

Climate Control System - General Information -

Lubricants, Fluids, Sealers and Adhesives



NOTE: NAS vehicles.

Description	Specification
Air conditioning (A/C) refrigerant	R-1234yf
A/C compressor oil	SPA2



NOTE: ROW vehicles.

Description	Specification
Air conditioning (A/C) refrigerant	R-134a
A/C compressor oil	SPA2



NOTE: EU vehicles.

Description	Specification
Air conditioning (A/C) refrigerant	R-1234yf
A/C compressor oil	SPA2

Capacities

Description	Grammes
A/C refrigerant - all engine variants	700

Refrigerant Oil Adding Capacities



NOTE: Rotate the A/C compressor shaft at least 6 to 8 turns when draining the refrigerant oil.

Item	Milliliters
A/C condenser core and desiccant bag	Add 25ml oil
A/C evaporator	Add 30ml oil
A/C compressor	1. Drain old A/C compressor. With drain plug removed and ports uncapped, rotate shaft to remove A/C compressor oil and measure the amount of oil captured. 2. Drain new A/C compressor into a clean vessel. With drain plug removed and ports uncapped, rotate shaft to remove oil. Then add back a quantity of the new oil that is identical to the quantity of oil removed from the old A/C compressor. However, if this quantity is less than 30ml, then make it up to 30ml.
A/C lines - if air conditioning has been operational.	Add 5ml oil per A/C line
A/C system after flushing - with new compressor installed	No oil should be used- new oil in new compressor is sufficient
A/C system after flushing - without a new compressor installed - remaining A/C compressor oil is to be drained. Compressor and expansion valve must not be flushed (removed from the circuit)	Add 80ml oil
A/C compressor drain plug	Torque 12Nm

Climate Control System - General Information - Climate Control System

Diagnosis and Testing

Principles of Operation

For a detailed description of the Climate Control System, refer to the relevant Description and Operation sections in the Workshop Manual. REFER to:

[Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation),
[Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation),
[Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation),
[Heating and Ventilation](#) (412-01 Climate Control, Description and Operation),
[Heating and Ventilation](#) (412-01 Climate Control, Description and Operation),
[Heating and Ventilation](#) (412-01 Climate Control, Description and Operation),
[Air Conditioning](#) (412-01 Climate Control, Description and Operation),
[Air Conditioning](#) (412-01 Climate Control, Description and Operation),
[Air Conditioning](#) (412-01 Climate Control, Description and Operation),
[Control Components](#) (412-01 Climate Control, Description and Operation),
[Control Components](#) (412-01 Climate Control, Description and Operation),
[Control Components](#) (412-01 Climate Control, Description and Operation),
[Electric Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation),
[Electric Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation),
[Electric Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation).

Inspection and Verification



WARNING: Servicing must be carried out by personnel familiar with both vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.



NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Coolant level • Hose(s) • Coolant pump • Control flap(s) • Duct(s) • Vent(s) • Cabin air filter • Drive belt • Air conditioning compressor • Thermostatic expansion valve • Evaporator • Receiver drier • Air conditioning condenser • Refrigerant pipes Auxiliary • drive belt • Fuel fired booster heater • Fuel fired booster heater fuel pump • Fuel fired booster heater fuel pipes 	<ul style="list-style-type: none"> • Fuse(s) • Wiring harness • Electrical connectors • Blower • Air conditioning compressor • Electric cooling fan • Automatic Temperature Control Module (ATCM) • Refrigerant pressure sensor

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Possible Causes	Action
Air conditioning performance poor or inoperative	<ul style="list-style-type: none"> Refrigerant undercharged Refrigerant overcharged Thermostatic expansion valve faulty Receiver drier restricted Water in refrigerant 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
Air conditioning operates briefly and then switches off	<ul style="list-style-type: none"> Electric cooling fan inoperative Air conditioning condenser airflow obstructed 	<ul style="list-style-type: none"> Test the operation of the electric cooling fan Check the air conditioning condenser for external obstructions

Pinpoint Tests

PINPOINT TEST A : PRELIMINARY TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: PRELIMINARY TEST 1	
NOTES:	
 This test is performed with the engine not running.	
 Normal pressure for a correctly charged and switched off system is approximately 4.5 bar on both gauges (system equalised).	
	1 Close the valves on the air conditioning station
	2 Connect the air conditioning station to the vehicle charging ports
	3 Check the pressure values
	Is a pressure registered on both gauges?
	Yes GO to Pinpoint Test B.
	No GO to Pinpoint Test D.

PINPOINT TEST B : FUNCTIONALITY TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: FUNCTIONALITY TEST 1	
NOTES:	
 Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low) and 11.0 bar to 15.0 bar (high).	
 Normal temperature (measured at the center air vent) for a correctly charged and working system is -7°C to -2°C when ambient temperature is 20°C.	
	1 Close the valves on the air conditioning station
	2 Connect the air conditioning station to the vehicle charging ports
	3 Open all doors and the tailgate
	4 Start the engine
	5 Set the temperature to the lowest setting (all zones)
	6 Set the fan speed to maximum
	7 Set the recirculate switch to off
	8 Insert a temperature probe into the centre air vent
	9 Raise engine speed to 1500rpm and maintain this speed for 5 minutes
	10 Check the temperature value
	11 Check the pressure values
	Are the pressure readings stable and in the green 'normal' region of the gauge?
	Yes Air conditioning system operating normally
	No Air conditioning system fault present. GO to Pinpoint Test C.

PINPOINT TEST C : GAUGE TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: GAUGE TEST 1	
 NOTE: This test is performed with the engine running and the air conditioning set to on.	
	1 Check the pressure values
	Did the gauges register a change in pressure when the air conditioning was switched on? Yes GO to C2. No Using the manufacturer approved diagnostic system, check the Automatic Temperature Control Module (ATCM) for related DTCs and refer to the relevant DTC index
C2: GAUGE TEST 2	
 NOTE: This test is performed with the engine running and the air conditioning set to on.	
	1 Check the pressure values
	Are the pressure gauge readings fluctuating? Yes Moisture present in the air conditioning system. Recover the refrigerant. Install a new receiver drier. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B. No GO to C3.
C3: GAUGE TEST 3	
NOTES:	
 This test is performed with the engine running and the air conditioning set to on.	
 Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low) and 11.0 bar to 15.0 bar (high).	
	1 Check the pressure values
	Are the pressure gauge readings too low? Yes GO to C4. No GO to C6.
C4: GAUGE TEST 4	
 NOTE: This test is performed with the engine not running.	
	1 Stop the engine
	2 Using the manufacturer approved refrigerant leak detector, check for a refrigerant leak
	Was a refrigerant leak detected? Yes Refer to the relevant section of the workshop manual and recover the refrigerant. Repair as necessary. Evacuate and recharge the air conditioning system. GO to Pinpoint Test B. No GO to C5.
C5: GAUGE TEST 5	
 NOTE: This test is performed with the engine not running.	
	1 Refer to the relevant section of the workshop manual and recover the refrigerant
	Was the weight of the recovered refrigerant less than specified for the air conditioning system? Yes Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B. No Install a new receiver drier. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.
C6: GAUGE TEST 6	
NOTES:	
 This test is performed with the engine running and the air conditioning set to on.	
 Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low) and 11.0 bar to 15.0 bar (high).	

	1 Check the pressure values
	Are the pressure gauge readings too high?
	Yes GO to C7.
	No Test inconclusive. GO to Pinpoint Test B.

C7: GAUGE TEST 7

 NOTE: This test is performed with the engine **not** running.

	1 Stop the engine
	2 Refer to the relevant section of the workshop manual and recover the refrigerant
	Was the weight of the recovered refrigerant more than specified for the air conditioning system?
	Yes Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.
	No Install a new thermal expansion valve. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.

PINPOINT TEST D : NITROGEN LEAK TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: NITROGEN LEAK TEST	
 CAUTION: When charging the system with nitrogen, the pressure should be regulated to 7.0 bar.	
 NOTE: This test is performed with the engine not running.	
	1 Charge the air conditioning system with nitrogen
	2 Isolate the nitrogen supply
	3 Monitor the pressure gauge and check for leaks
	Has the source of the leak been identified?
	Yes Rectify the leak as necessary. Install a new receiver drier. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.
	No Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Climate Control Module \(HVAC\)](#) (100-00 General Information, Description and Operation).

Climate Control System - General Information - Air Conditioning (A/C) System Recovery, Evacuation and Charging

General Procedures



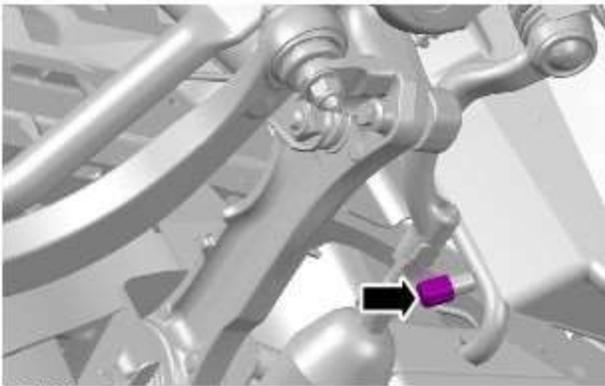
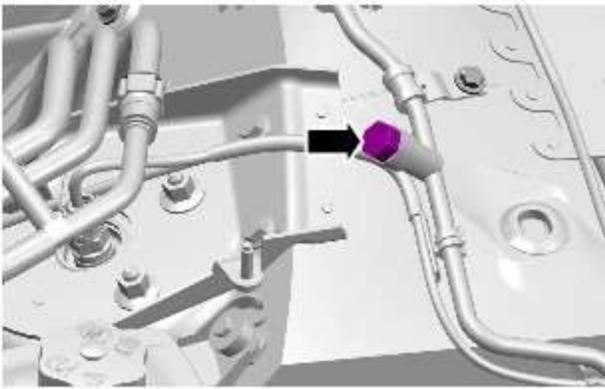
1. **WARNING:** Servicing must be carried out by personnel familiar with both vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.



NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure), the system is leaking and refrigerant has been lost to atmosphere, or the refrigerant circuit has been open more than 24 hours, due to repair.

Refrigerant recovery.

2. Remove the dust covers from the high and low pressure connections.



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3. Connect the high and low pressure lines to the appropriate connections.
4. Open the valves on the connections.
5. Turn the valves on the station to the correct positions.
6. Turn the process switch to the correct position.
7. Turn the main switch to 'ON'.



8. **WARNING:** Refrigerant must always be recycled before re-use to ensure that the purity of the refrigerant is high enough for safe use in the air conditioning system. Recycling should always be carried out with equipment which is design certified by Underwriter Laboratory Inc. for compliance with SEA J1991. Other equipment may not recycle refrigerant to the required level of purity. R134a Refrigerant Recover Recycling Recharging station must not be used with any other type of refrigerant. Refrigerant R134a from domestic and commercial sources must not be used in motor vehicles air conditioning systems.

Allow the system to recover the refrigerant from the system.

9. Close the valves on the refrigerant station.
10. Turn the main switch 'OFF'.
11. Close the valves on the connections.
12. Disconnect the high and low pressure connections.
13. Install the dust covers to the connectors.
14. Open the tap at the rear of the station to drain the refrigerant oil.
15. Measure and record the quantity of refrigerant oil recovered from the system.
16. Close the tap at the rear of the station.
17. Evacuation.
18. Remove the dust covers from the high and low pressure connections.
19. Connect the high and low pressure lines to the appropriate connections.
20. Open the valves on the connections.
21. Turn the valves on the station to the correct positions.
22. Turn the process switch to the correct position.
23. Turn the main switch to 'ON'.
24. Allow the station to evacuate the A/C system.



25. **CAUTION:** The system must be evacuated immediately before recharging commences. Delay between evacuation and recharging is not permitted

Recharging

26. Close the valves on the refrigerant station.

27. Close the valve on the oil charger.
28. Disconnect the yellow line from the refrigerant station.
29. Remove the cover from the oil charger.
30. Pour the correct quantity of refrigerant oil into the oil charger.
31. Install the cover to the oil charger.
32. Connect the yellow line to the refrigerant station.
33. Open the valve on the oil charger.
34. Move the pointer on the refrigerant gauge to mark the position of the refrigerant drop.
35. Slowly open the correct valve on the refrigerant to allow the vacuum to pull the refrigerant into the system.
36. Close the valve on the refrigerant station when the correct amount of refrigerant has been drawn into the air conditioning system.
37. Turn the main switch 'OFF'.
38. Close the valves on the connections.
39. Disconnect the high and low pressure connections.

Climate Control System - General Information - Air Conditioning (A/C) System Flushing

General Procedures

1. WARNINGS:



Use extreme care and observe all safety precautions related to the use of refrigerants. Due to refrigerant hazards, always wear safety goggles and non-penetrable gloves when working on or flushing air conditioning (A/C) systems. Failure to follow this instruction may result in personal injury.



When flushing the A/C system, refer to the manufacturers equipment instructions for additional information. Failure to do so may result in system damage or personal injury.



The A/C refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts shop bulk refrigerant at risk of contamination. If the vehicle A/C refrigerant is contaminated, refer the customer to return to the repair facility that performed the last A/C repair. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For additional information, refer to the manufacturers equipment instructions. Failure to follow this instruction may result in personal injury.



Prior to using the A/C flushing equipment for the first time, follow the operating instructions. Failure to follow this instruction may result in personal injury.



CAUTION: Prior to flushing, remove and discard the desiccant sack. Depending on the equipment used, other A/C components may have to be removed prior to flushing. For additional information, refer to the manufacturers equipment instructions before flushing the A/C system.

Recover the refrigerant.

For additional information, refer to [Air conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.

2. Remove the desiccant sack.
For additional information, refer to Section [412-03 Air Conditioning](#).
3. Flush the system. For additional information, refer to the manufacturers equipment instructions.
4. Install new refrigerant lines if blocked with debris.
5. Install a new desiccant sack.
For additional information, refer to Section [412-03 Air Conditioning](#).
6. Add the required amount of oil to the A/C system depending on the repair procedure.
For additional information, refer to [Refrigerant Oil Adding](#) in this section.
7. Evacuate and charge the A/C system.
For additional information, refer to [Air conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.
8. Carry out fluorescent dye leak detection test.

For additional information, refer to [Flourescent Dye Leak Detection](#) in this section.

9. Check the A/C system for correct operation.

Climate Control System - General Information - Contaminated Refrigerant Handling

General Procedures

1. If contaminated refrigerant is detected DO NOT recover the refrigerant into your R-134a OR R-12 recovery/recycling equipment. Take the following actions:
 1. Repeat the test to verify contaminated refrigerant is present.
 2. Advise the customer of the contaminated A/C system and any additional cost to repair the system. The customer may wish to return to the repair facility performing the last A/C repair.
 3. Recover the contaminated refrigerant using suitable recovery only equipment designed for capturing and storing contaminated refrigerant. This equipment must only be used to recover contaminated refrigerant to prevent the spread to other vehicles. As an alternative, contact an A/C repair facility in your area with the proper equipment to perform the repair.
 4. On completion of the recovery of the contaminated refrigerant, it will be necessary to carry out the A/C system flushing procedure. For additional information, refer to [Air Conditioning \(AC\) System Flushing](#) in this section.

Climate Control System - General Information - Electronic Leak Detection

General Procedures



1. **WARNING:** Good ventilation is necessary in the area where A/C leak testing is to be carried out. If the surrounding air is contaminated with refrigerant gas, the leak detector will indicate this gas all the time. Odors from other chemicals such as antifreeze, diesel fuel, disc brake cleaner, or other cleaning solvents can cause the same problem. A fan, even in a well ventilated area, is very helpful in removing small traces of contamination from the air that might affect the leak detector. Failure to follow this instruction may result in personal injury.

Attach an R-134a manifold gauge set or use a UL-approved recovery/recycling device such as an R-134a A/C refrigerant center (which meets SAE Standard J 1991). For additional information, refer to the manufacturers equipment instructions.

- Both gauges should indicate 413-551 kPa (60-80 psi) at 24°C (75°F) with the engine off.
 - If little or no pressure is indicated, carry out the air conditioning (A/C) system recovery, evacuation and charging procedure. For additional information, refer to [Air Conditioning \(AC\) System Recovery, Evacuation and Charging](#) in this section.
2. Use an R134-a Automatic calibration halogen leak detector to leak test the refrigerant system. For additional information, refer to the manufacturers equipment instructions.
 3. If a leak is found, carry out the air conditioning (A/C) system recovery procedure. For additional information, refer to [Air Conditioning \(AC\) System Recovery, Evacuation and Charging](#) in this section.

Climate Control System - General Information - Fluorescent Dye Leak Detection

General Procedures



1. **WARNING:** Eye protection glasses supplied with the ultraviolet (UV) lamp should be used to protect eyesight from harm.



NOTE: The air conditioning (A/C) system has an R-134a leak trace dye wafer incorporated into the desiccant bag. The exact location of leaks can be pinpointed by the bright yellow/green glow of the tracer dye. Since more than one leak may exist, always inspect each component. If it is necessary to add dye (due to a severe leakage for example) use proprietary tracer dye injection equipment.

Check for leaks using ultraviolet (UV) lamp.

2. Check all components, fittings and lines of the A/C system.
3. Carry out the repair. For additional information, refer to Section [412-03 Air Conditioning](#).
4. After the leak is repaired, remove any traces of leak trace dye with a general purpose oil solvent.
5. Check the A/C system for correct operation.
6. Verify the repair by operating the system for a short time and inspecting with the (UV) lamp.

Climate Control System - General Information - Inspection and Assembly Requirements

General Procedures

1. Check for leaks using ultraviolet (UV) Lamp.
For additional information, refer to [Flourescent Dye Leak Detection](#) in this section.

2. NOTES:



Any time a hose or component connection leak is observed, the component and fitting must be separated, cleaned and a new O-ring fitted and lubricated with air conditioning compressor oil. For additional information, refer to [Specifications](#) in this section.



When separating A/C joints, cap the open connections immediately. Do not leave open to atmosphere.

O-ring seal surfaces must be free of dirt, lint, burrs and scratches. The O-ring and connector should be lubricated with air conditioning compressor oil.

For additional information, refer to [Specifications](#) in this section.

Climate Control System - General Information - Manifold Gauge Set Connection

General Procedures

1. WARNINGS:



Use extreme care and observe all safety precautions related to the use of refrigerants. Failure to follow this instruction may result in personal injury.



For additional information, refer to the manufacturers equipment instructions. Failure to follow this instruction may result in personal injury and system damage.

Install the manifold gauge set. For additional information, refer to the manufacturers equipment instructions.

2. Carry out the repair.

3. Remove the manifold gauge set. For additional information, refer to the manufacturers equipment instructions.

4. Carry out fluorescent dye leak detection test.
For additional information, refer to [Flourescent Dye Leak Detection](#) in this section.

5. Check air conditioning (A/C) system for correct operation.

Climate Control System - General Information - Refrigerant Oil Adding TDV6

3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

General Procedures

Check

CAUTIONS:



Collect the refrigerant oil in a clean measuring cylinder.



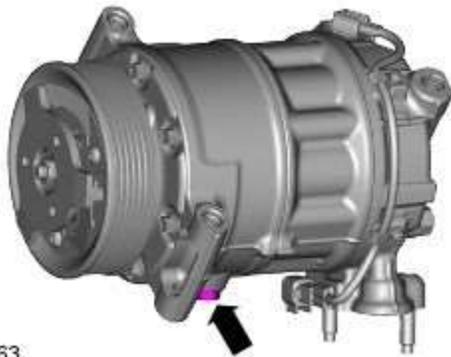
Make sure that all openings are sealed. Use new blanking caps.



Be prepared to collect escaping fluids.



NOTE: Removal steps in this procedure may contain installation details.



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1. NOTES:



This step only needs to be carried out when replacing the A/C compressor.



Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 15 Nm



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2. NOTES:



This step only needs to be carried out when replacing the A/C compressor.



Some variation in the illustrations may occur, but the essential information is always correct.

Rotate the A/C compressor shaft at least 6 to 8 turns when draining the refrigerant oil.

3. CAUTIONS:



The refrigerant oil top-up quantity must not exceed the refrigerant oil fill quantity.



If other A/C components are being renewed in addition to the A/C compressor, there is no need to top up with additional refrigerant oil, apart from filling the compressor.

Top up with the calculated quantity of new refrigerant oil.

Refer to: Specifications (412-00, Specifications).

Adjustment

1. To install, reverse the removal procedure.

Climate Control System - General Information - Refrigerant System Tests

General Procedures

1. WARNINGS:



Use extreme care and observe all safety precautions related to the use of refrigerants. Failure to follow this instruction may result in personal injury.



The A/C refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts shop bulk refrigerant at risk of contamination. If the vehicle A/C refrigerant is contaminated, refer the customer to return to the repair facility that carried out the last A/C repair. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For all equipment, follow the equipment manufacturers procedures and instructions. Failure to follow this instruction may result in personal injury.



NOTE: Jaguar Land Rover Limited supports the efficient usage, recovery and recycling of the refrigerant used in passenger car air conditioners. Jaguar Land Rover Limited recommends the use of UL-approved recovery/recycling device such as R-134a A/C refrigerant center (which meets SAE Standard J 1991) during any A/C system repair and recharge procedure which requires that the system be evacuated.

Use R-134a A/C Refrigerant Centre to evacuate and recover the A/C system.

- Follow the equipment manufactures procedures and instructions for use of equipment.

Climate Control System - General Information - Air Conditioning (A/C) Compressor Commissioning

General Procedures

Activation



CAUTION: Failure to follow this instruction may result in damage to the component.

1. Set the ignition to the on position, make sure the air conditioning (A/C) is in the off position.
2. Start the engine and allow to run for a minimum of 5 minutes.
3. Set the heater controls to 22°C, with the fan speed set to 75%.
4. Switch on the A/C system.
5. Open all air vents in the dashboard.
6. Run the A/C system for a minimum of 5 minutes, while the engine is still at idle speed.
7. Once this is achieved the compressor is stabilized, with the oil being distributed evenly throughout the system.

Climate Control -

Description	Nm	lb-ft	lb-in
Blower motor control module retaining bolts	1	-	9
Foot duct to cross car beam retaining bolt	5	-	44
Climate control assembly to cross car beam retaining bolts	9	-	80
Climate control module retaining bolts	1	-	9
Defrost vent/register blend door actuator retaining bolts	1	-	9
Evaporator pipe bracket retaining bolts	1	-	9
Evaporator housing retaining bolts	1	-	9
Footwell vent/duct blend door actuator retaining bolt	1	-	9
Heater core housing retaining bolts	2	-	18
Sunload sensor retaining bolt	2	-	18
Evaporator core pipes mounting bracket retaining bolts	1	-	9
Evaporator core pipes to thermostatic expansion valve retaining bolt	5	-	44
Thermostatic expansion valve retaining bolts	3	-	26

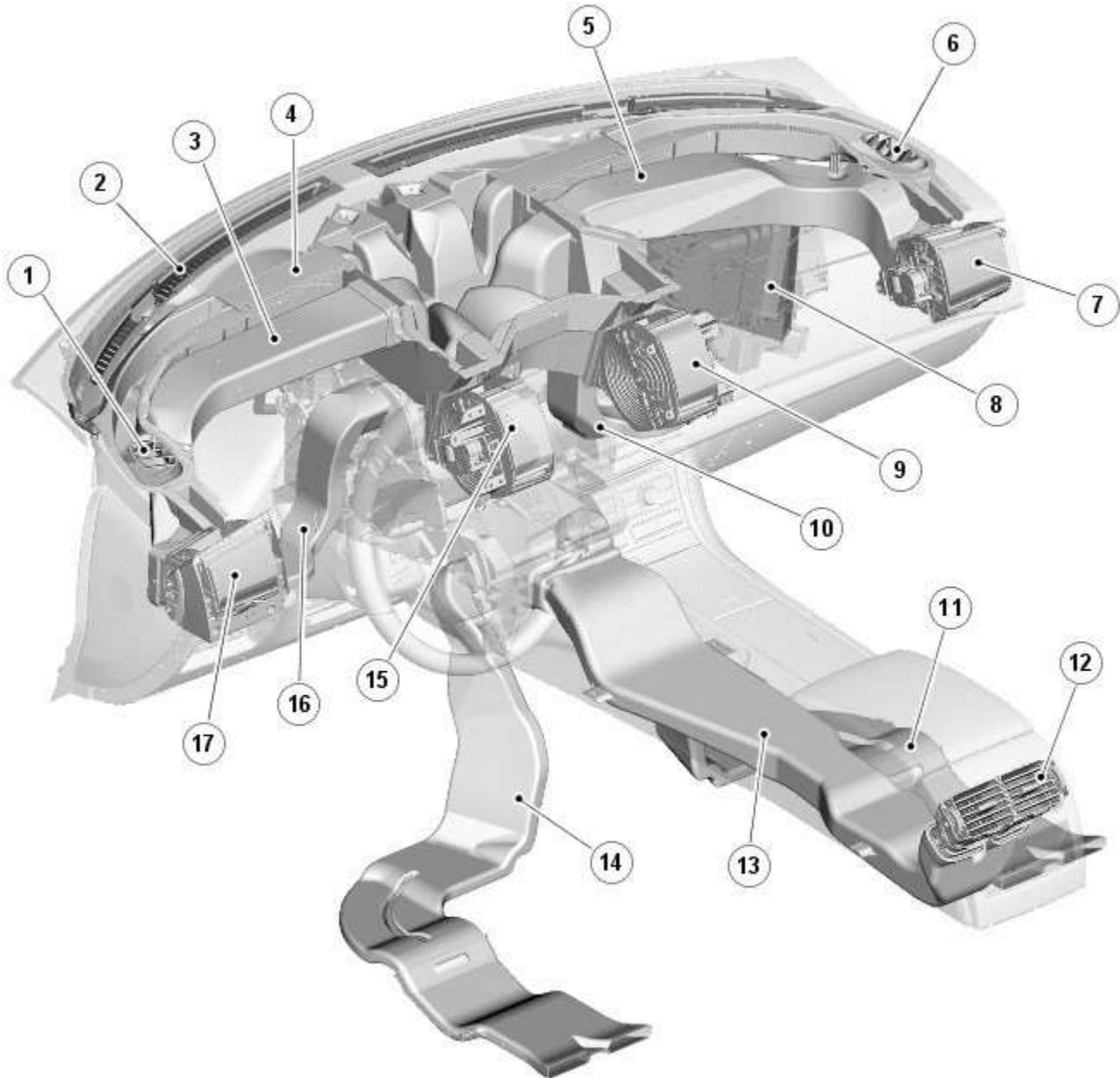
Climate Control - Air Distribution and Filtering - Component Location

Description and Operation



NOTE: LHD (left-hand drive) vehicle shown, RHD (right-hand drive) vehicle similar.

Component Location



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Item	Description
1	LH (left-hand) side window vent
2	Windshield vent
3	Driver's face level duct
4	Windshield/Side window vent duct
5	Front passenger's face level duct
6	RH (right-hand) side window vent
7	Front passenger's face level register

8	Pollen filter
9	RH inner face level register
10	Front passenger's footwell duct
11	RH rear footwell duct
12	Rear face level registers
13	Rear face level duct
14	LH rear footwell duct
15	LH inner face level register
16	Driver's footwell duct
17	Driver's face level register

Climate Control - Air Distribution and Filtering - Overview

Description and Operation

Overview

The air distribution and filtering system controls the distribution and quality of air supplied to the passenger compartment. The system comprises of a pollen filter and a number of ducts, vents and registers.

