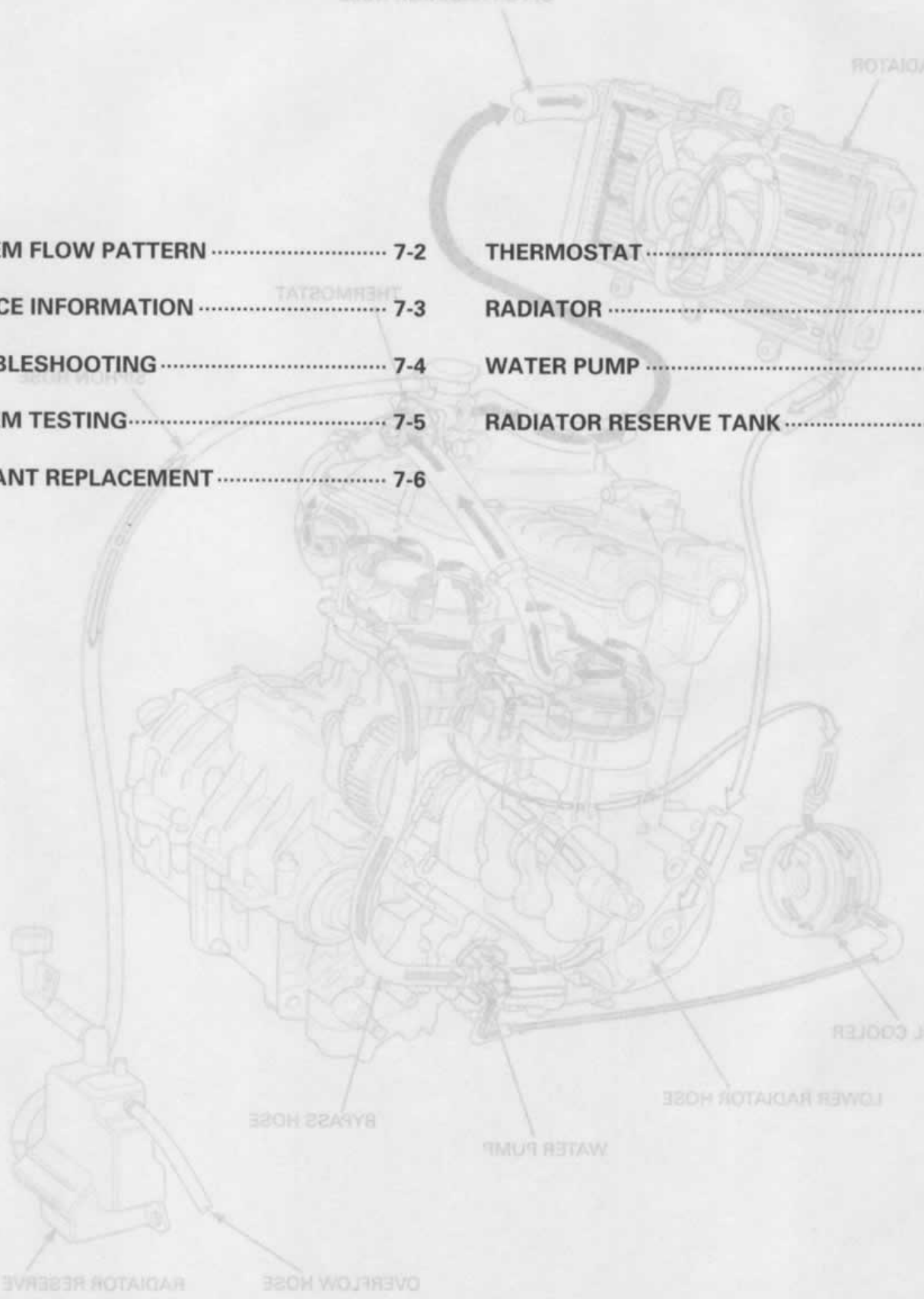
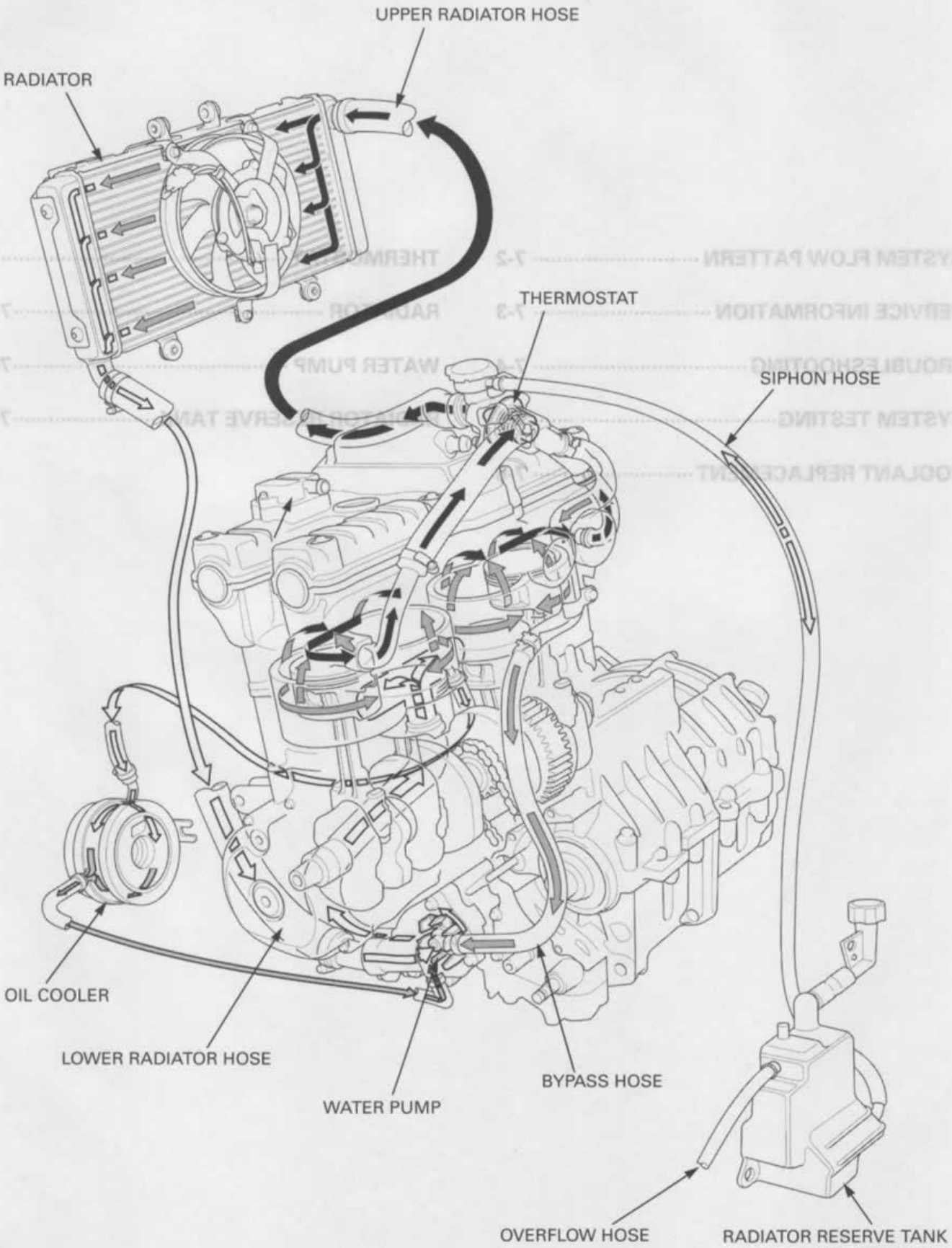
7. COOLING SYSTEM



SYSTEM FLOW PATTERN



SERVICE INFORMATION

GENERAL

⚠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.

