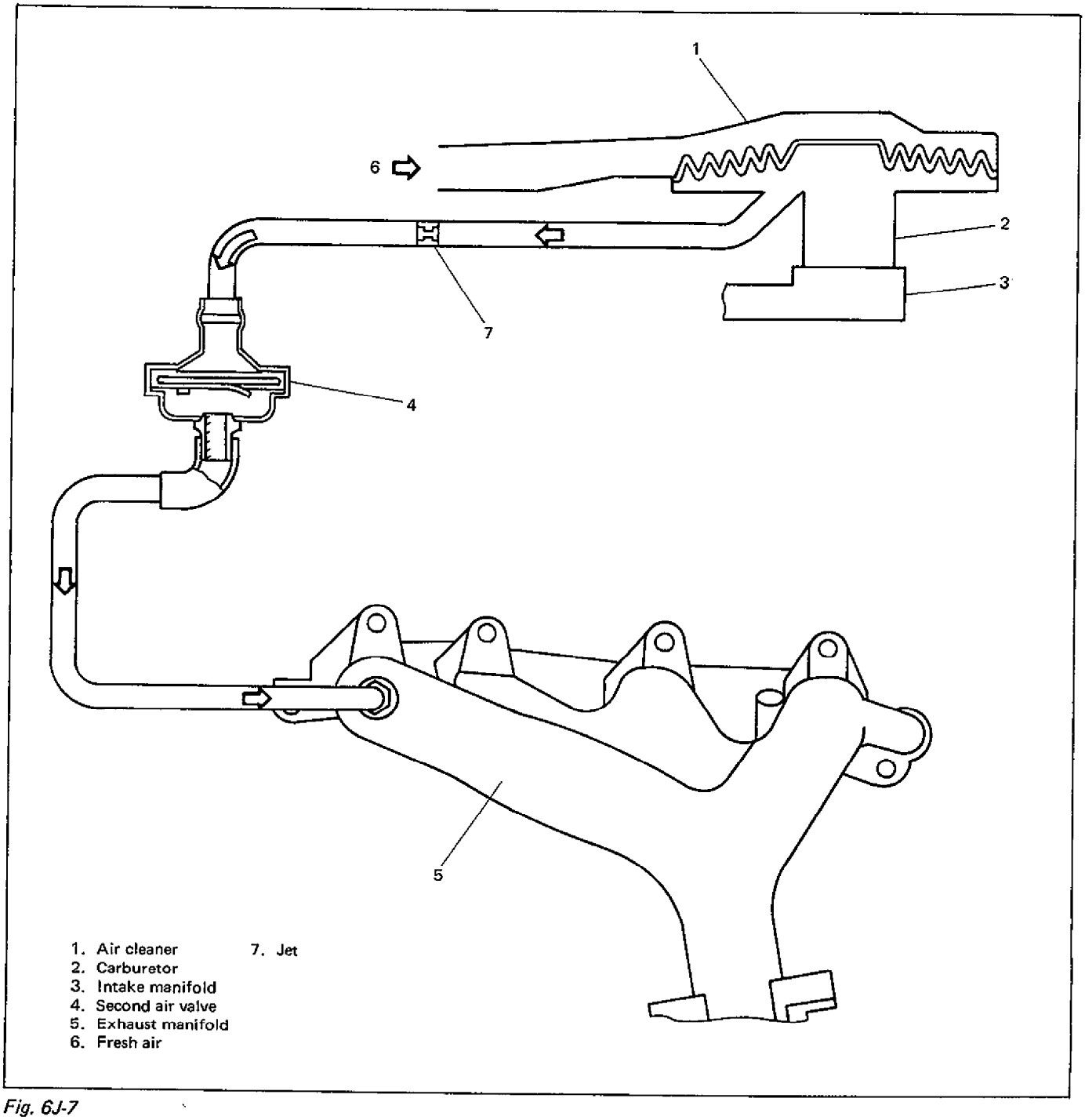


Fig. 6J-7

6. FUEL CUT SYSTEM

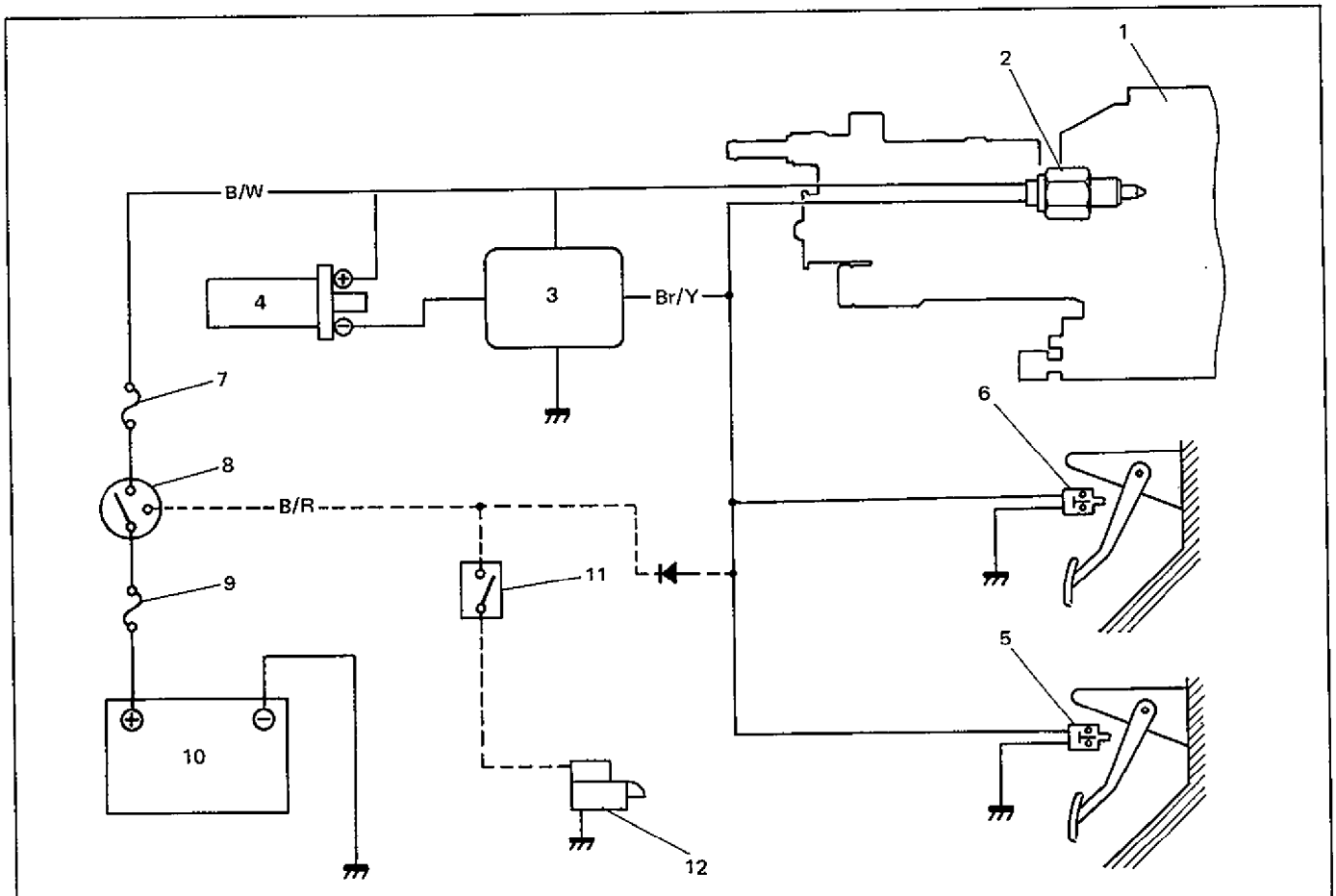
NOTE:
Applicable to the vehicle equipped with catalyst.

As shown in the figure, the fuel cut solenoid valve is provided in the primary slow system of the carburetor to open and close the fuel passage of the slow system.
As turning the ignition switch "OFF" cuts off the electric current to the solenoid, the solenoid closes the fuel passage. Thus this system contributes to preventing dieseling of the engine after the ignition switch is turned "OFF". Also, during the deceleration and provided that all below listed three conditions exist, the fuel cut solenoid valve operates to cut the fuel feed to the engine temporarily by closing the fuel passage.

Such operation of this system prevents the catalyst from getting heated high and improves fuel economy.

Three conditions.

- For car with manual transmission, the clutch switch is at "OFF" position, that is, the clutch pedal is not depressed. (With the pedal depressed, the clutch switch will turn "ON".)
  For car with automatic transmission, the selector lever is at "R", "2", "D" or "L" range position.
- The accelerator low switch is in "OFF" position. In other words, the accelerator pedal is released.
- The engine speed is higher than 2,600 rpm.



1. Carburetor
2. Fuel cut solenoid valve
3. Fuel controller
4. Ignition coil
5. Clutch switch
6. Accelerator low switch
7. Circuit fuse
8. Main switch
9. Fusible link
10. Battery
11. Shift switch (P & N range)
12. Starter motor

NOTE:
- **Broken line is applicable to car with automatic transmission only.**
- **Clutch switch is installed in car with manual transmission only.**

Fig. 6J-8

7. 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, when the engine is not running.
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, vent solenoid and 2 way check valve.
The fuel vapor from the fuel tank is led into the canister and stored there when the engine is not running.
The fuel vapor from the carburetor float chamber is also stored in the canister when the ignition switch is "OFF". This is because the vent solenoid valve closes the vent passage of the float chamber and the passage from the float chamber to the canister opens.
When the engine runs, the fuel vapor stored in the canister is drawn into the intake manifold together with fresh air. Also, in this state, the vent solenoid valve opens the vent passage of the float chamber 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 air vent solenoid valve opens when the ignition switch is ON and the vacuum is applied to the intake manifold (i.e., the engine is running).

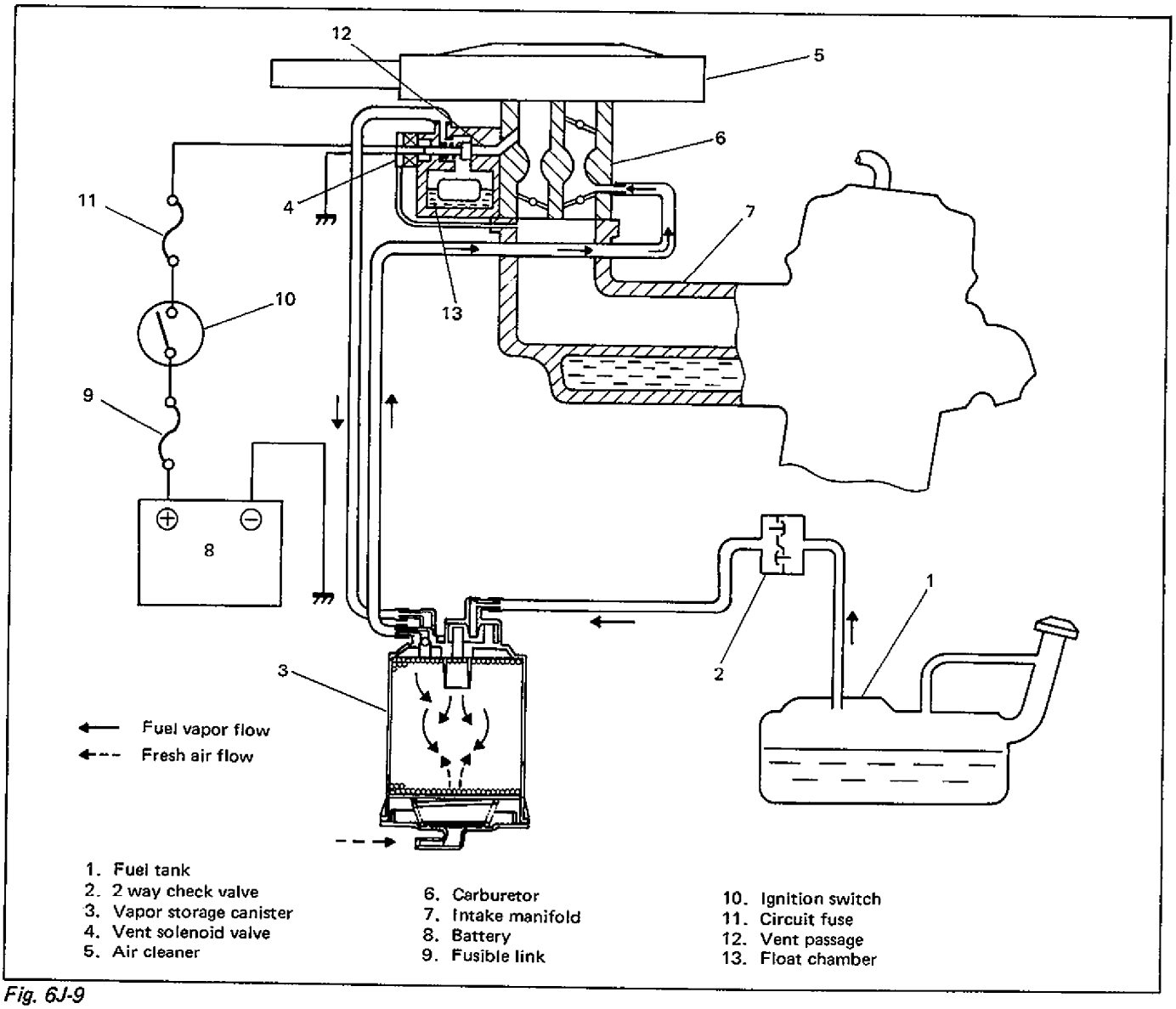


Fig. 6J-9

8. HOT IDLE COMPENSATOR (HIC)

NOTE:
Applicable to vehicle equipped with HIC in the air cleaner case.

HIC attached to the air cleaner case serves to provide the optimum air/fuel mixture during hot idle so as to ensure stable idle speed.

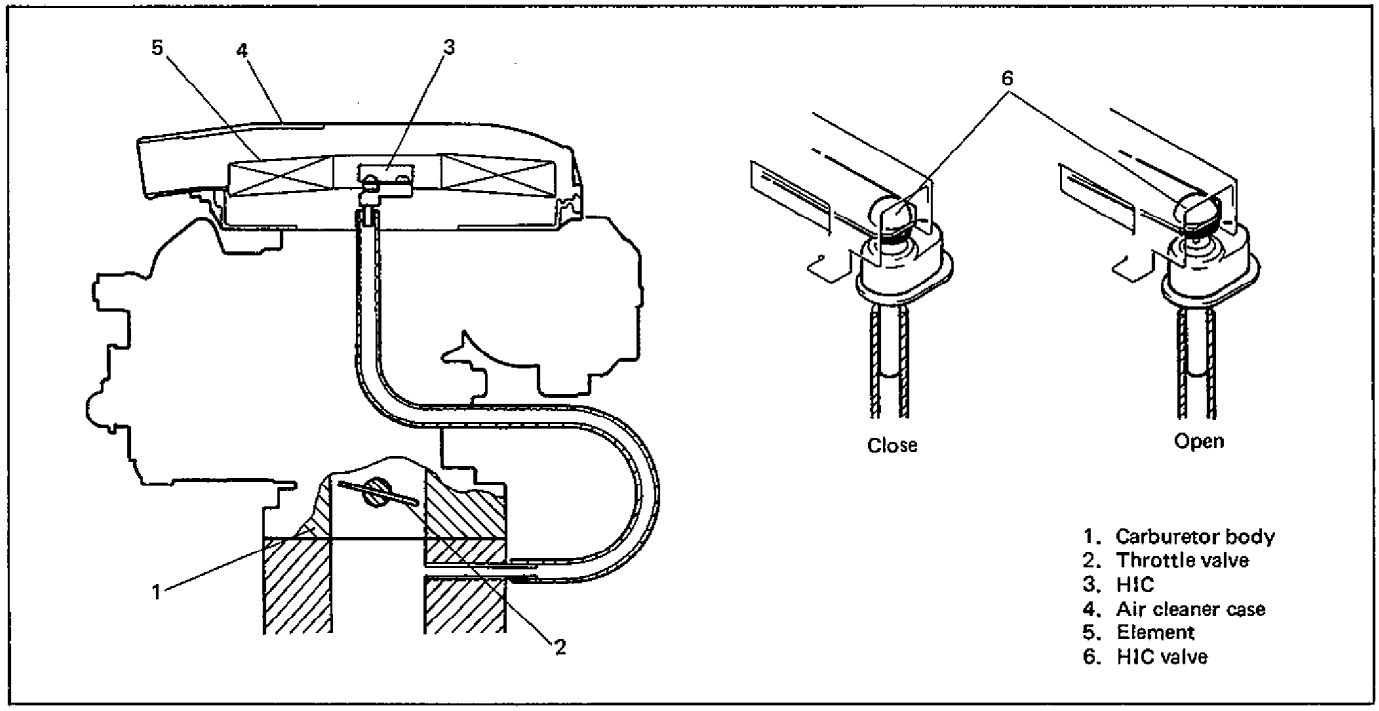


Fig. 6J-10

Operation
HIC has a bimetal which warps as the heat transferred to it rises higher than about 45°C (113°F). Caused by this, the valve in HIC starts to open and it reaches to the full open state at about 65°C (149°F).
While the engine at idle, the throttle valve is closed and the vacuum in the intake manifold stays high. As the HIC valve opens in this state, the air from the air cleaner side of the carburetor is drawn through the HIC valve into the intake manifold to prevent the air/fuel mixture getting richer during hot idle, thus maintaining a stable idle speed.

9. CATALYST

The catalyst is provided in the exhaust system (exhaust No. 1 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.

DIAGNOSIS

POSSIBLE CAUSES OF EMISSIONS TEST FAILURES		
Excessive Emission	**Explanation**	**Possible Causes**
Hydrocarbons (HC)	Excessive hydrocarbons are caused by an air/fuel mixture that is not burning completely.	• Engine not at normal operating temperature • Disconnected, obstructed, leaking, or misrouted vacuum hoses • Improper operating of throttle positioner system • Vacuum leaks • Maladjusted idle mixture • Improper adjusted/sticking choke • Maladjusted initial spark timing • Defective spark plugs, wires or distributor cap • Improper operation of pulse air control system • Lead contamination of catalytic converter (Check for absence of filler neck restrictor) • Defective HIC
Carbon monoxide (CO)	Excessive carbon monoxide emissions are due to a mixture that is rich.	• Engine not at normal operating temperature • Maladjusted idle mixture • Improperly adjusted/sticking choke • Lead contamination of catalytic converter (Check for absence of filler neck restrictor) • Improper operation of pulse air control system • Carburetor float level • Restricted air cleaner element • Defective HIC
Oxides of nitrogen (NOx)	Excessive oxides of nitrogen are generally due to high temperatures in the combustion chamber.	• Obstructed/leaking/misrouted vacuum lines • Improper operation of the EGR system • Plugged EGR passages • Inoperative TVSV • Lead contamination of catalytic converter (Check for absence of filler neck restrictor)

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.

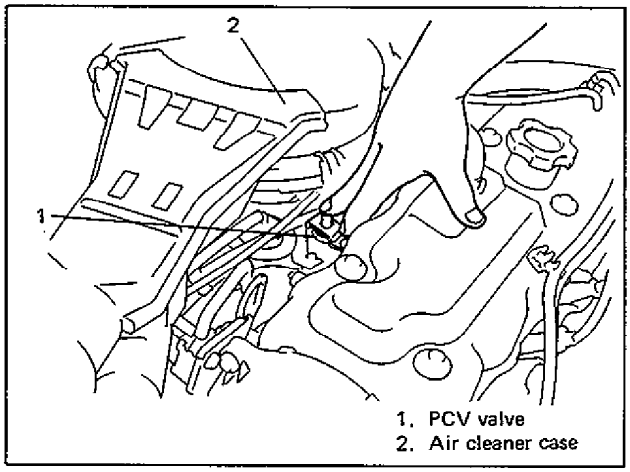


Fig. 6J-11 Checking Vacuum

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.

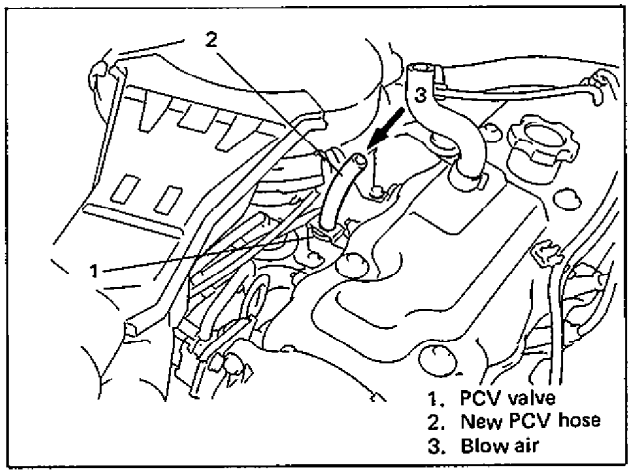


Fig. 6J-11-1 Checking PCV Valve for Sticking

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.

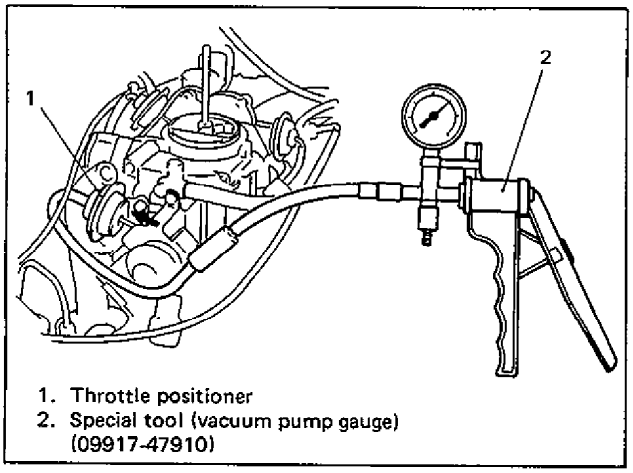
If found faulty, check following parts according to each procedure.

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-12

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-12-1.
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.

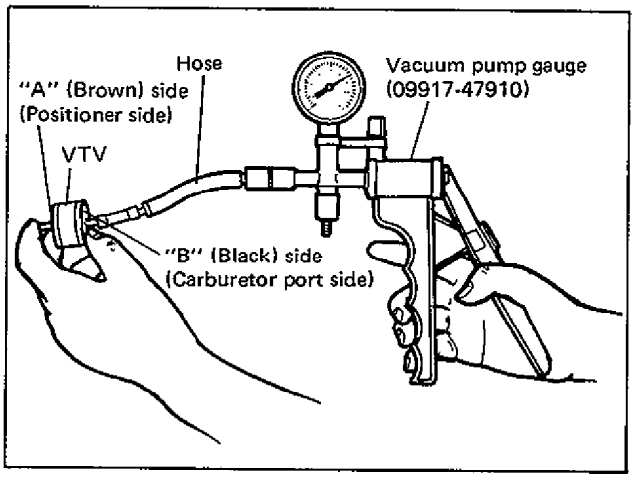


Fig. 6J-12-1

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.

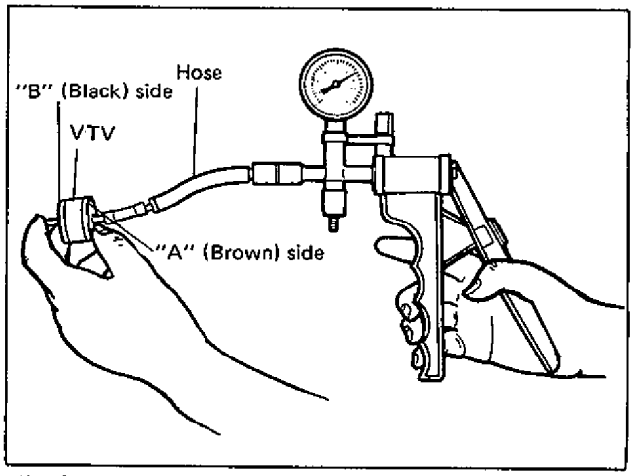


Fig. 6J-12-2

INTAKE AIR TEMPERATURE CONTROL SYSTEM

CHECKING PROCEDURE

1. Remove air cleaner upper case.

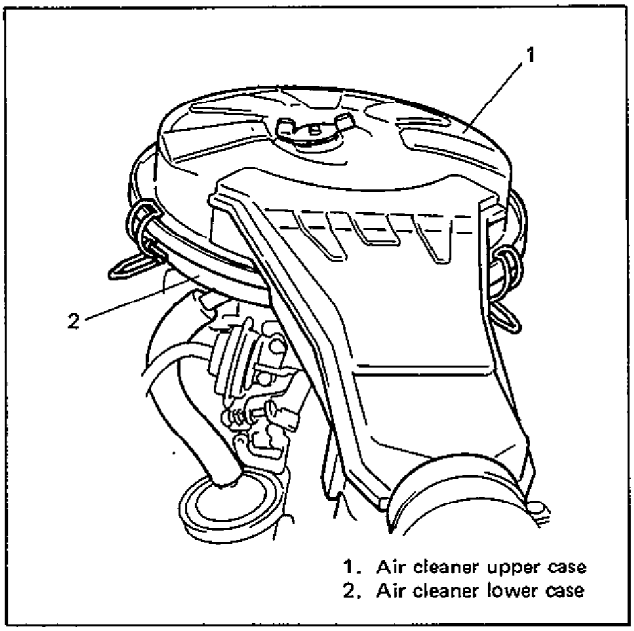


Fig. 6J-13 Air Cleaner

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.

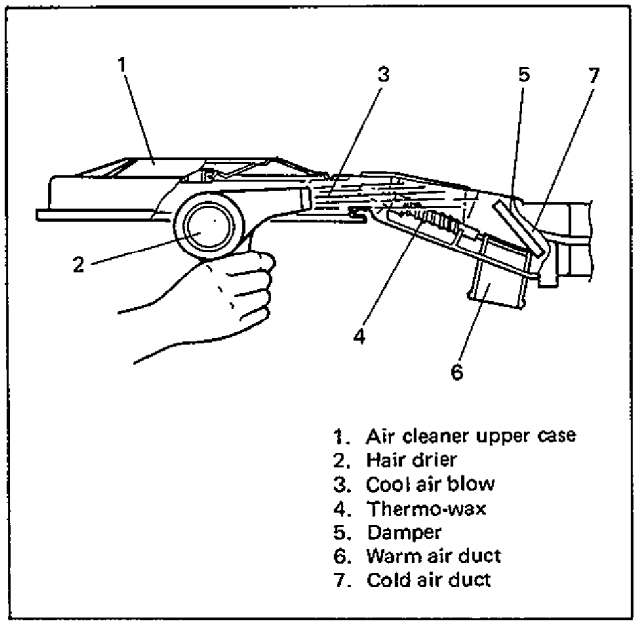


Fig. 6J-13-1 Fully Open Damper

3. Next, blow warm air to thermo-wax with drier and check that damper closes warm air duct and opens cold air duct.

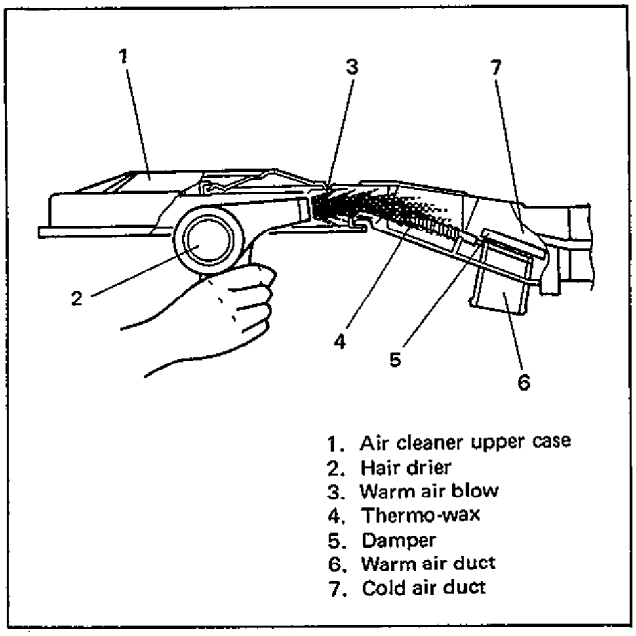


Fig. 6J-13-2 Closed Damper

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.

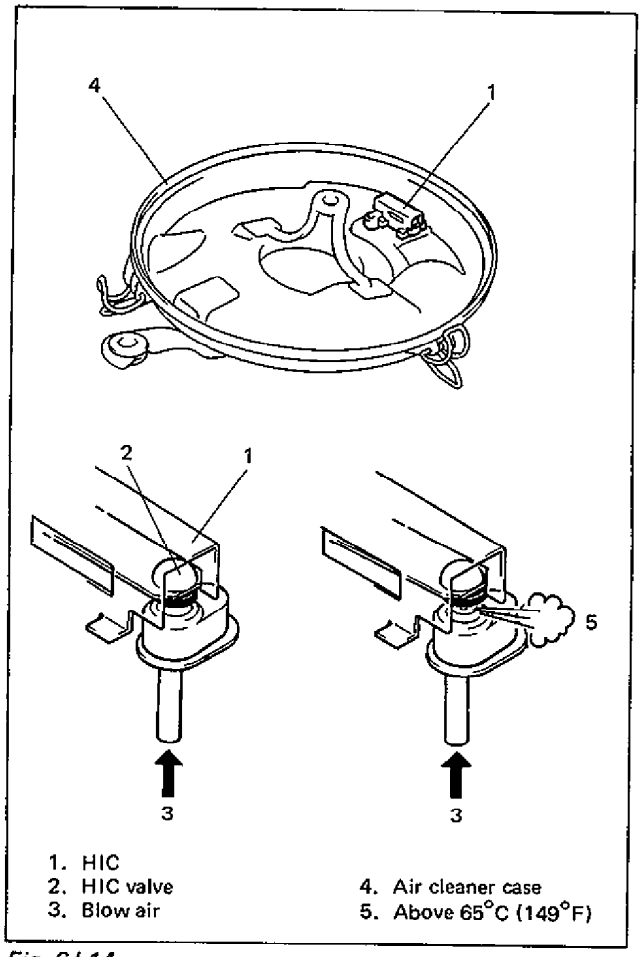
HOT IDLE COMPENSATOR (HIC)

1) Remove air cleaner case.
2) Remove vacuum hoses from carburetor.
3) Check temperature around HIC with thermometer.
4) If temperature is below 45°C (113°F), air should not come out of HIC when air is blown into HIC nozzle. If temperature is above 65°C (149°F), air comes out of HIC.
5) After checking, connect vacuum hose to HIC, and then reinstall air cleaner case.

Replace HIC, if defective.

NOTE:

- **To check HIC for operation at higher than 65°C (149°F) temperature when HIC (bimetal) temperature is lower than 45°C (113°F), remove HIC from air cleaner body and warm it up with hair drier or photo light before checking.**
- **Never touch bimetal or valve in HIC.**



1. HIC
2. HIC valve
3. Blow air
4. Air cleaner case
5. Above 65°C (149°F)

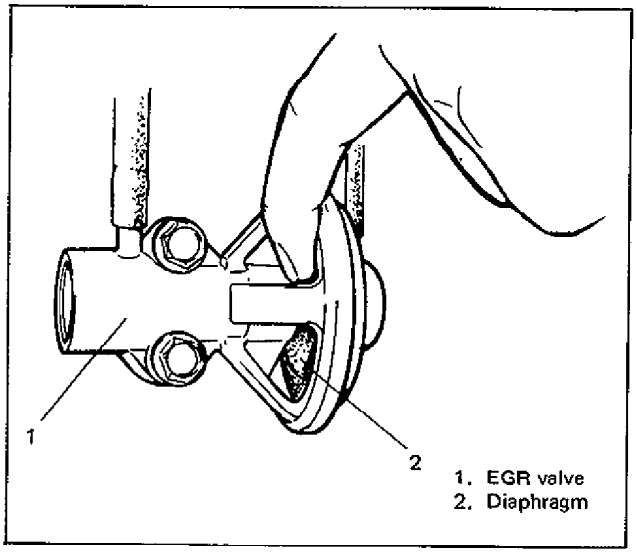
Fig. 6J-14

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

CHECKING EGR SYSTEM

1) Run engine when it is cool (coolant temperature is below 50°C (122°F)) and check that EGR valve diaphragm is not operating in this state, by touching diaphragm with finger.

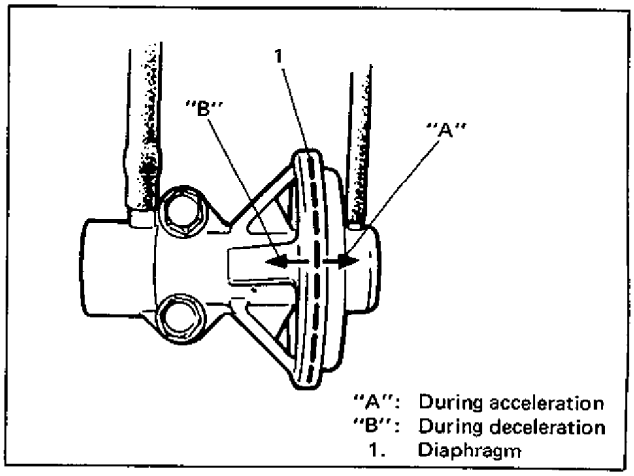
WARNING:
If EGR valve is hot, it may be necessary to wear gloves to avoid burning finger.



1. EGR valve
2. Diaphragm

Fig. 6J-14-1

2) Warm up engine to normal operating temperature and race it after warming up. Then check to be sure that diaphragm moves toward "A" in figure below during acceleration and toward "B" during deceleration.



"A": During acceleration
"B": During deceleration
1. Diaphragm

Fig. 6J-14-2

If found defective in above step 1) or 2), inspect following parts according to each procedure.

VACUUM HOSES

Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

EGR VALVE (with EGR modulator model)

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 more than 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.

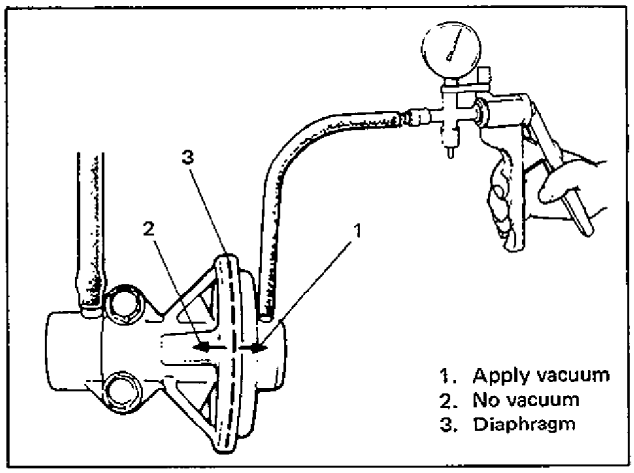


Fig. 6J-14-3

4) After checking, be sure to connect vacuum hose to EGR modulator.

THERMAL VACUUM SWITCHING VALVE (TVSV)

NOTE:
For 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 item 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 50°C (122°F)), blow nozzle "B". Air should not come out of nozzle "A".

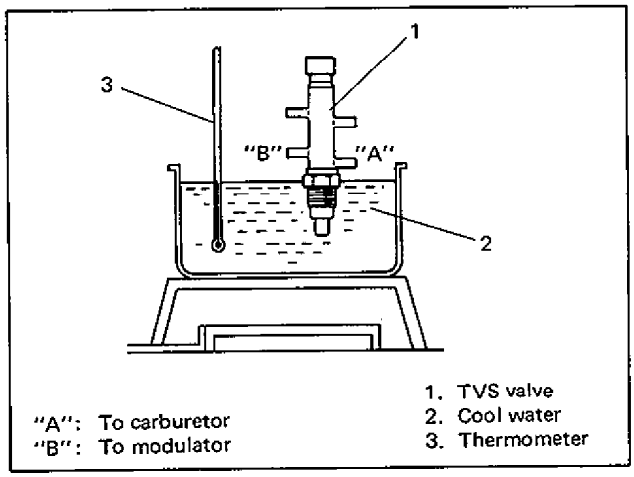


Fig. 6J-14-4

4) While keeping TVSV warm (above 70°C (158°F) in hot water, blow nozzle "B". Air should come out of nozzle "A".

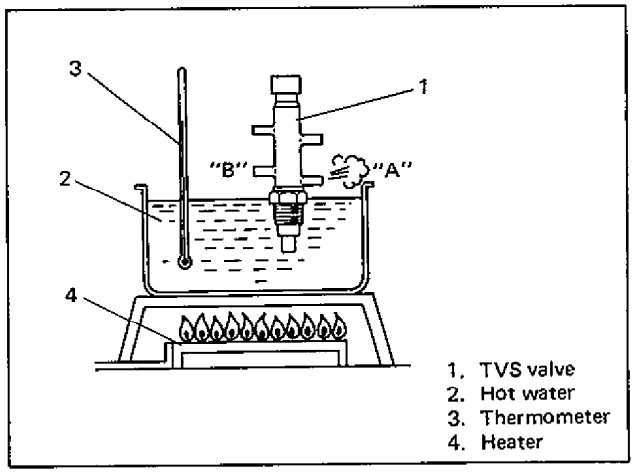


Fig. 6J-14-5

5) Reinstall TVSV to intake manifold. Before installing, wind sealing tape on its thread.
6) Connect vacuum hoses.

EGR MODULATOR (With EGR modulator model)

1) Check filter for contamination and damage. Using compressed air, clean filter.

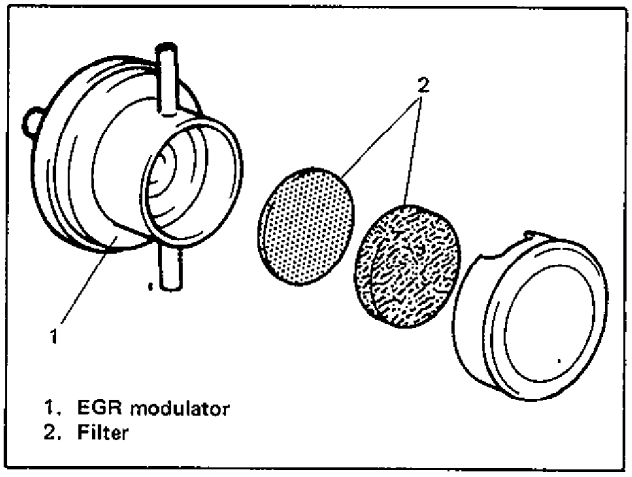


Fig. 6J-14-6

2) Remove EGR modulator and plug nozzle with your finger. Blow air into another nozzle and check that air passes through to air filter side freely.

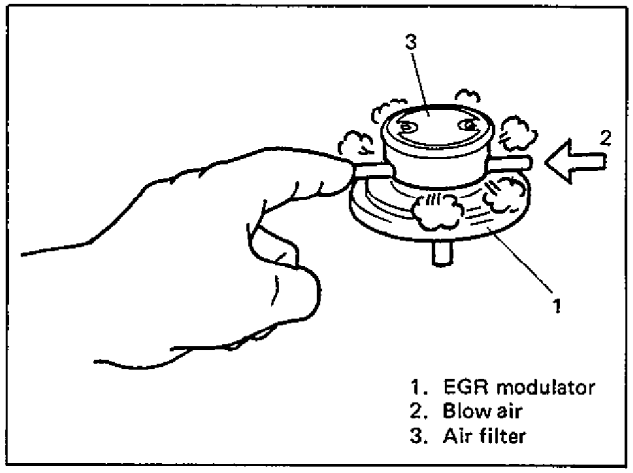


Fig. 6J-14-7

3) Connect vacuum pump gauge to nozzle 1 and plug nozzle 2 with your finger. While blowing air into nozzle 3 , operate vacuum pump gauge and check that vacuum is applied to modulator.

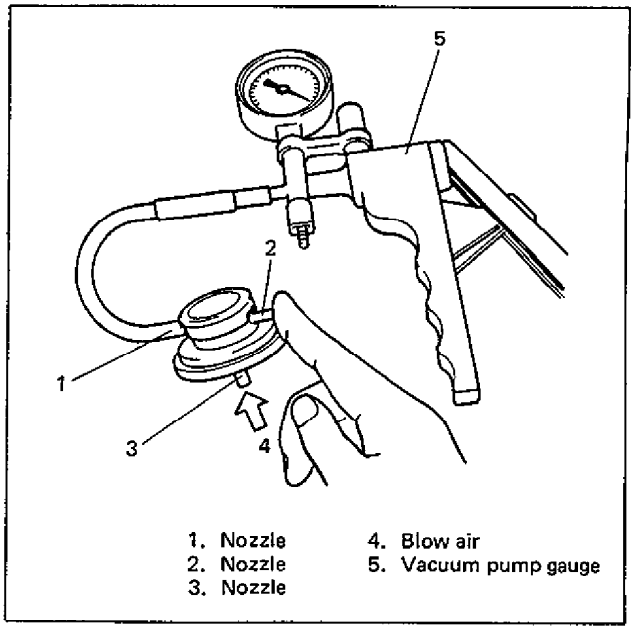


Fig. 6J-14-8

4) After checking, install modulator and connect hoses securely.

PULSE AIR CONTROL SYSTEM

CHECKING PULSE AIR CONTROL SYSTEM

Check hoses and pipe for cracks, kinks, damage or loose connections. If above checks are satisfactory, then check system for operation according to procedures outlined below.

1) Disconnect second air hose from air cleaner when engine is cold.
2) Start engine and run it at idle. In this state, check to be sure that air is drawn into hose (bubbling sound is heard from inside of hose).

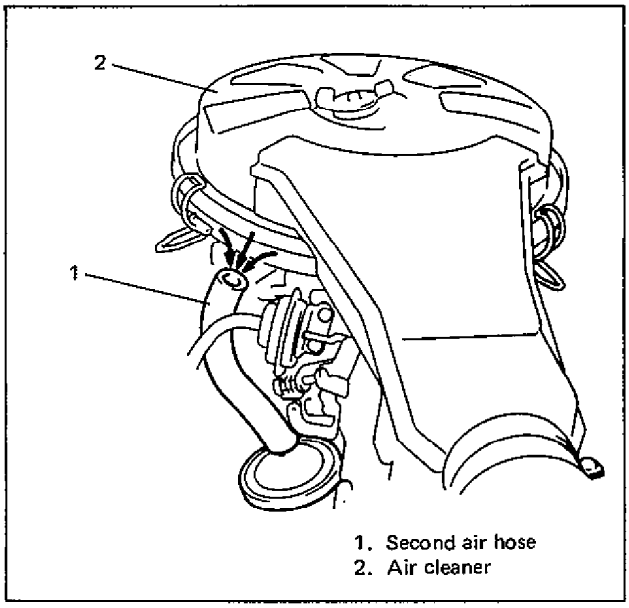


Fig. 6J-15

3) After checking, connect air hose to air cleaner case.

[Second air valve]

1) Remove second air valve with air pipe.
2) Blow air hose. Air should come out of air pipe. Blow air pipe. No air should come out from air hose.

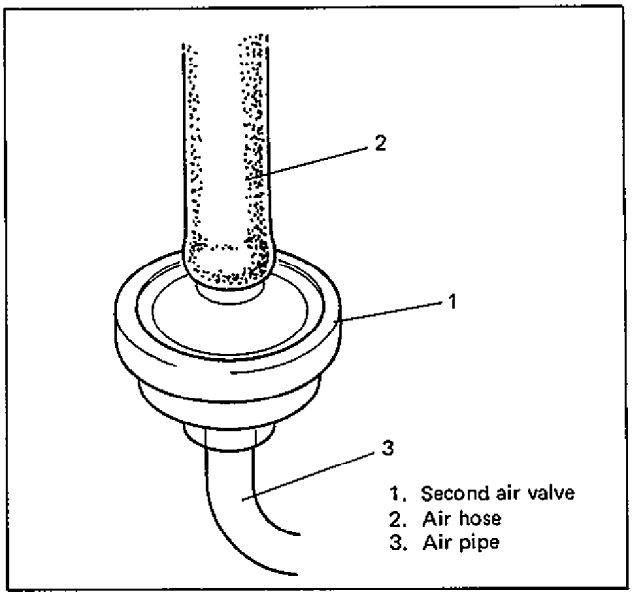


Fig. 6J-15-1

If found defective, replace.

3) Reinstall second air valve with air pipe.

FUEL CUT SYSTEM

CHECKING FUEL CUT SYSTEM

1) Disconnect coupler from fuel controller (located at the right of pedal bracket) and turn ignition switch to "ON" position without starting engine.
2) With conditions in step 1) maintained, turn accelerator low switch ON and OFF by depressing and releasing accelerator pedal to check for "clicking" sound.

NOTE:
For this check, note the following.
Don't depress clutch pedal. (car with manual transmission)
Make sure that selector lever is in a position other than "P" and "N" ranges. (car with automatic transmission)

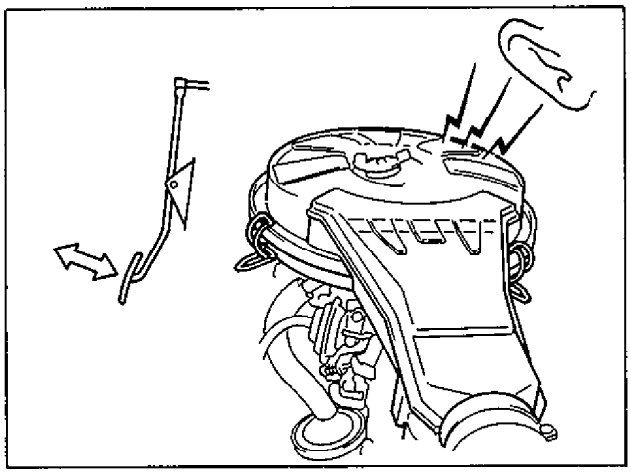


Fig. 6J-16

If anything faulty was found in step 2), repair wire harness or replace fuel cut solenoid or accelerator low switch.

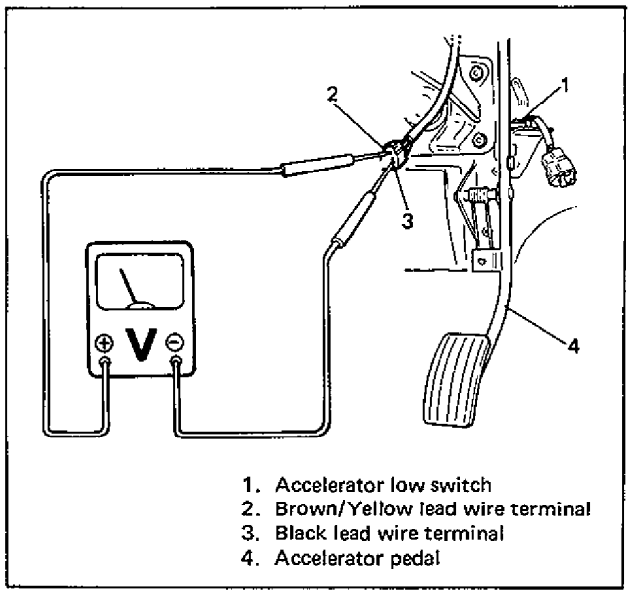
3) In case of car with manual transmission, check for "clicking" sound when clutch pedal is depressed and released.
   In case of car with automatic transmission, check for "clicking" sound when selector lever is shifted from "P" to "R" and from "R" to "P" ranges.

NOTE:
For this check, don't depress accelerator pedal.

If check result is not satisfactory, correct or replace switch or wire harness.

FUEL CONTROLLER

1) Set external tachometer.
2) Make sure that ignition switch is turned to "OFF" position.
3) Disconnect accelerator low switch lead wire at coupler.
4) Start engine and run it at idle speed.
   With automatic transmission equipped car, confirm that selector lever is in "P" range position and then disconnect shift switch lead wires at couplers.
5) Connect positive probe of voltmeter to Brown/Yellow wire terminal of accelerator low switch and negative probe to Black wire terminal, and check that voltmeter indicates 0V when engine speed is lower than about 2,600 r/min and about 12V when higher than that.



1. Accelerator low switch
2. Brown/Yellow lead wire terminal
3. Black lead wire terminal
4. Accelerator pedal

Fig. 6J-16-1

If check result is not satisfactory, correct wire harness or replace fuel controller.

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.

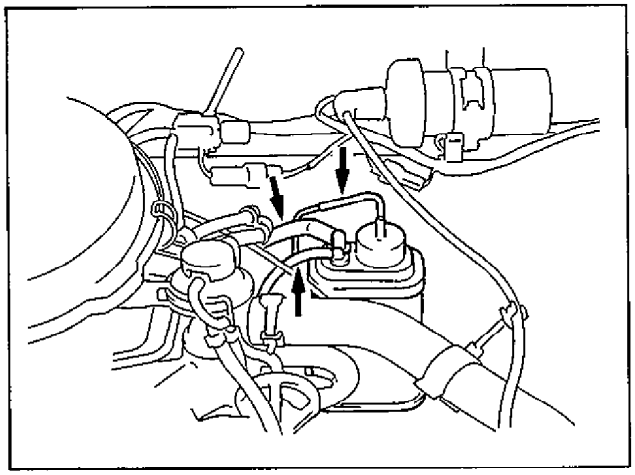


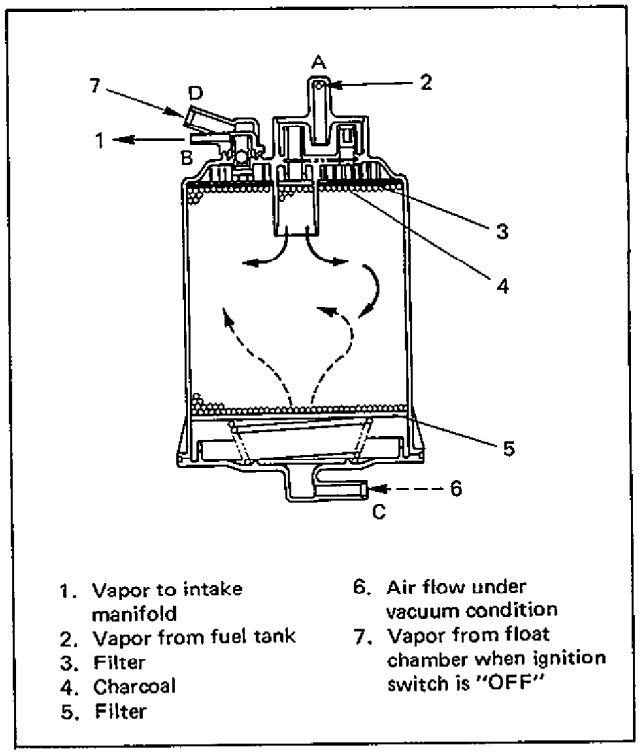
Fig. 6J-17

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) With pipes C and D closed with fingers, blow air into pipe A strongly, and air should come out from pipe B.
5) When air is blown into pipe B, air should not pass through pipe A, C or D.
6) 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.



1. Vapor to intake manifold
2. Vapor from fuel tank
3. Filter
4. Charcoal
5. Filter
6. Air flow under vacuum condition
7. Vapor from float chamber when ignition switch is "OFF"

Fig. 6J-17-1

7) Install canister and connect hoses and battery negative cable.

2-way check valve

1) Remove 2-way check valve.
2) Air should pass through valve smoothly from fuel tank side (black side of check valve) to orange side when blown hard.
3) From orange side, even when blown softly, air should come out of black side.
4) If air doesn't pass through valve in step 2) or hard blow is required in step 3), replace 2-way check valve.

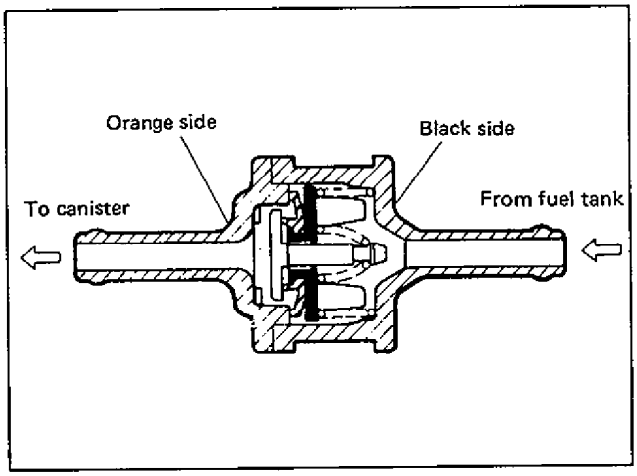
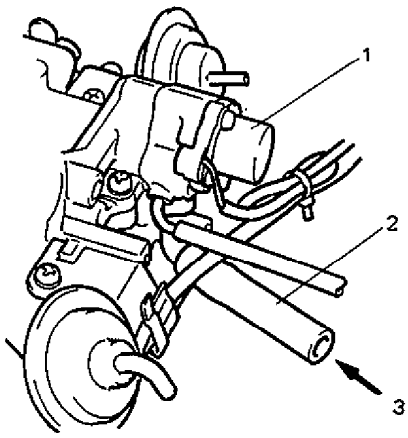


Fig. 6J-17-2

Vent solenoid valve

1) Disconnect canister hose from vent solenoid and connect a new hose to the pipe of solenoid.
2) Blow air into new hose with ignition switch at "OFF" and check to be sure that air passes through solenoid.



1. Vent solenoid
2. Canister hose (new)
3. Blow air

Fig. 6J-17-3

WARNING:
Do not suck hose. Fuel vapor in float chamber is harmful.

3) Start engine and check to be sure that air does not pass through solenoid when blowing air into new hose.
4) Remove new hose and connect original hose to switch vent solenoid.

SECTION 6K

EXHAUST SYSTEM

CONTENTS

NOTE:
There are two types of exhaust No. 2 pipe, one with catalytic converter and the other without it. Their use 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, and seals and gaskets etc.

The catalytic converter is an emission control device added to the exhaust system to lower the levels of Hydrocarbon (HC), and Carbon Monoxide (CO) pollutants in the exhaust gas.

THE CATALYTIC CONVERTER REQUIRES USE OF UNLEADED FUEL ONLY.

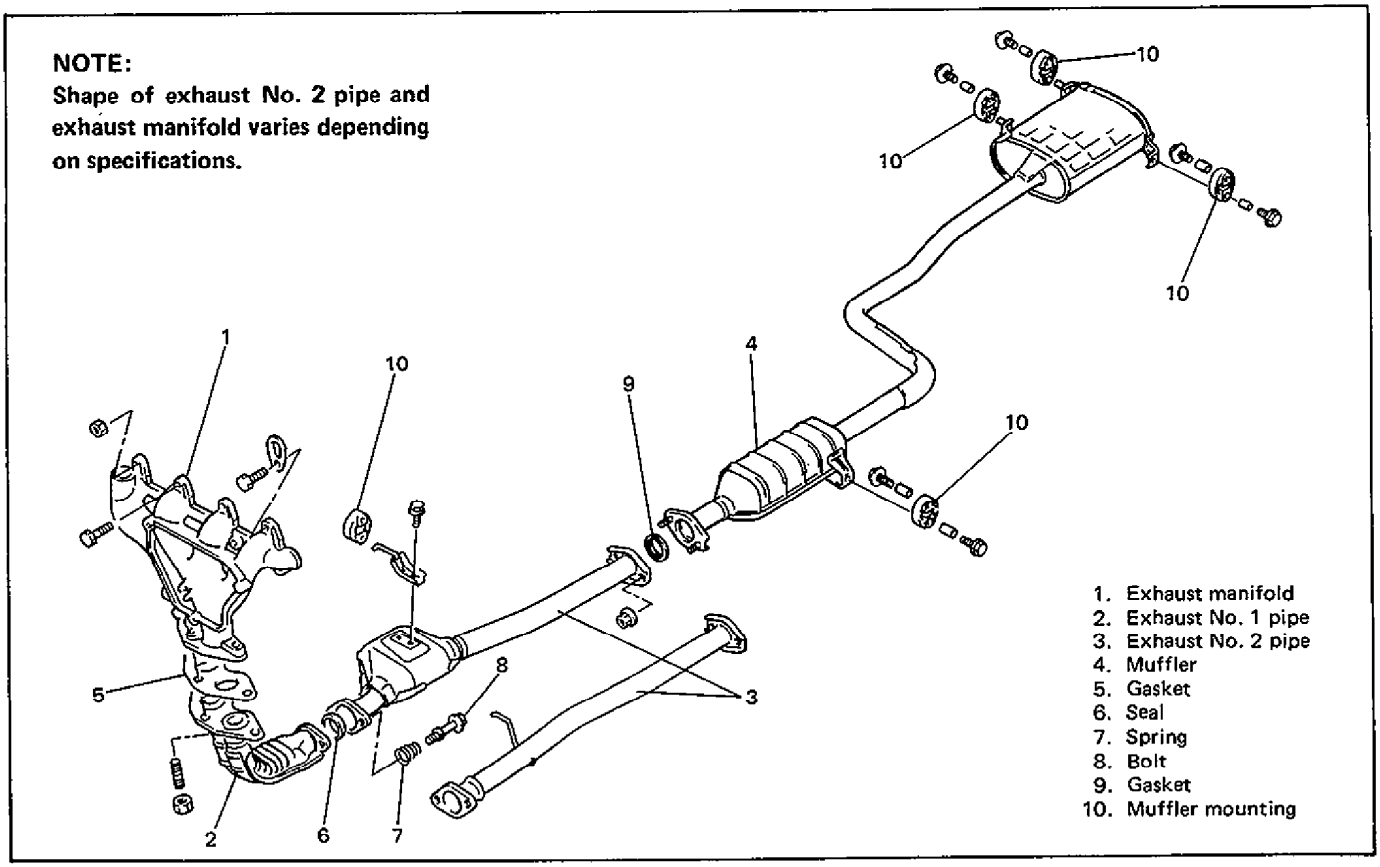


Fig. 6K-1 Exhaust System

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 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 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.

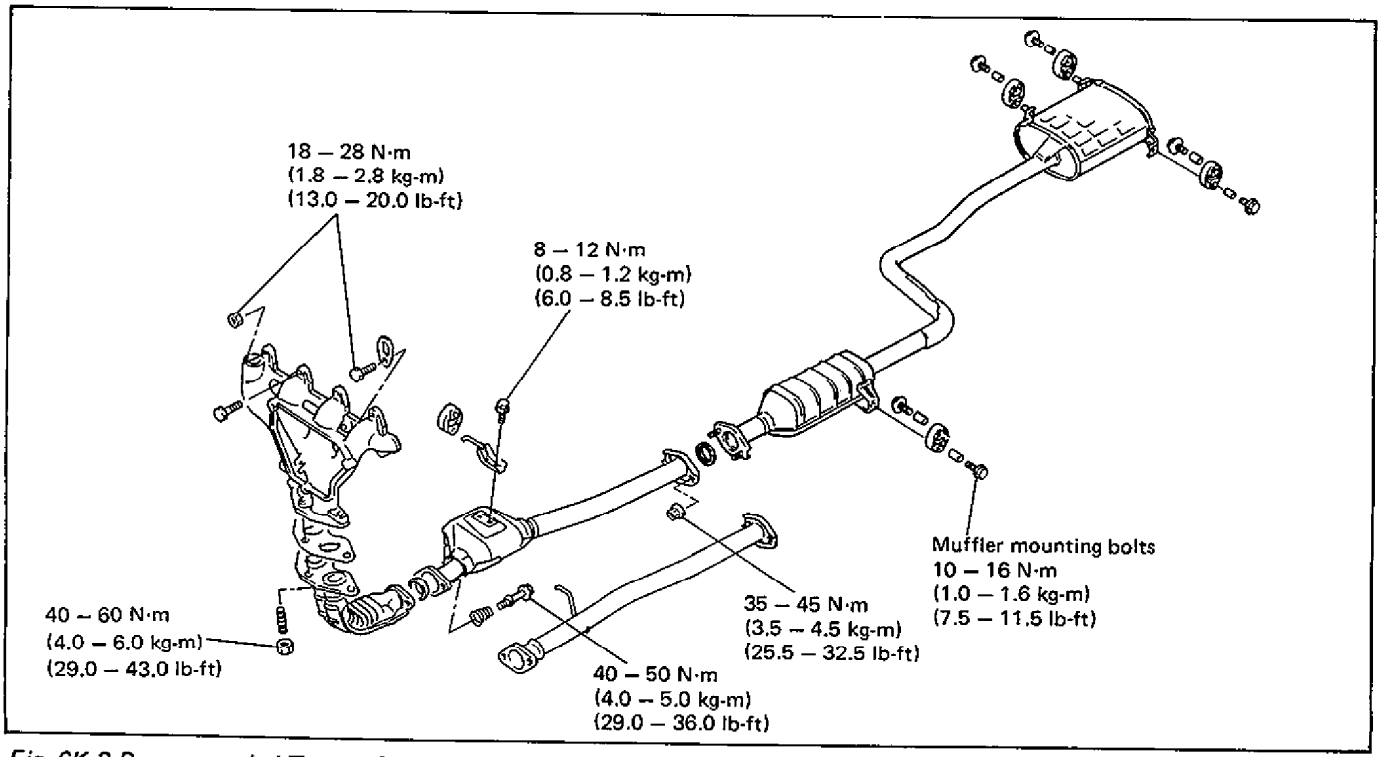


Fig. 6K-2 Recommended Torque Specification

SECTION 7A

MANUAL TRANSMISSION

CONTENTS

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.

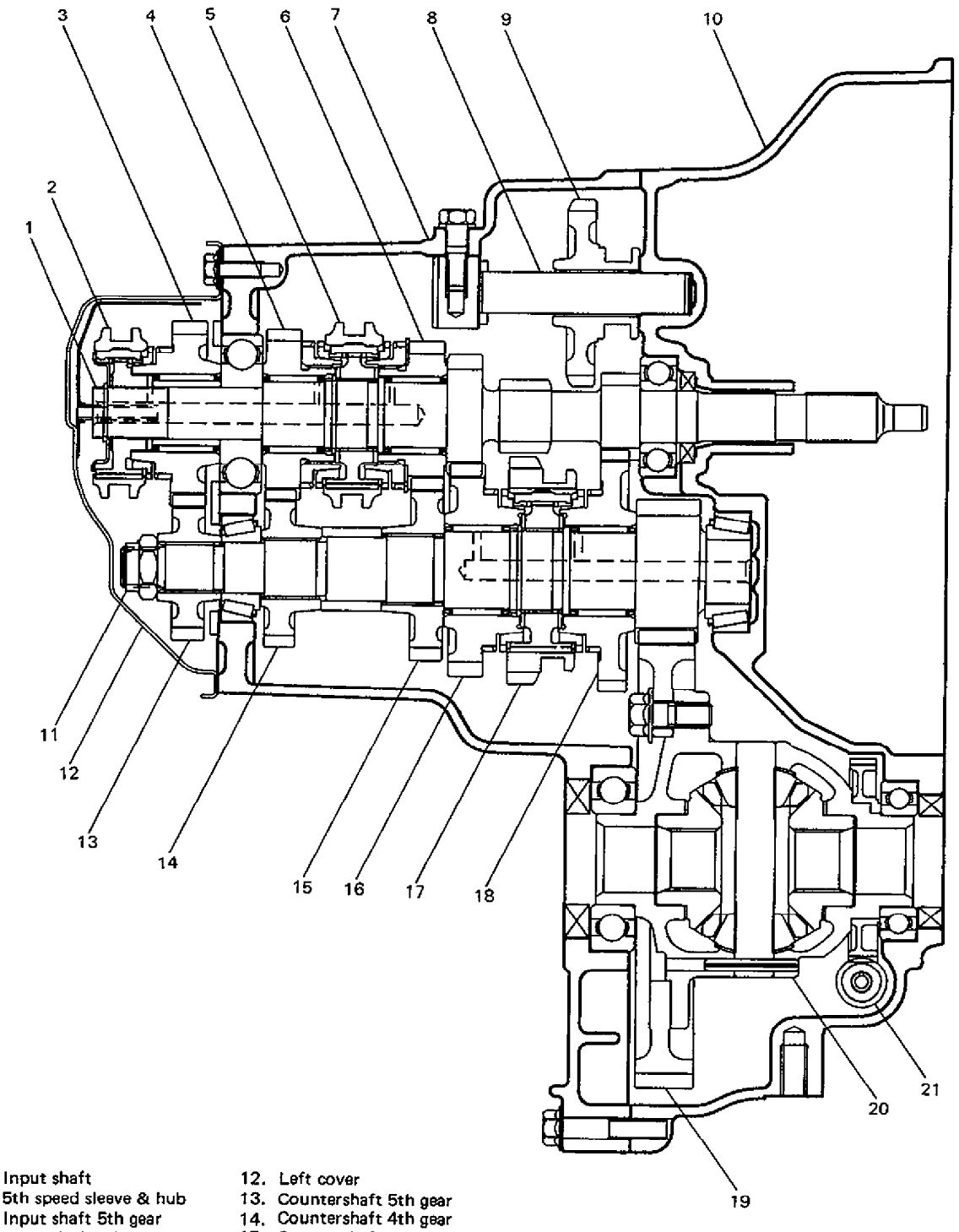
The low speed synchronizer is mounted on counter shaft and engaged with counter shaft first gear or second gear, while the high speed synchronizer is done on input shaft and engaged with input shaft third gear or fourth gear.

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.

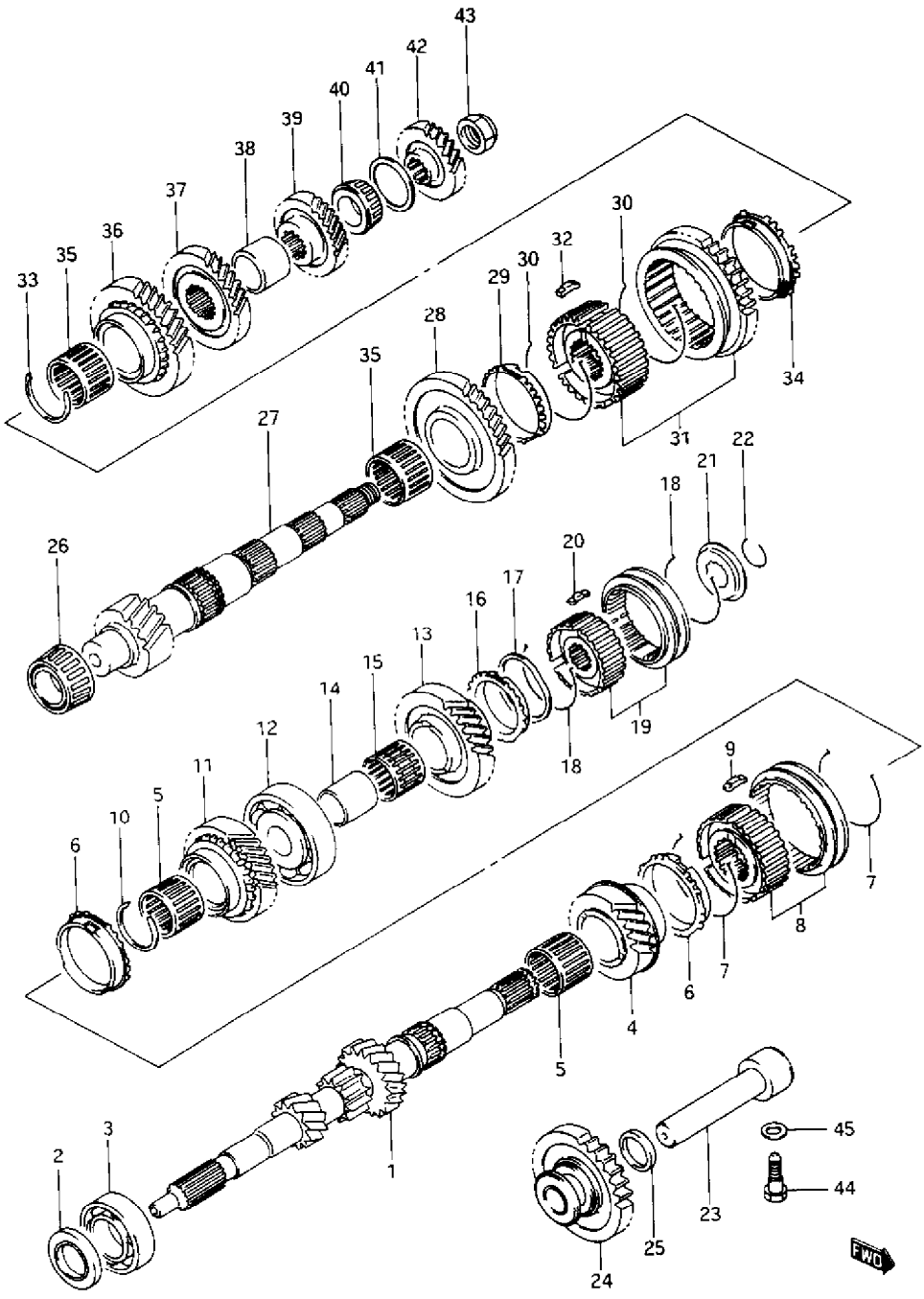
For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transmission case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning 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 gear shaft
9. Reverse 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. Synchronizer ring spring
18. 5th synchronizer spring
19. 5th speed sleeve & hub
20. 5th synchronizer key
21. 5th synchronizer hub plate
22. Circlip
23. Reverse gear shaft
24. Reverse idler gear
25. Reverse 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. Circlip
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

Movement of gear shift control lever is transmitted to gear shift shaft through gear shift control shaft, and gear shift & select shaft through gear shift arm and gear shift yoke, and then gear shift & select lever to each gear shift yoke, shaft and fork or arm. Gear shift interlock plate is provided to prevent the gear from engaging double.

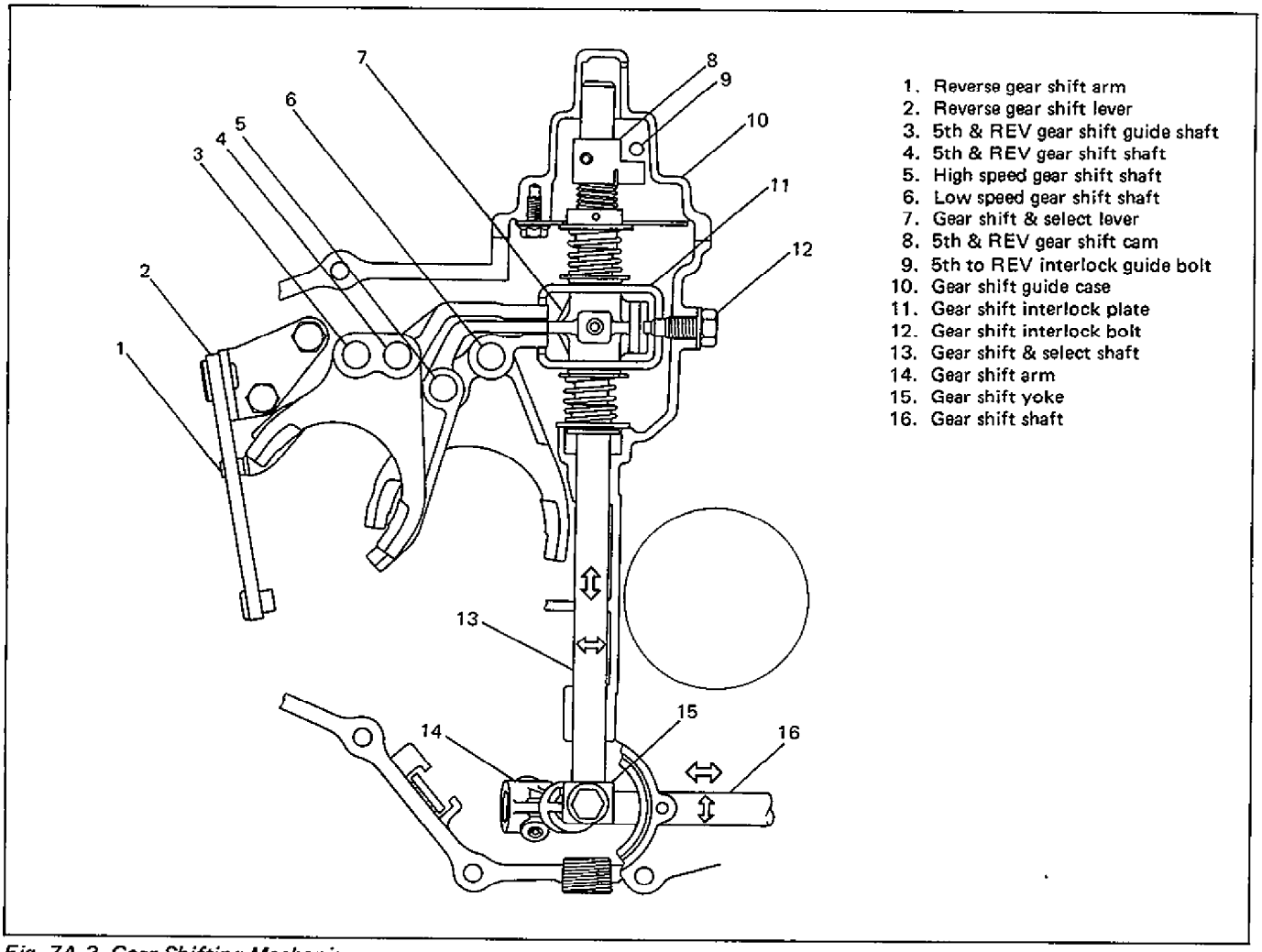


Fig. 7A-3 Gear Shifting Mechanism

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.

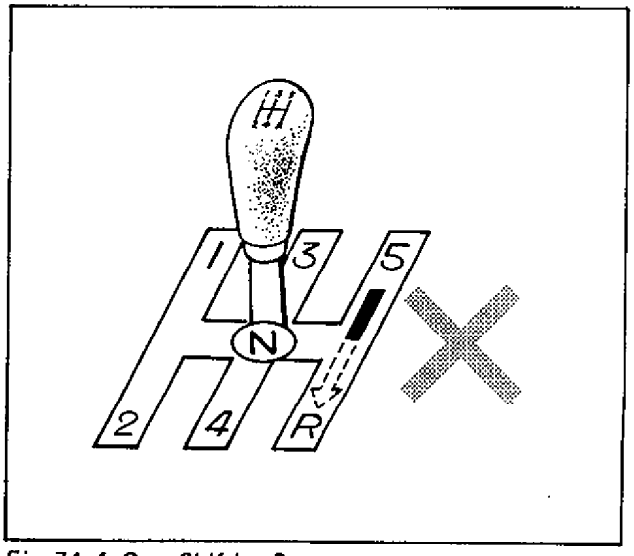


Fig. 7A-4 Gear Shifting Pattern

1. When gear is shifted to 5th speed, 5th & reverse gear shift cam turns clockwise with gear shift & select shaft and it is pushed up by cam guide return spring to the position where interlock guide bolt prevents the cam from being shifted to reverse straight.

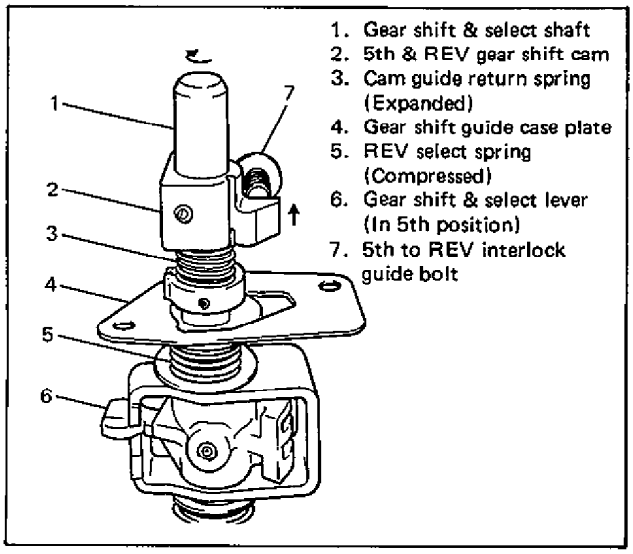


Fig. 7A-5 Shifted in 5th Speed

2. Shifting from 5th to neutral is available and further shift to reverse is interrupted.
However, when shift & select shaft is moved to neutral of 3rd – 4th position, shift limit cam mechanism is canceled as shown below.

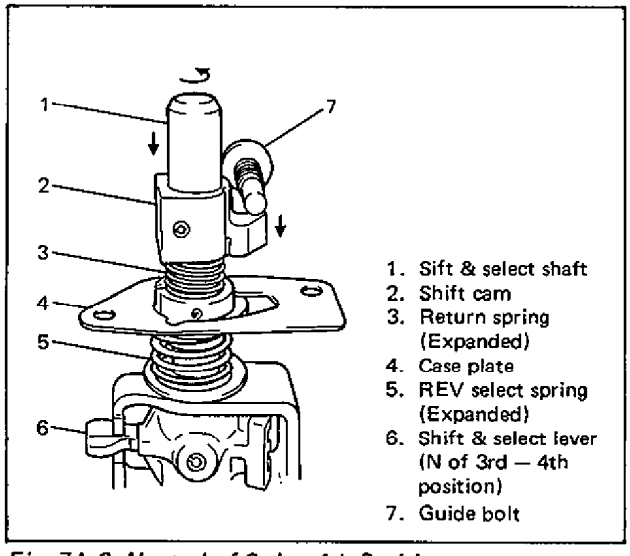


Fig. 7A-6 Neutral of 3rd – 4th Position

3. Selected position in neutral of 5th – REV is shown in the following figure. While shift & select lever to shift in 5th or reverse position, shift cam stays because of interference of guide bolt.

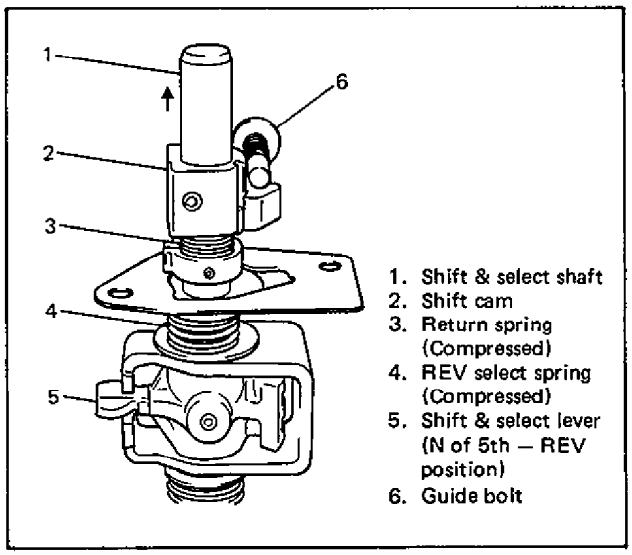


Fig. 7A-7 Neutral of 5th – REV Position

4. Now the mechanism is ready to be shifted to reverse without interference of shift cam.

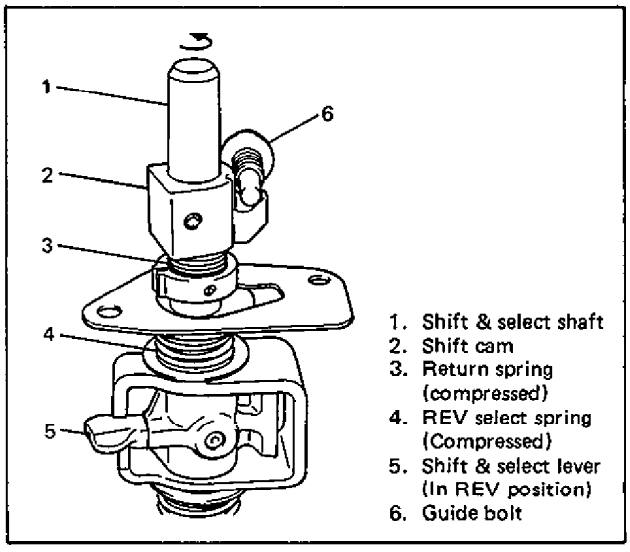


Fig. 7A-8 Shifted in Reverse

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	Adjust
	• Distorted or broken clutch disc	Replace
	• Damaged clutch pressure plate	Replace clutch cover
	• Worn synchronizer ring	Replace
	• Worn chamfered tooth on sleeve or gear	Replace sleeve 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

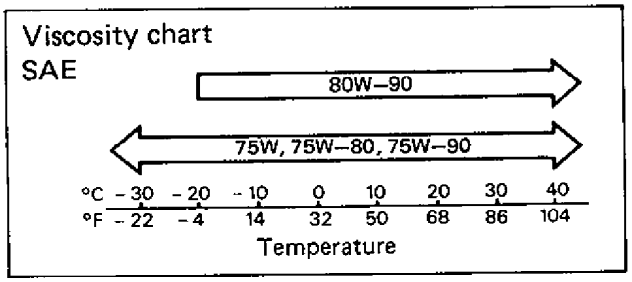
ON-CAR SERVICE

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.

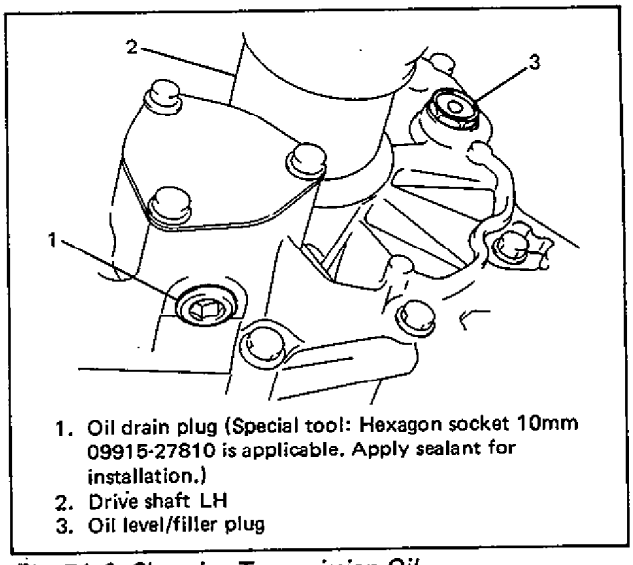
NOTE:

- **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 GL-5 For SAE classification, refer to above viscosity chart.
Oil capacity	2.4 liters 5.0/4.2 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

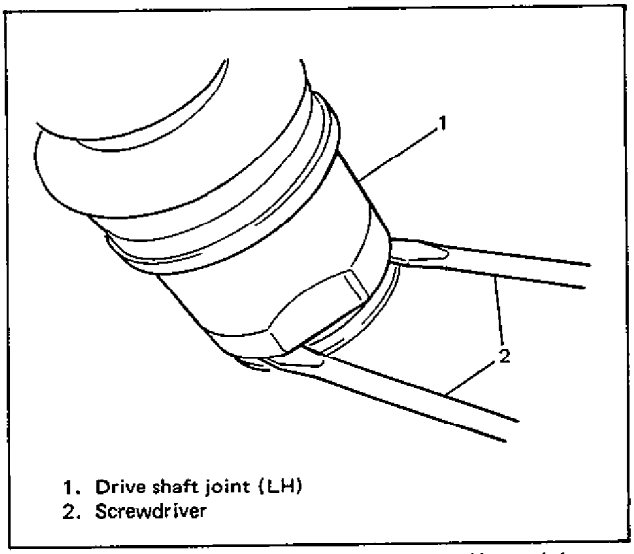


1. Oil drain plug (Special tool: Hexagon socket 10mm 09915-27810 is applicable. Apply sealant for installation.)
2. Drive shaft LH
3. Oil level/filler plug

Fig. 7A-9 Changing Transmission Oil

DIFFERENTIAL SIDE OIL SEAL

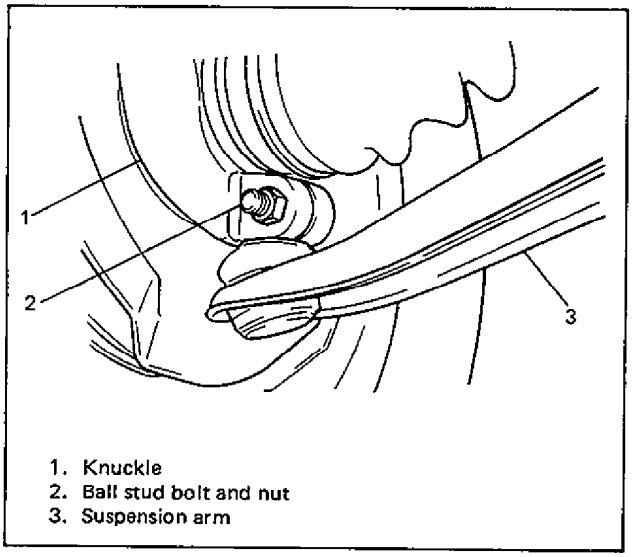
1. Lift up car and drain transmission oil.
2. By using large size screwdrivers, pull out drive shaft joint so as to release snap ring fitting of joint spline at differential side.



1. Drive shaft joint (LH)
2. Screwdriver

Fig. 7A-10 Detaching Snap Ring from Differential

3. Remove ball stud bolt and nut, and then separate suspension arm from knuckle.

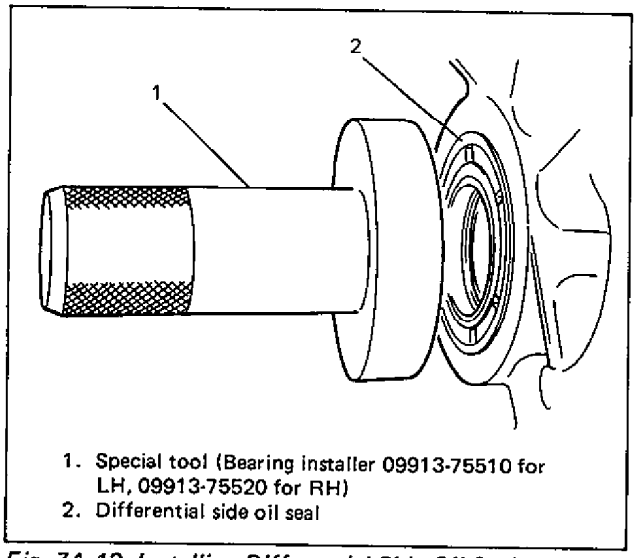


1. Knuckle
2. Ball stud bolt and nut
3. Suspension arm

Fig. 7A-11 Detaching Suspension Arm from Knuckle

4. Pushing knuckle portion outward, detach drive shaft at differential side.
5. Remove center bearing support bolts and then draw out center shaft from differential side gear.
6. Remove oil seal and install a new one until it becomes flush with case surface by using special tool and hammer.
7. Apply grease to oil seal lip and at the same time check drive shaft when oil seal contacts and make sure of its smoothness.

NOTE:
When install oil seal, face its spring side inward.



1. Special tool (Bearing installer 09913-75510 for LH, 09913-75520 for RH)
2. Differential side oil seal

Fig. 7A-12 Installing Differential Side Oil Seal

8. Insert drive shaft joint to differential side as it was.
9. Connect ball stud with knuckle and fasten with bolt to specification.

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.**

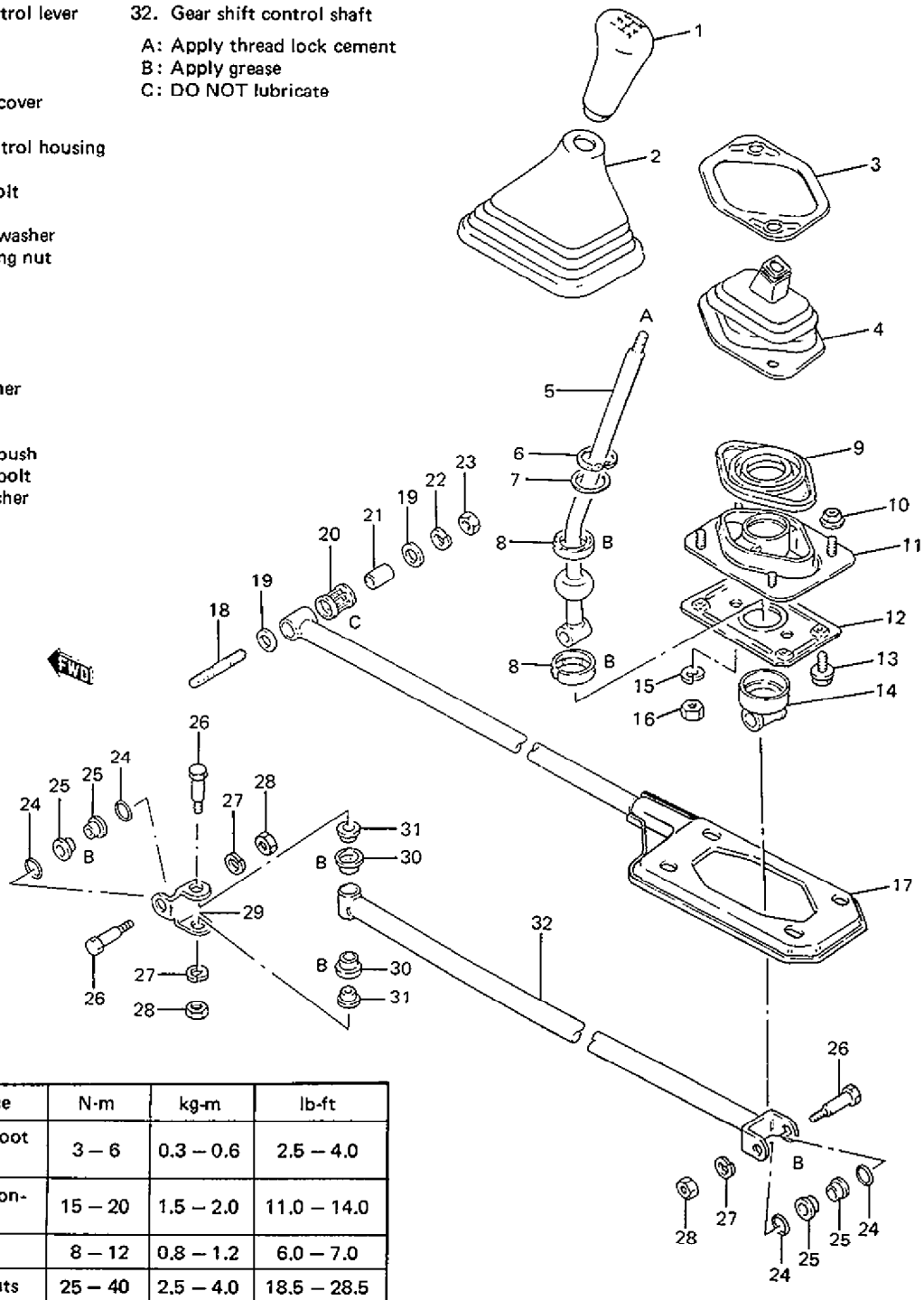
Tightening torque	N·m	kg-m	lb-ft
Ball stud bolt and nut	50 – 70	5.0 – 7.0	36.5 – 50.5

10. Fill transmission oil as specified and make sure that oil has been sealed with oil seal.

GEAR SHIFT CONTROL

1. Control lever knob
2. Boot No. 2
3. Boot cover
4. Boot
5. Gear shift control lever
6. Circlip
7. Adjust shim
8. Seat
9. Housing dust cover
10. Housing nut
11. Gear shift control housing
12. Guide plate
13. Guide plate bolt
14. Rear boot
15. Housing lock washer
16. Control housing nut
17. Extension rod
18. Rod stud bolt
19. Rod washer
20. Rod bush
21. Spacer
22. Rod lock washer
23. Rod nut
24. O ring
25. Control shaft bush
26. Control shaft bolt
27. Shaft lock washer
28. Shaft nut
29. Gear shift control joint
30. Shaft outer bush
31. Shaft inner bush
32. Gear shift control shaft

A: Apply thread lock cement
B: Apply grease
C: DO NOT lubricate



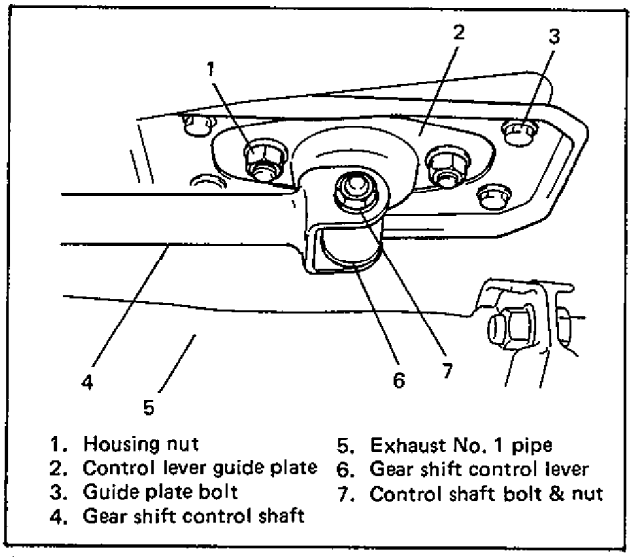
Tightening torque	N-m	kg-m	lb-ft
Housing nuts for boot cover	3 – 6	0.3 – 0.6	2.5 – 4.0
Housing nuts for control housing	15 – 20	1.5 – 2.0	11.0 – 14.0
Guide plate bolts	8 – 12	0.8 – 1.2	6.0 – 7.0
Control housing nuts	25 – 40	2.5 – 4.0	18.5 – 28.5
Extension rod stud bolt	15 – 20	1.5 – 2.0	11.0 – 14.0
Extension rod nut	25 – 40	2.5 – 4.0	18.5 – 28.5
Control shaft bolts and nuts	15 – 20	1.5 – 2.0	11.0 – 14.0

Fig. 7A-13 Gear Shift Control Components

REMOVAL

On Lift

1. Disconnect gear shift control shaft from gear shift control lever by removing control shaft bolt and nut.
2. Remove 4 guide plate bolts and loosen extension rod nut at transmission end and then move extension rod aside.



1. Housing nut
2. Control lever guide plate
3. Guide plate bolt
4. Gear shift control shaft
5. Exhaust No. 1 pipe
6. Gear shift control lever
7. Control shaft bolt & nut

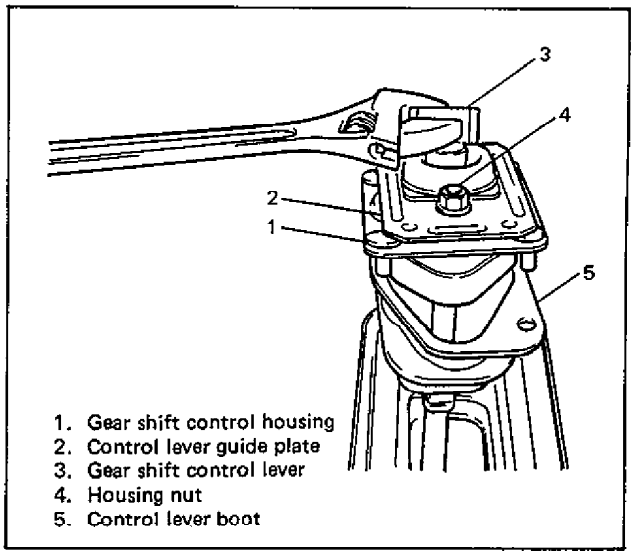
Fig. 7A-14 Removing Gear Shift Control Lever

In Cabin

1. Remove 2 screws from shift control lever cover, if the cover is equipped.
2. Remove 4 control lever housing nuts and then push shift control lever boot(s) into floor hole to take out shift control lever assembly from under the floor.

On Bench

1. Holding control lever knob with soft jawed vise, loosen its screw and remove control lever.
2. Remove 2 housing nuts, and then disassemble control lever.



1. Gear shift control housing
2. Control lever guide plate
3. Gear shift control lever
4. Housing nut
5. Control lever boot

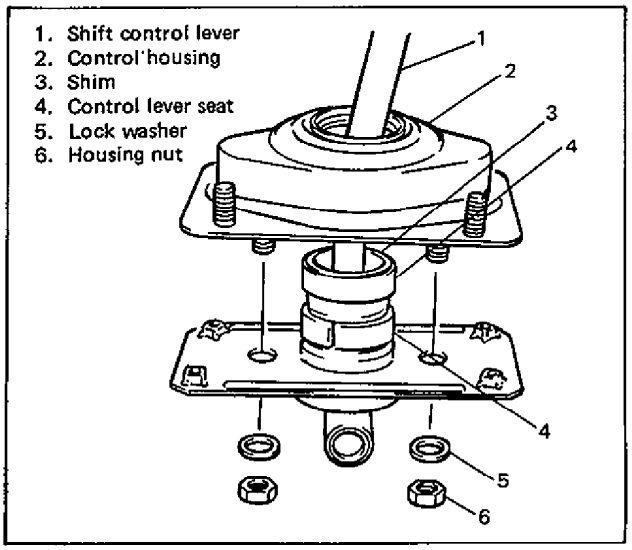
Fig. 7A-15 Removing Control Lever Knob

INSTALLATION

1. Assemble control lever by reversing removal procedure, replacing parts with new ones as required. Select shim for adjusting vertical play of control lever, if necessary.
   Apply grease to turning or sliding portions.

NOTE:
Check control lever for smooth movement after assembly.

Control lever vertical play	0 — 0.2 mm 0 — 0.007 in
Available shim size (thickness)	0.8, 1.0, 1.2 and 1.4 mm 0.03, 0.04, 0.05 and 0.06 in



1. Shift control lever
2. Control housing
3. Shim
4. Control lever seat
5. Lock washer
6. Housing nut

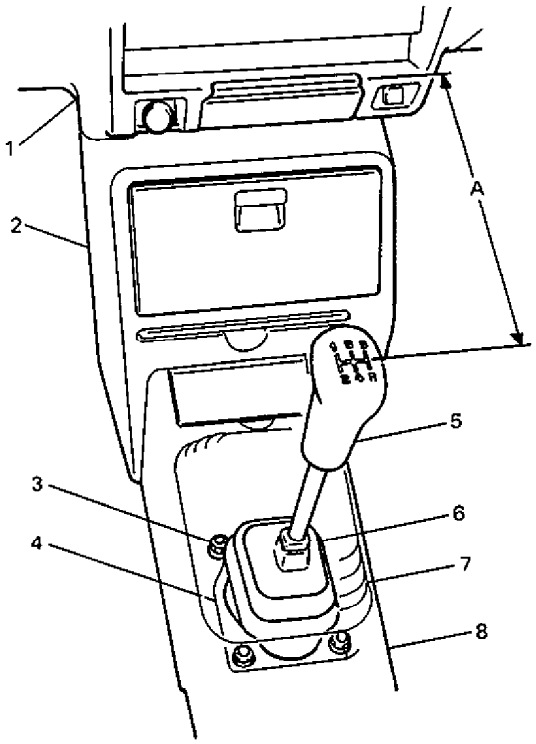
Fig. 7A-16 Assembling Gear Shift Control Lever

2. Apply thread lock cement and then install knob to control lever. Make sure that knob is aligned with lever.
3. Install control lever assembly and related parts as they were. For positioning control lever, loosely install 4 guide plate bolts and 4 control lever housing nuts first, adjust position and then tighten those nuts and bolts.

NOTE:

- **Do not apply grease to extension rod bush of transmission end.**
- **Apply grease to gear shift control shaft bushes.**
- **Make sure that boots are installed correctly.**

Control lever position: "A" distance	270 mm 10.6 in



1. Instrument panel
2. Console box
3. Control lever housing nut
4. Boot cover
5. Control lever knob
6. Control lever boot
7. Boot No. 2
8. Shift control lever cover

Fig. 7A-17 Installing Shift Control Lever

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.

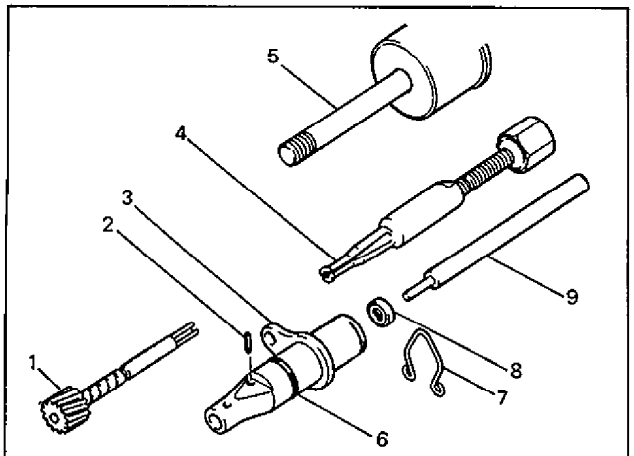
INSTALLATION

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-18 Speedometer Driven Gear

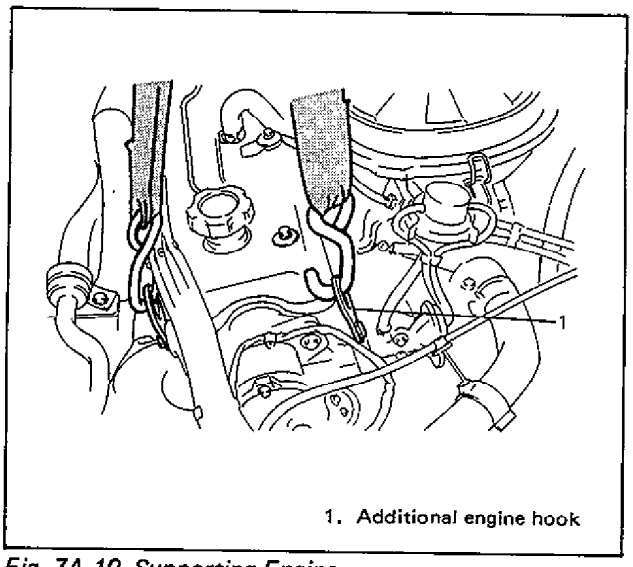
6. Make sure that oil level is as specified.

UNIT REPAIR OVERHAUL

DISMOUNTING OF TRANSMISSION

UNDER HOOD

1. Disconnect battery ground cable and then remove battery and its tray.
2. Remove clutch cable joint nut, joint pin from cable and then cable itself from bracket.
3. Undo wiring harness clamps and couplers.
4. Take off speedometer cable boot, speedometer case clip and then speedometer cable from case.
5. Disconnect left cover bolts fastening water intake pipe.
6. Remove transmission fastening bolts.
7. Remove starter taking out its 2 bolts. Starting motor plate should also come down.
8. Support engine by using hoist as shown.

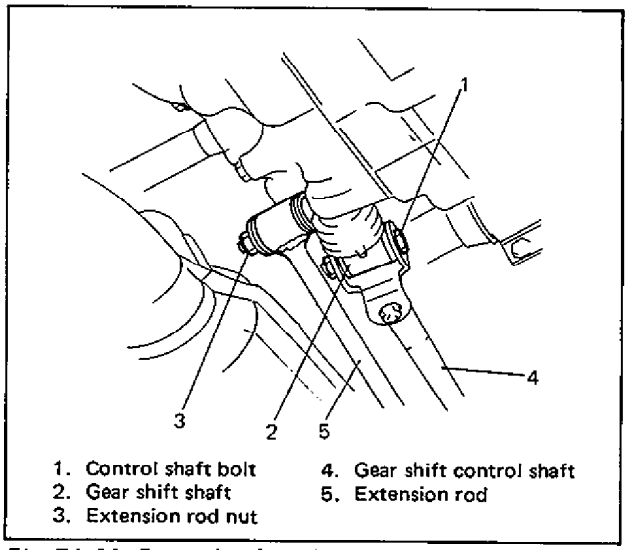


1. Additional engine hook

Fig. 7A-19 Supporting Engine

ON LIFT

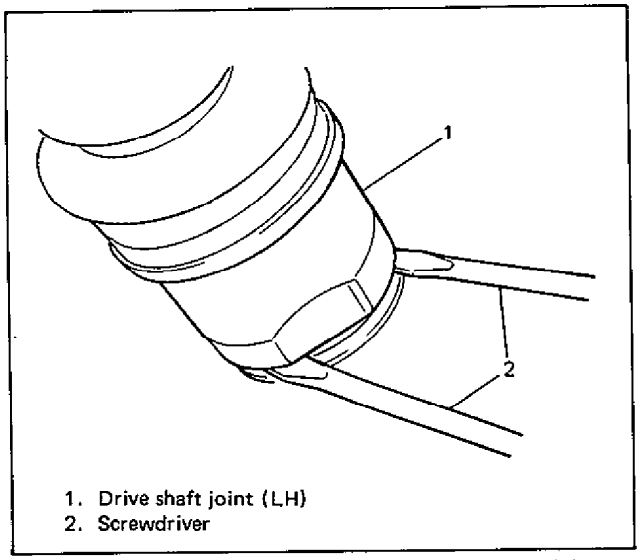
1. Drain transmission oil. 10 mm hexagon socket (special tool) and ratchet wrench are applicable.
2. Remove left side fender apron extension.
3. Remove exhaust pipe from exhaust manifold.
4. Remove gear shift control shaft bolt and nut, then detach control shaft from gear shift shaft.
5. Remove extension rod nut and then pull out rod with washers.



1. Control shaft bolt
2. Gear shift shaft
3. Extension rod nut
4. Gear shift control shaft
5. Extension rod

Fig. 7A-20 Removing Rear Portion

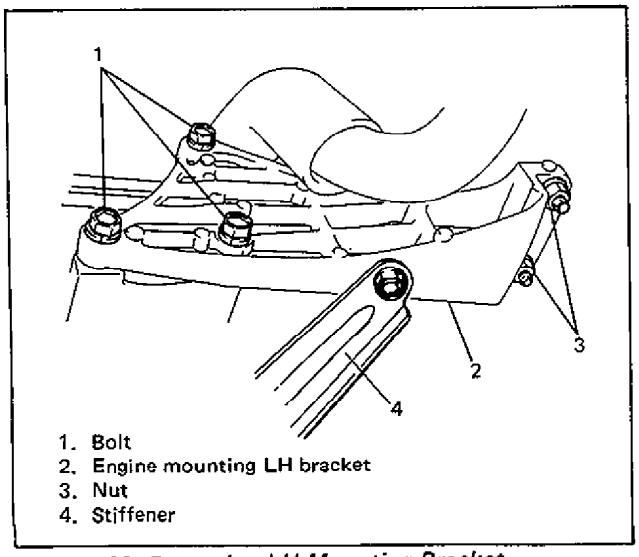
6. Remove clutch housing lower plate.
7. Remove ball stud bolt and nut from right and left knuckles, then disconnect each suspension arm.
8. By using large size screwdrivers, pull out drive shaft joints at differential side so as to release snap ring fitting of joint.



1. Drive shaft joint (LH)
2. Screwdriver

Fig. 7A-21 Detaching Snap Ring From Differential

9. Remove center bearing support bolts and then draw out center shaft from differential side gear.
10. Remove transmission to engine bolt and nut.
11. Remove 2 bolts fastening transmission case from rear mounting bracket.
12. Support transmission with transmission jack.
13. Remove engine mounting LH bracket and its stiffener.



1. Bolt
2. Engine mounting LH bracket
3. Nut
4. Stiffener

Fig. 7A-22 Removing LH Mounting Bracket

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 • Exhaust pipe to manifold nuts • 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

- 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.
- After connecting clutch cable, be sure to adjust its play properly (Refer to p. 7C-4 for free travel of clutch pedal).

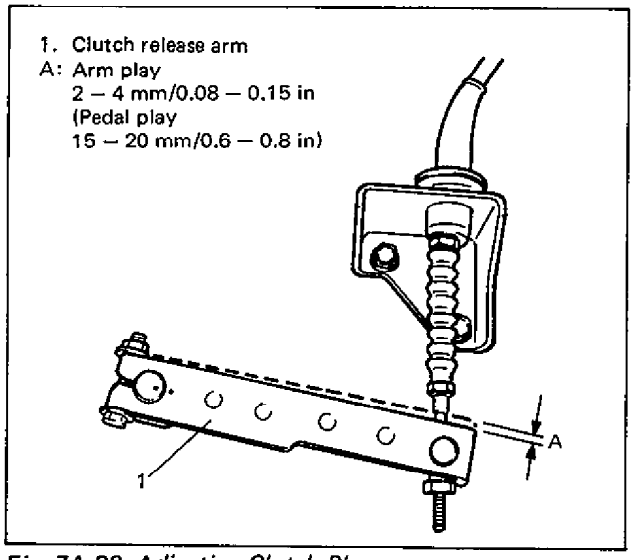


Fig. 7A-23 Adjusting Clutch Play

- Fill transmission with oil as specified.
- Connect battery and check function of engine, clutch and transmission.

DISASSEMBLING UNIT

FIFTH GEAR

1. Remove 8 bolts and take off transmission side cover.
2. Using special tool, remove circlip and then hub plate.

CAUTION:
Care should be taken not to distort side cover when it is removed from left case.

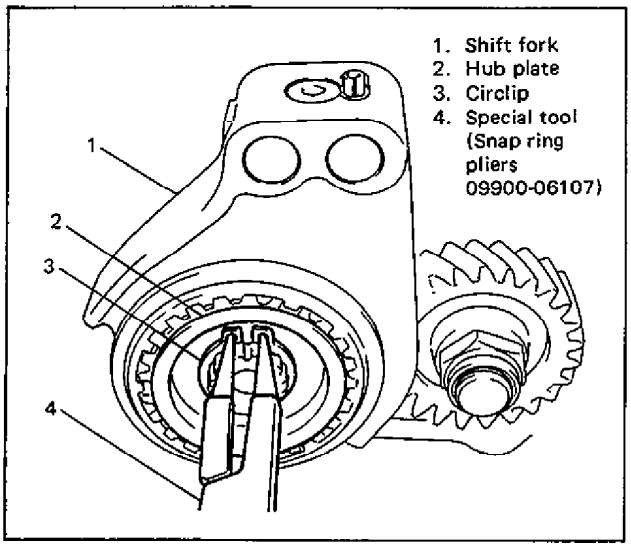


Fig. 7A-24 Removing Circlip and Hub Plate

3. Remove shift fork plug and guide ball.
4. Drive out spring pin by using special tool and hammer.

NOTE:
Use of magnet would facilitate removal of guide ball.

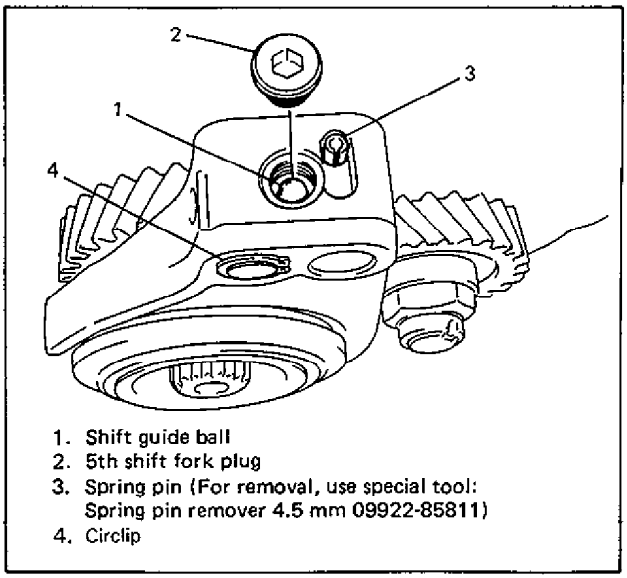


Fig. 7A-25 Removing Screw, Ball and Spring Pin

5. Remove gear shift fork, sleeve & hub assembly, synchronizer ring spring, 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.

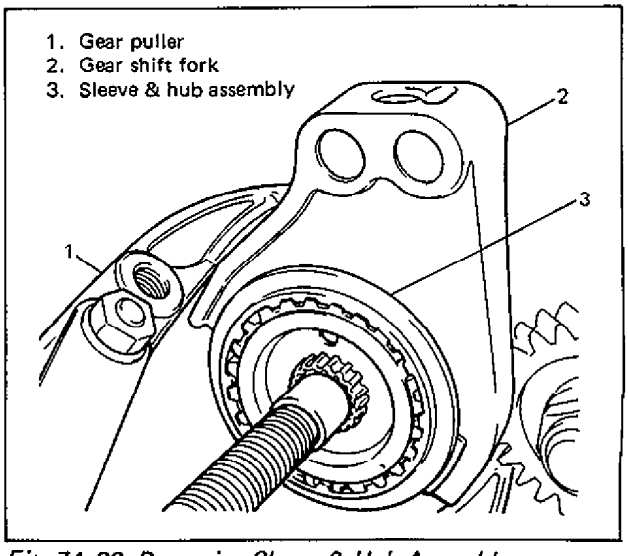
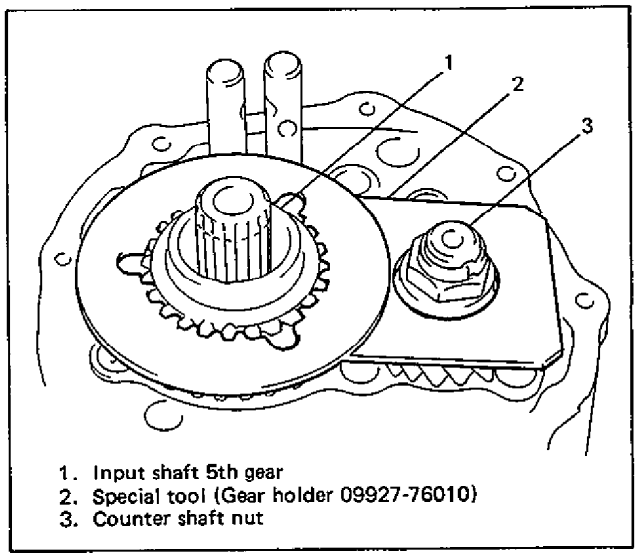


Fig. 7A-26 Removing Sleeve & Hub Assembly

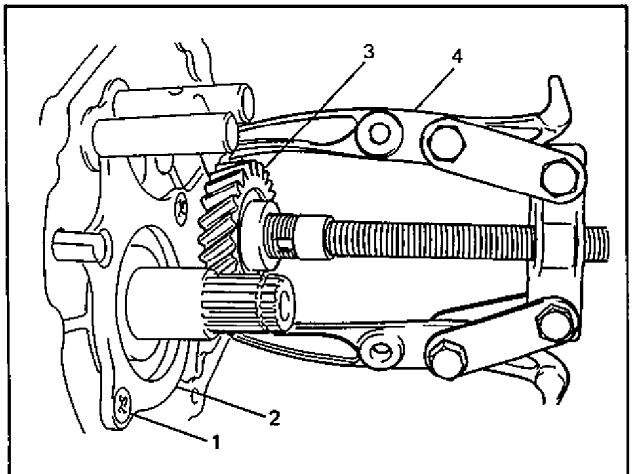
6. Unfasten caulking of countershaft nut, install main shaft 5th gear and special tool to stop rotation of shafts, and then remove counter-shaft nut.



1. Input shaft 5th gear
2. Special tool (Gear holder 09927-76010)
3. Counter shaft nut

Fig. 7A-27 Removing Counter Shaft Nut

7. Remove special tool, main shaft 5th gear, needle beaing and then counter shaft 5th gear. Gear puller would be necessary if spline fitting of counter shaft 5th gear is tight.
8. Remove 6 screws and take off left case plate, and then bearing set shim.

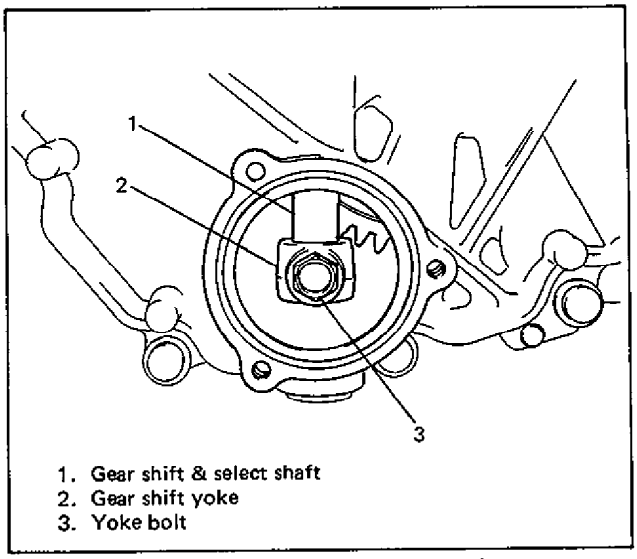


1. Plate screw
2. Left case plate
3. Countershaft 5th gear
4. Gear puller

Fig. 7A-28 Removing 5th Gear and Left Case Plate

GEAR SHIFTER, MAIN SHAFT AND COUNTERSHAFT

1. Remove 3 bolts from left case cap and then take off cap.
2. Remove gear shift yoke bolt.

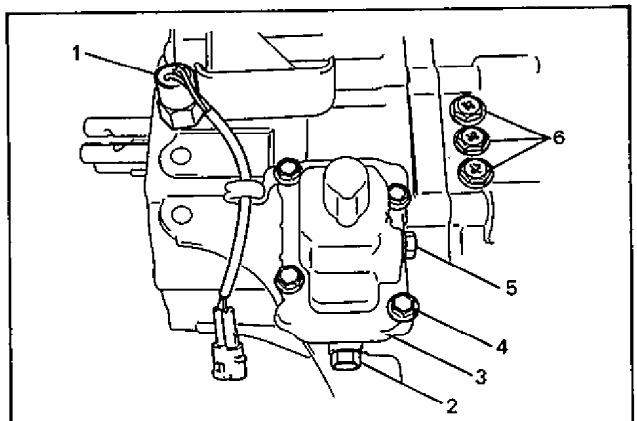


1. Gear shift & select shaft
2. Gear shift yoke
3. Yoke bolt

Fig. 7A-29 Removing Gear Shift Yoke Bolt

3. Remove 3 gear shift fork shaft bolts with washers, then take out locating springs and steel balls.
4. Remove 4 bolts from gear shift guide case, and then remove wiring harness clamp bracket and guide case.
5. Remove gear shift interlock bolt with washer.
6. Remove back up light switch.

NOTE:
Removal of 5th to REV interlock bolt is not necessary for removing gear shift & select shaft assembly.



1. Back up light switch
2. Gear shift interlock bolt
3. Gear shift guide case
4. Guide case bolt
5. 5th to REV interlock guide bolt
6. Gear shift fork shaft bolt

Fig. 7A-30 Removing Gear Shift Guide Case

7. Pull out gear shift & select shaft assembly.

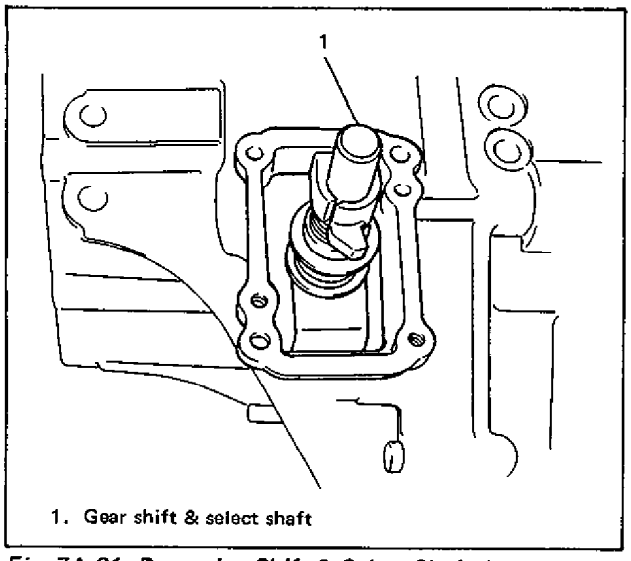


Fig. 7A-31 Removing Shift & Select Shaft Assembly

8. Remove reverse shaft bolt with washer.
9. Remove 11 case bolts from outside and another 2 from clutch housing side.

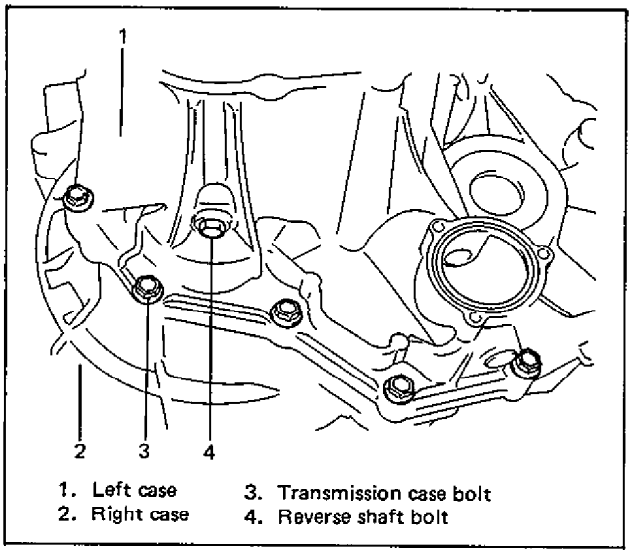


Fig. 7A-32 Removing Case Bolts

10. Tapping left case flanges with plastic hammer, remove left case.
11. Remove gear shift yoke.
12. Pull out reverse gear shaft with washer, then take off reverse idler gear.
13. Pull out 5th & REV gear shift guide shaft together with 5th & 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.

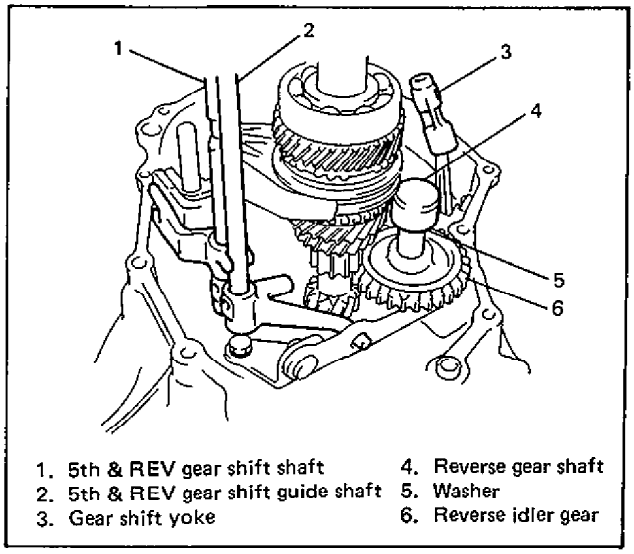


Fig. 7A-33 Removing Reverse Idler Gear

14. 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.

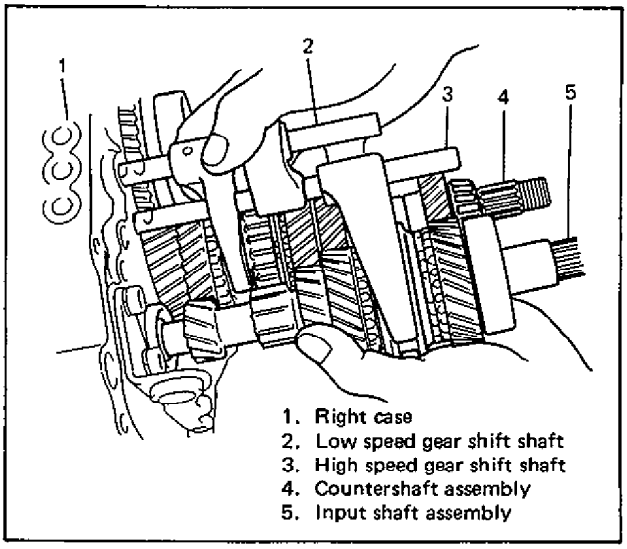


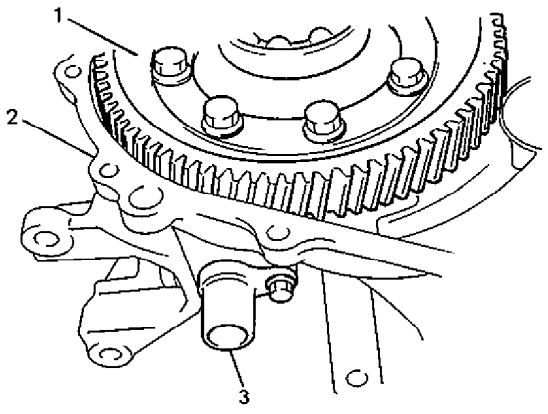
Fig. 7A-34 Removing Input and Counter Shafts

15. Remove countershaft L bearing cup from left case.
16. Remove differential side L oil seal also from left case.

RIGHT CASE

1. Remove differential gear assembly from right case.
2. 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.

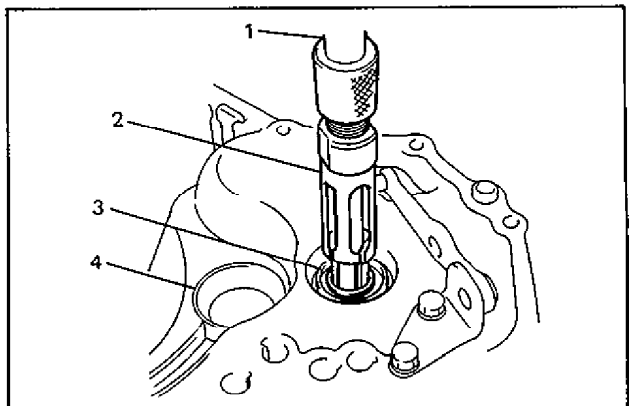


1. Differential assembly
2. Transmission right case
3. Speedometer driven gear case assembly

Fig. 7A-35 Removing Differential Assembly

3. Remove input shaft oil seal by using special tools (combination of bearing remover and sliding shaft).
4. Also pull out countershaft R bearing cup by using special tool.

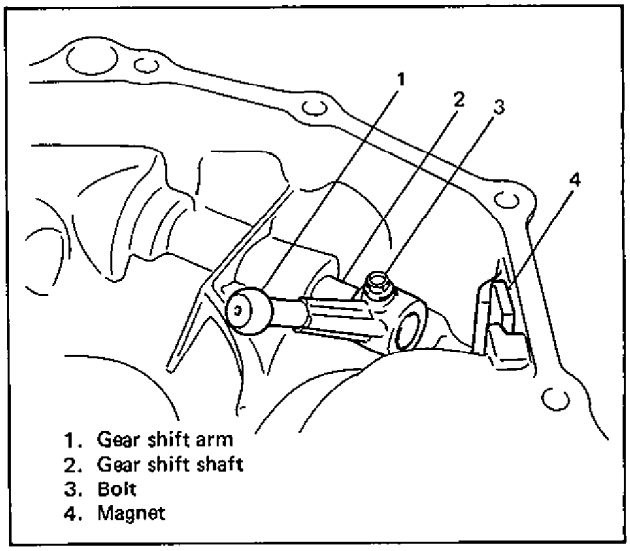
NOTE:
If input shaft R bearing has been left in right case, pull it out by using bearing remover 09923-73210 with sliding shaft 09930-30102.



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-36 Removing Input Shaft Oil Seal

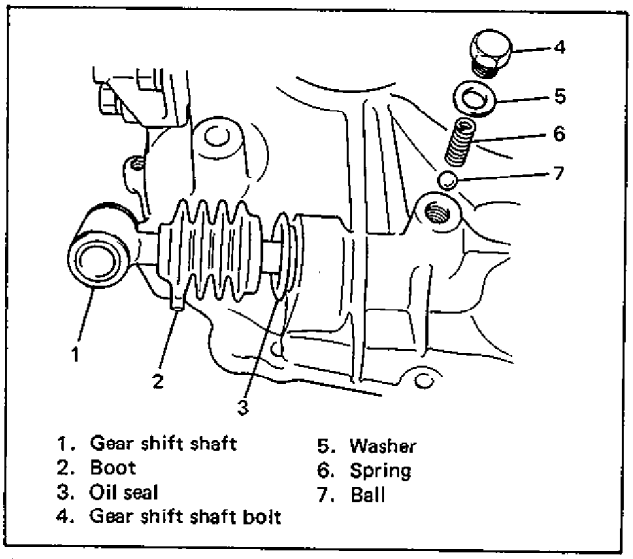
5. Take out magnet from case.
6. Remove bolt and then pull out gear shift arm.



1. Gear shift arm
2. Gear shift shaft
3. Bolt
4. Magnet

Fig. 7A-37 Removing Gear Shift Arm

7. Remove gear shift shaft bolt with washer, then take out spring and steel ball.
8. Remove gear shift shaft, boot and oil seal.



1. Gear shift shaft
2. Boot
3. Oil seal
4. Gear shift shaft bolt
5. Washer
6. Spring
7. Ball

Fig. 7A-38 Removing Gear Shift Shaft

9. Remove differential side R oil seal from right case.

SUB ASSEMBLY SERVICE

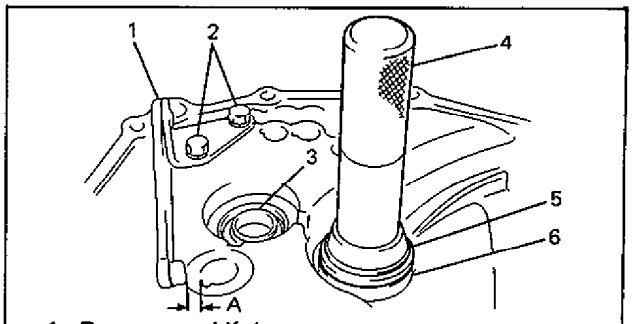
RIGHT CASE

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

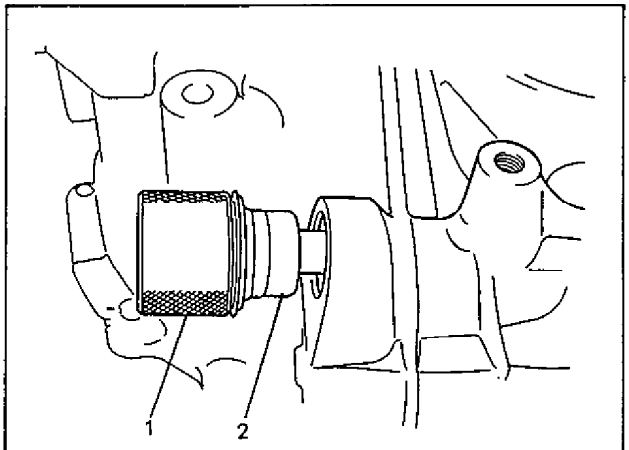


1. Reverse gear shift lever
2. Bolt (Apply thread lock 1322 99000-32110)
3. Input shaft oil seal (Use special tool: Bearing installer 09951-76010)
4. Special tool (Installer attachment 09924-74510)
5. Special tool (Bearing outer race installer 09925-68210)
6. Countershaft R bearing cup

A: Distance 5 mm/0.2 in

Fig. 7A-39 Installing Reverse Gear Shift Lever

4. Apply grease to gear shift shaft oil seal at its lip and install it up to bottom of the bore by using special tool and hammer.



1. Special tool (Oil seal installer 09925-58210)
2. Gear shift shaft oil seal

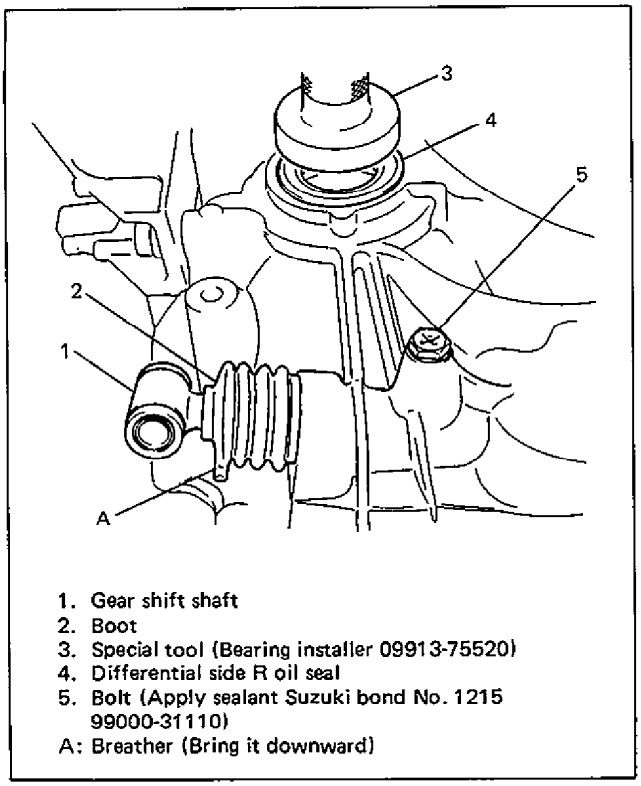
Fig. 7A-40 Installing Gear Shift Shaft Oil Seal

5. Install gear shift shaft, boot, steel ball, spring and tighten bolt with washer applied with sealant.
6. 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:

- **Bring breather of gear shift shaft boot downward.**
- **Face diff. side oil seal spring side inward.**

Tightening torque for gear shift shaft bolt	N·m	kg-m	lb-ft
	10 – 16	1.0 – 1.6	7.5 – 11.5



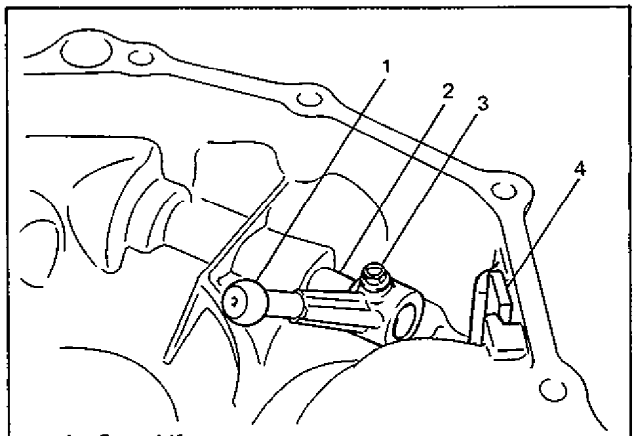
1. Gear shift shaft
2. Boot
3. Special tool (Bearing installer 09913-75520)
4. Differential side R oil seal
5. Bolt (Apply sealant Suzuki bond No. 1215 99000-31110)

A: Breather (Bring it downward)

Fig. 7A-41 Installing Gear Shift Shaft

7. Insert gear shift arm in gear shift shaft, then fasten them with bolt applied with thread lock cement.
8. Place magnet into case as it was.

Tightening torque for gear shift arm bolt	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



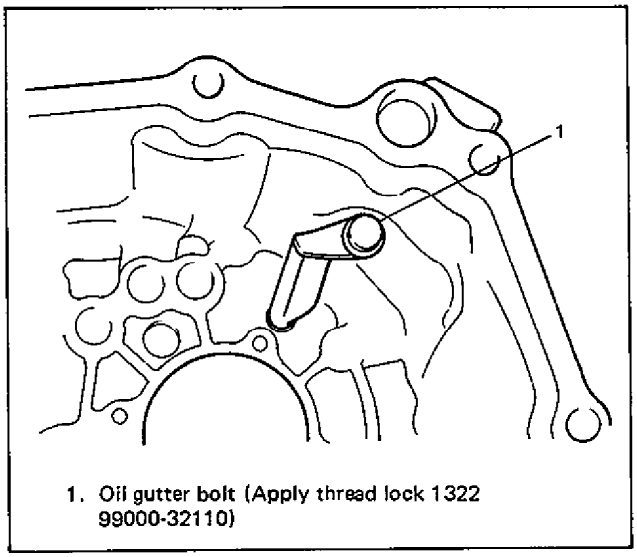
1. Gear shift arm
2. Gear shift shaft
3. Bolt (Apply thread lock 1322 99000-32110)
4. Magnet

Fig. 7A-42 Installing Gear Shift Arm

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



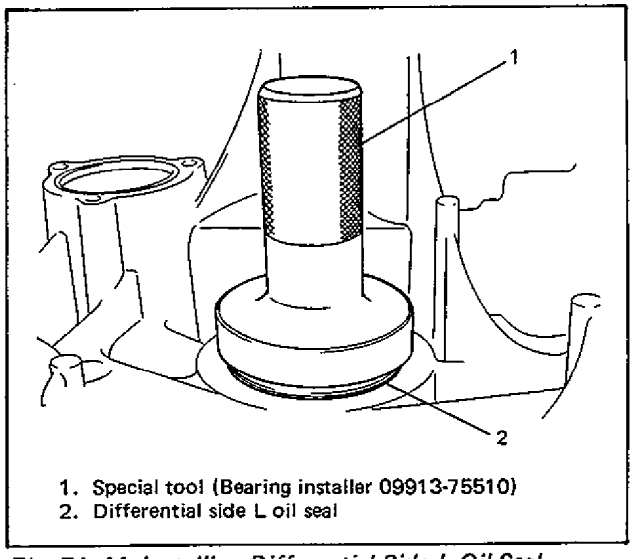
1. Oil gutter bolt (Apply thread lock 1322 99000-32110)

Fig. 7A-43 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 09913-75510)
2. Differential side L oil seal

Fig. 7A-44 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 by using bearing puller and press.

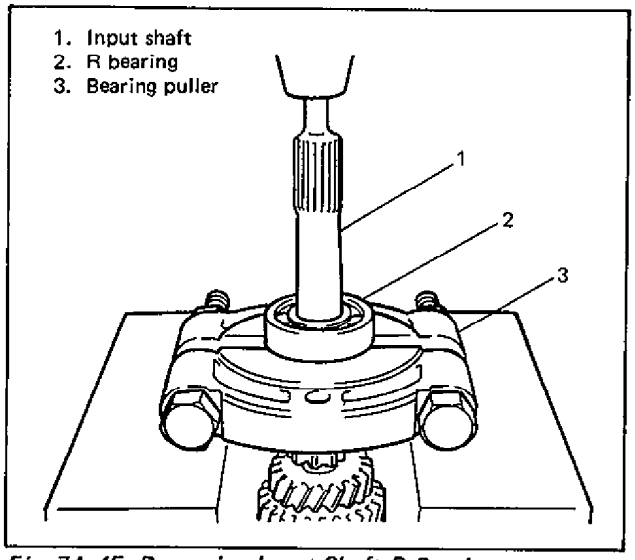


Fig. 7A-45 Removing Input Shaft R Bearing

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.**

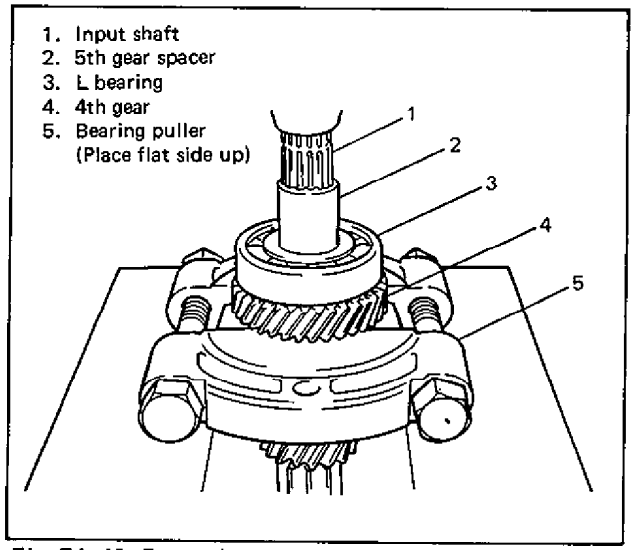


Fig. 7A-46 Removing Input Shaft L Bearing

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.

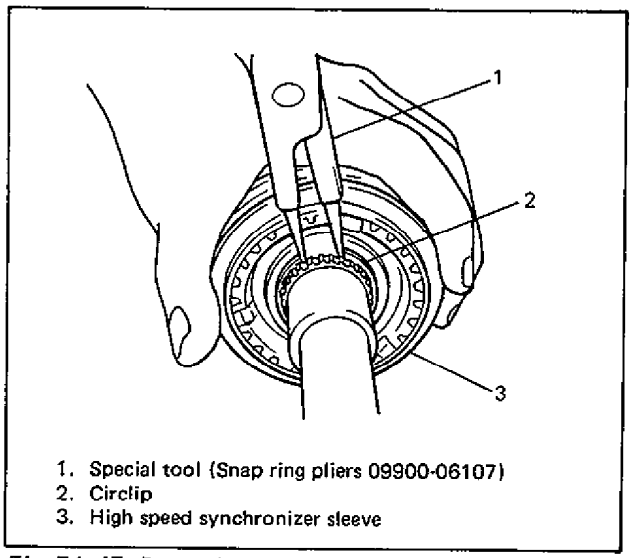


Fig. 7A-47 Removing Circlip

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.

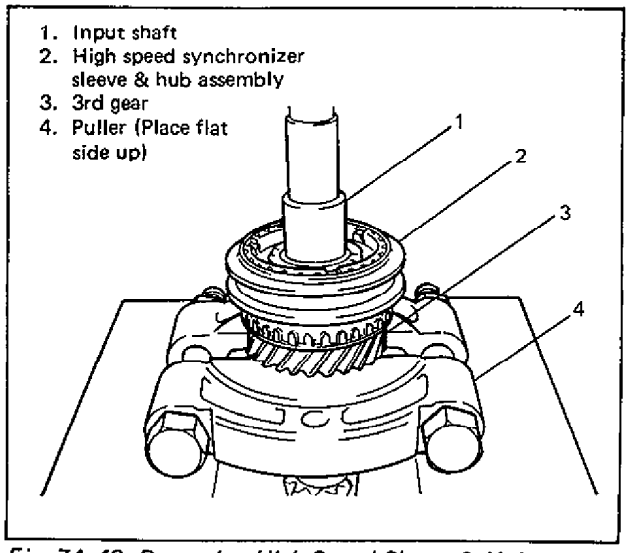


Fig. 7A-48 Removing High Speed Sleeve & Hub

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

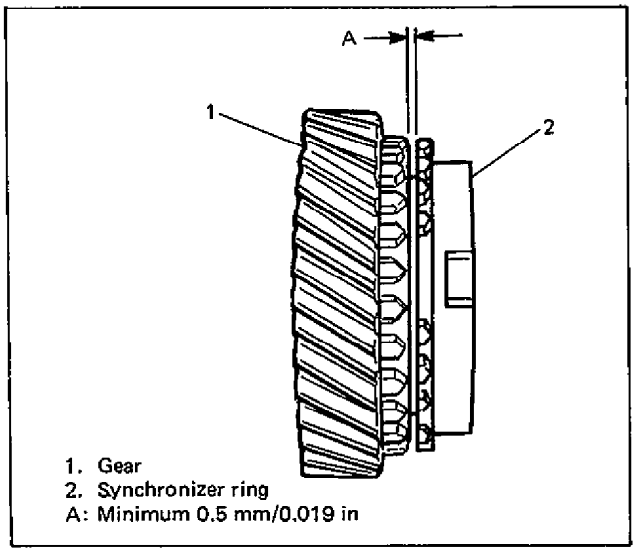


Fig. 7A-49 Checking Gear and Synchronizer Ring

3. To ensure lublication, air blow oil holes and make sure that they are free from any obstruction.

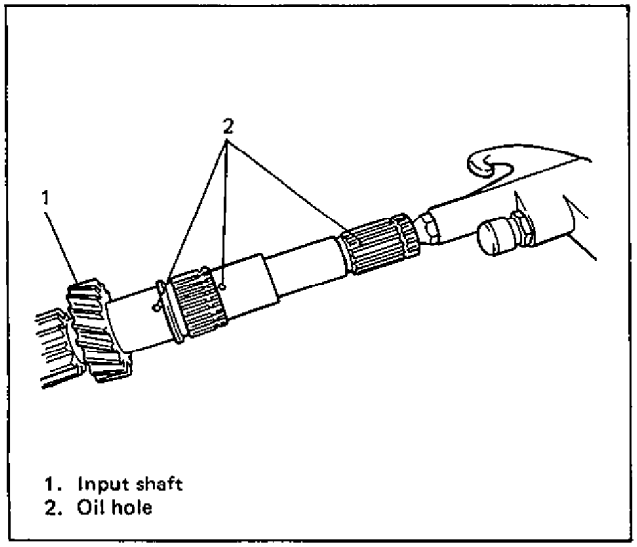


Fig. 7A-50 Air Checking Oil Holes

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.**

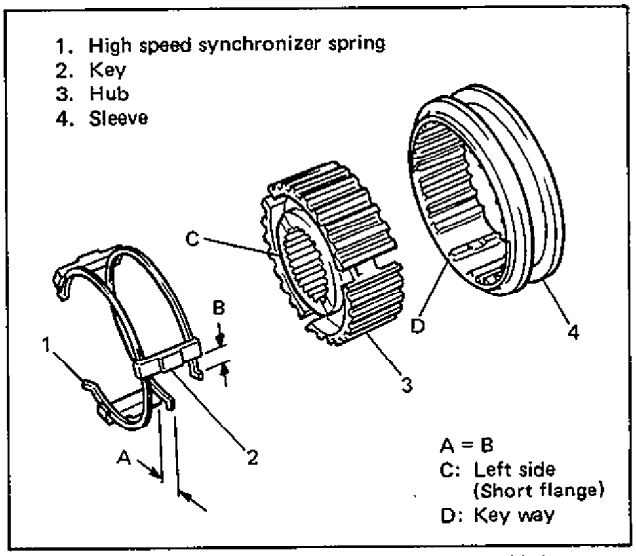


Fig. 7A-51 Assembling High Speed Sleeve & Hub

5. Drive in R bearing by using special tool and hammer.

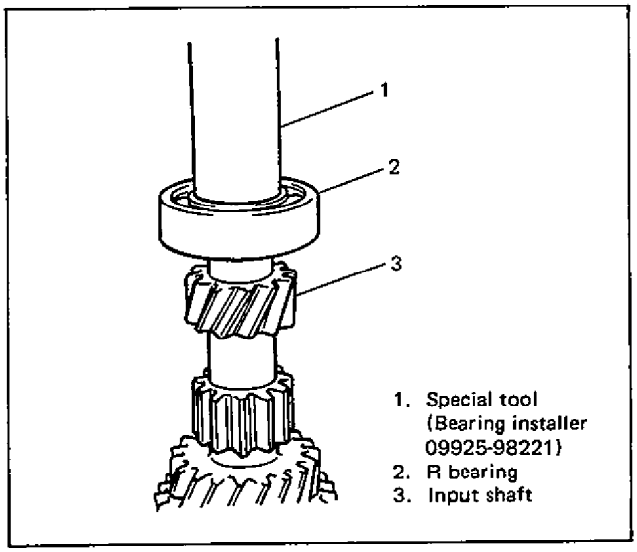
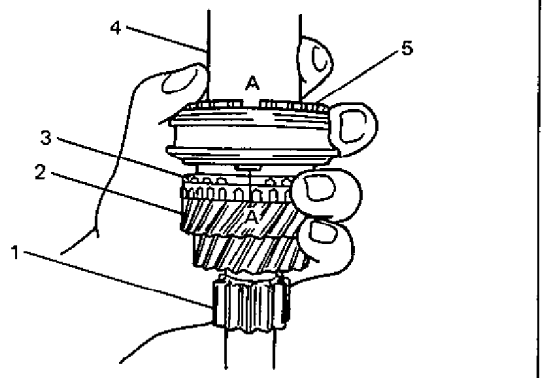


Fig. 7A-52 Press-fitting Input Shaft R Bearing

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.**



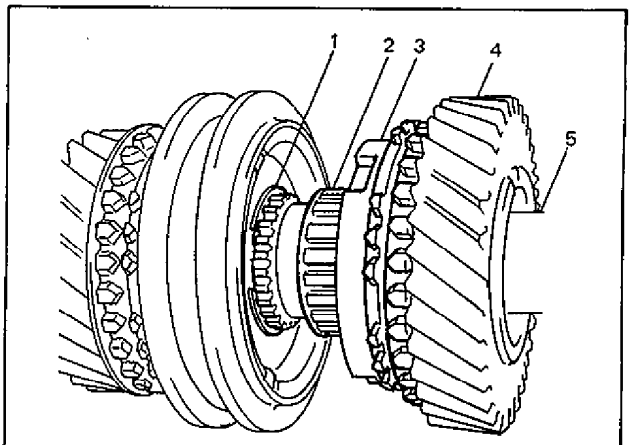
1. Input shaft
2. 3rd gear
3. Synchronizer ring
4. Special tool (Bearing installer 09913-84510)
5. Sleeve & hub assembly

A: Key way

Fig. 7A-53 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.

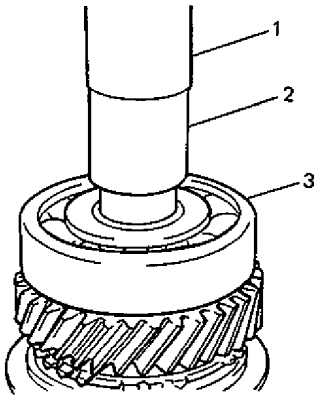


1. Circlip
2. Needle bearing
3. Synchronizer ring
4. 4th gear
5. Input shaft

Fig. 7A-54 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 09925-98221)
2. 5th gear spacer
3. L bearing (Install it first)

Fig. 7A-55 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.**

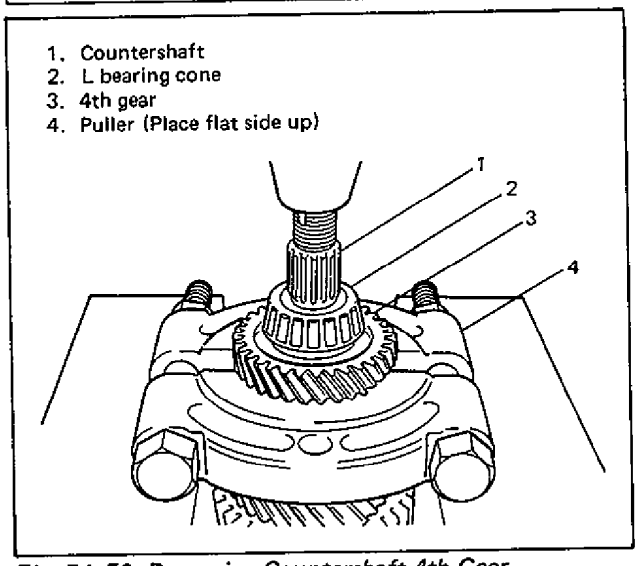


Fig. 7A-56 Removing Countershaft 4th Gear

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.

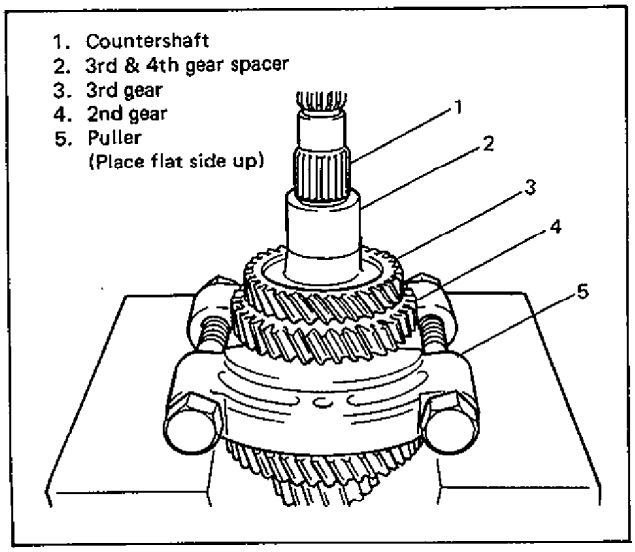


Fig. 7A-57 Removing Spacer and 3rd Gear

3. Take out 2nd synchronizer ring.
4. Using special tool, remove circlip.

NOTE:
Correct tool tips to be flat to facilitate removal of circlip.

