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1972 FORD Mustang Convertible OEM Service and Repair Workshop Manual

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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 (diagnostic trouble code)	Description	Fault Trigger Condition
PCM (powertrain control module) P0125:00	Insufficient Coolant Temp For Closed Loop Fuel Control: No Sub Type Information	Sets in the PCM (powertrain control module) when the CHT (cylinder head temperature) 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 (powertrain control module) P0128:00	Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature): No Sub Type Information	Sets in the PCM (powertrain control module) 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 (cylinder head temperature)
- ECT (engine coolant temperature) sensor

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

Sample

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 - 3.5L V6 PowerBoost (CN), Removal and Installation). CLEAR Diagnostic Trouble Codes (DTCs). If the DTC (diagnostic trouble code) returns check for correct CHT (cylinder head temperature) sensor operation.

No	GO to Pinpoint Test A

PINPOINT TEST D : EXHAUST HEAT EXCHANGER EXHAUST BYPASS VALVE

Refer to Wiring Diagrams Cell 24for schematic and connector information.

Normal Operation and Fault Conditions DTC Fault Trigger Conditions

DTC (diagnostic trouble code)	Description	Fault Trigger Condition
PCM (powertrain control module) P237F:00	Exhaust Heat Exchanger Exhaust Bypass Valve 'A' Control Performance: No Sub Type Information	This DTC (diagnostic trouble code) sets when the PCM (powertrain control module) senses a valid position but has not changed since start up.
PCM (powertrain control module) P2C22:00	Exhaust Heat Exchanger Exhaust Bypass Valve 'A' Position Sensor Circuit: No Sub Type Information	This DTC (diagnostic trouble code) sets when the PCM (powertrain control module) senses a valid position but has not changed since start up.
PCM (powertrain control module) P237C:00	Exhaust Heat Exchanger Exhaust Bypass Valve 'A' Control Circuit/Open: No Sub Type Information	This DTC (diagnostic trouble code) sets when the PCM (powertrain control module) senses an open circuit to the exhaust heat exchanger exhaust bypass valve.

Sample

D2 CHECK THE EXHAUST HEAT EXCHANGER PID

- Access the PCM (powertrain control module) and monitor the EHE_EBVA_POS_ST (Exhaust Heat Exchanger Exhaust Bypass Valve -A- Position Fault Status) PID (parameter identification)

Does the scan tool indicate a misaligned valve?

Yes	SWITCH the ignition to the OFF position. GO to D3

No	GO to D7

D3 CHECK THE EXHAUST HEAT EXCHANGER FOR DAMAGE

- Visually inspect the exhaust heat exchanger for damage or signs of failure.
- Residual condensation from normal operation can freeze the exhaust heat exchanger valve restricting its movement. Using the Hybrid Engine Running Diagnostic Mode, run the engine to operating temperature to melt any residual ice build-up in the exhaust heat exchanger.
- Access the PCM (powertrain control module) and monitor the EHE_EBVA_POS_ST (Exhaust Heat Exchanger Exhaust Bypass Valve -A- Position Fault Status) PID (parameter identification)
- Using the diagnostic scan tool, retrieve all DTCs.

Was DTC P237C, P237D, P237E, P237F, P2C22 or P2C23 set and does the scan tool indicate a misaligned valve?

Yes	INSTALL a new muffler inlet pipe. REFER to: Muffler Inlet Pipe (309-00D Exhaust System - 3.5L V6 PowerBoost (CN), Removal and Installation).

No	CLEAR Diagnostic Trouble Codes (DTCs). GO to D4

D4 CHECK THE BJB (BATTERY JUNCTION BOX) FUSE 8

- Disconnect BJB (battery junction box) Fuse 8 (20A).
- Visually inspect the BJB (battery junction box) Fuse 8.

Is the Fuse blown?

Yes	Repair the circuit for a short to ground. Install a new fuse.

Sample

No	REPAIR the circuit.

D7 CHECK THE EXHAUST HEAT EXCHANGER BYPASS VALVE CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

- Disconnect PCM (powertrain control module) C175T .
- Disconnect Exhaust heat exchanger exhaust bypass valve C4633 .
- Ignition ON.
- Measure:

Positive Lead	Measurement / Action	Negative Lead
C4633-2	V	Ground
C4633-4	V	Ground

Is there any voltage present?

Yes	REPAIR the circuit.

No	GO to D8

D8 CHECK THE EXHAUST HEAT EXCHANGER BYPASS VALVE CONTROL CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.
- Measure:

Positive Lead	Measurement / Action	Negative Lead

Sample

- Measure:

Positive Lead	Measurement / Action	Negative Lead
C4633-1	Ω	C4633-2
C4633-1	Ω	C4633-4
C4633-2	Ω	C4633-3
C4633-2	Ω	C4633-4
C4633-3	Ω	C4633-4

Are the resistances greater than 10,000 ohms?

Yes	GO to D11

No	REPAIR the circuit.

D11 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all PCM (powertrain control module) connectors.
- Repair:
  - corrosion (replace connector or terminals – clean module pins)
  - damaged or bent pins – replace terminals/pins
  - pushed-out pins – replace pins as necessary

Sample

PCM (powertrain control module) P01E4:00	Engine Coolant Temperature Sensor 3 Circuit Range/Performance: No Sub Type Information	This DTC (diagnostic trouble code) sets when the PCM (powertrain control module) senses voltage out of range on the ECT (engine coolant temperature) sensor 3 circuit.
PCM (powertrain control module) P01E6:00	Engine Coolant Temperature Sensor 3 Circuit High: No Sub Type Information	This DTC (diagnostic trouble code) sets when the PCM (powertrain control module) senses high voltage on the ECT (engine coolant temperature) sensor 3 circuit, indicating a short to voltage.

Possible Sources

- Wiring, terminals or connectors
- ECT (engine coolant temperature) sensor 3
- PCM (powertrain control module)

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

Sample

No	GO to E3

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

- Ignition OFF.
- Disconnect joint connector C1591 .
- Measure:

Positive Lead	Measurement / Action	Negative Lead
C4631-1	Ω	Ground
C4631-2	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:

Positive Lead	Measurement / Action	Negative Lead
C4631-1	Ω	C175B-52
C4631-2	Ω	C1591-42

Sample

Yes	GO to E7

No	Install a new ECT (engine coolant temperature) sensor 3. Refer to section 303-14.

E7 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect the PCM (powertrain control module) 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 (powertrain control module) 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 (Online Automotive Service Information System) for any applicable service articles: TSB (Technical Service Bulletin) , GSB (General Service Bulletin) , SSM (special service message) or FSA (Field Service Action) . If a service article exists for this concern, DISCONTINUE this test and FOLLOW the service article instructions. If no service articles address this concern,  Guided Routine available in the on-line Workshop Manual.

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 24for schematic and connector information.

DTC Fault Trigger Conditions

Sample

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 (powertrain control module) C175T .
- Disconnect ECT (engine coolant temperature) Sensor 4 C4632 .
- Ignition ON.
- Measure:

Positive Lead	Measurement / Action	Negative Lead
C4632-1	V	Ground

Sample