NOTICE

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

- Add cooling system 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
- Refer to the fan motor switch inspection (page 19-20) and coolant temperature sensor inspection (page 19-19).

SPECIFICATIONS

ITEM		SPECIFICATIONS
Coolant capacity	Radiator and engine	2.74 liter (2.90 US qt, 2.41 Imp qt)
	Reserve tank	0.31 liter(0.33 US qt, 0.27 Imp qt)
Radiator cap relief pressure		108 – 137 kPa (1.1 – 1.4 kgf/cm^2, 16 – 20 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
Recommended antifreeze		High quality ethylene glycol antifreeze containing corrosion protection inhibitors
Standard coolant concentration		50% mixture with soft water

TORQUE VALUES

Water pump cover flange bolt	13 N·m (1.3 kgf·m, 9 lbf··t)	CT bolt
Coolant drain bolt	13 N·m (1.3 kgf·m, 9 lbf··t)	CT bolt
Lower radiator hose joint mounting bolt	13 N·m (1.3 kgf·m, 9 lbf·ft)	
ECT/thermo sensor	23 N·m (2.3 kgf·m, 17 lbf·ft)	
Cooling fan mounting nut	3 N·m (0.27 kgf·m, 2.0 lbf·ft)	Apply a locking agent to the threads
Fan motor mounting nut	5 N·m (0.5 kgf·m, 3.6 lbf·ft)	
Fan motor bracket mounting nut	9 N·m (0.9 kgf·m, 6.5 lbf·ft)	

TROUBLESHOOTING

Engine temperature too high
- Faulty temperature gauge or ECT/thermo sensor
- Thermostat stuck closed
- Faulty radiator cap
- Insufficient coolant
- Passage blocked in radiator,hoses or water jacket
- Air in system
- Faulty cooling fan motor
- Faulty fan motor relay
- Faulty water pump

Engine temperature too low
- Faulty temperature gauge or ECT/thermo sensor
- Thermostat stuck open
- Faulty cooling fan motor relay

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 hose

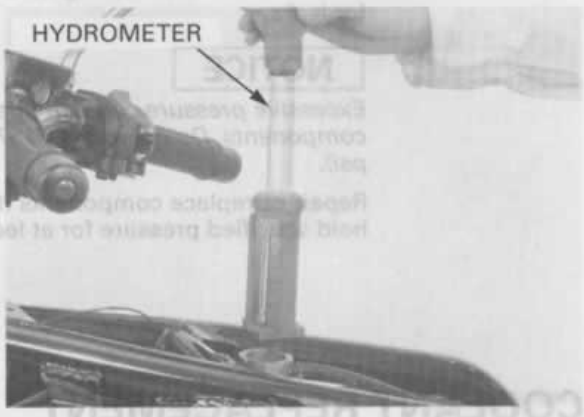
SYSTEM TESTING

COOLANT (HYDROMETER TEST)

Open and support the front end of fuel tank (page 4-5).

Remove the radiator cap.

Test the coolant gravity using a hydrometer (see below for "Coolant gravity chart").
For maximum corrosion protection, a 50 – 50% solution of ethylene glycol and distilled water is recommended (page 7-6).
Look for contamination and replace the coolant if necessary.



COOLANT GRAVITY CHART

		Coolant temperature °C (°F)										
		0 (32)	5 (41)	10 (50)	15 (59)	20 (68)	25 (77)	30 (86)	35 (95)	40 (104)	45 (113)	50 (122)
Coolant ratio%	5	1.009	1.009	1.008	1.008	1.007	1.006	1.005	1.003	1.001	0.999	0.997
	10	1.018	1.017	1.017	1.016	1.015	1.014	1.013	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	1.052	1.051	1.047	1.046	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	1.066	1.063	1.060	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

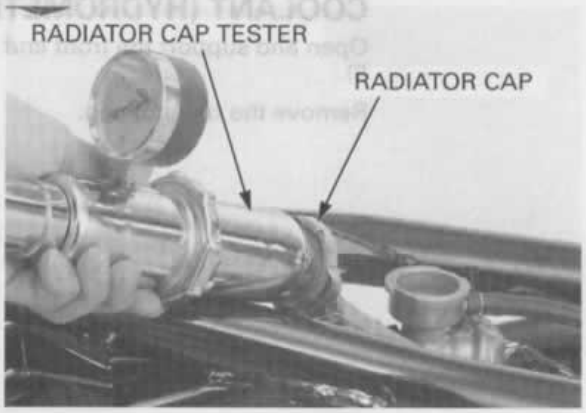
RADIATOR CAP/SYSTEM PRESSURE INSPECTION

Before installing the cap in the tester, wet the sealing surfaces.

Remove the radiator cap (page 7-5).

Pressure test the radiator cap.
Replace the radiator cap if it does not hold pressure, or if relief pressure is too high too low.
If must hold specified pressure for at least 6 seconds.

RADIATOR CAP RELIEF PRESSURE:
108 – 137 kPa (1.1 – 1.4 kgf/cm², 16 – 20 psi)



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

NOTICE

Excessive pressure can damage the cooling system components. Do not exceed 137 kPa (1.4 kgf/cm², 20 psi).

Repair or replace components if the system will not hold specified pressure for at least 6 seconds.

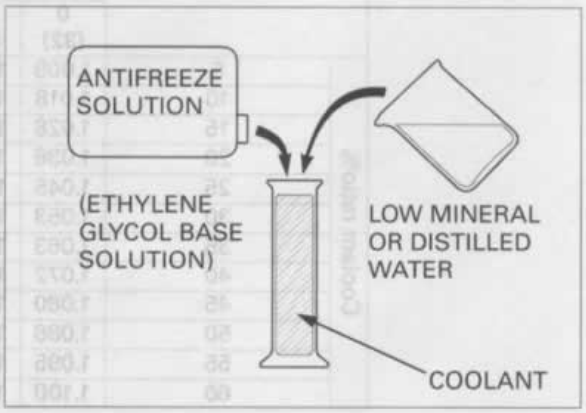
COOLANT REPLACEMENT

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 ANTIFREEZE:
High quality ethylene glycol antifreeze containing corrosion protection inhibitors

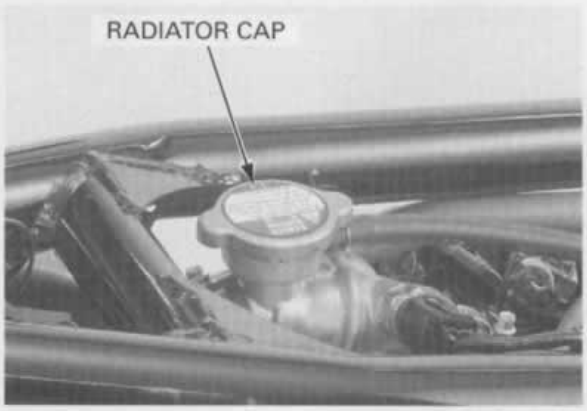
RECOMMENDED MIXTURE:
50 – 50 (Distilled water and antifreeze)



REPLACEMENT/AIR BLEEDING

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

Remove the radiator cap (page 7-5).

