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CLIMATE CONTROL SYSTEM – GENERAL INFORMATION

CLIMATE CONTROL SYSTEM (G2414591)

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PRINCIPLES OF OPERATION

For a detailed description of the Climate Control System, refer to the relevant Description and Operation section in the workshop manual. REFER to:(412-01 Climate Control)

[Air Conditioning](#) (Description and Operation),

[Control Components](#) (Description and Operation).

INSPECTION AND VERIFICATION

**WARNING:**

Servicing must be completed by personnel familiar with both vehicle system and the charging and testing equipment. All operations must be completed 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.

**NOTES:**

- If a control module or a component is at fault or may be at fault and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval program is in operation, prior to the installation of a new module/component.
- When performing voltage or resistance tests, always use a digital multimeter that has the resolution ability to view 3 decimal places. For example, on the 2 volts range can measure 1mV or 2 K Ohm range can measure 1 Ohm. When testing resistance always take the resistance of the digital multimeter leads into account.
- 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

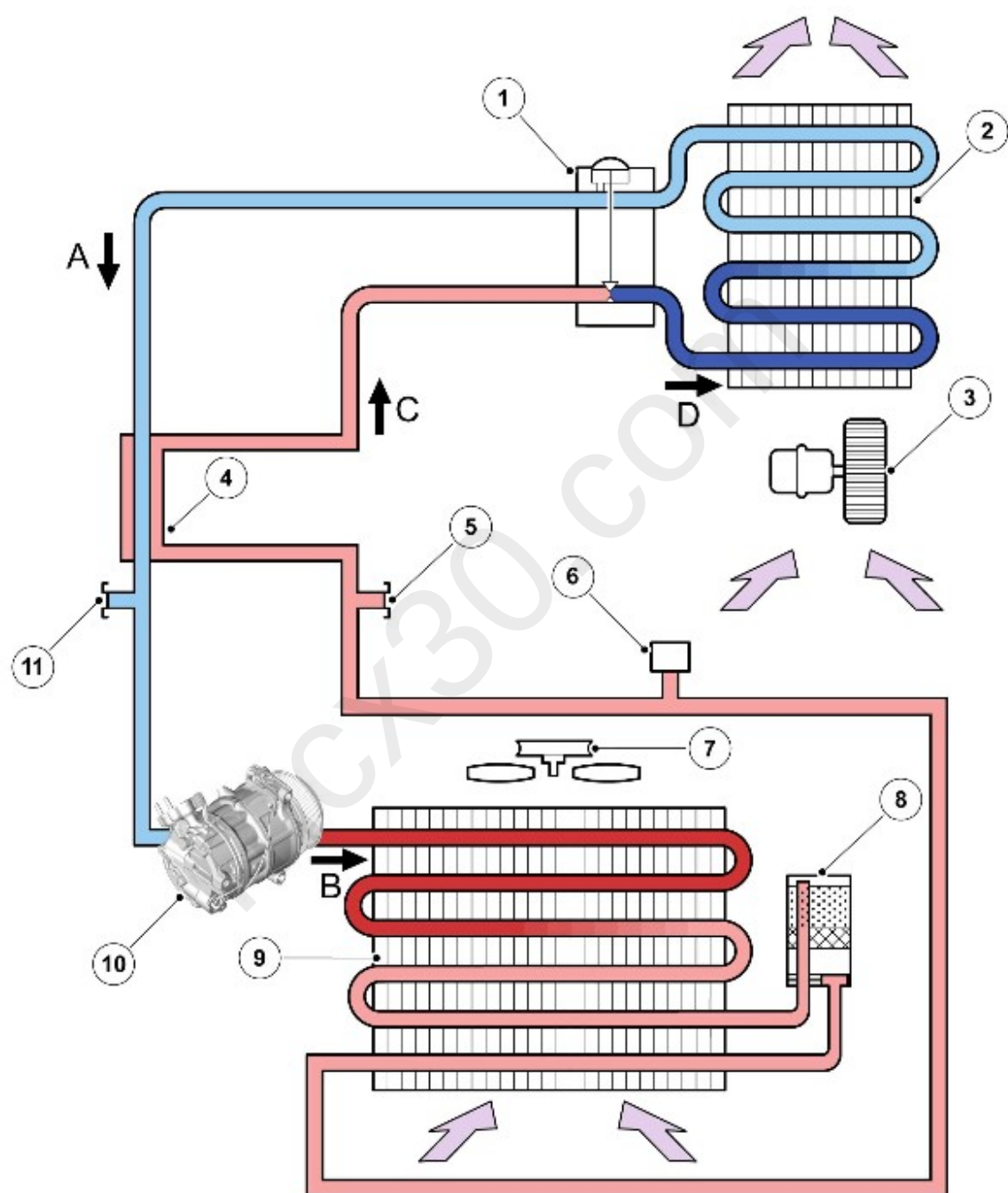
Visual Inspection

MECHANICAL	ELECTRICAL
■ Coolant level ■ Hoses ■ Coolant pump ■ Passenger compartment air filter ■ Accessory drive belt ■ Air conditioning compressor ■ Thermostatic expansion valve ■ Receiver drier ■ Air conditioning condensor ■ Refrigerant pipes ■ Fuel fired booster heater ■ Fuel fired booster heater fuel pump ■ Fuel fired booster heater fuel pipes	■ Fuses ■ Wiring harnesses and connectors ■ Blower ■ Electronic control valve ■ Electric cooling fan ■ HVAC Control Module (HVAC) ■ 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 Code(s) and refer to the Diagnostic Trouble Code(s) (DTC) Index

5. Check JLR claims submission system for open campaigns. Refer to the corresponding bulletins and SSMS which may be valid for the specific customer complaint and complete the recommendations as required.



E236441

A = Low Pressure (LP) VAPOR: B = High Pressure (HP) VAPOR: C = HP LIQUID: D = LP VAPOR

ITEM	DESCRIPTION
1	Thermostatic Expansion Valve (TXV)
2	Evaporator
3	Blower
4	Internal Heat Exchanger (If installed)
5	HP servicing connection
6	Refrigerant pressure sensor
7	Electric cooling fan
8	Air conditioning receiver drier
9	Air conditioning condensor
10	Air conditioning compressor
11	LP servicing connection

AIR CONDITIONING SYSTEM SPECIFICATIONS

For the correct air conditioning system specifications for the vehicle REFER to: [Specifications](#) (412-00 Climate Control System - General Information, Specifications).

