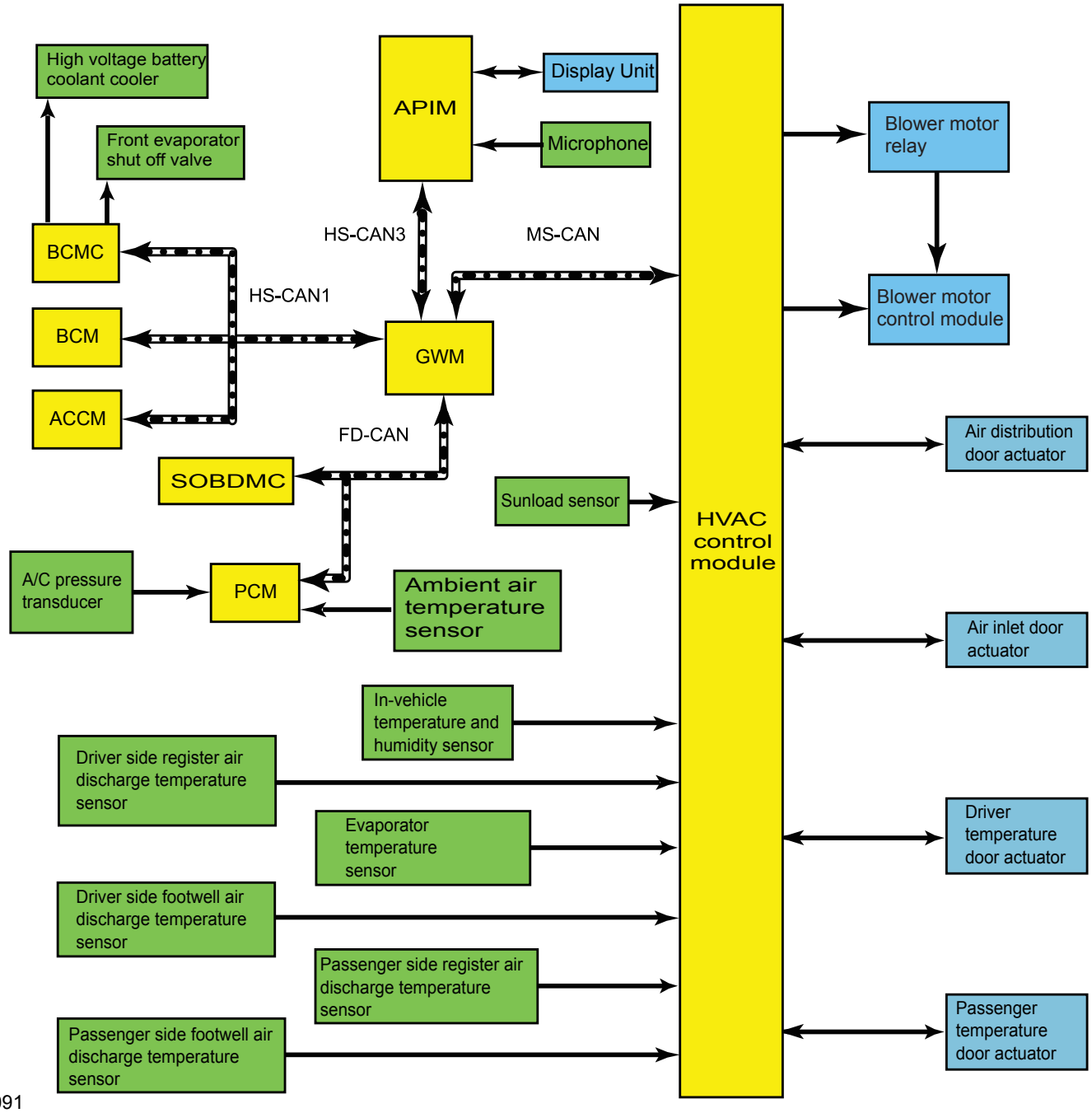
Climate Control System - System Operation and Component Description

