

COOLING AND LUBRICATION SYSTEM

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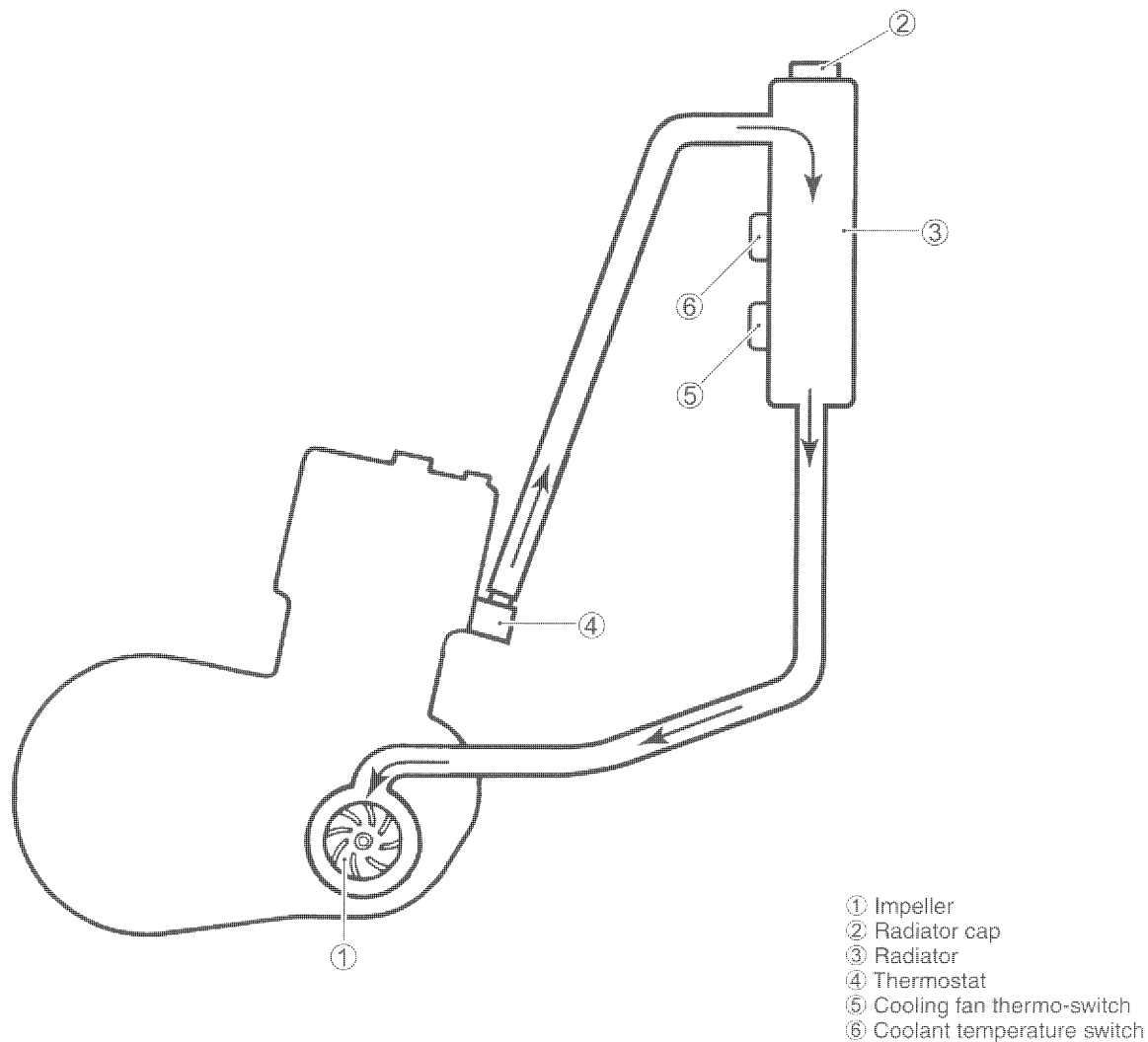
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COOLING SYSTEM DESCRIPTION

The engine is cooled by the forced circulation of engine coolant, using a high-capacity, centrifugal water pump, through water jackets formed in the cylinder and cylinder head, and through the radiator. The tube-and-fin type radiator is made of aluminum, which is characterized by lightness in weight and good heat dissipation.

A wax-pellet type thermostat is used to regulate the flow of engine coolant through the radiator. As the coolant temperature rises to about 75°C (167°F) the thermostat valve unseats and a normal coolant flow is established. At about 90°C (194°F) the thermostat becomes completely open and, as a result, heat is released to the atmosphere through the radiator core.

Referring to the following illustration, the thermostat is in the closed condition, so that engine coolant recirculates through the route comprising the water pump, engine, by-pass hole of the thermostat and radiator in the regulated condition.



ENGINE COOLANT

At the time of manufacture, the cooling system is filled with a 50:50 mixture of distilled water and ethylene glycol anti-freeze. This 50:50 mixture will provide the optimum corrosion protection and excellent heat protection, and will protect the cooling system from freezing at temperatures above -31°C (-24°F).

If the vehicle is to be exposed to temperatures below -31°C (-24°F), this mixing ratio should be increased up to 55% or 60% according to the figure.

CAUTION

- * Use a high quality ethylene glycol base anti-freeze, mixed with distilled water. Do not mix an alcohol base anti-freeze and different brands of anti-freeze.
- * Do not put in more than 60% anti-freeze or less than 50%. (Refer to Right figure.)
- * Do not use a radiator anti-leak additive.

50% Engine coolant including reserve tank capacity

Anti-freeze	600 ml (1.3/1.1 US/Imp. pt)
Water	600 ml (1.3/1.1 US/Imp. pt)

Anti-freeze density	Freezing point
50%	-31°C (-24°F)
55%	-40°C (-40°F)
60%	-55°C (-67°F)

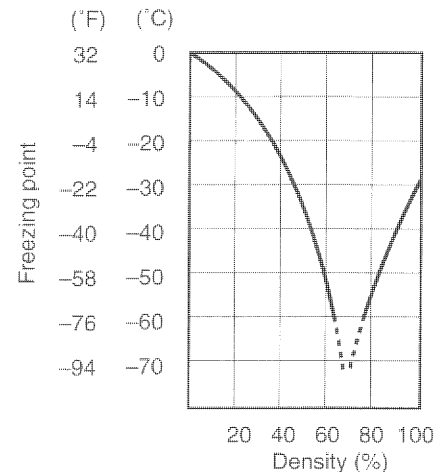


Fig.1 Engine coolant density-freezing point curve.

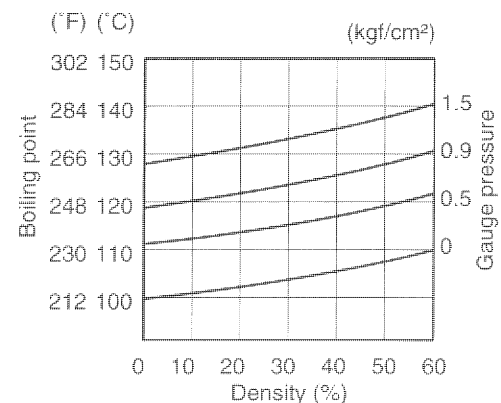


Fig.2 Engine coolant density-boiling point curve.

⚠ WARNING

- * You can be injured by scalding fluid or steam if you open the radiator cap when the engine is hot. After the engine cools, wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow pressure to escape and then turn the cap all the way off.
- * The engine must be cool before servicing the cooling system.
- * Coolant is harmful;
 - If it comes in contact with skin or eyes, flush with water.
 - If swallowed accidentally, induce vomiting and call physician immediately.
 - Keep it away from children.

RADIATOR AND HOSES

COOLING CIRCUIT INSPECTION

Before removing the radiator and draining the engine coolant, check the following.

Check the cooling system for leaks with a radiator tester ①.

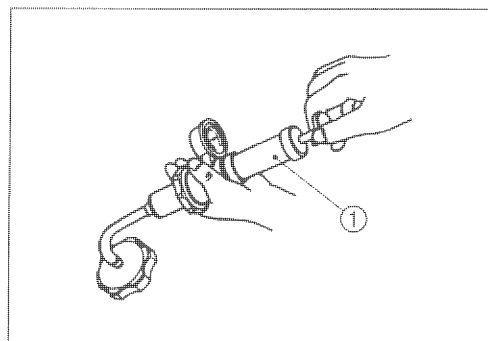
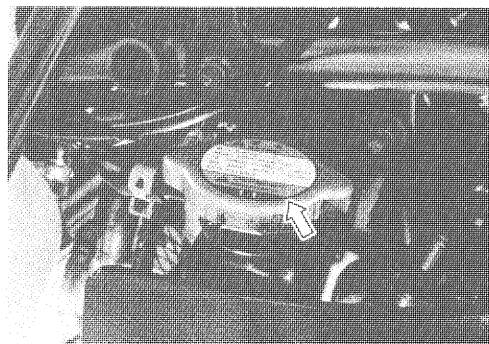
Remove the radiator cap and connect the radiator tester to the filler. Pressurize the cooling system with 120 kPa (1.2 kgf/cm², 17 psi) of pressure, and then check if it holds the pressure for 10 seconds. If the cooling system does not hold the pressure for at least 10 seconds, check the entire cooling system for leaks. If a leak is found, replace the damaged part.

⚠ WARNING

- * Do not open the radiator cap when the engine is hot, as you may be injured by escaping hot liquid or vapor.
- * When removing the radiator cap tester, put a rag on the filler to prevent the engine coolant from spraying out.

CAUTION

Do not exceed the radiator cap release pressure, or the radiator cap and subsequently the radiator, can be damaged.

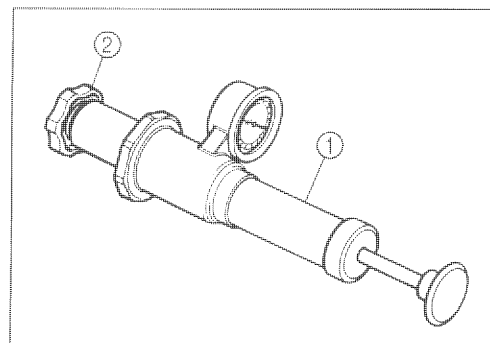


RADIATOR CAP INSPECTION

Check the radiator cap ② using a radiator tester ①.

