

COOLING SYSTEM

Return To Main Table of Contents

GENERAL	2
COOLING SYSTEM	9
RADIATOR	10
WATER PUMP	13
THERMOSTAT	15
WATER TEMPERATURE GAUGE UNIT, SENSOR	16
WATER HOSE AND PIPE	18

GENERAL**SPECIFICATIONS**

Cooling method	Water-cooled, pressurized, Forced circulation with electrical fan
Cooling system	
Quantity	5.3 lit (5.6 U.S.qts., 5.0 Imp.qts.)
Radiator cap	
Main valve opening pressure	81.4-108 kPa (11.8-15.6 psi, 0.83-1.1 kg/cm ²)
Vacuum valve opening pressure	-6.86 kPa (-1.00 psi, -0.07 kg/cm ²) or less
Water pump	Impeller of centrifugal type
Thermostat	
Valve opening temperature	88 ± 1.5°C (190.4 ± 2.7°F)
Full-opening temperature	100°C (212°F)
Valve lift, fully open	8 mm (0.31 in) or more
Identification mark	88 (Stamped on flange)
Water temperature gauge unit	
Resistance	90.5-117.5 Ω at 70°C (158°F) 21.3-26.3 Ω at 115°C (239°F)
Thermo switch (On radiator)	
Operating temperature	
OFF - ON	85 ± 3°C (185 ± 5.4°F)
ON - OFF	78°C (172°F) or more
Water temperature sensor	
Resistance	2.21-2.69 KΩ at 20°C (68°F) 264-382 KΩ at 80°C (176°F)

SERVICE STANDARD

Standard value	
Coolant concentration	50%

TIGHTENING TORQUE

	Nm	kg.cm	lb.ft
Alternator support nut	20-25	200-250	14-18
Alternator adjuster lock bolt	12-15	120-150	9-11
Water pump to cylinder block	12-15	120-150	9-11
Water pump to cylinder block (alternator brace mounting)	20-27	200-270	14-20
Water pump pulley	8-10	80-100	6-7
Water temperature gauge unit	10-12	100-120	7-9
Water temperature sensor	20-40	200-400	15-28
Water outlet fitting bolt	17-20	170-200	12-14

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Low coolant level	Leakage of coolant Heater or radiator hose Faulty radiator cap Thermostat housing Radiator Water pump	Repair or replace parts Tighten or replace clamps Replace gasket or housing Replace Replace parts
Clogged radiator	Foreign material in coolant	Replace coolant
Abnormally high coolant temperature	Faulty thermostat Faulty radiator cap Restricted to flow in cooling system Loosen or missing drive belt Faulty water pump Faulty temperature gauge or wiring Faulty electric fan Faulty thermo-switch in radiator Insufficient coolant	Replace parts Clear restriction or replace parts Adjust or replace Replace Repair or replace Repair or replace Replace Refill coolant
Abnormally low coolant temperature	Faulty thermostat Faulty temperature gauge or wiring	Replace Repair or replace
Leakage from oil cooling system	Loose connections Cracked or damaged Hoses Pipes Oil cooler	Tighten Replace
Inoperative electrical cooling fan	Damaged Thermo sensor Electrical motor Radiator fan relay Wiring	Repair or replace

COOLANT LEAK CHECK

1. Wait until the radiator is cool (less than 38°C, 100°F). Loosen the radiator cap.
2. Confirm that the coolant level is up to the filler neck.
3. Install a radiator cap tester to the radiator filler neck and apply 150 kPa (21 psi, 1.53 kg/cm²) pressure. Hold for two minutes in that condition, while checking for leakage from the radiator, hose, or connection.

CAUTION

Radiator coolant may be extremely hot. Do not open the system while hot, or scalding water could spray out causing personal injury. Allow the vehicle to cool before servicing this system.

Be sure to completely clean away any moisture from the places checked.

When the tester is removed, be careful not to spill any coolant from it.

Use care, when installing and removing the tester.

When testing, do not distort the filler neck of the radiator.

4. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP PRESSURE TEST

1. Use an adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

Main valve opening pressure	81.4-108 KPa (11.8-15.6 psi, 0.83-1.10 kg/cm ²)
Limit.	65 kpa (9.2 psi, 0.66 kg/cm ²)