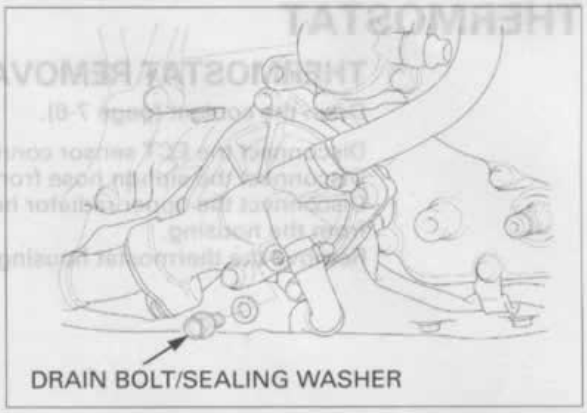


Remove the left crankcase side cover (page 8-4).

Remove the drain bolt on the water pump cover and drain the system coolant.

Reinstall the drain bolt with the new sealing washer. Tighten the drain bolt to the specified torque.

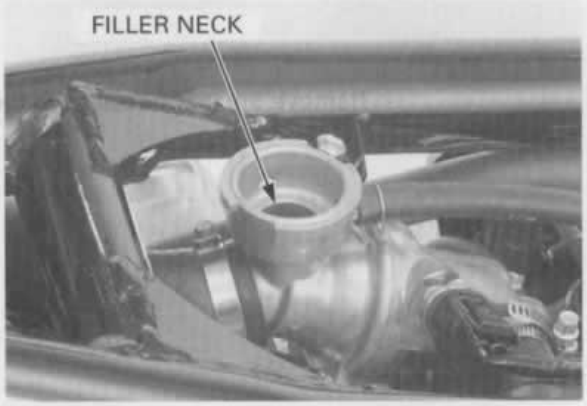
TORQUE: 13 N·m (1.3 kgf·m, 9 lbf·ft)



Disconnect the siphon hose and drain the reserve tank coolant.

Empty the coolant and rinse the inside of the reserve tank with water.

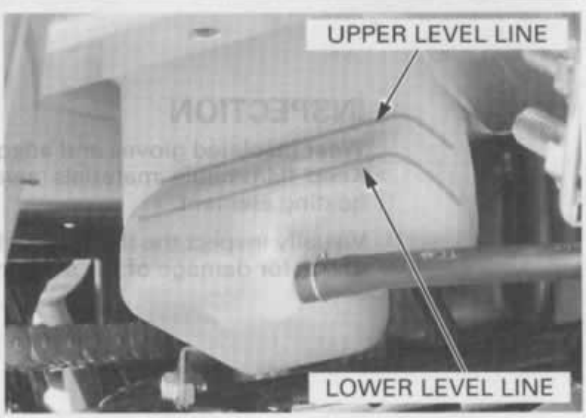
Fill the system with the recommended coolant through the filler opening up to filler neck.



Remove the radiator reserve tank cap and fill the reserve tank to the upper level line.

Bleed air from the system as follow:

1. Shift the transmission into neutral. Start the engine and let it idle for 2 – 3 minutes.
2. Snap the throttle 3 – 4 times to bleed air from the system.
3. Stop the engine and add coolant up 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.

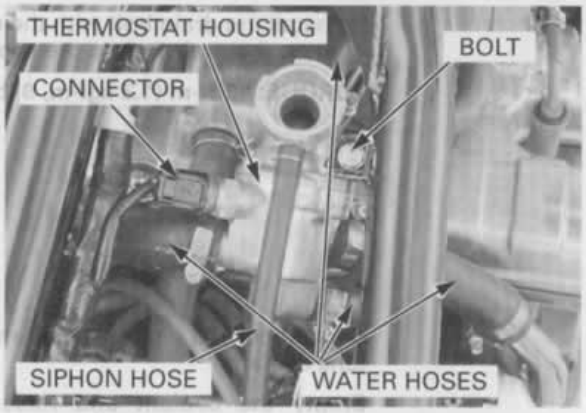


THERMOSTAT

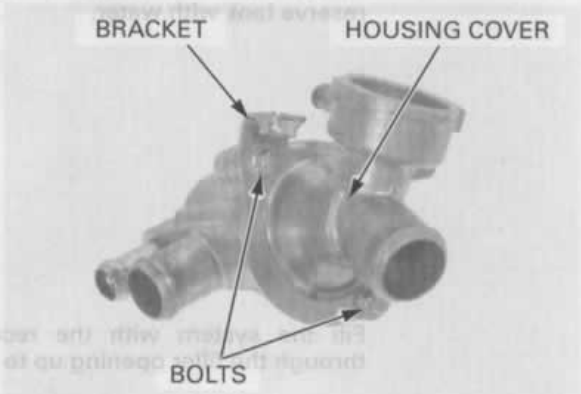
THERMOSTAT REMOVAL

Drain the coolant (page 7-6).

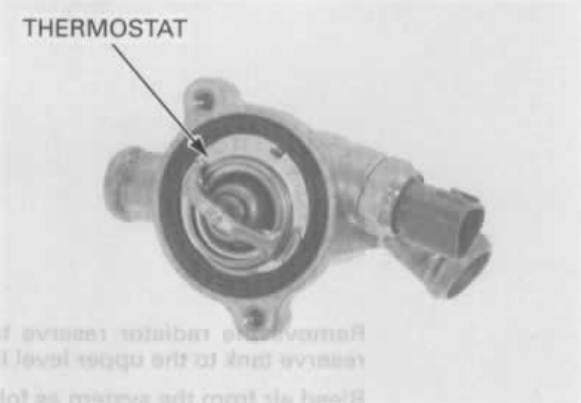
Disconnect the ECT sensor connector.
Disconnect the siphon hose from the filler neck.
Disconnect the upper radiator hose and water hoses from the housing.
Remove the thermostat housing mounting bolt.



Remove the thermostat housing cover mounting bolts, bracket and thermostat housing cover.



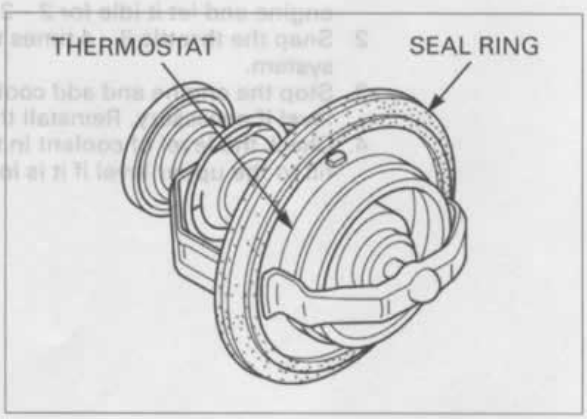
Remove the thermostat from the housing.



INSPECTION

Wear insulated gloves and adequate eye protection.
Keep flammable materials away from the electric heating element.

Visually inspect the thermostat for damage.
Check for damage of the seal ring.



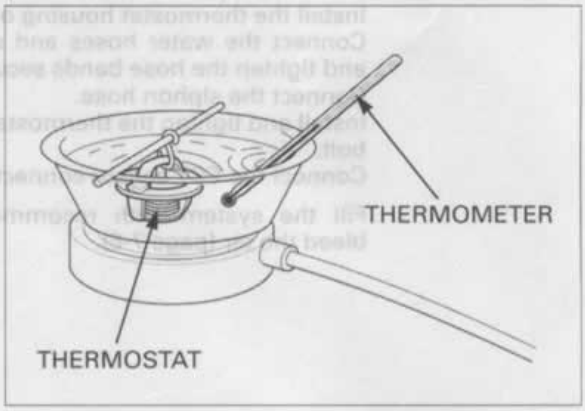
Do not let the thermostat or thermometer touch the pan, or you will get false reading.

Heat the water with an electric heating element to operating temperature for 5 minutes.
Suspend the thermostat in heated water to check its operation.

