[Fuel tank purging procedure]

WARNING:
This purging procedure will NOT remove all fuel vapor. Do not attempt any repair on tank where heat or flame is required, as an explosion resulting in personal injury could occur.

The following procedure is used for purging the fuel tank.

1) After removing fuel tank, remove all hoses, 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 inside is rusty.
5) Completely flush out remaining water after washing.

[Installation]
Reverse removal procedure for installation using care for the following.

Tightening torque for fuel tank drain plug	30 – 45 Nm (3.0 – 4.5 kg-m) (22.0 – 32.5 lb-ft)

Refer to Fig. 4-2-5 for piping and clamp positions.

- Make sure for correct hose-to-pipe connection.
- Clamp hoses securely.
- Upon completion of installation, start engine and check hose joints for leaks.

MAINTENANCE SERVICES

Fuel Lines

Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking, and damage. Make sure all clamps are secure.

Repair leaky joints, if any.
Replace hoses that are suspected of being cracked.

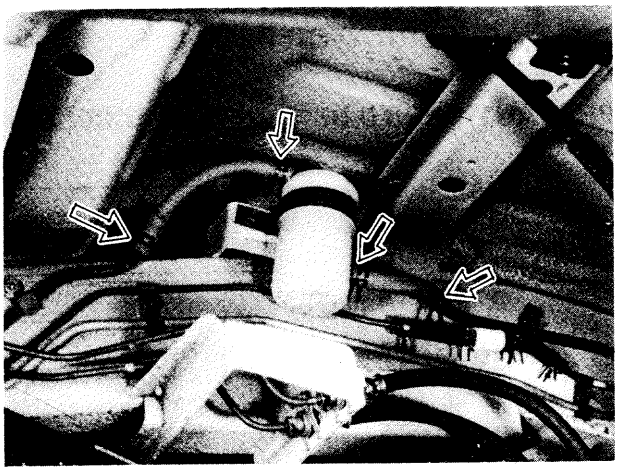
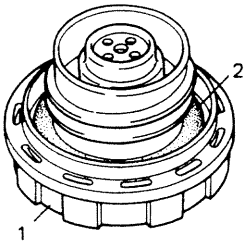


Fig. 4-2-14

Fuel Filler (tank) Cap

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

NOTE:
If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in a serious malfunction of the system.



1. Fuel filler cap
2. Fuel filler cap gasket

Fig. 4-2-15

Fuel Filter

As said before, this filter does not permit disassembly: it is to be replaced with a new one periodically.

Replace fuel filter referring to previous item of "Fuel Filter Removal and Installation".

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

4-4. ACCELERATOR PEDAL

PRECAUTIONS TO BE TAKEN IN ACCELERATOR PEDAL INSTALLATION

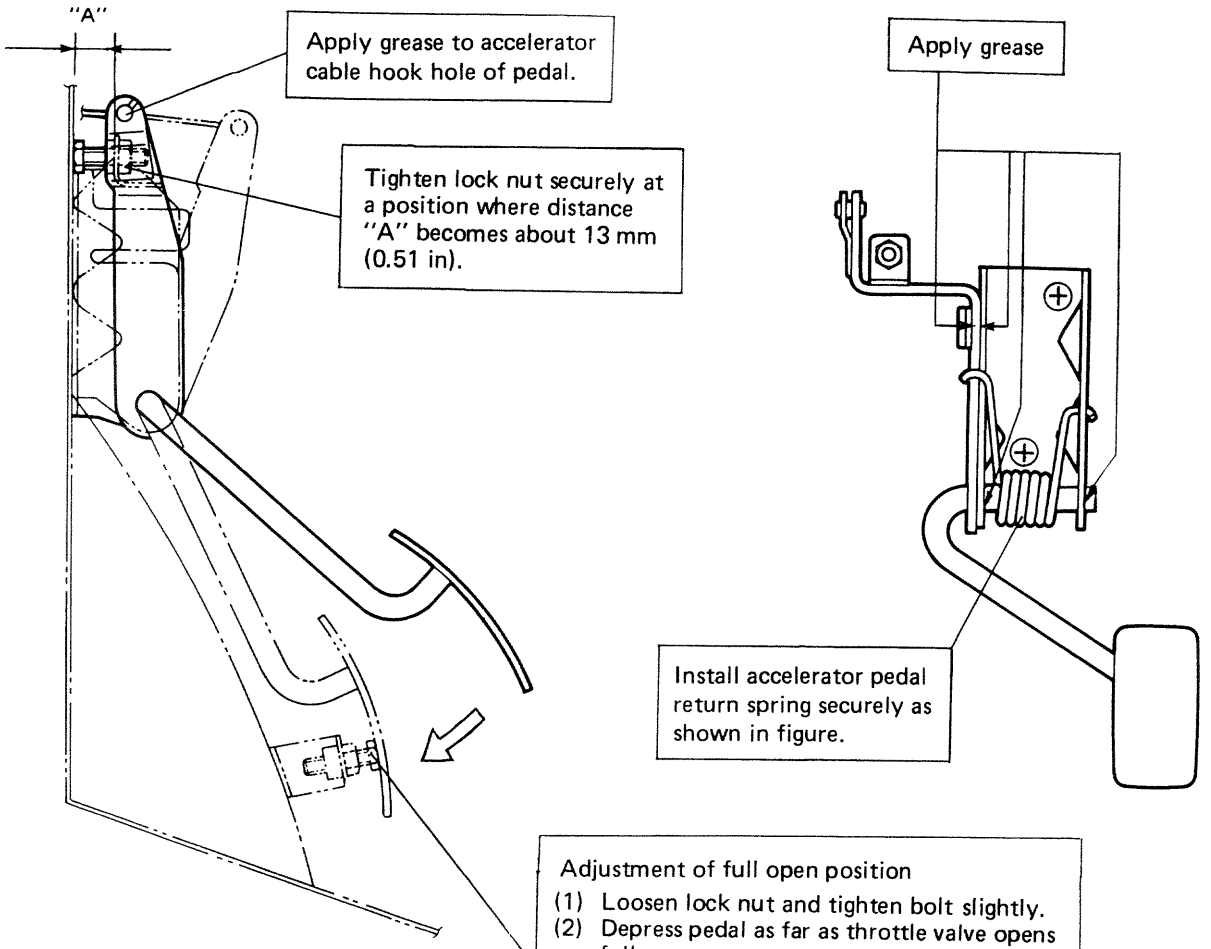


Fig. 4-2-16

SECTION 5

EMISSION CONTROL SYSTEM

CONTENTS

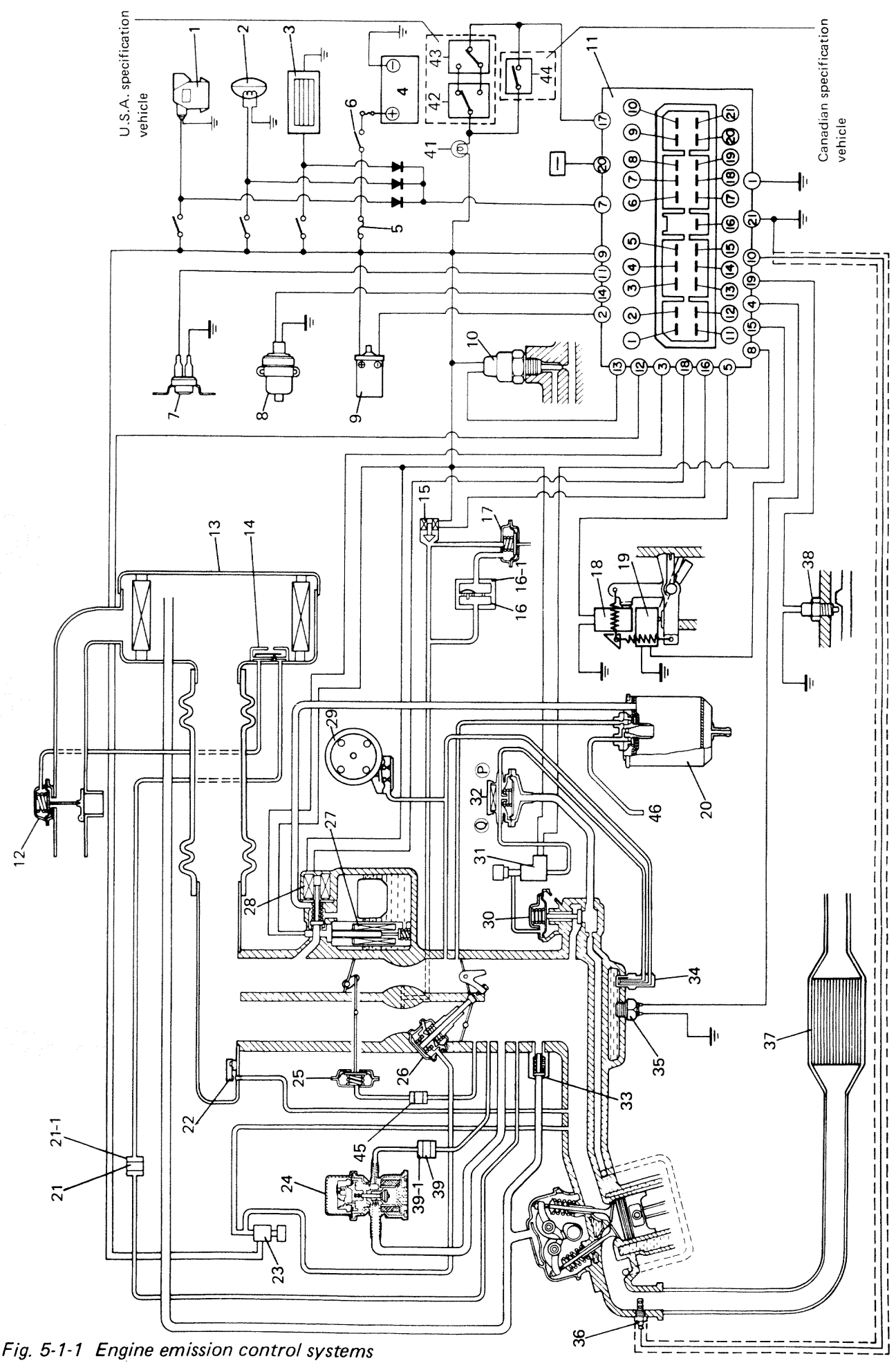


Fig. 5-1-1 Engine emission control systems

1. Heater fan
2. Small, Tail, Side marker & license light
3. Rear defogger
4. Battery
5. Fuse (circuit fuse)
6. Ignition switch
7. Thermal engine room switch
8. High altitude compensator (HAC)
9. Ignition coil
10. Fuel cut solenoid
11. Electronic control module (ECM)
12. Air control actuator
13. Air cleaner
14. Thermo sensor
15. Vacuum switching valve (VSV)
16. Vacuum transmitting valve (VTV)

16-1. Brown side

17. Secondary throttle valve actuator
18. Wide open micro switch
19. Idle micro switch
20. Vapor storage canister
21. Check valve (black)

21-1. Orange side

22. Hot idle compensator (HIC)
23. Three way solenoid valve (TWSV)
24. Mixture control valve (MCV)
25. Choke piston
26. Idle up actuator
27. Mixture control solenoid valve (MCSV)
28. Vent solenoid valve
29. Distributor
30. Exhaust gas recirculation (EGR) valve
31. Three way solenoid valve (TWSV)
32. EGR modulator
33. Positive crankcase ventilation (PCV) valve
34. Bi-metal vacuum switching valve (BVSV)
35. Thermal switch
36. Oxygen sensor
37. Three way catalyst
38. Fifth switch
39. Jet (colorless)

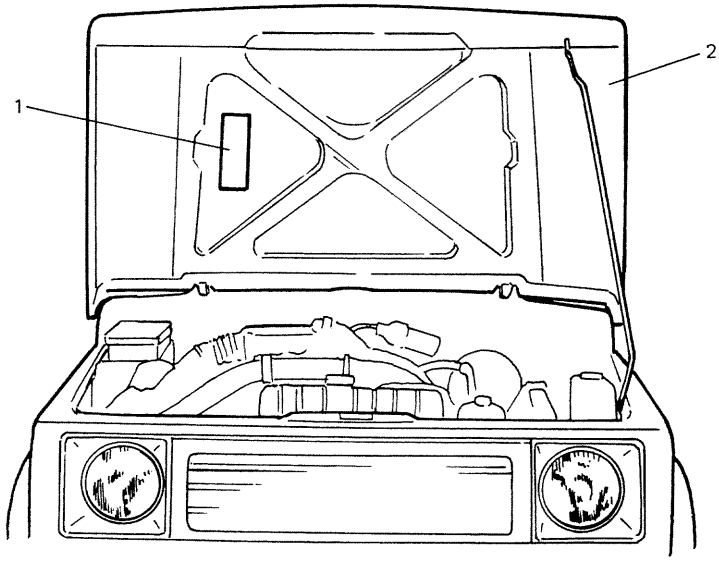
39-1. Gray side

40. Check connector
41. "CHECK ENGINE" light
42. Mileage sensor (U.S.A. specification vehicle)
43. Cancel switch (U.S.A. specification vehicle)
44. Check switch (Canadian specification vehicle)
45. Delay valve (orifice)
46. To fuel tank

VEHICLE EMISSION CONTROL INFORMATION LABEL

The Vehicle Emission Control Information Label is located under hood. The label contains important emission specifications and setting procedures, as well as a vacuum hose schematic with emission components identified.

When servicing the engine or emission systems, the Vehicle Emission Control Information Label should be checked for up-to-date information.



1. Emission control label
2. Hood

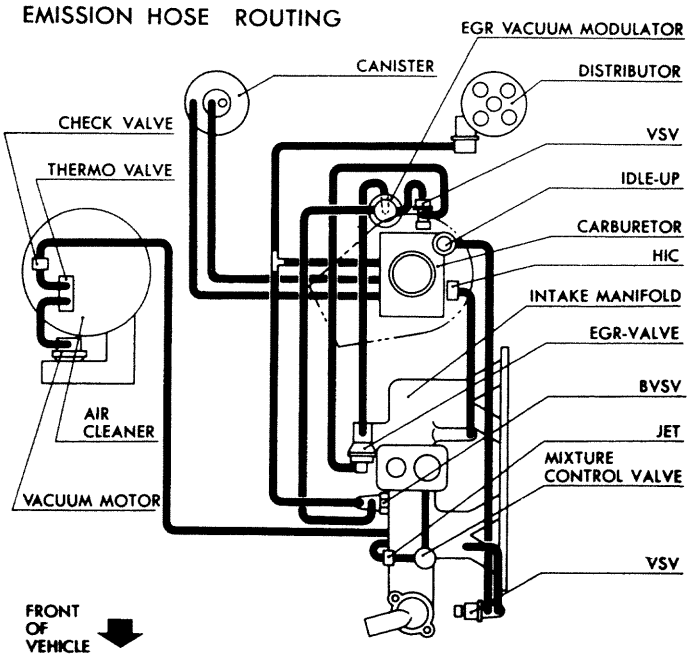


Fig. 5-1-2 Vehicle emission control information label

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

(Blow-by gas recycling system)

The blow-by gas in the crankcase flows through the passage in the cylinder block into the cylinder head. The oil particles are separated from the blow-by gas by the oil separating unit in the cylinder head cover. The gas is then returned together with the fresh air coming from the air cleaner through the PCV valve into the intake manifold for recombustion.

When the vacuum in the intake manifold is low (when the opening of the throttle valve is large), 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.

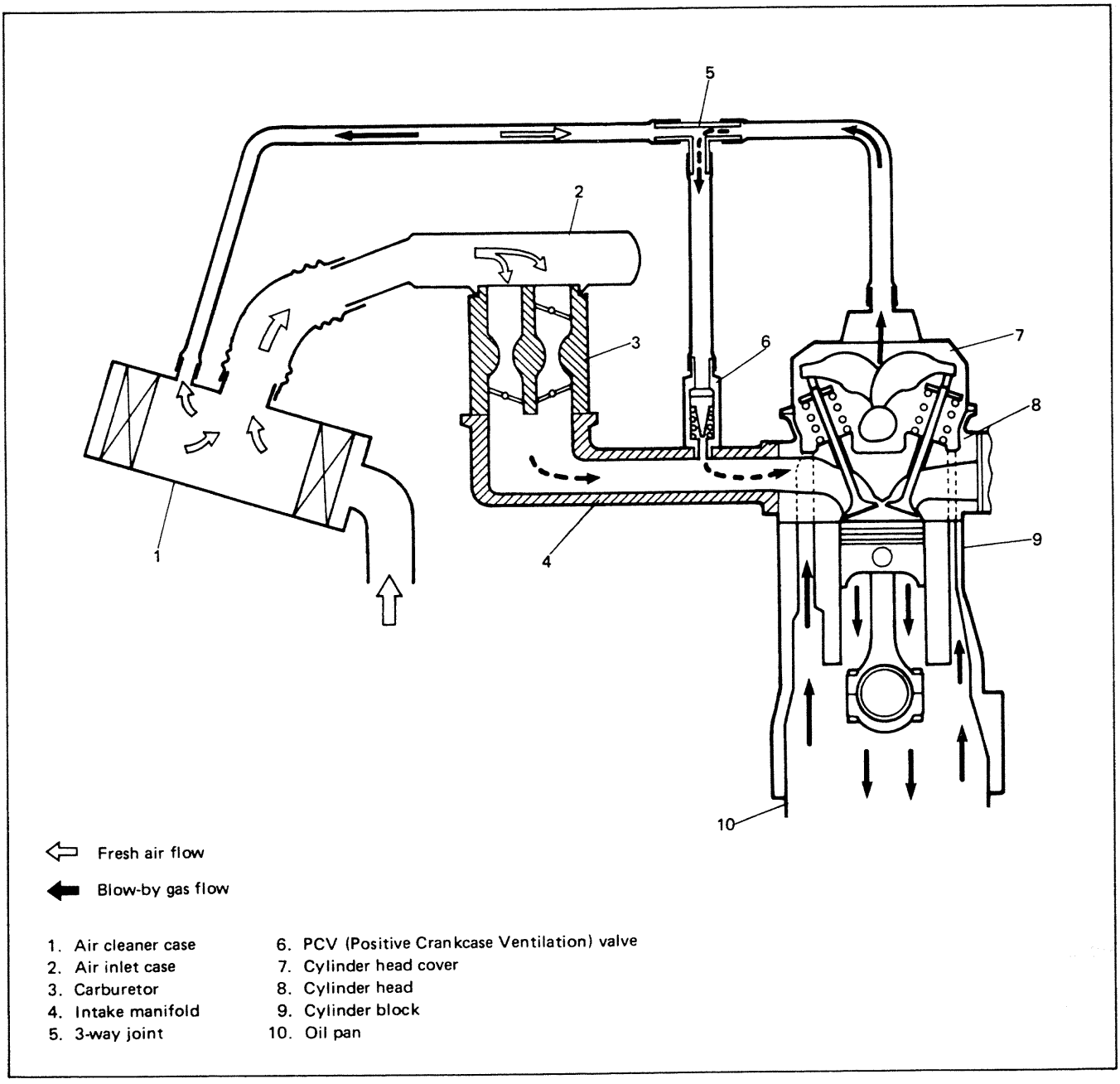


Fig. 5-1-3 PCV system operation

THERMOSTATICALLY CONTROLLED AIR CLEANER (TCAC) SYSTEM

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.

It consists of the thermo sensor (thermo valve) and the Air Control Actuator (ACA). The thermo sensor located in the air cleaner case senses the temperature of the intake air and controls the vacuum line by opening and closing its passage to the ACA. According to this opening and closing operation, the vacuum in the intake manifold actuates the damper through the diaphragm in the ACA. For the warm air, the air is warmed up in the exhaust manifold cover and for the cold air, the outside air is drawn through the fresh air passage and both enter the air cleaner.

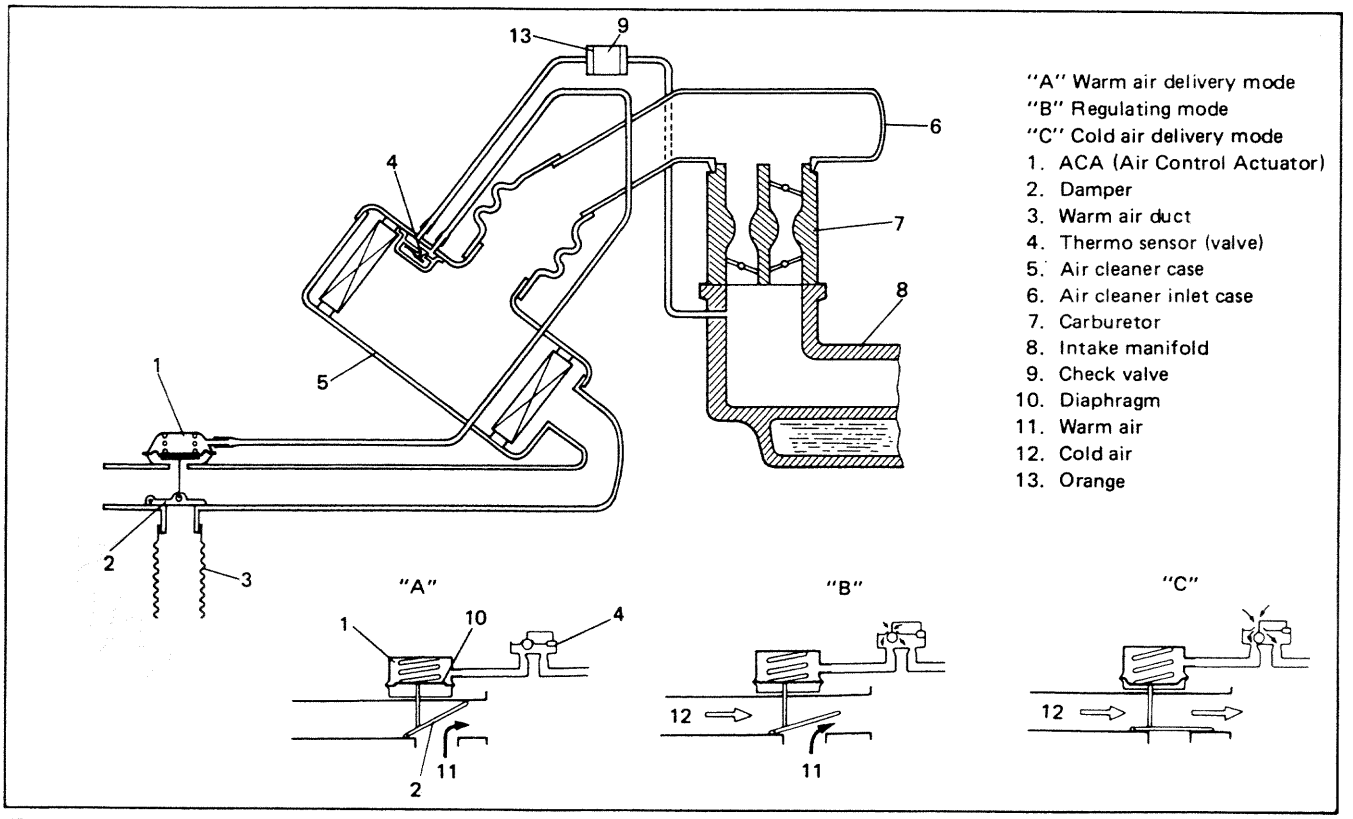


Fig. 5-1-4 TCAC system operation

System Operation

When engine is started in cold weather, the thermo valve is closed because the temperature of the intake air in the air cleaner is low. Therefore, the vacuum is transmitted to the ACA diaphragm, which then pulls up the damper linked to the diaphragm to open the warm air duct fully. As the engine is warmed up, the temperature of the intake air coming into the air cleaner from the warm air duct rises and the thermo valve starts opening. As a result, the vacuum transmitted to the ACA diaphragm decreases, and the damper pushed down by the spring force lessens the warm air duct opening. In this state, warm air and cold air are mixed together and enters the air cleaner.

When the engine is operating at high rpm and under high load condition, the temperature of the air coming from the warm air duct rises very high, causing the thermo valve opening to become even larger and the damper opening smaller. That is, the amount of the warm air coming from the warm air hose decreases and the cold air amount increases.

In this way, this system serves to maintain the temperature of the intake air going into the carburetor almost at a constant level.

EVAPORATIVE EMISSION CONTROL SYSTEM

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 liquid vapor separator.

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".

When engine runs, the fuel vapor stored in the canister is drawn into the carburetor together with fresh air.

For vent solenoid valve operation, refer to item of "BOWL VENTILATION SYSTEM."

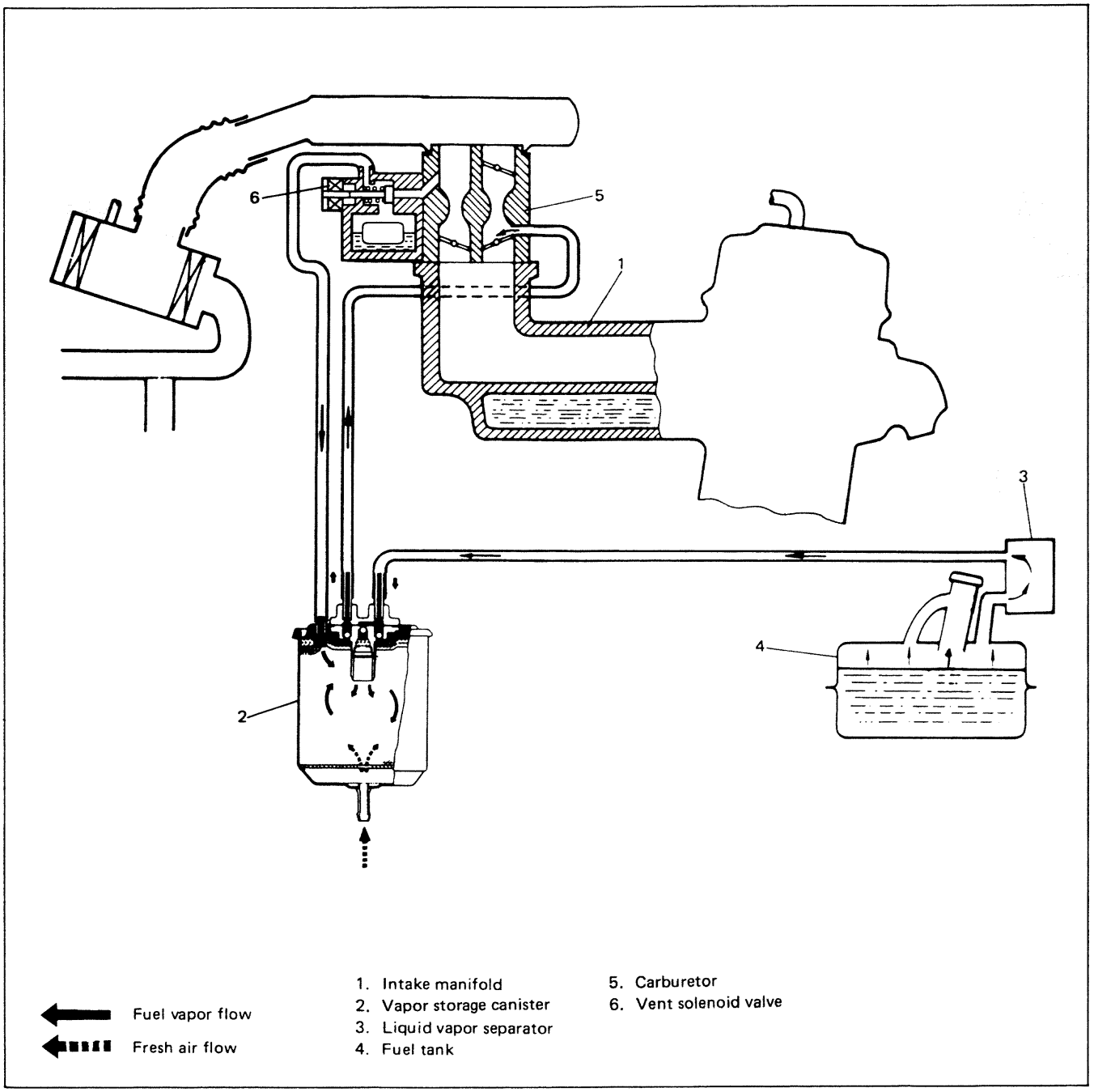


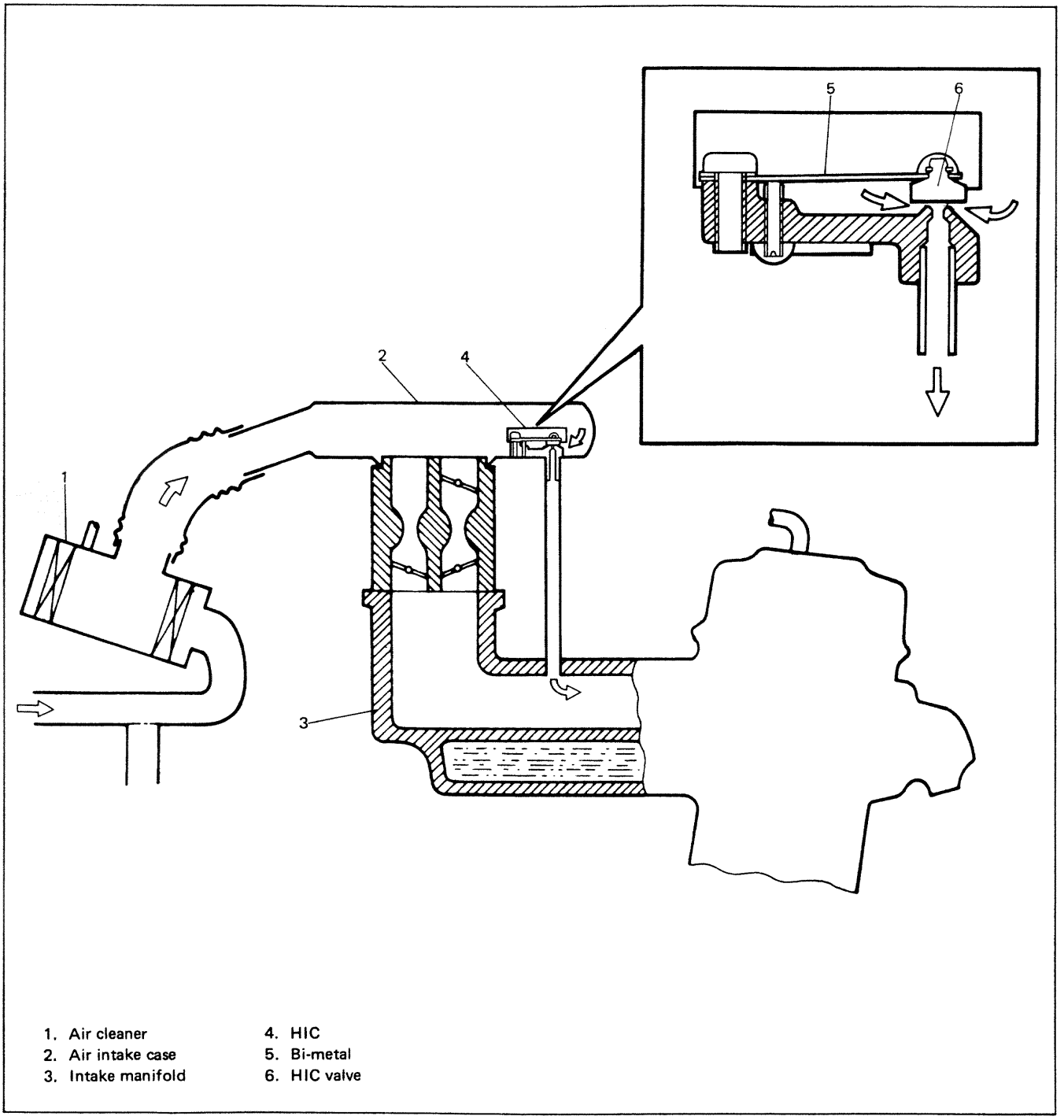
Fig. 5-1-5 Evaporative emission control system

HOT IDLE COMPENSATOR (HIC)

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

HIC has a bimetal which warps as the heat transferred to it rises higher than about 55° C (131° F). Caused by this, the valve in HIC starts to open and it reaches to the full open state at about 70° C (158° 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 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.



1. Air cleaner
2. Air intake case
3. Intake manifold
4. HIC
5. Bi-metal
6. HIC valve

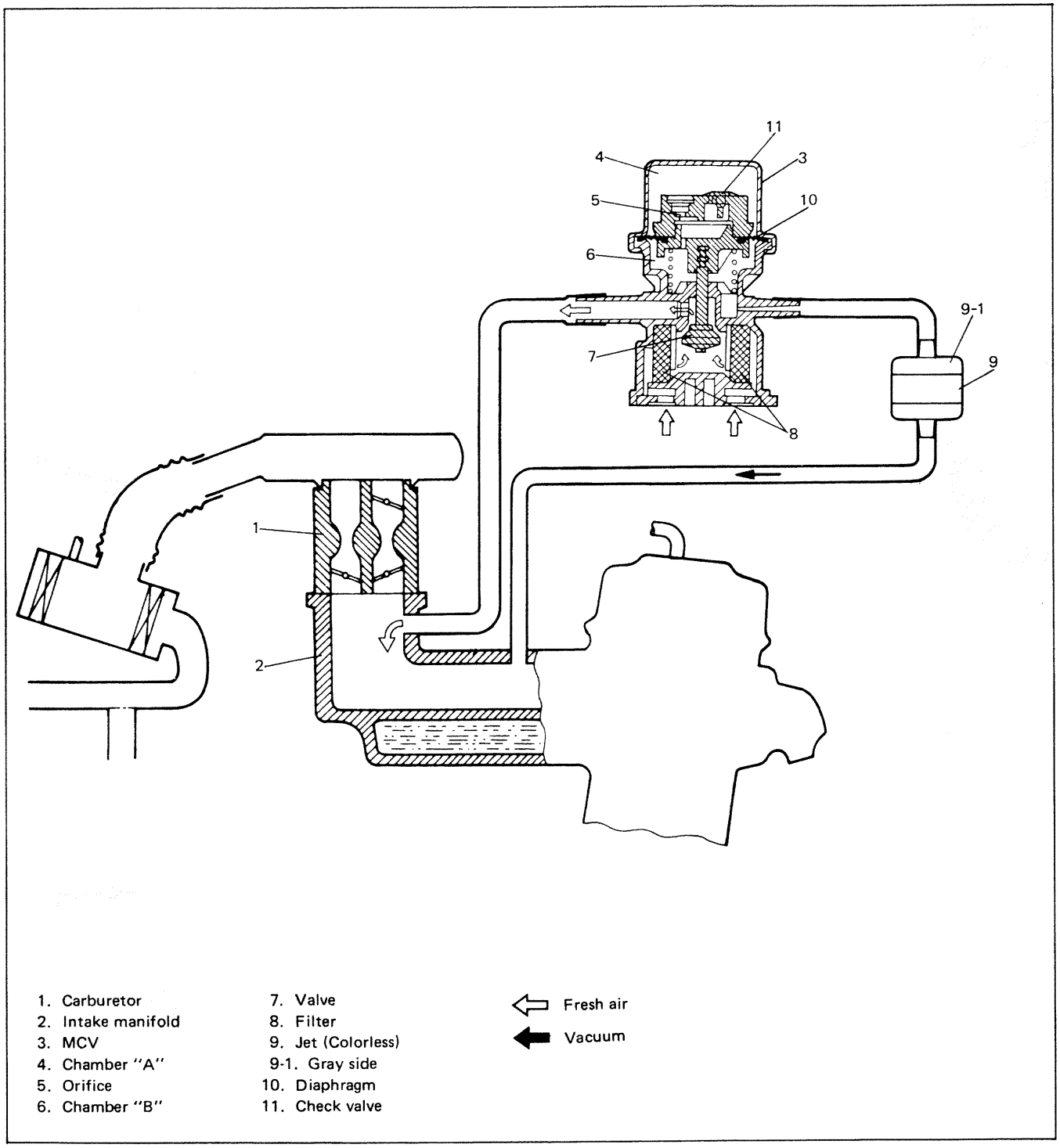
Fig. 5-1-6 Hot idle compensator

DECELERATION MIXTURE CONTROL SYSTEM

This system consists of a MCV (Mixture Control Valve), jet and vacuum hoses.

This system is designed to introduce fresh air into the intake manifold to reduce generation of excessive HC and CO emission caused by temporary rich air-fuel ratio while rapid deceleration.

The MCV has a pressure balancing orifice and check valve on its diaphragm, and closes when manifold vacuum is constant. As manifold vacuum increases according to rapid deceleration, manifold vacuum applies to MCV chamber "B" through jet, the MCV opens and introduces fresh air into the intake manifold. When manifold vacuum becomes constant, pressure difference between two sectioned chambers "A" and "B" gradually diminishes through pressure balancing orifice, then the MCV closes.



1. Carburetor
2. Intake manifold
3. MCV
4. Chamber "A"
5. Orifice
6. Chamber "B"
7. Valve
8. Filter
9. Jet (Colorless)
9-1. Gray side
10. Diaphragm
11. Check valve

⇦ Fresh air
⬅ Vacuum

Fig. 5-1-7 Deceleration mixture control system

COMPUTER CONTROLLED EMISSION CONTROL SYSTEM

[**Feed back system**]

A prime purpose of this system is to maintain a controlled air fuel ratio, allowing the catalyst to reduce oxides of nitrogen, hydrocarbons, carbon monoxide and to improve fuel economy simultaneously.

The electronic control module (ECM) and the oxygen sensor are provided in this system.

The oxygen sensor mounted on the exhaust manifold monitors the exhaust gas air fuel ratio and signals to the ECM.

The ECM processes the oxygen sensor signal and controls carburetor air fuel ratio by the operation of the mixture control solenoid in the carburetor.

Thus the signal of the exhaust gas air fuel ratio sensed by the oxygen sensor is fed back to ECM and the carburetor air fuel ratio is controlled.

[**Electronic control module (ECM)**]

The ECM controls the fuel cut system, idle-up system, bowl vent system, EGR system and secondary throttle valve system, as well as the feed back system. The ECM is located under the glove box of the instrument main panel. Refer to Fig. 5-1-9.

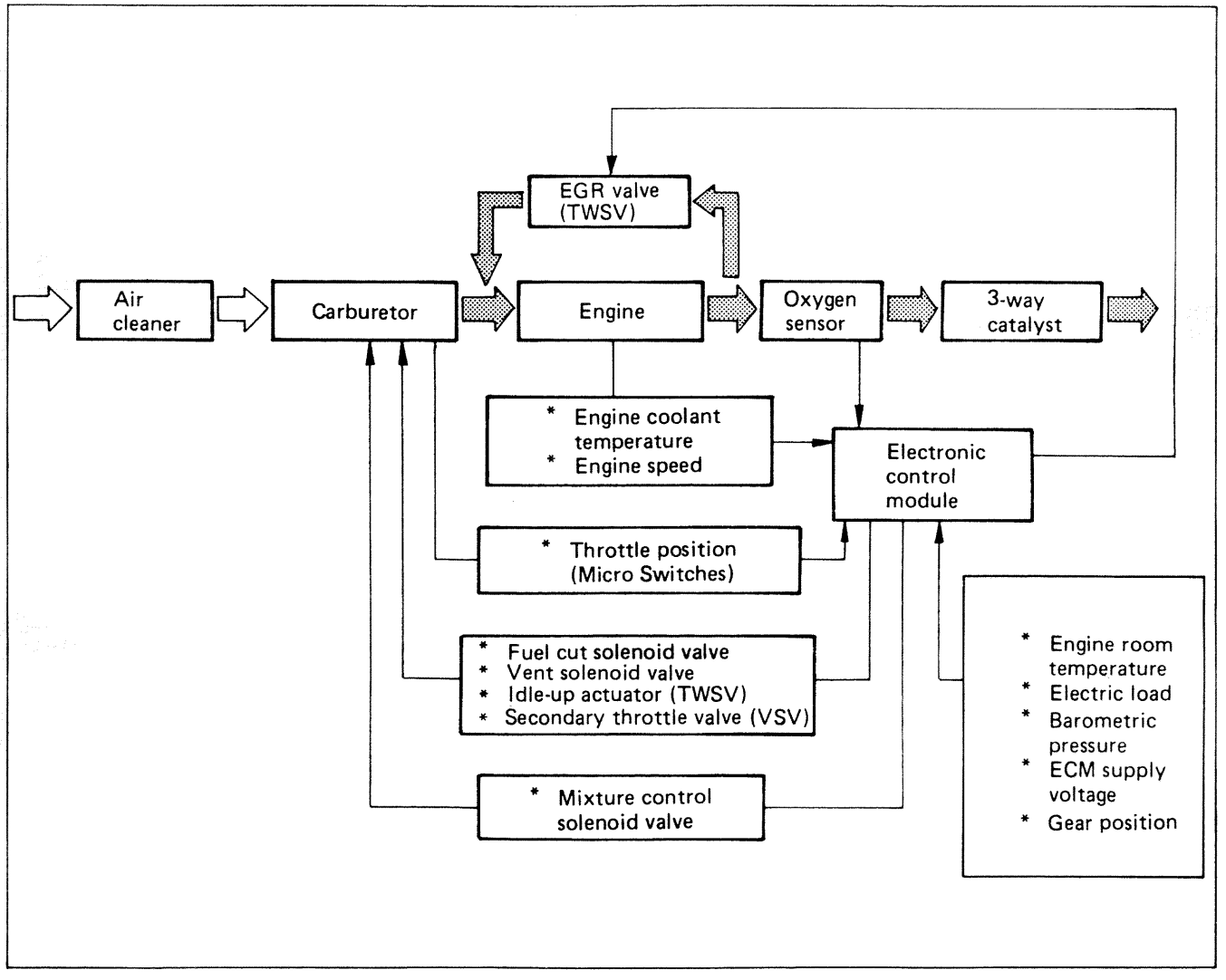
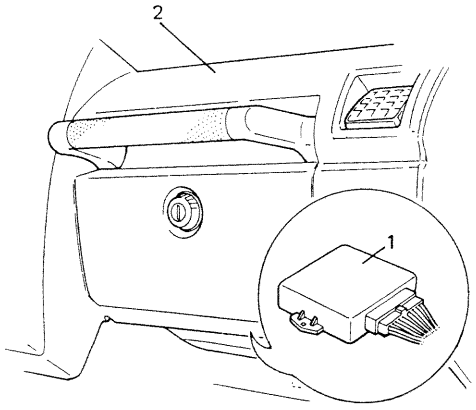


Fig. 5-1-8 Computer controlled emission control system

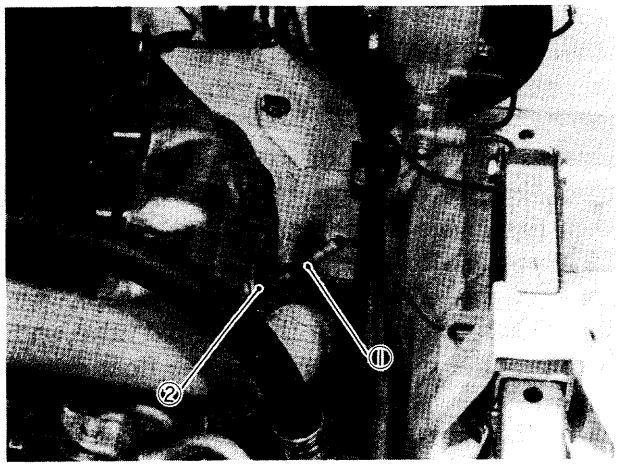


1. ECM
2. Instrument panel

Fig. 5-1-9 ECM

The ECM sensed parameters are as follows:

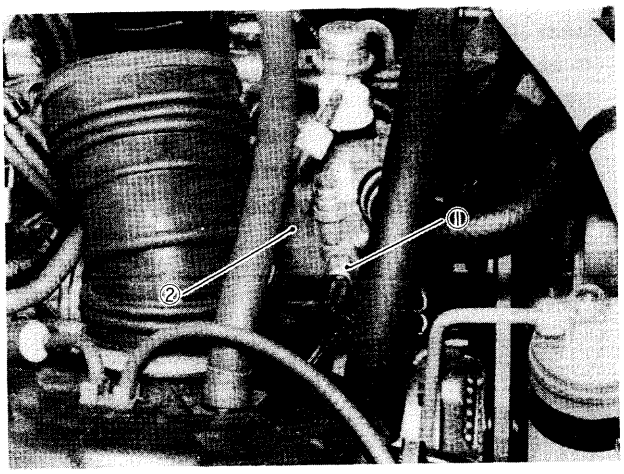
- **Exhaust Oxygen Concentration.**
  It is sensed by the oxygen sensor installed on the exhaust manifold.



1. Oxygen sensor
2. Exhaust manifold

Fig. 5-1-10 Oxygen sensor

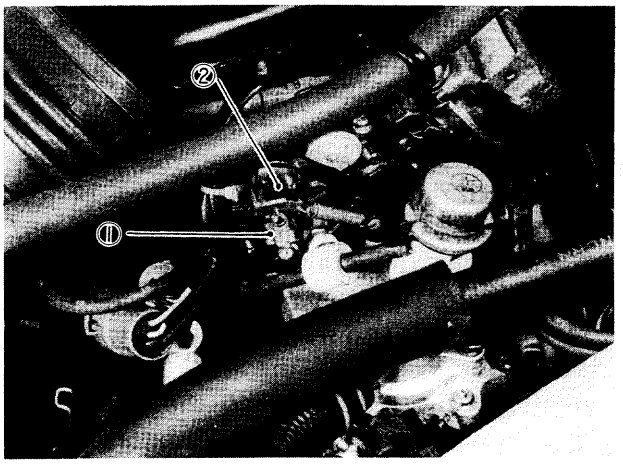
- **Engine coolant temperature.**
  It is sensed by the thermal switch installed on the intake manifold.



1. Thermal switch
2. Intake manifold

Fig. 5-1-11 Thermal switch

- **Throttle position.**
  It is sensed by the micro switches (wide open switch and idle switch) installed on the carburetor.



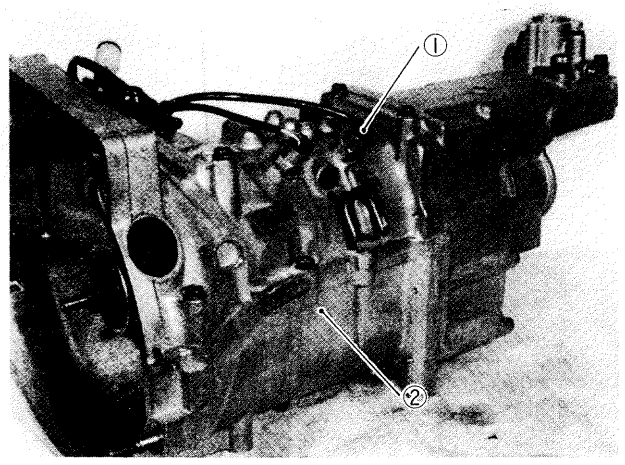
1. Idle micro switch
2. Wide open micro switch

Fig. 5-1-12 Micro switches

- **Engine speed.**
  It is computed by the ECM based on the electrical signal received from the ignition system.

- **Electric load.**
  The ECM senses electric loads of the following items to provide idle speed compensation.
  a. Small, tail, side marker, license light.
  b. Rear defogger (if equipped).
  c. Heater fan.

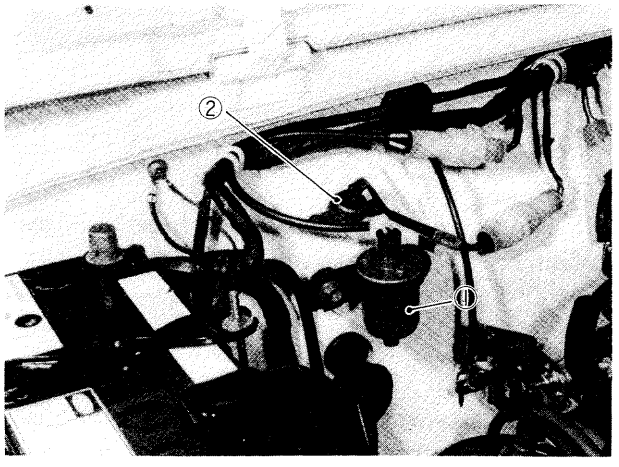
- **Gear position.**
  It is sensed by the fifth switch located on the transmission. The switch turns "ON" when the gear shift lever is shifted to fifth gear position and "OFF" when shifted to positions other than fifth gear position.



1. Fifth switch
2. Transmission

Fig. 5-1-13 Fifth switch

- **Altitude compensation.**
  When the vehicle is at high altitude and the feed back system does not function, the air/fuel mixture becomes richer because of low air density. To compensate the richer air/fuel mixture at high altitude, the high altitude compensator is "ON" by sensing the barometric pressure and sends a signal to the ECM. Following the signal, the ECM controls the mixture control solenoid in the carburetor, thus compensating the air/fuel mixture.



1. High altitude compensator
2. Thermal engine room switch

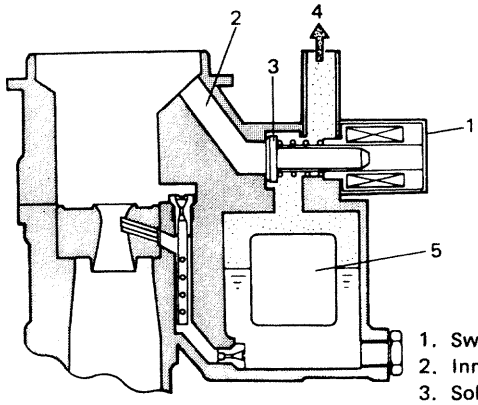
Fig. 5-1-14 High altitude compensator and thermal engine room switch

- **Engine room temperature compensation.**
  Sensing the air temperature in the engine room the thermal engine room switch sends an electric signal to ECM to compensate the air/fuel ratio of the mixture. When the air temperature in the engine room is low, the switch operates to make the mixture rich. When the air temperature in the engine room is high, the switch stops operating, which means, the air/fuel ratio of the mixture is not controlled by the switch. Refer to Fig. 5-1-14 for the thermal engine room switch.

[Three-way catalyst]
The three-way catalyst is provided in the exhaust system (exhaust center 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.

BOWL VENTILATION SYSTEM

This system has a switch vent solenoid which is operated by the ignition switch and the ECM. It prevents the fuel vapor in the float chamber from flowing out into the atmosphere both when the engine is at a stop and at work. When the ignition switch is at "OFF" position or when cranking the engine (engine not started), the vent passage is closed by the solenoid valve, and therefore, the vapor flows from the float chamber into the vapor storage canister. When the engine is operating, the solenoid receives an electrical signal from the ECM and its valve keeps the inner vent passage open. As a result, the vapor passes through the passage into the carburetor and is drawn into the engine.



1. Switch vent solenoid
2. Inner vent passage
3. Solenoid valve
4. To canister
5. Float

Fig. 5-1-15 Bowl ventilation system

FUEL CUT SYSTEM

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 when it received a signal from the ECM.

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

Three conditions:

- The coolant temperature is normal.
- The idle micro switch is in "ON" position. In other words, the primary throttle valve is closed.
- The engine revolution is more than 2,400 rpm.

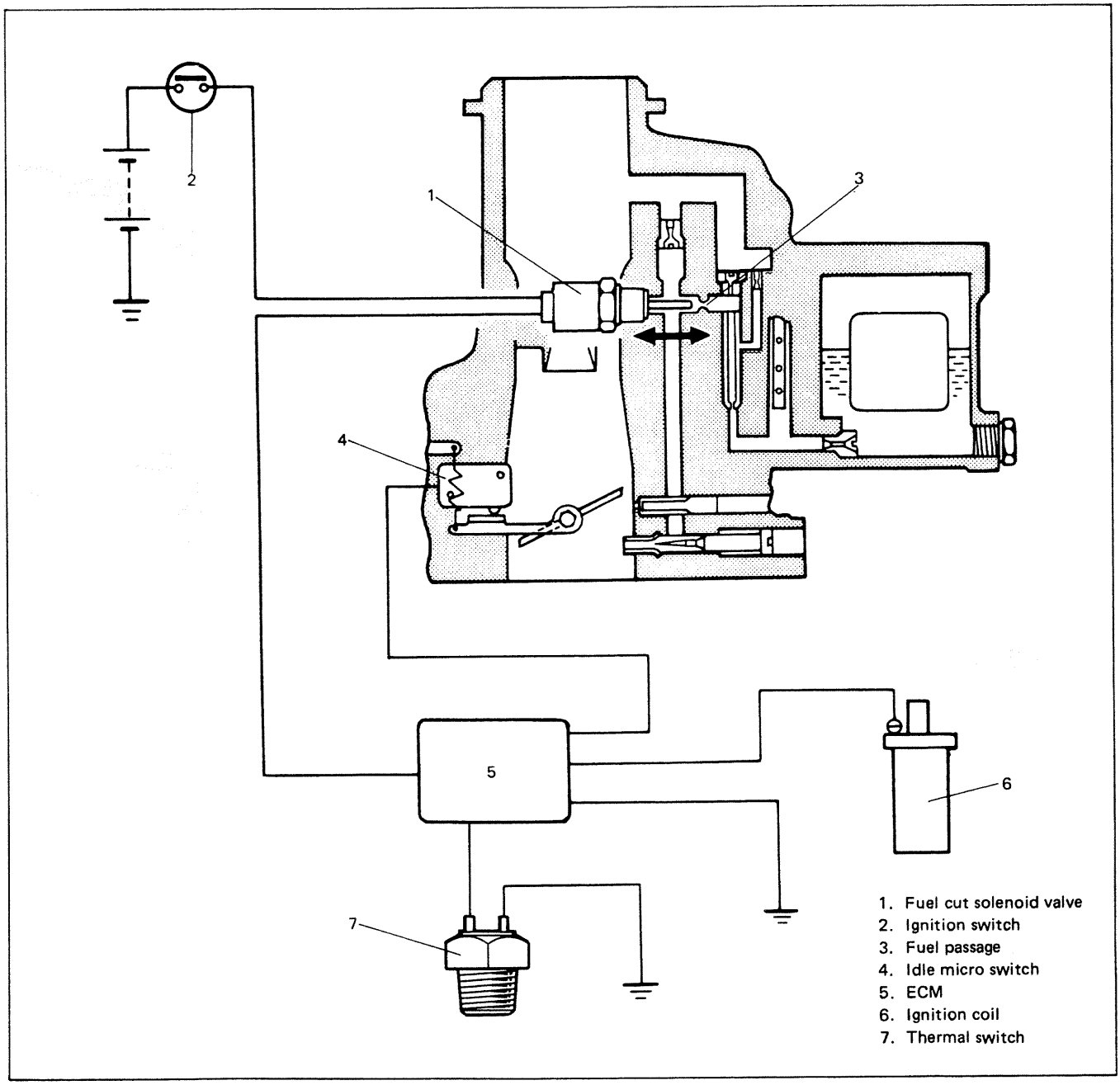


Fig. 5-1-16 Fuel cut system

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

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.

Under any one of the following conditions, the vacuum passage is closed by the TWSV or BVSV and the vacuum is not transmitted to the EGR valve which, therefore, doesn't operate.

- When the coolant temperature is low. (BVSV is closed)
- When the gear shift lever is shifted to fifth gear position and fifth switch is turned on. (TWSV is closed)
- When HAC is turned on. (TWSV is closed)

Other than the above, EGR valve opens and closes in accordance with the EGR modulator operation.

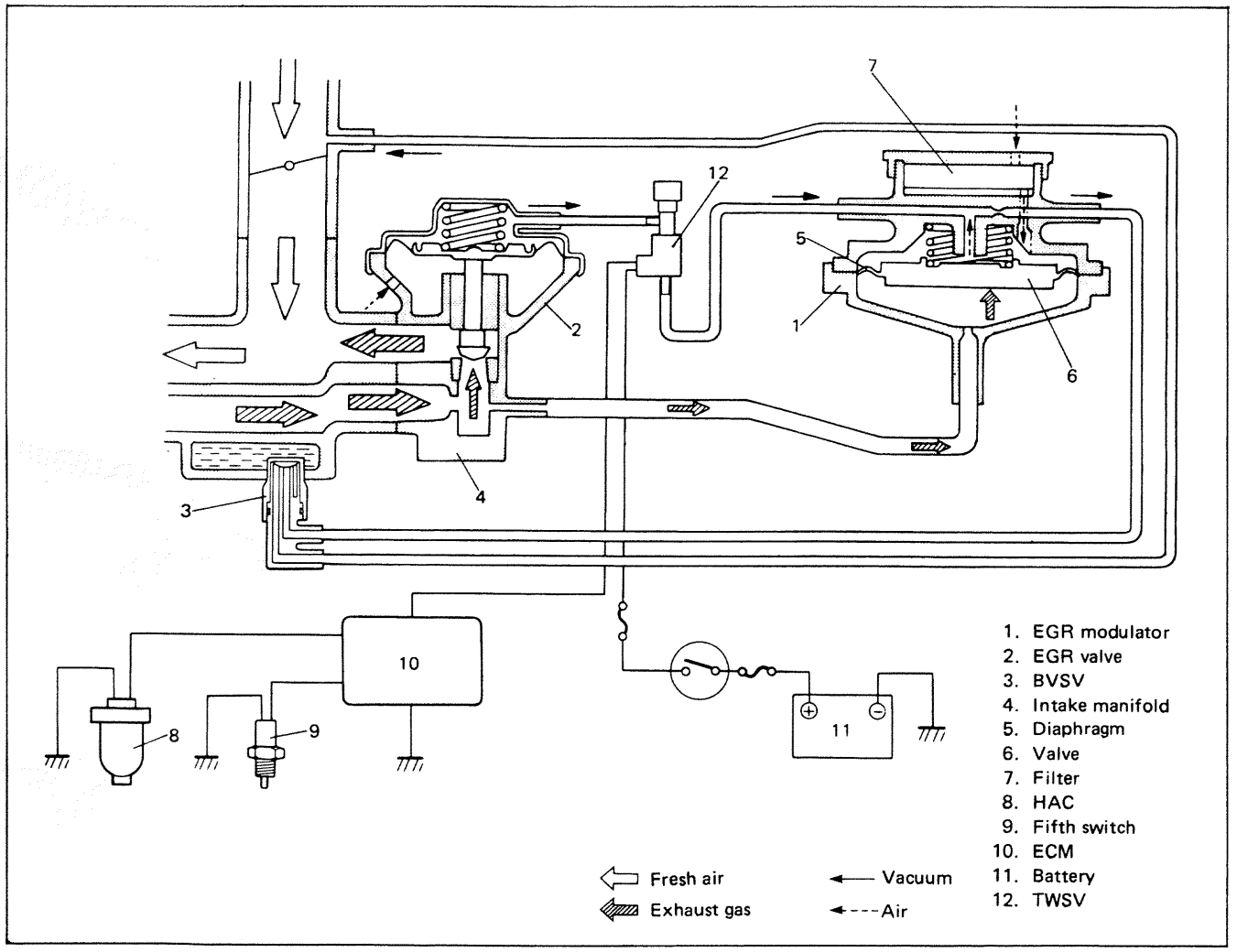


Fig. 5-1-17 EGR system operation

5-2. 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 • Vacuum leaks • Maladjusted idle mixture • Improper adjusted/sticking choke • Maladjusted initial spark timing • Defective spark plugs, wires or distributor cap • Malfunctioning MCV • Lead contamination of catalytic converter • Malfunctioning feed back system
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 • Leaking carburetor fuel passages or gaskets • Carburetor float level • Restricted air cleaner element • Malfunctioning feed back system
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 BVSV or TWSV • Lead contamination of catalytic converter • Malfunctioning feed back system

EGR DIAGNOSIS

Condition	Possible Cause	Correction
Engine idles abnormally rough and/or stalls.	EGR valve vacuum hoses misrouted.	Check EGR valve vacuum hose routing. Correct as required.
	Leaking EGR valve.	Check EGR valve for correct operation.
	EGR valve gasket failed or loose EGR attaching bolts.	Check EGR attaching bolts for tightness. If no loose, remove EGR valve and inspect gasket.
	Improper vacuum to EGR valve at idle.	Check vacuum from carburetor EGR port with engine at stabilized operating temperature and at idle speed.
	Sticky EGR valve	Check EGR valve for correct operation.
Engine runs rough on light throttle acceleration and has poor part load performance.	EGR valve vacuum hose misrouted.	Check EGR valve vacuum hose routing. Correct as required.
	Loose EGR attaching bolts	Torque bolts.
	Sticky or binding EGR valve.	Same as listing in "Engine Idles Abnomrally Rough and/or Stalls" condition. Clean EGR passage deposits. Perform EGR System Check.
	EGR modulator valve blocked or air flow restricted.	Check EGR modulator valve operation.
	Wrong or no EGR gasket.	Install new gasket, torque attaching parts.
Engine stalls on decelerations.	EGR modulator valve blocked of air flow restricted.	Check EGR modulator valve operation.
	Restriction in EGR vacuum line.	Check EGR vacuum lines for kinks, bends, etc. Remove or replace hoses as required.
	VSV filter plugged.	Check VSV for correct operation.
	Sticking or binding EGR valve.	Check EGR valve for excessive deposits causing sticky or binding operation.
Part throttle engine detonation. NOTE: **Non-functioning EGR valve could contribute to part throttle detonation. Detonation can be caused by several other engine variables. Perform ignition and carburetor related diagnosis.**	EGR modulator valve blocked of air flow restricted.	Check internal control valve operation.
	Insufficient exhaust gas recirculation flow during part throttle accelerations.	Check EGR valve hose routing. Check EGR valve operation. Repair or replace as required. Replace valve as required. Check EGR passages and valve for excessive deposit. Clean as required. Check VSV operation.

Condition	Possible Cause	Correction
Engine starts but immediately stalls when cold. NOTE: **Stalls after start can also be caused by carburetor problems.**	EGR valve hoses misrouted. BVSV is out of order.	Check EGR valve hose routings. Check BVSV. Replace as necessary.

PCV SYSTEM DIAGNOSIS

Condition	Possible Cause	Correction
Unstable idle, frequent stalling.	PCV valve completely stuck. Hose plugged.	Replace valve. Check hoses.
Oil in air cleaner.	PCV system plugged.	Replace valve.

5-3. MAINTENANCE SERVICE

GENERAL

If the emission control hoses were disconnected and any system component was removed for service, be sure to reinstall the component properly and route and connect hoses correctly after service. Refer to Fig. 5-1-1 for hose connection.

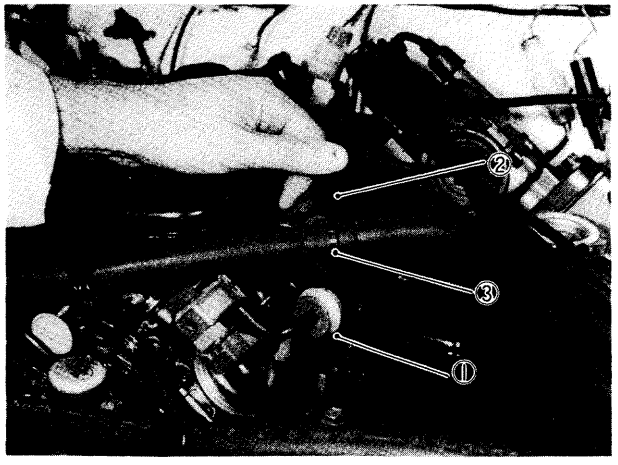
PCV SYSTEM

Checking PCV System

NOTE:
If the engine is idling rough, this may be caused by a stuck PCV valve, plugged hoses or vacuum leakage of PCV line, therefore, never adjust the carburetor idle without first checking the PCV valve and hoses.

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

[PCV valve]
1) Disconnect PCV hoses at three way joint.
2) Run engine at idle.
3) Place your thumb over the end of disconnected PCV hose to check for vacuum. If there is no vacuum, check for clogged hose or valve. Replace as necessary.

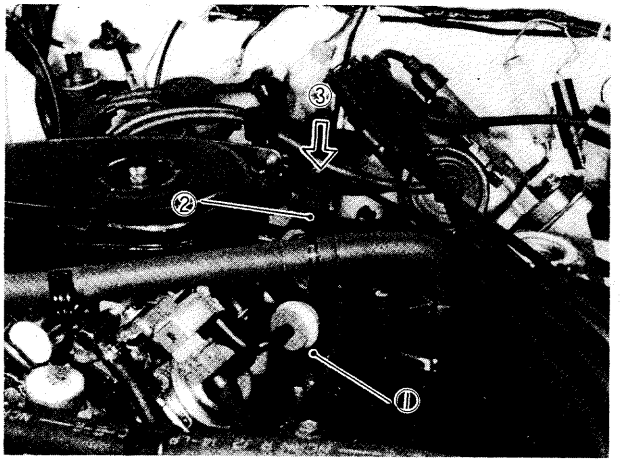


1. **PCV valve**
2. PCV hose
3. Three way joint

Fig. 5-3-1 Checking vacuum

4) After checking vacuum, stop engine and check PCV valve for sticking.
With engine stopped, remove PCV hose and connect a new hose to PCV valve.
Blow air into new hose and check that air flows with difficulty from cylinder head side to intake manifold side. If air flows without difficulty, the valve is stuck in "Open" position. Replace PCV valve. Before installing new PCV valve to intake manifold, wind sealing tape on thread of the valve.

> WARNING:
> **Do not suck air through PCV valve. The petroleum substances inside the valve and fuel vapor inside intake manifold are harmful.**



1. PCV valve
2. New PCV hose
3. Blow air

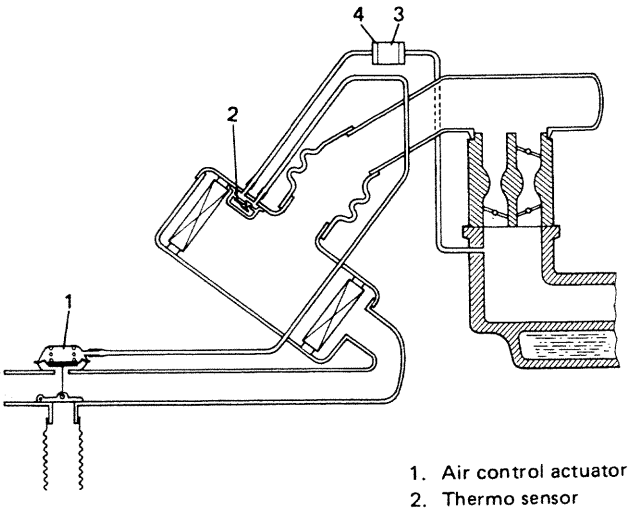
Fig. 5-3-2 Checking PCV valve for sticking

5) Connect PCV hose securely.

TCAC SYSTEM

Checking TCAC System

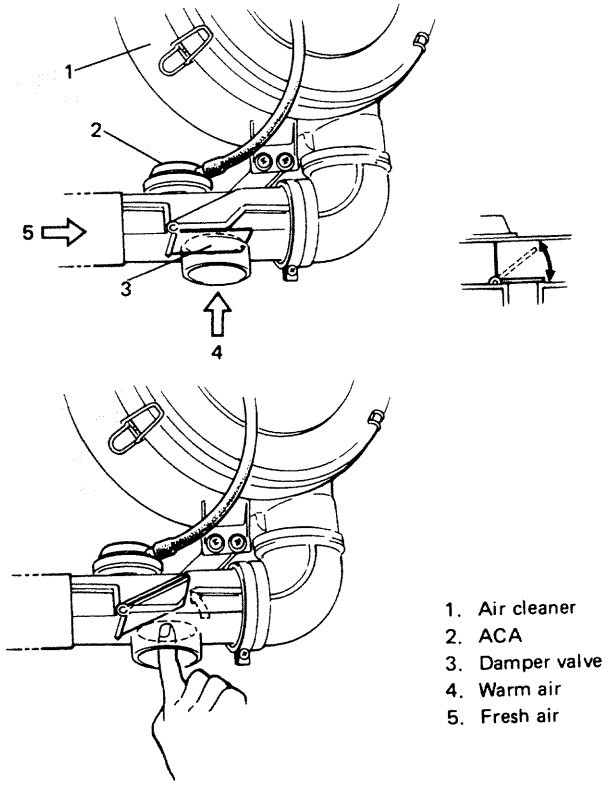
1) Check vacuum hose for connection, deterioration or damage. Replace as necessary.



1. Air control actuator
2. Thermo sensor
3. Check valve
4. Orange side

Fig. 5-3-3 TCAC system

2) With engine at a stop, make sure that the valve indicated in figure is completely closed (closing warm air side). This check should be carried out by putting finger into duct after removing warm air hose from it.



1. Air cleaner
2. ACA
3. Damper valve
4. Warm air
5. Fresh air

Fig. 5-3-4 Checking TCAC system

3) Check that when engine is started (and run at idle speed) under the condition that air cleaner is cool, valve on warm air side becomes fully open and one on fresh air inhaling side is completely closed.
4) If nothing was found faulty in the above step, connect warm air hose.

If found defective in above step 2) or 3), inspect following parts according to each procedure.

[Air control actuator]

1) Disconnect vacuum hose from thermo sensor.
2) Make sure that damper opens fully when more than 20 cmHg (7.87 in.Hg) vacuum is applied to ACA.

Also, make sure that damper is held at the same position when a constant vacuum is applied to it.
If damper doesn't open or close smoothly, or it isn't held at the same position, replace ACA.

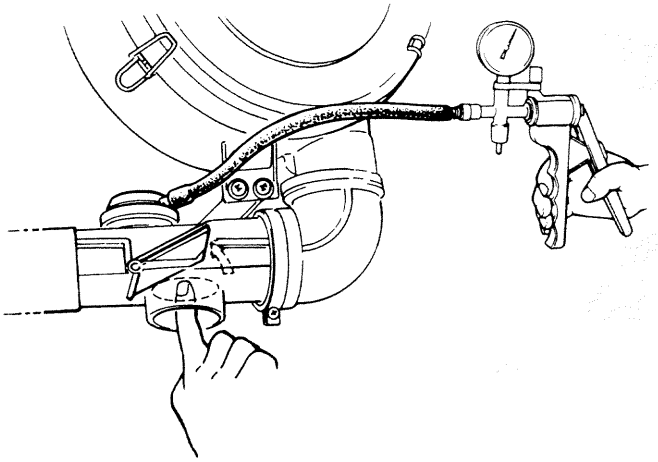


Fig. 5-3-5 Checking ACA

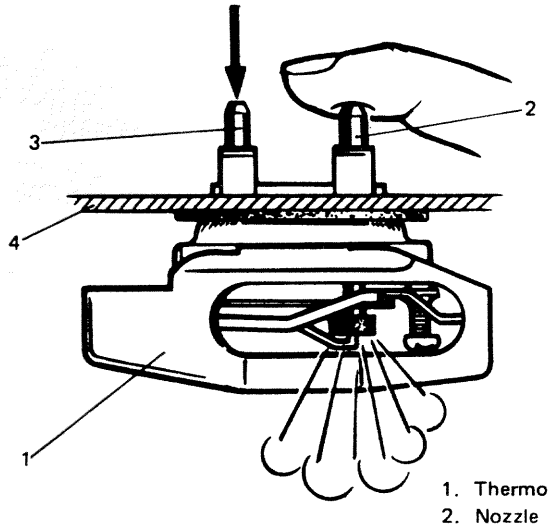
[Thermo sensor]

1) Remove air cleaner case cap.
2) Disconnect two vacuum hoses from thermo sensor.
3) Measure the temperature around thermo sensor.
4) Close a nozzle with finger and then blow air into nozzle. If measured temperature is above 40°C (104°F), air should come out of thermo sensor valve (valve is open) as shown in Fig. 5-3-6.
If the temperature is below 25°C (77°F), air should not come out (valve is closed).

Replace defective parts.

NOTE:

- **To check thermo sensor for operation at higher than 40°C (104°F) temperature when thermo sensor is lower than 25°C (77°F), remove thermo sensor from air cleaner cap and warm it up with hair drier or photo light before checking.**
- **Never touch bimetal or valve in thermo sensor.**



1. Thermo sensor
2. Nozzle
3. Nozzle
4. Air cleaner cap

Fig. 5-3-6 Checking thermo sensor

5) After checking, reinstall air cleaner case cap, and connect 2 vacuum hoses to thermo sensor.

[Check valve]

1) Remove check valve with vacuum hose.
2) Using vacuum pump gauge, check for the following.

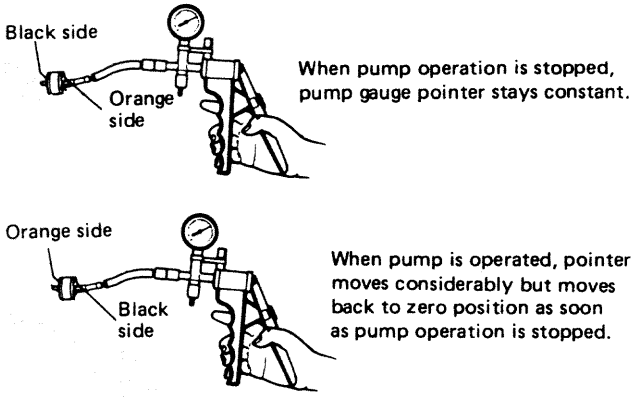


Fig. 5-3-7 Checking check valve

If found defective, replace.

3) Install check valve with its orange side directed toward thermo valve.

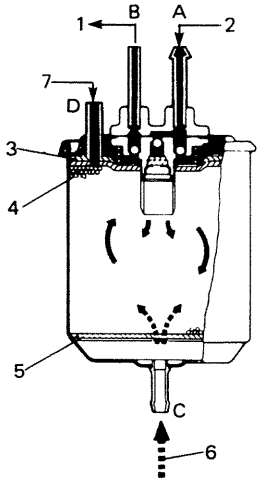
EVAPORATIVE EMISSION CONTROL SYSTEM

Checking vapor storage canister

WARNING:
DO NOT SUCK the 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 carburetor
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. 5-3-8 Checking canister

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

[Hoses]
Visually inspect hoses and pipe for cracks, damage, or excessive bends, and hose connection for tightness.

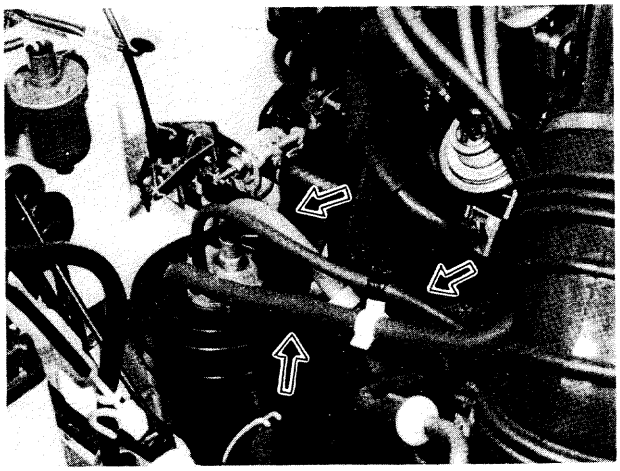


Fig. 5-3-9

HOT IDLE COMPENSATOR (HIC)

Checking Hot Idle Compensator

1) Remove air intake case with hose.
2) Check temperature around HIC with thermometer.
3) If temperature is below 45°C (113°F), air should not come out of HIC when air is blown into hose. If temperature is above 65°C (149°F), air comes out of HIC.
   Replace HIC if defective.
4) After checking, install air intake case and connect hose to intake manifold.

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), warm it up with hair drier or photo light before checking.**
- **Never touch bimetal or valve in HIC.**

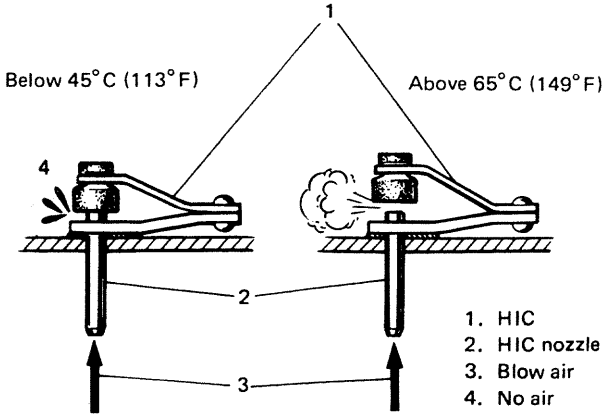


Fig. 5-3-10

DECELERATION MIXTURE CONTROL SYSTEM

Checking

[Hoses]
Inspect each hose for pinholes, cracks or damage. Also check to ensure that each joint is securely connected. Any part found defective must be corrected or replaced.

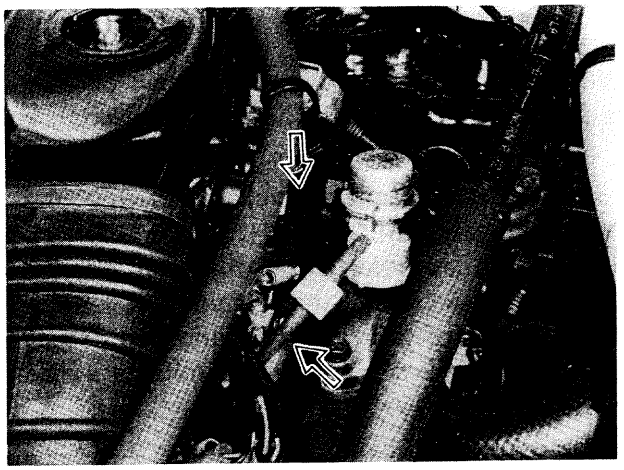


Fig. 5-3-11

[Mixture control valve (MCV)]
1) Warm up the engine to normal operating temperature.
2) Disconnect hose ① and reconnect it. At this time, check that air is drawn into MCV.

NOTE:
At this time, the engine will idle rough or die, but this is normal.

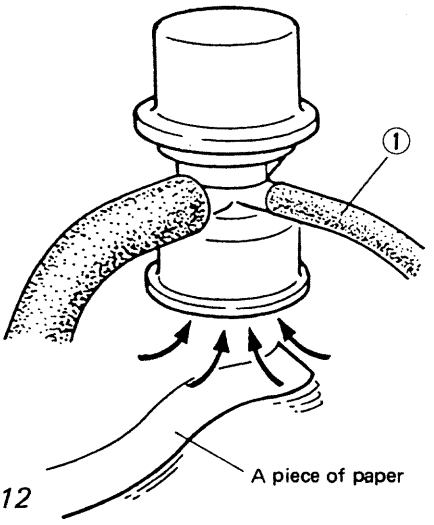
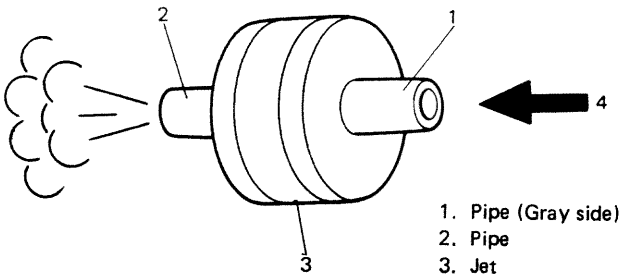


Fig. 5-3-12

If the above checks show anything wrong, replace it.

[Jet]
1) Remove jet.
2) When blowing air into pipe ①, air should come out of pipe ②.
   Replace clogged jet.
3) Install jet with its gray side directed toward MCV.



1. Pipe (Gray side)
2. Pipe
3. Jet
4. Blow air

Fig. 5-3-13

FEED BACK SYSTEM

Whether feed back system including oxygen sensor and ECM (Electronic Control Module) is in good condition or not, can be judged by checking for operation of "CHECK ENGINE" light in instrument cluster.

[U.S.A. specification vehicle]
As previously outlined, "CHECK ENGINE" light automatically flashes at 50,000 miles, 80,000 miles and 100,000 miles indicated on odometer when running warmed up engine. And this automatical flashing at above mileages proves that system is in good condition.
Should any of following malcondition occur, the system check can be performed according to "System check flow chart", even when mileage indicated by odometer is not any of 50,000 miles, 80,000 miles and 100,000 miles.

[Canadian specification vehicle]
Should any of following malconditions occur, the system check can be performed according to "System check flow chart".

- Fuel consumption increases excssively even in normal driving.
- Engine tends to stall.
- Engine is hard to start.

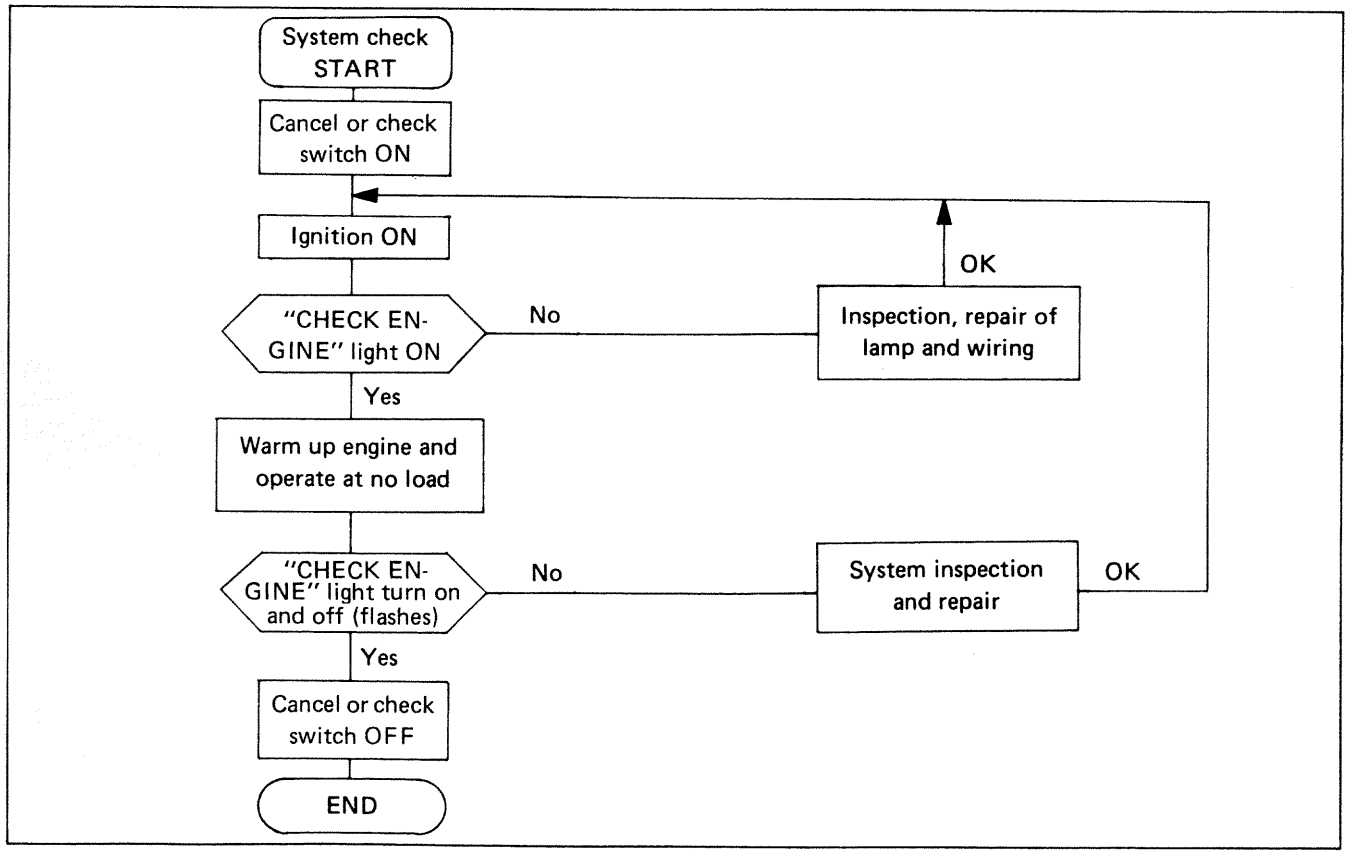
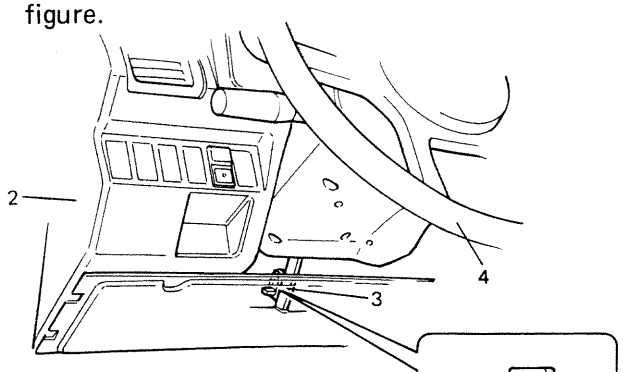


Fig. 5-3-14 System check flow chart

Checking feed back system

1) Operate (turn ON) cancel switch or check switch located at the place shown in below figure.



