

## 12. COOLING SYSTEM

---

---

### COOLING SYSTEM

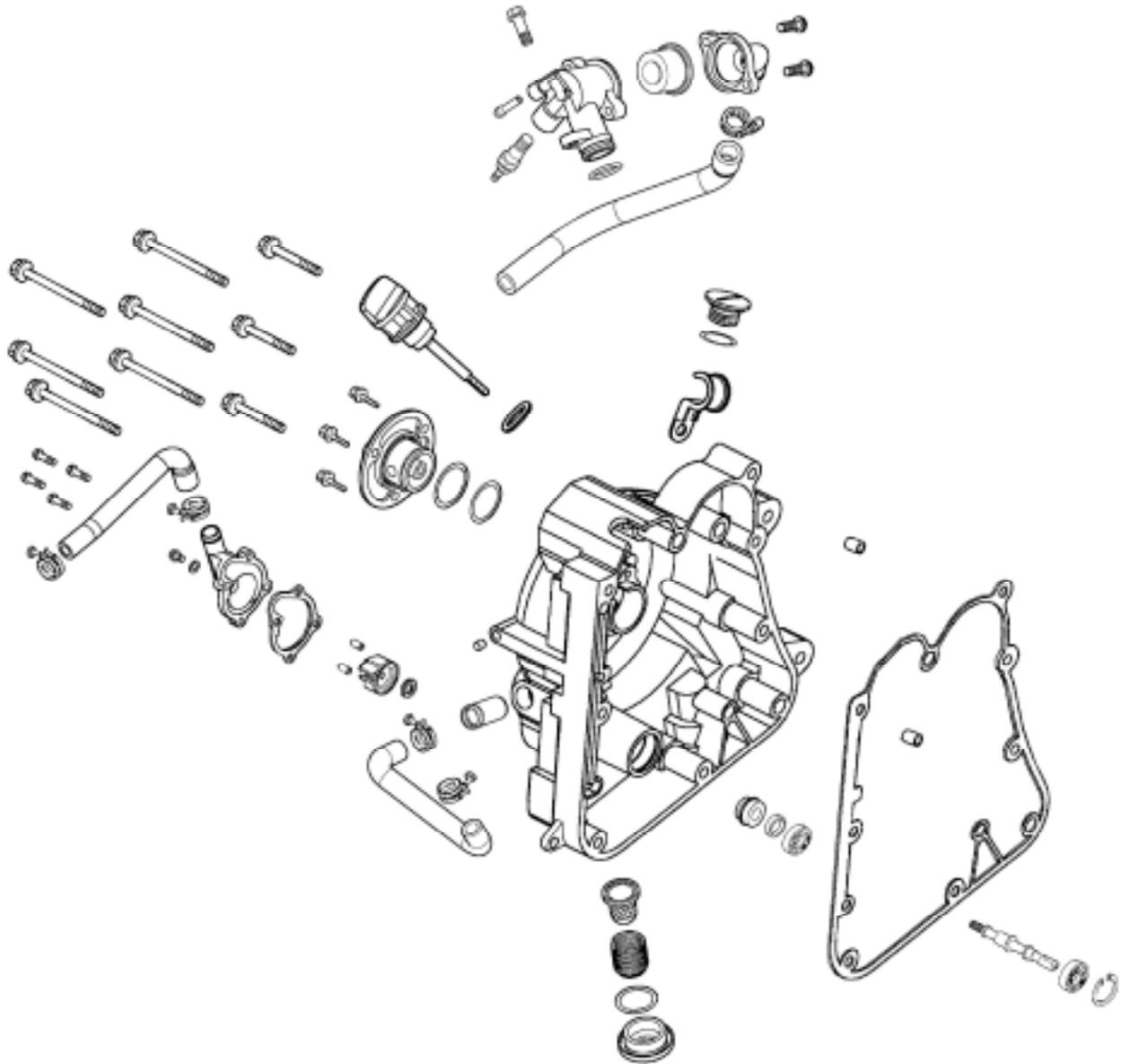
---

SCHEMATIC DRAWING .....	12- 1
SERVICE INFORMATION .....	12- 2
TROUBLESHOOTING .....	12- 2
COOLING SYSTEM TESTING .....	12- 4
RADIATOR .....	12- 4
WATER PUMP .....	12- 9
THERMOSENSOR .....	12-15
THERMOSTAT .....	12-16

## 12. COOLING SYSTEM

---

### SCHEMATIC DRAWING



## 12. COOLING SYSTEM

---

### SERVICE INFORMATION

#### GENERAL INSTRUCTIONS

- The water pump must be serviced after removing the engine. Other cooling system service can be done with the engine installed in the frame.
- The engine must be cool before servicing the cooling system.  
When the coolant temperature is over 100°C, never remove the radiator cap to release the pressure because the boiling coolant may cause danger.
- Avoid spilling coolant on painted surfaces because the coolant will corrode the painted surfaces. Wash off any spilled coolant with fresh water as soon as possible.
- After servicing the system, check for leaks with a cooling system tester.

#### SPECIAL TOOL

Mechanical seal driver

#### TORQUE VALUES

Water pump impeller	9.8_	13.7N-m
Water pump cover bolt	7.8_	11.8N-m

### TROUBLESHOOTING

#### Engine temperature too high

- Faulty temperature gauge or thermosensor
- Faulty radiator cap
- Faulty thermostat
- Insufficient coolant
- Passages blocked in hoses or water jacket
- Clogged radiator fins
- Passages blocked in radiator
- Faulty water pump

#### Temperature gauge pointer does not register the correct coolant temperature

- Faulty temperature gauge or thermosensor
- Faulty thermostat

#### Coolant leaks

- Faulty pump mechanical (water) seal
- Deteriorated O-rings
- Damaged or deteriorated water hoses

# 12. COOLING SYSTEM

## SPECIFICATIONS

Radiator cap relief pressure		0.9±0.15kg/cm	
Thermostat temperature	Begins to open	80±2°C	
	Full-open	90°C	
	Valve lift	3.5_ 4.5mm	
Coolant capacity		Total system 1165cc	Radiator: 825cc Reserve tank: 340cc

