

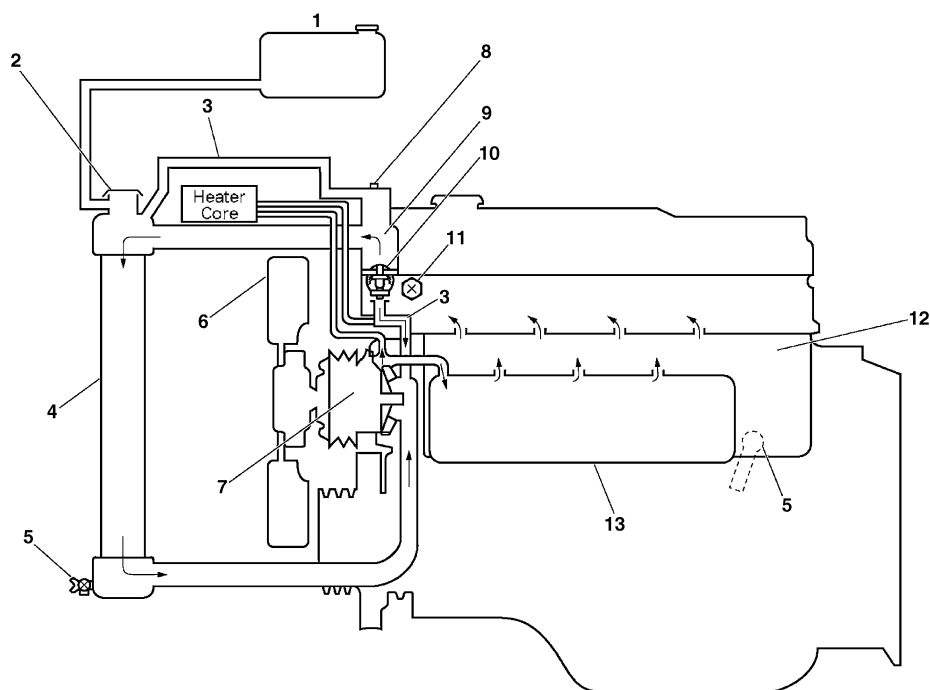
ENGINE 4H SERIES

SECTION 6B ENGINE COOLING

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GENERAL DESCRIPTION



N6A0789E

Legend

- | | |
|-------------------|----------------------|
| 1. Reservoir tank | 8. Air bleeding |
| 2. Radiator cap | 9. Water outlet pipe |
| 3. Bypass hose | 10. Thermostat |
| 4. Radiator | 11. Thermometer unit |
| 5. Drain cock | 12. Water jacket |
| 6. Cooling fan | 13. Oil cooler |
| 7. Water pump | |

The engine cooling system consists of the radiator, the water pump, the cooling fan, and the thermostats.

To quickly increase cold engine coolant temperature for smooth engine operation, the coolant is circulated by the water pump and thermostats through the by-pass hose and back to the cylinder body. The coolant does not circulate through the radiator.

When the coolant temperature reaches 82°C (180°F), the thermostat will begin to open and a gradually increasing amount of coolant will circulate through the radiator.

The thermostats will be fully open when the coolant temperature reaches 100°C (212°F). All of the coolant is now circulating through the radiator for effective engine cooling.

Engine coolant change procedure.

1. To change engine coolant, 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 and drain the cooling system by loosening the drain valve on the radiator and on the cylinder body.

Notice:

For best result it is suggested that the engine cooling system be flushed at least once a year.

It is advisable to flash the interior of the cooling system including the radiator before using anti-freeze (ethylene-glycol based).

Replace damaged rubber hoses as the engine anti-freeze coolant is liable to leak out even minor cracks.

Isuzu recommends to use Isuzu genuine anti-freeze (ethylene-glycol based) or equivalent, for the cooling system and not add any inhibitors or additives.

Caution:

A failure to correctly fill the engine cooling system in changing or topping up coolant may sometimes cause the coolant to overflow from the filler neck even before the engine and radiator are completely full.

If the engine runs under this condition, shortage of coolant may possibly result in engine overheating. To avoid such trouble, the following precautions should be taken in filling the system.

3. To refill engine coolant, pour coolant up to filler neck using a filling hose which is smaller in outside diameter of the filler neck. Otherwise air between the filler neck and the filling hose will block entry, preventing the system from completely filling up.
4. Keep a filling rate of 9 liter/min or less. Filling over this maximum rate may force air inside the engine and radiator.
And also, the coolant overflow will increase, making it difficult to determine, whether or not the system is completely full.
5. After filling the system to the full, pull out the filling hose and check to see if air trapped in the system is dislodged and the coolant level goes down. Should the coolant level go down, repeat topping-up until there is no more drop in the coolant level.
6. After directly filling the radiator, fill the reservoir to the maximum level.
7. Install and 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.

WARNING:

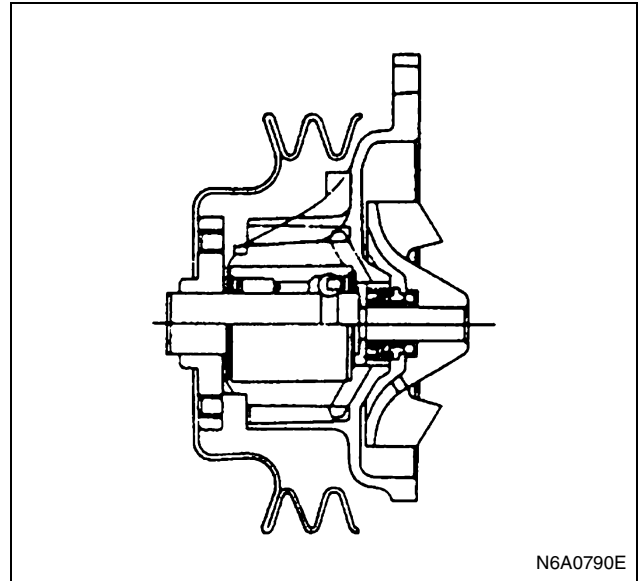
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8. After tightening radiator cap, warm up the engine at about 2,000 rpm.
Set heater adjustment to the highest temperature position, and let the coolant circulate also into heater water system.
9. Check to see the thermostat has opened through the needle position of water thermometer, conduct a 5-minute idling again and stop the engine.

10. 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.
11. Fill the coolant into the reservoir tank up to "MAX" line.

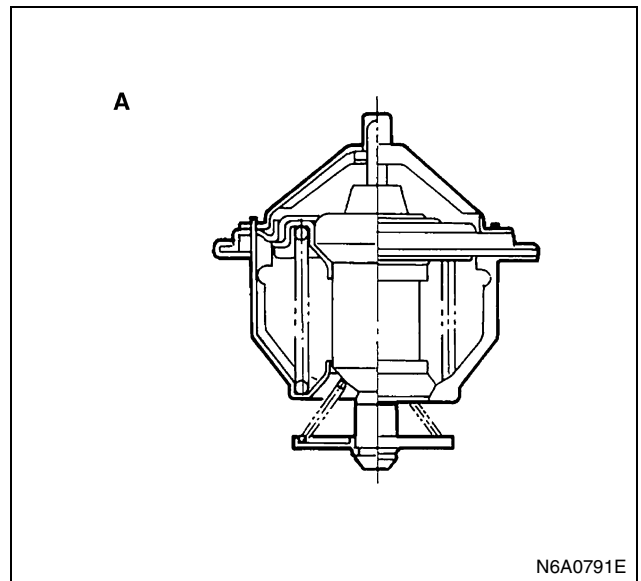
Water Pump

The coolant pump is a centrifugal impeller type and is driven by V type drive belt.



