

# Chapter 3

## Cooling, heating and ventilation systems

### Contents

Air conditioning system - component renewal	22	Heater matrix - dismantling and reassembly	20
Cooling fan switch - removal and refitting	16	Radiator - inspection and repair	6
Cooling system - draining	2	Radiator - removal and refitting	5
Cooling system - filling	4	Temperature gauge sender - removal and refitting	15
Cooling system - flushing	3	Thermostat - removal and refitting	7
Electric cooling fan(s) - removal and refitting	10	Thermostat - testing	8
Expansion tank - removal and refitting	14	Viscous-coupled fan - removal and refitting	9
General information and precautions	1	Water pump/alternator drivebelt(s) - inspection, renewal and adjustment	12
Heater assembly - removal and refitting	19	Water pump/alternator drivebelt tensioner - removal and refitting	13
Heater control cables - removal and refitting	18	Water pump - removal and refitting	11
Heater controls - removal and refitting	17		
Heater coolant valve - removal and refitting	21		

### Degrees of difficulty

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

### Specifications

#### General

System type	Sealed, pressurised, thermostatically controlled
Fan type	Mechanical temperature-sensitive viscous clutch, or electric (DOHC)

#### Coolant

Type	See "Lubricants and fluids"
Capacity:	
SOHC	8.0 litres (14.1 pints) approx
DOHC:	
Carburettor models	7.9 litres (13.9 pints) approx
Fuel injection models	7.3 litres (12.8 pints) approx
V6	8.5 litres (15.0 pints) approx
Specific gravity at 45 to 50% antifreeze concentration	1.069 to 1.077

#### Expansion tank cap

Opening pressure:	
SOHC and V6	0.85 to 1.10 bar
DOHC	1.0 to 1.4 bar

#### Thermostat

Nominal rating:	
SOHC	88°C (190°F)
DOHC	102°C (216°F)
V6	82°C (180°F)
Actual opening temperature:	
SOHC and DOHC	85° to 89°C (185° to 192°F)
V6	79° to 83°C (174° to 181°F)

#### Water pump drivebelt

Deflection	10 mm (0.4 in) approx under normal fingertip pressure at mid-point of longest run
------------	---

## 3•2 Cooling, heating and ventilation systems

### Torque wrench settings

	Nm	lbf ft
Radiator lower mountings	8 to 12	6 to 9
Thermostat housing bolts:		
SOHC, DOHC and 2.8 litre V6	17 to 20	13 to 15
2.4 & 2.9 litre V6	7 to 10	5 to 7
Water pump bolts:		
SOHC, M8 bolts	17 to 21	13 to 16
SOHC, M10 bolts	35 to 42	26 to 31
DOHC	21 to 28	16 to 21
2.8 litre V6	9 to 13	7 to 10
2.4 & 2.9 litre V6	7 to 10	5 to 7
Water pump pulley bolts	21 to 26	16 to 19
Water pump/alternator drivebelt tensioner bolt (DOHC)	70 to 97	52 to 72
Fan-to-viscous clutch bolts:		
SOHC	8 to 10	6 to 7
V6	17 to 23	13 to 17
Fan shroud bolts	8 to 11	6 to 8
Cylinder block drain plug	21 to 25	16 to 18

### 1 General information and precautions

#### Cooling system

The cooling system is of pressurised type and includes a front mounted crossflow radiator, belt-driven water pump, temperature-sensitive thermo-viscous fan (on DOHC models, an electrically-operated cooling fan is fitted, operated by a switch in the thermostat housing), wax type thermostat, and an expansion and degas tank.

The radiator matrix is of copper and brass construction and the end tanks are of plastic. On automatic transmission models the right-hand side end tank incorporates the transmission oil cooler.

The thermostat is located behind the water outlet elbow at the front of the cylinder head on OHC models, and on the front of the water pump on V6 models. Its purpose is to ensure rapid engine warm-up by restricting the flow of coolant in 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, in particular in the thermostat housing and the radiator, is returned to the tank and released in the air space thus maintaining the efficiency of the coolant.

On models fitted with the auxiliary warning system, the expansion tank contains a level sensor which operates a warning light if the coolant level falls significantly.

When the engine is started from cold, the water pump circulates coolant around the cylinder block, cylinder head(s) and inlet manifold. The warm coolant passes through the automatic choke housing (when applicable) and through the heater matrix before returning to the engine. As the coolant expands, the level in the expansion tank rises.

