

# 24. ELECTRIC STARTER/STARTER CLUTCH

SERVICE INFORMATION	24-1	CLUTCH SWITCH DIODE INSPECTION	24-8
TROUBLESHOOTING	24-1	STARTER CLUTCH INSPECTION	24-8
STARTER MOTOR	24-3	STARTER PINION INSPECTION	24-9
STARTER RELAY SWITCH	24-6		

## SERVICE INFORMATION

### ⚠ WARNING

- Always turn the ignition switch OFF before servicing the starter motor. The motor could suddenly start, causing serious injury.

- Refer to the Model Specific manual for removal and installation of the starter motor.
- A weak battery may be unable to turn the starter motor quickly enough, or, supply adequate ignition current.
- If the current is kept flowing through the starter motor to turn it while the engine will not be cranking, the starter motor may be damaged.
- For models with a centrifugal clutch, incorrect adjustment of the brake light switch could prevent the starter motor from operating.

## TROUBLESHOOTING

### Starter motor turns slowly.

- Low specific gravity in battery (or Dead battery).
- Poorly connected battery terminal cable.
- Poorly connected starter motor cable.
- Faulty starter motor.
- Poorly connected battery ground cable.

### Starter motor turns, but engine does not turn.

- Starter motor is running backwards.
  - Brushes assembled improperly.
  - Case assembled improperly.
  - Terminals connected improperly.
- Faulty starter clutch.
- Damaged or faulty starter pinion.
- Damaged idler gear or reduction gear.
- Broken starter motor drive chain.
- Faulty starter clutch.

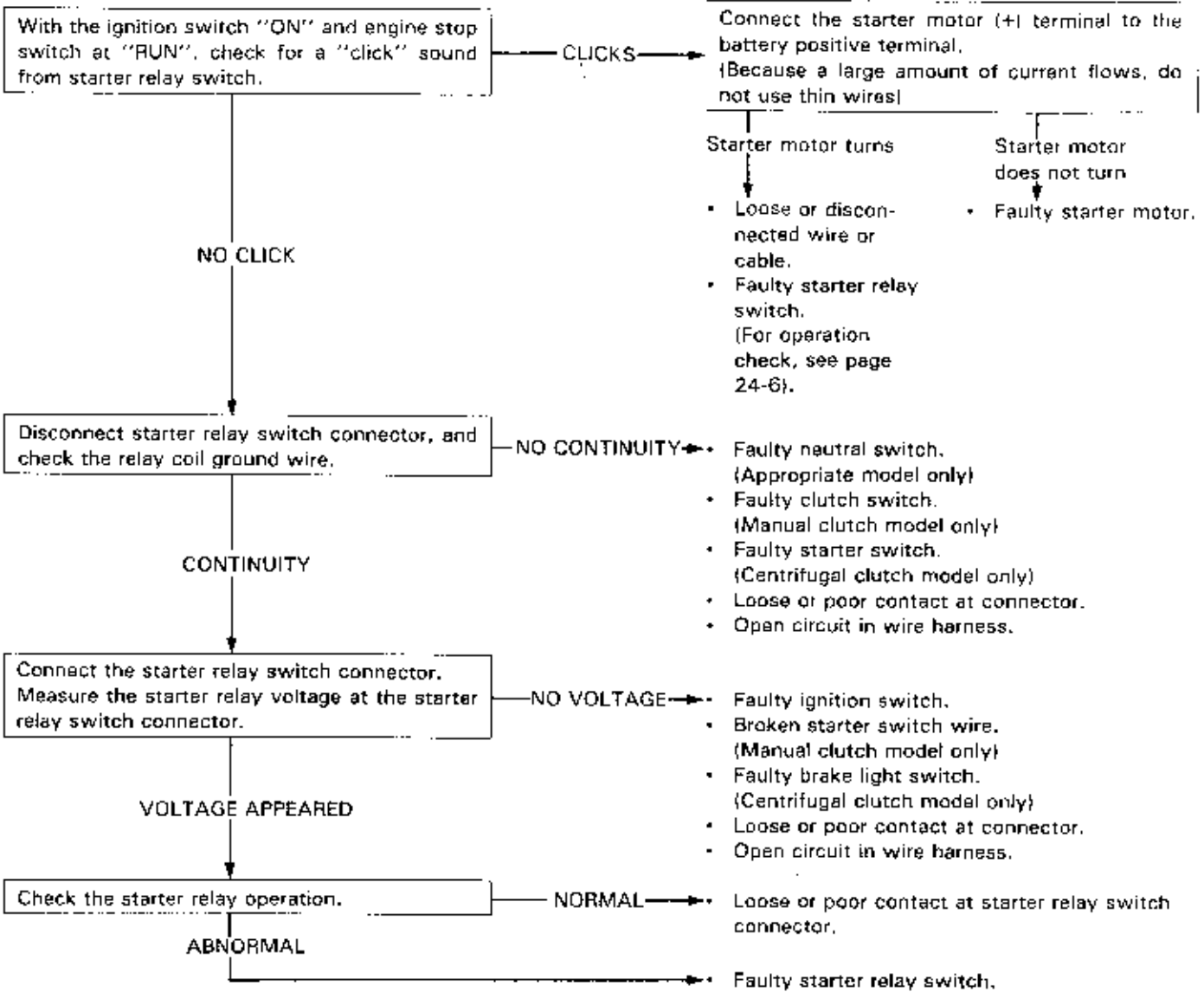
### Starter motor relay "clicks", but engine does not turn over.

- Crankshaft does not turn due to engine problems.
- Excessive reduction gear friction.
- Faulty starter pinion engagement.

# ELECTRIC STARTER/STARTER CLUTCH

## Starter motor will not turn.

- Check for a blown out main or sub fuse before servicing.
- For models with a centrifugal clutch, check that the brake light switch is correctly adjusted.



## STARTER MOTOR

### DISASSEMBLY

Before disassembling the starter motor mark the position of the case and cover so the starter can be assembled correctly later.

Remove the starter motor case screws and remove the cover.

### NOTE

- For models with shims between the armature and cover, record the location and number of shims.
- Record the order so the parts can be installed correctly later.

### INSPECTION

Check for continuity of the starter motor case.

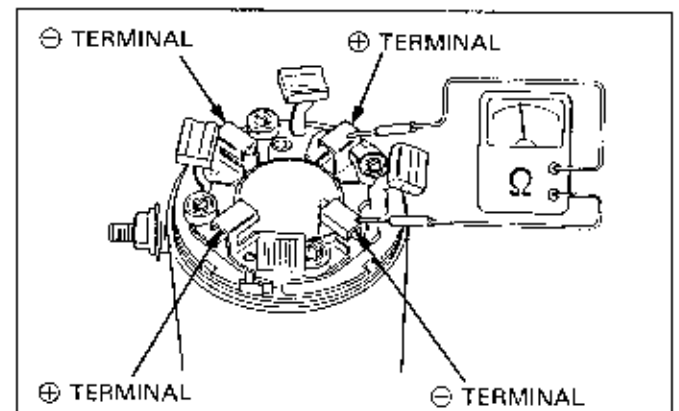
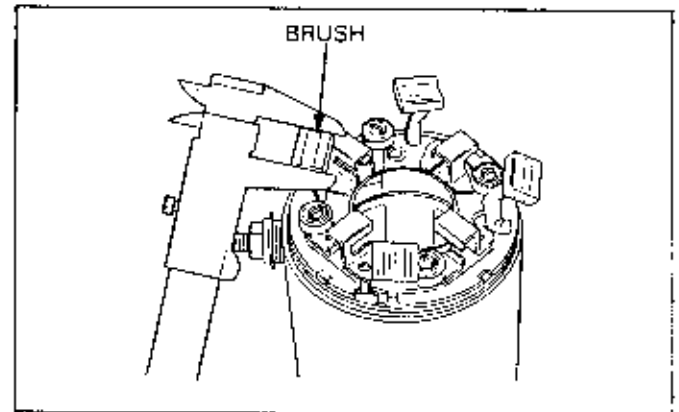
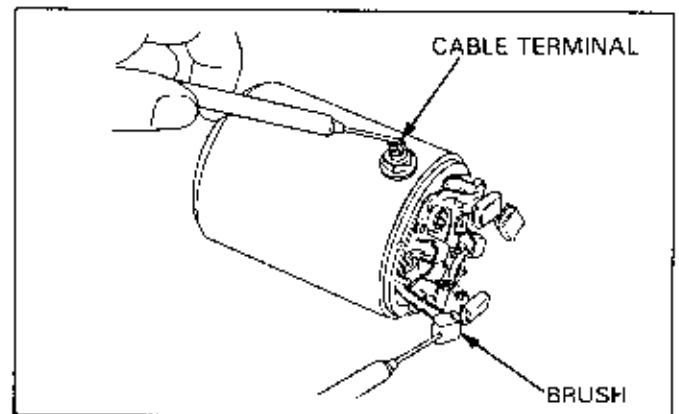
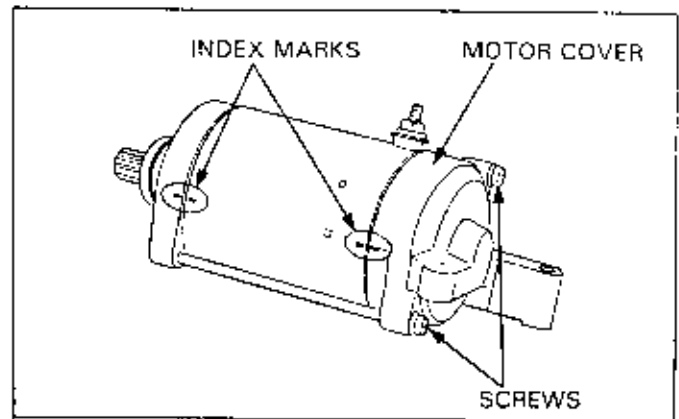
- Between cable terminal and case: normal if no continuity.
- Between cable terminal and brush (black wire): normal if there is continuity.

If abnormal, replace with a new one.

Measure the brush length.

Replace the brush if it is worn beyond the service limit.

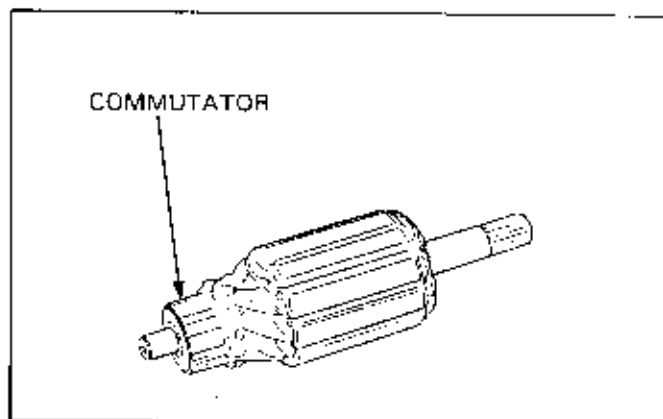
Check for continuity between  $\oplus$  and  $\ominus$  terminals of the brush



## ELECTRIC STARTER/STARTER CLUTCH

Check the commutator for:

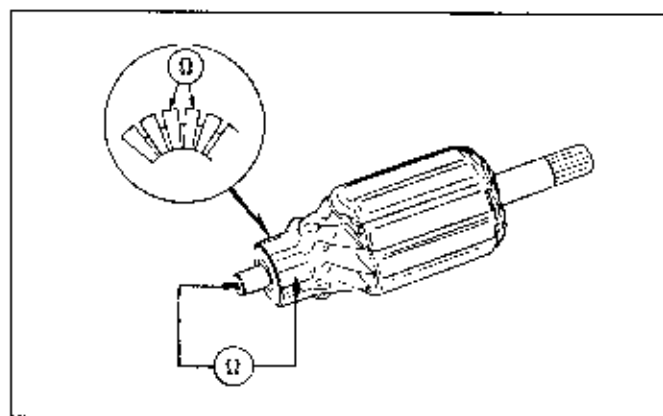
- Damage or abnormal wear. → Replace with a new one.
- Discoloration of the commutator bar.
  - Replace with a new one.
- Metallic debris between commutator bars.
  - Clean it off.



Check for continuity between pairs of commutator bars.

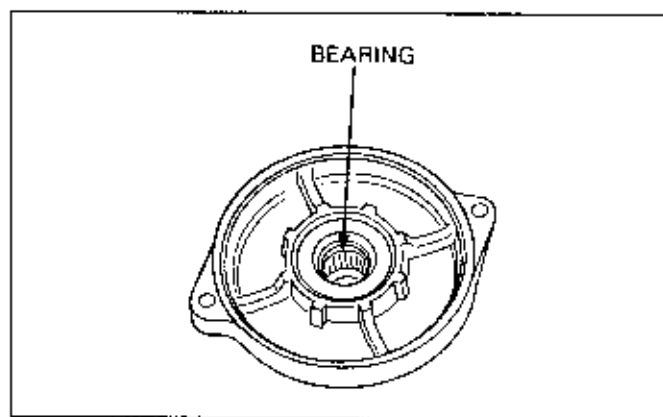
Make a continuity check between individual commutator bars and the armature shaft.

There should be no continuity.



Check the bearings. (For applicable models only)

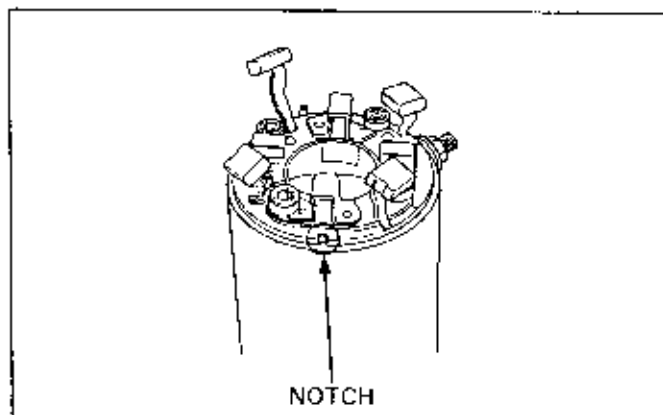
- Do not rotate smoothly. → Replace with a new one.
- Loose bearing. → Replace with a new one.



## ASSEMBLY

Align the case notch with the brush holder pin and install the case.

Place the O-ring (seal ring) on the case. (For applicable models only)



Carefully insert the brushes into the brush holder.

**CAUTION**

- The sliding surfaces of the brushes can be damaged if they are not installed properly.

Apply grease to both ends of the armature shaft.

Push and hold the brush inside the brush holder, and insert the armature through the brush holder.

When inserting the armature into the case, hold the armature tightly to keep the magnet from pulling the armature against the case.

**CAUTION**

- The coil may be damaged if the magnet pulls the armature against the case.

Insert the shims in the correct order to the armature shaft. (For applicable models only)

Insert the O-ring. (For applicable models only)

Align the mark (that you made earlier) and install the cover.

**CAUTION**

- When installing the cover, take care to prevent damaging the oil seal lip with the shaft.

Tighten the cover screws.