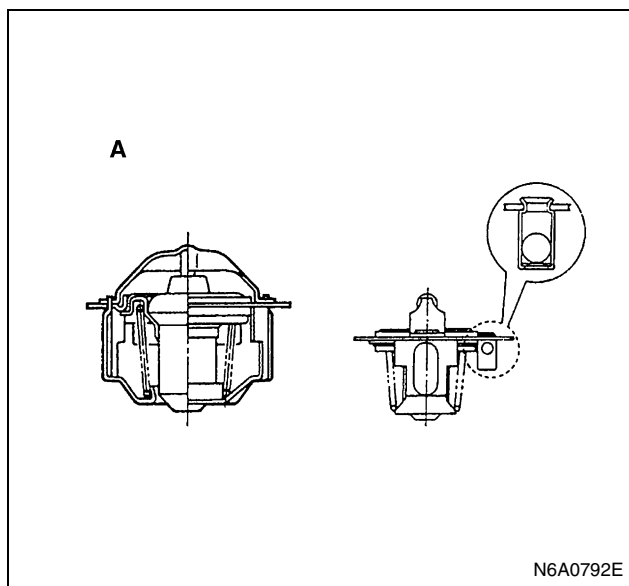
Thermostat

The thermostat is a wax pellet type with a jiggle valve and is installed in the outlet pipe.



Legend

- A. Without jiggle valve

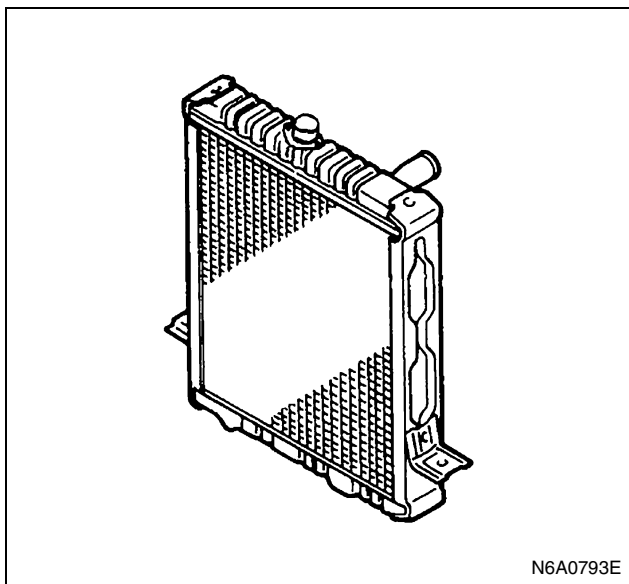


Legend

A. With jiggle valve

Radiator

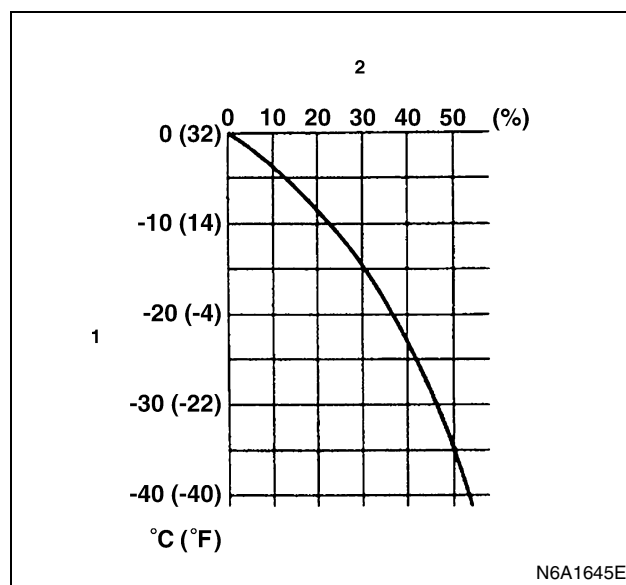
The radiator is a tube type with corrugated fins. In order to raise the boiling point of coolant, the radiator is adjusted through a valve fitted to the upper tank to a pressure range of 93 — 123 kPa (0.95 — 1.25 kg/cm²). The cap fitted to the cylinder head thermostat housing has only a water supply function.



In case of 12 lit (3.17 US gal/2.64 UK gal) total cooling system capacity

Anti-freeze Solution

- Relation between Mixing ratio and Freezing point
Freezing temperature of the engine coolant 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.



Legend

- Freezing point
- Mixing ratio

- Calculation of mixing ratio

Mixing ratio

$$= \frac{\text{Anti-freeze solution (Lit/qt.)}}{\text{Anti-freeze solution (Lit/qt.)} + \text{water (Lit/qt.)}}$$

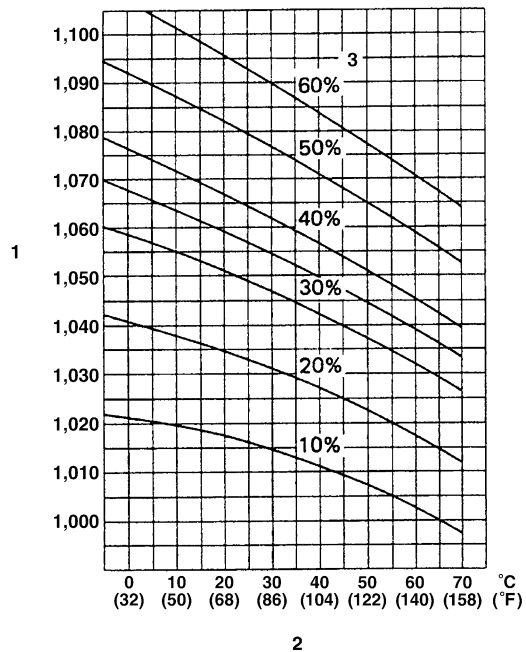
Notice:

Anti-freeze solution + Water = Total cooling system capacity.

Freezing point: °C (°F)	Mixing ratio: %	Anti-freeze solution: L (Imp.qt./U.S.qt)	Water: L (Imp.qt./U.S. qt)
-18 (4)	35	4.2 (4.44/3.70)	7.8 (8.24/6.86)
-25 (-13)	42	5.0 (5.29/4.40)	7.0 (7.40/6.16)
-35 (-31)	50	6.0 (6.34/5.28)	6.0 (6.34/5.28)
-40 (-40)	53	6.4 (6.76/5.63)	5.6 (5.92/4.93)

- Mixing ratio

Check the specific gravity of engine coolant in the cooling system in temperature ranges from 0 — 50°C (32 — 122°F) using a suction type hydrometer, then determine the mixing ratio of the coolant by referring to the table.



