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2013.0 XJ RANGE (X351), 412-01

CLIMATE CONTROL

AIR CONDITIONING - SYSTEM OPERATION AND COMPONENT DESCRIPTION [G1188391]

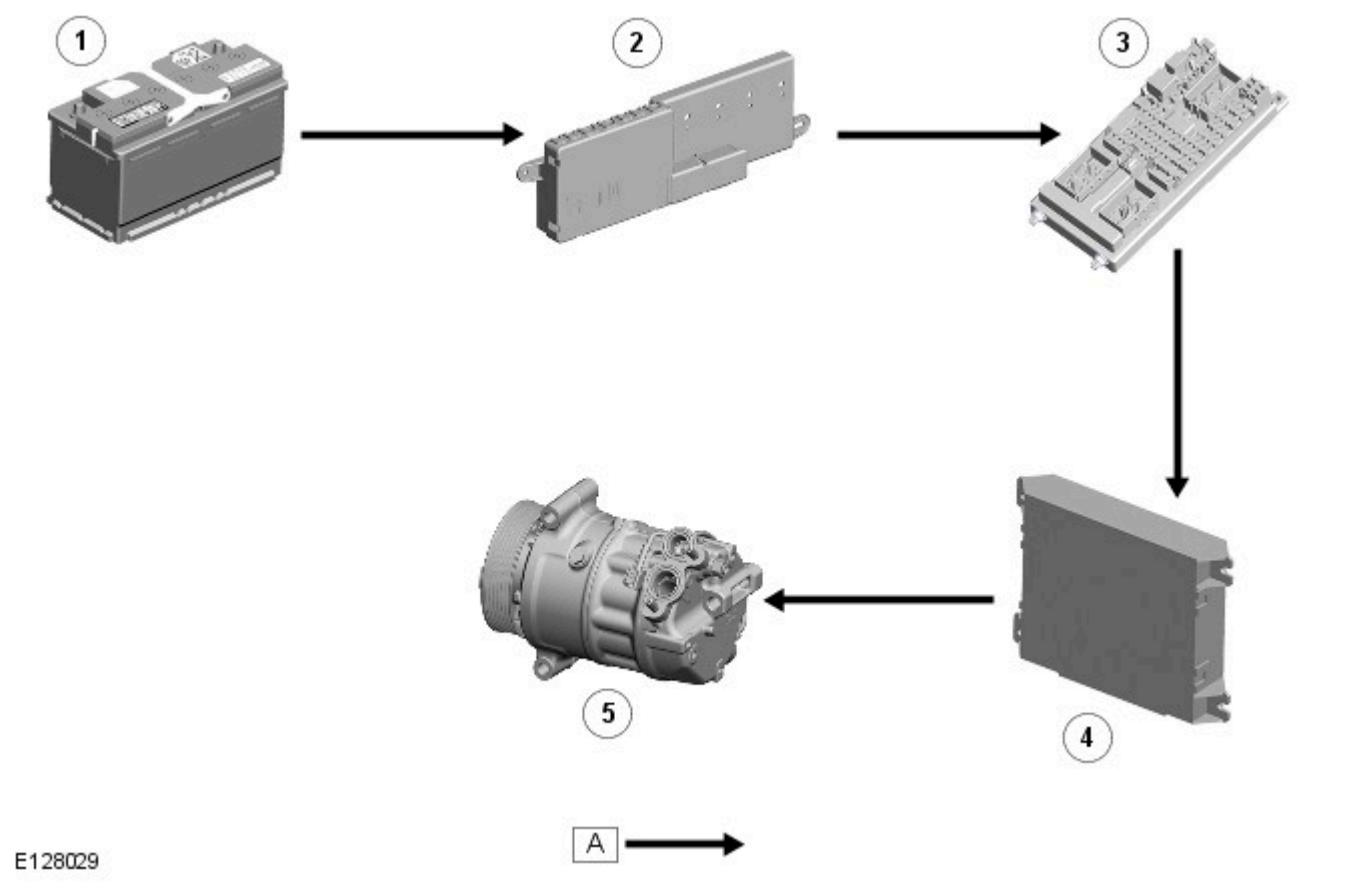
DESCRIPTION AND OPERATION

CONTROL DIAGRAM

NOTE:

A = Hardwired.