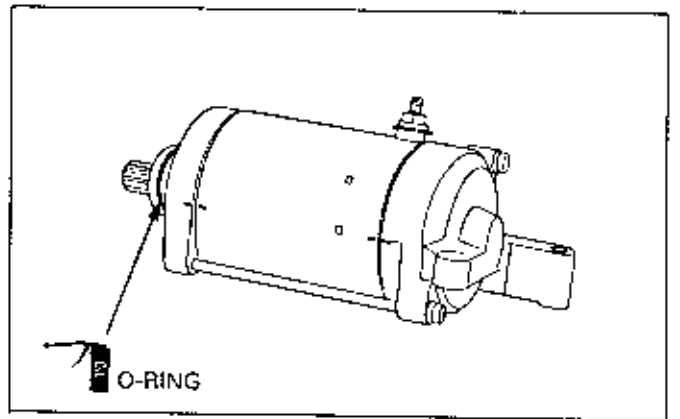
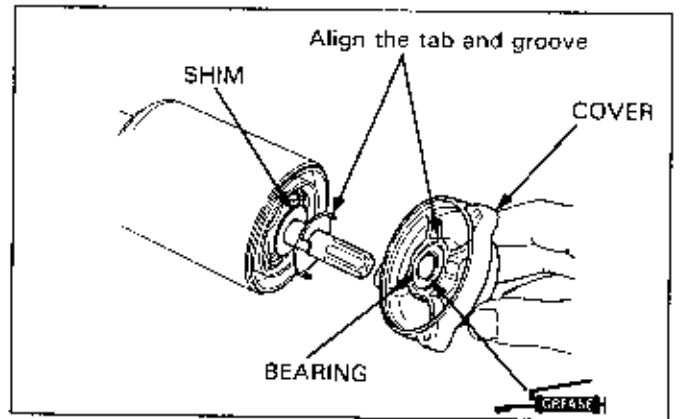
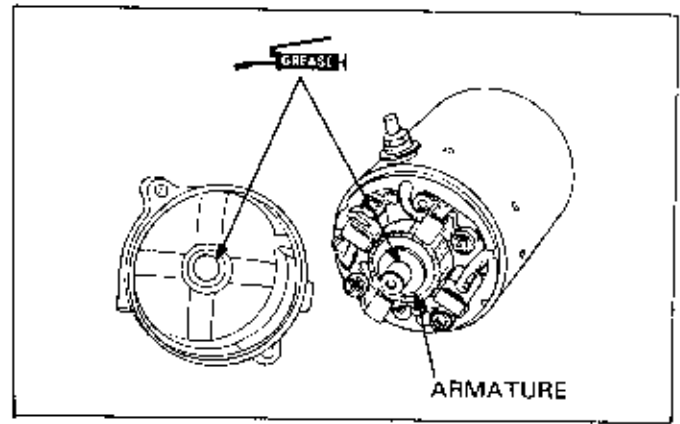
For starter motors that are mounted within a motor mount hole, check for a damaged O-ring.

In order to prevent damage, grease the O-ring.

Refer to the Model Specific manual for installation.

**CAUTION**

- Overtightening the cable terminal nuts may cause the terminals to turn inside the starter motor, resulting in serious damage to the inner connectors.



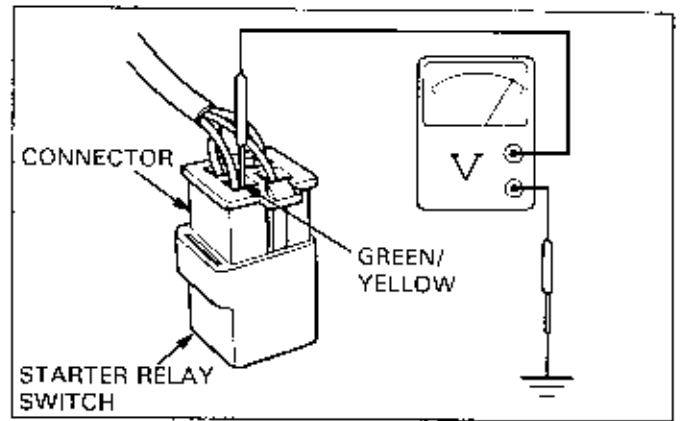
◀Circuit B▶

Measure the voltage between the green/yellow wire and ground at the starter relay switch connector.

If battery voltage is measured when the front or rear brake are applied, it is normal.

NOTE

- If the brake light adjustment is incorrect, no voltage will appear when the brake is ON.

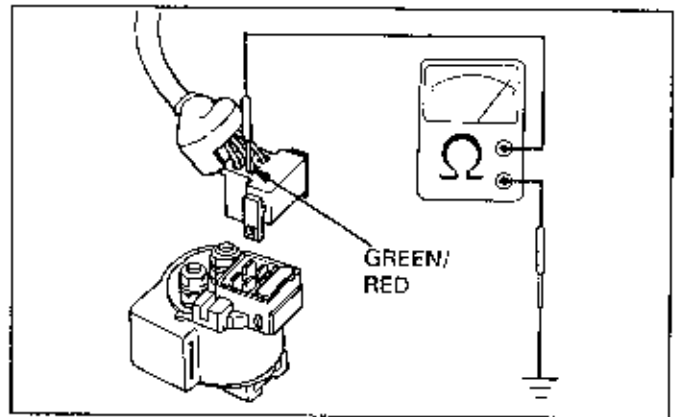


Starter relay switch ground line

◀Circuit A▶

Disconnect the connector from the starter relay switch and check for continuity between the ground wire (green/red) and ground.

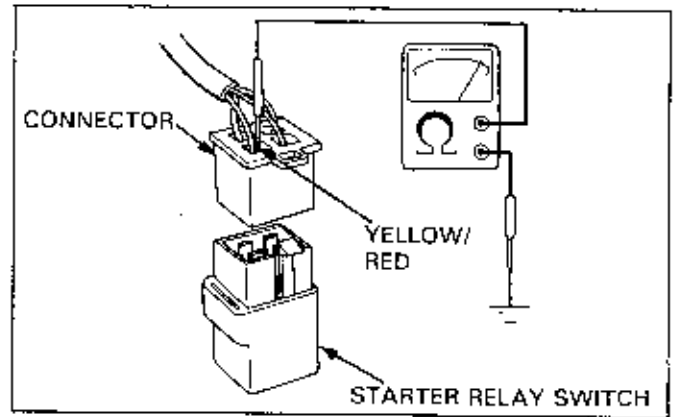
If there is continuity when the transmission is in neutral or when the clutch is disengaged, the ground circuit is normal. (In neutral, there is a slight resistance due to the diode.)



◀Circuit B▶

Disconnect the connector from the starter relay and check for continuity between the ground wire (yellow/red) and ground.

If there is continuity only when the starter switch is pressed, the ground circuit is normal.



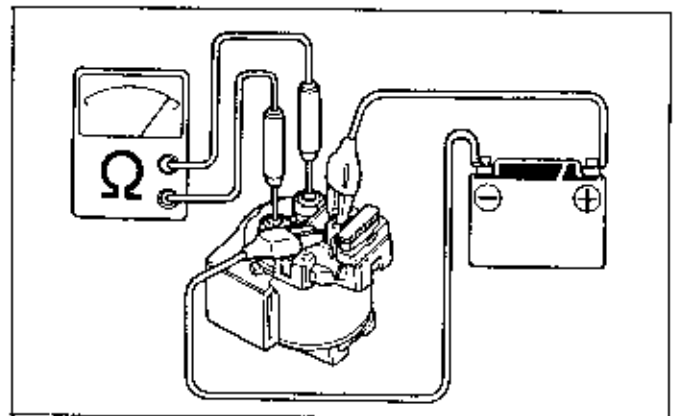
OPERATION CHECK

Apply battery voltage between the two relay coil terminals. Check for continuity between B (battery) and M (rotor) terminals.

◀Circuit A▶

Apply battery voltage between yellow/red and green/red terminals.

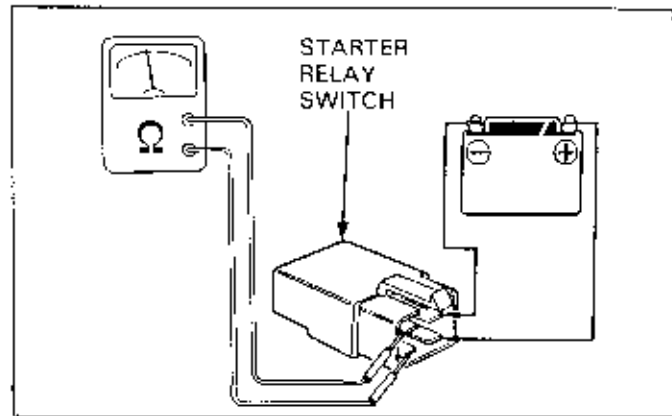
If there is continuity between B and M terminals, it is normal.



## ELECTRIC STARTER/STARTER CLUTCH

### «Circuit B»

When battery voltage is applied between the starter relay green/yellow wire and yellow/red terminals, there should be continuity between the red and red/white terminals. The terminals are distinguished by the corresponding wire color of the wire harness connector.



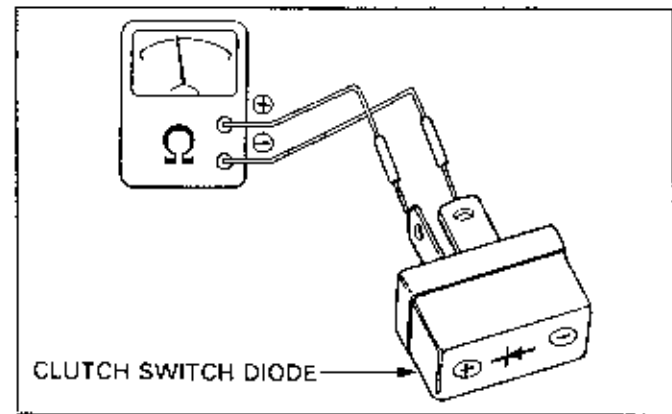
## CLUTCH SWITCH DIODE INSPECTION

The purpose of the clutch switch diode is to prevent reverse current flow from the neutral indicator to the clutch switch.

- Faulty diode. → Neutral indicator turns ON when clutch is disengaged.
- Loose connections at diode terminal.
  - Starter motor does not turn when transmission is in neutral.

Check for continuity between diode terminals. When there is continuity, a small resistance value is measured.

- If there is continuity in one direction, the clutch switch diode is good.

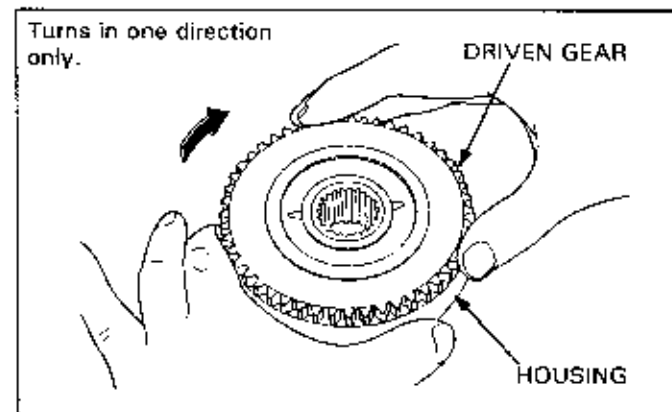


## STARTER CLUTCH INSPECTION

Refer to Model Specific manual for starter clutch removal and installation.

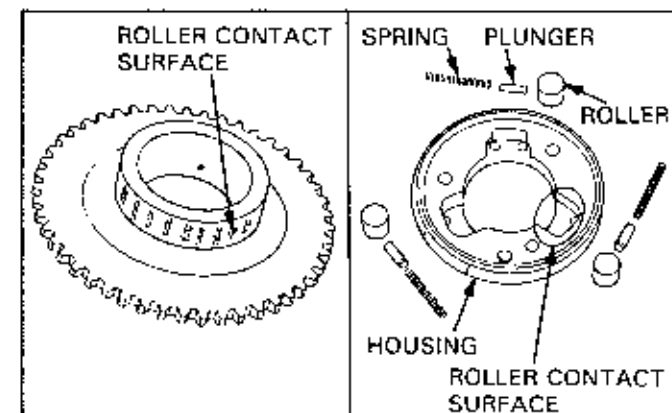
Install the driven gear into the housing. With all parts assembled, check the starter clutch.

- Check that the gear, or sprocket, turns smoothly in one direction and locks up in the other direction.



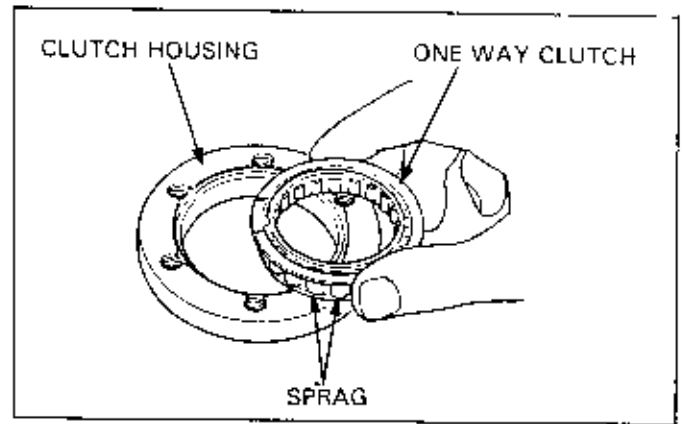
### Disassemble the housing.

- Check the roller contact surface of the gear, or sprocket, for damage. → Replace with a new one.
- Check the roller contact surface of the housing for damage. → Replace with a new one.
- Damage to roller. → Replace with a new one.
- Deformation or damage to the spring. → Replace with a new one.



For one-way sprag clutch, check each sprag, clutch housing, and all inner portion contact surfaces.

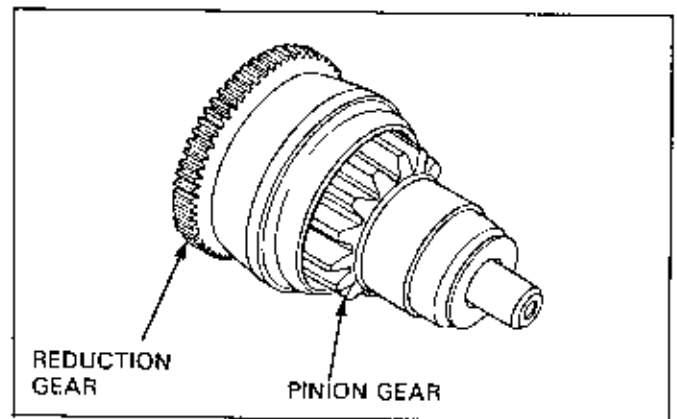
- Abnormal wear or damage to sprag.  
→ Replace with a new one.
- Irregular movement of the sprag.  
→ Replace with a new one.
- Damage to the clutch housing or inner portion contact surface. → Replace with a new one.



### STARTER PINION INSPECTION

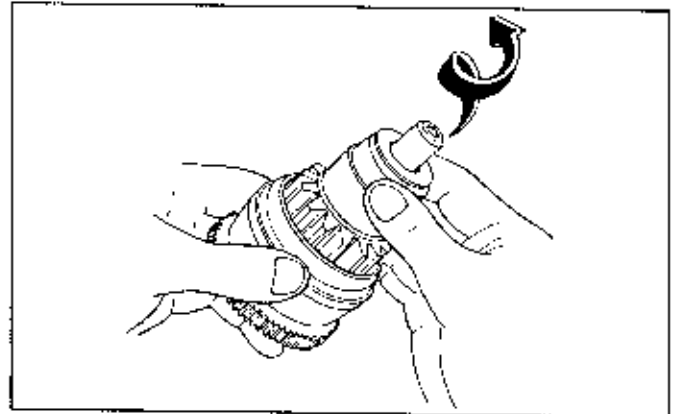
Refer to the Model Specific manual for starter pinion removal and installation.

- Wear or damage to the pinion, reduction gears  
→ Replace with a new one.
- Worn journals. → Replace with a new one.



Check if the pinion gear moves smoothly along the axis.

- Pinion gear does not move smoothly.  
→ Replace with a new one.





# 25. LIGHTS/METERS/SWITCHES

SERVICE INFORMATION	25-1	LOW FUEL INDICATOR	25-8
OIL PRESSURE WARNING LIGHT (4-STROKE ENGINE)	25-2	FUEL PUMP	25-9
OIL LEVEL INDICATOR (2-STROKE ENGINE)	25-2	HEADLIGHT BULB	25-11
FAN MOTOR SWITCH	25-4	SWITCHES	25-12
COOLANT TEMPERATURE GAUGE	25-5	TURN SIGNAL LIGHTS	25-16
FUEL GAUGE	25-7	HORN	25-17

## SERVICE INFORMATION

### ⚠ WARNING

- Halogen headlight bulbs become very hot while the headlight is ON, and remain hot for a while after they are turned OFF. Be sure to let them cool down before servicing.

Use a flame and heated water/coolant mixture for the thermo sensor inspection.

### ⚠ WARNING

- Keep all flammable materials away from the flame. Wear protective clothing, gloves and eye protection.