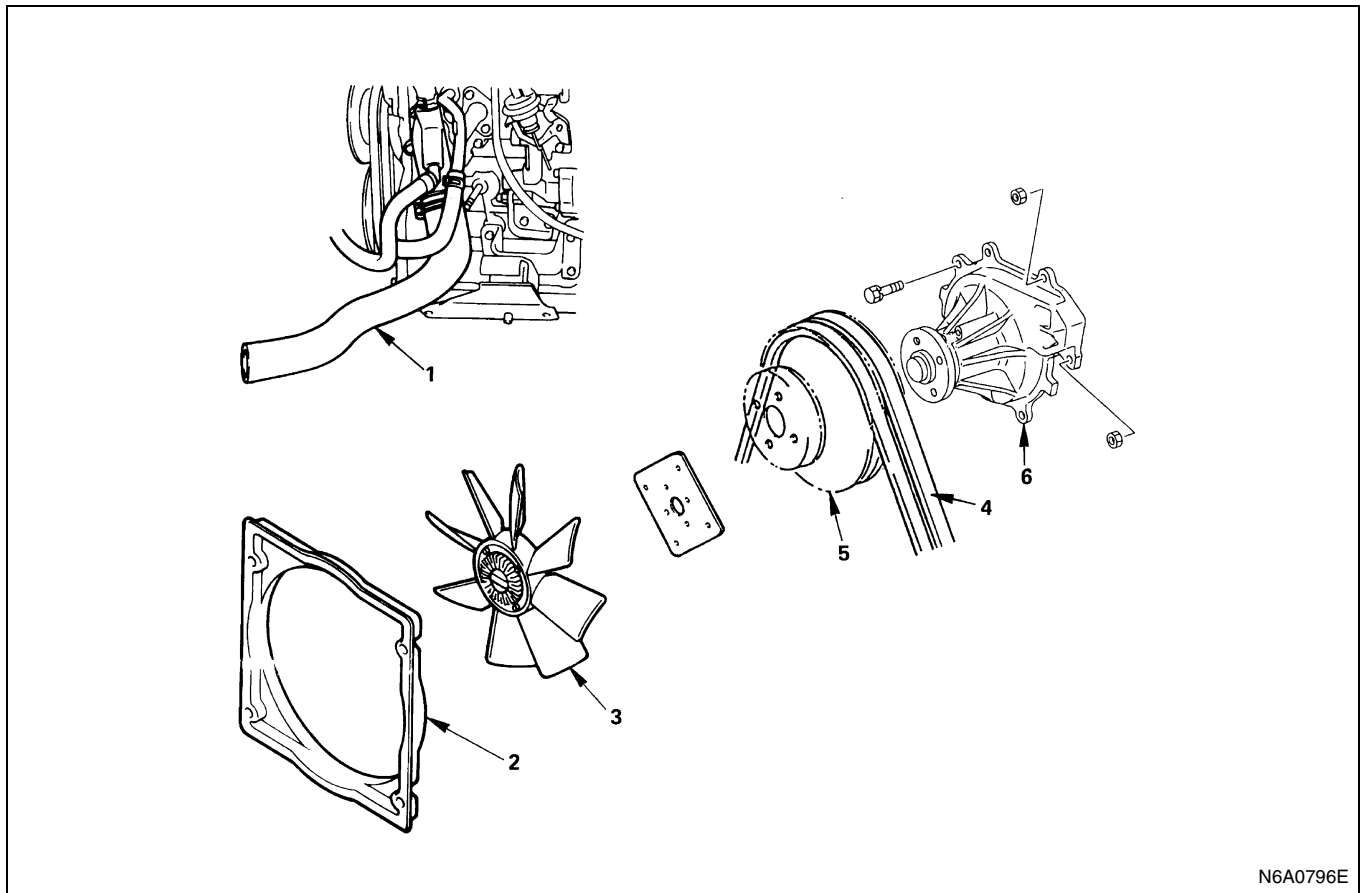
N6A1646E

Legend

1. Specific gravity
2. Coolant temperature
3. Mixing ratio

WATER PUMP

Component



N6A0796E

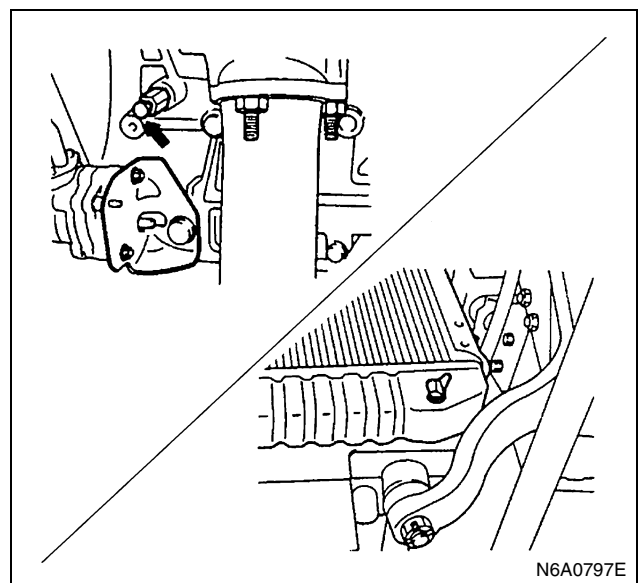
Legend

- | | |
|------------------------|------------------------|
| 1. Radiator lower hose | 4. Fan belt |
| 2. Fan guide | 5. Water pump pulley |
| 3. Fan | 6. Water pump assembly |

Removal

Preparation

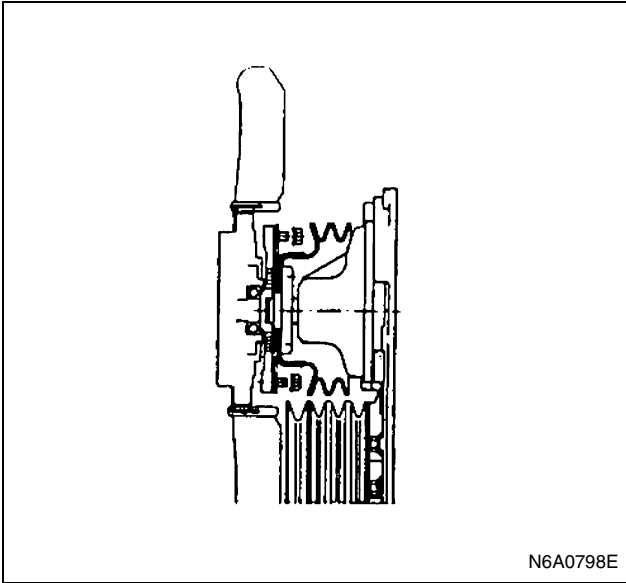
- Disconnect battery ground cable.
- Drain coolant.
- Tilt the cab.



N6A0797E

1. Radiator Lower Hose
Disconnect radiator Lower hose from radiator.

2. Fan Guide
3. Fan



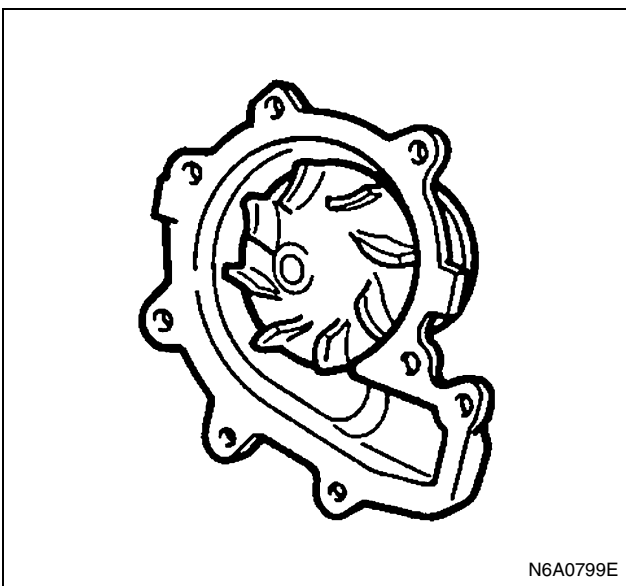
4. Fan Belt
5. Water Pump Pulley
6. Water Pump Assembly

Inspection

Make the necessary adjustments, repairs, and part replacements if excessive wear or damage is discovered during inspection.