AIR CONDITIONING SYSTEM PERFORMANCE CHECK

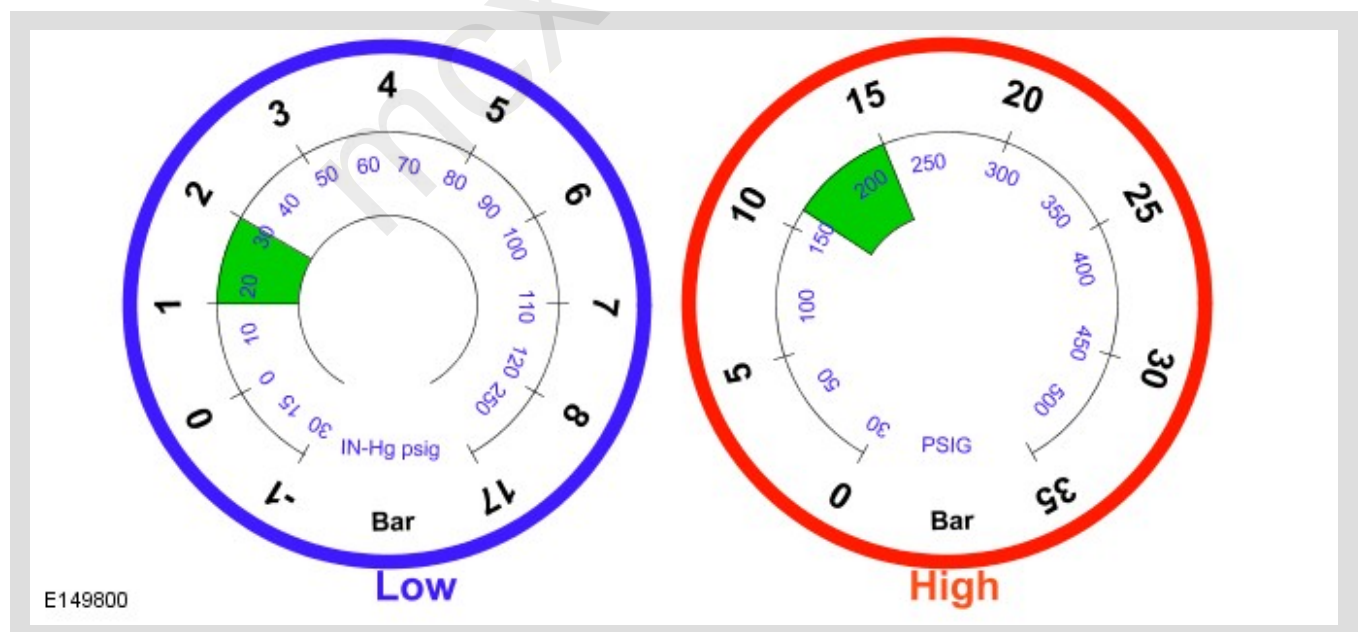


NOTES:

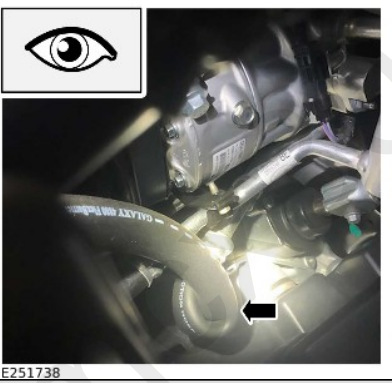
- Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low pressure system) and 11.0 bar to 15.0 bar (high pressure system).
- Make sure the air conditioning settings are as follows before performing the steps below:
 - Set the system to recirculate. Set the left and right side temperature to low and blower direction to face and feet.
 - Set fan speeds to max.
 - Make sure all doors, windows and tailgate are closed.
 - Make sure all vents are open, with no objects blocking the vent exits.
 - Make sure that there is no debris in the air conditioning charging ports before connecting the air conditioning station.

When a failure symptom has been reproduced, refer to the symptom chart. After completing a repair, the air conditioning performance check should be repeated to confirm that the repair is successful.

1. Connect the air conditioning station to the vehicle charging ports
2. Close the valves on the air conditioning station
3. Check the standing pressures of the air conditioning system. The system should not have been run for 20-30mins
4. Close all doors, windows and tailgate
5. Start the engine
6. Set the temperature to the lowest setting (all zones)
7. Set the blower speed to maximum
8. Set the recirculate switch to on
9. Set the air conditioning to on and check that the air conditioning compressor clutch engages and that the gauges register a change in pressure
10. Raise engine speed to 1500rpm and maintain this speed for 5 minutes
11. Check the pressure gauge readings



SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
During vehicle Pre Delivery Inspection: Air Conditioning not blowing cold air	  ■ Low pressure in the system due to twisted or kinked air conditioning inlet pipe	 NOTE: Make sure the system is depressurized before disconnecting any system pipe work or connections. ■ If the pressure is low due to a twisted or kinked air conditioning inlet pipe, install a new air conditioning inlet pipe
Customer returning the vehicle: Air Conditioning not blowing cold air	  ■ Low pressure in the system due to twisted or kinked air conditioning inlet pipe	 NOTE: Make sure the system is depressurized before disconnecting any system pipe work or connections. ■ If the inlet pipe is found to be twisted/kinked replace the inlet pipe and compressor (the compressor may have become damaged due to oil starvation)
No refrigerant in air conditioning system (no pressure registered on gauges)	■ Refrigerant leak: ■ Charge point caps/valves ■ Compressor inlet connection seal ■ Compressor outlet connection seal ■ Air conditioning pipes ■ Air conditioning pipe hose crimps ■ Compressor to bulkhead pipe seal ■ Bulkhead to condenser pipe seal ■ Condenser to compressor pipe seal ■ Receiver Drier seals ■ Refrigerant pressure sensor seal	 NOTES: ■ If there is a leak evident in the air conditioning system, all seals, pipe joints and unions must be checked before condemning the air conditioning compressor. ■ Make sure the system is depressurized before disconnecting any system pipe work or connections. ■ Lubricate the seals prior to installation. ■ GO to Pinpoint Test A.

SYMPTOM	POSSIBLE CAUSES	ACTION
	- Internal heat exchanger (If installed) - Evaporator inlet pipe seal - Evaporator outlet pipe seal - Thermostatic expansion valve pipe seals - Compressor casting joints, shaft seal, electronic control valve	
Air conditioning compressor clutch not engaging / Air conditioning pressures not changing	- Check the air conditioning compressor clutch operation - Air conditioning compressor clutch circuit short circuit to ground, open circuit, high resistance - Clutch solenoid fault - Pressure sensor fault or reading incorrect - Refrigerant undercharged	- Using the Jaguar Land Rover approved diagnostic equipment, check the following datalogger signal - - Air Conditioning Status - Air Conditioning Clutch Engaged (0x9801) - Refer to the electrical circuit diagrams and check the air conditioning compressor clutch circuit for short circuit to ground, open circuit, high resistance. Repair the wiring harness as necessary - GO to Pinpoint Test B.
Both high and low pressure system pressure gauges read too low	- Refrigerant undercharged - Low pressure pipe damaged/restricted	GO to Pinpoint Test C.
Air conditioning inoperative (no change in pressure when setting the air conditioning to on)	- Climate control system fault - Air conditioning compressor clutch circuit short circuit to ground, short circuit to power, open circuit, high resistance - Air conditioning compressor internal failure	- Using the Jaguar Land Rover approved diagnostic Equipment, check the HVAC control module for related DTCs and refer to the relevant DTC index - Refer to the electrical circuit diagrams and check the air conditioning compressor clutch circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Repair the wiring harness as necessary - GO to Pinpoint Test B.
Air conditioning operates briefly on Low/ Low setting and then switches off	- Electric cooling fan inoperative - Air conditioning condensor airflow obstructed - Active grille system fault - Refrigerant overcharged - Excessive oil in the refrigerant - Moisture contamination of the system - Thermostatic expansion valve blocked - Evaporator blocked	- Using the Jaguar Land Rover approved diagnostic equipment, check the powertrain control module and HVAC control module for related DTCs and refer to the relevant DTC index - Check the operation of the electric cooling fan - Check the air conditioning condensor for external obstructions - Check the operation of the active grille system - Using the Jaguar Land Rover approved equipment, recover the refrigerant. Evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil - Install a new thermostatic expansion valve - Install a new evaporator - GO to Pinpoint Test D.