- Refer to the section 21 for the general service rules.
- This section covers the general inspection/service procedures of the lights, meters and switches. Refer to the Model Specific manual for the location and arrangement of components on the model being serviced.
- Note the followings when replacing the halogen headlight bulb.
  - Wear clean gloves while replacing the bulb. Do not put finger prints on the headlight bulb, as they may create hot spots on the bulb and cause it to break.
  - If you touch the bulb with your bare hands, clean it with a cloth moistened with alcohol to prevent its early failure.
  - Be sure to install the dust cover after replacing the bulb.
- A continuity test can be made with the switches installed on the motorcycle.
- Check the battery condition before performing any inspection that requires proper battery voltage.
- There are two types of lighting systems; AC lighting that takes power from the alternator coil, and DC lighting that takes power from the battery. On DC lighting systems, the headlight comes on without starting the engine. On AC lighting systems, the headlight comes on when the engine is running. (Refer to section 21).

## OIL PRESSURE WARNING LIGHT (4 stroke engine)

### THEORY

When the oil pressure is below the specifications, the oil pressure switch senses it and the oil pressure warning light comes on. It should be OFF while the engine is running.

### INSPECTION

- Oil pressure warning light does not come on with the ignition switch turned ON.

1. Disconnect the oil pressure switch wire and turn the ignition switch ON. Check for battery voltage between the wire and ground.

No voltage

Voltage

- Oil pressure switch faulty.

2. Check for the voltage between the black/brown terminal of the instruments and ground.

No voltage

Voltage

- Ignition switch faulty.
- Sub fuse blown.

- Broken wire between the warning light and oil pressure switch.
- Bulb blown.

- Oil pressure warning light stays on while the engine is running.

1. Check the engine oil level.

Specified oil level

Low oil level

- Oil insufficient.

2. Disconnect the oil pressure switch wire and turn the ignition switch ON.

Indicator lights

Indicator does not light

- Shorted blue/red wire between the warning light and pressure switch.

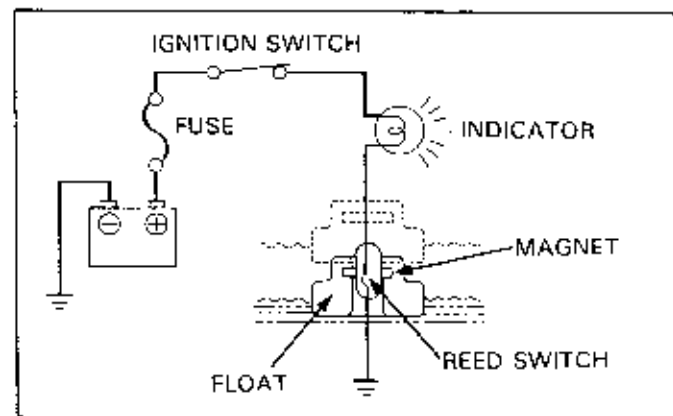
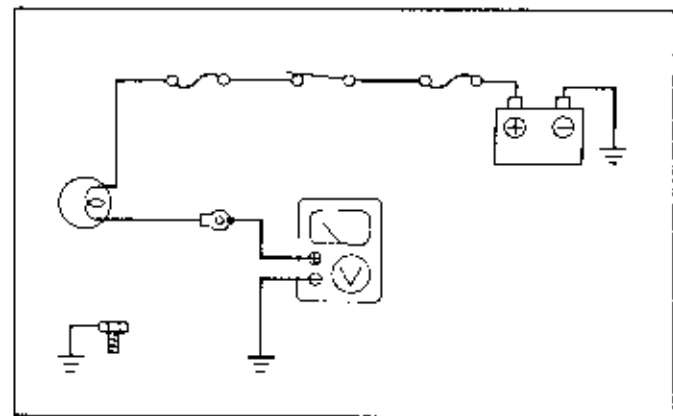
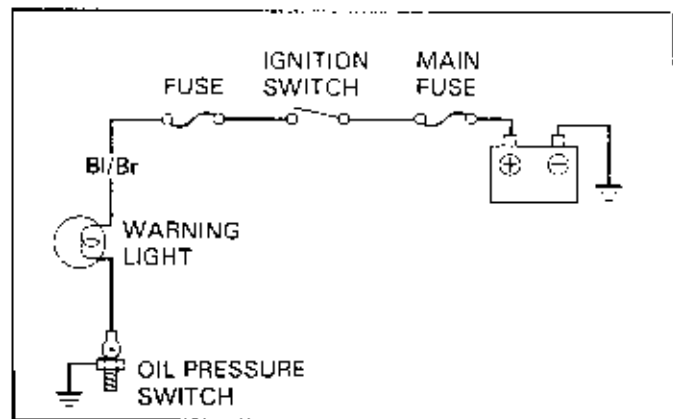
- Faulty oil pressure switch.
- Low oil pressure. (see section 3)

## OIL LEVEL INDICATOR (2 stroke engine)

### THEORY

The oil level switch float in the oil tank moves up and down in accordance with the volume of oil in the tank. When the oil level is low, the float also goes down and the reed switch (oil level switch) is closed by the magnetic force of the float.

When the ignition switch is turned ON, current flows through the reed switch and the oil level indicator comes on.



**INSPECTION**

- Oil level indicator comes on when the oil in the tank reaches a specified level.

1. Disconnect the wires from the oil level switch and turn the ignition switch ON.

Indicator lights

Indicator does not light

- Shorted wire between the indicator and oil level switch.
- Faulty oil level switch.

- Oil level indicator does not come on with no or low oil level in the tank.

1. Disconnect the wires from the oil level switch and connect a jumper wire between the wire terminals. Turn the ignition switch ON and check the indicator.

Indicator does not come on

Indicator comes on

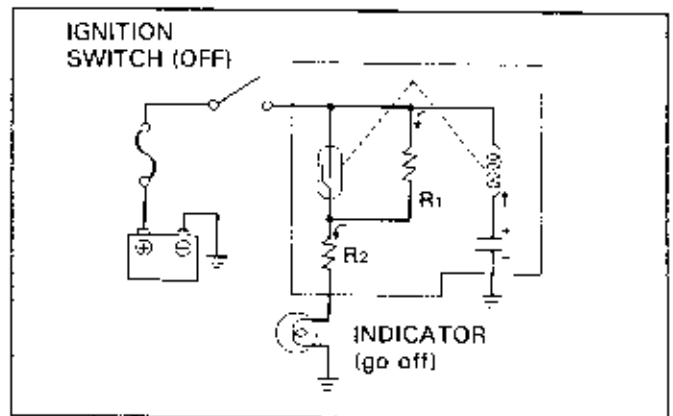
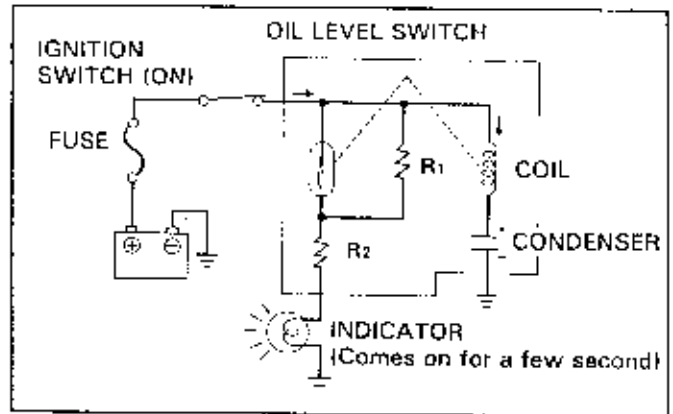
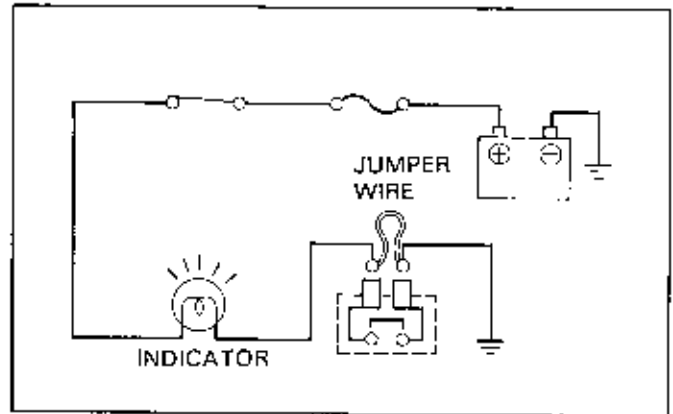
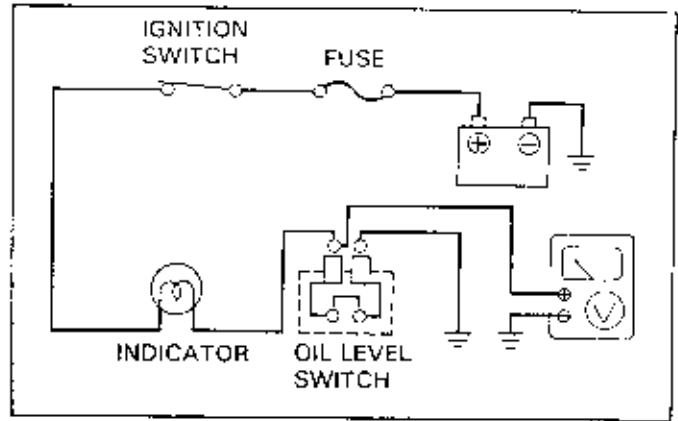
- Faulty oil level switch.
- Poor wire connection.

2. Disconnect the wires from the oil level switch and check for voltage between the wire and ground.

No voltage

Voltage

- Broken wire between the oil level indicator and level switch.
- Blown bulb.
- Faulty oil level switch.
- Poor oil level switch wire connection.



**TIMER TYPE THEORY**

A timer type indicator has a bulb check function so as to check the oil level indicator for proper operation.

When the ignition switch is turned ON, current flows through the exciter coil to the condenser, generates the electromagnetic force at the exciter coil and closes the reed switch. Current flows from the reed switch through the resistor R<sub>2</sub> to the oil level indicator and turns it on. When the condenser is fully charged, current flows through the exciter coil to the condenser decreases and, consequently, electromagnetic force at the coil decreases, the reed switch opens and the oil level indicator turns off.

When the ignition switch is turned OFF, current stored in the condenser flows through the exciter coil and through resistors R<sub>1</sub> and R<sub>2</sub> to the oil level indicator. The oil level indicator does not come on this time.

TIMER TYPE INDICATOR INSPECTION

- Oil level indicator comes on when the oil in the tank reaches a specified level.
  - Faulty oil level switch.
  - Shorted wire harness.
- Oil level indicator does not come on with no oil or low oil level in the tank.

1. Disconnect the oil level switch connector and connect a jumper wire to the power supply wire (black or black/brown) terminal and the indicator wire (green/red) terminal to short. Turn the ignition switch ON and check the oil level indicator.

Indicator does not come on

Indicator comes on

- Faulty oil level switch.
- Poor connection of the connector.

2. Disconnect the oil level switch connector and check for voltage between the power supply wire (black or black/brown) and ground.

Voltage

No voltage

- Broken power supply wire.
- Faulty sub fuse.
- Faulty ignition switch.
- Poor connection of the sub fuse connector.

3. Connect the jumper wire to the power supply wire and oil level indicator wire to short and check for voltage between the indicator wire and ground.

Voltage

No voltage

- Blown bulb.
- Faulty ground.
- Broken indicator wire.

FAN MOTOR SWITCH

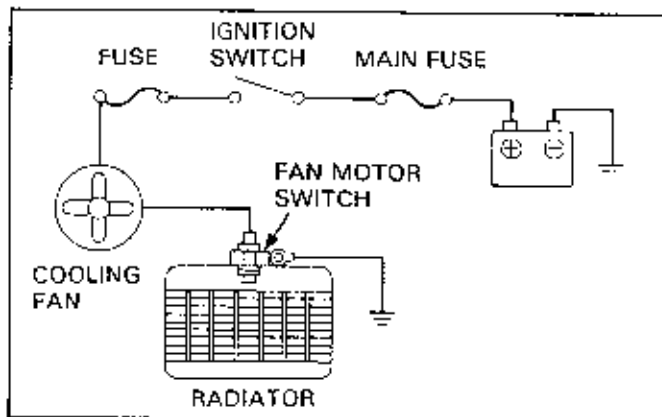
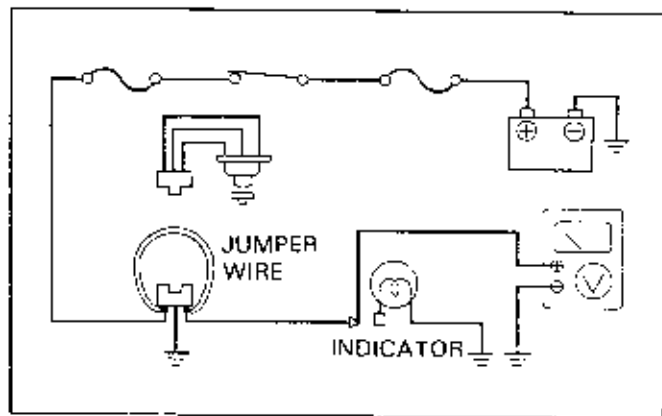
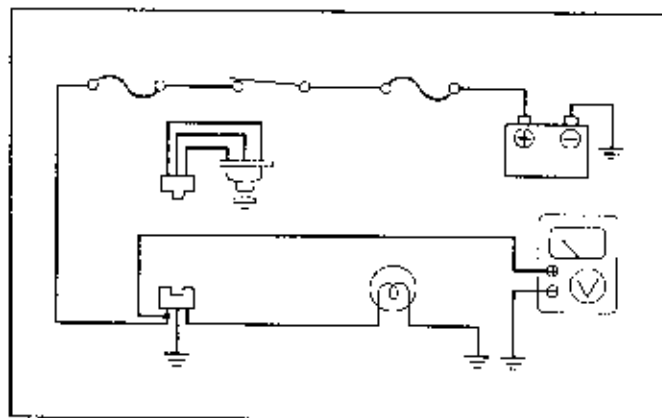
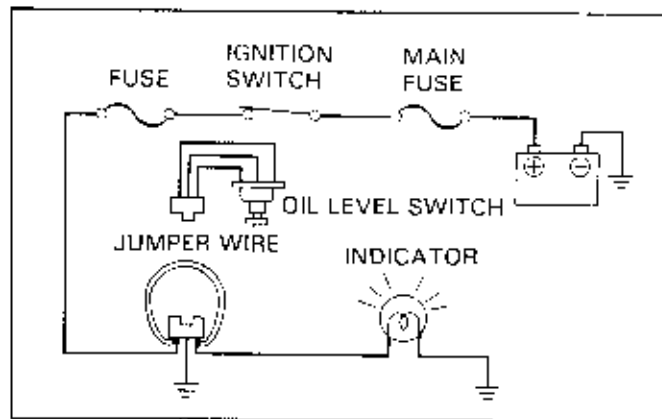
NOTE

- The fan motor may continue to run, even when the ignition switch is turned OFF. However, this does not necessarily indicate trouble.

When the coolant temperature increases to above the specification, the fan motor switch turns on to operate the fan motor. When the coolant temperature is below the specification, it turns off to stop the fan motor.

NOTE

- Check the coolant level and bleed air from the cooling system if the coolant is apt to overheat. (see page 5-6 for coolant replacement and air bleeding.)



**INSPECTION**

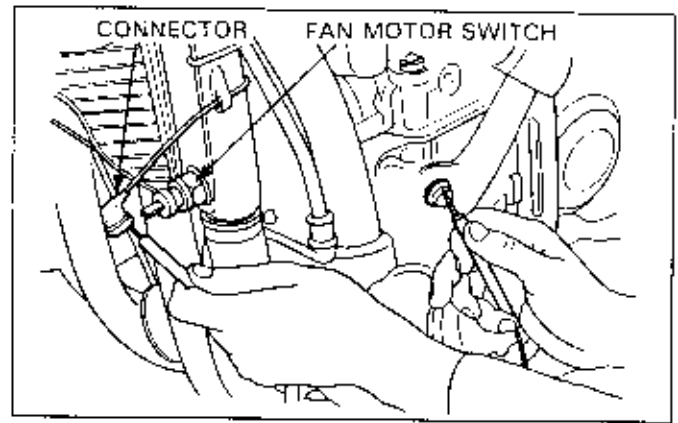
• Fan motor does not stop.

