

# COOLING SYSTEM

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## 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  $-31^{\circ}\text{C}$  ( $-24^{\circ}\text{F}$ ). If the motorcycle is to be exposed to temperatures below  $-31^{\circ}\text{C}$  ( $-24^{\circ}\text{F}$ ), 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	800 ml (1.7/1.4 US/Imp. pt)
Water	800 ml (1.7/1.4 US/Imp. pt)

Anti-freeze density	Freezing point
50%	$-30^{\circ}\text{C}$ ( $-24^{\circ}\text{F}$ )
55%	$-40^{\circ}\text{C}$ ( $-44^{\circ}\text{F}$ )
60%	$-55^{\circ}\text{C}$ ( $-67^{\circ}\text{F}$ )

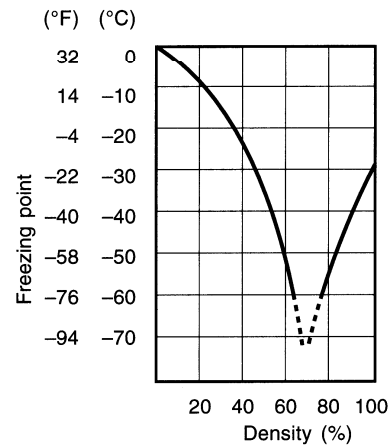


Fig.1 Engine coolant density-freezing point curve.

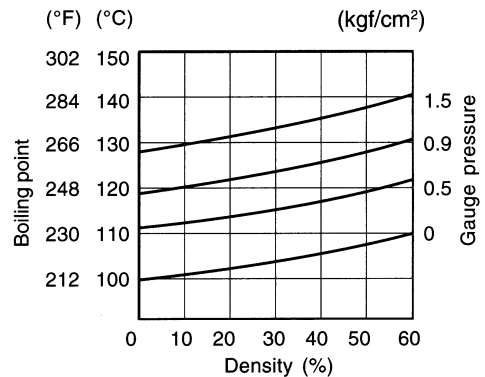
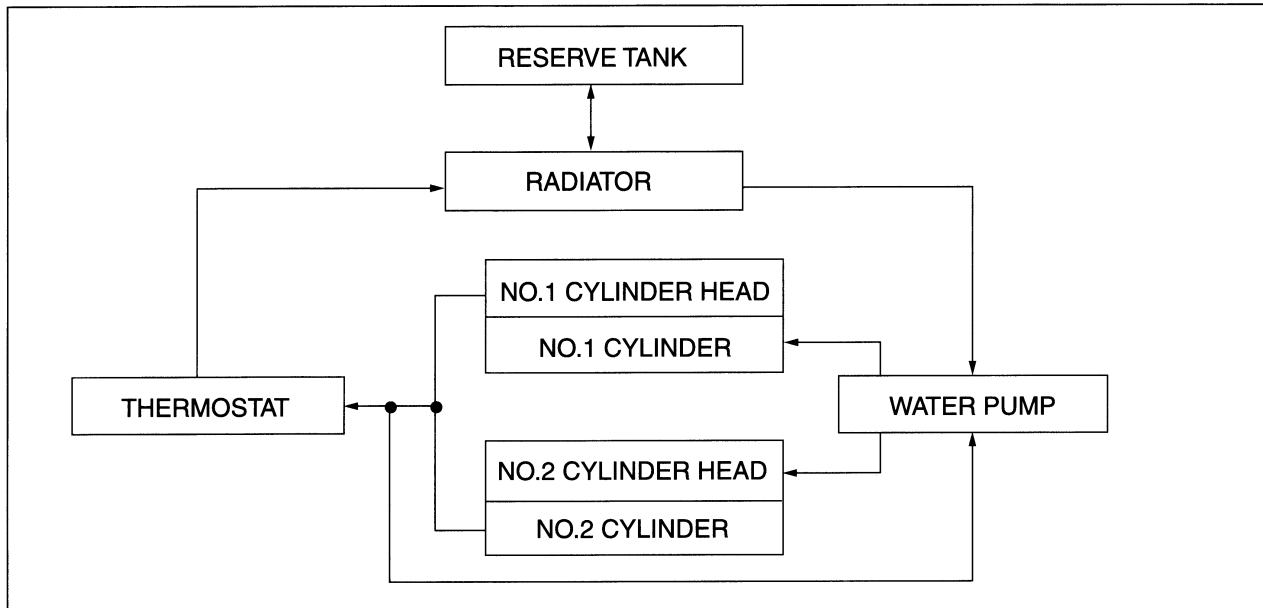


Fig.2 Engine coolant density-boiling point curve.

### ▲ 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.

## COOLING CIRCUIT



## COOLING CIRCUIT INSPECTION

Before removing the radiators and draining the engine coolant, inspect the cooling circuit for tightness.

- Loosen the radiator cap stop screw.
- Remove the radiator cap ① and connect the tester ② to the filler.

### ⚠ WARNING

**Do not remove the radiator cap when the engine is hot.**

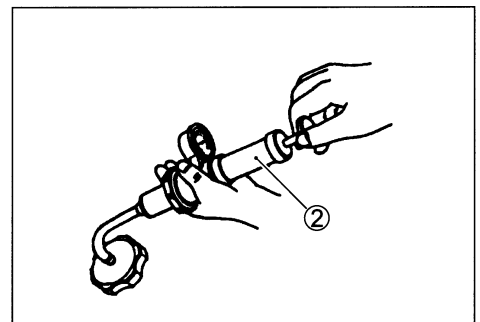
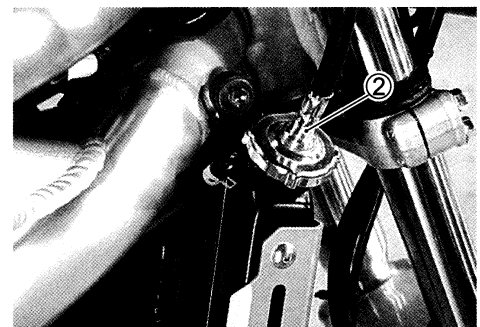
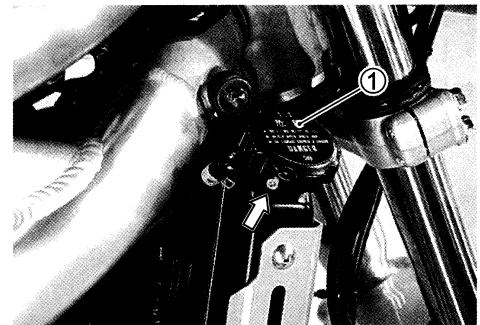
- Give a pressure of about 120 kPa (1.2 kgf/cm<sup>2</sup>, 17 psi) and see if the system holds this pressure for 10 seconds.
- If the pressure should fall during this 10-second interval, it means that there is a leaking point in the system. In such a case, inspect the entire system and replace the leaking component or part.