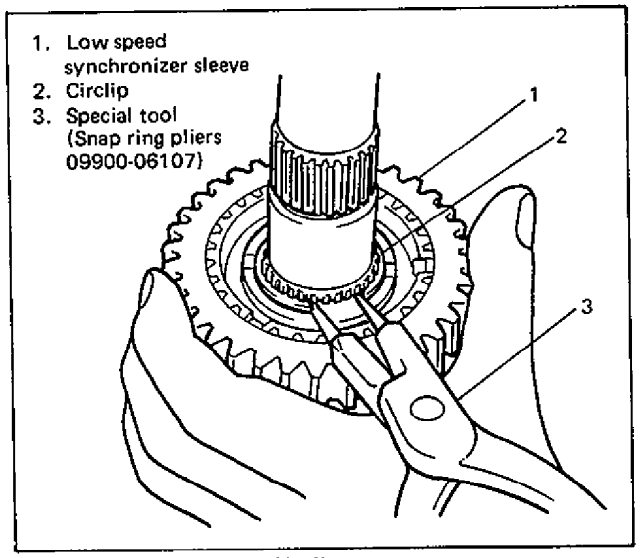


Fig. 7A-58 Removing Circlip

5. Apply puller to 1st gear and drive out low speed synchronizer sleeve & hub assembly with gear by using press.

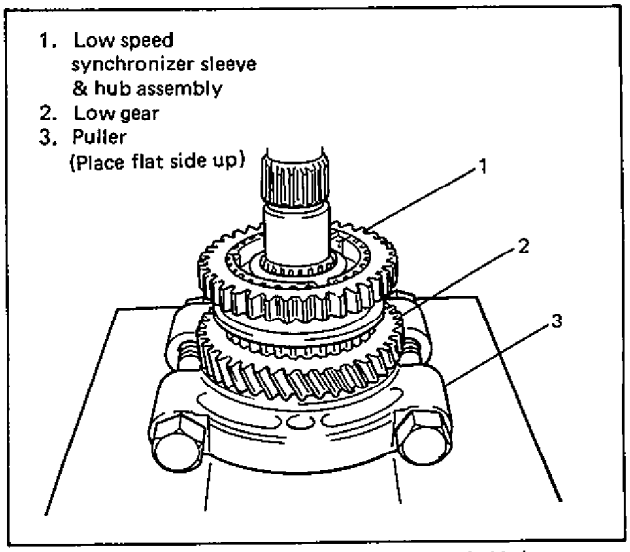


Fig. 7A-59 Removing Low Speed Sleeve & Hub

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.

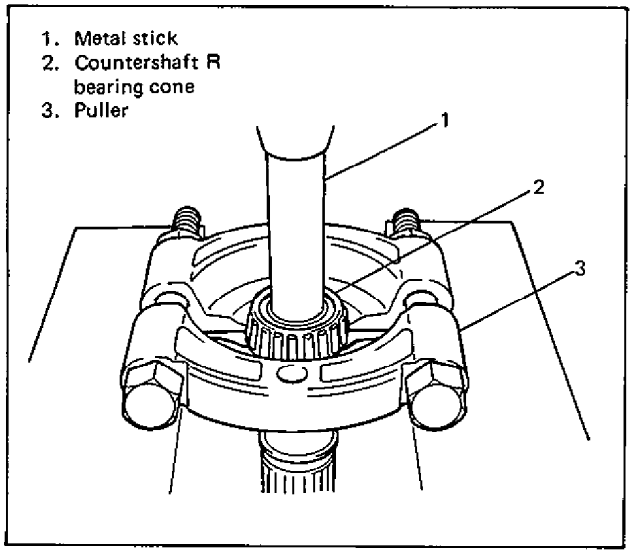


Fig. 7A-60 Removing Countershaft R Bearing Cone

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

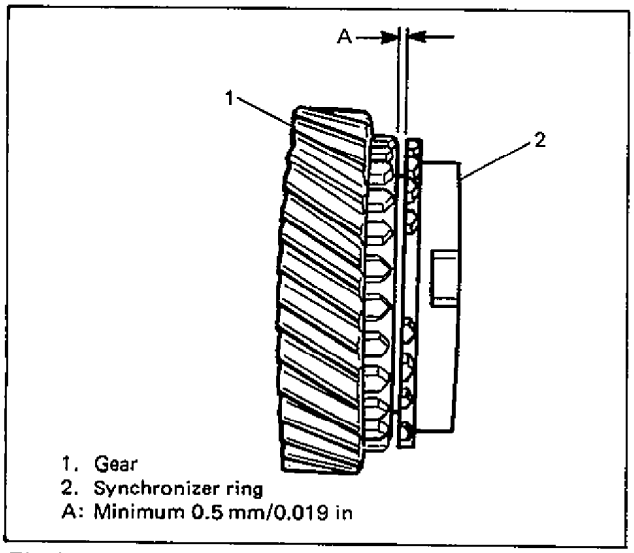


Fig. 7A-61 Checking Gear and Synchronizer Ring

3. To ensure lublication, air blow oil holes and make sure that they are free from any obstraction.

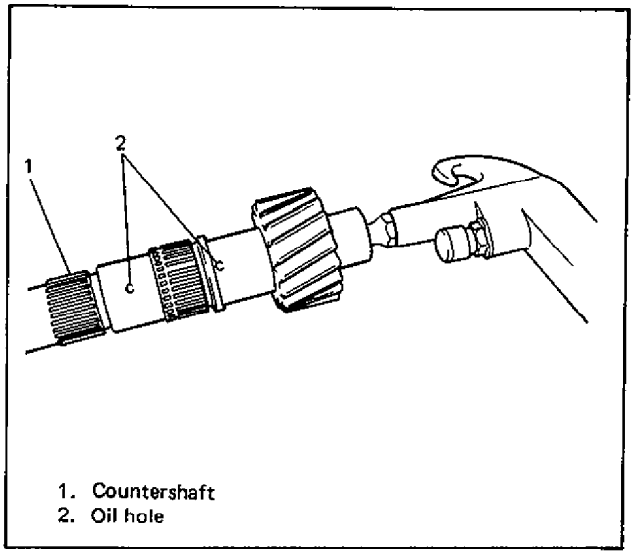


Fig. 7A-62 Air Checking Oil Holes

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.**

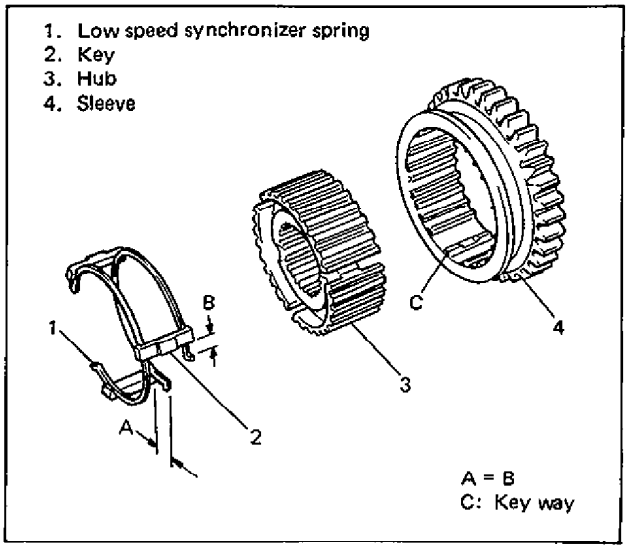
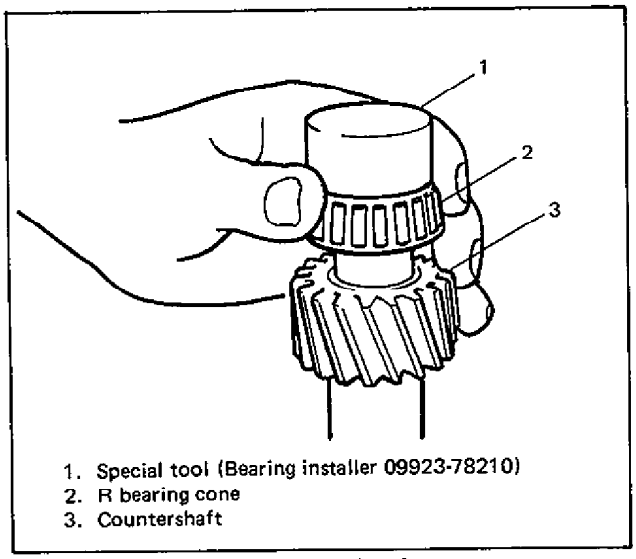


Fig. 7A-63 Assembling Low Speed Sleeve & Hub

5. Install R bearing cone by using special tool and hammer.



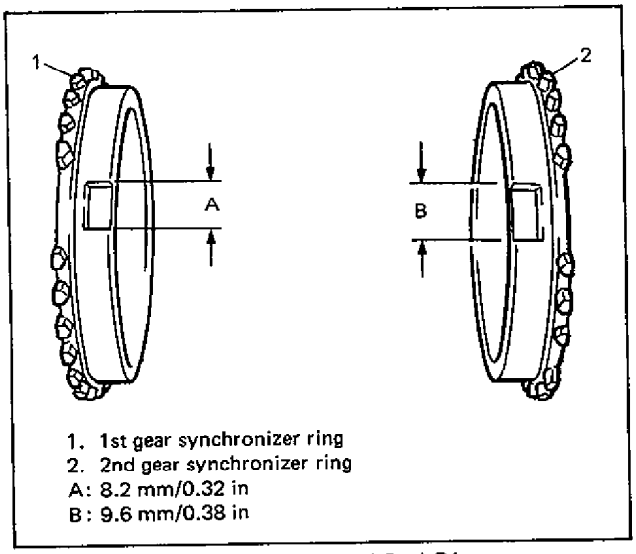
1. Special tool (Bearing installer 09923-78210)
2. R bearing cone
3. Countershaft

Fig. 7A-64 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.**



1. 1st gear synchronizer ring
2. 2nd gear synchronizer ring

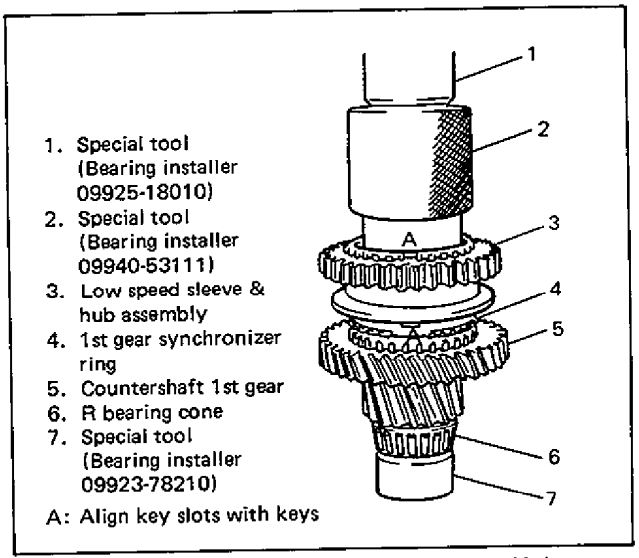
A: 8.2 mm/0.32 in
B: 9.6 mm/0.38 in

Fig. 7A-65 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.**



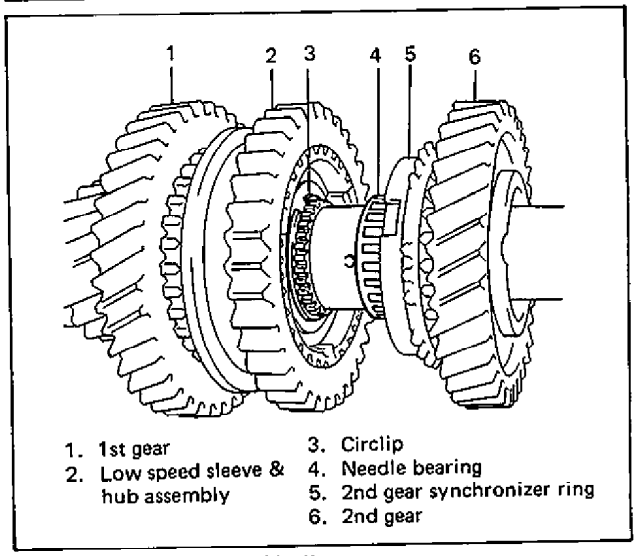
1. Special tool (Bearing installer 09925-18010)
2. Special tool (Bearing installer 09940-53111)
3. Low speed sleeve & hub assembly
4. 1st gear synchronizer ring
5. Countershaft 1st gear
6. R bearing cone
7. Special tool (Bearing installer 09923-78210)

A: Align key slots with keys

Fig. 7A-66 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.

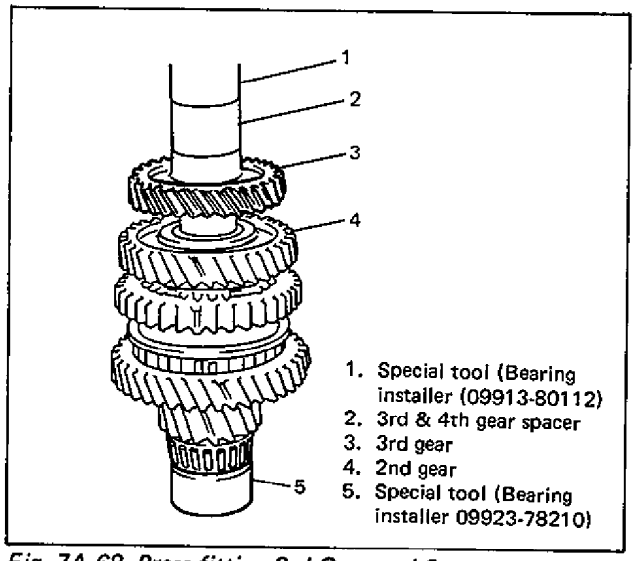


1. 1st gear
2. Low speed sleeve & hub assembly
3. Circlip
4. Needle bearing
5. 2nd gear synchronizer ring
6. 2nd gear

Fig. 7A-67 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.

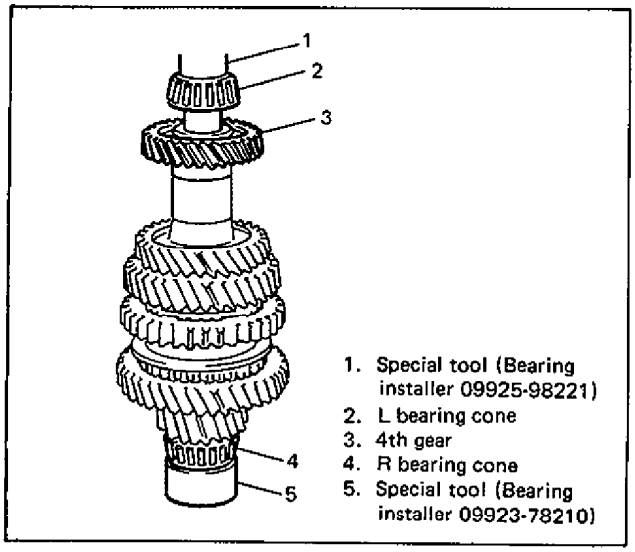


1. Special tool (Bearing installer (09913-80112)
2. 3rd & 4th gear spacer
3. 3rd gear
4. 2nd gear
5. Special tool (Bearing installer 09923-78210)

Fig. 7A-68 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.



1. Special tool (Bearing installer 09925-98221)
2. L bearing cone
3. 4th gear
4. R bearing cone
5. Special tool (Bearing installer 09923-78210)

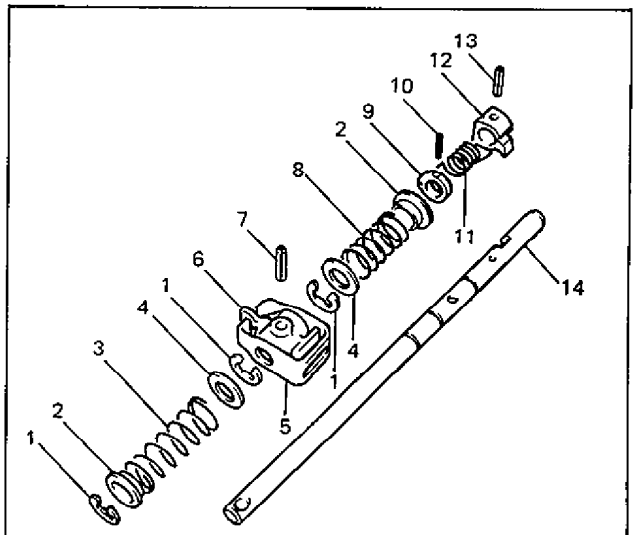
Fig. 7A-69 Press-fitting L Bearing Cone

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-70 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

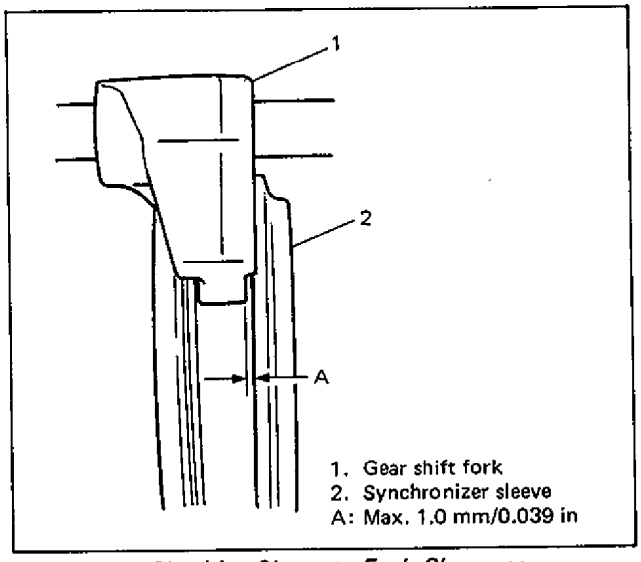


Fig. 7A-71 Checking Sleeve-to-Fork Clearance

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.**

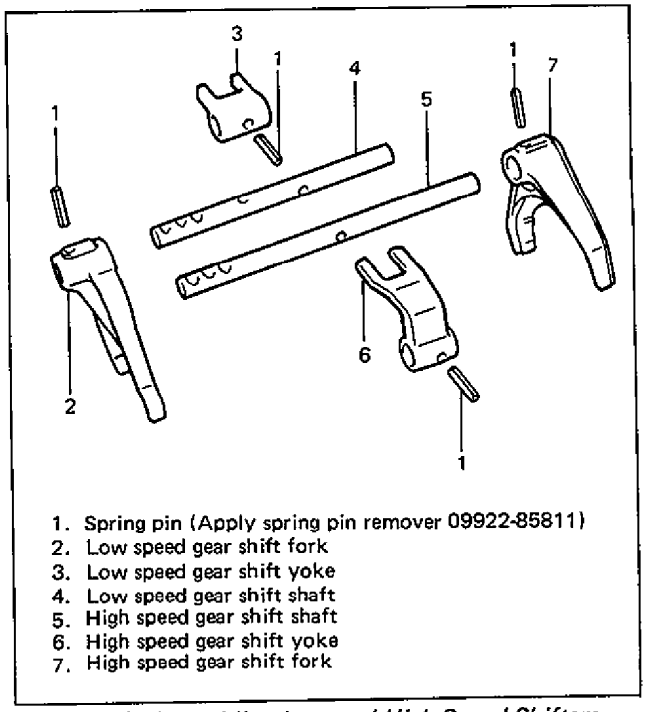
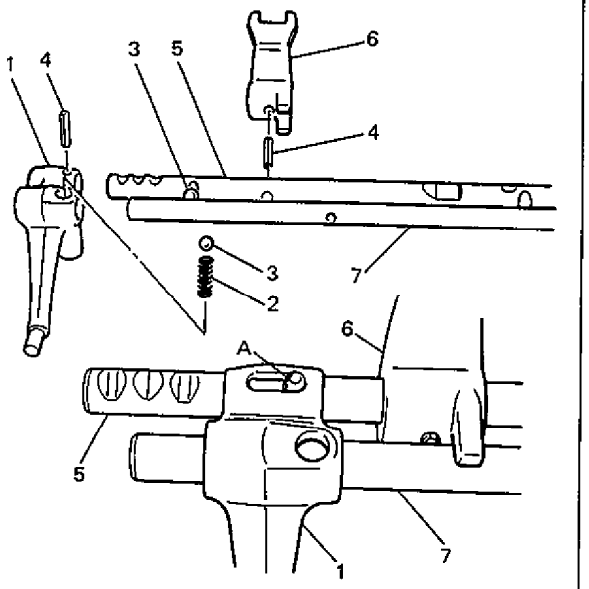


Fig. 7A-72 Assembling Low and High Speed Shifters

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:
- **Distinguish reverse gear shift arm spring (Blue) from low speed locating spring (Purple).**
- **Install 2 steel balls in reverse gear shift arm without fail.**
- **Drive in spring pin for reverse shift arm facing slit A toward front.**



1. Reverse gear shift arm
2. Reverse gear shift arm spring (Blue)
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

A: Face pin slit toward front

Fig. 7A-73 Assembling 5th & REV Shifter

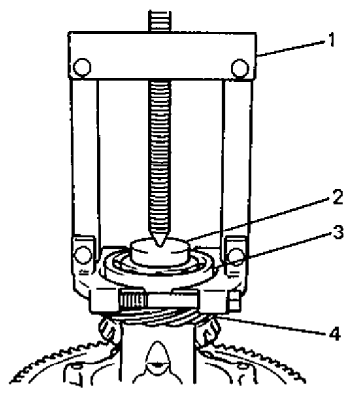
DIFFERENTIAL ASSEMBLY

Disassembly

1. Using special tool, remove R bearing.
2. Take out speedometer drive gear.

NOTE:

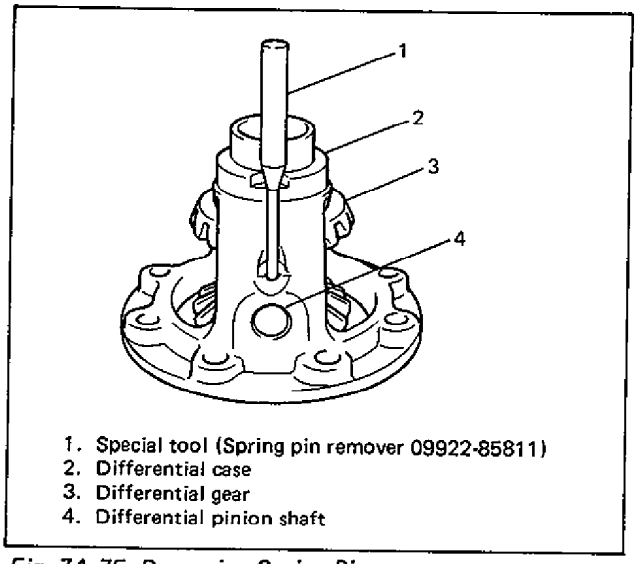
In case that half-moon type puller is used with press for bearing removal, remove final gear in advance.



1. Special tool (Bearing puller 09913-65810)
2. Special tool (Puller attachment 09925-88210)
3. R bearing
4. Speedometer drive gear

Fig. 7A-74 Removing Differential Side Bearing

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-75 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.

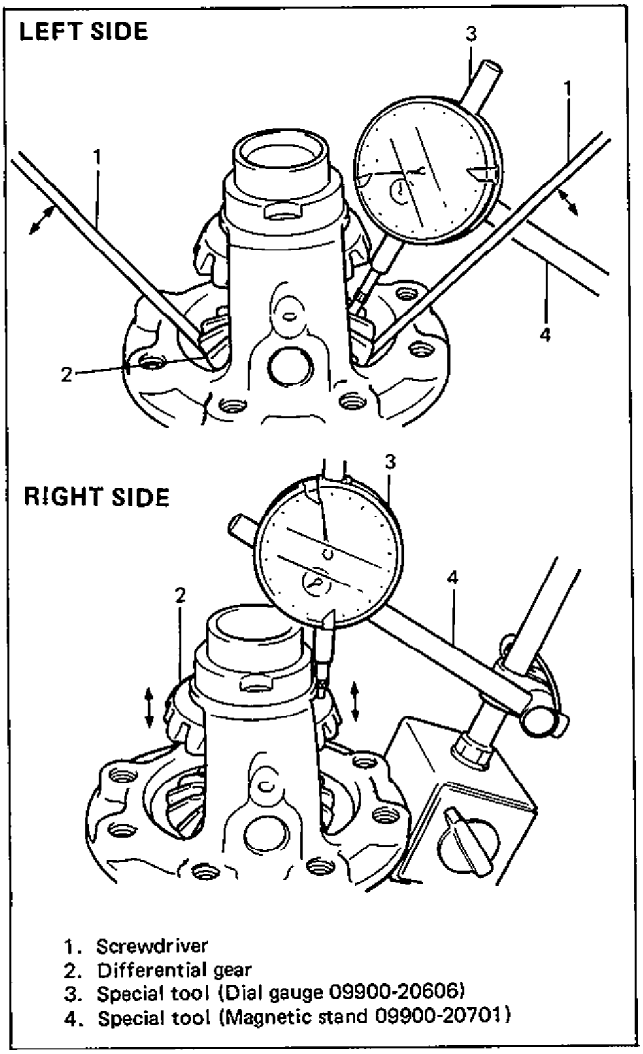
Left side

- 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



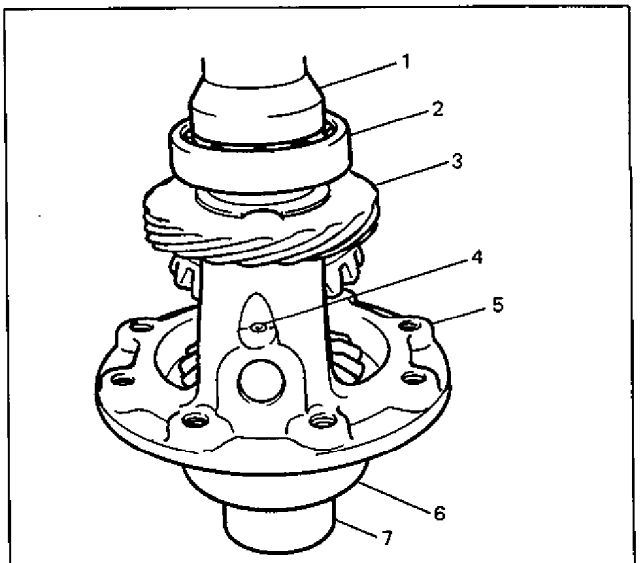
1. Screwdriver
2. Differential gear
3. Special tool (Dial gauge 09900-20606)
4. Special tool (Magnetic stand 09900-20701)

Fig. 7A-76 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.



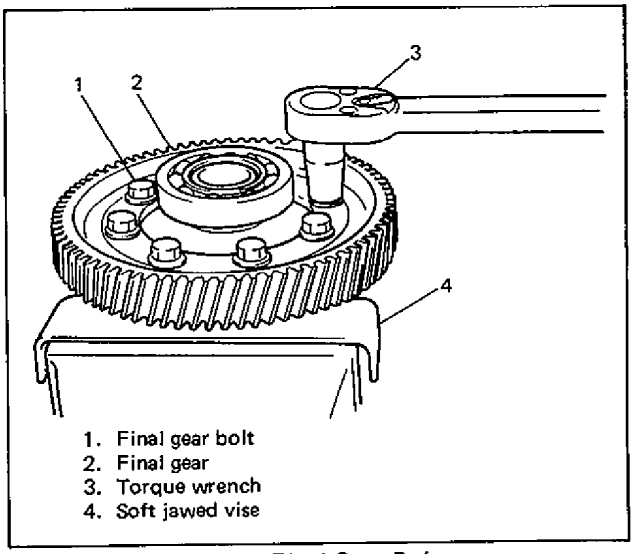
1. Special tool (Bearing installer 09951-76010)
2. Differential side R bearing
3. Speedometer drive gear
4. Differential side pinion shaft pin
5. Differential case
6. Differential side L bearing
7. Special tool (Bush remover 09951-16060)

Fig. 7A-77 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.

Tightening torque for final gear bolts	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. Soft jawed vise

Fig. 7A-78 Tightening Final Gear Bolts

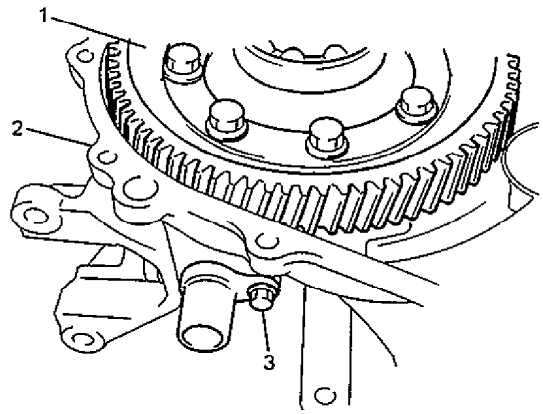
ASSEMBLING UNIT

DIFFERENTIAL TO LEFT CASE

1. Install differential assembly into right case.
2. 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

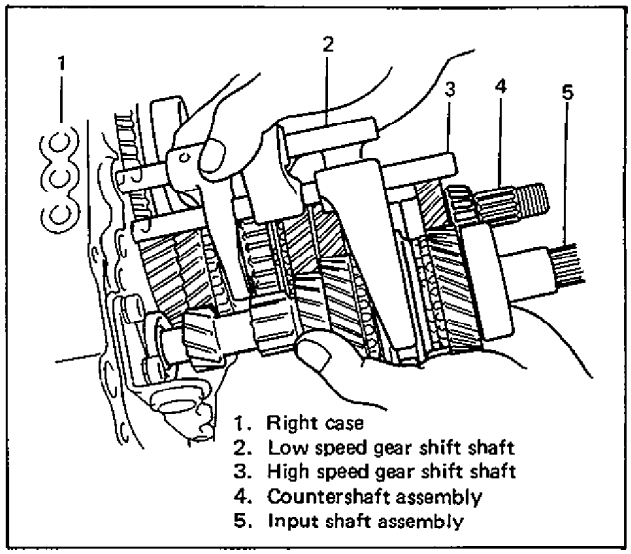


1. Differential assembly
2. Transmission right case
3. Speedometer driven gear case bolt

Fig. 7A-79 Installing Differential Assembly

3. Join input shaft, countershaft, low speed gear shift shaft and high speed gear shift shaft assemblies all together, then install them into right case.

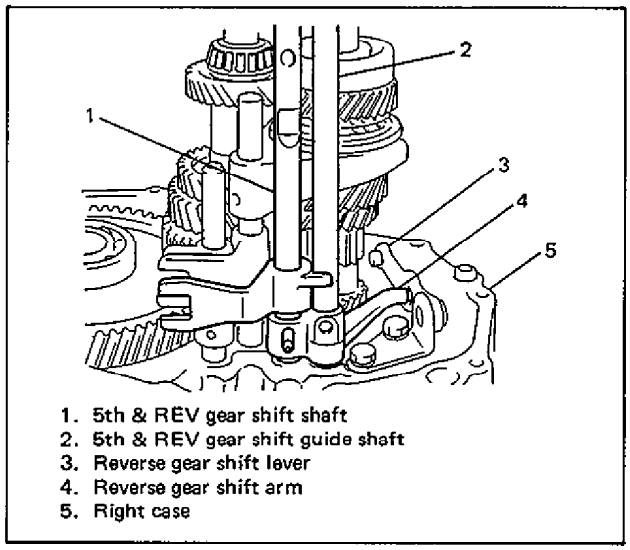
NOTE:
- **Input shaft R bearing on shaft can be installed into right case by tapping shaft with plastic hammer.**
- **Check to make sure that counter shaft is engaged with final gear while installing.**



1. Right case
2. Low speed gear shift shaft
3. High speed gear shift shaft
4. Countershaft assembly
5. Input shaft assembly

Fig. 7A-80 Installing Input Shaft and Countershaft

4. 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.

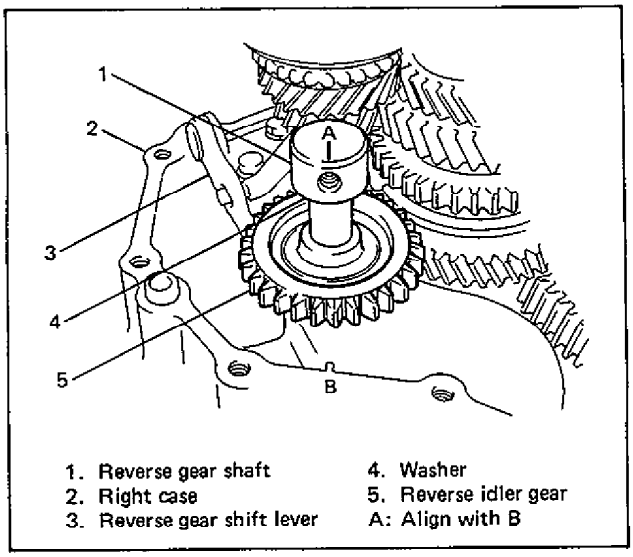


1. 5th & REV gear shift shaft
2. 5th & REV gear shift guide shaft
3. Reverse gear shift lever
4. Reverse gear shift arm
5. Right case

Fig. 7A-81 Installing 5th & REV Shifter

5. 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.

NOTE:
- **Make sure that washer has been installed in shaft at above the gear.**
- **Check to confirm that reverse gear shift lever end has clearance 1 mm (0.04 in) to idler gear groove.**

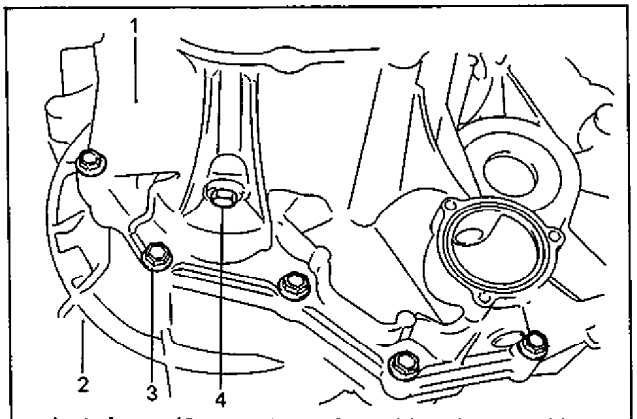


1. Reverse gear shaft
2. Right case
3. Reverse gear shift lever
4. Washer
5. Reverse idler gear
A: Align with B

Fig. 7A-82 Aligning Reverse Gear Shaft

6. Clean mating surfaces of both right and left cases, coat mating surface of left case with sealant evenly then mate it with right case.
7. Tighten case with 11 bolts from outside to specified torque.
8. Install reverse shaft bolt with aluminum washer and tighten it.

Tightening torque	N-m	kg-m	lb-ft
Case bolt	15 – 22	1.5 – 2.2	11.0 – 15.5
Reverse shaft bolt	10 – 18	1.0 – 1.8	7.5 – 13.0



1. Left case (Coat mating surface with sealant Suzuki bond No. 1215 99000-31110)
2. Right case
3. Case bolt
4. Reverse shaft bolt

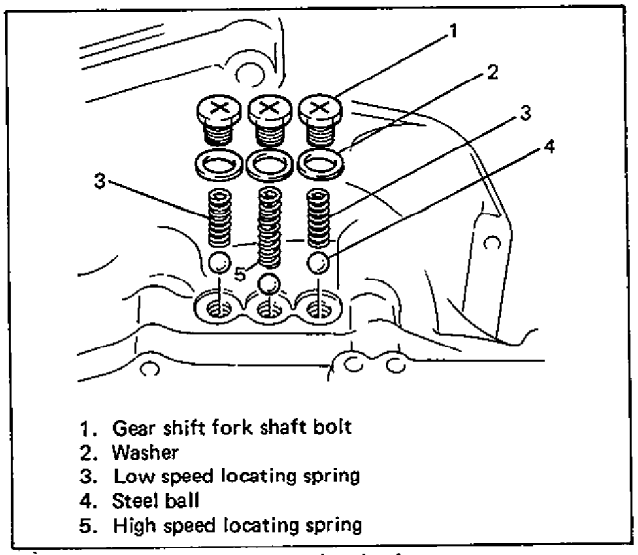
Fig. 7A-83 Fastening Case Bolts

9. Install another 2 case bolts from clutch housing side and tighten them to specification.

10. Check locating springs for deterioration and replace with new ones as necessary.
11. Install steel ball and locating spring for respective gear shift shaft and tighten with bolt.

Locating spring free length	Standard	Service limit
Low speed (Purple)	26.1 mm 1.028 in	25.0 mm 0.984 in
High speed	40.1 mm 1.579 in	39.0 mm 1.535 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

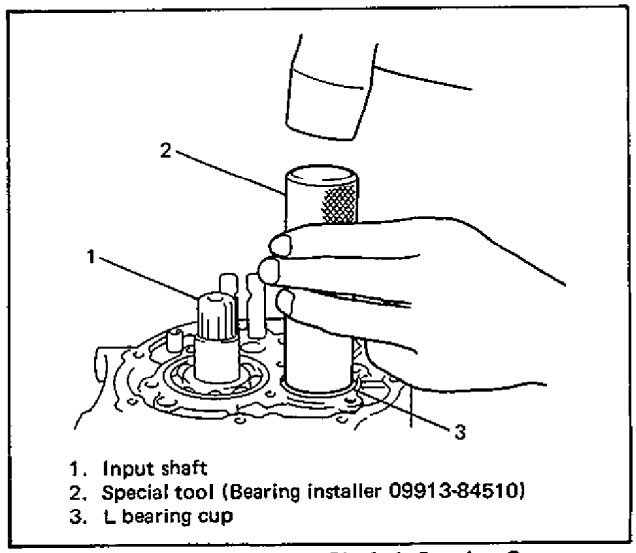


1. Gear shift fork shaft bolt
2. Washer
3. Low speed locating spring
4. Steel ball
5. High speed locating spring

Fig. 7A-84 Installing Locating Springs

FIFTH GEARS

1. To seat countershaft L bearing cup to bearing cone, tap cup by using special tool and plastic hammer.



1. Input shaft
2. Special tool (Bearing installer 09913-84510)
3. L bearing cup

Fig. 7A-85 Seating Counter Shaft L Bearing Cup

2. Put a shim on bearing cup 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 cup.

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	0.40, 0.45, 0.50, 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 0.015, 0.017, 0.019, 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

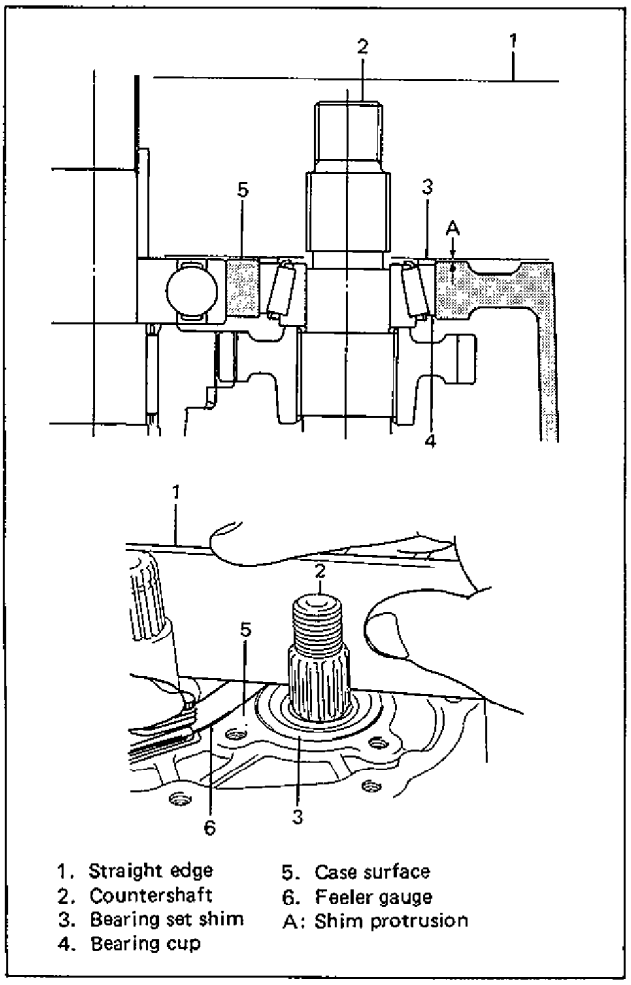


Fig. 7A-86 Selecting Bearing Set Shim

4. Place left case plate inserting its end in groove of shift guide shaft and then tighten it with 6 screws applied with thread lock cement.

NOTE:
After tightening screws, make sure that counter shaft can be rotated by hand feeling some load.

Tightening torque for left case plate screws	N·m	kg-m	lb-ft
	6 – 7	0.6 – 0.7	4.5 – 5.0

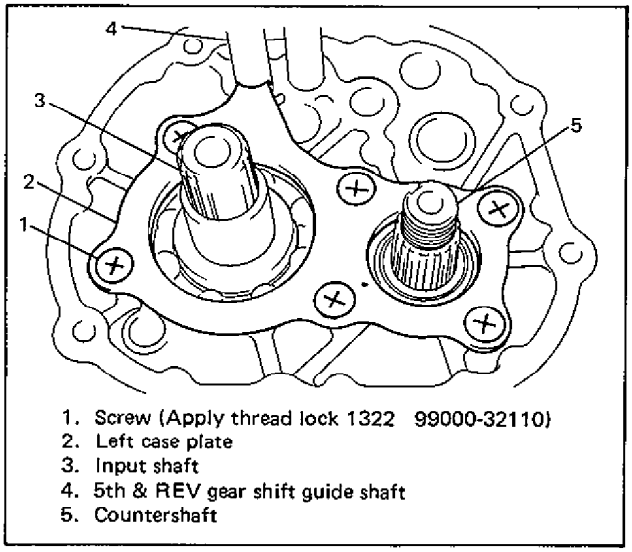


Fig. 7A-87 Fastening Left Case Plate Screw

5. 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).

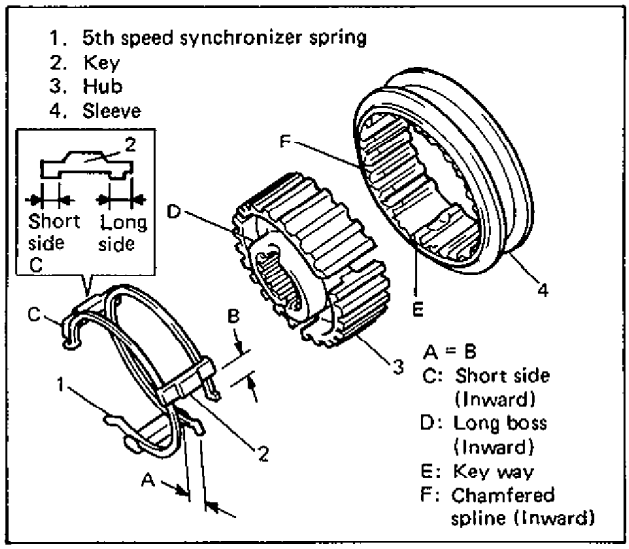
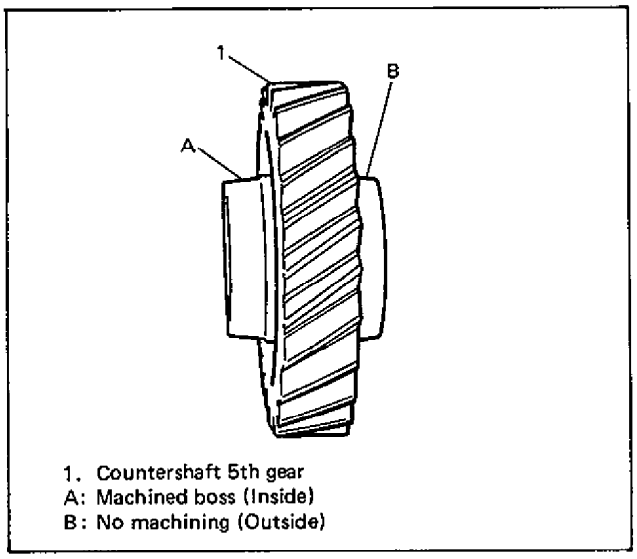


Fig. 7A-88 Assembling 5th Speed Sleeve & Hub

6. Install 5th gear to counter shaft facing machined boss A inward.

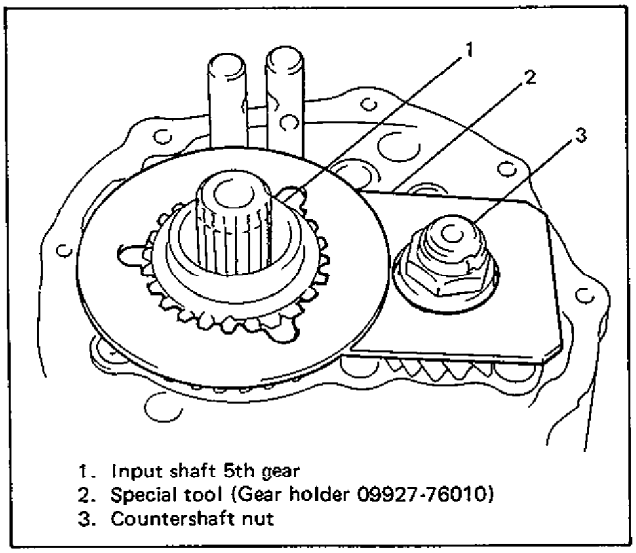


1. Countershaft 5th gear
A: Machined boss (Inside)
B: No machining (Outside)

Fig. 7A-89 Counter Shaft 5th Gear

7. Install needle bearing to input shaft, apply oil then install 5th gear and special tool to stop shaft rotation.
8. Install 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



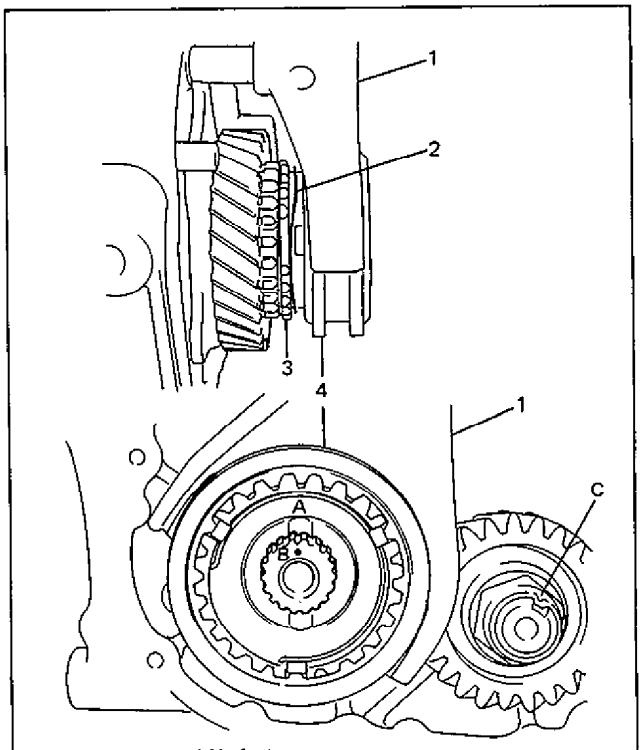
1. Input shaft 5th gear
2. Special tool (Gear holder 09927-76010)
3. Countershaft nut

Fig. 7A-90 Tightening Countershaft Nut

9. Remove special tool, then caulk nut at C with caulking tool and hammer.
10. Install synchronizer ring then ring spring.
11. Fit 5th gear shift fork to sleeve & hub assembly and install them into input shaft, shift shaft and shift guide shaft at once aligning hub oil groove A with shaft mark B.

NOTE:
Long boss of hub faces inward (gear side).

CAUTION:
Be careful not to pinch synchronizer ring spring by hub.



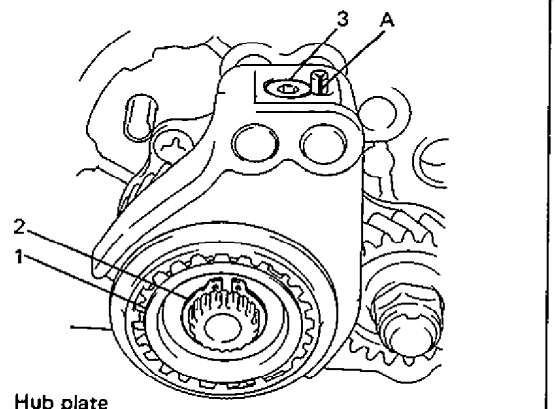
1. 5th gear shift fork
2. Synchronizer ring spring
3. 5th speed synchronizer ring
4. Sleeve & hub assembly
A: Oil groove (Align with B)
B: Punch mark (Shows oil hole)
C: Caulking

Fig. 7A-91 Installing 5th Speed Sleeve & Hub

12. Drive in spring pin facing its slit A outward.
13. Install steel ball, tighten shift fork plug applied with thread lock cement.
14. Fit hub plate and fix it with circlip.

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 shift fork plug	N·m	kg-m	lb-ft
	10 – 15	1.0 – 1.5	7.5 – 10.5



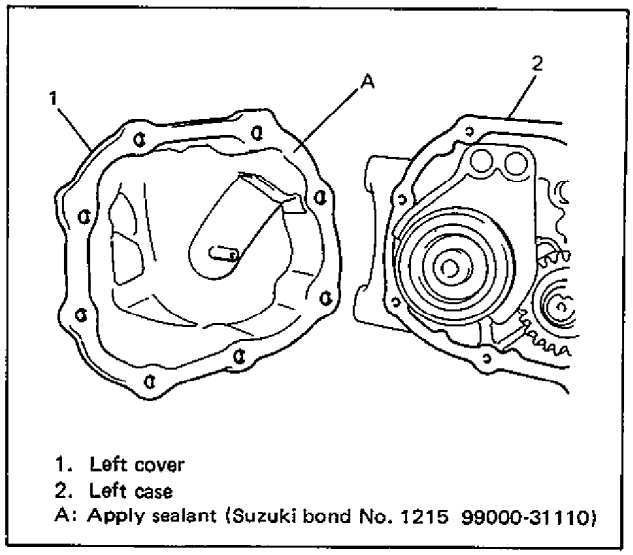
1. Hub plate
2. Circlip
3. Shift fork plug (Place steel ball inside and apply thread lock 1322 99000-32110 to thread)

A: Pin slit (Face outward)

Fig. 7A-92 Installing Circlip

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 8 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

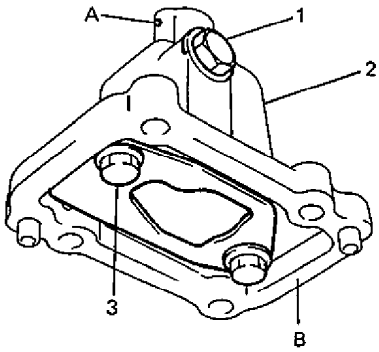
A: Apply sealant (Suzuki bond No. 1215 99000-31110)

Fig. 7A-93 Installing Side Cover

GEAR SHIFT & SELECT SHAFT ASSEMBLY

1. If gear shift guide case has been disassembled or replaced, tighten bolts as specified below. Also air check breather hole A.
2. Clean mating surface of guide case and coat it with sealant evenly.

Tightening torque	N·m	kg-m	lb-ft
Gear shift case plate bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
5th to REV interlock guide bolt	18 – 28	1.8 – 2.8	13.5 – 20.0



1. 5th to REV interlock guide bolt
2. Gear shift guide case
3. Gear shift case plate bolt

A: Breather (Air blow)

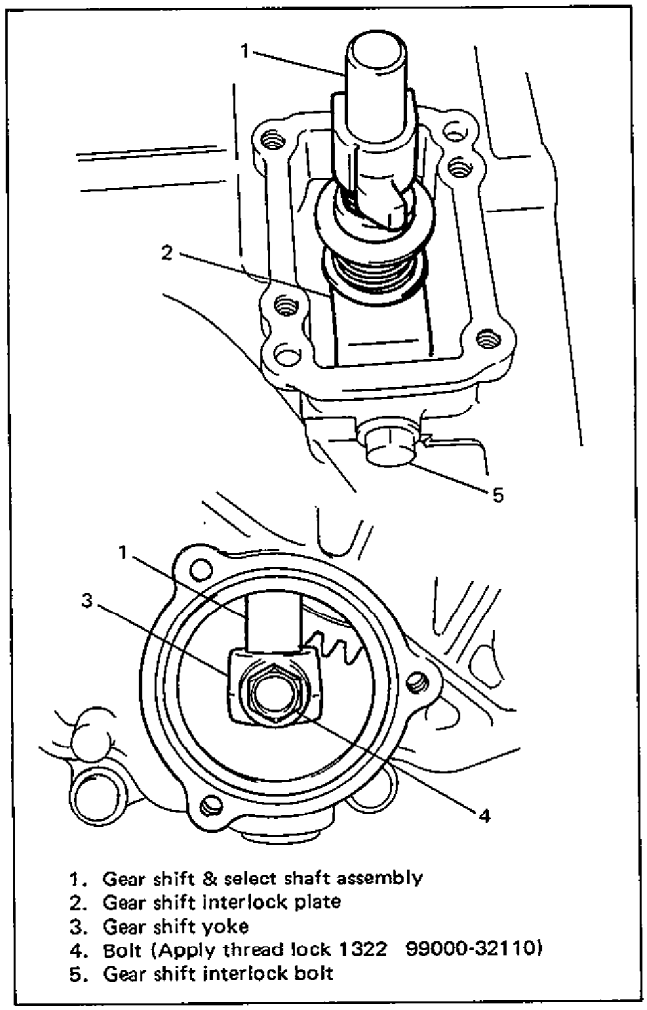
B: Apply sealant (Suzuki bond No. 1215 99000-31110)

Fig. 7A-94 Assembling Gear Shift Guide Case

3. Install gear shift yoke and join it with gear shift arm.
4. Install gear shift & select shaft assembly into transmission and join its bottom end with gear shift yoke.
5. Tighten yoke and shaft with bolt applied with thread lock cement.
6. 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 yoke bolt • Gear shift interlock bolt	18 – 28	1.8 – 2.8	13.5 – 20.0

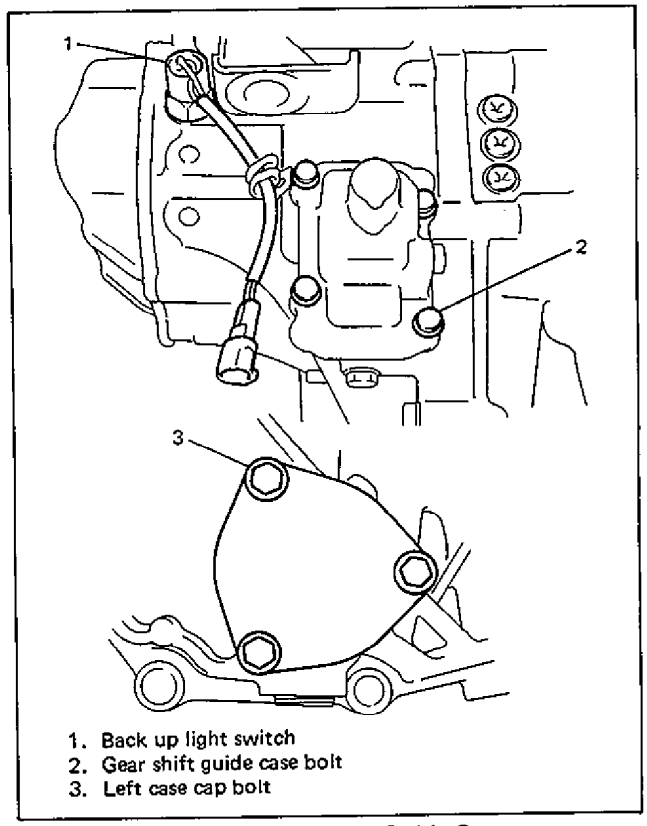


1. Gear shift & select shaft assembly
2. Gear shift interlock plate
3. Gear shift yoke
4. Bolt (Apply thread lock 1322 99000-32110)
5. Gear shift interlock bolt

Fig. 7A-95 Installing Gear Shift & Select Shaft

7. Clean mating surface of left case and put gear shift guide case applied with sealant on it.
8. Place wiring harness clamp bracket and fasten it together with gear shift guide case.
9. Install back up light switch and clamp its lead.
10. Clean left case cap and mating surface of left case, check condition of O ring and then fasten cap with 3 bolts.

Tightening torque	N·m	kg-m	lb-ft
• Gear shift guide case bolts • Left case cap bolts	8 – 12	0.8 – 1.2	6.0 – 8.5
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
3. Left case cap bolt

Fig. 7A-96 Installing Gear Shift Guide Case

11. Check input shaft for rotation in each gear position.
12. Also confirm function of back up light switch in reverse position by using ohmmeter.

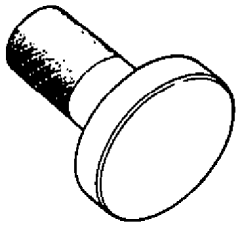
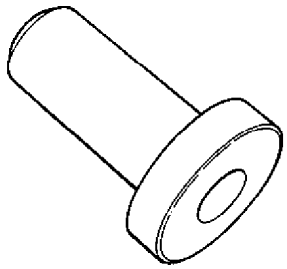
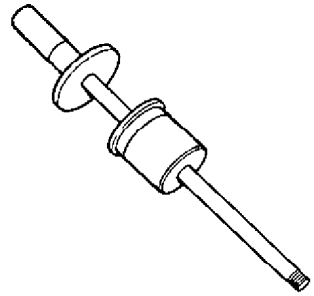
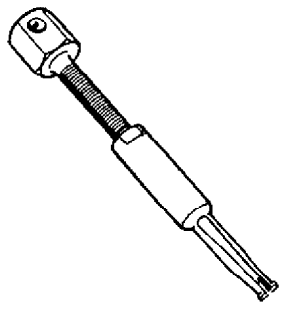
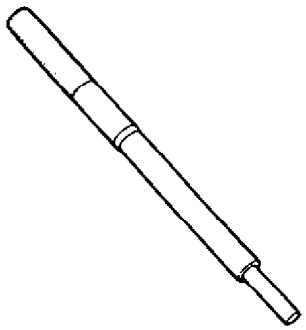
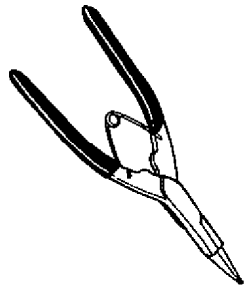
RECOMMENDED TORQUE SPECIFICATIONS

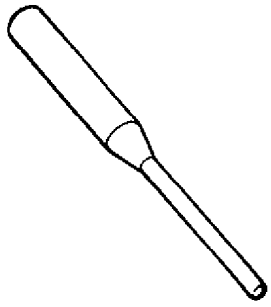
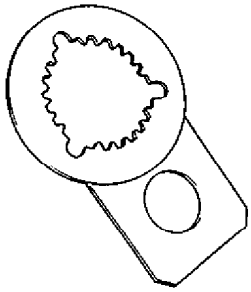
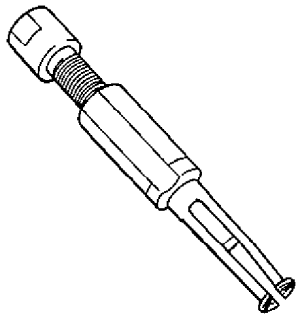
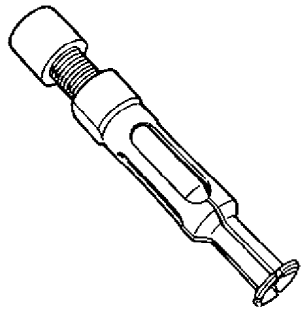
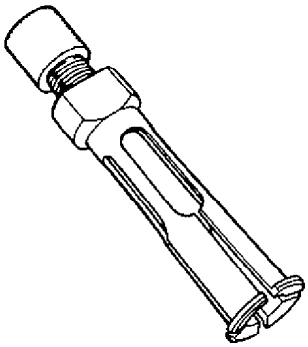
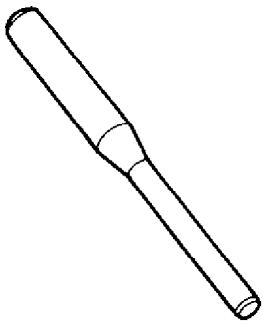
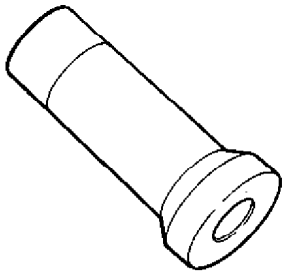
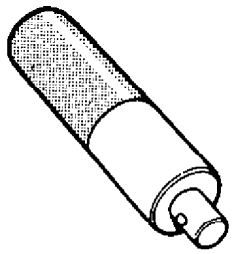
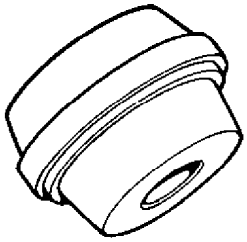
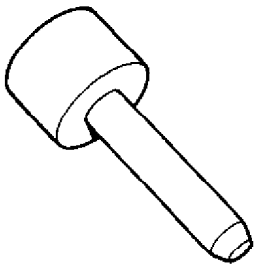
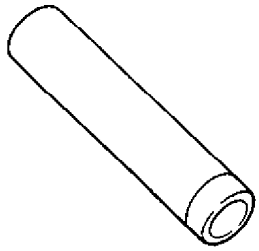
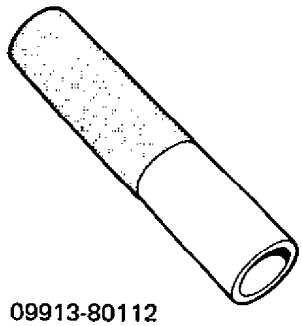
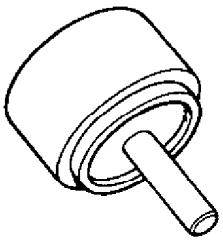
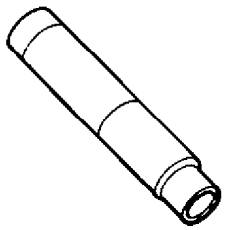
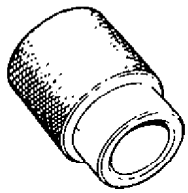
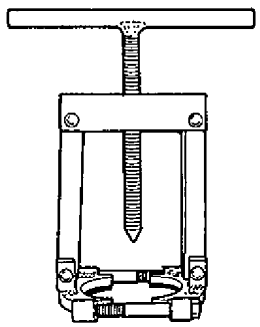
Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Oil filler/level plug	36 – 54	3.6 – 5.4	26.5 – 39.0
2. Oil drain plug	25 – 30	2.5 – 3.0	18.5 – 21.5
3. Ball stud bolt and nut	50 – 70	5.0 – 7.0	36.5 – 50.5
4. Gear shift control housing nuts for boot cover	3 – 6	0.3 – 0.6	2.5 – 4.0
5. Housing nuts for control housing	15 – 20	1.5 – 2.0	11.0 – 14.0
6. Guide plate bolts	8 – 10	0.8 – 1.0	6.0 – 7.0
7. Control housing nuts	25 – 40	2.5 – 4.0	18.5 – 28.5
8. Extension rod stud bolt	15 – 20	1.5 – 2.0	11.0 – 14.0
9. Extension rod nut	25 – 40	2.5 – 4.0	18.5 – 28.5
10. Gear shift control shaft bolts and nuts	15 – 20	1.5 – 2.0	11.0 – 14.0
11. Speedometer driven gear case bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
12. Transmission to engine bolts and nuts	40 – 60	4.0 – 6.0	29.0 – 43.0
13. Engine rear mounting bracket bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
14. Engine mounting LH bracket bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
15. Exhaust pipe to manifold nuts	40 – 60	4.0 – 6.0	29.0 – 43.0
16. Center bearing support bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
17. Extension rod nut	25 – 40	2.5 – 4.0	18.5 – 28.5
18. Reverse gear shift lever bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
19. Gear shift arm bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
20. Oil gutter bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
21. Final gear bolts	80 – 90	8.0 – 9.0	58.0 – 65.0
22. Transmission case bolts	15 – 22	1.5 – 2.2	11.0 – 15.5
23. Reverse shaft bolt	10 – 18	1.0 – 1.8	7.5 – 13.0
24. Gear shift fork shaft bolts	10 – 16	1.0 – 1.6	7.5 – 11.5
25. Left case plate screws	6 – 7	0.6 – 0.7	4.5 – 5.0
26. Counter shaft nut	60 – 80	6.0 – 8.0	43.5 – 57.5
27. 5th shift fork plug	10 – 15	1.0 – 1.5	7.5 – 10.5
28. Left cover bolts	8 – 12	0.8 – 1.2	6.0 – 8.5
29. Gear shift case plate bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
30. 5th to REV interlock guide bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
31. Gear shift yoke bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
32. Gear shift interlock bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
33. Gear shift guide case bolts	8 – 12	0.8 – 1.2	6.0 – 8.5
34. Left case cap bolts	8 – 12	0.8 – 1.2	6.0 – 8.5
35. Back up light switch	16 – 23	1.6 – 2.3	12.0 – 16.5

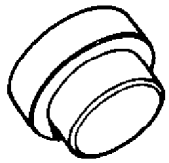
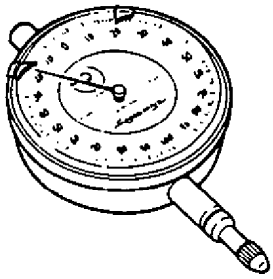
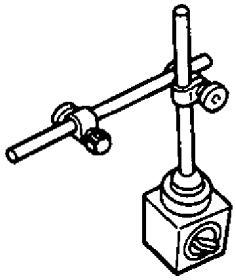
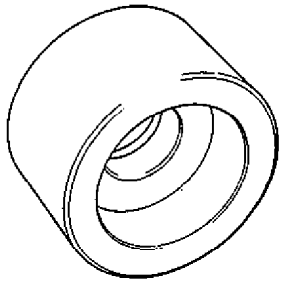
REQUIRED SERVICE MATERIALS

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 • Mating surface of gear shift guide case
Thread lock cement	THREAD LOCK 1322 (99000-32110)	• Control lever knob • Reverse gear shift lever bolts • Oil gutter bolt • Left case plate screws • Gear shift yoke bolt

SPECIAL TOOLS

1  09915-27810 Hexagon socket 10 mm	2  09913-75510 Bearing installer	3  09913-75520 Bearing installer	4  09930-30102 Sliding shaft
5  09917-58010 Bearing remover	6  09916-46010 Valve guide remover	7  09900-06107 Snap ring pliers (Opening type)	

9  09922-85811 Spring pin remover 4.5 mm	10  09927-76010 Gear holder	11  09923-73210 Bearing remover	12  09923-74510 Bearing remover
13  09941-64511 Bearing remover	14  09925-78210 Spring pin remover 6 mm	15  09951-76010 Bearing installer	16  09924-74510 Installer attachment
17  09925-68210 Bearing outer race installer	18  09925-58210 Oil seal installer	19  09925-98221 Bearing installer	20  09913-80112 09913-84510 Bearing installer
21  09923-78210 Bearing installer	22  09925-18010 Bearing installer	23  09940-53111 Bearing installer	24  09913-65810 Bearing puller

25	26	27	28
			
09925-88210 Bearing puller attachment	09900-20606 Dial gauge	09900-20701 Magnetic stand	09951-16060 Bush remover

SECTION 7B

AUTOMATIC TRANSMISSION

CONTENTS

GENERAL DESCRIPTION

The automatic transmission consists of the hydraulic troque converter, electronically controlled 3-speed automatic transmission, countershaft and differential.

The transmission consists of 2 planetary gears, 2 disk clutches, 1 band brake, 1 disk brake and 1 one-way clutch. Its operation is controlled by selecting a position from 6 positions (P, R, N, D, 2 and L) manually by means of the selector lever installed on the compartment floor.

In the D or 2 range, the gear ratio is changed for the 1st, 2nd or 3rd speed (D range only) automatically by electronic control.

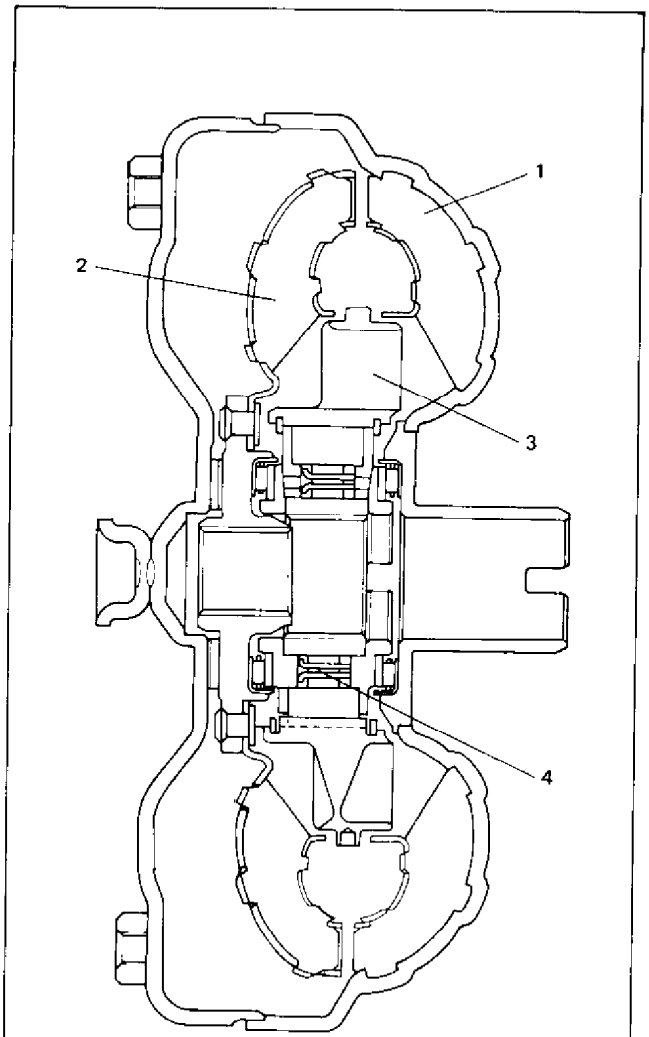
For the automatic transmission fluid, DEXRON II or its equivalent must be used. Lubrication in the automatic transmission is provided by the oil pump which is operated by the engine revolution. Therefore, the engine should not be stopped even during coasting to obtain proper lubrication.

When it becomes necessary to be towed, front wheels must be raised so as not to roll them.

TORQUE CONVERTER

The torque converter is of 3-element hydraulic type and consists of the pump, turbine and stator in a unit incapable of disassembly. The pump is mounted to the crankshaft (drive plate), the turbine to the input shaft and the stator to the transmission case (oil pump cover) by way of the one-way clutch.

The torque converter, which increases torque when starting, accelerating and up-hill driving, functions as a fluid clutch while driving at a constant speed.



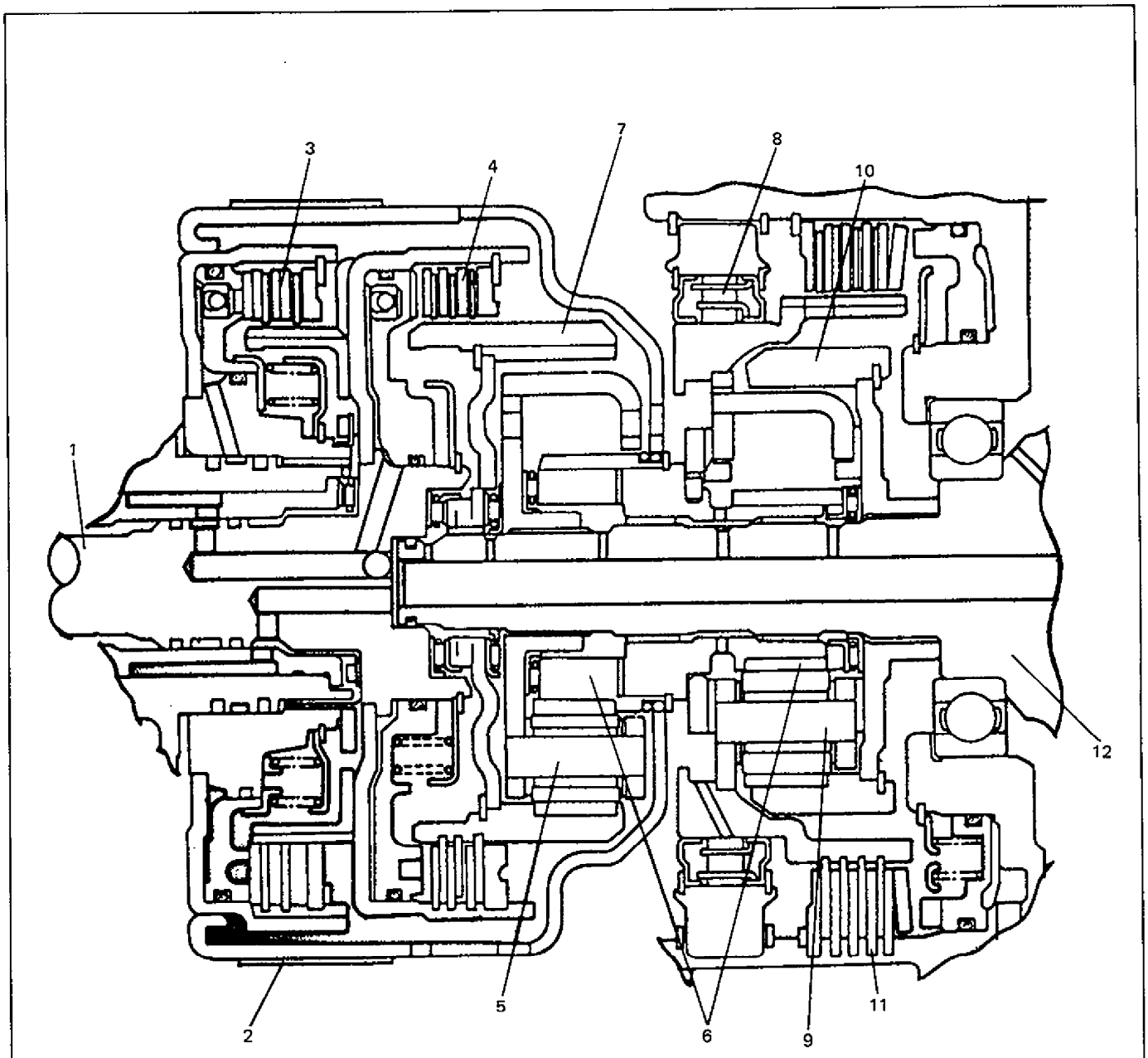
1. Pump
2. Turbine
3. Stator
4. One-way clutch

Fig. 7B-1 Torque Converter Cross Section

PLANETARY GEAR UNITS

In this unit, the sun gear is mounted in its center and engaged with it are 4 pinion gears supported by a carrier. Then, the outer ring gear is engaged with them. Depending on gear combinations, revolution is changed in speed or direction.

Among the units which operate in connection with the planetary gear unit, there are a direct clutch, a second brake, a forward clutch, a one-way clutch and a 1st-reverse brake.

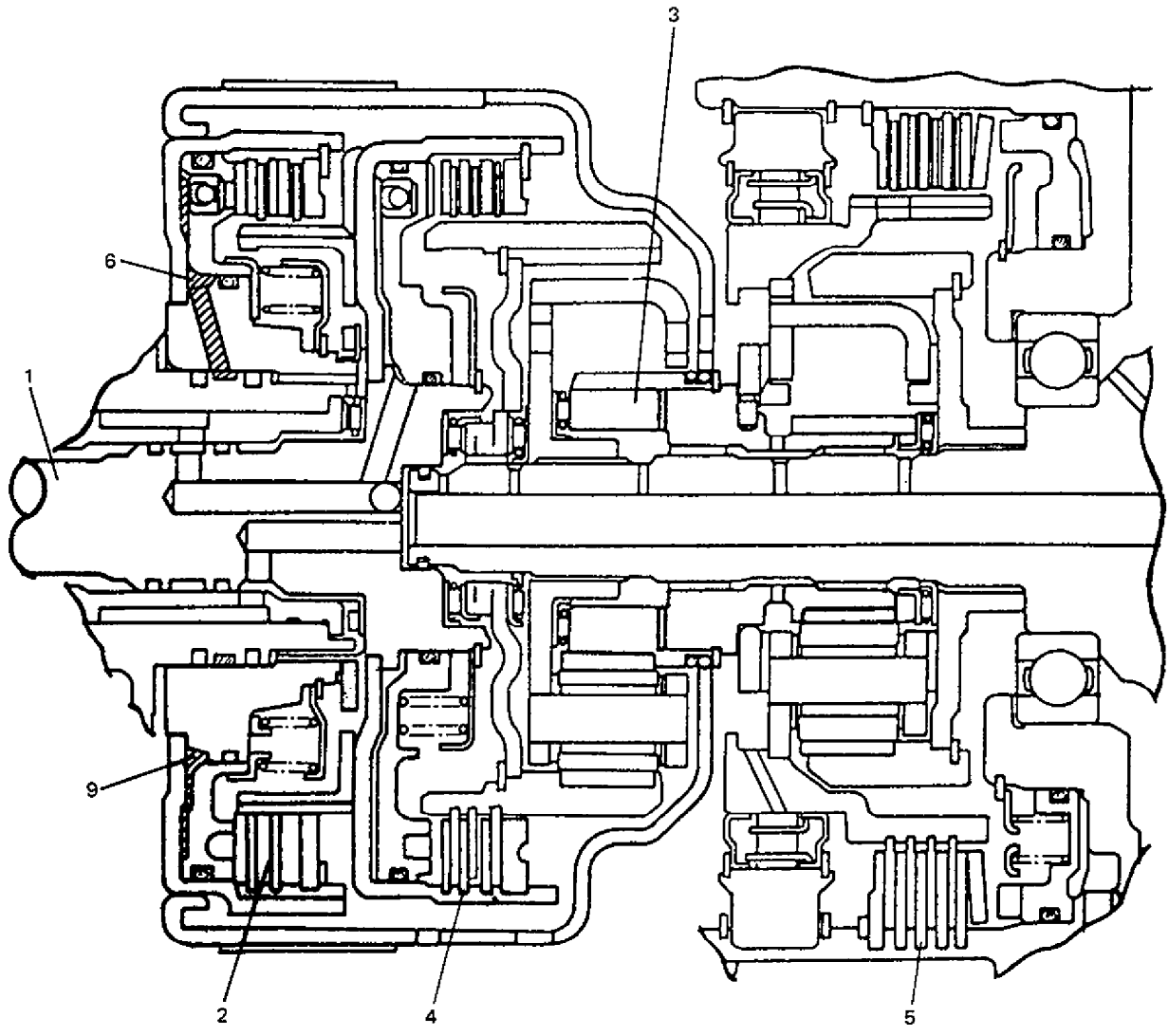


1. Input shaft
2. Second brake band
3. Direct clutch
4. Forward clutch
5. Front planetary gear
6. Sun gear
7. Front ring gear
8. One-way clutch
9. Rear planetary gear
10. Rear ring gear
11. 1st-reverse brake
12. Output shaft

Fig. 7B-2 Planetary Gear Sets Cross Section

DIRECT CLUTCH

The direct clutch connects the input shaft and the sun gear (common to both front and rear planetary gear units). It operates at the 3rd gear in the D range and in the R range. At the same time, the forward clutch operates in the former and the 1st-reverse brake in the latter.



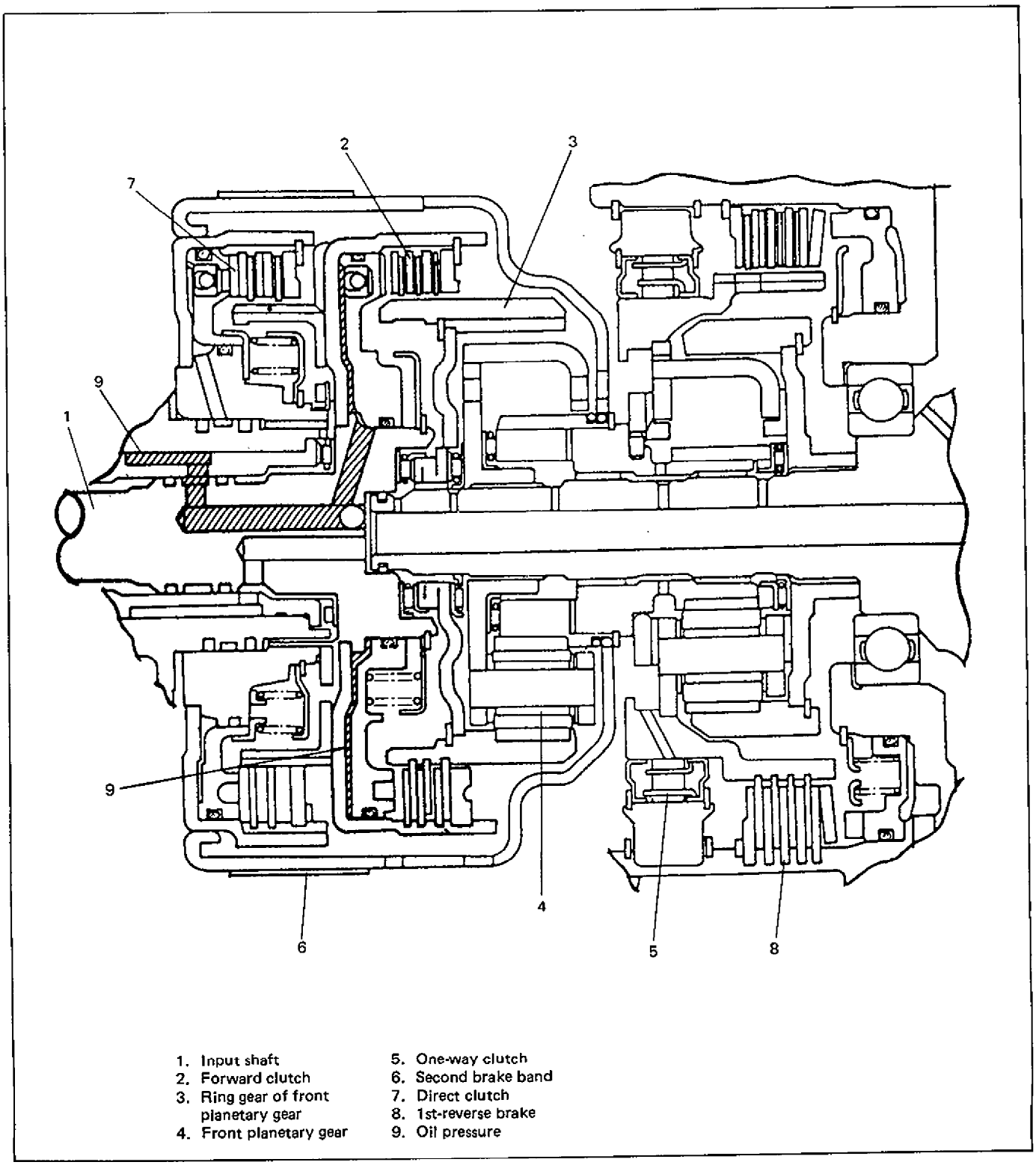
1. Input shaft
2. Direct clutch
3. Sun gear
4. Forward clutch
5. 1st-reverse brake
6. Oil pressure

Fig. 7B-3 Direct Clutch Cross Section

FORWARD CLUTCH

The forward clutch connects the input shaft and ring gear of the front planetary gear. It operates in the ranges other than P, R and N. The units which operate simultaneously with the forward clutch are as follows.

- One-way clutch at the 1st gear in D, 2 or L.
- Second brake at the 2nd gear in D, 2 or L.
- Direct clutch at the 3rd gear in D.
- 1st-reverse brake at the 1st gear in L.



1. Input shaft
2. Forward clutch
3. Ring gear of front planetary gear
4. Front planetary gear
5. One-way clutch
6. Second brake band
7. Direct clutch
8. 1st-reverse brake
9. Oil pressure

Fig. 7B-4 Forward Clutch Cross Section

SECOND BRAKE

The second brake is of band type. It holds the sun gear of the front and rear planetary gear units stationary. It operates at the 2nd gear in D, 2 or L simultaneously with the forward clutch.

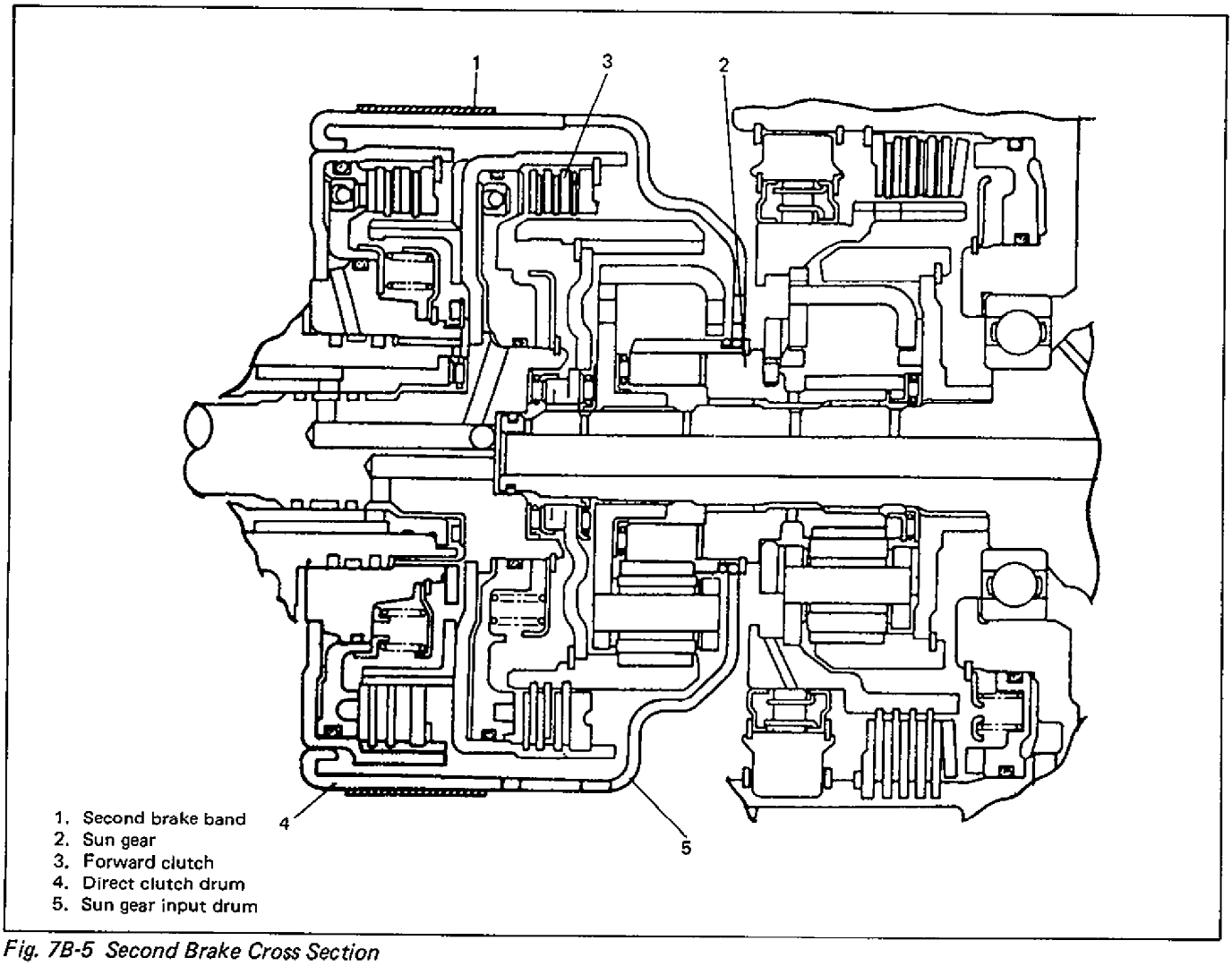


Fig. 7B-5 Second Brake Cross Section

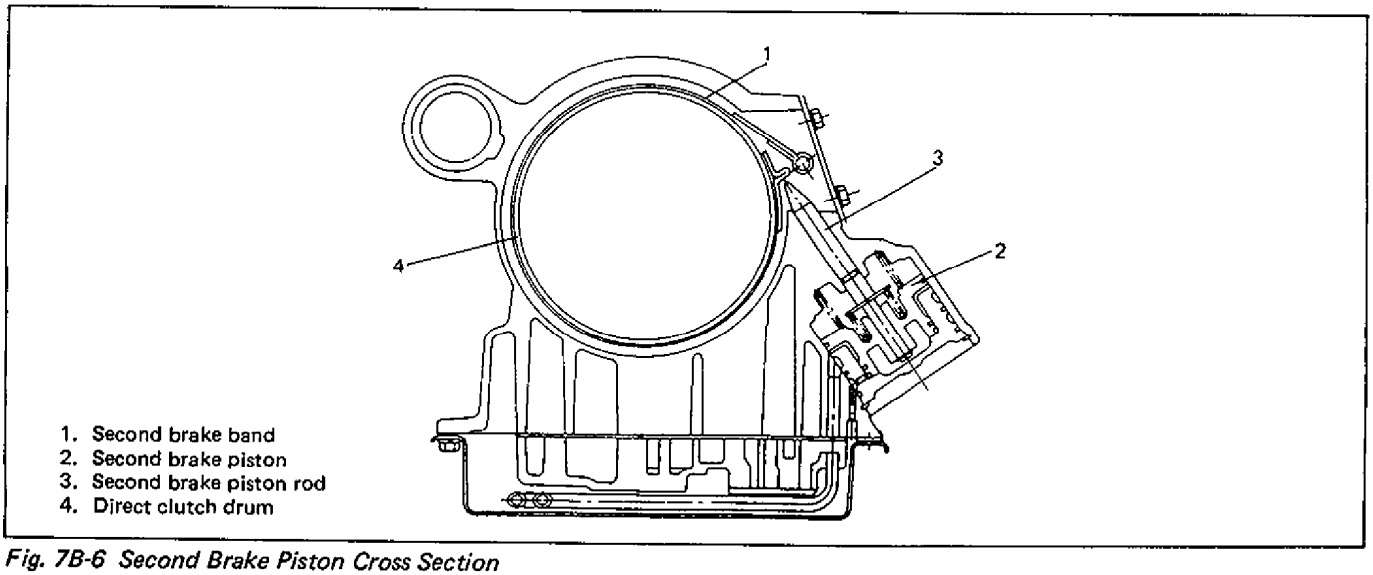


Fig. 7B-6 Second Brake Piston Cross Section

FIRST & REVERSE BRAKE

The 1st-reverse brake holds the rear planetary carrier stationary. It operates in L or R. At the same time, the forward clutch operates in L and the direct clutch in R.

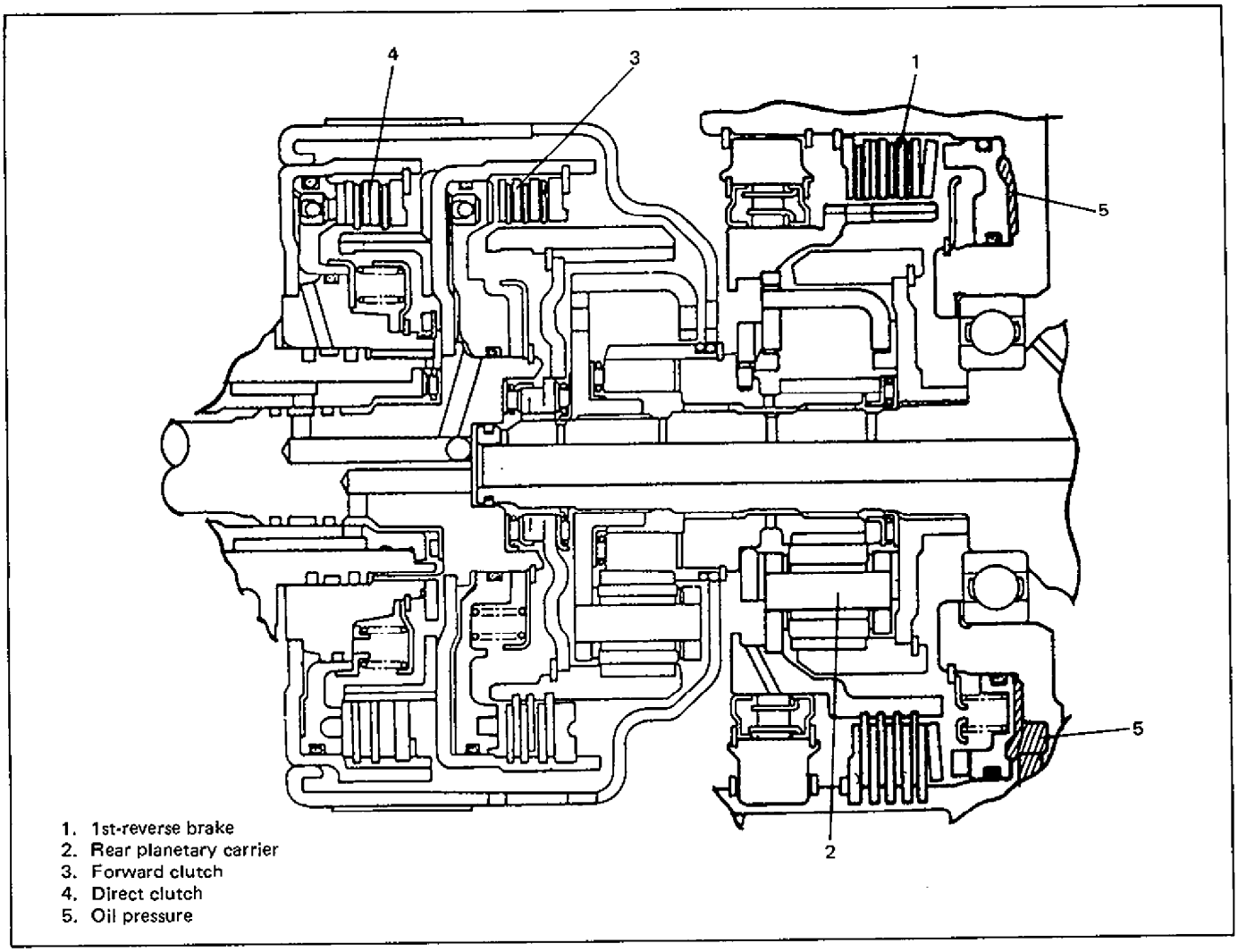


Fig. 7B-7 First & Reverse Brake Cross Section

ONE-WAY CLUTCH

The sprag type one-way clutch is used between the rear planetary carrier and the transmission case. It consists of a one-way clutch race, sprags and a retainer, and the one-way clutch race is mounted to transmission case. When the rear planetary carrier is in motion to turn to in the arrow direction the first gear in D, 2 or L, the sprags stick between carrier and race, and prevent the planetary carrier from turning in the arrow direction.

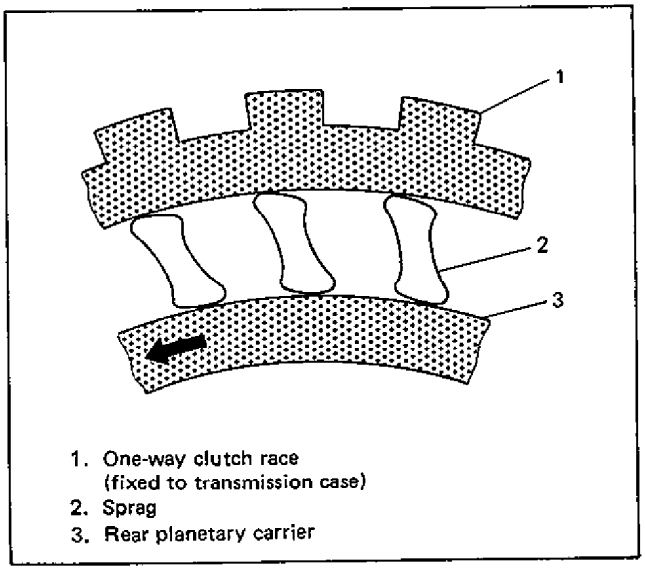


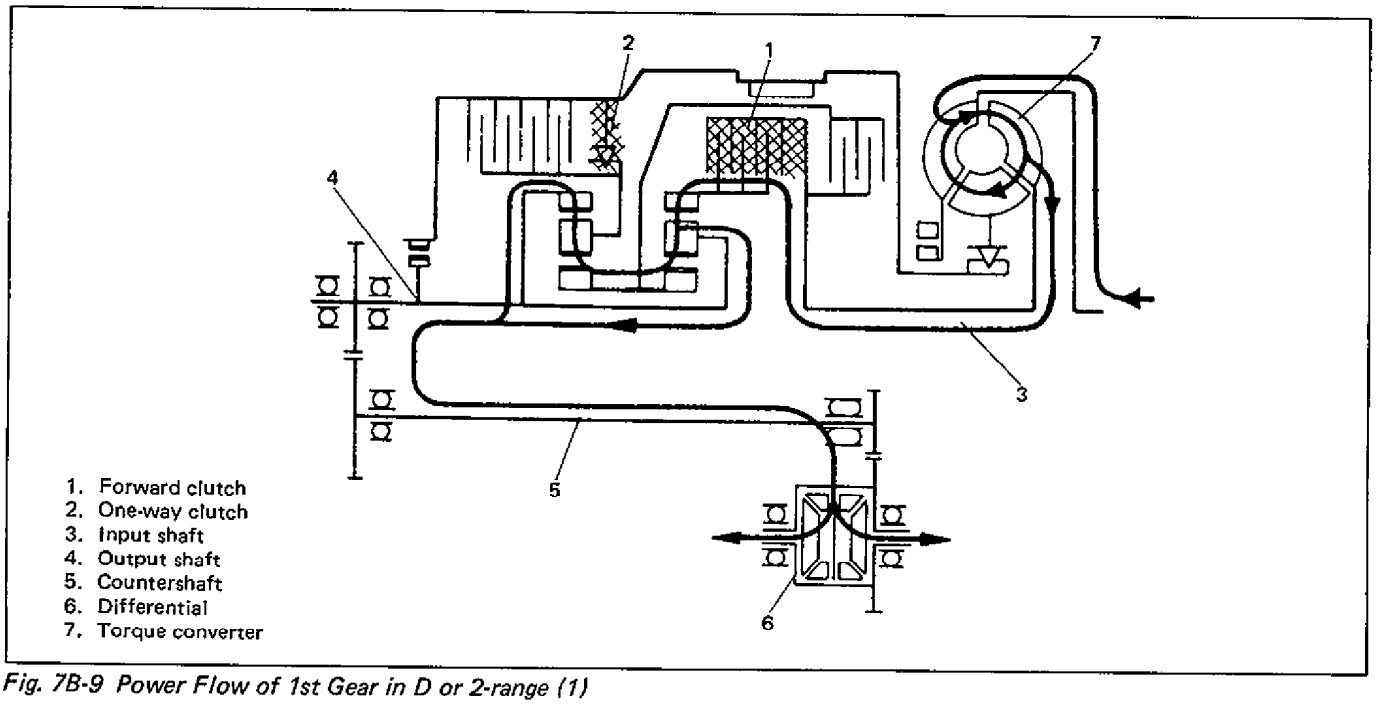
Fig. 7B-8 One-Way Clutch

POWER FLOW

1ST GEAR IN "D" OR "2" RANGE

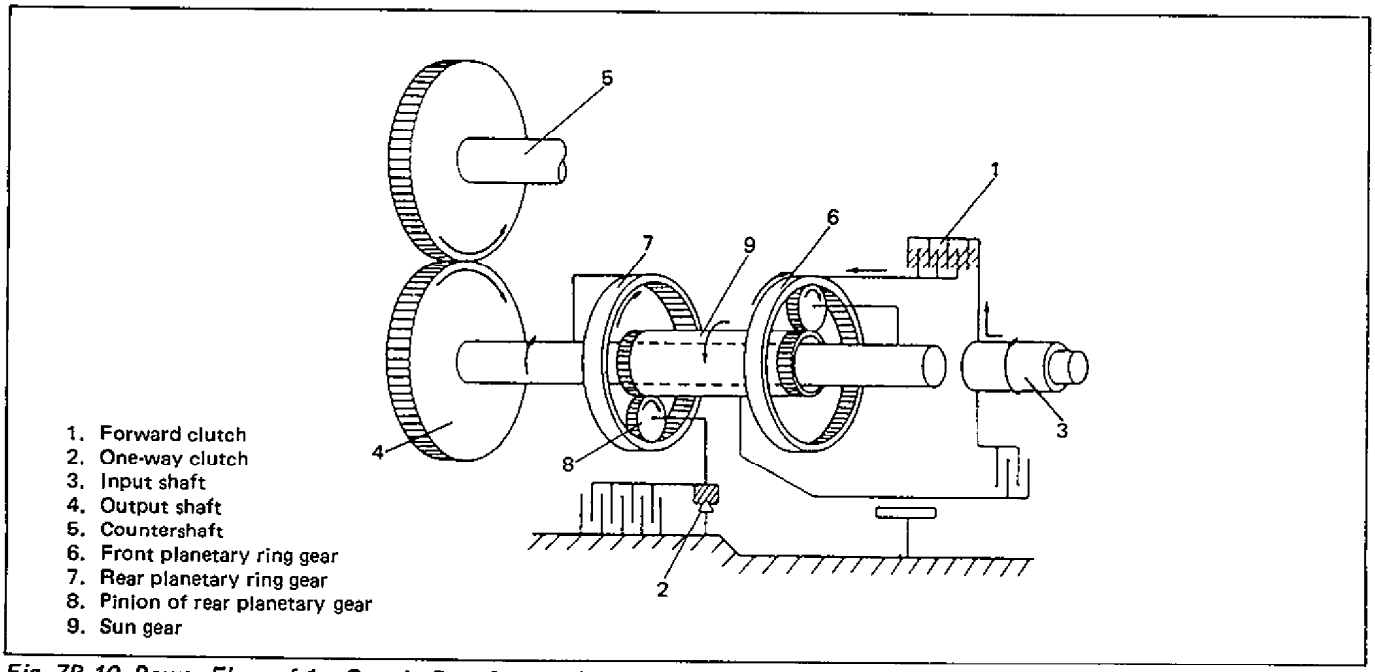
As oil pressure is applied to the forward clutch, the input shaft and the front planetary ring gear are engaged. This allows the clockwise revolution of the input shaft to be transmitted directly to the ring gear and then through the from planetary carrier to the output shaft.

On the other hand, the sun gear which is engaged with the pinion gears of the front planetary gear turns counterclockwise. As this revolution is transmitted to the pinions of the rear planetary gear, the rear planetary carrier would also turn counterclockwise. However, being held by the one-way clutch, it cannot turn. Consequently, the pinions turn clockwise on their axes and this causes the ring gear of the rear planetary gear and output shaft to turn clockwise.



1. Forward clutch
2. One-way clutch
3. Input shaft
4. Output shaft
5. Countershaft
6. Differential
7. Torque converter

Fig. 7B-9 Power Flow of 1st Gear in D or 2-range (1)



1. Forward clutch
2. One-way clutch
3. Input shaft
4. Output shaft
5. Countershaft
6. Front planetary ring gear
7. Rear planetary ring gear
8. Pinion of rear planetary gear
9. Sun gear

Fig. 7B-10 Power Flow of 1st Gear in D or 2-range (2)

2ND GEAR IN "D", "2" OR "L" RANGE

As oil pressure is applied to the forward clutch, the input shaft and the ring gear of the front planetary gear are engaged. This allows the revolution of the input shaft to be transmitted directly to the ring gear, causing the front planetary carrier to turn clockwise. In this state, the sun gear, being engaged with the pinions of the front planetary gear, would turn counterclockwise. However, the second brake is in operation and prevents it from turning. As a result, the pinions of the front planetary gear turn around the sun gear. Therefore, the front planetary ring gear and then the output shaft turn clockwise.

The 2nd gear in L is operated only when the slector lever is shifted to L at a higher than 53 km/h (33 mile/h) speed.

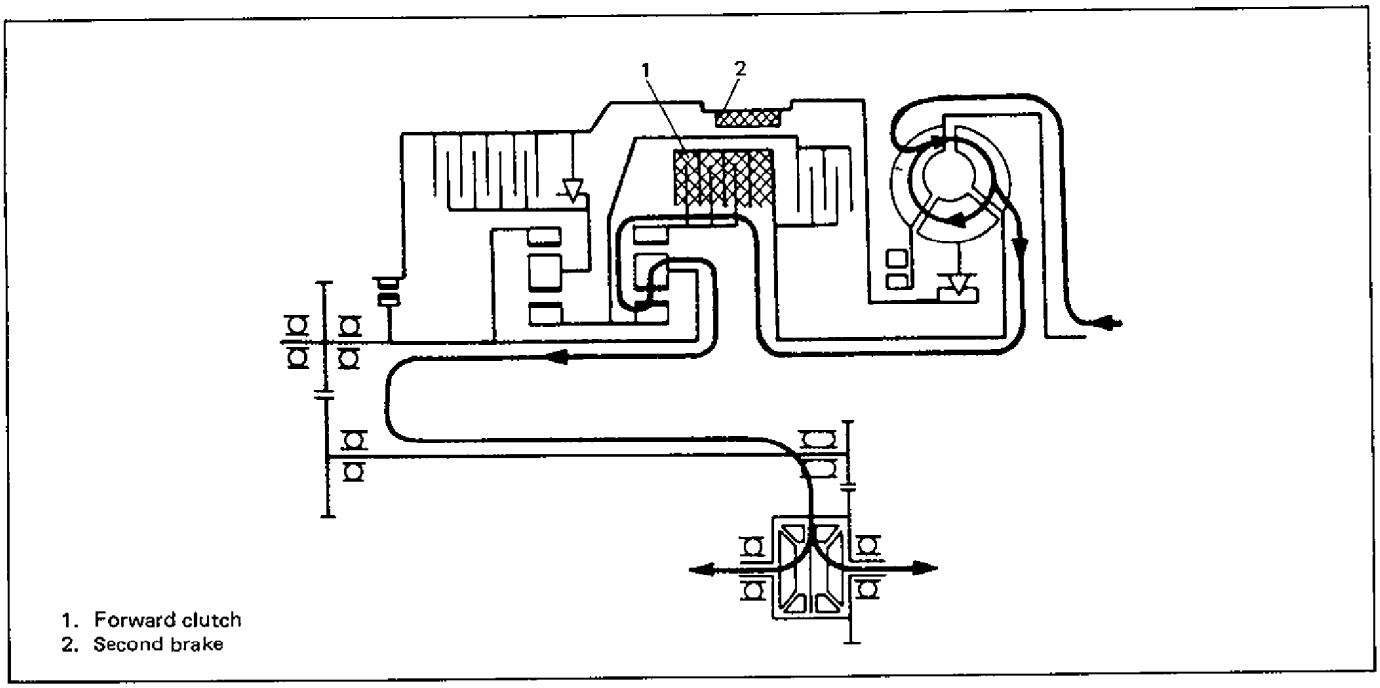


Fig. 7B-11 Power Flow of 2nd Gear in D or 2-range (1)

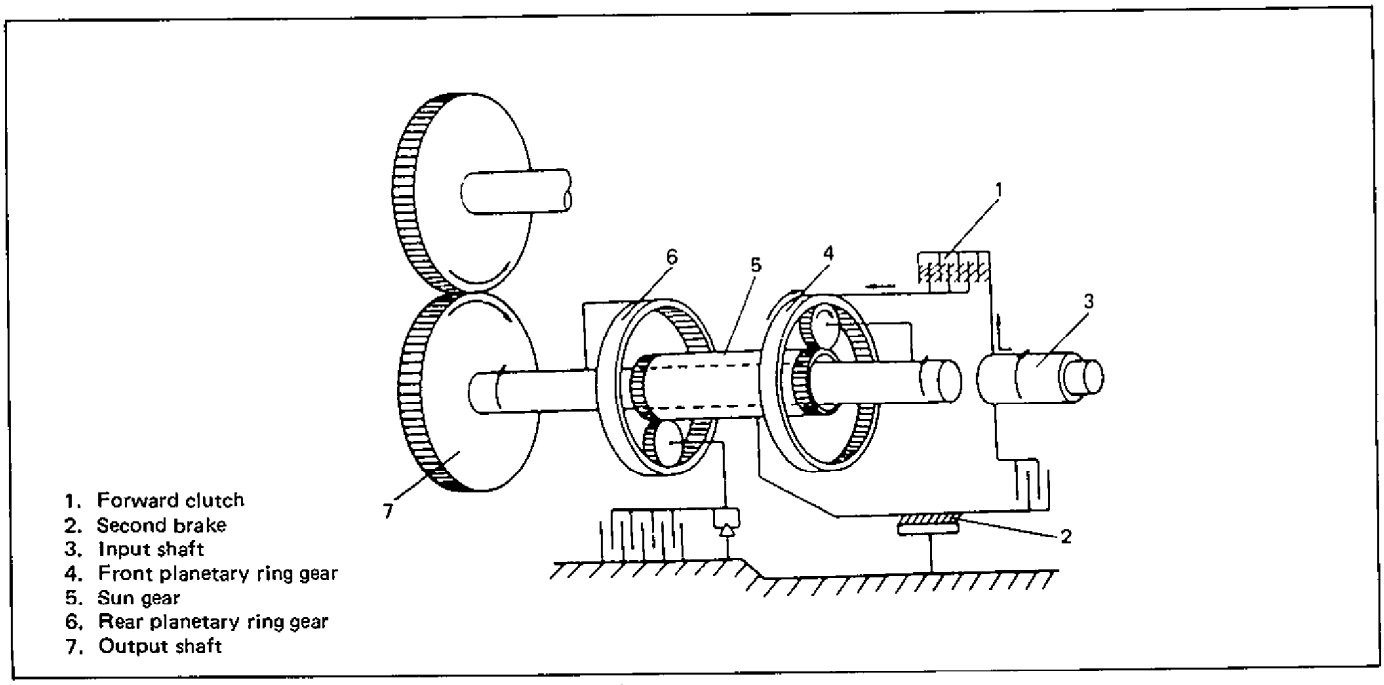


Fig. 7B-12 Power Flow of 2nd Gear in D or 2-range (2)

3RD GEAR IN "D" RANGE

As oil pressure is applied to the forward clutch and the direct clutch, the input shaft is engaged with the ring gear and the sun gear of the front planetary gear. In other words, the input shaft is directly connected to the planetary gear unit itself. As a result, the pinions of the planetary gear are locked and thus the input shaft revolution is transmitted directly to the output shaft.

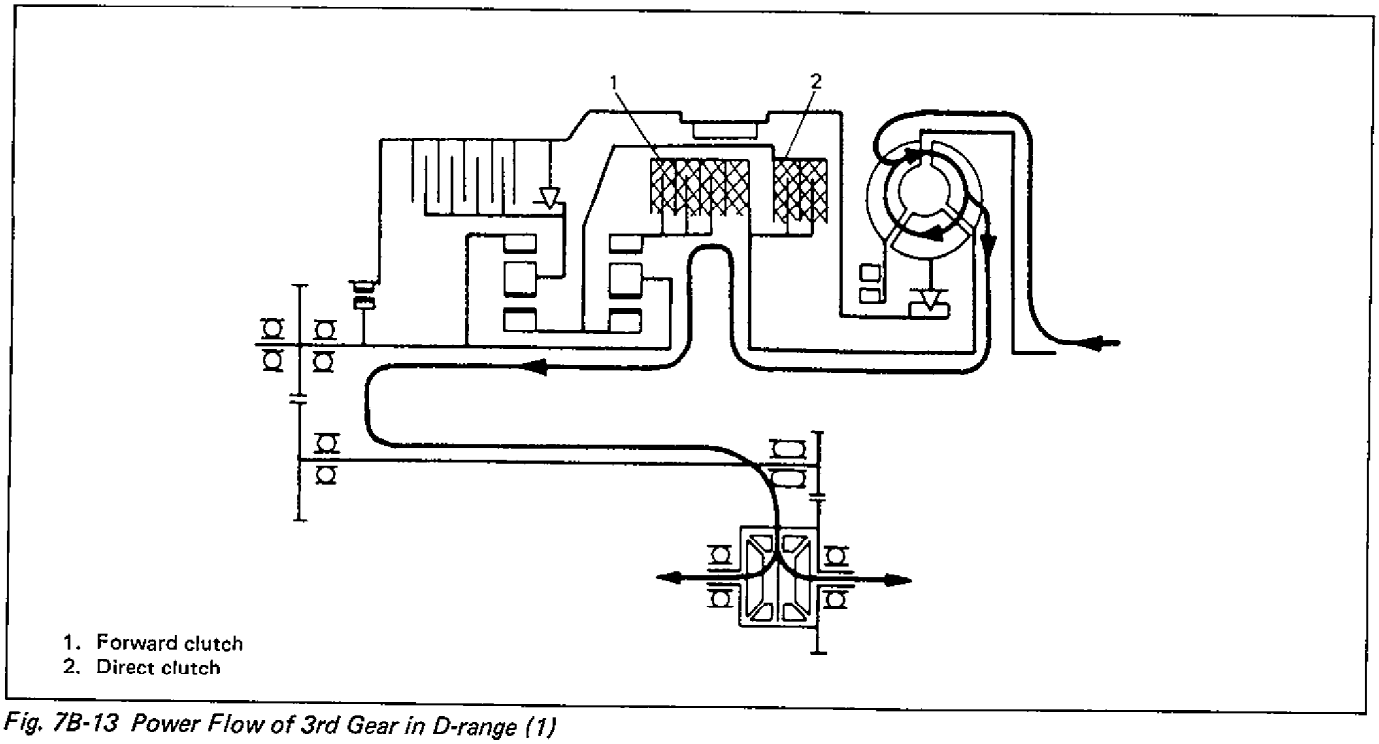


Fig. 7B-13 Power Flow of 3rd Gear in D-range (1)

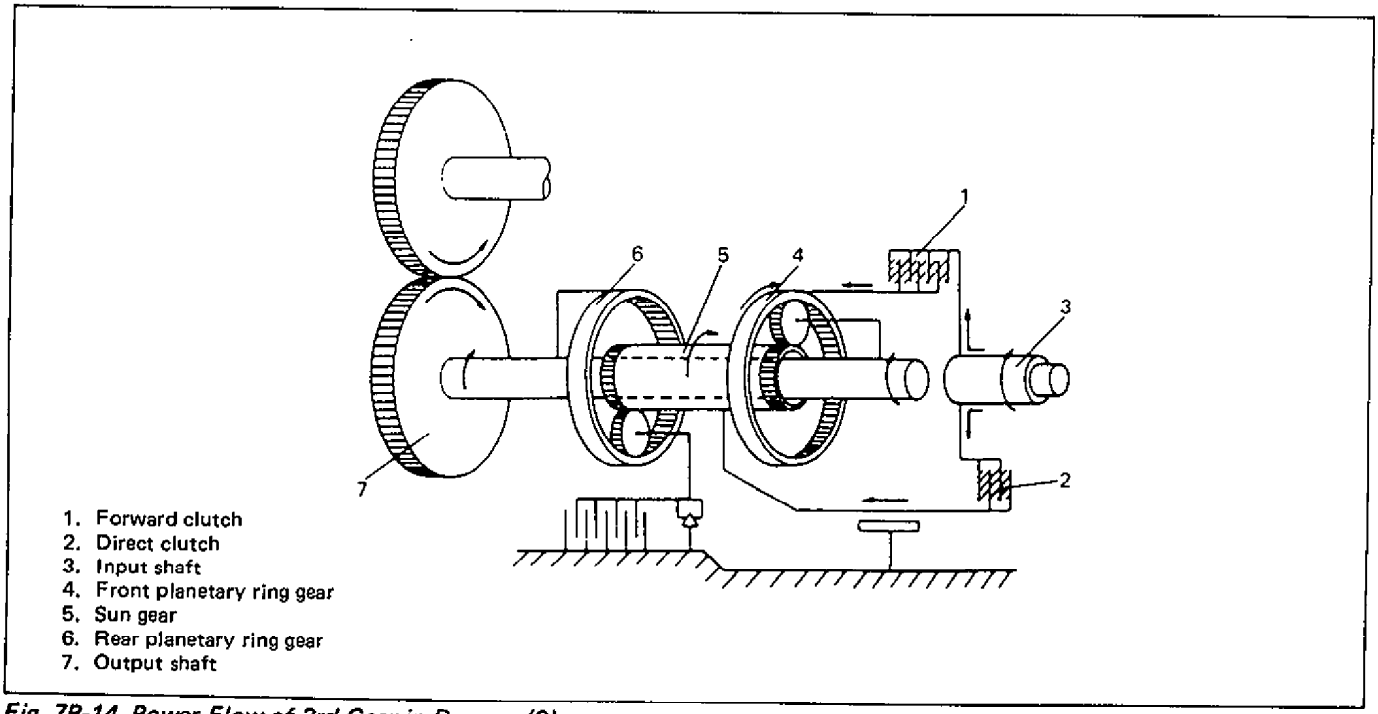


Fig. 7B-14 Power Flow of 3rd Gear in D-range (2)

"L" RANGE

The torque flow from the engine is the same as at the 1st gear in D or 2 range, but in this range, the 1st-reverse brake is put into operation to prevent the rear planetary carrier from clockwise revolution which occurs when engine brake is applied. In other words, when driving in D or 2 range, the counterclockwise revolution of the rear planetary carrier is stopped by means of the one-way clutch, but when the engine brake is applied, the torque (clockwise) from the output shaft acts to prevent the one-way clutch from operating and the rear planetary carrier idles. This puts the 1st-reverse brake into operation so as to hold the rear planetary carrier stationary. Thus engine braking force is provided.

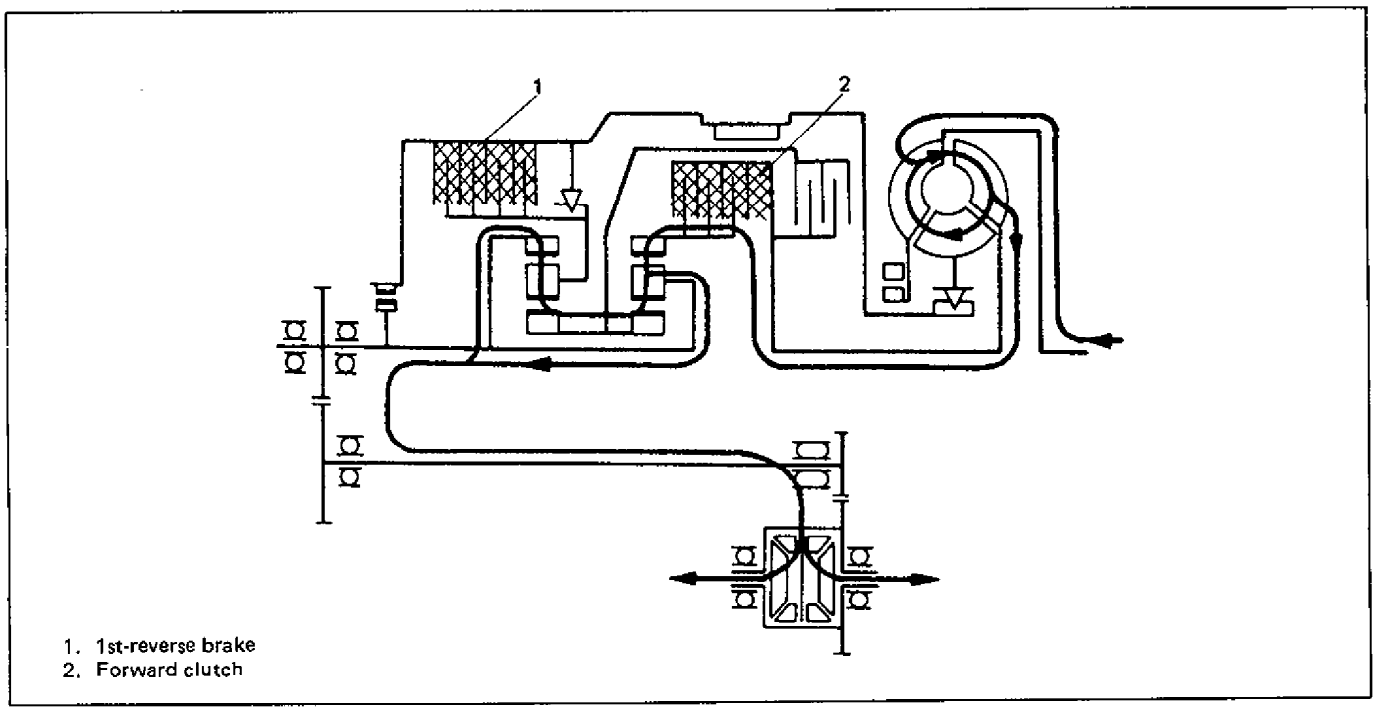


Fig. 7B-15 L-range Power Flow (1)

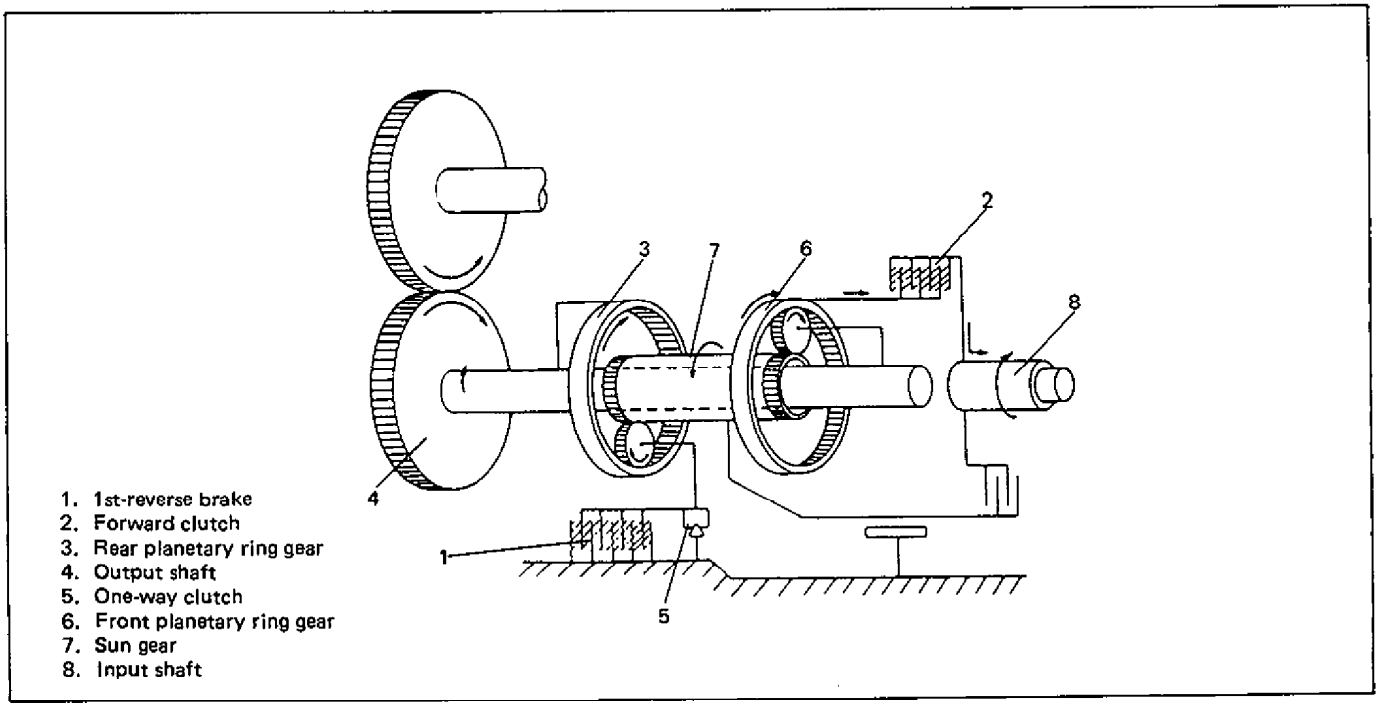
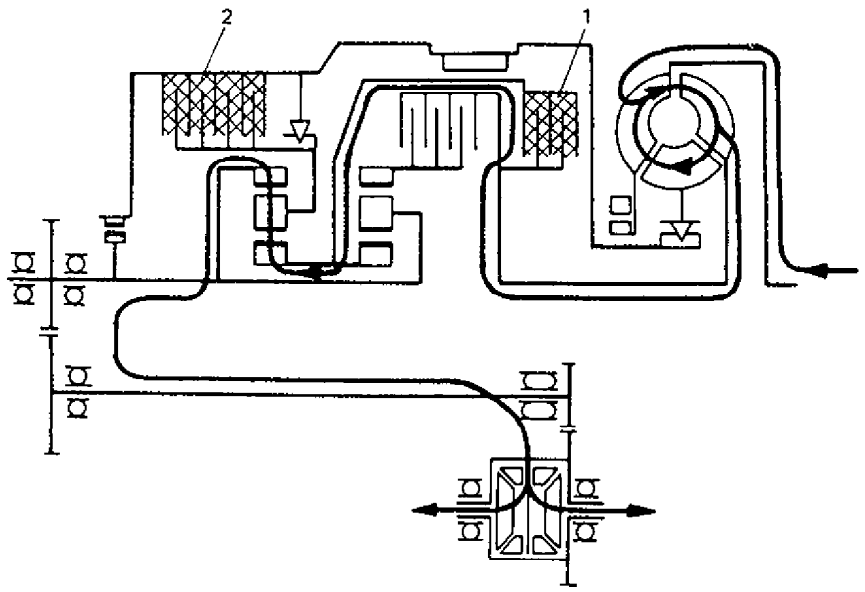


Fig. 7B-16 L-range Power Flow (2)

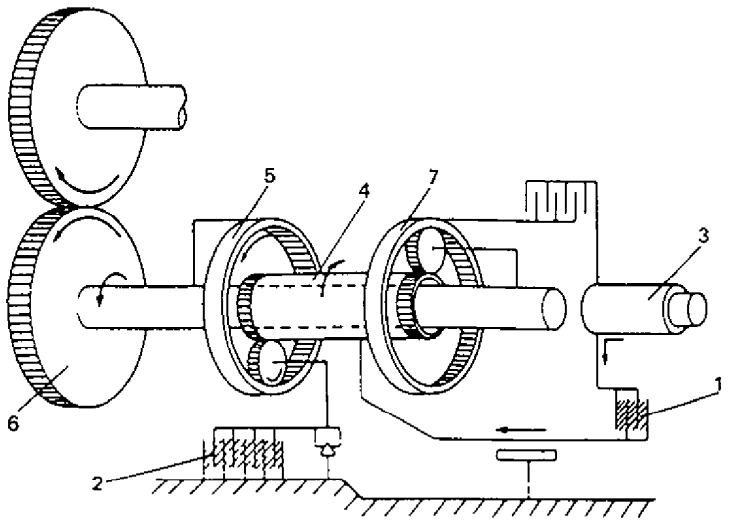
"R" RANGE

As oil pressure is applied to the direct clutch, the input shaft is engaged with the sun gear of the planetary gear. This allows the torque to be transmitted directly from the input shaft to the sun gear. On the other hand, the 1st-reverse brake is also at work and therefore the rear planetary carrier is held stationary. In this state, the pinions do not turn around the sun gear but turn around counterclockwise on their axes and cause the ring gear to turn counterclockwise. As the output shaft is spline fitted to the rear planetary ring gear, it also turns counterclockwise, thereby the car moves rearward.



1. Direct clutch
2. 1st-reverse brake

Fig. 7B-17 R-range Power Flow (1)



1. Direct clutch
2. 1st-reverse brake
3. Input shaft
4. Sun gear
5. Rear planetary ring gear
6. Output shaft
7. Front planetary ring gear

Fig. 7B-18 R-range Power Flow (2)

"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 P range, the parking lock pawl is engaged with the parking lock gear which is incorporated with the drive gear of the output shaft and thus the front wheels are mechanically locked.

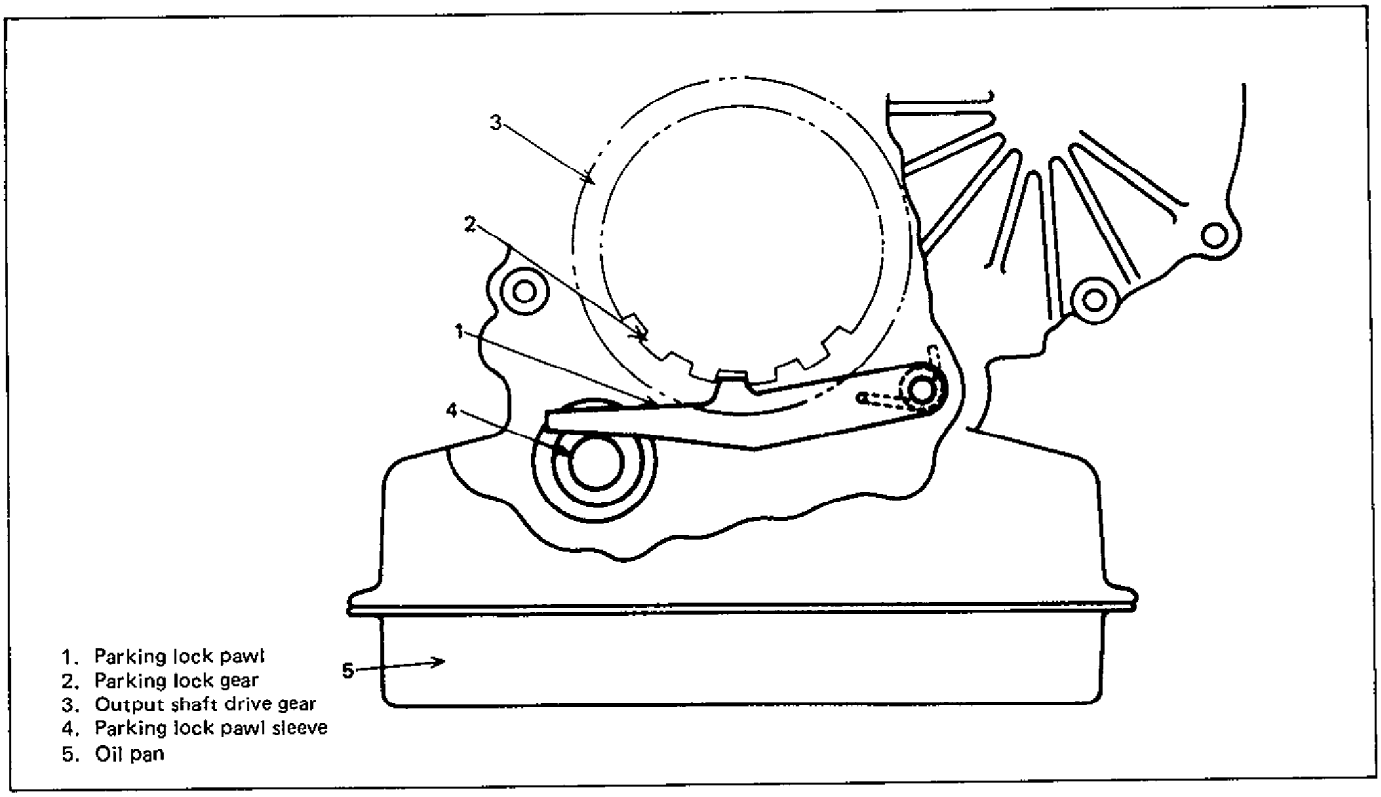


Fig. 7B-19 P-range

COMPONENTS OPERATION CHART

Range	Gear	Forward Clutch	Direct Clutch	Second Brake	1st & Reverse Brake	One-way Clutch	Parking Lock Pawl
P	Parking	–	–	–	**○	–	○
R	Reverse	–	○	–	○	–	–
N	Neutral	–	–	–	–	–	–
D	1st	○	–	–	–	○	–
	2nd	○	–	○	–	–	–
	3rd	○	○	–	–	–	–
2	1st	○	–	–	–	○	–
	2nd	○	–	○	–	–	–
L	1st	○	–	–	○	○	–
	*2nd	○	–	○	–	–	–

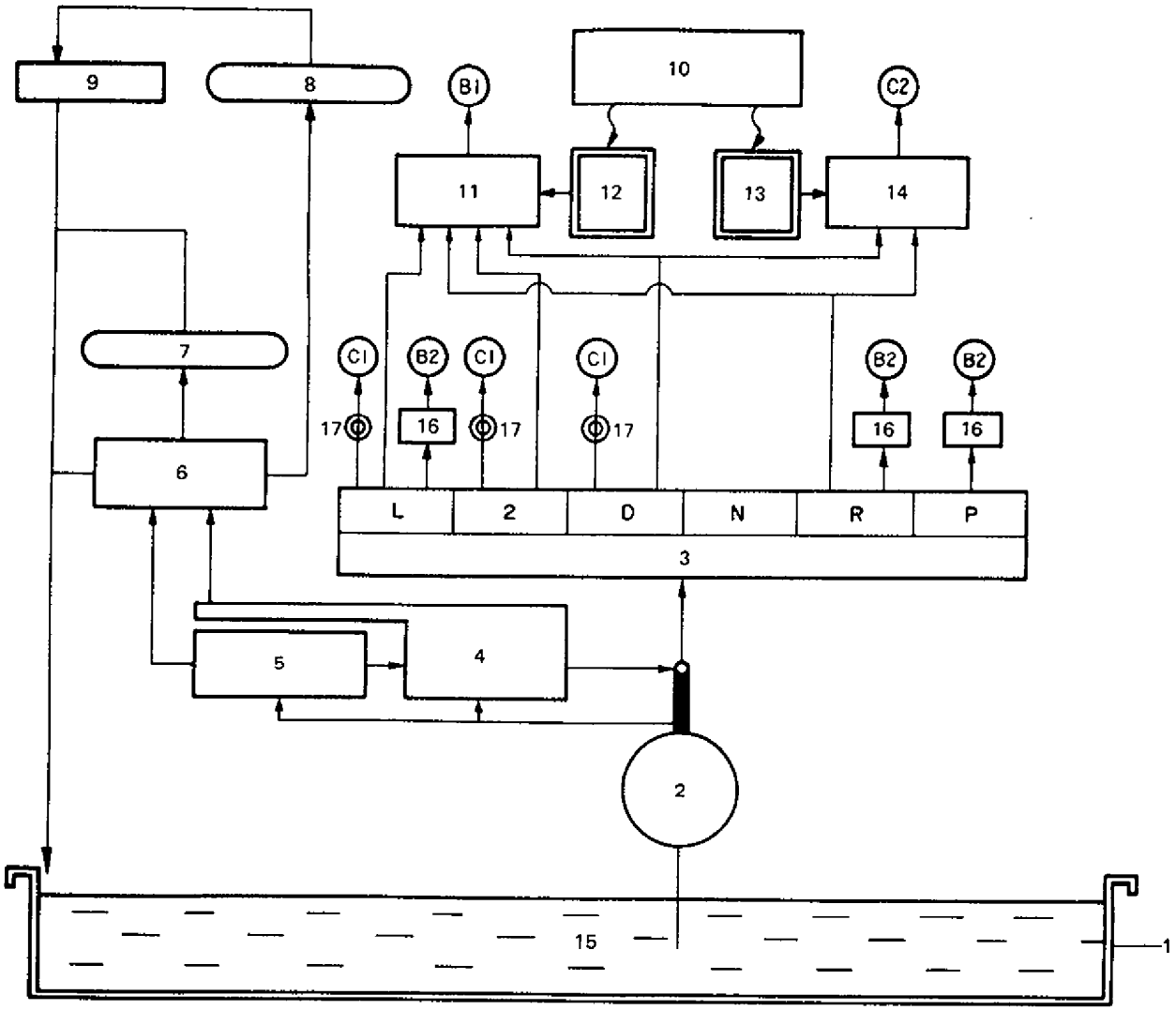
○ : Operated

*: To prevent overrevolution of engine, this 2nd gear is operated only when selector lever is shifted to L range at a higher than 53 km/h (33 mile/h) speed.

**: When engine is running.

OIL PRESSURE CONTROL SYSTEM

The oil pressure control system fundamentally consists of three parts: (1) oil pressure producing system which consists of an oil pump to produce oil pressure and regulator valve to regulate the pressure, (2) oil circuit to feed fluid into the torque converter, the oil cooler and the transmission components to be lubricated, and (3) control system to shift the gear of the planetary gear unit by acting on each clutch and brake.



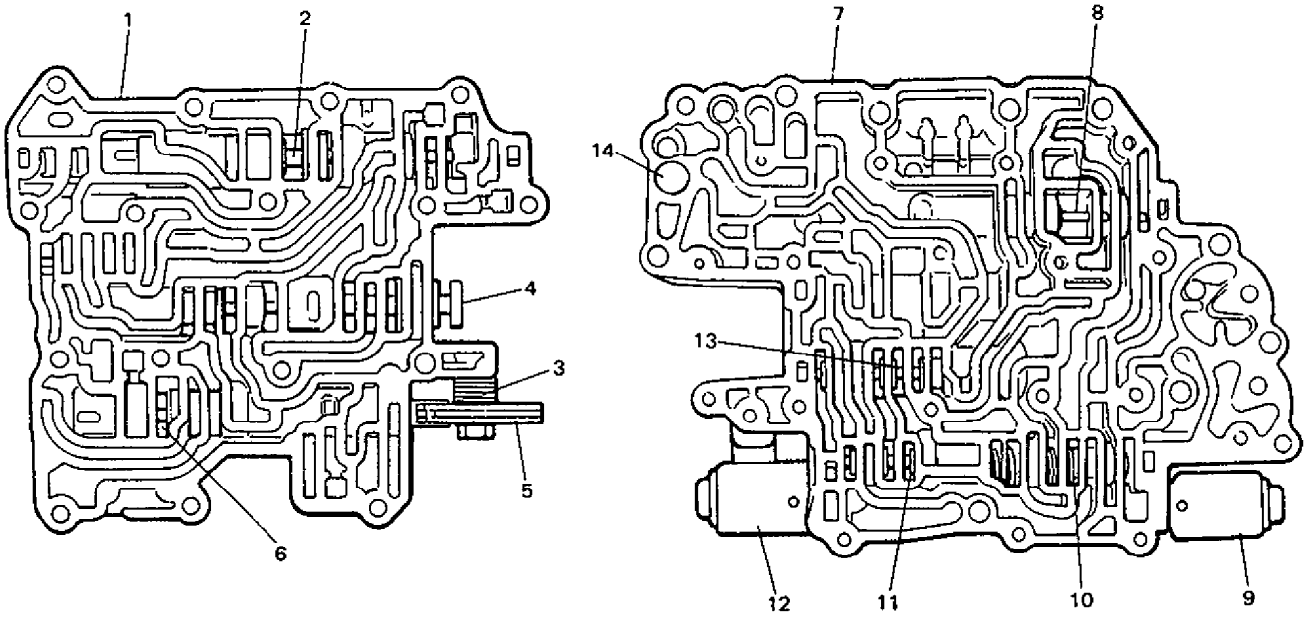
1. Oil pan
2. Oil pump
3. Manual valve
4. Primary regulator valve
5. Throttle valve
6. Secondary regulator valve
7. Lubrication
8. Torque converter
9. Oil cooler
10. Controller (Computor)
11. 1 – 2 Shift valve
12. Second (2nd) brake solenoid
13. Direct clutch solenoid
14. 2 – 3 Shift valve
15. Fluid
16. B_2 control valve
17. Accumulator

C1. Forward clutch
C2. Direct clutch
B1. Second (2nd) brake
B2. 1st-reverse brake

Fig. 7B-20 Oil Pressure Control System Diagram

VALVE BODY

The valve body is installed in the oil pan and has valves to control oil pressure. In the valve body, oil passages connect valves.

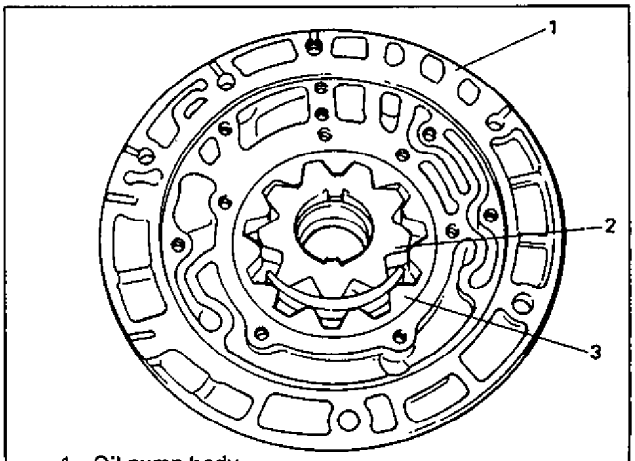


1. Upper valve body
2. Primary regulator valve
3. Return spring
4. Manual valve
5. Throttle valve cam
6. Throttle valve
7. Lower valve body
8. Secondary regulator valve
9. Direct clutch solenoid
10. 2 – 3 Shift valve
11. B_2 control valve
12. 2nd brake solenoid
13. 1 – 2 Shift valve
14. Cooler by-pass valve

Fig. 7B-21 Upper and Lower Valve Body

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 oil pump is driven together with the pump impeller by the engine.

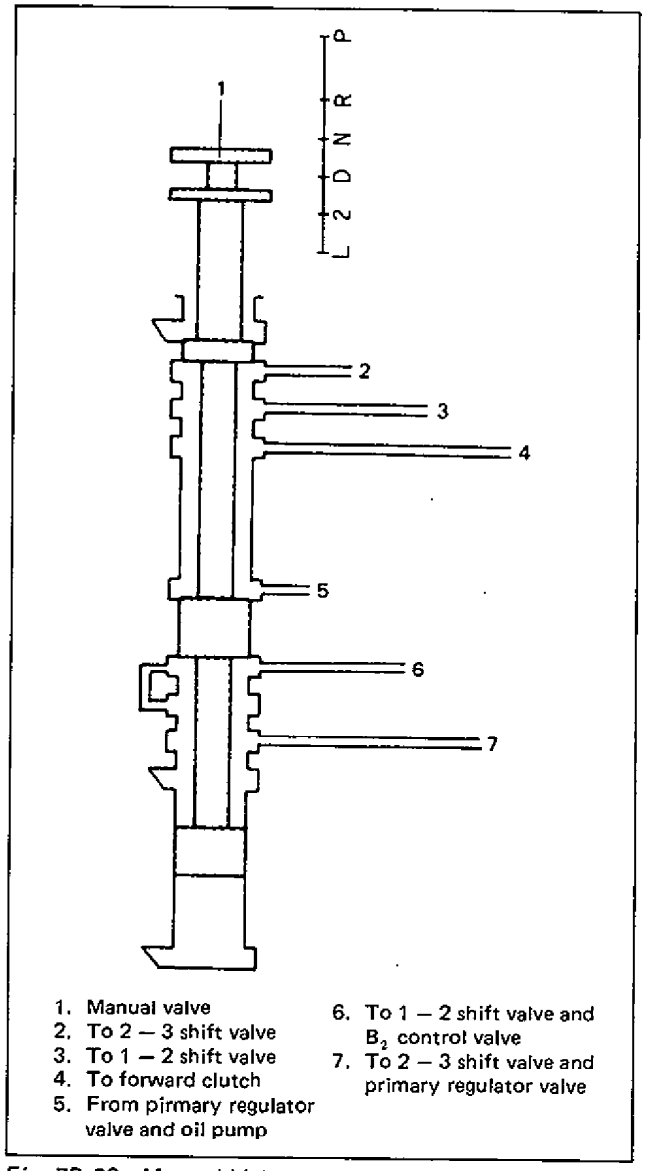


1. Oil pump body
2. Oil pump drive gear
3. Oil pump driven gear

Fig. 7B-22 Oil Pump

MANUAL VALVE

The manual valve is directly connected with the selector lever by wire. It opens and closes the oil passage mechanically so as to form respective oil pressure circuit for L, 2, D, N, R, or P range according to the selector lever movement.



1. Manual valve
2. To 2 – 3 shift valve
3. To 1 – 2 shift valve
4. To forward clutch
5. From pirmary regulator valve and oil pump
6. To 1 – 2 shift valve and B_2 control valve
7. To 2 – 3 shift valve and primary regulator valve

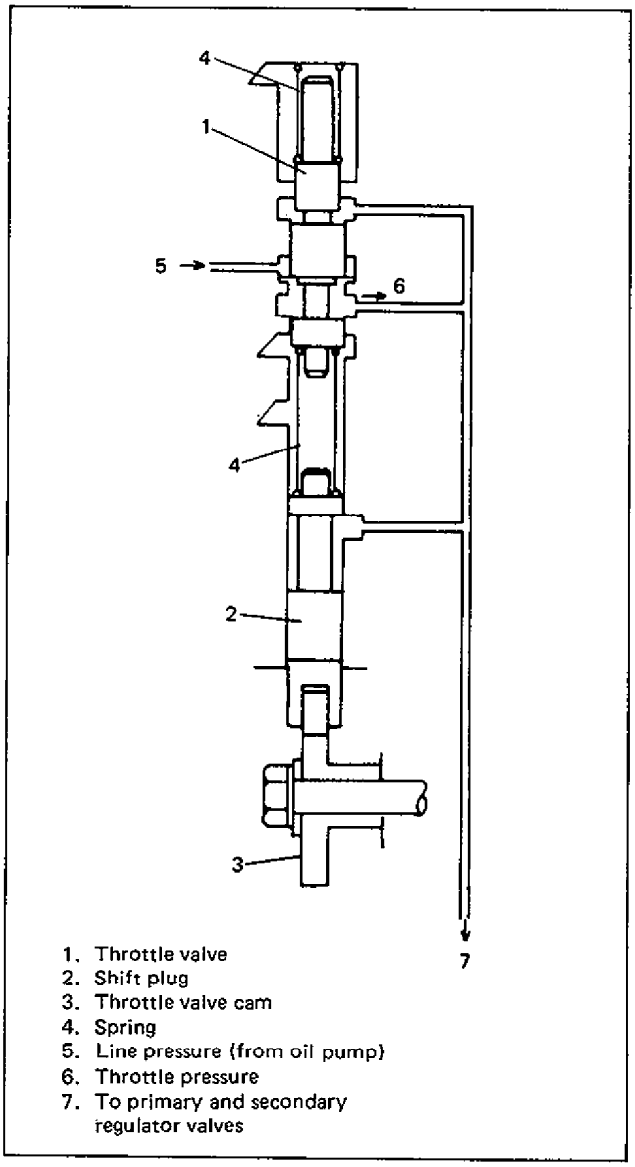
Fig. 7B-23 Manual Valve

THROTTLE VALVE

As the throttle valve is linked with the accelerator pedal by wire, it produces the throttle pressure corresponding to the extent to which the accelerator pedal is depressed which is, in other words, the engine output.

When the accelerator pedal is depressed, the throttle cam pushes the shift plug which then compresses two springs to move the throttle valve. Thus the line pressure passage is opened and the throttle pressure is produced.

The throttle pressure is also applied to the back of the throttle valve to push back the valve. The throttle pressure is determined by the tensile force of the springs (position of the shift plug) and applied to the primary and secondary regulator valves to regulate the line pressure.

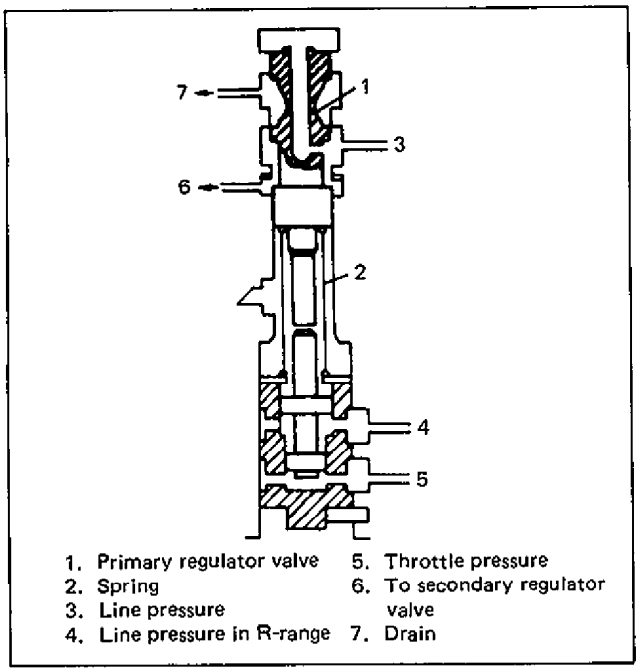


1. Throttle valve
2. Shift plug
3. Throttle valve cam
4. Spring
5. Line pressure (from oil pump)
6. Throttle pressure
7. To primary and secondary regulator valves

Fig. 7B-24 Throttle Valve

PRIMARY REGULATOR VALVE

This valve regulates the oil pressure produced by the oil pump (line pressure) to correspond to each condition of use. It is operated by the throttle pressure, line pressure when in reverse and the springs.

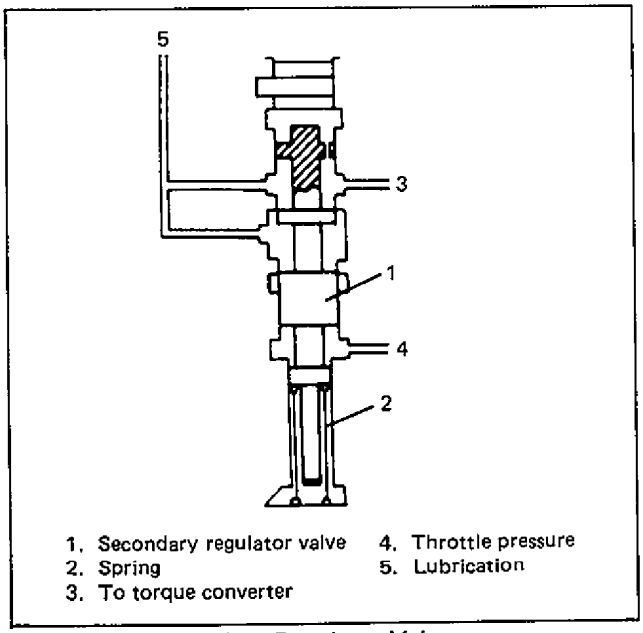


1. Primary regulator valve
2. Spring
3. Line pressure
4. Line pressure in R-range
5. Throttle pressure
6. To secondary regulator valve
7. Drain

Fig. 7B-25 Primary Regulator Valve

SECONDARY REGULATOR VALVE

This valve regulates the oil pressure to the torque converter and lubricating oil pressure to each part of the transmission by means of the throttle pressure and the spring.

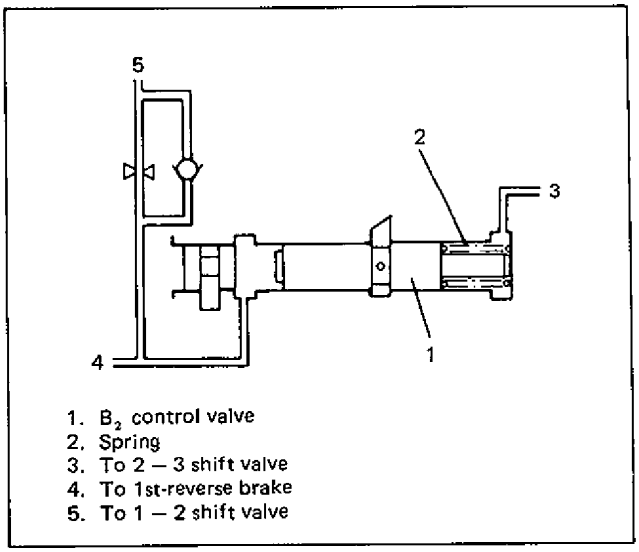


1. Secondary regulator valve
2. Spring
3. To torque converter
4. Throttle pressure
5. Lubrication

Fig. 7B-26 Secondary Regulator Valve

B_2 CONTROL VALVE

When in L range, this valve controls the line pressure acting on the 1st-reverse brake to reduce a shock.

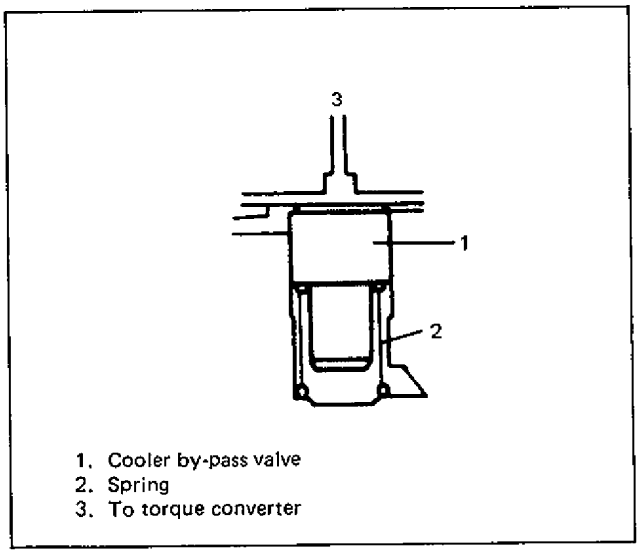


1. B_2 control valve
2. Spring
3. To 2 – 3 shift valve
4. To 1st-reverse brake
5. To 1 – 2 shift valve

Fig. 7B-27 B_2 Control Valve

COOLER BY-PASS VALVE

This valve is provided to keep the oil pressure in the torque converter constant.