1. Turn the ignition switch OFF, disconnect the connector from the fan motor switch and turn the ignition switch ON again.

↓  
Motor does not stop

↓  
Motor stops

- Shorted wire between the fan motor and switch.
- Faulty fan motor switch.



• Fan motor does not start.

1. Disconnect the connector from the fan motor switch and ground the connector to the body with a jumper wire. Turn the ignition switch ON and check the fan motor.

↓  
Motor does not start

↓  
Motor starts

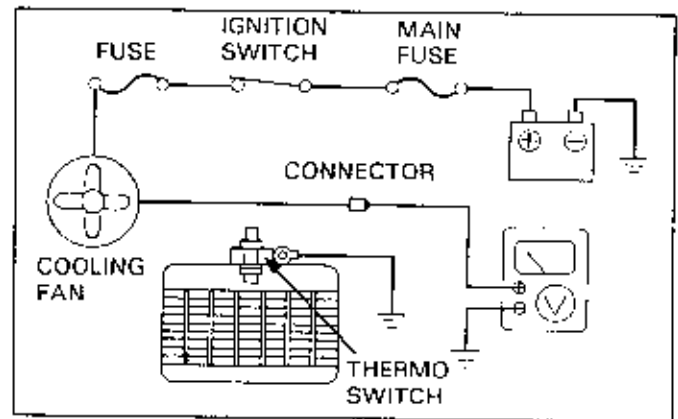
- Faulty fan motor switch.
- Poor connection of the fan motor switch connector.

2. Check for the battery voltage between the fan motor switch connector and ground.

↓  
No battery voltage

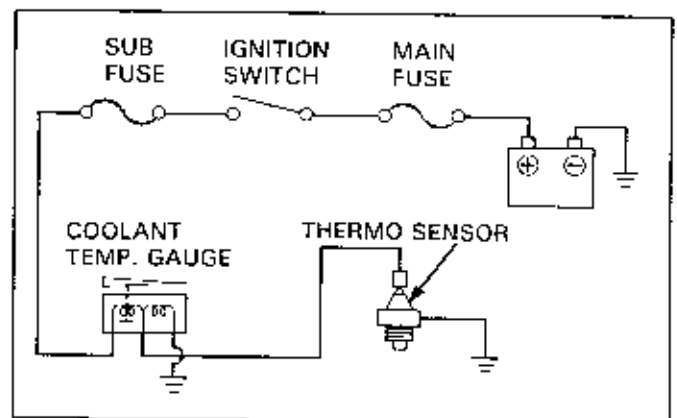
↓  
Battery voltage

- Broken wire harness
- Blown sub fuse.
- Faulty ignition switch
- Poor connection of the connector (between the ignition switch and fuse box).
- Faulty fan motor.



**COOLANT TEMPERATURE GAUGE**

The thermo sensor changes the amperage of the current that flows to the coolant temperature gauge in accordance with the change in coolant temperature and moves the temperature gauge needle.



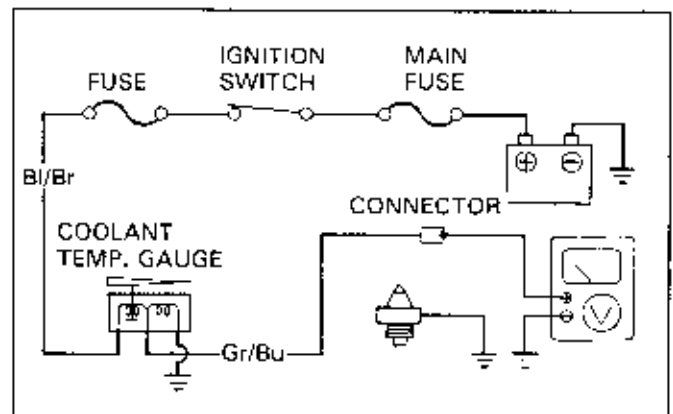
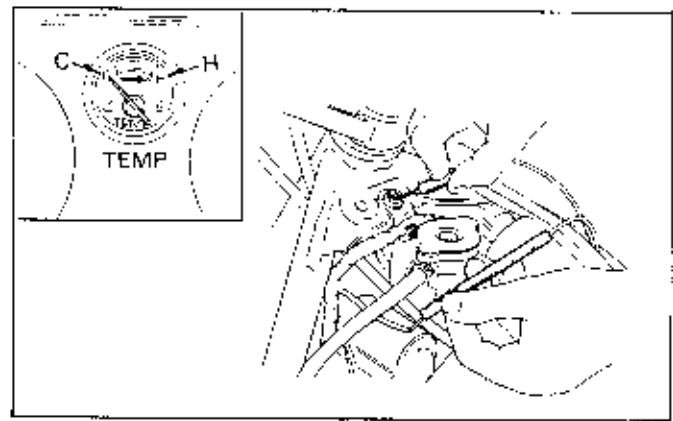
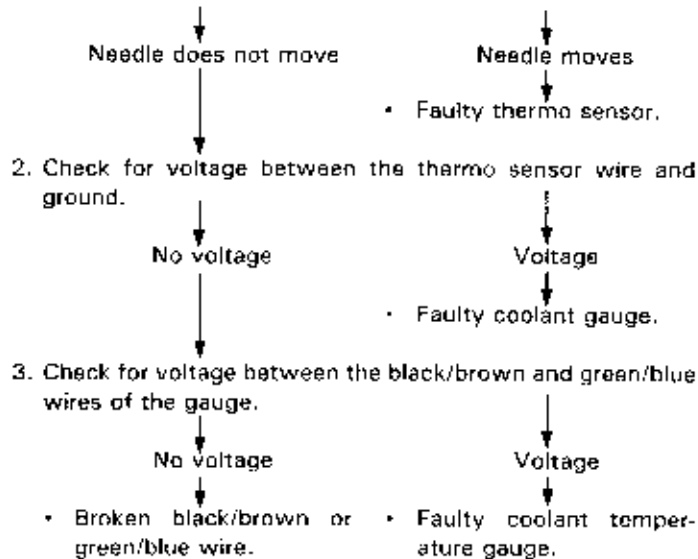
## LIGHTS/METERS/SWITCHES

### INSPECTION

1. Disconnect the wire from the thermo sensor.  
Ground the thermo sensor wire with a jumper wire.  
Turn the ignition switch ON and check the coolant gauge.  
Disconnect the thermo sensor wire from the ground immediately if the gauge needle moves fully to H.

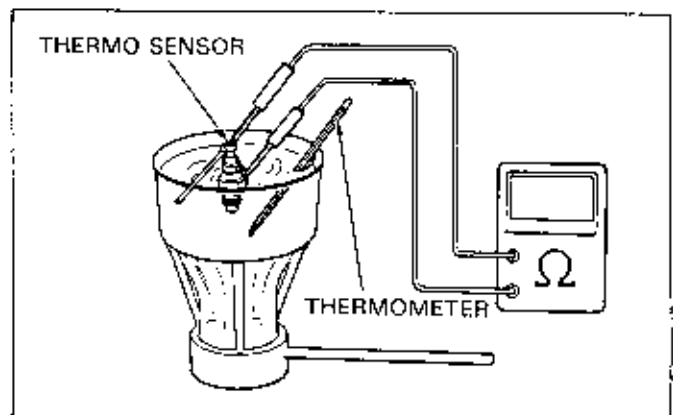
#### CAUTION

- Immediately disconnect the wire from the ground when the needle moves to H (hot) to prevent damage to the gauge.



### THERMO SENSOR INSPECTION

- Drain the coolant (see page 5-6).  
Disconnect the wire from the thermo sensor.  
Remove the thermo sensor.  
Suspend the thermo sensor in a pan of coolant (50-50 mixture) over a burner and measure the resistance through the sensor as the coolant heats up.



#### WARNING

- Keep flammable materials away from the burner.
- Wear insulated gloves and eye protection.

#### NOTE

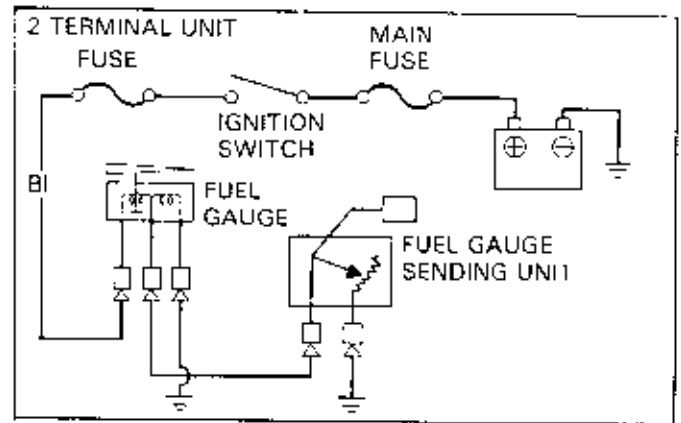
- Soak the thermo sensor in coolant up to its threads with at least 40 mm (1.57 in) from the bottom of the pan to the bottom of the sensor.
- Keep temperature constant for 3 minutes before testing. A sudden change of temperature will result in incorrect readings. Do not let the thermometer or thermo sensor touch the pan.
- Apply sealant to the threads on the thermo sensor prior to installation.

## FUEL GAUGE

Fuel unit resistance changes in accordance with the float in the fuel unit moving up and down. The fuel gauge needle is moved by the change of amperage that flows through the fuel gauge.

There are two types of fuel gauges: The "Return type" where the needle returns to "Empty" when the ignition switch is turned OFF, and "Stop type" where the needle stays in position when the ignition switch is turned OFF.

Check the fuel gauge if its needle does not move.



## INSPECTION

1. If the fuel unit connector has 2 terminals, short the gauge terminals with a jumper wire.

If the unit connector has 3 terminals, short the gauge side yellow/white terminal and green terminal with a jumper wire.

Turn the ignition switch ON and check the gauge needle.

Needle does not move

Needle moves

- Check the fuel unit.

2. Check for continuity between the unit and fuel gauge.

Continuity

No continuity

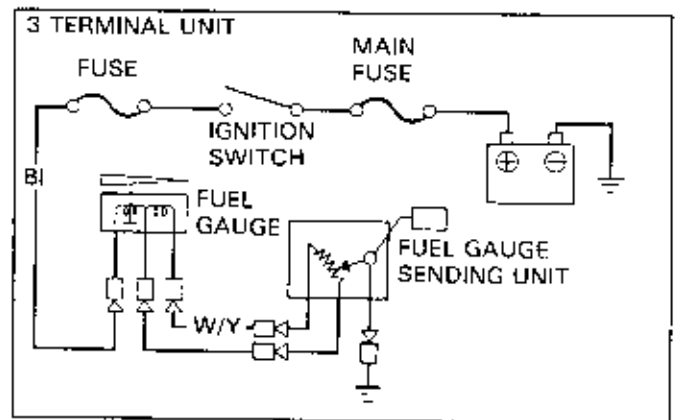
- Broken wire between the unit and gauge.

3. Check for voltage at the black or black/brown (positive power line) and ground wires of the fuel gauge.

No voltage

Voltage

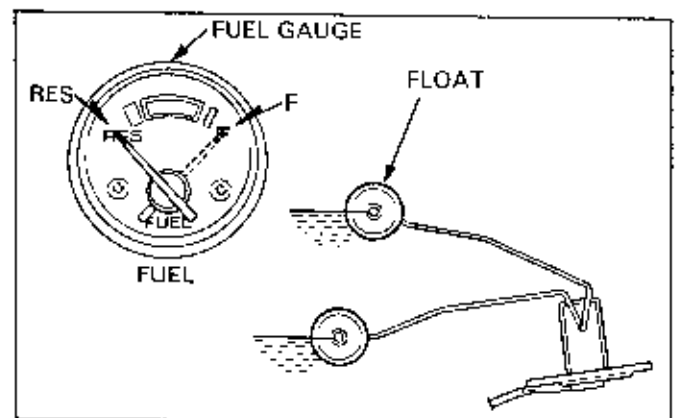
- Broken positive power line.
- Faulty fuel gauge.



## FUEL UNIT INSPECTION

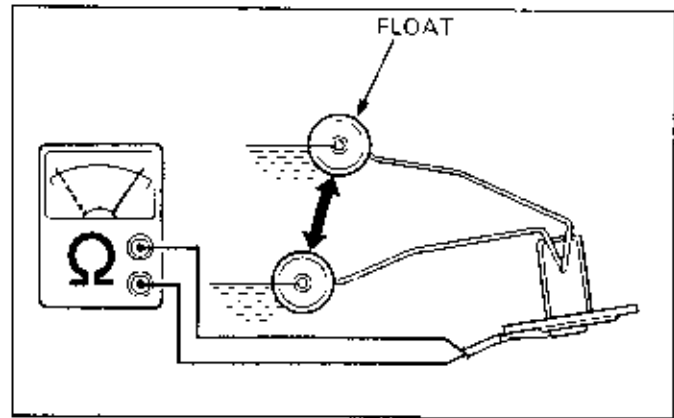
Refer to the Model Specific manual for the fuel unit removal/installation.

1. Connect the fuel unit connector.  
Turn the ignition switch ON.  
Move the float up and down to be sure that the fuel gauge needle moves to "F" and "RES".  
If the needle does not move, go to the step 2.



2. Measure the resistance between the connector terminals with the float in up and down positions.

If the resistance is normal, check the fuel gauge.  
If the resistance is not normal, replace the fuel unit.

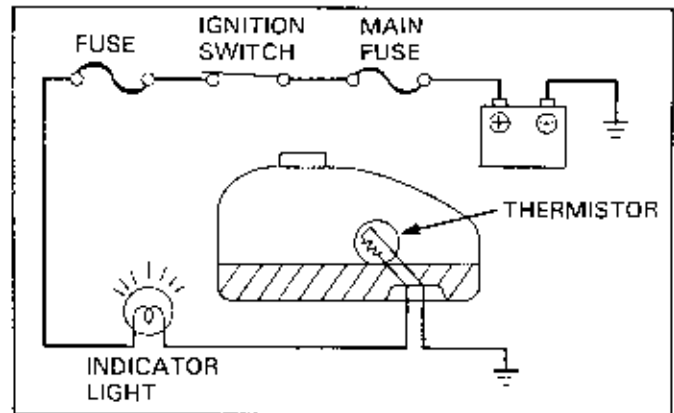


## LOW FUEL INDICATOR

A thermistor is built into the fuel level sensor in the fuel tank and the fuel warning light turns on due to the thermistor's self radiation of heat.

When the thermistor is in the gasoline, radiation of heat increases and the self heating action is reduced. As the resistance increases and the current does not flow at this time, the fuel warning light does not turn on.

When the thermistor is out of gasoline, i.e. fuel level is low, radiation of heat decreases and the self heating increases. As the resistance is low at this time, current flows and the low fuel indicator turns on.



## INSPECTION

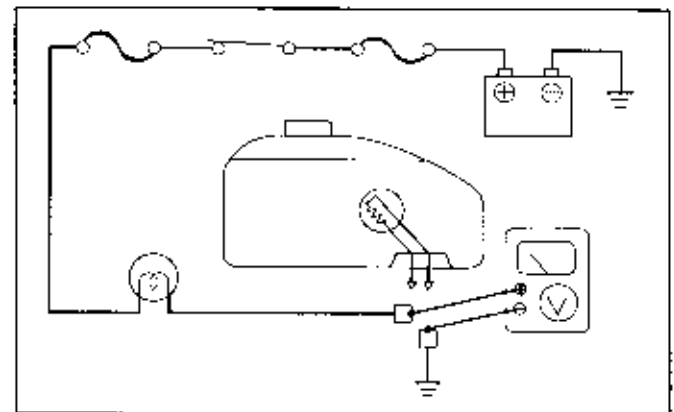
If the low fuel indicator does not go off, check as noted below. Check for battery voltage between the fuel level sensor connector terminals.