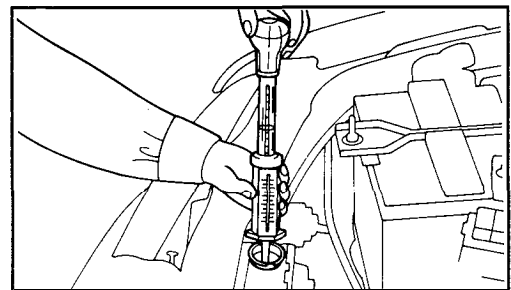
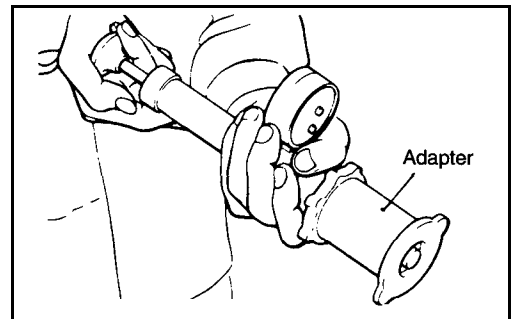
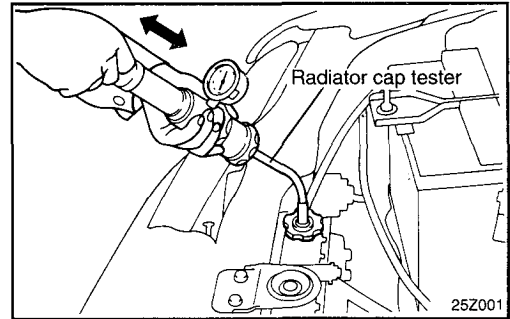
3. Check that the pressure level is maintained at or above the limit.
4. Replace the radiator cap if the reading does not remain at or above the limit.

NOTE

Be sure the cap is clean before testing. Rust or other foreign material on the cap seal will cause an incorrect indication.

SPECIFIC GRAVITY TEST

1. Measure the specific gravity of the coolant with a hydrometer.
2. Measure the coolant temperature, and calculate the concentration from the relation between the specific gravity and temperature using the following table for reference.



Relation Between Coolant Concentration and Specific Gravity

The following table is applicable only to the specified HIGH QUALITY ETHYLENE GLYCOL (ANTIFREEZE) COOLANT

Coolant temperature °C (°F) and specific gravity					Freezing temperature °C (°F)	Safe operating temperature °C (°F)	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)			
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30%
1.063	1.058	1.054	1.049	1.044	-20 (-4)	-15 (5)	35%
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40%
1.079	1.074	1.069	1.064	1.058	-30 (-22)	-25 (-13)	45%
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50%
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55%
1.103	1.098	1.092	1.084	1.076	-50 (-58)	-45 (-49)	60%

Example

The safe operating temperature is -15°C (5°F) when the measured specific gravity is 1.058 at coolant temperature of 20°C (68°F).

CAUTION

If the concentration of the coolant is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freeze and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.

Do not mix different brands of coolant.

RECOMMENDED COOLANT

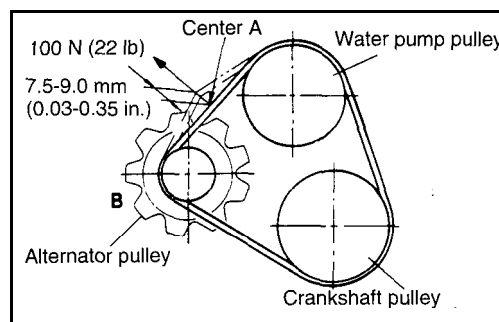
Antifreeze	Mixture ratio of antifreeze in coolant
ETHYLENE GLYCOL BASE FOR ALUMINUM	50%

DRIVE BELT TENSION DEFLECTION CHECK AND ADJUSTMENT

Drive Belt Measurement And Adjustment

To meet specifications measure belt deflection at point A. If not within specifications loosen the alternator (point B) and adjust in or out to meet specifications in the chart below.

	Installed new belt	Installed used belt
Deflection	5.5-7.0 mm (0.22-0.28 in.)	8.0 mm (0.31 in.)
Tension (T)	50-70 kg (110-154 lb)	40 kg (88 lb)



Length Checkup of Drive Belt

After engine is driven, belt length is to be satisfied following value when belt is measured as above method (cold engine temperature of engine cooling water is above 20°C (68°C)).

	Drive belt check up
Deflection	7.0-8.2 mm (0.28-0.32 in.)
Tension (T)	35-50 kg (77-110 lb)