1. Cancel switch (U.S.A.) Check switch (Canada)
2. Instrument panel
3. Steering column holder bracket
4. Steering wheel

Fig. 5-3-15 Cancel switch or check switch

2) Turn ignition switch ON without running engine.
At this time, "CHECK ENGINE" light should light (should not flash).
If it does not light, check electric circuit of the light, namely light for blow off and lead wire for disconnection.

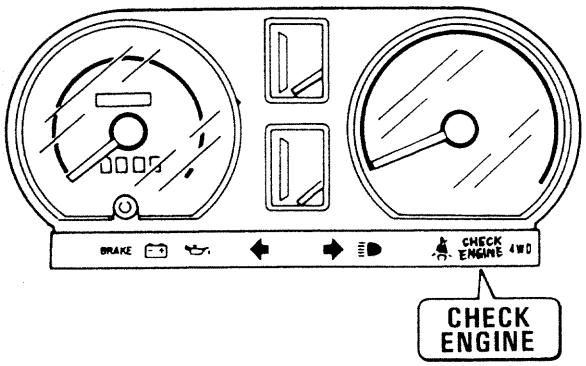


Fig. 5-3-16 "CHECK ENGINE" light

3) After lighting of the light is confirmed, start engine and warm it up to normal operating temperature.
4) When engine is warmed up, run engine at 1,500 – 2,000 rpm. In this state, make sure that "CHECK ENGINE" light flashes. Flashing of light proves that system is in good condition.
If light does not flash, it can be caused by one of the following. Check them and replace or adjust as necessary.

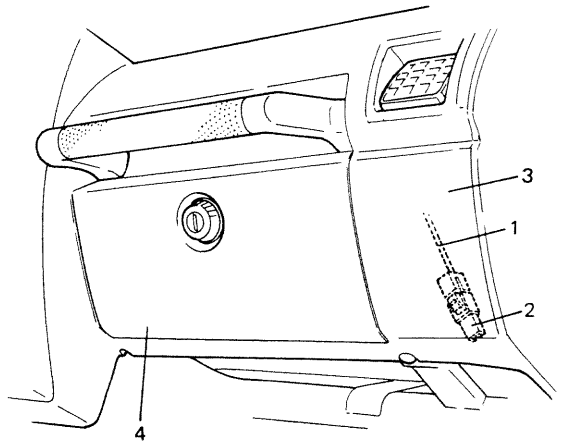
- Defective oxygen sensor
- Defective mixture control solenoid valve
- Defective carburetor or maladjusted idle mixture
- Defective thermal switch
- Disconnected or loosely connected electric lead wires of emission control systems
- Defective ECM
- Defective micro switches (idle and wot)

5) After making sure that "CHECK ENGINE" light flashes, turn cancel switch OFF. Light should go off.
6) Stop engine.

Checking idle and wide open micro switches

Check idle and wide open micro switches according to the following procedures.

1. Warm up engine to normal operating temperature and stop engine.
2. For this check, use check terminal coming from the lower right of instrument panel as shown.
Connect negative prod of ohmmeter to check terminal and positive prod to body.



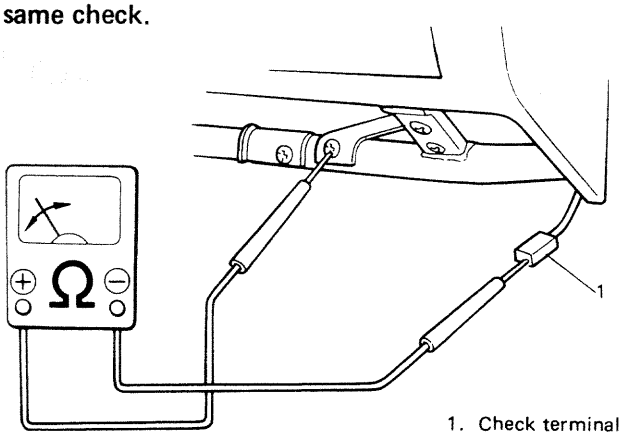
1. Light green wire
2. Check terminal
3. Instrument panel
4. Glove box lid

Fig. 5-3-17

3. Turn ignition switch to "ON" position.
4. Observe ohmmeter indicator reaction to make sure for the following movement for each throttle valve position.

THROTTLE VALVE POSITION	INDICATOR MOVEMENT
Idle position	Swing
1/2 open	Stay after deflection
Full open	Swing

NOTE:
If indicator doesn't deflect at all, reverse above connection, that is, negative prod to body and positive one to check terminal, and carry out the same check.

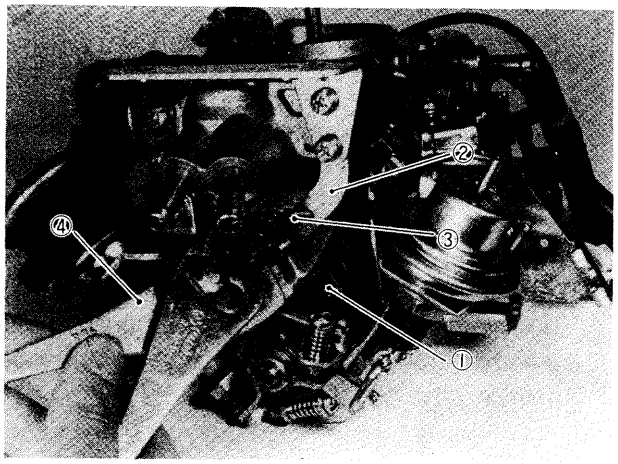


1. Check terminal

Fig. 5-3-18

If check results are not satisfactory, check idle and wide open micro switches as follows or their circuits for continuity referring to item "checking sensors and their lead wires " (p. 5-32).

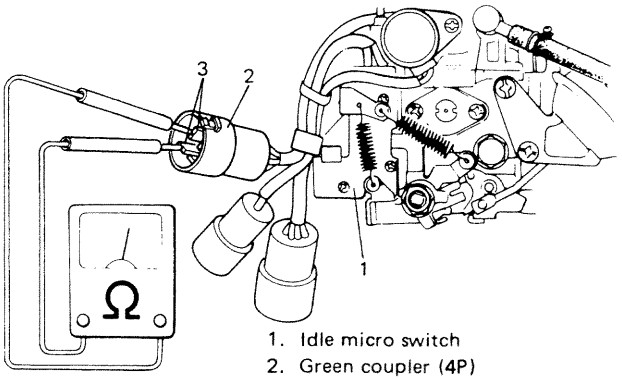
[Idle micro switch]
1) Remove carburetor following normal service procedures.
2) Turn fast idle cam counterclockwise and insert a suitable pin available then into holes in cam and bracket to lock the cam.



1. Fast idle cam
2. Bracket
3. Pin
4. Plier

Fig. 5-3-19

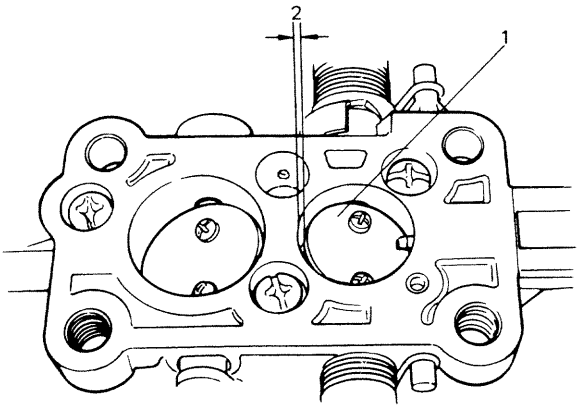
3) Connect ohmmeter to terminals of idle micro switch. Check for continuity between terminals. When throttle valve is at idle position, ohmmeter should indicated "zero" ohm.
4) Open throttle valve by 1/4 to 1/2, and ohmmeter indicator should indicate infinity.
If check results in steps 3) and 4) are not satisfactory, replace idle micro switch with a new one.



1. Idle micro switch
2. Green coupler (4P)
3. Idle micro switch's terminals (Green/White and Black wires)

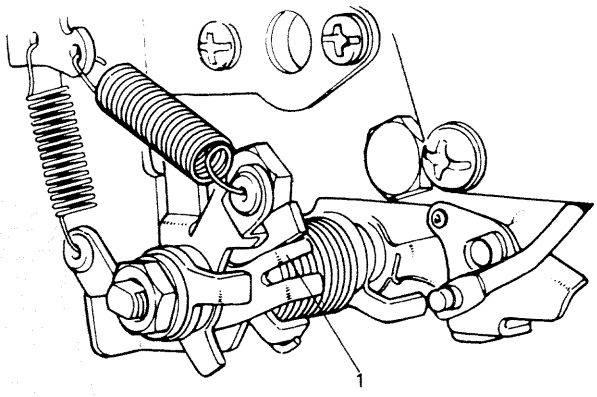
Fig. 5-3-20 Connecting ohmmeter to idle micro switch

5) Open throttle valve slowly till throttle valve-to-carburetor bore clearance becomes 0.36 – 0.62 mm (0.014 – 0.024 in) and check that ohmmeter indicator moves from "zero" ohm to infinity then.
If the above indicator movement does not occur within specified range, make adjustment by bending lever shown in below figure. Bend lever down when clearance is below specification and up when over specification.



1. Primary throttle valve
2. Clearance

Fig. 5-3-21 Clearance between throttle valve and carburetor bore

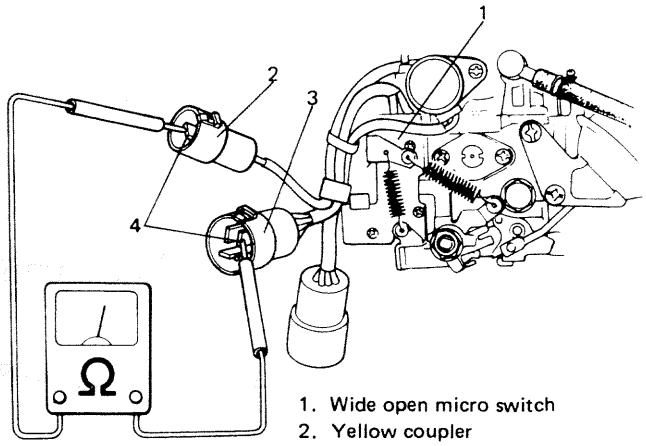


1. Lever

Fig. 5-3-22 Lever

[Wide open micro switch]

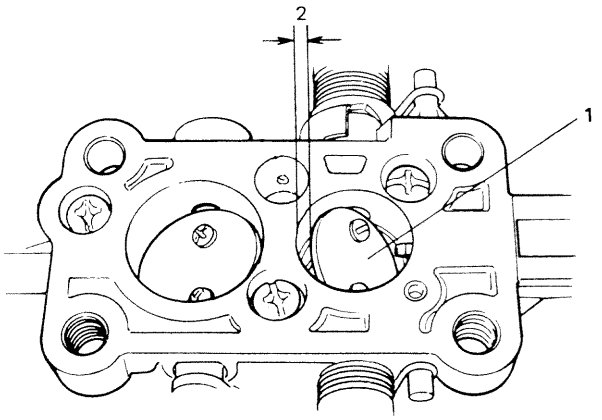
1) Connect ohmmeter to wide open micro switch as indicated in below figure.
   At this time, ohmmeter indicator should indicate "zero" ohm.
2) When throttle valve is fully opened, ohmmeter should indicate infinity.
   If any defect, replace.



1. Wide open micro switch
2. Yellow coupler
3. Green coupler (4P)
4. Wide open micro switch's terminals (Green and Black/Yellow wires)

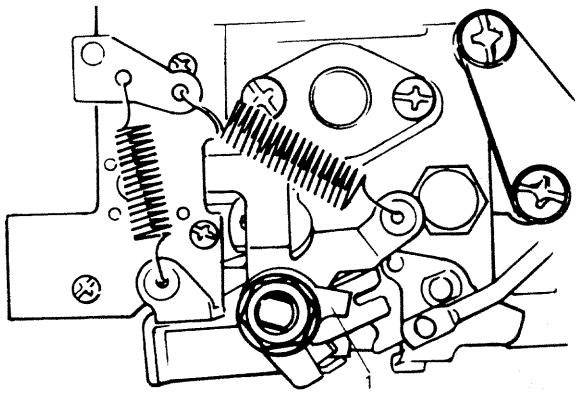
Fig. 5-3-23 Checking wide open micro switch

3) Open throttle valve gradually until the ohmmeter indicates infinity. Then, using a vernier, measure the clearance between throttle valve and carburetor bore as shown in below figure. The clearance should be within 6.0 – 7.2 mm (0.24 – 0.28 in). If the clearance is out of specified range, make adjustment by bending the lever in below figure.



1. Primary throttle valve
2. Clearance

Fig. 5-3-24 Clearance between throttle valve and carburetor bore



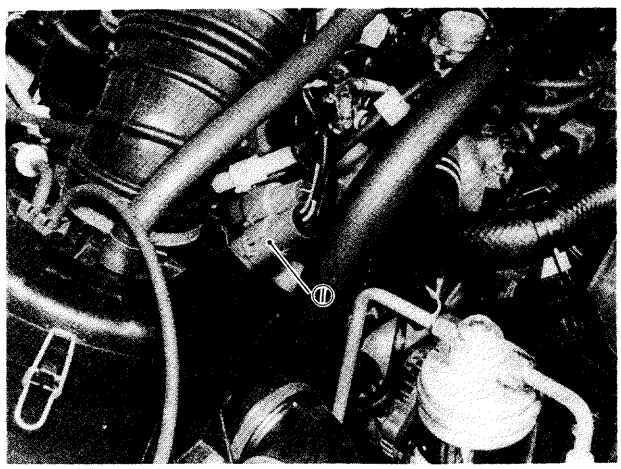
1. Wide open micro switch lever

Fig. 5-3-25 Wide open micro switch lever

Upon completion of checks, install carburetor following normal service procedures.

Checking mixture control solenoid valve

1) Check to make sure that ignition switch is at "OFF" position.
2) Disconnect couplers from ECM, TWSVs and VSV.
3) Disconnect mixture control solenoid valve lead wires at the coupler (5P).



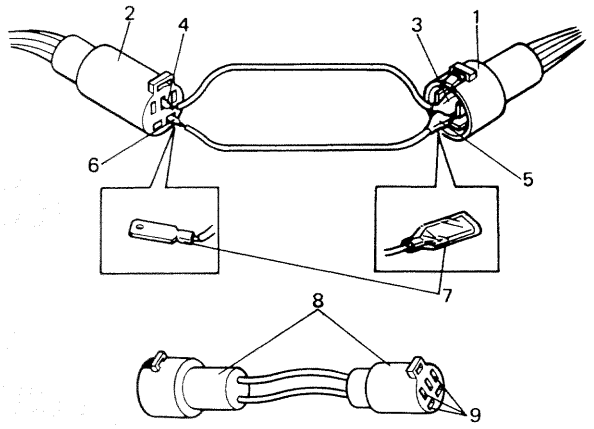
1. Green coupler (5P)

Fig. 5-3-26

4) Using couplers of the same shape as that mentioned in step 3) or 1P couplers, connect only mixture control solenoid valve wire terminals (Yellow/Black terminal of coupler ① and Black/White terminal of coupler ②, White terminal of coupler ① and Blue/Red terminal of coupler ②.

NOTE:

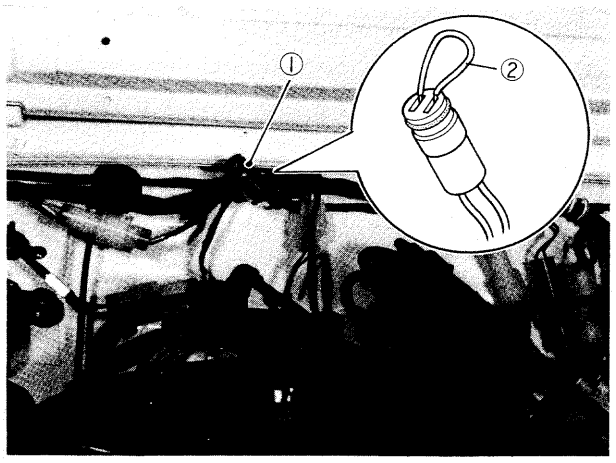
- **Couplers must be used to connect each terminal.**
- **Use special care when connecting terminals as wrong connection may cause damage to other parts.**



1. Coupler of MCSV side
2. Coupler of wire harness side
3. Yellow/Black wire terminal
4. Black/White wire terminal
5. White wire terminal
6. Blue/Red wire terminal
7. 1p coupler
8. 5p coupler (when using this coupler, leave positions indicated as 9 in figure blank).
9. Blank

Fig. 5-3-27

5) Remove cap of duty check coupler located on dash panel and connect terminals with a lead wire to short them.



1. Duty check coupler
2. Lead wire

Fig. 5-3-28

6) Turn ignition switch "ON" and "OFF" repeatedly (without starting engine) and check if MCSV operating sound is heard as ignition switch is operated.

Operating sounds prove its proper operation.

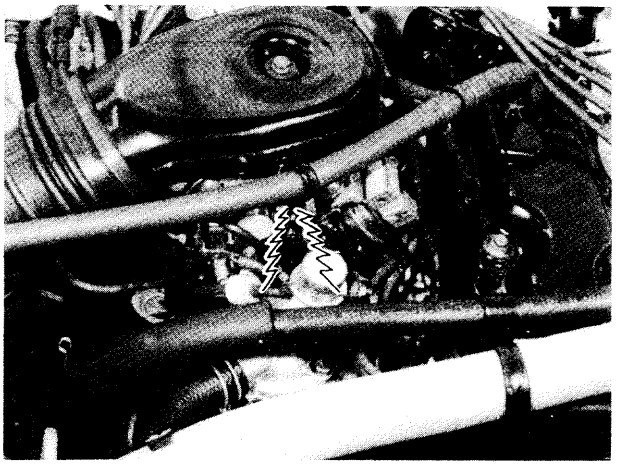


Fig. 5-3-29

7) Upon completion of checks, re-connect disconnected couplers to original positions securely.

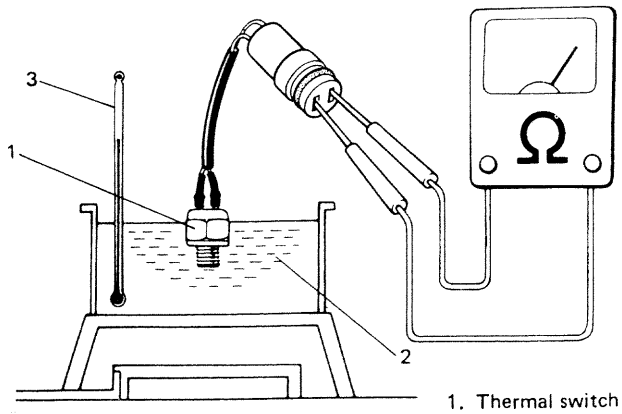
Checking thermal switch

NOTE:

For the rough check of the operation, thermal switch can be checked by warming up (above 46.5°C, 116°F) or cooling down (below 30°C, 86°F) the engine without being removed from the intake manifold.

The check procedure is the same as the following except item 1), 2), 5) and 6).

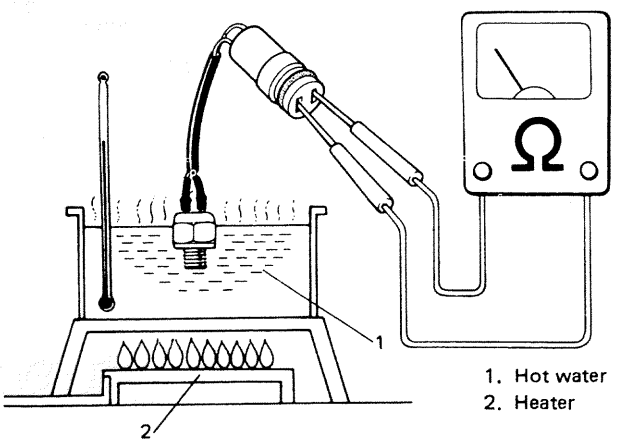
1) Drain cooling system.
2) Remove thermal switch from intake manifold.
3) Cool switch to below 30°C (86°F), and using an ohmmeter, check that there is continuity between terminals.



1. Thermal switch
2. Cool water
3. Thermometer

Fig. 5-3-30 Checking thermal switch in cool water

4) Heat switch to above 46.5°C (116°F), and check that there is no continuity between terminals.



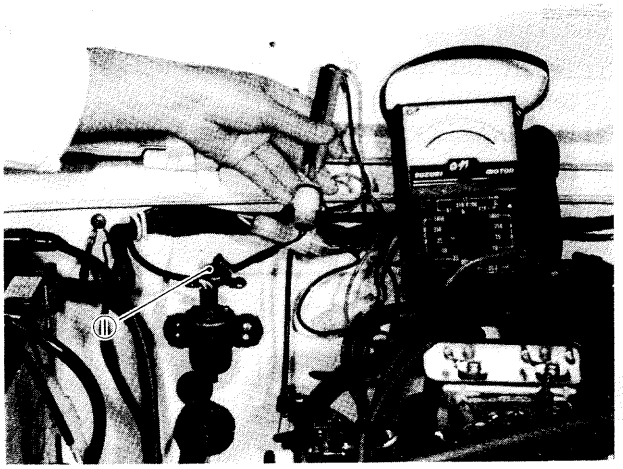
1. Hot water
2. Heater

Fig. 5-3-31 Checking switch in hot water

5) Reinstall switch to intake manifold. Before installing, wind sealing tape on its thread.
6) Refill cooling system.

Checking thermal engine room switch

1) Disconnect connector of switch and connect ohmmeter between terminals on switch side.
2) Make sure that switch is "ON" (ohmmeter indicates "Zero" ohm) when atmospheric temperature is below 7°C (44°F) and "OFF" (ohmmeter indicates infinity) when above 19.5°C (67°F).



1. Thermal engine room switch

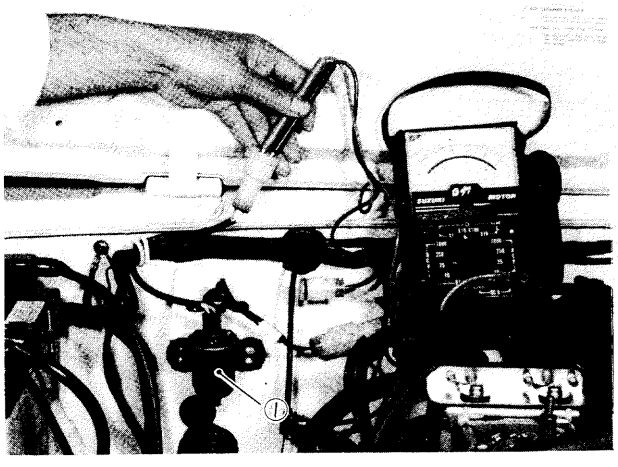
Fig. 5-3-32 Checking thermal engine room switch

Checking high altitude compensator

Check the compensator as follows:

1) Disconnect the coupler of compensator and connect an ohmmeter to the compensator.
2) Check to be sure that;
- If the altitude of the place where this check is performed is above 1,220 m (4,000 ft), the ohmmeter should indicate "Zero" ohm (compensator is ON).
- If the altitude is below 1,220 m (4,000 ft), the ohmmeter should indicate infinity ohm (compensator is OFF).

3) After checking, connect the coupler.



1. High altitude compensator

Fig. 5-3-33 Checking high altitude compensator

Checking oxygen sensor

1) Warm up the engine to normal operating temperature.
2) Disconnect the connector of the oxygen sensor.

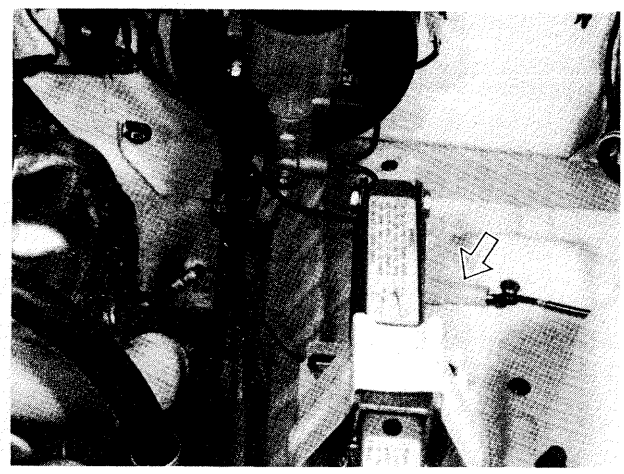
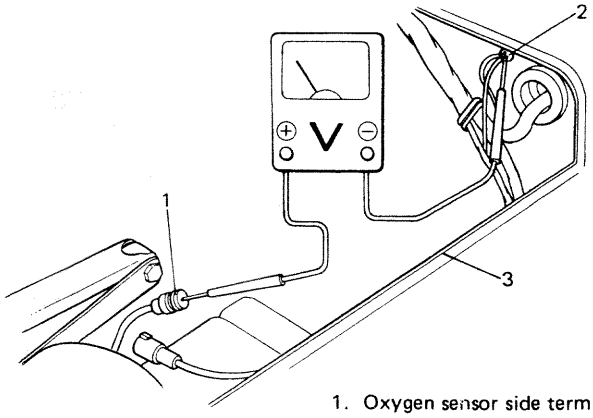


Fig. 5-3-34 Connector of oxygen sensor

3) Connect the voltmeter between the oxygen sensor side terminal of the disconnected connector and the ground as shown in below figure.

NOTE:

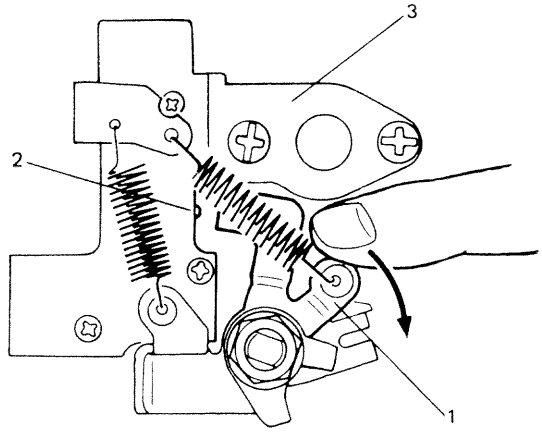
- **Be sure to use a voltmeter whose inner resistance is more than some MΩ per 1V or a digital type voltmeter. Any other voltmeter should not be used because accurate measurements are not obtained.**
- **NEVER apply voltage to the oxygen sensor as it may cause damage to the sensor.**
- **NEVER connect ohmmeter to the oxygen sensor as it may cause damage to the sensor.**



1. Oxygen sensor side terminal
2. Ground
3. Left side fender

Fig. 5-3-35 Connecting voltmeter

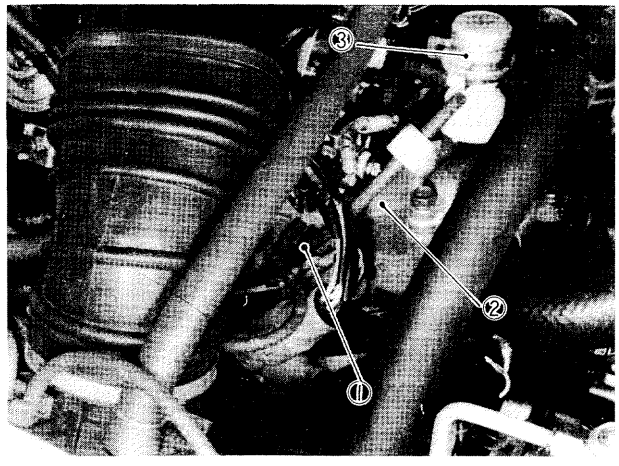
4) While keeping the engine running at 1,500 – 2,000 rpm, turn the wide open micro switch "OFF" by moving the lever with the finger as shown in below figure. Then take the reading of the voltmeter to make sure it is about 0.8V.



1. Lever
2. Wide open micro switch
3. Carburetor

Fig. 5-3-36 Moving lever

5) With the engine running at 1,000 – 1,500 rpm, disconnect the vacuum hose at the intake manifold as shown in below figure. At this time, check to ensure that the voltmeter indicator is below 0.2V.



1. Vacuum hose
2. Intake manifold
3. MCV

Fig. 5-3-37 Disconnecting vacuum hose

6) After checking, reconnect the vacuum hose to the intake manifold and the connector of oxygen sensor.

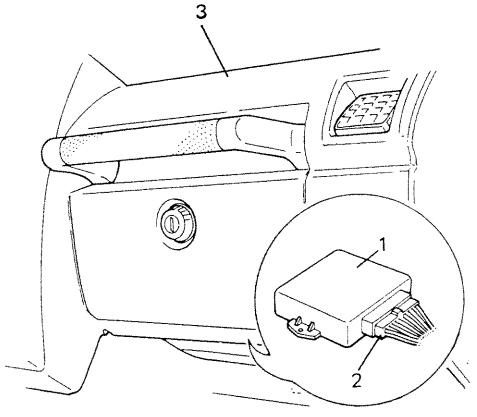
Checking feed back system circuits

When the feed back system does not seem to operate properly even after each of its components has been checked and proved normal, it is necessary to check each circuit of the feed back system. The checking procedure of each circuit is described here.

[Checking ECM ground circuits]

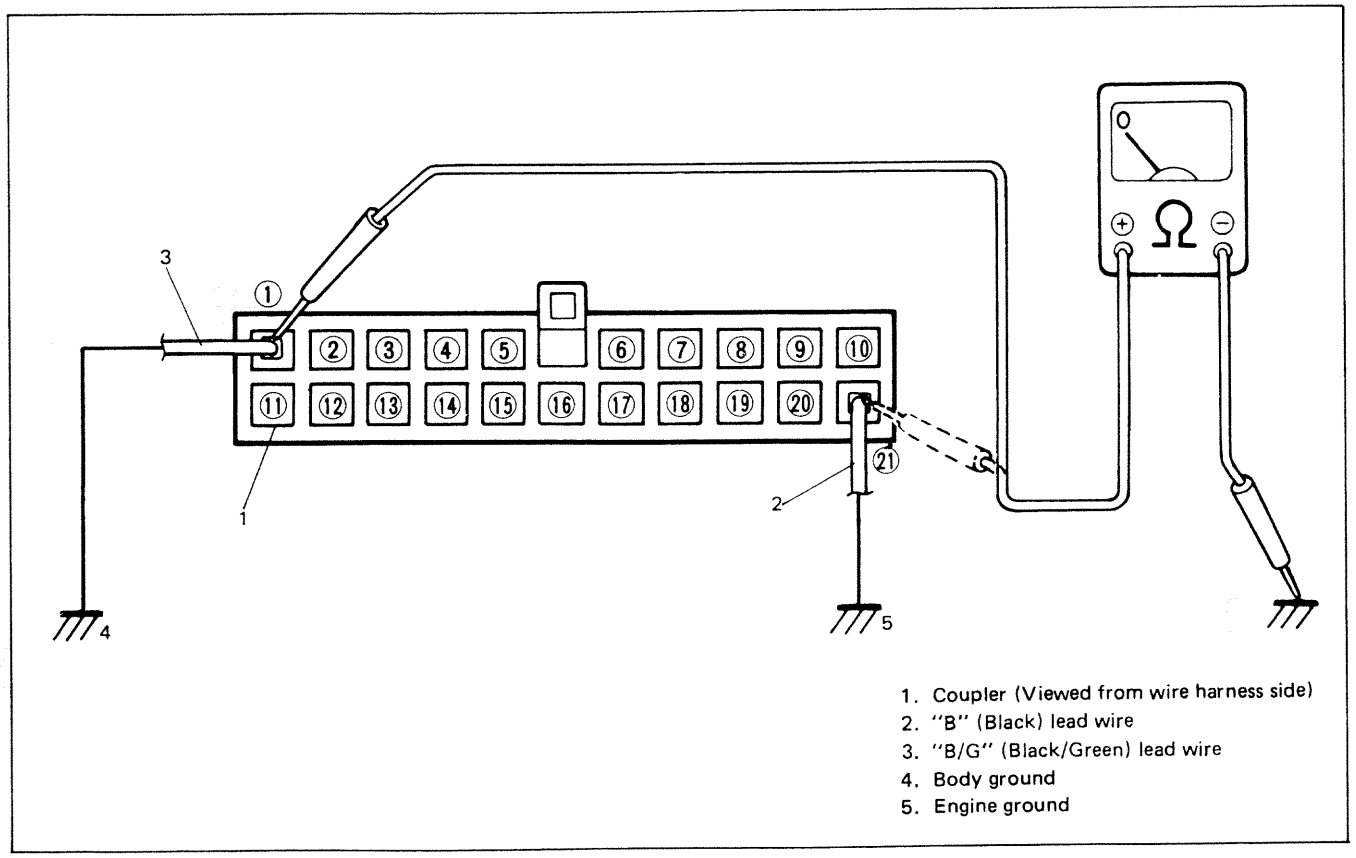
The ECM is grounded both at the dash panel and the intake manifold. If either grounding is not made securely, the feed back system will not operate. Therefore, check if the ECM is properly grounded at these two points according to the following procedure.

1) Turn OFF the ignition switch.
2) Disconnect the coupler from the ECM.
3) Connect an ohmmeter between the terminal ① of the disconnected coupler (on the wiring harness side) and the body (ground) as shown in below figure, and measure the resistance. Then repeat the same with the terminal ㉑.



1. ECM (Electronic Control Module)
2. Coupler
3. Instrument main panel

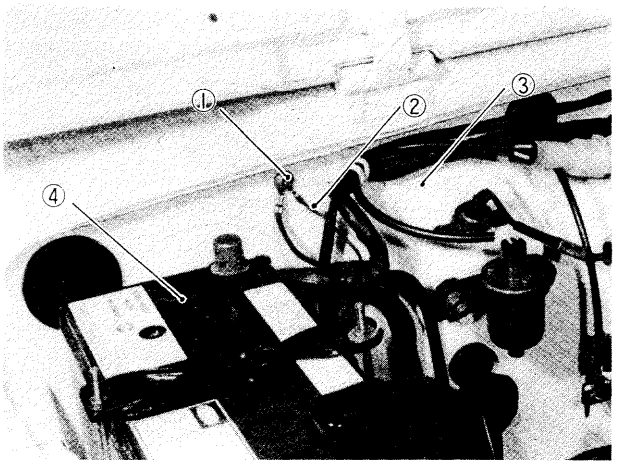
Fig. 5-3-38 ECM and coupler



1. Coupler (Viewed from wire harness side)
2. "B" (Black) lead wire
3. "B/G" (Black/Green) lead wire
4. Body ground
5. Engine ground

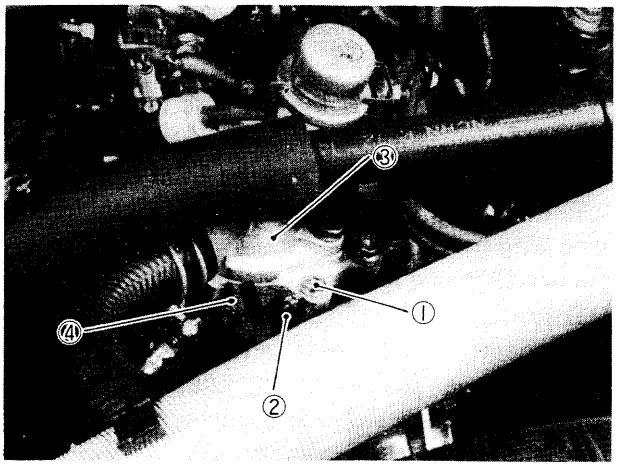
Fig. 5-3-39 Checking ECM ground circuit

4) If the measured resistance between each terminal (① and ㉑) and the body is "ZERO (0)" ohm, the ECM is grounded securely at two points. If the resistance is not "ZERO (0)" ohm, the possibility is that the lead wire between the terminal (① or ㉑) and the ground is not securely grounded or disconnected.
The below figures show the particular points where "B" and "B/G" wires are grounded. Check for their secure grounding by referring to these figures.



1. Body ground
2. Black/Green lead wire
3. Dash panel
4. Battery

Fig. 5-3-40 Body ground



1. Engine ground
2. Black lead wire
3. Thermostat cap
4. Intake manifold

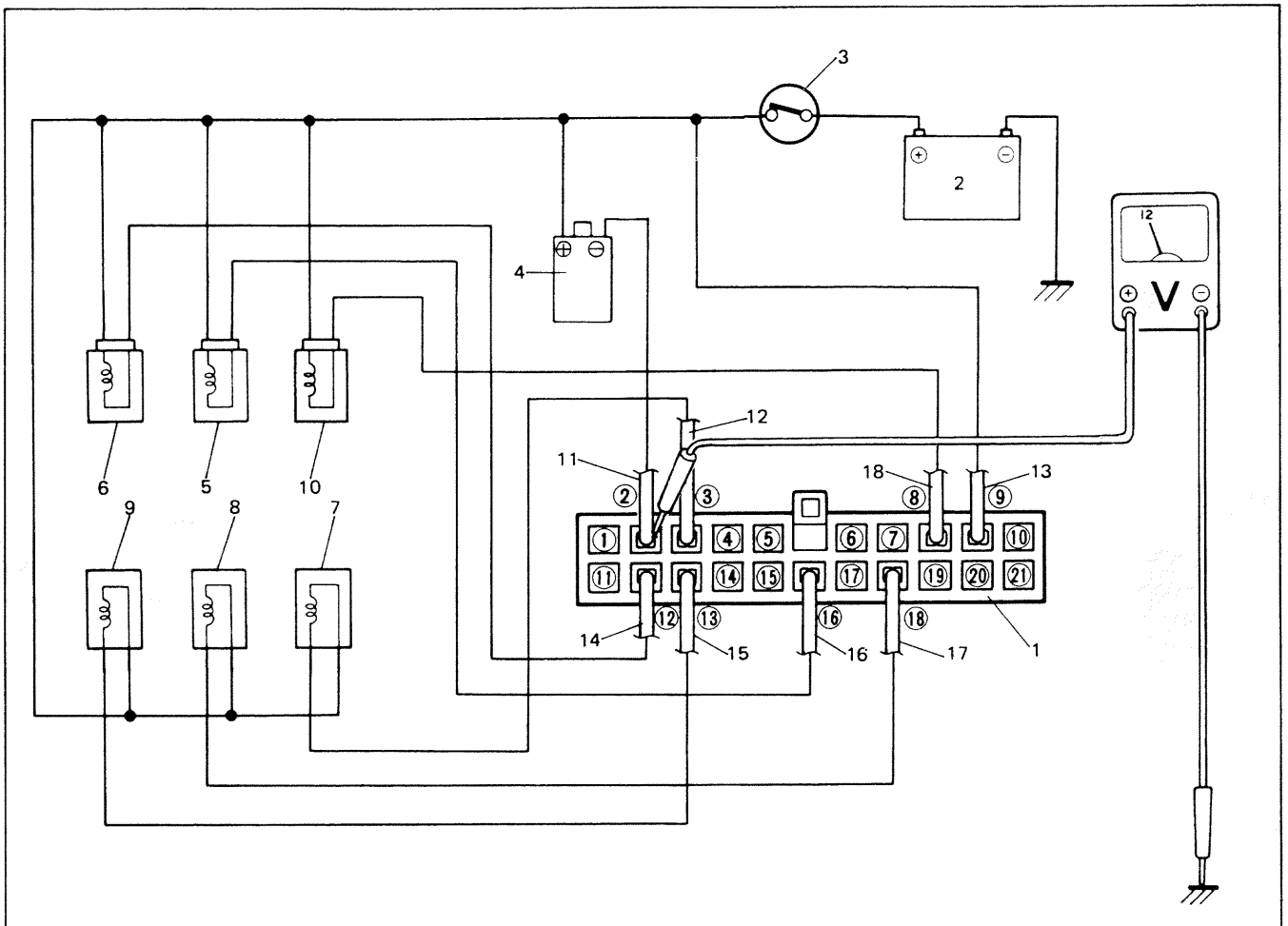
Fig. 5-3-41 Engine ground

5) After checking, connect the coupler to ECM securely.

[Checking ECM power circuits]

Connected to the ECM are the ignition coil and solenoids or solenoid valves. If a disconnection or a failure of contact occurs within a circuit (power circuit) including any of these coil or solenoids or solenoid valves, signals will not be sent to the ECM and as a result, the feed back system will not operate properly. Therefore, check the power circuits according to the following procedure.

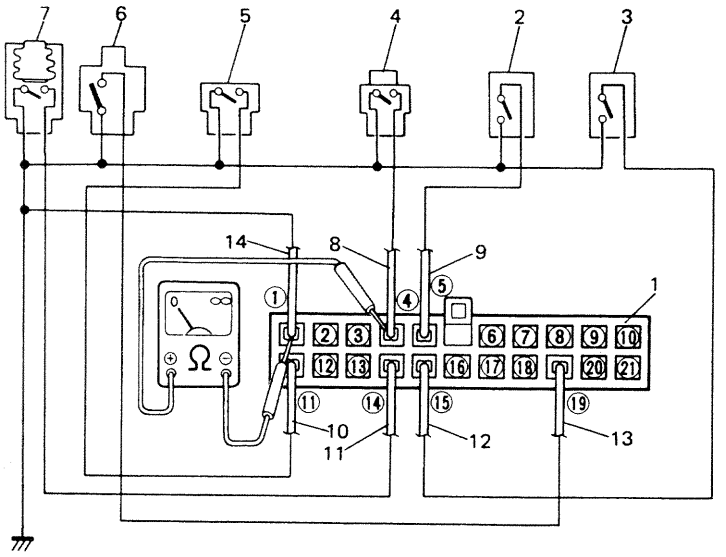
1) Disconnect the coupler connected to the ECM.
2) Turn ON the ignition switch but be sure not to run the engine.
3) Connect a voltmeter between the terminal ② of the disconnected coupler (on the wiring harness side) and the body (ground) as shown in below figure and measure the voltage. And then repeat the same with each of the terminals ③, ⑧, ⑨, ⑫, ⑬, ⑯ and ⑱. If the measured voltage between each terminal and the body is about 12V, each circuit is in good condition.
4) If about 12V is not obtained in the above check, the particular circuit may be disconnected or out of contact. Check the circuit for such conditions.
5) After checking, connect the coupler to ECM securely.



1. Coupler (Viewed from wire harness side)
2. Battery
3. Ignition switch (ON)
4. Ignition coil
5. Vacuum switching valve (secondary throttle valve)
6. Three way solenoid valve (Idle-up)
7. Mixture control solenoid
8. Switch vent solenoid
9. Fuel cut solenoid valve
10. Three way solenoid valve (EGR system)
11. Br (Brown) lead wire
12. Bl/R (Blue/Red) lead wire
13. B/W (Black/White) lead wire
14. Br/W (Brown/White) lead wire
15. Bl/B (Blue/Black) lead wire
16. Bl/Y (Blue/Yellow) lead wire
17. Bl/W (Blue/White) lead wire
18. Bl/G (Blue/Green) lead wire

Fig. 5-3-42 Checking ECM power circuits

[Checking sensors and their lead wires]
The sensors constituting the feed back system are; wide open micro switch, idle micro switch, thermal switch, high altitude compensator, thermal engine room switch and fifth switch. If any of the above sensors malfunctions or if the sensor circuit has some trouble, signals are not sent to the ECM and consequently the feed back system will not function properly.
Therefore, check each sensor and its circuit according to the following procedure.
1) Turn OFF the ignition switch.
2) Disconnect the coupler from the ECM.
3) Connect the ohmmeter between the terminal ④ of the disconnected coupler and the terminal ① (ground) as shown in below figure and measure the resistance. And then repeat the same with each of the terminals ⑤, ⑪, ⑭, ⑮ and ⑲.



1. Coupler (Viewed from wire harness side)
2. Wide open micro switch
3. Idle micro switch
4. Thermal switch
5. Thermal engine room switch
6. Fifth switch
7. High altitude compensator
8. Gr/R (Gray/Red) lead wire
9. Gr/Y (Gray/Yellow) lead wire
10. Bl (Blue) lead wire
11. P/B (Pink/Black) lead wire
12. Gr/B (Gray/Black) lead wire
13. Lg/R (Light green/Red) lead wire
14. B/G (Black/Green) lead wire

Fig. 5-3-43 Checking sensors and their circuits

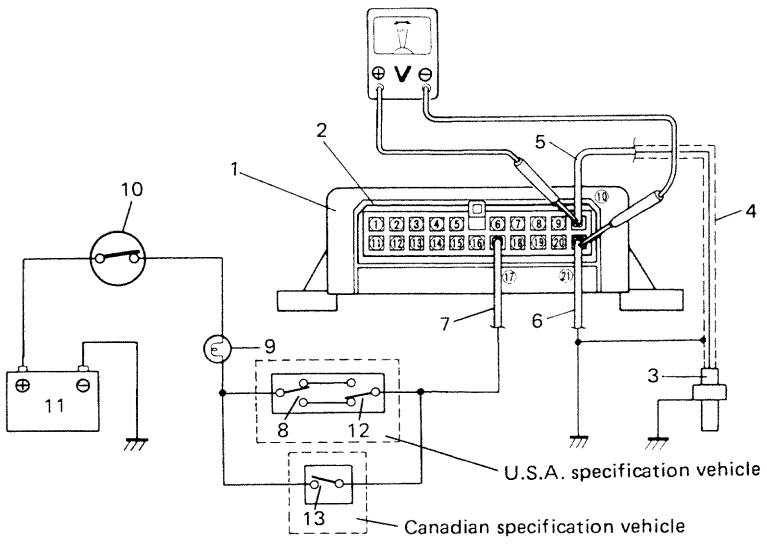
4) If each ohmmeter reading is as given below, the sensor and its circuit are in good condition. But if not, the sensor itself may be defective or the lead wire disconnected or out of contact. After checking, connect the coupler to ECM securely.

Sensor	Terminal	Ohmmeter reading (Ω)	Condition
Thermal switch	④	0	When coolant temp. is low.
		∞	When coolant temp. is above 46.5°C (116°F).
Idle micro switch	⑮	0	When engine is warm and accelerator pedal is not depressed.
		∞	When accelerator pedal is depressed a little.
High altitude compensator	⑭	∞	When altitude is below 1,220 m (4,000 ft.).
		0	When altitude is above 1,220 m (4,000 ft.).
Thermal engine room switch	⑪	0	When temp. in engine room is low.
		∞	When temp. in engine room is above 19.5°C (67°F).
Wide open micro switch	⑤	0	When accelerator pedal is not depressed or depressed only a little.
		∞	When accelerator pedal is depressed all the way.
Fifth switch	⑲	∞	When gear shift lever is shifted to low, second, third, forth or reverse gear position.
		0	When gear shift lever is shifted to fifth gear position.

[Checking function of oxygen sensor and feed back system]
If oxygen sensor fails to send signal to the ECM, the feed back system does not operate. While the feed back system is at work, the ECM sends out the feed back signal, and in this condition, after warming up engine to normal operating temperature, when the cancel switch or check switch is turned ON, the "CHECK ENGINE" light in the instrument cluster flashes. If the "CHECK ENGINE" light does not flash in such conditions as described above, check the feed back system for function according to the following procedure.

NOTE:
Except for Canadian specification vehicle, also when mileage sensor is turned ON (the odometer indicates 50,000, 80,000 or 100,000 miles), the "CHECK ENGINE" light flashes. If the "CHECK ENGINE" light does not flash in such condition, check the feed back system for function according to the following procedure.

1) Remove the ECM from the instrument main panel.
2) Connect the coupler to the ECM.
   (Don't disconnect the coupler from the ECM if connected)
3) Warm up the engine to the normal operating temperature and keep it at idle.
4) Connect voltmeter between the terminals ⑩ (oxygen sensor signal) and ㉑ (ground) as shown in below figure.
5) If the voltmeter indicator deflects between 0V and 0.8V while racing the engine at a speed between idling and 1,500 – 2,000 rpm, the feed back system is in good condition.



NOTE:
Never connect ohmmeter as it may cause damage to the oxygen sensor.

1. ECM
2. Coupler (Connected to ECM)
3. Oxygen sensor
4. Sealed wire
5. W (White) lead wire
6. B (Black) lead wire
7. Br/B (Brown/Black) lead wire
8. Cancel switch
9. "CHECK ENGINE" light
10. Ignition switch (ON)
11. Battery
12. Mileage sensor
13. Check switch

Fig. 5-3-44 Checking oxygen sensor signal

6) If the indicator does not deflect between 0V and 0.8V, possible causes are as follows.

Voltmeter indicator:	Possible causes
Remains at "Zero (0)"V	• Oxygen sensor lead wire is disconnected or out of contact. • Intake system is leaky or air/fuel mixture is too lean due to malfunction of carburetor. • Inner resistance of voltmeter is too small. • Oxygen sensor is defective.
Indicates about 0.8V and does not deflect.	• Choke is operating because engine is not warmed up fully. • Thermal switch is defective. • Wide open micro switch is defective. • Lead wire of mixture control solenoid is disconnected. • Mixture control solenoid valve is defective.

7) After it is confirmed through steps 1) to 5) that oxygen sensor sends signals to ECM properly, check feed back signal according to the following procedure. If feed back system operates properly, ECM should send out feed back signal.

a) Connect an ohmmeter between terminal ⑰ and body (ground). Be sure to connect positive (+) prod of the ohmmeter to body (ground) and negative (—) prod to terminal ⑰ as shown in below figure and never connect the other way around.

NOTE:

For this check, cancel switch must be OFF ("CHECK ENGINE" light off).

b) If indicator of ohmmeter deflects when connected as described in the above step, it means that ECM sends out feed back signal, that is, feed back system operates properly.

NOTE:

If indicator doesn't deflect at all, reverse connection (positive prod to terminal ⑰ and negative prod to body) and check.

In this state, turning ON cancel or check switch causes "CHECK ENGINE" light to flash. If "CHECK ENGINE" light does not flash, wire harness, bulb of light or cancel/check switch may be defective.

8) After checking, install ECM to instrument main panel, and make sure coupler is connected to ECM securely.

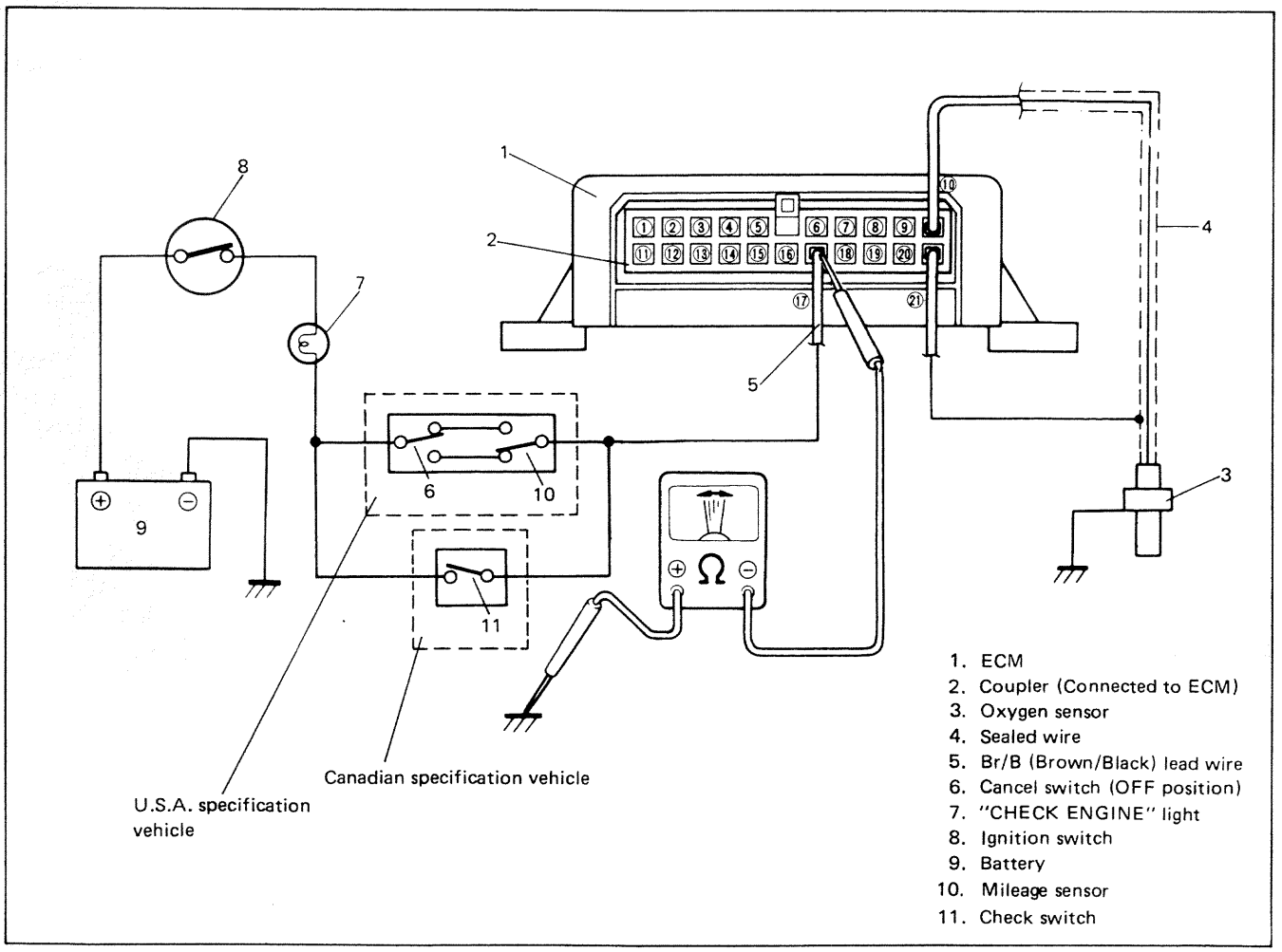


Fig. 5-3-45 Checking feed back signal

[Checking idle-up signal]
The idle-up system operates when any of the small lights (such as tail light, side marker light and license light), heater fan and rear defogger is put in operation. If the idle-up actuator fails to operate even when any of such equipments is put in operation, check if signal is sent to the ECM according to the following procedure.

1) Disconnect the coupler from the ECM.
2) Turn ON the ignition switch but don't run the engine.
3) Connect a voltmeter between the ⑦ terminal and the body (ground) as shown in below figure. If the voltmeter indicates 11 – 14V when each equipment is operated individually, it means that idle-up signal is sent to the ECM.
   If the voltmeter does not indicate 11 – 14V, the particular circuit is disconnected or in poor contact. Check the circuit for such conditions.
4) After checking, connect the coupler to ECM securely.

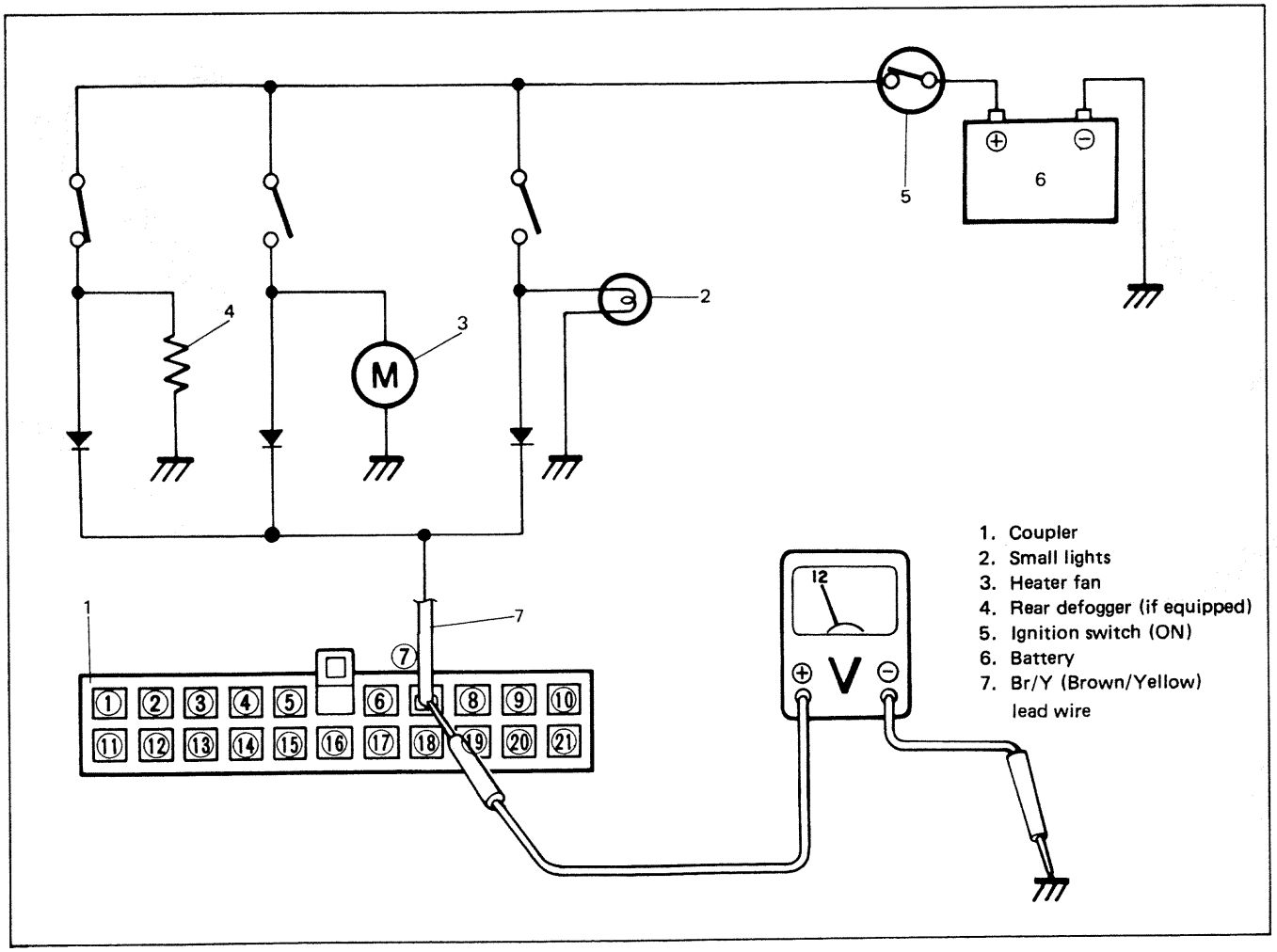


Fig. 5-3-46 Checking idle-up signal

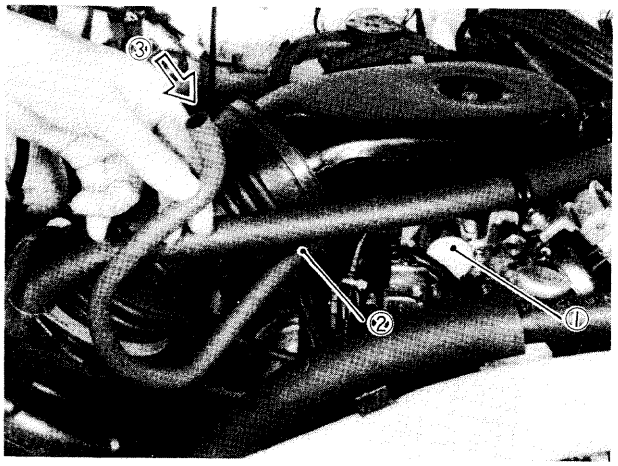
[Replacing ECM]
If a malcondition such as those listed below still occurs even after confirming proper function and condition of the sensors of the feed back system and their circuits through the above checks, a trouble may exist within the ECM. In such a cause, replace the ECM.

- Fuel consumption increases even in normal driving.
- Engine tends to stall.
- Engine is hard to start.

SWITCH VENT SOLENOID

Checking switch vent solenoid

1) Disconnect canister hose from switch vent solenoid and connect a new hose to the pipe of solenoid.
2) Blow air into new hose with ignition switch at both "OFF" and "ON" (but without starting engine) and check to be sure that air passes through solenoid in both cases.



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

Fig. 5-3-47 Checking switch vent solenoid

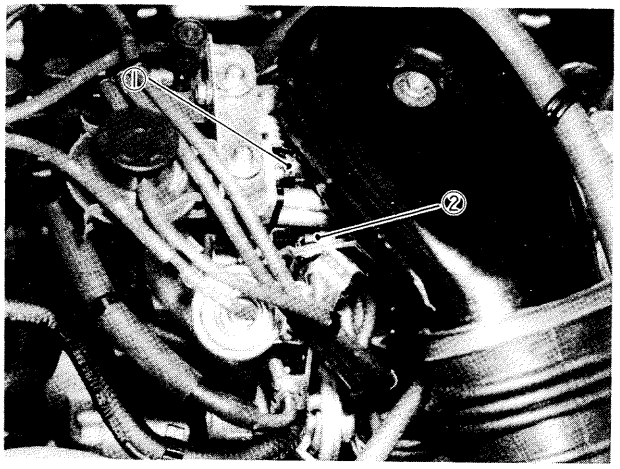
WARNING:
Do not suck the hose. The fuel vapor in float chamber is harmful.

3) Start engine and run it at idle speed. Then 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.

FUEL CUT SYSTEM

Checking fuel cut system

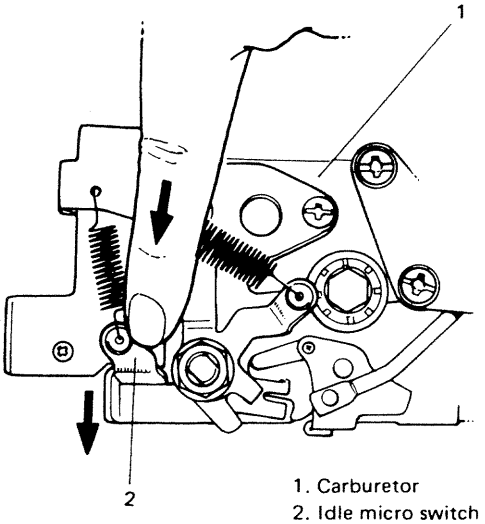
1) Make sure that fuel cut solenoid valve makes a clicking sound when ignition switch is turned to "ON" or "OFF" without cranking engine.



1. Carburetor
2. Fuel cut solenoid valve

Fig. 5-3-48 Fuel cut solenoid valve

2) Warm up engine to normal operating temperature.
3) Increase engine revolution to 3,000 – 3,500 rpm. Under these conditions, check to be sure that engine rpm changes when idle micro switch lever on carburetor is moved as shown in below figure.



1. Carburetor
2. Idle micro switch lever

Fig. 5-3-49 Idle micro switch lever

If found defective in above checks 1) and 3), check fuel cut solenoid circuit referring to item "checking feed back system circuits" in p. 5-29.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

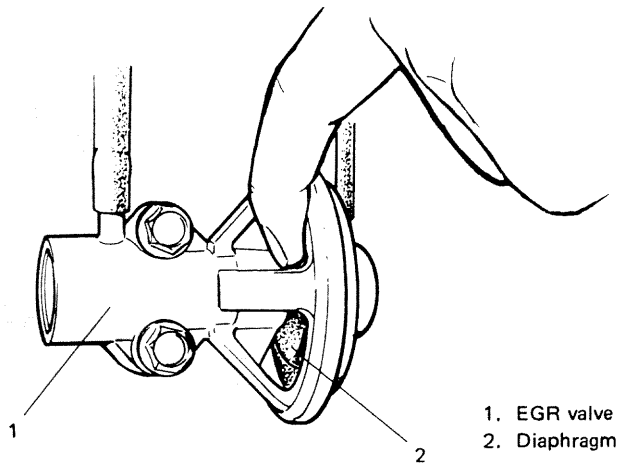
Checking EGR system

NOTE:

- **Before checking, confirm that altitude is not higher than 1,220 m (4,000 ft) (atmospheric pressure is below 680mmHg) and gear shift lever is at neutral position.**
- **When performing this check at higher than 1,220 m (4,000 ft) altitude, be sure to disconnect HAC coupler.**

1) Run engine when it is cool (coolant temperature is below 55°C (131°F)) and check that EGR valve diaphragm is not operating in this state, by touching diaphragm with finger.

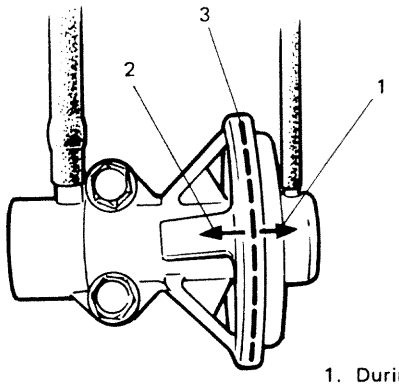
WARNING:
If EGR valve is hot, it may be necessary to wear gloves to avoid burning finger.



1. EGR valve
2. Diaphragm

Fig. 5-3-50 Checking EGR valve diaphragm

2) Warm up engine to normal operating temperature and race it after warming up. Then check to be sure that diaphragm moves toward ① in below figure during acceleration and toward ② during deceleration.



1. During acceleration
2. During deceleration
3. Diaphragm

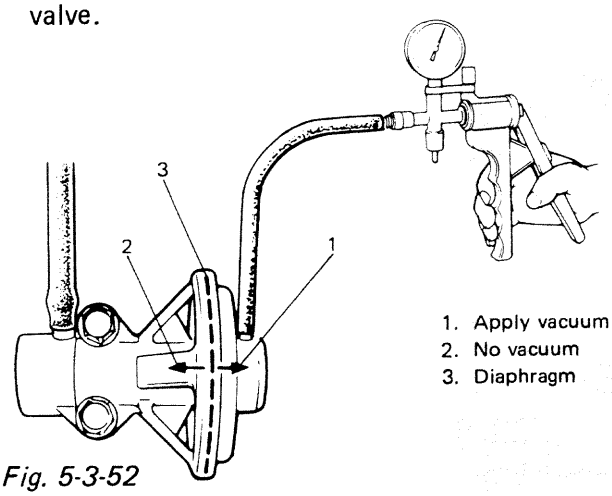
Fig. 5-3-51 Movement of EGR valve diaphragm

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

NOTE:
Refer to item "CHECKING SENSOR AND THEIR LEAD WIRES" in page 5-32 for checking HAC, fifth switch and their circuit.

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

[EGR valve]
1) Disconnect vacuum hose from TWSV.
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.



1. Apply vacuum
2. No vacuum
3. Diaphragm

Fig. 5-3-52

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

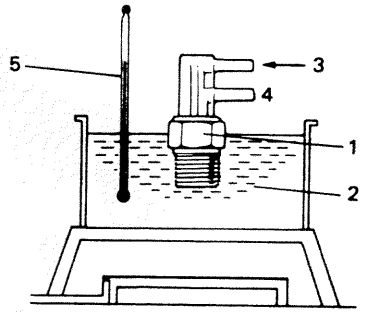
[Bi-metal vacuum switching valve (BVSV)]

NOTE:

For the rough check of the operation, BVSV can be checked by warming up or cooling down the engine without being removed from the intake manifold.

The check procedure is the same as the following except item 1), 2) and 5).

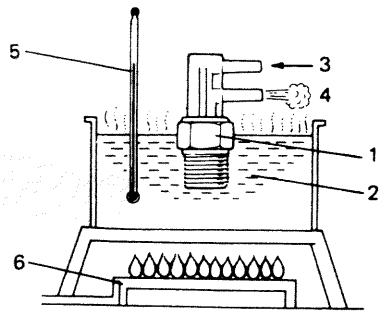
1) Drain cooling system when engine is cold.
2) Disconnect vacuum hoses and remove BVSV from intake manifold.
3) While keeping BVSV cool (below 53°C (127°F)), blow nozzle "3". Air should not come out of nozzle "4".



1. BVSV
2. Cool water
3. Blow air (nozzle)
4. "No air" (nozzle)
5. Thermometer

Fig. 5-3-53 Checking BVSV (1)

4) While keeping BVSV warm (above 65°C (149°F)) in hot water, blow nozzle "3". Air should come out of nozzle "4".



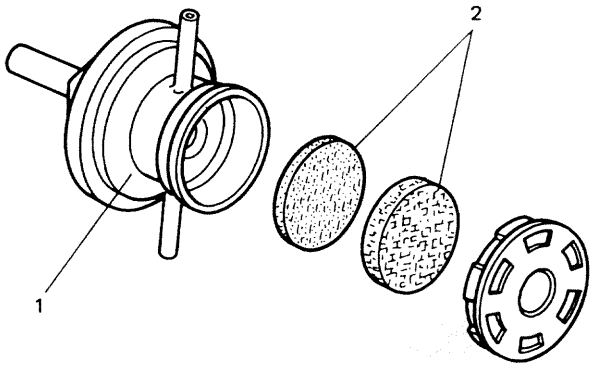
1. BVSV
2. Hot water
3. Blow air (nozzle)
4. Air (nozzle)
5. Thermometer
6. Heater

Fig. 5-3-54 Checking BVSV (2)

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

[EGR modulator]

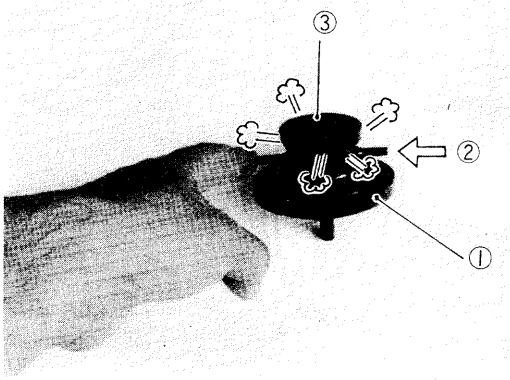
1) Check filter for contamination and damage. Using compressed air, clean filter.



1. EGR modulator
2. Filter

Fig. 5-3-55 Filter of EGR modulator

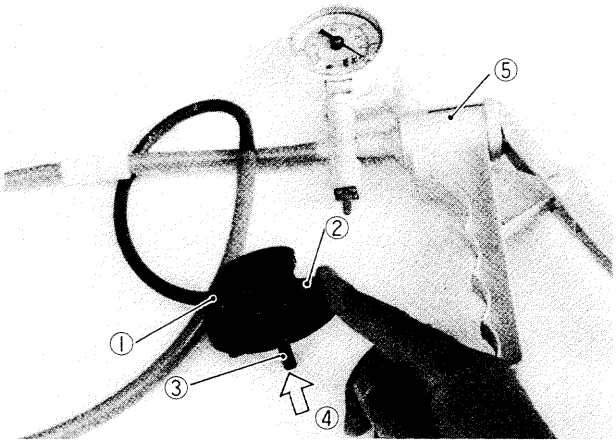
2) Remove EGR modulator and plug nozzle with your finger. Blow air into another nozzle and check that air passes through to air filter side freely.



1. EGR modulator
2. Blow air
3. Air filter

Fig. 5-3-56 Checking EGR modulator (1)

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 then.

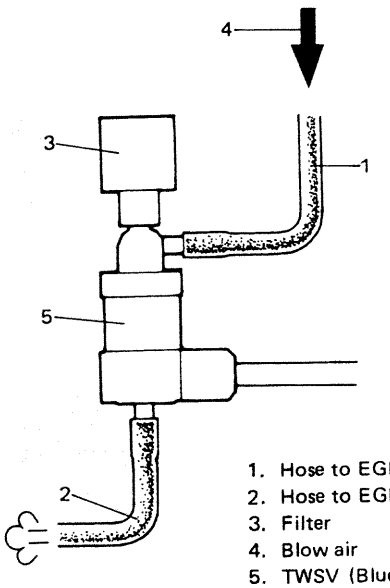


1. Nozzle
2. Nozzle
3. Nozzle
4. Blow air
5. Vacuum pump gauge

Fig. 5-3-57 Checking EGR modulator (2)

4) After checking, install modulator and connect hoses securely. Refer to Fig. 5-1-1 for connecting.

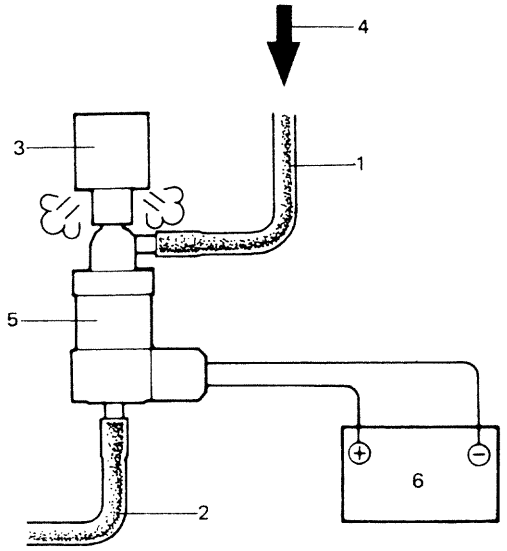
[Three way solenoid valve (TWSV)]
1) Disconnect 2 vacuum hoses from EGR modulator and EGR valve.
2) Blow hose ①. Air should come out of hose ② and not out of filter.



1. Hose to EGR valve
2. Hose to EGR modulator
3. Filter
4. Blow air
5. TWSV (Blue)

Fig. 5-3-58

3) Disconnect coupler and connect 12V-battery to TWSV terminals. In this state, blow hose ①. Air should come out of filter and not out of hose ②.



1. Hose to EGR valve
2. Hose to EGR modulator
3. Filter
4. Blow air
5. TWSV
6. Battery

Fig. 5-3-59

4) After checking, be sure to connect vacuum hoses and coupler.

SECTION 6

ENGINE COOLING SYSTEM

CONTENTS

6-1. GENERAL DESCRIPTION

The cooling system consists of the radiator cap, radiator, water reservoir tank, hoses, water pump, cooling fan & clutch, thermostat. The radiator is of tube-and-fin type.

Cooling System Circulation

During engine warm-up (thermostat closed), the water pump discharges coolant into the water jacket chamber adjacent to No. 1 cylinder. Coolant then flows through the cylinder block and the cylinder head. Coolant then returns to the water pump through intake manifold, heater inlet hose, heater unit, heater outlet hose, and water intake pipe.

During normal temperatures (thermostat open), coolant takes the same basic route but is now allowed to flow past the thermostat, the inlet hose and the radiator, and then back to the water pump through the outlet hose and the water intake pipe.

1. Radiator inlet hose
2. Radiator outlet hose
3. Water intake pipe
4. Thermostat
5. Water pump
6. Water pump drive belt
7. Intake manifold
8. Carburetor
9. Heater inlet hose
10. Heater outlet hose
11. Bypass hose

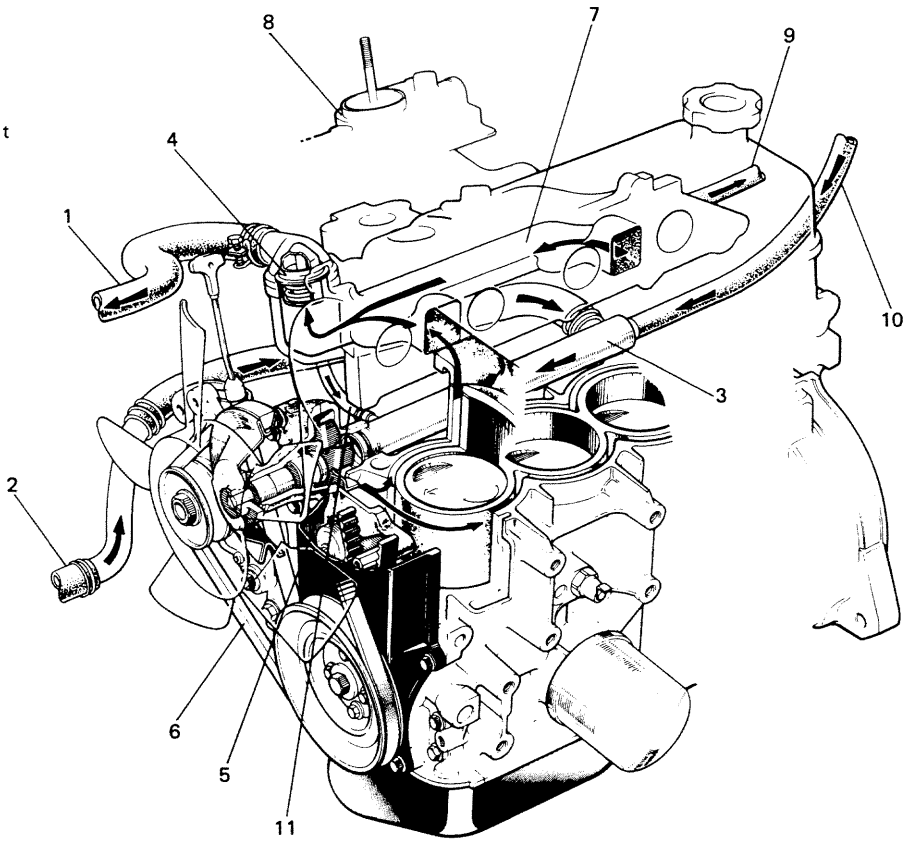


Fig. 6-1 Cooling system

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 vacuum 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.

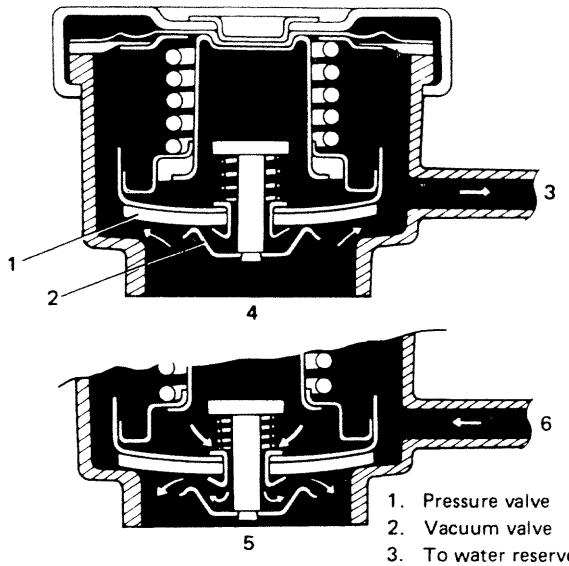
The cap has its face marked 0.9, which means that its pressure valve opens at 0.9 kg/cm² (12.8 psi, 90 kPa).

NOTE:

Do not remove radiator cap to check engine coolant level; check coolant visually the see-through water reservoir tank.

Coolant should be added only to reservoir tank as necessary.

> **WARNING:**
> **As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.**



1. Pressure valve
2. Vacuum valve
3. To water reservoir tank
4. Pressure relief
5. Vacuum relief
6. From water reservoir tank

Fig. 6-2

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.

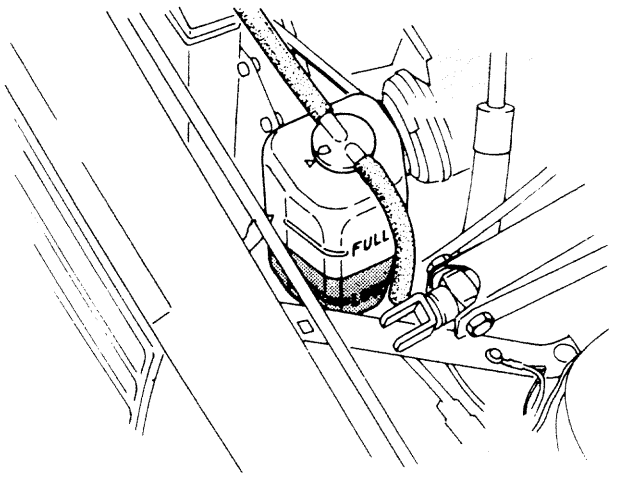


Fig. 6-3 Water reservoir tank

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.

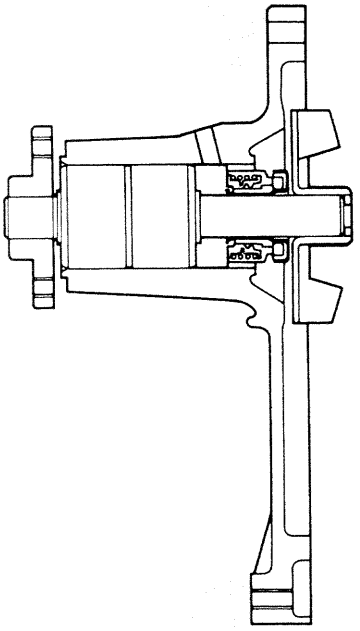


Fig. 6-4

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 a spring to close the valve.

Thus, the valve remains closed while the coolant is cold, preventing circulation of coolant through the radiator.

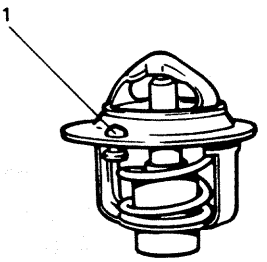
At this point, coolant is allowed to circulate only throughout the engine to warm it quickly and evenly.

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.

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. ± 1.5°C (2.7°F)		
	Thermostat "A"	Thermostat "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)
Valve lift	More than 8 mm at 95°C	More than 8 mm at 100°C



1. Air bleed valve

Fig. 6-5 Thermostat

6-2. REMOVAL

WARNING:
- **Check to make sure that cooling water temperature is cold before removing any part of cooling system components.**
- **Also be sure to disconnect ⊖ cord from battery ⊖ terminal before removing any part.**

1. Coolant Draining

1) Remove radiator cap.
2) Loosen drain plug ① on radiator to empty its water side.

