

Chapter 5

Cooling System

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Specifications

Coolant:

Capacity—

Without rear heater Approximately 8 litres

With rear heater Approximately 9 litres

Concentration Clean demineralised water and 50 % ethylene glycol type inhibitor

Radiator cap opening pressure 74 – 103 kPa

Thermostat:

Type Wax pellet

Opening temperature 80 – 84° C

Minimum valve lift at 95°C 8.5 mm

TORQUE WRENCH SETTINGS

Radiator retaining bolts 15 Nm

Thermostat cover nuts 20 Nm

Transmission oil cooler pipe fittings 34 Nm

Water pump nuts and bolts 20 Nm

Description

The cooling system is of a forced circulation type, which is pressurised to raise the boiling point of the coolant and so increase the efficiency of the engine. The cooling system pressure is limited by the pressure valve in the radiator cap. The temperature within the cooling system is controlled by a thermostat which prevents full circulation of the coolant until the engine has reached normal operating temperature. This restricted circulation decreases engine warm up time, improving driveability and fuel economy.

As the coolant expands due to the increase in temperature, the pressure valve in the radiator cap opens and allows the excess coolant to flow through the overflow hose into the reserve tank. The reserve tank is located between the left hand front head-lamp and the battery. When the engine stops and the temperature drops, a vacuum valve in the radiator cap opens and the excess coolant is siphoned back into the radiator. This makes frequent topping up of the cooling system unnecessary. In a

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system that operates correctly it is only necessary to check the level at the reserve tank.

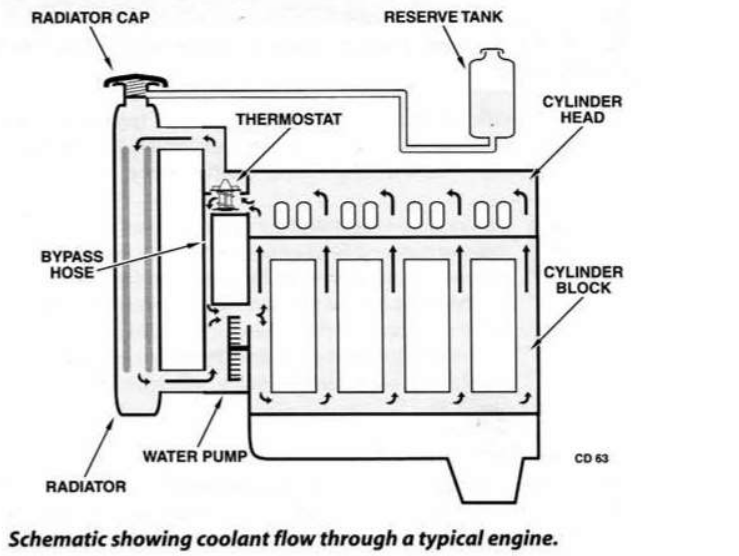
The engine oil is cooled by an oil cooler mounted on the left hand side of the cylinder block. The heat in the oil is transferred to the coolant circulating through the oil cooler. Procedures relating to the oil cooler are covered in Engine (chapter 4).

The cooling fan has a fluid type coupling. The coupling increases engine efficiency by allowing the fan to freewheel when the vehicle speed causes sufficient air flow through the radiator. The fan is mounted on the drive belt hub assembly at the front of the engine. The water pump and thermostat housing assembly is located within the timing case. The water pump is of the centrifugal impeller type and is driven by the timing belt. The body of the water pump is made of an aluminium alloy to assist in engine weight reduction and contains a prelubricated bearing and a spring loaded seal assembly. A drain hole, located between the seal and the bearing, prevents bearing lubricant contamination if coolant leaks past the seal. The water pump and thermostat housing is a one piece unit and if defective, must be renewed as a unit.

The radiator has an aluminium core with plastic top and bottom tanks attached via clinch tabs which are part of the core. A rubber seal is used to seal the tanks to the core.

Automatic transmission models, have a transmission cooler fitted in the lower tank

Different brands and types of coolant may not be compatible. Mixing some coolants may lead to overheating or corrosion of engine components. It is important that when topping up, coolant of the same type and concentration is used. If changing the coolant, the cooling system must first be thoroughly flushed with clean water.



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To avoid accidental scalding when working on the cooling system, do not release the radiator cap of an engine that is at operating temperature. Allow the engine to cool and exercise caution when releasing the radiator cap.

Routine Maintenance

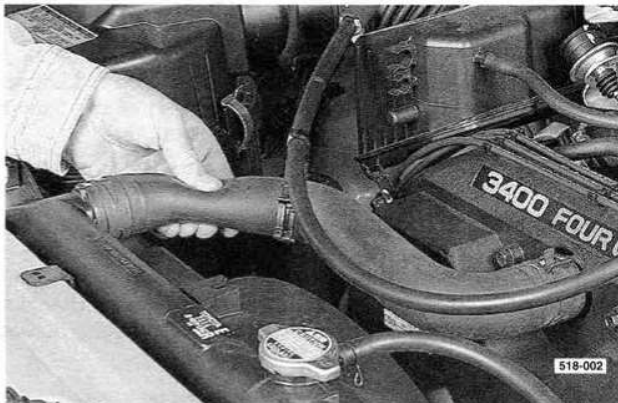
COOLANT

To Check Level

- 1 With the engine cold, check the coolant level in the reserve tank. The level should be between the minimum and maximum marks on the reserve tank.
- 2 If the level is below the minimum mark, remove the radiator cap and check that the coolant is level with the overflow hose orifice. If necessary, add coolant to the radiator until the level is at the overflow hose orifice.



