





# Chapter 3

## Cooling, heating and air conditioning systems

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### Degrees of difficulty

Easy, suitable for novice with little experience		Fairly easy, suitable for beginner with some experience		Fairly difficult, suitable for competent DIY mechanic		Difficult, suitable for experienced DIY mechanic		Very difficult, suitable for expert DIY or professional	
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### Specifications

#### Coolant

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

#### Expansion tank cap

System pressure . . . . .	1.0 bar
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#### Thermostat

4-cylinder engines:	
Starts-to-open temperature . . . . .	76° to 80°C
Fully-open temperature . . . . .	88°C
V6 engines:	
Fully-open temperature . . . . .	78°C

#### Air conditioning system

Refrigerant . . . . .	R12 or R134a
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#### Torque wrench settings

	Nm	lbf ft
Water outlet elbow to thermostat housing . . . . .	25	18
Thermostat housing to cylinder head . . . . .	25	18
Water pump:		
to cylinder block ("M" series engines) . . . . .	25	18
housing cover bolts ("T" series engines) . . . . .	7	5
to engine plate (V6 engines):		
M6x22 . . . . .	22	16
M6x25 . . . . .	12	9
Engine mounting bracket bolts . . . . .	25	18
Timing belt tensioner plate . . . . .	12	9
Intercooler to radiator bolts . . . . .	15	11
Air conditioning condenser pipe unions:		
M17 bolts . . . . .	17	13
M22 bolts . . . . .	12	9
Air conditioning condenser pipe union bolts (From VIN 152206) . . . . .	10	7
Air conditioning compressor pipe unions . . . . .	25	18
Air conditioning compressor mounting bolts . . . . .	25	18
Air conditioning compressor pipe bracket bolt . . . . .	10	7
Air conditioning receiver/dryer pipe unions . . . . .	12	9
Air conditioning evaporator pipe unions . . . . .	25	18

### 1 General information

#### Engine cooling system

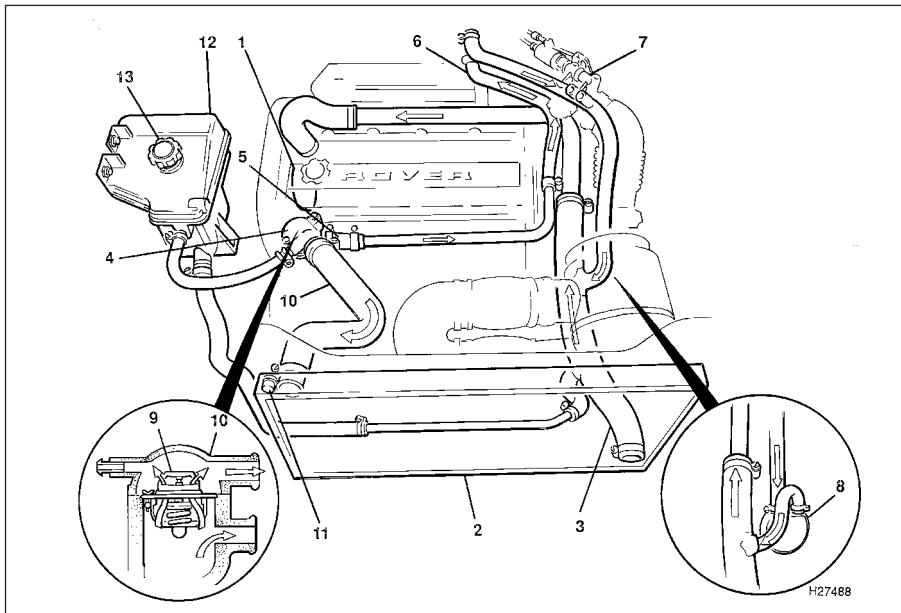
The cooling system is of the pressurized, pump-assisted thermosyphon type. The system consists of the radiator, water pump, thermostat, electric cooling fan, expansion tank and associated hoses (see illustrations). On "M" series 4-cylinder engines, and V6 engines, the impeller type water pump is mounted on the right-hand end of the engine, and is driven by the timing belt. On "T" series 4-cylinder engines, the water pump is mounted behind, and driven by, the power steering pump, which itself is driven by the auxiliary drive belt.

The system functions as follows. Cold coolant in the bottom of the radiator left-hand tank passes, via hoses and pipes, 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, and is diverted through a bypass hose to the heater matrix. On 4-cylinder engines, after passing through the heater, the coolant travels through the water jacket of the inlet manifold or throttle housing, and to the turbocharger, or to the automatic transmission fluid cooler where applicable, before returning to the water pump inlet hose. On V6 engines, after passing through the heater, the coolant circulates through the engine oil cooler, fuel system fast idle valve, idle control valve, throttle body and inlet manifold and to the automatic transmission fluid cooler, where applicable, before returning to the water pump.

When the engine is cold, the thermostat remains closed, and the coolant only circulates as described. When the coolant reaches a predetermined temperature, the thermostat opens, and the coolant passes through the top hose to the radiator right-hand tank. As the coolant circulates around 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(s) when necessary. Upon reaching the left-hand side of the radiator, the coolant is now cooled and the cycle is repeated.

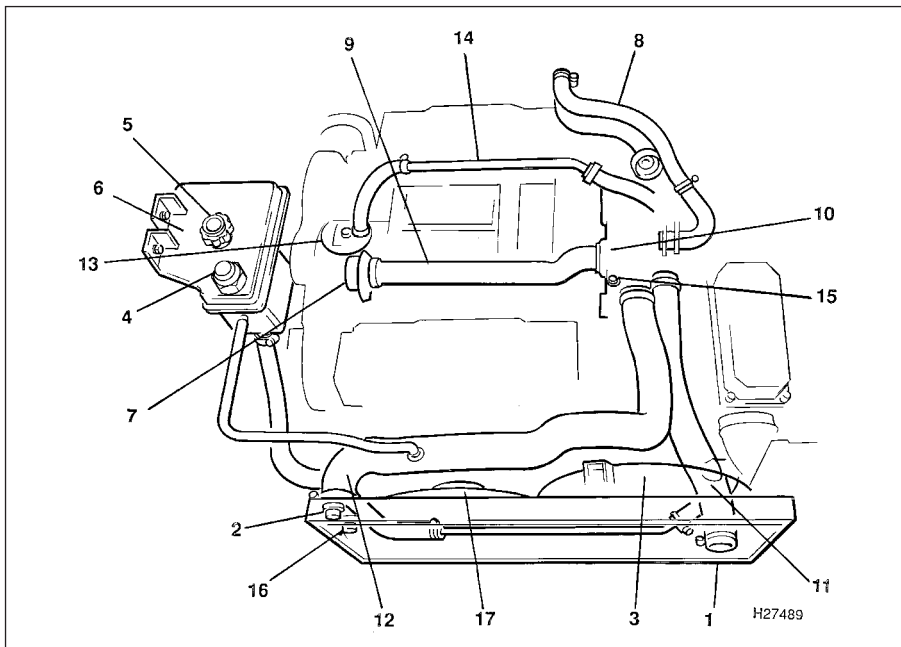
When the engine is at normal operating temperature, the coolant expands, and some of it is displaced into the expansion tank. This coolant collects in the tank, and is returned to the radiator when the system cools.

The electric cooling fan mounted on the radiator is controlled by a thermostatic switch, located in the radiator right-hand side tank. At a predetermined coolant temperature, the switch contacts close, thus actuating the fan. On models equipped with air conditioning, additional fans are fitted for cooling of the air conditioning system condenser.