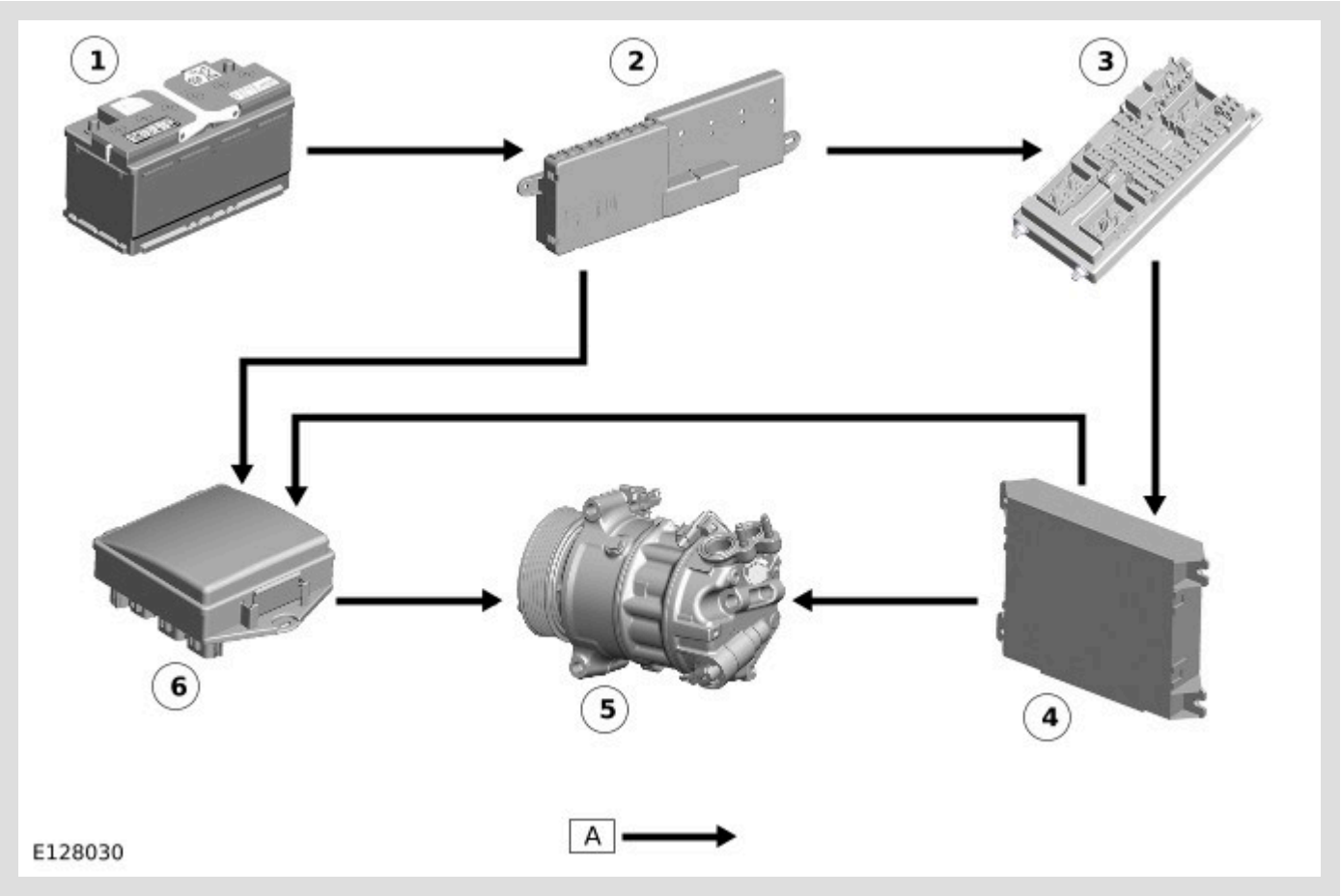
PETROL VEHICLES (up to 2013 MY)



ITEM	DESCRIPTION
1	Battery
2	battery junction box (BJB) (50 A midifuse)
3	central junction box (CJB)
4	automatic temperature control (ATC) module

ITEM	DESCRIPTION
5	air conditioning (A/C) compressor

PETROL VEHICLES (2013 MY ONWARDS), AND 3.0L DIESEL VEHICLES



ITEM	DESCRIPTION
1	Battery
2	BJB (50 A midifuse to CJB; 250 A megafuse to engine junction box (EJB))
3	CJB
4	ATC module
5	A/C compressor
6	EJB (ignition relay)