To prevent scalding, use caution when releasing the radiator cap if the engine is warm. Squeeze the upper radiator hose. If resistance is felt, the system is pressurised and the cap should not be removed until the radiator hose can easily be squeezed together. If the engine has overheated allow, the engine to cool for at least 30 minutes and fill the system with coolant while the engine is running to avoid cracking the cylinder heads or block.



Squeezing the upper radiator hose to check for a pressurised cooling system.

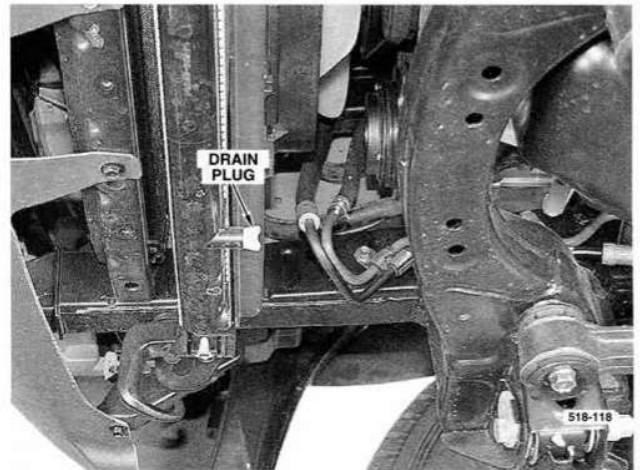
- 3 When adding coolant, always add the same type of coolant that is in the system. Install the radiator cap and add coolant to the reserve tank until the level is satisfactory.



If there is a problem with the secondary seal on the radiator cap, or a blocked or split overflow hose, it is possible for the reserve tank to indicate a satisfactory coolant level, but the radiator coolant level to be low. Other small leaks in the cooling system can also give indication that the coolant level in the reserve tank is satisfactory, while the level in the radiator is low.

To Drain, Flush and Renew Coolant

When renewing the coolant, it is recommended that the system be thoroughly flushed to avoid problems between incompatible coolants.



Radiator drain plug location. Stoneguards removed.

It is also recommended that a quality concentrated coolant be used. Avoid using pre-mixed coolants as these become diluted by any remaining water in the cooling system, diminishing the cooling and inhibiting properties of the coolant.

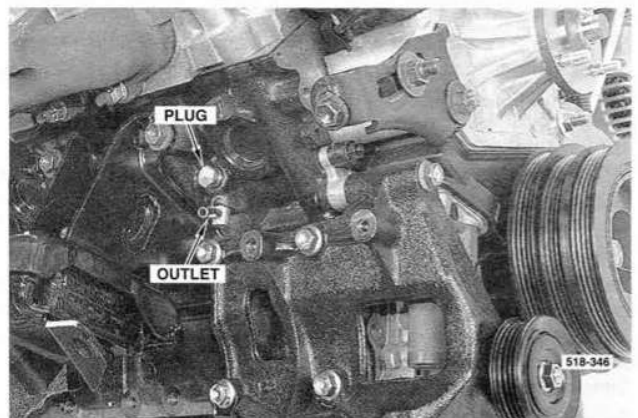
To completely drain the cooling system, it is necessary to loosen the drain plugs in the radiator and the right hand side of the cylinder block.

The colour of the coolant does not give a good indication of its condition. It is therefore recommended that the coolant be renewed at the intervals recommended in Routine Maintenance (chapter 2).



Use care when draining and disposing of engine coolant. Coolant is poisonous and lethal to pets. Pets are attracted to coolant because of its sweet smell and taste.

- 1 Check the cooling system for leaks and repair as necessary.
- 2 Set the front and if fitted, the rear heater controls to HOT.
- 3 With the engine cold remove the radiator cap.
- 4 Remove the bolts retaining the stoneguards and remove the stoneguards from beneath the vehicle.
- 5 Place a suitable container under the radiator and the cylinder block drain plugs.
- 6 Install a hose to the drain outlet on the cylinder block, to prevent coolant spilling on the crossmember.



The cylinder block drain plug and outlet is located on the right hand side of the engine.

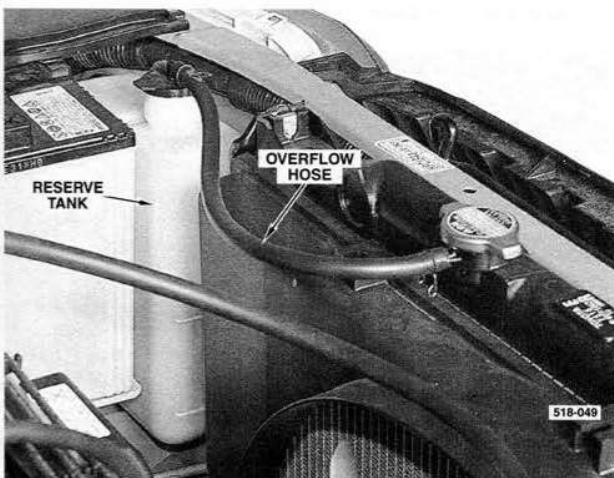
i The cylinder block drain plug is located forward of the right hand side engine mounting.

- 7 Loosen the drain plugs in the radiator and the cylinder block and drain the coolant into the container. Tighten the drain plugs securely.
- 8 Loosen the hose clamp and remove the upper radiator hose from the engine outlet. Insert a garden hose into the upper radiator hose, and flush the system for five minutes or until clear water flows out of the engine outlet. Turn off the tap.
- 9 Loosen the drain plugs and drain all the water from the radiator and engine. If the coolant still appears to be dirty, repeat the above procedure until clean water is expelled from the drain plugs. Tighten the drain plugs securely.