## COOLANT GRAVITY

Temp. °C Coolant concentration	0	5	10	15	20	25	30	35	40	45	50
5%	1.009	1.009	1.008	1.008	1.007	1.006	1.005	1.003	1.001	0.009	0.997
10%	1.018	1.107	1.017	1.016	1.015	1.014	0.013	1.011	1.009	1.007	1.005
15%	1.028	1.027	1.026	1.025	1.024	1.022	1.020	1.018	1.016	1.014	1.012
20%	1.036	1.035	1.034	1.033	1.031	1.029	1.027	1.025	1.023	1.021	1.019
25%	1.045	1.044	1.043	1.042	1.040	1.038	1.036	1.034	1.031	1.028	1.025
30%	1.053	1.051	1.051	1.049	1.047	1.045	1.043	1.041	1.038	1.035	1.032
35%	1.063	1.062	1.060	1.058	1.056	1.054	1.052	1.049	1.046	1.043	1.040
40%	1.072	1.070	1.068	1.066	1.064	1.062	1.059	1.056	1.053	1.050	1.047
45%	1.080	1.078	1.076	1.074	1.072	1.069	1.056	1.063	1.062	1.057	1.054
50%	1.086	1.084	1.082	1.080	1.077	1.074	1.071	1.068	1.065	1.062	1.059
55%	1.095	1.093	1.091	1.088	1.085	1.082	1.079	1.076	1.073	1.070	1.067
60%	1.100	1.098	1.095	1.092	1.089	1.086	1.083	1.080	1.077	1.074	1.071

## COOLANT MIXTURE (WITH ANTI-RUST AND ANTI-FREEZING EFFECTS)

Freezing Point	Mixing Rate	KYMCO SIGMA Coolant Concentrate	Distilled Water
-9°C	20%		
-15°C	30%	360cc	825cc
-25°C	40%		
-37°C	50%		
-44.5°C	55%		

### Cautions for Using Coolant:

- Use coolant of specified mixing rate. (The mixing rate of 360cc KYMCO SIGMA coolant concentrate + 825cc distilled water is 30%.)
- Do not mix coolant concentrate of different brands.
- Do not drink the coolant which is poisonous.
- The freezing point of coolant mixture shall be 5°C lower than the freezing point of the riding area.

## 12. COOLING SYSTEM

### COOLING SYSTEM TESTING

#### RADIATOR CAP INSPECTION

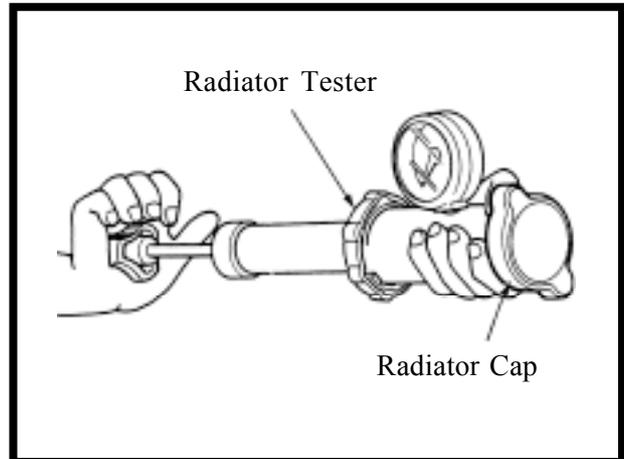
Install the radiator cap onto the radiator tester and apply specified pressure to it. It must hold specified pressure for at least six seconds.

- \* 

Apply water to the cap sealing surface before testing.
--------------------------------------------------------

#### Radiator Cap Relief Pressure:

$0.9 \pm 0.15 \text{ kg/cm}_2$



Install the radiator tester onto the radiator and apply specified pressure to it. It must hold specified pressure for at least six seconds.

Check the water hoses and connectors for leaks.

- \* 

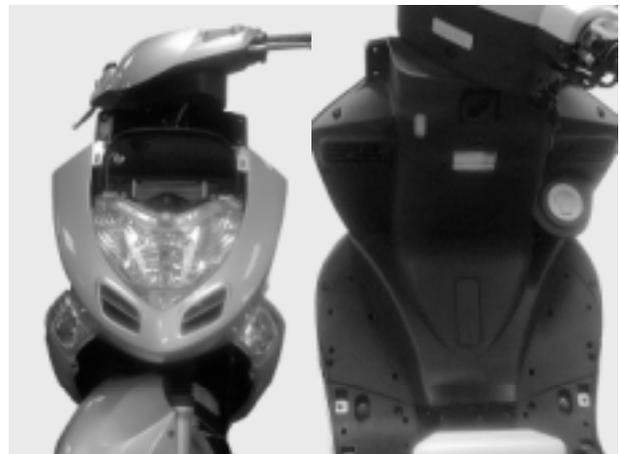
The test pressure should not exceed $1.05 \text{ kg/cm}_2$ . Excessive pressure can damage the radiator and its hose connectors.
----------------------------------------------------------------------------------------------------------------------------------

### RADIATOR

#### RADIATOR INSPECTION

Remove the front upper cover. (⇒2-5)

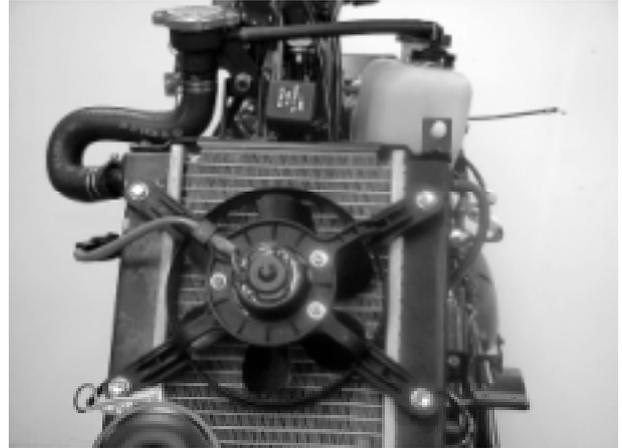
Remove the front lower cover. (⇒2-5)



## 12. COOLING SYSTEM

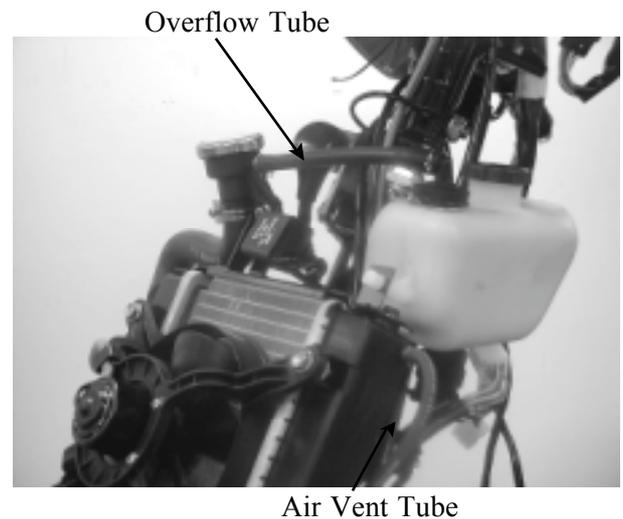
---

Inspect the radiator soldered joints and seams for leaks.  
Blow dirt out from between core fins with compressed air. If insects, etc., are clogging the radiator, wash them off.  
Carefully straighten any bent fins.

