






# Chapter 3

## Cooling, heating and ventilation systems

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### Degrees of difficulty

|   |  |  |   |  |
|---|--|--|---|--|
| <b>Easy</b> , suitable for novice with little experience<br> | <b>Fairly easy</b> , suitable for beginner with some experience<br> | <b>Fairly difficult</b> , suitable for competent DIY mechanic<br> | <b>Difficult</b> , suitable for experienced DIY mechanic<br> | <b>Very difficult</b> , suitable for expert DIY or professional<br> |
|---|--|--|---|--|

### Specifications

#### Coolant

|                                   |               |
|-----------------------------------|---------------|
| Mixture type . . . . .            | See Chapter 1 |
| Cooling system capacity . . . . . | See Chapter 1 |

#### System pressure

|                         |  |
|-------------------------|--|
| Pressure test . . . . . | 1.2 bars - should hold this pressure for at least 10 seconds |
|-------------------------|--|

#### Expansion tank filler cap

|                           |  |
|---------------------------|--|
| Pressure rating . . . . . | 1.0 to 1.4 bars approximately - see cap for actual value |
|---------------------------|--|

#### Thermostat

|                          |              |
|--------------------------|--------------|
| Starts to open . . . . . | 85°C to 89°C |
|--------------------------|--------------|

#### Coolant temperature sensor

|                    |                    |
|--------------------|--------------------|
| Resistance:        |                    |
| At 0°C . . . . .   | 89 to 102 kilohms  |
| At 20°C . . . . .  | 35 to 40 kilohms   |
| At 100°C . . . . . | 1.9 to 2.5 kilohms |
| At 120°C . . . . . | 1.0 to 1.4 kilohms |

## 3•2 Cooling, heating and ventilation systems

### Torque wrench settings

|   | Nm       | lbf ft   |
|---|----------|----------|
| Thermostat housing to cylinder head:                              |          |          |
| HCS engines   | 17 to 21 | 13 to 16 |
| CVH engines   | 9 to 12  | 7 to 9   |
| PTE engines   | 9        | 7        |
| Zetec engines   | 17 to 21 | 13 to 16 |
| Water outlet to thermostat housing (Zetec engines)                | 9 to 12  | 7 to 9   |
| Water pump pulley   | 10       | 7.5      |
| Water pump retaining bolts:                                       |          |          |
| HCS, CVH and PTE engines  | 8        | 6        |
| Zetec engines   | 18       | 13       |
| Coolant temperature gauge sender                                  | 6        | 4        |
| Coolant temperature sensor:                                       |          |          |
| HCS engines   | 23       | 17       |
| CVH engines:  |          |          |
| 1.4 litre models  | 19       | 14       |
| 1.6 litre models  | 15       | 11       |
| PTE engines   | 15       | 11       |
| Zetec engines   | 15       | 11       |
| Radiator mounting bolts   | 20 to 27 | 15 to 20 |
| Radiator cooling fan shroud retaining bolt                        | 3 to 5   | 2 to 4   |
| Radiator cooling fan motor to shroud nuts                         | 9 to 12  | 7 to 9   |
| Automatic transmission fluid cooling pipe connections to radiator | 17 to 21 | 13 to 16 |

## 1 General information and precautions

### Engine cooling system

The cooling system is of the pressurised type consisting of a belt-driven pump, aluminium crossflow radiator, expansion tank, electric cooling fan and a thermostat. The system functions as follows. Cold coolant in the bottom of the radiator passes through the bottom hose to the water pump, where it is pumped around the cylinder block and head passages. After cooling the cylinder bores, combustion surfaces and valve seats, the coolant reaches the underside of the thermostat, which is initially closed. The coolant passes through the heater and inlet manifold and is returned to the water pump.

When the engine is cold, the coolant circulates through the cylinder block, cylinder head, heater and inlet manifold. When the coolant reaches a predetermined temperature, the thermostat opens, and the coolant then passes through the top hose to the radiator. As the coolant circulates through the radiator, it is cooled by the inrush of air when the car is in forward motion. Airflow is supplemented by the action of the electric cooling fan when necessary. Upon reaching the bottom of the radiator, the coolant is now cooled, and the cycle is repeated.

When the engine is at normal operating temperature, the coolant expands, and some of it is displaced into the expansion tank. This coolant collects in the tank, and is returned to the radiator when the system cools.

The electric cooling fan, mounted behind the radiator, is controlled by a thermostatic

switch. At a predetermined coolant temperature, the switch contacts close, thus actuating the fan.

### Heating/ventilation system

The heating system consists of a blower fan and heater matrix (radiator) located in the heater unit, with hoses connecting the heater matrix to the engine cooling system. Hot engine coolant is circulated through the heater matrix. Air is forced through the matrix by the three-speed fan, dispersing the heat into the vehicle interior. Fresh air enters the vehicle through the grille slats between the windscreen and the rear edge of the bonnet, and passes through to the heater casing. Depending on the position of the heater slide controls, which actuate cable-controlled flap valves within the heater casing, the air is distributed, either heated or unheated, via the ducting to outlet vents. The main outlet vents in the fascia are adjustable. The airflow passes through the passenger compartment to exit at the rear of the vehicle.

