

TROOPER

ENGINE

ENGINE COOLING

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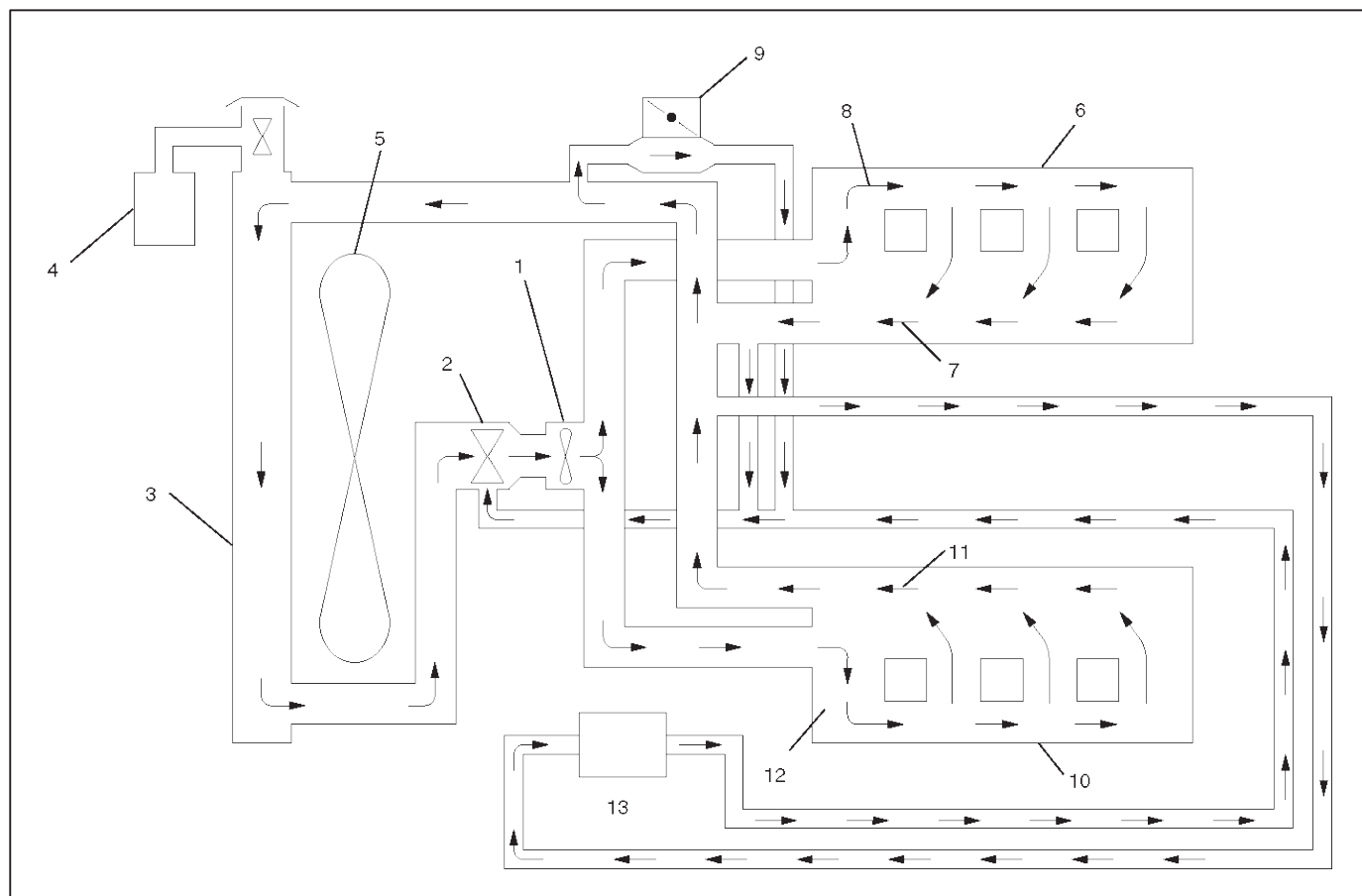
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Service Precaution

WARNING: THIS VEHICLE HAS A SUPPLEMENTAL RESTRAINT SYSTEM (SRS). REFER TO THE SRS COMPONENT AND WIRING LOCATION VIEW IN ORDER TO DETERMINE WHETHER YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING. WHEN YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING, REFER TO THE SRS SERVICE INFORMATION. FAILURE TO FOLLOW WARNINGS COULD RESULT IN POSSIBLE AIR BAG DEPLOYMENT, PERSONAL INJURY, OR OTHERWISE UNNEEDED SRS SYSTEM REPAIRS.

CAUTION: Always use the correct fastener in the proper location. When you replace a fastener, use ONLY the exact part number for that application. ISUZU will call out those fasteners that require a replacement after removal. ISUZU will also call out the fasteners that require thread lockers or thread sealant. UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (Paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and the joint clamping force, and may damage the fastener. When you install fasteners, use the correct tightening sequence and specifications. Following these instructions can help you avoid damage to parts and systems.

General Description



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Legend

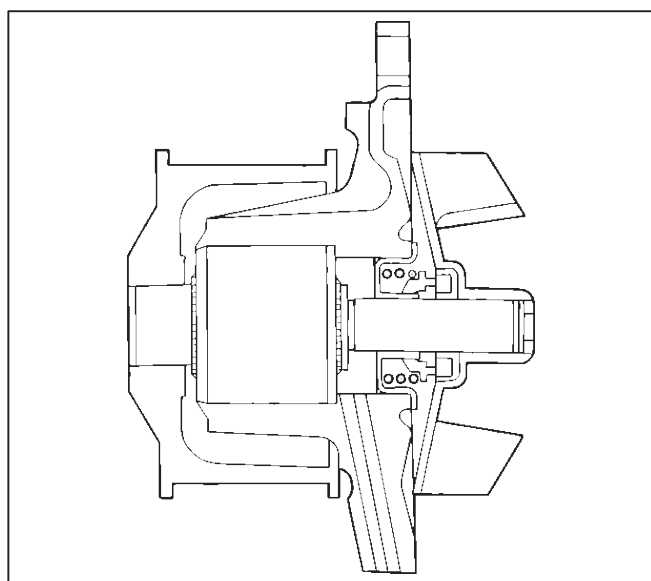
- (1) Water Pump
- (2) Thermostat
- (3) Radiator
- (4) Reserve Tank
- (5) Cooling Fan
- (6) Cylinder Block

- (7) Cylinder Head
- (8) Right Bank
- (9) Throttle Body
- (10) Cylinder Block
- (11) Cylinder Head
- (12) Left Bank
- (13) Heater

The cooling system is a pressurized Engine Coolant (EC) forced circulation type which consists of a water pump, thermostat cooling fan, radiator and other components. The automatic transmission fluid is cooled by the EC in radiator.