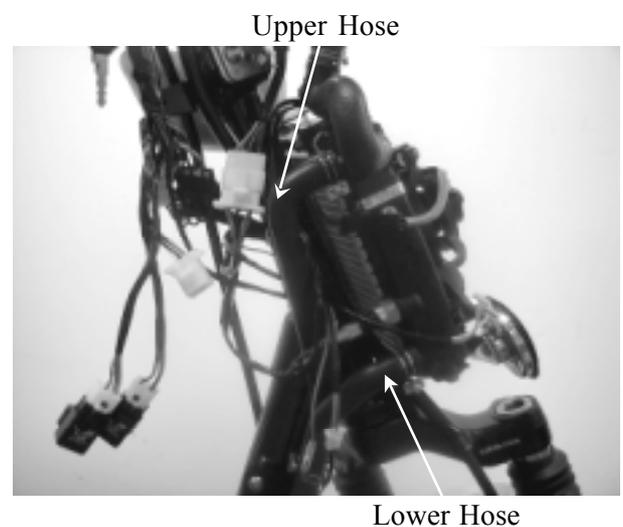


### **RADIATOR REMOVAL**

Drain the coolant. (⇒3-9)  
Disconnect the air vent tube from the radiator filler.  
Remove the overflow tube clamp and disconnect the overflow tube.



Loosen the hose band and disconnect the upper hose and lower hose from the radiator.



## 12. COOLING SYSTEM

Disconnect the thermostatic switch wire coupler.  
Disconnect the fan motor wire coupler.

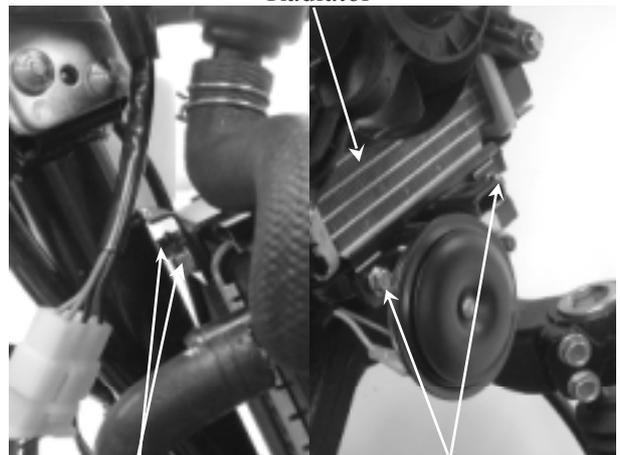
Fan Motor Wire Coupler    Thermostatic Switch



Thermostatic Switch Wire

Remove the two bolts and two nuts on the radiator.

Radiator



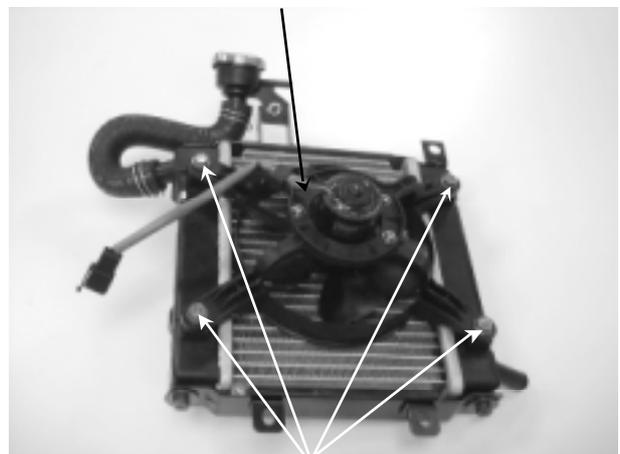
Nuts

Bolts

### **RADIATOR DISASSEMBLY**

Remove the four bolts and then remove the fan/shroud from the radiator.

Fan/Shroud

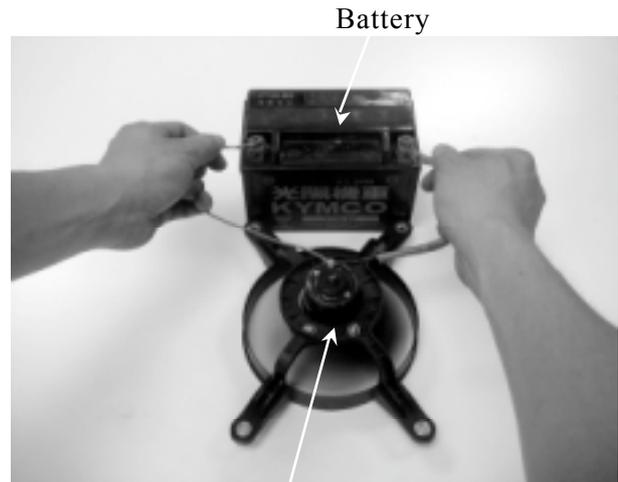


Bolts

## 12. COOLING SYSTEM

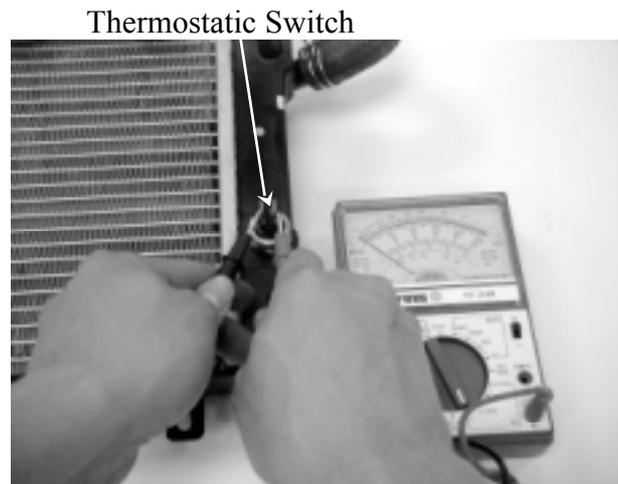
---

Check fan motor by battery.



