

COOLING SYSTEM

SPECIFICATIONS

Radiator cap pressure	75-107 kPa
Water pump type	Centrifugal impeller
Thermostat:	
Type	Wax pellet
Opening temperature	80-84 deg C
Fully open at	95 deg C
Valve lift	8 mm
Coolant capacity	7.5 litres

TORQUE WRENCH SETTINGS

Water pump cover bolts	9.2 Nm
Water pump retaining bolts	9.2 Nm
Thermostat cover nuts	8.8 Nm

1. COOLING SYSTEM TROUBLE SHOOTING

COOLANT LEAKAGE — EXTERNAL

- (1) Leaking reserve tank or hoses: Renew reserve tank or hoses.
- (2) Loose hose clips or faulty hoses: Tighten hose clips or renew hoses.



Check for leaking and damaged radiator hoses and Welch plugs.

- (3) Leaking radiator: Repair or renew radiator.
- (4) Leaking heater core or tap: Repair or renew heater core, check and renew heater tap as necessary.
- (5) Leak at thermostat cover or water pump joint gasket: Renew seal or gasket as necessary.
- (6) Worn or damaged water pump seal or bearing: Renew water pump.
- (7) Loose or rusted Welch plugs: Renew faulty Welch plugs.
- (8) Faulty cylinder head gasket or loose cylinder head bolts: Renew gasket and correctly tighten cylinder head bolts.
- (9) External crack in cylinder block or head: Renew faulty components.

NOTE: Check system for external leakage by running the engine to operating temperature over a dry floor and checking for leakage source.



Renew the radiator pressure cap if the sealing quality of the sealing rubber is suspect.

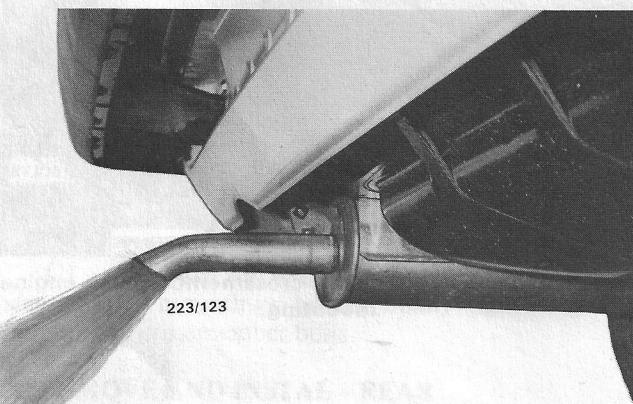
COOLANT LEAKAGE — INTERNAL

- (1) Cylinder head gasket leak due to warped cylinder head or cylinder block gasket face: Reface cylinder head or block and renew cylinder head gasket.
- (2) Crack in cylinder head or block: Repair or renew cylinder head or block.

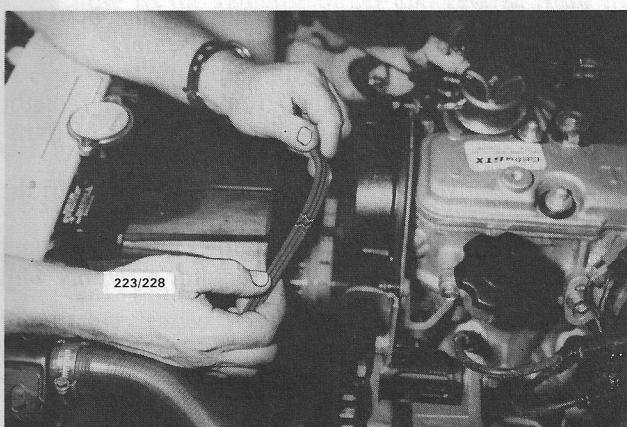
NOTE: Check the engine for internal leakage by withdrawing the dipstick and inspecting for emulsified oil. Also run the engine and check for excessive steam at the exhaust pipe which would indicate water leakage into the combustion chamber.