### Precautions



**Warning: DO NOT attempt to remove the expansion tank filler cap, or to disturb any part of the cooling system, while it or the engine is hot, as there is a very great risk of scalding. If the expansion tank filler cap must be removed before the engine and radiator have fully cooled down (even though this is not recommended) the pressure in the cooling system must first be released. Cover the cap with a thick layer of cloth, to avoid scalding, and slowly unscrew the filler cap until a hissing sound can be heard. When the hissing has stopped, showing that pressure is released, slowly unscrew the filler cap further until it can be removed; if more hissing sounds are heard, wait until they**

**have stopped before unscrewing the cap completely. At all times, keep well away from the filler opening.**



**Warning: Do not allow antifreeze to come in contact with your skin, or with the painted surfaces of the vehicle. Rinse off spills immediately with plenty of water. Never leave antifreeze lying around in an open container, or in a puddle in the driveway or on the garage floor. Children and pets are attracted by its sweet smell, but antifreeze can be fatal if ingested.**



**Warning: If the engine is hot, the electric cooling fan may start rotating even if the engine is not running, so be careful to keep hands, hair and loose clothing well clear when working in the engine compartment.**

## 2 Antifreeze - general information

**Note: Refer to the warnings given in Section 1 of this Chapter before proceeding.**

The cooling system should be filled with a water/ethylene glycol-based antifreeze solution, of a strength which will prevent freezing down to at least -25°C, or lower if the local climate requires it. Antifreeze also provides protection against corrosion, and increases the coolant boiling point.

The cooling system should be maintained according to the schedule described in Chapter 1. If antifreeze is used that is not to Ford's specification, old or contaminated coolant mixtures are likely to cause damage, and encourage the formation of corrosion and scale in the system. Use distilled water with the antifreeze, if available - if not, be sure to use only soft water. Clean rainwater is suitable.

Before adding antifreeze, check all hoses and hose connections, because antifreeze tends to leak through very small openings. Engines don't normally consume coolant, so if the level falls regularly, find the cause and correct it.

The exact mixture of antifreeze-to-water which you should use depends on the relative weather conditions. The mixture should contain at least 40% antifreeze, but not more than 70%. Consult the mixture ratio chart on the antifreeze container before adding coolant. Hydrometers are available at most automotive accessory shops to test the coolant. Use only good-quality ethylene-glycol-based antifreeze which meets the vehicle manufacturer's specifications.

### 3 Cooling system hoses - disconnection and renewal



**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

1 If the checks described in Chapter 1 reveal a faulty hose, it must be renewed as follows.

2 First drain the cooling system (see Chapter 1); if the antifreeze is not due for renewal, the drained coolant may be re-used, if it is collected in a clean container.

3 To disconnect any hose, use a pair of pliers to release the spring clamps (or a screwdriver to slacken screw-type clamps), then move them along the hose clear of the union. Carefully work the hose off its stubs. The hoses can be removed with relative ease when new - on an older car, they may have stuck.

4 If a hose proves stubborn, try to release it by rotating it on its unions before attempting to work it off. Gently prise the end of the hose with a blunt instrument (such as a flat-bladed screwdriver), but do not apply too much force, and take care not to damage the pipe stubs or hoses. Note in particular that the radiator hose unions are fragile; do not use excessive force when attempting to remove the hoses.

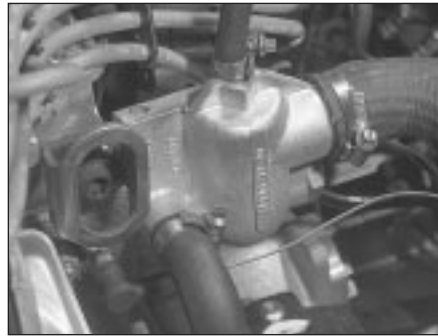


**If all else fails, cut the hose with a sharp knife, then slit it so that it can be peeled off in two pieces. Although this may prove expensive if the hose is otherwise undamaged, it is preferable to buying a new radiator.**

5 When refitting a hose, first slide the clamps onto the hose, then work the hose onto its unions.



**If the hose is stiff, use a little soapy water as a lubricant, or soften the hose by soaking it in hot water. Do not use oil or grease, which may attack the rubber.**



4.4a Thermostat housing hose attachments on the CVH engine



4.4b Disconnecting the expansion tank top hose from the thermostat housing (HCS engine). Radiator cooling fan thermal switch (arrowed)



4.6 Removing the thermostat housing from a CVH engine



4.7a Removing the gasket and thermostat from an HCS engine

6 Work each hose end fully onto its union, then check that the hose is settled correctly and is properly routed. Slide each clip along the hose until it is behind the union flared end, before tightening it securely.