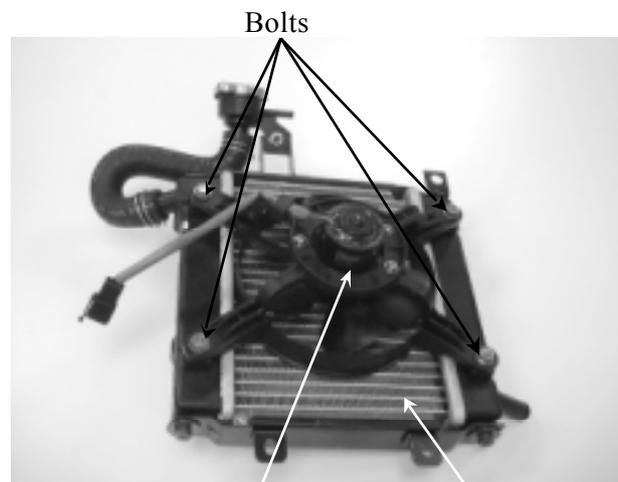
Fan Motor

**CHECK THERMOSTATIC SWITCH**  
When coolant temperature lower than  $85\sim 90^{\circ}\text{C}$  the thermostatic switch OFF.  
When coolant temperature over  $85\sim 90^{\circ}\text{C}$  the thermostatic switch ON.



Thermostatic Switch

Install the fan shroud on the radiator with the four bolts.



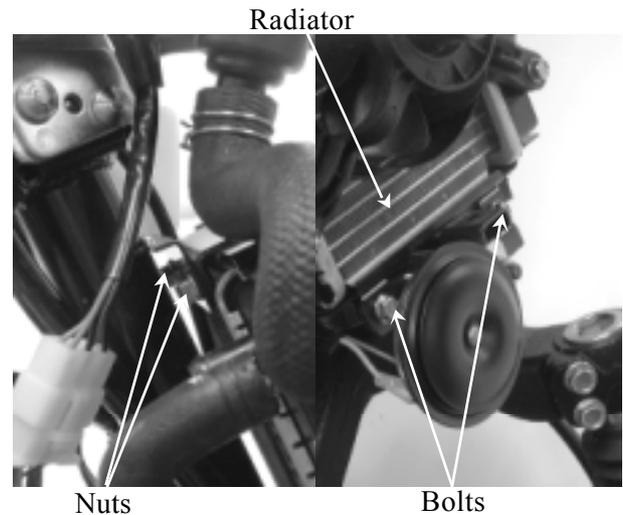
Fan Shroud

Radiator

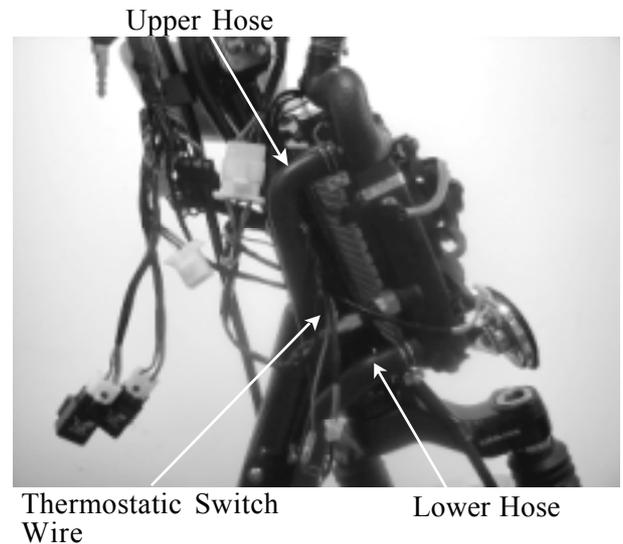
## 12. COOLING SYSTEM

### RADIATOR INSTALLATION

Install the radiator on the radiator bracket with the two bolts and two nuts.



Connect the upper and lower hoses and secure them with hose bands. Connect the thermostatic switch wire and fan motor wire couplers.

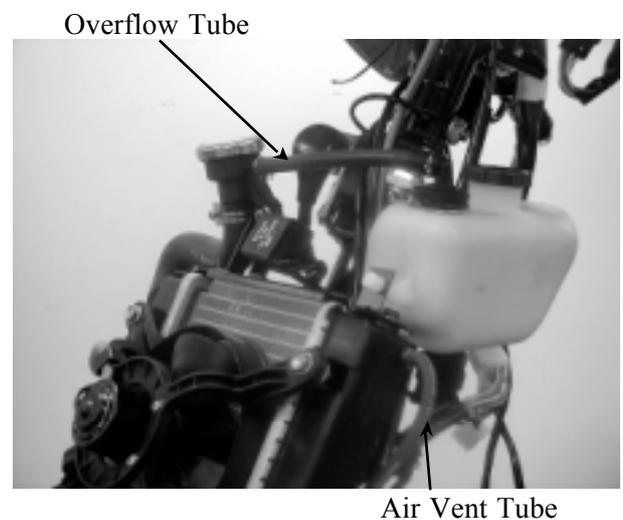


Connect the overflow tube and secure with the tube clamp. Fill the radiator with coolant. (⇒3-9) Connect the vent tube to the radiator filler. After installation, check for coolant leaks.

**\***

If you want to refill the coolant, the following procedure must be checked.

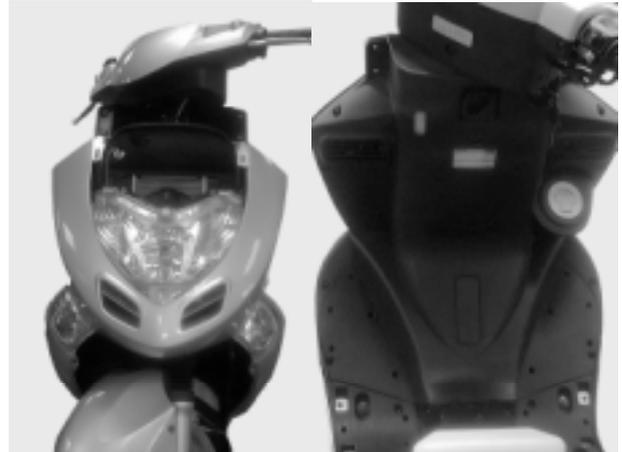
1. Please make the radiator filler and the air vent tube to be separated.
2. Then start the engine, filled in the coolant till the coolant flowed out from the air vent tube.
3. Put the air vent tube on.



## 12. COOLING SYSTEM

---

Install the front upper cover.

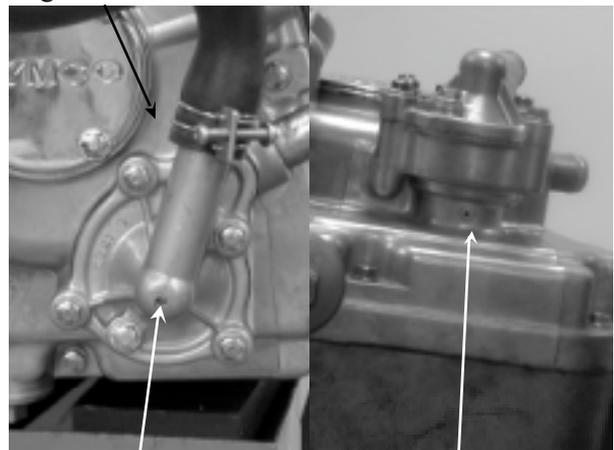


### **WATER PUMP**

#### **MECHANICAL SEAL (WATER SEAL) INSPECTION**

Inspect the telltale hole for signs of mechanical seal coolant leakage. If the mechanical seal is leaking, remove the right crankcase cover and replace the mechanical seal.

