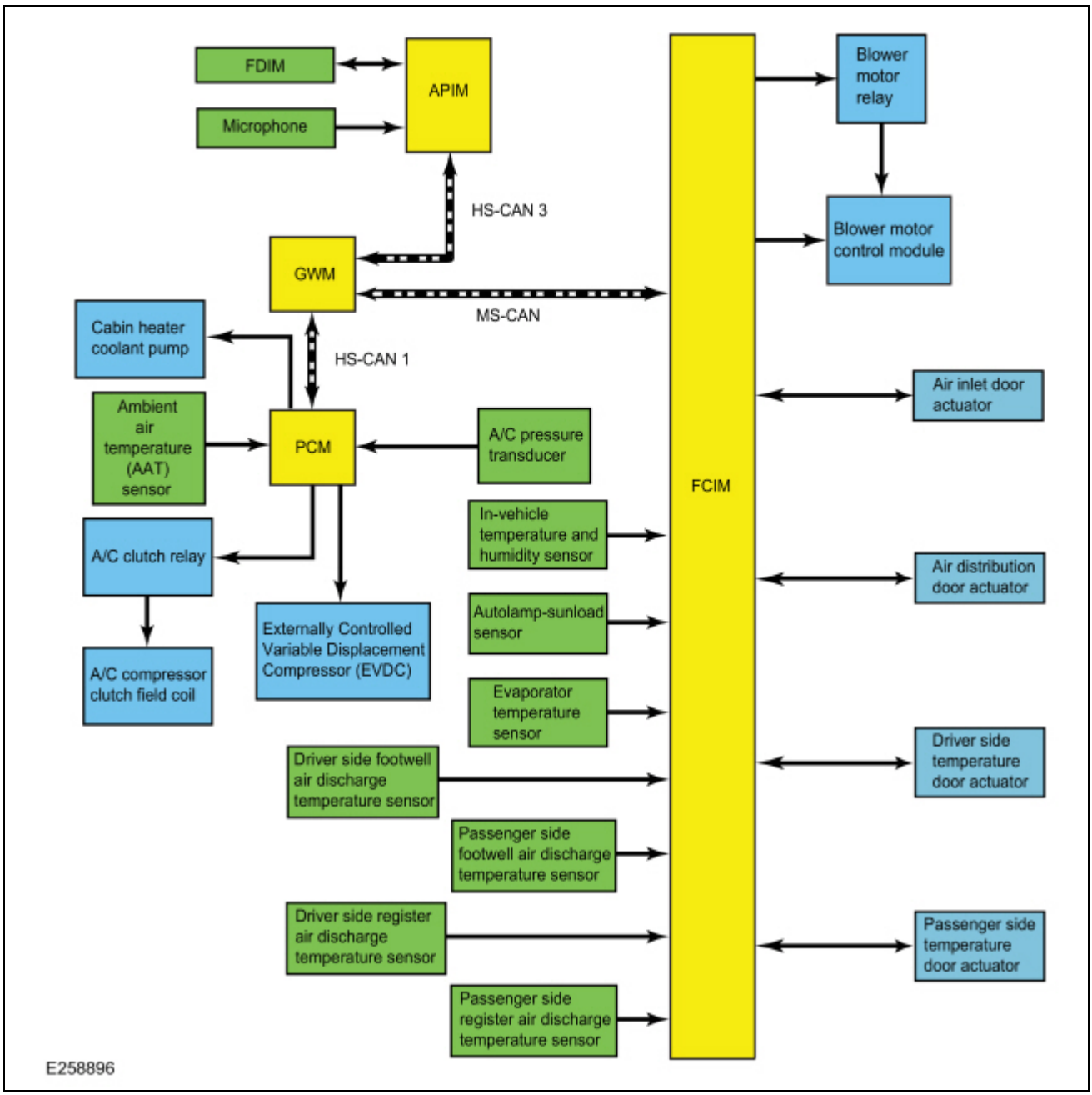
Climate Control System - Vehicles With: Dual Automatic Temperature Control (DATC) - System Operation and Component Description

System Operation

System Diagram



Network Message Chart

Module Network Input Messages APIM

Broadcast Message	Originating Module	Message Purpose
Climate control button status	FCIM	This message contains the climate control button status.

