

6. COOLING SYSTEM

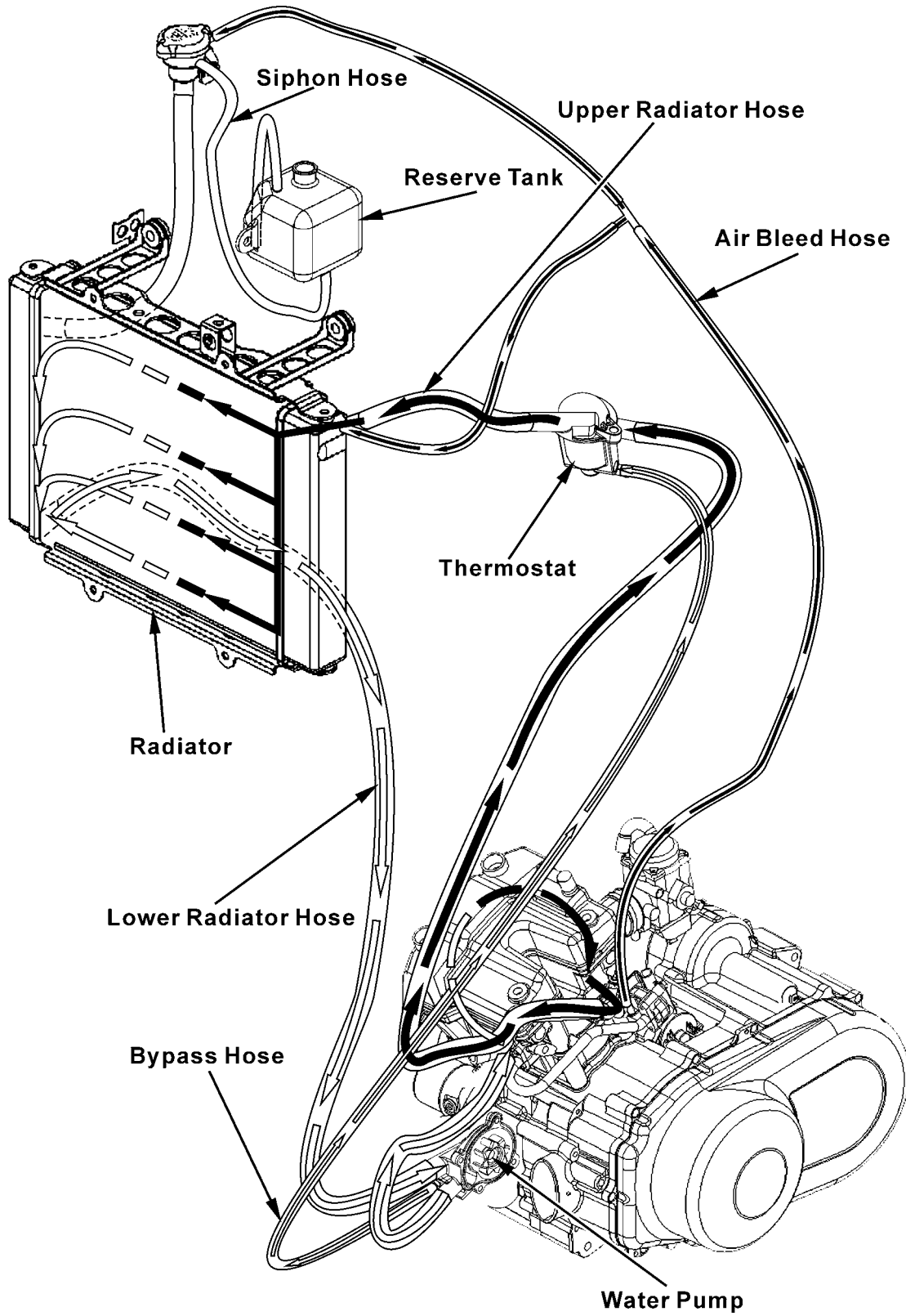
COOLING SYSTEM



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SYSTEM FLOW PATTERN



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SERVICE INFORMATION

GENERAL INSTRUCTIONS

WARNING:

Removing the radiator cap while the engine is hot can allow the coolant to spray out, seriously scalding you. Always let the engine and radiator cool down before removing the radiator cap.

CAUTION:

Radiator coolant is toxic. Keep it away from eyes, mouth, skin and clothes.

- If any coolant gets in your eyes, rinse them with water and consult a physician immediately.
- If any coolant is swallowed, induce vomiting, gargle and consult a physician immediately.
- If any coolant gets on your skin or clothes, rinse thoroughly with plenty of water.

NOTE:

Use coolant with silicate inhibitors may cause premature wear of water pump seals or blockage of radiator passages. Using tap water may cause engine damage.

- This section covers service of the cooling system.
- Add coolant at the reserve tank. Do not remove the radiator cap except to refill or drain the system.
- All cooling system services can be done with the engine in the frame.
- Avoid spilling coolant on painted surfaces.
- After servicing the system, check for leaks with a cooling system tester.