SYSTEM OPERATION

PRINCIPLES OF OPERATION

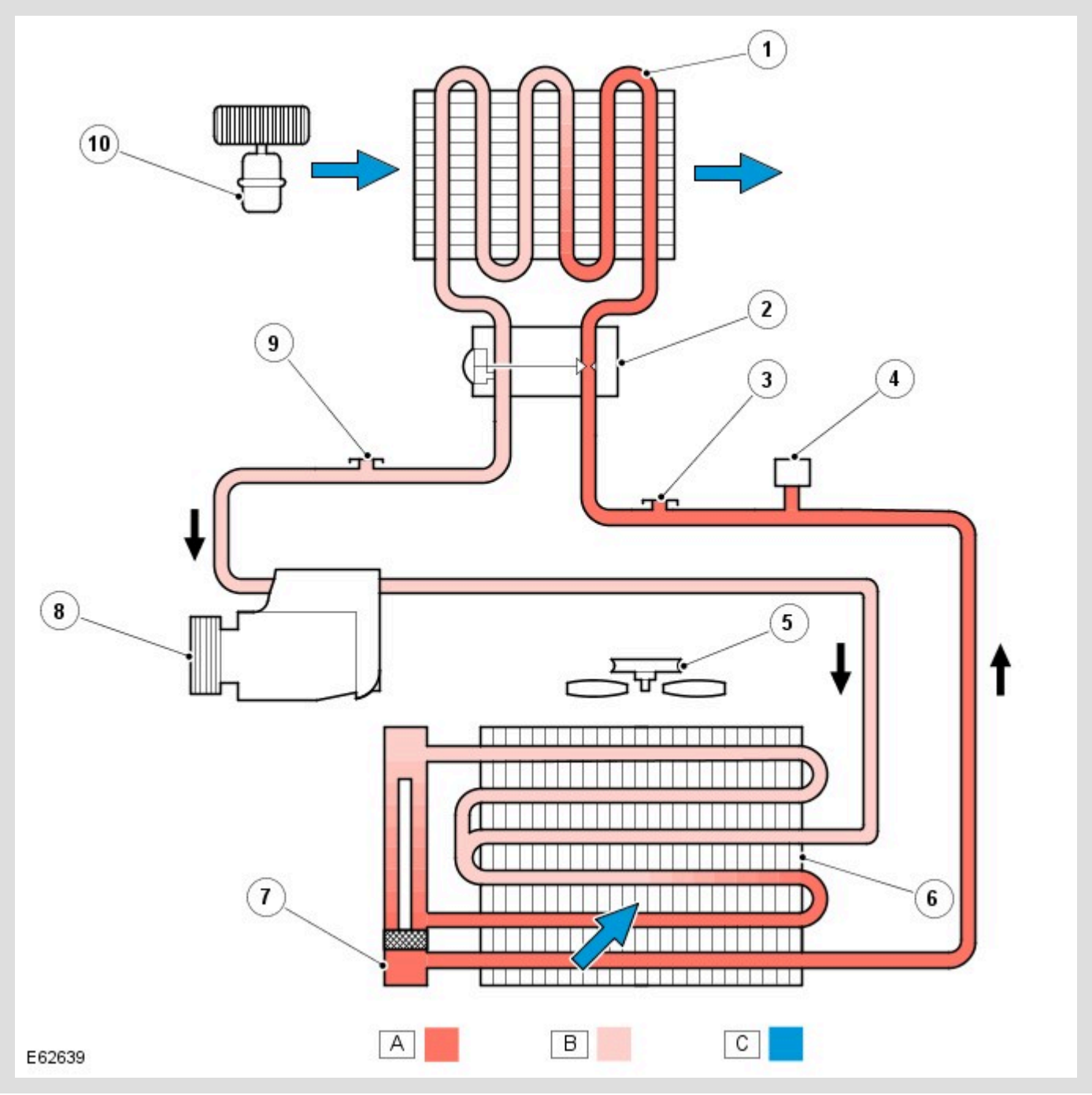
To accomplish the transfer of heat, refrigerant is circulated around a sealed system, where it passes through two pressure/temperature regimes. In each of the regimes the refrigerant changes state, during which process maximum heat absorption or dissipation occurs.