### ⚠ WARNING

**When removing the radiator cap tester, put a rag on the filler to prevent spouting of engine coolant.**

### ⚠ CAUTION

**Do not allow the pressure to exceed the radiator cap release pressure, or the radiator can be damaged.**

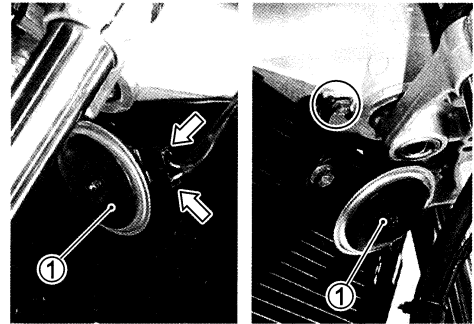


## RADIATOR AND WATER HOSES

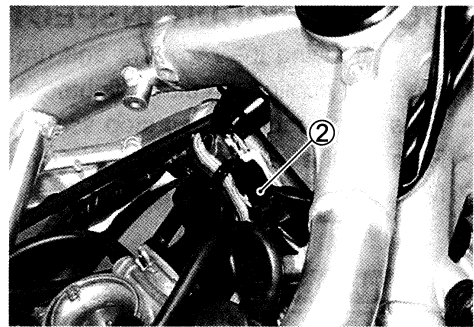
### RADIATOR REMOVAL

- Drain engine coolant. (☞ 2-18)

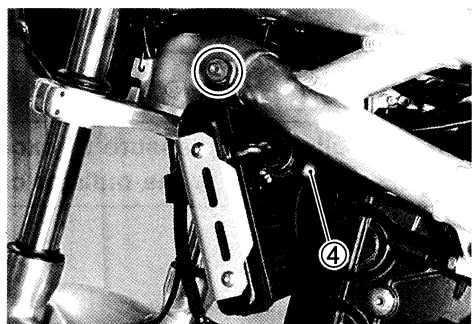
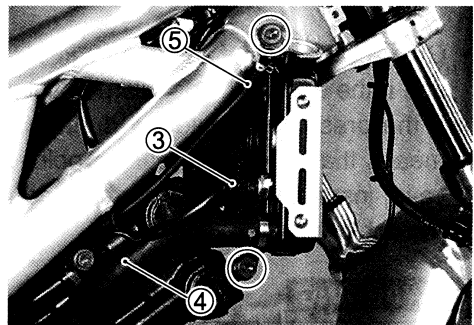
- Disconnect the horn lead wires.
- Remove the horn ① with the bracket.



- Remove the front and rear seats. (☞ 6-3)
- Lift and support the fuel tank. (☞ 4-4)
- Remove the air cleaner box. (☞ 3-4)
- Remove the cooling fan lead wire coupler ②.



- Disconnect the cooling fan thermo-switch lead wire coupler ③.
- Remove the water hoses ④ and the reserve tank hose ⑤ from the radiator.
- Remove the radiator mounting bolts.
- Remove the radiator.



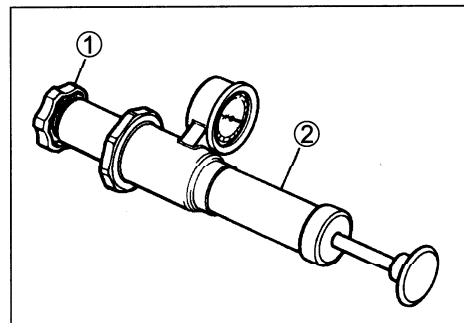
## RADIATOR CAP INSPECTION

- Fit the cap ① to the radiator cap tester ②.
- Build up pressure slowly by operating the tester. Make sure that the pressure build-up stops at 95 – 125 kPa (0.95 – 1.25 kgf/cm<sup>2</sup>, 13.5 – 17.8 psi) and that, with the tester held stand-still, the cap is capable of holding that pressure for at least 10 seconds.
- Replace the cap if it is found not to satisfy either of these two requirements.

### **DATA** Radiator cap valve opening pressure

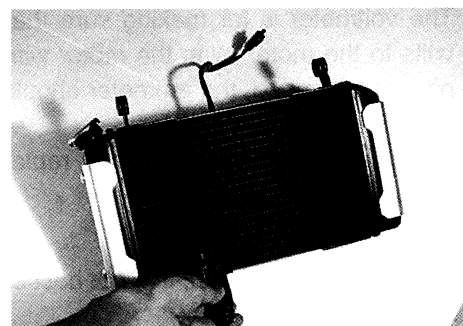
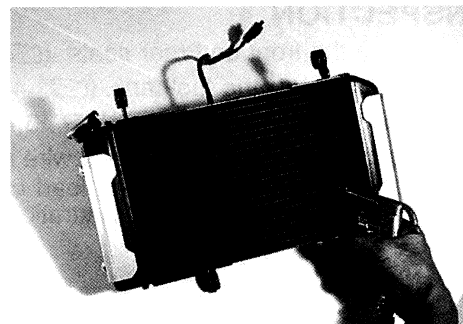
Standard: 95 – 125 kPa

(0.95 – 1.25 kgf/cm<sup>2</sup>, 13.5 – 17.8 psi)



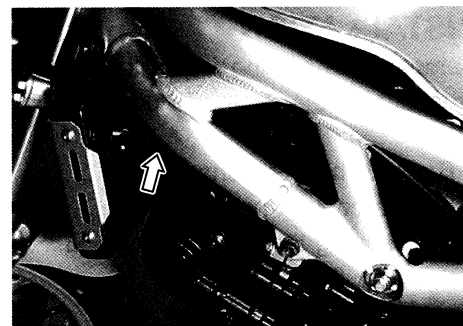
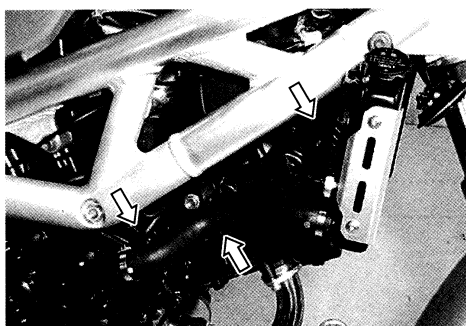
## RADIATOR INSPECTION AND CLEANING

- Road dirt or trash stuck to the fins must be removed.
- Use of compressed air is recommended for this cleaning.
- Fins bent down or dented can be repaired by straightening them with the blade of a small screwdriver.