TIP If the coolant flowing from the cylinder block drain plug appears to be dirty or there is doubt as to the last time the cooling system has been flushed, remove the thermostat as described later in this chapter and thoroughly flush the cooling system.

Flush the cylinder block by placing the hose into the top radiator hose and covering the thermostat housing with a cloth. When water flows from the top radiator hose, remove the cloth, draining the cylinder block. Repeat this until the water flowing from the cylinder block is clean.

- 10 Flush the front heater core using the following procedure:
 - a Disconnect the heater hoses from the heater core pipes. The pipes are located at the rear of the engine and go through the firewall. For more information refer to Ventilation (chapter 18).
 - b Connect a garden hose to one heater pipe and flush the heater for five minutes or until clear water flows out of the other pipe. Turn off the tap.
 - c Install the heater hoses to the heater core pipes.
- 11 On models with a rear heater, flush the rear heater core using the following procedure:
 - a Beneath the vehicle, disconnect the heater hoses from the heater.
 - b Connect a garden hose to a heater core pipe and flush for five minutes or until clear water flows out of the heater. Turn off the tap.
 - c Install the heater hoses to the heater core pipes.
- 12 If the reserve tank is dirty, remove and clean it as follows:



Coolant reserve tank location.

- a Withdraw the overflow hose from the tank filler neck.
- b Remove the battery retaining bracket and lift the reserve tank from its bracket.
- c Flush out the reserve tank using clean water. Baking soda can also be used to clean the reserve tank.
- d Install the tank, the battery bracket and connect the overflow hose.
- e Fill the reserve tank with the specified coolant to the level between the marks.
- 13 Remove the upper radiator hose from the engine outlet, hold the hose vertically and slowly fill the system with at least 4 litres of the specified coolant concentrate. Install the upper radiator hose to the engine outlet and secure the hose with the clamp.
- 14 Remove the radiator cap and top up the cooling system with demineralised water. Run the engine and continue topping up the cooling system with demineralised water.
- 15 Test drive the vehicle, then allow the engine to cool before removing the radiator cap and checking the coolant level. Top up as necessary.

i It may be necessary to repeat this procedure several times to expel all the trapped air from the system. Top up the radiator via the cap with water as necessary.

HOSES

To Inspect

- 1 Inspect all hoses for signs of cracking, perishing, being excessively soft or hard and bulging. Usually, the first sign of a deteriorating hose is the ends turning up. Pay particular attention to the lower radiator hose, as the water pump suction could cause the lower radiator hose to collapse and cut off coolant circulation.

i This can also be an indication of a restriction in the radiator, which will require flushing.

- 2 Bend the heater hoses and check for surface cracking, especially near the hose clamps.
- 3 Check the engine and the transmission for oil leaks. Oil leaking onto hoses can severely weaken them.
- 4 Check that no hose is rubbing on other components such as brackets, pulleys and hose clamps.
- 5 Renew any suspect hoses as necessary and refill the cooling system as previously described.
- 6 Ensure that the hose clamps are secure, without being overtight and distorting the hose.

To Renew

- 1 Drain the cooling system as previously described.
- 2 Loosen the hose clamps of the hose to be renewed. On models with spring type clamps squeeze the tangs together and slide the clamp along the hose until it is clear of the pipe fitting.
- 3 Noting the installed position of the hose, use a twisting motion to remove the hose.

TIP If the hose is difficult to remove, carefully cut the hose lengthwise to ease removal. Avoid damaging the hose fittings.

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- 4 Check the condition of the hose fitting surface and, if necessary, clean metal fittings with a wire brush or emery paper.
- 5 Check the condition of the hose clamps. Renew if necessary.
- 6 Install the hose clamps on the hose, apply a small amount of water to the hose fitting and install the hose to the fitting. Secure the hose with the hose clamps.
- 7 Fill the cooling system as previously described under the To Drain, Flush and Renew Coolant heading.
- 8 Run the engine and check for leaks.

RADIATOR

To Inspect

- 1 Check the condition of the tanks, hose fittings and the radiator core.



To check the condition of the front of the radiator core, the radiator must be removed as described later in this chapter.

- 2 If available, fit a pressure tester and pressurise the cooling system to 120 – 150 kPa, check for any signs of leakage from the radiator core, filler neck, tanks, hoses and on automatic transmission models, the oil cooler seals.
- 3 Check that the radiator mountings and fastenings are in serviceable condition.
- 4 Check the condition of the coolant in the radiator. If the condition of the coolant is suspect, flush the cooling system and refill with the specified coolant as previously described under the To Drain, Flush, and Renew Coolant heading.
- 5 On automatic transmission models, check the automatic transmission fluid for signs of foaming.



Foaming occurs when coolant mixes with transmission fluid. The fluid will turn a milky pink colour instead of the normal dark red colour.

RADIATOR CAP AND RESERVE TANK

To Inspect

- 1 Allow the engine to cool and remove the radiator cap.



Do not remove the radiator cap from a hot engine, as boiling coolant may cause serious injury. Ensure that the top radiator hose can easily be squeezed together, indicating that the cooling system is not pressurised prior to removing the radiator cap.

- 2 Lift the vacuum valve and clean the seal under the valve with a cloth and clean water.
- 3 Inspect the radiator cap for signs of leakage, deterioration of seals and the condition of the vacuum valve.
- 4 If available, pressure test radiator cap. The cap is serviceable if it holds pressure at 120 kPa and releases pressure over 135 kPa.
- 5 Prior to refitting the radiator cap check that the radiator cap seating area or the filler cap is clean and free from obstruction.
- 6 Check condition of overflow hose and its connection to radiator filler neck and reserve tank.