SYMPTOM	POSSIBLE CAUSES	ACTION
High and low pressure system pressures unstable	- Refrigerant contaminated - Refrigerant contaminated with water - Air conditioning compressor internal failure	GO to Pinpoint Test E.
High and low pressure system pressures normal and insufficient cooling	Restricted air flow through the evaporator due to a blockage	- Visually inspect the evaporator for blockages. Clear blockage as necessary - REFER to: Cabin Comfort Climate Control System (412-00 Climate Control System - General Information, Diagnosis and Testing).
High and low pressure system pressures too high	- Refrigerant overcharged - Air conditioning condenser airflow obstructed - Electric cooling fan inoperative - Electronic pressure control valve - Air conditioning compressor internal failure	GO to Pinpoint Test F.
High and low pressure system pressures too low	- Refrigerant undercharged - Low pressure pipe damaged/restricted between the charging port and the high pressure side of the TXV	 NOTES: - With the compressor running, a low pressure could be caused by suction on the low pressure gauge. The high pressure side could be low due to low refrigerant in the system. Check for a blocked evaporator, crushed /kinked pipework, blocked, faulty or closed TXV. - Check the refrigerant hoses for any signs of kinking after any repair work has been completed, the pipes have a core that can crush while the exterior appears correct. - GO to Pinpoint Test C.
Low pressure system pressure too high and high pressure system pressure too low	- Air conditioning compressor electronic control valve circuit short circuit to ground, short circuit to power, open circuit, high resistance - Air conditioning compressor electronic control valve internal failure - Air conditioning pressure sensor failure or intermittent fault - Air conditioning compressor failure when the compressor is spinning	GO to Pinpoint Test F.
Noise from air conditioning system		GO to Pinpoint Test H.

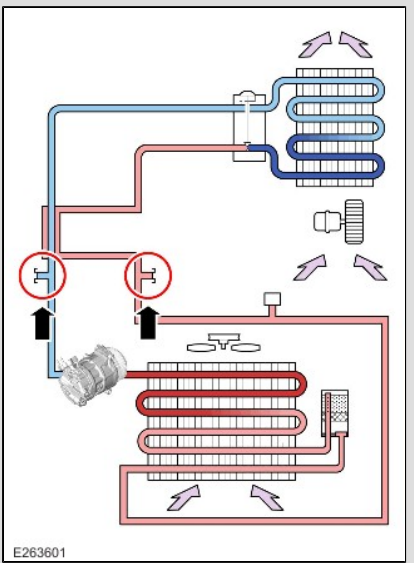
SYMPTOM	POSSIBLE CAUSES	ACTION
	 NOTES: - Check all air conditioning pipe work for damage or kinks before inspecting other air conditioning components. - Check service records for previous air conditioning repairs. - Air conditioning pipe work damaged, crushed or kinked - Air conditioning compressor pulley bearing - Air conditioning compressor pulley foul condition - Air conditioning compressor clutch operation excessively noisy - Air conditioning compressor internal failure - Thermostatic expansion valve internal failure - Refrigerant undercharged - Refrigerant overcharged - Air conditioning pipe(s) fouling body	

PINPOINT TESTS

PINPOINT TEST A : LEAK TESTS	
A1: LEAK TEST 1 CHARGE PORTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 NOTES: - Do not test for leaks by charging the system with refrigerant and oil. Nitrogen must be used for leak detection. - Borescopes and endoscopes can also be used to confirm leak points. - This test is performed with the engine not running.	 NOTE: For detailed information of the component indicated in the image Refer to: 412-01 Climate Control - Description and Operation Make sure that there is no debris in the air conditioning charging ports

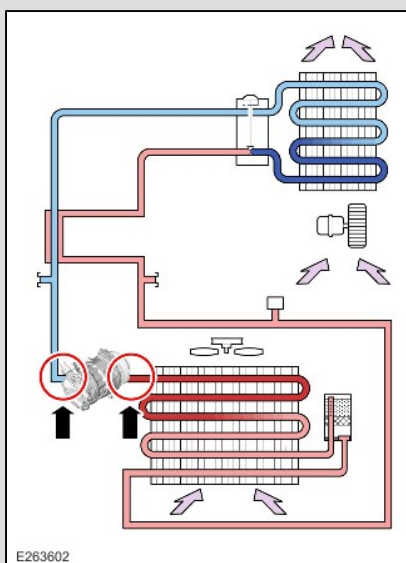
PINPOINT TEST A : LEAK TESTS

A1: LEAK TEST 1 CHARGE PORTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	
	2 Charge the air conditioning system with nitrogen and regulate to 7.0 bar
	3 Isolate the nitrogen supply
	NOTES: - Any decay in pressure indicates a leak. - Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas.
	4 Monitor the pressure gauge and check for leaks for 30 minutes.
	Can a leak be identified with the leak detector or escaping gas heard? Yes Inspect the air conditioning charge ports for leaks. Disconnect and re-connect the charging station from the charging ports recharge the air conditioning system and make sure there are no leaks evident from the charging ports GO to A2. No Reconfirm the customer issue

A2: LEAK TEST 2 COMPRESSOR SEALS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	NOTES: - Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas. - Make sure the system is depressurized before disconnecting any system pipe work or connections.
	NOTE: For detailed information of the component indicated in the image Refer to: 412-01 Climate Control - Description and Operation



- 1 Inspect the air conditioning compressor inlet and outlet pipe seals for leaks. Inspect for leaking oil or dye from the joints.

Can a leak be identified as coming from the air conditioning compressor inlet or outlet pipe seals?

Yes

Install new air conditioning compressor inlet and outlet pipe seals, recharge the air conditioning system with nitrogen and recheck the system for leaks

No

GO to A3.

A3: LEAK TEST 3 PIPE WORK

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



NOTES:

- Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas.
- Make sure the system is depressurized before disconnecting any system pipe work or connections.

