

## **12. COOLING SYSTEM**

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### **COOLING SYSTEM**

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### 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	1.2 kgf-m (12 Nm, 8.6 lbf-ft)
Water pump cover bolt	1 kgf-m (10 Nm, 7.2 lbf-ft)

### 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

#### Coolant leaks

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

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

- Faulty temperature gauge or thermosensor
- Faulty thermostat

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### SPECIFICATIONS

Radiator cap relief pressure		0.75~1.05 kgf/cm <sup>2</sup> (75~105 kPa, 10.65~14.91 psi)	
Thermostat temperature	Begins to open	80±2°C	
	Full-open	90°C	
	Valve lift	3.5~4.5 mm (0.14~0.18 in)	
Coolant capacity		Total system 1400±20cc	Radiator: 1100±20cc Reserve tank: 300±20cc

### 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%	425cc	975cc
-25°C	40%		
-37°C	50%		
-44.5°C	55%		

#### Cautions for Using Coolant:

- Use coolant of specified mixing rate. (The mixing rate of 425cc KYMCO SIGMA coolant concentrate + 975cc 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.

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### COOLING SYSTEM TESTING

#### RADIATOR CAP INSPECTION

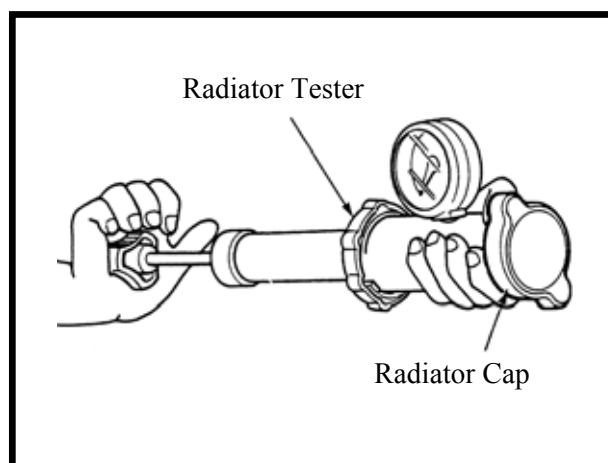
Install the radiator cap onto the radiator tester and apply specified pressure to it. It must hold specified pressure for at least six seconds.

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

#### Radiator Cap Relief Pressure:

0.75~1.05 kgf/cm<sup>2</sup>

(75~105 kPa, 10.65~14.91 psi)



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 kg/cm<sup>2</sup> (105kPa, 14.91 psi). Excessive pressure can damage the radiator and its hose connectors.

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### RADIATOR

#### RADIATOR INSPECTION

Remove the front fender. (⇒ 2-8)

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.



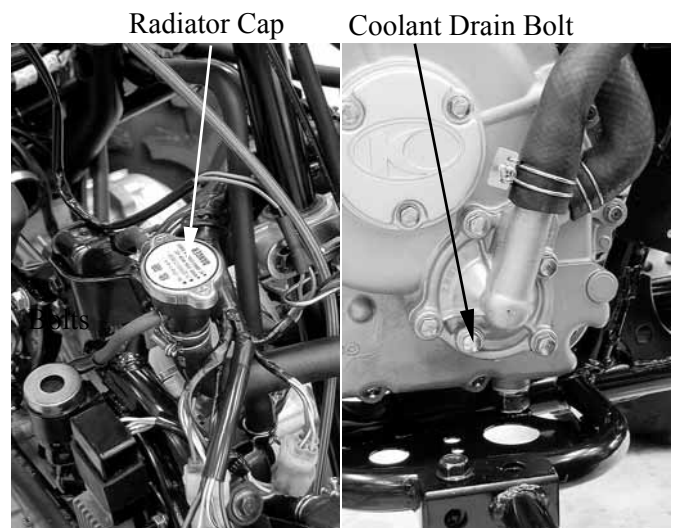
Radiator

#### RADIATOR REMOVAL

Remove the front fender. (⇒2-8)

Remove the radiator cap.

Remove the drain bolt and drain the coolant from the system.