Module Network Input Messages FCIM

Broadcast Message	Originating Module	Message Purpose
Ambient air temperature	PCM	This message contains raw value from the ambient air temperature sensor.
Climate control requests	APIM	This message contains both the climate control system voice commands as well as all climate control system touchscreen inputs.
A/C clutch status	PCM	This message contains the status of the A/C compressor clutch.

Module Network Input Messages PCM

Broadcast Message	Originating Module	Message Purpose
HVAC A/C request	FCIM	This message requests the A/C compressor to be engaged.
Evaporator temperature	FCIM	This message contains the evaporator temperature. The PCM uses the evaporator temperature to determine the A/C compressor output.

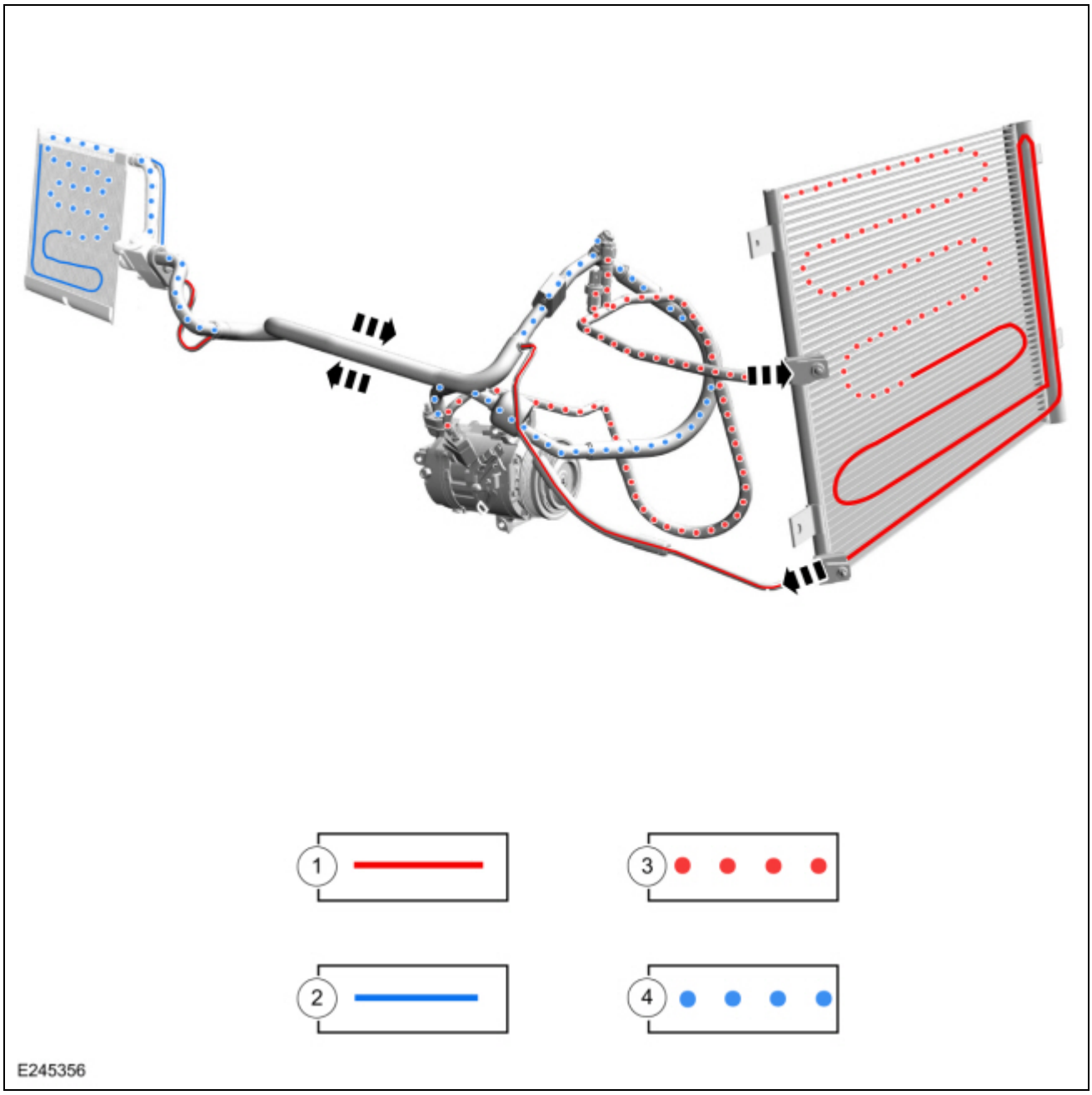
The Refrigerant Cycle

For information regarding basic HVAC 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 PCM controls the A/C clutch relay.
- The evaporator temperature sensor monitors the temperature of the evaporator core and sends a signal to the PCM. If the temperature of the evaporator core is low enough to cause the condensed water vapor to freeze, the PCM disengages the A/C clutch relay.
- The line pressure is monitored so that A/C compressor operation is interrupted if the system pressure becomes too high or too low.
- The A/C compressor relief valve opens and vents refrigerant to relieve unusually high system pressure.

A/C Flow and State



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

Control System Logic

The DATC system customer interface is in one or more locations depending on vehicle option content:

- FCIM

- FDIM (part of APIM)

When the touchscreen FDIM or voice commands are used and A/C is selected, the APIM sends the request message over the HS-CAN3 to the GWM. The GWM sends the message to the FCIM over the MS-CAN and the GWM sends the A/C request to the PCM over the HS-CAN1.

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-CAN1.

The FCIM requires PMI when it is replaced.

A/C Request

When an A/C request is received by the PCM, the A/C clutch relay is engaged 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 (32.0°F).
- Evaporator temperature is above approximately 1°C (33.8°F).
- Engine coolant temperature conditions are within normal parameters.