7 Refill the system with coolant (see Chapter 1).

8 Check carefully for leaks as soon as possible after disturbing any part of the cooling system.

### 4 Thermostat - removal, testing and refitting



**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

#### Removal

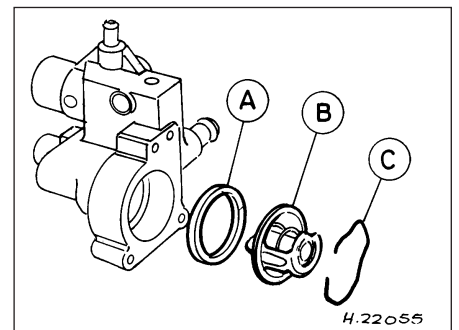
1 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

2 Drain the cooling system (see Chapter 1).

3 Refer to the relevant Part of Chapter 4 and remove the air cleaner or air inlet hoses, according to engine type as necessary, to gain access to the thermostat housing.

#### HCS, CVH and PTE engines

4 Loosen the clips, and disconnect the radiator top hose, expansion tank hose and, where applicable, the heater hose from the thermostat housing (see illustrations).



4.7b Exploded view of thermostat and housing (CVH and PTE engines)

A Sealing ring

C Retaining clip

B Thermostat

5 Disconnect the thermostatic switch wire multi-plug from the thermostat housing.

6 Unscrew the retaining bolts, and remove the thermostat housing (see illustration).

7 Remove the gasket from the mating face of the thermostat housing, then using suitable pliers, compress the thermostat retaining clip (where applicable) and remove it from the housing. Extract the thermostat from the housing (noting its direction of fitting) and where applicable, remove the O-ring seal (see illustrations).

#### Zetec engines

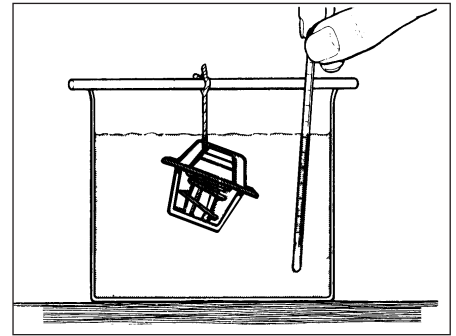
8 Disconnect the expansion tank hose and



4.8 Disconnect the coolant hoses from the water outlet on a Zetec engine



4.10 Zetec engine thermostat removal



4.16 Testing the thermostat

the radiator top hose from the thermostat housing's water outlet (see illustration).

9 Unscrew the retaining bolts, and remove the water outlet from the thermostat housing.

10 Withdraw the thermostat from the housing noting the position of the air bleed valve, and how the thermostat is installed (which end is facing outwards) (see illustration).

#### Testing

##### General check

11 Before assuming the thermostat is to blame for a cooling system problem, check the coolant level, auxiliary drivebelt tension and condition (see Chapter 1) and temperature gauge operation.

12 If the engine seems to be taking a long time to warm up (based on heater output or temperature gauge operation), the thermostat is probably stuck open. Renew the thermostat.

13 If the engine runs hot, use your hand to check the temperature of the radiator top hose. If the hose isn't hot, but the engine is, the thermostat is probably stuck closed, preventing the coolant inside the engine from escaping to the radiator - renew the thermostat.

**Caution: Don't drive the vehicle without a thermostat. The lack of a thermostat will slow warm-up time. The engine management system's ECU will then stay in warm-up mode for longer than necessary, causing emissions and fuel economy to suffer.**



5.2 Radiator cooling fan thermostatic switch location on CVH engine thermostat housing



5.5 Disconnecting the multi-plug from the radiator cooling fan motor

14 If the radiator top hose is hot, it means that the coolant is flowing and the thermostat is open. Consult the "Fault finding" section at the end of this manual to assist in tracing possible cooling system faults.

##### Thermostat test

15 If the thermostat remains in the open position at room temperature, it is faulty, and must be renewed as a matter of course.

16 To test it fully, suspend the (closed) thermostat on a length of string in a container of cold water, with a thermometer beside it; ensure that neither touches the side of the container (see illustration).

17 Heat the water, and check the temperature at which the thermostat begins to open; compare this value with that specified. It's not possible to check the fully-open temperature, because this occurs above the boiling point of water at normal atmospheric pressure. If the temperature at which the thermostat began to open was as specified, then it is most likely that the thermostat is working properly at all temperatures. Remove the thermostat, and allow it to cool down; check that it closes fully.

18 If the thermostat does not open and close as described, if it sticks in either position, or if it does not open at the specified temperature, it must be renewed.

#### Refitting

##### All models

19 Refitting is a reversal of removal. Clean the mating surfaces carefully, and renew the

thermostat's O-ring seal or housing gasket, as applicable.

20 On Zetec engines, ensure that the thermostat is fitted with its air bleed valve uppermost.

21 Tighten the thermostat housing/water outlet bolts to the specified torque.

22 Refill the cooling system (see Chapter 1).

23 Refit the air cleaner or air inlet components, as applicable, if removed for access.

24 Start the engine and allow it to reach normal operating temperature, then check for leaks and proper thermostat operation.

## 5 Radiator electric cooling fan assembly - testing, removal and refitting



**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

#### Testing

1 If it is suspected that the cooling fan is not operating when high engine temperature would normally require it to do so, first check the relevant fuses and relays (see Chapter 12).

