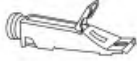
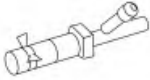


Engine Cooling

Special Tool(s)

 E144765	Coolant/Battery Refractometer ROB75240 or equivalent
 E144767	D-Gas Adapter 300-OTC014-R1068 or equivalent
 E144766	Radiator Tester 014-R1072 or equivalent
 E145674	UView® Combustion Leak Tester UVU560000-R

Diagnostic Trouble Code (DTC) Chart

Diagnostic Trouble Code Chart

Module	DTC	Description	Action <i>New: hover over Pinpoint Test links to show title</i>
PCM	P0125:00	Insufficient Coolant Temp For Closed Loop Fuel Control: No Sub Type Information	GO to Pinpoint Test C
PCM	P0128:00	Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature): No Sub Type Information	GO to Pinpoint Test C
PCM	P0217:00	Engine Coolant Overtemperature Condition: No Sub Type Information	GO to Pinpoint Test B
PCM	P1299:00	Cylinder Head Overtemperature Protection Active: No Sub Type Information	GO to Pinpoint Test B

Inspection and Verification

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. 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.

1. Verify the customer concern.
2. Visually check the engine coolant level at the degas bottle when the system is cold.
3. Make sure the pressure relief cap is installed correctly.
4. Record any cooling system Diagnostic Trouble Codes (DTCs) retrieved. Refer to the PCM DTC chart in this section for DTC descriptions.

5. **NOTE:** Take note of any coolant odor or steam coming from cooling system components.

If the system coolant is filled correctly and no Diagnostic Trouble Codes (DTCs) associated with fail-safe cooling are retrieved, verify the customer concern by operating the engine to duplicate the condition.

6. Visually inspect for obvious signs of any mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
- Leaks or weeps at: - Hoses - Tubes - Clamp joints - Gaskets - O-rings - Thermostat housing - Radiator - Pressure relief cap - Coolant pump - Heater core (wet floor or coolant odor in vehicle) - Lower intake manifold - Degas bottle - Cylinder block core plugs - Cylinder head core plugs - Cracked or damaged: - Hoses - Tubes - Hose clamps - Thermostat housing - Radiator - Pressure relief cap - Cooling fan - Cooling fan clutch - Cooling fan shroud - Radiator seals - Air deflectors - Coolant pump - Degas bottle - Oil cooler (if equipped) - 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 - Engine oil in coolant	- Inoperative or damaged: - Wiring, connectors, relays or modules - CHT sensor - Electric coolant shut off valve

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.

- 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.

REFER to: Specifications (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Specifications).

REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), 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 - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Specifications).
REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), 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 - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Specifications).
REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), 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 - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Specifications).
REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), 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 (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), 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 until the readings are within acceptable levels.
REFER to: Specifications (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), 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 Diagnostic Routine	GO to Pinpoint Test A
The engine overheats	Refer to the Diagnostic Routine	GO to Pinpoint Test B
The engine does not reach normal operating temperature	Refer to the Diagnostic Routine	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 - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Removal and Installation).
Noisy mechanical fan operation	Fan clutch	CARRY OUT the Fan Clutch Test "Minimum Speed Requirement Component Test in this section.

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
- Radiator
- Pressure relief cap
- Coolant pump leaking from weep hole
- Heater core
- Lower intake manifold
- Engine gaskets (may leak internally or externally)
- Degas bottle
- Cylinder block core plugs
- Cylinder head core plugs

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 or transmission fluid.

Is engine oil evident in the 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 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.

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 to transfer engine-generated heat to the outside air.

Engine overheating generally occurs when there is a disruption in the ability to control either coolant flow at the correct rate, the inability to transfer heat from the engine through the coolant (including low coolant) or an inability to transfer engine-generated heat to the outside air through the radiator.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
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.
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.

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
- Cooling fan
- Cooling fan clutch
- CHT sensor
- Radiator
- Thermostat
- Coolant pump
- Coolant flow restriction

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 B3
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 - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Diagnosis and Testing).