1.1a Cooling system layout and flow diagram - 4-cylinder engines

- |   |                                       |                                    |
|---|---------------------------------------|------------------------------------|
| Dark arrows indicate hot coolant flow   | 4 Thermostat housing                  | 10 Coolant flow through top hose   |
| Light arrows indicate cold coolant flow | 5 Bypass (heater) hose                | 11 Cooling fan thermostatic switch |
| 1 Water pump                            | 6 Heater hose                         | 12 Expansion tank                  |
| 2 Radiator                              | 7 Throttle housing                    | 13 Pressure cap                    |
| 3 Bottom hose                           | 8 Automatic transmission fluid cooler |                                    |
|   | 9 Thermostat open                     |                                    |



1.1b Cooling system layout - V6 engines

- |                                   |                         |   |
|-----------------------------------|-------------------------|---|
| 1 Radiator                        | 7 Water pump            | 14 Oil cooler return pipe                             |
| 2 Cooling fan thermostatic switch | 8 Heater hoses          | 15 Bleed screw  |
| 3 Radiator cooling fan            | 9 Water pump inlet pipe | 16 Air conditioning condenser fan thermostatic switch |
| 4 Coolant low level switch        | 10 Thermostat housing   | 17 Air conditioning condenser fan                     |
| 5 Pressure cap                    | 11 Bottom hose          |   |
| 6 Expansion tank                  | 12 Top hose             |   |
|                                   | 13 Oil cooler           |   |



**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:** *If the engine is hot, the electric cooling fan(s) 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.*

### Heating 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. When the heater temperature control on the fascia is operated, a flap door opens to expose the heater box to the passenger compartment. When the blower control is operated, the blower fan forces air through the unit according to the setting selected.

### Air conditioning system

See Section 14.

## 2 Antifreeze - general information



**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. Antifreeze is highly toxic if ingested. Never leave antifreeze lying around in an open container, or in puddles on the floor; children and pets are attracted by its sweet smell, and may drink it. Check with local authorities about disposing of used antifreeze - many have collection centres which will see that antifreeze is disposed of safely.*

The cooling system should be filled with a water/ethylene glycol-based antifreeze solution, of a strength which will prevent freezing down to -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 Rover'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 goes down, find the cause and correct it.

The exact mixture of antifreeze-to-water which you should use depends on the relative weather conditions. On all V6 engines, and 4-cylinder engines equipped with air conditioning, the mixture should contain approximately 50% antifreeze. On 4-cylinder engines without air conditioning, approximately a 33% antifreeze mixture is recommended. Antifreeze concentrations greater than 55% for V6 engines or 60% for 4-cylinder engines are not recommended as the efficiency of the cooling system may be impaired. 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 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 coolant hose with a sharp knife, then slit it so that it can be peeled off in two pieces. While expensive, this is preferable to buying a new radiator. Check first, however, that a new hose is readily available.**

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 soap (or washing-up liquid) as a lubricant, or soften it by soaking it in boiling water, but take care to prevent scalding.

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.*

### 4-cylinder engines

#### Removal

1 Partially drain the cooling system (approximately 2.5 litres), using the procedure described in Chapter 1.

2 Slacken the clips and detach the radiator top hose and expansion tank hose from the water outlet elbow on the thermostat housing (see illustration).

3 Undo the two bolts and remove the water



**4.2 Detach the radiator top hose and expansion tank hose from the water outlet elbow**

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



4.3a Undo the two retaining bolts ...



4.3b ... and remove the water outlet elbow



4.4 Withdraw the thermostat from the housing

outlet elbow (see illustrations). Remove the gasket.

4 Withdraw the thermostat from its seat in the housing (see illustration).

5 To remove the housing, disconnect the coolant temperature sensor wiring multiplug(s). A single sensor is fitted to early engines; two are fitted to later engines.

6 Slacken the retaining clips, and disconnect the heater pipe connecting hose from the side of the housing.

7 Undo the two bolts, and remove the thermostat housing and gasket from the cylinder head (see illustration).

#### Testing

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

9 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.

10 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.**

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

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

13 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 or bottom of the container.

14 Heat the water, and check the temperature at which the thermostat begins to open, or is fully open. Compare this value with the figures given in the Specifications, then remove the thermostat and allow it to cool down; check that it closes fully.

15 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

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

- Position the unit with its support legs across the heater outlet pipe.
- Clean away all traces of old gasket from the mating faces, and use a new gasket, lightly smeared with jointing compound.
- Tighten the water outlet elbow retaining bolts to the specified torque.
- Top up the cooling system with reference to Chapter 1.

#### V6 engines

##### Removal

17 Refer to Chapter 4, Part D, and remove the air cleaner components as necessary for access to the thermostat housing.

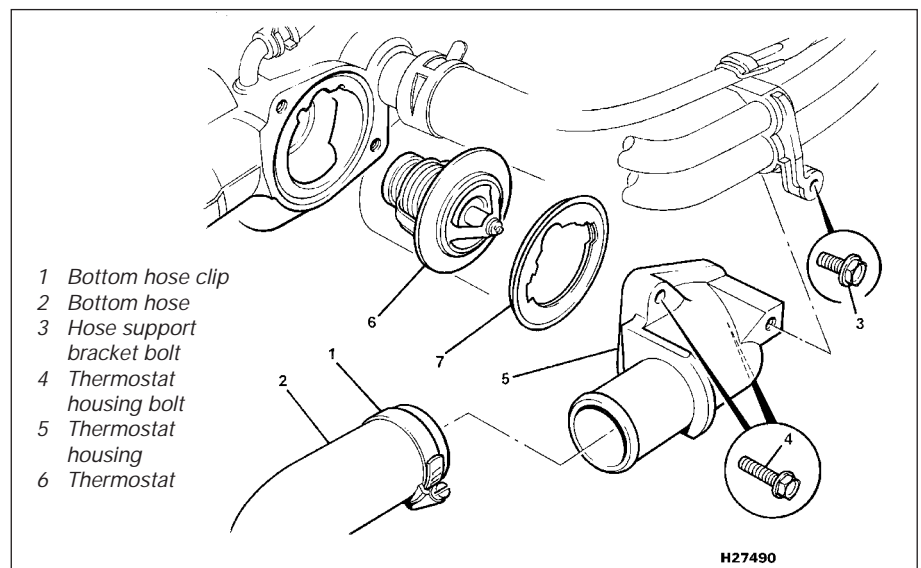
18 Partially drain the cooling system (approximately 2.5 litres), using the procedure described in Chapter 1.

19 Undo the bolt securing the hose support bracket to the thermostat housing and move the hoses aside (see illustration).

20 Slacken the clip and detach the radiator hose from the thermostat housing.

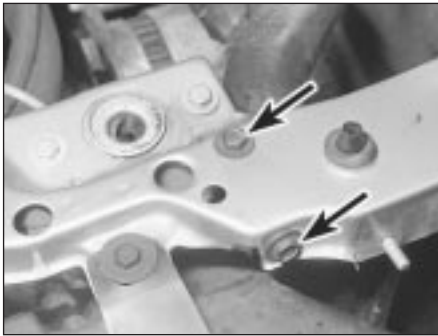


4.7 Removing the thermostat housing

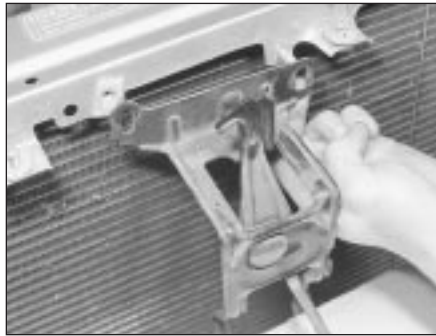


4.19 Thermostat and housing components on V6 engines





5.6 Centre platform retaining bolts - right-hand side (arrowed)



5.7 Remove the bonnet safety catch from the centre platform



5.8 Cut off the cable ties securing the bonnet release cable

21 Undo the three bolts and remove the thermostat housing and gasket.

22 Withdraw the thermostat from its seat in the housing.

### Testing

23 Refer to the procedures described above for 4-cylinder engines.

### Refitting

24 Refitting is a reversal of removal. Ensure that the housing mating surfaces are clean and use a new gasket.

## 5 Electric cooling fan assembly - testing, removal and refitting



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

**Note:** On cars equipped with air conditioning, a second cooling fan for the condenser is mounted alongside the main cooling fan for the radiator. The following procedures are applicable to both types of installation.

### Testing

1 The cooling fans are controlled by complex circuitry and their operation is dependant on a number of factors. Single or twin fans may be fitted, with variable speed operation. Numerous sensors used in conjunction with the engine management system and, where

fitted, the air conditioning system determine their operating temperature and at what speed they will run.