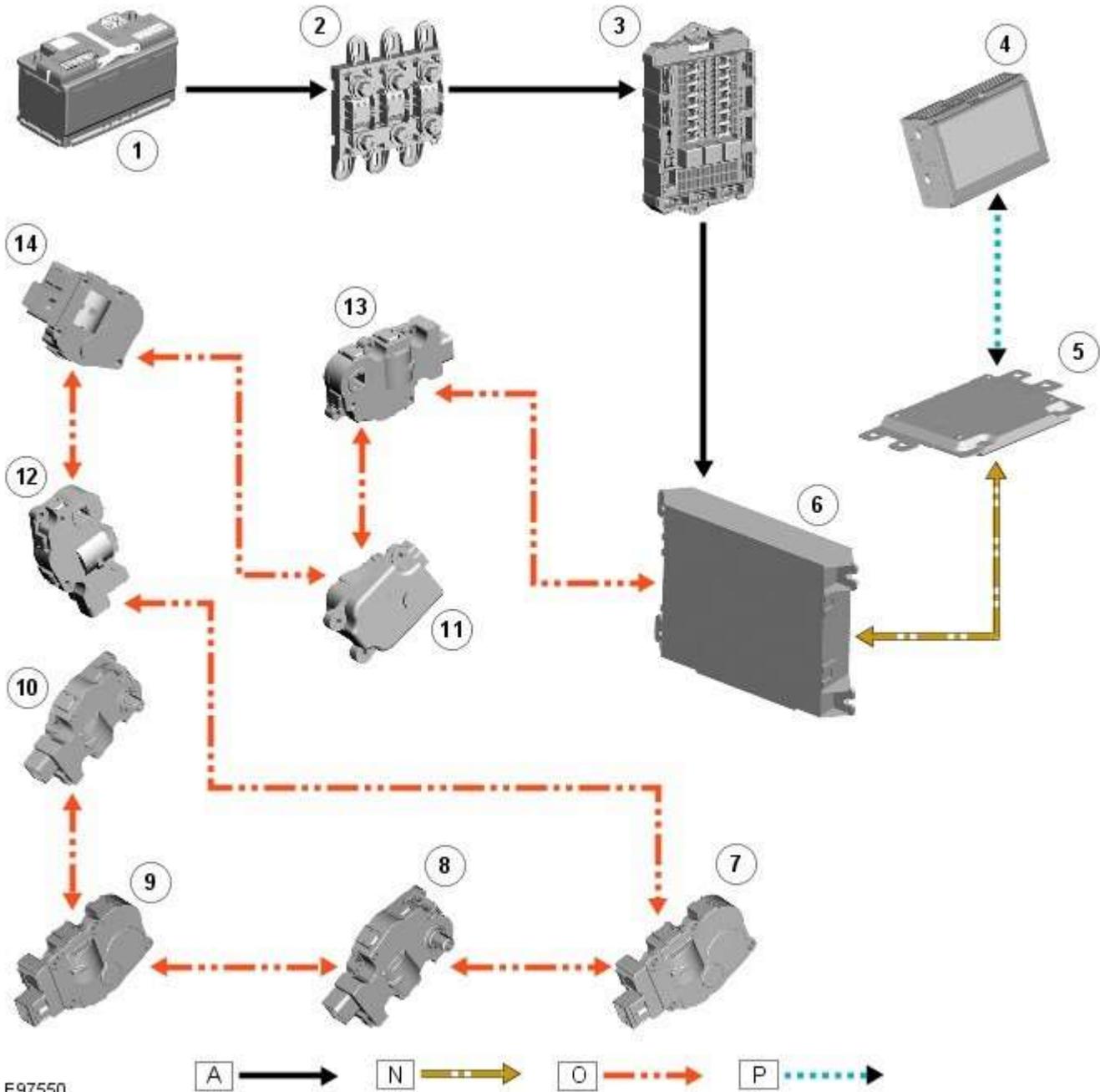
Climate Control - Air Distribution and Filtering - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **N** = Medium speed CAN (controller area network) bus; **O** = LIN (local interconnect network) bus; **P** = Media orientated system transport (MOST) ring.



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Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	Touch screen display (TSD)
5	Information and entertainment module

6	ATC (automatic temperature control) module
7	RH (right-hand) outer face level register
8	RH inner face level register
9	LH (left-hand) inner face level register
10	LH outer face level register
11	Face/Feet distribution stepper motor
12	RH temperature blend stepper motor
13	Windshield (defrost) distribution stepper motor
14	LH temperature blend stepper motor

System Operation

Face Level Registers

Operation of the face level registers is controlled by the [ATC](#) module, using [LIN](#) bus messages to the integral stepper motors. The four registers operate together in both the opening and closing phases.

The face level registers can be selected to run in one of two modes: 'automatic' or 'always open'. The mode is selected on the climate control screen of the TSD.

Refer to: [Navigation System \(415-01 Information and Entertainment System, Description and Operation\)](#).

In the automatic mode, operation of the face level registers is synchronized with the engine START/STOP button. When the engine starts the [ATC](#) module opens the registers. When the engine stops, the [ATC](#) module closes the registers.

If a face level register is fouled, when it receives an open or close request, the register concerned makes a number of attempts to reach the requested position. If the register still does not move, it is left in the fouled position. The remaining registers will continue to open and close as normal.

The automatic mode is disabled when the climate control system is off. The [ATC](#) module closes the registers if they are open in the automatic mode and the climate control system is selected off.

Diagnostics

If a fault occurs with the face level registers, a [DTC \(diagnostic trouble code\)](#) is stored in the [ATC](#) module. The [DTC](#) can be read using the Jaguar approved diagnostic system. The Jaguar approved diagnostic system can also initiate a self test routine to check the operation of the face level registers.

Refer to: [Climate Control System \(412-00 Climate Control System - General Information, Diagnosis and Testing\)](#).

Component Description

Air Ducts

The air ducts distribute air from the heater assembly to the registers and vents in the instrument panel and the center floor console. Air ducts also direct air from the heater assembly into the front and rear footwells.

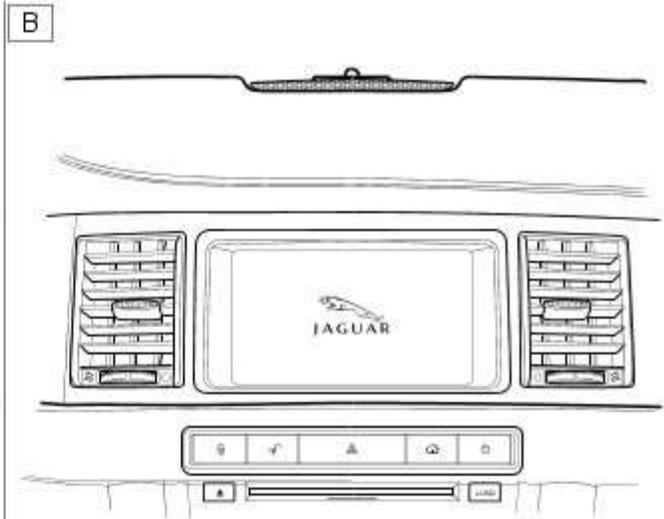
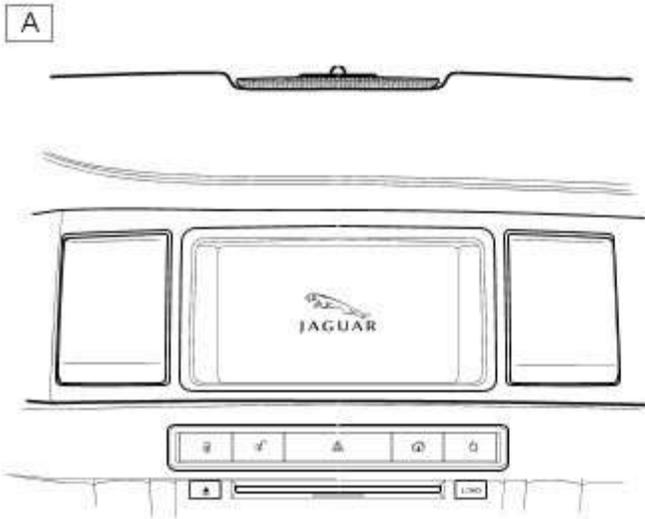
Registers and Vents

The registers control the flow and direction of air from the air ducts. The instrument panel contains four face level registers; one at each end and two mounted centrally. For the rear seat occupants, two registers are installed in the rear face of the center floor console. All of the registers incorporate vertical and horizontal directional vane adjustment and full air flow adjustment down to zero.

The four face level registers in the instrument panel each contain an integral stepper motor. The stepper motors enable the registers to rotate between the open and closed positions. In the open position, the registers have normal appearance and functionality. In the closed position, the registers present a smooth surface flush with the surrounding instrument panel.

The vents are fixed outlets. There are four vents in the upper surface of the instrument panel; one in each end to direct air onto the side windows and two along the front edge to direct air onto the windshield.

Central Face Level Registers



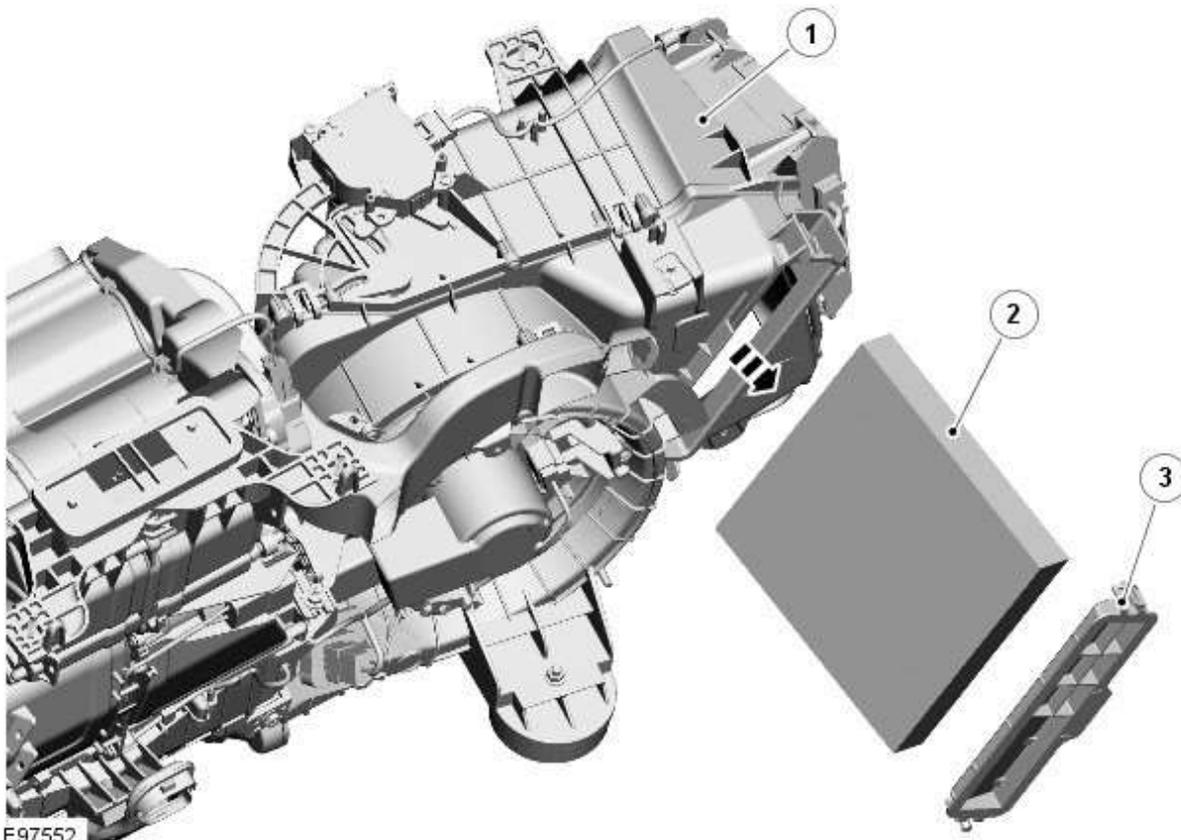
E97551

Item	Description
A	Registers closed
B	Registers open

Pollen Filter



NOTE: LHD (left-hand drive) vehicle shown, RHD (right-hand drive) vehicle similar.



E97552

Item	Description
1	Air inlet duct
2	Pollen filter
3	Cover

The pollen filter removes odors and fine particles from fresh air entering the passenger compartment. The pollen filter is located in the air inlet duct, in the inlet to the blower. A cover on the underside of the air inlet duct provides access to the pollen filter for servicing.

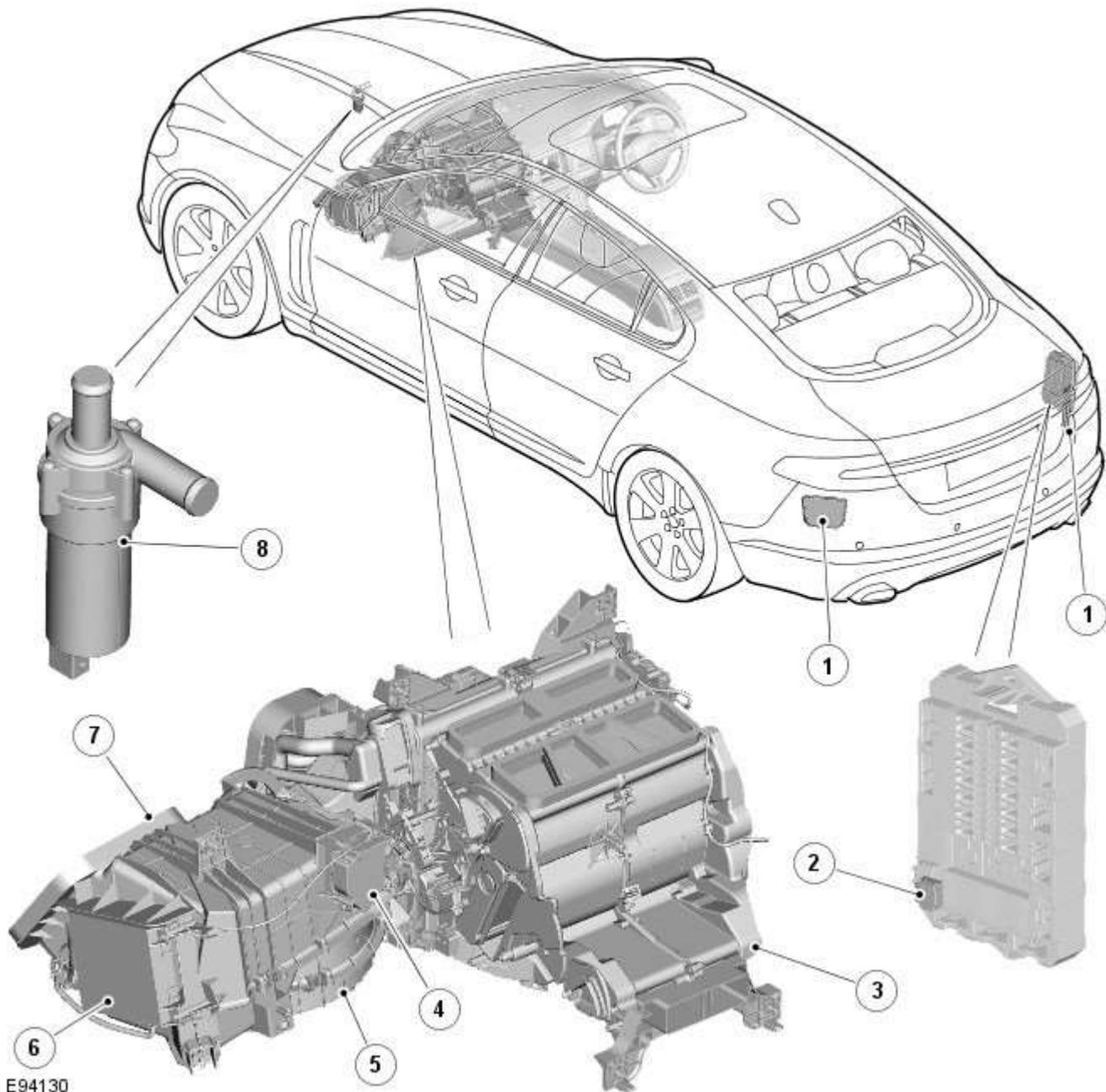
Climate Control - Heating and Ventilation - Component Location

Description and Operation



NOTE: RHD (right-hand drive) vehicle shown, LHD (left-hand drive) vehicle similar.

Component Location



E94130

Item	Description
1	Ventilation outlet
2	Blower relay (on RJB (rear junction box))
3	Heater assembly
4	Blower control module
5	Blower
6	ATC (automatic temperature control) module
7	Air inlet duct
8	Auxiliary coolant pump
Comments:	
All except 3.0L vehicles; 5.0L version shown, 3.0L diesel version similar.	

Climate Control - Heating and Ventilation - Overview

Description and Operation

Overview

The heating and ventilation system controls the temperature and flow of air supplied to the passenger compartment. The system is a dual zone automatic system, which can provide different temperature settings for the [LH \(left-hand\)](#) and [RH \(right-hand\)](#) sides of the passenger compartment.

5	Touch screen display (TSD)
6	Integrated control panel
7	Information control module
8	ATC (automatic temperature control) module
9	Face/Feet distribution stepper motor
10	RH (right-hand) temperature blend stepper motor
11	LH (left-hand) temperature blend stepper motor
12	Windshield (defrost) distribution stepper motor
13	Blower control module
14	RJB (rear junction box)
15	Blower

System Operation

Operation of the heating and ventilation system is controlled by the [ATC](#) module.
Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

The system can be operated in automatic or manual mode, with temperature settings selected using the switches on the integrated control panel.

When the engine is running, coolant is constantly circulated through the heater core by the engine coolant pump and the auxiliary coolant pump. Where fitted, the auxiliary coolant pump is energized by the [CJB](#) on receipt of medium speed [CAN](#) bus signals from the [ATC](#) module. The [CJB](#) broadcasts auxiliary coolant pump status over the medium speed [CAN](#) bus for use by other vehicle systems.

The blower is supplied with power by the blower relay on the [RJB](#) and connected to ground via the blower control module. The blower control module regulates the voltage across the blower motor to control blower speed. The voltage set by the blower control module is controlled by a [PWM \(pulse width modulation\)](#) signal from the [ATC](#) module. The [ATC](#) module uses a feedback signal from the blower control module to monitor blower speed.
Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

Component Description

Heater Assembly

The heater assembly controls the temperature and flow of air supplied to the air distribution ducts. The heater assembly is mounted on the vehicle centerline, between the instrument panel and the engine bulkhead.

The heater assembly consists of a casing that contains an [A/C \(air conditioning\)](#) evaporator, a heater core, two air distribution control doors and two temperature blend control doors. On 2.7L diesel vehicles, the heater assembly also contains an electric booster heater.

Refer to: [Electric Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation).

Mounted on the heater casing are four stepper motors. Each of the stepper motors is connected to either an air distribution control door or a temperature blend control door.

The [A/C](#) evaporator is part of the [A/C](#) system.
Refer to: [Air Conditioning](#) (412-01 Climate Control, Description and Operation).

The heater core provides the heat source to warm the air supplied to the passenger compartment. The heater core is an aluminum two pass, fin and tube heat exchanger, and is installed across the width of the heater housing. Two aluminum tubes attached to the heater core extend through the engine bulkhead and connect to the engine cooling system. For additional information, refer to:

Engine Cooling (303-03A, Description and Operation),
[Engine Cooling](#) (303-03B Engine Cooling - V6 3.0L Petrol, Description and Operation),
Engine Cooling (303-03C, Description and Operation).

Air Inlet Duct

The air inlet duct connects the fresh air inlet in the engine bulkhead to the heater assembly. The air inlet duct is installed behind the instrument panel on the passenger side.

The air inlet duct consists of a casing that contains a pollen filter, an air inlet door, a blower and a blower control module. A recirculation air inlet is incorporated into the casing. A servo motor is mounted on the casing and connected to the air inlet door, to allow selection between fresh and recirculated air.

Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

The pollen filter is part of the air distribution and filtering system.
Refer to: [Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation).

The blower regulates the volume of air flowing through the air inlet duct to the heater assembly. The blower consists of an open hub, centrifugal fan and an electric motor.

The blower control module regulates the power supply to the blower motor. The blower control module is installed in the air

inlet duct downstream of the blower, where any heat generated during operation is dissipated by the air flow.

Auxiliary Coolant Pump

On all vehicles except 3.0L, an auxiliary coolant pump is installed on the rear right side of the radiator housing, in the return line from the heater core. The auxiliary coolant pump is an electric pump that boosts the flow of coolant through the heater core.

Ventilation Outlets

The ventilation outlets allow the free flow of air through the passenger compartment. The outlets are installed in the LH and RH rear quarter panels, below the rear lamps. Each ventilation outlet consists of a grille covered by a soft rubber flap, and is effectively a non-return valve. The flaps open and close automatically depending on the pressure differential between the air inside and outside the vehicle.

Climate Control - Air Conditioning - Component Location

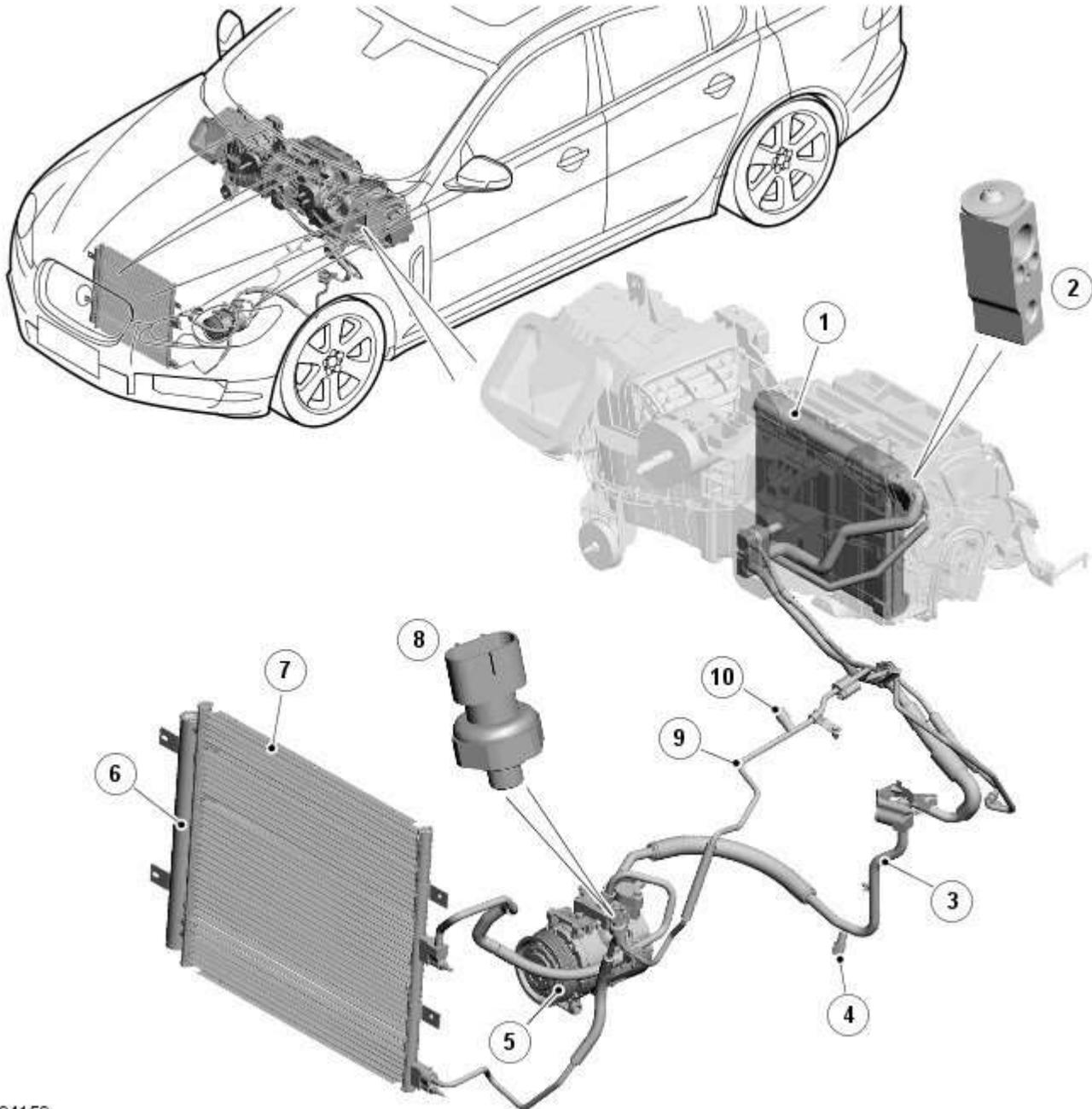
Published: 11-May-2011

Description and Operation



NOTE: LHD (left-hand drive)) . \$L vehicle shown, other vehicles similar.

Component Location



E94159

Item	Description
1	Evaporator
2	Thermostatic expansion valve
3	Low pressure line
4	Low pressure servicing connection
5	A/C (air conditioning) compressor
6	Receiver/Drier
7	Condenser

8	Refrigerant pressure sensor
9	High pressure line
10	High pressure servicing connection

Climate Control - Air Conditioning - Overview

Description and Operation

Overview

The [A/C \(air conditioning\)](#) system transfers heat from the passenger compartment to the outside atmosphere to provide the heater assembly with dehumidified cold air. It is a sealed, closed loop system filled with a charge weight of R134a refrigerant as the heat transfer medium. Oil is added to the refrigerant to lubricate the internal components of the [A/C](#) compressor.

Climate Control - Air Conditioning - System Operation and Component Description

Description and Operation

System Operation

General

To accomplish the transfer of heat, refrigerant is circulated around a sealed system, where it passes through two pressure/temperature regimes. In each of the regimes the refrigerant changes state, during which process maximum heat absorption or dissipation occurs.

The low pressure/temperature regime is from the thermostatic expansion valve, through the evaporator to the compressor. The refrigerant decreases in pressure and temperature at the thermostatic expansion valve, then changes state from a liquid to a vapor in the evaporator to absorb heat.

The high pressure/temperature regime is from the compressor, through the condenser and receiver drier assembly to the thermostatic expansion valve. The refrigerant increases in pressure and temperature as it passes through the compressor, then releases heat and changes state from a vapor to a liquid in the condenser.

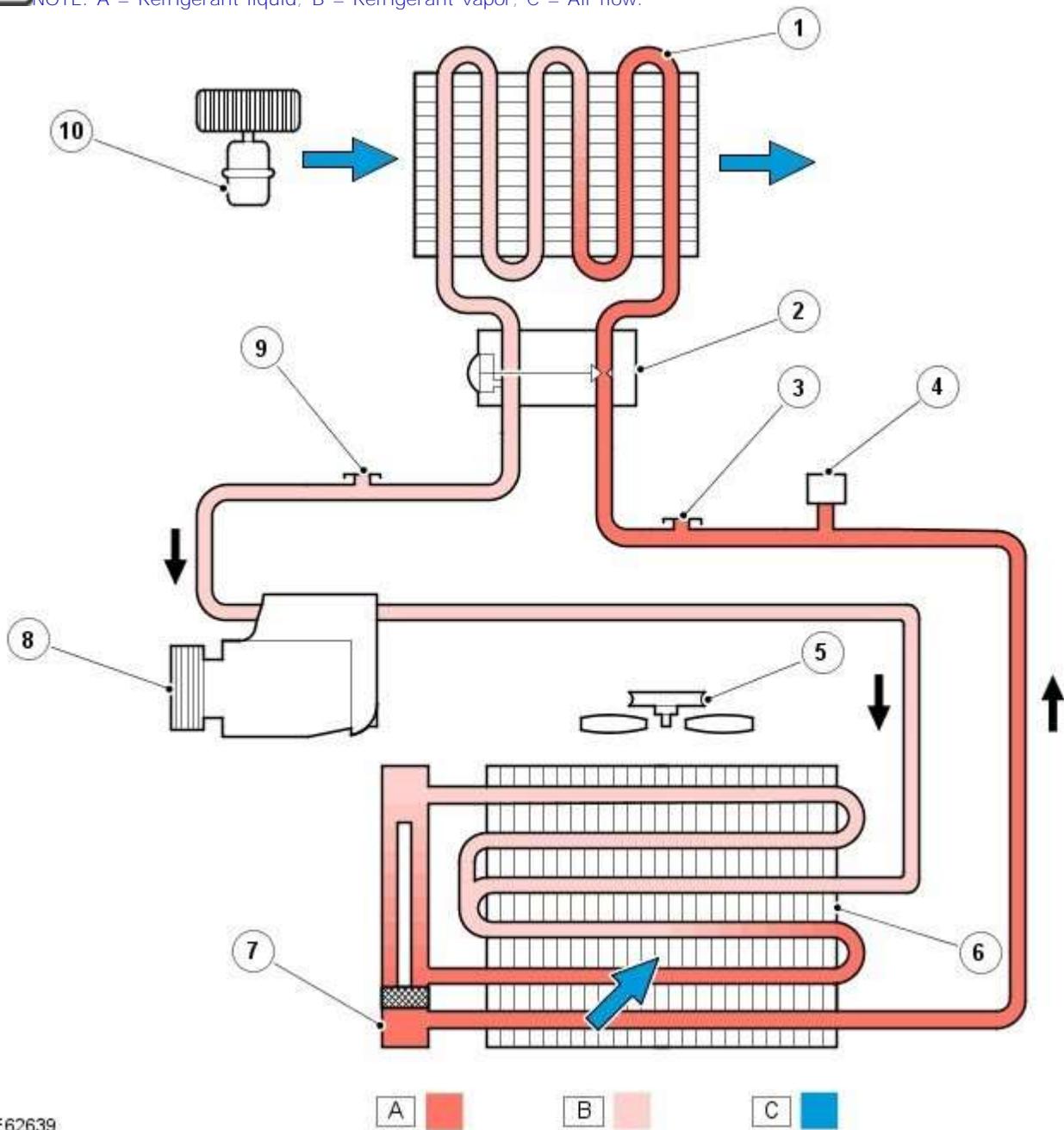
Operation of the [A/C \(air conditioning\)](#) system is controlled by the [ATC \(automatic temperature control\)](#) module. Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

The [A/C](#) system works in conjunction with:

- The air distribution and filtering system.
Refer to: [Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation).
- The heating and ventilation system.
Refer to: [Heating and Ventilation](#) (412-01 Climate Control, Description and Operation).

