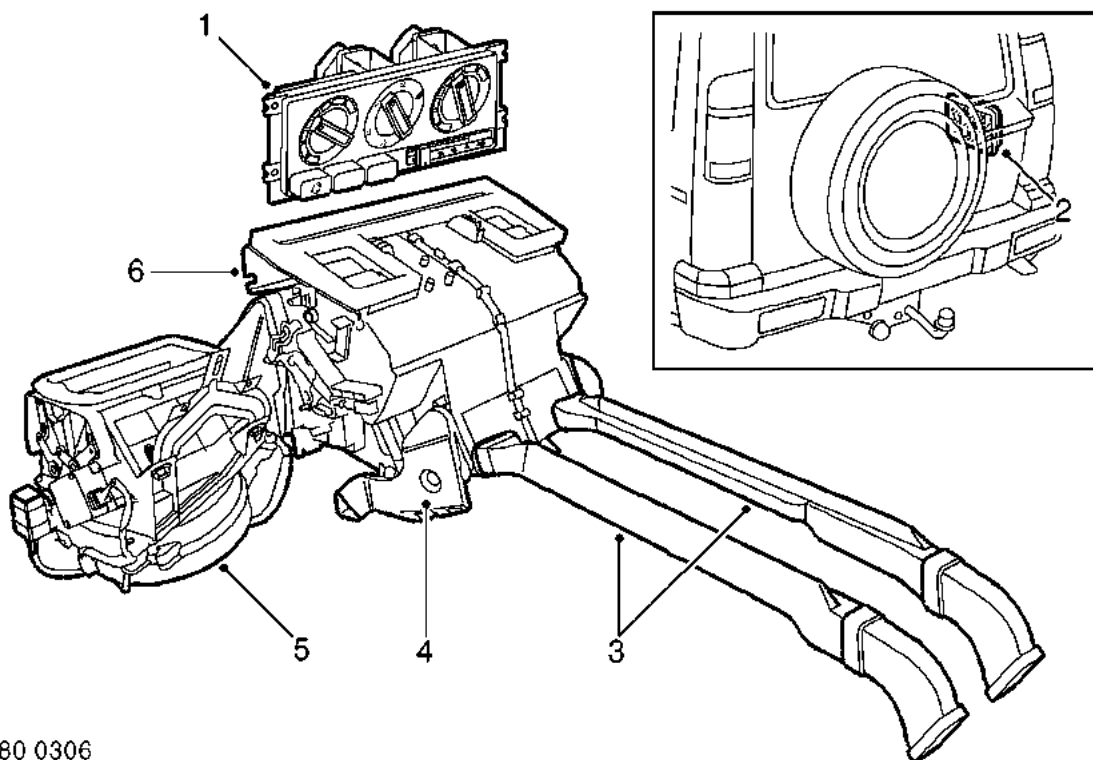


## Heating and ventilation component layout



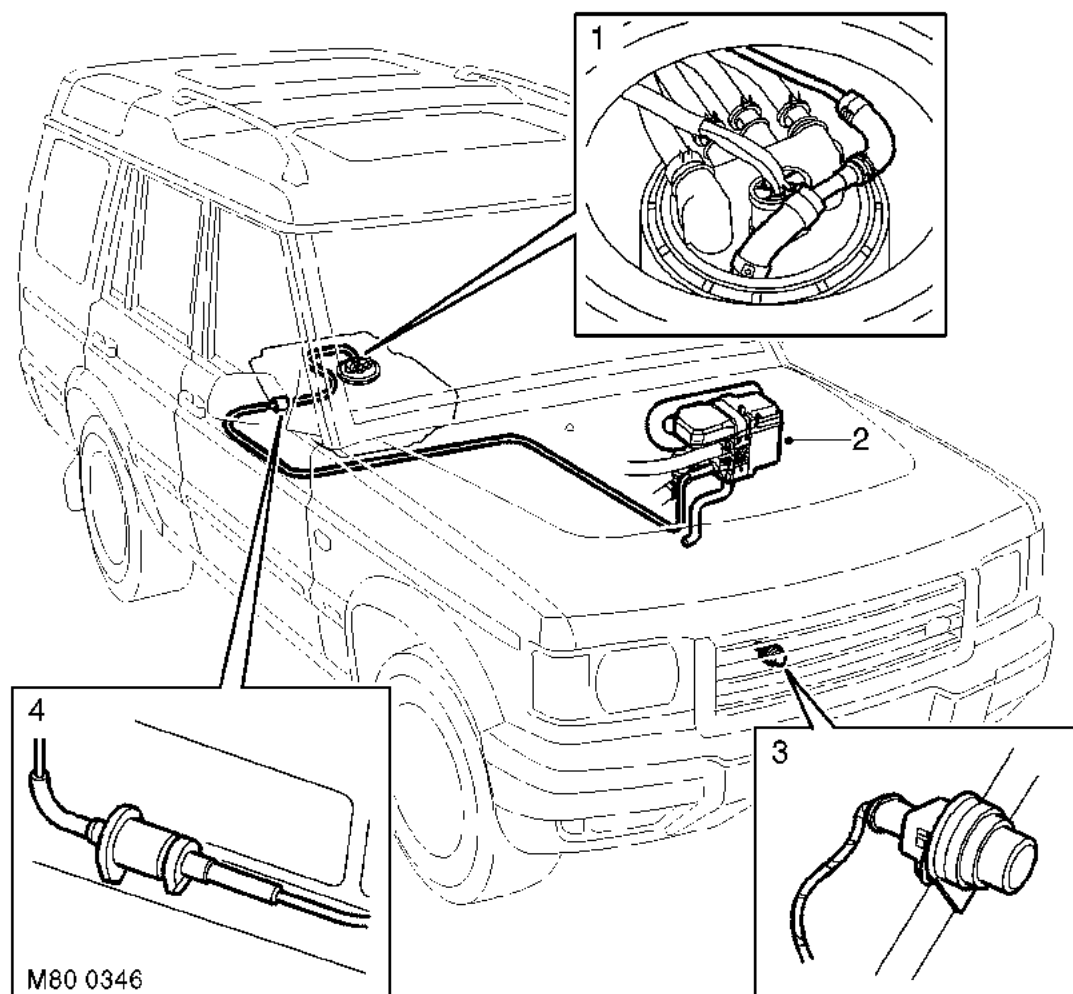
M80 0306

*RH drive shown, LH drive similar*

- |                       |                       |
|-----------------------|-----------------------|
| 1 Control panel       | 4 Front footwell duct |
| 2 Outlet vent         | 5 Air inlet duct      |
| 3 Rear footwell ducts | 6 Heater assembly     |

## HEATING AND VENTILATION

### Fuel burning heater component layout



- 1 FBH fuel line connection
- 2 FBH unit

- 3 Air temperature sensor
- 4 FBH pump

*RH drive shown, LH drive similar*



---

## Description

---

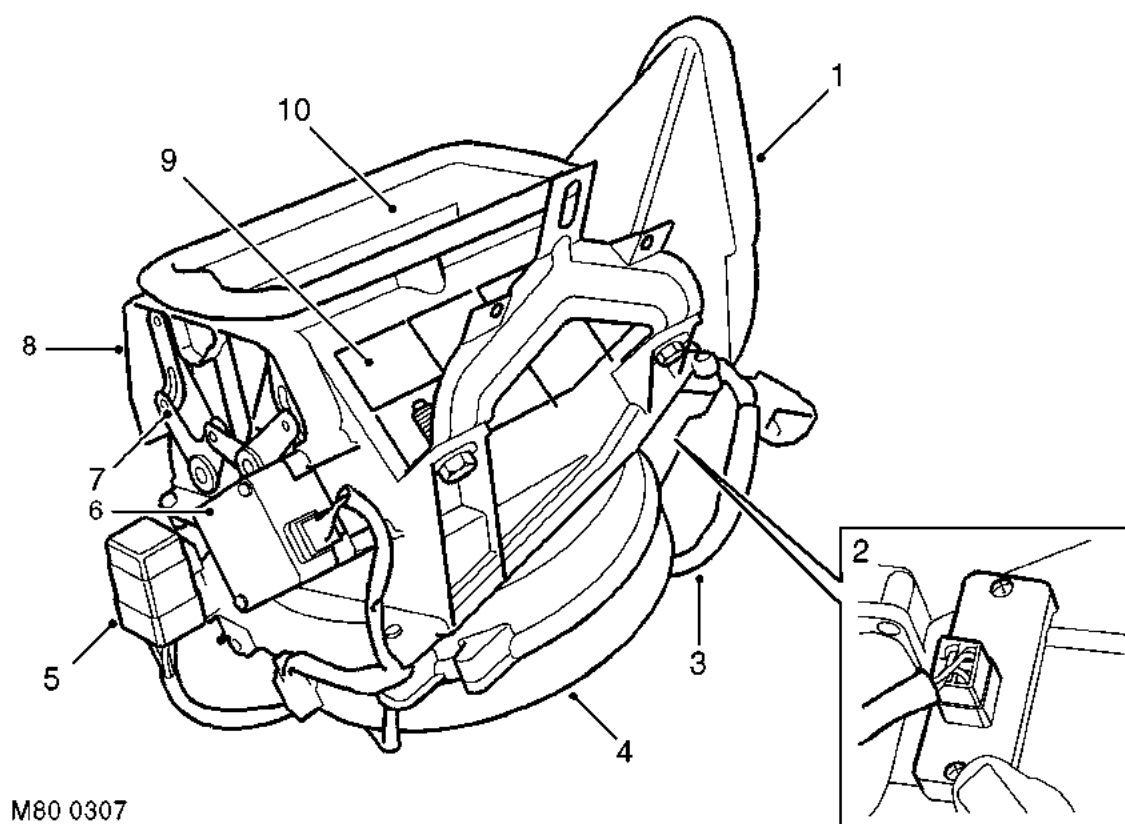
### General

The heating and ventilation system controls the temperature and distribution of air supplied to the vehicle interior. The system consists of an air inlet duct, heater assembly, distribution ducts and a control panel. An outlet vent is incorporated at the rear of the cabin. Some diesel models also incorporate a fuel burning heater (FBH) system in the engine coolant supply to the heater assembly.

Fresh or recirculated air flows into the heater assembly from the inlet duct. An electrical variable speed blower in the inlet duct, and/or ram effect, forces the air through the system. Depending on the settings on the control panel, the air is then heated and supplied through the distribution ducts to fascia and floor level outlets.