System Operation

System Diagrams



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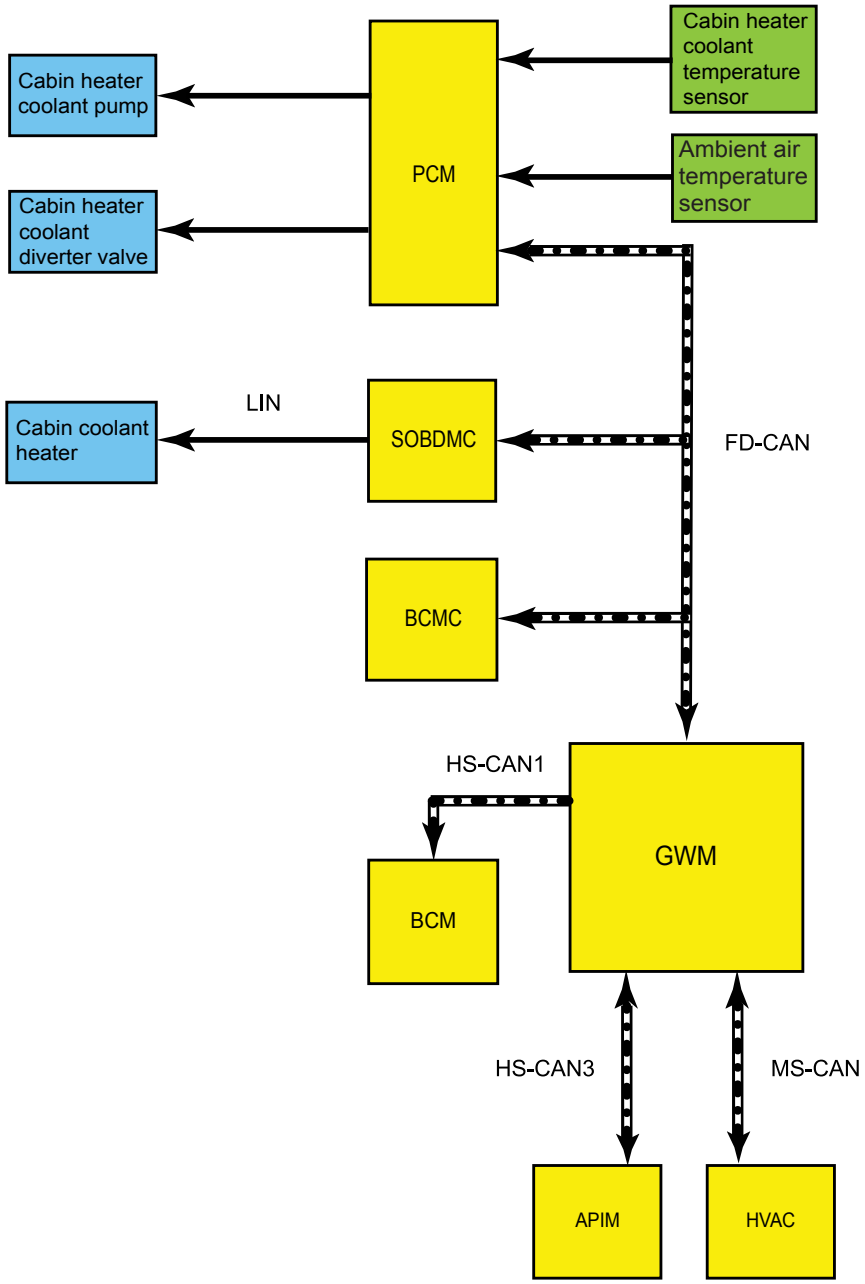
Cabin Coolant Heater System



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Network Message Charts

Module Network Input Messages - ACCM

Broadcast Message	Originating Module	Message Purpose

A/C compressor requests	HVAC control module	This message contains the electric A/C compressor cooling requests.

Module Network Input Messages - APIM

Broadcast Message	Originating Module	Message Purpose
Climate control status	HVAC control module	This message contains the HVAC mode status for the mode indicators.

Module Network Input Messages - HVAC control module

Broadcast Message	Originating Module	Message Purpose
Ambient air temperature	PCM	This message contains the raw value from the ambient temperature sensor.
Climate control buttons request (gateway)	APIM	This message contains the climate control system button requests from the information and entertainment display unit.
Climate control voice interaction	APIM	This message contains the climate control system voice commands.
Ignition status	BCM	This message contains the current ignition state: off, accessory, run, start unknown or invalid.
Vehicle configuration data	BCM	This message contains the vehicle configuration information downloaded according to the VIN.
Remote start status	BCM	This message contains the climate control system controls request for remote start/cabin pre conditioning.

Module Network Input Messages - PCM

Broadcast Message	Originating Module	Message Purpose
Evaporator temperature request	HVAC control module	This message contains the evaporator temperature information. The PCMuses the evaporator temperature to determine the A/C compressor output.

Module Network Input Messages - SOBDMC [also known as HPCM]

Broadcast Message	Originating Module	Message Purpose

A/C compressor request (gateway)	HVAC control module	This message contains the electric A/C compressor cooling requests.
Cabin coolant heater request	HVAC control module	This message contains the cabin coolant heater ON requests.