2 If it is suspected that the cooling fan(s) are not operating when high engine temperature would normally require them to do so, check the relevant fuses and relays (see Chapter 12) and ensure that all wiring connections are clean and soundly made.

3 Further testing can really only be carried out successfully using Rover test equipment and should therefore be entrusted to a dealer.

### Removal

4 On pre-1992 model year vehicles, remove the radiator grille as described in Chapter 11, Section 19.

5 On turbocharged and V6 engines, remove the engine undertray.

6 Undo the two bolts each side securing the centre platform to the body side members (see illustration).

7 Undo the nut and retaining bolt securing the bonnet safety catch to the centre platform (see illustration).

8 Lift the centre platform upwards, turn it over, and cut off the cable ties securing the bonnet release cable to the platform underside (see illustration). Remove the platform from the car.

9 Disconnect the cooling fan multiplug at the wiring connector (see illustration).

10 Undo the three retaining nuts (four on turbocharged engines), then carefully lift out

the cooling fan assembly (see illustrations). Note that the cooling fan, motor and cowl are a balanced assembly, and should not be dismantled. Should renewal be necessary, all three components are supplied as an assembled unit.

### Refitting

11 Refitting is a reversal of removal.

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



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

### Cooling fan thermostatic switch

**Note:** On cars equipped with air conditioning, a second thermostatic switch for the condenser fan is mounted in the radiator side tank, below the main thermostatic switch for the radiator cooling fan. The following procedures are applicable to both types of installation.

### Removal

1 Partially drain the cooling system (approximately 2.5 litres), as described in Chapter 1

2 Disconnect the two wires, remove the switch retaining ring, which is a bayonet



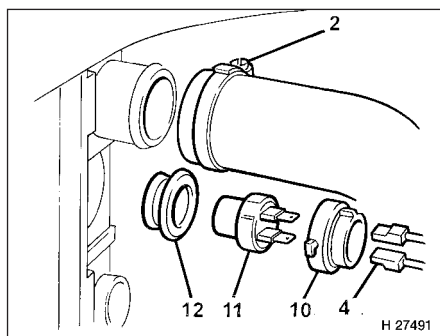
5.9 Disconnect the cooling fan multiplug at the wiring connector



5.10a Cooling fan upper retaining nut (arrowed)



5.10b Removing the cooling fan assembly



**6.2 Cooling fan thermostat switch components**

- |                           |                          |
|---------------------------|--------------------------|
| 2 Top hose retaining clip | 10 Switch retaining ring |
| 4 Wiring connectors       | 11 Switch                |
|                           | 12 Seal                  |

fitting, and withdraw the switch and seal from the radiator (see illustration).

### Refitting

3 Refitting is a reversal of removal, but renew the seal if the old one has deteriorated. Top up the cooling system as described in Chapter 1.

### Coolant temperature sensors

#### Removal

4 The coolant temperature sensors contain an element, the resistance of which alters

according to coolant temperature. The units control the operation of the temperature gauge, and are also used by the fuel and ignition system control units to determine engine temperature. Depending on the engine management system fitted, either a single sensor performs both functions, or a separate sensor is used for each.

5 On 4-cylinder engines either a single sensor, or two sensors are located on the thermostat housing. On V6 engines a single sensor is located in a coolant passage on top of the engine, just below the distributor.

6 Partially drain the cooling system (approximately 2.5 litres) as described in Chapter 1.

7 Disconnect the wiring multiplug, then unscrew the relevant sensor from its location (see illustrations).

#### Refitting

8 Refitting is a reversal of removal, but refill the cooling system as described in Chapter 1.

### 7 Radiator (4-cylinder engines) - removal, inspection and refitting

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

#### Radiator - normally aspirated engines

##### Removal

1 Drain the cooling system as described in Chapter 1. Leave the bottom radiator hose disconnected.

2 Slacken the retaining clip and disconnect the radiator top hose.

3 Disconnect the cooling fan motor multiplug(s) at the wiring connector(s).

4 Disconnect the wires at the thermostatic switch(s) just below the top hose outlet.

5 On pre-1992 model year vehicles, remove the radiator grille as described in Chapter 11, Section 19.

6 Undo the two bolts each side securing the centre platform to the body side members (see illustration 5.6).

7 Undo the nut and retaining bolt securing the bonnet safety catch to the centre platform (see illustration 5.7).

8 Lift the centre platform upwards, turn it over, and cut off the cable ties securing the bonnet release cable to the platform underside. Remove the platform from the car.

9 Lift the radiator upwards, and carefully remove it from the car.

10 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. Clear the matrix of flies and small leaves with a soft brush, or by hosing.

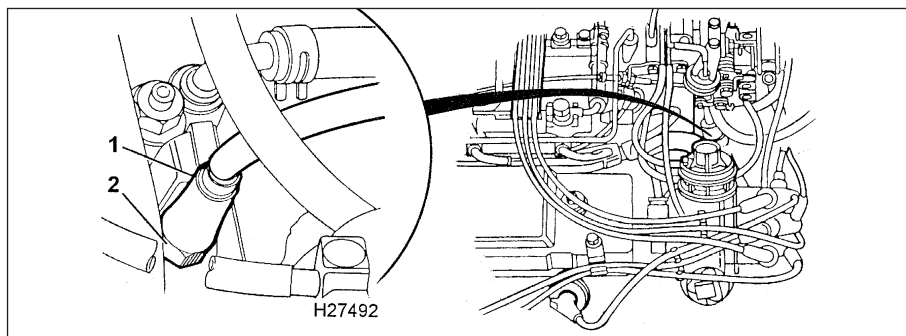
11 Reverse-flush the radiator, as described in Chapter 1. Renew the top and bottom hoses and clips if they are damaged or have deteriorated.

#### Refitting

12 Refitting the radiator is a reversal of removal, but ensure that the lower mounting lugs engage in the rubber grommets, and the centre platform grommets locate over the radiator upper lugs (see illustrations). Re-secure the bonnet release cable to the centre platform, using new cable ties. On completion, fill the cooling system as described in Chapter 1.



**6.7a Disconnecting the coolant temperature sensor multiplug on the 4-cylinder engine**



**6.7b Coolant temperature sensor location on V6 engines**

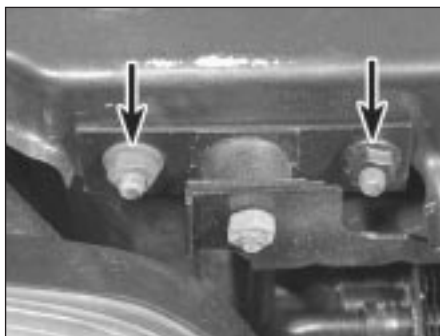
- |                    |                      |
|--------------------|----------------------|
| 1 Wiring multiplug | 2 Temperature sensor |
|--------------------|----------------------|



**7.12a Ensure that the radiator lower lugs (arrowed) engage with the rubber grommets . . .**



**7.12b . . . and the centre platform grommets (arrowed) locate over the radiator upper lugs**



8.4 Condenser-to-centre platform retaining nuts (arrowed) on the right-hand side



8.6 Undo the screw and release the hose support strap from the fan cowl



9.3 Removing the lower backplate from the engine (early metal version shown, later plastic version similar)

## Radiator and intercooler - turbocharged engines

### Removal

- 13 Remove the right-hand headlight lens unit as described in Chapter 12, Section 7.
- 14 Remove the air cleaner components, as necessary for access to the radiator, as described in the relevant Part of Chapter 4.
- 15 Drain the cooling system as described in Chapter 1. Leave the bottom radiator hose disconnected.
- 16 Slacken the retaining clip and disconnect the radiator top hose.
- 17 Disconnect the cooling fan motor multiplug(s) at the wiring connector(s).
- 18 Disconnect the wires at the thermostatic switch(s) just below the top hose outlet.
- 19 On pre-1992 model year vehicles, remove the radiator grille as described in Chapter 11, Section 19.
- 20 Undo the two bolts each side securing the centre platform to the body side members.
- 21 Undo the nut and retaining bolt securing the bonnet safety catch to the centre platform.
- 22 Lift the centre platform upwards, turn it over, and cut off the cable ties securing the bonnet release cable to the platform underside. Remove the platform from the car.
- 23 Slacken the hose clip and disconnect the coolant outlet hose at the turbocharger.
- 24 Slacken the retaining clip and remove the air intake hose from the turbocharger.
- 25 Slacken the two clips and remove the air intake and outlet hoses from the intercooler.
- 26 Lift the radiator and intercooler upwards, and carefully remove the assembly from the car.
- 27 If required, remove the upper and lower mounting bolts and nuts and separate the intercooler from the radiator.
- 28 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. Clear the matrix of flies and small leaves with a soft brush, or by hosing.
- 29 Reverse-flush the radiator, as described in Chapter 1. Renew the top and bottom hoses and clips if they are damaged or have deteriorated.

