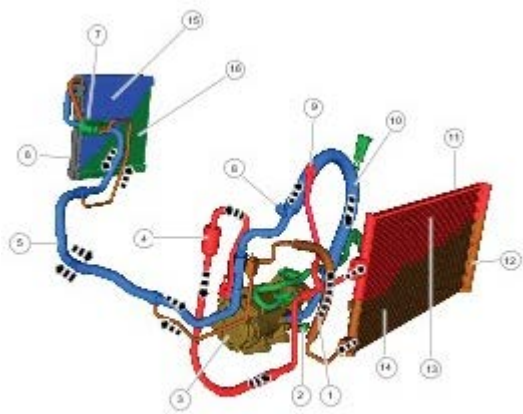


Description and Operation

System Operation

The Refrigerant Cycle

NOTE: HEV (hybrid electric vehicle) shown, others similar.



Item	Description
1	Condenser outlet line
2	A/C (air conditioning) pressure transducer
3	A/C compressor
4	A/C compressor outlet line
5	Evaporator inlet and outlet manifold
6	Evaporator
7	Thermostatic Expansion Valve (TXV)
8	A/C charge valve port (low side)
9	A/C charge valve port (high side)
10	A/C compressor inlet line
11	Condenser
12	Receiver drier element
13	High pressure vapor
14	High pressure liquid
15	Low pressure vapor
16	Low pressure liquid

Control System Logic

The climate control system controls are in one or more locations depending on vehicle option content:

- FCIM (front controls interface module) (DATC (dual automatic temperature control) system)
- FDIM (front display interface module) (part of APIM (SYNC module))

When the FDIM touchscreen or voice commands are used and A/C is selected, the APIM sends a function request message over the Infotainment or HS-CAN (controller area network)3 to the IPC (instrument panel cluster). The IPC relays the requests to the GWM (gateway module A) and the FCIM over the (MS-CAN). The GWM sends the requests to the PCM (powertrain control module) over the (HS-CAN)1. The PCM controls the A/C clutch relay.

When the customer directly inputs an A/C request into the FCIM, the module sends the request to the GWM over the (MS-CAN). The GWM sends the request to the PCM over the (HS-CAN)1. The PCM controls the A/C clutch relay.

The FCIM PMI (programmable module installation) when it is replaced.

Controls and Compressor Operation

When an **A/C** request is received by the **PCM**, the **PCM** engages the **A/C** clutch relay when all of the following conditions are met:

- The **PCM** does not detect excessively high or low refrigerant pressure from the **A/C** pressure transducer.
- The **PCM** does not detect an ambient air temperature below approximately 2°C.
- The **PCM** does not receive a message from the **FCIM** detecting an evaporator temperature below approximately 2°C.

The **PCM** monitors the discharge pressure measured by the **A/C** pressure transducer. The **PCM** interrupts **A/C** compressor operation in the event the **A/C** pressure transducer indicates high system discharge pressures. It is also used to sense low charge conditions. If the pressure is below a predetermined value for a given ambient temperature, the **PCM** does not allow the **A/C** clutch to engage.

The **FCIM** adjusts the air inlet door depending on the humidity measured by the in-vehicle temperature and humidity sensor. If the vehicle cabin becomes too humid and recirculated air is selected, the **FCIM** adjusts the air inlet door to allow more fresh air. When the humidity level drops, it may adjust back to partial recirculated air. The **FCIM** also adjusts the system based on in-vehicle temperature.

The sunload sensor supplies information to the **FCIM** indicating the intensity of the sun on the vehicle. The **FCIM** adjusts the system based on the intensity.

Component Description

FCIM - DATC

The **DATC** system uses the **FCIM** as the **HVAC (heating, ventilation and air conditioning)** control module. The **FCIM** also controls the outputs for rear window defrost and climate controlled seats. For vehicles equipped with touchscreen audio, the **DATC** system uses voice commands or the touchscreen to control the system. For details on the **FCIM** communication, refer to Control System Logic in this section.

The **FCIM** requires **PMI** when it is replaced.

Cabin Heater Coolant Pump - vehicles equipped with Auto Start-Stop

The cabin heater coolant pump is available on vehicles equipped with Auto Start-Stop feature only. The cabin heater coolant pump provides coolant to the heater core whenever the **HVAC** system requests heat and the vehicle is in Auto Start-Stop mode. Refer to the Owner's Literature, Unique Driving Characteristics, for full Auto Start-Stop enabling/disabling information.

The **PCM** sends a **PWM (pulse width modulation)** signal to the cabin heater coolant pump based upon the:

- Auto Start-Stop mode enabled
- **HVAC** system temperature control setting (requesting heat)
- Ambient air temperature
- Engine coolant temperature
- Engine Revolutions Per Minute
- Vehicle speed

Externally Controlled Variable Displacement A/C Compressor

The externally controlled variable displacement compressor has:

- a non-serviceable shaft seal.
- a non-serviceable pressure relief valve installed in the rear of the compressor to protect the refrigerant system against excessively high refrigerant pressures.
- a non serviceable **A/C** clutch and field coil.
- Uses Polyalkylene Glycol oil or equivalent. This oil contains special additives required for the **A/C** compressor. The oil may have some slightly dark-colored streaks while maintaining normal oil viscosity. This is normal for this **A/C** compressor because of break-in wear that can discolor the oil.

Variable displacement compressors have a swash plate that rotates to reciprocate pistons, which compresses refrigerant. Variable displacement compressors change the swash plate angle to change the refrigerant displacement. The externally controlled variable displacement compressor changes the swash plate angle in accordance with an electrical signal from the **PCM**. Externally controlled variable displacement compressor manages displacement by controlling refrigerant differential pressure before and after a throttle at the discharge side; achieving precise cooling capability control in accordance with cabin environment and driving conditions.

The **PCM** sends a **PWM** signal to the solenoid in the compressor to control the compressor displacement based upon

the:

- Evaporator temperature
- Ambient air temperature
- Engine Revolutions Per Minute
- Vehicle speed
- A/C high side pressure
- Intake air temperature

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