## HEATING AND VENTILATION

### Air inlet duct



M80 0307

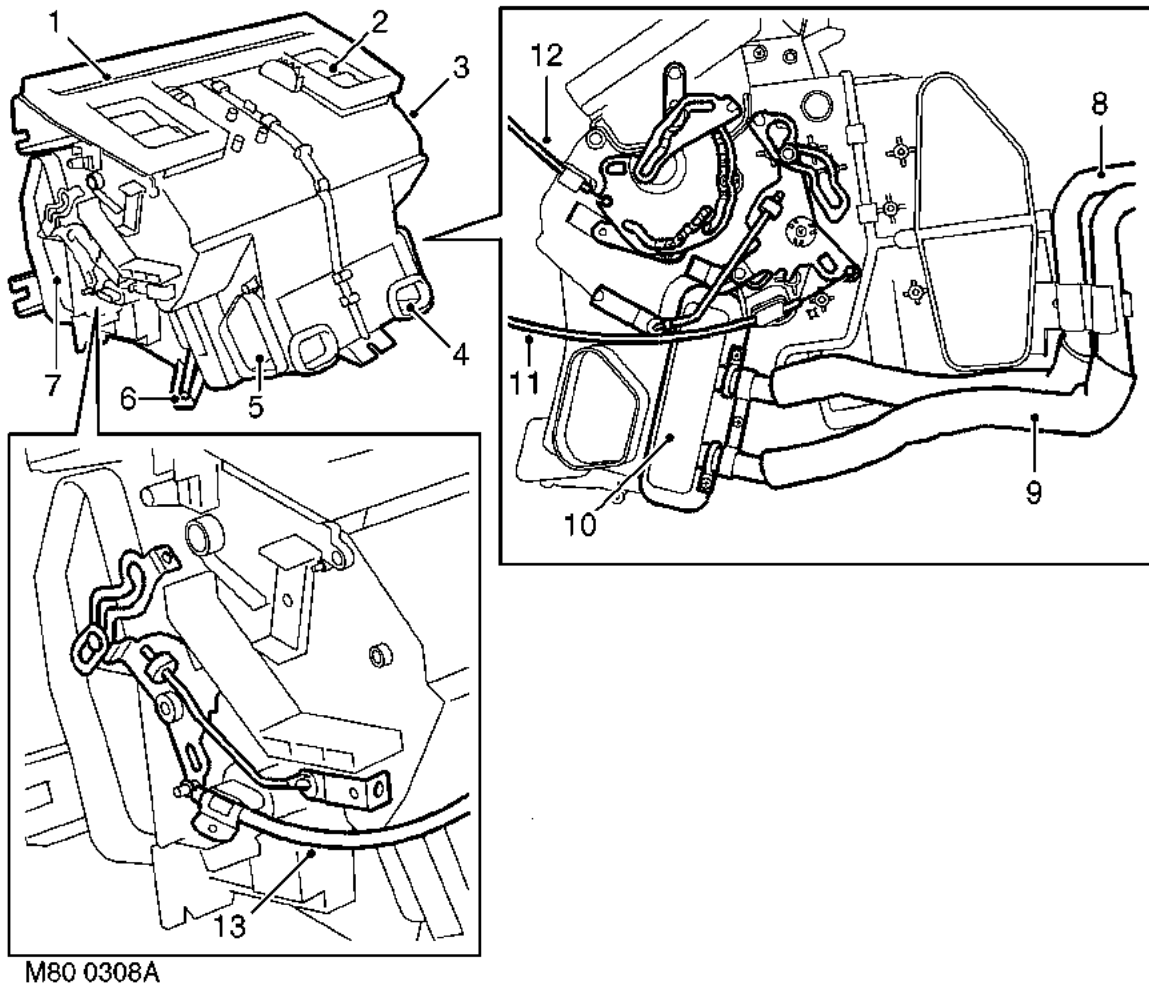
*RH drive shown, LH drive similar*

- |                  |                                    |
|------------------|------------------------------------|
| 1 Air outlet     | 6 Recirculated air servo motor     |
| 2 Resistor pack  | 7 Control flap operating mechanism |
| 3 Wiring harness | 8 Recirculated air inlet           |
| 4 Blower         | 9 Recirculated air inlet           |
| 5 Blower relay   | 10 Fresh air inlet                 |

The air inlet duct is installed behind the fascia, on the passenger's side. The air inlet duct is connected to the plenum to provide the fresh air inlet. Two grilles in the air inlet duct provide recirculated air inlets from the cabin. Two control flaps, operated by a servo motor, open and close the fresh and recirculated air inlets to control the source of incoming air. Operation of the servo motor is controlled by a switch on the control panel.

The blower is installed between the air inlets and the outlet to the heater assembly, and consists of an open hub, centrifugal fan powered by an electric motor. Operation of the blower is controlled by a slider switch on the control panel, via a blower relay mounted on the air inlet duct and a resistor pack. The resistor pack is installed in the air outlet from the blower fan, so that any heat generated is dissipated by the air flow. A wiring harness on the air inlet duct connects the servo motor, blower motor, blower relay and resistor pack to the vehicle wiring.

## Heater assembly



- 1 Windscreen and side window air outlet
- 2 Face level air outlet
- 3 Casing
- 4 Rear footwell air outlet
- 5 Front footwell air outlet
- 6 Drain outlet
- 7 Air inlet

- 8 Engine coolant return
- 9 Engine coolant feed
- 10 Heater matrix
- 11 RH temperature control cable
- 12 Distribution control cable
- 13 LH temperature control cable

The heater assembly heats and distributes air as directed by selections made on the control panel. The assembly is installed on the vehicle centre-line, between the fascia and the engine bulkhead. The heater assembly consists of a casing, formed from a series of plastic moldings, which contains a heater matrix and control flaps. Internal passages integrated into the casing guide the air through the casing and separate it into two flows, one for the LH outlets and one for the RH outlets. Two drain outlets at the bottom of the casing connect to overboard drain tubes installed in the sides of the transmission tunnel.

### Heater matrix

The heater matrix provides the heat source to warm the air being supplied to the distribution outlets. The heater matrix is an aluminium two pass, fin and tube heat exchanger, installed in the RH side of the casing. Two aluminium tubes attached to the heater matrix extend through the engine bulkhead to connect the heater assembly to the engine coolant system. When the engine is running, coolant is constantly circulated through the heater matrix by the engine coolant pump. On diesel models, the coolant flow is assisted by an electric pump while the FBH system is active.

## HEATING AND VENTILATION

### Control flaps

Control flaps are installed in the heater assembly to control the temperature and distribution of air. Blend flaps control the temperature and distribution flaps control the distribution.

### Temperature and distribution control

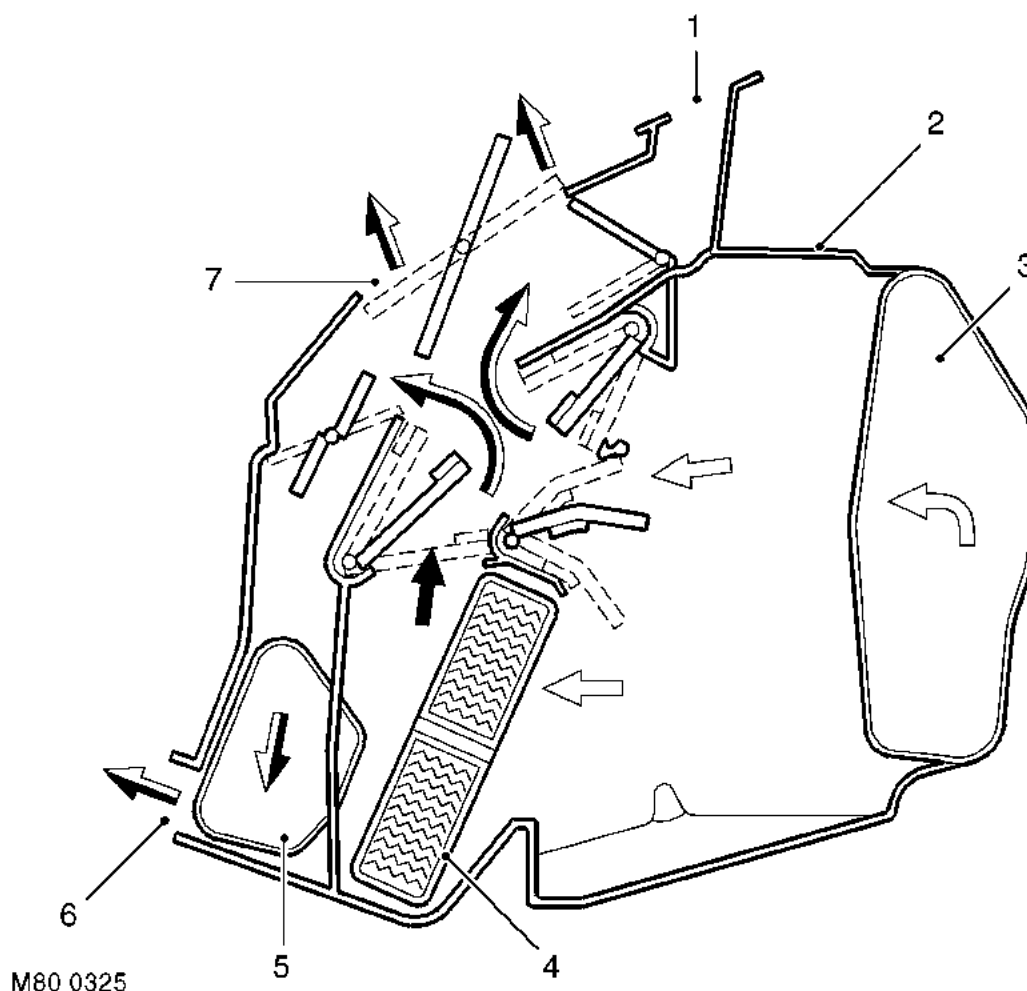


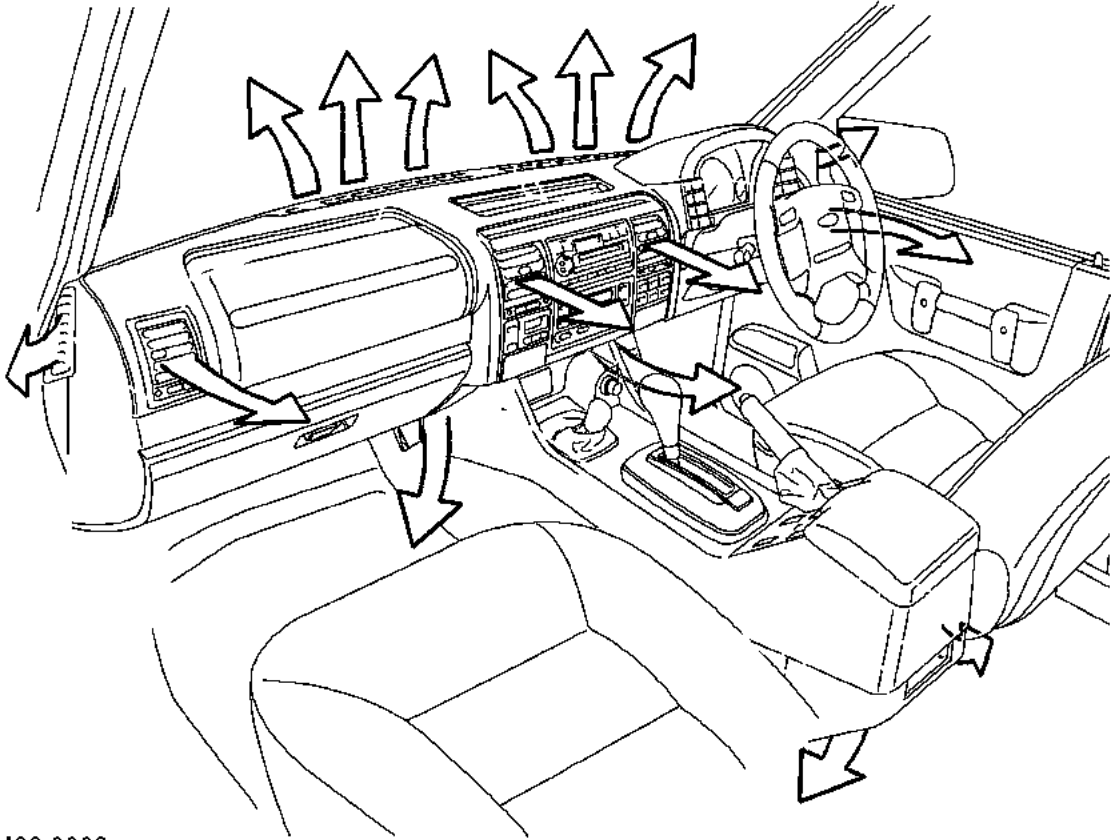
Figure shows flaps set for medium heat to face level and footwell outlets

- |                                  |                          |
|----------------------------------|--------------------------|
| 1 Windscreen/Side windows outlet | 5 Front footwells outlet |
| 2 Heater assembly casing         | 6 Rear footwells outlet  |
| 3 Air inlet                      | 7 Face level outlet      |
| 4 Heater matrix                  |                          |

**Blend flaps:** Two sets of three blend flaps, one LH and one RH, regulate the flow of air through the heater matrix and a heater matrix bypass, to control the temperature of the air leaving the heater assembly. The two sets of blend flaps operate independently to allow different temperatures to be set for the LH and RH outlets.

Each blend flap is attached to a spindle. The end of each spindle extends through the side of the heater casing and is attached to a common lever mechanism on the related side of the casing. A control cable is installed between the lever mechanism and the related temperature knob on the control panel. When the flow is split between the bypass and the heater matrix, the two flows mix downstream of the heater matrix to produce an even air temperature at the individual outlets.

**Distribution flaps:** Separate distribution flaps are installed to control the flow of air to the footwells, windscreen/side windows and the LH and RH face level outlets. The distribution flaps are attached to spindles that extend through the RH side of the heater casing and are attached to a common lever mechanism. A control cable is installed between the lever mechanism and the distribution knob on the control panel.

**Distribution ducts**

M80 0309

Separate distribution ducts are installed for the front and rear footwell outlets. Distribution ducts for the face level, windscreen and side windows outlets are integrated into the fascia. The front footwell ducts are attached to ports at the sides of the heater assembly. The rear footwell ducts locate in ports at the rear of the heater assembly and extend along each side of the centre console to vent into the rear footwells from below the cubby box.