USAGE OF TENSION GAUGE

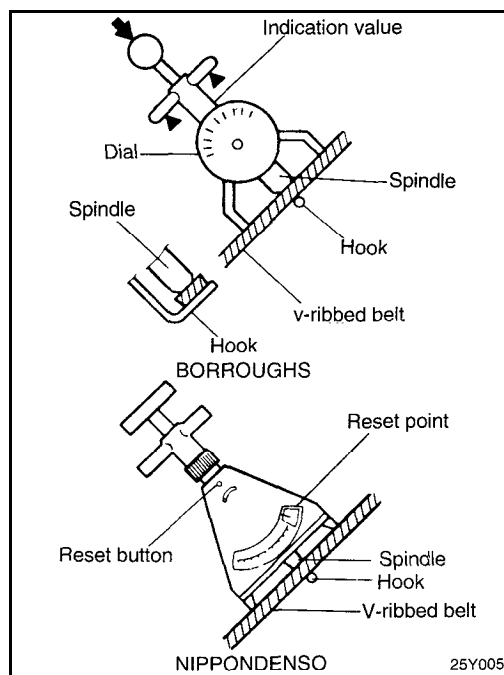
Using Tension Gauge

BORROUGHS BT-33-73F Type

NIPPONDENSO BTG-2 Type

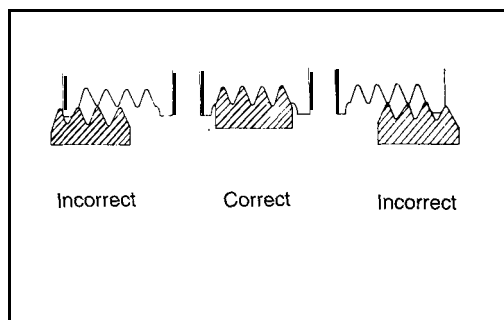
Measuring Method

1. Press down on the tension gauge handle and insert the belt between the spindle and hook of the gauge.
2. Release the handle and read the measurement on the gauge.



NOTE

1. A belt which has been in operation for 5 minutes or more, must be adjusted to the used belt specifications.
2. Check to see that the belt is installed correctly, as shown in the illustration.
3. A loose belt will produce a high-pitched squealing noise.
4. A belt that is too tight will damage the alternator and water pump bearings.



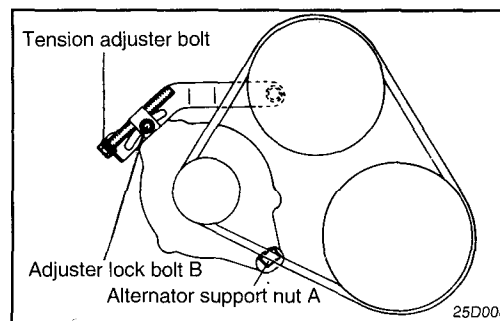
DRIVE BELT AND PULLEY

Removal

1. Loosen the alternator support nut "A" and the belt tension adjuster lock bolt "B".
2. Rotate the adjuster bolt counterclockwise to relieve belt tension, and remove the belt.
3. Remove the water pump pulley bolts and remove the water pump pulley.

Tightening torque A

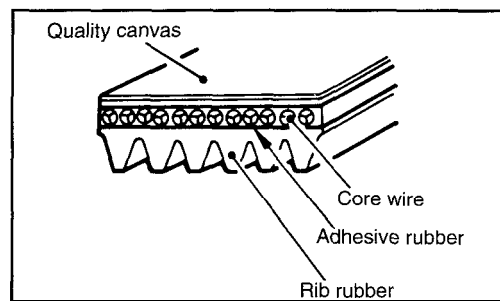
Alternator support nut A	20-25 Nm (200-250 kg.cm, 14-18 lb.ft)
Adjuster lock bolt B	12-15 Nm (120-150 kg.cm, 9-11 lb.ft)



Inspection

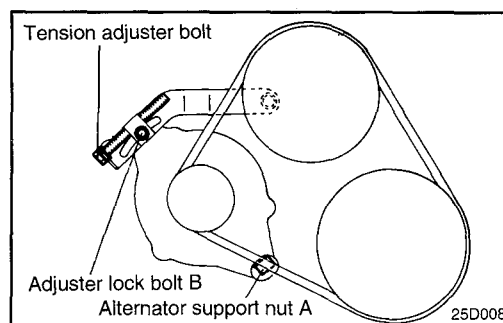
Check the following items and replace if defective.

1. Check the surface for damage, peeling or cracks.
2. Check the belt surface for oil or grease.
3. Check the rubber for worn or hardened areas.
4. Check the surface of the pulley for cracks or damage.