### Refitting

- 30 Refitting the radiator and intercooler is a reversal of removal, but ensure that the lower mounting lugs engage in the rubber grommets, and the centre platform grommets locate over the radiator upper lugs. Re-secure the bonnet release cable to the centre platform, using new cable ties. On completion, fill the cooling system as described in Chapter 1.

## 8 Radiator (V6 engines) - removal, inspection and refitting



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

### Removal

- 1 Drain the cooling system as described in Chapter 1. Leave the bottom radiator hose disconnected.
- 2 On pre-1992 model year vehicles, remove the radiator grille as described in Chapter 11, Section 19.
- 3 Undo the two bolts each side securing the centre platform to the body side members (see illustration 5.6).
- 4 On vehicles with air conditioning, undo the two nuts securing the condenser to the front of the centre platform (see illustration).
- 5 Undo the nut and retaining bolt securing the bonnet safety catch to the centre platform (see illustration 5.7).
- 6 On vehicles equipped with air conditioning, cut off the cable ties or undo the screws and release the support straps, securing the various hoses to the centre platform and to the fan cowl (see illustration).
- 7 Lift the centre platform upwards, turn it over, and cut off the cable ties securing the bonnet release cable to the platform underside. Remove the platform from the car.
- 8 Slacken the retaining clip and disconnect the radiator top hose.
- 9 Disconnect the cooling fan motor multiplug(s) at the wiring connector(s).
- 10 Disconnect the wires at the thermostatic switch(s) just below the top hose outlet.

- 11 Where applicable, unscrew the union nuts and disconnect the automatic transmission oil cooler pipes from the radiator. Cover the disconnected pipes and fit blanking plugs to the radiator ports.

- 12 Lift the radiator upwards, and carefully remove it from the car.

- 13 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. Clear the matrix of flies and small leaves with a soft brush, or by hosing.

- 14 Reverse-flush the radiator, as described in Chapter 1. Renew the top and bottom hoses and clips if they are damaged or have deteriorated.

### Refitting

- 15 Refitting the radiator is a reversal of removal, but ensure that the lower mounting lugs engage in the rubber grommets, and the centre platform grommets locate over the radiator upper lugs (see illustrations 7.12a and 7.12b). Re-secure the bonnet release cable and hoses to the centre platform, using new cable ties. On completion, fill the cooling system as described in Chapter 1. On models with automatic transmission, top up the transmission fluid as described in Chapter 1.

## 9 Water pump (4-cylinder engines) - removal and refitting



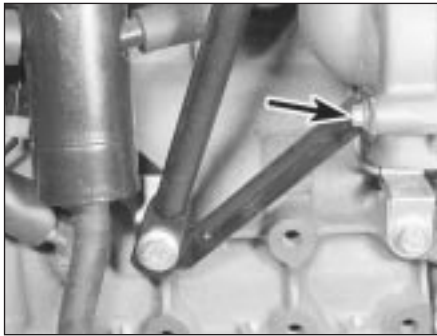
**Note:** Refer to the warnings given in Section 1 of this Chapter before starting work.

### "M" Series engines

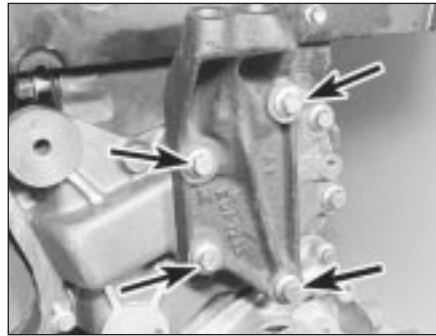
#### Removal

- 1 Drain the cooling system as described in Chapter 1.
- 2 Remove the timing belt as described in Chapter 2, Part A.
- 3 Undo the three remaining bolts securing the lower backplate to the engine, noting that on some engines, one bolt also retains a breather hose clip, and one retains an oil pipe clip. Remove the lower backplate (see illustration).

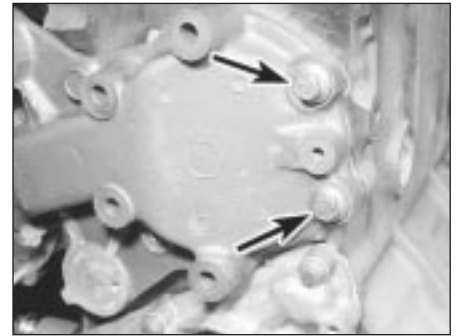




9.6 Undo the bolt (arrowed) securing the support strut to the housing



9.7 Undo the four bolts securing the right-hand engine mounting bracket to the water pump



9.8 Undo the remaining two bolts securing the water pump to the cylinder block

4 If not already done, undo the centre retaining bolt and remove the timing belt tensioner.

5 Slacken the clip and detach the water inlet hose from the rear of the pump.

6 Undo the bolt securing the support strut to the rear of the pump housing (see illustration).

7 Undo the four bolts securing the right-hand engine mounting bracket to the water pump, then remove the bracket (see illustration).

8 Undo the remaining two bolts securing the water pump to the cylinder block (see illustration).

9 Have a container handy to catch any remaining coolant, then withdraw the pump from the block. If necessary, carefully tap the pump body with a soft-faced mallet to free it.

10 With the pump removed, scrape away all traces of RTV sealant from the pump and cylinder block mating faces, ensuring that both are completely clean and dry.

11 If the pump is to be renewed, undo the three bolts or Torx type socket-headed screws, as applicable, and remove the timing belt tensioner mounting plate so that it can be transferred to the new pump. Note, however, that it will be necessary to obtain new bolts or screws, prior to refitting. These are of the micro-encapsulated type incorporating locking compound in their threads; consequently, they can only be used once.

## Refitting

12 If removed, locate the timing belt tensioner mounting plate in position, and fit

the three bolts or screws tightened to the specified torque.

Do not attempt to retighten any of the screws or bolts after the locking compound has set (approximately two minutes), otherwise the locking properties will be destroyed, and the screws may loosen in service.

13 Apply a thin, continuous bead of RTV sealant to the cylinder block mating face, and locate the water pump in position (see illustration).

14 Apply thread sealer to the two pump retaining bolts, and fit them finger-tight at this stage.

15 Apply thread sealer to the four engine mounting bracket-to-pump bolts, fit the bracket and tighten the bolts to the specified torque. Now tighten the two pump bolts fitted previously.

16 Refit the bolt securing the support strut to the rear of the pump housing.

17 Reconnect the inlet water hose.

18 Refit the lower backplate to the engine, and secure with the three bolts.

19 Refer to Chapter 2, Part A, and refit the timing belt.

20 Refit the auxiliary drivebelt and refill the cooling system as described in Chapter 1.

## "T" Series engines

### Removal

21 Drain the cooling system as described in Chapter 1.

22 Slacken the clip and detach the water inlet hose from the rear of the pump cover (see illustration).

23 Undo the five bolts and remove the pump cover from the housing.

24 Withdraw the pump assembly from the housing and, where fitted, collect and discard the three sealing rings. The sealing rings are used on factory assembly, but Loctite sealer is used instead, when the pump is refitted or renewed in service.

