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2022 Ford Police Interceptor Utility Service and Repair Manual

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The EVAP (evaporative emission) canister vent valve seals the EVAP (evaporative emission) system to atmosphere during the EVAP (evaporative emission) leak check monitor.

The PCM (powertrain control module) outputs a duty cycle between 0% and 100% to control the EVAP (evaporative emission) purge valve.

The FTP sensor monitors the fuel tank pressure during engine operation and continuously transmits an input signal to the PCM (powertrain control module). During the EVAP (evaporative emission) monitor testing, the FTP sensor monitors the fuel tank pressure or vacuum bleed up.

The vapor blocking valve is used to isolate the fuel tank from the rest of the EVAP (evaporative emission) system for more efficient canister purging.

A valve inside the fuel tank mounted fuel vapor tube assembly prevents liquid fuel from entering the EVAP (evaporative emission) canister and the EVAP (evaporative emission) purge valve under any vehicle altitude, handling, or rollover condition.

The EVAP (evaporative emission) check valve prevents boost pressure from entering the EVAP (evaporative emission) system.

The EVAP (evaporative emission) ejector is used to create a vacuum in the purge line during boost conditions. When in boost conditions a percentage of the boost pressure is applied to the EVAP (evaporative emission) ejector to create a vacuum. This vacuum draws purge vapors through the EVAP (evaporative emission) ejector into the intake air system upstream of the turbocharger.

The normally open VBV (vapor blocking valve) is a PCM (powertrain control module) controlled valve that blocks the flow of vapors from the fuel tank to the EVAP (evaporative emission) canister during engine operation. Closing the VBV (vapor blocking valve) during engine operation allows the EVAP (evaporative emission) system to purge the EVAP (evaporative emission) canister without purging the fuel tank. The VBV (vapor blocking valve) will open to relieve excess fuel tank pressure if the fuel tank pressure reaches a maximum calibrated value.

Evaporative Emission (EVAP) Leak Check Monitor

The EVAP (evaporative emission) leak check monitor is an on board strategy designed to detect a leak from an opening equal to or greater than 0.5 mm (0.020 inch) in the EVAP (evaporative emission) system. The correct function of the individual components of the EVAP (evaporative emission) system, as well as its ability to flow fuel vapor to the engine, is also examined. The EVAP (evaporative emission) leak check monitor relies on the individual components of the EVAP (evaporative emission) system to either allow a natural vacuum to occur in the fuel tank or apply engine vacuum to the fuel tank and then seal the entire EVAP (evaporative emission) system from the atmosphere. The fuel tank pressure is then monitored to determine the total vacuum lost (bleed up) for a calibrated period of time. Inputs from the CHT (cylinder head temperature) sensor or the ECT (engine coolant temperature) sensor, IAT (intake air temperature) sensor, MAF (mass air flow) sensor (if equipped), vehicle speed, fuel level input (FLI) and fuel tank pressure (FTP) sensor, are required to enable the EVAP (evaporative emission) leak check monitor.

system passes. If the calibrated bleed up exceeds the calibrated threshold, the test aborts. The test can be repeated up to 3 times.

- If the bleed up threshold is still being exceeded after 3 tests, a vapor generation test is carried out before DTC P0442 (small leak detected) sets. This is accomplished by returning the EVAP (evaporative emission) system to atmospheric pressure by closing the EVAP (evaporative emission) purge valve and opening the EVAP (evaporative emission) canister vent valve. Once the FTP sensor observes the fuel tank is at atmospheric pressure, the EVAP (evaporative emission) canister vent valve closes and seals the EVAP (evaporative emission) system.
- The fuel tank pressure build up over a calibrated period of time is compared to a calibrated threshold for pressure build up due to vapor generation. If the fuel tank pressure build up exceeds the threshold, the leak test results are invalid due to vapor generation. The engine on EVAP (evaporative emission) leak check monitor attempts to repeat the test again. If the fuel tank pressure build up does not exceed the threshold, the leak test results are valid and DTC P0442 sets.
- If the 1.0 mm (0.040 inch) test passes, the test time is extended to allow the 0.5 mm (0.020 inch) test to run. The calculated change in fuel vacuum over the extended time is compared to a calibrated threshold for a leak from a 0.5 mm (0.020 inch) opening. If the calculated bleed up exceeds the calibrated threshold, the vapor generation test is run. If the vapor generation test passes (no vapor generation), an internal flag sets in the PCM (powertrain control module) to run a 0.5 mm (0.020 inch) test at idle (vehicle stopped). On the next start following a long engine OFF period, the EVAP (evaporative emission) system is sealed and evacuated for the first 10 minutes of operation. If the appropriate conditions are met, a 0.5 mm (0.020 inch) leak check is conducted at idle. If the test at idle fails, DTC P0456 sets. There is no vapor generation test with the idle test.
- The MIL (malfunction indicator lamp) is activated for any EVAP (evaporative emission) system component DTCs.