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 system is controlled by the ATC module. Refer to: Control Components (412-01 Climate Control, Description and Operation).

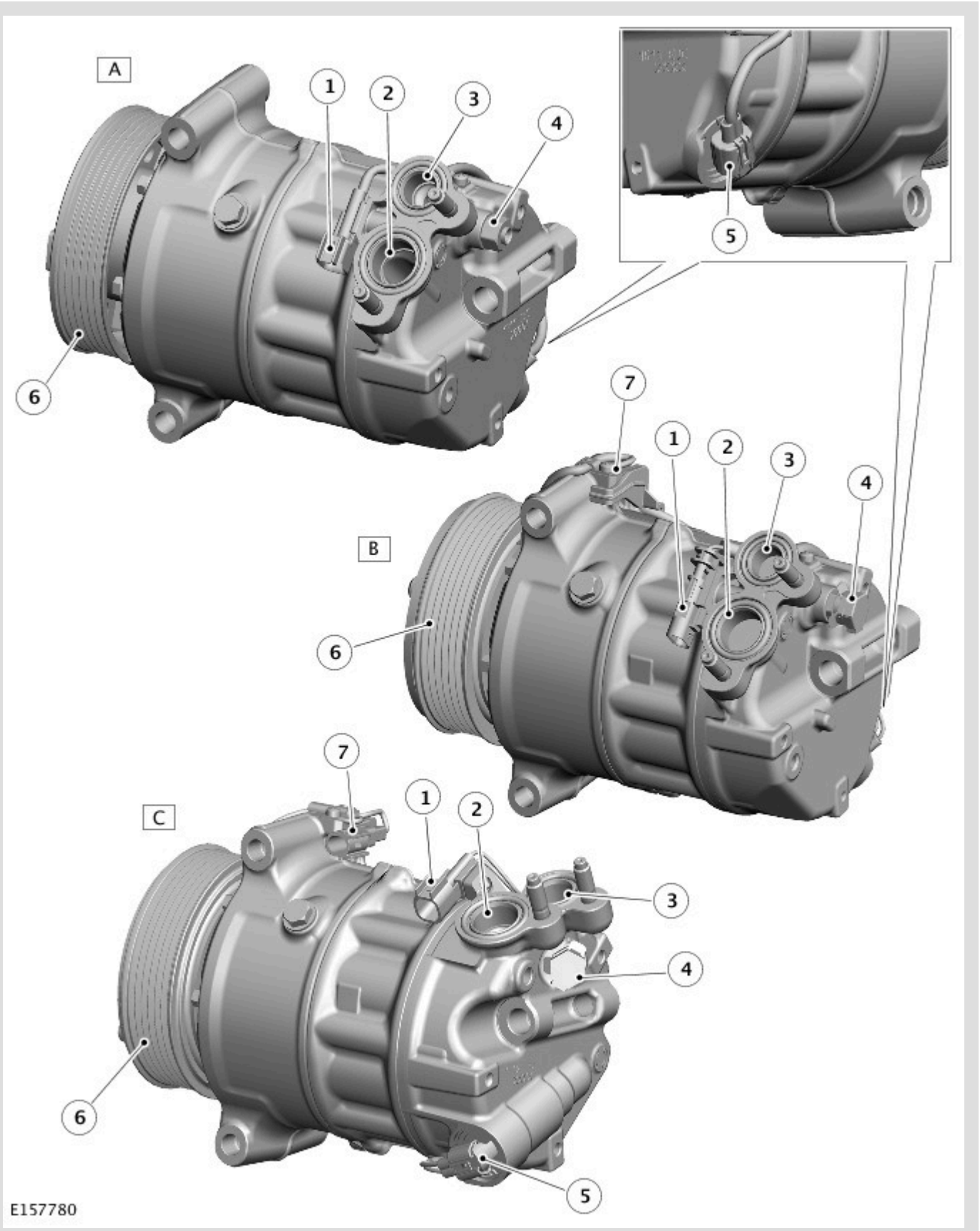
A/C System Flow Diagram



ITEM	DESCRIPTION
A	Refrigerant liquid
B	Refrigerant vapor

ITEM	DESCRIPTION
C	Air flow
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

COMPRESSOR



ITEM	DESCRIPTION
A	Compressor - petrol vehicles (up to 2013 MY)

ITEM	DESCRIPTION
B	Compressor - petrol vehicles (2103 MY onwards)
C	Compressor - 3.0L diesel vehicles
1	Solenoid valve electrical connector
2	Inlet port
3	Outlet port
4	Pressure relief valve
5	Solenoid valve
6	Pulley
7	Clutch electrical connector

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.