Attach the radiator cap to the radiator tester as shown. Slowly apply pressure to the radiator cap; do not exceed 108 – 137 kPa (1.1 – 1.4 kgf/cm², 15.6 – 19.9 psi). If the radiator cap does not hold the pressure for at least 10 seconds, replace it with a new one.

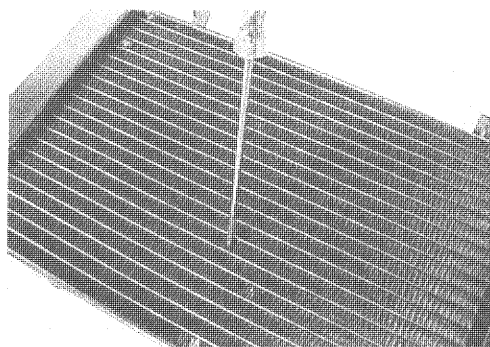
DATA Radiator cap release pressure: 108 – 137 kPa
(1.1 – 1.4 kgf/cm², 15.6 – 19.9 psi)



RADIATOR INSPECTION

Check the radiator for dirt and other foreign materials. If any are found, clean the radiator using compressed air. Also, repair any bent or dented fins using a small screwdriver.

Check all the water hoses for cracks, flat spots, or loose connections. Replace any damaged hoses and properly tighten any loose connections.

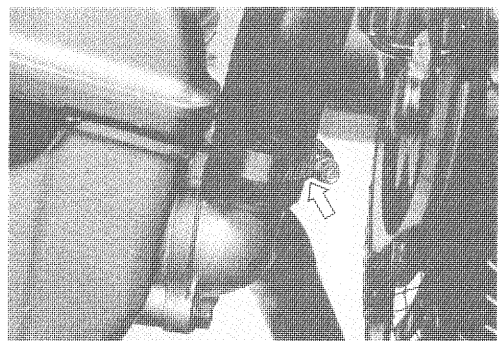
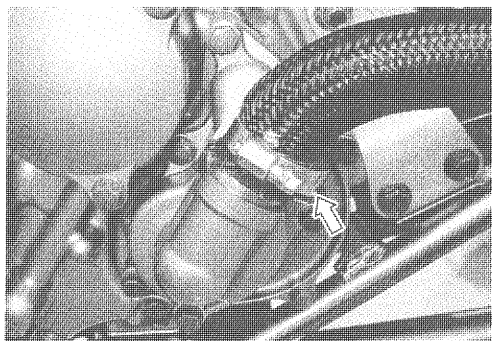
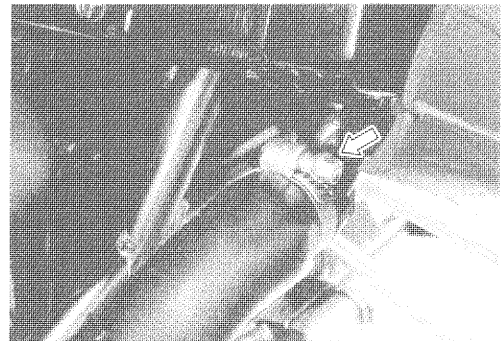
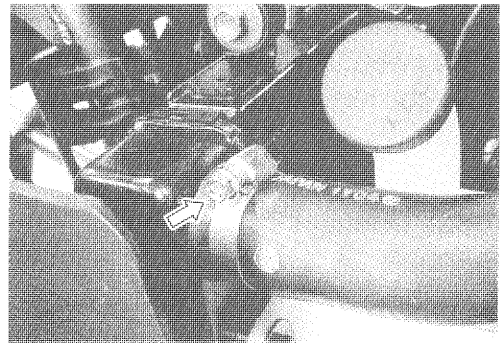


RADIATOR HOSE INSPECTION

- Remove the front fender. (☞ 6-4)

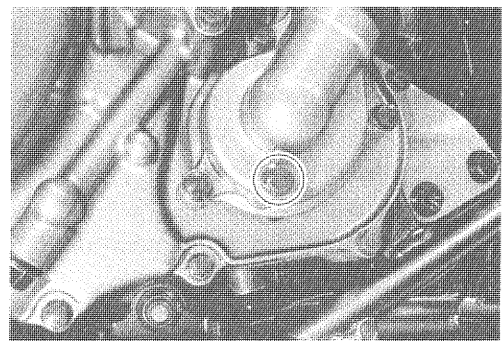
Any radiator hose found in a cracked condition or flattened must be replaced.

Any leakage from the connecting section should be corrected by proper tightening.

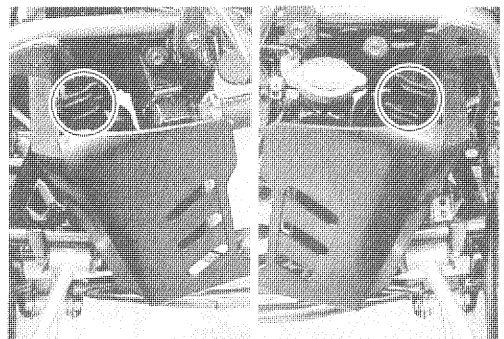


RADIATOR REMOVAL

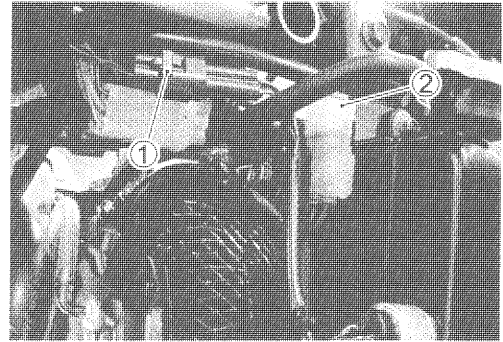
- Remove the front fender. (☞ 6-4)
- Drain engine coolant by removing the drain plug.



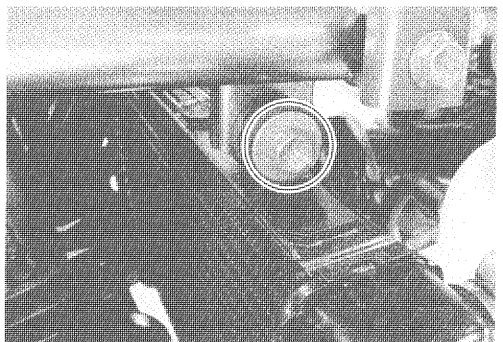
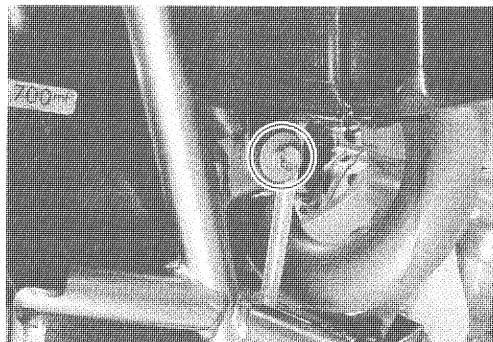
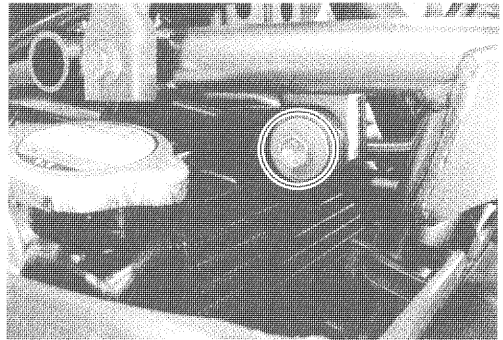
- Remove the radiator cover that is put in frame bar.



- Disconnect the engine coolant temperature switch lead wire coupler ① and cooling fan motor lead wire coupler ②.
- Disconnect the upper and lower radiator hoses.



- Remove the three mounting bolts and radiator assembly.

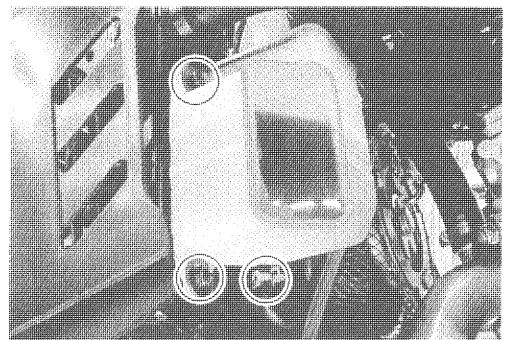


RADIATOR REMOUNTING

- Install the radiator and the radiator hoses in the reverse order of removal.
- Connect the cooling fan motor lead wire coupler and engine coolant temperature switch lead wire coupler.
- Install the radiator cover.
- Install the drain plug.
- Pour engine coolant. (2-14)
- Bleed air from the cooling circuit. (2-14)
- Install the front fender.

RADIATOR RESERVOIR TANK REMOVAL/REMOUNTING

- Remove the reservoir tank mounting bolts and disconnect the siphon hose from the reservoir tank and drain engine coolant.
- Install the reservoir tank in the reverse order of removal.
- Fill the reservoir tank to the upper level line.

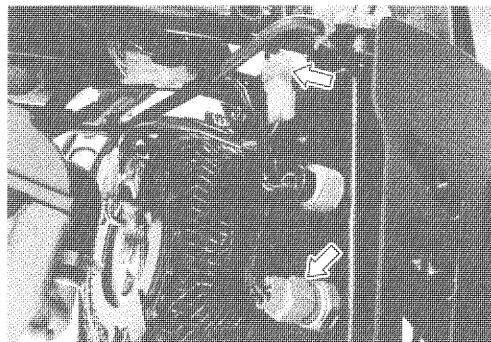


COOLING FAN

INSPECTION

- Remove the front fender. (☞ 6-4)
- Disconnect the cooling fan lead wire coupler.

Test the cooling fan motor for load current with an ammeter connected as shown in the illustration.