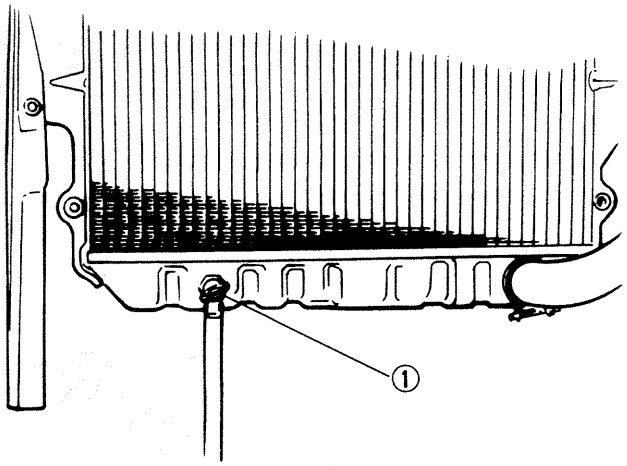


Fig. 6-6

2. Cooling Water Pipes or Hoses

1) Drain cooling system.
2) To remove these pipes or hoses, loosen screw on each pipe or hose clip and pull hose end off.

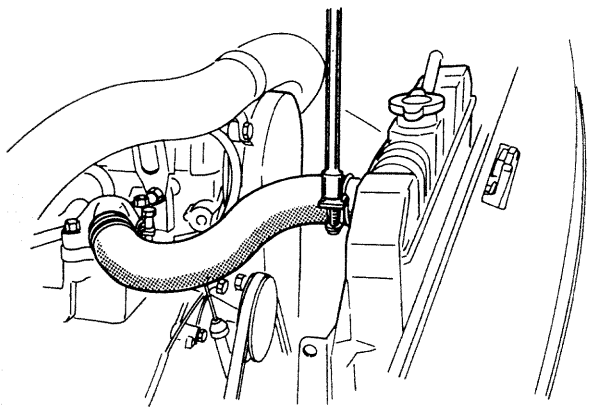


Fig. 6-7

3. Water Pump Drive Belt

1) Loosen water pump drive belt tension.
2) Remove belt.

4. Cooling Fan, Fan Clutch and Water Pump Pulley

1) Remove radiator shroud securing bolts (4 pcs) and cooling fan securing nuts (or bolts, 4 pcs).

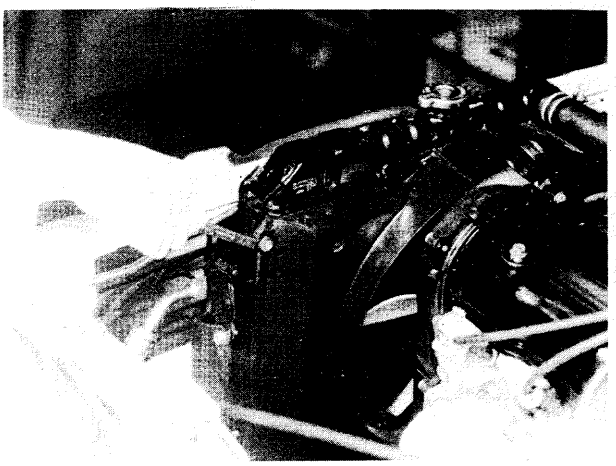


Fig. 6-8

2) Then remove radiator shroud and cooling fan and/or fan clutch and water pump pulley at the same time.

5. Radiator

1) Drain cooling system.
2) Loosen water pump drive belt tension.
3) Remove radiator shroud and cooling fan & clutch at the same time.
4) Disconnect water hoses from radiator.
5) Remove radiator.

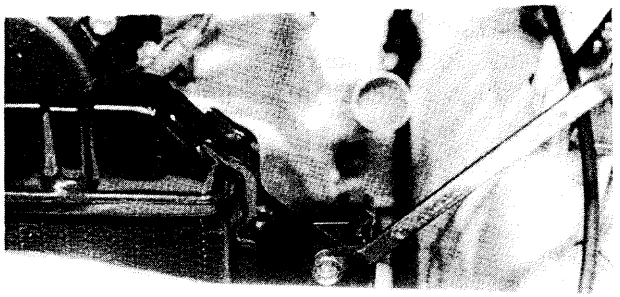


Fig. 6-9

6. **Thermostat**

1) Drain cooling system.
2) Disconnect thermostat cap from intake manifold.

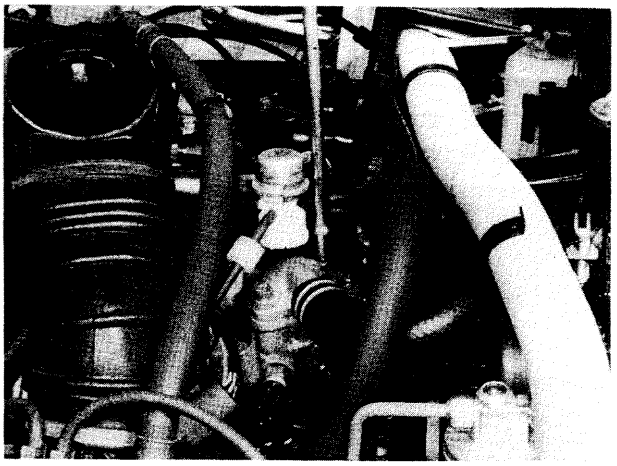


Fig. 6-10

3) Remove thermostat.

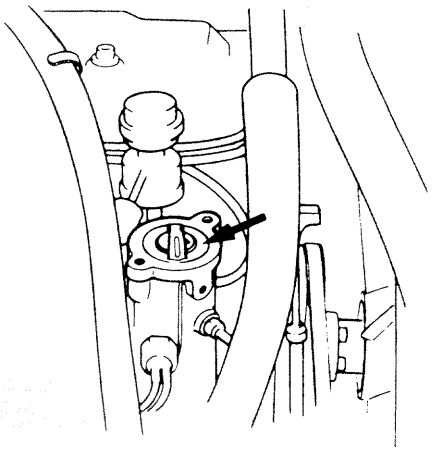
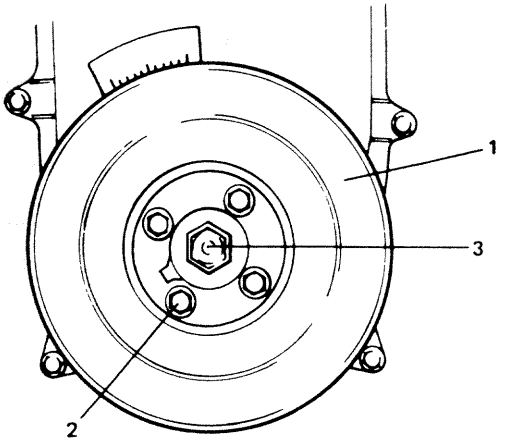


Fig. 6-11

7. **Water Pump**

1) Drain cooling system.
   Refer to 1. Coolant draining on previous page.
2) Remove the radiator shroud and cooling fan & clutch at the same time.
   Refer to item 4 on previous page.
3) Loosen water pump drive belt tension.
   Then remove water pump pulley and pump drive belt.
4) Remove crankshaft pulley by removing 4 pulley bolts. Crankshaft timing belt pulley bolt at the center is needs not to be loosened.



1. Crankshaft pulley
2. Crankshaft pulley bolt
3. Crank timing belt pulley bolt

Fig. 6-12

5) Remove timing belt outside cover.

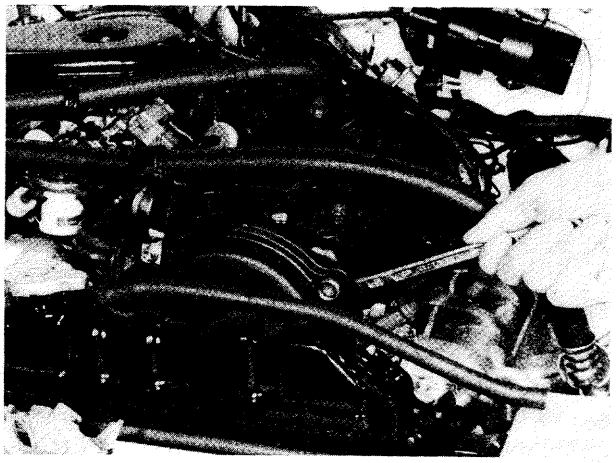
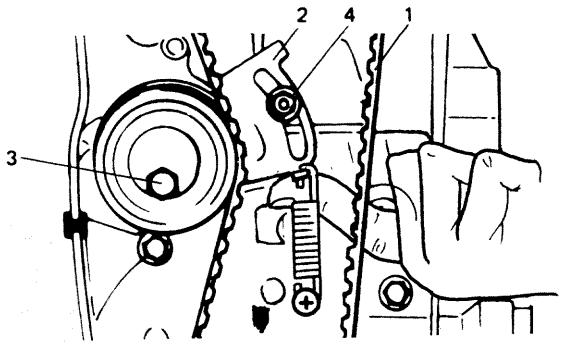


Fig. 6-13

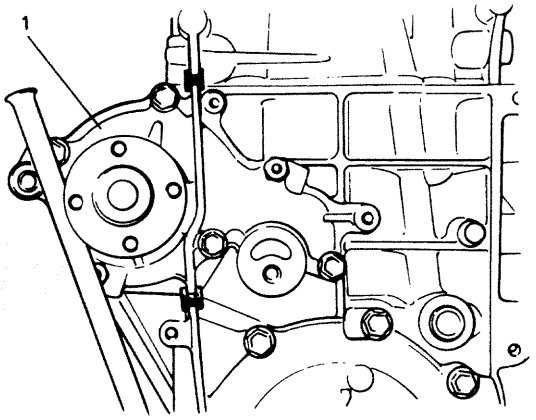
6) Loosen tensioner bolt and stud, and remove belt from crank timing belt pulley and camshaft pulley after pushing up tensioner plate fully with finger as shown in Figure.



1. Timing belt
2. Tensioner plate
3. Tensioner bolt
4. Tensioner stud

Fig. 6-14

7) Remove timing belt tensioner, plate and spring.
8) Remove water pump assembly.



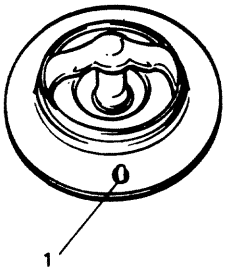
1. Water pump

Fig. 6-15

6-3. INSPECTION OF COMPONENTS

Thermostat

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

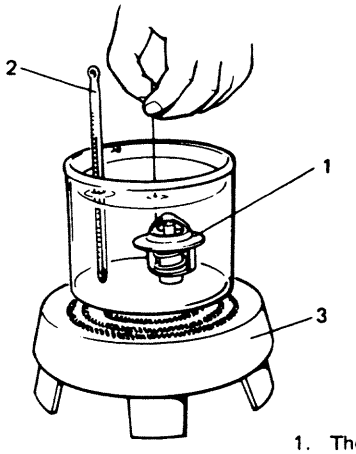


1. Air bleed valve

Fig. 6-16

2) Check valve seat for some foreign matters being stuck which 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 specification temp.
- If valve starts to open at a temperature substantially below or above, thermostat unit should be replaced with a new one. Such a unit, if re-used, will bring about overcooling or overheating tendency.



1. Thermostat
2. Thermometer
3. Heater

Fig. 6-17

Radiator

If the water side of the radiator is found excessively rusted or covered with scales, clean it by flushing with the radiator cleaner compound. This flushing should be carried out at regular intervals for scale or rust formation advances with time even where a recommended type of coolant is used. Periodical flushing will prove more economical.

Inspect the radiator cores and straighten the flattened or bent fins, if any. Clean the cores, removing road grimes and trashes.

Excessive rust or scale formation on the wet side of the radiator lowers the cooling efficiency. Flattened or bent fins obstruct the flow of air through the core to impede heat dissipation.

Radiator flushing interval	Two years (recommended)

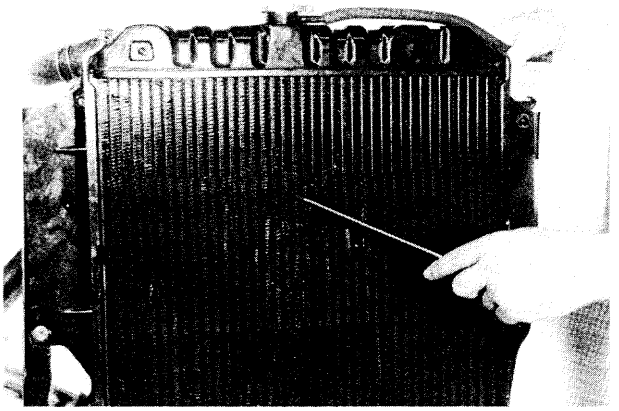


Fig. 6-18

Water Temperature Gauge

For gauge inspection, refer to SECTION 21 BODY ELECTRICAL EQUIPMENT of this manual.

Water Pump

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 an abnormal noise, replace it.

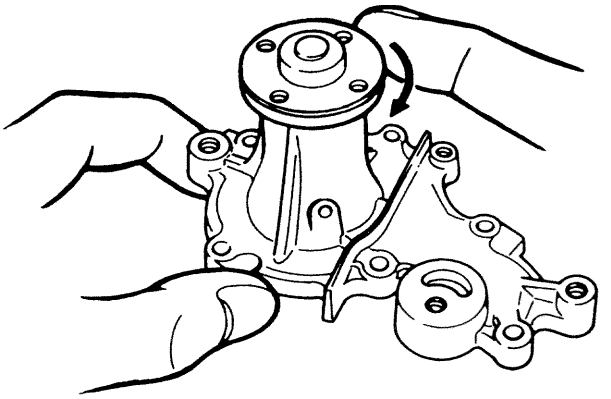


Fig. 6-19

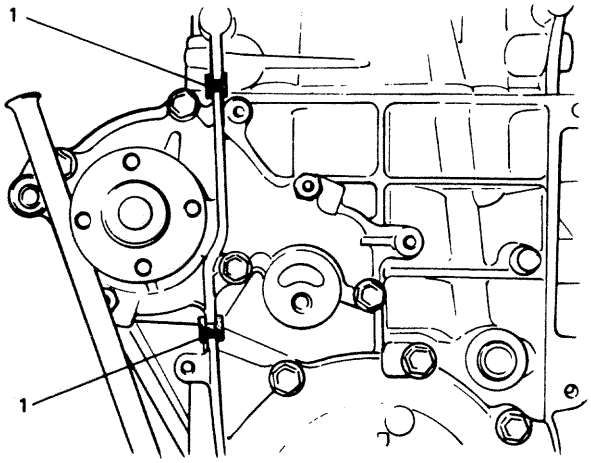
6-4. IMPORTANT STEPS FOR REINSTALLATION

Water Pump

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

After installing water pump, install rubber seal between water pump and oil pump, and another between water pump and cylinder head.



1. Rubber seal

Fig. 6-20

3) 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 p. 3-48 of this manual.**
- **Torque each bolt and nut to specification.**

4) Install crankshaft pulley, water pump pulley, pump drive belt, cooling fan & clutch and radiator shroud.
5) Adjust intake and exhaust valve lashes. (For adjustment and related data, refer to p. 3-53 of this manual).
6) Adjust water pump belt tension. (Refer to P. 6-10).
7) Connect negative cable at battery.
8) Fill the cooling system.

Thermostat

1) When positioning the thermostat on the intake manifold, be sure to bring its air breather valve ① to front side of the engine.

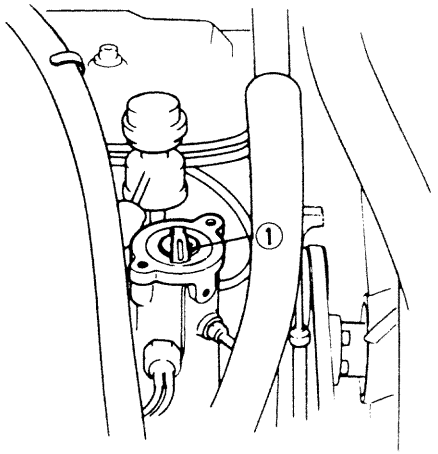


Fig. 6-21

2) Install new gasket and thermostat cap to intake manifold.
3) Fill the cooling system.

Cooling Fan, Fan clutch and Water Pump Belt

Once cooling fan, fan clutch or water pump belt has been removed, make sure to tighten bolts and nuts securely in reinstallation and adjust pump belt tension to specification. (For specified tension, refer to p. 6-10.)

Radiator

1) Tighten bolts securely for proper installation. Also, fix joints of 2 hoses with clamps.

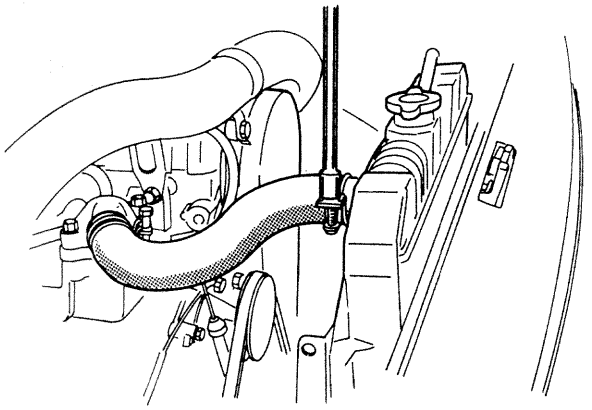


Fig. 6-22

2) Install radiator shroud and cooling fan & clutch at the same time.
3) Tighten shroud bolts and fan clutch nuts.
4) Adjust water pump belt tension.
5) Fill specified amount of coolant.

6-5. MAINTENANCE SERVICE

Water Pump Belt

1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to p6-5 for procedure.
2) Check belt for tension. Belt is in proper tension when it deflects 6 to 9 mm (0.24 – 0.35 in.) under thumb pressure (about 10 kg or 22 lb.).

Belt tension specification	6 – 9 mm (0.24 – 0.35 in.) as deflection

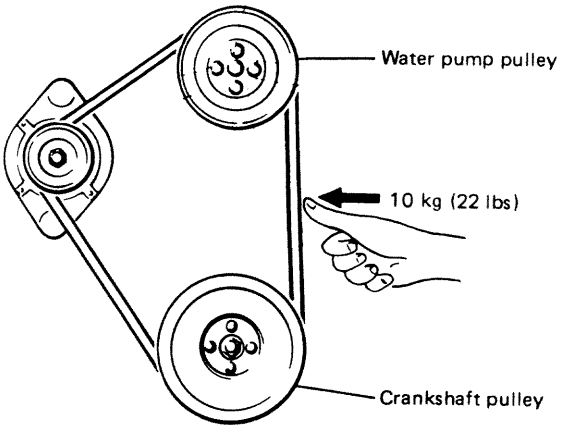


Fig. 6-23

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

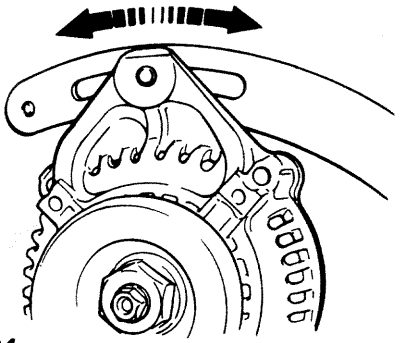


Fig. 6-24

4) Tighten alternator adjusting bolt and pivot bolt.

WARNING:
All adjustments described above are to be performed with ENGINE NOT RUNNING.

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 1200NA, 99000-99032-10X (non-amine type) or 30/70 mixture of water and GOLDEN CRUISER 1200NA.
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).

GOLDEN CRUISER 1200NA – "Anti-freeze and Summer Coolant" – its effects

1) Its freezing temperature is much lower and depends on the concentration of GOLDEN CRUISER 1200NA. It is an anti-freeze coolant.
2) It does not corrode the metal surfaces of the cooling circuit. It is an anti-corrosion coolant.
3) It does not develop foam or bubbles. It is a foam-inhibited coolant.

When changing the engine coolant, use mixture of 50% water and 50% GOLDEN CRUISER 1200NA for the market where ambient temperature falls lower than −16°C (3°F) in winter and mixture of 70% water and 30% GOLDEN CRUISER 1200NA 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
GOLDEN CRUISER Concentration	%	30	50
Ratio of compound to cooling water	ltr.	1.50/3.50	2.50/2.50
	US pt.	3.17/7.39	5.28/5.28
	Imp. pt.	2.64/6.16	4.40/4.40

COOLANT CAPACITY	
Engine, radiator and heater	4.2 liters (8.9/7.4 US/Imp pt.)
Reservoir tank	0.6 liters (1.3/1.1 US/Imp pt.)
Total	4.8 liters (10.1/8.4 US/Imp pt.)

NOTE:

- **Alcohol or methanol base coolants 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% GOLDEN CRUISER 1200NA should be used for the purpose of corrosion protection and lubrication.**

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:

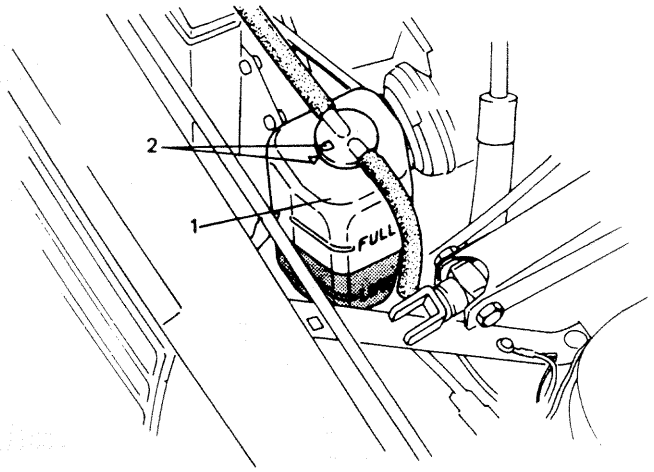
- **do not remove reservoir tank cap while coolant is "boiling", and**
- **do not remove radiator cap while engine and radiator are still hot.**

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 aligning the arrow marks on the tank and cap.

NOTE:
If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.



1. Reservoir tank
2. Arrow mark

Fig. 6-25

Cooling System Service

Cooling system should be serviced as follows.

1) Check cooling system for leaks 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 ① to radiator, make sure that its ear ② is aligned with reservoir tank hose ③ as shown in Figure. If not, turn cap more to align its ear with hose.

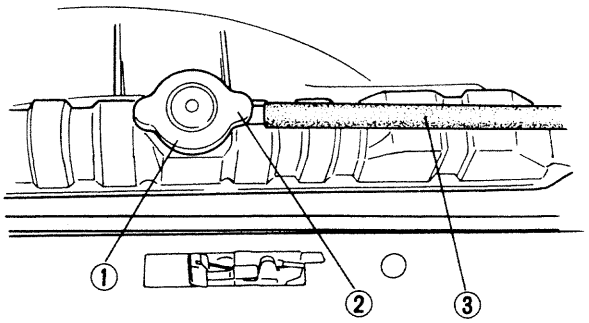


Fig. 6-26 Installation of radiator cap

Cooling System, Flush and Refill

1) Remove radiator cap when engine is cool:

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 ① to drain coolant.

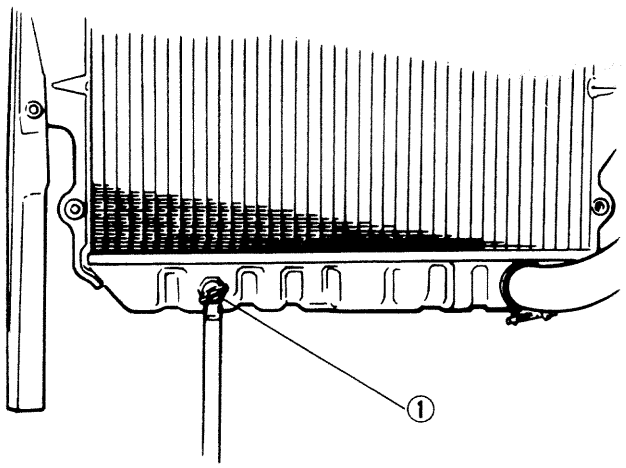


Fig. 6-27 Radiator drain plug

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 mixture coolant (refer to page 6-11 of GOLDEN CRUISER 1200NA, 99000-99032-10X 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 rediator 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.

Cooling Fan Clutch

Inspect fluid coupling for oil leakage.
If necessary, replace fan clutch assembly. Do not disassemble clutch assembly.

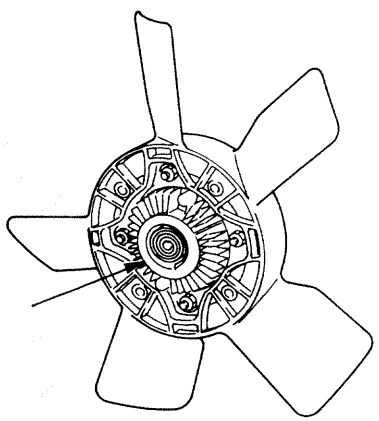


Fig. 6-28

SECTION 7

CAR HEATER

CONTENTS

7-1. DESCRIPTION

The car heater is of a hot water type and operates quietly. The air is heated by the engine coolant and the warm air is blown into the car interior by the blower motor.
The blower motor is driven electrically, independent of engine speed, and operates effectively even when the engine speed is low.

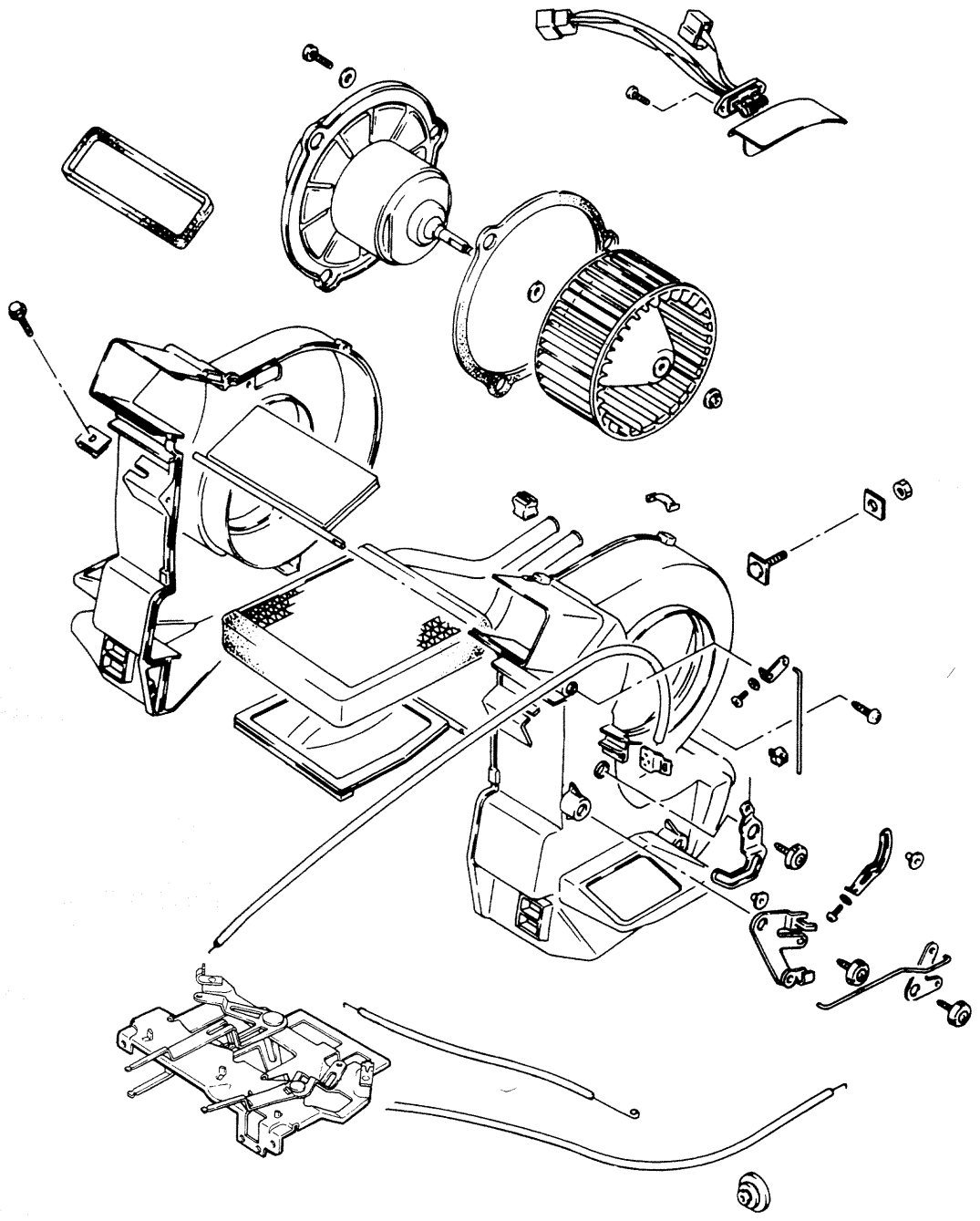


Fig. 7-1

7-2. ELECTRICAL CIRCUIT

The circuit diagram (Fig. 7-2) shows how the blower motor is controlled. Turn the main switch to "ON", turn (slide) the blower switch lever on one step, and voltage is applied across the blower motor. The current is small because of the resistor provided in the circuit (indicated as "blower motor resistance" in the diagram).
Under this condition, the blower runs slowly. By turning (sliding) the blower switch lever fully, the full battery voltage is applied across the blower motor, a large current flows and the blower motor runs at full speed.

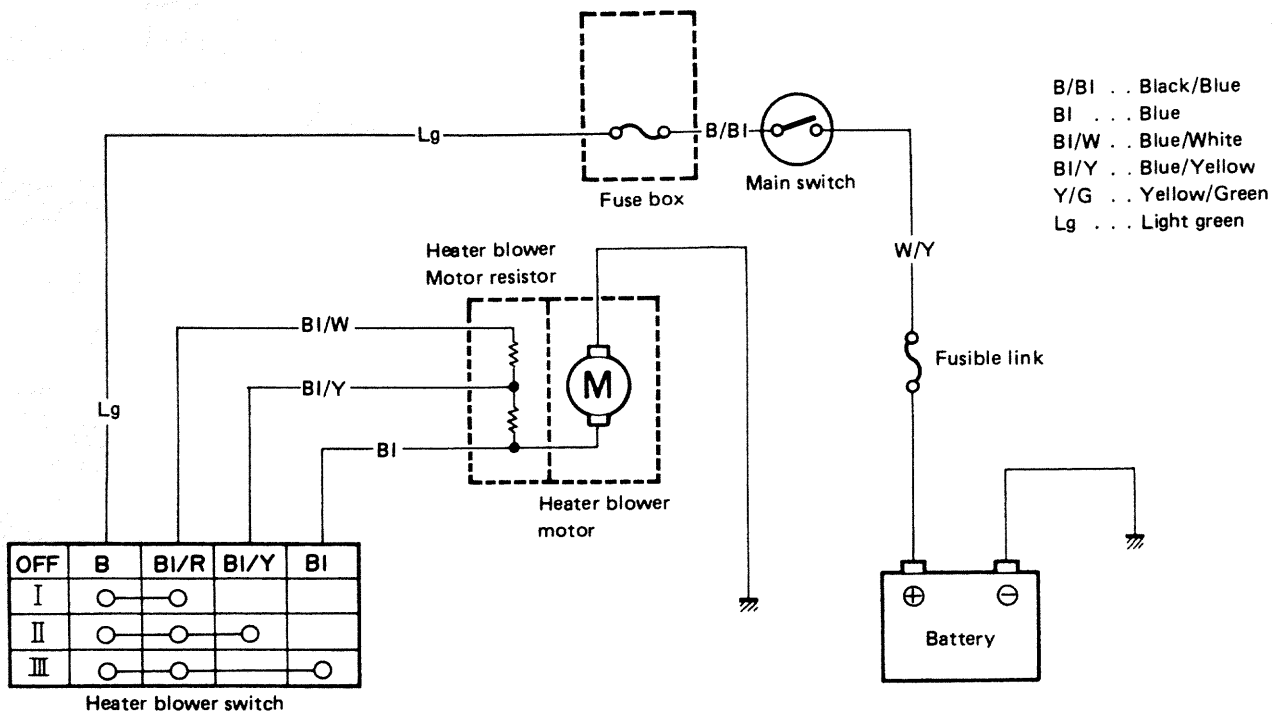


Fig. 7-2

7-3. HEATER SERVICES

Blower resistor

This resistor is on heater case. Check it for signs of cracking or breakage and replace as necessary. If blower motor will not run or when resistor is replaced, check continuity between Blue/White and Blue/Black terminals using a circuit tester.

Blower resistor specification	Several ohms

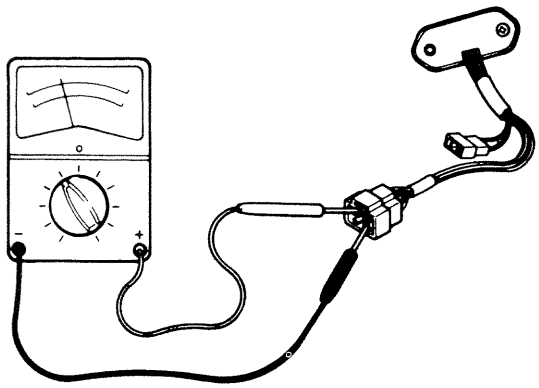


Fig. 7-3

Blower switch

Using a circuit tester, check this switch for circuit continuity:

III	○			○
II	○		○	
I	○	○		
OFF				
	Black	Blue/red	Blue/Yellow	Blue

Heater hoses

Check heater hoses for the connection condition, breakage, cracks and other damage and replace if necessary.

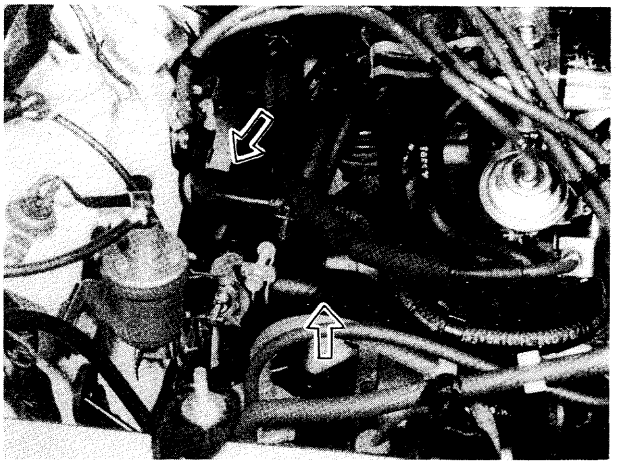


Fig. 7-4

7-4. REMOVAL AND INSTALLATION

Removal

[Heater and blower motor]

1. Disconnect battery negative cable.
2. Drain cooling system.

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

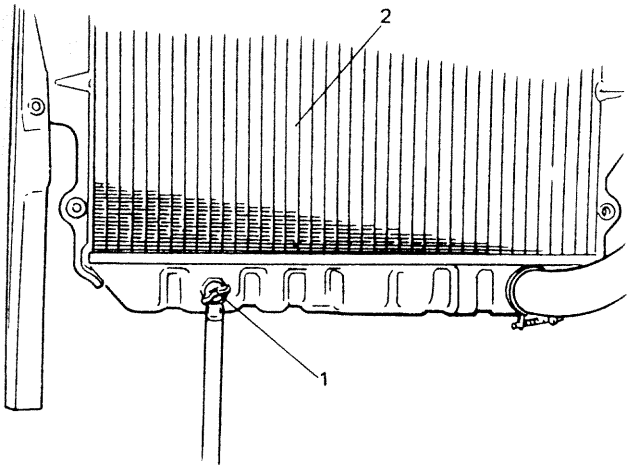


Fig. 7-5 1. Drain plug 2. Radiator

3. Disconnect heater inlet and outlet hoses from heater unit pipes.
4. Remove instrument panel ass'y with speedometer ass'y as follows.
   1) Take off horn pad and remove steering wheel using special tool Ⓐ.

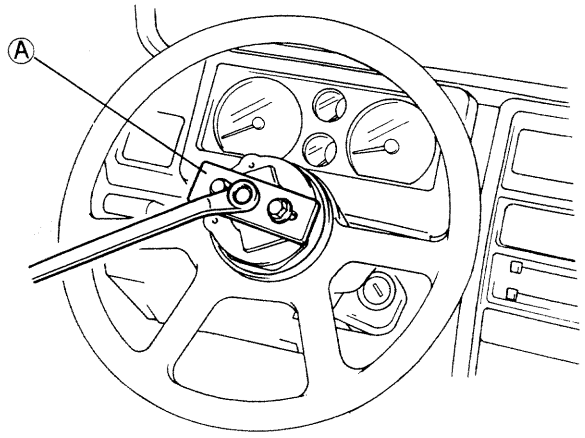


Fig. 7-6 Ⓐ *Special tool (Steering wheel remover 09944-36010)*

   2) If equipped with radio and cigarette lighter, disconnect radio and cigarette lighter lead wires, and pull out radio case with radio and cigarette lighter after loosening case stay screw, and remove radio case bracket.
   3) Pull out ashtray and loosen ashtray plate screws.
   4) Disconnect front food opening cable from lock ass'y.
   5) Loosen panel box stay screw and hood opening cable lock nut on back side of panel box cover.
   6) Disconnect lead wires to control lever at the coupler and heater control cables.
   7) Pull out lever knobs and plate, and loosen lever case screws.
   8) Remove defroster and side ventilator hoses.
   9) Disconnect lead wires to speedometer and switches installed instrument panel at the couplers.
   10) Disconnect speedometer cable from speedometer.
   11) Release wire harness clamps installed to instrument panel.
   12) Loosen screws securing instrument panel.
   13) Remove instrument panel.

NOTE:

- **Before removing, recheck to ascertain all hoses, wire harness, cables and screws are disconnected from instrument panel.**
- **When removing heater lever case which is fitted in steering column holder, be very careful not to damage it.**

5. Remove steering column holder after loosening front door open stopper screws.

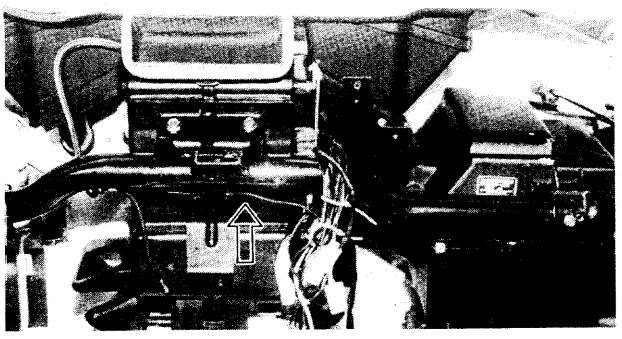


Fig. 7-7

6. Disconnect heater blower motor and resistor lead wires at the coupler.
7. Loosen heater case securing nut on the engine room side.

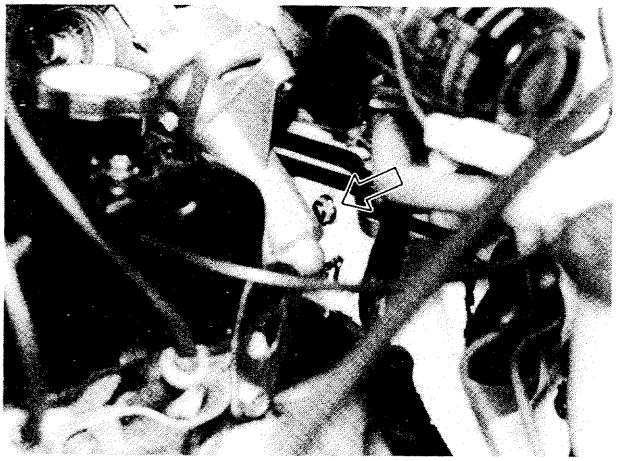


Fig. 7-8

8. Remove heater ass'y.

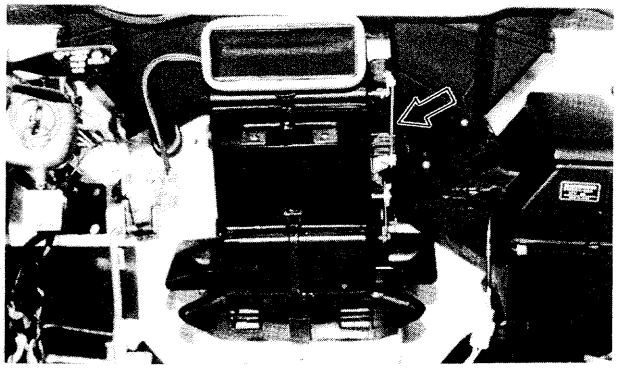


Fig. 7-9

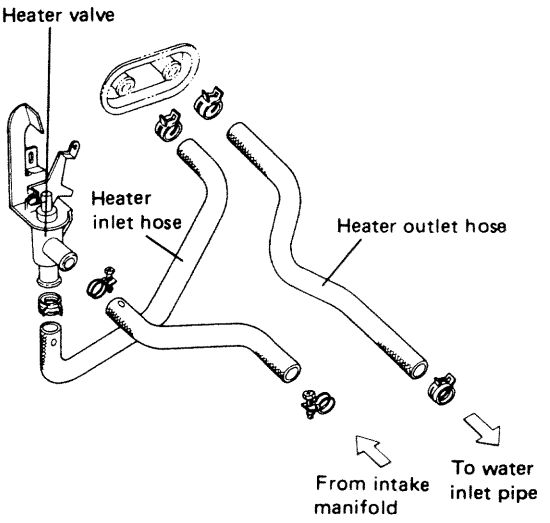
9. Remove heater blower motor.

Installation

Reverse the removal procedure for installation, exercising care to the following.

1. Make definitely sure to insert holder plate between holder and body.
2. When installing parts, be careful to prevent wire harness from being caught between parts.
3. Clamp wire harness securely and make sure that it does not contact sharp edge of any part.
4. When connecting heater hoses, route them correctly making sure they are free from twist.

[For right hand steering vehicle]



[For left hand steering vehicle]

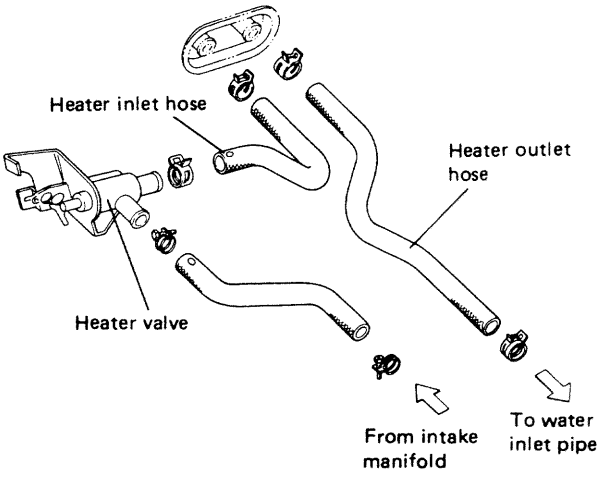


Fig. 7-10

5. Refill the proper coolant. Refer to section 6.

NOTE:
Upon completion of all jobs, perform following checks.

- **Check to ensure that every joint of each heater hose and pipe is free from leakage of cooling water.**
- **Check to ensure that each control lever operates smoothly and that car heater operates correctly to each control lever position.**
  If found faulty, adjust by changing control cable clamp position.
- **Check to ensure that each wire harnesses are securely clamped.**

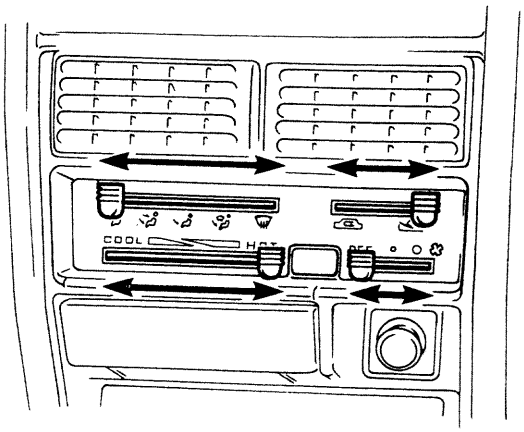
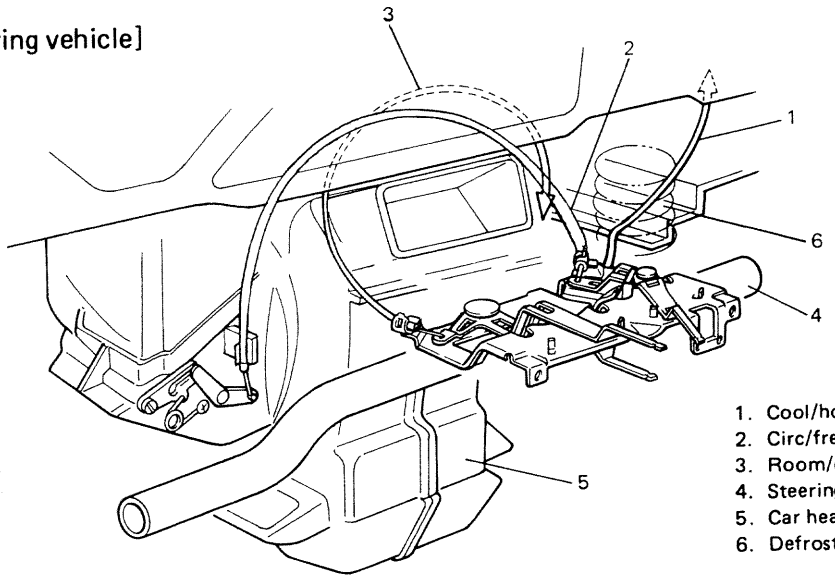


Fig. 7-11

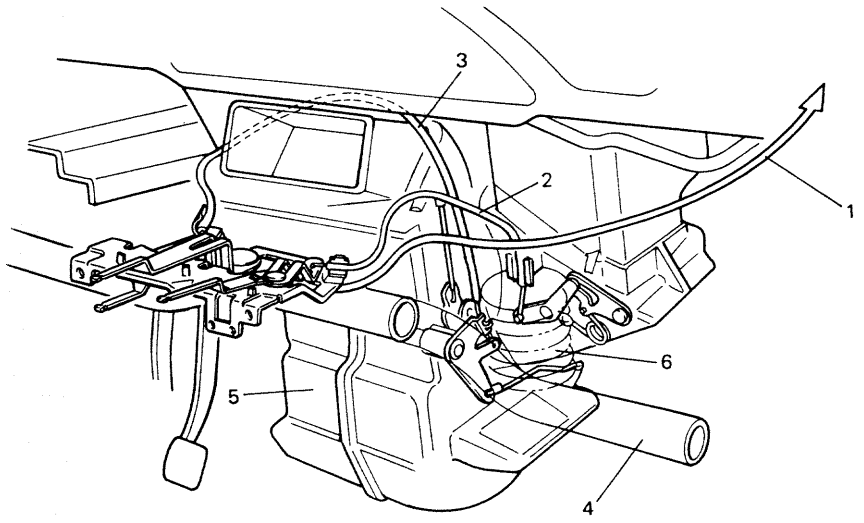
Heater & Ventilator Control Cable Routing

[For right hand steering vehicle]



1. Cool/hot cable
2. Circ/fresh cable
3. Room/def. cable
4. Steering column holder
5. Car heater
6. Defroster hose

[For left hand steering vehicle]



SECTION 8

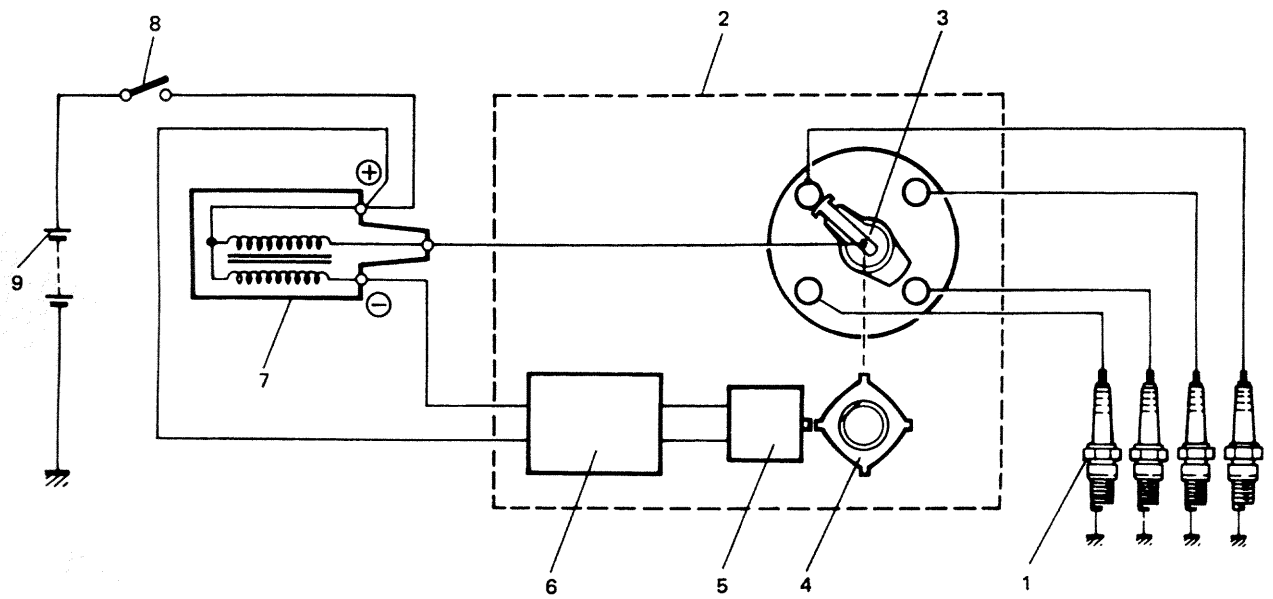
IGNITION SYSTEM

CONTENTS

8-1. GENERAL DESCRIPTION

The ignition system is of contact-pointless type (full-transistorized type).
The principal components of the ignition system are spark plugs, ignition coil, and distributor. The distributor has a rotor, an ignitor, a signal generator, a vacuum advancer and a centrifugal advancer.
The signal generator is to generate the ignition signal and consists of a signal rotor, a magnet and a pickup coil. The signal rotor is attached to the distributor shaft, and the magnet and the pickup coil are attached to the generator base plate.
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 ignitor 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 distributor is a sort of rotary switch, whose rotor connects the four plugs, one at a time, to secondary winding of the ignition coil through the wires called "high-tension" cords. Note that there are one high-tension cord, from secondary winding to the center of the distributor cap, and four more high-tension cords between the spark plugs and the four terminals on the cap.

NOTE:
Whereabouts of terminal connections are clearly indicated in the diagram below. When inspecting the electrical wiring, refer to this diagram and check to be sure that each connection is tight. Examine the cords for torn insulation and for evidence of grounding.



1. Spark plug
2. Distributor
3. Distributor rotor
4. Signal rotor
5. Generator
6. Ignitor
7. Ignition coil
8. Ignition switch
9. Battery

Fig. 8-1

Distributor

1. Vacuum controller
2. Distributor cap
3. Seal
4. Distributor housing
5. Distributor driven gear
6. Pin
7. O-ring
8. Rotor
9. Signal generator dust cover
10. Ignitor dust cover
11. Signal generator
12. Ignitor
13. Generator base plate
14. Signal rotor

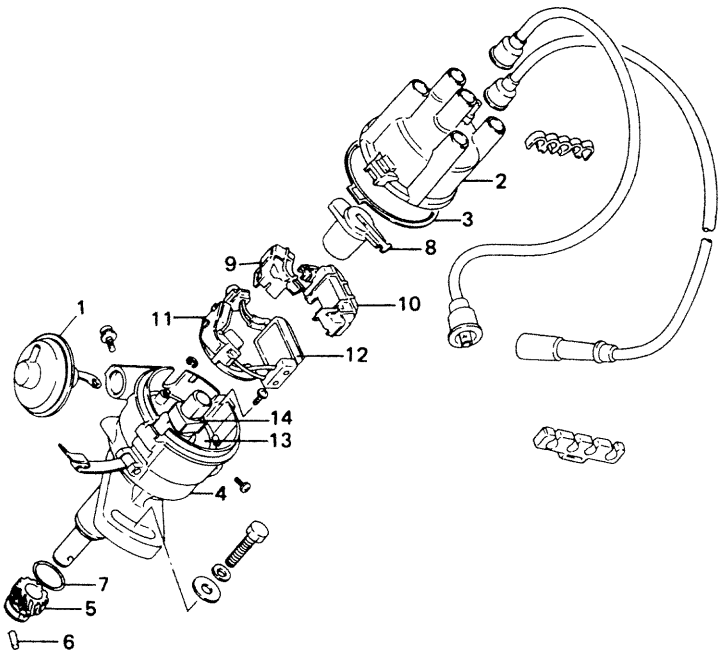


Fig. 8-2

[Timing advancer]
The distributor shaft, from its driven-gear end to the rotor-carrying end, is not a single solid piece; actually this shaft is in two pieces connected together through the timing advancer. The advancer is essentially a flyweight mechanism. Timing advancing action is accomplished by twisting the top shaft piece relative to the bottom one in the direction of shaft rotation.
The single rotor is mounted on the top piece. The twisting movement is produced by the speed-dependent radial (or spreading) movements of the two flyweights.

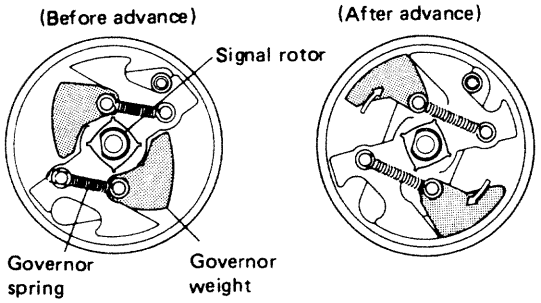


Fig. 8-3

[Vacuum advancer]
In this vacuum-advance mechanism, when the vacuum in the carburetor gets high, the pressure acting on the diaphragm overcomes the spring force in it and the controller rod attached to the diaphragm is pulled. And the rod so pulled turns the generator base plate counter to the direction of the distributor shaft rotation (counterclockwise) to advance (quicken) the ignition.

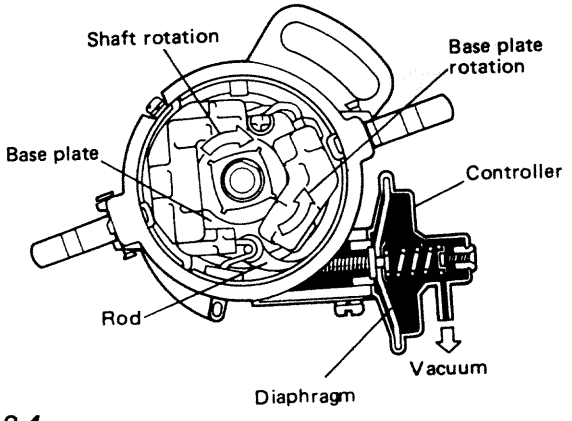


Fig. 8-4

Ignition Coil

The ignition coil is a sort of miniature transformer and, as such, has an iron core around which two coils are wound – primary and secondary windings mentioned above. The two are so close to each other that a sudden change in the magnetic flux produced by "primary current" flowing in primary winding (in a less number of coil turns) induces a very large electromotive force (voltage) in secondary winding (in a greater number of coil turns). These live parts are housed in a tight, insulator case topped by the cap. Note that the cap has three terminals: one high-tension terminal and two low-tension terminals.

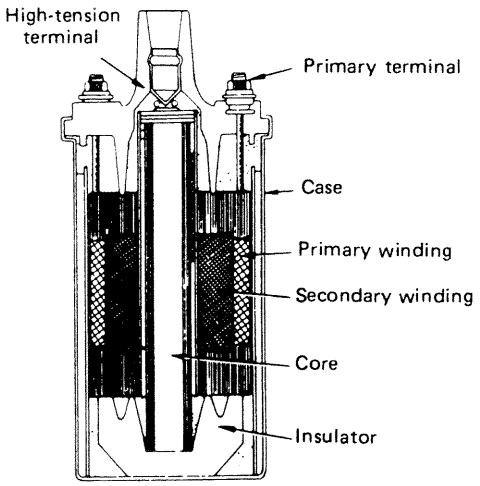


Fig. 8-5

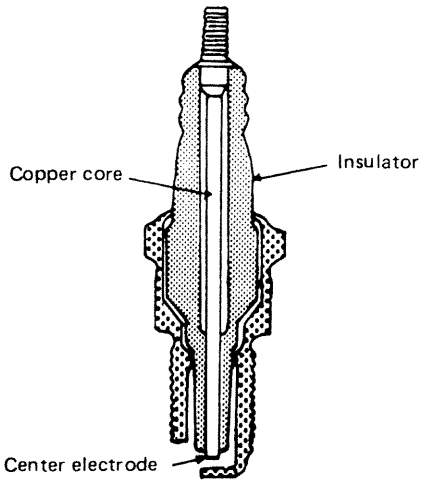


Fig. 8-6

Spark Plugs

Each new machine shipped from the factory is fitted with standard plugs.

	Standard type	Cold type
NGK	BPR-5ES	BPR-6ES
Nippon Denso	W16EXR-U	W20EXR-U

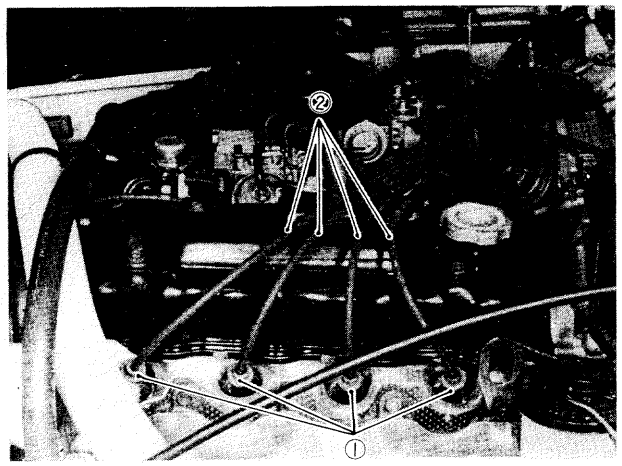
8-2. MAINTENANCE SERVICE

High Tension Cords

Check cord terminals for corrosion, breaks and distortion, and cords for crack or deterioration. Replace cord as necessary.

NOTE:

DO NOT bend or pull high tension cords to avoid inside damage. Grip rubber boot when removing or installing cords.



1. Rubber boot
2. High tension cord

Fig. 8-7

Spark Plugs

Check following:

- Electrode wear
- Carbon deposits
- Insulator damage.

If any fault is found, replace plugs.

Check gap, and make sure that gap is within specification. If gap is out of specification, adjust it by bending ground (side) electrode.

Plug gap "A"	0.7 – 0.8 mm (0.027 – 0.031 in.)

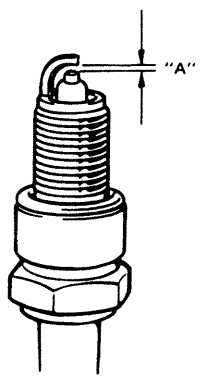


Fig. 8-8

Ignition Coil

Disconnect negative cable at battery. Disconnect lead wires and high tension cord from ignition coil. Remove ignition coil, and check it as follows.

Measure primary coil resistance.

Using ohmmeter, measure resistance between positive ⊕ and negative ⊖ terminals.

Primary coil resistance	1.35 – 1.65 Ω

Measure secondary coil resistance.

Using ohmmeter, measure resistance between positive ⊕ terminal and high tension terminal.

Secondary coil resistance	11.0 – 14.5 kΩ

NOTE:

Take readings when coil is about 20° C (68° F).

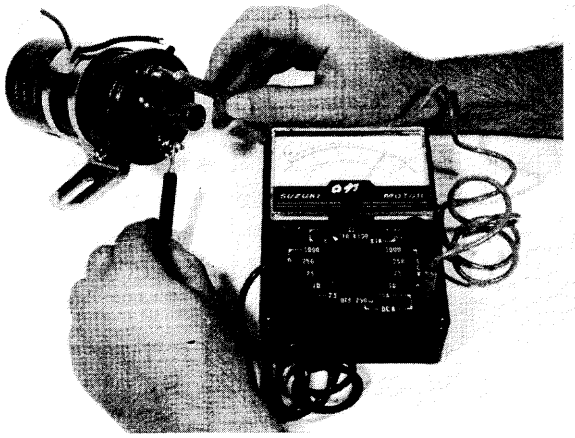


Fig. 8-9

Reverse removal procedure for installation.

When reinstalling, make sure that each connection is tight.

Distributor

[Distributor cap]

Leakage of high-tension energy for ignition shows up as misfiring in the engine. It occurs at any part of the high-tension line where insulation has failed or in a dirty distributor cap, that is, an internally dirty cap.

A wider spark gap in the plug, a condition often found in poorly cared spark plugs, promotes a tendency of high-tension energy to find a short-cut to ground.

Cleanliness is very important for the distributor cap. With a clean dry cloth, wipe off dust or grime, if any, and inspect for any damaged (scarred, scratched or cracked) part or any part evidencing high-tension leakage inside the cap. Be sure to replace such parts.

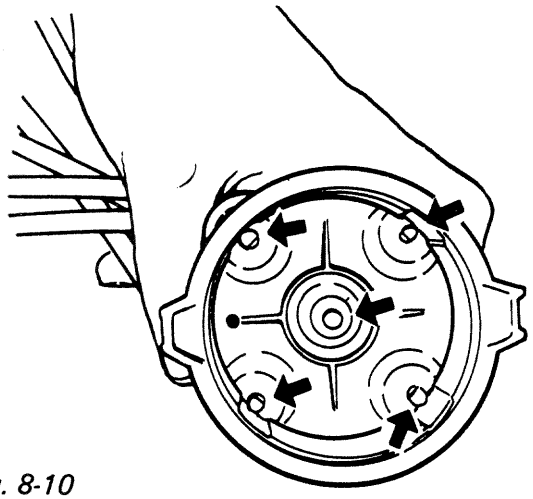
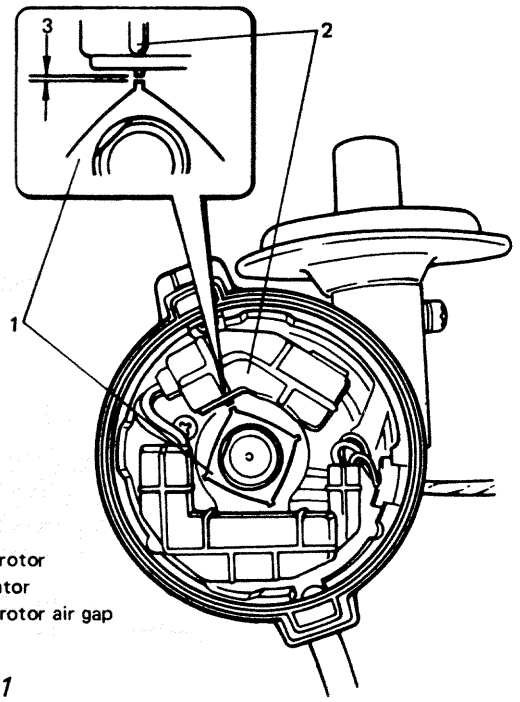


Fig. 8-10

[Signal rotor air gap]

Signal rotor air gap	0.2 – 0.4 mm (0.008 – 0.016 in)

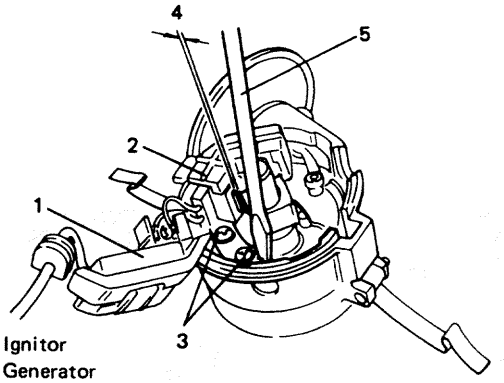
Check air gap and adjust it as necessary.
1. Remove distributor cap and rotor.
2. Using thickness gauge, measure air gap between signal rotor tooth and generator.



1. Signal rotor
2. Generator
3. Signal rotor air gap

Fig. 8-11

3. If air gap is out of specification, adjust it.
   Remove distributor and then ignitor.
   Loosen 2 screws securing generator.
   Using blade (–) screwdriver, move generator and adjust air gap to specification.

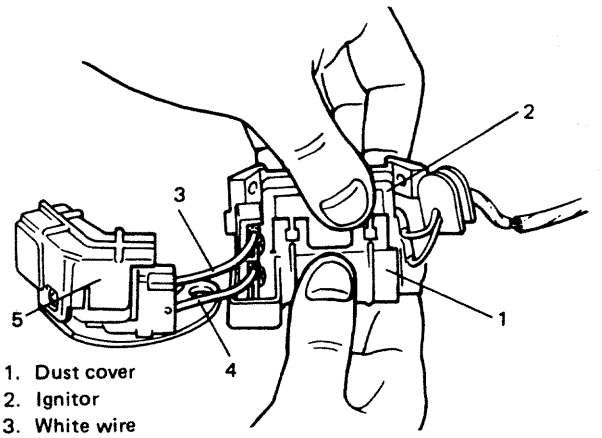


1. Ignitor
2. Generator
3. Generator screw
4. Signal rotor air gap
5. Blade screwdriver

Fig. 8-12

After adjustment, tighten 2 screws and recheck air gap. Install ignitor, rotor and distributor cap.
Install distributor referring to p. 8-11.

[Generator]
1. Disconnect negative cable at battery. Remove distributor, and then ignitor and generator.
2. Remove dust cover from ignitor.
3. Disconnect red and white wires from ignitor.

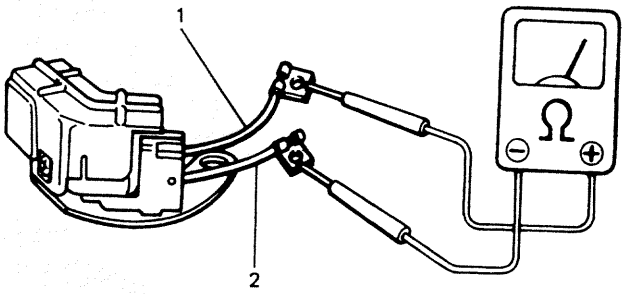


1. Dust cover
2. Ignitor
3. White wire
4. Red wire
5. Generator

Fig. 8-13

4. Connect ohmmeter to red and white wires, and measure generator resistance.
   Generator resistance should be within 130 – 190 ohms. If resistance is not within specification, replace the generator.

Generator (Pickup coil) resistance	130 – 190 ohms

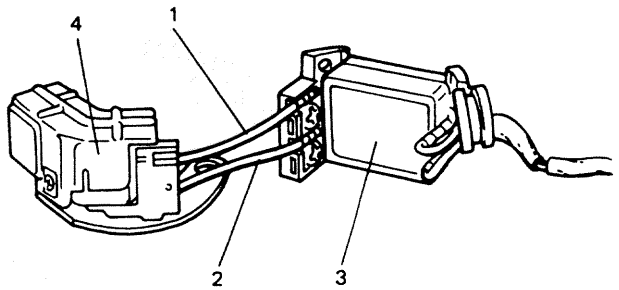


1. White wire
2. Red wire

Fig. 8-14

5. After checking, connect red and white wires to ignitor as shown in Figure 8-15, and then install dust cover.

NOTE:
NEVER connect red and white wires reversely. Reverse connection may cause damage to generator and ignitor.



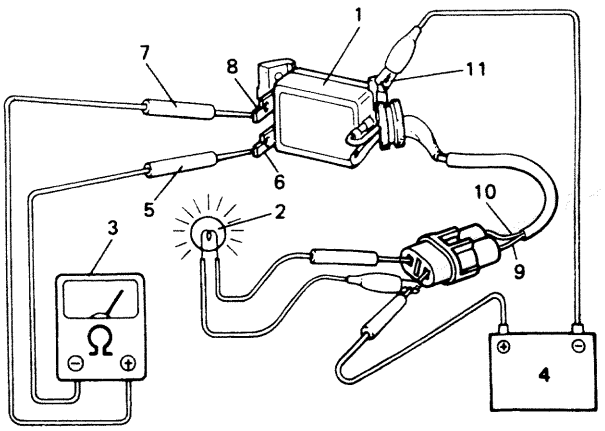
1. White wire
2. Red wire
3. Ignitor
4. Generator

Fig. 8-15

6. After generator has been assembled on distributor, make sure to adjust air gap and install ignitor.
7. Install distributor referring to page 8-11.

[Ignitor]
1. Disconnect negative cable at battery. Remove distributor, and then ignitor and generator.
2. Remove dust cover from ignitor.
3. Disconnect red and white wires from ignitor.
4. Connect an ohmmeter, a bulb and 12 voltage battery to ignitor as shown in Figure 8-16.
   Set ohmmeter at 1 ohm to 10 ohm range. Then bring ohmmeter negative ⊖ prod to touch red wire terminal of ignitor, and positive ⊕ prod to touch white wire terminal. If bulb is illuminated, it indicates that ignitor is satisfactory. If not, replace ignitor.

NOTE:
- **Never connect battery positive and negative wires reversely. Reverse connection may cause damage to ignitior.**
- **Under no circumstances should ohmmeter be connected reversely.**
- **Be sure to perform this ohmmeter check within a short time (two to three seconds).**



1. Ignitor
2. Bulb
3. Ohmmeter
4. Battery (12V)
5. Negative prod
6. Red wire terminal
7. Positive prod
8. White wire terminal
9. Black/White wire
10. Brown wire
11. Earth

Fig. 8-16

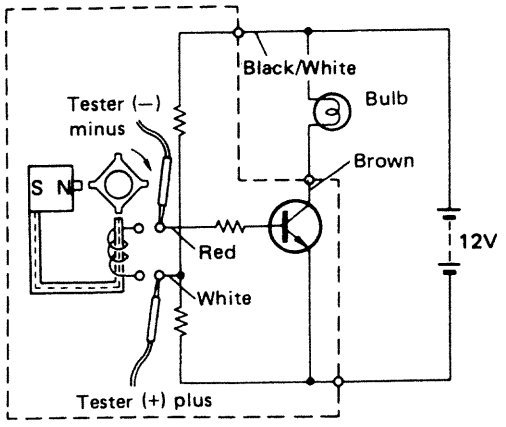


Fig. 8-17

5. After checking, connect red and white wires of generator to ignitor and install dust cover on ignitor.
   Refer to Fig. 8-15 for proper connection of red and white wires.
6. After the generator and ignitor have been assembled on the distributor, make sure to adjust the air gap.
7. Install distributor referring to page 8-11.

[Distributor driven gear]
Inspect gear teeth for wear, and see if the backlash is normal or not. Excessive backlash can be told by turning the shaft back and forth, with its driven gear in mesh with driving gear. Maladjusted ignition timing is often due to excessive tooth wear in this gearing and, in such a case, can be corrected by replacing driven gear.

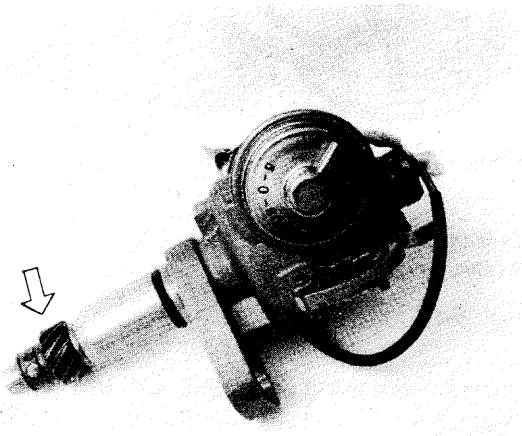


Fig. 8-18

To replace driven gear, grind off both caulked ends of driven gear set pin with grinder and drive it off. After fitting new gear, make sure to use a new pin and caulk its both ends.

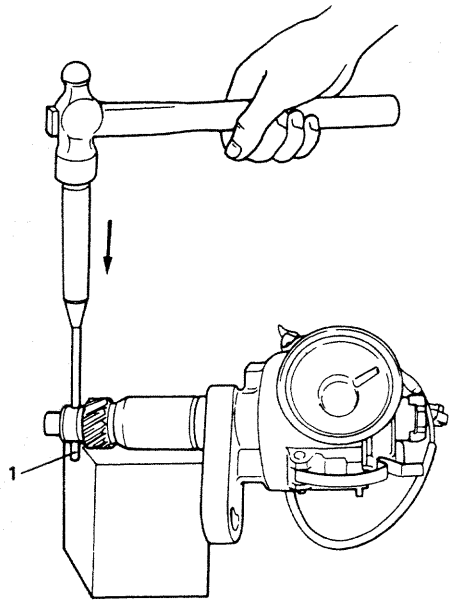


Fig. 8-19 1. Driven gear set pin

Ignition Timing

Ignition timing	10° BTDC at 800 ± 50 r/min
Ignition order	1 – 3 – 4 – 2

When checking and adjusting ignition timing, be sure to use timing light (09900-27301 or 09900-27311).

NOTE:
Prior to check and adjustment of ignition timing, make sure that head lights, heater fan, rear defogger (if equipped), and air conditioner (if equipped) are "OFF". If any one of these systems is "ON", idle up system operates and engine idle speed will be out of the specification.

[Checking]
1. Remove rubber plug from timing check window on the transmission case.
2. Start engine and warm it up to normal operating temperature.
3. After warming up, check to be sure that idle speed is within specification. If idle speed is out of specification, adjust it by turning idle speed adjusting screw of carburetor.
4. Connect timing light to high tension cord of No. 1 cylinder.
5. With engine running at specified idle speed, direct the timing light to timing check window. If 10° BTDC timing mark ① on flywheel appears aligned to timing match mark ②, ignition is properly timed.

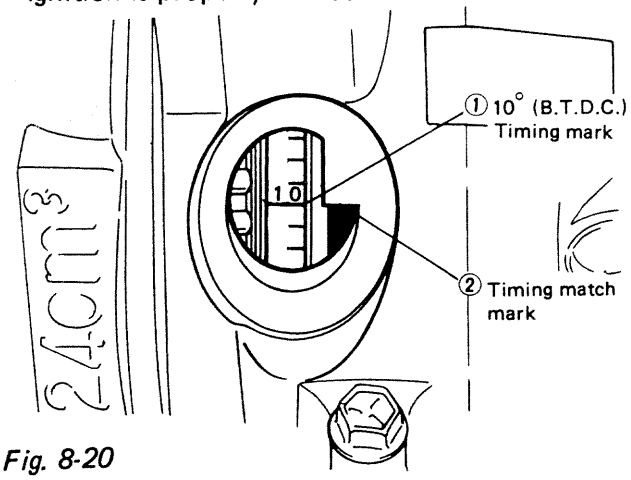
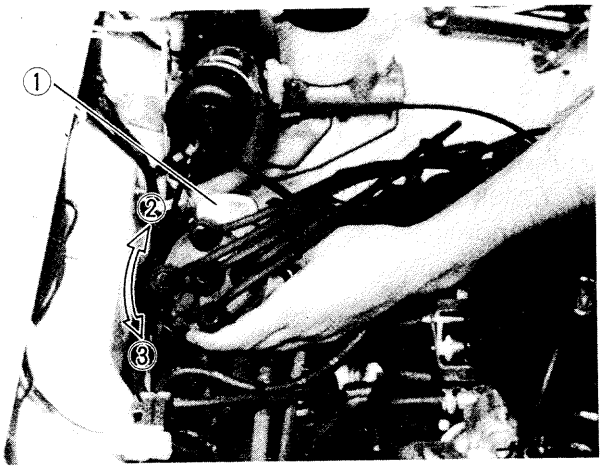


Fig. 8-20

[Adjusting]
If ignition timing is out of specification, adjust it.
Loosen distributor flange bolt and turn distributor housing in place to advance or retard timing.

Turning housing counterclockwise advances timing, and vice versa. After adjustment, tighten flange bolt and recheck timing.



1. Distributor flange bolt
2. Timing is retarded
3. Timing is advanced

Fig. 8-21

Be sure to re-install check window rubber plug after making above check and adjustment.

WARNING:
When engine is warmed up, exhaust manifold cover and other parts are hot as well. Be careful not to touch them when removing and reinstalling rubber plug.

[Checking centrifugal advancer]
After removing distributor cap, turn rotor clockwise by finger and release it.
Check that rotor returns smoothly counterclockwise by spring force.
If defective, replace distributor.

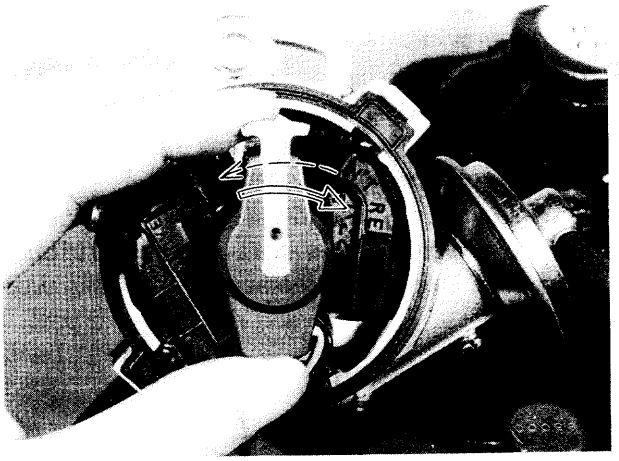
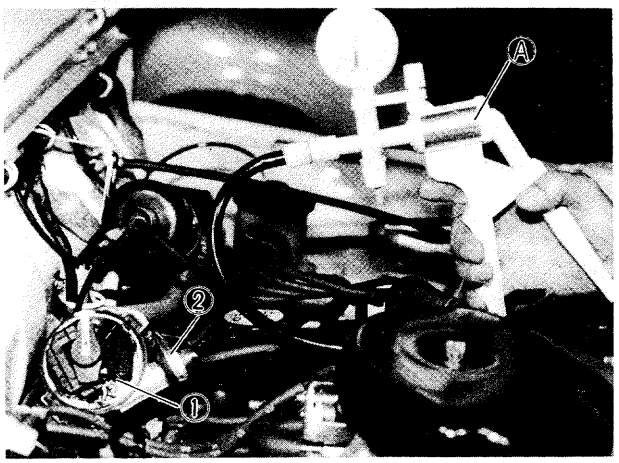


Fig. 8-22

[Checking vacuum advancer]
Remove distributor cap.
Disconnect vacuum hose from vacuum hose 3 way joint, and connect vacuum pump gauge (09917-47910) to its hose. Apply vacuum (about 400 mmHg). And then with pump stopped, check to ensure that vacuum pump gauge indicator remains at the same level, and release it. Check that generator base plate with generator moves smoothly. If plate does not move smoothly, replace defective parts.



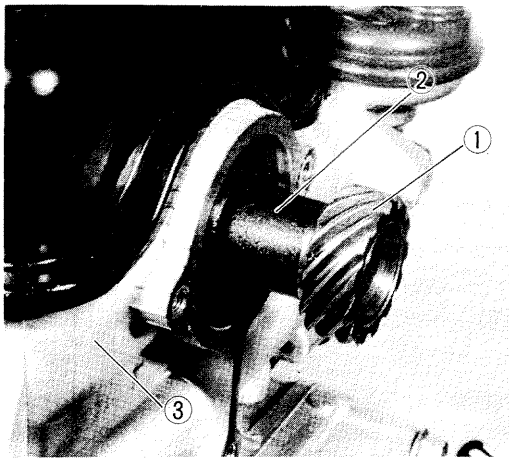
Ⓐ Vacuum pump gauge (09917-47910)
1. Generator base plate
2. Vacuum controller

Fig. 8-23

Distributor Drive Gear

NOTE:
When removing distributor gear case from cylinder head, engine oil in cylinder head may come out. So place waste or receiver under gear case when removing.

Inspect drive gear for wear.
Worn gear is likely to disturb ignition timing and therefore must be replaced.
Replacing worn-down drive gear is not enough. Inspect driven gear (a part of the distributor assembly), too, and replace it if badly worn down.



1. Distributor drive gear
2. Camshaft
3. Cylinder head

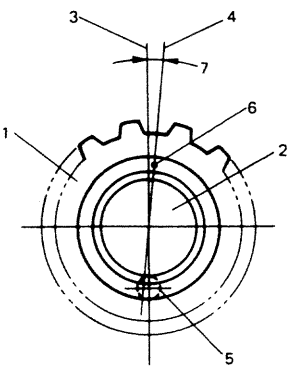
Fig. 8-24

[Important reminders for removal and installation]

- Before removing drive gear from camshaft, scribe a match mark on this shaft to root center line of drive gear as shown in Fig. 8-25 and, when mounting replacement drive gear, refer to this mark.
- When pressing replacement drive gear onto camshaft, be sure to position gear angularly as shown in Fig. 8-25. (align mark on camshaft scribed in removal with root center of drive gear)

NOTE:
There is no need to discriminate between two end faces of drive gear.

Distributor side view



1. Drive gear
2. Camshaft
3. Center line of ϕ5 mm hole
4. Center line of root
5. ϕ5 mm hole (Provided on pulley side of camshaft)
6. Scribed match mark
7. 5°

Fig. 8-25

- About 30 cc (1.01/1.05 US/Imp oz) of engine oil must be fed into distributor gear case after servicing this case, that is, removing and putting it back. Be sure to add this much oil before starting engine for the first time after servicing.

8-3. IMPORTANT REMINDERS FOR INSTALLATION

Distributor

When re-installing distributor, be sure to insert it into distributor gear case in the following sequence:

1. Turn over crankshaft in normal direction (clockwise as viewed from crankshaft pulley side) until specified timing mark ① on flywheel aligns with timing match mark ②.

> **CAUTION:**
> **After aligning two marks, remove cylinder head cover to visually confirm that rocker arms are not riding on camshaft cams at No. 1 cylinder. If arms are found to be riding on cams, turn over crankshaft 360° to align two marks anew.**

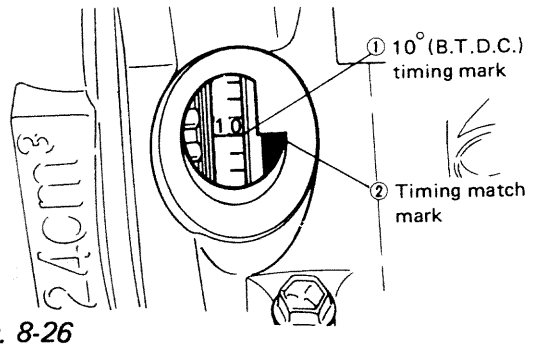


Fig. 8-26

2. Remove distributor cap, and turn rotor to make center of rotor align with cap clamp center on distributor housing as shown in figure.