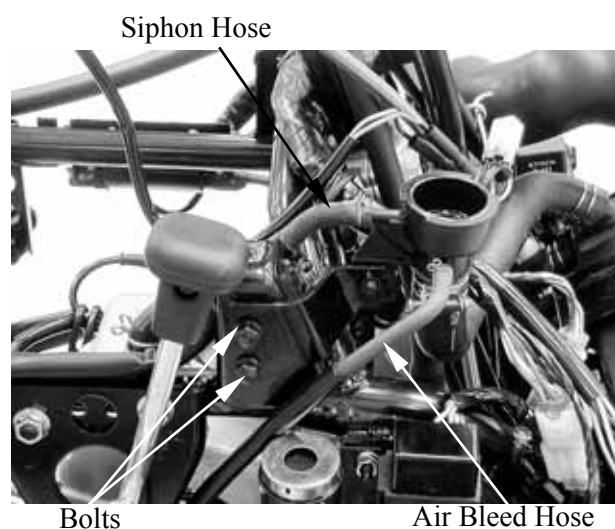
Radiator Cap

Coolant Drain Bolt

Disconnect the air bleed hose from the radiator filler.

Remove the siphon hose clamp and disconnect the siphon hose.

Remove the two bolts from filler neck hold plate.



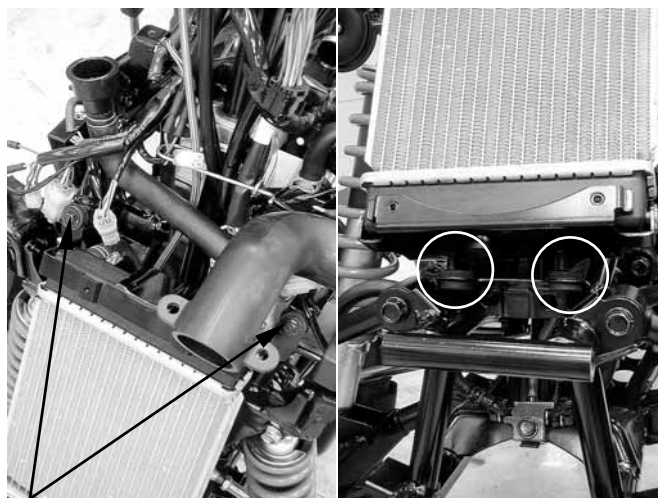
Siphon Hose

Bolts

Air Bleed Hose

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Remove the two bolts on the radiator.  
Pull radiator forward and raise the radiator from frame.



Bolts

Disconnect the thermostatic switch wire connectors.

Disconnect the fan motor connector.

Loosen the hose bands and disconnect the coolant hoses from the radiator.

Fan Motor Connector      Radiator Hoses



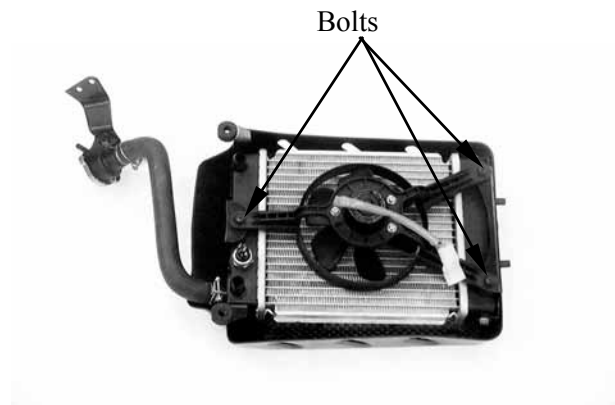
Thermostatic Switch Connector

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### RADIATOR DISASSEMBLY

Remove the three bolts and then remove the fan shroud from the radiator.

Check fan motor by battery.

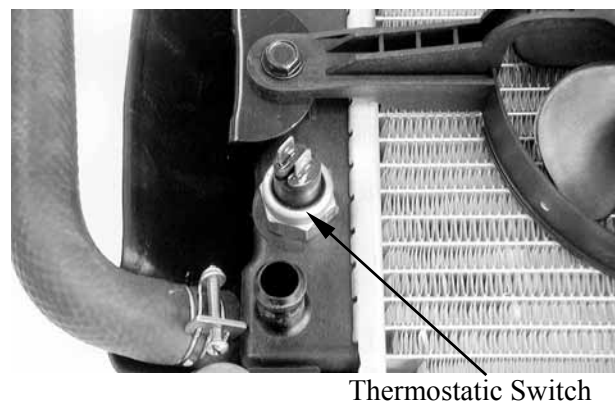


### CHECK THERMOSTATIC SWITCH

When coolant temperature lower then 85~90°C the thermostatic switch OFF.  
When coolant temperature over 85~90°C the thermostatic switch ON.