1. Cooler by-pass valve
2. Spring
3. To torque converter

Fig. 7B-28 Cooler By-pass Valve

1–2 SHIFT VALVE

This valve carries out the gear shift between 1st and 2nd gears. When the 2nd brake solenoid operates, the line pressure is applied to the shift valve and the valve moves to allow the line pressure to be applied to the 2nd brake and thus the transmission is shifted into 2nd gear.

When the oil pressure to the 2nd brake solenoid is relieved, the shift valve returns by means of the spring force and the transmission is shifted to the 1st gear.

In L or R range, the fluid pressure is applied to the 1st-reverse brake when the 2nd brake solenoid operates.

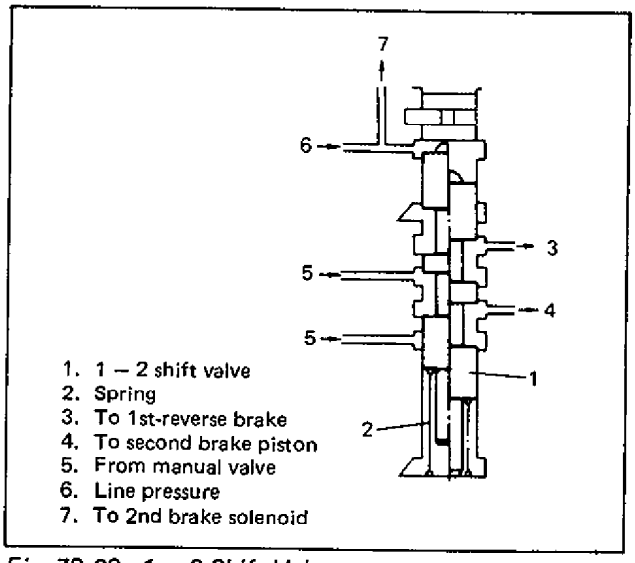


Fig. 7B-29 1 – 2 Shift Valve

2–3 SHIFT VALVE

This valve carries out the gear shift between 2nd and 3rd gears. When the direct clutch solenoid operates, the line pressure is applied to the shift valve and the valve moves to allow the line pressure to be applied to the direct clutch and thus the transmission is shifted from the 2nd to the 3rd gear. When the oil pressure to the solenoid is relieved, the shift valve returns by means of the spring force and the transmission is shifted to the 2nd gear.

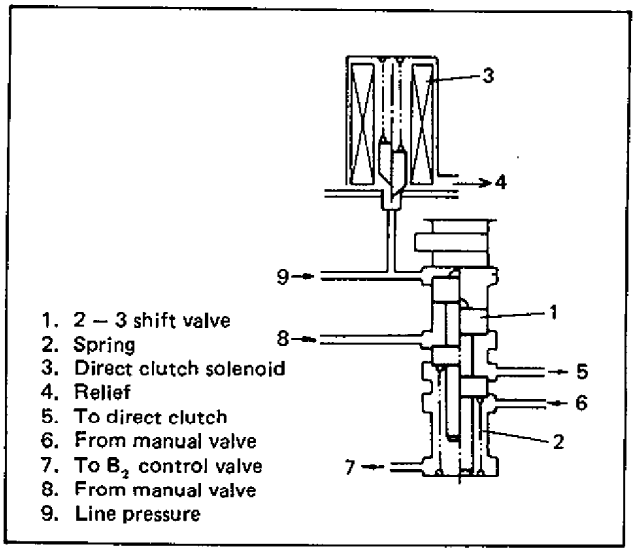


Fig. 7B-30 2 – 3 Shift Valve

ACCUMULATOR

This serves to reduce a shock in each gear shift. There are two accumulators, one for the forward clutch and the other for the 2nd brake.

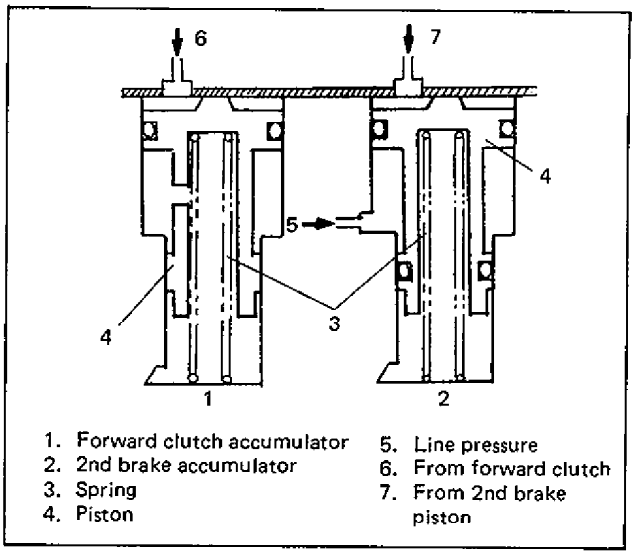


Fig. 7B-31 Accumulator

DIRECT CLUTCH AND 2ND BRAKE SOLENOIDS

These solenoids turn ON and OFF by the electric signals from the controller (computer). They serve to control the gear shift by operating the 1 – 2 and 2 – 3 shift valves. Direct clutch solenoid operates the 2 – 3 shift valve, and 2nd brake solenoid does the 1 – 2 shift valve. When the solenoid valve is ON, the valve moves up to relieve the line pressure and when OFF, the valve moves down and therefore the line pressure is applied to the shift valve.

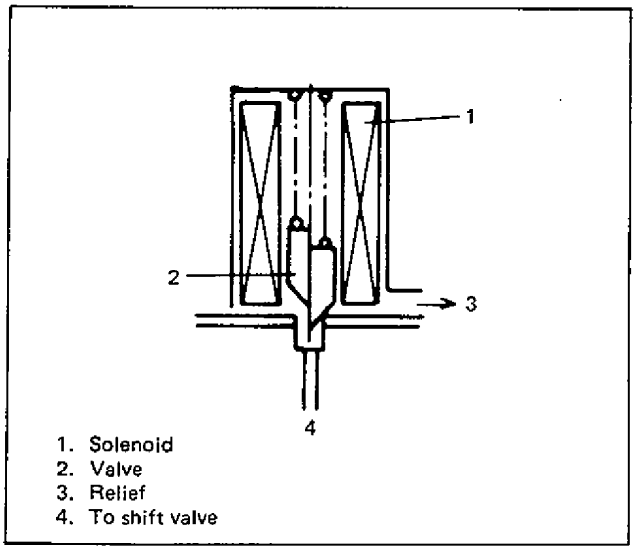
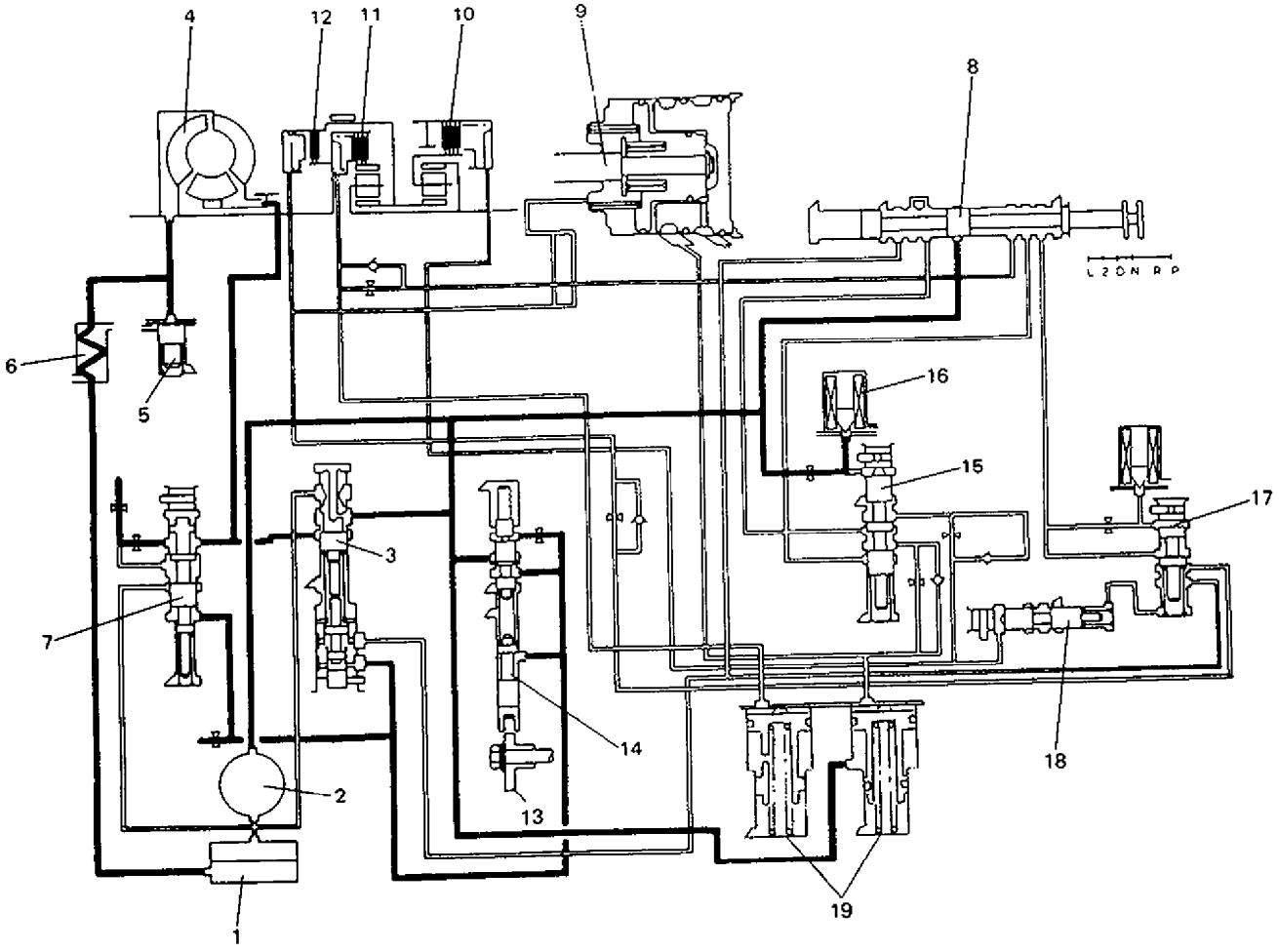


Fig. 7B-32 Direct Clutch and 2nd Brake Solenoids

OIL CIRCUIT IN "N" RANGE

When the engine is started and the oil pump starts to operate, fluid in the oil pan passes through the oil pump, is regulated by the primary regulator valve and sent to the torque converter. Also, the fluid which is further regulated by the secondary regulator valve lubricates each part of the transmission.

In this range, the oil pressure is not applied to any clutch or brake as the line pressure from the regulator valve is stopped by means of the manual valve.



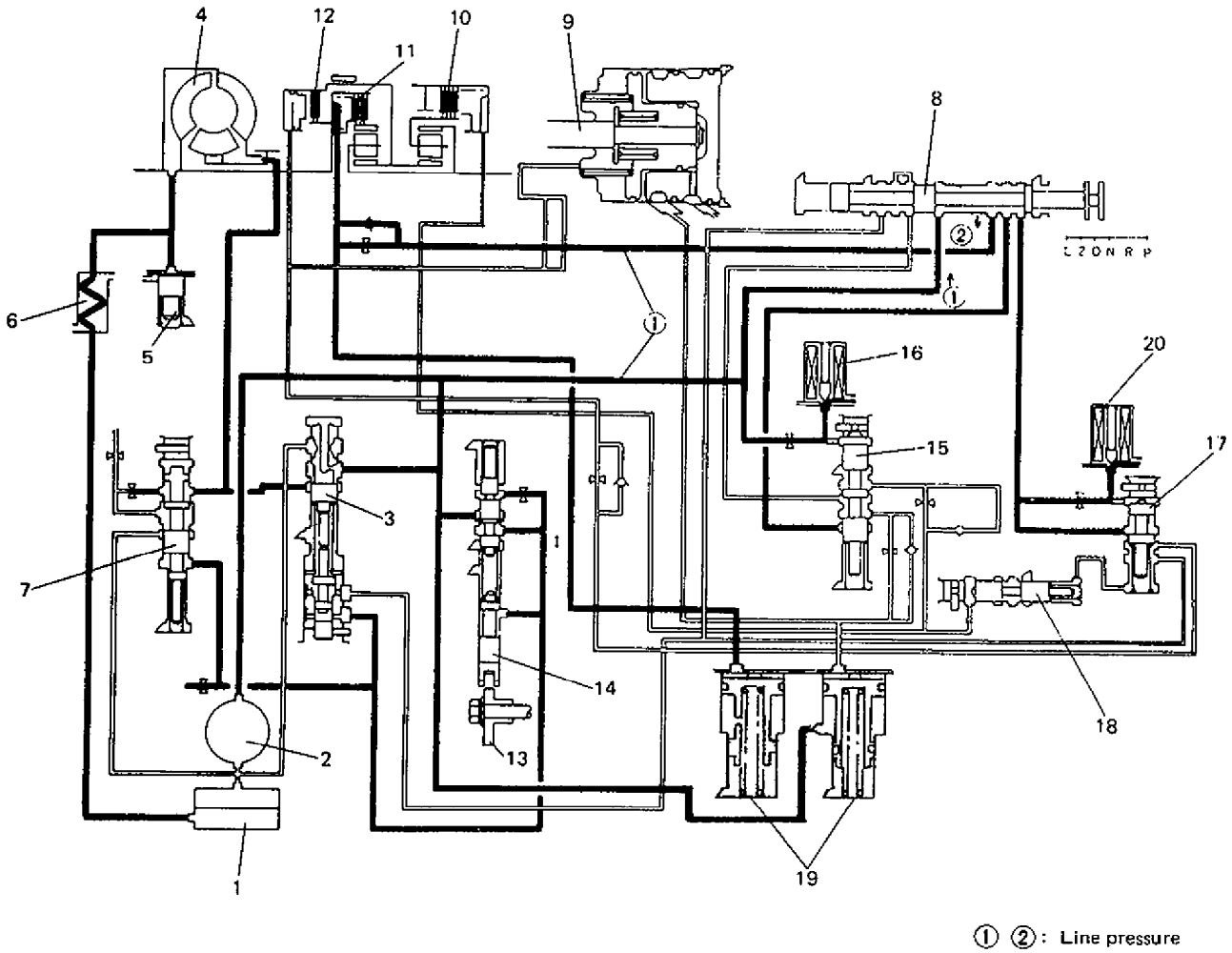
1. Oil pan
2. Oil pump
3. Primary regulator valve
4. Torque converter
5. Cooler by-pass valve
6. Oil cooler
7. Secondary regulator valve
8. Manual valve
9. 2nd brake piston
10. 1st-reverse brake
11. Forward clutch
12. Direct clutch
13. Throttle valve cam
14. Throttle valve
15. 1 – 2 shift valve
16. 2nd brake solenoid
17. 2 – 3 shift valve
18. B_2 control valve
19. Accumulator

Fig. 7B-33 Oil Circuit in N-range

OIL CIRCUIT IN "D" OR "2" RANGE (1ST GEAR)

The line pressure which has passed through the manual valve is applied directly to the forward clutch. As this causes the clutch to be engaged, the 1st gear is shifted. The line pressure is also applied to the accumulator to reduce shocks at the time of clutch engagement.

As the direct clutch and the 2nd brake solenoids receive the electric signal from the controller, that is, they are turned ON, they relieve the line pressure. Therefore, neither the 1 – 2 nor 2 – 3 shift valve operates due to no oil pressure.



① ②: Line pressure

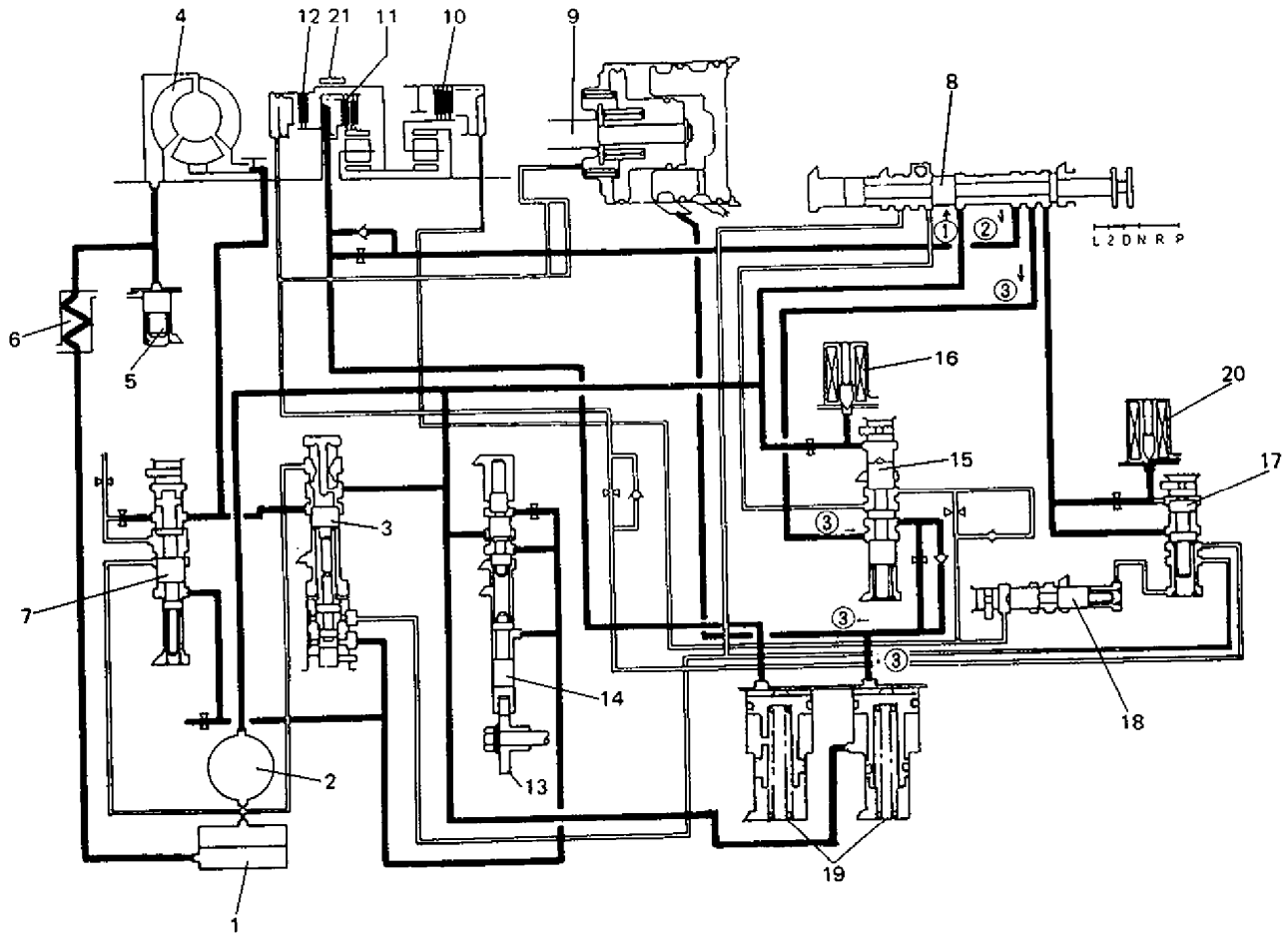
1. Oil pan
2. Oil pump
3. Primary regulator valve
4. Torque converter
5. Cooler by-pass valve
6. Oil cooler
7. Secondary regulatro valve
8. Manual valve
9. 2nd brake piston
10. 1st-reverse brake
11. Forward clutch
12. Direct clutch
13. Throttle valve cam
14. Throttle valve
15. 1 – 2 shift valve
16. 2nd brake solenoid
17. 2 – 3 shift valve
18. B_2 control valve
19. Accumulator
20. Direct clutch solenoid

Fig. 7B-34 Oil Circuit in D or 2-range (1st Gear)

OIL CIRCUIT IN "D" OR "2" RANGE (2ND GEAR)

As the car speed is accelerated at the 1st gear and reaches the 2nd gear shift point, the 2nd brake solenoid turns OFF and closes the relief circuit. This causes the line pressure ① to act on the 1 – 2 shift valve. Then the valve moves to allow the line pressure ③ to be applied to the 2nd brake and the 2nd gear is attained. At this time, the line pressure ③ is also applied to the accumulator to reduce a shock occurring when the 2nd brake works.

The same oil circuit acts in D when the car speed is lowered to the shift down point from the 3rd to the 2nd gear.



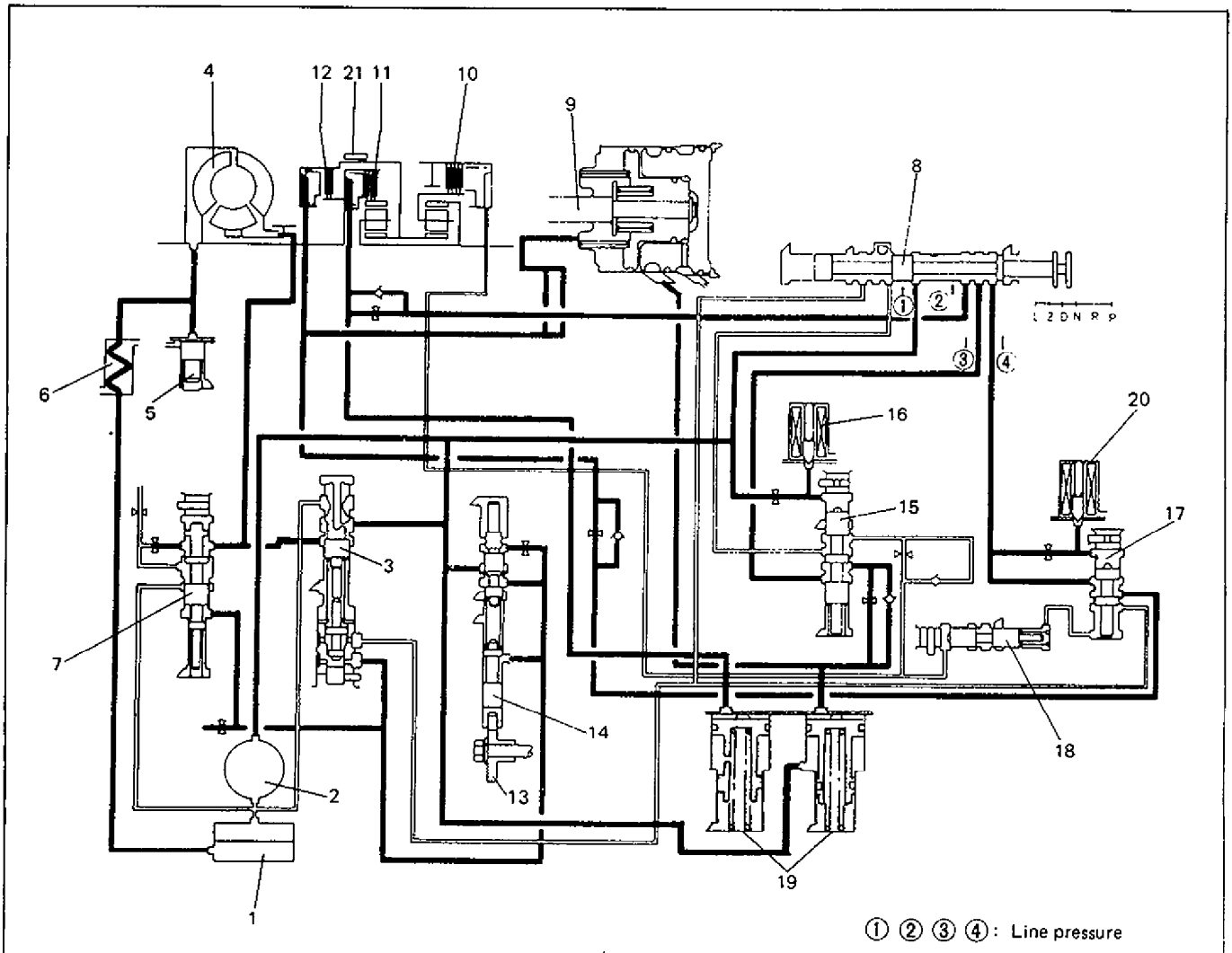
① ② ③ : Line pressure

1. Oil pan
2. Oil pump
3. Primary regulator valve
4. Torque converter
5. Cooler by-pass valve
6. Oil cooler
7. Secondary regulator valve
8. Manual valve
9. 2nd brake piston
10. 1st-reverse brake
11. Forward clutch
12. Direct clutch
13. Throttle valve cam
14. Throttle valve
15. 1 – 2 shift valve
16. 2nd brake solenoid
17. 2 – 3 shift valve
18. B_2 control valve
19. Accumulator
20. Direct clutch solenoid
21. 2nd brake

Fig. 7B-35 Oil Circuit in D or 2-range (2nd Gear)

OIL CIRCUIT IN "D" RANGE (3RD GEAR)

As the car speed is further accelerated in the 2nd gear and reaches the 3rd gear shift point, the direct clutch solenoid turns OFF and closes the relief circuit. This causes the line pressure ④ to be applied to the 2 — 3 shift valve. Then the oil pressure is applied to the direct clutch to make it engaged. At the same time, the oil pressure acts, as a back pressure, on the 2nd brake piston. Thus the 2nd brake piston is pushed back, the 2nd brake is released and the 3rd gear is attained. In this state, as the 2nd brake solenoid is OFF, the 1 — 2 shift valve is at work and opens the oil passage to the 2nd brake but the 2nd brake does not operate. It is because the oil pressure to the 2nd brake is balanced with the above mentioned back pressure and the return spring force pushes back the piston to prevent the 2nd brake from operating.



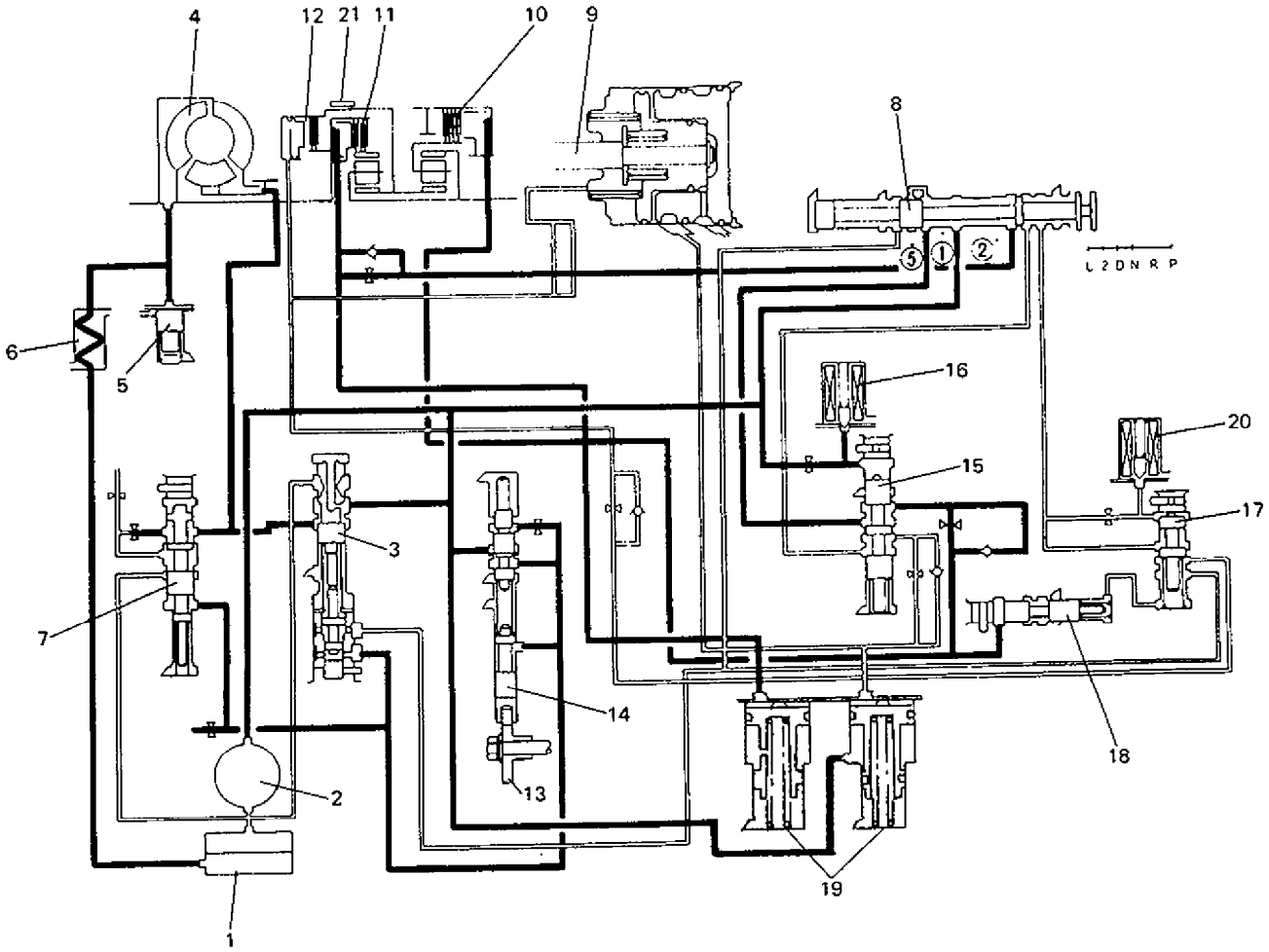
1. Oil pan
2. Oil pump
3. Primary regulator valve
4. Torque converter
5. Cooler by-pass valve
6. Oil cooler
7. Secondary regulator valve
8. Manual valve
9. 2nd brake piston
10. 1st-reverse brake
11. Forward clutch
12. Direct clutch
13. Throttle valve cam
14. Throttle valve
15. 1 — 2 shift valve
16. 2nd brake solenoid
17. 2 — 3 shift valve
18. B_2 control valve
19. Accumulator
20. Direct clutch solenoid
21. 2nd brake

Fig. 7B-36 Oil Circuit in D-range (3rd Gear)

OIL CIRCUIT IN "L" RANGE

The line pressure ① , after passing through the manual valve, comes out as the line pressures ② and ⑤ . The line pressure ② is applied to the forward clutch. In this state, as the 2nd brake solenoid is OFF because it is not electrically charged from the controller, the line pressure ① is applied to the 1 — 2 shift valve. Then the line pressure is applied to the 1st-reverse brake. Consequently the 1st gear is attained.

When the selector lever is shifted to L at a speed higher than 53 km/h (33 mile/h), the 2nd brake solenoid is electrically actuated and the solenoid valve opens to allow the line pressure ① to be relieved. Then the 1 — 2 shift valve is pushed back by its return spring and the passage of the line pressure ⑤ is switched from the 1st-reverse brake to the 2nd brake piston. Therefore, the 2nd gear is attained until the car speed lowers.



① ② ⑤ : Line pressure

1. Oil pan
2. Oil pump
3. Primary regulator valve
4. Torque converter
5. Cooler by-pass valve
6. Oil cooler
7. Secondary regulator valve
8. Manual valve
9. 2nd brake piston
10. 1st-reverse brake
11. Forward clutch
12. Direct clutch
13. Throttle valve cam
14. Throttle valve
15. 1 — 2 shift valve
16. 2nd brake solenoid
17. 2 — 3 shift valve
18. B_2 control valve
19. Accumulator
20. Direct clutch solenoid
21. 2nd brake

Fig. 7B-37 Oil Circuit in L-range

OIL CIRCUIT IN "R" RANGE

The line pressure ① , after passing through the manual valve, comes out as the line pressures ⑤ and ⑥ . In this state, as the 2nd brake solenoid is OFF, the line pressure ① is applied to the 1 — 2 shift valve and the line pressure ⑤ is applied to the 1st-reverse brake after passing through the B_2 control valve. On the other hand, the line pressure ⑥ is applied to the direct clutch via the 2 — 3 shift valve, thus resulting in the reverse gear. Also, a part of the line pressure ⑥ acts on the primary regulator valve to regulate the line pressure ① .

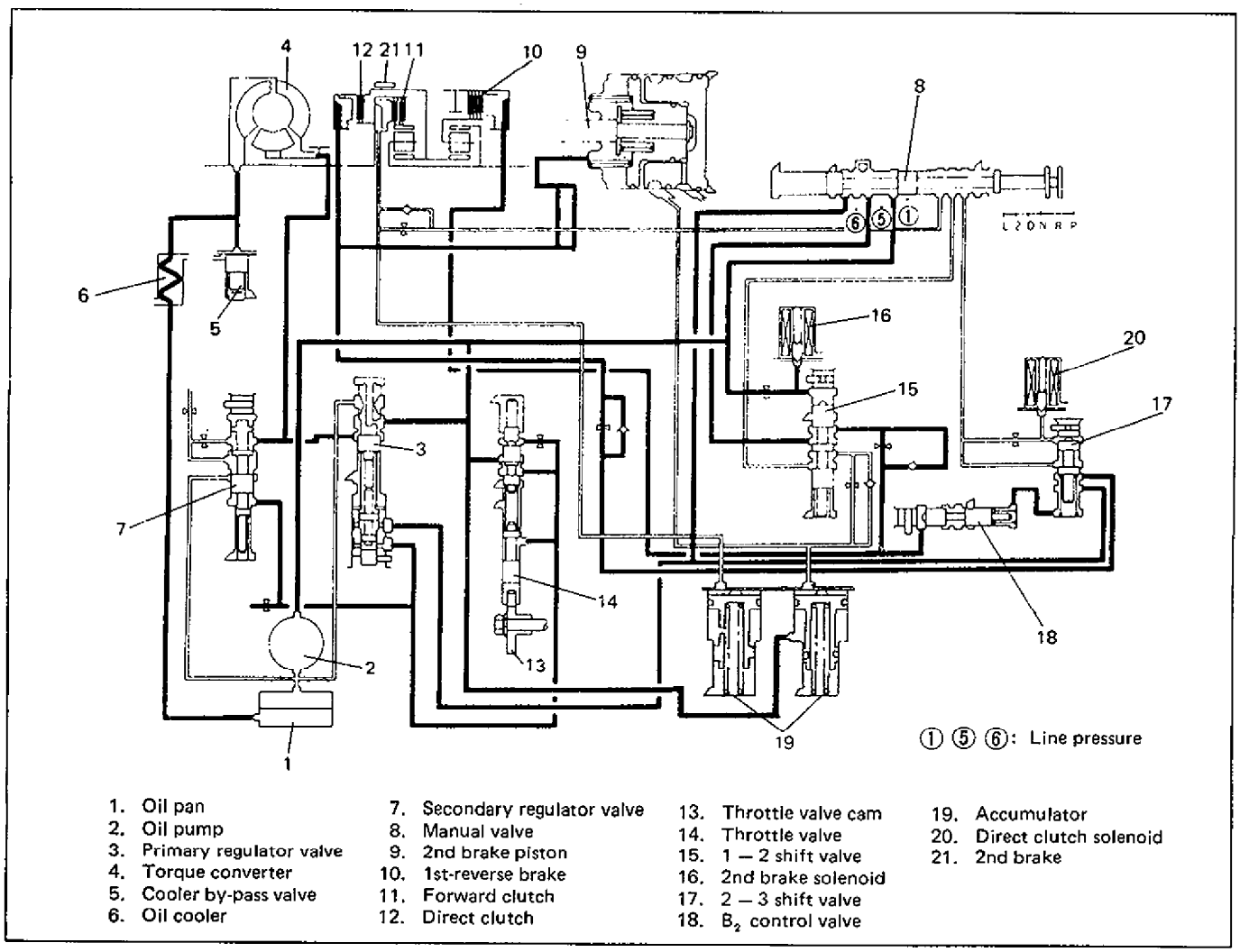


Fig. 7B-38 Oil Circuit in R-range

OIL COOLING SYSTEM

The oil cooler of dual pipe type is built in the lower tank of the engine cooling radiator and cools off the automatic transmission fluid.

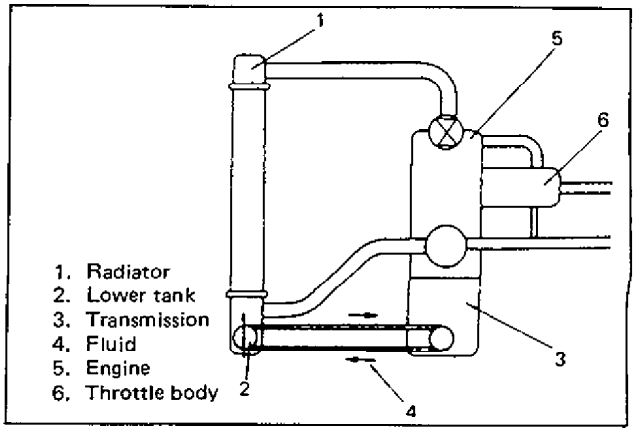


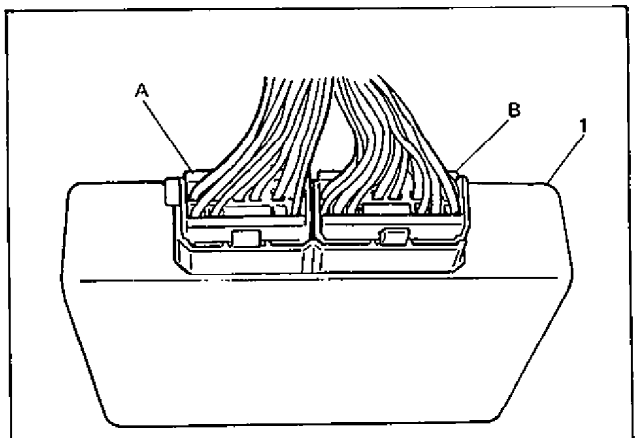
Fig. 7B-39 Oil Cooling System

ELECTRIC SHIFT CONTROL SYSTEM

A/T CONTROL MODULE (CONTROLLER)

The controller controls the 2nd brake solenoid and the direct clutch solenoid by sending electric signals to them so as to attain automatic gear shift between the 1st and 2nd gears, and the 2nd and 3rd gears.

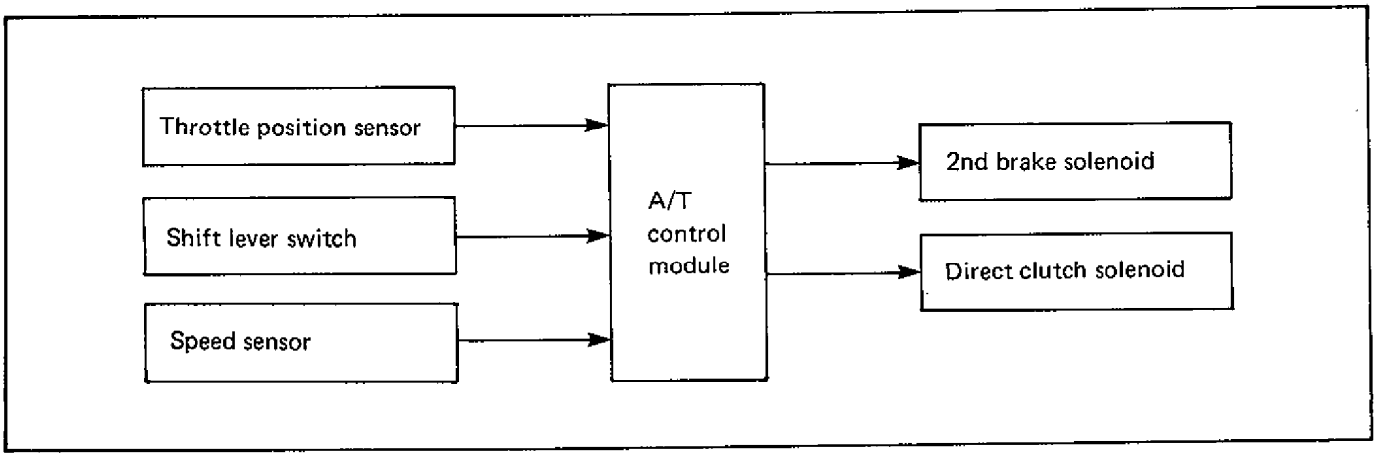
Equipped as controller sensed parameters are the throttle position sensor (TPS), shift lever switch and speed sensor. These switch and sensors sense the carburetor throttle valve opening, selector lever's position and car speed, and send those signals to the controller. Then, the controller opens and closes valves of the above solenoids according to these signals. For the left hand steering car, the controller is located at the right hand of steering column. For the right hand steering car, it is located at the left hand of steering column.



1. A/T control module
A: 10P coupler
B: 14P coupler

Fig. 7B-40 A/T Control Module

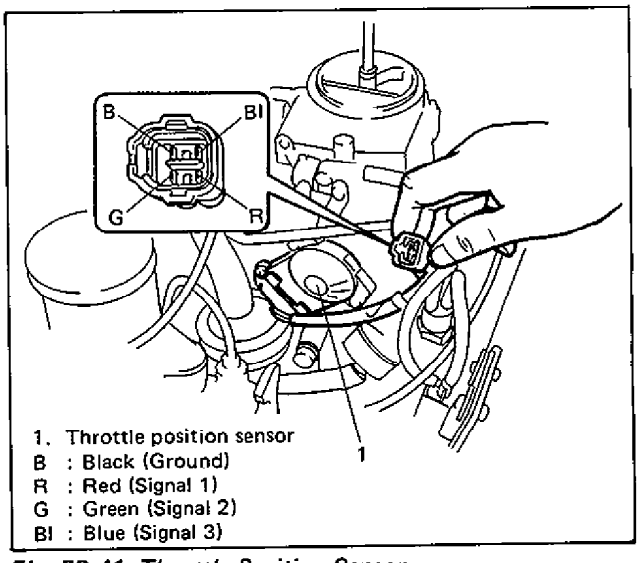
GEAR SHIFT CONTROL SYSTEM



THROTTLE POSITION SENSOR (TPS)

The throttle position sensor consisting of a potentiometer is connected to the throttle valve shaft.

Throttle valve opening signals are transmitted from TPS to A/T controller as signal.



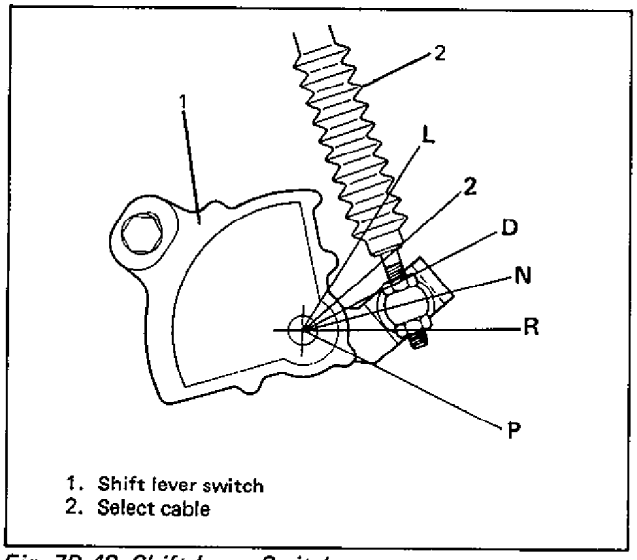
1. Throttle position sensor
B : Black (Ground)
R : Red (Signal 1)
G : Green (Signal 2)
Bl : Blue (Signal 3)

Fig. 7B-41 Throttle Position Sensor

SHIFT LEVER SWITCH

Being linked with the selector lever, this switch changes selector lever positions into electric signals and send them to the controller. The contact points of this switch for P and N ranges are also connected with the starting motor circuit. So when the selector lever is shifted to the P or N position, the contact points for P or N range are connected and cause the starting motor to operate by turning the starter switch ON. When the selector lever is in any other position than P and N, the switch remains OFF and therefore the starting motor cannot be operated, that is, the engine cannot be started.

Also, as its contact point for R range is connected with the back up light circuit, only when the selector lever is shifted to R range, the contact point contacts to light the back up light.



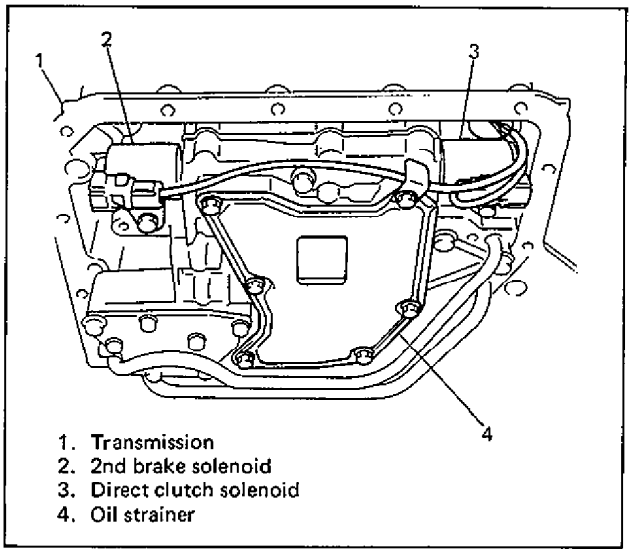
1. Shift lever switch
2. Select cable

Fig. 7B-42 Shift Lever Switch

DIRECT CLUTCH AND 2ND BRAKE SOLENOIDS

These solenoids are mounted on the valve body. They are turned ON and OFF by the signals from the controller and actuate each shift valve (1 – 2 and 2 – 3 valves) so as to control transmission gear shift.

2nd brake solenoid operates 1 – 2 shift valve, and direct clutch solenoid does 2 – 3 shift valve.



1. Transmission
2. 2nd brake solenoid
3. Direct clutch solenoid
4. Oil strainer

Fig. 7B-43 Direct Clutch and 2nd Brake Solenoid

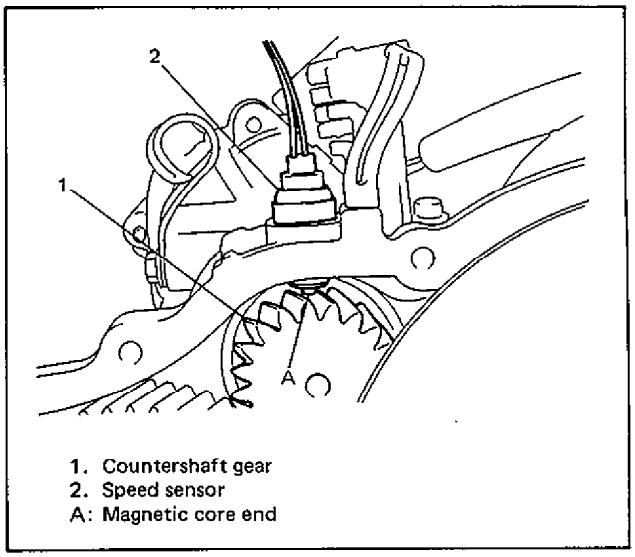
OPERATION OF DIRECT CLUTCH AND 2ND BRAKE SOLENOIDS

Range	D			2		L		P, N & R
Gear	1st	2nd	3rd	1st	2nd	1st	(2nd)	–
Direct clutch solenoid	O	O	X	X	O	X	X	X
2nd brake solenoid	O	X	X	O	X	X	O	X

O : Operated (Solenoid Valve is Open) X : Unoperated (Solenoid Valve is Closed)

SPEED SENSOR

The speed sensor consists of a magnetic core with magnet and coil. It is mounted on transmission case with 0.6 mm (0.024 in) air gap between the core end and countershaft gear tooth. While the countershaft rotates, magnetic flux is cut by gear tooth thus a pulse is generated in the sensor coil according to the speed. And then, the pulse is transmitted to A/T control module as speed signal.

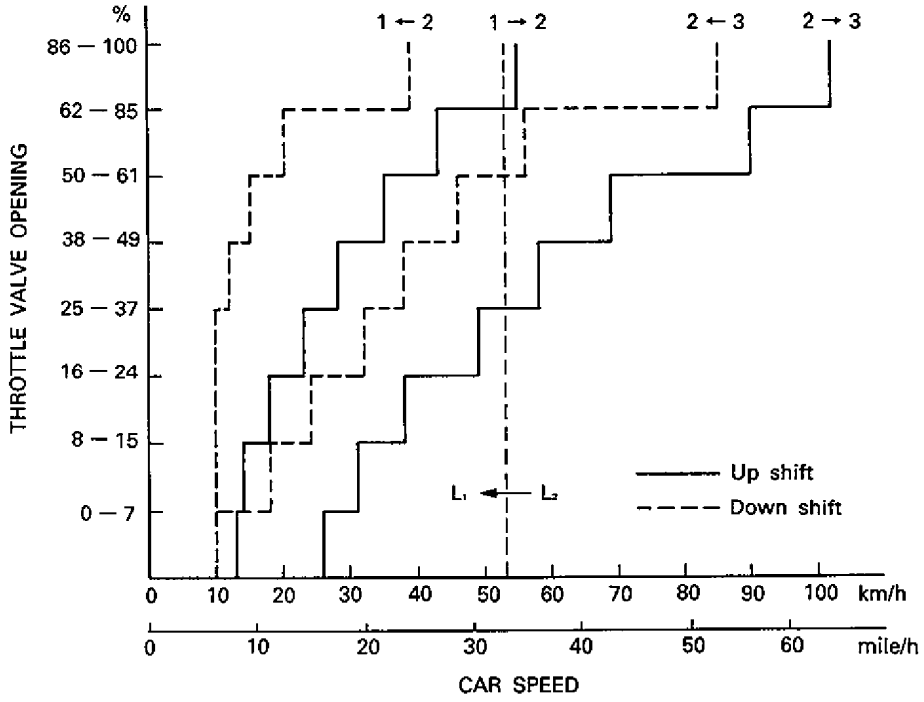


1. Countershaft gear
2. Speed sensor
A: Magnetic core end

Fig. 7B-44 Speed Sensor

AUTOMATIC SHIFT DIAGRAM

Automatic shift schedule as a result of shift control is shown below. In case that selector lever is shifted to L at a higher than 53 km/h (33 mile/h) speed, 2nd gear is operated and then down shifts to 1st at a speed lower than that. No up shift is available in L.



Selector / Gear / Throttle / Speed		D or 2	D		D or 2	L
		1 → 2	2 → 3	3 → 2	2 → 1	2 → 1
Full close	Km/h	13	26	10	10	53
	mile/h	8	16	6	6	33
Full open	Km/h	55	102	85	39	53
	mile/h	34	63	53	24	33

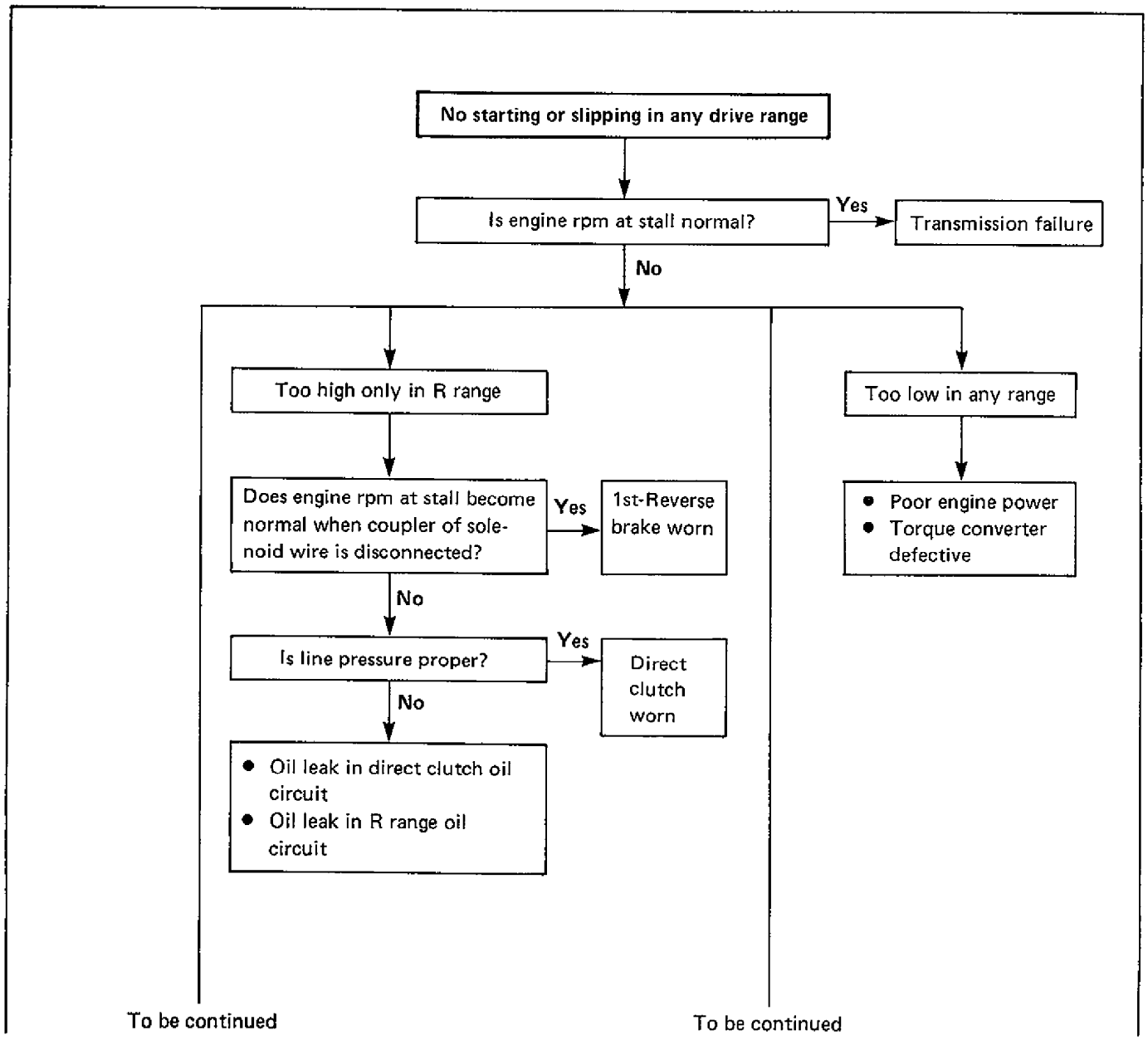
DIAGNOSIS

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 800 – 900 rpm.
3. Transmission fluid level is between FULL HOT and LOW HOT on oil level gauge at normal operating temperature of transmission fluid.
4. Accelerator cable, oil pressure control cable and select cable are adjusted properly.
5. Electric circuit of gear shift control system is free from break, coupler disconnection and poor contact.



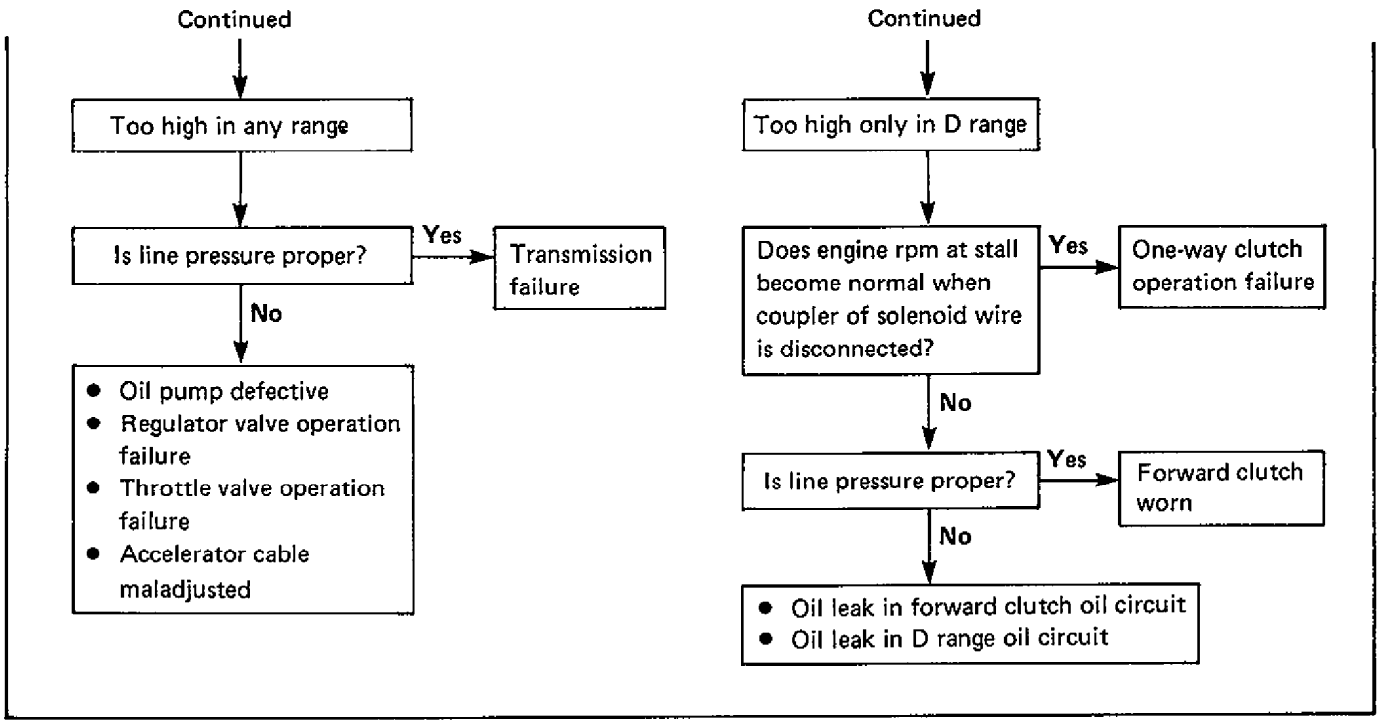


Fig. 7B-45 Stall Test and Line Pressure Test

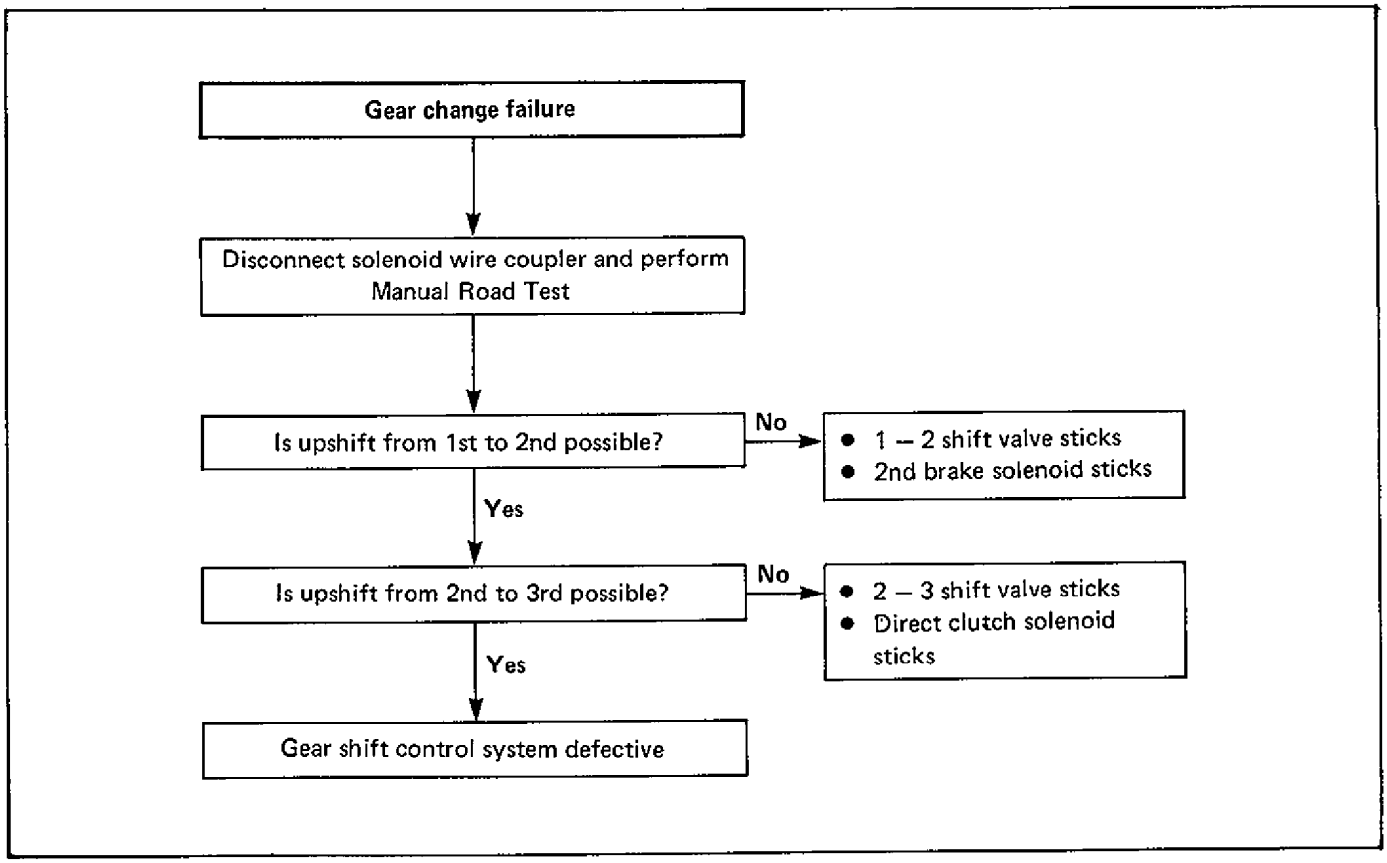


Fig. 7B-46 Manual Road Test

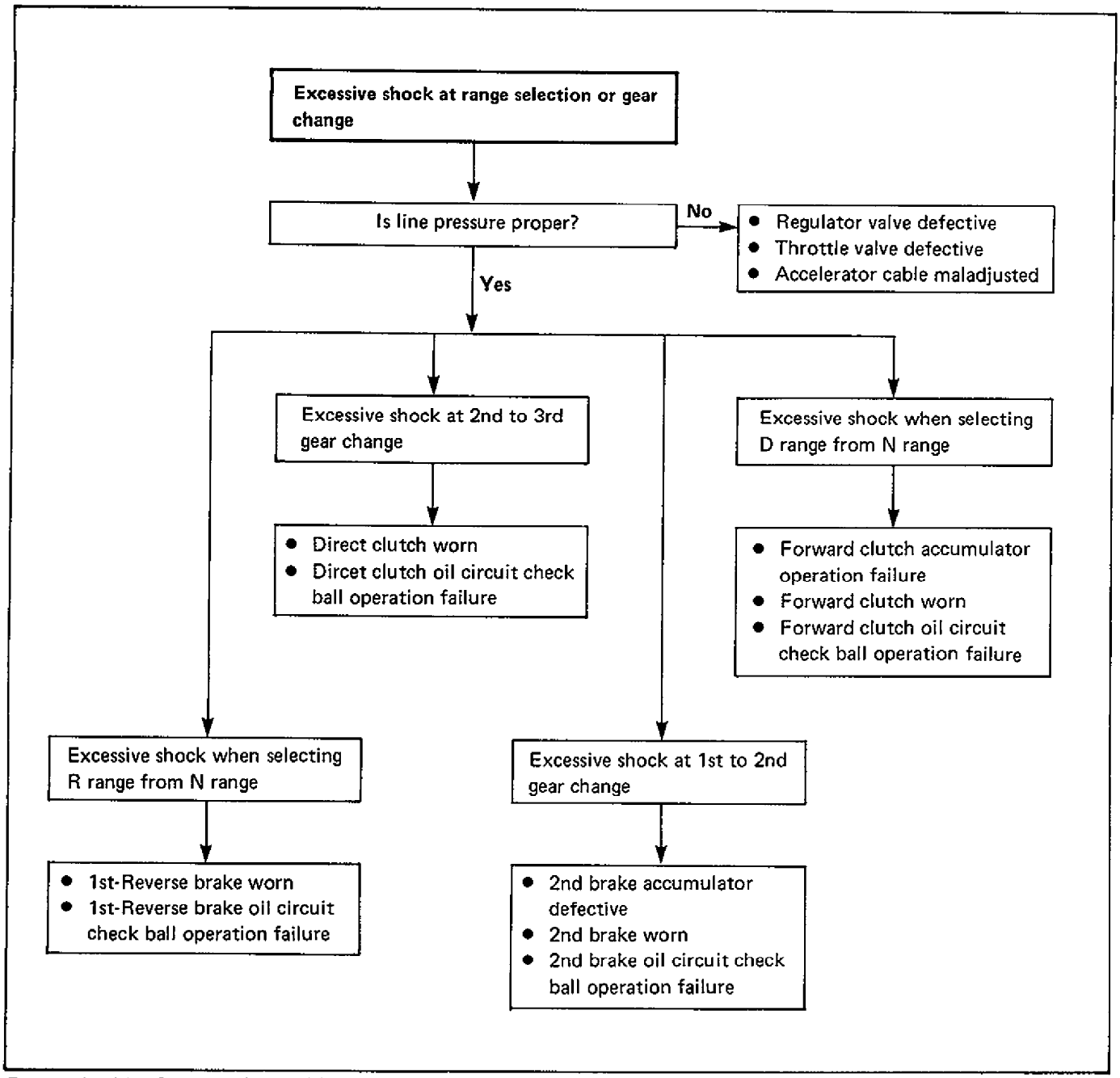


Fig. 7B-47 Line Pressure Test and Road Test

STALL TEST

This test is to check overall performance of automatic transmission and engine by measuring stall speed at D and R ranges. Be sure to perform this test only when transmission fluid is at normal operating temperature and its level is between FULL HOT and LOW HOT.

CAUTION:
Do not run engine at stall more than 5 seconds continuously, for oil temperature may rise excessively high.

1. Install tachometer.
2. Apply parking brake and block car wheels.
3. Start engine with selector lever shifted to P.
4. Depress brake pedal.
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 R range.
8. Stall speed should be within following specification.

Stall speed	2,000 – 2,500 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 specification	• Engine output insufficient • Torque converter defective
Higher than specification in D range	• Forward clutch slippage • One-way clutch defective
Higher than specification in R range	• Direct clutch slippage • 1st – reverse brake slippage

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 HOT and LOW HOT 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 R.

CAUTION:
Do not run engine at stall more than 5 seconds continuously, for oil temperature may rise excessively high.

8. If line pressure is within respective specification in below table, oil pressure system is in good condition.

Engine speed	Line pressure	
	D range	R range
Idling speed (800 – 900 r/min)	2 – 4 kg/cm^2 28.5 – 56.8 psi 200 – 400 kPa	5.5 – 8 kg/cm^2 78.2 – 113.7 psi 550 – 800 kPa
Stall speed (2,000 – 2,500 r/min)	5 – 7 kg/cm^2 71.1 – 99.5 psi 500 – 700 kPa	10.5–14.0 kg/cm^2 149.4 – 199.1 psi 1,050 – 1,400 kPa

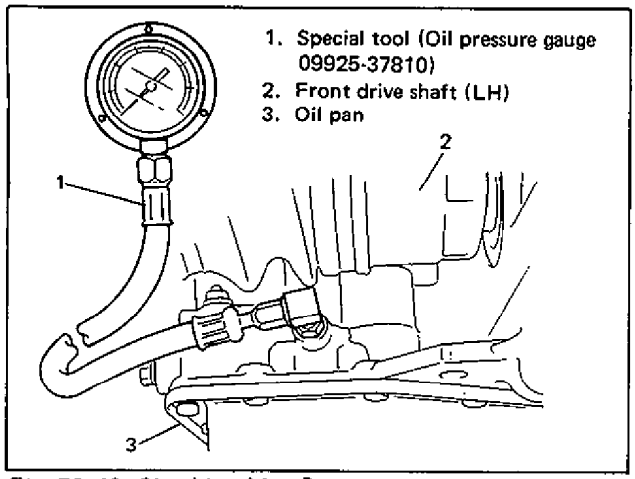


Fig. 7B-48 Checking Line Pressure

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	• Regulator valve defective • Throttle valve in valve body defective • Accelerator cable and oil pressure control cable maladjusted
Lower than specification in D and R ranges	• Oil pump defective • Regulator valve defective • Throttle valve in valve body defective • Accelerator cable and oil pressure control cable maladjusted
Lower than specification only in D range	• Forward clutch oil pressure system oil leakage • D range oil pressure system oil leakage
Lower than specification only in R range	• Direct clutch oil pressure system oil leakage • 1st – reverse brake oil pressure system oil leakage • R range oil pressure system oil leakage

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 the test in very little traffic area to prevent an accident.**
- **The test requires 2 persons, a driver and a tester.**

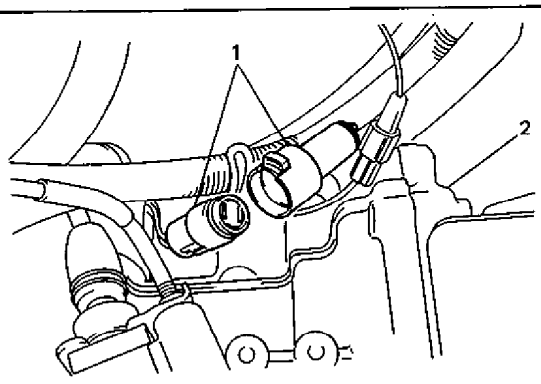
1. Warm up engine.
2. With engine running at idle, shift selector lever to D.
3. Accelerate car speed by depressing accelerator pedal very little (within 5 deg. of throttle valve opening).
4. Check if upshift takes place from 1st to 2nd at about 13 km/h (8 mile/h) and from 2nd to 3rd at about 26 km/h (16 mile/h).
5. Stop car once. Then start it again and while accelerating by depressing accelerator pedal fully, check if upshift takes place from 1st to 2nd at 55 km/h (34 mile/h) and from 2nd to 3rd at 102 km/h (63 mile/h).
6. Stop car again.
7. Start car and keep it running at 25 km/h (16 mile/h) and then release accelerator pedal completely. 1 or 2 seconds later, depress accelerator pedal fully and check if downshift from 2nd to 1st takes place.
8. Keep car running at 75 km/h (47 mile/h) and in the same way as in step 7, check if downshift from 3rd to 2nd takes place.
9. If upshift or downshift fails to take place at each specified speed in the road test, possible causes for such failure are as follows. Check each part which is suspected to be the cause.

Condition	Possible causes
No upshift from 1st to 2nd	• 1 – 2 shift valve defective • 2nd brake solenoid defective • Controller defective, or disconnection or poor connection in controller electric circuit
No upshift from 2nd to 3rd	• 2 – 3 shift valve defective • Direct clutch solenoid defective • Controller defective, or disconnection or poor connection in controller electric circuit
No downshift from 2nd to 1st or 3rd to 2nd	• Throttle position sensor defective • Controller defective, or disconnection or poor connection in controller electric circuit

MANUAL ROAD TEST

This test checks the gears being used in L, 2 or D range when driven with unoperated gear shift control system. Test drive car on a level road.

1. With selector lever in P, start engine and warm it up.
2. After warming up engine, disconnect coupler of solenoid wire as shown in figure.



1. Solenoid wire coupler (Disconnected)
2. Transmission

Fig. 7B-49 Disconnecting Solenoid Wire Coupler

3. With selector lever in L range, start car and accelerate to 30 km/h (19 mile/h). Check in this state that 1st gear is being used.
4. At 30 km/h (19 mile/h), shift selector lever to 2 range and accelerate to 60 km/h (37 mile/h). Check in this state that 2nd gear is being used.
5. At 60 km/h (37 mile/h), shift selector lever to D range and check that 3rd gear is used when speed is higher than 60 km/h (37 mile/h).
6. After above checks, stop car then engine, and connect solenoid wire coupler.

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, release parking brake lever gradually and check that car remains stationary.

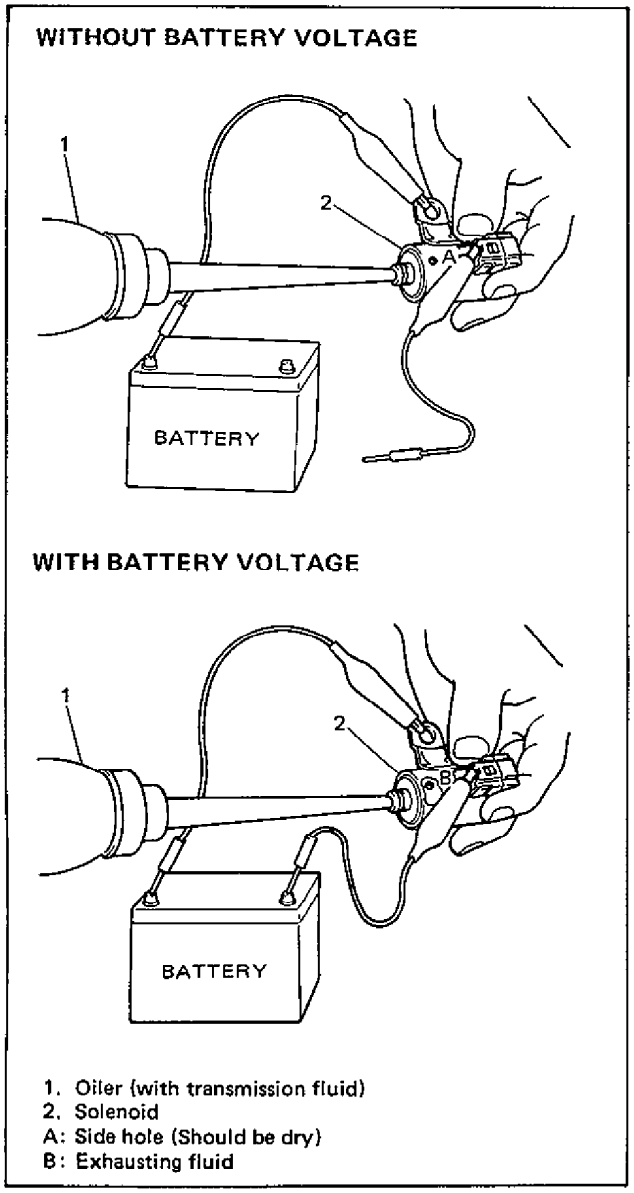
SHIFT SOLENOID CHECK

Whenever shift solenoids are removed from transmission, verify their valve function physically before they are reinstalled.

1. Apply oiler to solenoid and give compression by hands and then check to be sure that transmission fluid from oiler does not come out from side holes of solenoid when battery voltage is not conducted.
2. Holding the above condition, conduct battery voltage and then make sure that fluid is exhausted with vigor.

NOTE:

If fluid does not come out with vigor in above step 2 inspection, do not re-use that solenoid.

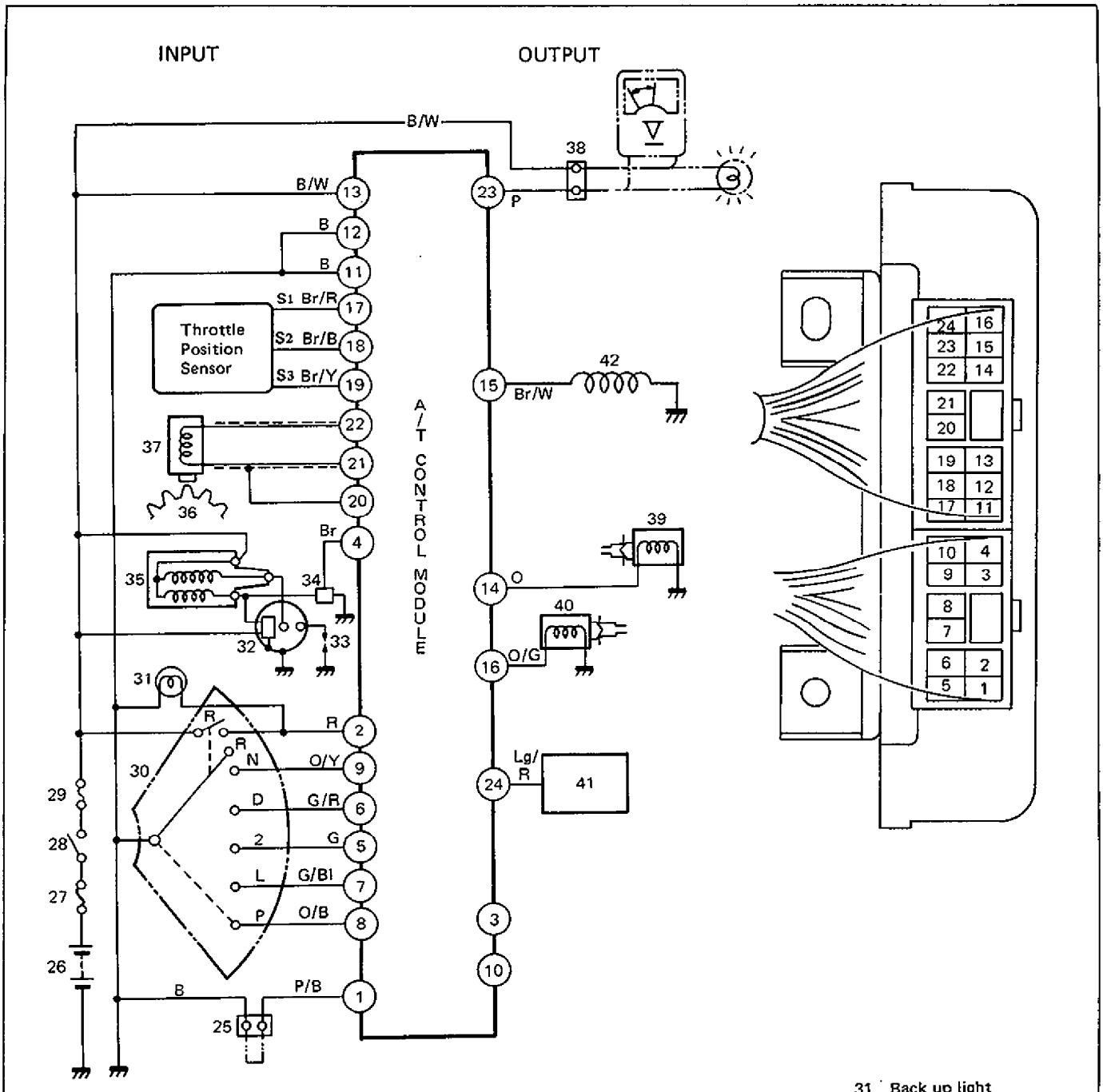


1. Oiler (with transmission fluid)
2. Solenoid
A: Side hole (Should be dry)
B: Exhausting fluid

Fig. 7B-50 Checking Solenoid Valve Function

ELECTRIC SHIFT CONTROL SYSTEM

Process trouble shooting for electric control system by using SELF-DIAGNOSIS and SYSTEMATIC TROUBLE SHOOTING and find a defective area reasonably.



1. Diagnosis switch
2. R position
3. No connection
4. Ignition signal
5. 2nd position
6. D position
7. L position
8. P position
9. N position
10. No connection
11. Ground
12. Ground
13. Power supply
14. Direct clutch solenoid
15. R, D, 2 and L signal
16. 2nd brake solenoid
17. Throttle opening signal
18. Throttle opening signal
19. Throttle opening signal
20. Speed sensor ground
21. Speed sensor
22. Speed sensor
23. Diagnosis monitor
24. Air-con control
25. Diagnosis switch
26. Battery
27. Main fuse
28. Ignition switch
29. Fuse
30. Shift lever switch
31. Back up light
32. Distributor
33. Spark plug
34. Noise filter
35. Ignition coil
36. Countershaft
37. Speed sensor
38. Diagnosis monitor
39. Direct clutch solenoid
40. 2nd brake solenoid
41. Air-con controller (If equipped)
42. Idle up VSV

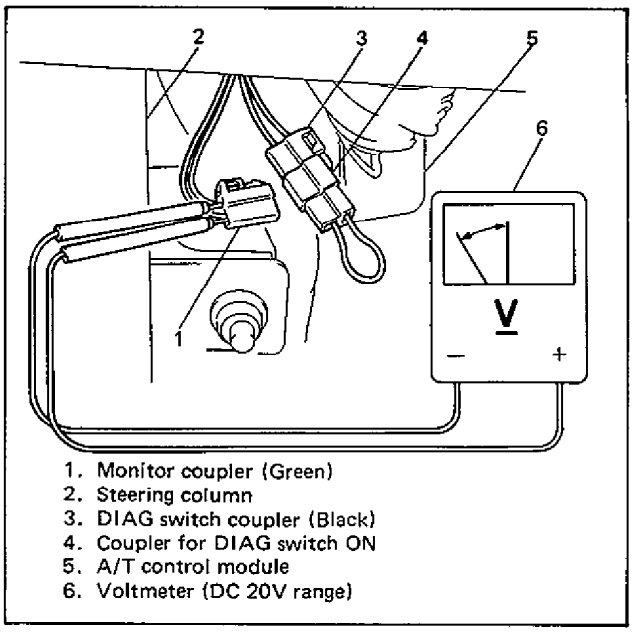
Fig. 7B-51 Gear Shift Control System Wiring Diagram

SELF-DIAGNOSIS

1. After test driving, hold engine running in P position applied with parking brake.
2. Connect voltmeter probes to monitor coupler (green coupler) under dash panel beside steering column.
3. Using a coupler with lead, make a short circuit at DIAG SW coupler (black coupler) beside monitor coupler.
4. To read diagnostic code, watch swing of voltmeter indicator.

NOTE:

- **All applicable code will be indicated from smaller number to large number in order.**
- **Code memory, if any, will be erased when ignition switch is turned off.**
- **Instead of using voltmeter, code may be read by connecting small bulb (12V 1.4 or 3.4W) into monitor coupler.**
- **Ignition signal is used for fail-safe but it is not a factor of shift control.**



1. Monitor coupler (Green)
2. Steering column
3. DIAG switch coupler (Black)
4. Coupler for DIAG switch ON
5. A/T control module
6. Voltmeter (DC 20V range)

Fig. 7B-52 Monitoring Diagnostic Code

Diagnostic Code		Diagnostic Area	Diagnosis
No.	Mode		
12		Normal	No problem exists as far as self-diagnosis system is concerned.
21		Direct clutch solenoid	Open circuit.
22			Short circuit to ground.
23		2nd brake solenoid	Open circuit.
24			Short circuit to ground.
25		Idle up VSV	Short circuit to ground in wiring to A/T controller.
31		Speed sensor	Open circuit while runnig. However, this code does not appear once ignition switch is turned off.
32		Shift lever switch	2 points or more are grounded at once or all points are open.
33		Ignition signal	No ignition signal for more than 9 seconds while running at 30 km/h (19 mile/h) or more with throttle position sensor opened more than 24%.

SYSTEMATIC TROUBLE SHOOTING

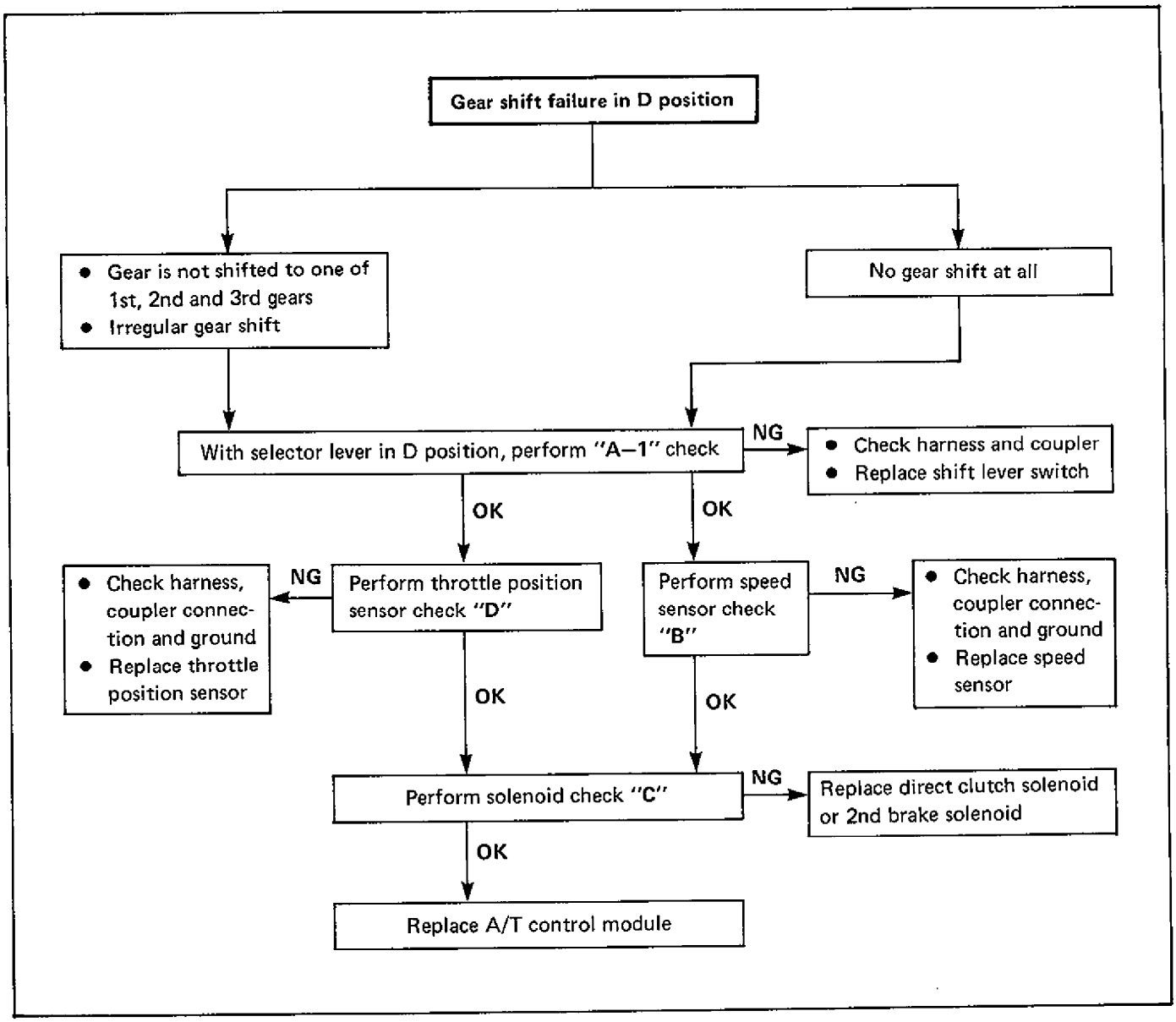


Fig. 7B-53 Gear Shift Failure in D

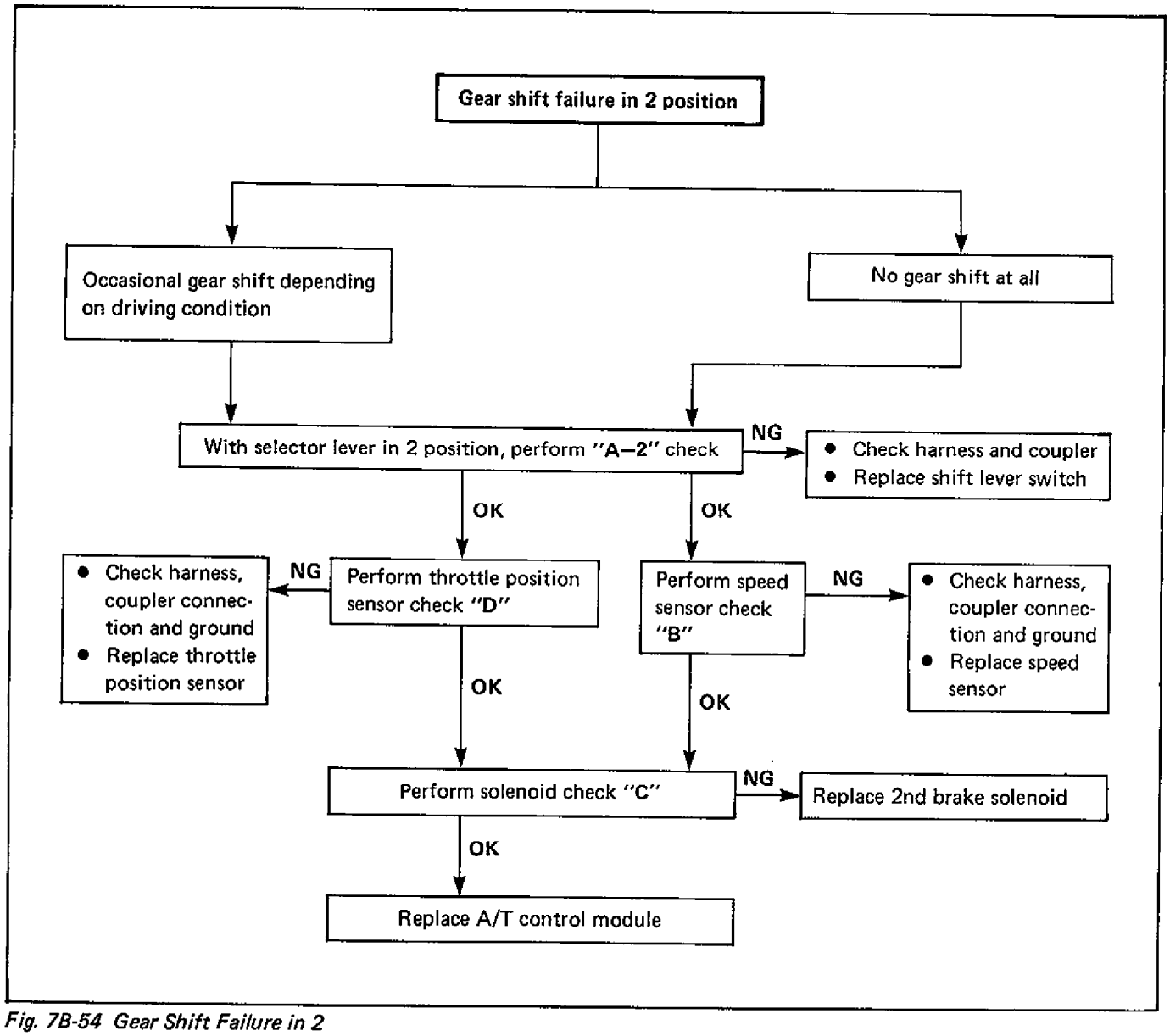


Fig. 7B-54 Gear Shift Failure in 2

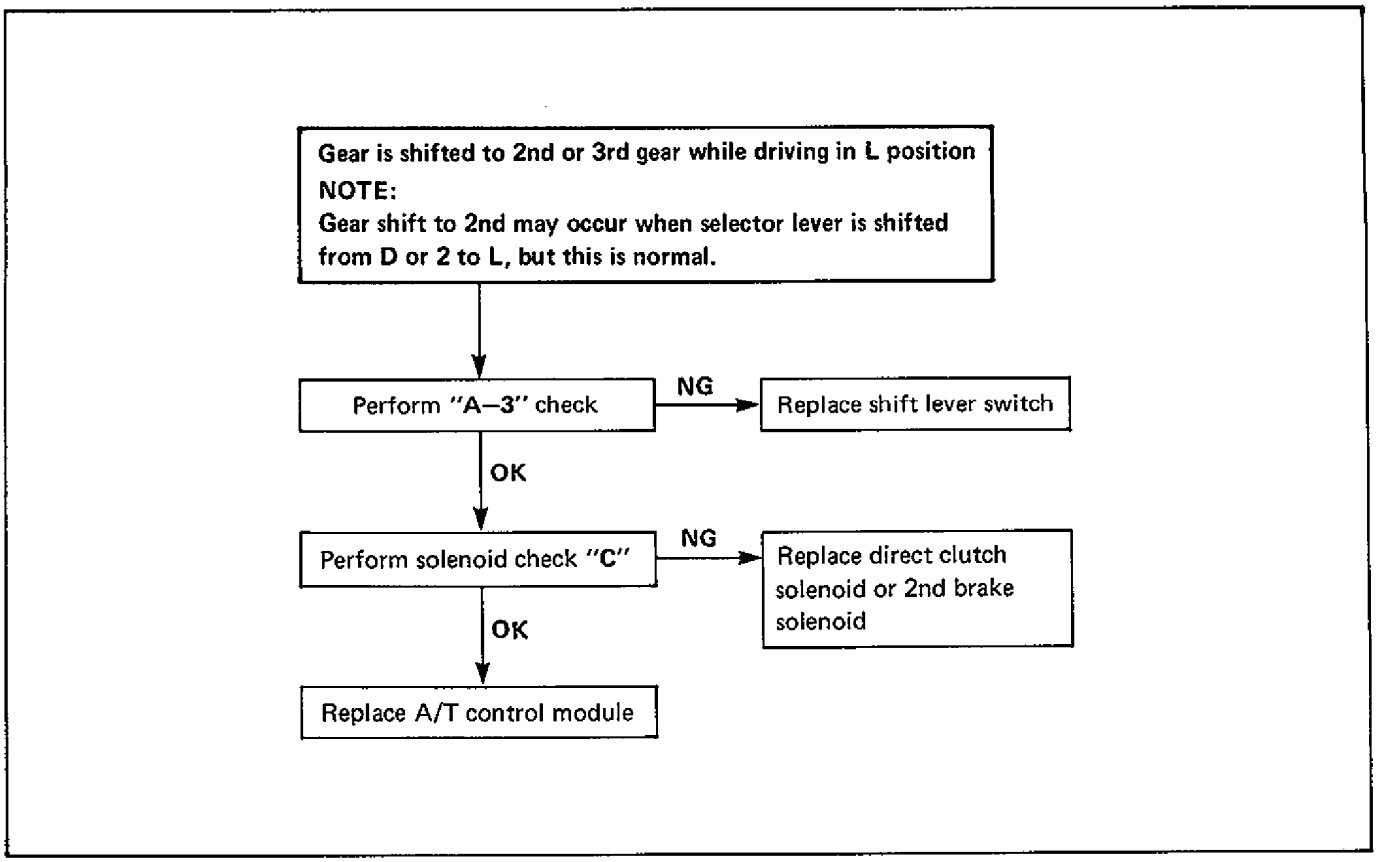


Fig. 7B-55 Gear Shift Failure in L

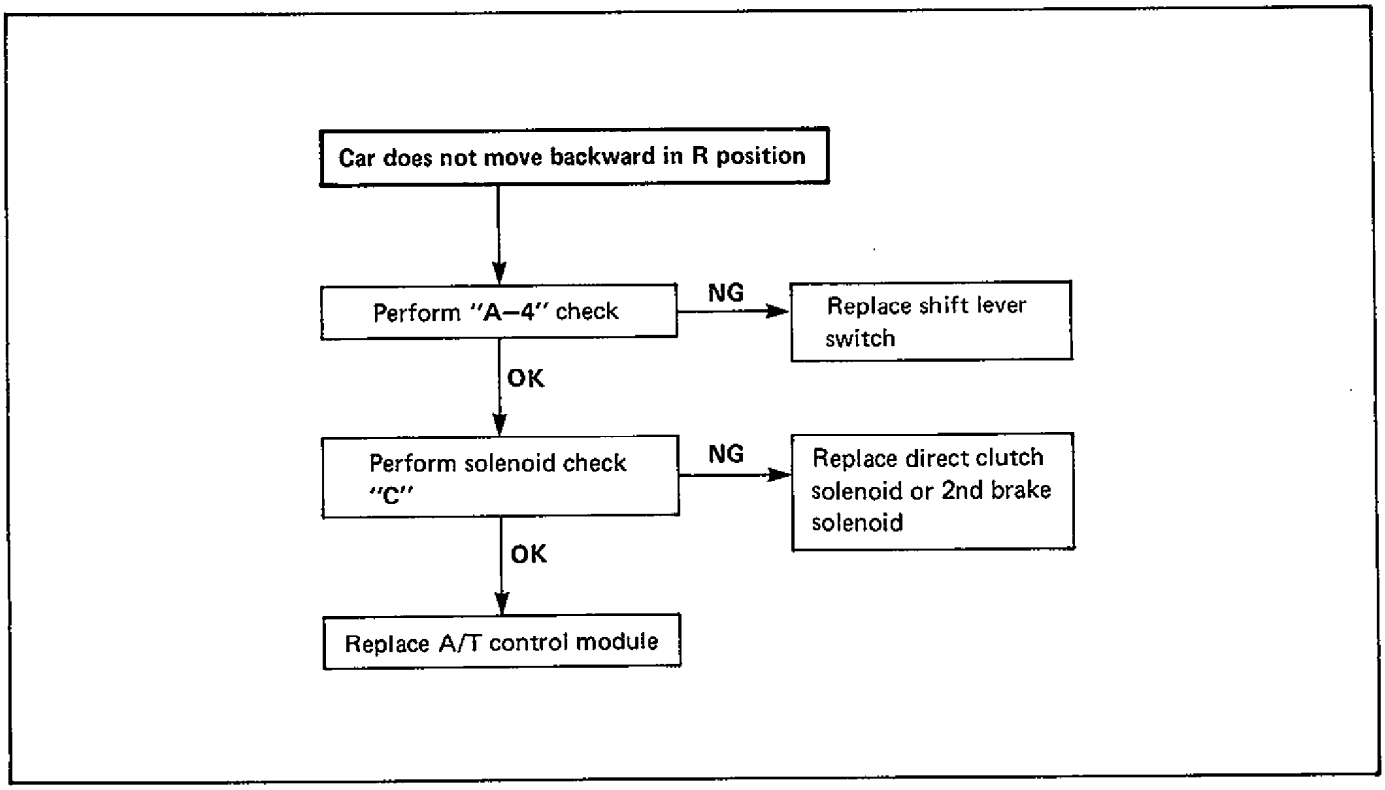
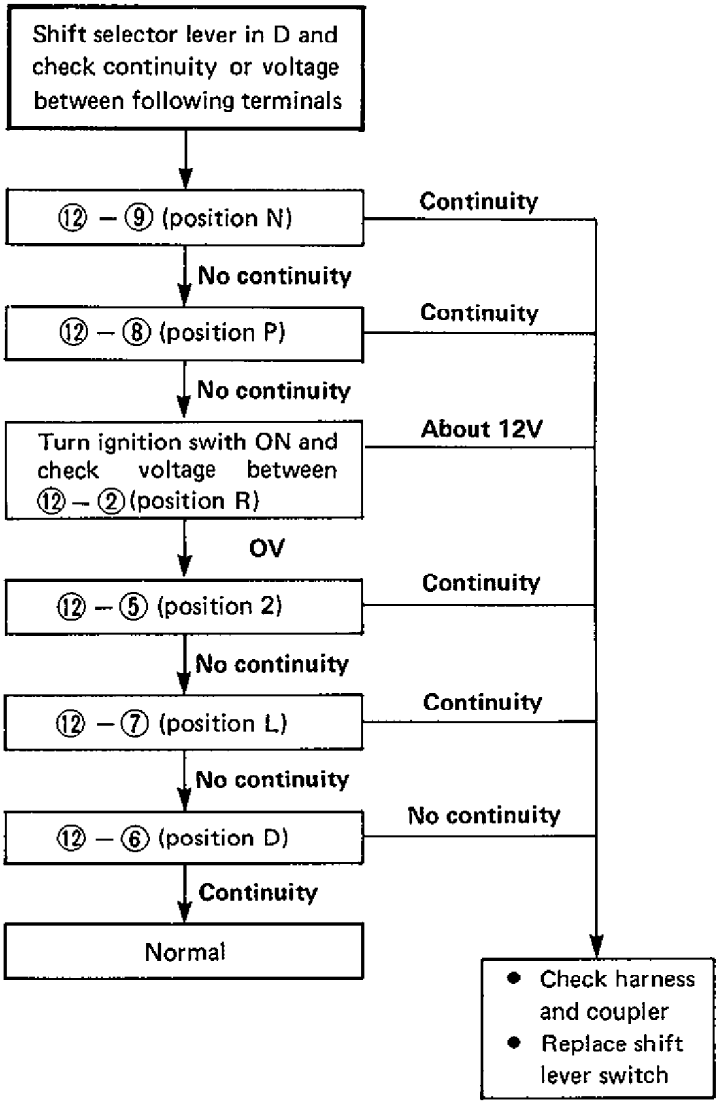


Fig. 7B-56 No Moving in R

SHIFT LEVER SWITCH CHECKING PROCEDURE

1. Turn OFF ignition switch.
2. Disconnect couplers from A/T control module.
3. For each check, bring tester probes in touch with coupler terminals from harness side.

A-1 Check Procedure



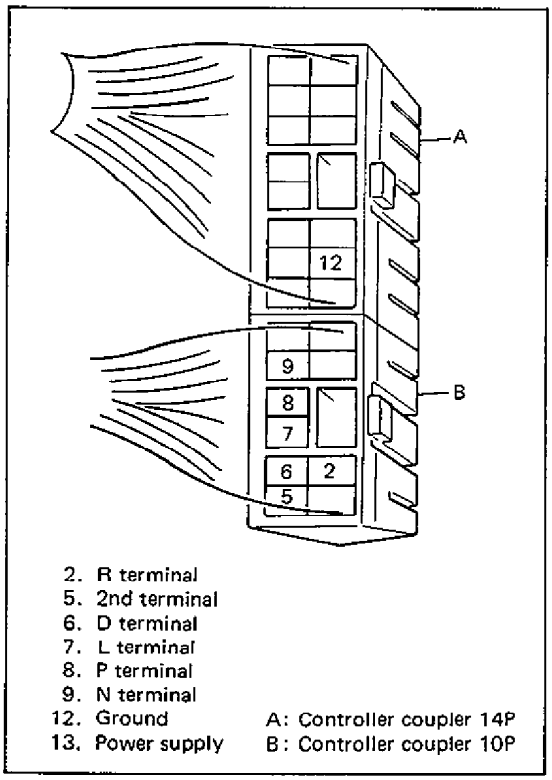
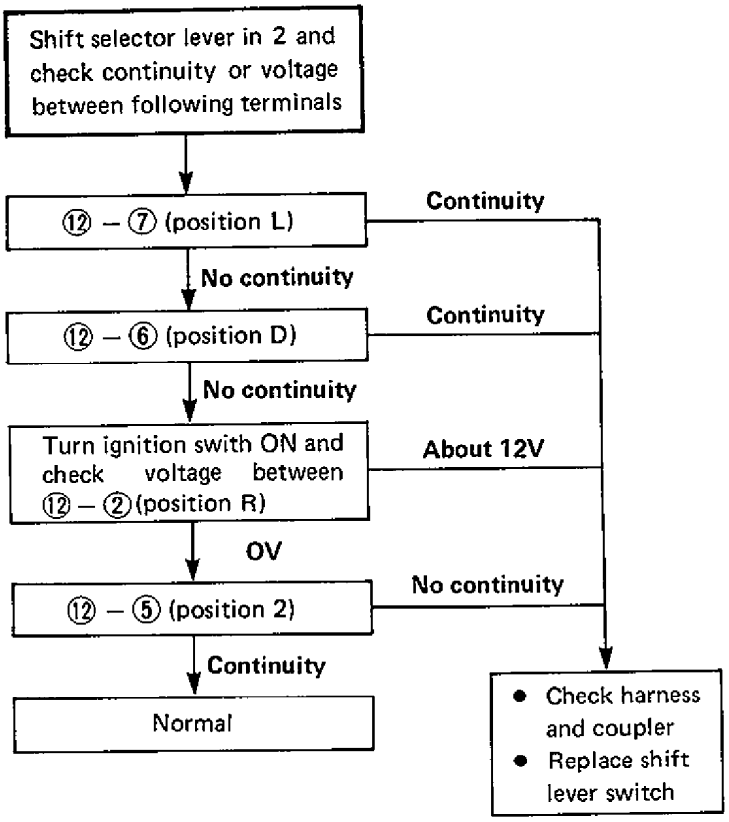


Fig. 7B-57 A-1 Check

A-2 Check Procedure



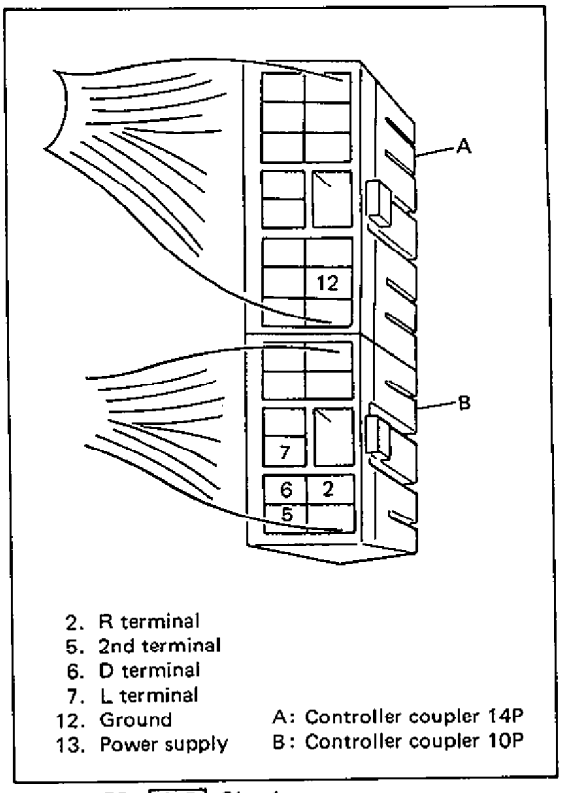
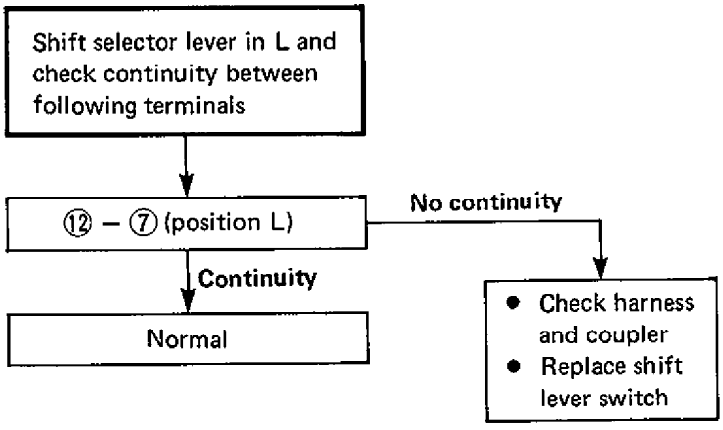


Fig. 7B-58 A-2 Check

A-3 Check Procedure



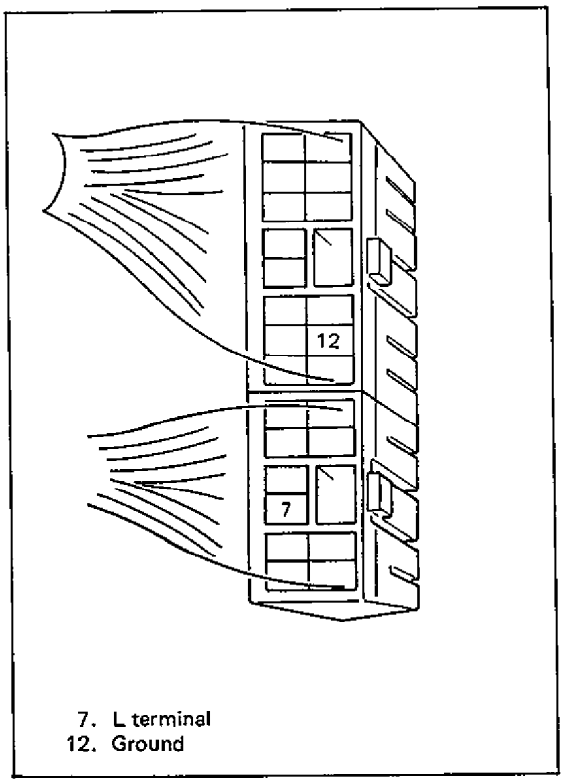


Fig. 7B-59 A-3 Check

A–4 Check Procedure

Shift selector lever in R and check continuity or voltage between following terminals

⑫ – ⑦ (position L) — Continuity → • Check harness and coupler • Replace shift lever switch

No continuity

Turn ignition swith ON and check voltage between ⑫ – ②(position R) — OV → • Check harness and coupler • Replace shift lever switch

About 12V

Normal

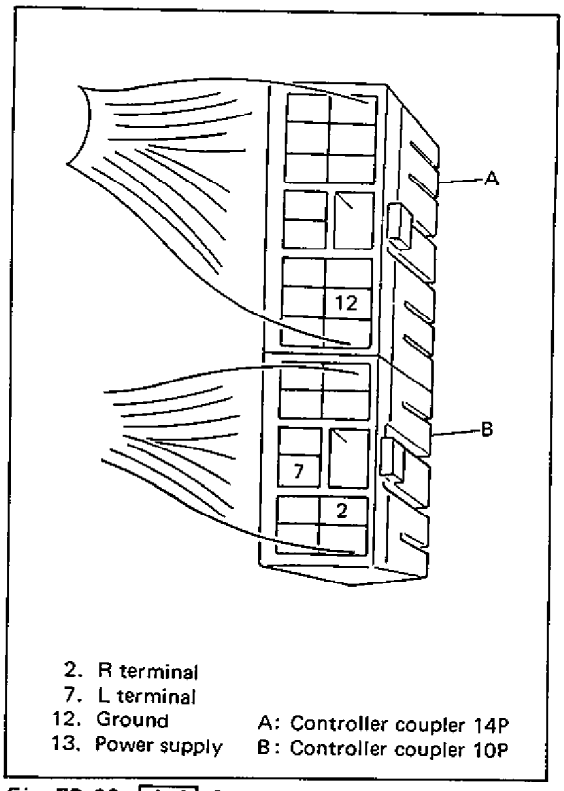


Fig. 7B-60 A-4 Check

N P Check Procedure

Shift selector lever in N and check continuity between following terminals

⑫ – ⑨ (position N) — No continuity → • Check harness and coupler • Replace shift lever switch

Continuity

Normal

Shift selector lever in P and check continuity between following terminals

⑫ – ⑧ (position P) — No continuity → • Check harness and coupler • Replace shift lever switch

Continuity

Normal

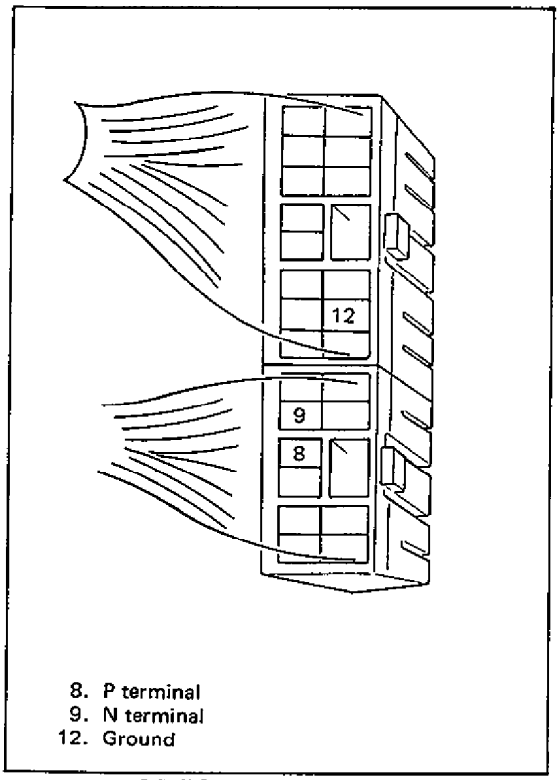


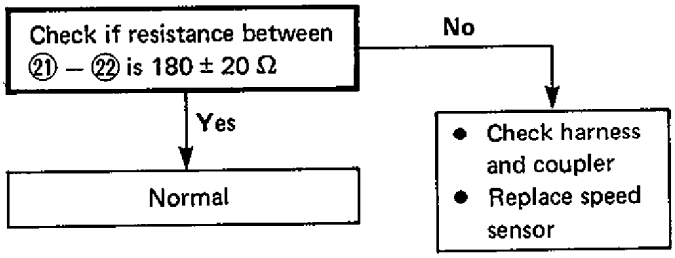
Fig. 7B-61 N P Check

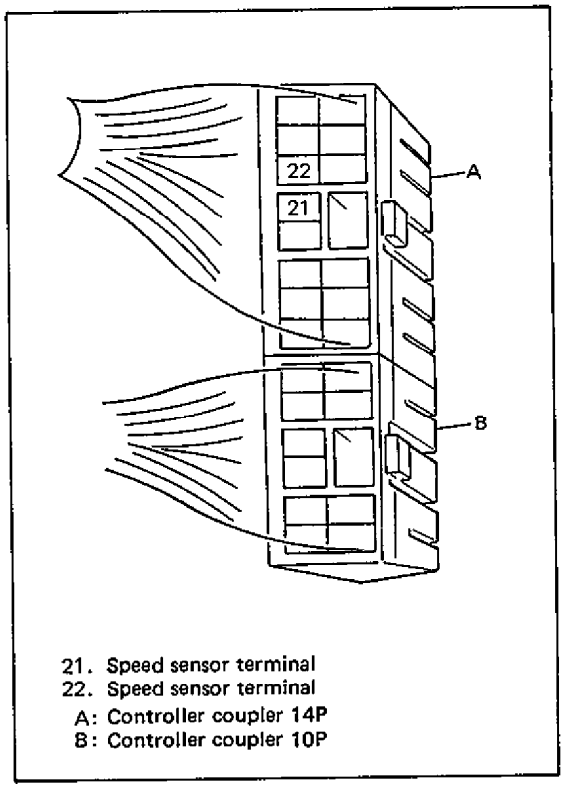
Separately from the above inspection, shift lever switch itself can be checked on continuity in each shift position. Refer to following table for connection and lead wire color.

Position	Shift lever switch lead wire color									
	Black	Blue/ White	Blue	Green	Green/ Red	Green/ Blue	Red	Yellow	Black/ Red	Black/ Yellow
P	○	○							○	○
R							○	○		
N	○		○						○	○
D	○			○						
2	○				○					
L	○					○				

SPEED SENSOR CHECKING PROCEDURE [B]

1. Turn OFF ignition switch.
2. Disconnect coupler(s) from A/T control module.
3. Bring ohmmeter probes in touch with coupler terminals from harness side.





21. Speed sensor terminal
22. Speed sensor terminal
A: Controller coupler 14P
B: Controller coupler 10P

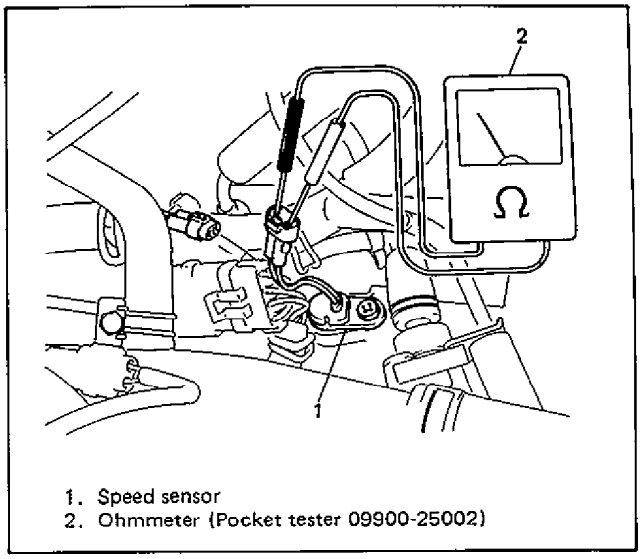
Fig. 7B-62 [B] Check

Separately from the above inspection, speed sensor itself can be checked on its resistance by disconnecting coupler.

NOTE:

- **Function of speed sensor can be checked by measuring generated pulse as voltage.**
- **For its measurement, use an analog type voltmeter while spinning wheels on lift and with selector lever in D position.**

Speed sensor specifications	
Coil resistance	180 ± 20 Ω
Output voltage at 40 km/h (37 mile/h)	Approximately 1V



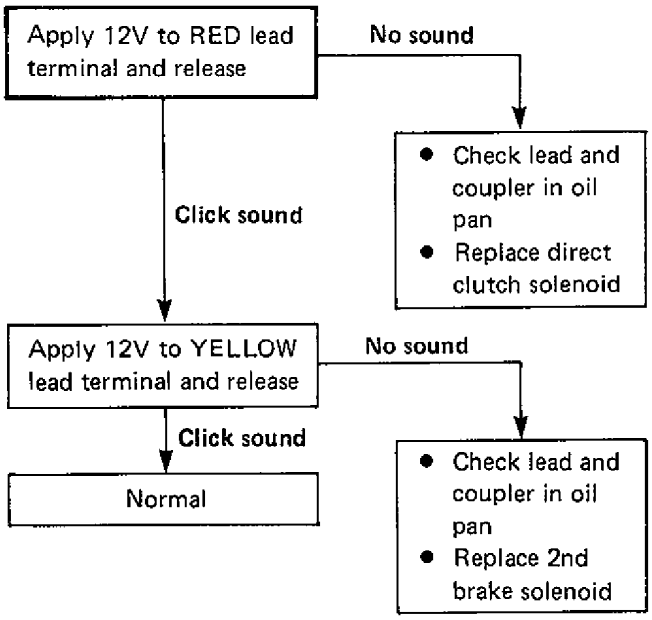
1. Speed sensor
2. Ohmmeter (Pocket tester 09900-25002)

Fig. 7B-63 Checking Speed Sensor Resistance

SHIFT SOLENOID CHECKING PROCEDURE

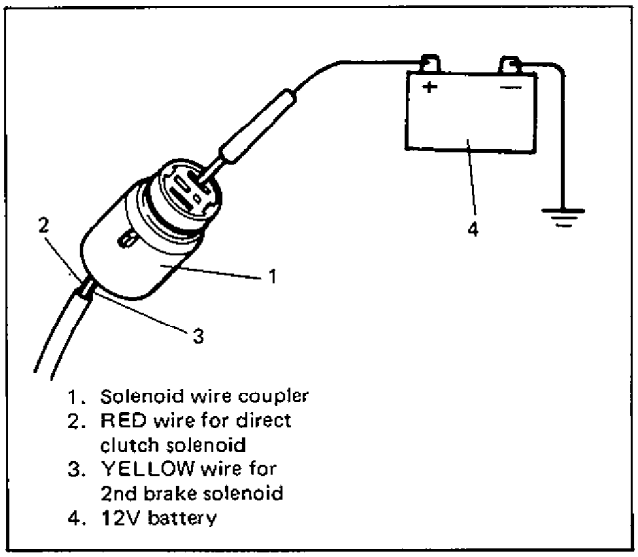
C

1. Disconnect shift solenoid coupler from harness.
2. Apply 12V to each terminal in solenoid coupler and check to be sure that a click sound is heard.



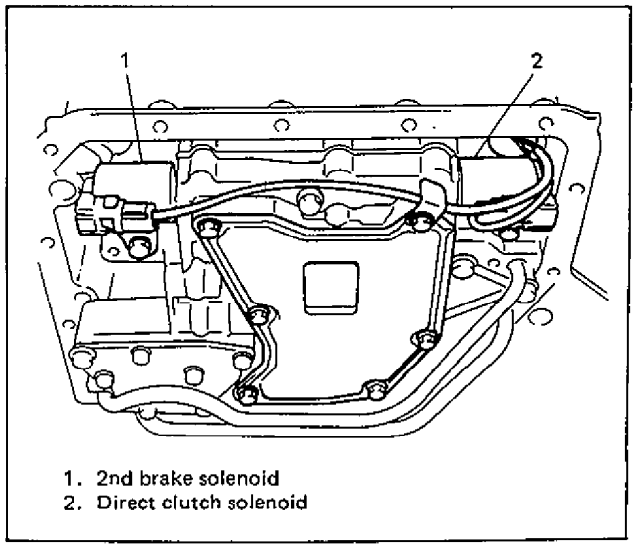
NOTE:

Refer to p. 7B-34 for physical function check of solenoid valves.



1. Solenoid wire coupler
2. RED wire for direct clutch solenoid
3. YELLOW wire for 2nd brake solenoid
4. 12V battery

Fig. 7B-64 C *Check*



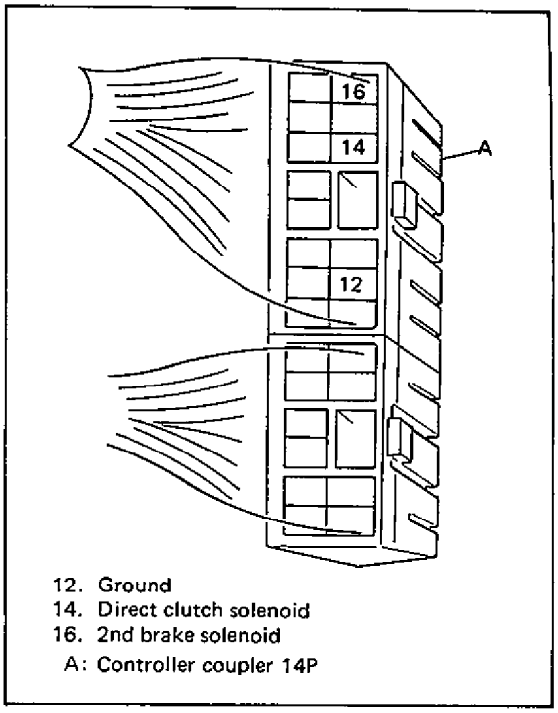
1. 2nd brake solenoid
2. Direct clutch solenoid

Fig. 7B-65 Direct Clutch and 2nd Brake Solenoid

Shift solenoid circuit will be checked by using ohmmeter at controller coupler.

1. With ignition switch turned OFF, disconnect controller coupler.
2. Bring ohmmeter probes in touch with coupler terminals from harness side and measure each resistance.

Solenoid	Terminal	Resistance
Direct clutch	⑭ – ⑫	13 Ω
2nd brake	⑯ – ⑫	13 Ω

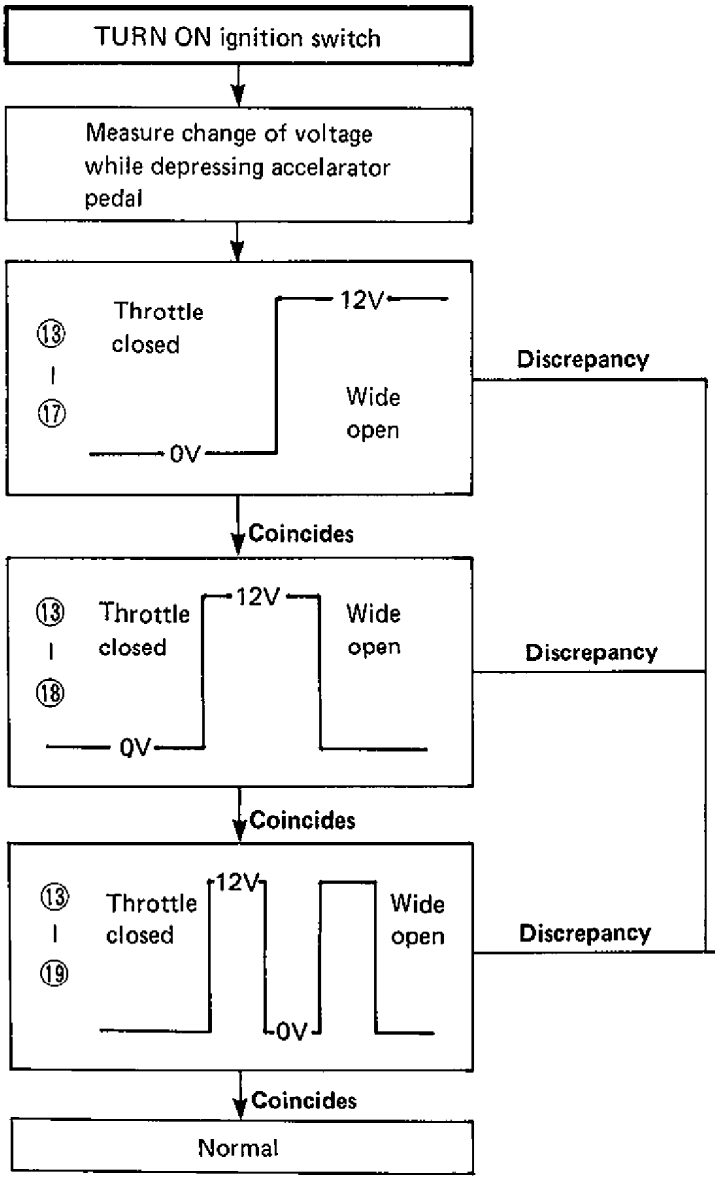


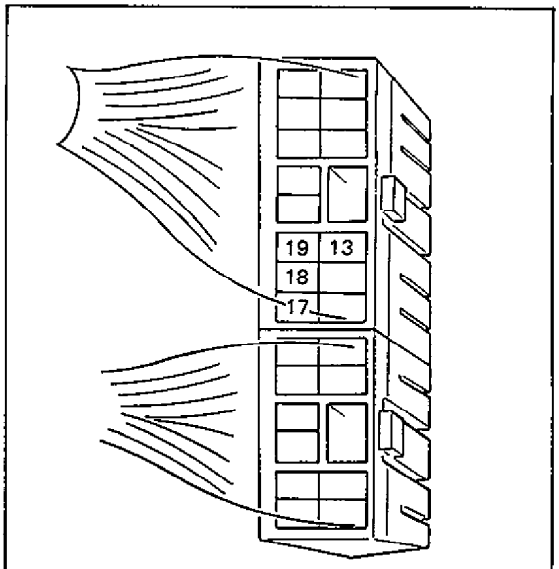
12. Ground
14. Direct clutch solenoid
16. 2nd brake solenoid
A: Controller coupler 14P

Fig. 7B-66 Checking Solenoid Circuit

THROTTLE VALVE OPENING SIGNAL CHECKING PROCEDURE D

1. Disconnect coupler(s) from A/T control module.
2. Bring voltmeter probes in touch with coupler terminals from harness side.





13. Power supply
17. Throttle opening signal S1
18. Throttle opening signal S2
19. Throttle opening signal S3

Fig. 7B-67 Checking Throttle Position Sensor

ON CAR SERVICE

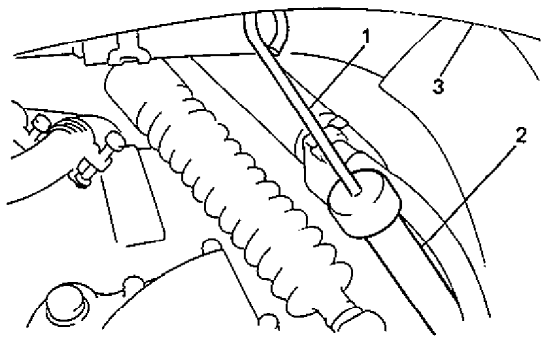
MAINTENANCE SERVICE

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 corresponds to 70° C – 80° C (158° F – 176° F) of fluid, perform fluid level check when fluid temperature is within the above temperature range. Driving at 60 km/h (37 mile/h) in D range for about 15 minutes will raise fluid temperature to normal operating temperature.

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 guage from oil filler tube and wipe off oil level gauge with clean cloth.



1. Oil level gauge
2. Oil filler tube
3. Radiator hose

Fig. 7B-68 Oil Level Gauge and Oil Filler Tube

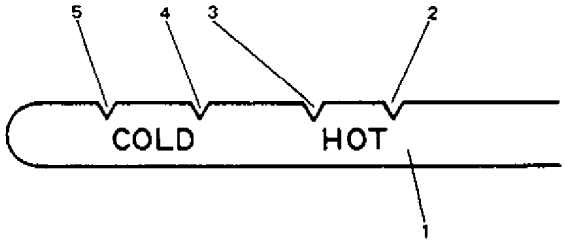
6. Reinsert oil level gauge all the way into oil filler tube.
7. Take up the gauge and check oil level on it. The level should be between FULL HOT and LOW HOT marks. If level is below LOW HOT mark, add fluid to bring level to FULL HOT mark.

NOTE:

- **Do not overfill. Overfilling can cause foaming and loss of fluid through vent. Then slippage and transmission failure can result.**
- **Bringing fluid level from LOW HOT to FULL HOT requires 0.35 liters (0.74/0.62 US/Imp. pt).**
- **Lesser volume than following table may fill up transmission, in case that oil pan only is removed leaving valve body as it is and reinstalled soon.**

Fluid specification
DEXRON-II automatic transmission fluid

Fluid capacity	
Pan and valve body removal (left for 2 hours or more)	3.5 liters 3.7/3.1 US/Imp. qt.
Overhaul (assembled with a new torque converter)	4.9 liters 5.2/4.3 US/Imp. qt.



1. Oil level gauge
2. FULL HOT mark
3. LOW HOT mark
4. FULL COLD mark
5. LOW COLD mark

Fig. 7B-69 Fluid Level

COLD Level Check at Room Temperature of About 25° C (77° F)

If transmission was overhauled or fluid was drained for oil pan (and or valve body) service, refill fluid after assembling and check its level according to following procedure.

1. Place car on level surface.
2. Apply parking brake and block car wheels.
3. With selector lever in P position, start engine and run it at idle for 5 minutes. DO NOT RACE ENGINE.
4. Move selector lever through each range and put it in P positon again.
5. With engine running at idle, check fluid level on oil level gauge. Fluid level should be between FULL COLD and LOW COLD marks on oil level gauge.
6. If level is below LOW COLD mark, add fluid to bring level between LOW COLD and FULL COLD marks. Use DEXRON-II or equivalent automatic transmission fluid. DO NOT OVERFILL.

   The above COLD level check is strictly temporary. Therefore, as a final check perform HOT level check at normal operating temperature as described previously.

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).

Severe Condition

- In heavy city traffic where outside temperature regularly reaches 32° C (90° F).
- In very hilly or mountainous areas.
- Commercial use, such as taxi, police car or delivery service.

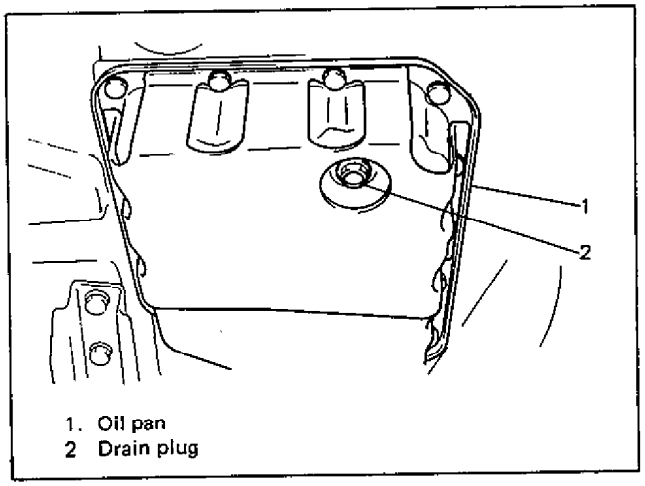
CHANGING FLUID

1. Raise car.
2. With transmission cool, remove drain plug and drain fluid.
3. Install drain plug gasket and drain plug to oil pan, and tighten drain plug to specification.
4. Remove oil level gauge from oil filler tube, and add new fluid from oil filler tube. Use DEXRON-II or equivalent automatic transmission fluid.

NOTE:

- **About 0.8 liters (0.8/0.7 US/Imp. qt.) of fluid would be necessary to refill oil pan.**
- **Draining or refilling volume of fluid may change depending on draining time or temperature etc.**

Tightening torque for drain plug	N·m	kg-m	lb-ft
	18 – 23	1.8 – 2.3	13.5 – 16.5



1. Oil pan
2 Drain plug

Fig. 7B-70 Drain Plug

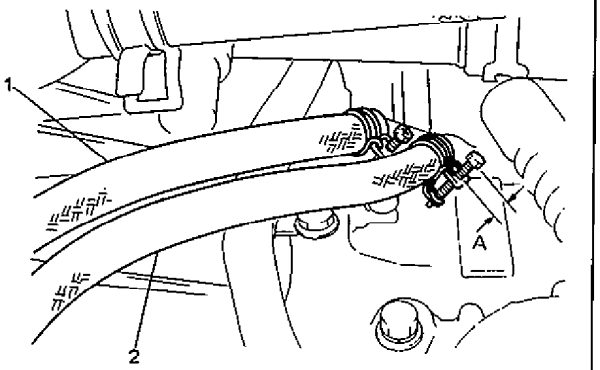
5. Check fluid level with transmission at room temperature and at normal operating temperature as perviously outlined.

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.

- Replace clamps at the same time.
- Insert hose as far as its limit mark.
- Tighten clamps to specified torque.
- Check for fluid leakage after replacing.
- Confirm fluid level at normal operating temperature.

Tightening torque for oil hose clamps	N·m	kg-cm	lb-in
	1.5	15	13



1. Oil inlet hose
2. Oil outlet hose

A: Remaining thread for specified torque:
7 – 5 mm/0.27 – 0.19 in as rough standard

Fig. 7B-71 Oil Cooler Hoses

3. Oil pan gasket.
   Remove gasket on mating surface thoroughly.

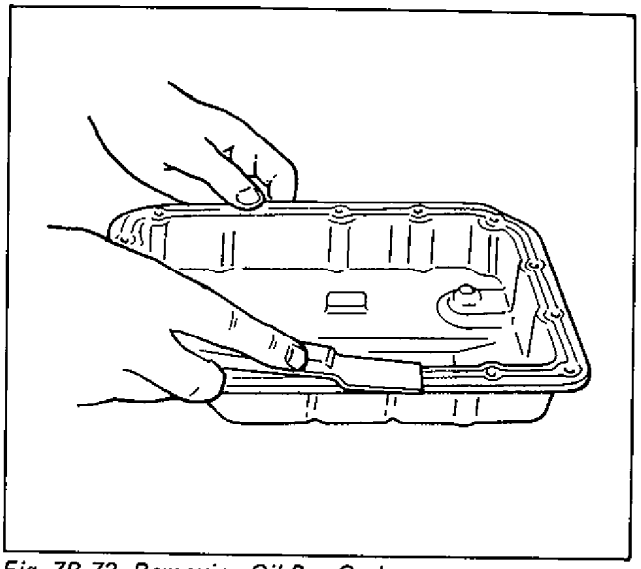


Fig. 7B-73 Removing Oil Pan Gasket

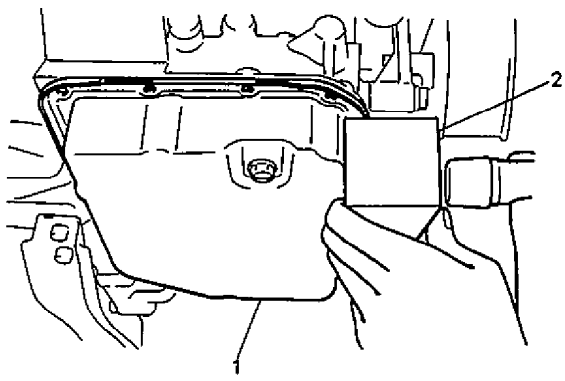
OIL PAN GASKET

REMOVAL

1. Raise car and drain transmission fluid.
2. Oil pan from transmission.
   After removing oil pan bolts, tap around oil pan lightly with a plastic hammer for removal.

CAUTION:

- **Never hammer oil pan hard, or it may get deformed. It is recommended to hit oil pan indirectly through wood block.**
- **Do not force oil pan off by using a flat tip screwdriver or the like as it may cause damage to gasketed surface.**



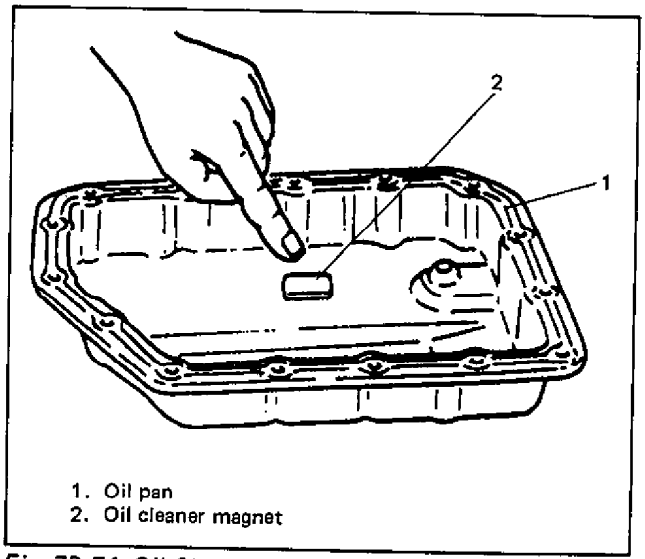
1. Oil pan
2. Wood block

Fig. 7B-72 Removing Oil Pan

INSTALLATION

For oil pan installation, reverse its removal procedure using care for the following.

1. Make sure to use new gasket.
2. Clean inside of oil pan before installation.
3. Clean oil cleaner magnet and install it in the position right below oil strainer.



1. Oil pan
2. Oil cleaner magnet

Fig. 7B-74 Oil Cleaner Magnet Installation

4. There are 15 oil pan securing bolts in all and two of them have cross slot in their heads. Mount these cross slotted bolts in such positions as shown in figure after applying sealant to their threads. However, do not apply sealant to other 13 bolts.
5. Tighten oil pan bolts to the following torque one after another diagonally.

CAUTION:
- **Do not use sealant to gasket surface.**
- **Over tightening of bolts may cause fluid leakage.**

Tightening torque for oil pan bolt	N·m	kg-m	lb-ft
	4 – 6	0.4 – 0.6	3.0 – 4.0

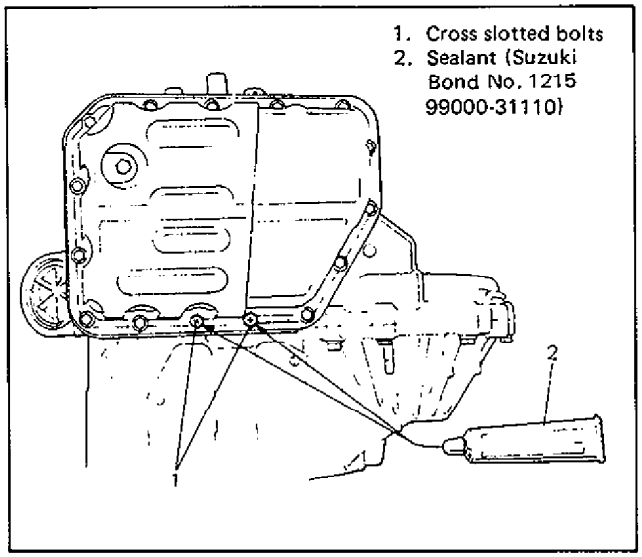


Fig. 7B-75 Oil Pan Bolt Installation

6. Upon completion of installation , warm up transmission and check for fluid level and leakage.

OIL STRAINER

1. Drain transmission fluid.
2. Remove oil pan.
3. Remove oil strainer.
4. Clean oil strainer.
5. Install oil strainer to lower valve body.
6. Reinstall oil pan and refill transmission fluid.
7. Upon completion of installation, warm up transmission and check for fluid level and leakage.

Tightening torque for oil strainer bolts	N·m	kg-m	lb-ft
	5 – 6	0.5 – 0.6	4.0

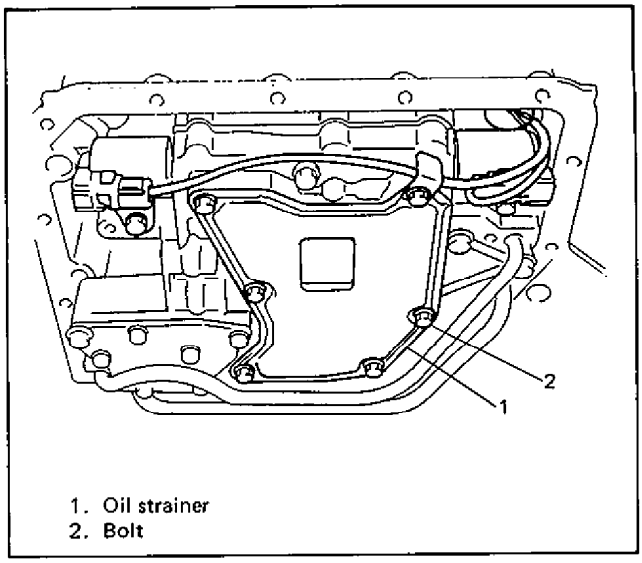


Fig. 7B-76 Oil Strainer

SHIFT SOLENOIDS

REMOVAL

1. Drain transmission fluid and remove oil pan.
2. Couplers from direct clutch and 2nd brake solenoids, and then solenoids themselves.
3. Solenoid wire harness with grommet from upper side.

Tightening torque for shift solenoid bolts	N·m	kg-m	lb-ft
	7 – 9	0.7 – 0.9	5.5 – 6.5

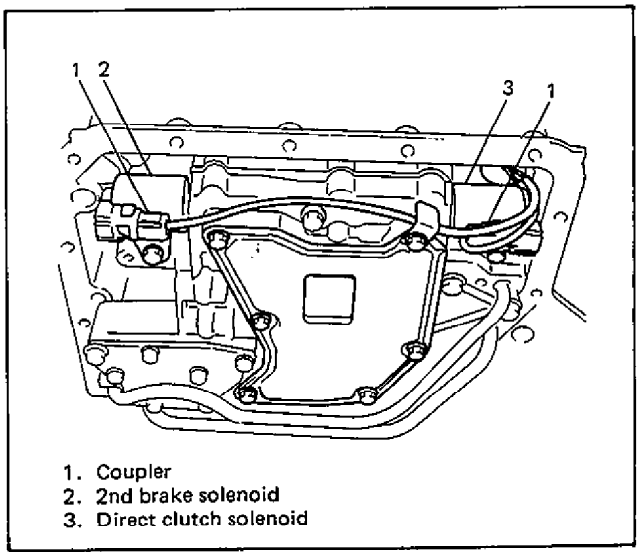


Fig. 7B-77 Solenoids

INSTALLATION

1. Solenoid wire harness to transmission case. If grommet seal (O ring) is damaged, replace.

2. Direct clutch and 2nd brake solenoids to lower valve body. If solenoid seal (O ring) is damaged, replace.
3. Solenoid wires to each solenoid.
4. Oil pan to transmission and then refill transmission fluid.
5. Solenoid wire harness coupler.
6. Upon completion of installation, warm up transmission and check for fluid level and leakage.

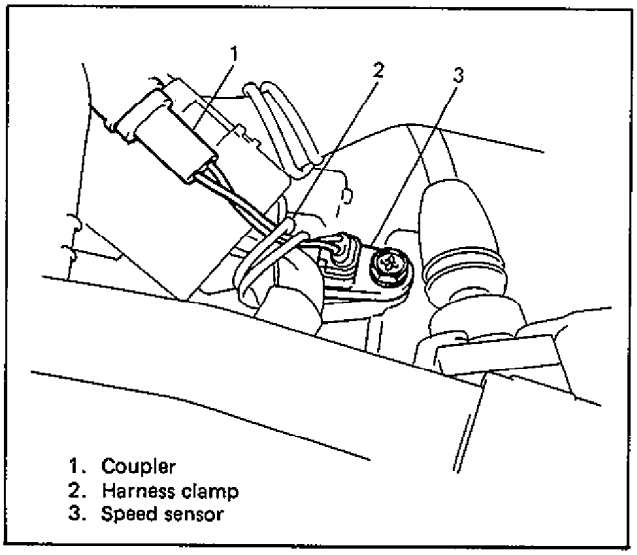
SPEED SENSOR

1. Undo wiring harness clamp.
2. Disconnect speed sensor coupler.
3. Remove speed sensor bolt.
4. Pull out speed sensor by gripping sensor body.
5. For installing, reverse removal procedure.

NOTE:

Check to be sure that O ring is in good condition.

Tightening torque for speed sensor bolt	N·m	kg-m	lb-ft
	7 – 9	0.7 – 0.9	5.5 – 6.5



1. Coupler
2. Harness clamp
3. Speed sensor

Fig. 7B-78 Speed Sensor

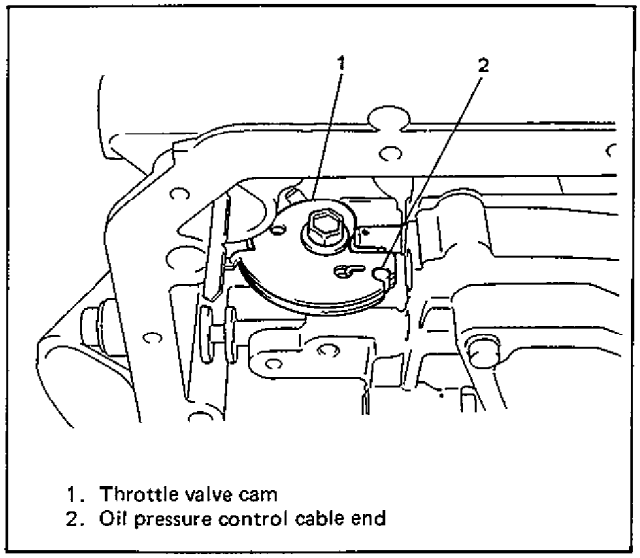
OIL PRESSURE CONTROL CABLE

REMOVAL

1. Oil pressure control cable from accelerator cable after removing cable cover.
2. Drain transmission fluid.
3. Oil pan.
4. Oil pressure control cable from throttle valve cam.
5. Oil pressure control cable from transmission case.

NOTE:

Oil pressure control cable can be disconnected from throttle valve cam without removal of 2nd brake solenoid.



1. Throttle valve cam
2. Oil pressure control cable end

Fig. 7B-79 Throttle Valve Cam

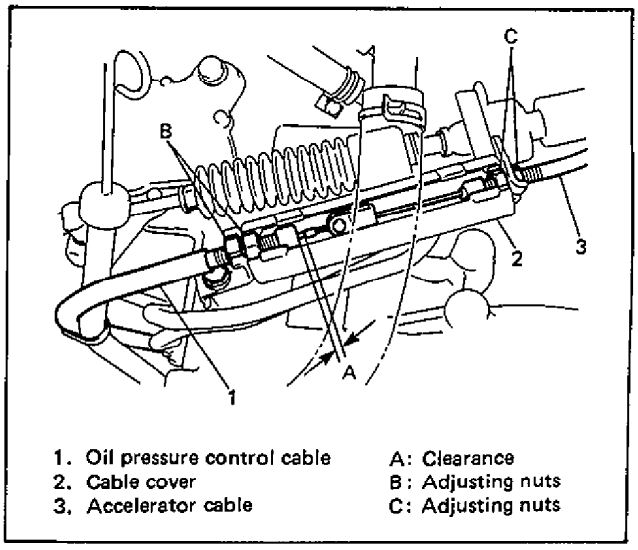
INSTALLATION

Reverse removal procedure for installation. After connecting oil pressure control cable to accelerator cable, check and adjust oil pressure control cable play.

ADJUSTMENT

1. With cable cover removed, adjust clearance A to specification by turning nuts B. Nuts C can be used for this adjustment if necessary.
2. Tighten nuts and install cable caver.

Control cable clearance A	0 – 0.5 mm 0 – 0.02 in



1. Oil pressure control cable
2. Cable cover
3. Accelerator cable

A: Clearance
B: Adjusting nuts
C: Adjusting nuts

Fig. 7B-80 Adjusting Oil Pressure Control Cable

SELECT CABLE

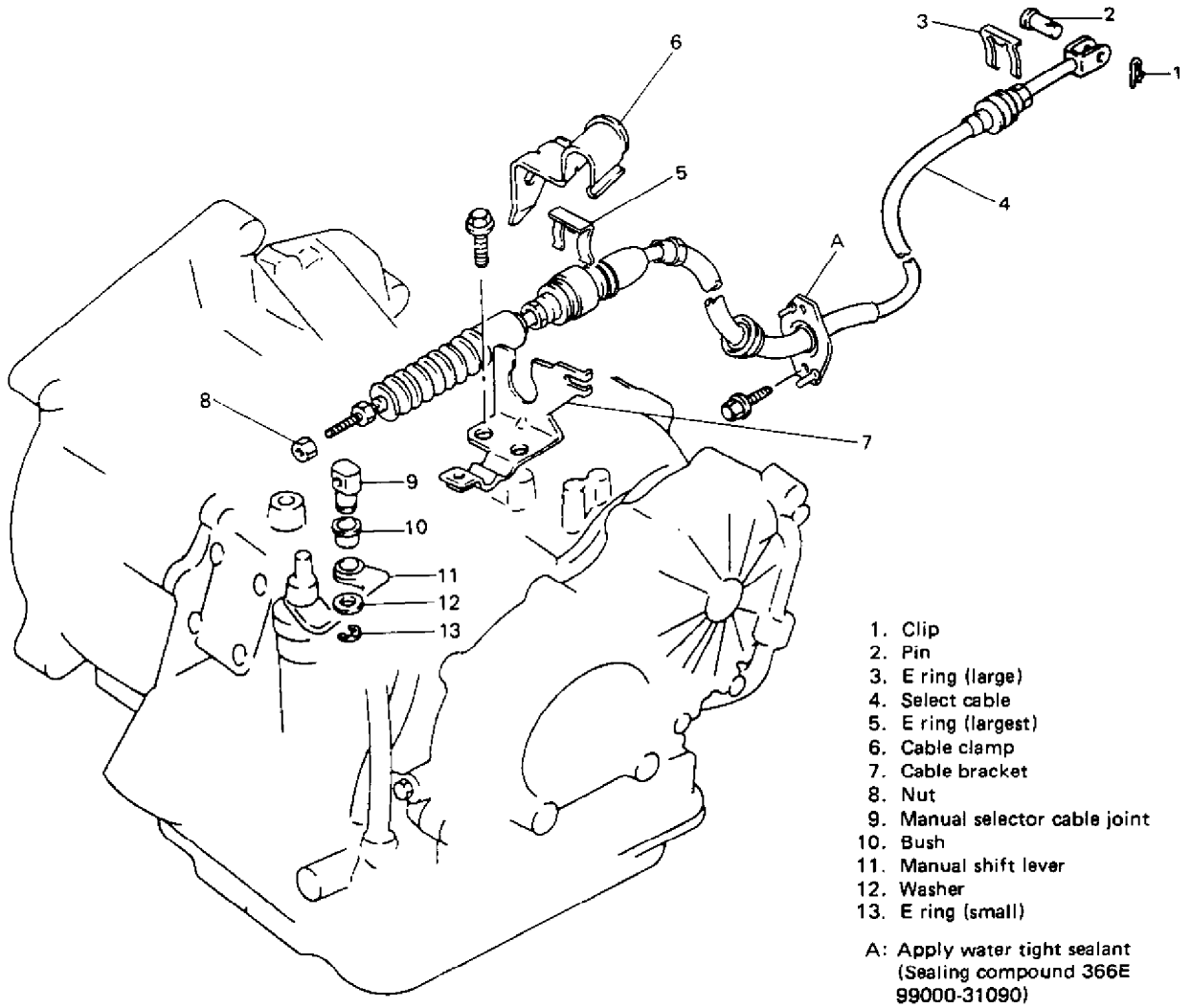


Fig. 7B-81 Select Cable Components

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:

Make sure that nut and cable joint have clearance under above conditions.