Circulation of coolant through the radiator is prevented while the thermostat is shut. When the coolant reaches the predetermined

temperature the thermostat opens and hot water passes through the top hose to the top of the radiator. As the water circulates down through the radiator, it is cooled by the passage of air past the radiator when the car is in forward motion, supplemented by the action of the thermo-viscous fan when necessary. Having reached the bottom of the radiator, the water is now cool and the cycle is repeated. Circulation of water continues through the expansion tank, inlet manifold and heater at all times; the heater temperature control being by an air flap.

The thermo-viscous fan is controlled by the temperature of 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 of the vanes are driven directly by the water 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 drag or viscosity of the fluid, and this in turn depends on ambient temperature and engine speed. The fan is therefore only operated when required, and compared with direct drive type fan represents a considerable improvement in fuel economy, drivebelt wear and fan noise.

#### Air conditioning

Air conditioning is fitted as standard on Scorpio models and is optionally available on some other models. In conjunction with the heater, the system enables any reasonable air temperature to be achieved inside the car, 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 dehydration the refrigerant returns to the evaporator where it absorbs heat from air passing over the evaporator fins. 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

##### 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 every two years 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.

##### Air conditioning refrigerant

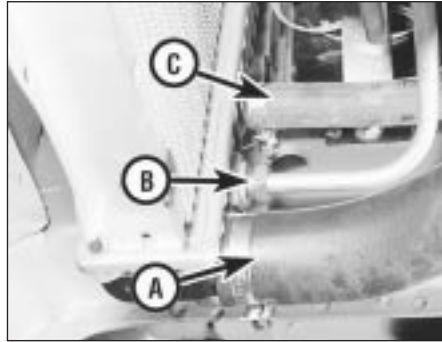
Although the refrigerant is not itself toxic, in the presence of a naked flame (or a lighted cigarette) it forms a highly toxic gas. Liquid refrigerant spilled on the skin will cause frostbite. If refrigerant enters the eyes, rinse them with a dilute solution of boric acid and seek medical advice immediately.

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 110°C (230°F) - 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.



5.2a Radiator top hose



5.2b Radiator bottom hose (A)

Also shown are automatic transmission fluid cooler lower union (B) and hose to expansion tank (C)



5.4 Transmission fluid cooler upper union

## 2 Cooling system - draining

See Chapter 1, Section 46.

## 3 Cooling system - flushing

See Chapter 1, Section 46.

## 4 Cooling system - filling

See Chapter 1, Section 46.

## 5 Radiator - removal and refitting

**1** Drain the radiator. There is no need to drain the cylinder block. On DOHC engines the electric cooling fan assembly must be removed to gain the clearance to remove the radiator.

**2** Disconnect the top and bottom hoses from the radiator by slackening the hose clips and pulling off the hoses with a twisting motion (see illustrations). Do not use excessive force - the radiator side tanks are made of plastic.

**3** On OHC models, disconnect the small hose running from the expansion tank to the radiator.

**4** On automatic transmission models, clean around the transmission fluid cooler unions on the radiator and disconnect them (see

illustration). Be prepared for fluid spillage; plug or cap the cooler lines to keep dirt out.

**5** On models with air conditioning, disconnect the auxiliary fan thermo-switch. If the thermo-switch is mounted in the radiator, remove it.

**6** Remove the upper half of the fan shroud by removing the two bolts and two clips (see illustration), and the lower half which is secured by two bolts.

**7** Release the two radiator top mounting clips by pulling out the plastic plugs (see illustration).

**8** Raise and support the front of the vehicle. Support the radiator and remove the two bottom mounting bolts (see illustration).

**9** Carefully lower the radiator slightly to free the top mountings, then remove it from under the vehicle.

**10** If a new radiator is being fitted, transfer the fan shrouds and mountings from the old one.

**11** Refit by reversing the removal operations, then refill the cooling system.

**12** On automatic transmission models, check the transmission fluid level.

## 6 Radiator - inspection and repair

**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.

**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 radiator sealant while the radiator is *in situ*.

## 7 Thermostat - removal and refitting

### SOHC engines

**1** Disconnect the battery negative lead.

**2** Drain the cooling system. As it is not necessary to completely drain the radiator, the bottom hose can be disconnected from the water pump.

**3** Disconnect the top hose from the thermostat housing at the front of the cylinder head (see illustration).

**4** Unscrew the bolts and remove the housing and gasket (see illustration).

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

**6** Clean the thermostat housing and cylinder head mating surfaces. Obtain a new gasket for reassembly, and if necessary a new sealing ring too.

**7** Refit by reversing the removal operations.



5.6 Fan shroud clip



5.7 Pull out the plug to release the radiator top mounting



5.8 One of the radiator bottom mounting bolts (arrowed)

### 3•4 Cooling, heating and ventilation systems



7.3 Top hose attachment to the thermostat housing



7.4 Removing the thermostat housing



7.5a Remove the retaining clip . . .