Water Pump

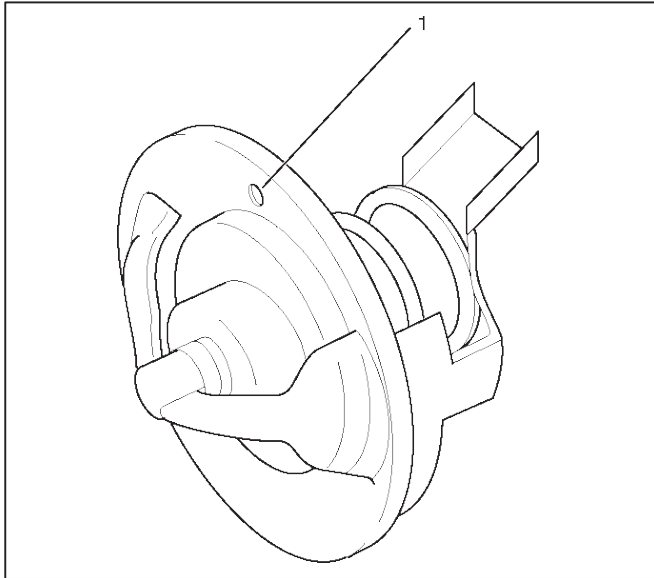
The EC pump is a centrifugal impeller type and is driven by a timing belt.



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Thermostat

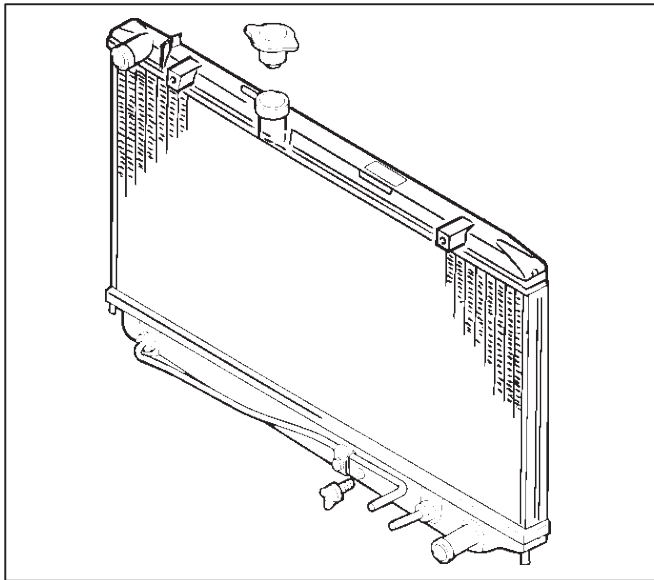
The thermostat is a wax pellet type with a air hole(1) and is installed in the thermostat housing.



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Radiator

The radiator is a tube type with corrugated fins. In order to raise the boiling point of the coolant, the radiator is fitted with a cap in which the valve is operated at 88.2 ~ 117.6 kPa (12.8 ~ 17.0 psi) pressure. (No oil cooler provided for M/T)



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Anti Freeze Solution

- Relation between the mixing ratio and freezing temperature of the EC varies with the ratio of anti-freeze solution in water. Proper mixing ratio can be determined by referring to the chart. Supplemental inhibitors or additives claiming to increase cooling capability that have not been specifically approved by Isuzu are not recommended for addition to the cooling system.
- Calculating mixing ratio

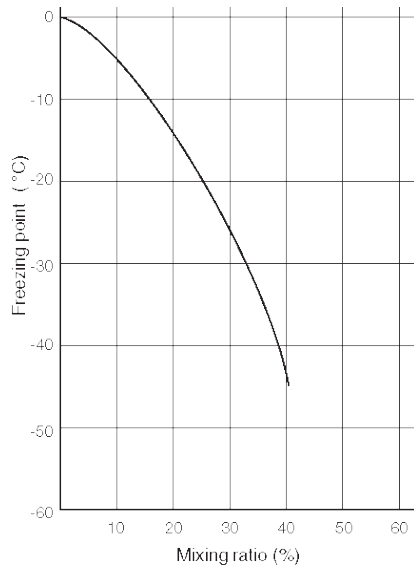
Mixing ratio

$$= \frac{\text{Antifreeze solution (Lit/gal.)}}{\text{Antifreeze solution (Lit/gal.)} + \text{Water (Lit/gal.)}}$$

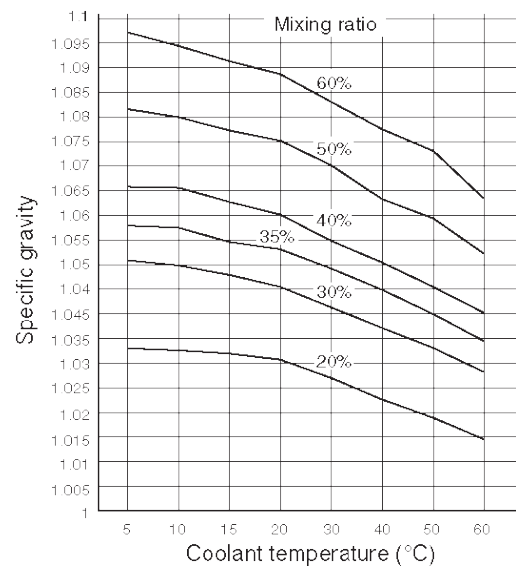
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NOTE: Antifreeze solution + Water = Total cooling system capacity.

- **Total Cooling System Capacity**
- **M/T 8.8Lit (2.32Us gal)**
- **A/T 8.4Lit (2.22Us gal)**



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● Mixing ratio

Check the specific gravity of engine coolant in the cooling system temperature ranges from 0°C to 50°C using a suction type hydrometer, then determine the density of the engine coolant by referring to the table.

NOTE:

1. Even in the areas where the atmospheric temperature is higher than 0°C, be sure not to use antifreeze solution at a mixing ratio lower than 20% so that the inside of the engine may not be corroded.
2. If antifreeze solution is used at a mixing ratio higher than 60%, the specific heat of the coolant falls and the engine may be overheated. Moreover, antifreeze performance drop and the coolant may be frozen. The density of the solution must be adjusted as occasion calls.