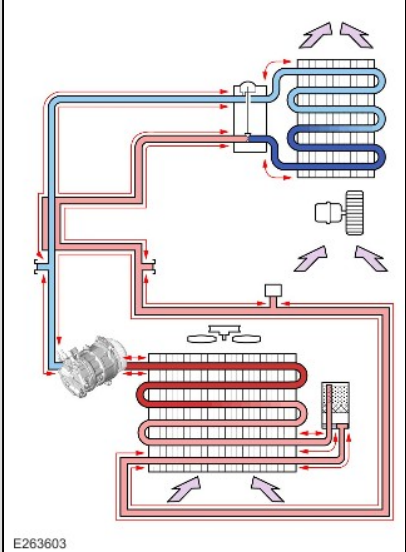


NOTE:

For detailed information of the component indicated in the image Refer to:
412-01 Climate Control - Description and Operation

- 1 Inspect the air conditioning system pipe work for leaks, check flexible pipes for cracks and/or splits. Inspect pipe flanges and joints for damage or poor connections. Inspect for leaking oil or dye from the joints.

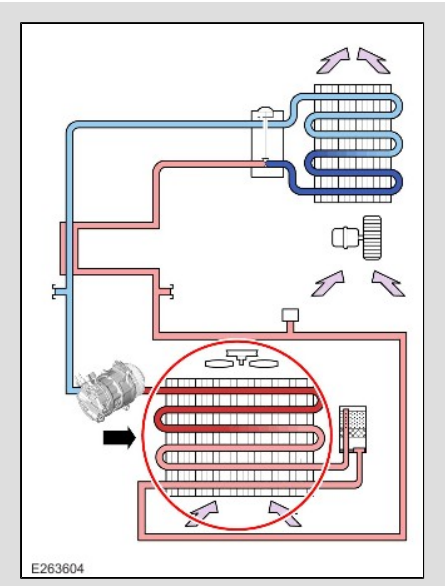
A3: LEAK TEST 3 PIPE WORK

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E263603	
	Can a leak be identified as coming from the air conditioning pipe work including any pipe flanges or joints? Yes Replace worn or damaged pipe work as necessary, recharge the air conditioning system with nitrogen and recheck the system for leaks No GO to A4.

A4: LEAK TEST 4 CONDENSOR

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTES: - Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas. - Make sure the system is depressurized before disconnecting any system pipe work or connections.	
	NOTE: For detailed information of the component indicated in the image Refer to: 412-01 Climate Control - Description and Operation 1 Inspect the air conditioning system condensor for damage or corrosion. Check the pipe connections and seals for leaks. Inspect for leaking oil or dye from the pipe connections or core of the condensor.

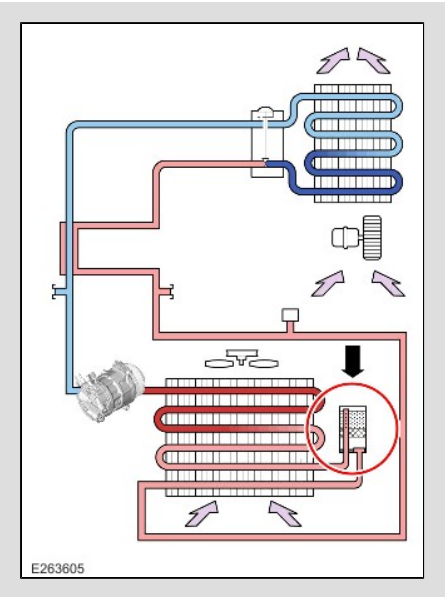
A4: LEAK TEST 4 CONDENSOR

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Can a leak be identified as coming from the air conditioning condenser or pipe connections to the condenser? Yes If a leak is evident from the pipe seals to the condenser replace the seals as necessary, recharge the air conditioning system with nitrogen and recheck the system for leaks. If the leak is due to damage or corrosion to the air conditioning condenser, replace the condenser as necessary, recharge the air conditioning system with nitrogen and recheck the system for leaks No GO to A5.

A5: LEAK TEST 5 RECEIVER DRIER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTES: - Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas. - Make sure the system is depressurized before disconnecting any system pipe work or connections.	
	NOTE: For detailed information of the component indicated in the image Refer to: 412-01 Climate Control - Description and Operation 1 Inspect the air conditioning system receiver drier for damage or corrosion. Check the pipe connections for leaks. Inspect for leaking oil or dye from the pipe connections.

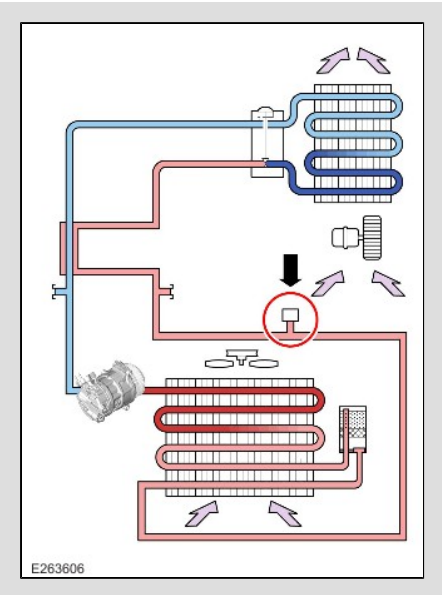
A5: LEAK TEST 5 RECEIVER DRIER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Can a leak be identified as coming from the air conditioning receiver drier or pipe connections to the receiver drier? Yes If a leak is evident from the pipe seals to the receiver drier replace the seals as necessary, recharge the air conditioning system with nitrogen and recheck the system for leaks. If the leak is due to damage or corrosion to the air conditioning receiver drier, replace the receiver drier as necessary, recharge the air conditioning system with nitrogen and recheck the system for leaks No GO to A6.

A6: LEAK TEST 6 REFRIGERANT PRESSURE SENSOR

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTES: - Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas. - Make sure the system is depressurized before disconnecting any system pipe work or connections.	
	NOTE: For detailed information of the component indicated in the image Refer to: 412-01 Climate Control - Description and Operation 1 Inspect the refrigerant pressure sensor for damage or a leaking seal. Inspect for leaking oil or dye from the refrigerant pressure sensor.

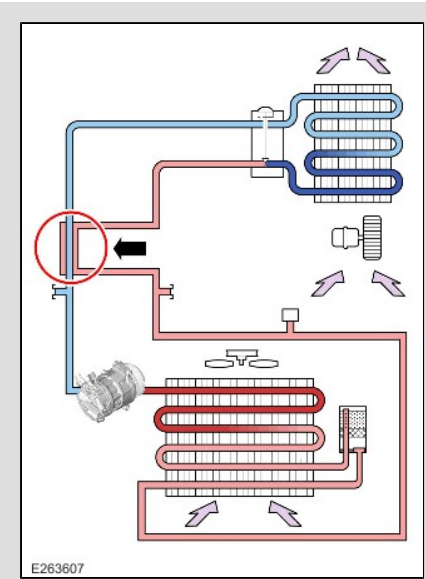
A6: LEAK TEST 6 REFRIGERANT PRESSURE SENSOR

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	
	Can a leak be identified as coming from the air conditioning refrigerant pressure sensor or seal? Yes If a leak is evident from the refrigerant pressure sensor or seals, replace the sensor and seals as necessary, recharge the air conditioning system with nitrogen and recheck the system for leaks No If an internal heat exchanger is installed to the vehicle GO to A7. If an internal heat exchanger is NOT installed to the vehicle GO to A8.