ENGINE OVERHEATING

- (1) Broken or slipping fan drive belt: Adjust or renew fan drive belt.
- (2) Loss of coolant: Determine whether coolant loss is due to external or internal leakage and investigate under relevant heading.
- (3) Obstructed air passage through radiator core from front to rear: Blow out obstruction from rear to front of the radiator core with compressed air or water pressure.
- (4) Faulty thermostat: Check and renew thermostat.



Excessive steam at the exhaust pipe indicates water leakage into the combustion chamber.



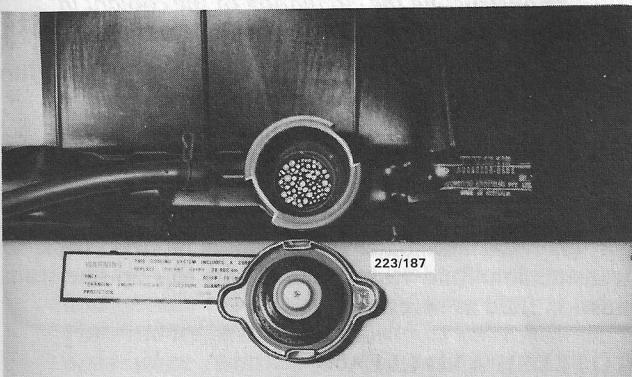
Check the drive belts for cracks and deterioration.

- (5) Poor circulation: Check and rectify as under Coolant Circulation Faulty.
- (6) Incorrect ignition timing: Check and reset ignition timing as described in the Engine Tune-up section.
- (7) Restricted muffler or tail pipe accompanied by loss of power: Remove restrictions or renew components.
- (8) Incorrectly adjusted or dragging brakes: Check and rectify by adjustment or renewal of components.

NOTE: The coolant level in the see-through reserve tank does not always indicate the coolant content of the cooling system. If in any doubt, remove the radiator cap when the engine is cool, to ascertain the coolant level. Engine overheating is indicated by excessive rise in engine temperature as shown by the temperature gauge. Overheating is usually accompanied by steam emitting from the radiator reserve tank and loss of engine power. A blown head gasket is indicated by bubbles in the radiator coolant.

COOLANT CIRCULATION FAULTY

- (1) Partial blockage of the radiator core tubes: Reverse flush or renew radiator core.
- (2) Water sludge deposits in engine water jackets: Clean and flush engine water jackets and add coolant conditioner to system.



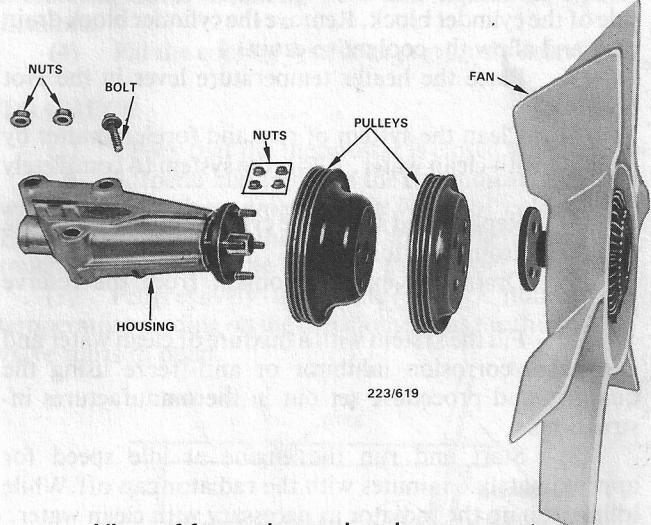
A blown gasket is indicated by bubbles in the radiator coolant.

- (3) Faulty water pump: Renew water pump.
- (4) Faulty thermostat: Renew thermostat.
- (5) Collapsing bottom radiator hose: Check and renew bottom radiator hose and check radiator core tubes.
- (6) Insufficient coolant in system: Replenish coolant and check for leaks, (refer to previous Note if necessary).

NOTE: This condition is best checked out by removing the radiator cap and running the engine to check for water turbulence in the radiator. With the engine at operating temperature, a normal system should show turbulence at part throttle. Check the radiator tubes for blockage by partially draining the system and then checking visually for rust scale in the tubes.