7.5b . . . extract the thermostat . . .



7.5c . . . and the sealing ring



7.7 Thermostat direction of flow arrow



7.12a Disconnecting the coolant hoses . . .



7.12b . . . from the thermostat housing



7.13 Disconnect the cooling fan switch wiring plug . . .



7.14 . . . and remove the thermostat housing

Make sure that the thermostat is the right way round - the wax capsule fits into the cylinder head, with the direction of flow arrow facing forwards (see illustration).

8 Refill the cooling system.

#### **DOHC engines**

9 Disconnect the battery negative lead.

10 Drain the cooling system.

11 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.

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

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

14 Unscrew the three securing bolts, and

withdraw the thermostat housing (see illustration).

15 Manoeuvre the thermostat away from the inlet manifold and recover the O-ring. If it is necessary to prise the thermostat out, take care not to damage the surface of the housing in the inlet manifold.

16 Refitting is a reversal of removal, bearing in mind the following points:

- Ensure that the O-ring seal is correctly fitted around the edge of the thermostat.
- When fitting the thermostat to the inlet manifold ensure that the relief valve is located in the 12 o'clock position (see illustration).
- Tighten the thermostat housing bolts to the specified torque.
- Refill the cooling system.





7.16 Thermostat relief valve (arrowed) positioned in the 12 o'clock position

### V6 engines

17 The thermostat is removed in the course of water pump removal.

### 8 Thermostat - testing

1 A rough test of the thermostat may be made by suspending it with a piece of string in a saucepan full of water (see illustration). Bring the water to the boil. The thermostat must open by the time the water boils. If not, renew it.

2 If a thermometer is available, the precise opening temperature of the thermostat may be determined and compared with that given in the Specifications.

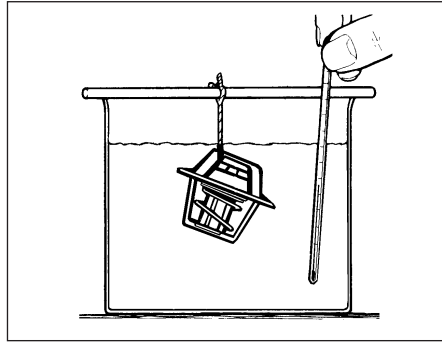
3 A thermostat which fails to close as the water cools must also be renewed.

### 9 Viscous-coupled fan - removal and refitting

1 Disconnect the battery negative lead.

2 Remove the upper half of the fan shroud (two bolts, four clips).

3 Undo the nut which secures the fan clutch to the water pump. **This nut has a left-hand thread**, ie it is undone in a clockwise direction. A thin cranked spanner, 32 mm (OHC) or 36 mm (V6) AF is needed (see illustration); alternatively, if two of the pulley bolts are removed, a normal thickness or even an



8.1 Checking the thermostat opening temperature

adjustable spanner can be used (see illustrations). Tap the spanner with a mallet if need be to release the nut.

**HAYNES HINT** *If problems are experienced with the pulley turning as the nut is undone, remove the drivebelt and clamp an old drivebelt round the pulley to restrain it, using self-locking pliers.*

4 The fan can now be unbolted from the viscous clutch if required. Do not overtighten the bolts when refitting.

5 Refit by reversing the removal operations.

### 10 Electric cooling fan(s) - removal and refitting

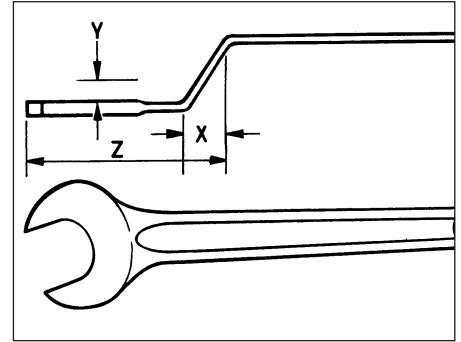
1 Disconnect the battery negative lead.

2 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").

3 Disconnect the wiring plug(s) from the motor(s), and where applicable, unclip the wiring from the fan shroud.

4 Unclip the expansion tank hose from the fan shroud.

5 Unscrew the two nuts securing the fan shroud to the top of the radiator, then tilt the top of the



9.3a Dimensions of spanner for undoing fan clutch nut. Spanner thickness must not exceed 5 mm (0.2 in)

X = 10 mm (0.4 in) Z = 50 mm (2.0 in)  
Y = 10 mm (0.4 in)

shroud away from the radiator, and lift the shroud to release the lower securing clips. Withdraw the assembly from below the vehicle.