A7: LEAK TEST 7 INTERNAL HEAT EXCHANGER (IF INSTALLED)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 NOTES: - The internal heat exchanger is incorporated primarily because of the introduction of refrigerant HFO1234yf (which is less efficient than refrigerant R134a), but is included in all systems for commonality reasons. - Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas. - Make sure the system is depressurized before disconnecting any system pipe work or connections.	
	 NOTE: For detailed information of the component indicated in the image Refer to: 412-01 Climate Control - Description and Operation 1 Inspect the internal heat exchanger for damage or leaks. Inspect for leaking oil or dye from the internal heat exchanger.

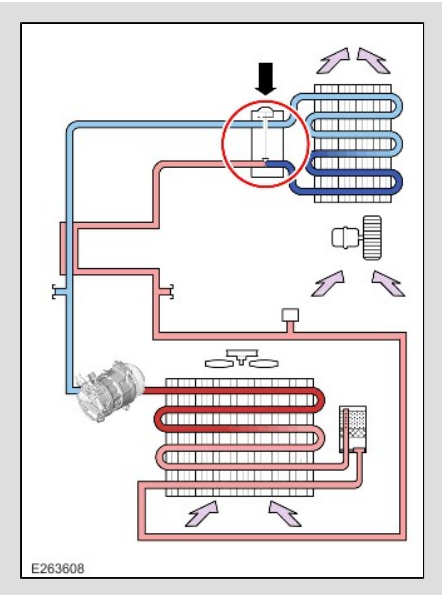
A7: LEAK TEST 7 INTERNAL HEAT EXCHANGER (IF INSTALLED)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E263607	
	Can a leak be identified as coming from the air conditioning internal heat exchanger? Yes If a leak is evident from the internal heat exchanger, replace the internal heat exchanger as necessary, recharge the air conditioning system with nitrogen and recheck the system for leaks No GO to A8.

A8: LEAK TEST 8 THERMOSTATIC EXPANSION VALVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTES: - Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas. - Make sure the system is depressurized before disconnecting any system pipe work or connections.	
	NOTE: For detailed information of the component indicated in the image Refer to: 412-01 Climate Control - Description and Operation 1 Inspect the thermostatic expansion valve for damage, leaking pipe connections and seals. Inspect for leaking oil or dye from the thermostatic expansion valve.

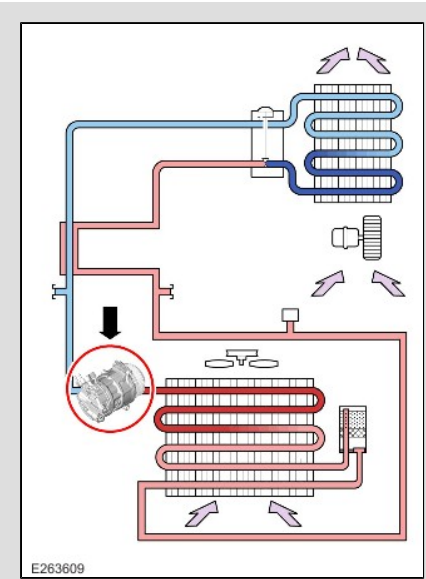
A8: LEAK TEST 8 THERMOSTATIC EXPANSION VALVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	
	Can a leak be identified as coming from the thermostatic expansion valve, connections or seals? Yes If a leak is evident from the thermostatic expansion valve, connections or seals, install a new thermostatic expansion valve and seals as necessary. Recharge the air conditioning system with nitrogen and recheck the system for leaks No GO to A9.

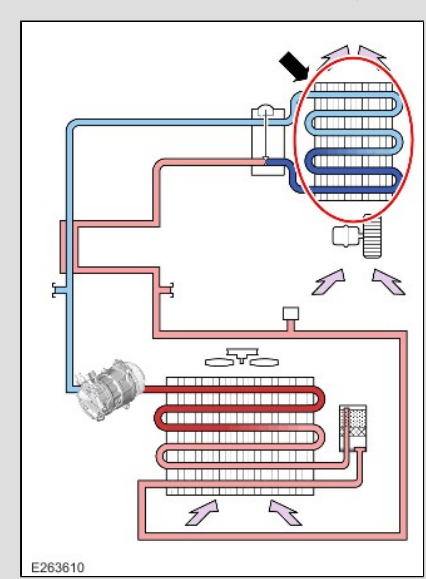
A9: LEAK TEST 9 AIR CONDITIONING COMPRESSOR

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTES: - Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas. - Make sure the system is depressurized before disconnecting any system pipe work or connections.	
	NOTE: For detailed information of the component indicated in the image Refer to: 412-01 Climate Control - Description and Operation 1 Inspect the air conditioning compressor for damage. Check the compressor shaft seal, electronic control valve and compressor casting for leaks. Inspect for leaking oil or dye from the compressor.

A9: LEAK TEST 9 AIR CONDITIONING COMPRESSOR

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E263609	
	Can a leak be identified as coming from the air conditioning compressor? Yes If a leak is evident from the air conditioning compressor, install a new air conditioning compressor as necessary. GO to Pinpoint Test G. No GO to A10.

A10: LEAK TEST 10 EVAPORATOR

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTES: - Leak sources may be identified by using a Jaguar Land Rover approved leak detector, by using an ultra-violet lamp (if dye is in the system) or by listening for the sound of escaping gas. - Make sure the system is depressurized before disconnecting any system pipe work or connections.	
 E263610	NOTE: For detailed information of the component indicated in the image Refer to: 412-01 Climate Control - Description and Operation Inspect the evaporator for damage, leaking pipe connections and seals. Inspect for leaking oil or dye from the evaporator.

A10: LEAK TEST 10 EVAPORATOR	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Can a leak be identified as coming from the evaporator, connections or seals? Yes If a leak is evident from the evaporator, connections or seals, install a new evaporator and seals as necessary. Recharge the air conditioning system with nitrogen and recheck the system for leaks No Reconfirm the customer issue

PINPOINT TEST B : COMPRESSOR MECHANICAL TESTS	
B1: COMPRESSOR CLUTCH NOT ENGAGING / AIR CONDITIONING PRESSURES NOT CHANGING 1	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Confirm if the air conditioning compressor clutch is engaging.
	2 Set the air conditioning to maximum cooling, then cycle the air conditioning switch on and off.
	 NOTE: Make sure that the center shaft rotates during this step and NOT just the pulley.
	3 Using a flashlight visually check the air conditioning compressor clutch change of state, check to see if the center shaft of the compressor is spinning
	Does the air conditioning compressor center shaft rotate? Yes If the air conditioning compressor center shaft did rotate GO to B5. No If the air conditioning compressor center shaft did not rotate GO to B2.
B2: COMPRESSOR CLUTCH NOT ENGAGING / AIR CONDITIONING PRESSURES NOT CHANGING 2	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 The air conditioning clutch may not engage due to a low level of refrigerant in the system. Using the Jaguar Land Rover approved equipment, recover the refrigerant
	2 Compare the weight of the recovered refrigerant against the vehicle specification
	Is the weight of the recovered refrigerant low? Yes If the weight of the recovered refrigerant is low, this indicates a leak in the system GO to Pinpoint Test A. No If the weight or the recovered refrigerant is within the specification for the vehicle GO to B3.
B3: COMPRESSOR CLUTCH NOT ENGAGING / AIR CONDITIONING PRESSURES NOT CHANGING 3	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Remove the air conditioning compressor drive belt
	 NOTE: Make sure that the shaft rotates during this step and not just the pulley.
	2 Rotate the air conditioning compressor centre shaft by hand and check for smooth rotation