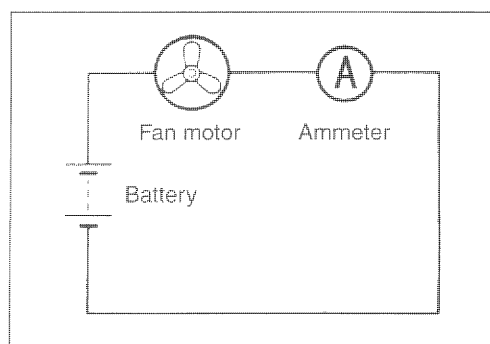


The voltmeter is for making sure that the battery applies 12 volts to the motor. With the motor with electric motor fan running at full speed, the ammeter should be indicating not more than 5 amperes.

If the fan motor does not turn, replace the motor assembly with a new one.

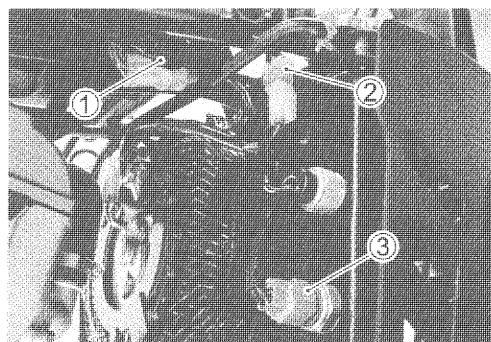
NOTE:

When making above test, it is not necessary to remove the cooling fan.

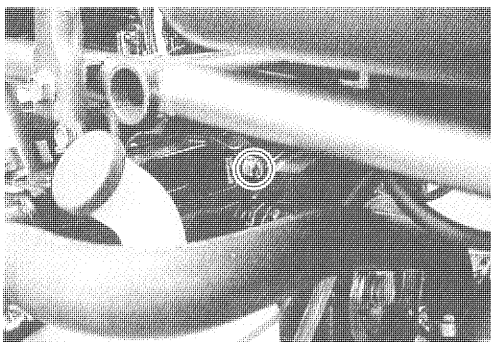
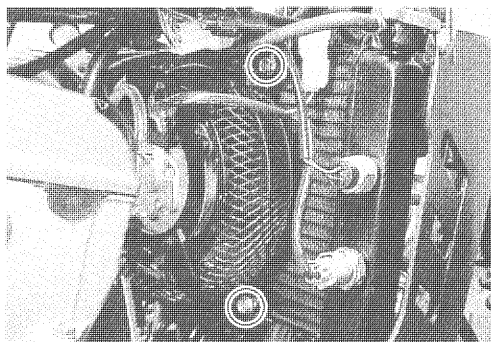


REMOVAL

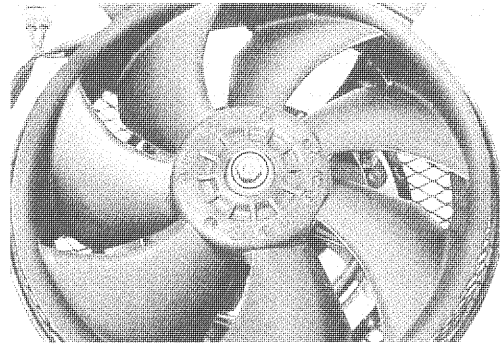
- Remove the front fender. (☞ 6-4)
- Disconnect the coolant temperature switch lead wire coupler ① and the cooling fan motor lead wire coupler ② and the cooling fan thermo-switch lead wire coupler ③.



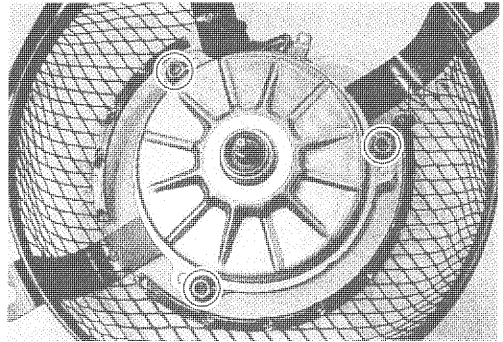
- Remove the three mounting bolts and the cooling fan unit.



- Remove the cooling fan.



- Remove the cooling fan motor.

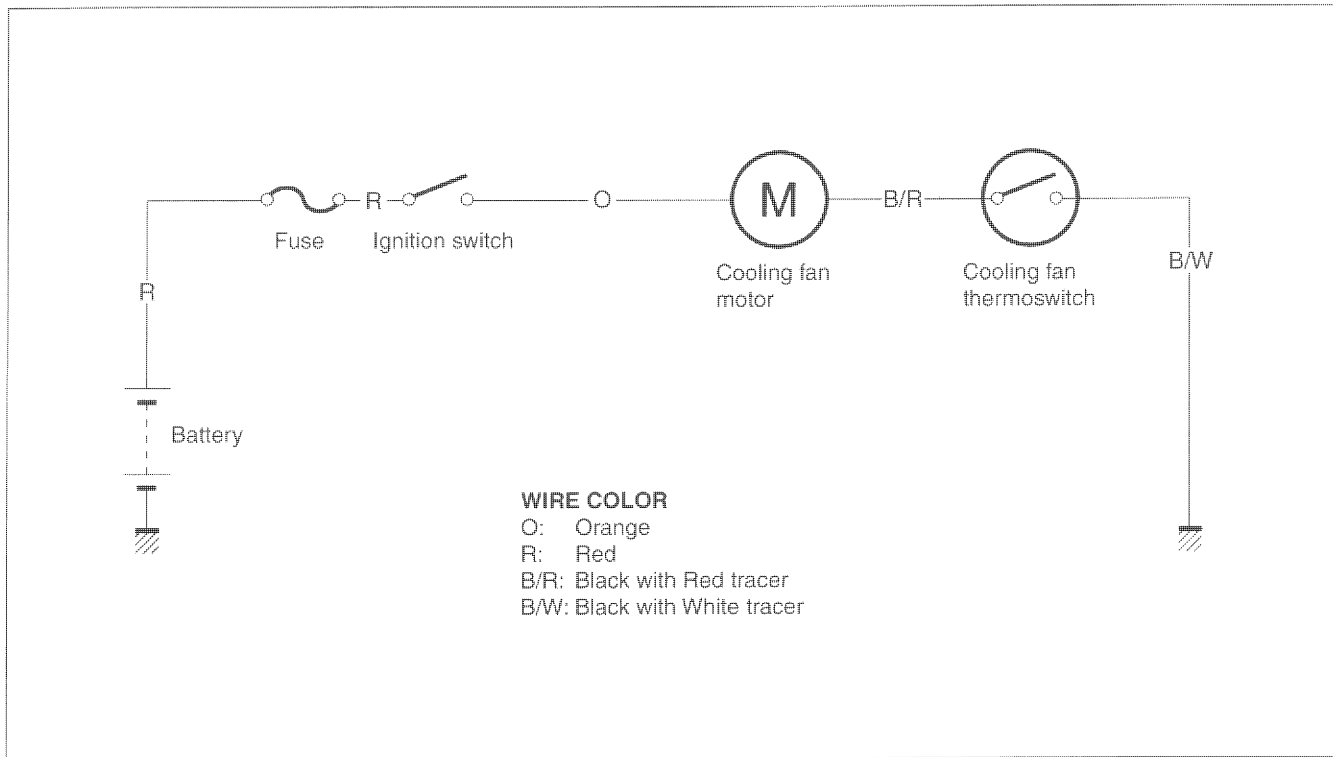


REMOUNTING

Remount the cooling fan in the reverse order of removal.

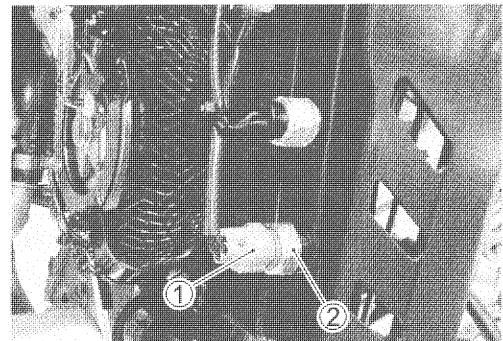
COOLING FAN THERMO-SWITCH

The cooling fan is secured behind the radiator by three bolts and is automatically controlled by the thermo-switch. The thermo-switch remains open when the temperature of the engine coolant is low, but closes when the temperature reaches approximately 88°C (190°F) setting the cooling fan in motion.



REMOVAL

- Remove the front fender. (☞ 6-4)
- Drain engine coolant. (☞ 2-14)
- Disconnect the cooling fan thermo-switch lead wire coupler ①.
- Remove the cooling fan thermo-switch ②.



INSPECTION

- Check the thermo-switch closing or opening temperatures by testing it at the bench as shown in the figure. Connect the thermo-switch ① to a circuit tester and place it in the oil contained in a pan, which is placed on a stove.
- Heat the oil to raise its temperature slowly and read the column thermometer ② when the switch closes or opens.

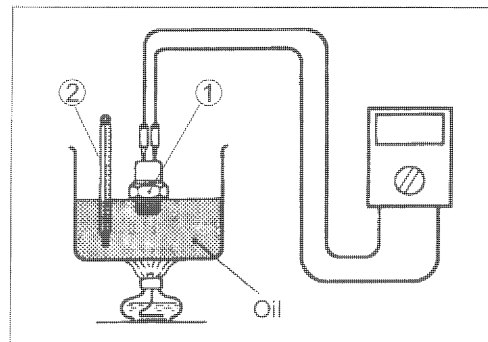
TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Continuity test (•••)

DATA Cooling fan thermo-switch operating temperature

Standard (OFF→ON): Approx. 88°C (190°F)

(ON→OFF): Approx. 82°C (180°F)



CAUTION

- * Do not contact the cooling fan thermo-switch ① and the column thermometer ② with a pan.

INSTALLATION

Install the cooling fan thermo-switch in the reverse order of removal. Pay attention to the following points:

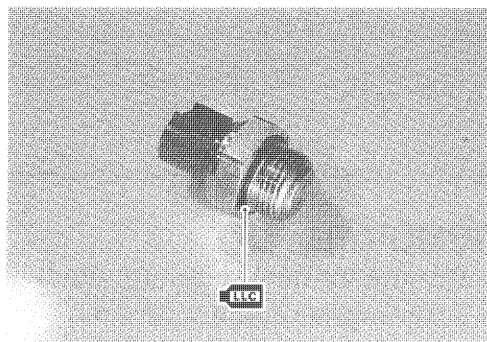
- Apply engine coolant to the O-ring.
- Tighten the cooling fan thermo-switch to the specified torque.