Antifreeze solution lower than 20% may not have sufficient anticorrosive performance, and therefore, please never fail to adjust as occasion demands within the range of 20% to 60%.

Diagnosis

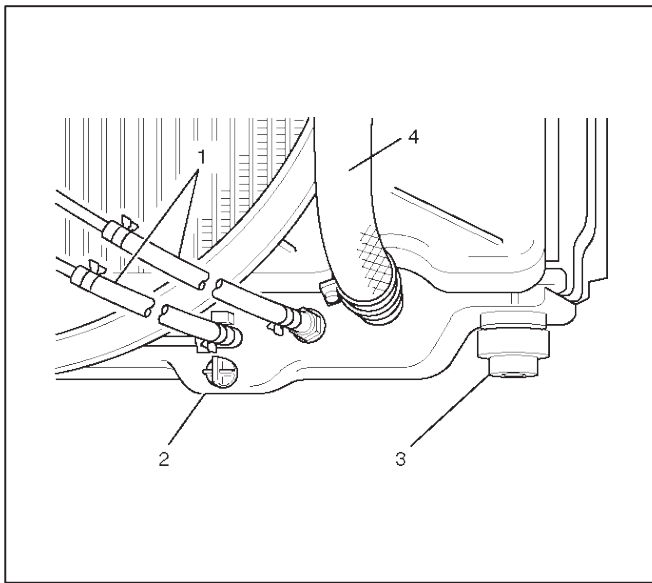
Engine Cooling Trouble

Condition	Possible cause	Correction
Engine overheating	Low Engine Coolant level	Replenish
	Incorrect fan installed	Replace
	Thermo meter unit faulty	Replace
	Faulty thermostat	Replace
	Faulty Engine Coolant temperature sensor	Repair or replace
	Clogged radiator	Clean or replace
	Faulty radiator cap	Replace
	Low engine oil level or use of improper engine oil	Replenish or change oil
	Clogged exhaust system	Clean exhaust system or replace faulty parts
	Faulty Throttle Position sensor	Replace throttle valve assembly
	Open or shorted Throttle Position sensor circuit	Repair or replace
	Damaged cylinder head gasket	Replace
Engine overcooling	Faulty thermostat	Replace
Engine slow to warm-up	Faulty thermostat	Replace
	Thermo unit faulty	Replace

Draining and Refilling Cooling System

Before draining the cooling system, inspect the system and perform any necessary service to ensure that it is clean, does not leak and is in proper working order. The engine coolant (EC) level should be between the "MIN" and "MAX" lines of reserve tank when the engine is cold. If low, check for leakage and add EC up to the "MAX" line. There should not be any excessive deposit of rust or scales around the radiator cap or radiator filler hole, and the EC should also be free from oil. Replace the EC if excessively dirty.

1. Completely drain the cooling system by opening the drain plug (2) at the bottom of the radiator.



2. Remove the radiator cap.

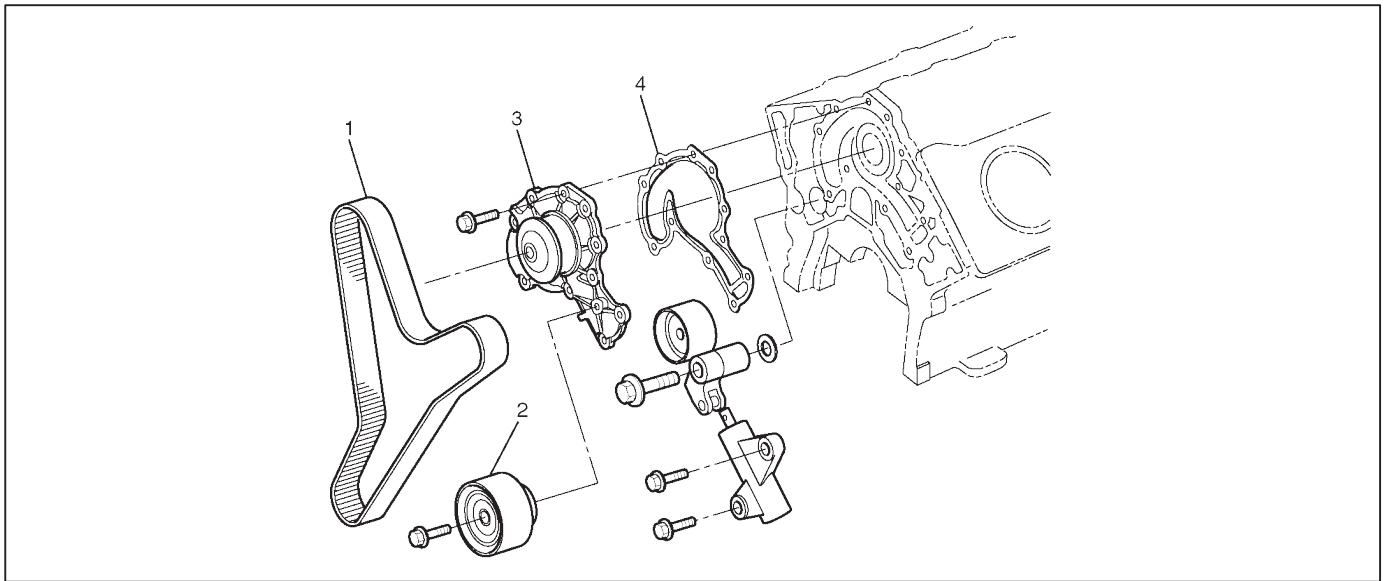
WARNING: TO AVOID THE DANGER OF BEING BURNED, DO NOT REMOVE THE CAP WHILE THE ENGINE AND RADIATOR ARE STILL HOT. SCALDING FLUID AND STEAM CAN BE BLOWN OUT UNDER PRESSURE.

3. Disconnect all hoses from the EC reserve tank. Scrub and clean the inside of the reserve tank with soap and water. Flush it well with clean water, then drain it. Install the reserve tank and hoses.
4. Refill the cooling system with the EC using a solution that is at least 50 percent antifreeze but no more than 70 percent antifreeze.
5. Fill the radiator to the base of the filler neck. Fill the EC reserve tank to "MAX" line when the engine is cold.
6. Block the drive wheels and firmly apply the parking brake. Shift an automatic transmission to "P" (Park) or a manual transmission to neutral.
7. Remove the radiator cap. Start the engine and warm it up at 2,500 ~ 3,000 rpm for about 30 minutes.
8. When the air comes out from the radiator filler neck and the EC level has gone down, replenish with the EC. Repeat this procedure until the EC level does not go down. Then stop the engine and install the radiator cap. Let the engine cool down.

