

# Chapter 3

## Cooling, heating and air conditioning systems

### Contents

|  |    |  |    |
|--|----|--|----|
| Air conditioning system - component renewal . . . . .  | 21 | General information and precautions . . . . .                              | 1  |
| Coolant pump - removal and refitting . . . . .   | 9  | Heater controls - removal and refitting . . . . .                          | 17 |
| Coolant pump/alternator drivebelt(s) - checking, renewal and<br>tensioning . . . . .                               | 10 | Heater motor - removal and refitting . . . . .                             | 20 |
| Coolant pump/alternator drivebelt tensioner (DOHC models with<br>power steering) - removal and refitting . . . . . | 11 | Heater unit - overhaul . . . . .   | 19 |
| Cooling fan switch - removal and refitting . . . . .   | 14 | Heater unit - removal and refitting . . . . .                              | 18 |
| Cooling system - draining . . . . .  | 2  | Radiator - inspection and cleaning . . . . .                               | 6  |
| Cooling system - filling . . . . .   | 4  | Radiator - removal and refitting . . . . .                                 | 5  |
| Cooling system - flushing . . . . .  | 3  | Temperature gauge sender - removal and refitting . . . . .                 | 16 |
| Electric cooling fan - removal and refitting . . . . .   | 13 | Thermostat - removal and refitting . . . . .                               | 7  |
| Expansion tank and coolant level sensor - removal and refitting . . . . .  | 15 | Thermostat - testing . . . . .   | 8  |
|  |    | Thermo-viscous cooling fan (SOHC models) - removal and refitting . . . . . | 12 |

### Degrees of difficulty

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

### Specifications

#### System type

|                               |  |
|-------------------------------|--|
| SOHC models . . . . .         | Pressurised, with belt-driven coolant pump, crossflow radiator, thermo-viscous fan, thermostat, and expansion tank |
| CVH and DOHC models . . . . . | Pressurised, with belt-driven coolant pump, crossflow radiator, electric fan, thermostat, and expansion tank       |

#### Thermostat

|  |                           |
|--|---------------------------|
| Nominal temperature rating (fully open): |                           |
| SOHC models . . . . .                    | 88°C (190°F)              |
| CVH models . . . . .                     | 100°C (212°F)             |
| DOHC models . . . . .                    | 102°C (216°F)             |
| Opening temperature:                     |                           |
| SOHC models . . . . .                    | 85 to 89°C (185 to 192°F) |
| CVH models . . . . .                     | 88°C (190°F)              |
| CVH (R6A type) models . . . . .          | 85 to 89°C (185 to 192°F) |
| DOHC models . . . . .                    | 85 to 89°C (185 to 192°F) |

#### Expansion tank cap opening pressure

|                       |   |
|-----------------------|---|
| SOHC models:          |   |
| Up to 1987 . . . . .  | 0.85 to 1.1 bar (12 to 16 lbf/in <sup>2</sup> ) |
| From 1987 . . . . .   | 1.0 to 1.25 bar (15 to 18 lbf/in <sup>2</sup> ) |
| CVH models . . . . .  | 1.0 to 1.25 bar (15 to 18 lbf/in <sup>2</sup> ) |
| DOHC models . . . . . | 1.0 to 1.4 bar (15 to 20 lbf/in <sup>2</sup> )  |

**Coolant mixture** . . . . . See Chapter 1 Specifications

**System capacity** . . . . . See Chapter 1 Specifications

#### Drivebelt tensions

|  |   |
|--|---|
| Air conditioning system compressor . . . . . | 10.0 mm (0.4 in) deflection at the midpoint of the belt's longest run under firm thumb pressure                                   |
| Coolant pump/alternator . . . . .            | 10.0 mm (0.4 in) deflection midway between coolant pump and alternator (or power steering pump) pulleys under firm thumb pressure |

## 3•2 Cooling, heating and air conditioning systems

| Torque wrench settings                                       | Nm         | lbf ft   |
|--|------------|----------|
| Radiator upper mounting nuts                                 | 21 to 25   | 15 to 18 |
| Radiator lower mounting bolts                                | 8 to 12    | 6 to 9   |
| Coolant pump bolts:  |            |          |
| SOHC models:   |            |          |
| M8 bolts   | 17 to 21   | 13 to 15 |
| M10 bolts  | 35 to 42   | 26 to 31 |
| CVH models   | 8 to 11    | 6 to 8   |
| CVH (R6A type) models  | 7 to 10    | 5 to 7   |
| DOHC models  | 21 to 28   | 15 to 21 |
| Thermostat housing bolts:                                    |            |          |
| SOHC/DOHC models   | 17 to 20   | 13 to 15 |
| CVH models   | 8 to 11    | 6 to 8   |
| CVH (R6A type) models  | 8 to 12    | 6 to 9   |
| Cooling fan shroud-to-radiator nuts/bolts                    | 8 to 11    | 6 to 8   |
| Coolant pump pulley bolts:                                   |            |          |
| SOHC models  | 21 to 28   | 15 to 21 |
| DOHC models  | 20 to 25   | 15 to 18 |
| Coolant pump/alternator drivebelt tensioner bolt:            |            |          |
| CVH models   | 23 to 30   | 17 to 22 |
| DOHC models  | 70 to 97   | 52 to 72 |
| Cooling fan blades-to-fan hub bolts (SOHC models)            | 8 to 10    | 6 to 7   |
| Air conditioning compressor-to-bracket bolts                 | 65 to 75   | 48 to 55 |
| Air conditioning compressor bracket-to-engine bolts:         |            |          |
| M10  | 85 to 92   | 63 to 68 |
| M12  | 110 to 120 | 81 to 89 |
| Air conditioning condenser fan assembly-to-condenser bolts:  |            |          |
| Models up to 1987  | 2 to 3     | 1 to 2   |
| Models from 1987   | 8 to 11    | 6 to 8   |
| Air conditioning condenser securing bolts (models from 1987) | 27 to 33   | 20 to 24 |

### 1 General information and precautions

#### General information

The cooling system is of pressurised type, and consists of a front mounted radiator, coolant pump, cooling fan, wax type thermostat, and an expansion tank.