Right Crankcase Cover

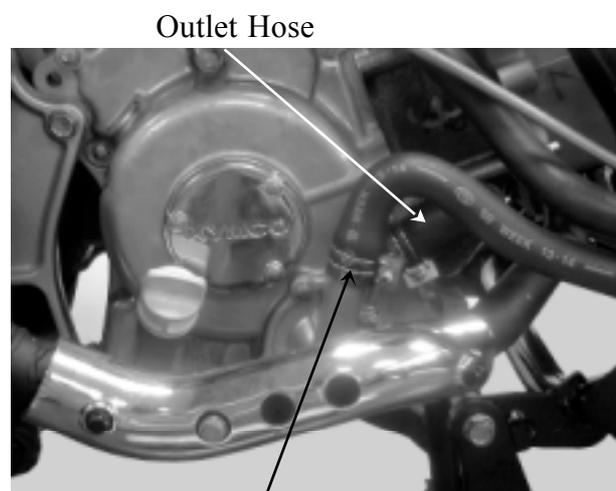


Water Pump

Telltale Hole

### **WATER PUMP/IMPELLER REMOVAL**

Remove the coolant inlet hose and outlet hose.

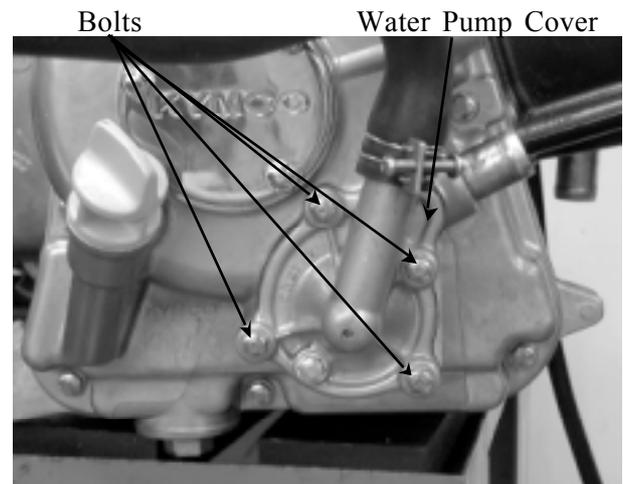


Outlet Hose

Inlet Hose

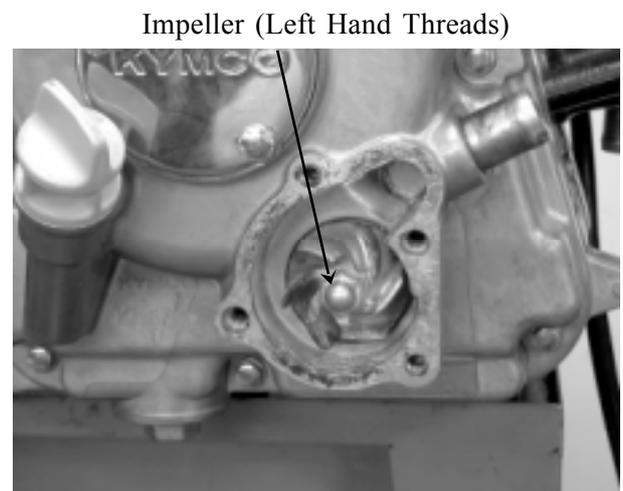
## 12. COOLING SYSTEM

Remove the four bolts and the water pump cover, gasket and 2 dowel pins.



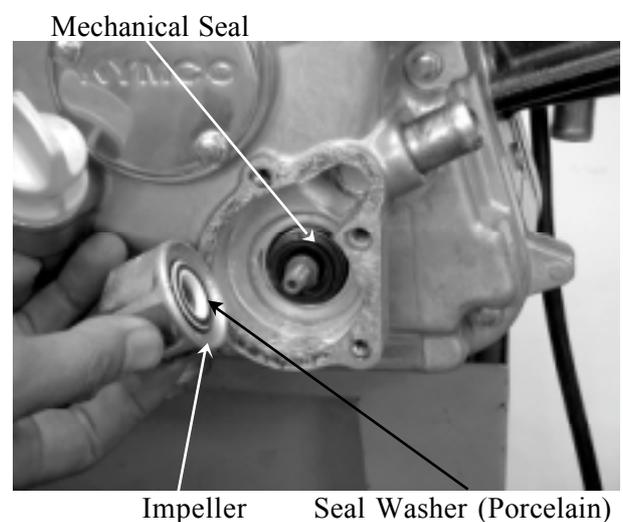
Remove the water pump impeller.

\* The impeller has left hand threads.



Inspect the mechanical (water) seal and seal washer for wear or damage.

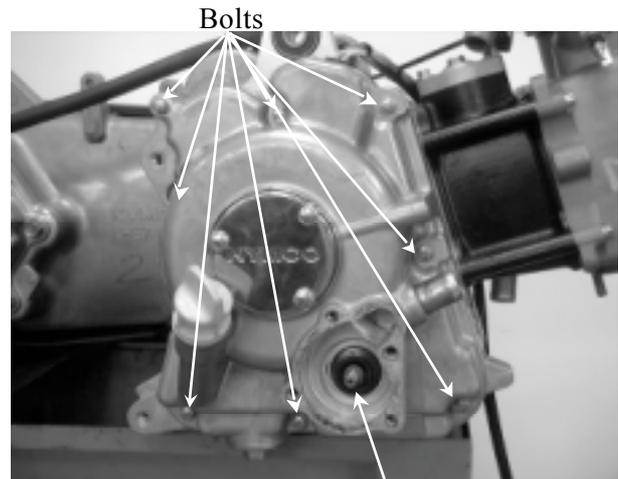
\* The mechanical seal and seal washer must be replaced as a set.



## 12. COOLING SYSTEM

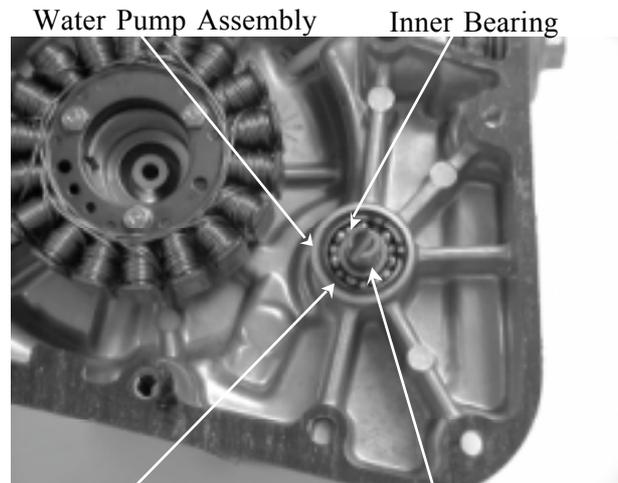
### WATER PUMP SHAFT REMOVAL

Disconnect the water hose from the right crankcase cover.  
Remove the eight bolts attaching the right crankcase cover.