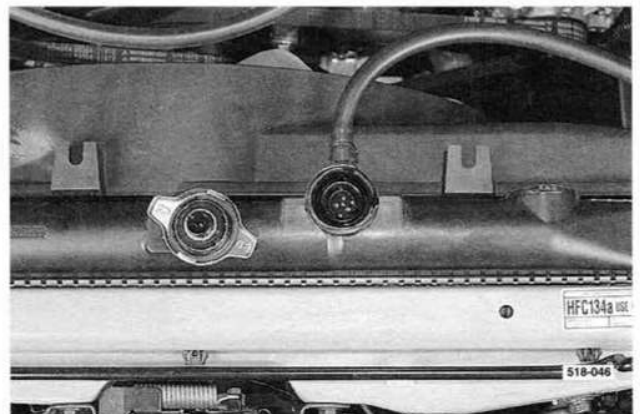


Check the radiator cap sealing rubber for deterioration.

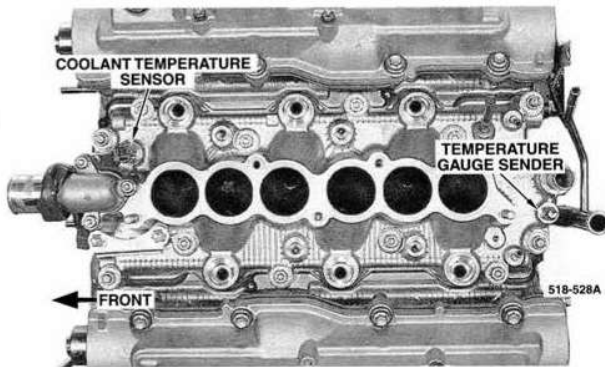
Trouble Shooting

ENGINE OVERHEATING

- 1 Insufficient coolant: Replenish the coolant, check the cooling system for leaks and repair as necessary.
- 2 Worn or slipping drive belt: Check and renew drive belt as described in Engine (chapter 4).
- 3 Reduced air flow through the radiator: Check for obstructions blocking airflow through the radiator. Clean radiator cooling fins with compressed air or water pressure from the rear to the front of the radiator core or renew the radiator core.
- 4 Faulty thermostat: Test and renew the thermostat if necessary.
- 5 Cooling fan faulty: Check the fan coupling as described under the Cooling Fan and Coupling heading, later in this chapter.
- 6 Reduced coolant flow through the radiator: Remove the radiator and have it cleaned by a radiator specialist.
- 7 Faulty water pump: Check for eroded or broken impeller vanes on the water pump and renew as necessary.
- 8 Leaking cylinder head gasket: Check and repair as described under Coolant Leakage — Internal.
- 9 Restricted exhaust system: Remove the restriction or renew the restricted components.
- 10 Low engine oil level: Stop the engine immediately and top up to the correct level.



A leaking head gasket is sometimes indicated by bubbles in the radiator when the engine is running.



Location of the coolant temperature sensor and the temperature gauge sender.

- 11 Dragging brakes: Check the operation of the brake system and the handbrake adjustment. Refer to Brakes (chapter 15).
- 12 Slipping clutch: Repair the clutch as necessary.
- 13 Engine tight after overhaul: Stop the engine and allow to cool down, check that the engine is not unduly tight.

i In addition to indication on the temperature gauge, engine overheating is usually accompanied by steam emitting from the coolant reserve tank and loss of engine power. If there are no symptoms of engine overheating, check for a faulty temperature gauge or temperature gauge sender.

COOLANT LEAKAGE — EXTERNAL

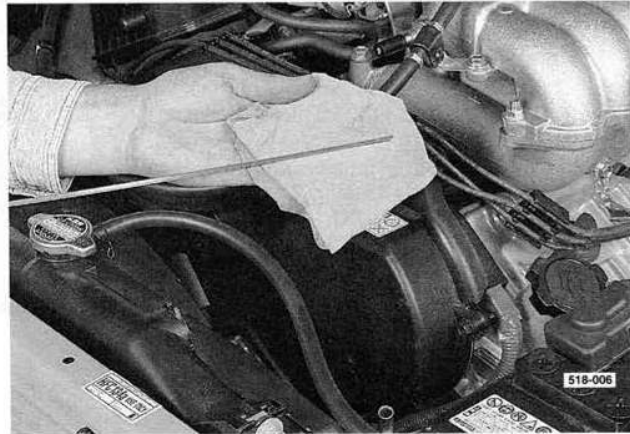
- 1 Loose hose clamp or faulty hose: Check all hoses and connections. Tighten or renew loose hose clamps. Renew faulty hoses.
- 2 Faulty radiator cap: Renew the cap.
- 3 Leaking radiator core or tanks: Repair or renew the radiator.
- 4 Worn water pump causing leakage at water pump seal: Remove the timing belt covers and check the water pump bearings for excessive play. Renew the water pump if necessary.
- 5 Leaks at the thermostat cover or coolant inlet fittings: Renew the gasket or the component as necessary.
- 6 Corroded or damaged welch plugs: Renew the welch plugs.
- 7 External cracks in the cylinder block or cylinder heads: Repair or renew any faulty components.
- 8 Leaking heater core(s): Repair or renew the heater core(s).
- 9 Leaking engine oil cooler: Renew the oil cooler

i Check the cooling system for external leakage by running the vehicle over a dry floor and checking for the leak source. Also, check the vehicle interior below the heaters for moisture.

On models with air conditioning, it is normal for water to be seen draining under the vehicle from the evaporator after the vehicle has been operating with the air conditioning on.

