

Mechanical	Electrical
- Leaks or weeps at: - Hoses - Tubes - Clamp joints - Gaskets - O-rings - Thermostat housing - Radiator - Pressure relief cap - Coolant pump - Cabin heater coolant pump - Heater core (wet floor or coolant odor in vehicle) - Oil Cooler (may leak internally or externally) (if equipped) - Transmission fluid warmer (may leak internally or externally) - Transmission fluid heater coolant control valve - Lower intake manifold - Degas bottle - Cylinder block core plugs - Cylinder head core plugs - Block heater (if equipped) - Cracked or damaged: - Hoses - Tubes - Hose clamps - Thermostat housing - Lower intake manifold - Oil cooler (may leak internally or externally) (if equipped) - Transmission fluid warmer (may leak internally or externally) - Transmission fluid heater coolant control valve - Radiator - Pressure relief cap - Cooling fan - Coolant pump - Cabin heater coolant pump - Degas bottle - Cylinder block core plugs - Cylinder head core plugs - Block heater (if equipped) - Restricted airflow through the A/C condenser/radiator - Drive belt loose, worn or installed incorrectly - Broken or weak drive belt tensioner - Excessive white or light gray exhaust smoke (may have burnt coolant odor) - Coolant in engine oil - Coolant in transmission fluid - Engine oil in coolant - Transmission fluid in coolant	- Inoperative or damaged: - Electric cooling fan - Wiring, connectors, relays or modules - CHT sensor

7. If the inspection reveals an obvious concern that can be readily identified, repair it as necessary.

8. Inspect the coolant condition.

1. Inspect the coolant color.

- A darker color with the presence of debris could indicate a commercially available stop leak may have been used and could result in loss of coolant flow to critical parts of the engine. If sediment is present, flush the system and refill with the correct mixture of distilled water and the appropriate concentrated antifreeze/coolant.
 REFER to: Specifications (303-03D Engine Cooling - 3.3L Duratec-V6 â€ Hybrid (BP), Specifications).
 REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 3.3L Duratec-V6 â€ Hybrid (BP), General Procedures).
- A light or reddish brown color indicates that rust may be present in the cooling system. Flush the system and refill with the correct mixture of distilled water and the appropriate concentrated antifreeze/coolant.

REFER to: Specifications (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), Specifications).
 REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), General Procedures).

- An iridescent sheen on top of the coolant could indicate a trace of oil is entering the system. For engine diagnosis, REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).
 Flush the system and refill with the correct mixture of distilled water and the appropriate concentrated antifreeze/coolant. REFER to: Specifications (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), Specifications).
 REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), General Procedures).
- A milky brown color may indicate that engine oil is entering the cooling system. Pressure test the cooling system. Refer to component tests in this section. If engine oil is suspected, the cause of the leak may be internal to the engine. For engine diagnosis, REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).
 Flush the system and refill with the correct mixture of distilled water and the appropriate concentrated antifreeze/coolant. REFER to: Specifications (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), Specifications).
 REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), General Procedures).

2. **WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.**

If the engine coolant appearance is acceptable, test the engine coolant freezing point range with the Coolant/Battery Refractometer. Maintain the coolant concentration refer to specifications.
 REFER to: Specifications (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), Specifications).

3. Adjust coolant range and level if necessary:

- If coolant is low, add specified coolant mixture only.
- If the engine coolant tests too weak, remove some of the engine coolant and add the appropriate concentrated antifreeze/coolant. Concentrated until the readings are within acceptable levels.
 REFER to: Specifications (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), Specifications).
- If the engine coolant tests strong, remove some of the engine coolant and add distilled water until the readings are within acceptable levels.

9. If an obvious cause for an observed or reported concern is found, correct the cause and test the system for normal operation before proceeding to the next step.

Symptom Chart

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.
 REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Condition	Possible Sources	Actions
Loss of coolant	Refer to the Pinpoint Test	GO to Pinpoint Test A
The engine overheats.	Refer to the Pinpoint Test	GO to Pinpoint Test B
The engine does not reach normal operating temperature.	Refer to the Pinpoint Test	GO to Pinpoint Test C
The block heater does not operate correctly.	• Block heater power cable • Block heater	• CHECK continuity in all 3 power cable circuits. If any circuit measures more than 5 ohms, INSTALL a new power cable. • CHECK the resistance of the block heater. If the resistance does not measure between 30 and 40 ohms, INSTALL a new block heater. REFER to: Block Heater (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), Removal and Installation).

The electric cooling fan is inoperative in one or more speeds or does not operate correctly.	• Wiring • Relays • Fuses • Cooling fan motor	Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
The electric cooling fan stays on all the time.	• Wiring • Relays	Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
Noisy electric cooling fan operation.	• Foreign material contamination • Fan motor	• REMOVE the foreign material from the cooling fan and shroud. TEST the system for normal operation. If still noisy, INSTALL a new cooling fan assembly. REFER to: Cooling Fan Motor and Shroud (303-03D Engine Cooling - 3.3L Duratec-V6 “Hybrid (BP), Removal and Installation).
	• Fan blade detached from fan motor	• INSTALL a new cooling fan assembly. REFER to: Cooling Fan Motor and Shroud (303-03D Engine Cooling - 3.3L Duratec-V6 “Hybrid (BP), Removal and Installation).

Pinpoint Tests

PINPOINT TEST A : LOSS OF COOLANT

Normal Operation and Fault Conditions

The engine cooling system is a closed system providing for coolant expansion and contraction as well as changes in pressure as coolant warms and cools with engine operation. Various gaskets, seals, hoses and clamps contain coolant within the cooling system and keep other fluids and contaminants from entering the cooling system.