## WATER HOSE INSPECTION

- Any water hose found in a cracked condition or flattened must be replaced.
- Any leakage from the connecting section should be corrected by proper tightening.



## RADIATOR REMOUNTING

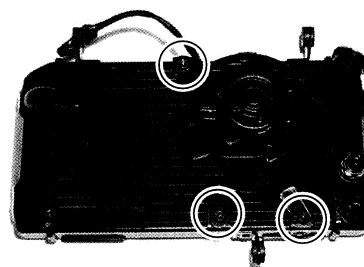
Remount the radiator in the reverse order of its removal procedure. Refer to the following pages.

	Page
* Radiator hose routing .....	8-19
* Engine coolant pouring .....	2-18
* Air bleeding the cooling circuit .....	2-19

## COOLING FAN

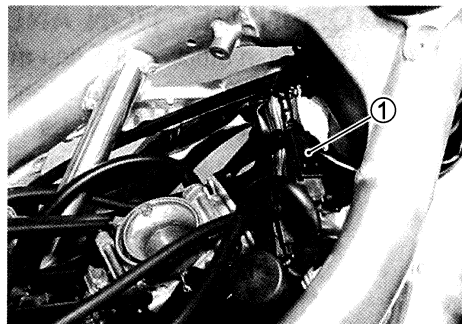
### REMOVAL

- Remove the radiator. (☞ 5-4)
- Remove the cooling fan.



### INSPECTION

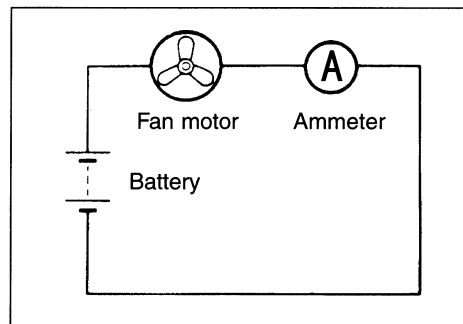
- Remove the front and rear seats. (☞ 6-3)
- Lift and support the fuel tank. (☞ 4-4)
- Remove the air cleaner box. (☞ 3-4)
- Disconnect the cooling fan lead wire coupler ①.
- Test the cooling fan motor for load current with an ammeter connected as shown in the illustration.



- 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.



## INSTALLATION

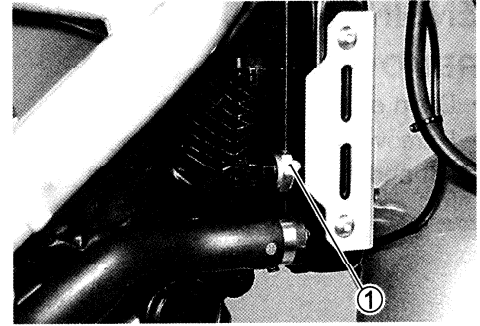
Remount the cooling fan in the reverse order of their removal procedure. Refer to the following pages.

	Page
* Radiator hose routing .....	8-19
* Engine coolant pouring .....	2-18
* Air bleeding the cooling circuit .....	2-19

## COOLING FAN THERMO-SWITCH

### REMOVAL

- Drain engine coolant. (☞ 2-18)
- Disconnect the cooling fan thermo-switch lead wire coupler.
- Remove the cooling fan thermo-switch ①.



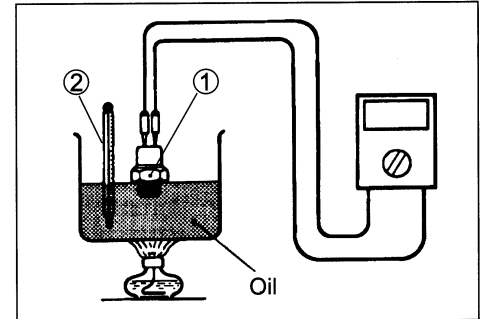
### INSPECTION

- Check the thermo-switch closing or opening temperatures by testing it at the bench as shown in the figure. Connect the thermo-switch 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 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. 96°C (204.8°F)  
 (ON→OFF): Approx. 91°C (195.8°F)



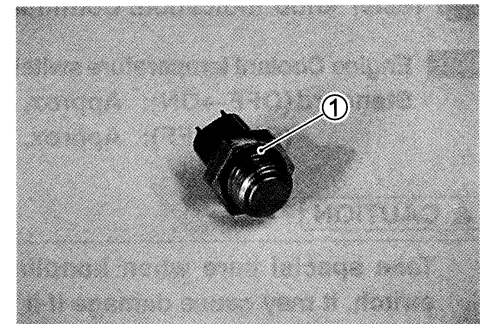
### ⚠ CAUTION

- \* Take special care when handling the thermo-switch. It may cause damage if it gets a sharp impact.
- \* Do not contact the cooling fan thermo-switch ① and the column thermometer ② with a pan.

### INSTALLATION

- Install the O-ring ①.
- Tighten the cooling fan thermo-switch to the specified torque.