The radiator matrix is manufactured from honeycombed metal, and the end tanks are made of plastic. On automatic transmission models, the right-hand end tank incorporates the transmission fluid cooler.

The coolant pump is located on the front face of the engine block, and is belt-driven. The pump is of the impeller type.

The cooling fan draws cold air over the radiator matrix to assist the cooling process when the forward speed of the vehicle is too low to provide sufficient cooling airflow, or the ambient temperature is unusually high. SOHC models have a thermo-viscous fan, whereas CVH and DOHC models have an electrically-operated fan.

The thermo-viscous fan is controlled by the temperature of the air behind the radiator. When the air temperature reaches a predetermined level, a bi-metallic coil commences to open a valve within the unit, and silicon fluid is fed through a system of vanes. Half the vanes are driven directly by the coolant pump, and the remaining half are connected to the fan blades. The vanes are arranged so that drive is transmitted to the fan blades in relation to the viscosity of the silicon fluid, and this in turn depends on ambient

temperature and engine speed. The fan is therefore only operating when required, and compared with direct-drive type fans represents a considerable improvement in fuel economy, drivebelt wear and fan noise.

The electrically-operated fan is switched on by a temperature sensor mounted in the thermostat housing when the temperature reaches a predetermined level. The fan is therefore only operating when required, and like the thermo-viscous fan, offers a considerable advantage over direct-drive type fans.

A thermostat is fitted. Its purpose is to ensure rapid engine warm-up by restricting the flow of coolant to the engine when cold and also to assist in regulating the normal operating temperature of the engine.

The expansion tank incorporates a pressure cap which effectively pressurises the cooling system as the coolant temperature rises, thereby increasing the boiling point of the coolant. The tank also has a further degas function. Any accumulation of air bubbles in the coolant is returned to the tank and released in the air space, thus maintaining the efficiency of the coolant. The pressure cap also incorporates a vacuum relief valve which prevents a vacuum forming in the system as it cools.

The system functions as follows. Cold coolant in the bottom of the radiator circulates through the bottom hose to the coolant pump where the pump impeller pushes the coolant through the passages within the cylinder block, cylinder head and inlet manifold. After cooling the cylinder bores, combustion chambers and valve seats, the coolant reaches the underside of the thermostat which is initially closed. A small proportion of

the coolant passes from the thermostat housing to the expansion tank, but the main circulation is through the inlet manifold, automatic choke (where applicable), and heater matrix, finally returning to the coolant pump. When the coolant reaches a predetermined temperature, the thermostat opens and hot water passes through the top hose to the top of the radiator. As the coolant circulates through the radiator, it is cooled by the flow of air to the vehicle's forward motion, supplemented by the action of the cooling fan where necessary. By the time it reaches the bottom of the radiator the coolant is cooled, and the cycle is repeated. Circulation of coolant continues through the expansion tank, inlet manifold, automatic choke (where applicable) and heater at all times, the heater temperature being controlled by an air flap.

An air conditioning system is available as an optional extra on certain models. In conjunction with the heater, the system enables any reasonable air temperature to be achieved inside the vehicle; it also reduces the humidity of the incoming air, aiding demisting even when cooling is not required.

The refrigeration side of the air conditioning system functions in a similar way to a domestic refrigerator. A compressor, belt-driven from the crankshaft pulley, draws refrigerant in its gaseous phase from an evaporator. The compressed refrigerant passes through a condenser where it loses heat and enters its liquid phase. After passing through the dehydrator, which acts as a reservoir and filter to extract moisture from the circuit, the refrigerant returns to the evaporator where it absorbs heat from the air

passing over the evaporator fins on its way to the vehicle interior. The refrigerant becomes a gas again and the cycle is repeated.

Various subsidiary controls and sensors protect the system against excessive temperature and pressures. Additionally, engine idle speed is increased when the system is in use to compensate for the additional load imposed by the compressor.

## Precautions

### Air conditioning refrigerant

Although the refrigerant is not itself toxic, in the presence of a naked flame (or a lighted cigarette) it forms a highly toxic gas. Liquid refrigerant spilled on the skin will cause frostbite. If refrigerant enters the eyes, rinse them with a dilute solution of boric acid and seek medical advice immediately.

In view of the above points, and of the need for specialised equipment for evacuating and recharging the system, any work which requires the disconnection of a refrigerant line must be left to a specialist.

Do not allow refrigerant lines to be exposed to temperatures above 230°F (110°C) - eg during welding or paint drying operations and do not operate the air conditioning system if it is known to be short of refrigerant, or further damage may result.

### Antifreeze mixture

*Antifreeze mixture is poisonous. Keep it out of reach of children and pets. Wash splashes off skin and clothing with plenty of water. Wash splashes off vehicle paintwork to avoid discolouration.*

Antifreeze/water mixture must be renewed at the specified intervals to preserve its anti-corrosive properties. In climates where antifreeze protection is unnecessary, a corrosion inhibitor may be used instead - consult a Ford dealer. Never run the engine for long periods with plain water as coolant. Only use the specified antifreeze as inferior brands may not contain the necessary corrosion inhibitors, or may break down at high temperatures. Antifreeze containing methanol is particularly to be avoided, as the methanol evaporates.

The specified mixture is 45 to 50% antifreeze and 50 to 55% clean soft water (by volume). Mix the required quantity in a clean container.

## 2 Cooling system - draining

Refer to Chapter 1, Section 46.

## 3 Cooling system - flushing

Refer to Chapter 1, Section 46.

## 4 Cooling system - filling

Refer to Chapter 1, Section 46.