Possible Sources

- Coolant hoses or tubes
- Hose clamps
- Thermostat O-ring seal or gasket
- Coolant pump O-ring seal or gasket
- Thermostat housing
- Oil cooler (may leak internally or externally) (if equipped)
- Transmission fluid warmer (may leak internally or externally)
- Transmission fluid heater coolant control valve
- Radiator
- Pressure relief cap
- Coolant pump leaking from weep hole
- Cabin heater coolant pump
- Heater core
- Lower intake manifold
- Engine gaskets (may leak internally or externally)
- Degas bottle
- Cylinder block core plugs
- Cylinder head core plugs
- Block heater (if equipped)

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

A1 CARRY OUT INSPECTION AND VERIFICATION

- Carry out Inspection and Verification.

Are any concerns present?

Yes	REPAIR as needed.
No	GO to A2

A2 CHECK THE ENGINE COOLANT LEVEL AND PRESSURE TEST THE ENGINE COOLING SYSTEM

NOTE: Allow the engine to cool before checking the engine coolant level.

- Ignition OFF
- Visually inspect the engine coolant level at the degas bottle and adjust as necessary. Pressure test the engine cooling system. Refer to Component Tests, Cooling System Pressure Test in this section.

Does the engine cooling system leak externally?

Yes	REPAIR or INSTALL new components.
No	GO to A3

A3 CHECK THE ENGINE COOLANT FOR AN INTERNAL LEAK

- Inspect the engine coolant in the degas bottle for signs of engine oil.

Is engine oil evident in the engine coolant?

Yes	REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).
No	GO to A4

A4 CHECK THE ENGINE OIL FOR COOLANT

- Remove the oil level indicator from the engine.

Is coolant evident in the oil?

Yes	REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).
No	GO to A5

A5 CHECK THE ENGINE COOLANT FOR TRANSMISSION FLUID

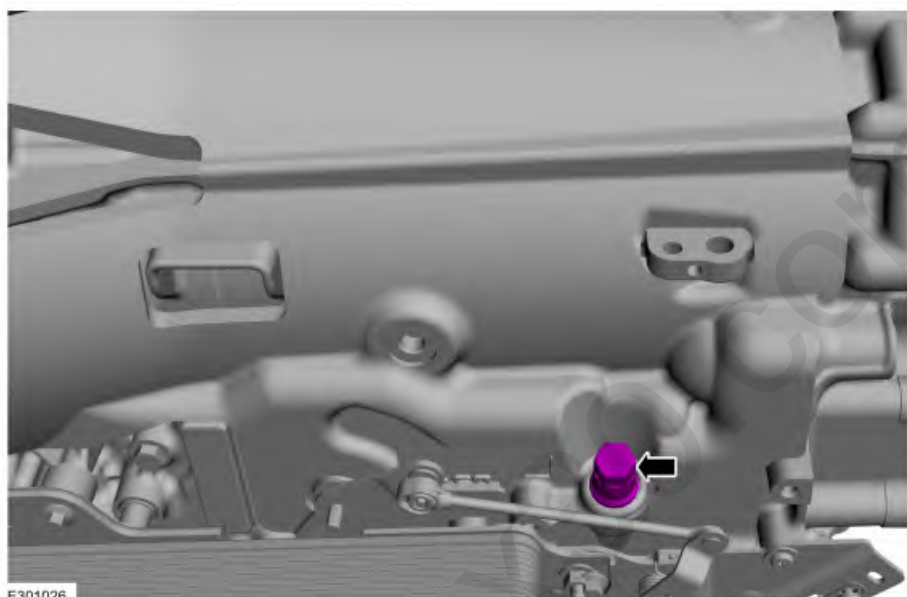
- Check the engine coolant in the degas bottle for signs of transmission fluid.

Is transmission fluid evident in the engine coolant?

Yes	INSTALL a new transmission fluid warmer. REFER to: Transmission Fluid Cooler (307-02A Transmission Cooling - 10-Speed Automatic Transmission â€“ 10R60, Removal and Installation). REPAIR the transmission as necessary.REFER to: Diagnosis By Symptom (307-01A Automatic Transmission, Transfer Case and Power Transfer Unit - 10-Speed Automatic Transmission â€“ 10R60, Diagnosis and Testing). TEST the system for normal operation.
No	GO to A6

A6 CHECK THE TRANSMISSION FLUID FOR ENGINE COOLANT

- Remove the transmission oil leveling plug.



- Check the transmission fluid for engine coolant.

Is engine coolant evident in the transmission fluid?

Yes	INSTALL a new transmission fluid warmer. REFER to: Transmission Fluid Cooler (307-02A Transmission Cooling - 10-Speed Automatic Transmission â€“ 10R60, Removal and Installation). REPAIR the transmission as necessary.REFER to: Diagnosis By Symptom (307-01A Automatic Transmission, Transfer Case and Power Transfer Unit - 10-Speed Automatic Transmission â€“ 10R60, Diagnosis and Testing). TEST the system for normal operation.
No	GO to A7

A7 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES

NOTE: Use UView[®] Combustion Leak Tester part number UVU560000-R or equivalent.

- Using a cooling system combustion gas leak tester, following the instructions supplied with the tester, check the coolant for combustion gases.

Are combustion gases present?

Yes	REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).
No	The cooling system is operational

PINPOINT TEST B : THE ENGINE OVERHEATS

Normal Operation and Fault Conditions

The engine cooling system maintains the engine temperature during operation. Correct coolant flow through the engine, radiator and remainder of cooling system passages and components is essential to maintaining a correct engine temperature.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
PCM P1299:00	Cylinder Head Overtemperature Protection Active: No Sub Type Information	Sets in the PCM when an engine overheat condition was sensed by the CHT sensor.
PCM P0217:00	Engine Coolant Overtemperature Condition: No Sub Type Information	Sets in the PCM when an engine overheat condition was sensed by the CHT sensor.