SPECIFICATIONS

ITEM		SPECIFICATIONS
Coolant capacity	Radiator and engine	2 liter (2.1 US qt, 1.76 Imp qt)
	Reserve tank	0.45 liter (0.47 US qt, 0.39 Imp qt)
Radiator cap relief pressure		90 kPa (0.9 kgf/cm ² , 12.8 psi)
Thermostat	Begin to open	80 - 84°C (176 - 183°F)
	Fully open	95°C (203°F)
	Valve lift	8 mm (0.3 in) minimum
Standard coolant concentration		1:1 mixture with soft water

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COOLANT GRAVITY CHART

Temp. 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	20%		
-15	30%	425cc	975cc
-25	40%		
-37	50%		
-44.5	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 lower than the freezing point of the riding area.

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TORQUE VALUES

Water pump cover bolt	1.3 kgf-m (13 N-m, 9 lbf-ft)
Fan motor bolt	0.53 kgf-m (5 N-m, 3.8 lbf-ft)
Fan motor switch	1.8 kgf-m (17 N-m, 13 lbf-ft)

TROUBLESHOOTING

Engine temperature too high

- Faulty radiator cap
- Faulty temperature gauge or thermosensor
- Air in system
- Thermostat stuck closed
- Insufficient coolant
- Passages blocked in radiator, hoses or water jacket
- Faulty cooling fan motor
- Faulty fan motor switch
- Faulty water pump

Engine temperature too low

- Faulty temperature gauge or thermosensor
- Thermostat stuck open
- Faulty fan motor switch

Coolant leak

- Faulty water pump mechanical seal
- Deteriorated O-rings
- Faulty radiator cap
- Damaged or deteriorated cylinder head gasket
- Loose hose connection or clamp
- Damaged or deteriorated hoses

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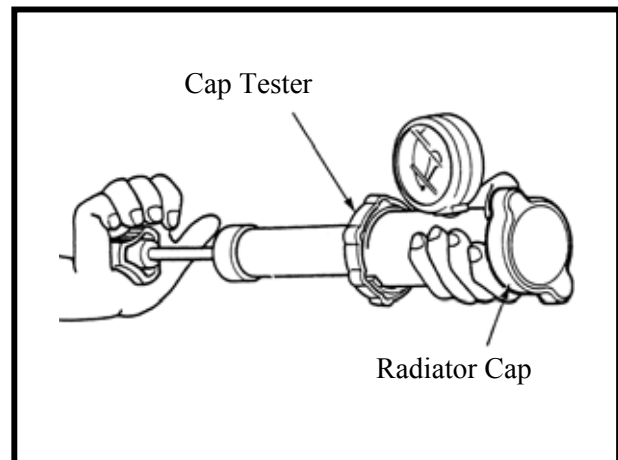
COOLING SYSTEM TESTING

RADIATOR CAP INSPECTION

Remove the radiator cap (refer to the “**COOLANT REPLACEMENT**” section in this chapter).

Pressure test the radiator cap.
 Replace the radiator cap if it does not hold pressure, or if relief pressure is too high or too low.
 It must hold the specified pressure for at least six seconds.

* Before installing the cap in the tester, wet the sealing surface.

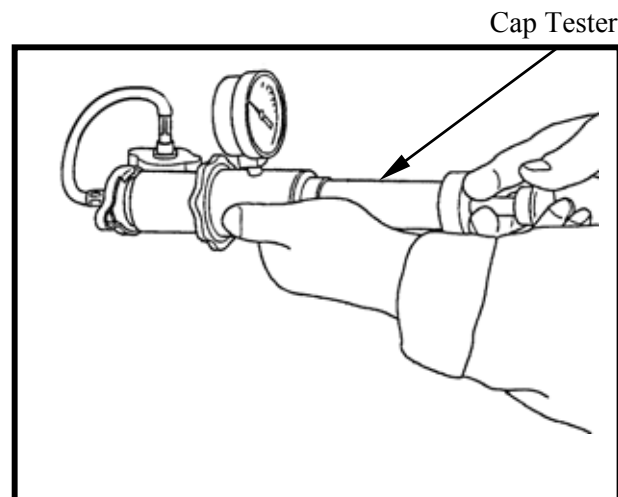


Radiator Cap Relief Pressure:

90 kPa (0.9 kg/cm², 12.8 psi)

Pressurize the radiator, engine and hoses, and check for leaks.

* Excessive pressure can damage the cooling system components.
 Do not exceed 105 kPa (1.05 kg/cm², 14.9 psi).



Repair or replace components if the system will not hold the specified pressure for at least six seconds.