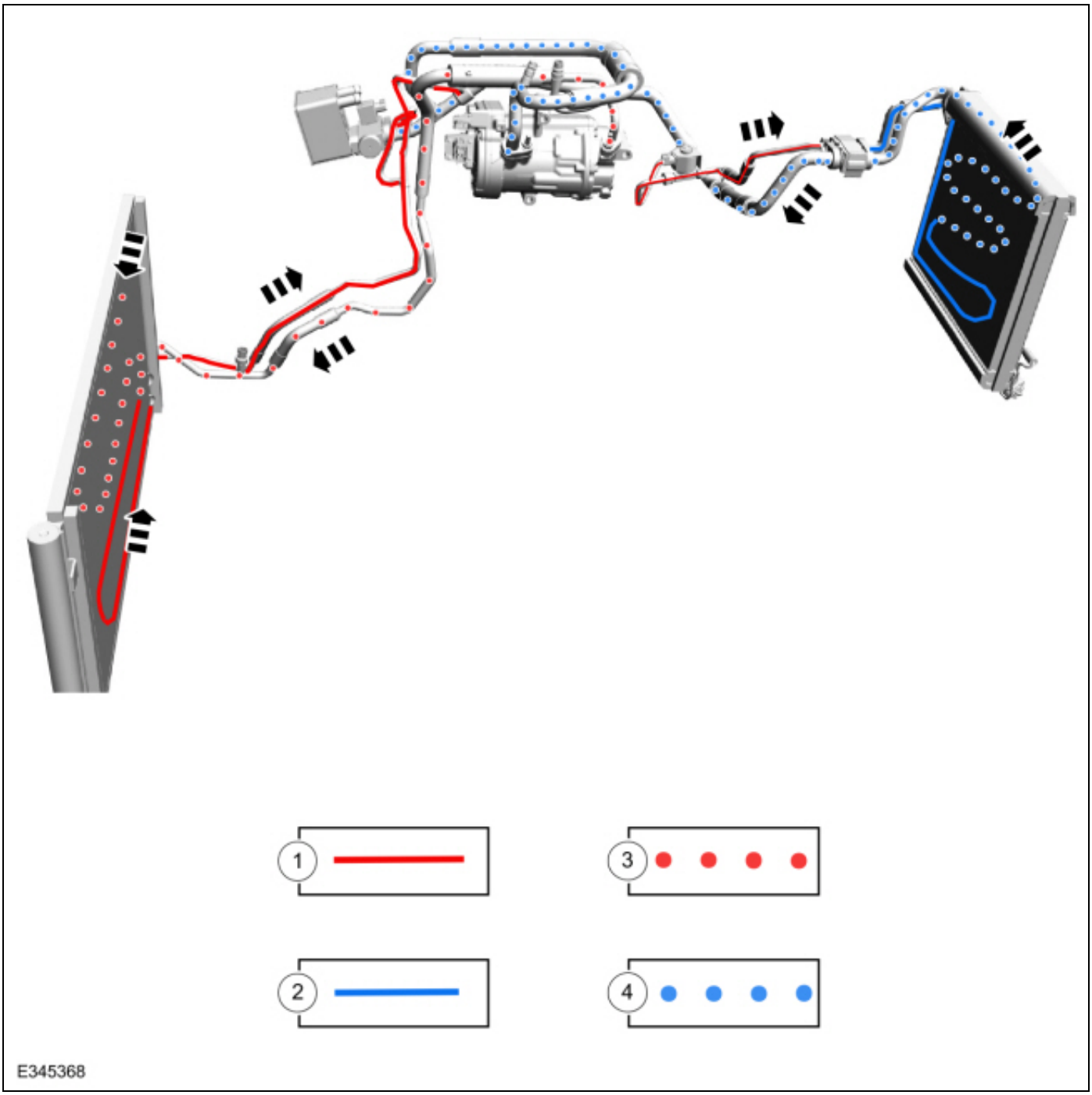
The Refrigerant Cycle

For information regarding basic HVAC (heating, ventilation and air conditioning) system refrigerant operation, refer to the current Ford Web Based Technical Training courses. The following diagram shows the refrigerant system state in each component.

The following are characteristics of the DATC system:

- The SOBDMC sends the requests to the electric A/C compressor ACCM.
- The evaporator temperature sensor monitors the temperature of the air that has passed through the evaporator core and sends a signal to the HVAC control module. If the temperature of the evaporator core discharge air is low enough to cause the condensed water vapor to freeze, a CAN message is sent to the ACCM to reduce the electric A/C compressor output or shut it off.
- The line pressure is monitored through the pressure transducer so that the electric A/C compressor operation is interrupted if the system pressure becomes too high or too low.
- The electric A/C compressor thermal protection switch interrupts compressor operation if the compressor housing exceeds temperature limits.
- The A/C compressor relief valve opens and vents refrigerant to relieve unusually high system pressure.

Thermostatic Expansion Valve (TXV) Type Refrigerant System



Item	Description
1	High pressure liquid
2	Low pressure liquid
3	High pressure vapor
4	Low pressure vapor

Control System Logic

When the customer inputs an A/C request into the information and entertainment display unit or by voice command, the APIM sends the request to the GWM over the HS-CAN3. The GWM relays the request to the SOBDMC over the FD-CAN, and the request message is sent to the ACCM over the HS-CAN1. For a list of all the network messages,
Refer to: Controller Area Network (CAN) Module Communications Network - System Operation and Component Description (418-00A Controller Area Network (CAN) Module Communications Network, Description and Operation).

A/C Request

When the ACCM request for cooling, the electric A/C compressor is commanded on when all of the following conditions are met:

- Excessively high or low refrigerant pressure from the A/C pressure transducer is not detected.
- Ambient air temperature is above approximately 0°C (32°F).
- Electric motor coolant temperature conditions are within normal parameters.
- Evaporator temperature is above approximately 2°C (35.6°F).
- Battery state of charge conditions are within normal parameters.

Compressor control and the evaporator temperature are a function of many parameters, not just a straight on/off, to avoid freezing the evaporator. The PCM monitors multiple temperature sensors for correlation including, but not limited to, AAT, ECT Parameter Identifications (PIDs) (as applicable). The PCM runs this logic after an engine off and a calibrated soak period of 6 to 8 hours. This soak period allows the Ambient Air Temperature (AAT) sensor and the other temperature sensors to stabilize and not differ by greater than a calibrated value, typically 16.7ºC (30ºF). If a temperature sensor input is found to be reporting a temperature imbalance the PCM does not allow the A/C compressor operation. When the ACCM receives the A/C request message, it engages the A/C electric compressor. Instead of cycling ON and OFF like a traditional A/C compressor, the A/C electric compressor speeds up or slows down as required. For more information on PCM sensors, refer to the appropriate workshop manual section.

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 ACCM does not allow the electric A/C compressor to engage.

The HVAC control module adjusts the system based on cabin temperature. The HVAC control module also 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 HVAC control module adjusts the air inlet door to allow more fresh air. When the humidity level drops, it adjusts back to partial recirculated air.