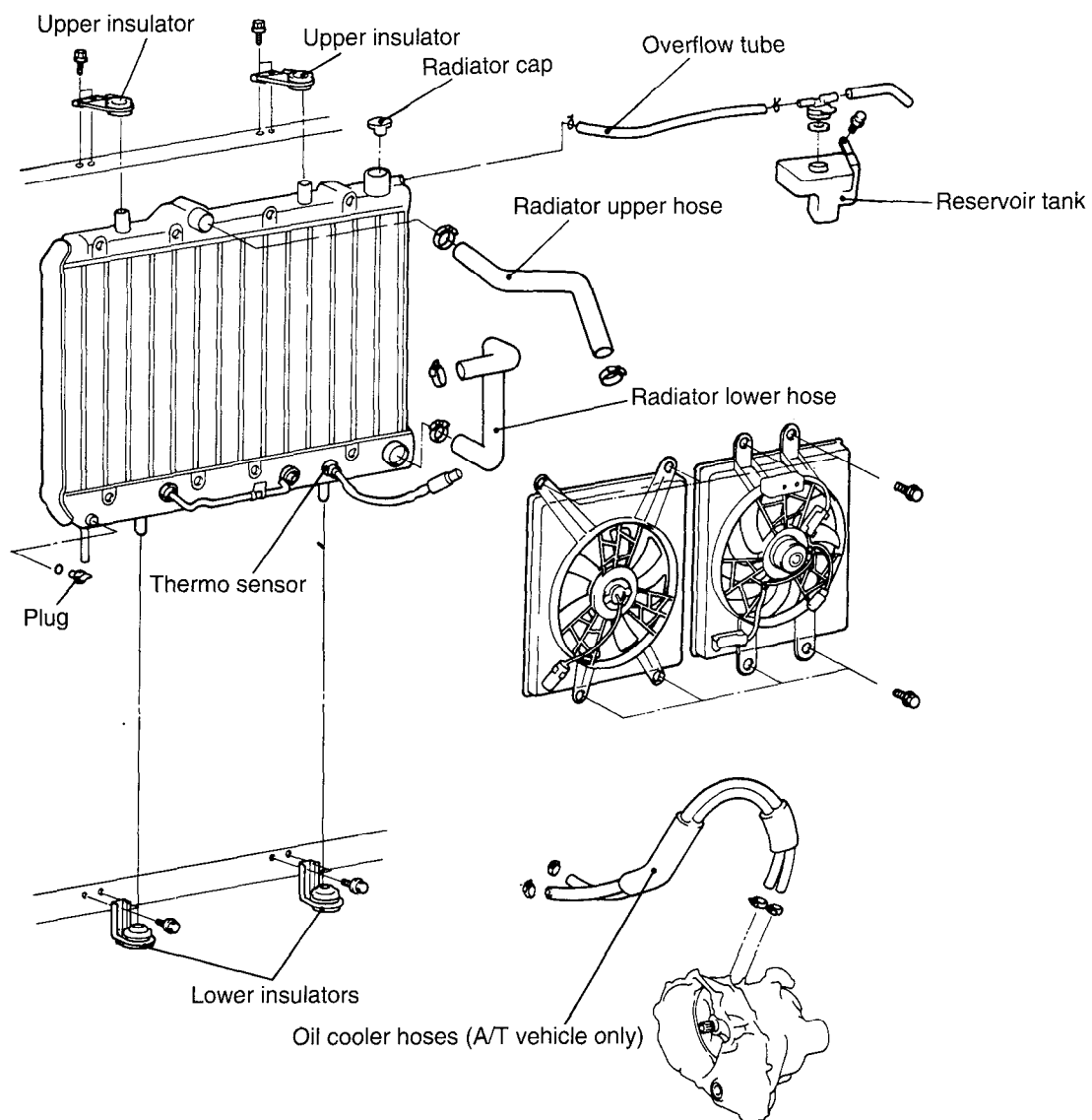
Installation

1. Install the water pump pulley to the water pump pulley bracket and tighten the bolts firmly.
2. After installing the belt, adjust the belt tension. See "DRIVE BELT TENSION DEFLECTION CHECK AND ADJUSTMENT".



RADIATOR

COMPONENTS



REMOVAL

1. Disconnect the fan motor plug.
2. Set the warm water flow control knob of the heater control to the hot position.
3. Loosen the radiator drain plug to drain coolant.
4. Disconnect the upper and lower hose, and the overflow tube.
5. For vehicles with an automatic transaxle, disconnect the oil cooler hoses from the automatic transaxle.

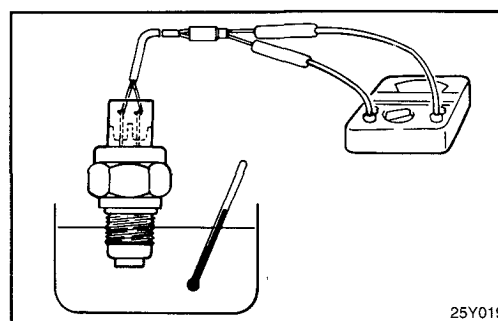
CAUTION

Plug the ends of the oil cooler hoses and the automatic transaxle port to prevent the transaxle fluid from spilling out and foreign material from getting in.

6. Remove the radiator mounting bolts.
7. Remove the radiator together with the fan motor.
8. Remove the fan motor from the radiator.

INSPECTION

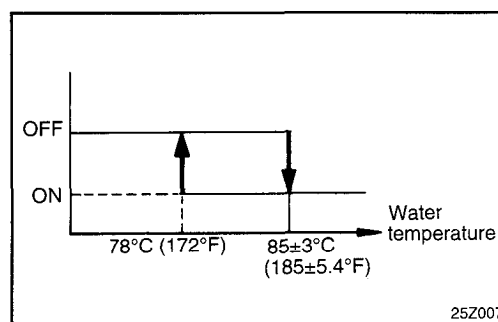
1. Check the radiator for bent, broken or plugged fins.
2. Check the radiator for corrosion, damage, rust or scale.
3. Check the radiator hoses for cracks, damage or deterioration.
4. Check the reservoir tank for damage.
5. Check the radiator cap spring for damage. Pressure test the cap using a cooling system checker.
6. Check the radiator cap seal for cracks or damage.