B3: COMPRESSOR CLUTCH NOT ENGAGING / AIR CONDITIONING PRESSURES NOT CHANGING 3	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Does the air conditioning compressor shaft rotate smoothly? Yes If the air conditioning compressor shaft rotated smoothly, GO to B4. No If the air conditioning compressor shaft did NOT rotate smoothly, install a new air conditioning compressor
B4: COMPRESSOR CLUTCH NOT ENGAGING / AIR CONDITIONING PRESSURES NOT CHANGING 4	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	 NOTE: Recharge the air conditioning system with the correct quantity of refrigerant and oil before conducting further electrical tests. 1 Using the Jaguar Land Rover approved diagnostic equipment, check the following datalogger signal - Air Conditioning Status - Air Conditioning Clutch Engaged (0x9801) This will confirm that the HVAC control module is attempting to engage the air conditioning compressor clutch
	Does datalogger signal - Air Conditioning Status - Air Conditioning Clutch Engaged (0x9801) show that the HVAC control module is attempting to activate the air conditioning compressor clutch, but the clutch is not operating? Yes If the datalogger signal - Air Conditioning Status - Air Conditioning Clutch Engaged (0x9801) shows that the HVAC control module is attempting to activate the air conditioning compressor clutch, but the clutch is not operating, refer to the electrical circuit diagrams and check the air conditioning compressor clutch circuits for short circuit to ground, open circuit, high resistance. Repair circuit as necessary. If no air conditioning compressor clutch circuit faults are found GO to B5. No Using the Jaguar Land Rover approved diagnostic equipment, check for associated DTCs that could inhibit the air conditioning compressor clutch from engaging
B5: COMPRESSOR CLUTCH NOT ENGAGING / AIR CONDITIONING PRESSURES NOT CHANGING 5	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Disconnect the electronic control valve from the HVAC control module a check the continuity of the circuit.
	2 Electronic control valve testing - Refer to the electrical circuit diagrams and check the electronic control valve from the HVAC control module connector (Make sure it is disconnected from the HVAC while completing this testing) Check the voltage is between 0v to +5v and 0.26Amps to 0.79Amps. Check for short circuit to ground, short circuit to power, open circuit, high resistance
	Did the continuity check of the electronic control valve circuit return a result of open circuit? Yes If the continuity check of the electronic control valve circuit did return a result of open circuit, install a new air conditioning compressor. GO to Pinpoint Test G. No If the continuity check of the electronic control valve circuit did not return a result of open circuit, install a new air conditioning compressor. The air conditioning compressor is turning but not generating sufficient pressure. GO to Pinpoint Test G.

PINPOINT TEST C : HIGH AND LOW PRESSURE SYSTEM PRESSURE GAUGES READING TOO LOW TESTS	
C1: HIGH AND LOW PRESSURE SYSTEM PRESSURE GAUGES READING TOO LOW TEST 1	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Low pressures in the air conditioning system can be caused by low refrigerant. Using the Jaguar Land Rover

PINPOINT TEST C : HIGH AND LOW PRESSURE SYSTEM PRESSURE GAUGES READING TOO LOW TESTS	
C1: HIGH AND LOW PRESSURE SYSTEM PRESSURE GAUGES READING TOO LOW TEST 1	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	approved equipment, recover the refrigerant
	2 Compare the weight of the recovered refrigerant against the vehicle specification
	Is the weight of the recovered refrigerant low? Yes If the weight of the recovered refrigerant is low, this indicates a leak in the system GO to Pinpoint Test A. No GO to C2.
C2: HIGH AND LOW PRESSURE SYSTEM PRESSURE GAUGES READING TOO LOW TEST 2	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Visually check for damage and internal restrictions between the two charging ports of the system, on the evaporator side of the system
	Is there damage to the system between the two charge ports, that could cause a restriction to the flow of refrigerant in the system? Yes If there is damage to the system between the two charge ports, repair or replace the affected pipe work as necessary No If there is no damage to the system between the two charge ports, confirm the charging station is connected correctly at charging ports and retest

PINPOINT TEST D : AIR CONDITIONING OPERATES BRIEFLY ON LOW/LOW SETTING THEN SWITCHES OFF	
D1: AIR CONDITIONING OPERATES BRIEFLY ON LOW/LOW SETTING AND THEN SWITCHES OFF TEST 1	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Using the Jaguar Land Rover approved diagnostic equipment, check the Powertrain Control Module (PCM) and the HVAC control module (HVAC) for relevant DTCs and refer to the relevant DTC index
	Were any DTCs present? Yes If relevant DTCs are present in the Powertrain Control Module (PCM) and/or HVAC control module (HVAC) follow the DTC repair actions as necessary, clear the DTCs and retest No If no DTCs are present GO to D2.
D2: AIR CONDITIONING OPERATES BRIEFLY ON LOW/LOW SETTING AND THEN SWITCHES OFF TEST 2	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Inspect the front and back of the condensor for blockages and damage
	2 If installed, inspect the active grille shutter for obstructions and damage
	3 Inspect the cooling fan for blockages and damage
	Are any obstructions or damage found to the condensor, active grille shutter or cooling fan? Yes If obstructions or damage are evident to the condensor, active grille shutter or cooling fan, Repair as necessary and retest