Heating and Ventilation

The heating and ventilation system:

- controls the temperature of the air inside the vehicle.
- reduces the relative humidity of the air inside the vehicle (during A/C compressor operation).
- delivers heated or cooled air to maintain the vehicle interior temperature and comfort level.

The heating and ventilation system uses a reheat method to provide conditioned air to the passenger compartment. Temperature blending is controlled by the temperature doors, which regulate the amount of air that flows through and around the heater core, where it is then mixed and distributed. All airflow from the blower motor passes through the A/C evaporator core.

Vehicles have a cabin heater coolant pump and a cabin coolant heater with coolant circuits to the heater core.

Air Handling

There are 4 door actuators that control the air flow into the passenger compartment:

- Air distribution
- Air inlet

- Driver temperature
- Passenger temperature

All of the door actuators contain a reversible electric motor and a potentiometer. The potentiometer circuit consists of a 5-volt reference signal connected to one end of a variable resistor, and a signal ground connected to the other. A signal circuit is connected to a contact wiper, which is driven along the variable resistor by the actuator shaft. The signal to the HVAC control module from the contact wiper indicates the actuator door position. The HVAC control module powers the actuator motors to move the doors to the desired positions. The desired door positions are calculated by the HVAC control module based on the set temperature, in-vehicle temperature, ambient air temperature and sunload.

When an airflow mode, desired temperature, fresh air, or recirculation mode is selected, the HVAC control module moves the actuator motor in the desired direction.

The HVAC control module may adjust the air inlet door based on the in-vehicle temperature and humidity sensor information to maintain the desired humidity of the passenger cabin air.

The HVAC control module sends a PWM signal to the blower motor control module to regulate the blower speed as necessary. The blower motor control module provides variable ground feed for the blower motor based on the input from the HVAC control module. A delay function provides a gradual increase or decrease in blower motor speed under all conditions.

Air Flow Strategy For Anti Fogging

This vehicle is equipped with an anti fogging feature known as enhanced windshield anti fogging strategy (EWAFS). This feature is based off the input data that is sent from the in-vehicle temperature and humidity sensor that is mounted near the center top of the windshield typically under the IPMA cover. The in-vehicle temperature and humidity sensor is hard wired to the HVAC module and supplies the vehicles humidity and temperature to the HVAC module. The module uses that data automatically to adjust the airflow in the cabin to prevent the windshield from fogging up. Below are the feature details and climate control operation based on the vehicles climate control system.

Background Strategy Operations		
Background Feature Details	Single Zone Manual	Dual Zone/Single Zone Auto
To prevent window fogging, recirculated air cannot be switched on when MAX Defrost is on.	X	X
In certain conditions (i.e. Max Defrost), the A/C compressor may continue to operate even though the A/C button is off.	X	X
In certain conditions, the A/Cbutton may turn on and off automatically based on the temperature setting and/or the current conditions.	X	X
Recirculated air may turn off automatically (or be prevented from turning on) in all airflow modes except MAX A/C to reduce risk of fogging. Recirculated air may also turn on and off automatically in various airflow modes in order to improve heating or cooling efficiency.	X	X
Whenever the blower motor speed is automatically controlled, all of the blower indicators turn off.	-	X
When Auto operation is switched on the air distribution, A/C operation, and outside or recirculated air will also be automatically controlled to heat or cool the vehicle in order to maintain the selected temperature. Under high humidity conditions, automatic operation will also take action to reduce the risk of window fogging by automatically engaging the A/C compressor, increasing blower motor speed, and/or directing more air to the windshield.	-	X

AUTO

NOTE: *For additional information on the climate control features found on the Information and Entertainment Display Unit, Refer to the Owner's Literature.*

When AUTO is selected:

- the HVAC system operates in a manner to achieve and maintain the temperature set by the operator.
- the HVAC control module controls the air inlet door to recirculate, partially recirculate or open to the fresh air position depending on the in-car temperature and humidity sensor inputs.
- the airflow mode is automatically controlled by the HVAC module based on the temperature setting.
- the temperature doors are automatically controlled by the HVAC module based on the temperature setting.
- the A/C compressor is automatically controlled by the HVAC control module based on the temperature setting. The A/C compressor does not operate if the outside temperature is below approximately 0°C (32°F).
- the blower motor speed is automatically controlled through the blower motor control module when it receives a PWM signal from the HVAC control module based on the temperature setting, but can be manually adjusted if desired.

OFF

When the system is OFF:

- the air inlet door closes, preventing outside air and allowing only recirculated air.
- the blower motor is off.

MAX A/C

When MAX A/C is selected:

- the air inlet door closes, preventing outside air and admits only recirculated air.
- the recirculated air indicator is illuminated (recirculated air forced on).
- the A/C button is illuminated.
- the A/C compressor operates as long as the outside temperature is above approximately 0°C (32°F).
- the blower motor is commanded to the highest speed. The blower motor speed is adjustable.

PANEL

When PANEL is selected:

- the mode doors direct airflow to the instrument panel registers.
- the recirculated air request button can be enabled.
- blended air temperature is available. The airflow temperature can only be cooled below the outside air temperature when the A/C is commanded on.
- the blower motor is on and the speed is adjustable.

PANEL-FLOOR

When PANEL-FLOOR is selected:

- the mode doors direct airflow to the floor duct and the instrument panel registers. A small amount of airflow from the side window demisters and defrost duct is present.
- the recirculated air request button can be enabled.
- blended air temperature is available. The airflow temperature can only be cooled below the outside air temperature when the A/C is commanded on.
- the blower motor is on and the speed is adjustable.