Water Pump Assembly

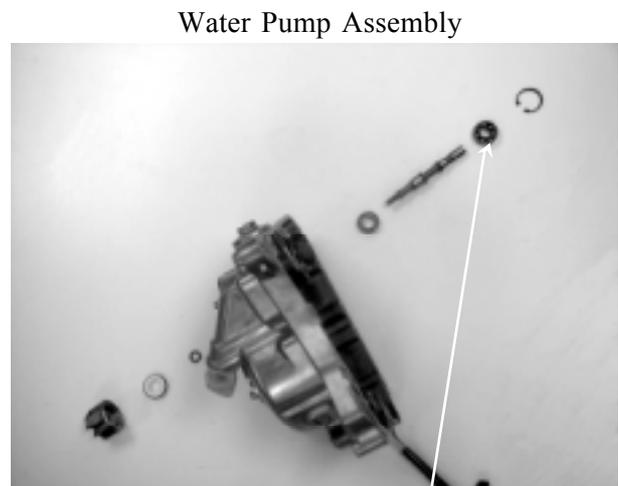
Remove the water pump bearing snap ring from the water pump assembly.  
Remove the water pump shaft and inner bearing.



Snap Ring

Water Pump Shaft

Remove the water pump shaft outer bearing.



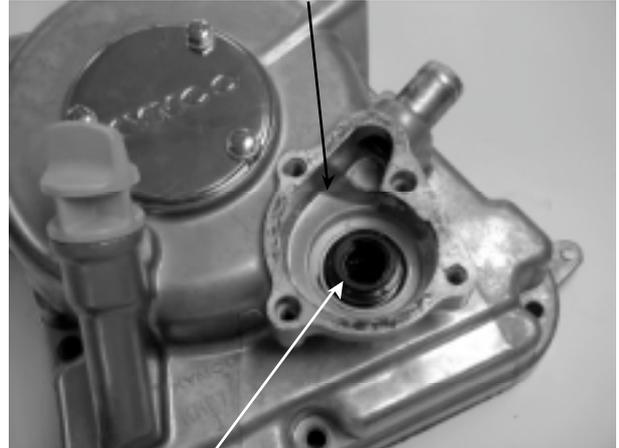
Inner Bearing

## 12. COOLING SYSTEM

### MECHANICAL SEAL REPLACEMENT

Drive the mechanical seal out of the water pump assembly from the inside.

Water Pump Assembly



Mechanical Seal (Water Seal)

Drive in a new mechanical seal using a mechanical seal driver.

- \* Apply sealant to the right crankcase cover fitting surface of a new mechanical seal and then drive in the mechanical seal.

Mechanical Seal Driver



Outer Bearing



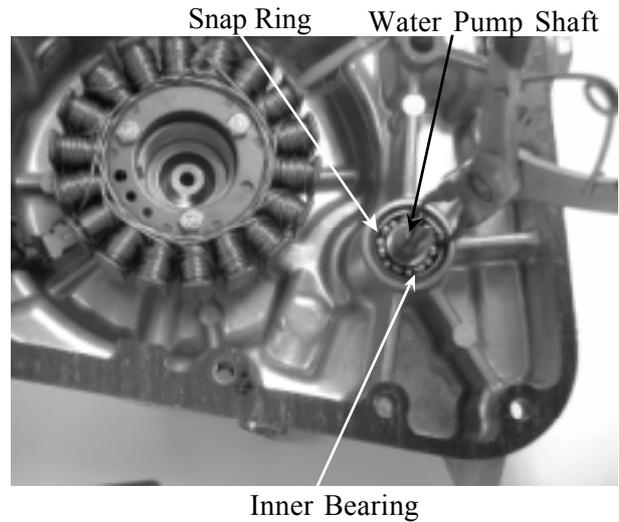
Water Pump Assembly

### WATER PUMP SHAFT INSTALLATION

Drive a new water pump shaft outer bearing into the water pump assembly from the inside.

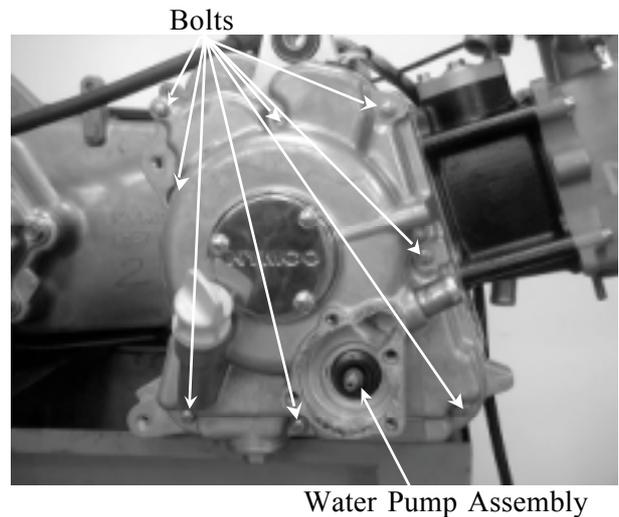
## 12. COOLING SYSTEM

Install the water pump shaft and shaft inner bearing into the water pump assembly. Install the snap ring to secure the inner bearing properly.



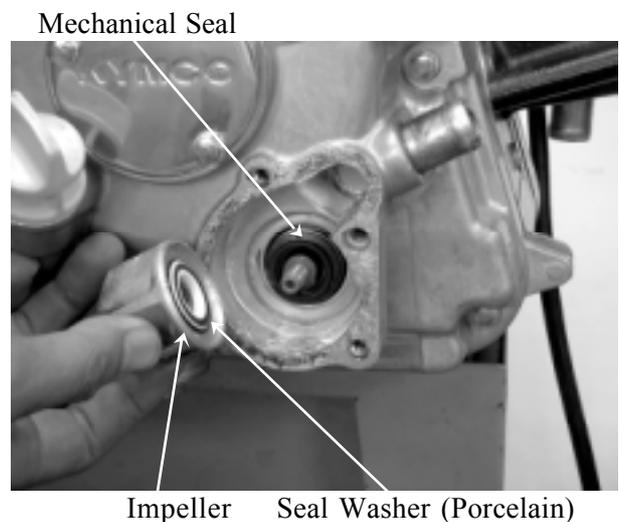
Install the dowel pins and a new gasket and then install the water pump assembly to the right crankcase cover. Tighten the eight bolts to secure the right crankcase cover.