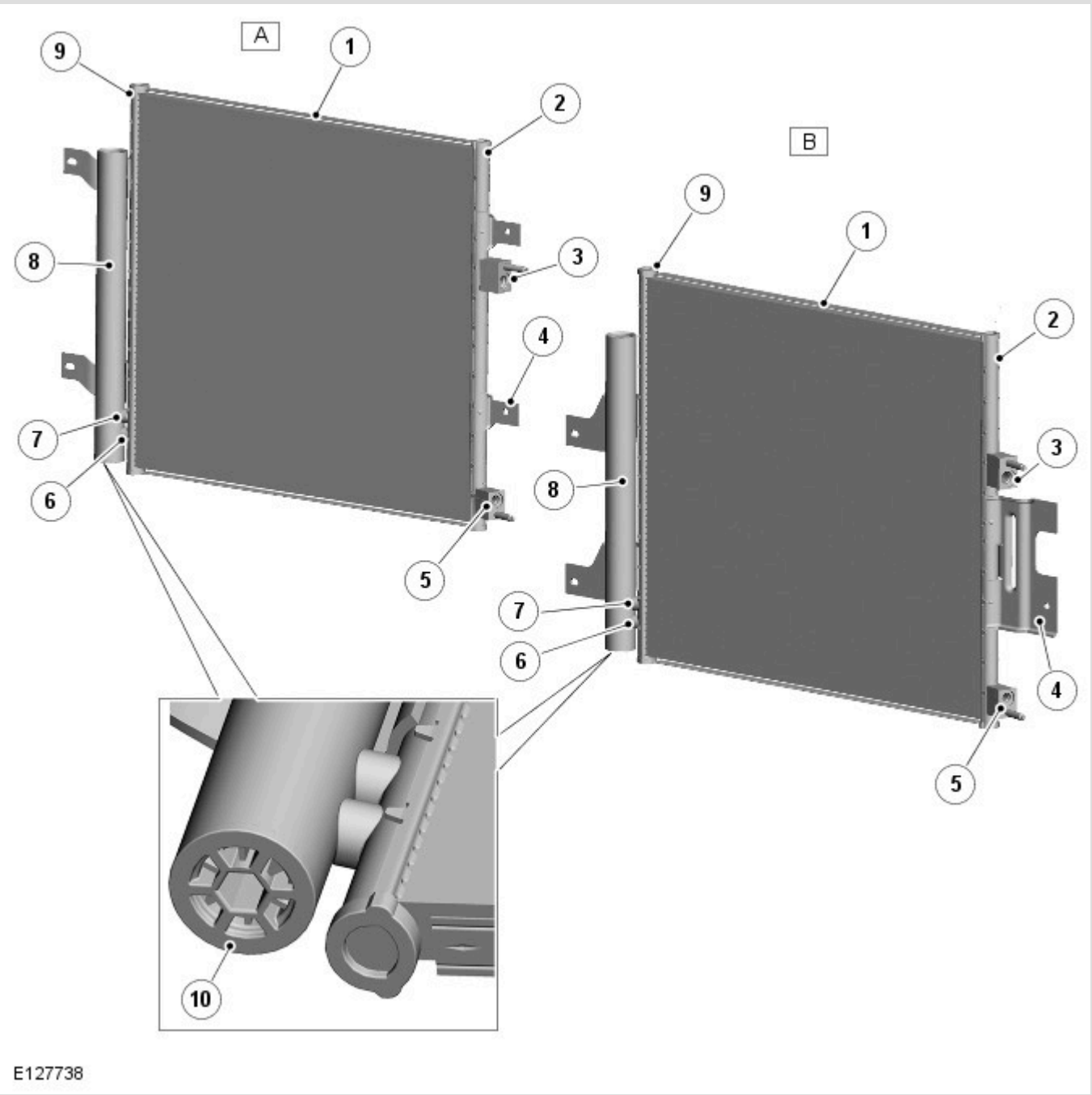
The A/C compressor is a variable displacement unit driven by the engine accessory drive belt.