W Cooling fan thermo-switch: 20 N·m (2.0 kgf-m, 14.5 lb-ft)

CAUTION

- * Take special care when handling the cooling fan thermo-switch. Do not subject it to strong blows or allow it to be dropped.
- * Replace the removed O-ring with a new one.

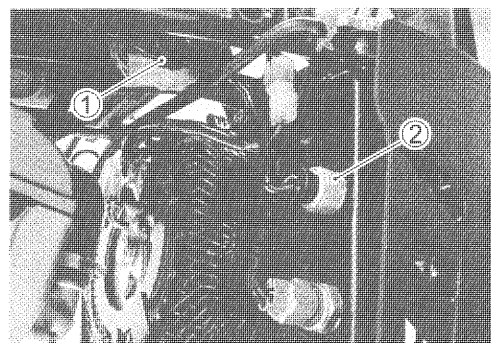
- After installing the cooling fan thermo-switch, be sure to add engine coolant. (P2-14)



ENGINE COOLANT TEMPERATURE SWITCH

REMOVAL

- Remove the front fender. (☞ 6-4)
- Drain a small amount of engine coolant. (☞ 2-14)
- Disconnect the engine coolant temperature switch lead wire coupler ①.
- Remove the engine coolant temperature switch ②.



INSPECTION

- Check the engine coolant temperature switch by testing it at the bench as shown in the figure. Connect the temperature switch ① to a circuit tester and place it in the oil contained in a pan, which is placed on a stove.
- Heat the oil to raise its temperature slowly and read the column thermometer ② when the switch closes or opens.

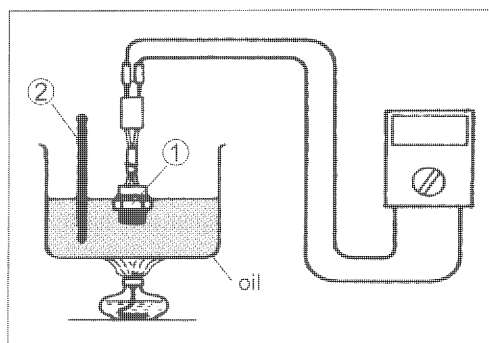
TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Continuity test (•••)

DATA Engine coolant temp. switch operating temperature

Standard (OFF→ON): Approx. 120°C (248°F)

(ON→OFF): Approx. 113°C (235°F)



CAUTION

* Do not contact the engine coolant temperature switch ① and the column thermometer ② with a pan.

INSTALLATION

Install the engine coolant temperature thermo-switch in the reverse order of removal. Pay attention to the following points:

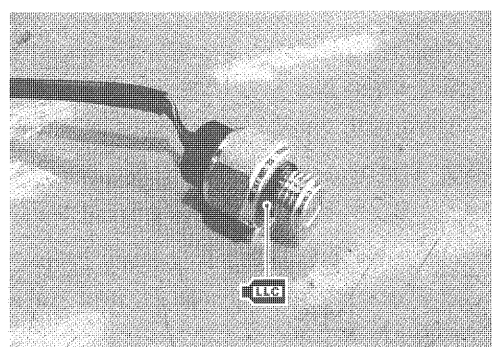
- Apply engine coolant to the O-ring.
- Tighten the engine coolant temperature thermo-switch to the specified torque.

Engine coolant temperature thermo-switch:
13 N·m (1.3 kgf-m, 9.5 lb-ft)

CAUTION

Take special care when handling the engine coolant temperature thermo-switch. Do not subject it to strong blows or allow it to be dropped.

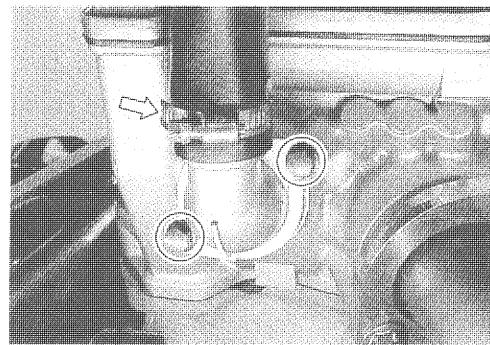
- After installing the engine coolant temperature thermo-switch, be sure to add engine coolant. (☞ 2-14)



THERMOSTAT

REMOVAL

- Drain a small amount of engine coolant. (☞ 2-14)
- Place a rag under the thermostat case.
- Remove the thermostat case.
- Remove the thermostat.



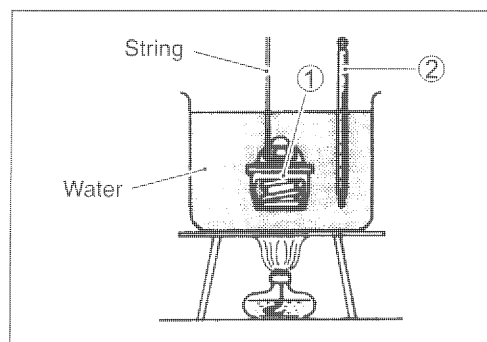
INSPECTION

Inspect the thermostat pellet for signs of cracking.

Test the thermostat at the bench for control action, in the following manner.

- Immerse the thermostat ① in the water contained in a beaker, as shown in the illustration. Note that the immersed thermostat is in suspension. Heat the water by placing the beaker on a stove and observe the rising temperature on a thermometer ②.
- Read the thermometer just when opening the thermostat. This reading, which is the temperature level at which the thermostat valve begins to open, should satisfy the standard value.

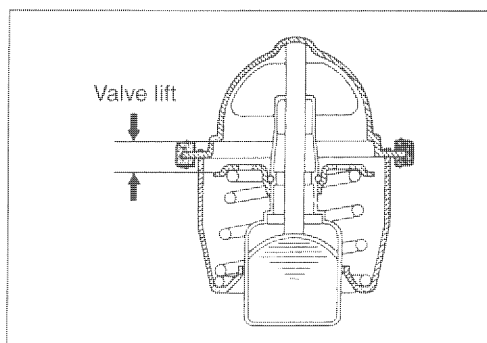
DATA **Thermostat valve opening temperature**
Standard: Approx. 75°C (167 °F)



- Keep on heating the water to raise its temperature.
- Just when the water temperature reaches specified value, the thermostat valve should have lifted by at least 6.0 mm (0.24 in).

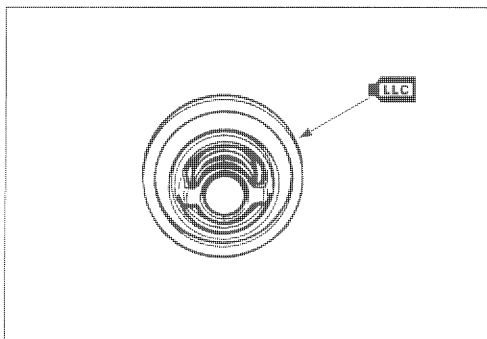
DATA **Thermostat valve lift**
Standard: Over 6.0 mm at 90°C (Over 0.24 in at 194°F)

- A thermostat failing to satisfy either of the two requirements (start-to-open temperature and valve lift) must be replaced with a new one.

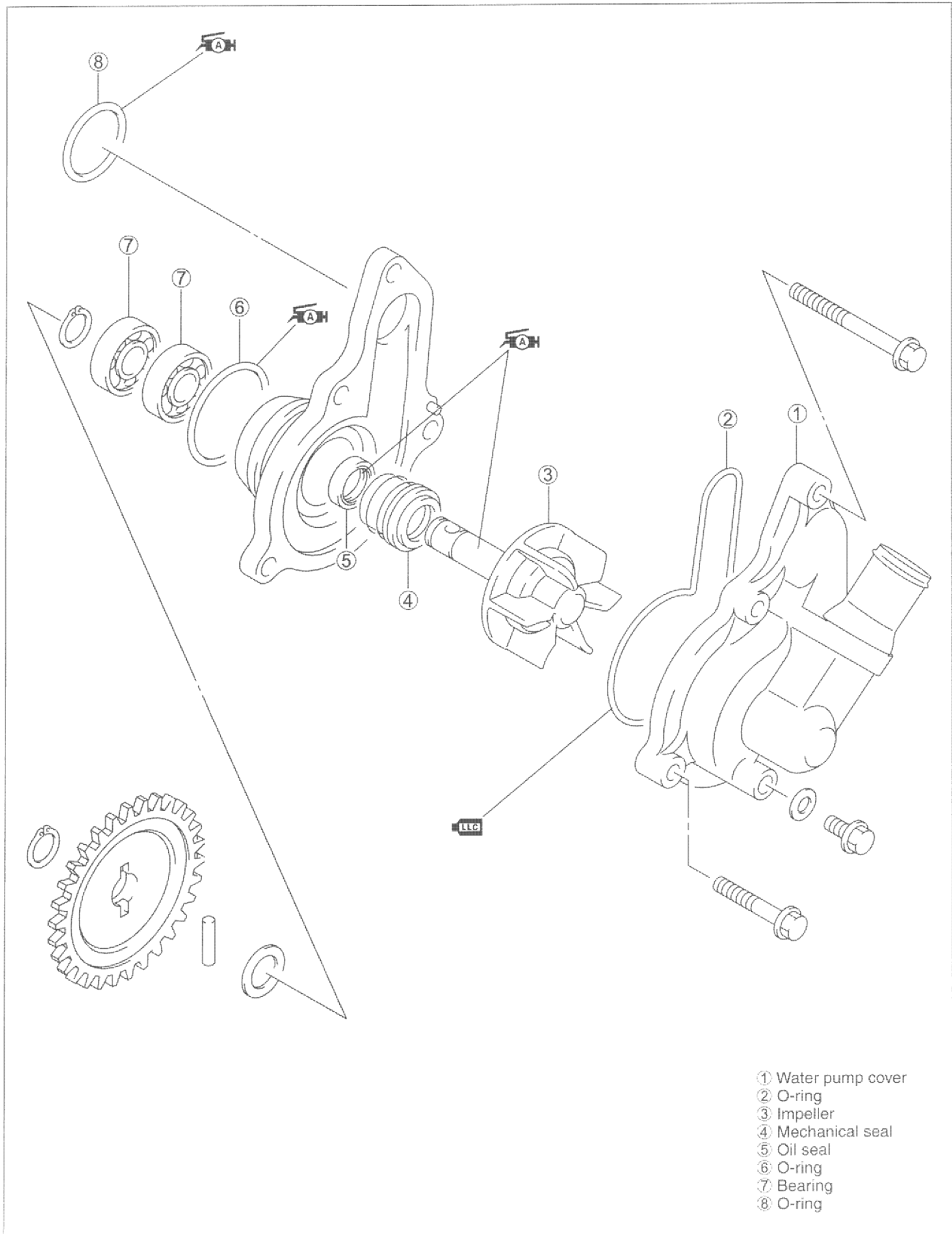


INSTALLATION

- Install the thermostat in the reverse order of removal.
- Apply engine coolant to the rubber seal on the thermostat.
- After installing the thermostat, be sure to add engine coolant. (☞ 2-14)
- Install the front fender.