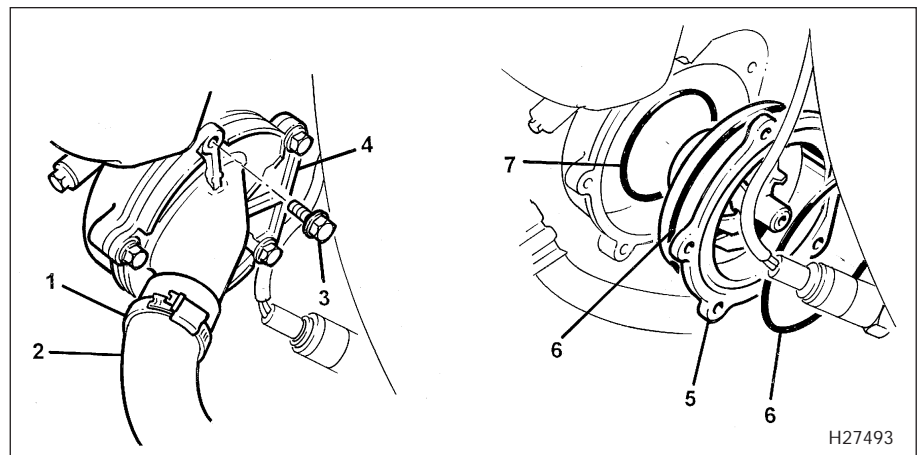
25 Thoroughly clean the sealing ring grooves, removing all traces of any old sealant (if the pump has been removed previously).

### Refitting

26 Refitting is a reversal of removal, but apply Loctite 405 to the sealing ring grooves, and tighten the retaining bolts to the specified torque. Refill the cooling system as described in Chapter 1 on completion.



9.13 Apply RTV sealant to the cylinder block mating face

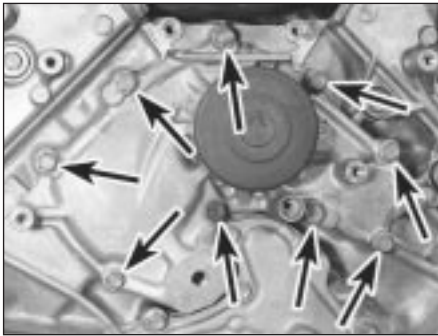


9.22 Water pump components on the "T" series engine

- |                              |                    |                      |
|------------------------------|--------------------|----------------------|
| 1 Hose clip                  | 4 Water pump cover | 6 Sealing rings      |
| 2 Water inlet hose           | 5 Water pump       | 7 Inner sealing ring |
| 3 Pump cover retaining bolts |                    |                      |

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10.3 Water pump retaining bolts (arrowed) on V6 engines

### 10 Water pump (V6 engines) - removal and refitting



**Note:** Due to the layout of the V6 engine and the limited space available in the engine compartment, access to most components is extremely limited and may present unforeseen difficulties. Read through all the relevant procedures and familiarize yourself with what's involved before proceeding.

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

#### Removal

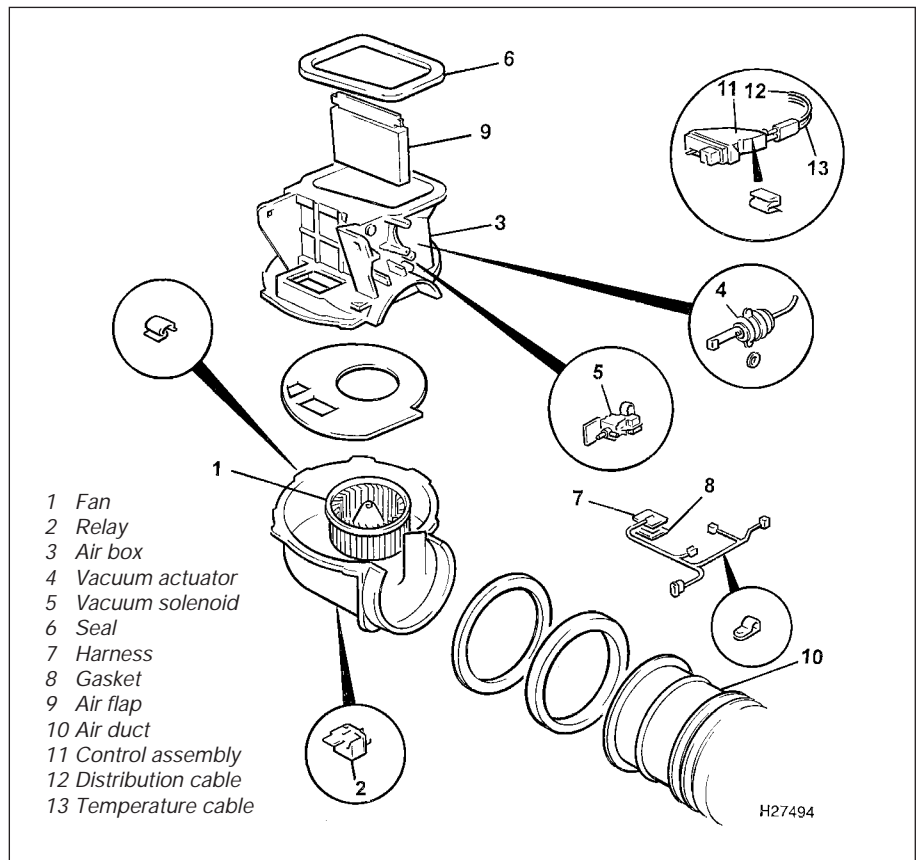
- 1 Drain the cooling system as described in Chapter 1.
- 2 Remove the timing belt and timing belt tensioner as described in Chapter 2, Part B.
- 3 Undo the nine bolts securing the water pump to the engine front plate, noting that two are of a different length than the rest (see illustration).
- 4 Withdraw the water pump and recover the large sealing O-ring.
- 5 Thoroughly clean the mating faces, locating dowels and O-ring recesses.

#### Refitting

- 6 Refitting is a reversal of removal, but use a new sealing O-ring, and tighten the retaining bolts to the specified torque. Refit the timing belt and tensioner as described in Chapter 2,



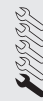
11.6 Blower motor wiring multiplug



11.4 Exploded view of the heater blower motor housing assembly

Part B, and refill the cooling system as described in Chapter 1.

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



#### Heater blower motor and housing assembly

##### Removal

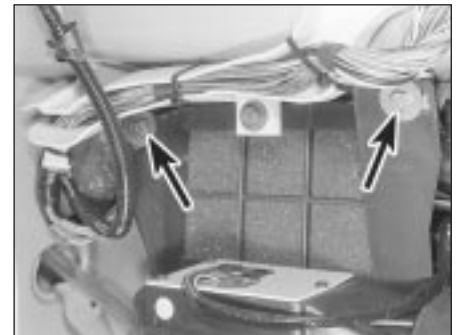
- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 2 Remove the trim panel under the fascia on the passenger's side.



11.7 Solenoid vacuum hose (arrowed)

- 3 Open the glovebox, undo the two screws securing the glovebox bar, and remove the glovebox.

- 4 Disconnect the air duct from the side of the unit, and recover the seals (see illustration).
- 5 Release the screw cap and undo the fascia retaining bolt at the extreme end, adjacent to the door aperture.
- 6 Disconnect the blower motor wiring multiplug (see illustration).
- 7 Disconnect the vacuum hose at the solenoid (see illustration).
- 8 Undo the two upper bolts and one lower nut securing the heater housing assembly in position, and remove the unit from under the fascia (see illustrations).



11.8a Undo the two upper bolts (arrowed) . . .