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

THERMOSTAT BEGIN TO OPEN:
80 – 84 °C (176 – 183 °F)

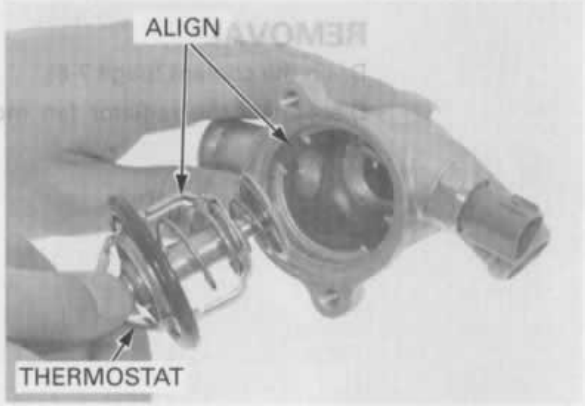
VALVE LIFT:
8 mm (0.3 in) minimum at 95 °C (203 °F)



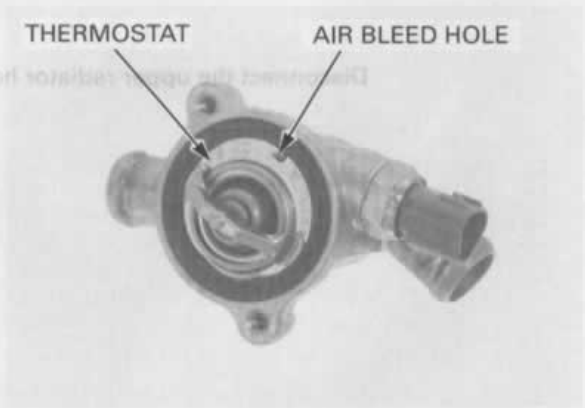
THERMOSTAT INSTALLATION

Make sure the air bleed hole on the thermostat facing up.

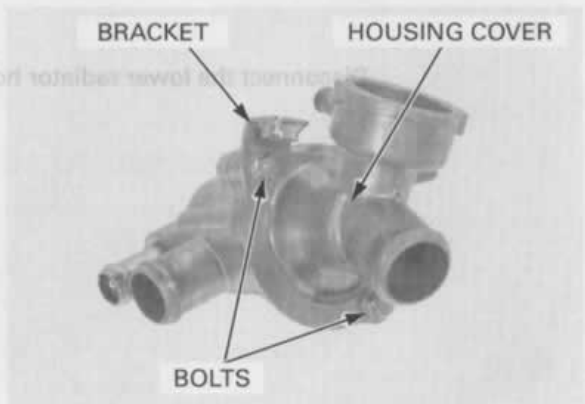
Install the thermostat into the housing while aligning it with the thermostat housing groove.



Make sure that the air bleed hole facing up as shown.

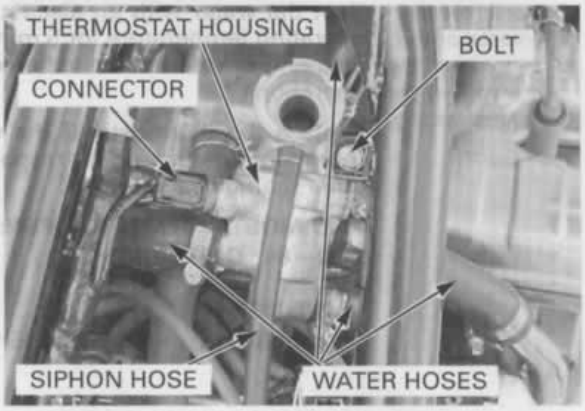


Install the thermostat housing cover and bracket, tighten the cover bolts securely.



Install the thermostat housing onto the frame.
Connect the water hoses and upper radiator hose and tighten the hose bands securely.
Connect the siphon hose.
Install and tighten the thermostat housing mounting bolt.
Connect the ECT sensor connector.

Fill the system with recommended coolant and bleed the air (page 7-6).

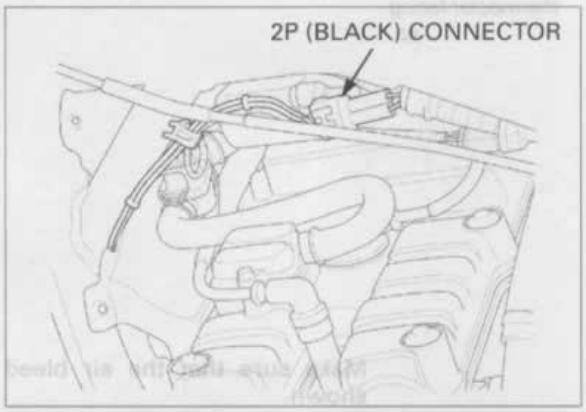


RADIATOR

REMOVAL

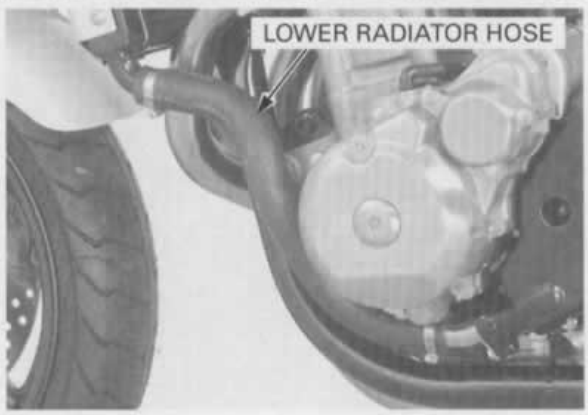
Drain the coolant (page 7-6).

Disconnect the radiator fan motor 2P (Black) connector.



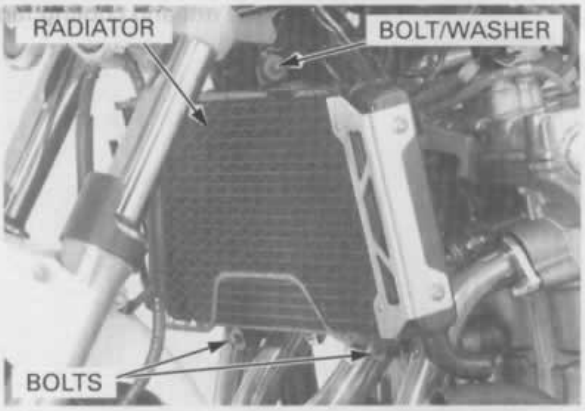
Disconnect the upper radiator hose.

Disconnect the lower radiator hose.



Remove the radiator lower mounting bolts.

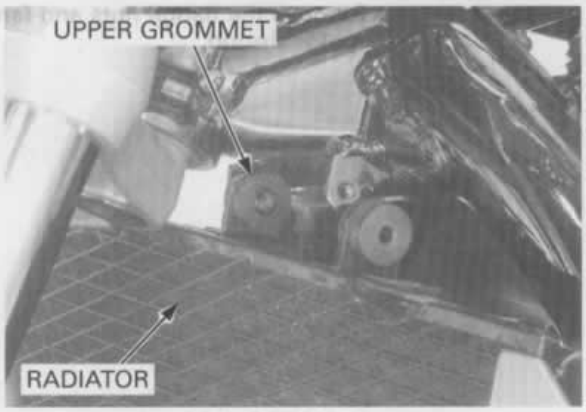
Remove the radiator upper mounting bolt and washer.



Slide the radiator to the right, then release the upper grommet from the frame boss.