Engine Off Natural Vacuum (EONV) EVAP Leak Check Monitor

The EONV EVAP (evaporative emission) leak check monitor is executed during ignition OFF, after the engine on EVAP (evaporative emission) leak check monitor is completed. The EONV EVAP (evaporative emission) leak check monitor determines a leak is present when the naturally occurring change in fuel tank pressure or vacuum does not exceed a calibrated limit during a calibrated amount of time. A separate, low power consuming, microprocessor in the PCM (powertrain control module) manages the EONV leak check. The engine OFF EVAP (evaporative emission) leak check monitor is executed by the individual components of the EVAP (evaporative emission) system as follows:

- The EVAP (evaporative emission) purge valve is normally closed at ignition OFF.
- The normally open EVAP (evaporative emission) canister vent valve remains open for a calibrated amount of time to allow the fuel tank pressure to stabilize with the atmosphere. During this time period the FTP sensor is monitored for an increase in pressure. If pressure remains below a calibrated limit the

(powertrain control module) suspects a leak within 2 consecutive trips after a DTC clear or a battery disconnect using the fast initial response logic. A step change logic becomes active after the 4th EONV EVAP (evaporative emission) monitor test. The step change logic detects an abrupt change from a no leak condition to a suspected leak condition. The MIL (malfunction indicator lamp) illuminates if the PCM (powertrain control module) suspects a leak within 2 consecutive trips using the step change logic. During the EONV EVAP (evaporative emission) monitor test the PCM (powertrain control module) uses an exponentially weighted moving average to filter test data. The PCM (powertrain control module) uses this average after the fourth EONV EVAP (evaporative emission) test and illuminates the MIL (malfunction indicator lamp) on the first trip when the exponentially weighted moving average is greater than a calibrated threshold. When a leak is suspected a DTC sets and the MIL (malfunction indicator lamp) is illuminated.

- The EONV EVAP (evaporative emission) leak check monitor is controlled by a separate low power consuming microprocessor inside the PCM (powertrain control module). The fuel level input, fuel tank pressure, and battery voltage are inputs to the microprocessor. The microprocessor outputs are the EVAP (evaporative emission) canister vent valve and the stored test information. If the separate microprocessor is unable to control the EVAP (evaporative emission) canister vent valve or communicate with other processors a DTC sets.
- The MIL (malfunction indicator lamp) is activated for any EVAP (evaporative emission) system component DTCs.

Component Description

Evaporative Emission (EVAP) Canister Vent Valve

The EVAP (evaporative emission) canister vent valve (located in the EVAP (evaporative emission) canister dust box) is part of the EVAP (evaporative emission) system controlled by the PCM (powertrain control module). During the EVAP (evaporative emission) leak check monitor, the EVAP (evaporative emission) canister vent valve seals the EVAP (evaporative emission) canister from the atmospheric pressure. This allows the EVAP (evaporative emission) purge valve to achieve the target vacuum in the fuel tank during the EVAP (evaporative emission) leak check monitor.

Evaporative Emission (EVAP) Check Valve

The EVAP (evaporative emission) check valve is used on turbocharged engines to prevent boost pressure from forcing open the EVAP (evaporative emission) purge valve and entering the EVAP (evaporative emission) system. The valve is open under normal engine vacuum. The valve closes during boost conditions to prevent the fuel tank from being pressurized and hydrocarbons forced out of the EVAP (evaporative emission) system into the atmosphere through the EVAP (evaporative emission) canister vent valve. When the engine is OFF, or at atmospheric pressure, the EVAP (evaporative emission) check valve is in an indeterminate state. The EVAP (evaporative emission) check valve is an integral part of the EVAP (evaporative emission) purge valve assembly.

Evaporative Emissions

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| 303-13C Evaporative Emissions - 3.5L EcoBoost (BM) | 2022 F-150 |
| Diagnosis and Testing | Procedure revision date: 08/4/2021 |

Evaporative Emissions

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) | P00FE:00 | EVAP System Tank Vapor Line Restricted/Blocked: No Sub Type Information | GO to Pinpoint Test HX |
| PCM (powertrain control module) | P0442:00 | EVAP System Leak Detected (Small Leak): No Sub Type Information | GO to Pinpoint Test HX |
| PCM (powertrain control module) | P0443:00 | EVAP System Purge Control Valve A Circuit: No Sub Type Information | GO to Pinpoint Test HX |
| PCM (powertrain control module) | P0446:00 | EVAP System Vent Control Circuit: No Sub Type Information | GO to Pinpoint Test HX |