11.8b ... and lower nut (arrowed)

## Refitting

9 Refitting is a reversal of removal.

## Heater blower motor

### Removal

10 Remove the blower motor and housing assembly from the car as described previously.

11 Extract the clips securing the two halves of the housing assembly, and lift off the upper half.

12 Remove the separator plate.

13 Undo the nut and remove the fan from the motor.

14 Disconnect the cooling hose and wiring multiplug from the side of the motor.

15 Undo the motor retaining nuts, withdraw the motor and collect the gasket.

### Refitting

16 Refitting is a reversal of removal.

## Heater matrix

### Removal

17 Remove the fascia as described in Chapter 11.

18 Drain the cooling system as described in Chapter 1.

19 From within the engine compartment, disconnect the heater hoses at the matrix pipe stubs.

20 Remove the duct between the heater blower motor assembly and the matrix housing. Collect the two seals.

21 Extract the retaining stud from the driver's side footwell duct and remove the duct (see illustration).

22 Extract the two studs securing the rear compartment duct to the matrix casing, and slide the duct rearwards.

23 Remove the two retaining clips at the base of the matrix housing.

24 Undo the two upper retaining bolts and remove the matrix housing from the car (see illustration).

25 Remove the seal from the top of the housing.

26 Undo the screw and remove the left-hand duct.

27 Release the clips around the upper face aperture, and remove the face panel.

28 Release the clips securing the two halves of the matrix housing, and separate the housing.

29 Remove the matrix.

### Refitting

30 Refitting is a reversal of removal.

## Heater vacuum servo

### Removal

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

32 Remove the trim panel under the fascia on the passenger's side.

33 Open the glovebox, undo the two screws securing the glovebox bar, and remove the glovebox.

34 Disconnect the air duct from the side of the heater blower assembly, and recover the two seals.

35 Disconnect the vacuum hose at the servo unit.

36 Extract the retaining spire clip, and release the servo arm from the heater lever.

37 Undo the two screws and remove the servo from the heater assembly.

### Refitting

38 Refitting is a reversal of removal.

## Heater solenoid valve

### Removal

39 Proceed as described in paragraphs 31 to 34 above.

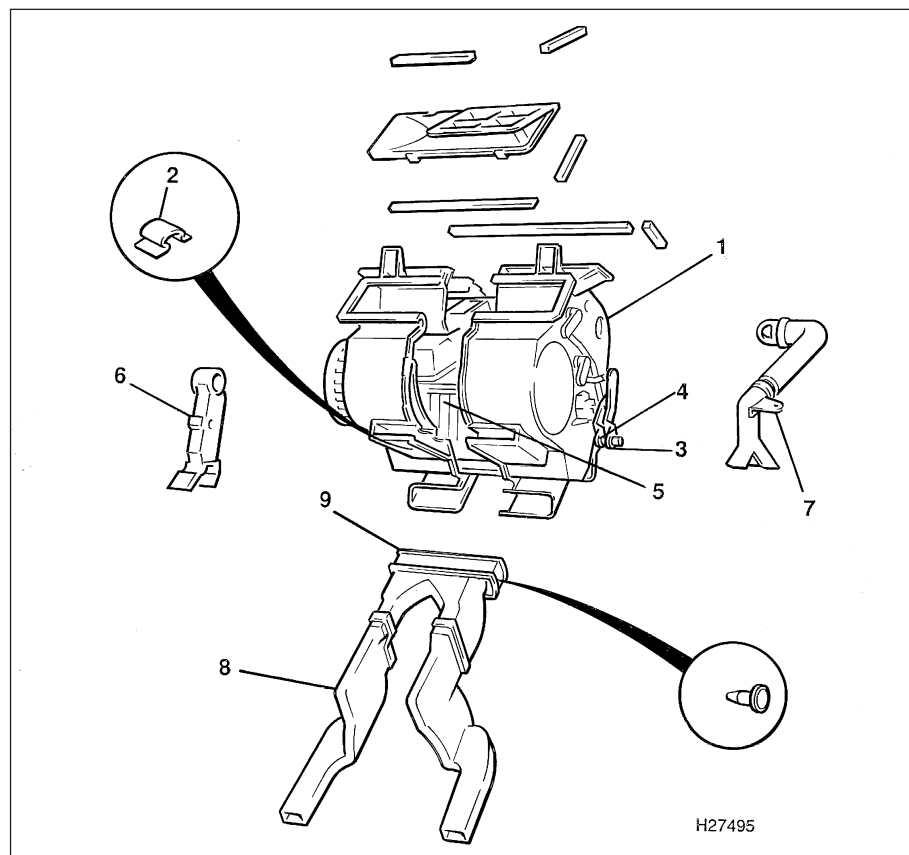
40 Disconnect the vacuum hose at the solenoid valve.

41 Disconnect the solenoid wiring multiplug.

42 Undo the retaining screw and remove the solenoid from the car.

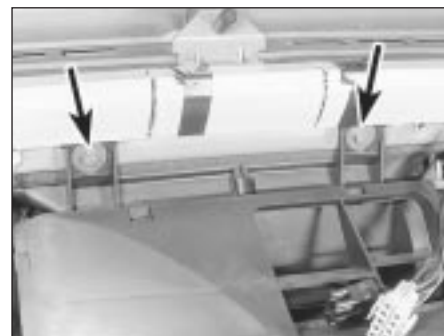
### Refitting

43 Refitting is a reversal of removal.



11.21 Exploded view of the matrix and housing assembly

- |                    |                      |              |
|--------------------|----------------------|--------------|
| 1 Housing assembly | 4 Distribution lever | 7 Duct       |
| 2 Clip             | 5 Heater matrix      | 8 Duct       |
| 3 Blend lever      | 6 Duct               | 9 Duct joint |



11.24 Matrix housing upper retaining bolts (arrowed)

## 12 Heater/air conditioning controls - removal and refitting



### Heater control unit and cables

#### Removal

- 1 Remove the cowl around the instrument panel as described in Chapter 12, Section 9.
- 2 Remove the trim panel under the facia on the driver's side.
- 3 Extract the outer cable retaining clips, and slip the cable ends off the heater levers.
- 4 Withdraw the control unit and cables from the facia.
- 5 Release the two inner and outer cables from the control unit.

#### Refitting

- 6 Refitting is a reversal of removal. When connecting the heater cables, adjust the position of the outer cables in their retaining clips so as to give full travel of the heater levers, consistent with full travel of the control levers.

### Air conditioning control unit

- 7 Refer to "Instrument cowl switch units" in Chapter 12, Section 4.

## 13 Air conditioning system - general information and precautions

### General information

The air conditioning system consists of a condenser mounted in front of the radiator, an evaporator mounted adjacent to the heater matrix, a compressor mounted on the engine, a receiver/dryer, and the plumbing connecting all of the above components (see illustration).

A blower fan forces the warmer air of the passenger compartment through the evaporator core (rather like a radiator in reverse), transferring the heat from the air to the refrigerant. The liquid refrigerant boils off into low-pressure vapour, taking the heat with it when it leaves the evaporator.

Two versions of the system are used, the change point being on models from VIN 152206 onwards. Both versions are virtually identical in component layout apart from minor differences in the condenser pipe connections. The main difference, however is that the later version uses the more environmentally friendly R134a refrigerant whereas the early version uses the ozone-depleting R12.

### Precautions



**Warning:** The air conditioning system is under high pressure. Do not loosen any fittings or remove any components until

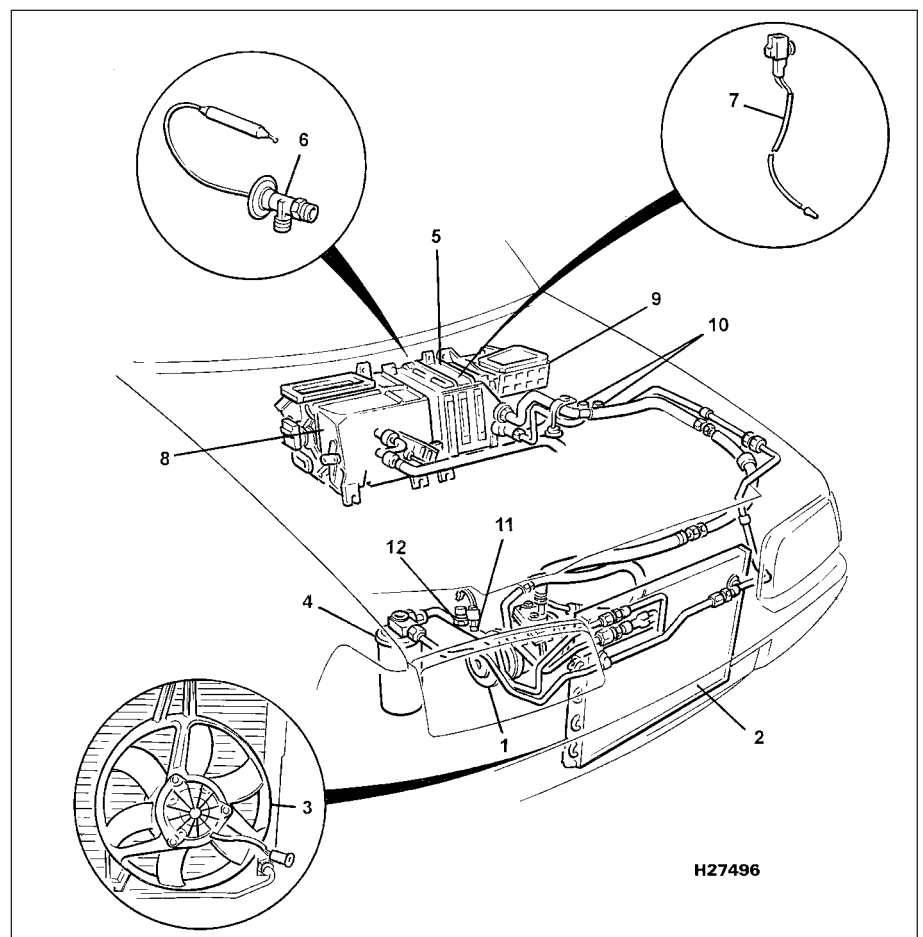
after the system has been discharged. Air conditioning refrigerant should be properly discharged into an approved type of container, at a dealer service department or an automotive air conditioning repair facility capable of handling the refrigerant safely. Always wear eye protection when disconnecting air conditioning system fittings.