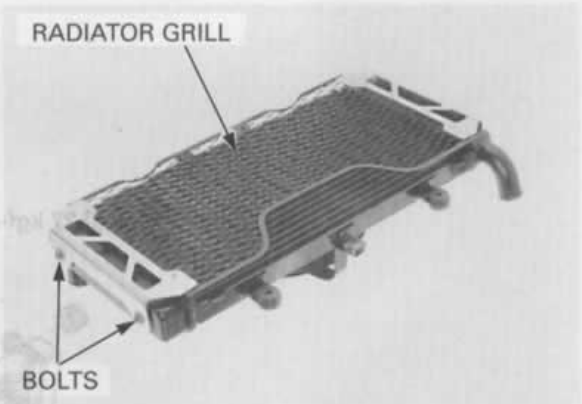
Be careful not to damage the radiator core.

Remove the radiator assembly.

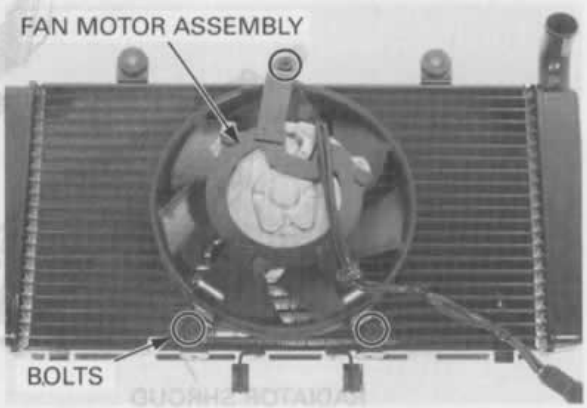


DISASSEMBLY

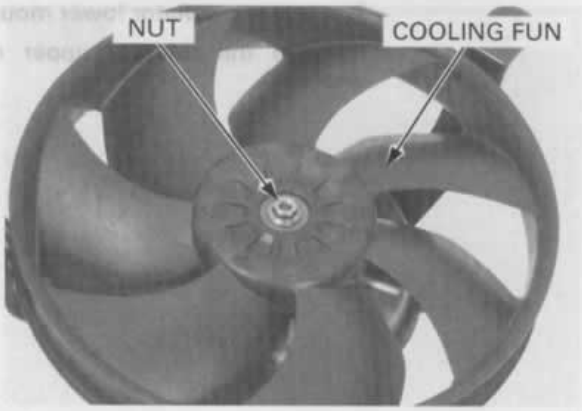
Remove the bolts and radiator grill.



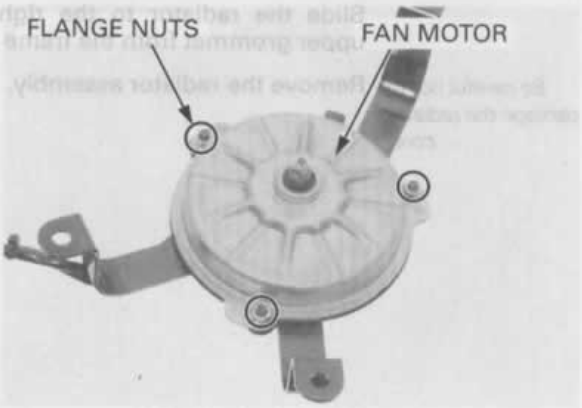
Remove the three bolts and cooling fan motor assembly.



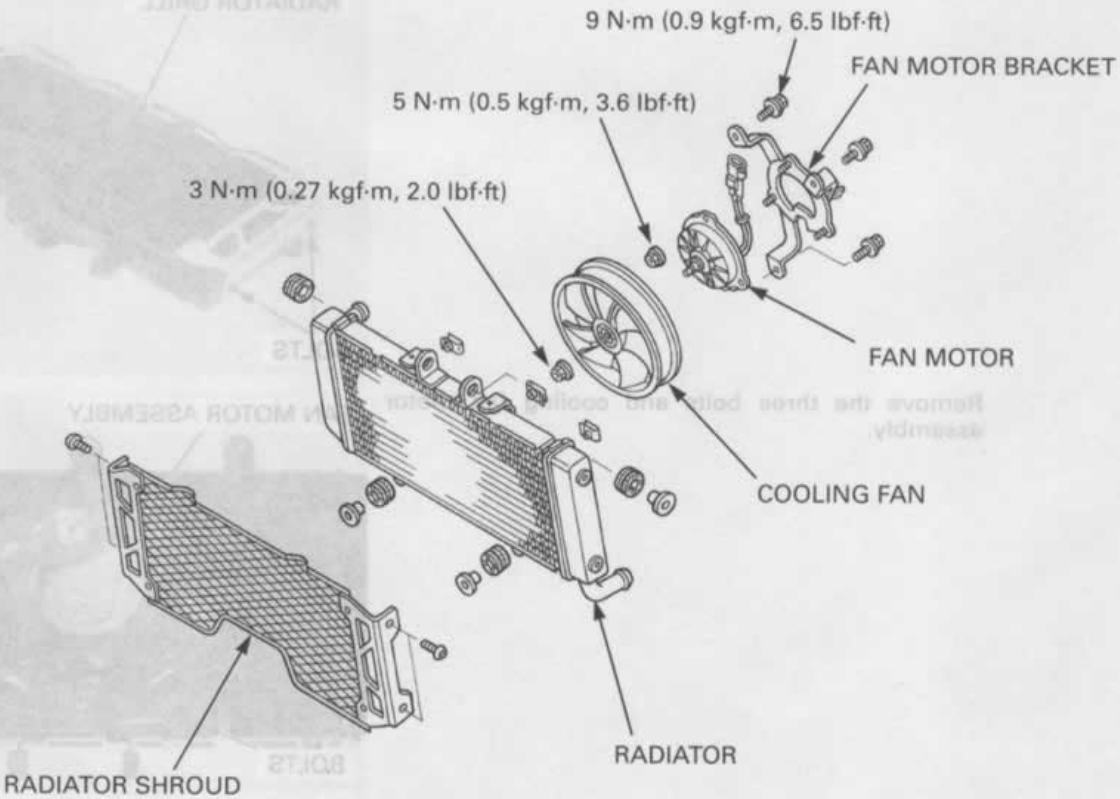
Remove the nut and cooling fan.



Remove the flange nuts and fan motor from the fan motor shroud.

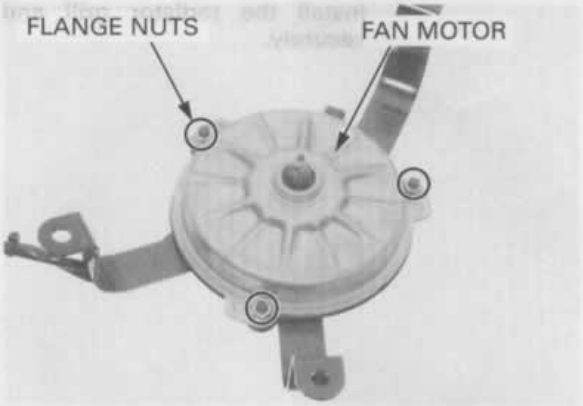


ASSEMBLY

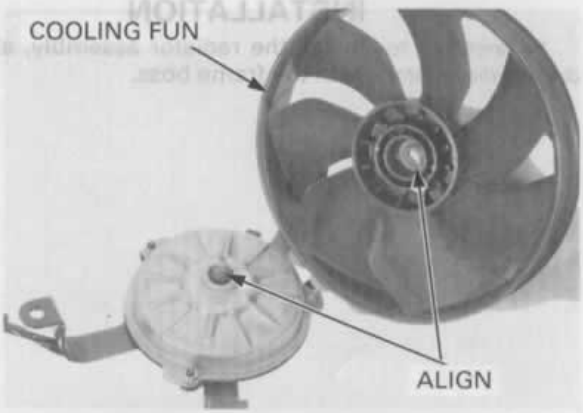


Install the fan motor onto the fan motor shroud and tighten the flange nuts to the specified torque.