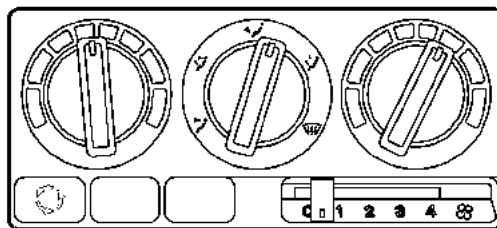
Vent assemblies in the fascia allow occupants to control the flow and direction of face level air. Each vent assembly incorporates a thumbwheel to regulate flow and moveable vanes to control direction.

cardiagn.com

## HEATING AND VENTILATION

---

### Control panel



M80 0310

The controls for heating and ventilation are installed on a control panel in the centre of the fascia, below the radio. Three rotary knobs control the LH and RH outlet temperatures and distribution. A slider switch controls blower speed. A latching pushswitch controls the selection of fresh/recirculated air; an amber LED in the switch illuminates when recirculated air is selected.

Graphics on the panel and the controls indicate the function and operating positions of the controls.

### Outlet vent

The outlet vent promotes the free flow of heating and ventilation air through the cabin. The outlet vent is installed in the RH rear quarter body panel and vents cabin air into the sheltered area between the rear quarter body panel and the outer body side panel. The vent consists of a grille covered by soft rubber flaps and is effectively a non-return valve. The flap opens and closes automatically depending on the differential between cabin and outside air pressures.

### FBH system (diesel models only)

The FBH system is an auxiliary heating system that compensates for the relatively low coolant temperatures inherent in the diesel engine. At low ambient temperatures, the FBH system heats the coolant supply to the heater assembly, and maintains it within the temperature range required for good in-car heating performance. Operation is fully automatic, with no intervention required by the driver.

The system consists of an air temperature sensor, a FBH fuel pump and a FBH unit. Fuel for the FBH system is taken from the fuel tank, through a line attached to the fuel tank's fuel pump, and supplied via the FBH fuel pump to the FBH unit. The connection on the fuel tank's fuel pump incorporates a tube which extends down into the tank. At the FBH unit connection, the fuel line incorporates a self-sealing, quick disconnect coupling. In the FBH unit, the fuel delivered by the FBH fuel pump is burned and the resultant heat output is used to heat the coolant. An ECU integrated into the FBH unit controls the operation of the system at one of two heat output levels, 2.5 kW at part load and 5 kW at full load.

### Ambient temperature sensor

The ambient temperature sensor controls a power supply from the alternator to the FBH unit. The sensor is installed on the RH support strut of the bonnet closing panel and contains a temperature sensitive switch that is closed at temperatures below 5 °C (41 °F) and open at temperatures of 5 °C (41 °F) and above.



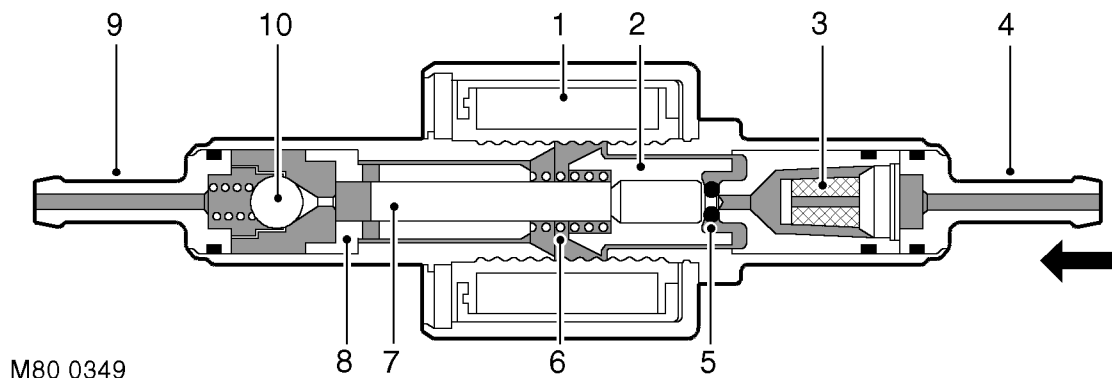
### FBH fuel pump

The FBH fuel pump regulates the fuel supply to the FBH unit. The FBH fuel pump is installed in a rubber mounting on the chassis crossmember immediately in front of the fuel tank. The pump is a self priming, solenoid operated plunger pump, with a fixed displacement of 0.063 ml/Hz. The ECU in the FBH unit outputs a pulse width modulated signal to control the operation of the pump. When the pump is de-energised, it provides a positive shut-off of the fuel supply to the FBH unit.

**FBH fuel pump nominal operating speeds/outputs**

Operating phase	Speed, Hz	Output, l/h (US galls/h)
Start sequence	0.70	0.159 (0.042)
Part load	1.35	0.306 (0.081)
Full load	2.70	0.612 (0.163)

**Sectioned view of FBH fuel pump**



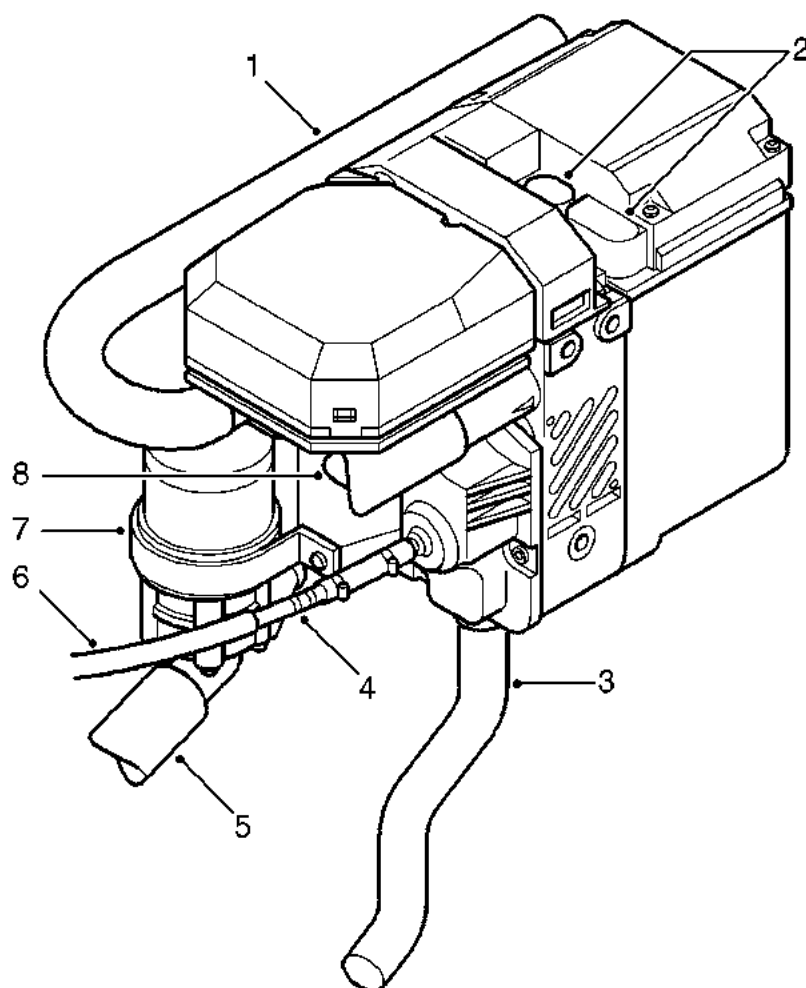
- |                       |                       |
|-----------------------|-----------------------|
| 1 Solenoid coil       | 6 Spring              |
| 2 Plunger             | 7 Piston              |
| 3 Filter insert       | 8 Bush                |
| 4 Fuel line connector | 9 Fuel line connector |
| 5 'O' ring seal       | 10 Non return valve   |

The solenoid coil of the FBH fuel pump is installed around a housing which contains a plunger and piston. The piston locates in a bush, and a spring is installed on the piston between the bush and the plunger. A filter insert and a fuel line connector are installed in the inlet end of the housing. A non return valve and a fuel line connector are installed in the fuel outlet end of the housing.

While the solenoid coil is de-energised, the spring holds the piston and plunger in the 'closed' position at the inlet end of the housing. An 'O' ring seal on the plunger provides a fuel tight seal between the plunger and the filter insert, preventing any flow through the pump. When the solenoid coil is energised, the piston and plunger move towards the outlet end of the housing, until the plunger contacts the bush, and draw fuel in through the inlet connection and filter. The initial movement of the piston also closes transverse drillings in the bush and isolates the pumping chamber at the outlet end of the housing. Subsequent movement of the piston then forces fuel from the pumping chamber through the non return valve and into the line to the FBH unit. When the solenoid coil de-energises, the spring moves the piston and plunger back towards the closed position. As the piston and plunger move towards the closed position, fuel flows passed the plunger and through the annular gaps and transverse holes in the bush to replenish the pumping chamber.

## HEATING AND VENTILATION

### FBH unit



M80 0311

- 1 Air inlet hose
- 2 Electrical connectors
- 3 Exhaust pipe
- 4 Quick disconnect coupling

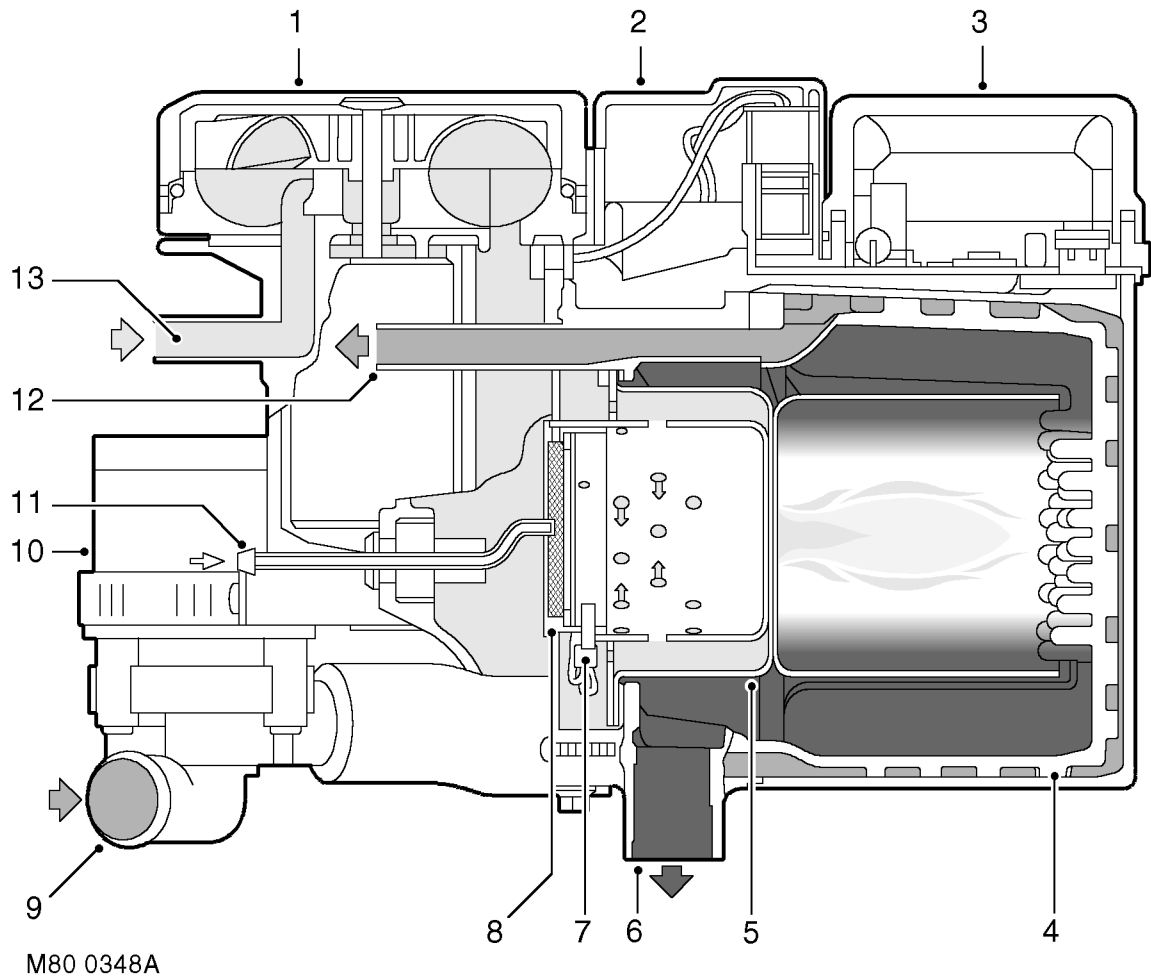
- 5 Coolant inlet hose
- 6 Fuel supply line
- 7 Circulation pump
- 8 Coolant outlet hose

The FBH unit is installed on the bulkhead in the engine compartment, on the side opposite the brake servo, and is connected in series in the coolant supply to the heater assembly. Two electrical connectors on the top of the FBH unit connect to the vehicle wiring.