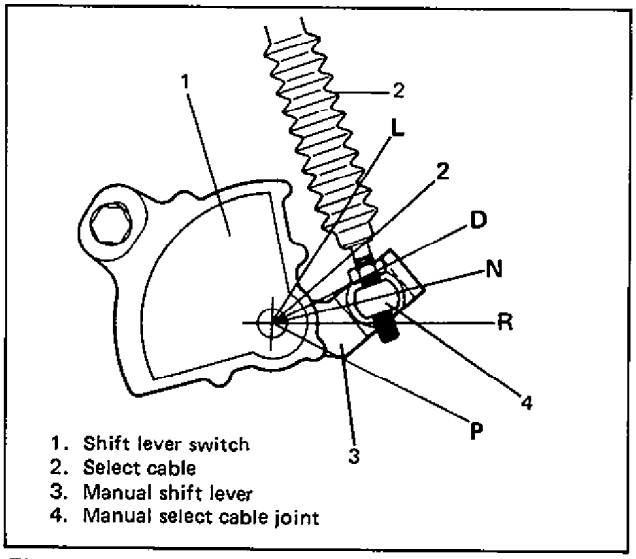


Fig. 7B-82 Shifting Manual Selector and Manual Shift Lever to N

3. Turn nut A by hand till it contacts manual select cable joint. Then tighten nut B with wrench.

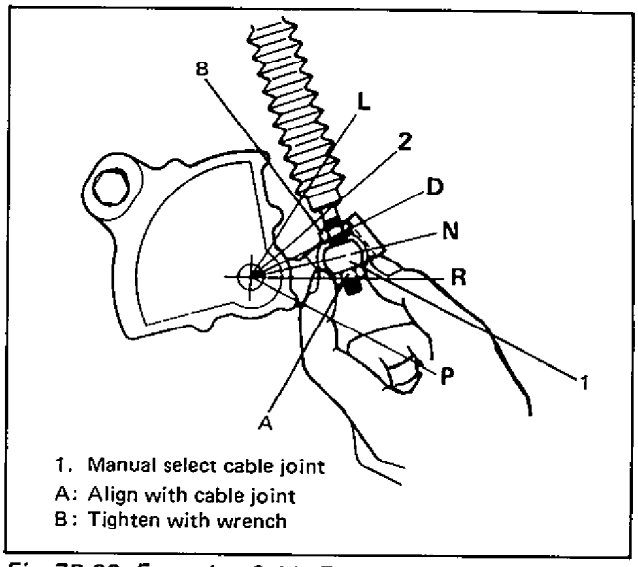


Fig. 7B-83 Fastening Cable End Nuts

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.

SHIFT LEVER SWITCH

REMOVAL

1. Shift lever switch coupler.
2. Shift lever switch from transmission.

> **CAUTION:**
> **Do not overhaul shift lever switch.**

INSTALLATION

1. Shift manual shift lever to N, that is, to shift selector lever to N.

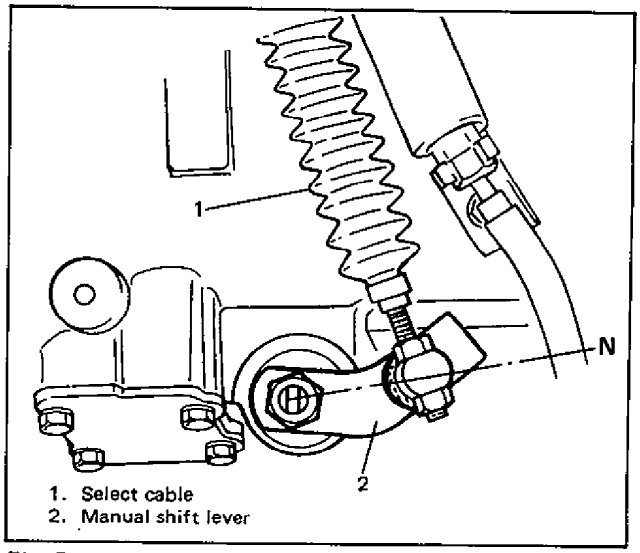
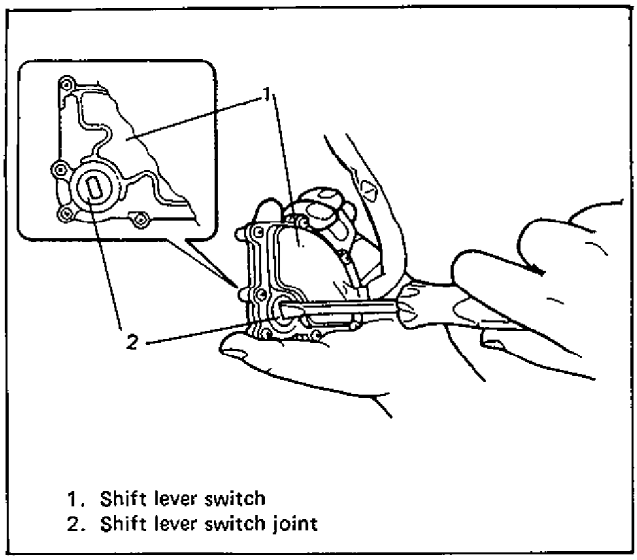


Fig. 7B-84 Manual Shift Lever in N Position

2. Using flat tip screwdriver, turn shift lever switch joint clockwise or counterclockwise to the position shown in figure and check that a "click" is heard from joint at this positon.

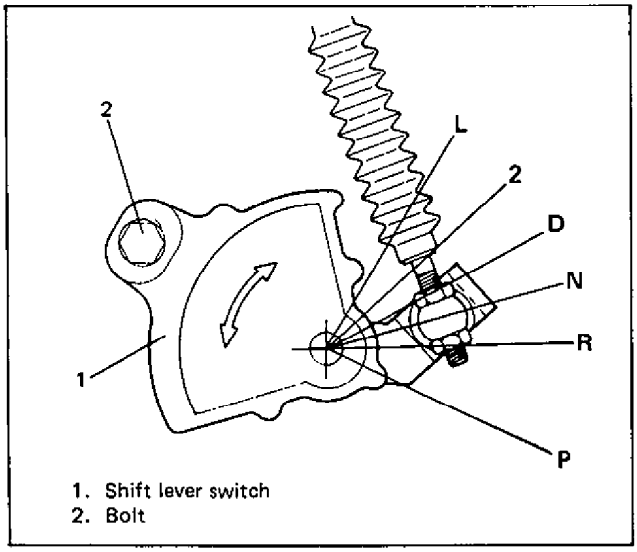


1. Shift lever switch
2. Shift lever switch joint

Fig. 7B-85 Shift Lever Switch Joint

3. After installing shift lever switch to manual shift shaft, move shift lever switch by hand in arrow direction as shown in figure. Stop at the position where a "click" from joint is heard or felt by hand and then secure it.

Tightening torque for shift lever switch bolt	N·m	kg-m	lb-ft
	13 – 23	1.3 – 2.3	9.5 – 16.5



1. Shift lever switch
2. Bolt

Fig. 7B-86 Adjusting Shift Lever Switch Position

4. Coupler and clamp.
5. Upon completion of shift lever switch installation, check for its proper installation according to the following.
   1) Apply parking brake and block car wheels.
   2) With selector lever shifted to P, turn starter switch ON and check that this causes starting motor to operate.
   3) Shift selector lever from P to N, turn starter switch ON and check that this causes starting motor to operate.
   4) Shift selector lever from N to L and then back to N, turn starter switch ON and check that this causes starting motor to operate.
   5) Shift selector lever from N to P and check starting motor for operation as in step 4).
   6) Check to make sure that in any other range than P and N, starting motor doesn't operate even when starter switch is turned ON.
   7) Turn ignition switch ON (without starting engine) and shift selector lever to R. Then check that back up lights light.
6. If any check result was unsatisfactory in step 5, remove shift lever switch and perform step 1 to 4 all over again.

MANUAL SELECTOR

REMOVAL

1. Selctor knob screw and then selector knob by turning it counterclockwise.
2. Console box, if equipped.
3. Parking brake lever cover.
4. Shift control lever cover.
5. Select indicator assembly.
6. Illumination lamp coupler.
7. Select cable from selector lever.
8. Raise car.
9. 4 housing nuts.
10. Lever housing with selector lever from floor.

NOTE:

- **When taking off knob by turning it, push its push button.**
- **Knob and push button must not be disassembled.**
- **Do not drive out detent pin.**

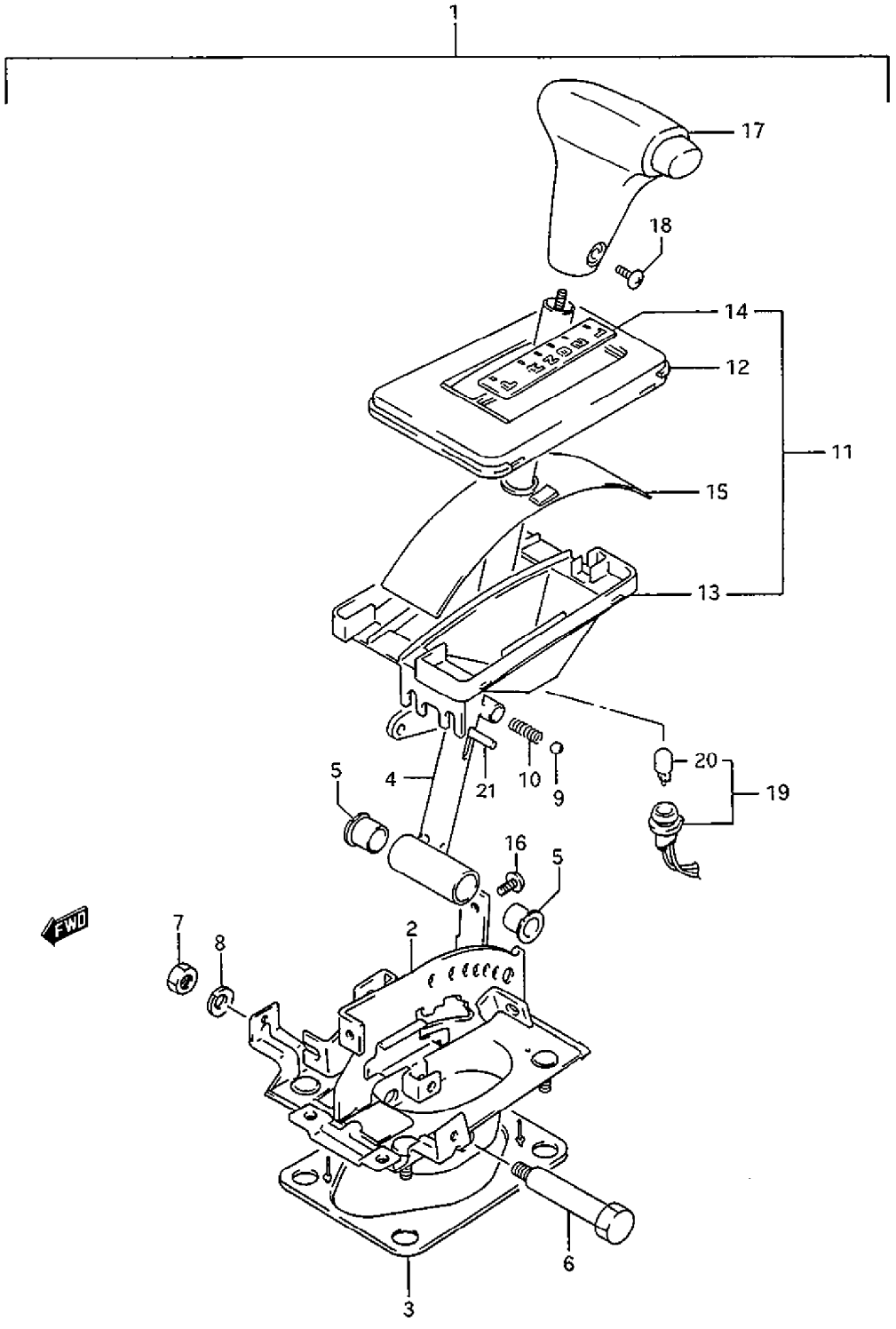
INSTALLATION

Assemble selector by reversing removal procedure, replacing parts with new ones as necessary. Apply grease to portions indicated as A in figure.

NOTE:

- **When installing knob, make sure that there is a slight clearance between detent pin and cam bottom when knob botton is pushed in all the way.**
- **Check selector for proper operation as follows.**
  1. **With knob botton pushed half way, N to R and D to 2 shifts are available (but not any other shift).**
  2. **With knob button pushed all the way in, 2 to L and R to P shifts are available.**
- **Check that illumination lamp lights when light switch is turned ON.**

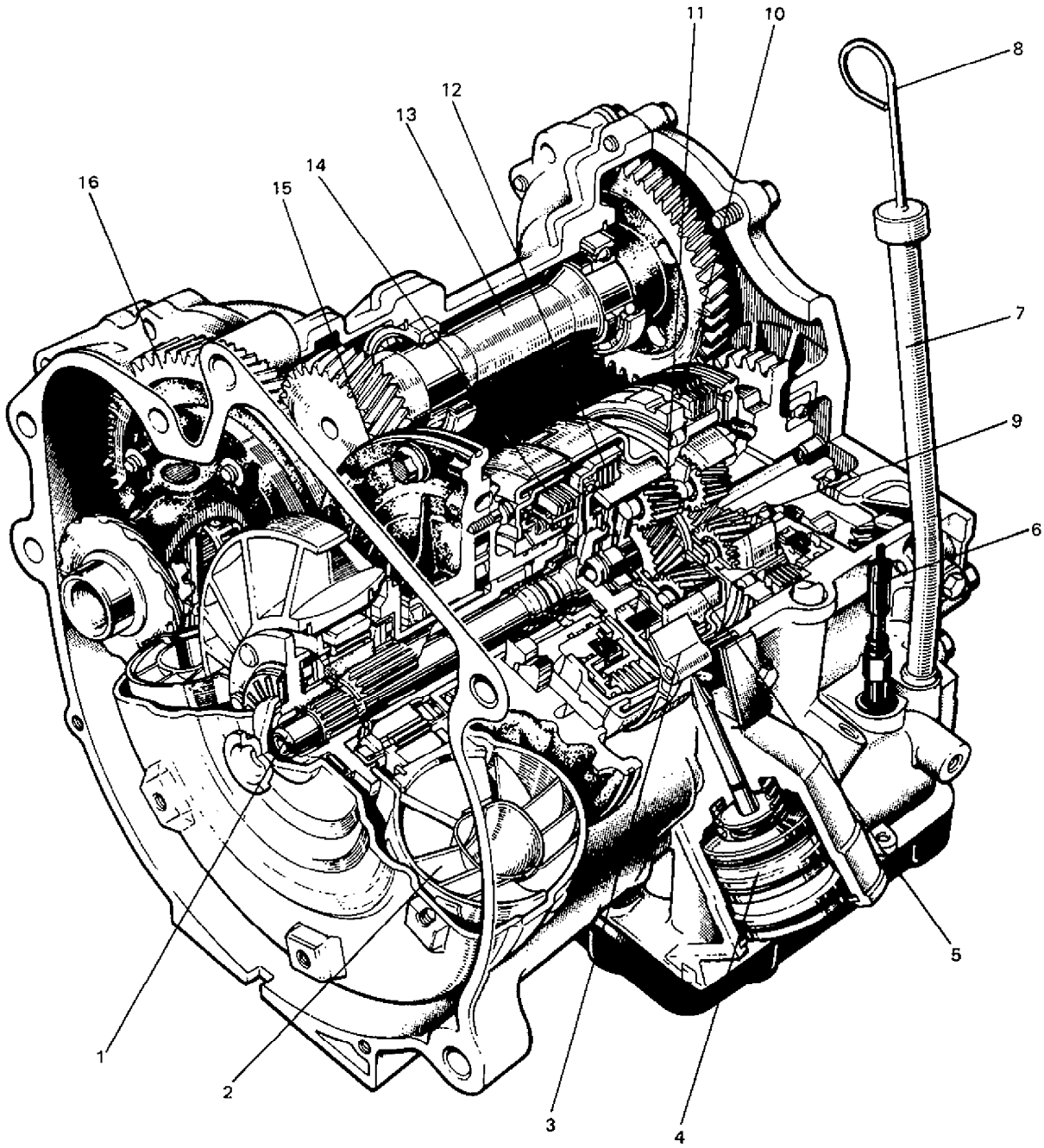
Tightening torque	N·m	kg-m	lb-ft
Selector lever shaft nut	18 – 22	1.8 – 2.2	13.0 – 15.5
Housing nuts	10 – 16	1.0 – 1.6	7.5 – 11.5



1. Selector assembly
2. Selector lever housing
3. Housing sheet
4. Selector lever
5. Selector lever bush
6. Selector lever shaft
7. Nut
8. Lock washer
9. Locating ball
10. Locating spring
11. Indicator assembly
12. Upper cover
13. Lower cover
14. Position plate
15. Slide cover
16. Indicator screw
17. Selector lever knob
18. Screw
19. Illumination lamp
20. Bulb
21. Detent pin

Fig. 7B-87 Manual Selector Components

TRANSMISSION UNIT REPAIR OVERHAUL

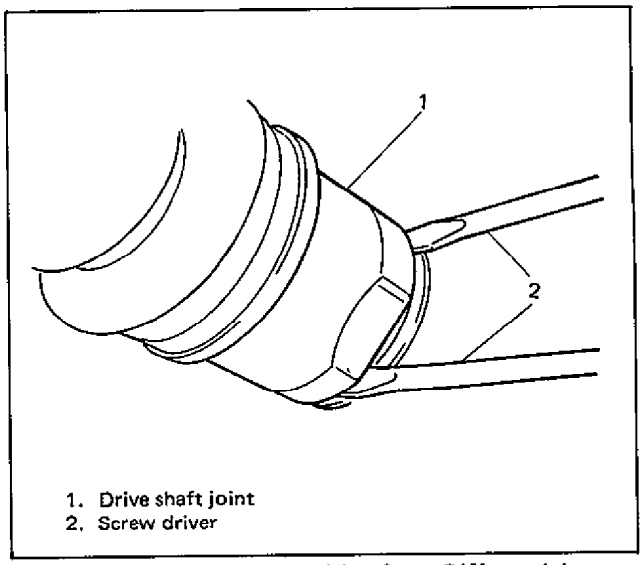


1. Input shaft
2. Torque converter
3. Second brake band
4. Second brake piston cover
5. Front planetary gear
6. Oil pressure control cable
7. Oil filler tube
8. Oil level gauge
9. Rear planetary gear
10. 1st-reverse brake
11. One-way clutch
12. Forward clutch
13. Countershaft
14. Direct clutch
15. Oil pump
16. Differential

Fig. 7B-88 Automatic Transmission Construction

DISMOUNTING

1. Disconnect ground cable at battery.
2. Remove engine hood panel.
3. Remove battery and battery tray.
4. Remove intake air duct and air cleaner case assembly.
5. Disconnect each lead wire at coupler.
6. Undo wiring harness clamps.
7. Take off speedometer cable boot, speedometer case clip and then cable from case.
8. Disconnect accelerator cable.
9. Disconnect select cable and oil pressure control cable from transmission.
10. Drain coolant.
11. Disconnect cooling water hose from thermostat case.
12. Disconnect high-tension cord from ignition coil.
13. Disconnect air purge hoses and vacuum hose from canister. (If equipped)
14. Remove canister. (If equipped)
15. Disconnect fuel feed and return hose at joint of dash panel side.
16. Disconnect brake booster vacuum hose from booster.
17. Disconnect heater hoses (inlet & outlet) at joint of dash panel side.
18. Remove alternator assembly. (for right-hand steering car)
19. Hoist car and drain transmission fluid.
20. Remove exhaust pipe bolts to set its flange free from exhaust manifold.
21. Disconnect oil cooler hoses from radiator and hold them upright.
22. Disconnect radiator outlet hose from radiator.
23. 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 of for this procedure.



1. Drive shaft joint
2. Screw driver

Fig. 7B-89 Detaching Snap Ring from Differential

24. Remove ball stud bolts and nuts from both side knuckles and detach suspension arms and then pull out both drive shaft joints from differential.
25. Remove radiator lower mounting bolts.
26. Disconnect engine rear torque rod bracket from transmission case.
27. Lower hoist.
28. Remove radiator.

NOTE:
With air conditioner equipped car, removal of its parts is necessary in addition to above procedure.

29. Support engine and transmission with lifting device.

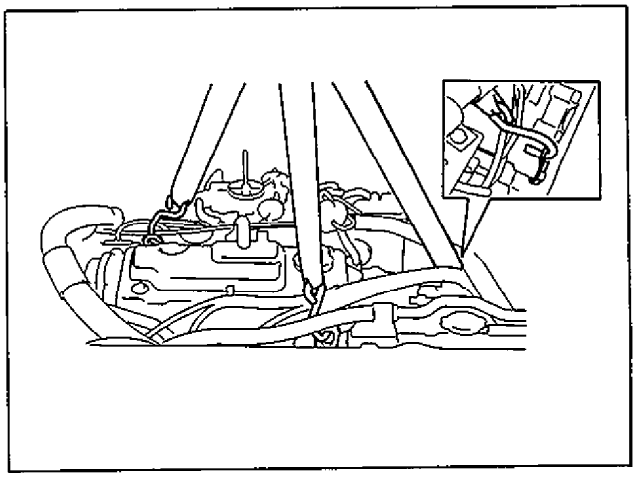
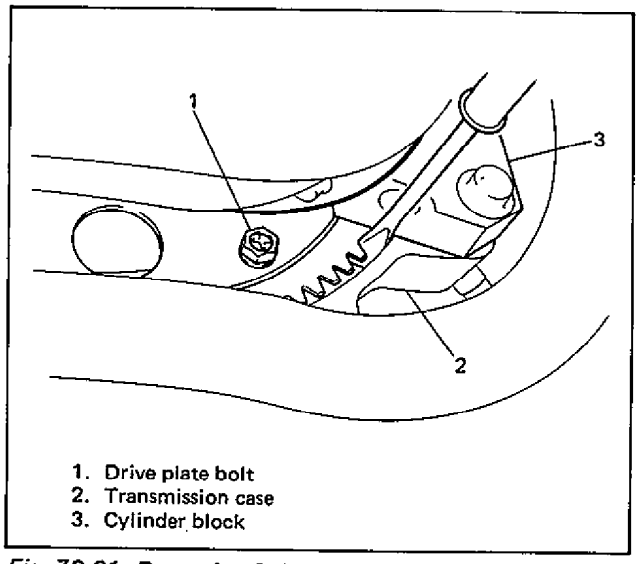


Fig. 7B-90

30. Remove engine rear mounting nut, two bolts of right side mounting bracket and left side bracket.

NOTE:
Before lifting engine with transmission, recheck to ascertain all hoses, electric wires and cables are disconnected from engine and transmission.

31. Hoist engine with transmission from car body.
32. Take down engine with transmission.
33. Remove clutch housing lower plate.
34. Holding drive plate with a large size screwdriver against rotation, remove drive plate bolts.



1. Drive plate bolt
2. Transmission case
3. Cylinder block

Fig. 7B-91 Removing Drive Plate Bolts

35. Remove bolts and nut fastening engine and transmission, and remove transmission from engine.

NOTE:
- **When removing transmission ass'y from engine, move it in parallel with crankshaft and use care so as not to apply excessive force to drive plate and torque converter.**

REMOUNTING

For remounting, reverse dismounting procedure and use specified torque as given below.

Tightening torque	N·m	kg-m	lb-ft
●Transmission-to-engine bolts and nuts ●Exhaust pipe to manifold bolts	40 I 60	4.0 I 6.0	29.0 I 43.0
●Mounting LH bracket nuts ●LH mounting bush bolt	50 I 60	5.0 I 6.0	36.5 I 43.0
Rear mounting bracket nut	40 I 50	4.0 I 5.0	29.0 I 36.5
Ball stud bolts and nuts	50 I 70	5.0 I 7.0	36.5 I 50.5
Drive plate-to-converter bolts	18 I 10	1.8 I 1.9	13.5

- Push in each drive shaft joint fully so that snap ring engages with differential gear.

CAUTION:
- **Care should be taken not to scratch oil seal lip with drive shaft while inserting drive shaft joint into transmission.**
- **Do not hit drive shaft joint with hammer when installing it.**
- **Recheck to make sure that each bolt and nut are tightened and that each coupler and clamp are installed.**

- Refill coolant to specified level.
- Set each clamp for wiring securely.
- Adjust oil pressure control cable referring to p. 7B-50.
- Adjust select cable following description on p. 7B-54.
- Refill fluid and adjust its level at normal operating temperature.
- Check to confirm engine and transmission function acceptably.
- Make sure that these is no evidence of fluid and coolant leakage.
- Adjust accelerator cable play.
  Refer to SECTION 6D.

COOLER LINE FLUSHING

In a major transmission failure, where particles of metal have been carried with the fluid throughout transmission, it will be necessary to flush out oil cooler and connecting lines thoroughly.

TORQUE CONVERTER DIAGNOSIS

STATOR ASSEMBLY FREEWHEELS

If the stator roller clutch becomes ineffective, the stator assembly freewheels at all times in both directions. With this condition, the vehicle tends to have poor acceleration from a standstill. If poor acceleration problems are noted, what to be checked first are that the exhaust system is not blocked, the engine is running properly and the transmission is in 1st gear when starting out.

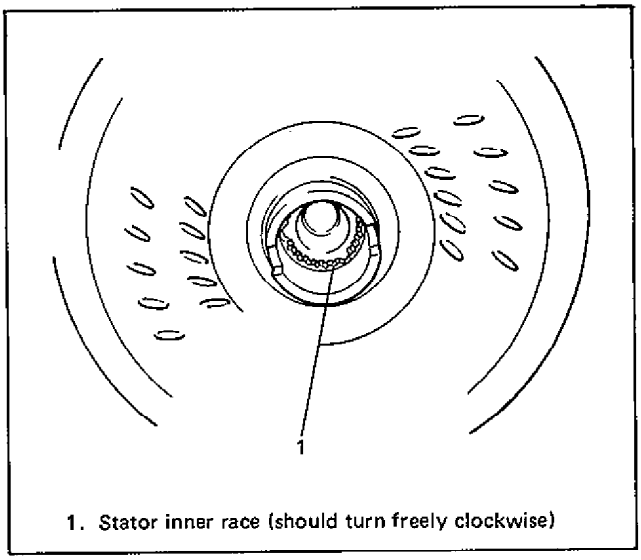
STATOR ASSEMBLY REMAINS LOCKED UP

If the stator assembly remains locked up at all times, the engine rpm and car speed will tend to be limited or restricted at high speeds. The car performance when accelerating from a standstill will be normal. Engine overheating may be noted. Visual examination of the converter may reveal a blue color from the overheating that will result.

Under above conditions, if the converter has been removed from the transmission, the stator roller clutch can be checked by inserting a finger into the splined inner race of the roller clutch and trying to turn the race in both directions. The inner race should turn freely clockwise, but be heavy to turn counterclockwise.

NOTE:

- **Converter placed with its flange upright does not fit for this inspection.**
- **For proper checking, position converter with its flange horizontal.**
- **Turn stator inner race clockwise as quickly as possible with finger, then turn reversely at the same speed and feel difference of enertia.**



1. Stator inner race (should turn freely clockwise)

Fig. 7B-92 Checking Stator

DO NOT REPLACE CONVERTER FOR FOLLOWING CONDITIONS:

1. The fluid has an odor, is discolored, and there is no evidence of metal particles. There is no indication of existence of internal damage, or oil pump damage. Dump out as much fluid as possible from the converter and replace only the oil pump screen in the pan.
2. A small amount of wear (sometimes referred to as fretting wear) appears on the hub where the oil pump drive gear is located. A certain amount of such wear is normal for both the hub and oil pump gear. Neither the converter nor the oil pump assembly should be replaced.

DISASSEMBLY

CAUTION:
- **Thoroughly clean transmission exterior before overhauling it.**
- **Keep working table, tools and hands clean while overhauling.**
- **Use special care to handle aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Keep them clean always.**

1. Torque converter.

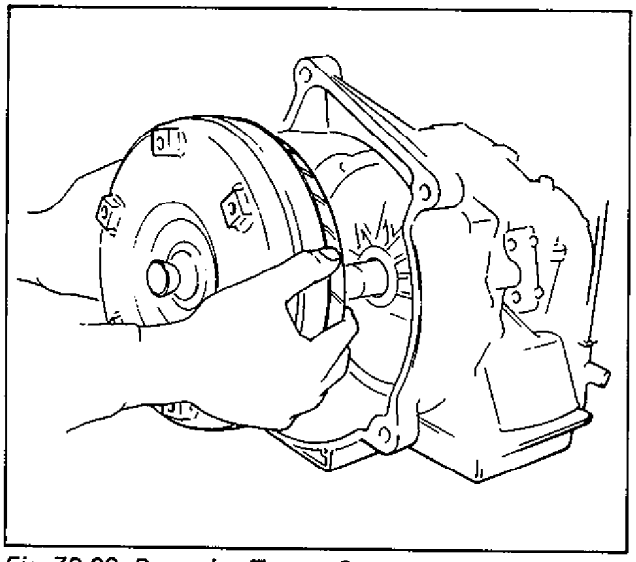


Fig. 7B-93 Removing Torque Converter

2. Engine mounting LH bracket.
3. Oil level gauge and oil filler tube.

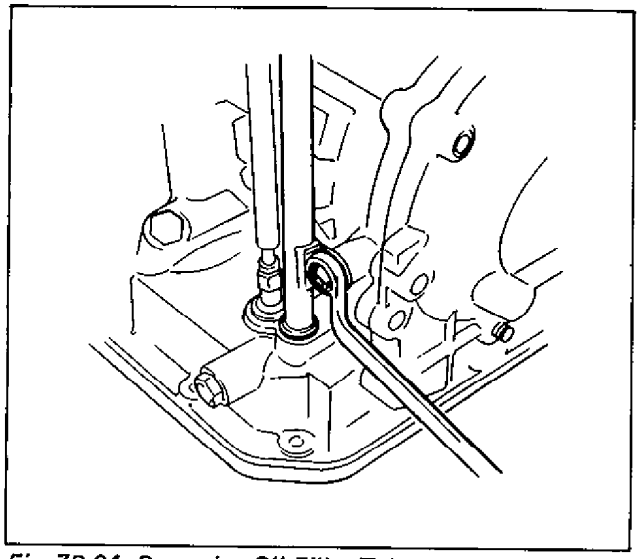
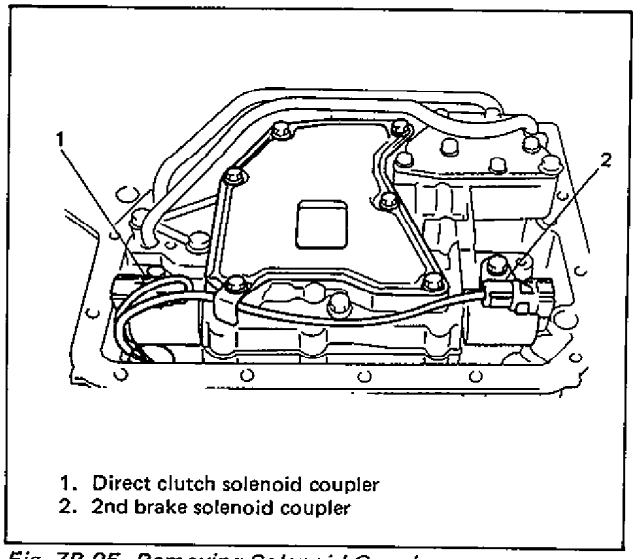


Fig. 7B-94 Removing Oil Filler Tube

4. Drain transmission fluid.
   To drain fluid better, tilt transmission in various directions.
5. Oil pan and oil pan gasket.

NOTE:
- **For removal of oil pan, do not turn transmission over as this will contaminate valve body with foreign matters in the bottom of oil pan.**
- **When removing oil pan, tap around it lightly with a palstic hammer. Do not force it off by using a screwdriver or the like.**

6. Couplers of direct clutch and 2nd brake solenoids.



1. Direct clutch solenoid coupler
2. 2nd brake solenoid coupler

Fig. 7B-95 Removing Solenoid Couplers

7. 2 oil tubes from lower valve body.
   Remove them by pulling up tube end with a screwdriver.

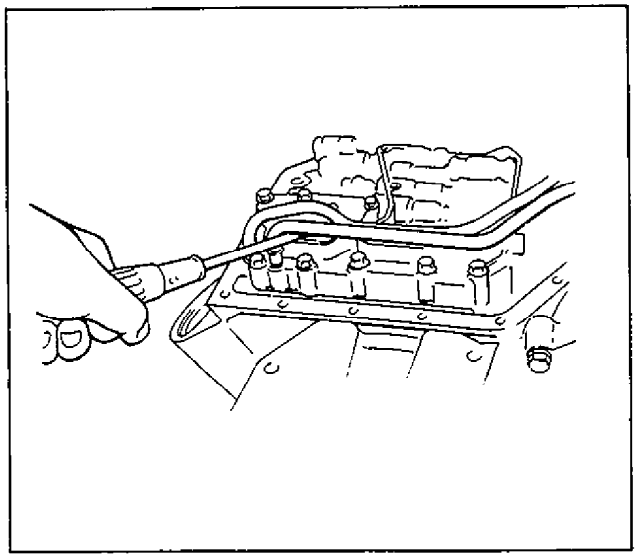
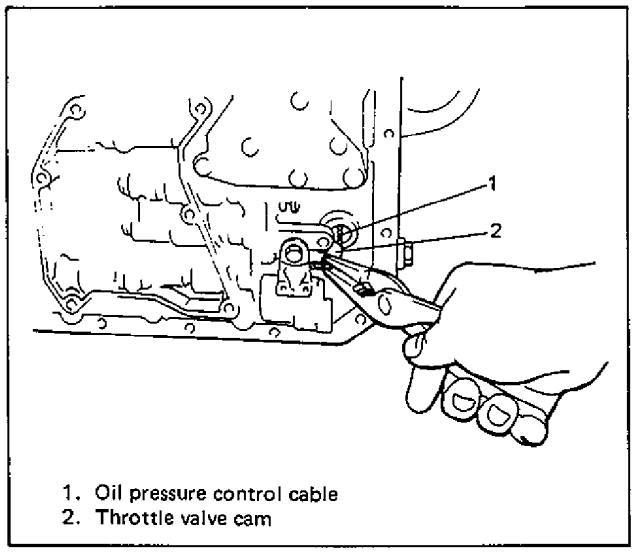


Fig. 7B-96 Removing Oil Tubes

8. Oil pressure control calbe from throttle valve cam and then cable.

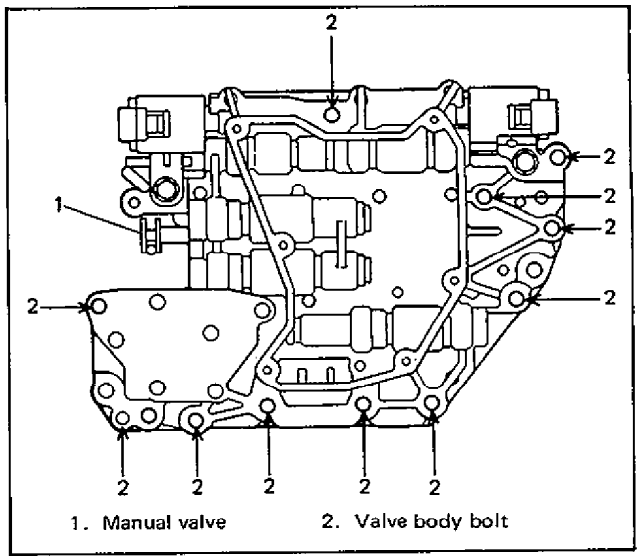


1. Oil pressure control cable
2. Throttle valve cam

Fig. 7B-97 Removing Oil Pressure Control Cable

9. Oil strainer and lower valve body.
   For removal of lower valve body, remove 11 bolts shown in figure.

CAUTION:
Be careful not to let manual valve fall off when removing valve body assembly.

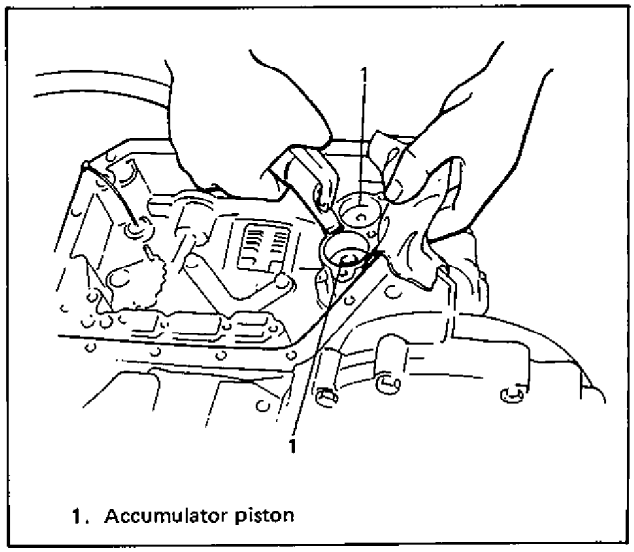


1. Manual valve
2. Valve body bolt

Fig. 7B-98 Removing Lower Valve Body

10. Accumulator pistons and spring.
    Position a rag on pistons to catch each piston. To remove pistons, force low-pressure compressed air (1 kg/cm², 15 psi, 100 kPa, max) into hole as shown, and pop each piston into the rag.

NOTE:
Do not push accumulator pistons with fingers or anything before removing them. Pushing them may cause compressed fluid in accumulator to spew out of hole at face and clothes.



1. Accumulator piston

Fig. 7B-99 Removing Accumulator Pistons

11. Second brake band cover and gasket.
12. After removing second brake band cover, check second brake piston stroke as follows.
 1) Scribe mark on piston rod as shown in below figure.
 2) Blow air into oil hole and measure rod stroke.
 3) If stroke is out of specification, replace piston rod with the one of different length or replace second brake band.
 2nd brake piston rod of 2 different lengths are available as spare parts.

	Piston rod length	Identification mark
Available piston rod	121.3 mm (4.77 in)	Unmarked
	122.7 mm (4.83 in)	Marked

Second brake piston rod stroke B	1.5 – 3.0 mm 0.06 – 0.11 in

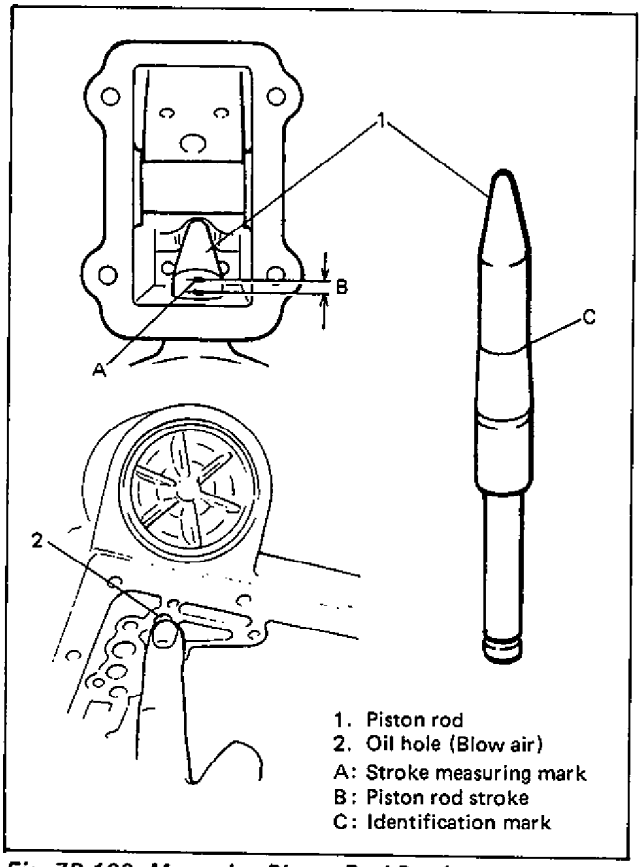


Fig. 7B-100 Measuring Piston Rod Stroke

13. Second brake piston.
 1) Install 17 mm socket with 8 mm bolt.
 2) Apply valve lifter as illustrated and push in piston cover.
 3) Remove snap ring by using screwdriver(s) or the like.
 4) Remove tools and take out 2nd brake piston cover and piston. Tap cover head lightly to pull out cover.

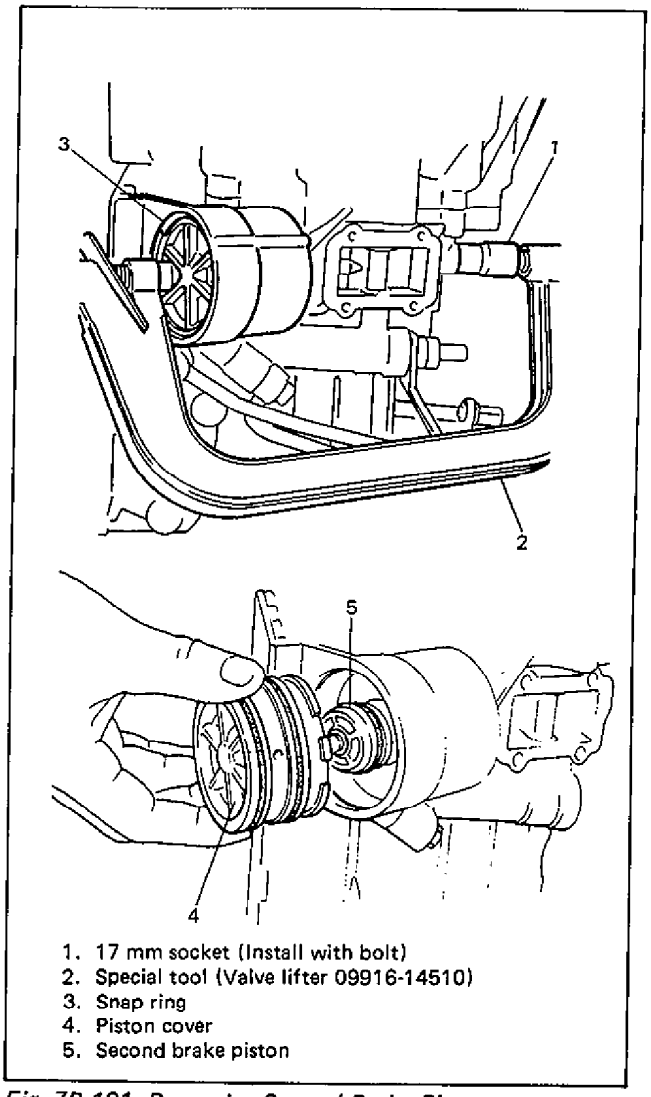
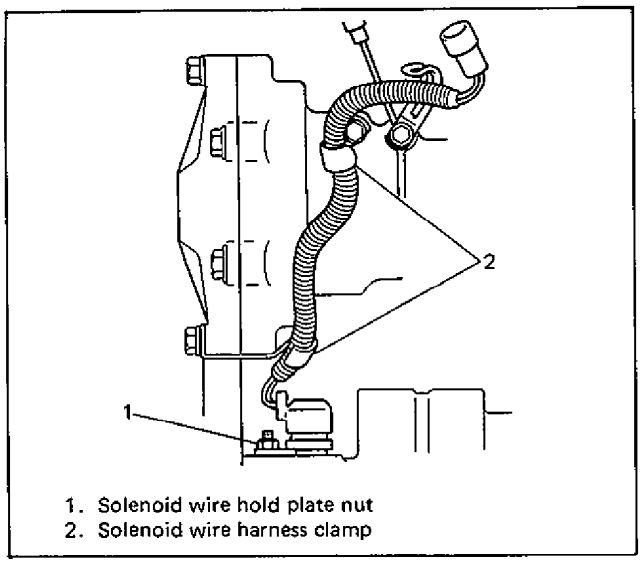


Fig. 7B-101 Removing Second Brake Piston

14. Solenoid wire harness.
 1) Remove wire hold plate securing nut.
 2) Remove 2 wire clamps on transmission and pull out solenoid wire.

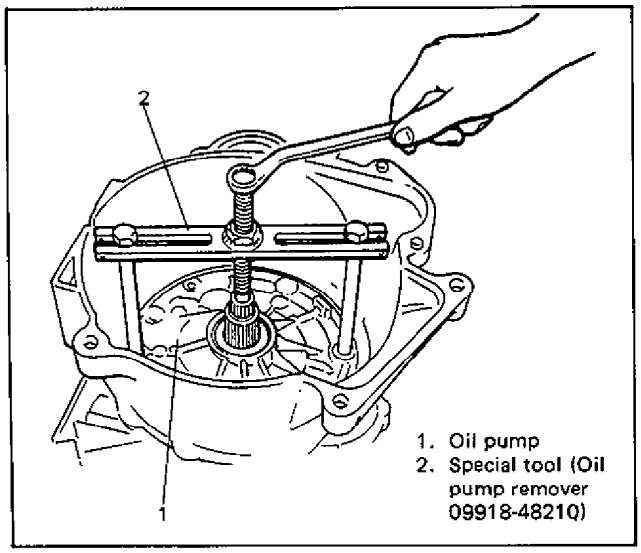


1. Solenoid wire hold plate nut
2. Solenoid wire harness clamp

Fig. 7B-102 Removing Solenoid Wiring Harness

15. Oil pump.
 1) Remove 6 oil pump securing bolts.
 2) Remove oil pump by using special tool.

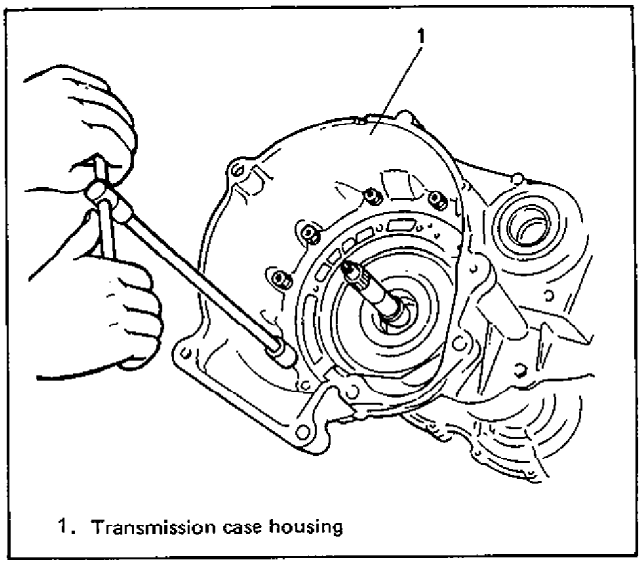
CAUTION:
Make sure that 2nd brake piston and piston rod have been removed before oil pump removal. If not, they may cause breakage of 2nd brake band.



1. Oil pump
2. Special tool (Oil pump remover 09918-48210)

Fig. 7B-103 Removing Oil Pump

16. Transmission case housing.
 1) Remove housing internal bolts and external bolts.
 2) Remove housing while tapping around it lightly with a plastic hammer.



1. Transmission case housing

Fig. 7B-104 Removing Transmission Case Housing

17. Second brake band pin.

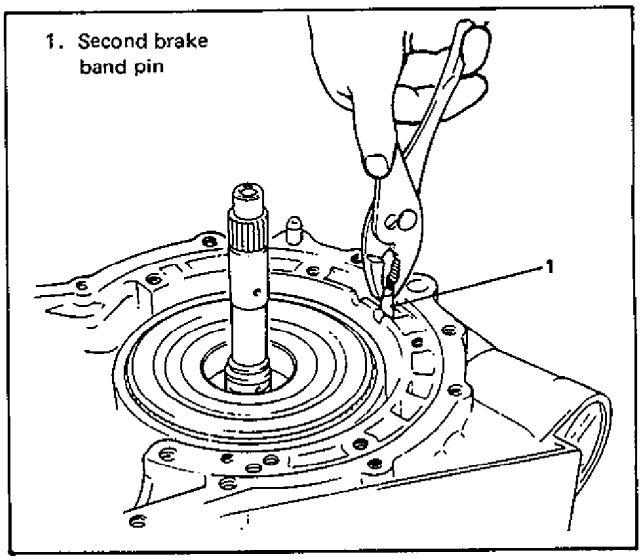


Fig. 7B-105 Removing Second Brake Band Pin

18. Direct clutch and forward clutch at the same time while holding input shaft.

NOTE:
Be careful not to loose ring gear race and bearing which may sometimes stick to input shaft.

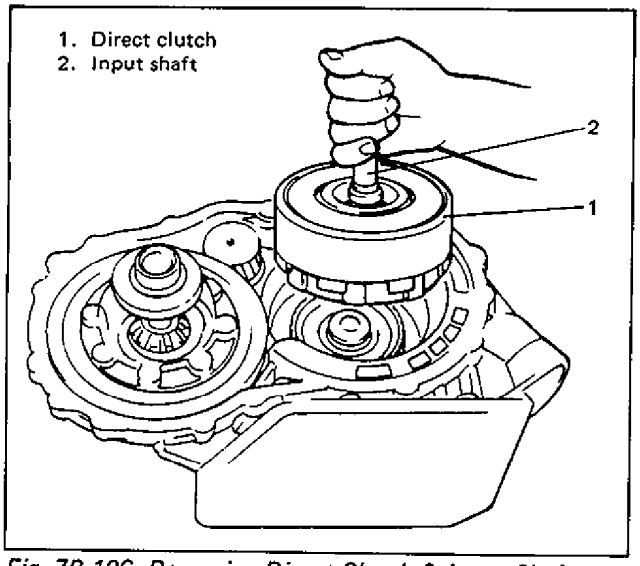


Fig. 7B-106 Removing Direct Clutch & Input Shaft

19. Direct clutch assembly from input shaft.

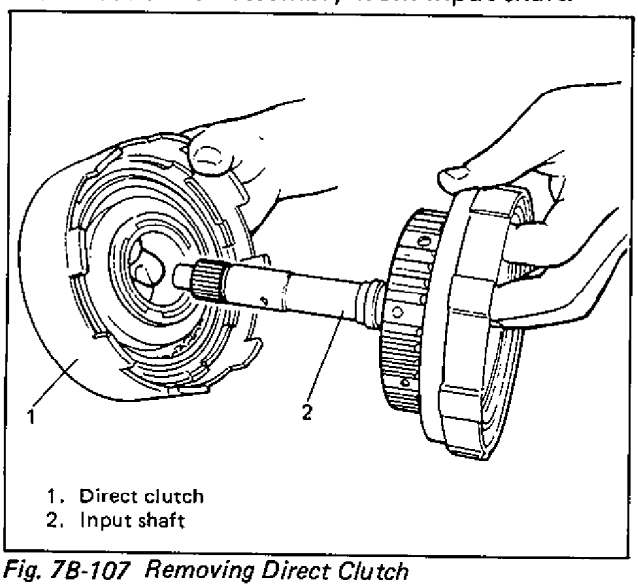


Fig. 7B-107 Removing Direct Clutch

20. Second brake band.
21. Front planetary ring gear and ring gear bearing.

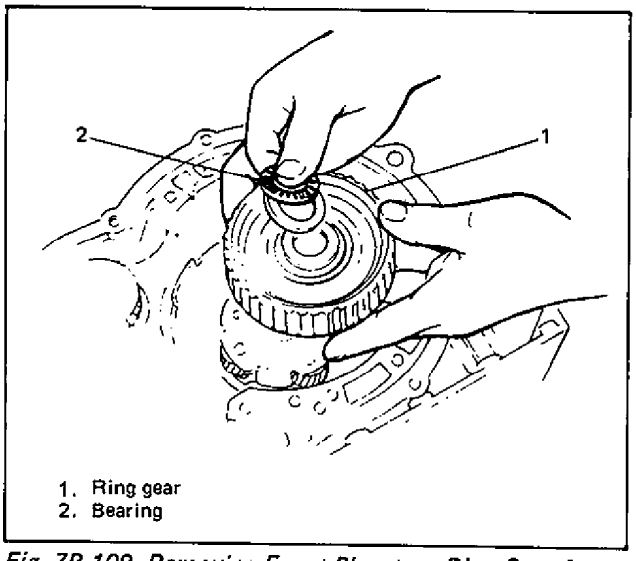


Fig. 7B-108 Removing Front Planetary Ring Gear & Bearing

22. Front planetary gear assembly.

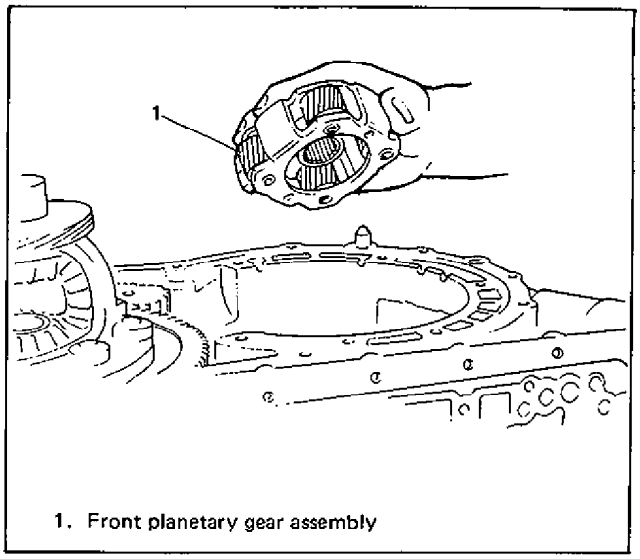


Fig. 7B-109 Removing Front Planetary Gear

23. Planetary sun gear and front planetary gear bearing.

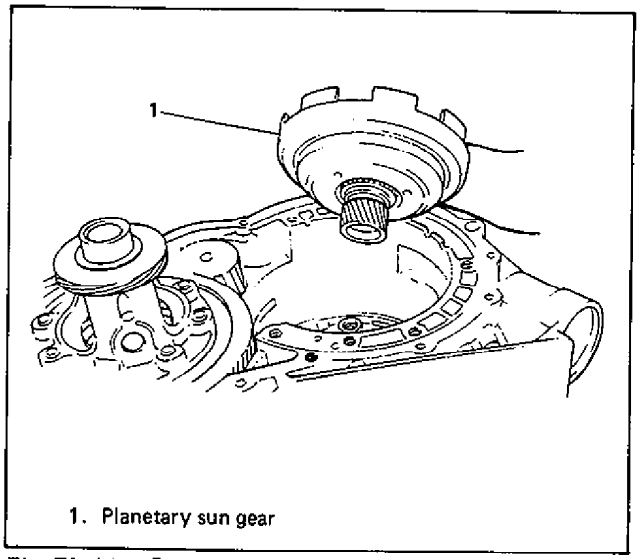
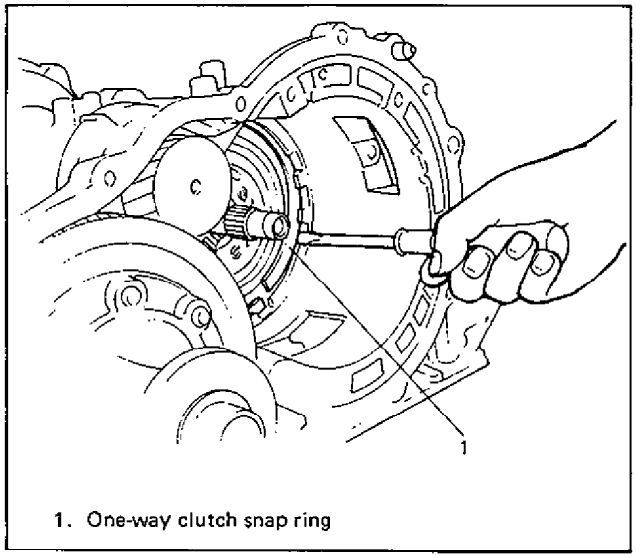


Fig. 7B-110 Removing Planetary Sun Gear

24. One way clutch snap ring by using a screwdriver.

NOTE:
Use care not to damage transmission case when removing snap ring.



1. One-way clutch snap ring

Fig. 7B-111 Removing One-way Clutch Snap Ring

25. One way clutch and rear planetary gear.

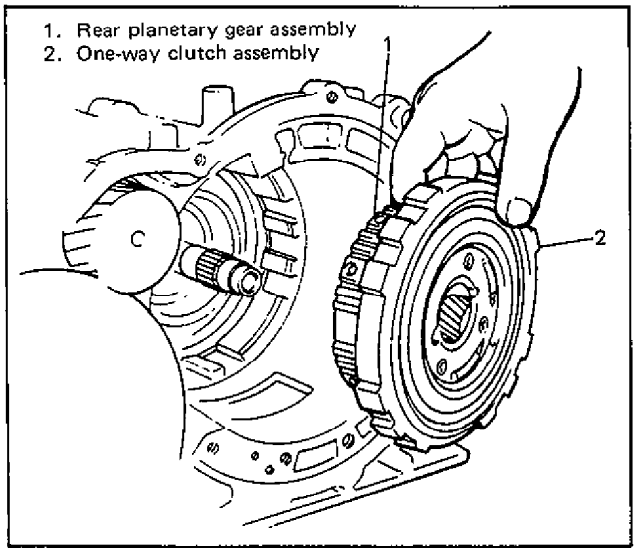


Fig. 7B-112 Removing One-way Clutch

26. Rear planetary ring gear, ring gear bearing and washers.

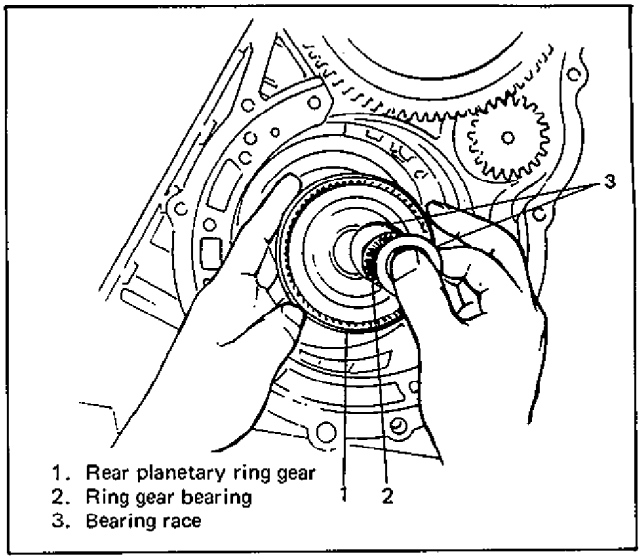
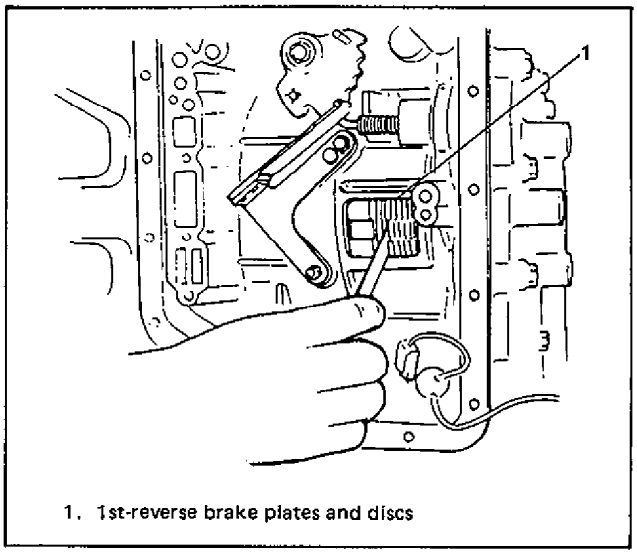


Fig. 7B-113 Removing Rear Planetary Ring Gear

27. Check 1st-reverse brake clearance.
Measure clearance between snap ring and flange with feeler gauge. If out of specification, replace 1st-reverse brake discs or plates.

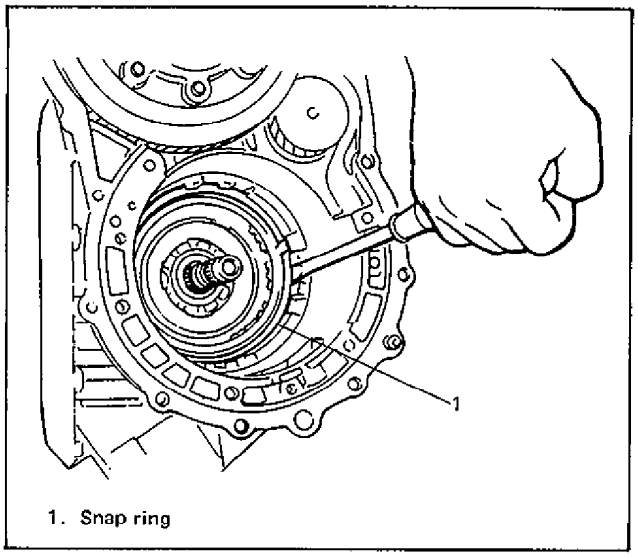
1st-reverse brake clearance	0.58 – 1.92 mm 0.023 – 0.075 in



1. 1st-reverse brake plates and discs

Fig. 7B-114 Measuring 1st-reverse Brake Clearance

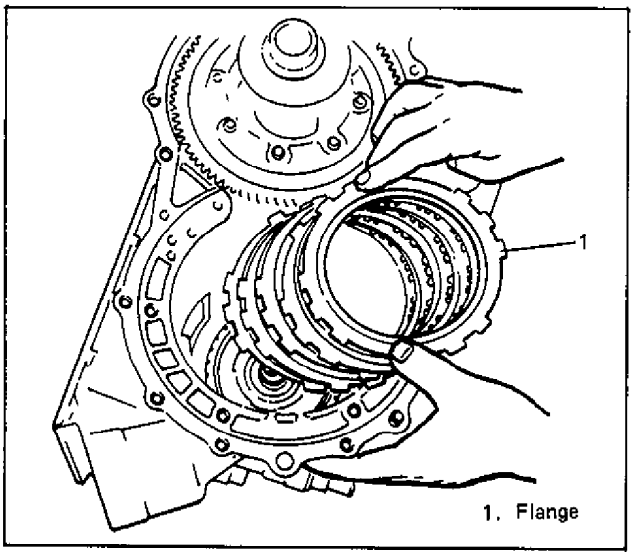
28. 2 snap rings by using a flat tip screwdriver.



1. Snap ring

Fig. 7B-115 Removing Snap Rings

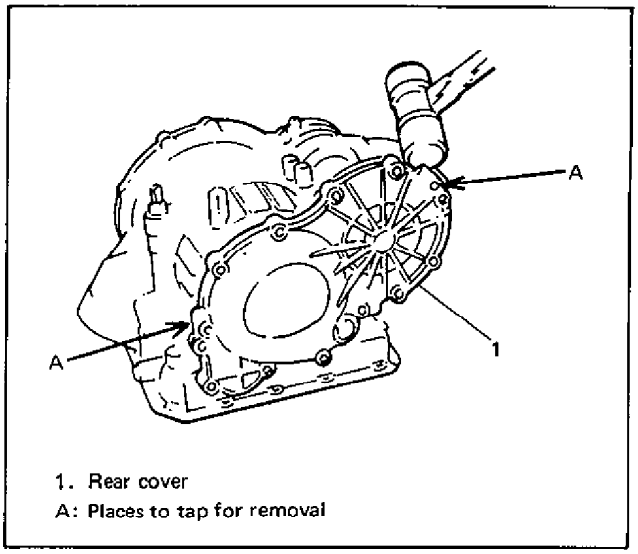
29. 1st-reverse brake flange, discs, plates and damper plate.



1. Flange

Fig. 7B-116 Removing 1st-reverse Brake

30. Differential gear assembly.
31. Rear cover.
    1) Remove 10 bolts and 2 nuts.
    2) Remove rear cover by tapping A with plastic hammer shown in following figure.

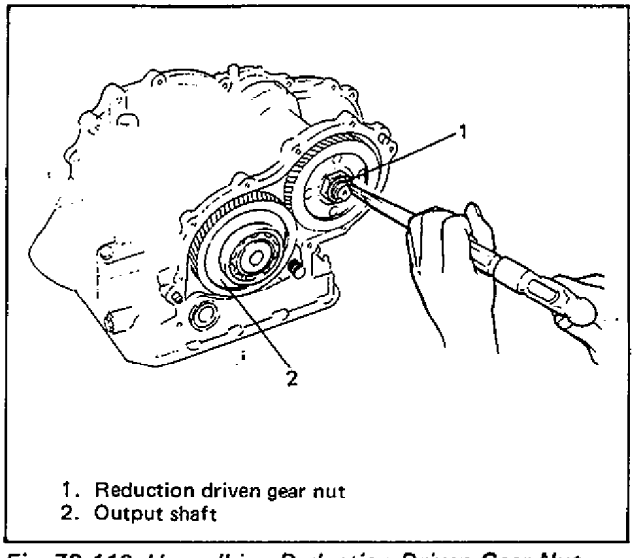


1. Rear cover
A: Places to tap for removal

Fig. 7B-117 Removing Rear Cover

32. Reduction driven gear nut.
    1) Undo caulking.
    2) Shift manual shift lever to P so that output shaft is locked.
    3) Loosen nut.

CAUTION:
Calmly apply torque to loosen nut so as not to damage reduction gear or parking lock pawl.



1. Reduction driven gear nut
2. Output shaft

Fig. 7B-118 Uncaulking Reduction Driven Gear Nut

33. Pull out reduction driven gear.

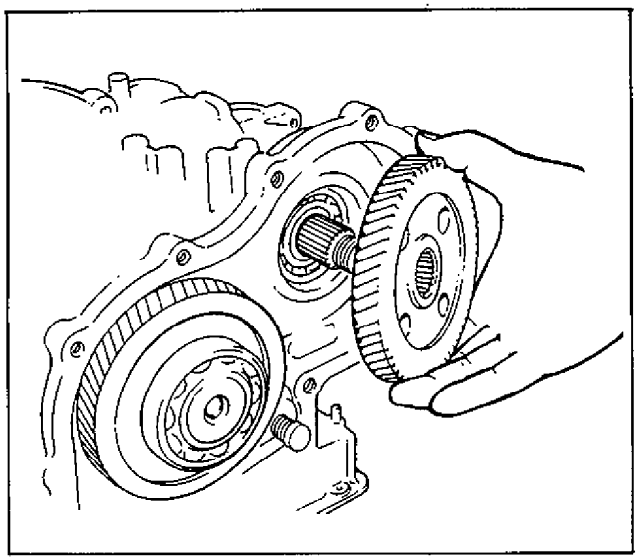


Fig. 7B-119 Removing Reduction Driven Gear

34. Drive countershaft out with a plastic hammer.

CAUTION:
To avoid unnecessary damage of speed sensor due to contact with countershaft gear, it should be removed previously.

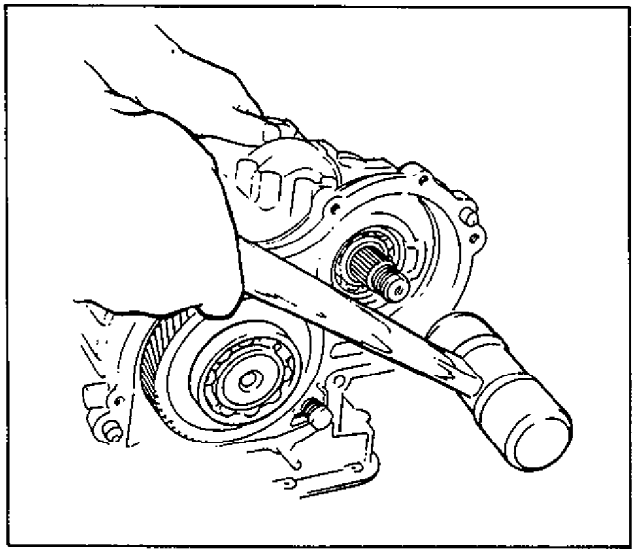


Fig. 7B-120 Removing Countershaft

35. Output shaft.
Remove output shaft by pushing outer race of internal output shaft bearing with special tools from inside of transmission case.

CAUTION:
- **Do not hit output shaft or shaft end will be damaged.**
- **Hold special tools by hand while hitting them and avoid their bounce.**

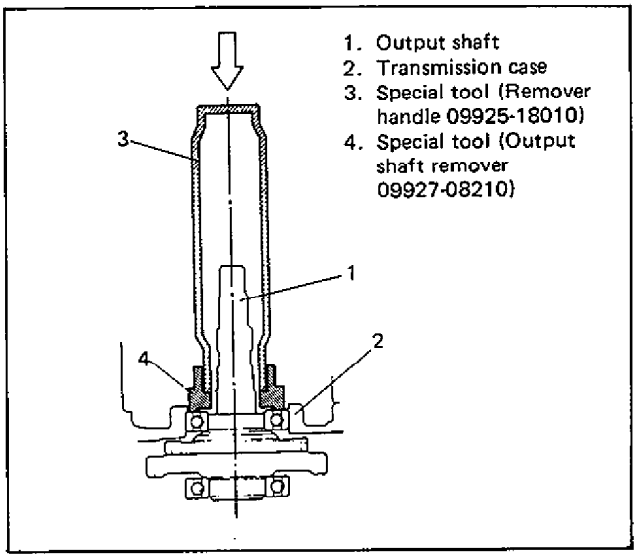


Fig. 7B-121 Removing Output Shaft

36. Parking lock pawl, pawl shaft and sleeve, etc.
1) Pull out parking lock pawl shaft and spring.
2) Remove parking lock pawl.

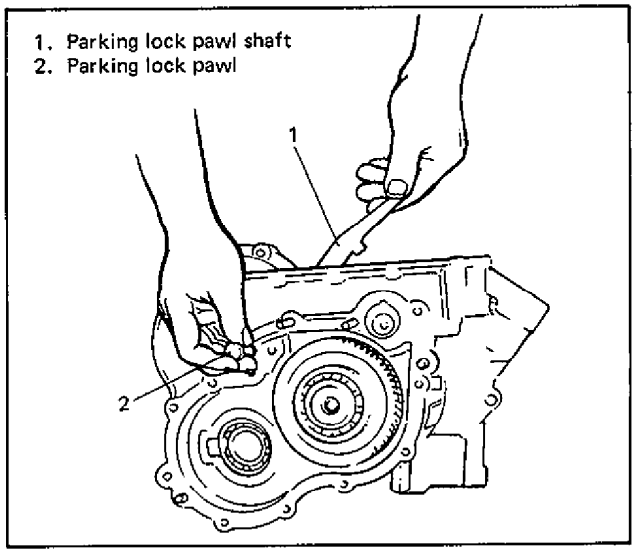
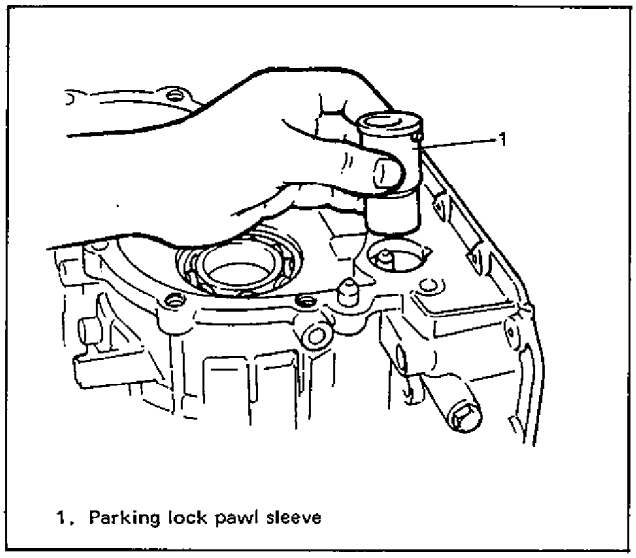


Fig. 7B-122 Removing Parking Lock Pawl

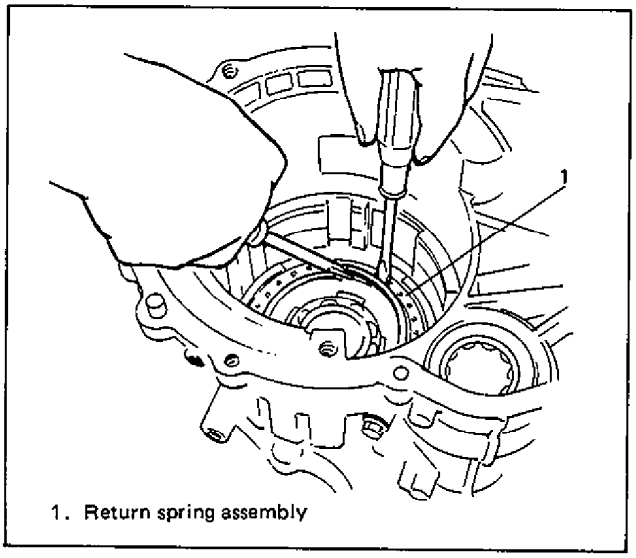
3) Pull out parking lock pawl sleeve.
4) Manual detent spring assembly and manual shift shaft.



1. Parking lock pawl sleeve

Fig. 7B-123 Removing Parking Lock Pawl Sleeve

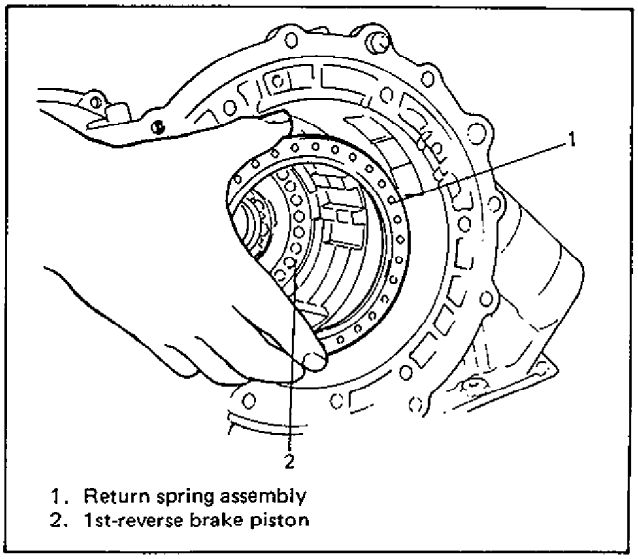
37. 1st-reverse brake piston.
1) Push down return spring assembly and remove snap ring.



1. Return spring assembly

Fig. 7B-124 Removing Snap Ring

2) Take out return spring assembly.



1. Return spring assembly
2. 1st-reverse brake piston

Fig. 7B-125 Removing Return Spring Assembly

3) By blowing air, push out 1st-reverse brake piston.

CAUTION:
- **Blow air very carefully, or outer O ring will be damaged.**
- **Pull out piston by using long nose pliers, if failed to remove it by air blow.**
- **Without replacing O rings prepared, do not attempt to remove piston.**

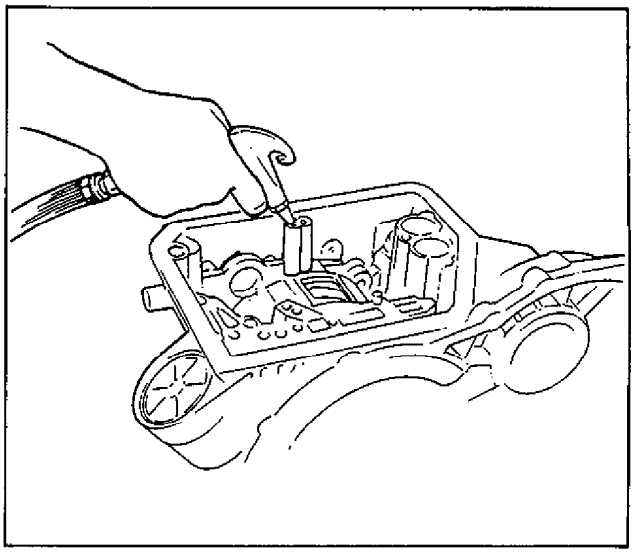


Fig. 7B-126 Removing 1st-reverse Brake Piston

CLUTCH AND BRAKE PARTS DIAGNOSIS

SYMPTOMS

Clutch Discs and Brake Band

Dry and inspect them for pitting, flaking, wear, glazing, cracking, charring and chips or metal particles imbedded in lining. If discs or brake band show any of the above conditions, replacement is required.

Clutch Steel Plates

Dry plates and check for discoloration. If plate surface is smooth and even color smear is indicated, the plate should be reused. If severe heat spot discoloration or surface scuffing is indicated, the plate must be replaced.

Clutch or Brake Return Spring Assembly

Evidence of extreme heat or burning in the area of clutch may have caused springs to take a heat set and would require their replacement.

POSSIBLE CAUSES OF BURNING

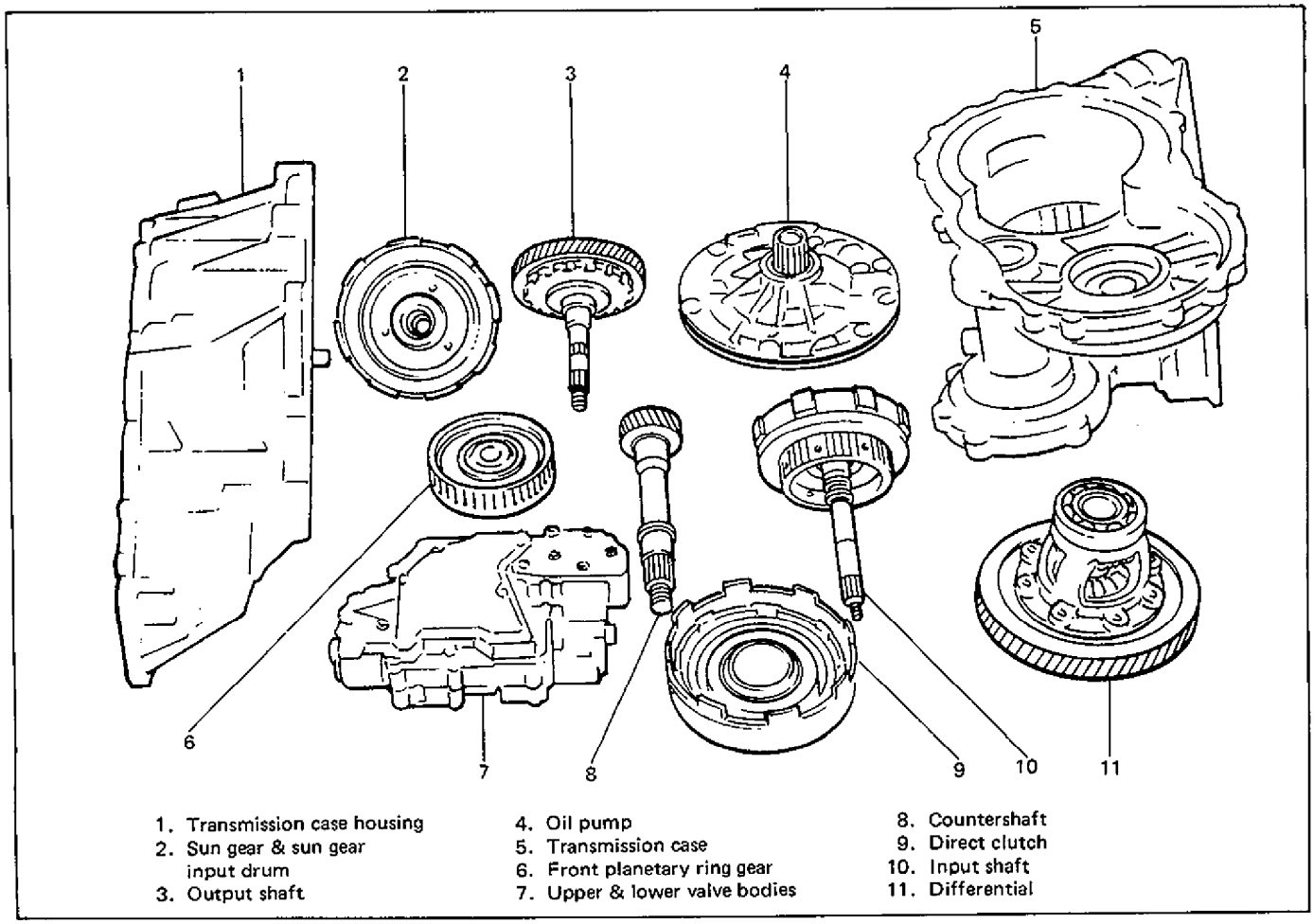
Forward and Direct Clutch Discs

- Stuck or leak in check ball in clutch piston.
- Damaged clutch piston seals.
- Worn or broken seal rings.
- Obstruction in solenoid valves or shift valves.
- Disconnected speed sensor, solenoid or controller.
- Leak in valve body gaskets.
- Low line pressure.

1st/REV Brake Discs and 2nd Brake Band

- Damaged piston seals.
- Obstruction in solenoid valves or shift valves.
- Leak in valve body gaskets.
- Low line pressure.

SUB ASSEMBLY SERVICE



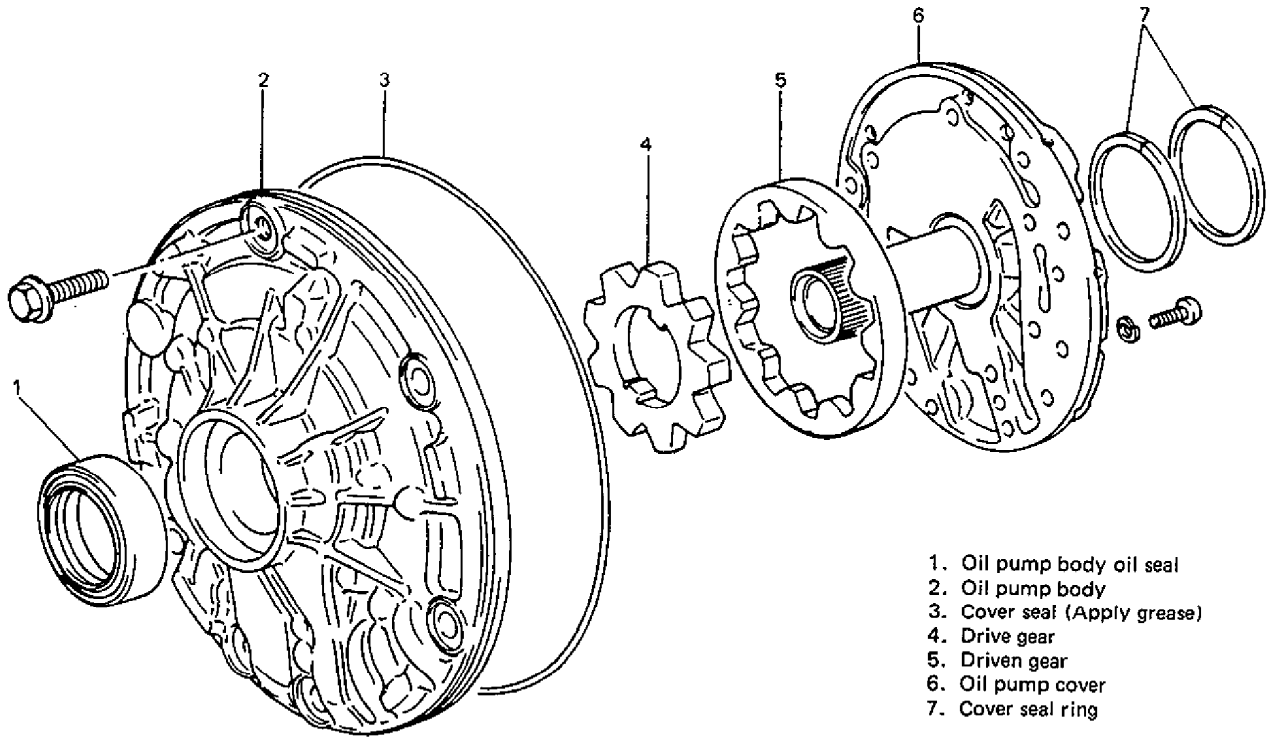
1. Transmission case housing
2. Sun gear & sun gear input drum
3. Output shaft
4. Oil pump
5. Transmission case
6. Front planetary ring gear
7. Upper & lower valve bodies
8. Countershaft
9. Direct clutch
10. Input shaft
11. Differential

Fig. 7B-127 Sub Assemblies

CAUTION:

- Keep component parts in group for each sub assembly and avoid mixing them up.
- Clean all parts with cleaning solvent thoroughly and air dry them.
- Use kerosene or automatic transmission fluid as cleaning solvent.
- Do not use wiping cloths or rags to clean or dry parts.
- All oil passages should be blown out and checked to make sure that they are not obstructed.
- Keep face and eyes away from solvent spray while air blowing parts.
- Check mating surface for irregularities and remove them, if any, and clean it again.
- Soak new clutch discs and brake band in transmission fluid for 2 hours or more before assembly.
- Replace all gaskets and O rings with new ones.
- Apply automatic transmission fluid to all O rings except oil pump cover seal.
- When installing seal ring, be careful so that it is not expanded excessively, extruded or caught.
- Replace oil seals that are removed and apply grease to their lips.
- Before installing, be sure to apply automatic transmission fluid to sliding, rolling and thrusting surface of all component part. Also after installation, make sure to check each part for proper operation.
- Always use torque wrench when tightening bolts.

OIL PUMP



1. Oil pump body oil seal
2. Oil pump body
3. Cover seal (Apply grease)
4. Drive gear
5. Driven gear
6. Oil pump cover
7. Cover seal ring

Fig. 7B-128 Oil Pump Components

Removal

1. 2 oil pump cover seal rings.
2. Oil pump cover seal (O ring).
3. 11 bolts.
4. Oil pump cover.

Inspection

1. Pump body oil seal.
   Check for wear, damage or cracks.
   Replace oil seal if necessary and apply grease to its lip portion slightly when it is installed.
2. Body clearance of driven gear.
   Push driven gear to one side of body. Using a feeler gauge, measure clearance between driven gear and body.
   If clearance exceeds its limit, replace driven gear.

	Standard	Limit
Driven gear-to-body clearance	0.07 – 0.15 mm 0.0028 – 0.0059 in	0.3 mm 0.011 in

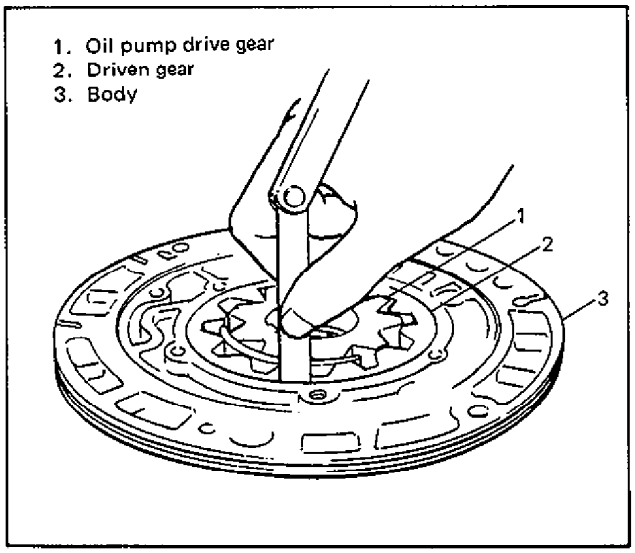


Fig. 7B-129 Checking Gear-to-Body Clearance

3. Tip clearance of both drive and driven gears.
   Measure radial clearance between gear tooth and crescent.
   If clearance exceeds its limit, replace gear.

	Standard	Limit
Gear tooth tip clearance	0.11 – 0.14 mm 0.0043 – 0.0055 in	0.3 mm 0.011 in

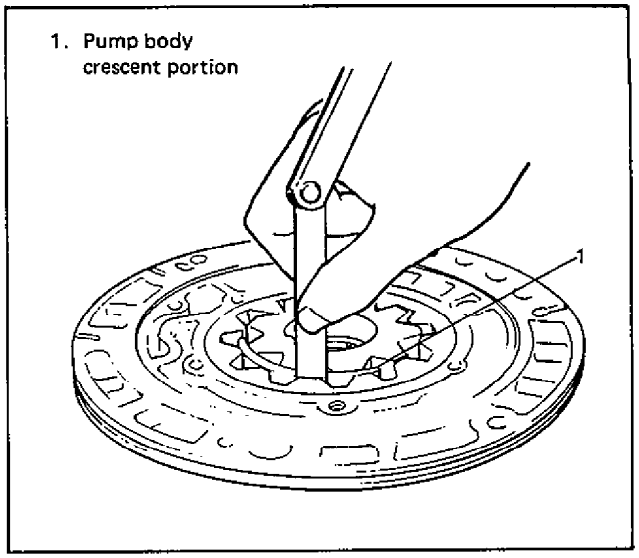


Fig. 7B-130 Checking Gear Tip Clearance

4. Side clearance of both gears.
   Using a straightedge and a feeler gauge, measure side clearance between gear and pump body.

	Standard	Limit
Gear side clearance	0.02 – 0.05 mm 0.0008 – 0.0019 in	0.1 mm 0.0039 in

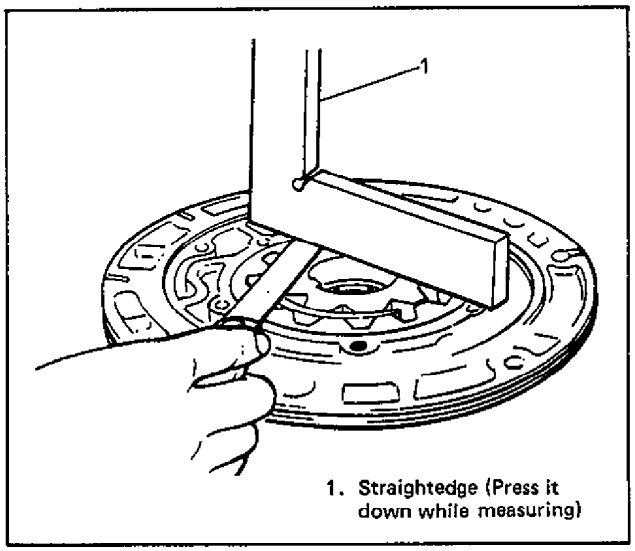
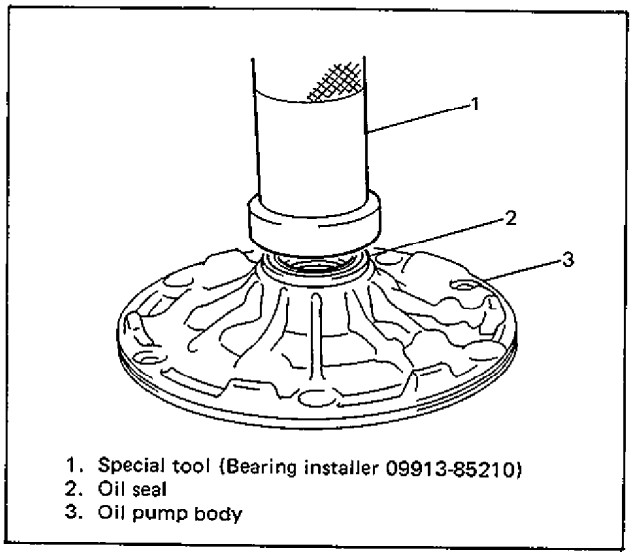


Fig. 7B-131 Checking Side Clearance

Installation

1. Pump body oil seal.
   Use special tool and hammer to install it, and then apply grease to its lip portion.
2. Driven gear and drive gear to pump body after applying fluid to gears.
3. Pump cover to pump body and tighten 11 pump cover bolts to specification.
4. 2 oil pump cover seal rings.
5. Apply transmission fluid to oil pump bushes and 2 seal rings.
6. Oil pump cover seal (O ring).
   Install cover seal applied with grease and make sure that it is not twisted or extruded.
7. Check drive gear for smooth rotation.



1. Special tool (Bearing installer 09913-85210)
2. Oil seal
3. Oil pump body

Fig. 7B-132 Installing Pump Body Oil Seal

Tightening torque for pump cover bolt	N·m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5

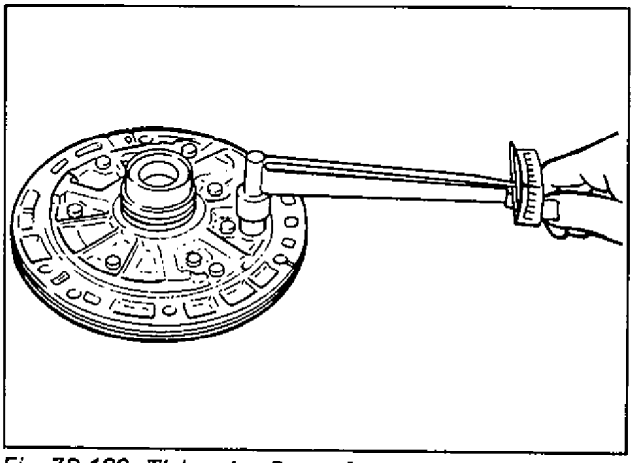
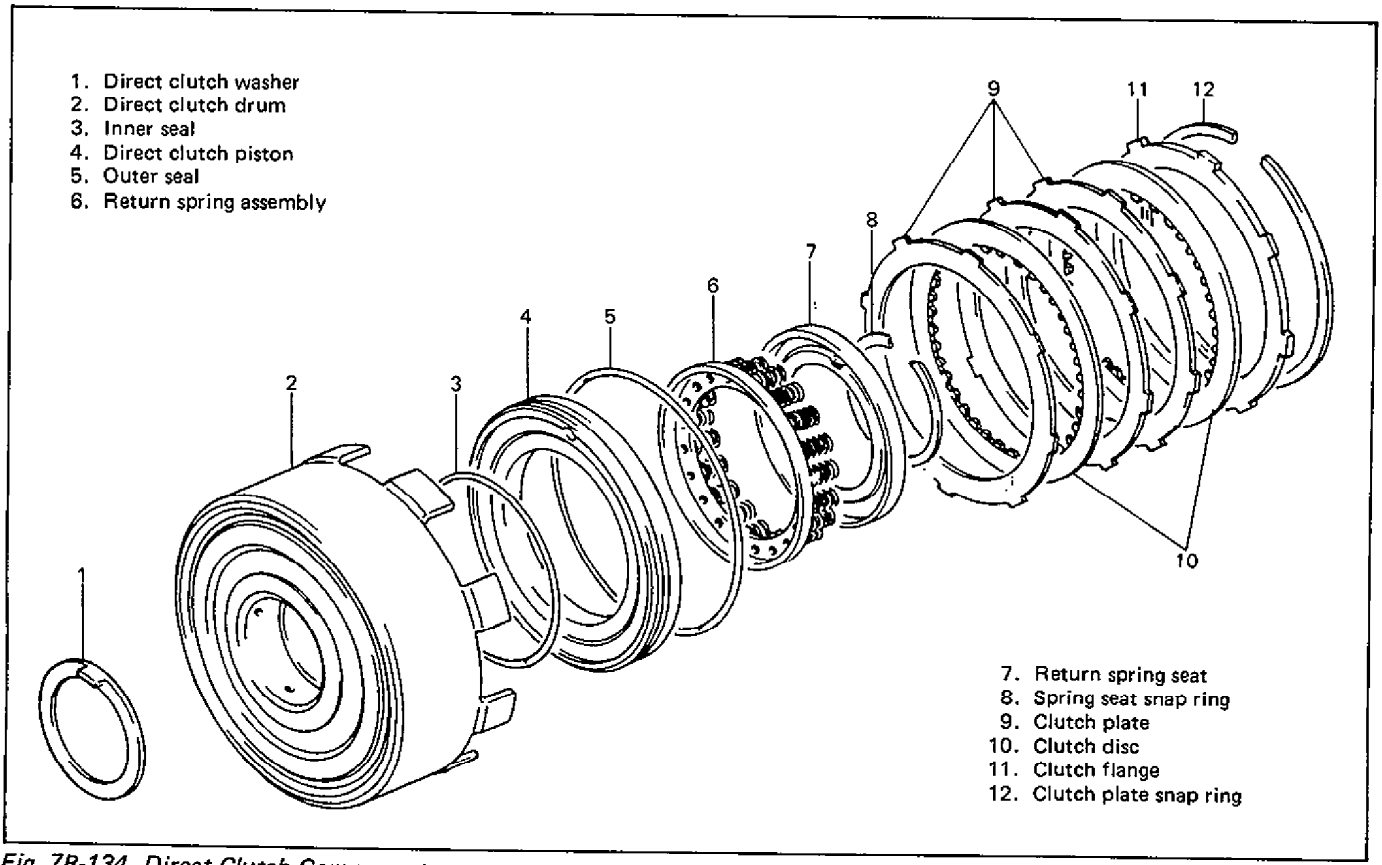


Fig. 7B-133 Tightening Pump Cover Bolts

DIRECT CLUTCH



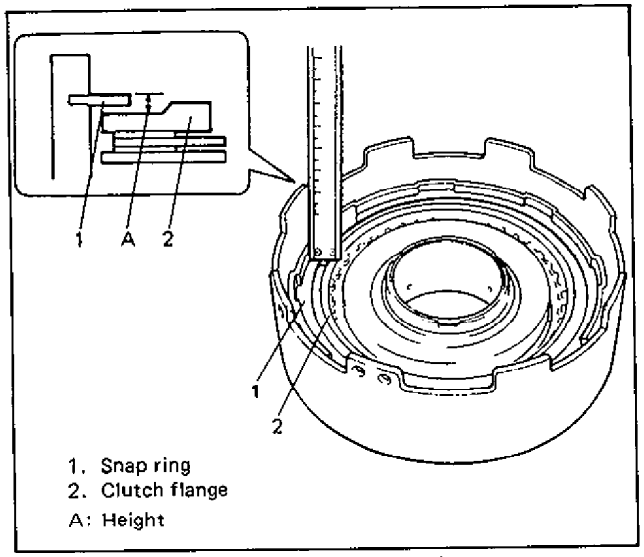
1. Direct clutch washer
2. Direct clutch drum
3. Inner seal
4. Direct clutch piston
5. Outer seal
6. Return spring assembly
7. Return spring seat
8. Spring seat snap ring
9. Clutch plate
10. Clutch disc
11. Clutch flange
12. Clutch plate snap ring

Fig. 7B-134 Direct Clutch Components

Preliminary Check

Check direct clutch clearance before disassembly. For checking clearance, measure height between snap ring and clutch flange by using vernier as shown in figure. If height is within specification, it means that clutch clearance is within specification. If height is out of specification, replace clutch discs or plates with new ones.

Height between snap ring and clutch flange	2.49 – 3.06 mm 0.098 – 0.120 in



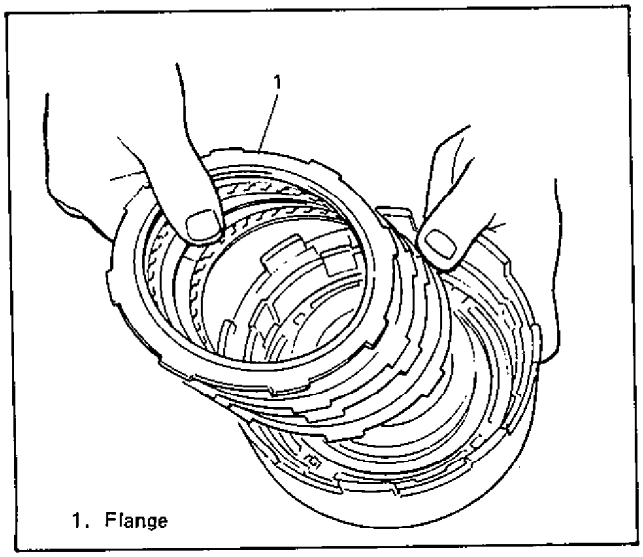
1. Snap ring
2. Clutch flange

A: Height

Fig. 7B-135 Measuring Direct Clutch Clearance

Removal

1. Clutch plate snap ring.
2. Clutch flange, discs and plates.

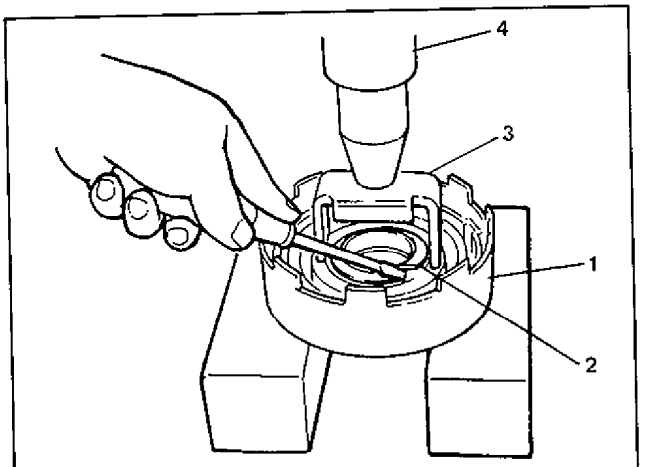


1. Flange

Fig. 7B-136 Removing Flange, Discs and Plates

3. Spring seat snap ring.
   Compress piston return springs by using special tool and then remove snap ring.

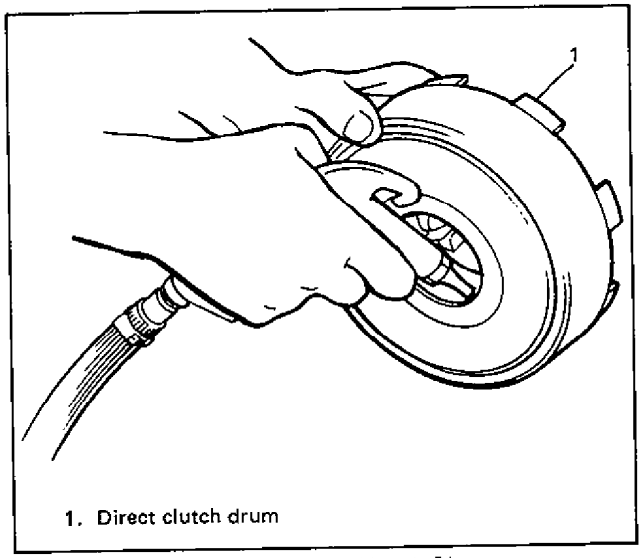
CAUTION:
Do not compress spring seat too much. Excessive compression may cause to spring seat to become distorted.



1. Direct clutch drum
2. Spring seat snap ring
3. Special tool (Clutch spring compressor 09926-98310)
4. Press

Fig. 7B-137 Removing Snap Ring

4. Spring seat and return spring assembly.
5. Direct clutch piston.
   Blow compressed air through drum oil hole to remove piston. If piston does not pop out, take out piston with long nose pliers.



1. Direct clutch drum

Fig. 7B-138 Removing Direct Clutch Piston

6. Inner seal from drum.
7. Outer seal from piston.

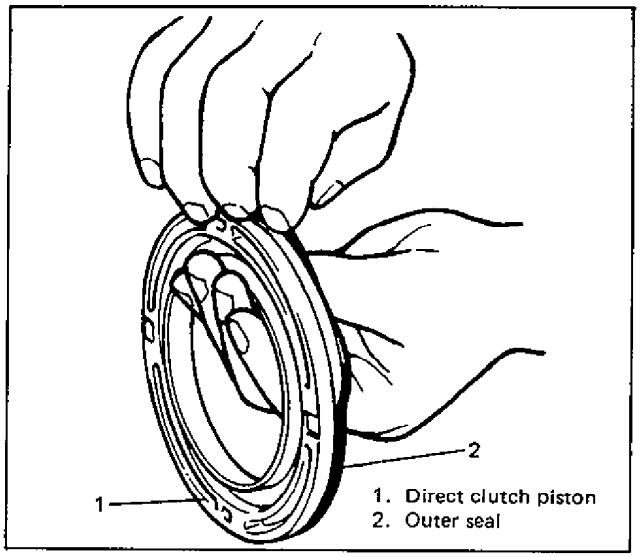


Fig. 7B-139 Removing Outer Seal

Inspection

1. Check valve (steel ball) for free movement in piston.
2. Check valve for leakage by using low pressure air.
   If found faulty, replace piston.

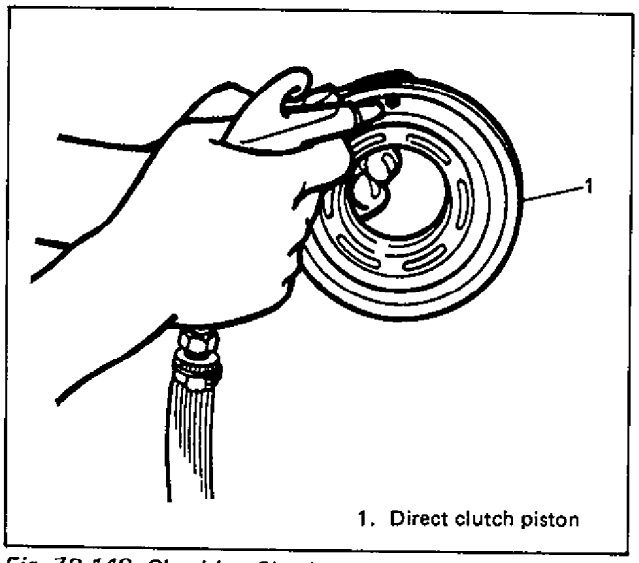


Fig. 7B-140 Checking Check Ball Leakage

Installation

1. Inner seal (O ring).
   Apply transmission fluid to inner seal and fit it in drum. Use new inner seal.
2. Outer seal (O ring).
   Apply transmission fluid to outer seal and fit it to piston. Use new outer seal.
3. Piston into drum.
   Be careful so that seals (O rings) do not get twisted or caught.

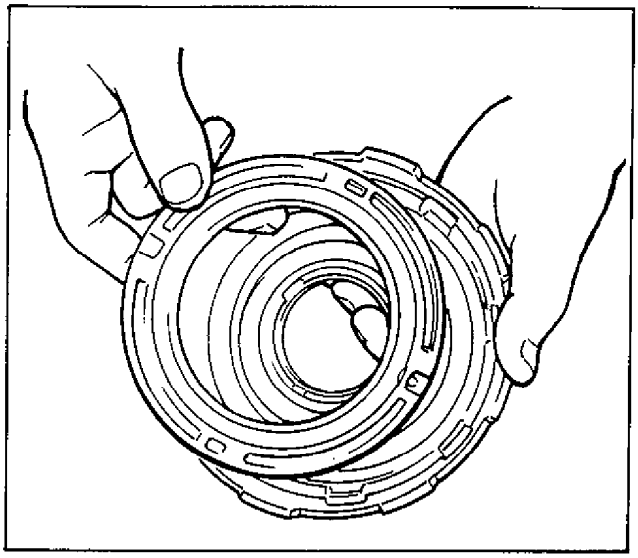


Fig. 7B-141 Installing Piston to Drum

4. Clutch return spring assembly.
5. Spring seat.

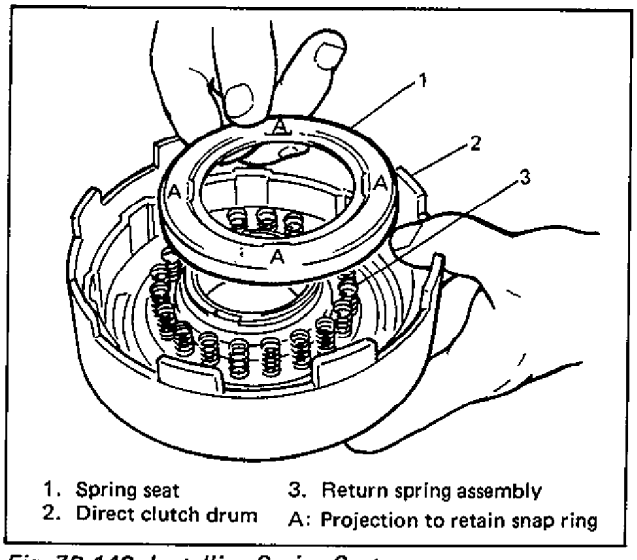


Fig. 7B-142 Installing Spring Seat

6. Snap ring.
   Compress return springs and install spring seat snap ring in groove. Place special tool (clutch spring compressor) on spring seat and compress springs with press, and then, install snap ring using a screwdriver.

CAUTION:
- **Check to make sure that snap ring is securely fitted in 4 projections A of spring seat.**
- **Do not compress return spring more than necessary.**

7. Discs, plates and flange.
   Install the following in that order.

   ① Plate → ② Disc → ③ Plate → ④ Plate → ⑤ Disc → ⑥ Flange

NOTE:
If new clutch discs are installed, soak them in automatic transmission fluid for 2 hours or more before assembly.

8. Clutch plate snap ring.
9. After installing clutch plate snap ring, measure height between snap ring and clutch flange as previously outlined.
   If height is out of specification even when new clutch discs and plates are installed, install flange of different thickness. Following 2 types of clutch flanges are available as spare parts.

Height between snap ring and clutch flange	2.49 – 3.06 mm 0.098 – 0.120 in

Available clutch flange size (thickness)	3.00 mm/0.118 in
	3.37 mm/0.132 in

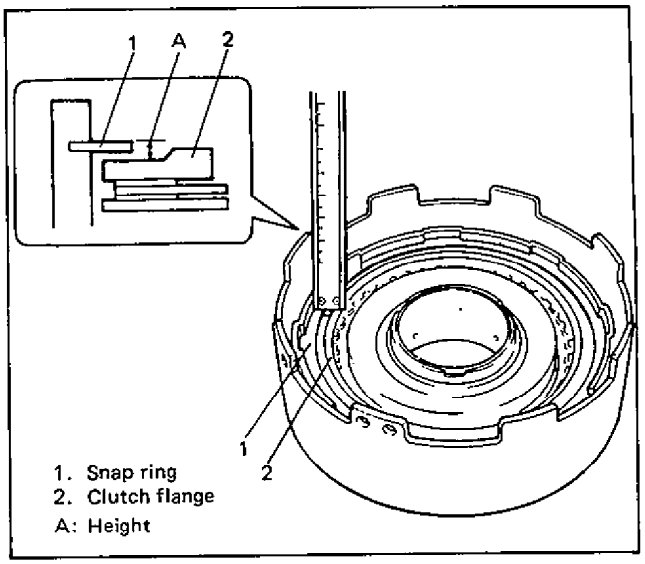


Fig. 7B-143 Measuring Direct Clutch Clearance

10. Check piston for movement by blowing air through oil hole in drum.

CAUTION:
Apply only low pressure air for checking movement. Excessive air pressure may cause damage to spring seat.

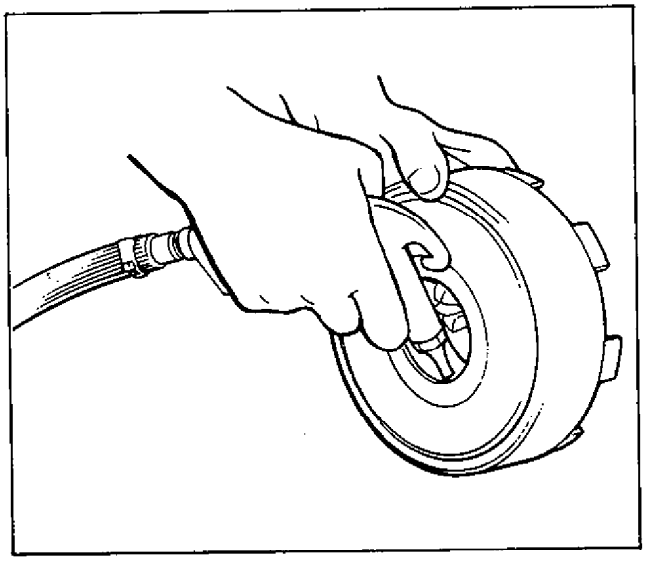
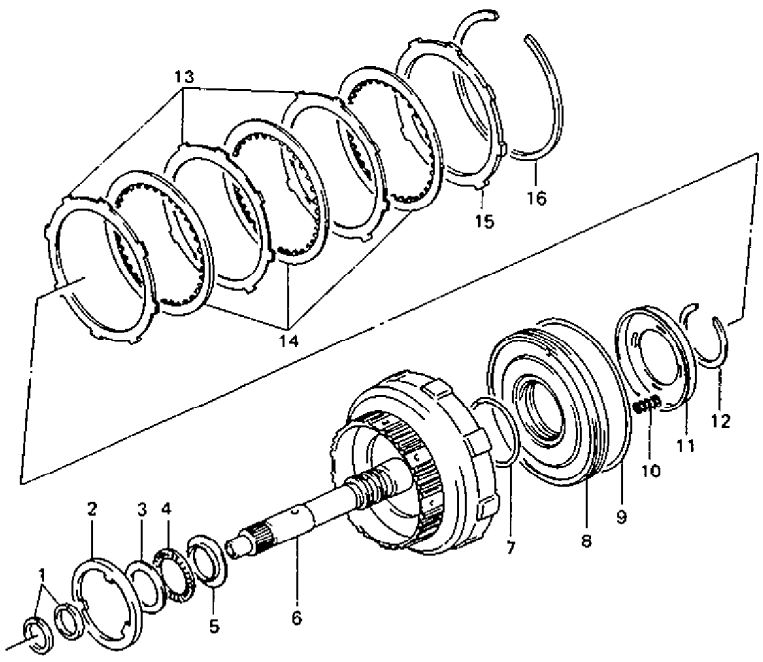


Fig. 7B-144 Checking Piston for Movement

FORWARD CLUTCH



1. Input shaft seal ring
2. Direct clutch washer
3. Input shaft bearing race
4. Input shaft bearing
5. Bearing race
6. Input shaft
7. Inner seal
8. Forward clutch piston
9. Outer seal
10. Return spring
11. Return spring seat
12. Spring seat snap ring
13. Clutch plate
14. Clutch disc
15. Clutch flange
16. Clutch plate snap ring

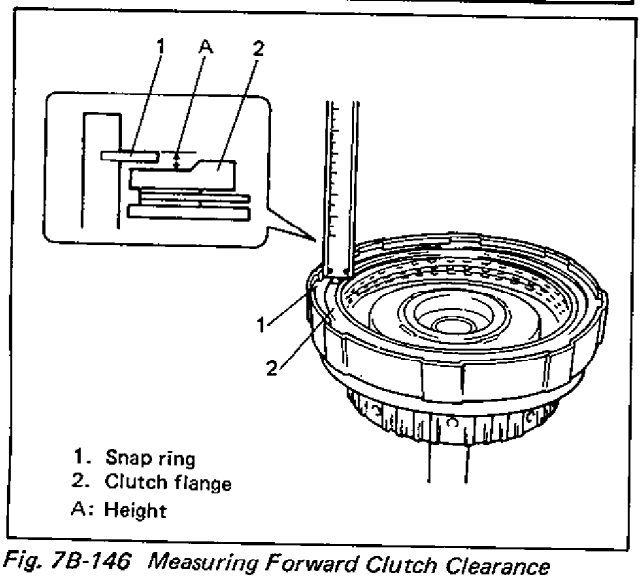
Fig. 7B-145 Exploded View of Forward Clutch

Preliminary Check

Check forward clutch clearance before disassmbly.

For checking clearance, measure hight between snap ring and clutch flange by using vernier as shown in fugure. If height is within specification, it means that clutch clearance is within specification. If height is out of specification, replace clutch discs or plates with new ones.

Height between snap ring and clutch flange	2.01 – 2.68 mm 0.079 – 0.105 in



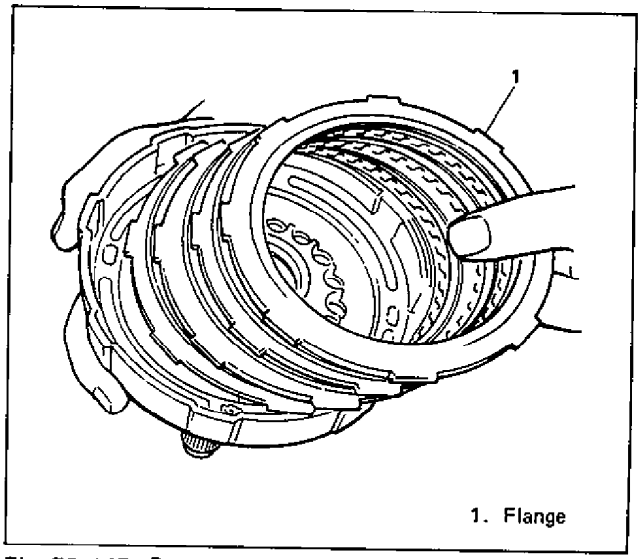
1. Snap ring
2. Clutch flange

A: Height

Fig. 7B-146 Measuring Forward Clutch Clearance

Removal

1. Clutch plate snap ring.
2. Flange, discs and plates.

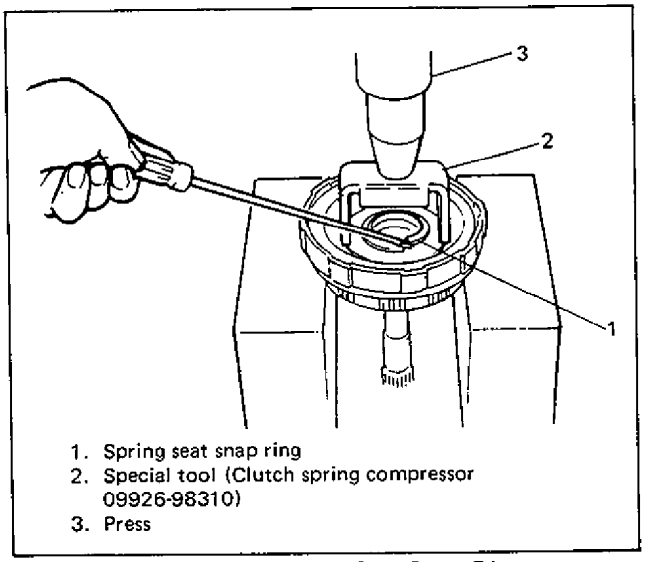


1. Flange

Fig. 7B-147 Removing Flange, Discs & Plates

3. Spring seat snap ring.
   Compress piston return springs and remove snap ring. Place special tool (clutch spring compressor) on spring seat and compress spring with a press, and then, remove snap ring, using a screwdriver.

CAUTION:
Do not push down return spring more than necessary.



1. Spring seat snap ring
2. Special tool (Clutch spring compressor 09926-98310)
3. Press

Fig. 7B-148 Removing Spring Seat Snap Ring

4. Spring seat and springs.
5. Forward clutch piston.
   Blow compressed air through input shaft oil hole to remove piston. If piston does not pop out, take it out with long nose pliers.

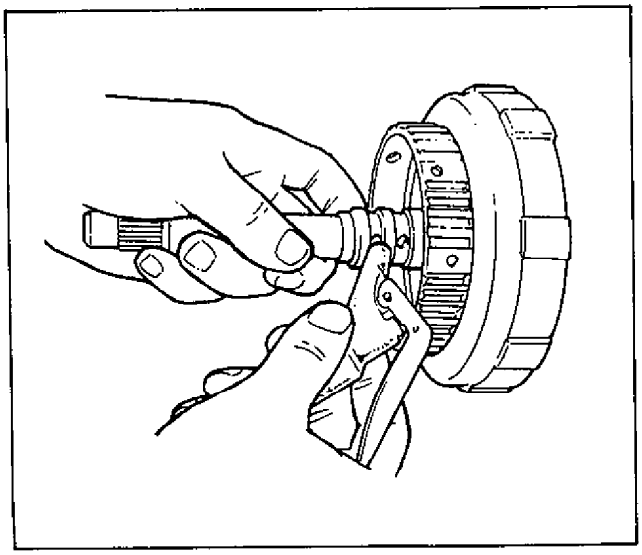


Fig. 7B-149 Removing Clutch Piston

6. Inner and outer seals (O rings) from piston.

Inspection

1. Check valve (ball) for free movement in clutch piston.
2. Check valve for leakage by using low pressure air. If found faulty, replace clutch piston.

Installation

1. Inner and outer seals (O rings) to clutch piston. Apply transmission fluid to them and fit to piston. Use new seals.
2. Piston into input shaft drum.
   use care so that seals do not get twisted or caught.
3. 18 piston return springs and spring seat.

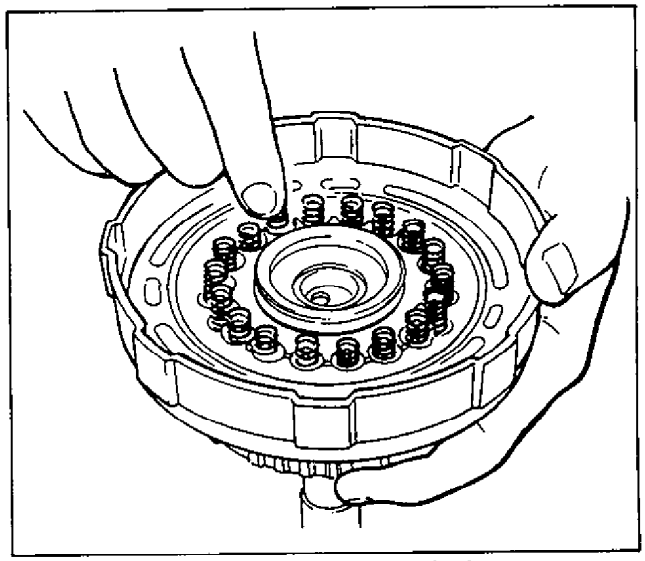


Fig. 7B-150 Installing Piston Return Springs

4. Spring seat snap ring.
   Compress return springs and install snap rings in groove by using a screwdriver.
   Place special tool (clutch spring compressor) on spring seat and compress springs with a press.

CAUTION:
- **Check to make sure that snap ring is securely fitted in 4 projections of spring seat.**
- **Do not compress return spring more than necessary.**

5. Install discs, plates and flange.
   Install them in following order.

   ① Plate → ② Disc → ③ Plate → ④ Disc → ⑤ Plate → ⑥ Disc → ⑦ Flange

NOTE:
Before assembly, new discs should be soaked in automatic transmission fluid for 2 hours or more.

6. Clutch plate snap ring.
7. After installing clutch plate snap ring, measure height between snap ring and clutch flange as previously outlined.
   If discs and plates are new and yet out of above specification, install flange of different thickness. Following 2 types of clutch flanges are available as spare parts.

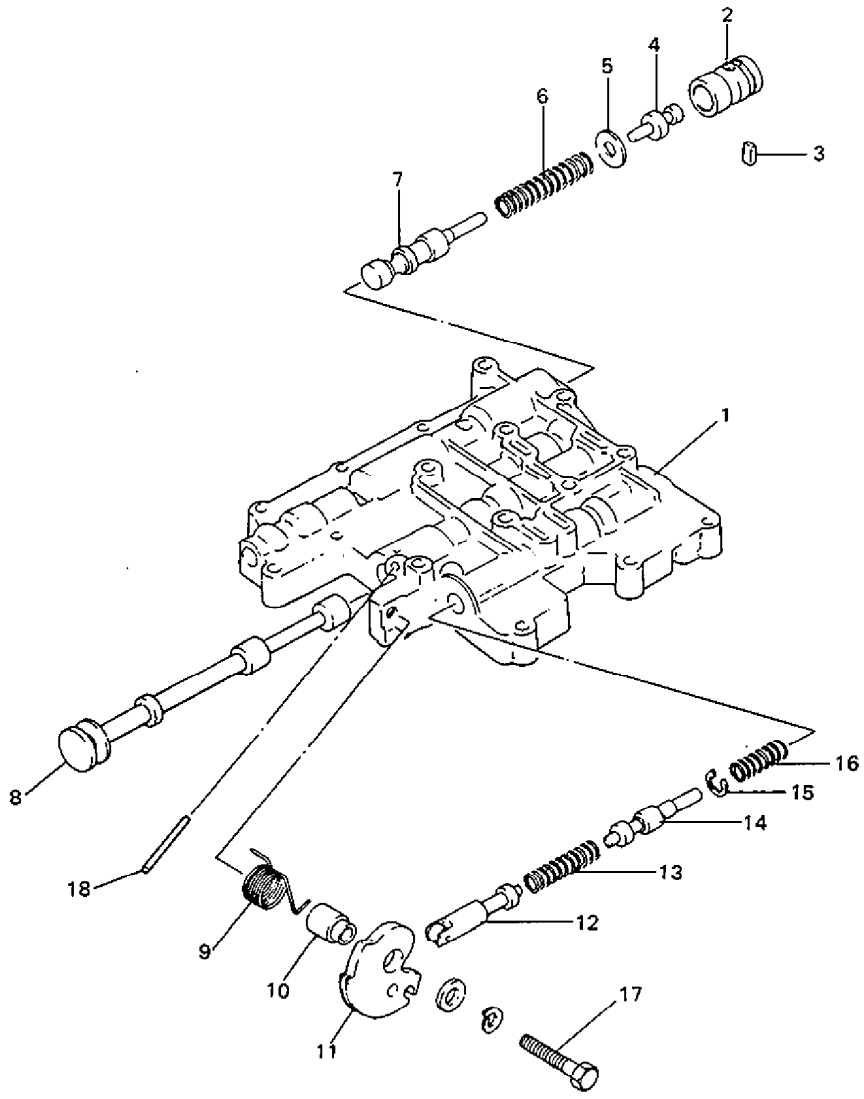
Height between snap ring and clutch flange	2.01 – 2.68 mm 0.079 – 0.105 in

Available clutch flange size (thickness)	3.00 mm/0.118 in
	3.37 mm/0.132 in

8. Check clutch piston for movement by blowing air through input shaft oil hole.

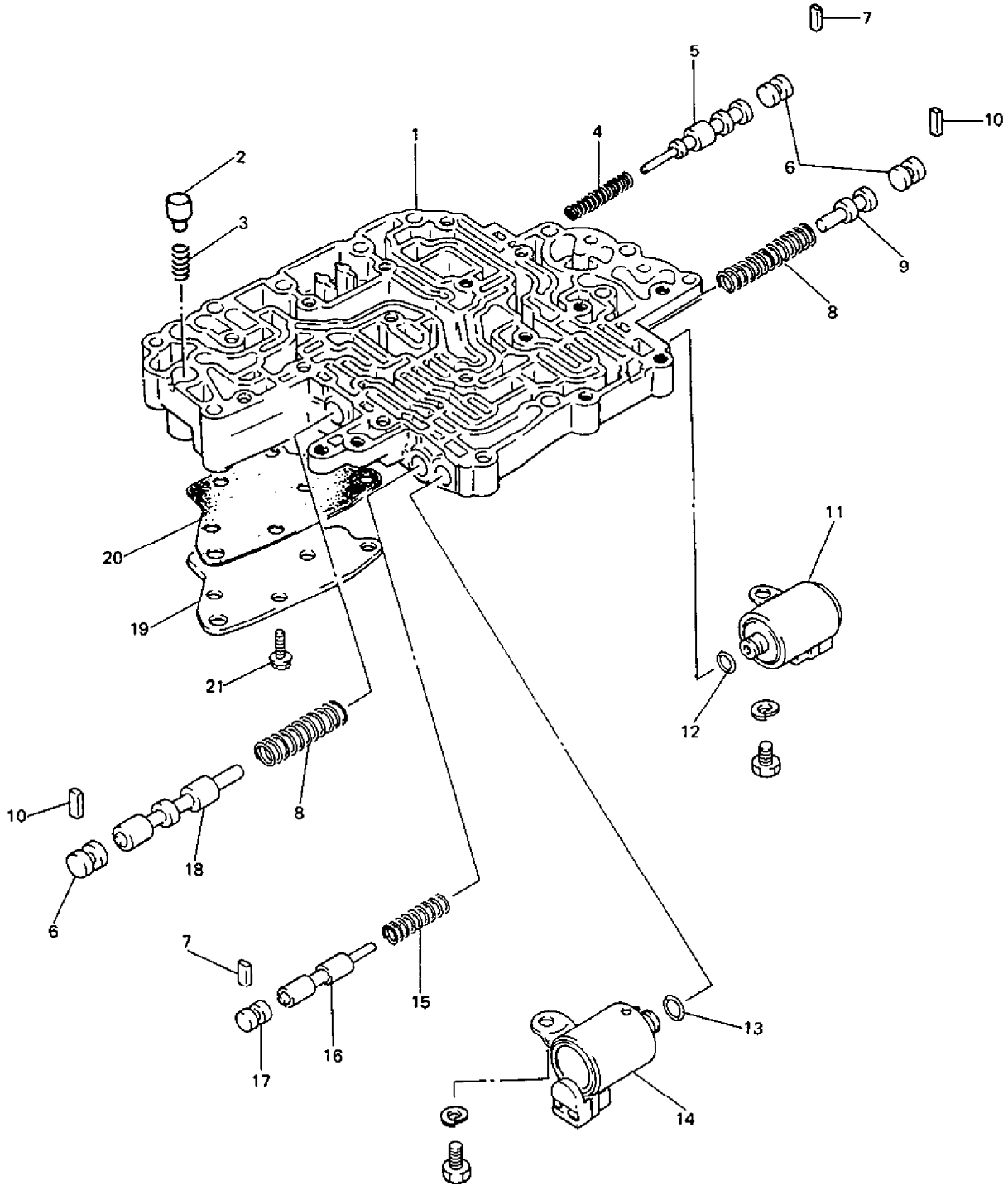
CAUTION:
Apply only low pressure air, or spring seat may be damaged.

VALVE BODY



1. Upper valve body
2. Pressure regulator valve sleeve
3. No. 1 key (short)
4. Primary regulator valve plunger
5. Plate washer
6. Primary regulator valve spring (Red. L: 52.5 mm/2.07 in)
7. Primary regulator valve
8. Manual valve
9. Throttle valve spring
10. Throttle valve cam pin
11. Throttle valve cam
12. Down shift plug
13. Throttle valve No. 2 spring (Light blue. L: 31.04 mm/1.22 in)
14. Throttle valve
15. Throttle valve ring(s)
16. Throttle valve No. 1 spring (White. I : 22.2 mm/0.87 in)
17. Throttle valve cam bolt
18. Neutral drain nozzle

Fig. 7B-151 Upper Valve Body Components

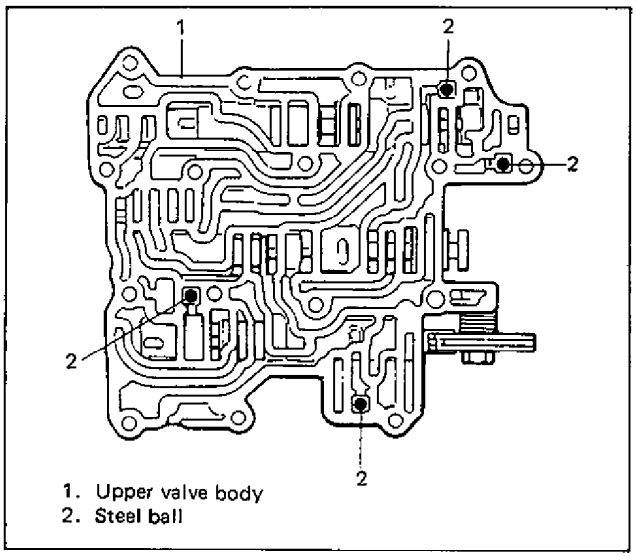


1. Lower valve body
2. Cooler by-pass valve
3. Spring (Orange. L: 19.9 mm/0.78 in)
4. Secondary regulator valve spring (Brown. L: 30.17 mm/1.19 in)
5. Secondary regulator valve
6. Plug
7. No. 1 key (Medeum)
8. Shift valve spring (Pink. L: 39.6 mm/1.56 in)
9. 2 – 3 shift valve
10. No. 2 key (Long)
11. Direct clutch solenoid
12. Seal
13. Seal
14. 2nd brake solenoid
15. B2 control valve spring (Blue. L: 28.1 mm/1.11 in)
16. B2 control valve
17. B2 control valve plug
18. 1 – 2 shift valve
19. Lower valve body cover
20. Gasket
21. Lower valve body cover bolt

Fig. 7B-152 Lower Valve Body Components

Important Steps in Disassembly and Reassembly of Valve Bodies

- When disassembling valve body, be sure to keep each valve together with its corresponding spring.
- When removing upper valve body from lower one, be careful not to let 4 steel balls shown in figure fall off.
- When assembling, install these four (4) steel balls in such in upper valve body as shown in figure.



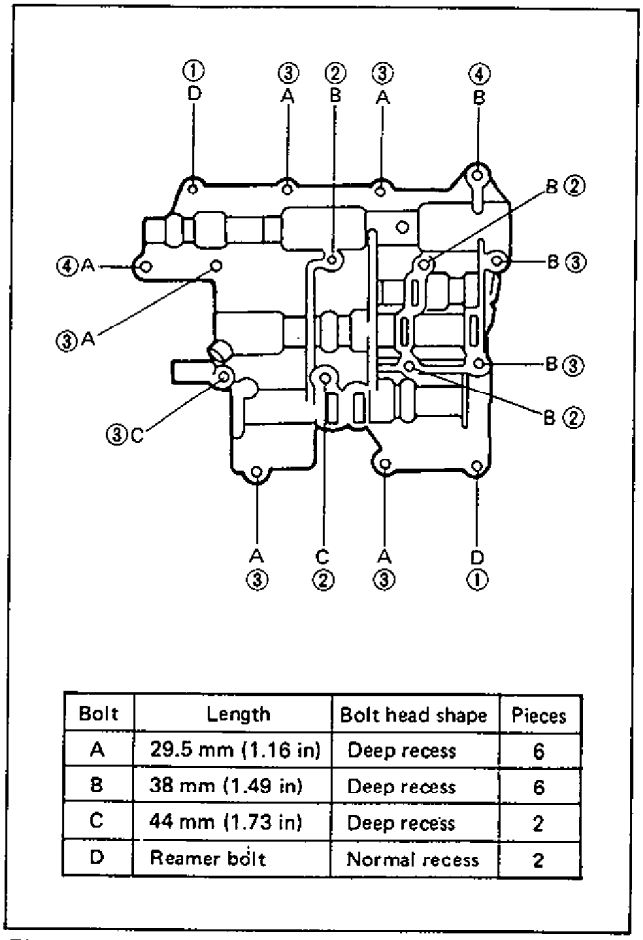
1. Upper valve body
2. Steel ball

Fig. 7B-153 Installing Four (4) Steel Balls

- Replace each gasket with new one. Make sure that new gasket is the same as old one before installation.
- When installing each valve to valve body, use special care for proper installing direction.
- Several of throttle valve rings are used at throttle valve in upper valve body. Be sure to install the same number of throttle valve rings as those used before disassembly.
- When installing lower valve body cover and gasket to lower valve body, tighten lower valve body bolts to specification.
- Tighten throttle valve cam bolt to specification.
- When installing upper valve body to lower one, install 16 upper valve body bolts and tighten them to specified torque.

1) – Lightly install 2 reamer bolts (positioning bolts) to D.
2) – Install all other 14 bolts.
3) – Tighten 4 bolts ② to specification.
4) – Tighten 8 bolts ③ to specification.
5) – Tighten 2 bolts ④ and 2 reamer bolts ① to specification.

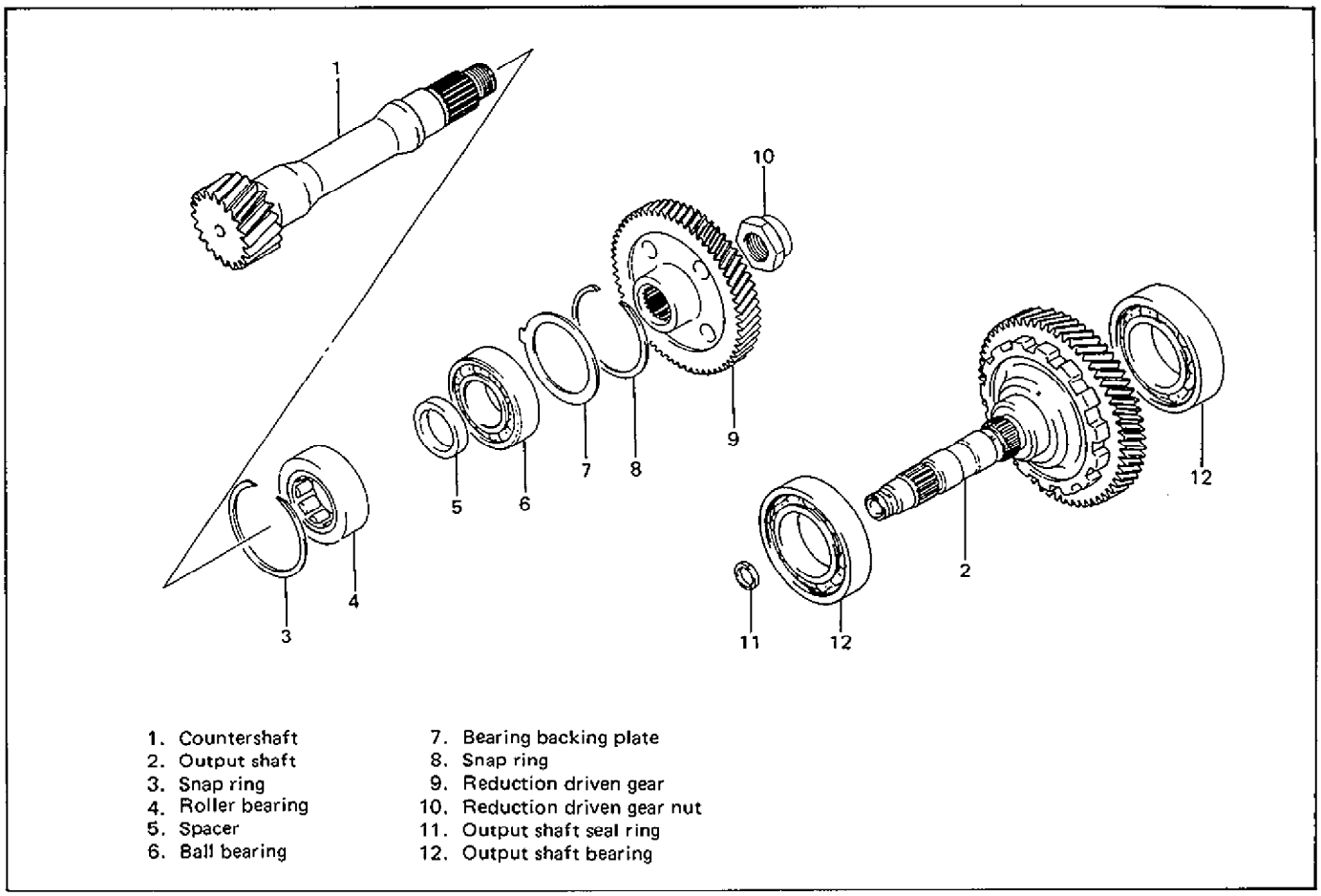
Tightening torque	N·m	kg-m	lb-ft
Lower valve body cover bolts	4 – 6	0.4 – 0.6	3.0 – 4.0
Throttle valve cam bolt	6 – 9	0.6 – 0.9	4.5 – 6.5
Upper valve body bolts	5 – 6	0.5 – 0.6	4.0



Bolt	Length	Bolt head shape	Pieces
A	29.5 mm (1.16 in)	Deep recess	6
B	38 mm (1.49 in)	Deep recess	6
C	44 mm (1.73 in)	Deep recess	2
D	Reamer bolt	Normal recess	2

Fig. 7B-154 Installing Upper Valve Body Bolts

COUNTERSHAFT AND OUTPUT SHAFT



1. Countershaft
2. Output shaft
3. Snap ring
4. Roller bearing
5. Spacer
6. Ball bearing
7. Bearing backing plate
8. Snap ring
9. Reduction driven gear
10. Reduction driven gear nut
11. Output shaft seal ring
12. Output shaft bearing

Fig. 7B-155 Countershaft and Output Shaft

Countershaft Bearings

Removal

1. Snap rings by using a screwdriver.

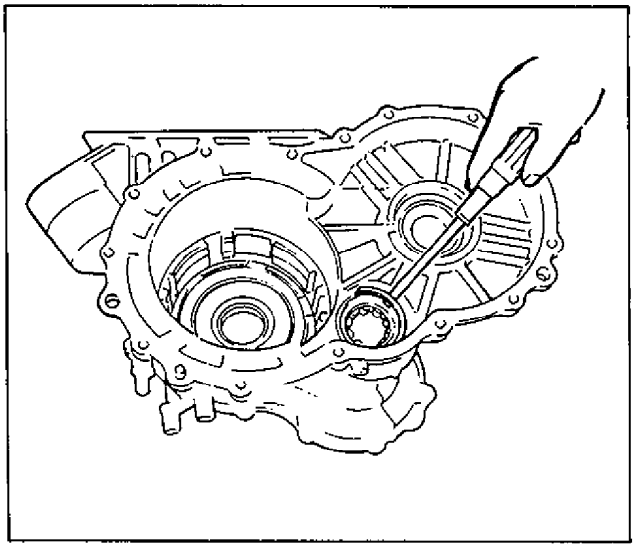
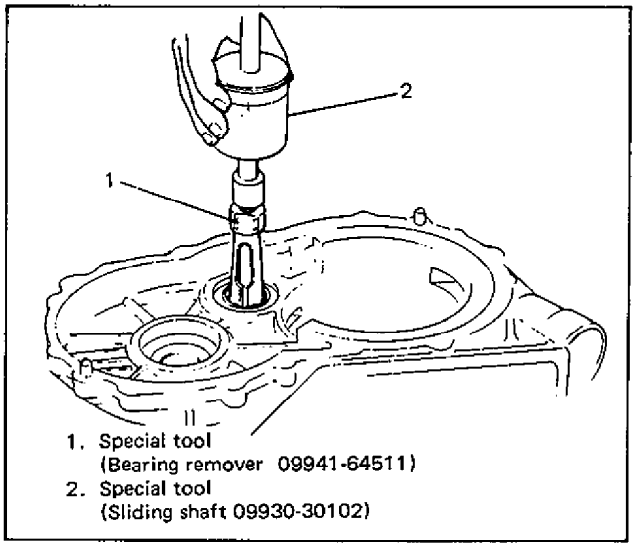


Fig. 7B-156 Removing Snap Ring

2. Backing plate (rear cover side).
3. Front and rear counter shaft bearings.
   1) Using special tools (Bearing remover and sliding shaft), remove bearing.
   2) Remove other side of bearing in the same way.



1. Special tool (Bearing remover 09941-64511)
2. Special tool (Sliding shaft 09930-30102)

Fig. 7B-157 Removing Bearing

Installation

1. Countershaft bearing (Roller bearing) to case.
   Use special tools (Bearing installer attachment and installer handle).
   The bearing installer attachment has two sides. Use small side A for installation of counter shaft bearings.

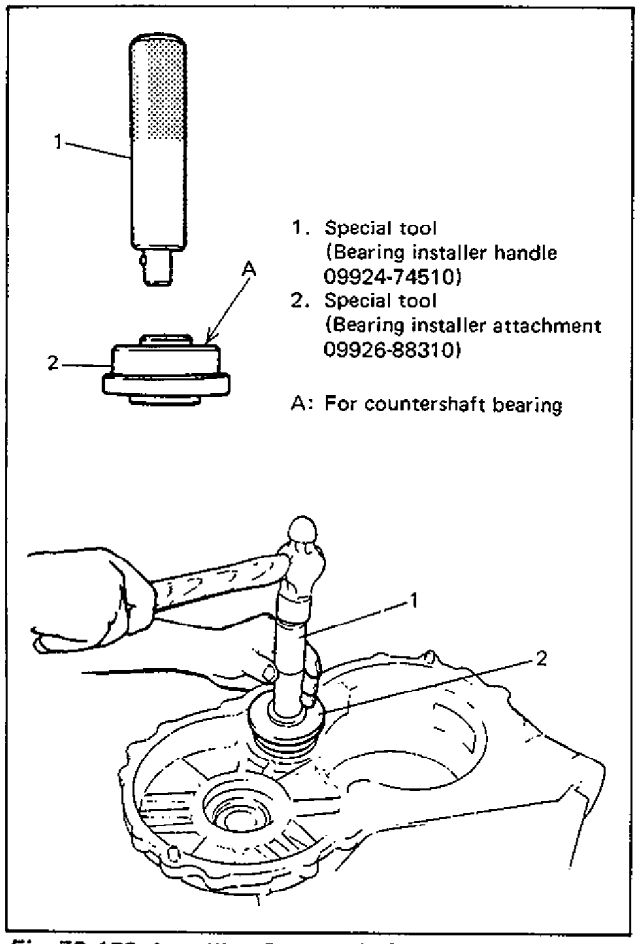


Fig. 7B-158 Installing Countershaft Bearing

2. Snap ring.
3. Countershaft spacer to case.
4. Another countershaft bearing (ball bearing) to case.
   Use special tools (Bearing installer attachment and installer handle).

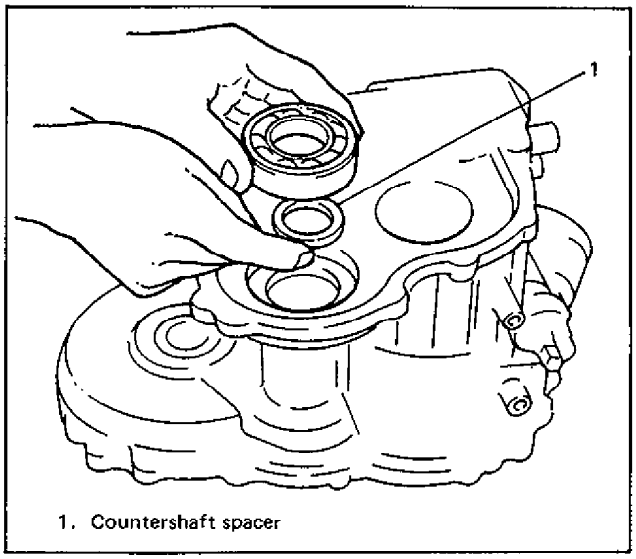


Fig. 7B-159 Installing Countershaft Spacer

5. Bearing backing plate and snap ring.

Output Shaft Bearings

Removal

1. Cover side bearing.
   Hold output shaft with soft jawed vise and remove bearing by using bearing puller.

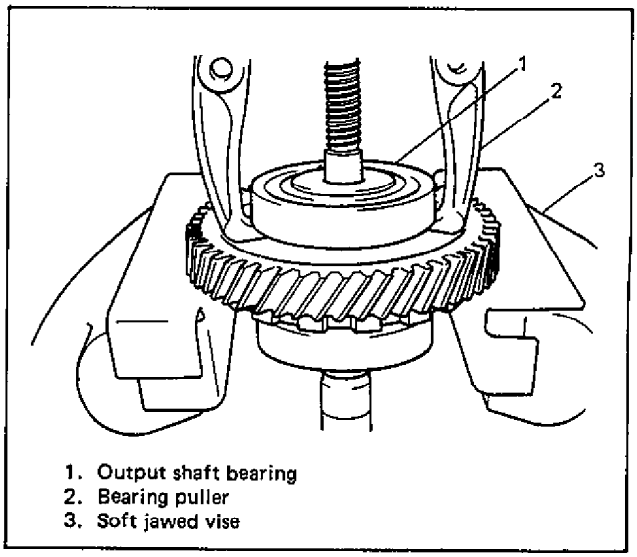


Fig. 7B-160 Removing Output Shaft Bearing

2. Inside bearing.
   Hold bearing by using bearing puller and drive out shaft with press.

CAUTION:
Never hit shaft end where seal ring is installed so as not to distort ring slit.

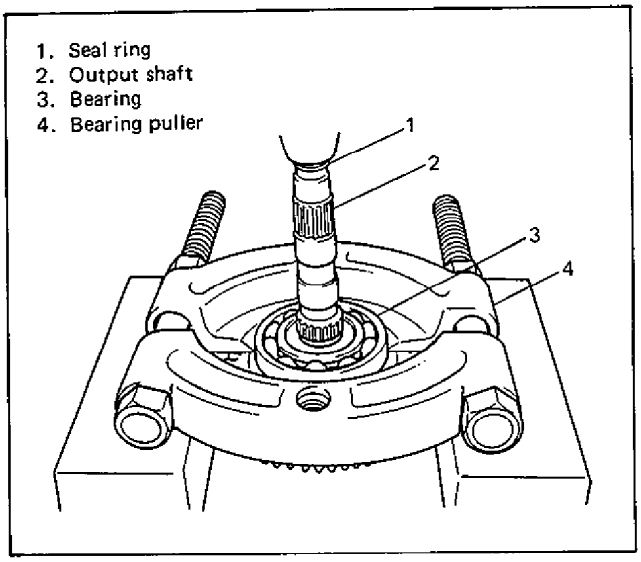


Fig. 7B-161 Removing Output Shaft Bearing

2. Cover side bearing.
   Hold shaft at parking lock gear and press-fit bearing by using special tool with press.

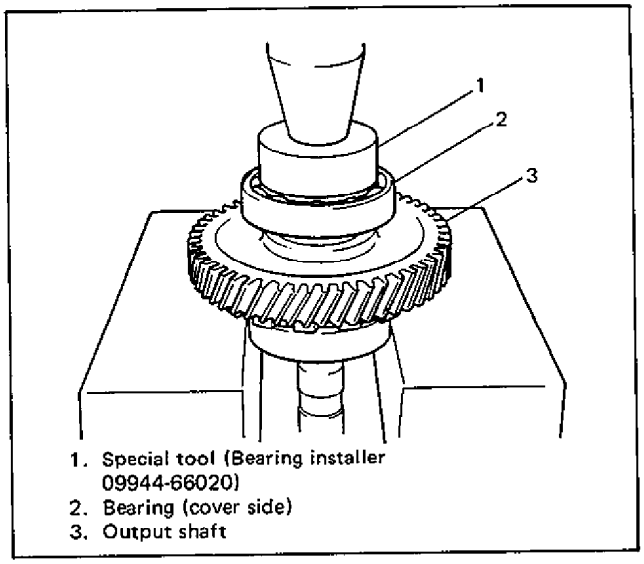


Fig. 7B-163 Installing Output Shaft Bearing

Installation

1. Inside bearing.
   Use special tool with press.

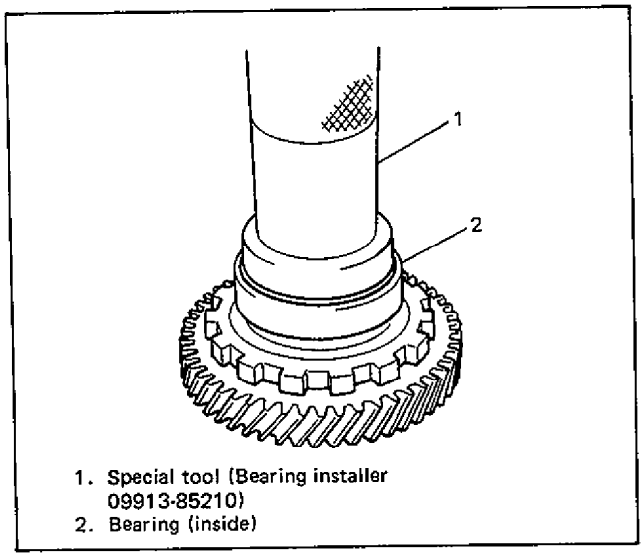


Fig. 7B-162 Installing Output Shaft Bearing

DIFFERENTIAL ASSEMBLY

Servicing procedure for differential assembly is similar to that for manual transmission. Refer to p. 7A-28 for further information.