Battery voltage

- Faulty fuel level sensor.
- Poor connection of the connector.

No battery voltage

- Shorted wire between the indicator light and sensor.
- Faulty ground.





If the fuel warning light does not turn on, check as noted below.

1. Check for battery voltage between the fuel level sensor connector terminals.

No battery voltage

Battery voltage

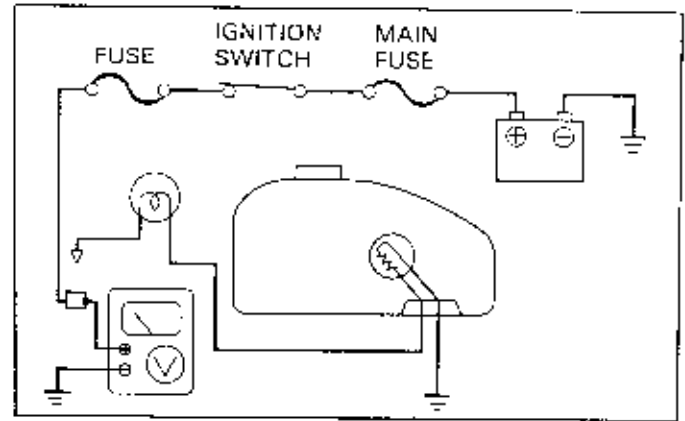
- Faulty fuel level sensor.
- Poor connection of the connector.

2. Check for battery voltage between the battery side of the wire from the indicator light and ground.

No battery voltage

Battery voltage

- Faulty sub fuse.
- Faulty ignition switch.
- Poor connection of the fuse holder connector.
- Blown bulb.
- Broken wire between the warning light and sensor.
- Faulty ground.



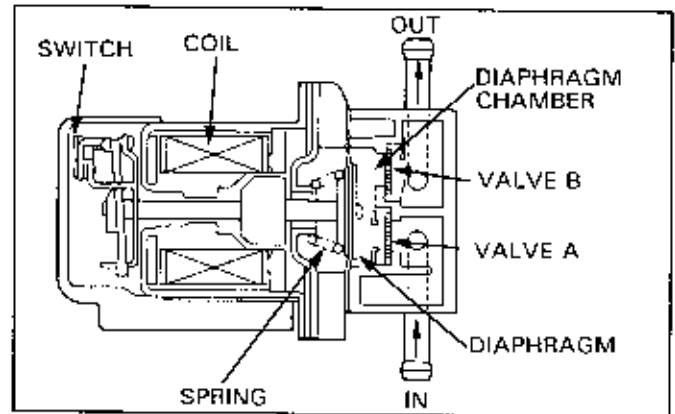
## FUEL PUMP

### DESCRIPTION

Certain models are equipped with a low pressure electromagnetic fuel pump to send the fuel to the carburetor.

When the engine is started, the switch is turned on by the function of the fuel cut-off relay (refer to the description of fuel cut-off relay), which generates the electromagnetic force at the coil and moves the plunger and diaphragm up. The valve A is then opened by the vacuum and the fuel flows to the diaphragm chamber. The plunger pushes the switch up and turns it off. As the electromagnetic force at the coil goes out this time, the plunger and diaphragm are returned by the spring and the fuel in the diaphragm chamber is sent to the carburetor through the valve B.

Certain types of this fuel pump have the fuel cut-off relay built in.



FUEL CUT-OFF RELAY

With the ignition switch ON, current flows to the transistor and thyrister but it does not flow to the fuel pump. To fill the carburetor float chamber with fuel when the ignition switch is turned ON, certain types of the fuel cut-off relay have a timer function that sends current to the fuel pump for a few seconds.

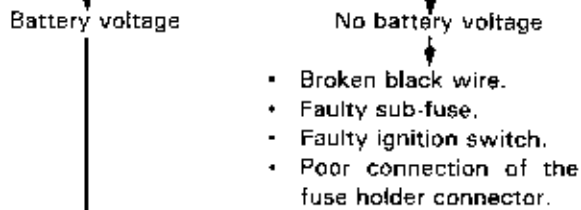
While the engine is running, pulses are transmitted from the spark unit to the ignition primary circuit and, when it is transmitted to the transistor, current flows from the transistor to the thyrister to turn it ON. The battery current flows to the fuel pump this way.

As the fuel cut-off relay is controlled by the ignition primary circuit, the relay does not operate unless the ignition primary circuit operates properly.

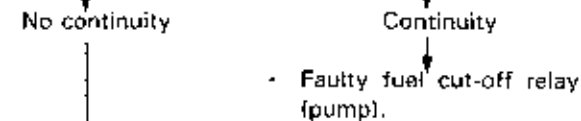
INSPECTION

Turn the ignition switch ON and perform the following inspections.

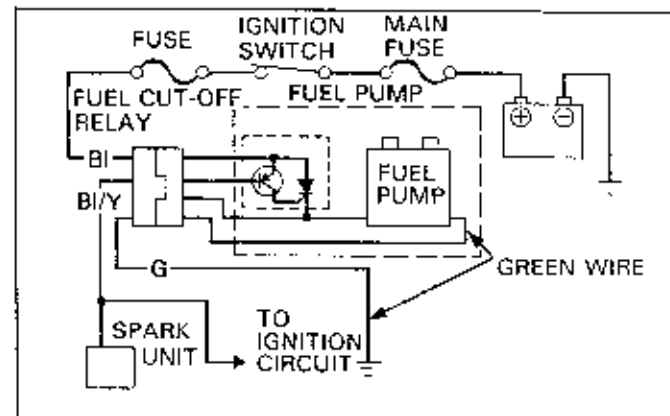
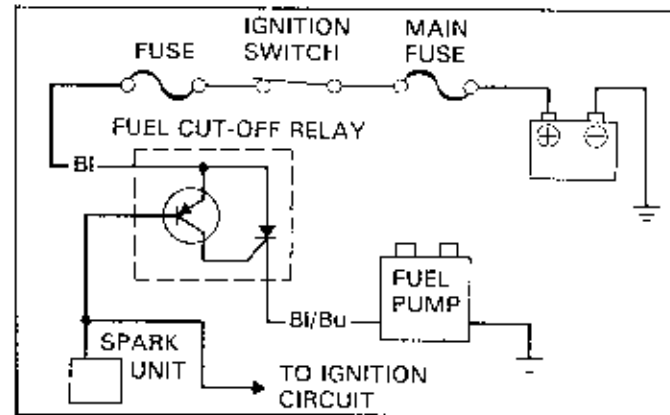
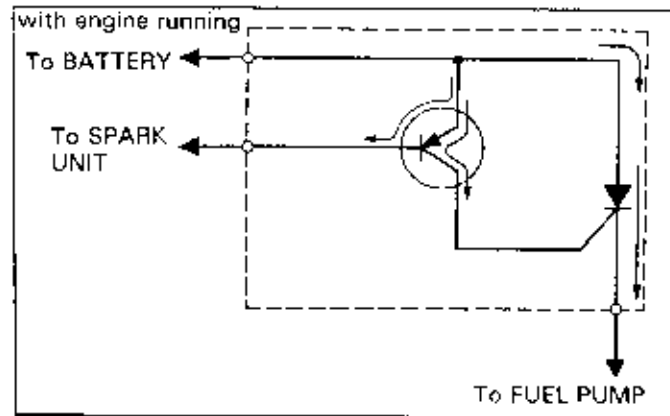
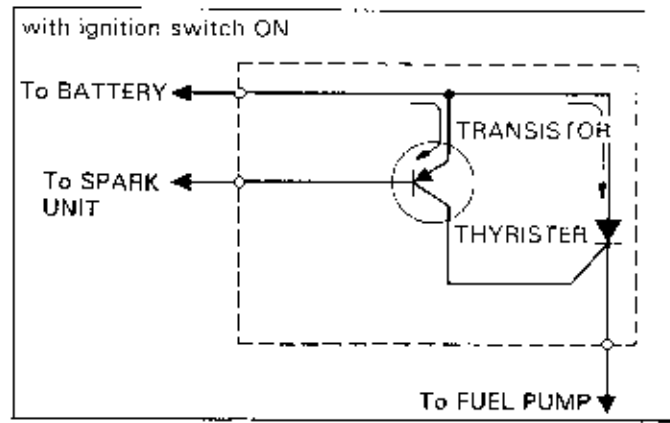
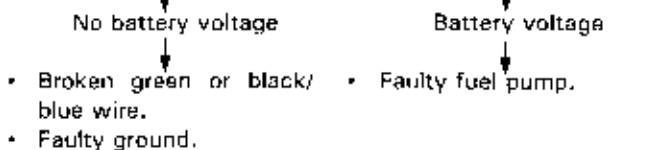
1. Check for battery voltage between the black wire (+) of the fuel cut-off relay connector (pump connector if the relay is built in the pump) and ground (-).



2. Check for continuity between the black/blue wire of the relay connector and ground (or black/yellow wire and green wire of the pump connector, if the relay is built into the pump).



3. Short the black and black/blue wires of the relay connector with a jumper wire and check for battery voltage between the black/blue (+) wire and green wire of the pump connector.



**DISCHARGE VOLUME INSPECTION**

Turn the ignition switch OFF.

Disconnect the fuel pump-to-carburetor tube from the carburetor and place the tube end in a beaker.

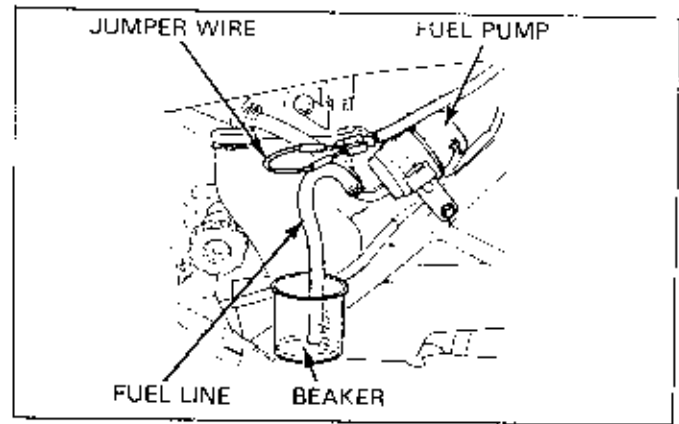
**NOTE**

- If it is hard to reconnect the tube to the carburetor, disconnect it from the fuel pump and connect the other tube to the pump (gasoline discharge port).

Refer to step 3 of INSPECTION and short the relay connectors. If the relay is built into the pump, short the black and black/yellow wires.

Turn the ignition switch ON for 5 seconds and drain the pump.

Multiply the drained fuel by 12. It should be as specified in the Model Specific manual.

**HEADLIGHT BULB**

Before replacing the bulb, be sure to check the switches for loose connection of the connectors.

**WARNING**

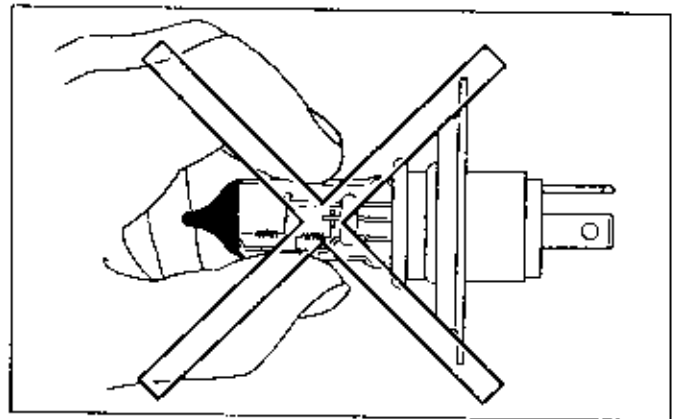
- Halogen headlight bulbs become very hot while the headlight is ON, and remain hot for a while after they are turned OFF. Be sure to turn the ignition switch OFF and let the bulb cool down before replacement.

If you touch the bulb with your bare hands, clean it with a cloth moistened with denatured alcohol to prevent early bulb failure.

**CAUTION**

- Avoid touching Halogen headlight bulbs. Finger prints can create hot spots that cause a bulb to break.

Be sure to install the dust cover after replacing the bulb.



## SWITCHES

### INSPECTION

Disconnect the connector that is nearest to the switch that you are to inspect and check for continuity between the switch side terminals of the connector.

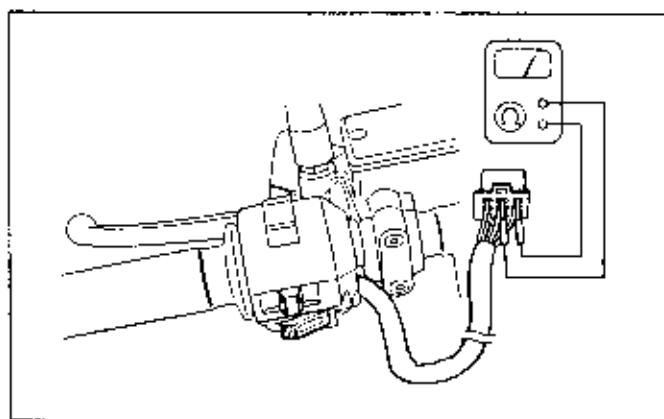
There should be continuity between the  $\bigcirc$  -  $\bigcirc$  positions on the continuity chart. (Refer to the Model Specific manual for the continuity chart.)

Example: Turn signal switch

Wire color	Orange	Gray	Blue
Switch position			
L	$\bigcirc$ — $\bigcirc$	$\bigcirc$ — $\bigcirc$	
N			
R		$\bigcirc$ — $\bigcirc$	$\bigcirc$ — $\bigcirc$

With the turn signal switch in N (neutral), there should be no continuity between the wires.

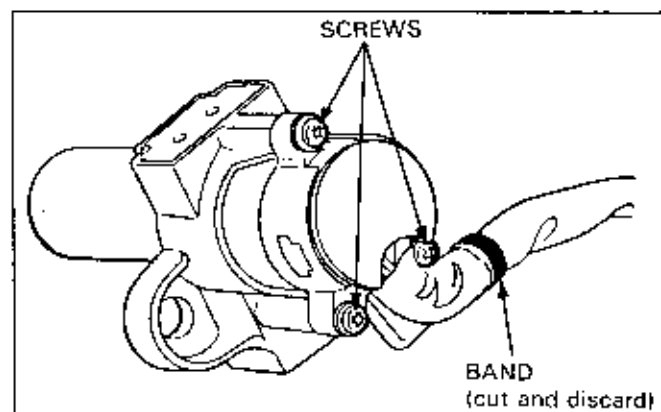
With the switch in L (left), there should be continuity between the orange and gray wires and with the switch in R (right), there should be continuity between the blue and gray wires.



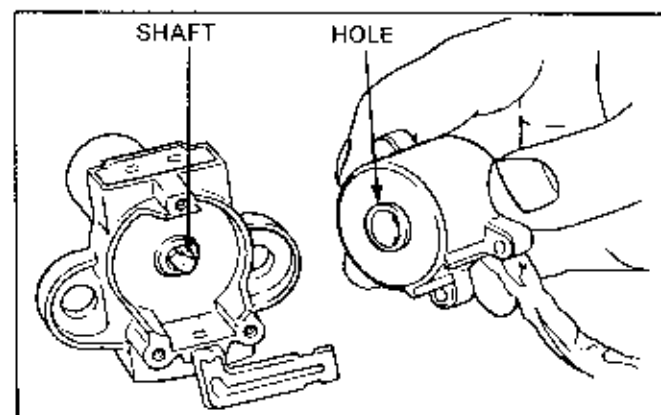
### CONTACT BASE REPLACEMENT

When the contact base is mounted with screws;  
Remove the ignition switch.

Remove the band and three screws, then remove the switch from the switch cylinder.

