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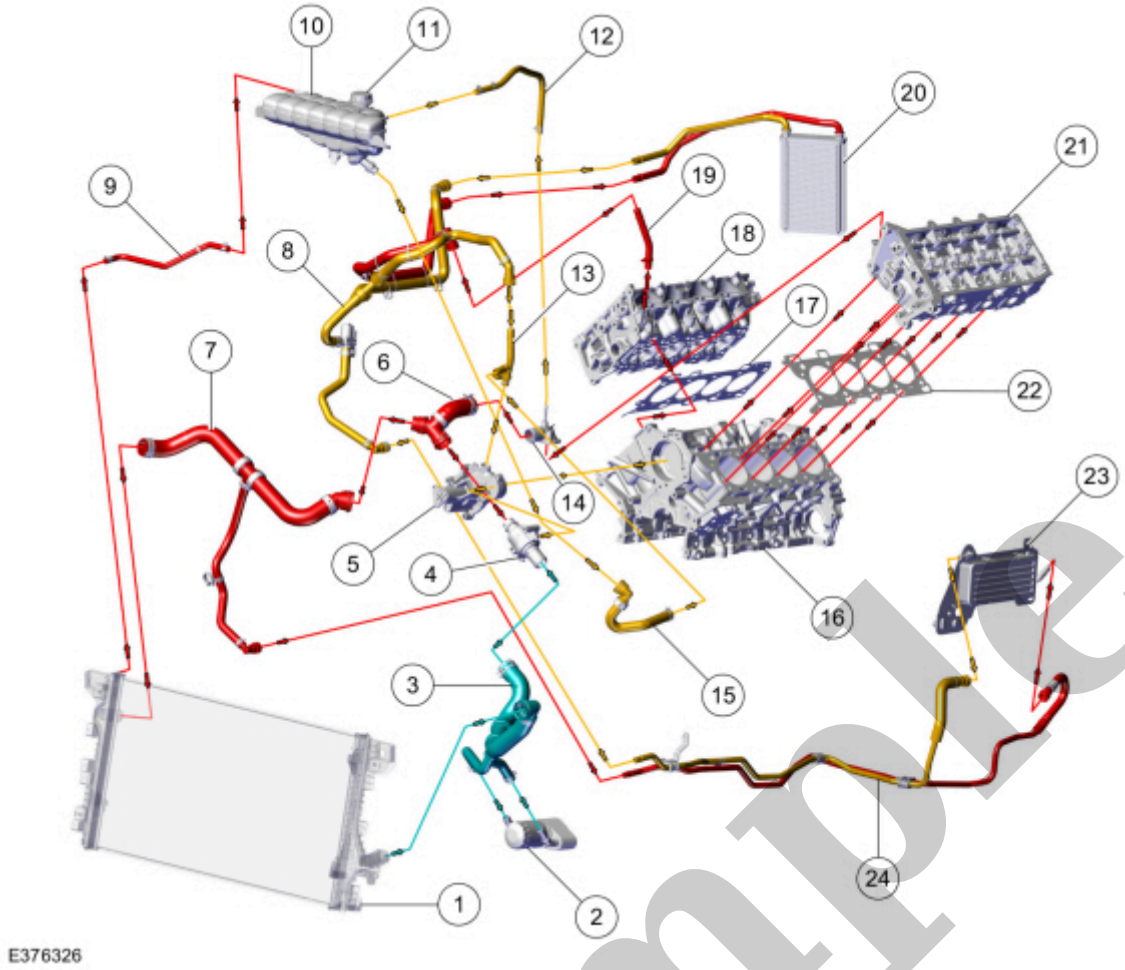
1966 FORD Mustang Convertible OEM Service and Repair Workshop Manual

Go to manual page



Item	Description
1	Radiator
2	Engine oil cooler
3	Lower radiator hose and clamp assembly
4	Thermostst housing
5	Coolant pump
6	Coolant bypass hose assembly
7	Upper radiator hose
8	Heater hose assembly

Engine Cooling - System Operation and Component Description

303-03E Engine Cooling - 5.0L 32V Ti-VCT	***2022 F-150***
Description and Operation	***Procedure revision date: 02/8/2022***

Engine Cooling - System Operation and Component Description

System Operation

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 heads. A separate circuit from the engine also feeds the heater core with coolant. The coolant pump, operated by engine rotation through the accessory drive belt, 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.