2. DESCRIPTION

The cooling system is of the thermo siphon type with fan and water pump assistance. The system is pressurised in order to raise the boiling point of the coolant and so increase the efficiency of the engine. Coolant is expelled from the radiator past the pressure seal in the radiator cap



View of fan and associated components.

as the engine temperature rises. This coolant is then stored in a reserve tank to refill the radiator when the engine is stopped and cools down. This ensures the system maintains a full radiator at all times.

The water pump is driven from the crankshaft pulley by means of the timing belt.

A thermostatically operated fan and housing assembly are bolted to the side of the engine block and driven by the crankshaft via a multi 'V' belt. The belt also drives the air pump. A fan shroud is provided to help the flow of air through the radiator.

On vehicles fitted with automatic transmissions the bottom radiator tank also houses the transmission oil cooler.

A plug is fitted to the left hand side of the cylinder block to allow the cylinder block to be drained. To drain the

radiator it is necessary to remove the hose from the bottom of the radiator.

3. RADIATOR

NOTE: To avoid accidental scalding do not remove the radiator cap of an engine that is at or above normal operating temperature.

TO DRAIN AND REFILL COOLING SYSTEM

(1) Position a suitable drain tin below the radiator and drain the cooling system by removing the bottom radiator hose. It will be best to leave the radiator cap in position during this operation. This will cause a partial vacuum in the radiator therefore avoiding heavy gushes of coolant when the bottom hose is removed. When the flow of coolant stops, the radiator cap may be 'cracked' open a little at a time until all the coolant has drained from the radiator.

NOTE: It may be necessary to remove the engine splash shield to gain access to the hose clip.

(2) Position a suitable drain tin under the left hand side of the cylinder block. Remove the cylinder block drain plug and allow the coolant to drain.

(3) Place the heater temperature lever in the Hot position.

(4) Clean the system of rust and foreign matter by flushing with clean water. Allow the system to completely drain.

(5) Replace and secure the cylinder block drain plug and the bottom radiator hose.

(6) Drain any existing coolant from the reserve tank.

(7) Fill the system with a mixture of clean water and a suitable corrosion inhibitor or anti-freeze using the quantity and procedure set out in the manufacturers instructions.

(8) Start and run the engine at idle speed for approximately 6 minutes with the radiator cap off. While idling, top up the radiator as necessary with clean water.

(9) After 6 minutes, switch off the engine and instal the radiator cap.

(10) Fill the coolant reserve tank to approximately half way between the Low and Full marks.

(11) Start and run the engine until it reaches normal operating temperature. Check around the engine and hoses for leaks.

(12) Top up the coolant reserve tank as necessary to bring it to the Full line.

TO REMOVE AND INSTAL

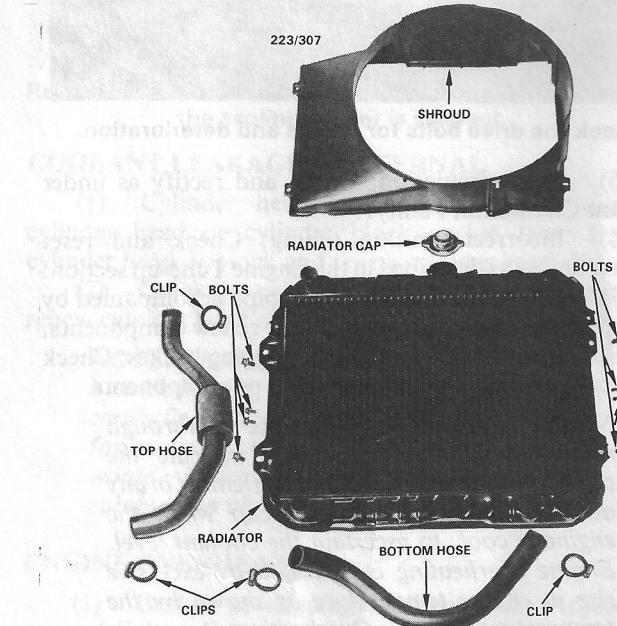
(1) Drain the radiator as previously described.
 (2) Loosen the retaining clip and disconnect the top radiator hose from the radiator.
 (3) Disconnect the overflow to coolant reserve tank hose from the radiator.