**FBH unit connector pin details**

Connector/Pin No.	Description	Input/Output
<b>C0925</b>		
2	K line (diagnostics)	Input/Output
3	Alternator power supply	Input
6	FBH fuel pump	Output
<b>C0926</b>		
1	Battery power supply	Input
2	Earth	-

Sectioned view of FBH unit



- 1 Combustion air fan
- 2 Burner housing
- 3 ECU
- 4 Heat exchanger
- 5 Burner insert
- 6 Exhaust
- 7 Glow plug/flame sensor

- 8 Evaporator
- 9 Coolant inlet
- 10 Circulation pump
- 11 Fuel inlet
- 12 Coolant outlet
- 13 Air inlet

The FBH unit consists of:

- A circulation pump.
- A combustion air fan.
- A burner housing.
- An ECU/heat exchanger.
- An air inlet hose.
- An exhaust pipe.

**Circulation pump.** The circulation pump is installed at the coolant inlet to the FBH unit to assist the coolant flow through the FBH unit and the heater assembly. The pump runs continuously while the FBH unit is in standby or active operating modes. While the FBH unit is inactive, coolant flow is reliant on the engine coolant pump.

**Combustion air fan.** The combustion air fan regulates the flow of air into the unit to support combustion of the fuel supplied by the FBH pump. It also supplies the air required to purge and cool the FBH unit. Ambient air is supplied to the combustion air fan through an air inlet hose containing a sound deadening foam ring.

## HEATING AND VENTILATION

---

*Burner housing.* The burner housing contains the burner insert and also incorporates connections for the exhaust pipe, the coolant inlet from the circulation pump and the coolant outlet to the heater assembly. The exhaust pipe directs exhaust combustion gases to atmosphere at the bottom of the engine compartment.

The burner insert incorporates the fuel combustion chamber, an evaporator and a glow plug/flame sensor. Fuel from the FBH fuel pump is supplied to the evaporator, where it evaporates and enters the combustion chamber to mix with air from the combustion air fan. The glow plug/flame sensor provides the ignition source of the fuel:air mixture and, once combustion is established, monitors the flame.

*ECU/heat exchanger.* The ECU controls and monitors operation of the FBH system. Ventilation of the ECU is provided by an internal flow of air from the combustion air fan. The heat exchanger transfers heat generated by combustion to the coolant. A sensor in the heat exchanger provides the ECU with an input of heat exchanger casing temperature, which the ECU relates to coolant temperature and uses to control system operation. The temperature settings in the ECU are calibrated to compensate for the difference between coolant temperature and the heat exchanger casing temperature detected by the sensor. Typically: as the coolant temperature increases, the coolant will be approximately 7 °C (12.6 °F) hotter than the temperature detected by the sensor; as the coolant temperature decreases, the coolant will be approximately 2 °C (3.6 °F) cooler than the temperature detected by the sensor.

---

## Operation

---

### Air distribution

Turning the distribution knob on the control panel turns the control flaps in the heater assembly to direct air to the corresponding fascia and footwell outlets.

### Air temperature

Turning the LH or RH temperature knob on the control panel turns the related blend flaps in the heater assembly. The blend flaps vary the proportion of air going through the cold air bypass and the heater matrix. The proportion varies, between full bypass no heat and no bypass full heat, to correspond with the position of the temperature knob.

### Blower speed

The blower can be selected off or to run at one of four speeds. While the ignition is on, when the blower switch is set to positions 1, 2, 3, or 4, ignition power energises the blower relay, which supplies battery power to the blower. At switch positions 1, 2 and 3, the blower switch also connects the blower to different earth paths through the resistor pack, to produce corresponding differences of blower operating voltage and speed. At position 4, the blower switch connects an earth direct to the blower, bypassing the resistor pack, and full battery voltage drives the blower at maximum speed.

### Fresh/Recirculated inlet air

When the recirculated air switch is latched in, the amber indicator LED in the switch illuminates and an earth is connected to the recirculated air side of the fresh/recirculated air servo motor. The fresh/recirculated air servo motor then turns the control flaps in the air inlet duct to close the fresh air inlet and open the recirculated air inlets.

When the latch of the recirculated air switch is released, the amber indicator LED in the switch extinguishes and the earth is switched from the recirculated air side to the fresh air side of the fresh/recirculated air servo motor. The fresh/recirculated air servo motor then turns the control flaps in the air inlet duct to open the fresh air inlet and close the recirculated air inlets.

### FBH system (where fitted)

The FBH system operates only while the engine is running and the ambient temperature is less than 5 °C (41 °F). With the engine running and the ambient temperature below 5 °C (41 °F), the air temperature sensor connects the alternator power supply to the ECU in the FBH unit. On receipt of the alternator power supply, the ECU starts the circulation pump and, depending on the input from the temperature sensor in the heat exchanger, enters either a standby or active mode of operation. If the heat exchanger casing temperature is 65 °C (149 °F) or above, the ECU enters a standby mode of operation. If the heat exchanger casing temperature is below 65 °C (149 °F), the ECU enters an active mode of operation. In the standby mode, the ECU monitors the heat exchanger casing temperature and enters the active mode if it drops below 65 °C (149 °F). In the active mode, the ECU initiates a start sequence and then operates the system at full or part load combustion to provide the required heat input to the coolant.

### Start sequence

At the beginning of the start sequence the ECU energises the glow plug function of the glow plug/flame sensor, to preheat the combustion chamber, and starts the combustion air fan at slow speed. After 30 seconds, the ECU energises the FBH fuel pump at the starting sequence speed. The fuel delivered by the FBH fuel pump evaporates in the combustion chamber, mixes with air from the combustion air fan and is ignited by the glow plug/flame sensor. The ECU then progressively increases the speed of the FBH fuel pump and the combustion air fan to either part or full load speed, as required by the system. Once full or part load speed is achieved, the ECU switches the glow plug/flame sensor from the glow plug function to the flame sensing function to monitor combustion. From the beginning of the start sequence to stable combustion takes approximately 90 seconds for a start to part load combustion and 150 seconds for a start to full load combustion.

## HEATING AND VENTILATION

### **Coolant temperature control**

When the ECU first enters the active mode, it initiates a start to full load combustion. Full load combustion continues until the heat exchanger casing temperature reaches 60 °C (140 °F), when the ECU decreases the speed of the FBH fuel pump and the combustion air fan to half speed, to produce part load combustion. The ECU maintains part load combustion while the heat exchanger casing temperature remains between 54 and 65 °C (129 and 149 °F). If the heat exchanger casing temperature decreases to 54 °C (129 °F), the ECU switches the system to full load combustion again. If the heat exchanger casing temperature increases to 65 °C (149 °F), the ECU enters a control idle phase of operation.

On entering the control idle phase, the ECU immediately switches the FBH fuel pump off, to stop combustion, and starts a timer for the combustion air fan. After a 2 minute cooldown period, the ECU switches the combustion air fan off and then remains in the control idle phase while the heat exchanger casing temperature remains above 59 °C (138 °F). If the heat exchanger casing temperature decreases to 59 °C (138 °F), within 15 minutes of the ECU entering the control idle phase, the ECU initiates a start to part load combustion. If more than 15 minutes elapse before the heat exchanger casing temperature decreases to 59 °C (138 °F), the ECU initiates a start to full load combustion.

In order to limit the build-up of carbon deposits on the glow plug/flame sensor, the ECU also enters the control idle phase if the continuous part and/or full load combustion time exceeds 72 minutes. After the cooldown period, if the heat exchanger casing is still in the temperature range that requires additional heat, the ECU initiates an immediate restart to part or full load combustion, as appropriate.

### **Shutdown**

The FBH system is de-activated when the alternator power supply to the FBH unit is disconnected, either by the engine stopping or, if the ambient temperature increases to 5 °C (41 °F) or above, by the contacts in the air temperature sensor opening. If the system is active when the alternator power supply is disconnected, the ECU de-energises the FBH fuel pump to stop combustion, but continues operation of the combustion air fan and the circulation pump to cool down the FBH unit. The cool down time depends on the combustion load at the time the alternator power input is disconnected.

**Cool down times**

Combustion load	Cool down time, seconds
Part	100
Full	175

### **Diagnostics**

The ECU in the FBH unit monitors the system for faults. Any faults detected are stored in a volatile memory in the the ECU, which can be interrogated by Testbook. A maximum of three faults and associated freeze frame data can be stored at any one time. If a further fault is detected, the oldest fault is overwritten by the new fault.

The ECU also incorporates an error lockout mode of operation that inhibits system operation to prevent serious faults from causing further damage to the system. In the error lockout mode, the ECU immediately stops the FBH fuel pump, and stops the combustion air fan and circulation pump after a cool down time of approximately 2 minutes. Error lockout occurs for start sequence failures and/or combustion flameouts, heat exchanger casing overheat and out of limit input voltage. The error lockout mode can be cleared using Testbook, or by disconnecting the battery power supply for a minimum of 10 seconds.

**Start failure/flameout.** If a start sequence fails to establish combustion, or a flameout occurs after combustion is established, the ECU immediately initiates another start sequence. The start failure or flameout is also recorded by an event timer in the ECU. The event timer is increased by one after each start failure or flameout, and decreased by one if a subsequent start is successful. If the event timer increases to three (over any number of drive cycles), the ECU enters the error lockout mode.


**Heat exchanger casing overheat.** To protect the system from excessive temperatures, the ECU enters the error lockout mode if the heat exchanger casing temperature exceeds 105 °C (221 °F).

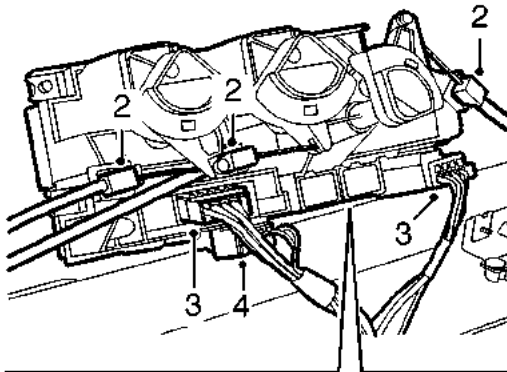
**Out of limit voltage.** The ECU enters the error lockout mode if the battery or alternator power input is less than 10.5 ± 0.3 V for more than 20 seconds, or more than 15.5 ± 0.5 V for more than 6 seconds.

## Heater control and fan switch

🔑 80.10.02

### Remove


1. Remove louvre panel assembly.  
 **INTERIOR TRIM COMPONENTS, REPAIRS, Louvre panel assembly - centre fascia.**



M80 0326

2. Release temperature and air distribution cable abutments from heater control housing and disconnect inner cables from controls.
3. Disconnect multiplugs from switches.
4. Disconnect multiplug from control illumination.
5. Remove heater control.
6. Remove 3 switches from heater control.

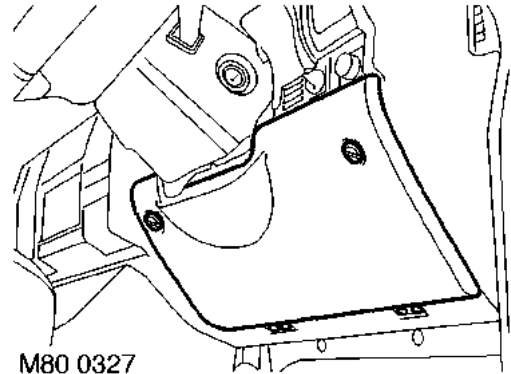
### Refit

1. Fit switches to heater control housing.
2. Position heater control assembly and connect multiplugs to switches and illumination.
3. Connect heater control cables and secure outer cable abutments to casing.
4. Fit louvre panel assembly.  
 **INTERIOR TRIM COMPONENTS, REPAIRS, Louvre panel assembly - centre fascia.**

## Cables - heater control

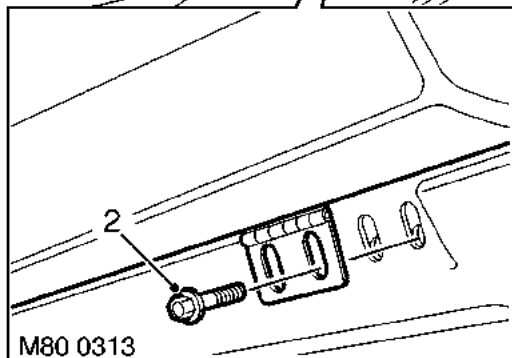
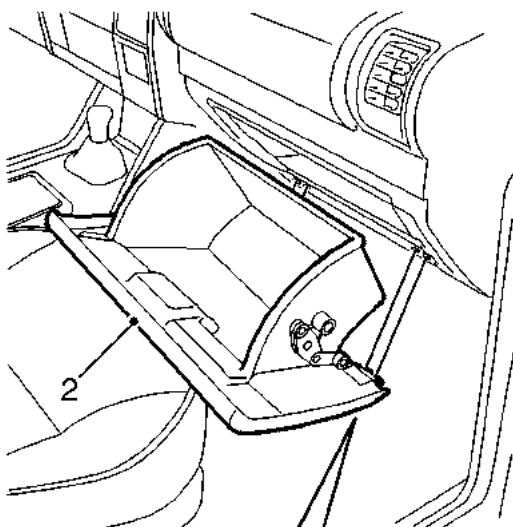
🔑 80.10.06


### Remove

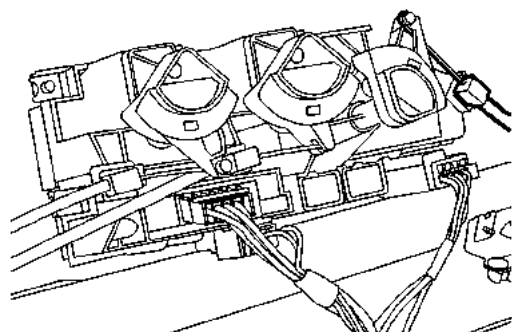


M80 0327

1. **Driver temperature control and air flow control cables:** Release fixings and lower fascia fuse box access cover.