COOLANT LEAKAGE — INTERNAL

- 1 Cylinder head gasket leakage: Check for bubbles in the coolant, check the cylinder heads and cylinder block for distortion. Renew the cylinder head gaskets.
- 2 Crack in the cylinder heads or the cylinder block: Repair or renew the faulty components.



Check the engine dipstick for emulsified oil indicating internal coolant leakage.

- 3 Leaking oil cooler: Remove and pressure test the oil cooler.



Check the engine for internal leakage by withdrawing the dipstick and inspecting for emulsified oil. A compression test as described in Engine (chapter 4) will locate a leaking cylinder head gasket.

If available run the engine from cold to operating temperature with a radiator pressure tester installed.

If a cylinder head gasket leak is present, pressure will continue to climb steadily, when quickly opening and closing the throttle repeatedly. If no leak is present the pressure will stabilise and when quickly opening and closing the throttle repeatedly, pressure will fluctuate but always return close to the same reading.

A testing kit is also available with a dye that changes colour if combustion gasses are present in the coolant. This is an indication of head gasket failure or a cracked cylinder head/block. Due to the cost of this equipment, it is recommended that the vehicle be taken to a workshop so equipped, if a head gasket failure is suspected.

If an automatic transmission is fitted, also check for emulsified (water contaminated) oil in the transmission.

COOLANT CIRCULATION FAULTY

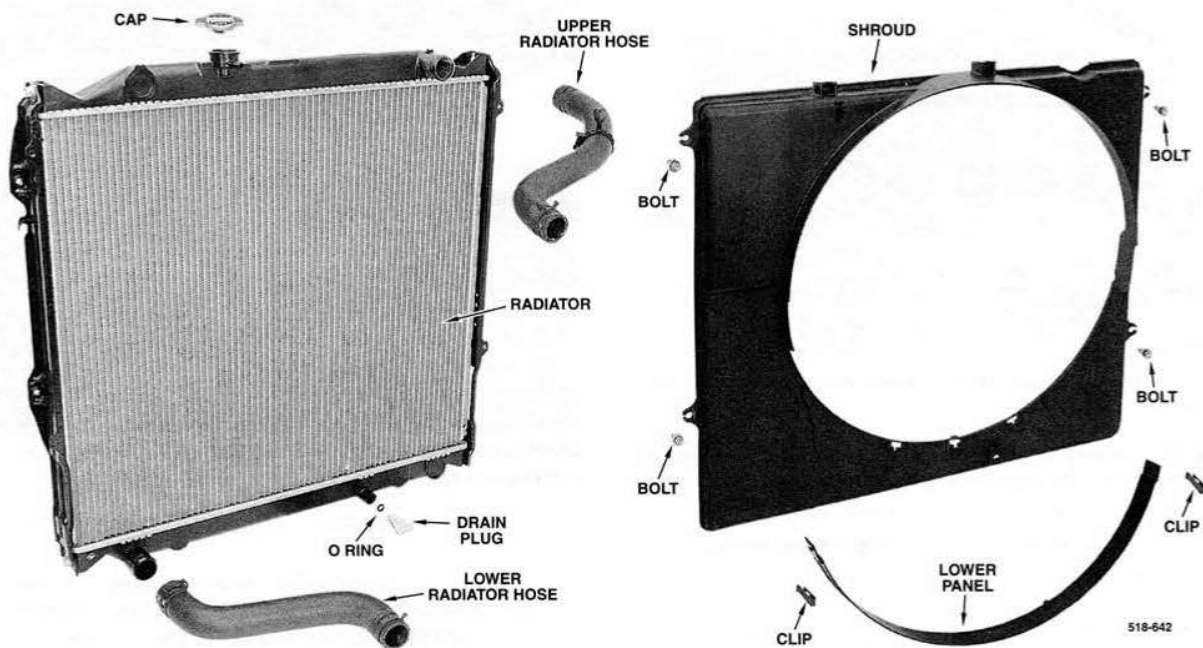
- 1 Insufficient coolant in the system: Top up the coolant and check for leaks.
- 2 Faulty thermostat: Test the thermostat and renew if necessary.
- 3 Partial blockage of the radiator core tubes: Reverse flush or renew the radiator.
- 4 Sludge deposits in engine cooling passages: Reverse flush the engine.
- 5 Collapsing radiator hoses: Renew the radiator hoses as required and check the radiator for restrictions.
- 6 Faulty water pump: Renew the water pump.

Radiator

TO REMOVE

- 1 Drain the cooling system as previously described.

