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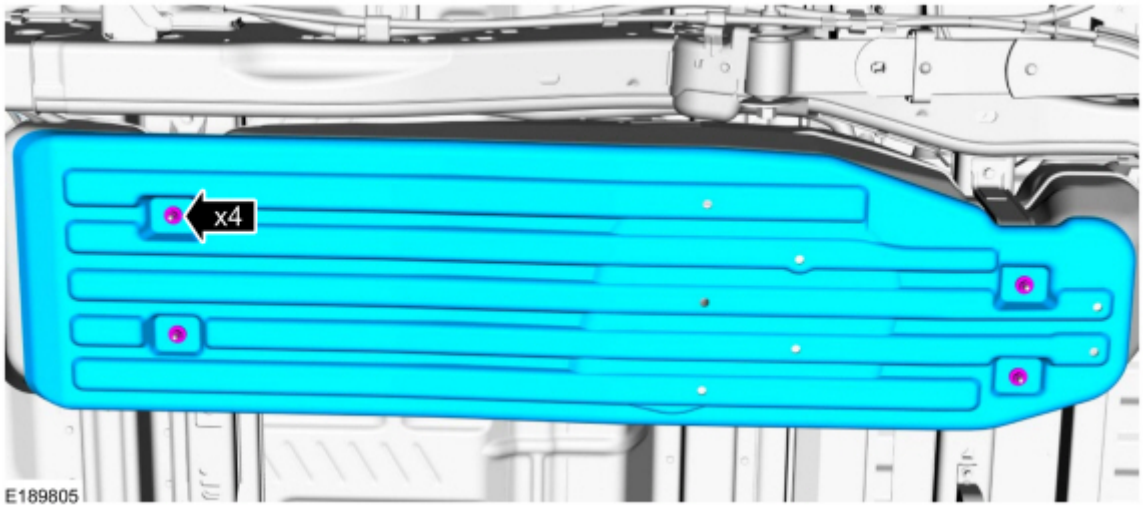
## 1991 FORD Thunderbird OEM Service and Repair Workshop Manual

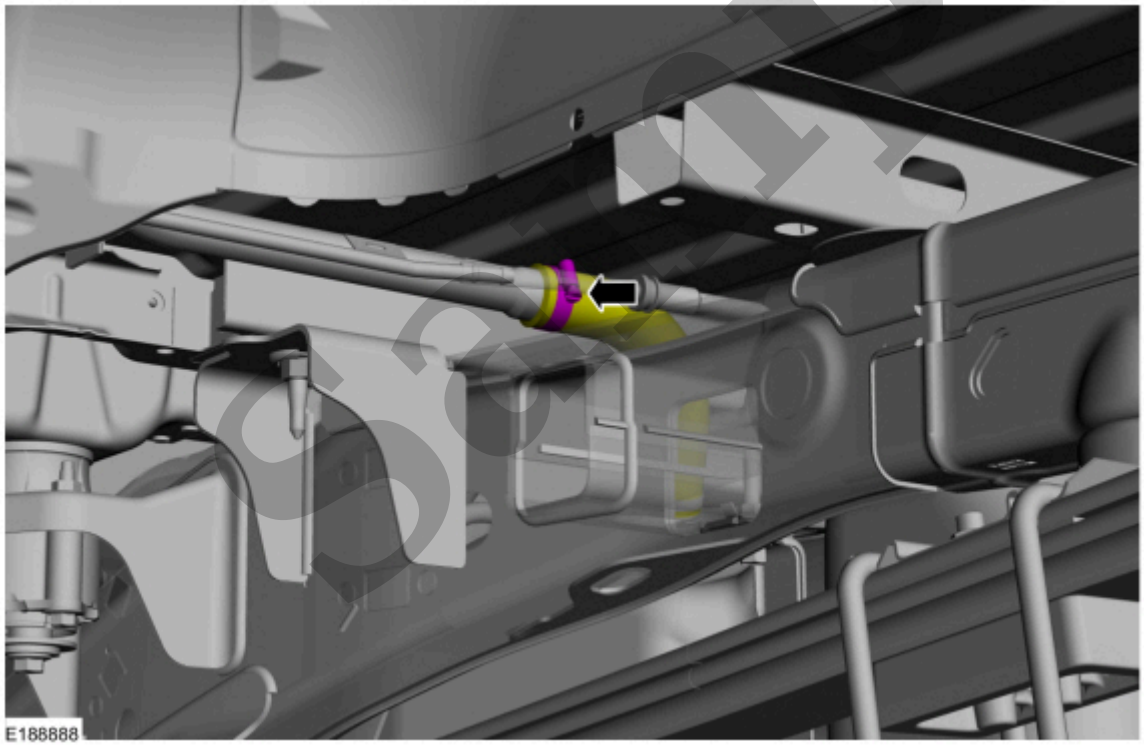
Go to manual page




Click here to learn about symbols, color coding, and icons used in this manual.