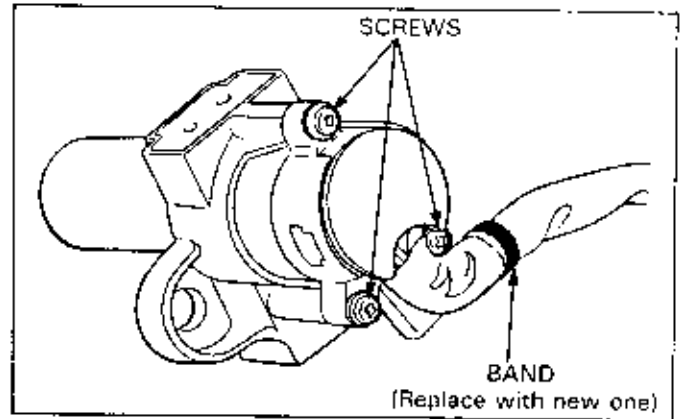


Reassemble the switch and cylinder with the cylinder shaft aligned with the hole in the switch.



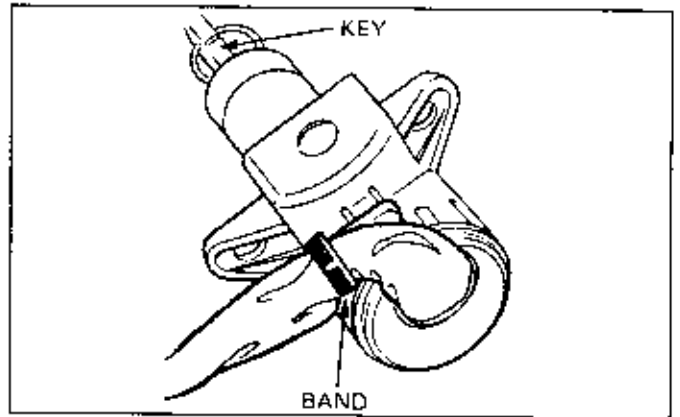
Tighten the contact base with the three screws.

Clamp the wires with a wire band and cut off the excess portion of the band. Check the ignition switch.



When the contact base is secured with tabs; Remove the ignition switch and band.

Insert the ignition switch key and turn it to the position between ON and OFF.

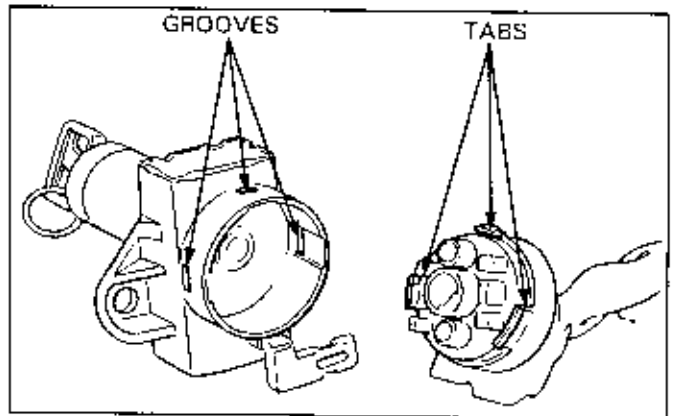


Push the contact base tabs in with a screwdriver so that they are out of the slots in the ignition switch body, and remove the contact base.

Insert the contact base on the ignition switch body with its tabs aligned with the slots in the ignition switch body.

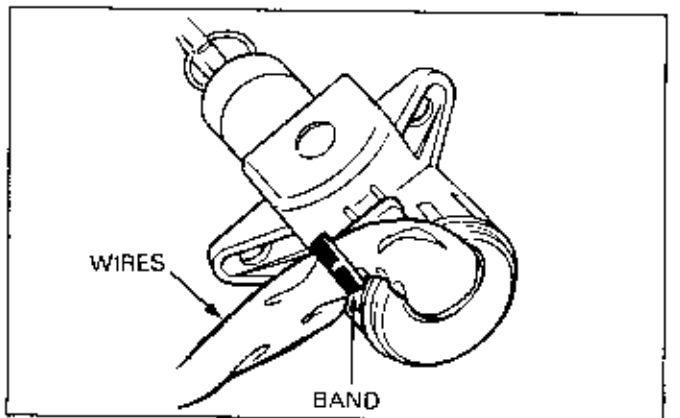
**NOTE**

- Be sure that the ignition switch key is in the position between ON and OFF before attempting to remove the contact base.



Clamp the wires with a wire band and cut off the excess portion of the band.

Check the ignition switch.



## LIGHTS/METERS/SWITCHES

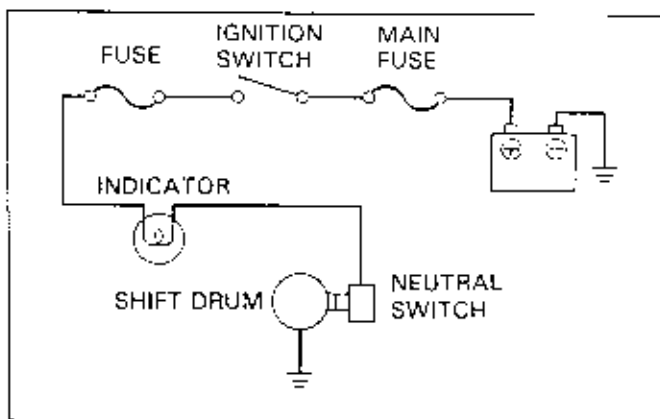
### NEUTRAL SWITCH

When the ignition switch is ON and the transmission is in neutral, the neutral switch turns the indicator on.

Some models are equipped with a change switch and/or over drive switch.

The change switch detects the gear position by the position of the shift drum and sends a signal to the gear position indicator/CDI unit.

The overdrive switch turns the overdrive indicator on when the transmission is in OD (overdrive) position.



### INSPECTION

#### Neutral Indicator does not go off;

Disconnect the light green/red wire from the neutral switch and turn the ignition switch ON.

Indicator does not light

- Faulty neutral switch

Indicator lights

- Broken light green/red wire

#### Neutral indicator does not come on;

Disconnect the light green/red wire from the neutral switch and turn the ignition switch ON.

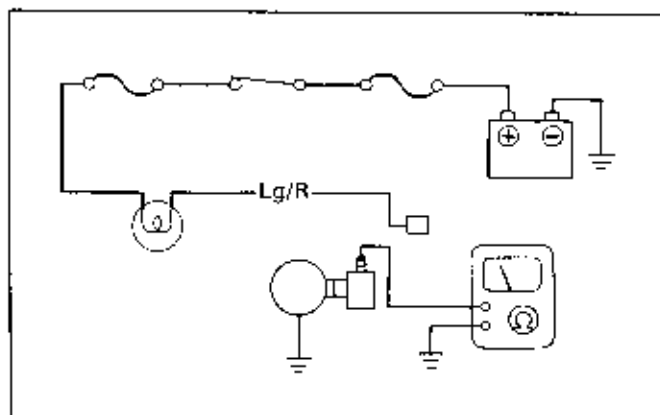
Check for battery voltage between the light green/red wire and ground.

Battery voltage

- Faulty neutral switch.

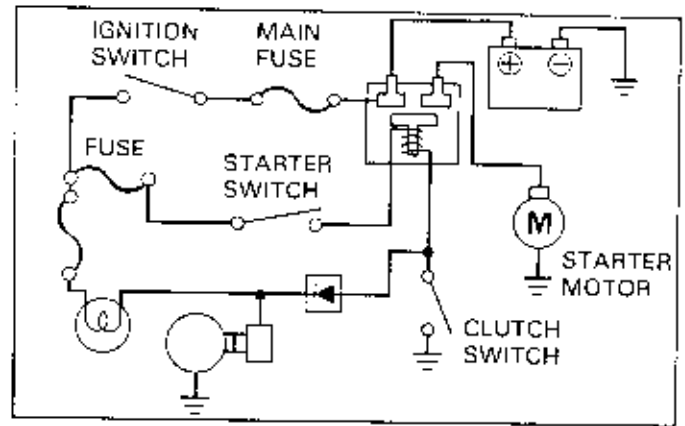
No battery voltage

- Broken light green/red wire between the indicator and neutral switch.
- Blown bulb.
- Blown sub fuse.
- Poor connection of the fuse connector.



## CLUTCH SWITCH

The clutch switch prevents the starter motor from rotating while the engine is running and the transmission is in positions other than neutral.



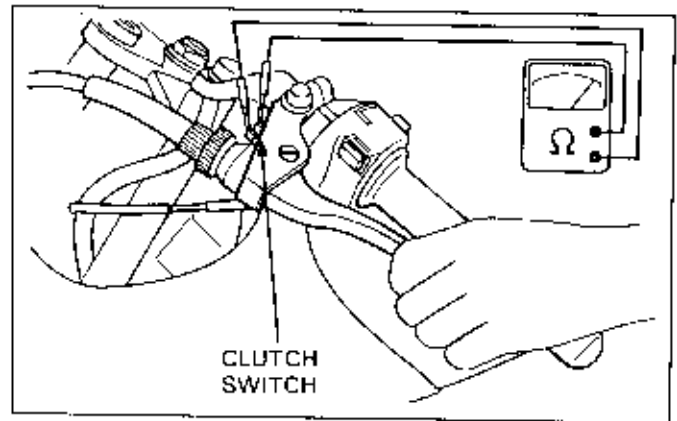
### INSPECTION

Check the starter system if the starter motor rotates with the transmission in positions other than neutral. The starter motor should be operated with the clutch lever squeezed and not be operated with the lever released. If the system is normal, check the following.

Disconnect the wire from the clutch switch and check for continuity between the clutch switch terminals while operating the clutch lever.

When the clutch lever is pulled in:  
There should be continuity between the terminals.

When the clutch lever is released:  
There should be no continuity between the terminals.



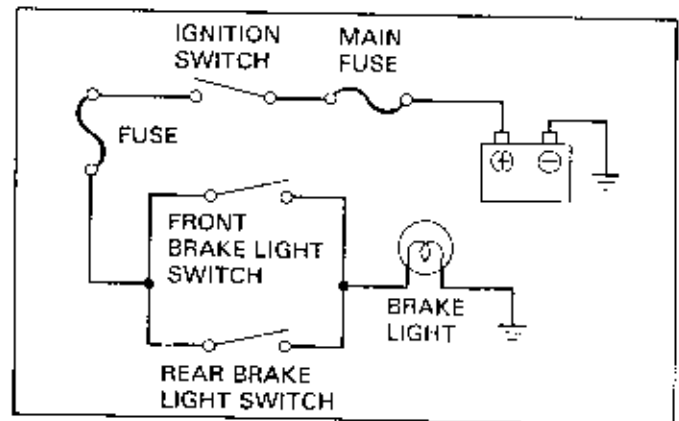
If the clutch switch is normal, check the following.

- Check for shorted wire between the starter relay switch and the clutch switch.
- Check the neutral switch.

## BRAKE LIGHT SWITCH

The brake light comes on when the brake lever (or pedal) is applied.

Starter motor equipped scooters: To prevent the accidental start up of the scooter, current does not flow to the starter motor unless the brake lever (or pedal) is applied.

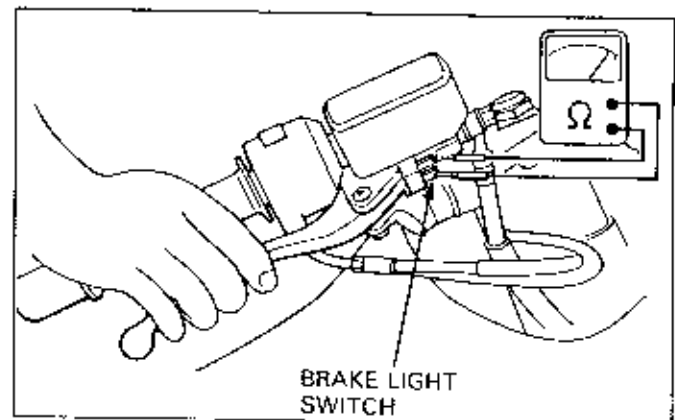


### INSPECTION

Brake light does not come on;

1. Check for the following.

- Burned bulb.
- Poor connection of the brake light switch connector.



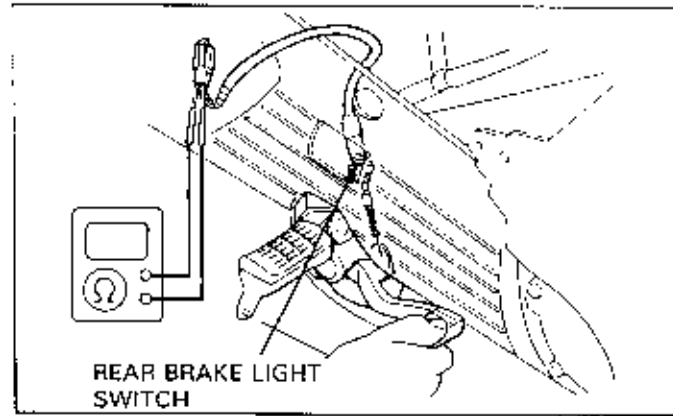
## LIGHTS/METERS/SWITCHES

2. If normal, disconnect the brake light switch connector and check for continuity between the terminals while operating the brake lever (or pedal).

When the brake lever (or pedal) is depressed:  
There should be continuity between the terminals.  
When the brake lever (or pedal) is released:  
There should be no continuity between the terminals.

3. If the brake light switch is normal, check for the following.

- Burned sub fuse.
- Ignition switch.
- Poor connection of the fuse connector.
- Broken wire between the sub fuse and brake light switch.
- Broken wire between the brake light switch and brake light.



## TURN SIGNAL LIGHTS

If the turn signal light does not blink, check the following.

- Is the battery normal?
- Is the bulb burned out?
- Is the bulb of the specified wattage?
- Is the fuse burned out?
- Are the ignition switch and turn signal switch normal?
- Is the connector properly connected?

If normal, check as noted below.

- When the turn signal relay has 2 terminals:

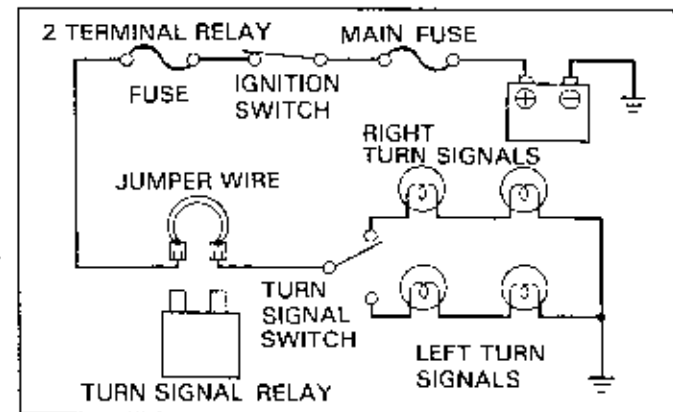
Disconnect the connector from the relay and short the connector with a jumper wire. Turn the ignition switch ON and check the turn signal light by turning the switch ON.

Light does not come on

- Broken wire harness.

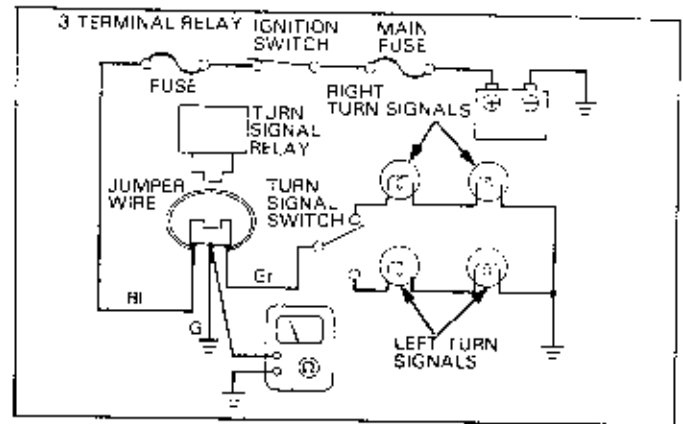
Light comes on

- Faulty turn signal relay.
- Poor connection of the connector.