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**Radiator components.**

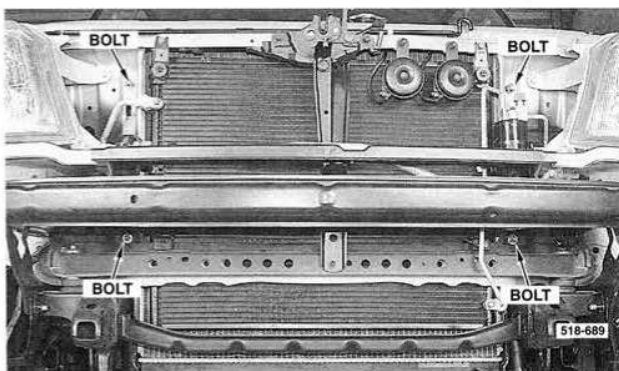
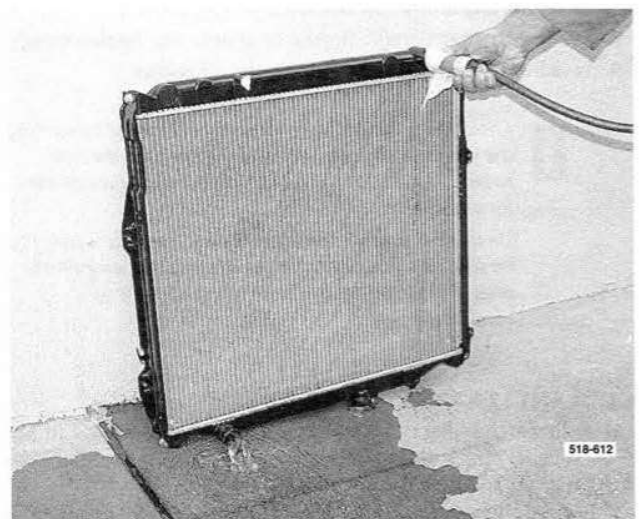
- 2 Disconnect the upper and lower radiator hoses and the overflow hose from the radiator.
- 3 Remove the shroud lower panel by releasing the clips on the inside and rotating the top of the lower panel toward the engine to disengage the tangs of the lower panel from the bottom of the shroud.
- 4 Remove the fan shroud retaining bolts and manoeuvre the shroud from the engine compartment.
- 5 On automatic transmission models, place a container beneath the radiator and using an open end spanner and a suitable flare nut spanner, disconnect the transmission oil cooler pipes from the radiator. Seal the openings to prevent dirt entry.
- 6 Remove the radiator retaining bolts and lift the radiator to disengage the tangs from the radiator support panel. Tilt the radiator backward and lift it from the engine compartment.

TO FLUSH AND CLEAN

- 1 With the radiator removed as previously described, install the radiator cap securely and carefully invert the radiator.
- 2 Insert a garden hose in the lower radiator outlet fitting. Use a cloth to seal the hose to the radiator.
- 3 Reverse flush the radiator until the water flowing from the radiator is clean.
- 4 It may be necessary to reverse the direction of flushing several times to clean out all the deposits from the radiator.

i If excessive back pressure or diminished flow indicates severely blocked radiator core tubes, which cannot be cleaned by reverse flushing, it is recommended that the radiator be repaired by a radiator specialist.

TIP To prevent internal deposits from drying and possibly blocking the radiator tubes, causing overheating, seal the hose fittings and fill the radiator with coolant if it is to be removed from the vehicle for any length of time.

**Location of the radiator retaining bolts. Shown with the front bumper and grille removed.****Reverse flushing the radiator using water pressure.**



Cleaning the radiator core externally.

- 5 Apply a stream of water or compressed air to the radiator core from the rear to the front. To avoid damage to the radiator core, maintain a distance of 40 – 50 cm between the cleaning nozzle and the radiator core.

TO INSTALL

Installation is a reversal of the removal procedure with attention to the following points:

- 1 Ensure that the mounting tangs are correctly located in the radiator support panel.
- 2 Install the retaining bolts and tighten to the specified torque.
- 3 Install the fan shroud and the fan shroud lower panel. Tighten the bolts securely.
- 4 Install the upper and lower radiator hoses and the overflow hose and secure with the clamps.
- 5 If removed, install the transmission oil cooler pipes to the radiator and tighten to the specified torque.
- 6 Refill the cooling system as previously described under the Routine Maintenance heading in this chapter.

TO REPAIR

As special tools are needed to repair the radiator, it is recommended that the radiator be removed and taken to a radiator specialist for repairs.

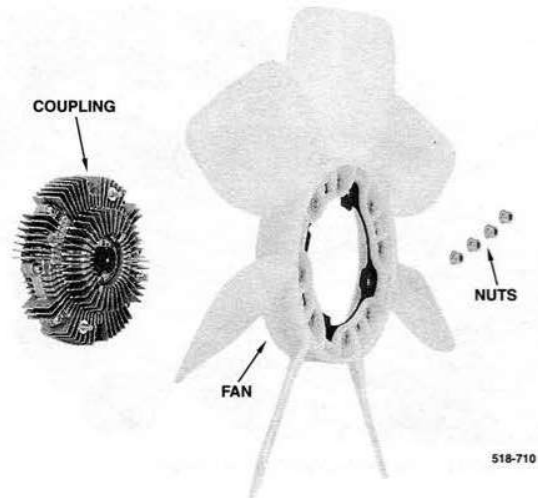
Cooling Fan and Coupling

TO TEST COOLING FAN COUPLING ON THE VEHICLE

- 1 With the engine Off and cold, rotate the fan by hand. A distinct resistance should be felt. If the fan rotates freely or is very stiff to turn, the coupling is faulty.
- 2 Check the coupling for external leaks of silicone fluid and if necessary renew the coupling.
- 3 Check the bimetal spring at the front of the coupling for damage. If damage is evident, renew the coupling.

TO REMOVE AND INSTALL

- 1 Loosen the four nuts retaining the coupling to the hub of the drive belt pulley assembly.



Fan and coupling components.

- 2 Loosen the alternator and power steering belt tensioners.
- 3 Remove the nuts and manoeuvre the coupling from the hub.
- 4 Remove the pulley and check the hub bearing by rotating the hub by hand. If the hub does not rotate smoothly, renew the bracket as described under the Drive Belt Hub Assembly heading in Engine (chapter 4).
- 5 If the coupling is to be renewed, remove the retaining bolts and separate the fan blade from the coupling.