TORQUE: 5 N·m (0.5 kgf·m, 3.6 lbf·ft)

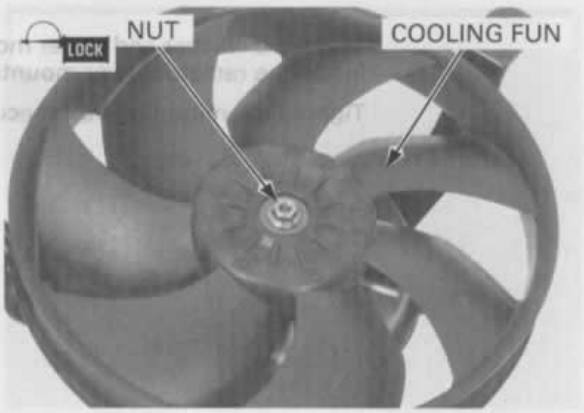


Install the cooling fan onto the fan motor shaft by aligning the flat surfaces.



Apply a locking agent to the cooling fan nut threads. Install and tighten the nut to the specified torque.

TORQUE: 3 N·m (0.27 kgf·m, 2.0 lbf·ft)

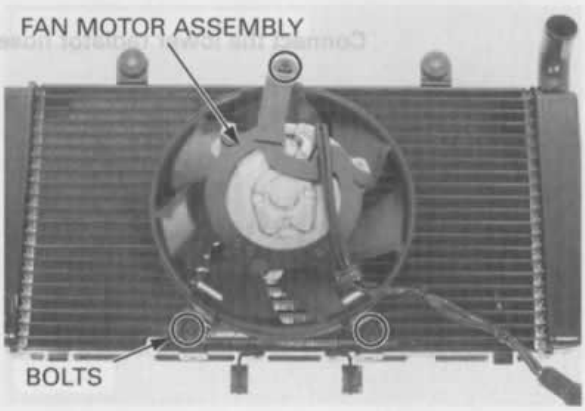


Install the cooling fan motor assembly onto the radiator.

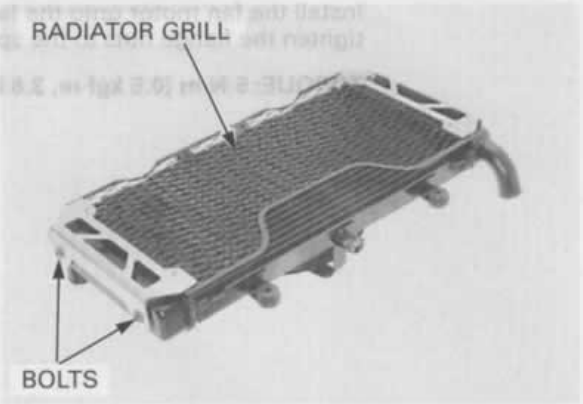
Install and tighten the fan motor bracket bolts.

TORQUE: 9 N·m (0.9 kgf·m, 6.5 lbf·ft)

Install the radiator sub-harness connector to the fan motor bracket clamp.



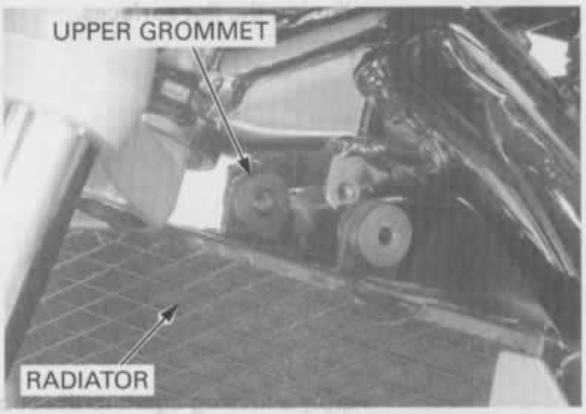
Install the radiator grill and tighten the bolts securely.



INSTALLATION

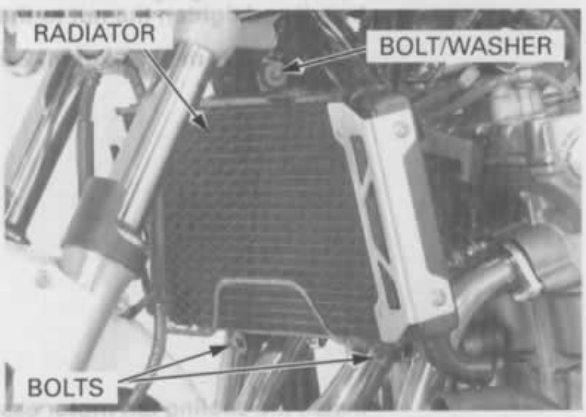
Be careful not to damage the radiator core.

Install the radiator assembly, aligning its grommet with the frame boss.

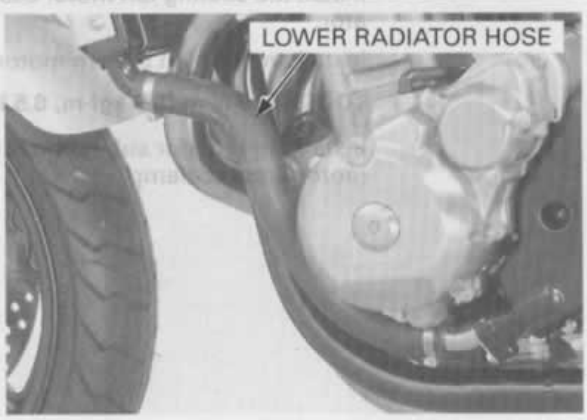


Install the washer and upper mounting bolt.
Install the radiator lower mounting bolts.

Tighten the mounting bolts securely.



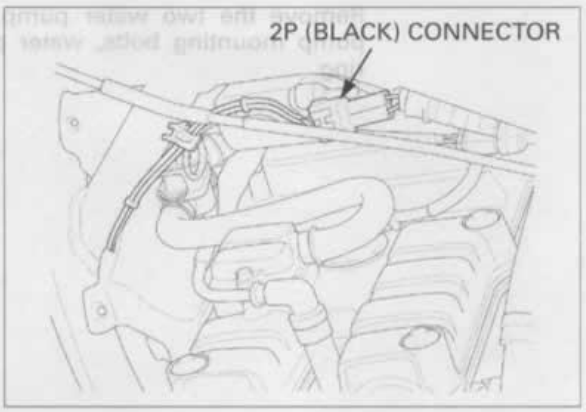
Connect the lower radiator hose.



Connect the upper radiator hose.

Fill the system with recommended coolant (page 7-6).

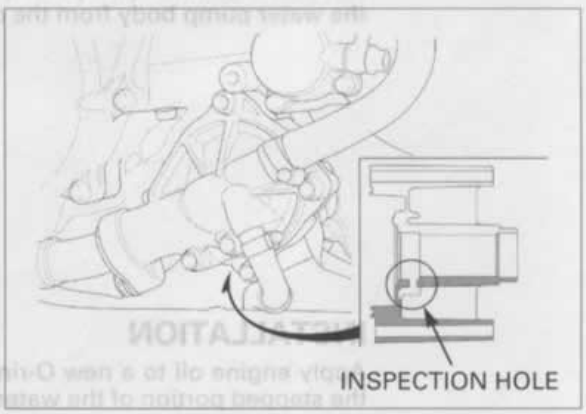
Route the fan motor wire properly, and connect the 2P (Black) connector.