2 Detach the wiring multi-plug from the thermostatic switch, which is located either in the thermostat housing or at the right-hand end of the radiator, next to the bottom hose (see illustration). Using a suitable piece of wire, bridge the two connections within the plug. Switch the ignition on and check if the cooling fan operates. If the fan now operates, the thermostatic switch is at fault, and should be renewed as described in Section 6. Remove the bridging wire from the plug, and reconnect the wiring connector to complete the test.

3 If the fan failed to operate in the previous test, either the fan motor is at fault, or there is a fault in the wiring loom (see Chapter 12 for testing details).

#### Removal

##### All models except Turbo

4 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

5 Detach the wiring multi-plug from the fan motor and unclip the wiring from the retaining clips on the shroud (see illustration).

6 Unscrew the nut securing the cooling fan shroud to the radiator, noting the insulating washer arrangement, then lift the fan shroud and motor assembly from the vehicle (see illustration).

7 To separate the fan from the motor shaft, first remove its retaining clip and washer, then withdraw the fan (see illustration). A new clip will be needed upon reassembly. Remove the three nuts securing the motor to the shroud and separate the two components.

#### Turbo models

8 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

9 Undo the two retaining screws and move the HT lead bracket clear of the working area, disconnecting the HT leads as required.

10 Disconnect the fan motor wiring multi-plug and the two auxiliary lamp wiring multi-plugs. Unclip the wiring from any local retaining clips.

11 Remove the front bumper as described in Chapter 11.

12 Undo the two lower fan shroud retaining bolts, release the shroud upper locating tongue from the radiator and withdraw the assembly from the front of the car.

13 To separate the fan from the motor shaft, pull off the fan guard from the shroud, flatten back the raised lockwasher tab, and unscrew clockwise (a left-hand thread is employed) the nut securing the fan to the motor shaft. Remove the fan then undo the three nuts securing the motor to the shroud and separate the two components.

### Refitting

#### All models

14 Refitting is a reversal of the removal procedure. On non-Turbo models, ensure that the locating tags on the base of the shroud locate correctly in their slots in the body crossmember. On Turbo models, if the fan was removed, use a new lockwasher when refitting. On all models, ensure that the wiring connections are cleanly and securely made, and locate the loom in the retaining clips.

## 6 Cooling system electrical switches and sensors - testing, removal and refitting



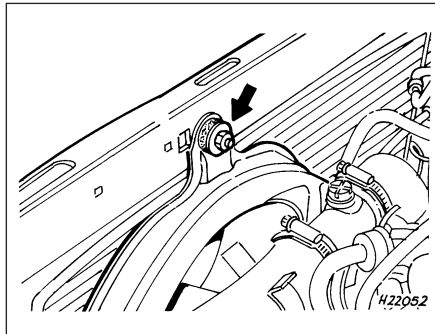
**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

### Coolant temperature gauge sender

#### Testing

1 If the coolant temperature gauge is inoperative, check the fuses first (see Chapter 12).

2 If the gauge indicates overheating at any time, consult the "Fault finding" section at the end of this manual, to assist in tracing possible cooling system faults.



5.6 Radiator cooling fan shroud securing nut (arrowed)

3 If the gauge indicates overheating shortly after the engine is started from cold, disconnect the temperature gauge sender's wiring multi-plug. The sender is located below the thermostat housing on HCS engines, adjacent to the thermostat housing on CVH and PTE engines, and on the forward-facing side of the thermostat housing on Zetec engines. If the gauge reading now drops, renew the sender. If the reading remains high, the wire to the gauge may be shorted to earth, or the gauge is faulty.

4 If the gauge fails to indicate after the engine has been warmed up (approximately 10 minutes) and the fuses are known to be sound, switch off the engine. Disconnect the sender's wiring multi-plug, and use a jumper wire to ground the connector to a clean earth point (bare metal) on the engine. Switch on the ignition without starting the engine. If the gauge now indicates Hot, renew the sender.

5 If the gauge still does not work, the circuit may be open, or the gauge may be faulty. See Chapter 12 for additional information.

#### Removal

6 Refer to the relevant Part of Chapter 4 and remove the air cleaner or air inlet hoses, according to engine type as necessary, to gain access to the sender unit.

7 Drain the cooling system (see Chapter 1).

8 On Zetec engines, disconnect the expansion tank coolant hose and the radiator top hose from the thermostat housing's water outlet.

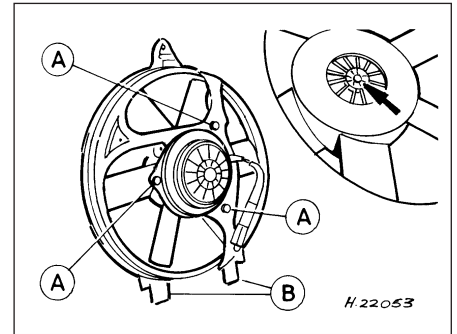
9 Disconnect the wiring multi-plug from the sender unit.