7. Check for continuity with the thermo sensor in hot water.
Continuity at $85 \pm 3^{\circ}\text{C}$ ($185 \pm 5.4^{\circ}\text{F}$)
No continuity at 78°C (172°F) or more

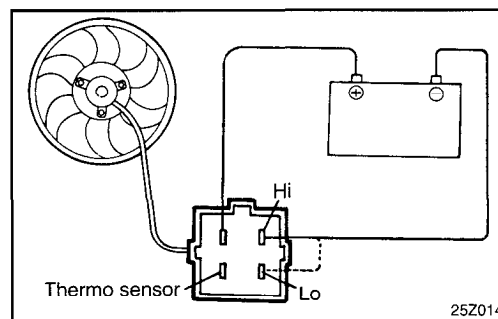
NOTE

Immerse the thermo sensor in hot water up to the mounting threads to check for continuity.



Radiator Fan Motor

1. Check to be sure that the radiator fan rotates when battery voltage is applied between the terminals (as shown in the figure).
2. Check to see that abnormal noises are not produced while the motor is turning.

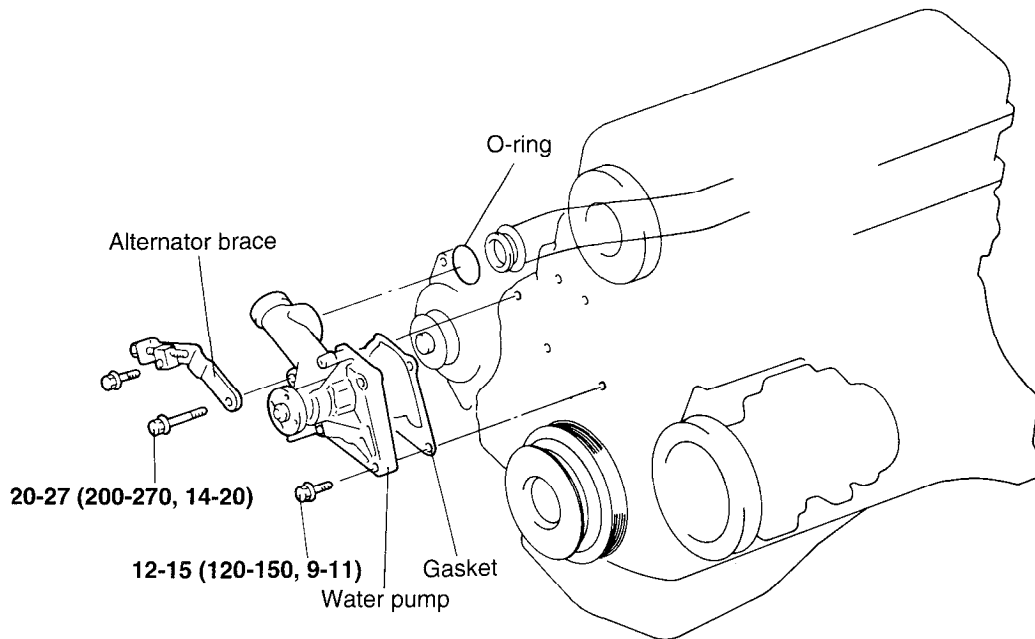


INSTALLATION

1. Fill the radiator and reservoir tank with a fresh coolant mixture.
2. Run the engine until the coolant has warmed up enough so that the thermostat valve opens, and then stop the engine.
3. Remove the radiator cap, pour in the coolant until it is up to the filler neck of the radiator, and then fill the reservoir tank to the upper level.
4. Check to be sure that there is no leakage from the radiator, hoses or connections.

WATER PUMP

COMPONENTS



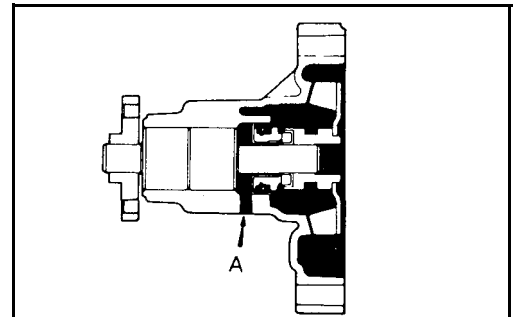
TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

1. Drain the coolant and disconnect the radiator outlet hose from the water pump.
2. Remove the drive belt and water pump pulley.
3. Remove the timing belt covers and the timing belt tensioner.
4. Remove the water pump mounting bolts and remove the alternator brace.
5. Remove the water pump assembly from the cylinder block.

INSPECTION

1. Check for excessive corrosion, cracks, damage, or wear. Replace the water pump assembly if necessary.
2. Check the bearing for damage, abnormal noise, and sluggish rotation. Replace the water pump assembly if necessary.
3. Check for water leakage. If water leaks from hole "A", the seal unit is defective. Replace water pump assembly.