FLOOR

When FLOOR is selected:

- the mode doors direct airflow to the floor duct. A small amount of airflow from the defroster duct and side window demisters is present.
- the recirculated air request button can be enabled.
- blended air temperature is available. The airflow temperature can only be cooled below the outside air temperature when the A/C is commanded on.
- the blower motor is on and the speed is adjustable.

FLOOR-DEFROST

When FLOOR-DEFROST is selected:

- the mode doors direct airflow to the floor duct, the defroster duct and the side window demisters.
- the recirculated air request button can be enabled, but can automatically turn off.
- blended air temperature is available. The airflow temperature can only be cooled below the outside air temperature when the A/C is commanded on.
- the blower motor is on and the speed is adjustable.

DEFROST

When DEFROST is selected:

- the mode doors direct airflow to the defroster duct and side window demisters. A small amount of airflow from the floor duct is present.
- the recirculated air request button can be enabled, but can automatically turn off.
- the A/C is automatically commanded on and remains on until the system is either turned off or the airflow mode has changed and the A/C button is pressed.
- the A/C compressor operates as long as the outside temperature is above approximately 0°C (32°F).
- the blower motor is on and the speed is adjustable.

MAX DEFROST

When MAX DEFROST is selected:

- the recirculated air request button is disabled. The air inlet door opens, allowing only outside air into the passenger compartment.
- the air distribution doors operate in combination to direct airflow to the defroster duct and side window demisters. A small amount of airflow from the floor duct is present.
- the A/C is automatically commanded on and remains on until the system is either turned off or the airflow mode has changed and the A/C button is pressed.
- the A/C compressor operates as long as the outside temperature is above approximately 0°C (32°F).
- the temperature is set to the highest setting and is **not** adjustable.
- the fan is set to the highest speed and is **not** adjustable.
- MAX DEFROST can be exited by pressing the AUTO button.

Remote Start-Pre Conditioning

The system allows you to remotely start your vehicle and to adjust the interior temperature according to the settings that you chose.

When the factory remote start feature is used, the climate control system can be set to run in Auto mode, or can be set to run at the last setting it was set to when the vehicle was last turned off. Refer to the Owner's Literature for information to set up the remote start features.

Component Description

Component Description

Air Conditioning (A/C) Electric Compressor ACCM

Refer to: Specifications (412-00 Climate Control System - General Information, Specifications).
for the appropriate refrigerant and refrigerant oil. The refrigerant and refrigerant oil listed are the only oils to be used as the refrigerant system lubricant for electric vehicles. Addition of any oil other than the referred to oils for the refrigerant system damages the A/C electric compressor and contaminate the refrigerant system. Use the oil adding procedure specified for this vehicle when installing a new A/C electric compressor.

For BEV the A/C electric compressor may run and airflow may be felt when the climate control is off to provide cooling to the battery.

The ACCM is an integral part of the A/C electric compressor and cannot be removed from or serviced separately. The ACCM has both low voltage and high voltage connections. The ACCM requires a low voltage system operating voltage between 9 and 16 volts. The ACCM also requires high voltage system operating voltage between 110 and 467 volts. The A/C electric compressor allows for A/C operation to continue even when the vehicle is in full electric mode, when battery voltage allows. The high voltage low current fuse supplies voltage to the cabin coolant heater and ACCM. When the ACCM receives the A/C request message, it engages the A/C electric compressor. Instead of cycling ON and OFF like a traditional A/C compressor, the A/C electric compressor speeds up or slows down as required.

Air Conditioning (A/C) Line Bundle

The evaporator inlet and outlet manifold incorporates the Internal Heat Exchanger (IHX) and is serviced as an assembly called the Air Conditioning (A/C) Line Bundle. The Internal Heat Exchanger (IHX) combines a section of the A/C suction and liquid refrigerant lines into one component. It uses the cold vapor from the evaporator to cool the hot liquid from the condenser before it enters the Thermostatic Expansion Valve (TXV). After the Thermostatic Expansion Valve (TXV), more liquid refrigerant is available for absorbing heat in the evaporator. The result is an increase in cooling and operating efficiency of the HVAC system.

Air Discharge Temperature Sensors

There are 4 air discharge temperature sensors in the DATC system:

- Driver side footwell air discharge temperature sensor
- Driver side register air discharge temperature sensor
- Passenger side footwell air discharge temperature sensor
- Passenger side register air discharge temperature sensor

The air discharge temperature sensors contain a thermistor and are inputs to the HVAC control module. The sensors vary their resistance with the temperature. As the temperature rises, the resistance falls. As the temperature falls, the resistance rises. The HVAC control module uses the sensor information to maintain the desired temperature of the passenger cabin air.

Air Distribution Door Actuator

The air distribution door actuator contains a reversible electric motor and a potentiometer. The potentiometer allows the HVAC control module to monitor the position of the air distribution door.

Air Inlet Door Actuator

The air inlet door actuator contains a reversible electric motor and a potentiometer. The potentiometer allows the HVAC control module to monitor the position of the air inlet door. The HVAC control module drives the actuator motor in the direction necessary to move the door to the position set by the recirculation button and when the MAX A/C, Defrost or MAX Defrost buttons are selected.

Ambient Air Quality Sensor (if equipped)

The ambient air quality sensor is an input to the HVAC control module. When pollution and bad odors coming from the external environment are detected, the air inlet door automatically closes.