10 Unscrew the sender and withdraw it.

#### Refitting

11 Clean as thoroughly as possible the sender unit location, then apply a light coat of sealant to the sender's threads. Screw in the sender, tighten it to the specified torque, and reconnect the wiring multi-plug.

12 Reconnect the hoses, and refit any components disconnected for access. Refill or top-up the cooling system (see "Weekly Checks" or Chapter 1) and run the engine. Check for leaks and proper gauge operation.



5.7 Nuts securing fan motor to shroud (A), and shroud to body crossmember locating tags (B). Inset shows fan to motor shaft retaining clip (arrowed)

### Engine coolant temperature sensor

#### Testing

13 Disconnect the battery negative (earth) lead (see Chapter 5A, Section 1).

14 Locate the coolant temperature sensor, which will be found below the inlet manifold on HCS engines, on the side or centre of the inlet manifold on CVH and PTE engines, or on top of the thermostat housing on Zetec engines. Once located, refer to the relevant Part of Chapter 4 and remove the air cleaner or air inlet hoses, according to engine type as necessary, to improve access to the sensor unit.

15 Disconnect the wiring multi-plug from the sensor.

16 Using an ohmmeter, measure the resistance between the sensor terminals. Depending on the temperature of the sensor tip, the resistance measured will vary, but should be within the broad limits given in the *Specifications* of this Chapter. If the sensor's temperature is varied - by removing it (see below) and placing it in a freezer for a while, or by warming it gently - its resistance should alter accordingly.

17 If the results obtained show the sensor to be faulty, renew it.

18 On completion, reconnect the wiring multi-plug and refit any components removed for access, then reconnect the battery.

#### Removal

19 Disconnect the battery negative (earth) lead (see Chapter 5A, Section 1).

20 Locate the sensor as described previously, and remove any components as necessary for access.

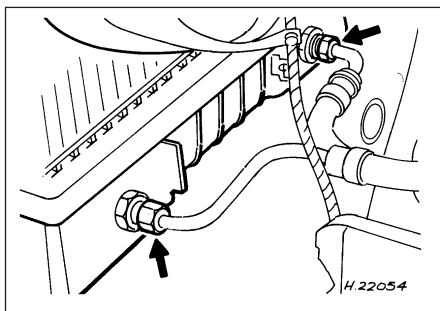
21 Drain the cooling system (see Chapter 1).

22 Disconnect the wiring multi-plug from the sensor.

23 Unscrew the sensor and withdraw it.

#### Refitting

24 Clean as thoroughly as possible the sensor location, then apply a light coat of sealant to the sensor's threads. Refit and tighten the sensor to the specified torque



7.4 Automatic transmission fluid cooling pipe connections (arrowed) at the radiator

wrench setting, and reconnect the multi-plug.  
25 Refit any components disconnected for access then refill the cooling system (see Chapter 1).

### Radiator electric cooling fan thermostatic switch

#### Testing

26 Refer to the procedures contained in Section 5.

#### Removal

27 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

28 Drain the cooling system (see Chapter 1).

29 Disconnect the wiring multi-plug from the thermostatic switch, and then unscrew the switch from the thermostat housing or radiator side tank, as applicable. Remove the sealing washer.

#### Refitting

30 Refitting is a reversal of removal, but fit a new sealing washer and tighten the switch securely. Refill the cooling system as described in Chapter 1, then reconnect the battery.

## 7 Radiator and expansion tank - removal, inspection and refitting



**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

### Radiator



*If leakage is the reason for removing the radiator, bear in mind that minor leaks can often be cured using a radiator sealant with the radiator in situ.*

#### Removal (all models except Turbo)

1 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

2 Drain the cooling system (see Chapter 1).

3 Remove the radiator cooling fan assembly as described in Section 5.

4 Release the hose clips and disconnect the hoses from the radiator. Additionally, on



7.6a Radiator securing bolt, insulator and washer

automatic transmission models, disconnect the transmission fluid cooling pipe connections fitting blanking plugs to prevent excessive fluid loss (see illustration).

5 On Zetec engine models, disconnect the wiring multi-plug from the cooling fan thermostatic switch

6 Remove the radiator securing bolts and lift the radiator out of its locating slots in the body crossmember. Note rubber insulators fitted to the locating lugs on the base of the radiator (see illustrations).

7 With the radiator removed, it can be inspected for leaks and damage. If it needs repair, have a radiator specialist or dealer service department perform the work, as special techniques are required.

8 Insects and dirt can be removed from the radiator with a garden hose or a soft brush. Don't bend the cooling fins as this is done.

#### Removal (Turbo models)

9 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

10 Drain the cooling system (see Chapter 1).

11 Remove the radiator cooling fan assembly as described in Section 5.

12 Release the hose clips and disconnect the hoses from the radiator.

13 Disconnect the turbocharger coolant feed by slackening its clamp and pulling the hose (at the radiator rear right-hand side) off the turbocharger's metal pipe.

14 Remove the intercooler, as described in Chapter 4C.

15 Remove its three retaining screws, and withdraw the exhaust manifold heat shield.



7.22a Remove the single bolt retaining the expansion tank . . .