9. After the engine has cooled, replenish with EC up to the "MAX" line of the reserve tank.
10. Start the engine. With the engine running at 3,000 rpm, make sure there is no running water sound from the heater core (behind the center console).
11. If the running water sound is heard, repeat steps 8 to 10.

Water Pump

Water Pump and Associated Parts



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Legend

- (1) Timing Belt
- (2) Idle Pulley

- (3) Water Pump Assembly
- (4) Gasket

Removal

1. Disconnect battery ground cable.
2. Drain coolant.
3. Radiator hose (on inlet pipe side).
4. Remove timing belt. Refer to "Timing Belt" in this manual.
5. Remove Idle pulley.
6. Remove water pump assembly.
7. Remove gasket.

2. Install water pump assembly and tighten bolts to the specified torque.

Torque: 25 N·m (18 lb ft)

• Tightening order

The tightening order are in the illustrate.

NOTE: To prevent the oil leakage, apply the LOCTITE 262 or an equivalent, to the arrow marked fixing bolt thread.

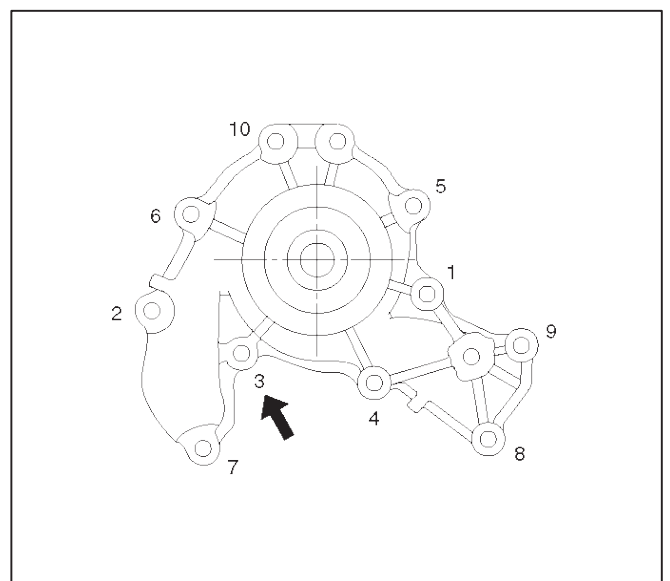
Inspection

Make necessary repair and parts replacement if extreme wear or damage is found during inspection. Should any of the following problems occur, the entire water pump assembly must be replaced:

- Crack in the water pump body
- EC leakage from the seal unit
- Play or abnormal noise in the bearing
- Cracks or corrosion in the impeller.

Installation

1. Install gasket, clean the mating surface of gasket before installation.



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3. Idle pulley

- Install idle pulley and tighten bolt to the specified torque.

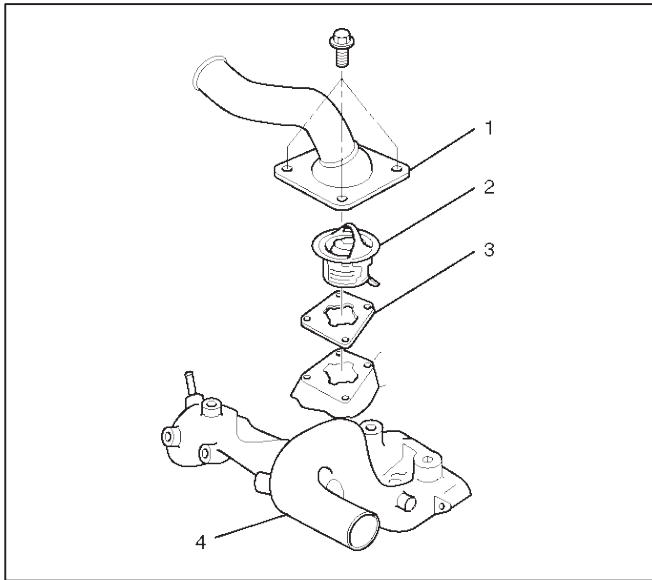
Torque: 52 N·m (38 lb ft)**4. Timing belt**

- Install timing belt. Refer to timing belt installation step in "Timing Belt" in this manual.

5. Connect radiator inlet hose and replenish EC.**6. Connect battery ground cable.**

Thermostat

Thermostat and Associated Parts



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Legend

- (1) Thermostat Housing
- (2) Thermostat
- (3) Outlet Pipe

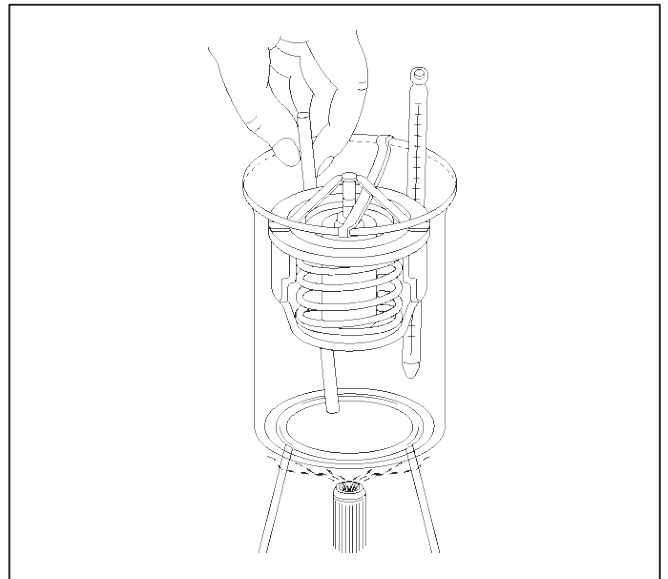
Removal

1. Disconnect battery ground cable.
2. Drain engine coolant from the radiator and engine.
3. Disconnect radiator hose from the inlet pipe.
4. Remove thermostat housing.
5. Remove thermostat(2).

Inspection

Suspend the thermostat in a water-filled container using thin wire. Place a thermometer next to the thermostat. Do not directly heat the thermostat.

Gradually increase the water temperature. Stir the water so that the entire water is same temperature.



031RS003

Confirm the temperature when the valve first begins to open.

**Valve opening temperature 74.5C ~ 78.5°C
(166.1°F ~ 173.3°F)**

Confirm the temperature when the valve is fully opened.