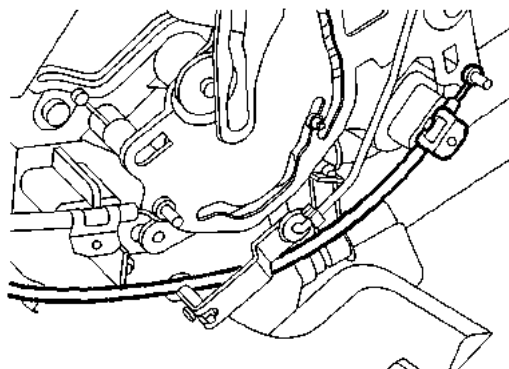


2. **Passenger temperature control cable:**  
Remove 4 screws securing glove box, release catch and remove glove box.
3. Remove louvre panel assembly.  
 **INTERIOR TRIM COMPONENTS, REPAIRS, Louvre panel assembly - centre fascia.**



M80 0328


4. Release control cable abutment from control housing and disconnect inner cable from control.



M80 0329

5. Release clip securing control outer cable to heater case and disconnect inner cable from flap lever.
6. Remove control cable.

## Refit

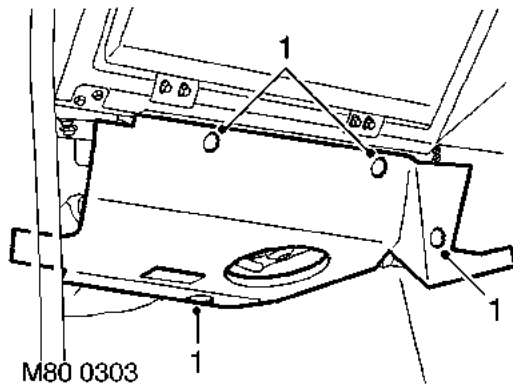
1. Fit new control cable, connect inner cable to control and secure abutment to control housing.
2. Fit other end of inner cable to flap lever.
3. Position control to maximum heat for temperature control cables or demist for air flow control cable, hold flap lever in fully closed position and secure outer cable in clip on heater casing.
4. Refit louvre panel assembly.  
 **INTERIOR TRIM COMPONENTS, REPAIRS, Louvre panel assembly - centre fascia.**
5. **Driver temperature and air flow control cables:** Close fuse access cover and secure fixings.
6. **Passenger temperature control cable:** Refit glove box and secure with bolts.



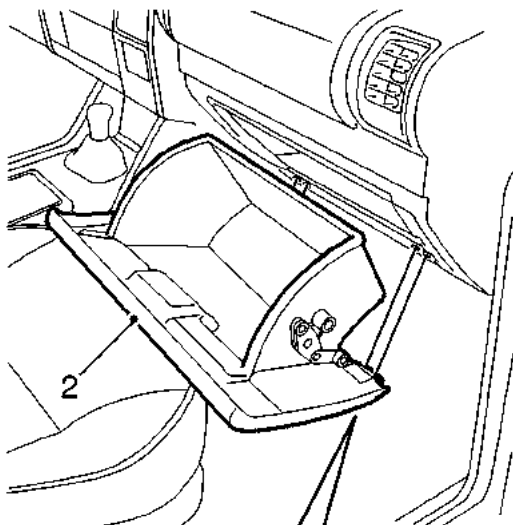
## Servo - recirculation flap

80.10.18

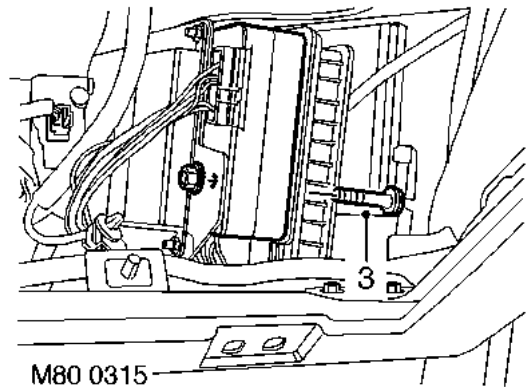
### Remove



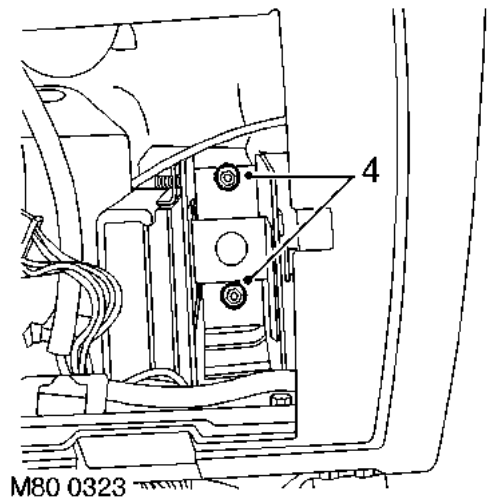
1. Remove 4 studs securing passenger toe board and remove toe board.



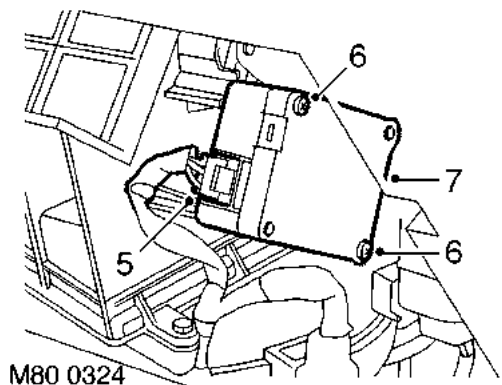
2. Remove 4 screws securing glove box, release catch and remove glove box.



3. Remove bolt securing BCM, release BCM from retaining peg and lower BCM.



4. Remove 2 nuts securing ECU assembly and lower ECU assembly to gain access to servo screws.



5. Disconnect multiplug from servo.
6. Remove 2 screws securing servo.
7. Release servo, disconnect operating lever and remove servo.

### Refit


1. Position servo and connect operating lever.
2. Fit and tighten screws securing servo.
3. Connect multiplug to servo.
4. Position ECU assembly, fit and tighten nuts.
5. Position BCM, fit and tighten bolt.
6. Position toe board and secure with studs.
7. Position glove box, fit and tighten screws.

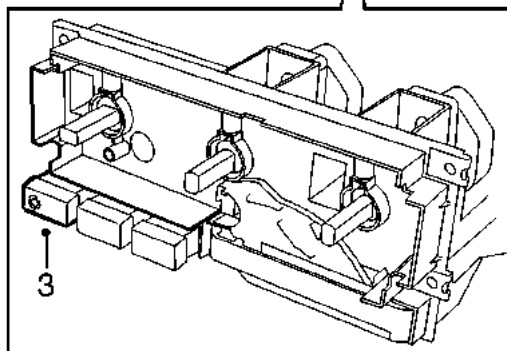
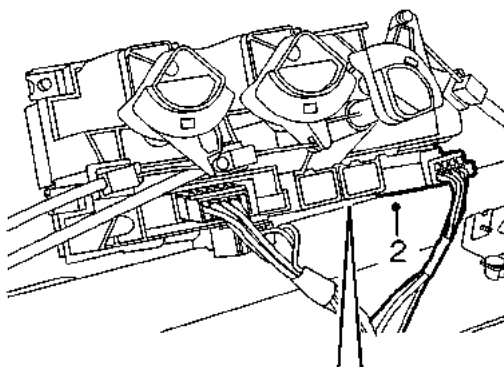
### Switch - recirculation control

80.10.21

### Remove

1. Remove louvre panel assembly.

 **INTERIOR TRIM COMPONENTS, REPAIRS, Louvre panel assembly - centre fascia.**




M80 0345

2. Disconnect multiplug from recirculation switch.
3. Remove recirculation switch from heater control panel.

### Refit



1. Fit recirculation switch to heater control panel and connect multiplug.
2. Fit louvre panel assembly.

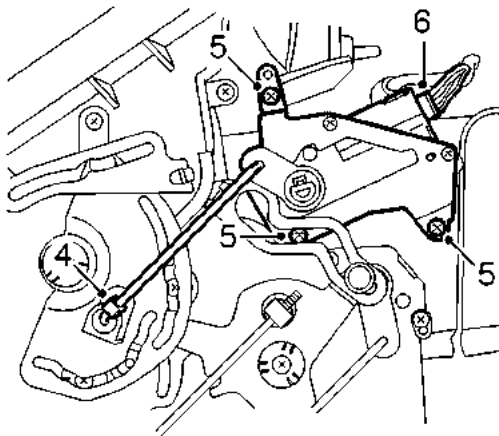
 **INTERIOR TRIM COMPONENTS, REPAIRS, Louvre panel assembly - centre fascia.**

## Servo - air distribution control

🔑 80.10.30

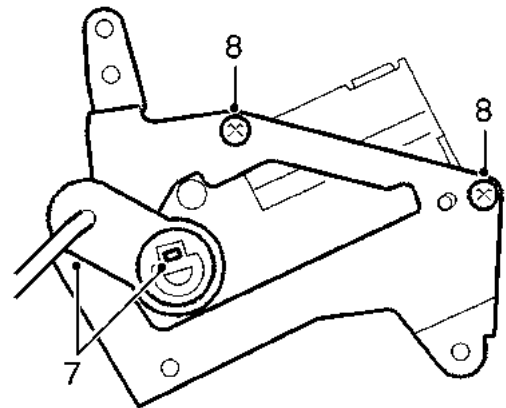
### Remove

1. Disconnect battery earth lead.
2. **RHD models:** Remove heater assembly.  
 **HEATING AND VENTILATION, REPAIRS, Heater assembly - models with air conditioning.**
3. **LHD models:** Remove heater motor assembly.  
 **HEATING AND VENTILATION, REPAIRS, Blower assembly.**



M80 0301



4. Release clip securing operating lever and release the lever from linkage.
5. Remove 3 screws securing servo support bracket to casing and release servo.
6. Disconnect multiplug from servo and remove servo.



M80 0302

7. Release clip securing operating lever to servo and remove lever.
8. Remove 2 screws securing support bracket and remove support bracket.

### Refit

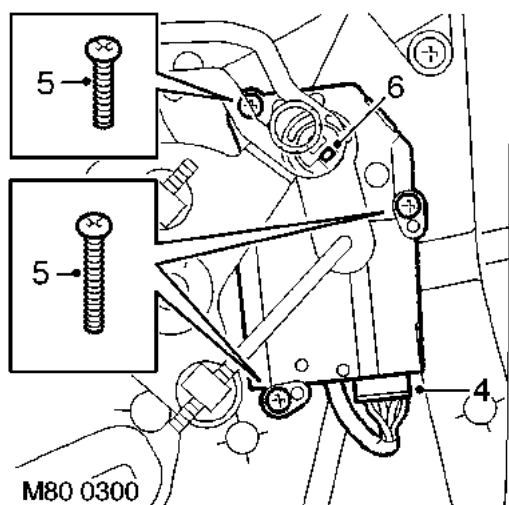
1. Position support bracket to servo and secure with screws.
2. Position servo lever to servo and secure clip.
3. Connect multiplug to servo.
4. Position servo to casing and secure with screws.
5. Connect operating lever to servo and secure with clip.
6. **RHD models:** Fit heater assembly.  
 **HEATING AND VENTILATION, REPAIRS, Heater assembly - models with air conditioning.**
7. **LHD models:** Fit heater motor assembly.  
 **HEATING AND VENTILATION, REPAIRS, Blower assembly.**
8. Connect battery earth lead.