When an air conditioning system is fitted, it is necessary to observe the following special precautions whenever dealing with any part of the system, its associated components, and any items which necessitate disconnection of the system:

- (a) While the refrigerant used on later models - R134a - is less damaging to the environment than the previously-used R12, both are very dangerous substances. They must not be allowed into contact with the skin or eyes, or there is a risk of frostbite. They must also not be

discharged in an enclosed space as there is a risk of suffocation. The refrigerant is heavier than air, and so must never be discharged over a pit.

- (b) The refrigerant must not be allowed to come in contact with a naked flame, otherwise a poisonous gas will be created - under certain circumstances, this can form an explosive mixture with air. For similar reasons, smoking in the presence of refrigerant is highly dangerous, particularly if the vapour is inhaled through a lighted cigarette.
- (c) Never discharge the system to the atmosphere - R134a is not an ozone-depleting ChloroFluoroCarbon (CFC) as is R12, but is instead a hydrofluorocarbon, which causes environmental damage by contributing to the "greenhouse effect" if released into the atmosphere.
- (d) R134a refrigerant must **not** be mixed with R12; the system uses different seals and



13.1 Air conditioning system layout (V6 engine installation shown - 4-cylinder engine installation similar)

- |                                  |                                      |  |
|----------------------------------|--------------------------------------|--|
| 1 Compressor                     | 6 Thermostatic expansion valve       | 9 Blower unit                                  |
| 2 Condenser                      | 7 Thermistor                         | 10 High and low pressure servicing connections |
| 3 Cooling fans (behind radiator) | 8 Heater distribution and blend unit | 11 High pressure switch                        |
| 4 Receiver/drier                 |                                      | 12 Dual pressure switch                        |
| 5 Evaporator                     |                                      |  |



has different fittings requiring different tools, so that there is no chance of the two types of refrigerant becoming mixed accidentally.

- (e) If for any reason the system must be disconnected, entrust this task to your Rover dealer or a refrigeration engineer.
- (f) It is essential that the system be professionally discharged prior to using any form of heat - welding, soldering, brazing, etc - in the vicinity of the system, before having the vehicle oven-dried at a temperature exceeding 70°C after repainting, and before disconnecting any part of the system.

### 14 Air conditioning system components - removal and refitting



**Warning:** Refer to the precautions given in the previous Section before proceeding.

#### Condenser

##### Removal

- 1 Have the refrigerant discharged at a dealer service department or an automotive air conditioning repair facility.
- 2 Disconnect the battery negative (earth) lead (see Chapter 5, Section 1).

3 On pre-1992 model year vehicles, remove the radiator grille as described in Chapter 11, Section 19.

4 Undo the two bolts each side securing the centre platform to the body side members.

5 Undo the two nuts securing the condenser to the front of the centre platform (see illustration).

6 Undo the nut and retaining bolt securing the bonnet safety catch to the centre platform.

7 Cut off the cable ties securing the various hoses to the centre platform.

8 Lift the centre platform upwards, turn it over, and cut off the cable ties securing the bonnet release cable to the platform underside. Remove the platform from the car.

9 On early models, using two spanners, one to unscrew the union nut and a second to counterhold the relevant pipe, unscrew the pipe unions on the front of the condenser. Where fitted, recover the O-rings from the pipe unions. Plug or cover the open pipes and condenser ports. On later models, undo the two pipe union retaining bolts and release the pipes. Recover the O-rings from the pipe connector ends.

10 Undo the bolts from the pipe support brackets and move the disconnected pipes aside.

11 Lift the condenser upwards, and carefully remove it from the car.

##### Refitting

12 Refitting the condenser is a reversal of

removal, but ensure that the lower mounting lugs engage in the rubber grommets, and the centre platform grommets locate over the radiator upper lugs. Re-secure the bonnet release cable and hoses to the centre platform, using new cable ties. Have the system evacuated, charged and leak-tested by the specialist who discharged it.

### Compressor - 4-cylinder engines

#### Removal

13 Have the refrigerant discharged at a dealer service department or an automotive air conditioning repair facility.

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

15 Raise the front of the vehicle and securely support it on axle stands.

16 Remove the auxiliary drivebelt (see Chapter 1).

17 Remove the alternator as described in Chapter 5.

18 Undo the bolts securing the alternator support bracket to the compressor and move the support bracket aside.

19 Disconnect the compressor clutch wiring at the in-line connector.

20 Unscrew the two pipe unions at the rear of the compressor and plug or cover the disconnected pipes and compressor ports. Where fitted, recover the O-rings from the pipe unions.

21 Undo the bolt securing the pipe bracket to the flange on the underside of the compressor.

22 Undo the upper and lower compressor mounting nuts and bolts and remove the unit upwards off the engine.

#### Refitting

23 Refitting the compressor is a reversal of removal. Tighten the unions and mountings to the specified torque. Have the system evacuated, charged and leak-tested by the specialist who discharged it.

### Compressor - V6 engines

#### Removal

24 Have the refrigerant discharged at a dealer service department or an automotive air conditioning repair facility.

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

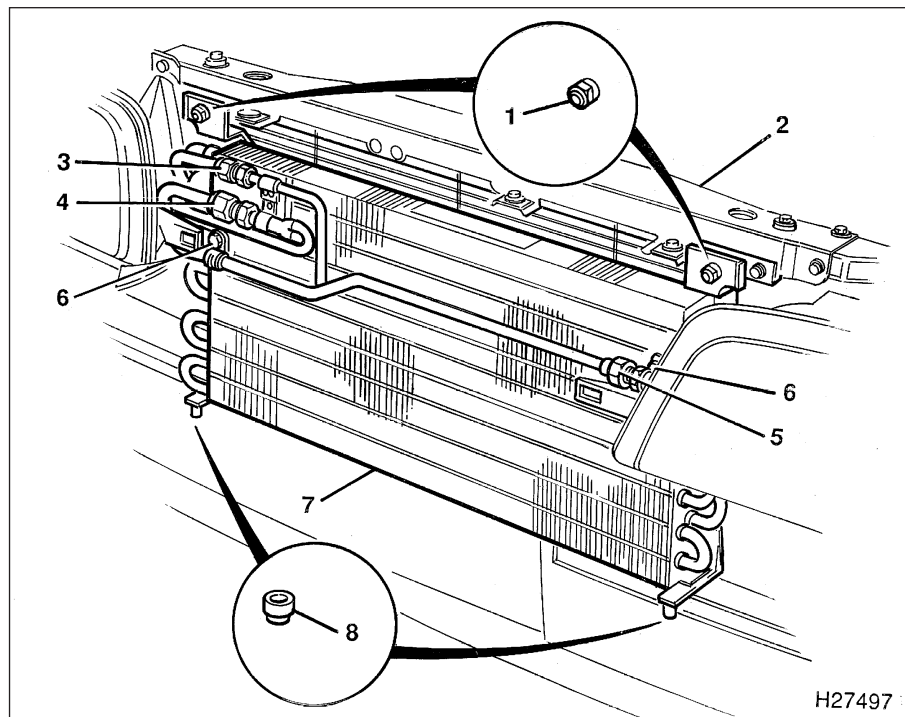
26 Raise the front of the vehicle and securely support it on axle stands.