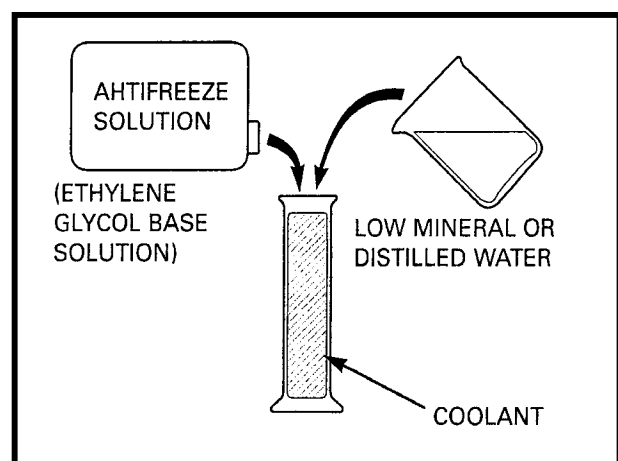
COOLANT REPLACEMENT

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.

Recommended mixture:

1:1 (Distilled water and antifreeze)



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REPLACEMENT/AIR BLEEDING

Remove the front center cover and right footboard (refer to the “**FRAME COVERS**” section in the chapter 2).

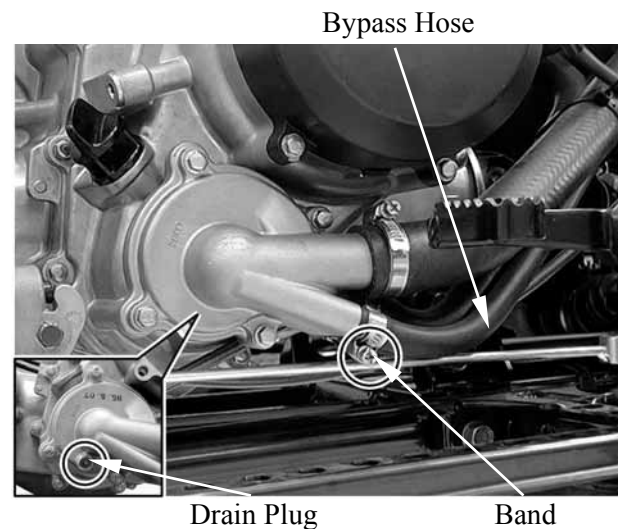
★ When filling the system or reserve tank with coolant (checking the coolant level), place the machine in a vertical position on a flat, level surface.

Remove the radiator cap.



Loosen the hose band

Disconnect the bypass hose from water pump or remove the drain plug and drain the coolant from the system.



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

Reconnect the bypass hose securely.



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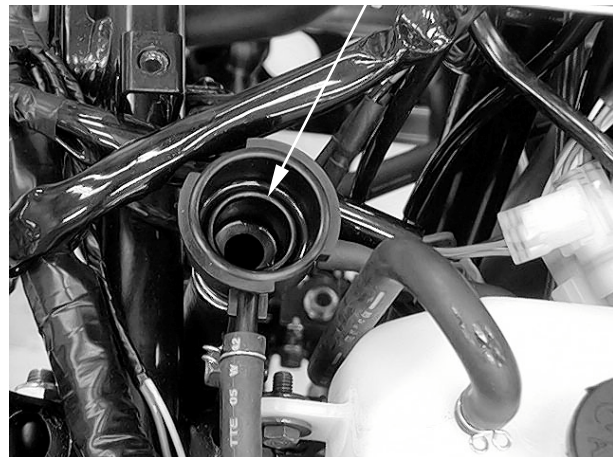
Place the machine on a flat, level surface.
Fill the reserve tank to the upper level
(FULL) line.

Reserve Tank Cap



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

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.

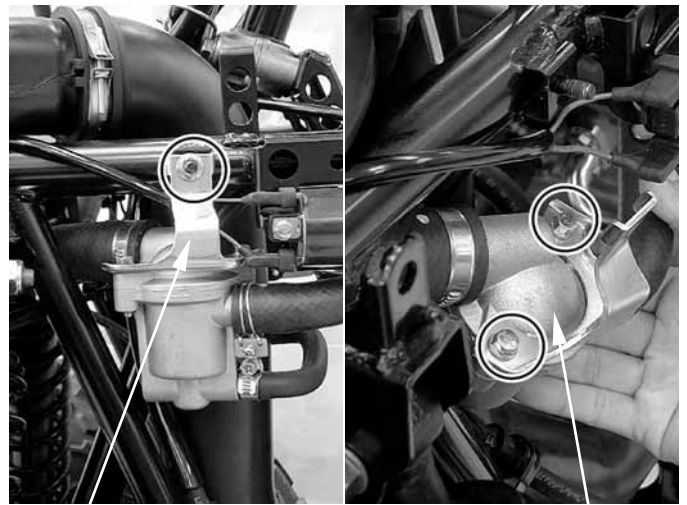
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THERMOSTAT

REMOVAL

Remove the nut and thermostat housing stay from the frame.

Remove the bolts, housing stay and thermostat housing cover.



Housing stay

Thermostat Housing Cover

Remove the O-ring from the housing cover.
Remove the thermostat.