B3 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 B4

B4 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 B5

B5 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 B6

B6 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 B7

B7 CHECK THE ENGINE COOLANT FOR TRANSMISSION FLUID

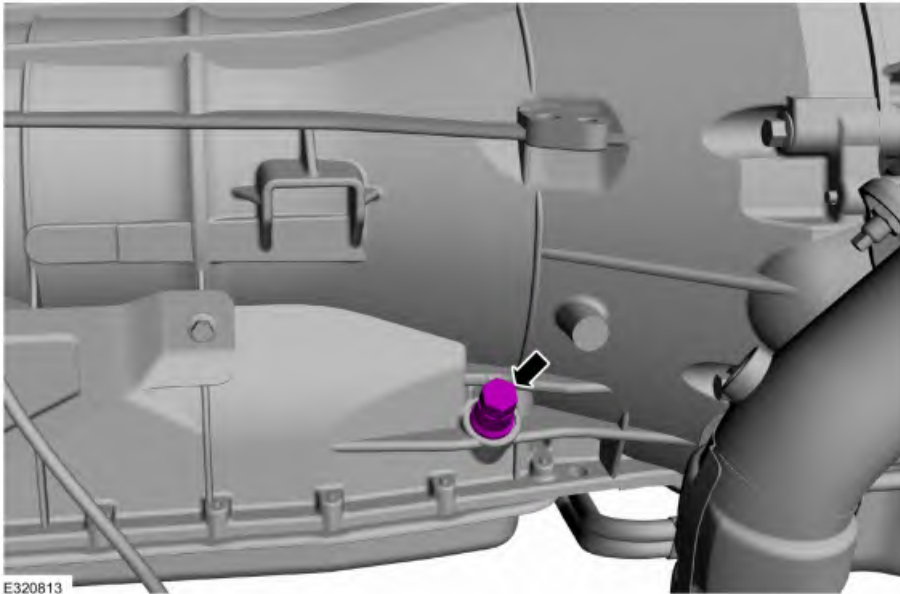
- Check the engine coolant in the degas bottle for signs of transmission fluid.

Is transmission fluid evident in the engine coolant?

Yes	INSTALL a new transmission fluid warmer. REFER to: Transmission Fluid Cooler - 6.2L V8/7.3L 2V DEVCT V8 (239kW/320PS) (J0) (307-02B Transmission Cooling - 10-Speed Automatic Transmission “ 10R140, Removal and Installation). REPAIR the transmission as necessary.REFER to: Diagnosis By Symptom (307-01B Automatic Transmission, Transfer Case and Power Transfer Unit - 10-Speed Automatic Transmission “ 10R140, Diagnosis and Testing). TEST the system for normal operation.
No	GO to B8

B8 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 - 6.2L V8/7.3L 2V DEVCT V8 (239kW/320PS) (J0) (307-02B Transmission Cooling - 10-Speed Automatic Transmission â€“ 10R140, Removal and Installation). REPAIR the transmission as necessary.REFER to: Diagnosis By Symptom (307-01B Automatic Transmission, Transfer Case and Power Transfer Unit - 10-Speed Automatic Transmission â€“ 10R140, Diagnosis and Testing). TEST the system for normal operation.
No	GO to B9

B9 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES

NOTE: Use UViewÂ® 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 B10

B10 CHECK COOLANT CONDITION

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

Is the coolant condition OK?

Yes	GO to B11
No	FLUSH the engine cooling system. REFER to: Engine Cooling System Flushing (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), General Procedures).

B11 CHECK THE COOLING FAN CLUTCH OPERATION

- Ignition OFF.
- Perform the Fan Clutch Tests in the Component Tests portion of this section.

Is the cooling fan clutch operation OK?

Yes	GO to B12
No	INSTALL a new fan clutch. REFER to: Cooling Fan (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Removal and Installation).

B12 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 B13
No	INSTALL a new coolant pump. REFER to: Coolant Pump (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Removal and Installation).

B13 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 B14

B14 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 - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Removal and Installation).
No	INSTALL a new thermostat. REFER to: Thermostat (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Removal and Installation). If the engine still overheats, INSTALL a new radiator.REFER to: Radiator (303-03D Engine Cooling - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), 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. For Dual Automatic Temperature Control (DATC), REFER to: Climate Control System - Vehicles With: Dual Automatic Temperature Control (DATC) (412-00 Climate Control System - General Information, Diagnosis and Testing). For Electronic Manual Temperature control (EMTC), REFER to: Climate Control System - Vehicles With: Electronic Manual Temperature Control (EMTC) (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 - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), 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 - 7.3L 2V DEVCT V8 (239kW/320PS) (J0), Removal and Installation). CLEAR Diagnostic Trouble Codes (DTCs). If the DTC returns check for correct CHT sensor operation.
No	GO to Pinpoint Test A

Component Tests

Cooling System Pressure Test

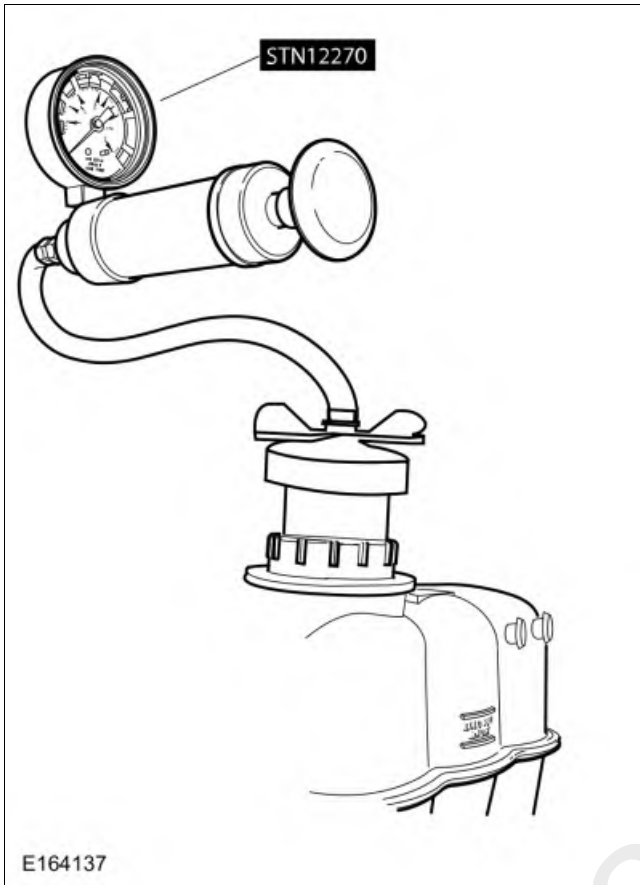
WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure 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. Remove the degas bottle cap. Inspect the degas bottle cap and degas bottle for any issues that would cause improper sealing, such as for

