AIR CONDITIONING (A/C)

DESCRIPTION

General

The Air Conditioning (A/C) system provides cooled air for the occupants of the car. The system is sealed and filled with refrigerant R134a.

The compressor, driven by the alternator drive belt, pumps low pressure refrigerant vapour from the evaporator to the condenser. As the refrigerant passes through the condenser, it is cooled by air passing over the outer fins. The vapour reverts to its liquid state as it is cooled. Air flow over the cooling fins is assisted by the cooling fan and the condenser fan.

From the condenser, the refrigerant passes to the receiver-drier which acts as a reservoir and also removes any moisture from the refrigerant.

High pressure liquid refrigerant passes through the thermostatic expansion valve which converts the refrigerant to a low pressure spray as it enters the evaporator. The change in pressure causes the liquid to change to a vapour and as it does so, heat is absorbed from the surrounding air. Air is blown over the evaporator matrix and directed into the passenger compartment. The refrigerant vapour in the evaporator returns to the compressor and continues the cycle.

The system contains a number of safety features which guard against mechanical damage. If the refrigerant pressure is too high or too low, the evaporator matrix is too cold, the compressor becomes too hot or the engine coolant temperature becomes too high, the compressor drive is disengaged.

System operation is controlled by the A/C switch on the centre console and the Engine Control Module (ECM). The system only operates when one of the four blower speeds is selected and the engine is running.

OPERATION

Power supplies

Fuse 5 (C0601) and fuse 6 (C0572) of the under bonnet fuse box provide the A/C relay pack (C0172) with permanent feeds on NW and N wires respectively. The A/C relay pack contains relays for the compressor clutch, cooling fan and condenser fan.

Fusible link 4 (C0570) and fusible link 5 (C0573) of the under bonnet fuse box provide the ignition switch (C0028) with permanent feeds on NP and NW wires respectively. When the ignition switch is in position ll, feeds are connected from the ignition switch (C0028) to Fuse 15 of the passenger compartment fuse box (C0586) on a Y wire and Fuse 24 of the satellite fuse box (C0595) on a WLG wire.

Fuse 15 of the passenger compartment fuse box (C0585) provides an ignition feed to the A/C relay pack (C0173) on a LGS wire, then on a pair of LGS wires. Fuse 15 (C0585) also provides an ignition feed to the A/C switch pack (C0275),fresh/recirculated air switch (C0750) and fresh/recirculated air mode motor (C0413) on LGS wires.

Fuse 24 of the satellite fuse box (C0595) provides an ignition feed to the blower motor (C0056) on a LGP wire and from the blower motor (C0056) to the blower motor switch (C0058) on SB wire. When the blower switch is selected to positions 1 to 4, the feed is supplied from the blower switch (C0058) to the air conditionng switch pack (C0275) on a SW wire.

A/C request

When the A/C switch is pressed, while one of the four blower speeds is selected, SK wires connect the power feed from the A/C switch pack (C0275) to the A/C thermostat (C0422) and from the A/C thermostat (C0423) to the trinary switch (C0279). Provided the high and low temperature switches are closed, the trinary switch (C0279) then supplies the power feed to the ECM (C0159) on a UR wire. With A/C selected on, the tell tale illumination LED in the A/C switch pack (C0275) is earthed on the B wire, connected to an earth header (C0017), and illuminates.

When the ECM receives an A/C request, it energises the appropriate relays in the A/C relay pack to operate the compressor, cooling fan and condenser fan.

The high and low switches in the trinary switch guard against extremes of pressure in the refrigerant system. If refrigerant system pressure reaches either of the limits, the related switch opens and disconnects the A/C request to the ECM. The air temperature sensor detects evaporator matrix temperature and, if the temperature is less than 2 °C (36 F), opens and disconnects the A/C request to the ECM.

Compressor

To operate the compressor, the ECM earths the UB wire between the ECM (C0159) and the coil of the compressor clutch relay in the A/C relay pack (C0173). The energised compressor clutch relay connects the power feed from fuse 5 in the under bonnet fuse box to the R wire between the A/C relay pack (C0172) and the A/C compressor clutch (C0127). The A/C compressor clutch is earthed through the compressor fixings and energises to transmit drive to the compressor.

Cooling and condenser fans

The ECM operates the two fans together at one of two speeds. Low speed is achieved by connecting the fans in series and high speed is achieved by connecting the fans in parallel. The fans operate at low speed when either the compressor clutch is engaged or the engine coolant temperature is between 92 and 99 “C (198 and 210 OF). The fans operate at high speed when either the engine temperature is in excess of 107 “C (225 OF) or the medium pressure switch in the trinary switch detects a system pressure in excess of 18 bar (261 lbf.in^2). When refrigerant system pressure exceeds 18 bar (261 lbf.in2), the medium pressure switch closes and connects the U wire, between the ECM (C0159) and the trinary switch (C0279), to earth on the B wire between the trinary switch (C0279) and the earth point (C0564 on LHD) or earth header (C0017 on RHD).

On receipt of an A/C request, the ECM (C0159) earths the US wire from the A/C relay pack (C0173) to energise cooling fan relay 2. The energised cooling fan relay 2 connects the feed from fuse 6 of the under bonnet fuse box to the PS wire between the A/C relay box (C0172) and the cooling fan motor (C0005). The feed passes through the cooling fan motor (C0005) to cooling fan relay 1 in the A/C relay pack (C0172) on the US wire, then from cooling fan relay 1 to the condenser fan relay. The condenser fan relay connects the feed to the SU wire between the A/C relay pack and (C0172) and the condenser fan (C0280). The condenser fan (C0280) is earthed on a B wire connected to an earth header (C0017). With the fans connected in series, they run at slow speed.