INSTALLATION

1. Clean the gasket surfaces of the water pump body and the cylinder block.
2. Install the new O-ring onto the groove on the front end of the water pipe. Wet the O-ring with water. Do not apply oil or grease.

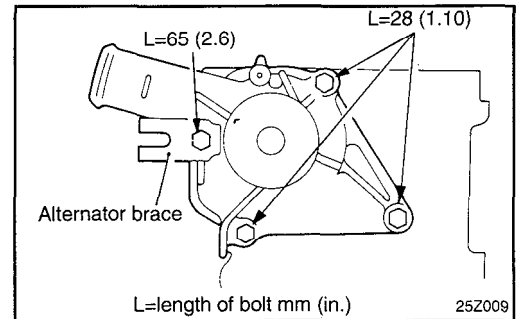
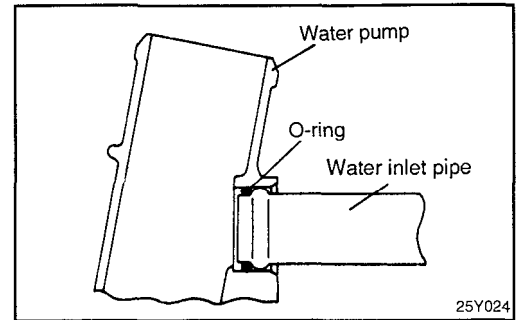
3. Install a new water pump gasket and water pump assembly. Tighten the bolts to the specified torque.

Tightening torque

Water pump to cylinder block

Head mark "4" bolt	12-15 Nm (120-150 kg.cm, 9-11 lb.ft)
Head mark "7" bolt	20-27 Nm (200-270 kg.cm, 14-20 lb.ft)

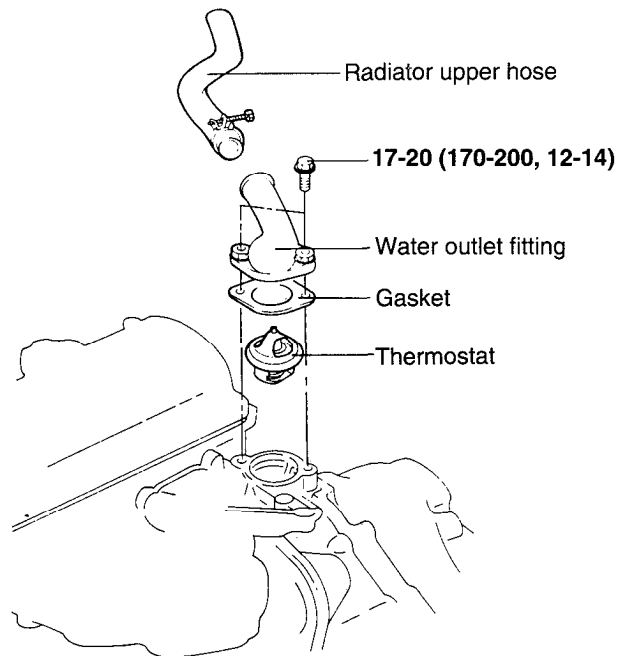
4. Install the timing belt tensioner and the timing belt. Adjust the timing belt tension. Then install the timing belt covers. See "Engine", for detailed procedure.
5. Install the water pump pulley and drive belt. Then adjust the belt tension.
6. Refill with fresh coolant mixture.
7. Run the engine and check for leaks.



L=length of bolt mm (in.)

THERMOSTAT

COMPONENTS

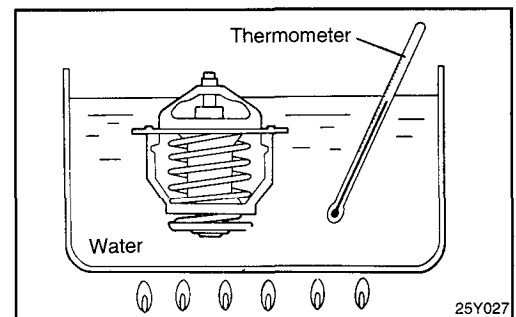


TORQUE : Nm (kg.cm, lb.ft)

REMOVAL AND INSPECTION

1. Drain the coolant down to the thermostat level or below.
2. Remove the water outlet fitting and gasket.
3. Remove the thermostat.
4. Heat the thermostat as shown in the illustration.
5. Check to see if the valve operates properly.
6. Determine temperature at which the valve begins to open,

Valve opening temperature $88 \pm 1.5^{\circ}\text{C}$ ($190.4 \pm 2.7^{\circ}\text{F}$)
 Full opening temperature 100°C (212°F)
 Valve lift (at full open) 8 mm (0.31 in.) or more