A/C System Flow Diagram

△ NOTE: A = Refrigerant liquid; B = Refrigerant vapor; C = Air flow.

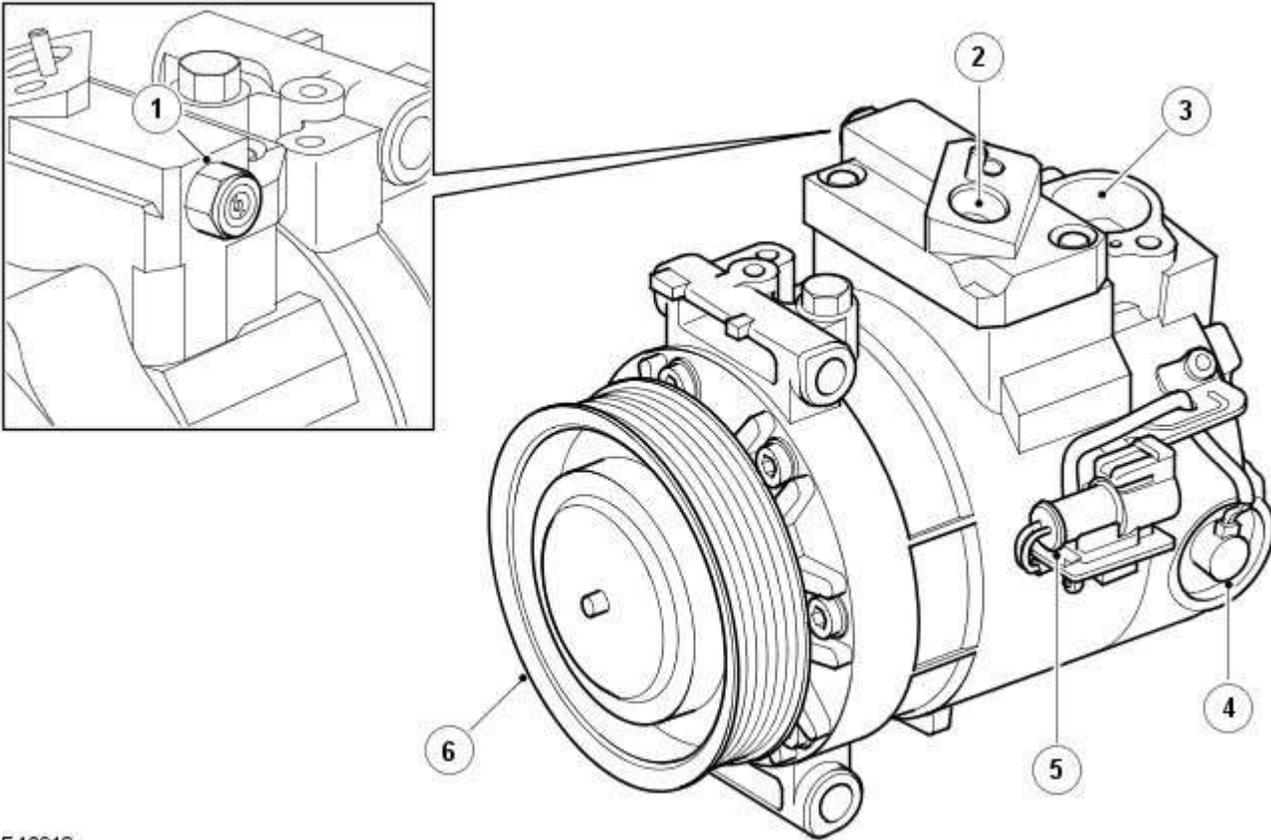


E62639

Item	Description
1	Evaporator
2	Thermostatic expansion valve
3	High pressure servicing connection
4	Refrigerant pressure sensor
5	Engine cooling fan
6	Condenser
7	Receiver/Drier
8	A/C compressor
9	Low pressure servicing connection
10	Blower

Component Description

A/C Compressor



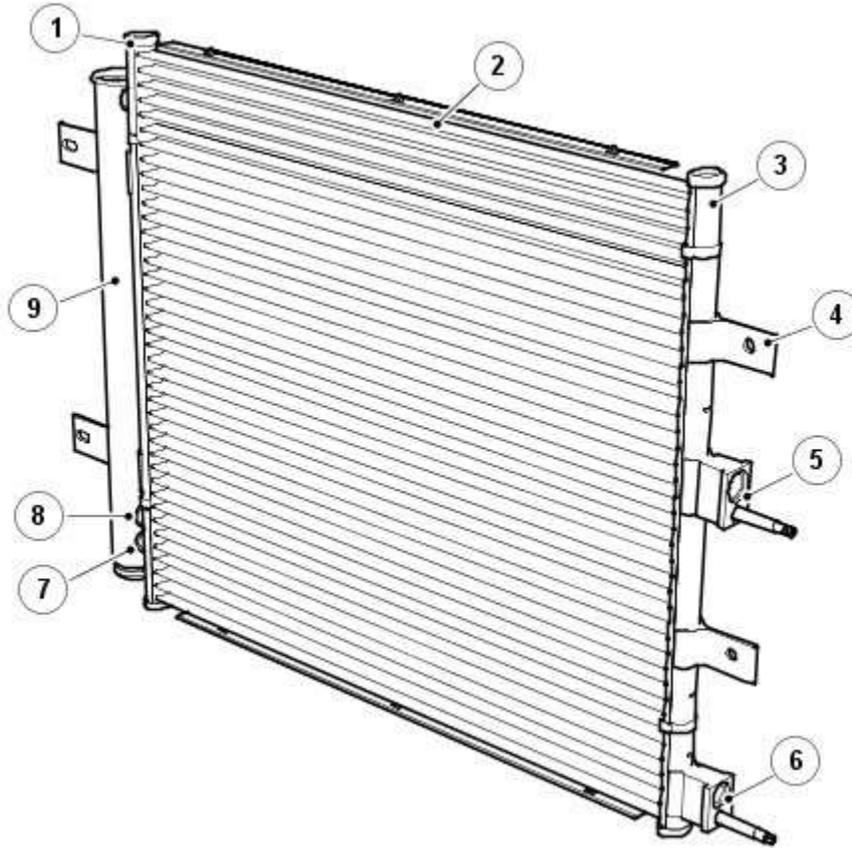
E46918

Item	Description
1	Pressure relief valve
2	Outlet port
3	Inlet port
4	Solenoid valve
5	Electrical connector
6	Pulley

The [A/C](#) compressor circulates refrigerant around the system by compressing low pressure, low temperature vapor from the evaporator and discharging the resultant high pressure, high temperature vapor to the condenser.

The [A/C](#) compressor is a permanently engaged variable displacement unit which is driven by the engine accessory drive belt. To protect the system from excessive pressure, a pressure relief valve is installed in the outlet side of the [A/C](#) compressor. The pressure relief valve vents excess pressure into the engine compartment.

Condenser



E72963

Item	Description
1	RH (right-hand) end tank
2	Condenser core
3	LH (left-hand) end tank
4	Mounting brackets (4 off)
5	High pressure compressor discharge line connector block
6	High pressure liquid outlet line connector block
7	Receiver/Drier outlet pipe
8	Receiver/Drier inlet pipe
9	Receiver/Drier

The condenser transfers heat from the refrigerant to the surrounding air to convert the high pressure vapor from the compressor into a liquid. The condenser is installed immediately in front of the radiator. Two brackets on each end tank attach the condenser to the end tanks of the radiator.

The condenser is classified as a sub-cooling condenser and consists of a fin and tube heat exchanger core installed between two end tanks. Divisions in the end tanks separate the heat exchanger into a four pass upper (condenser) section and a two pass lower (sub-cooler) section.

The [LH](#) end tank provides the connections to the high pressure line from the [A/C](#) compressor and the high pressure liquid line to the evaporator.

The [RH](#) end tank provides the connections to the receiver drier.

Receiver Drier

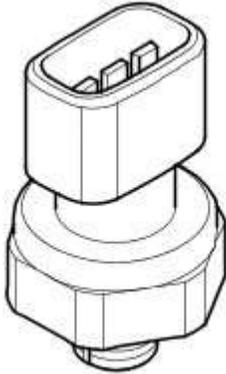
The receiver drier is integrated into the [RH](#) end tank of the condenser to remove solid impurities and moisture from the refrigerant. It also provides a reservoir for liquid refrigerant to accommodate changes of heat load at the evaporator.



NOTE: The receiver drier is part of the condenser assembly and is not serviceable separately.

Refrigerant entering the receiver drier passes through a filter and a desiccant pack, then collects in the base of the unit before flowing through the outlet pipe back to the condenser.

Refrigerant Pressure Sensor

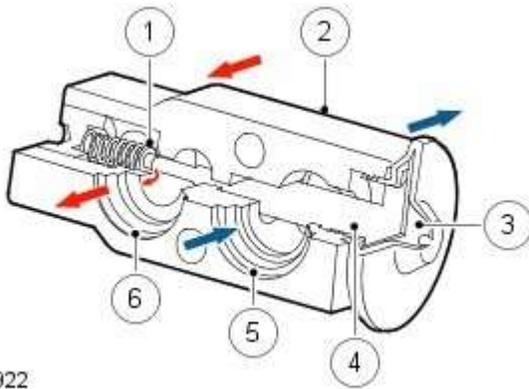


E43581

The refrigerant pressure sensor is located in the high pressure/temperature refrigerant line between the condenser and the thermostatic expansion valve.

Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

Thermostatic Expansion Valve



E46922

Item	Description
1	Metering valve
2	Housing
3	Diaphragm
4	Temperature sensor
5	Outlet passage from evaporator
6	Inlet passage to evaporator

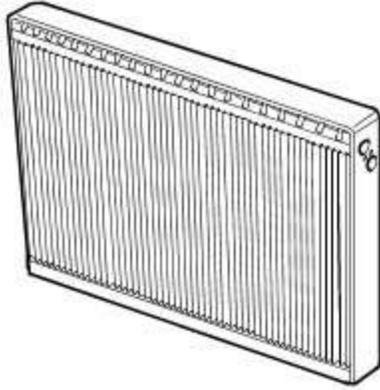
The thermostatic expansion valve meters the flow of refrigerant into the evaporator, to match the refrigerant flow with the heat load of the air passing through the evaporator.

The thermostatic expansion valve is a block type valve located behind the heater assembly, and attached to the inlet and outlet ports of the evaporator. The thermostatic expansion valve consists of an aluminium housing containing inlet and outlet passages. A ball and spring metering valve is installed in the inlet passage and a temperature sensor is installed in the outlet passage. The temperature sensor consists of a temperature sensitive tube connected to a diaphragm. The bottom end of the temperature sensitive tube acts on the ball of the metering valve. Pressure on top of the diaphragm is controlled by the evaporator outlet temperature conducted through the temperature sensitive tube. The bottom of the diaphragm senses evaporator outlet pressure.

Liquid refrigerant flows through the metering valve into the evaporator. The restriction across the metering valve reduces the pressure and temperature of the refrigerant. The restriction also changes the liquid stream of refrigerant into a fine spray, to improve the evaporation process. As the refrigerant passes through the evaporator, it absorbs heat from the air flowing through the evaporator. The increase in temperature causes the refrigerant to vaporise and increase in pressure.

The temperature and pressure of the refrigerant leaving the evaporator acts on the diaphragm and temperature sensitive tube, which regulate the metering valve opening and so control the volume of refrigerant flowing through the evaporator. The warmer the air flowing through the evaporator, the more heat available to evaporate refrigerant and thus the greater volume of refrigerant allowed through the metering valve.

Evaporator



E46923

The evaporator is installed in the heater assembly, between the blower and the heater matrix, to absorb heat from the exterior or recirculated air.

Most of the moisture in the air passing through the evaporator condenses into water, which drains out of the vehicle by passing through a drain tube to the underside of the vehicle.

Refrigerant Lines

To maintain similar flow velocities around the [A/C](#) system, the diameter of the refrigerant lines varies to suit the two pressure/temperature regimes. Larger diameter pipes are installed in the low pressure/temperature regime and smaller diameter pipes are installed in the high pressure/temperature regime.

Low and high pressure charging connections are incorporated into the refrigerant lines for system servicing.

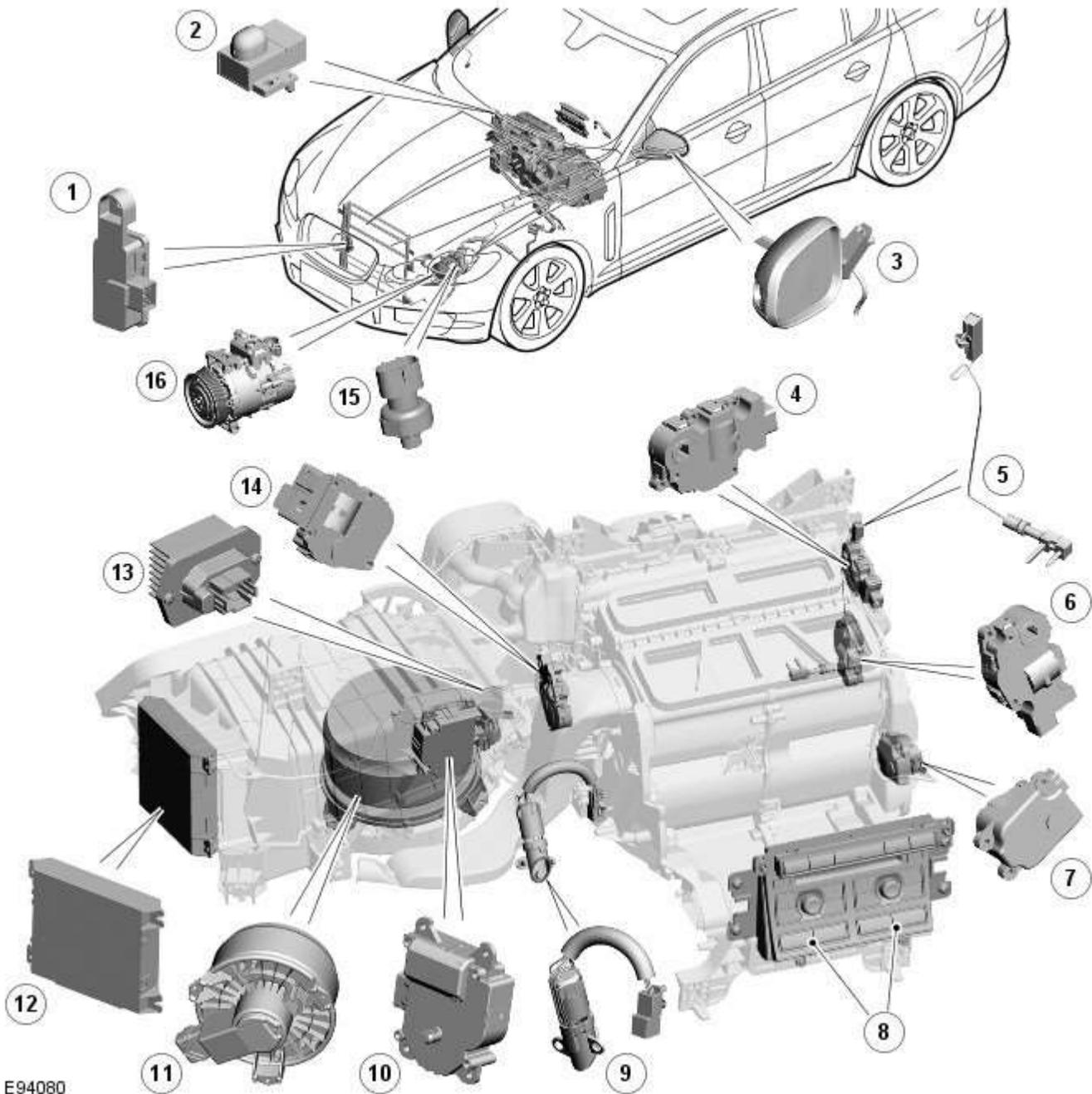
Climate Control - Control Components - Component Location

Description and Operation



NOTE: RHD (right-hand drive) vehicle shown, LHD (left-hand drive) vehicle similar.

Component Location



E94080

Item	Description
1	Pollution sensor Comments: where fitted
2	Sunload sensor
3	Ambient air temperature sensor
4	Windshield (Defrost) distribution stepper motor
5	Evaporator temperature sensor

6	RH (right-hand) temperature blend stepper motor
7	LH (left-hand) temperature blend stepper motor
8	Control switches
9	Humidity and temperature sensor
10	Air inlet servo motor
11	Blower
12	ATC (automatic temperature control) module
13	Blower control module
14	Face/Feet distribution stepper motor
15	Refrigerant pressure sensor
16	A/C (air conditioning) compressor solenoid valve

Climate Control - Control Components - Overview

Description and Operation

Overview

The climate control system is controlled by the [ATC \(automatic temperature control\)](#) module. It controls the heating and ventilation system and the [A/C \(air conditioning\)](#) system to regulate the temperature, volume and distribution of air into the passenger compartment. The system is a fully automatic dual zone system capable of maintaining individual temperature levels selected for the [LH \(left-hand\)](#) and [RH \(right-hand\)](#) sides of the passenger compartment, up to a maximum differential of approximately 3 °C (5.4 °F). Manual overrides for the system include inlet air source, blower speed and air distribution. These selections can be made using either the soft switches on the home and climate control screens of the touch screen display (TSD), or the switches on the integrated control panel.

The [ATC](#) module also controls:

- The rear window heater.
- The windshield heater (where fitted).
- The exterior mirror heaters.
- The seat heaters (where fitted).
- The steering wheel heater.

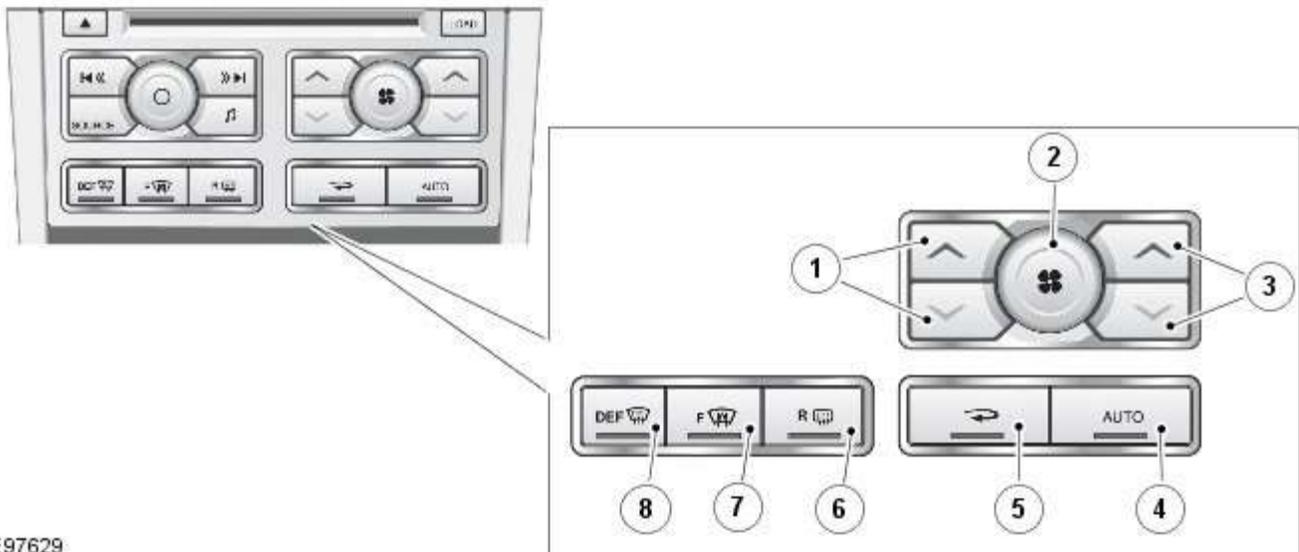
TSD Home Screen



TSD Climate Control Screen



Integrated Control Panel



E97629

Item	Description
1	LH temperature switches
2	Blower switch
3	RH temperature switches
4	Automatic climate control switch
5	Recirculation switch
6	Rear window heater switch
7	Windshield heater switch
Comments:	
where fitted	
8	Programmed defrost switch

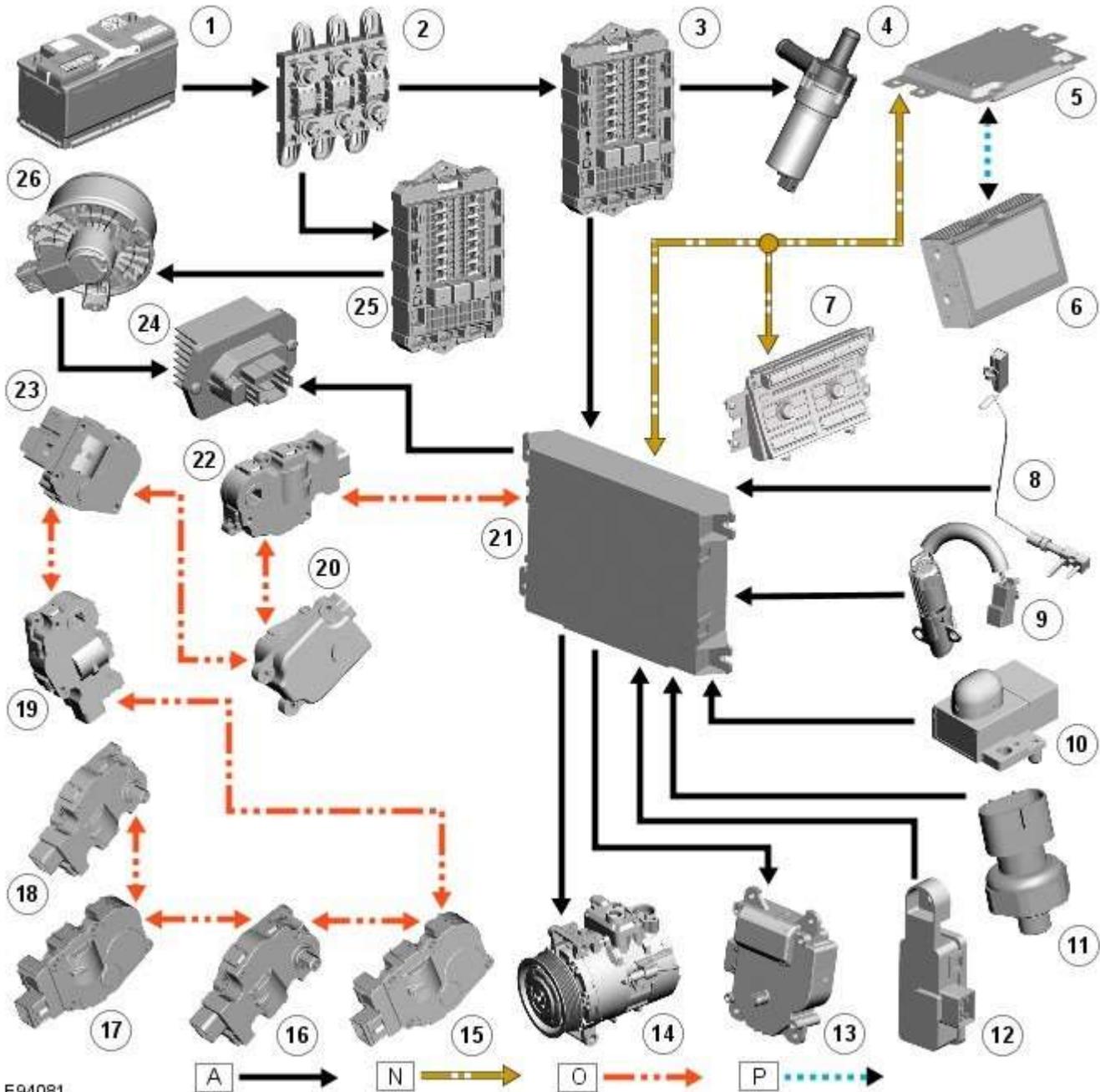
Climate Control - Control Components - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **N** = Medium speed CAN (controller area network) bus; **O** = LIN (local interconnect network) bus; **P** = Media orientated system transport (MOST) ring.



E94081

Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	Auxiliary coolant pump
Comments:	
All except 3.0L vehicles; 5.0L version shown, 3.0L diesel version similar.	

5	Information and entertainment module
6	TSD (touch screen display)
7	Integrated control panel
8	Evaporator temperature sensor
9	Humidity and temperature sensor
10	Sunload sensor
11	Refrigerant pressure sensor
12	Pollution sensor Comments: where fitted
13	Air inlet servo motor
14	A/C (air conditioning) compressor solenoid valve
15	RH (right-hand) outer face level register
16	RH inner face level register
17	LH (left-hand) inner face level register
18	LH outer face level register
19	RH temperature blend stepper motor
20	Face/Feet distribution stepper motor
21	ATC (automatic temperature control) module
22	LH temperature blend stepper motor
23	Windshield (Defrost) stepper motor
24	Blower control module
25	RJB (rear junction box)
26	Blower

System Operation

Air Inlet Control

The source of inlet air is automatically controlled unless overridden by pressing the air recirculation switch on the integrated control panel. During automatic control, the [ATC](#) module determines the required position of the recirculation door from its 'comfort' algorithm and, if fitted, the pollution sensor.

The [ATC](#) module provides analogue signals to the air inlet servo motor along a hardwired connection. A potentiometer in the motor supplies the [ATC](#) module with a position feedback signal for closed loop control.

Air Temperature Control

Cooled air from the evaporator enters the heater assembly, where temperature blend doors direct a proportion of the air through the heater core to produce the required output air temperature.

The two temperature blend doors operate independently to enable individual temperature settings for the left and right sides of the passenger compartment. The temperature blend doors are operated by stepper motors, which are controlled by the [ATC](#) module using [LIN](#) bus messages.

The [ATC](#) module calculates the temperature blend stepper motor positions required to achieve the selected temperature and compares it against the current position. If there is any difference, the [ATC](#) module signals the stepper motors to adopt the new position.

Air temperature is controlled automatically unless maximum heating (HI) or maximum cooling (LO) is selected. When maximum heating or cooling is selected, a 'comfort' algorithm in the [ATC](#) module adopts an appropriate strategy for air distribution, blower speed, and air source.

Temperature control in one side of the passenger compartment can be compromised by the other side of the passenger compartment being set to a high level of heating or cooling. True maximum heating or cooling (displayed as 'HI' or 'LO' on the TSD) can only be selected for the driver's side of the passenger compartment. If 'HI' or 'LO' is selected for the driver's side, the temperature for the front passenger's side is automatically set to match the driver's side.