27 Remove the auxiliary drivebelt (see Chapter 1).

28 Disconnect the compressor clutch wiring at the in-line connector (see illustration).

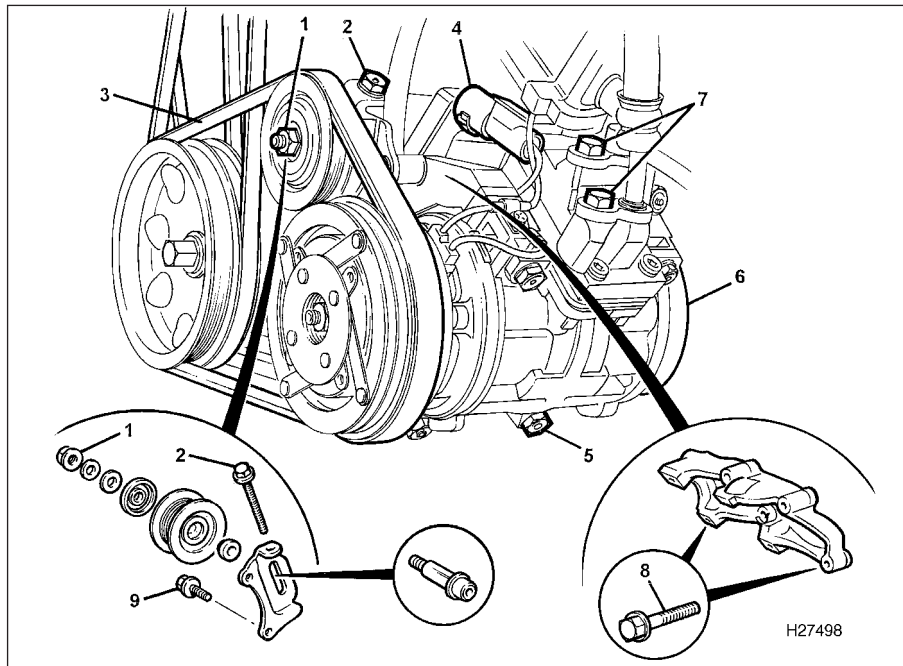
29 Undo the four compressor mounting bolts and withdraw the compressor from the mounting bracket.

30 Undo the two bolts and release the pipe mounting flanges from the compressor. Recover the O-rings from the pipe unions and plug or cover the disconnected pipes and compressor ports.



14.5 Air conditioning condenser mounting and attachment details (early version shown)

- |   |                  |                                      |
|---|------------------|--------------------------------------|
| 1 Condenser-to-centre platform retaining nuts | 4 Pipe union nut | 7 Condenser                          |
| 2 Centre platform                             | 5 Pipe union nut | 8 Lower mounting lug rubber grommets |
| 3 Pipe union nut                              | 6 Bracket        |                                      |



**14.28 Air conditioning compressor mountings and attachments on V6 engines**

- |                            |                             |                              |
|----------------------------|-----------------------------|------------------------------|
| 1 Tensioner pulley locknut | 4 Wiring connector          | 7 Pipe mounting flange bolts |
| 2 Tensioner adjuster bolt  | 5 Compressor mounting bolts | 8 Mounting bracket bolts     |
| 3 Drivebelt                | 6 Compressor                | 9 Tensioner bracket bolt     |

**31** Working under the car, place a jack and block of wood under the engine to support it, then unscrew the eight bolts that secure the engine longitudinal support member by approximately 15 mm - it should not be necessary to remove the bolts. Have an assistant lever the support member down to give increased clearance, which will allow the compressor to be removed from the car.

#### Refitting

**32** Refitting the compressor is a reversal of removal. Tighten the unions and all mountings to the specified torque. Have the system evacuated, charged and leak-tested by the specialist who discharged it.

#### Receiver/dryer

##### Removal

**33** Have the refrigerant discharged at a dealer service department or an automotive air conditioning repair facility.

**34** Unscrew the two pipe unions on top of the receiver/dryer and plug or cover the disconnected pipes and receiver/dryer ports (see illustration). Recover the O-rings from the pipe unions.

**35** Undo the three mounting bolts, move the adjacent components clear and remove the unit from the car.

##### Refitting

**36** Refitting the receiver/dryer is a reversal of removal. Tighten the unions and mountings to the specified torque. Have the system evacuated, charged and leak-tested by the specialist who discharged it.

#### Electric cooling fan assembly

**37** Refer to Section 5.

#### Blower motor

##### Removal

**38** Remove the trim panel under the facia on the passenger's side.

**39** Disconnect the wiring multiplug from the motor socket.

**40** Detach the hose from the motor and motor housing.

**41** Undo the three bolts and remove the motor from the blower housing.

#### Refitting

**42** Refitting is a reversal of removal.

#### Evaporator

##### Removal

**43** Have the refrigerant discharged at a dealer service department or an automotive air conditioning repair facility.

**44** Undo the five screws and remove the glovebox from the facia.

**45** Remove the radio/cassette player and the clock as described in Chapter 12.

**46** Undo the retaining screws and remove the glovebox bar.

**47** From within the engine compartment unscrew the two pipe unions using two spanners, one to unscrew the union nut and a second to counterhold the relevant pipe. Recover the O-rings from the pipe unions. Plug or cover the disconnected pipes immediately.

**48** Disconnect the thermistor wiring multiplug on the front face of the evaporator.

**49** Undo the evaporator mounting nuts and bolts, noting the location of any cable support brackets and clips.

**50** Disconnect the wiring at the connector multiplugs as the unit is withdrawn and remove the evaporator from the car.

##### Refitting

**51** Refitting the evaporator is a reversal of removal. Tighten the unions and mountings to the specified torque. Have the system evacuated, charged and leak-tested by the specialist who discharged it.

#### Blower housing

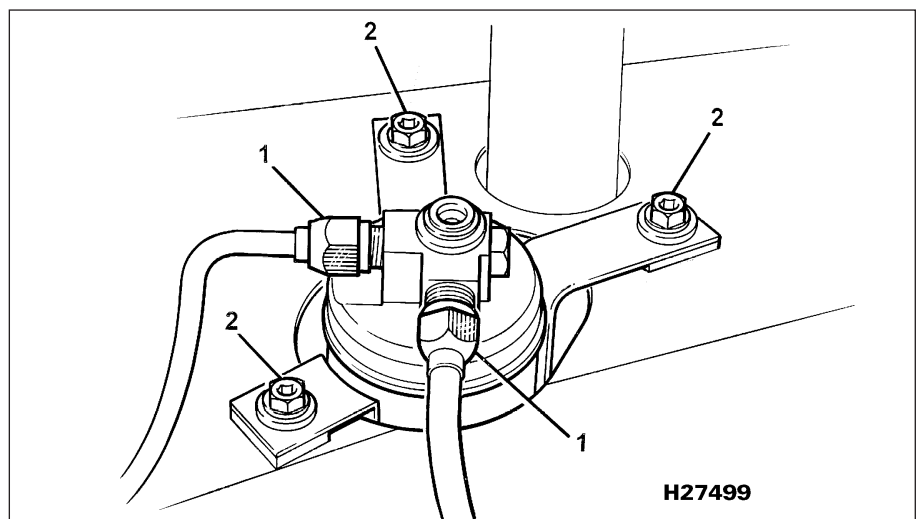
##### Removal

**52** Remove the evaporator as described previously.

**53** Disconnect the wiring multiplugs, undo the mounting bolts and remove the unit from the car.

##### Refitting

**54** Refitting is a reversal of removal.



**14.34 Air conditioning receiver/dryer pipe unions (1) and mounting bolts (2)**