Thermostat



O-ring

Thermostat



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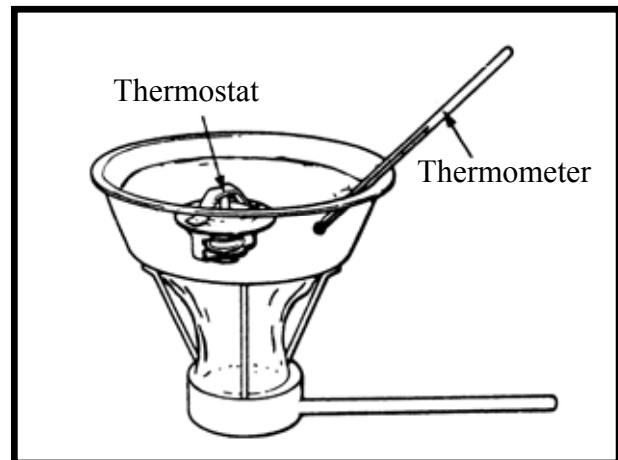
INSPECTION

Visually inspect the thermostat for damage.

Heat the water with an electric heating element to operating temperature for five minutes.

Suspend the thermostat in heated water to check its operation.

- Keep flammable materials away from the electric heating element.
- Do not let the thermostat or thermometer touch the pan, or you will get false readings.



Replace the thermostat if the valve stays open at room temperature, or if it respond at temperatures other than those specified.

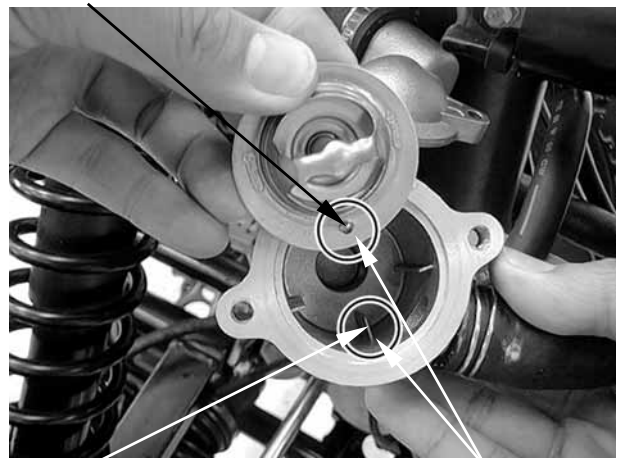
Thermostat begin to open:
80–84°C (176–183°F)

Valve lift:
8 mm (0.3 in) minimum at 95°C (203°F)

INSTALLATION

Install the thermostat into the housing with its air bleed hole facing up and aligning bleed hole with the tab in the housing.

Air Bleed Hole



Tab

Align

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Install a new O-ring into the housing cover groove.

Install the housing cover and housing stay to the housing.
Tighten the bolts securely.

Install the housing stay to the frame.
Tighten the nut securely.

Fill the system with recommended coolant and bleed the air (refer to the “**COOLANT REPLACEMENT**” section in this chapter).



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WATER PUMP

MECHANICAL SEAL INSPECTION

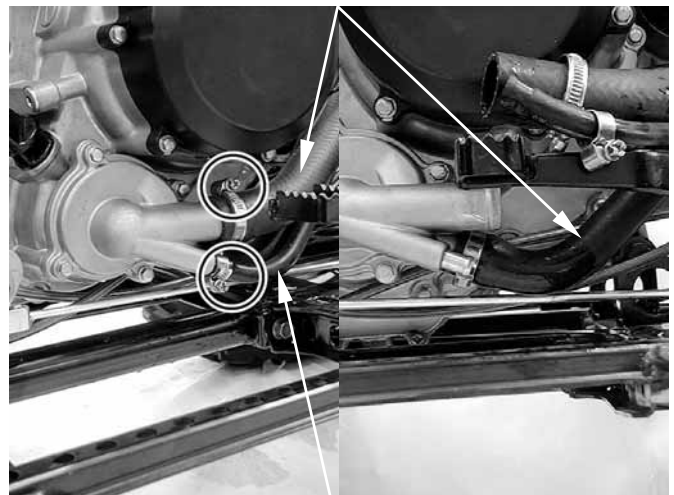
Inspect the coolant leakage.

If there is leakage, the mechanical seal is defective, and water pump body should be replaced.

REMOVAL

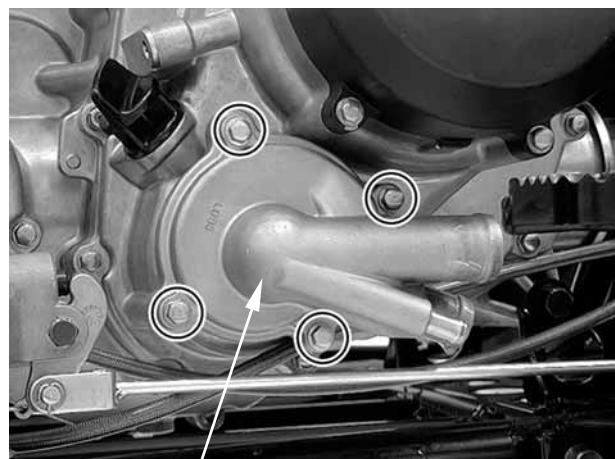
Drain the coolant (refer to the “**COOLANT REPLACEMENT**” section in this chapter).