### Servo - air temperature control

🔑 80.10.42

#### Remove

1. Disconnect battery earth lead.
2. **Driver side:** Remove heater assembly.  
👉 **HEATING AND VENTILATION, REPAIRS, Heater assembly - models with air conditioning.**
3. **Passenger side:** Remove blower assembly.  
👉 **HEATING AND VENTILATION, REPAIRS, Blower assembly.**



4. Disconnect multiplug from servo.
5. Remove 3 screws securing servo to casing and release servo.
6. Release clip securing operating lever, release the lever and remove servo. lever.

#### Refit

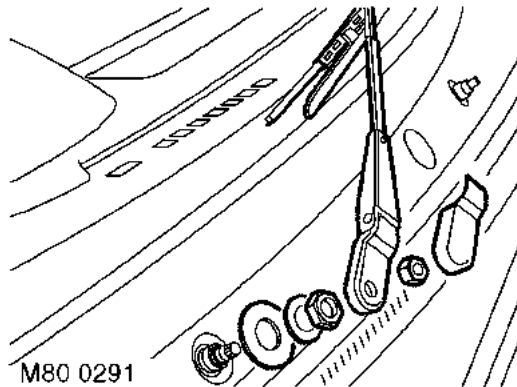
1. Connect operating lever to servo and secure with clip.
2. Position servo to casing, engage locating pegs and secure with screws.
3. Connect multiplug to servo.
4. **Driver side:** Fit heater assembly.  
👉 **HEATING AND VENTILATION, REPAIRS, Heater assembly - models with air conditioning.**
5. **Passenger side:** Fit blower assembly.  
👉 **HEATING AND VENTILATION, REPAIRS, Blower assembly.**
6. Connect battery earth lead.

## Plenum Air Intake

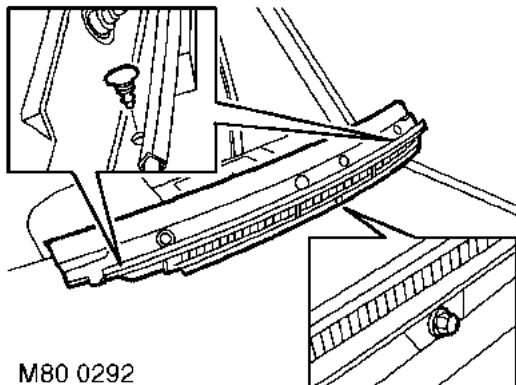
🔑 80.15.62

### Remove

1. Remove both windscreen side finishers.  
 **EXTERIOR FITTINGS, REPAIRS,**  
**Side finisher - windscreen.**




2. Remove caps from windscreen wiper arms.
3. Remove nuts securing wiper arms to wiper linkage.
4. Remove both wiper arms.
5. Remove lock nuts from wiper linkage and collect washer and rubber spacers.



6. Remove 2 trim clips and centre bolt securing plenum air intake to body.
7. Remove plenum air intake.



### Refit

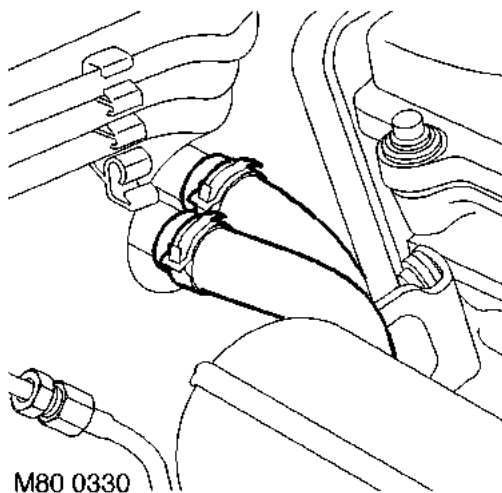
1. Fit plenum air intake.
2. Fit trim clips and centre bolt securing plenum air intake to body.
3. Fit rubber spacers and washers to wiper linkage.
4. Fit locknuts to wiper linkage and tighten to 7 Nm (5.2 lbf.ft).
5. Fit wiper arms to wiper linkage.
6. Fit nuts securing wiper arms to wiper linkage and tighten to 15 Nm (11 lbf.ft).
7. Fit caps to wiper arms.
8. Fit both windscreen side finishers.  
 **EXTERIOR FITTINGS, REPAIRS,**  
**Side finisher - windscreen.**

### Heater assembly - models without air conditioning

80.20.01.99


#### Remove

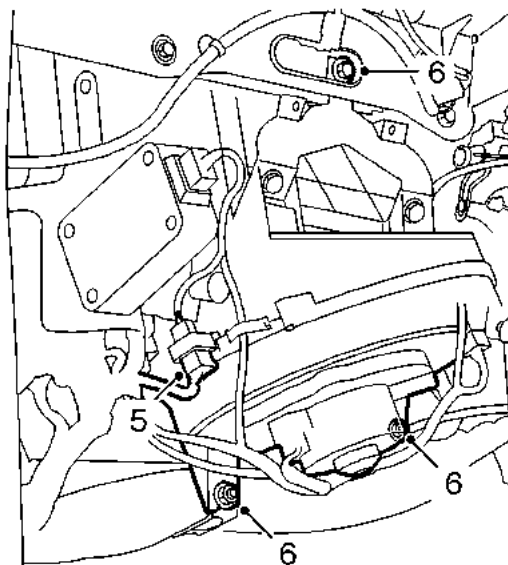
1. Drain cooling system.
  -  **COOLING SYSTEM - Td5, ADJUSTMENTS, Drain and refill.**
  -  **COOLING SYSTEM - V8, ADJUSTMENTS, Drain and refill.**
2. **Diesel models:** Remove 3 bolts and remove engine cover.



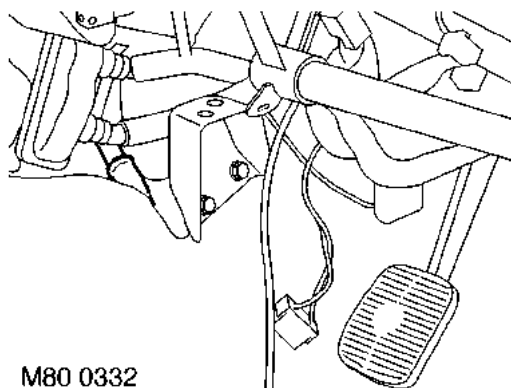
3. Release clips and disconnect coolant hoses from heater pipes.

**CAUTION: Always fit plugs to open connections to prevent contamination.**

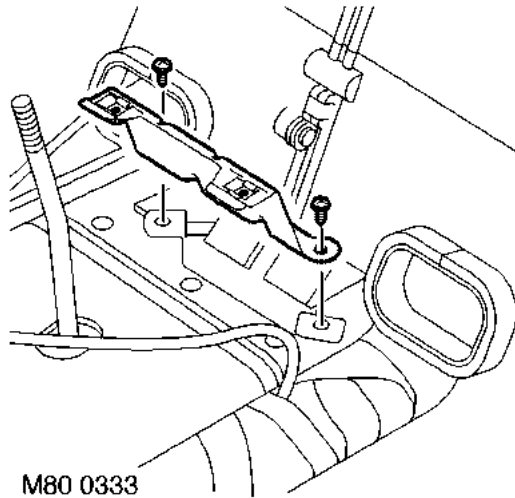
4. Remove facia assembly.
  -  **INTERIOR TRIM COMPONENTS, REPAIRS, Fascia.**



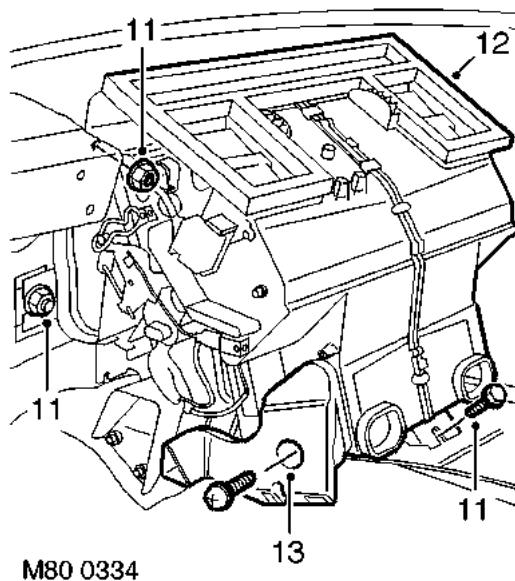
5. Disconnect harness multiplug from heater blower motor.
6. Remove bolt and 2 nuts securing heater blower housing assembly to body and remove blower.



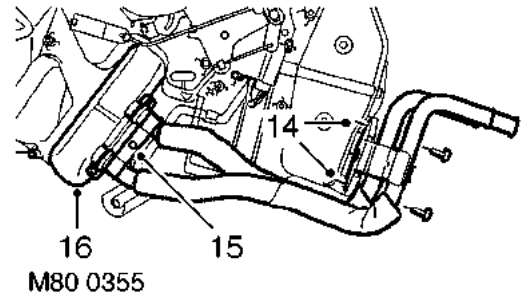
7. Disconnect 2 drain tubes from base of heater.



8. Remove 2 screws securing console bracket to tunnel and remove bracket.
9. Release radio coaxial cable from behind heater pipes.
10. Protect the carpet from coolant spillage.




11. Remove 4 nuts and 1 bolt securing heater to body.
12. Remove heater from vehicle.
13. Remove 2 screws securing heater RH and LH footwell outlet duct to heater casing and remove ducts.




14. Remove 2 screws securing matrix pipe bracket to heater casing.
15. Remove screw securing pipe clamp to heater casing and remove clamp.
16. Carefully remove matrix from heater.

#### Refit

1. Fit matrix into heater casing.
2. Fit screws securing pipe bracket to heater casing.
3. Fit pipe clamp and secure with screw.
4. Fit heater ducts and secure with screws.
5. Position heater assembly to vehicle, ensure heater coolant pipe grommet is correctly located in bulkhead and secure with nuts and bolt.
6. Fit radio coaxial cable behind heater pipes.
7. Fit console bracket and secure with screws.
8. Connect drain tubes to base of heater.
9. Fit blower unit to heater and secure to body with nuts and bolt.
10. Connect harness multiplug to blower motor.
11. Fit facia assembly
12. Connect heater hoses and secure with clips.
13. **Diesel models:** Fit engine cover and secure with bolts.
14. Refill cooling system

 **COOLING SYSTEM - Td5, ADJUSTMENTS, Drain and refill.**

 **COOLING SYSTEM - V8, ADJUSTMENTS, Drain and refill.**

## HEATING AND VENTILATION


### Heater assembly - models with air conditioning

80.20.01.98


#### Remove

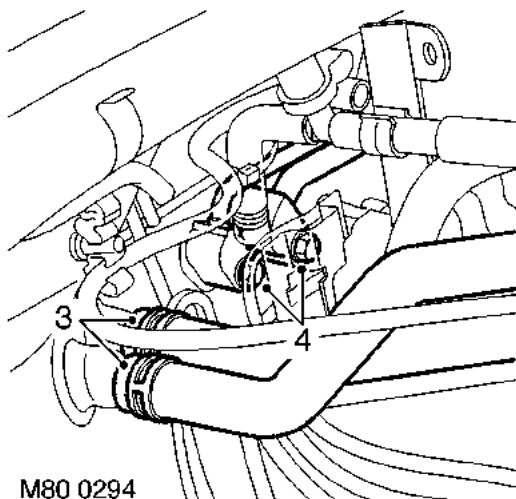
1. Drain cooling system.

●  **COOLING SYSTEM - V8, ADJUSTMENTS, Drain and refill.**

●  **COOLING SYSTEM - Td5, ADJUSTMENTS, Drain and refill.**

2. Evacuate air conditioning system.


 **AIR CONDITIONING, REFRIGERANT RECOVERY, RECYCLING AND RECHARGING, Refrigerant recovery, recycling and recharging.**

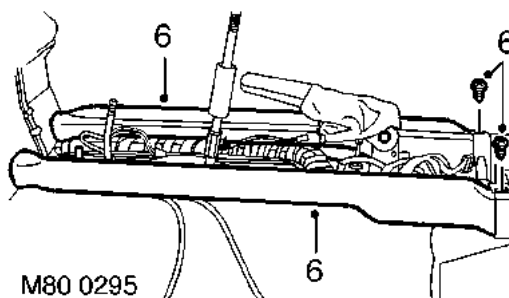


3. Release 2 clips securing heater hoses to heater and release hoses.
4. Remove 2 bolts securing air conditioning pipes to evaporator, release pipes and discard 'O' rings.