If [A/C](#) is selected off in the automatic mode, no cooling of the inlet air will take place. The minimum output air temperature from the system will be ambient air temperature plus any heat pick up in the air inlet path.

If the Temp. sync. soft button on the TSD is pressed, the [ATC](#) module synchronizes the temperature of the passenger side of the passenger compartment with the driver's side.

Blower Control

When the system is in the automatic mode, the [ATC](#) module determines the blower speed required from a comfort algorithm. When the system is in the manual mode, the [ATC](#) module operates the blower at the speed selected using either the rotary

control switch on the integrated control panel or the + and - soft buttons on the touch screen display (TSD). The [ATC](#) module also adjusts blower speed to compensate for the ram effect on inlet air produced by forward movement of the vehicle. As vehicle speed and ram effect increases, blower motor speed is reduced, and vice versa.

Air Distribution Control

Two air distribution doors are used to direct air into the passenger compartment. The doors are operated by stepper motors, which are controlled by the [ATC](#) module using [LIN](#) bus messages.

When the [A/C](#) system is in automatic mode, the [ATC](#) module automatically controls air distribution into the passenger compartment in line with its 'comfort' algorithm. Automatic control is overridden if any of the TSD air distribution soft buttons are selected. Air distribution in the passenger compartment will remain as selected until the 'Auto' switch is pressed or a different manual selection is made.

A/C Compressor Control

When [A/C](#) is selected the [ATC](#) module maintains the evaporator at an operating temperature that varies with the passenger compartment cooling requirements. If the requirement for cooled air decreases, the [ATC](#) module raises the evaporator operating temperature by reducing the flow of refrigerant provided by the [A/C](#) compressor. The [ATC](#) module closely controls the rate of temperature increase to avoid introducing moisture into the passenger compartment.

If the requirement for cooled air increases, the [ATC](#) module lowers the evaporator operating temperature by increasing the flow of refrigerant provided by the [A/C](#) compressor.

When [A/C](#) is off, the compressor current signal supplied by the [ATC](#) module holds the [A/C](#) compressor solenoid valve in the minimum flow position, effectively switching off the [A/C](#) function.

The [ATC](#) module incorporates limits for the operating pressure of the refrigerant system. If the system approaches the high pressure limit, the compressor current signal is progressively reduced until the system pressure decreases. If the system falls below the low pressure limit, the compressor current signal is held at its lowest setting so that the [A/C](#) compressor is maintained at its minimum stroke. This avoids depletion of the lubricant from the [A/C](#) compressor.

A/C Compressor Torque

The [ATC](#) module transmits refrigerant pressure and [A/C](#) compressor current values to the [ECM \(engine control module\)](#) over the medium speed then high speed [CAN](#) bus, using the [CJB](#) as a gateway. The [ECM](#) uses these values to calculate the torque being used to drive the [A/C](#) compressor. The [ECM](#) compares the calculated value with its allowable value and if necessary forces the [ATC](#) module to inhibit the [A/C](#) compressor by transmitting the 'ACClutchInhibit' [CAN](#) message. This forces the [ATC](#) module to reduce the drive current to the [A/C](#) compressor solenoid valve, which reduces refrigerant flow. This in turn reduces the torque required to drive the [A/C](#) compressor.

By reducing the maximum [A/C](#) compressor torque, the [ECM](#) is able to reduce the load on the engine when it needs to maintain vehicle performance or cooling system integrity.

Cooling Fan Control

The [ATC](#) module determines the amount of condenser cooling required from the refrigerant pressure sensor, since there is a direct relationship between the temperature and pressure of the refrigerant. The cooling requirement is broadcast to the [ECM](#) on the medium speed [CAN](#) bus. The [ECM](#) then controls the temperature of the condenser using the cooling fan.

Programmed Defrost

The programmed defrost DEF switch is located on the integrated control panel. When the switch is pressed, the [ATC](#) module instigates the programmed defrost function. When selected, the [ATC](#) module configures the system as follows:

- Automatic mode off.
- [A/C](#) on.
- Selected temperature unchanged.
- Air inlet set to fresh air.
- Air distribution set to windshield.
- Blower speed set to level 6.
- Windshield heater (where fitted) and rear window heater on.

The programmed defrost function can be cancelled by one of the following:

- Selecting any air distribution switch on the TSD.
- Pressing the AUTO switch on the integrated control panel.
- A second press of the DEF button.
- Switching the ignition OFF.

The blower speed can be adjusted without terminating the programmed defrost function.

Rear Window Heater

Rear window heater operation is only enabled when the engine is running. The [ATC](#) module controls operation of the rear window heater using a relay in the [RJB](#). When rear window heater operation is required, the [ATC](#) module broadcasts a message to the [RJB](#) on the medium speed [CAN](#) bus. On receipt of the message, the [RJB](#) energizes the relay by providing a ground path for the relay coil. This allows a battery feed to flow across the relay to power the rear window heater element.

There are two modes of rear window heater operation; manual and automatic.

Manual operation is activated by pressing the rear window heater switch on the integrated control panel. When the switch is pressed, the status [LED \(light emitting diode\)](#) in the switch illuminates and the rear window heater element is energized. Manual operation is discontinued when the rear window heater switch is pressed a second time, 21 minutes have elapsed (the heating phase), or the engine stops. If manual operation is discontinued by the engine stopping, the previous heating phase is resumed if the engine is re-started within 30 seconds.

There are two variants of automatic operation; automatic operation at the start of a journey and automatic operation during a journey.

Automatic operation at the start of a journey is initiated if the ambient air temperature is below 5 °C (41 °F). In this instance, the switch [LED](#) is illuminated and the heater element is energized for 21 minutes. Automatic operation is discontinued if the rear window heater switch is pressed or the engine stops.

Automatic operation during a journey is initiated when low ambient air temperatures are experienced and the vehicle has been travelling for a set period of time above a threshold speed. In this instance, no feedback is given to the driver to inform him the rear window heater is operational (the switch [LED](#) is not illuminated). The duration of heater operation is variable depending on the ambient air temperature, vehicle speed and the amount of time the vehicle has been travelling.

Windshield Heater (Where Fitted)

Windshield heater operation is only enabled when the engine is running. The [ATC](#) module controls operation of the windshield heater using two relays in the [EJB \(engine junction box\)](#). When windshield heater operation is required, the [ATC](#) module broadcasts a message to the [CJB](#) on the medium speed [CAN](#) bus. On receipt of the message, the [CJB](#) energizes the relays by providing a ground path for both relay coils. This allows a battery feed to flow across the relays to power the windshield left and right heater elements.

There are two modes of windshield heater operation; manual and automatic.

Manual operation is activated by pressing the windshield heater switch on the integrated control panel. When the switch is pressed, the status [LED](#) in the switch illuminates and the windshield heater elements are energized. Manual operation is discontinued when the windshield heater switch is pressed a second time, 5 minutes have elapsed (the heating phase), or the engine stops. If manual operation is discontinued by the engine stopping, the previous heating phase is resumed if the engine is re-started within 30 seconds.

There are two variants of automatic operation; automatic operation at the start of a journey and automatic operation during a journey.

Automatic operation at the start of a journey is initiated if the ambient air temperature is below 5 °C (41 °F). In this instance, the switch [LED](#) is illuminated and the heater elements are energized for 6.5 minutes. Automatic operation is discontinued if the windshield heater switch is pressed or the engine stops.

Automatic operation during a journey is initiated when low ambient air temperatures are experienced and the vehicle has been travelling for a set period of time above a threshold speed. In this instance, no feedback is given to the driver to inform him the windshield heater is operational (the switch [LED](#) is not illuminated) and the duration of operation is variable depending upon the ambient air temperature, vehicle speed and the amount of time the vehicle has been travelling.

Exterior Mirror Heaters

Operation of the exterior mirror heaters is fully automatic and not controllable by the driver. Exterior mirror heater operation is determined by ambient air temperature and windshield wiper status. When ambient air temperature reaches a pre-determined level, the [ATC](#) module broadcasts an exterior mirror heating request to the door modules over the medium speed [CAN](#) bus. On receipt of this message, the door modules provide feed and ground connections to both exterior mirror heater elements.

The amount of time the exterior mirror heaters are operational increases if the windshield wipers are switched on. This ensures the mirrors remain mist free in damp and wet conditions, where there is an increased risk of misting.

Seat Heaters (Where Fitted)

There are four seat heater settings available; off, 1, 2 and 3, which can be selected on the home and climate control screens of the TSD. The heat setting is relayed to the vehicle occupants through a graduated display on the TSD.

Operation of the heated seats is controlled by the [ATC](#) module. When the [ATC](#) module receives a heating request from the TSD, it broadcasts a message to the [CJB](#) over the medium speed [CAN](#) bus. The [CJB](#) then provides a hardwired 12 V supply to the three heater elements in the related front seat. The heater elements, two in the seat cushion and one in the seat squab, are wired in series. The [ATC](#) module monitors seat temperature using a temperature sensor located in each seat cushion. The [CJB](#) provides the temperature sensors with a 5 V supply. The level of the returned voltage back to the [CJB](#) is proportional to the seat temperature. The value of the return signal is broadcast to the [ATC](#) module, over the medium speed [CAN](#) bus, which allows it to control the seat temperature to the required level. The [ATC](#) module will suspend or disable operation of the seat heaters if any of the following occur:

- Battery voltage exceeds 16.5 ± 0.3 V for more than 5 seconds. Seat heating is re-enabled when battery voltage decreases to 16.2 ± 0.3 V.
- If a short or open circuit is detected.
- If the seat heat temperature rises significantly above the target temperature setting.

The graduated display on the TSD remains illuminated until the seat heaters are turned off or the engine stops. If the engine is restarted within 30 seconds the seat heater resumes the previous heating level.

Steering Wheel Heater

The steering wheel heater has a single heat setting and is turned on/off on the home and climate control screens of the TSD. The on/off status of the steering wheel heater is relayed to the vehicle occupants through the TSD. When the ignition is switched off, the steering wheel heater will reset to off.

Power for the heater element is supplied by the [CJB](#) on receipt of a request from the [ATC](#) module over the medium speed [CAN](#) bus. Temperature control for the heater element is provided by the steering wheel heater control module which receives a temperature feedback signal from a [NTC \(negative temperature coefficient\)](#) thermistor located within the steering wheel.

Component Description

ATC Module



E97625

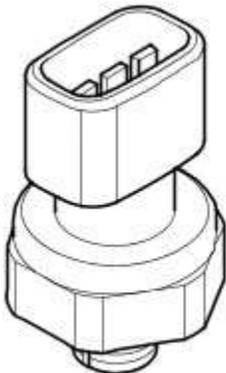
The [ATC](#) module is mounted on the outboard end of the air inlet duct, behind the front passenger side of the instrument panel. The [ATC](#) module processes inputs from the TSD, the switches on the integrated control panel and the system sensors. In response to these inputs, the [ATC](#) module outputs control signals to the [A/C](#) system and the heating and ventilation system.

Two electrical connectors provide the interface between the [ATC](#) module and the vehicle wiring. The [ATC](#) module uses hardwired inputs from the system sensors, the [LIN](#) bus to communicate with the stepper motors and the medium speed [CAN](#) bus to communicate with other control modules on the vehicle.

A/C Compressor Solenoid Valve

The [A/C](#) compressor solenoid valve is integral with the [A/C](#) compressor. Operation of the solenoid valve is controlled by the [ATC](#) module using a hardwired drive current of differing values. By controlling the flow of refrigerant through the compressor, the solenoid valve can control the [A/C](#) system pressure and the evaporator operating temperature.

Refrigerant Pressure Sensor



E43581

The refrigerant pressure sensor provides the [ATC](#) module with a pressure input from the high pressure side of the refrigerant system. The refrigerant pressure sensor is located in the refrigerant line between the condenser and the thermostatic expansion valve.

The [ATC](#) module supplies a 5 V reference voltage to the refrigerant pressure sensor and receives a return signal voltage, between 0 V and 5 V, related to system pressure.

The [ATC](#) module uses the signal from the pressure sensor to protect the refrigerant system from extremes of pressure. The [ATC](#) module transmits the [A/C](#) pressure, along with the compressor drive current value, to the instrument cluster on the medium speed [CAN](#) bus. These signals are broadcast to the [ECM](#) on the high speed [CAN](#) bus to allow it to calculate the torque being applied to the engine by the compressor.

To protect the system from extremes of pressure, the [ATC](#) module sets the [A/C](#) compressor to the minimum flow position if the pressure:

- Decreases to 2.1 ± 0.2 bar (31.5 ± 3 lbf/in²); the [ATC](#) module loads the [A/C](#) compressor again when the pressure increases to 2.3 ± 0.2 bar (33.4 ± 3 lbf/in²).
- Increases to 31 ± 1 bar (450 ± 14.5 lbf/in²); the [ATC](#) module loads the [A/C](#) compressor again when the pressure decreases to 26 ± 1 bar (377 ± 14.5 lbf/in²).

Evaporator Temperature Sensor



E97626

The evaporator temperature sensor is a [NTC](#) thermistor that provides the [ATC](#) module with a temperature signal from the downstream side of the evaporator. The evaporator temperature sensor is mounted directly onto the evaporator matrix fins.

The [ATC](#) module uses the input from the evaporator temperature sensor to control the load of the [A/C](#) compressor and thus the operating temperature of the evaporator.

Humidity and Temperature Sensor



E97627

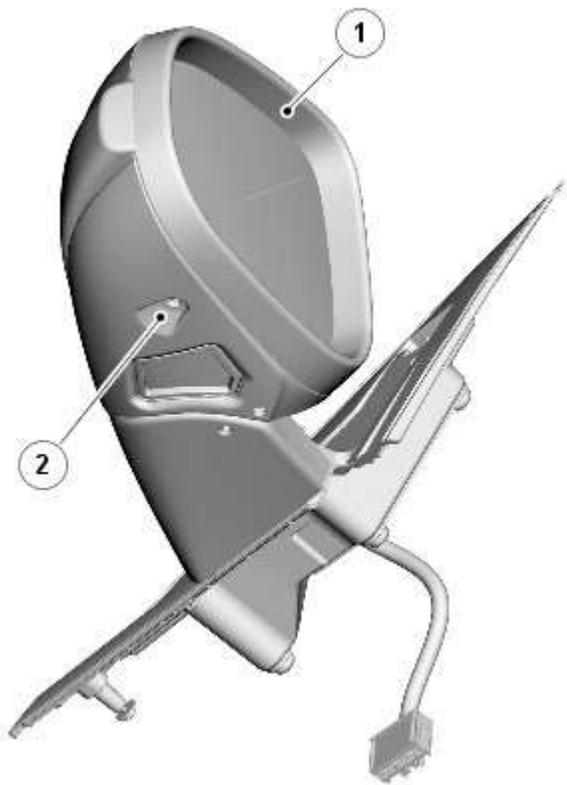
The humidity and temperature sensor is installed above the glovebox in the instrument panel. The sensor incorporates:

- A [NTC](#) thermistor to measure temperature.
- A capacitive sensor element to measure humidity.
- A motor driven fan to draw air through the sensor and over the sensing elements.

The humidity sensor element is built out of a film capacitor on different substrates. The dielectric is a polymer which absorbs or releases water proportional to the relative humidity of the air being drawn through the sensor, and thus changes the capacitance of the capacitor. For protection, the sensor element is contained in a nylon mesh cover.

Humidity within the passenger compartment is controlled by raising and lowering the evaporator temperature. An increase in evaporator temperature increases the moisture content of the air entering the passenger compartment. Lowering the evaporator temperature reduces the moisture content of the air entering the passenger compartment.

Ambient Air Temperature Sensor

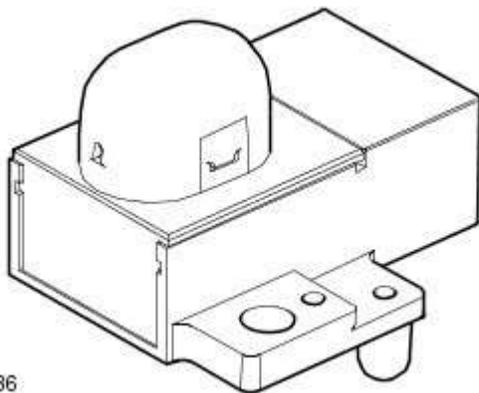


E97628

Item	Description
1	LH door mirror
2	Ambient air temperature sensor

The ambient air temperature sensor is a [NTC](#) thermistor that provides the [ATC](#) module with an input of external air temperature. The sensor is hard wired to the [ECM](#) and its signal is transmitted to the instrument cluster on the high speed [CAN](#) bus. The instrument cluster acts as a gateway and transmits the ambient air temperature signal to the [ATC](#) module on the medium speed [CAN](#) bus. The sensor is installed in the [LH](#) door mirror, and is accessed by removing the mirror glass, cap and actuator.

Sunload Sensor



E71886

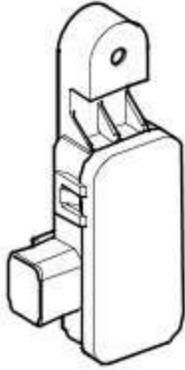
The sunload sensor consists of two photoelectric cells that provide the [ATC](#) module with inputs of light intensity; one as sensed coming from the left of the vehicle and one as sensed coming from the right. The inputs are a measure of the solar heating effect on vehicle occupants, and are used by the [ATC](#) module to adjust blower speed, temperature and distribution to improve comfort.

The sensor is installed in the speaker grill on the upper surface of the instrument panel. Power for the sensor is provided by a 5 V feed from the instrument cluster.

The sensor also contains the active anti-theft alarm indicator.

Refer to: Anti-Theft - Active (419-01 Anti-Theft - Active, Description and Operation).

Pollution Sensor (Where Fitted)



E43588

The pollution sensor allows the [ATC](#) module to monitor the ambient air for the level of hydrocarbons and oxidized gases such as nitrous oxides, sulphur oxides and carbon monoxide. The sensor is attached to the center of the upper front crossmember.

The pollution sensor is powered by an ignition controlled voltage feed from the [CJB](#) and provides the [ATC](#) module with separate signals of hydrocarbon and oxidized gas levels. With a pollution sensor fitted, the [ATC](#) module can control the air inlet source to reduce the amount of contaminants entering the passenger compartment. This function is fully automatic, but can be overridden by manual selection of the air source using the recirculation switch on the integrated control panel.

If there is a fault with the sensor, the [ATC](#) module disables automatic operation of the recirculation door.

Climate Control - Ambient Air Temperature Sensor

Removal and Installation

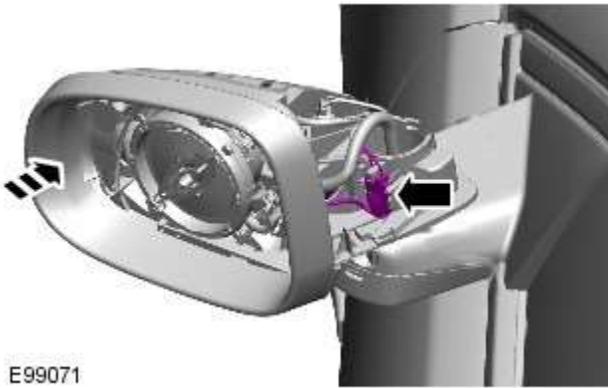
Removal



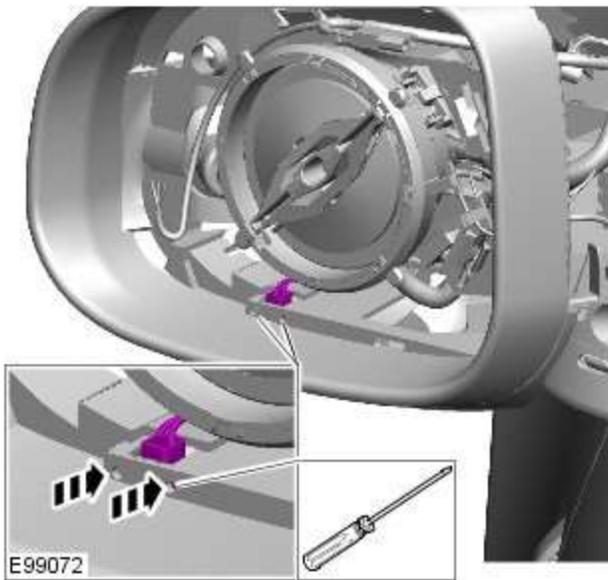
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Exterior Mirror Cover](#) (501-09 Rear View Mirrors, Removal and Installation).

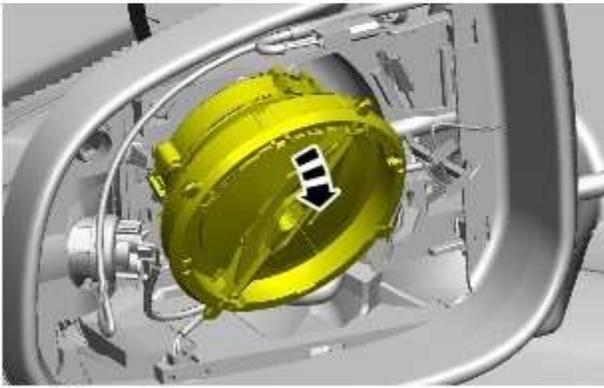
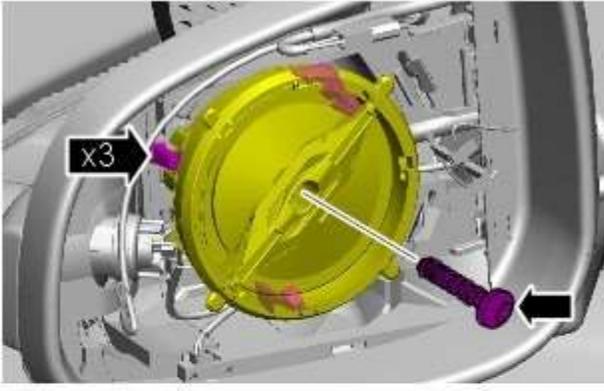
2.



3.

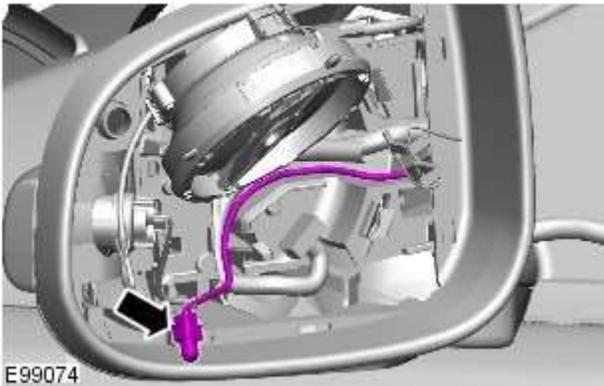


4.



E99073

5.



E99074

Installation

1. To install, reverse the removal procedure.

Climate Control - Blower Motor

Removal and Installation

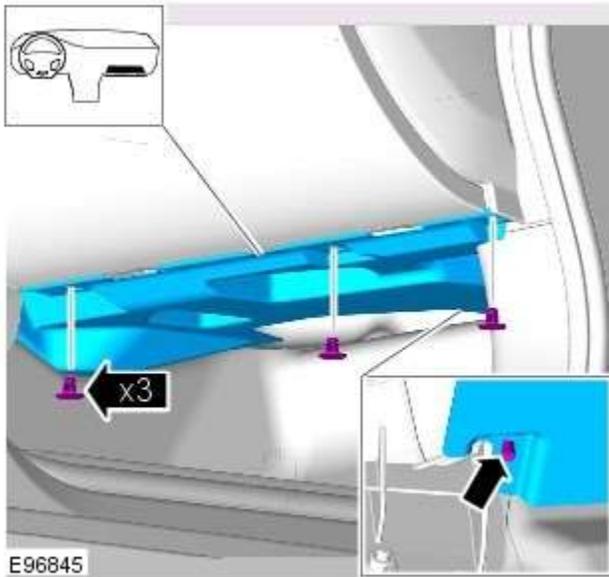
Removal



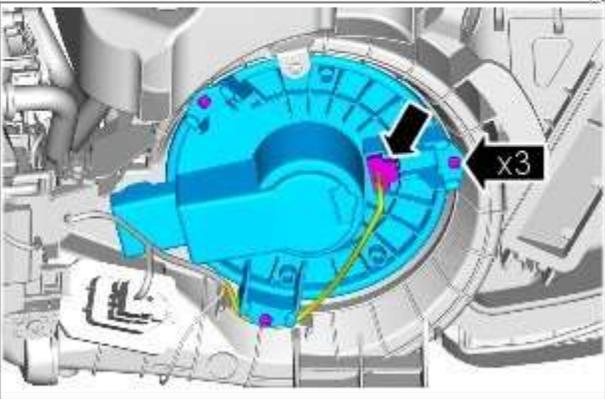
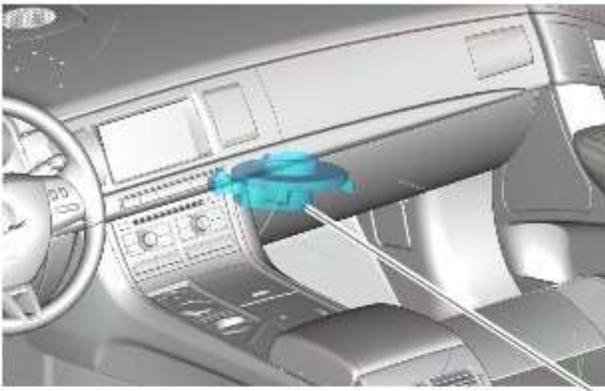
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2.



3.



E100074

Installation

1. To install, reverse the removal procedure.

Climate Control - Blower Motor Control Module

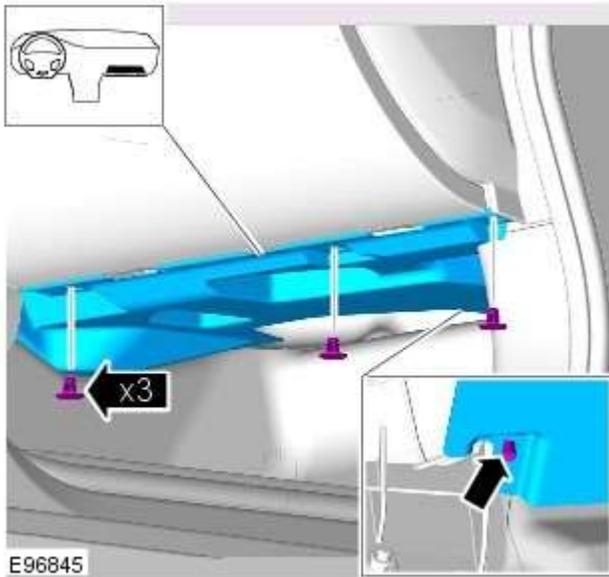
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

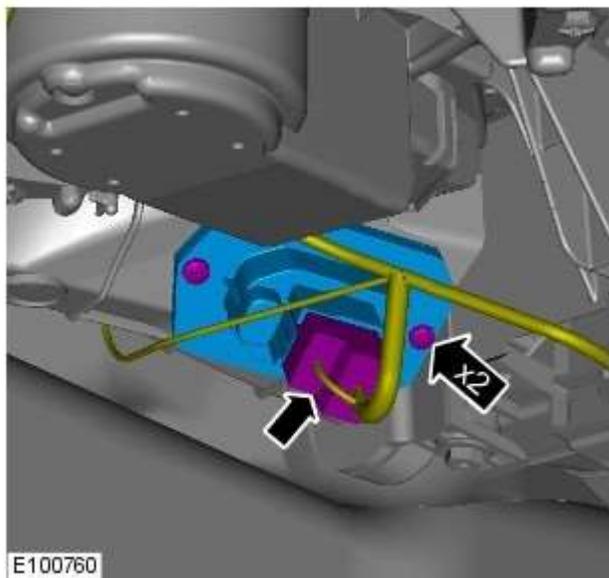
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.



NOTE: RHD illustration shown, LHD is similar.



3. *Torque:* 1.3 Nm

Installation

1. To install, reverse the removal procedure.

Climate Control - Center Registers

Removal and Installation

Removal



CAUTION: Do not manually open the registers. Failure to follow this instruction may result in damage to the internal components.