- Wide Open Throttle (WOT) condition is not present.
- Engine torque conditions are within normal parameters.
- 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, CACT, CHT, ECT, IAT, IAT2, MAF, MAPT, TCB and TCIPT 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 18ºC (32.4ºF). If a temperature sensor input is found to be reporting a temperature imbalance the PCM does not allow the A/C clutch to engage. For more information on PCM sensors, refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

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 adjusts back to partial recirculated air. The FCIM also adjusts the system based on in-vehicle temperature. The autolamp-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.

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 equipped with auto start-stop have a cabin heater coolant pump.

Instrument Panel Console Switch Assembly - Auto Start-Stop Deactivation Switch (if equipped)

The Instrument Panel Console Switch Assembly - Auto Start-Stop deactivation switch is available on vehicles equipped with Auto Start- Stop feature only. Auto Start-Stop deactivation switch is a momentary contact switch that includes a LED indicator. This switch is used to deactivate the Auto Start-Stop mode. Refer to the Owner's Literature, Unique Driving Characteristics, for full Auto Start-Stop enabling/disabling information.

Cabin Heater Coolant Pump - vehicles equipped with Auto Start-Stop (if equipped)

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 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 (RPM)
- Vehicle speed

Air Handling

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

- Air distribution
- Air inlet
- Driver side temperature
- Passenger side 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 FCIM from the contact wiper indicates the actuator door position. The FCIM powers the actuator motors to move the doors to the desired positions. The desired door positions are calculated by the FCIM based on the requested temperature, in-vehicle temperature, ambient air temperature and sunload.

When an airflow mode, desired driver or passenger temperature, fresh air, or recirculation mode is selected, the FCIM moves the actuator motor in the desired direction.