**☑ Cooling fan thermo-switch: 13 N·m**  
 (1.3 kgf·m, 9.5 lb-ft)

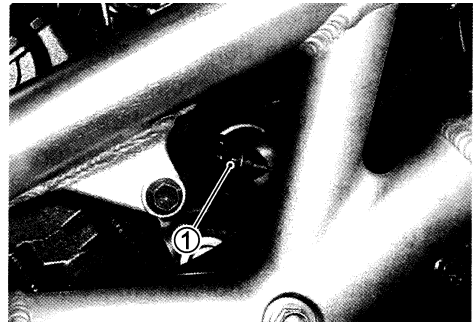


- Pour engine coolant. (☞ 2-18)

## ENGINE COOLANT TEMPERATURE SWITCH

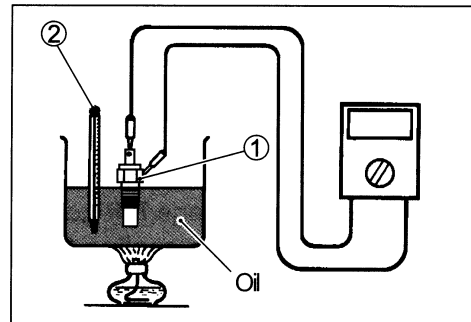
### REMOVAL

- Drain engine coolant. (☞ 2-18)
- Remove the front and rear seats. (☞ 6-3)
- Lift and support the fuel tank. (☞ 4-4)
- Disconnect the engine coolant temperature switch lead wire.
- Remove the engine coolant temperature switch ①.



### INSPECTION

- Check the engine coolant temperature switch closing or opening temperatures by testing it at the bench as shown in the figure. Connect the temperature switch 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 when the switch closes or opens.



 09900-25008: Multi circuit tester set

 Tester knob indication: Continuity test(•••••)

**DATA** Engine Coolant temperature switch operating temperature  
 Standard (OFF→ON): Approx. 115°C (239°F)  
 (ON→OFF): Approx. 108°C (226.4°F)

### ▲ CAUTION

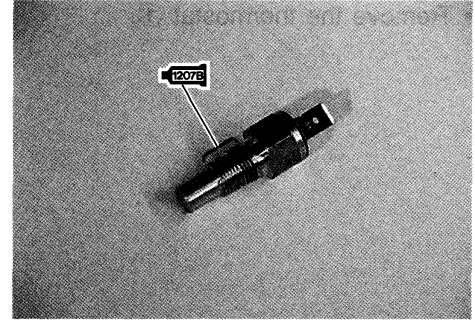
- \* Take special care when handling the temperature-switch. It may cause damage if it gets a sharp impact.
- \* Do not contact the engine coolant temperature switch ① and the column thermometer ② with a pan.



## INSTALLATION



- Apply a small quantity of SUZUKI BOND “1207B” to the engine coolant temperature switch thread portion.

 99104-31140: SUZUKI BOND “1207B”







- Tighten the engine coolant temperature switch to the specified torque.

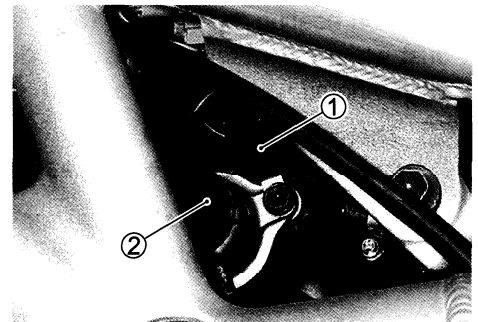
 **Engine coolant temperature switch: 10 N·m**  
(1.0 kgf·m, 7.3 lb-ft)

- Install the fuel tank.
- Install the front and rear seats. ( 6-3)
- Pour engine coolant. ( 2-18)

## THERMOSTAT

### REMOVAL

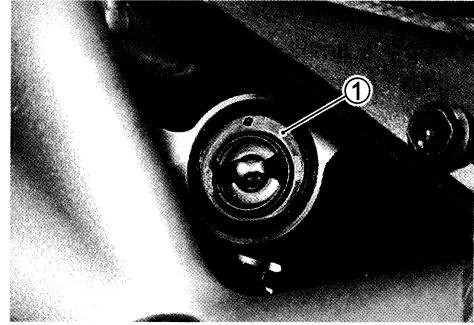
- Drain engine coolant. ( 2-18)
- Remove the front and rear seats. ( 6-3)
- Lift and support the fuel tank. ( 4-4)
- Remove the air cleaner box. ( 3-4)
- Disconnect the ground lead wire ①.
- Disconnect the water hose ②.



- Remove the thermostat case cover.



- Remove the thermostat ①.

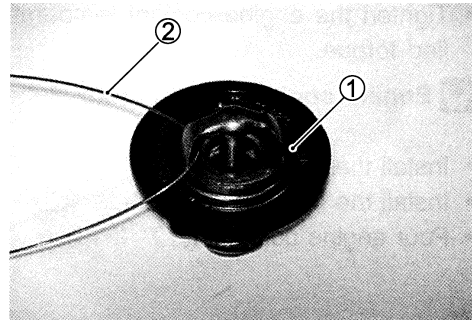


## INSPECTION

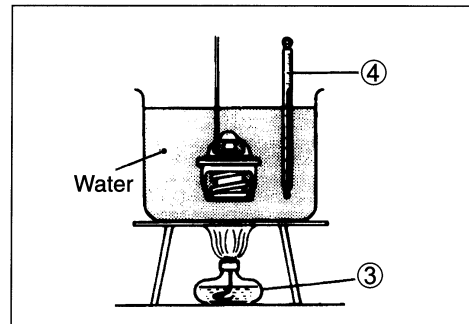
Inspect the thermostat pellet for signs of cracking. Test the thermostat at the bench for control action, in the following manner.

- Pass a string between flange, as shown in the illustration.
- Immerse the thermostat 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.
- Read the thermometer just when opening the thermostat. This reading, which is the temperature level at which the thermostat valve begins to open, should be within the standard value.

**DATA** Thermostat valve opening temperature  
Standard: Approx. 82°C (179.6°F)



① Thermostat ② String

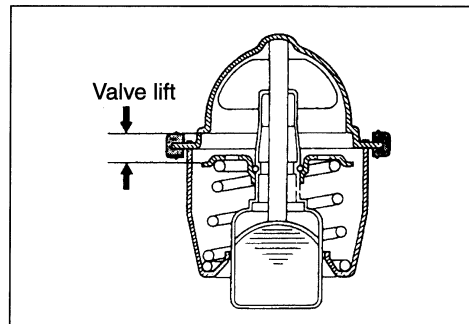


③ Stove ④ Thermometer

- Keep on heating the water to raise its temperature.
- Just when the water reaches specified valve, the thermostat valve should have lifted by at least 8.0 mm (0.31 in).