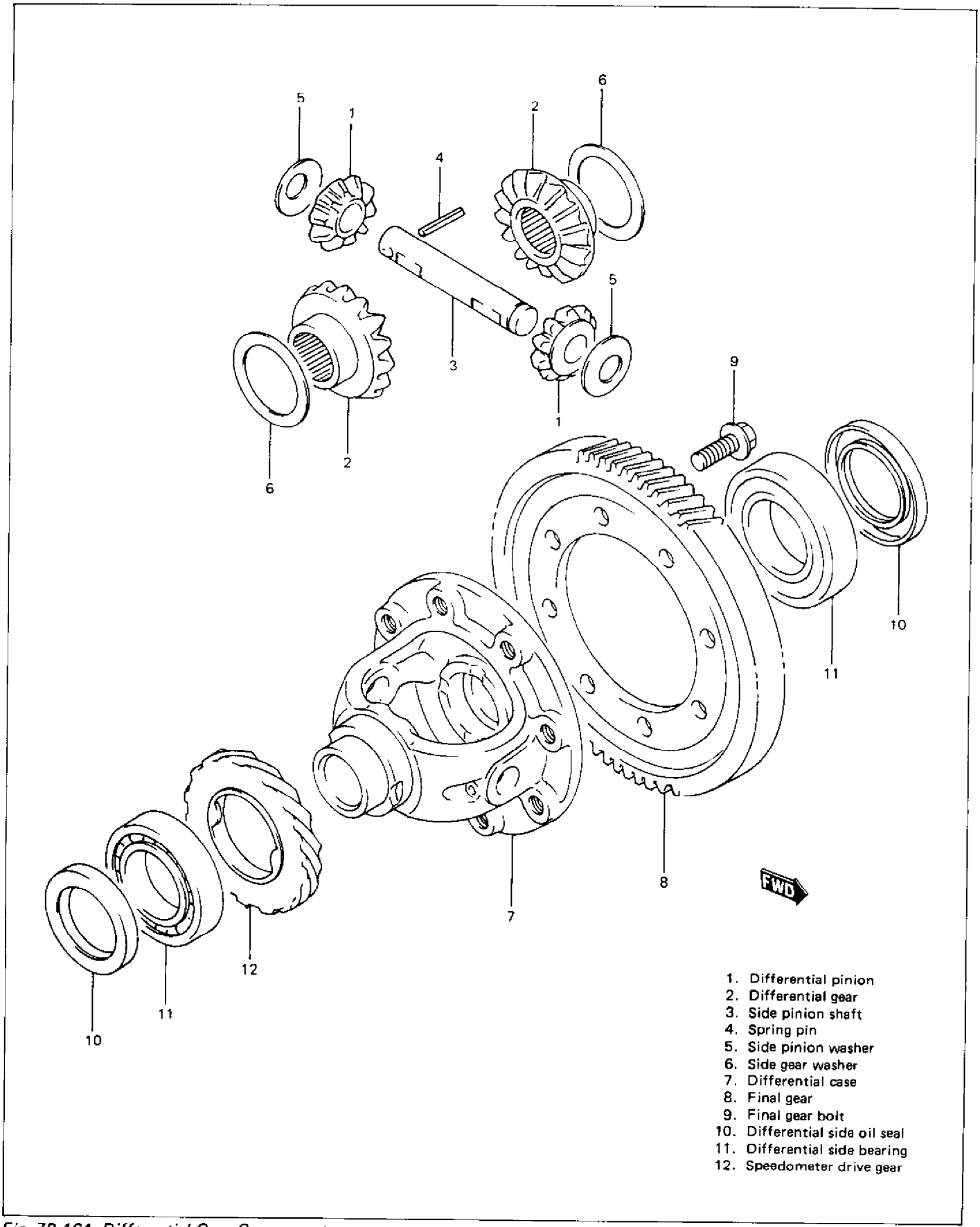
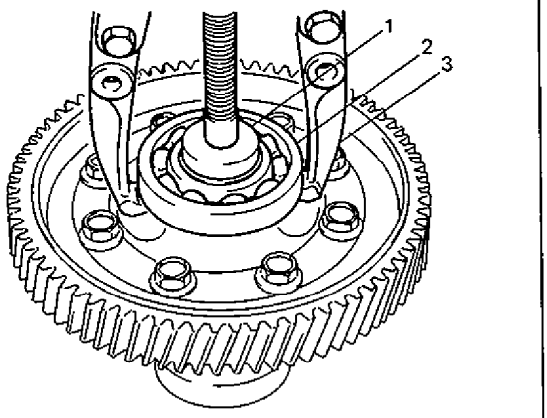


Fig. 7B-164 Differential Gear Components

Disassembly

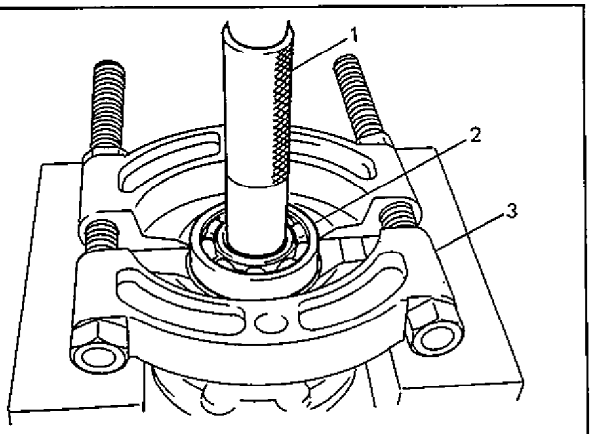
1. Diff. side bearing (L).
   Use special tool and puller for its removal.



1. Special tool (Bearing puller attachment 09925-88210)
2. Side bearing (L)
3. Bearing puller

Fig. 7B-165 Removing Differential Side Bearing (L)

2. Final gear.
   Hold diff. case with soft jawed vise and remove 8 bolts then take out final gear.
3. Diff. side bearing (R).
   Drive it out by using special tool, bearing puller and press.



1. Special tool (Bearing installer 09913-80112)
2. Diff. side bearing (R)
3. Bearing puller

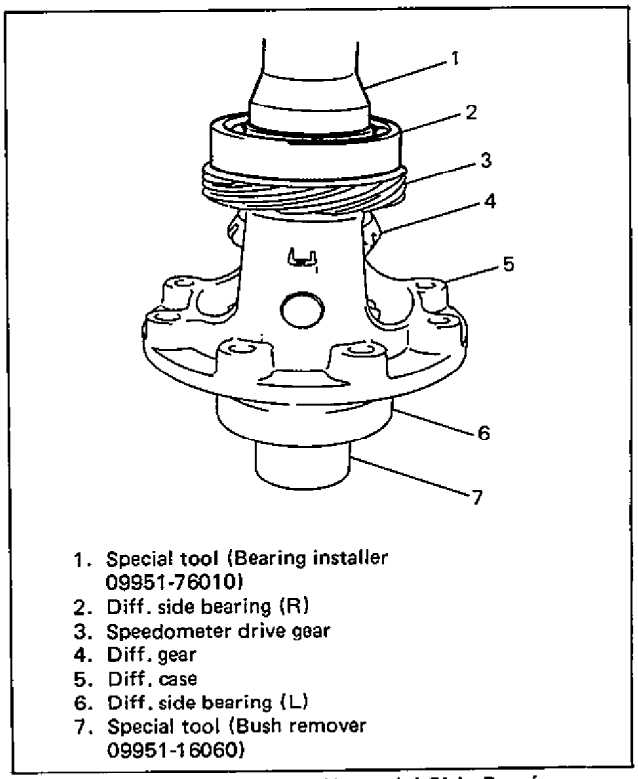
Fig. 7B-166 Removing Differential Side Bearing (R)

4. Speedometer drive gear.
5. Side pinion shaft pin.
   Use special tool (Spring pin remover 4.5 mm 09922-85811) and hammer for its removal.
6. Side pinion shaft, differential pinions with each washer, differential gears with each washer.

Adjustment and Reassembly

Prepare replacing parts as required and proceed to reassembly. Make sure that all parts are clean.

1. Differential gears.
   Measure and adjust thrust play referring to p. 7A-28, and then assemble them with suitable thrust washers.
2. Side pinion shaft pin.
   Drive in spring pin from right side till it is flush with diff. case surface.
3. Diff. side bearing (L).
   Face its seal side inward (diff. case side) and press-fit by using the same special tool with right hand bearing in step 5.
4. Speedometer drive gear.
5. Diff. side bearing (R).
   Face its seal side inward and press-fit it by using special tool with copper hammer.
   While press-fitting, support diff. assembly as illustrated so that left hand bearing is floating.



1. Special tool (Bearing installer 09951-76010)
2. Diff. side bearing (R)
3. Speedometer drive gear
4. Diff. gear
5. Diff. case
6. Diff. side bearing (L)
7. Special tool (Bush remover 09951-16060)

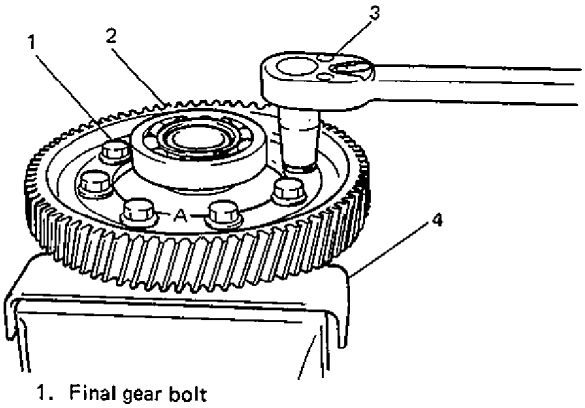
Fig. 7B-167 Press-fitting Differential Side Bearings

6. Final gear.
   Hold differential assembly with soft jawed vise, install final gear and then tighten it with 8 bolts to specified torque.

NOTE:
Place offset side of final gear flange toward differential case.

CAUTION:
Use of any other bolts than specified ones is prohibited.

Tightening torque for final gear bolts	N·m	kg-m	lb-ft
	80 – 90	8.0 – 9.0	58.0 – 65.0



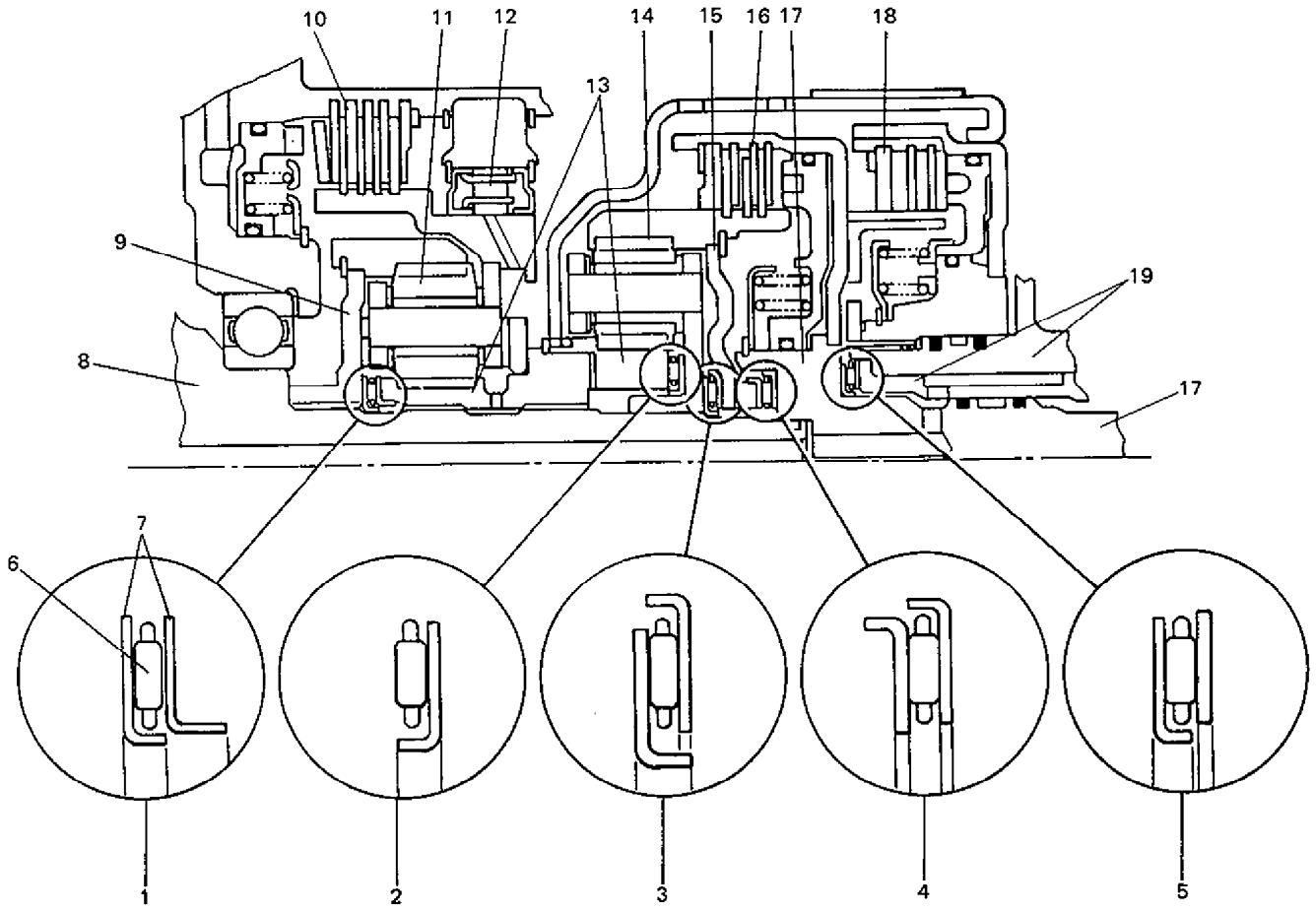
1. Final gear bolt
2. Final gear
3. Torque wrench
4. Soft jawed vise

A: Deeper flange side from gear edge

Fig. 7B-168 Tightening Final Gear Bolts

ASSEMBLING UNIT

CAUTION:
- **Automatic transmission consists of highly precise parts. As even a flaw in a small part may cause oil leakage or decrease in function, check each part carefully before installation.**
- **Clean all parts with compressed air. Never use wiping cloths or rags.**
- **Before assembling new clutch discs and brake band, soak them in automatic transmission fluid for at least 2 hours.**
- **Be sure to use new gaskets and O rings.**
- **Lubricate O rings with automatic transmission fluid.**
- **Apply automatic transmission fluid on sliding or rotating surfaces of the parts before assembly.**
- **Use yellow petrolatum grease or Suzuki super grease C to retain parts in place.**
- **Be sure to install thrust bearings and races in correct direction and position as shown in right figure.**
- **Make sure that snap ring ends are not aligned with one of cutouts and are installed in groove correctly.**
- **Do not use adhesive cements on gaskets and similar parts.**
- **Be sure to torque each bolt and nut to specification.**



1. Rear ring gear races and bearing
2. Front planetary gear race and bearing
3. Ring gear races and bearing
4. Ring gear races and bearing
5. Input shaft bearing and races
6. Bearing
7. Race
8. Output shaft
9. Ring gear flange
10. 1st-reverse brake
11. Rear planetary gear
12. One-way clutch
13. Sun gear
14. Front planetary gear
15. Ring gear flange
16. Forward clutch
17. Input shaft
18. Direct clutch
19. Oil pump

Fig. 7B-169 Thrust Bearings and Races

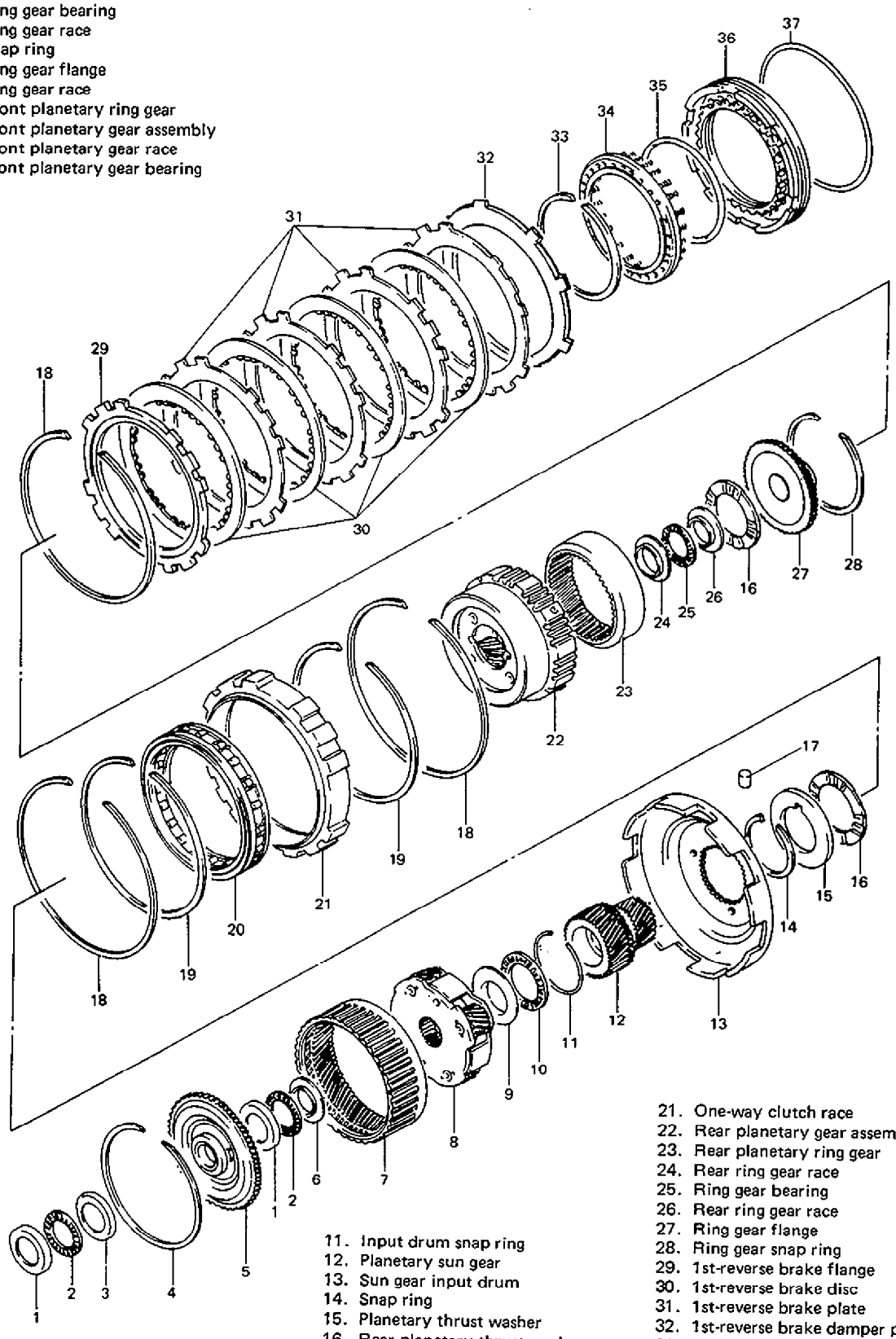


Fig. 7B-170 Planetary Gears and Related Parts

INSTALLATION

1. 2nd brake piston.

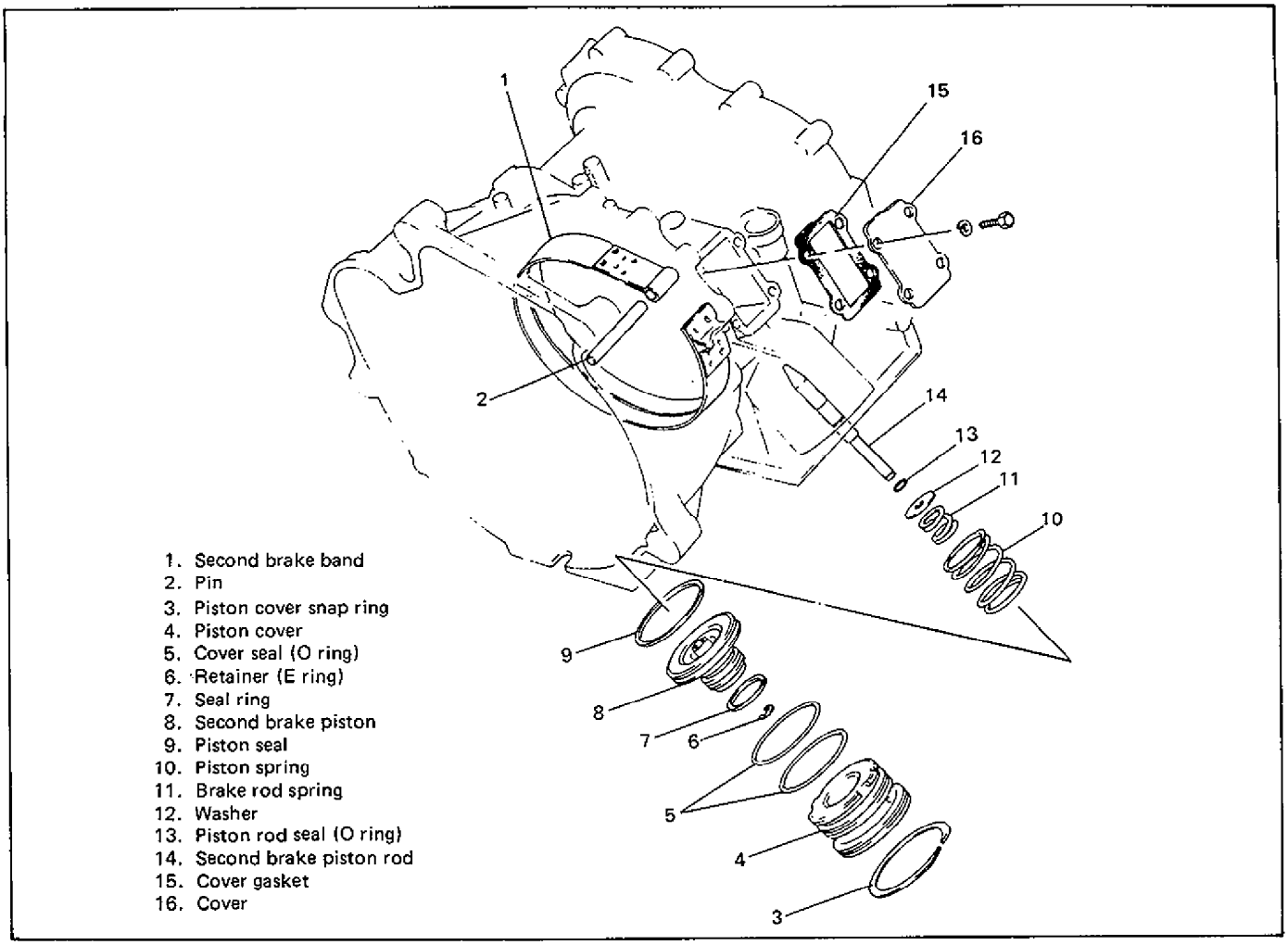


Fig. 7B-171 Second Brake Components

1) Put piston spring in transmission case and insert piston assembly into case after applying fluid to piston rod, seal and seal ring.

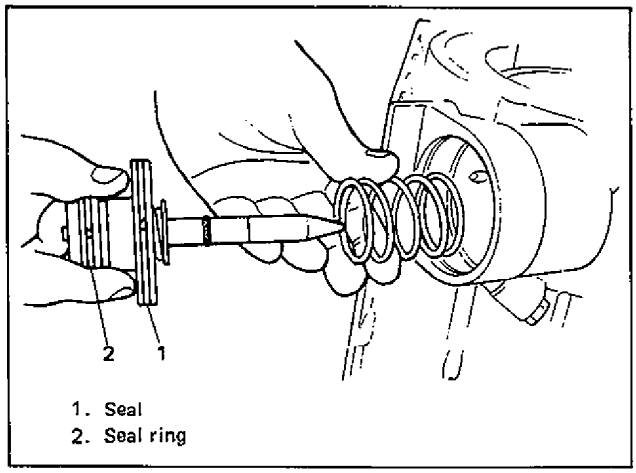


Fig. 7B-172 Installing 2nd Brake Piston

2) Piston cover to case after applying fluid to 2 cover seals.
3) Push down piston cover by using valve lifter with 17 mm socket and install snap ring. Refer to Fig. 7B-101.

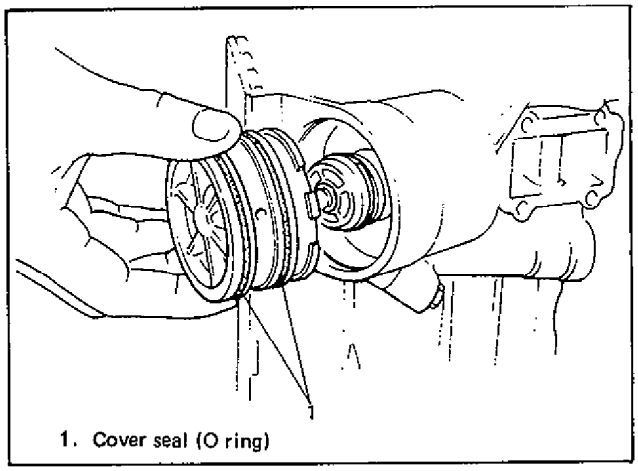


Fig. 7B-173 Installing 2nd Brake Piston Cover

2. Manual shift shaft and parking lock pawl.

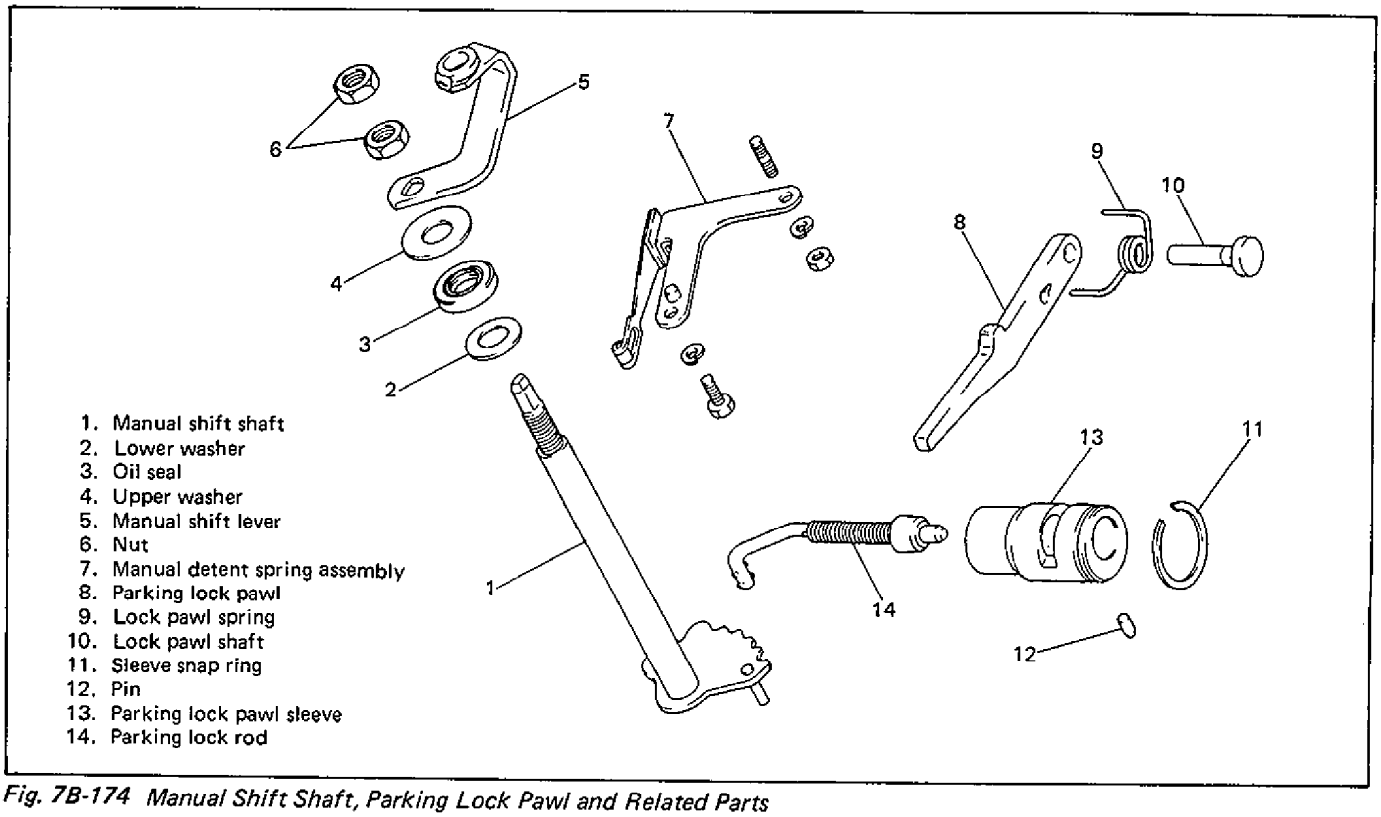


Fig. 7B-174 Manual Shift Shaft, Parking Lock Pawl and Related Parts

1) Install lower washer and parking lock rod to manual shift shaft.
2) Manual shift shaft into transmission case, and then, manual detent spring.
   Use special care so that manual shift shaft will not damage oil seal lip when passing through it.
3) Shift shaft upper washer and then manual shift lever to manual shift shaft. Tighten lower nut first and then upper nut.
4) After tightening nuts, check manual shift shaft for smooth rotation.

Tightening torque	N·m	kg-m	lb-ft
Manual detent spring bolt and nut	8 – 12	0.8 – 1.2	6.0 – 8.5
●Shift shaft lower nut ●Upper nut	27 – 33	2.7 – 3.3	20.0 – 23.5

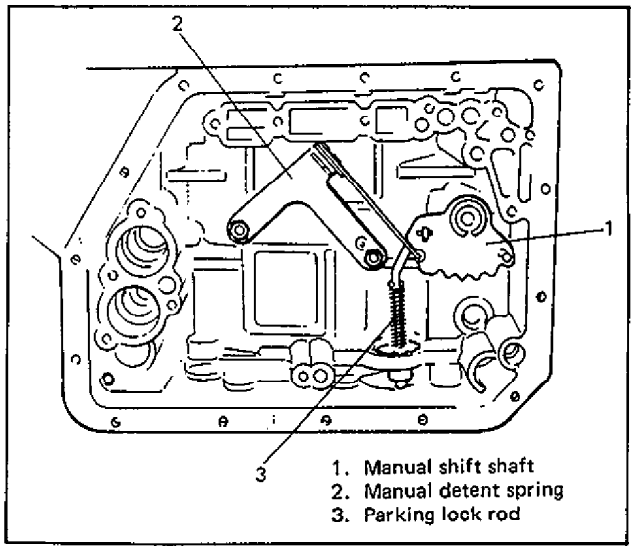


Fig. 7B-175 Installing Manual Shift Shaft and Manual Detent Spring

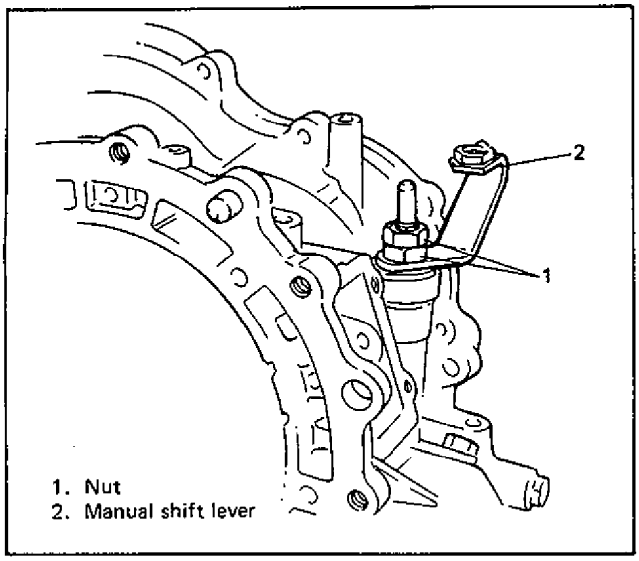


Fig. 7B-176 Upper and Lower Nuts

5) Restrictor pin and snap ring to parking lock pawl sleeve and then install to case.

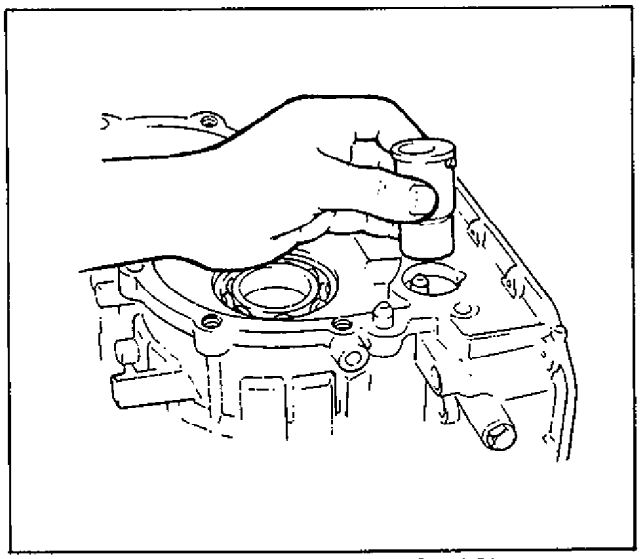


Fig. 7B-177 Installing Parking Lock Pawl Sleeve

6) Parking lock pawl.
   a. Shift manual shift lever to a position other than P.
   b. Install parking lock pawl.
   c. Install lock pawl shift and lock pawl spring, and then, check to make sure that parking lock pawl moves smoothly when manual shift lever is moved.

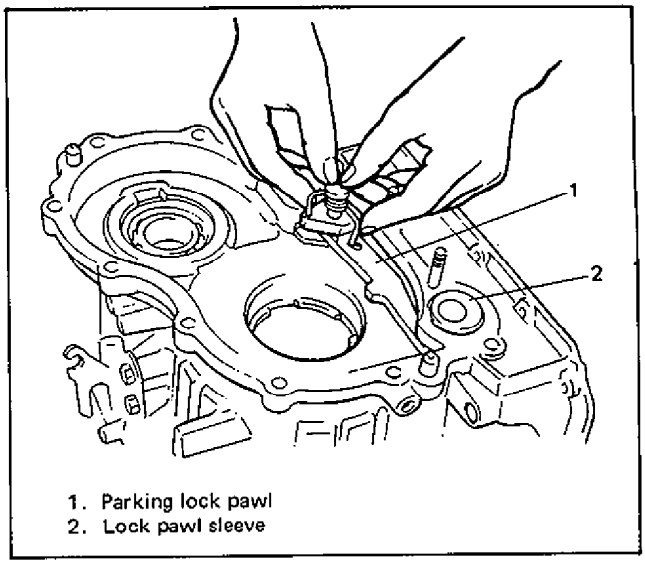


Fig. 7B-178 Installing Lock Pawl Shaft and Lock Pawl Spring

3. 1st-reverse brake piston.
   1) Apply fluid to inner and outer seals (O rings) and fit them to piston. Use new seals.
   2) Insert piston into case in such way that the side with spring holes comes to the top. Make suer that seals are not twisted or caught.
   3) Place return spring assembly on piston. Check to make sure that each spring of return spring assmbly is fitted securely in spring hole in piston.
   4) Push down return spring assembly and install snap ring.

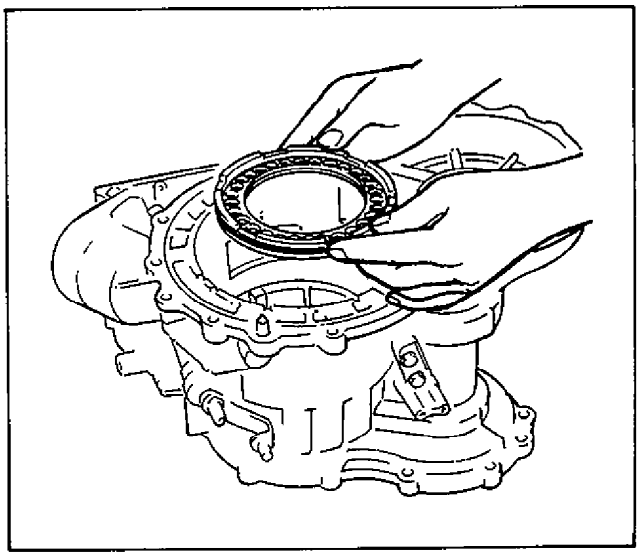


Fig. 7B-179 Installing 1st-REV Brake Piston

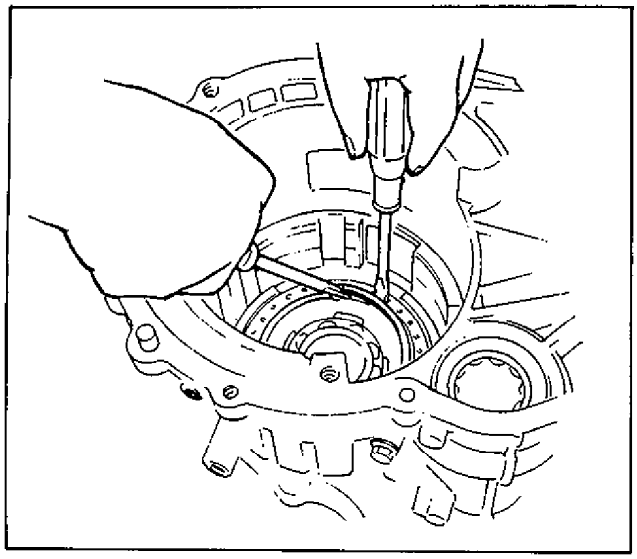


Fig. 7B-180 Installing Snap Ring

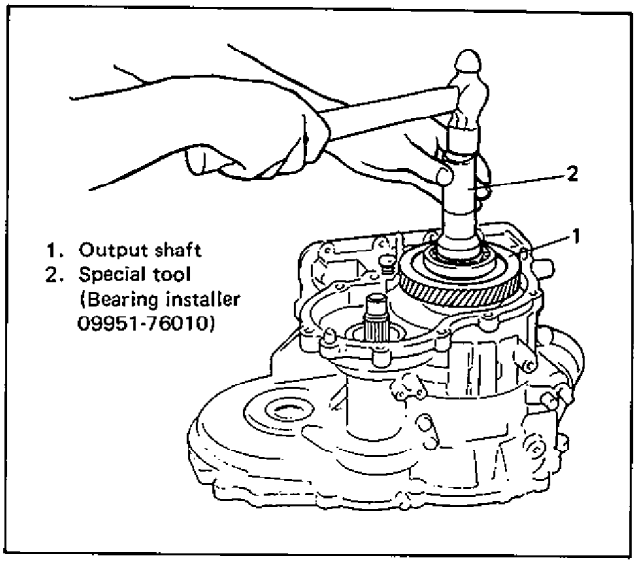


Fig. 7B-182 Installing Output Shaft

4. Countershaft.
Using a special tool (Bearing installer) and a hammer, install countershaft.
When inserting countershaft into case, check to make sure that spacer is in such position as shown in figure.

CAUTION:
Do not hammer shaft excessively hard, or snap ring and case will be damaged.

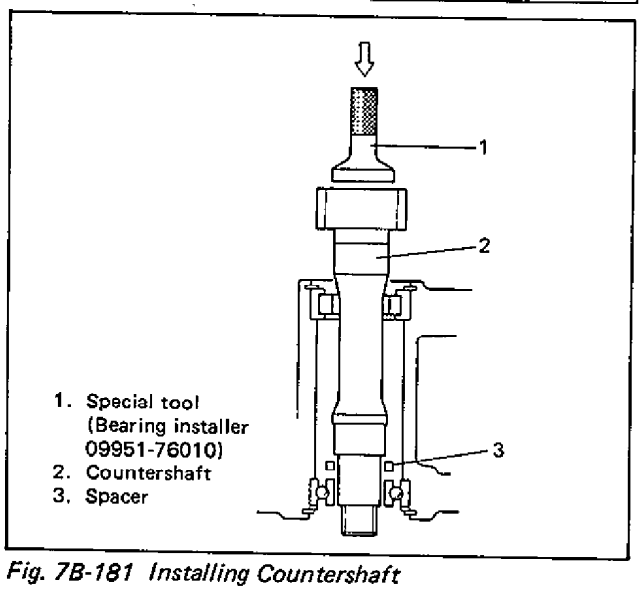


Fig. 7B-181 Installing Countershaft

5. Output shaft.
1) Shift manual shift lever to a position other than P.
2) Using a special tool (Bearing installer) and hammer, install output shaft.

6. Reduction driven gear on counterhsaft.
1) Shift manual shift lever to P position so that output shaft is locked and cannot turn.
2) Tighten driven gear nut to specification.

CAUTION:
- **Tighten nut by turning wrench by hand.**
- **Tightening nut by hammering wrench may cause damage to parking lock pawl, output shaft and reduction gear.**

Tightening torque for driven gear nut	N·m	kg-m	lb-ft
	110—150	11.0—15.0	80.0—108.0

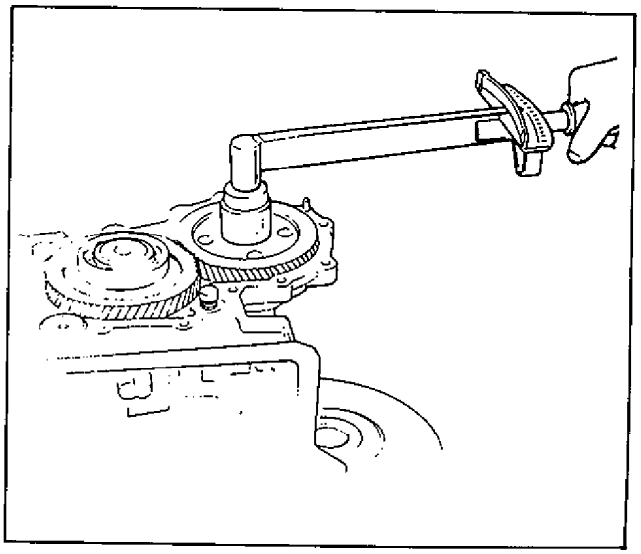


Fig. 7B-183 Tightening Driven Gear Nut

3) Using a chisel and a hammer, caulk driven gear nut at 2 places.

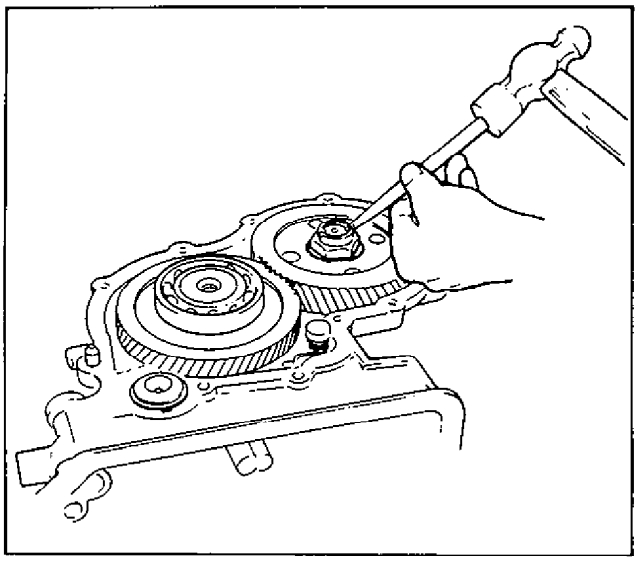


Fig. 7B-184 Caulking Driven Gear Nut

7. Transmission rear cover.
   1) Install rear cover gasket.
   2) Install rear cover.
      Check that output shaft bearing enters to rear cover bearing hole smoothly.
   3) Install 10 bolts and 2 nuts.
      Torque bolts and nuts to following specifications.

NOTE:
Check to make sure that the shafts rotate smoothly without abnormal noise.

Tightening torque	N·m	kg-m	lb-ft
Rear cover bolts	16 – 23	1.6 – 2.3	12.0 – 16.5
Rear cover nuts	11 – 15	1.1 – 1.5	8.0 – 10.5

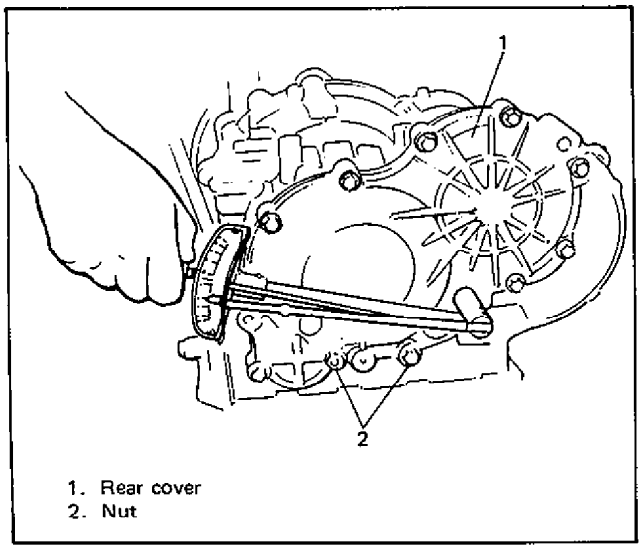


Fig. 7B-185 Installing Rear Cover

8. Using special tools (Output shaft remover and Bearing remover handle), push output shaft against rear cover side.
   1) Fit 4 projections of special tool (Output shaft remover) to 4 notches A in case.
   2) Push bearing and output shaft against rear cover side by tapping special tool (Bearing remover handle) with a hammer lightly.

CAUTION:
- **Do not hit output shaft directly, or shaft end will be damaged.**
- **Be careful not to hammer with special tool too hard.**

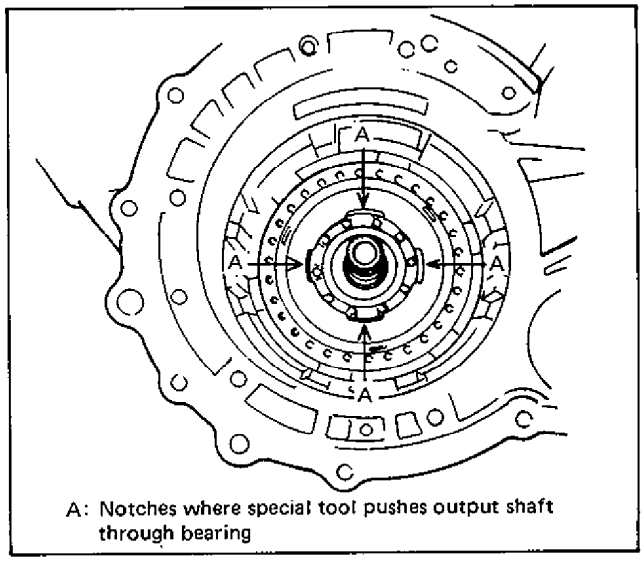


Fig. 7B-186 Notches

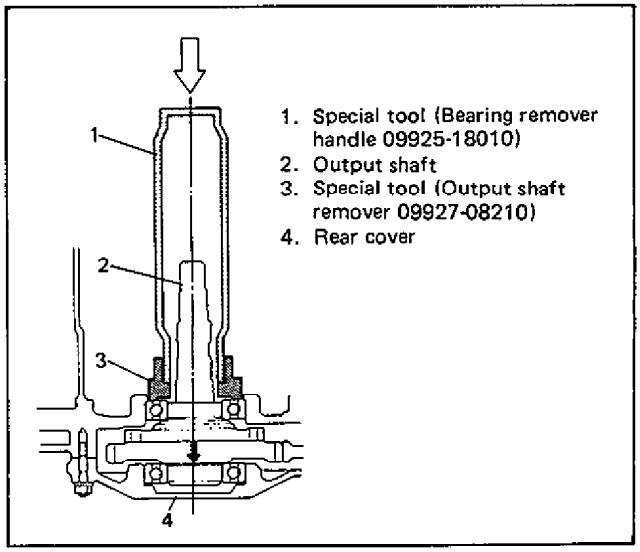


Fig. 7B-187 Seating Output Shaft in Rear Cover

9. Differential gear assembly.
After engaging teeth of final gear and countershaft gear, install differential assembly.

CAUTION:
- **Be careful not to damage gear tooth by hitting it with other one.**
- **Make suer that differential assembly is placed on case straightly, while installing it.**
- **Drive in differential by giving force to side bearing inner race through bearing installer 09951-76010.**

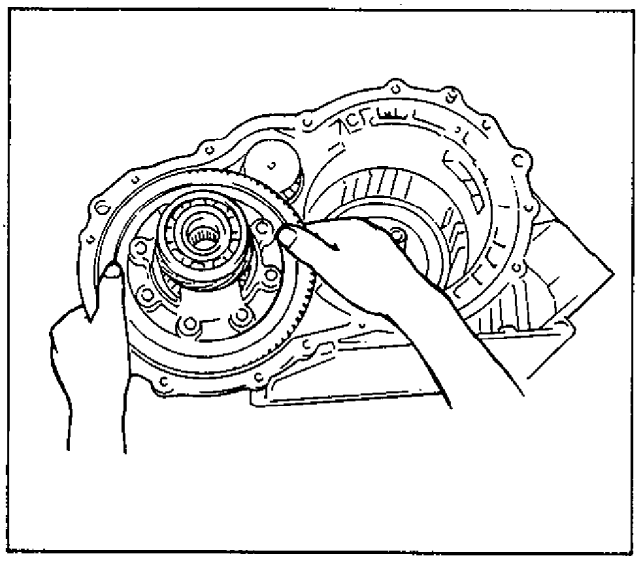


Fig. 7B-188 Installing Differential Gear Assembly

10. 1st-reverse brake parts.
1) Install damper plate to return spring assembly with convex side upward. Use care not to install in reverse direction.

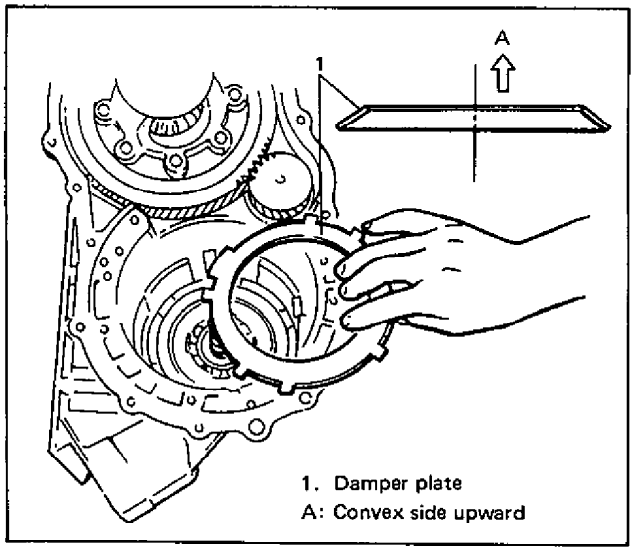


Fig. 7B-189 Installing Damper Plate

2) Install discs, plates and flange. Install in following order:

① Plate → ② Disc → ③ Plate → ④ Disc → ⑤ Plate → ⑥ Disc → ⑦ Plate → ⑧ Disc → ⑨ Flange (Flat side down)

NOTE:
When using new discs for installation, soak them in fluid for more than 2 hours before installation.

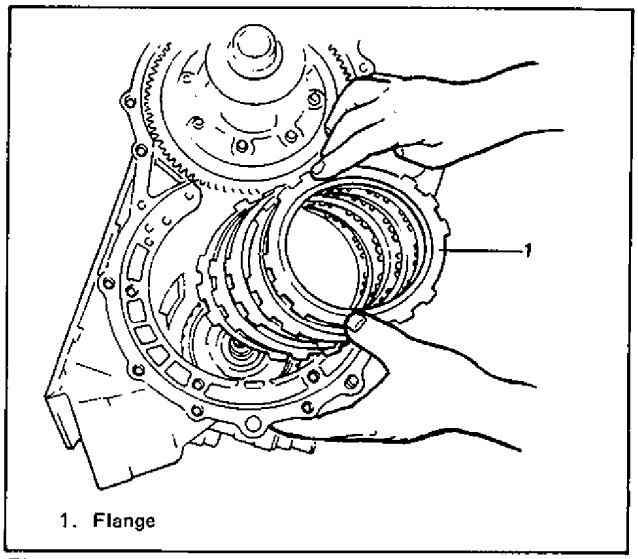


Fig. 7B-190 Installing Discs, Plates and Flange

3) Install snap ring.

11. Measure 1st-reverse brake clutch clearance.
Measure clearance between snap ring and flange.

1st-reverse brake clutch clearance	0.58 – 1.92 mm 0.023 – 0.075 in

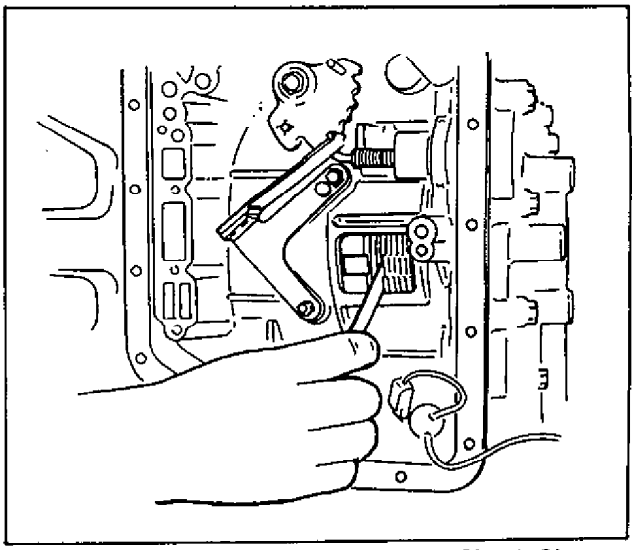


Fig. 7B-191 Measuring 1st-reverse Brake Clutch Clearance

12. Check 1st-reverse brake piston for operation.
Check for piston movement by blowing air into oil hole.

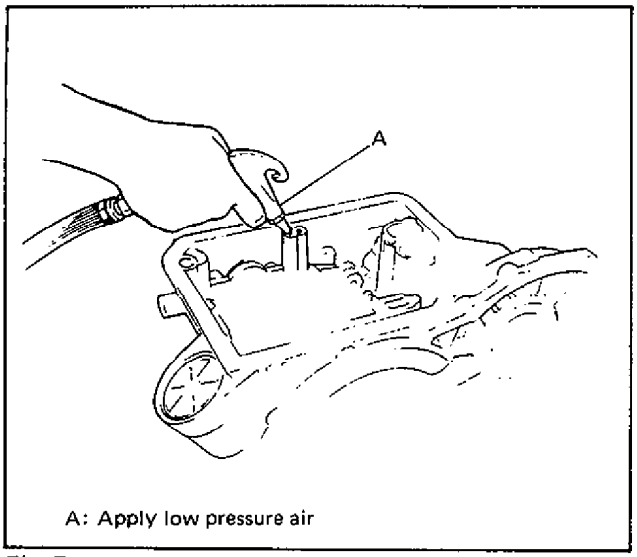


Fig. 7B-192 Checking 1st-reverse Brake Piston Movement

13. Rear planetary ring gear.
Engage ring gear and output shaft spline, and insert.

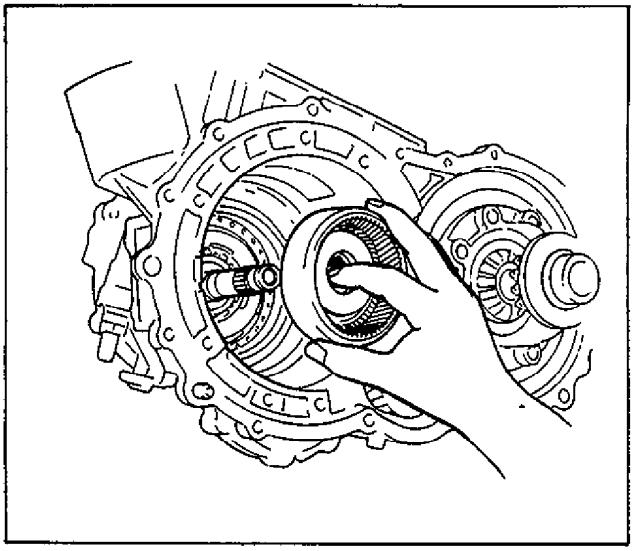


Fig. 7B-193 Installing Rear Planetary Ring Gear

14. Rear planetary ring gear races and bearing.
Install in following order:

①Race (flange side up)
②Bearing
③Race (flange side up)

For proper positions and directions of ring gear races installation, refer to p. 7B-87.

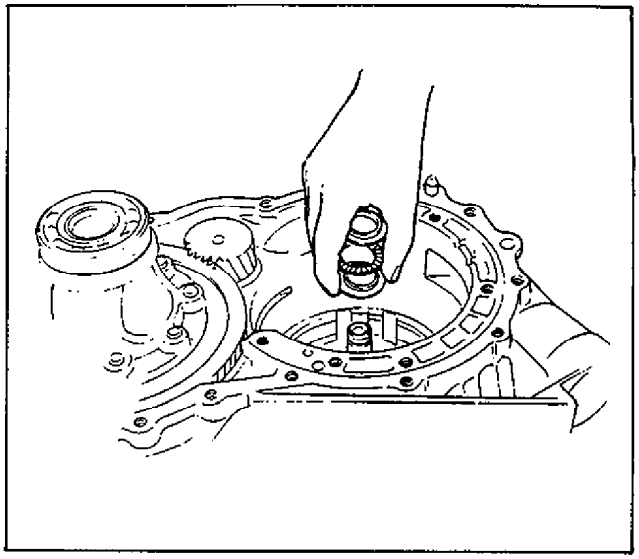


Fig. 7B-194 Installing Rear Planetary Ring Gear Bearing

15. Checking one-way clutch direction.
Provisionally assemble one-way clutch and rear planetary gear, then turn them by hand. They should rotate freely in arrow direction A but lock in the other way.
Remove one-way clutch and keep its correct side in mind until it is installed into transmission.

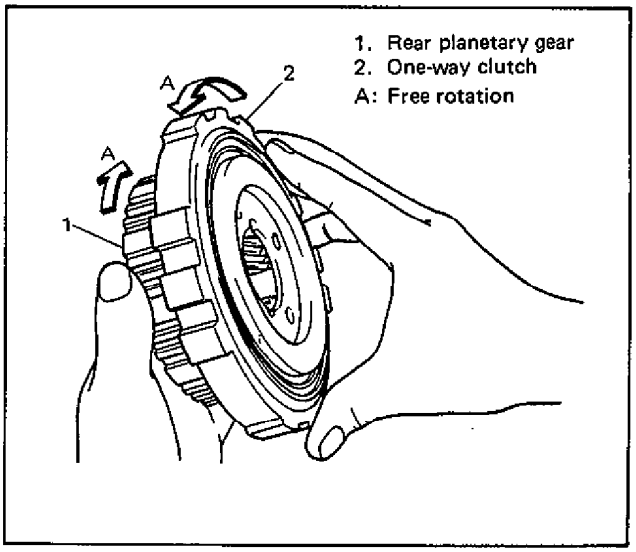
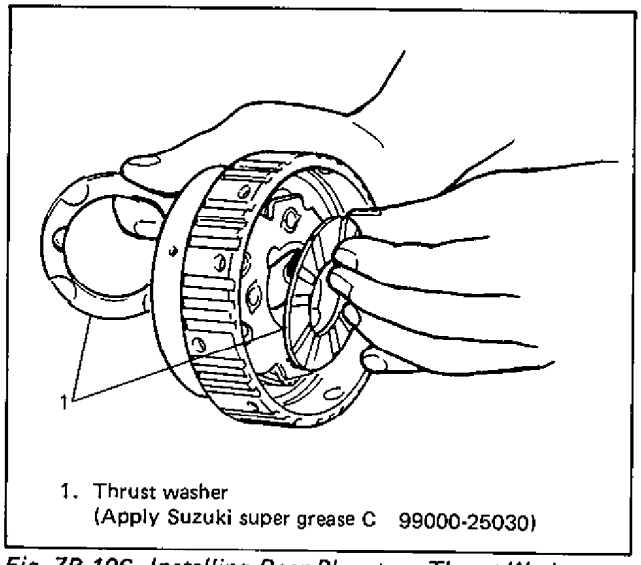


Fig. 7B-195 Checking Free Rotation of One-way Clutch

16. Rear planetary thrust washers on rear planetary gear.
    Apply grease to thrust washers and fit them before and behind planetary gear, one each.
    Make sure that different lug shapes match slots in planetary gear.



1. Thrust washer
   (Apply Suzuki super grease C 99000-25030)

Fig. 7B-196 Installing Rear Planetary Thrust Washers

17. Rear planetary gear.
    Install it with teeth of 1st-reverse brake discs aligned.
    After installing rear planetary gear, check thrust washers and races for proper installation by moving rear planetary gear up and down lightly by hand. If gear assembly makes clear sound like "Click" when moved up and down, washers and races are installed in place. But if no sound or thick one is heard, it is possible that they are out of place. In such case, remove gear assembly and check.

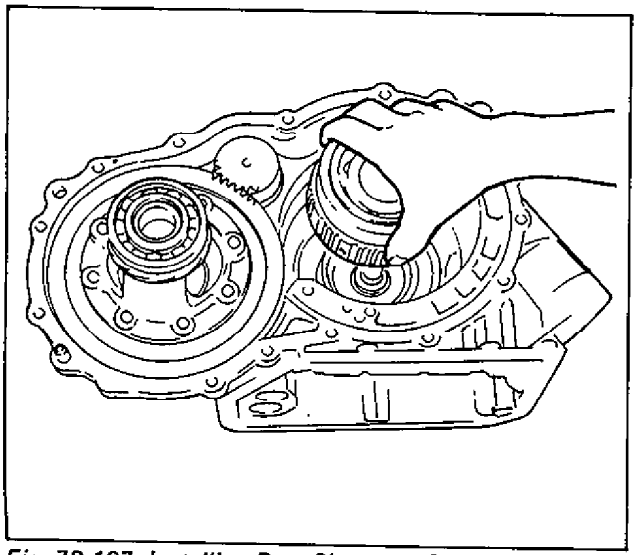


Fig. 7B-197 Installing Rear Planetary Gear Assembly

18. One-way clutch race snap ring into groove of transmission case.
19. One-way clutch.
    Place one-way clutch on rear planetary gear and while turning planetary gear clockwise by hand, insert one-way clutch to correct position.

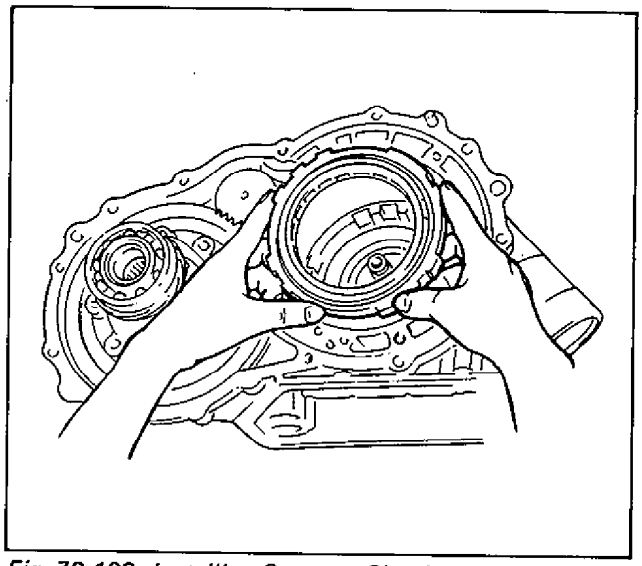
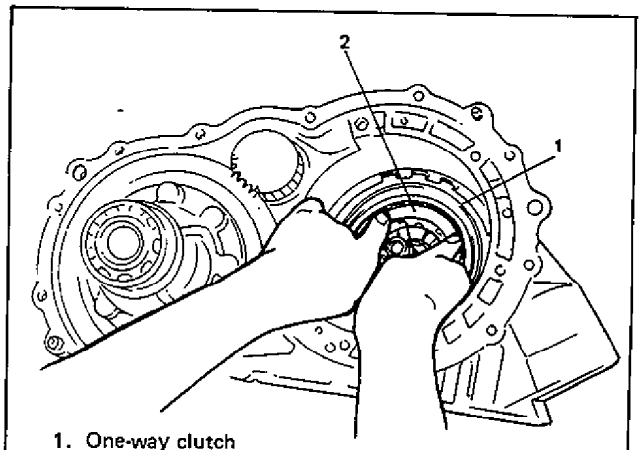


Fig 7B-198 Installing One-way Clutch

After installing one-way clutch to rear planetary gear, check to confirm that planetary gear turns clockwise but locks in the other way.

NOTE:
Rotation check must be performed without fail.



1. One-way clutch
2. Rear planetary gear assembly
   CLOCKWISE ..... FREE
   COUNTERCLOCKWISE ... LOCKED

Fig. 7B-199 Checking Rear Planetary Gear Rotation

20. One-way clutch race snap ring.
    Push snap ring into place by hand. Visually check to make sure that ring is fully seated. Also, make sure that ends of snap ring are between lugs.

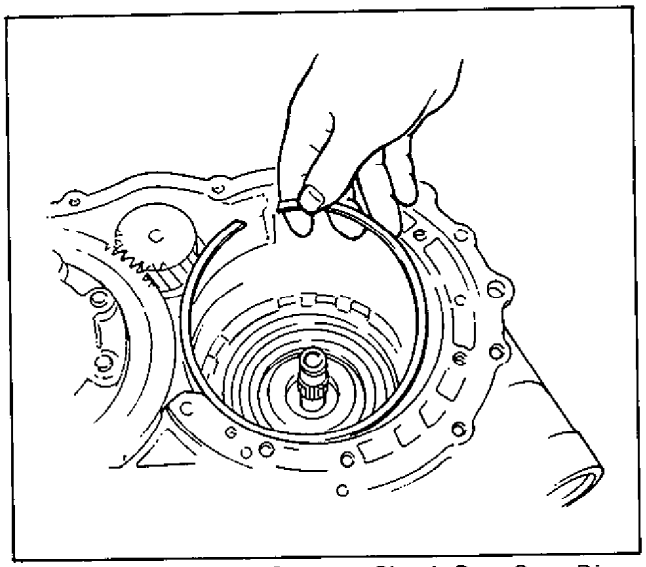
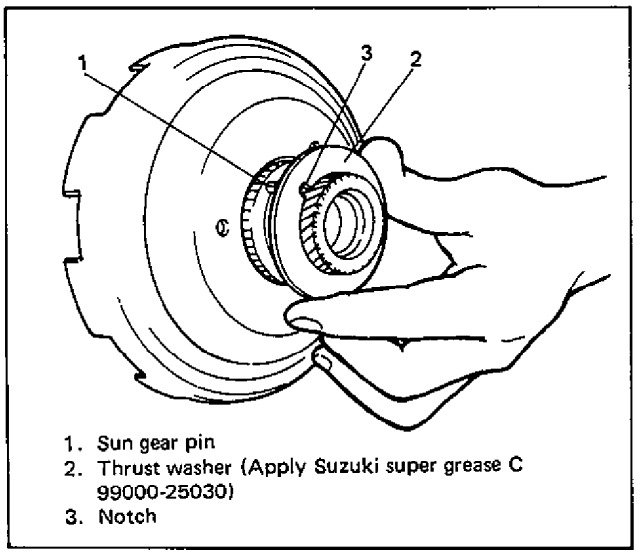


Fig. 7B-200 Installing One-way Clutch Race Snap Ring

21. Sun gear pin and thrust washer on sun gear assembly.
    Apply grease to thrust washer so that it will not fall off. Check to make sure that pin is fitted in thrust washer notch.



1. Sun gear pin
2. Thrust washer (Apply Suzuki super grease C 99000-25030)
3. Notch

Fig. 7B-201 Installing Sun Gear Pin and Thrust Washer

22. Sun gear assembly.
    Push in sun gear while engaging it with rear planetary gear. Be careful not to damage bushing inside sun gear. After installing sun gear, check thrust washers for proper installation by moving sun gear up and down lightly with finger. If sun gear makes clear sound like "Click" when moved up and down, washers are installed in place. But if no sound or thick one is heard, it is possible that they are out of places. In such case, remove sun gear and check.

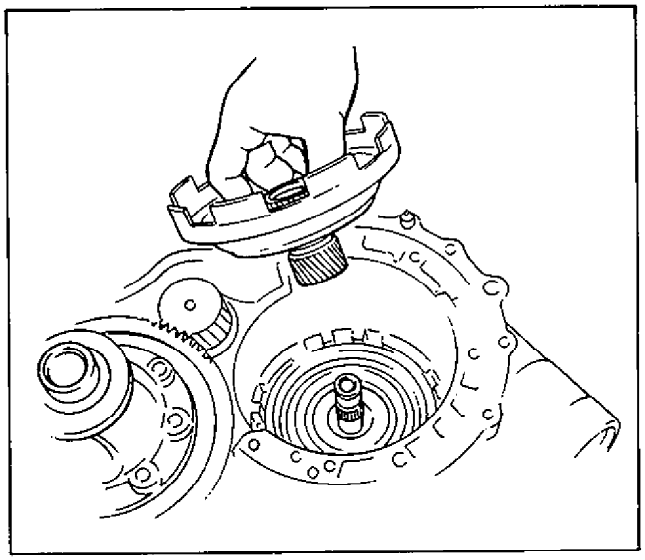


Fig. 7B-202 Installing Sun Gear Assembly

23. Front planetary gear bearing and race.
    Install to sun gear in following order.

    ① Bearing
    ② Race (flange side down)

Refer to p. 7B-87 for installation.

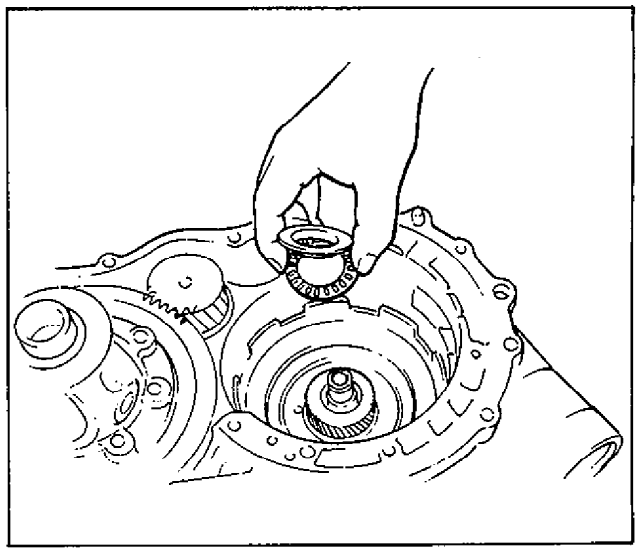


Fig. 7B-203 Installing Front Planetary Gear Bearing

24. Front planetary gear assembly.
    Install front planetary gear assembly while turning it back and forth.
    After installing front planetary gear assembly, check bearing and race installed in step 23 for proper installation by moving planetary gear assembly up and down lightly with finger. If planetary gear makes clear sound like "Click" when moved up and down, bearing and race are installed in place. But if no sound or thick one is heard, it is possible that they are out of place. In such case, remove planetary gear assembly and check.

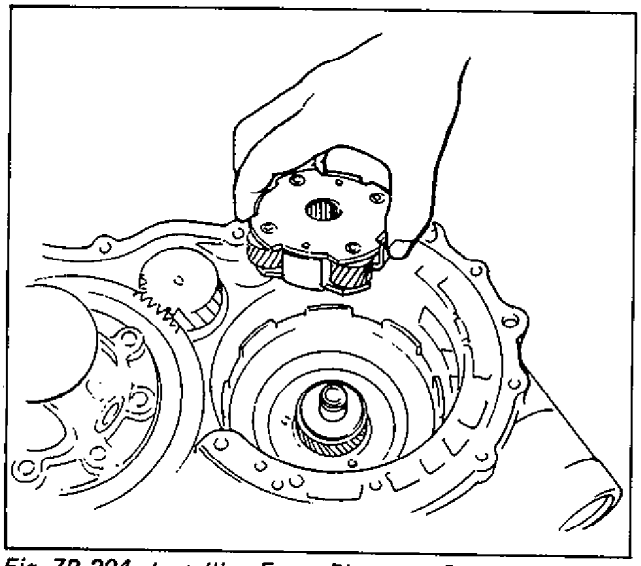


Fig. 7B-204 Installing Front Planetary Gear Assembly

25. Ring gear bearing and races on front planetary gear assembly.
    Install in following order:

    ① Race (flange side up)
    ② Bearing
    ③ Race (flange side down)

    Refer to p. 7B-87 for proper installation.

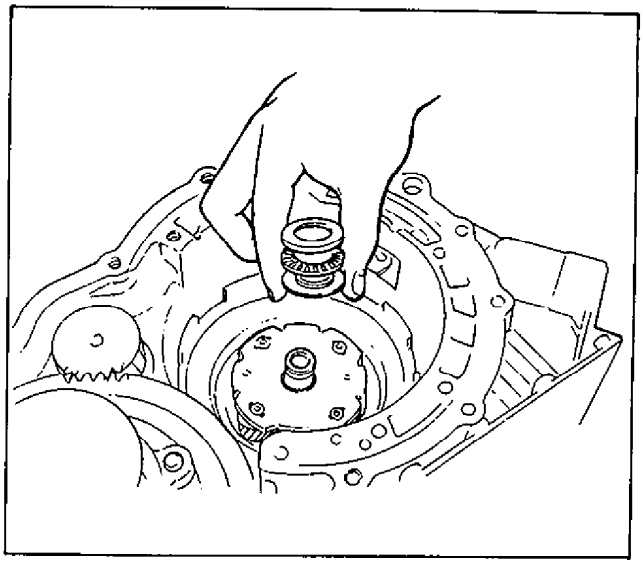


Fig. 7B-205 Installing Ring Gear Races and Bearing

26. Front planetary ring gear assembly.
    After installing front planetary ring gear assembly, check bearing and races installed in step. 25 for proper installation by moving ring gear assembly up and down lightly with finger. If ring gear assembly makes clear sound like "Click" when moved up and down, bearing and races are installed in place. But if no sound or thick one is heard, it is possible that they are out of place. In such case, remove ring gear assembly and check.

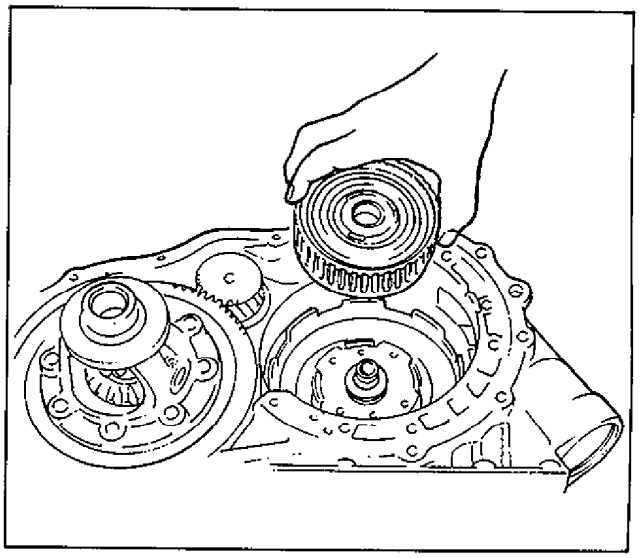


Fig. 7B-206 Installing Front Planetary Ring Gear Assembly

27. 2nd brake band.
    After making sure for its correct installing direction, install it in case.
    Be careful not to bend it too much or damage it.

NOTE:
When installing a new brake band, soak it in transmission fluid for more than 2 hours in advance.

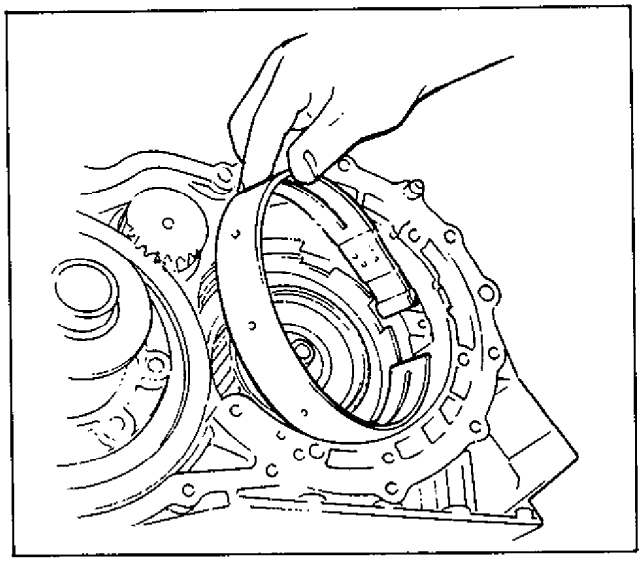


Fig. 7B-207 Installing 2nd Brake Band

28. Inspect output shaft seal ring for wear or damage, and replace if necessary.
    Do not expand seal ring excessively when installing.

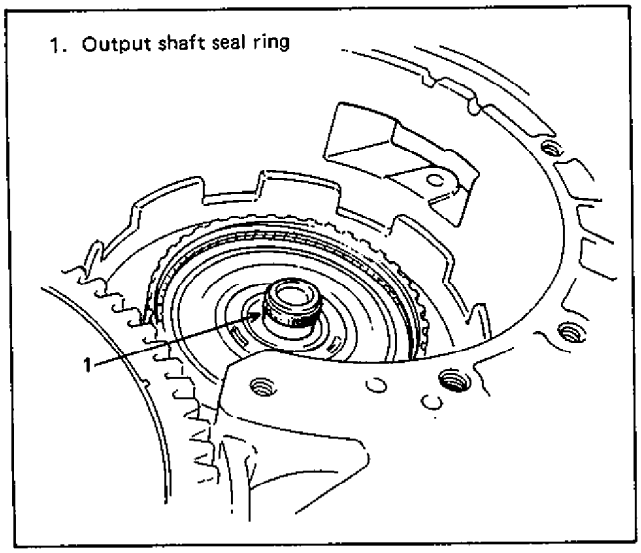


Fig. 7B-208 Checking Output Shaft Seal Ring

29. Input shaft seal rings on input shaft, if replacing is required.
    When installing input shaft seal rings, apply grease to grooves in input shaft before installation.
    Do not expand seal ring excessively.

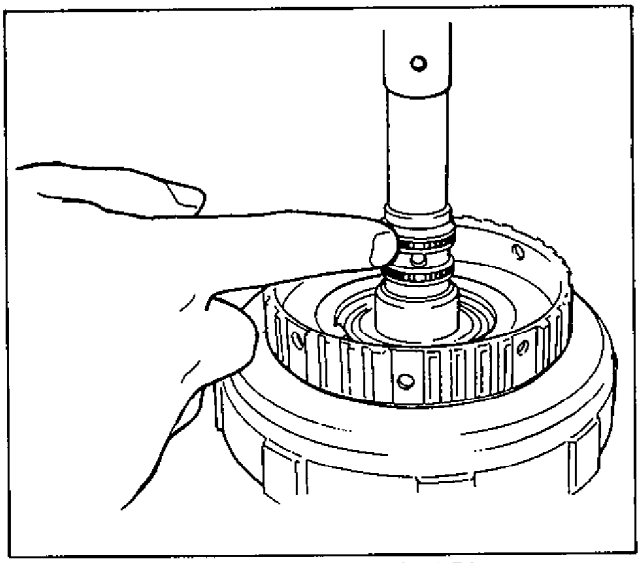


Fig. 7B-209 Installing Input Shaft Seal Rings

30. Direct clutch washer on direct clutch.
    Apply grease to washer, and install it on direct clutch with its grooved face outward and aligning washer protrusions to direct clutch drum groove.

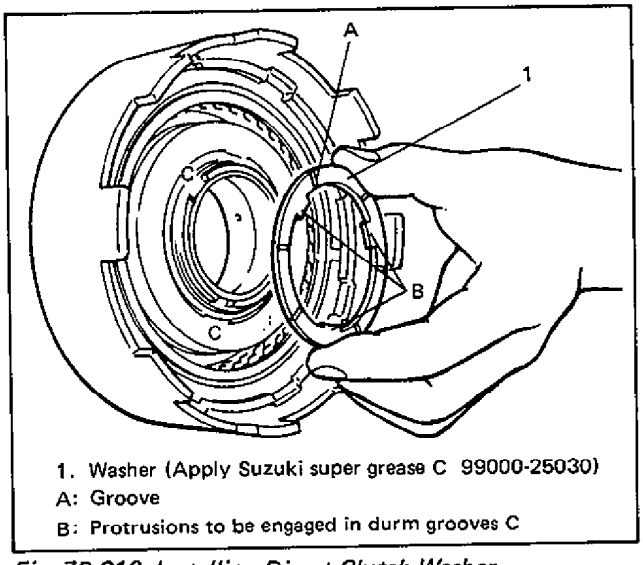


Fig. 7B-210 Installing Direct Clutch Washer

31. Direct clutch on input shaft.
Align teeth of direct clutch discs and then install direct clutch on input shaft.
After installing direct clutch, check it for proper installation by moving it up and down lightly by hand. If direct clutch makes clear sound like "Click" when move up and down, it is installed in place. But if no sound or thick one is heard, it is possible that direct clutch is not installed correctly. In such case, remove direct clutch and reinstall.

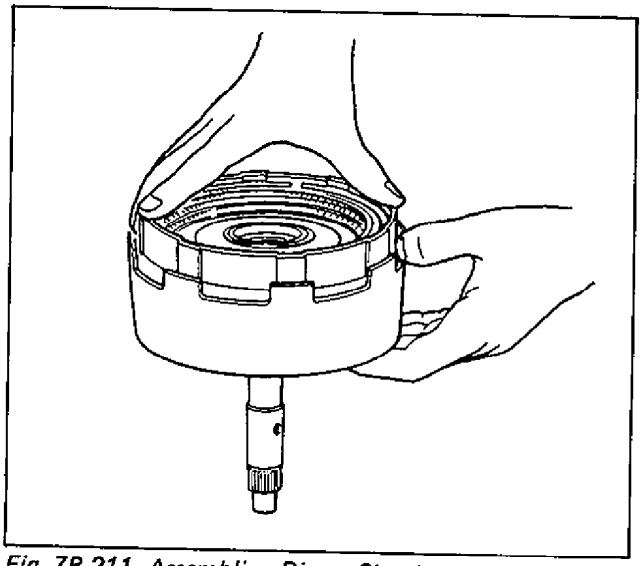
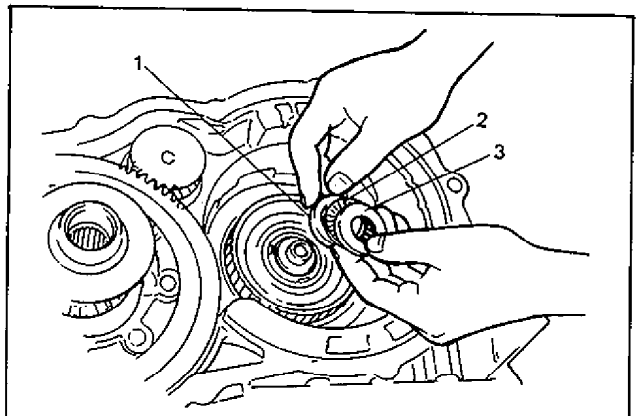


Fig. 7B-211 Assembling Direct Clutch and Input Shaft

32. Ring gear races and bearing.
Apply grease to ring gear races and bearing. Install ring gear race (OD: 35.8 mm/1.41 in) on ring gear with its flange side down. Another ring gear race (OD: 37.9 mm/1.49 in) and bearing are attached on input shaft. Refer to page 7B-87 for proper installation.



1. Ring gear race (OD: 35.8mm/1.41 in)
2. Bearing
3. Ring gear race (OD: 37.9 mm/1.49 in . . . Apply Suzuki super grease C 99000-25030)

Fig. 7B-212 Installing Ring Gear Bearing

33. Input shaft and forward and direct clutch assemblies.
Hold input shaft with direct clutch installed by hand and while turning it back and forth, insert it into case.
Align teeth of forward clutch discs before installation. When installing input shaft, be careful so that its bearing and race will not fall off.
Be careful not to damage output shaft seal.
After installing input shaft, check it for proper installation by moving it up and down lightly by hand. If input shaft makes clear sound like "Click" when moved up and down, it is installed in place. But if it doesn't, try again for proper installation.

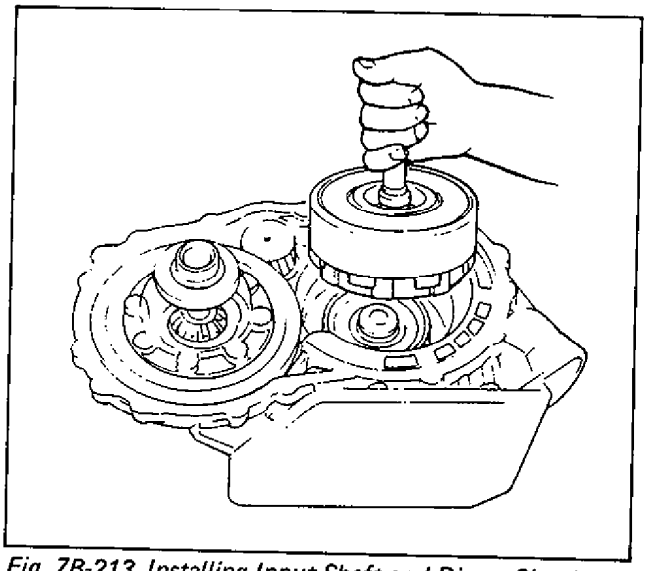
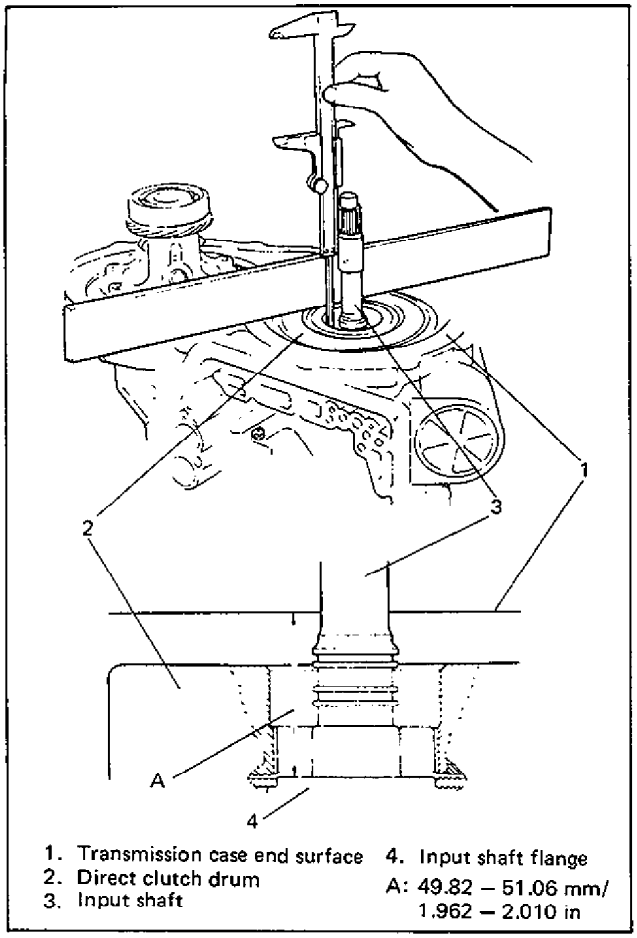


Fig. 7B-213 Installing Input Shaft and Direct Clutch

34. Check for correct installation of each component parts as follows.
After installing input shaft, check to make sure that each component is installed properly according to following description.
Place straightedge on transmission case end surface and measure the distance A by using vernier. For the distance A, subtract the width of straightedge from vernier reading.
If measured distance A is within following specification, it means that component parts other than direct clutch are installed properly.
If out of specification, remove input shaft with direct clutch and reinstall them properly.

Distance A	49.82 – 51.06 mm 1.962 – 2.010 in



1. Transmission case end surface
2. Direct clutch drum
3. Input shaft
4. Input shaft flange

A: 49.82 – 51.06 mm/ 1.962 – 2.010 in

Fig. 7B-214 Measuring Distance Between Case End Surface and Input Shaft Flange

35. Second brake band pin.
    Align hole in second brake band with case pin hole and insert brake band pin.
    Apply fluid to brake band pin before installation.

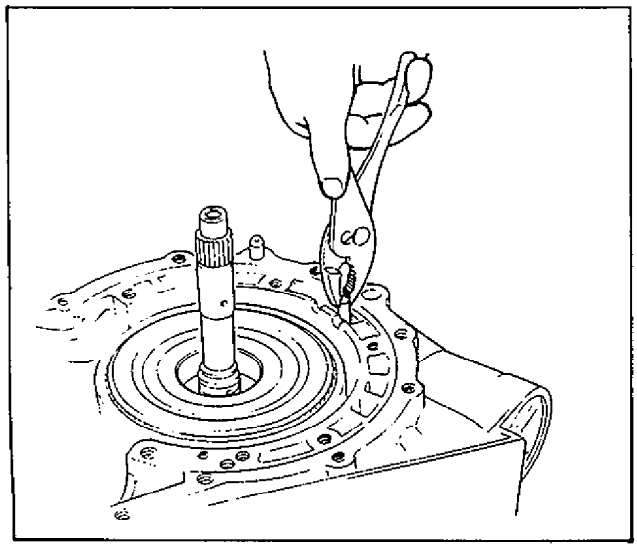


Fig. 7B-215 Installing Second Brake Band Pin

36. Case gasket and transmission case housing.
    Use new gasket. Install gasket using care so that it will not protrude inside.

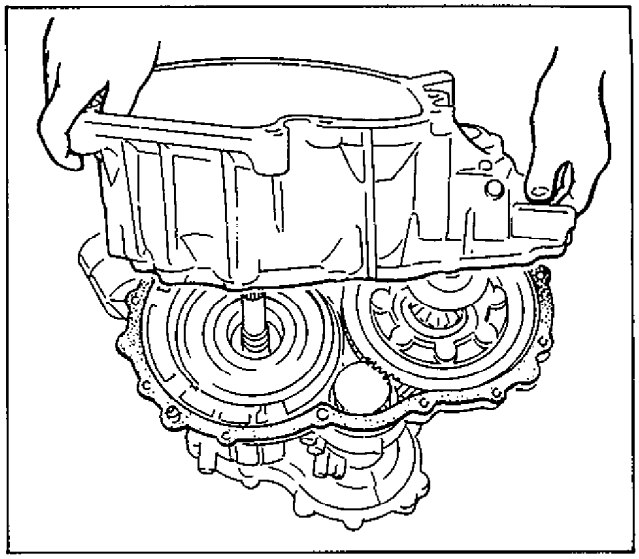
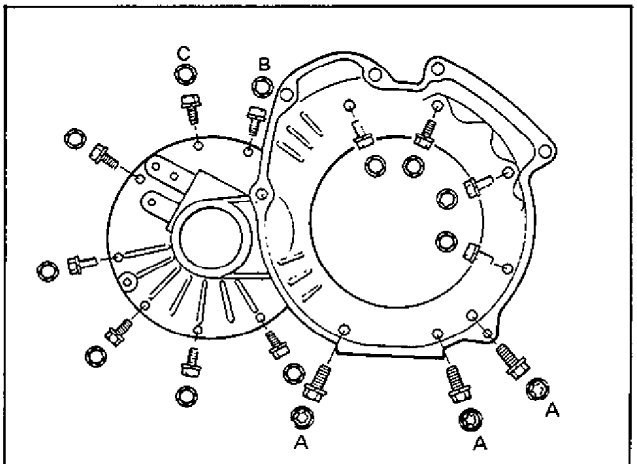


Fig. 7B-216 Installing Gasket and Case Housing

37. Among 14 bolts of case housing bolts, 3 bolts have star-shaped recess in their heads. Install these 3 bolts in such positions as shown by A in figure after applying sealant to their threads. Do not apply thread locking compound to housing bolts. Tighten case housing bolts to specification.

Tightening torque for case housing bolts	N·m	kg-m	lb-ft
	16 – 23	1.6 – 2.3	12.0 – 16.5



A: Bolt with star-shaped recess in head (Apply sealant Suzuki bond No. 1215 99000-31110 to the thread)
B: Install clamp for wiring harness
C: Install clamp for select cable

Fig. 7B-217 Installing Case Housing Bolts

38. Measure input shaft position.
    Seated position of input shaft can also be measured after installing case housing as distance A (Measured dimension – straightedge width B), and it should be 188.37 to 189.91 mm (7.416 to 7.477 in).

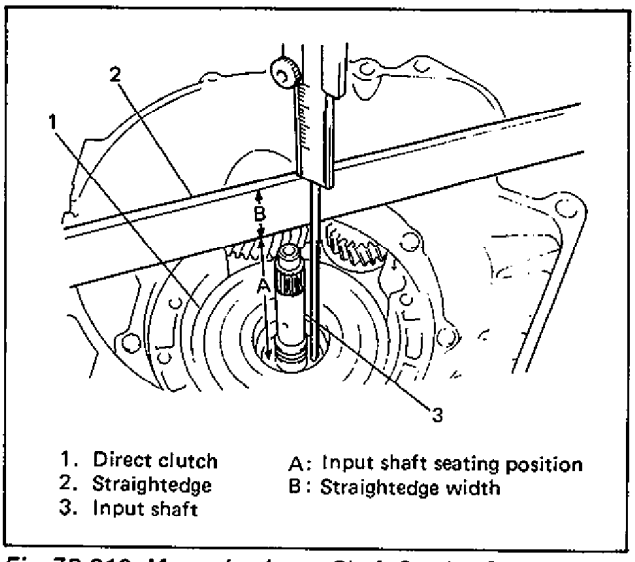


Fig. 7B-218 Measuring Input Shaft Seating Position

39. Input shaft bearing race and bearing on input shaft.
    Grease bearing race and install it with its flange side outward together with bearing.
    Install so that bearing does not get on bearing race flange.

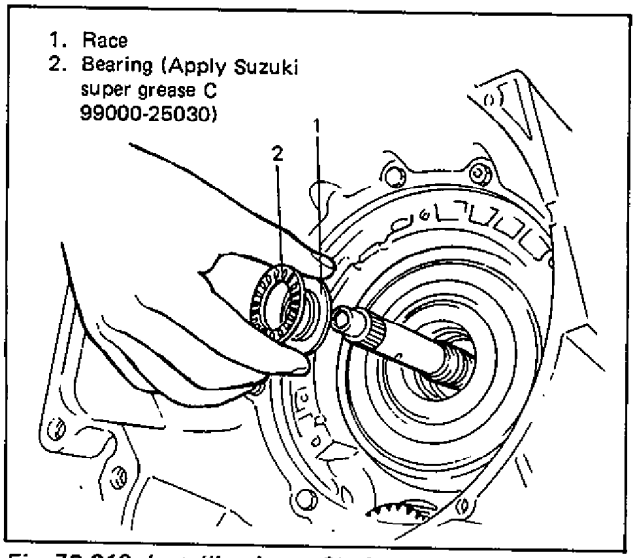


Fig. 7B-219 Installing Input Shaft Bearing

40. Another input shaft bearing race on oil pump.
    Grease bearing race and attach it to oil pump body.

NOTE:

- **With this bearing race, input shaft thrust play is adjusted. Refer to step 44 for measuring procedure.**
- **Make sure seal rings are installed in pump cover flange in good condition lubricated with automatic transmission fluid.**

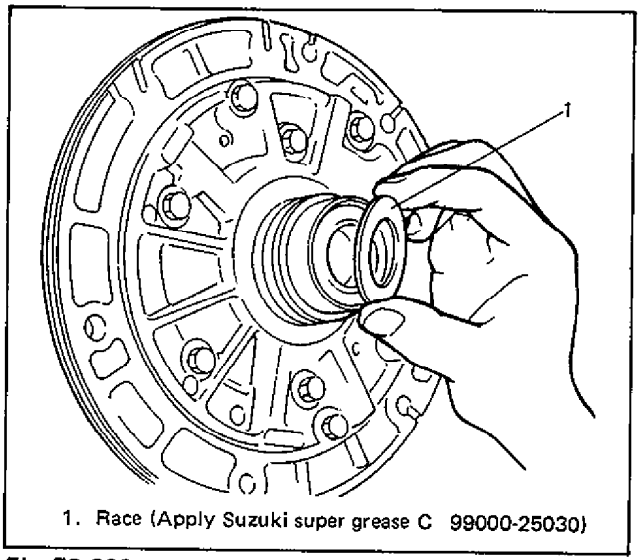


Fig. 7B-220 Installing Another Input Shaft Bearing Race

41. Direct clutch washer on oil pump.
    Attach greased washer on oil pump.
    Fit washer flange into notch of oil pump body.

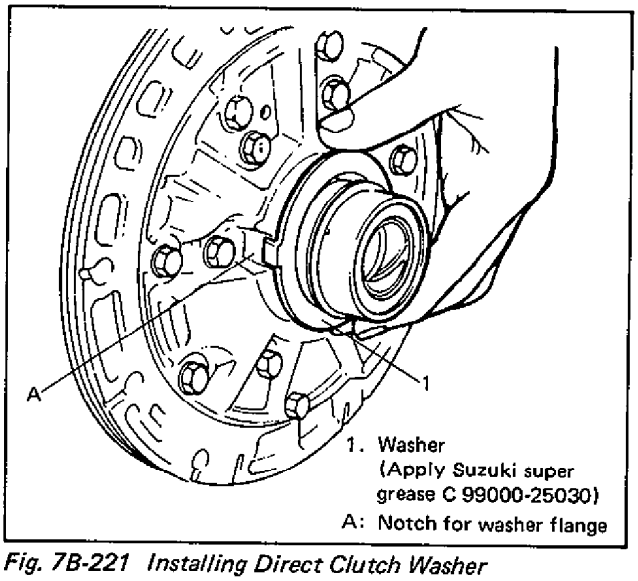


Fig. 7B-221 Installing Direct Clutch Washer

42. New oil pump cover seal (O ring) to oil pump.
    Install greased cover seal in outer groove of oil pump.
    Make sure that cover seal is not twisted or extruded.
43. Oil pump to transmission case.
    Align oil pump bolt hole with case bolt hole and push in pump gently by hand until it contacts case. Use care so that direct clutch washer does not fall off, and input shaft seal rings and pump cover seal rings will not come off or get damaged.
    While making sure smooth rotation of input shaft, tighten 6 oil pump bolts gradually to specification.

Tightening torque for oil pump bolts	N·m	kg-m	lb-ft
	18 – 27	1.8 – 2.7	13.5 – 19.5

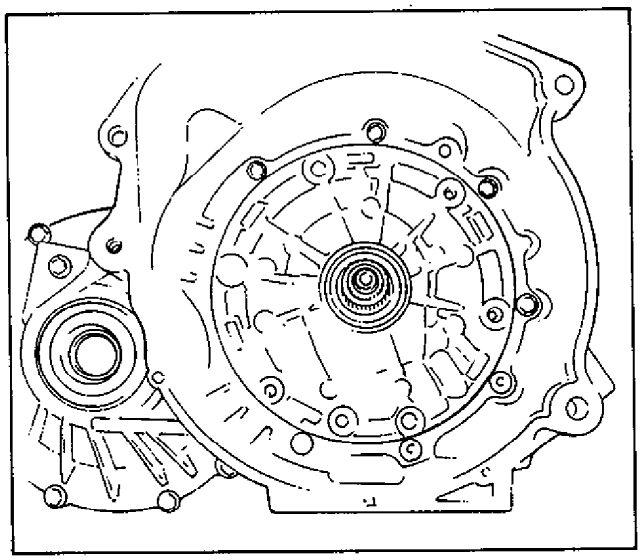


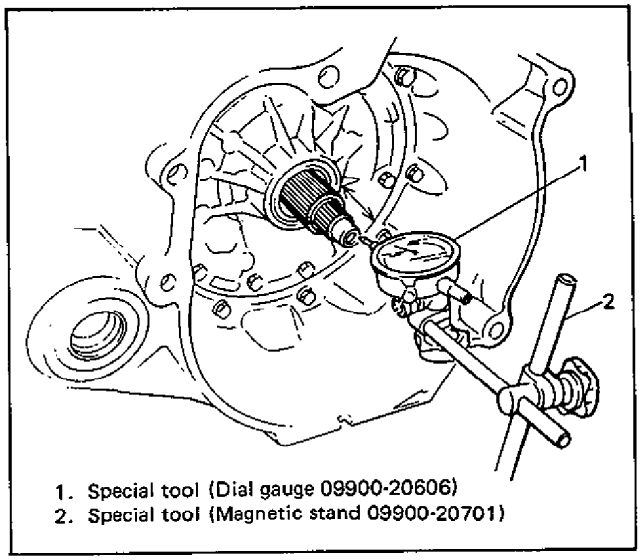
Fig. 7B-222 Installing Oil Pump

44. Check input shaft end play.
    Apply dial gauge onto input shaft end surface and measure thrust play of input shaft.
    If out of specification, remove oil pump and replace input shaft bearing race on oil pump side (Refer to step 40).

NOTE:
Check to be sure that input shaft turns smoothly.

Input shaft thrust play	0.3 – 0.9 mm 0.012 – 0.035 in

Available input shaft bearing race (oil pump side) thickness	0.8 mm/0.031 in
	1.4 mm/0.055 in



1. Special tool (Dial gauge 09900-20606)
2. Special tool (Magnetic stand 09900-20701)

Fig. 7B-223 Measuring Thrust Play of Input Shaft

45. Solenoid wire harness to case.
    1) Insert solenoid wire hold plate in groove in solenoid wire grommet and install it to stud bolt of transmission case.
    2) Secure hold plate with lock washer and nut.
    3) Install solenoid wire clamps to rear cover and case. Secure harness with them.

NOTE:
When inserting grommet into case bore, check to be sure that its O ring is in good condition.

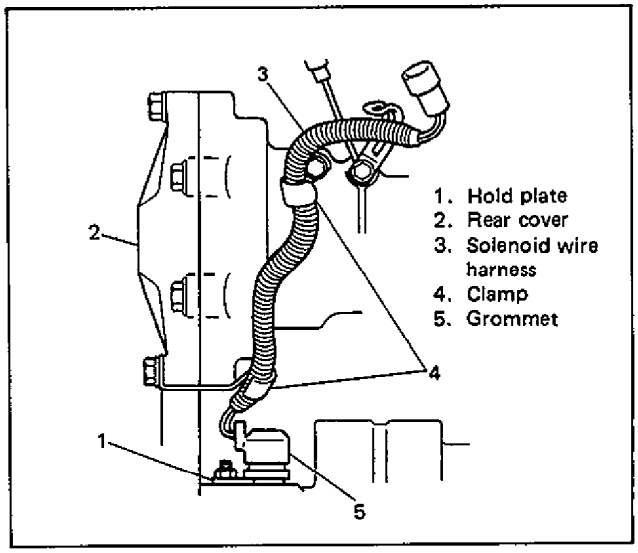


Fig. 7B-224 Installing Solenoid Wiring Harness

46. Check second brake band for proper installation.
    Looking through second brake band cover hole, check that second brake piston rod end is aligned with the center of recess in brake band as shown in figure. If rod end contacts outside of brake band recess, pull up second brake band by inserting thin wire in brake band fitting so that band recess aligns with rod end properly.
47. Check second brake piston stroke as previously described. For checking procedure, refer to p. 7B-62.

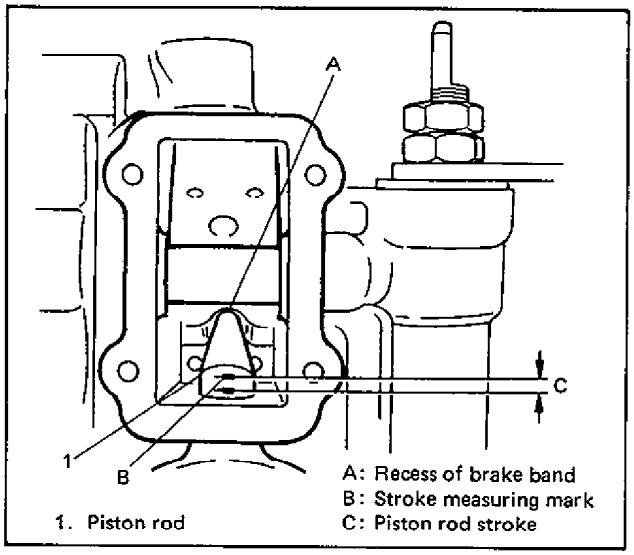


Fig. 7B-225 Checking Second Brake Band Alignment

48. Install second brake band cover with new gasket.

Tightening torque for second brake band cover bolts	N·m	kg-m	lb-ft
	7 – 9	0.7 – 0.9	5.5 – 6.5

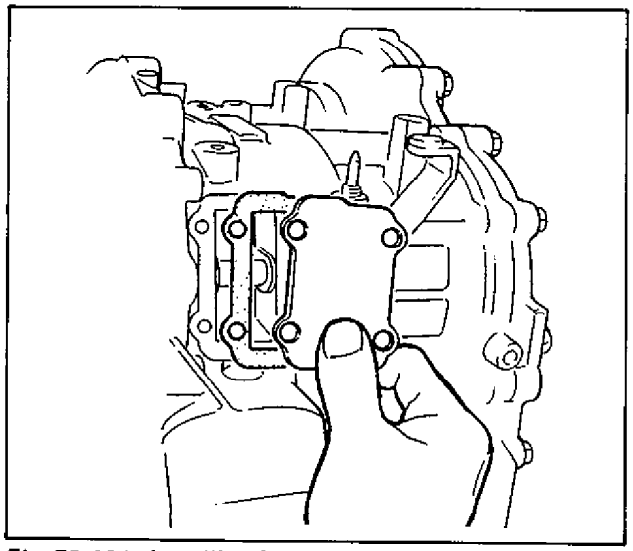


Fig. 7B-226 Installing Second Brake Cover

49. Oil pressure control cable in case.
50. Accumulator springs and pistons.
    1) Install new seal rings on pistons, if required. Be sure to apply automatic transmission fluid to pistons and seal rings.
    2) Insert springs into accumulator bores.
    3) Install pistons into case.

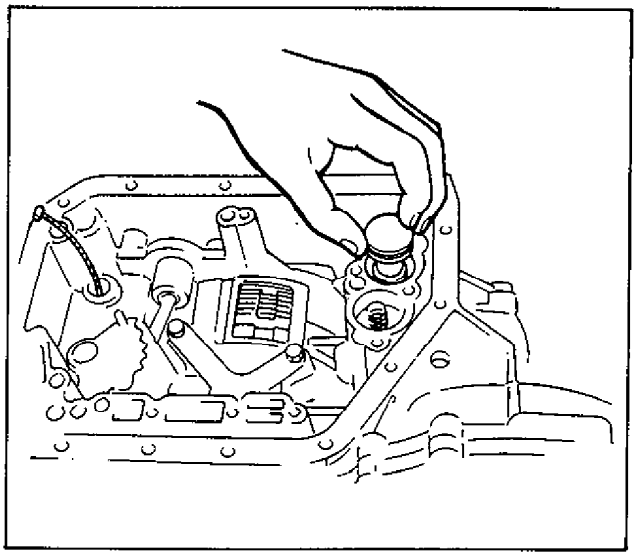
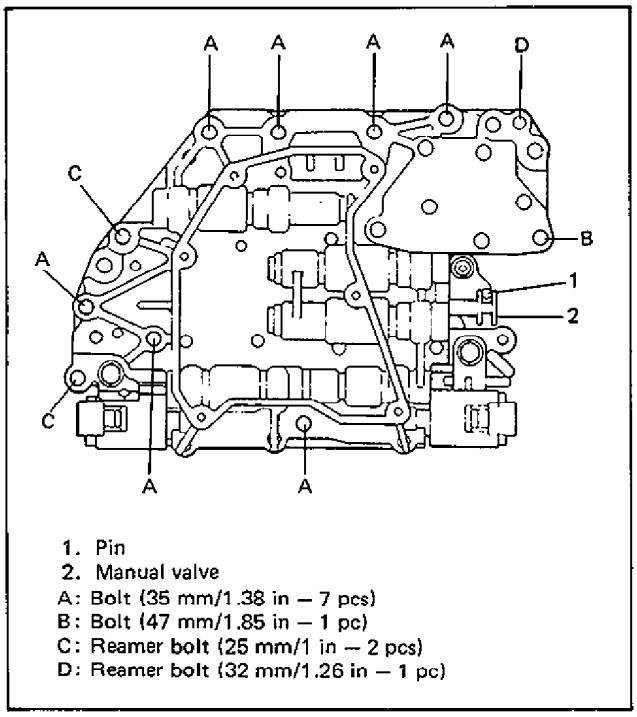


Fig. 7B-227 Installing Accumulator Pistons and Spring

51. Valve body assembly to case.
    Align manual valve with pin on manual shift lever and lower valve body into place.
    Install 11 bolts in lower valve body.
    Each bolt length is given in following figure.
    First, tighten 3 reamer bolts (positioning bolts) C and D lightly. Then tighten all bolts in diagonal order.

CAUTION:
Care should be taken to put manual shift lever pin in between two flanges at end of manual shift valve.

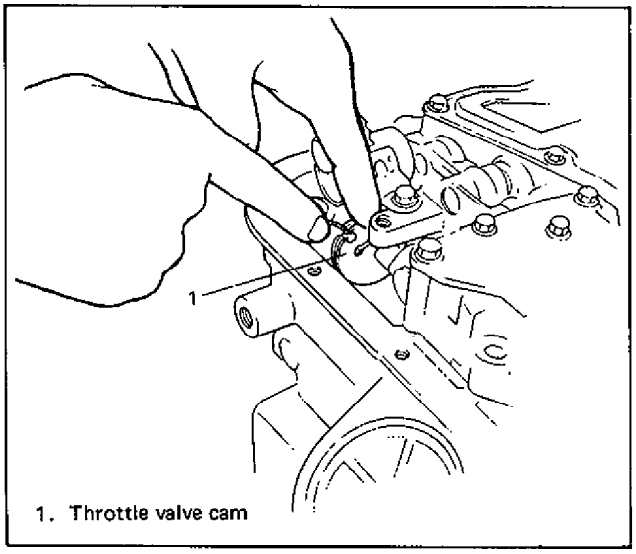
Tightening torque for lower valve body bolts	N·m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5



1. Pin
2. Manual valve
A: Bolt (35 mm/1.38 in – 7 pcs)
B: Bolt (47 mm/1.85 in – 1 pc)
C: Reamer bolt (25 mm/1 in – 2 pcs)
D: Reamer bolt (32 mm/1.26 in – 1 pc)

Fig. 7B-228 Installing Valve Body

52. Install oil pressure control cable on throttle valve cam.
    While holding cam down with fingers, slip cable end into slot.



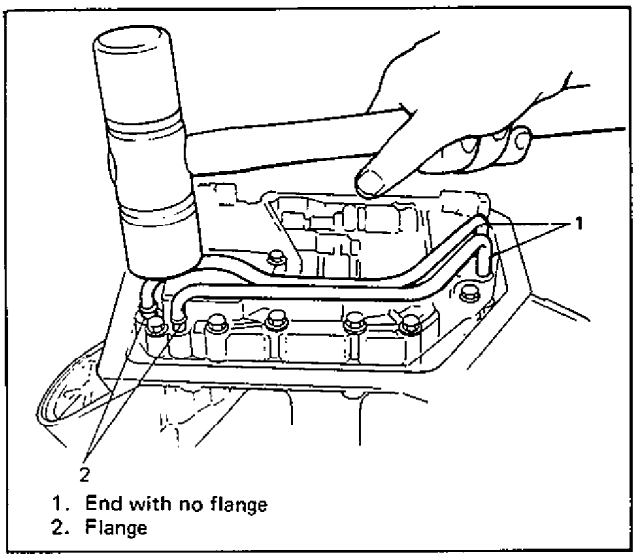
1. Throttle valve cam

Fig. 7B-229 Connecting Oil Pressure Control Cable

53. Oil tubes to lower valve body.
    First put the end of oil tube without flange about 2 mm (0.08 in) into lower valve body, then insert the one with flange and push both ends of tube by hand. Next, tap them in lightly with a plastic hammer as far as flange position.

NOTE:

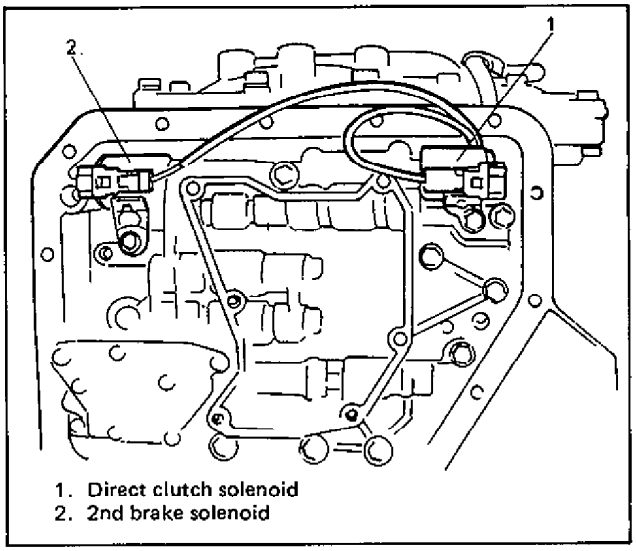
- **Install them horizontally to valve body.**
- **Make sure to insert them up to flange position securely.**
- **Care should be taken not to deform tubes.**



1. End with no flange
2. Flange

Fig. 7B-230 Installing Oil Tubes

54. 2 solenoid wires; one to direct clutch solenoid and the other to second brake solenoid.



1. Direct clutch solenoid
2. 2nd brake solenoid

Fig. 7B-231 Connecting Solenoid Wires

55. Oil strainer and solenoid wire clamp.
Clamp solenoid wire by fastening solenoid wire clamp with oil strainer bolt in the position as shown in figure.

Tightening torque for oil strainer bolts	N·m	kg-m	lb-ft
	5 – 6	0.5 – 0.6	4.0

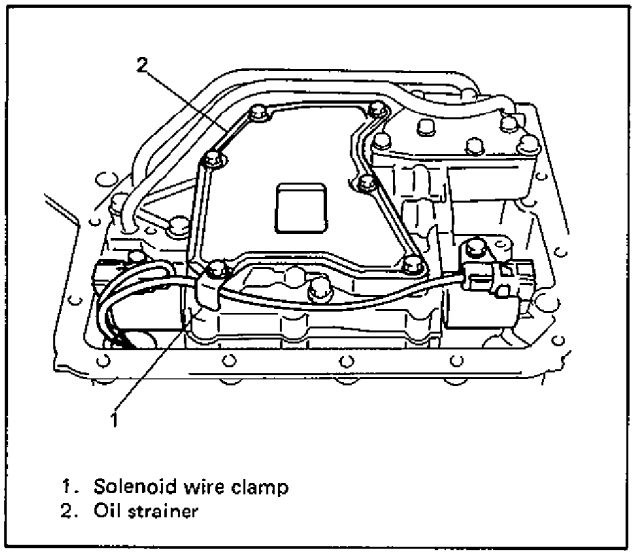


Fig. 7B-232 Installing Oil Strainer

56. Magnet in oil pan and oil pan with new gasket.
1) Install magnet in oil pan right under oil strainer.

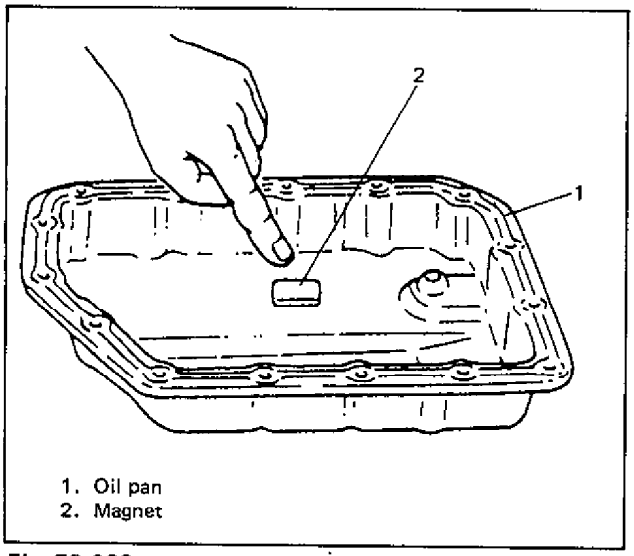


Fig. 7B-233 Installing Magnet in Oil Pan

2) Check to make sure that oil tubes are not in contact with oil pan.
3) There are 15 oil pan bolts in all and two of them have cross slot in their heads. Mount these two cross slotted bolts in such positions as shown in below figure after applying sealant to their threads.
Tighten 15 oil pan bolts to specification.
4) Tighten oil pan drain plug to specification.

Tightening torque	N·m	kg-m	lb-ft
Oil pan bolts	4 – 6	0.4 – 0.6	3.0 – 4.0
Drain plug	18 – 23	1.8 – 2.3	13.5 – 16.5

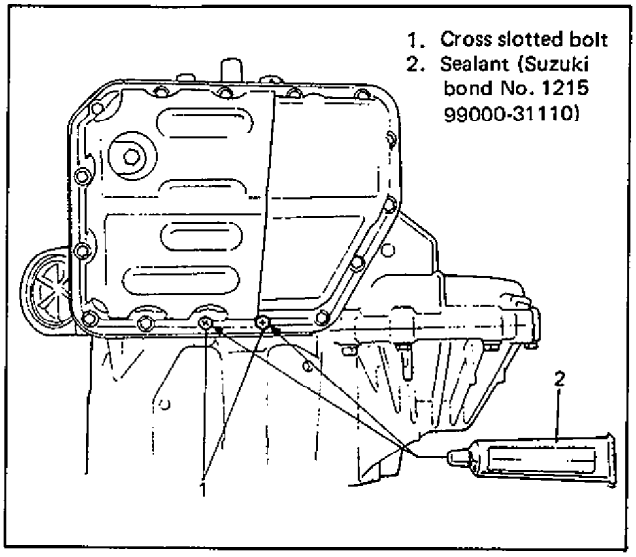
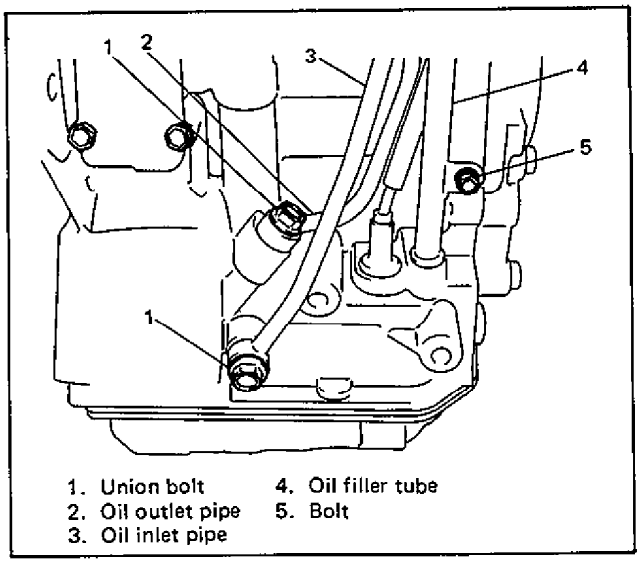


Fig. 7B-234 Installing Oil Pan Bolts

57. Oil pipes.
1) If oil inlet and outlet pipes have been removed or replaced, tighten them with union bolts with new gaskets to specified torque.
2) Clamp pipes with oil pipe plate through rubber tubes.
58. Oil filler tube with O ring.
Insert oil filler tube in case as far as its flange and tighten with bolt.

NOTE:
Check to make sure that oil filler tube O ring is in good condition.

Tightening torque		N·m	kg-m	lb-ft
Union bolts		11 – 13	1.1 – 1.3	8.0 – 9.0
Plate bolts	8 mm	10 – 16	1.0 – 1.6	7.5 – 11.5
	6 mm	4 – 7	0.4 – 0.7	3.0 – 5.0
Oil filler tube bolt		4 – 7	0.4 – 0.7	3.0 – 5.0



1. Union bolt
2. Oil outlet pipe
3. Oil inlet pipe
4. Oil filler tube
5. Bolt

Fig. 7B-235 Installing Oil Filler Tube

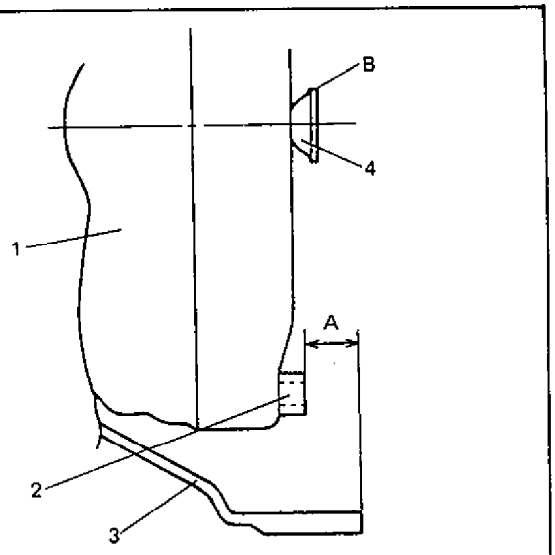
59. Engine mounting LH bracket.
Tighten bolts to specification.

Tightening torque	N·m	kg-m	lb-ft
Engine mounting LH bracket bolts	50 – 60	5.0 – 6.0	36.5 – 43.0
Engine LH mounting bolt			

60. Torque converter to input shaft.
1) Install torque converter, using care not to damage oil seal of oil pump.
2) After installing torque converter, check to make sure that distance A is within specification.
3) Check torque converter for smooth rotation.
4) Apply grease around cup at the center of torque converter.

CAUTION:
- **Before installing converter, make sure that its pump hub portion is free from nicks, burrs or damage which may cause oil seal to leak.**
- **Be very careful not to drop converter on oil pump gear. Damage in gear, should it occur, may cause a critical trouble.**

Distance A: Converter flange to housing end	More than 21.4 mm/0.85 in



1. Torque converter
2. Flange nut
3. Transmission case housing
4. Cup

A: More than 21.4 mm/0.85 in
B: Apply grease (Suzuki super grease A 99000-25010)

Fig. 7B-236 Installing Torque Converter

DIMENSION DATA

ITEM			DATA	
			Standard	Limit
Oil pump	Driven gear-to-body clearance		0.07 – 0.15 mm 0.0028 – 0.0059 in	0.3 mm 0.011 in
	Gear tooth tip clearance		0.11 – 0.14 mm 0.0043 – 0.0055 in	0.3 mm 0.011 in
	Gear side clearance		0.02 – 0.05 mm 0.0008 – 0.0019 in	0.1 mm 0.0039 in
Planetary gear	Side clearance		0.2 – 0.5 mm 0.008 – 0.019 in	0.7 mm 0.027 in
Bush bore	Oil pump body		38.113 – 38.138 mm 1.500 – 1.501 in	38.188 mm 1.503 in
	Direct clutch drum		51.520 – 51.545 mm 2.028 – 2.029 in	51.595 mm 2.031 in
	Planetary sun gear		22.025 – 22.046 mm 0.867 – 0.868 in	22.096 mm 0.870 in
	Ring gear flange		19.025 – 19.050 mm 0.749 – 0.750 in	19.100 mm 0.752 in
Clutch brake and 2nd piston	Height between snap ring and clutch flange	Direct clutch	2.49 – 3.06 mm 0.098 – 0.120 in	3.26 mm 0.128 in
		Forward clutch	2.01 – 2.68 mm 0.079 – 0.105 in	2.88 mm 0.113 in
	1st-reverse brake clutch clearance		0.58 – 1.92 mm 0.023 – 0.075 in	2.12 mm 0.083 in
	2nd brake piston rod stroke		1.5 – 3.0 mm 0.06 – 0.11 in	——
Input shaft	Thrust play		0.3 – 0.9 mm 0.012 – 0.035 in	——
Torque converter	Converter flange to housing end		More than 21.4 mm 0.85 in	——

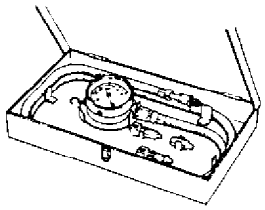
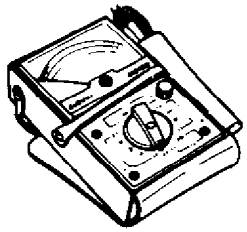
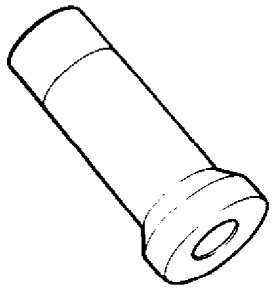
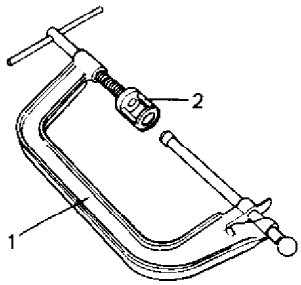
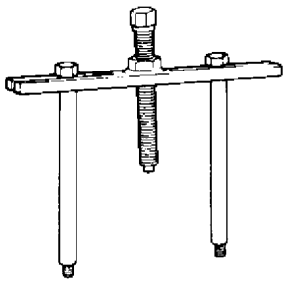
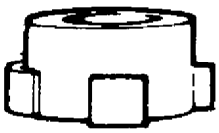
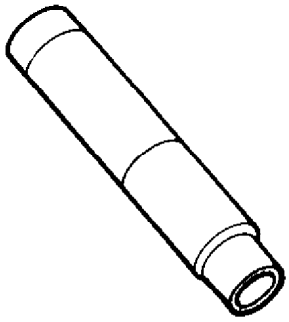
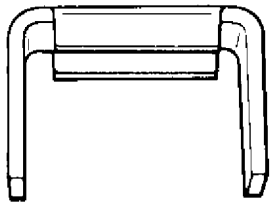
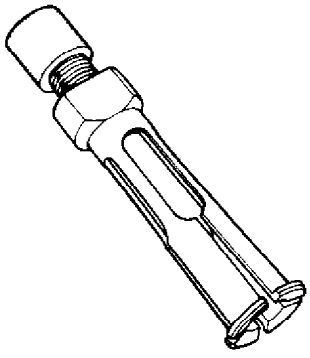
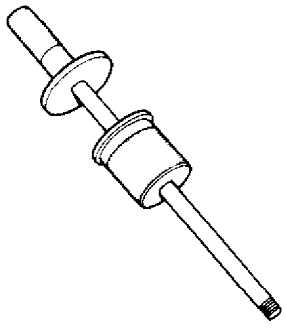
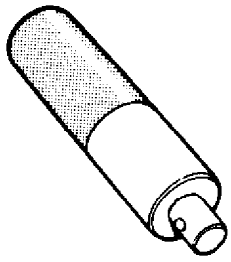
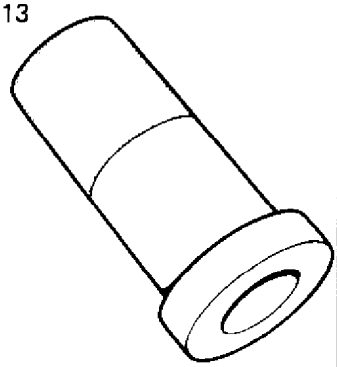
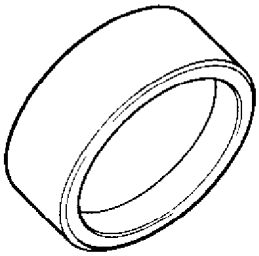
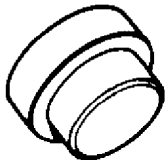
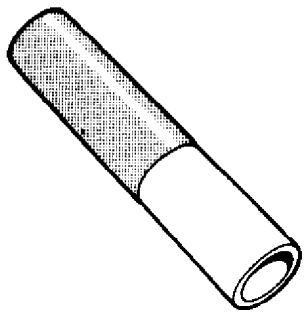
RECOMMENDED TORQUE SPECIFICATIONS

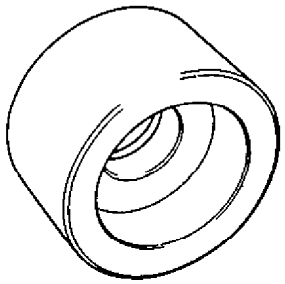
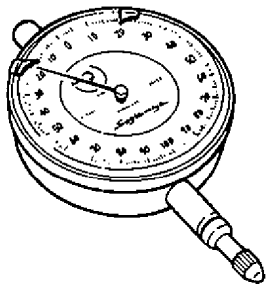
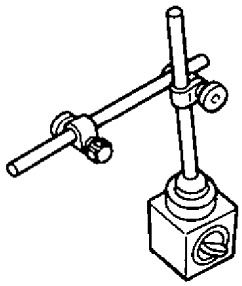
	Fastening portion		Tightening torque		
			N·m	kg-m	lb-ft
ON CAR SERVICE	1. Transmission case plug		6 – 9	0.6 – 0.9	4.5 – 6.5
	2. Drain plug		18 – 23	1.8 – 2.3	13.5 – 16.5
	3. Oil cooler hose clamps		1.5	0.15	1
	4. Oil pan bolts		4 – 6	0.4 – 0.6	3.0 – 4.0
	5. Oil strainer bolts		5 – 6	0.5 – 0.6	4.0
	6. Shift solenoid bolts		7 – 9	0.7 – 0.9	5.5 – 6.5
	7. Speed sensor bolt		7 – 9	0.7 – 0.9	5.5 – 6.5
	8. Shift lever switch bolt		13 – 23	1.3 – 2.3	9.5 – 16.5
	9. Selector lever shaft nut		18 – 22	1.8 – 2.2	13.0 – 15.5
	10. Selector housing nut		10 – 16	1.0 – 1.6	7.5 – 11.5
MOUNTING	1. Transmission to engine bolts and nuts		40 – 60	4.0 – 6.0	29.0 – 43.0
	2. Engine LH mounting body bracket bolts		50 – 60	5.0 – 6.0	36.5 – 43.0
	3. Rear mounting bracket nut		40 – 50	4.0 – 5.0	29.0 – 36.5
	4. Exhaust pipe to manifold bolts				
	5. Ball stud bolts and nuts		50 – 70	5.0 – 7.0	36.5 – 50.5
	6. Drive plate to converter bolts		18 – 19	1.8 – 1.9	13.0 – 14.0
	7. Engine mounting LH bracket nuts		50 – 60	5.0 – 6.0	36.5 – 43.0
	8. Engine LH mounting bush bolt		50 – 60	5.0 – 6.0	36.5 – 43.0
TRANSMISSION OVERHAUL	1. Oil pump cover bolts		8 – 12	0.8 – 1.2	6.0 – 8.5
	2. Lower valve body cover bolts		4 – 6	0.4 – 0.6	3.0 – 4.0
	3. Throttle valve cam bolt		6 – 9	0.6 – 0.9	4.5 – 6.5
	4. Upper valve body bolts		5 – 6	0.5 – 0.6	4.0
	5. Lower valve body bolts		8 – 12	0.8 – 1.2	6.0 – 8.5
	6. Differential final gear bolts		80 – 90	8.0 – 9.0	58.0 – 65.0
	7. Manual detent spring bolt and nut		8 – 12	0.8 – 1.2	6.0 – 8.5
	8. Shift shaft nuts		27 – 33	2.7 – 3.3	20.0 – 23.5
	9. Reduction driven gear nut		110 – 150	11.0 – 15.0	80.0 – 108.0
	10. Rear cover bolts		16 – 23	1.6 – 2.3	12.0 – 16.5
	11. Rear cover nuts		11 – 15	1.1 – 1.5	8.0 – 10.5
	12. Transmission case housing bolts		16 – 23	1.6 – 2.3	12.0 – 16.5
	13. Oil pump bolts		18 – 27	1.8 – 2.7	13.5 – 19.5
	14. Second brake band cover bolts		7 – 9	0.7 – 0.9	5.5 – 6.5
	15. Oil pipe union bolts		11 – 13	1.1 – 1.3	8.0 – 9.0
	16. Oil pipe plate bolts	8 mm	10 – 16	1.0 – 1.6	7.5 – 11.5
		6 mm	4 – 7	0.4 – 0.7	3.0 – 5.0
	17. Oil filler tube bolt		4 – 7	0.4 – 0.7	3.0 – 5.0

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Automatic transmission fluid	DEXRON-II (99000-22760)	• Automatic transmission • Parts lubrication when installing
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Case housing star-shaped recess bolts (3 pcs only) • Oil pan cross slotted bolts (2 pcs only)
Lithium grease	SUZUKI SUPER GREASE C (99000-25030)	• Retaining parts in place when assembling • Oil seal lips • Oil pump O ring
	SUZUKI SUPER GREASE A (99000-25010)	• Cable ends • Converter center cup
Water tight sealant	SUZUKI SEALING COMPOUND 366E (99000-31090)	Select cable fastening portion with dash panel

SPECIAL TOOLS

1  09925-37810 Oil pressure gauge	2  09900-25002 Pocket tester	3  09951-76010 Bearing installer	4  1. 09916-14510 Valve lifter (Attachment 2 is included)
5  09918-48210 Oil pump remover	6  09927-08210 Output shaft remover	7  09925-18010 Remover handle	8  09926-98310 Clutch spring compressor
9  09941-64511 Bearing remover	10  09930-30102 Sliding shaft	11  09926-88310 Bearing installer attachment	12  09924-74510 Installer handle
13  09913-85210 Bearing installer	14  09944-66020 Bearing installer	15  09925-88210 Bearing puller attachment	16  09913-80112 Bearing installer

17	18	19
		
09951-16060 Bush remover	09900-20606 Dial gauge	09900-20701 Magnetic stand

SECTION 7C

CLUTCH

CONTENTS

GENERAL DESCRIPTION

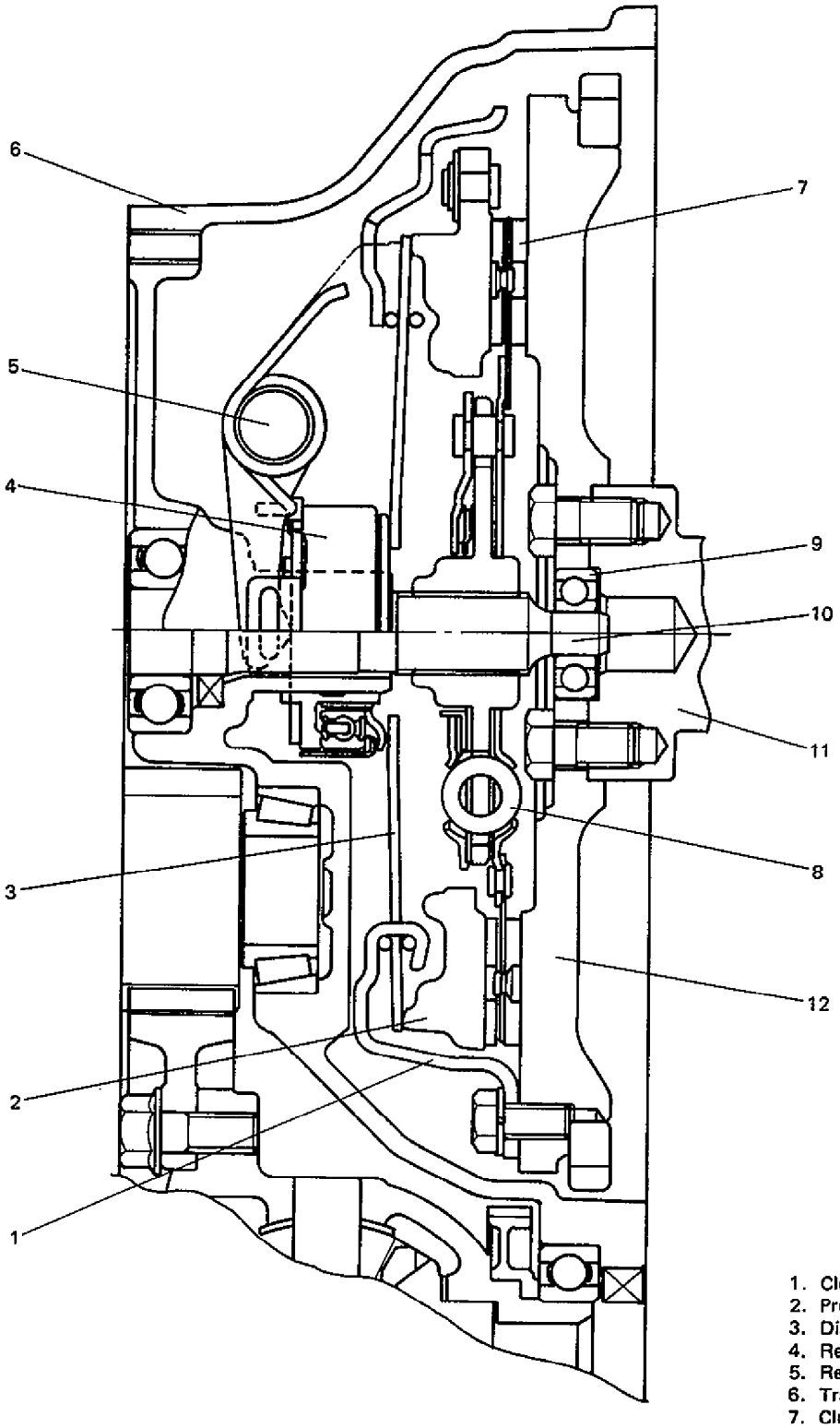
The clutch is a diaphragm-spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapered fingers pointing inward.

The disc, carrying six 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.

In the catalytic converter equipped car, the clutch switch is located above the clutch pedal. For the description of the clutch switch, refer to SECTION 6G.



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. 7C-1 Clutch Cutaway

DIAGNOSIS

Condition	Possible Cause	Correction
Slipping	• Improper clutch pedal free travel.	Adjust free travel.
	• Worn or oily clutch disc facing.	Replace disc.
	• Warped disc, pressure plate or flywheel surface.	Replace disc, clutch cover or flywheel.
	• Weakened diaphragm spring.	Replace clutch cover.
	• Rusted clutch cable.	Replace cable.
Dragging clutch	• Improper clutch pedal free travel.	Adjust free travel.
	• Weakened diaphragm spring, or worn spring tip.	Replace clutch cover.
	• Rusted input shaft splines.	Lubricate.
	• Damaged or worn splines of transmission input shaft.	Replace input shaft.
	• Excessively wobbly clutch disc.	Replace disc.
	• Clutch facings broken or dirty with oil.	Replace disc.
Clutch vibration	• Glazed (glass-like) clutch facings.	Repair or replace disc.
	• Clutch facings dirty with oil.	Replace disc.
	• Release bearing slides unsmoothly on input shaft bearing retainer.	Lubricate or replace input shaft bearing retainer.
	• Wobbly clutch disc, or poor facing contact.	Replace disc.
	• Weakened torsion springs in clutch disc.	Replace disc.
	• Clutch disc rivets loose.	Replace disc.
	• Distorted pressure plate or flywheel surface.	Replace clutch cover or flywheel.
	• Weakened engine mounting or loosened mounting bolt or nut.	Retighten or replace mounting.
Noisy clutch	• Worn or broken release bearing.	Replace release bearing.
	• Input shaft front bearing worn down.	Replace input shaft bearing.
	• Excessive rattle of clutch disc hub.	Replace disc.
	• Cracked clutch disc.	Replace disc.
	• Pressure plate and diaphragm spring 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 the facing.	Replace disc.
	• Weakened torsion springs.	Replace disc.

ON CAR SERVICE

MAINTENANCE SERVICE

CLUTCH PEDAL HEIGHT

Adjust clutch pedal height with adjust bolt located on pedal bracket and tighten lock nut.

- For left hand steering car:
  Height "A" of clutch pedal is normal if it is about 8 mm (0.3 in) higher than brake pedal.
- For right hand steering car:
  Height "A" of clutch pedal is normal if it is as high as brake pedal.

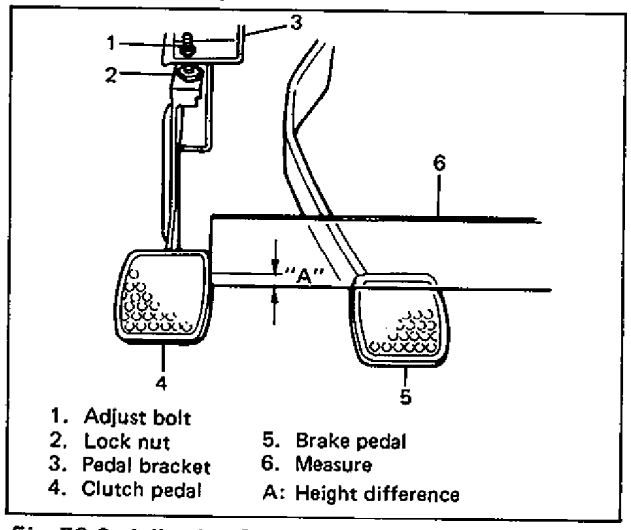


Fig. 7C-2 Adjusting Clutch Pedal Height

CLUTCH PEDAL FREE TRAVEL

1. Depress clutch pedal, stop the moment clutch resistance is felt, and measure distance (clutch pedal free travel). Free travel should be within following specification.

Clutch pedal free travel	15 – 20 mm 0.6 – 0.8 in.

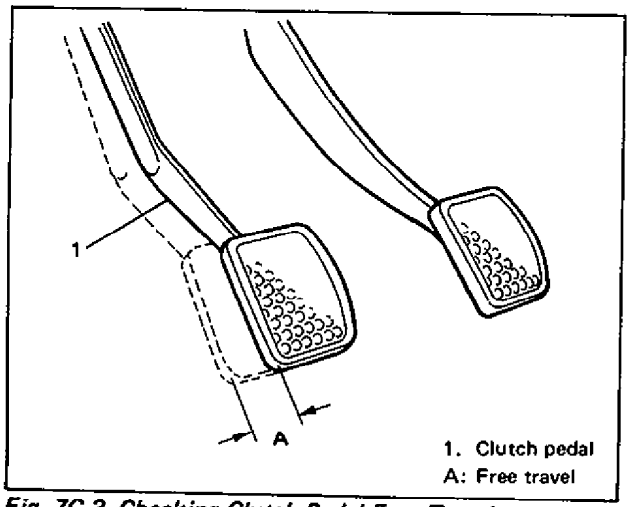


Fig. 7C-3 Checking Clutch Pedal Free Travel

2. If free travel is out of specification, adjust it with cable joint nut.

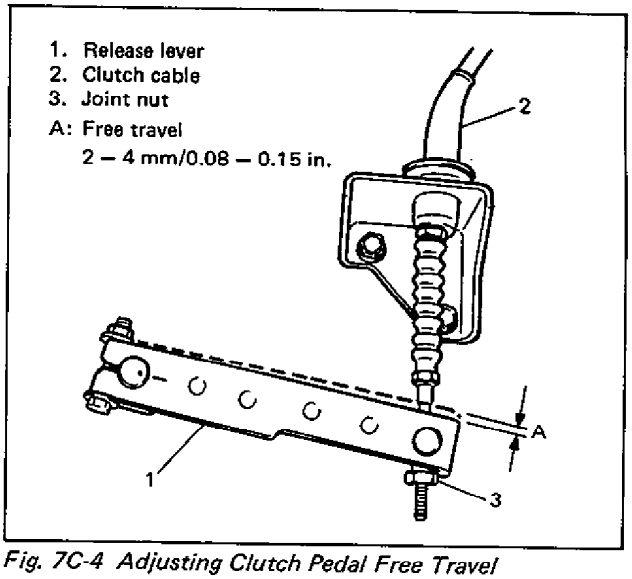


Fig. 7C-4 Adjusting Clutch Pedal Free Travel

3. After checking clutch pedal free travel, also check clutch for proper function with engine running.

CLUTCH SWITCH

NOTE:
This switch is applicable to cars equipped with a catalytic converter.

ADJUSTMENT

1. Apply parking brake firmly and place gear shift control lever in neutral position.
2. Disconnect lead wire coupler beside pedal bracket.
3. Loosen lock nut.
4. Adjust clutch pedal installation so that clearance between tip of switch and clutch stay equals to dimension "A". Then tighten lock nut to specification.
5. Connect lead wire.

Tightening torque for switch lock nut	N·m	kg-m	lb-ft
	10 – 15	1.0 – 1.5	7.5 – 10.5

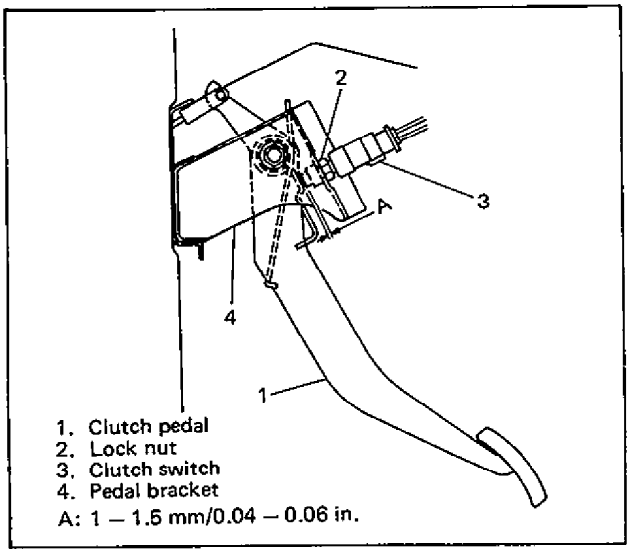


Fig. 7C-5 Adjusting Clutch Switch

Tightening torque for clutch cable outer bolts	N·m	kg-m	lb-ft
	4 – 7	0.4 – 0.7	3.0 – 5.0

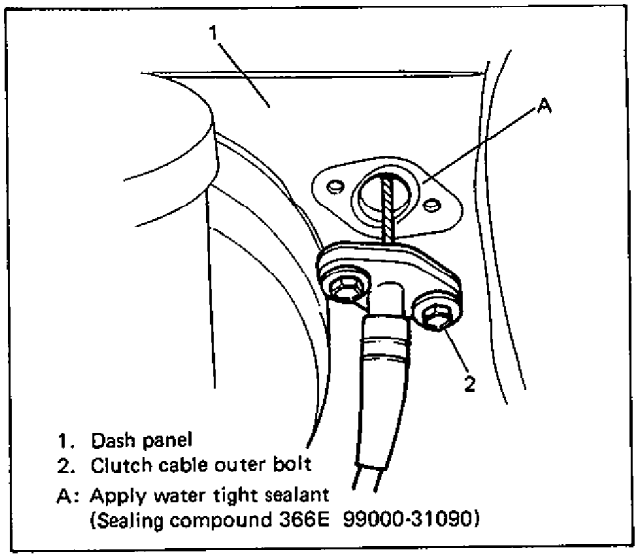


Fig. 7C-6 Fastening Clutch Cable

CLUTCH CABLE

REMOVAL

1. Remove clutch cable joint nut and disconnect joint pin from inner cable.
2. Remove 2 bolts at dash panel, unhook cable end from pedal top by using screwdriver from engine room, and then take out cable.

INSPECTION

Inspect clutch cable and replace it if any of following conditions exists.

- Excessive cable friction.
- Frayed cable.
- Bent or kinked cable.
- Broken boots.
- Worn end.

INSTALLATION

1. Apply grease to cable end hook and also joint pin before installing cable.
2. Hook cable end with pedal by using screwdriver or long nose pliers from cabin inside, then join inner cable with joint pin in release arm.
3. Apply water tight sealant to mating surface of cable and fasten it with 2 bolts to dash panel.
4. Screw in joint nut and adjust free travel of pedal to specification by turning nut.
5. Check clutch for proper function with engine running.

UNIT REPAIR OVERHAUL

CLUTCH COVER, CLUTCH DISC AND FLYWHEEL

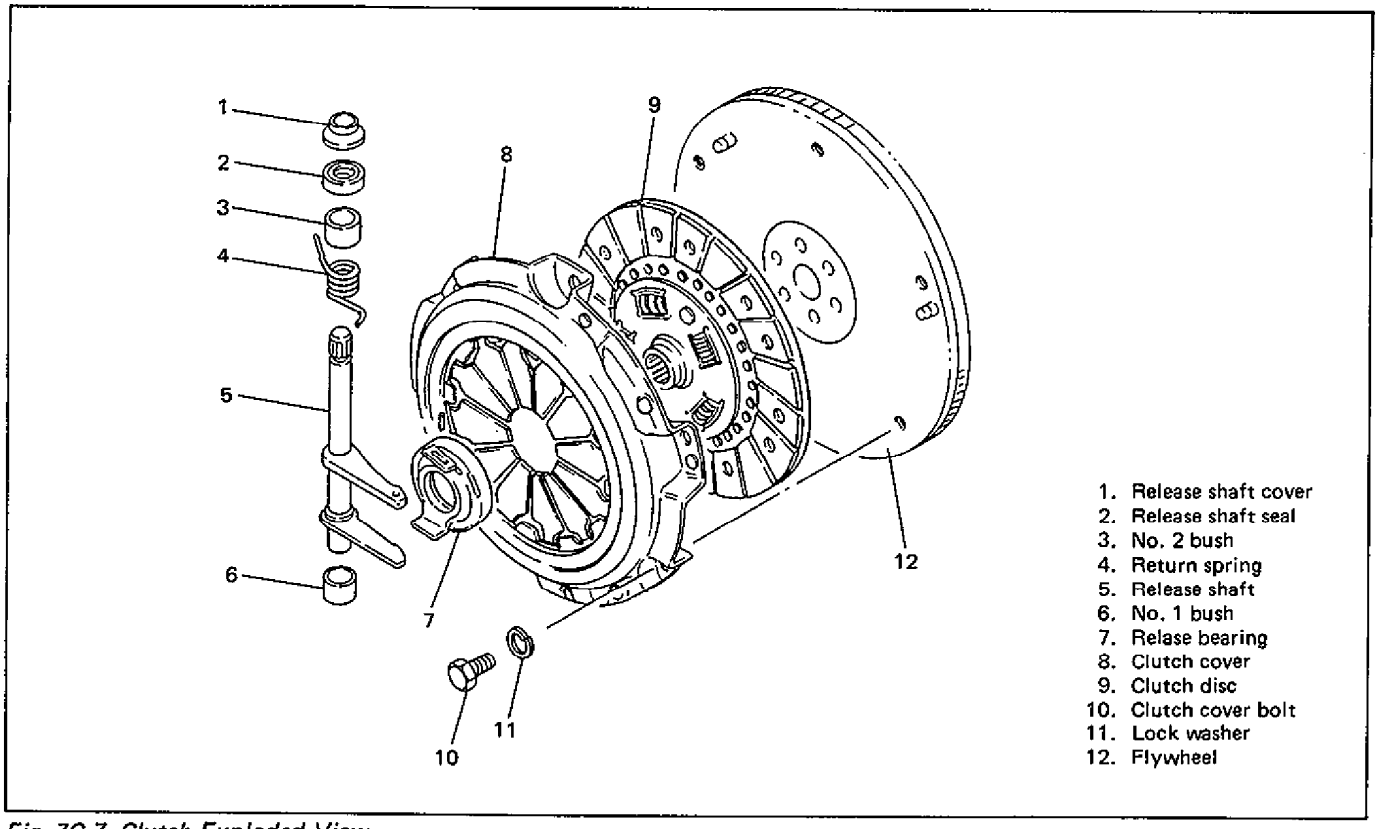


Fig. 7C-7 Clutch Exploded View

DISMOUNTING AND REMOUNTING

Refer to page 7A-12.

REMOVAL

1. Hold flywheel stationary with special tool and remove clutch cover bolts, clutch cover and clutch disc.

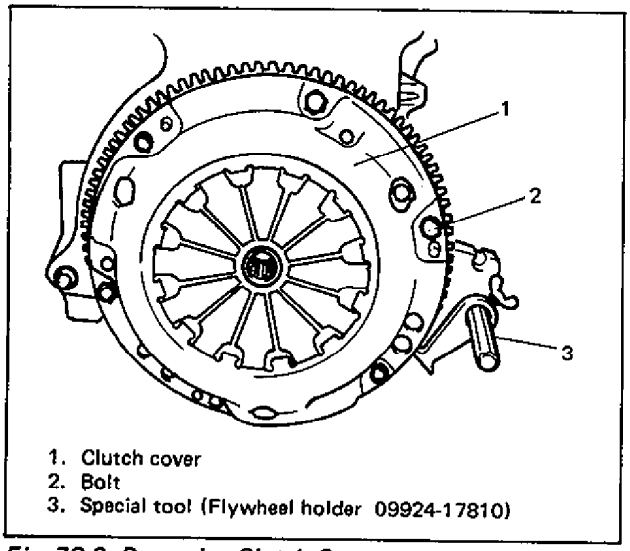


Fig. 7C-8 Removing Clutch Cover

2. Pull out input shaft bearing by using special tool and wrench.

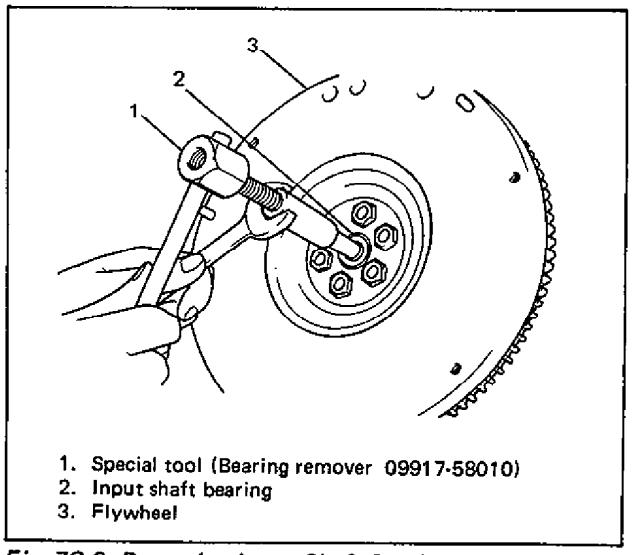


Fig. 7C-9 Removing Input Shaft Bearing

INSPECTION

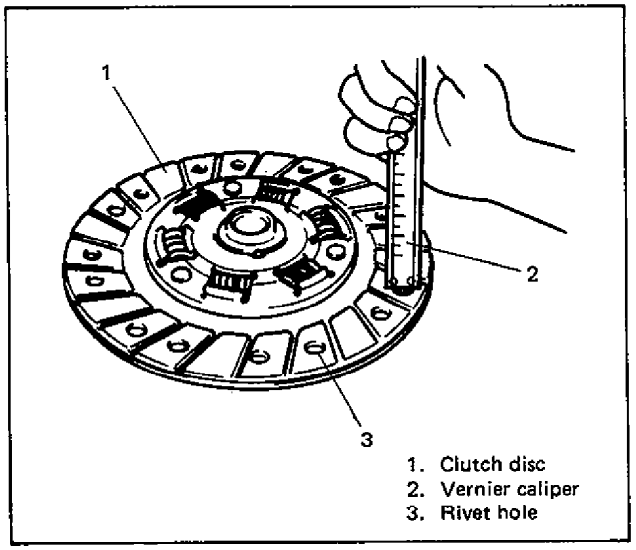
Input Shaft Bearing

Check bearing for smooth rotation and replace it if abnormality is found.