The engine uses a cold side thermostat. This means the thermostat is located at the lower radiator hose connection to the engine, where coolant enters the engine after being cooled by the radiator. During initial warm-up, the cooler coolant from the radiator quickly closes the thermostat after the warm coolant in the engine opens the thermostat slightly. The thermostat opens and closes several times before the coolant coming from the radiator is warm enough to allow the thermostat to remain open. The engine must run much longer than a vehicle with a hot side thermostat before the thermostat remains fully opened.

The degas bottle holds surplus coolant and removes air from the cooling system. It also allows for coolant expansion and system pressurization, replenishes coolant to the cooling system and serves as the location for service fill.

The thermostat monitor is a function of the PCM (powertrain control module) and is designed to verify correct thermostat operation. The monitor executes once per drive cycle and has a monitor run duration of 300-800 seconds. If a malfunction occurs, DTC (diagnostic trouble code) P0125 or P0128 sets, and the MIL (malfunction indicator lamp) illuminates.

Fail Safe Cooling

Thermostat Monitor

The thermostat monitors identify a thermostat concern.

During a cold start, when the thermostat should be closed, the thermostat monitor uses intake air temperature, engine speed, and engine load to predict the engine coolant temperature. Once the predicted temperature has exceeded a target temperature for a length of time, the actual engine coolant temperature is compared to its required threshold. This threshold is 11°C (20°F) below the thermostat regulating temperature. If the engine coolant temperature exceeds this threshold, the thermostat is functioning correctly. If the engine coolant temperature is too low, the thermostat may be stuck open and a DTC (diagnostic trouble code) sets. This monitor is executed once per drive cycle during a cold start and has a run duration of 300 seconds.

Component Description

Cabin Coolant Heater Pump (If Equipped)

The cabin heater coolant pump is available on vehicles equipped with Auto Start-Stop feature to assist in flowing coolant through the heater core. For Dual Automatic Temperature Control (DATC),

Refer to: Climate Control System - Vehicles With: Raptor High Performance Level - System Operation and Component Description

(412-00 Climate Control System - General Information, Description and Operation).

For Electronic Manual Temperature control (EMTC),Refer to: Climate Control System - Vehicles With: Electronic Manual Temperature Control (EMTC) - System Operation and Component Description

(412-00 Climate Control System - General Information, Description and Operation).

Cooling Fan

The PCM (powertrain control module) monitors certain parameters, such as engine coolant temperature, vehicle speed, A/C (air conditioning) ON/OFF status, A/C (air conditioning) pressure to determine engine cooling fan needs.

The PCM (powertrain control module) controls the fan speed and operation using a duty cycle output on the FCV circuit. The fan controller (located at or integral to the engine cooling fan assembly) receives the FCV command and operates the cooling fan at the speed requested (by varying the power applied to the fan motor).

The fan controller is able to detect certain failure modes within the fan motors. Under certain failure modes, such as a motor that is drawing excessive current, the fan controller shuts the fans off. Fan motor concerns may not set a specific DTC (diagnostic trouble code) . With the fan motor disconnected from the fan controller, voltage may not be present at the fan controller.

Cylinder Head Temperature (CHT) Sensor

Cooling Fan Control

303-03E Engine Cooling - 5.0L 32V Ti-VCT	***2022 F-150***
Diagnosis and Testing	***Procedure revision date: 10/29/2020***

Cooling Fan Control

Diagnostic Trouble Code (DTC) 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).

Diagnostic Trouble Code Chart

Module	DTC (diagnostic trouble code)	Description	Action
PCM (powertrain control module)	P0480:00	Fan 1 Control Circuit: No Sub Type Information	GO to Pinpoint Test KN

Global Customer Symptom Code (GCSC) 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).