**Valve full open temperature and lift More than
8.5mm (0.33 in) at 90°C (194°F)**

Make necessary repair and parts replacement if extreme wear or damage is found during inspection.

Installation

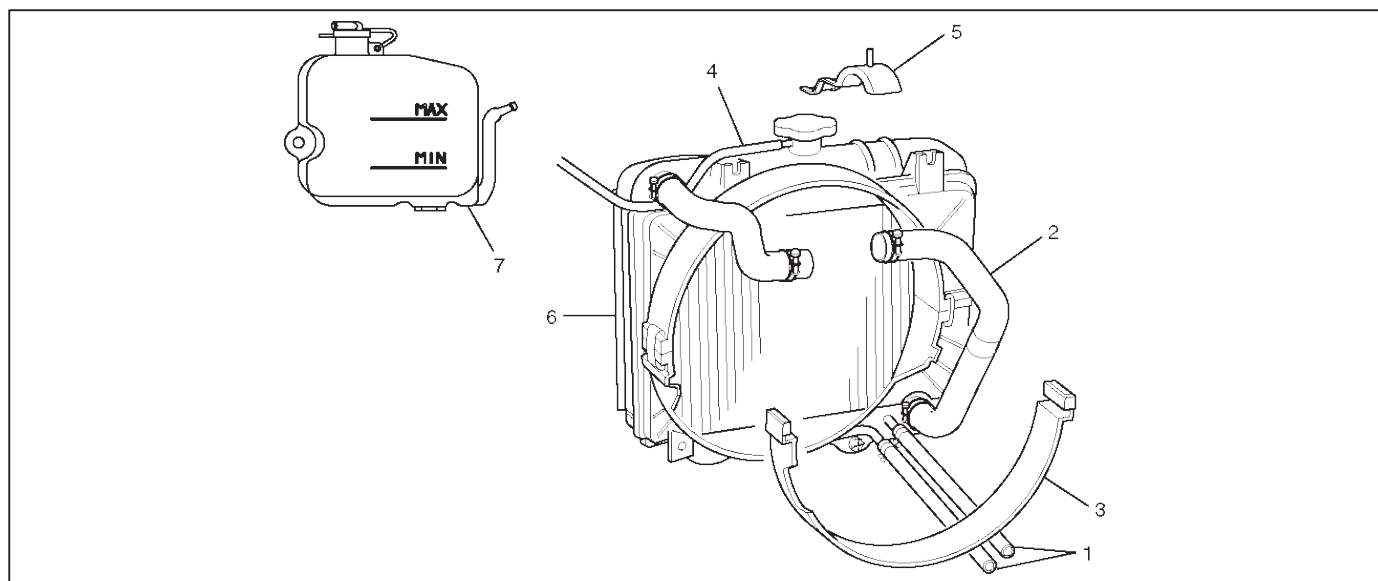
1. Install thermostat into the outlet pipe(4) making sure that the air hole is in the up position.
2. Install thermostat housing and tighten bolts to the specified torque.

Torque: 25 N·m (18 lb ft)

3. Installation rubber hose.
4. Replenish engine coolant (EC).
5. Start engine and check for EC leakage.

Radiator

Radiator and Associated Parts



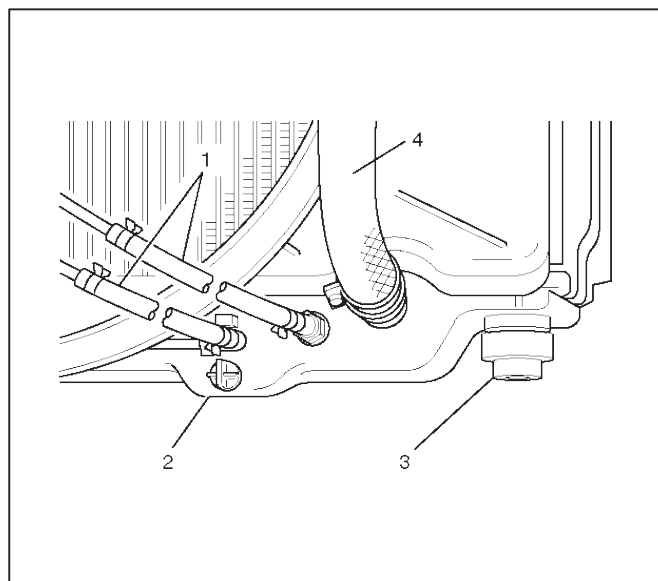
110RW003

Legend

- | | |
|--|-----------------------|
| (1) Oil Cooler Hose For Automatic Transmission | (4) Reserve Tank Hose |
| (2) Radiator Hose | (5) Bracket |
| (3) Fan Guide, Lower | (6) Radiator Assembly |
| | (7) Reserve Tank |

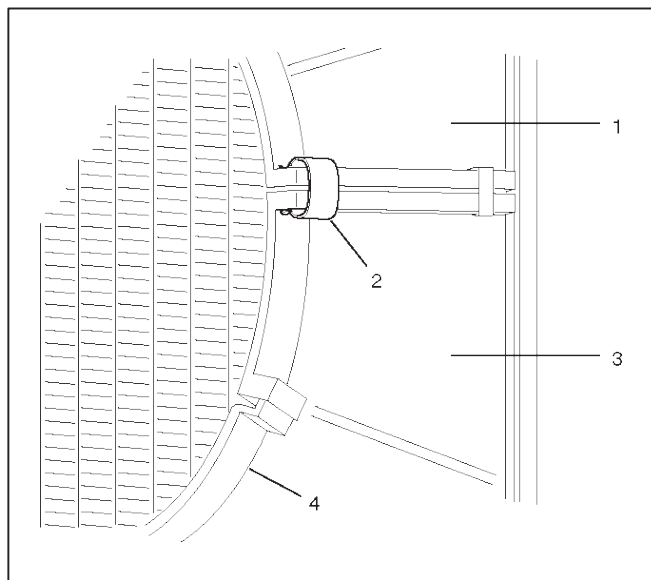
Removal

1. Disconnect battery ground cable.
2. Loosen a drain plug(2) to drain EC.
3. Disconnect oil cooler hose(1) on automatic transmission (A/T).
4. Disconnect radiator inlet hose and outlet hose from the engine.