### RADIATOR ASSEMBLY

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



### RADIATOR INSTALLATION

Reverse the "RADIATOR REMOVAL" procedures.

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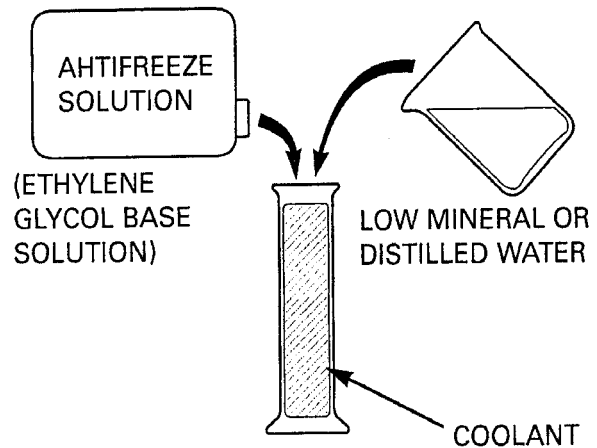
### COOLANT REPLACEMENT PREPARATION

- The effectiveness of coolant decreases with the accumulation of rust or if there is a change in the mixing proportion during usage. Therefore, for best performance change the coolant regularly as specified in the maintenance schedule.
- Mix only distilled, low mineral water with the antifreeze.

Mix only distilled, low mineral water with the antifreeze.

#### Recommended mixture:

1:1 (Distilled water and antifreeze)

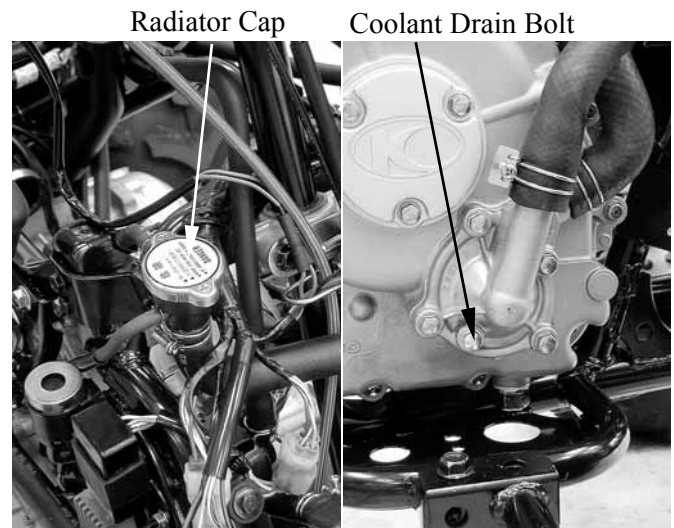


### REPLACEMENT/AIR BLEEDING

- \* When filling the system or reserve tank with coolant (checking the coolant level), place the vehicle in a vertical position on a flat, level surface.

Remove the radiator cap.

Remove the drain bolt and drain the coolant from the system.



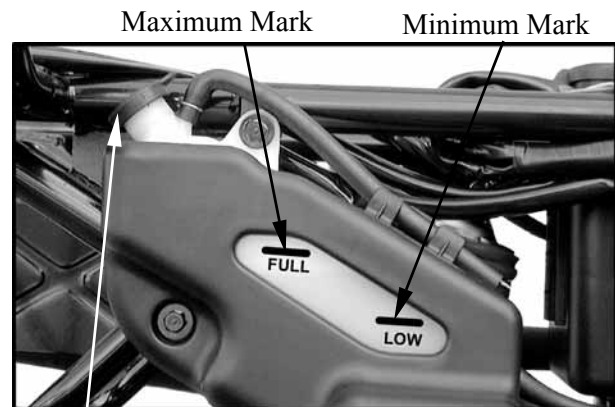


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Remove the reserve tank cap and drain the coolant from the reserve tank.

Reinstall the drain bolt with the new sealing washer securely.

Place the vehicle on a flat, level surface.  
Fill the reserve tank to the upper level line.



Coolant Reservoir Cap

Fill the system with the recommended coolant through the filler opening up to the filler neck.