6 To remove the fan blades, prise the securing clip from the end of the motor shaft.

7 The motor can be separated from the fan shroud by unscrewing the three securing nuts and bolts.

8 Note that two cooling fans may be fitted, depending on model. Both fans are secured to the shroud in the same manner.

9 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.

### 11 Water pump - removal and refitting

#### SOHC engines

1 Disconnect the battery negative lead.

2 Drain the cooling system.

3 Remove the fan and viscous coupling.

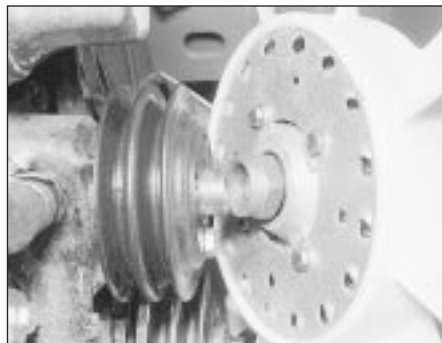
4 If not already done, remove the pump drivebelt(s), then unbolt and remove the water pump pulley (see illustration).

5 Disconnect the radiator bottom hose and the heater return hose from the pump.

6 Remove the timing belt cover, which is secured by three bolts.



9.3b Undoing the viscous fan clutch nut



9.3c Removing the fan and clutch



11.4 Undoing a water pump pulley bolt



11.7a This water pump bolt also secures the alternator strap

- 7 Remove the three securing bolts and withdraw the water pump (see illustrations).
- 8 A leaking, noisy or otherwise defective pump must be renewed.
- 9 Clean the mating faces and obtain a new gasket for reassembly (see illustration).
- 10 Refit by reversing the removal operation, tightening all fastenings to the correct torque (where specified).
- 11 Refill the cooling system.

**DOHC engines**

- 12 Disconnect the battery negative lead.
- 13 On fuel-injection models, for access to the water pump, remove the air inlet hose, plenum chamber, and air cleaner lid as an assembly.
- 14 Drain the cooling system.
- 15 Remove the water pump/alternator drivebelt.



11.17 Withdrawing the water pump from the cylinder block (engine removed)



11.18 On refitting, renew the water pump O-ring (arrowed)



11.7b Water pump removed

16 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 (which can be improvised using an old drivebelt and a large socket and wrench), and unscrew the four pulley securing bolts. Withdraw the pulley.

17 Position a suitable container beneath the water pump to catch the coolant which will be released as the pump is removed, then unscrew the five securing bolts and withdraw the pump from the housing in the cylinder block (see illustration). Recover the O-ring seal and discard it; a new one must be used on refitting.

18 Refitting is a reversal of removal, bearing in mind the following points:

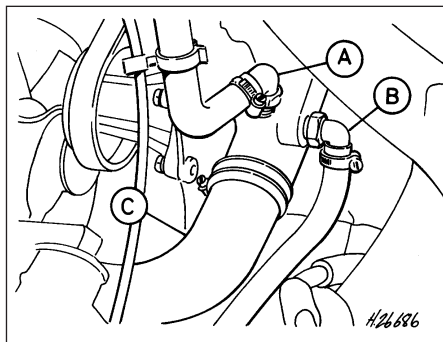
a) Ensure that the mating faces of the water pump and cylinder block are clean and fit a new O-ring to the pump (see illustration).

b) Tighten the water pump bolts and where applicable the pump pulley bolts to the specified torque.

c) On completion refill the cooling system.

19 Note that on models up to May 1990, the coolant hoses were connected to the water pump housing as shown (see illustration).

20 On models from May 1990, the heater hose (A) and the expansion tank hose (B) connections were swapped over.



11.19 Water 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



11.9 Fitting a new gasket to the water pump

21 If the hoses are disconnected on earlier models, such as during engine removal, 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 reduce the possibility of noises from the heater matrix due to air in the system.

**V6 engines**

22 Disconnect the battery negative lead.

23 Drain the cooling system.

24 Remove the fan and viscous coupling.

25 If not already done, remove the pump drivebelt(s), then unbolt and remove the water pump pulley.

26 Disconnect the radiator bottom hose and the heater return hose from the thermostat housing.

27 Remove the three bolts which secure the thermostat housing to the water pump. Remove the housing and the thermostat.

28 Remove the twelve securing bolts and withdraw the water pump. Note that on some models it will be necessary to remove the crankshaft pulley and damper to gain access to the lower water pump bolts (see illustration).