Loosen the hose bands and disconnect the lower radiator hoses and bypass hose from the water pump.



Bypass Hose

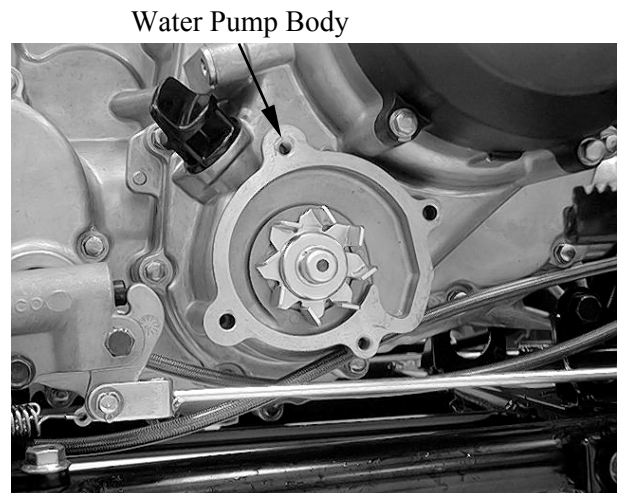
Remove the four bolts and water pump cover and O-ring.



Water Pump Cover/O-ring

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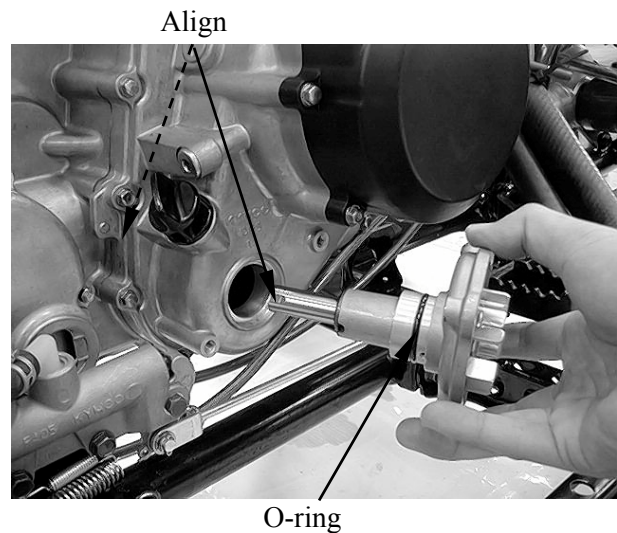
Remove the water pump body from the crankcase.



INSTALLATION

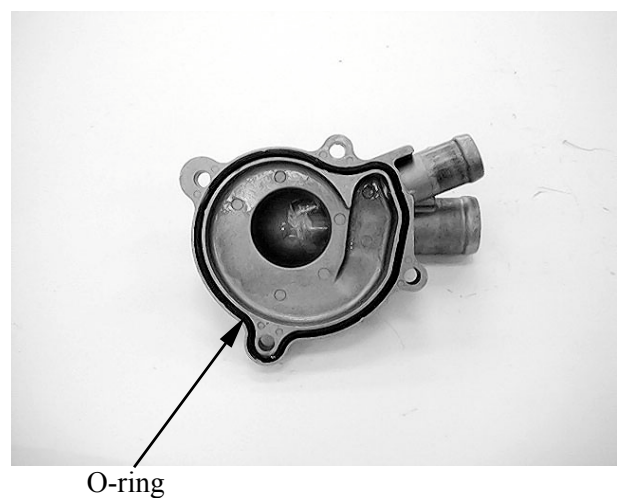
Apply engine oil to a new O-ring and install it onto the stepped portion of the water pump.

Install the water pump into the crankcase while aligning the water pump shaft groove with oil pump shaft end.



Align the mounting bolt holes in the water pump and crankcase and make sure the water pump is securely installed.

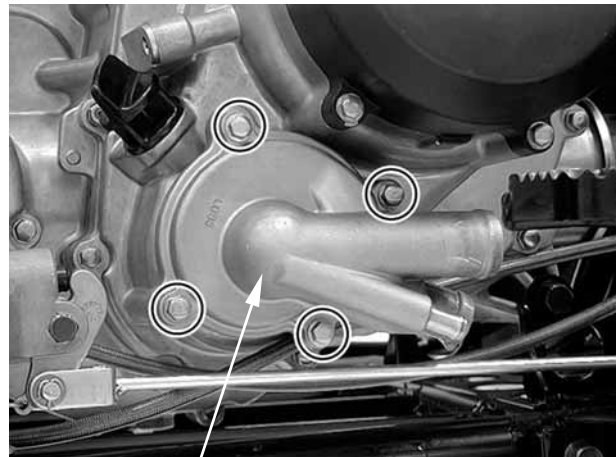
Install a new O-ring into the groove in the water pump cover.