(4) Remove the radiator shroud retaining bolts and position the shroud back over the fan assembly.

(5) On vehicles fitted with automatic transmission disconnect the oil cooler pipes from the lower radiator tank. To prevent the entry of dirt and the loss of transmission fluid, plug the pipes and unions.

(6) Remove the radiator retaining bolts and lift the radiator from the vehicle.

(7) Securely plug the water outlets in the upper and lower radiator tanks and fill the radiator assembly with clean water.



View of radiator and associated components.

NOTE: When a radiator that has been in use for some time is removed from the vehicle to enable repairs to be carried out to the engine, it should not be allowed to stand empty for any length of time. The radiator should be kept full. Failure to observe this precaution may result in overheating when the engine is put back into service. This is caused by internal deposits in the radiator drying and flaking and so obstructing the circulation of the coolant in the system.

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

(1) Ensure that the radiator shroud is positioned correctly.

(2) Fill the cooling system as previously described and check for coolant leaks.

(3) On automatic transmission models check for transmission fluid leaks. Check and top up the transmission fluid as necessary.

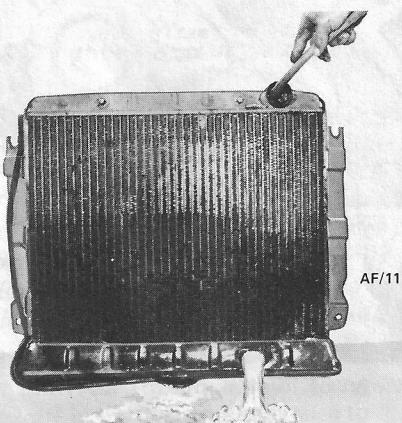
TO FLUSH AND CLEAN

(1) Remove the radiator as previously described.
 (2) Stand the radiator upside down and apply a

water hose to the radiator outlet and reverse flush the radiator until the water flowing from it is clean.

(3) Stand the radiator upright and apply a stream of water or compressed air to the radiator core from the rear to the front. Maintain this procedure until all dirt and foreign matter is removed from the radiator core.

(4) With the aid of a light make a visual check down through the radiator filler neck onto the radiator tubes. If it is apparent that the tubes are severely impregnated with flakes of rust, it will be necessary to have the upper and lower tanks removed from the radiator core and the tanks thoroughly cleaned. It is recommended that this operation be carried out by a radiator specialist who has the necessary specialised equipment to carry out this type of work.



Reverse flush the radiator using water pressure.

NOTE: Should it be necessary to flush the cylinder block, remove the thermostat and the cylinder block drain plug. Apply a water hose to the cylinder block outlet and flush the cylinder block until the water flowing from the cylinder block and the drain plug holes is clean.

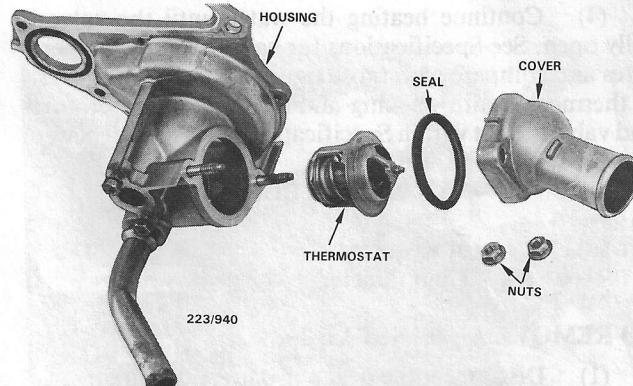
4. THERMOSTAT

Special Equipment Required: To Check - Thermometer

TO REMOVE AND INSTAL

- (1) Drain the radiator as previously described.
- (2) Disconnect and remove the bottom radiator hose from the cylinder block.
- (3) Remove the thermostat cover retaining nuts and detach the thermostat cover from the housing. Withdraw the thermostat from the recess in the housing with the seal.

NOTE: A visual examination of the thermostat will often determine its serviceability and obviate the necessity for further testing. For instance, a thermostat with its valve fully open when removed from a cold engine is obviously faulty and should be discarded and a new unit fitted.