5.9 Unscrew the fan shroud/radiator retaining nuts

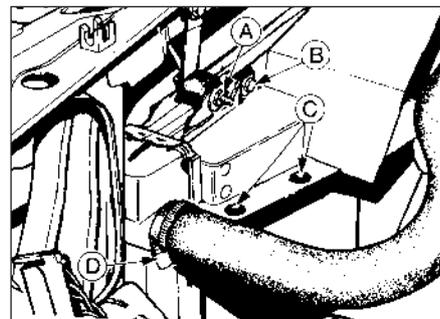
## 5 Radiator - removal and refitting

### Removal

- 1 Disconnect the battery negative lead.
- 2 Drain the cooling system.
- 3 If not already done, disconnect the bottom hose from the radiator.
- 4 Disconnect the top hose and the expansion tank hose from the radiator.
- 5 On automatic transmission models, place a suitable container beneath the fluid cooler pipe connections at the radiator. Unscrew the union and plug the upper pipe, then repeat the procedure on the lower pipe.
- 6 Apply the handbrake, jack up the front of the vehicle and support on axle stands (see "Jacking and Vehicle Support").
- 7 To improve access, remove the cooling fan shroud as follows, according to model.
- 8 On SOHC models, remove the four retaining clips and unscrew the two retaining screws, then withdraw the upper section of the fan shroud. Unclip and remove the lower section of the shroud.
- 9 On CVH and DOHC models, unclip the wiring connector from the fan motor(s) then unscrew the retaining nuts and washers, and withdraw the fan shroud(s) and cooling fan assembly(s) (see illustration).
- 10 On early models, unscrew and remove the upper radiator mounting nuts and washers (see illustration). Unscrew and remove the lower mounting bolts and washers and withdraw the radiator from under the vehicle (see illustration).



5.10b Lower radiator mounting bolt



5.10a Radiator and cooling fan shroud upper mountings

- A Radiator mounting nut
- B Shroud securing screw
- C Shroud securing clips
- D Radiator top hose clip

- 11 On all later models, the radiator is secured to the engine compartment front panel using clips and locking pegs. To release the top of the radiator, work through the cut-outs in the engine compartment front panel and remove the two radiator upper locking pegs (see illustration). Working under the front of the vehicle, remove the two radiator lower mounting bolts. Support the radiator from underneath. Squeeze the upper radiator locking pegs to release them from the engine compartment front panel and lower the radiator assembly from the vehicle.

### Refitting

- 12 Refitting is a reversal of removal, bearing in mind the following points.
- 13 Refill the cooling system.
- 14 On automatic transmission models, check and if necessary top-up the transmission fluid level.

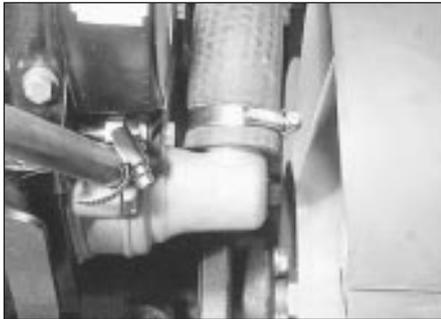
## 6 Radiator - inspection and cleaning

- 1 If the radiator has been removed because of suspected blockage, reverse-flush it.
- 2 Clean dirt and debris from the radiator fins using an air jet or water and a soft brush. Be careful not to damage the fins or cut your fingers.



5.11 Removing a radiator upper locking peg

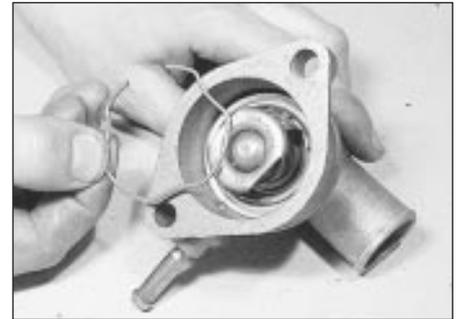
### 3•4 Cooling, heating and air conditioning systems



7.4a Radiator top hose connection at thermostat housing



7.4b Disconnect the expansion tank hose from the thermostat housing



7.6a Prise out the retaining clip . . .



7.6b . . . and extract the thermostat . . .



7.6c . . . and sealing ring



7.9 Thermostat flow direction markings (arrowed)

3 A radiator specialist can perform a "flow test" on the radiator to establish whether an internal blockage exists.

4 A leaking radiator must be referred to a specialist for permanent repair. Do not attempt to weld or solder a leaking radiator, as damage to the plastic parts may result.

5 In an emergency, minor leaks from the radiator can be cured by using a sealant.

#### 7 Thermostat - removal and refitting



- 1 Disconnect the battery negative lead.
- 2 Drain the cooling system.
- 3 Proceed as follows according to model:

#### SOHC models

- 4 Disconnect the radiator top hose and expansion tank hose from the thermostat

housing situated at the front of the cylinder head (see illustrations).

5 Unscrew the two securing bolts and remove the housing and gasket.

6 Using a screwdriver, prise the retaining clip from the housing, and extract the thermostat and sealing ring (see illustrations).

7 Refitting is a reversal of removal, bearing in mind the following points.

8 Clean the housing and the mating face of the cylinder head. Check the thermostat sealing ring for condition and renew it if necessary. Use a new gasket when refitting the housing.

9 The thermostat wax capsule must face into the cylinder head with the flow direction arrow facing forward (see illustration).

10 Refill the cooling system.

#### CVH models

- 11 Disconnect the wiring plug from the

cooling fan switch on the thermostat housing situated at the front of the inlet manifold.

12 Disconnect the automatic choke hose, radiator top hose and expansion tank hose from the thermostat housing. Where applicable, take care not to strain the wiring which is routed around the housing. If necessary, disconnect the wiring connector (see illustrations).

13 Unscrew the three securing bolts and remove the housing and gasket (see illustration).

14 Lift the thermostat from the housing, and carefully prise out the sealing ring.

15 Refitting is a reversal of removal, bearing in mind the following points.

16 Clean the housing and the mating face of the inlet manifold. Check the thermostat sealing ring for condition and renew it if necessary. Use a new gasket when refitting the housing.



7.12a Disconnect the automatic choke hose . . .



7.12b . . . the radiator top hose . . .



7.12c . . . and the expansion tank hose



7.13 Removing the thermostat housing and gasket

17 Note that the thermostat wax capsule must face into the inlet manifold, with the flow direction arrow pointing forward, in line with the pressure relief valve in the housing (see illustration).

18 Refill the cooling system.

**DOHC models**

19 On fuel injection models, for access to the thermostat housing loosen the clips and remove the air inlet tube which connects the plenum chamber to the inlet manifold.