Possible Sources

- Low coolant level
- External engine coolant leak
- Airlock in system
- Pressure relief cap installation
- Restricted airflow through A/C condenser/radiator
- Internal engine coolant leak
- Coolant condition/concentration
- Non-OEM engine enhancement components
- Electric cooling fan
- CHT sensor
- Radiator
- Thermostat
- Coolant pump
- Coolant flow restriction
- Active grill shutter assembly

B1 CARRY OUT INSPECTION AND VERIFICATION

- Carry out the Inspection and Verification procedure in this section.

Are any concerns present?

Yes	REPAIR as needed.
No	GO to B2

B2 CHECK FOR PCM (POWERTRAIN CONTROL MODULE) DTCS

- Ignition ON.
- Using a scan tool, perform PCM self-test.

Is DTC P0217 and/or P1299 present?

Yes	GO to B4
No	Actual engine overheating has not been verified. CHECK the engine coolant temperature gauge operation. REFER to: Instrumentation, Message Center and Warning Chimes (413-01 Instrumentation, Message Center and Warning Chimes, Diagnosis and Testing). If any other PCM DTCs are retrieved, REFER to: Electronic Engine Controls (303-14C Electronic Engine Controls - 3.3L Duratec-V6/3.3L Duratec-V6 "Hybrid (BP), Diagnosis and Testing).

B3 CHECK FOR ACTIVE GRILL SHUDDER DTCS

- Review the PCM DTCs.

Are any active grill shudder DTCs present?

Yes	REFER to: Active Grille Shutter (501-02 Front End Body Panels, Diagnosis and Testing).
No	GO to B4

B4 CHECK FOR AN AIRFLOW OBSTRUCTION AND MISSING AIR DEFLECTORS

NOTE: *Verify no vehicle front end damage is present.*

- Check the radiator or A/C condenser for an external obstruction such as leaves or cardboard and verify all air deflectors are present.

Is an airflow obstruction present or air deflectors missing?

Yes	REPAIR as necessary.
No	GO to B5

B5 CHECK THE ENGINE COOLANT LEVEL AND PRESSURE TEST THE COOLING SYSTEM

- Ignition OFF.
- Visually check the engine coolant level in the coolant expansion tank and adjust as necessary. Pressure test the cooling system.

Does the engine cooling system leak externally?

Yes	REPAIR or INSTALL new components.
No	GO to B6

B6 CHECK THE ENGINE COOLANT FOR AN INTERNAL LEAK

- Inspect the engine coolant in the coolant expansion tank for signs of engine oil.

Is engine oil evident in the coolant?

Yes	REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).
No	GO to B7

B7 CHECK THE ENGINE OIL FOR COOLANT

- Remove the oil level indicator from the engine.

Is coolant evident in the oil?

Yes	REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).
No	GO to B8

B8 CHECK THE ENGINE COOLANT FOR TRANSMISSION FLUID

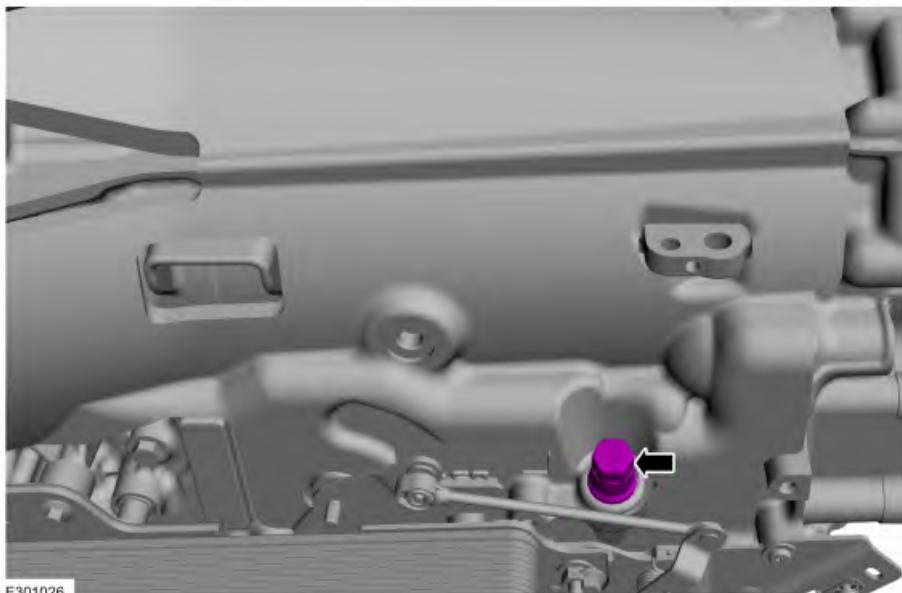
- Check the engine coolant in the degas bottle for signs of transmission fluid.

Is transmission fluid evident in the engine coolant?

Yes	INSTALL a new transmission fluid warmer. REFER to: Transmission Fluid Cooler (307-02A Transmission Cooling - 10-Speed Automatic Transmission “10R60, Removal and Installation). REPAIR the transmission as necessary.REFER to: Diagnosis By Symptom (307-01A Automatic Transmission, Transfer Case and Power Transfer Unit - 10-Speed Automatic Transmission “10R60, Diagnosis and Testing). TEST the system for normal operation.
No	GO to B9

B9 CHECK THE TRANSMISSION FLUID FOR ENGINE COOLANT

- Remove the transmission oil leveling plug.



• E301026

- Check the transmission fluid for engine coolant.

Is engine coolant evident in the transmission fluid?

Yes	INSTALL a new transmission fluid warmer. REFER to: Transmission Fluid Cooler (307-02A Transmission Cooling - 10-Speed Automatic Transmission “ 10R60, Removal and Installation). REPAIR the transmission as necessary.REFER to: Diagnosis By Symptom (307-01A Automatic Transmission, Transfer Case and Power Transfer Unit - 10-Speed Automatic Transmission “ 10R60, Diagnosis and Testing). TEST the system for normal operation.
No	GO to B10

B10 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES

NOTE: Use UView[®] Combustion Leak Tester part number UVU560000-R or equivalent.