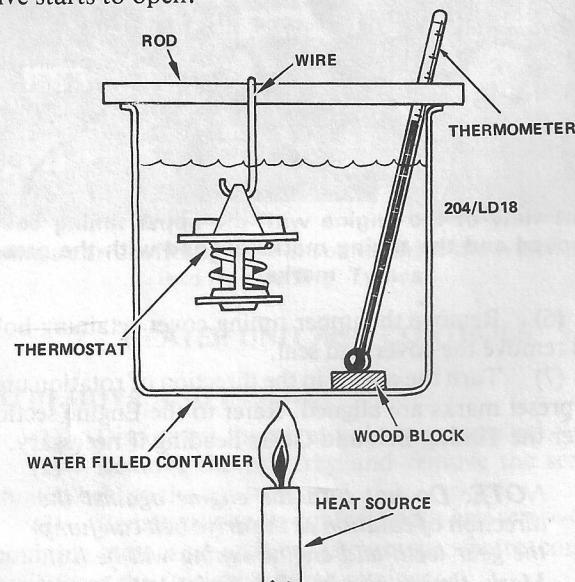
Dismantled view of thermostat and housing components.

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

- (1) Ensure that the sealing surfaces are perfectly clean and that a new seal is fitted when assembling.
- (2) Instal the thermostat with the seal fitted into the thermostat cover.
- (3) Instal the thermostat cover to the housing ensuring that the seal is correctly seated, instal the thermostat cover retaining nuts and tighten to Specifications.
- (4) Fill the cooling system as previously described.

TO CHECK

- (1) Check that the thermostat is closed when cold.
- (2) Suspend and immerse the thermostat, together with a reliable thermometer, in a vessel of cold water. Ensure that neither the thermostat nor the thermometer is touching the sides or the bottom of the vessel.
- (3) Progressively heat the water, noting the temperature reading on the thermometer as the thermostat valve starts to open.



Line drawing showing the correct method used to test a thermostat.

(4) Continue heating the water until the valve is fully open. See Specifications for valve opening temperatures and compare with those figures obtained in the test. A thermostat with opening and fully open temperatures and valve lift not within Specifications should be renewed.

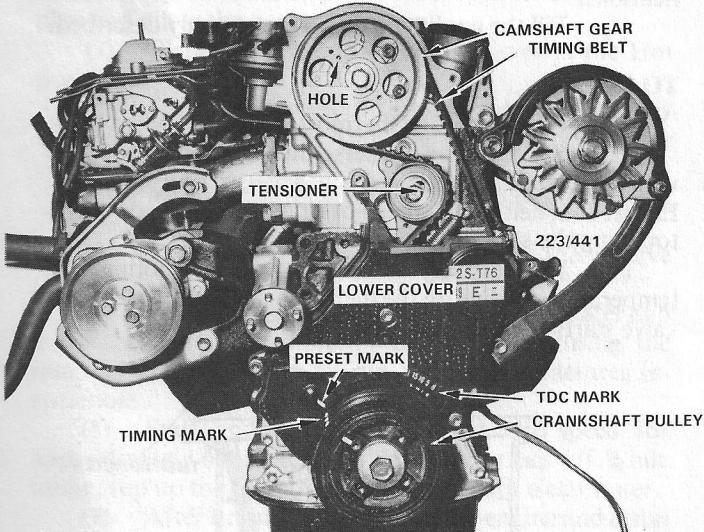
5. WATER PUMP

Special Equipment Required:

To Check - Thermometer

TO REMOVE AND INSTAL

- (1) Disconnect the negative battery terminal.
- (2) Drain and remove the radiator as previously described, lift out the fan shroud.
- (3) Remove the retaining nuts and remove the fan assembly from the housing shaft.
- (4) Loosen the adjusting and retaining bolts that secure the air pump to the side of the cylinder block, push the pump down towards the cylinder block and remove the drive belt.
- (5) Loosen the adjusting and retaining bolts that secure the alternator to the mounting bracket, push the alternator down towards the cylinder block and remove the drive belt.



Front view of the engine with the upper timing cover removed and the timing marks aligned with the preset marks.