**DATA** Thermostat valve lift  
Standard: Over 8.0 mm at 95°C (Over 0.31 in at 203°F)

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

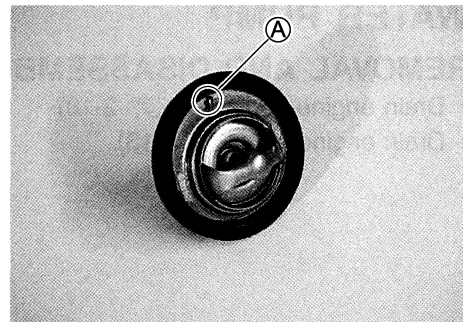


## INSTALLATION

- Install the thermostat.

**NOTE:**

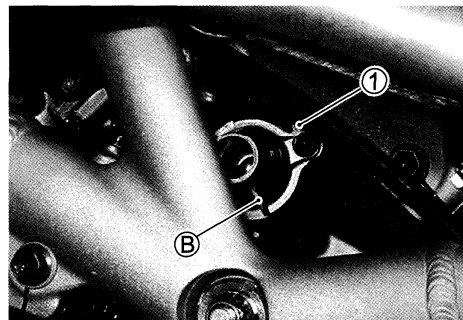
*The jiggle valve ① of the thermostat faces upside.*



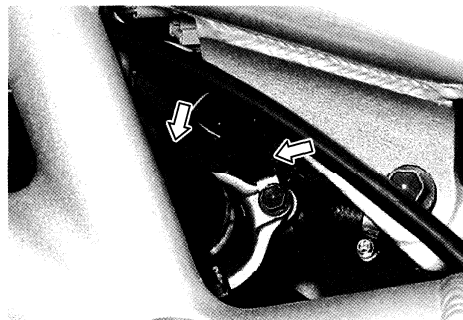
- Install the thermostat case cover and the ground lead wire terminal ①.

**NOTE:**

*The rib ② of the thermostat case cover faces lower.*



- Connect the water hose.
- Connect the ground lead wire.



- Install the air cleaner box.
- Install the fuel tank.
- Install the front and rear seat. (☞ 6-3)
- Pour engine coolant. (☞ 2-18)

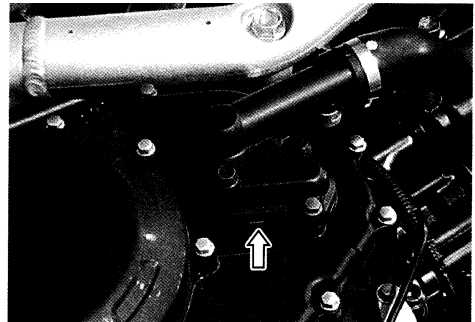
## WATER PUMP

### REMOVAL AND DISASSEMBLY

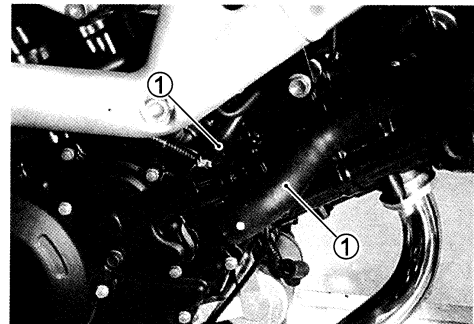
- Drain engine coolant. (🔧 2-18)
- Drain engine oil. (🔧 2-13)

**NOTE:**

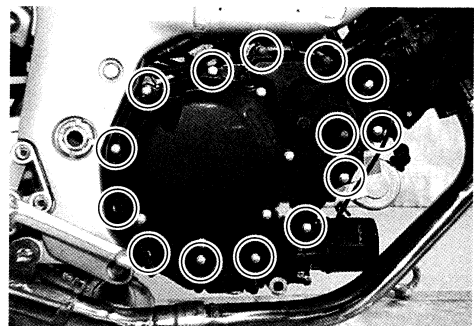
*Before draining engine oil and engine coolant, inspect engine oil and coolant leakage between the water pump and clutch cover. If engine oil is leaking, visually inspect the oil seal and O-ring. If engine coolant is leaking, visually inspect the mechanical seal, seal washer and O-rings. (🔧 5-15)*



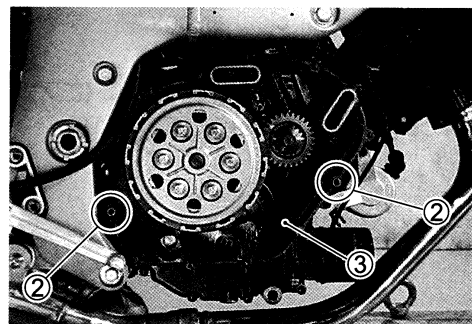
- Disconnect the water hoses ①.



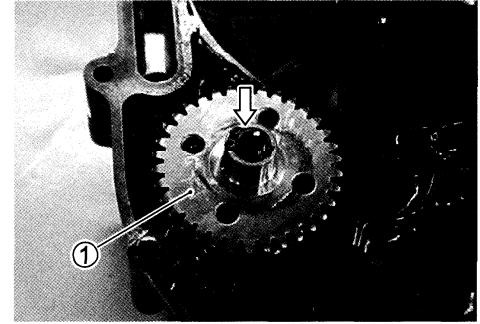
- Remove the clutch cover with the water pump.



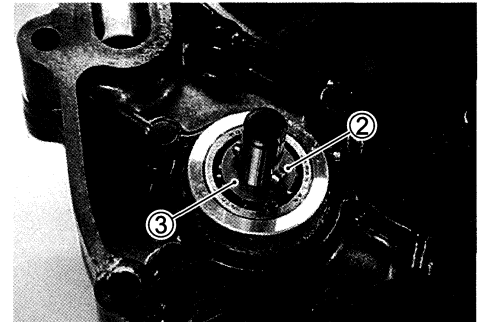
- Remove the dowel pins ② and gasket ③.



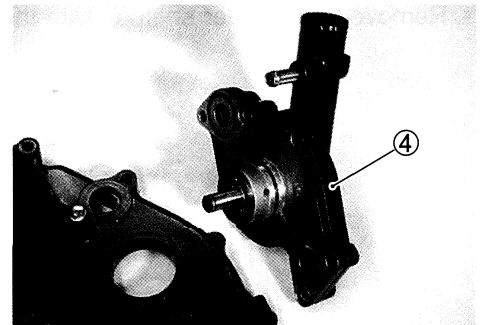
- Remove the circlip and the water pump driven gear ①.