- Using a cooling system combustion gas leak tester, following the instructions supplied with the tester, check the coolant for combustion gases.

Are combustion gases present?

Yes	REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).
No	GO to B11

B11 CHECK COOLANT CONDITION

- Check the coolant for dirt, rust or contamination and check the coolant concentration.

Is the coolant condition OK?

Yes	GO to B12
No	FLUSH the engine cooling system. REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), General Procedures).

B12 CHECK THE ELECTRIC COOLING FAN OPERATION

- Start the engine.
- Place the climate control function selector in the MAX A/C position and the blower motor switch in the HI position.

Did the electric cooling fan operate?

Yes	GO to B13
No	DIAGNOSE the electric cooling fan operation. Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual. Section 3 Symptom Charts.

B13 CHECK THE COOLANT PUMP OPERATION

- Start the engine.
- Allow the engine to run for 30 minutes. Place the climate control function selector in the MAX HEAT position. Feel the heater outlet hose.

Is the heater outlet hose hot?

Yes	GO to B14
No	INSTALL a new coolant pump. REFER to: Coolant Pump (303-03D Engine Cooling - 3.3L Duratec-V6 4-cylinder Hybrid (BP), Removal and Installation).

B14 CHECK THE THERMOSTAT OPERATION

NOTE: This cooling system uses a cold side thermostat. The coolant in the radiator must reach full operating temperature for the thermostat to remain in an open state.

- Start the engine.
- Allow the engine to run for 30 minutes. Place the climate control function selector in the MAX HEAT position. Feel the lower radiator hose.

Is the lower radiator hose hot?

Yes	CHECK the temperature gauge operation. REFER to: Instrumentation, Message Center and Warning Chimes (413-01 Instrumentation, Message Center and Warning Chimes, Diagnosis and Testing).
No	GO to B15

B15 VISUALLY INSPECT THE THERMOSTAT

- Carry out the Thermostat Visual Inspection in the Component Tests portion of this section.

Is the thermostat damaged?

Yes	INSTALL a new thermostat. REFER to: Thermostat (303-03D Engine Cooling - 3.3L Duratec-V6 â€“ Hybrid (BP), Removal and Installation).
No	INSTALL a new thermostat. REFER to: Thermostat (303-03D Engine Cooling - 3.3L Duratec-V6 â€“ Hybrid (BP), Removal and Installation). If the engine still overheats, INSTALL a new radiator.REFER to: Radiator (303-03D Engine Cooling - 3.3L Duratec-V6 â€“ Hybrid (BP), Removal and Installation).

PINPOINT TEST C : THE ENGINE DOES NOT REACH NORMAL OPERATING TEMPERATURE

Normal Operation and Fault Conditions

The engine cooling system maintains engine temperature during operation. Correct coolant flow through the engine, radiator and remainder of cooling system passages and components is essential to maintaining a correct engine temperature.

Engine coolant flows primarily from the engine to the radiator circuit and back to the coolant pump. Coolant is sent from the coolant pump through the engine block and cylinder head. A separate circuit from the engine also feeds the heater core with coolant. The coolant pump circulates the coolant. The coolant thermostat is a control valve actuated by coolant temperature. When the thermostat is closed, coolant flow bypasses the radiator circuit and returns to the coolant pump. When the thermostat is opened, coolant flows through the radiator circuit in order to transfer engine generated heat to the outside air.

Concerns of engine inability to reach normal operating temperature typically occur when the rate of coolant flow through some coolant circuits (radiator, heater core) is more than expected given the conditions. Heat is not allowed to build in the engine because a heat exchanger is removing too much heat, including the radiator, heater core and oil cooler. In addition, perceived concerns that the engine does not reach normal operating temperature can be related to a low coolant level or trapped air which does not allow for hot coolant to be available at the heater core, an inoperative climate control system, or for concerns perceived or related to an incorrect engine temperature gauge indication.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
PCM P0125:00	Insufficient Coolant Temp For Closed Loop Fuel Control: No Sub Type Information	Sets in the PCM when the CHT sensor has not achieved the required temperature level to enter closed loop operating conditions within a specified amount of time after starting the engine.
PCM P0128:00	Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature): No Sub Type Information	Sets in the PCM when the thermostat monitor has not achieved the required engine operating temperature within a specified amount of time after starting the engine.

Possible Sources

- Low coolant level
- Thermostat
- Temperature gauge
- CHT

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

C1 CARRY OUT INSPECTION AND VERIFICATION

- Carry out the Inspection and Verification procedure in this section.

Were any concerns found?

Yes	REPAIR as needed.
No	GO to C2

C2 CHECK FOR DTC P0125 OR P0128

- Using a scan tool, perform the PCM self-test.

Is DTC P0125 or P0128 present?

Yes	GO to C3
No	The cooling system is operational. If an inoperative temperature gauge is suspected, CHECK the temperature gauge operation. REFER to: Instrumentation, Message Center and Warning Chimes (413-01 Instrumentation, Message Center and Warning Chimes, Diagnosis and Testing). If an inoperative climate control system is suspected, CHECK the climate control system operation. REFER to: Climate Control System (412-00 Climate Control System - General Information, Diagnosis and Testing). If any other Diagnostic Trouble Codes (DTCs) are retrieved, REFER to: Electronic Engine Controls (303-14C Electronic Engine Controls - 3.3L Duratec-V6/3.3L Duratec-V6 â€“ Hybrid (BP), Diagnosis and Testing).

C3 CHECK THE COOLANT LEVEL

NOTE: Allow the engine to cool before checking the coolant expansion tank.

- Visually check the engine coolant level in the coolant expansion tank

Is the engine coolant level within specification?

Yes	INSTALL a new thermostat. REFER to: Thermostat (303-03D Engine Cooling - 3.3L Duratec-V6 â€“ Hybrid (BP), Removal and Installation). CLEAR Diagnostic Trouble Codes (DTCs). If the DTC returns check for correct CHT sensor operation.
No	GO to Pinpoint Test A

PINPOINT TEST D : EXHAUST HEAT EXCHANGER EXHAUST BYPASS VALVE

Refer to Wiring Diagrams Cell [40](#) for schematic and connector information.