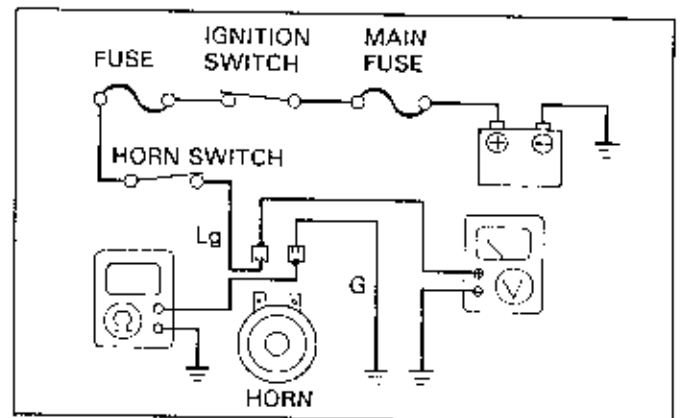
- When the turn signal relay has 3 terminals;
  1. Short the black and gray terminals of the turn signal relay connector with a jumper wire. Turn the ignition switch ON and check the turn signal light by turning the switch ON.
    - Light comes on
      - Broken wire harness.
    - Light does not come on
      - Broken wire harness.
  2. Check for continuity between the green terminal of the relay connector and ground.
    - Continuity
      - Faulty turn signal relay.
      - Poor connection of the connector.
    - No continuity
      - Broken ground wire.



## HORN

### Horn does not sound:

1. Check the ignition switch and horn switch. If normal, check the following.
2. Disconnect the wire from the horn. Turn the ignition switch ON, press the horn switch (or start the engine and press the horn switch if your motorcycle is battery-less type) and check for voltage between the light green wire and ground.
  - Voltage
    - Broken light green wire.
    - Faulty sub fuse.
  - No voltage
    - Broken light green wire.
    - Faulty sub fuse.
3. Check for continuity between the green wire and ground.
  - Continuity
    - Faulty horn.
  - No continuity
    - Broken green wire.
    - Faulty ground.

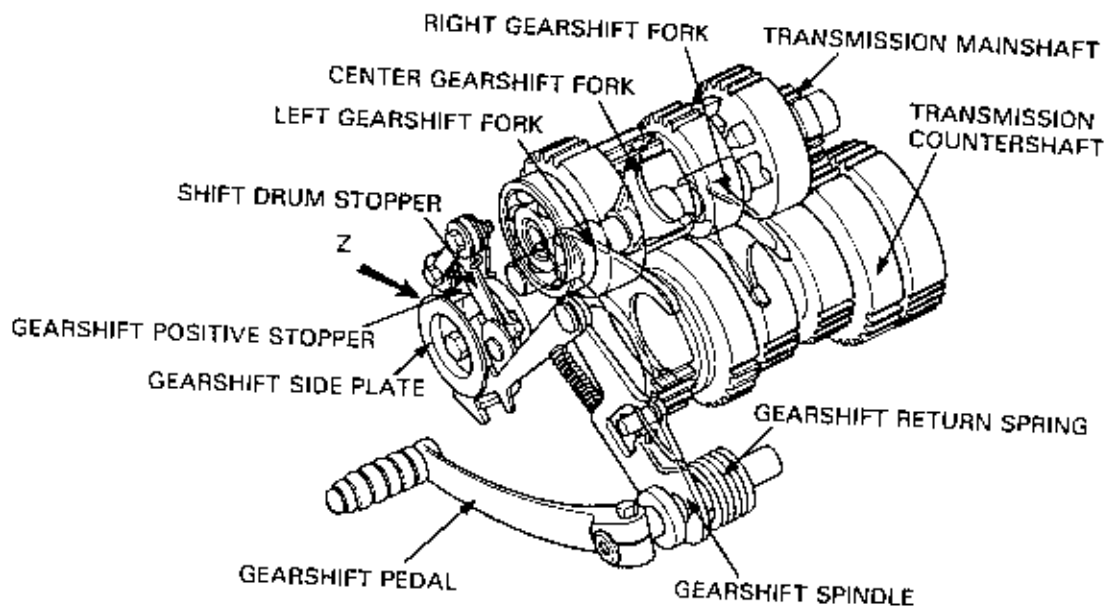
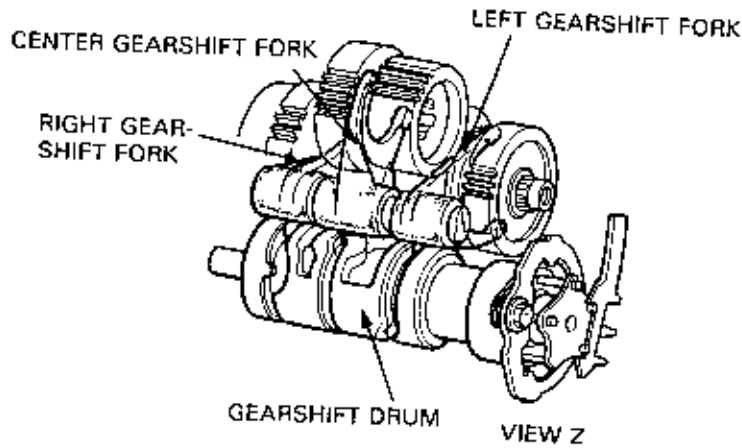


# SYSTEM DESCRIPTION

## GEARSHIFT MECHANISM

### CONVENTIONAL TYPE

The gearshift mechanism consists of three gearshift forks, a gearshift drum, a gearshift arm, a shift drum stopper and a gearshift positive stopper. When the gearshift pedal is depressed the gearshift spindle rotates, causing the gearshift arm to rotate the shift drum. When the shift drum rotates, the shift forks move sideways due to the cam action of the groove cut in the shift drum body.



## PLANETARY GEAR TYPE

**OPERATION:**

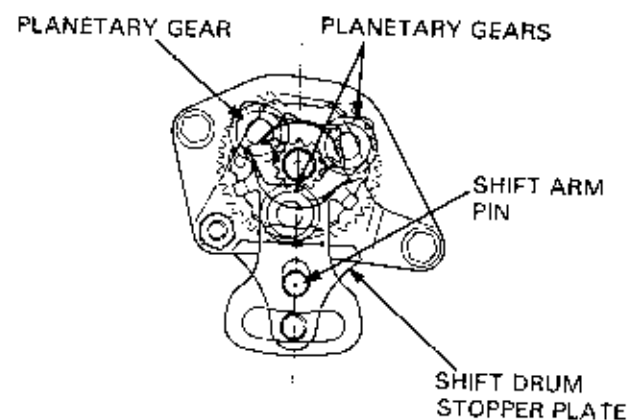
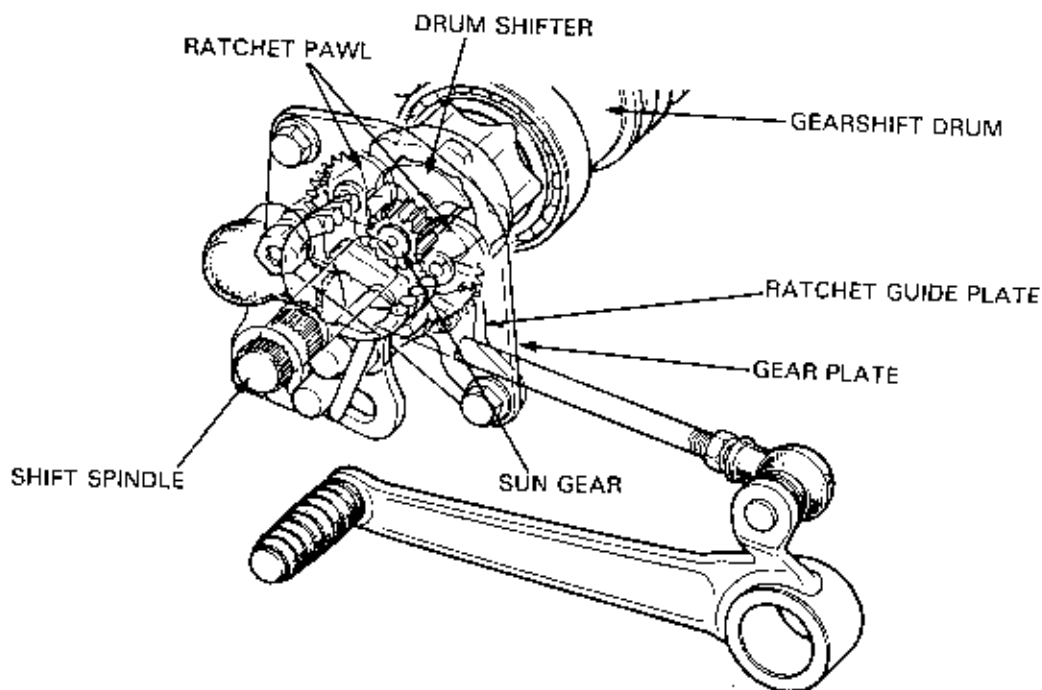
This system is comprised of a shift spindle assembly, guide plates, drum shifter, and two stopper assemblies.

The shift spindle assembly is comprised of the shift spindle, and the three planetary gears.

The shift spindle assembly, plus the guide plates, transmit the gear shifter movement to the sun gear on the drum shifter. As the drum shifter turns, one of its pawls will engage a detent in the shift drum, turning the drum.

Turning the drum causes the shift forks to move by the same cam action as with the conventional type shift mechanism.

The two stopper assemblies locate the shift drum at the proper gear and neutral positions.

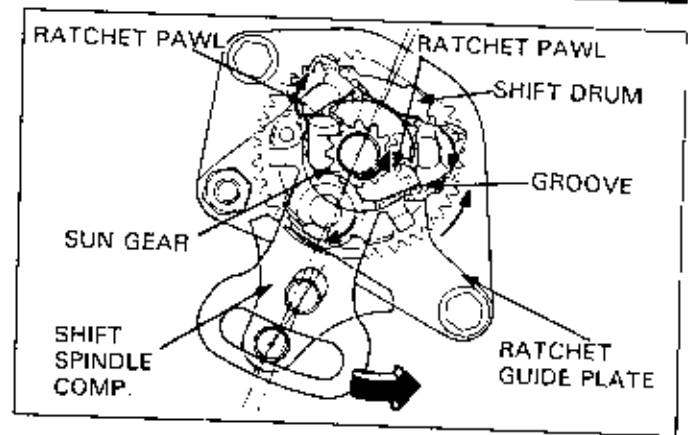


## TRANSMISSION

### Shift Start

Pushing down on the shift pedal turns the spindle counterclockwise. Because the gear plate is fixed, the planetary gears turn clockwise, turning the drum shifter counterclockwise.

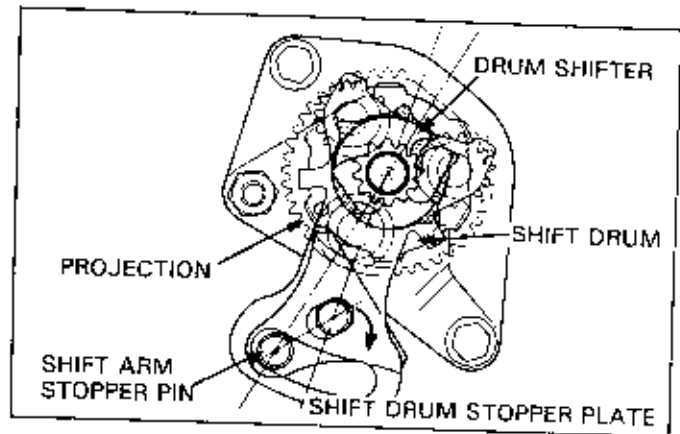
As the drum shifter turns counterclockwise, the right pawl engages the detent in the shift drum, while the left pawl is pushed out of the way into the shifter by the guide plate. With the pawl engaged, the drum shifter turns the shift drum, moving the shift forks into place.



### Shift Finish

To prevent the drum from rotating too far, a shift drum stopper plate is used. The shift drum stopper plate rotates on an eccentric pivot moved by the spindle assembly.

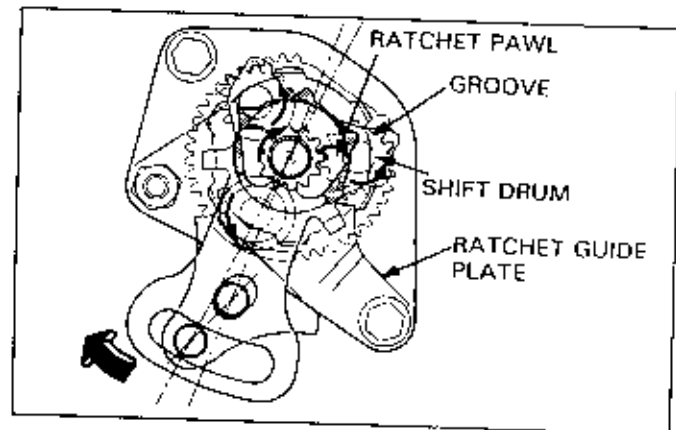
As the spindle reaches the end of its travel, one leg of the stopper plate is moved up to contact a positive stop on the shift drum. At the same time the spindle assembly is prevented from moving too far by the shift arm stopper pin.



### Shift Return

When the shift pedal is released, the shift return spring brings the spindle assembly back to the centered position.

At this time, the drum shifter rotates and the ratchet feature allows the right pawl to disengage from the shift drum. As the drum shifter rotates, the drum stopper arm prevents the shift drum from moving.



**CONSTANT MESH TRANSMISSION**

The constant mesh transmission consists of the following components:

- The mainshaft, with its fixed and sliding gears.
- The countershaft, with its fixed and sliding gears.
- The shift forks.
- The shift drum.

Power is transmitted through the clutch to the mainshaft.

From the mainshaft, power may be transmitted through several gear sets to the countershaft.

M1 through M5 are the gears on the mainshaft and C1 through C5 are the countershaft gears.

The gear sets are comprised of opposing gears, one gear on each shaft.

The illustration on the right shows the gear sets, pairing the mainshaft number with the countershaft number (M1/C1, M2/C2, etc.).

Selection of the proper gear set is done by moving a sliding gear into contact with the gear set desired.

