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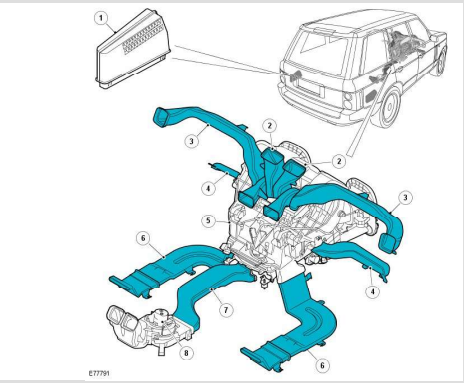
2011.0 RANGE ROVER (LM), 412-02A

HEATING AND VENTILATION (G874267)

COMPONENT LOCATION



ITEM	DESCRIPTION
1	Forced ventilation outlet
2	Windshield duct
3	Face level duct
4	Front footwell duct
5	Heater assembly
6	Rear footwell duct
7	Rear face duct
8	Rear blower

OVERVIEW

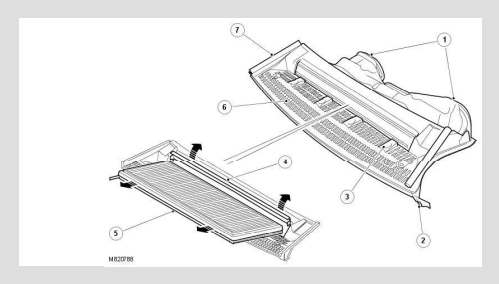
The heating and ventilation system controls the temperature and flow of air supplied to the vehicle interior. The system consists of:

- An air inlet duct.
- A heater.
- A rear blower.
- Two ventilation outlets.

Fresh or recirculated air flows into the heater from the inlet duct. The blower, and ram effect when the vehicle is moving, forces the air through the heater. Air from the cabin exhausts through the ventilation outlets.

Some vehicles may be fitted with a 4 zone climate control system. For additional information, refer to: Auxiliary Climate Control (412-02C Auxiliary Climate Control, Description and Operation).

AIR INLET DUCT



ITEM	DESCRIPTION
1	Air outlet to heater assembly
2	Fixing lug
3	Door catch
4	Door
5	Particle or particle/odor filter
6	Inlet grille
7	Seal

The air inlet duct directs fresh air from above the hood into the heater. The air inlet duct is centrally mounted on the engine bulkhead, below a ventilation grill in the hood, and secured to the bulkhead closing panels.

The cabin air filter is installed in the air inlet duct behind a hinged door. For additional information, refer to: Air Distribution and Filtering (412-01A Air Distribution and Filtering, Description and Operation).

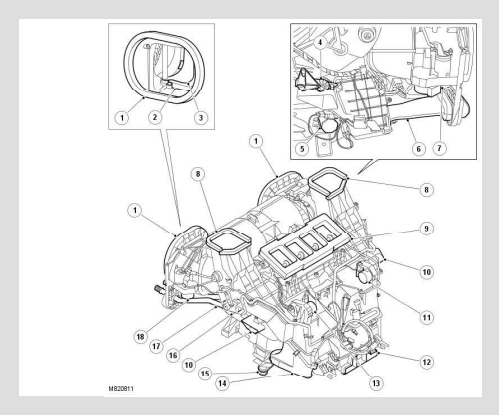
HEATER

The heater controls the temperature, volume and distribution of air supplied to the distribution ducts as directed by selections made on the automatic temperature control (ATC) module control panel. The heater is installed on the vehicle center-line, between the instrument panel and the engine bulkhead. The heater consists of a casing formed from a series of plastic moldings. Internal passages integrated into the casing guide the air through the casing and separate it into two flows, one for the left-hand (LH) outlets and one for the right-hand (RH) outlets. Two drain outlets at the bottom of the casing are connected to overboard drain hoses in the sides of the transmission tunnel.

The heater incorporates:

- A blower.
- A blower motor control module.
- A heater core.
- Control doors.
- Control door motors.
- The thermostatic expansion valve and the evaporator of the air conditioning (A/C) system. For additional information, refer to: Air Conditioning (412-03A Air Conditioning, Description and Operation).
- The evaporator temperature sensor and 2 heater temperature sensors. For additional information, refer to: Control Components (412-01B Climate Control, Description and Operation).