NOTES:



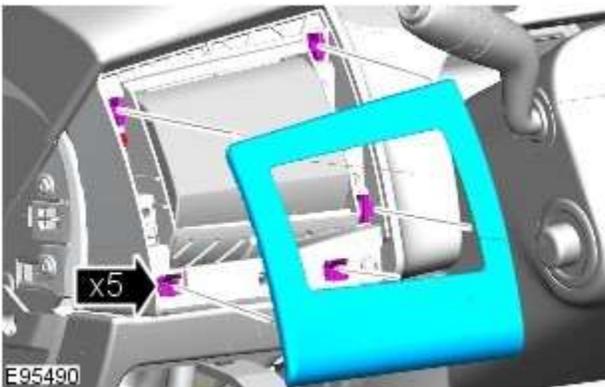
The center registers must be open before carrying out this procedure. To achieve this set the registers to 'Always Open' using the climate settings tab on the information and entertainment display. If the registers are set to 'Automatic' mode (rotating with ignition on/off) and one or more are disconnected during an ignition cycle, a vehicle battery reset may be required to reconnect the affected registers to the LIN BUS.

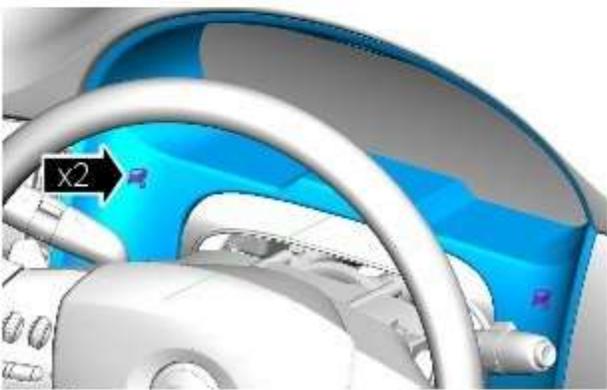
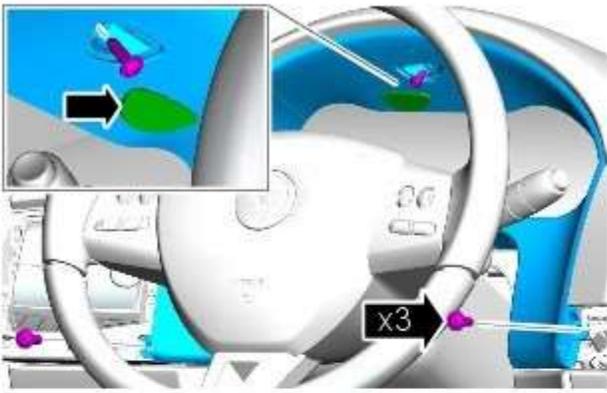


Removal steps in this procedure may contain installation details.

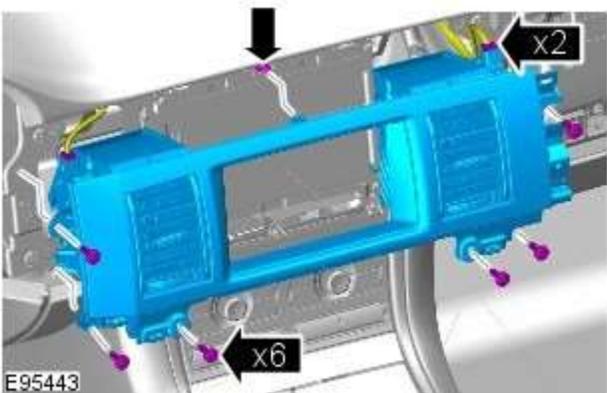
1. Set the registers to 'Always Open', using the information and entertainment display.
2. Refer to: [Passenger Side Register](#) (412-01 Climate Control, Removal and Installation).
3. Fully extend and lower the steering column for access.

4.

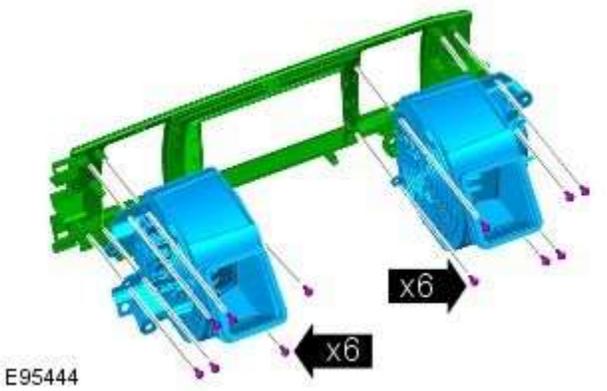




E95491



E95443



E95444

5.

6. CAUTIONS:



The center registers must be open to aid access and prevent damage to surrounding trim.



Do not manually open the registers. Failure to follow this instruction may result in damage to the internal components.

7.  NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.
2. Return the registers to their original setting - 'Automatic' - using the information and entertainment display.

Climate Control - Climate Control Assembly

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



RHD illustration shown, LHD is similar.

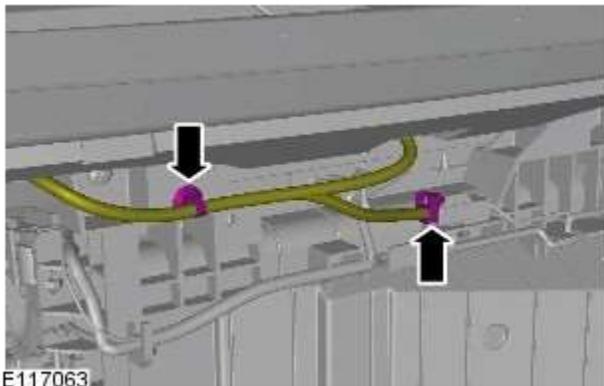
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



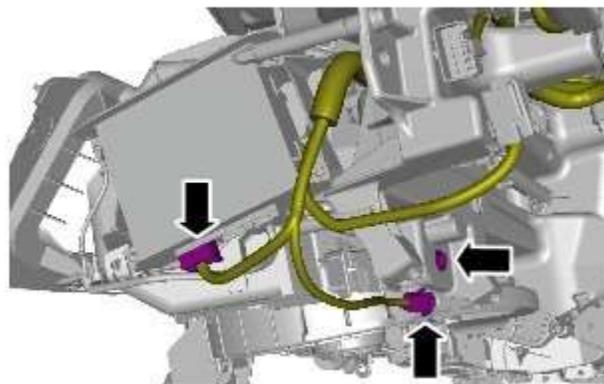
2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

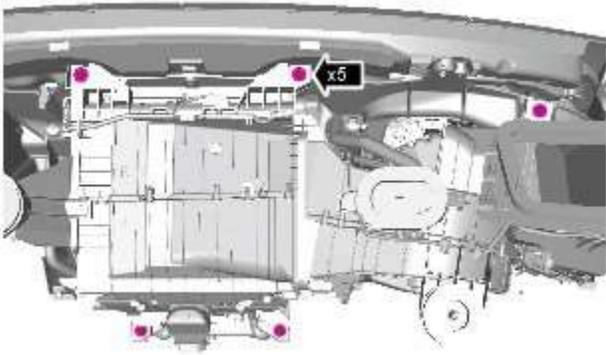
3. Refer to: [Instrument Panel Console](#) (501-12 Instrument Panel and Console, Removal and Installation).

4.



5. **Torque:** 9 Nm



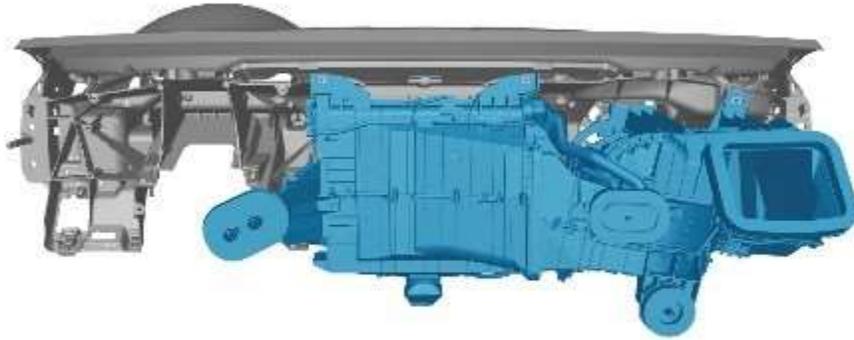


E117065

6.  CAUTION: Be prepared to collect escaping coolant.

Torque: 9 Nm

7.



E117066

Installation

1. To install, reverse the removal procedure.

Climate Control - Climate Control Module

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Instrument Panel Console](#) (501-12 Instrument Panel and Console, Removal and Installation).

3. CAUTIONS:



Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

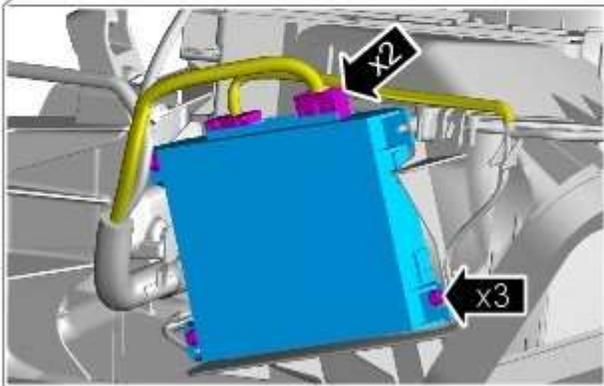
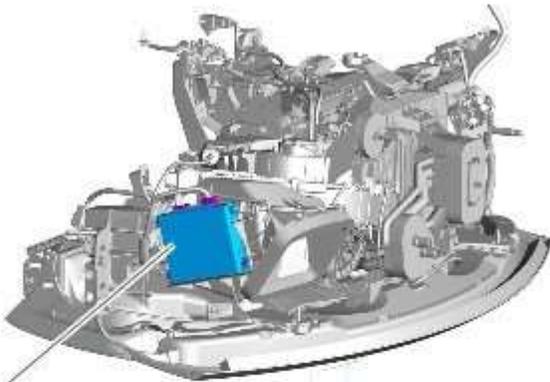


Make sure that the component is correctly located on the locating dowels.



NOTE: RHD illustration shown, LHD is similar.

Torque: 1.3 Nm



E100701

Installation

1. To install, reverse the removal procedure.

Climate Control - Defrost Vent/Register Blend Door Actuator

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01, General Procedures).
2. Refer to: Instrument Panel Console (501-12, Removal and Installation).

3. CAUTIONS:



Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

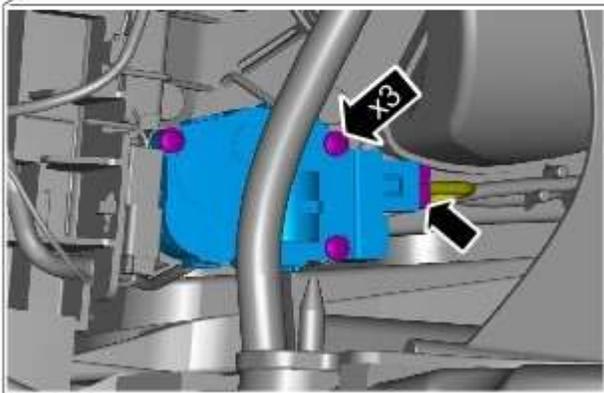
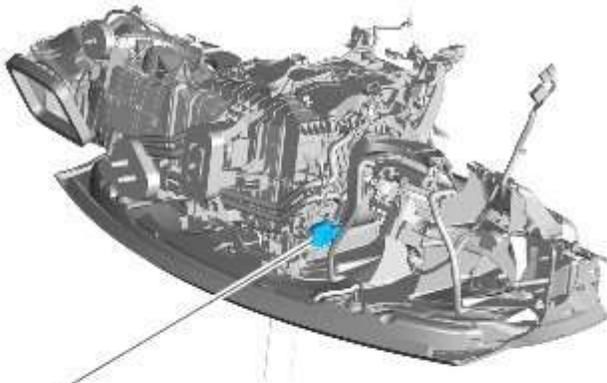


Make sure that the component is correctly located on the locating dowels.



NOTE: RHD illustration shown, LHD is similar.

Torque: 1.3 Nm



E100698

Installation

1. To install, reverse the removal procedure.

Climate Control - Driver Side Register

Removal and Installation

Removal



CAUTION: Do not manually open the registers. Failure to follow this instruction may result in damage to the internal components.

NOTES:

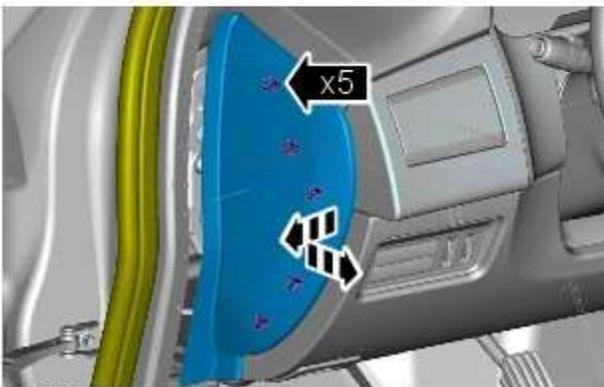
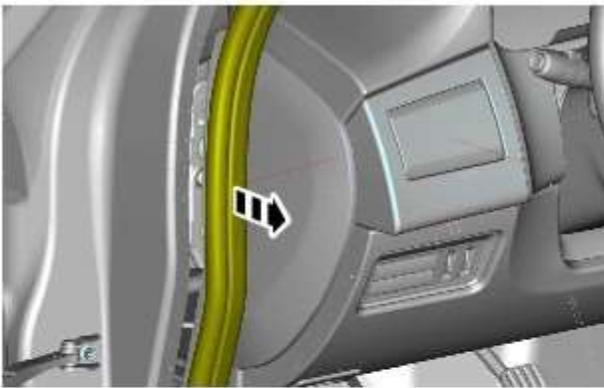


If the registers are set to 'Automatic' mode and one or more are disconnected during an ignition cycle, a vehicle battery reset may be required to reconnect the affected registers to the LIN BUS.

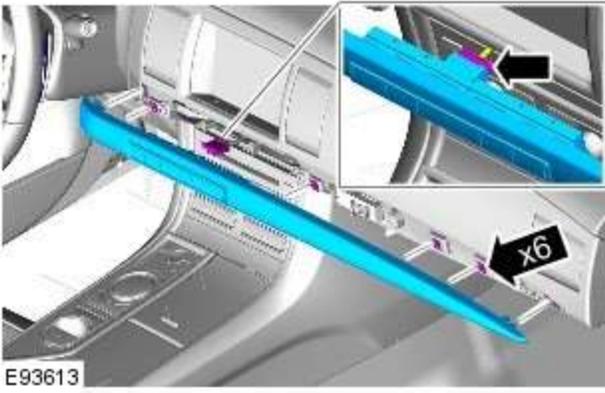


Removal steps in this procedure may contain installation details.

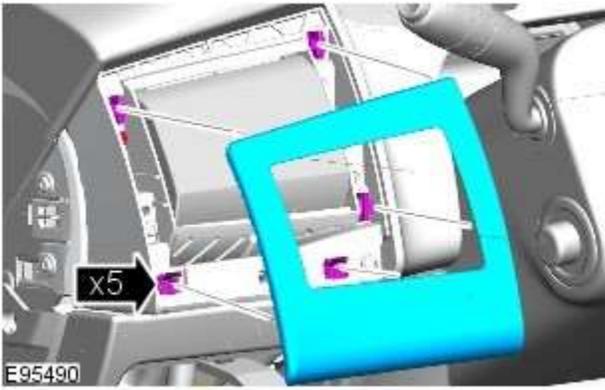
1.



E95489



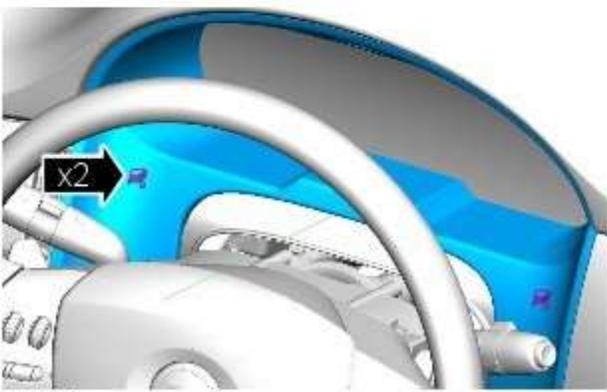
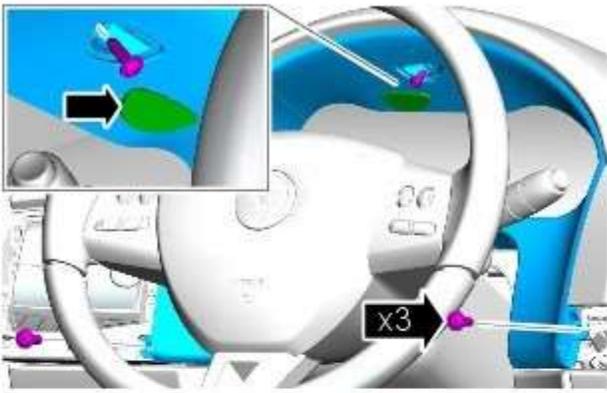
2.



3.

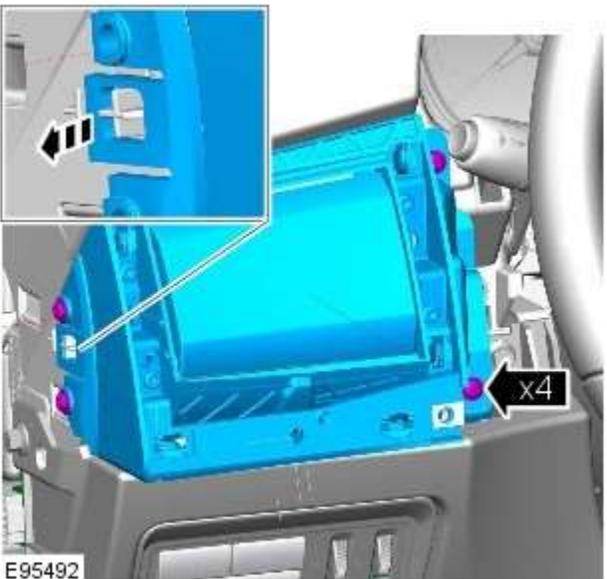
4. Fully extend and lower the steering column for access.

5.

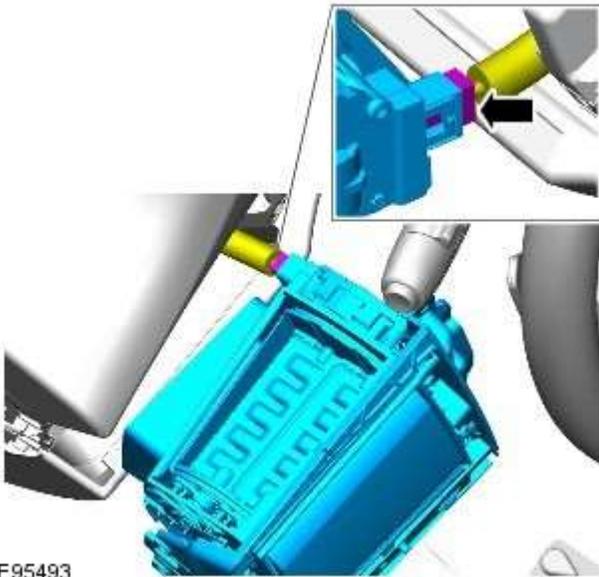


E95491

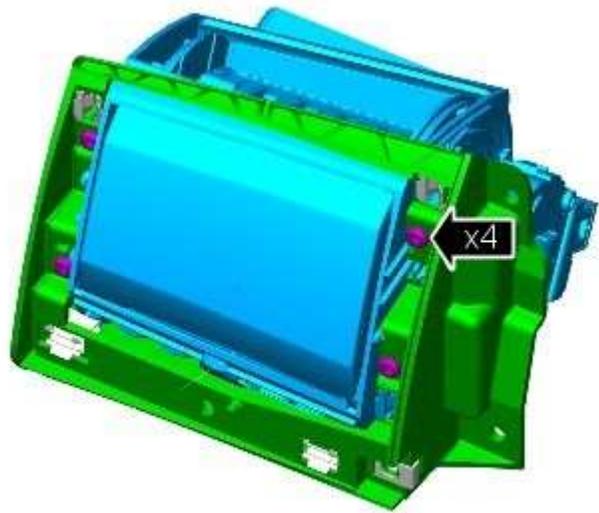
6.



E95492



7.



8.  NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

Climate Control - Evaporator

Removal and Installation

Removal

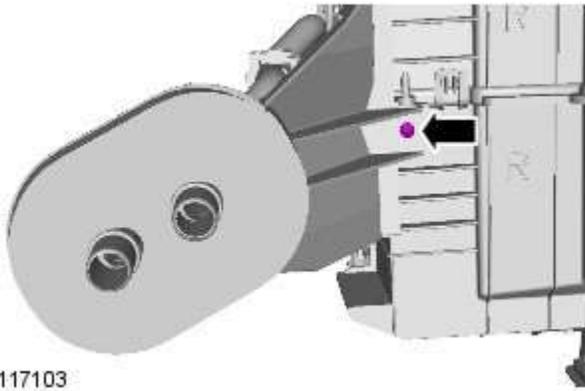


NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Heater Core and Evaporator Core Housing](#) (412-01 Climate Control, Removal and Installation).
3. Refer to: [Thermostatic Expansion Valve](#) (412-01 Climate Control, Removal and Installation).

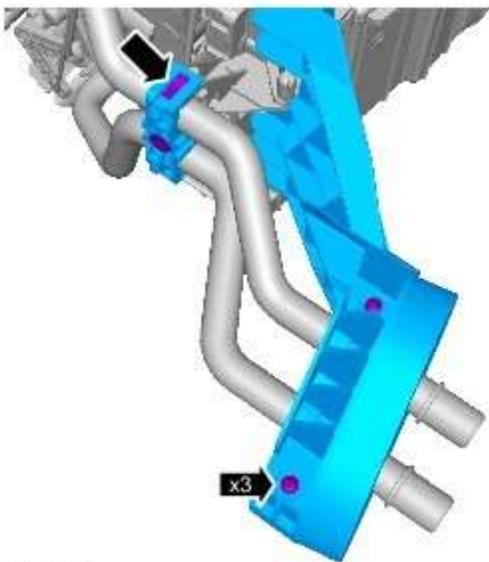
Right-hand drive vehicles



E117103

4.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

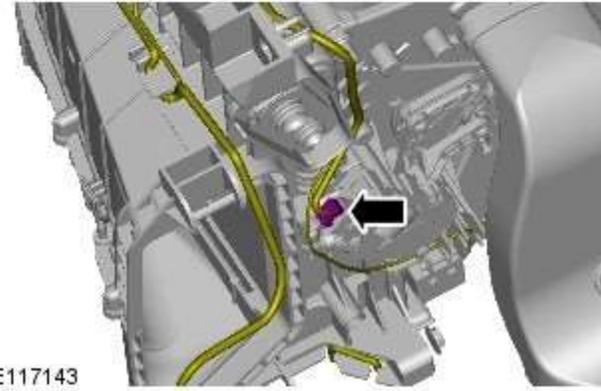
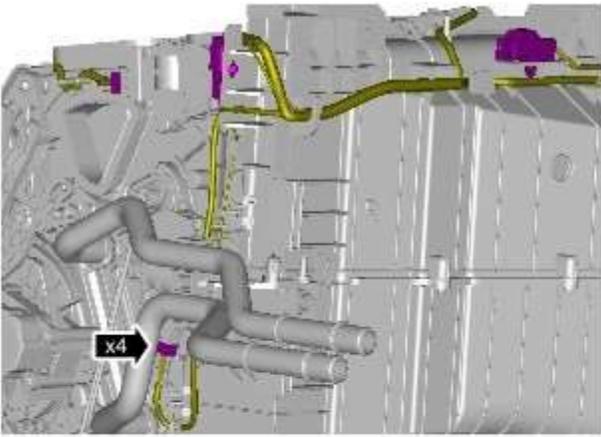
Torque: 1.3 Nm



E117104

5. *Torque:* 1.3 Nm

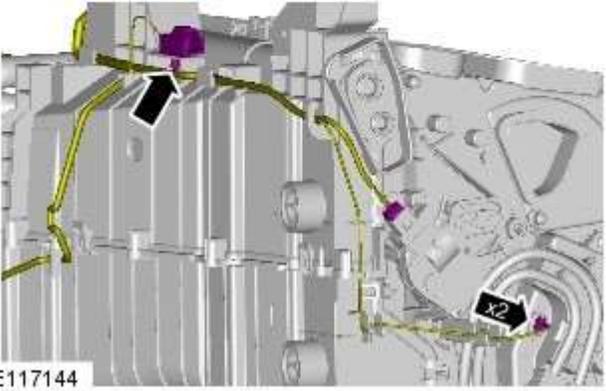
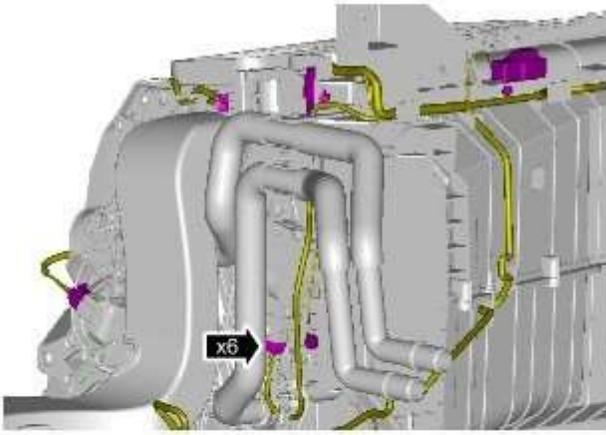
6.



E117143

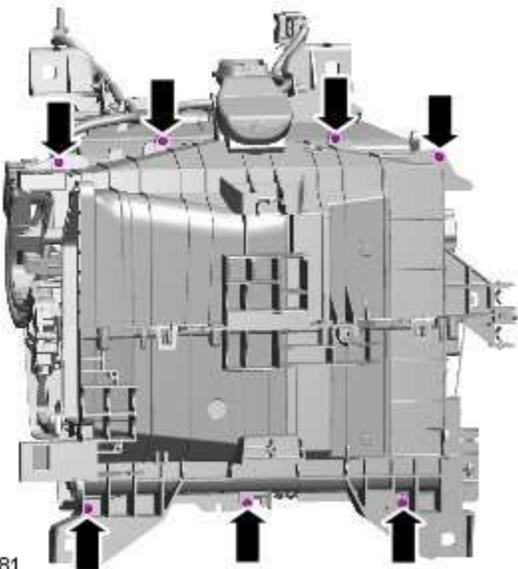
Left-hand drive vehicles

7.



E117144

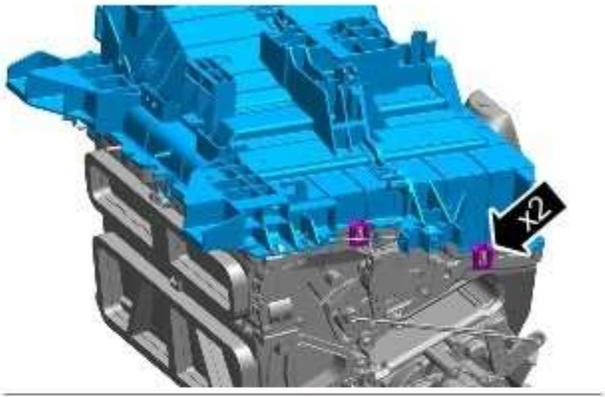
All vehicles



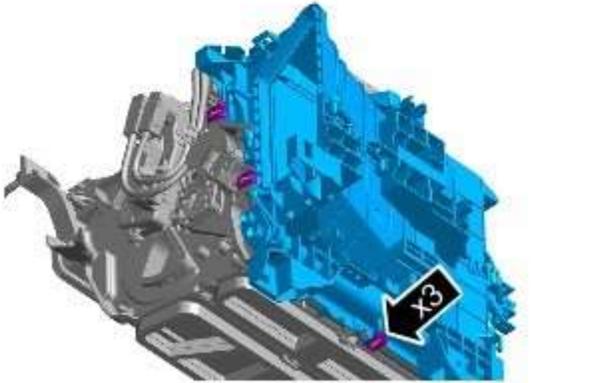
E100781

8.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

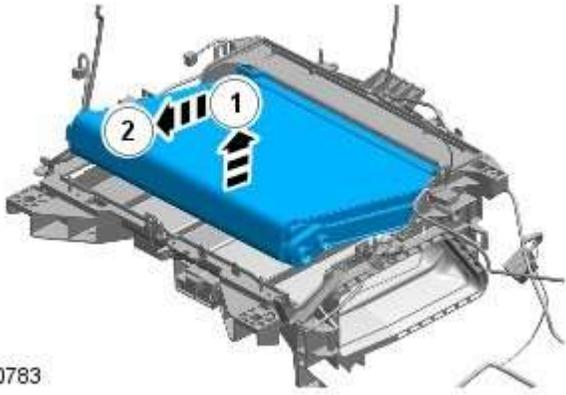
Torque: 1.3 Nm



9.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E100782



E100783

10.  WARNING: Only use moderate force when installing the sensor.

CAUTIONS:

 Make sure the evaporator temperature sensor harness does not become trapped.