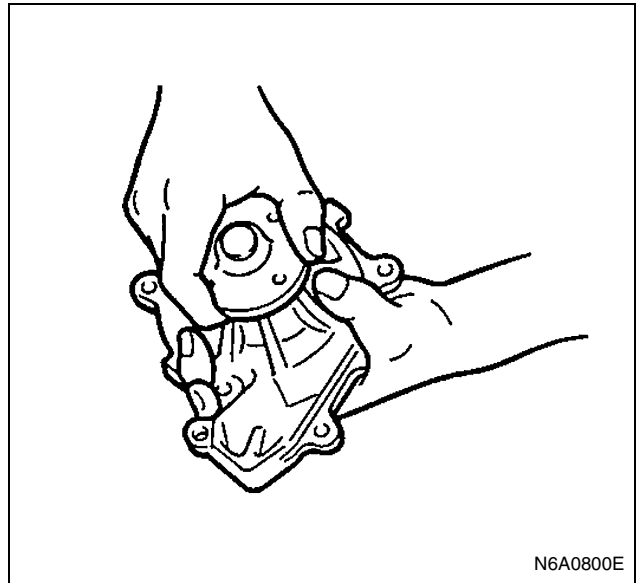
Water Pump Assembly

1. Check the pump body for crack and damage.
2. Check the impeller for crack and corrosion.
3. Check the seal unit leakage.
4. If there is any abnormal condition, replace the water pump as an assembly.



Bearing Unit

1. Rotate the fan center while pushing it toward the radius, and check to see if there is any excessive play or noise.
2. When there is any excessive play or noise found, replace it as a water pump assembly.



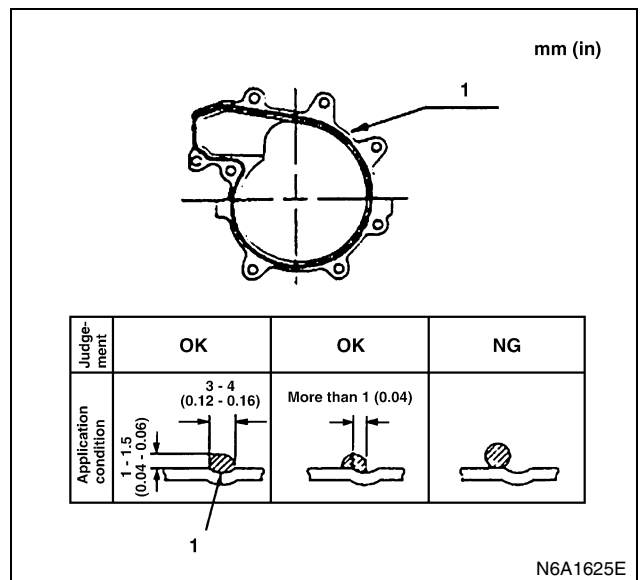
Installation

1. Water Pump Assembly
 - 1) Apply 3 — 4 mm (0.12 — 0.16 in) bead of the recommended liquid gasket (Three Bond 1207C) or its equivalent on the water pump fitting surface.
 - 2) Install the water pump to the front retainer.

Tighten:

Water pump bolt to 24 N·m (2.4 kg·m / 17 lb·ft)

- Install the water pump within 7 minutes after application of liquid gasket.
- For the dislocation of liquid gasket, refer to the illustration.



6B-8 ENGINE COOLING

Legend

1. Liquid gasket

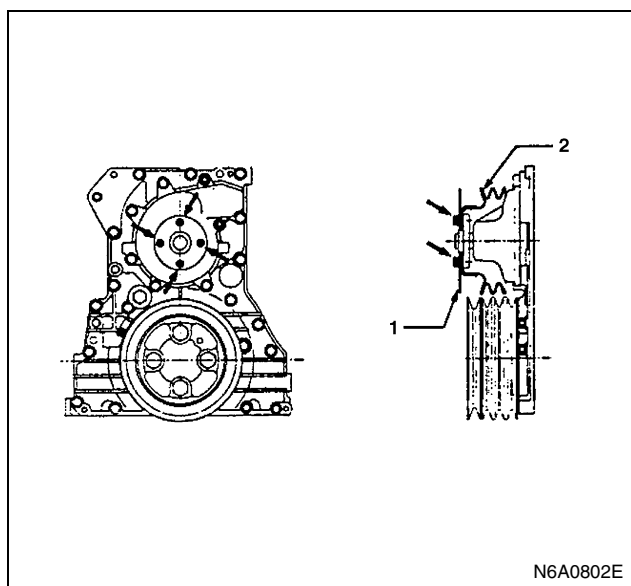
Caution:

The water pump clamping bolt is also used to tighten the front retainer. So, install the water pump before liquid gasket gets dry immediately after installation of the front retainer.

2. Water Pump Pulley

Tighten:

Water pump pulley bolt to 24 N·m (2.4 kg·m / 17 lb·ft)



Legend

1. Set plate
2. Pulley

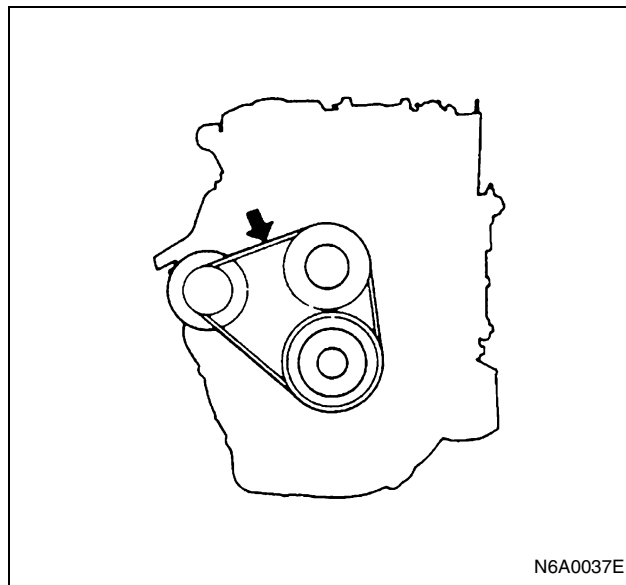
3. Fan Belt

Check the drive belt tension.

Depress the drive belt mid-portion with a 98 N (10 kg / 22 lb) force.

Drive Belt Deflection		mm (in)
New belt	8 — 12	(0.31 — 0.47)
Reuse belt	10 — 14	(0.39 — 0.55)

Check the drive belt for cranking and other damage.