Bleed air from the system as follow:

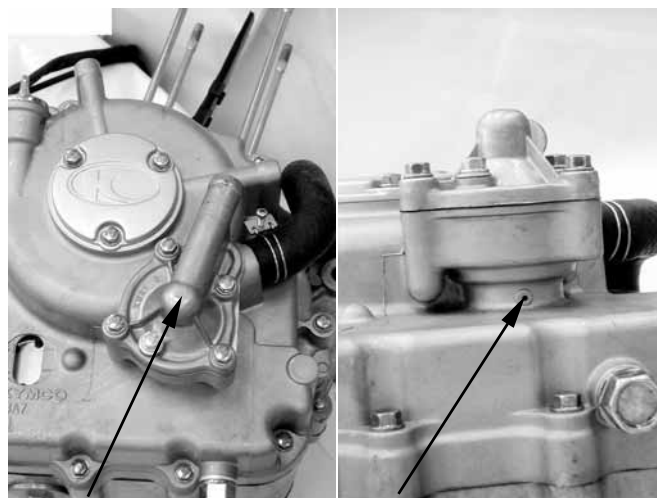
1. Start the engine and let it idle for 2 – 3 minutes.
2. Snap the throttle three to four times to bleed air from the system.
3. Stop the engine and add coolant to the proper level if necessary. Reinstall the radiator cap.
4. Check the level of coolant in the reserve tank and fill to the upper level if it is low.

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### 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.



Water Pump

Telltale Hole

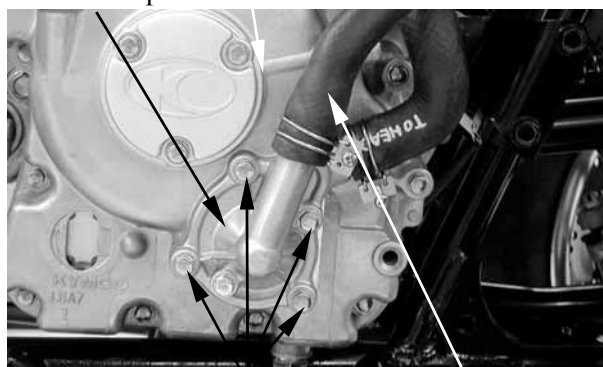
#### WATER PUMP/IMPELLER REMOVAL

Drain the coolant. (⇒12-7)

Loosen the screw and disconnect the coolant inlet hose.

Remove the four bolts and the water pump cover.

Water Pump Cover



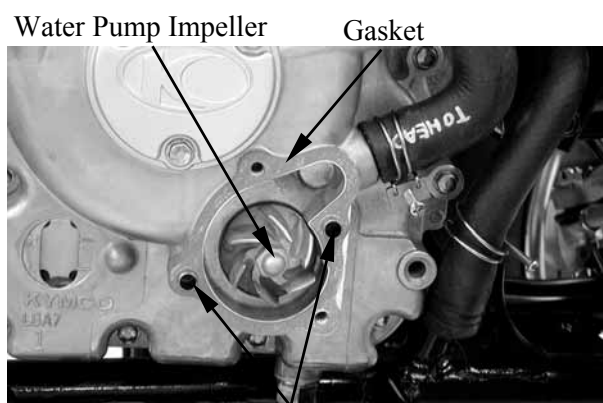
Bolts

Inlet Hose

Remove the gasket and 2 dowel pins

Remove the water pump impeller, washer and seal washer (porcelain).

\* The impeller has left hand threads.