 Make sure that the sensor is correctly installed.

-  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

Climate Control - Floor Console Register

Removal and Installation

Removal

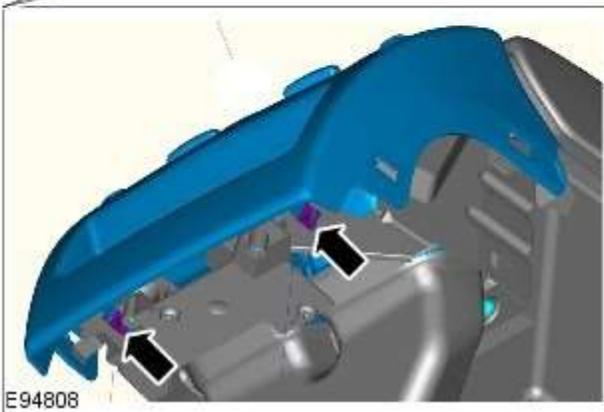


NOTE: Removal steps in this procedure may contain installation details.

1. Remove both floor console side trim panels.

Refer to: [Floor Console Side Trim Panel](#) (501-12 Instrument Panel and Console, Removal and Installation).

- 2.





E94809

3.  NOTE: Do not disassemble further if the component is removed for access only.



E94810

4. Remove the 2 clips.

Installation

1. To install, reverse the removal procedure.

Climate Control - Footwell Vent/Duct Blend Door Actuator

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Climate Control Assembly](#) (412-01 Climate Control, Removal and Installation).

3. CAUTIONS:



Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

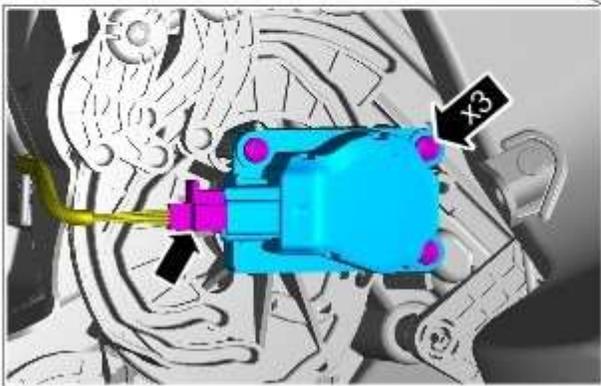
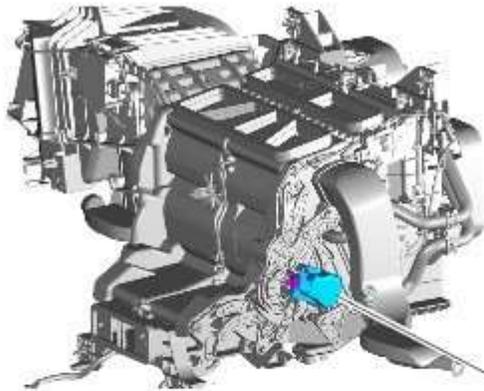


Make sure that the component is correctly located on the locating dowels.



NOTE: RHD illustration shown, LHD is similar.

Torque: 1.3 Nm



E100700

Installation

1. To install, reverse the removal procedure.

Climate Control - Heater Core

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.

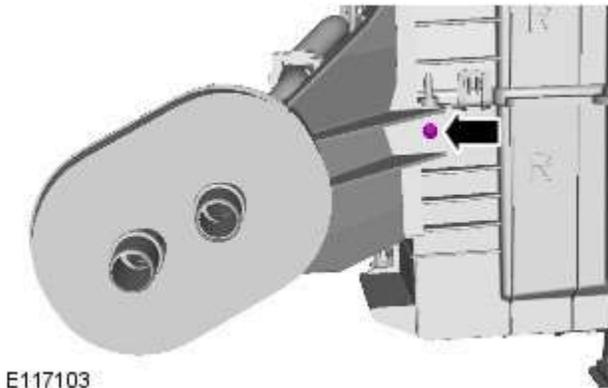


Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Heater Core and Evaporator Core Housing](#) (412-01 Climate Control, Removal and Installation).

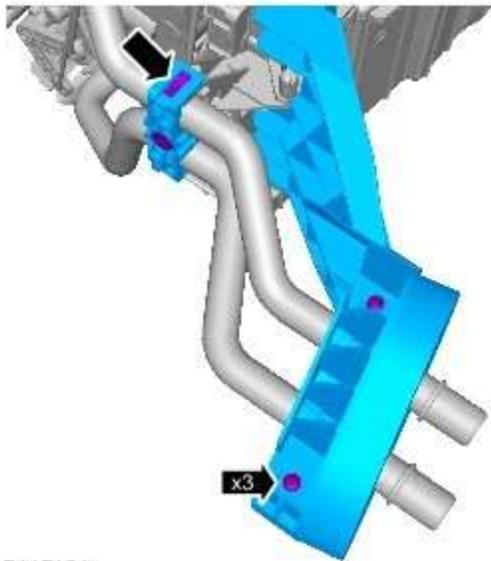
Right-hand drive vehicles



E117103

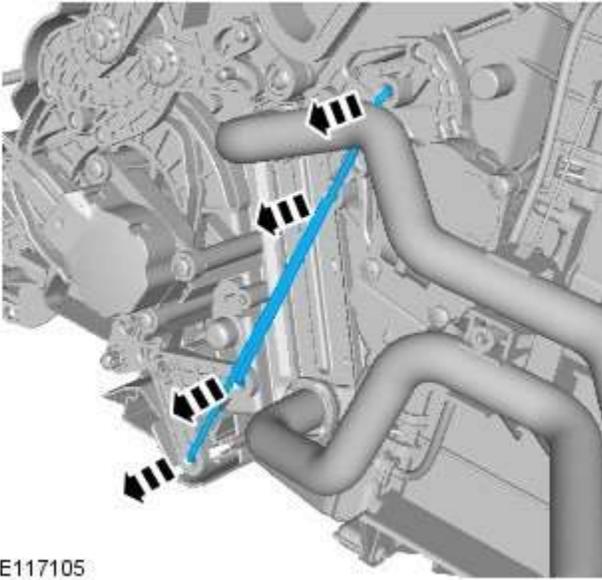
3.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm



E117104

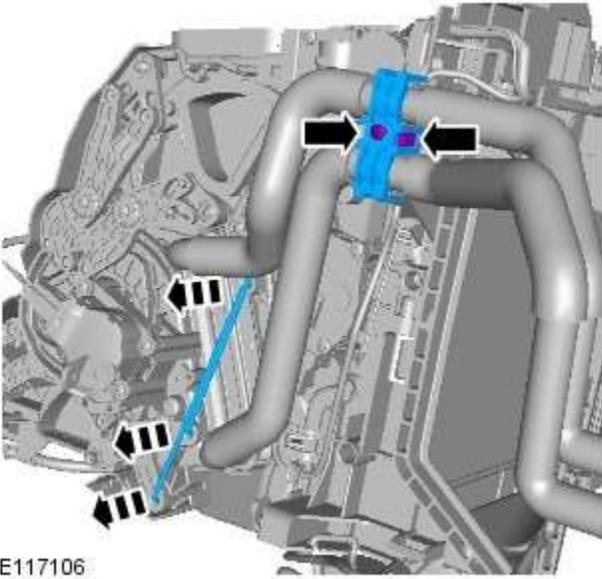
4. *Torque:* 1.3 Nm



E117105

Left-hand drive vehicles

5.  CAUTION: Take extra care not to damage the component.



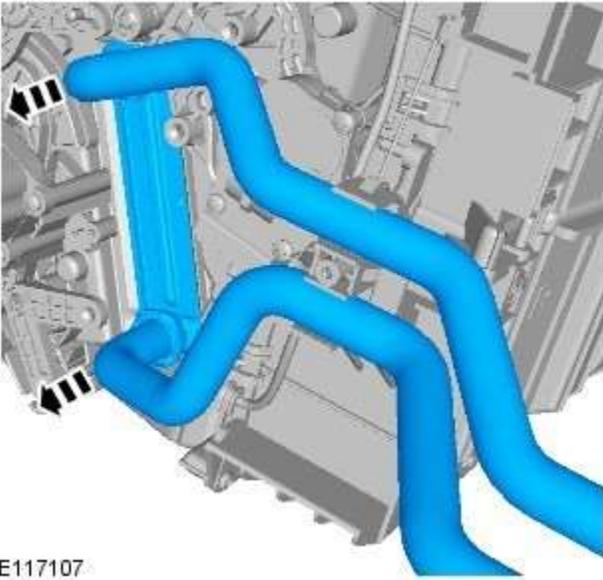
E117106

Right-hand drive vehicles

6.  CAUTION: Take extra care not to damage the component.

Torque: 1.3 Nm

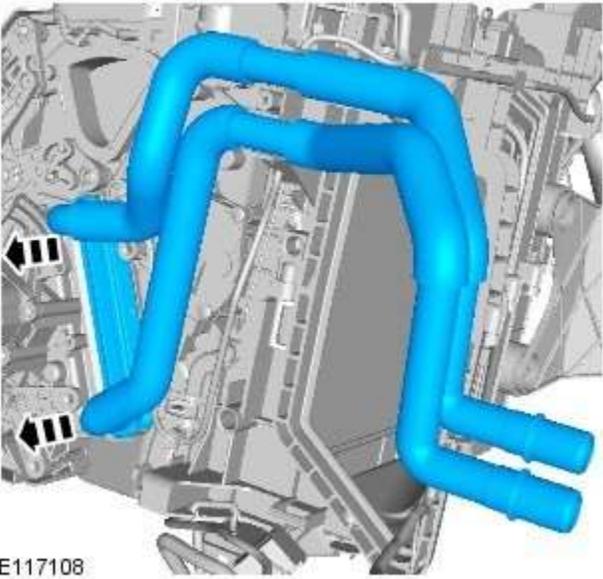
7.



E117107

Left-hand drive vehicles

8.



E117108

Installation

1. To install, reverse the removal procedure.

Climate Control - Heater Core and Evaporator Core Housing

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

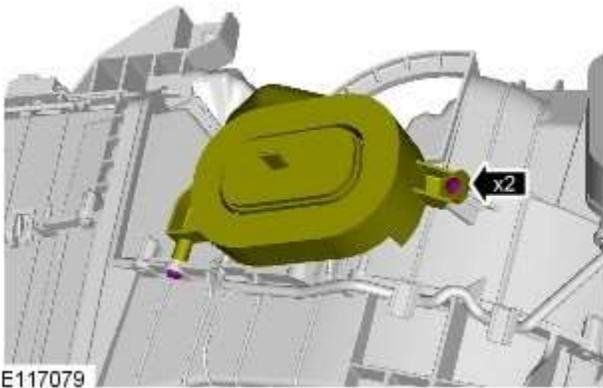
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

3. Refer to: [Climate Control Assembly](#) (412-01 Climate Control, Removal and Installation).

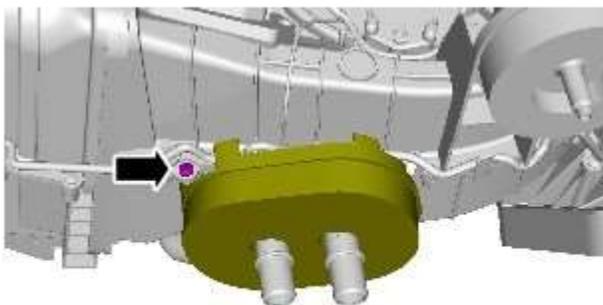
Right-hand drive vehicles



4.  **CAUTION:** Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm

Left-hand drive vehicles

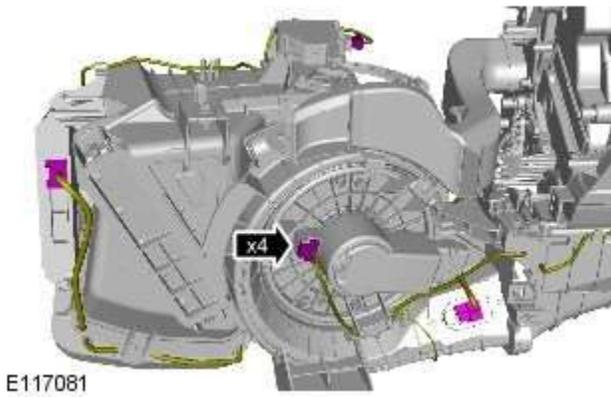


5.  **CAUTION:** Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm

E117080

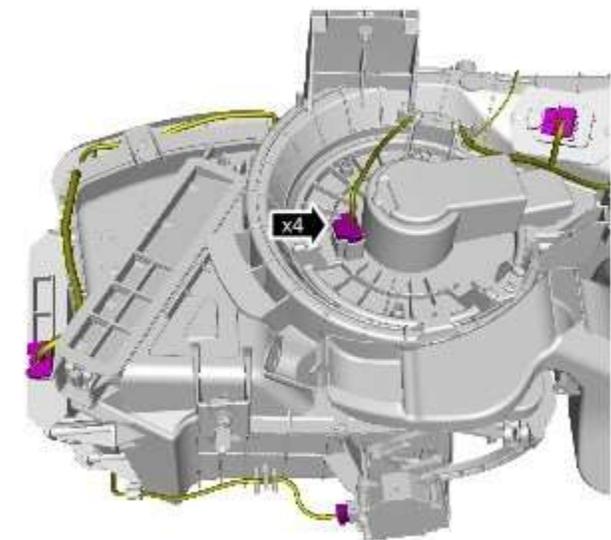
Right-hand drive vehicles



6.  CAUTION: Make sure that the wiring harnesses are correctly located.

 NOTE: Note the position of the wiring harnesses to aid installation.

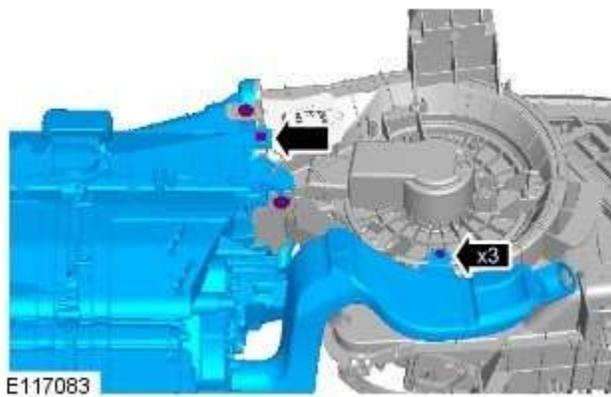
Left-hand drive vehicles



7.  CAUTION: Make sure that the wiring harnesses are correctly located.

 NOTE: Note the position of the wiring harnesses to aid installation.

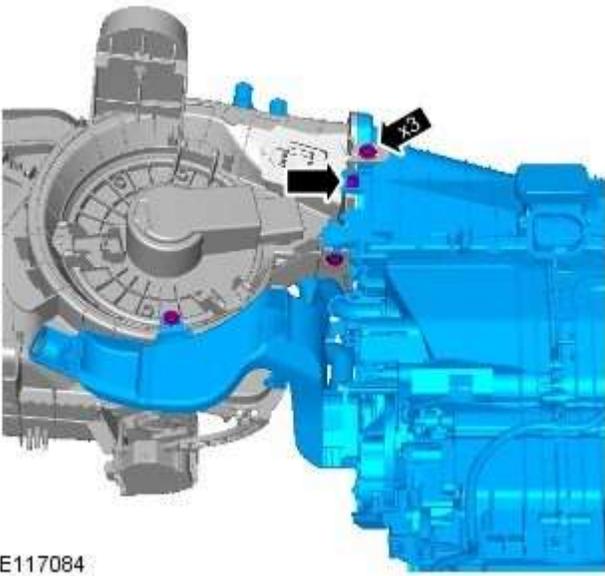
Right-hand drive vehicles



8. *Torque:* 2.4 Nm

Left-hand drive vehicles

9. *Torque:* 2.4 Nm



E117084

Installation

1. To install, reverse the removal procedure.

Climate Control - Instrument Panel Register Trim Panel

Removal and Installation

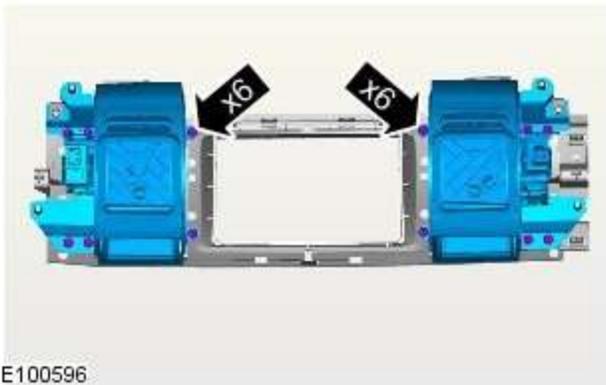
Removal



NOTE: Removal steps in this procedure may contain installation details.

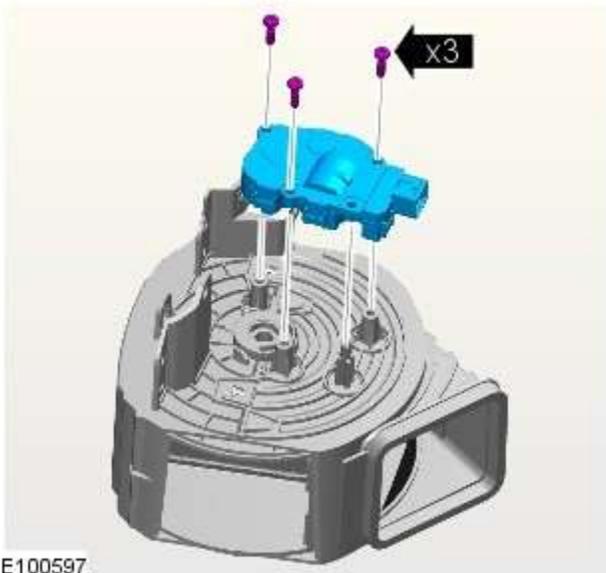
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Center Registers](#) (412-01 Climate Control, Removal and Installation).

3.



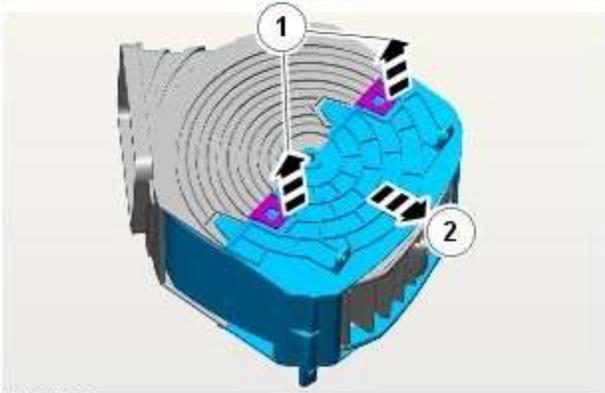
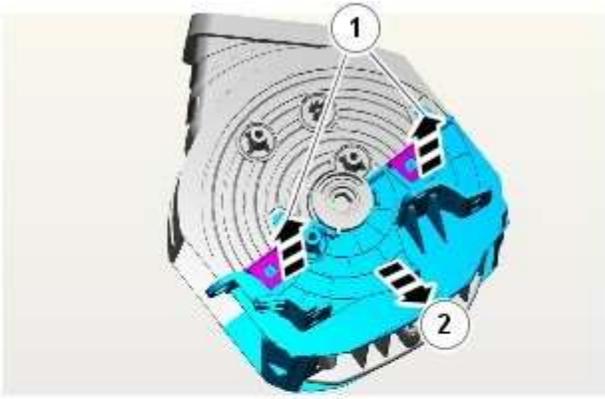
E100596

4.



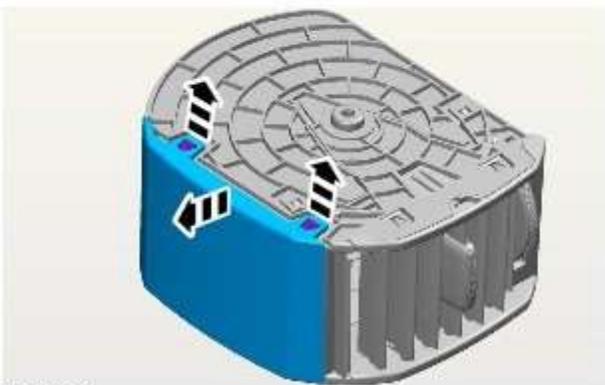
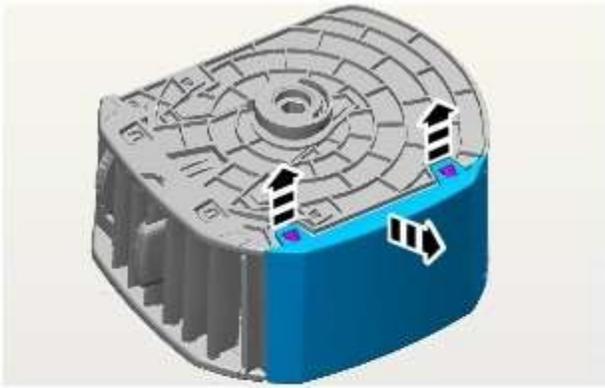
E100597

5.



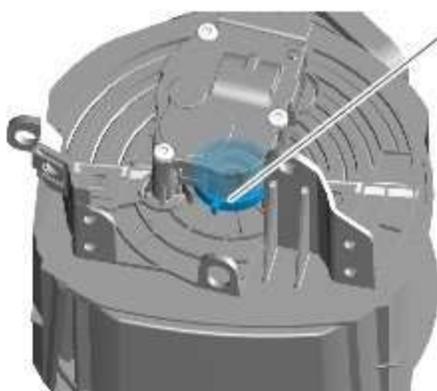
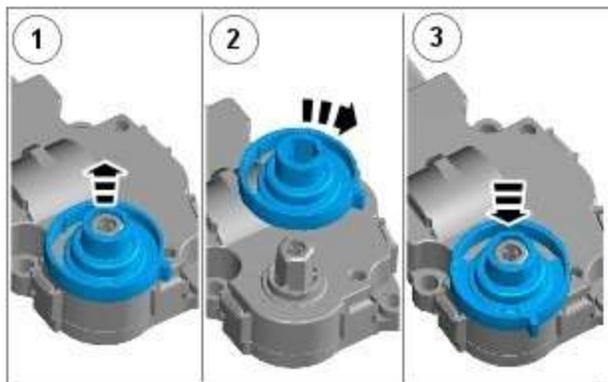
E100598

6.



E100599

Installation



E100759

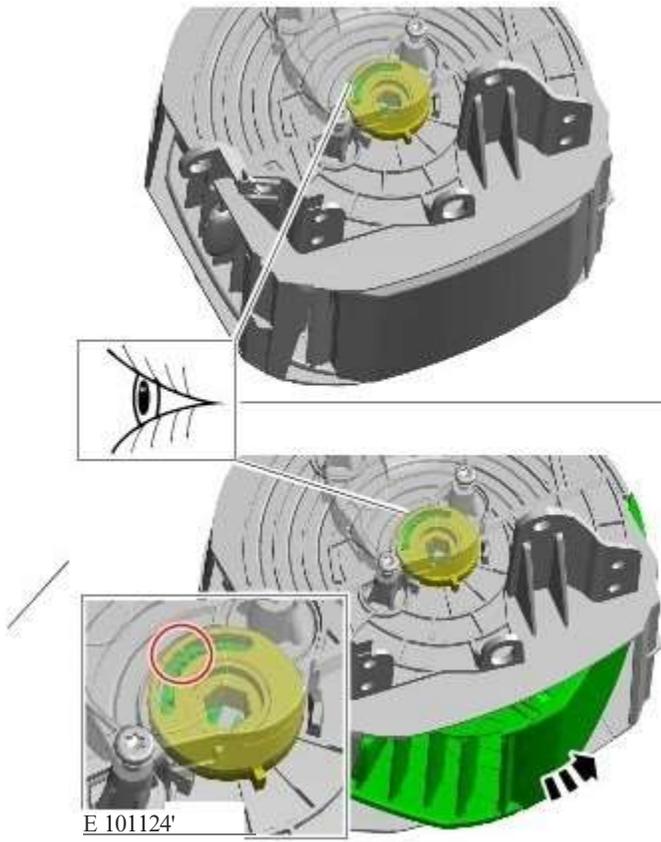


1. CAUTION: Make sure that the clutch rib is located between the two ribs on the car rearward (front half), of the register housing to avoid damage on installation.

To install, reverse the removal procedure.

2.

- Position the locating peg.



Climate Control - In-Vehicle Temperature Sensor

Removal and Installation

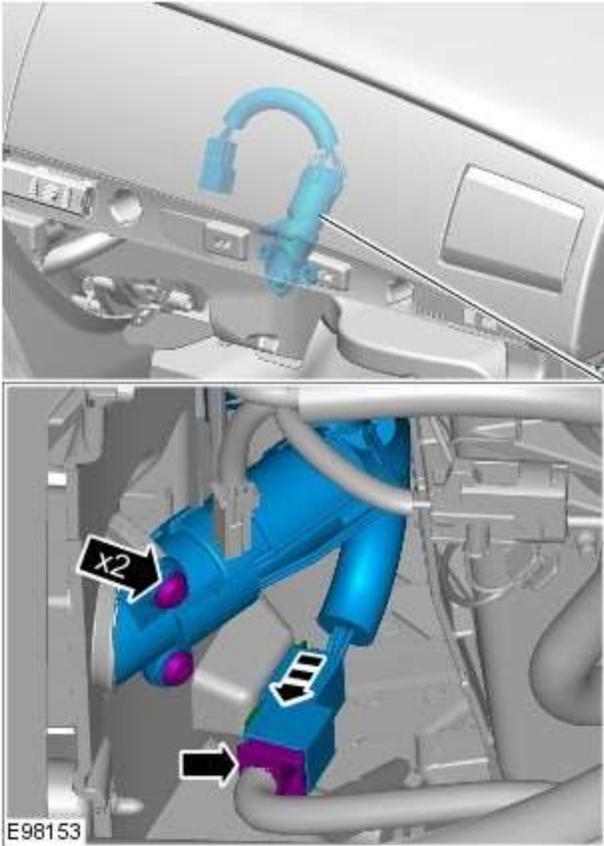
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Glove Compartment](#) (501-12 Instrument Panel and Console, Removal and Installation).

2.



Installation

1. To install, reverse the removal procedure.

Climate Control - Passenger Side Register

Removal and Installation

Removal



CAUTION: Do not manually open the registers. Failure to follow this instruction may result in damage to the internal components.

NOTES:

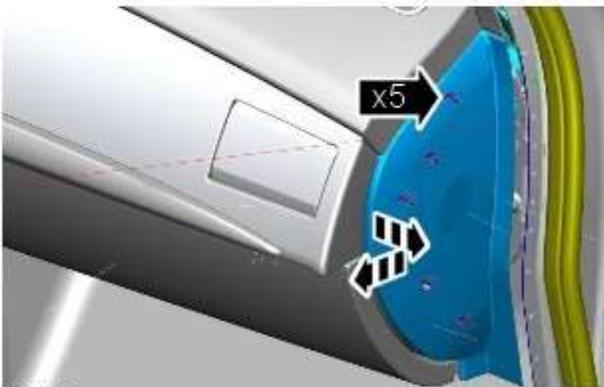


If the registers are set to 'Automatic' mode and one or more are disconnected during an ignition cycle, a vehicle battery reset may be required to reconnect the affected registers to the LIN BUS.