29 A leaking, noisy or otherwise defective pump must be renewed.

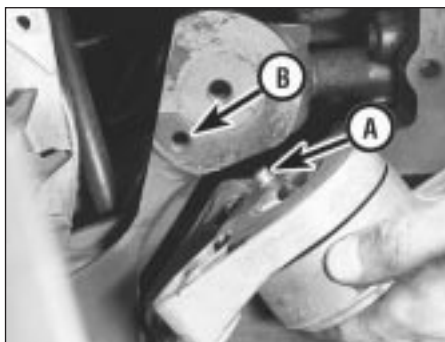
30 Clean the mating faces and obtain a new gasket for reassembly. Use a new thermostat housing gasket also.

31 Refit by reversing the removal operation, tightening all fastenings to the correct torque (where specified).

32 Refill the cooling system.



11.28 Removing the water pump



13.4 On refitting, ensure the drivebelt tensioner lug (A) engages with hole in the mounting bracket (B)

## 12 Water pump/alternator drivebelt(s) - inspection, renewal and adjustment

See Chapter 1, Section 21.

## 13 Water pump/alternator drivebelt tensioner - removal and refitting

- 1 On 2.0 litre DOHC engines only, remove the water pump/alternator drivebelt as described in the previous Section.
- 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.
- 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 (see illustration). 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 assembly, then refit and tighten the upper mounting bolt, then the lower throughbolt.
- 6 Check the full length of the drivebelt for cracks and deterioration and renew if necessary.
- 7 Fit the drivebelt using a reversal of the removal procedure, and release the tensioner to tension the drivebelt.

## 14 Expansion tank - removal and refitting

- 1 Disconnect the battery negative lead.
- 2 Depressurize the cooling system by unscrewing the expansion tank cap. **Take precautions against scalding if the system is hot.**
- 3 Slacken the hose clips on all the hoses which are connected to the tank. Pull off and plug those hoses which are above the waterline.



15.1a Temperature gauge sender (manifold removed)

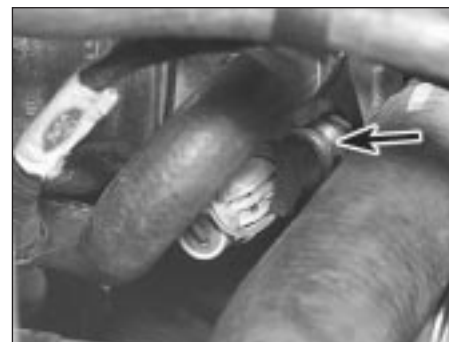
- 4 Remove the two screws which secure the tank. Tilt the tank so that the coolant lies away from the outlets, then disconnect and plug the remaining hose.
- 5 Disconnect the coolant level sensor, when fitted, and remove the tank.
- 6 Refit by reversing the removal operations. Top-up the cooling system on completion.

## 15 Temperature gauge sender - removal and refitting

- 1 The temperature gauge sender is located towards the front of the engine. On SOHC models it is just below the inlet manifold (see illustration); on V6 models it is just below the top hose connection on the front of the left-hand cylinder head, and on DOHC models it is located at the front of the inlet manifold (see illustration).
- 2 Slacken the expansion tank cap to release pressure in the cooling system, **taking precautions against scalding if the system is hot.** Tighten the cap again to minimise coolant loss.
- 3 Disconnect the wiring from the sender unit. Unscrew and remove it, being prepared for some coolant spillage.
- 4 Smear sealant on the sender unit threads before refitting, then insert and tighten it. Reconnect the wiring.
- 5 Top-up the cooling system if necessary, then run the engine and check the operation of the temperature gauge.



17.4 Heater control cable clip (arrowed) viewed through windscreen



15.1b Temperature gauge sender unit location (arrowed)

## 16 Cooling fan switch - removal and refitting

The cooling fan switch is located in the end of the thermostat housing.

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

## 17 Heater controls - removal and refitting

### Models before April 1992

#### Front

- 1 Disconnect the battery negative lead.
- 2 Remove the instrument cluster (Chapter 13).
- 3 Remove the facia top (Chapter 12).
- 4 Unclip the two control cables from the control levers (see illustration).
- 5 On air conditioned models, disconnect the hoses from the vacuum switch.
- 6 Remove the four screws which secure the heater control assembly. Withdraw the assembly from the facia.
- 7 When refitting, secure the control assembly with the four screws. Reconnect the vacuum switch (when applicable) and the control cables. Adjust the control cables if necessary by altering the positions of the cable clips.
- 8 When satisfied with the operation of the cables, refit the other disturbed components.