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Install the water pump cover and tighten the bolts to the specified torque.

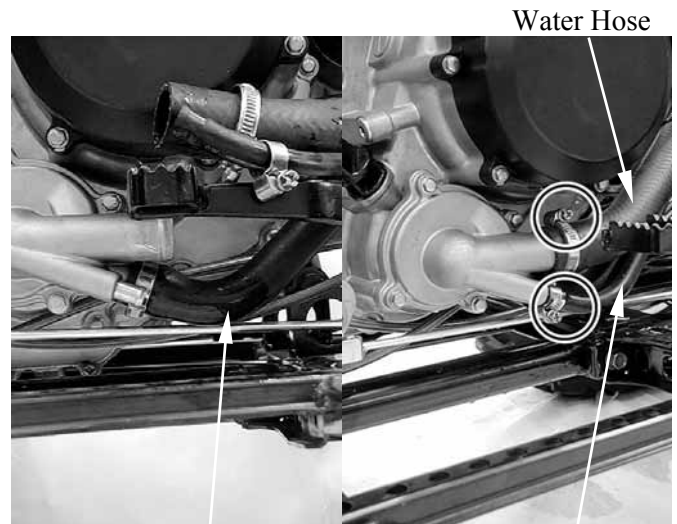
Torque: 1.3 kgf-m (13 N-m, 9 lbf-ft)



Water Pump Cover/O-ring

Connect the water hoses and bypass hose, then tighten the hose bands.

Fill the system with recommended coolant and bleed the air (refer to the “**COOLANT REPLACEMENT**” section in this chapter).



Water Hose

Bypass Hose

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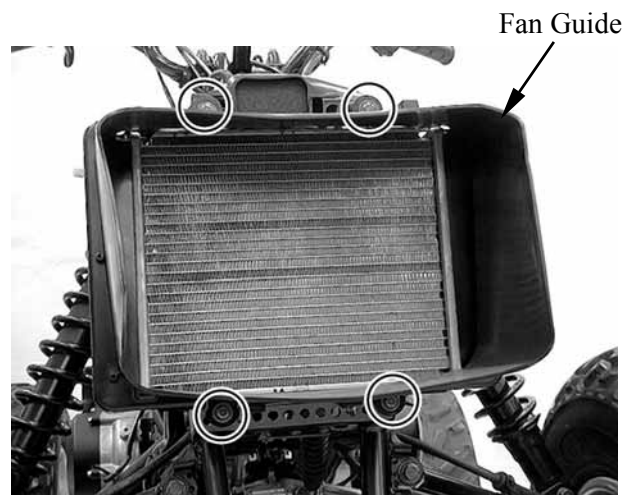
RADIATOR

REMOVAL

Drain the coolant (refer to the “**COOLANT REPLACEMENT**” section in this chapter).

Remove the front fender (refer to the “**FRAME COVERS**” section in the chapter 2).

Remove the four mounting bolt from fan guide and then remove fan guide.

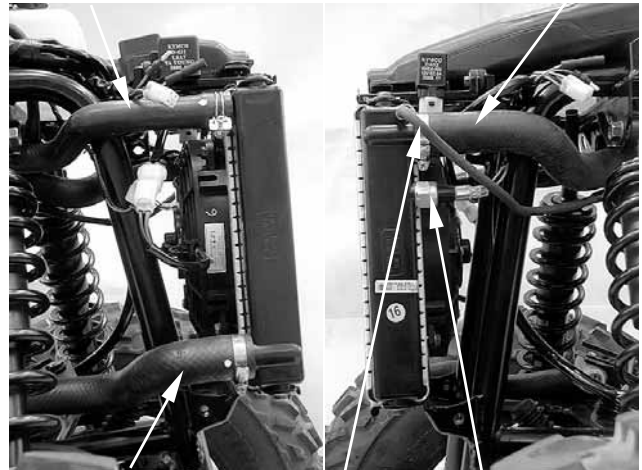


Loosen the hose bands and disconnect the radiator lower water hose, water filler hose, bleed hose and upper water hose from the radiator.

Disconnect the fan switch connectors.

Water Filler Hose

Upper Water Hose



Lower Water Hose

Bleed Hose

Fan Motor SW

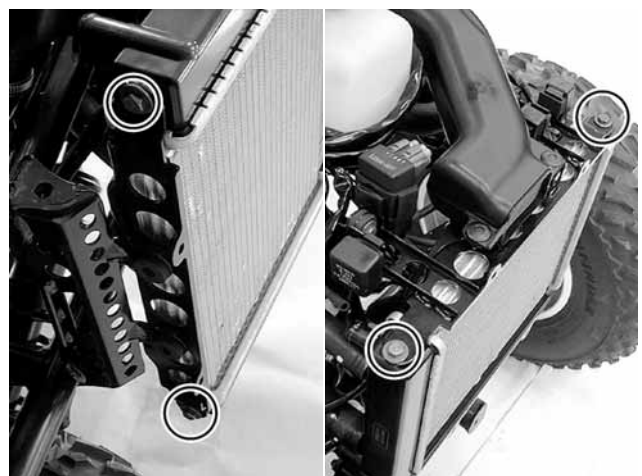
Remove the two mounting bolts under radiator and two mounting bolts on the radiator, then remove radiator.