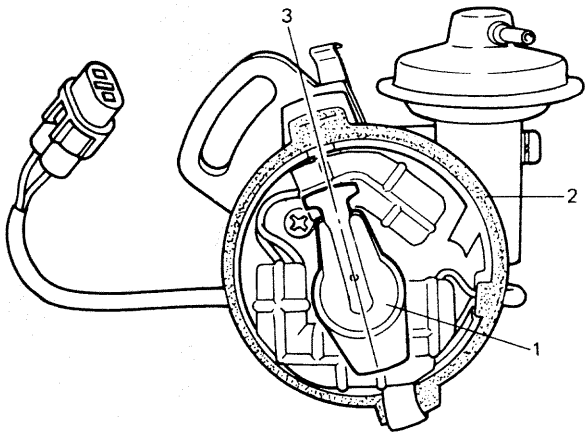


Fig. 8-27

1. Rotor
2. Housing
3. Center of rotor and clamp

3. Insert distributor into gear case in such a way that center of distributor flange will coincide with the distributor mounting screw hole provided in distributor gear case. When distributor is inserted properly, position of distributor rotor becomes as shown in figure. Secure distributor in place tentatively by making mounting screw finger-tight.

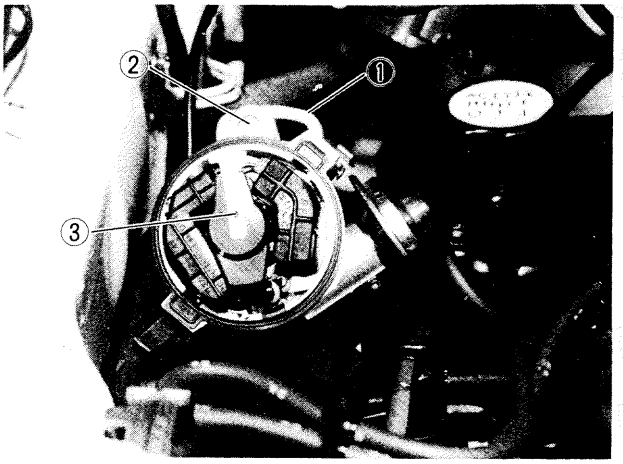
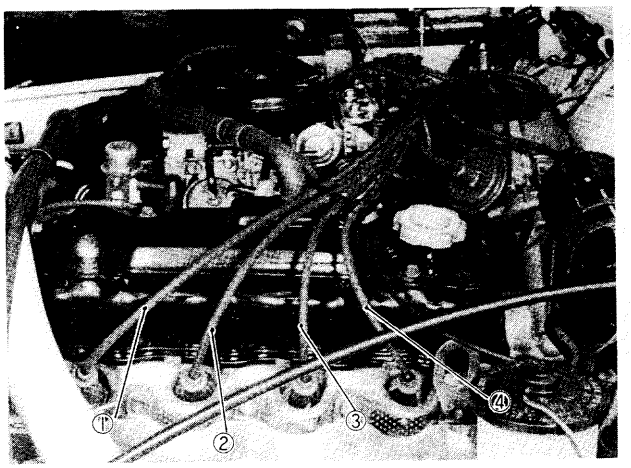


Fig. 8-28

1. Distributor flange
2. Mounting screw
3. Rotor

4. Install cap gasket and distributor cap to distributor.
   Hook 2 clamps securely.
5. Distribute cords as shown in figure. Securely connect cords to distributor cap terminals and spark plugs.

NOTE:
Make sure to clamp high tension cords so that they do not contact other parts.



1. No. 1 cylinder
2. No. 2 cylinder
3. No. 3 cylinder
4. No. 4 cylinder

Fig. 8-29 High tension cords distribution

6. Connect vacuum hose to vacuum controller, and coupler of lead wires.
7. Connect negative cable at battery.
8. Start engine and adjust ignition timing by using timing light as previously outlined.
   After adjustment, tighten distributor flange bolt.

SECTION 9

CRANKING SYSTEM

CONTENTS

9-1. GENERAL DESCRIPTION

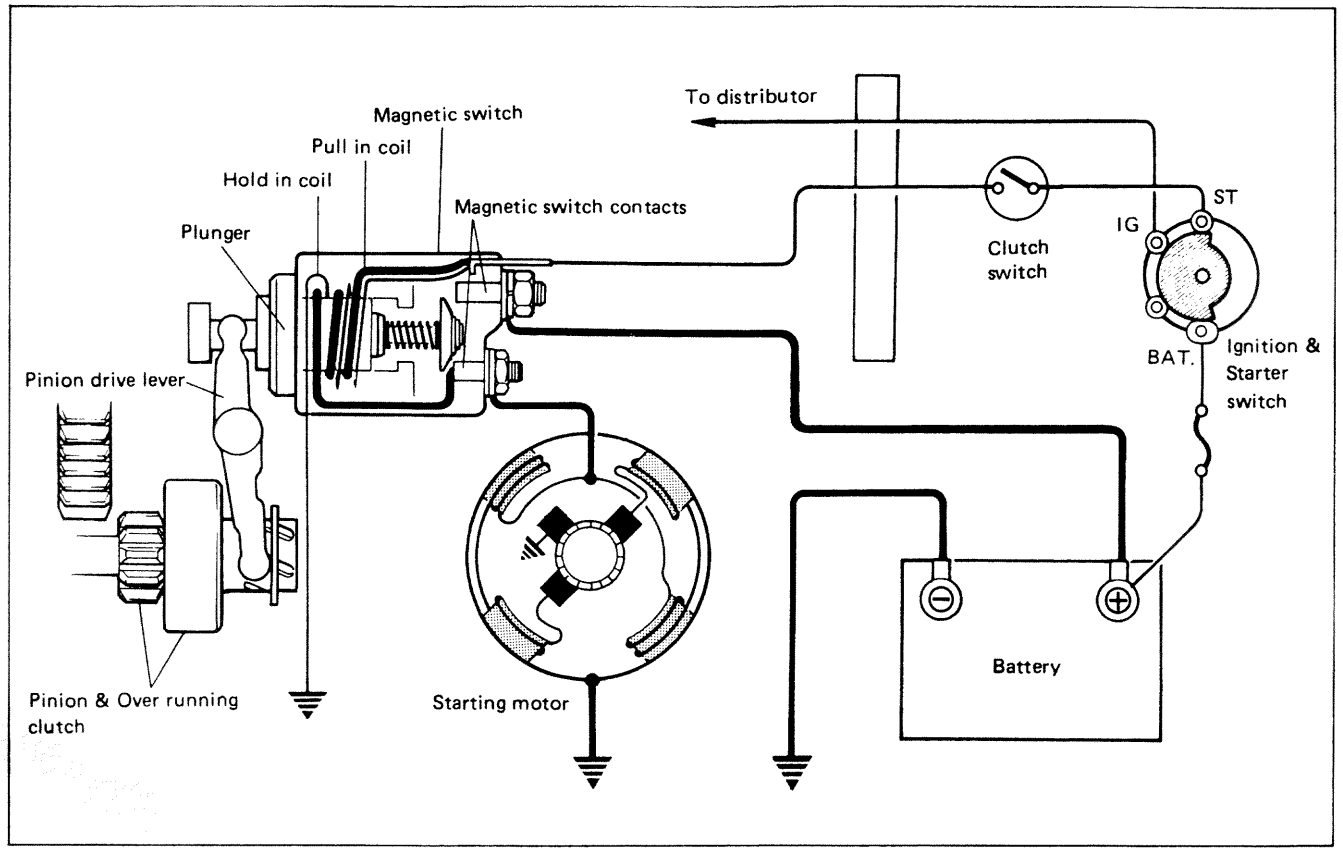


Fig. 9-1 Cranking circuit

CRANKING CIRCUIT

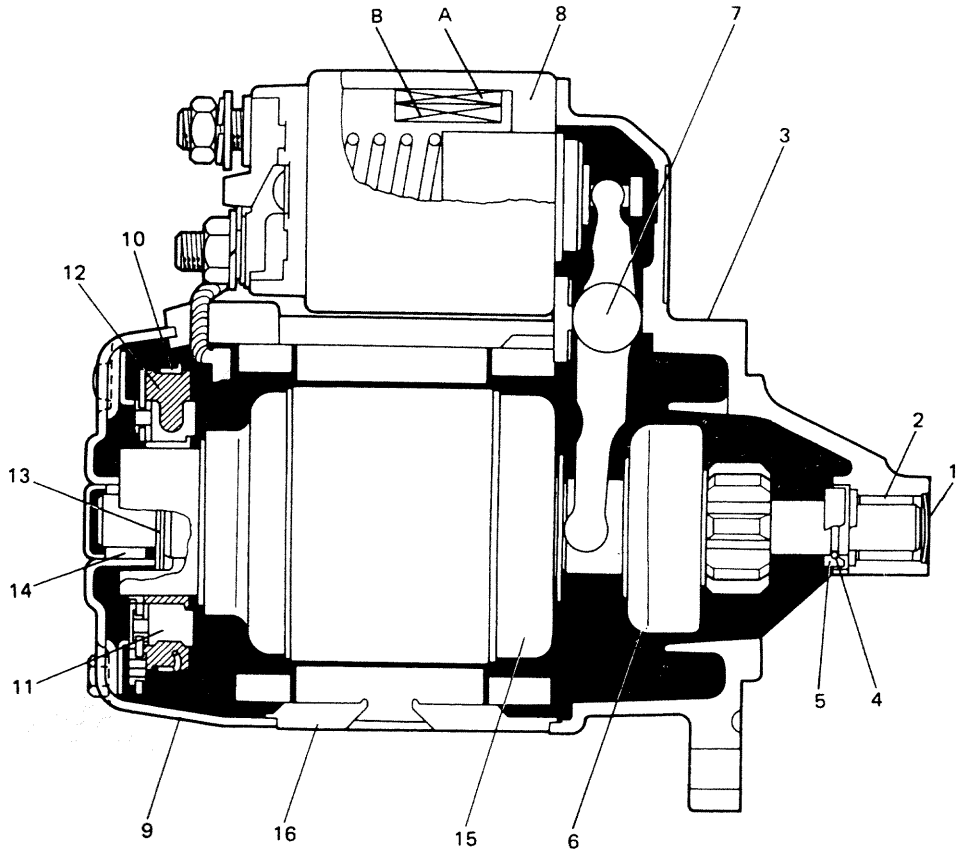
The cranking circuit consists of the battery, starting motor, ignition switch, clutch switch and related electrical wiring. These components are connected electrically as shown in Fig. 9-1. Only the starting motor will be covered in this portion.

STARTING MOTOR

The starting motor consists of parts shown in Fig. 9-2 and has field coils mounted in starting motor yoke (frame).

The magnetic switch assembly and parts in the starting motor are enclosed in the housings so that they will be protected against possible dirt and water splash.

In the circuit shown in Fig. 9-1, the magnetic (motor) switch coils are magnetized when the ignition switch is closed. The resulting plunger and pinion drive lever movement causes the pinion to engage the engine flywheel gear and the magnetic switch main contacts to close, and cranking takes place. When the engine starts, the pinion overrunning clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.



1. Drive housing cover
2. Drive bushing
3. Drive housing
4. Armature ring
5. Armature stop ring
6. Over-running clutch
7. Pinion drive lever
8. Magnetic switch
9. Commutator end cover
10. Brush spring
11. Brush holder
12. Brush
13. Washer
14. Commutator end bushing
15. Armature
16. Starting motor yoke

A : Hold-in coil
B : Pull-in coil

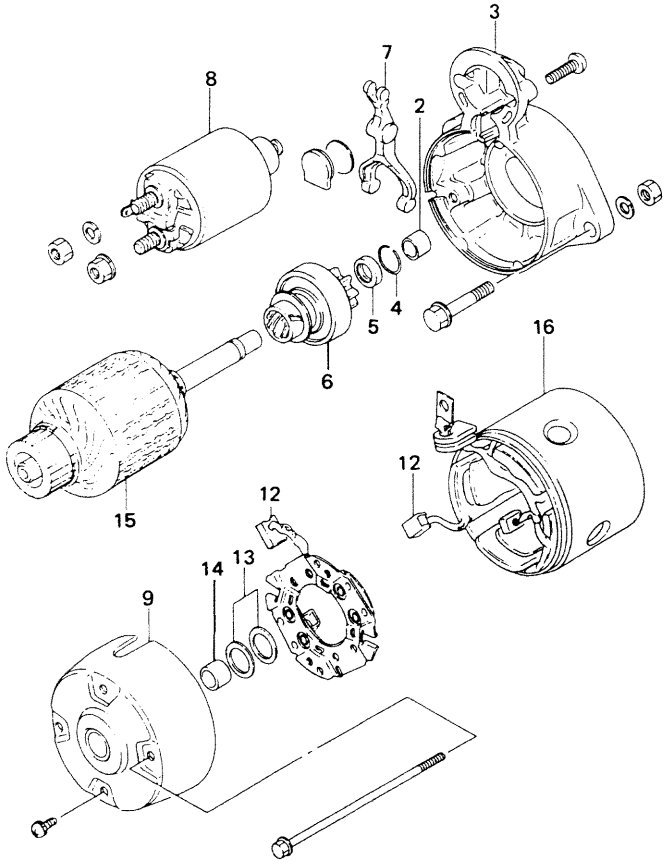


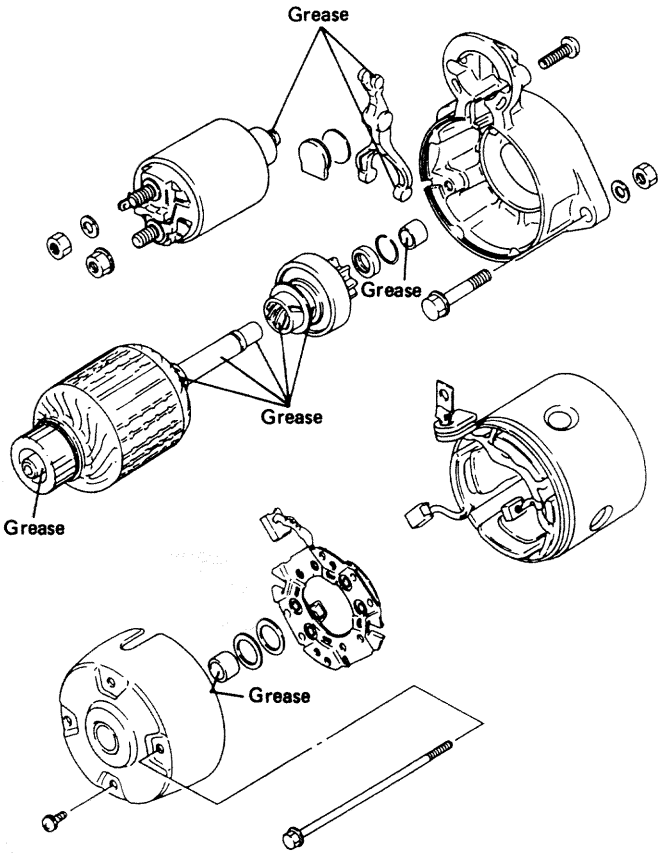
Fig. 9-2

9-2. SPECIFICATIONS

Voltage	12 volts
Output	0.9 kW
Rating	30 seconds
Direction of rotation	Clockwise as viewed from pinion side
Brush length	17 mm (0.67 in.)
Number of pinion teeth	8
No-load characteristic	60 A maximum at 11.5 volts, 6,600 r/min minimum
Load characteristic	150 A maximum at 9 volts and 0.29 kg-m torque, 1,900 r/min minimum
Locked rotor current	500A maximum at 5 volts, 1.15 kg-m minimum
Magnetic switch operating voltage	8 volts maximum

9-3. LUBRICATION

The starting motor does not require lubrication except during overhaul.
When the motor is disassembled for any reason, lubricate as follows:



Bearing grease
SUZUKI SUPER GREASE A
99000-25010

Fig. 9-3 Starting motor greasing point

9-4. REMOVAL AND INSTALLATION

Use following procedure to remove starter:

1) Disconnect negative battery lead at battery.
2) Disconnect magnetic switch lead wire (BLACK/YELLOW) and battery cable from starting motor terminals.
3) Remove two starting motor mount bolts.
4) Remove starting motor.
5) To install, reverse the above procedure.

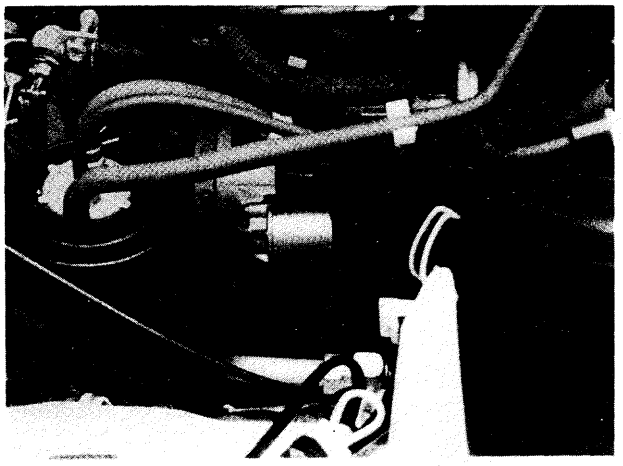


Fig. 9-4 Starting motor mounting

9-5. DISASSEMBLY

NOTE:
Before disassembling starting motor, be sure to put match marks at two locations (Ⓐ and Ⓑ) as shown in the figure below so that any possible mistakes can be avoided.

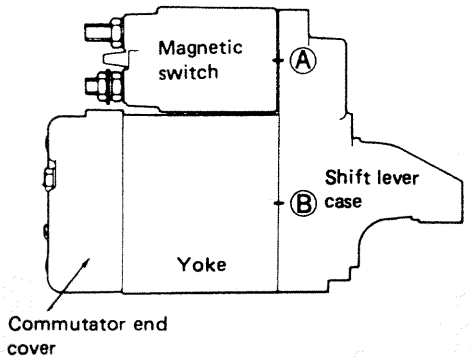


Fig. 9-5

1) Remove nut securing the end of field coil lead to terminal on the head of magnetic switch.

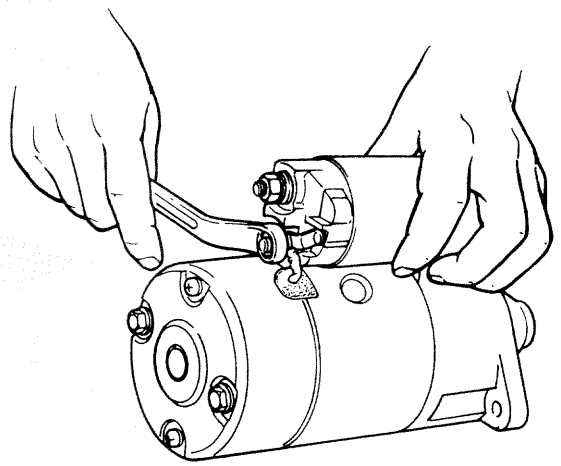


Fig. 9-6

2) Take off magnetic switch ① from starting motor body by removing two mounting screws.

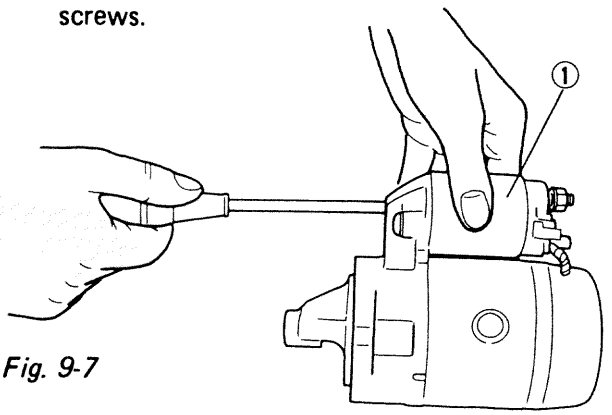


Fig. 9-7

3) Loosen 2 bolts and 2 screws to remove commutator end cover.
4) Separate drive housing and armature from yoke.

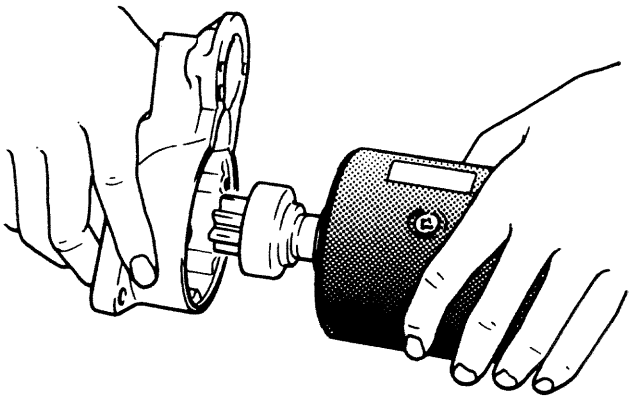


Fig. 9-8

5) Draw brushes out of holder.

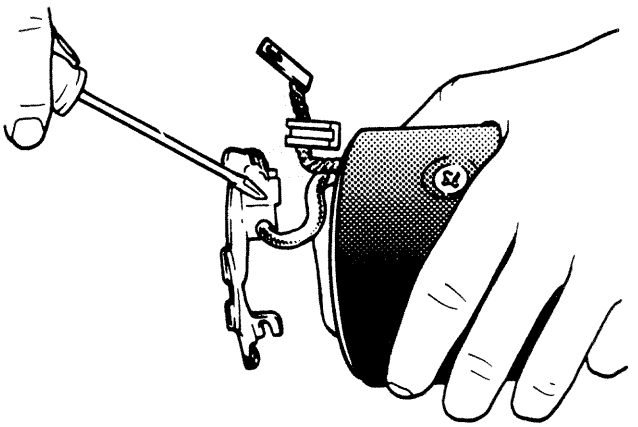


Fig. 9-9

6) Draw off over running clutch, as follows:
   (1) Draw stop ring ① toward clutch side.
   (2) Remove armature ring ② and slide off clutch.

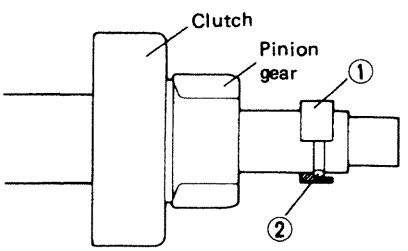


Fig. 9-10

9-6. STARTING MOTOR INSPECTION

1) Inspect Commutator

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

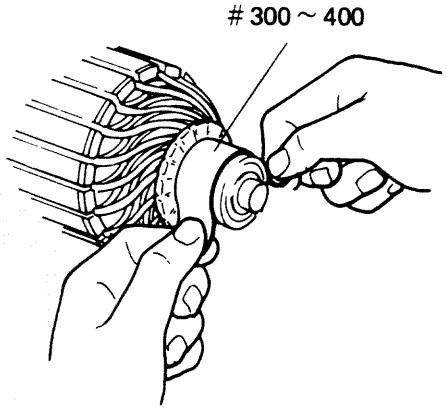


Fig. 9-11

Check commutator for uneven wear. If deflection of dial gauge pointer exceeds limit, repair or replace.

NOTE:

Below specification presupposes that armature is free from bend. Bent shaft must be replaced.

	Standard	Limit
Commutator out of round	0.05 mm (0.0019 in.) or less	0.4 mm (0.015 in.)

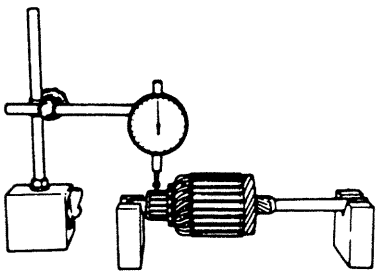


Fig. 9-12

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

	Standard	Limit
Commutator outside diameter	32 mm (1.26 in.)	31 mm (1.22 in.)

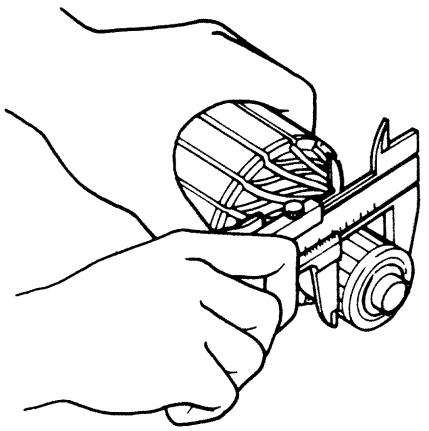


Fig. 9-13

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

	Standard	Limit
Commutator mica depth	0.4 – 0.6 mm (0.015 – 0.023 in.)	0.2 mm (0.0078 in.)

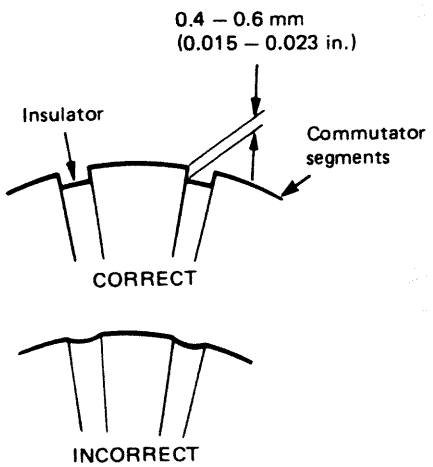


Fig. 9-14

Ground test

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

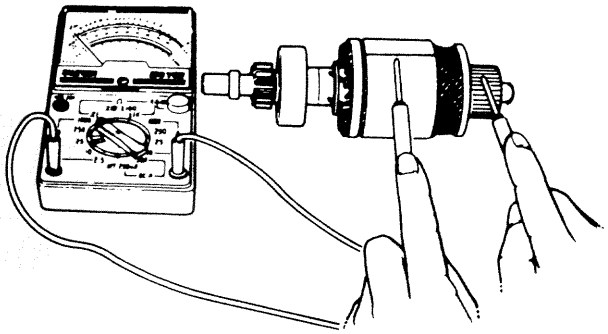


Fig. 9-15

Open circuit test

Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and armature must be replaced.

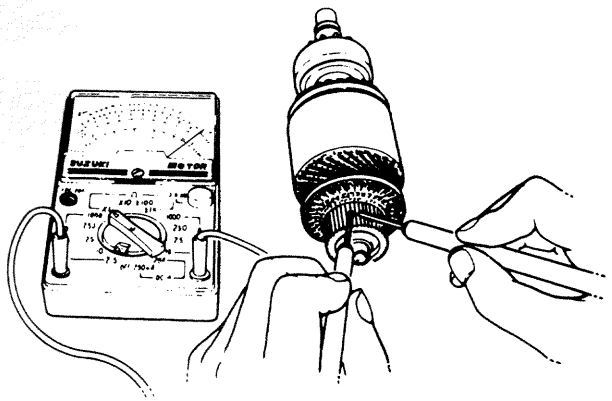


Fig. 9-16

2) Inspect Field Coil

Open circuit test

Check for continuity between brush and bare surface. If there is continuity, field windings are grounded. The field coil must be replaced.

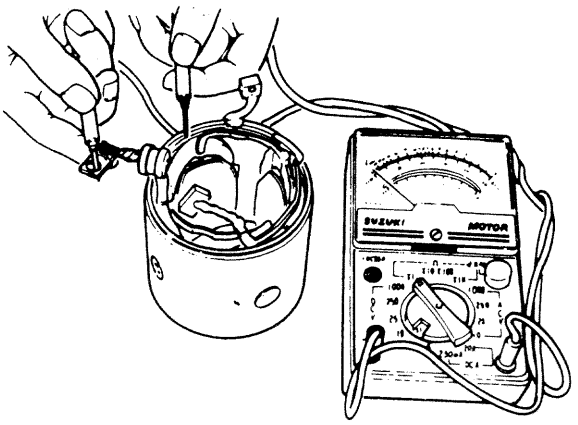


Fig. 9-17

3) Inspect Brush

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

	Standard	Limit
Brush length	17 mm (0.67 in.)	11.5 mm (0.45 in.)

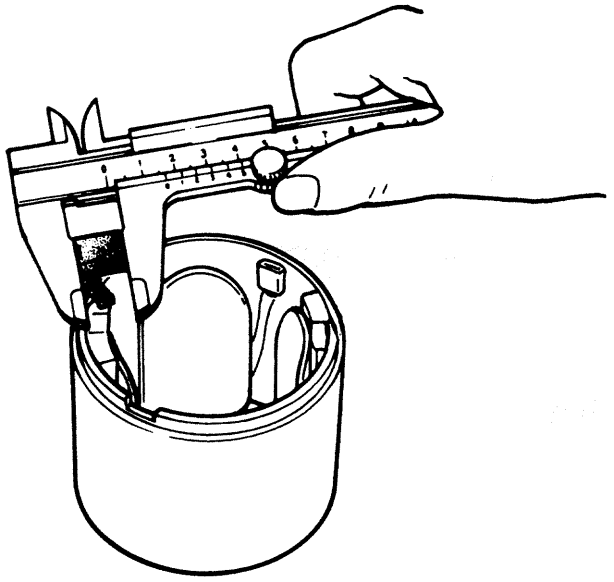


Fig. 9-18

4) Inspect Brush Holder and Spring

Check movement of brush in brush holder. If brush movement within brush holder is sluggish, check brush holder for distortion and sliding faces for contamination.

Clean or correct as necessary.

Check for continuity across insulated brush holder (positive side) and grounded brush holder (negative side).

If continuity exists, brush holder is grounded due to defective insulation and should be replaced.

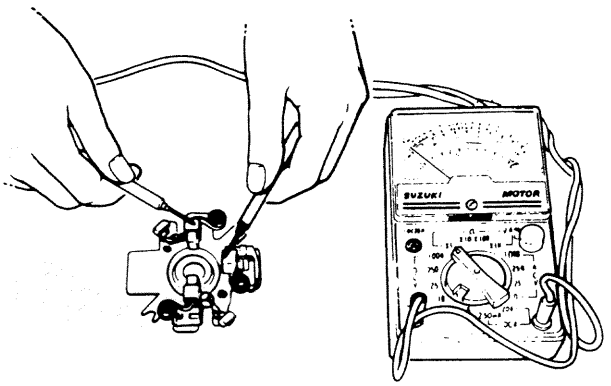


Fig. 9-19

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

	Standard	Limit
Brush spring tension	1.6 kg (3.53 lb)	1.0 kg (2.20 lb)

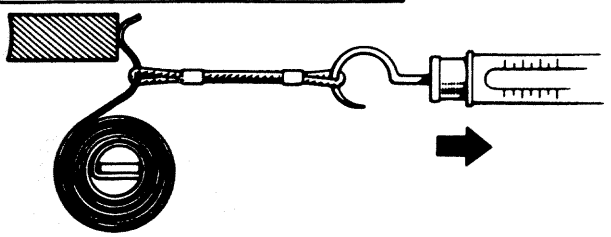


Fig. 9-20

5) Inspect Drive Lever

Inspect drive lever for wear. Replace if necessary.

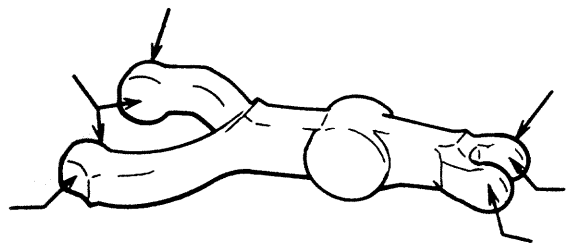


Fig. 9-21

6) Inspect Pinion

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.

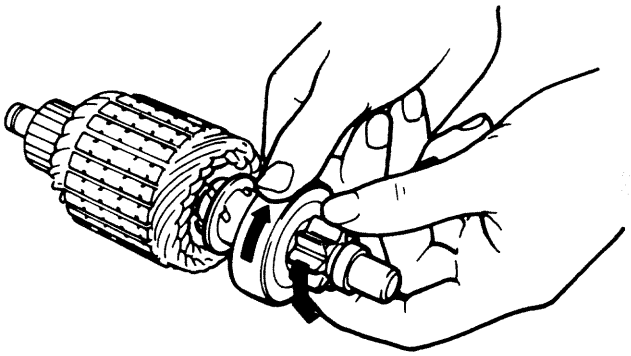


Fig. 9-22

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

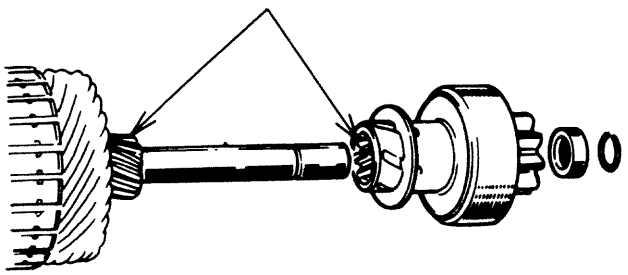


Fig. 9-23

7) Inspect Armature Shaft Bush

Inspect bushes for wear or damage. Replace if necessary.

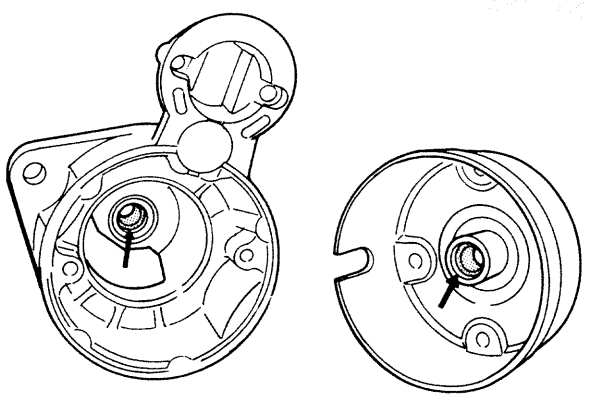


Fig. 9-24

8) Inspect Magnetic Switch

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

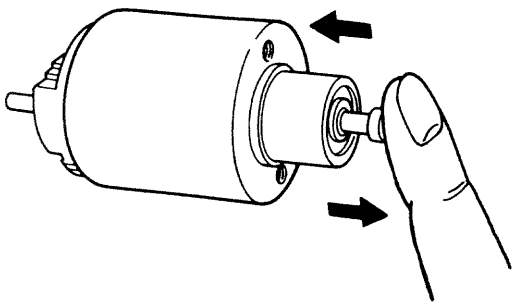


Fig. 9-25

Pull-in coil open circuit test

Check for continuity across magnetic switch 'S' terminal and 'M' terminal. If no continuity exists, the coil is open and should be replaced.

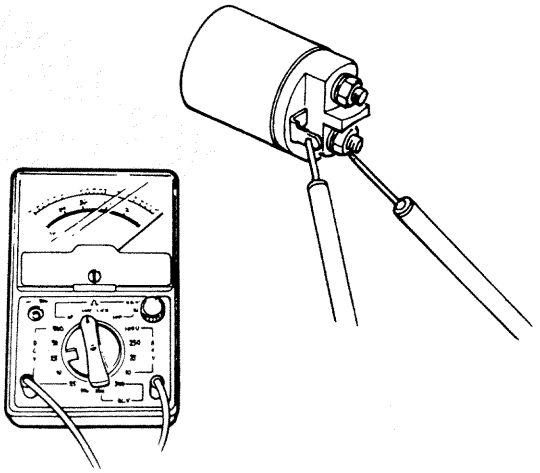


Fig. 9-26

Hold in coil open circuit test

Check for continuity across magnetic switch 'S' terminal and coil case. If no continuity exists, the coil is open and should be replaced.

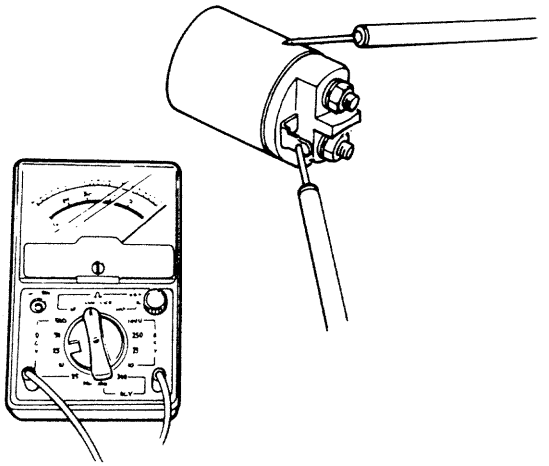
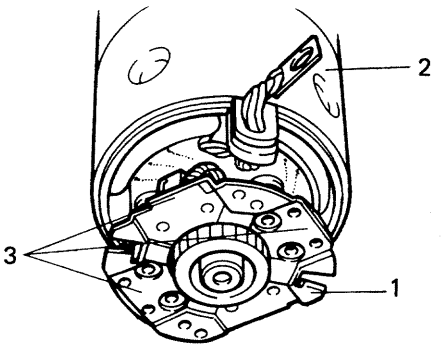


Fig. 9-27

REASSEMBLY

Reverse disassembly procedure, using care on following points.

- When installing pinion drive lever, refer to Fig. 9-2 for its installation direction.
- When installing brush holder, be careful of brush position.



1. Brush holder
2. Yoke
3. Brush positions

Fig. 9-27-1

9-7. PERFORMANCE TEST

IMPORTANT:
These tests must be performed within 3 – 5 seconds to avoid burning out the coil.

1) Pull-in Test

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

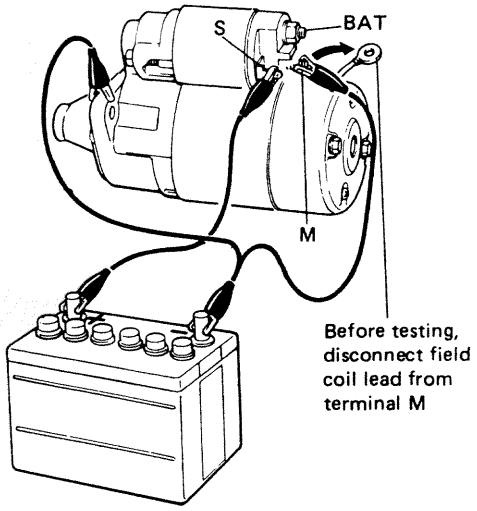


Fig. 9-28

2) 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.

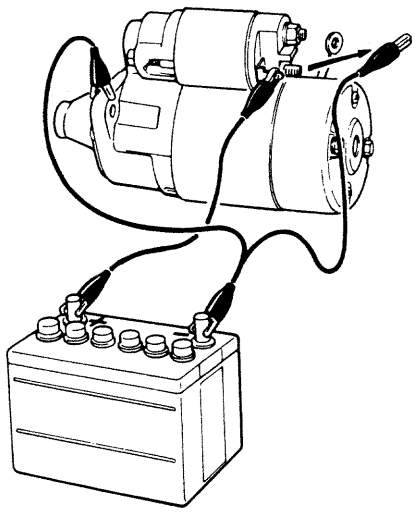


Fig. 9-29

3) Check Plunger Return

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

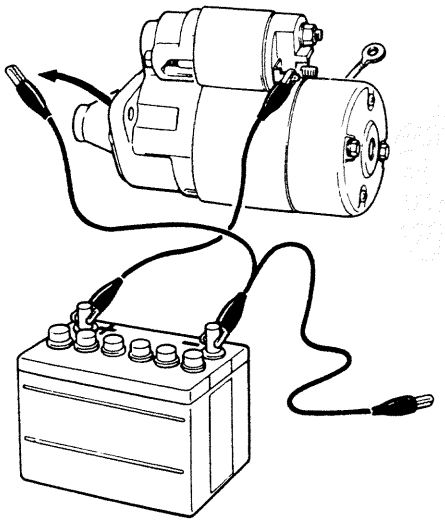


Fig. 9-30

4) No-load Performance Test

a) Connect battery and ammeter to starter as shown.
b) Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter reads the specified current.

Specified current
Less than 60 A at 11.5 V

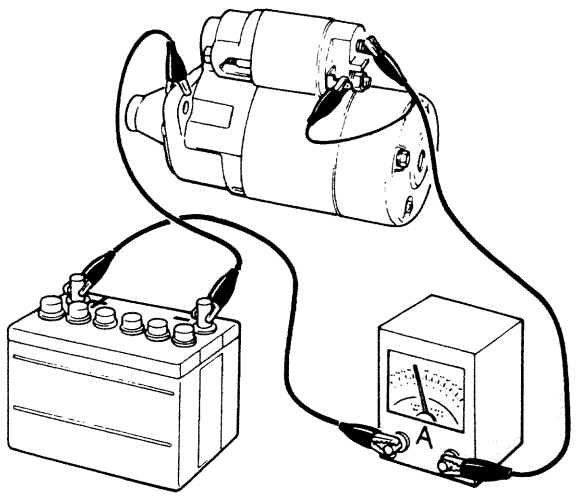


Fig. 9-31

9-8. CLUTCH SWITCH

Install clutch switch in such a way that clearance between thread end of clutch switch and clutch pedal (distance 3 in Fig. 9-32) satisfies following specification when clutch pedal is depressed fully.

Tighten clutch switch lock nut to specified torque.

Clutch switch thread end-to-clutch pedal clearance	1.0 – 1.5 mm (0.04 – 0.06 in)

Tightening torque for clutch switch lock nut	N·m	kg-m	lb-ft
	10 – 15	1.0 – 1.5	7.5 – 10.5

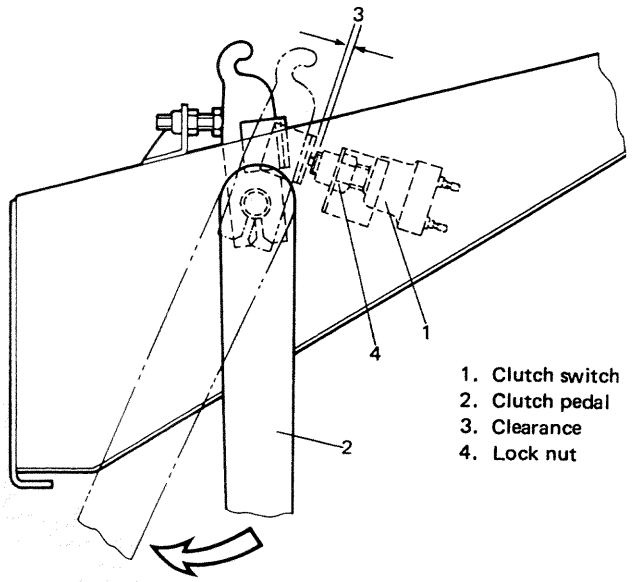


Fig. 9-32

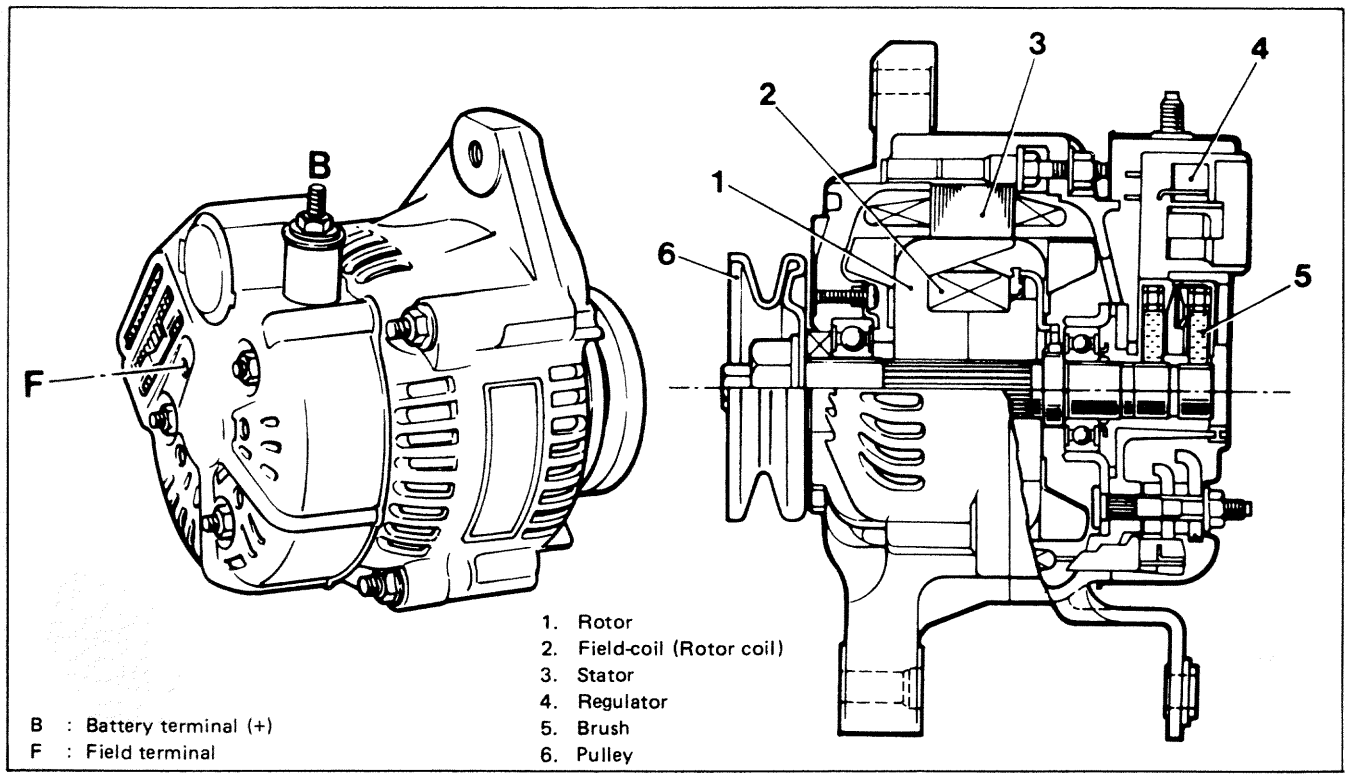
SECTION 10

CHARGING SYSTEM

CONTENTS

10-1. ALTERNATOR

GENERAL DESCRIPTION

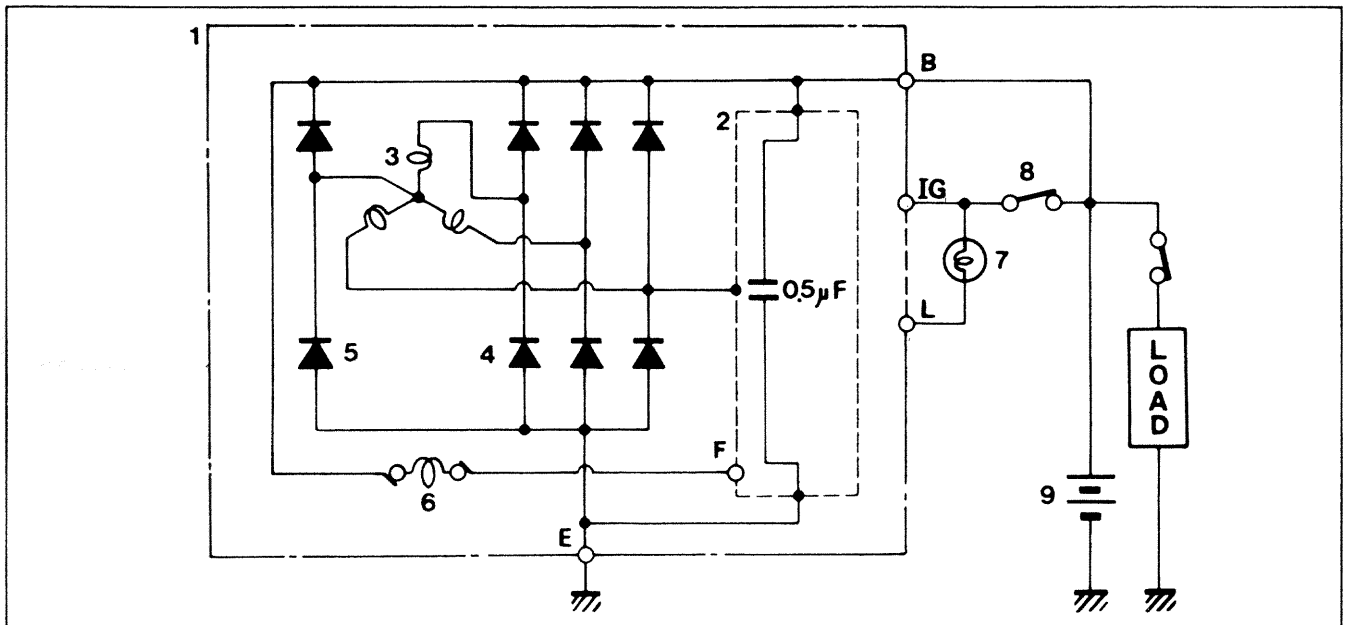


B : Battery terminal (+)
F : Field terminal

1. Rotor
2. Field-coil (Rotor coil)
3. Stator
4. Regulator
5. Brush
6. Pulley

Fig. 10-1

The basic charging system is the IC integral regulator charging system. The internal components are connected electrically as shown below.



1. Alternator with regulator ass'y
2. I.C. regulator
3. Stator coil
4. Diode
5. Neutral point diode
6. Field coil (rotor coil)
7. Charge indicator light
8. Main switch
9. Battery

Fig. 10-2

The alternator features a solid state regulator that is mounted inside the alternator. All regulator components are enclosed into a solid mold, and this unit along with the brush holder assembly is attached to the slip ring end frame. The regulator voltage setting cannot be adjusted.

The alternator 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 alternator 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 alternator output.

A condenser mounted in the end frame protects the diodes from high voltages and suppresses radio noise.

DATA AND SPECIFICATION

Nominal operating voltage	12 volts
Max. alternator output	45A
Polarity	Negative ground
No-load alternator speed	1,110 rpm (r/min)
Regulated voltage	14.5 ± 0.3 V
Direction of rotation	Clockwise as viewed from pulley side
Maximum permissible alternator speed	15,000 rpm (r/min)
Working temperature range	−30 ~ 90° C (−22 ~ 194° F)
Rectification	Full wave rectification

Noisy Alternator
Noise from the alternator may be caused by a loose drive pulley, loose mounting bolts, worn or dirty bearings, defective diode, or defective stator.

DIAGNOSIS

A charging circuit wiring diagram for alternator connection is shown above. To avoid damage, always follow these precautions:

1) Do not mistake the polarities of IG terminal and L terminal.
2) Do not create short circuit between IG and L terminals. Always connect these terminals through a lamp.
3) Do not connect any load between L and E.

Trouble in the charging system will show up as one or more of the following conditions:

a. Faulty indicator lamp operation.
b. An undercharged battery as evidenced by slow cranking or indicator clear with red dot.
c. An overcharged battery as evidenced by excessive spewing of electrolyte from the vents.

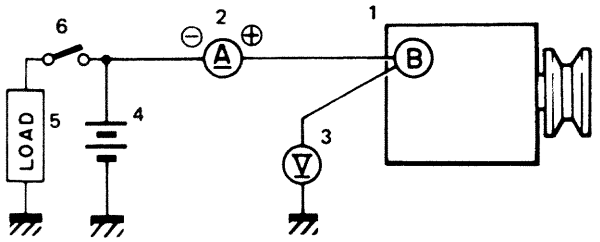
A. Faulty Indicator Lamp Operation

Problem	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 re-charging)	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

B. Undercharged Battery

This condition, as shown by slow cranking or indicator clear with red dot, can be caused by one or more of the following conditions even though the indicator lamp may be operating normally. The following procedures also apply to cars with a voltmeter.

1) Insure that the undercharged condition has not been caused by accessories left on for extended period.
2) Check drive belt for proper tension.
3) If a battery defect is suspected, refer to latter part of this section, p. 10-10 ~ p. 10-11.
4) Inspect wiring for defects. Check all connections for tightness and cleanliness, including slip connectors at alternator and bulkhead, and battery cable connections at battery, starter and ignition ground cable.
5) Connect voltmeter and ammeter as shown in the diagram below.



1. Generator
2. Ammeter
3. Volt meter
4. Battery
5. Load
6. Switch

Fig. 10-3

a. Voltmeter
Set between alternator (B) terminal and ground.
b. Ammeter
Set between alternator (B) terminal and battery (+) terminal.
6) Current and voltage measurements
a. No-load check
Run engine from idling up to 2,000 r/min (rpm) and read meters.

Standard current	10 A maximum
Standard voltage	14.2 – 14.8 V (at 25°C, 77°F)

NOTE:
Consideration should be taken that the voltage will vary somewhat with regulator case temperature.

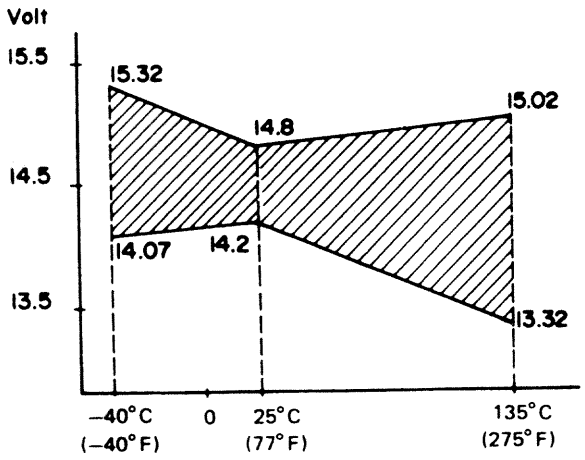


Fig. 10-4

If voltage is higher than standard value, replace IC regulator.
If voltage is below standard value, check IC regulator and alternator as follows:
Ground F terminal and start engine. Then measure voltage at B terminal.

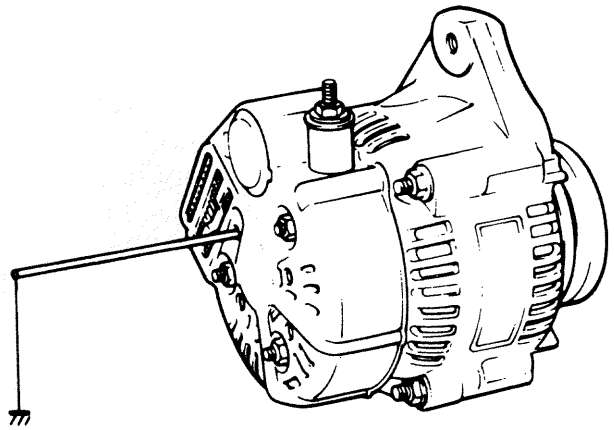


Fig. 10-5 Grounding terminal "F"

If voltage is above standard value, replace IC regulator.
If voltage is below standard value, check alternator.

b. Load check
Run engine at 2,000 r/min (rpm) and turn on headlamps and heater motor.
Measure current and if less than 20A, repair alternator.

C. Overcharged Battery

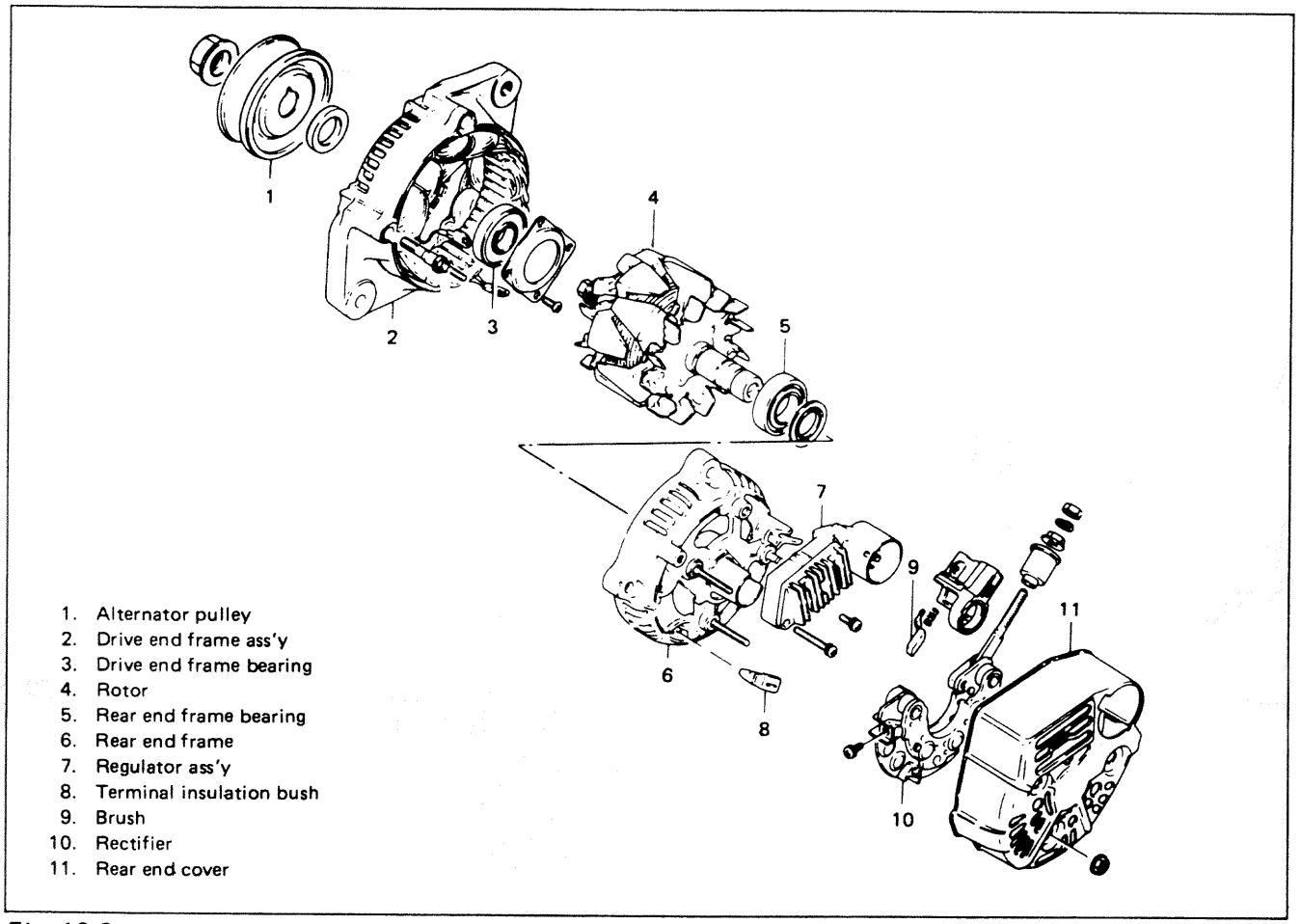
1) If an obvious overcharge condition exists as evidenced by excessive spewing of electrolyte, proceed to DISASSEMBLY under ALTERNATOR SERVICE on p. 10-6 and check field windings for grounds and shorts. If defective, replace rotor.

ALTERNATOR SERVICE

REMOVAL

1) Remove battery (−) terminal.
2) Disconnect alternator lead wires (coupler & white lead wire).
3) Unclamp brake pipe from pipe clamp on radiator under cover and remove radiator under cover.
4) Remove alternator mounting bolts and alternator drive belt adjusting bolt.
5) Take down alternator.

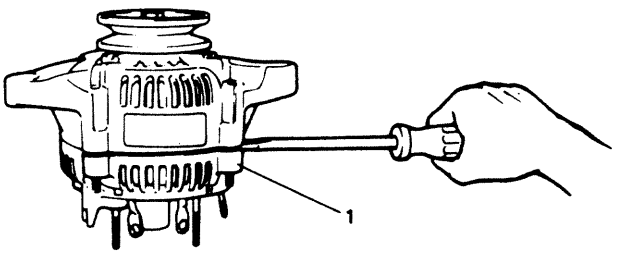
DIASSEMBLY



1. Alternator pulley
2. Drive end frame ass'y
3. Drive end frame bearing
4. Rotor
5. Rear end frame bearing
6. Rear end frame
7. Regulator ass'y
8. Terminal insulation bush
9. Brush
10. Rectifier
11. Rear end cover

Fig. 10-6

1) Remove nut and take off B terminal insulator bushing.
2) Remove 3 nuts and take off rear end cover.
3) Remove 2 regulator mounting screws and 3 brush holder screws and take off regulator and brush holder.
4) Remove 4 stator coil terminal screws.
5) Remove rectifier holder together with I.C. regulator.
6) Remove 4 nuts and take off rear end frame.



1. Rear end frame

Fig. 10-7

7) Loosen alternator pulley nut and take off pulley.

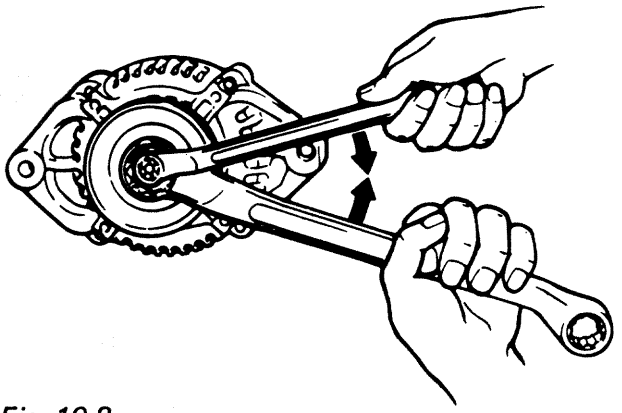


Fig. 10-8

8) Remove rotor from drive end frame.

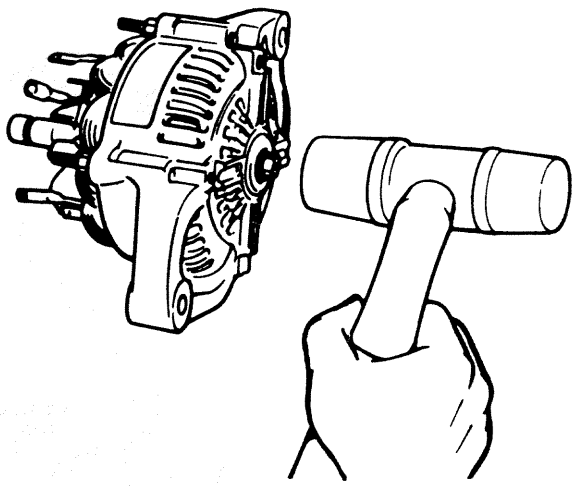
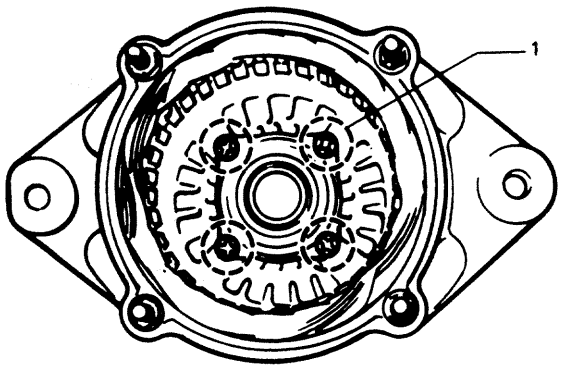


Fig. 10-9

9) When removing front end bearing, remove 4 4-mm bearing retainer screws.



1. Bearing retainer fitting screw

Fig. 10-10

10) When removing rear bearing, use bearing puller.

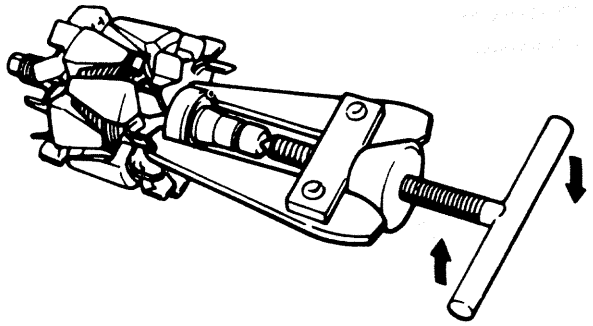


Fig. 10-11

INSPECTION

Rotor

1) Check rotor for no open circuits
   Using an ohmmeter, check for continuity between slip rings.

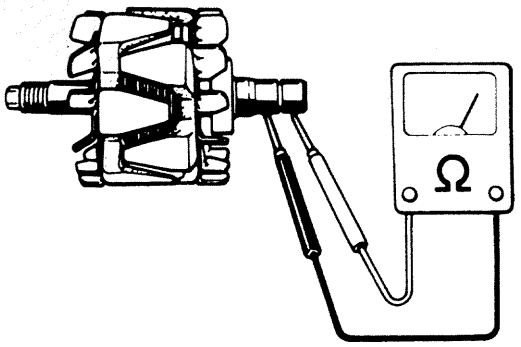


Fig. 10-12

Standard resistance	2.8 – 3.0 Ω

If there is no continuity, replace rotor.

2) Check rotor for no grounds.
   Using an ohmmeter, check that there is no continuity between slip ring and rotor. If there is continuity, replace rotor.

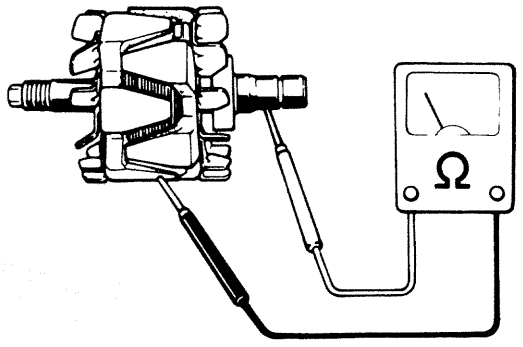


Fig. 10-13

3) Inspect slip rings
   Check slip rings for roughness or scoring. If rough or scored, replace rotor.

Stator

1) Check stator for no open circuits
   Using an ohmmeter, check all leads for continuity. If there is no continuity, replace stator.

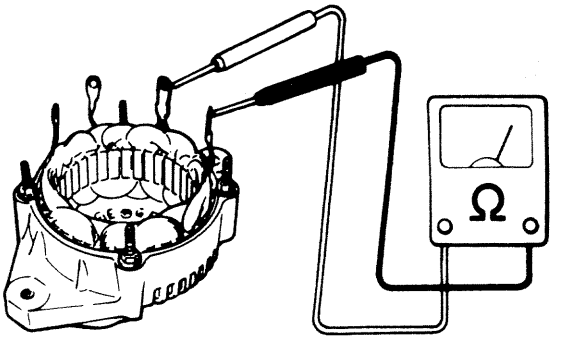


Fig. 10-14

2) Check stator for no grounds
   Using an ohmmeter, check that there is no continuity between coil leads and stator core. If there is continuity, replace rotor.

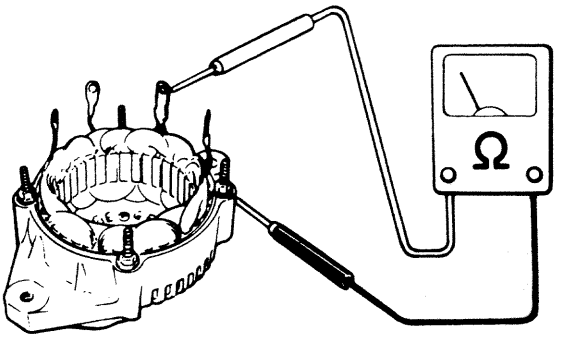


Fig. 10-15

Brush and Brush holder

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	Standard	Service limit
	11 mm (0.43 in)	5 mm (0.20 in)

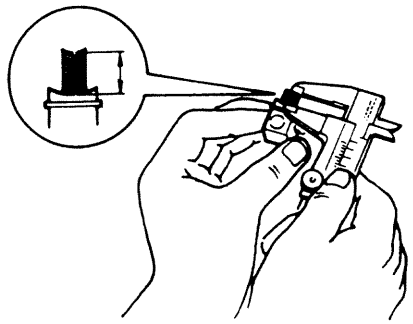


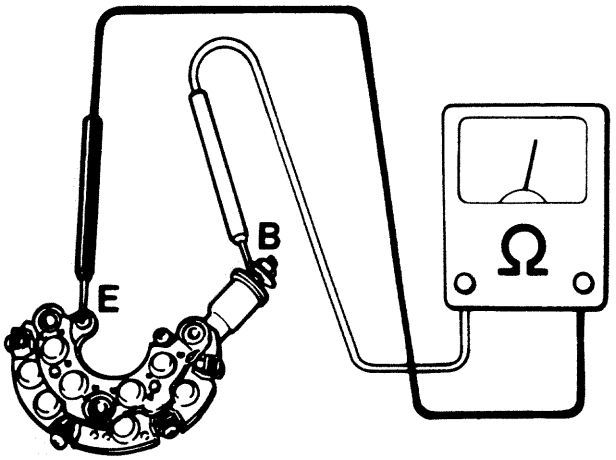
Fig. 10-16

Rectifier

Using an ohmmeter, check continuity between "B" terminal and ground.

Put one tester lead to terminal "B" and the other lead to ground; then swap two leads. Of two tester indications, one should be about 10 ohms, meaning continuity, and the other should be infinity (non continuity).

If not, replace rectifier assembly.



B : Battery terminal
E : Earth

Fig. 10-17

Condenser

Check condenser capacity in regulator.

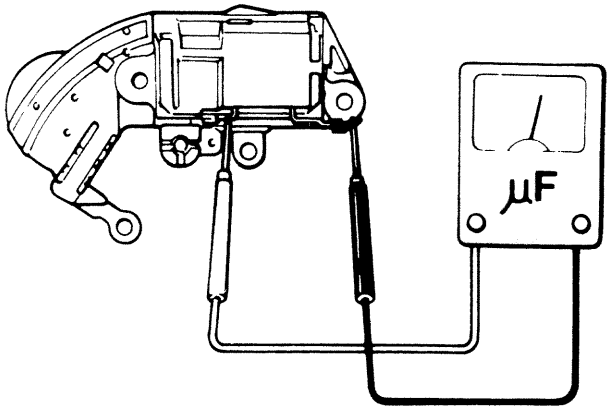


Fig. 10-18

Condenser capacity	0.5 μF

ASSEMBLY

Reverse disassembly procedure, using care on following points.

1) Use a press when forcing bearing into rotor shaft or drive end frame.

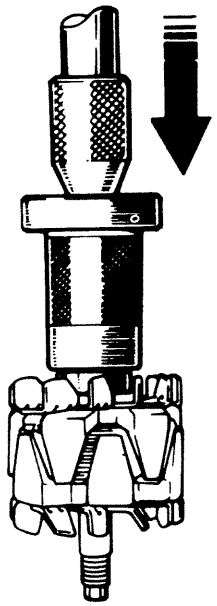
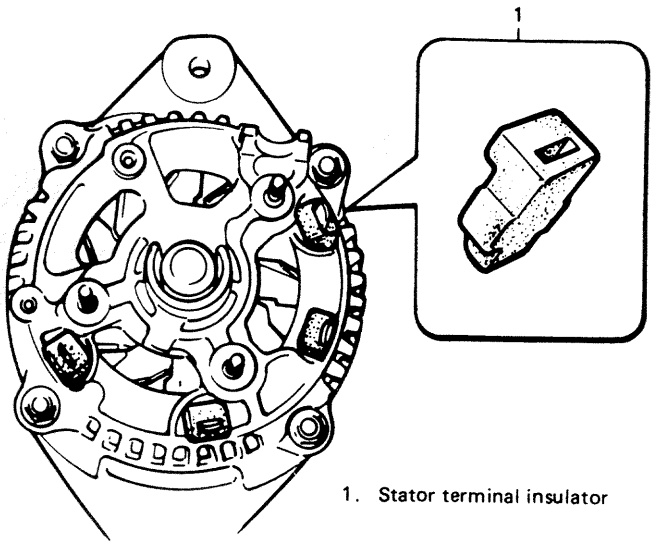


Fig. 10-19

2) Alternator pulley tightening torque.

Tightening torque		
50 – 65 N·m	5.0 – 6.5 kg-m	37 – 47 lb-ft

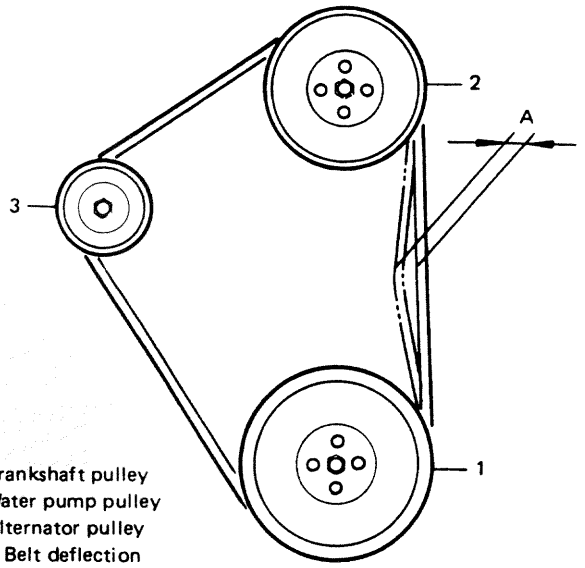
3) Make sure to assemble stator terminal insulator properly.



1. Stator terminal insulator

Fig. 10-20

4) Alternator V belt tension.



1. Crankshaft pulley
2. Water pump pulley
3. Alternator pulley
A : Belt deflection

Fig. 10-21

Drive belt deflection (Under 10 kg thumb pressure)	6 – 9 mm (0.24 – 0.35 in)

NOTE:
Clamp brake pipe with pipe clamp on radiator under cover after installing radiator under cover.

10-2. 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.
Each new car shipped from the factory is fitted with following battery.

Model	55B24R (S) (NX100-S6 (S))
Rated capacity	137 kC (38 Ah)/5HR

This battery is completely sealed, except for six small vent holes in the top. These vent holes allows 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.

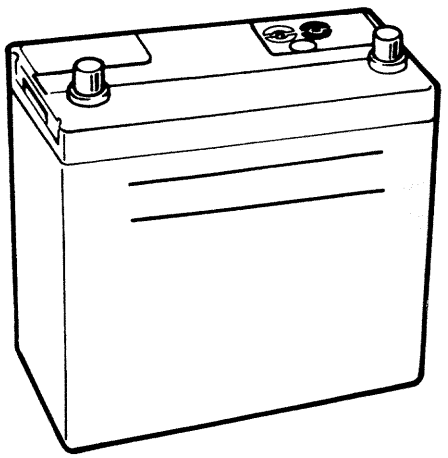


Fig. 10-22

CARE OF THE BATTERY

[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 over tightened.

[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 the battery. Determine cause of damage and correct as needed.

Check the battery terminal and cords for corrosion. If any, it should be cleaned.

[Built-in indicator]
This sealed battery has a built-in temperature compensated indicator in the top of the battery. This indicator is to be used with the following diagnostic procedure. When observing the indicator, make sure that the battery has a clean top. A light may be needed in some poorly-lit areas.

Under normal operation, two indications can be seen

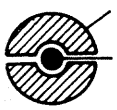
1		OK
2		CHARGING NECESSARY

Fig. 10-23

- **Clear with Red Dot**

This means the discharging battery. In this case, charge the battery until the indicator will be blue with red dot. The charging and electrical systems should also be checked at this time. If any defective is found, correct it. While charging it, if the battery feels hot 52°C (125°F), or if violent gassing or spewing of electrolyte through the vent hole occurs, discontinue charging or reduce charging rate.

[Jump starting in case of emergency with auxiliary (booster) battery]

NOTE:
- **Do not push or tow the vehicle to start. Damage to the emission system and/or to other parts of the vehicle may result.**
- **Both booster and discharged battery should be treated carefully when using jumper cables. Follow the procedure outlined below, being careful not to cause sparks:**

CAUTION:
- **Departure from these conditions or the procedure 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; and/or (2) damage to electronic components of either vehicle.**
- **Never expose battery to open flame or electric spark-batteries generate a 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 - fluid is a corrosive acid. Flush any contacted area with water immediately and thoroughly. Be careful that metal tools or jumper cables do not contact the positive battery terminal (or metal in contact with it) and any other metal on the car, because a short circuit could occur. Batteries should always be kept out of the reach of children.**

1) Set parking brake and place transmission in neutral. Turn off the ignition, turn off lights and all other electrical loads.
2) Check electrolyte level. If level is below low level line, replace battery.

NOTE:
When jump starting an engine with charging equipment, be sure equipment used is 12-volt and negative ground. Do not use 24-volt charging equipment. Using each equipment can cause serious damage to the electrical system or electronic parts.

3) Attach the end of one jumper cable to the positive terminal of the booster battery and the other end of the same cable to the positive terminal of the discharged battery. Do not permit vehicles to touch each other as this could cause a ground connection and counteract the benefits of this procedure. (Use 12-volt battery only to jump start the engine).
4) Attach one end of the remaining negative cable to the negative terminal of the booster battery, and the other end to a solid engine ground (such as A/C compressor bracket or generator mounting bracket) at least 18 inches from the battery of the vehicle being started (DO NOT CONNECT DIRECTLY TO THE NEGATIVE TERMINAL OF THE DEAD BATTERY).
5) Start the engine of the vehicle that is providing the jump start and turn off electrical accessories. Then start the engine in the car with the discharged battery.
6) Reverse these directions exactly when removing the jumper cables. The negative cable must be disconnected from the engine that was jump started first.

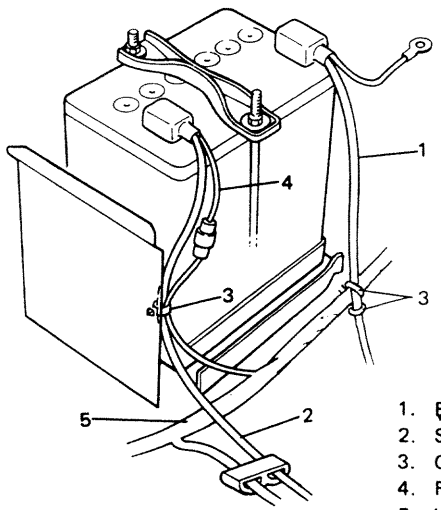
REMOVE AND REPLACE

When handling a battery, the following safety precautions should be followed:

1) Hydrogen gas is produced by the battery. A flame or spark near the battery may cause the gas to ignite.
2) 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 a battery, always disconnect the negative cable first, then the positive cable.

BATTERY CABLES

Connect battery cables as shown in the figure below and make sure to properly tighten all terminals.



1. Battery ground cable
2. Starter cable
3. Clamp
4. Fusible link
5. Wiring harness No. 2

Fig. 10-24

SECTION 11

CLUTCH

CONTENTS

11-1. GENERAL DESCRIPTION

The clutch is a diaphragm-spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapering fingers pointing inward. The disc, carrying four torsional coil springs, is slidably mounted on the transmission input shaft with a serration fit.

The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch release bearing is held back: This is the engaged condition of the clutch.

Depressing the clutch pedal causes the release bearing to advance and push on the tips of the tapering fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transmission input shaft.

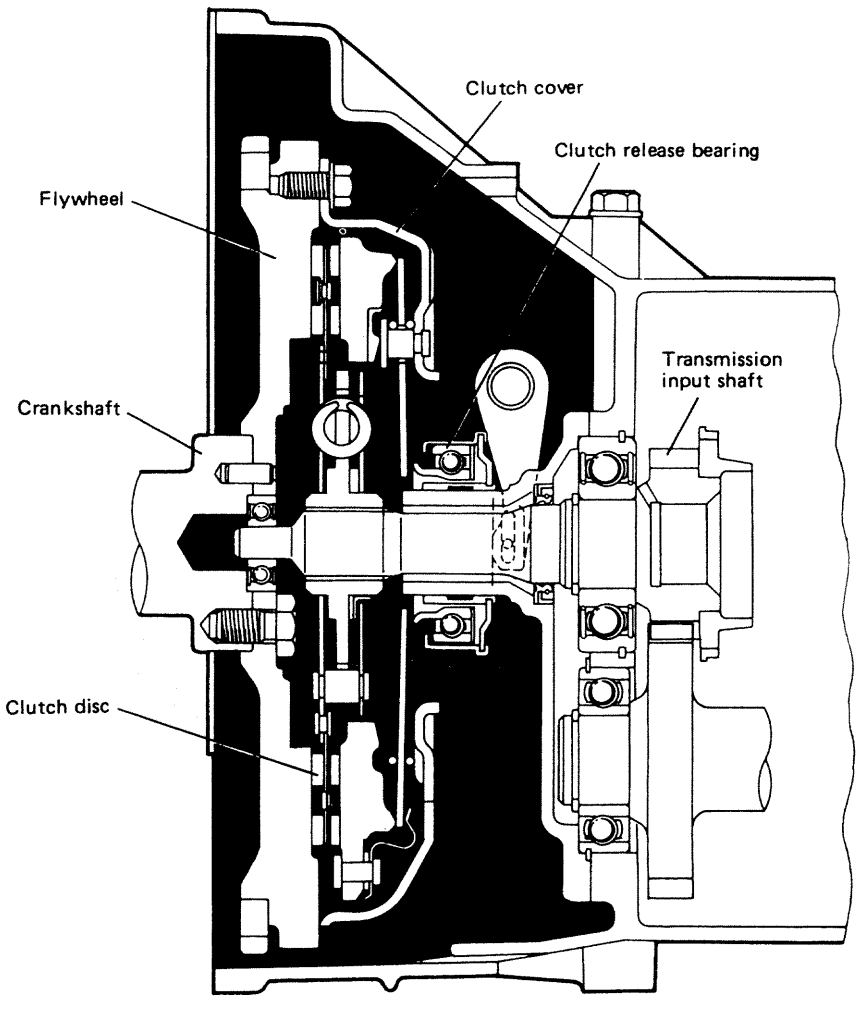
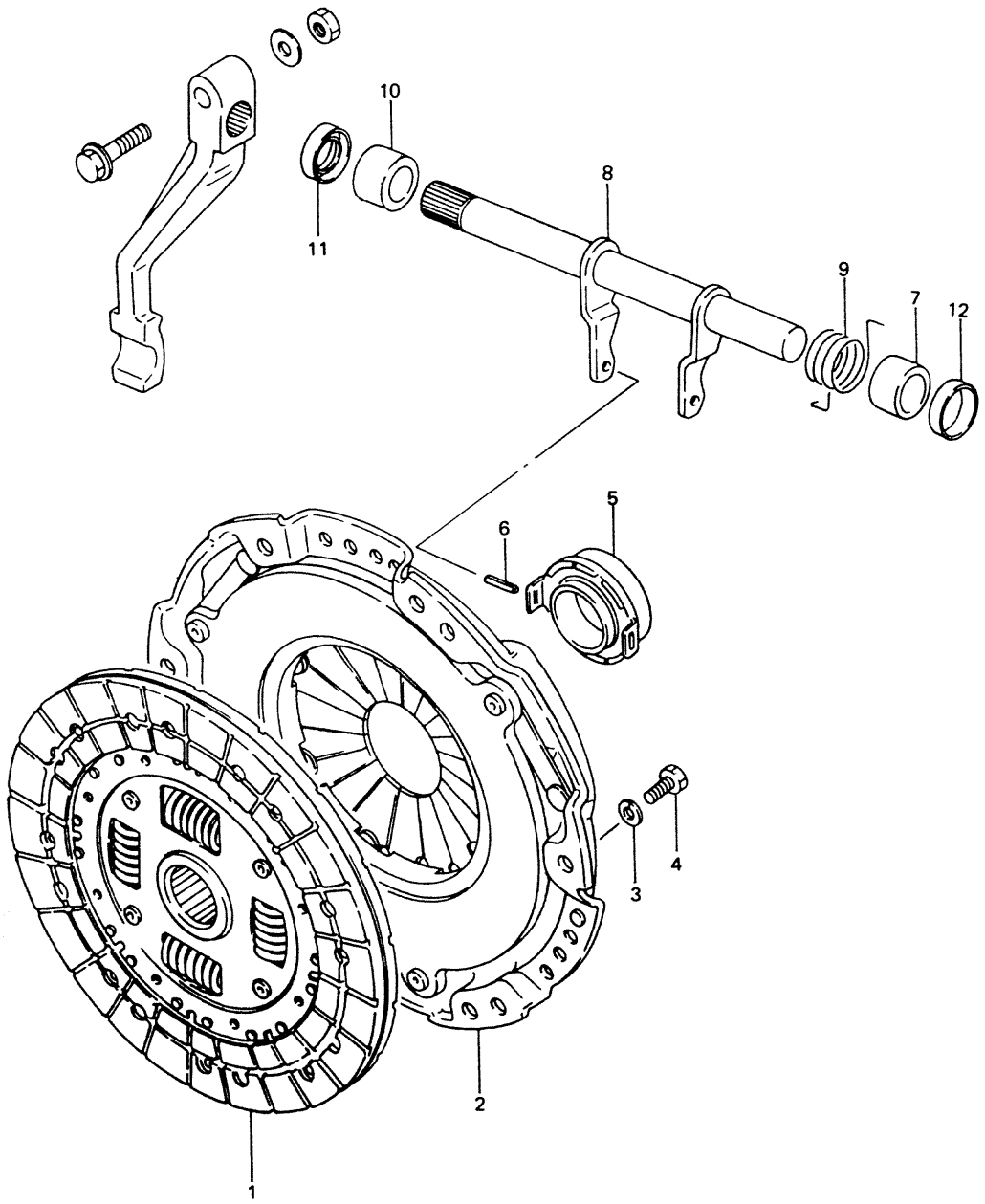


Fig. 11-1



1. Clutch disc
2. Clutch cover
3. Lock washer
4. Cover bolt
5. Clutch release bearing
6. Clutch release fork pin
7. No. 2 bushing
8. Clutch release shaft
9. Return spring
10. No. 1 bushing
11. Shaft seal
12. Shaft cover

Fig. 11-2

11-2. REMOVAL

Removal of clutch presupposes that the transmission has been dismounted according to the method outlined in SECTION 13 TRANSMISSION.