7.6b Rubber insulator on radiator locating lug

16 Lift the radiator out of its locating slots in the body crossmember. Note rubber insulators fitted to the locating lugs on the base of the radiator.

17 Clean and inspect the radiator with reference to paragraphs 7 and 8 above.

#### Refitting (all models)

18 Refitting is a reversal of removal, but check the rubber insulators, and if necessary renew them. Refill the cooling system with reference to Chapter 1. On automatic transmission models check, and if necessary top-up, the automatic transmission fluid level (Chapter 1).

### Expansion tank

#### Removal

19 Partially drain the cooling system, so that the coolant level drops below the expansion tank. Refer to Chapter 1 for details.

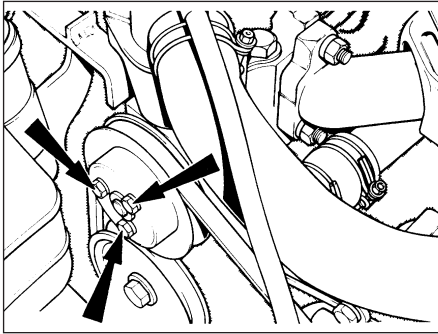
20 Before disconnecting the coolant hoses from the expansion tank, it is advisable to clamp them just short of their connections to the expansion tank, to prevent spillage of coolant and the ingress of air when they are detached.

21 Loosen off the coolant hose clips at the expansion tank, and detach the hoses from it. If they are not clamped, secure them so that their ends are raised, to minimise coolant spillage.

22 Remove the single bolt retaining the expansion tank, and slide the other side of the tank free from its retaining bracket (see illustrations).



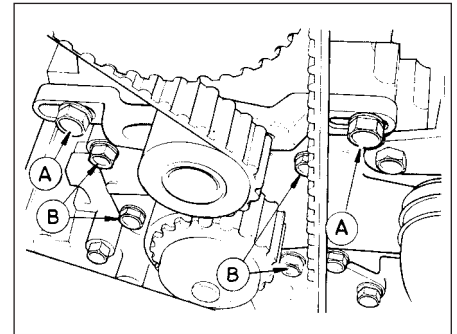
7.22b . . . and release the expansion tank from its retaining bracket



8.3 HCS engine water pump pulley retaining bolts (arrowed)



8.6 HCS engine water pump removal



9.5 CVH engine timing belt tensioner retaining bolts (A) and water pump securing bolts (B)

### Refitting

23 Refit in the reverse order of removal. Top-up the cooling system as described in "Weekly Checks".

## 8 Water pump (HCS engines) - removal and refitting



**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

### Removal

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).
- 2 Drain the cooling system (see Chapter 1).
- 3 Slacken the water pump pulley retaining bolts, then remove the auxiliary drivebelt as described in Chapter 1 (see illustration).
- 4 Remove the retaining bolts, and remove the drivebelt pulley from the water pump.
- 5 Loosen off the coolant hose securing clips, and disconnect the hoses from the water pump.
- 6 Unscrew the retaining bolts, and withdraw the water pump from the engine (see illustration).
- 7 No provision is made for the repair of the water pump; if it is noisy or defective in any way, it must be renewed.

### Refitting

- 8 Clean all traces of gasket from the engine and the water pump mating faces. Ensure that the mating faces are clean and dry. Note that the water pump gasket fitted during production is integral with the timing cover gasket, and this will need to be cut away using a sharp knife, keeping as close to the timing cover as possible.
- 9 Refitting is a reversal of the removal procedure. Use a new gasket, lightly smeared with jointing compound, and tighten the retaining bolts to the specified torque.
- 10 Refit and adjust the auxiliary drivebelt as described in Chapter 1.
- 11 Refill the cooling system as described in Chapter 1, and reconnect the battery.

## 9 Water pump (CVH and PTE engines) - removal and refitting



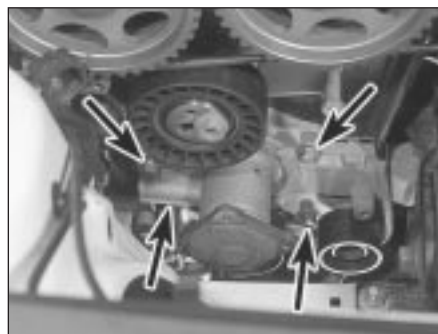
**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

### Removal

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).
- 2 Drain the cooling system (see Chapter 1).
- 3 Remove the timing belt and tensioner (see Chapter 2B). If the belt is fouled with coolant, it must be renewed as a matter of course.
- 4 Loosen off the coolant hose retaining clip, and detach the coolant hose from the water pump.
- 5 Unscrew and remove the four bolts securing the water pump to the front end face of the cylinder block, and then withdraw the pump from the vehicle (see illustration).

### Refitting

- 6 Clean the engine water pump mating faces. Ensure that the mating faces are clean and dry.
- 7 No provision is made for the repair of the water pump; if it is noisy or defective in any way, it must be renewed.
- 8 Refitting is a reversal of the removal procedure. Tighten the retaining bolts to the specified torque, and ensure that the coolant hose connection to the water pump is securely made.