Heater Assembly



ITEM	DESCRIPTION
1	Fresh air inlet
2	Fresh/Recirculated air door
3	Ram air door
4	Face level temperature blend door control
5	Rear face level temperature blend motor
6	Insulated refrigerant pipes
7	Ram air doors motor
8	Windshield air outlet
9	Face level air outlets
10	Front footwell air outlet
11	Footwell air doors motor

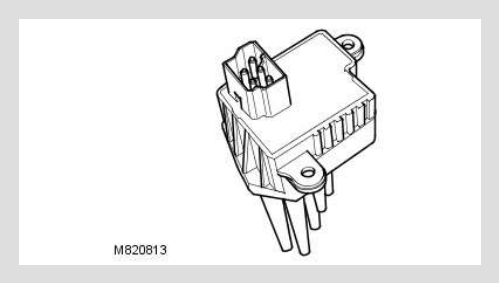
ITEM	DESCRIPTION
12	Rear face level air outlet
13	Face level air doors motor
14	Rear footwell air outlet
15	Water drain
16	Windshield distribution motor
17	Coolant pipes
18	Fresh/Recirculated air door motor

BLOWER

The blower is installed between the air inlets and the evaporator, and consists of 2 open hub, centrifugal fans powered by a single electric motor. Operation of the electric motor is controlled by the ATC module via the blower motor control module (voltage amplifier) installed in the outlet of the RH fan.

To produce the seven blower speeds the ATC module outputs a stepped control voltage between 0 and 8 V to the blower motor control module, which regulates a battery power feed from the central junction box (CJB) to the blower. The control voltage changes, in 1 V steps, between 2 V (blower speed 1) and 8 V (blower speed 7). If the control voltage is less than 2 V the blower is off.

Blower Motor Control Module



HEATER CORE

The heater core is internally divided into two separate halves, with separate coolant inlets for each half and a common coolant outlet. On the manual system, the two coolant inlets are connected to a common feed from the single coolant valve. Each coolant inlet pipe is connected to a feed from a separate coolant valve.

CONTROL DOORS

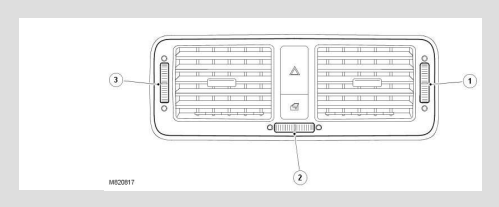
Control doors in the heater control the source of inlet air and the distribution and temperature of outlet air.

On both the manual and automatic heaters, a fresh/recirculated air door is installed in the air inlet on each side of the heater. A stepper motor drives the LH fresh/recirculated air door and a Bowden cable transmits the drive from the LH to the RH fresh/recirculated air door. On the automatic system, a ram air door is installed inside each fresh /recirculated air door. A stepper motor drives the RH ram air door and a Bowden cable transmits the drive from the RH to the LH ram air door.

Each side of the heater contains separate distribution doors for the footwell, face level and windshield. The related doors on each side of the heater are installed on common drive spindles. On the manual heater, the distribution doors are driven by Bowden cables connected to a cam mechanism, which, in turn, is driven by a stepper motor. On the automatic heater, each set of distribution doors is driven by a separate stepper motor.

On both the manual and automatic heaters, a blend door is installed below the face level registers. The blend door is driven by a Bowden cable connected to a thumbwheel on the center face level registers in the instrument panel, and allows the temperature of face level air to be modified with cold air direct from the evaporator.

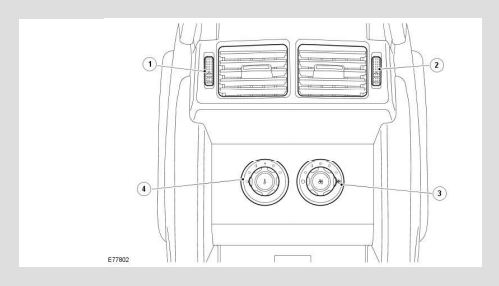
Instrument Panel Center Face Level Register



ITEM	DESCRIPTION
1	RH air control thumbwheel
2	Temperature control thumbwheel
3	LH air control thumbwheel

The heater incorporates an additional blend door for the air directed to the rear passenger face level register. This allows the temperature of rear face level air to be adjusted independently from the temperatures selected on the control panel of the ATC module. The blend door is driven by a stepper motor controlled by a thumbwheel on the rear passenger face level register. The blend door is also used to close off the rear passenger face level register when maximum air output is required for the front outlets, e.g. when defrost is selected.