Clutch Disc

Measure depth of rivet head depression, i.e. distance between rivet head and facing surface. If depression is found to have reached service limit at any of holes, replace disc assembly.

	Standard	Service limit
Rivet head depth	1.5 mm 0.06 in.	0.5 mm 0.02 in.



1. Clutch disc
2. Vernier caliper
3. Rivet hole

Fig. 7C-10 Measuring Rivet Head Depth

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.

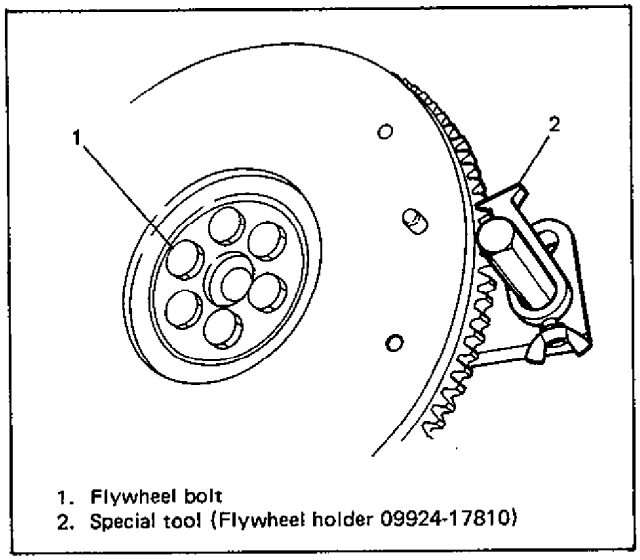
INSTALLATION

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.

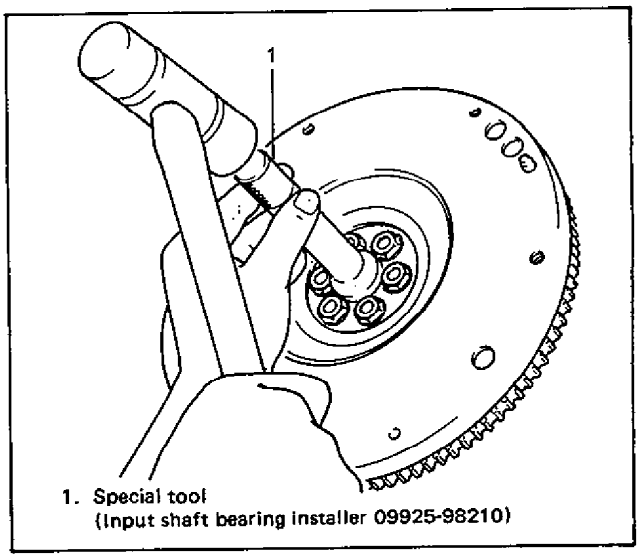
Tightening torque for flywheel bolts	N·m	kg-m	lb-ft
	57 – 65	5.7 – 6.5	41.5 – 47.0



1. Flywheel bolt
2. Special tool (Flywheel holder 09924-17810)

Fig. 7C-11 Installing Flywheel

2. Using special tool, install input shaft to flywheel.



1. Special tool
(Input shaft bearing installer 09925-98210)

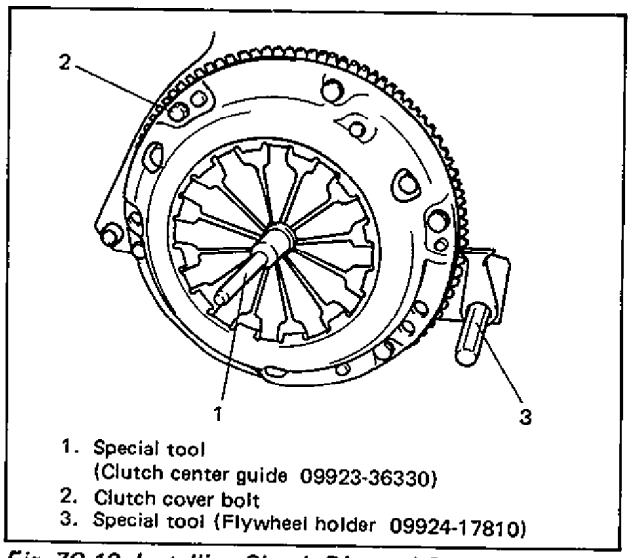
Fig. 7C-12 Installing Input Shaft Bearing

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.**

Tightening torque for clutch cover bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



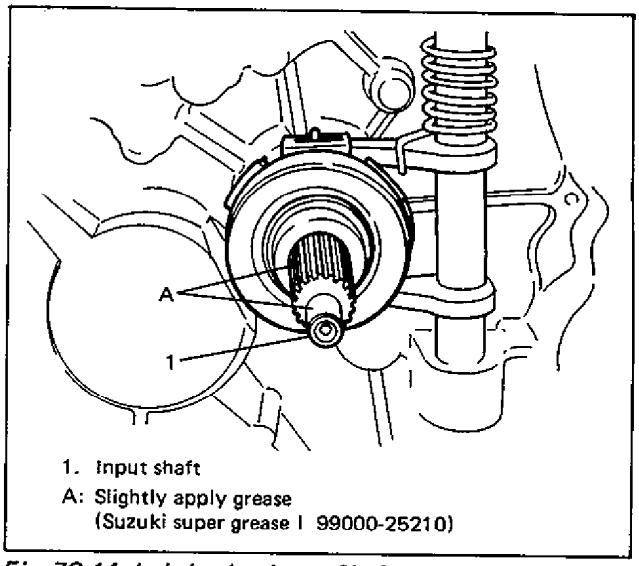
1. Special tool (Clutch center guide 09923-36330)
2. Clutch cover bolt
3. Special tool (Flywheel holder 09924-17810)

Fig. 7C-13 Installing Clutch Disc and Cover

4. Slightly apply grease to input shaft, then join transmission assembly with engine. Refer to p. 7A-13 for remounting procedure.

NOTE:

Turn crankshaft a little through flywheel gear while inserting transmission input shaft to clutch disc until splines mesh.



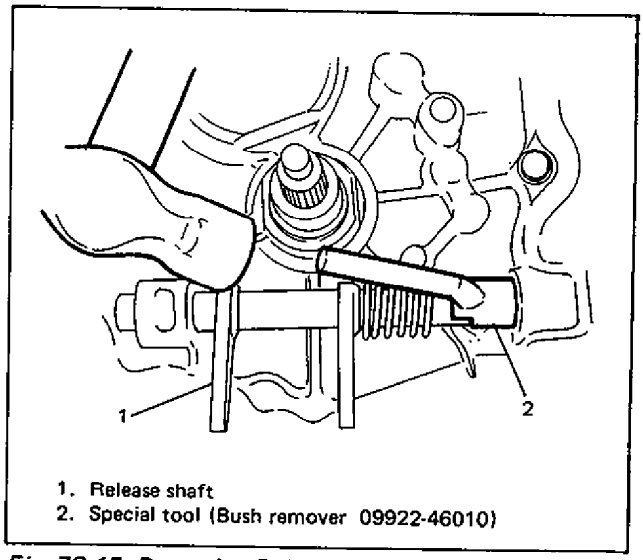
1. Input shaft
A: Slightly apply grease (Suzuki super grease I 99000-25210)

Fig. 7C-14 Lubricating Input Shaft

CLUTCH RELEASE SYSTEM

REMOVAL

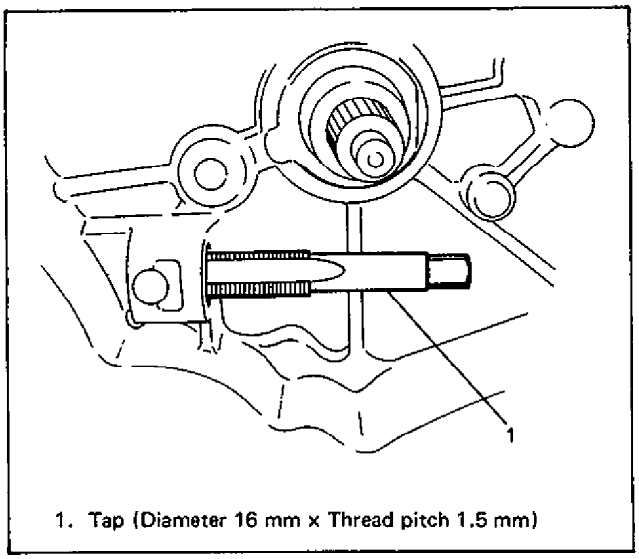
1. Remove release arm by loosening its bolt, and then shaft cover.
2. Take out release bearing by turning release shaft.
3. Unhook return spring by using pliers.
4. Drive out No. 2 bush by using special tool and hammer. Release shaft seal will also be pushed out.



1. Release shaft
2. Special tool (Bush remover 09922-46010)

Fig. 7C-15 Removing Release Shaft Bush No. 2

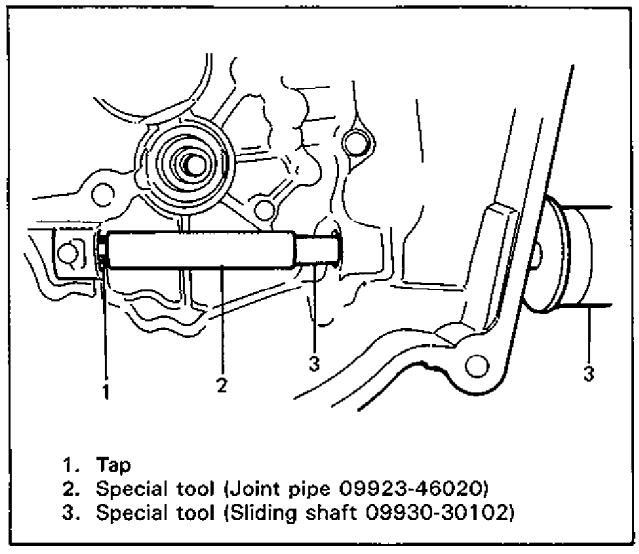
5. Remove release shaft.
6. For removal of No. 1 bush, tap it by using M16 x 1.5 tap.



1. Tap (Diameter 16 mm x Thread pitch 1.5 mm)

Fig. 7C-16 Tapping Bush No. 1

7. Leaving tap in No. 1 bush, screw in joint pipe over tap, join sliding shaft with joint pipe, and then drive out bush.



1. Tap
2. Special tool (Joint pipe 09923-46020)
3. Special tool (Sliding shaft 09930-30102)

Fig. 7C-17 Removing Bush No. 1

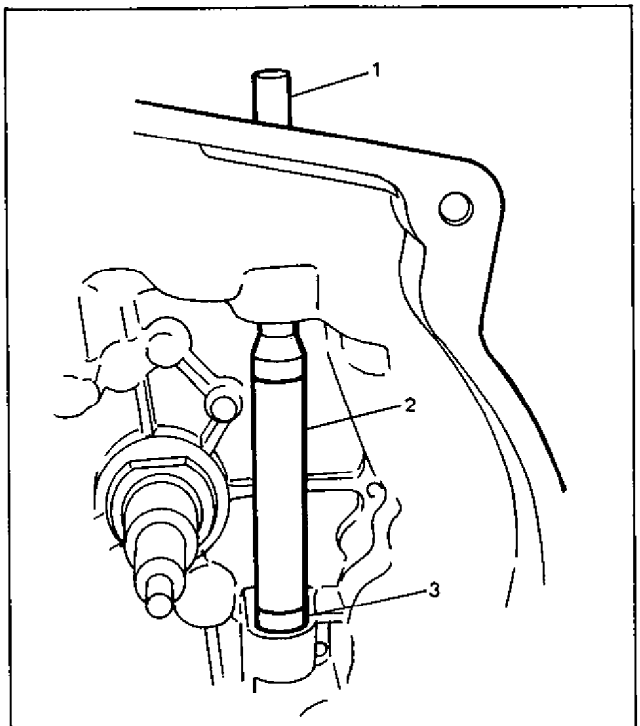
INSPECTION

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.

CAUTION:
Do not wash release bearing. Washing may cause grease leakage and consequential bearing damage.

INSTALLATION

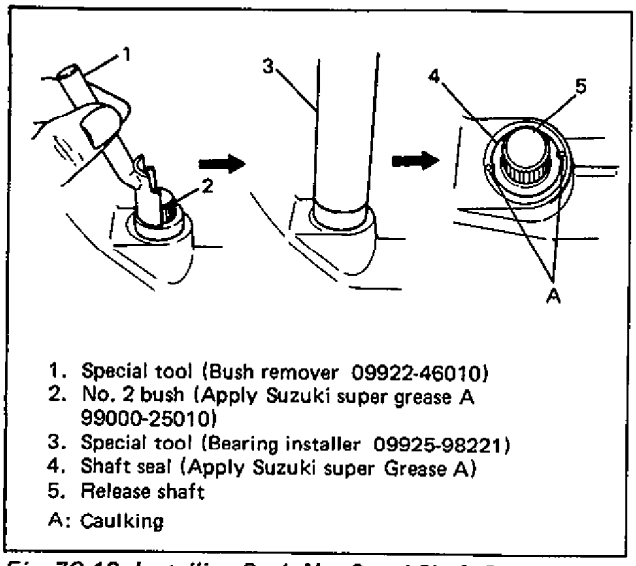
1. Drive in a new No. 1 bush by using adequate drive handle and hammer and then apply grease to bush inside.



1. Special tool (Bearing installer 09943-88211)
2. Special tool (Joint pipe 09923-46020) or the like
3. No. 1 bush

Fig. 7C-18 Installing Bush No. 1

2. Install release shaft with return spring applied to it.
3. Apply grease to No. 2 bush inside and press-fit it by using the same special tool as in removal.
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.

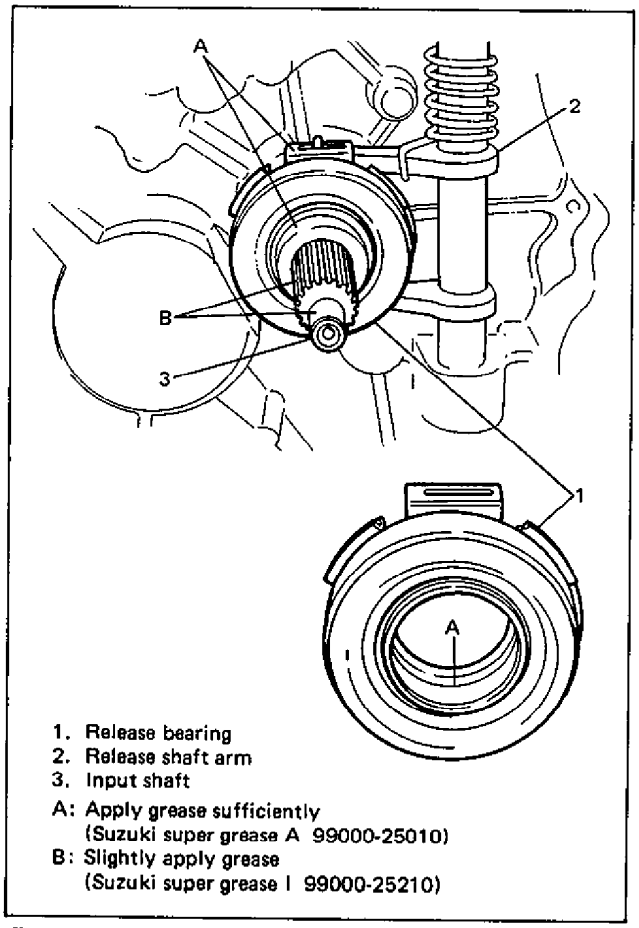


1. Special tool (Bush remover 09922-46010)
2. No. 2 bush (Apply Suzuki super grease A 99000-25010)
3. Special tool (Bearing installer 09925-98221)
4. Shaft seal (Apply Suzuki super Grease A)
5. Release shaft

A: Caulking

Fig. 7C-19 Installing Bush No. 2 and Shaft Seal

6. Hook return spring.
7. Apply grease to release bearing inside and release shaft arm, then set bearing.
8. Apply small amount of grease to input shaft spline and front end as well.



1. Release bearing
2. Release shaft arm
3. Input shaft

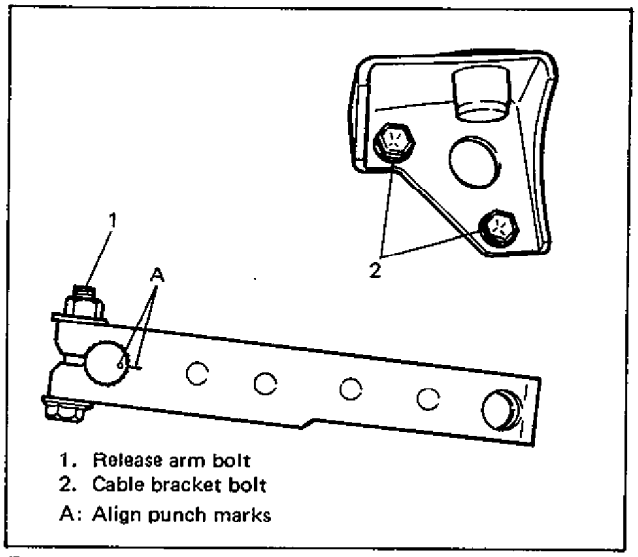
A: Apply grease sufficiently (Suzuki super grease A 99000-25010)

B: Slightly apply grease (Suzuki super grease I 99000-25210)

Fig. 7C-20 Lubricating Release System and Input Shaft

9. Install release shaft cover.
10. Set release arm to release shaft aligning their punch marks, then tighten bolt.
11. If clutch cable bracket 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
Cable bracket bolts	18 – 28	1.8 – 2.8	13.5 – 20.0



1. Release arm bolt
2. Cable bracket bolt

A: Align punch marks

Fig. 7C-21 Installing Clutch Release Arm

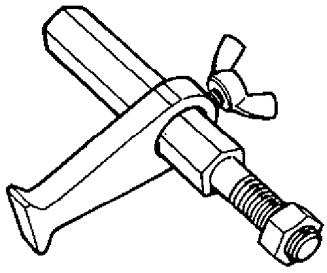
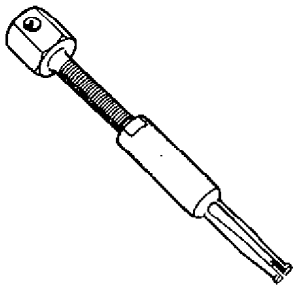
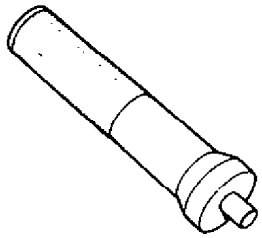
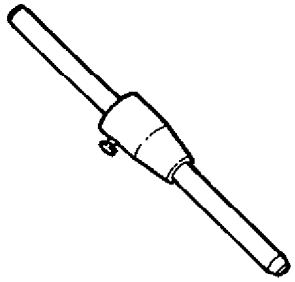
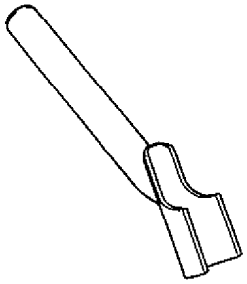
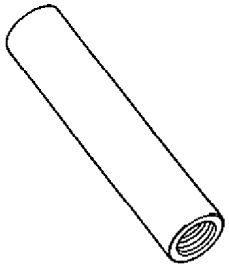
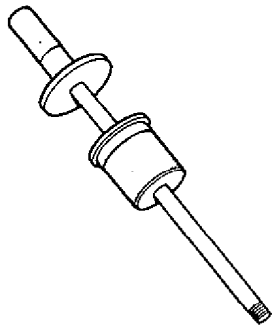
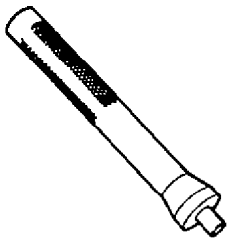
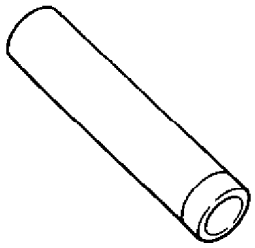
RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Switch lock nut	10 – 15	1.0 – 1.5	7.5 – 10.5
2. Clutch cable outer bolts	4 – 7	0.4 – 0.7	3.0 – 5.0
3. Flywheel bolts	57 – 65	5.7 – 6.5	41.5 – 47.0
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. Cable bracket bolts	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)	• Cable end hook and joint pin. • Release shaft bushes and seal. • Release bearing inside and release shaft arm.
	SUZUKI SUPER GREASE I (99000-25210)	Input shaft spline and front end.
Water tight sealant	SUZUKI SEALING COMPOUND 366E (99000-31090)	Clutch cable fastening portion with dash panel.

SPECIAL TOOLS

1  09924-17810 Flywheel holder	2  09917-58010 Bearing remover	3  09925-98210 Input shaft bearing installer	4  09923-36330 Clutch center guide
5  09922-46010 Bush remover	6  09923-46020 Joint pipe	7  09930-30102 Sliding shaft	8  09943-88211 Bearing installer
9  09925-98221 Bearing installer			

SECTION 8

BODY ELECTRICAL SYSTEM

CONTENTS

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

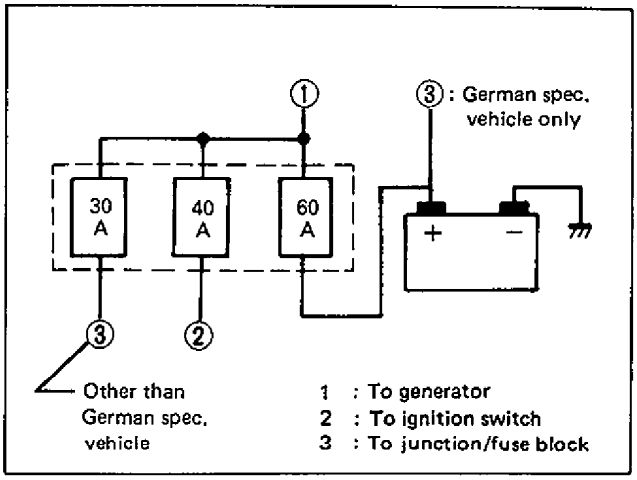


Fig. 8-1 Main Fuse Block Circuit

JUNCTION/FUSE BLOCK CIRCUIT AND FUSE BLOCK DESIGNATIONS

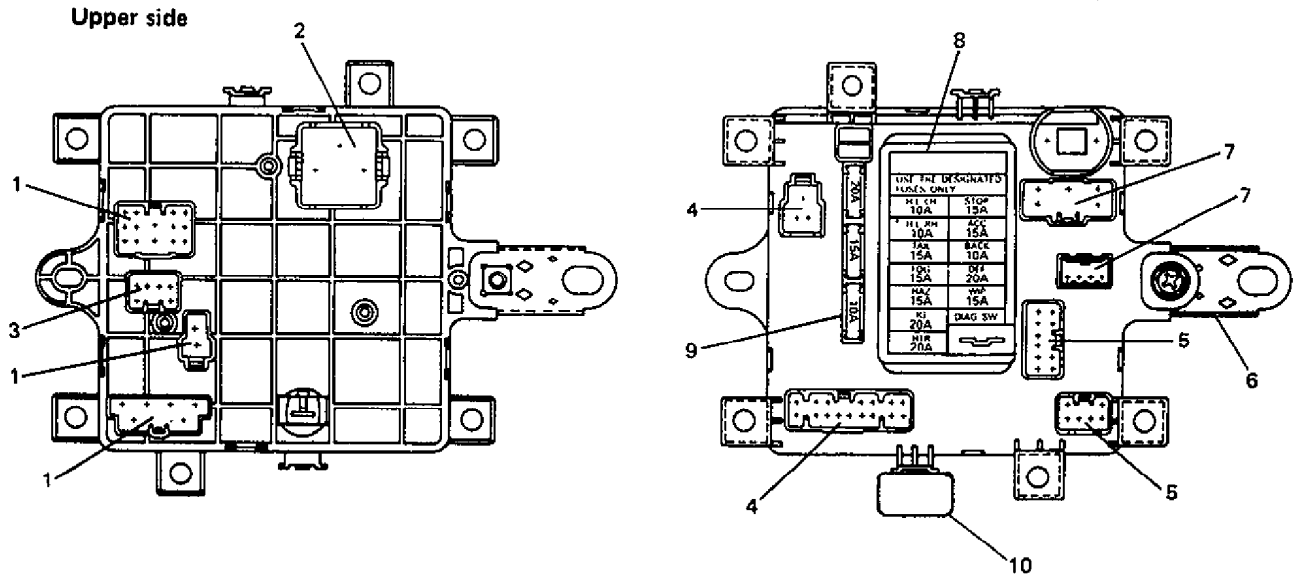


Fig. 8-2-1

NOTE:
For West 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

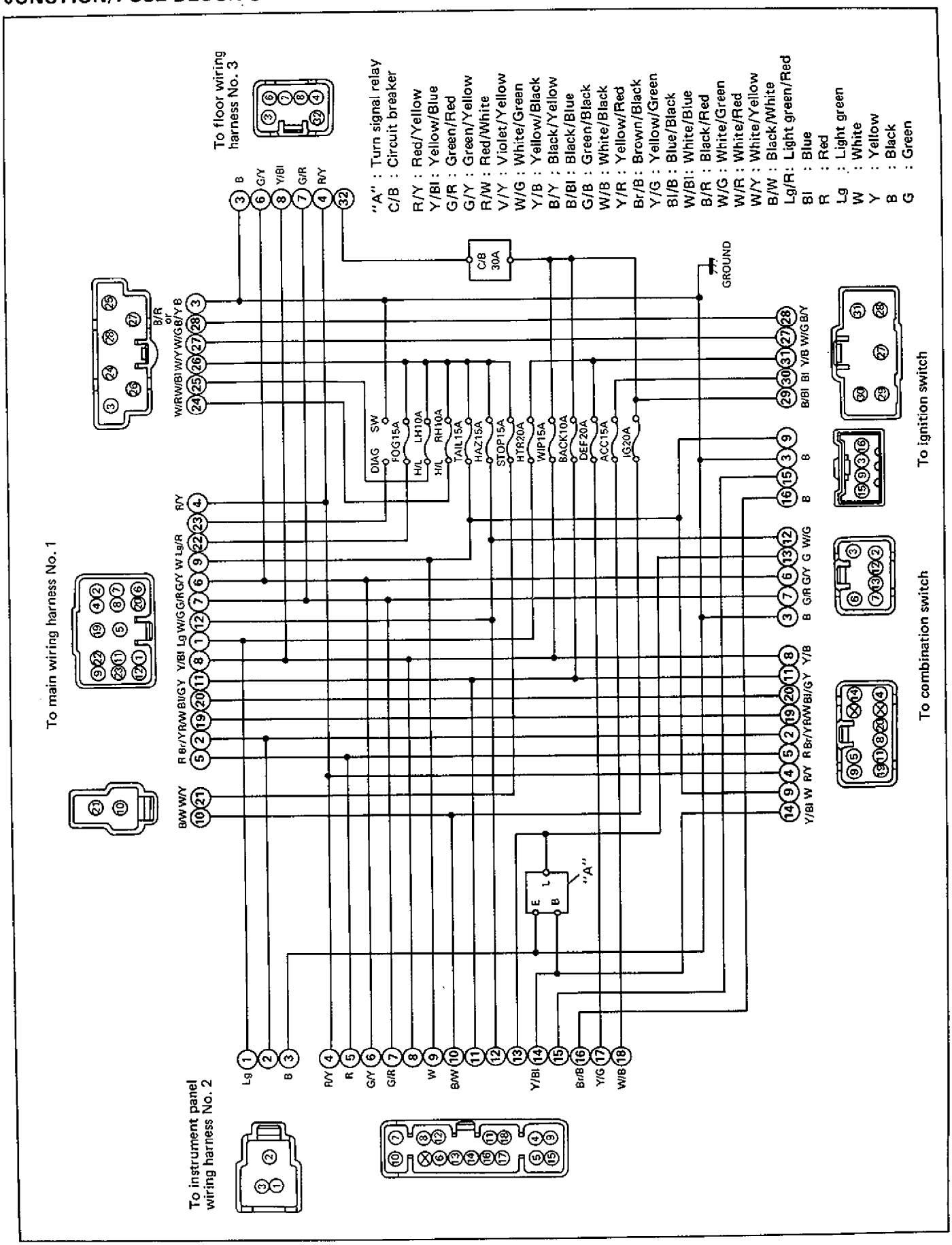


Fig. 8-3

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 \ Wire color / Position		W/G	Bl	B/Bl	Y/B	B/Y	B	B
OUT	LOCK	○						
IN	ACC	○—○						
	ON	○—○—○—○						
	START	○—		—○—		—○	○—	—○

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

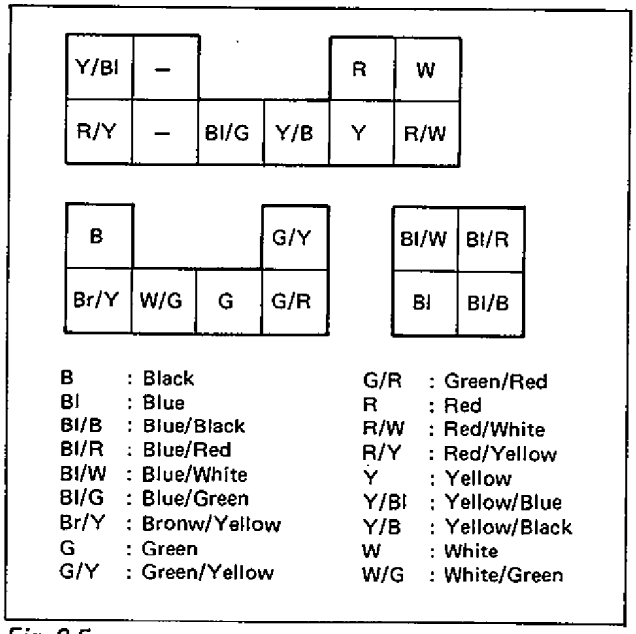


Fig. 8-5

Continuity between terminals

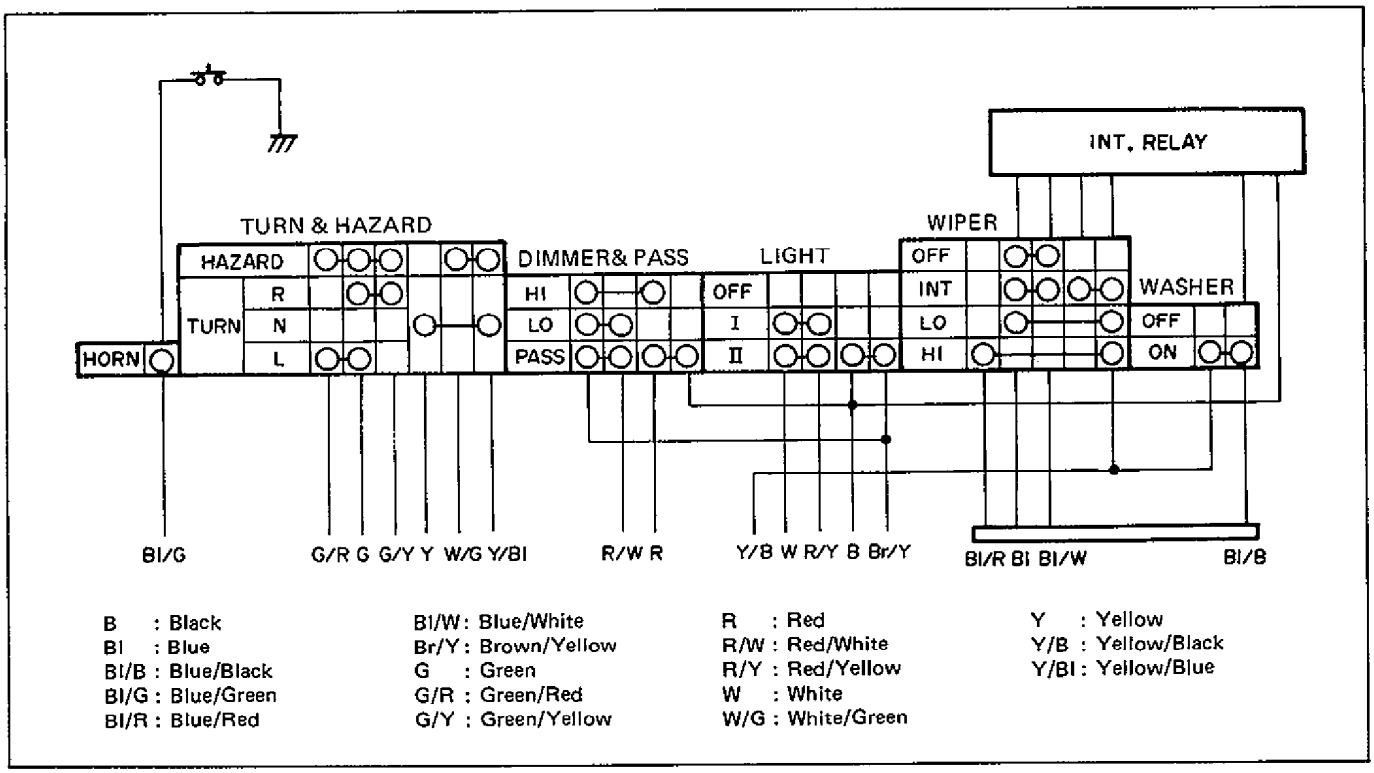


Fig. 8-6

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.

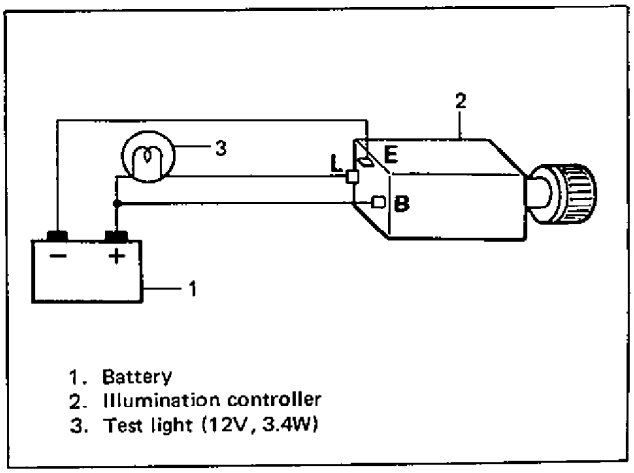


Fig. 8-7

INSTRUMENTS AND GAUGES

COMBINATION METER WIRING

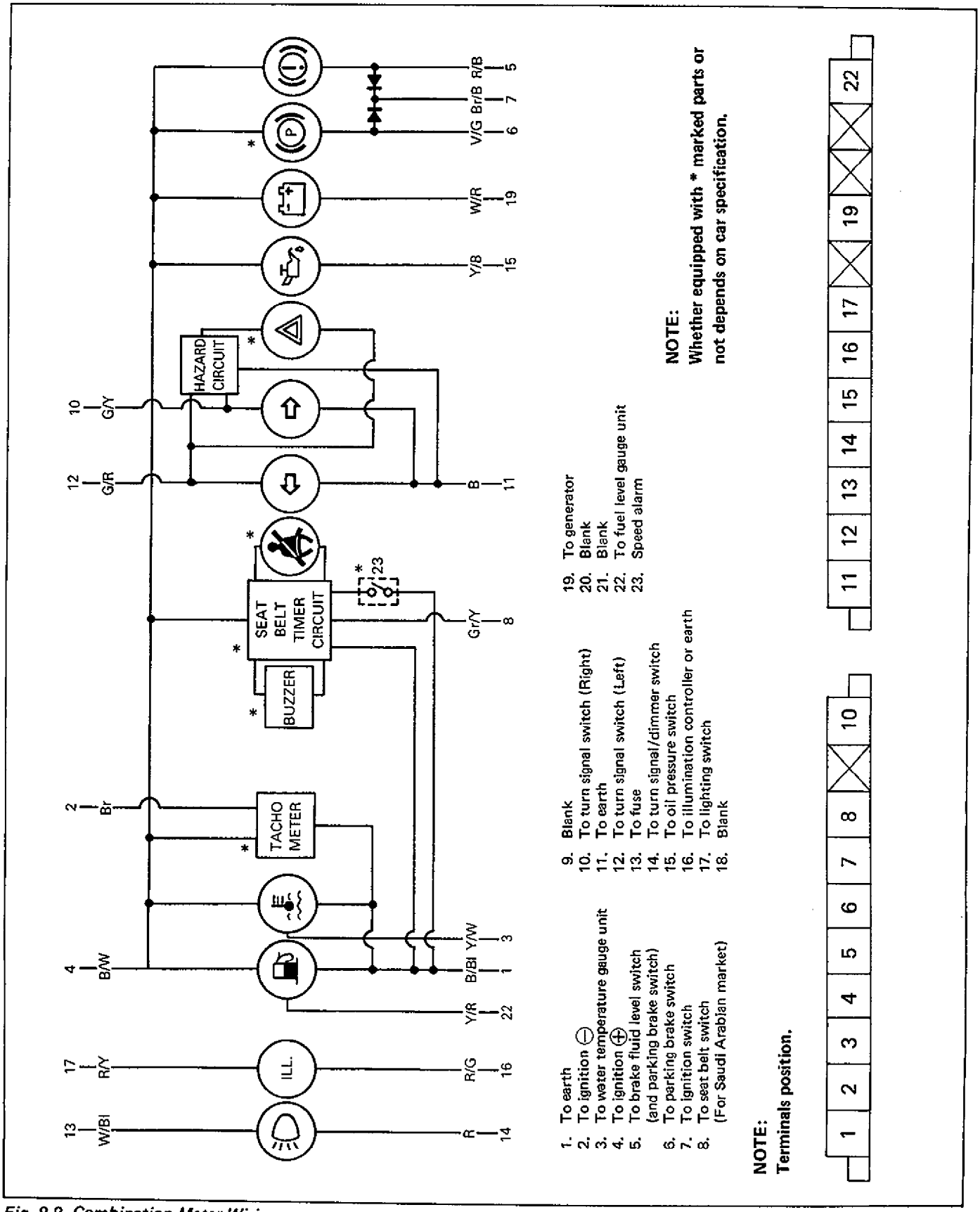


Fig. 8-8 Combination Meter Wiring

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.

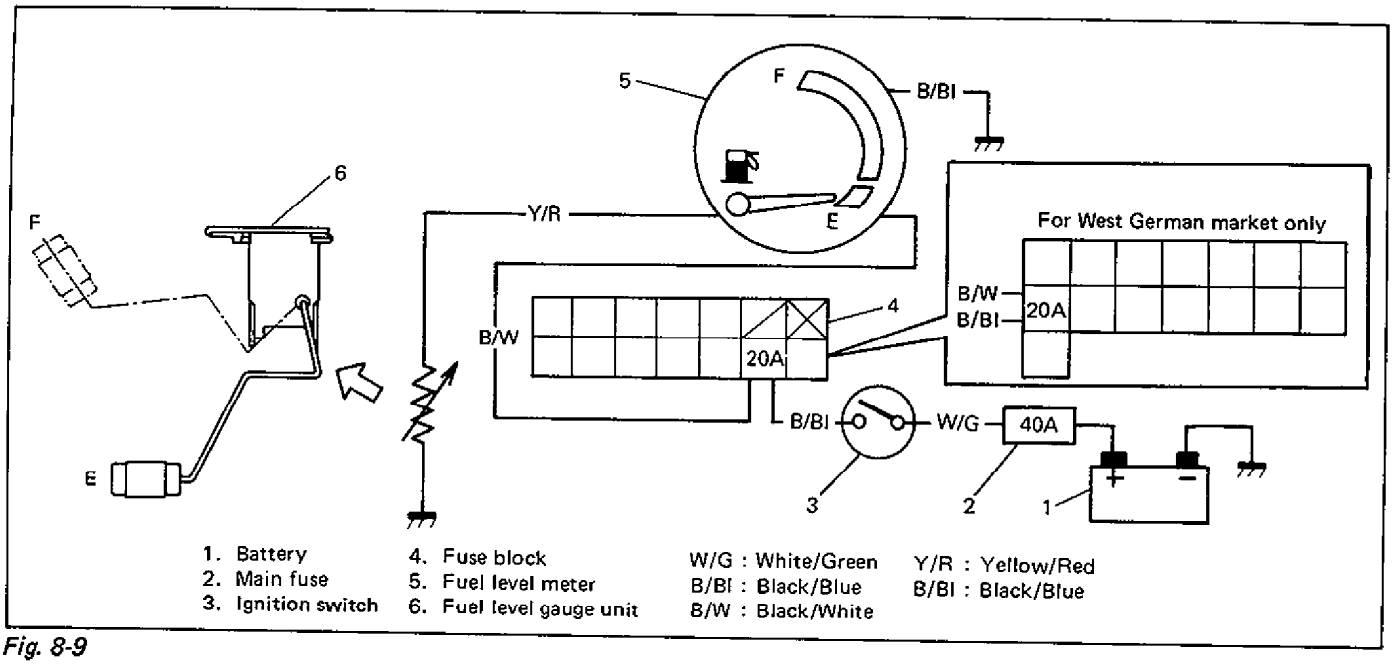


Fig. 8-9

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.

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.

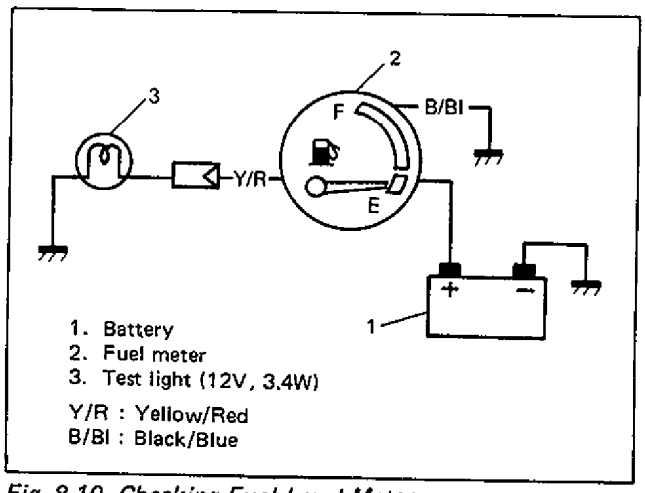


Fig. 8-10 Checking Fuel Level Meter

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.

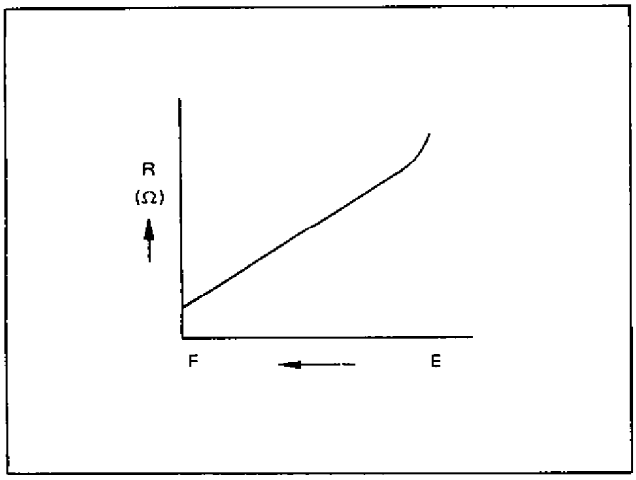


Fig. 8-11 Resistance-Fuel Level Relationship

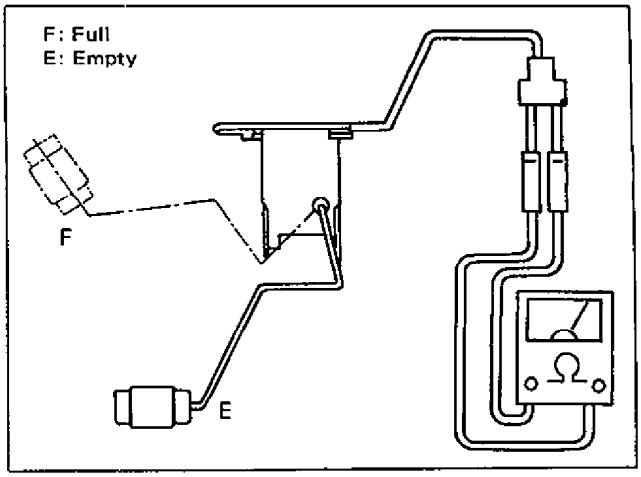


Fig. 8-12 Checking Fuel Gauge Unit

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.

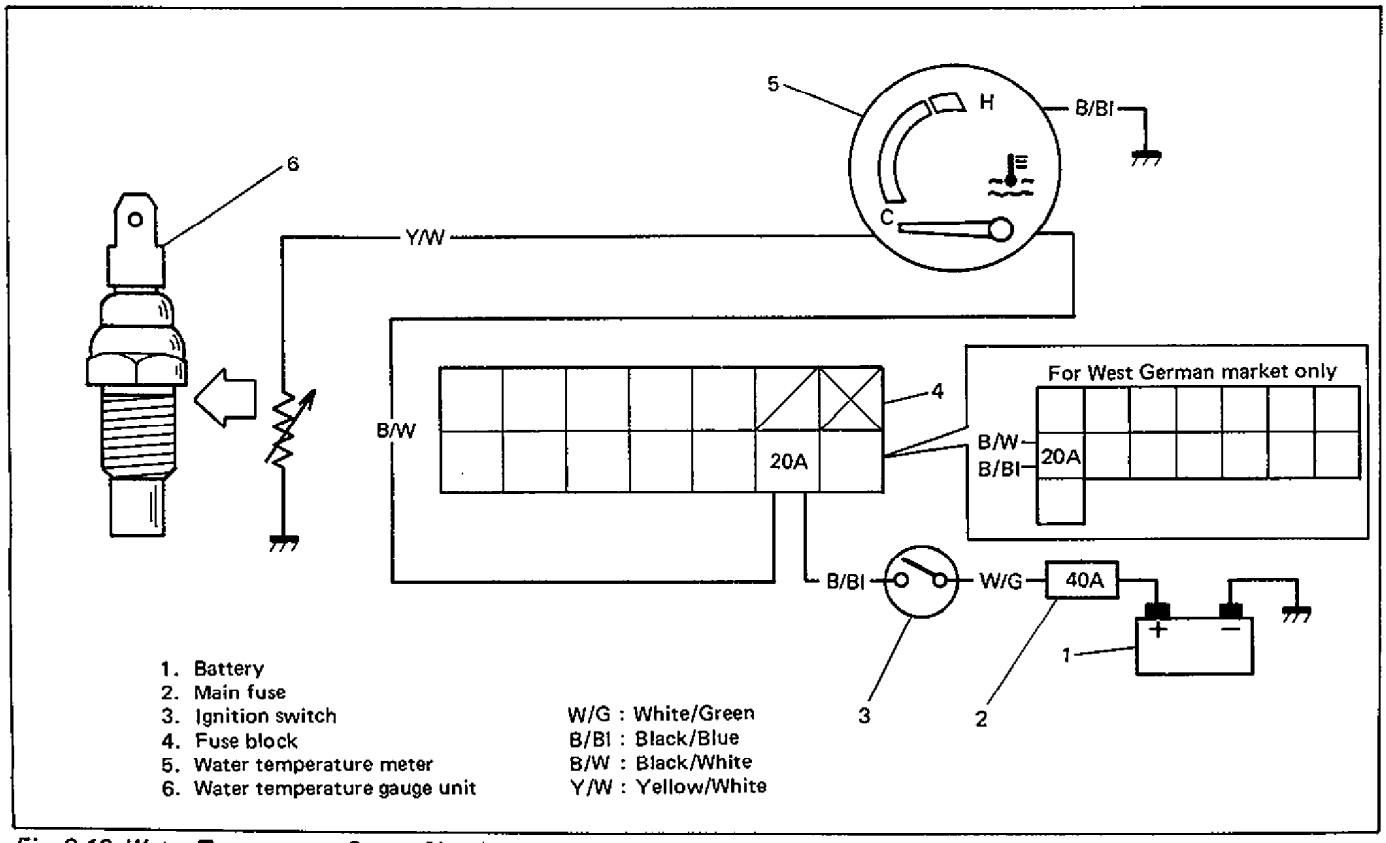


Fig. 8-13 Water Temperature Gauge Circuit

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.

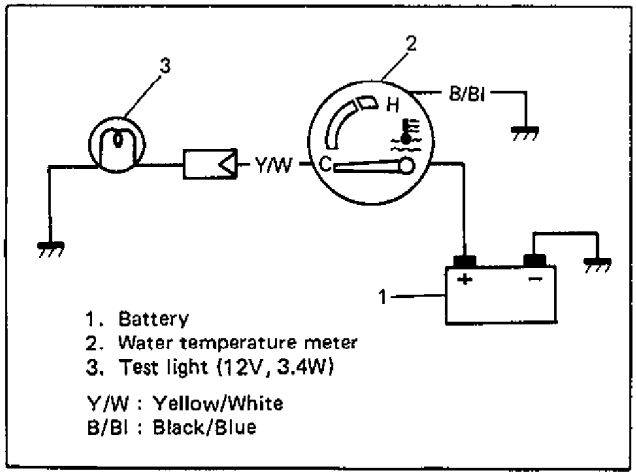


Fig. 8-14 Checking Water Temperature Meter

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.

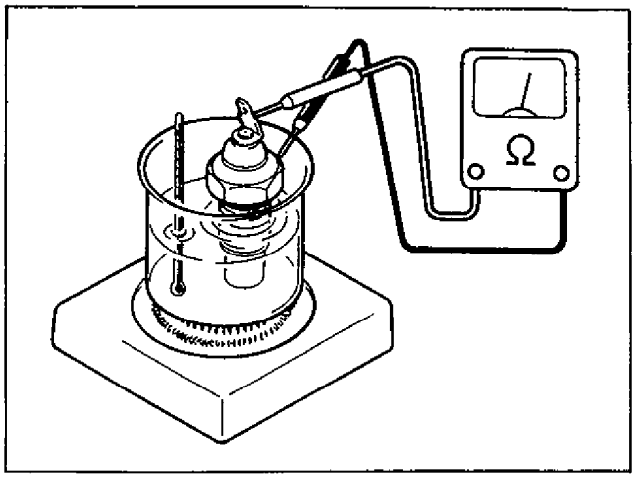


Fig. 8-15 Checking Temperature Gauge Unit

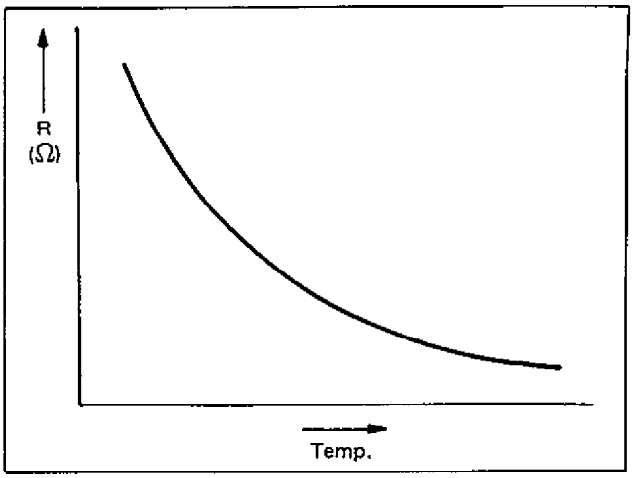


Fig. 8-16 Resistance-Temp. Relationship

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.

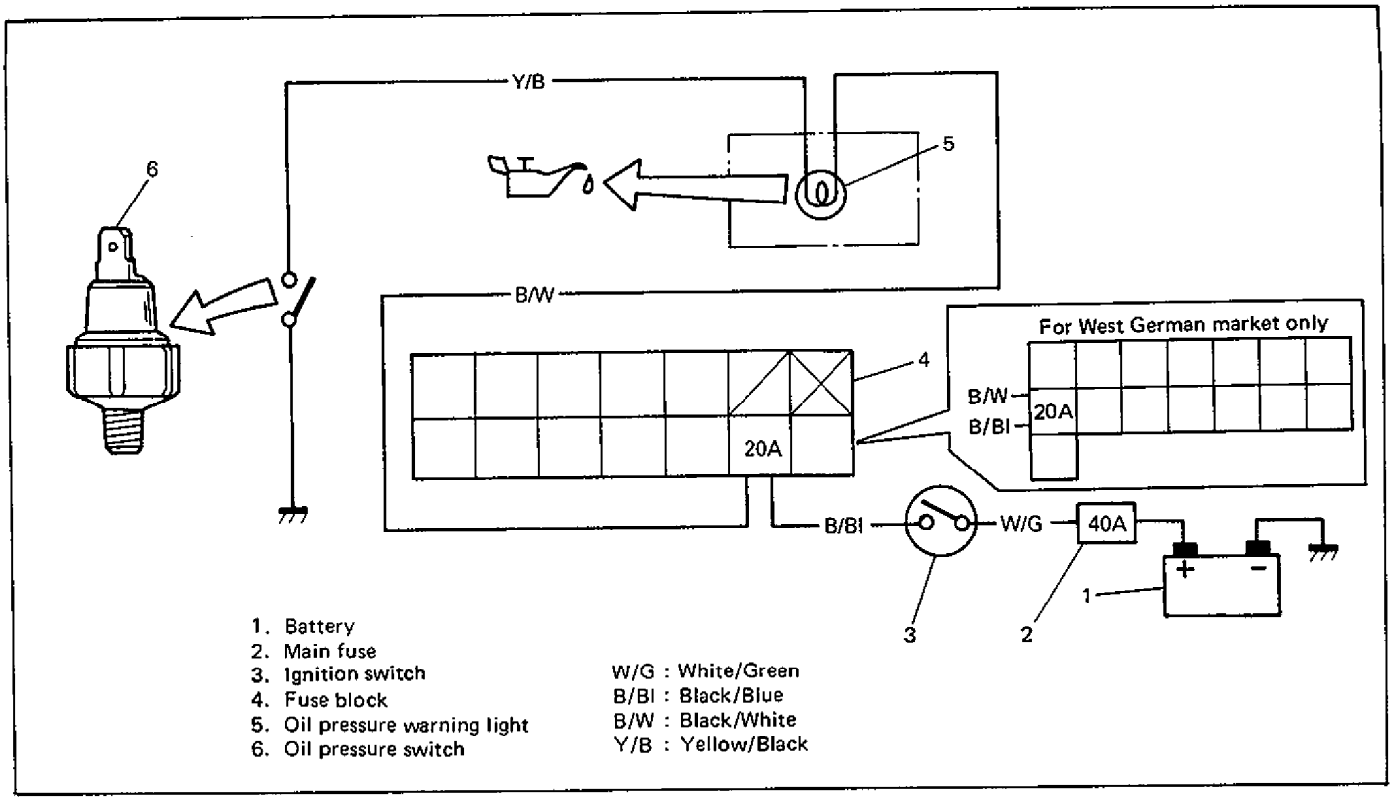


Fig. 8-17 Oil Pressure Switch Circuit

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 (∞ Ω)
At Engine Stop	Continuity obtained (0 Ω)

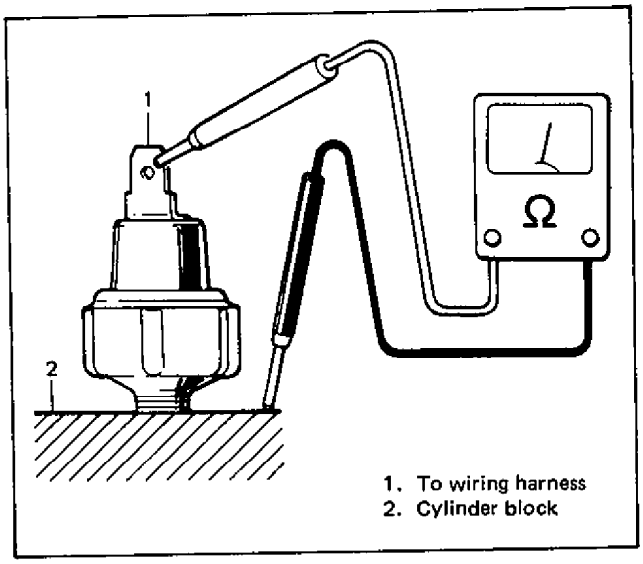


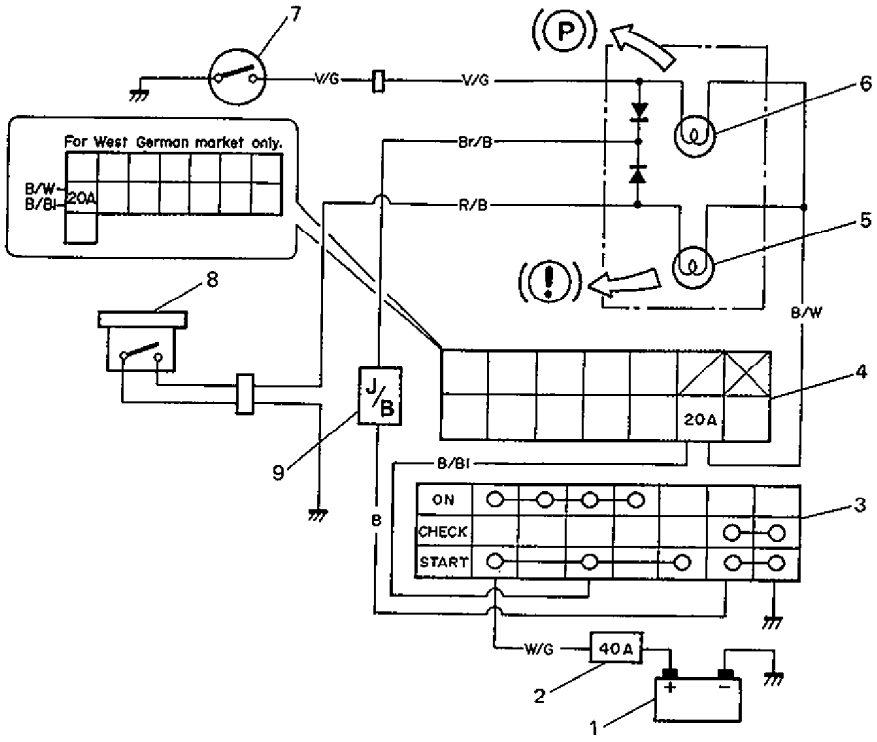
Fig. 8-18 Checking Oil Pressure Switch

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

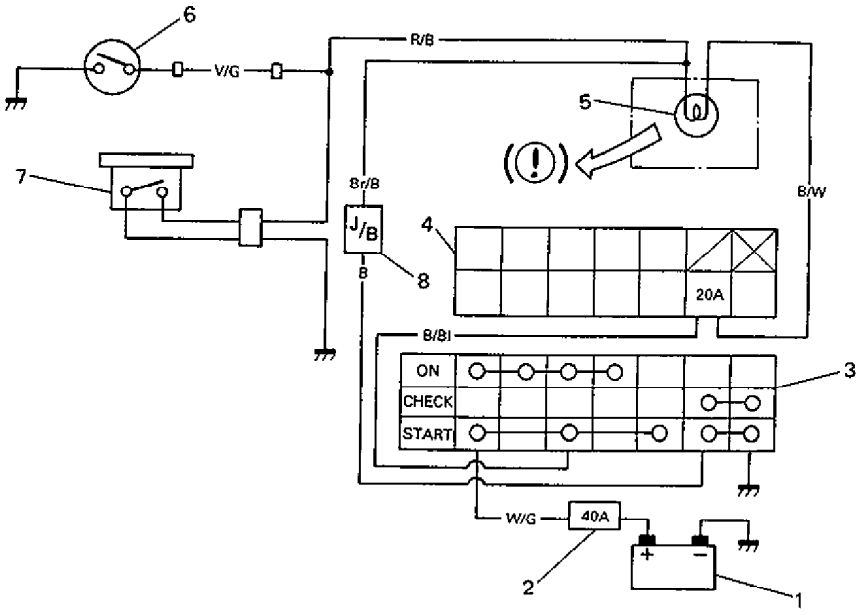


1. Battery
2. Main fuse
3. Ignition switch
4. Fuse block
5. Brake fluid level warning light
6. Parking brake indicator light
7. Parking brake switch
8. Brake fluid level switch
9. Junction block

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

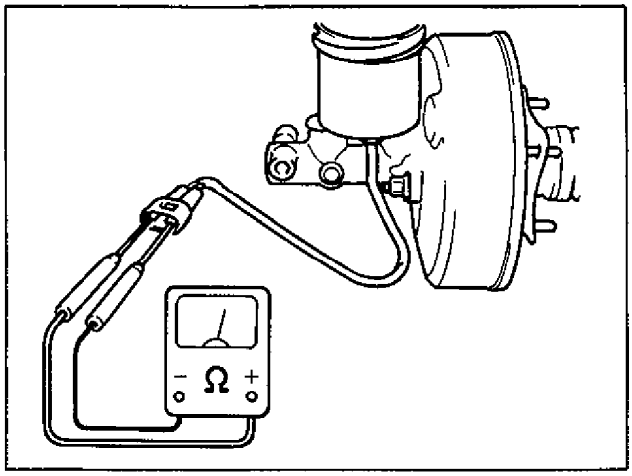


Fig. 8-20 Checking Fluid Level Switch

SEAT BELT WARNING LIGHT/BUZZER (For Saudi Arabian market 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.

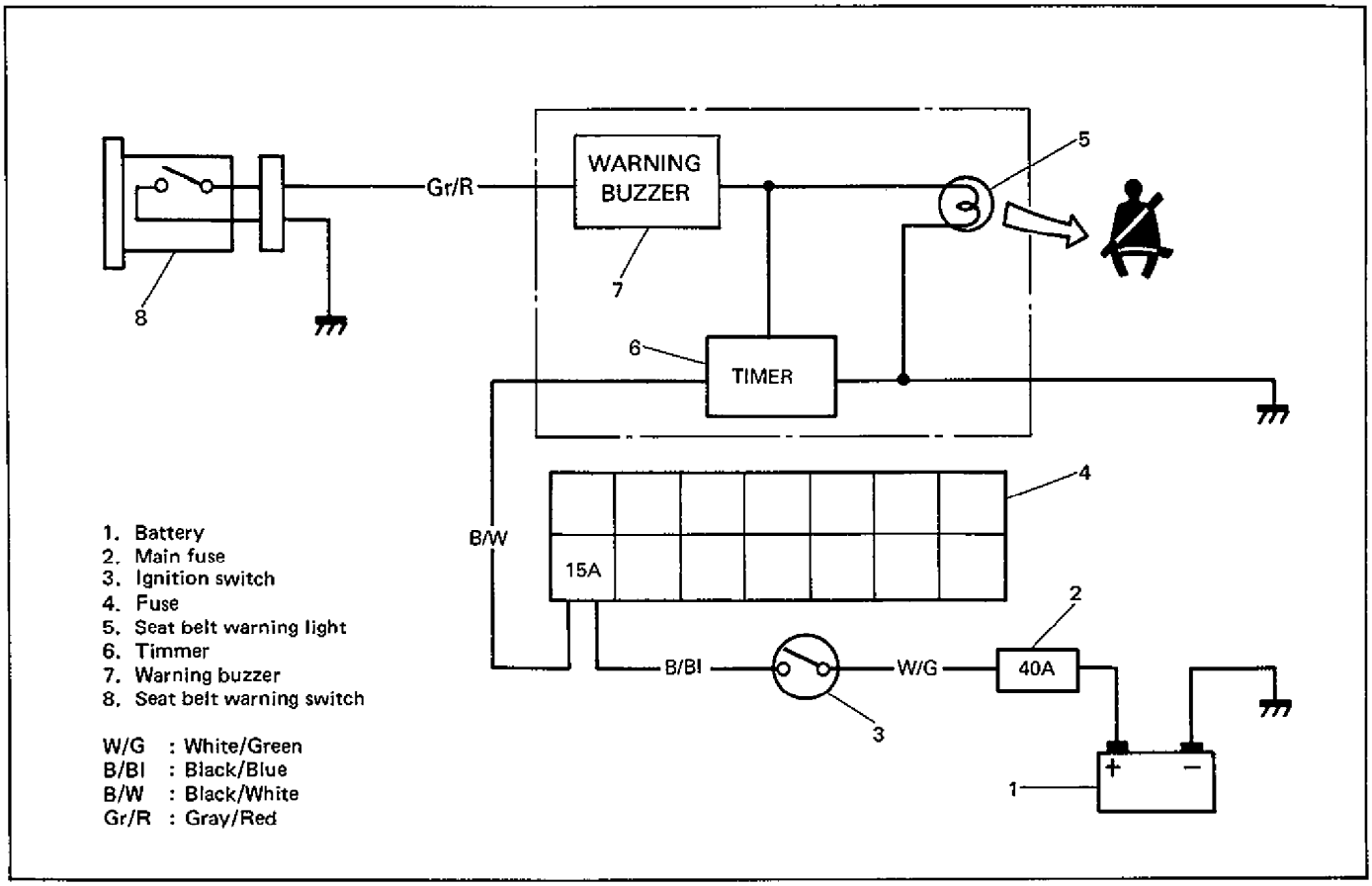


Fig. 8-21 Seat Belt Warning System Circuit

INSPECTION

When warning light/buzzer fails to make lighting/sounding, use above circuit diagram as reference to check bulb, buzzer, wiring, etc.

ON CAR SERVICE

LIGHTING SYSTEMS

HEADLIGHTS

WIRING CIRCUIT

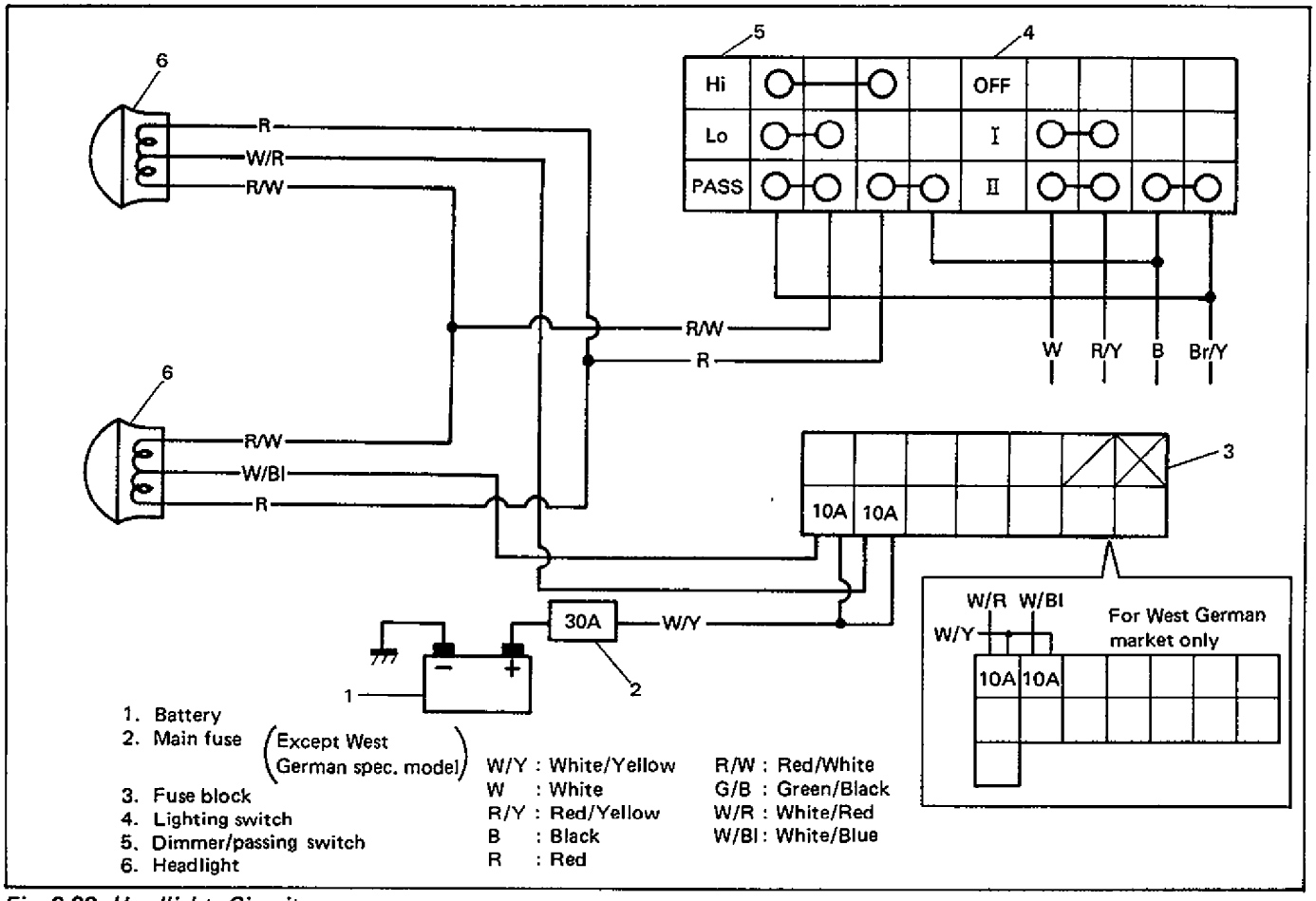


Fig. 8-22 Headlights Circuit

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	Replace light.
	Fuse blown	Replace fuse.
	Socket, wiring or grounding faulty	Repair as necessary.
Headlights do not light.	Main fuse and/or fuses blown	Replace main fuse and/or fuses to check for short.
	Lighting and dimmer switches faulty	Check switches.
	Wiring or grounding faulty	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.

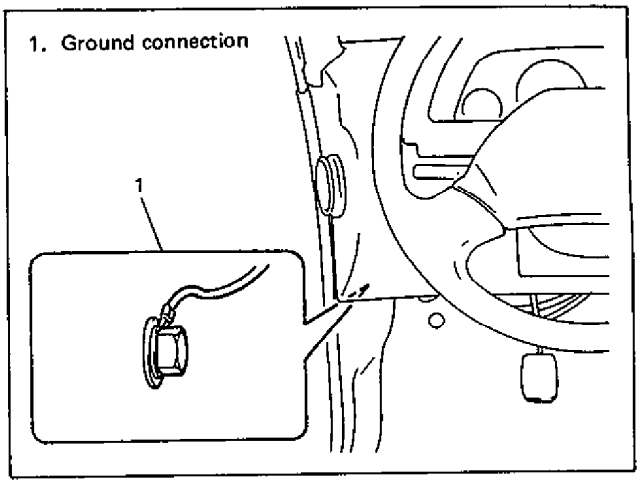


Fig. 8-23

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.

1. Vertical beam alignment

Unless otherwise obligated by local regulations, align headlight beams according to following procedure. Set a blank wall 10 m (32.8 ft) ahead of headlights. Check where on wall hot spot (high intensity zone) of each main (high) beam falls. It should be within a vertical range on wall from headlight height "H" to height "h" which is 1/5 of H lower therefrom as shown below.

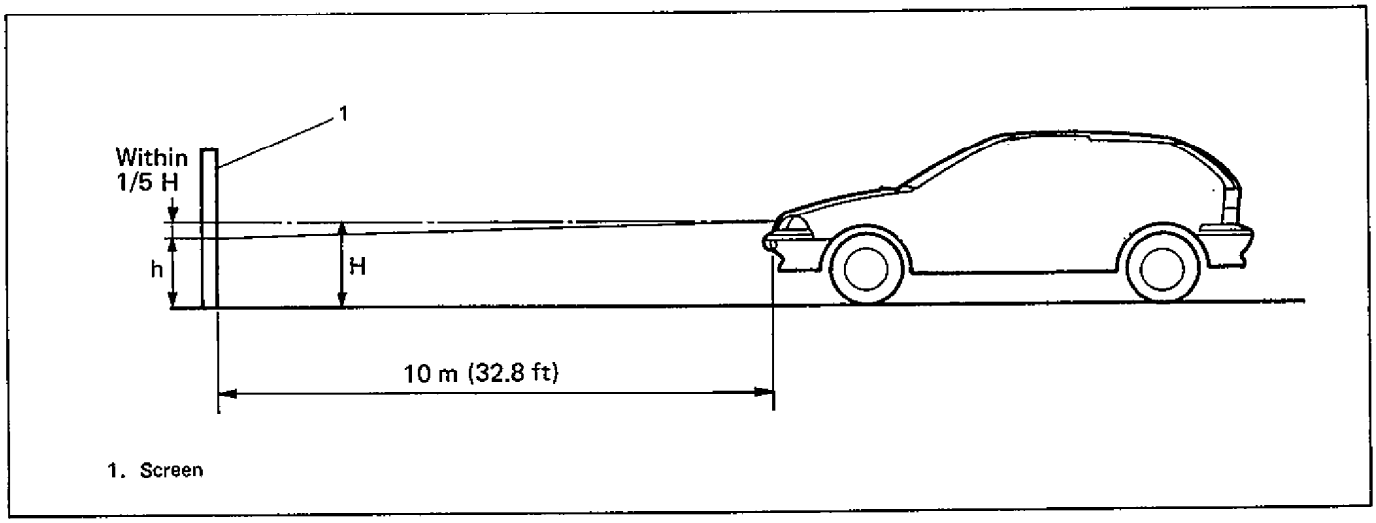


Fig. 8-24

2. Horizontal beam alignment

Check that hot spot of each main (high) beam is within a horizontal range on wall as specified below.

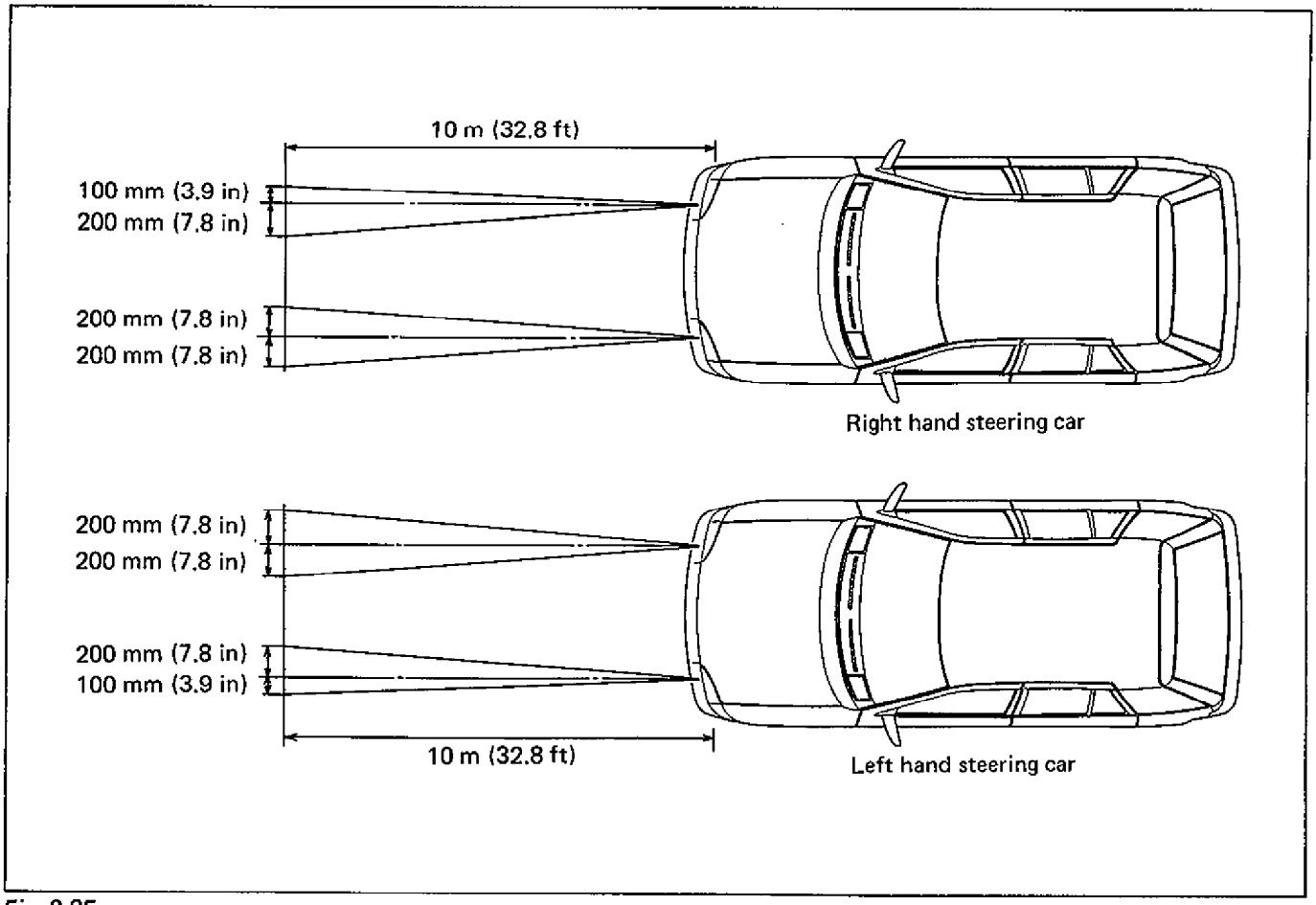


Fig. 8-25

HEADLIGHT ADJUSTMENT

When adjusting headlight beam (vertical and horizontal), turn adjusting bolts.

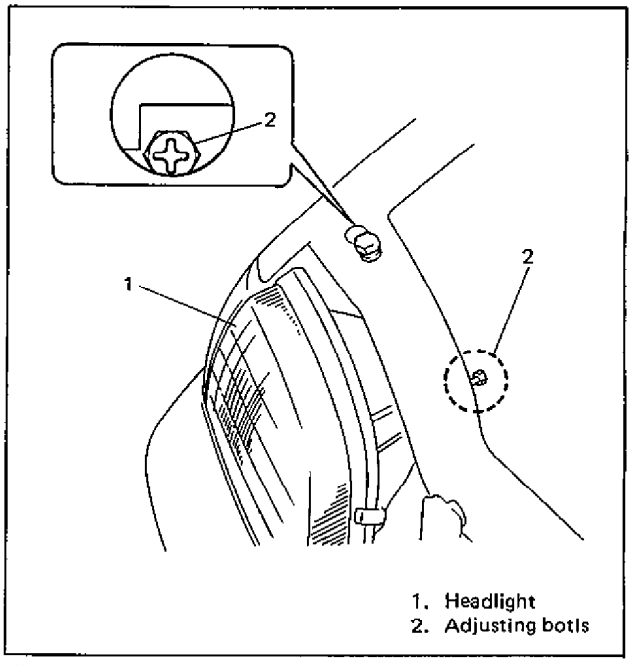


Fig. 8-26

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.

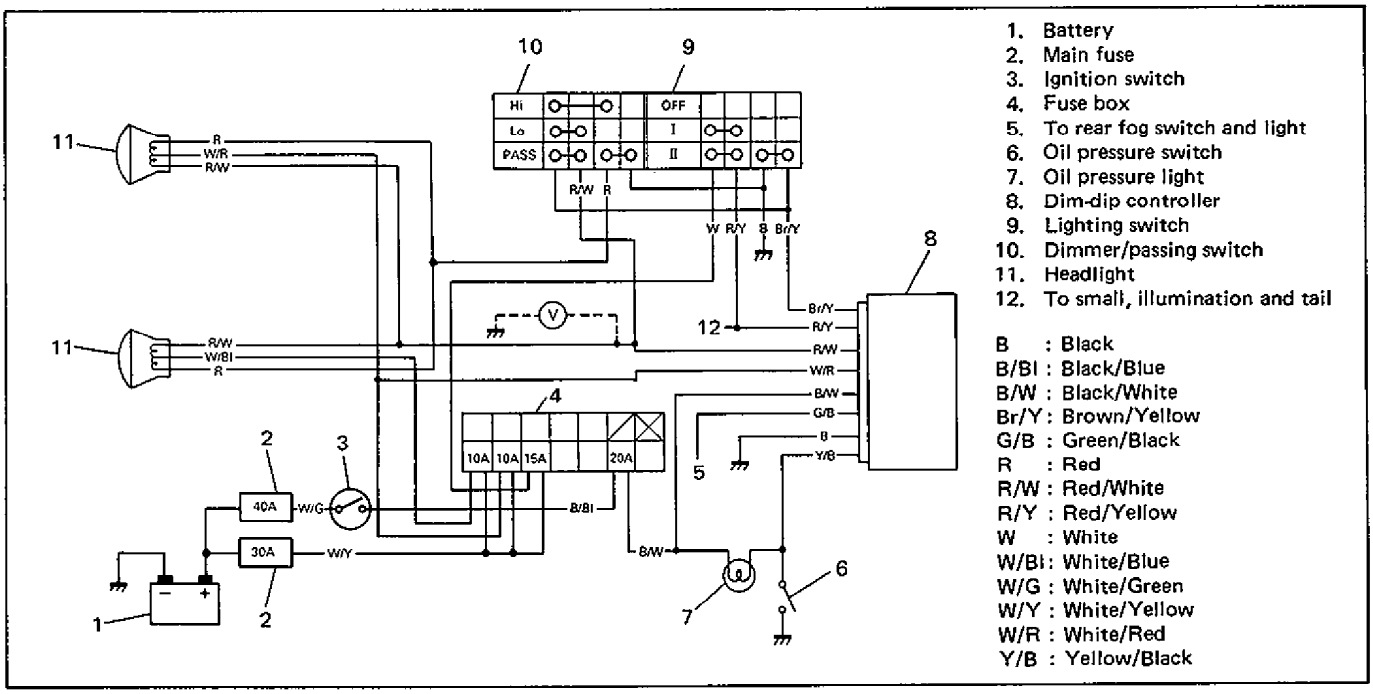


Fig. 8-27 Dim-Dip System Circuit

TURN SIGNAL AND HAZARD WARNING LIGHT

Wiring Circuit

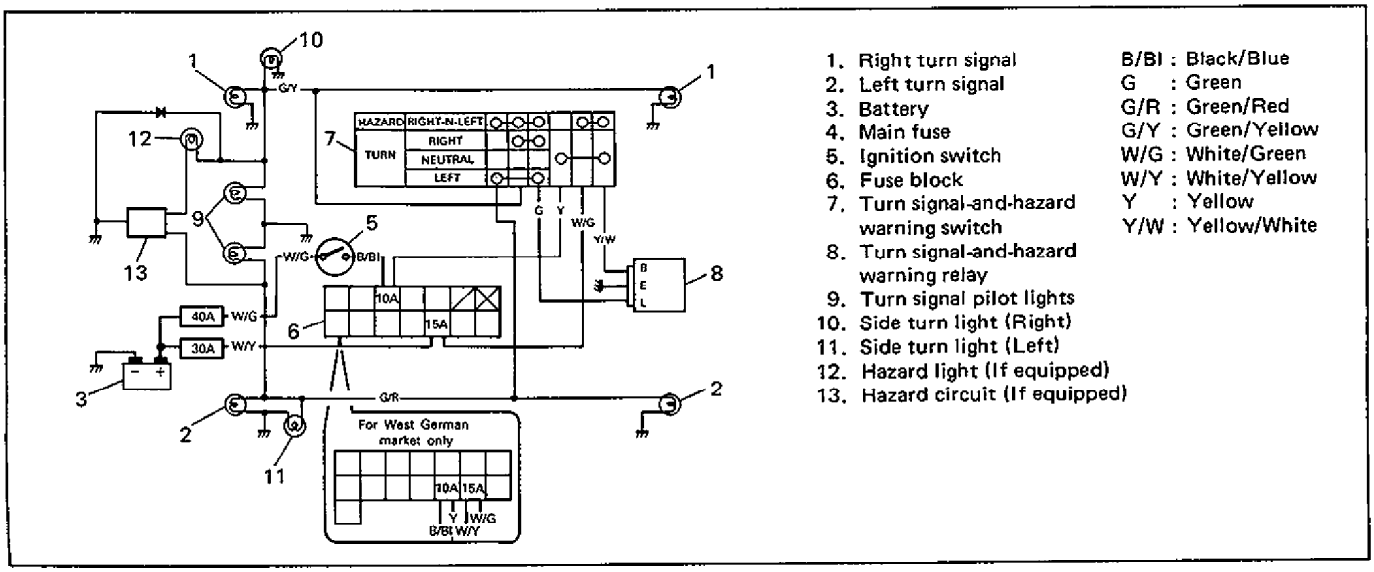


Fig. 8-28 Turn Signal Hazard Warning Circuit

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. Open circuit or high resistance existing between swith and relay	Repair
	4. Defective swith	Replace.
	5. Defective relay	Replace.
Flash rate low	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.

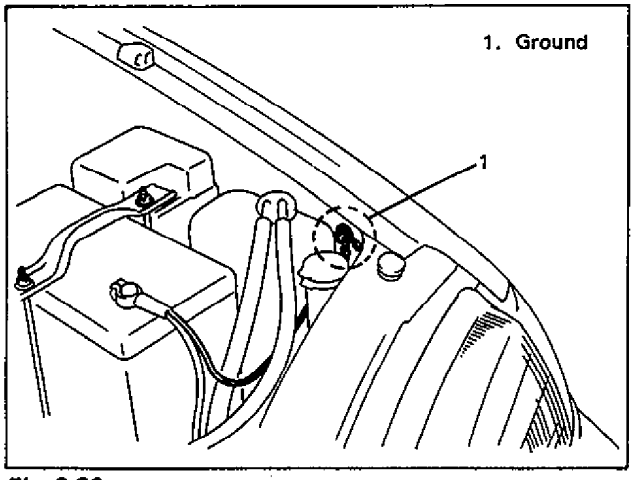


Fig. 8-29

BACK-UP LIGHTS

WIRING CIRCUIT

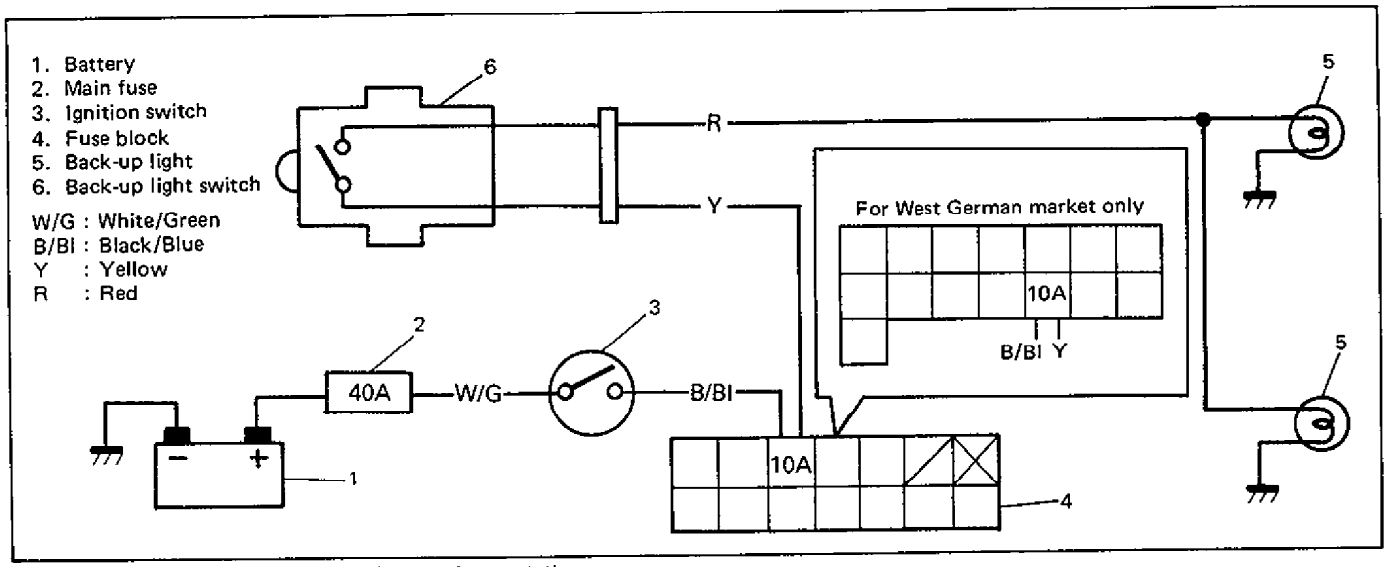


Fig. 8-30 Back-up Light Circuit (For M/T model)

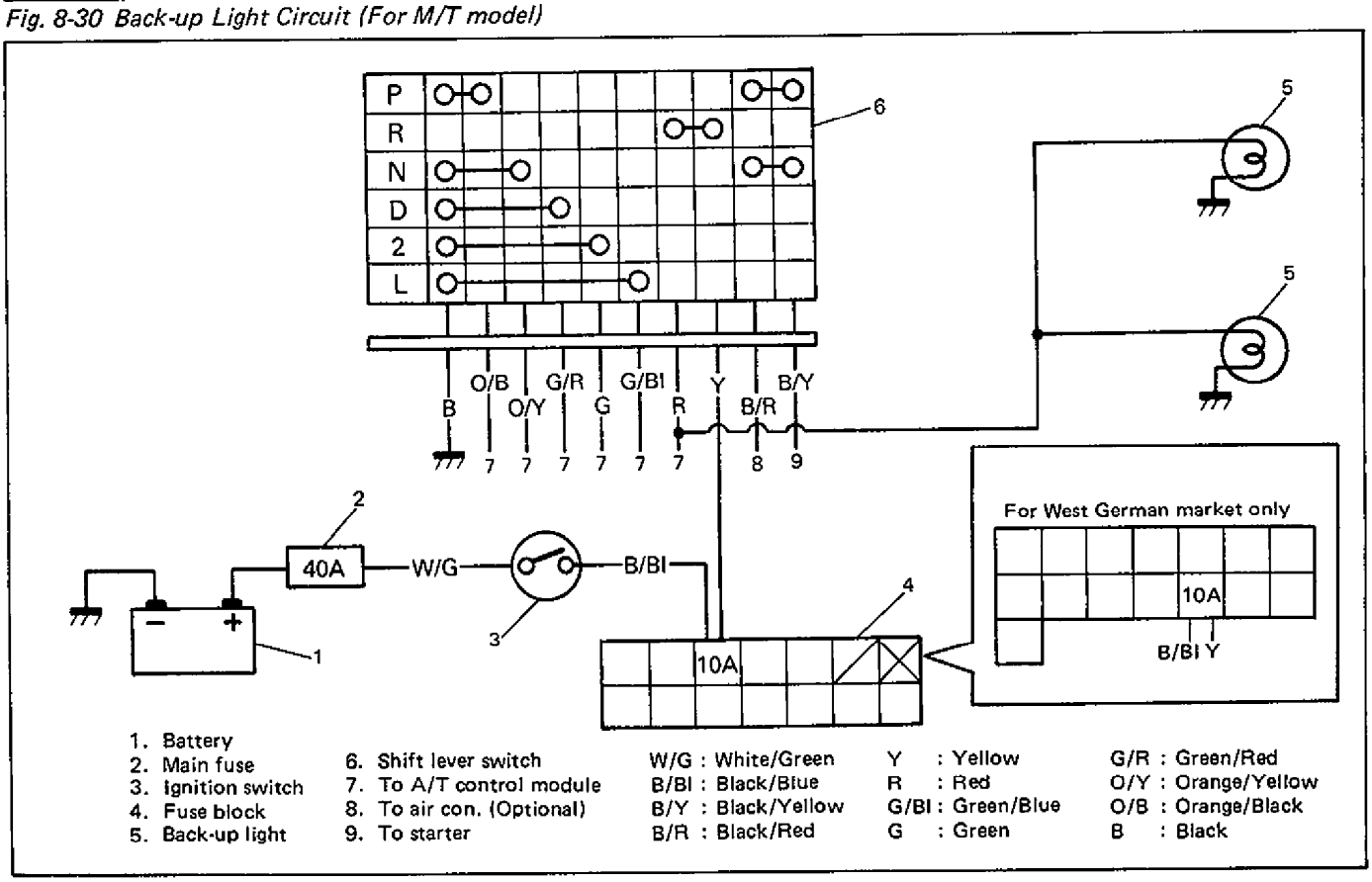


Fig. 8-31 Back-up Light Circuit (For A/T model)

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 shift lever switch faulty	Check switch.
	Wiring or grounding faulty	Repair as necessary.

STOP LIGHTS

WIRING CIRCUIT

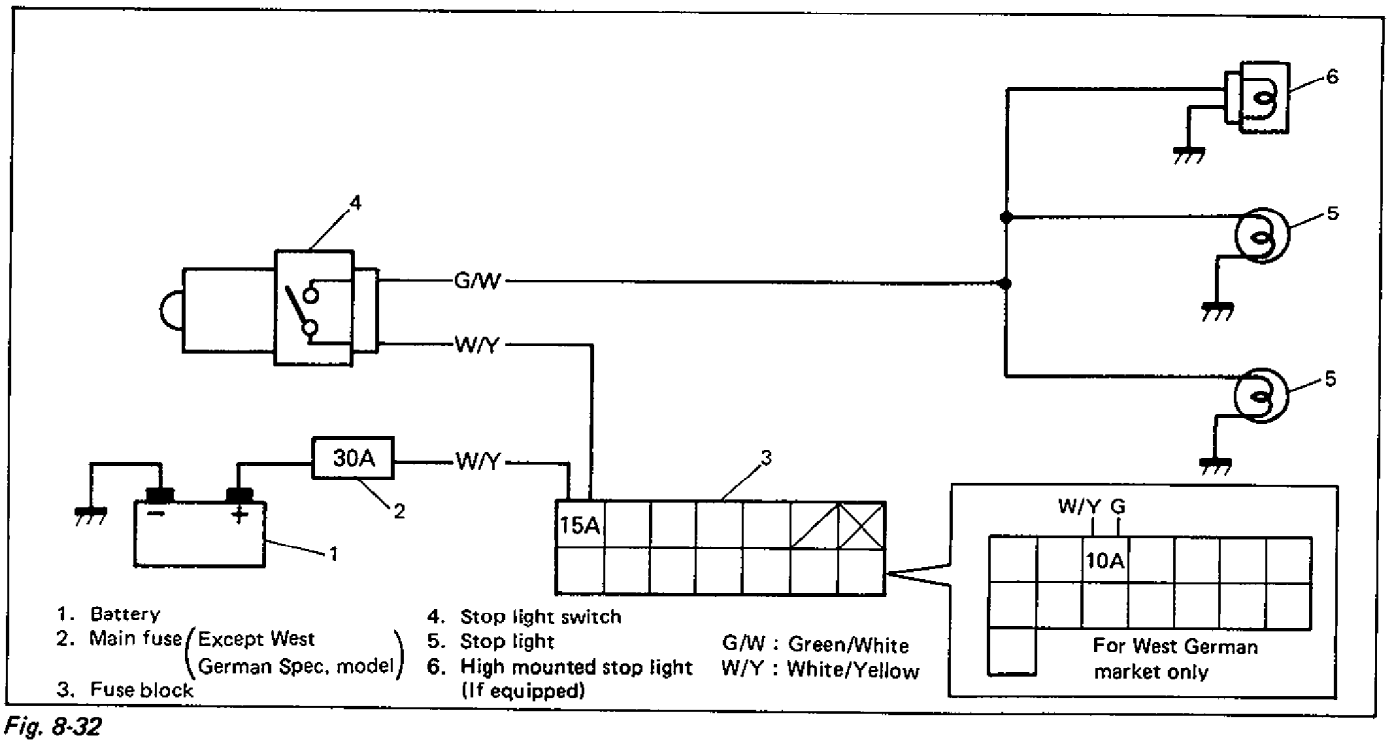


Fig. 8-32

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 West German market)

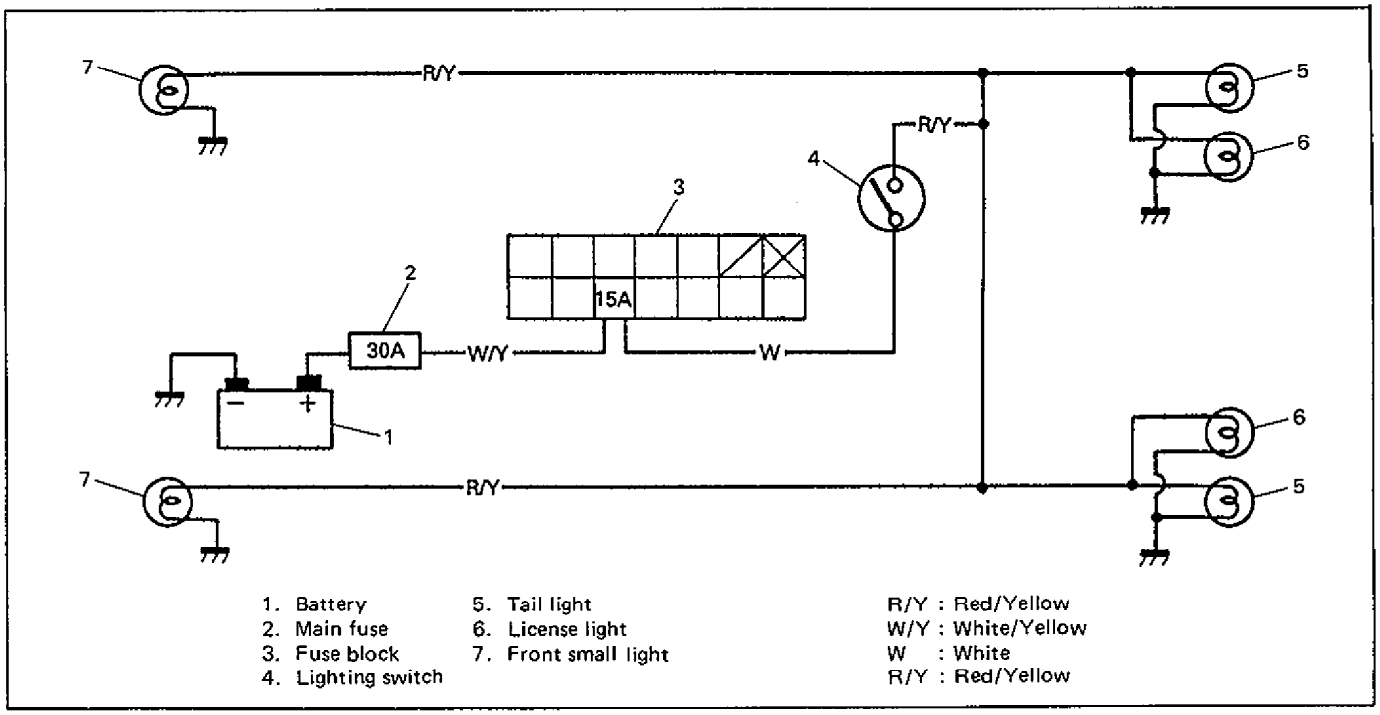


Fig. 8-33-1

WIRING CIRCUIT (For West German market)

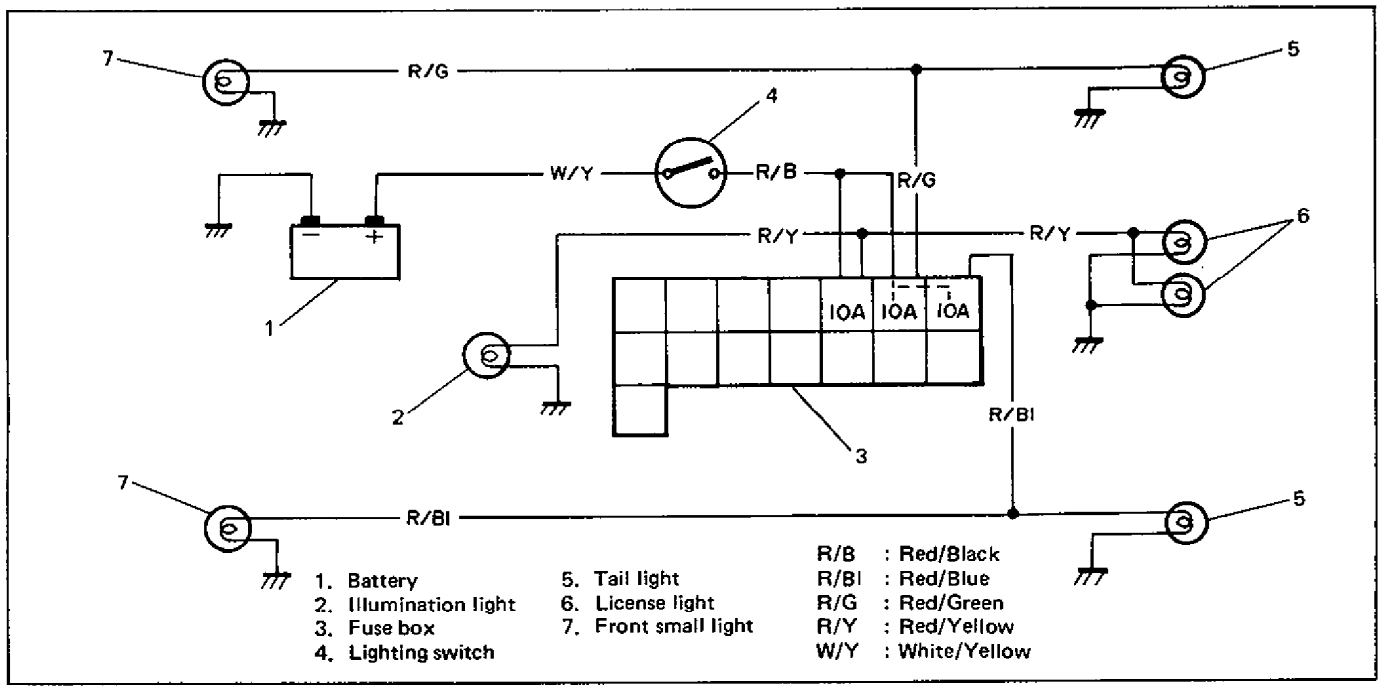


Fig. 8-33-2

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

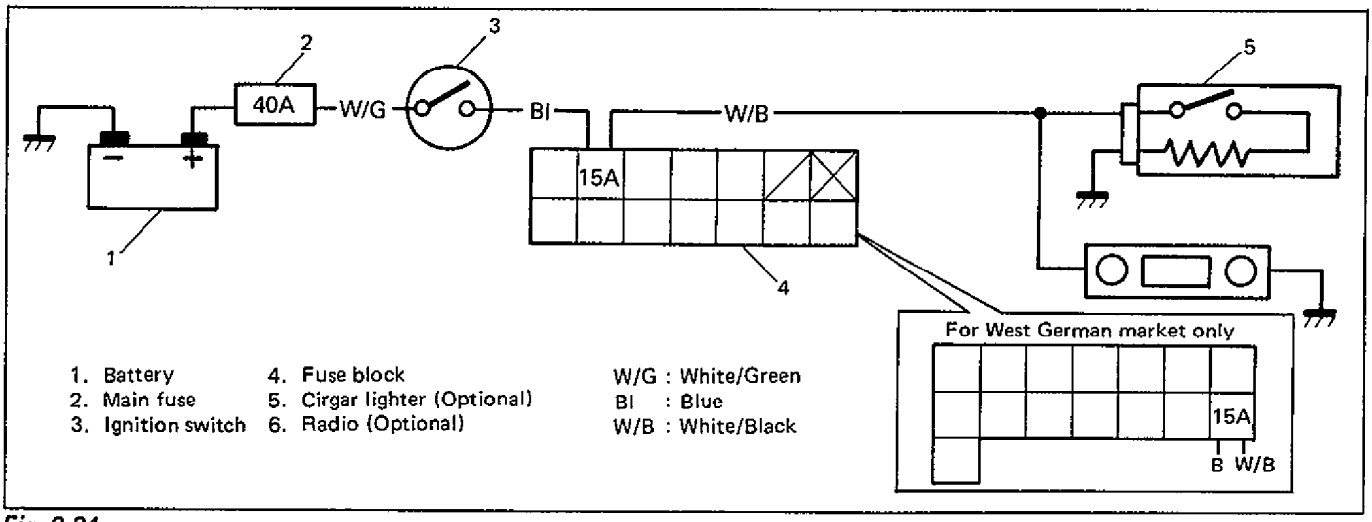


Fig. 8-34

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Cigar lighter (radio) does not work.	Fuse blown	Replace fuse to check for short.
	Main switch faulty	Check switch.
	Wiring or grounding faulty	Repair as necessary.

INTERIOR (DOME) LIGHT

WIRING CIRCUIT

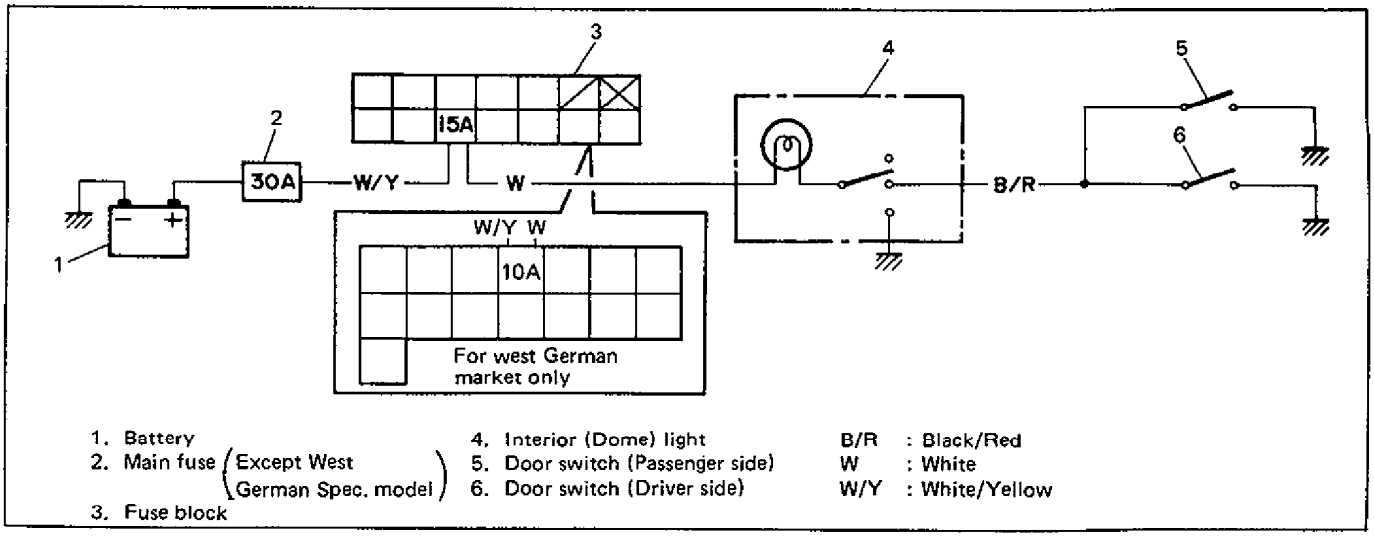


Fig. 8-35 Interior Light Circuit

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Interior light does not light.	Fuse blown	Replace fuse to check for short.
	Switch faulty	Check switch
	Wiring or grounding faulty	Repair as necessary

FRONT WINDOW WIPER (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.

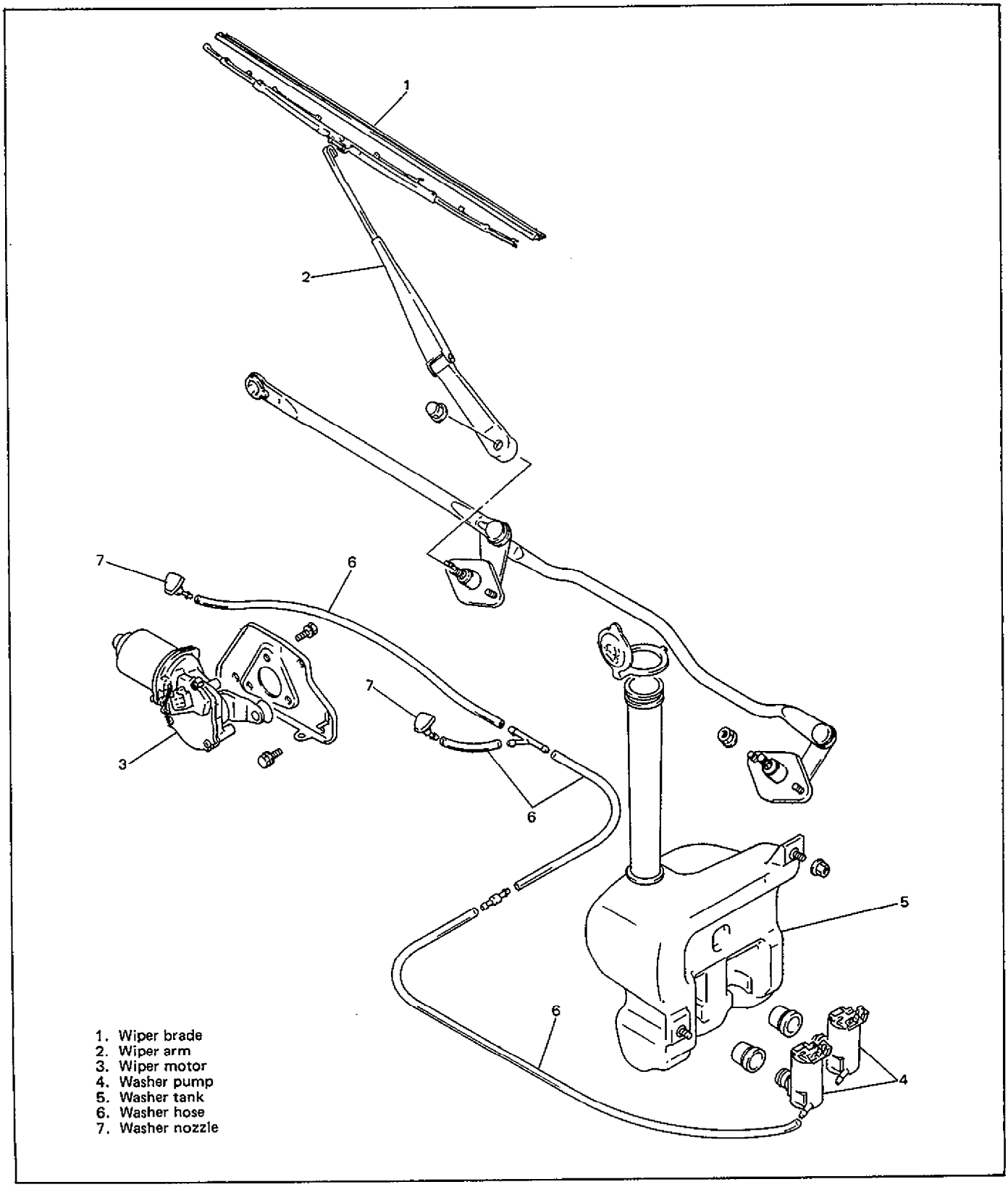


Fig. 8-36 Windshield Wiper and Washer

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.

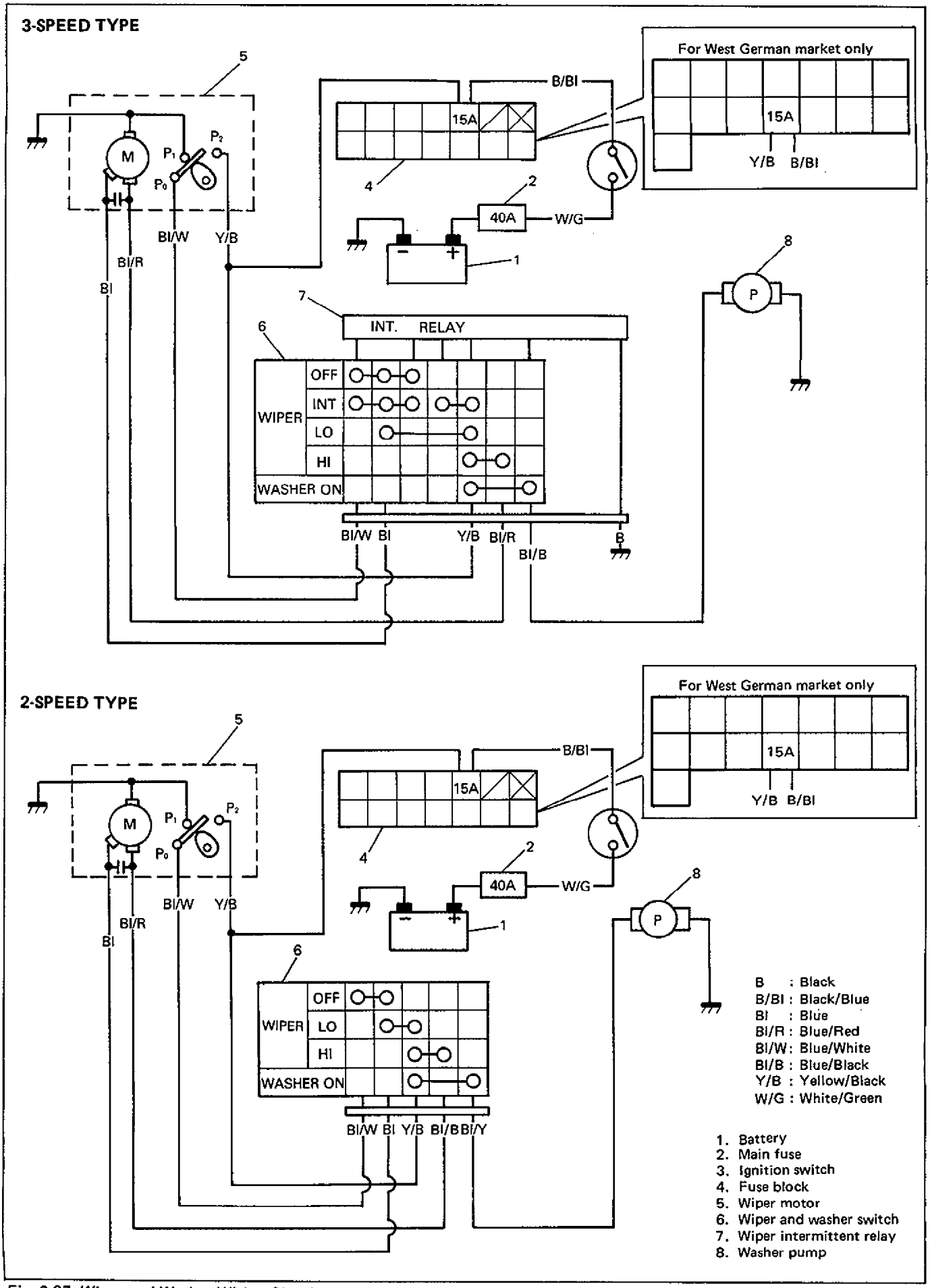


Fig. 8-37 Wiper and Washer Wiring Circuit

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.

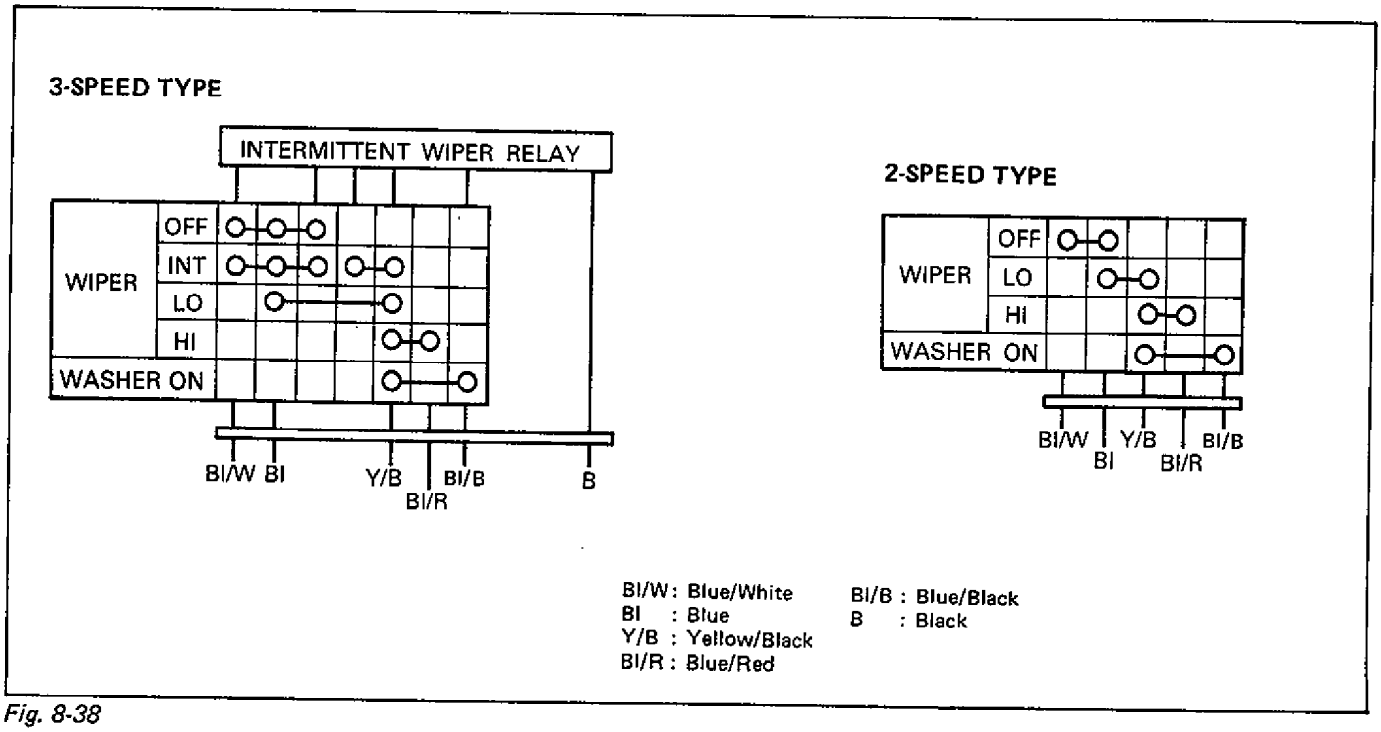


Fig. 8-38

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.

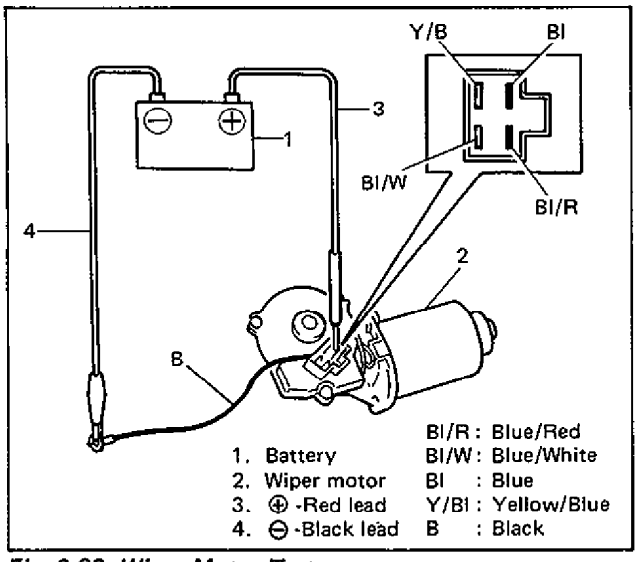


Fig. 8-39 Wiper Motor Test

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.

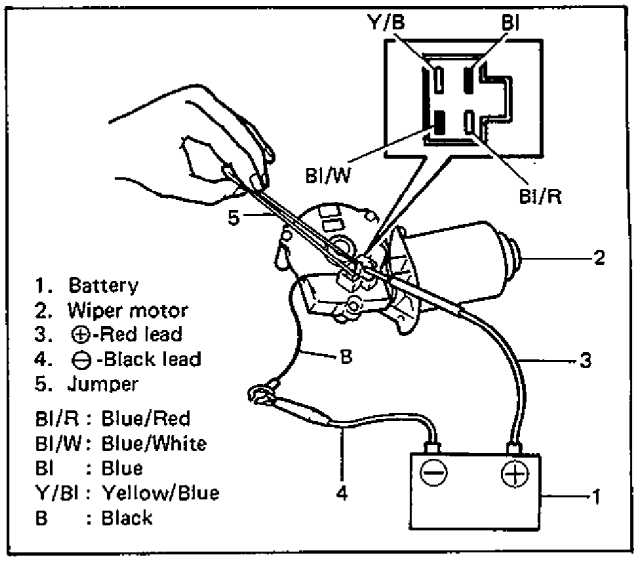


Fig. 8-40 Checking

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.

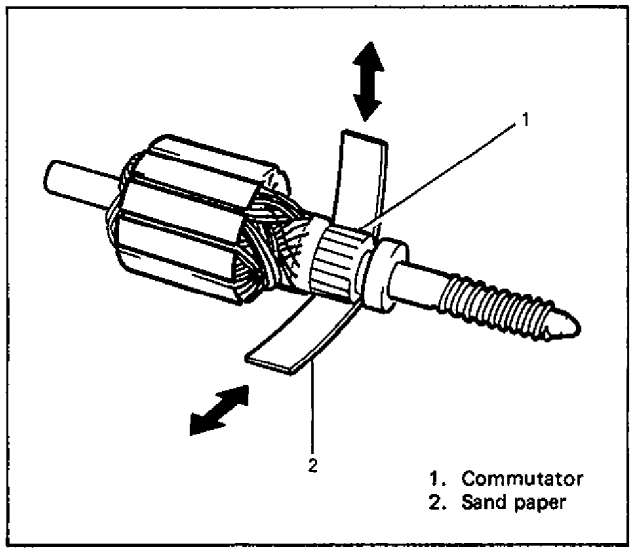


Fig. 8-41 Resurfacing Commutator

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.

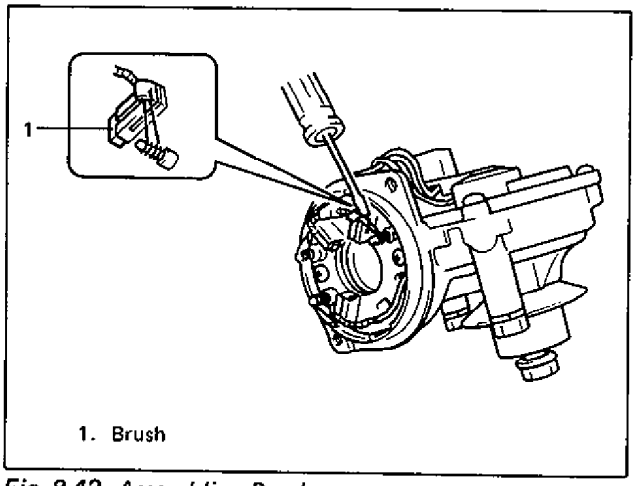


Fig. 8-42 Assembling Brushes

When assembling wiper motor cover, be careful of its notch position which serves as a guide for proper assembly.

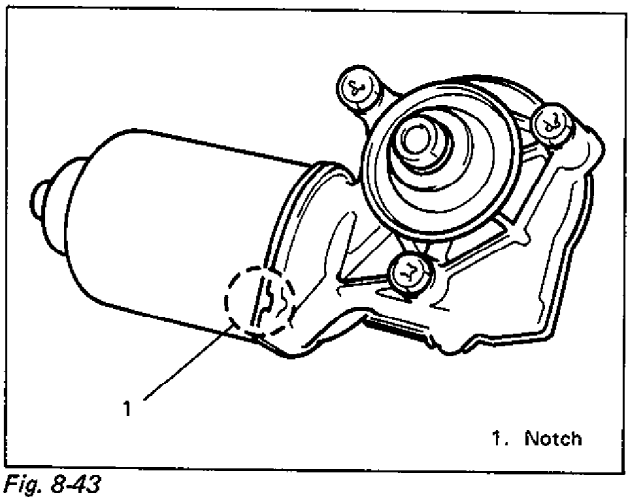


Fig. 8-43

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.

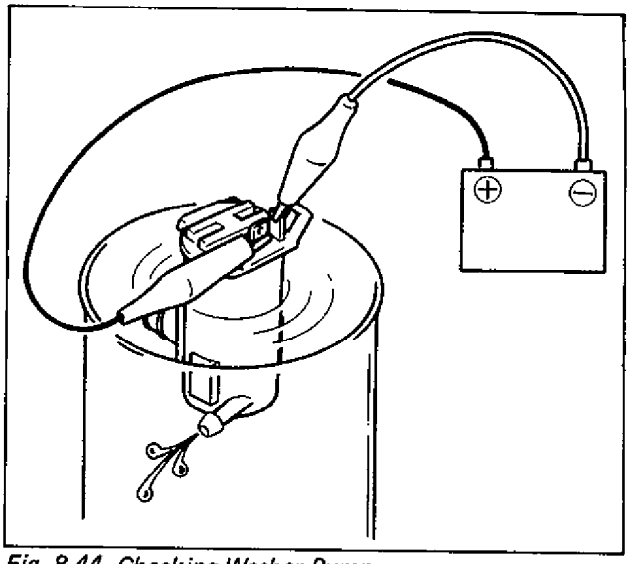


Fig. 8-44 Checking Washer Pump

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.

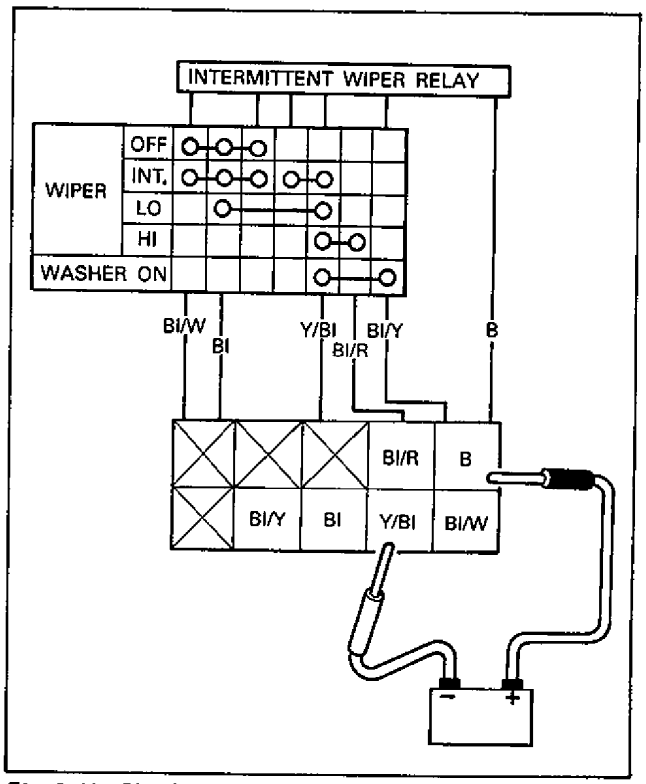
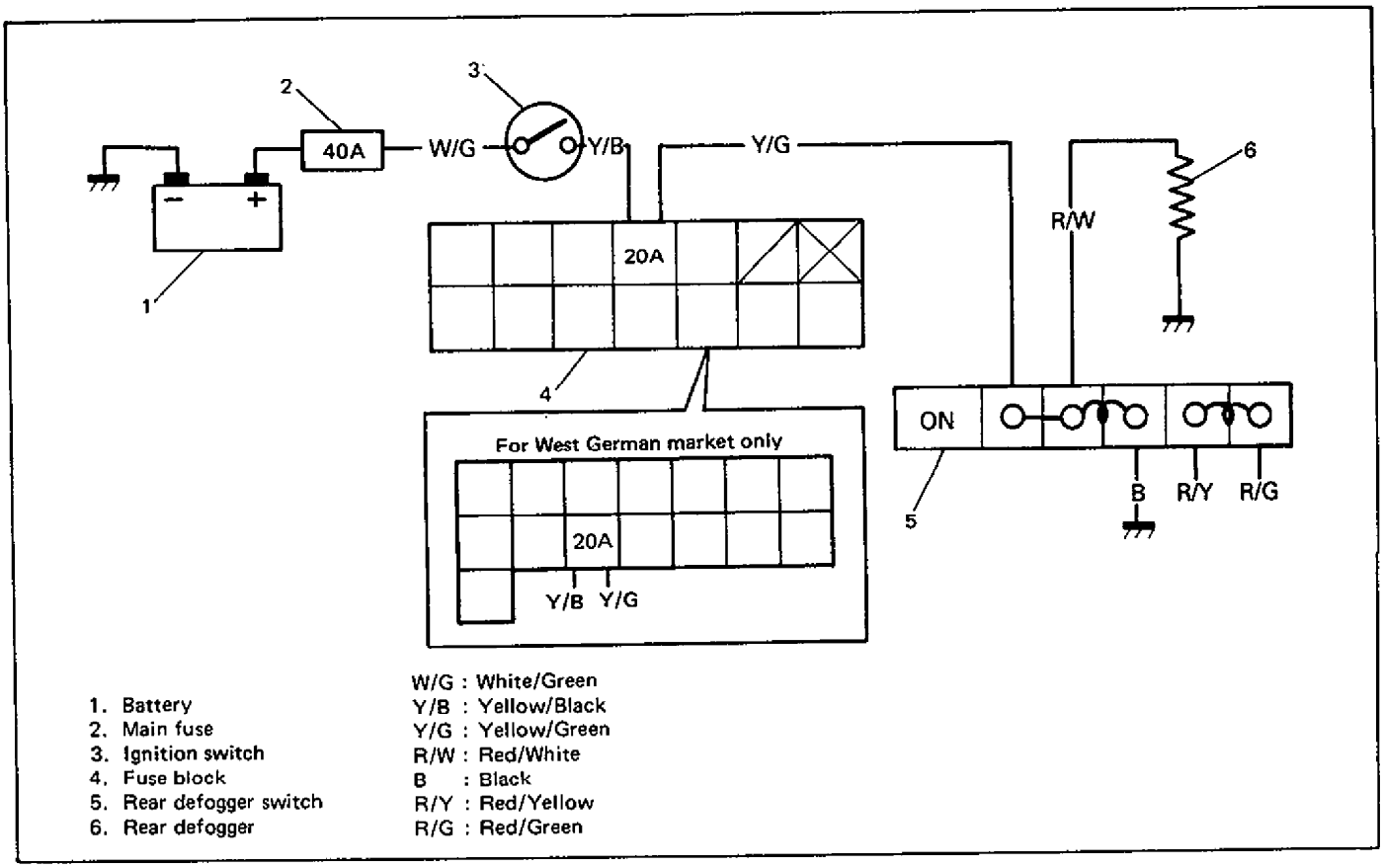


Fig. 8-45 Checking Int. Relay Operation Sound

REAR WINDOW DEFOGGER (If eqipped)

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



1. Battery
2. Main fuse
3. Ignition switch
4. Fuse block
5. Rear defogger switch
6. Rear defogger

W/G : White/Green
Y/B : Yellow/Black
Y/G : Yellow/Green
R/W : Red/White
B : Black
R/Y : Red/Yellow
R/G : Red/Green

Fig. 8-46

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Defogger won't work.	Defogger switch faulty	Check switch.
	Defogger heat wire faulty	Check heat wire.
	Wiring or grounding faulty	Repair as necessary.

INSPECTION

DEFOGGER SWITCH

Use a circuit tester to check defogger switch for continuity.

	Yellow/ Green	Red/ White	Black	Black (Red/ Green)	Red/ Yellow
OFF		○ ○ ○		○ ○ ○	
ON	○	○ ○ ○			

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.**

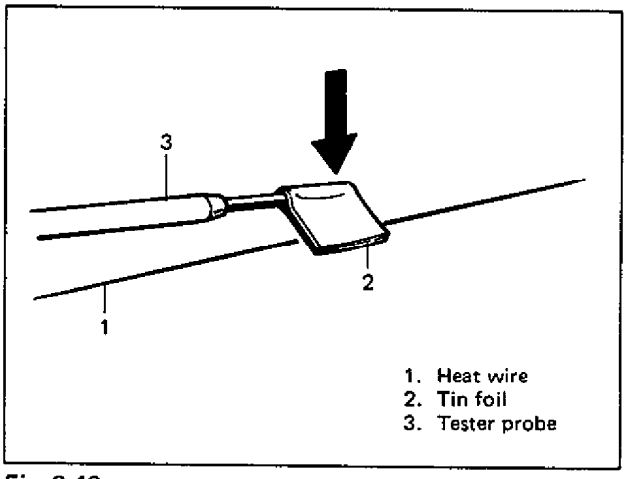


Fig. 8-48

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.

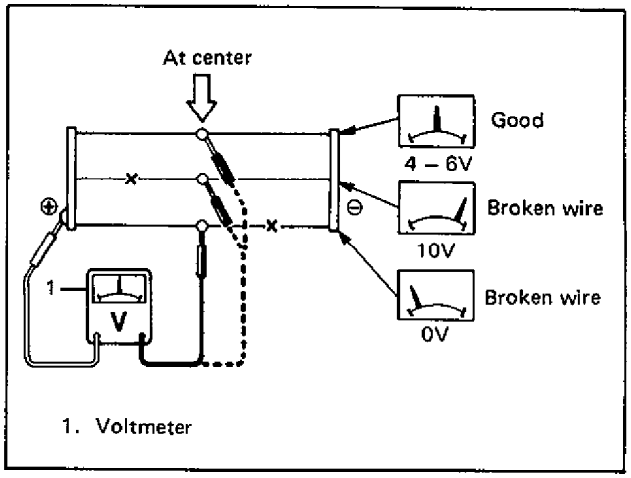


Fig. 8-49

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.

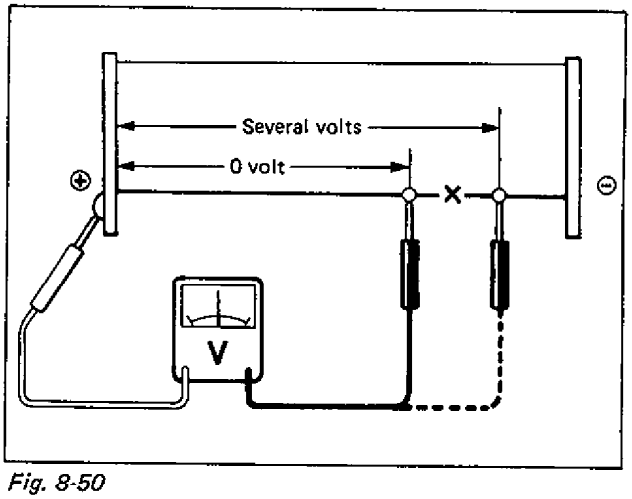


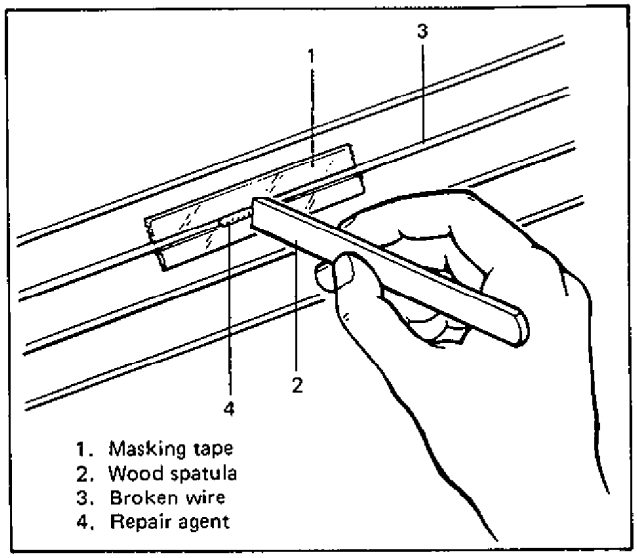
Fig. 8-50

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)

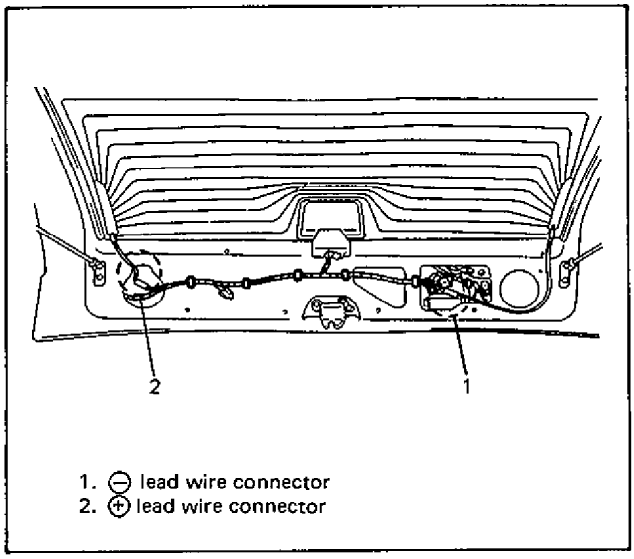
REMOVAL

Remove back window glass.
(For removal procedure, refer to Body Service section.)

INSTALLATION

Before installing, disconnect negative battery cable.

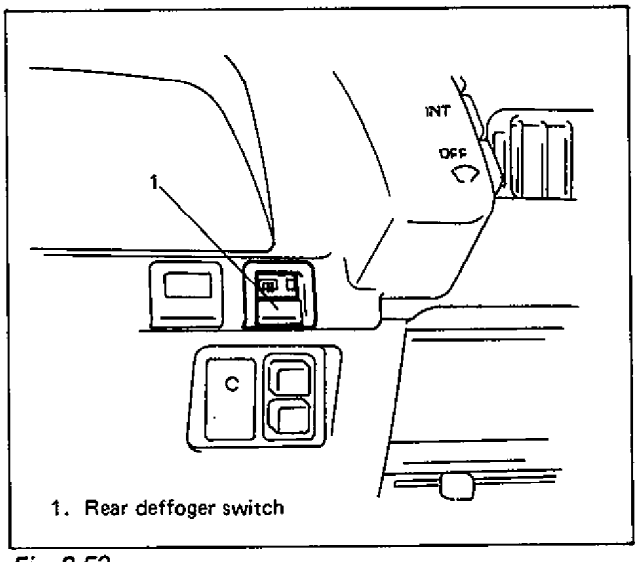
1) Install back window glass.
2) Connect lead wires to harness connectors.



1. ⊖ lead wire connector
2. ⊕ lead wire connector

Fig. 8-52

3) Install defogger switch on instrument panel and connect switch connector to harness connector.



1. Rear deffoger switch

Fig. 8-53

REAR WINDOW WIPER AND WASHER (If equipped)

The rear window wiper is of the one-speed type, and its washer is equipped with a separate-type washer pump.

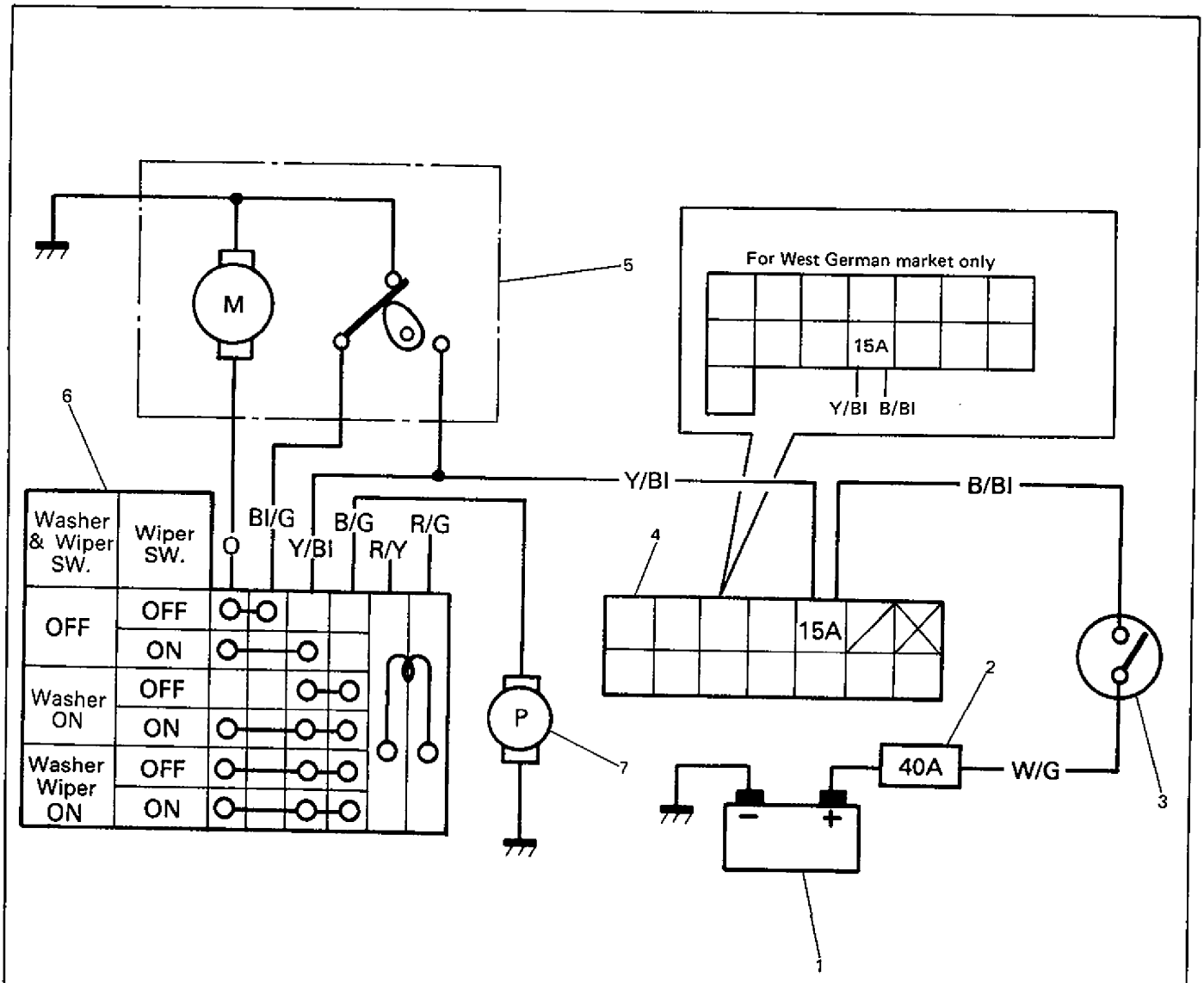


Fig. 8-54 Rear Wiper and Washer Circuit

DESCRIPTION OF CIRCUIT AND TROUBLE DIAGNOSIS

Refer to "WINDSHIELS WIPERS" section.

INSPECTION

A. WIPER AND WASHER SWITCHES

Rear Wiper Switch Connector

REAR WIPER & WASHER SWITCH CONTINUITY			
O			B/G
R/Y	Y/Bl	R/G	Bl/G

B/G : Black/Green
Y/Bl : Yellow/Blue
O : Orange
R/G : Red/Green
R/Y : Red/Yellow

CONTINUITY BETWEEN TERMINALS		
Switch Position		Terminal-to-Terminal Continuity
Washer & Wiper	Wiper	
OFF	OFF	Bl/G – O
	ON	Y/Bl – O
WASHER ON	OFF	B/G – Y/Bl
	ON	B/G – Y/Bl – O
WASHER & WIPER ON	OFF	B/G – Y/Bl – O
	ON	B/G – Y/Bl – O
R/G, an illumination light lead wire of lighting switch, produces constant R/G – R/Y continuity.		

Continuity Check

NOTE:
Rear wiper and washer switch position.

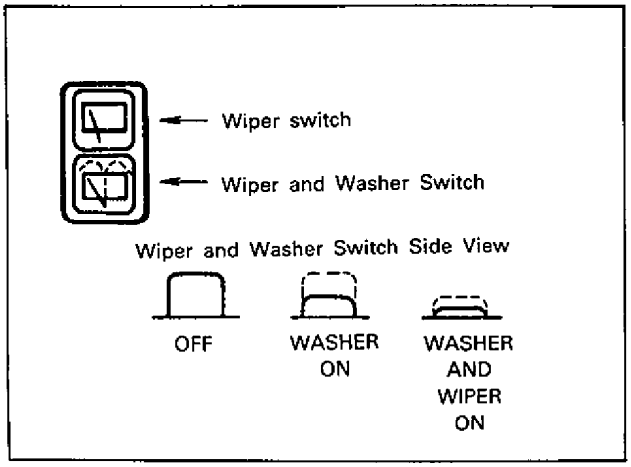


Fig. 8-55

B. WIPER MOTOR

1) As shown below, use a 12V battery to connect its (+) and (–) terminals to Orange terminal and Black lead wire respectively. Then motor should rotate at a 38 to 46 rpm.

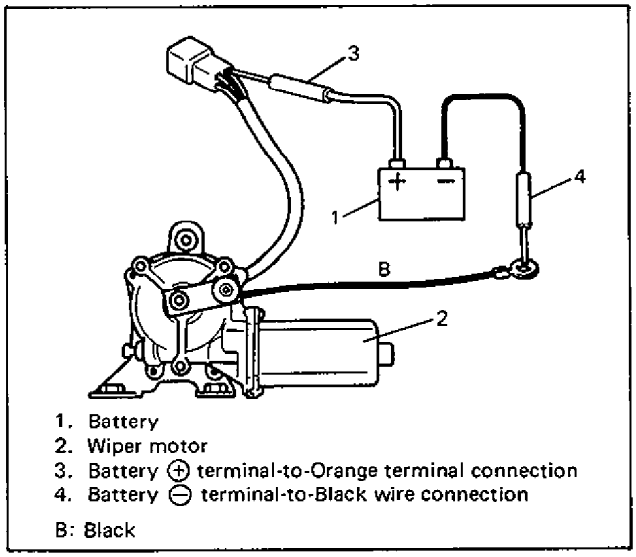


Fig. 8-56

2) TESTING AUTOMATIC STOP ACTION

Connect battery (+) and (–) terminals to motor Yellow/Blue terminal and Black lead wire respectively.

Use a jumper to short Orange and Blue/Green terminals to each other to check whether motor shaft stops at a given position. Use jumper to make sure again and again that shaft stops at the same position.

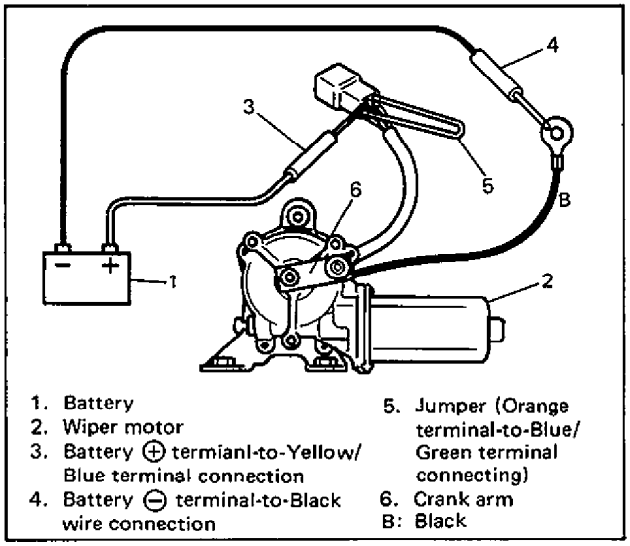


Fig. 8-57 Checking Crank Arm Stop Position

3) CHECKING BRUSH AND COMMUTATOR

Use a circuit tester to check Orange-to-Black lead wire continuity. If continuity is poor, check brush-and-commutator area for proper contact condition.

If fouled, clean the area with a cloth damped with gasoline.

If surface of the area is coarse or burnt, smooth it with a sand-paper.

(Refer to "FRONT WIPER MOTOR" section.)

C. WASHER PUMP

In the same manner as with the windshield washer pump, check pumping rate.

Refer to "WINDSHIELD WIPERS AND WASHERS" section.

WASHER PUMP REMOVAL

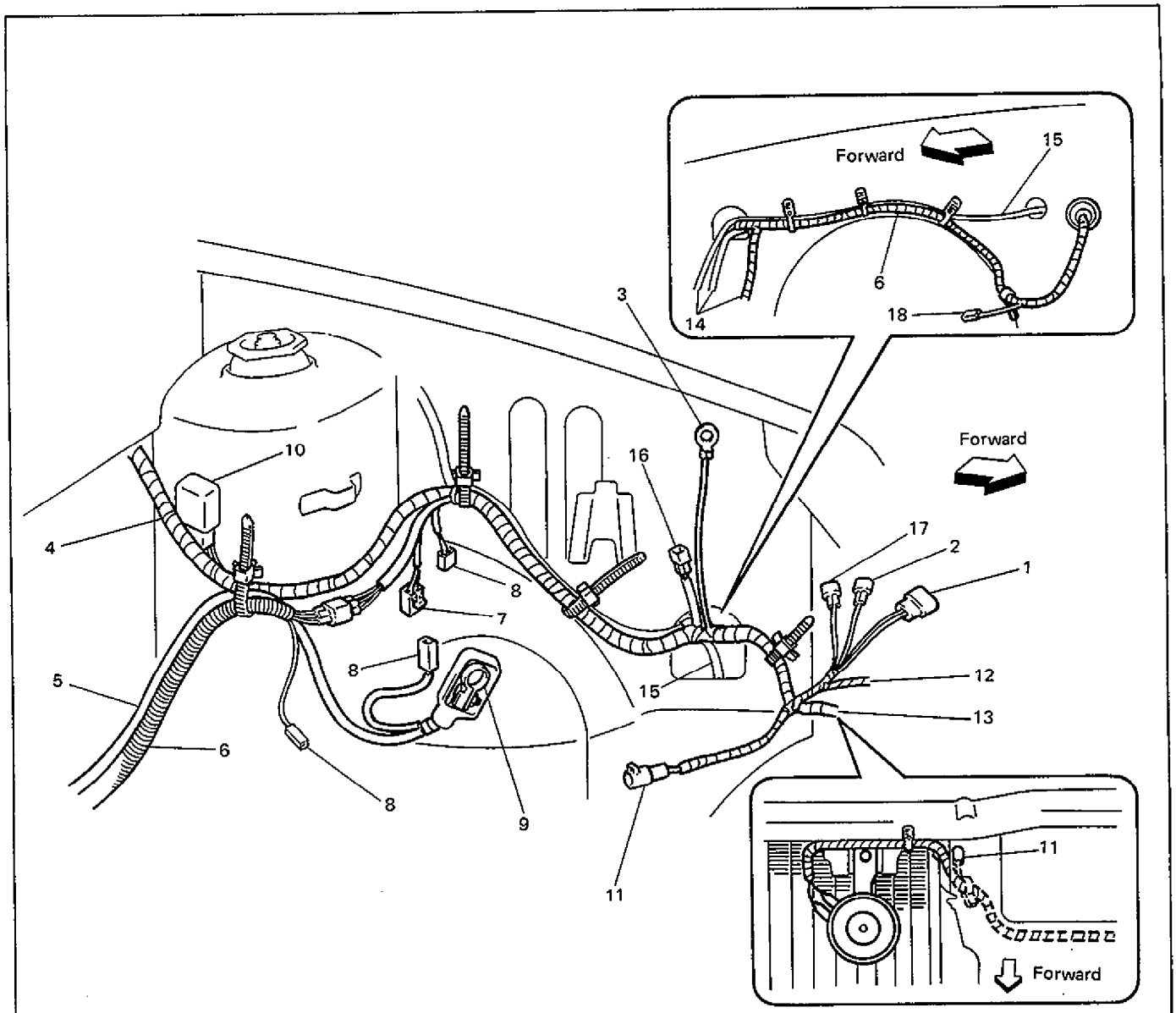
1) Disconnect battery (—) cable.
2) Remove front fender lining (LH).
3) Remove washer tank fitting screws.
4) Disconnect pump lead wires and hoses.
5) Remove washer tank.
6) Remove pump from tank.