\* When installing the water pump assembly, aligning the groove on the water pump shaft with the tab on the oil pump shaft.



### WATER PUMP/IMPELLER INSTALLATION

When the mechanical seal is replaced, a new seal washer must be installed to the impeller.



## 12. COOLING SYSTEM

Install the impeller onto the water pump shaft.

**Torque:** 9.8\_ 13.7N-m

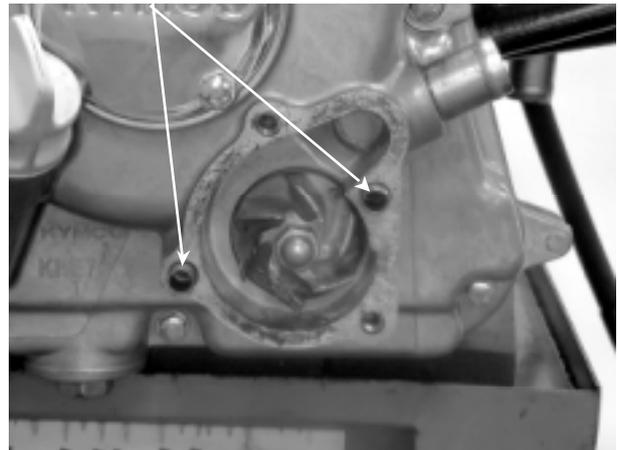
\* The impeller has left hand threads.

Impeller (Left Hand Threads)



Install the two dowel pins and a new gasket.

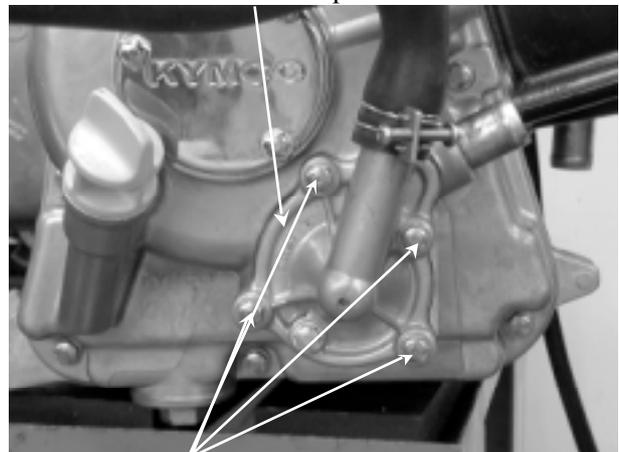
Dowel Pins



Install the water pump cover and tighten the 4 bolts.

**Torque:** 7.8\_ 11.8N-m

Water Pump Cover



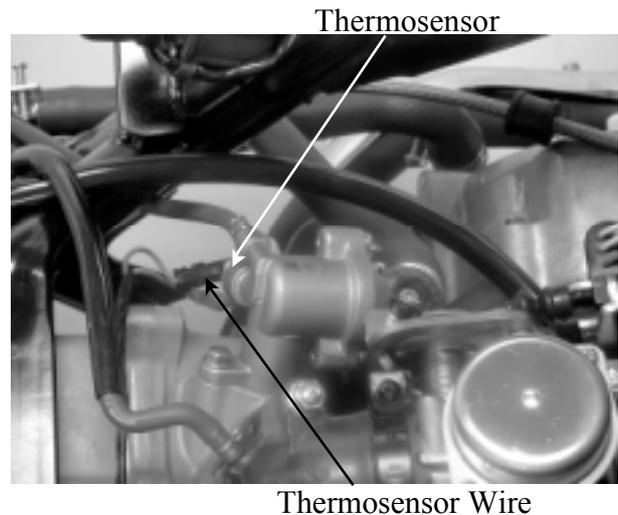
Bolt

# 12. COOLING SYSTEM

## THERMOSENSOR

### THERMOSENSOR REMOVAL

Remove the seat, met-in box and center cover.  
 Drain the coolant.  
 Disconnect the thermosensor wire.  
 Remove the thermosensor.

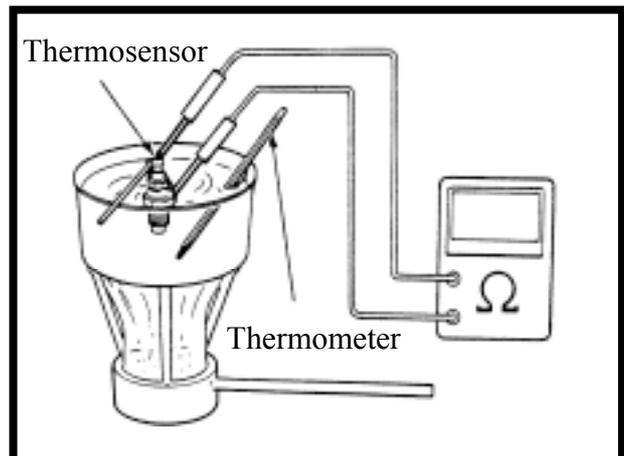


Thermosensor Wire

### THERMOSENSOR INSPECTION

Suspend the thermosensor in a pan of water over a burner and measure the resistance through the sensor as the water heats up.

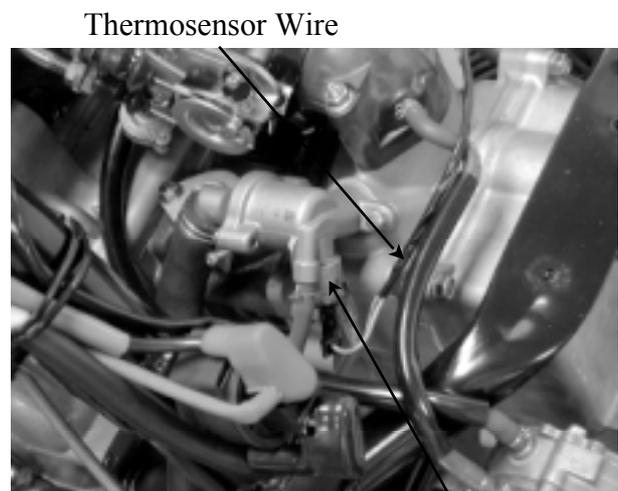
Temperature(°C)	50	80	100	120
Resistance(Ω)	154	52	27	16



### THERMOSENSOR INSTALLATION

Apply 3-BOND No. 1212 sealant or equivalent to the thermosensor threads and install it into the thermostat housing.  
 Connect the thermosensor wire.  
 Fill the radiator with coolant. (⇒3-9)  
 Install the center cover, met-in box and seat. (⇒2-3)

\* Be sure to bleed air from the cooling system.