10.5a Unscrew the bolts (arrowed) . . .



10.5b . . . and remove the Zetec engine water pump

9 Refit the timing belt and tensioner as described in Chapter 2B.

10 Refill the cooling system as described in Chapter 1, and reconnect the battery.

## 10 Water pump (Zetec engines) - removal and refitting



**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

### Removal

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).
- 2 Drain the cooling system (see Chapter 1).
- 3 Remove the timing belt and tensioner (see Chapter 2C). If the belt is fouled with coolant, it must be renewed as a matter of course.
- 4 Disconnect the radiator bottom hose from the pump union.
- 5 Unbolt and remove the water pump (see illustrations). If the pump is to be renewed, unbolt the timing belt guide pulleys, and transfer them to the new pump.

### Refitting

- 6 Clean the mating surfaces carefully; the gasket must be renewed whenever it is disturbed.
- 7 On refitting, use grease to stick the new gasket in place, refit the pump, and tighten the pump bolts to the specified torque.
- 8 The remainder of refitting is a reversal of the

removal procedure. Refit the timing belt and tensioner as described in Chapter 2C, noting that a new tensioner spring and retaining pin must be fitted if the timing belt has been removed for the first time. Tighten all fasteners to the specified torque, and refill the system with coolant as described in Chapter 1.

### 11 Heater/ventilation components - removal and refitting



#### Heater controls

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).
- 2 Refer to Chapter 12 and remove the radio.
- 3 Pull off the heater fan motor control knob, then move the air distribution and temperature controls fully to the right. Unclip and remove the heater slide fascia towards the left-hand side of the vehicle, removing the slide control knobs only as necessary, and disconnecting its bulbholder (bayonet type) as it is withdrawn.
- 4 Squeeze the two release tabs together on the heater fan motor control switch, and remove it, disconnecting its multi-plug as it is withdrawn.
- 5 Disconnect the heater control cables from the heater casing assembly by releasing the outer cable abutments and disengaging the



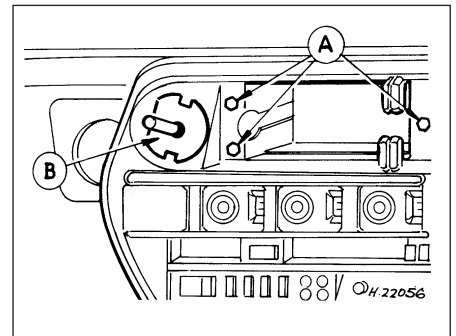
11.5 Disengaging heater control cable from its flap operating mechanism on the heater casing

cable inner cores from their flap operating mechanisms (see illustration).

6 Undo the three heater control panel securing screws, and remove the control panel (with its cables attached) from behind the fascia (see illustration).

7 Disconnect the heater control cables from their control panel levers, as required, by releasing their outer cable clamping covers and inner cable core securing clips (see illustrations).

8 If renewing a heater control panel, note that the new unit, is supplied with control cables and assembly aids fitted (see illustration). The assembly aids ensure correct heater control adjustments during fitting, and must be removed thereafter.



11.6 Heater control panel securing screws (A), and fan motor control switch (B)

9 Refitting is a reversal of the removal procedure, adjusting the heater control cables to complete. The adjustment is made automatically by moving the heater slide control levers from their left-hand stop to their right-hand stop. When moving the control levers, a considerable amount of resistance may be encountered, which must be overcome.

#### Heater fan motor and resistor assembly

- 10 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).
- 11 Depending on engine type, refer to the relevant Part of Chapter 4 and remove the air cleaner if necessary, to gain access to the bulkhead panel in the engine compartment.
- 12 Remove the expansion tank as described in Section 7.
- 13 Undo the retaining bolt and remove the jack and wheelbrace.
- 14 Disconnect the modules on the bulkhead panel. Release the wiring loom and any connectors, cable-ties and hoses from the bulkhead panel, and remove its rubber seal.
- 15 Remove the bulkhead panel. The panel is secured by screws, with a nut at either end (behind the panel), and is removed in two sections.
- 16 Detach and remove the cover from the heater fan motor assembly (see illustration).
- 17 Disconnect the wiring from the heater fan



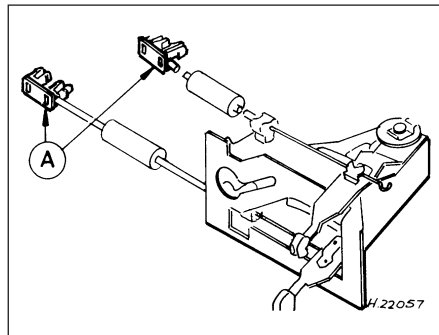
11.7a Releasing outer cable clamping cover ...