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

AUTO

When AUTO is selected:

- the HVAC system operates to achieve and maintain the temperature requested by the operator.
- the driver and passenger side temperature doors are automatically controlled by the FCIM based on the temperature setting.
- the A/C compressor is automatically controlled by the PCM based on temperature information sent by the FCIM. The A/C compressor does not operate if the outside temperature is below approximately 0°C (32.0°F).
- the blower motor speed is automatically controlled through the blower motor speed control when it receives a PWM signal from the FCIM based on the temperature setting, but can be manually adjusted if desired.
- the FCIM 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 dual zone auto can be turned off by holding button for two seconds.

OFF

When OFF is selected:

- the recirculated air request button is disabled.
- the air inlet door closes, preventing outside air and allowing only recirculated air.
- the A/C request button is disabled.
- the blower motor is off.

MAX A/C

When MAX A/C is selected:

- the air inlet door closes, preventing outside air and allowing only recirculated air.
- the recirculated air indicator is illuminated (recirculated air forced on).
- the air distribution doors operate simultaneously to direct airflow to the instrument panel registers. A small amount of airflow from the floor duct is present.
- the temperature doors move to the full cool position. The air temperature is adjustable.
- the A/C button is illuminated.
- the A/C compressor operates if the outside temperature is above approximately 0°C (32.0°F).
- the blower motor is commanded to the highest speed, but can be manually adjusted if desired.

PANEL

When PANEL mode is selected:

- the recirculated air request button is enabled. If the recirculated air request button is selected (indicator on), the air inlet door closes, preventing outside air from entering the passenger compartment. If the recirculated air request button is not selected (indicator off), the air inlet door opens, allowing only outside air into the passenger compartment.
- the air distribution doors operate simultaneously to direct airflow to the instrument panel registers. A small amount of airflow from the floor duct is present.
- blended air temperature is available. Only when A/C compressor operation has been selected by pressing the A/C button (indicator on) can the airflow temperature be cooled below the outside air temperature.
- the blower motor is on and the speed is adjustable.

PANEL/FLOOR

When PANEL/FLOOR mode is selected:

- the recirculated air request button is enabled. If the recirculated air request button is selected (indicator on), the air inlet door closes, preventing outside air from entering the passenger compartment. If the recirculated air request button is not selected (indicator off), the air inlet door opens, allowing only outside air into the passenger compartment.
- the air distribution doors operate simultaneously to 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.
- blended air temperature is available. Only when A/C compressor operation has been selected by pressing the A/C button (indicator on) can the airflow temperature be cooled below the outside air temperature.
- the blower motor is on and the speed is adjustable.

FLOOR

When FLOOR mode is selected:

- the recirculated air request button is enabled. If the recirculated air request button is selected (indicator on), the air inlet door closes, preventing outside air from entering the passenger compartment. If the recirculated air request button is not selected (indicator off), the air inlet door opens, allowing only outside air into the passenger compartment.

- the air distribution doors operate simultaneously to direct airflow to the floor duct. A small amount of airflow from the defroster duct and side window demisters is present.
- blended air temperature is available. Only when A/C compressor operation has been selected by pressing the A/C button (indicator on) can the airflow temperature be cooled below the outside air temperature.
- the blower motor is on and the speed is adjustable.

FLOOR/DEFROST

When FLOOR/DEFROST mode is selected:

- the recirculated air request button is enabled. If the recirculated air request button is selected (indicator on), the air inlet door closes, preventing outside air from entering the passenger compartment. If the recirculated air request button is not selected (indicator off), the air inlet door opens, allowing only outside air into the passenger compartment.
- the air distribution doors operate simultaneously to direct airflow to the floor duct, the defroster duct and the side window demisters.
- blended air temperature is available. Only when A/C compressor operation has been selected by pressing the A/C button (indicator on) can the airflow temperature be cooled below the outside air temperature.
- the blower motor is on and the speed is adjustable.

MAX DEFROST

When MAX DEFROST mode 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 simultaneously 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 turned on in defrost mode. The A/C compressor operates as long as the outside temperature is above approximately 0°C (32.0°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.
- the heated rear window automatically turns on.