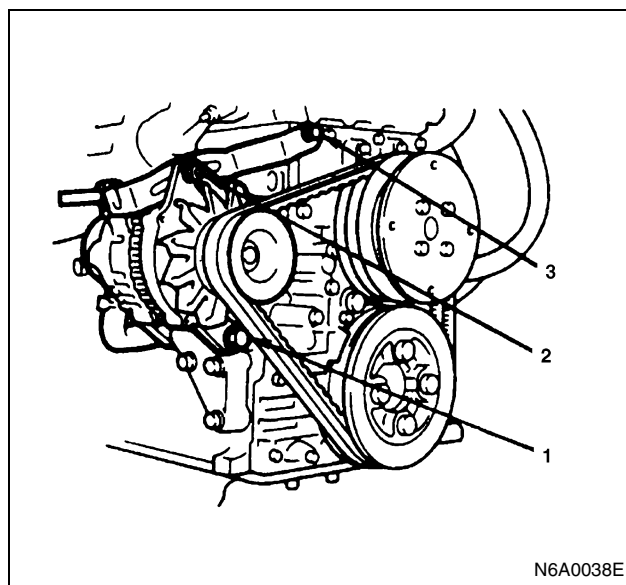
Fan Belt Adjustment

Fan belt tension is adjusted by moving the generator.

Tighten:

Bolt to

- (1): 40 N·m (4.1 kg·m / 30 lb·ft)
- (2): 24 N·m (2.4 kg·m / 17 lb·ft)
- (3): 46 N·m (4.7 kg·m / 34 lb·ft)



4. Fan

Tighten:

Fan bolt to 24 N·m (2.4 kg·m / 17 lb·ft)

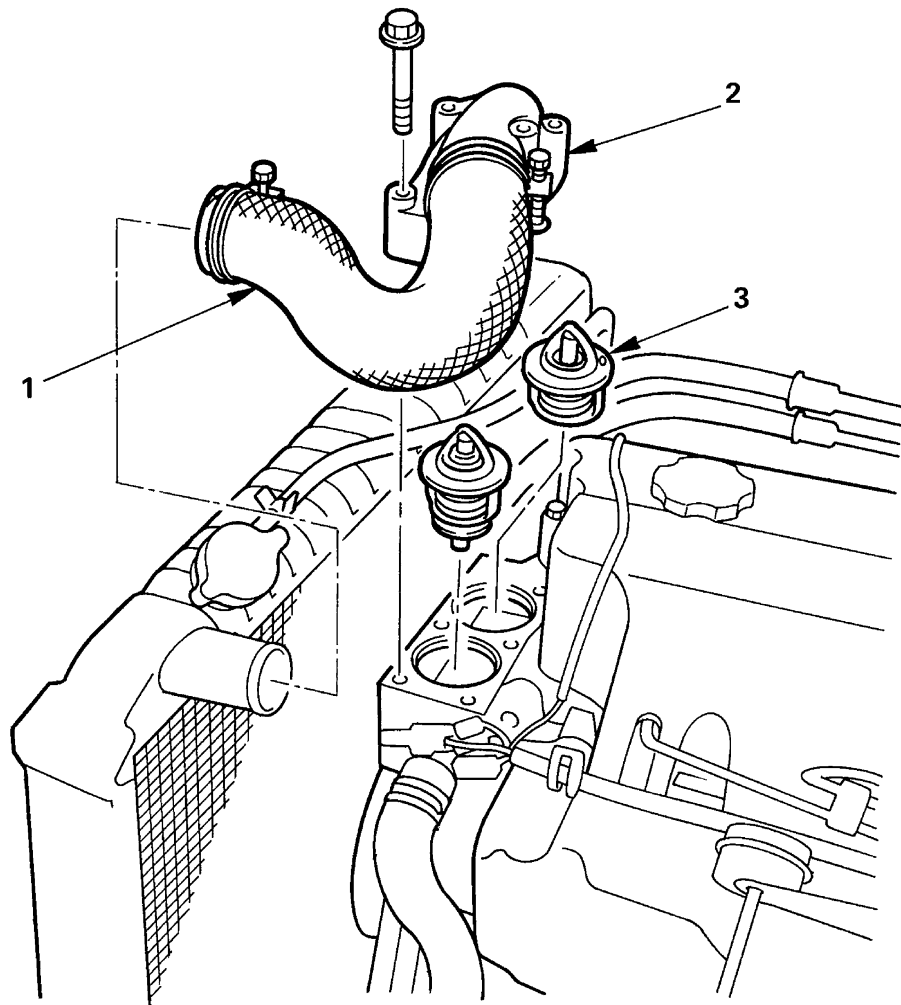
5. Fan Guide

6. Radiator Lower Hose

- Pour coolant into radiator.
- Connect battery ground cable.
- Start engine and check for water leakage carefully.

THERMOSTAT

Component



N6A0805E

Legend

- | | |
|------------------------|---------------|
| 1. Radiator upper hose | 3. Thermostat |
| 2. Water outlet pipe | |

Removal

Preparation

- Disconnect battery ground cable
 - Drain coolant
1. Radiator Upper Hose
Disconnect radiator upper hose from radiator.
 2. Water Outlet Pipe
Remove mounting bolt and remove outlet pipe together with radiator upper hose.
 3. Thermostat

Inspection

Make the necessary adjustments, repairs, and part replacements if excessive wear or damage is discovered during inspection.

Operating Test

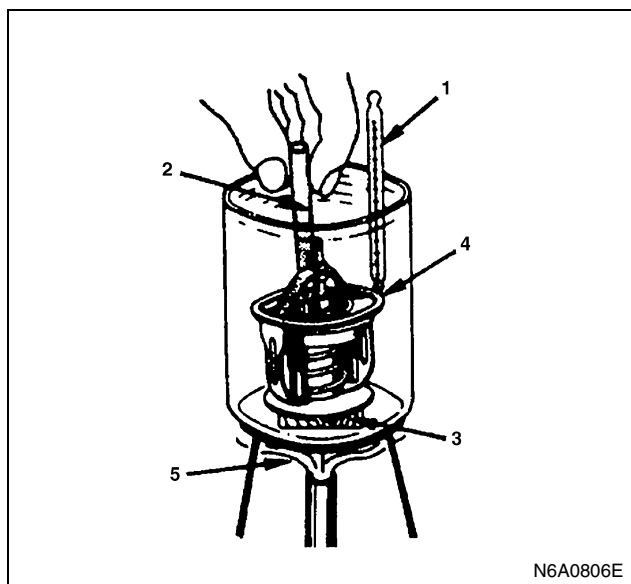
1. Completely submerge the thermostat in water.
2. Heat the water.
Stir the water constantly to avoid direct heat being applied to the thermostat.
3. Check the valve initial opening temperature.

6B-10 ENGINE COOLING

Valve Initial Opening Temperature		°C (°F)
		Standard
without jiggle valve	Primary valve	80 — 84 (176 — 183)
	Secondary valve	83 — 87 (181 — 189)
with jiggle valve		83.5 — 86.5 (182 — 188)

4. Check the valve lift full opening temperature.

Valve Lift Full Opening Temperature		°C (°F)
		Standard
without jiggle valve		95 (203)
with jiggle valve		100 (212)



N6A0806E

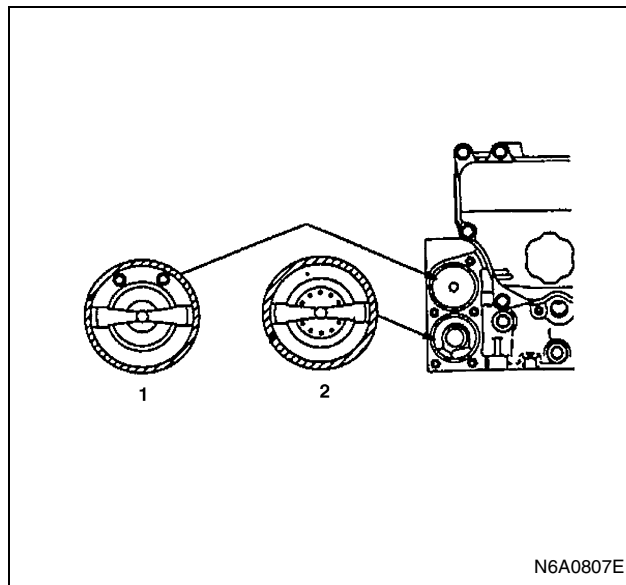
Legend

1. Thermometer
2. Agitating rod
3. Wooden piece
4. Thermostat
5. Heat

Installation

1. Thermostat

Install the gaskets to the thermostats and the thermostats to the cylinder head as shown in the illustration.