Clutch Cover and Disc

Remove 6 bolts securing clutch cover to flywheel, and take off clutch cover and disc.

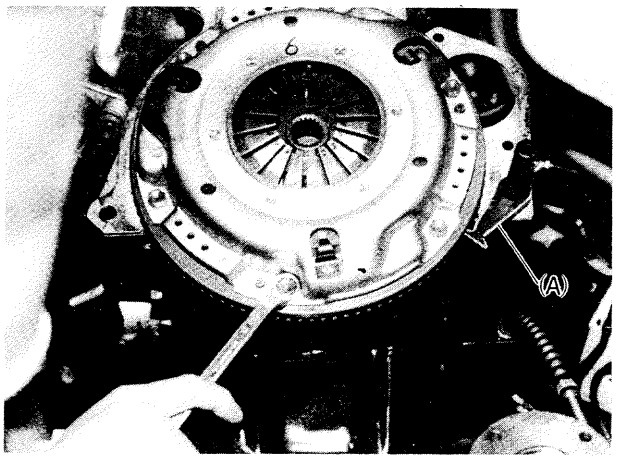


Fig. 11-3 Ⓐ Special tool (Flywheel holder 09924-17810)

Clutch Release Bearing

Remove clutch release bearing from transmission input shaft bearing retainer.

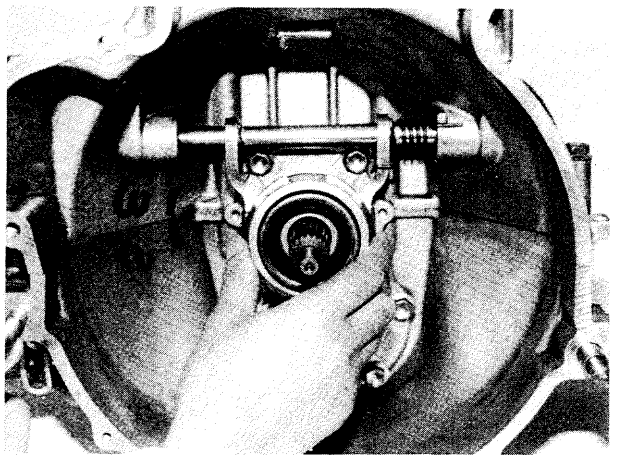
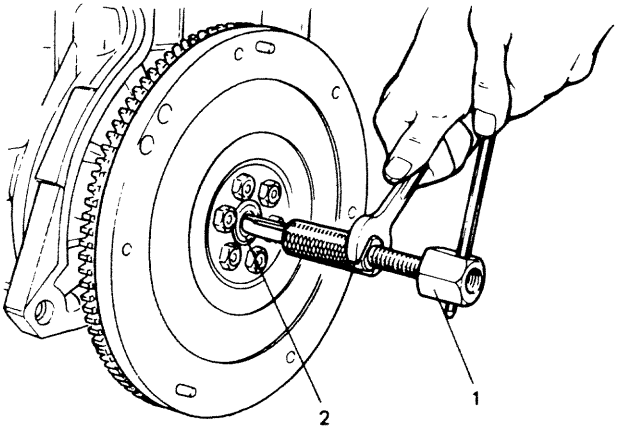


Fig. 11-4

Input Shaft End Bearing

Use bearing remover (special tool) for removal of this bearing.



1. Special tool (Bearing remover 09917-58010)
2. Input shaft bearing

Fig. 11-5

Clutch Release Shaft Bushes

For replacement of bushes, refer to p. 13-5 of SECTION 13 TRANSMISSION.

11-3. INSPECTION OF COMPONENTS

Clutch Disc Facing Surface Condition

A burnt or glazed (glass-like surface) facing can be reconditioned by grinding it with No. 120 – 200 sandpaper. If surface is in bad condition beyond repair, replace whole clutch disc assembly.

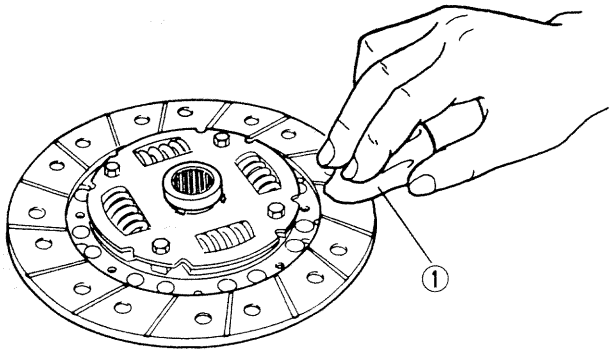


Fig. 11-6 ① Sandpaper

Clutch Facing Wear

Check wear of facing by measuring depth of each rivet head depression, i.e. distance between rivet head and facing surface. If depressing is found to have reached service limit at any of the holes, replace clutch disc assembly.

	Standard	Service limit
Rivet head depression	1.2 mm (0.05 in.)	0.5 mm (0.02 in.)

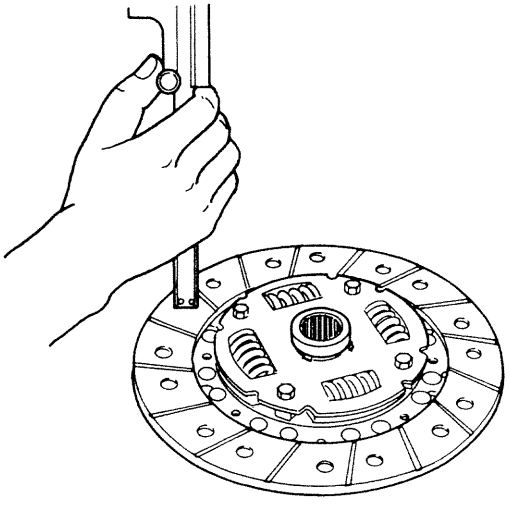


Fig. 11-7

Backlash in Disc Serration Fit

Check backlash by turning disc back and forth as mounted on transmission input shaft. Replace disc assembly if backlash is noted to exceed service limit. Backlash here is a circular displacement as measured with a dial indicator.

	Service limit
Backlash in serration fit	0.8 mm (0.03 in.)

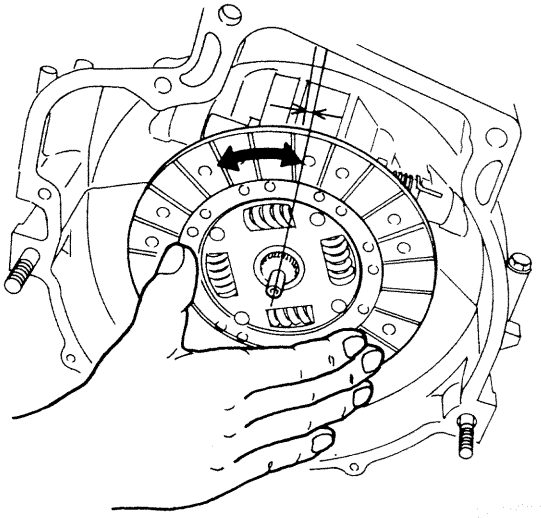


Fig. 11-8

Clutch Cover

Inspect clutch cover for evidence of diaphragm spring rivets getting loose. If rivets are loose or are getting loose, replace cover assembly as such cover makes rattling noise when clutch pedal is depressed.

Inspect tips of tapering fingers (to which the release bearing exerts a push to disengage clutch) for wear. If tips are worn excessively, replace cover assembly.

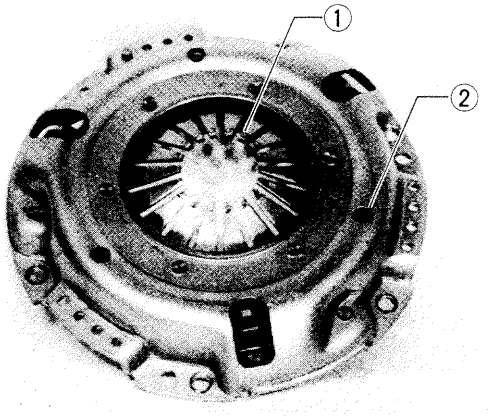


Fig. 11-9 ① Spring wear; ② Rivet

Release Bearing
Replace release bearing if it sticks, rattles or makes abnormal noise when spun and turned by hand.

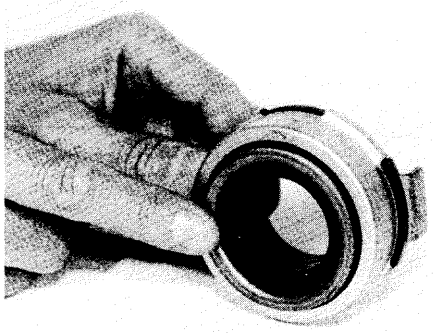


Fig. 11-10

Input Shaft Bearing
Replace input shaft bearing if it sticks, rattles or makes abnormal noise when spun and turned by hand.

Fig. 11-11

Flywheel
Check surface contacting clutch disc for any wear or damage.

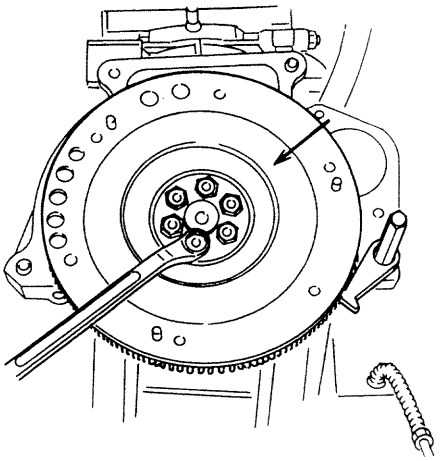


Fig. 11-12

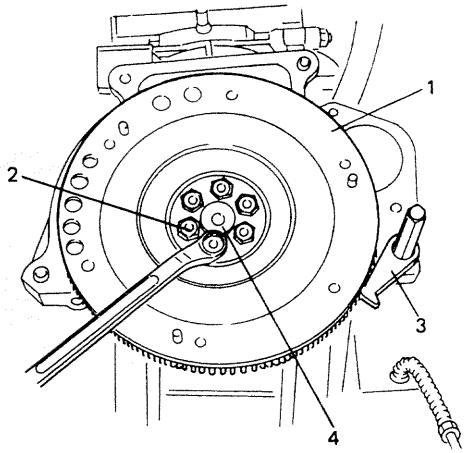
11-4. INSTALLATION

Install clutch by reversing removal procedure. Some important steps will be explained below.

Flywheel

1) Tighten bolts to specification.

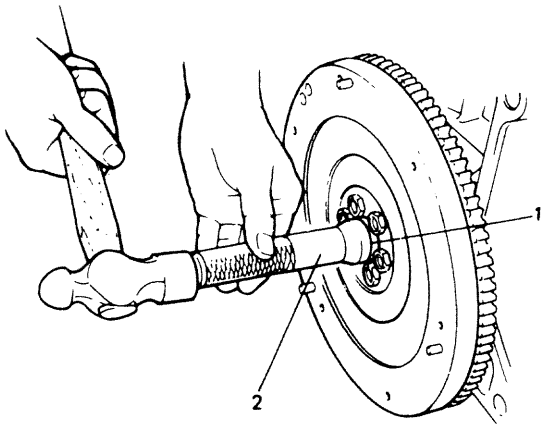
Tightening torque for flywheel bolts	N·m	kg-m	lb-ft
	57 – 65	5.7 – 6.5	41.5 – 47.0



1. Flywheel
2. Flywheel bolt
3. Special tool (Flywheel holder 09924-17810)
4. Input shaft bearing

Fig. 11-13

2) Install input shaft end bearing to flywheel using bearing installer (special tool).



1. Input shaft bearing
2. Special tool (Input shaft bearing installer 09925-98210)

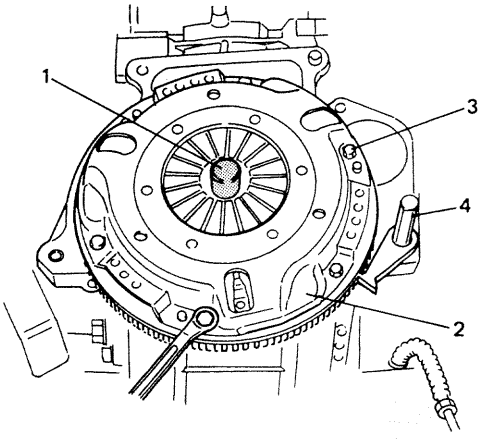
Fig. 11-13-1

Clutch Disc and Clutch Cover

Using special tool (clutch center guide), install clutch disc and clutch cover.

Tighten clutch cover bolts to specification using special tool (Flywheel holder).

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 09923-38220)
2. Clutch cover
3. Clutch cover bolt
4. Special tool (Flywheel holder 09924-17810)

Fig. 11-14

Clutch Release Bearing

Before installing retainer, apply grease to its inner surface.

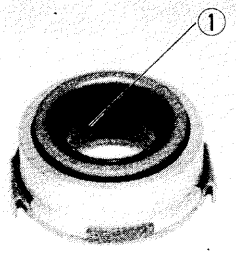


Fig. 11-15 ① Grease (SUZUKI SUPER GREASE "A")

Clutch Release Shaft Fork
Apply grease to end of fork.

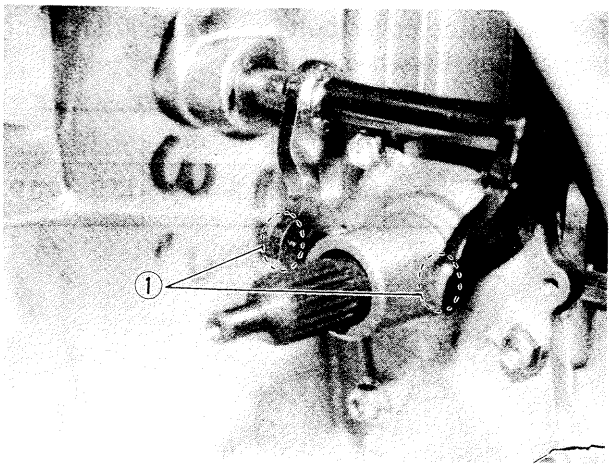


Fig. 11-16 ① Grease (SUZUKI SUPER GREASE "A")

Clutch Release Arm
Align two punch marks when installing clutch release arm on clutch release shaft.

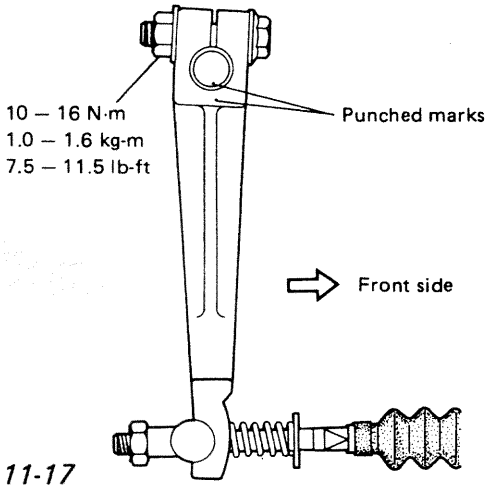


Fig. 11-17

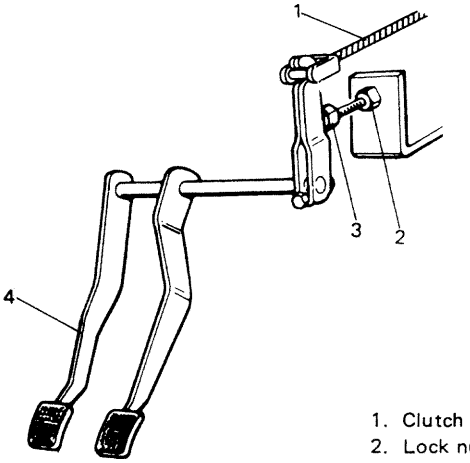
Clutch Release Shaft Bushes
For reinstallation of bushes, refer to p. 13-5 in SECTION 13 TRANSMISSION of this manual.

Transmission
For remounting transmission, refer to p. 13-4 in SECTION 13 TRANSMISSION of this manual and reverse dismounting procedure.

Before remounting transmission ass'y, apply grease (SUZUKI SUPER GREASE I) to input shaft. Refer to Fig. 13-84.

11-5. MAINTENANCE SERVICES

Clutch Pedal Height
Adjust height of clutch pedal with clutch pedal stop bolt so that pedal is level with brake pedal. Tighten lock nut after adjusting.

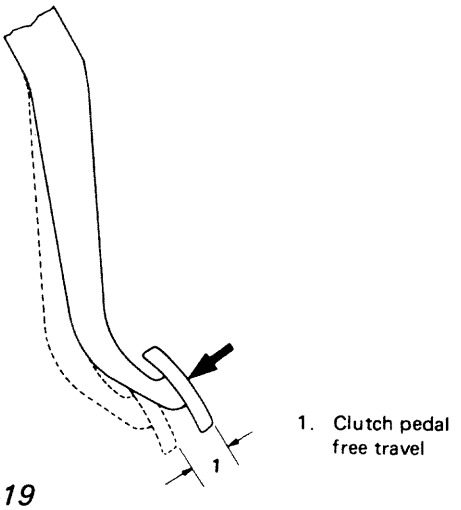


1. Clutch cable
2. Lock nut
3. Adjust bolt
4. Clutch pedal

Fig. 11-18

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 the following specification.

Clutch pedal free travel	20 – 30 mm (0.8 – 1.1 in.)



1. Clutch pedal free travel

Fig. 11-19

2) If free travel is out of specification, adjust it with clutch cable outer nuts.

NOTE:
After adjusting free travel, make sure that the clutch cable end protrudes at least 5 mm from joint nut.

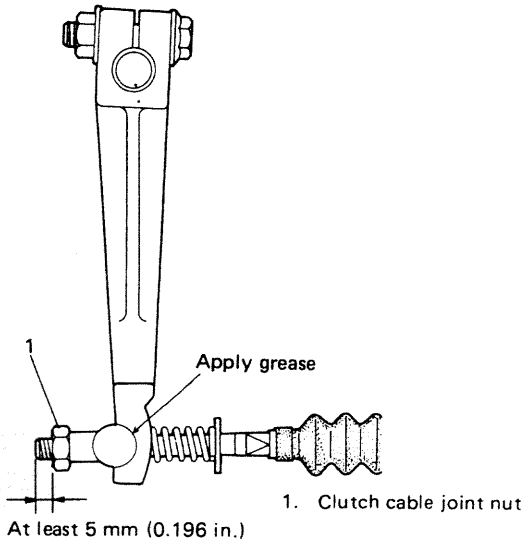


Fig. 11-20

Clutch Cable Lubrication
Apply grease to hook part ① of clutch cable.

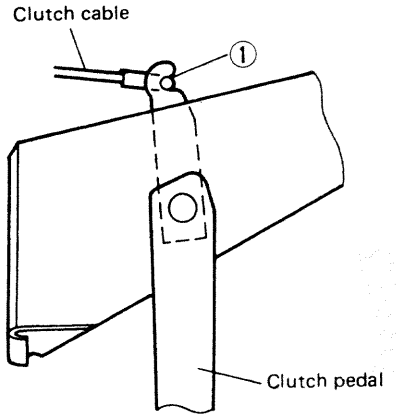


Fig. 11-21

Clutch Cable Routing
1) For left-hand side steering vehicle.

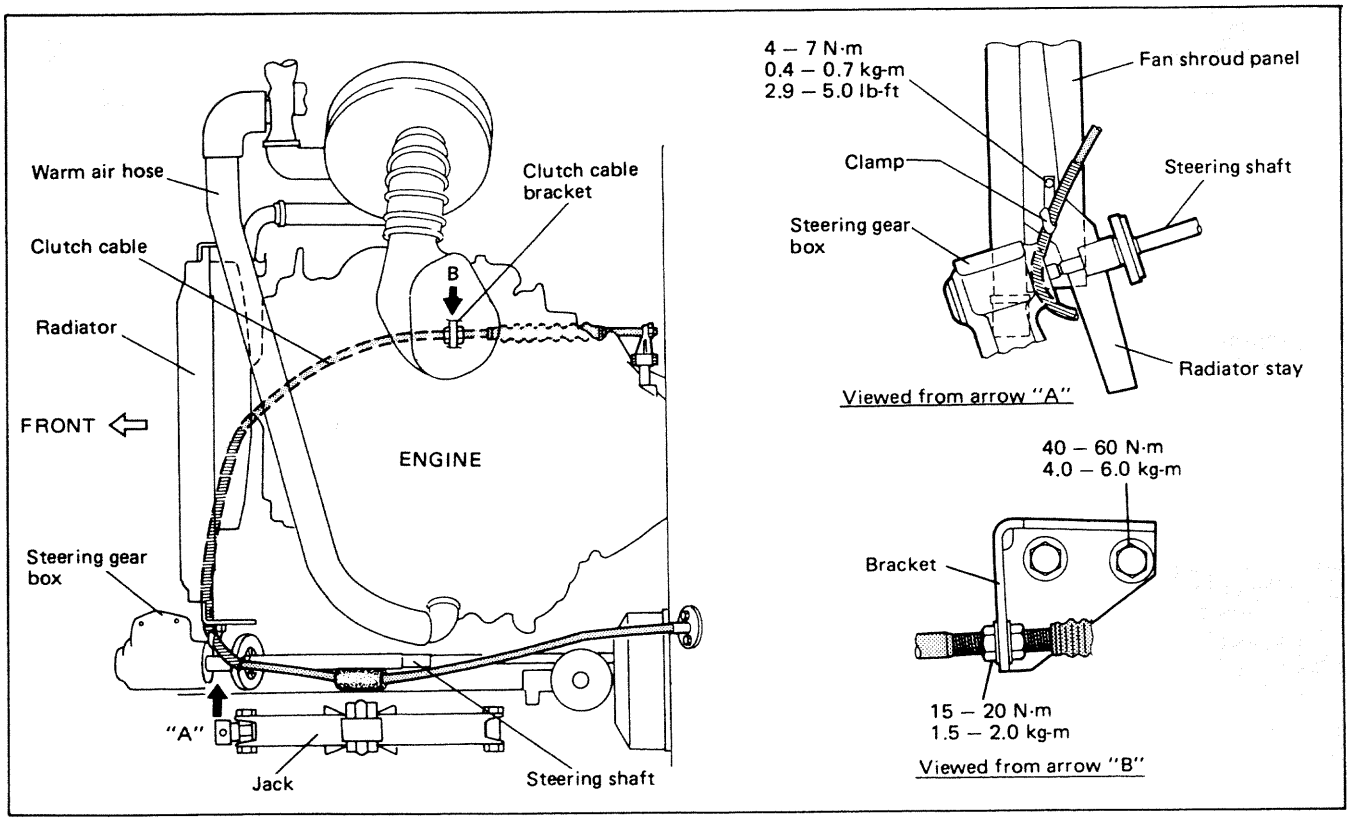


Fig. 11-22

2) For right-hand side steering vehicle.

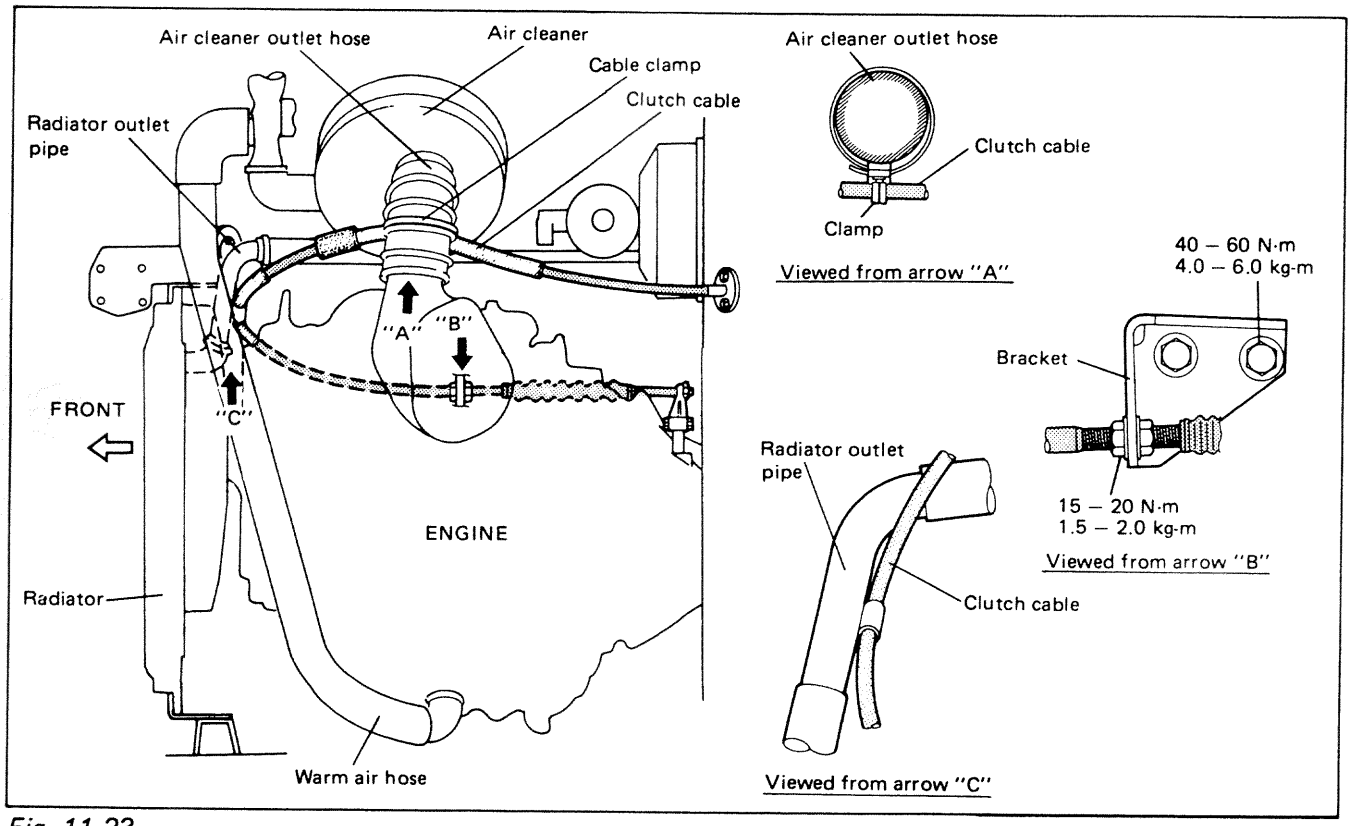


Fig. 11-23

11-6. RECOMMENDED TORQUE SPECIFICATION

Be sure to torque each nut or bolt, if loosened, to specification given below.
If specified tightening torque for particular bolt or nut is not included here, refer to p. 0-12 of this manual.

Fastening Parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Flywheel bolts	57 – 65	5.7 – 6.5	41.5 – 47.0
2. Clutch cover bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
3. Clutch release arm bolt and nut	10 – 16	1.0 – 1.6	7.5 – 11.5

SECTION 12

GEAR SHIFTING CONTROL

CONTENTS

12-1. GENERAL DESCRIPTION

In this gear shifting control system, by its mechanical structure, the movement of the gear shift lever, which is located beside the driver's seat, directly actuates the gear shift fork shaft to shift the gear into the selected position. This system consists of the following parts.

1. Gear shift lever knob
2. Gear shift lever
3. Gear shift lever boot No. 2
4. Gear shift lever boot No. 1
5. Gear shift lever case cover
6. Gear shift lever locating bolt
7. Gear shift lever case
8. Reverse select pin screw
9. Reverse select locating springs
10. Reverse select locating ball
11. Reverse select guide pin
12. Reverse gear shift fork shaft
13. High speed gear shift fork shaft
14. Select return springs
15. Low speed select pin bolt
16. Low speed select guide pin
17. Low speed gear shift fork shaft
18. Gear shift lever wave washer
19. Gear shift lever seat

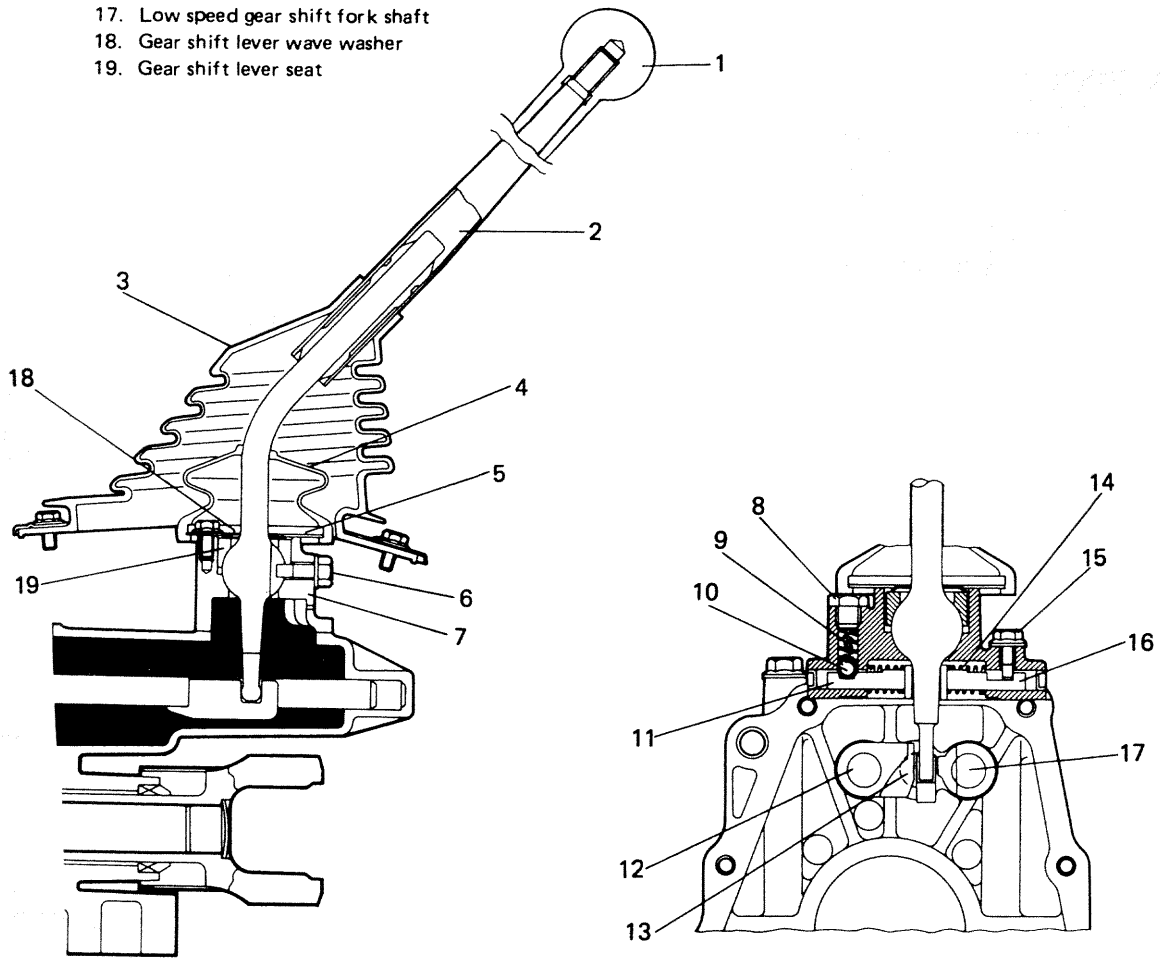


Fig. 12-1

12-2. REMOVAL

Gear Shift Lever

1) Remove bolts tightening gear shift lever boot No. 2 and take boot off floor center tunnel.

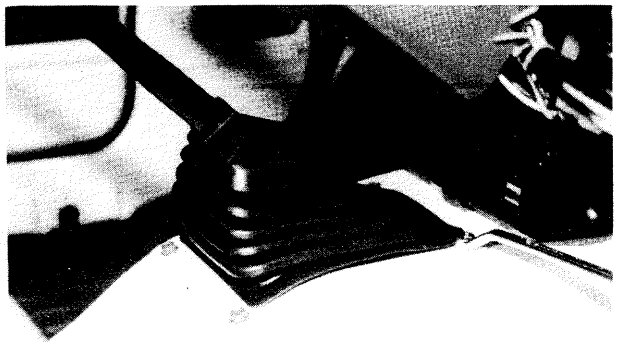


Fig. 12-2

2) Take boot No. 1 off gear shift lever case and move it up (toward knob).
3) Remove 3 bolts tightening gear shift lever case cover.

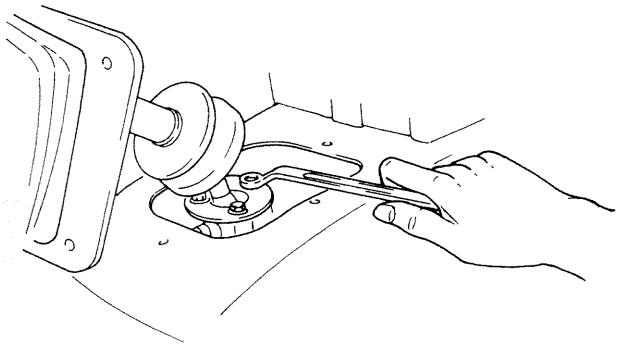


Fig. 12-3

4) Pull gear shift lever out of gear shift lever case.

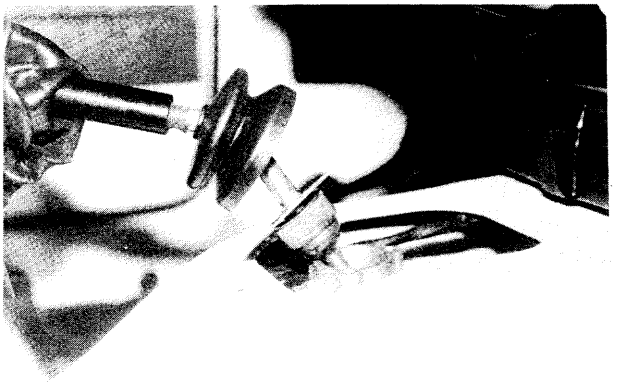


Fig. 12-4

Gear Shift Lever Select Guide Pins

1) After gear shift lever is removed according to foregoing steps 1) through 4), remove gear shift lever case by loosening its tightening bolts.

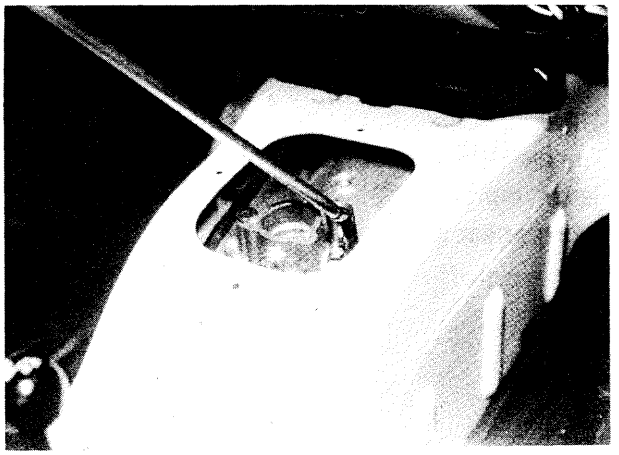


Fig. 12-5

2) Remove reverse select pin screw and take out spring and ball from case.
3) Remove low speed select pin bolt.
4) Compress reverse select guide pin ② against low speed select guide pin ① and take it out of gear shift lever case.

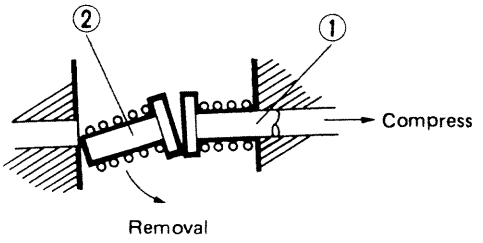


Fig. 12-6

12-3. INSPECTION OF COMPONENTS

Gear Shift Lever

Check lower end of gear shift lever where gear shift fork shaft contact, ① and ②, for wear and any kind of damage. Worn or damaged gear shift lever must be replaced with a new one.

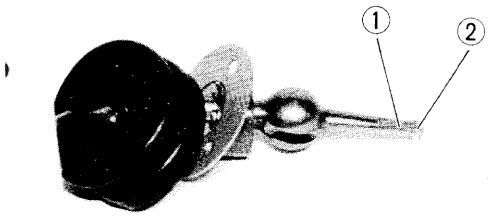


Fig. 12-7

Reverse & Low Speed Select Guide Pins

Check both select guide pins where gear shift lever contacts, ③, for stepped wear. Replace worn select guide pin.

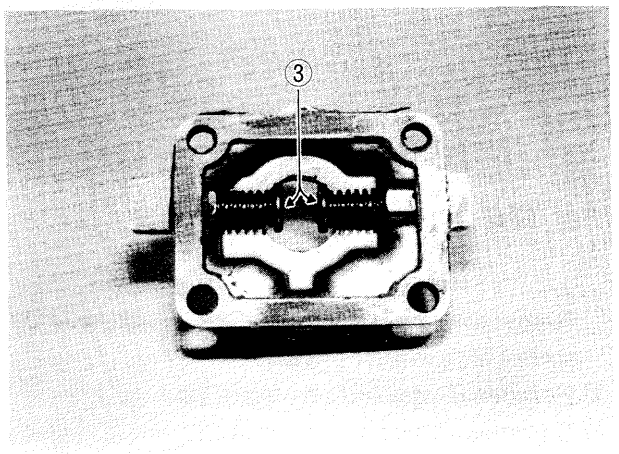


Fig. 12-8

Move shaft and check low speed select guide pin for smooth movement without rattle. If found defective, replace it and apply grease to pin.

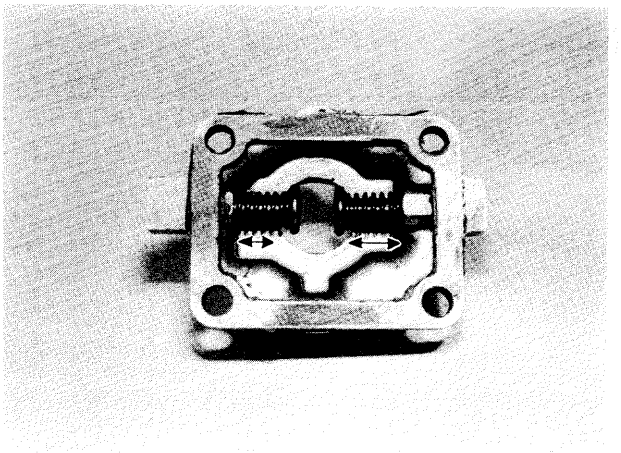


Fig. 12-9

Gear Shift Fork Shaft

Visually check each gear shift fork shaft (High, Low and Reverse) where gear shift lever contacts, ④, for wear. Worn shaft must be replaced.

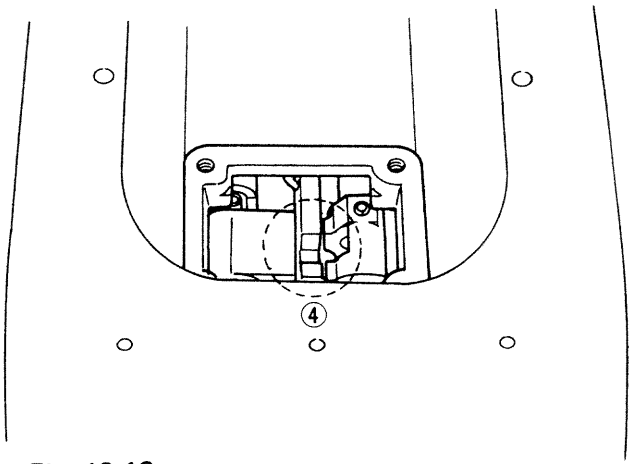


Fig. 12-10

12-4. INSTALLATION

Gear shift lever is installed by reversing removal procedure. Some important steps will be explained in detail.

Reverse & Low Speed Guide Pins

Be sure to apply grease to select guide pins before installing them into gear shift lever case.

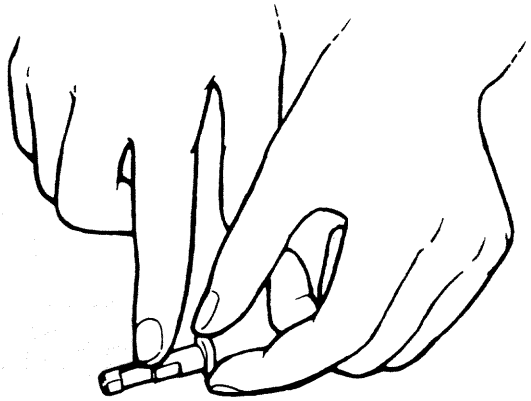


Fig. 12-11

When fitting low speed select guide pin into gear shift lever case, tighten locating bolt while pushing pin so that bolt goes in the groove provided in the pin. Then install reverse select guide pin in case and securely fit the locating ball in the groove provided in the pin.

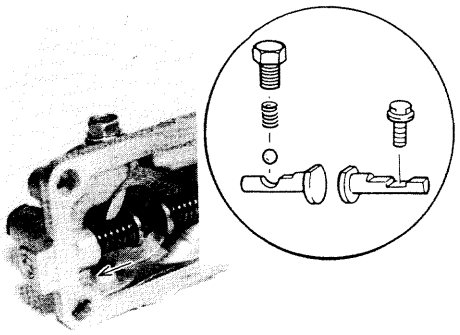


Fig. 12-12

NOTE:

After each guide pin is installed, make sure that flat surface ⑤ at the tip of pin faces upward (toward gear shift lever).

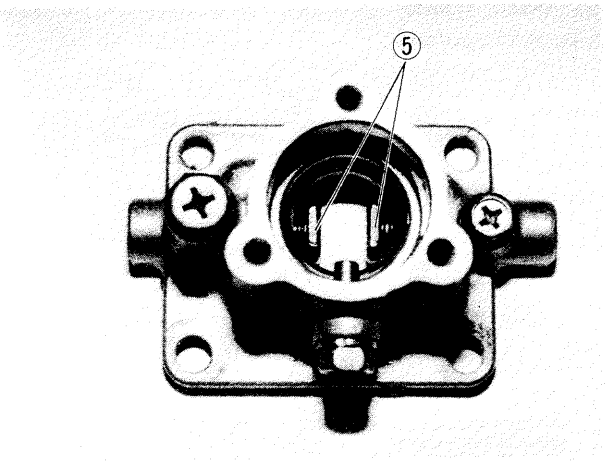


Fig. 12-13

Gear Shift Lever Case

When installing lever case to transmission extension case, clean joint faces, and then apply sealant (SUZUKI BOND NO. 1215, 99000-31110) to joint faces.

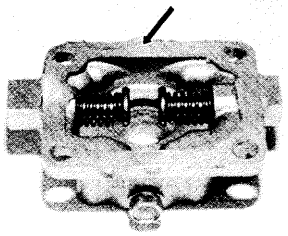


Fig. 12-14

Gear Shift Control Lever Seat

Make sure to fit control lever seat ⑥ into gear shift lever case so that locating bolt ⑦ goes in the groove of control lever seat. And fit wave washer ⑧ with its projection surface directed upward.

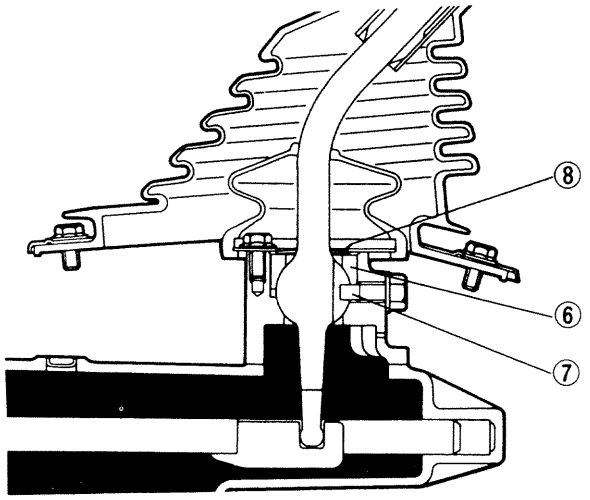


Fig. 12-15

Tightening Torque & Greasing point

To be tightened to:	N·m	kg-m	lb-ft
① Lever case cover bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
② Reverse select pin screw	25 – 35	2.5 – 3.5	18.5 – 25.0
③ Lever boot bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
④ Lever locating bolt	14 – 20	1.4 – 2.0	10.5 – 14.0
⑤ Lever case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
⑥ Low speed select pin bolt	4 – 7	0.4 – 0.7	3.0 – 5.0

Apply to

Ⓐ : Between gear shift lever boot No. 1 and lever case cover
Ⓑ : Between gear shift lever and lever seat
Ⓒ : Between gear shift lever and lever case
Ⓓ : Gear shift lever locating bolt

* Grease to be used for each greasing point is SUZUKI SUPER GREASE A(99000-25010).
* If gear shift lever locating bolt is removed from case, be sure to apply locking agent (THREAD LOCK CEMENT SUPER "1333B" 99000-32020) to bolt thread for reinstallation.

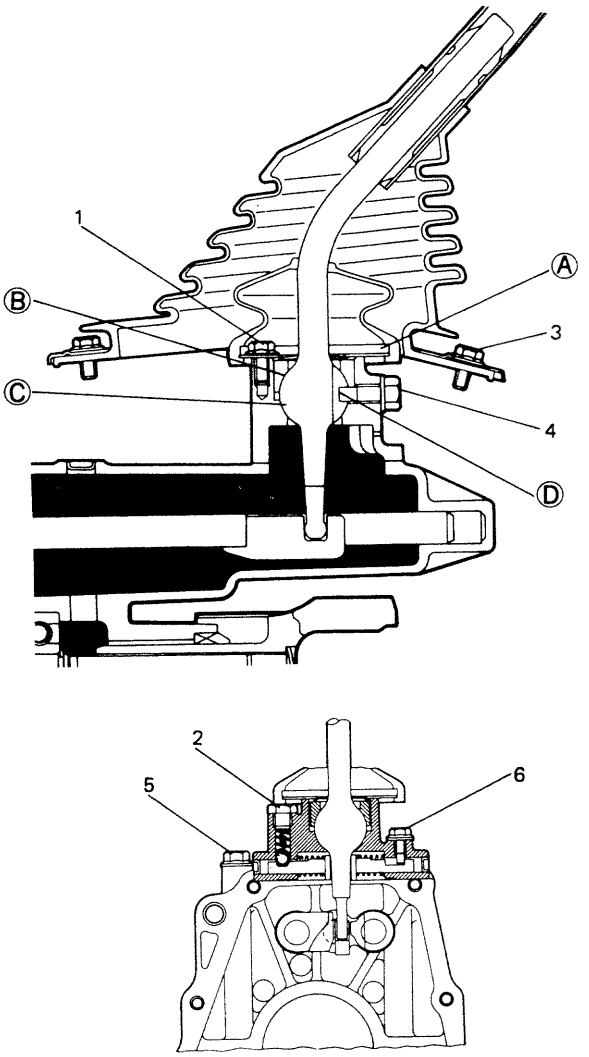


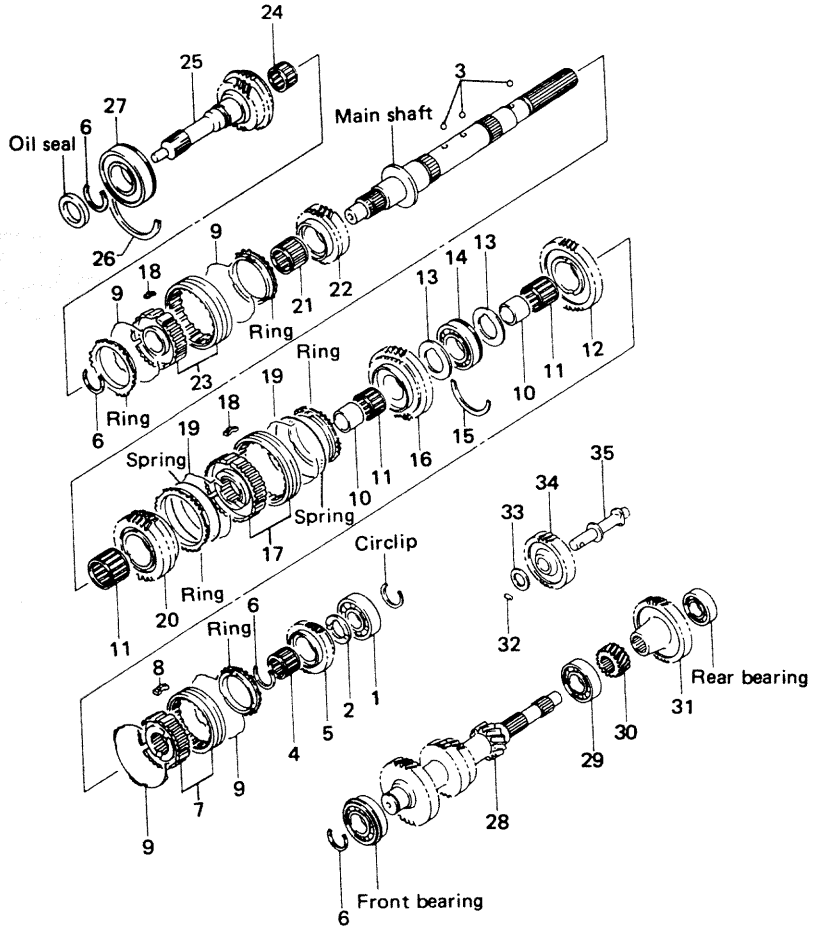
Fig. 12-16

SECTION 13

TRANSMISSION

CONTENTS

13-1. GENERAL DESCRIPTION



1. Main shaft rear bearing
2. 5th gear washer
3. Main shaft washer ball
4. 5th gear needle bearing
5. 5th gear
6. Circlip
7. Synchronizer reverse hub set
8. Synchronizer key
9. Synchronizer spring
10. Gear bush
11. Needle bearing
12. Reverse gear
13. Main shaft bearing washer
14. Main shaft bearing
15. C ring
16. Low gear
17. Synchronizer low speed hub set
18. Synchronizer key
19. Synchronizer spring
20. 2nd gear
21. 3rd gear needle bearing
22. 3rd gear
23. High speed synchronizer hub set
24. Input shaft bearing
25. Input shaft
26. C ring
27. Front bearing
28. Counter shaft
29. Center bearing
30. Reverse gear
31. Counter shaft 5th gear
32. Pin
33. Washer
34. Reverse idle gear
35. Reverse gear shaft

Fig. 13-1

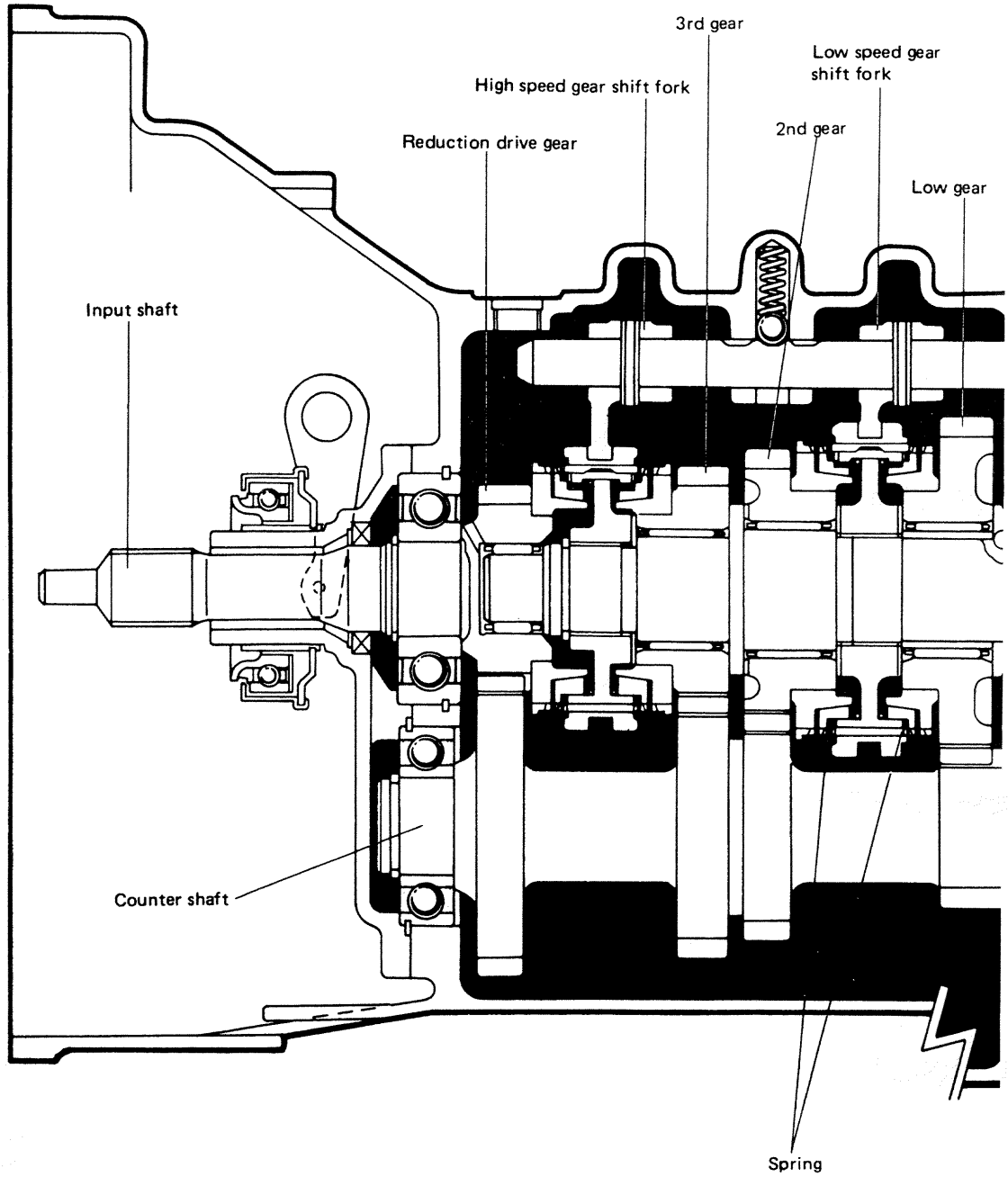
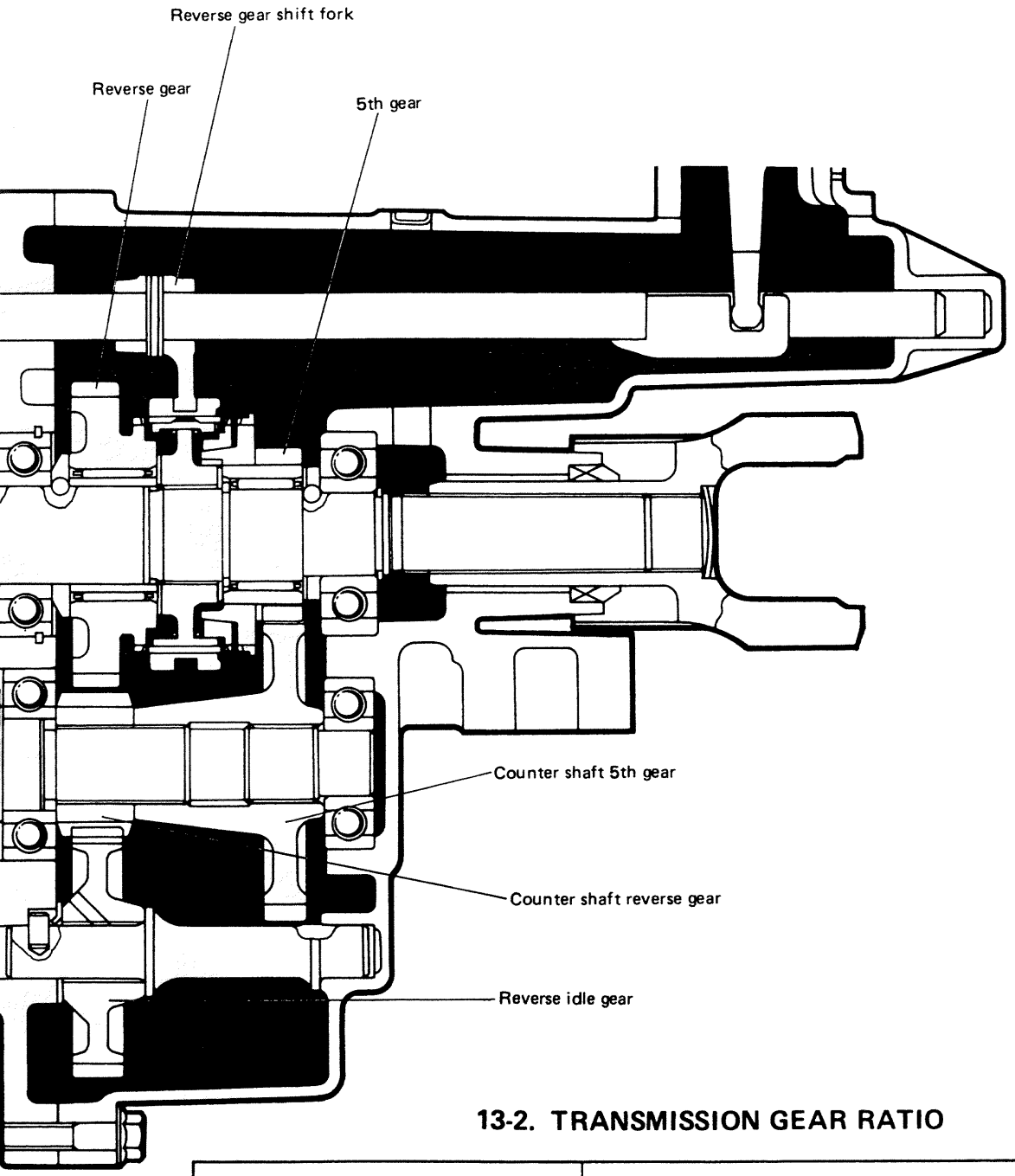

3rd gear
Low speed gear shift fork
High speed gear shift fork
2nd gear
Reduction drive gear
Low gear
Input shaft
Counter shaft
Spring

Fig. 13-2



13-2. TRANSMISSION GEAR RATIO

Primary gear ratio		35/23				–	35/23
Primary speed ratio		1.521				–	1.521
Shift position		Reverse	Low	Second	Third	Fourth	Fifth
Secondary ratios	Gear ratio	41/18	36/15	32/25	29/31	–	25/44
	Speed ratio	2.277	2.400	1.280	0.935	–	0.568
Overall speed reduction ratio		3.466	3.652	1.947	1.423	1.000	0.864

13-3. DISMOUNTING

In Passenger Compartment

1) Loosen 4 bolts fastening gear shift lever boot No. 2 and move boot upward.

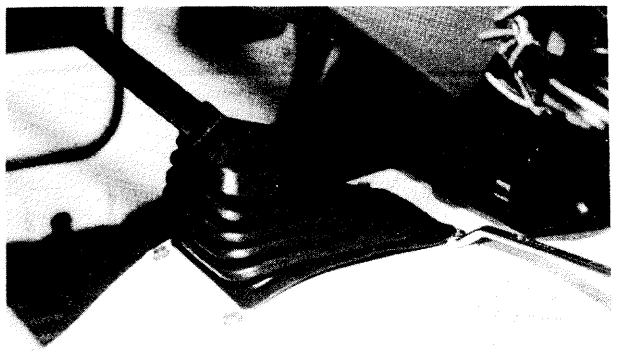


Fig. 13-2-1

2) Move gear shift boot No. 1 upward. Loosen gear shift lever case cover bolts (3 pcs) and draw gear shift lever out of lever case.

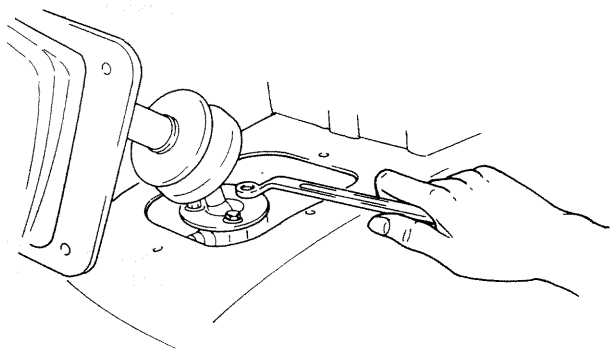


Fig. 13-2-2

In Engine Room

3) Disconnect negative (–) and positive (+) cords from battery terminals.
4) Disconnect back light and fifth switch lead wires at coupler respectively.
5) Disconnect Black/Yellow lead wire and positive (+) cord from starter motor.
6) Remove starter motor from transmission case and fuel hoses clamp from transmission case.

Under Engine

7) Remove drain plug to drain oil in transmission.
8) Disconnect clutch wire from clutch release lever.
9) Remove propeller shaft No. 1 (from transmission to transfer).
10) Remove propeller shaft No. 2 (from transfer to front differential).
11) Remove clutch housing lower plate from transmission case.

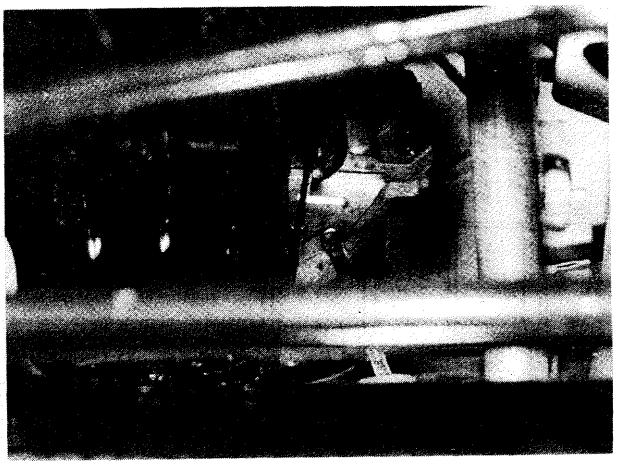


Fig. 13-2-3

12) Remove bolts and nuts fastening engine cylinder block and transmission case.
13) Remove pipe ① as shown in Fig. 13-2-4.

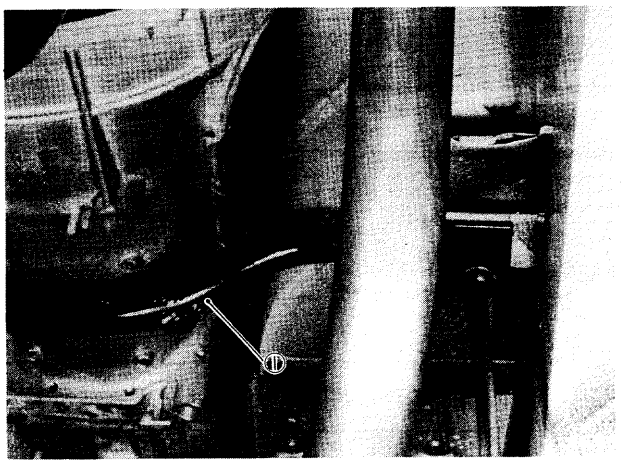


Fig. 13-2-4

14) Remove exhaust center pipe.
15) Remove transmission rear mounting bracket from chassis and transmission case.

NOTE:
Before starting to remove transmission, check around once again to be sure that there is no connection left undone.

16) Take down transmission.

13-4. DISASSEMBLY

Replacing Clutch Release Shaft Bush

1) Remove clutch release bearing from input shaft bearing retainer.

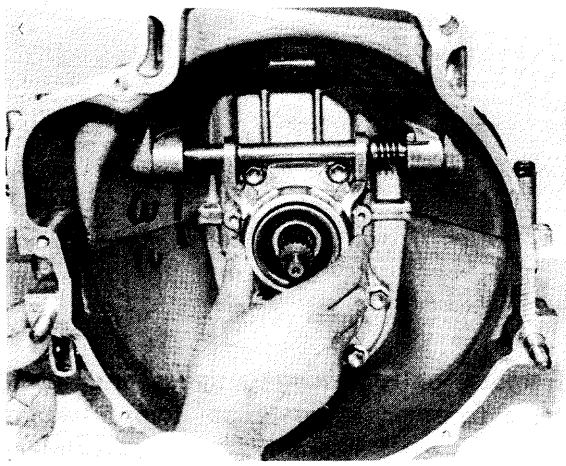


Fig. 13-3

2) Remove a part of spring from clutch release shaft lever.

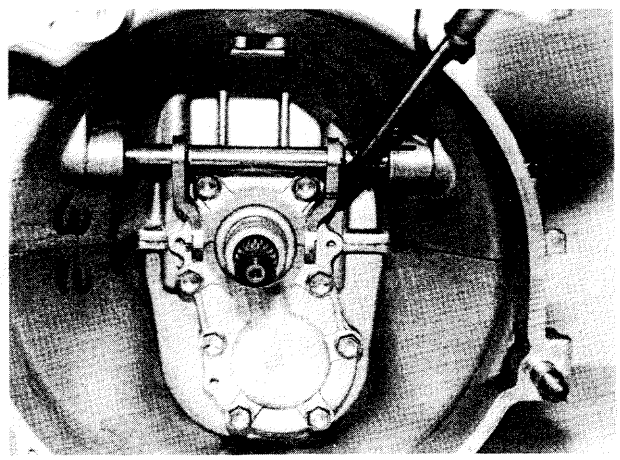


Fig. 13-3-1

3) Remove clutch release shaft spring from shaft. With special tool (A) applied in such a position as shown in Fig. 13-3-2, tap the end of special tool to take out bush and cap. Clutch release bush remover (A) (09925-48210)

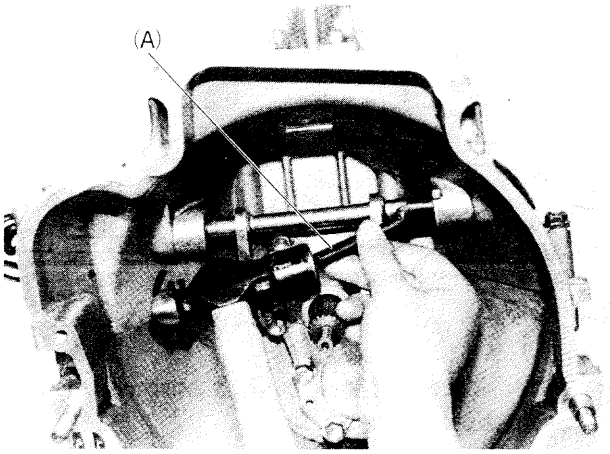


Fig. 13-3-2

4) Take out the other bush, too.

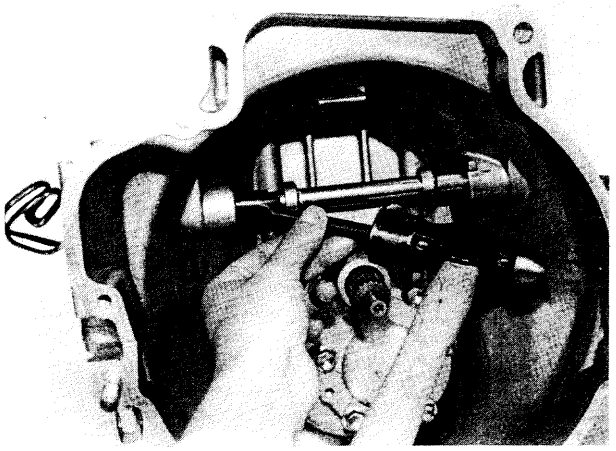


Fig. 13-3-3

5) Precautions on bush reinstallation:
- Make sure to apply grease to inside of bushes.
- Drive in bushes to the same level as inside surface of transmission case. Install cap and oil seal securely after greasing oil seal lip.

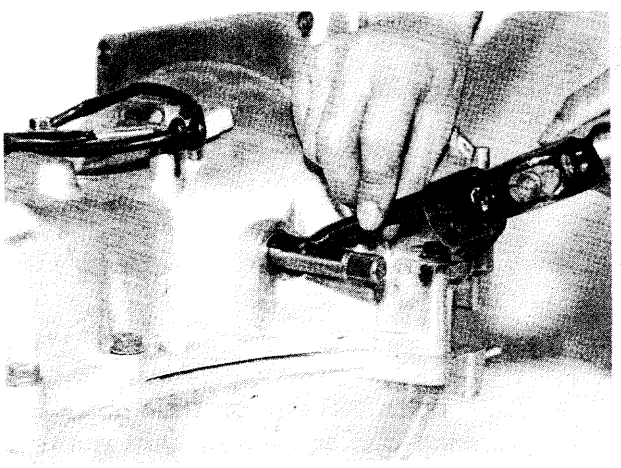


Fig. 13-3-4

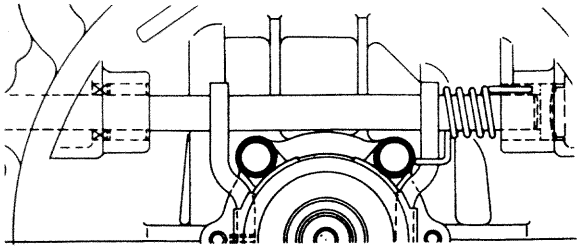


Fig. 13-3-5

- After installing seal, caulk transmission case against seal at two points.

Separating Upper Case from Lower Case

1) Remove clutch release bearing from transmission input shaft.

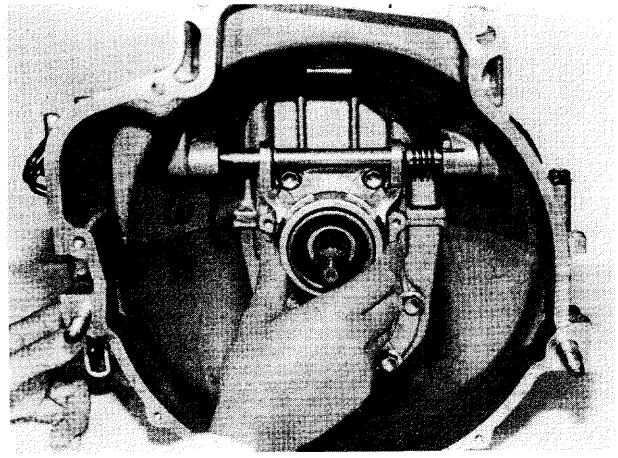


Fig. 13-4

2) Remove input shaft bearing retainer bolts and pull out retainer by using 3 conventional 6 mm bolts.

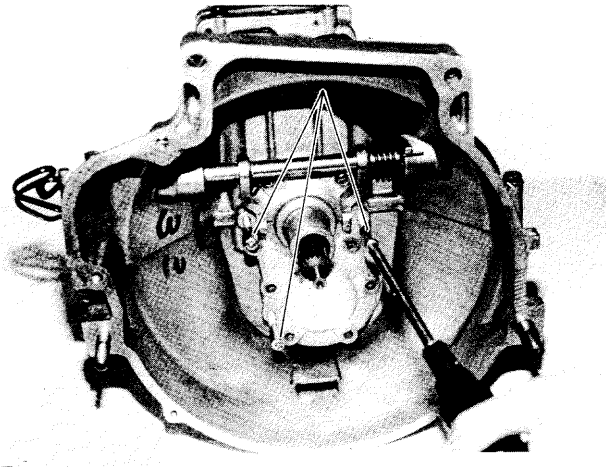


Fig. 13-4-1

3) Remove bolts securing extension case to transmission case and reverse shift rim bolt ①. Then take off extension case.

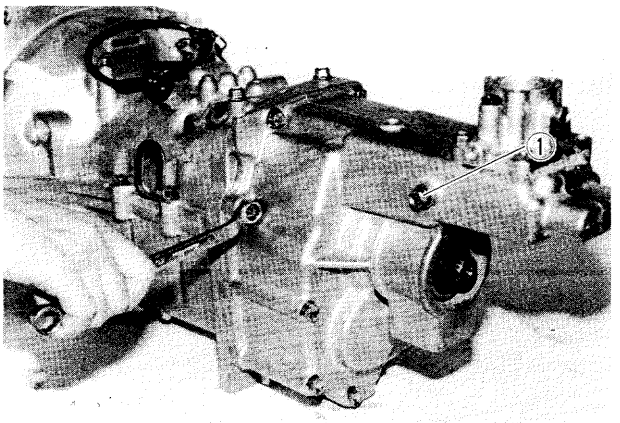


Fig. 13-4-2

4) Remove bolts fastening upper and lower cases together, separate the two, and take out main shaft assembly. A steel bar, similar in shape to screwdriver, may have to be used to pry two cases apart, as shown. In such a case, do not stick bar too far into between two mating faces, or faces may become damaged.

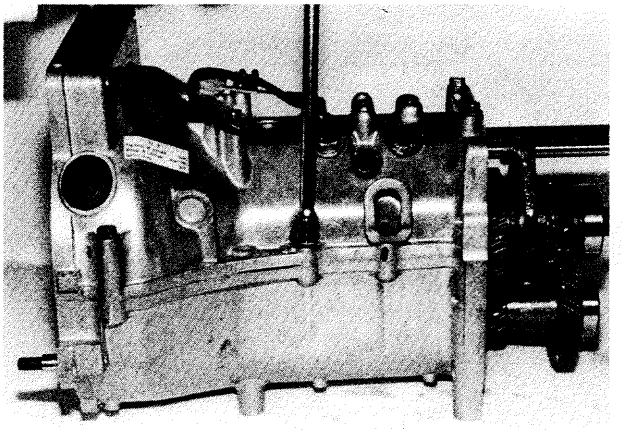


Fig. 13-5

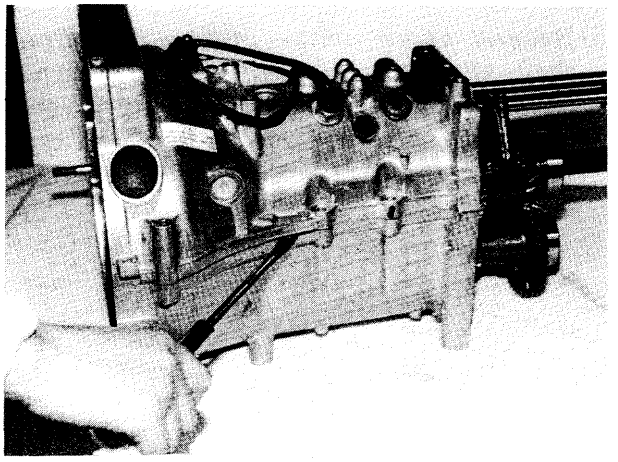


Fig. 13-5-1

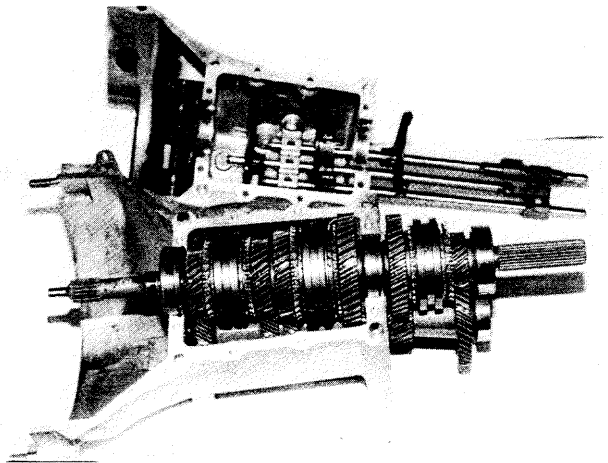


Fig. 13-5-2

Removing Countershaft

1) Remove reverse gear shaft with gear.

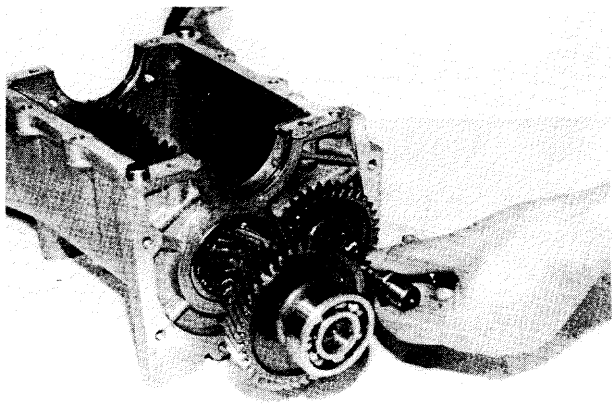


Fig. 13-6

2) Remove countershaft rear bearing.

Bearing puller (B) (09913-65135)

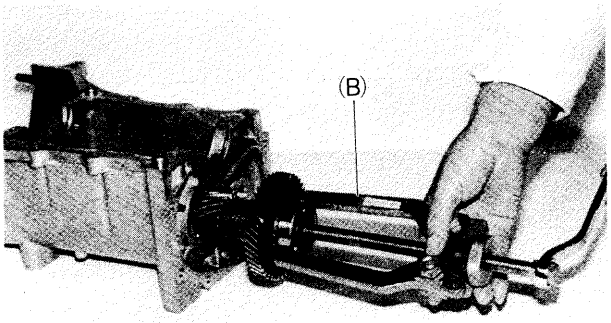


Fig. 13-7

3) Remove countershaft 5th gear and countershaft reverse gear.

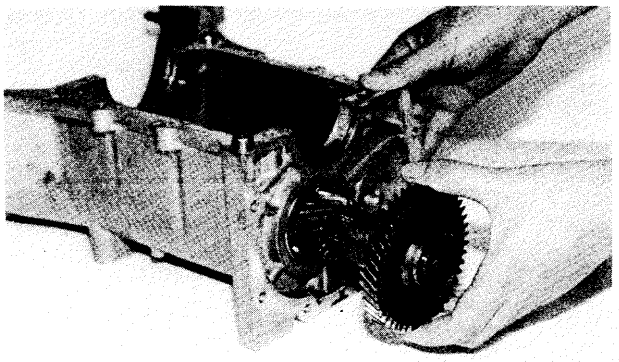


Fig. 13-8

4) Remove circlip from countershaft. Push out countershaft to extension case side by using hydraulic press, remove bearing, and take countershaft assembly out of case.

Bearing puller (B) (09913-65135)

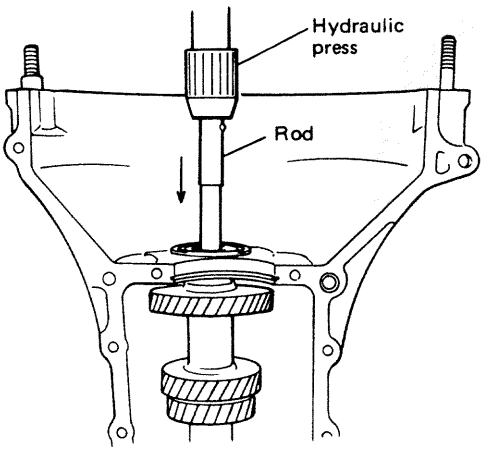


Fig. 13-9

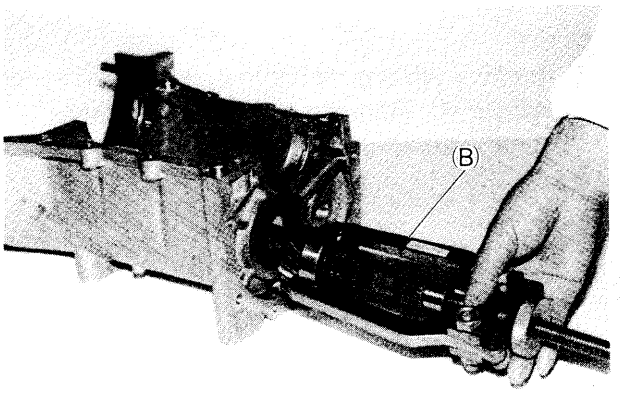


Fig. 13-9-1

Removing Main Shaft and Input Shaft

1) Take out input shaft by hand, taking care not to let high-speed synchronizer ring fall off.

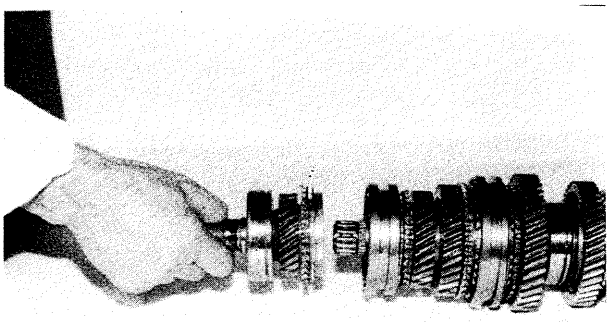


Fig. 13-10

2) Remove circlip retaining hub of high-speed synchronizer sleeve, and slide off sleeve hub, third driven gear and needle bearing from main shaft.

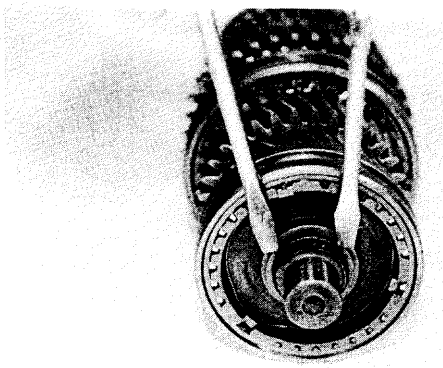


Fig. 13-11

3) Remove circlip retaining rear bearing on main shaft. Remove main shaft bearing.