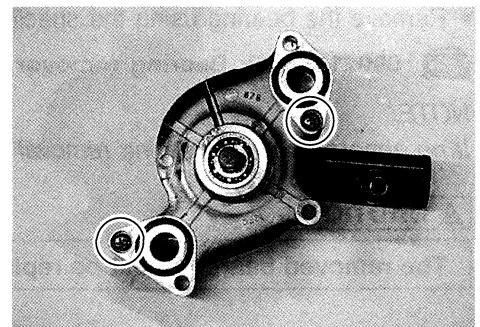
- Remove the pin ② and washer ③.



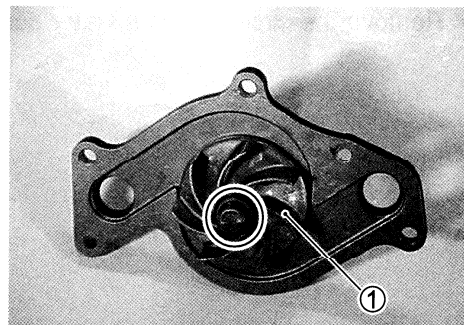
- Remove the water pump ④ from the clutch cover.



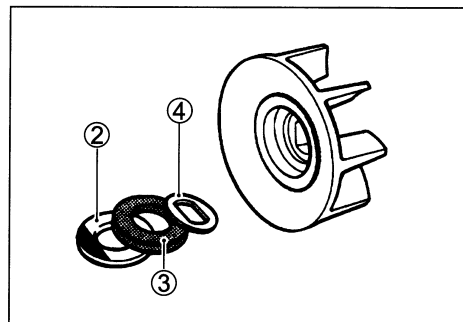
- Remove the screws and separate the water pump.



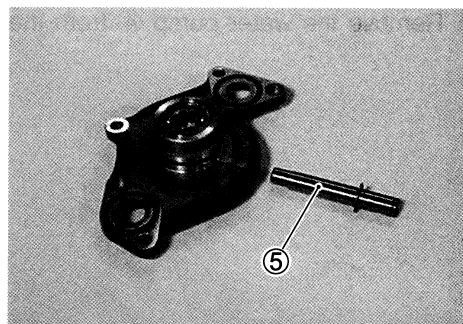
- Remove the Impeller ①.



- Remove the mechanical seal ring ②, the rubber seal ③ and the washer ④ from the impeller.



- Remove the impeller shaft ⑤ with the E-ring.



- Remove the bearing using the special tool ( $\phi 10$  mm).

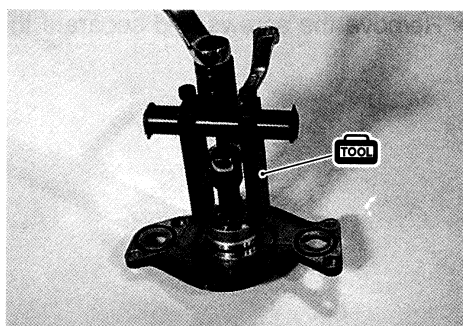
 **09921-20220: Bearing remover set**

**NOTE:**

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

**▲ CAUTION**

**The removed bearing must be replaced with a new one.**



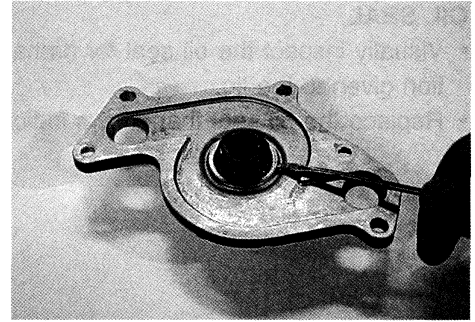
- Remove the mechanical seal using a suitable bar.

**NOTE:**

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

**▲ CAUTION**

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



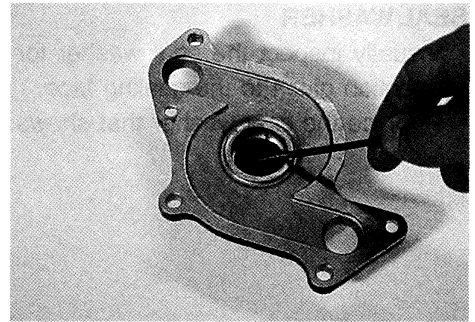
- Remove the oil seal using a suitable bar.

**NOTE:**

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

**▲ CAUTION**

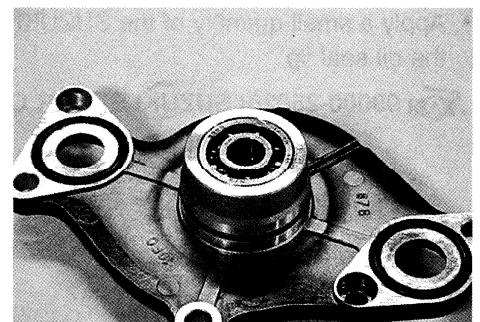
**The removed oil seal must be replaced with a new one.**



## INSPECTION

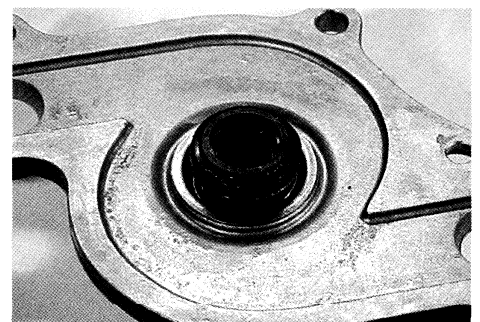
### BEARING

- 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.