20 Disconnect the coolant hoses from the thermostat housing (see illustrations).

21 Disconnect the wiring plug from the cooling fan switch mounted in the thermostat housing (see illustration).

22 Unscrew the three securing bolts, and withdraw the thermostat housing (see illustration).

23 Manipulate the thermostat from the inlet manifold, and recover the O-ring. If it is



7.17 Correct orientation of thermostat with flow direction arrow pointing towards pressure relief valve

necessary to prise the thermostat out, take care not to damage the surface of the housing in the inlet manifold.

24 Refitting is a reversal of removal, bearing in mind the following points.

25 Ensure that the O-ring seal is correctly fitted around the edge of the thermostat.

26 When fitting the thermostat to the inlet manifold, ensure that the relief valve is located in the 12 o'clock position (see illustration).

27 Tighten the thermostat housing securing bolts to the specified torque.

28 Refill the cooling system.

**8 Thermostat - testing**

1 To test the thermostat, suspend it by a piece of string in a container of water (see illustration).



7.20a Disconnect the coolant hoses . . .

2 Gradually heat the water, and using a thermometer with a range of at least 100°C, note the temperature at which the thermostat starts to open.

3 Remove the thermostat from the water and check that it is fully closed when cold.

4 Renew the thermostat if the opening temperature is not as given in the Specifications, or if the unit does not fully close when cold.

**9 Coolant pump - removal and refitting**

- 1 Disconnect the battery negative lead.
- 2 Drain the cooling system.
- 3 Proceed as follows according to model:

**SOHC models**

4 Disconnect the heater and radiator bottom hoses from the coolant pump.

5 Remove the thermo-viscous fan (Section 12).

6 If not already done, remove the coolant pump drivebelt, then unscrew the four retaining bolts and remove the coolant pump pulley. If necessary, the pulley can be prevented from turning using a strap wrench.

**HAYNES HINT** Holding the pulley can be improvised using an old drivebelt, and a suitable socket and wrench.

7 Unbolt and remove the timing belt cover.



7.20b . . . from the thermostat housing



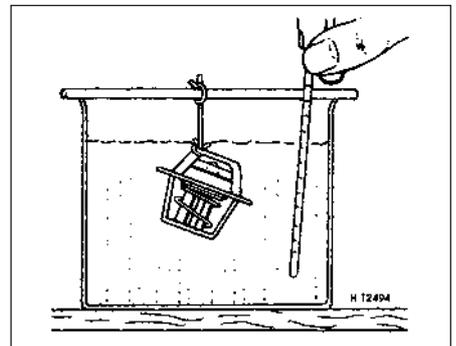
7.21 Disconnect the cooling fan switch wiring plug



7.22 Withdrawing the thermostat housing



7.26 Thermostat relief valve (arrowed) should be in the 12 o'clock position



8.1 Testing the thermostat opening temperature



9.8 Location of the alternator adjusting link under the right-hand retaining bolt

8 Unscrew the three retaining bolts and remove the coolant pump and gasket from the front of the cylinder block. Note that on certain models, the alternator adjusting link is secured by the right-hand retaining bolt (see illustration).

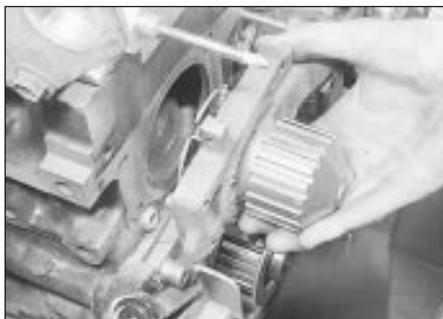
9 If the coolant pump is faulty, it must be renewed, as it is not possible to obtain individual components.

10 Before refitting, clean the mating faces of the coolant pump and cylinder block.

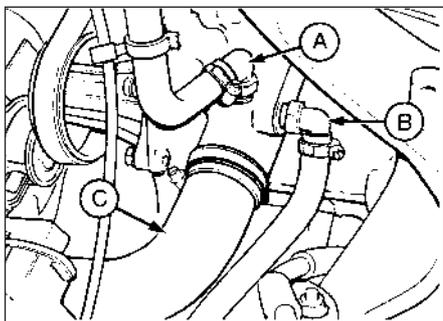
11 Refitting is a reversal of removal, bearing in mind the following points.

12 Use a new gasket, and tighten the retaining bolts to the specified torque.

13 Before fitting the coolant pump pulley, ensure that the timing belt cover support bolt is located in its hole in the pump.



9.21 Withdraw the coolant pump



9.29 Coolant pump housing hose connections

- A Heater hose connection - up to May 1990
- B Expansion tank hose connection - up to May 1990
- C Bottom radiator hose



9.15 Disconnect the coolant elbow from the coolant pump

14 Refill the cooling system.

#### CVH models

15 Unscrew the two securing nuts, and disconnect the coolant elbow from the left-hand side of the coolant pump (see illustration).

16 Remove the timing belt.

17 Unscrew the camshaft sprocket bolt and withdraw the distributor drive sleeve.

18 Screw the camshaft sprocket bolt part way back into the end of the camshaft, and using a suitable puller, pull the sprocket from the camshaft.

19 Remove the plastic rear timing belt cover.

20 Unscrew the two retaining bolts, and remove the timing belt tensioner (see illustration).

21 Unscrew the four securing bolts, and withdraw the coolant pump (see illustration).

22 If the coolant pump is faulty it must be renewed, as it is not possible to obtain individual components.

23 Before refitting, clean the mating faces of the coolant pump and cylinder block.

24 Refitting is a reversal of removal, bearing in mind the following points.

25 Use a new gasket, and tighten the securing bolts to the specified torque.

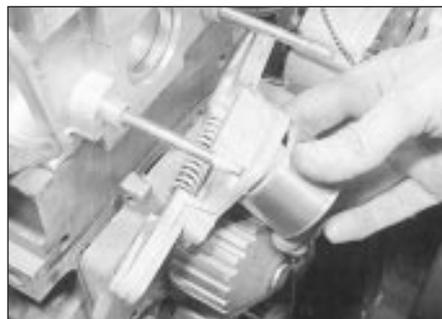
26 Before refitting the camshaft sprocket bolt, the threads must be coated with sealer (Loctite 74 or 274, or Omnifit 30M blue), as the bolt acts as an oil seal for the hollow camshaft. Do not forget to fit the distributor drive sleeve.