4. Release the clamp and position the fuel tank filler pipe hose aside.

   ***Torque*** : 44 lb.in (5 Nm)




Click here to learn about symbols, color coding, and icons used in this manual.

5. **NOTE**

   145 inch wheelbase shown, others similar.

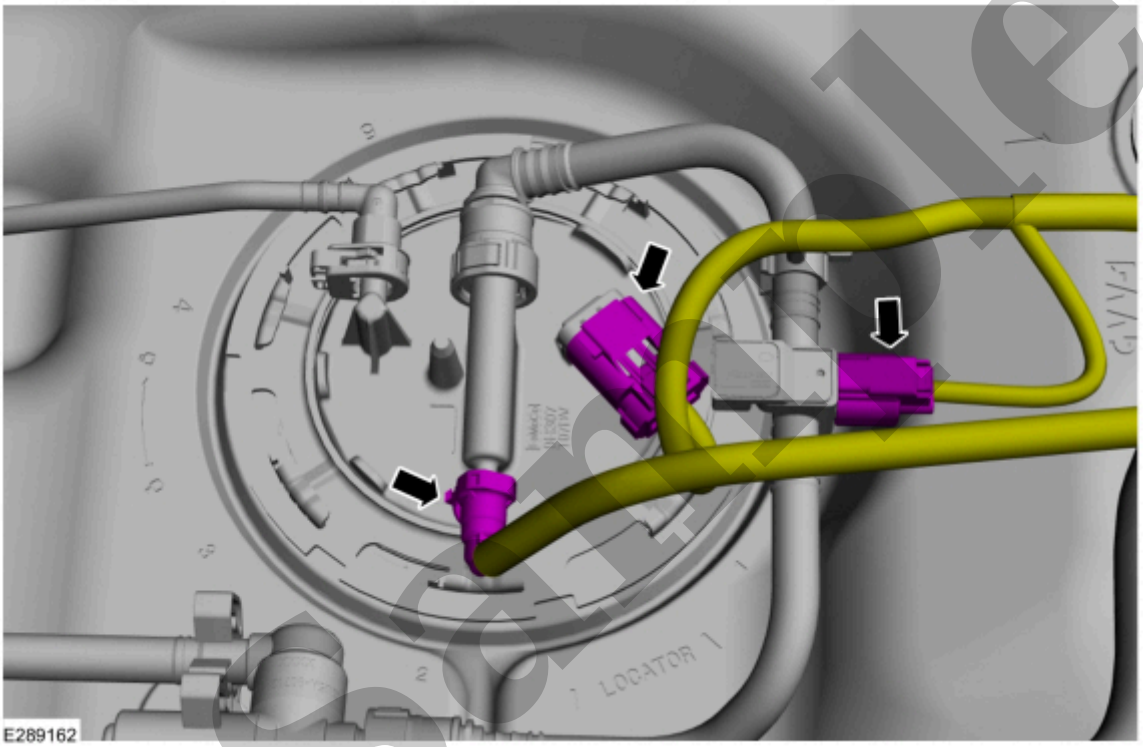
8. **NOTE**

   Make sure the fuel tank is partially lowered before disconnecting the quick release coupling and electrical connectors.

   - Disconnect the quick release coupling.

     Refer to: Quick Release Coupling(310-00C Fuel System - General Information - 3.5L EcoBoost (BM), General Procedures).

   - Disconnect the electrical connectors.






Click here to learn about symbols, color coding, and icons used in this manual.

9. Remove the fuel tank.

# Fuel Tank and Lines - System Operation and Component Description

| | |
|---|---|
| ***310-01D Fuel Tank and Lines - 3.5L V6 PowerBoost (CN)*** | ***2022 F-150*** |
| ***Description and Operation*** | ***Procedure revision date: 09/8/2021*** |

## Fuel Tank and Lines - System Operation and Component Description

System Operation

**Fuel Systems**

The fuel system supplies the fuel injectors with clean fuel at a controlled pressure. The PCM (powertrain control module) controls the fuel pump and monitors the fuel pump circuit. The PCM (powertrain control module) controls the fuel injector ON/OFF cycle duration and determines the correct timing and amount of fuel delivered. When a new fuel injector is installed it is necessary to reset the learned values contained in the KAM (keep alive memory) in the PCM (powertrain control module) .