INSTALLATION

Reverse the removal sequence to install washer pump.

WIRING HARNESS ROUTING

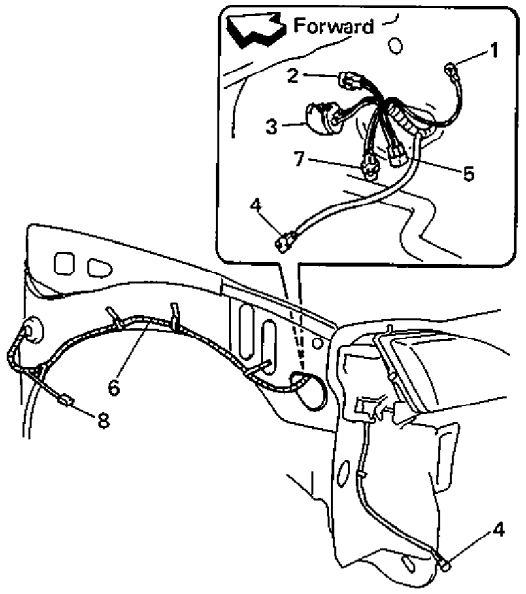
LEFT SIDE FENDER APRON WIRING



1. To headlight
2. To small light
3. Ground
4. Main wiring harness No. 1
5. Starting motor cable
6. Engine wiring harness No. 5
7. To fuel pump relay
8. To main fuse
9. To battery positive terminal
10. Noise suppressor
11. To radiator fan motor
12. To turn signal light
13. To horn
14. To washer pump
15. Washer hose
16. To air con. wiring harness for right hand steering car (Optional)
17. To fog light (If equipped)
18. To side turn signal

Fig. 8-58 Left Side Fender Apron Wiring

RIGHT SIDE INNER FENDER WIRING

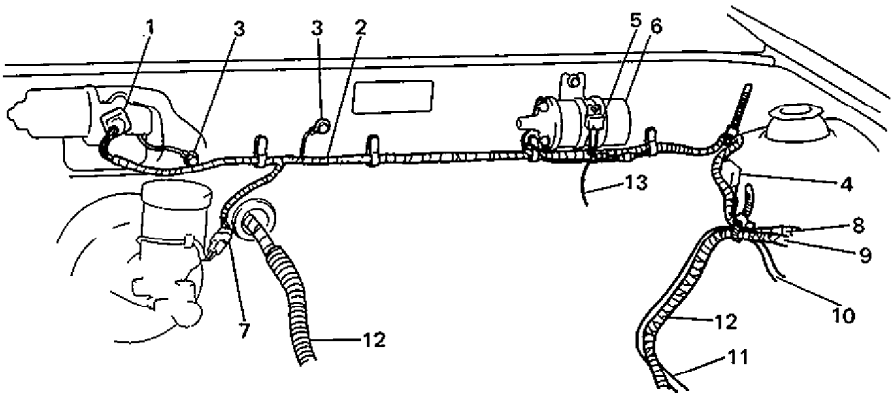


1. Ground
2. To small light
3. To headlight
4. To turn signal
5. To air con. wiring harness for left hand steering car (Optional)
6. Main wiring harness No. 1
7. To fog light (If equipped)
8. To side turn signal

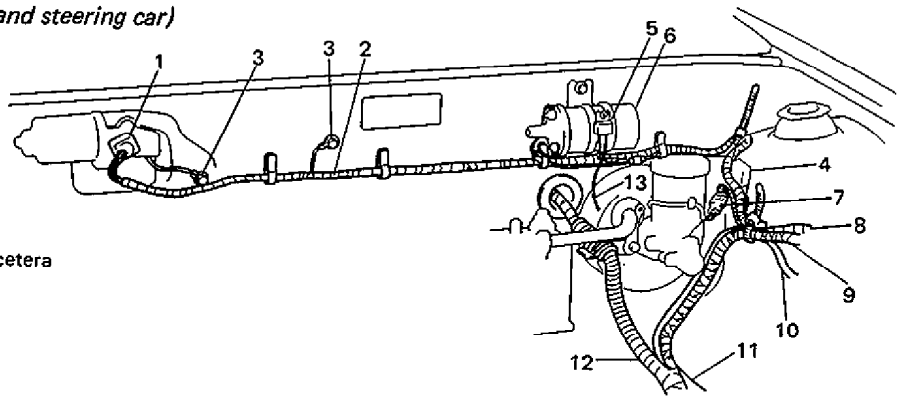
Fig. 8-59 Right Side Inner Fender Wiring

COWL TOP PANEL WIRING

(Right hand steering car)



(Left hand steering car)



1. To wiper motor
2. Main wiring harness No. 1
3. Ground
4. Noise suppressor
5. Condenser
6. Ignition coil
7. To brake fluid level switch
8. To left headlight, turn signal and etcetera
9. To main fuse and main wiring harness No. 1
10. To battery positive terminal
11. To starting motor
12. Engine wiring harness No. 5
13. To ground

Fig. 8-60 Cowl Top Panel Wiring

ENGINE WIRING

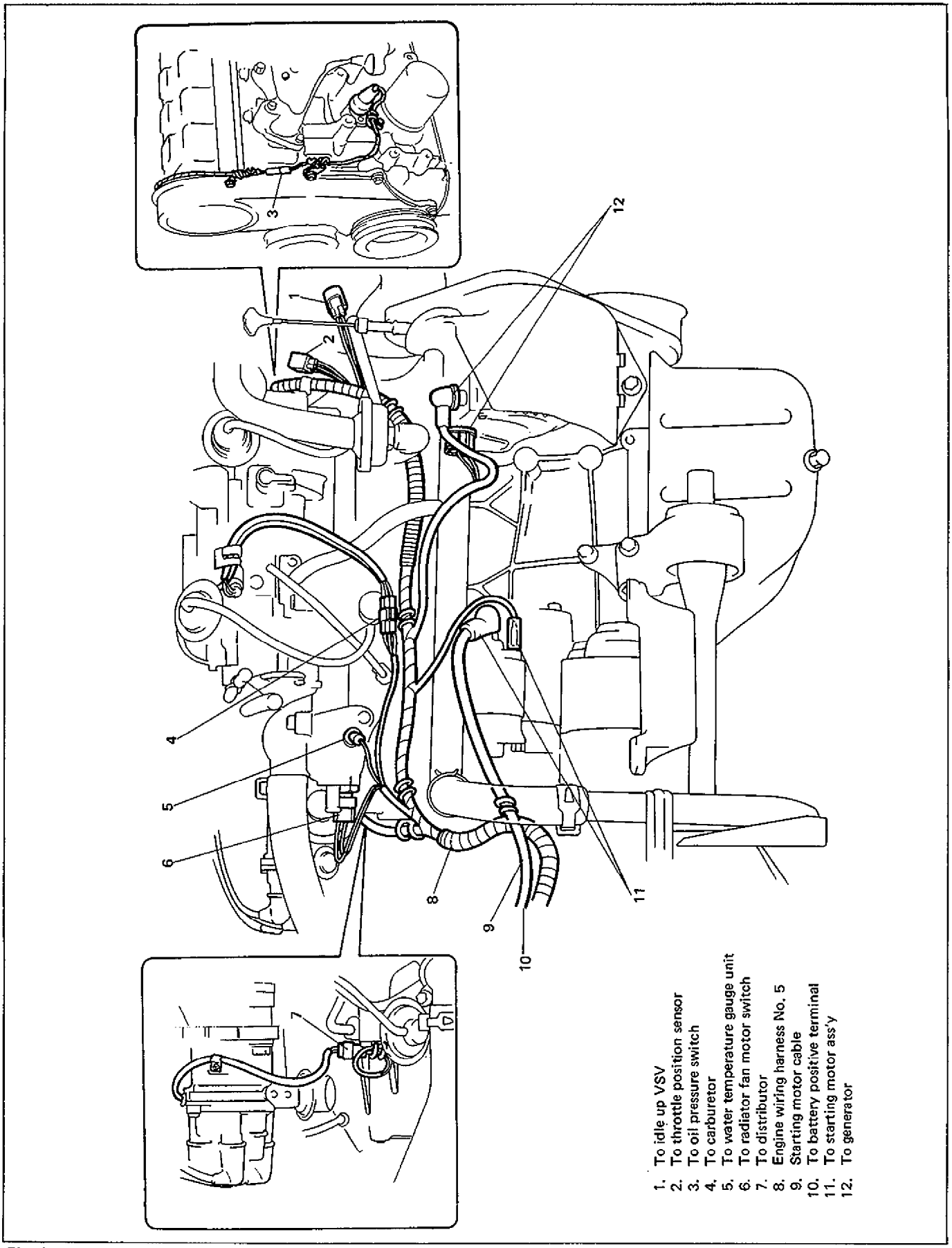
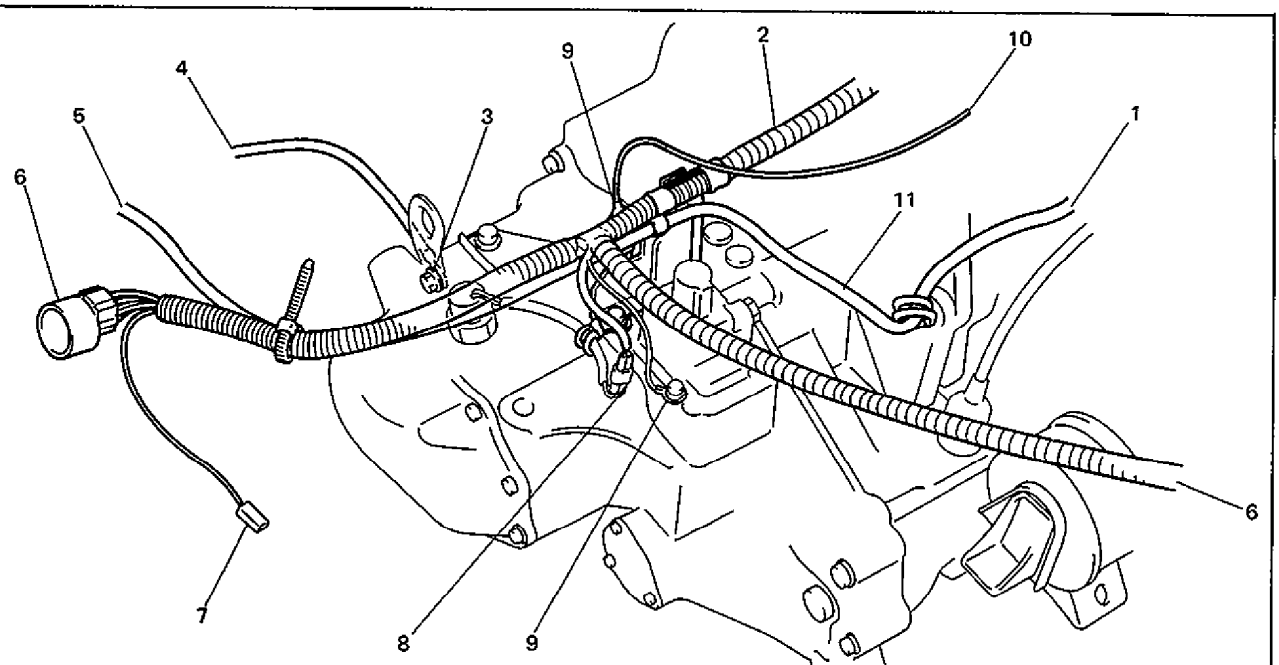


Fig. 8-61 Engine Wiring

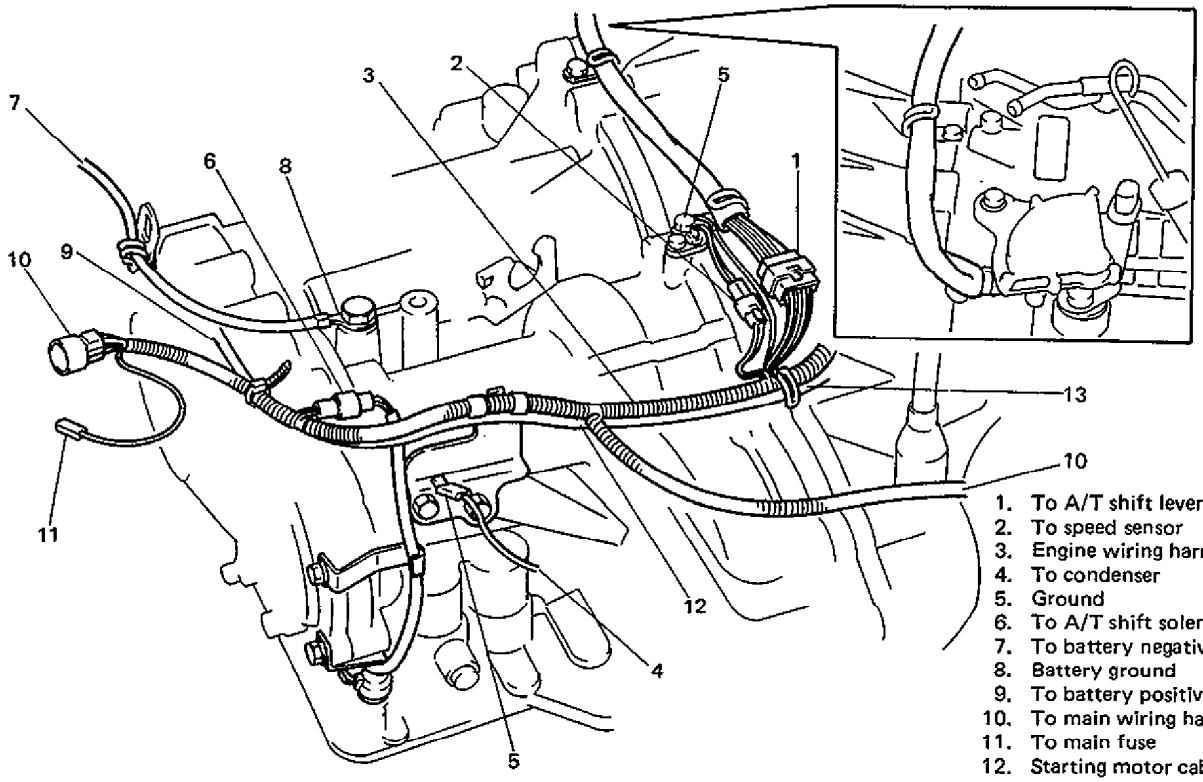
MANUAL TRANSMISSION WIRING



1. To starting motor
2. Engine wiring harness No. 5
3. Battery ground
4. To battery negative terminal
5. To battery positive terminal
6. To main wiring harness No. 1
7. To main fuse
8. To back up light switch
9. Ground
10. To condenser
11. Starting motor cable

Fig. 8-62 Manual Transmission Wiring

AUTOMATIC TRANSMISSION WIRING

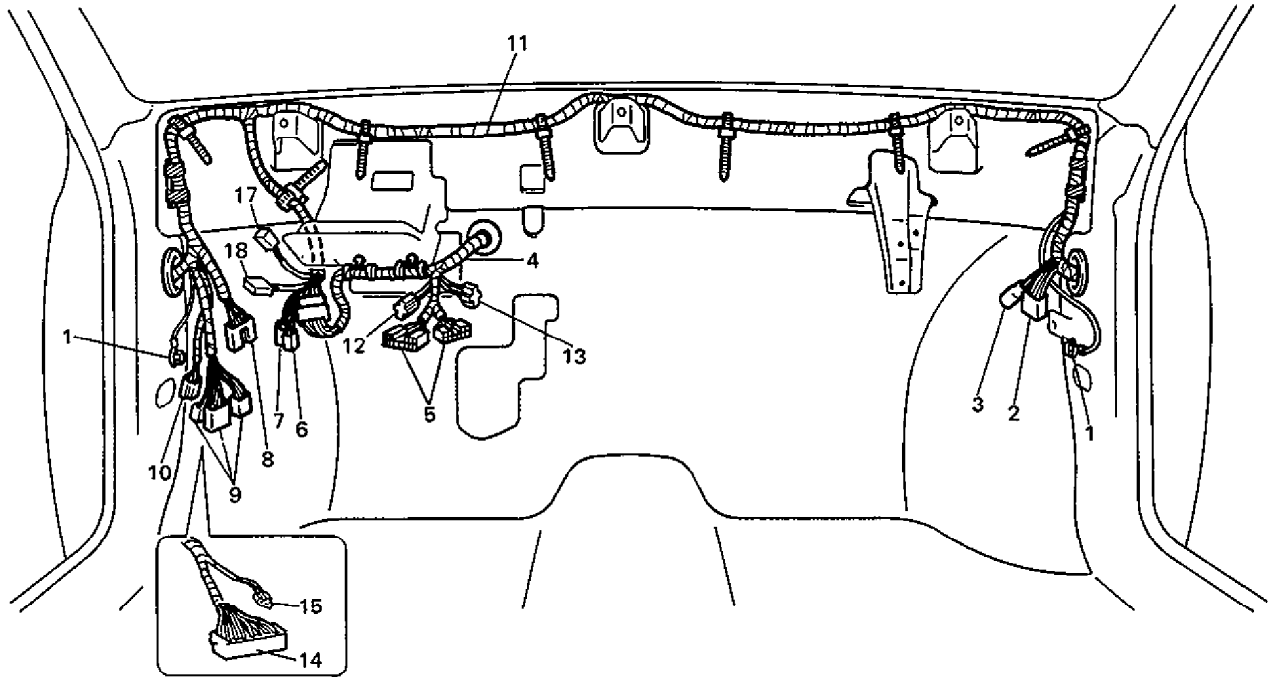


1. To A/T shift lever switch
2. To speed sensor
3. Engine wiring harness No. 5
4. To condenser
5. Ground
6. To A/T shift solenoid
7. To battery negative terminal
8. Battery ground
9. To battery positive terminal
10. To main wiring harness No. 1
11. To main fuse
12. Starting motor cable
13. To starting motor

Fig. 8-63 Automatic Transmission Wiring

COWL UPPER WIRING

(Left hand steering car)



For West German market only

1. Ground
2. To air con. wiring harness (Optional)
3. To dome light
4. Engine wiring harness No. 5
5. To A/T control module (For A/T model only)
6. To stop light switch
7. To combination swtich
8. To instrument panel wiring harness No.2
9. To junction block (Other than West German market)
10. To floor wiring harness No. 3
11. Main wiring harness No. 1
12. Monitor coupler for A/T controller
13. Diag switch coupler for A/T controller
14. Fuse box
15. To turn signal/hazard relay
16. To dim dip controller (If equipped)
17. To ignition switch (For West German market)
18. To combination switch (For West German market)

(Right hand steering car)

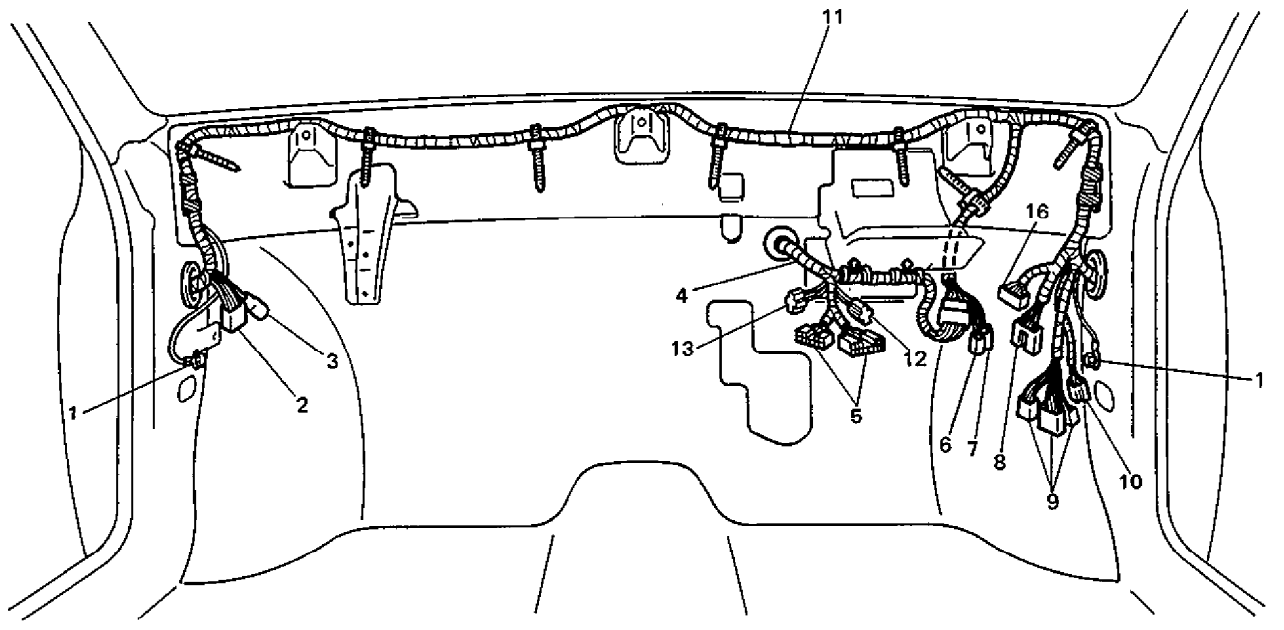
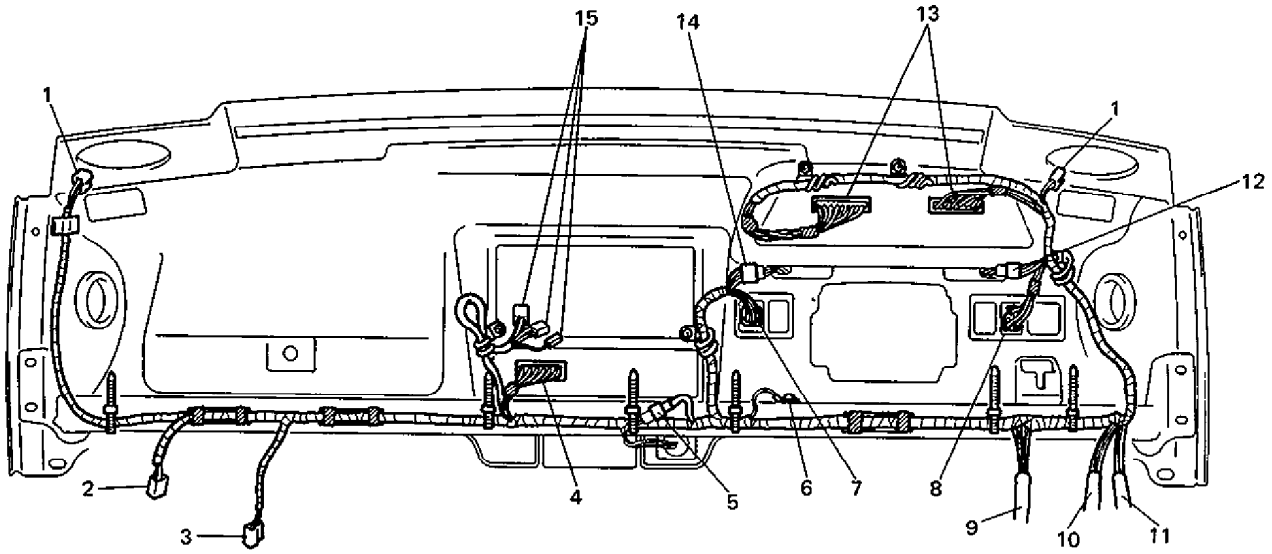


Fig. 8-64 Cowl upper wiring

INSTRUMENT PANEL WIRING

(Left hand steering car)



1. To front speaker (Optional)
2. To blower resister
3. To blower motor
4. To heater fan switch
5. To cigar lighter (Optional)
6. Ground
7. To rear wiper/washer switch (If equipped)
8. To illumination controller (If equipped)
9. To floor wiring harness No. 3 (Except West German market)
10. To junction block (or main wiring harness No. 1)
11. To main wiring harness No. 1
12. To front fog light switch (If equipped)
13. To combination meter
14. To rear defogger switch (If equipped)
15. To radio (Optional)

(Right hand steering car)

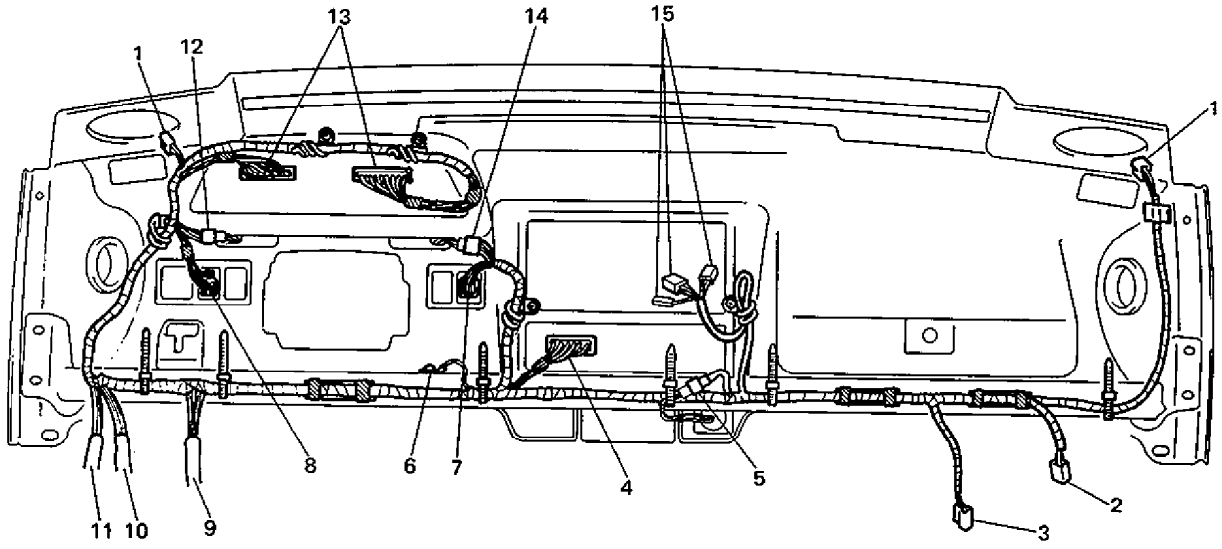
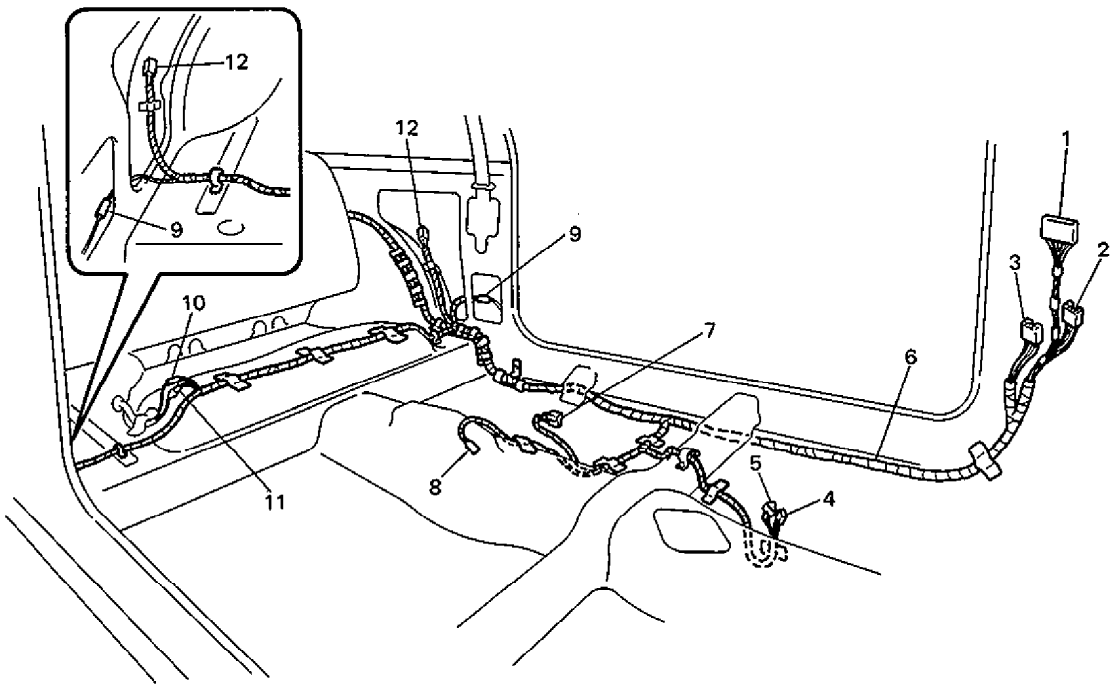


Fig. 8-65 Instrument Panel Wiring

FLOOR WIRING

(Left hand steering car)



1. To instrument panel wiring harness No. 2
2. To junction block
3. To main wiring harness No. 1
4. To A/T shift illumination light (For A/T model only)
5. To A/T shift lock solenoid (For A/T model only)
6. Floor wiring harness No. 3
7. To seat belt switch (If equipped)
8. To parking brake switch
9. To door switch
10. To fuel level gauge unit
11. To fuel pump
12. To rear speaker (Optional)

(Right hand steering car)

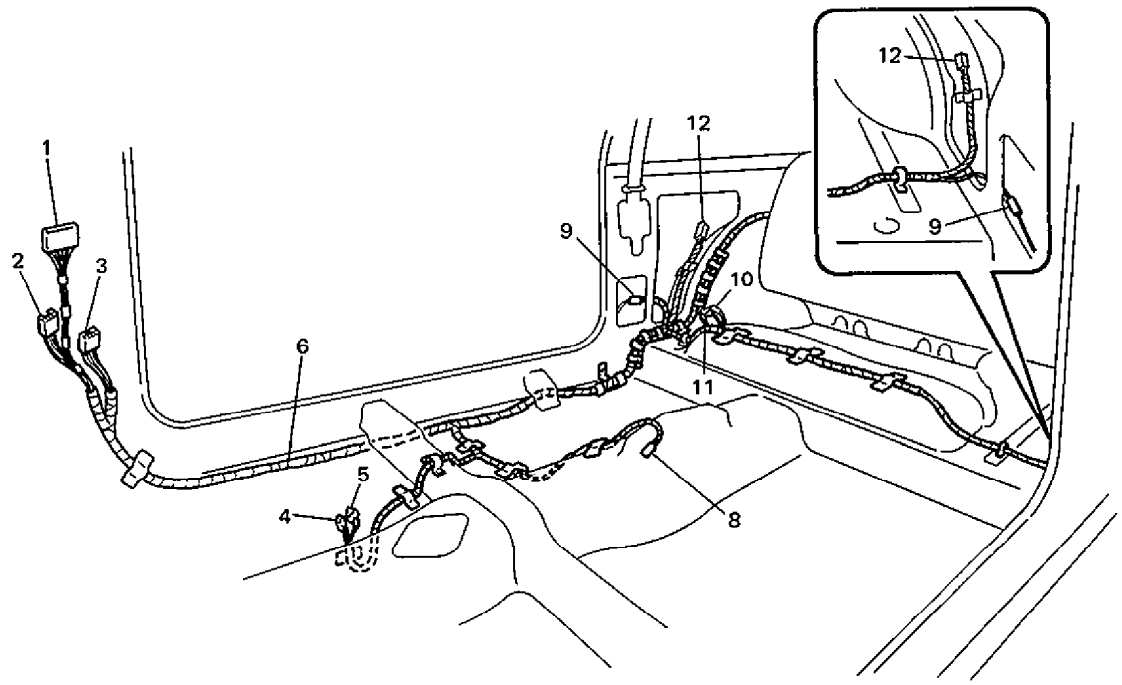
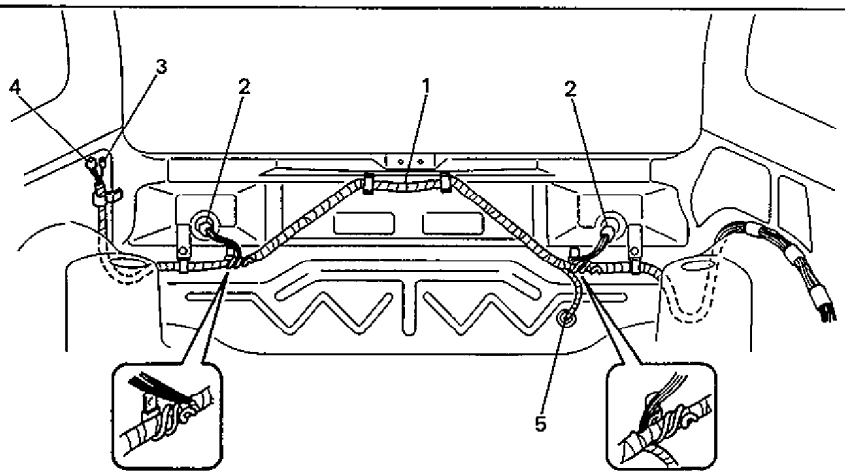


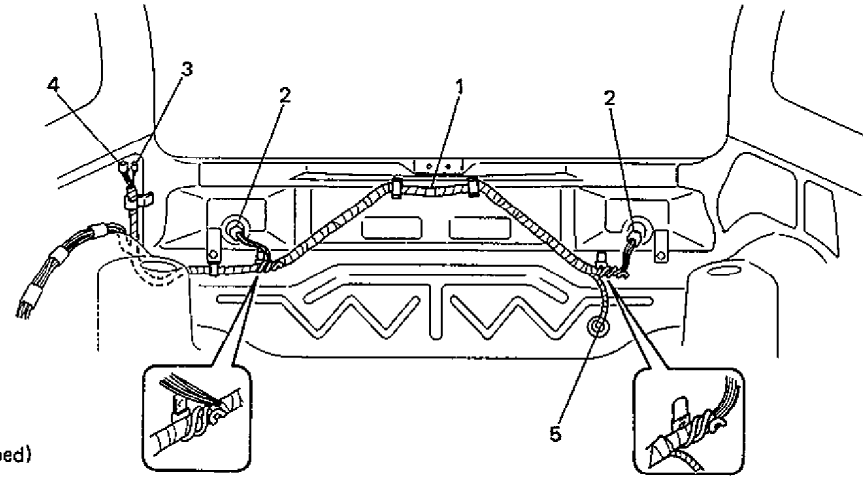
Fig. 8-66 Floor wiring

REAR BODY WIRING

(Left hand steering car)



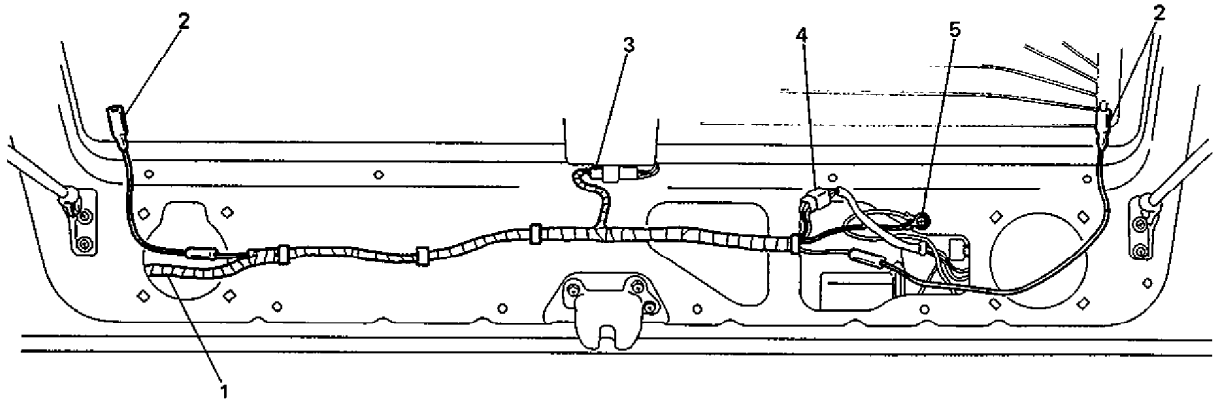
(Right hand steering car)



1. Floor wiring harness No. 3
2. To rear combination light
3. To high mounted stop light (If equipped)
4. To rear wiper motor (If equipped)
5. To license, back up and rear fog lights (If equipped)

Fig. 8-67 Rear Body Wiring

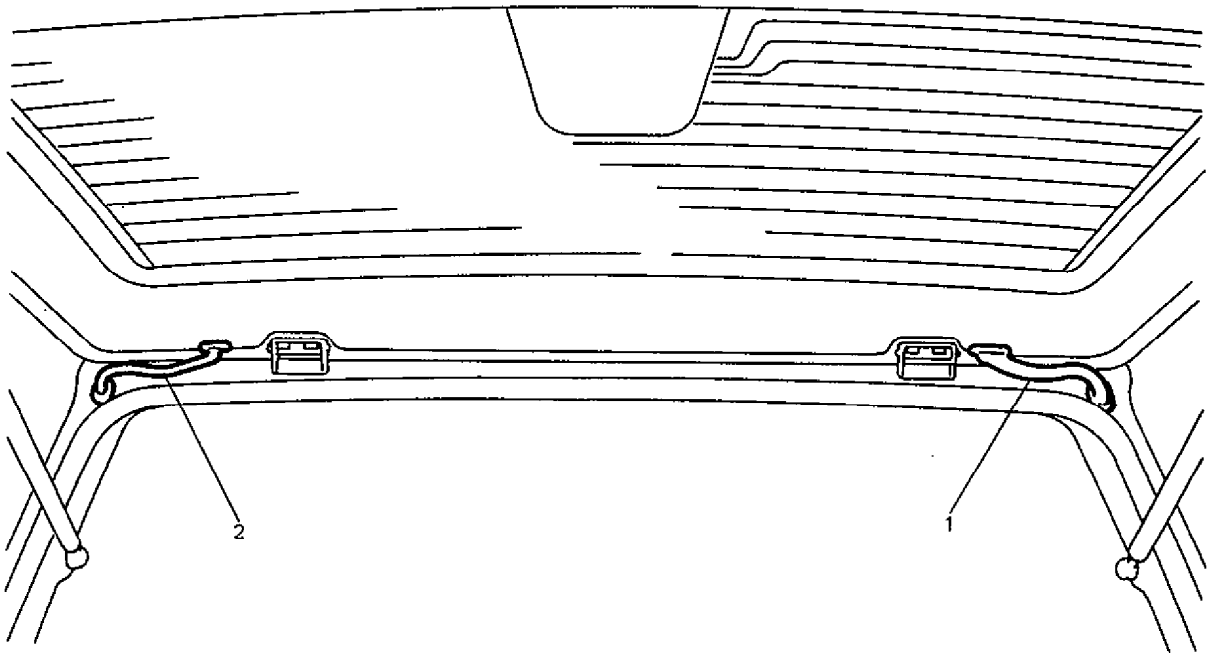
BACK DOOR WIRING



1. From floor wiring harness No. 3
2. To rear defogger (If equipped)
3. To high mounted stop light (If equipped)
4. To rear wiper motor (If equipped)
5. Ground

Fig. 8-68

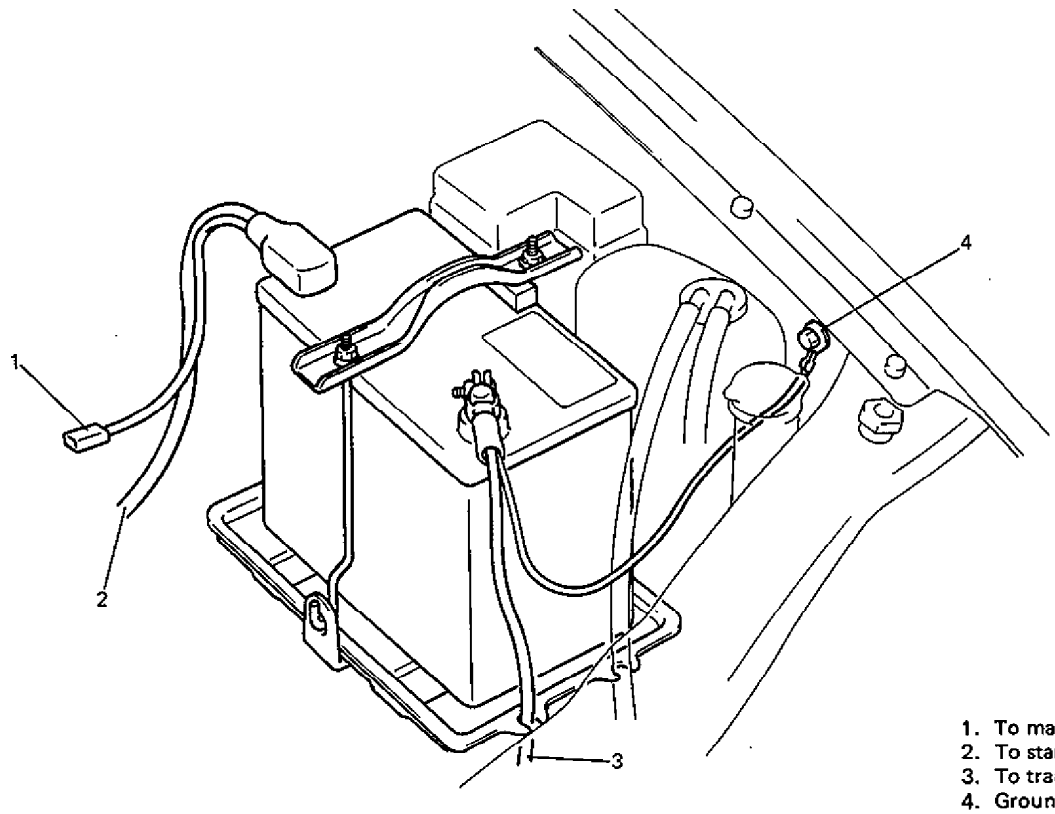
BACK DOOR WIRING PROTECTOR



1. Wiring harness protector
2. Rear washer hose
   (If equipped)

Fig. 8-69 Back Door Wiring Protector

BATTERY WIRING



1. To main fuse
2. To starting motor
3. To transmission case
4. Ground

Fig. 8-70 Battery Wiring

GROUNDING POINTS

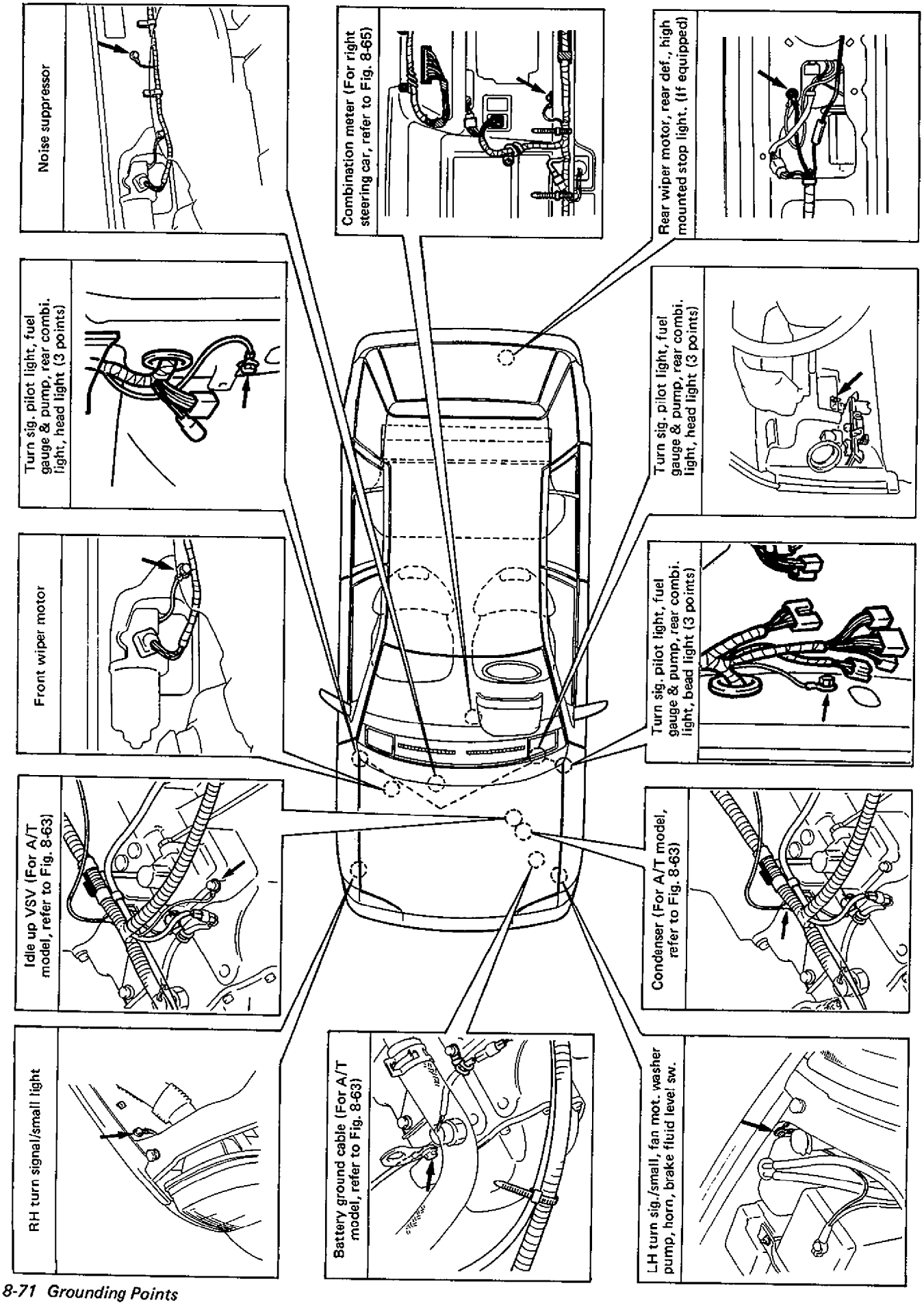


Fig. 8-71 Grounding Points

SECTION 9

BODY SERVICE

CONTENTS

ON CAR SERVICE

FRONT DOOR

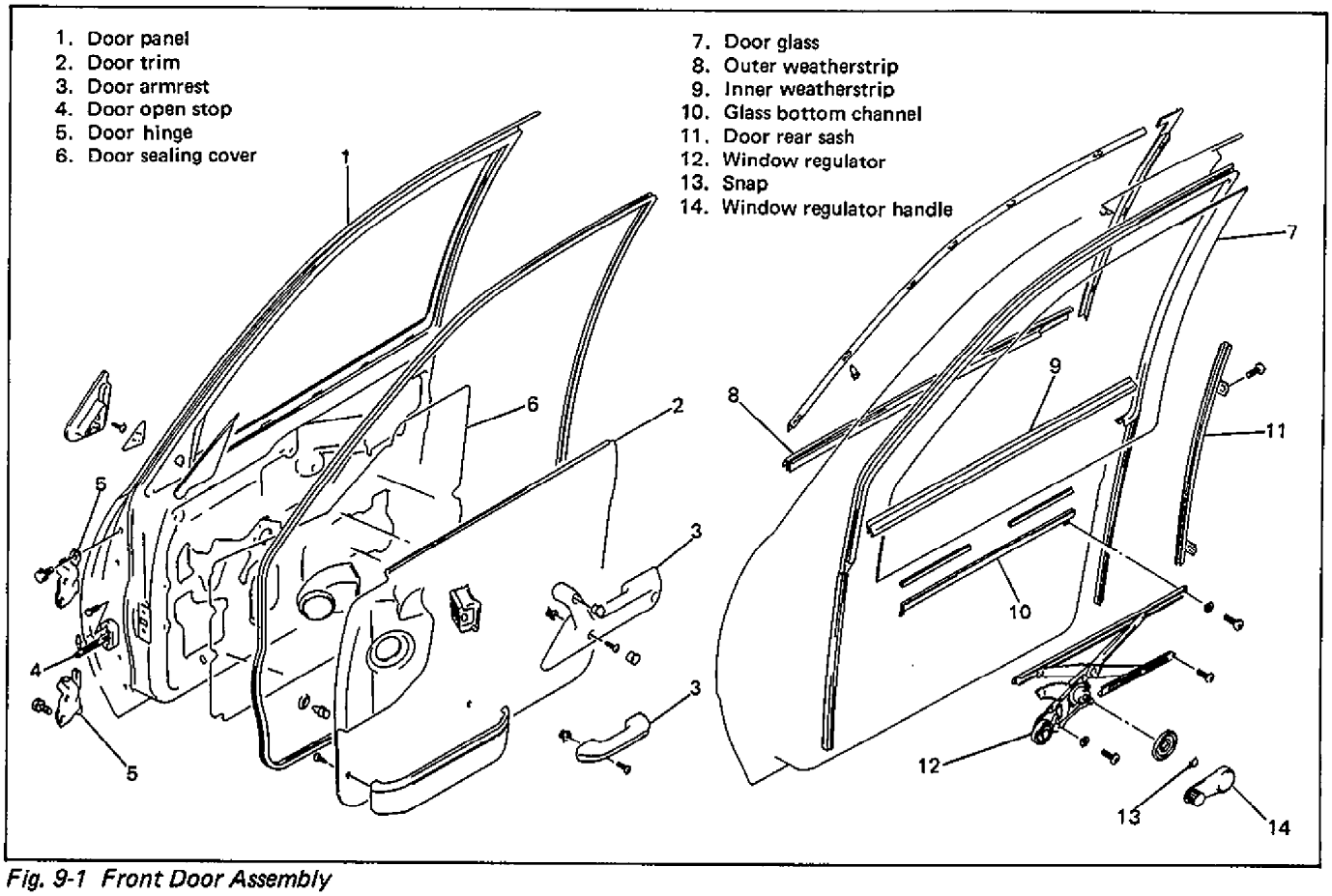


Fig. 9-1 Front Door Assembly

DOOR GLASS

REMOVAL

Remove following parts.

1) Inside handle bezel attaching screw.
2) Door armrest.
3) Window regulator handle.
   For its removal, pull off snap by using a cloth as shown below.

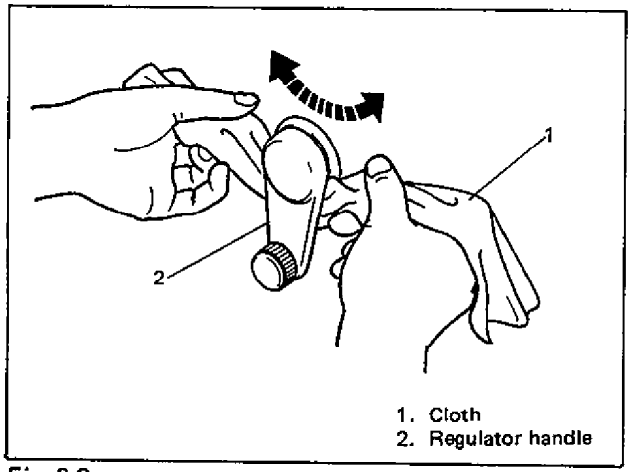


Fig. 9-2

4) Inner weatherstrip (5 door model).
5) Door trim.

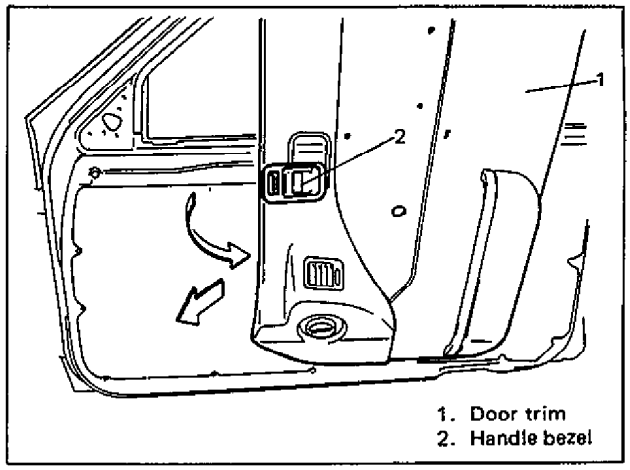


Fig. 9-3 Removing Door Trim

6) Door sealing cover.
7) Fit inside handle bezel back in position temporarily.

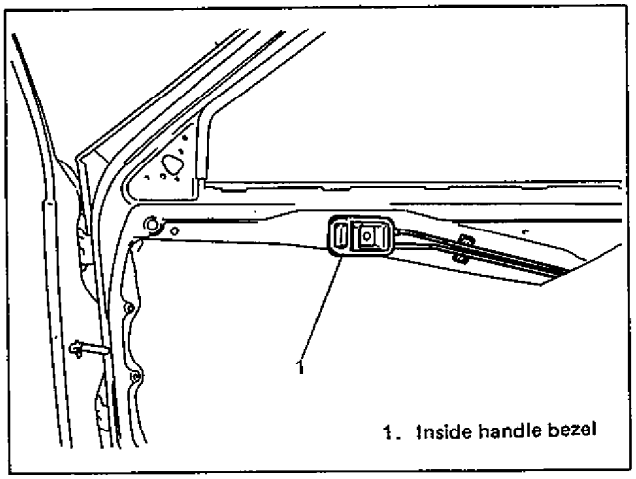


Fig. 9-4

8) Door outside weatherstrip.
9) Glass bottom channel attaching screws.

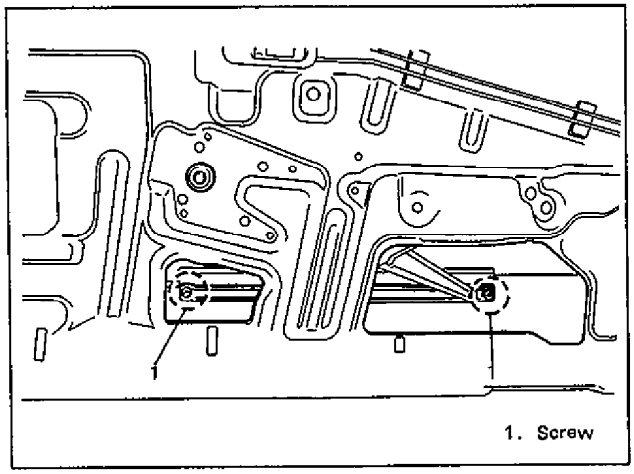


Fig. 9-5

10) Take out door glass together with bottom channel.
11) 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.

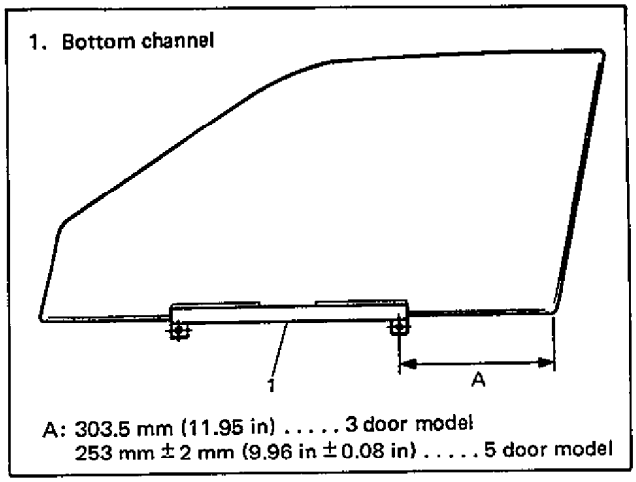


Fig. 9-6

2) Adjust equalizer of window regulator so that measurements A and B in Fig. 9-8 are equal to each other.

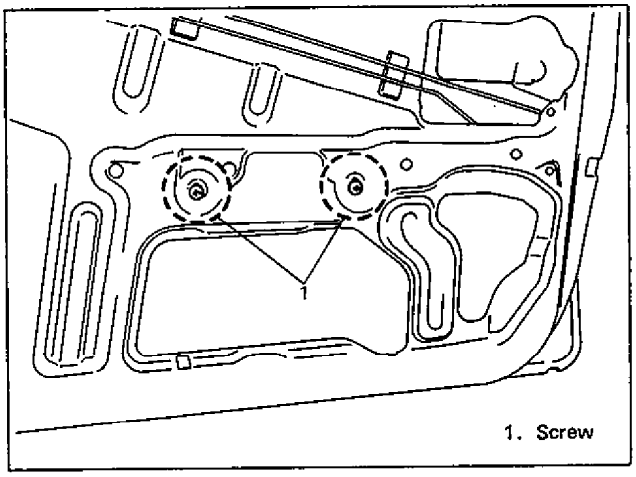


Fig. 9-7 Adjusting Equalizer

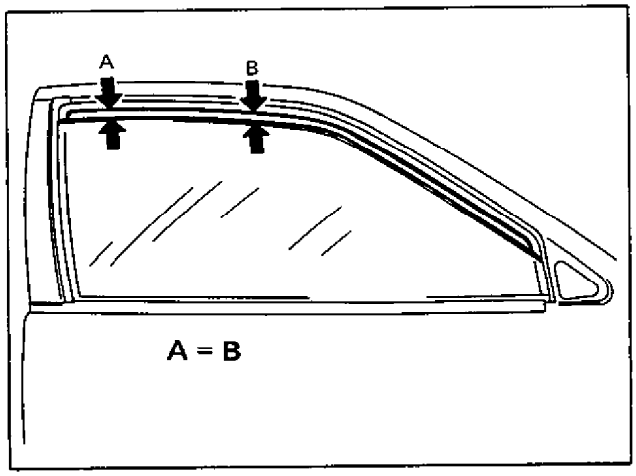


Fig. 9-8

3) Securely seal door sealing cover with adhesive.

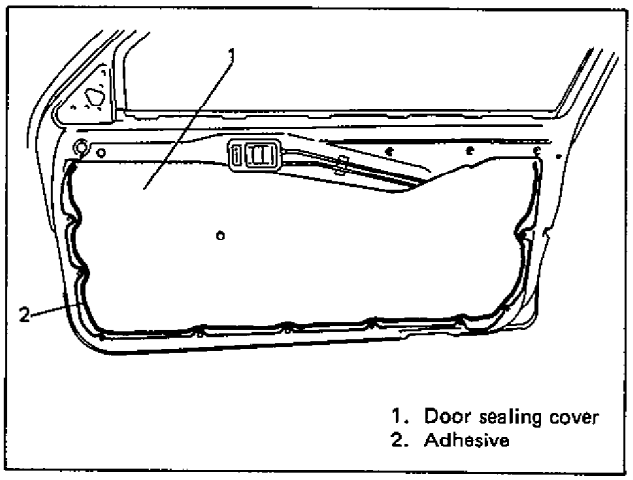


Fig. 9-9

4) Install door window regulator handle so that it has a 45° angle when glass is fully closed, as illustrated below.

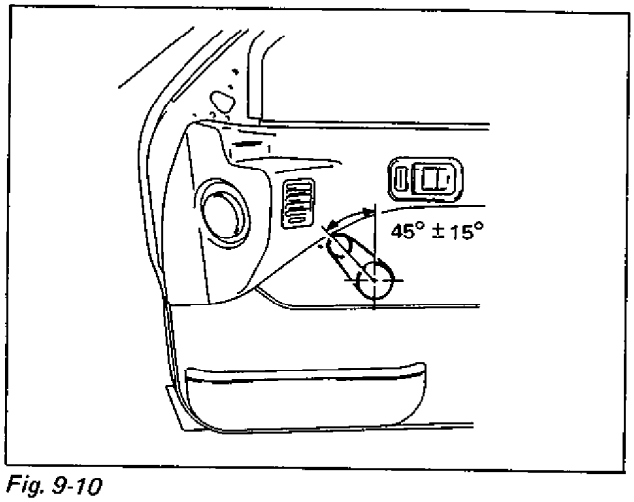


Fig. 9-10

DOOR WINDOW REGULATOR

REMOVAL

Remove following parts.

1) Door glass. (See previous section.)
2) Door window regulator attaching screws (six pcs.). Loosen 6 screws and take out regulator through hole "A".

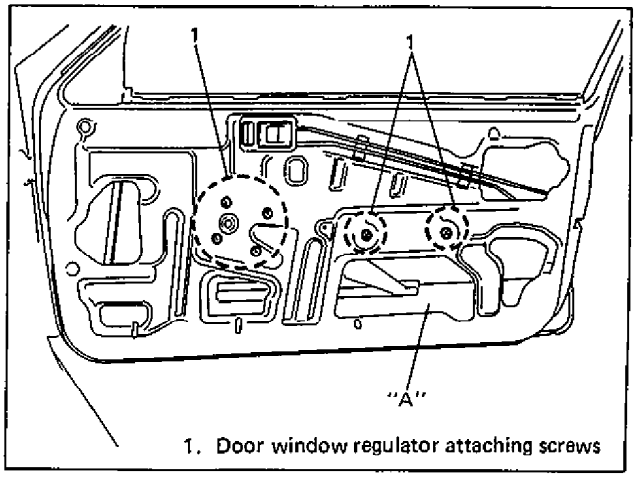


Fig. 9-11

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.

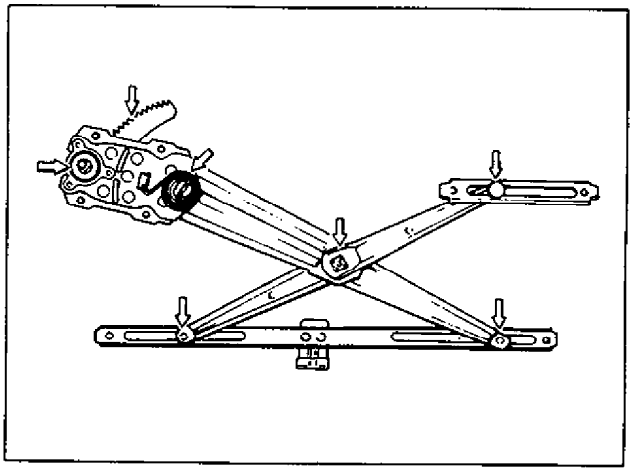


Fig. 9-12 Greasing Sliding Points

FRONT DOOR LOCK

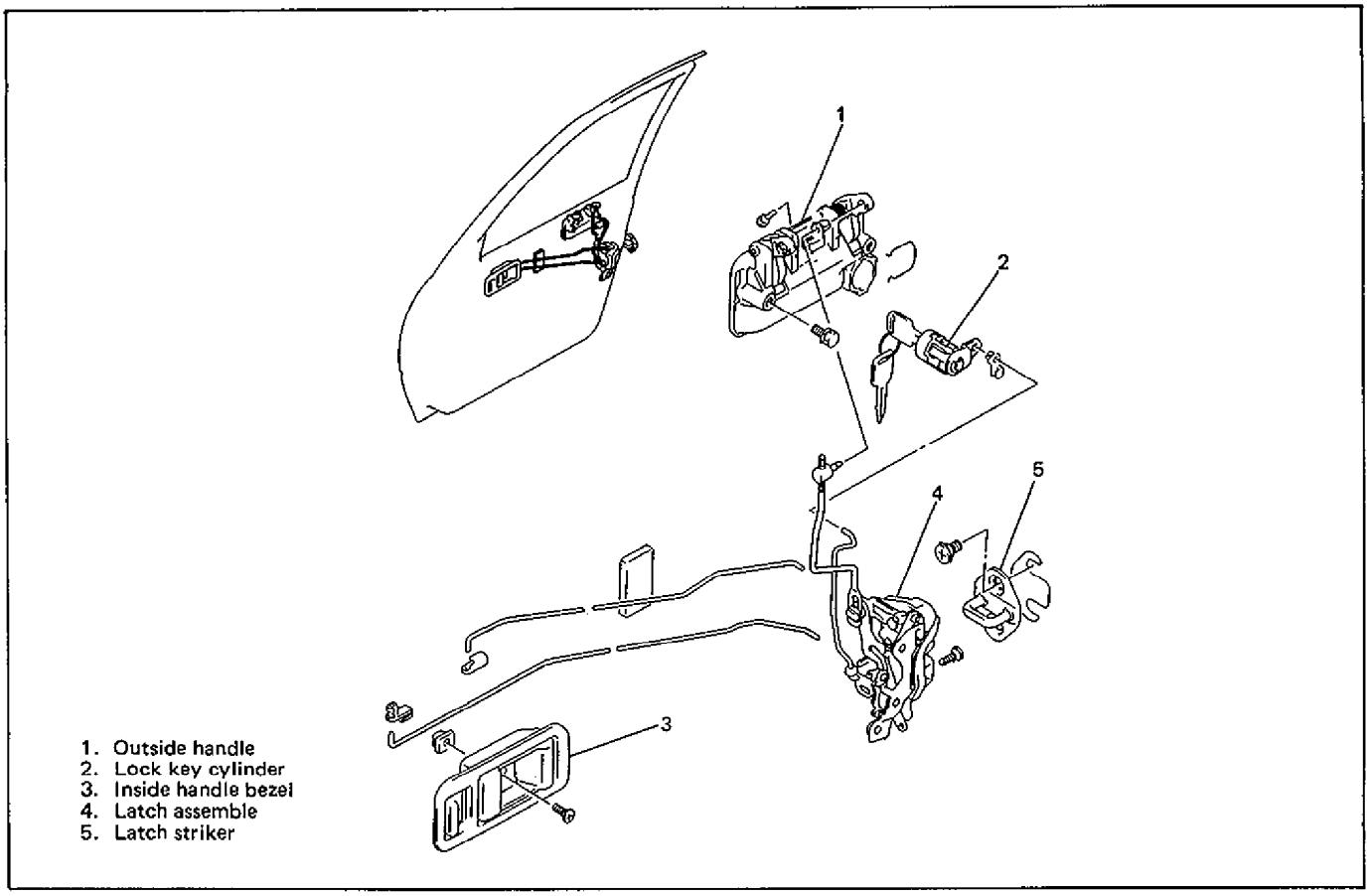


Fig. 9-13 Front Door Lock Assembly

REMOVAL

Remove following parts.

1) Inside handle bezel attaching screw.
2) Door armrest.
3) Window regulator handle.
   For its removal, pull off snap by using a cloth as shown below.

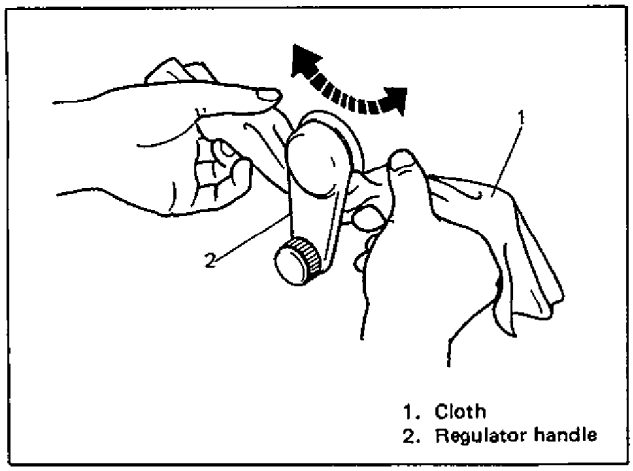


Fig. 9-14

4) Inner weatherstrip (5 door model).
5) Door trim.

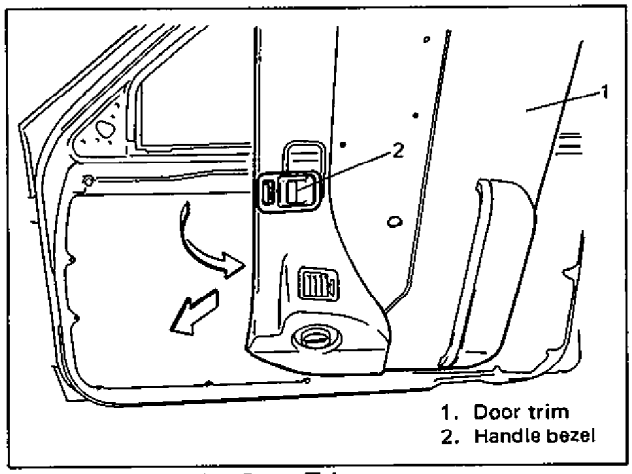


Fig. 9-15 Removing Door Trim

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 and door latch ass'y.

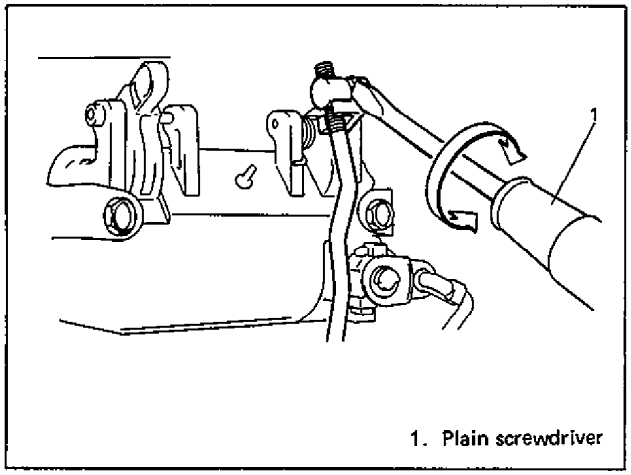


Fig. 9-16 Disconnecting Door Opening Control Link

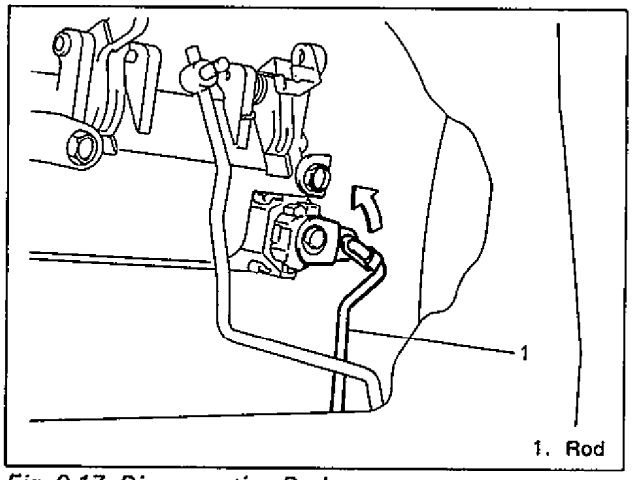


Fig. 9-17 Disconnecting Rod

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.

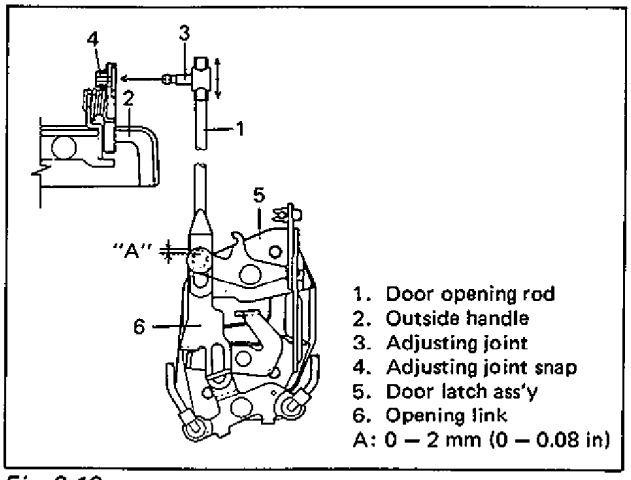


Fig. 9-18

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.

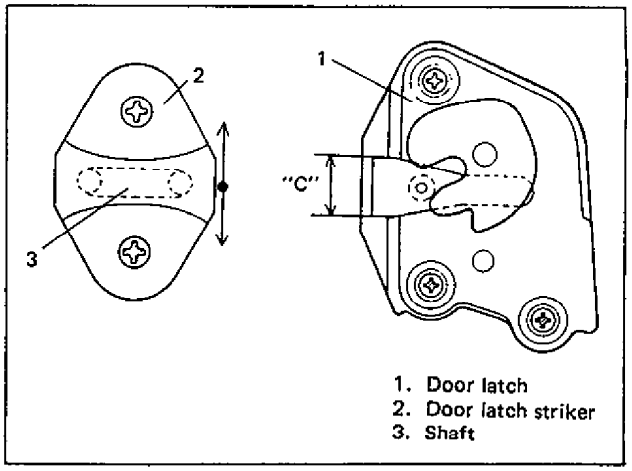


Fig. 9-19

Move door latch striker sideways to adjust to 0 mm (0 in.) the door surface-to-body surface difference with door closed.

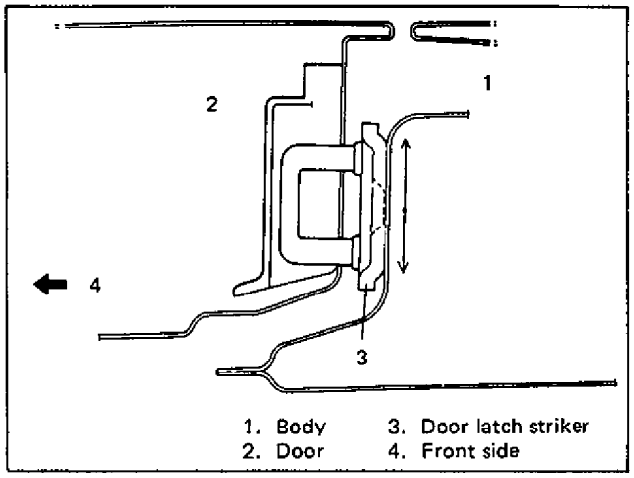


Fig. 9-20

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.).

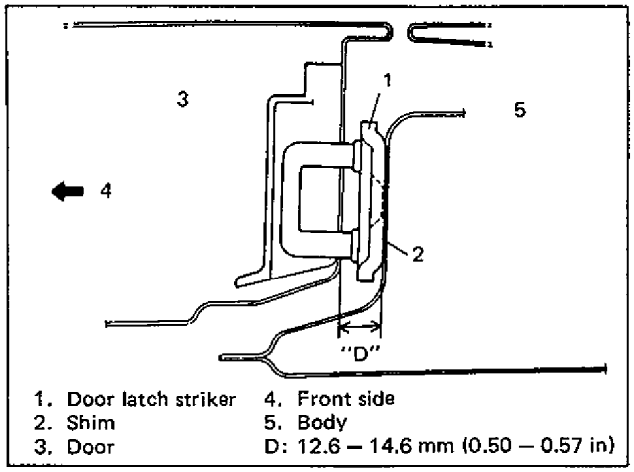


Fig. 9-21

NOTE:
Apply oil or grease to striker joints periodically.

FRONT DOOR ASSEMBLY

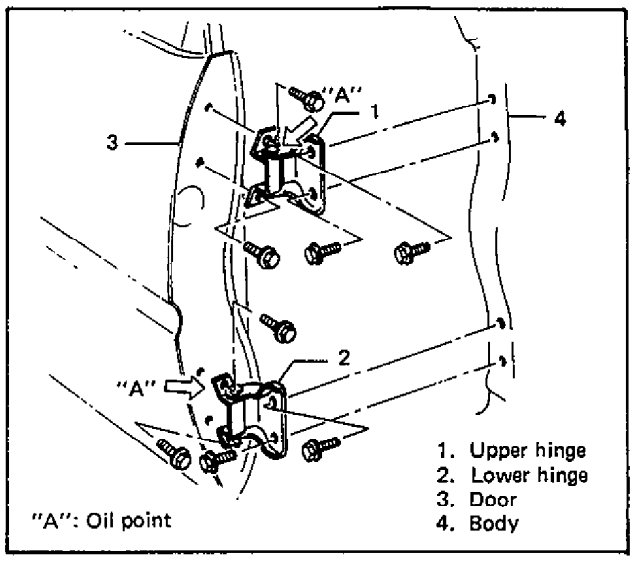


Fig. 9-22

REMOVAL

1) Remove stopper pin upward by tapping it with hammer.

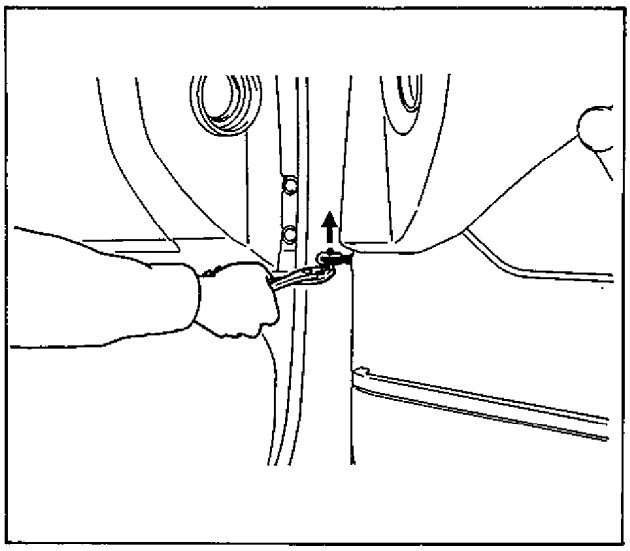


Fig. 9-23

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.

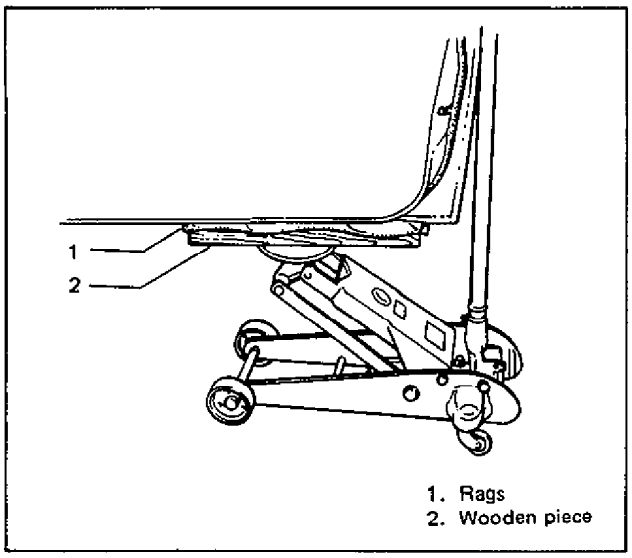


Fig. 9-24

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 (For 5 door model)

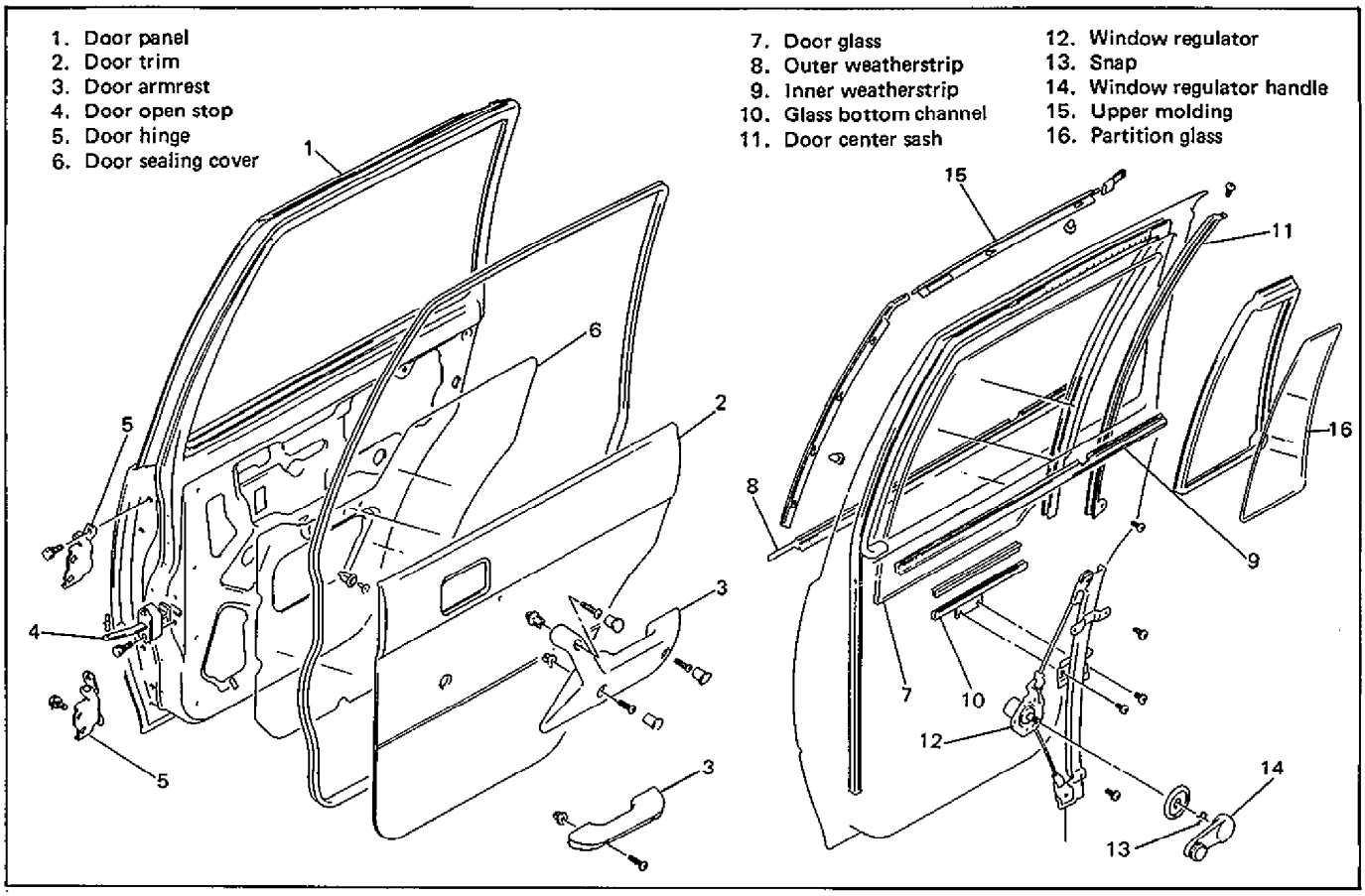


Fig. 9-25 Rear Door Assembly

DOOR GLASS

REMOVAL

Remove following parts.

1) Inside handle bezel fitting screw.
2) Door armrest.
3) Window regulator handle.
   For its removal, pull off snap by using a cloth as shown below.

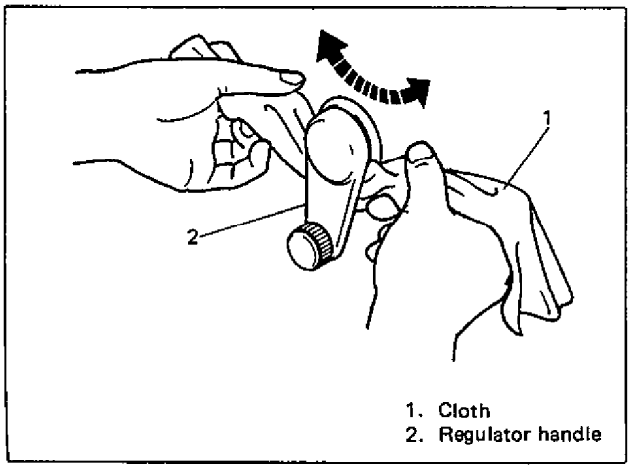


Fig. 9-26

4) Door inner weatherstrip.
5) Door trim.
6) Door sealing cover.
7) Detach rear part of glass run from center sash.

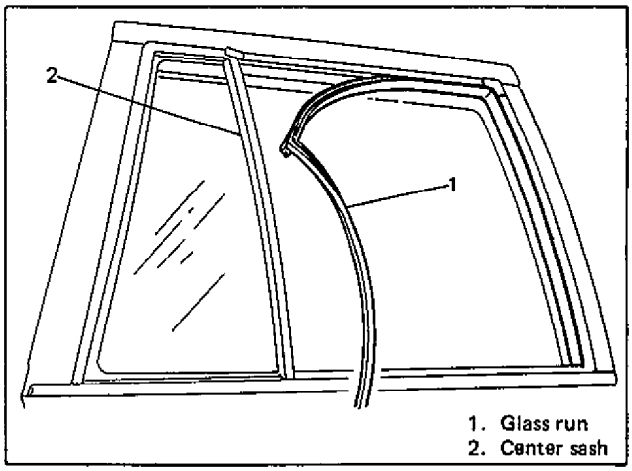


Fig. 9-27

8) Door outer weatherstrip and upper moulding. Lower window fully. Then, turn off outer weatherstrip and upper molding as shown.

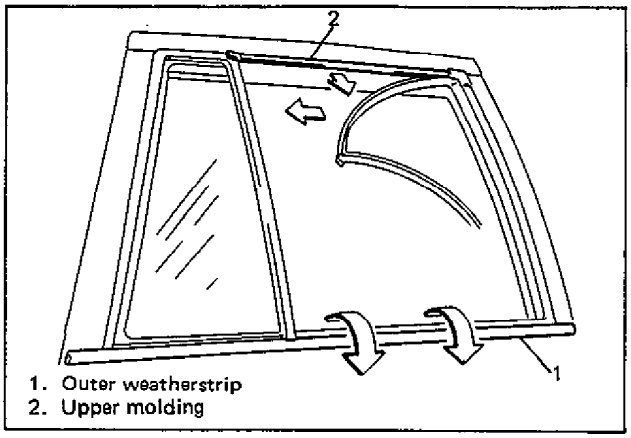


Fig. 9-28

9) Door center sash 4 (by removing two screws 1 with door glass lowered all the way down).

10) Partition glass.
Slide to front to remove it.

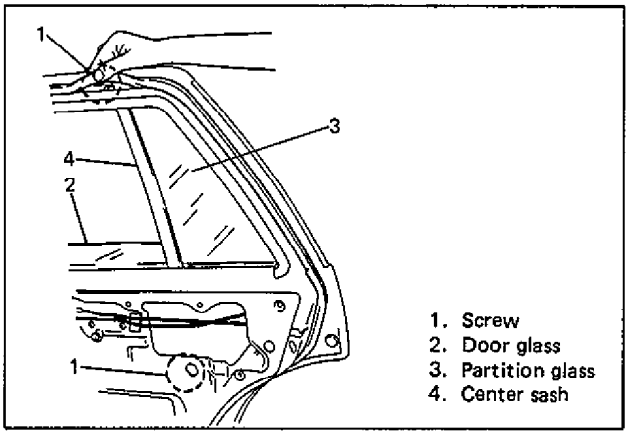


Fig. 9-29

11) Glass fitting screws. Then, take out door glass together with bottom channel.

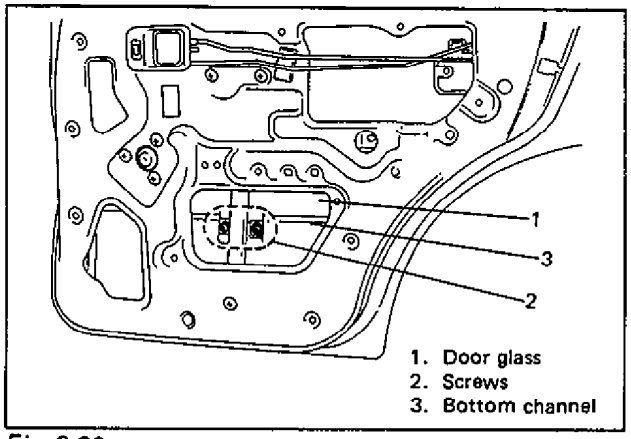


Fig. 9-30

12) 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.

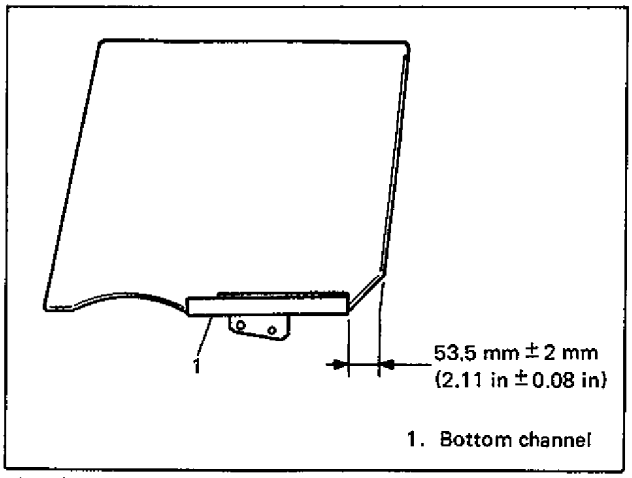


Fig. 9-31

2) Securely seal door sealing cover with adhesive.

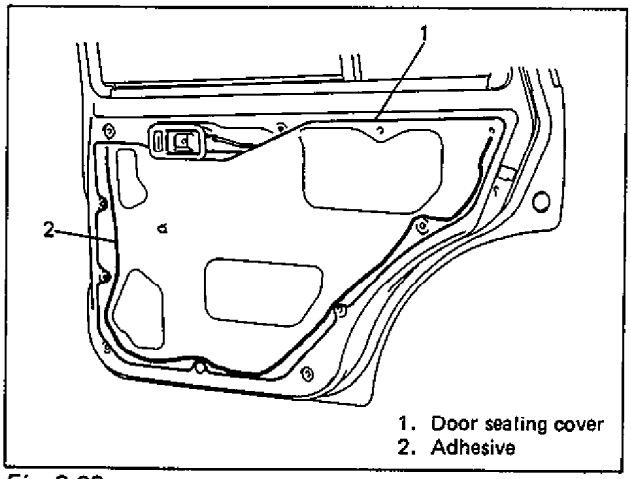


Fig. 9-32

3) Install door window regulator handle so that it has a 45° angle when glass is fully closed, as illustrated below.

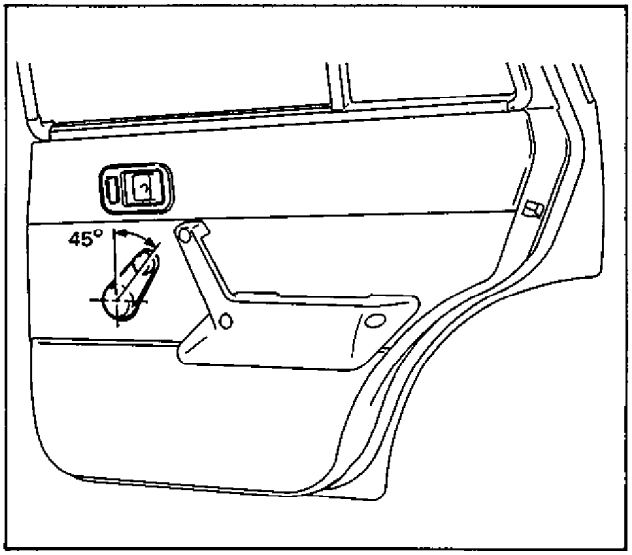


Fig. 9-33

DOOR WINDOW REGULATOR

REMOVAL

Remove following parts.

1) Door glass. (See previous section.)
2) Door window regulator attaching screws (six pcs.). Loosen 6 screws and take out regulator through hole "A".

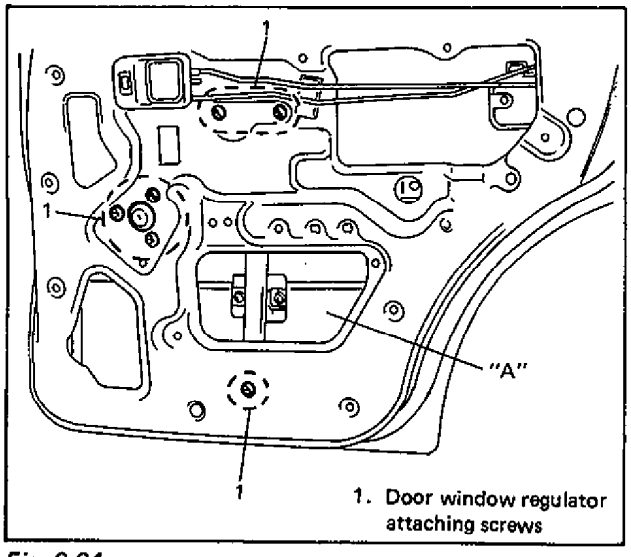


Fig. 9-34

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.

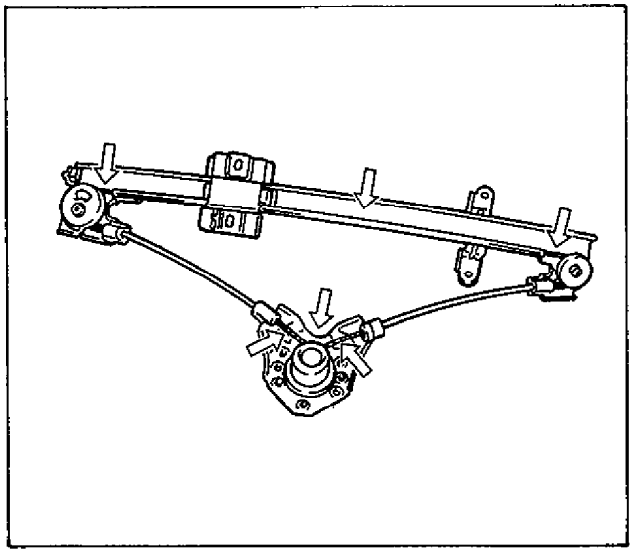


Fig. 9-35 Greasing Sliding Points

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.

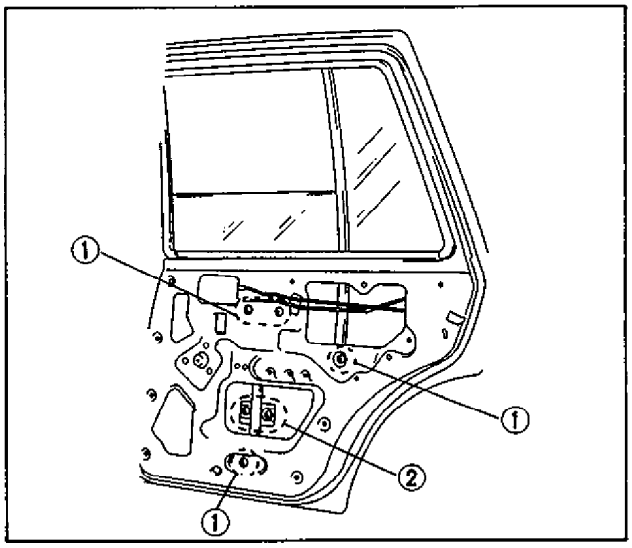


Fig. 9-36 Adjusting Door Wondow Regulater

REAR DOOR LOCK

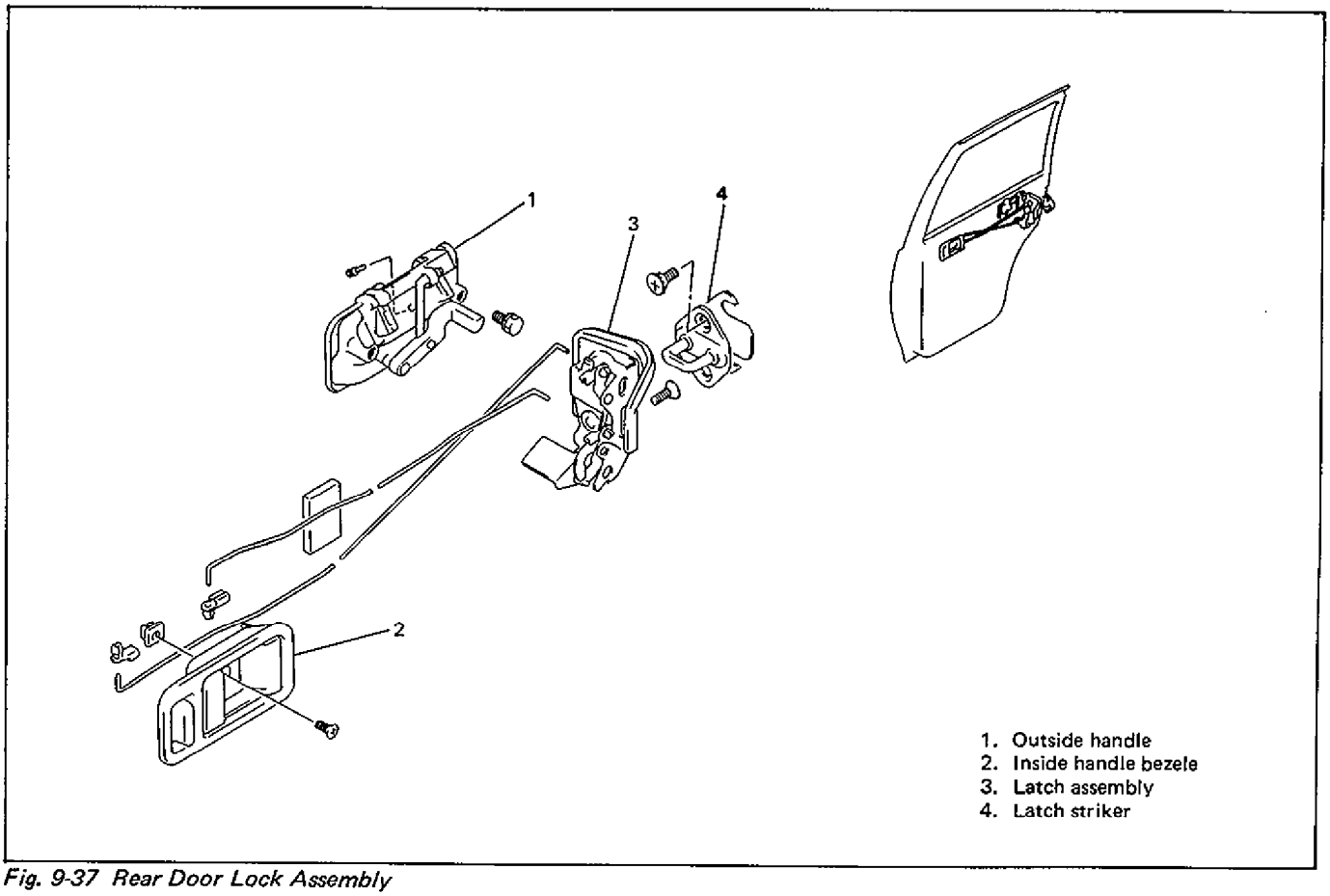


Fig. 9-37 Rear Door Lock Assembly

REMOVAL

Remove following parts.

1) Inside handle bezel screw.
2) Door armrest.
3) Window regulator handle.
   For its removal, pull off snap by using a cloth as shown below.

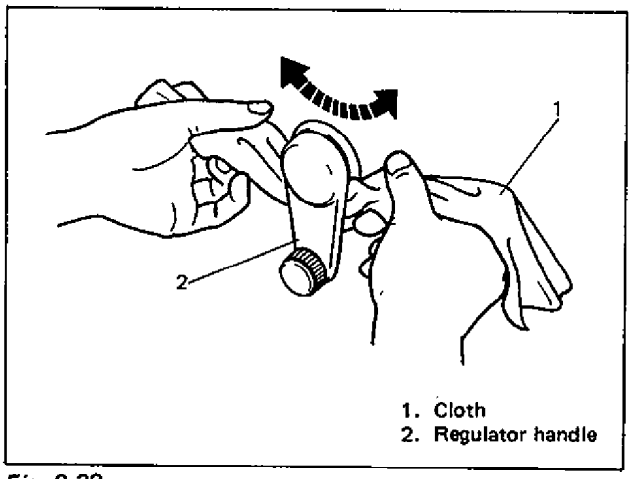


Fig. 9-38

4) Door inner weatherstrip.
5) Door trim.
6) Door sealing cover.
7) Door latch ass'y with door inside handle.
8) 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.

REAR QUARTER WINDOW (For 3 door model)

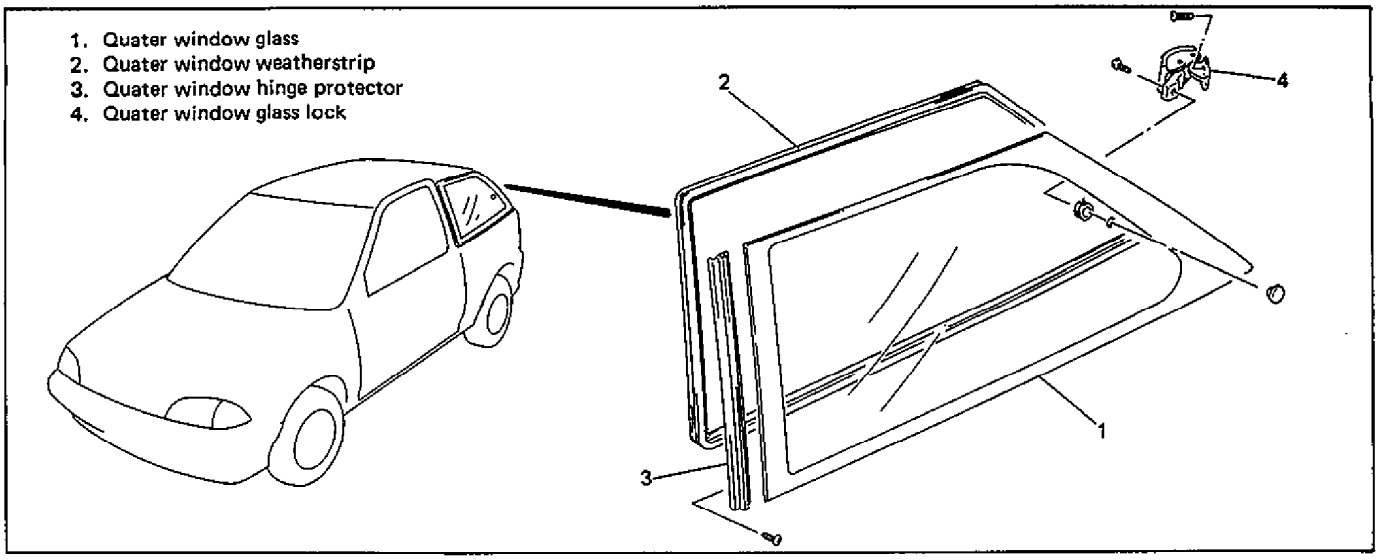


Fig. 9-39 Quarter Vent Window Assembly (for 3 door model)

Quater window is adhered to protector.

ADHESIVE PROCEDURE

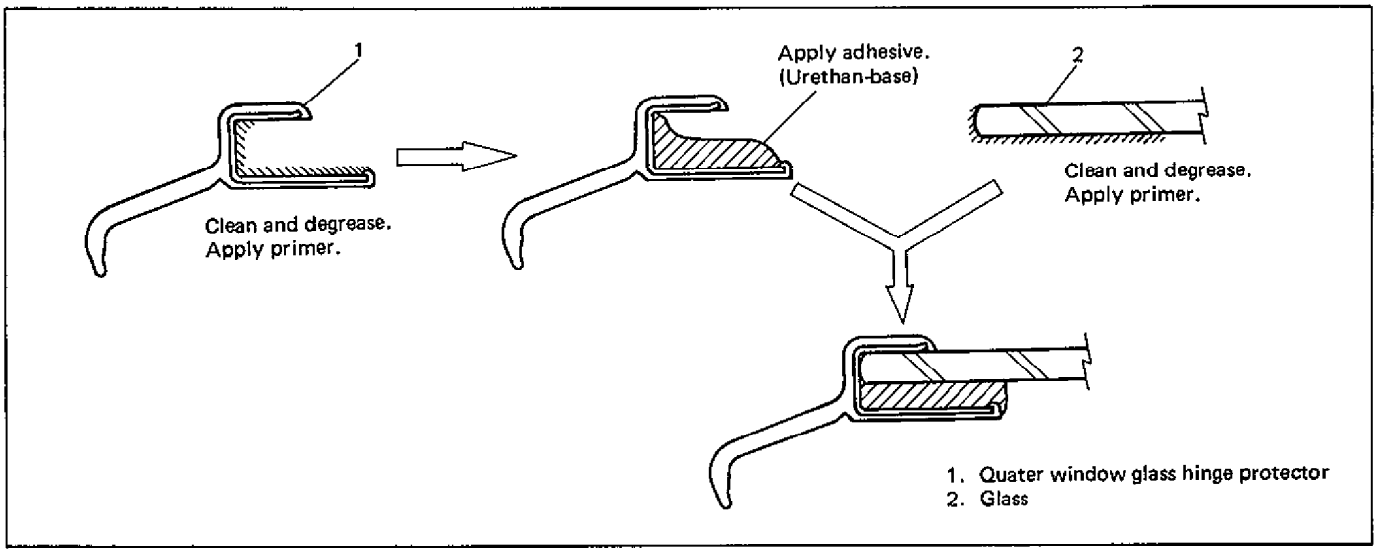


Fig. 9-40

REMOVAL

1) Remove quarter window lock.
2) Remove hinge screws.

INSTALLATION

Reverse removal procedure.

NOTE:

When replacing quarter window glass with new one, be sure to use new hinge protector.

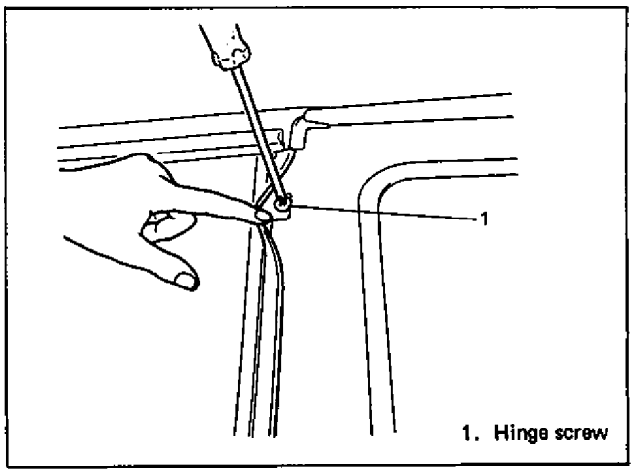


Fig. 9-41

REAR QUARTER WINDOW (For 5 door model)

The rear quarter window 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.

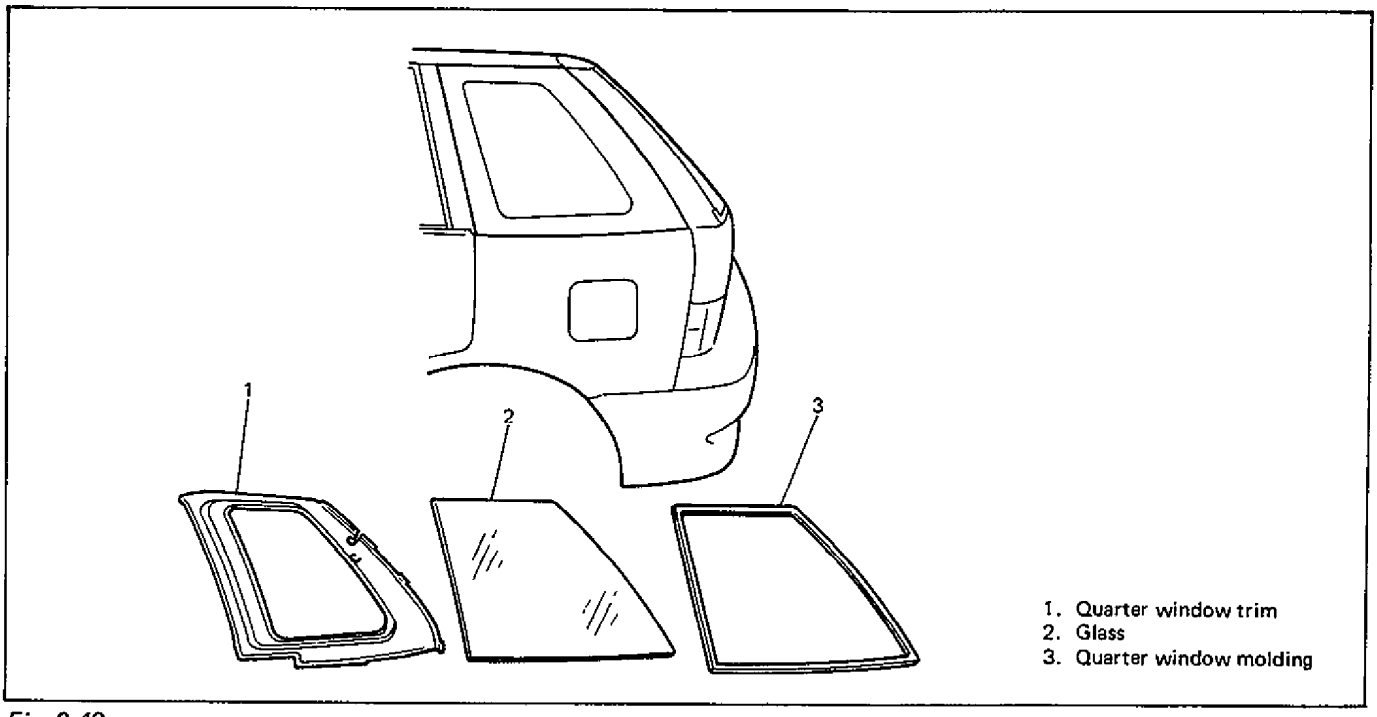


Fig. 9-42

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.

Separating strength (Peeling)	15 – 20 kg/10 mm (width) or more (83.8 – 112 lb/in (width))
Shearing strength	30 kg/cm² or more (427 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 (380 g (13.4 oz.))
  Primer for glass (30 g (1.1 oz.))
  Primer for body (30 g (1.1 oz.))
  Primer for urethane (moulding) (30g (1.1 oz))
- Eyeleteer
- Piano string
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

REMOVAL

1) Detach rear part of door opening weatherstrip from body.
2) Cut moulding all around quarter glass with knife.
3) Using a tape, cover body surface around quarter window glass to prevent any damage.
4) Remove quarter window trim.
5) Drill a hole with an eyeleteer through adhesive and let a piano string through it.

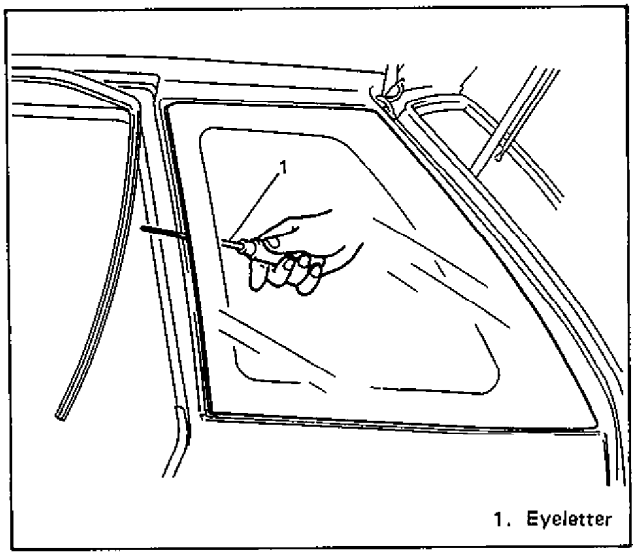


Fig. 9-43

6) Cut adhesive all around quarter glass with piano string.

NOTE:
Use piano string as close to glass as possible so as to prevent damage to body.

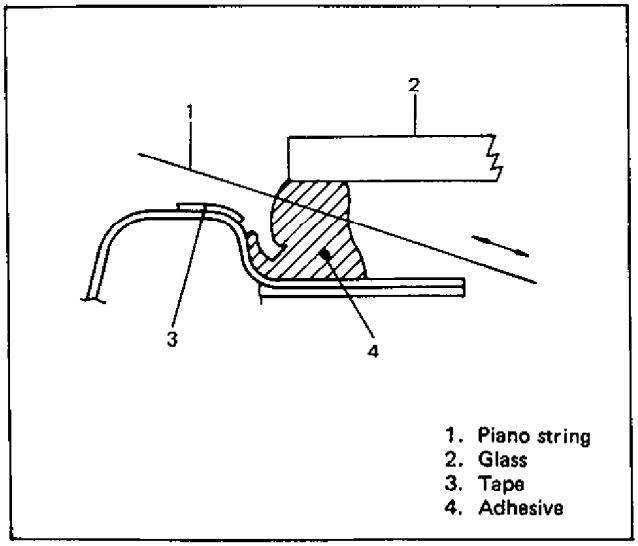


Fig. 9-44

7) Using a knife, smooth adhesive remaining on body side so that it is 2 — 3 mm thick all around.
8) Where adhesive will be attached, remove adhesive untill painted surface is exposed and clean.

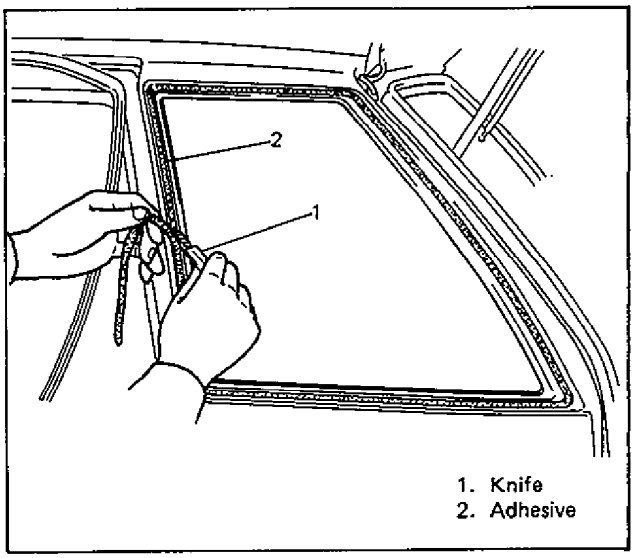


Fig. 9-45

9) When re-using glass, remove adhesive from glass, using care not to damage primer coated surface.

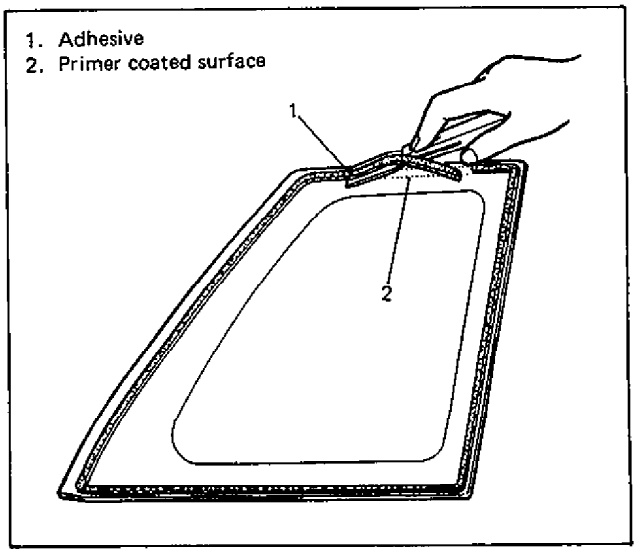


Fig. 9-46

INSTALLATION

1) Using cleaning solvent, clean window opening edge where window glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Using a new brush, apply sufficient amount of primer for body along body surface where window is to be adhered.

NOTE:

Be sure to refer to marker's instruction for proper handling and drying time.

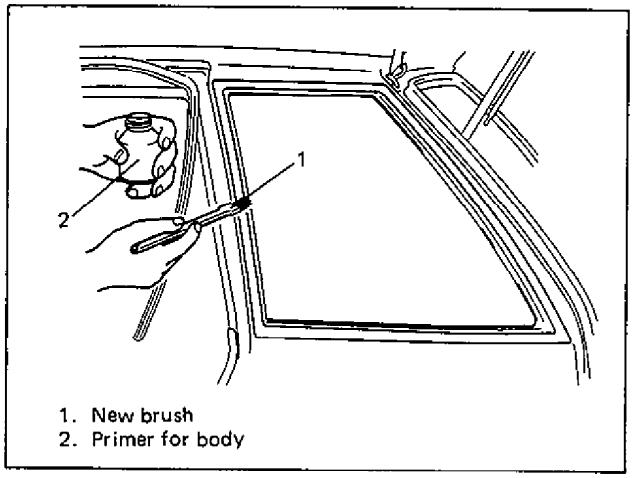


Fig. 9-47

3) Cleen glass surface to be adhered to window with clean cloth. If unleaded gasoline is used, let it dry for more than 10 minutes.
4) Slide glass into new moulding.
5) Clean moulding surface "A" with clean cloth. (Refer to Fig. 9-50.)
6) Peel paper from one side of new dam which is included in new moulding set, and attach that side to glass.

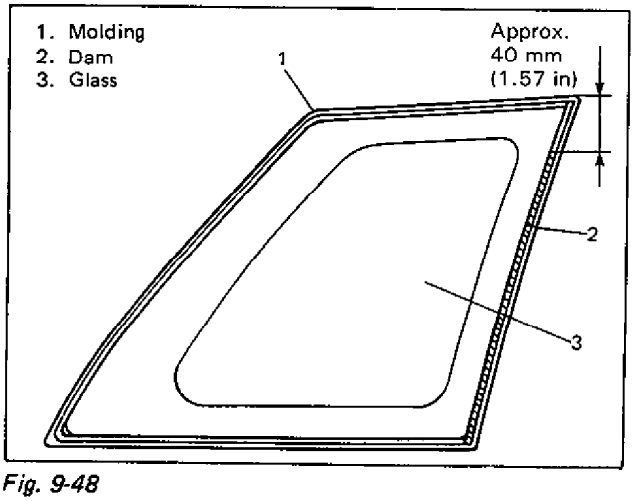


Fig. 9-48

7) Using a 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.**

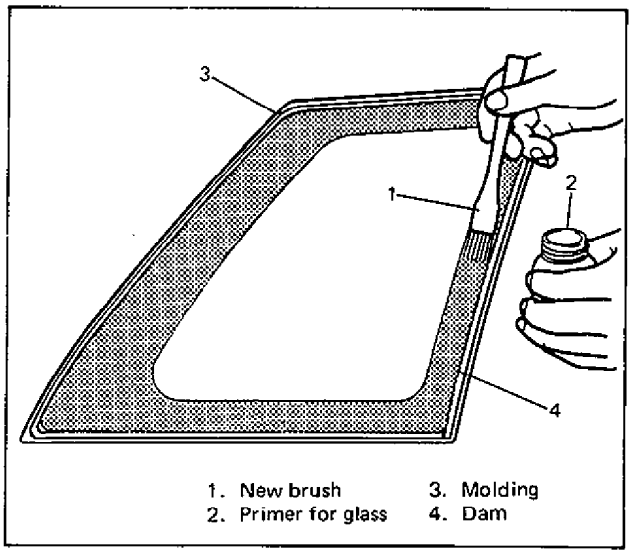


Fig. 9-49

8) Using new brush, apply sufficient amount of primer for moulding (Urehane) to surface "A" as shown in Fig. 9-50.

NOTE:

- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not touch primer coated surface.**

7) Apply adhesive as shown.

NOTE:

- **Start from bottom side Ⓐ of glass.**
- **As for rear side Ⓑ of glass, apply adhesive so that shape of the adhesive applied part matches shape of primer coated part of body (as in step 2).**

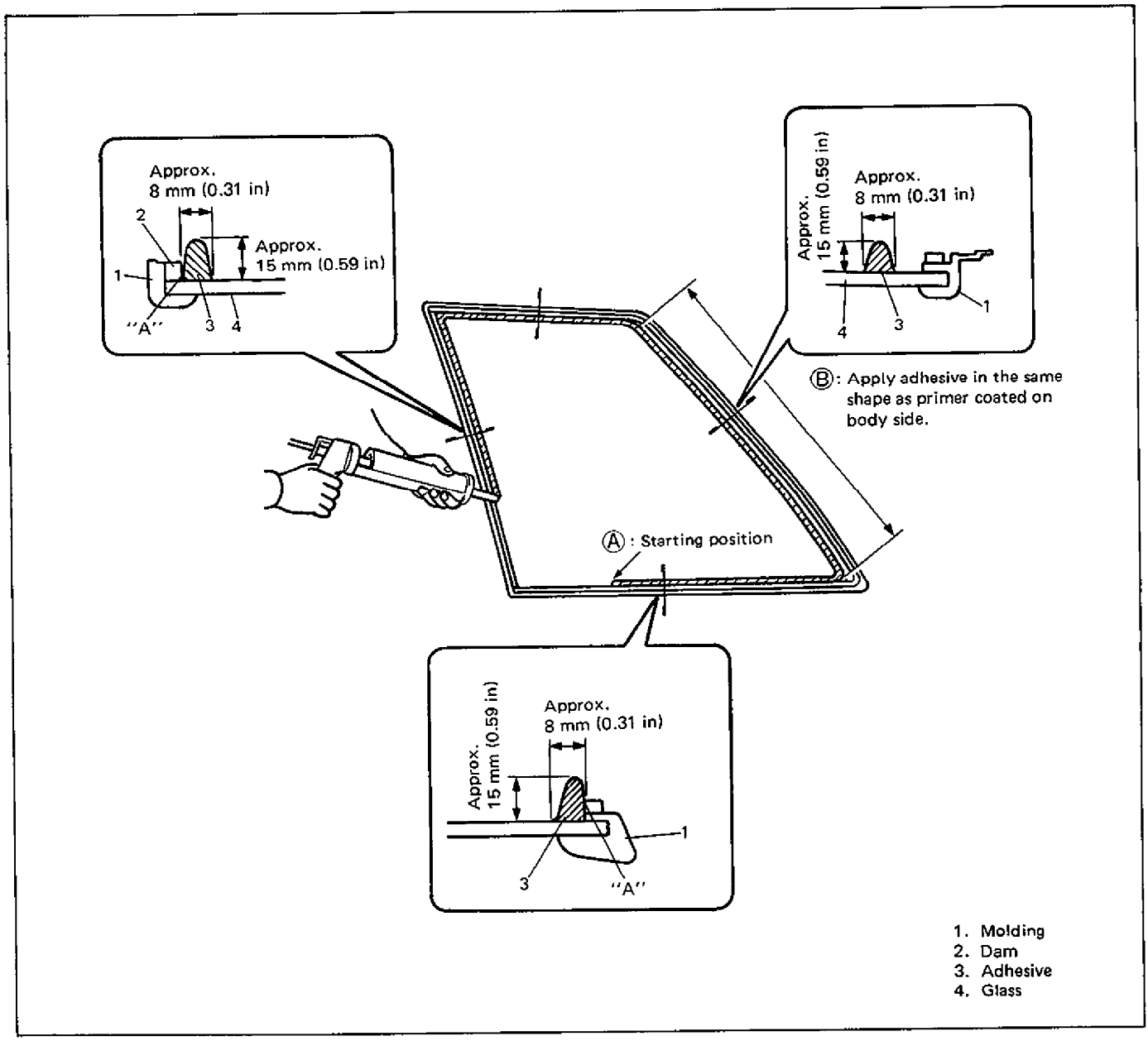


Fig. 9-50 Application of Adhesive

8) Peel remaining paper from dam and moulding.

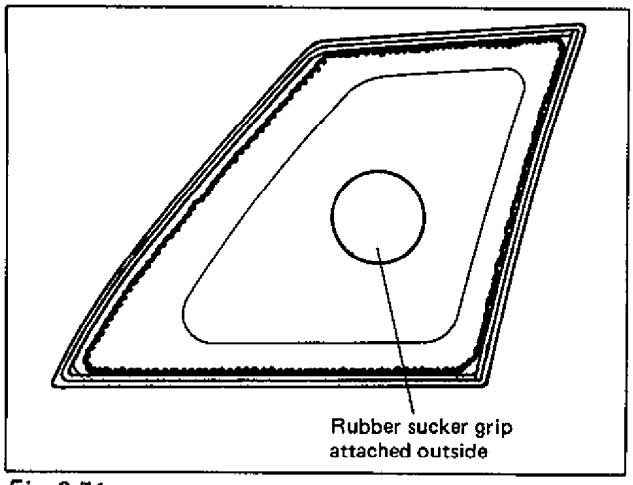


Fig. 9-51

Use of a rubber sucker grip is helpful to hold and carry glass after adhesive is applied.

9) Press glass against body so that clearance Ⓐ and Ⓑ comes even.

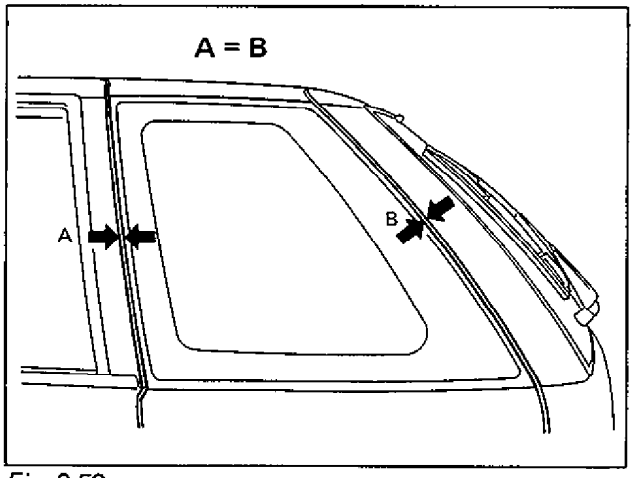


Fig. 9-52

10) Check for water leakage by pouring water over window through a hose. If a 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 an infrared lamp or the like for drying.**

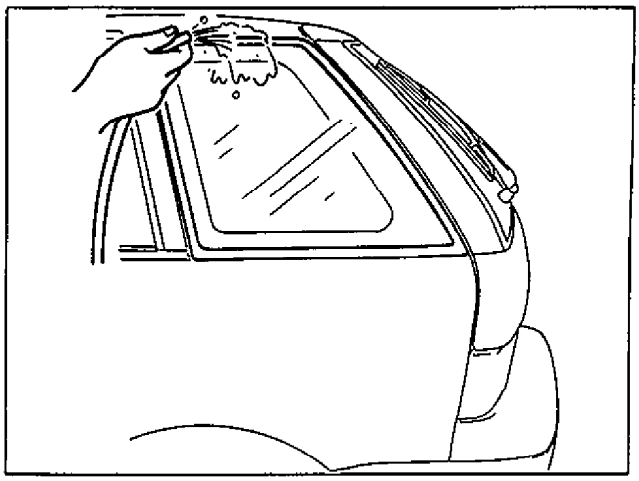


Fig. 9-53

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.**
- **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.**

11) Install quarter window trim.

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 urethane (moulding) (20 g (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)

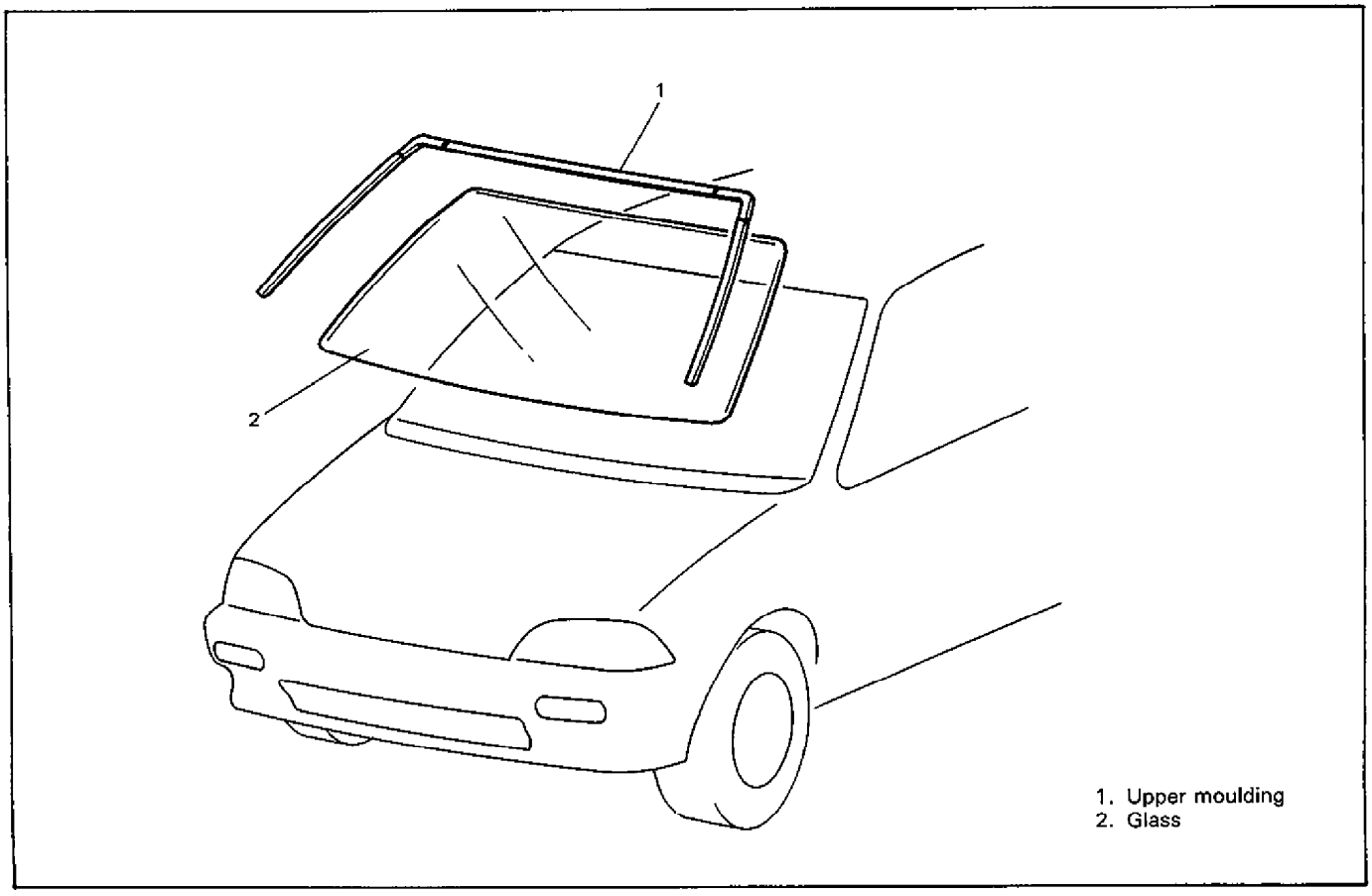


Fig. 9-54 Windshield

REMOVAL

1) Clean both inside and outside of glass and arount it.
2) Remove wiper arms, garnish and spacers.
3) Remove moulding and moulding joints by cutting with knife.
4) Using tape, cover body surface around windshield glass to prevent any damage.
5) Remove room mirror, sunshades, and front pillar trims (right & left).
6) Warm up font part of roof lining. Then, remove front side rib of roof lining from between front glass and body.

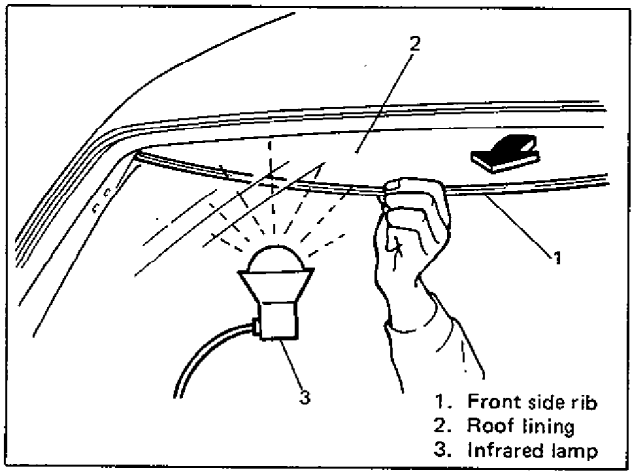


Fig. 9-55

7) Drill hole with eyeleteer through adhesive and let piano string through it.

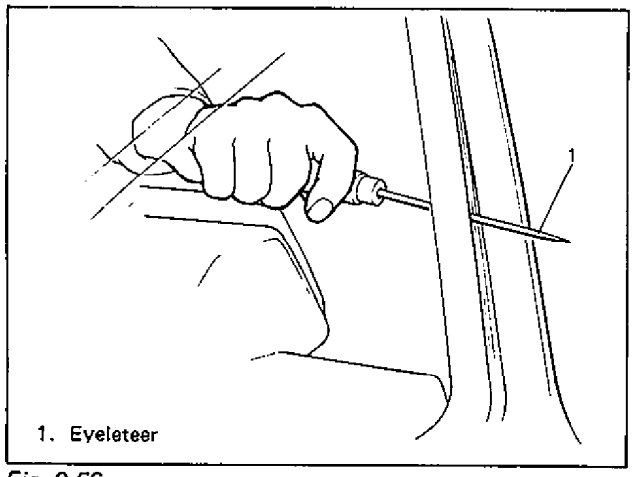


Fig. 9-56

8) Cut adhesive all around windshield glass with piano string.

NOTE:
Use piano string as close to glass as possible so as to prevent damage to body.

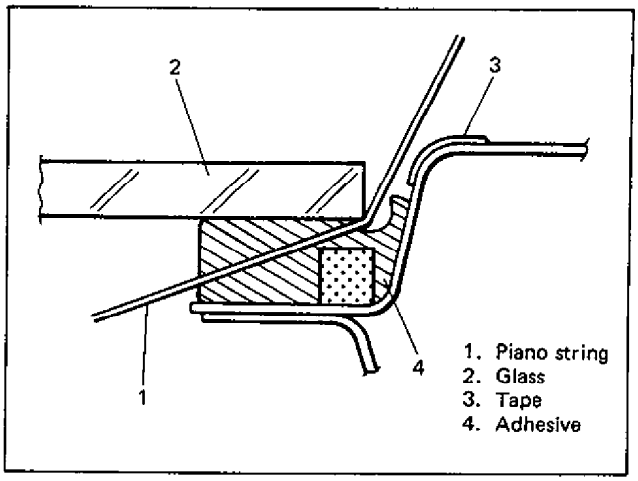


Fig. 9-57

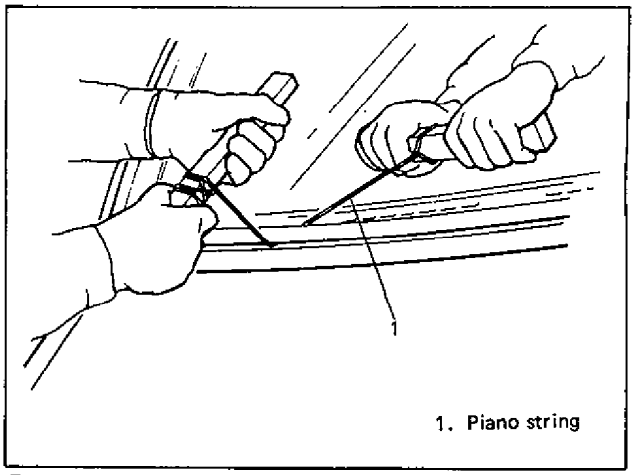


Fig. 9-58

9) 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.

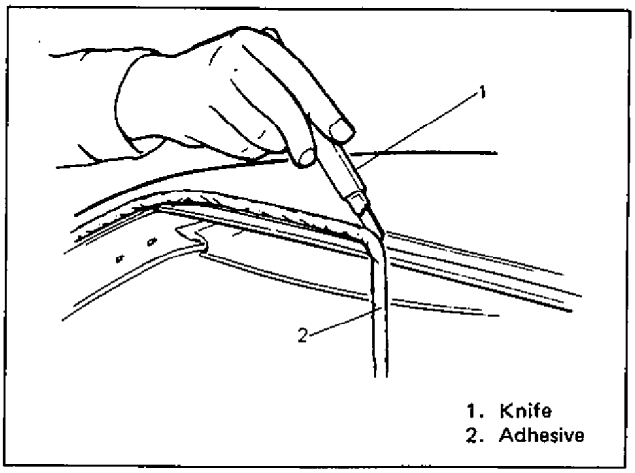


Fig. 9-59

10) When re-using glass, remove adhesive from glass, using care not to damage primer coated surface.

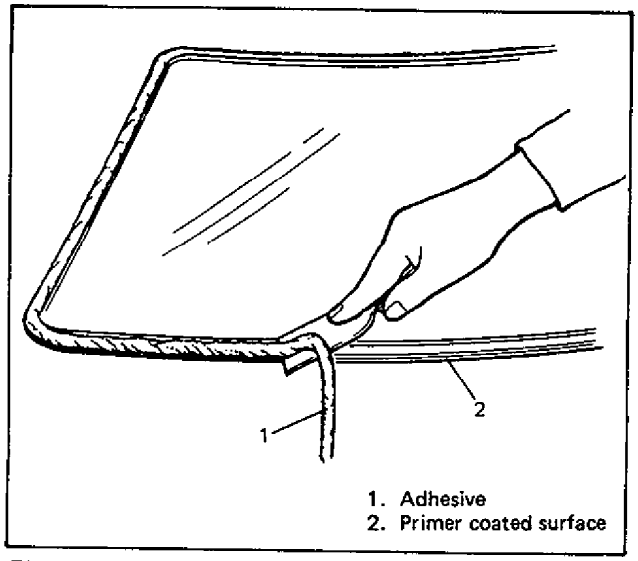


Fig. 9-60

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 front window.
3) Install new upper moulding to glass. Warming moulding 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 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.

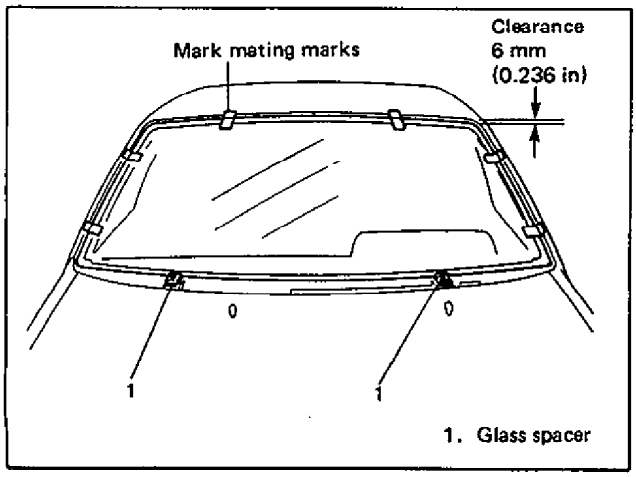


Fig. 9-61

5) Using new brush, apply sufficient amount of primer for body along body surface where windshield glass is to be adhered.

NOTE:
Be sure to refer to maker's instruction for proper handling and drying time.

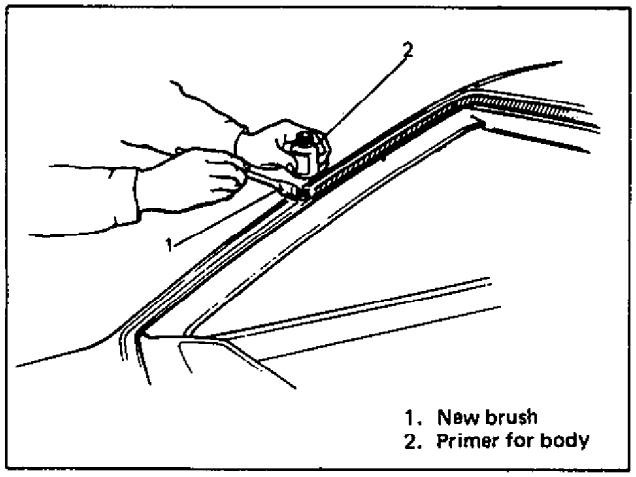


Fig. 9-62

6) Clean glass surface to be adhered to body 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.)

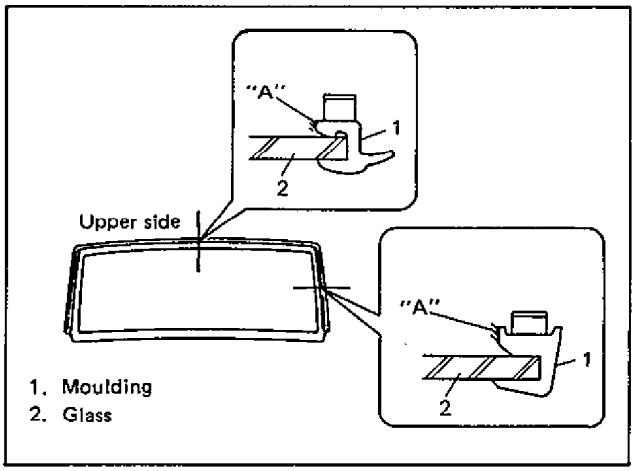


Fig. 9-63

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.**

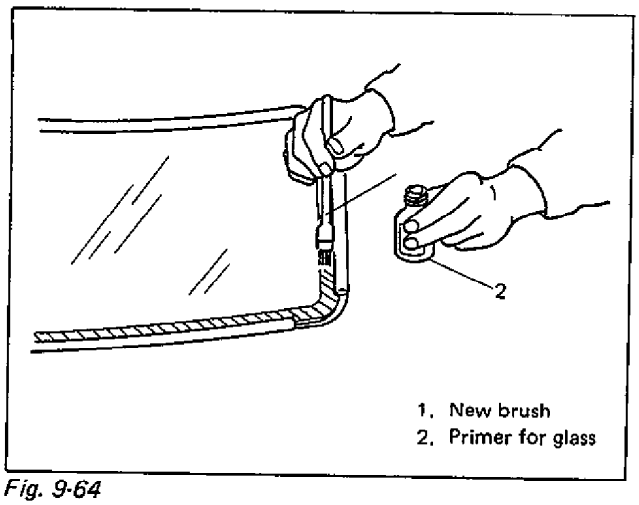


Fig. 9-64

9) Using new brush, apply sufficient amount of primer for moulding (Urethane) to surface "A" as shown in Fig. 9-63.

NOTE:

- **Be sure to refer to maker's instruciton for proper handling and drying time.**
- **Do not touch primer coated surface.**

10) Apply adhesive referring to Fig. 9-65.

NOTE:

- **Start from bottom side of glass.**
- **For application of adhesive in detail, refer to Fig. 9-65.**
- **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.**

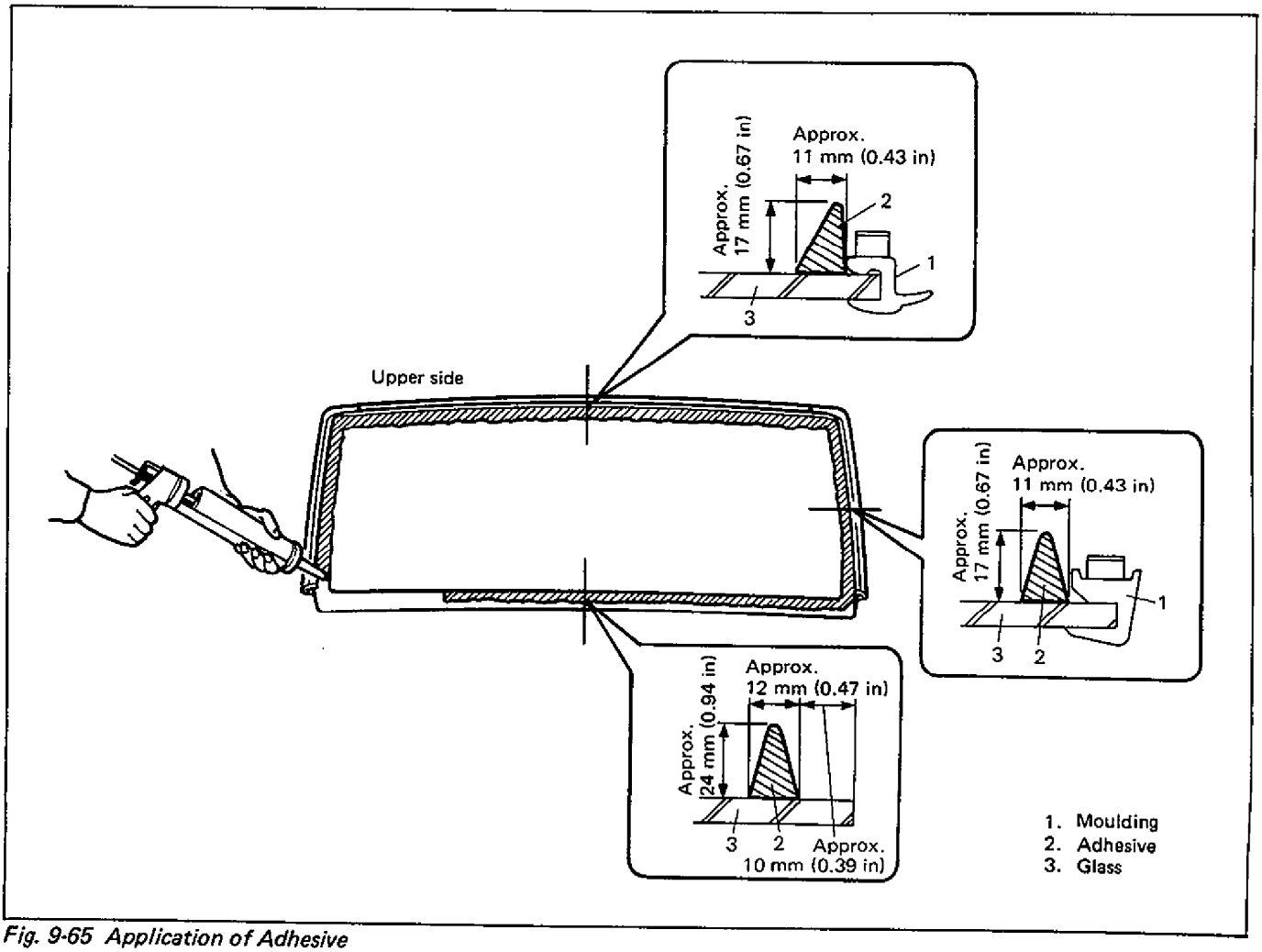


Fig. 9-65 Application of Adhesive

11) Peel remaining paper from moulding.
12) Holding rubber sucker grips, place glass onto body by aligning mating marks marked in step 4) and press it.

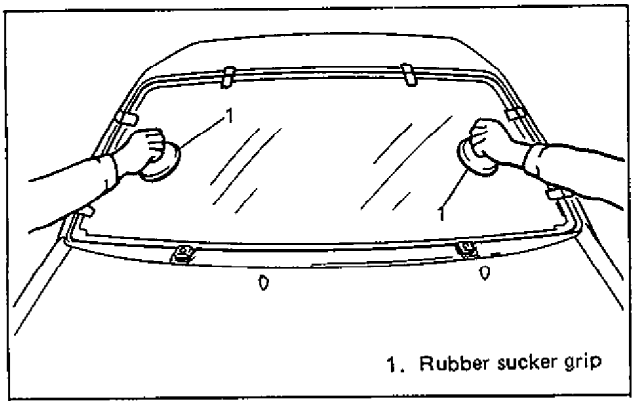


Fig. 9-66

13) 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.**

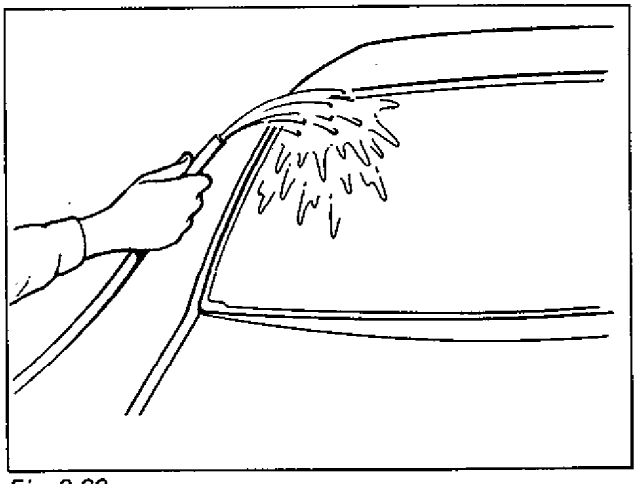


Fig. 9-69

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.**

BACK DOOR

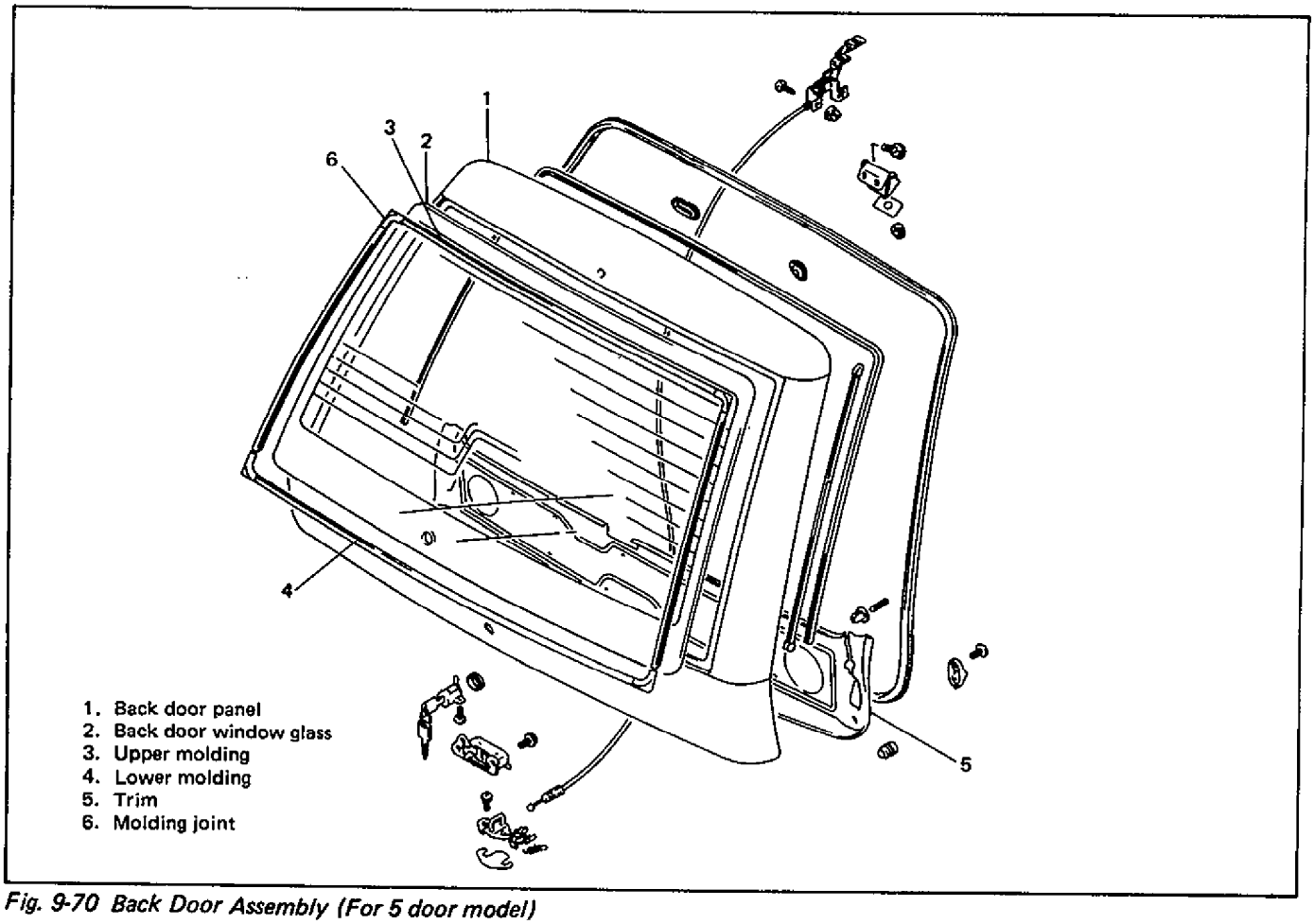


Fig. 9-70 Back Door Assembly (For 5 door model)

REMOVAL

Remove following parts.

1) Back door trim.
2) Disconnect wire harness connector inside back door to take it out from door. As to car provided with back window washer, disconnect washer hose.
3) Back door balancer lower (door side) fitting screws.
4) Door hinge bolts, and then door.

INSTALLATION

Reverse removal sequence noting following points.

1) Securely clamp wire harnesses.