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|---------------------------------|----------|---|--|
| PCM (powertrain control module) | P1450:00 | Unable To Bleed Up Fuel Tank Vacuum: No Sub Type Information | GO to Pinpoint Test HX |
| PCM (powertrain control module) | P2418:00 | EVAP System Switching Valve Control Circuit/Open: No Sub Type Information | GO to Pinpoint Test HX |
| PCM (powertrain control module) | P2450:00 | EVAP System Switching Valve Performance/Stuck Open: No Sub Type Information | GO to Pinpoint Test HX |
| PCM (powertrain control module) | P260F:00 | EVAP System Monitoring Processor Performance: No Sub Type Information | GO to Pinpoint Test HX |

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 |
|---|--|
| Driving Performance > Idle Quality > Rough > Always | GO to Pinpoint Test HX |
| Driving Performance > Stalls/Quits > At Idle > Always | GO to Pinpoint Test HX |
| Driving Performance > Engine Surge > At Idle > Always | GO to Pinpoint Test HX |

Pinpoint Tests

PINPOINT TEST HX : EVAPORATIVE EMISSION (EVAP) SYSTEM AND MONITOR

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

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| | | <p>than expected, a restricted fuel vapor tube is suspected and an intrusive test is carried out in the final phase of the EVAP (evaporative emission) monitor. Check the fuel vapor tube for a restriction between the fuel tank pressure sensor and the fuel tank.</p> |
| <p>PCM (powertrain control module) P0442:00</p> | <p>EVAP System Leak Detected (small leak): No Sub Type Information</p> | <p>Sets when the PCM (powertrain control module) detects a small fuel vapor leak by the EVAP (evaporative emission) running loss monitor test. Check for a missing fuel filler cap or the integrity of the cap (if equipped). Verify the capless fuel tank filler pipe is sealed correctly (if equipped). Install and remove the supplemental fueling adapter five times in the capless fuel tank filler pipe to clear debris on the seal. Refer to the Owner Literature for the location of the supplemental fueling adapter in the vehicle. Check for loose or damaged vapor hoses. Visually inspect the EVAP (evaporative emission) canister inlet port, EVAP (evaporative emission) canister vent valve filter, and canister vent hose assembly for contamination or debris.</p> |
| <p>PCM (powertrain control module) P0443:00</p> | <p>EVAP System Purge Control Valve 'A' Circuit: No Sub Type Information</p> | <p>Sets when the PCM (powertrain control module) detects the signal moves outside the minimum or maximum limit for the commanded state. To verify normal function, monitor the EVMV PID (parameter identification) or EVAP canister pressure PID (parameter identification) and the signal voltage (PCM (powertrain control module) control side). With the valve closed, the EVMV indicates 0 mA (0% duty cycle for EVAP (evaporative emission) canister pressure) and voltage approximately equal to battery voltage. When the valve is commanded fully open, EVMV indicates 1,000 mA (100% duty cycle for EVAP (evaporative emission) canister pressure) and a voltage drop of 3 volts minimum is normal.</p> |
| <p>PCM (powertrain control module) P0446:00</p> | <p>EVAP System Vent Control Circuit: No Sub Type Information</p> | <p>Sets when the PCM (powertrain control module) detects the signal moves outside the minimum or maximum allowable calibrated parameters for a specified EVAP (evaporative emission) canister vent valve duty cycle by PCM (powertrain control module) command. To verify normal function, monitor the EVAP canister vent valve signal PID (parameter identification) EVAP (evaporative emission) canister vent and the signal voltage (PCM (powertrain control module) control side). With the valve open, EVAP (evaporative emission) canister vent indicates 0% duty cycle and a</p> |