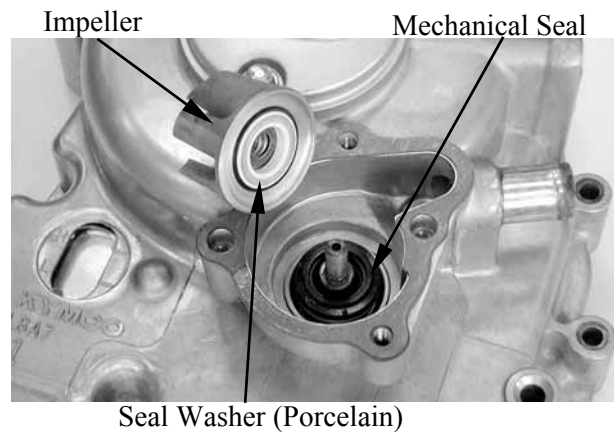


Dowel Pins

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

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

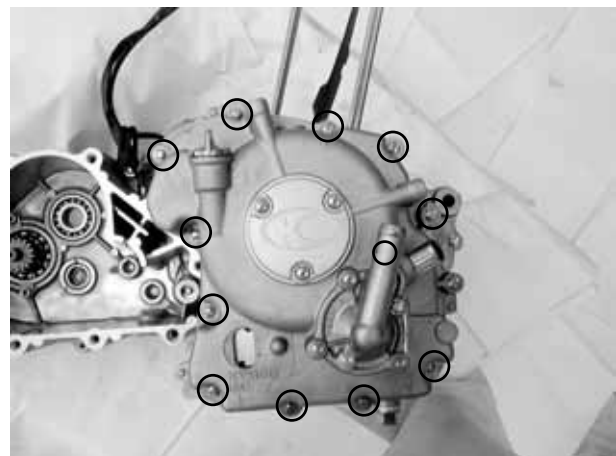


### WATER PUMP SHAFT REMOVAL

Remove the water pump impeller. (⇒12-9)

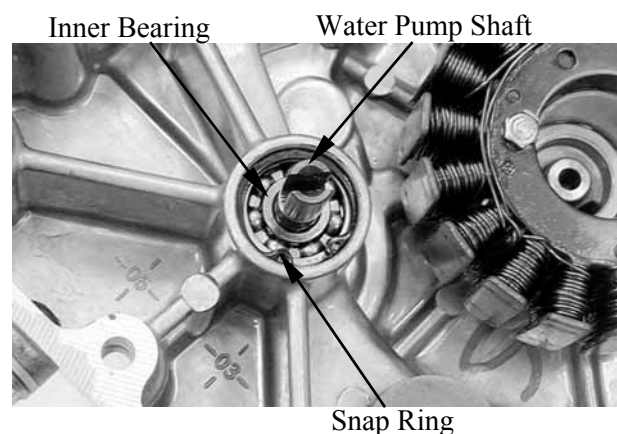
Disconnect the water hose from the right crankcase cover.

Remove the twelve bolts attaching the right crankcase cover.



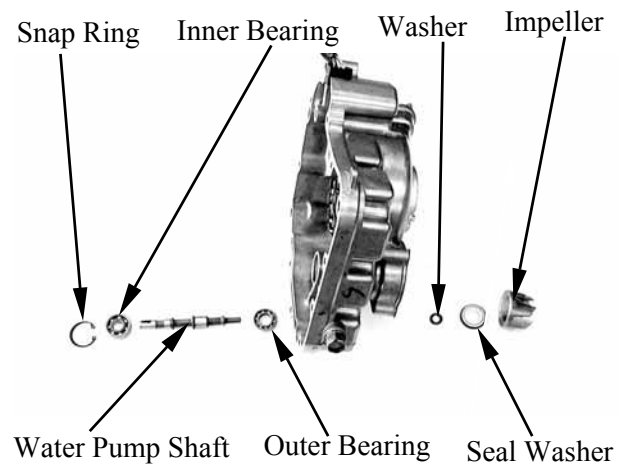
Remove the water pump bearing snap ring from the water pump assembly.

Remove the water pump shaft and inner bearing.



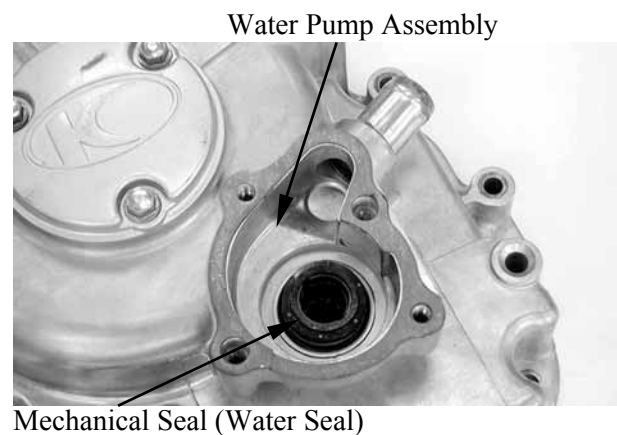
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Remove the water pump shaft outer bearing.