N6A0807E

Legend

1. With jiggle valve
2. Without jiggle valve

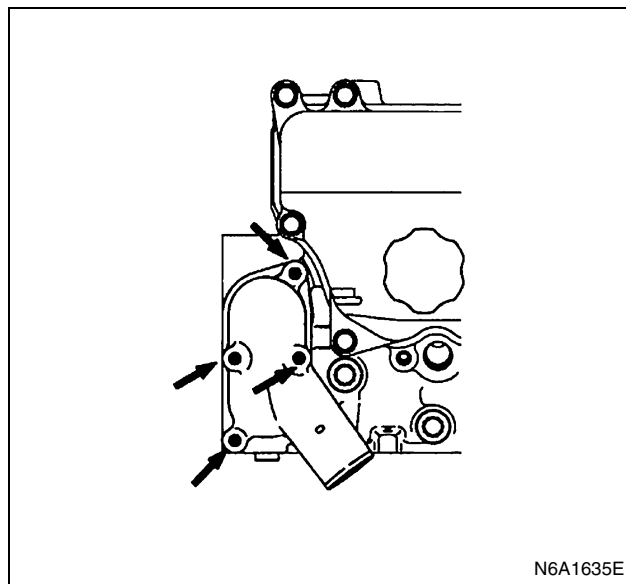
2. Water Outlet Pipe

Install the water outlet pipe with thermostat to the cylinder head.

Tighten the water outlet pipe bolts to the specified torque.

Tighten:

Water outlet pipe bolt to 24 N·m (2.4 kg·m / 17 lb·ft)



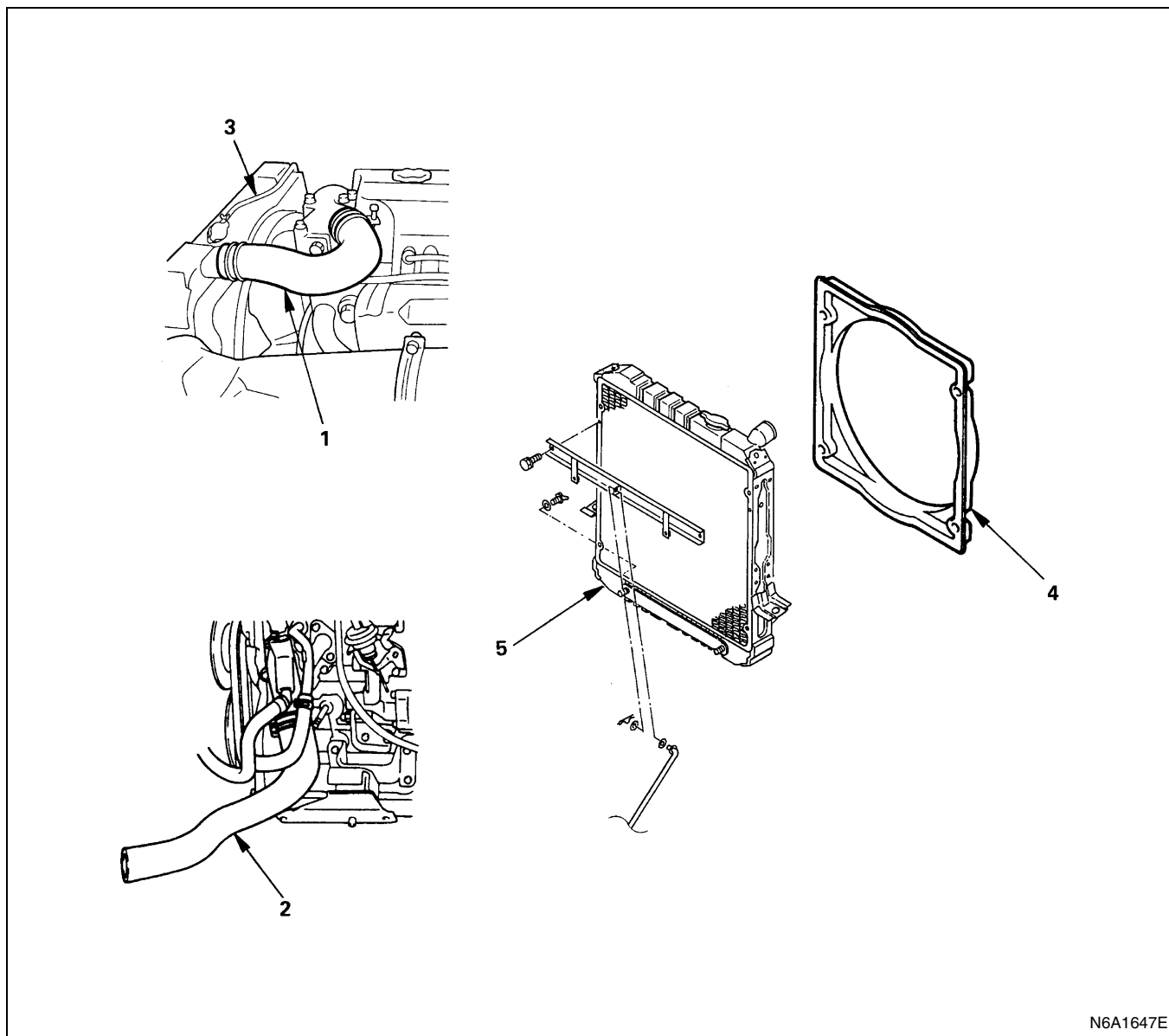
N6A1635E

3. Radiator Upper

- Connect battery ground cable.
- Pour coolant
- Start the engine and check coolant leakage.