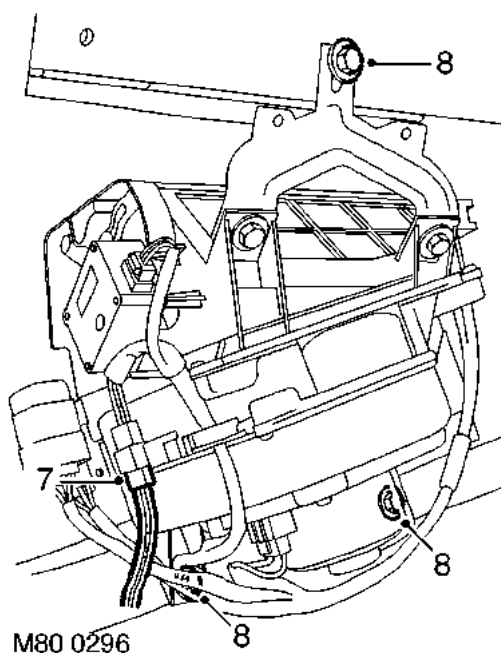
**CAUTION: Always fit plugs to open connections to prevent contamination.**

5. Remove fascia.

 **INTERIOR TRIM COMPONENTS, REPAIRS, Fascia.**

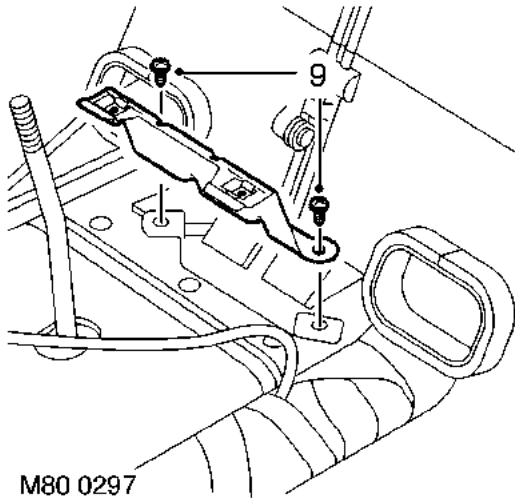


6. Remove screws securing rear heater ducting and remove ducting.

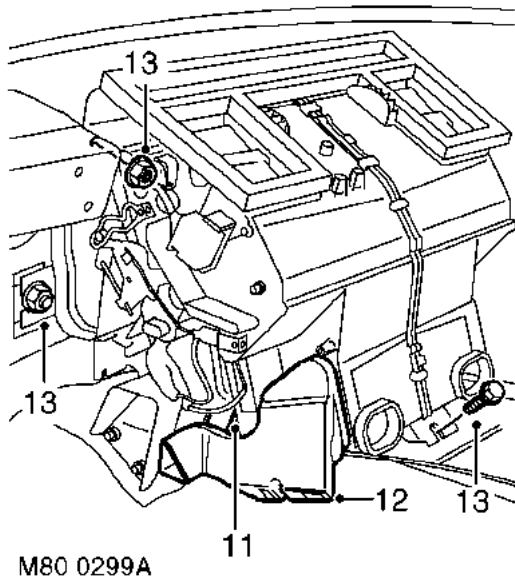
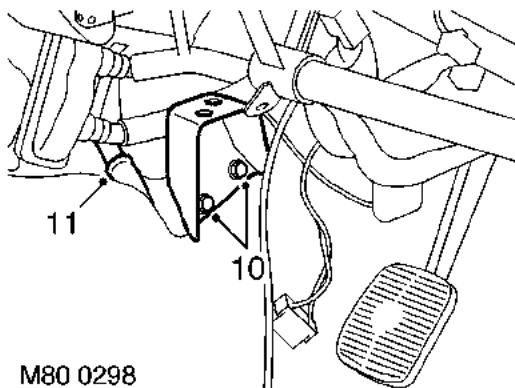


7. Disconnect multiplug from heater motor.
8. Remove 2 nuts and bolt securing heater motor assembly and remove motor assembly from heater casing.





9. Remove 2 screws securing centre console support bracket and remove bracket.



10. Remove 2 nuts securing RH fascia support bracket and remove bracket.

11. Disconnect both evaporator drain hoses.
12. Remove front heater ducting.
13. Remove 4 nuts and bolt securing heater assembly, release heater assembly from bulkhead grommet and remove from vehicle.

#### Refit

1. Position heater assembly to bulkhead, locate heater in bulkhead grommet.
2. Fit nuts and bolt securing heater and tighten to 16 Nm (12 lbf.ft).
3. Position RH fascia support bracket, fit and tighten nuts.
4. Fit front heater ducting.
5. Position centre console support bracket, fit and tighten screws.
6. Connect evaporator drain hoses.
7. Position heater motor to heater casing, fit nuts and bolt and tighten to 19 Nm (14 lbf.ft).
8. Connect multiplug heater motor.
9. Position rear heater ducting and secure with screws.
10. Fit fascia.

#### INTERIOR TRIM COMPONENTS, REPAIRS, Fascia.

11. Using new 'O' rings, position air conditioning pipes to evaporator fit bolts and tighten to 5 Nm (3.7 lbf.ft).
12. Position heater hoses and secure hose clips.
13. Recharge air conditioning system.

#### AIR CONDITIONING, REFRIGERANT RECOVERY, RECYCLING AND RECHARGING, Refrigerant recovery, recycling and recharging.

14. Refill cooling system.

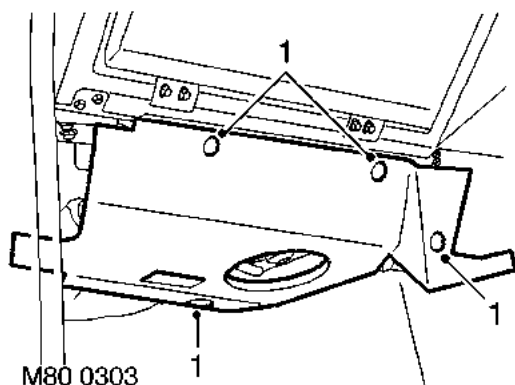
#### ● COOLING SYSTEM - V8, ADJUSTMENTS, Drain and refill.

#### ● COOLING SYSTEM - Td5, ADJUSTMENTS, Drain and refill.

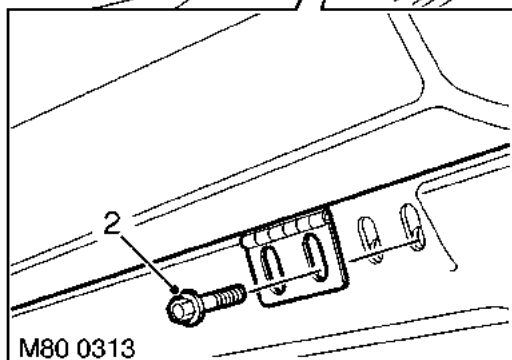
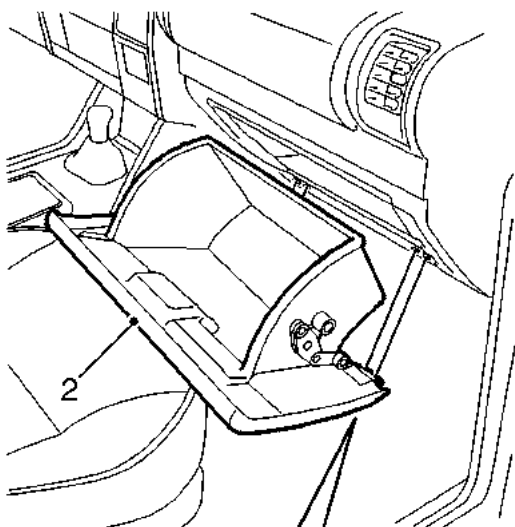
## Blower assembly

🔑 80.20.12

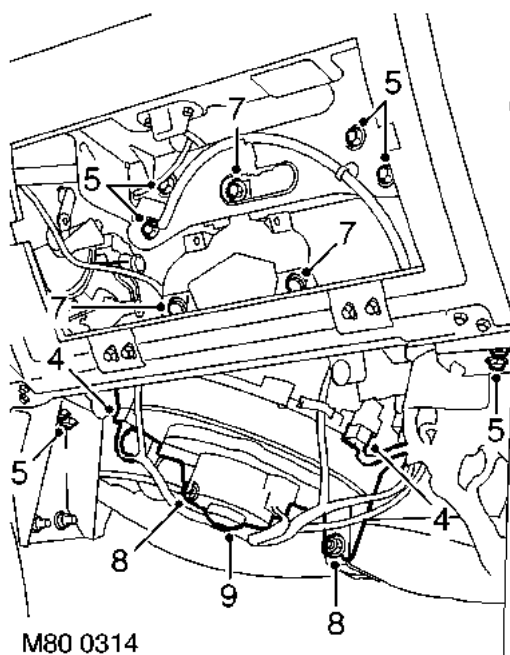
### Remove



1. Remove 4 studs securing toe board and remove toe board.



2. Remove 4 screws securing glove box, release catch and remove glove box.
3. Disconnect battery earth lead.



4. Disconnect multiplugs from blower motor.
5. Remove 8 bolts securing passenger side of fascia panel.
6. Carefully ease fascia away from bulkhead
7. Remove 3 bolts securing blower motor support bracket and remove bracket.
8. Remove 2 nuts securing motor assembly.
9. Release blower motor assembly from heater and manoeuvre from under fascia.

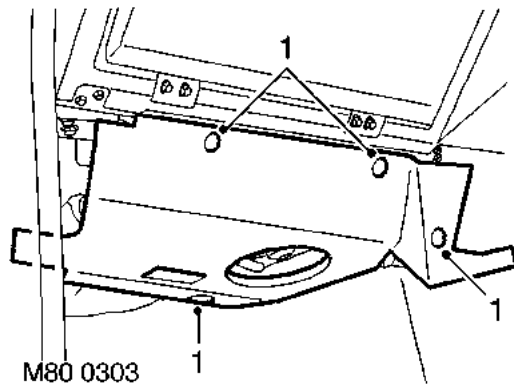
### Refit

1. Position blower motor assembly under fascia and locate to heater casing.
2. Position support bracket, fit and tighten nuts and bolts.
3. Align fascia, fit bolt to support bracket and tighten to 26 Nm (19 lbf.ft).
4. Connect multiplugs to blower motor.
5. Connect battery earth lead.
6. Fit glove box, align hinges and tighten screws.
7. Position toe board and secure with studs.

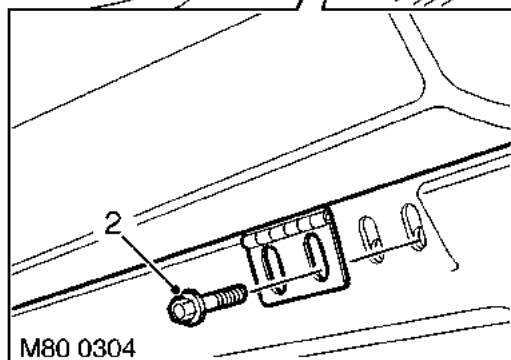
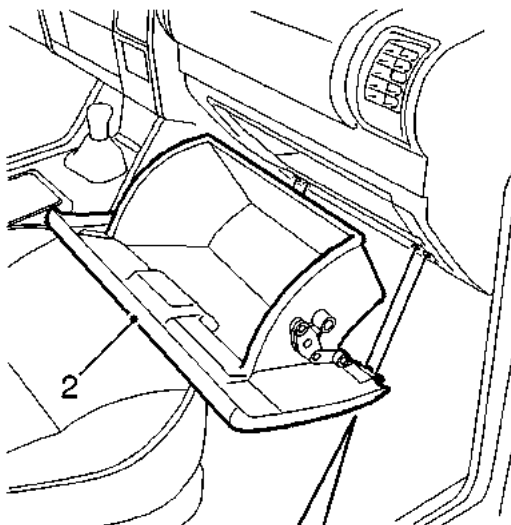
## Motor - blower

🔑 80.20.15

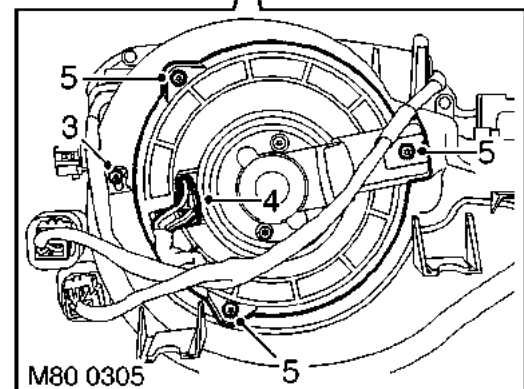
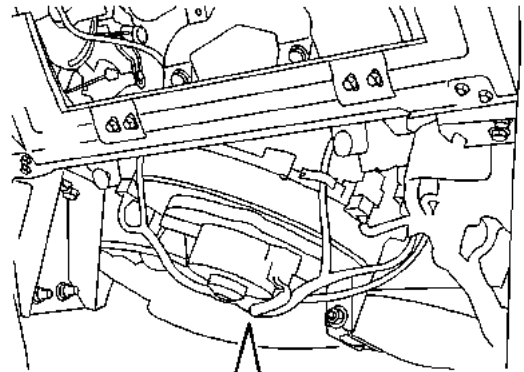
### Remove



1. Remove 4 studs securing toe board and remove toe board.



2. Remove 4 screws securing glove box, release catch and remove glove box.



3. Remove screw securing harness to blower motor and release harness.
4. Disconnect multiplug from blower motor.
5. Remove 3 screws securing blower motor to casing and remove blower motor.