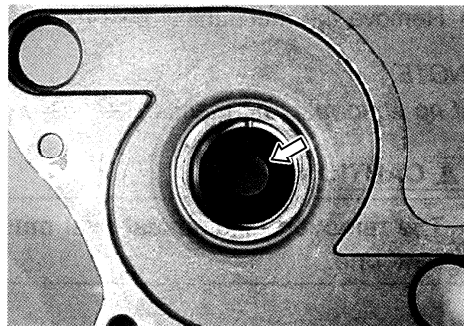
### MECHANICAL SEAL

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



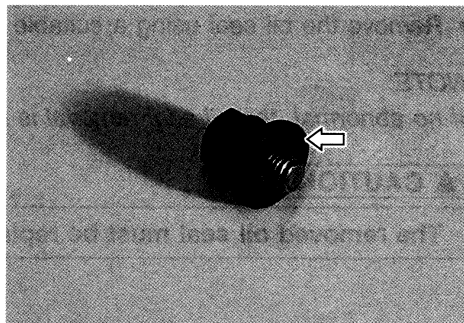
### OIL SEAL

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



### SEAL WASHER

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




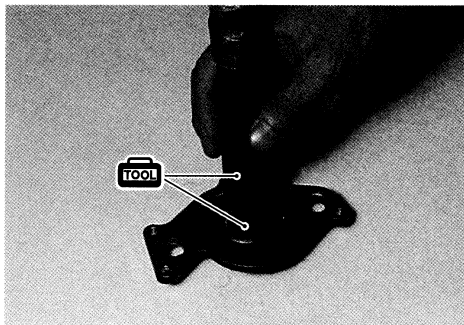
### REASSEMBLY AND INSTALLATION

- Install the oil seal using the special tool.

 **09913-70210: Bearing installer set**

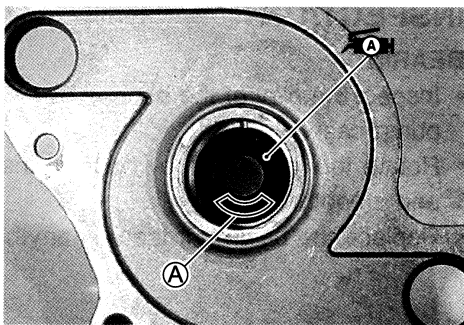
#### NOTE:

*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"**



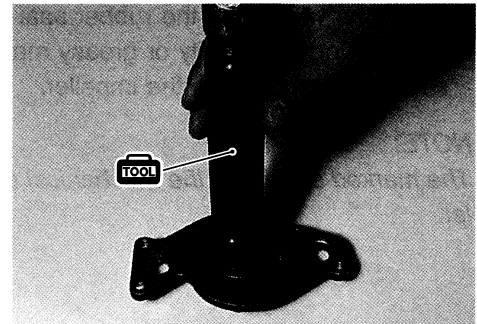
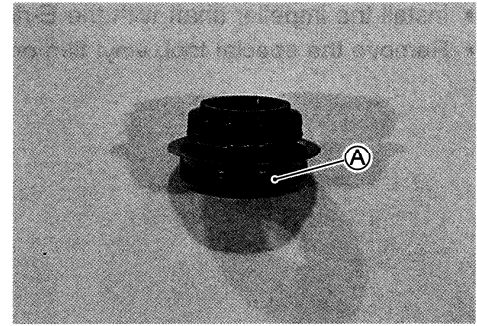


- Install the new mechanical seal using the special tool.

 **09913-70210: Bearing installer set**

**NOTE:**

*The new mechanical seal has been applied the sealer (A).*

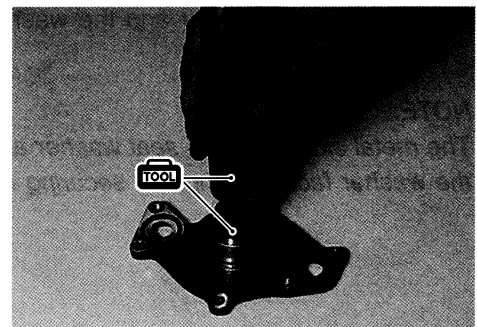


- Install the new bearing using the special tool.

 **09913-70210: Bearing installer set**

**NOTE:**

*The stamped mark on the bearing faces crankcase side.*



- Install the E-ring to the impeller shaft.
- To protect the oil seal lip from damage, cover the edge of the impeller shaft with the special tool, vinyl film or tape.

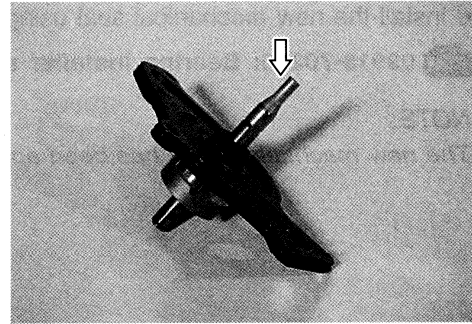
 **09923-80210: Oil seal guide**

- Apply grease to the special tool, vinyl film or tape.

 **99000-25030: SUZUKI SUPER GREASE "A"**



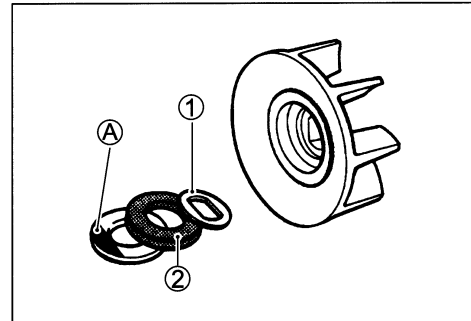
- Install the impeller shaft with the E-ring.
- Remove the special tool, vinyl film or tape.



- Install the washer ① the rubber seal ② into the impeller.
- After wiping off the oily or greasy matter from the mechanical seal ring, install it into the impeller.

**NOTE:**

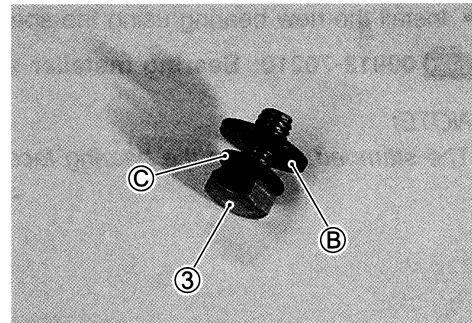
The marked side (A) of the mechanical seal ring faces the impeller.




- Install the seal washer and the washer onto the impeller securing bolt ③.

**NOTE:**

The metal side (B) of the seal washer and the convex side (C) of the washer face the impeller securing bolt head.