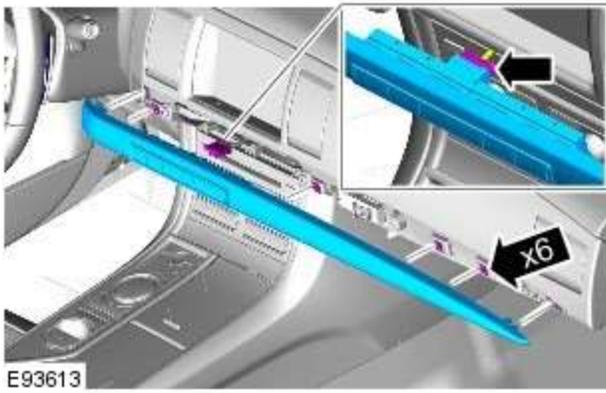


Removal steps in this procedure may contain installation details.

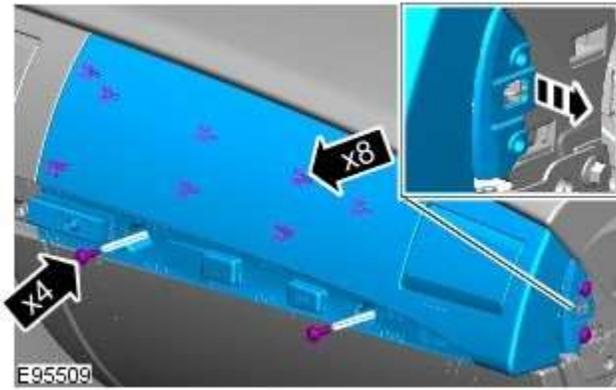
1.



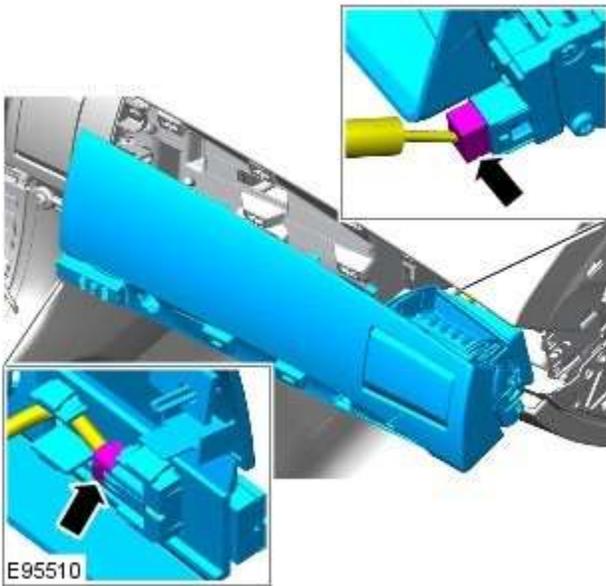
E95508



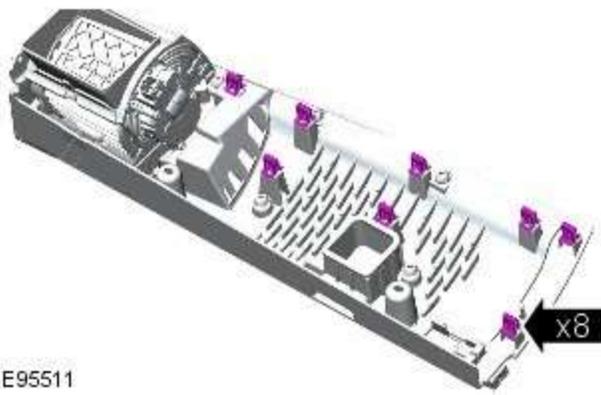
2.



3.

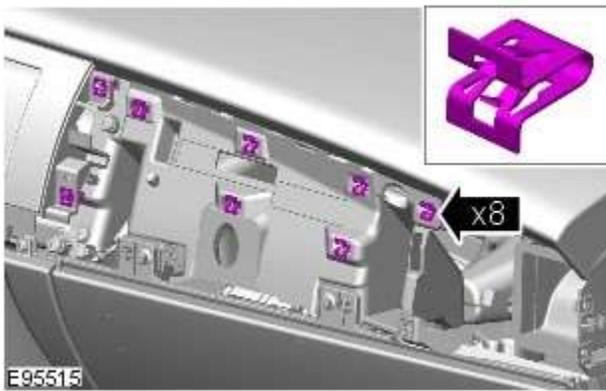


4.



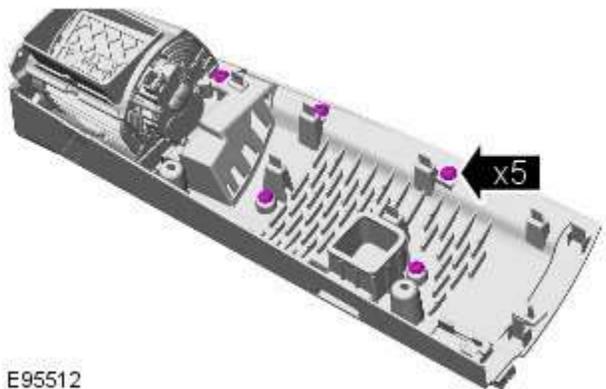
E95511

5.



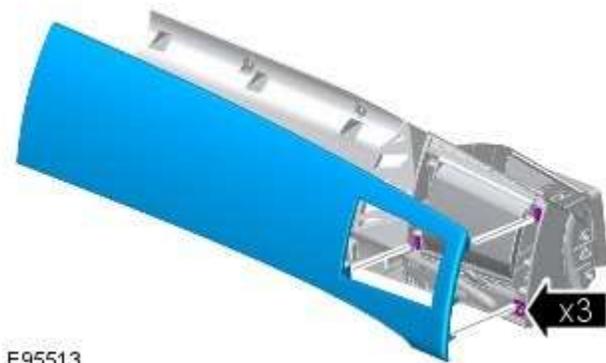
E95515

6. Install the clips into the instrument panel.



E95512

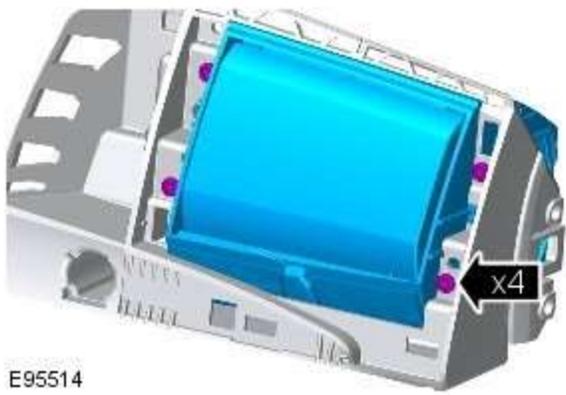
7.  NOTE: Do not disassemble further if the component is removed for access only.



E95513

8.  NOTE: When removing the component, some of the clips may remain attached. These clips should be removed and returned to their original positions in the passenger side register carrier.

9.



E95514

Installation

1. To install, reverse the removal procedure.

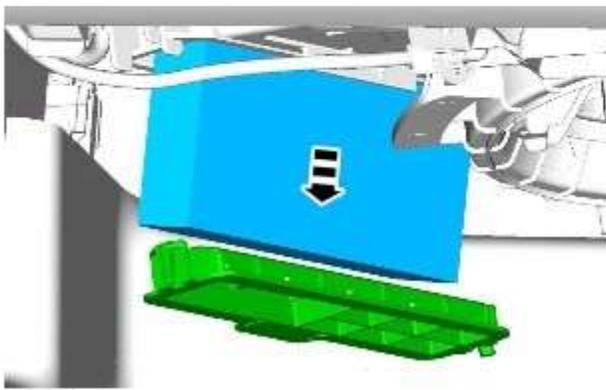
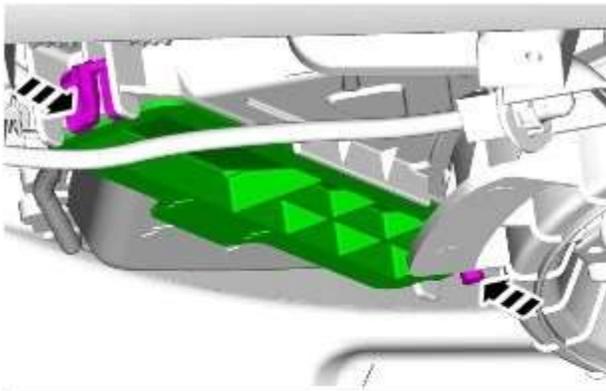
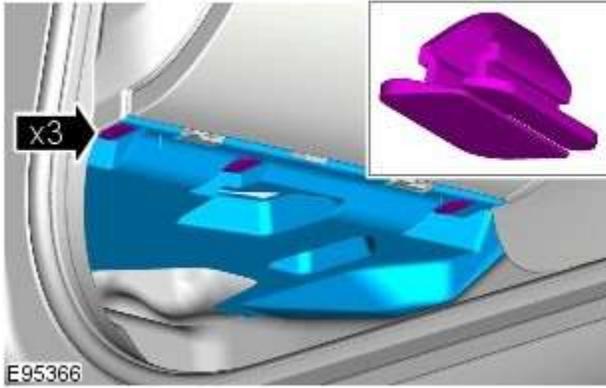
Climate Control - Pollen Filter

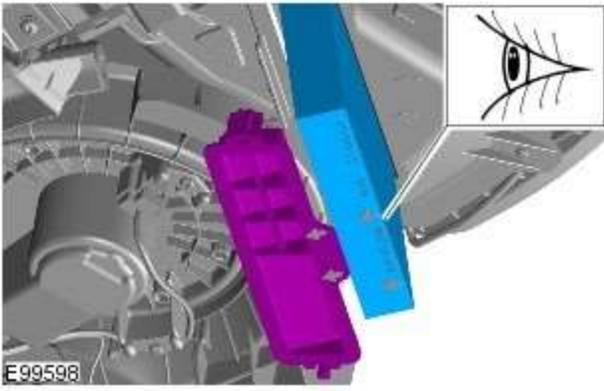
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.





3.

Installation

1. To install, reverse the removal procedure.

Climate Control - Recirculation Blend Door Actuator

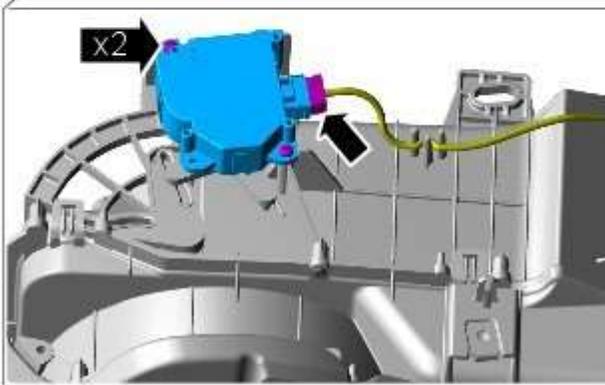
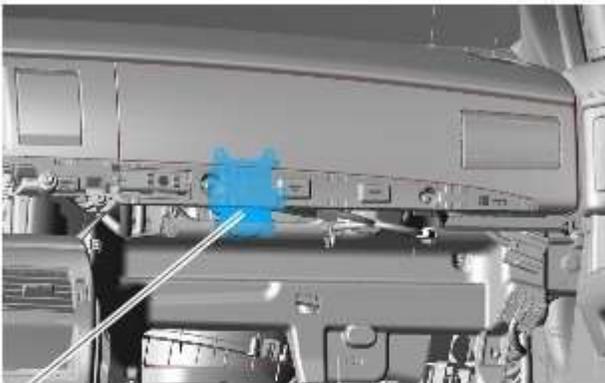
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Glove Compartment](#) (501-12 Instrument Panel and Console, Removal and Installation).



E100075



3. NOTE: Make sure that the actuator is correctly aligned to the recirculation blend door arm.

Installation

1. To install, reverse the removal procedure.

Climate Control - Sunload Sensor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

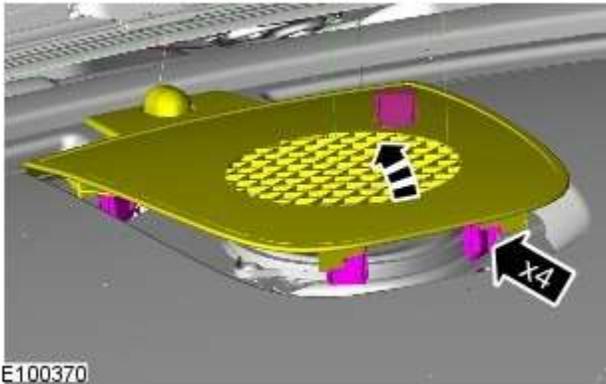
2. CAUTIONS:



Protect the surrounding trim to avoid damage.

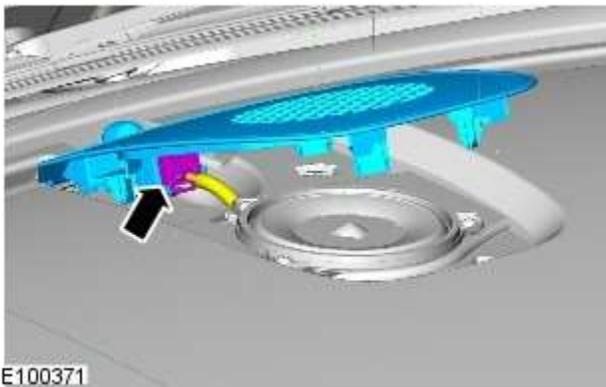


Make sure that the clips are correctly located.



E100370

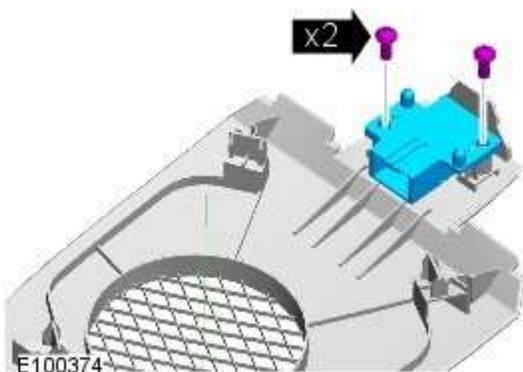
3.



E100371

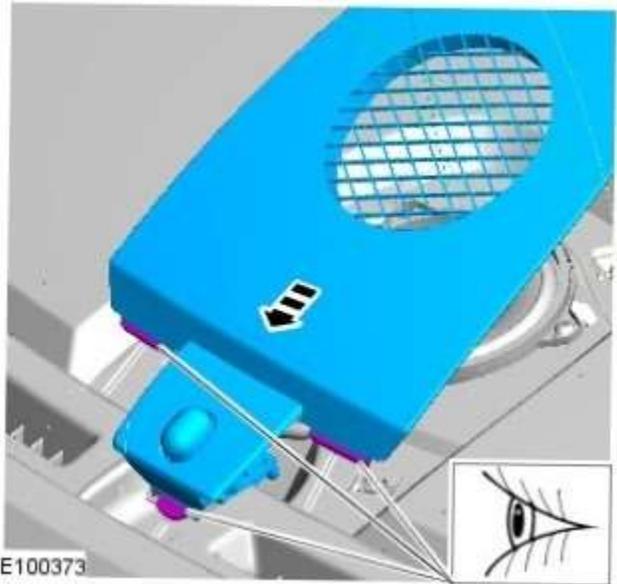
4.  CAUTION: Make sure that the component is correctly located on the locating dowels.

Torque: 2 Nm



E100374

Installation



1. To install, reverse the removal procedure.

Climate Control - Thermostatic Expansion Valve

Removal and Installation

Removal

NOTES:



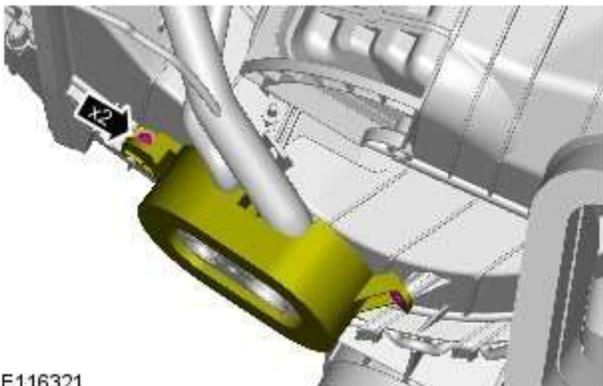
Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Climate Control Assembly](#) (412-01 Climate Control, Removal and Installation).

Right-hand drive vehicles

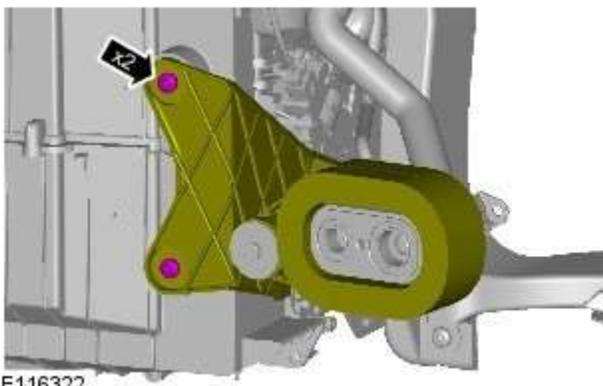


E116321

3.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm

Left-hand drive vehicles

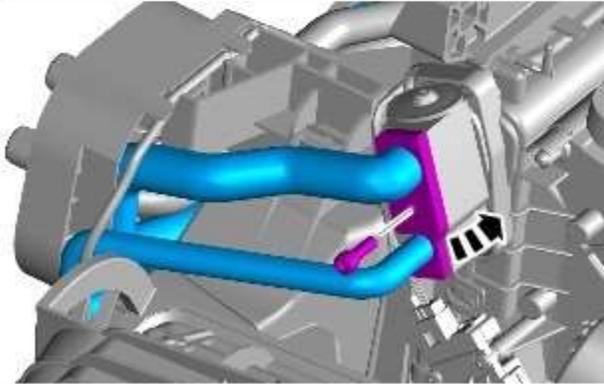
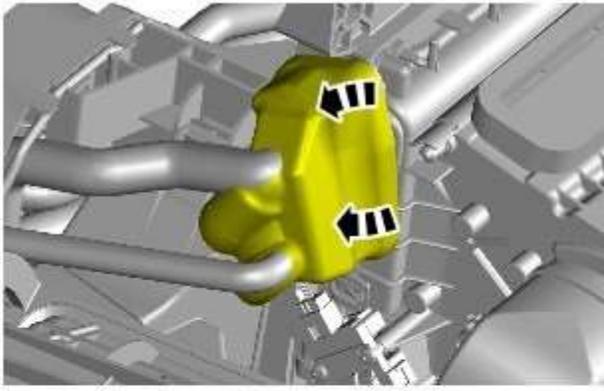


E116322

4.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm

All vehicles



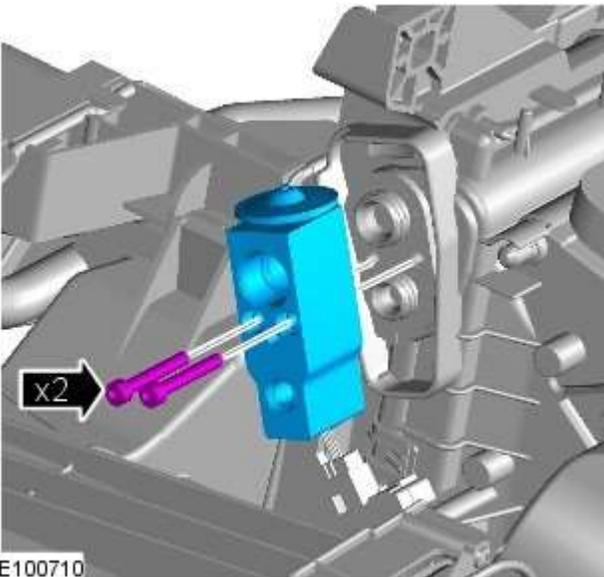
E100709

5. CAUTIONS:

 Take care not to damage the O-ring seals during installation.

 A new O-ring seal is to be installed.

Torque: 5.3 Nm



E100710

6. CAUTIONS:

 Take care not to damage the O-ring seals during installation.

 A new O-ring seal is to be installed.

Torque: 3.5 Nm

Installation

1. To install, reverse the removal procedure.

Climate Control - Desiccant Bag V6 3.0L Petrol/V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal

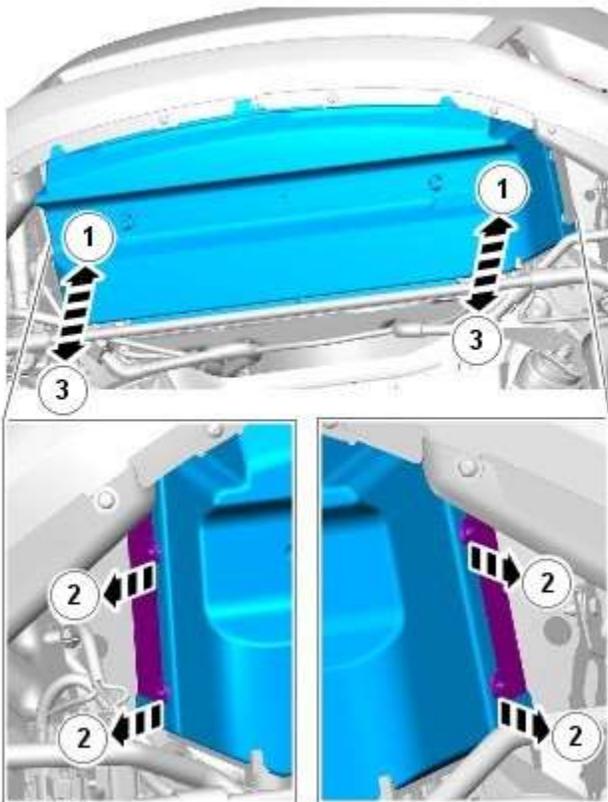


NOTE: Removal steps in this procedure may contain installation details.



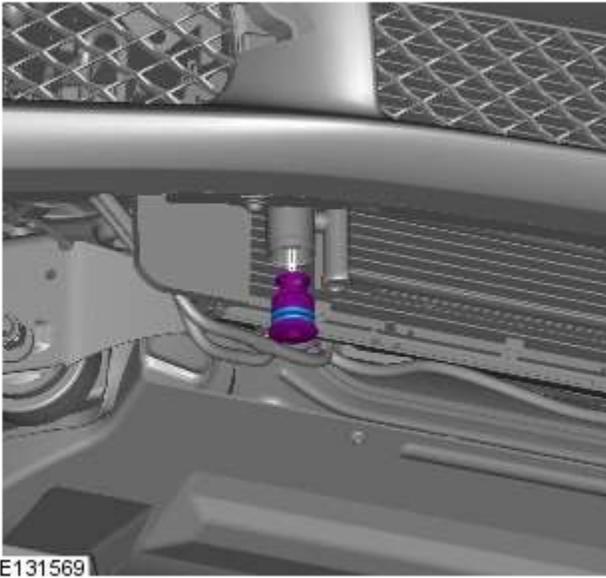
1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
3. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

4.

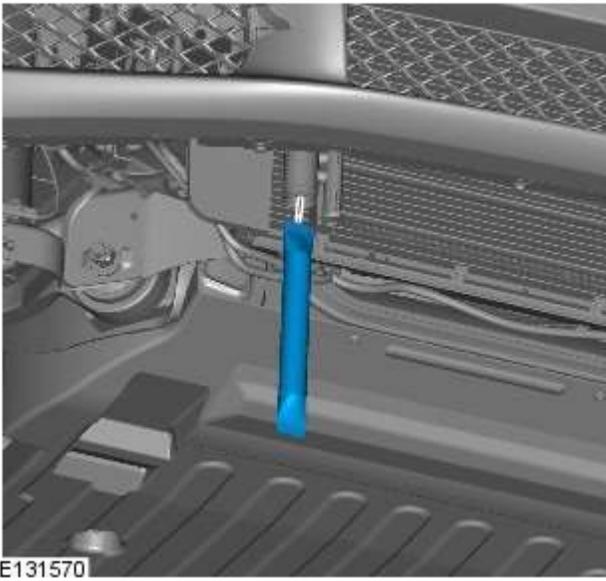


E97870

5. *Torque:* 12 Nm



6.



Installation

1. To install, reverse the removal procedure.

Auxiliary Climate Control -

Description	Nm	lb-ft	lb-in
Electric booster heater retaining screws	1.3	-	11

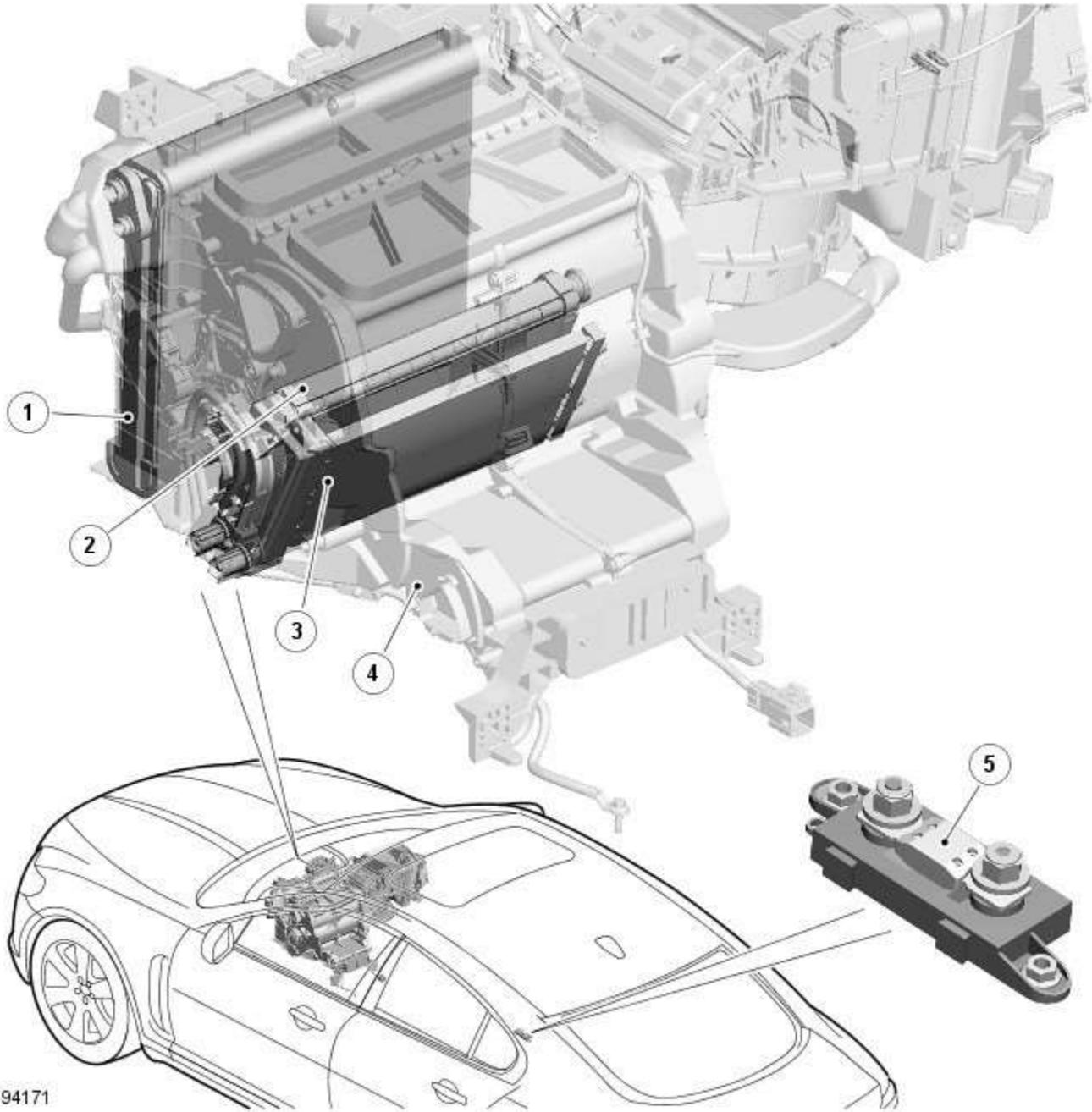
Auxiliary Climate Control - Electric Booster Heater - Component Location

Description and Operation



NOTE: LHD (left-hand drive) vehicle shown, RHD (right-hand drive) vehicle similar.