RADIATOR

Component



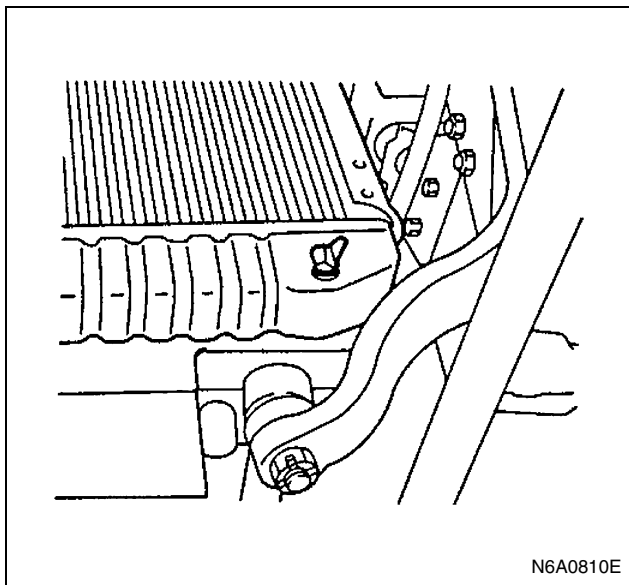
N6A1647E

Legend

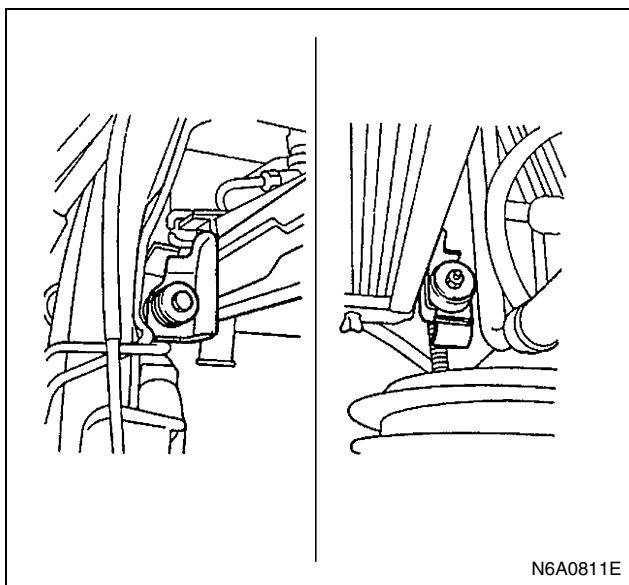
- | | |
|------------------------------|--------------|
| 1. Radiator upper hose | 4. Fan guide |
| 2. Radiator lower hose | 5. Radiator |
| 3. Coolant reserve tank hose | |

Removal

- Disconnect battery ground cable.
- Tilt the cab.
- Loosen drain plug to drain coolant.



1. Radiator Upper Hose
2. Radiator Lower Hose
Disconnect upper hose and lower hose from the radiator.
3. Coolant Reserve Tank Hose
4. Fan Guide
5. Radiator
 - 1) Remove upward the radiator assembly with hose, taking care not to damage the radiator core by fan blade.



Inspection

Radiator Valve Check

1. Apply air pressure from filler neck using radiator cap tester and check the opening pressure of radiator valve. If the valve opening pressure is out of the standard value range, replace with a new radiator valve.

Radiator Valve Opening Pressure	kPa (kg/cm ² /psi)
93 — 123	(0.95 — 1.25/13.5 — 17.8)

2. Remove the radiator valve and check a negative pressure valve as the center of the valve seat side. If the negative pressure valve does not work smoothly, clean or replace the radiator valve.

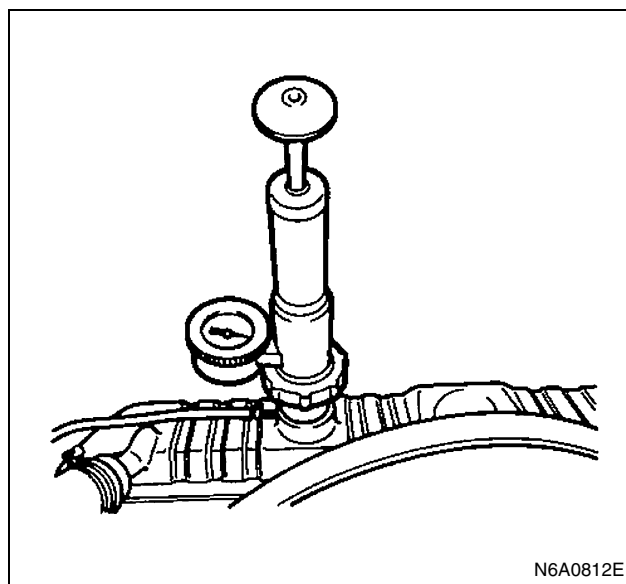
Tighten:

Radiator valve fixing to 6 N·m (0.6 kg·m / 4 lb·ft)

3. Conduct cooling system leakage check after re-installing the radiator valve.

Cooling System Leakage Check

1. Clog up the reservoir tank hose carefully and check the cooling system for leakage with a radiator cap tester by applying an air pressure of 196 kPa (2 kg/cm²/28 psi) from filler neck to inside the radiator.
2. As the radiator upper tank is provided with a valve, the pressure fails to rise higher than the valve opening pressure unless the hose is clogged up.



Radiator Core

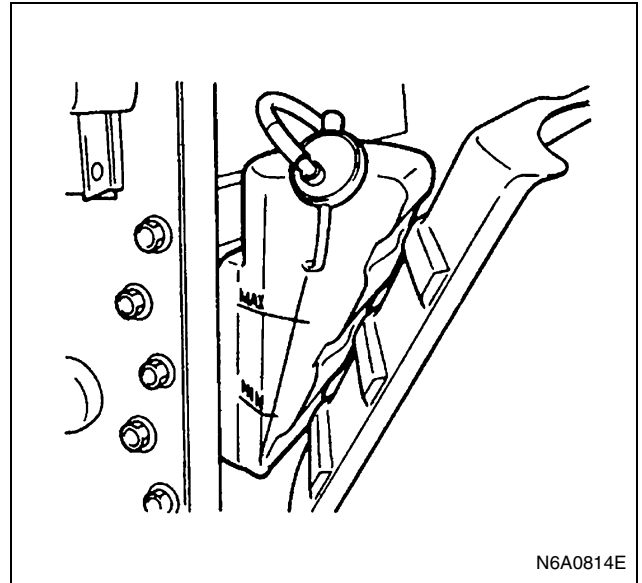
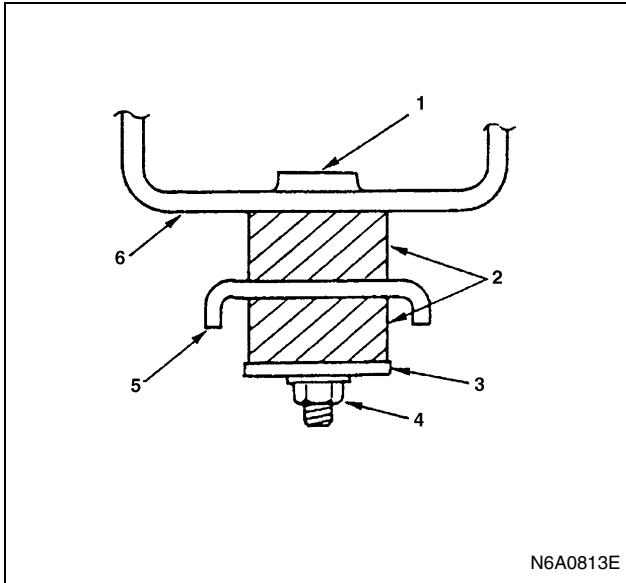
1. Deformed radiator fins could reduce radiation effects, resulting in overheat. Straighten the fins. In such a case, take care not to damage the fin roots.
2. Remove dust and other foreign materials.

Flushing the Radiator

Wash the inside of radiator and the coolant passage with water and neutral detergent. Remove all scales and rust.

Installation

1. Radiator
With due attention paid not to damage the radiator core by the fan blades, install the both brackets of the radiator to the brackets on the frame as shown in the illustration.