* Be careful not to damage the radiator core.

INSTALLATION

Installation is in the reverse order of removal.

Fill the system with recommended coolant and bleed the air (refer to the “**COOLANT REPLACEMENT**” section in this chapter).



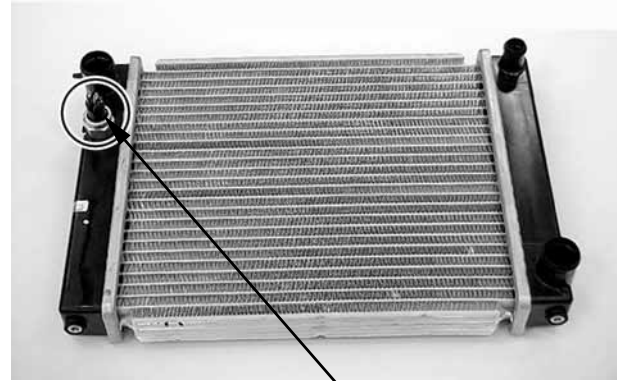
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FAN MOTOR SWITCH

REMOVAL

Disconnect the fan motor switch connectors (refer to the “**RADIATOR**” section in this chapter).

Remove the fan motor switch.



Fan Motor Switch

INSPECTION

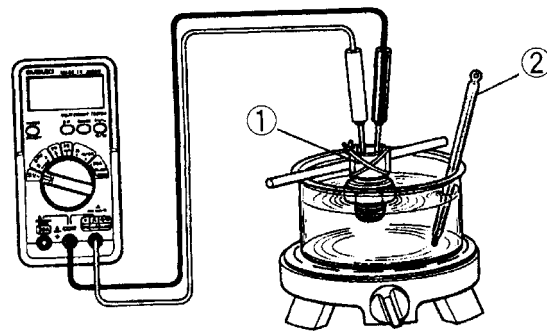
Place the fan motor switch in oil contained in a pan as shown and raise the oil temperature gradually to check for the temperature at which the switch starts to operate.

If the switch operating temperature is not within the specified range, replace the switch with a new one.

OFF→ON	Over 88–92°C
ON→OFF	Lower 88–92°C

★

- Handle the cooling fan motor switch carefully as it is vulnerable to impact.
- Do not allow the cooling fan motor switch ① and the thermometer ② to come in contact with the bottom of the pan.



INSTALLATION

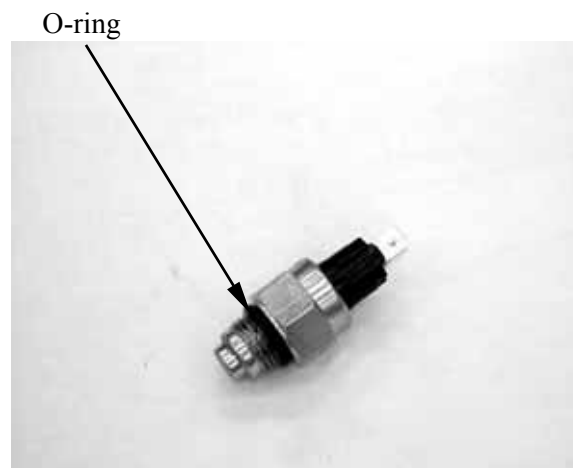
Fit the O-ring.

Tighten the cooling fan motor switch to specified torque.

Torque: 1.8 kgf-m (17 N-m, 13 lbf-ft)

★

- Replace the O-ring a new one.
- Do not coat grease to the O-ring.



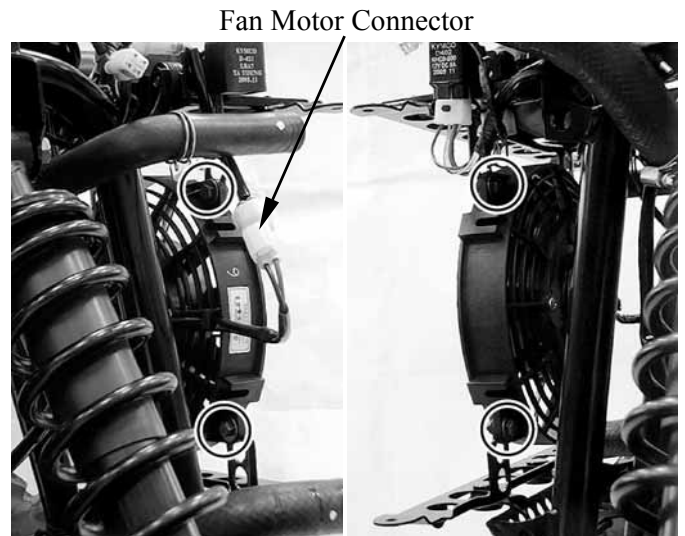
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FAN MOTOR