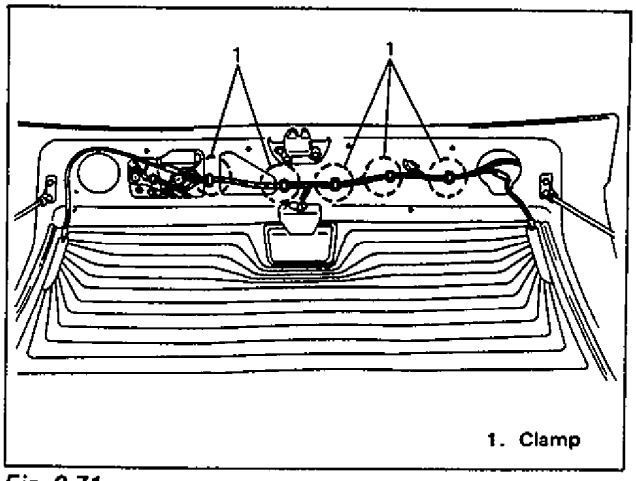


Fig. 9-71

2) Door latch striker
Adjust door latch striker so that striker shaft approximately aligns with the center of groove of door latch.

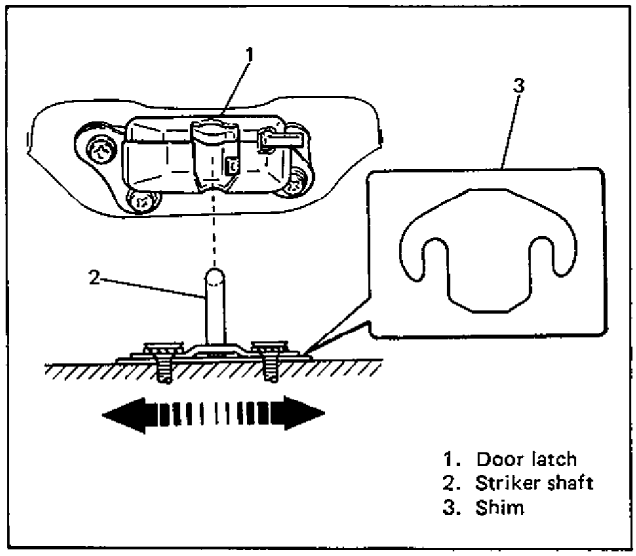


Fig. 9-72

3) To adjust door latch and striker with each other in the door up-and-down direction, insert a proper number of shims under the bottom of striker as shown below.

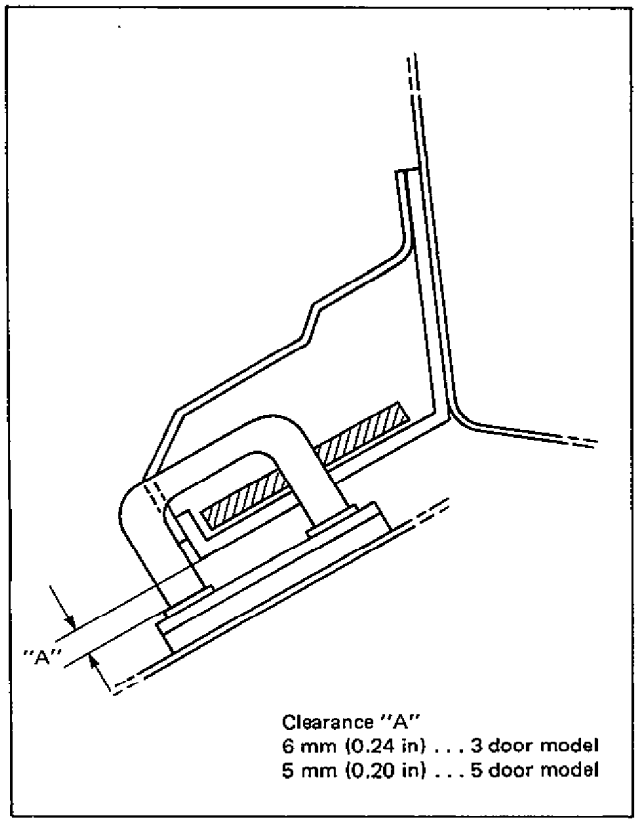


Fig. 9-73

4) Door adjustment by rubber cushion
Rubber cushion installed at each side of back door is of screw-adjustable type. Turn cushion to adjust door for proper position.

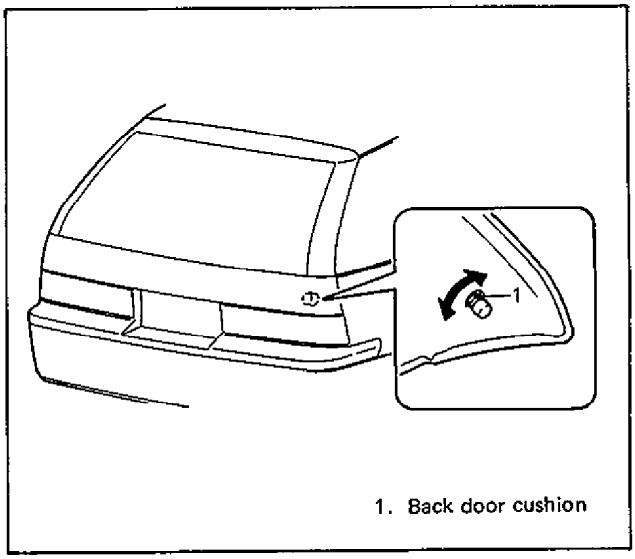


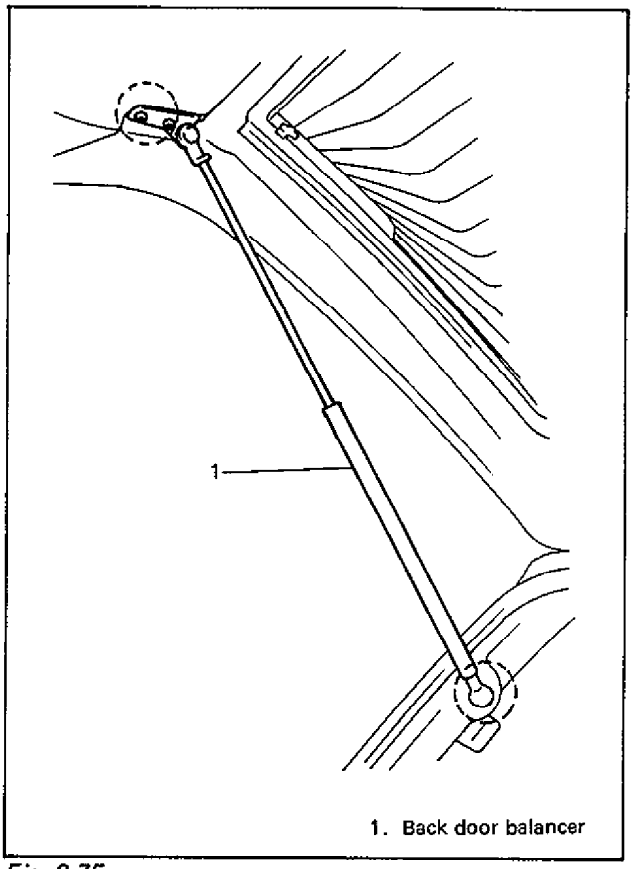
Fig. 9-74

BACK DOOR BALANCER

REMOVAL

Remove following parts.

1) Rear seat belt rear anchor.
2) Quater window lock screw (body side).
3) Rear pillar trim.
4) Back door balancer (first at its door-side and next at its body-side).



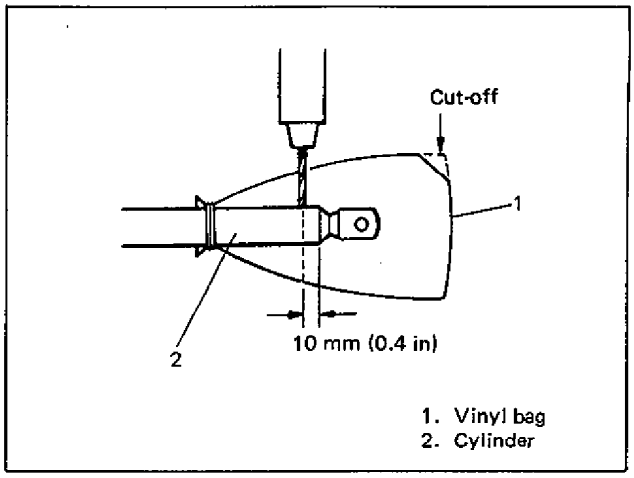
1. Back door balancer

Fig. 9-75

IMPORTANT:

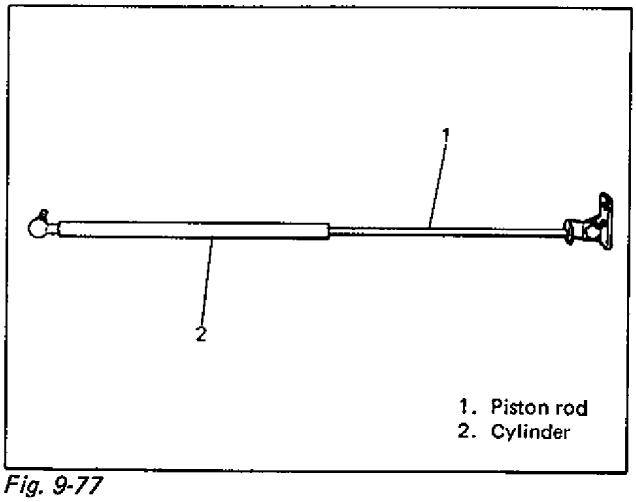
Handling of Back Door Balancer (Damper)

- **Do not disassemble balancer because its cylinder is filled with gas.**
- **When discarding removed back door balancer (damper), envelop it, as illustrated with a vinyl bag. Then, use a 2 to 3 mm (0.08 to 0.12 in) drill to make a hole, as shown, from above through vinyl bag into balancer.**
- **Handle balancer carefully. Do not scar or scratch exposed surface of its piston rod, and never allow any paint or oil to stick to its surface.**
- **Do not turn piston rod with balancer fully extended.**



1. Vinyl bag
2. Cylinder

Fig. 9-76



1. Piston rod
2. Cylinder

Fig. 9-77

INSTALLATION

Reverse removal sequence to install back door.

	N·m	kg-m	lb-ft
Tightening torque for rear anchor mounting bolt	40 – 50	4.0 – 5.0	29.0 – 36.5

BACK DOOR GLASS (Fig. 9-70)

Back door glass is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For back door 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) (20 g (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)

REMOVAL

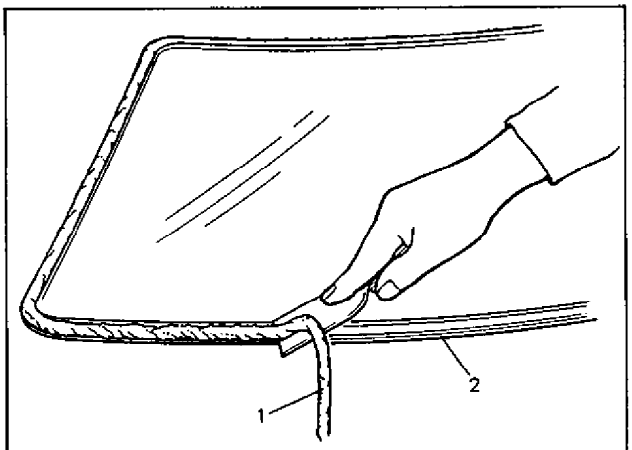
1) Clean both inside and outside of glass and around it.
2) Remove wiper arms.
3) Remove moulding and moulding joint by cutting with knife.
4) Using tape, cover body surface around back door glass to prevent any damage.
5) Remove back door trim, rear wiper motor ass'y and high mounted stop lamp.
6) Drill 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.



1. Adhesive
2. Primer coated surface

Fig. 9-78

INSTALLATION

1) Using cleaning solvent, clean window edge where window glass is to be adhered. (Let it dry for more than 10 mimutes.)
2) Install new back door window trim to window (Don't peel off paper of trim at this stage).
3) 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.

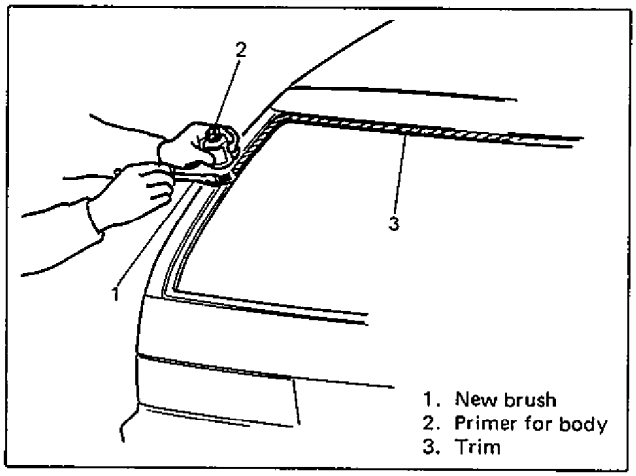


Fig. 9-79

4) Clean glass surface to be adhered to window with clean cloth. If cleaning solvent is used, let it dry for more than 10 minutes.
5) Clean moulding surface "A" with clean cloth. (Refer to below figure.)

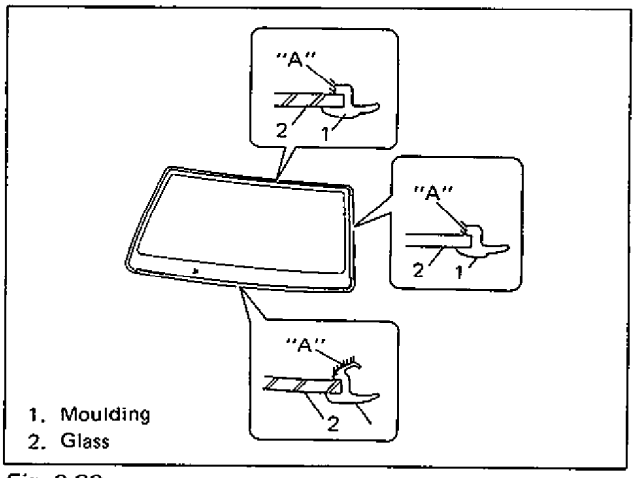


Fig. 9-80

6) Install new mouldings 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.
7) 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.**

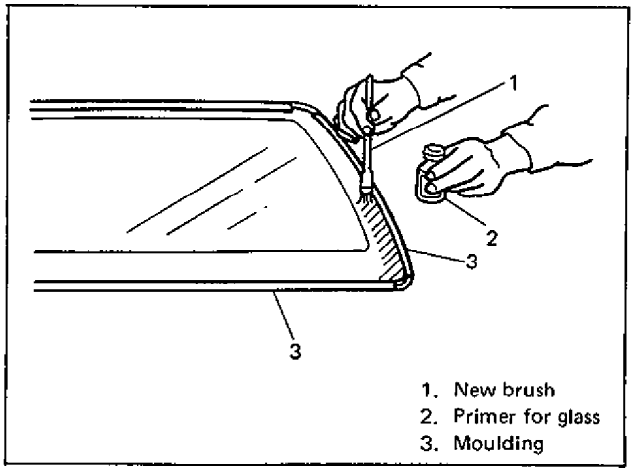


Fig. 9-81

8) Using new brush, apply sufficient amount of primer for moulding (Urethane) to surface "A" as shown in Fig. 9-80.

NOTE:
- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not touch primer coated surface.**

9) Apply adhesive along upper and lower moulding as shown.

NOTE:
- **Start from bottom side of glass.**
- **Height of applied adhesive should exceed that of trim and 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.**

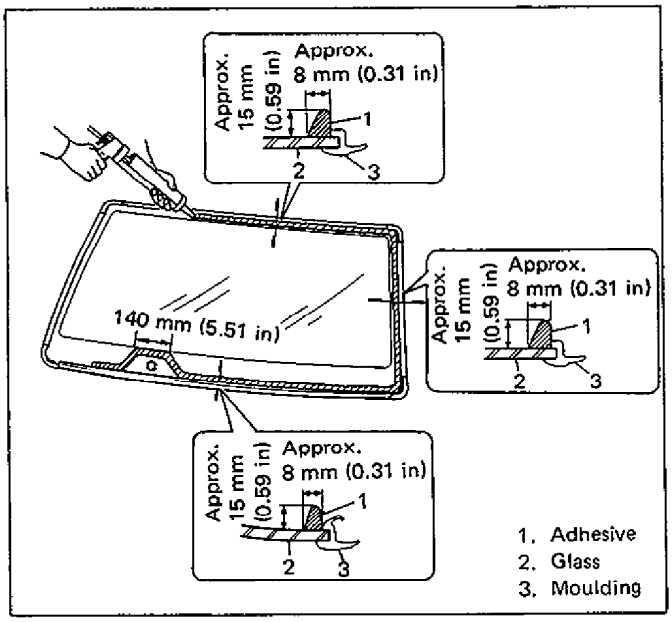


Fig. 9-82

10) Peel paper from mouldings and window trim.

11) Holding rubber sucker grips, press glass against door so that clearances Ⓐ and Ⓑ become even.

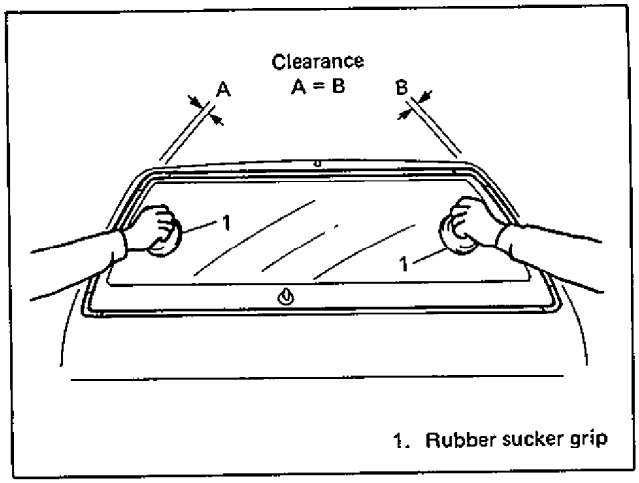


Fig. 9-83

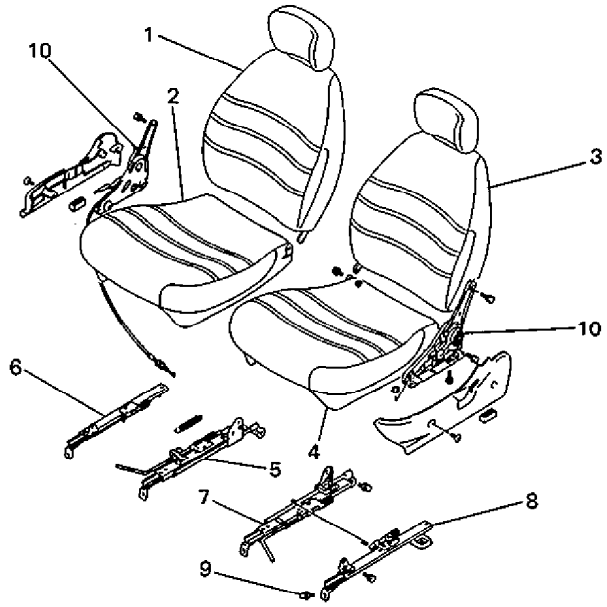
12) Check for water leakage by pouring water over window through hose. If leakage is found, dry window and fill leaky point with adhesive. If water still leaks even after that, remove glass and start the installation procedure all over again.

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. 9-85 Front Seat Assembly

REMOVAL

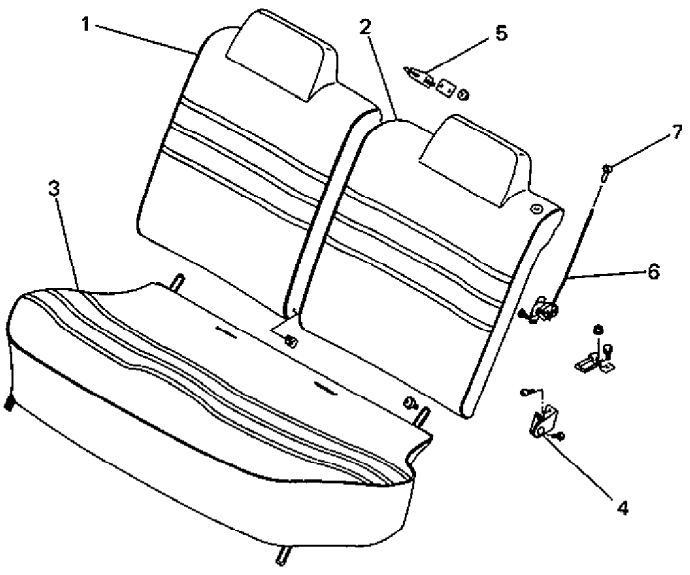
1) Remove five seat rail mounting bolts. Then, remove seat ass'y with seat rail.
2) Disassemble and repair seat as necessary.

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

Fig. 9-86 Rear Seat Assembly

REAR SEAT CUSHION

REMOVAL

1) Remove seatback.
2) Remove seat cushion fitting screws.
3) Raise the front portion of seat cushion to remove rear seat cushion.

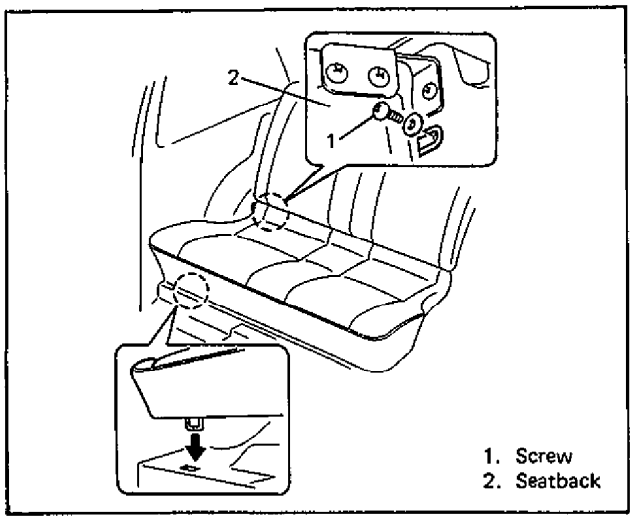


Fig. 9-87 Rear Seat Cushion Removal

INSTALLATION

Reverse removal procedure to install rear seat cushion.

REAR SEATBACK

REMOVAL

1) Remove spare tire (separate type seatback).
2) Remove seatback by removing its fitting nuts and screws.

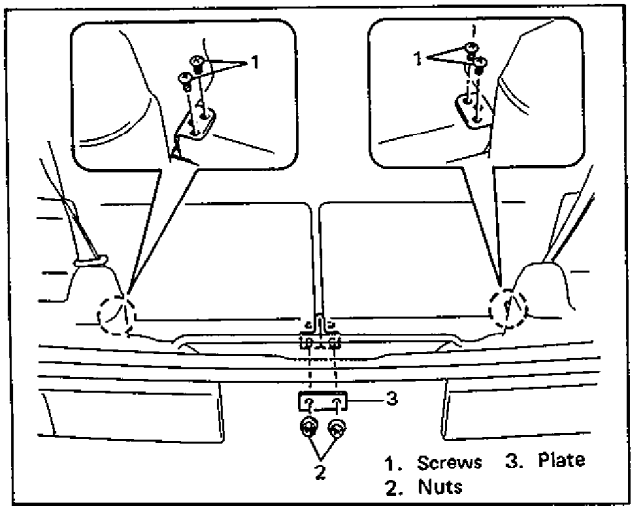


Fig. 9-88

INSTALLATION

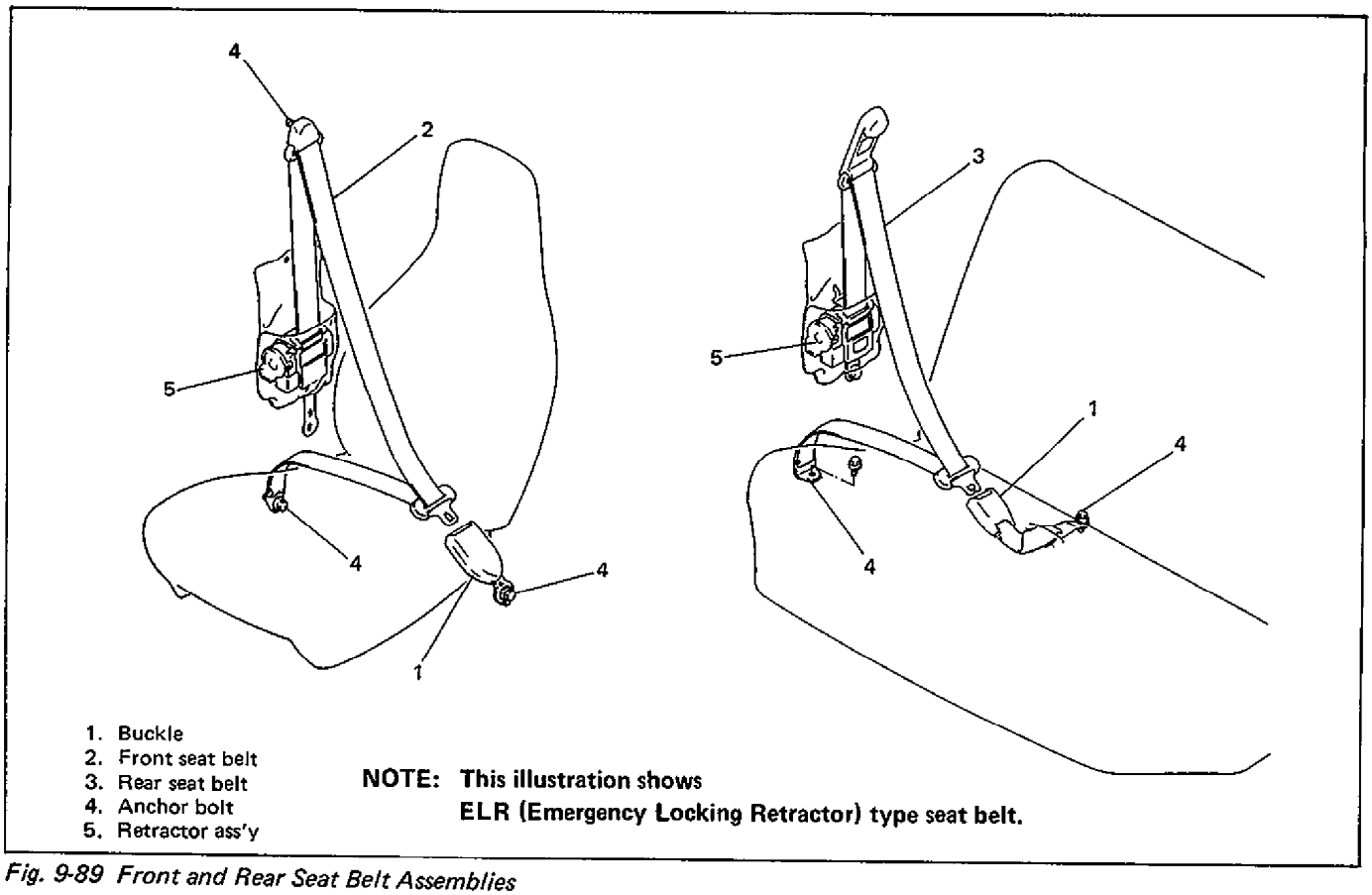
Reverse removal procedure to install rear seatback.

SEAT BELTS (Fig. 9-89)

DESCRIPTION

Different types of seat-belt are used depending of regulations of each country.
They are emergency locking retractor (ELR) type and 2-point or 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.



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. 9-89 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 coarse 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 (For Saudi Arabian market)
   Check driver's seat belt strap switch.

For the details of seat belt warning system, refer to the section "ELECTRICAL SYSTEM".

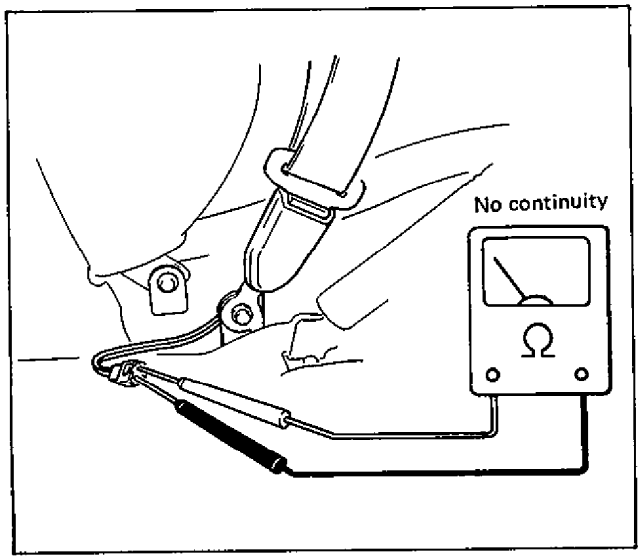


Fig. 9-90 Belt Latch "ON" Check

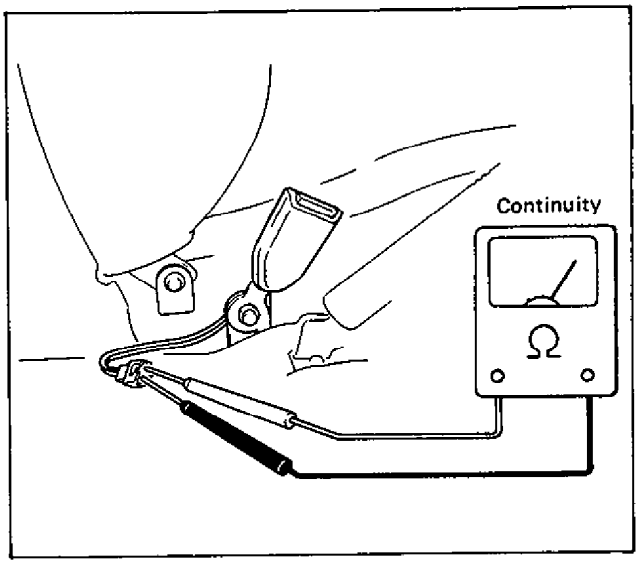


Fig. 9-91 Belt Latch "OFF" Check

FLOOR CARPET

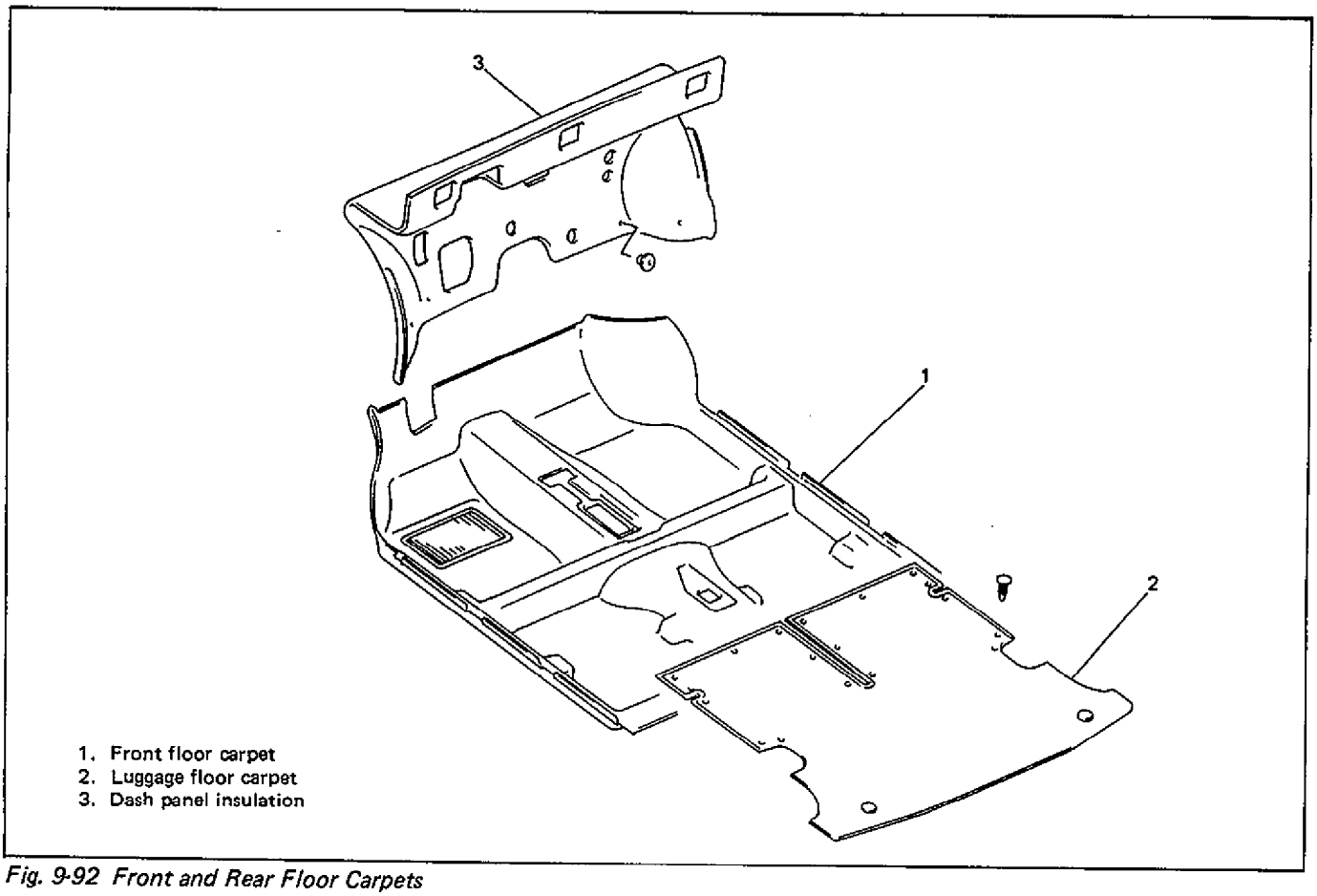


Fig. 9-92 Front and Rear Floor Carpets

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.

HEAD LINING

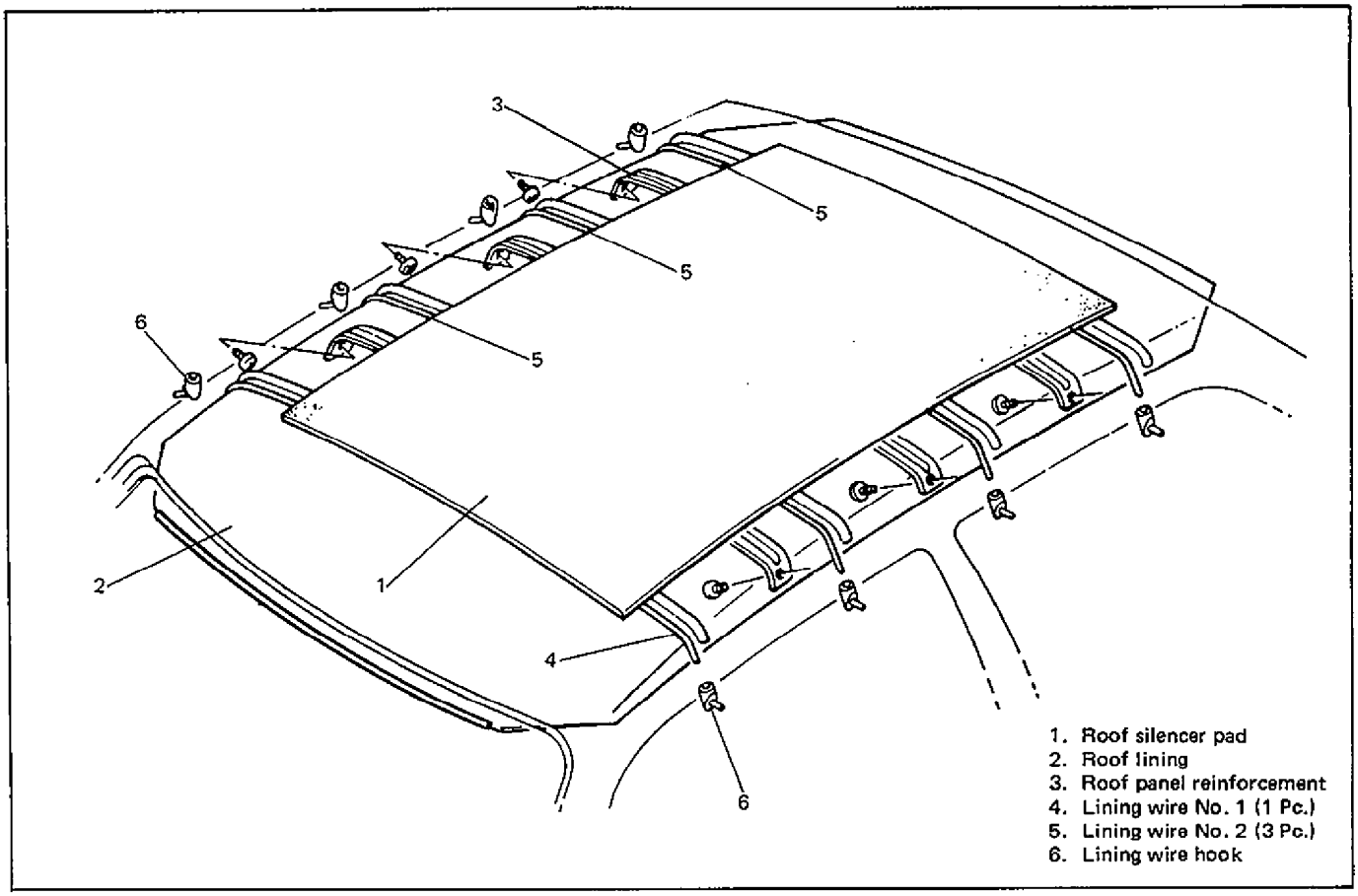


Fig. 9-93 Head Lining Assembly

REMOVAL

Remove following parts:

1) Inside rear view mirror.
2) Sunshade assembly.
3) Dome lamp.
4) Assist grips.
5) Door, quarter window, and back window windlaces and weatherstrips.
6) Pillar trims.
7) Head lining.

Adhesive used for securing head lining and roof silencer in place should be cleaned with solvent.

INSTALLATION

1) Affix a two-side bondable tape to upper side of each flange.

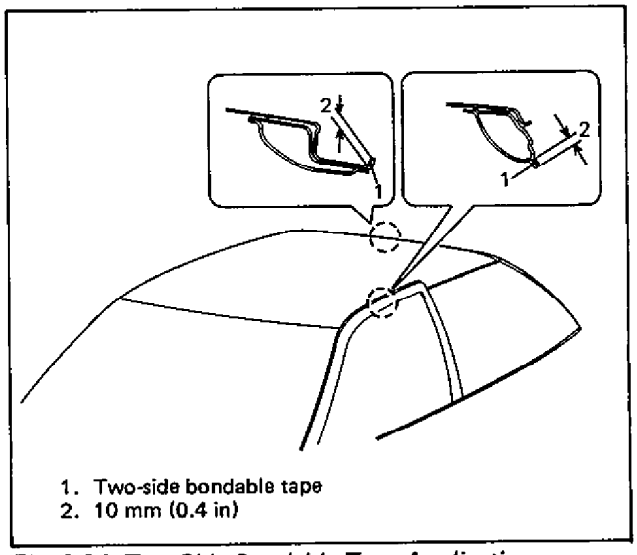


Fig. 9-94 Two-Side Bondable Tape Application

Two-side bondable tape should be affixed no further than 10 mm from the end of flange.

2) Take out dome lamp harness lead wire from roof lining hole to the room interior-side.
3) Use roof lining's mating mark (roof lining-to-roof panel mating mark) as a guide to pull roof lining backward.
4) Pull roof lining at its end so it is free from wrinkles and fix it to adhesive tape (two-side bondable tape) previously affixed to flange portion.
5) Use an infrared lamp and warm up roof lining for 30 to 60 secons to remove wrinkles from it.

NOTE:
Use infrared lamp for the shortest possible time only.

The assembly in the right-and-left direction should be matched with the above-mentioned assembly in the fore-and-aft direction. Pull the roof lining free from wrinkles and affix it to the adhesive tape (two-side bondable tape) affixed to the flange portion previously.
When fixing roof lining around the center pillar, use care that it is free from slits degrading its appearance.

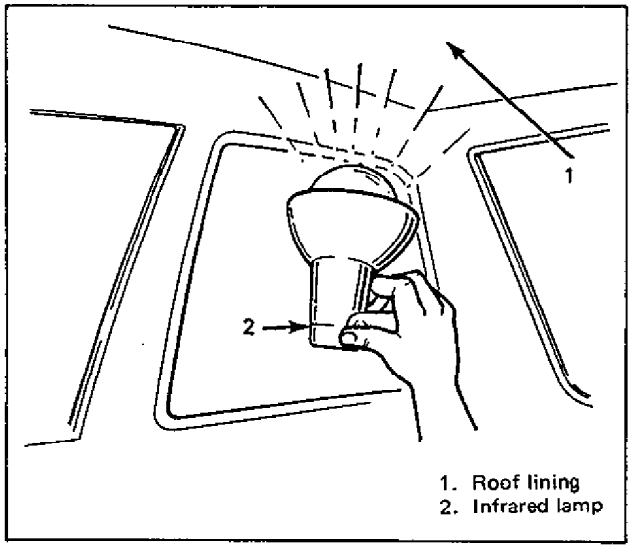


Fig. 9-95 Headlining Wrinkle Removal

HEAD LINING HEM CUTTING

For each flange portion, roof lining should be cut with width of its bonded hem equal to or less than width of a bonding tape (max. 10 mm). Cutting lining with wider than 10 mm bonded hem adversely affects sealability of weatherstrip, causing water leakage.
Install following parts:
1) Weatherstrips (Doors, side windows and windlaces back window)
2) Assist grip.
3) Dome lamp.
4) Sunshade assembly.
5) Inside rear view mirror.
6) Pillar trims.

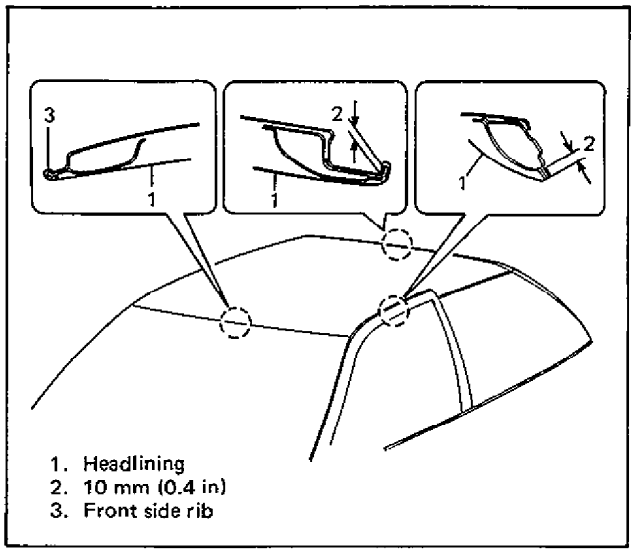


Fig. 9-96 Head Lining to Flange Overhang

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 again.
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 compount to inner surfaces of exterior body parts to be installed.

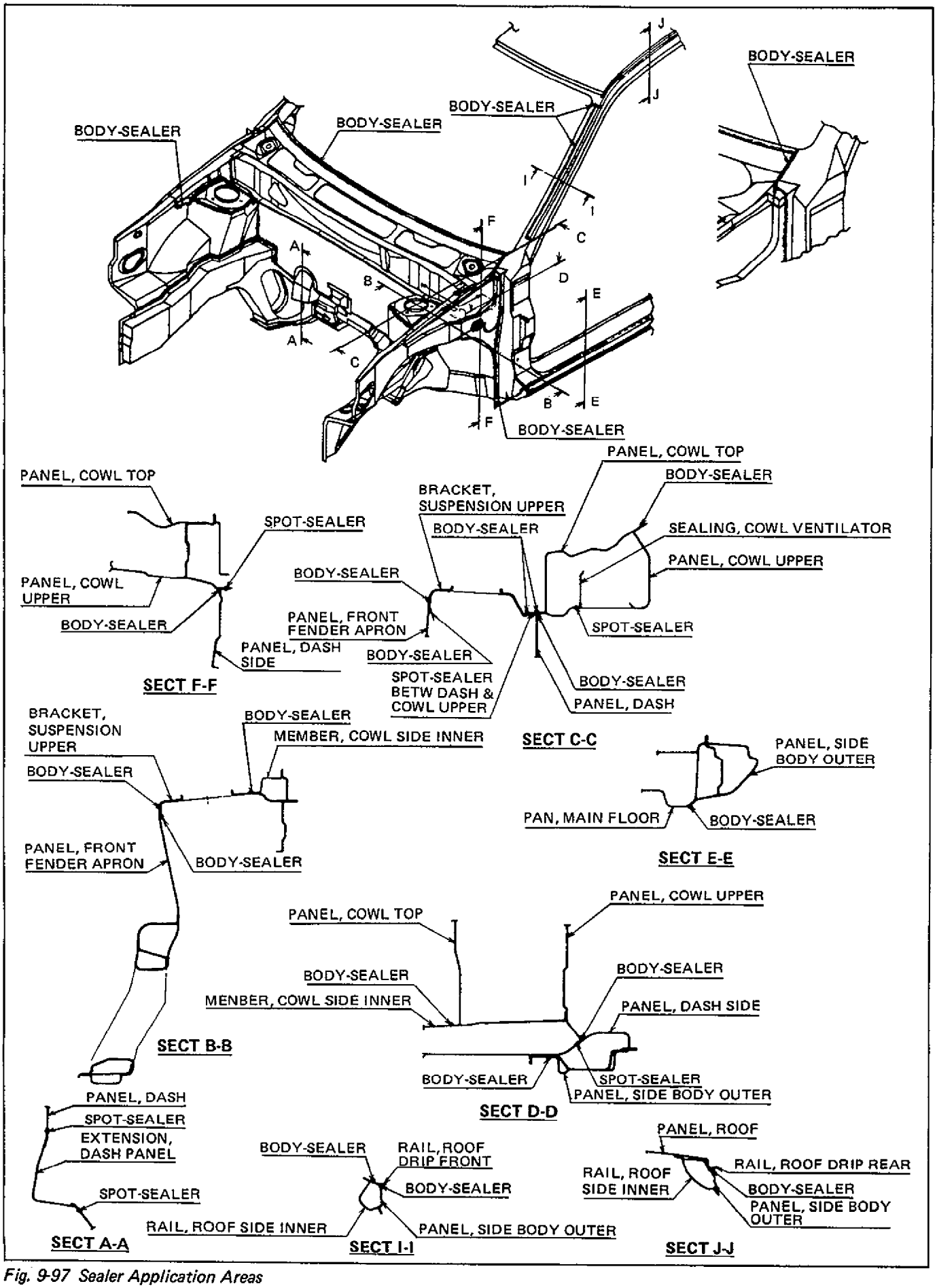


Fig. 9-97 Sealer Application Areas

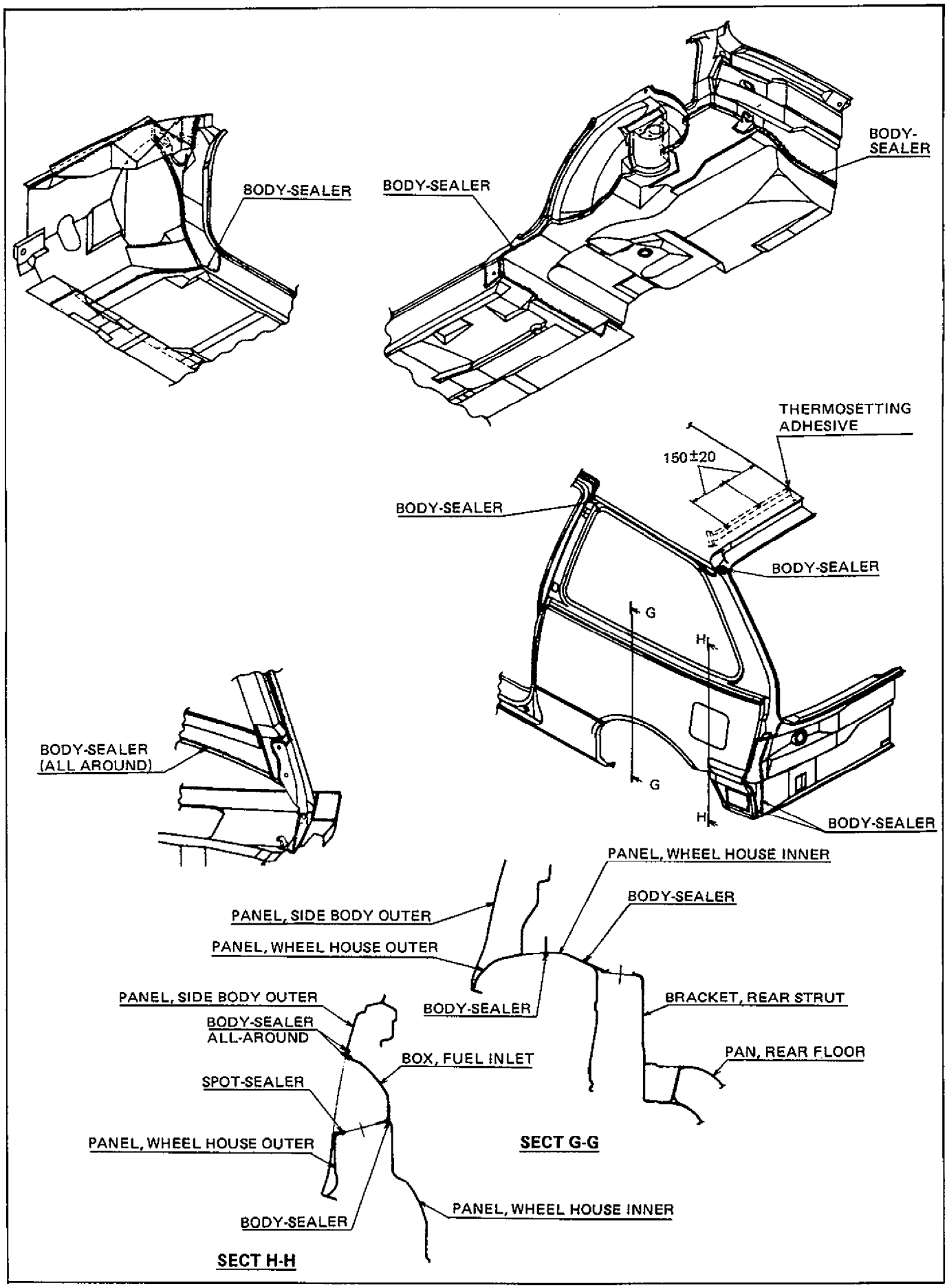
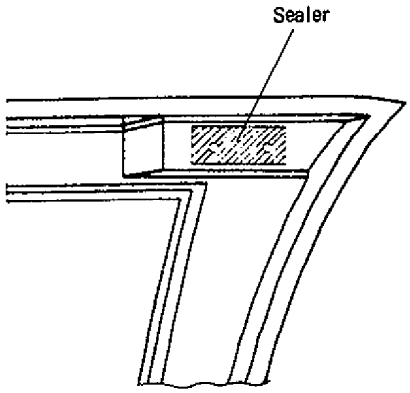
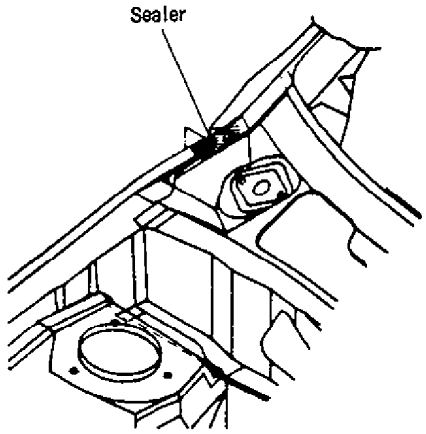


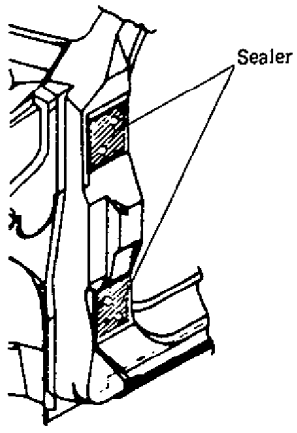
Fig. 9-98 Sealar Application Areas



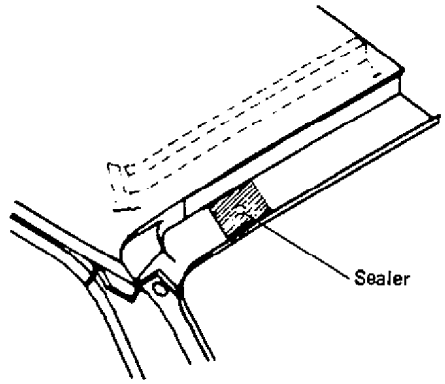
FRONT HOOD



COWL TOP



FRONT PILLAR



ROOF BACK MEMBER

Fig. 9-99 Sealer Application Areas

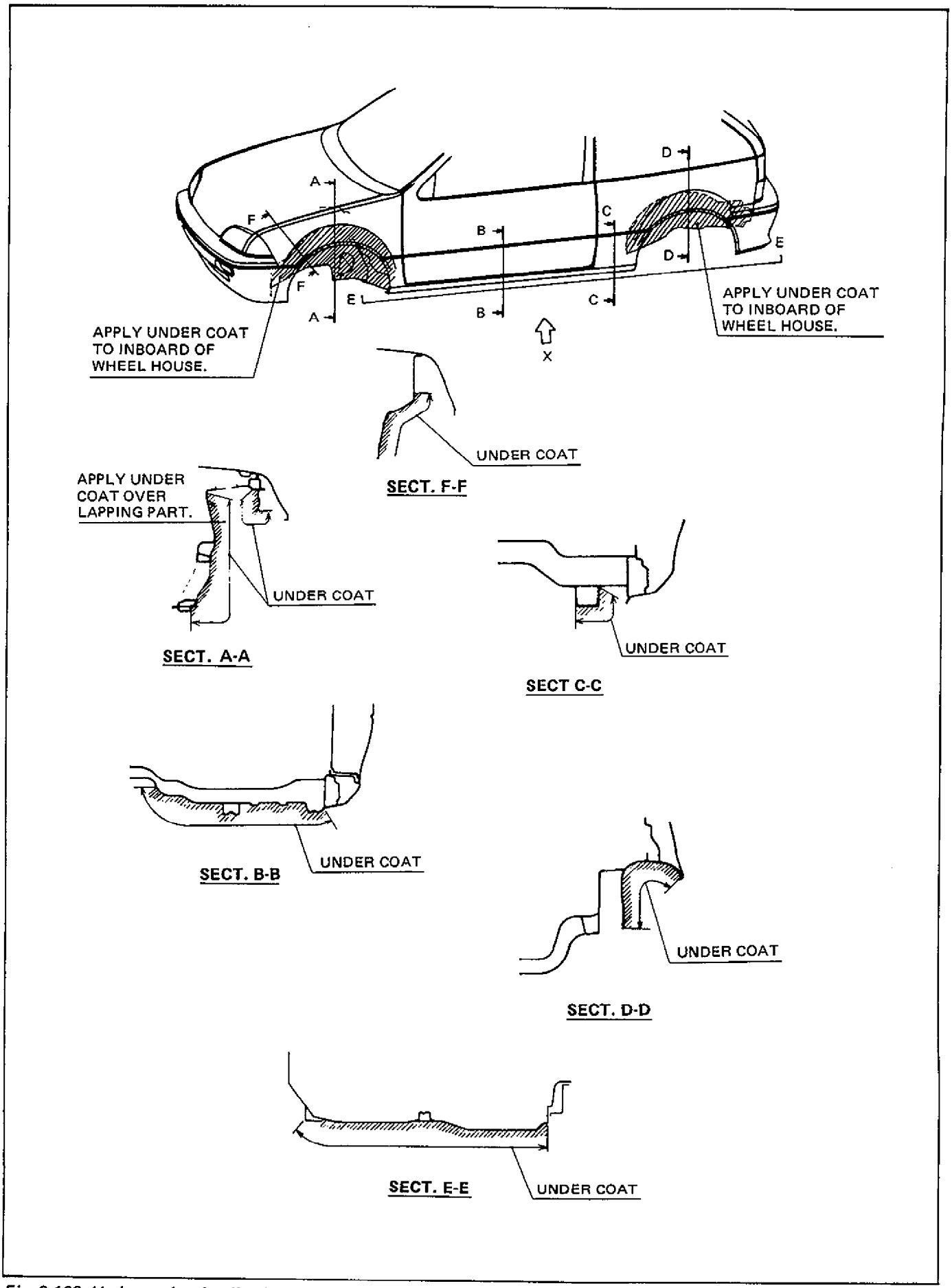


Fig. 9-100 Undercoating Application Areas

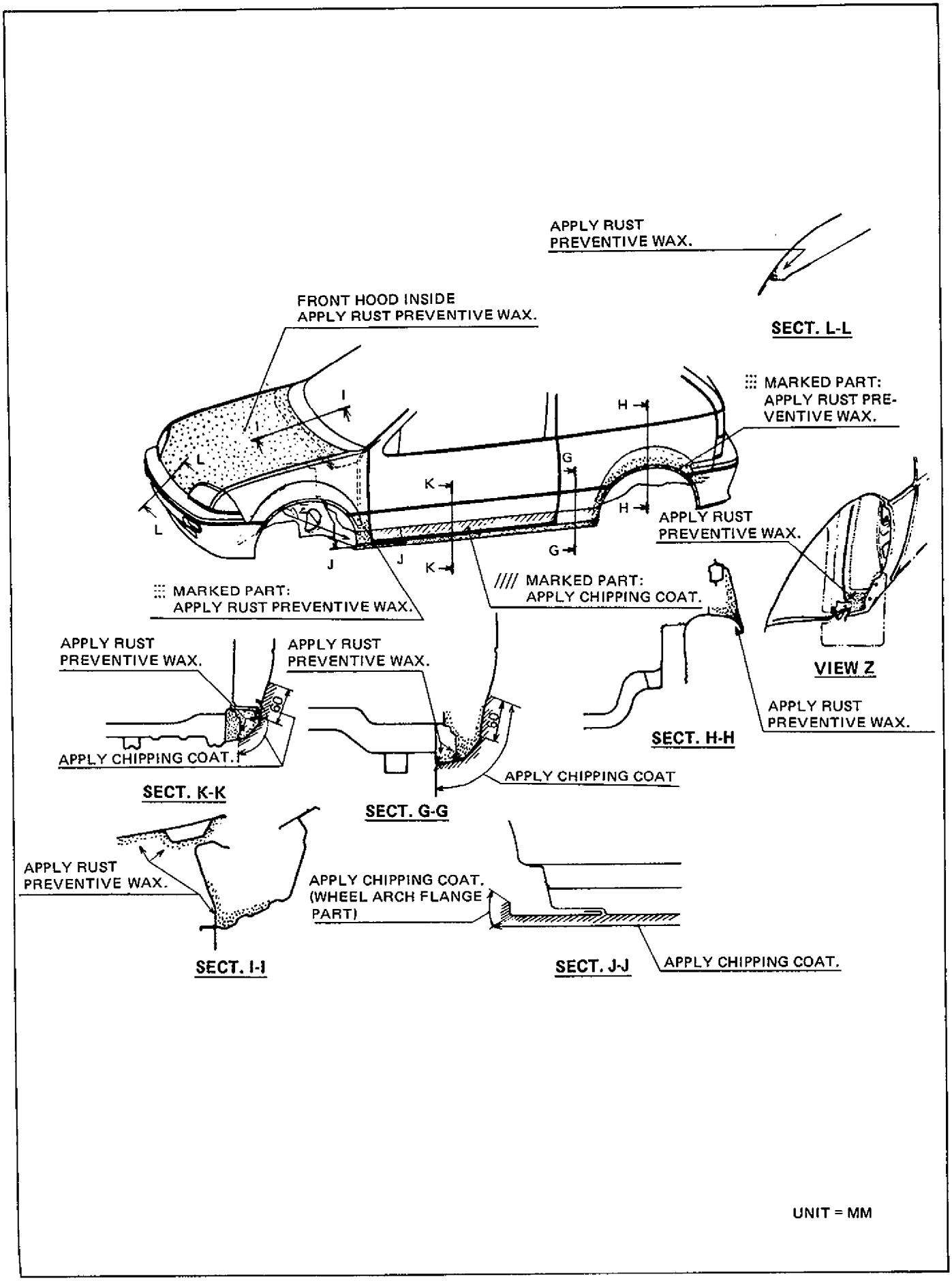


Fig. 9-101 Application of Anti-Corrosion Compound and Chip Resistant Material

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)

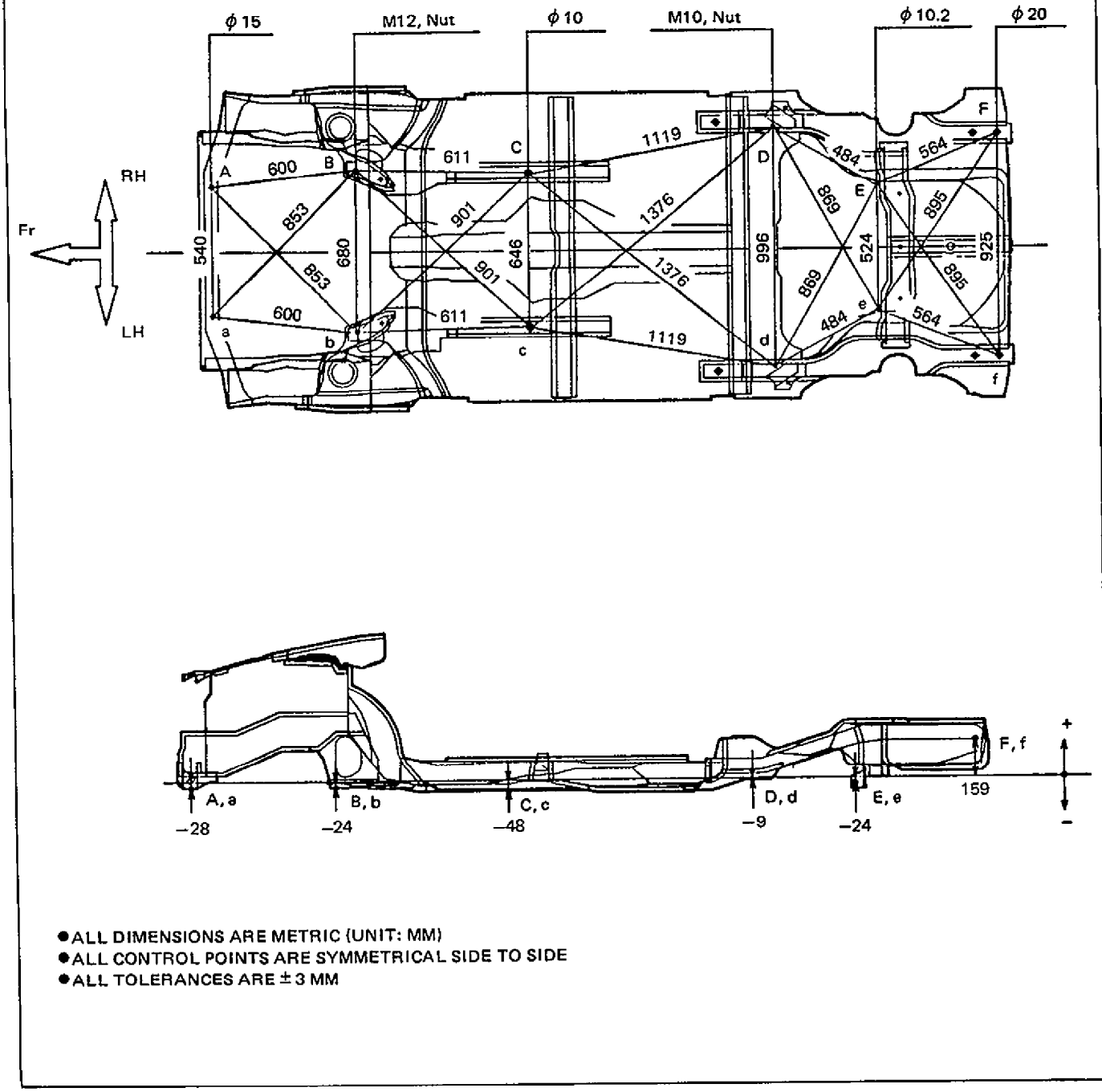
Reference

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.

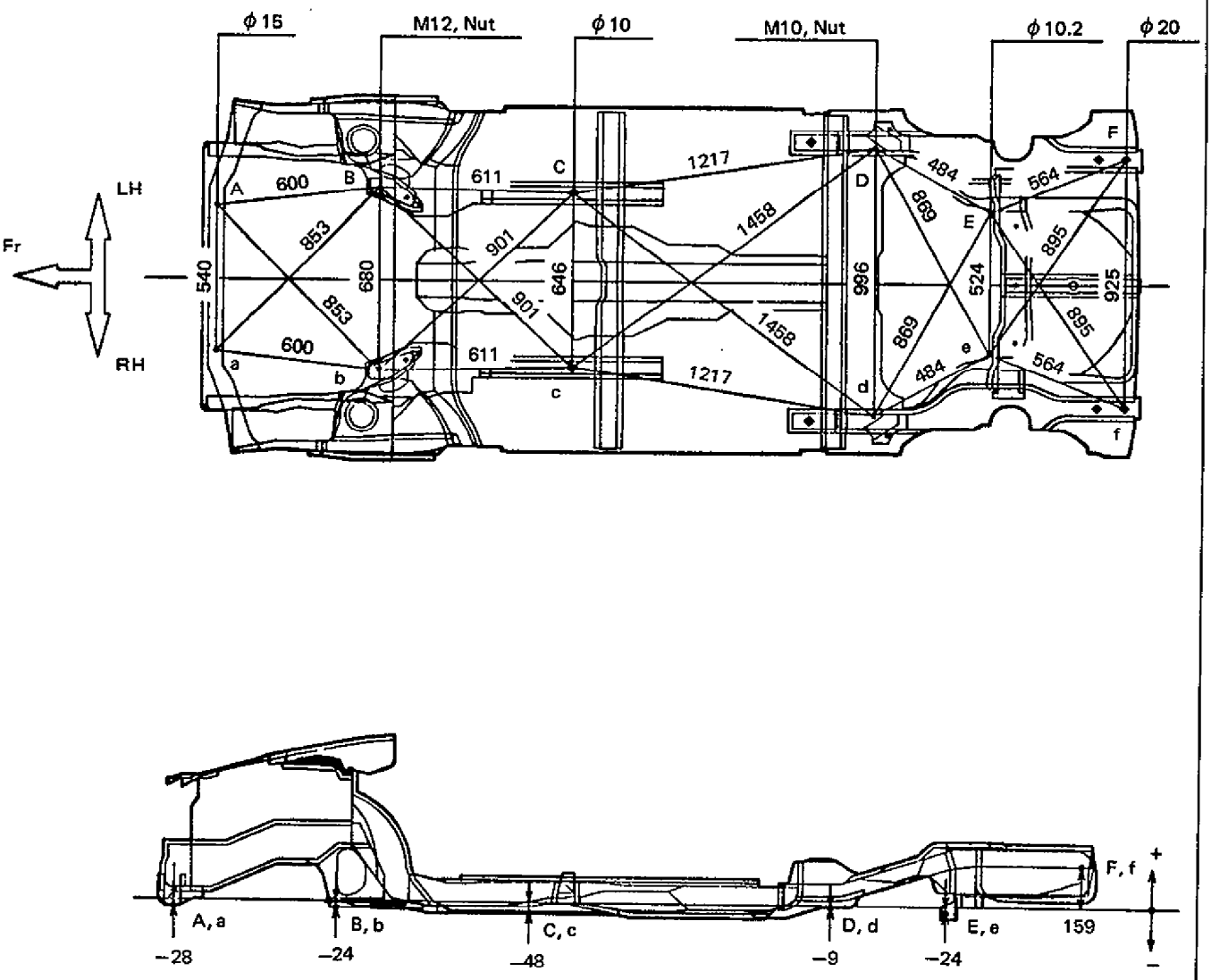
UNDERBODY DIMENSIONS

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

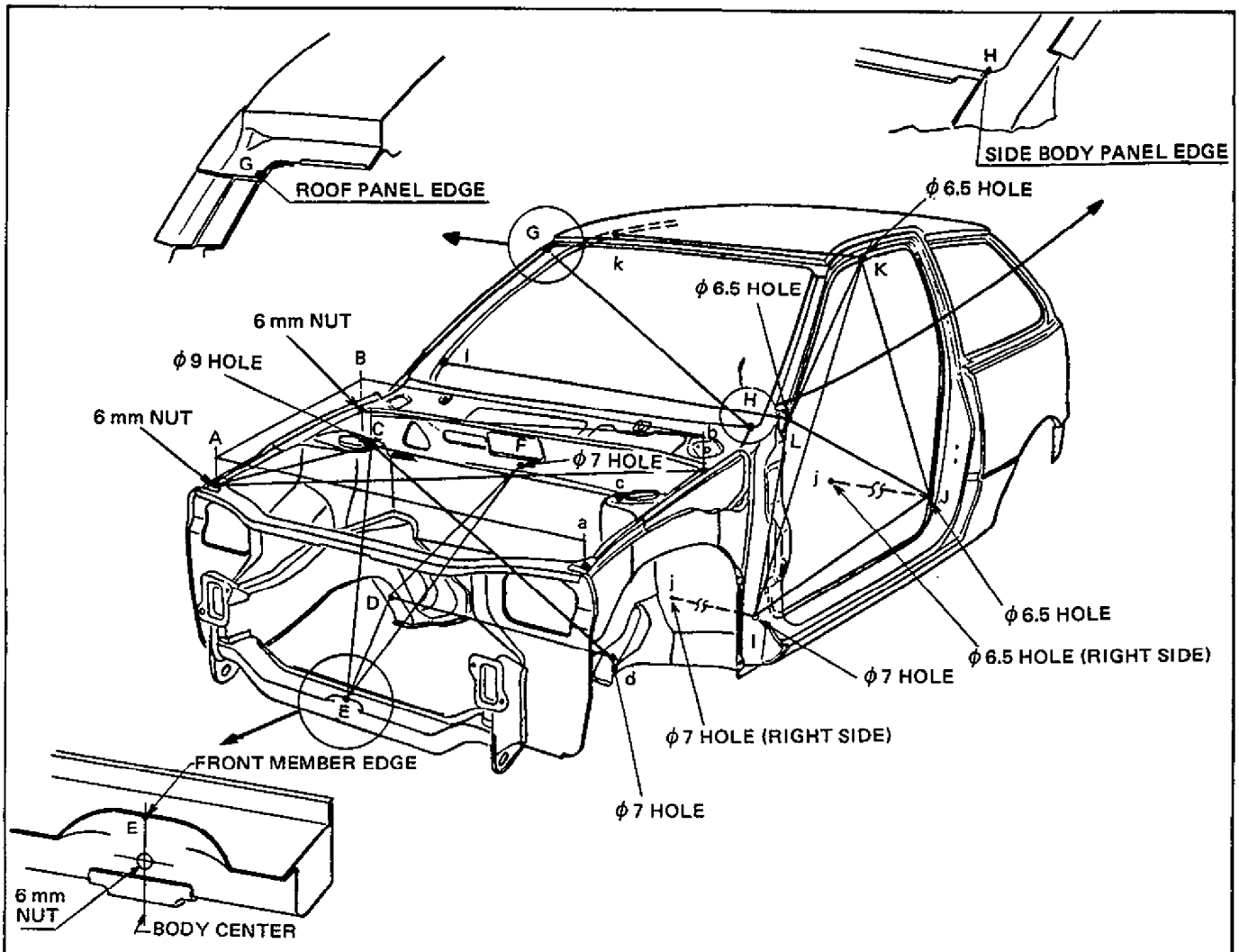
Fig. 9-102 Underbody Dimensions – 3 Door Model



- ALL DIMENSIONS ARE METRIC (UNIT: MM)
- ALL CONTROL POINTS ARE SYMMETRICAL SIDE TO SIDE
- ALL TOLERANCES ARE ± 3 MM

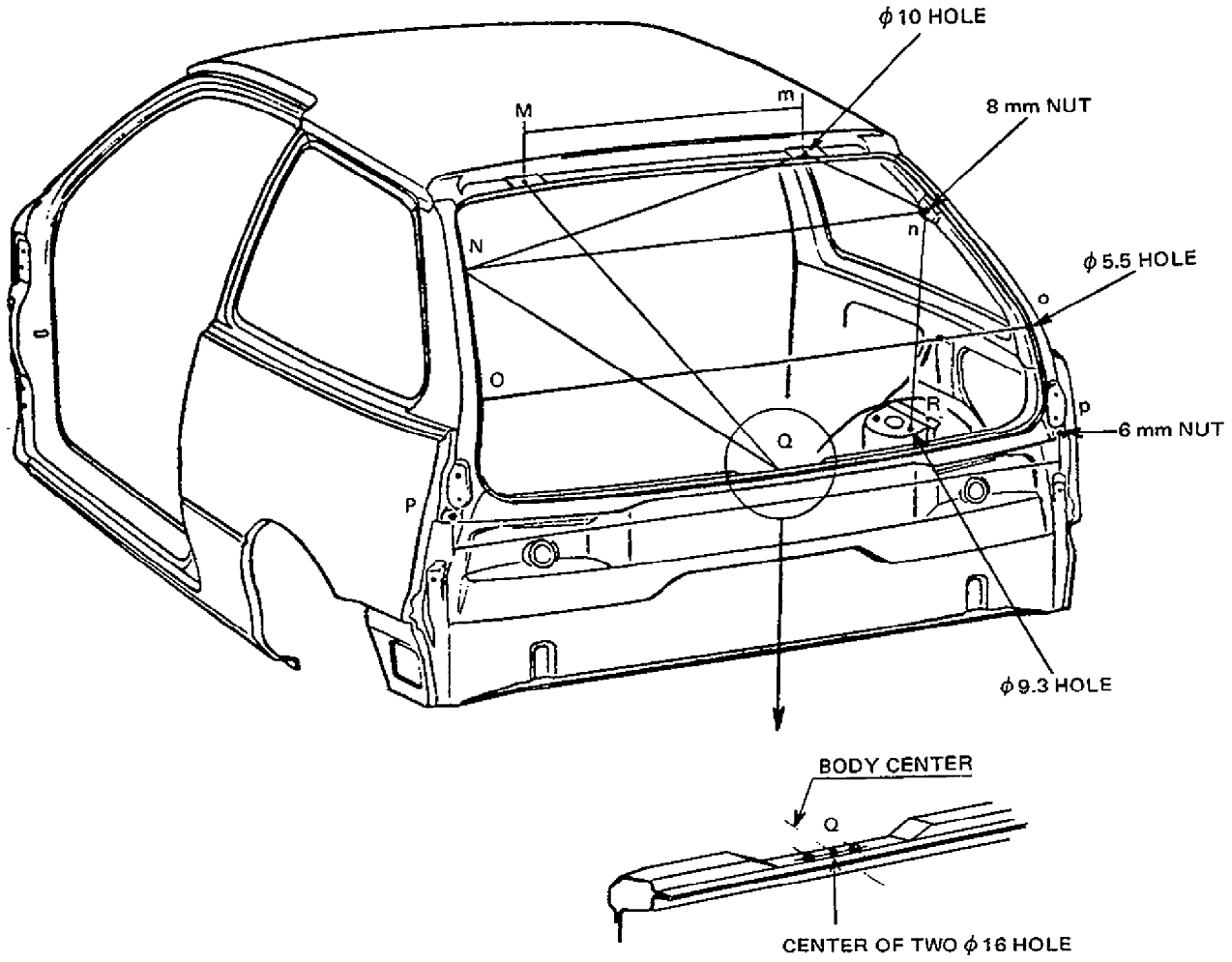
Fig. 9-103 Underbody Dimensions – 5 Door Model

BODY DIMENSIONS



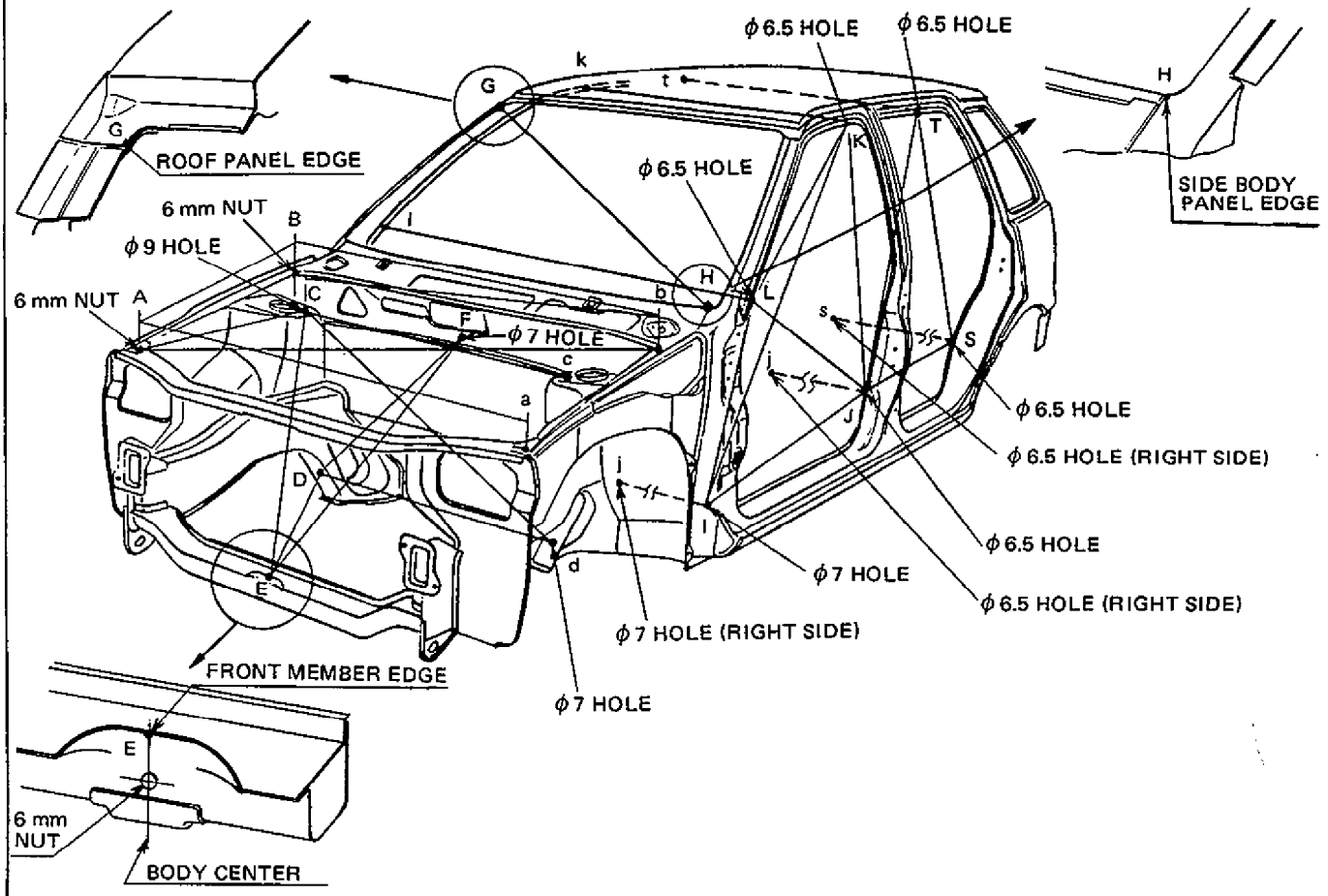
NO.	MEASUREMENT POSITION	LENGTH mm (in.)	NO.	MEASUREMENT POSITION	LENGTH mm (in.)
1	A–a	1 242 (48.90)	14	D–F	589 (23.19)
2	A–b	1 386 (54.57)	15	E–F	827 (32.56)
3	A–C	471 (18.54)	16	G–H	1 299 (51.14)
4	A–B	582 (22.91)	17	I–i	1 250 (49.21)
5	B–b	1 273 (50.12)	18	I–J	1 157 (45.55)
6	B–C	236 (9.29)	19	I–K	1 277 (50.28)
7	C–c	908 (35.75)	20	I–L	614 (24.17)
8	C–b	1 101 (43.35)	21	J–j	1 302 (51.26)
9	C–d	950 (37.40)	22	J–L	1 049 (41.30)
10	C–E	896 (35.28)	23	J–K	814 (32.05)
11	C–F	464 (18.27)	24	K–k	988 (38.90)
12	D–E	705 (27.76)	25	K–L	783 (30.83)
13	D–d	782 (30.79)	26	L–I	1 276 (50.24)

Fig. 9-104 Body Dimensions – 3 Door Model



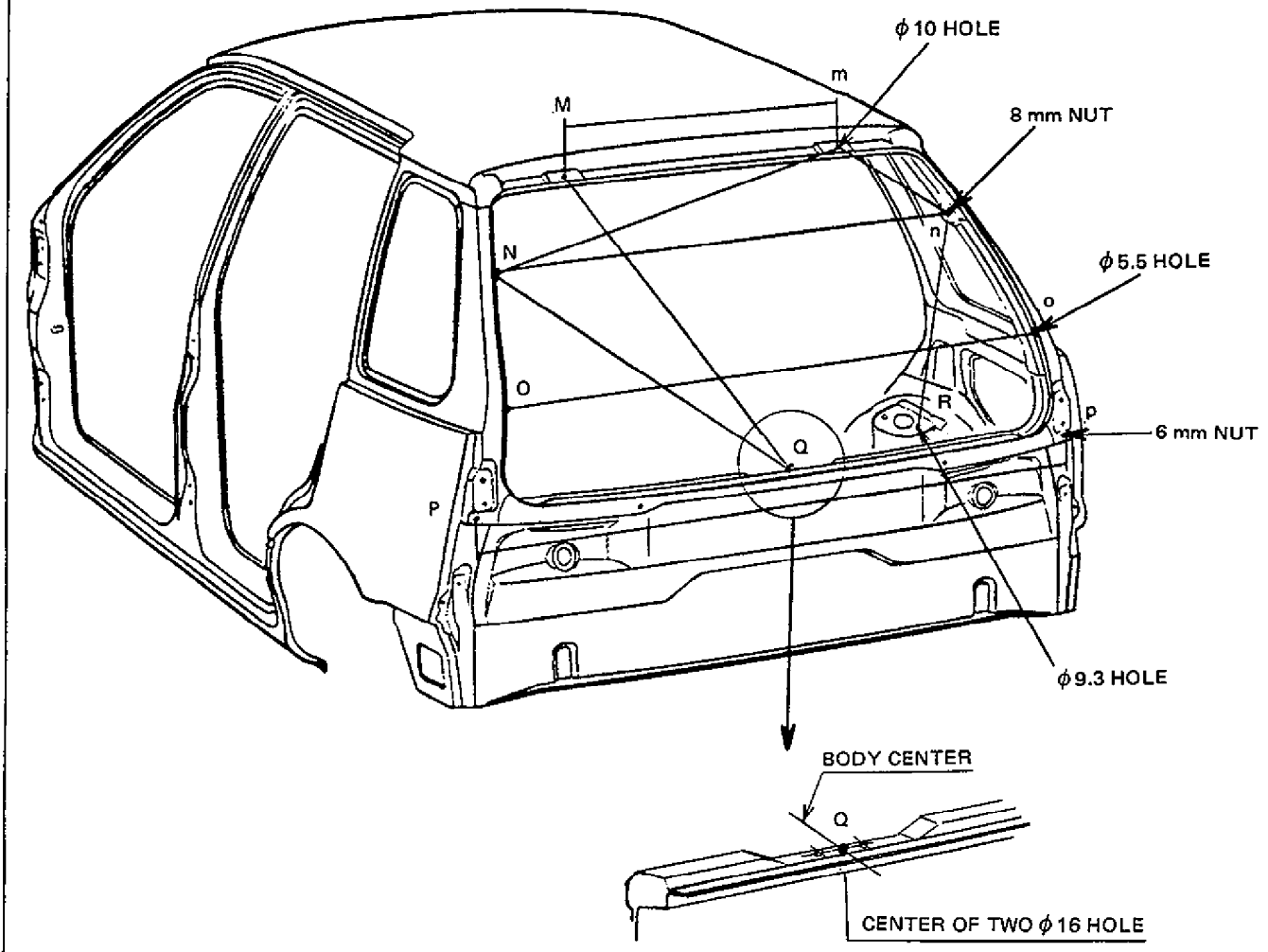
NO.	MEASUREMENT POSITION	LENGTH mm (in.)
25	M – m	600 (23.62)
26	M – Q	750 (29.53)
27	N – m	812 (31.97)
28	N – n	983 (38.70)
29	N – Q	708 (27.87)
30	O – o	1 131 (44.53)
31	P – p	1 284 (50.55)
32	R – n	520 (20.47)
33	m – n	264 (10.39)

Fig. 9-105 Body Dimensions – 3 Door Model



NO.	MEASUREMENT POSITION	LENGTH mm (in.)	NO.	MEASUREMENT POSITION	LENGTH mm (in.)
1	A–a	1 242 (48.90)	17	I–i	1 250 (49.21)
2	A–b	1 386 (54.57)	18	I–J	939 (36.97)
3	A–C	471 (18.54)	19	I–K	1 382 (54.41)
4	A–B	582 (22.91)	20	I–L	670 (26.38)
5	B–b	1 273 (50.12)	21	J–j	1 300 (51.18)
6	B–C	236 (9.29)	22	J–L	841 (33.11)
7	C–c	908 (35.75)	23	J–K	814 (32.05)
8	C–b	1 101 (43.35)	24	K–k	982 (38.66)
9	C–d	950 (37.40)	25	K–L	839 (33.03)
10	C–E	896 (35.28)	26	L–i	1 253 (49.33)
11	C–F	464 (18.27)	27	J–S	721 (28.39)
12	D–E	705 (27.76)	28	J–T	1 018 (40.08)
13	D–d	782 (30.79)	29	T–S	759 (29.88)
14	D–F	589 (23.19)	30	S–s	1 288 (50.71)
15	E–F	827 (32.56)	31	T–t	978 (38.51)
16	G–H	1 316 (51.81)			

Fig. 9-106 Body Dimensions – 5 Door Model



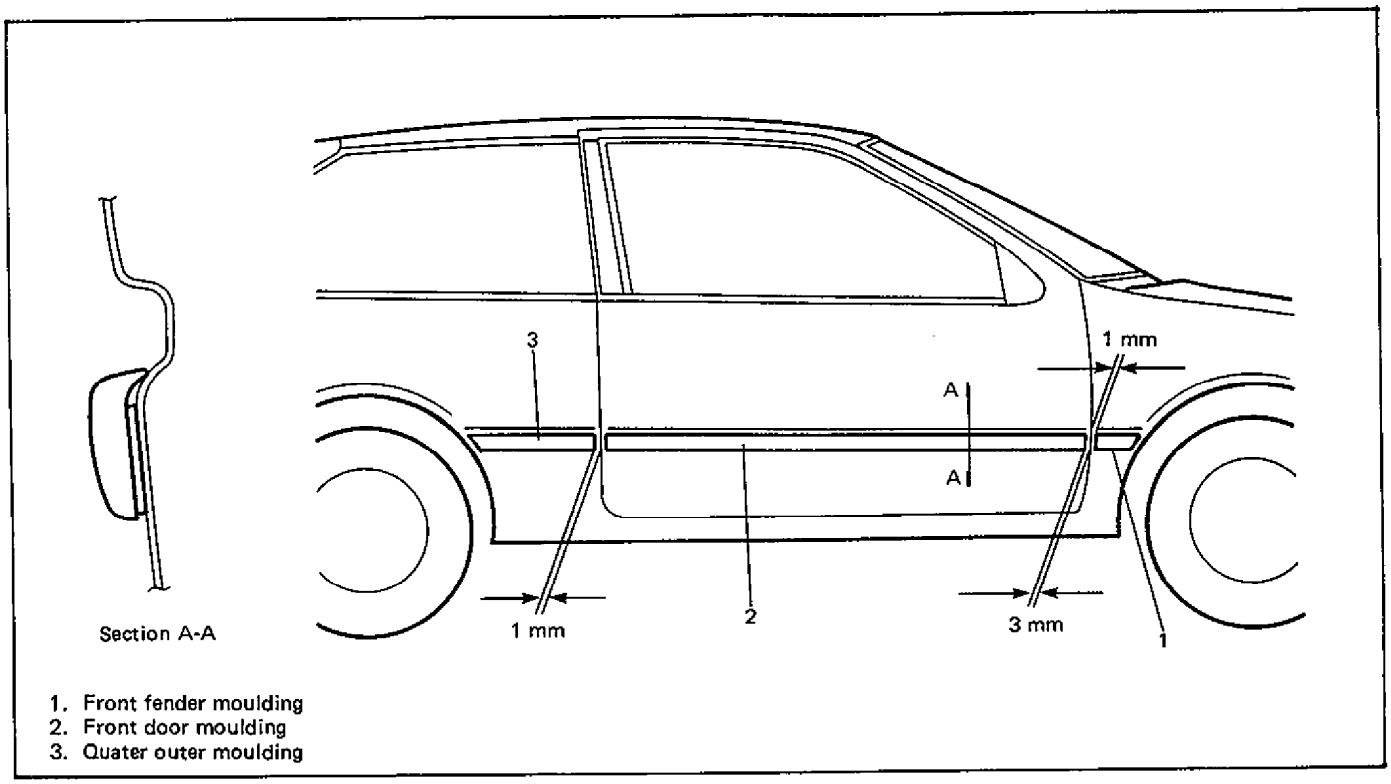
NO.	MEASUREMENT POSITION	LENGTH mm (in.)
31	M – m	600 (23.62)
32	M – Q	736 (28.98)
33	N – m	819 (32.24)
34	N – n	1 002 (39.45)
35	N – Q	709 (27.91)
36	O – o	1 137 (44.76)
37	P – p	1 284 (50.55)
38	R – n	552 (21.73)
39	m – n	264 (10.39)

Fig. 9-107 Body Dimensions – 5 Door Model

SIDE MOLDING (OPTIONAL)

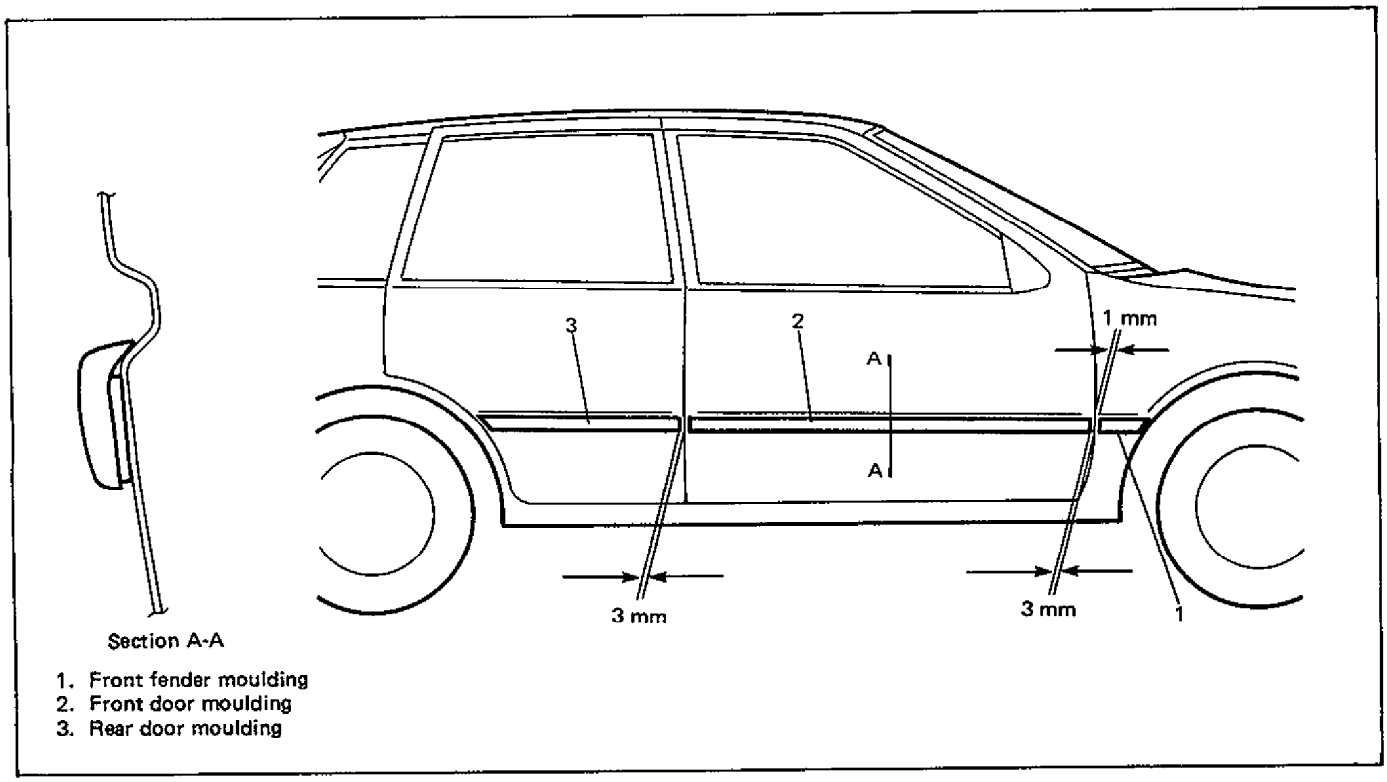
INSTALLATION

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.



1. Front fender moulding
2. Front door moulding
3. Quater outer moulding

Fig. 9-108 Molding Location – 3 Door Model



1. Front fender moulding
2. Front door moulding
3. Rear door moulding

Fig. 9-109 Molding Location – 5 Door Model

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. 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.

JUNCTION/FUSE BLOCK CIRCUIT

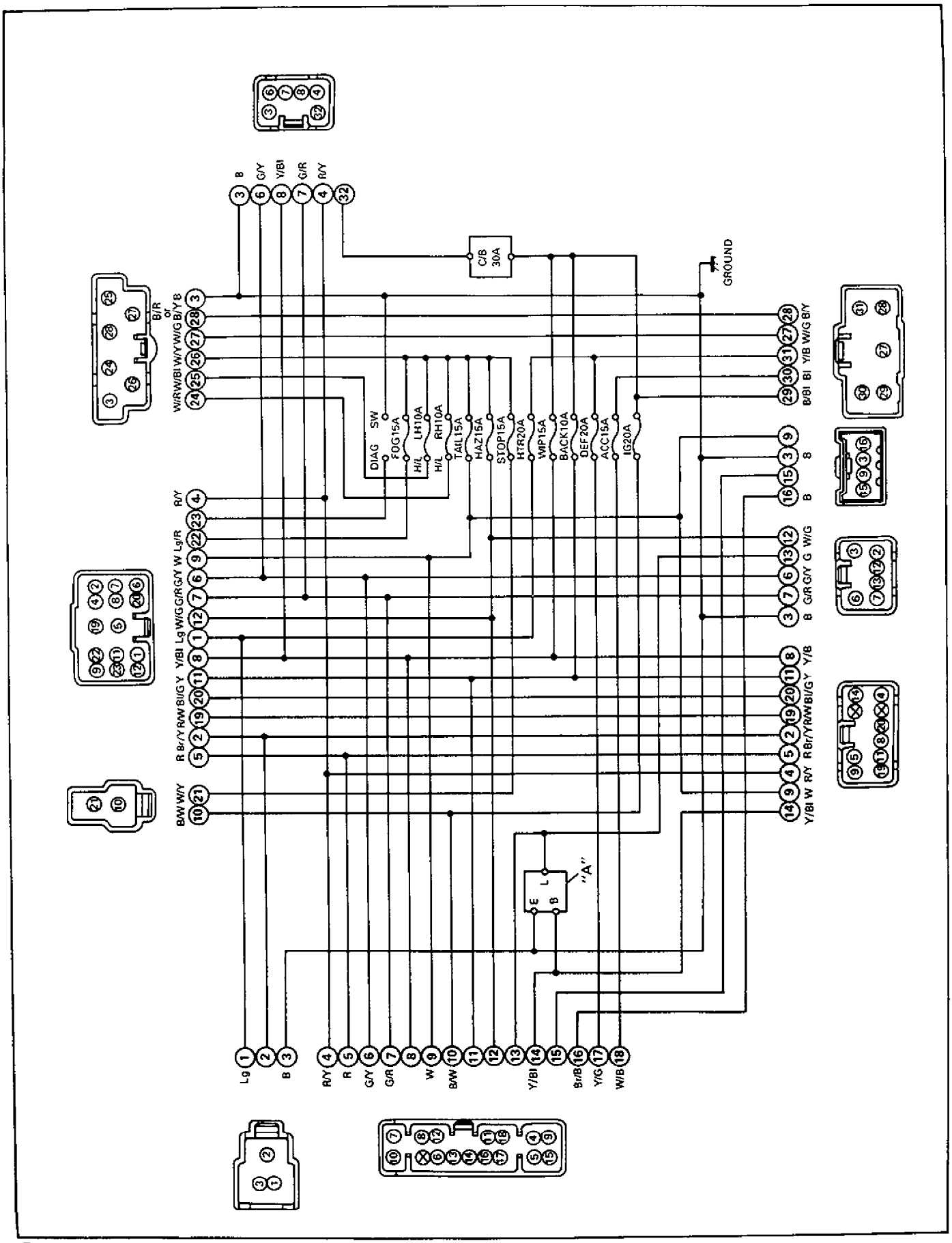


Fig. 10-1

AUTOMATIC TRANSMISSION BRAKE INTERLOCK SYSTEM

GENERAL DESCRIPTION

This system is so designed that selector lever connot 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.

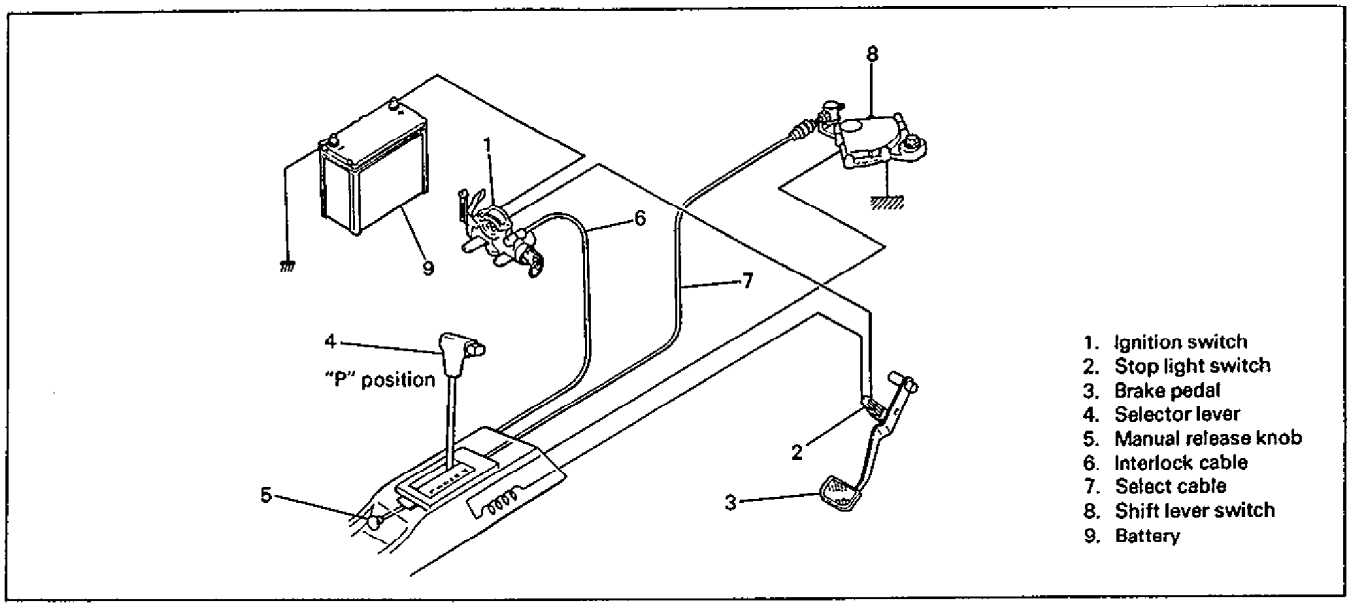


Fig. 7B-1

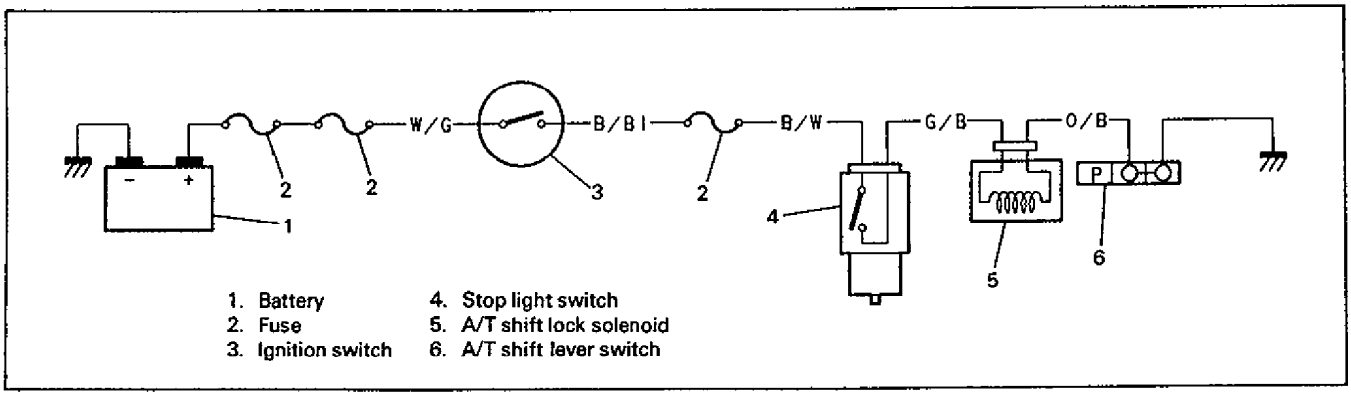


Fig. 7B-2 Automatic Transmission Brake Interlock System Circuit

OPERATIONS

1. 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.

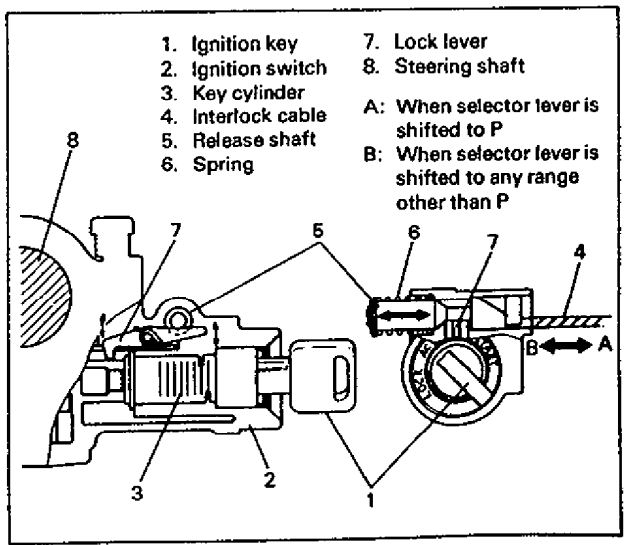


Fig. 7B-3 Ignition Switch Lock Mechanism

2. 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.

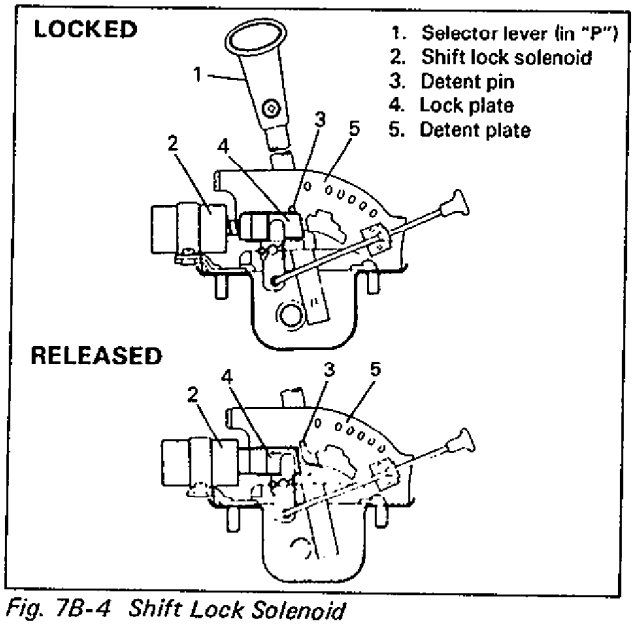


Fig. 7B-4 Shift Lock Solenoid

3. MANUAL RELEASE

As an auxiliary device, manual release is equipped.

Without ignition key, shift lock can be released by pulling release knob.

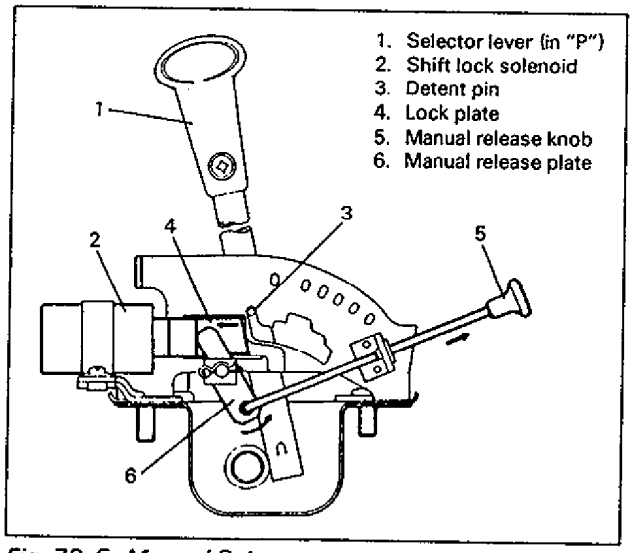


Fig. 7B-5 Manual Release

ON CAR SERVICE

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.**

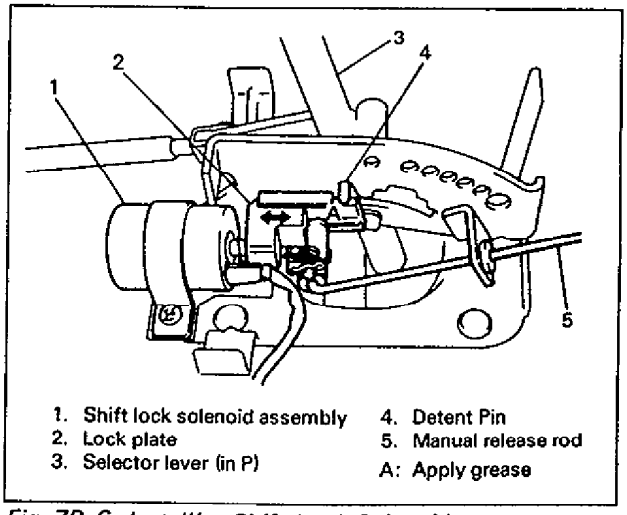


Fig. 7B-6 Installing Shift Lock Solenoid

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.**

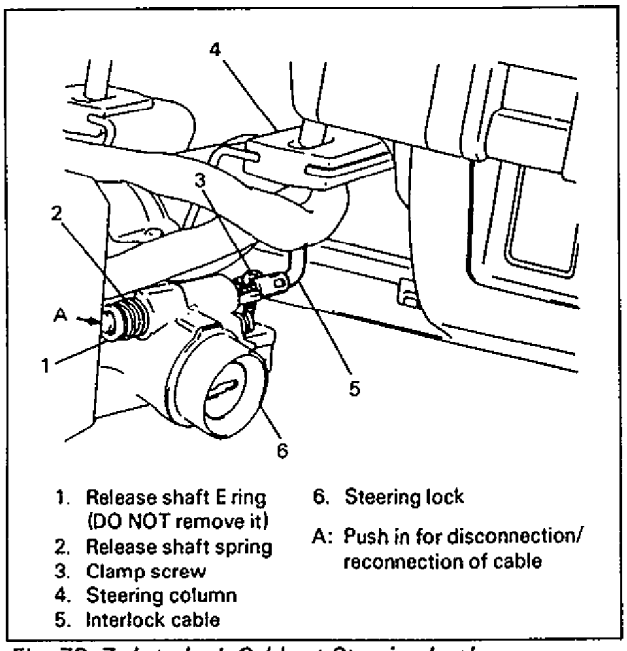


Fig. 7B-7 Interlock Cable at Steering Lock

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".**

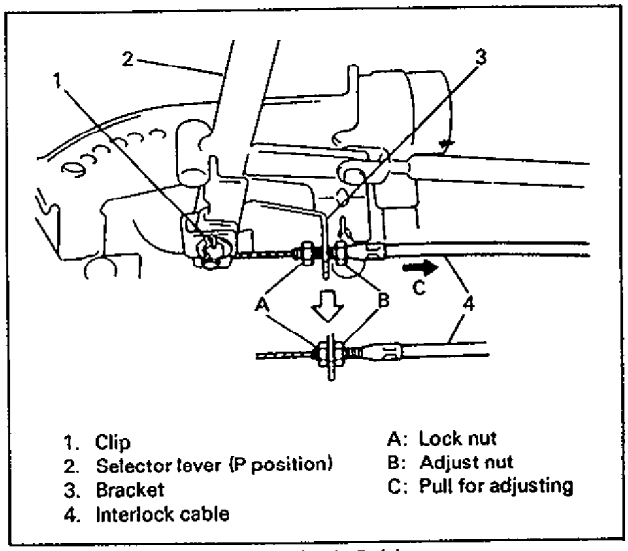


Fig. 7B-8 Adjusting Interlock Cable

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

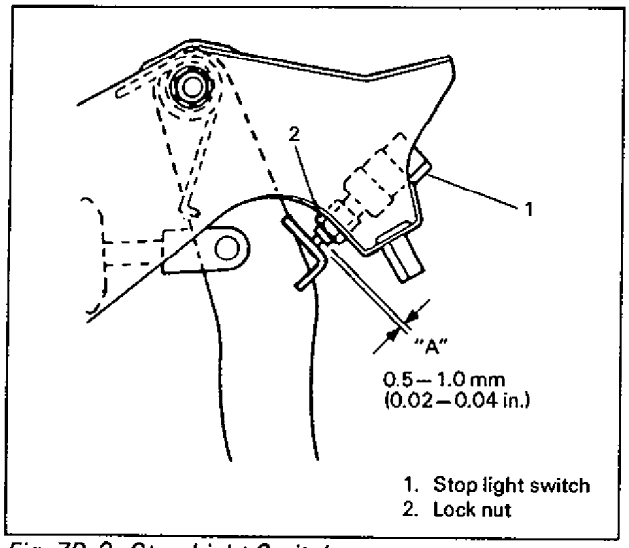


Fig. 7B-9 Stop Light Switch

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.

WIRING DIAGRAM

For European Markets (Manual Transmission Model)

NOTE:
- The parts with (*) are provided or not depending on specifications.
- These lines (——) are not applicable to car with dim dip controller.
- These lines (——) are applicable to car with dim dip controller.

REMARQUE:
- Les pièces marquées d'un (*) sont ou non selon les fournies, spécifications.
- Ces lignes (——) ne concernent pas les véhicules pourvus d'une commande vodyrhara.
- Ces lignes (——) concernent les véhicules pourvus d'une commande code-phare.

NOTA:
- Die mit einem (*) bezeichneten Teile werden je nach spezifikation mitgeliefert.
- Diese Kabel (——) sind an Fahrzeugen mit DIM-DIP-Steuergerat nicht vorhanden.
- Diese Kabel (——) sind der an Fahrzeugen mit DIM-DIP-Steuergerat vorhanden.

WIRE COLOR

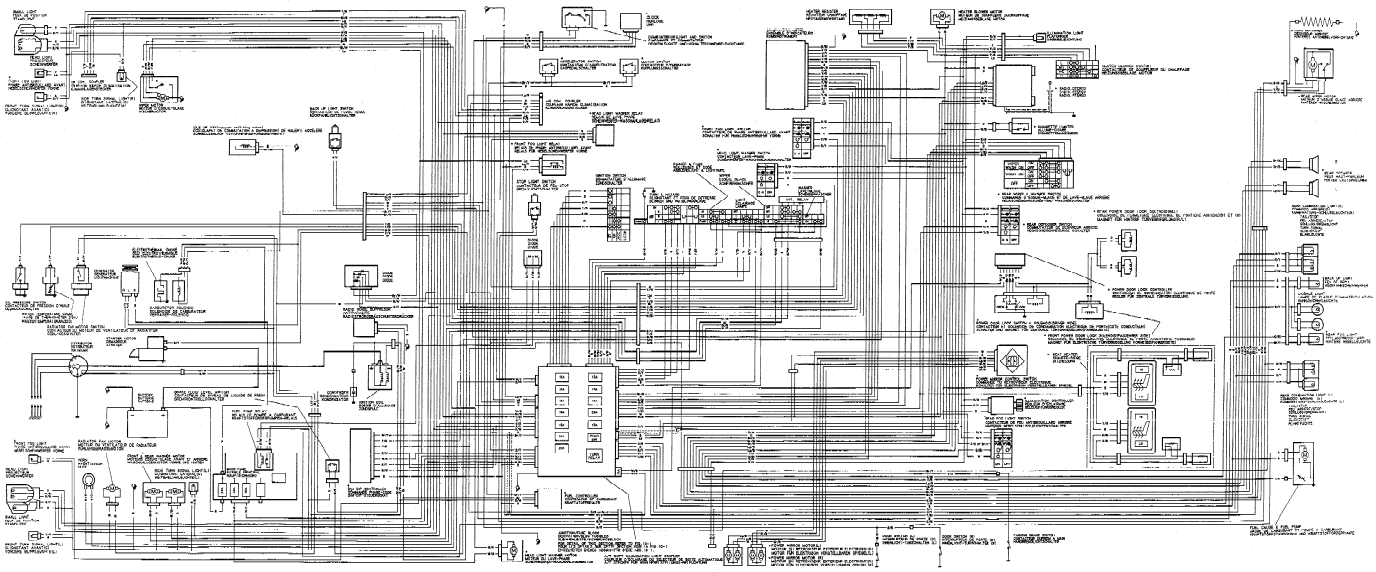
B	Black
Bl	Blue
Br	Brown
G	Green
Gr	Gray
Lg	Light blue
LG	Light green
O	Orange
P	Pink
W	White
Y	Yellow
V	Violet
R/B	Red with blue tracer
R/W	Red with white tracer
R/Y	Red with yellow tracer
B/R	Blue with red tracer
B/W	Blue with white tracer
B/Y	Blue with yellow tracer
Br/R	Brown with red tracer
Br/W	Brown with white tracer
Br/Y	Brown with yellow tracer
G/R	Green with red tracer
G/W	Green with white tracer
G/Y	Green with yellow tracer
Gr/R	Gray with red tracer
Gr/W	Gray with white tracer
O/B	Orange with blue tracer
O/G	Orange with green tracer
O/W	Orange with white tracer
P/B	Pink with blue tracer
P/G	Pink with green tracer
V/G	Violet with green tracer
V/W	Violet with white tracer
W/B	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 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
Lg	Bleu clair
LG	Vert clair
O	Orange
P	Rose
V	Violet
W	Blanc
Y	Jaune
R/B	Rouge avec filet bleu
R/W	Rouge avec filet blanc
R/Y	Rouge avec filet jaune
B/R	Bleu avec filet rouge
B/W	Bleu avec filet blanc
B/Y	Bleu avec filet jaune
Br/R	Brun avec filet rouge
Br/W	Brun avec filet blanc
Br/Y	Brun avec filet jaune
G/R	Vert avec filet rouge
G/W	Vert avec filet blanc
G/Y	Vert avec filet jaune
Gr/R	Gris avec filet rouge
Gr/W	Gris avec filet blanc
O/B	Orange avec filet bleu
O/G	Orange avec filet vert
O/W	Orange avec filet blanc
P/B	Rose avec filet bleu
P/G	Rose avec filet vert
V/G	Violet avec filet vert
V/W	Violet avec filet blanc
W/B	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 bleu
Y/G	Jaune avec filet vert
Y/R	Jaune avec filet rouge
Y/W	Jaune avec filet blanc

FARBE FARBEN

B	Schwarz
Bl	Blau
Br	Braun
G	Grün
Gr	Grau
Lg	Hellblau
LG	Hellgrün
O	Orange
P	Rosa
V	Violett
W	Weiß
Y	Gelb
R/B	Rot mit blauem Streifen
R/W	Rot mit weißem Streifen
R/Y	Rot mit gelbem Streifen
B/R	Blau mit rotem Streifen
B/W	Blau mit weißem Streifen
B/Y	Blau mit gelbem Streifen
Br/R	Braun mit rotem Streifen
Br/W	Braun mit weißem Streifen
Br/Y	Braun mit gelbem Streifen
G/R	Grün mit rotem Streifen
G/W	Grün mit weißem Streifen
G/Y	Grün mit gelbem Streifen
Gr/R	Grau mit rotem Streifen
Gr/W	Grau mit weißem Streifen
O/B	Orange mit blauem Streifen
O/G	Orange mit grünem Streifen
O/W	Orange mit weißem Streifen
P/B	Rosa mit blauem Streifen
P/G	Rosa mit grünem Streifen
V/G	Violett mit grünem Streifen
V/W	Violett mit weißem Streifen
W/B	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 blauem Streifen
Y/G	Gelb mit grünem Streifen
Y/R	Gelb mit rotem Streifen
Y/W	Gelb mit weißem Streifen



For European Markets (Automatic Transmission Model)

NOTE:
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- These lines ( ) are not applicable to car with dim dip controller.
- These lines ——— are applicable to car with dim dip controller.

REMARQUE:
- Les pièces marquées d'un (*) sont ou non selon les fiches spécifications.
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- Ces lignes ——— concernent les véhicules pourvus d'une commande code phare.

NOTA:
- Die mit einem (*) gekennzeichneten Teile werden je nach Spezifikation mitgeliefert.
- Diese Kabel ( ) sind an Fahrzeugen mit DIM-DIP-Steuergerät nicht vorhanden
- Diese Kabel ( ) sind nur an Fahrzeugen mit DIM-DIP-Steuergerät vorhanden.

WIRE COLOR

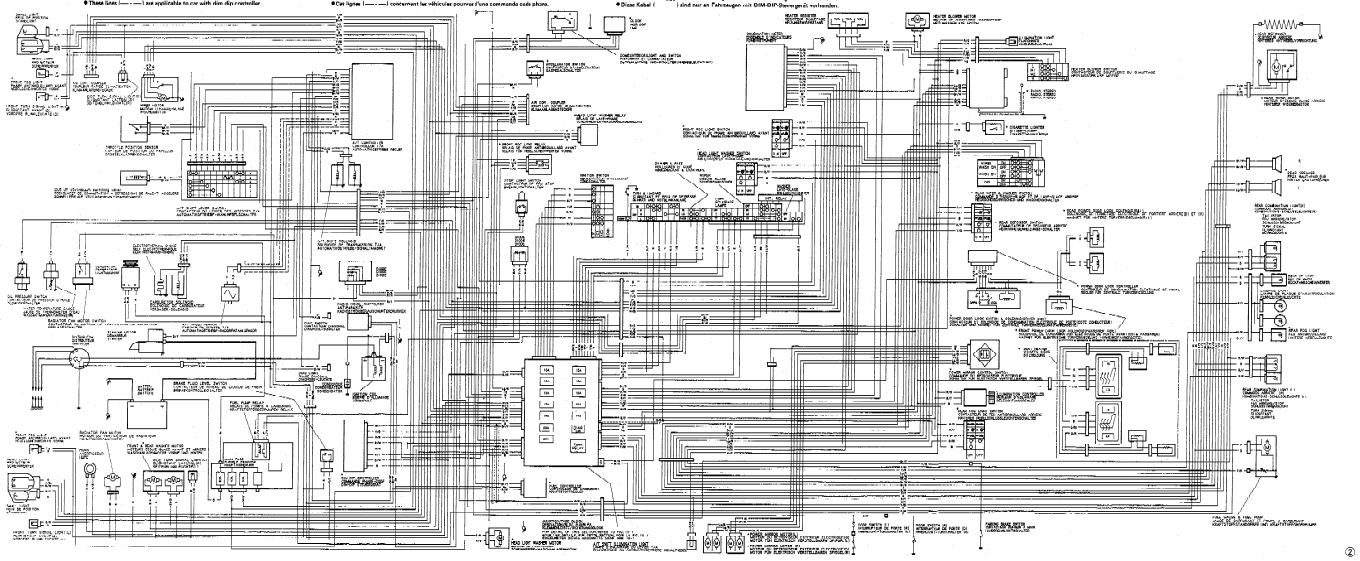
B : Black	Gr/R : Gray with Red tracer
Bl : Blue	Gr/Y : Gray with Yellow tracer
Br : Brown	Lg/B : Light green with Black tracer
G : Green	Lg/R : Light green with Red tracer
Gr : Gray	Lg/W : Light green with White tracer
Lb : Light blue	Lg/Y : Light green with Yellow tracer
Lg : Light green	O/B : Orange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

CODE DES COULEURS

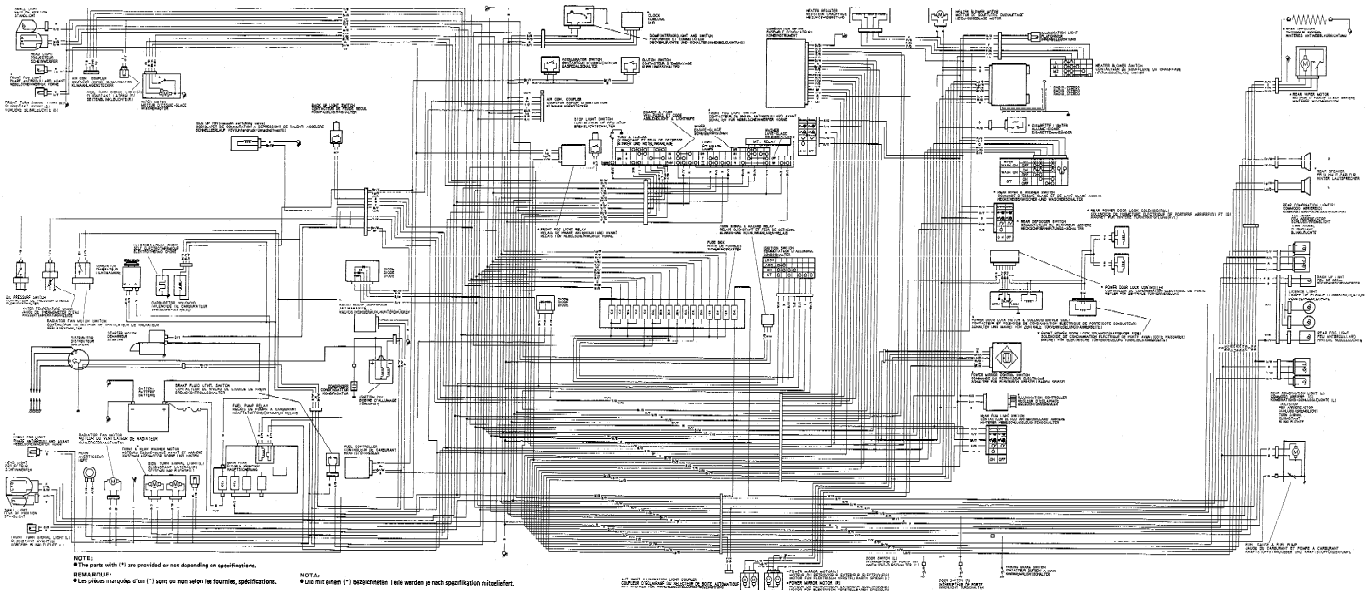
B : Noir	Gr/O : Gris avec Fil Orange
Bl : Bleu	Gr/R : Gris avec Fil Rouge
Br : Brun	Lg/B : Vert clair avec Fil Noir
G : Vert	Lg/R : Vert clair avec Fil Rouge
Gr : Gris	Lg/W : Vert clair avec Fil Blanc
Lb : Bleu clair	Lg/Y : Vert clair avec Fil Jaune
Lg : Vert clair	O/B : Orange avec Fil Noir
O : Orange	O/G : Orange avec Fil Vert
R : Rouge	O/R : Orange avec Fil Rouge
W : Blanc	O/W : Orange avec Fil Blanc
Y : Jaune	O/Y : Orange avec Fil Jaune
B/G : Noir avec Fil Vert	P/B : Rose avec Fil Noir
B/O : Noir avec Fil Orange	P/G : Rose avec Fil Vert
B/R : Noir avec Fil Rouge	P/W : Rose avec Fil Blanc
B/W : Noir avec Fil Blanc	R/B : Rouge avec Fil Noir
B/Y : Noir avec Fil Jaune	R/G : Rouge avec Fil Vert
Bl/B : Bleu avec Fil Noir	R/W : Rouge avec Fil Blanc
Bl/G : Bleu avec Fil Vert	R/Y : Rouge avec Fil Jaune
Bl/O : Bleu avec Fil Orange	W/B : Blanc avec Fil Noir
Bl/R : Bleu avec Fil Rouge	W/G : Blanc avec Fil Vert
Bl/W : Bleu avec Fil Blanc	W/R : Blanc avec Fil Rouge
Bl/Y : Bleu avec Fil Jaune	Y/B : Jaune avec Fil Noir
Br/B : Brun avec Fil Noir	Y/G : Jaune avec Fil Vert
Br/W : Brun avec Fil Blanc	Y/R : Jaune avec Fil Rouge
G/B : Vert avec Fil Noir	Y/W : Jaune avec Fil Blanc
G/O : Vert avec Fil Orange	
G/R : Vert avec Fil Rouge	
G/W : Vert avec Fil Blanc	
G/Y : Vert avec Fil Jaune	
Gr/B : Gris avec Fil Noir	
Gr/O : Gris avec Fil Orange	

FARBCODES

B : Schwarz	Gr/O : Grau mit rotem Streifen
Bl : Blau	Gr/R : 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
Lb : Hellblau	Lg/Y : Hellgrün mit gelbem Streifen
Lg : Hellgrün	O/B : Orange mit schwarzem Streifen
O : Orange	O/G : Orange mit grünem Streifen
R : Rot	O/R : Orange mit rotem Streifen
W : Weiß	O/W : Orange mit weißem Streifen
Y : Gelb	O/Y : Orange mit gelbem Streifen
B/G : Schwarz mit grünem Streifen	P/B : Rosa mit schwarzem Streifen
B/O : Schwarz mit orangem Streifen	P/G : Rosa mit grünem Streifen
B/R : Schwarz mit rotem Streifen	P/W : Rosa mit weißem Streifen
B/W : Schwarz mit weißem Streifen	P/Y : Rosa mit gelbem Streifen
B/Y : Schwarz mit gelbem Streifen	R/B : Rot mit schwarzem Streifen
Bl/B : Blau mit schwarzem Streifen	R/G : Rot mit grünem Streifen
Bl/G : Blau mit grünem Streifen	R/W : Rot mit weißem Streifen
Bl/O : Blau mit orangem Streifen	R/Y : Rot mit gelbem Streifen
Bl/R : Blau mit rotem Streifen	W/B : Weiß mit schwarzem Streifen
Bl/W : Blau mit weißem Streifen	W/G : Weiß mit grünem Streifen
Bl/Y : Blau mit gelbem Streifen	W/R : Weiß mit rotem Streifen
Br/B : Braun mit schwarzem Streifen	W/Y : Weiß mit gelbem Streifen
Br/W : Braun mit weißem Streifen	Y/B : Gelb mit schwarzem Streifen
G/B : Grün mit schwarzem Streifen	Y/G : Gelb mit grünem Streifen
G/O : Grün mit orangem Streifen	Y/R : Gelb mit rotem Streifen
G/R : Grün mit rotem Streifen	Y/W : Gelb mit weißem Streifen
G/W : Grün mit weißem Streifen	
G/Y : Grün mit gelbem Streifen	
Gr/B : Grau mit schwarzem Streifen	
Gr/O : Grau mit orangem Streifen	



For West German Market (Manual Transmission Model)

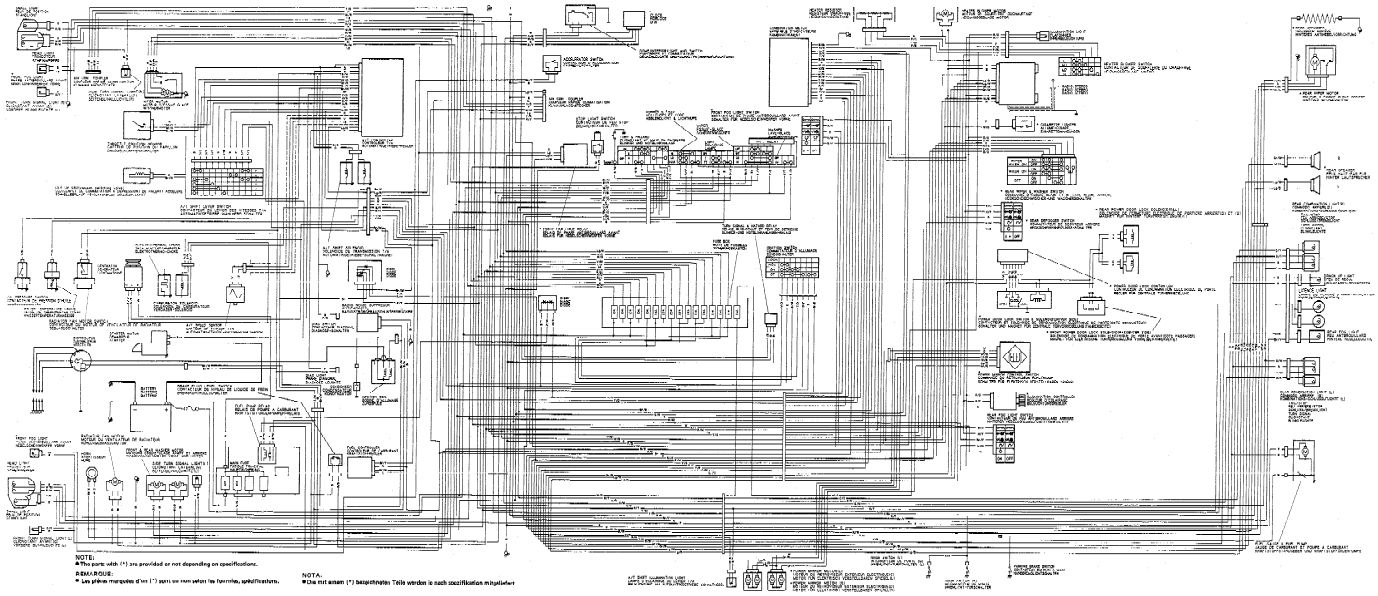


NOTE:
● The parts with (*) are provided or not depending on specifications.

REMARQUE:
● Les pièces marquées d'un (*) sont ou non selon les fournies, spécifications.

NOTA:
● Los mit einem (*) gekennzeichnete Teile werden je nach spezifikation mitgeliefert.

For West German Market (Automatic Transmission Model)



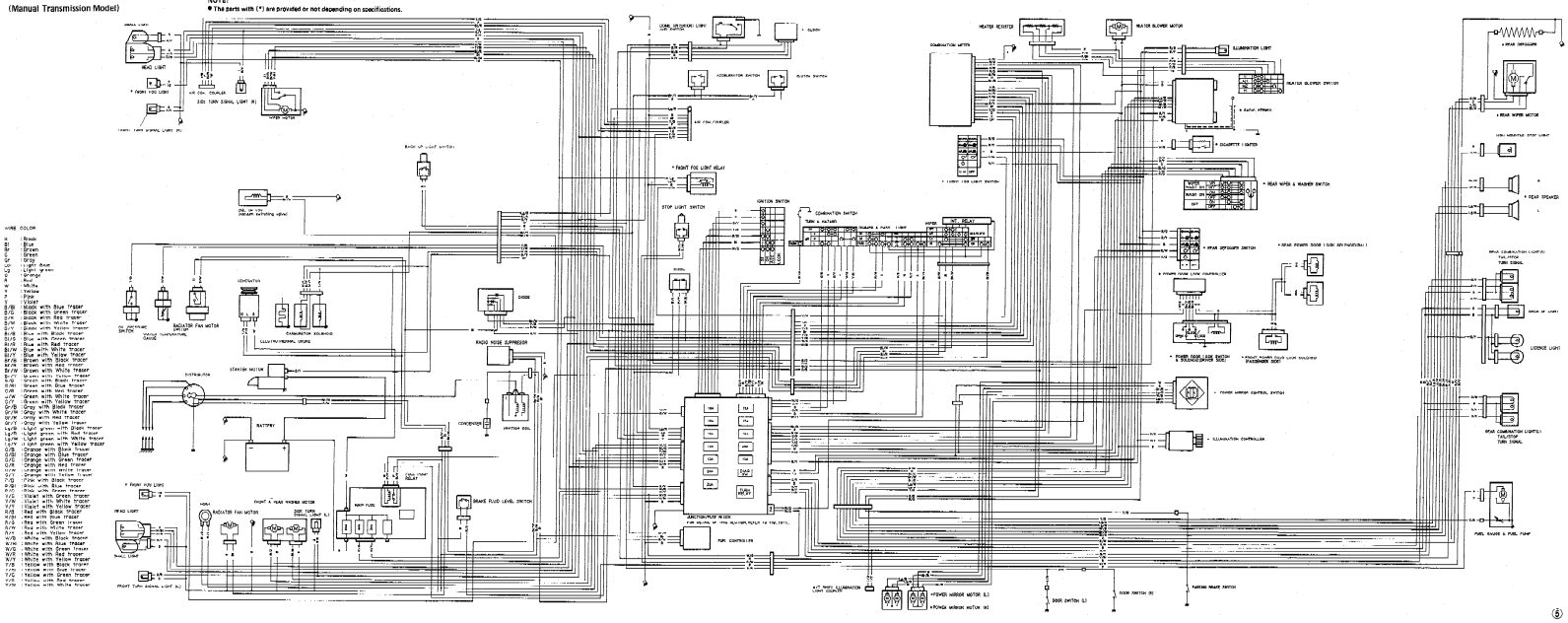
NOTE:
*The parts with (*) are provided or not depending on specifications.

REMARQUE:
* Les pièces marquées d'un (*) sont ou non selon les formules, spécifications.

NOTA:
*Die mit einem (*) bezeichneten Teile werden je nach Ausführung mitgeliefert

For Australian market
(Manual Transmission Model)

NOTE:
● The parts with (*) are provided or not depending on specifications.

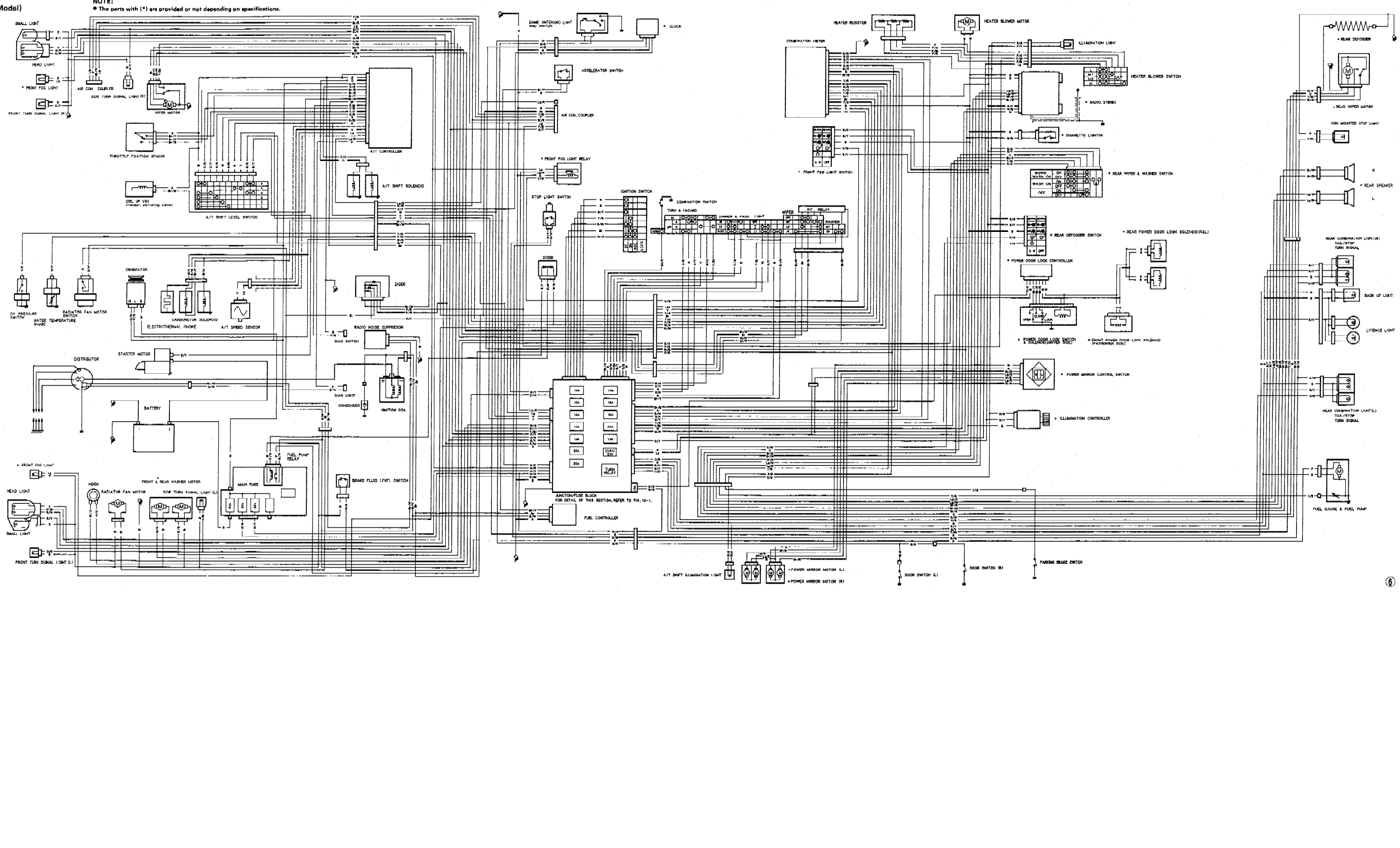


For Australian market
(Automatic Transmission Model)

NOTE:
- The parts with (*) are provided or not depending on specifications.

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

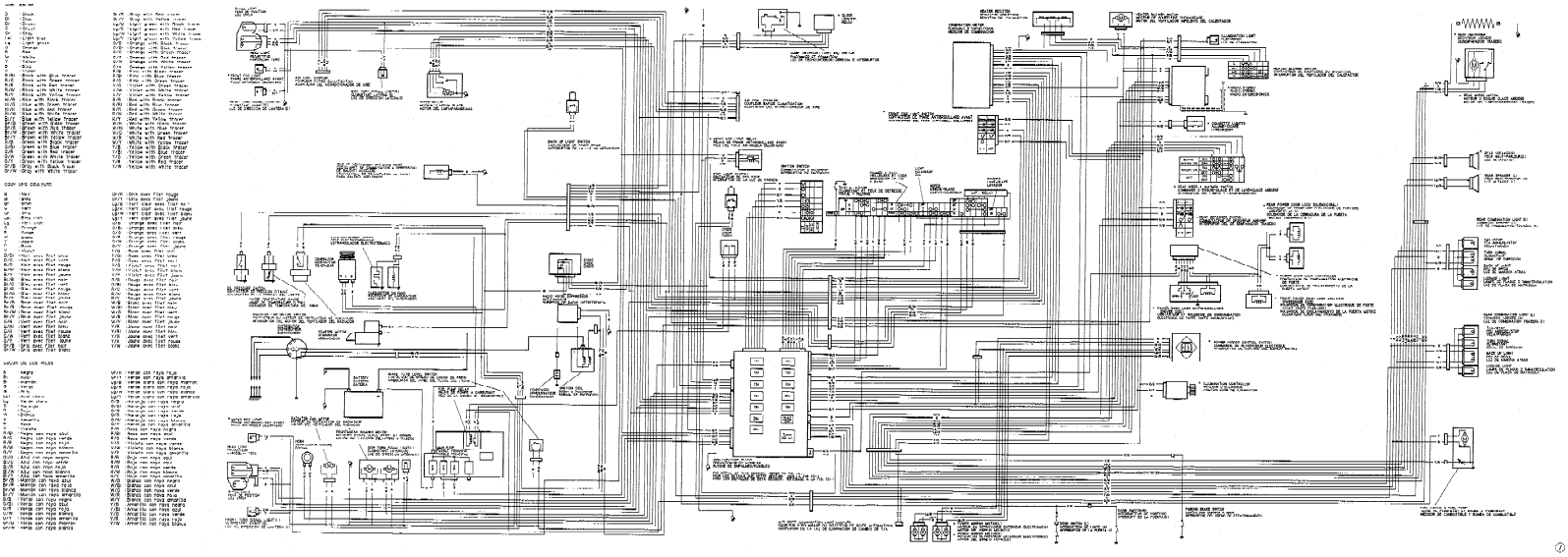


For General Markets except the above Markets (Manual Transmission Model)

NOTE:
*This parts with (*) are provided or not depending on specifications.

REMARQUE:
*Les pièces marquées d'un (*) sont ou non selon les fournitures, spécifications.

NOTA:
*Las piezas con (*) son provistas o nó dependiendo de las especificaciones.

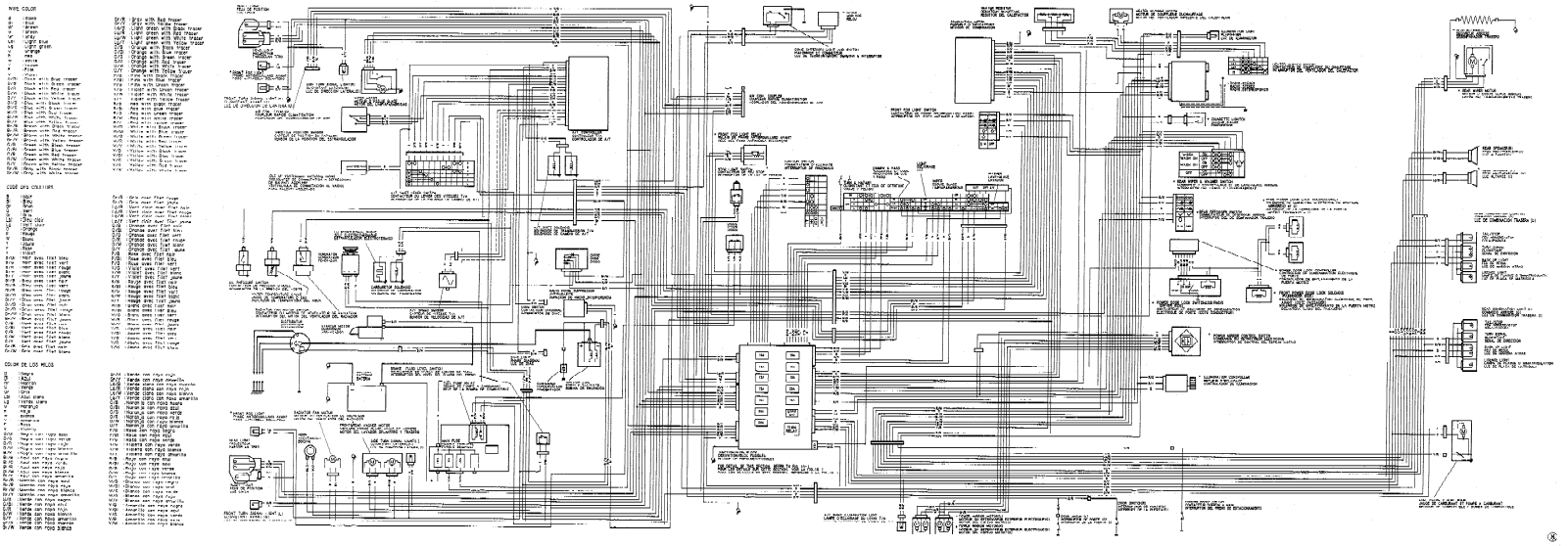


For General Markets except the above Markets (Automatic Transmission Model)

NOTE:
● This parts with (*) are provided or not depending on specifications.

REMARQUE:
● Les pièces marquées d'un (*) sont ou non selon les fiches spécifications.

NOTA:
● Las piezas con (*) son provistas o no dependiendo de las especificaciones.



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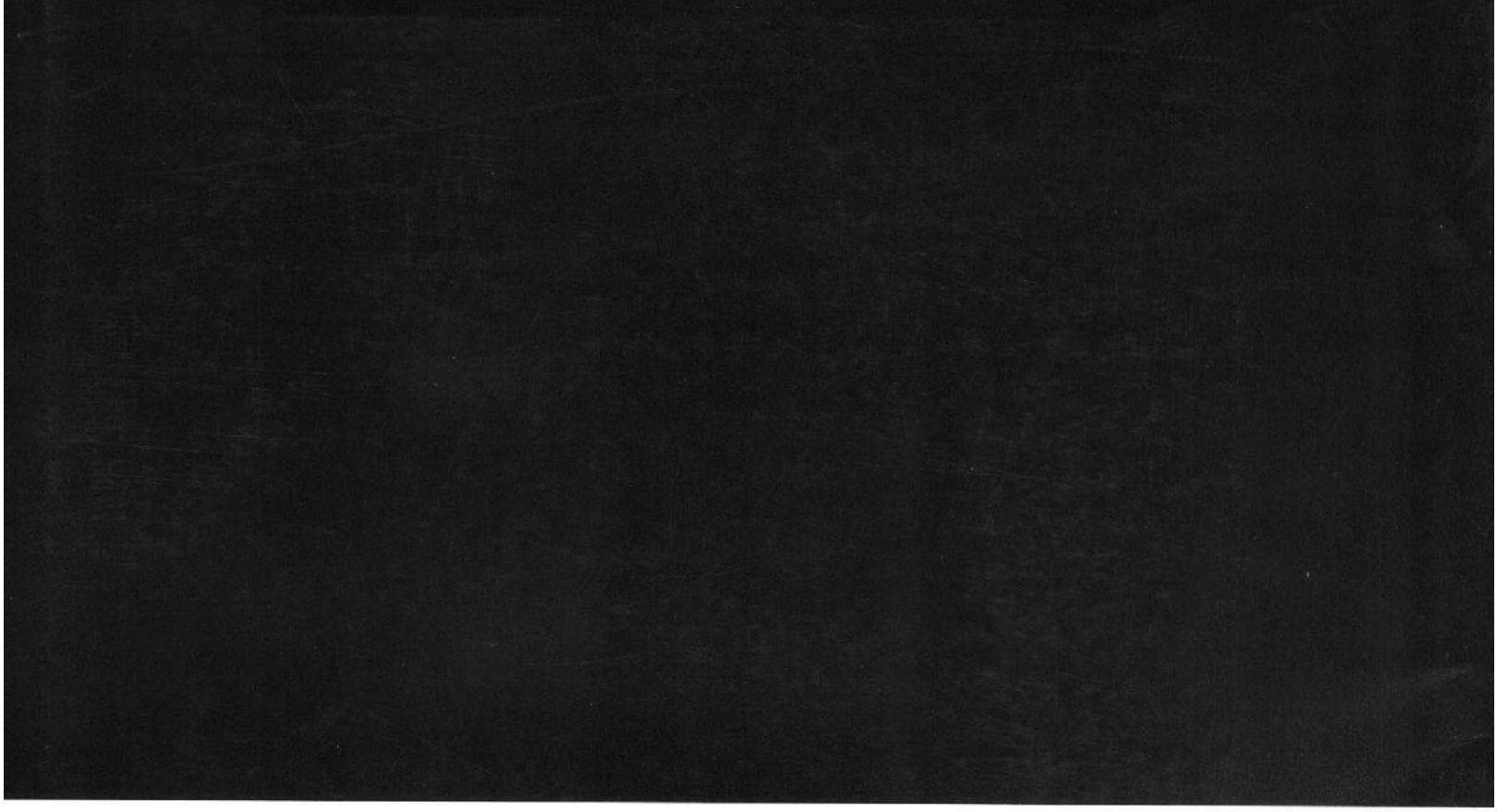

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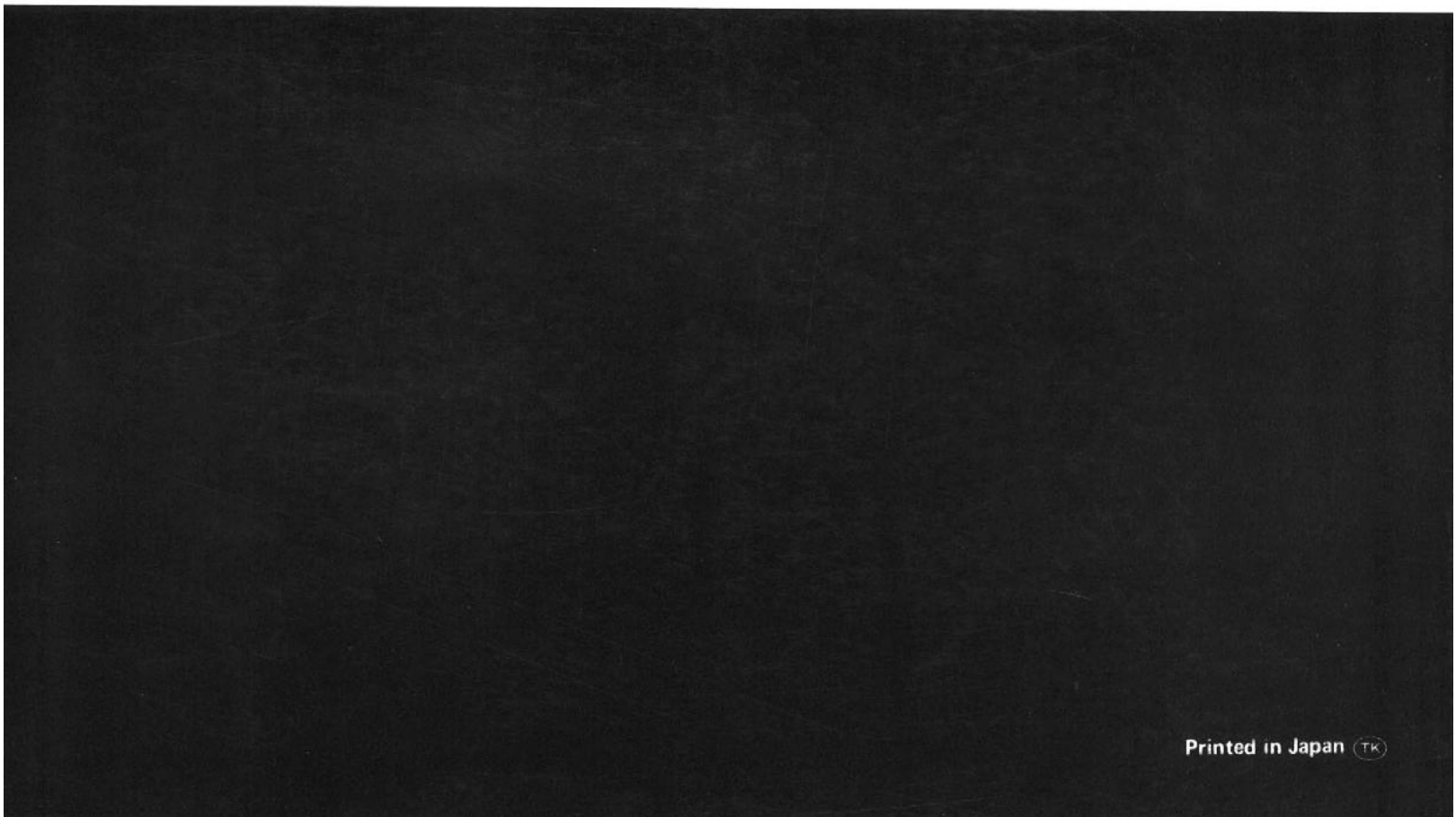

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