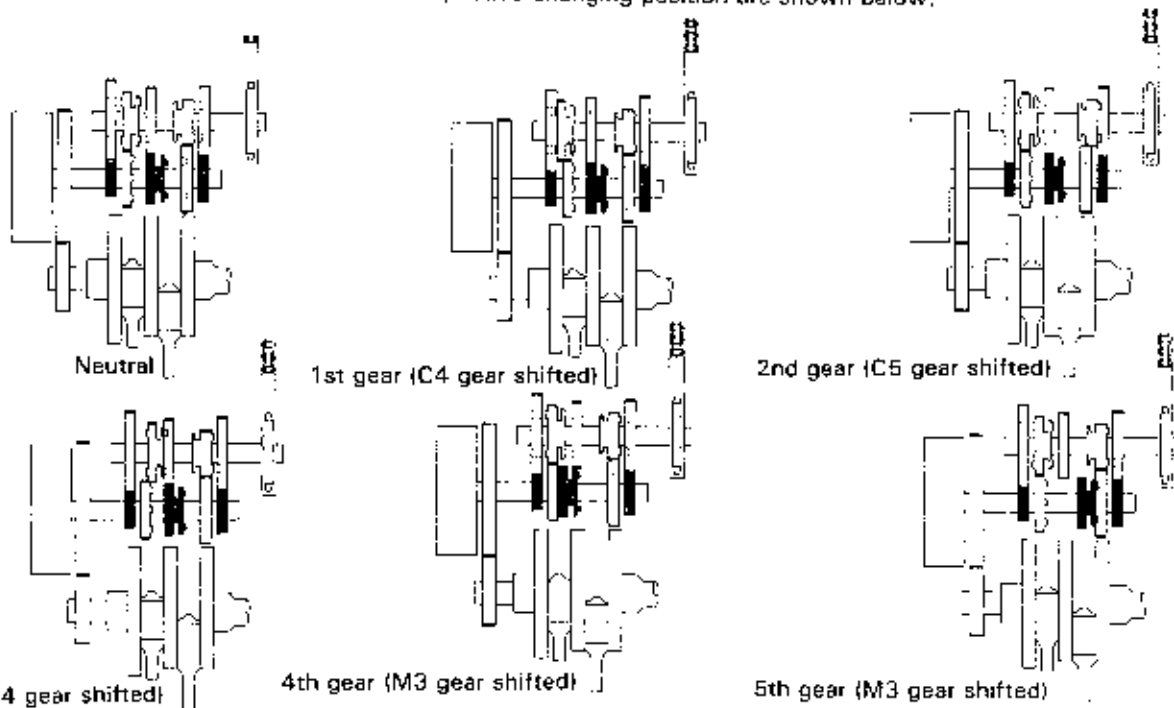
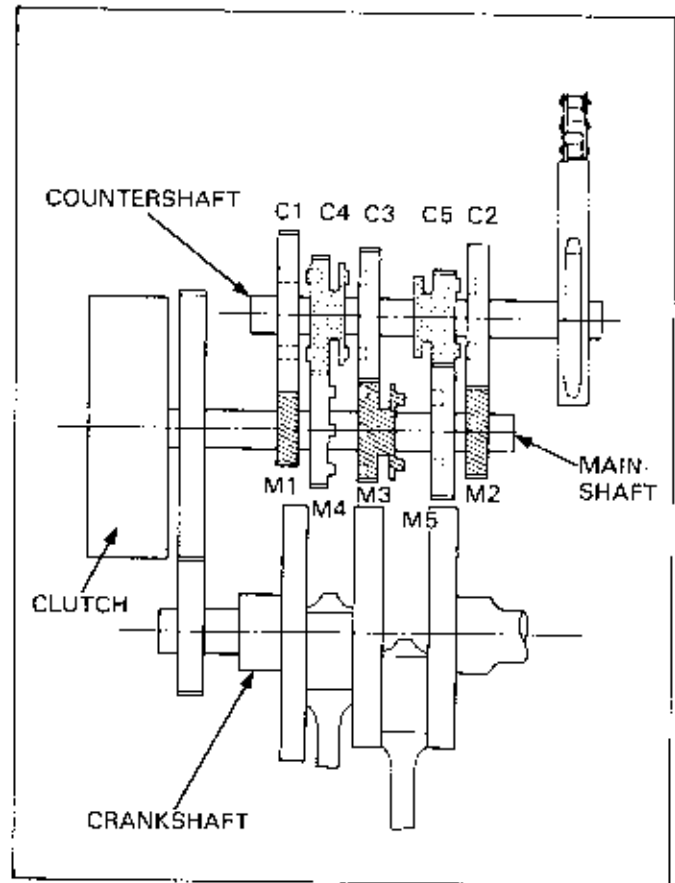
Connection of the sliding gear and the gear set is done using dogs and dog holes on the sides of the gears.

In the illustration, gears M3, C4, and C5 are the sliding gears.

The sliding gears are moved by shift forks which ride on the shift drum. Cam grooves cut in the shift drum move the shift forks as the drum rotates.

Rotation of the shift drum is done by working the gearshift pedal.

The relative positions of the transmission at the respective changing position are shown below.

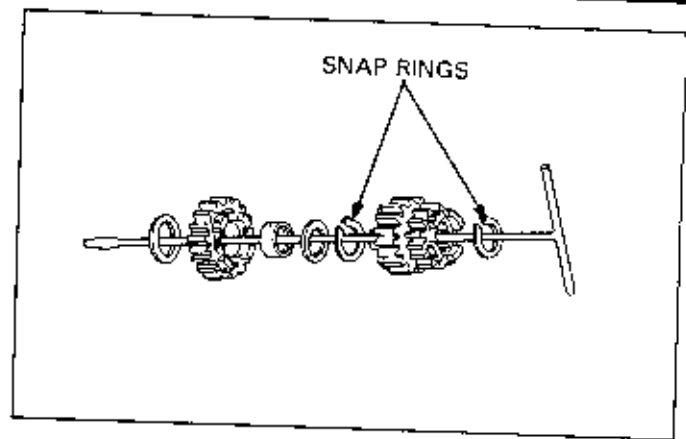


## TRANSMISSION

### TRANSMISSION DISASSEMBLY

#### NOTE

- Keep track of the disassembled parts (gears, bushings, washers, and snap rings) by stacking them on a tool or slipping them onto a piece of wire.
- Do not expand the snap ring more than necessary for removal. To remove a snap ring, expand the snap ring and pull it off using the gear behind it.

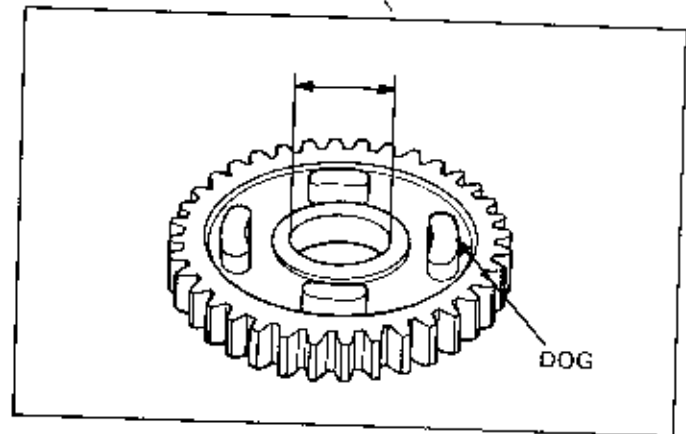


### TRANSMISSION INSPECTION

#### Check the following:

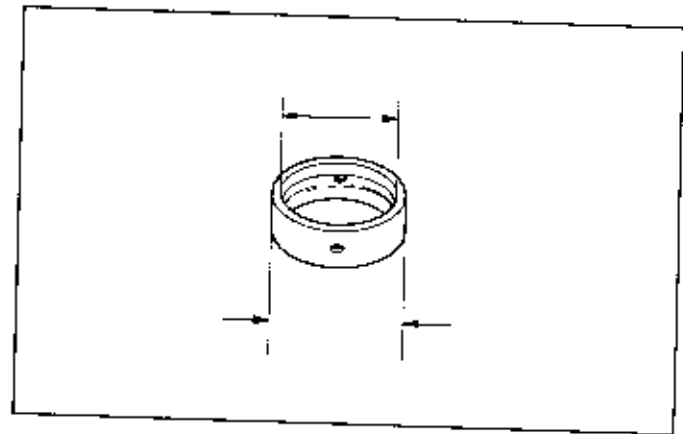
##### Gears:

- Teeth—for damage or excessive wear.
- Dogs and dog holes—for damage or excessive wear.
- Measure the gear I.D. (except splined holes and holes with needle bearings).



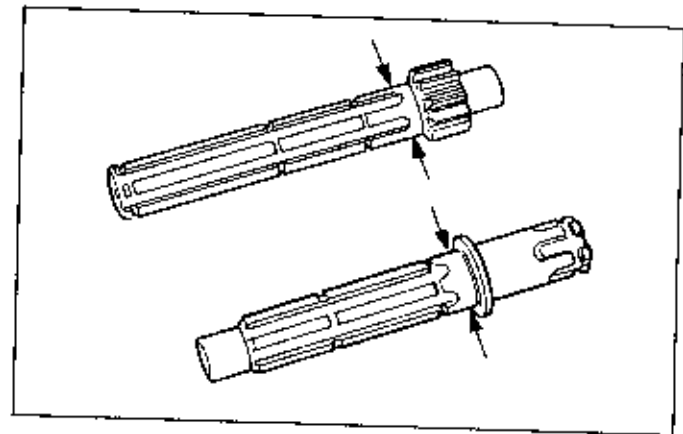
##### Bushings:

- For wear or damage.
- Measure the I.D. and O.D.
- Calculate the gear-to-bushing and bushing-to-shaft clearances.



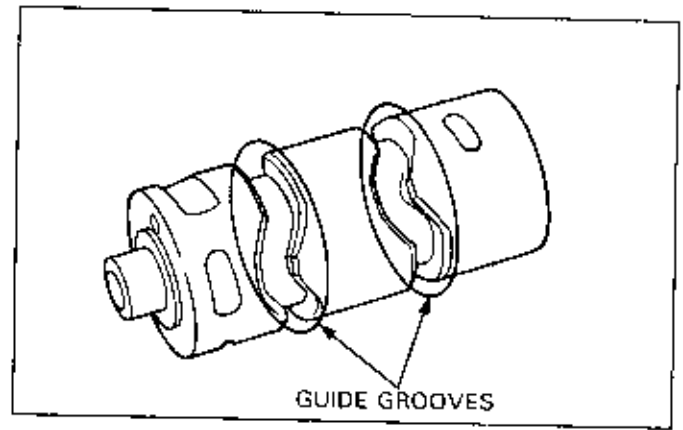
##### Mainshaft, Countershaft

- Spline groove and sliding surface for abnormal wear or damage.
- Measure O.D. at the gear sliding areas.
- Calculate the gear-to-shaft and shaft-to-bushing clearances.



**Shift Drum**

- The guide groove for abnormal wear or damage.
- The bearing for excessive play or damage (if required).

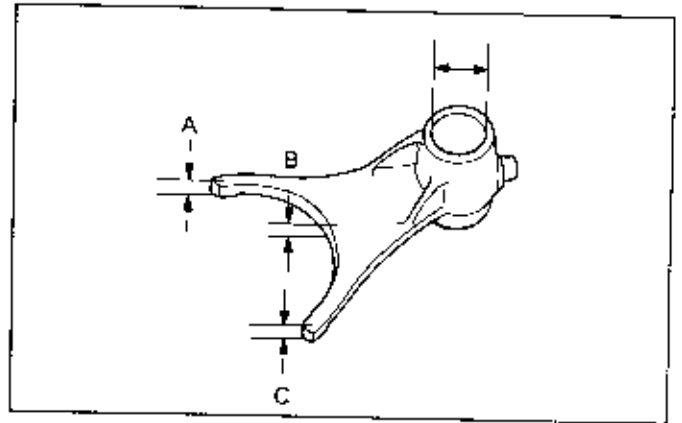


**Shift Fork**

- For deformation or abnormal wear.
- Measure the fork claw thickness.
- Measure the I.D. of the shift fork.

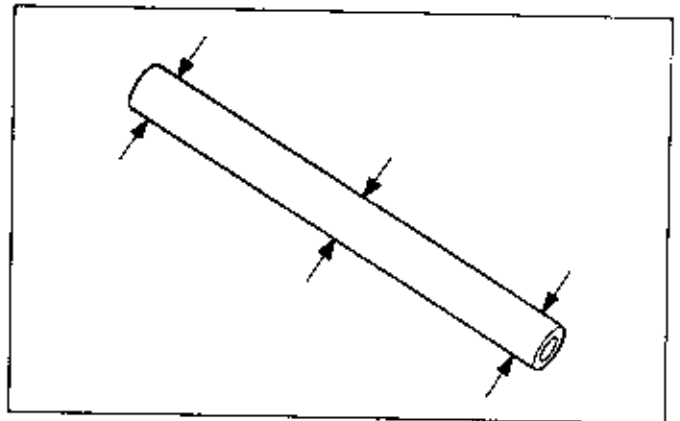
**NOTE**

- Some fork claws are measured at A and C (claw ends). Others are measured at B (the center).



**Shift Fork Shaft**

- For damage and straightness.
- Measure the O.D. at the shift fork areas.



**TRANSMISSION ASSEMBLY**

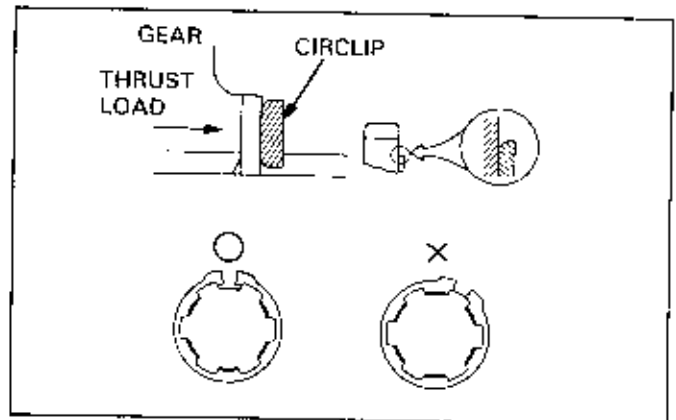
Clean all parts in solvent.

Apply molybdenum disulfide grease to all sliding surfaces of the mainshaft, countershaft and bushings to ensure initial lubrication.

Reassemble all parts into their original positions.

**NOTE**

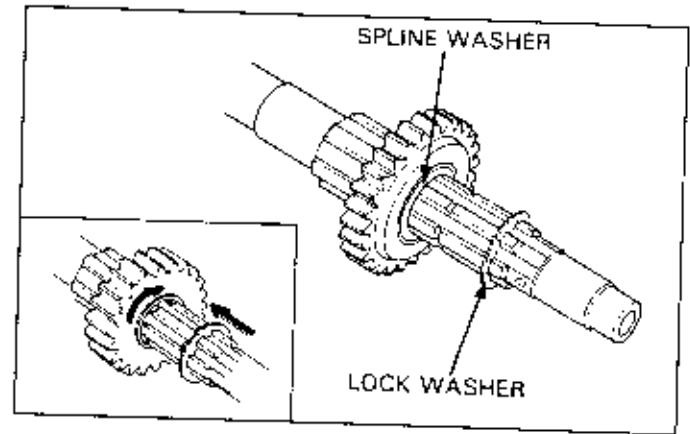
- Always install the thrust washers with the chamfered (rolled) edge facing away from the thrust load.
- After installing a snap ring, slightly open the ring and rotate it in its groove to be sure it is fully seated.
- Do not use worn snap rings which could easily spin in the groove. It would be too loose to properly seat in the groove. Align the gap in the snap ring with the groove of the spline.



## TRANSMISSION

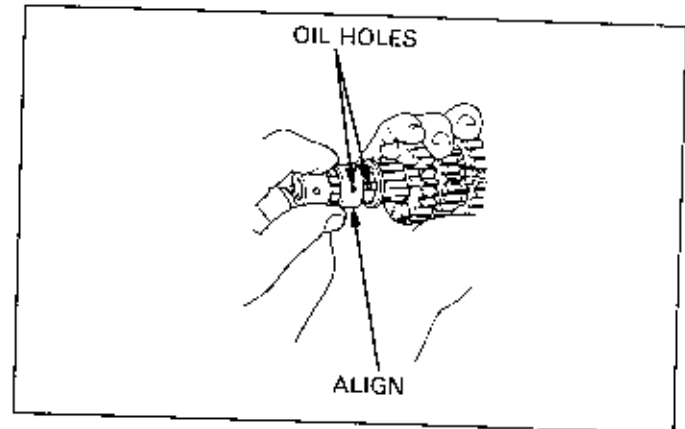
### NOTE

- Install the lock washer by aligning its tabs with the grooves of the spline washer.
- Do not forget to install the thrust washer at the end of the mainshaft and countershaft.



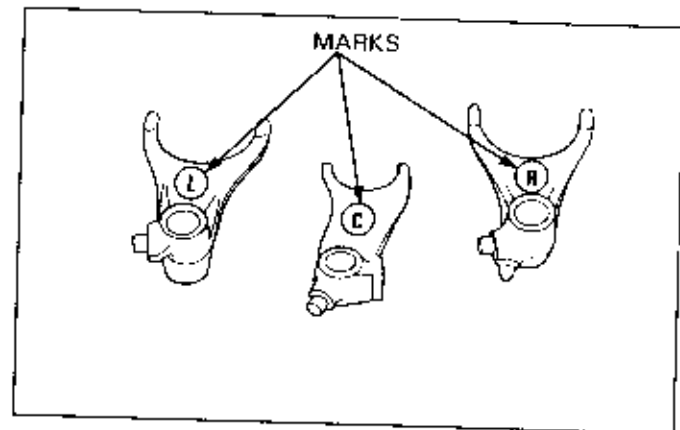
### NOTE

- Align oil hole in the bushing or gear with shaft oil hole.



Install the shift forks in the correct positions according to the location mark on each fork.

- "L" mark: Left side of the crankcase
- "C" mark: Center of the crankcase
- "R" mark: Right side of the crankcase



Turn the mainshaft or countershaft to ensure that the gears turn smoothly after reassembly.

Lubricate gears with clean (recommended) engine oil while turning the shaft.