Rear Passenger Face Level Register



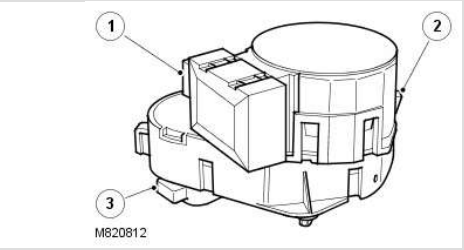
ITEM	DESCRIPTION
1	LH air control thumbwheel
2	RH air control thumbwheel
3	Blower control

ITEM	DESCRIPTION
4	Temperature control

CONTROL DOOR MOTORS

Two types of electrical stepper motor are used to operate the control doors in the heater. A conventional 500 Hz stepper motor operates the recirculation doors. Five bus controlled 200 Hz stepper motors operate the ram air, distribution (windshield, face level and footwell) and the rear face level temperature control doors. All of the stepper motors are controlled by the ATC module. None of the stepper motors are interchangeable.

Typical Control Door Motor



ITEM	DESCRIPTION
1	Electrical connector
2	Release clip
3	Output shaft

Each bus controlled stepper motor incorporates a microprocessor and is connected to an M bus from the ATC module, which consists of three wires making up power, ground and signal circuits. The microprocessor in each bus controlled stepper motor is programmed with a different address. Each M bus message from the ATC module contains the address of an individual bus controlled stepper motor, so only that motor responds to the message.

None of the stepper motors incorporate a feedback potentiometer. Instead, the ATC module determines the positions of the doors by using either their closed or open position as a datum and memorizing the steps that it drives the individual stepper motors. Each time the ignition is switched on, the ATC module checks the memorized position of the stepper motors against fixed values for the current system configuration. If there is an error (e.g. after a power supply failure during operation or after replacement of the ATC module), the ATC module calibrates the applicable stepper motors, to re-establish the datums, by driving them fully closed or open before re-setting them to their nominal position. A calibration run can also be invoked using the Land Rover approved diagnostic system.

When any of the control doors are set to fully closed or open, the ATC module signals the related stepper motor to move the appropriate number of steps in the applicable direction. To accommodate build tolerances and wear, and to ensure the doors are held in the selected position, every 20 seconds the ATC module signals the stepper motor to move an additional 10 steps in the relevant direction.

REAR BLOWER

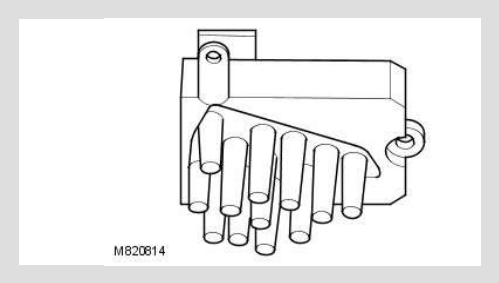
The blower is installed between the front seats, in the rear face air duct, and consists of an open hub, centrifugal fan powered by an electric motor. Operation of the electric motor is controlled by a rotary control on the rear passenger face vent via the ATC module and a blower motor control module (voltage amplifier) installed in the outlet of the fan.

The rotary control allows 7 differing blower speeds to be selected. The position of the rotary control is monitored by the ATC module, which then outputs a proportional control voltage between 0 and 5 V to the blower motor control module. The blower motor control module regulates a battery power feed from the rear blower relay to the blower to produce the related blower speed.

The rear blower relay is installed in the AJB (auxiliary junction box) and energized while the ignition is on.

Some vehicles may be fitted with a 4 zone climate control system. For additional information, refer to: Auxiliary Climate Control (412-02C Auxiliary Climate Control, Description and Operation).

Rear Blower Motor Control Module



VENTILATION OUTLETS

The ventilation outlets promote the free flow of air through the passenger compartment. The outlets are installed in the LH and RH rear quarter body panels and vent passenger compartment air into the sheltered area between the rear quarter body panels and the rear bumper.