Normal Operation and Fault Conditions

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
PCM P237C:00	Exhaust Heat Exchanger Exhaust Bypass Valve "A" Control Circuit/Open: No Sub Type Information	This DTC sets when the PCM senses an open circuit to the exhaust heat exchanger exhaust bypass valve.
PCM P237D:00	Exhaust Heat Exchanger Exhaust Bypass Valve "A" Control Circuit Low: No Sub Type Information	This DTC sets when the PCM senses low voltage on the exhaust heat exchanger exhaust bypass valve.
PCM P237E:00	Exhaust Heat Exchanger Exhaust Bypass Valve "A" Control Circuit High: No Sub Type Information	This DTC sets when the PCM senses high voltage on the exhaust heat exchanger exhaust bypass valve.
PCM P2C23:00	Exhaust Heat Exchanger Exhaust Bypass Valve "A" Position Sensor Performance: No Sub Type Information	This DTC sets when the PCM senses a valid position but has not changed since start up.

Possible Sources

- Wiring, terminals or connectors
- BJB Fuse 7 (20A).
- PCM

D1 RETRIEVE AND RECORD ALL DTCS

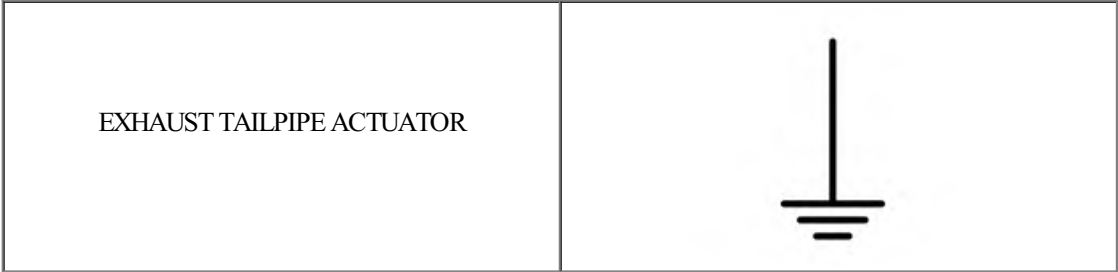
- Start the vehicle and allow engine to reach normal operating temperatures. Using the diagnostic scan tool, retrieve all DTCs.

Was DTC P237C, P237D or P237E set?

Yes	GO to D2
No	The issue may not be the Transmission Fluid Heater Coolant Control Valve electrical system. REFER to symptom chart.

D2 CHECK THE EXHAUST HEAT EXCHANGER EXHAUST BYPASS VALVE CIRCUITS FOR A SHORT TO VOLTAGE

- Disconnect BJB Fuse 7 (20A).
- Disconnect PCM [C175T](#) .
- Disconnect Exhaust heat exchanger exhaust bypass valve [C4467](#) .
- Ignition ON.
- Measure:



Positive Lead	Measurement / Action	Negative Lead
C4467-2		Ground
C4467-3		Ground
C4467-4		Ground

Is there any voltage present?

Yes	REPAIR the circuit.
No	GO to D3

D3 CHECK THE EXHAUST HEAT EXCHANGER EXHAUST BYPASS VALVE CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.
- Measure:

EXHAUST TAILPIPE ACTUATOR	
---------------------------	--

Positive Lead	Measurement / Action	Negative Lead
C4467-2	Ω	Ground
C4467-3	Ω	Ground

Are the resistances greater than 10,000 ohms?

Yes	GO to D4
No	REPAIR the circuit.

D4 CHECK THE EXHAUST HEAT EXCHANGER EXHAUST BYPASS VALVE CIRCUITS FOR AN OPEN

- Measure:

EXHAUST TAILPIPE ACTUATOR	
---------------------------	--

Positive Lead	Measurement / Action	Negative Lead
C4467-1	Ω	Ground

EXHAUST TAILPIPE ACTUATOR	
---------------------------	--

Positive Lead	Measurement / Action	Negative Lead
C4467-3	Ω	BJB fuse 7 (20A) cavity, component side

EXHAUST TAILPIPE ACTUATOR	POWERTRAIN CONTROL MODULE (PCM)
---------------------------	---------------------------------

Positive Lead	Measurement / Action	Negative Lead
C4467-2	Ω	C175T-90
C4467-4	Ω	C175T-52

Are the resistances less than 3 ohms?

Yes	GO to D5
No	REPAIR the circuit.

D5 CHECK THE EXHAUST HEAT EXCHANGER EXHAUST BYPASS VALVE CIRCUITS FOR A SHORT TOGETHER

- Measure:

EXHAUST TAILPIPE ACTUATOR

Positive Lead	Measurement / Action	Negative Lead
C4467-1	Ω	C4467-2
C4467-1	Ω	C4467-3
C4467-1	Ω	C4467-4
C4467-2	Ω	C4467-3
C4467-2	Ω	C4467-4
C4467-3	Ω	C4467-4

Are the resistances greater than 10,000 ohms?

Yes	GO to D6
No	REPAIR the circuit.

D6 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all PCM connectors.
- Repair:
 - corrosion (replace connector or terminals “clean module pins)
 - damaged or bent pins “replace terminals/pins
 - pushed-out pins “replace pins as necessary
- Reconnect all PCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	CHECK OASIS for any applicable service articles: TSB, GSB, SSM or FSA. If a service article exists for this concern, DISCONTINUE this test and FOLLOW the service article instructions. If no service articles address this concern, Click here to access Guided Routine (PCM) .
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

Refer to Wiring Diagrams Cell [24](#) for schematic and connector information.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
PCM P01E5:00	Engine Coolant Temperature Sensor 3 Circuit Low: No Sub Type Information	This DTC sets when the PCM senses low voltage on the ECT sensor 3 circuit, indicating a short to ground.
PCM P01E4:00	Engine Coolant Temperature Sensor 3 Circuit Range/Performance: No Sub Type Information	This DTC sets when the PCM senses voltage out of range on the ECT sensor 3 circuit.
PCM P01E6:00	Engine Coolant Temperature Sensor 3 Circuit High: No Sub Type Information	This DTC sets when the PCM senses high voltage on the ECT sensor 3 circuit, indicating a short to voltage.