Remote Start - Message Center Set To Auto

Remote start is an optional feature. In addition to being able to start the vehicle remotely, the remote start feature also utilizes other vehicle systems to increase the level of comfort to the vehicle occupants upon entering the vehicle. For additional information on the remote start feature and the other vehicle systems, refer to the Owner's Literature.

Set the climate control to operate in Auto mode through the information display setting: Remote Start > Climate Control > Heater–A/C > Auto, refer to the Owner's Literature for more information.

When the factory remote start feature is used, the climate control system automatically sets certain parameters in an attempt to achieve a comfortable cabin temperature. These parameters are set based on multiple inputs including the in-vehicle temperature and humidity sensor, the autolamp-sunload sensor and the ambient air temperature sensor.

Remote Start - Message Center Set To Last User Settings

Remote start is an optional feature. In addition to being able to start the vehicle remotely, the remote start feature also utilizes other vehicle systems to increase the level of comfort to the vehicle occupants upon entering the vehicle. For additional information on the remote start feature and the other vehicle systems, refer to the Owner's Literature.

Set the climate control to operate using the last climate control settings through the information display setting: Remote Start > Climate Control > Heater–A/C > Last Settings, refer to the Owner's Literature for more information.

When the factory remote start feature is used and the IPC message center is set to last user settings, the climate control system automatically uses the settings last selected before the vehicle was turned off. The climate control system cannot be adjusted during remote start operation. Turn the ignition on to return the system to its previous settings. Refer to the Owner's Literature for more information.

Component Description

FCIM - Dual Automatic Temperature Control (DATC)

The DATC system uses the FCIM as the HVAC 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 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 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 diagnostic 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 FCIM requires PMI when it is replaced.

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 FCIM to determine the desired blower speed and varies the ground feed for the blower motor to control the speed.

Compressor Clutch Assembly

When battery voltage is applied to the A/C compressor clutch field coil, the clutch disc and hub assembly is drawn toward the A/C clutch pulley. The magnetic force locks the clutch disc and hub assembly and the A/C clutch pulley together as one unit, causing the compressor shaft to rotate with the engine. When battery voltage is removed from the A/C compressor clutch field coil, springs in the clutch disc and hub assembly move the clutch disc away from the A/C clutch pulley.

An A/C clutch diode is integrated into the coil for A/C clutch field coil circuit spike suppression.

Evaporator Core

The evaporator core is an aluminum plate/fin type and is located in the climate control housing. A mixture of liquid refrigerant and oil enters the evaporator through the evaporator inlet tube and continues out of the evaporator through the evaporator 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 fins.

Heater Core

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

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 door(s). After passing through the heater core, the airflow is distributed to the selected outlet by the airflow mode doors.

Air Distribution Door Actuator

The air distribution door actuator contains a reversible electric motor and a potentiometer. The potentiometer allows the FCIM to monitor the position of the airflow mode door.

Air Inlet Door Actuator

The air inlet door actuator contains a reversible electric motor and a potentiometer. The potentiometer allows the FCIM to monitor the position of the airflow mode door. The FCIM drives the actuator motor in the direction necessary to move the door to the position set by the recirculation button and the in-vehicle temperature and humidity sensor information.

Driver Side Temperature Door Actuator

The driver side temperature door actuator contains a reversible electric motor and potentiometer. The potentiometer allows the FCIM to monitor the position of the temperature blend door.

Passenger Side Temperature Door Actuator

The passenger side temperature door actuator contains a reversible electric motor and potentiometer. The potentiometer allows the FCIM to monitor the position of the temperature blend door.

Air Conditioning (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.

Ambient Air Temperature (AAT) Sensor

The Ambient Air Temperature (AAT) 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 clutch to engage.

The PCM sends raw ambient air temperature data to the FCIM. The FCIM filters the raw data, sends it to the APIM and the touchscreen displays the outside temperature.