27 Correctly tension the timing belt.

28 Refill the cooling system.



9.32 Withdrawing the coolant pump from the cylinder block (engine removed)



9.20 Remove the timing belt tensioner

#### DOHC models

**Note:** Before proceeding, take note of the following modifications: On models up to May 1990, the coolant hoses were connected to the coolant pump housing as shown (see illustration). On models from May 1990, the heater hose (A) and the expansion tank hose (B) connections were swapped over. If the hoses are disconnected on earlier models, they should be reconnected as on later models, ie connect the heater hose to connection "B", and connect the expansion tank hose to connection "A". This will prevent the possibility of noises from the heater matrix due to air in the system.

29 On fuel injection models, for access to the coolant pump, remove the air inlet hose, plenum chamber, and air cleaner lid as an assembly.

30 Remove the coolant pump/alternator drivebelt.

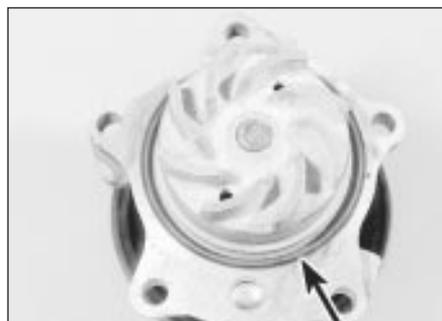
31 If the pump pulley is to be removed, it is easiest to do this with the pump in position, as follows. Prevent the pulley from rotating using a strap wrench and unscrew the four pulley securing bolts. Withdraw the pulley.

32 Position a suitable container beneath the coolant pump, to catch the coolant which will be released as the pump is removed. Unscrew the five securing bolts, and withdraw the pump from the housing in the cylinder block (see illustration). Recover the O-ring seal.

33 Before refitting, clean the mating faces of the coolant pump and the cylinder block.

34 Refitting is a reversal of removal, bearing in mind the following points.

35 Use a new O-ring seal (see illustration).



9.35 Coolant pump O-ring (arrowed)

- 36 Tighten the coolant pump securing bolts, and where applicable the pump pulley securing bolts, to the specified torque.  
37 On completion, refill the cooling system.

### 10 Coolant pump/alternator drivebelt(s) - checking, renewal and tensioning

Refer to Chapter 1, Section 21.

### 11 Coolant pump/alternator drivebelt tensioner (DOHC models with power steering) - removal and refitting

#### Removal

- 1 Remove the alternator drivebelt.
- 2 Loosen the alternator lower mounting through-bolt, then remove the alternator upper mounting bolt and swing the alternator away from the engine.
- 3 Unscrew the central securing bolt, and withdraw the drivebelt tensioner assembly (see illustration).

#### Refitting

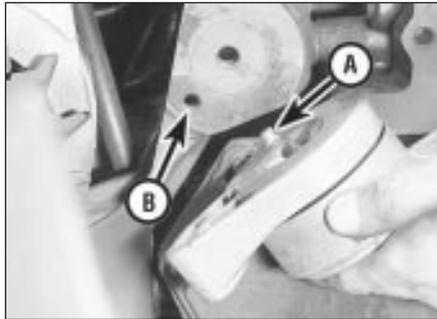
- 4 Commence refitting by positioning the tensioner on the cylinder block, ensuring that the lug on the rear of the tensioner bracket engages with the corresponding hole in the cylinder block. Tighten the securing bolt.
- 5 Swing the alternator into position, to align the upper mounting bolt hole with the corresponding hole in the drivebelt tensioner



12.2a Remove the retaining clips followed by the screws . . .



12.2b . . . and withdraw the upper section of the fan shroud



11.3 Withdrawing the coolant pump/alternator drivebelt tensioner assembly. Note lug (A) on tensioner which engages with hole (B) in mounting bracket

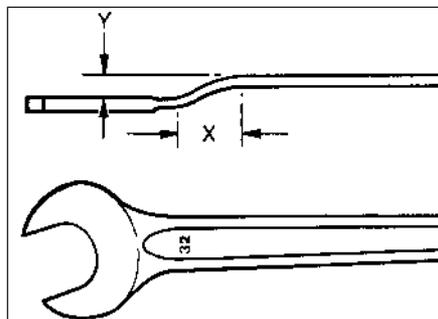
assembly. Refit the upper mounting bolt, and tighten the upper bolt and lower through-bolt.  
6 Fit the drivebelt by reversing the removal procedure, and release the tensioner to tension the drivebelt.

- 7 Observe the tensioner indicator, which should be central in its slot (see illustration).

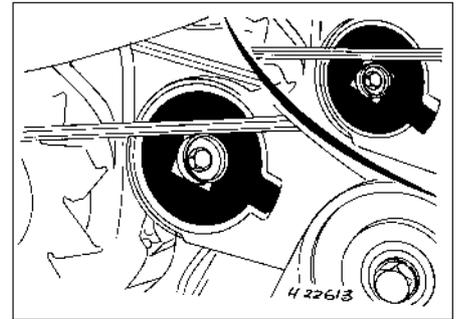
### 12 Thermo-viscous cooling fan (SOHC models) - removal and refitting

#### Removal

- 1 Disconnect the battery negative lead.
- 2 Remove the four retaining clips and unscrew the two retaining screws, then withdraw the upper section of the fan shroud (see illustrations).
- 3 The cooling fan hub nut must now be unscrewed from the coolant pump drive flange. A thin cranked 32.0 mm (1.25 in AF) spanner with a jaw thickness not exceeding 5.0 mm (0.2 in) will be required (see illustration). Alternatively, if two of the coolant pump pulley bolts are removed, a normal thickness spanner can be used. *Note that the fan hub nut has a left-hand thread, (ie it is undone in a clockwise direction.)* If the pulley turns as the nut is undone, remove the drivebelt, and clamp an old drivebelt round the pulley to restrain it, using self-locking pliers. Tap the spanner with a mallet if required to remove the nut.



12.3 Modified spanner required for removing the thermo-viscous cooling fan  
 $X = 25.0 \text{ mm (1.0 in)}$   $Y = 12.0 \text{ mm (0.5 in)}$



11.7 Alternator/coolant pump drivebelt tensioner indicator position  
*Inset shows tensioner at maximum adjustment*

- 4 If required, the fan blades can be separated from the fan hub by unscrewing the four securing bolts.