Ambient Air Temperature Sensor

The ambient air temperature sensor is an input to the PCM. If the outside air temperature is below approximately 0°C (32°F), the PCM does not allow the A/C compressor to engage.

The PCM sends raw ambient air temperature data to the HVAC control module. The HVAC control module filters the raw data, sends it to the APIM and the information and entertainment display unit displays the outside temperature.

After replacing an Ambient Air Temperature (AAT) sensor, the sensor data must be reset by following the menu prompts on the FDRS scan tool.
Refer to: Reset the Outside Air Temperature Sensor Learned Values (412-00 Climate Control System - General Information, General Procedures).

Blower Motor Control Module

The blower motor and the blower motor speed control are combined into one assembly called the blower motor control module. The blower motor pulls air from the air inlet and forces it into the climate control housing and the plenum chamber where it is mixed and distributed. The blower motor speed control uses a PWM signal from the HVAC Control Module to determine the desired blower speed and varies the ground feed for the blower motor to control the speed.

Cabin Coolant Heater System

The cabin coolant heater circuit provides warm coolant to the heater core to warm the passenger compartment. A SOBDMC controlled cabin coolant heater warms the coolant. The cabin heater diverter valve allows warm coolant from the electric motor circuit, when available, to enter the cabin heater circuit to provide warm coolant for cabin heat. The upper temperature limit for the cabin heater circuit is 80°C (176°F). The cabin heater coolant temperature sensor, [ECT sensor], in the cabin heater circuit provides the PCM with coolant temperature information. For additional information on the electric powertrain cooling system,
Refer to: Electrified Drivetrain Cooling (302-03A Electrified Drivetrain Cooling - Motor Electronics, Description and Operation).
Refer to: Electrified Drivetrain Cooling (302-03B Electrified Drivetrain Cooling - High Voltage Battery, Description and Operation).

An auxiliary high voltage cable connects the high voltage battery to each of the high voltage components: cabin coolant heater, ACCM, DCDC and Battery Charger Control Module (BCCM) also known as the SOBDM. Two circuits supply high voltage to the DCDC and two separate circuits supply high voltage to the cabin coolant heater. The DCDC acts as a pass through and sends high voltage to the SOBDM. The cabin coolant heater acts as a pass through and sends high voltage to the ACCM (air conditioning control module). [The high voltage low current fuse, mounted in the high voltage battery junction box, supplies voltage to the cabin coolant heater and ACCM (air conditioning control module)]. For additional information on the high voltage battery, mounting and cable system,
Refer to: High Voltage Battery, Mounting and Cables - System Operation and Component Description (414-03A High Voltage Battery, Mounting and Cables, Description and Operation).

Cabin Coolant Heater

The cabin coolant heater has both low voltage and high voltage electrical connections. The low voltage circuits are used for controlling the unit, while the high voltage circuits are used for heating the coolant. The cabin coolant heater uses electricity, or more accurately, the heat for resistance in electrical circuits to quickly raise the temperature of the coolant to normal operating temperature. The SOBDMC sends power to the cabin coolant heater and controls the LIN circuit to the heater.

Cabin Heater Coolant Diverter Valve

The default state of the cabin heater coolant diverter valve is de-energized, placing the system into the **isolated loop** mode. Coolant flows out of the valve, then back, in the following order:

- cabin heater coolant pump
- cabin coolant heater

- cabin heater coolant temperature sensor
- heater core
- cabin heater coolant diverter valve

When energized by the PCM, the cabin heater coolant diverter valve places the system into the **combined loop** mode. Coolant flows out of the valve, then back, in the following order:

- cabin heater coolant pump
- cabin coolant heater
- cabin heater coolant temperature sensor
- heater core
- cabin heater coolant diverter valve
- HV battery coolant pump
- HV battery
- Traction battery coolant proportional valve
- cabin heater coolant diverter valve

Cabin Heater Coolant Pump

The cabin heater coolant pump is controlled by the PCM and provides coolant to the cabin coolant heater system while the vehicle is in a driving mode, remote started, or doing Cabin Drive-Conditioning.

Cabin Heater Coolant Temperature Sensor

The cabin heater coolant temperature sensor is connected to the PCM. The sensor provides the coolant temperature information to the PCM.

Climate Control Housing

The climate control housing directs airflow from the blower motor through the evaporator core and heater core. All airflow from the blower motor passes through the evaporator core. The airflow is then directed through or around the heater core by the temperature doors. After passing through the heater core, the airflow is distributed to the selected outlet by the airflow mode doors.

Air Conditioning (A/C) Condenser

The A/C condenser is an aluminum tube and fin design heat exchanger. It cools compressed refrigerant gas by allowing air to pass over fins and tubes to extract heat, and condenses gas to liquid refrigerant as it is cooled.

Driver Temperature Door Actuator

The driver temperature door actuator contains a reversible electric motor and potentiometer. The potentiometer allows the HVAC control module to monitor the position of the temperature door.

Evaporator Core

The evaporator core is an aluminum tube and fin type and is located in the climate control housing. A mixture of liquid refrigerant and oil enters the evaporator core through the evaporator core inlet tube and continues out of the evaporator core through the evaporator core outlet tube as a vapor. During A/C compressor operation, airflow from the blower motor is cooled and dehumidified as it flows through the evaporator core fins.