- Up to 2013 MY: petrol vehicles, the A/C compressor is driven directly from the pulley.
- 2013 MY Onwards: petrol vehicles, the A/C compressor is driven via an electro-magnetic clutch.
- On 3.0L diesel vehicles the A/C compressor is driven via an electro-magnetic clutch.

While the ignition is on, the clutch is permanently engaged by a power feed from the ignition relay in the EJB

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.

The solenoid valve enables the flow of refrigerant through the A/C compressor to be adjusted to match the cooling load. 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 controls the A/C system pressure and the evaporator operating temperature.



ITEM	DESCRIPTION
A	Condenser - petrol vehicles
B	Condenser - 3.0L diesel vehicles
1	Condenser core
2	left-hand (LH) end tank
3	High pressure compressor discharge line connector block
4	Mounting bracket
5	High pressure liquid outlet line connector block
6	Receiver drier outlet pipe
7	Receiver drier inlet pipe

ITEM	DESCRIPTION
8	Receiver drier
9	right-hand (RH) end tank
10	Desicant access plug

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.

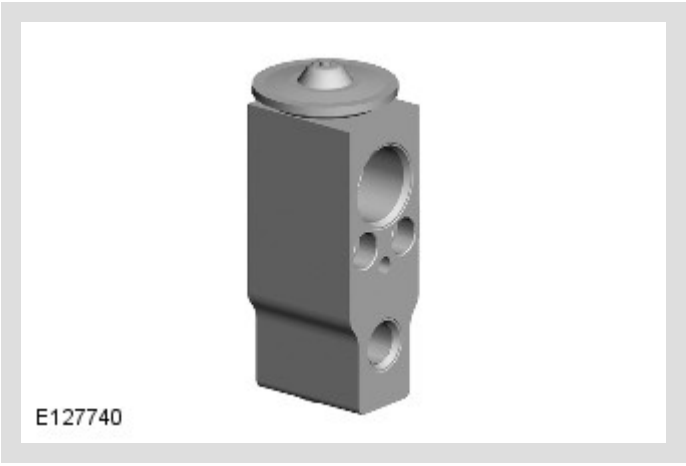
The LH end tank provides the connections to the high pressure line from the A/C compressor and the high pressure liquid line to the evaporator.

The RH end tank provides the connections to the receiver drier.

RECEIVER DRIER

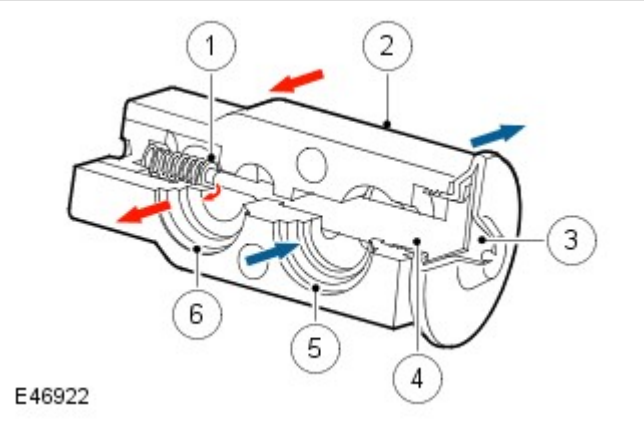
The receiver drier is connected to the RH end tank of the condenser. It removes solid impurities and moisture from the refrigerant, and provides a reservoir for liquid refrigerant to accommodate changes of heat load at the evaporator. The receiver drier is part of the condenser assembly and is not serviceable separately.

THERMOSTATIC EXPANSION VALVE



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 aluminum 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.



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

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 vaporize 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

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

The refrigerant lines consist of a combination of rigid pipes and flexible hoses that connect the thermostatic expansion valve on the evaporator to the A/C compressor and the condenser. 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 servicing connections are incorporated into the refrigerant lines for system servicing.

Petrol engine vehicles (NAS market from 14 MY)

An internal heat exchanger is installed which increases the efficiency of the evaporator and ensures any residual liquid in the low pressure line is evaporated before it reaches the compressor. Refer to the Component Location graphic titled: Petrol engine vehicles (NAS market from 14 MY).

NOTE:

The internal heat exchanger is incorporated primarily because of the introduction of refrigerant R1234yf which replaces refrigerant R134a.

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