#### Refitting

- 5 Refitting is a reversal of removal, but where applicable, take care not to overtighten the bolts securing the fan blades to the fan hub, as thread damage may require the whole unit to be renewed. Where applicable, refit and tension the drivebelt.

### 13 Electric cooling fan - removal and refitting

#### CVH models

- 1 Disconnect the battery negative lead. Unclip the wiring connector from the fan motor then unscrew the retaining nuts and washers. Withdraw the fan shroud and cooling fan assembly (see illustration).
- 2 To remove the fan blades, prise the securing clip from the end of the motor shaft (see illustration).
- 3 The motor can be separated from the fan shroud by unscrewing the three securing nuts and bolts.
- 4 Where two cooling fans are fitted, both fans are secured to the fan shroud in the same manner.
- 5 Refitting is a reversal of removal, but when refitting the fan blades, ensure that the direction of rotation arrow faces away from the motor, towards the radiator.



13.1 Withdrawing the fan shroud and cooling fan assembly



13.2 Fan blade securing clip and direction of rotation arrow

**DOHC models**

- 6 Disconnect the battery negative lead.
- 7 To provide additional clearance when removing the cooling fan shroud assembly (which is removed from below the vehicle), apply the handbrake, then jack up the front of the vehicle and support it securely on axle stands (see "Jacking and Vehicle Support").
- 8 Disconnect the wiring plug(s) from the motor(s), and where applicable, unclip the wiring from the fan shroud.
- 9 Unclip the expansion tank hose from the fan shroud.
- 10 Unscrew the two nuts securing the fan shroud to the top of the radiator, then tilt the top of the shroud away from the radiator, and lift the shroud to release the lower securing clips. Withdraw the assembly from below the vehicle.
- 11 To remove the fan blades, prise the securing clip from the end of the motor shaft.

- 12 The motor can be separated from the fan shroud by unscrewing the three securing nuts and bolts.
- 13 Where two cooling fans are fitted, both are secured to the shroud in the same manner.
- 14 Refitting is a reversal of removal, but when fitting the fan blades, ensure that the drive dog on the motor shaft engages with the slot in the rear of the fan blades.

**14 Cooling fan switch - removal and refitting**



On CVH models, the cooling fan switch is located on the right-hand side of the thermostat housing (see illustration). On DOHC models, the switch is located in the end of the thermostat housing.

Removal and refitting of the switch is as described for the temperature gauge sender.

**15 Expansion tank and coolant level sensor - removal and refitting**



**Removal**

- 1 With the engine cold, slowly unscrew the expansion tank cap to release any remaining pressure from the cooling system. Remove the cap.
- 2 Place a suitable container beneath the expansion tank.
- 3 Disconnect and plug the upper hose.
- 4 Where applicable, disconnect the coolant level sensor wiring plug.

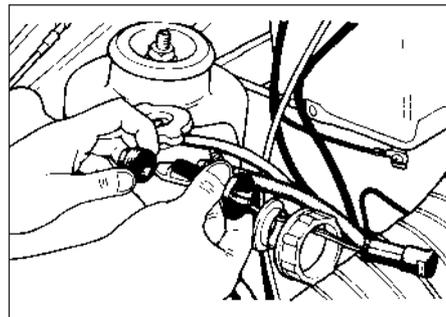


14.1 Disconnecting the wiring plug from the cooling fan switch

- 5 Unscrew the expansion tank securing screws, and tilt the tank so that the coolant runs to the sealed end.
- 6 Disconnect and plug the lower hose.
- 7 Drain the expansion tank into the container and remove the tank.
- 8 Where applicable, the coolant level sensor can be removed from the tank by unscrewing the collar from the sensor, then withdrawing the spacer, sensor and seal (see illustration). Renew the seal if necessary. Note that the sensor can only be fitted in one position (see illustration).

**Refitting**

- 9 Refitting is a reversal of removal.
- 10 On completion, top-up the coolant level to the maximum mark, then refit the expansion tank cap and run the engine at a fast idling speed for several minutes. Check the expansion tank for leaks, then stop the engine and if necessary top-up the coolant level.



15.8a Removing the coolant level sensor from the expansion tank



15.8b Fitting the coolant level sensor

**16 Temperature gauge sender - removal and refitting**



**Removal**

- 1 On SOHC models, the temperature gauge sender is located on the front left-hand side of the cylinder head, just in front of the inlet manifold. On CVH models, the sender is located on the front face of the inlet manifold, next to the thermostat housing. On DOHC models, the sender is located at the front of the inlet manifold (see illustration).



16.1 Temperature gauge sender location (arrowed)



16.3a Disconnect the temperature gauge sender wiring - SOHC



16.3b Disconnect the temperature gauge sender wiring - CVH

2 With the engine cold, slowly unscrew the expansion tank cap to release any remaining pressure from the cooling system, then refit the cap.

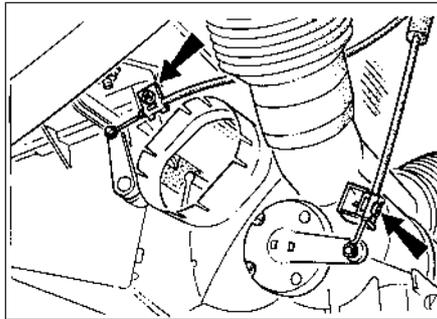
3 Disconnect the wiring from the sender terminal (see illustrations).

4 Unscrew and remove the sender, and temporarily plug the aperture.

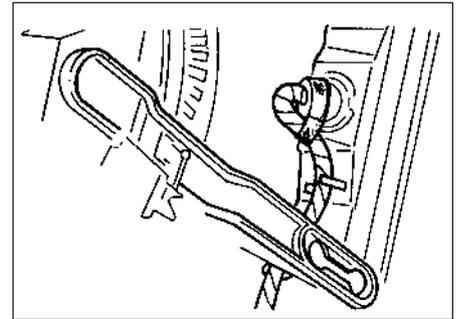
### Refitting

5 Refitting is a reversal of removal, but smear a little sealing compound on the sender unit threads before fitting.

6 On completion, check and if necessary top-up the coolant level.



17.5 Heater control cable lower end fittings (arrowed)



17.9 Heater control panel illumination bulb wiring loom correctly routed

## 17 Heater controls - removal and refitting

### Removal

1 Disconnect the battery negative lead.

2 Remove the securing screws and unclip the lower and upper steering column shrouds.

3 Remove the four securing screws and withdraw the instrument panel surround. Note that the bottom right-hand screw is covered by a plastic panel which must be prised out.