After replacing an Ambient Air Temperature (AAT) sensor, the sensor data must be reset by either driving the vehicle at speeds consistently about 20 MPH for at least 5 minutes to update the filtered data or perform the multiple button press reset procedure to update to the current raw value.

The multiple button reset for the Ambient Air Temperature (AAT) sensor is as follows:

- On the HVAC panel controls, press the A/C and Recirc buttons simultaneously, then, release both.
- Within 2 seconds press the A/C button again.

In-Vehicle Temperature And Humidity Sensor

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, then sends those readings to the FCIM. The in-vehicle temperature and humidity sensor has an electric fan within the sensor that draws in-vehicle air across the two sensing elements. The FCIM 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.

Autolamp-Sunload Sensor

The autolamp-sunload sensor supplies information to the FCIM indicating the intensity of the sun on the vehicle. The FCIM compensates high sun load with higher blower and reduced discharge temperatures.

Evaporator Temperature Sensor

The evaporator temperature sensor contains a thermistor. The sensor varies its resistance with the temperature. As the temperature rises, the resistance falls. As the temperature falls, the resistance rises. The evaporator temperature sensor is an input to the FCIM and the information is relayed to the PCM over the CAN. If the evaporator temperature is below approximately 1°C (33.8°F), the PCM does not allow the A/C compressor to operate.

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 FCIM. The sensors vary their resistance with the temperature. As the temperature rises, the resistance falls. As the temperature falls, the resistance rises. The FCIM uses the sensor information to maintain the desired temperature of the passenger cabin air.

Externally Controlled Variable Displacement Compressor (2.7L EcoBoost, 3.0L Power Stroke Diesel, 3.5L EcoBoost, 5.0L 32V Ti-VCT)

NOTE: *Proper Air Conditioning (A/C) system diagnosis on a vehicle's compressor is dependent on correct refrigerant system charge and tested in ambient temperatures above 21.1°C (70°F).*

Variable displacement compressor internals are similar to fixed displacement compressors. The pistons are placed around an angled plate (swash plate) and are pushed back and forth as the plate rotates. Variable displacement compressors vary the swash plate angle to allow piston displacement to vary from 5% (default) to 100% of full capacity to meet cooling demand.

The externally controlled variable displacement compressor has the following characteristics:

- 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.
- Refer to Specifications in Group 412 for the appropriate refrigerant and refrigerant oil. 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.

The piston displacement of the externally controlled variable displacement compressor is controlled by a PWM signal from the PCM which electronically drives the control valve. The control valve drives the crankcase pressure and thus the swash plate angle. The externally controlled variable displacement compressor achieves precise cooling capability based on the cabin temperature and driving conditions, resulting in the target evaporator core temperature. The target evaporator core temperature range for the EATC system is 3-8°C (37.4-46.4°F); 3-5°C (37.4-41°F) for the EMTC system.

The PCM pulse width modulates the ground to the externally controlled variable displacement compressor control valve to change the displacement of the A/C compressor by changing the swash plate angle based on the following items:

- Ambient air temperature
- Engine RPM
- Evaporator temperature
- High side and low side A/C pressures
- Temperature and mode settings of the climate control head

Fixed Displacement A/C Compressor (3.3L Duratec - V6)

NOTE: *Proper Air Conditioning (A/C) system diagnosis on a vehicle's compressor is dependent on correct refrigerant system charge and tested in ambient temperatures above 21.1°C (70°F).*

The fixed displacement compressor has:

- a non-serviceable shaft seal.
- a serviceable pressure relief valve installed in the rear of the compressor to protect the refrigerant system against excessively high refrigerant pressures.
- a serviceable A/C clutch and field coil.
- Refer to Specifications in Group 412 for the appropriate refrigerant and refrigerant oil. 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.

Fixed displacement A/C compressors are always at 100% displacement. The pistons are placed around an angled plate (swash plate) and are pushed back and forth as the plate rotates. Cooling performance is controlled by switching the compressor clutch on or off depending upon the evaporator temperature.