cross-threading, burrs, damaged o-ring, etc. If any issues are found, INSTALL a new cap and/or degas bottle.

4. Attach the Pressure Tester and adaptor (Snap-On TA53 or equivalent), to the degas bottle cap. The cap must hold pressure of 145 kPa +/- 21 kPa (21 PSI +/- 3 PSI). If any issues are found, INSTALL a new cap.
5. Attach the Pressure Tester and adaptor (Snap-On TA52, AST ASSFZ-47, Redline RDL95-0750 or equivalent) to the degas bottle.



NOTICE: Do not pressurize the cooling system beyond the maximum pressure listed in the specifications table in this section, or cooling system components can be damaged.

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

6. To pressurize the engine cooling system, slowly press the plunger of the pressure test pump and increase the pressure to between 124 - 138 kPa (18 - 20 PSI). 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 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. If the pressure does not drop remove the cooling system Pressure Tester and adaptor from degas bottle.
9. Install the degas bottle cap until it contacts the hard stop.

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.

Fan Clutch Test – Minimum Speed Requirement

1. Use a suitable marker to mark the coolant pump or fan pulley and one of the fan blades.
2. Make sure the A/C is OFF, if equipped.
3. **WARNING:** Do not stand in line with or near the engine cooling fan blade when revving the engine. A damaged fan can separate during operation. Failure to follow this instruction may result in serious personal injury.

Start the engine and run it at approximately 2,000 rpm for 5 minutes or until there is a noticeable reduction in fan noise to allow the fan clutch to go into disengaged mode.

4. Aim a laser photo tachometer at the coolant pump or fan pulley. Run the engine to achieve 3,000 rpm at the coolant pump or fan pulley.
5. Aim a laser photo tachometer at the coolant pump or fan pulley. Run the engine to achieve 3,000 rpm at the coolant pump or fan pulley.
6. With the coolant pump or fan pulley at 3,000 rpm, aim the laser photo tachometer at the fan blade. Monitor and record fan speed.
7. The fan blade speed must be less than the specified rpm at 3,000 rpm coolant pump or fan pulley rpm. Refer to Specifications in this section for correct fan speed.
8. Turn the engine off.
9. If the fan blade speed was greater than specified, install a new fan clutch.

Fan Clutch Test – Maximum Speed Requirement

1. Use a suitable marker to mark the coolant pump or fan pulley and one of the fan blades.
2. Block off areas on each side of the radiator in the engine compartment, the front of the radiator grille and the bumper. Close the hood. This will raise the temperature of the air striking the fan clutch and should cause the fan blade to operate at maximum speed.
3. Place the climate control function selector switch in the MAX A/C position and the blower motor switch in the HI position, if equipped.
4. **WARNING:** Do not stand in line with or near the engine cooling fan blade when revving the engine. A damaged fan can separate during operation. Failure to follow this instruction may result in serious personal injury.

NOTE: *Do not open the hood to check the coolant pump or fan pulley temperature. This will lower the temperature of the air reaching the fan clutch and void the test. Aim the infrared thermometer through the wheel well or from under the vehicle.*

Start the engine and run it at approximately 2,000 rpm until normal operating temperature has been achieved. Using an infrared thermometer, monitor the coolant pump or fan pulley. Run the engine until the coolant pump or fan pulley is at least 96°C (205°F).

5. **NOTE:** *Do not open the hood to check the coolant pump or fan pulley temperature. This will lower the temperature of the air reaching the fan clutch and void the test. Aim the infrared thermometer through the wheel well or from under the vehicle.*
Aim a laser photo tachometer at the coolant pump or fan pulley. Run the engine to achieve 3,000 rpm at the coolant pump or fan pulley.
6. With the coolant pump or fan pulley at 3,000 rpm, aim the laser photo tachometer at the fan blade. Monitor and record fan blade speed.
7. The fan blade speed must be greater than the specified rpm at 3,000 rpm coolant pump or fan pulley rpm. Refer to Specifications in this section for correct fan speed.

8. Open the hood and allow the engine to idle momentarily to lower engine temperature. Turn the engine off and remove the blocks from the radiator, grille and bumper.
 9. If the fan blade speed is less than specified, install a new fan clutch.
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