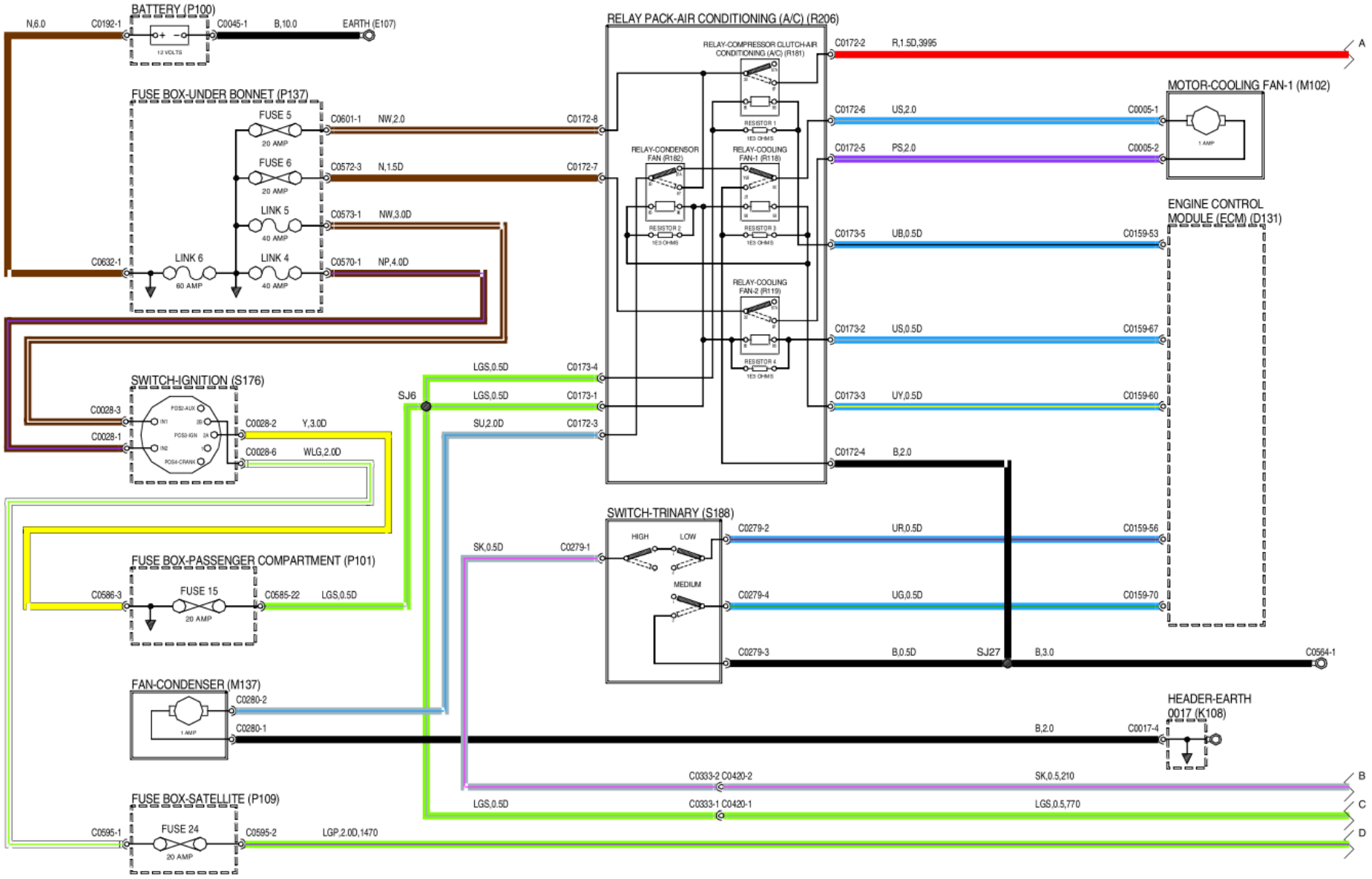
If the engine temperature or system pressure increases to their respective switching points, the ECM (C0159) earths the UY wire to energise cooling fan relay 1 and the condenser fan relay in the A/C relay pack (C0173). The energised cooling fan relay 1 switches the feed from the cooling fan motor to earth on the B wire between the A/C switch pack (C0172) and the earth point (C0564 on LHD) or earth header (C0017 on RHD). The energised condenser fan

relay switches a feed from fuse 5 in the under bonnet fuse box to the SU wire between the A/C relay pack (C0172) and the condenser fan (C0280). With the fans connected in parallel, they run at high speed.

Recirculated air

With the fresh/recirculated air switch in the fresh air (off) position, current flows from the fresh/recirculated air mode motor (C0413) to the fresh/recirculated air switch (C0750) on the Y wire and to earth on a B wire between the fresh/ recirculated air switch (C0750) and an earth header (C0017). With the fresh/recirculated air switch in the recirculated air (on) position, current flows from the fresh/ recirculated air mode motor (C0413) to the fresh/recirculated air switch (C0750) on the K wire and to earth on the B wire; the tell tale illumination in the fresh/recirculated air switch is also earthed on the B wire and illuminates to indicate the position on the fresh/recirculated air mode motor.

MGF/TF ECD3 (➔2003 incl.)



MGF/TF ECD3 (➔2003 incl.)