INSTALLATION

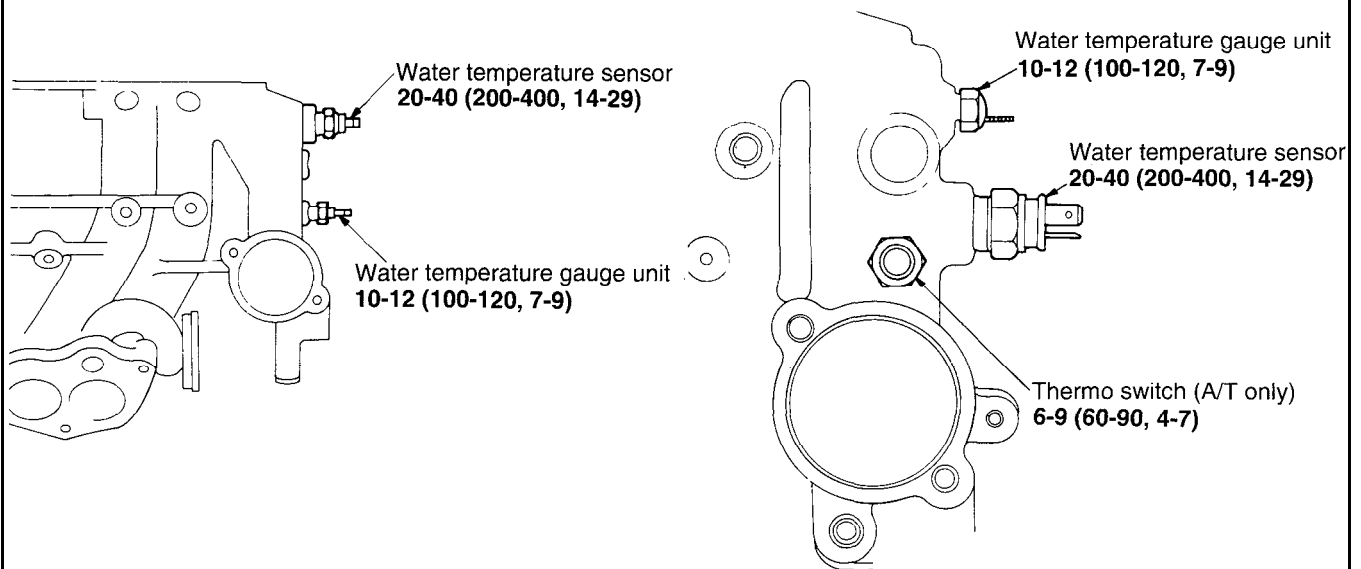
1. Make sure that the flange of the thermostat is correctly seated in the socket of the thermostat housing. If the thermostat is installed in the wrong direction, bottom of thermostat will touch the rib inside the intake manifold, making it impossible to seat the flange.
2. Install a new gasket and the water outlet fitting.
3. Refill with fresh coolant mixture.

WATER TEMPERATURE GAUGE UNIT, SENSOR

COMPONENTS

[MPI]

[FBC]



TORQUE : Nm (kg.cm, lb.ft)

REMOVAL

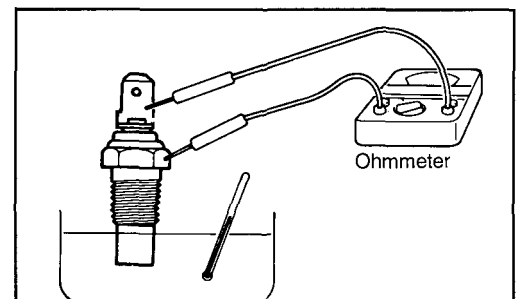
1. Drain the coolant down to the gauge unit level or below.
2. Disconnect the battery ground cable and the engine harness,
3. Remove the water temperature gauge unit, sensor.

INSPECTION

Water Temperature Gauge Unit

1. Heat the water temperature gauge unit by submerging it in hot water.
2. Check that the resistance is within the specified range.

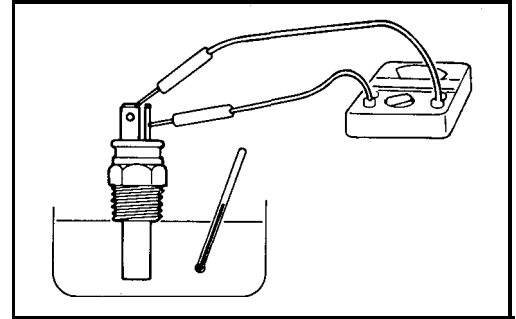
Resistance.....	90.5 - 117.5 Ω at 70°C (158°F)
	21.3-26.3 Ω at 115°C (239°F)



Water Temperature Sensor

1. Heat the sensor by submerging it in hot water.
2. Check that the resistance is within the specified range.

Resistance 2.21-2.69 K Ω at 20°C (68°F)
 264-328 Ω at 80°C (176°F)