### MECHANICAL SEAL REPLACEMENT

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



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.

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### WATER PUMP SHAFT INSTALLATION

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

Outer Bearing



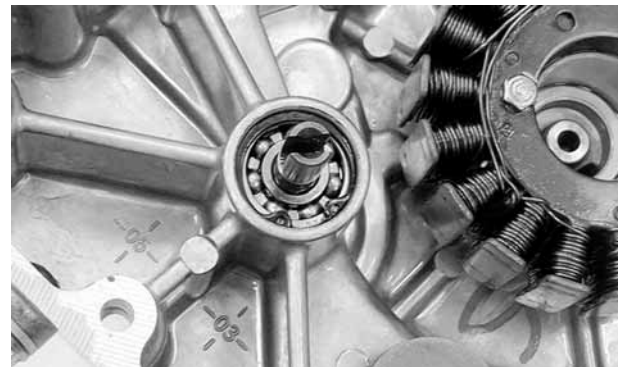
Water Pump Assembly

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 twelve 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.

Install the impeller onto the water pump shaft.

**Torque:** 1.2 kgf-m (12 Nm, 8.64 lbf-ft)

\* The impeller has left hand threads.

Install the two dowel pins and a new gasket. Install the water pump cover and tighten the four bolts.

**Torque:** 1 kgf-m (10 Nm, 7.2 lbf-ft)



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### THERMOSENSOR

#### THERMOSENSOR REMOVAL

Drain the coolant. (⇒12-7)  
 Disconnect the thermosensor wire.  
 Remove the thermosensor from the thermostat.



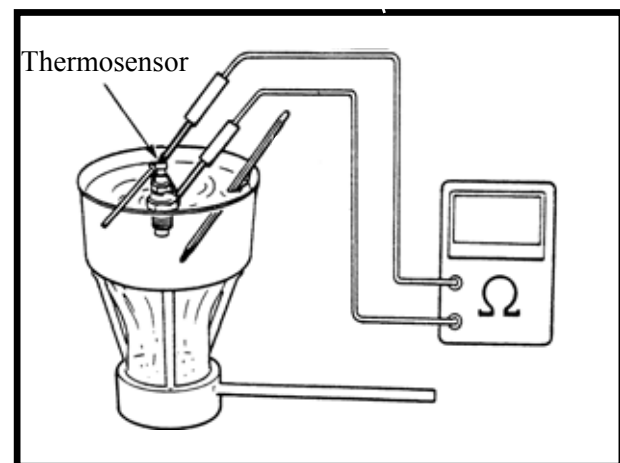
Thermosensor

Thermosensor Connector

#### 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. (⇒12-7)

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

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### THERMOSTAT

#### THERMOSTAT REMOVAL

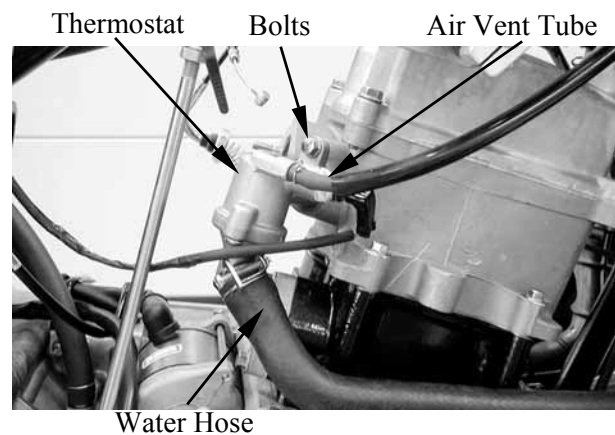
Drain the coolant. (⇒12-7)

Disconnect the thermosensor wire from the thermosensor.