Installation is a reversal of the removal procedure with attention to the following points:

- 1 Ensure that the belts are installed correctly to the pulleys.
- 2 Install the coupling and tighten the nuts securely.
- 3 Tension the belts as described under the Routine Maintenance heading in Engine (chapter 4)

Thermostat



To Test Thermostat — Thermometer

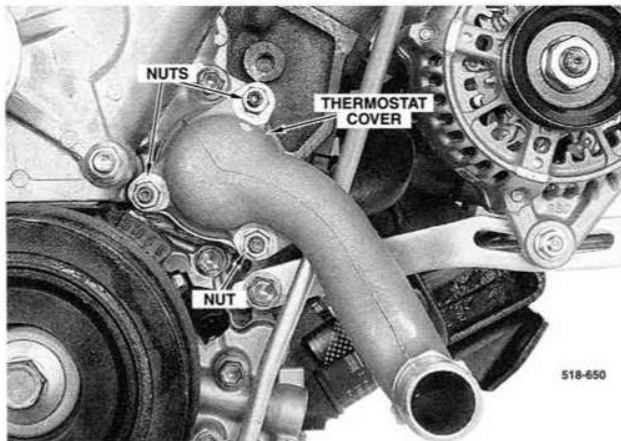
TO REMOVE AND INSTALL

- 1 With the engine cool remove the radiator cap.
- 2 Remove the retaining bolts and remove the stoneguards from beneath the vehicle.
- 3 Place a container beneath the radiator, loosen the drain plug in the radiator and drain the coolant.
- 4 Disconnect the lower radiator hose from the thermostat cover and remove the thermostat cover retaining nuts.
- 5 Lift the thermostat cover from the thermostat housing.
- 6 Remove the thermostat from the housing. Remove and discard the seal.

Installation is a reversal of the removal procedure with attention to the following points:

- 1 Ensure the mating faces between the thermostat cover and housing are clean.
- 2 Install the thermostat with a new seal and the jiggle valve down.

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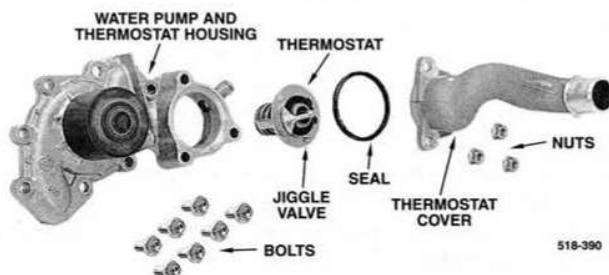
Thermostat cover and retaining nut locations.

- 3 Ensure that the thermostat is seated correctly in the recess of the thermostat housing.
- 4 If the machined faces of the thermostat cover or housing are not perfectly smooth, apply a smear of Permatex No 3 or equivalent sealant to the faces.
- 5 Tighten the thermostat cover nuts to the specified torque.
- 6 Install and secure the lower radiator hose with the clamp. Tighten the radiator drain plug securely.
- 7 Fill the cooling system as described under the Routine Maintenance heading in this chapter.

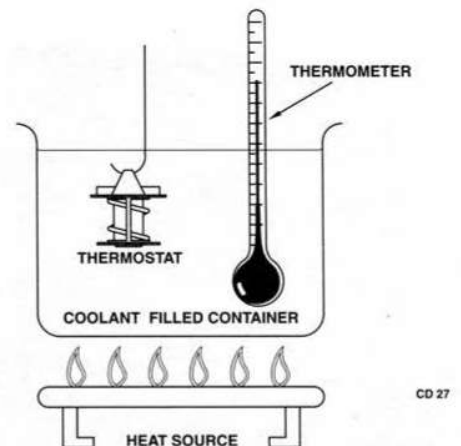
TO TEST

i A visual examination of the thermostat will often determine its serviceability and make further testing unnecessary. For example, a thermostat with its valve fully open when removed from a cold engine is obviously faulty and should be renewed.

- 1 Check that the thermostat is fully closed when cold.
- 2 Suspend and immerse the thermostat and a thermometer in a container filled with coolant, making sure that neither the thermostat nor the thermometer touches the container.
- 3 Progressively heat the coolant, noting the temperature reading on the thermometer. The thermostat valve should begin to open between 80° – 84°C.
- 4 The thermostat should have reached a valve lift of 8.5 mm at 95°C. A thermostat with an opening temperature and valve lift outside these specifications must be renewed.
- 5 Check that the thermostat is fully closed when it has cooled down to 40° C. If it is not fully closed, renew the thermostat.



Water pump and thermostat housing components.



Testing the thermostat.

Water Pump

TO INSPECT

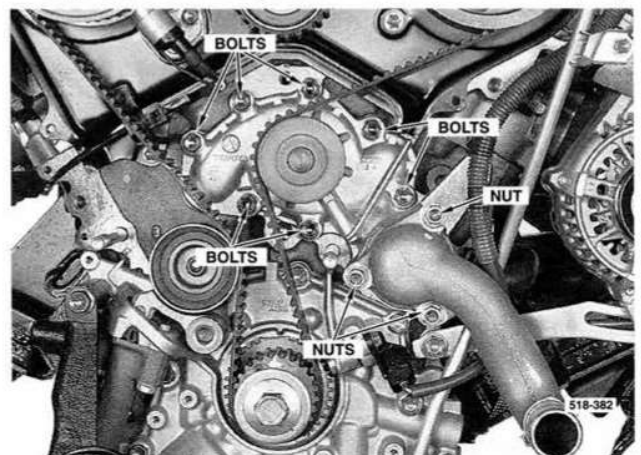
Remove the timing belt as described in Engine (chapter 4).

Check the water pump for excessive end play, or roughness by rotating the pulley. Using a mirror, inspect the drain hole for signs of leakage. If the pump is serviceable reinstall the belt. If the water pump has been leaking, renew the timing belt with the water pump.