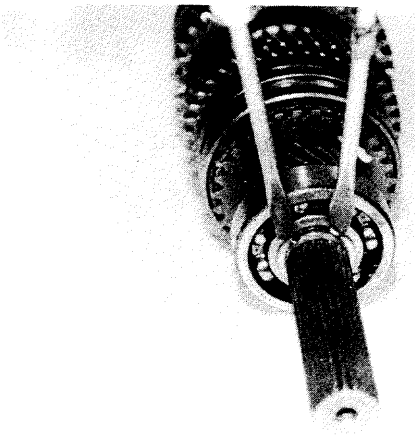


Fig. 13-12

Bearing puller (B) (09913-65135)

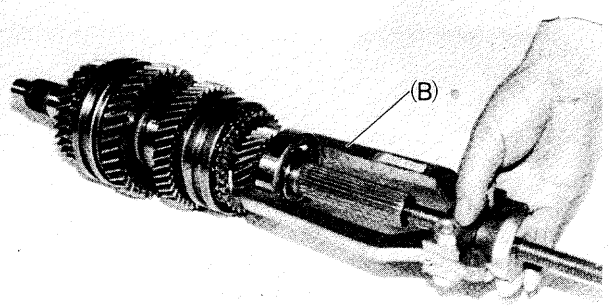


Fig. 13-13

4) From main shaft, take off 5th gear washer, ball, 5th gear, 5th speed synchronizer ring and 5th gear needle bearing.

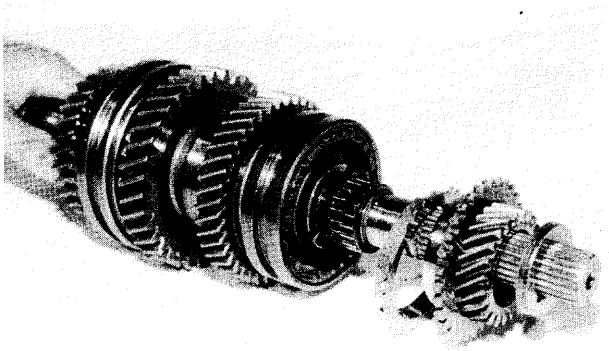


Fig. 13-14

5) Remove circlip retaining the reverse synchronizer hub on main shaft.

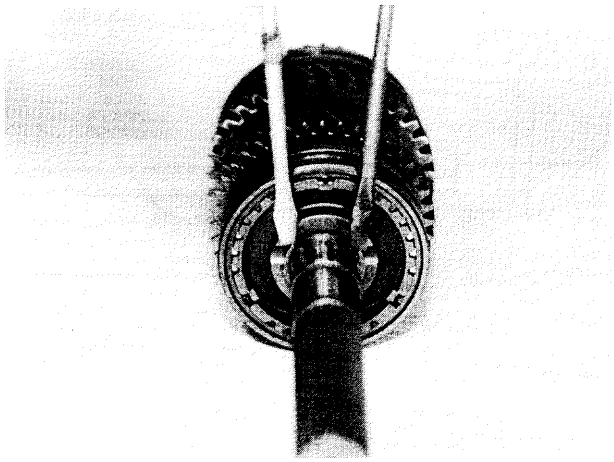


Fig. 13-15

6) Remove reverse synchronizer hub, reverse gear and reverse gear needle bearing.

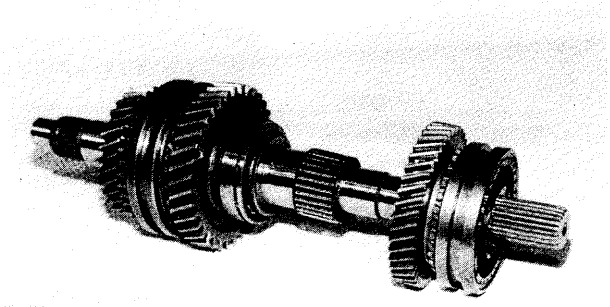


Fig. 13-16

7) Remove bearing washer and reverse gear bush on main shaft by using hydraulic press.

NOTE:
During this removal, watch out for a ball which may fall off. It must not be lost. Also, ball bearing should not be removed together with above washer and bush.

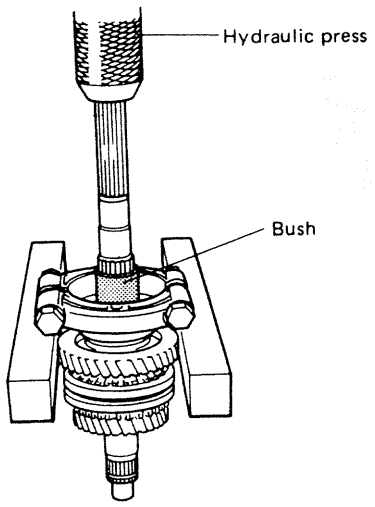


Fig. 13-17

8) Remove ball and main shaft (center) bearing by using hydraulic press.

NOTE:
In the state as shown below, there is a ball in washer which is located under bearing. Be sure to prevent it from falling off and getting lost.

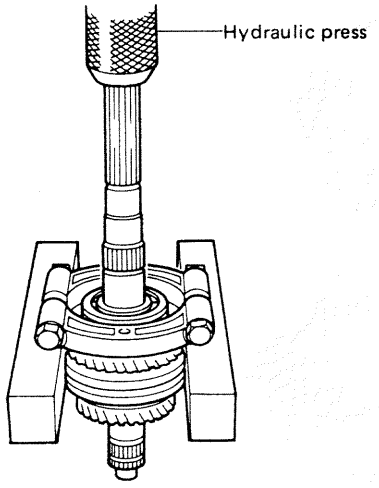


Fig. 13-18

9) Remove low gear, needle bearing, synchronizer ring and spring on main shaft.

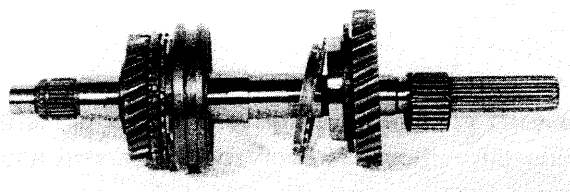


Fig. 13-19

10) Remove low gear bush, low speed synchronizer hub, ring, spring, 2nd gear and 2nd gear bearing by using hydraulic press.

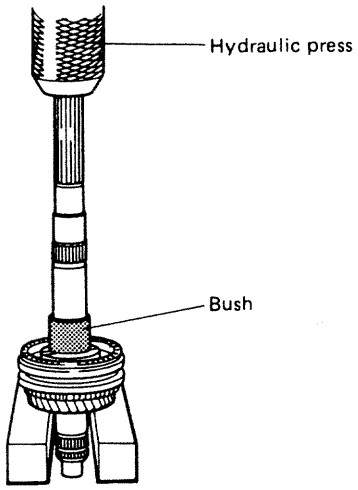
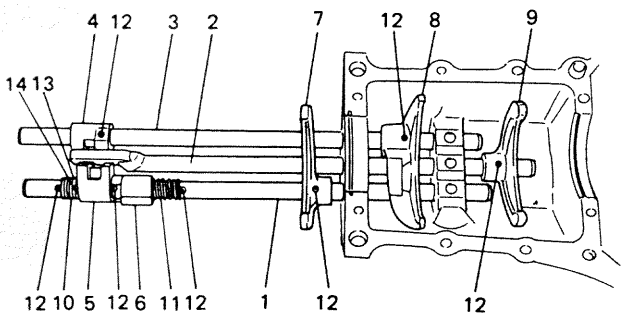


Fig. 13-20

Removing Shift Yokes, Forks and Shafts



1. Reverse gear shift shaft
2. High speed gear shift shaft
3. Low speed gear shift shaft
4. Low speed gear shift yoke
5. 5th gear shift yoke
6. Reverse gear shift rim yoke
7. Reverse gear shift fork
8. Low speed gear shift fork
9. High speed gear shift fork
10. 5th select return spring
11. Reverse gear shift rim spring
12. Shift yoke pin
13. E-ring
14. Washer

Fig. 13-21

[Gear shift yoke]
For shift yoke removal, drive out yoke pin with spring pin remover (special tool) first, and then remove yoke.

Spring pin remover (C) (09922-85811)

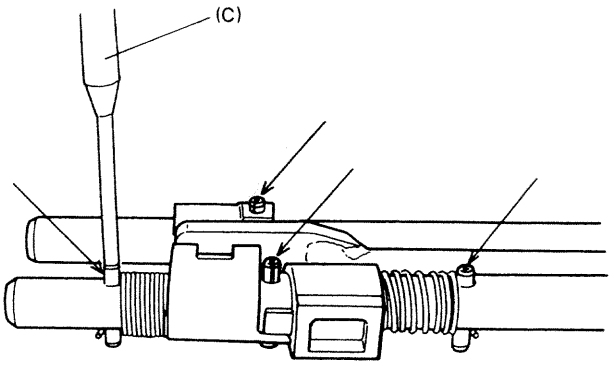


Fig. 13-22

[Gear shift fork and shaft]
Before starting removal, make sure that all shift fork shafts in place are in neutral position and remove each fork and shaft according to following 1), 2) and 3).

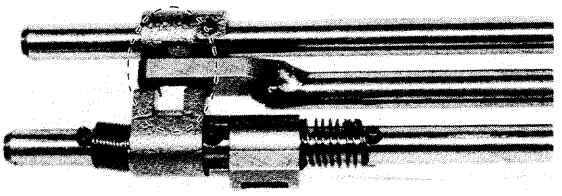


Fig. 13-23 Neutral position

1) Pull out reverse gear shift shaft. As this shaft comes out, locating ball and spring will jump out of hole; do not let them fly away.

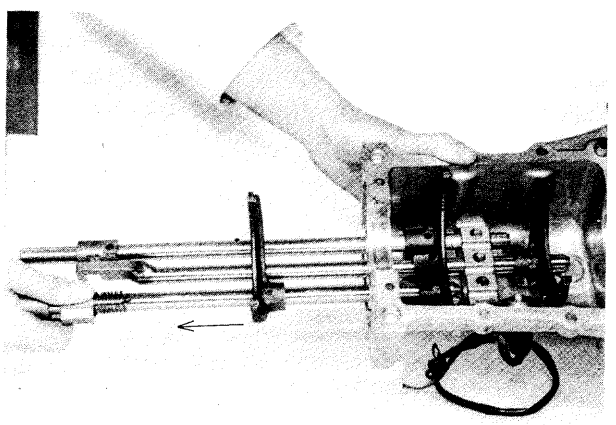


Fig. 13-24

2) Using the same special tool (C), mentioned above, drive out yoke pin on high speed gear shift fork, and pull out shift shaft. As in above case, be careful not to let locating ball, interlock ball and spring fly away.

CAUTION:
When removing yoke pin, be sure not to drive it out so far as to contact case. Or it will cause damage to case.

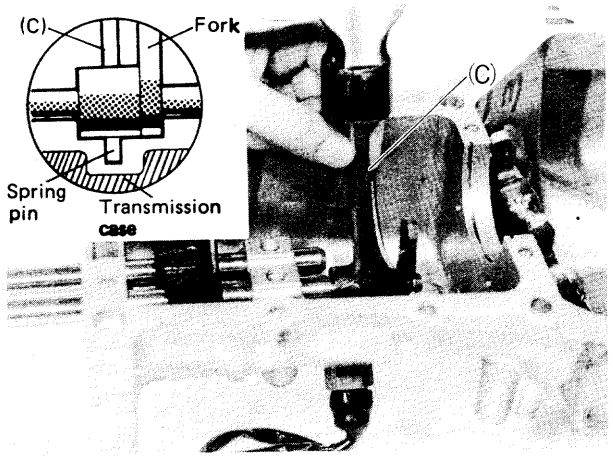


Fig. 13-25

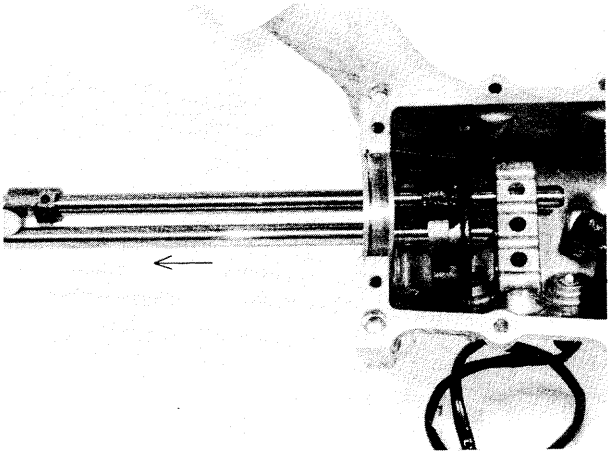


Fig. 13-26

3) Drive yoke pin out of low speed gear shift fork as in above step 2) and pull out fork shaft and fork.

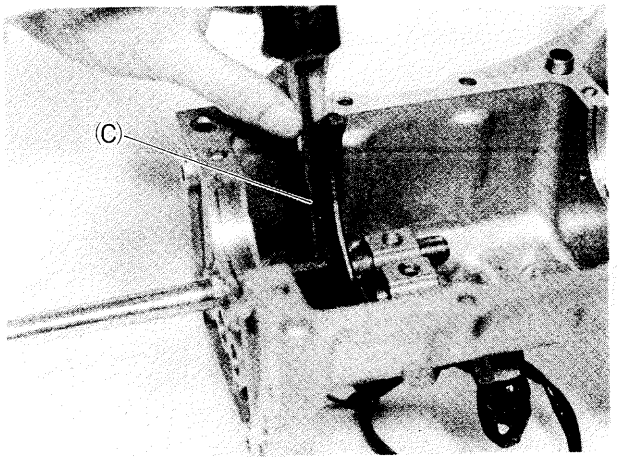


Fig. 13-27

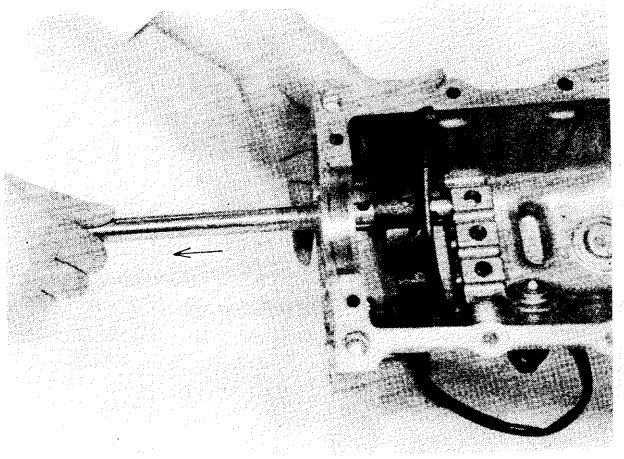


Fig. 13-28

13-5. INSPECTION OF COMPONENTS

Gears
Check each part for wear, damage or discoloration. Replace if found defective.

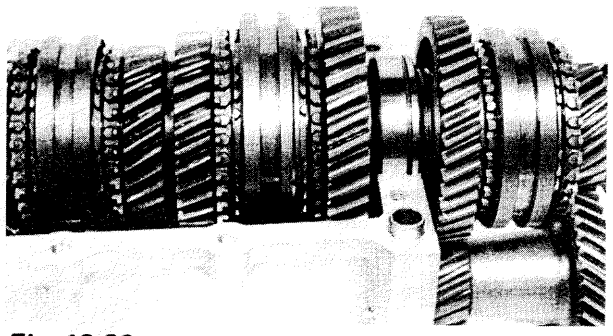


Fig. 13-29

Synchronizer Hubs, Sleeves and Keys
Check each part for wear or damage. Replace if found defective.

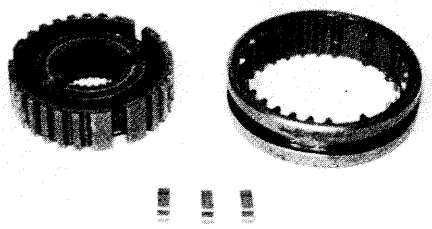


Fig. 13-30

Shift Forks and Sleeves
Check contact surfaces for wear or damage. Measure clearance between fork and sleeve.

Maximum clearance	1.0 mm (0.039 in)

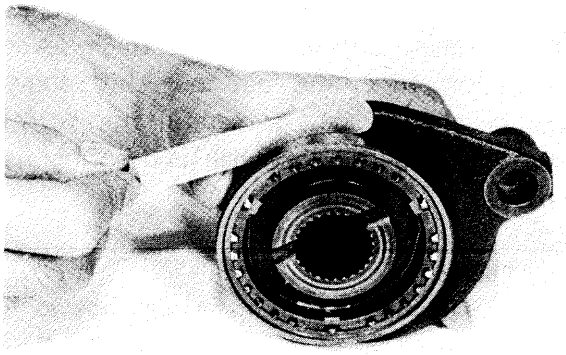


Fig. 13-31

Main Shaft
Check each part of shaft for wear, discoloration or damage. Replace shaft if any part is found defective.

Fig. 13-32

Bearings and Bushes
Check each part for wear, damage or discoloration. With ball bearing, check to ensure that it rotates smoothly and it does not make noise. Replace if found defective.

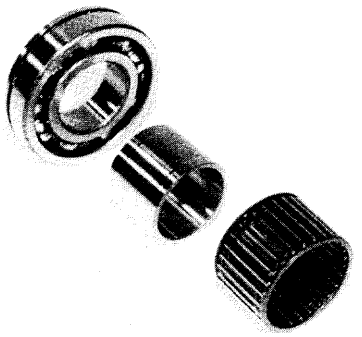


Fig. 13-33

Input Shaft

Referring to Fig. 13-34, inspect cone ① and toothed ring ② for wear and damage.

Inspect gear teeth ③ and splines ④ for wear and damage.

If any part of input shaft inspected as above is found excessively worn or badly damaged, replace shaft.

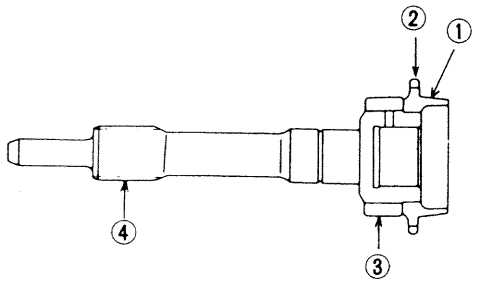


Fig. 13-34

Combination of Gear and Synchronizer Ring

Fit ring to cone of each gear, and measure clearance between the two at peripheral teeth, as shown in Fig. 13-35. If clearance exceeds service limit, replacement is necessary.

Clearance between gear and ring		
	Standard	Service limit
Low and High speed	1.0 – 1.4 mm (0.039 – 0.055 in.)	0.5 mm (0.019 in.)
5th speed	1.2 – 1.6 mm (0.047 – 0.063 in.)	0.5 mm (0.019 in.)

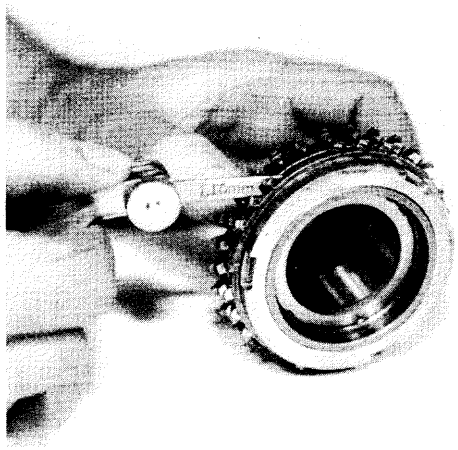


Fig. 13-35

Inspect external cone (of gear) and internal cone (of ring) for abnormal wear. Be sure that contact patterns on these surfaces indicate uniform full-face contact, and that surfaces are free from any wavy wear. A badly worn member must be replaced.

Proper synchronizing action on gear shifting can be expected only when ring-to-gear clearance (Fig. 13-35) and condition of cone surfaces, among other things, are satisfactory.

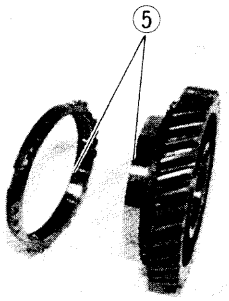


Fig. 13-36 ⑤ Checking contacting surface

Chamfered Tooth Ends of Ring (External Teeth) and Sleeve (Internal Teeth)

Synchronizer ring and hub have three slots each, in which keys are carried as backed by expanding springs, so that the hub and its two rings, one on each end, are capable of running together. Since the sleeve is engaged by its internal teeth with the hub as if the two were splined together, the sleeve, too, runs with the hub and rings.

In meshing action, the sleeve is pushed (by the shifter fork) to one side, so that if slides axially on the hub, pushing the ring toward the cone surface of the gear. This push is transmitted by three keys, which are lightly gripped by the sleeve.

By friction between the gear cone and ring cone (internal), the ring begins to rotate but is copposed by the hub because of keys. In other words, the ring is at this time twisted, while the sleeve is advancing further to push the ring fully against the gear cone. Since the ring is unable to slide along any further, the sleeve lets go off the keys and rides over to the ring. At this moment, the initial contact between the chamfered ends of teeth of the ring and those of internal teeth of the sleeve occurs. This contact is such that the internal teeth of the sleeve align themselves to those of the ring. When the sleeve advances and slides into the ring, the ring will be rotating nearly with the speed of the gear, so that the sleeve is enabled smoothly to slide over into the clutch teeth of the gear.

The initial contactor mesh between sleeve and ring is determined by the widths of key and slot or, in other words, the key clearance in the slot, and is prescribed to extend at least a third (1/3) of the chamfer.

With the synchronizer properly assembled on the shaft, push in and twist each synchronizer to see if one-third mesh occurs or not; if not, it means that the overall wear (which is the sum of wears of slots, keys and chamfered tooth ends) is excessive and, in such a case, the entire synchronizer assembly must be replaced.

Mesh of chamfered tooth ends of synchronizer ring and sleeve	Contact extending about 1/3 of chamfered face from apex

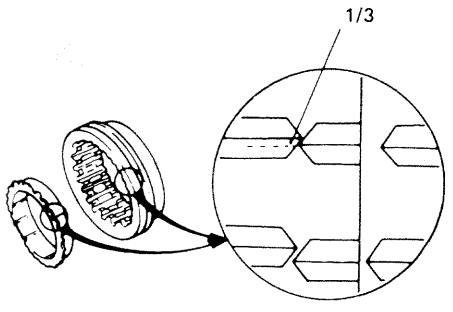


Fig. 13-37

Synchronizer Rings

Inspect each synchronizer ring for wear of its key slots by measuring width of each slot. If width reading exceeds limit, replace ring.

	Standard	Service limit
Key slot width of synchronizer ring	10.1 mm (0.397 in.)	10.4 mm (0.409 in.)

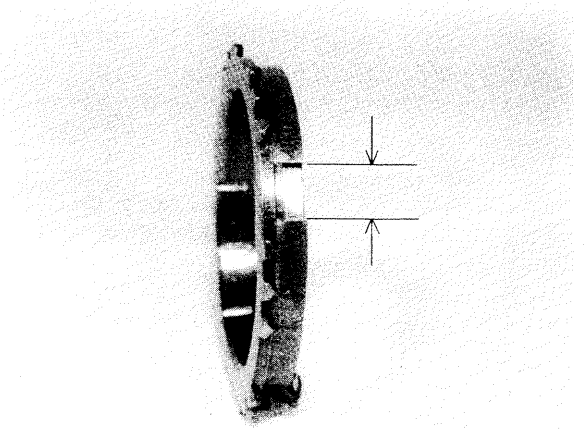


Fig. 13-38

Fork Shaft Locating Springs

If "gears slipping out of mesh" has been complained, check these springs for strength by measuring their free length, and replace them if their free lengths are less than service limit.

Spring No.	Standard	Service limit
Free length	25.5 mm (1.004 in.)	21.0 mm (0.826 in.)

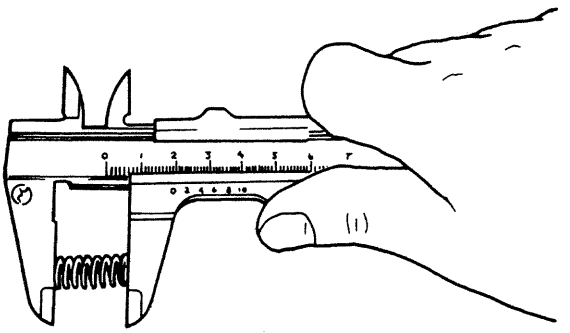


Fig. 13-39

Gear Shift Shafts

Check the part of shaft as indicated in below figure for uneven wear. Replace shaft if uneven wear is noted.

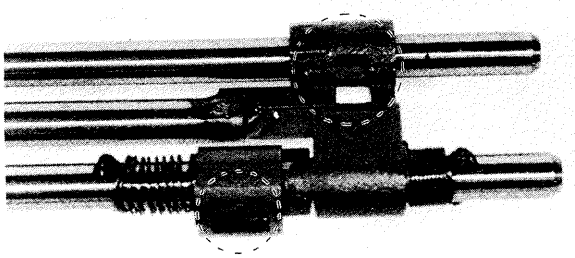


Fig. 13-40

Extension Case Bush

Check bush press-fitted in extension case for wear by measuring radial clearance between bush bore and sliding yoke. If sliding yoke rattles in bush because of advanced wear it will cause propeller shaft to rattle. For this reason, an extension case found to allow its sliding yoke to rattle in excess of service limit must be replaced; replacement of bush alone is not permissible.

	Standard	Service limit
Rattle of sliding yoke in extension case bush	0.025 – 0.089 mm (0.0010 – 0.0035 in.)	0.2 mm (0.0078 in.)

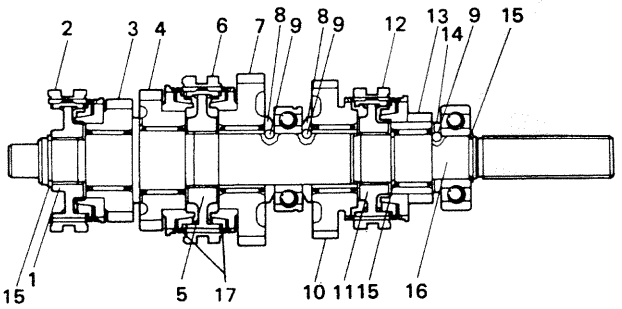
13-6. IMPORTANT STEPS IN INSTALLATION

NOTE:

- **Before installation, wash each part and apply specified gear oil to sliding faces of bearing and gear.**
- **Use new circlips on shaft for reinstallation. Don't reuse used circlips.**
- **Tighten each fastening bolt and nut according to specified torque data listed on the last page of this section.**

Main Shaft and Input Shaft

Install each parts by reversing respective removal procedures. Be careful for installing direction of each washer, gear, synchronizer hub and sleeve. Refer to figure below. Make sure to install each ball on main shaft.



1. High speed synchronizer hub
2. High speed synchronizer sleeve
3. 3rd gear
4. 2nd gear
5. Low speed synchronizer hub
6. Low speed synchronizer sleeve
7. Low gear
8. Washer
9. Ball
10. Reverse gear
11. Reverse synchronizer hub
12. Reverse synchronizer sleeve
13. 5th gear
14. 5th gear washer
15. Circlip
16. Main shaft
17. Spring

Fig. 13-41

1) Install 2nd gear bearing, 2nd gear, spring, synchronizer ring and low speed synchronizer hub/sleeve onto main shaft, using care for installing direction of synchronizer sleeve.
After putting on each synchronizer, be sure that 3 keys mounted on hub fit snugly into slots cut in ring.

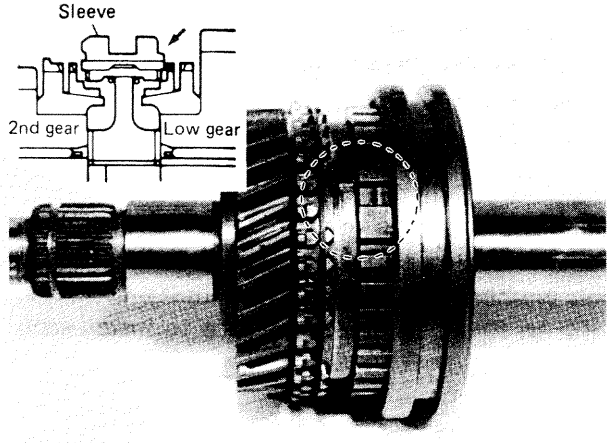


Fig. 13-42

Then using hydraulic press, press-fit low gear bush. 2 bushes on main shaft are the same.
Bearing installer (D) (09925-18010)

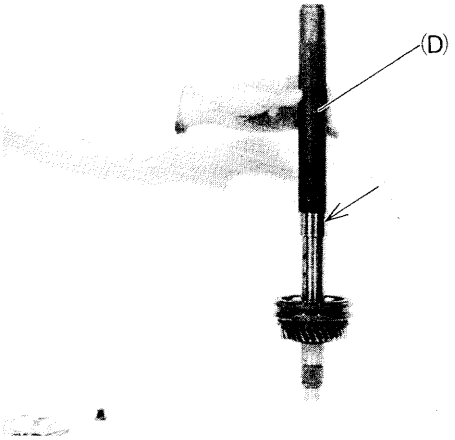


Fig. 13-43

2) Install low gear needle bearing, spring, synchronizer ring, low gear, ball and washer onto main shaft.
Fit ball into hole in shaft and install washer so that its slot ① comes over ball ③.
To direct washer correctly, bring its circumpherence chamfered side ② to main shaft center bearing.

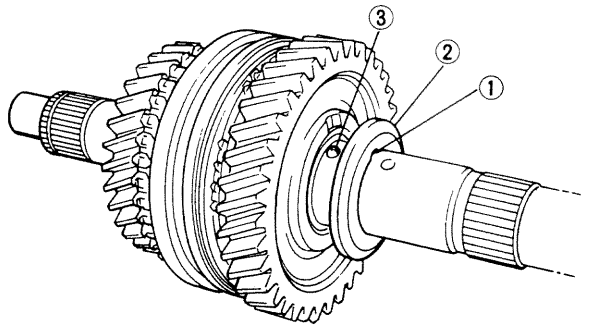


Fig. 13-44

3) Press-fit center bearing with bearing installer (special tool) using care for its installing direction.
Bearing installer (D) (09925-18010)

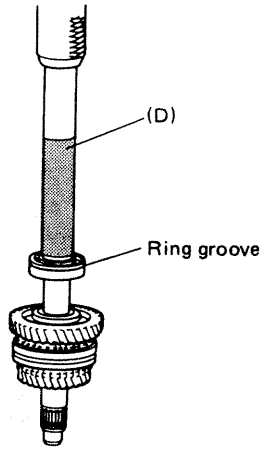


Fig. 13-45

4) Install ball and washer.
As figure shows, install washer so that its circumfherence chamfered side faces center bearing ① and its slot ② comes over ball ③.

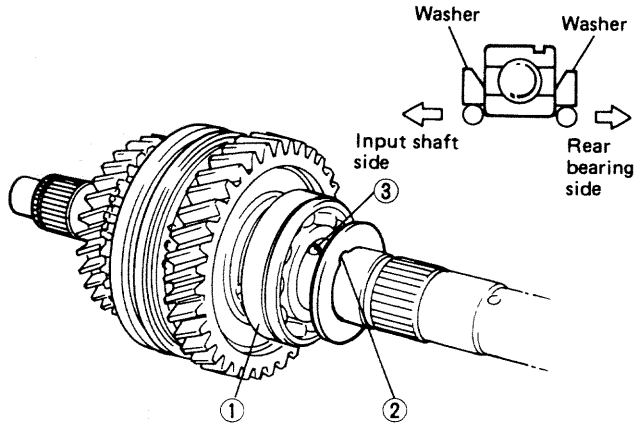


Fig. 13-46

5) Press-fit reverse gear bush, preventing ball installed in step 4) from coming off.
Bearing installer (D) (09925-18010)

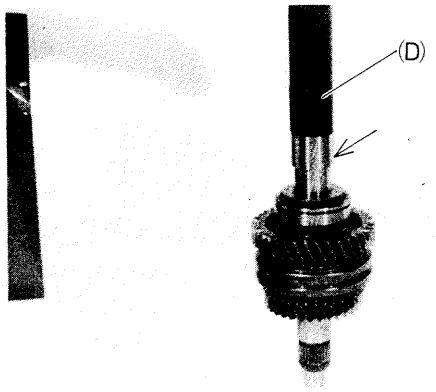


Fig. 13-47

6) Install reverse gear bearing, reverse gear and reverse synchronizer hub/sleeve. For proper direction, make sure to install hub so that the side whose inside boss ① is smaller in diameter and longer is directed to main shaft rear bearing, and sleeve so that the side whose inside is stepped ② is also directed to main shaft rear bearing.

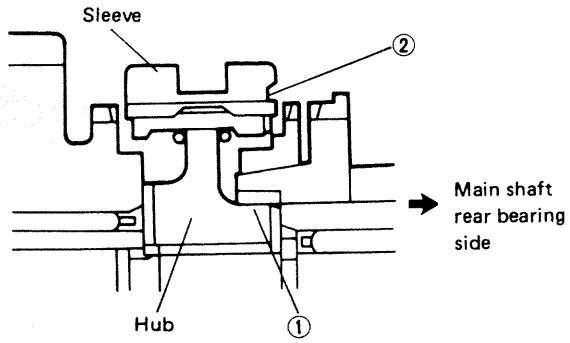


Fig. 13-48

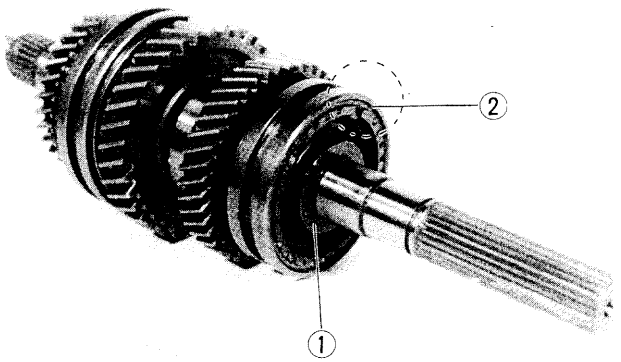


Fig. 13-49

7) Fit reverse hub circlip into groove in main shaft.

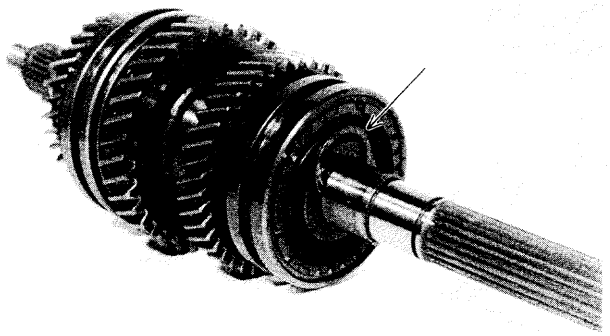


Fig. 13-50

8) Install 5th gear bearing, 5th gear synchronizer ring and 5th gear. Then install ball and washer, making oil groove of washer face 5th gear.

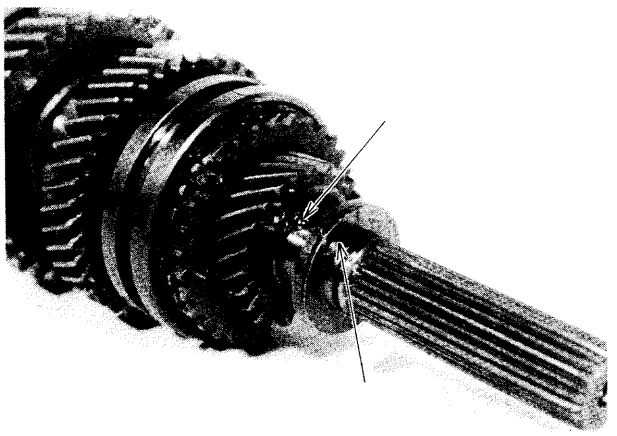


Fig. 13-51

9) Press-fit main shaft rear bearing and fit circlip into groove in main shaft.
Bearing installer (D) (09925-18010)

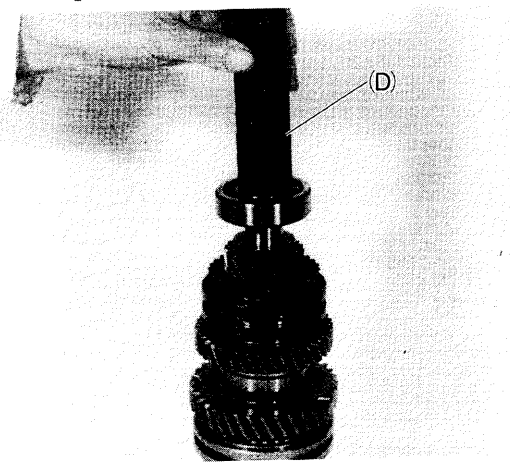


Fig. 13-52

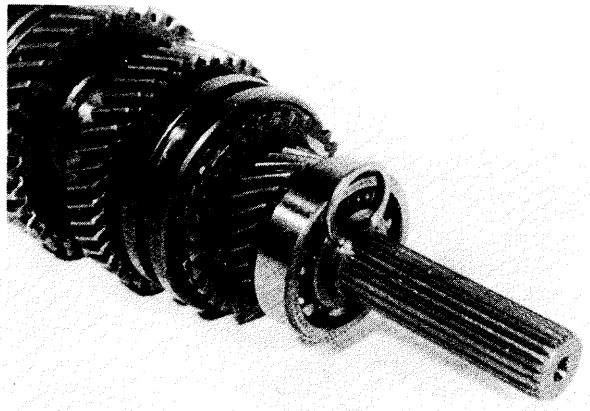


Fig. 13-53

10) Install 3rd gear bearing, 3rd gear, high speed synchronizer ring and hub/sleeve. When installing hub, direct the side with larger outer diameter boss to 3rd gear side. Then fit circlip into groove in main shaft.

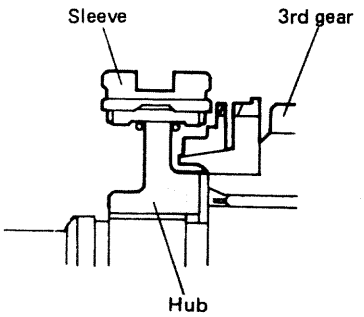


Fig. 13-54

Fig. 13-55

11) Install synchronizer ring, needle bearing and input shaft.

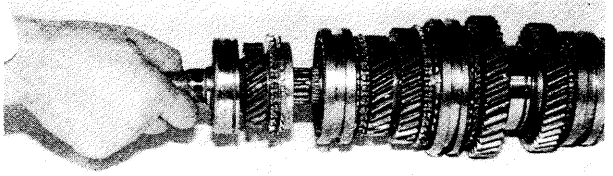
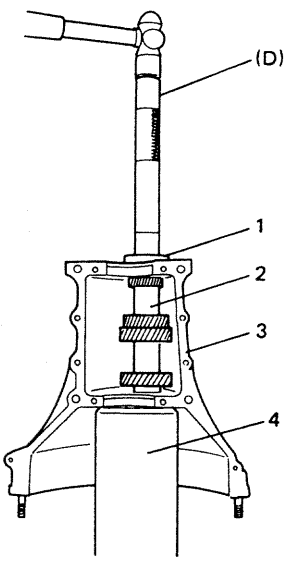


Fig. 13-56

Counter Shaft and Reverse Idle Gear

1) Drive counter shaft front bearing into lower case. Then using plastic hammer, drive counter shaft into front bearing a little.
In the above state, using bearing installer (special tool), drive center bearing onto counter shaft and into lower case.
Bearing installer (D) (09925-18010)



1. Center bearing
2. Counter shaft
3. Transmission lower case
4. Wood stand

Fig. 13-57

2) Fit counter shaft front circlip into groove in shaft.

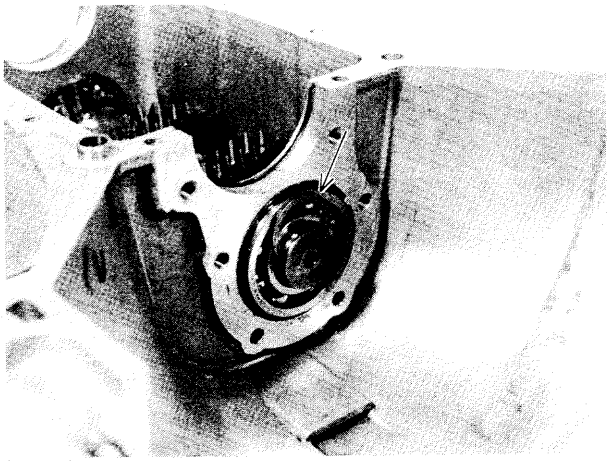


Fig. 13-58

3) Install counter shaft reverse gear and 5th gear onto counter shaft. And then drive counter shaft rear bearing onto it.

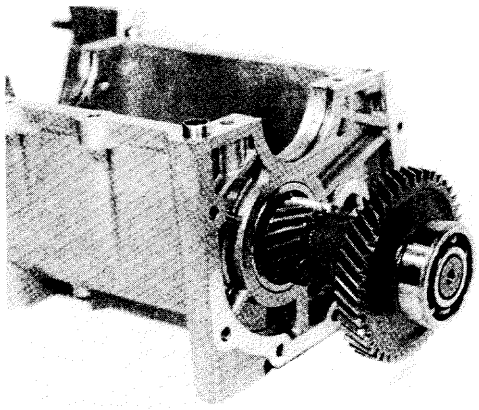


Fig. 13-59

4) Install idle gear and washer onto reverse gear shaft and pin into it.
Install above as assembled into lower case with pin ① and washer tongue ② aligned as shown below.

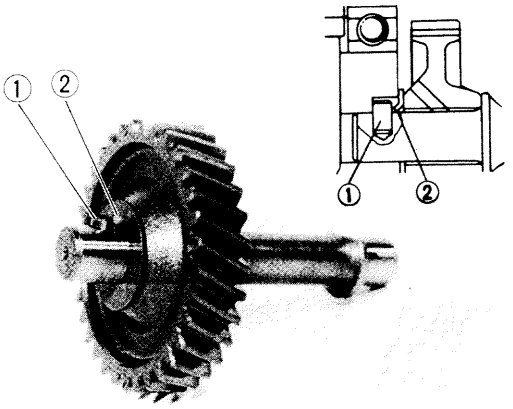


Fig. 13-60

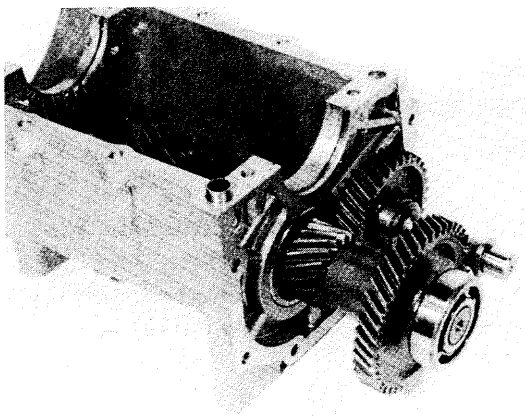


Fig. 13-61

Shifter Forks, Shafts and Yokes
[Forks and Shafts]

Fig. 13-62

① Low speed gear shift shaft
② High speed gear shift shaft
③ Reverse gear shift shaft

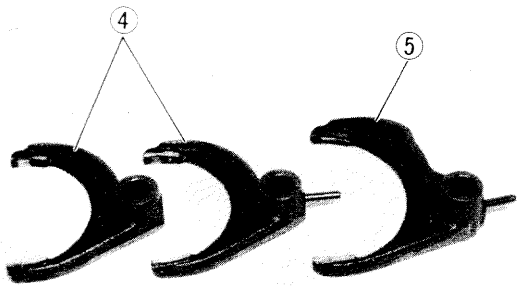


Fig. 13-63 ④ High and reverse gear shift fork
⑤ Low speed gear shift fork

NOTE:
Gear shift forks used for high and reverse are the same.

Note that 3 shift shafts individually have a locating ball and locating spring, and that 2 interlock balls and an interlock roller are used between shafts as shown in Fig. 13-64.

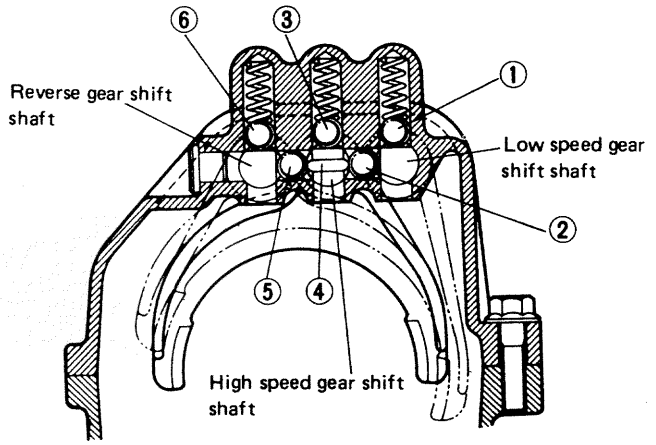
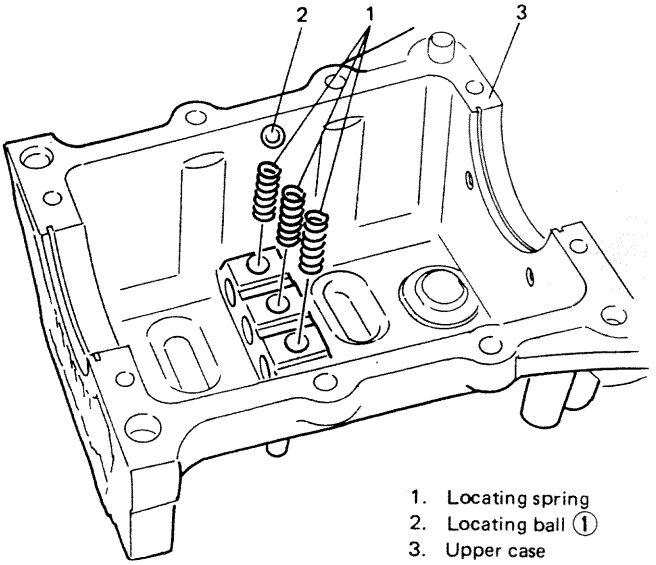


Fig. 13-64

Install low, high and reverse shafts in that order.

1) Install 3 locating springs into 3 holes in upper case. Fit locating ball (① in Fig. 13-64) on top of locating spring in hole.



1. Locating spring
2. Locating ball ①
3. Upper case

Fig. 13-65

2) Insert low speed gear shift shaft into upper case and low speed shift fork in the direction as shown in Fig. 13-66.

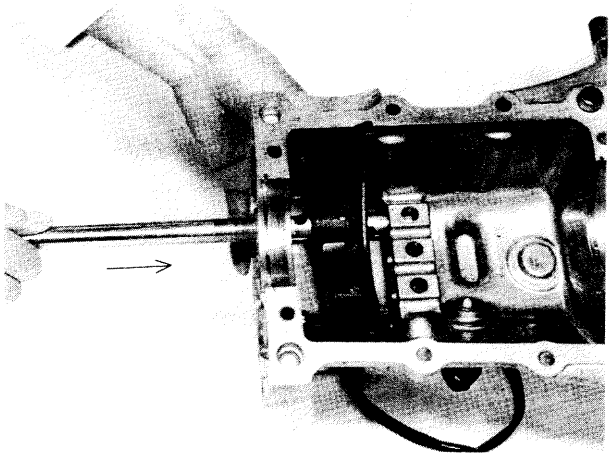


Fig. 13-66

3) As shown below, push down low speed gear shift shaft locating ball to pass shaft over it and keep inserting shaft until locating ball fits in center slot of 3 continuous slots in shaft.
Drive shift yoke pin into fork and shaft.

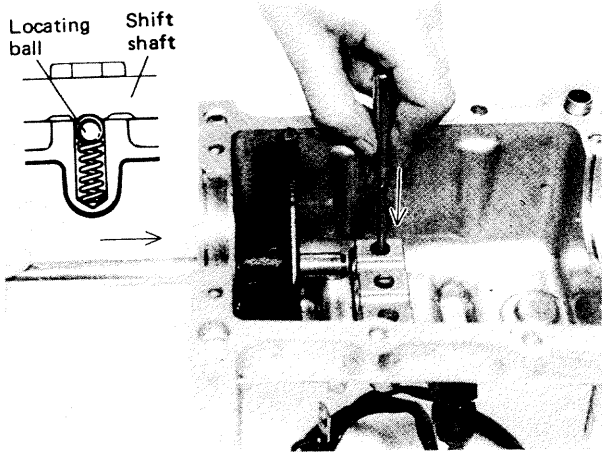


Fig. 13-67

4) Install interlock ball (② in Fig. 13-64) and locating ball (③ in Fig. 13-64) in upper case. After installing interlock roller (④ in Fig. 13-64) in high speed gear shift shaft and insert shaft into upper case as described in 2) and 3).
Fork should be installed in such direction as shown in Fig. 13-68. Then drive shift yoke pin until it becomes flush with outer surface of fork.

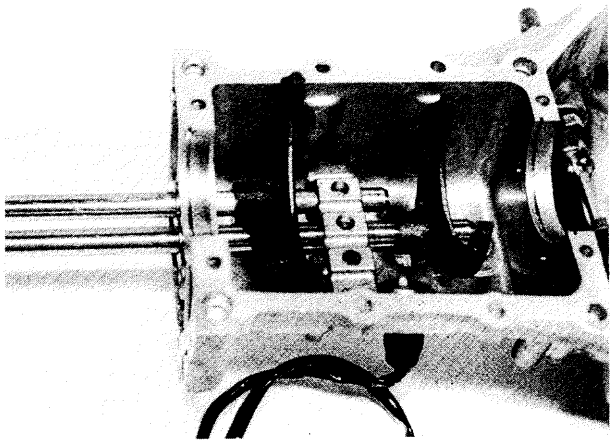


Fig. 13-68

5) Install interlock ball (⑤ in Fig. 13-64) and locating ball (⑥ in Fig. 13-64) into upper case. Then insert reverse gear shift shaft into upper case as described in 2) and 3).

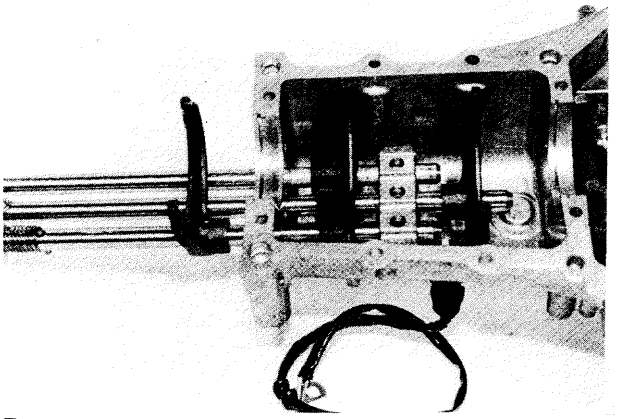


Fig. 13-69

[Yokes]
1) Install low speed gear shift yoke as shown below, using care for its direction.

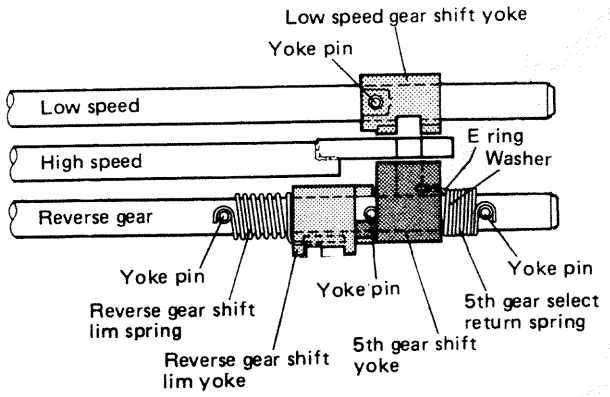


Fig. 13-70

2) Install reverse gear shift yoke and 5th gear shift yoke as shown below. Use care for installing direction of each part.
Between 2 springs, shorter one is 5th select return spring.

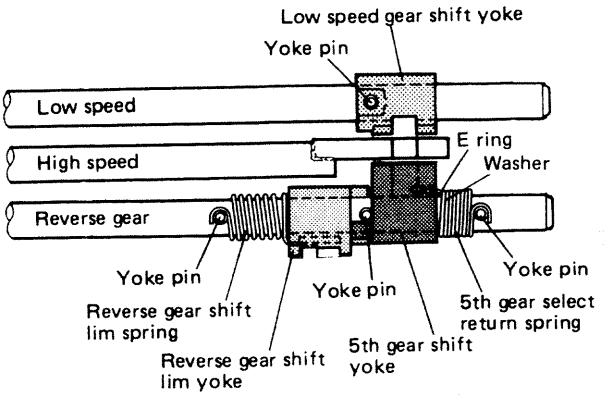


Fig. 13-71

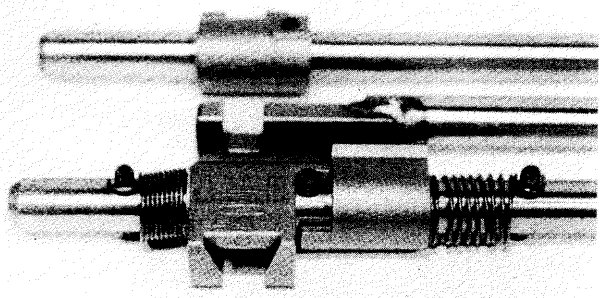


Fig. 13-72

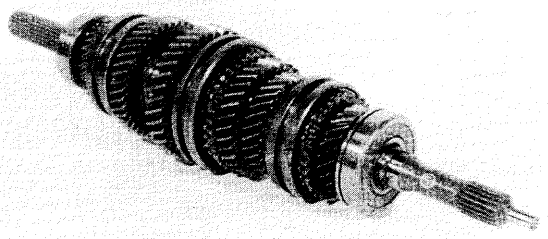


Fig. 13-74 Main shaft and input shaft assembly

Transmission Lower Case and Upper Case

1) With counter shaft ass'y, reverse idle gear and reverse gear shaft installed in lower case, check to ensure that bearing stopper rings ① are fitted in both sides of lower case as shown below.
Also check for 2 knock pins ②.

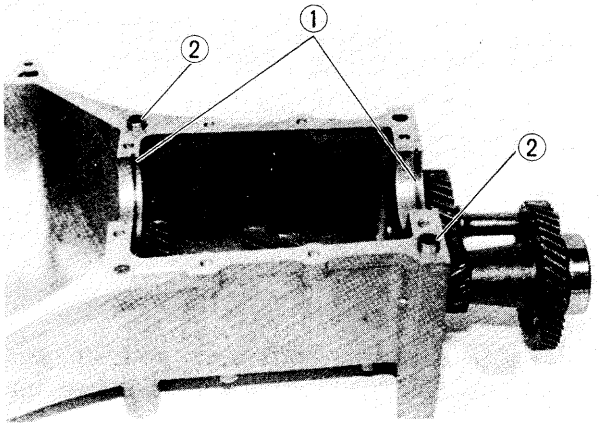


Fig. 13-73

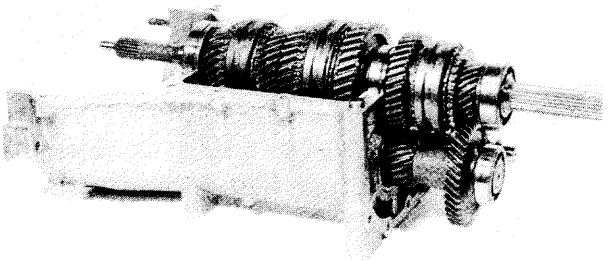


Fig. 13-75

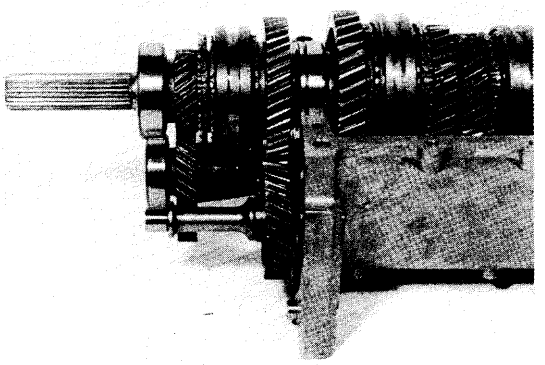


Fig. 13-76

2) Make sure that mating surfaces of both lower and upper cases are clean.
3) Install main shaft and input shaft ass'y in lower case.

4) Uniformly apply sealant (SUZUKI BOND NO. 1215, 99000-31110) to mating surface of lower case.

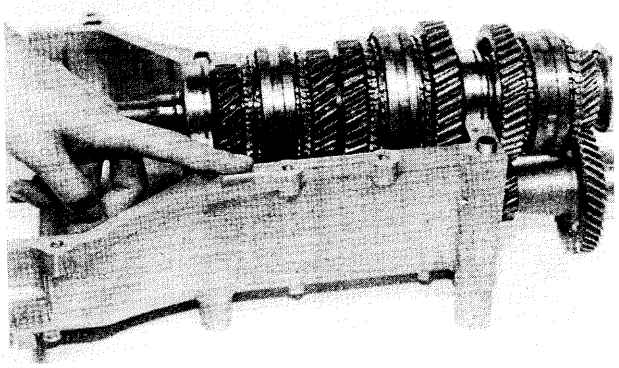


Fig. 13-77

5) Install upper case to lower case by matching 3 shift forks with 3 grooves in synchronizer sleeve on main shaft respectively.

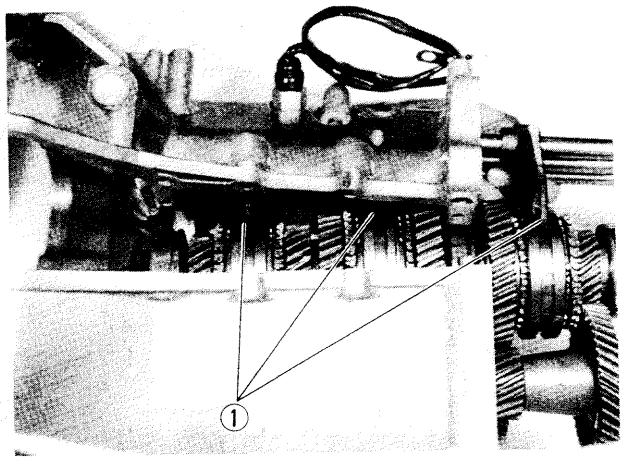


Fig. 13-78 ① Shift forks

6) Tighten case bolts to specification.

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

Extension Case

1) Check to ensure that knock pins ① are fitted.

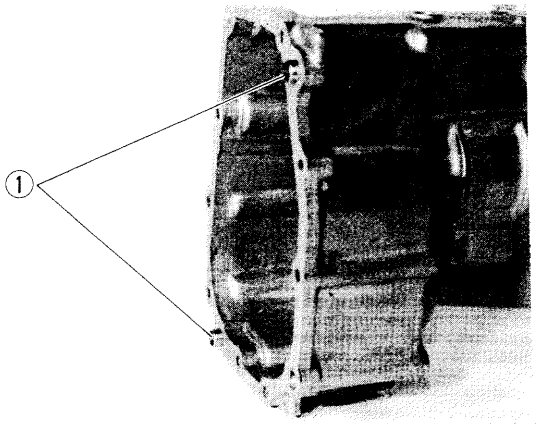


Fig. 13-79

2) Apply grease (SUZUKI SUPER GREASE A 99000-25010) to oil seal lip.
3) Clean surface of extension case to mate with transmission case and uniformly apply sealant (SUZUKI BOND No. 1215, 99000-31110).

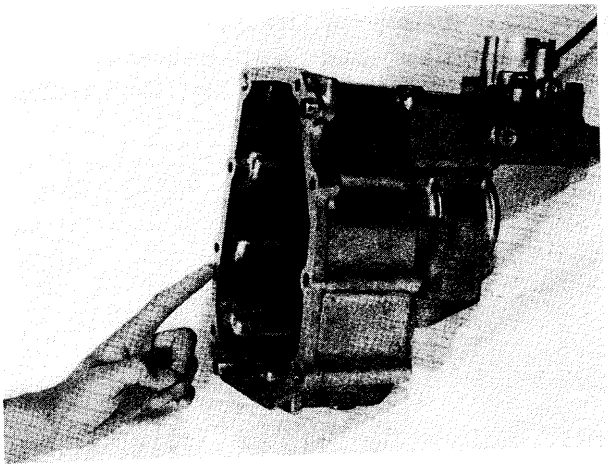


Fig. 13-80

4) Make sure that 3 shift shafts are in neutral position as shown in Fig. 13-23.
5) Install extension case to transmission case.
6) Tighten case bolts to specification.

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

7) Apply thread lock agent (THREAD LOCK CEMENT SUPER "1333B" 99000-32020) to thread of reverse gear shift rim bolt. And tighten rim bolt to extension case to specified torque.

Tightening torque for reverse gear shift rim bolt	N·m	kg-m	lb-ft
	14 – 20	1.4 – 2.0	10.5 – 14.0

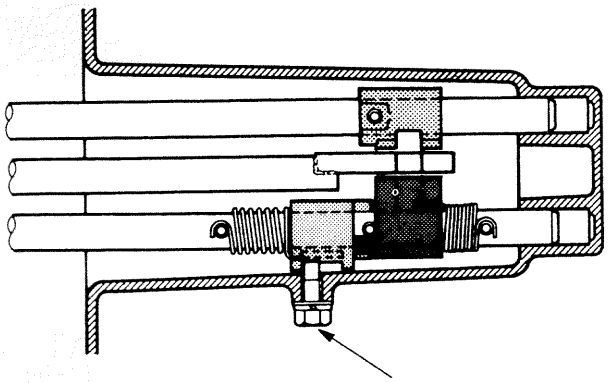


Fig. 13-81

Input Shaft Bearing Retainer

1) Apply grease (SUZUKI SUPER GREASE A 99000-25010) to oil seal lip.
2) Clean surface of retainer to mate with transmission case and uniformly apply sealant (SUZUKI BOND No. 1215, 99000-31110).

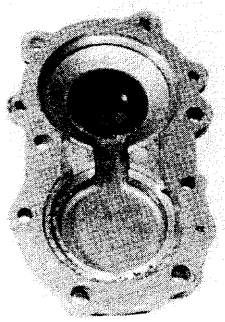


Fig. 13-82

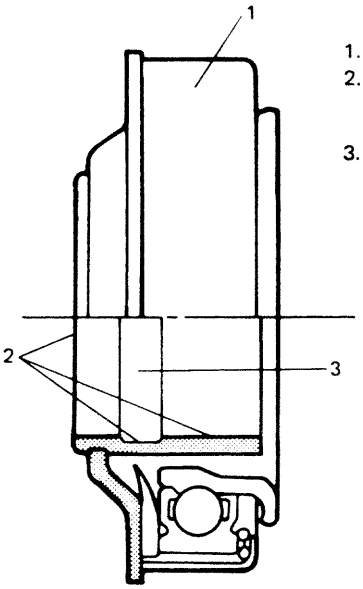
3) Tighten retainer bolts to specification.

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

4) Check transmission input shaft for easy rotation by hand.
5) Check each select and shift shaft for operation.

Clutch Release Bearing

Before installing bearing, apply grease (SUZUKI SUPER GREASE A 99000-25010) to inner surface of clutch release bearing.

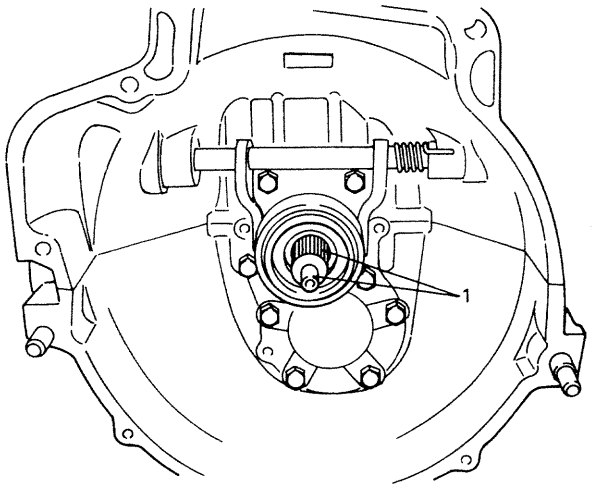


1. Clutch release bearing
2. Apply grease (SUZUKI SUPER GREASE A, 99000-25010)
3. I.D. recess

Fig. 13-83

Input shaft

Before remounting transmission ass'y to engine and car body, apply grease (SUZUKI SUPER GREASE I, 99000-25210) to input shaft.



1. Apply grease

Fig. 13-84

Others

Upon completion of reassembly and installation of transmission ass'y in car body, pour specified amount of transmission oil into transmission, and check carefully for oil leakage.
Refer to p. 13-25 for oil to be used and specified amount.

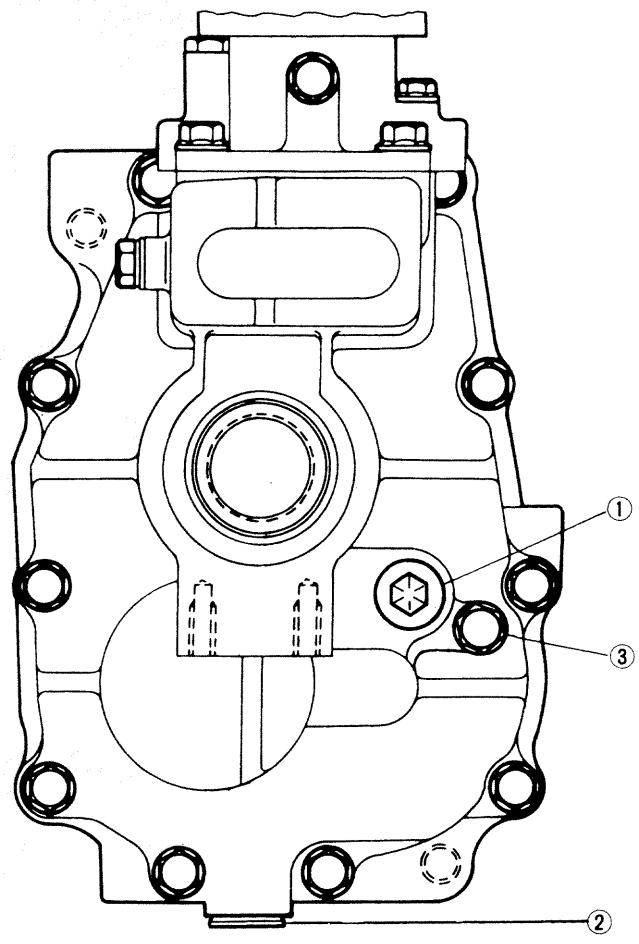
13-7. MAINTENANCE SERVICES

Transmission Oil

Before changing oil, check for oil leakage first and correct defects, if any. Fill specified new oil in specified amount.

Oil capacity	1.3 litres (2.75/2.29 US/Imp. pt.)
Oil specification	Gear oil, SAE 80W–90, 75W–80 or 75W–90

It is highly recommended to use SAE 75W–90 gear oil.
For viscosity chart, refer to P. 1-17.



① Oil filler plug
② Oil drain plug
③ Oil level plug

Fig. 13-85

After filling transmission with oil, torque oil filler and drain plugs to specification.

	N·m	kg-m	lb-ft
Tightening torque for oil drain and filler plug	18 – 28	1.8 – 2.8	13.5 – 20.0
Tightening torque for oil level plug	10 – 16	1.0 – 1.6	7.5 – 11.5

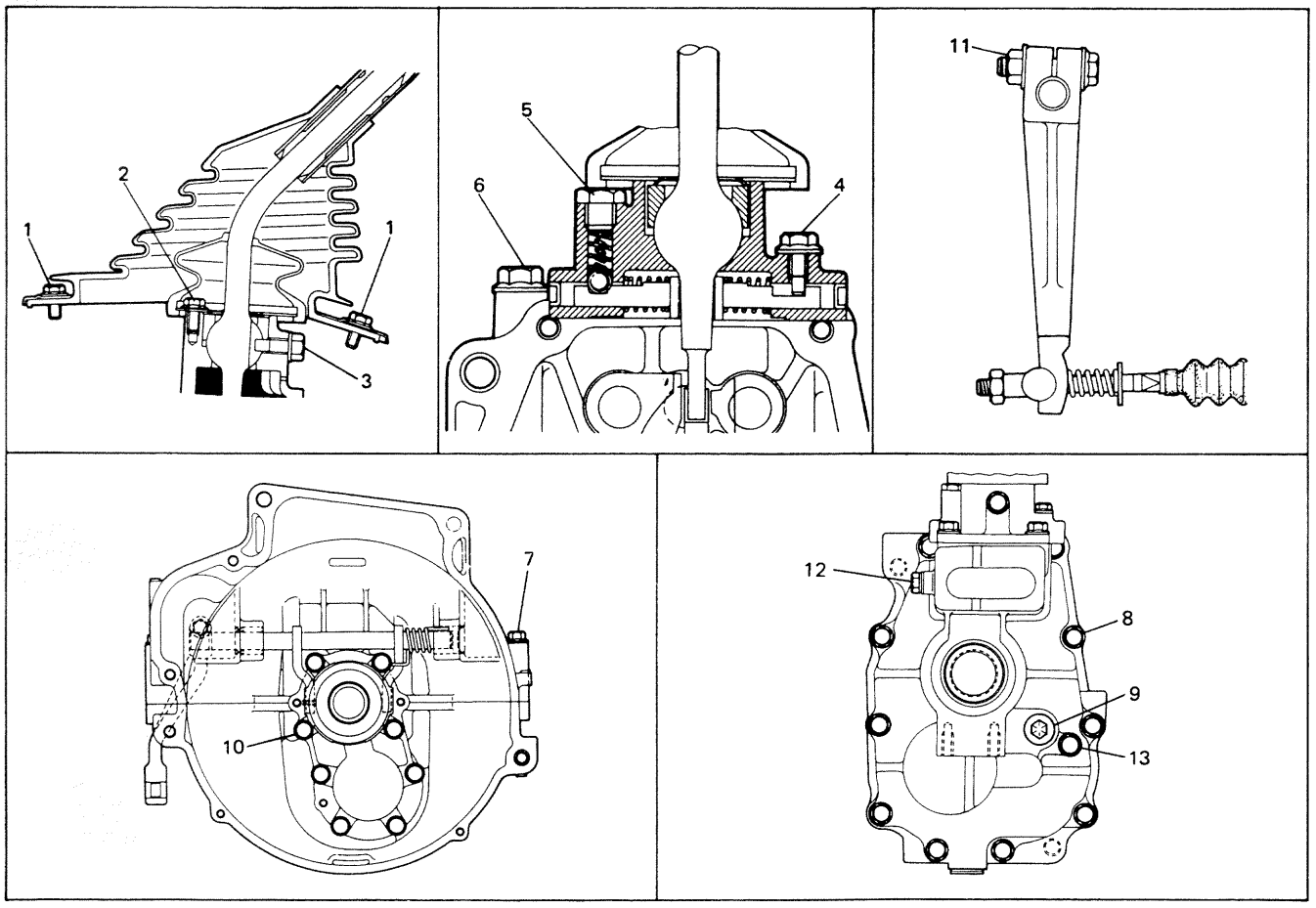
NOTE:
Whenever car was hoisted for any other service work than oil change, also be sure to check for oil leakage.

When installing oil drain and filler plugs to transmission case, apply sealant (SUZUKI BOND No.1215, 99000-31110) to thread part of plug.

13-8. RECOMMENDED TORQUE SPECIFICATION

Be sure to torque each bolt and nut according to specification given below, whenever loosened.
If specified torque for particular bolt or nut is not included in the list, refer to page 0-13.

System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Gear shifting control	1. Gear shift control boot cover bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
	2. Gear shift lever case cover bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
	3. Control lever locating bolt	14 – 20	1.4 – 2.0	10.5 – 14.0
	4. Low speed select pin bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
	5. Reverse select pin screw	25 – 35	2.5 – 3.5	18.5 – 25.0
	6. Gear shift lever case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
Transmission	7. Transmission case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
	8. Extension case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
	9. Transmission oil filler and drain plug	18 – 28	1.8 – 2.8	13.5 – 20.0
	10. Input shaft bearing retainer bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
	11. Clutch release arm nut	10 – 16	1.0 – 1.6	7.5 – 11.5
	12. Reverse gear shift rim bolt	14 – 20	1.4 – 2.0	10.5 – 14.0
	13. Transmission oil level plug	10 – 16	1.0 – 1.6	7.5 – 11.5



SECTION 14

TRANSFER GEAR BOX

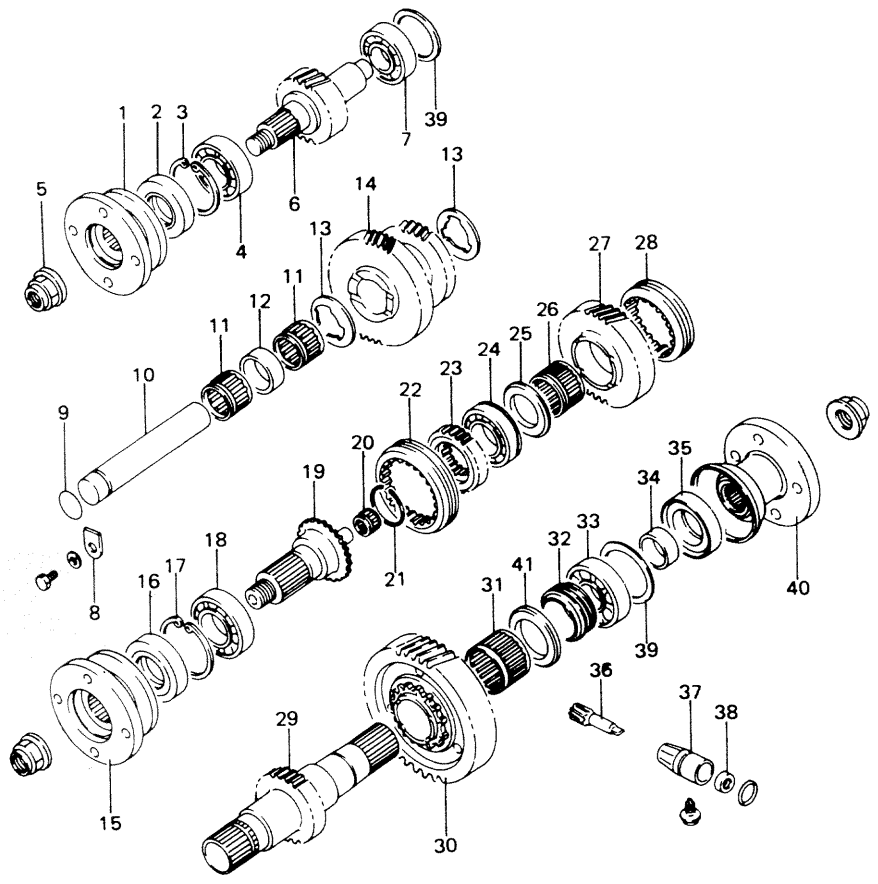
CONTENTS

14-1. GENERAL DESCRIPTION

The transfer gear box is an auxiliary transmission for on-off control of two-speed drive transmitted to both front and rear axles concurrently and provides additional speed reductions, HIGH and LOW, for any selection of main transmission gears.

The functions of this auxiliary transmission are mainly two—selection between four-wheel drive (front and rear axles) and two-wheel drive (rear axle) and between HIGH and LOW for four-wheel drive. Three propeller shafts are associated with the gear box.

These functions are accomplished by means of four shafts arranged in three-axis configuration and two sliding clutches. The selection is effected by actuating these clutches from a single control lever located beside the driver's seat. The gear box is mounted on a chassis frame.



1. Flange
2. Oil seal
3. Circlip
4. Bearing
5. Nut
6. Input shaft
7. Bearing
8. Counter shaft lock plate
9. O-ring
10. Counter shaft
11. Bearing
12. Spacer
13. Thrust washer
14. Counter gear
15. Flange
16. Oil seal
17. Circlip
18. Bearing
19. Output front shaft
20. Bearing
21. Circlip
22. Sleeve
23. Hub
24. Bearing
25. Thrust washer
26. Bearing
27. Output high gear
28. Sleeve
29. Output rear shaft
30. Output low gear
31. Bearing
32. Speedometer drive gear
33. Bearing
34. Retainer
35. Oil seal
36. Speedometer driven gear
37. Speedometer gear case
38. Oil seal
39. Shim
40. Flange
41. Washer

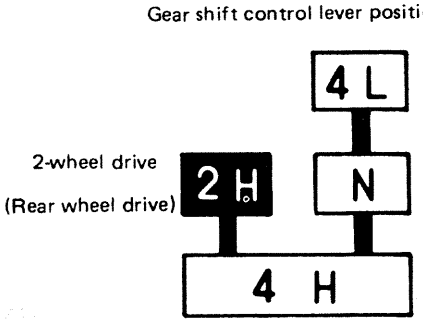
Fig. 14-1

14-2. SELECTIVE FLOWS OF TRANSFER DRIVE

2-Wheel Drive (Rear-Wheel Drive)

Rear shifter fork pushes rear clutch sleeve into "high" gear, thus coupling the gear to output rear shaft.

Drive flows from input shaft to output rear shaft through big gear, "high" gear and rear clutch.



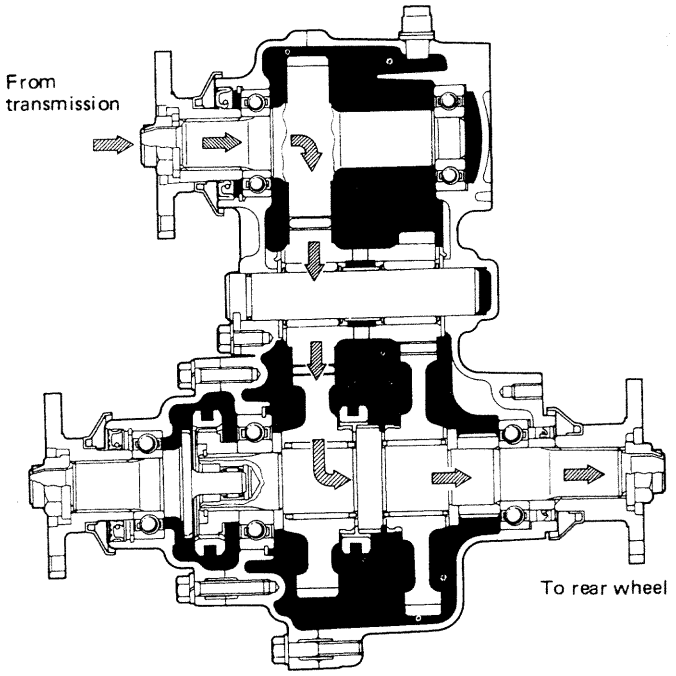
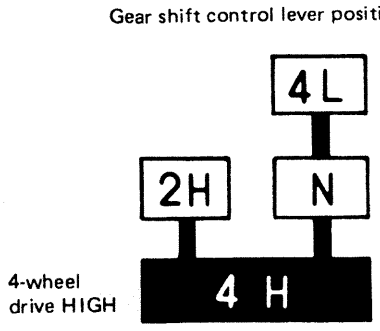


Fig. 14-2

4-Wheel Drive HIGH (All-Wheel Drive on HIGH)

Under the conditions of rear-wheel drive, described above, front shifter fork pushes the sleeve of front clutch onto the toothed clutch ring, thus coupling output rear shaft to output front shaft. Front shaft and rear shaft run together on HIGH.



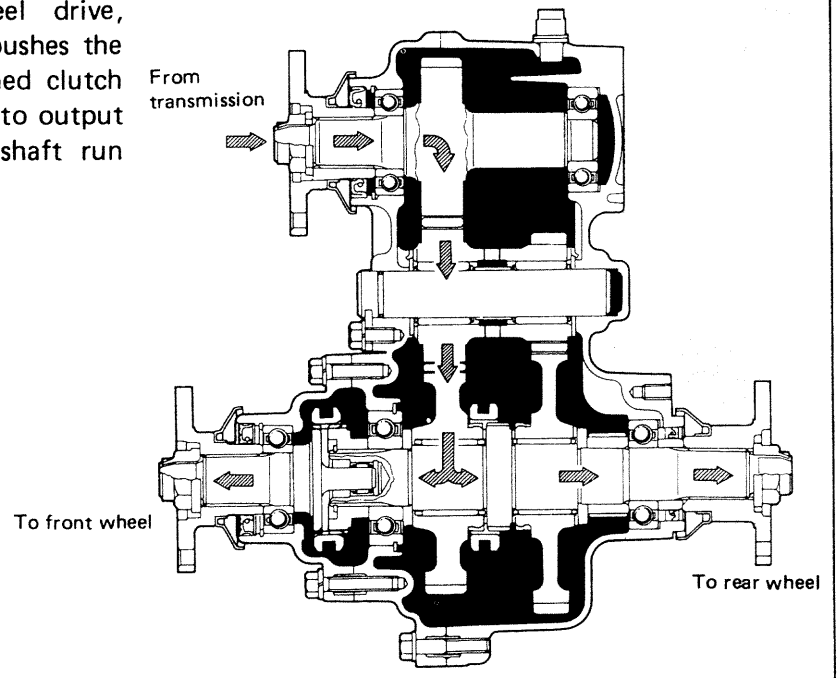
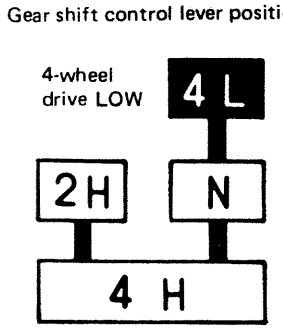


Fig. 14-3

4-Wheel Drive LOW (All-Wheel Drive on LOW)
Front shifter fork actuates front clutch to couple rear shaft to front shaft; and rear shifter fork actuates rear clutch to couple "low" gear to rear shaft. Front shaft and rear shaft run together on LOW.