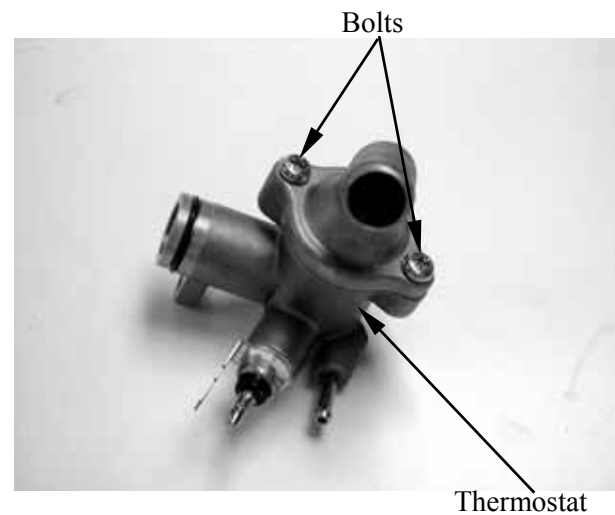
Disconnect the water hose from the thermostat housing.

Disconnect the air vent tube from the thermostat housing.

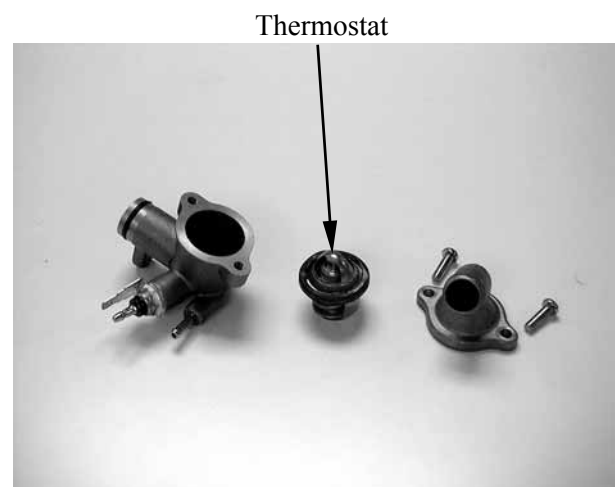
Remove the mounting bolt and the thermostat housing from the cylinder head.



Remove the two screws and separate the thermostat housing halves.



Remove the thermostat from the thermostat housing.



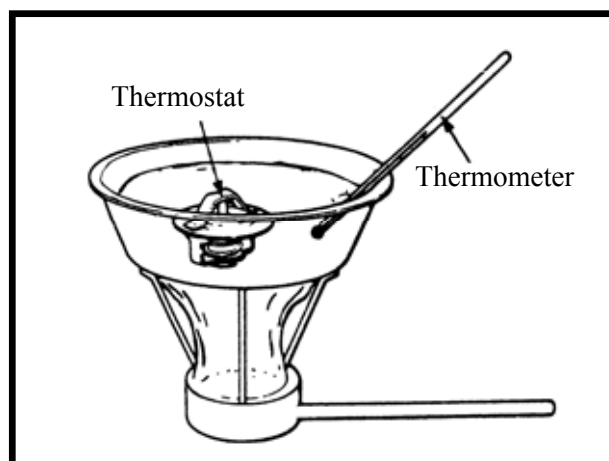
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### THERMOSTAT INSPECTION

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	$80 \pm 2^{\circ}\text{C}$
Full-open	$90^{\circ}\text{C}$
Valve lift	3.5~4.5 mm

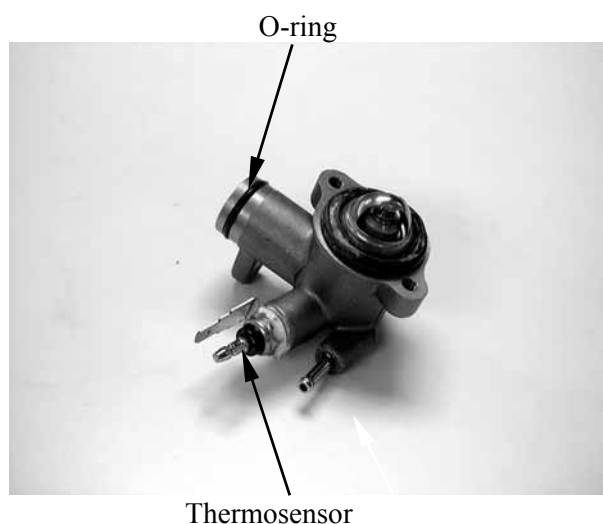


- \* Do not let the thermostat touch the pan as it will give a false reading.
- \* Replace the thermostat if the valve stays open at room temperature.
- \* Test the thermostat after it is opened for about 5 minutes and holds the temperature at  $70^{\circ}\text{C}$ .

### 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. (⇒12-7)