11.7b ... and removing it



11.7c Releasing inner cable core from heater control lever



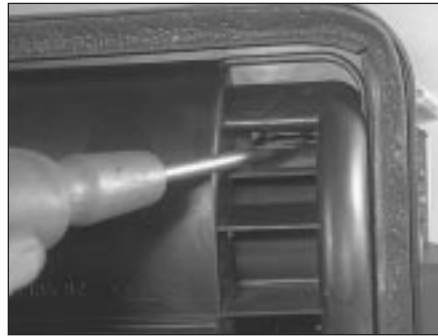
11.8 Heater control panel. Assembly aids (A) fitted to heater casing flap valve end of cables



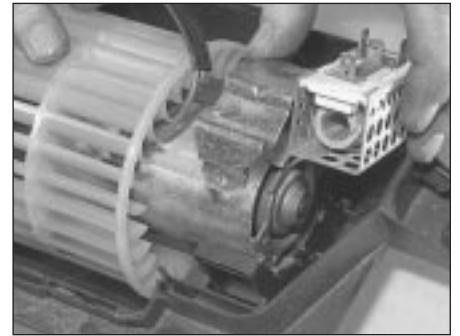
11.16 Removing the cover from the heater fan motor assembly



11.17 Disconnecting the wiring from the heater fan motor and resistor assembly (arrowed)



11.20a Releasing the heater fan motor retaining strap from the underside of the assembly



11.20b Removing the heater fan motor

motor and resistor assembly (see illustration).

18 Undo the two nuts securing the assembly to the bulkhead and remove it from the vehicle.

19 Detach the heater fan cover, having released its two retaining clips.

20 Release the heater fan motor retaining strap from underneath, using a flat-bladed screwdriver, and remove it. Remove the resistor assembly and/or heater fan motor, as required (see illustrations).

21 Refitting is a reversal of the removal

procedure, ensuring that the heater fan motor wires are routed under the retaining strap, but are not pinched by it.

### Heater matrix

**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

22 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

23 Drain the cooling system (see Chapter 1).

24 Release the hose clips and disconnect the two heater hoses from their dual heater matrix connector on the bulkhead, at the rear of the engine compartment. Plug the hoses to prevent excessive coolant loss, collecting spillage and any remaining coolant from the heater matrix in a suitable container.

25 Undo the screws securing the heater

matrix connector to the bulkhead, and detach its cover plate and gasket (see illustration).

26 Where fitted, remove the centre console as described in Chapter 11.

27 Unclip and detach the footwell vent from the base of the heater casing (see illustration).

28 Unclip the lower cover from the heater casing and remove the heater matrix, being careful to avoid any residual coolant spillage in the passenger compartment (see illustrations).

29 Refitting is a reversal of the removal procedure. On completion, refill the cooling system as described in Chapter 1.

### Heater casing assembly

30 Remove the fascia, as described in Chapter 11.

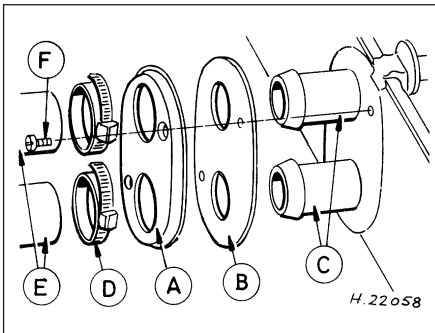
31 Remove the heater matrix, as described previously in this Section.

32 Disconnect the heater control cables from the heater casing assembly as described previously in this Section.

33 Disconnect the side outlet vent ducting from the heater casing. The side outlet ducts can be removed by undoing the screws securing them to the bulkhead, as required.

34 Undo the two heater casing securing nuts and remove the casing from the vehicle (see illustration).

35 Refitting is a reversal of the removal procedure, with reference to the applicable Chapters and Sections of this manual.



11.25 Exploded view of the heater matrix connections

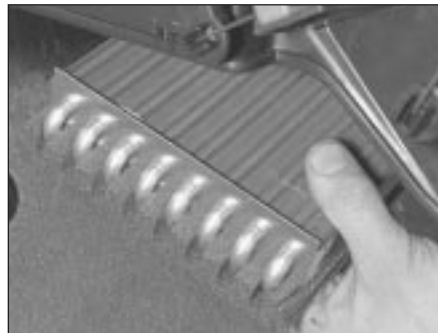
- |                                |                |
|--------------------------------|----------------|
| A Cover plate                  | D Hose clips   |
| B Gasket                       | E Heater hoses |
| C Heater matrix connector pipe | F Screw        |



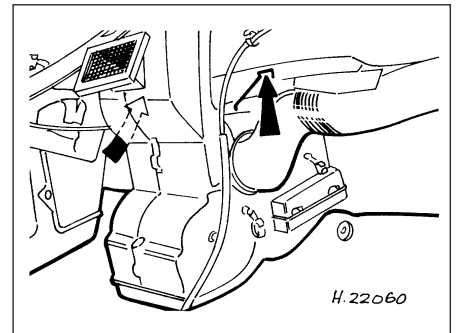
11.27 Removing the footwell vent from the base of the heater casing



11.28a Unclipping the lower heater casing cover



11.28b Withdrawing the heater matrix



11.34 Heater casing securing nuts (arrowed)

**Notes**