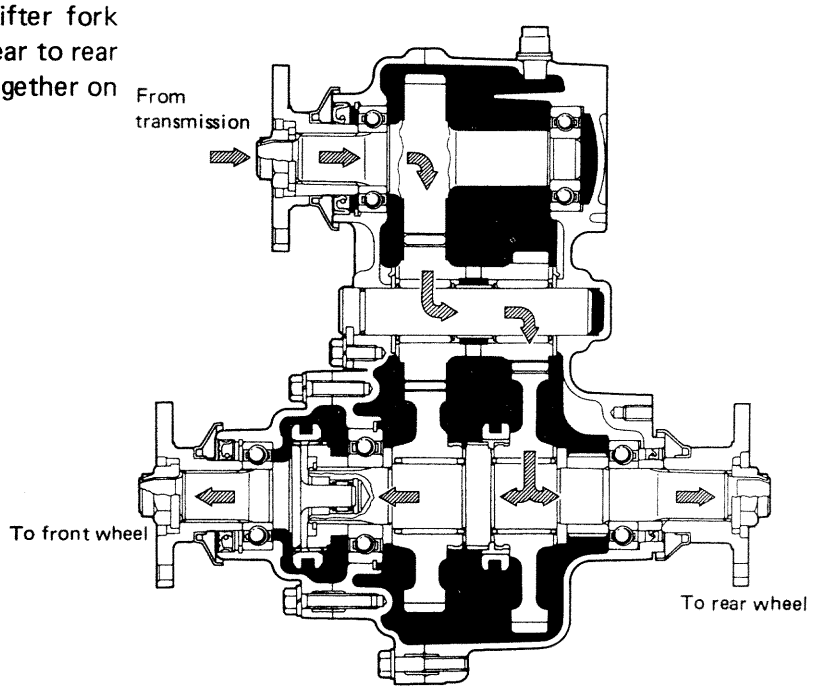


Fig. 14-4

14-3. GEAR RATIO DATA

Shift position	Rear-wheel drive	All-wheel drive high	All-wheel drive low
Gear	41/44 · 62/41	41/44 · 62/41	41/44 · 56/23
Reduction	1.409	1.409	2.268

14-4. TRANSFER SERVICES NOT REQUIRING TRANSFER REMOVAL

Following parts or components do not require transfer removal to receive services (replacement, inspection) :

Part or Component	Nature of Service
1. Universal-joint yoke flanges	Replacement or inspection
2. Front drive shift shaft fork	Replacement or inspection
3. Transfer output front shaft oil seal	Replacement or inspection
4. Transfer output front shaft bearing	Replacement
5. Transfer output front shaft	Replacement
6. Transfer front case	Replacement
7. Front drive clutch hub	Replacement or inspection
8. Front drive clutch sleeve	Replacement or inspection
9. Transfer input shaft oil seal	Replacement
10. 4WD indicator light switch	Replacement or inspection
11. Speedometer driven gear	Replacement or inspection
12. Gear shift control lever	Replacement or inspection
13. Gear shift control boot No. 1, No. 2	Replacement
14. Gear shift control lever spring seat	Replacement or inspection

14-5. REMOVAL

1) Lift up car and remove securing bolts from each universal-joint flange connection to sever 3 propeller shafts from transfer gear box.

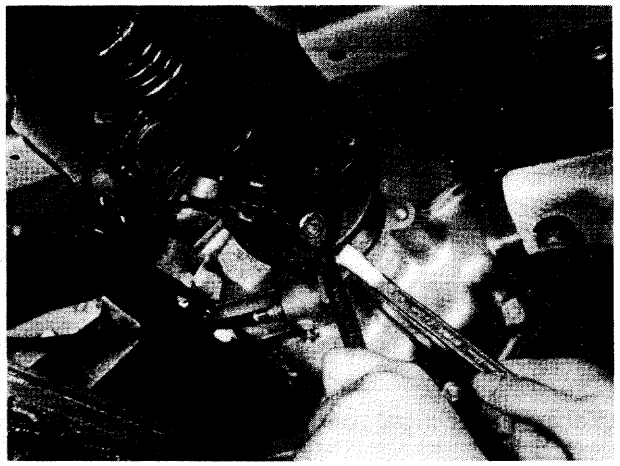


Fig. 14-5

2) Remove clamp ① and boot ② from transfer gear box.

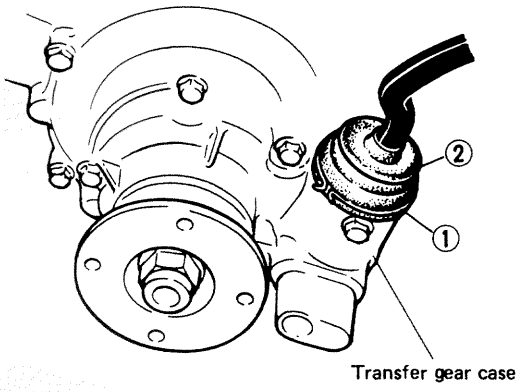


Fig. 14-6

3) Twist control lever guide counterclockwise while pushing it down; this will permit lever to be removed from gear box.

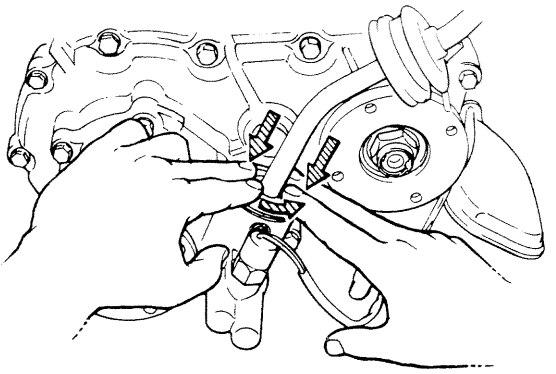


Fig. 14-7

4) Drain out oil from gear box by loosening its drain plug.

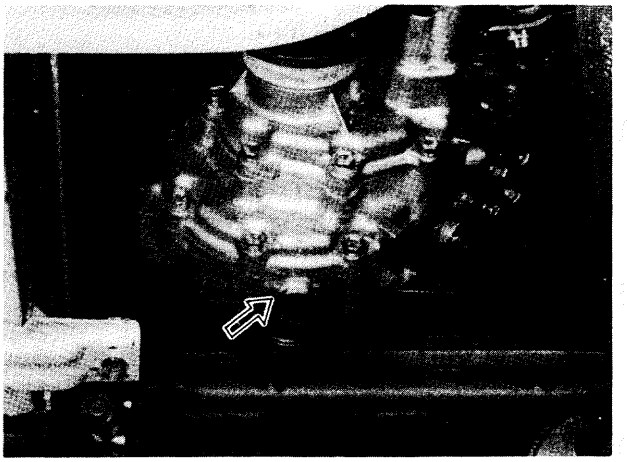


Fig. 14-8

5) Disconnect speedometer drive cable from transfer gear box.

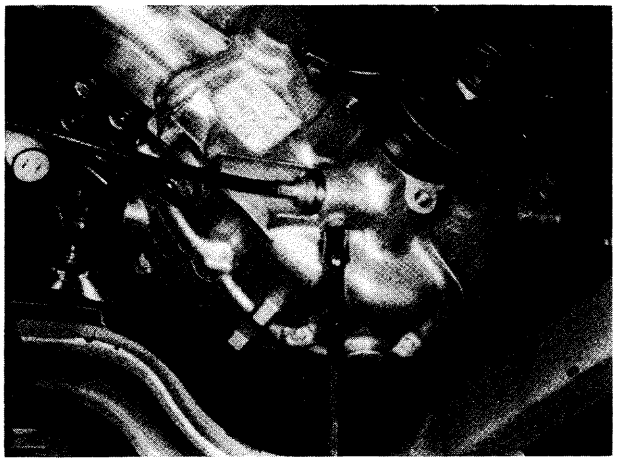


Fig. 14-9

6) Disconnect 4WD switch lead wire at coupler.
7) Remove 3 mounting nuts securing gear box to chassis, and take down gear box.

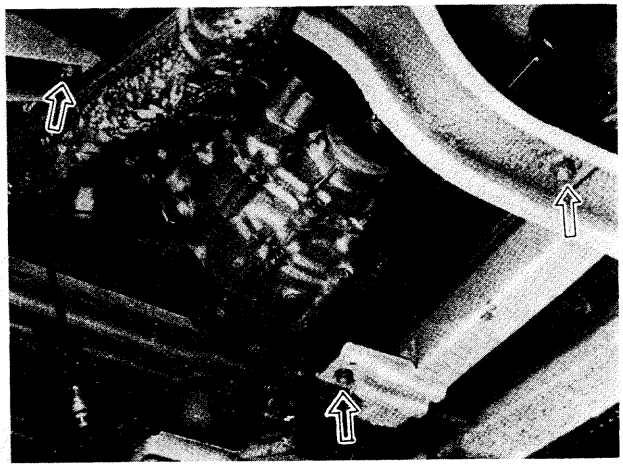


Fig. 14-11

14-6. DISASSEMBLY

Universal-Joint Yoke Flanges

There are 3 flanges to be removed: one from input shaft and other from output front and rear shafts. Lock flange so that it will not turn, and loosen and remove nut holding flange to the shaft. Draw off flange.

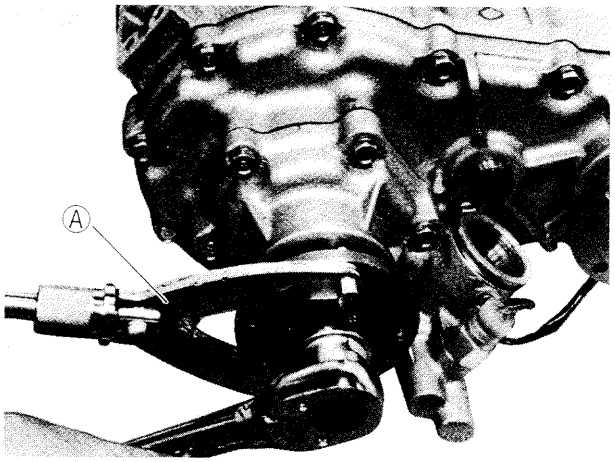


Fig. 14-12 Ⓐ Special tool (09930-40113)

Speedometer Driven Gear

Loosen speedometer driven gear case bolt and remove speedometer driven gear case with gear.

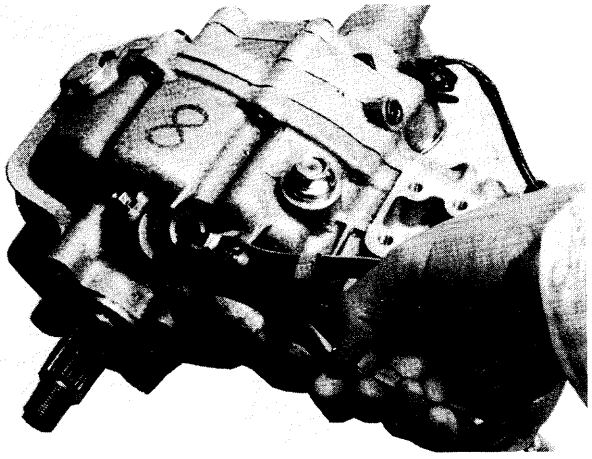


Fig. 14-15

Transfer Front Case

Remove the indicator light switch from front case.

NOTE:

Use care not to lose switch ball. This ball is larger than interlock ball and locating balls.

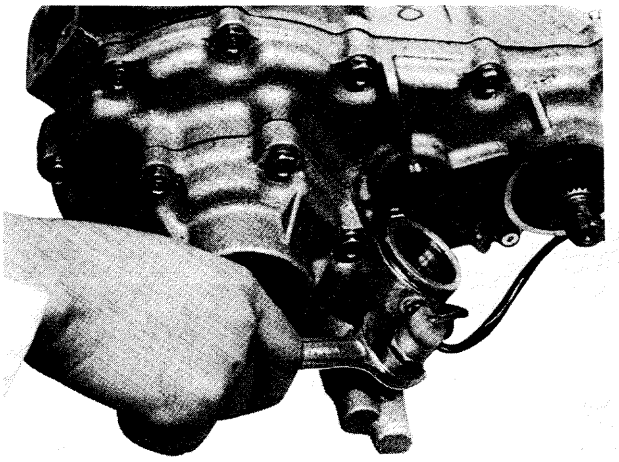


Fig. 14-16

Remove bolts securing transfer front case, and take off case.

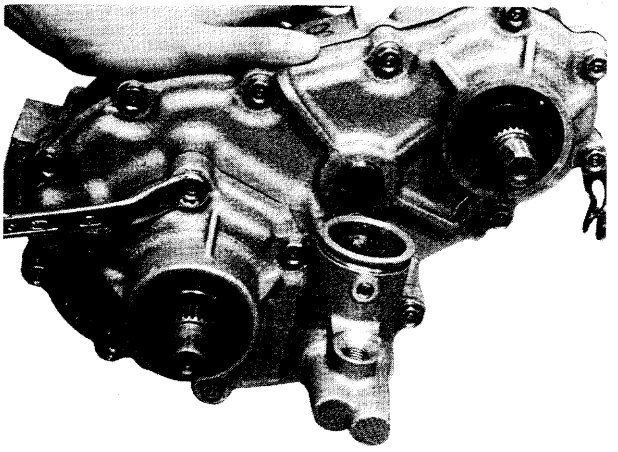


Fig. 14-17

By tapping output front shaft with a plastic hammer, remove output front shaft from front case.

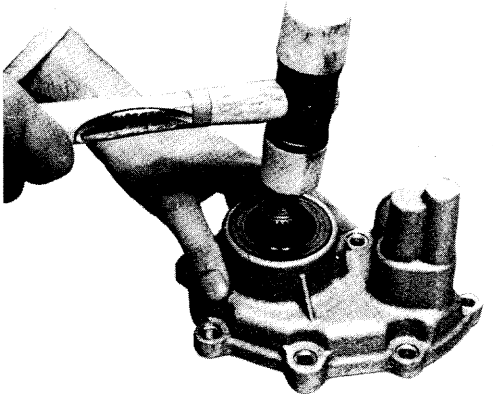


Fig. 14-18

After removing oil seal, remove circlip and drive bearing out of front case by using bearing installer (special tool).

Bearing installer Ⓒ : (09913-76010)

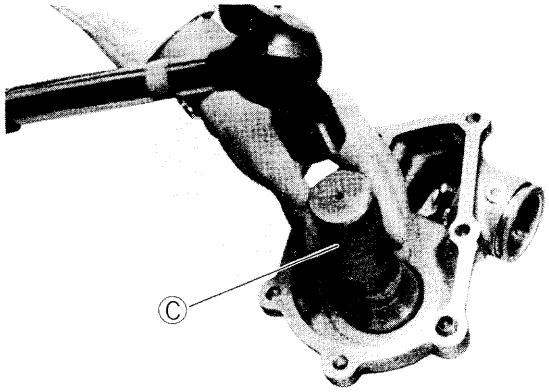


Fig. 14-19

Transfer Center Case

Remove bolts fastening center case and rear case together.

Do not loosen bolt ① at this point.

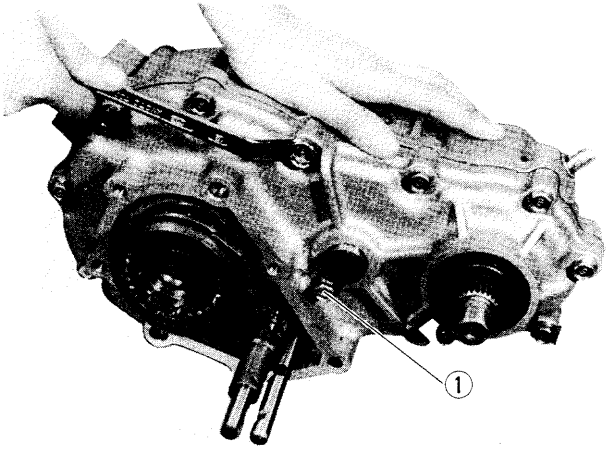


Fig. 14-20

By tapping rear case and output rear shaft with a plastic hammer, separate center and rear case.

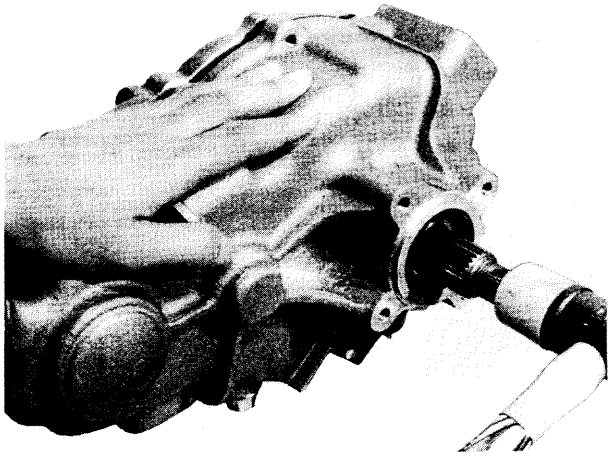


Fig. 14-21

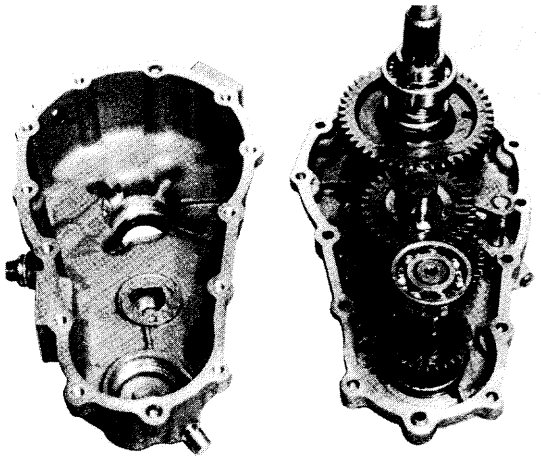


Fig. 14-22

Given below are procedures for disassembling component parts of center case as separated from rear case.

1) Loosen gear shift locating spring plug and take out spring and locating ball.

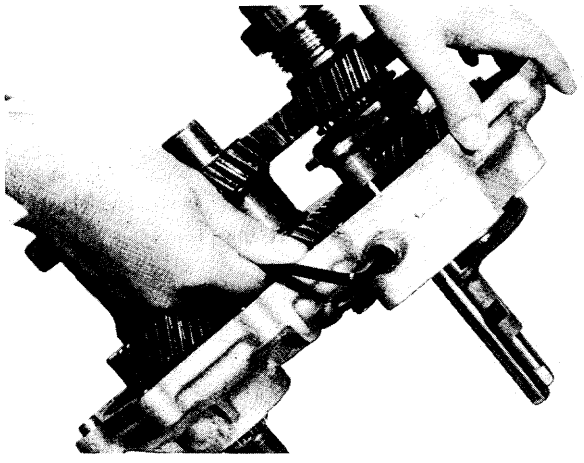


Fig. 14-23

2) Using spring pin remover (special tool), drive 2 spring pins out of front drive shift shaft ① and reduction shift shaft ②.
Spring pin remover Ⓓ : (09922-85811).

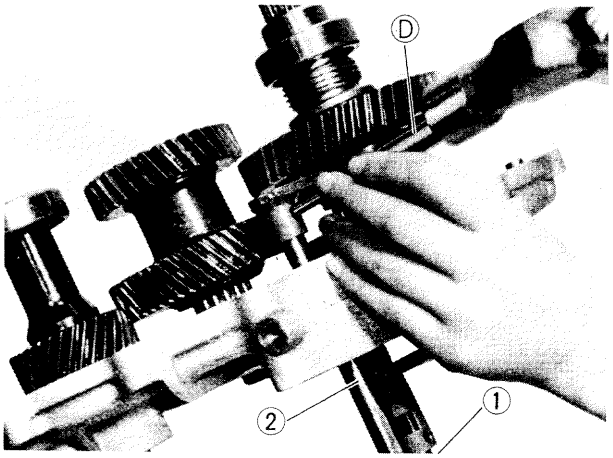


Fig. 14-24

3) Remove forks and shift shafts.

NOTE:
At this time, locating ball and spring will jump out of hole, use care not to lose them.

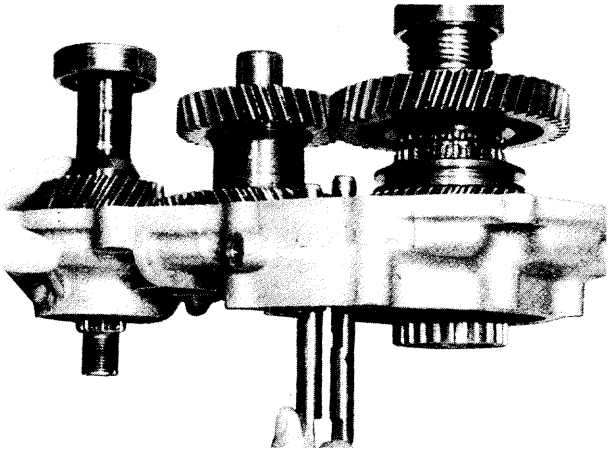


Fig. 14-25

4) Hammer output rear shaft with a plastic hammer to drive it out of center case.

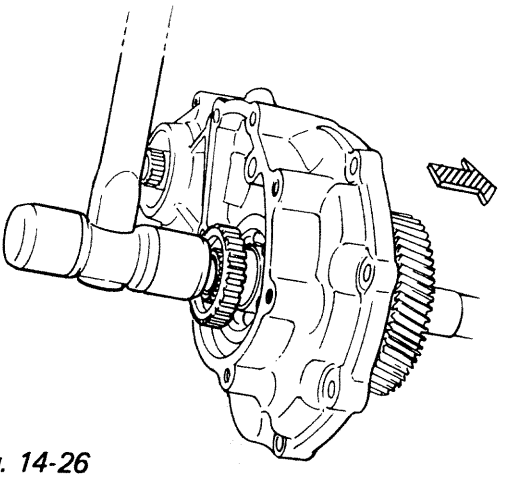


Fig. 14-26

5) Pull out counter gear, bearings and spacer. Remove counter shaft from center case by loosening counter shaft lock plate bolt.

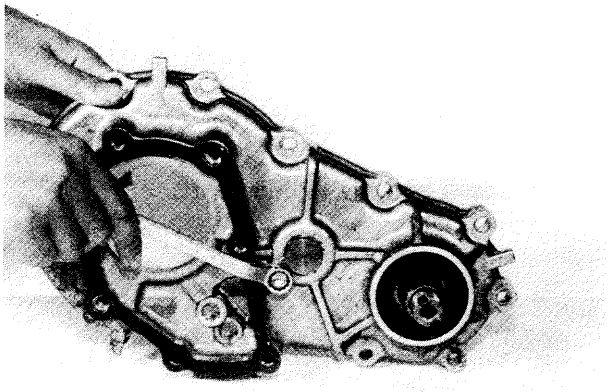


Fig. 14-27

6) Remove input shaft from center case by hammering thick part of case or input shaft center with a plastic hammer.

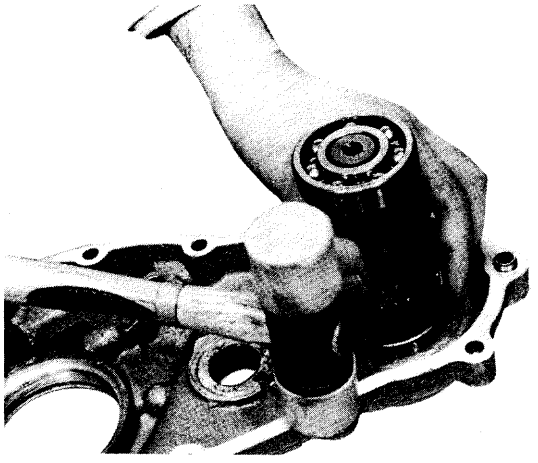


Fig. 14-28

7) Remove output shaft rear bearing and retainer together by using bearing puller. After removing bearing, speedometer drive gear, thrust washer, output low gear and needle roller bearing can be removed.

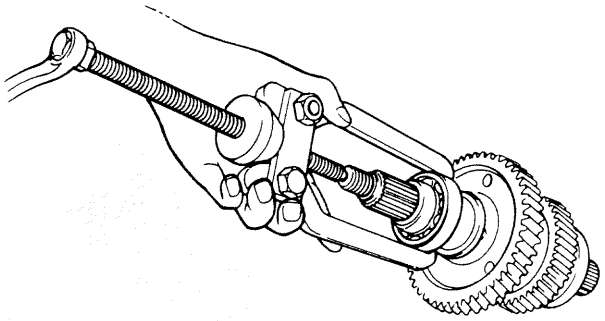


Fig. 14-29

8) Remove front drive clutch hub circlip and pull clutch hub off shaft by using bearing puller and puller attachment (special tool A).

NOTE:
Use care to prevent damage to needle roller bearing in output rear shaft when removing clutch hub.

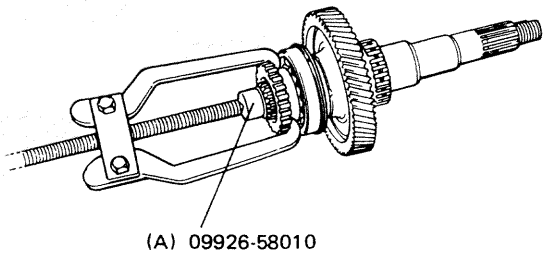


Fig. 14-30

9) Remove front bearing by using bearing puller and puller attachment (special tool A).

NOTE:
Use care to prevent damage to needle roller bearing in output rear shaft while bearing is being removed.

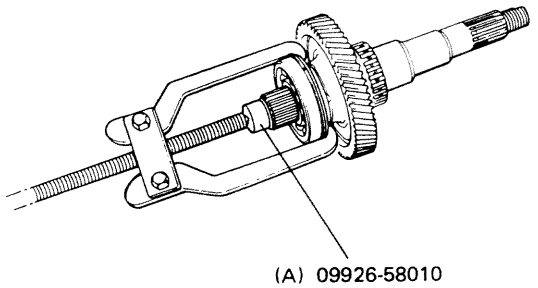


Fig. 14-31

10) When input shaft is removed or center case and rear case are separated, input shaft bearings may come off. In such a case, bearings can be removed from shaft by using bearing puller.

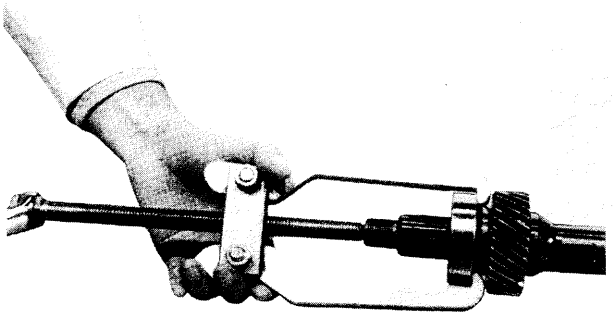


Fig. 14-32

11) When input shaft is removed, front bearing may be left in case. In this case, after removing oil seal and circlip, bearing can be taken out of case by using bearing installer (special tool).
Bearing installer Ⓕ : (09913-75810)

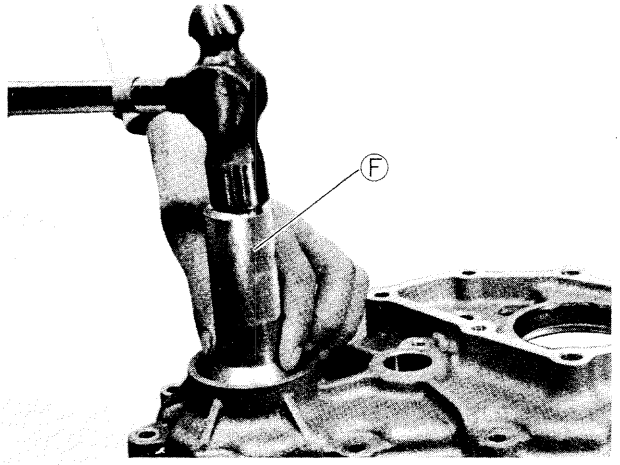


Fig. 14-33

Transfer Rear Case

1) When center case and rear case are separated, input shaft may be left in rear case. In this case, remove input shaft from rear case by hammering thick part of case with a plastic hammer.

Fig. 14-34

14-7. INSPECTION OF COMPONENTS

Gear Teeth

Inspect gear teeth ①, internal teeth of rear clutch sleeve ② and clutch teeth of gear ③ for wear, cracking, chipping and other malcondition. Replace gear or sleeve as necessary.

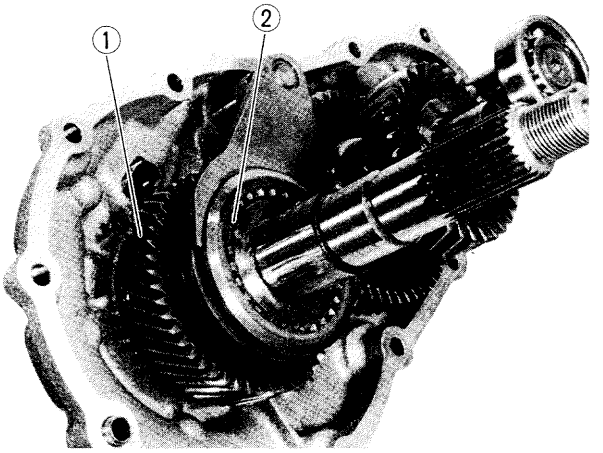


Fig. 14-35

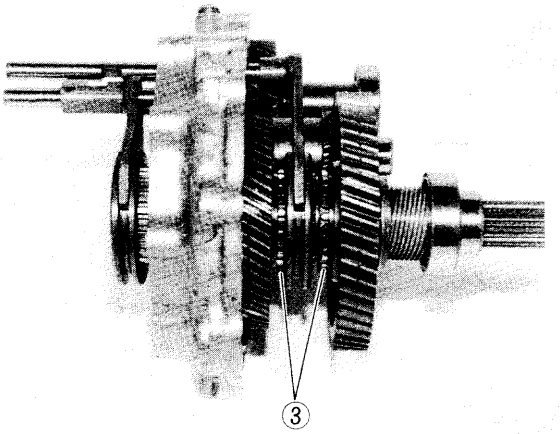


Fig. 14-36

Locating Spring

Check each shifter fork shaft locating spring for strength by measuring its free length. If length is noted to be less than service limit, replace it.

	Standard	Service limit
Free length of locating spring	23.7 mm (0.933 in)	22.0 mm (0.866 in)

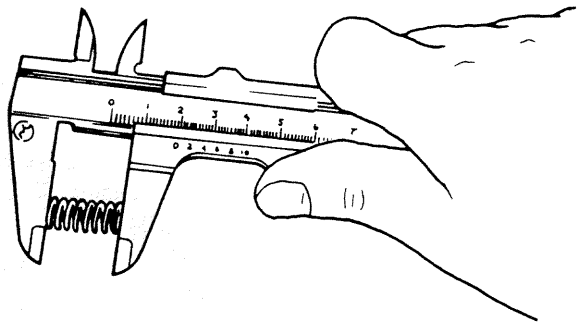


Fig. 14-37

Bearings

Check each bearing by spinning its outer race by hand to "feel" smoothness of rotation. Replace bearing if noted to exhibit sticking, resistance or abnormal noise when spun or rotated by hand.

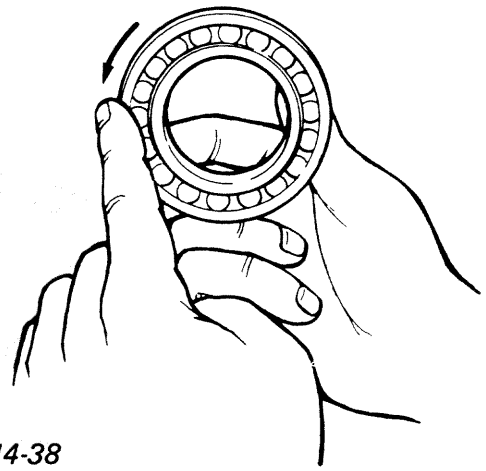


Fig. 14-38

Side Clearance of Gears

With gear, bearing and thrust washer installed on shaft, check for side clearances of gears. If clearance exceeds service limit, replace thrust washer.

Side clearance of gear		Standard	Service limit
Output gears	low gear	0.175 – 0.325mm	0.7mm
	high gear	(0.007 – 0.012in)	(0.027in)

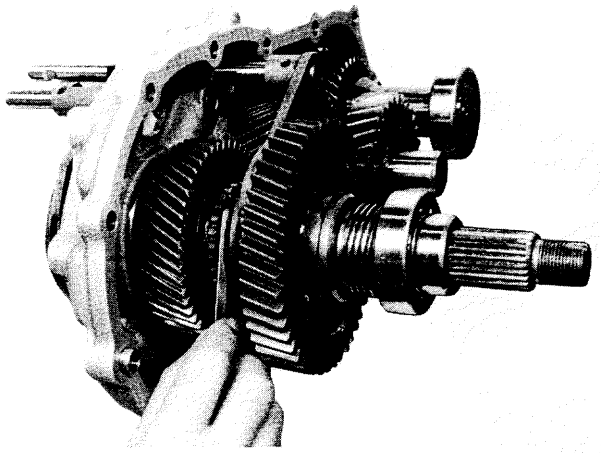


Fig. 14-39 Output high gear

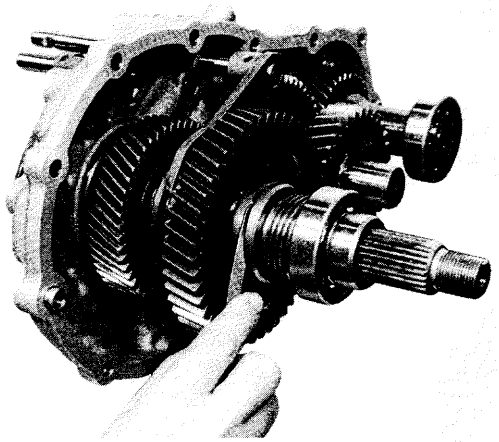


Fig. 14-40 Output low gear

Gear Shift Shafts

Check each part as indicated in below figures for uneven wear. Replace defective parts.

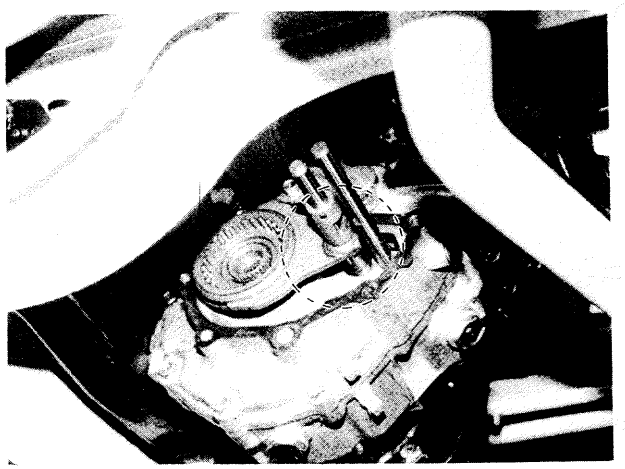


Fig. 14-41

4WD Gear Shift Lever

Check lower end of gear shift lever where gear shift fork shaft contacts ① for wear and any kind of damage. Worn or damaged shift lever must be replaced with new one.

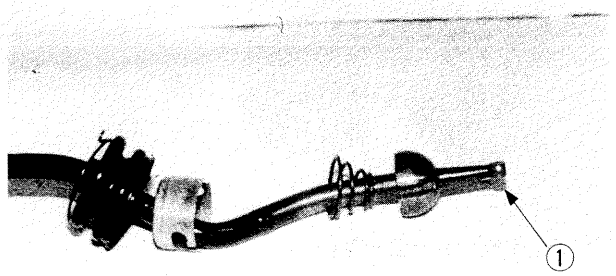


Fig. 14-42

14-8. REASSEMBLY

NOTE:

- **All parts to be used in reassembly must be perfectly clean.**
- **Oil or grease sliding and rubbing surfaces of transfer components just before using them in reassembly with gear oil and SUZUKI SUPER GREASE A (99000-25010).**
- **Oil seals, "O" rings, gaskets and similar sealing members must be in perfect condition. For these members, use replacement parts in stock.**
- **Tightening torque is specified for important fasteners — mainly bolts — of transfer and other components. Use torque wrenches and constantly refer to specified data given in P. 14-23.**

Input Shaft

Press-fit bearings onto both sides of input shaft by using bearing installer (special tool).
Bearing installer (A) : (09913-84510)

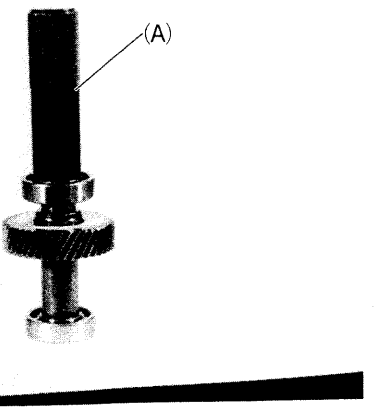
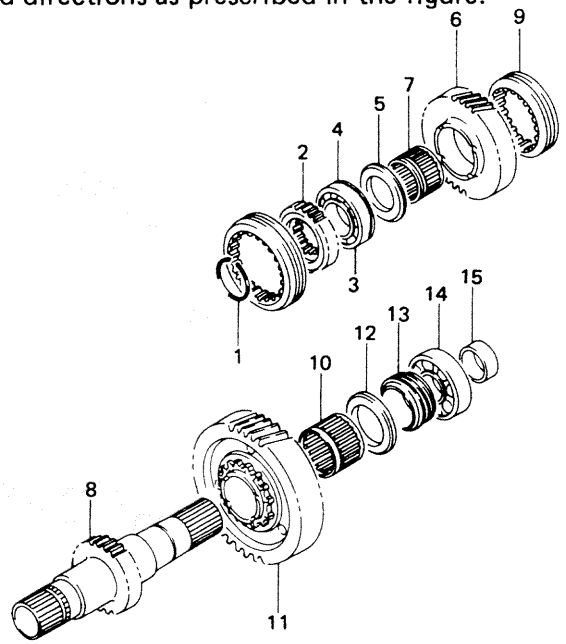


Fig. 14-43

Output Rear Shaft

Install following parts onto shaft in such order and directions as prescribed in the figure.



1. Circlip
2. Hub
3. Bearing
4. Bearing outer ring
5. Thrust washer
6. Output high gear
7. Bearing (long)
8. Output rear shaft
9. Sleeve
10. Bearing (short)
11. Output low gear
12. Thrust washer
13. Speed meter drive gear
14. Bearing
15. Retainer

Fig. 14-44

1) After installing bearing (long), high gear and thrust washer, press-fit bearing ③ and then hub ② by using bearing installer (special tool).

Bearing installer (A) : (09913-84510)

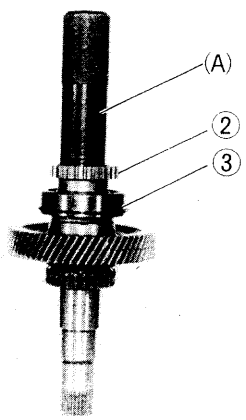


Fig. 14-45

2) Fit circlip ① securely into groove in shaft.

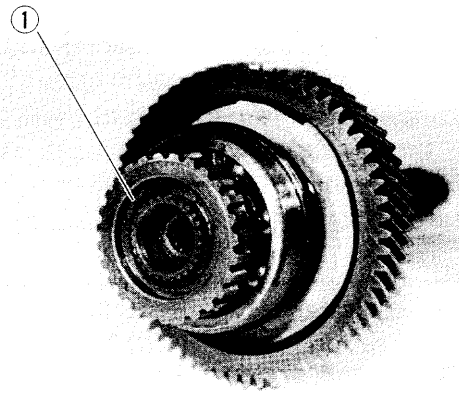


Fig. 14-46

3) After installing sleeve, bearing (short), low gear and thrust washer, press-fit speedometer drive gear by using bearing installer (special tool).

Bearing installer (A) : (09913-84510)

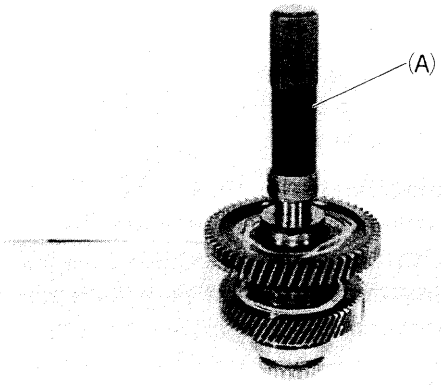


Fig. 14-47

4) Press-fit bearing ⑭ and the retainer ⑮ by using bearing installer (special tool).

Bearing installer (A) : (09913-84510)

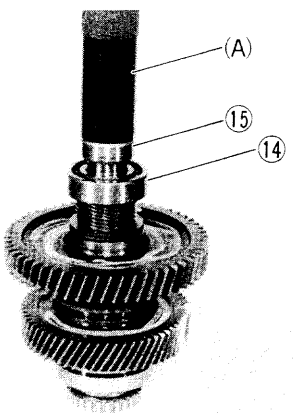


Fig. 14-48

Shim Adjustment of Input and Output Shafts

Clearance in thrust direction of both input and output shafts is adjusted by putting shims between input shaft rear bearing and rear case for input shaft and between output shaft rear bearing and rear case for output shaft.

As thrust clearance is specified as follows, determine shim thickness to meet specification according to the following procedures.

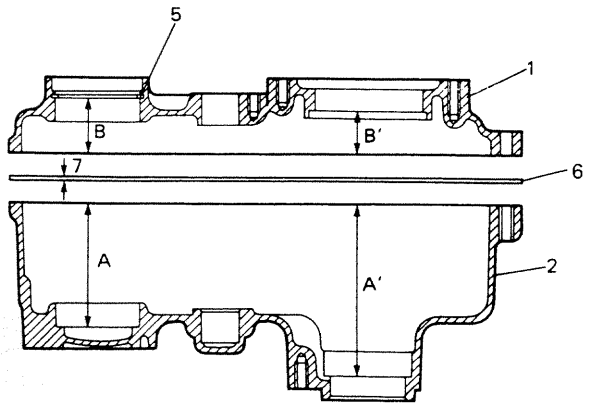
Thrust clearance specification	0.05 – 0.15 mm (0.002 – 0.006 in.)

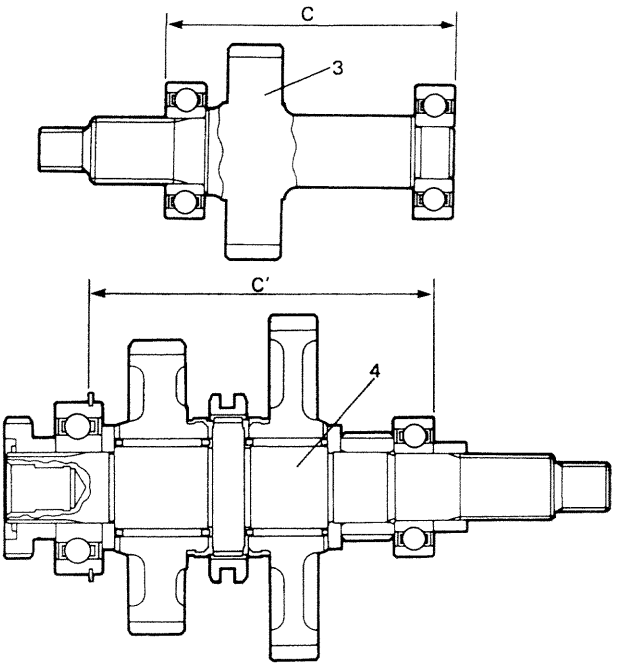
[Input shaft]

1) Take measurement "A" of rear case as shown in figure below by using depth gauge.
2) Take measurement "B" of center case with bearing circlip installed.
3) Take measurement "C" (between bearing inner races) of input shaft with bearings installed, by using micrometer.

NOTE:

- **Before measuring, make sure that each bearing is free from abnormal noise or resistance by spinning its outer race.**
- **Each measurement in above steps 1) to 3) must be taken accurately in careful manner. If shim thickness is determined based on rough measurement, clearance of each shaft in thrust direction will not satisfy specification. And improper clearance may cause oil leakage, broken bearing and abnormal noise.**
- **Take the same measurement at 3 to 4 different positions and use their mean.**





1. Center case
2. Rear case
3. Input shaft
4. Output shaft
5. Bearing circlip
6. Gasket
7. Gasket thickness (0.3 mm or 0.012 in)

Fig. 14-48-1

4) Using measurements obtained in steps 1) to 3) and equation described below, calculate shim thickness which is necessary for proper thrust clearance.

Thrust clearance = ("A" + "B" + Gasket thickness) – "C"

As the above equation holds for thrust clearance and gasket thickness is specified as 0.3 mm and thrust clearance as 0.05 to 0.15 mm, shim thickness is calculated by the following equation.

Shim thickness = ("A" + "B" + 0.3) – ("C" + 0.05 ~ 0.15)

[Example]

Supposing A, B and C are as follows;

A = 81.35 mm (3.203 in.)
B = 35.70 mm (1.405 in.)
C = 117.05 mm (4.608 in.)

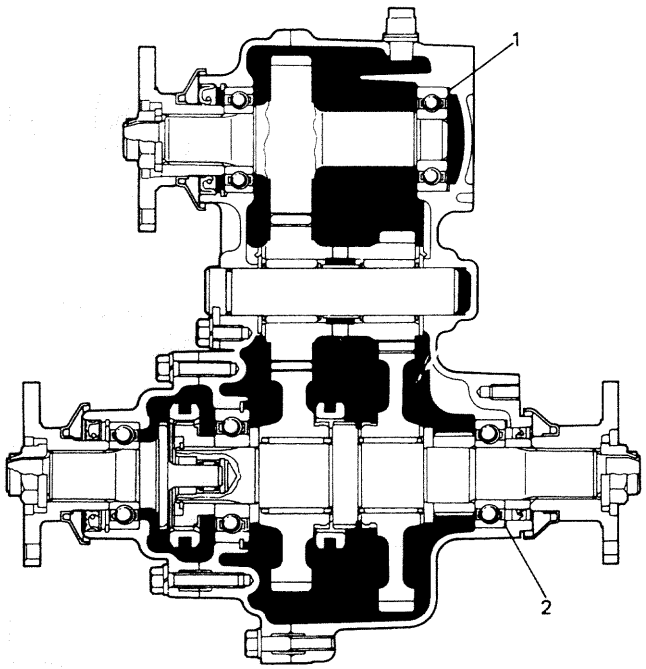
Shim thickness = (81.35 + 35.70 + 0.3) – (117.05 + 0.05 ~ 0.15)
= 117.35 – 117.10 ~ 117.20
= 0.25 ~ 0.15

In this case, use of 0.15 to 0.25 mm (0.006 to 0.009 in) thick shim(s) will ensure specified thrust clearance which is 0.05 to 0.15 mm (0.002 to 0.006 in). Therefore 2 pieces of 0.1 mm (0.004 in) thick shim should be selected in available shims below to satisfy thickness.

5) When shim thickness is determined, select proper shim(s) from among the following shims and use it (them) between input shaft rear bearing and rear case when matching center case and rear case.

Available shim size (thickness)	0.1, 0.3, 0.5 mm (0.004, 0.012, 0.020 in.)

[Output shaft]
Just as with input shaft, take measurements of "A' ", "B' " and "C' " as indicated in Fig. 14-48-1, calculate shim thickness and install proper shim(s) between output shaft rear bearing and rear case when matching center case and rear case.



1. Shim for input shaft
2. Shim for output shaft

Fig. 14-48-2

Rear Case

1) Install oil seal in rear case and apply grease to oil seal lip.

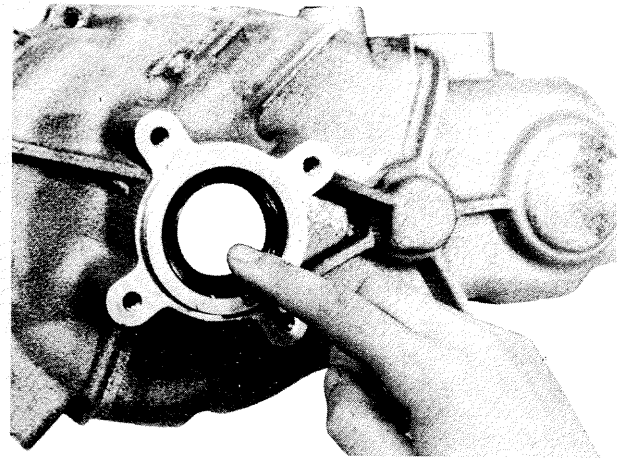


Fig. 14-49

2) Install counter shaft thrust washer to rear case, bringing its face without depressions against case and fit its bent portion securely into groove in case.

NOTE:
Apply ample amount of grease to both surfaces of washer so as to lubricate sliding surfaces and prevent washer from moving out of place or slipping off.

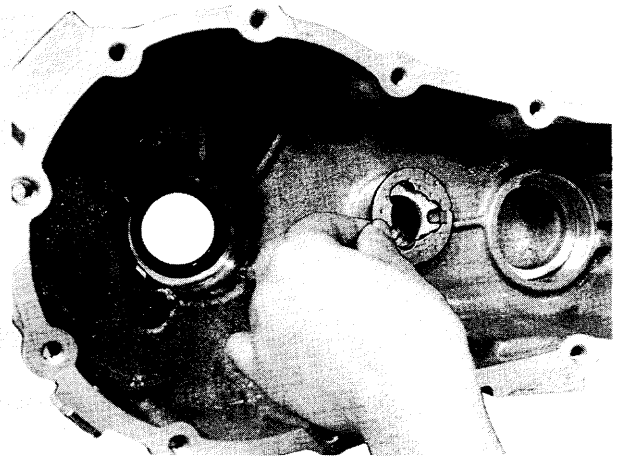


Fig. 14-50

Center Case

1) Install input shaft front bearing circlip and oil seal in center case.
Snap ring pliers Ⓐ : (09900-06108)

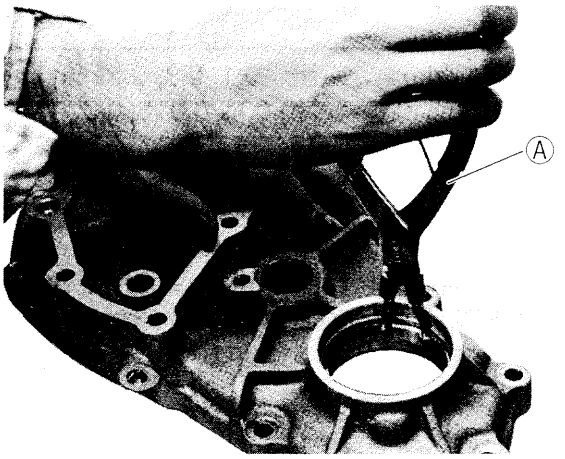


Fig. 14-51

2) Install input shaft to center case.

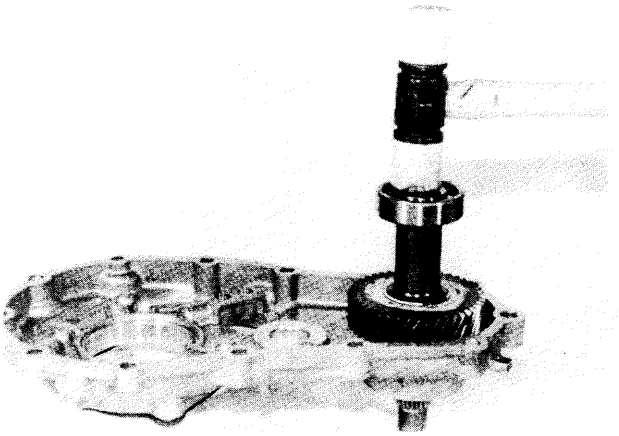


Fig. 14-52

3) After greasing O ring on counter shaft, insert shaft into center case and secure shaft with lock plate and bolt.

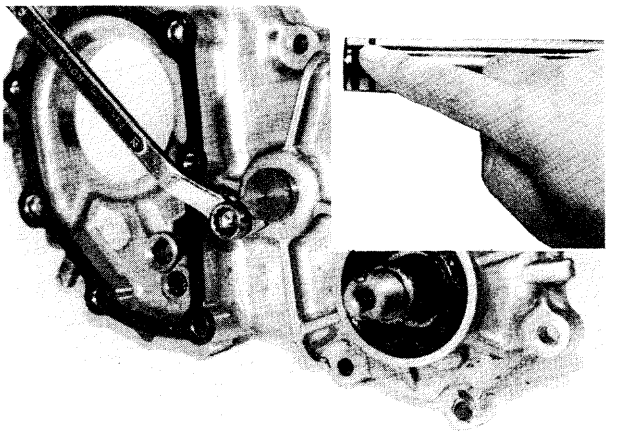


Fig. 14-53

4) Install the counter shaft thrust washer to center case. For installation, apply ample amount of grease to both faces of the washer so as to lubricate sliding surfaces and prevent it from moving out of place or slipping off and bring its face without depressions against center case, and fit its bent portion into groove in case securely.

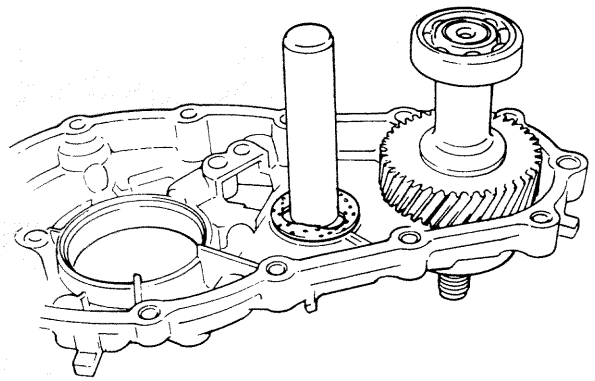


Fig. 14-54

5) Install needle roller bearings, spacer and counter gear on counter shaft.

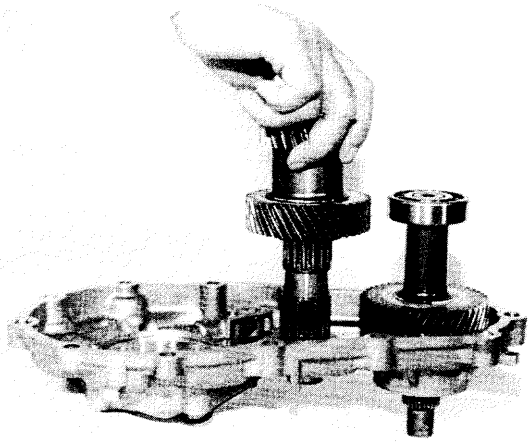


Fig. 14-55

6) Install output shaft assembly to center case.

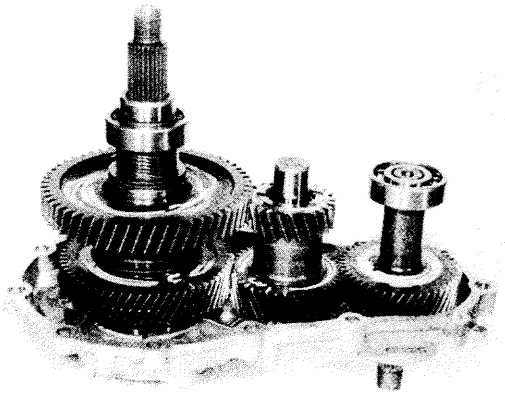


Fig. 14-56

7) When installing front drive shift shaft and reduction shift shaft in center case, install spring ①, ball ②, shaft ③, ball ④, shaft ⑤, ball ⑥, spring ⑦ and plug ⑧ in that order.

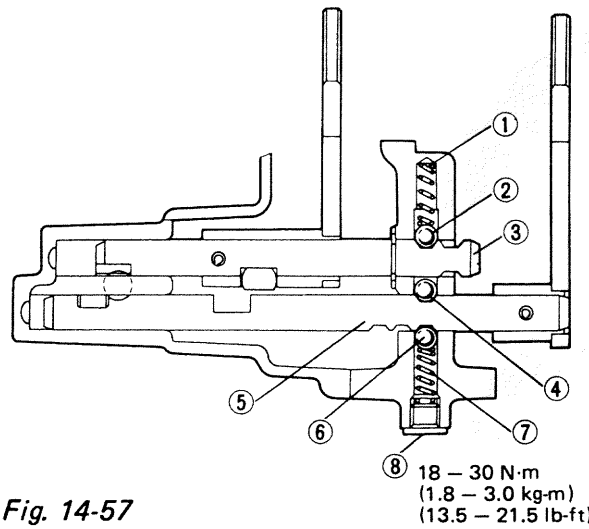


Fig. 14-57

8) Fit forks on shift shafts and lock them with spring pins. Forks should be fitted in correct direction according to below figure.

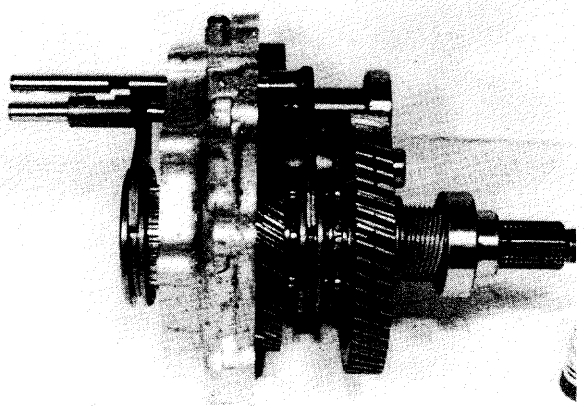


Fig. 14-58

Center and Rear Cases

1) Check center case (or rear case) to ensure that it is provided with 2 dowel pins ①.

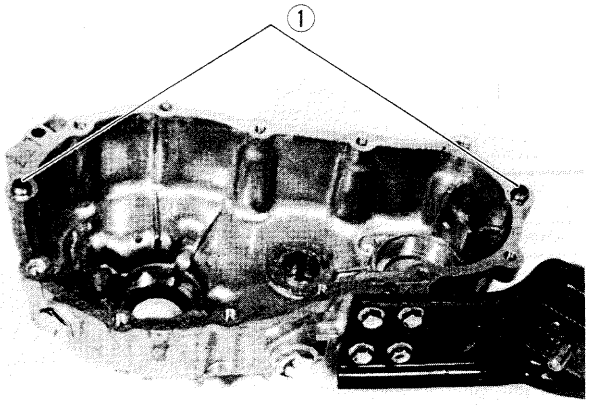


Fig. 14-59

2) Put gasket on center case. Bring rear case and center case into match and apply uniform force gradually all around rear case with a plastic hammer. Tighten center case securing bolts to specified torque.

NOTE:

- **Matching must be made carefully so as not to move countershaft thrust washers out of place.**
- **Be sure to install shims determined in previous item "Shim Adjustment of Input and Output Shafts" between input shaft rear bearing and rear case and between output shaft rear bearing and rear case.**

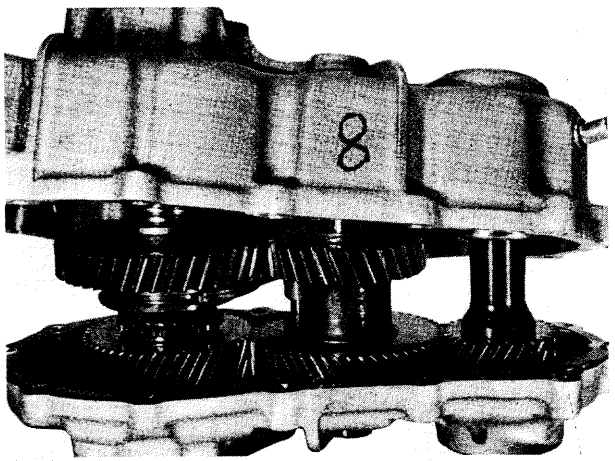


Fig. 14-60

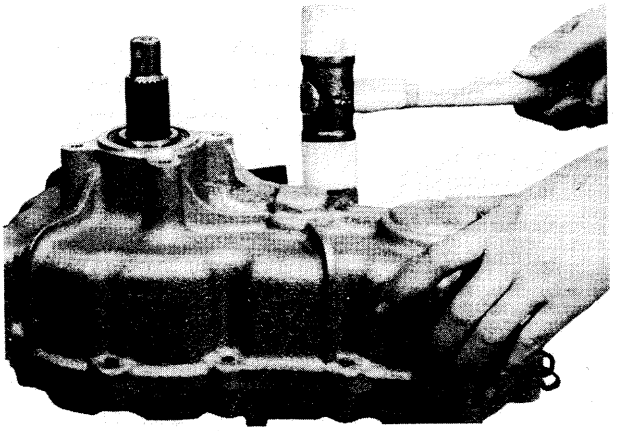


Fig. 14-61

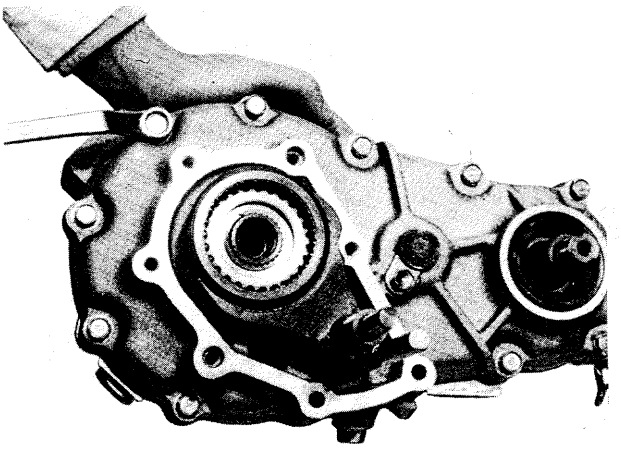


Fig. 14-62

3) Apply grease to output front shaft rear bearing.

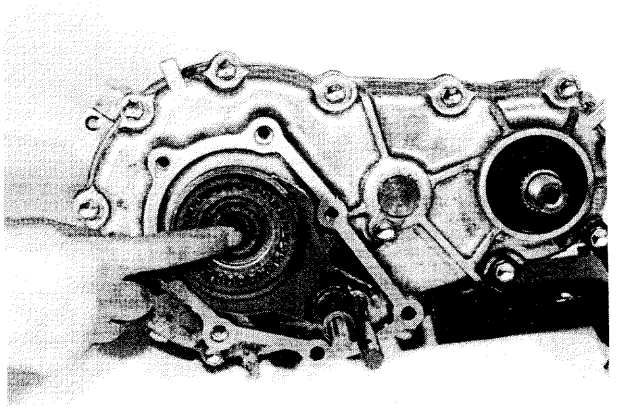


Fig. 14-63

Front Case

1) Install bearing, circlip and oil seal to front case. Apply grease to oil seal lip and install output front shaft using bearing installer (special tool).
   Bearing installer (A) : (09913-76010)

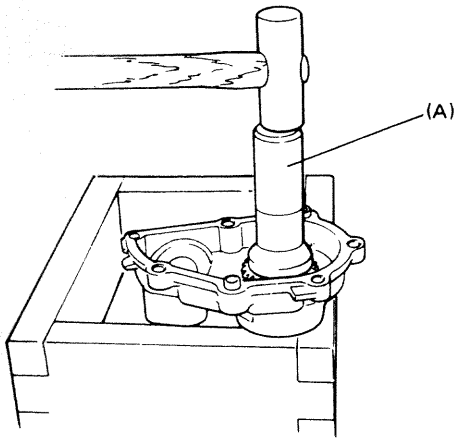


Fig. 14-64

2) Put gasket on center case.
3) Check front case to ensure that it is provided with 2 dowel pins.

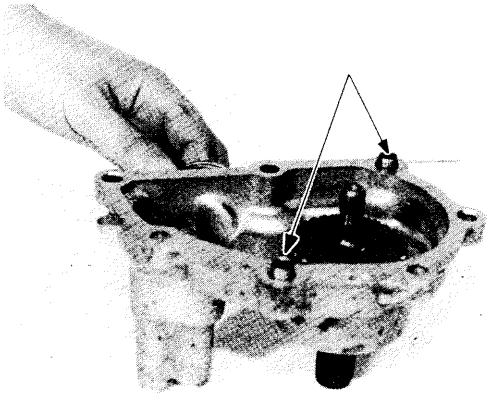


Fig. 14-65

4) Install front case to center case.

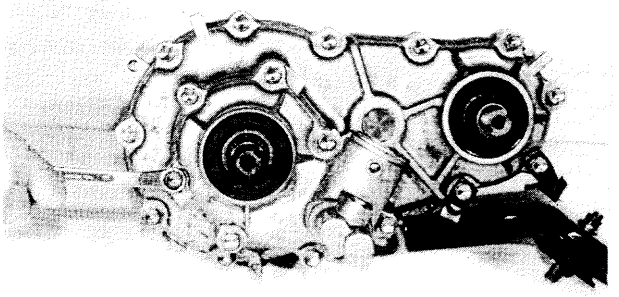


Fig. 14-66

5) When installing speedometer driven gear and its gear case in rear case, apply grease to O ring and oil seal lip, and align bolt holes in rear case and driven gear case.

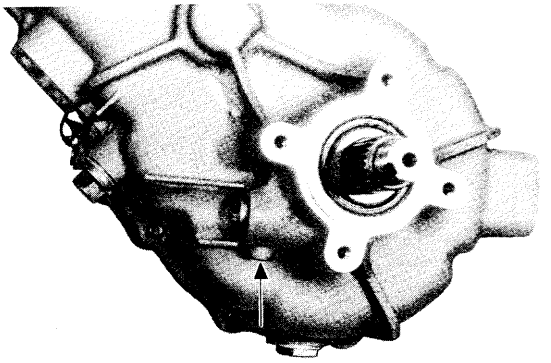


Fig. 14-67

6) Install 4WD ball and switch. Then clamp switch lead wire properly.

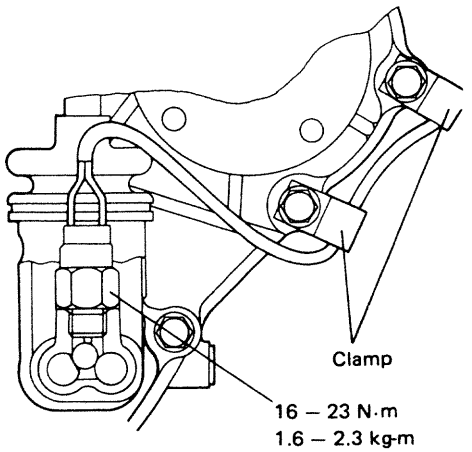


Fig. 14-68

7) Install propeller shaft flanges and tighten nuts to specified torque and calk the nuts.
8) Upon completion of entire assembly work, install transfer in chassis body in reverse sequence of removal. Pour gear oil into transfer gear box.
Refer to information given in next oil and oil capacity for oil to be used and specified amount.

NOTE:
When installing oil filler and drain plugs to transfer case, apply sealant (SUZUKI BOND No.1215, 99000-31110) to theread part of plug.

14-9. MAINTENANCE SERVICES

Oil Level

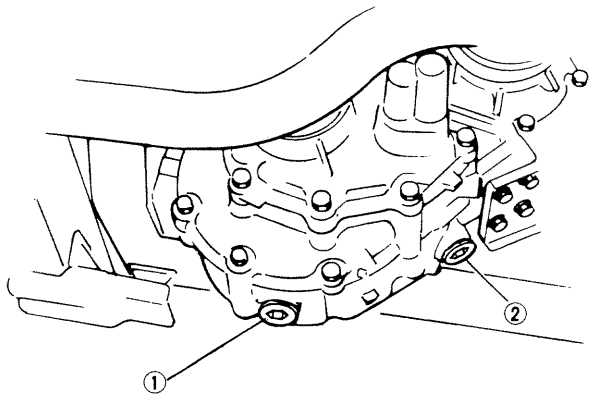
Oil level must be checked with car held in horizontal position in both front to rear and side to side directions.
Oil level plug and oil filler plug are one and the same as shown in figure.
If oil flows out of filler plug hole or if oil level is found up to hole when plug is removed, amount of oil is appropriate. Replenish oil if noted as insufficient.

Oil and Oil Capacity

Whenever car is lifted up for any service including oil change, make sure to check around transfer gear box for oil leakage. Correct defects, if any, and change or refill oil.

Transfer oil capacity	0.8 litre (1.7/1.4 US/Imp. pt)
Transfer oil specification	Gear oil SAE 80W–90, 75W–80 or 75W–90

It is highly recommended to use SAE 75W–90 gear oil.
For viscosity chart, refer to P.1-20.



① : *Oil drain plug*
② : *Oil filler & level plug*

Fig. 14-70

14-10. TIGHTENING TORQUE

Fastening parts	N·m kg-m	lb-ft
Front case bolt	13 – 23 1.3 – 2.3	9.5 – 16.5
Center case bolt	13 – 23 1.3 – 2.3	9.5 – 16.5
Counter shaft lock plate bolt	9 – 17 0.9 – 1.7	7.0 – 12.0
Universal joint flange nut	110 – 150 11.0 – 15.0	80.0 – 108.0
Transfer mounting bracket bolt	18 – 28 1.8 – 2.8	13.5 – 20.0
Transfer mounting nut	25 – 35 2.5 – 3.5	18.5 – 25.0
Cross joint bolt & nut	23 – 30 2.3 – 3.0	17.0 – 21.5
Oil filler and drain plug	18 – 28 1.8 – 2.8	13.5 – 20.0

SECTION 15

PROPELLER SHAFTS

CONTENTS

15-1. GENERAL DESCRIPTION

These automobiles, covered in this manual are four-wheel drive machines and, as such, use three propeller shafts designated as No. 1, No. 2 and No. 3.
No. 1 propeller shaft transmits drive from the transmission to the transfer gear box. No. 2 shaft and No. 3 shaft extend from the transfer gear box, the former driving the front axle and the latter the rear axle.
The cross spider in each universal joint is fitted with four needle roller bearings.

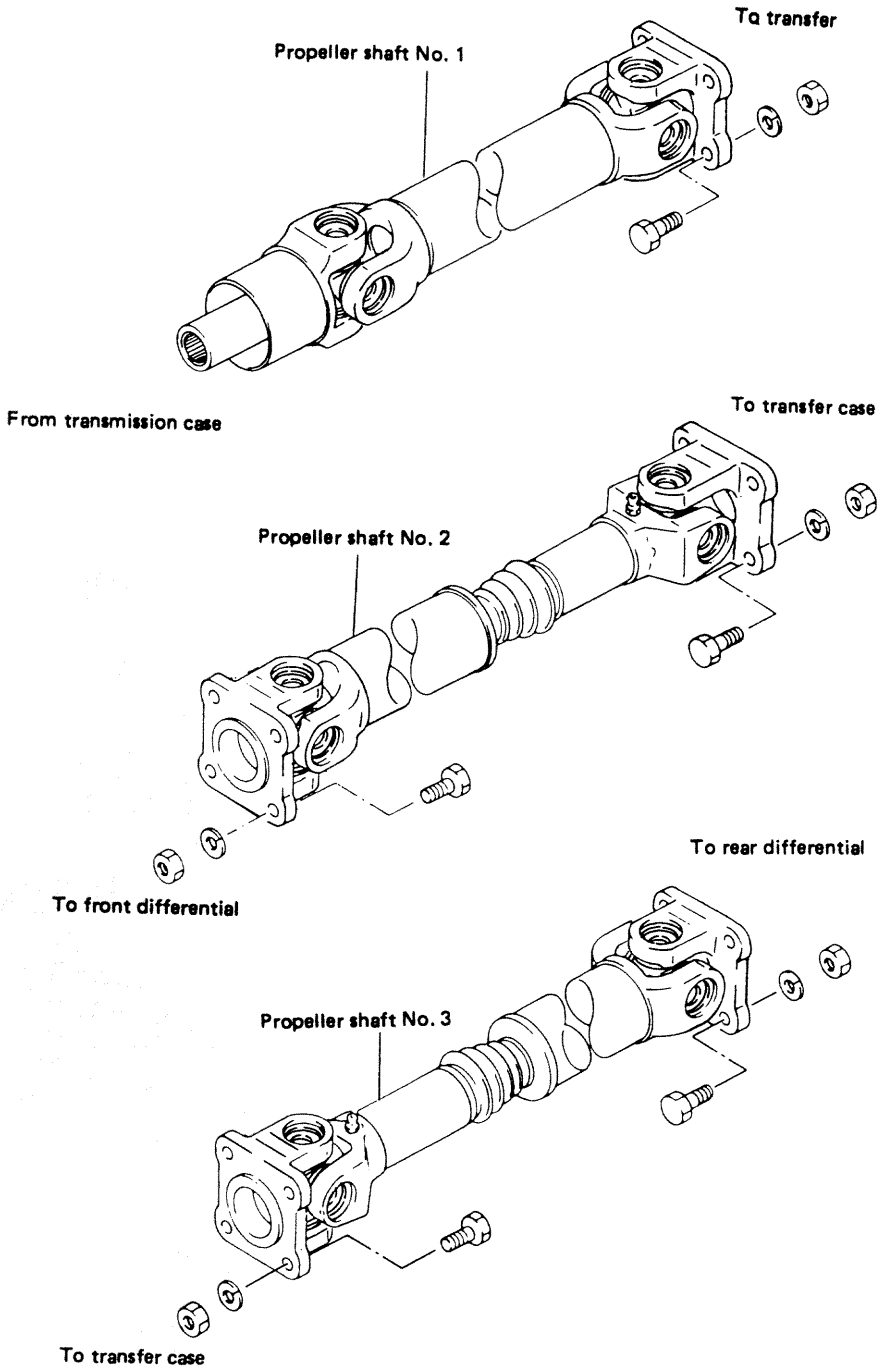


Fig. 15-1

15-2. REMOVAL

1) Hoist car.
2) Loosen propeller shaft nuts and bolts.
3) Remove propeller shaft.
   Transmission-side end of No. 1 shaft has no flange piece; this end is splined to driving shaft inside extension case. All you have to do there is to pull No. 1 shaft off extension case.

NOTE:
When withdrawing propeller shaft No. 1 from transmission, transmission oil will not leak, provided oil level is to specification and car is raised horizontally in its front and rear direction. However, if only car front is hoisted, be sure to drain transmission oil before withdrawing propeller shaft No. 1.

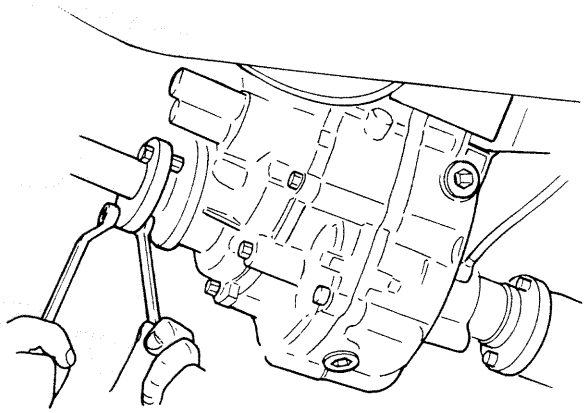


Fig. 15-2

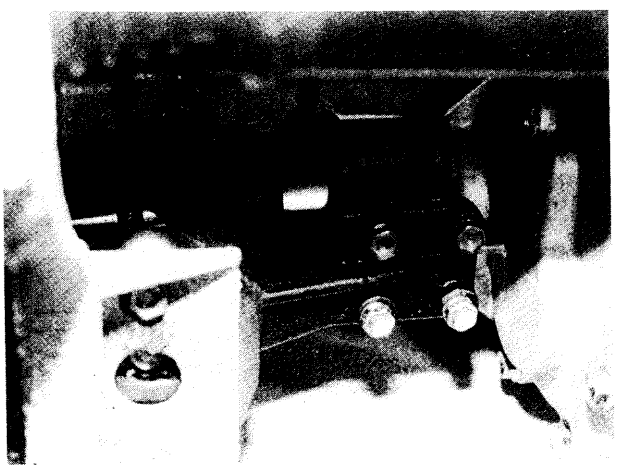


Fig. 15-3

15-3. INSTALLATION

The installing procedure is reverse of the removal procedure. Be sure to adhere to following instructions when installing shafts:

- Flange tightening torque
  Be sure to tighten 4 nuts to the following torque when securing companion flange to yoke at each end of propeller shaft:

Tightening torque for universal joint flange bolts & nuts	23 – 30 N·m (2.3 – 3.0 kg-m) (17.0 – 21.5 lb-ft)

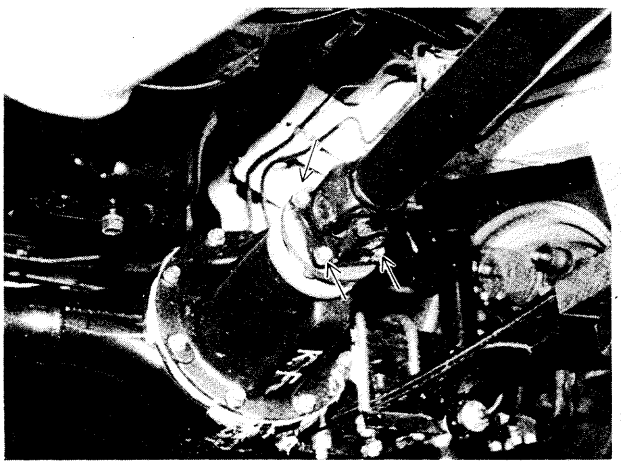


Fig. 15-4

- Grease splines liberally, filling grooves with grease.

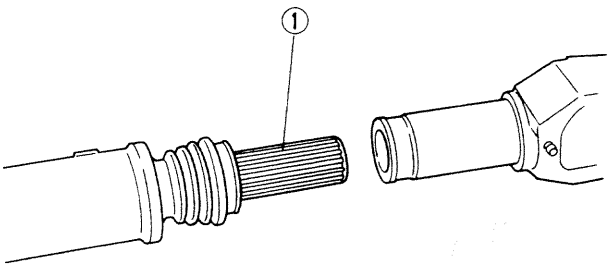


Fig. 15-5 ① Grease (chassis grease)

- Joint sheath rubber has a large diameter in one end and a small diameter in the other. Be sure to fit sheath rubber with its large-diameter end brought to joint yoke side.

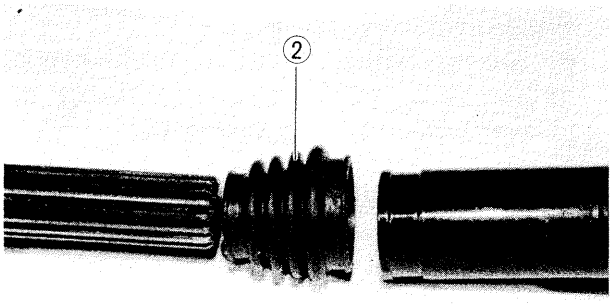


Fig. 15-6 ② Joint sheath rubber

NOTE:
If transmission oil was drained for propeller shaft No. 1 removal, pour specified gear oil into transmission case to specified level.

- Match marks are provided on slip-on spline connections. Inserting splined end into splined bore without regard to match marks can be a possible cause of noise or vibration of propeller shaft. Be sure to index marks.

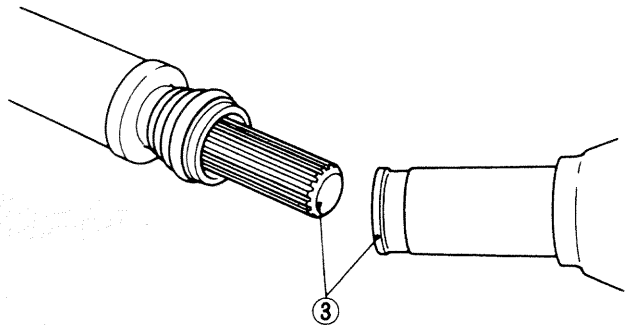


Fig. 15-7 ③ Match marks

15-4. MAINTENANCE SERVICES

Lubrication
Inside yoke of each universal joint has a grease nipple. At regular intervals stated in the recommended servicing schedule, pump in grease to relubricate joint. Use chassis grease.

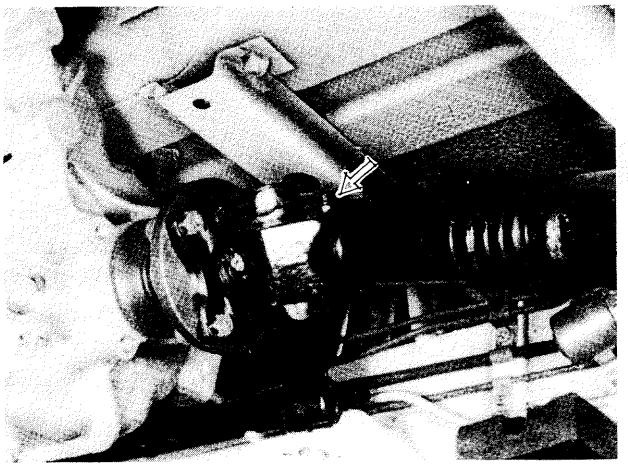


Fig. 15-8

Universal Joint Noise
If universal joints are suspected of producing chattering or rattling noise, inspect them for wear. Check to see if cross spider rattles in yokes or if splines are worn down and replace defective propeller shaft with new one.

The noise coming from universal joint can be easily distinguished from other noises because rhythm of chattering or rattling is in step with cruising speed. Noise is pronounced particularly on standing start or in coasting condition (when braking effect of engine is showing in the drive line).

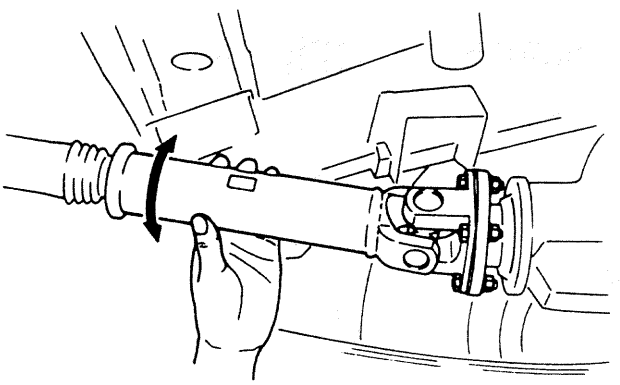


Fig. 15-9

15-5. TIGHTENING TORQUE

Bolts & Nuts

Check following bolts and nuts for tightness and retighten them as necessary:

Fastening parts	N·m	kg-m (lb-ft)
Propeller shaft bolt & nut	23 – 30	2.3 – 3.0 (17.0 – 21.5)

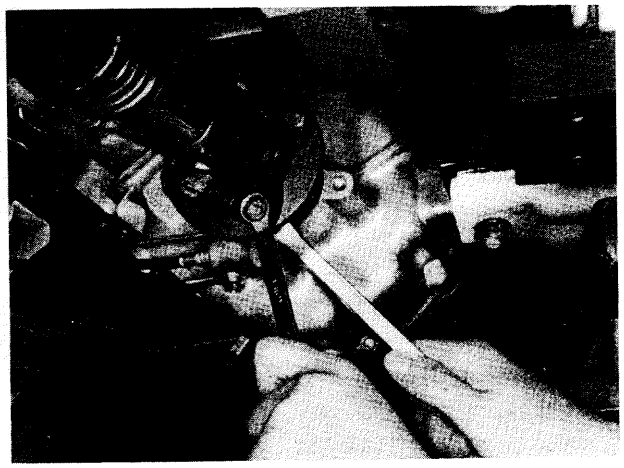


Fig. 15-10

15-6. DISASSEMBLY

- Disassembling on propeller shaft yoke side.

1) Using snap ring pliers (Special tool), remove 2 circlips.

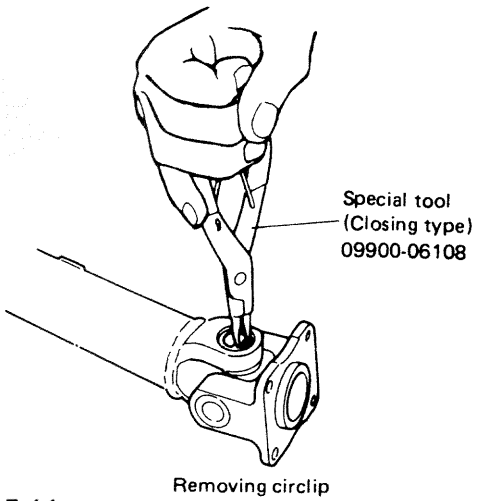
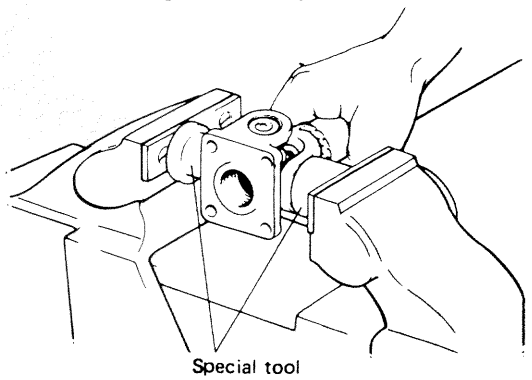


Fig. 15-11

2) Using universal joint assembler (Special tool 09926-48010), push spider bearing race out 3 – 4 mm (0.12 – 0.16 in.) from shaft yoke race.