Legend

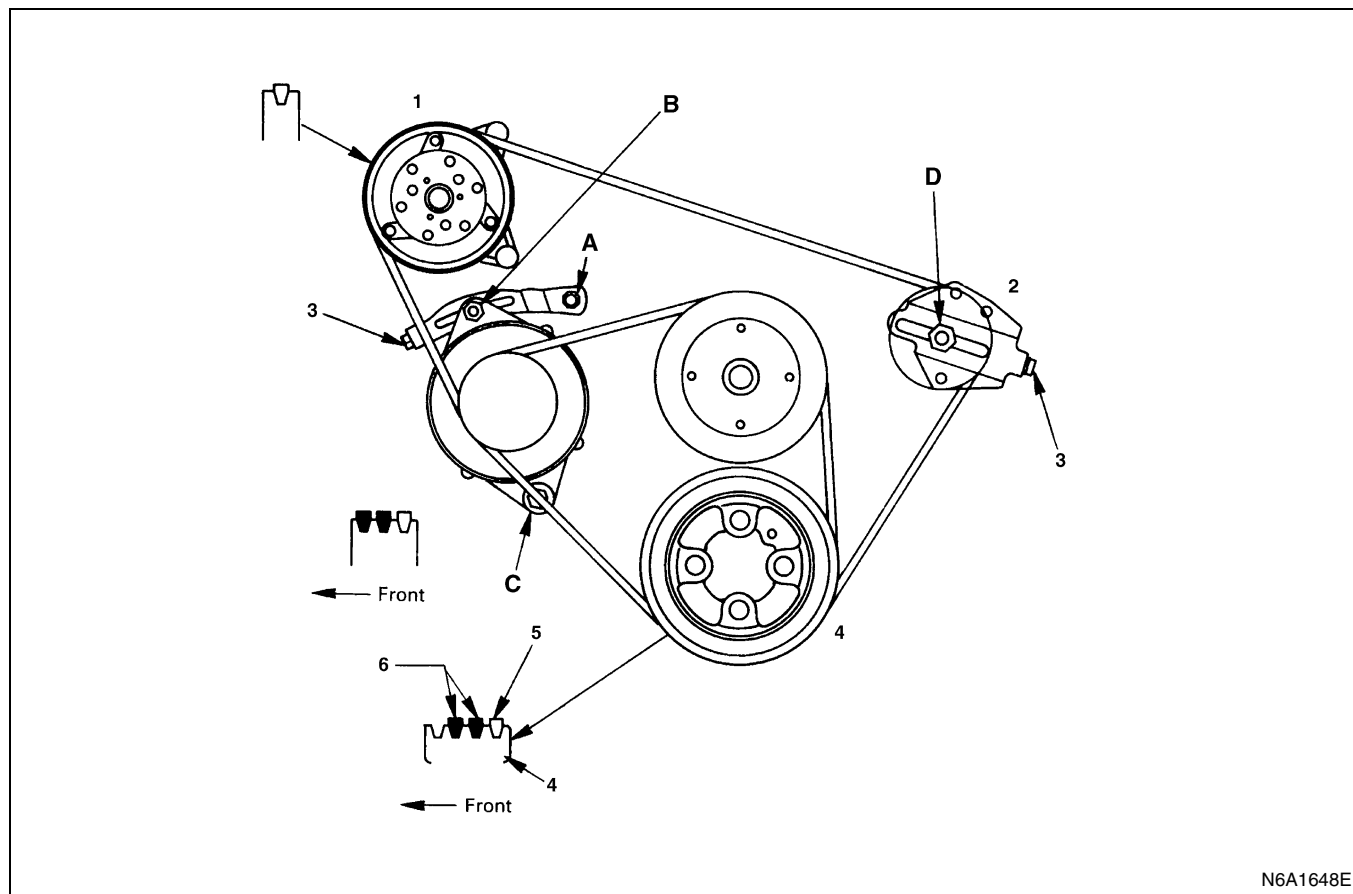
1. Stud bolt
2. Rubber
3. Washer
4. Flange nut
5. Flame side bracket
6. Radiator side bracket

2. Fan Guide
3. Coolant Reserve Tank Hose
4. Radiator Lower Hose
5. Radiator Upper Hose
 - Connect battery ground cable.
 - Pour coolant
 - Pour coolant up to filler neck of outlet pipe, and up to MAX mark of reserve tank.
 - Start engine to warm up, and check for coolant level.

Replenish coolant if it does not reach the outlet pipe filler neck, and tighten the cap completely.

DRIVE BELT ADJUSTMENT

Component



N6A1648E

Legend

- | | |
|-------------------|--------------------------|
| 1. A/C compressor | 4. Crank pulley |
| 2. Tension pulley | 5. Compressor drive belt |
| 3. Adjust bolt | 6. Generator drive belt |

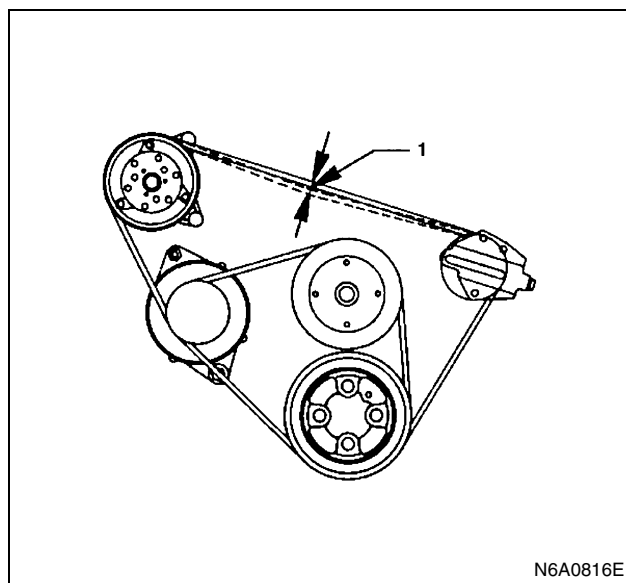
Inspection

Check drive belts for wear or damage, and replace with new ones as necessary. Check belts for tension, and adjust as necessary.

1. Check drive belts tension
2. Push the middle of belts with a force of 98 N (10 kg / 22 lb) and check each belt for deflection.
3. Standard deflection

Fan Drive Belt Deflection		mm (in)
New belt	8 — 12	(0.31 — 0.47)
Reuse belt	10 — 14	(0.39 — 0.55)

A/C Drive Belt Deflection		mm (in)
New belt	16 — 20	(0.63 — 0.79)
Reuse belt	18 — 22	(0.71 — 0.87)



N6A0816E

Legend

1. Belt deflection
-

Tension Adjustment

(Refer to the illustration on the previous page.)

1. Generator & Water Pump Pulley Drive Belt
 - 1) Loosen the Air Conditioning (A/C) drive belt tension pulley adjust bolt and lock nut (D). Then free the A/C drive belt.
 - 2) Loosen the adjust plate lock nut (B), the fixing bolt (A), and the fixing bolts (C) on the lower side of the generator.
 - 3) Rotate the adjust bolt to adjust the belt.
 - 4) After adjustment, tighten each section to the specified torque.

Tighten:

Bolt and nut to

- (A): 46 N·m (4.7 kg·m / 34 lb·ft)
 - (B): 24 N·m (2.4 kg·m / 17 lb·ft)
 - (C): 40 N·m (4.1 kg·m / 30 lb·ft)
- 5) Adjust the A/C drive belt tension.

2. A/C Compressor Drive Belt

- 1) Loosen the tension pulley lock nut (D), and rotate the adjust bolt to adjust the belt.

When finishing the fan drive belt adjustment, then adjust the A/C drive belt.

After adjustment, tighten the lock nut (D) to the specified torque.

Tighten:

Lock nut (D) to 27 N·m (2.8 kg·m / 20 lb·ft).