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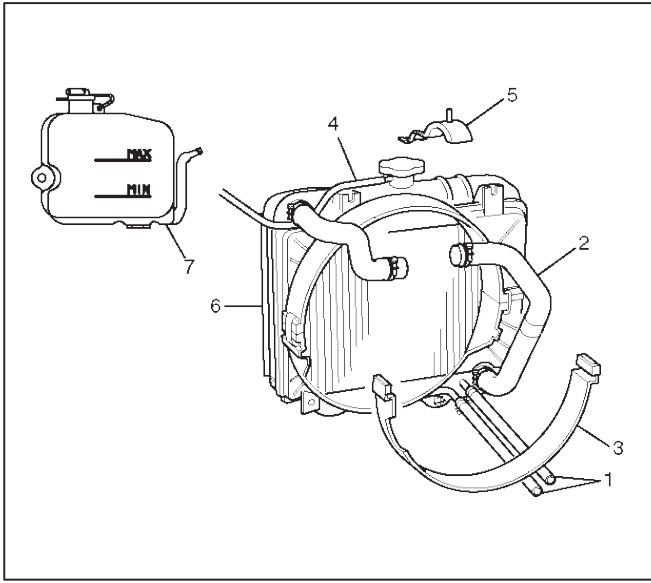
5. Remove fan guide(1), clips(3) on both sides and the bottom lock, then remove lower fan guide(3) with fan shroud(4).



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6. Disconnect the reserve tank hose(4) from radiator.
7. Remove bracket(5).



8. Lift up and remove the radiator assembly with hose, taking care not to damage the radiator core with a fan blade.
9. Remove rubber cushions on both sides at the bottom.

Inspection

Radiator Cap

Measure the valve opening pressure of the pressurizing valve with a radiator filler cap tester. Replace the cap if the valve opening pressure is outside the standard range.

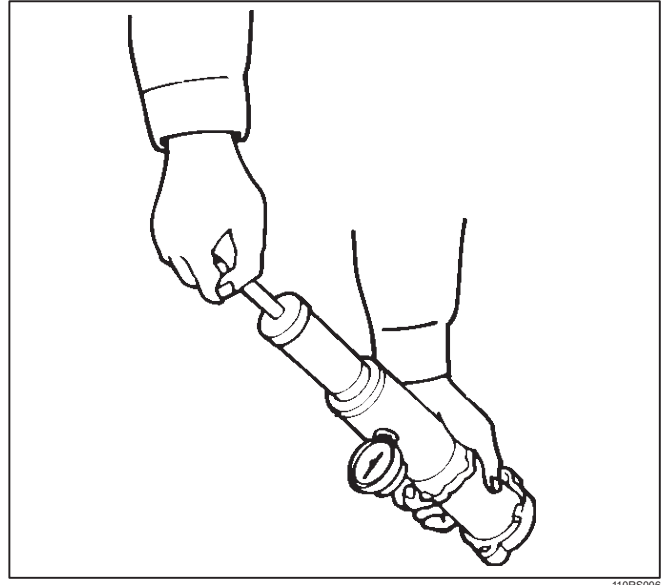
Valve opening pressure kPa (psi) 88.3 ~ 117.7 (12.8 ~17.1)

Cap tester: J-24460-01

Adapter: J-33984-A

Check the condition of the vacuum valve in the center of the valve seat side of the cap. If considerable rust or dirt is found, or if the valve seat cannot be moved by hand, clean or replace the cap.

Valve opening vacuum kPa (psi) 1.96 ~ 4.91 (0.28 ~ 0.71)



Radiator Core

1. A bent fin may result in reduced ventilation and overheating may occur. All bent fins must be straightened. Pay close attention to the base of the fin when it is being straightened.
2. Remove all dust, bugs and other foreign material.

Flushing the Radiator

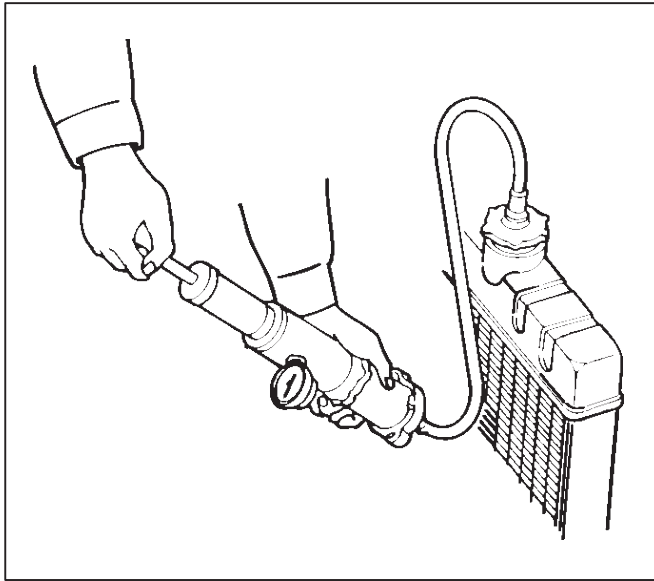
Thoroughly wash the inside of the radiator and the engine coolant passages with cold water and mild detergent. Remove all signs of scale and rust.

Cooling System Leakage Check

Use a radiator cap tester to force air into the radiator through the filler neck at the specified pressure of 196 kPa (28.5 psi) with a cap tester:

- Leakage from the radiator
- Leakage from the coolant pump
- Leakage from the water hoses
- Check the rubber hoses for swelling.

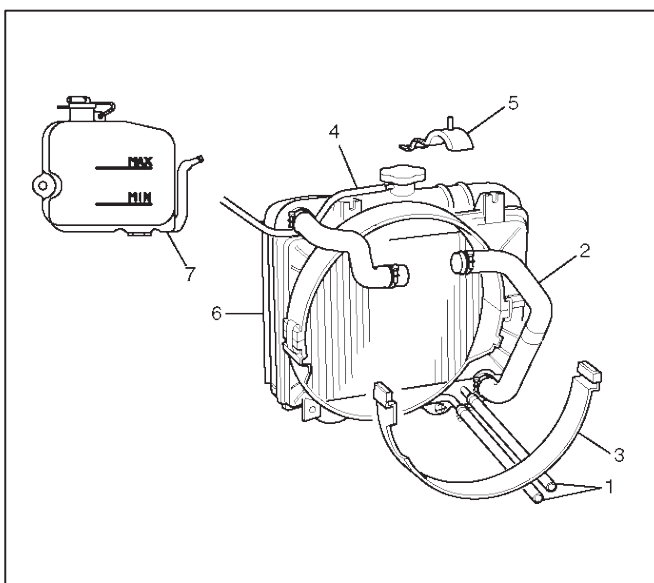
Cap tester: J-24460-01
Adapter: J-33984-A