NOTE:
Before pushing it out, apply penetrate lubricant between bearing race and yoke race.



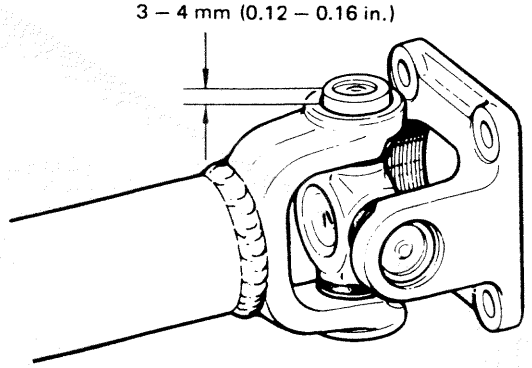


Fig. 15-12

3) Tapping yoke with a hammer, completely remove bearing race.

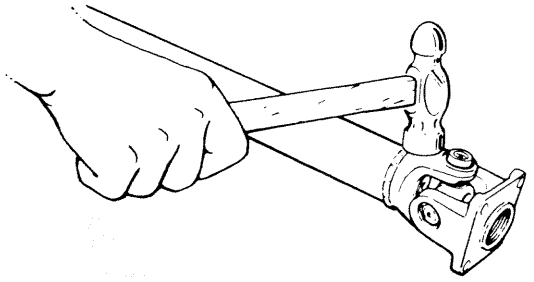


Fig. 15-13

4) Take out bearing race on the other side in the same way as in 2) and 3).

- Disassembling on flange yoke side
  Push out bearing race on flange yoke side as described in 1) and 2), and then, holding bearing race in a vice, tap flange yoke and take out race. (Refer to the below figure.)
  Remove bearing race on the opposite side in te same way.

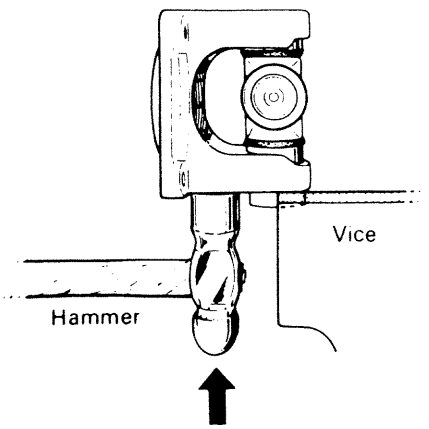


Fig. 15-14

NOTE:
- **Take care not to lose rollers in spider bearing race when removing it.**
- **Fit removed bearings temporarily in spider so that they can be reinstalled in their original positions.**

15-7. REASSEMBLY

NOTE:
- **Make certain that rollers inside spider bearing race are all in place.**
- **Make sure to apply SUPER GREASE C (99000-25030) to spider bearing race.**

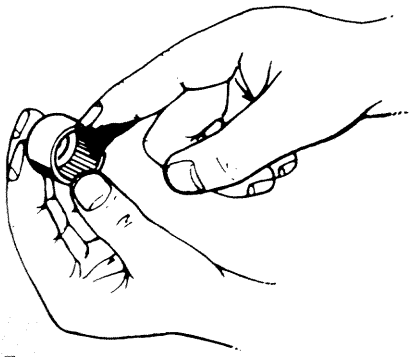


Fig. 15-15

CAUTION:
In reassembly, be sure to use new circlips, spider and bearings. Reuse of circlips, spider and bearings once reassembled in prohibited.

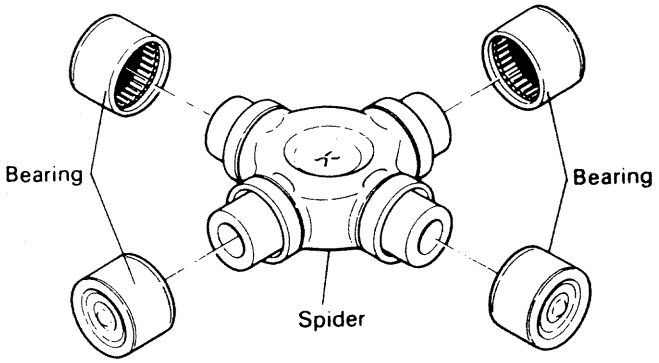
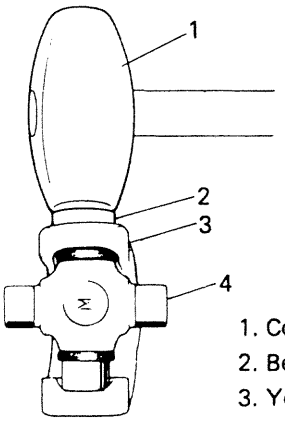


Fig. 15-16

1) Insert bearing race into yoke, tapping it with a hammer, until it is flush with yoke face. When doing this, insert spider into bearing race to prevent rollers in bearing race from coming out.



1. Copper hammer
2. Bearing race
3. Yoke
4. Spider

Fig. 15-17

2) Insert the other bearing race on the opposite side into yoke, tapping with a hammer until it is flush with yoke face.
3) Insert bearing races on the flange yoke side in the same way as described in 1) and 2) above.

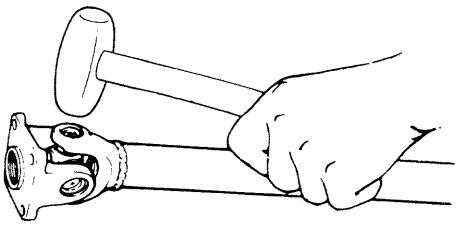


Fig. 15-18

4) Place a metal plate on bearing races when tapping them in to avoid damaging yoke.
5) Securely fit 4 circlips to shaft and flange york.

NOTE:
- **After reassembly, check to ensure that both shaft yoke and flange yoke move smoothly.**
- **Make sure that each circlip is fitted in the groove securely.**

6) Inspect propeller shaft and flange yoke for damage, and propeller shaft for runout.
If damage is found or shaft runout exceeds specifications, replace.

Runout limit	0.8 mm (0.031 in.)

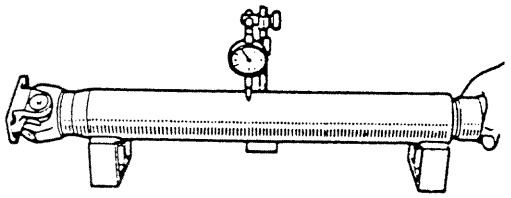


Fig. 15-19

SECTION 16

DIFFERENTIAL

CONTENTS

16-1. GENERAL DESCRIPTION

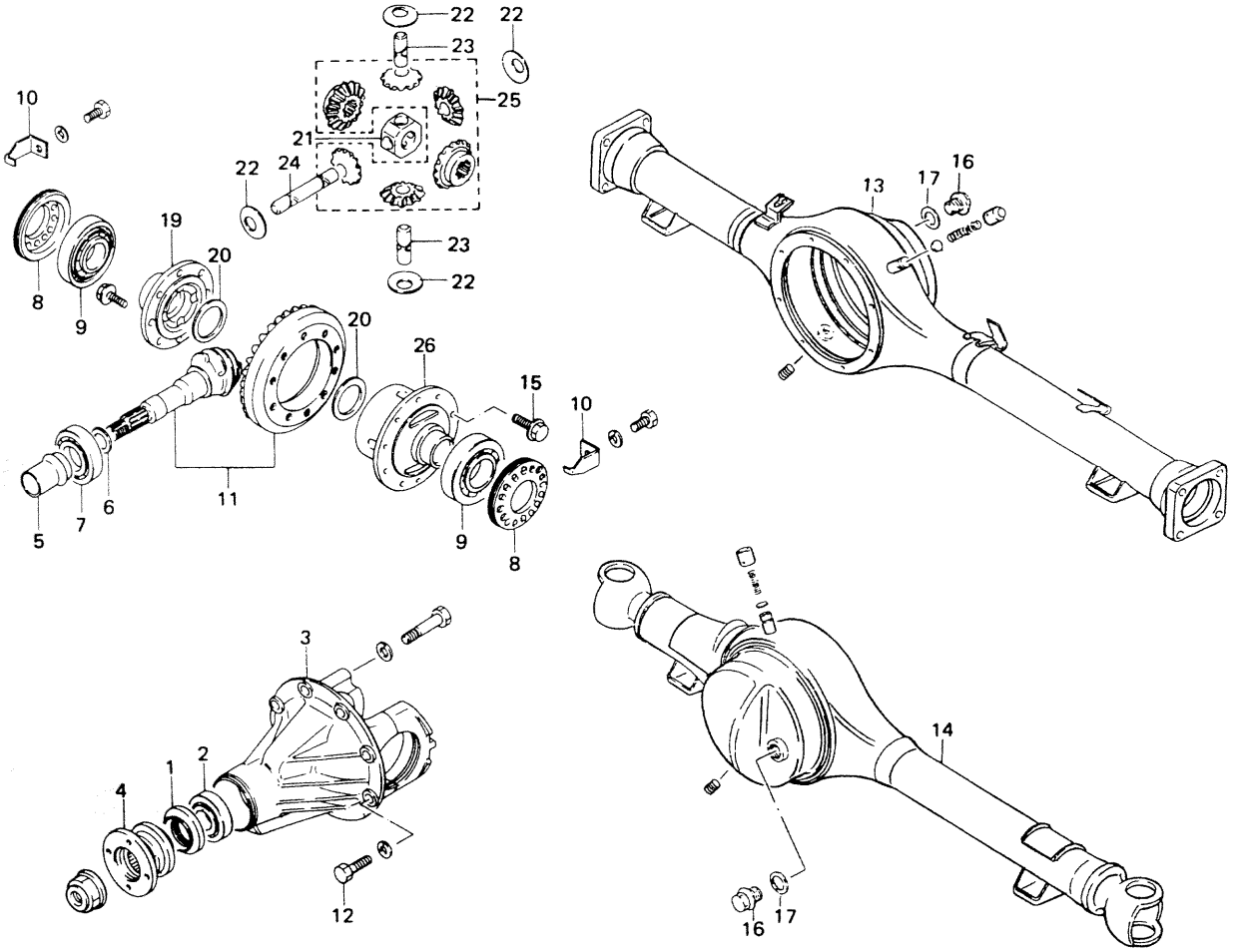
The two axles, front and rear, are identical as far as the designs of pinion-and-gear drive and differential gearing are concerned. The major difference in this limited sense lies in the shape of the housing.

Each axle may be regarded as consisting, speaking roughly, of supporting parts (axle sleeves, differential housing and carrier case) and drive transmitting parts (bevel pinion and gear, differential gearing and live axle shafts). In the present section, only the bevel pinion and gear and differential gearing are taken up under the collective title of "differential."

The bevel gear drive is of hypoid design; pinion and gear have hypoid gear teeth. This means that the pinion is located slightly below the center of the bevel gear to permit the car body to be lowered in design, and that some wiping or sliding action occurs in tooth meshing between pinion and gear. Here lies the reason why use of hypoid gear oil is specified for the differential.

Four differential pinions are used in the differential case to qualify this gearing for heavy-duty "differential" drive. Thus, a total of 8 gears—a drive pinion, a crown gear, two side gears and four pinions—are inside the differential housing, all mounted on the differential carrier case bolted to the housing.

This differential is so constructed that the bevel pinion bearing preload is adjusted by tightening the bevel pinion nut to compress the spacer.



1. Oil seal
2. Bearing
3. Carrier
4. Joint flange
5. Bearing preload adjusting spacer
6. Shim
7. Bearing
8. Bearing adjuster
9. Side bearing
10. Adjuster lock plate
11. Bevel gear pinion set
12. Bolt
13. Rear axle housing
14. Front axle housing
15. Bolt
16. Oil level plug
17. Gasket
18. Oil drain plug
19. Right case
20. Thrust washer
21. Joint
22. Thrust washer
23. Pinion shaft No. 2
24. Pinion shaft No. 1
25. Side gear set
26. Left case

Fig. 16-1

16-2. REMOVAL

1. Loosen, but do not remove, wheel nuts of front or rear wheels, and raise car off the floor by jacking.
   Rest car steady on safety stands.
2. Drain out oil in differential housing by loosening drain plug.
3. Remove wheel nuts and take off wheels, front or rear. Each wheel has five wheel nuts.

For Front Differential

After taking down front wheels, remove disc brake caliper with 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 caliper removed.

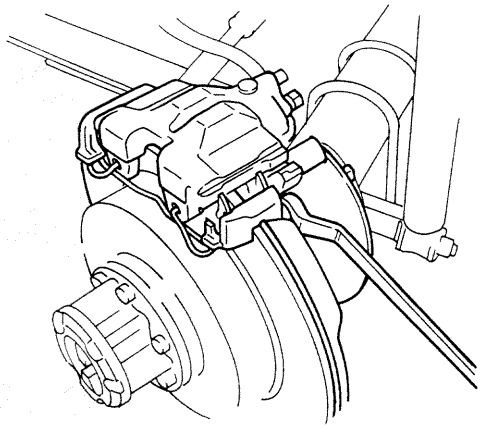


Fig. 16-2

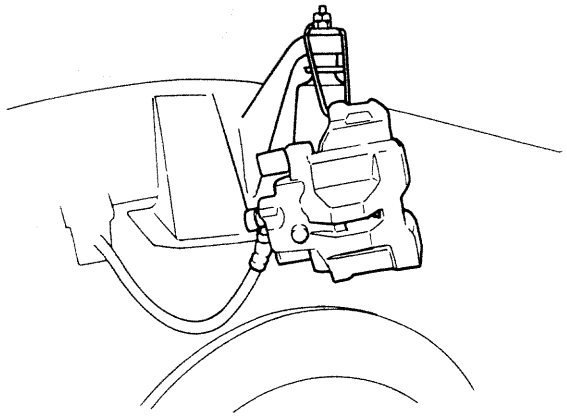


Fig. 16-3

At each tie rod end, remove nut and disconnect the end from steering knuckle using special tool Ⓐ

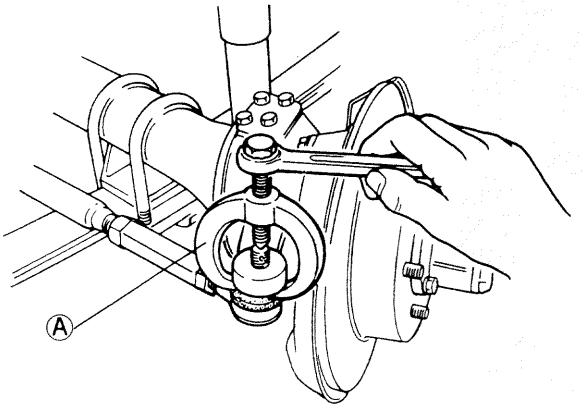


Fig. 16-4 *Ⓐ Special tool (Tie rod end remover 09913-65210)*

Remove 8 oil seal cover securing bolts. From steering knuckle, take off felt pad, oil seal and seal retainer.

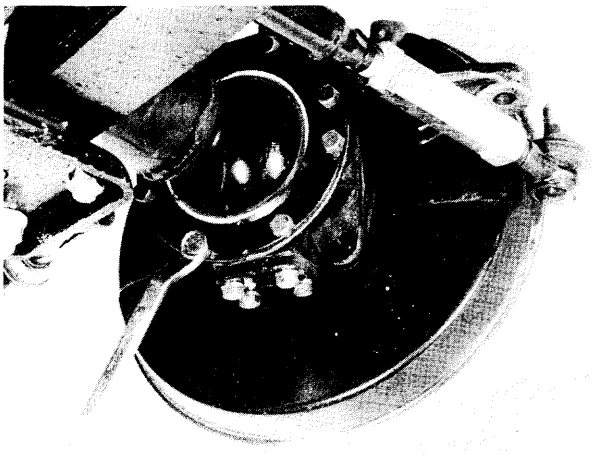


Fig. 16-5

Remove top and bottom kingpins from knuckle by removing 4 bolts securing each pin.

NOTE:

The removed top and bottom kingpins must be kept separated so as to prevent an error when putting them back in their place in reassembly.

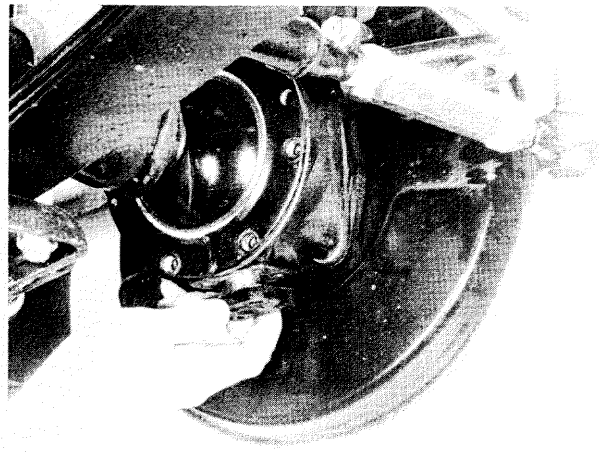


Fig. 16-6

Draw out live axle shaft from axle housing.

NOTE:

At this time, lower kingpin bearing sometimes falls off. So remove bearing while pulling off knuckle gradually.

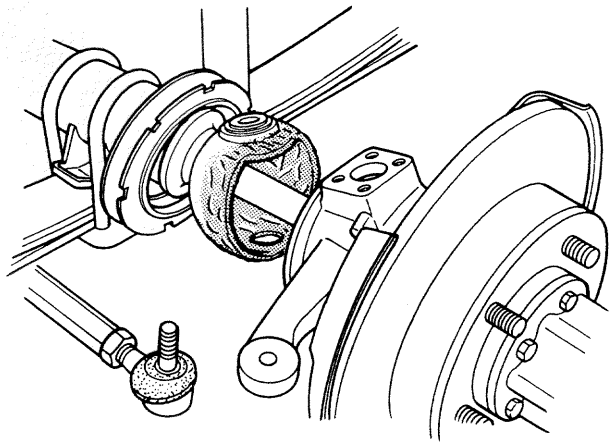


Fig. 16-7

At differential housing, disconnect propeller shaft by removing bolts securing flange yoke to companion flange. Remove 8 bolts holding fast differential carrier case to housing, and take down carrier assembly.

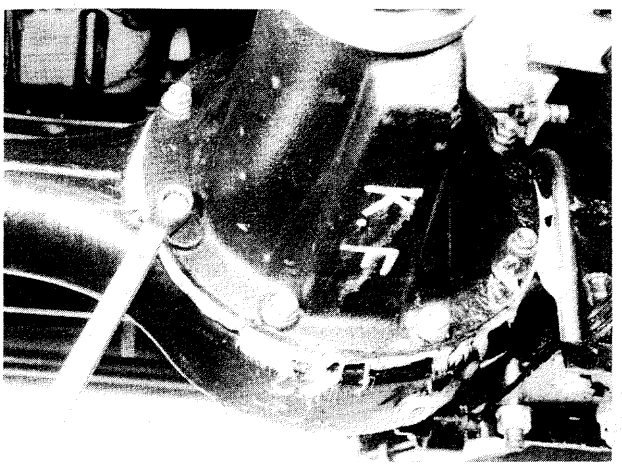


Fig. 16-8

For Rear Differential

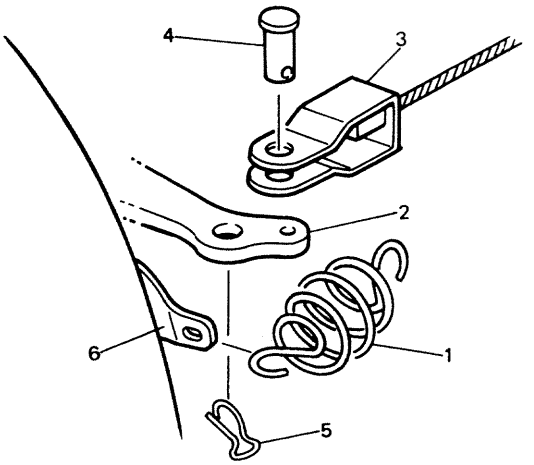
After taking down rear wheels, remove brake drums by using special tools.

NOTE:

Before removing brake drum, check to ensure that parking brake lever is not pulled up.

To increase clearance between brake shoe and brake drum, remove parking brake shoe lever return spring ① and disconnect parking brake cable joint ③ from parking brake shoe lever ②.

Remove parking brake shoe lever stopper plate.



1. Parking brake shoe lever return spring
2. Parking brake shoe lever
3. Parking brake cable joint
4. Pin
5. Clip
6. Brake back plate

Fig. 16-9

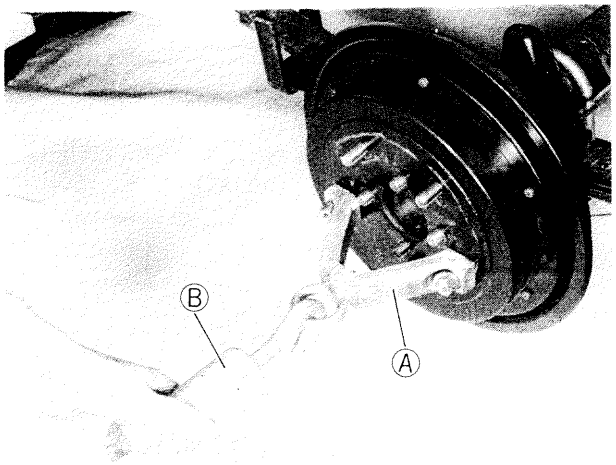


Fig. 16-9-1 Ⓐ *Special tool (Brake drum remover 09943-35511)*
Ⓑ *Special tool (Sliding hammer 09942-15510)*

Disconnect brake pipe from wheel cylinder. Have a small plug ready for use when disconnecting pipe. As pipe comes off the wheel cylinder, plug the pipe to prevent brake fluid from leaking out.
And remove 4 brake backing plate securing bolts.

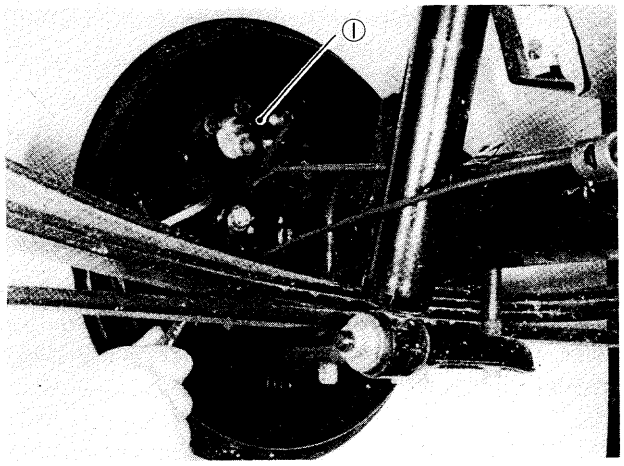


Fig. 16-9-2 ① *Plug*

Using special tools indicated below, draw out each axle shaft with brake backing plate.

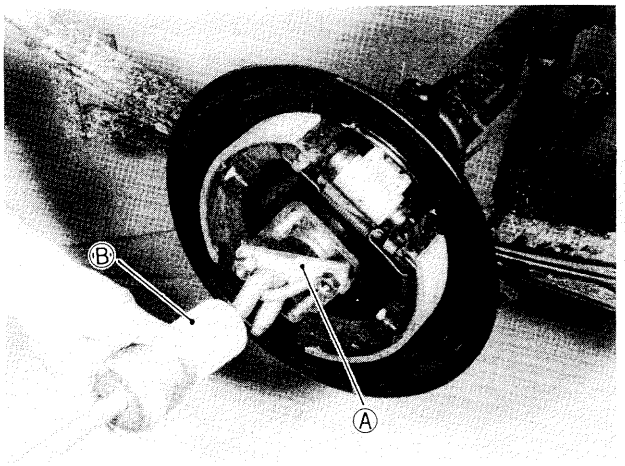


Fig. 16-10 Ⓐ *Special tool (Rear axle remover 09922-66010)*
Ⓑ *Special tool (Sliding hammer 09942-15510)*

Disconnect propeller shaft as in the case of front axle, and detach and take down differential carrier case from housing by removing 8 bolts.

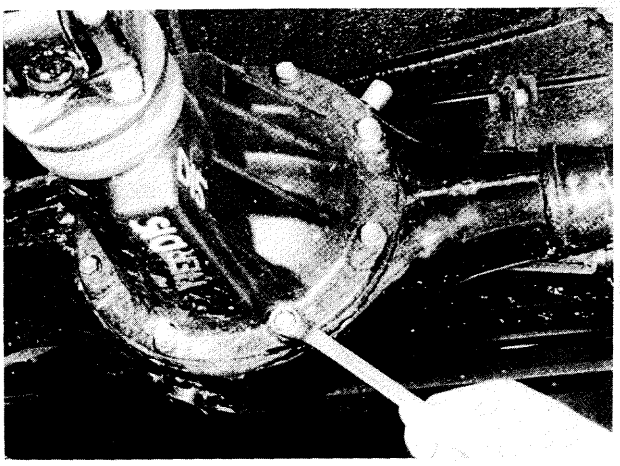


Fig. 16-11

16-3. DISASSEMBLY

Lock flange immovable by using special tool, and remove nut from the end of bevel pinion shank.

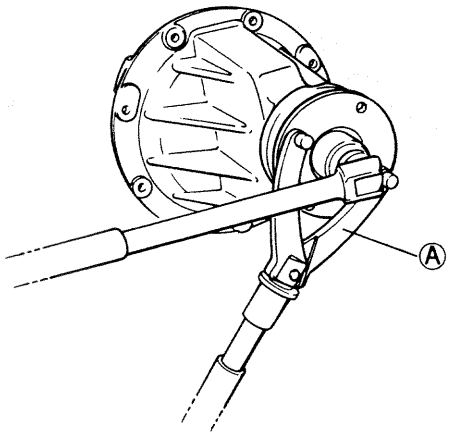


Fig. 16-12 Ⓐ Special tool (Rotor holder 09930-40113)

Scribe marks on each cap bolted to the saddle portion of carrier case and holding down the side bearing. The marks are to identify caps. This means that there are right and left caps, so identified and so handled at the time of reassembly.

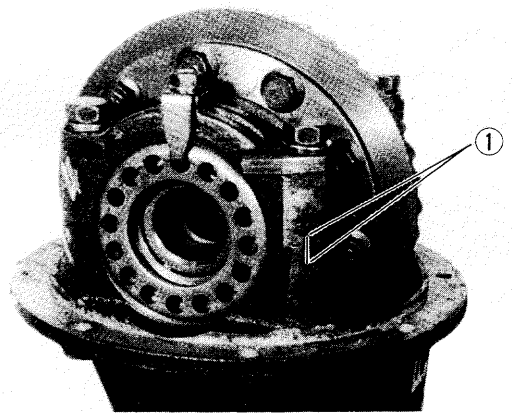


Fig. 16-13 ① Scribed match marks

At each side, loosen bolts on bearing adjuster stopper, remove bearing cap securing bolts, and take off cap. Lift differential case assembly, complete with bevel gear, off the carrier.

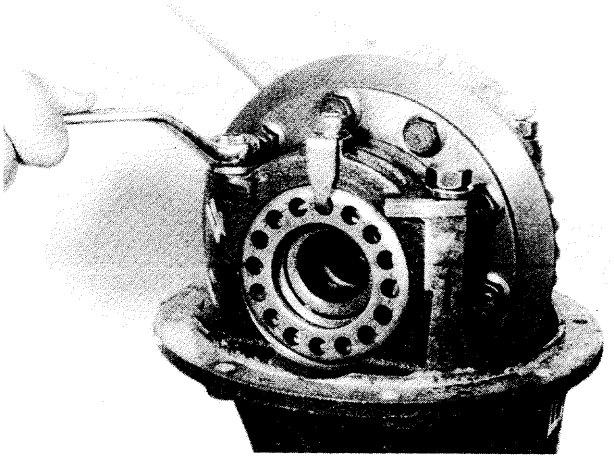


Fig. 16-14

Remove 10 bolts securing bevel gear to differential case, and separate gear from case.

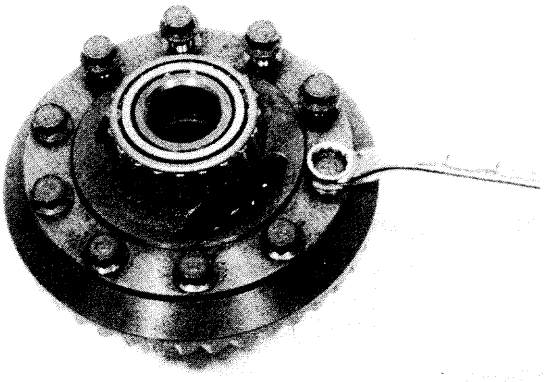


Fig. 16-15

There are 8 bolts fastening two differential case halves together. Remove these bolts to sever right-hand case half from left-hand one, and take off right-hand one.

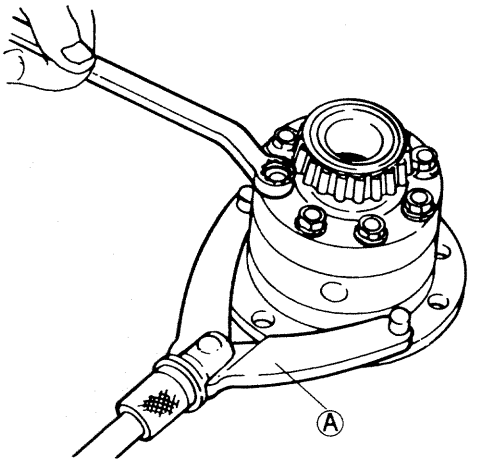


Fig. 16-16 Ⓐ Special tool (Rotor holder 09930-40113)

Remove side gears, differential pinions and thrust washers.

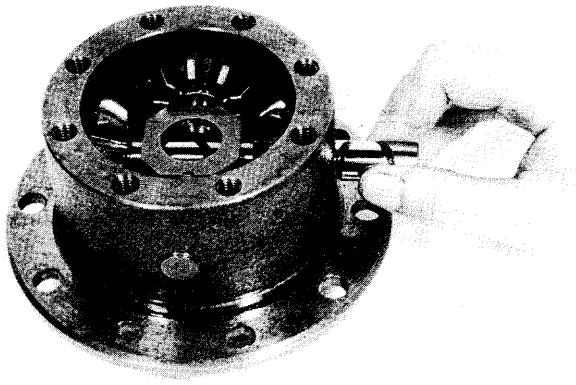


Fig. 16-17

Using special tools indicated below, extract side bearing from each differential case half.

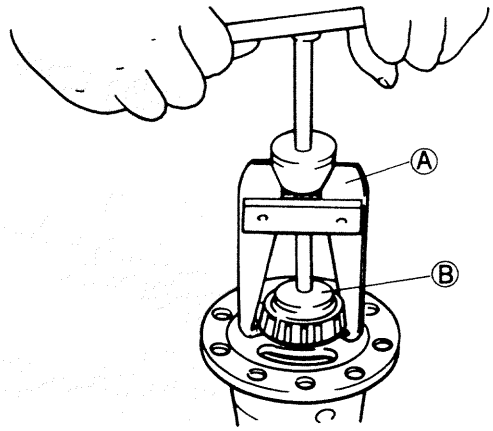


Fig. 16-18 Ⓐ *Special tool (Bearing puller 09913-60910)*
Ⓑ *Special tool (Side bearing removing jig 09913-85230)*

Using puller and hydraulic press, remove inner race of bevel pinion bearing.

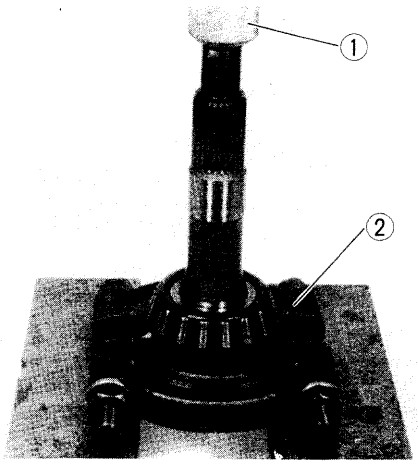


Fig. 16-18-1 ① *Hydraulic press* ② *Puller*

16-4. INSPECTION AND ADJUSTMENT OF COMPONENTS

Side Gear Thrust Play

To check thrust play, assemble differential gearing and case, as shown in Fig. 16-19, fastening together two case halves by tightening securing bolts to prescribed torque. By comparing thrust play reading, taken as shown in Fig. 16-19, against thrust play indicated below, increase or decrease total thickness of thrust washers, which are located in two places, that is, on the inner side of each case half.

Side gear thrust play specification	0.12 – 0.37 mm (0.005 – 0.014 in)

Available thrust washer sizes (thickness)	0.9, 1.0, 1.1 & 1.2 mm (0.035, 0.039, 0.043 & 0.047 in)

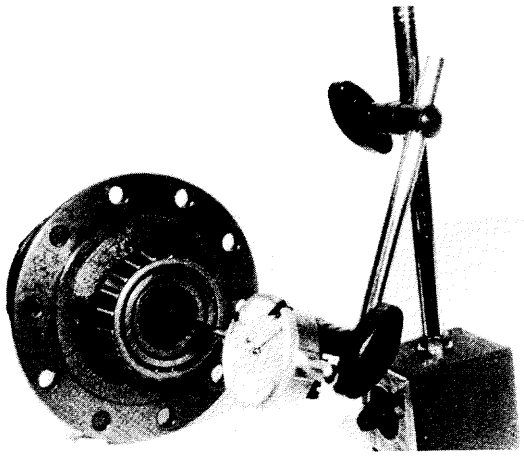


Fig. 16-19

Determination of Shim Thickness for Bevel Pinion

Thickness of shims to be used on the bevel pinion varies from one vehicle to another on account of factors involved in machining and assembling. Thus, for each vehicle, the thickness of shims necessary for locating pinion in correct position (for producing a proper backlash in the mesh between pinion and gear) must be determined anew at the time of reassembly.

In order to facilitate this determination, a two-piece dummy tool (special tool) is made available. Following procedure is based on use of this tool and supposes that pinion dummy (one of the two pieces) is set in carrier, without any shims, as shown in Fig. 16-20.

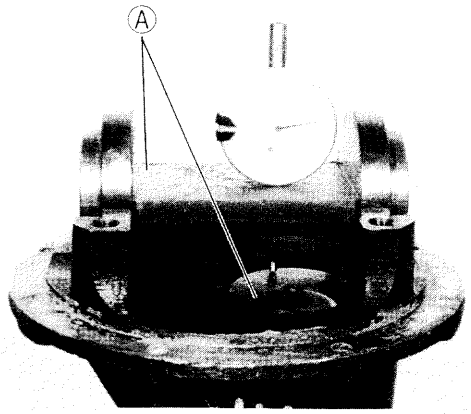


Fig. 16-20 Ⓐ Special tool (Bevel pinion mounting dummy 09926-78310)

- Set dial indicator on dummy, letting the indicator spindle protrude 5 to 6 mm from the bottom of dummy as shown in Fig. 16-21-1.

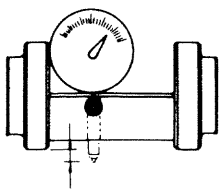


Fig. 16-21-1

2) Feed dummy pinion with bearings into the carrier, positioning it properly, and install joint flange.
And then tighten bevel pinion nut until specified starting torque of bevel pinion is obtained. Refer to item 2) and 3) of "Bevel Pinion Bearing Preload Adjustment" described on next page.

NOTE:
In this case, fit only bearings to bevel pinion. Don't fit spacer.

3) Rest dummy with dial indicator on carrier and pinion dummy, and set dial indicator to zero.

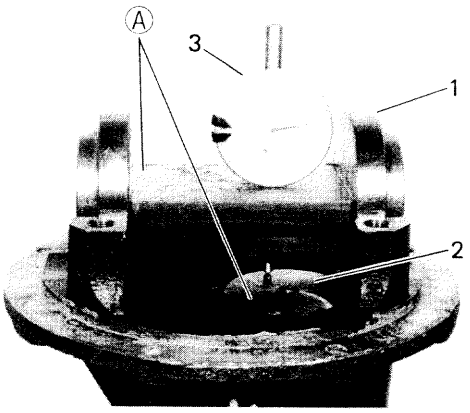


Fig. 16-21-2 1. Dummy 2. Pinion dummy 3. Dial indicator

4) Referring to Fig. 16-21-3, note that three dimensions are involved: "a" "b" and "c". The value of "b" is unknown, and is to be determined now for calculating the required thickness of shims. The values of "a" and "c" are given: the sum, "a" +"c", is 94 mm, which is indicated on the dummy tool.

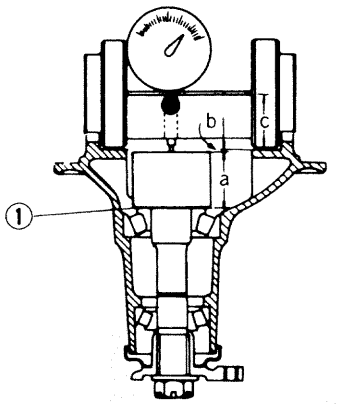
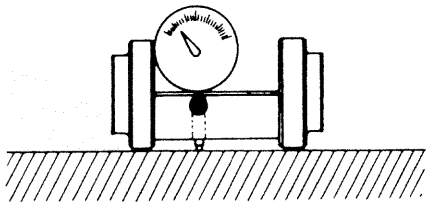


Fig. 16-21-3

Rest dummy with dial indicator on surface plate, and the dial indicator pointer may have deflected from "0" mark to show a certain value; read this value, which is "b".



SURFACE PLATE

Fig. 16-21-4

Add this reading to 94 mm (= "a" + "c") and, from the sum, subtract the value marked on bevel pinion. The remainder is required shim thickness: (94+"b") - marked value = required shim thickness

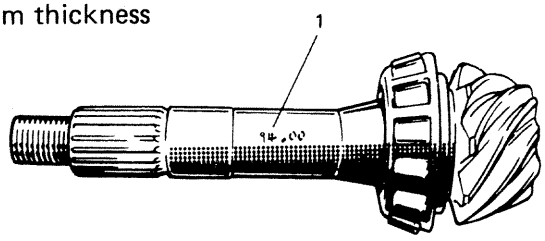


Fig. 16-22 1. *Marked value*

5) Shim stock is available in twelve selective thicknesses. Select one or two shim(s) from the below to obtain the closest thickness to above required thickness, and insert selected shim piece(s) into clearance indicated as Fig. 16-21-3– ①.

Sizes of shims for bevel pinion	1.00, 1.03, 1.06, 1.09, 1.12, 1.15, 1.18, 1.21, 1.24, 1.27, 1.30 & 0.3 mm {0.039, 0.041, 0.042, 0.043, 0.044, 0.045, 0.046, 0.047, 0.048, 0.049, 0.050 & 0.012 in.}

Bevel Pinion Bearing Preload Adjustment

The bevel pinion, as installed in normal manner in carrier, is required to offer a certain torque resistance when checked by using prescribed preload adjuster (special tool Ⓐ) as shown in Fig. 16-23. This resistance is a "preload," which is due to the tightness of the two tapered roller bearings by which the pinion is held in the carrier. And this tightness is determined primarily by tightening torque of bevel pinion nut.

Adjust preload of bevel pinion bearings as follows.

1) Install pinion bearings, spacer, bevel pinion, oil seal and universal joint flange to differential carrier.
   At this time, be sure to apply gear oil to bearings lightly and grease to oil seal lip.
2) Tighten bevel pinion nut by hand, and install special tool to universal joint flange.
3) After turning pinion several times, tighten pinion nut gradually, while checking pinion starting torque with spring balance, and stop tightening when starting torque reaches specification given below.
4) Caulk bevel pinion nut to prevent it from loosening.

NOTE:

Bevel pinion bearing preload is adjusted by tightening bevel pinion nut to crush spacer. Therefore, be sure to use a new spacer for adjustment and tighten pinion nut step by step and check for starting torque (preload) as often as tightening to prevent over crushing of spacer. If exceeds specification given below during adjustment, replace spacer and repeat preload adjustment procedure. Attempt to decrease starting torque (preload) by loosening pinion nut will not do.

The below data are not tightening torque of pinion nut but pinion bearing preload.

Pinion bearing preload	9.0 – 17.0 kg-cm (7.8 – 14.7 lb-in)
Starting torque (When using special tool)	1.8 – 3.4 kg (4.0 – 7.5 lb)

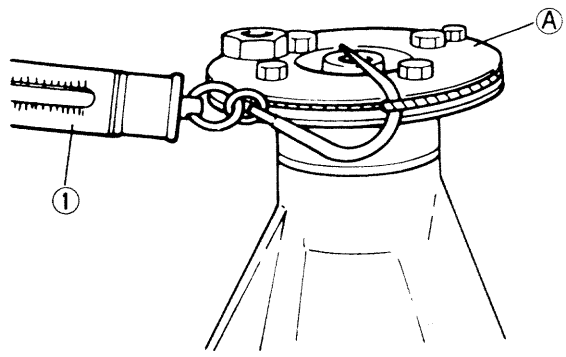


Fig. 16-23 ① *Spring balance*
Ⓐ *Special tool (Differential gear preload adjuster 09922-75221)*

Bevel Gear Backlash Adjustment

Backlash between bevel gear and pinion is checked as shown in Fig. 16-24. Note that differential case assembly is mounted in the normal manner, and fastened down by tightening the side bearing cap bolts to 1.0 – 2.0 kg-m (7.5 – 14.0 lb-ft). At this time, screw in each adjuster till it contacts bearing outer race so that outer race is prevented from inclining. The dial indicator spindle is pointed squarely to "heel" on drive side (convex side) of gear tooth. Hold bevel pinion rigidly, and turn gear back and forth.

The dial indicator reading, which is bevel gear backlash, must be within this range:

Bevel gear backlash	0.10 – 0.15 mm (0.004 – 0.006 in.)

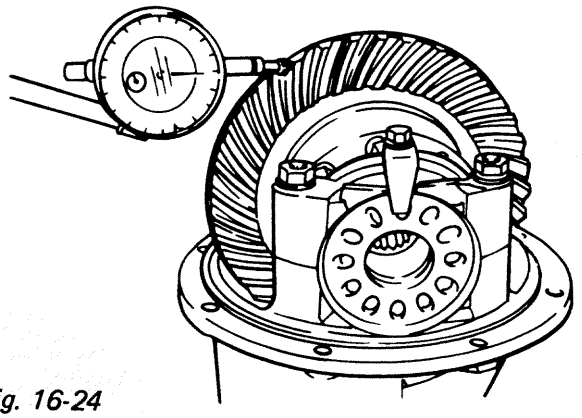


Fig. 16-24

To increase or decrease backlash for adjustment, displace bevel gear toward or away from pinion by running in one adjuster and running out the other adjuster by equal amount.

Turning the adjuster one notch changes backlash by about 0.05 mm (0.002 in.).

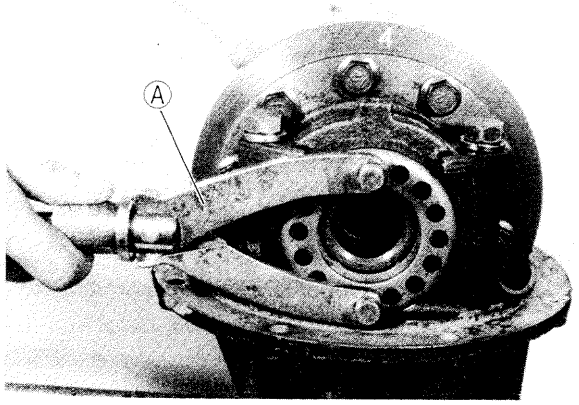
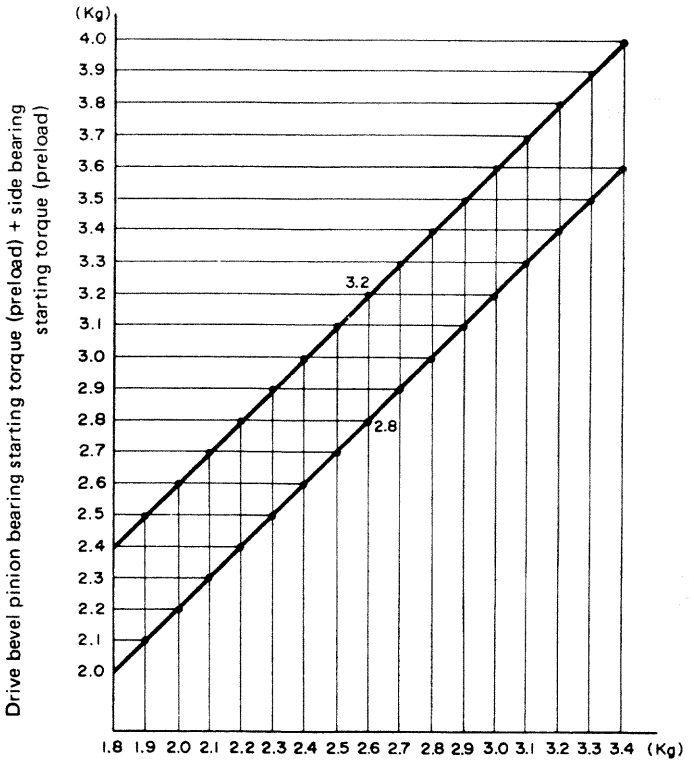


Fig. 16-25 Ⓐ Special tool (Rotor holder 09930-40113)

CAUTION:

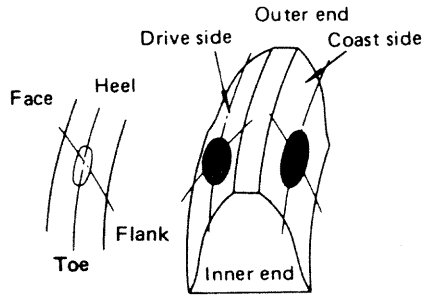
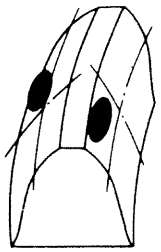
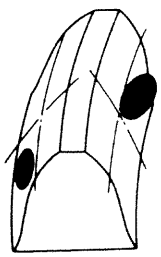
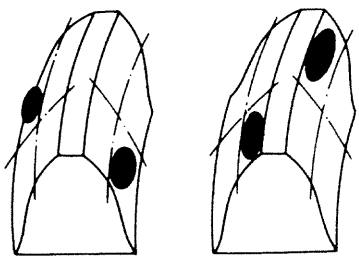
- **Adjust preload on side bearing during back-lash adjustment: mount special tool on drive bevel pinion as shown in Fig. 16-23 and measure using spring balance ①. If reading at the instant bevel gear starts moving is within the range given below, side bearing preload is acceptable. Referring to the graph, for example, when the drive bevel pinion bearing preload measured as shown in Fig. 16-23 is 2.6 kg (5.73 lb), drive bevel pinion bearing preload (kg) + bevel gear side bearing preload (kg) should be 2.8 – 3.2 kg (6.17 – 7.05 lb).**
- **Upon completion of this adjustment, be sure to tighten bearing cap bolts to 7.0 – 10.0 kg-m or 51.0 – 72.0 lb-ft.**

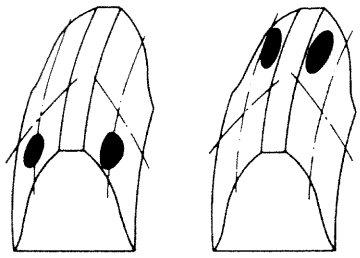
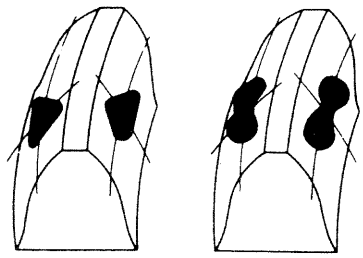


Pinion-to-gear Tooth Contact Pattern Check and Adjustment

In addition to proper backlash, proper tooth contact must be secured in the mesh of bevel pinion and gear, so that there will be no "gear noise" coming from the axle and that the hypoid teeth will not be overstressed in transmitting drive.

After the specified amount of backlash has been secured, check the pinion and gear for tooth contact by "rolling" contact patterns in a manner consistent with the standard shop practice: use a red lead paste to paint ten teeth, both drive side and coast side, of the gear, turn the gear back and forth by hand while holding the pinion in a "braking" manner, and examine the contact patterns in reference to the following chart:

	Contact patterns	Diagnosis, and what to do
Normal contact pattern		Contact is roughly centered and somewhat more displaced toward toe than toward heel on both drive side (concave) and coast (convex) side.
Patterns due to improper shim adjustment		High contact: Contact is on heel (drive side) and on toe (coast side). This condition means that the pinion is too far back and must be brought forward by increasing its shim thickness used in "mounting distance" adjustment.
		Low contact: Contact is on toe (drive side) and on heel (coast side). This condition means that the pinion is too far out from the carrier and must be backed away by decreasing its shim thickness.
Pattern due to defective parts		These contact patterns indicate that the "offset" of differential carrier is too much or too little. The remedy is to replace the carrier with a new one.

	Contact patterns	Diagnosis, and what to do
Patterns due to defective parts		These contact patterns, located on toe or heel on both drive and coast sides, mean that 1) both pinion and gear are defective, 2) carrier is not true and square, or 3) gear is not properly seated on differential case. The remedy is to replace the defective member.
		Irregular patterns: If the pattern is not oval, it means that bevel gear is defective. High or low spots on tooth surfaces or on the seat of bevel gear are the cause of irregular patterns appearing on some teeth. The remedy is to replace the pinion and-gear set and, if the seat is defective, so is differential case.

CAUTION:
When applying red lead paste to teeth, be sure to paint tooth surfaces uniformly. The paste must not be too dry or too fluid.

16-5. REASSEMBLY

Reverse disassembly procedure for reassembly, noting the following.

NOTE:
Bevel pinion and bevel gear are supplied as a set. Even when only bevel pinion or bevel gear replacement is necessary, be sure to replace both as a set.

Differential Pinion Shaft (Shorter)
When installing shaft into differential case and pinion, insert its "A" side into pinion joint.

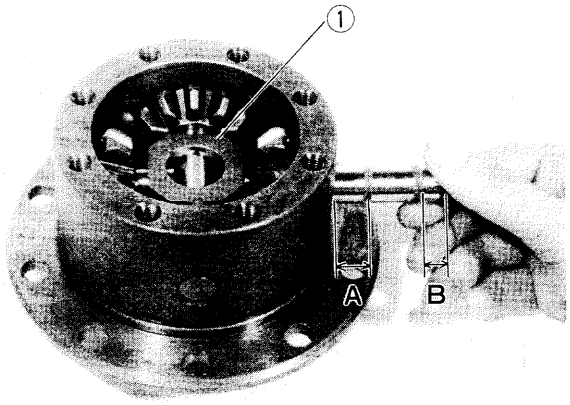


Fig. 16-26 ① Pinion joint
A>B ("A" is longer than "B".)

Drive Bevel Gear Bolts
Bolts securing bevel gear to differential case are subject to shear stress since drive is transmitted by these bolts from gear to case. For this reason, they are special bolts made from chrome steel and must never be replaced by common bolts.
When mounting gear onto case, be sure to apply THREAD LOCK CEMENT SUPER 1333B (99000-32020) to these bolts before running them in.

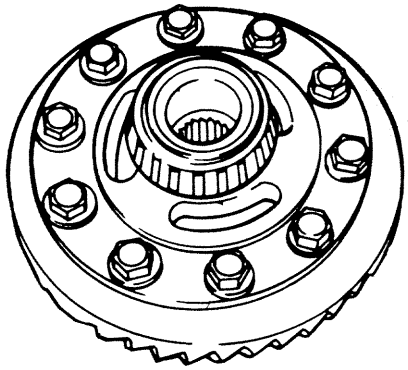


Fig. 16-26-1

Differential Side Bearings
Press-fit these bearings into differential case by using special tool. Driving the bearing into case is not permitted.

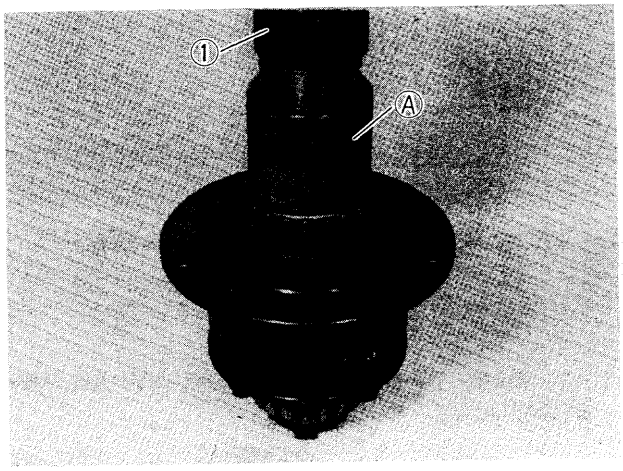


Fig. 16-27 *① Press*
Ⓐ Special tool (Bearing installer 09940-53111)

Bevel Pinion Bearings

A press must be used to install two tapered roller bearings on bevel pinion. Outer races are press-fitted into the differential carrier and inner races onto the pinion.

NOTE:

When replacing bevel pinion bearings, check to ensure that gear side and flange side bearings are the same marker's products.

1) For outer race of flange side bearing, use special tool as shown below.

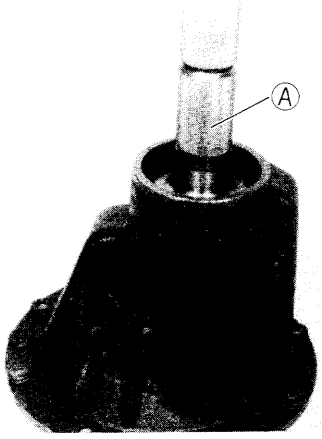


Fig. 16-28 Ⓐ Special tool (Bearing installer 09913-75510)

2) For outer race of gear side bearing, use special tools.

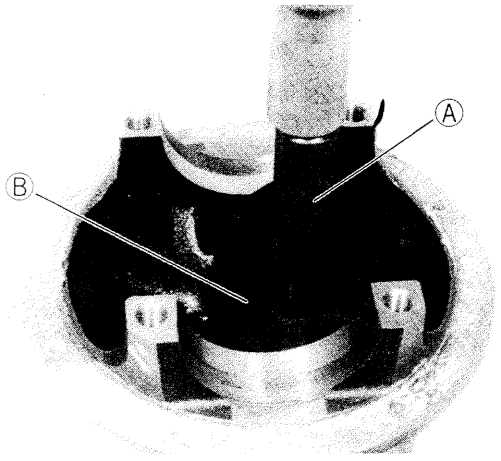
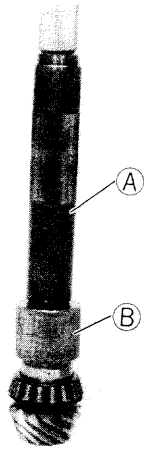


Fig. 16-29 Ⓐ Special tool (Bearing installer attachment 09924-74510)
Ⓑ Special tool (Bearing installer 09926-68310)

3) After installing proper bevel pinion shim(s), press-fit inner race to bevel pinion using special tools.



Ⓐ Special tool (Bearing installer 09925-18010)
Ⓑ Special tool (Bearing installer 09940-53111)

Fig. 16-30

4) After installing bevel pinion, spacer, bearings and universal joint flange to carrier and carrying out "bevel pinion bearing preload adjustment" as described previously, caulk bevel pinion nut to prevent it from loosening.

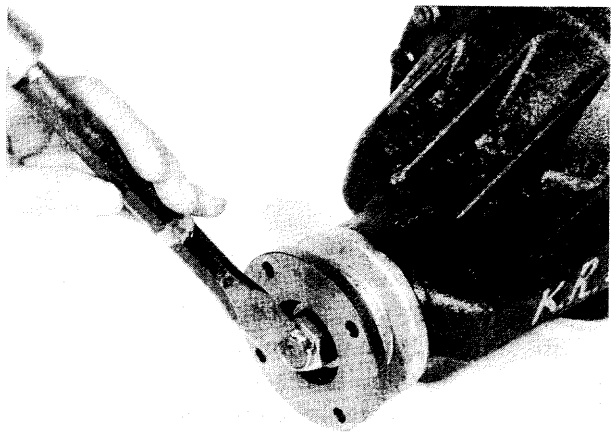


Fig. 16-30-1

Side Bearings Caps
When putting on side bearing caps, be sure to discriminate the right-hand cap from the left-hand one by referring to match marks scribed at the time of disassembly.
Then, after carrying out "Bevel gear backlash adjustment" as described on p. 16-10 torque cap bolts to specification.

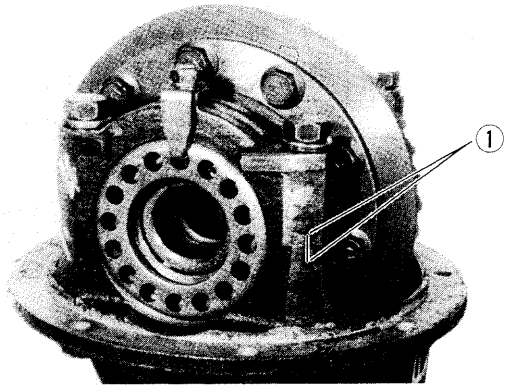


Fig. 16-31 ① Scribed match marks

16-6. INSTALLATION

Reverse removal procedure for installation, noting the following.

Differential
Before installing differential ass'y to axle housing, clean mating surfaces of differential carrier and housing and apply sealant to them.

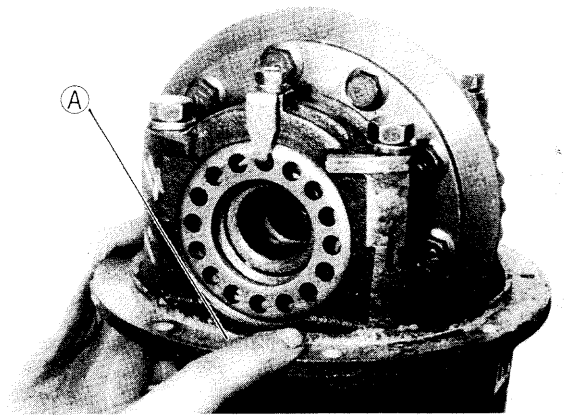


Fig. 16-32 Ⓐ Sealant (SUZUKI BOND NO. 1215 99000-31110)

Front Axle Shaft and Steering Knuckle
For installation them, refer to "Front Suspension Installation" in SECTION 17 of this manual.

Rear Brake Drum
For installation of rear brake drum, refer to "Rear Brake Installation" in SECTION 19 of this manual.

Differential Gear Oil
Refill differential housing with new specified oil. Refer to "MAINTENANCE SERVICE" in this section for refill.

Brake Circuit Air Purging
If brake pipe (right & left) was disconnected from wheel cylinder as in Fig. 16-9-2, make sure to purge air out of brake circuit. Refer to section 19. BRAKES for "air purging" operation. Then check to ensure that joint seam of pipe is free from oil leak.

16-7. MAINTENANCE SERVICES

Inspection

Inspect differential and differential housing for evidence of oil leakage.

Oil level is checked by means of its oil level plug. Refer to p. 1-17 for level inspection.

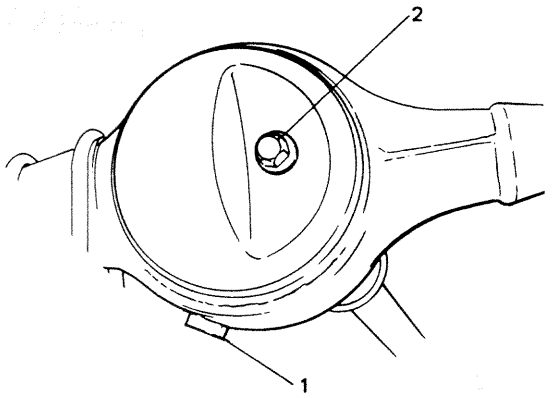


Fig. 16-33 ① Drain plug
② Oil level & filler plug

Oil Change

1) Remove oil drain plug and drain oil.
2) Reinstall drain plug and tighten it to specified tightening torque.
3) Remove oil level & filler plug and fill differential housing with new specified oil.

Differential oil specification		Hypoid gear oil SAE 80W-90, 75W-80 or 75W-90
Oil capacity	Front	2.0 litres (4.2/3.5 US/Imp pt.)
	Rear	1.5 litres (3.2/2.6 US/Imp pt.)

It is highly recommended to use SAE 75W-90 gear oil.
For viscosity chart, refer to P.1-17.

4) Reinstall oil level & filler plug and tighten it to specified tightening torque.

16-8. RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Side bearing cap bolt	70 – 100	7.0 – 10.0	51.0 – 72.0
Drive bevel gear bolt	80 – 90	8.0 – 9.0	58.0 – 65.0
Differential case bolt	37 – 45	3.7 – 4.5	27.0 – 32.5
Side bearing adjuster lock bolt	9 – 14	0.9 – 1.4	7.0 – 10.0
Differential carrier bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
Oil level & filler plug	35 – 50	3.5 – 5.0	25.5 – 36.0
Oil drain plug	18 – 25	1.8 – 2.5	13.5 – 18.0

SECTION 17

SUSPENSION

CONTENTS

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.
- The leaf spring number or shape shown in this manual may differ from the car being actually serviced, depending on specification.

17-1. FRONT SUSPENSION

GENERAL DESCRIPTION

The front suspension consists of the double-acting shock absorbers, stabilizer bar, semi-elliptical leaf springs, axle housing, etc. as shown below.

The Barfield universal joints are used in the front axle to enable the axle shafts to drive the front wheels while allowing the wheels to be steered. This type of joint provides for a larger steering angle range and, what is more important, constant-velocity drive to the wheel.

If a single two-yoke (or Hooke's) universal joint is used to connect the axle shaft to the wheel on each side of the front end, the wheels will run with the same speed, but not with the same constant velocity, as that of the axle shafts when the wheels are turned around their kingpins for steering action. The barfield joint transmits drive without varying the angular velocity of drive.

The Barfield joint is enclosed by the knuckle, which is shaped integral with the knuckle arm, and has a two-piece kingpin, namely, upper and lower kingpins.

The end of the dead axle sleeve is in the shape of dish. This dish is rotatably fitted into the knuckle structure to form a flexible connection, the sliding clearance between the two being sealed with a felt packing (against road dust and mud) and also with an oil seal (against the oil inside). The upper and lower kingpins, bolted to the knuckle extend into the knuckle and, inside, are held by the dish-like inner case through tapered roller bearings.

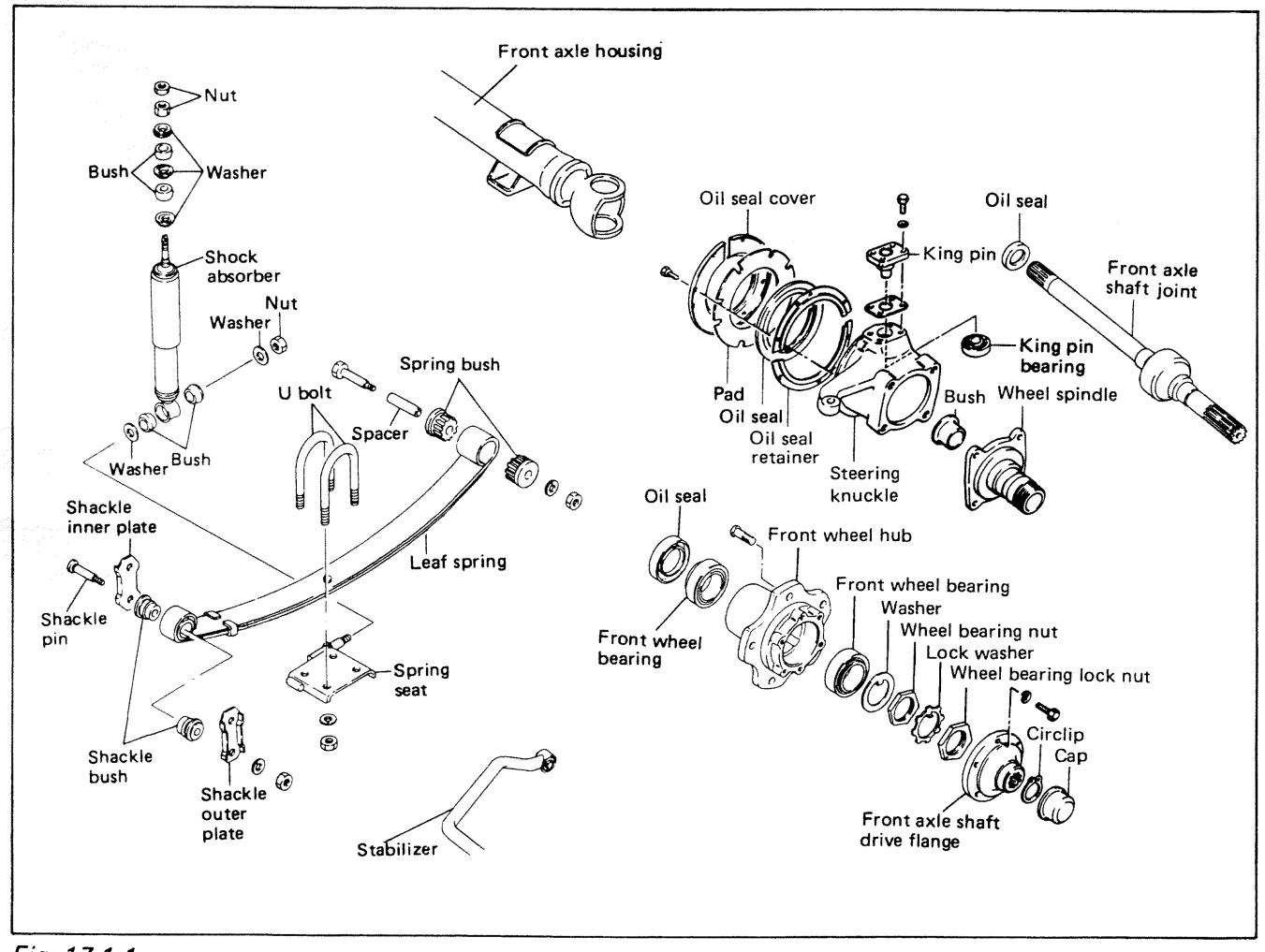
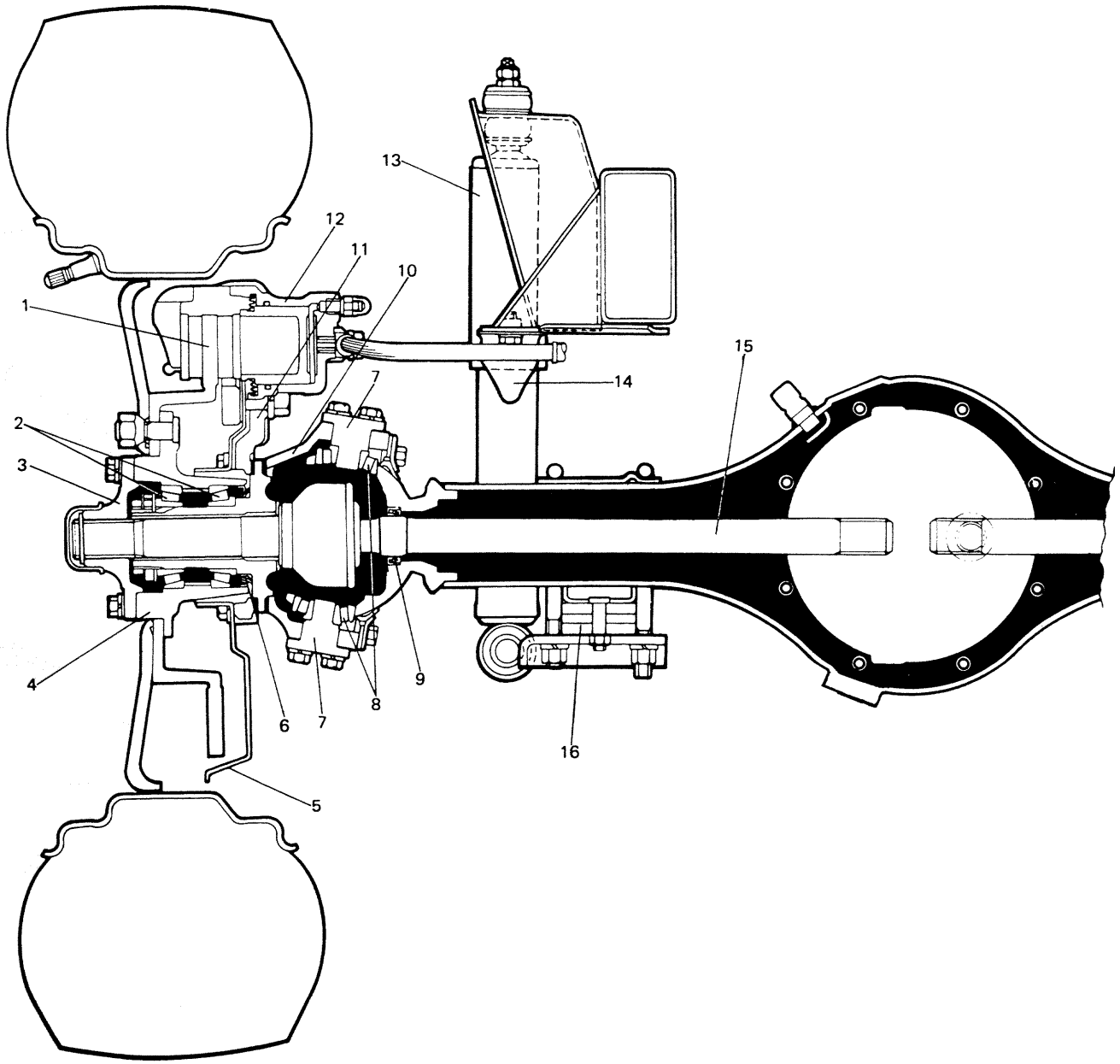


Fig. 17-1-1



1. Front brake disc
2. Wheel bearing
3. Axle shaft drive flange
4. Wheel hub
5. Dust cover
6. Oil seal
7. King pin
8. King pin bearing
9. Oil seal
10. Steering knuckle
11. Disc brake holder
12. Disc brake caliper
13. Shock absorber
14. Spring bumper
15. Axle shaft joint
16. Leaf spring

Fig. 17-1-2

BARFIELD JOINT CONSTRUCTION AND OPERATION

The major parts of the Barfield joint are the outer race (integral with wheel spindle, to which the wheel disc is splined), inner race (splined to the live axle shaft), six steel balls disposed between the two races, and cage (holding the steel balls in a single row lying in a plane).

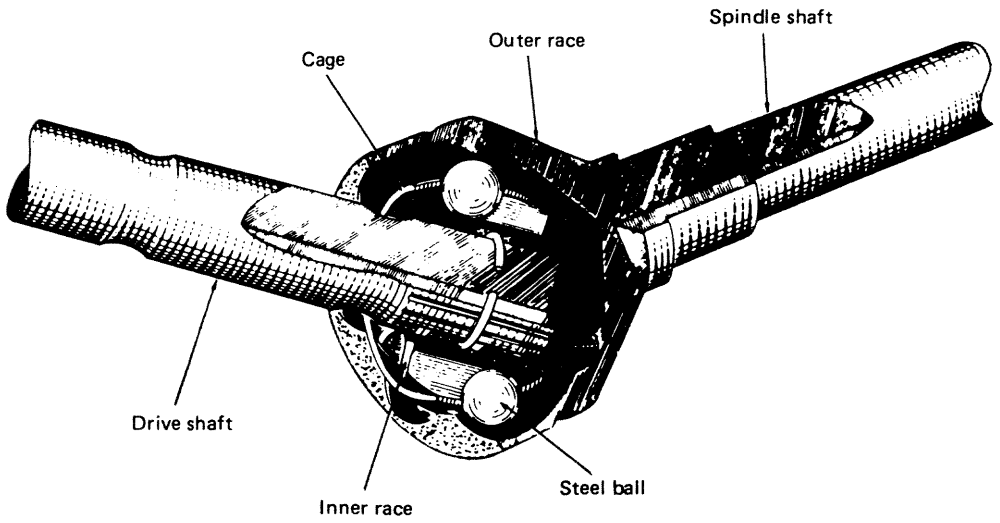


Fig. 17-1-3

The balls are fitted in two groups of raceways; one group is on the outer race and the other group on the inner race. Each ball is in its own raceways as if it were locked between the two races in the direction of rotation. The outer race with its wheel spindle is capable of angling and, when it so angles with respect to the axis of axle shaft, the row of steel balls angles just half as much, that is, the plane including this row tilts by an angle equal to one-half of the spindle angle. This relationship is illustrated in Fig. 17-1-4.

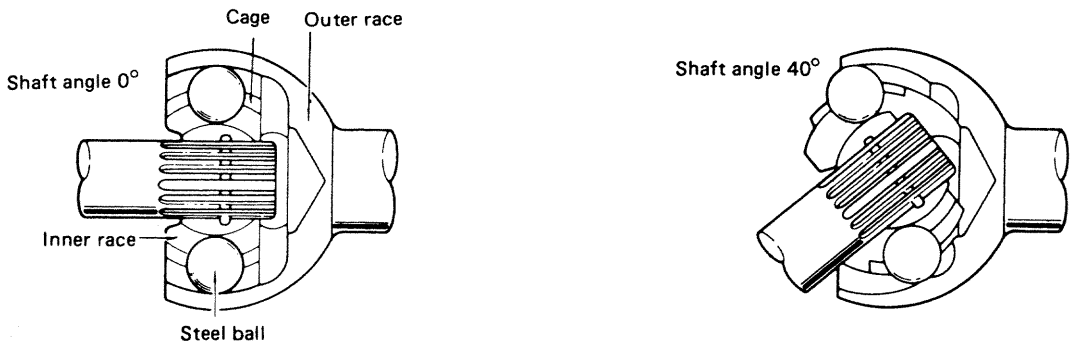


Fig. 17-1-4

REMOVAL

Shock Absorber

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

1. Hoist car.
2. Loosen lower and upper mounting nuts and remove shock absorber.

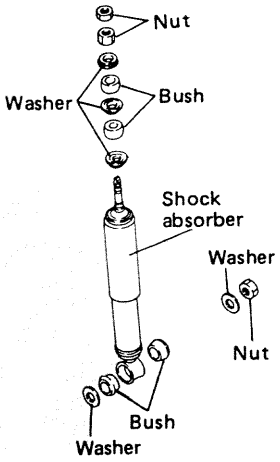


Fig. 17-1-5

Leaf Spring

1. Raise car. In this operation, garage jack or hoist must not be positioned against front suspension related parts. When garage jack is used, place safety stands under chassis to support raised body.
2. Remove front wheel.
3. Remove stabilizer bolt.
4. Remove U-bolt nuts.
5. Remove shackle nuts and leaf spring nut.

NOTE:
Removal of leaf spring causes axle housing to hang. Support it with safety stand to prevent it from damaging universal joint of propeller shaft and others.

6. Pull out leaf spring bolt and remove leaf spring from shackle pin.

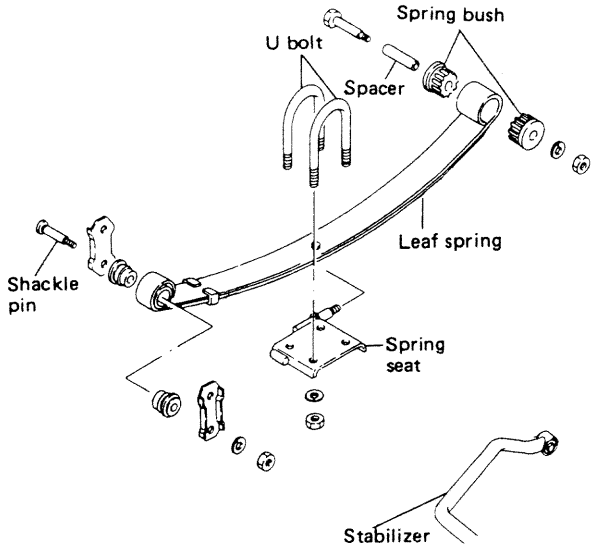


Fig. 17-1-6

Stabilizer

1. Hoist car.
2. Remove stabilizer bolts.
3. After removing stabilizer mount bush bracket bolts, remove stabilizer.

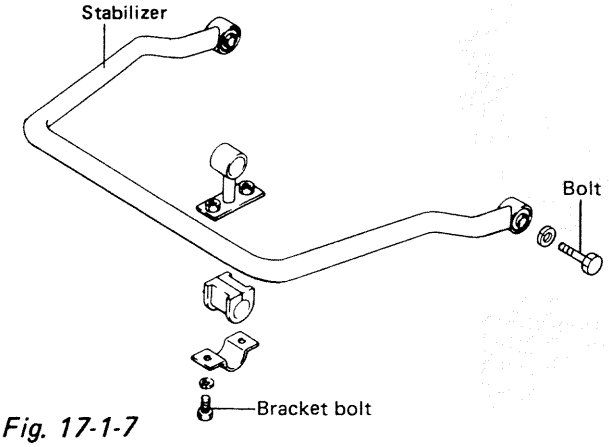


Fig. 17-1-7

Front Wheel Hub & Bearing

1. Loosen the five nuts securing the wheel. Raise the front end by jacking. Rest the machine steady on safety stands.
2. Remove the five nuts and take off the wheel.

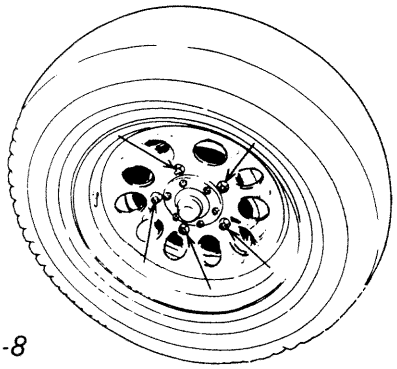


Fig. 17-1-8

3. Remove the caliper with carrier by loosening carrier bolts.

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 caliper removed.

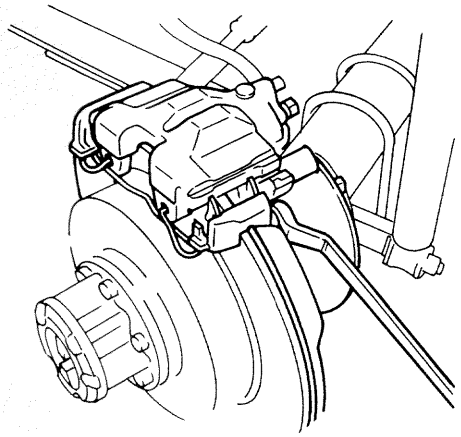


Fig. 17-1-9

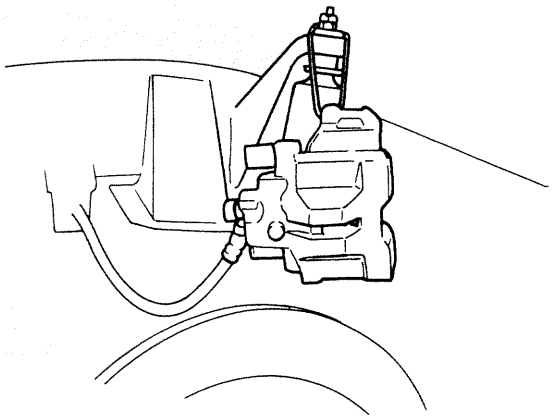


Fig. 17-1-10

4. Remove brake disc.

NOTE:
If brake disc can not be removed by hand, use 8 mm bolts as shown below.

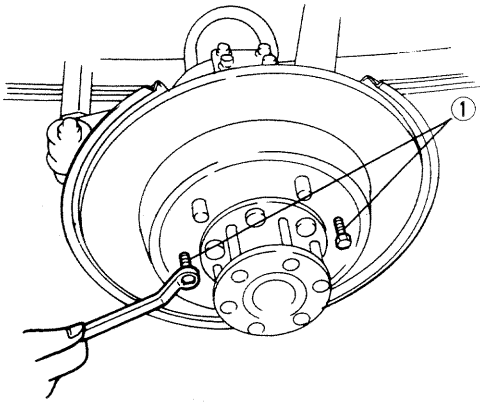


Fig. 17-1-11 ① 8 mm bolt

[For car equipped with free wheeling hub]

5. Remove free wheeling hub cover and circlip.

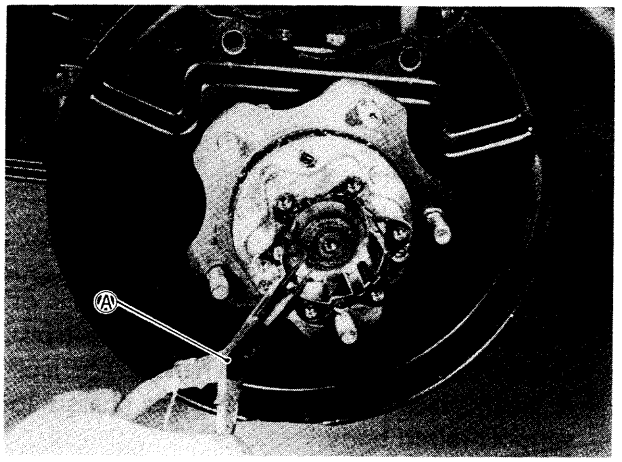


Fig. 17-1-12-1 Ⓐ Circlip remover (09900-06107)

6. Remove free wheeling hub body.

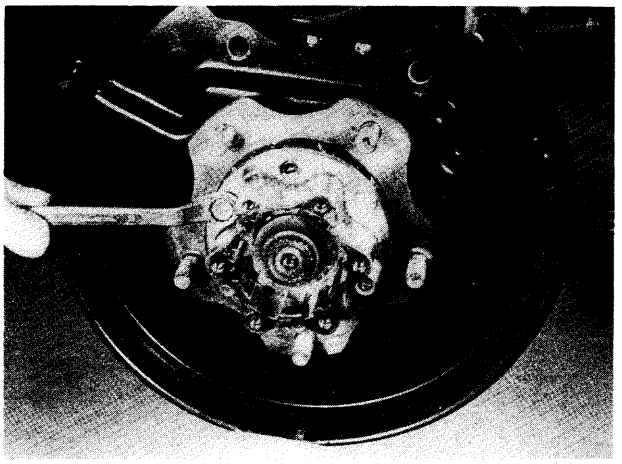


Fig. 17-1-12-2