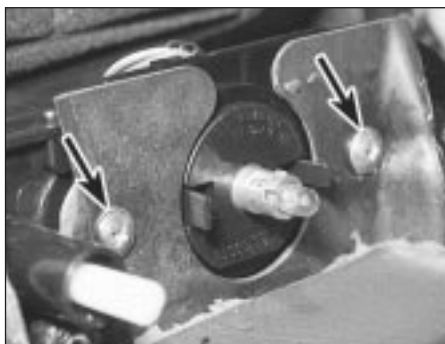
#### Rear

- 9 Remove the centre console (Chapter 12).
- 10 Unclip the control cables and remove the control unit.
- 11 Refit in the reverse order to removal.

### Models from April 1992

- 12 Undo the two instrument panel surround retaining screws, then carefully release the retaining clips and remove the surround from the facia.
- 13 Pull off the three knobs from the heater and ventilation controls to gain access to the two hidden central vent panel retaining screws. Slacken and remove the four panel retaining screws and partially withdraw the





17.14 Heater control panel retaining screws (arrowed)

panel. Disconnect the wiring connectors from the heated window switches and fuel computer (where fitted) and remove the panel from the car.

14 Undo the two retaining screws then manoeuvre the control panel out of the fascia and disconnect the wiring connector (see illustration).

15 Unclip the central fan switch from the panel then, using a small flat-bladed screwdriver, bend back the retaining tabs and remove the cover from the panel base plate (see illustration).

16 Cut the cable retaining clips then release the cables from the toothed guides and remove the base plate.

17 Refitting is a reversal of the removal procedure securing the cables to the base plate using new retaining clips.

### 18 Heater control cables - removal and refitting



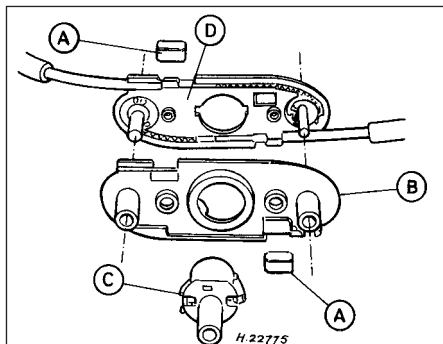
#### Models before April 1992

##### Front

- 1 Remove the heater controls as described in the previous Section.
- 2 Remove the centre console as described in Chapter 12. Also remove the console bracket and the gear lever inner gaiter.
- 3 Unclip the under-dash trim on both sides. Remove the glovebox lid.
- 4 Remove the radio (Chapter 13).
- 5 Remove the ABS and (when applicable) the EEC IV modules (Chapters 10 and 13).
- 6 Remove the remaining lower trim on the passenger side to expose the heater casing.
- 7 Remove the two securing screws and release the cables from the heater.
- 8 When refitting, place the air distribution and temperature control valve levers in their uppermost positions, then connect the cables.
- 9 The remainder of refitting is a reversal of the removal procedure.

##### Rear

- 10 Remove the centre console (Chapter 12).
- 11 Remove the front seat on the side concerned. Also remove the rear seat cushion.



17.15 Exploded view of the heater control panel

- A Control cable retaining clips
- B Cover
- C Fan switch
- D Base plate

- 12 Remove the front seat belt lower anchor bolt.
- 13 Remove the front scuff plate, which is secured by three screws. Remove the front screw from the rear scuff plate.
- 14 Roll back the front carpet from the scuff plates to expose the heater cable. Release the cable from its ties and disconnect it from the control unit and the nozzle (see illustration).
- 15 Refit by reversing the removal operations.

#### Models from April 1992

- 16 Remove the fascia undercovers, the right-hand lower fascia panel and the glovebox.
- 17 Undo the two retaining nuts, then release the retaining clips and remove the trim panel from the glovebox aperture.
- 18 Remove the heater control panel.
- 19 Slacken and remove the control cable retaining screws then release the retaining clips (one screw and one clip for each cable). Detach the cables from the heater assembly and withdraw them from the fascia whilst noting the correct routing (see illustration).
- 20 Refitting is a reverse of the removal procedure noting the following points.
  - a) Ensure that the cables are correctly routed prior to connecting them to the heater housing.
  - b) Prior to refitting the glovebox aperture trim panel, check that the panel controls function correctly and that the cables move the relevant operating lever smoothly from the fully open to the fully closed position without any trace of undue friction.

### 19 Heater assembly - removal and refitting



#### Models before April 1992

- 1 Disconnect the battery negative lead.
- 2 Depressurise the cooling system by slackening the expansion tank cap. Take precautions against scalding if the system is hot.