WATER PUMP CONSTRUCTION

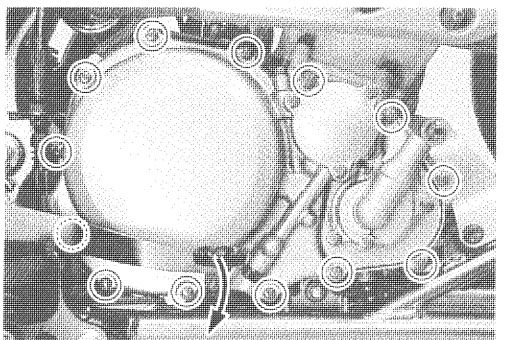
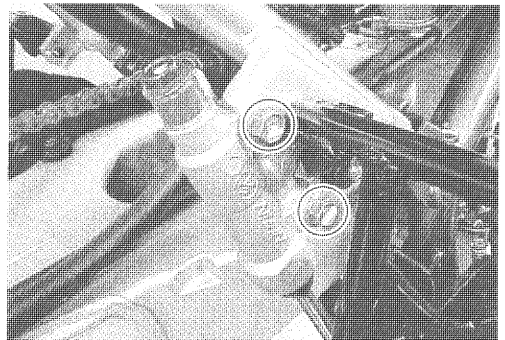
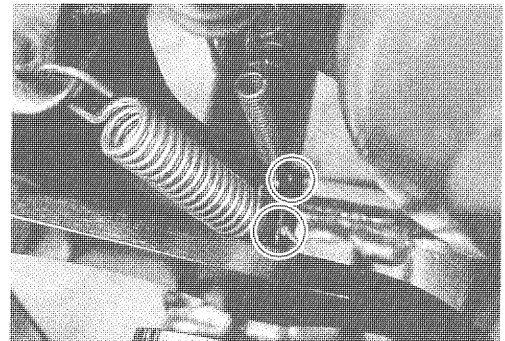
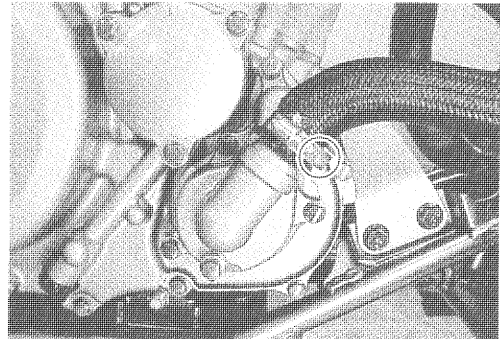


REMOVAL AND DISASSEMBLY

- Drain engine coolant. (☞ 2-14)
- Drain engine oil. (☞ 2-12)

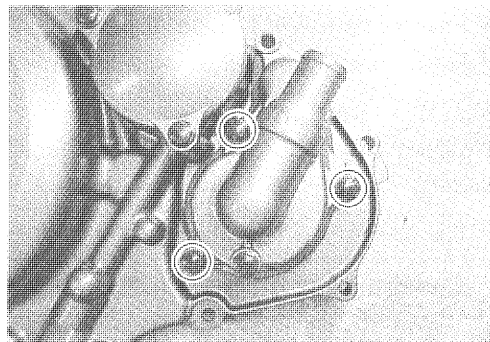
⚠ WARNING

- * Do not open the radiator cap when the engine is hot, as you may be injured by escaping hot liquid or vapor.
- * The engine must be cool before servicing the cooling system.
- * Engine coolant may be harmful if swallowed or if it comes in contact with the skin or eyes. If engine coolant gets into the eyes or contacts the skin, flush the eyes or wash the skin thoroughly, with plenty of water. If engine coolant is swallowed, induce vomiting and call a physician immediately.

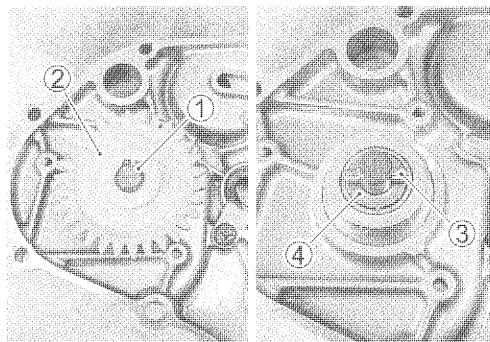


- Disconnect the radiator hose.
- Disconnect the rear brake switch spring and brake pedal spring as to lower side.
- Remove the master cylinder mounting bolts.
- Remove the clutch cover with pushing down the rear brake pedal.

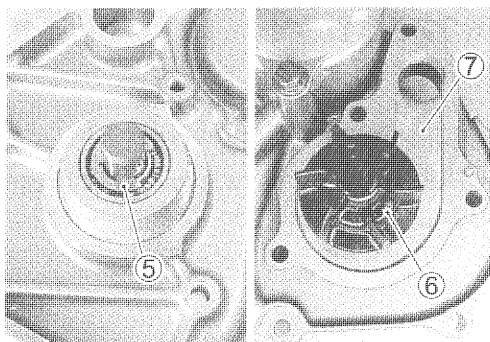
- Remove the water pump cover.



- Remove the snap ring ①, water pump driven gear ②, pin ③ and washer ④.



- Remove the E-ring ⑤, impeller ⑥, and water pump body ⑦.



- Remove the bearing using the special tool.

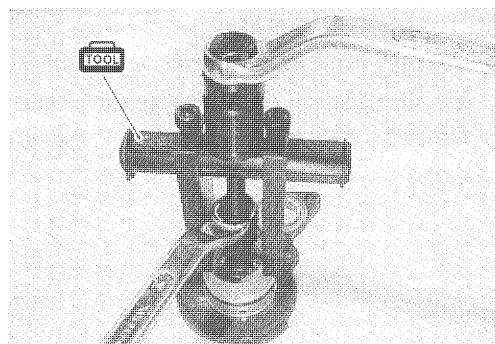
TOOL 09921-20240: Bearing remover set

NOTE:

If there is no abnormal noise, bearing removal is not necessary.

CAUTION

The removed bearing must be replaced with a new one.



- Remove the mechanical seal using the special tool.

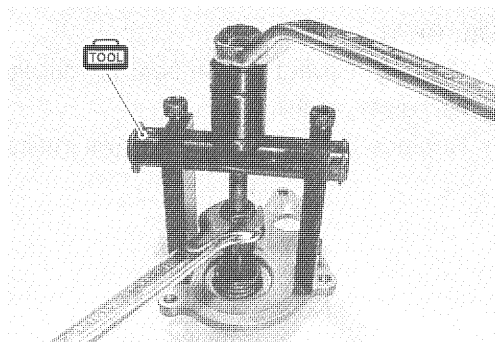
TOOL 09921-20240: Bearing remover set

NOTE:

If there is no abnormal condition, the mechanical seal removal is not necessary.

CAUTION

The removed mechanical seal must be replaced with a new one.



- Place a rag over the water pump.
- Remove the oil seal using a suitable bar.

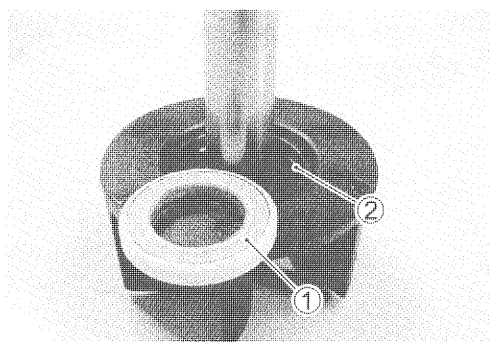
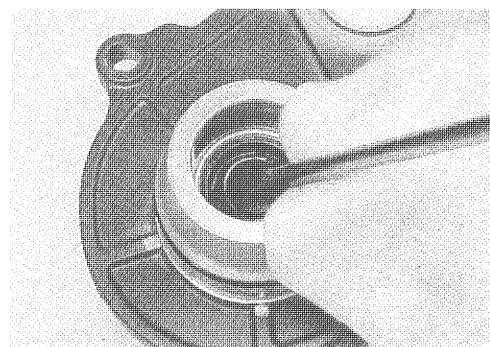
NOTE:

If there is no abnormal condition, the oil seal removal is not necessary.

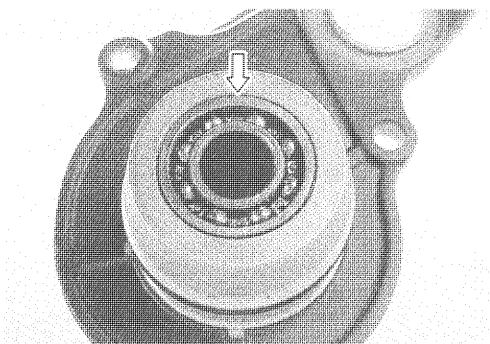
CAUTION

The removed oil seal must be replaced with a new one.