Thermosensor

## 12. COOLING SYSTEM

### THERMOSTAT

#### THERMOSTAT REMOVAL

Remove the seat, met-in box and center cover.

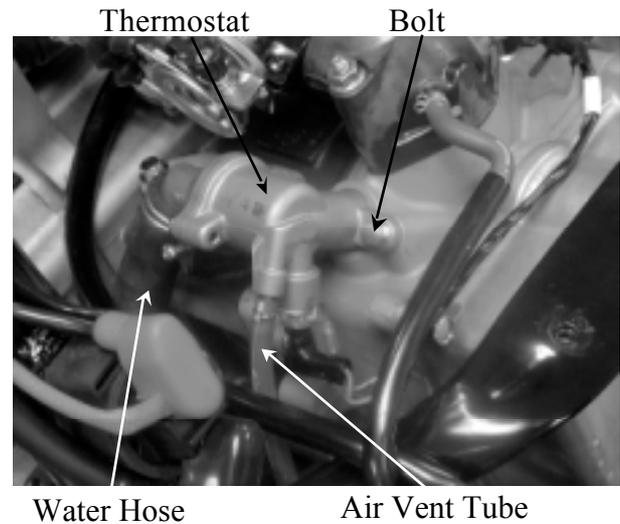
Drain the coolant.

Disconnect the thermosensor wire from the thermosensor.

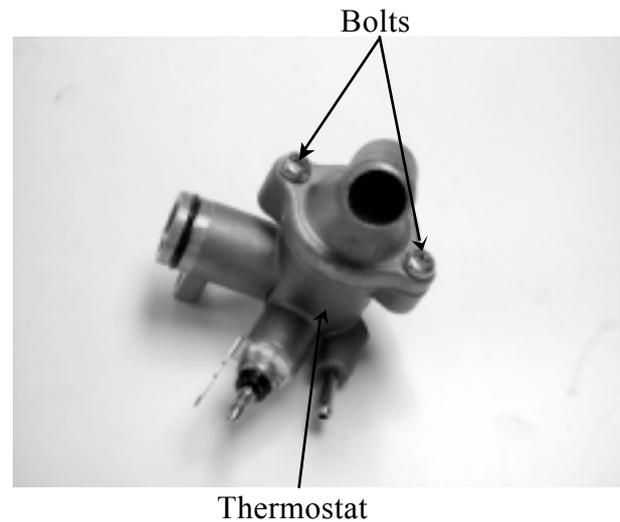
Disconnect the water hose from the thermostat housing.

Disconnect the air vent tube from the thermostat housing.

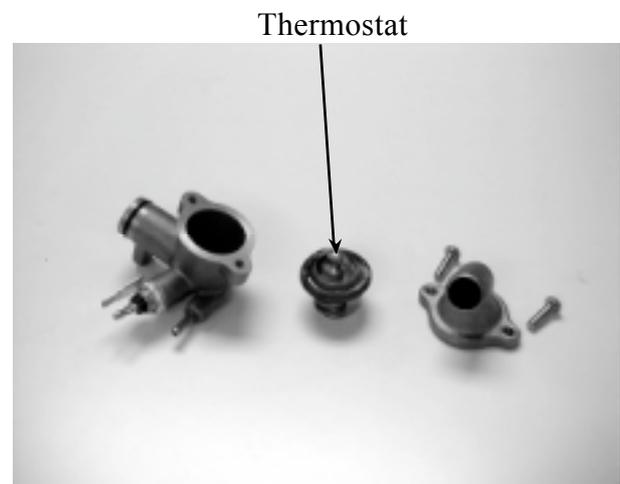
Remove the mounting bolt and the thermostat housing from the cylinder head.



Remove the two bolts and separate the thermostat housing halves.



Remove the thermostat from the thermostat housing.



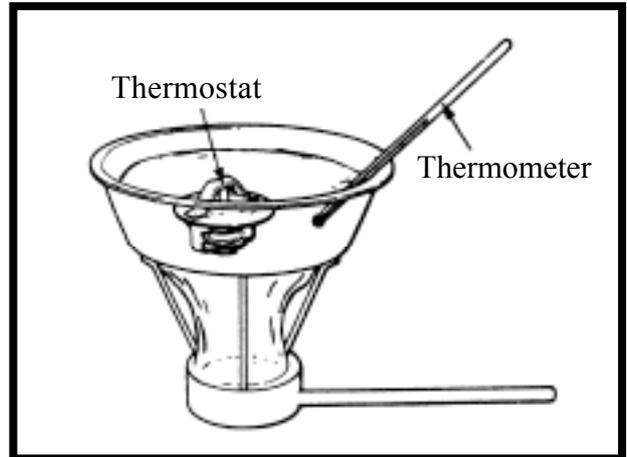
# 12. COOLING SYSTEM

## THERMOSTAT INSPECTION

Suspend the thermostat in a pan of water over a burner and gradually raise the water temperature to check its operation.

### Technical Data

Begins to open	80±2°C
Full-open	90°C
Valve lift	3.5_ 4.5mm

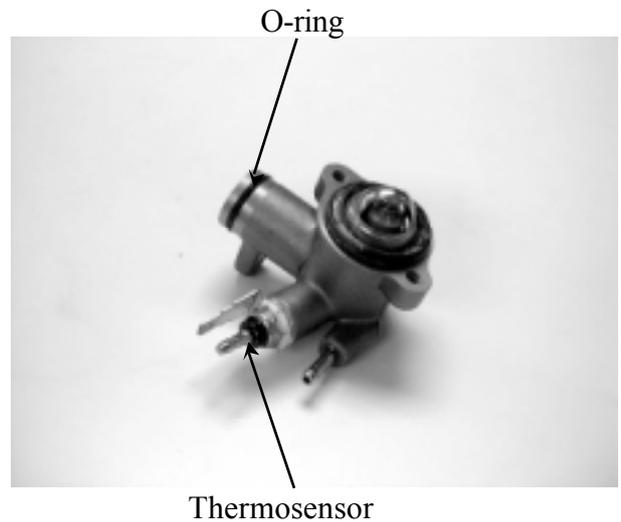


- \* Do not let the thermostat touch the pan as it will give a false reading.
- \* Replace the thermostat if the valve stays open at room temperature.
- \* Test the thermostat after it is opened for about 5 minutes and holds the temperature at 70°C .

## THERMOSTAT INSTALLATION

The installation sequence is the reverse of removal.

- \* Replace the O-ring with a new one and apply grease to it.



Fill the cooling system with the specified coolant. (⇒3-9)