Possible Sources

- Wiring, terminals or connectors
- ECT sensor 3
- PCM

WARNING: To prevent the risk of high-voltage shock, always follow precisely all warnings and service instructions, including instructions to depower the system. The high-voltage system utilizes approximately 300 volts DC, provided through high-voltage cables to its components and modules. The high-voltage cables and wiring are identified by orange harness tape or orange wire covering. All high-voltage components are marked with high-voltage warning labels with a high-voltage symbol. Failure to follow these instructions may result in serious personal injury or death.

NOTICE: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

NOTE: Before performing this pinpoint test, ensure the high voltage battery is at least 50 % charged. For charging information, refer to section 414-03.

E1 CHECK THE COOLANT HOSE ROUTING

NOTE: Routing of the coolant hoses is critical to proper engine cooling system operation.

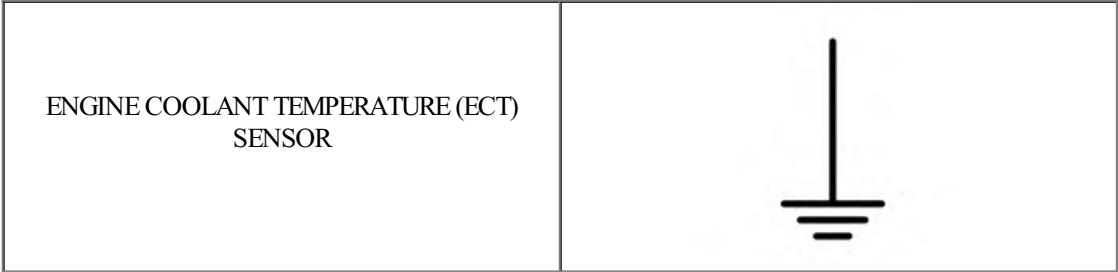
- Ignition OFF.
- Check the cabin coolant heater system hose routing. Pay close attention to the diverter valve hose routing and the top and bottom ports of the bulkhead. View the system diagrams, Refer to the appropriate Description and Operation procedure in Group 303-03.

Are the coolant hoses routed correctly?

Yes	CLEAR all Continuous Memory Diagnostic Trouble Codes (CMDTCs) from all modules. TEST system for normal operation. If the concern is still present, GO to E2
No	CORRECT the coolant hose routing. Refer to the appropriate Description and Operation procedure in Group 303-03.

E2 CHECK THE ECT (ENGINE COOLANT TEMPERATURE) SENSOR 3 CIRCUITS FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect PCM [C175B](#) .
- Disconnect ECT Sensor 3 [C1015](#) .
- Ignition ON.
- Measure:



Positive Lead	Measurement / Action	Negative Lead
C1015-1		Ground

Is there any voltage present?

Yes	REPAIR the circuit in question.
No	GO to E3

E3 CHECK THE ECT (ENGINE COOLANT TEMPERATURE) SENSOR 3 CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.
- Disconnect joint connector [C1193](#) .
- Measure:

ENGINE COOLANT TEMPERATURE (ECT) SENSOR	
--	--

Positive Lead	Measurement / Action	Negative Lead
C1015-1	Ω	Ground
C1015-2	Ω	Ground

Are the resistances greater than 10,000 ohms?

Yes	GO to E4
No	REPAIR the circuit in question.

E4 CHECK THE ECT (ENGINE COOLANT TEMPERATURE) SENSOR 3 CIRCUITS FOR AN OPEN

- Measure:

ENGINE COOLANT TEMPERATURE (ECT) SENSOR	POWERTRAIN CONTROL MODULE (PCM)
--	---------------------------------

Positive Lead	Measurement / Action	Negative Lead
C1015-1	Ω	C175B-24
C1015-2	Ω	C1193-5

Are the resistances less than 3 ohms?

Yes	GO to E5
No	REPAIR the circuit in question.

E5 CHECK THE ECT (ENGINE COOLANT TEMPERATURE) SENSOR 3 CIRCUITS FOR A SHORT TOGETHER

- Measure:

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Positive Lead	Measurement / Action	Negative Lead
C1015-1	Ω	C1015-2

Is the resistance greater than 10,000 ohms?

Yes	GO to E6
No	REPAIR the circuits.

E6 CHECK FOR CORRECT POWERTRAIN CONTROL MODULE (PCM) OPERATION

- Ignition OFF.
- Disconnect and inspect the PCM connectors.
- Repair:
 - corrosion (replace connector or terminals & clean module pins)
 - damaged or bent pins & replace terminals/pins
 - pushed-out pins & replace pins as necessary
- Reconnect the PCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	CHECK OASIS for any applicable service articles: TSB, GSB, SSM or FSA. If a service article exists for this concern, DISCONTINUE this test and FOLLOW the service article instructions. If no service articles address this concern, Click here to access Guided Routine (PCM) .
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

PINPOINT TEST F : ENGINE COOLANT TEMPERATURE SENSOR 4

Refer to Wiring Diagrams Cell [24](#) for schematic and connector information.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
PCM P2AFF:00	Engine Coolant Temperature Sensor 4 Circuit High: No Sub Type Information	This DTC sets when the PCM senses high voltage on the ECT sensor 4 circuit, indicating a short to voltage.
PCM P2AFD:00	Engine Coolant Temperature Sensor 4 Circuit Range/Performance: No Sub Type Information	This DTC sets when the PCM senses voltage out of range on the ECT sensor 4 circuit.
PCM P2AFE:00	Engine Coolant Temperature Sensor 4 Circuit Low: No Sub Type Information	This DTC sets when the PCM senses low voltage on the ECT sensor 4 circuit, indicating a short to ground.