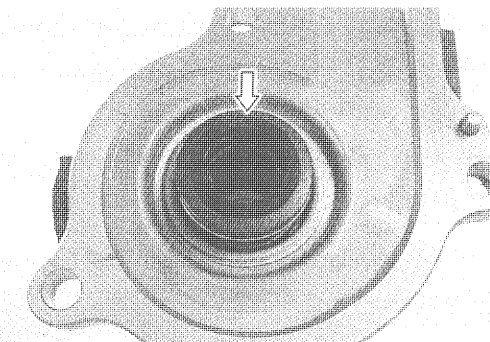
- Remove the mechanical seal ring ① and the rubber seal ② from the impeller.

**INSPECTION****BEARING**

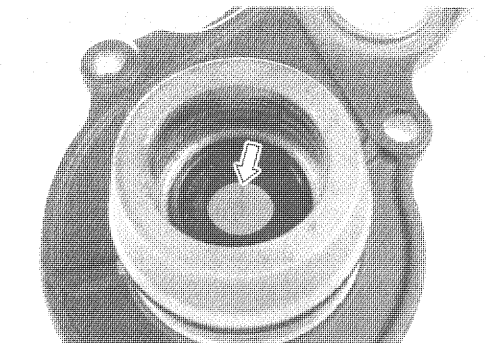
- Inspect the play of the bearing by hand while it is in the water pump case.
- Rotate the inner race by hand to inspect for abnormal noise and smooth rotation.
- Replace the bearing if there is anything unusual.

**MECHANICAL SEAL**

- Visually inspect the mechanical seal for damage, with particular attention given to the sealing face.
- Replace the mechanical seal that shows indications of leakage.

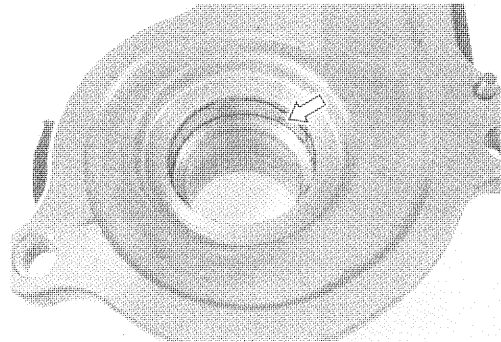
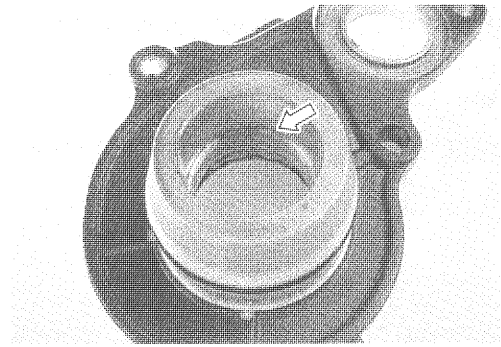
**OIL SEAL**

- Visually inspect the oil seal for damage, with particular attention given to the lip.
- Replace the oil seal that shows indications of leakage.

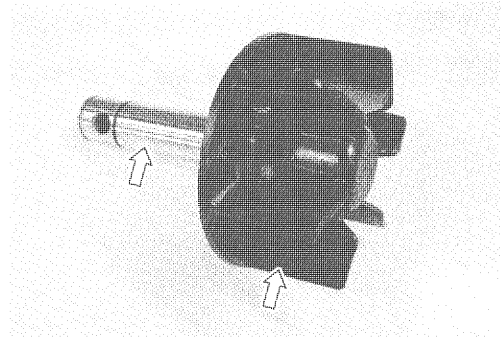


BEARING CASE/MECHANICAL CASE

- Visually inspect the bearing case and mechanical case for damage.
- Replace the water pump body if necessary.

**IMPELLER**

- Visually inspect the impeller and its shaft for damage.

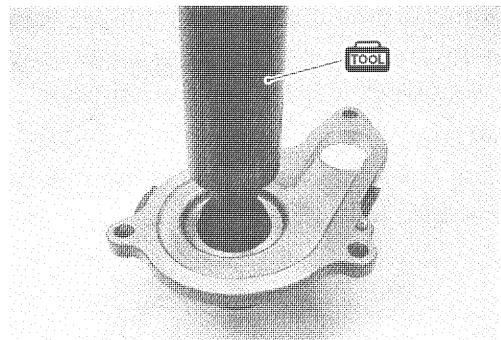
**REASSEMBLY AND INSTALLATION**

- Install the oil seal using the special tool.

 09913-70210: Bearing installer set

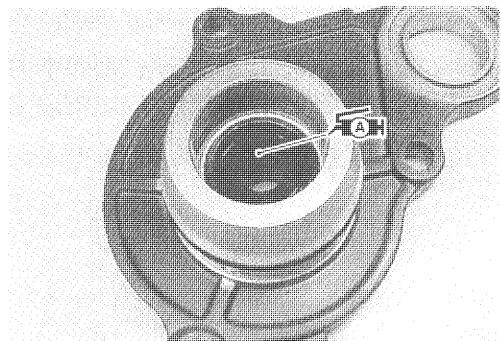
NOTE:

The stamped mark on the oil seal faces outside.



- Apply a small quantity of the SUZUKI SUPER GREASE "A" to the oil seal lip.

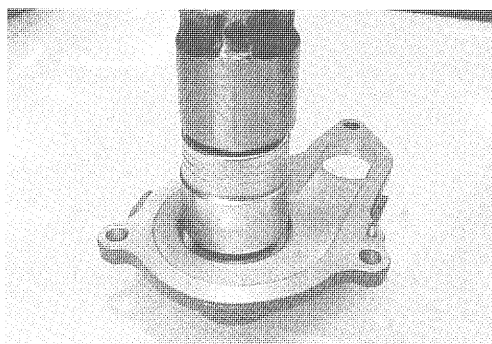
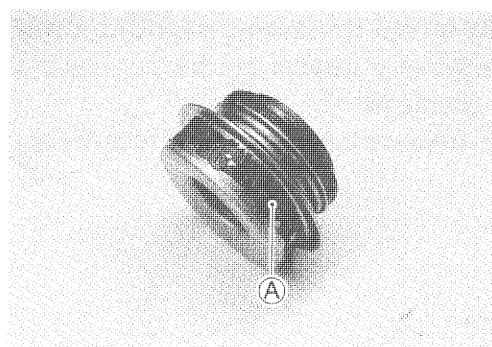
 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Install the new mechanical seal using a suitable size socket wrench.

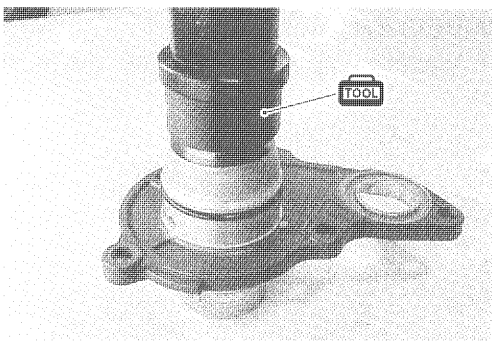
NOTE:

On the new mechanical seal, the sealer (A) has been applied.



- Install the new bearing using the special tool.

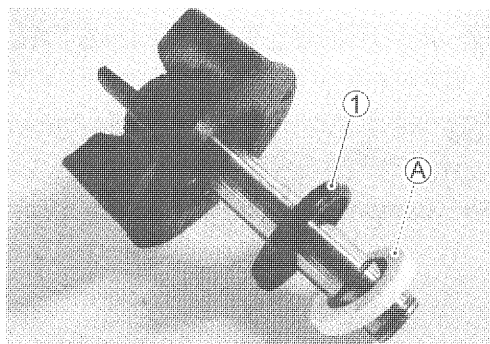
 **09913-70210: Bearing installer set**



- Install the rubber seal ① into the impeller.
- After wiping off the oily or greasy matter from the mechanical seal ring, install it into the impeller.

NOTE:

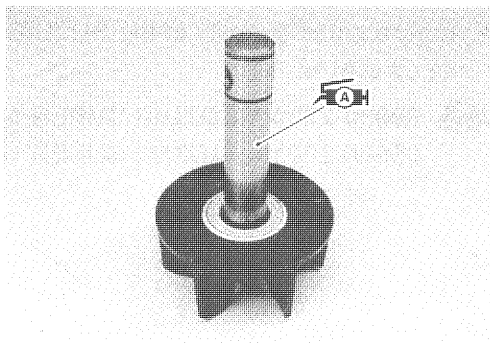
The paint marked side (A) of the mechanical seal ring faces the impeller.



- Apply grease to the impeller shaft.

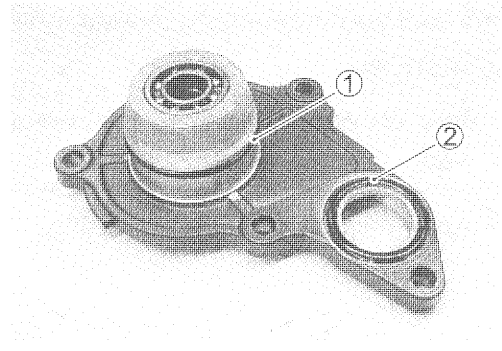
 **99000-25030: SUZUKI SUPER GREASE "A" (USA)**
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Install the impeller shaft to the water pump body.

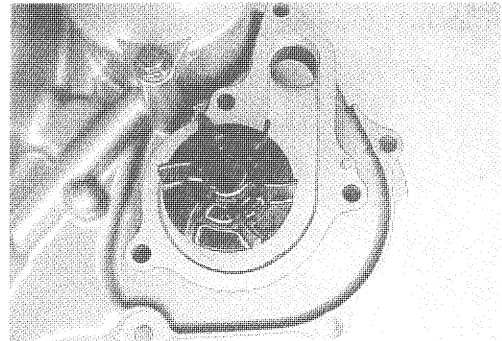


- Install the new O-rings ① and ②.
- Apply grease to the O-rings.