- (6) Remove the upper timing cover retaining bolts and remove the cover and seal.
- (7) Turn the engine in the direction of rotation until the preset marks are aligned. Refer to the Engine section under the Timing Belt and Gears heading if necessary.

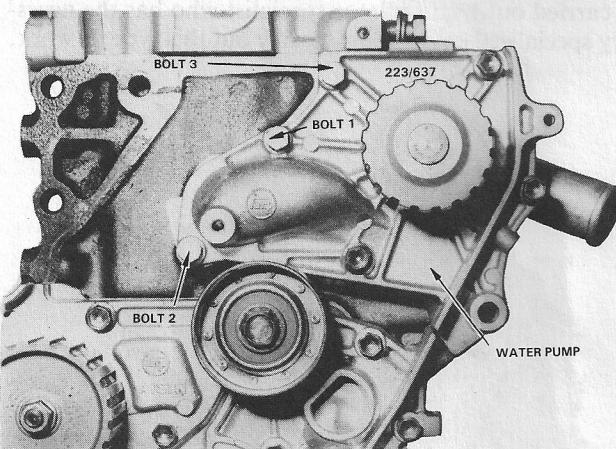
NOTE: Do not turn the engine against the direction of rotation as the drive belt can jump the gear teeth and engine timing will be lost. Mark timing marks and directional marks on the timing belt and timing gears with quick drying paint.

(8) Remove the crankshaft pulley retaining bolt and withdraw the crankshaft pulley, ensuring that the cam-shaft gear has not moved from its original setting. A suitable puller may be required to remove the crankshaft pulley.

(9) Remove the lower timing belt cover retaining bolts and remove the cover and seal.

(10) Mark the crankshaft gear timing marks on the timing belt to aid correct replacement of the timing belt.

(11) Loosen the timing belt adjusting pulley retaining bolt and move the pulley as far as possible to the left and tighten the retaining bolt temporarily.



Installed view of water pump, showing the pump retaining bolts.

(12) Remove the timing belt from all gears and idler pulleys noting the layout of the timing belt.

(13) Remove the bolt retaining the alternator adjusting bar and remove the bar.

(14) Remove the bottom radiator hose from the thermostat housing outlet.

(15) Loosen the retaining clips and remove the bypass hose from the water pump.

(16) Remove the heater pipe flange retaining bolts from the water pump and remove the pipe and gasket.

(17) The water pump is secured to the cylinder block by the 3 bolts on the left hand side of the water pump. The bolts should be loosened and removed in the following sequence; 1-centre, 2-bottom, 3-top.

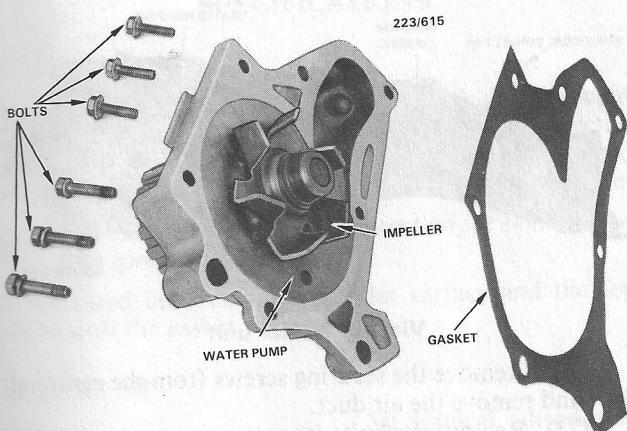
(18) Remove the water pump and 'O' ring from the engine.

NOTE: If the water pump is difficult to remove from the cylinder block, tap the pump housing with a soft hammer.

(19) Remove the remaining 3 bolts and separate the cover from the water pump.

(20) Inspect the water pump for cracks and damage to the gasket surfaces. Check the water pump bearing operation for roughness or noisy operation. Inspect the water pump drain hole for signs of coolant leakage. If defects are found, replace the water pump as an assembly.

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



Dismantled view of water pump.

(1) Instal a new gasket between the water pump and the cover and tighten the bolts to the specified torque.

NOTE: Ensure that the cover to water pump bolts are not intermixed with the water pump retaining bolts. The cover to pump bolts are 20 mm long while the pump retaining bolts are 25 mm long.