4 Remove the passenger side lower facia panel.

5 Where necessary for improved access, detach the two vent hoses from the left-hand side of the heater, then detach the lower ends of the two control cables from the heater by removing the retaining screws (see illustration).

6 Unscrew the three securing screws, and remove the heater control panel by sliding it through the facia panel and withdrawing it downwards. Disconnect the wiring from the control panel illumination bulb.

7 If necessary, the bulb can be removed with its holder.

### Refitting

8 Refitting is a reversal of removal, bearing in mind the following points.

9 When reconnecting the wiring to the control panel illumination bulb, wrap insulating tape

around the wiring loom over a length of approximately 330.0 mm (13.0 in) starting from the bulbholder. Route the loom, ensuring that it is located in the two retaining clips, bend it over and secure it to the bulbholder with insulating tape as shown (see illustration). This procedure will prevent the wiring loom from chafing against the heater control levers.

10 When reconnecting the control cables to the heater, move the control levers on the control panel to the fully up position, then attach the cables to the clips on the heater. The cable ends should project from the clips by between 0 and 4.0 mm (0 and 0.16 in). The cables are adjusted automatically by moving the control levers fully downwards. It is possible that considerable resistance may have to be overcome when moving the control levers.

## 18 Heater unit - removal and refitting

### Removal

1 Disconnect the battery negative lead.

2 If the coolant is still hot, release the pressure in the system by slowly unscrewing the expansion tank cap. Place a thick rag over the cap to prevent scalding as the pressure is released.

3 Note the location of the two heater hoses

on the engine compartment bulkhead, then disconnect and plug them (see illustration). Alternatively, the hoses can be secured high enough to prevent the coolant from draining.

4 To prevent unnecessary spillage of coolant when the heater unit is removed, blow into the upper heater pipe until all the coolant has been expelled through the lower pipe.

5 Remove the two securing screws and withdraw the heater pipe cover from the bulkhead (see illustration). Recover the gasket.

6 Working inside the vehicle, remove the passenger side lower facia panel.

7 Disconnect the ends of the two control cables from the heater by removing the two retaining screws.

8 Detach the five vent hoses from the heater.

9 Unscrew the two mounting bolts, and move the heater to the rear until the pipes are clear of the bulkhead, then withdraw the heater to the left. If necessary, remove the lower facia bracket (see illustration).

### Refitting

10 Refitting is a reversal of removal, but adjust the control cables by moving the levers on the control panel to the top and then the bottom stops. Considerable resistance may be encountered when moving the levers towards the bottom stops, which should be overcome.

11 On completion, top-up the coolant level.



18.3 Location of heater hoses on engine compartment bulkhead



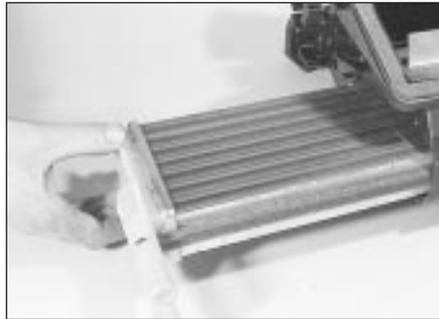
18.5 Heater pipe cover



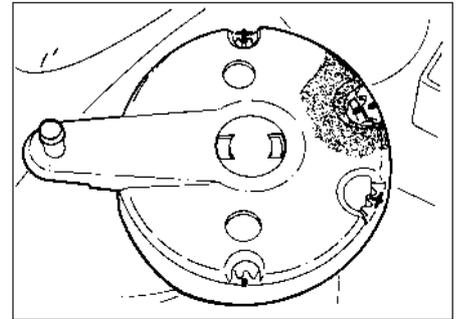
18.9 Withdrawing the heater



19.1a Remove the securing screws . . .



19.1b . . . and withdraw the heater matrix



19.3 Heater "up/down" control lever must be aligned as shown before removal  
Note that the cross marks are for right-hand drive vehicles

## 19 Heater unit - overhaul



1 With the heater unit removed from the vehicle, remove the two securing screws and withdraw the heater matrix from the casing (see illustrations).

2 Cut the heater casing gasket in line with the casing joint, then use two suitable screwdrivers to prise off the retaining clips and separate the casing halves. Withdraw the lower part of the casing to the side.

3 Remove the air flap valves, then press the control levers from the casing. Note that the "up/down" control lever can only be removed when the marks are aligned as shown (see illustration).

4 Clean all components and hose through the matrix to remove any debris. If necessary use

a chemical cleaner to clear the inner passage of the matrix. Renew the components as necessary.

5 Reassembly is a reversal of dismantling.

## 20 Heater motor - removal and refitting



### Removal

1 Disconnect the battery negative lead.

2 Where necessary, unclip the brake servo vacuum hose for improved access.

3 On models from 1987, unclip the windscreen washer hoses and wiring from the motor cover, and secure them to the bodywork out of the way.

4 Unscrew the two securing bolts from the motor cover, pull off the rubber moulding, then withdraw the cover (see illustration).