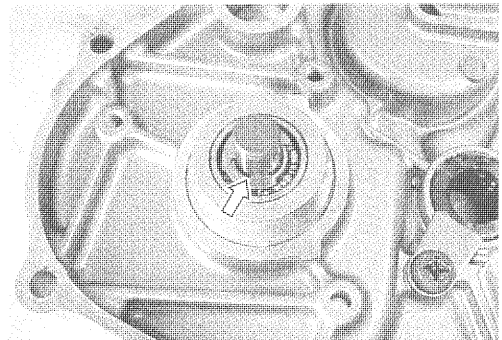
 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



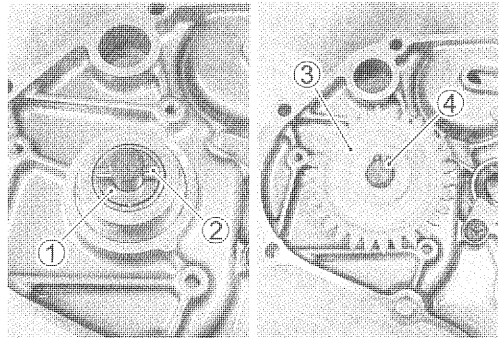
- Install the water pump body with the impeller to the clutch cover.



- Install the E-ring to the impeller shaft.



- Install the washer ①, pin ②, water pump driven gear ③ and snap ring ④.

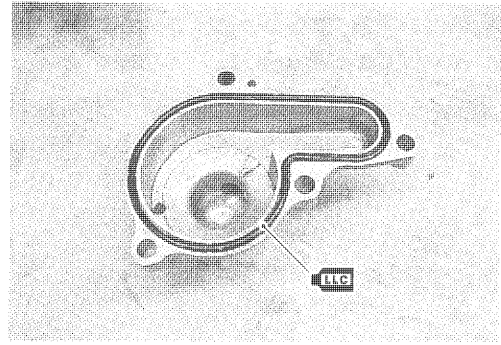


- Install the new O-ring to the water pump cover.

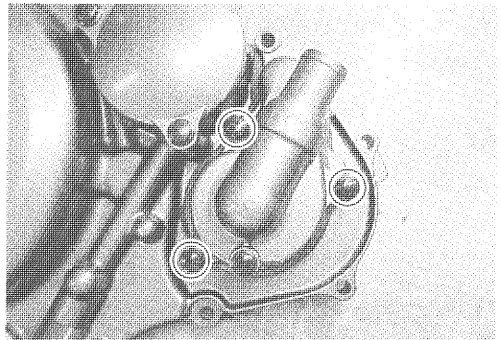
CAUTION

Use the new O-rings to prevent engine coolant leakage.

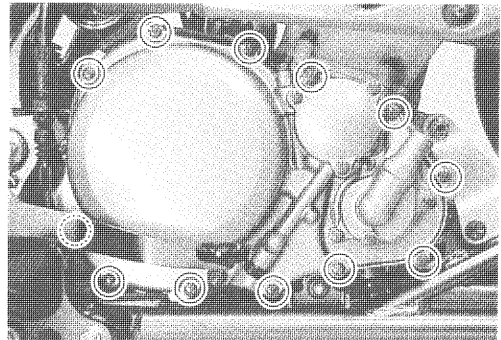
- Apply engine coolant to the O-ring.



- Install the water pump cover to the clutch cover.



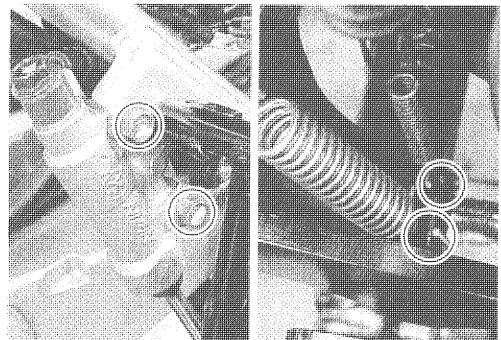
- Install the clutch cover. (☞ 3-55)



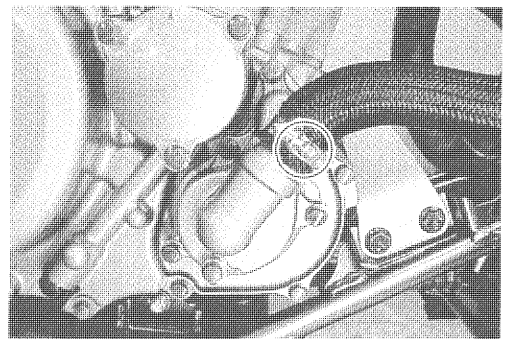
- Install the master cylinder mounting bolts.

Master cylinder mounting bolt:
10 N·m (1.0 kgf-m, 7.0 lb-ft)

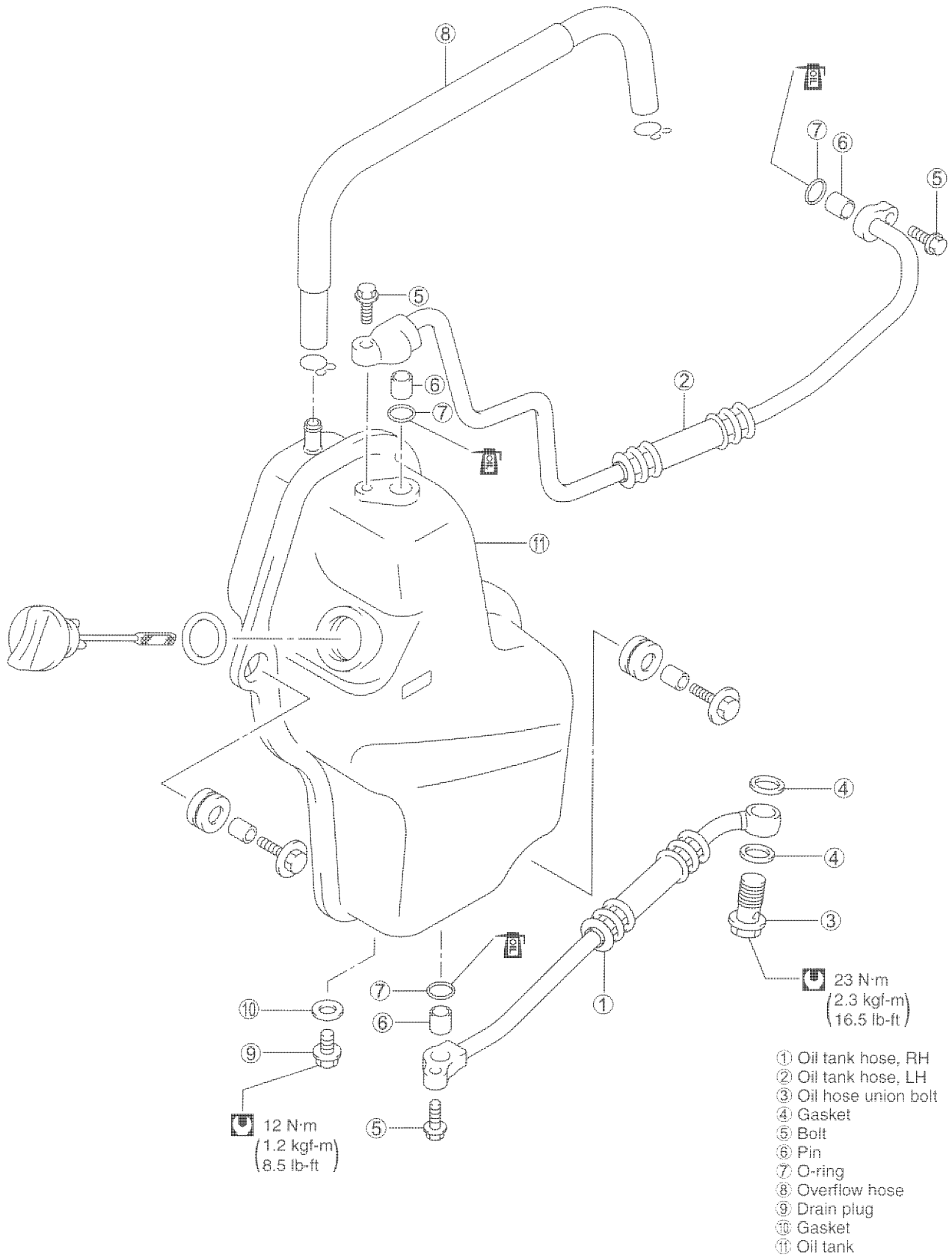
- Connect the rear brake switch spring and brake pedal spring as to lower side.



- Connect the radiator hose.
- Pour engine oil. (☞ 2-12)
- Pour engine coolant. (☞ 2-14)