Global Customer Symptom Code Chart

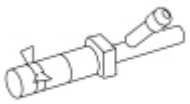
Customer Symptom	Action

Engine Cooling

303-03E Engine Cooling - 5.0L 32V Ti-VCT	***2022 F-150***
Diagnosis and Testing	***Procedure revision date: 02/8/2022***

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

Customer Symptom	Action
Driver Aides & Information > Warning Indicators/Messages/Chimes > Coolant > Stays On	GO to Pinpoint Test A
Driver Aides & Information > Warning Indicators/Messages/Chimes > Coolant > Stays On	GO to Pinpoint Test B
Start/Run/Move > Running > Overheats > Always	GO to Pinpoint Test B
Start/Run/Move > Running > Overheats > Intermittent	GO to Pinpoint Test B
Start/Run/Move > Fluids > Coolant > Consumption	GO to Pinpoint Test A
Start/Run/Move > Fluids > Coolant > Visible Leak	GO to Pinpoint Test A

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 electric cooling fan is inoperative in one or more speeds or does not operate correctly.	• Wiring • Relays • Fuses	REFER to: Cooling Fan Control(303-03E Engine Cooling - 5.0L 32V Ti-VCT, Diagnosis and Testing).

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 CHECK COMPONENTS FOR DAMAGE OR FAILURE

- Visually inspect the possible sources for obvious signs of physical damage or failure.

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?

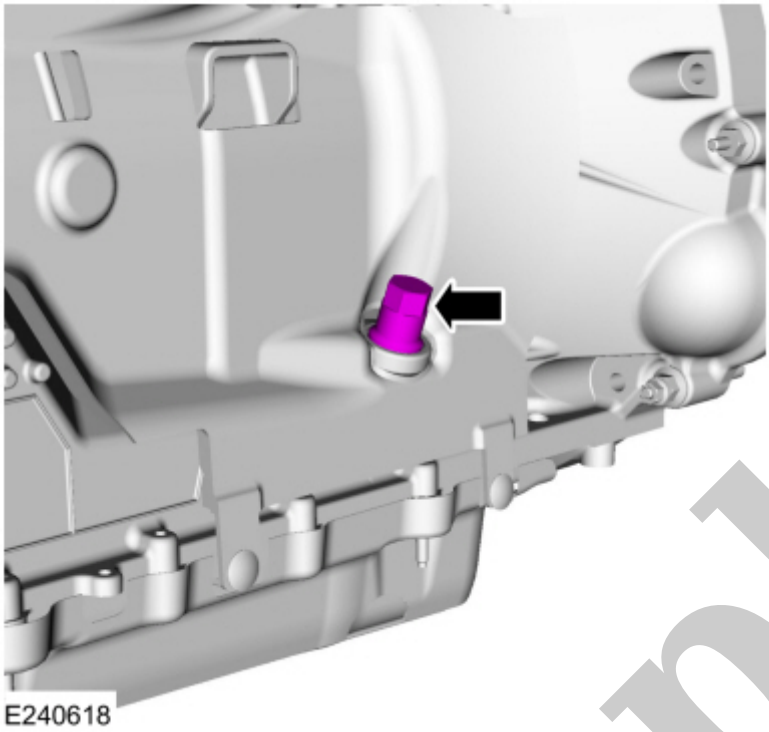
Yes	REPAIR or INSTALL new components.

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?

- 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 heat exchanger. REFER to: Transmission Fluid Heat Exchanger (307-02A Transmission Cooling - 10-Speed Automatic Transmission – 10R80, Removal and Installation). REPAIR the transmission as necessary.REFER to: Diagnosis By Symptom (307-01A Automatic Transmission - 10-Speed Automatic Transmission – 10R80, Diagnosis and Testing). TEST the system for normal operation.

No	GO to A7

A7 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES

PCM (powertrain control module) P1299:00	Cylinder Head Overtemperature Protection Active: No Sub Type Information	Sets in the PCM (powertrain control module) when an engine overheat condition was sensed by the CHT (cylinder head temperature) sensor.

Possible Sources

- Low coolant level
- External engine coolant leak
- Airlock in system
- Pressure relief cap installation
- Restricted airflow through A/C (air conditioning) condenser/radiator
- Internal engine coolant leak
- Coolant condition/concentration
- Turbochargers
- Non-OEM engine enhancement components
- Cooling fan
- Cooling fan clutch
- CHT (cylinder head temperature) sensor
- ECT (engine coolant temperature) sensor
- Radiator
- Thermostat
- Coolant pump
- Coolant flow restriction
- Active grill shutter assembly

B1 CHECK COMPONENTS FOR DAMAGE OR FAILURE

- Visually inspect the possible sources for obvious signs of physical damage or failure.

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 (powertrain control module) self-test.