D2: AIR CONDITIONING OPERATES BRIEFLY ON LOW/LOW SETTING AND THEN SWITCHES OFF TEST 2	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	No If no obstructions or damage are evident GO to D3.
D3: AIR CONDITIONING OPERATES BRIEFLY ON LOW/LOW SETTING AND THEN SWITCHES OFF TEST 3	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Start the engine and set the air conditioning to on
	2 Allow the system to stabilize for 5 minutes, then inspect the function of the cooling fan
	Is the cooling fan operating correctly? Yes GO to D4. No If the cooling fan is not operating correctly, refer to the electrical circuit diagrams and check the cooling fan circuit for short circuit to ground, open circuit, high resistance. Repair the circuit as necessary
D4: AIR CONDITIONING OPERATES BRIEFLY ON LOW/LOW SETTING AND THEN SWITCHES OFF TEST 4	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Using the Jaguar Land Rover approved equipment, recover the refrigerant using a prolonged evacuation
	2 Compare the weight of the recovered refrigerant against the vehicle specification
	Is the weight of the recovered refrigerant too low? Yes If the weight of the recovered refrigerant is low, this indicates a leak in the system GO to Pinpoint Test A. No If the weight of the recovered refrigerant was correct to the vehicle specification GO to D5.
D5: AIR CONDITIONING OPERATES BRIEFLY ON LOW/LOW SETTING AND THEN SWITCHES OFF TEST 5	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 The air conditioning system contains excessive water. Using the Jaguar Land Rover approved equipment, recover the refrigerant using a prolonged evacuation and install a new receiver drier desiccant bag, if available. If a desiccant bag is not available, install a new receiver drier, or receiver drier and condensor if they are only available as a single component
	Has the system been evacuated of refrigerant and a new receiver drier desiccant bag, receiver drier, or receiver drier and condensor installed correctly? Yes If the system has been evacuated and a new receiver drier desiccant bag, receiver drier, or receiver drier and condensor installed correctly GO to Pinpoint Test A. and complete the leak testing procedure No Evacuate the system and make sure the new receiver drier desiccant bag, receiver drier, or receiver drier and condensor is correctly installed. GO to Pinpoint Test A. and complete the leak testing procedure

PINPOINT TEST E : HIGH AND LOW PRESSURE SYSTEM PRESSURES UNSTABLE TESTS	
E1: HIGH AND LOW PRESSURE SYSTEM PRESSURES UNSTABLE TEST 1	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 If the approved Jaguar Land Rover equipment gauges are fluctuating excessively, then the refrigerant may be

PINPOINT TEST E : HIGH AND LOW PRESSURE SYSTEM PRESSURES UNSTABLE TESTS	
E1: HIGH AND LOW PRESSURE SYSTEM PRESSURES UNSTABLE TEST 1	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	contaminated with water.
	Did the pressure gauges fluctuate excessively when the air conditioning was set to off? Yes The refrigerant may be contaminated, for example with water. Using the Jaguar Land Rover approved equipment, complete a prolonged evacuation of the refrigerant and install a new receiver drier desiccant bag, if available. If a desiccant bag is not available, install a new receiver drier, or receiver drier and condensor if they are only available as a single component. Recharge the air conditioning system with nitrogen and confirm the gauges are stable. GO to Pinpoint Test A. No GO to Pinpoint Test G.

PINPOINT TEST F : HIGH AND LOW PRESSURE SYSTEM PRESSURES TOO HIGH TESTS	
F1: HIGH AND LOW PRESSURE SYSTEM PRESSURES TOO HIGH TEST 1	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Inspect the front and back of the condensor for blockages and damage
	2 If installed, inspect the active grille shutter for obstructions and damage
	3 Inspect the cooling fan for blockages and damage
	Are any obstructions or damage found to the condensor, active grille shutter or cooling fan? Yes If obstructions or damage are evident to the condensor, active grille shutter or cooling fan, Repair as necessary and retest No If no obstructions or damage are evident GO to F2.
F2: HIGH AND LOW PRESSURE SYSTEM PRESSURES TOO HIGH TEST 2	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Start the engine and set the air conditioning to on
	2 Allow the system to stabilize for 5 minutes, then inspect the function of the cooling fan
	Is the cooling fan operating correctly? Yes GO to F3. No If the cooling fan is not operating correctly, refer to the electrical circuit diagrams and check the cooling fan circuit for short circuit to ground, open circuit, high resistance. Repair the circuit as necessary
F3: HIGH AND LOW PRESSURE SYSTEM PRESSURES TOO HIGH TEST 3	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Remove the air conditioning pipe between the low side charging port and the air conditioning compressor. Inspect the pipe for damage, blockages, or kinks that could cause a restriction to the flow of refrigerant.
	Is there any damage, blockages or kinks to the air conditioning pipe that could cause a restriction to the flow of refrigerant?

F3: HIGH AND LOW PRESSURE SYSTEM PRESSURES TOO HIGH TEST 3	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Yes If there is any damage, blockages or kinks to the air conditioning pipe that could cause a restriction to the flow of refrigerant. Replace or repair the pipe as necessary. Recharge the air conditioning system with nitrogen and recheck the system for leaks No If there are no damage, blockages, or kinks to the air conditioning pipe GO to F4.
F4: HIGH AND LOW PRESSURE SYSTEM PRESSURES TOO HIGH TEST 4	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Using the Jaguar Land Rover approved equipment, complete a prolonged evacuation of the refrigerant and compare the weight of the recovered refrigerant with the vehicle specification
	Was the weight of the recovered refrigerant greater than specified for the vehicle? Yes Using the Jaguar Land Rover approved equipment, evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil No If the weight of the recovered refrigerant was correct for the vehicle specification, recharge the air conditioning system GO to F5.
F5: HIGH AND LOW PRESSURE SYSTEM PRESSURES TOO HIGH TEST 5	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Refrigerant pressure sensor test
	2 Compare the reading on the Jaguar Land Rover approved air conditioning equipment gauges and the live pressure reading on the Jaguar Land Rover approved diagnostic equipment. Refer to datalogger signal - Aircon System Pressure - (0x9990). Reading should be 0.5Bar (7PSI)
	Were the pressure readings on the Jaguar Land Rover air conditioning gauges and the Jaguar Land Rover approved diagnostic equipment within tolerance? Yes If the pressure readings were within tolerance GO to F6. No If the pressure readings were outside of the tolerance, refer to the electrical circuit diagrams and check the refrigerant pressure sensor circuit for short circuit to power, short circuit to ground, open circuit, high resistance. Repair the circuit or replace the refrigerant pressure sensor as necessary
F6: HIGH AND LOW PRESSURE SYSTEM PRESSURES TOO HIGH TEST 6	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 NOTE: If the result of the continuity test below is open circuit, this indicates an internal electrical failure of the air conditioning compressor. If the result of the continuity test is not an open circuit, this indicates the air conditioning compressor is turning but not generating sufficient pressure. For both scenarios the air conditioning compressor must be replaced.	
	1 Disconnect the electronic control valve from the HVAC control module and check the continuity of the circuit.
	2 Electronic control valve testing - Refer to the electrical circuit diagrams and check the electronic control valve from the HVAC control module connector (Make sure it is disconnected from the HVAC while completing this testing) Check the voltage is between 0v to +5v and 0.26Amps to 0.79Amps. Check for short circuit to ground, short circuit to power, open circuit, high resistance

F6: HIGH AND LOW PRESSURE SYSTEM PRESSURES TOO HIGH TEST 6	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Did the continuity check of the electronic control valve circuit return a result of open circuit? Yes If the continuity check of the electronic control valve circuit did return a result of open circuit, install a new air conditioning compressor. GO to Pinpoint Test G. No If the continuity check of the electronic control valve circuit did not return a result of open circuit, install a new air conditioning compressor. The air conditioning compressor is turning but not generating sufficient pressure. GO to Pinpoint Test G.