The mechanical returnless fuel system (MRFS) can be configured with a dual or variable speed fuel pump. The mechanical returnless fuel system (MRFS) incorporates a fuel pump control module which is used to control the speed of the fuel pump.

The mechanical returnless fuel system (MRFS) uses a fuel tank with reservoir, the fuel pump, the fuel pump control module, the fuel pressure regulator, the fuel filter, the fuel supply line, the fuel rail, and fuel injectors.

For vehicles with gasoline direct fuel injection, a pressure accumulator is incorporated into the fuel line to prevent fuel vapor formation after several hours of cold soak and reduce crank time.

- The fuel delivery system is enabled during PCM (powertrain control module) wake up for 1 second and during crank or running mode once the PCM (powertrain control module) receives a valid CKP (crankshaft position) sensor signal. For the PCM (powertrain control module) wake up circuit diagnostics, refer to the workshop section 303-06. On vehicles with gasoline direct fuel injection, the high pressure fuel system may be under vacuum after several hours of cold soak. Fuel vapor may collect at the fuel injection pump, causing a long start condition. To prevent this, the fuel pump relay is energized, depending on application, when the PCM (powertrain control module) receives a calibrated signal. This

| FP Duty Cycle Command | PCM (powertrain control module) Status | Fuel Pump Control Module Actions |
|---|---|---|
| 0-5% | Invalid OFF duty cycle. | The fuel pump control module sends a 20% duty cycle signal on the FPM circuit. The fuel pump is OFF. |
| 5-47% | Normal operation. | The fuel pump control module operates the fuel pump at the speed requested. fuel pump (FP) duty cycle times 1.43 minus 14.29 equals pump speed % of full ON. For example, fuel pump (FP) duty cycle equals 42%. 42 times 1.43 minus 14.29 equals 46 (rounded). Pump is run at 46% of full ON. The fuel pump control module sends a 60% duty cycle signal on the FPM circuit. |
| 47-51% | Normal operation - full ON. | The fuel pump control module operates the fuel pump at full ON. The fuel pump control module sends a 60% duty cycle signal on the FPM circuit. |
| 51-67% | Invalid OFF duty cycle. | The fuel pump control module sends a 20% duty cycle signal on the FPM circuit. The fuel pump is OFF. |
| 67-83% | Valid OFF duty cycle. | The fuel pump control module sends a 60% duty cycle signal on the FPM circuit. The fuel pump is OFF. |
| 83-100% | Invalid ON duty cycle. | The fuel pump control module sends a 20% duty cycle signal on the FPM circuit. The fuel pump is OFF. |



**Fuel Pump Monitor (FPM)**

The fuel pump control module communicates diagnostic information to the PCM (powertrain control module) through the FPM circuit. This information is sent by the fuel pump control module as a duty cycle signal. The duty cycle signals that may be sent are listed in the following table.

**Fuel Pump Control Module Duty Cycle Signals**

| Duty Cycle | Comments |
|---|---|
| 20% | This duty cycle indicates the fuel pump control module is receiving an invalid duty cycle from the PCM (powertrain control module) . |

fuel pump control module sends diagnostic information to the PCM (powertrain control module)  on the FPM circuit.

On vehicles with gasoline direct fuel injection, the high pressure fuel system may be under vacuum after several hours of cold soak. Fuel vapor may collect at the fuel injection pump, causing a long start condition. To prevent this, the fuel pump relay is energized, depending on application, when the PCM (powertrain control module)  receives a calibrated signal. This causes the fuel pump control module and the fuel pump to cycle and purge any trapped air or fuel vapor from the high pressure fuel system.

| | | | |
|---|---|---|---|
| PCM (powertrain control module) | P025B:00 | Fuel Pump Module A Control Circuit Range/Performance: No Sub Type Information | GO to Pinpoint Test KC |
| PCM (powertrain control module) | P0627:00 | Fuel Pump A Control Circuit/Open: No Sub Type Information | GO to Pinpoint Test KC |
| PCM (powertrain control module) | P064A:00 | Fuel Pump Control Module A: No Sub Type Information | GO to Pinpoint Test KC |
| PCM (powertrain control module) | P166A:00 | Restraints Deployment Communication Circuit: No Sub Type Information | GO to Pinpoint Test KC |
| PCM (powertrain control module) | U0109:00 | Lost Communication With Fuel Pump Control Module A: No Sub Type Information | GO to Pinpoint Test KC |

**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 |
|---|---|
| Start/Run/Move > Starting > Hard Start/Long Crank > Always | GO to Pinpoint Test HC |
| Start/Run/Move > Starting > Hard Start/Long Crank > Hot | GO to Pinpoint Test HC |
| Driving Performance > Lack/Loss of Power > Cruise/ Steady Speed > Always | GO to Pinpoint Test HC |
| Driving Performance > Hesitates/Stumble > Cruise/ Steady Speed > Hot | GO to Pinpoint Test HC |

**Pinpoint Tests**

**PINPOINT TEST HC : FUEL DELIVERY SYSTEM**

Replacement fuel injectors may not be the same color as the original injectors in the vehicle. Verify the replacement injector is correct for the application by part number.