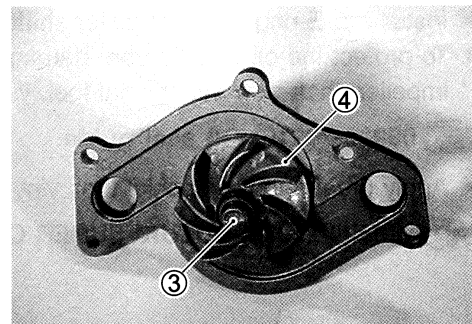
- Install the impeller ④ and its securing bolt ③ onto the shaft.
- Tighten the impeller securing bolt ③ to the specified torque.

 **Impeller securing bolt: 13 N·m (1.3 kgf·m, 9.5 lb-ft)**

**NOTE:**

Before installing the impeller securing bolt, apply a small quantity of the **THREAD LOCK "1342"** to it.

 **99000-32050: THREAD LOCK "1342"**



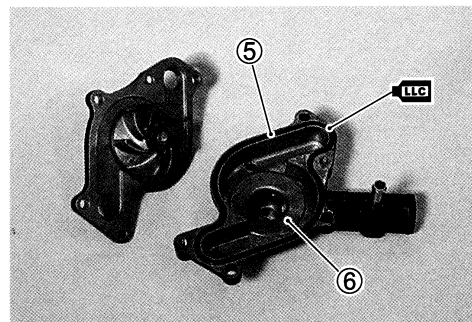
- Install the new O-ring ⑤ onto the water pump cover ⑥.

**▲ CAUTION**

**Use the new O-ring to prevent engine coolant leakage.**

**NOTE:**

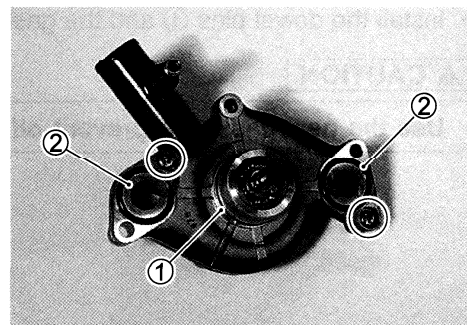
Apply engine coolant to the O-ring ⑤.



- Tighten the water pump cover screws to the specified torque.

 **Water pump cover screw: 4.5 N·m**  
(0.45 kgf·m, 3.3 lb-ft)

- Install the new O-rings ①, ② to the water pump.



**NOTE:**

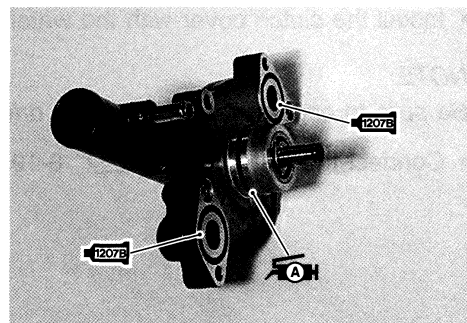
Apply grease to the O-ring ①.

 **99000-25030: SUZUKI SUPER GREASE "A"**

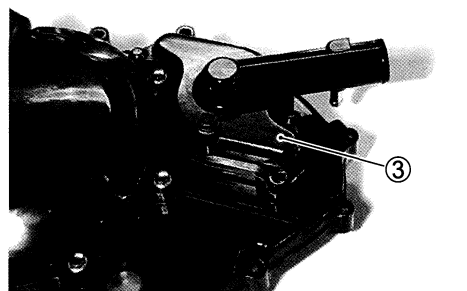
**NOTE:**

Apply SUZUKI BOND "1207B" to the O-rings ②.

 **99104-31140: SUZUKI BOND "1207B"**



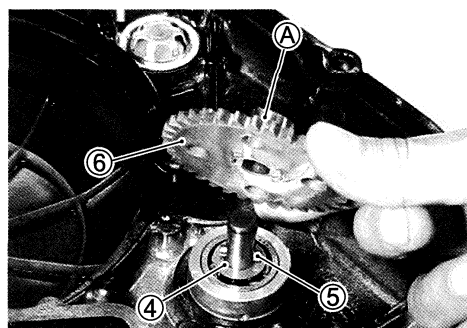
- Install the water pump ③ to the clutch cover.



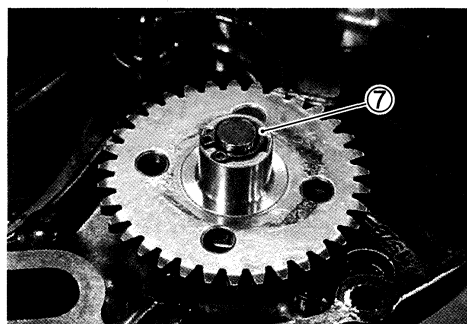
- Install the washer ④, the pin ⑤ and water pump driven gear ⑥.

**NOTE:**

The boss ① of the water pump driven gear ⑥ faces crankcase side.



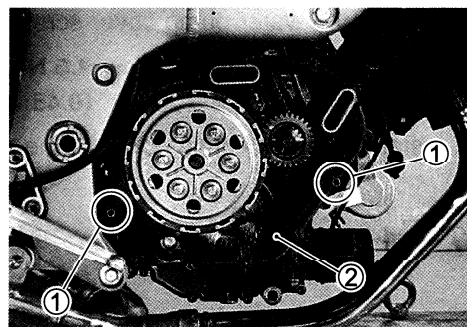
- Install the circlip ⑦.



- Install the dowel pins ① and the gasket ②.

**▲ CAUTION**

Use the new gasket to prevent oil leakage.

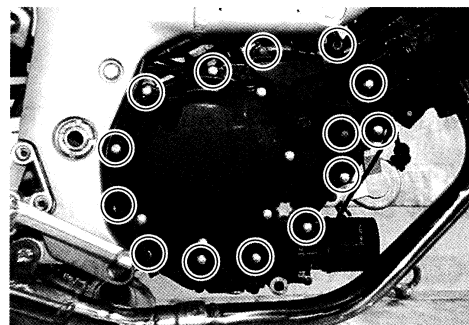


- Install the clutch cover with the water pump. (☞ 3-100)

**NOTE:**

*Be sure to engage the water pump drive and driven gears.*

- Connect the water hoses. (☞ 8-19)



- Pour engine coolant. (☞ 2-18)
- Pour engine oil. (☞ 2-13)