Component Location



E94171

Item	Description
1	Evaporator
2	Heater core
3	Electric booster heater
4	Heater assembly
5	150 A megafuse

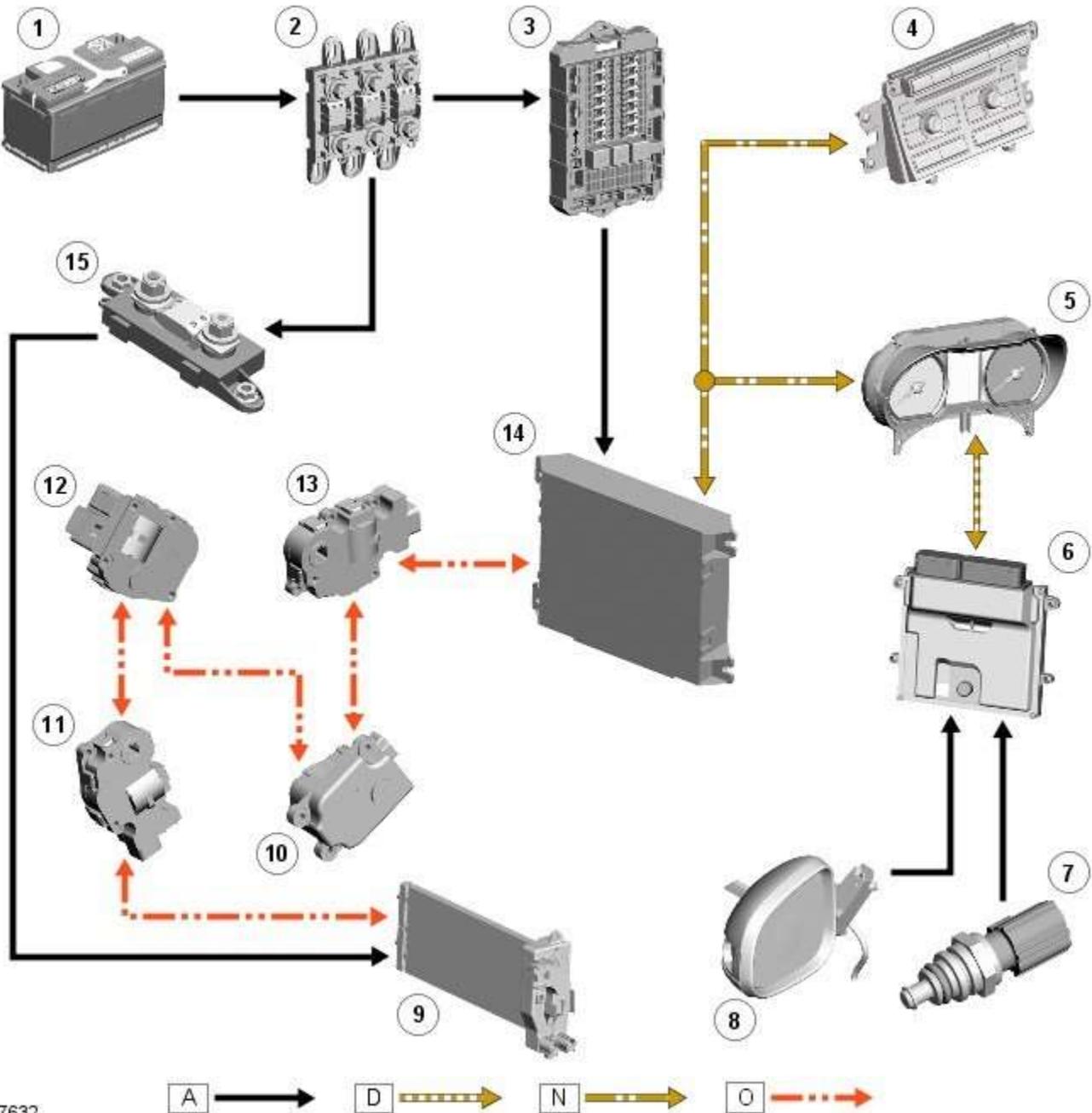
Auxiliary Climate Control - Electric Booster Heater - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus; **N** = Medium speed CAN bus; **O** = LIN (local interconnect network) bus.



E97632



Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	Integrated control panel
5	Instrument cluster

6	ECM (engine control module)
7	ECT (engine coolant temperature) sensor
8	Ambient temperature sensor
9	Electric booster heater
10	Face/Feet distribution stepper motor
11	RH (right-hand) temperature blend stepper motor
12	LH (left-hand) temperature blend stepper motor
13	Windshield (defrost) distribution stepper motor
14	ATC (automatic temperature control) module
15	150 A megafuse

System Operation

General

Operation of the electric booster heater is controlled by the [ATC](#) module, which communicates with the micro-controller in the booster heater using the [LIN](#) bus. The temperature requested by the [ATC](#) module is based on:

- The ambient air temperature.
- The engine coolant temperature.
- The temperatures selected on the integrated control panel.

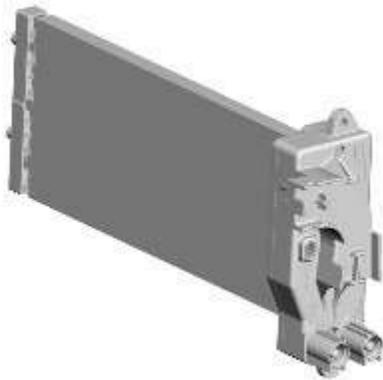
The blower must be running for the electric booster heater to operate.

If electrical load management is in force, electric booster heater performance is reduced. For additional information, refer to:

[Electronic Engine Controls \(303-14A, Description and Operation\)](#),
[Electronic Engine Controls \(303-14B Electronic Engine Controls - V6 3.0L Petrol, Description and Operation\)](#),
[Electronic Engine Controls \(303-14C, Description and Operation\)](#).

Component Description

Electric Booster Heater



E97633

The electric booster heater is installed in the heater assembly, on the downstream side of the heater core. It consists of ceramic coated thermistor elements, rated at 1.25 kW, and a micro-controller. Electrical power for the booster heater is supplied by the [BJB](#) via a 150 A megafuse installed under the [RH](#) front seat.

Auxiliary Climate Control - Auxiliary Coolant Flow Pump

Removal and Installation

Removal

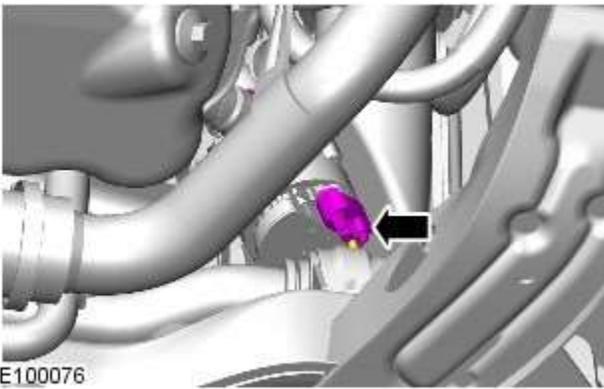


1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

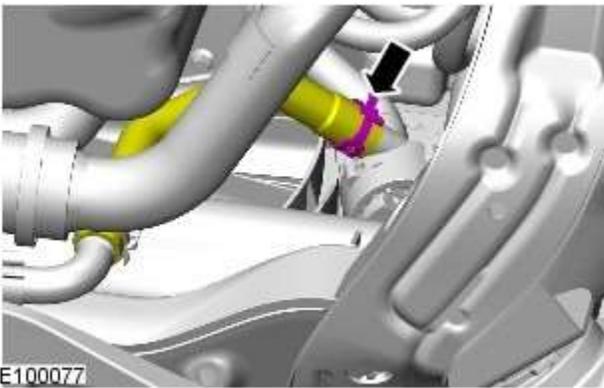
Raise and support the vehicle.

2. Refer to: Air Deflector (501-02, Removal and Installation).

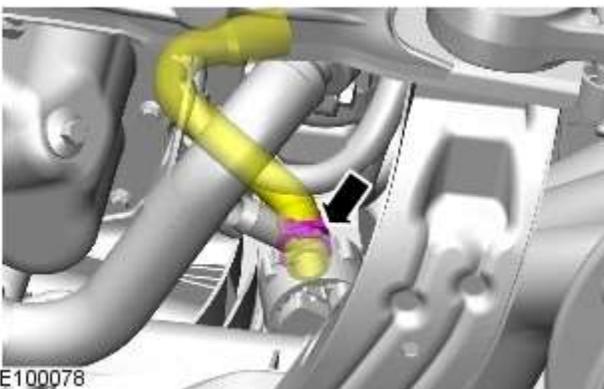
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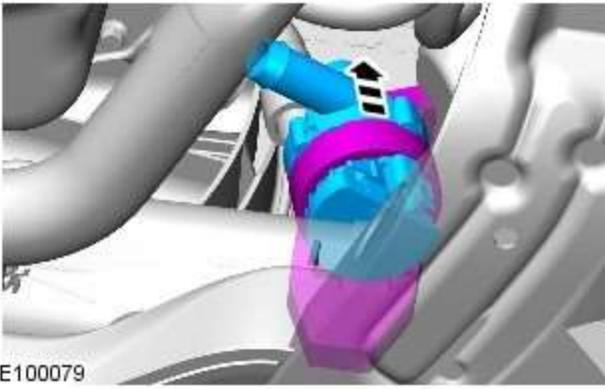


4.  **NOTE:** Clamp the coolant hose to minimize coolant lose.



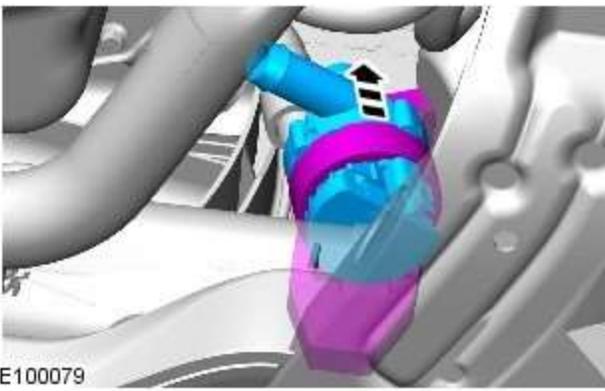
5.  **NOTE:** Clamp the coolant hose to minimize coolant lose.



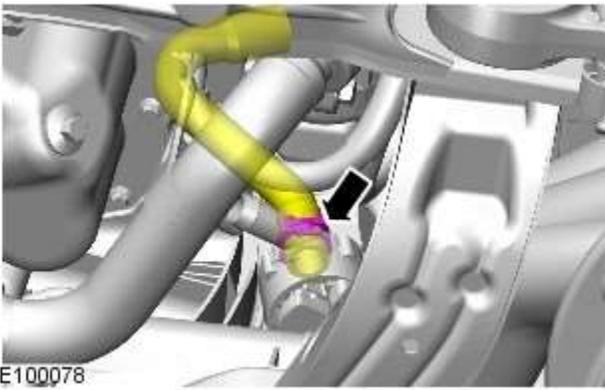


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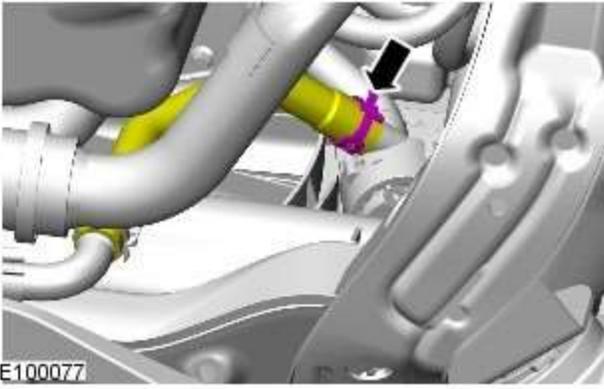
Installation



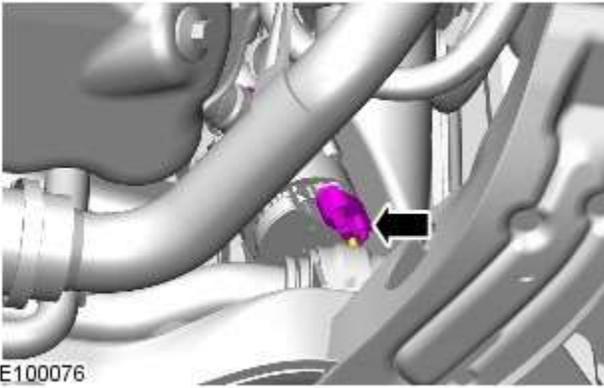
1.



2.  NOTE: Clamp the coolant hose to minimize coolant lose.



3.  NOTE: Clamp the coolant hose to minimize coolant lose.



4.

5. Lower the vehicle.
6. Remove the coolant expansion tank pressure cap.
7. Fill the cooling system up to the MAX mark on the coolant expansion tank using a fifty percent mixture of Jaguar Premium Cooling System Fluid or equivalent, meeting Jaguar specification WSS M97B44-D and fifty percent water.
8. Install the coolant expansion tank pressure cap.
9. Start and run the engine.
10. Set the heating system to MAX heat, the blower motor to MAX speed and the air distribution to the instrument panel registers.
11.  CAUTION: Observe the engine temperature gauge. If the engine starts to over-heat switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle

Allow the engine to run until hot air is emitted from the instrument panel registers, while observing the engine temperature gauge.
12. Switch the engine off.
13. Allow the engine to cool.

14. WARNINGS:



Never remove the coolant expansion tank cap under any circumstances while the engine is operating. Failure to follow this instruction may result in personal injury.



To avoid having scalding hot coolant or steam blowing out of the cooling system, use extreme care when removing the coolant pressure cap from a hot cooling system. Wait until the engine has cooled, then wrap a thick cloth around the coolant pressure cap and turn it slowly until the pressure begins to release. Step back while the pressure is released from the system. When certain all the pressure has been released (still with a cloth) turn and remove the coolant pressure cap from the coolant expansion tank. Failure to follow these instructions may result in personal injury.

Release the cooling system pressure.

15. Fill the cooling system up to the MAX mark on the coolant expansion tank using a fifty percent mixture of Jaguar Premium Cooling System Fluid or equivalent, meeting Jaguar specification WSS M97B44-D and fifty percent water.

16. Install the coolant expansion tank pressure cap.

17. Raise the vehicle.

18. Check all coolant hoses for visible signs of coolant leaks.

19. Install the air deflector.

Refer to: Air Deflector (501-02, Removal and Installation).

Auxiliary Climate Control - Electric Booster Heater

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

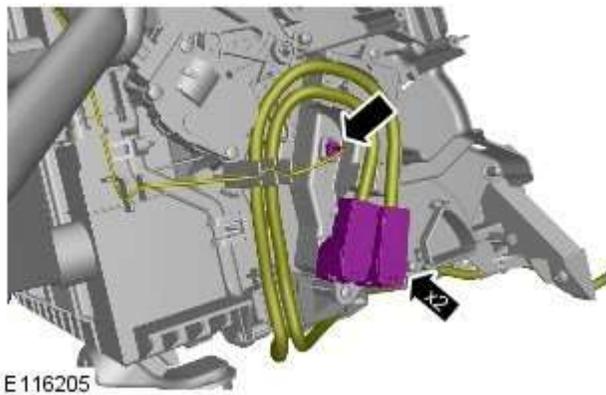
All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Right-hand drive vehicles

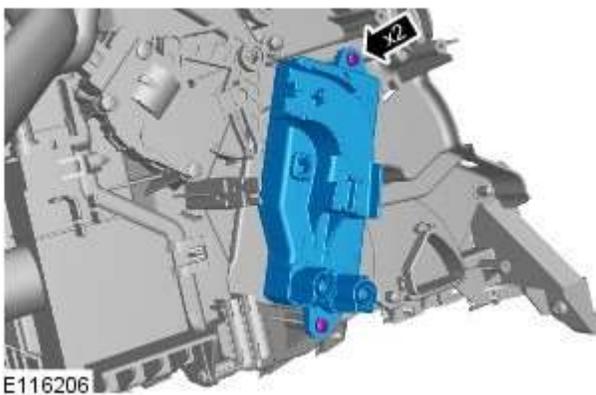
2. Refer to: [Heater Core and Evaporator Core Housing](#) (412-01 Climate Control, Removal and Installation).

All vehicles



3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 1.3 Nm



4. CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

Air Conditioning -

Torque Specifications

Description	Nm	lb-ft	lb-in
A/C compressor retaining bolts	25	18	-
A/C compressor manifold and tube retaining bolt	9	-	80
A/C condenser core retaining studs	5	-	48
A/C condenser core supply and return lines retaining nuts	8	-	71
Power steering oil cooler retaining nuts	7	-	62
A/C desiccant bag retaining screw (vehicles fitted with petrol engines)	22	16	-
A/C desiccant bag retaining screw (vehicles fitted with diesel engines)	4	-	37
A/C pressure cutoff switch	8	-	71

Air Conditioning - Air Conditioning

Diagnosis and Testing

For additional information.

REFER to: [Climate Control System](#) (412-00 Climate Control System - General Information, Diagnosis and Testing).

Air Conditioning - Air Conditioning (A/C) Compressor V8 5.0L Petrol/V8 S/C

5.0L Petrol

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

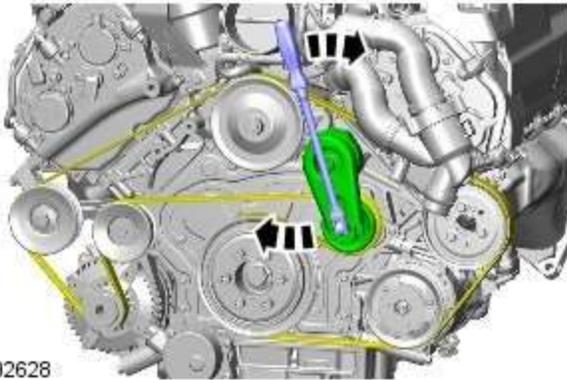


2. **WARNING:** Make sure to support the vehicle with axle stands.

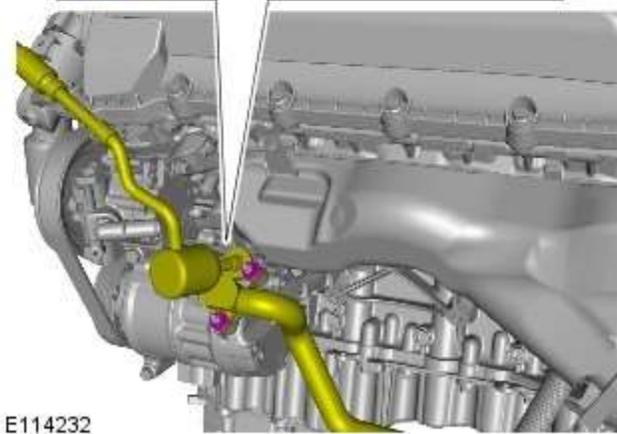
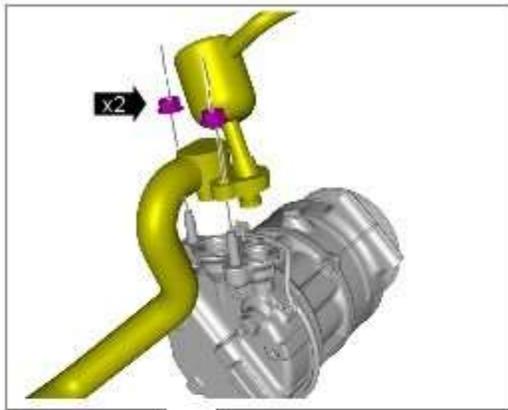
Raise and support the vehicle.

3. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
4. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
5. Refer to: [Specifications](#) (412-00 Climate Control System - General Information, Specifications).
6. Refer to: [Refrigerant Oil Adding - V6 3.0L Petrol](#) (412-00 Climate Control System - General Information, General Procedures).

7.



E102628



E114232

8. CAUTIONS:



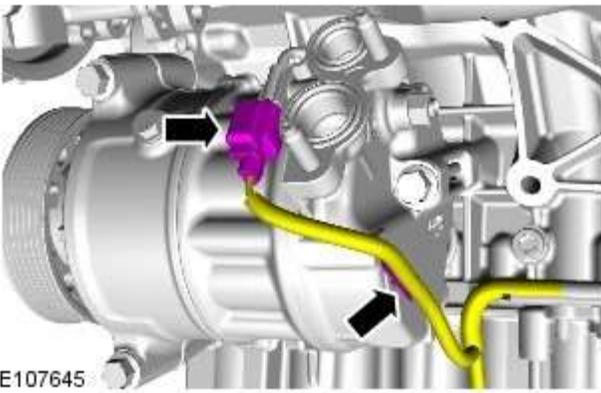
Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.



Make sure that all openings are sealed. Use new blanking caps.

Torque: 9 Nm

9.



E107645

10. CAUTIONS:

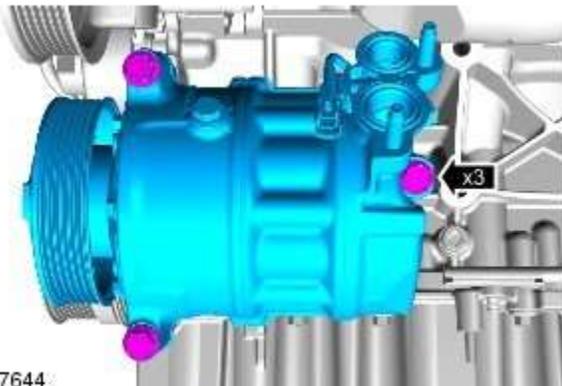


Make sure that all openings are sealed. Use new blanking caps.



Take care not to damage the O-ring seals during installation.

Torque: 25 Nm



E107644

Installation

1. To install, reverse the removal procedure.

Air Conditioning - Condenser Core V8 S/C 5.0L Petrol

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).

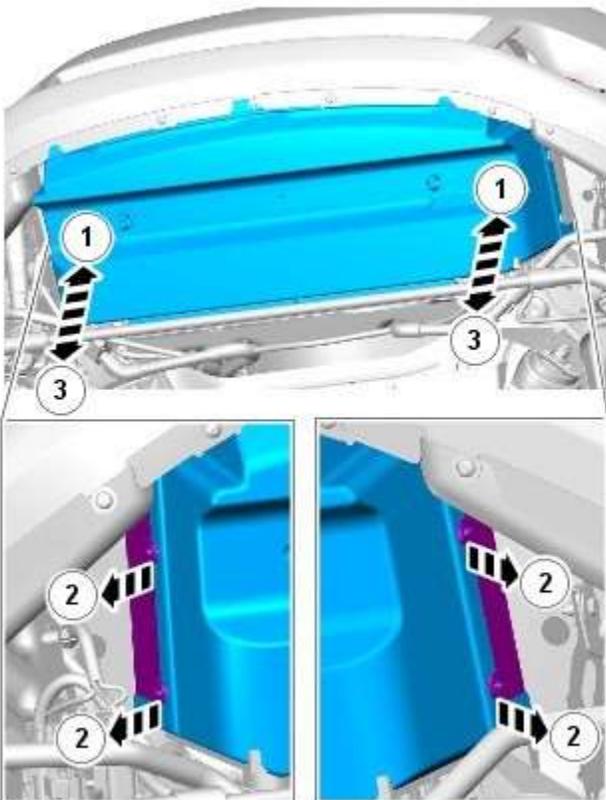


2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

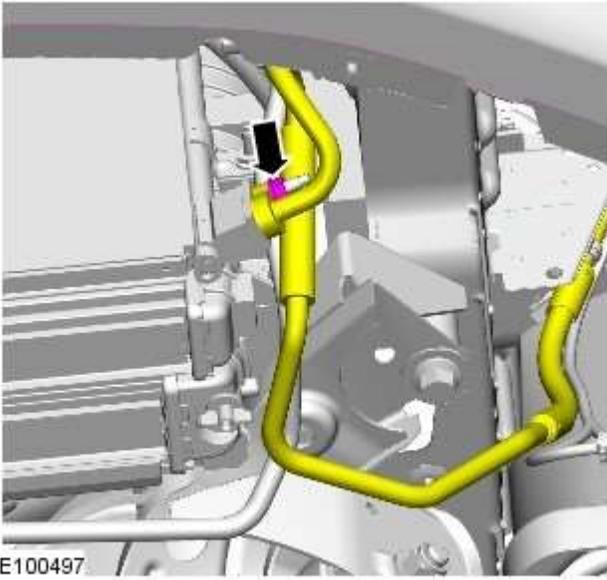
Raise and support the vehicle.

3. Refer to: [Radiator](#) (303-03D Supercharger Cooling - V8 S/C 5.0L Petrol, Removal and Installation).

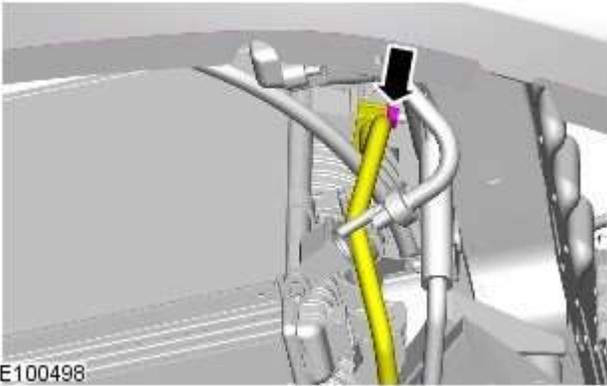
4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



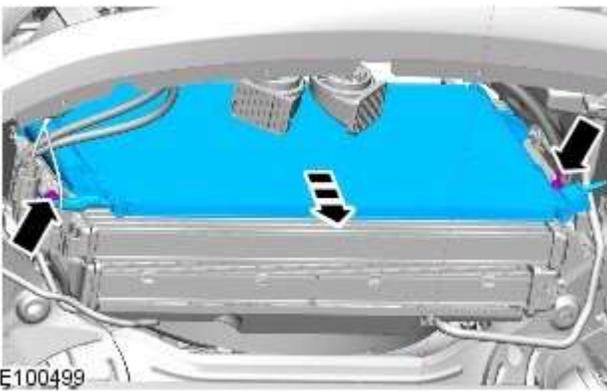
E97870



5. *Torque:* 8 Nm



6. *Torque:* 8 Nm



7.  **NOTE:** Support the air conditioning (A/C) condenser.
Torque: 7 Nm

Installation

1. To install, reverse the removal procedure.

Air Conditioning - Pressure Cutoff Switch

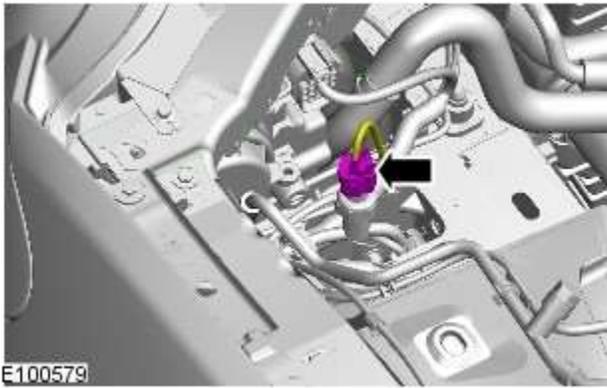
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. For additional information, refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
2. For additional information, refer to: Air Cleaner (303-12, Removal and Installation).



3.



4.  CAUTION: Make sure the air conditioning (A/C) hose does not turn when removing the low pressure switch.

TORQUE: 8 Nm

Installation

1. To install, reverse the removal procedure.