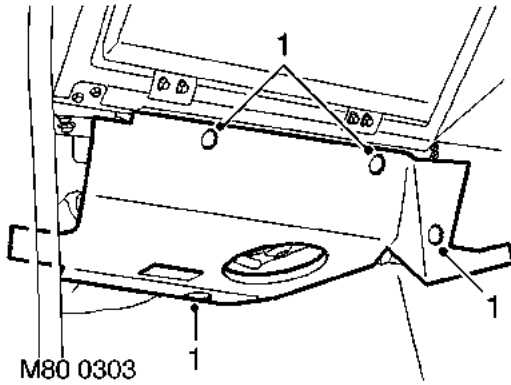
### Refit

1. Position blower motor to casing and secure with screws.
2. Connect multiplug to blower motor.
3. Position harness and secure clip with screw.
4. Fit glove box, align hinges and tighten screws.
5. Position toe board and secure with studs.

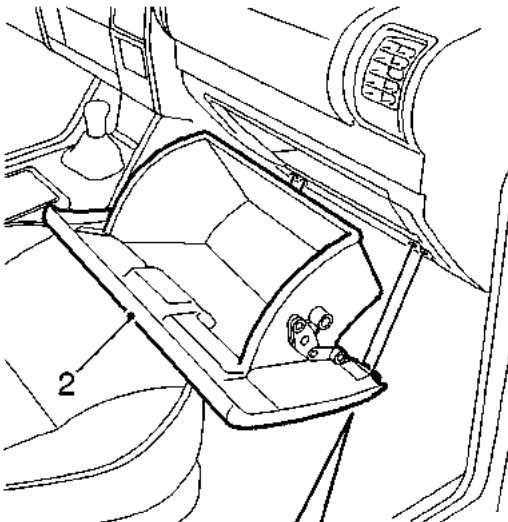
### Resistor pack - power resistor A/C

80.20.17

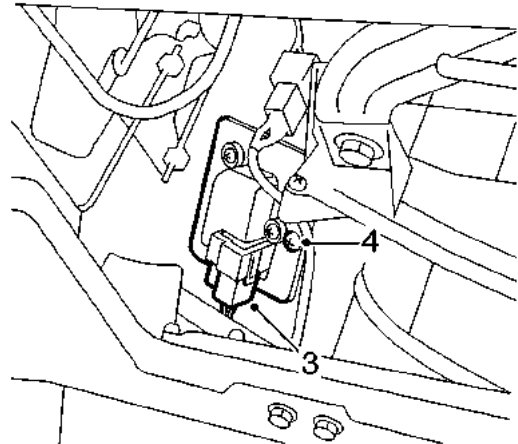
#### Remove



1. Remove 4 studs securing toe board and remove toe board.



2. Remove 4 screws securing glove box, release catch and remove glove box.



3. Disconnect multiplug from resistor.
4. Remove screws securing resistor, release and remove resistor.


#### Refit

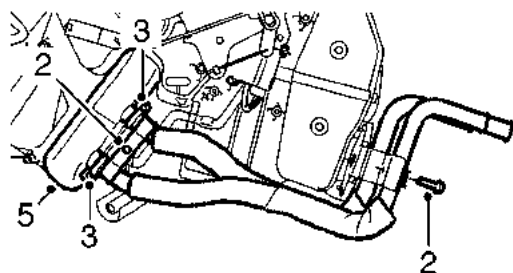
1. Position resistor and secure with screw.
2. Connect multiplug to resistor.
3. Position glove box, fit and tighten screws.
4. Position toe board and secure with studs.

## Heater matrix

80.20.29

### Remove


1. Remove heater assembly.  
 **HEATING AND VENTILATION, REPAIRS, Heater assembly - models with air conditioning.**



M80 0293

2. Remove 2 screws securing coolant pipe saddles and remove saddles.
3. Loosen screws securing coolant pipes to matrix, release clamps and remove coolant pipes.
4. Remove and discard 'O' rings.
5. Remove heater matrix.


### Refit

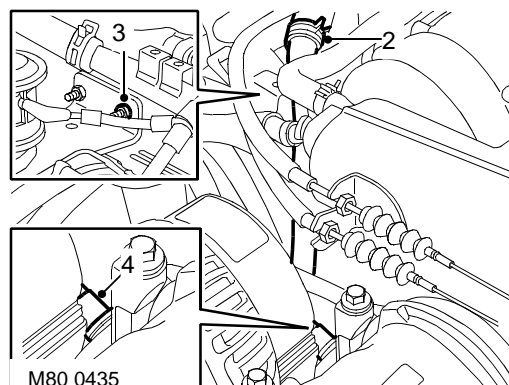
1. Position heater matrix, using new 'O' rings fit coolant pipes and align clamps.
2. Fit saddle clamps and secure with screws
3. Tighten coolant pipe clamp screws.
4. Fit heater assembly.  
 **HEATING AND VENTILATION, REPAIRS, Heater assembly - models with air conditioning.**

## Pipe - Heater - Feed

80.25.07


### Remove

1. Remove heater return pipe.  
 **HEATING AND VENTILATION, REPAIRS, Pipe - Heater - Return.**



2. Release clip securing heater feed hose to heater feed pipe and disconnect hose from pipe.
3. Remove nut securing heater feed pipe to plenum chamber.
4. Press quick release connector and release heater feed pipe from plenum chamber.
5. Remove and discard 'O' ring from pipe.

### Refit

1. Fit new 'O' ring to heater feed pipe and lubricate with castor oil.
2. Secure heater feed pipe to plenum chamber.
3. Fit and tighten nut securing heater feed pipe to plenum chamber.
4. Connect heater feed hose to heater feed pipe and secure with clip.
5. Fit heater return pipe.  
 **HEATING AND VENTILATION, REPAIRS, Pipe - Heater - Return.**

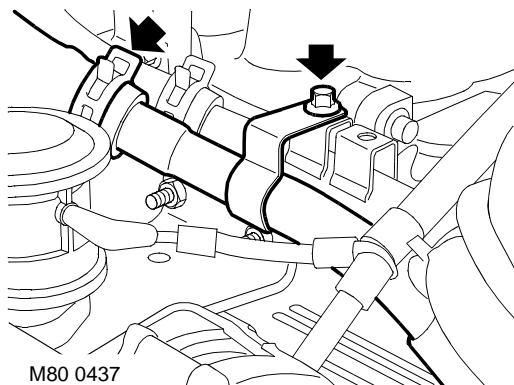
### Pipe - Heater - Return

🔑 80.25.12

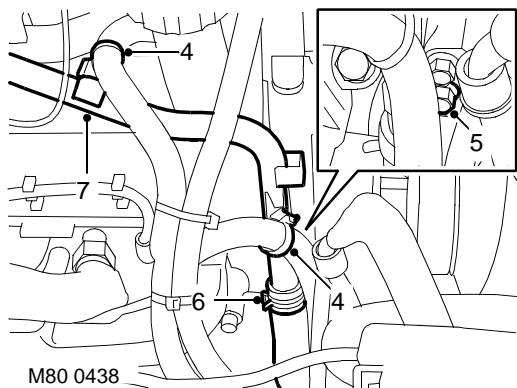
#### Remove

1. Drain engine coolant.

👉 **COOLING SYSTEM - V8,  
ADJUSTMENTS, Drain and refill.**



2. Release clip securing heater return hose to heater return pipe and disconnect hose from pipe.



3. Remove bolt securing heater return pipe to heater feed pipe.
4. Release clips securing engine harness and vacuum pipe to heater return pipe.
5. Remove bolt securing heater return pipe to cylinder head.
6. Release clip securing engine coolant hose to heater return pipe.
7. Release engine coolant hose from heater return pipe and collect pipe.

#### Refit

1. Connect engine coolant hose to heater return pipe and secure with clip.
2. Position heater return pipe to cylinder block and secure with bolt.
3. Secure engine harness and vacuum pipe to heater return pipe and secure with clips.
4. Fit and tighten bolt securing heater return pipe to heater feed pipe.
5. Connect heater return hose to heater return pipe and secure with clip.
6. Refill engine coolant.

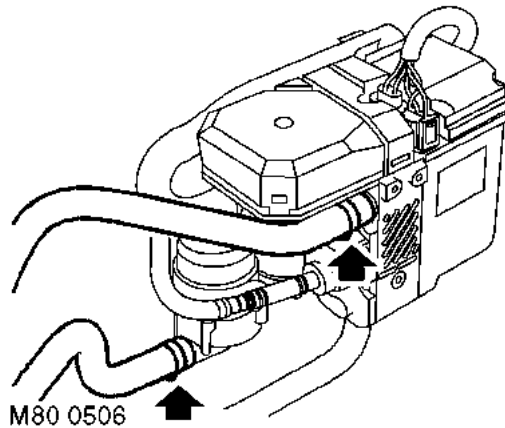
👉 **COOLING SYSTEM - V8,  
ADJUSTMENTS, Drain and refill.**

## Fuel burning heater - (FBH) - Td5

80.40.01.99

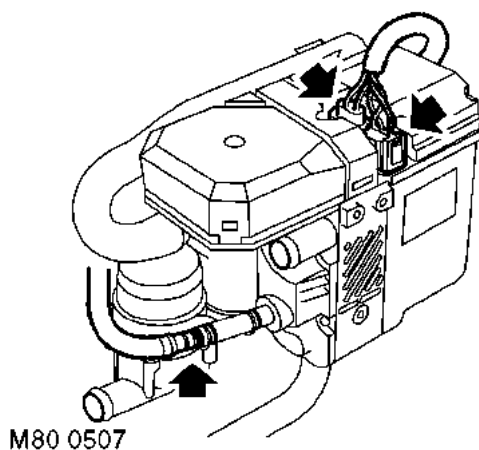
### Remove

1. Release fixings and remove battery cover.
2. Disconnect battery earth lead.
3. Clamp feed and return coolant hoses at FBH.
4. Position container to collect spillage.



5. Release clips, disconnect coolant feed and return hoses from FBH.

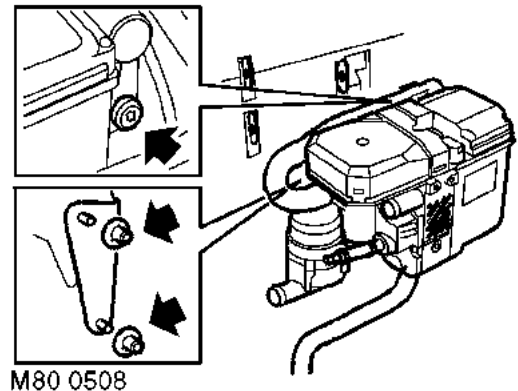
**CAUTION: Before disconnecting or removing components, ensure the immediate area around joint faces and connections are clean. Plug open connections to prevent contamination.**



6. Disconnect 2 multiplugs from FBH.

7. Position container to collect spillage and disconnect quick release fuel pipe from FBH.

**CAUTION: Before disconnecting any part of the fuel system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into fuel system.**



8. Remove Torx bolt securing FBH to bulkhead mounting bracket.
9. Release and remove FBH.
10. Collect locating bushes from pegs.

### Refit

1. Fit bushes to pegs.
2. Align FBH to pegs, fit Torx bolt and tighten to 25 Nm (18 lbf.ft).
3. Clean quick release connection and fit fuel pipe to FBH.
4. Connect multiplugs to FBH.
5. Connect coolant hoses to FBH and secure with clips.
6. Release clamps from hoses.
7. Connect battery earth lead.
8. Fit and secure battery cover.
9. Top-up cooling system.

**MAINTENANCE, PROCEDURES, Cooling system.**