(2) Instal a new 'O' ring between the water pump and the engine and tighten the retaining bolts to the specified torque in the opposite sequence to the loosening sequence.

(3) Ensure all timing marks made on removal are correctly aligned. Refer to the Engine section as necessary.

6. WELCH PLUGS

To facilitate the casting of the cylinder block and cylinder head passages and the water jackets, a number of openings had to be made at manufacture. These openings are plugged with welch plugs. The plugs may have to be renewed when cleaning the engine water jackets or when the plugs become defective due to corrosion.

TO RENEW

NOTE: If one welch plug is found to be defective it is good policy to renew all welch plugs.

(1) Drain the radiator and cylinder block as previously described.

(2) Remove the necessary engine components or accessories to gain ample working space around the plug.

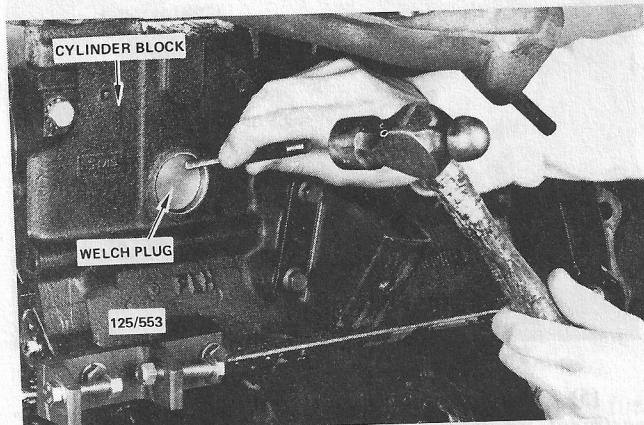
(3) Use a suitable punch and hammer and tap the welch plug on its outer circumference into its opening.

(4) Grasp the edge of the welch plug with a pair of multigrip pliers and using the shoulder of the multigrip pliers, lever the plug out of its opening.

(5) Throughly clean and dry the welch plug opening.

(6) Lightly smear the edge of the new welch plug and its opening with 'Stag' jointing compound.

(7) Place the welch plug into the opening and using



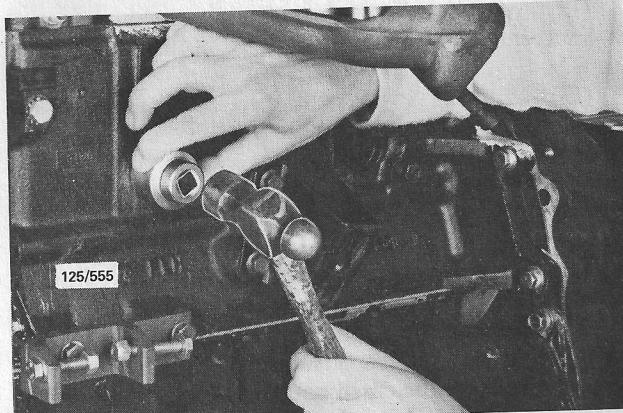
Tap the welch plug on its outer circumference into the cylinder block. Typical.

a suitable tube or socket fitting the rim of the plug, drive the plug squarely into the opening.

NOTE: The plug must be driven into the opening squarely or leaks may occur.

(8) Instal the components which were removed to gain access to the plug.

(9) Fill 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.



Using a correct fitting tube or socket drive the welch plug into its opening. Typical.

7. HEATER UNIT AND CONTROLS

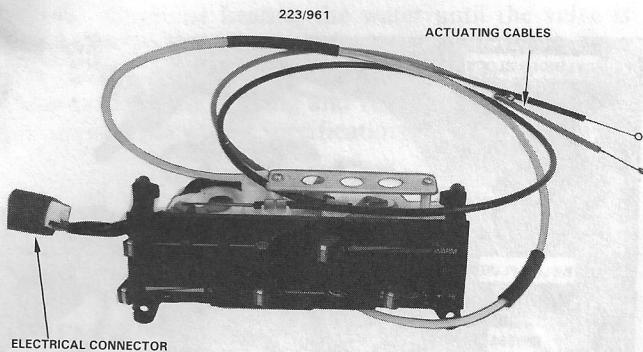
TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Remove the ash tray and remove the screws situated behind the ash tray.