WATER PUMP

MECHANICAL SEAL INSPECTION

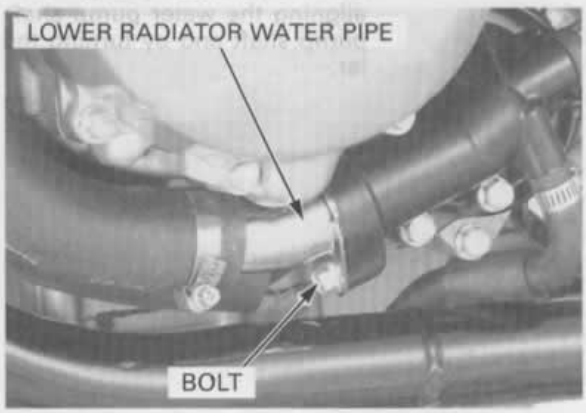
Inspect the inspection hole for signs of coolant leakage.
If there is leakage, the mechanical seal is defective and replace the water pump as an assembly.



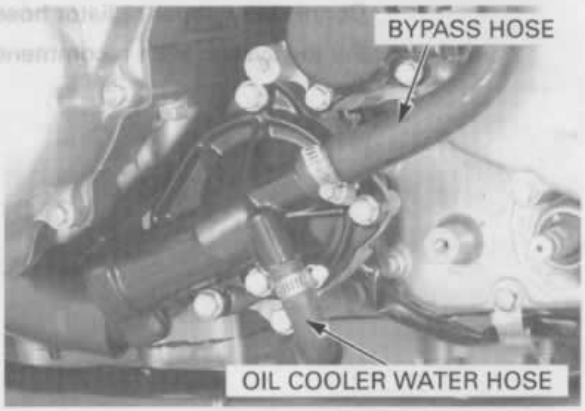
REMOVAL

Remove the left crankcase side cover (page 8-4).
Drain the coolant (page 7-6).

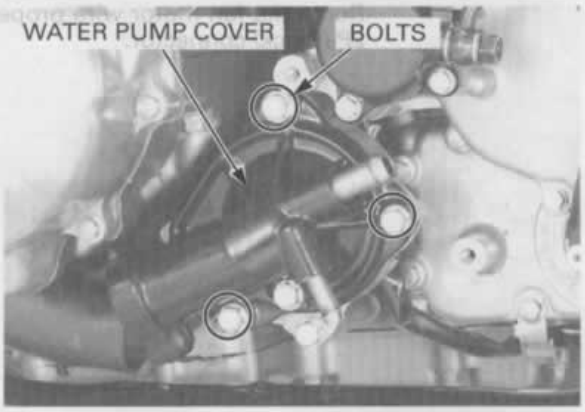
Remove the bolt and disconnect the lower radiator hose joint pipe from the water pump cover.



Disconnect the bypass hose and oil cooler water hose from the water pump cover.

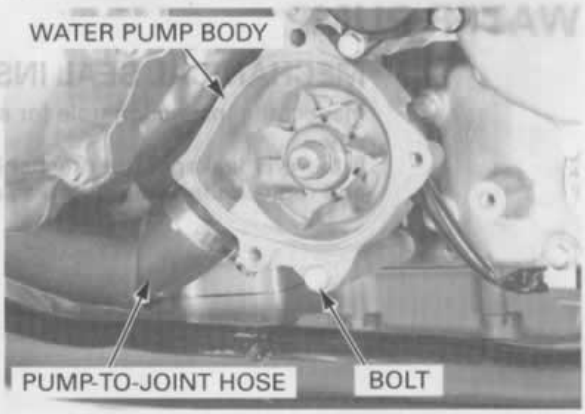


Remove the two water pump cover bolts, water pump mounting bolts, water pump cover and O-ring.



Disconnect the water pump-to-water joint hose from the water pump body.

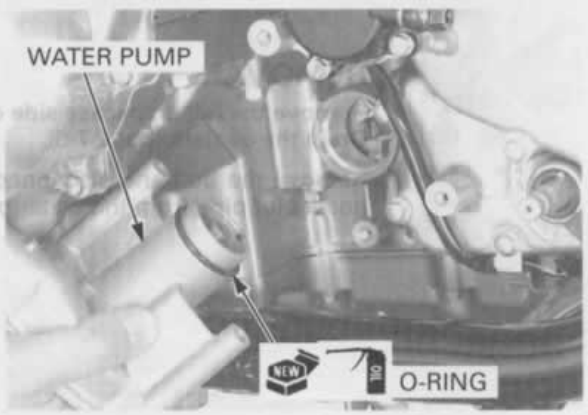
Remove the water pump body mounting bolt and the water pump body from the crankcase.



INSTALLATION

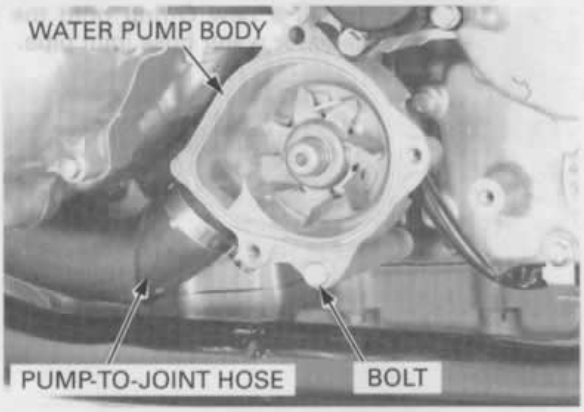
Apply engine oil to a new O-ring and install it onto the stepped portion of the water pump.

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

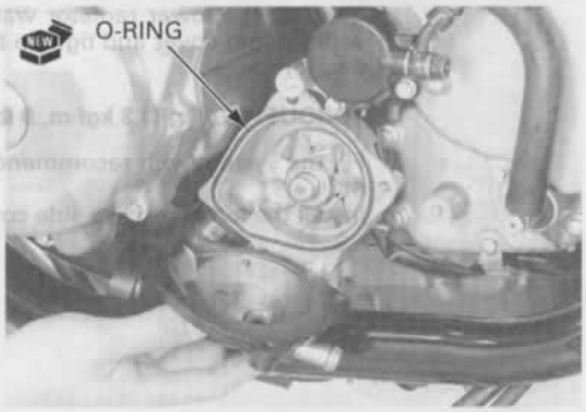


Connect the water pump-to-water joint hose to the water pump and tighten the clamp screws.

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

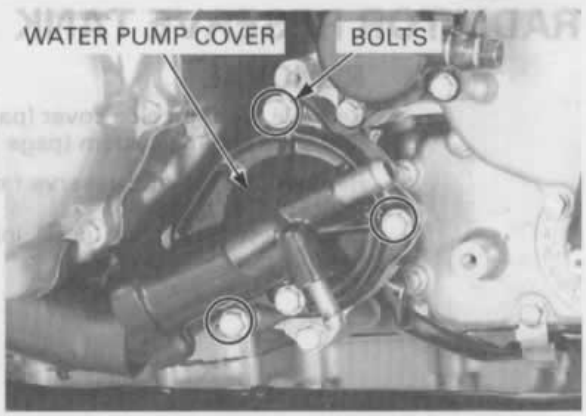


Install a new O-ring into the groove in the water pump body.