Possible Sources

- Wiring, terminals or connectors
- ECT sensor 4
- PCM

WARNING: To prevent the risk of high-voltage shock, always follow precisely all warnings and service instructions, including instructions to depower the system. The high-voltage system utilizes approximately 300 volts DC, provided through high-voltage cables to its components and modules. The high-voltage cables and wiring are identified by orange harness tape or orange wire covering. All high-voltage components are marked with high-voltage warning labels with a high-voltage symbol. Failure to follow these instructions may result in serious personal injury or death.

NOTICE: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

NOTE: Before performing this pinpoint test, ensure the high voltage battery is at least 50 % charged. For charging information, refer to section 414-03.

F1 CHECK THE COOLANT HOSE ROUTING

NOTE: Routing of the coolant hoses is critical to proper engine cooling system operation.

- Ignition OFF.
- Check the cabin coolant heater system hose routing. Pay close attention to the diverter valve hose routing and the top and bottom ports of the bulkhead. View the system diagrams, Refer to the appropriate Description and Operation procedure in Group 303-03.

Are the coolant hoses routed correctly?

Yes	CLEAR all Continuous Memory Diagnostic Trouble Codes (CMDTCs) from all modules. TEST system for normal operation. If the concern is still present, GO to F2
No	CORRECT the coolant hose routing. Refer to the appropriate Description and Operation procedure in Group 303-03.

F2 CHECK THE ECT (ENGINE COOLANT TEMPERATURE) SENSOR 4 CIRCUITS FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect PCM [C175B](#) .
- Disconnect ECT Sensor 4 [C1016](#) .
- Ignition ON.
- Measure:

SECONDARY ENGINE COOLANT TEMPERATURE 2 (ECT2) SENSOR	
--	--

Positive Lead	Measurement / Action	Negative Lead
C1016-1		Ground

Is there any voltage present?

Yes	REPAIR the circuit in question.
No	GO to F3

F3 CHECK THE ECT (ENGINE COOLANT TEMPERATURE) SENSOR 4 CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.
- Disconnect joint connector [C1193](#) .
- Measure:

SECONDARY ENGINE COOLANT TEMPERATURE 2 (ECT2) SENSOR	
---	--

Positive Lead	Measurement / Action	Negative Lead
C1016-1	Ω	Ground
C1016-2	Ω	Ground

Are the resistances greater than 10,000 ohms?

Yes	GO to F4
No	REPAIR the circuit in question.

F4 CHECK THE ECT (ENGINE COOLANT TEMPERATURE) SENSOR 4 CIRCUITS FOR AN OPEN

- Measure:

SECONDARY ENGINE COOLANT TEMPERATURE 2 (ECT2) SENSOR	POWERTRAIN CONTROL MODULE (PCM)
--	---------------------------------

Positive Lead	Measurement / Action	Negative Lead
C1016-1	Ω	C175B-25
C1016-1	Ω	C1193-4

Are the resistances less than 3 ohms?

Yes	GO to F5
No	REPAIR the circuit in question.

F5 CHECK THE ECT (ENGINE COOLANT TEMPERATURE) SENSOR 4 CIRCUITS FOR A SHORT TOGETHER

- Measure:

SECONDARY ENGINE COOLANT TEMPERATURE 2 (ECT2) SENSOR
--

Positive Lead	Measurement / Action	Negative Lead
C1016-1	Ω	C1016-2

Is the resistance greater than 10,000 ohms?

Yes	GO to F6
No	REPAIR the circuits.

F6 CHECK FOR CORRECT POWERTRAIN CONTROL MODULE (PCM) OPERATION

- Ignition OFF.
- Disconnect and inspect the PCM connectors.
- Repair:
 - corrosion (replace connector or terminals & clean module pins)
 - damaged or bent pins & replace terminals/pins
 - pushed-out pins & replace pins as necessary
- Reconnect the PCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	CHECK OASIS for any applicable service articles: TSB, GSB, SSM or FSA. If a service article exists for this concern, DISCONTINUE this test and FOLLOW the service article instructions. If no service articles address this concern, Click here to access Guided Routine (PCM) .
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

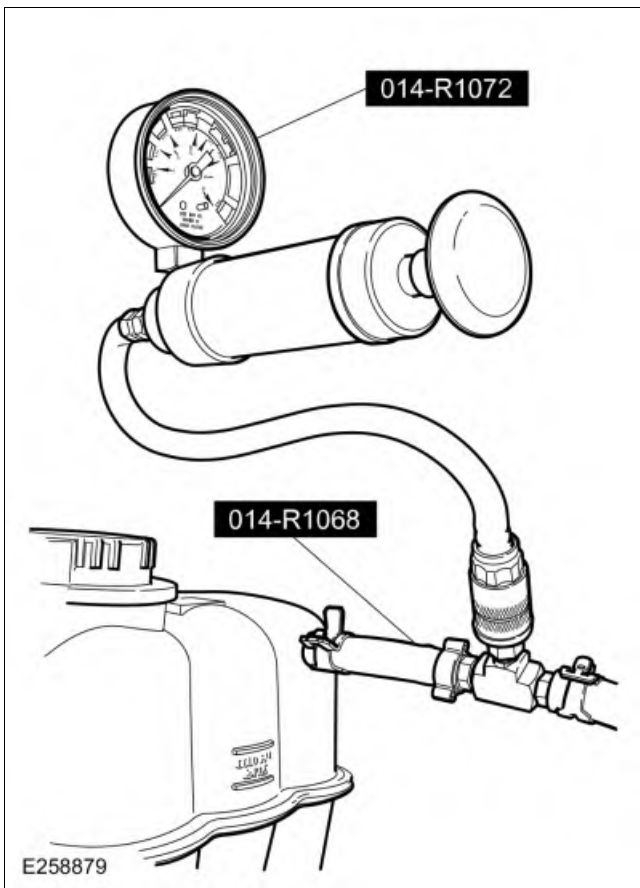
Component Tests

Cooling System Pressure Test

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

NOTE: Vehicles have a pressure relief cap on the degas bottle and no radiator cap.