Refer to Wiring Diagrams Cell 024for schematic and connector information.

**Normal Operation and Fault Conditions** Refer to the DTC (diagnostic trouble code) Fault Trigger Conditions. **DTC Fault Trigger Conditions**

| DTC (diagnostic trouble code) | Description | Fault Trigger Condition |
|---|---|---|
| PCM (powertrain control module) P008A:00 | Low Pressure Fuel System Pressure - Too Low: No Sub Type Information | Sets when PCM (powertrain control module) detects the low pressure fuel system pressure falls below an expected threshold. |
| PCM (powertrain control module) P008B:00 | Low Pressure Fuel System Pressure - Too High: No Sub Type Information | Sets when PCM (powertrain control module) detects the low pressure fuel system pressure rises above an expected threshold. |

**Possible Sources**

- High ethanol content
- Fuel supply line
- Low fuel level
- MAF (mass air flow) sensor
- Fuel pressure sensor
- Fuel filter (9155)
- Fuel injector (9F593)
- Fuel pump (9H307)

**Pinpoint Test Steps available in the on-line Workshop Manual.**

**PINPOINT TEST KC : FUEL PUMP CONTROL MODULE**

**WARNING**

Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

| | | |
|---|---|---|
| module) P025A:00 | No Sub Type Information | commands the fuel pump ON, the PCM (powertrain control module) is able to detect a short to voltage on the fuel pump command circuit. When the PCM (powertrain control module) commands the fuel pump OFF, the PCM (powertrain control module) is able to detect an open circuit or a short to ground from the fuel pump command circuit. |
| PCM (powertrain control module) P025B:00 | Fuel Pump Module 'A' Control Circuit Range/Performance: No Sub Type Information | Sets when the PCM (powertrain control module) detects the fuel pump control module is still reporting an invalid duty cycle or frequency from the PCM (powertrain control module) after a calibrated amount of time. The fuel pump control module monitors the duty cycle and frequency of the signal it receives from the PCM (powertrain control module) . The fuel pump control module determines if the signal from the PCM (powertrain control module) on the fuel pump command circuit is a valid duty cycle and frequency. If the duty cycle or frequency is invalid, the fuel pump control module sends a 20% duty cycle signal on the fuel pump monitor circuit to report the concern to the PCM (powertrain control module) . Check the harness for routing, alterations, incorrect shielding, or electrical interference from other systems. |
| PCM (powertrain control module) P0627:00 | Fuel Pump 'A' Control Circuit/Open: No Sub Type Information | Sets when the PCM (powertrain control module) detects the fuel pump control module is reporting a concern with the fuel pump module or secondary circuits after a calibrated amount of time. The fuel pump control module monitors the fuel pump module and secondary circuits for a concern. If the fuel pump control module detects a concern with the fuel pump module or secondary circuits, the fuel pump control module sends an 80% duty cycle signal on the fuel pump monitor circuit to report the concern to the PCM (powertrain control module) . |
| PCM (powertrain control module) P064A:00 | Fuel Pump Control Module 'A': No Sub Type Information | Sets when the PCM (powertrain control module) detects the fuel pump control module has an internal concern. Clear the PCM (powertrain control module) Diagnostic Trouble Codes (DTCs). Repeat the self-test. If the DTC (diagnostic trouble code) is retrieved again, install a new fuel pump control module. Refer to the appropriate 303-04 section, Fuel Charging And Controls. |

# Fuel Level Sender

| | |
|---|---|
| ***310-01D Fuel Tank and Lines - 3.5L V6 PowerBoost (CN)*** | ***2022 F-150*** |
| ***Removal and Installation*** | ***Procedure revision date: 10/1/2020*** |

## Fuel Level Sender

### Removal

**NOTE**

Removal steps in this procedure may contain installation details.

1. Remove the Fuel Pump and Sender Unit.

   Refer to: Fuel Pump and Sender Unit(310-01D Fuel Tank and Lines - 3.5L V6 PowerBoost (CN), Removal and Installation).

2. Disconnect the electrical connector.