110RS005

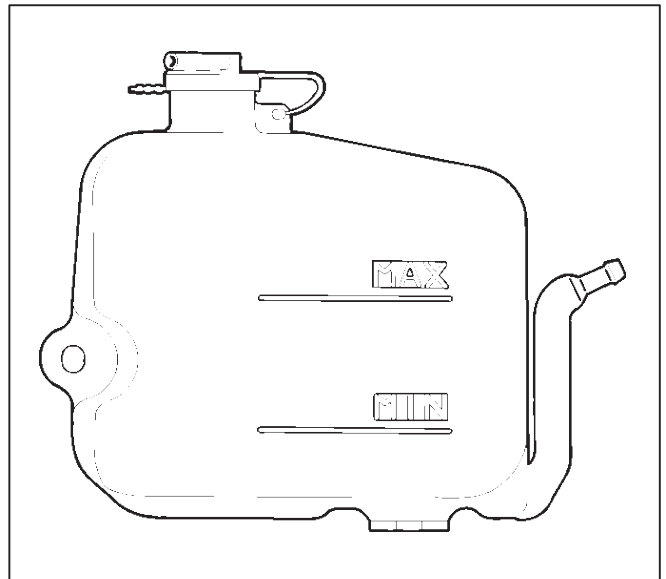
Installation

1. Install rubber cushions on both sides of radiator bottom.
2. Install radiator assembly with hose, taking care not to damage the radiator core with a fan blade.
3. Install bracket (6) and support the radiator upper tank with the bracket (5) and secure the radiator.
4. Connect reserve tank hose (4).
5. Install lower fan guide (3).
6. Connect radiator inlet hose and outlet hose to the engine.
7. Connect oil cooler hose (1) to automatic transmission.



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8. Connect battery ground cable.
9. Pour engine coolant up to filler neck of radiator, and up to MAX mark of reserve tank.



111RS001

Important operation (in case of 100% engine coolant change) procedure for filling with engine coolant.

Engine Coolant Filling Up Procedure

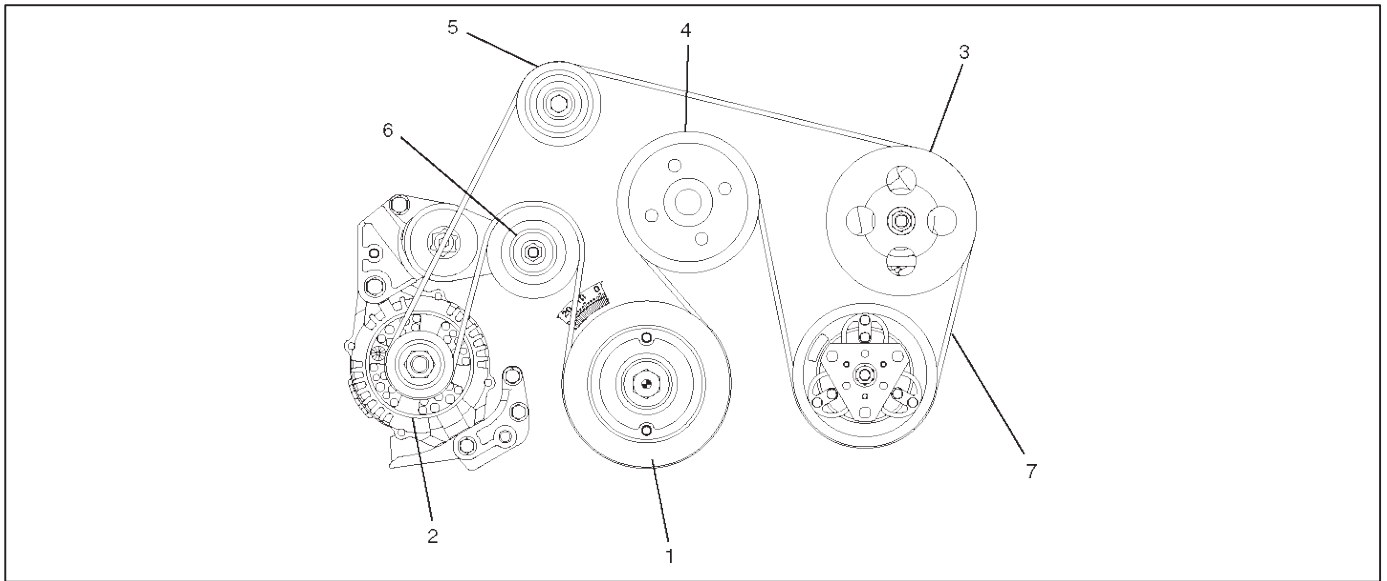
1. Make sure that the engine is cool.

WARNING: WHEN THE COOLANT IS HEATED TO A HIGH TEMPERATURE, BE SURE NOT TO LOOSEN OR REMOVE THE RADIATOR CAP. OTHERWISE YOU MIGHT GET SCALDED BY HOT VAPOR OR BOILING WATER. TO OPEN THE RADIATOR CAP, PUT A PIECE OF THICK CLOTH ON THE CAP AND LOOSEN THE CAP SLOWLY TO REDUCE THE PRESSURE WHEN THE COOLANT HAS BECOME COOLER.

2. Open radiator cap pour coolant up to filler neck.
3. Pour coolant into reservoir tank up to "MAX" line.
4. Tighten radiator cap and start the engine. After idling for 2 to 3 minutes, stop the engine and reopen radiator cap. If the water level is lower, replenish.
5. After replenish the coolant tighten radiator cap, warm up the engine at about 2000 rpm. Set heater adjustment to the highest temperature position, and let the coolant circulate also into heater water system.
6. Check to see the thermometer, continuously idling 5 minutes and stop the engine.
7. When the engine has been cooled, check filler neck for water level and replenish if required. Should extreme shortage of coolant is found, check the coolant system and reservoir tank hose for leakage.
8. Pour coolant into the reservoir tank up to "MAX" line.

Drive Belt and Cooling Fan

Drive Belt and Associated Parts



Legend

- | | |
|-------------------------|---------------------------------------|
| (1) Crankshaft Pulley | (4) Water Pump and Cooling Fan Pulley |
| (2) Generator | (5) Idle Pulley |
| (3) Power Steering Pump | (6) Tension Pulley |
| | (7) Drive Belt |

The drive belt adjustment is not required as automatic drive belt tensioner is equipped.