1. Turn the engine OFF.
2. Check the engine coolant level and adjust as necessary.
3. Attach the Pressure Tester to the degas bottle nipple and overflow hose. Install a pressure test pump to the quick connect fitting of the test adapter.



4. **NOTICE:** Do not pressurize the cooling system beyond the maximum pressure listed in the Specifications table in this section or cooling system components may be damaged.

NOTE: If the plunger of the pressure tester is pressed too fast, an erroneous pressure reading results.

Slowly press the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained. If the pressure reading exceeds the maximum cap pressure listed in the Specifications table, install a new pressure relief cap.

5. If the system does not hold pressure, remove the pressure relief cap and wash in clean water to dislodge all the foreign material from the gasket. Check the sealing surface in the filler neck of the degas bottle for nicks or cuts. Install the pressure relief cap.
6. Pressurize the engine cooling system as described in Step 4 above. Observe the gauge reading for approximately 2 minutes. Pressure should not drop during this time. If the pressure drops within this time, inspect for leaks and repair as necessary.
7. If no leaks are found after a new pressure relief cap is installed, and the pressure drops, the leak may be internal to the engine. Inspect the coolant for engine oil and the engine oil for coolant.
REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).

8. Release the system pressure by loosening the pressure relief cap. Check the coolant level and adjust as necessary.

Thermostat

Install a new thermostat only after at least one of the following tests and checks have been carried out:

- Pinpoint Test B or C
- Thermostat Visual Inspection

Thermostat Visual Inspection

1. Remove the thermostat.
2. Examine the thermostat for signs of damage including:
 - Valve not fully seated (light visible through the valve)
 - Foreign material lodged in the main valve
 - Bent or broken frame or flange
 - Bent or broken spring
 - Wax leaking from wax reservoir or a bulge in the reservoir

- Any other damage or distortion
3. **NOTE:** *If no damage is found during the inspection, do not attempt to open the thermostat using hot water or other heat sources. This method is not an accurate means to test the function of the thermostat and may damage the thermostat.*

If damage is found during the inspection, remove any foreign material or broken pieces and install a new thermostat.

Radiator Leak Test, Removed From Vehicle

NOTICE: Never leak test an aluminum radiator in the same water that copper/brass radiators are tested in. Flux and caustic cleaners may be present in the cleaning tank and they will damage aluminum radiators.

NOTE: *Clean the radiator before leak testing to avoid contamination of tank.*

1. Leak test the radiator in clean water with air pressurized to the maximum pressure listed in the Specifications table.
-

mcx30.com

General Procedures

Engine Cooling System Draining, Vacuum Filling and Bleeding

Special Tool(s) / General Equipment

 ST1720-A	ROB75240 Coolant/Battery Refractometer (Fahrenheit)
	Fluid Container
	Cooling System Vacuum Tester and Refiller

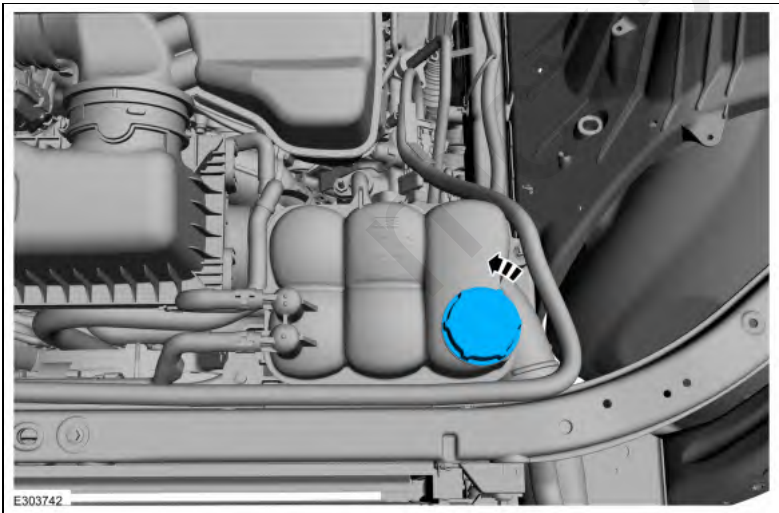
Draining

- NOTICE:** The coolant must be recovered in a suitable, clean container for reuse. If the coolant is contaminated, it must be recycled or disposed of correctly. Using contaminated coolant may result in damage to the engine or cooling system components.
- NOTICE:** Use the correct coolant. Do not mix coolant types. Mixing coolant types may degrade the coolant corrosion protection and may damage the engine or cooling system. For the correct coolant specified for this vehicle, refers to Specification.
- NOTICE:** Always fill the cooling system with the manufacturer's specified coolant. Chemically flush the cooling system if a non-specified coolant has been used. Refer to Cooling System Flushing. Failure to follow these instructions may damage the engine or cooling system.
- NOTE:** During normal vehicle operation, coolant can change color. As long as the engine coolant is clear and uncontaminated, this color change does not indicate the engine coolant has degraded nor does it require the engine coolant to be drained, the system to be flushed, or the engine coolant to be replaced.
- NOTE:** Less than 80% of coolant capacity can be recovered with the engine in the vehicle. Dirty, rusty or contaminated coolant requires replacement.

1. 
- 

⚠️**WARNING:** When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.

Remove the pressure relief cap.



2. With the vehicle in NEUTRAL, position it on a hoist.
Refer to: Jacking and Lifting - Overview (100-02 Jacking and Lifting, Description and Operation).
3. Remove the retainers and the engine underbodyshield.