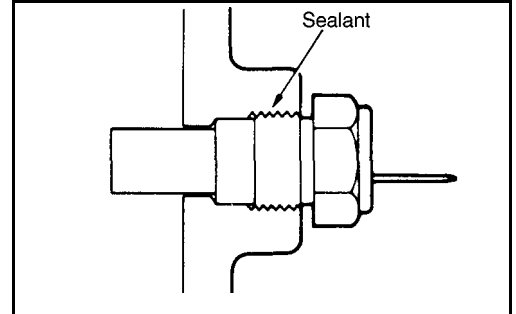


INSTALLATION

1. Apply sealant to the threaded portion of the sensor, gauge unit and tighten to the specified torque.

Tightening torque

Water temperature gauge unit 10-12 Nm (100-120 kg.cm, 7.2-8.7 lb.ft)
 Water temperature sensor 20-40 Nm (200-400 kg.cm, 14-29 lb.ft)

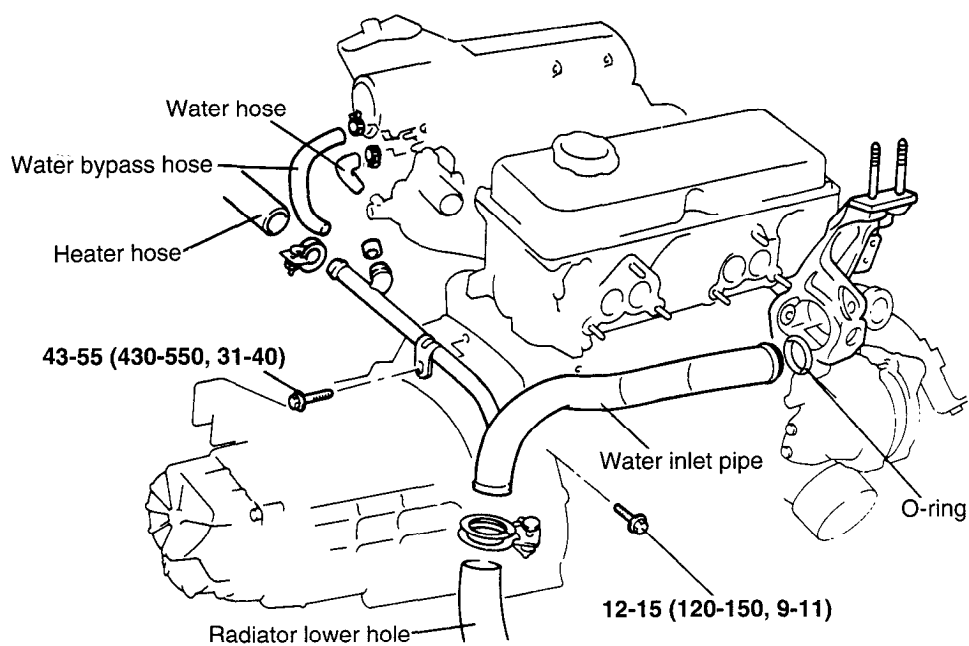


2. Connect the harness to the water temperature gauge unit, temperature sensor.
3. Connect the battery ground cable.
4. Refill with a fresh coolant mixture.

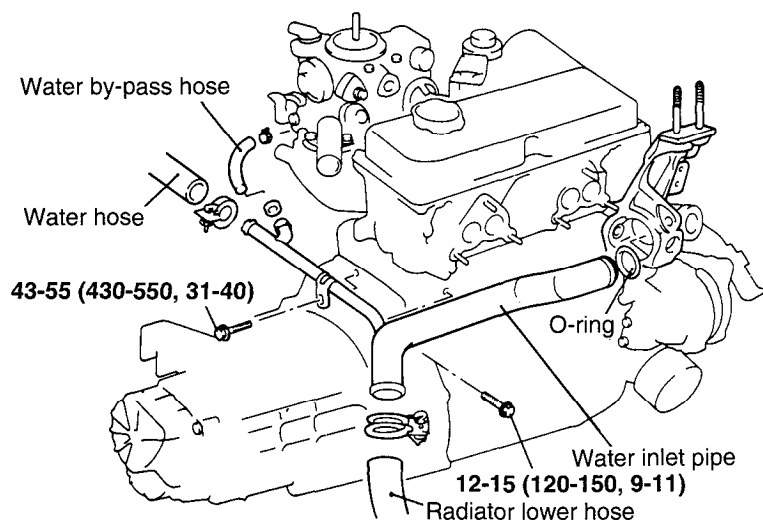
WATER HOSE AND PIPE

COMPONENTS

[MPI]



[FBC]



TORQUE : Nm (kg.cm, lb.ft)

INSPECTION

Check the water pipe and hose for cracks, damage, or restrictions.
Replace if necessary.

INSTALLATION

Fit the O-ring in the groove provided at the water inlet pipe end. Wet the O-ring with water and insert the water inlet pipe.

NOTE

1. Do not apply oils or greases to the water pipe O-ring.
2. Keep the water pipe connections free of sand, dust, etc.
3. Insert the water pipe until its bottoms.