18.14 Rear heater control cable at nozzle

3 Disconnect the two heater hoses from the stubs on the bulkhead. Be prepared for some coolant spillage: catch the coolant in a clean container if it is fit for re-use. Plug the hoses, or tie them up with their open ends raised.

4 Expel as much coolant as possible from the heater matrix by blowing through it.

5 Remove the matrix connector plate and gasket from the bulkhead.

6 Working inside the vehicle, remove the centre console and other trim as described for access to the heater control cables.

7 Remove the instrument cluster surround, which is secured by four screws. Also pull out the heater louvre panel.

8 Remove the fascia panel top, which is secured by five screws and four clips.

9 Detach the air trunking from the heater casing. Release the trunking from the bulkhead when necessary.

10 Remove the two nuts which secure the heater unit. Pull the unit into the vehicle until the pipe stubs are clear of the bulkhead, then remove it sideways. Be prepared for coolant spillage.

11 Check the condition of the foam gasket on the bulkhead and renew it if necessary.

12 Refit by reversing the removal operations.

13 Top-up the cooling system on completion, and check the level again after the engine has been run.

#### Models from April 1992

- 14 Disconnect the battery negative terminal.
- 15 Drain the cooling system.



18.19 Heater control cable retaining screw and clip (arrowed)





**19.19** Release the facia wiring loom from the bulkhead to gain access to the demister nozzle retaining nut and screw (arrowed)

**16** Locate the heater matrix feed and return hoses on the engine compartment bulkhead. Slacken the retaining clips and disconnect both hoses from the matrix unions. Be prepared for some coolant spillage. Plug the matrix unions to prevent residual coolant being spilled as the assembly is removed.

**17** Slacken and remove the two retaining screws then remove the matrix cover plate and gasket from the bulkhead; discard the gasket as a new one should be used on refitting.

**18** Remove the facia panel.

**19** Release the facia wiring loom from the bulkhead to gain access to the demister nozzle fasteners (see illustration).

**20** Remove the retaining nut and screw then detach each windscreen demister nozzle from the heater assembly. Undo the two retaining nuts and detach the centre face level nozzle from the heater.

**21** Slacken and remove the two retaining nuts then detach the right-hand face level nozzle from the heater and remove it from the vehicle. Repeat the procedure for the left-hand nozzle.

**22** To detach each rear footwell nozzle from the heater unit, remove the pin from the nozzle retaining clip whilst supporting the outer part of the retaining clip from the rear (see illustration). **Note:** If the rear of the clip is not supported when the pin is removed it will drop down into the nozzle. To retrieve the clip will require the removal of the vent which first requires the front seat to be removed and carpet lifted.

**23** Disconnect the wiring connector from the heater control panel.

**24** Undo the two nuts securing the heater assembly to the bulkhead then carefully manoeuvre the assembly out of the vehicle whilst being prepared for the possibility of coolant spillage from the matrix unions.

**25** Refitting is a reverse of the removal procedure noting the following points.

- a) Tighten all retaining nuts and screws securely and ensure that all nozzles are securely connected to the heater assembly so that there are no air gaps or leaks.



**19.22** Detach the rear footwell nozzles from the heater assembly

- b) Check the operation of all heater cables before refitting the facia, ensuring that the relevant component moves smoothly from the fully open to the fully closed position.
- c) Ensure that the heater hoses are correctly reconnected and are securely held by the retaining clips.
- d) Use a new gasket when refitting the matrix cover plate.
- e) Refill the cooling system.

## 20 Heater matrix - dismantling and reassembly

**1** Remove the heater assembly as described in the previous Section.

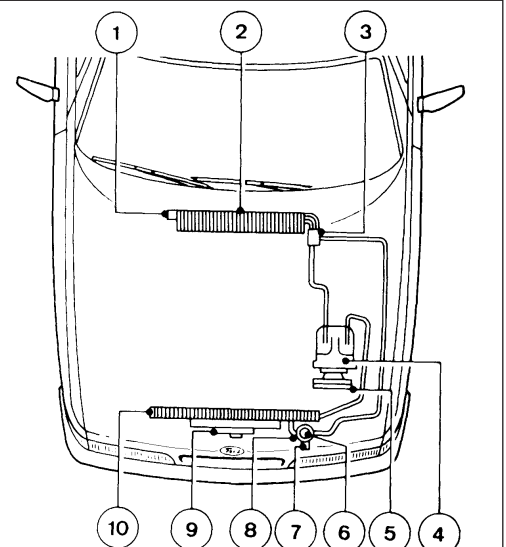
**2** Remove the two screws which secure the heater matrix. Withdraw the matrix.