(3) Remove the radio control knobs and remove the mounting nuts and washers. Lever the centre control fascia from the fascia mounting retainers.

(4) Remove the retaining screws securing the passenger side lower instrument panel from beneath the glove compartment.



View of heater control assembly

(5) Remove the screws retaining the glove compartment lid striker plate, lid hinge and the lid stay. Disconnect the electrical wires from the lamp and remove the glove compartment and lid from the vehicle.

(6) Remove the screws retaining the sector control switch unit to the centre control panel.

(7) Disconnect the flow control cable from the blower motor housing.

(8) Disconnect the temperature control cable from the heater housing.

(9) Disconnect the direction control cable from the drivers side of the heater housing.

(10) Disconnect the left and right control cable from the front of the heater housing.

(11) Disconnect the electrical control connectors from their sockets in the wiring harness.

(12) Working within the engine compartment disconnect the water control cable from the heater water tap.

(13) Working inside the vehicle, manoeuvre the heater control assembly from the centre control panel.

(14) Remove the instrument cluster as described in the Electrical System section.

(15) Prise the radio speaker cover from the right hand speaker unit location. Remove the retaining screws securing the left hand speaker unit cover and carefully prise the cover from the speaker unit location.

(16) Remove the crash pad retaining screws located above both speaker units.

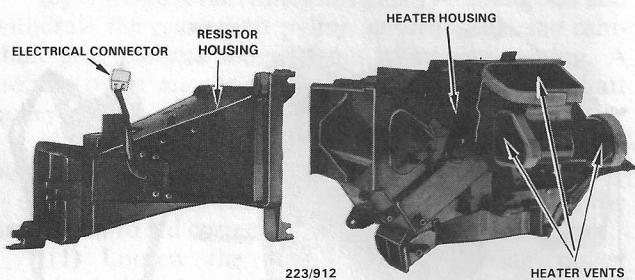
(17) Remove the crash pad retaining screws located at the body panel behind the instrument cluster and the centre console.

(18) Remove the crash pad retaining nuts securing the crash pad to the centre body bar and manoeuvre the crash pad from the vehicle.

(19) Remove the steering column from the vehicle as described in the Steering section.

(20) Remove the bonnet control lever retaining screws and disconnect the unit from the actuating cable.

(21) Remove the radio unit retaining screws and withdraw the radio unit far enough to disconnect the electrical and aerial connections. Remove the radio unit from the vehicle.



View of heater unit

(22) Remove the securing screws from the centre air duct and remove the air duct.

(23) Remove the bolts from the centre of the instrument panel frame and the right hand outer air duct and lower frame support.

(24) Remove the right and left hand air duct retaining screws from the instrument panel frame.

(25) Manoeuvre the instrument panel frame away from the body and disconnect the electrical connectors.

(26) Remove the retaining bolts from the centre console support bracket on the floor panel.

(27) Remove the centre body bar to vehicle body frame retaining bolts and steering column support bracket.

(28) Disconnect and remove all necessary heater and demister ducting. Carefully manoeuvre the centre body bar and brackets from the vehicle.

(29) Working within the engine compartment remove the heater hoses from the heater core outlets and remove the sealing grommets.

(30) Working inside the vehicle, remove the retaining screws and remove the vent ducting.

(31) Remove the heater unit retaining nuts. Remove the screws retaining the resistor housing to the blower motor and carefully manoeuvre the heater housing with the resistor housing attached from the blower motor and from the vehicle.

(32) Remove the lower mounting bolt and nut and the upper retaining nut securing the blower motor housing to the firewall.

(33) Remove the screws retaining the wiring harness to the firewall and move it carefully to one side.

(34) Disconnect the electrical wiring from the blower motor and remove the blower motor housing from the vehicle.

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

(1) Ensure that all heater hoses are correctly fitted and that the hose clips are secure.

(2) Ensure that the heater control cable retaining clips are correctly fitted and that the cables are correctly adjusted.

(3) Ensure that all electrical connections are correctly installed.