PINPOINT TEST G : AIR CONDITIONING COMPRESSOR	
G1: AIR CONDITIONING COMPRESSOR	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	 NOTES: - Always install new seals. Lubricate the seals prior to installation. - All used seals must be returned for warranty purposes. 1 Remove and drain the oil from the old air conditioning compressor and measure the quantity of oil
	2 Drain the oil from the new compressor in to a suitable clean container and measure to the same quantity as the old removed oil
	3 Refill the new compressor with the new measured quantity of oil and install the new compressor
	4 Using the Jaguar land Rover approved equipment, recharge the air conditioning system with nitrogen and recheck the system for leaks
	Is the air conditioning system confirmed to be free of leaks? Yes Install a new receiver drier desiccant bag, if available. Using the Jaguar Land Rover Approved Equipment, evacuate and recharge the air conditioning system with the correct quantity of refrigerant No GO to Pinpoint Test A.

PINPOINT TEST H : AIR CONDITIONING SYSTEM NOISE TESTS	
H1: AIR CONDITIONING SYSTEM NOISE TEST 1	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Start the engine, set the air conditioning system to on and check for noises from the engine compartment
	Is a noise only present when the air conditioning system is set to on? Yes GO to H7. No GO to H2.

H2: AIR CONDITIONING SYSTEM NOISE TEST 2	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Make sure the engine remains off
	2 Inspect the condition of the drive belt, check for wear, damage or oil contamination
	Is the drive belt damaged, worn or contaminated with oil? Yes If the drive belt is damaged, worn or contaminated with oil, Refer to: Accessory Drive (303-05, Diagnosis and Testing) No GO toH3.
H3: AIR CONDITIONING SYSTEM NOISE TEST 3	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Remove the drive belt from the vehicle and attempt to recreate the fault. Start the engine and check for noises from the engine compartment
	Is the noise still present? Yes If the noise is still present, Refer to: Engine System - General Information (303-00, Diagnosis and Testing) No GO toH4.
H4: AIR CONDITIONING SYSTEM NOISE TEST 4	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Make sure the engine remains off
	2 Access and inspect for components fouling the air conditioning compressor pulley
	Are any components fouling the air conditioning pulley? Yes Rectify as necessary and retest No GO toH5.
H5: AIR CONDITIONING SYSTEM NOISE TEST 5	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Make sure the engine remains off
	2 Access and inspect the air conditioning compressor pulley bearing for excessive wear
	Is there excessive wear evident in the air conditioning compressor pulley bearing? Yes Install a new air conditioning compressor GO to Pinpoint Test G. No GO toH6.
H6: AIR CONDITIONING SYSTEM NOISE TEST 6	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Using the Jaguar land Rover approved equipment, recover the refrigerant using a prolonged evacuation
	2 Compare the weight of the recovered refrigerant against the vehicle specification

H6: AIR CONDITIONING SYSTEM NOISE TEST 6	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Is the weight of the recovered refrigerant too low? Yes If the weight of the recovered refrigerant is low, this indicates a leak in the system GO to Pinpoint Test A. No If the weight of the recovered refrigerant was too high or correct to the vehicle specification, using the Jaguar Land Rover approved equipment, evacuate and recharge the air conditioning system with the correct quantity of refrigerant GO toH7.
H7: AIR CONDITIONING SYSTEM NOISE TEST 7	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Start the engine
	2 Set the air conditioning to on and off repeatedly and check for noise from the air conditioning compressor clutch as it engages and disengages
	3 Compare the noise made by the air compressor clutch on another similar vehicle as it engages and disengages
	Is the noise made by the air conditioning compressor clutch excessively loud when compared to the other vehicle? Yes If the air conditioning compressor clutch is excessively loud install a new air conditioning compressor as necessary GO to Pinpoint Test G. No If the air conditioning compressor clutch is not excessively loud GO toH8.
H8: AIR CONDITIONING SYSTEM NOISE TEST 8	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Check the installation of the air conditioning pipes
	2 Check that all brackets are present and secure
	3 Check for foul conditions
	Is the noise caused by a problem with the air conditioning pipe installation? Are the pipes trapped or kinked? Yes If the pipes are installed incorrectly, or the pipes are trapped or kinked, repair or replace the pipes as necessary and retest No GO toH9.
H9: AIR CONDITIONING SYSTEM NOISE TEST 9	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Set the air conditioning to on and assess the duration of the noise. Check for the noise around the TXV area
	Does the noise occur for a short period immediately after setting the air conditioning to on? Yes Install a new Thermostatic Expansion Valve as necessary and retest No GO toH10.

H10: AIR CONDITIONING SYSTEM NOISE TEST 10	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Check for noise internal to the air conditioning compressor (bearing, contact between rotating and fixed components)
	2 Compare the noise made by the air conditioning compressor on another similar vehicle
	Is the noise made by the air conditioning compressor excessively loud when compared to the other vehicle? Yes If the noise made by the air conditioning compressor is excessively loud when compared to another similar vehicle GO to Pinpoint Test G. No Reconfirm the customer issue

HVAC CONTROL SYSTEM SENSOR RESISTANCE VALUES

To assist with HVAC sensor diagnosis, please refer to the table below for sensor resistances. The values indicated may vary slightly from those shown due to changes in ambient temperature

SENSOR TEMPERATURE °C	FRONT EVAPORATOR TEMPERATURE SENSOR OHMS Ω	REAR EVAPORATOR TEMPERATURE SENSOR OHMS Ω	IN CAR TEMPERATURE SENSOR OHMS Ω	AMBIENT TEMPERATURE SENSOR OHMS Ω	LOW PRESSURE TEMPERATURE SENSOR OHMS Ω
0	4851	4851	27600	6318	32014
10	2959	2959	17970	3852	19691
20	1866	1866	11990	2418	12474
30	1214	1214	8184	1559	8080
40	811	811	5704	1031	5372
50	556	556	4053	697	3661

SENSOR TYPE	RESISTANCE VALUE	AMBIENT TEMPERATURE
Front Evaporator Temperature Sensor	1600 ohms	22°C
Rear Evaporator Temperature Sensor	1600 ohms	22°C
Duct Air Temperature Sensor	3000 ohms	22°C
In Car Temperature Sensor (measured at pins 3 and 5)	9000 ohms	22°C
Compressor Solenoid Sensor	10000 ohms	22°C
Compressor Clutch Sensor	4300 ohms	22°C

Air Conditioning system pressure table (Static)

**NOTES:**

- The air conditioning system pressure values in the table below are expected when the vehicle is static with the air conditioning system switched off and with refrigerant in the system either partly or fully charged
- The engine compartment and passenger compartment need to be at the same temperature as the workshop otherwise this will have an effect on the system pressure

AMBIENT TEMPERATURE °C	AIR CONDITIONING SYSTEM PRESSURE R134A (BAR)	AIR CONDITIONING SYSTEM PRESSURE HFO1234YF (BAR)
0	2.93	3.16
5	3.50	3.73
10	4.15	4.38
15	4.88	5.10
20	5.72	5.92
25	6.65	6.83
30	7.70	7.84
35	8.87	8.95
40	10.16	10.18
45	11.60	11.54
50	13.18	13.02

DTC INDEX

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