Evaporator Temperature Sensor

The evaporator temperature sensor contains a thermistor. Sensor resistance varies with evaporator temperature. As the temperature rises, the resistance falls. As the temperature falls, the resistance rises. The evaporator temperature sensor is an input to the HVAC control module and the information is relayed to the PCM over the CAN. If the temperature is below approximately 2°C (35.6°F), the PCM does not allow the A/C compressor to engage.

Heater Core

The heater core consists of fins and tubes arranged to extract heat from the electric motor coolant and transfer it to air passing through the heater core.

Heating Ventilation Air Conditioning (HVAC) Control Module - Dual Automatic Temperature Control (DATC)

The DATC system uses the HVAC control module, and it also controls the outputs for rear window defrost and climate controlled seats. For details on the HVAC control module communication, refer to Control System Logic in this section.

The HVAC control module utilizes a Field-Effect Transistor (FET) protective circuit strategy for its actuator outputs. Output load (current level) is monitored for excessive current (typically short circuits) and is shut down (turns off the voltage or ground provided by the module) when a fault event is detected. A short circuit DTC is stored at the fault event and a cumulative counter is started.

When the demand for the output is no longer present, the module resets the Field-Effect Transistor (FET) circuit protection to allow the circuit to function. The next time the driver requests a circuit to activate that has been shut down by a previous short (Field-Effect Transistor (FET) protection) and the circuit is still shorted, the Field-Effect Transistor (FET) protection shuts off the circuit again and the cumulative counter advances.

When the excessive circuit load occurs often enough, the module shuts down the output until a repair procedure is carried out. The Field-Effect Transistor (FET) protected circuit has 3 predefined levels of short circuit tolerance based on the harmful effect of each circuit fault on the Field-Effect Transistor (FET) and the ability of the Field-Effect Transistor (FET) to withstand it. A module lifetime level of fault events is established based upon the durability of the Field-Effect Transistor (FET). If the total tolerance level is determined to be 600 fault events, the 3 predefined levels would be 200, 400 and 600 fault events

When each tolerance level is reached, the short circuit DTC that was stored on the first failure cannot be cleared by a command to clear the Diagnostic Trouble Codes (DTCs). The module does not allow the DTC to be cleared or the circuit to be restored to normal operation until a successful self-test proves that the fault has been repaired. After the self-test has successfully completed (no on-demand Diagnostic Trouble Codes (DTCs) present), DTC U1000:00 and the associated DTC (the DTC related to the shorted circuit) automatically clears and the circuit function returns.

When each level is reached, the DTC associated with the short circuit sets along with DTC U1000:00. These Diagnostic Trouble Codes (DTCs) can be cleared using the module self-test, then the Clear DTC operation on the scan tool. The module never resets the fault event counter to zero and continues to advance the fault event counter as short circuit fault events occur.

If the number of short circuit fault events reach the third level, then Diagnostic Trouble Codes (DTCs) U1000:00 and U3000:49 set along with the associated short circuit DTC. DTC U3000:49 cannot be cleared and a new module must be installed after the repair.

The HVAC control module requires Programmable Module Installation (PMI) when it is replaced.

In-Vehicle Temperature and Humidity Sensor

The in-vehicle temperature and humidity sensor is an input to the HVAC control module. The in-vehicle temperature and humidity sensor contains a thermistor and a sensing element which separately measures the in-vehicle air temperature and the humidity. The in-vehicle temperature and humidity sensor does not contain a fan motor. The HVAC control module may adjust the air inlet door based on the in-vehicle temperature and humidity sensor information to maintain the desired humidity of the passenger cabin air.

Passenger Temperature Door Actuator

The passenger temperature door actuator contains a reversible electric motor and potentiometer. The potentiometer allows the HVAC control module to monitor the position of the temperature door.

A/C Pressure Transducer

The PCM monitors the discharge pressure measured by the A/C pressure transducer. As the refrigerant pressure

changes, the resistance of the A/C pressure transducer changes. It is not necessary to recover the refrigerant before removing the A/C pressure transducer.

A 5-volt reference voltage is supplied to the A/C pressure transducer from the PCM. The A/C pressure transducer receives a ground from the PCM. The A/C pressure transducer then sends a voltage to the PCM to indicate the A/C refrigerant pressure.

Refrigerant System Dye

A fluorescent refrigerant system dye wafer is added to the receiver drier desiccant bag at the factory to assist in refrigerant system leak diagnosis. This fluorescent dye wafer dissolves after about 30 minutes of continuous A/C operation. It is not necessary to add additional dye to the refrigerant system before diagnosing leaks, even if a significant amount of refrigerant has been removed from the system. For more information for leak detection,
Refer to: Fluorescent Dye Leak Detection (412-00 Climate Control System - General Information, General Procedures).

Replacement desiccant bags, either separately or part of the receiver drier assembly, are equipped with a new fluorescent dye wafer. It is not necessary to add additional dye to the refrigerant system before diagnosing leaks. If the system has been out of refrigerant through the winter the dye at the leak point may have oxidized and may not fluoresce. If this happens, recharge and operate the A/C system to circulate the oil and allow any residual dye to show up at the leak point. It is important to understand that dye adheres to the oil not the refrigerant; the refrigerant carries the oil out of the leak point.