5 Disconnect the wiring from the motor, and detach the earth lead from its bracket.

6 Unscrew the two motor securing nuts, and withdraw the motor assembly (see illustration).

7 Unclip the casing halves, then prise open the motor retaining strap using a screwdriver, or if necessary a drift.

8 Detach the wiring from the motor, then remove the motor and fan wheels from the casing.

### Refitting

9 Refitting is a reversal of removal.

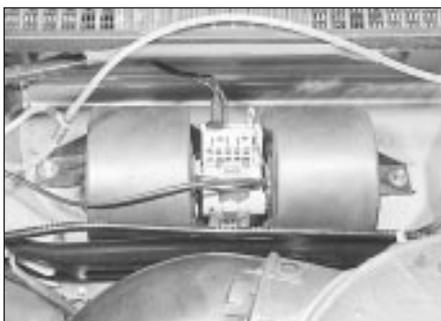
## 21 Air conditioning system - component renewal



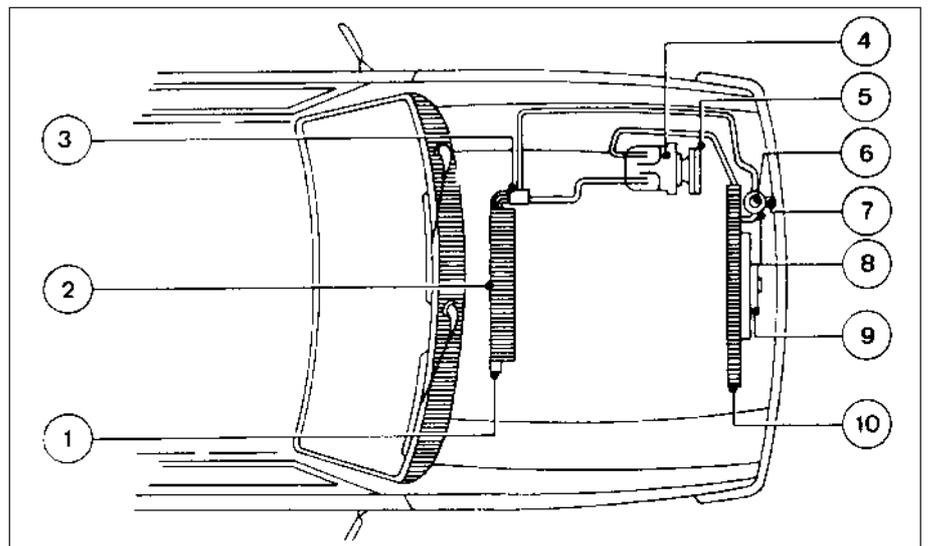
1 Only those items which can be renewed without discharging the system are described here (see illustration). Other items must be dealt with by a Ford dealer or air conditioning specialist.



20.4 Unscrew the securing bolts and withdraw the heater motor cover



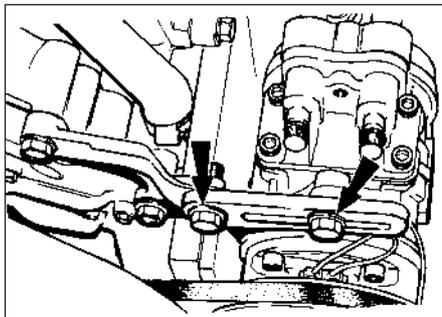
20.6 Heater motor and wiring



21.1 Layout of air conditioning system components

- 1 De-ice thermostat
- 2 Evaporator
- 3 Expansion valve
- 4 Compressor
- 5 Compressor clutch

- 6 Pressure switch
- 7 Sight glass
- 8 Dehydrator/collector
- 9 Cooling fan
- 10 Condenser



21.4 Typical air conditioning compressor mounting and pivot bolts (arrowed)

### Compressor drivebelt

- 2 Disconnect the battery negative lead.
- 3 On SOHC models, remove the thermo-viscous cooling fan.
- 4 Slacken the compressor mounting and pivot bolts, move the compressor towards the engine and remove the old drivebelt (see illustration).
- 5 Fit the new drivebelt, position the compressor to achieve the correct belt tension, then tighten the mounting and pivot bolts.
- 6 On SOHC models, refit the thermo-viscous cooling fan.
- 7 Reconnect the battery negative lead.

### Condenser fan and motor

#### Models up to 1987

- 8 Disconnect the battery negative lead, and remove the radiator grille. On Ghia models, remove the front bumper.

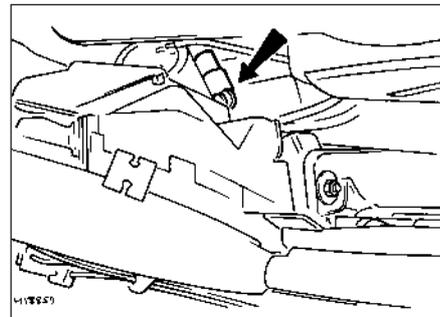
- 9 Disconnect the fan wiring connector at the side of the condenser.
- 10 Remove the three securing bolts and withdraw the fan assembly. Turn the frame to position the fan wiring on the dehydrator side to avoid damaging the wiring. Take care also not to damage the condenser fins or tube.
- 11 To remove the fan blades from the motor, remove the retaining nut and circlip. The nut has a left-hand thread, ie, it is undone in a clockwise direction.
- 12 With the blades removed, the motor can be unscrewed from the frame.
- 13 Reassemble and refit in the reverse order of dismantling and removal.

#### Models from 1987

- 14 Disconnect the battery negative lead.
- 15 Remove the bonnet lock.
- 16 Unclip the guard from the fan frame.
- 17 Disconnect the fan wiring connector (see illustration).
- 18 Apply the handbrake, jack up the front of the vehicle and support on axle stands (see "Jacking and Vehicle Support").
- 19 Unscrew the two lower condenser securing bolts and disengage the condenser from the top of the radiator by releasing the three clips.
- 20 Unscrew the four securing bolts and detach the fan assembly from the condenser. Withdraw the fan assembly from underneath the vehicle.
- 21 Proceed as described in paragraphs 11 to 13 inclusive.

### De-ice thermostat

- 22 Disconnect and remove the battery.



21.17 Air conditioning condenser fan wiring connector location (arrowed) - models from 1987

- 23 Disconnect any vacuum hoses, windscreen washer hoses and electrical wiring as necessary, then unscrew the four securing bolts and on models up to 1987 the single nut, and remove the right-hand plenum chamber cover plate from the bulkhead.
- 24 Disconnect the thermostat from the evaporator casing and withdraw it. Also withdraw the thermostat probe from the casing.
- 25 Refitting is a reversal of removal.

### Heating/air conditioning controls

- 26 The procedure is similar to that described for the heater controls but additionally the vacuum hoses must be disconnected from the control unit vacuum valve during removal, and reconnected when refitting.