If necessary renew the water pump as follows:

TO REMOVE AND INSTALL

- 1 Allow the engine to cool and drain the cooling system as described under the Routine Maintenance heading in this chapter.
- 2 Disconnect the negative battery terminal.
- 3 Remove the timing belt as described in Engine (chapter 4) under the timing belt heading.
- 4 Remove the thermostat as previously described.
- 5 Remove the bolts retaining the water pump to the engine.
- 6 Using a soft faced hammer, tap the water pump housing to separate it from the cylinder block. Remove the water pump.



Location of the water pump and thermostat housing bolts and nuts.

Installation is a reversal of the removal procedure with attention to the following points:

- 1 Ensure that the mating faces of the water pump and the cylinder block are clean and free of old gasket material.
- 2 Apply a smear of Permatex Ultra Grey sealant to the mating face of the water pump.
- 3 Clean the threads of the retaining bolts and apply a drop of Permatex Lock Nut or equivalent to the threads.
- 4 Position the water pump on the dowels and install the retaining bolts.
- 5 Install the thermostat and the thermostat cover and tighten all of the water pump and thermostat cover nuts and bolts to the specified torque.
- 6 Install the timing belt as described in Engine (chapter 4) under the Timing Belt heading.
- 7 Fill the cooling system as described under the Routine Maintenance heading in this chapter.
- 8 Reconnect the negative battery terminal, run the engine and check the cooling system for leaks.

Welch Plugs

To facilitate the casting of the cylinder block and cylinder heads, a number of openings were made during manufacture. These openings are sealed with welch plugs.

The welch plugs will have to be renewed when cleaning the water jackets or when they become defective due to corrosion.



If a welch plug is found to be corroded, it is advisable to renew all the welch plugs.

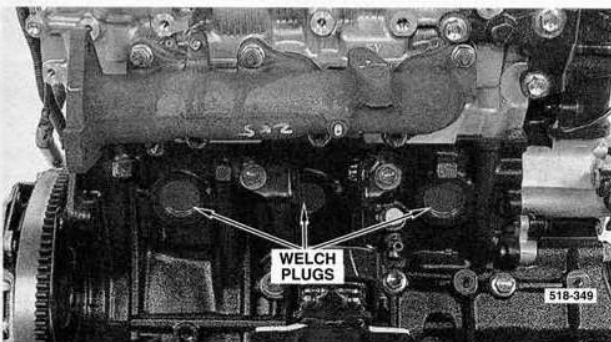
TO RENEW

- 1 Drain the cooling system as previously described.
- 2 Remove the necessary engine components or accessories to gain ample working space around the damaged plug.

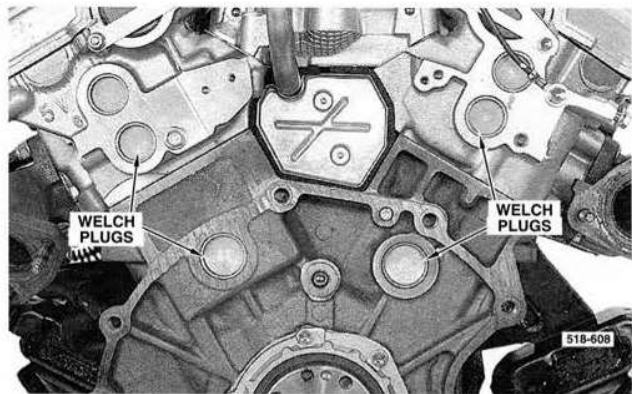


To access the welch plugs in the rear of the cylinder heads and the rear of the cylinder block, it will be necessary to remove the transmission.

- 3 Using a punch and hammer, tap the welch plug on its outer circumference into its opening.
- 4 Grasp the edge of the welch plug with a pair of multigrip pliers and using the shoulder of the pliers as a fulcrum, lever the plug out of its opening.



Location of the welch plugs in the side of the cylinder block. Right hand side shown.



Location of the cooling system welch plugs at the rear of the engine. The upper welch plugs in the cylinder head do not pass into the coolant passages.

- 5 Thoroughly clean and dry the welch plug opening.
- 6 Lightly smear the edge of the new welch plug and the opening with a suitable jointing compound, such as Permatex No 2.
- 7 Place the new welch plug onto the opening and using a large socket or piece of tubing fitting neatly inside the rim of the welch plug, tap the plug squarely into the opening.

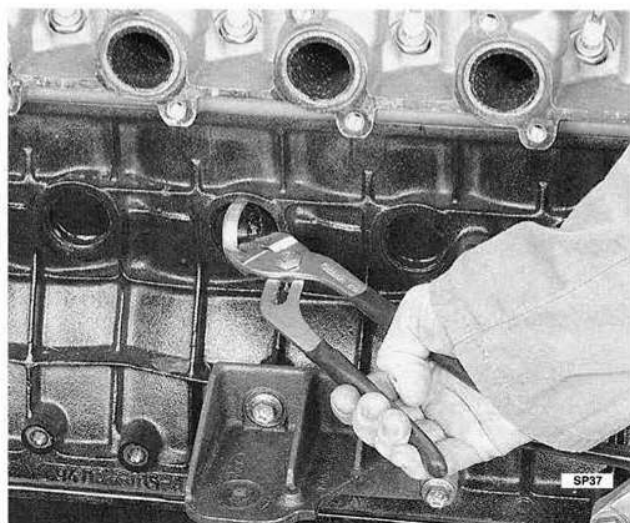


The welch plug must be entered squarely into its opening or leakage may occur.

- 8 Install the components which were removed to gain access to the welch plug.
- 9 Refill the cooling system as previously described. With the radiator cap installed, run the engine until it reaches normal operating temperature and check for coolant leaks. Rectify as necessary.

Drive Belts

The inspection and renewal of the drive belts is fully covered under the Routine Maintenance heading in Engine (chapter 4).



Method of removing a welch plug using multigrip pliers.