**3** If the matrix is leaking it is best to obtain a new or reconditioned unit; home repairs are seldom successful.

**HAYNES HINT** If the heater matrix is blocked it can sometimes be cleared by reverse-flushing using a garden hose and a proprietary radiator cleaning product if necessary.

## 22.1 Air conditioning system component locations

- 1 De-ice thermostat
- 2 Evaporator
- 3 Expansion valve
- 4 Compressor
- 5 Compressor clutch
- 6 Pressure switch
- 7 Sight glass
- 8 Dehydrator
- 9 Cooling fan
- 10 Condenser



**4** To dismantle, release the clips which secure the casing halves together by using a screwdriver. Carefully prise the halves apart and separate them.

**5** Remove the flap valves and operating levers from the casing halves, noting how they are fitted for reference when reassembling.

**6** Flush the matrix with clean water to remove any debris.

**7** Reassembly is a reversal of dismantling. Additional clips may be needed to secure the casing halves once they have been separated.

## 21 Heater coolant valve - removal and refitting

**1** Drain the cooling system.

**2** Noting the correct fitted positions, slacken the retaining clips and disconnect the coolant hoses from the valve.

**3** Disconnect the vacuum pipe from the top of the valve then unclip the valve and remove it from the retaining bracket.

**4** Refitting is a reverse of the removal procedure ensuring that the coolant hoses are reconnected to their original unions on the valve and are securely held in position with the retaining clips.

## 22 Air conditioning system - component renewal

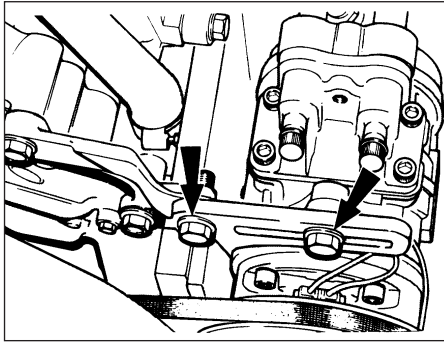
**1** Only those items which can be renewed without discharging the system are described here. Other items must be dealt with by a Ford dealer or air conditioning specialist (see illustration).

### Compressor drivebelt

**2** Disconnect the battery earth lead.

**3** On OHC engines, remove the radiator cooling fan.

**4** Slacken the compressor strap and pivot bolts (see illustration), move the compressor



22.4 Air conditioning compressor adjuster strap bolts (arrowed)

towards the engine and remove the old drivebelt.

5 Fit the new drivebelt, position the compressor to achieve the correct belt tension and tighten the strap and pivot bolts.

6 Refit and secure the fan, when applicable, and reconnect the battery.

7 Recheck the belt tension after it has run for at least 10 minutes under load.

#### **Condenser fan and motor**

8 Disconnect the battery earth lead and remove the radiator grille.

9 Disconnect the fan wiring connector at the right-hand side of the condenser.

10 Remove the three securing bolts and

remove the fan and motor (see illustration). 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 Unclip the fan guard from the top of the frame.

12 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 clockwise.

13 With the blades removed, the motor can be unscrewed from the frame.

14 Reassemble and refit in the reverse order of dismantling and removal.

#### **De-ice thermostat**

15 Disconnect the battery negative lead.

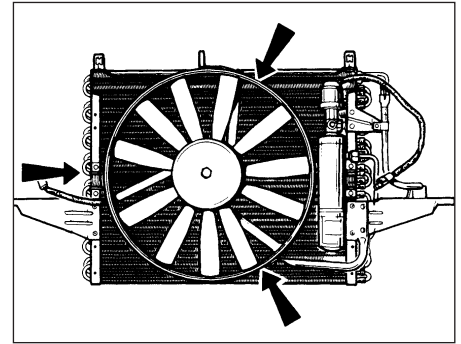
16 Disconnect the vacuum hoses from the plenum chamber cover. Pull off the rubber seal and remove the plenum chamber cover; it is secured by four screws and one nut.

17 Disconnect the thermostat from the evaporator casing and remove it. Also remove the thermostat probe.

18 Refit by reversing the removal operations.

#### **Heater water valve**

19 The heater water valve used with air conditioning is vacuum-operated. It is located on the right-hand side of the engine bay, near the bulkhead.



22.10 Condenser fan securing bolts (arrowed)

20 Drain the cooling system.

21 Slacken the hose clips and detach the coolant hoses from the valve, noting how they are connected.

22 Disconnect the vacuum hose from the top of the valve.

23 Unclip the valve from its bracket and remove it.

24 Refit by reversing the removal operations. Refill the cooling system.