Condenser

The A/C condenser is an aluminum fin-and-tube 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. The receiver drier is incorporated onto the LH side of the condenser.

Internal Heat Exchanger (IHX)

The Thermostatic Expansion Valve Manifold and Tube Assembly incorporates the Internal Heat Exchanger (IHX) and is serviced as an assembly. 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.

Receiver Drier

The receiver drier stores high-pressure liquid. The desiccant bag mounted inside the receiver drier removes any retained moisture from the refrigerant. The receiver drier desiccant bag is a separate component and can be removed and installed separately from the condenser. The receiver drier is incorporated onto the LH side of the condenser.

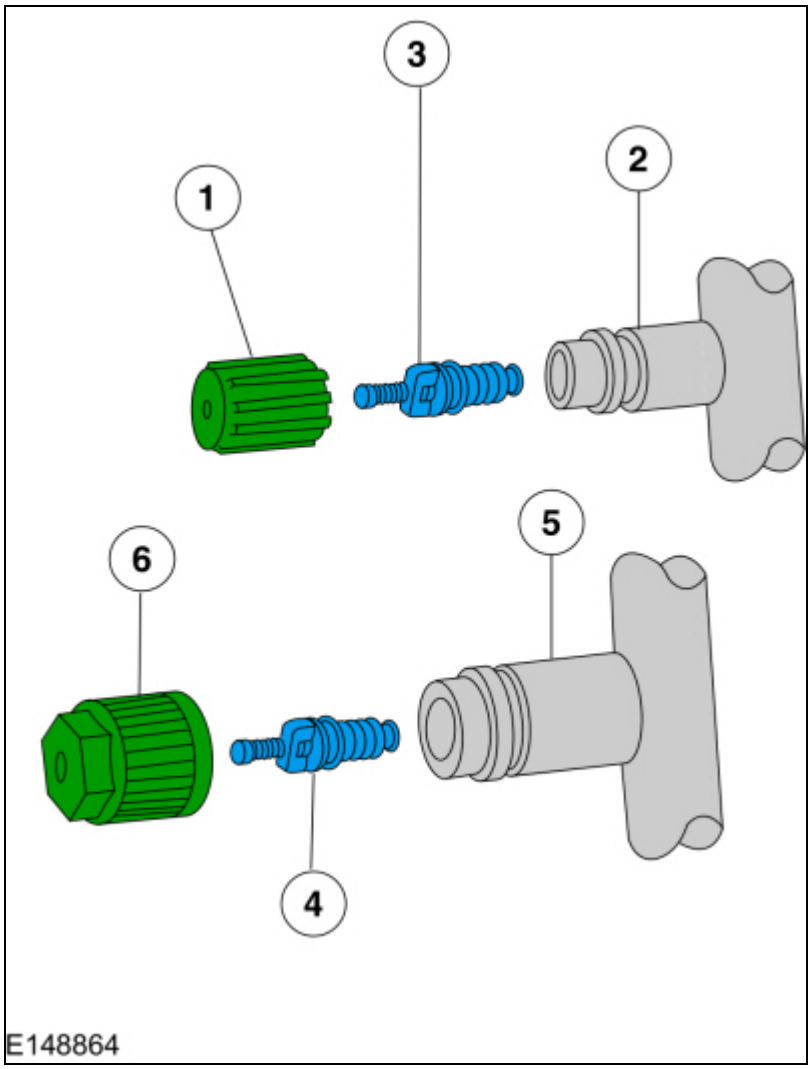
Refrigerant System Dye

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 Florescent Dye Leak Detection Refer to General Procedures in Group 412.

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 UV lamp and dye enhancing glasses.*

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	—

Item	Description	Torque
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 the service gauge port valves to ensure 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 procedure and the notes for electronic leak testing. Refer to General Procedures in Group 412.

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 engine compartment. The TXV provides a restriction to the refrigerant flow and separates the low-pressure and high-pressure sides of the refrigerant system. Refrigerant entering and exiting the evaporator core passes through the 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.