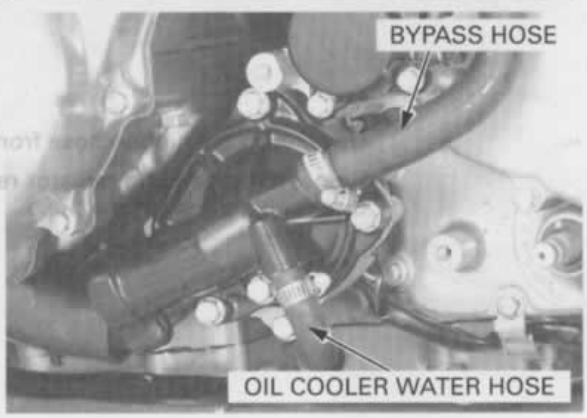


Install the water pump cover, water pump mounting bolt and two cover mounting bolts.
Tighten the water pump cover mounting bolts to the specified torque.

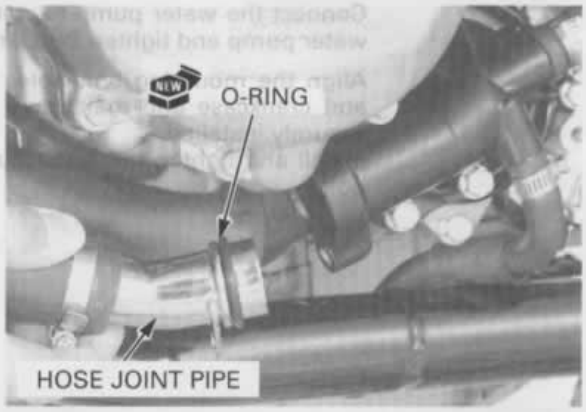
TORQUE: 13 N·m (1.3 kgf·m, 9 lbf·ft)



Connect the oil cooler water hose and bypass hose to the water pump cover and tighten the clamp screws securely.



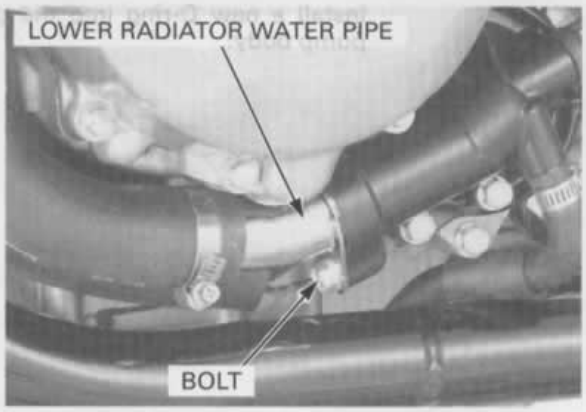
Install a new O-ring onto the flange of the lower radiator water hose joint pipe.



Connect the lower radiator water joint pipe to the water pump cover and tighten the bolt to the specified torque.

TORQUE: 13 N·m (1.3 kgf·m, 9 lbf·ft)

Fill the system with recommended coolant (page 7-6).
Install the left crankcase side cover (page 8-12).



RADIATOR RESERVE TANK

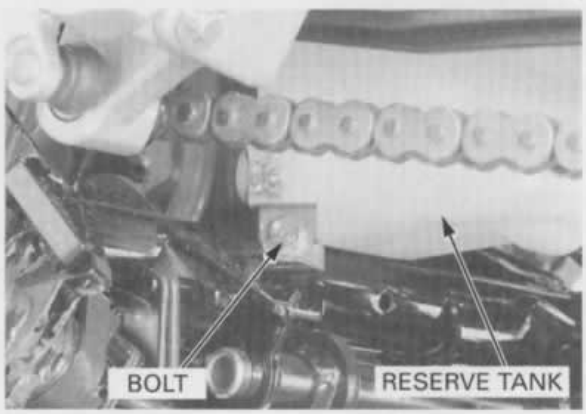
REMOVAL

Remove the right side cover (page 3-4).
Drain the cooling system (page 7-6).

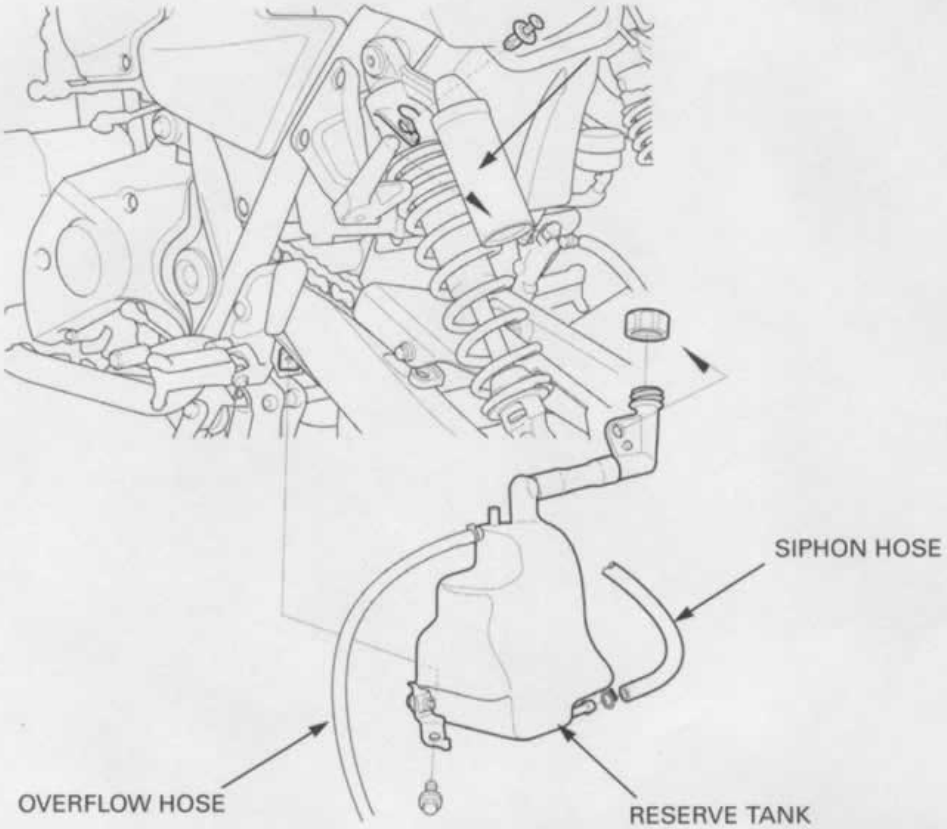
Remove the radiator reserve tank filler neck retaining clip.
Disconnect the filler neck joint hose from the reserve tank.

Disconnect the siphon hose from the reserve tank.

Remove the bolt and radiator reserve tank and then disconnect the overflow hose.



INSTALLATION

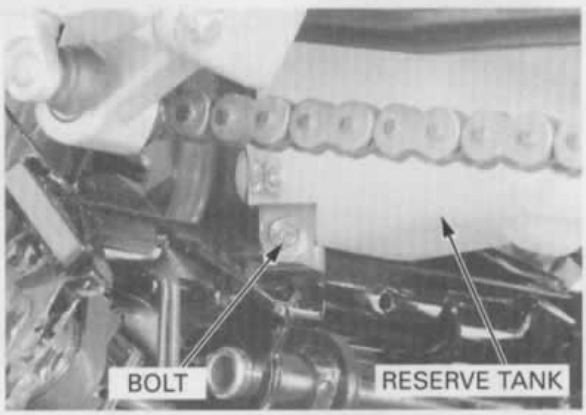


Connect the overflow hose to the reserve tank.

Install the reserve tank onto the frame while connecting the filler neck joint hose.

Install and tighten the reserve tank mounting bolt.

Connect the siphon hose.



Install the filler neck retaining clip.

Fill the system with recommended coolant (page 7-6).

Install the right side cover (page 3-4).