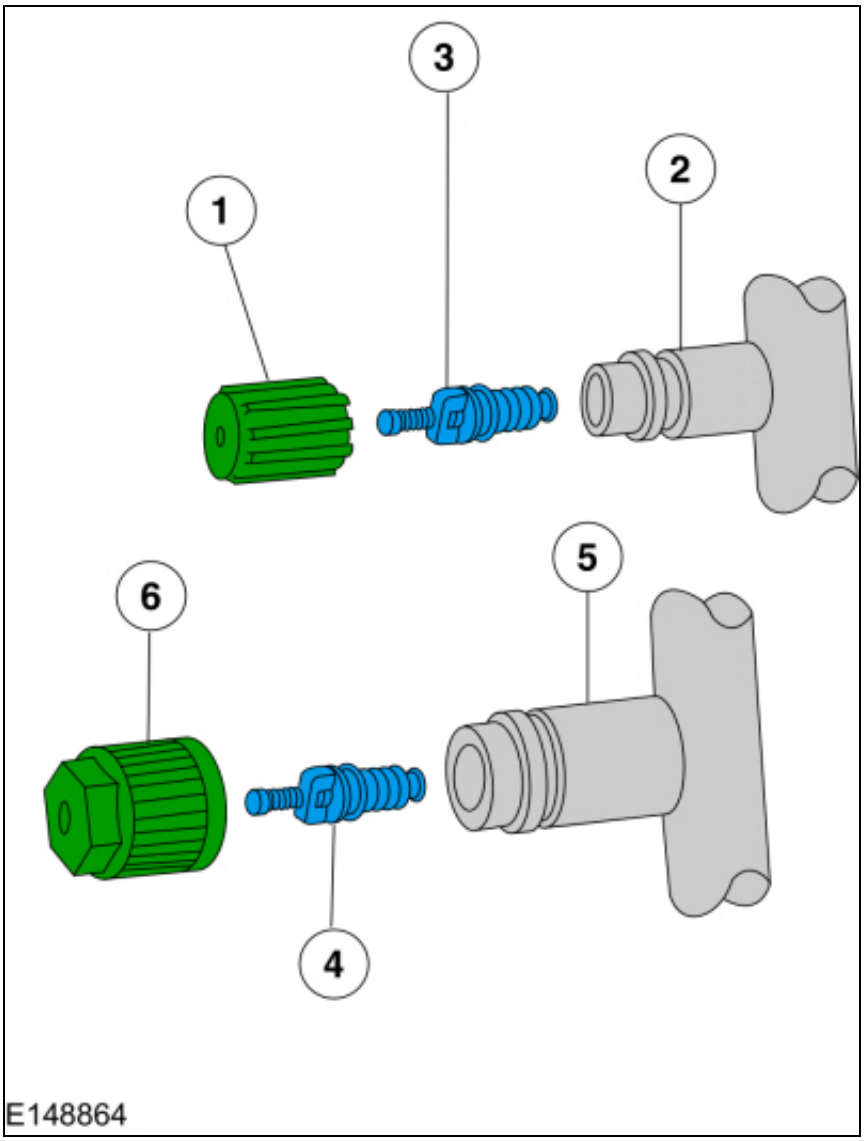
NOTE: *Check for leaks using a Rotunda-approved Ultraviolet (UV) lamp and dye enhancing glasses.*

Receiver Drier

The receiver drier stores high-pressure liquid and the desiccant bag mounted inside the receiver drier removes any retained moisture from the refrigerant.

The receiver drier is incorporated into the LH side of the A/C condenser. The receiver drier element is a separate component and can be removed and installed with the A/C condenser in the vehicle.

Service Gauge Port Valves



Item	Description	Torque
1	Low-pressure service gauge port valve cap	0.8 Nm (7 lb-in)
2	Low-pressure service gauge port valve	—
3	Low-pressure Schrader-type valve	1.8 Nm (16 lb-in)
4	High-pressure Schrader-type valve	2.5 Nm (22 lb-in)
5	High-pressure service gauge port valve	—
6	High-pressure service gauge port valve cap	0.8 Nm (7 lb-in)

The service gauge port fitting is an integral part of the refrigerant line or component.

- Prior to leak testing, blow air over service gauge port valves to insure an accurate test.
- Special couplings are required for both the high-side and low-side service gauge ports.
- A very small amount of leakage around the Schrader-type valve with the service gauge port valve cap removed is

considered normal. Install a new Schrader-type valve core if the seal leaks excessively.
- The A/C service gauge port valve caps are used as primary seals in the refrigerant system to prevent leakage through the Schrader-type valves from reaching the atmosphere. Always install and tighten the A/C service gauge port valve caps to the correct torque after they are removed.
- Follow the procedures and the notes for leak testing. REFER to the appropriate General Procedures in Group 412-00.

Sunload Sensor

The sunload sensor supplies information to the HVAC control module indicating the intensity of the sun on the vehicle. The HVAC control module compensates high sun load with higher blower speed and reduced discharge temperatures.

Thermostatic Expansion Valve (TXV)

The Thermostatic Expansion Valve (TXV) is located at the evaporator core inlet and outlet tubes at the center rear of the underhood storage compartment. The Thermostatic Expansion Valve (TXV) provides a restriction to the flow of refrigerant and separates the low-pressure and high-pressure sides of the refrigerant system. Refrigerant entering and exiting the evaporator core passes through the Thermostatic Expansion Valve (TXV) through 2 separate flow paths. An internal temperature sensing bulb senses the temperature of the refrigerant flowing out of the evaporator core and adjusts an internal pin-type valve to meter the refrigerant flow into the evaporator core. The internal pin-type valve decreases the amount of refrigerant entering the evaporator core at lower temperatures and increases the amount of refrigerant entering the evaporator core at higher temperatures.