OIL TANK AND HOSES CONSTRUCTION

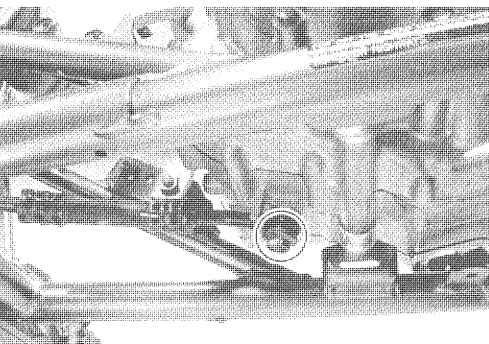
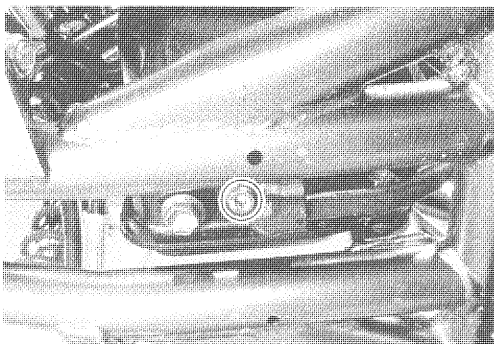
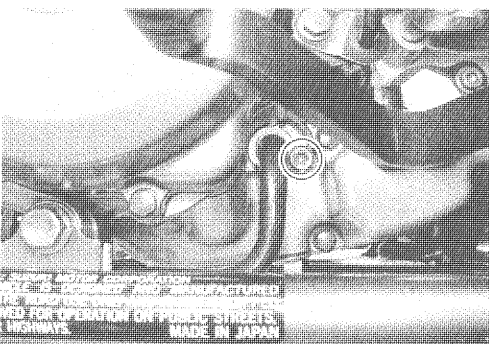
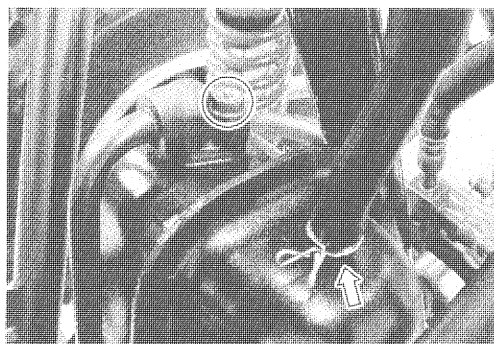
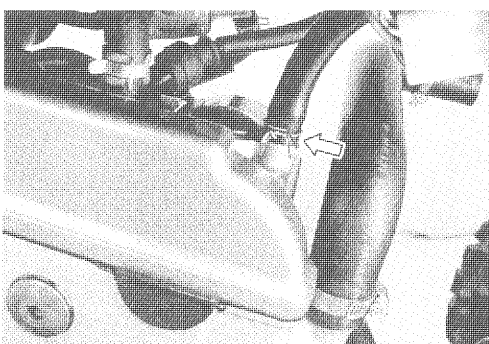
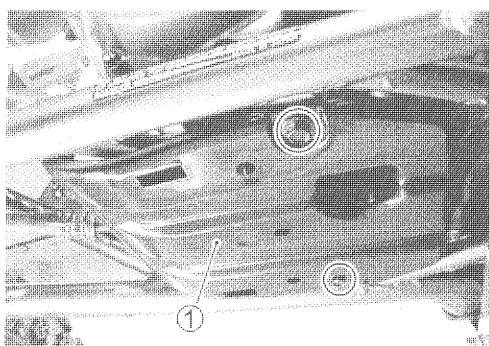
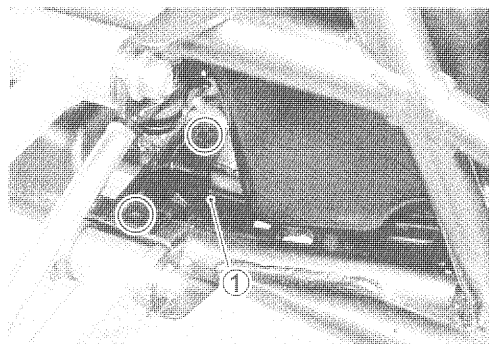


REMOVAL

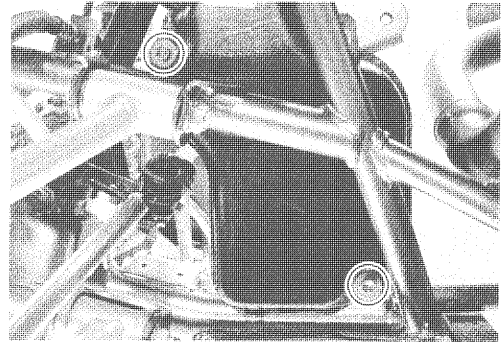
- Remove the front fender. (☞ 6-4)
- Drain engine coolant. (☞ 2-14)
- Remove the radiator. (☞ 5-5)
- Drain engine oil. (☞ 2-12)
- Remove the oil tank protector ①.

- Remove the engine protector ①.

- Remove the oil hoses.



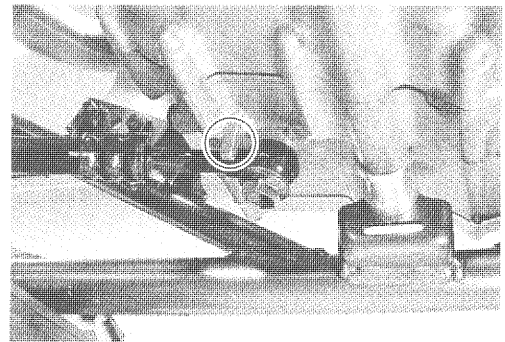
- Remove the oil tank.



REMOUNTING

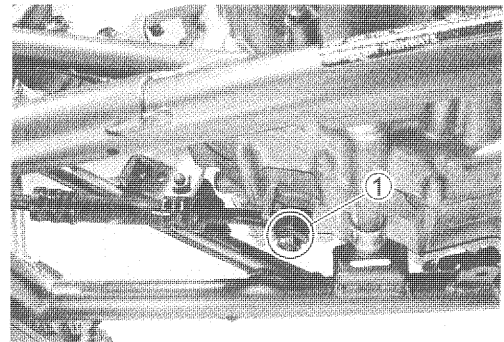
Remount the oil tank and hoses in the reverse order of removal. Pay attention to the following points.

- When connecting the oil tank right hose, place the base of oil pipe against the stopper on engine.



- Tighten the oil hose union bolt ① to the specified torque.

 Oil hose union bolt : 23 N·m (2.3 kgf-m, 16.5 lb-ft)

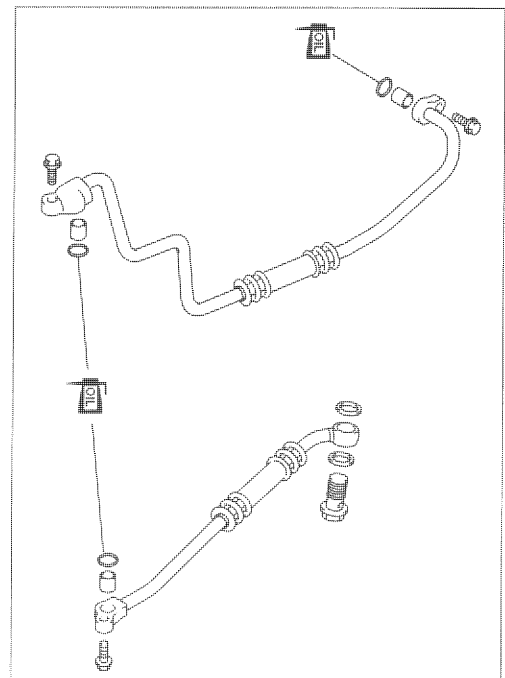


- Install the new O-rings to the right and left hoses.

CAUTION

Use the new O-rings to prevent engine coolant leakage.

- Apply engine oil to the O-rings.
- Pour engine oil. (➡ 2-12)
- Install the radiator. (➡ 5-6)
- Pour engine coolant. (➡ 2-14)
- Install the front fender.



LUBRICATION SYSTEM

OIL PRESSURE

 2-30

OIL FILTER

 2-13

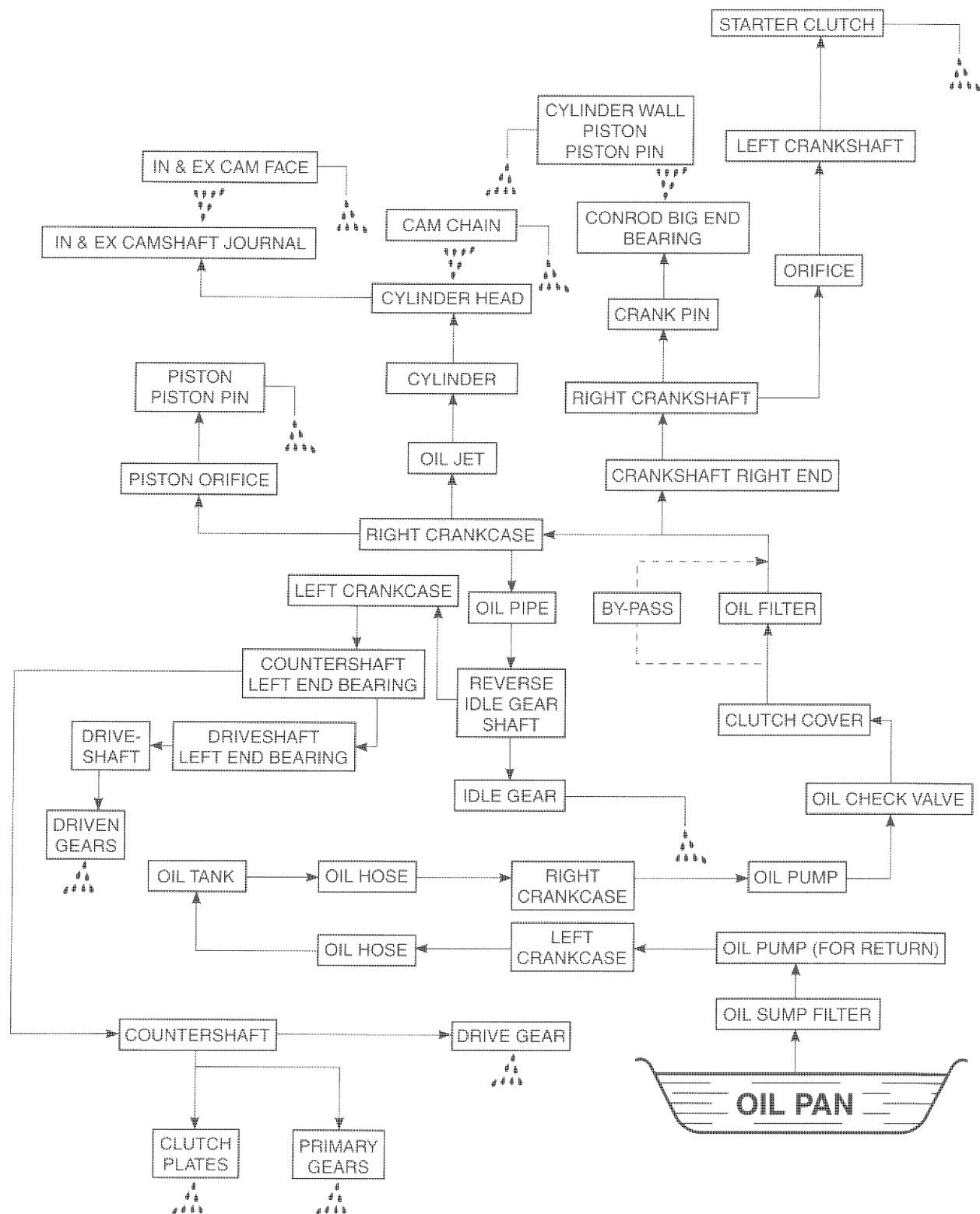
OIL SUMP FILTER

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OIL PUMP

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ENGINE LUBRICATION SYSTEM CHART



CHASSIS

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