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| module) P0455:00 | No Sub Type Information | (evaporative emission) running loss monitor test with the engine running, but not at idle. The PCM (powertrain control module) monitors the complete EVAP (evaporative emission) control system for no purge flow, the presence of a large fuel vapor leak, or multiple small fuel vapor leaks. Check for audible vacuum noise or significant fuel odor in the engine compartment or near the EVAP (evaporative emission) canister and fuel tank. Verify the capless fuel tank filler pipe is sealed correctly. Install and remove the supplemental fueling adapter five times in the capless fuel tank filler pipe to clear debris on the seal. Refer to the Owner's Literature for the location of the supplemental fueling adapter in the vehicle. |
| PCM (powertrain control module) P0456:00 | EVAP System Leak Detected (very small leak); No Sub Type Information | Sets when the PCM (powertrain control module) detects a very small fuel vapor leak by the engine off natural vacuum leak check monitor. Refer to the EVAP (evaporative emission) Leak Check Monitor, Engine Off Natural Vacuum Leak Check Monitor description for additional information. Check for a missing fuel filler cap or the integrity of the cap (if equipped). Verify the capless fuel tank filler pipe is sealed correctly (if equipped). Install and remove the supplemental fueling adapter five times in the capless fuel tank filler pipe to clear debris on the seal. Refer to the Owner's Literature for the location of the supplemental fueling adapter in the vehicle. Check for loose or damaged vapor hoses. Visually inspect the EVAP (evaporative emission) canister inlet port, EVAP (evaporative emission) canister vent valve filter, and EVAP (evaporative emission) canister vent hose assembly for contamination or debris. |
| PCM (powertrain control module) P0457:00 | EVAP System Leak Detected (fuel cap loose/off); No Sub Type Information | Sets when the PCM (powertrain control module) detects a gross leak while the refueling flag is set and a loose fuel filler cap (if equipped) or an incorrectly sealed capless fuel tank filler pipe (if equipped) is suspected. On most vehicles, a message on the IPC (instrument panel cluster) displays to instruct the driver to check the fuel cap or capless fuel tank filler pipe (if equipped). The PCM (powertrain control module) continuously monitors the fuel level and retains the last updated value prior to the ignition being placed in the OFF mode. After the ignition is placed in the ON mode, a new fuel level is taken and compared to the level recorded at ignition OFF. If the fuel level has increased, a flag is set in the PCM (powertrain control module) indicating the vehicle was |

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| | | vacuum increases quicker than expected, a restricted fuel vapor tube is suspected and an intrusive test is carried out in the final phase of the EVAP (evaporative emission) monitor. Check the fuel vapor tube for a restriction between the FTP sensor and the fuel tank. |
| PCM (powertrain control module) P144C:00 | EVAP System Purge Flow Performance During Boost: No Sub Type Information | Sets when the PCM (powertrain control module) detects the fuel tank pressure exceeds a calibrated amount within a specified amount of time during the test (single path check valve), or when the fuel tank vacuum is less than a calibrated amount within a specified amount of time or when the fuel tank pressure exceeds a calibrated amount within a specified amount of time during the test (dual path check valve). The EVAP (evaporative emission) check valve test is carried out during minimal boost conditions, once per drive cycle, when entry conditions are met. |
| PCM (powertrain control module) P1450:00 | Unable to Bleed Up Fuel Tank Vacuum: No Sub Type Information | Sets when the PCM (powertrain control module) detects the EVAP (evaporative emission) running loss monitor detects excessive fuel tank vacuum with the engine running, but not at idle. Visually inspect the EVAP (evaporative emission) canister inlet port, EVAP (evaporative emission) canister vent valve filter, and EVAP (evaporative emission) canister vent hose assembly for contamination or debris. Check EVAP (evaporative emission) purge valve for vacuum leak. |
| PCM (powertrain control module) P2418:00 | EVAP System Switching Valve 'A' Control Circuit/Open: No Sub Type Information | Sets when the PCM (powertrain control module) detects the signal moves outside the minimum or maximum limit for the commanded state of the EVAP (evaporative emission) vapor blocking valve. |
| PCM (powertrain control module) P2450:00 | EVAP System Switching Valve 'A' Performance/Stuck Open: No Sub Type Information | Sets when the PCM (powertrain control module) detects the rate of vacuum loss is greater than a calibrated threshold. The PCM (powertrain control module) commands the EVAP (evaporative emission) vapor blocking valve closed while vacuum is present in the fuel tank. If the valve does not close, the vacuum in the tank is quickly lost. Retrieve all continuous memory and on-demand self-test Diagnostic Trouble Codes (DTCs) from the PCM (powertrain control module). Diagnose any circuit related EVAP (evaporative emission) vapor blocking valve Diagnostic Trouble Codes (DTCs) before diagnosing this performance DTC (diagnostic trouble code) |



Evaporative Emission System Leak Test

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| 303-13C Evaporative Emissions - 3.5L EcoBoost (BM) | 2022 F-150 |
| General Procedures | Procedure revision date: 10/16/2014 |

Evaporative Emission System Leak Test

Activation

Phase 1 - Leak Verification

1. Run the EVAP (evaporative emission) Test with the scan tool.

2. NOTE

Some small leaks may not be detected using the EVAP (evaporative emission) Test. If the system has passed the test but a leak is still suspected, then proceed to Phase 2.

If the EVAP (evaporative emission) system failed the EVAP (evaporative emission) Test, then proceed to Phase 2.

Phase 2 - System Leak Check

3. Disconnect the fuel vapor tube-to- EVAP (evaporative emission) canister purge valve quick connect coupling.

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

4. Connect the VACUTEC Smoke Machine Fuel EVAP (evaporative emission) Emissions System Tester to the fuel vapor tube quick connect coupling. Refer to the manufacturer's instructions.

5. NOTE