REMOVAL

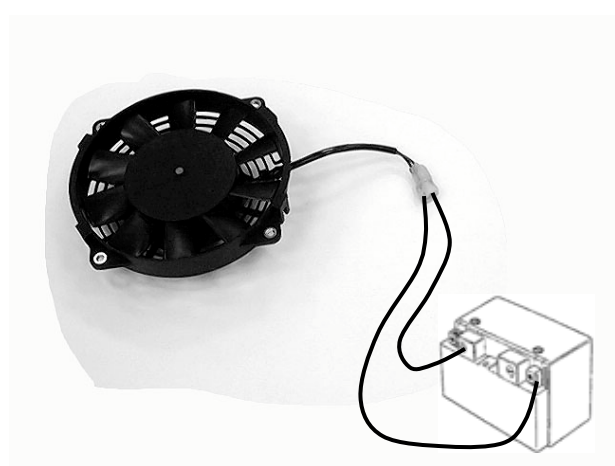
Remove the front fender (refer to the “**FRAME COVERS**” section in the chapter 2)

Disconnect the fan motor connector.
Remove the four mounting bolts and then remove the fan motor



INSPECTION

Check the fan motor to operate using an available battery.



INSTALLATION

Installation is in the reverse order of removal.

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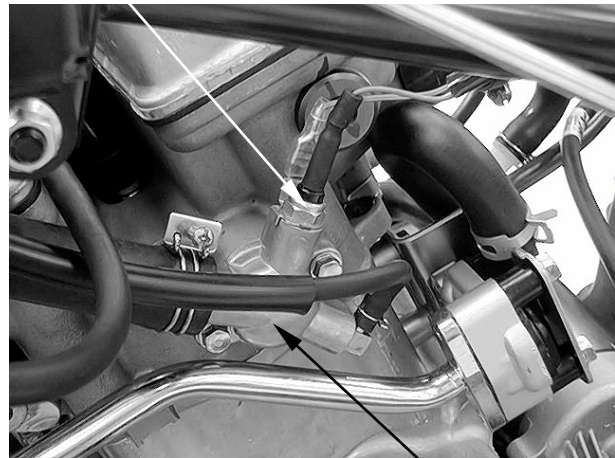
WATER TEMPERATURE SENSOR

Remove the right side body cover and right footboard (refer to the “**FRAME COVERS**” section in the chapter 2).

Disconnect the water temperature sensor connector.

Remove the water temperature sensor from the water joint.

Water Temperature Sensor



Water joint

INSPECTION

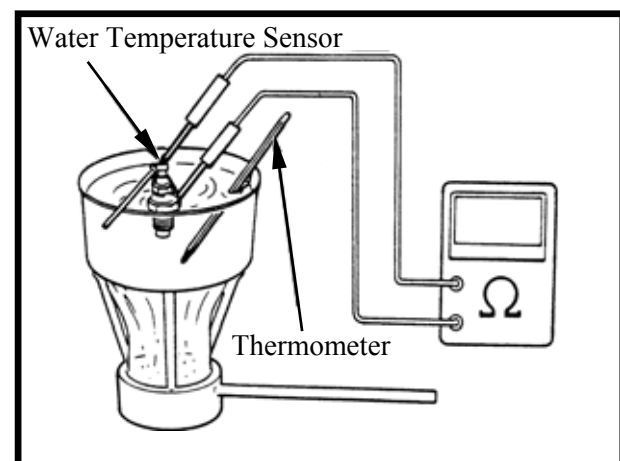
Connect the water temperature sensor to the ohmmeter and dip it in oil contained in a pan which is placed on an electric heater.

Gradually raise oil temperature while reading the thermometer in the pan and the ohmmeter connected. If the resistance measured is out of specification, replace the temperature gauge with a new one.

Temperature	Standard resistance
50°C	123.9 – 478.9 Ω
100°C	26 – 29.3 Ω

* _____

- Handle the water temperature sensor carefully as it is vulnerable to impact.
- Do not allow the water temperature sensor and the thermometer to come in contact with the bottom of the pan.



After the water temperature sensor has been installed, fill coolant and perform air bleeding (refer to the “**COOLANT REPLACEMENT**” section in this chapter).

INSTALLATION

With thread lock applied to the threaded part, tighten the water temperature sensor.

Torque: 0.8 kgf-m (8 N-m, 5.8 lbf-ft)

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RADIATOR RESERVE TANK

REMOVAL

Remove the front fender (refer to the “**FRAME COVERS**” section in the chapter 2).

Remove the two mounting bolts and then remove the radiator reserve tank from frame.



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

Disconnect the siphon hose.

INSTALLATION

Installation is in the reverse order of removal.

Pour the recommended coolant to the upper level line with the center stand applied



Siphon Hose