Inspection

Check drive belt for wear or damage, and replace with a new one as necessary.

Installation

Install cooling fan assembly and tighten bolts/nuts to the specified torque.

Torque : 22 N·m (16 lb ft) for fan pulley and fan bracket.

Torque : 10 N·m (87 lb in) for fan and clutch assembly.

NOTE: Fan belts for 6VE1 Gasoline Engine mounted on 98MY Trooper (UX) have been brought into one. As a result, the rotating direction of a fan belt is opposite to the direction of cooling fan for 92 to 97MY 6VD1 with no interchangeability.

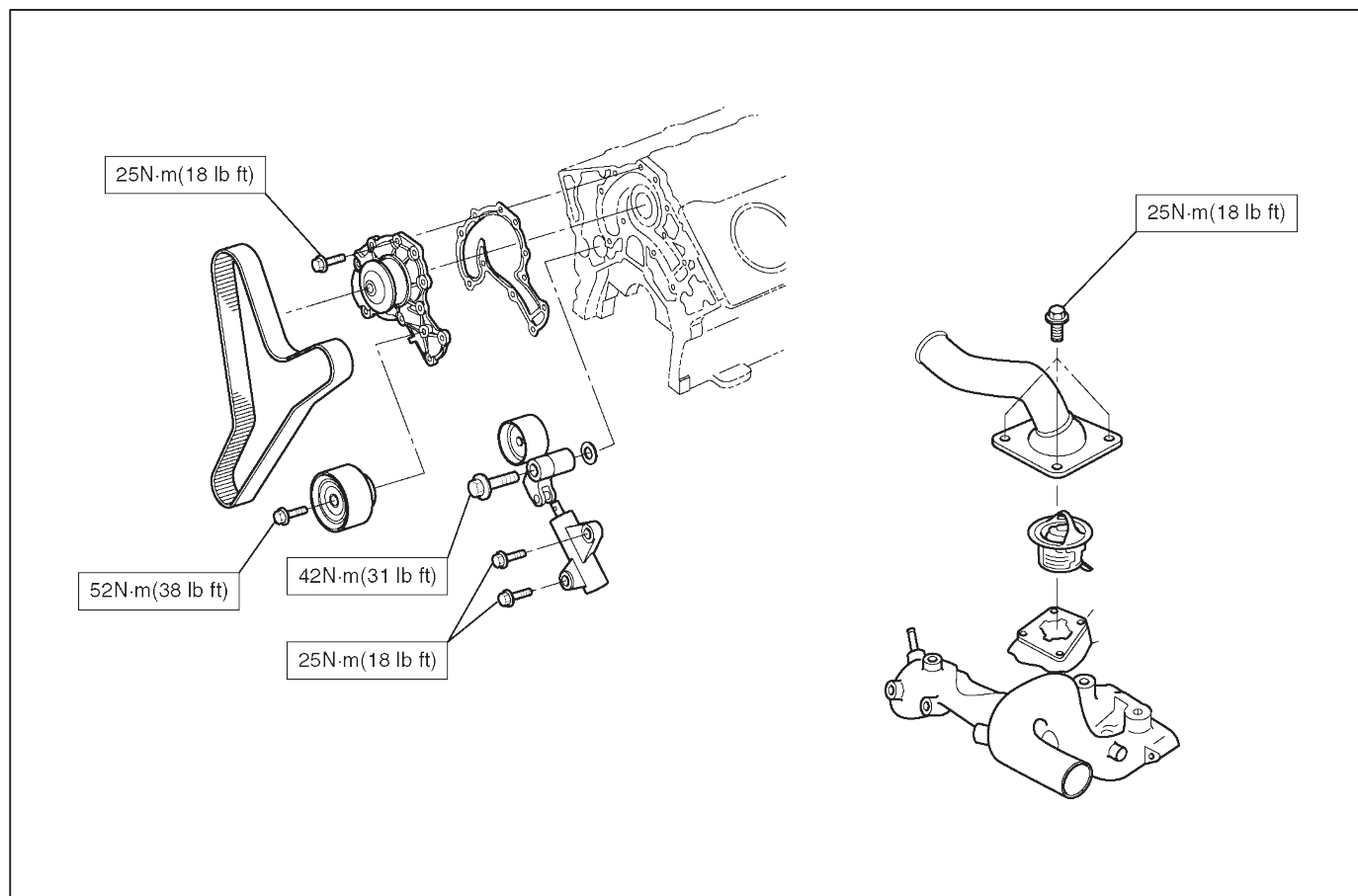
Therefore, incorrect installation of a fan may cause the air for cooling to flow in the opposite direction, this resulting in the poor performance of the air-conditioner and a rise temperature in engine cooling water.

Main Data and Specifications

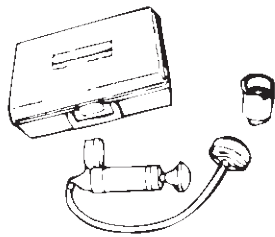
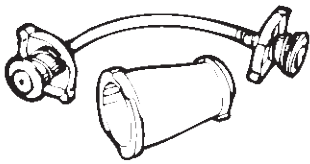
General Specifications

	M/T	A/T
Cooling system	Engine coolant forced circulation	
Radiator	(1 tube in row) Tube type corrugated (2 tube in row)	
Heat radiation capacity	68,000 kcal/h	77,000 kcal/h
Heat radiation area	9.445m ² (0.878ft ²)	11.21m ² (1.04ft ²)
Radiator front area	0.302m ² (0.028ft ²)	
Radiator dry weight	39N (8.8lb)	44N (9.9lb)
Radiator cap valve opening pressure	93.3 ~ 122.7kpa (13.5 ~ 17.8psi)	
Radiator coolant capacity	2.5lit (2.6U.S q.t.)	2.4lit (2.5U.S q.t.)
Engine coolant pump	Centrifugal impeller type	
Delivery	300 lit (79 U.S. gal)/min or more	
Pump speed	5000 ± 50 rpm	
Thermostat	Wax pellet type with air hole	
Valve opening temperature	74.5 ~ 78.5°C (166.1 ~ 173.3°F)	
Engine coolant total capacity	10.4lit (11.0U.S qt)	10.5lit (11.1U.S qt)

Torque Specifications



Special Tool

ILLUSTRATION	TOOL NO. TOOL NAME
	J-24460-01 Tester; radiator cap
	J-33984-A Adapter; radiator cap