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2018 Ford F-450 Super Duty Service and Repair Manual

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Sample

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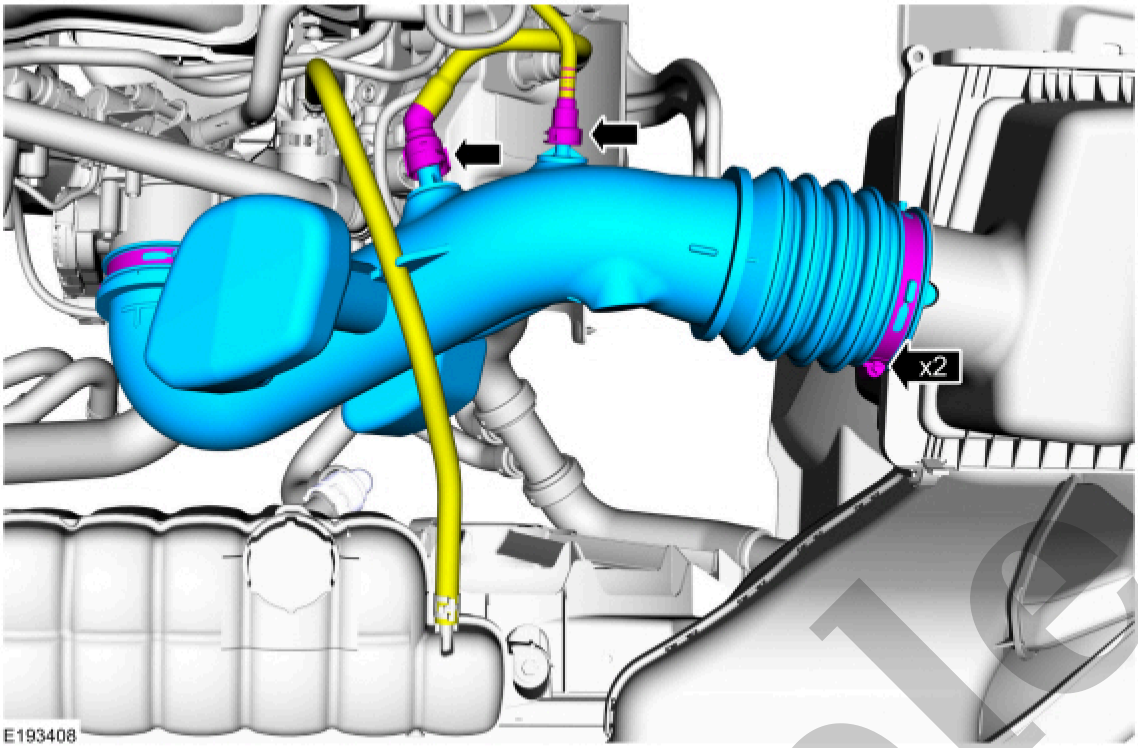

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Installation

1. To install, reverse the removal procedure.

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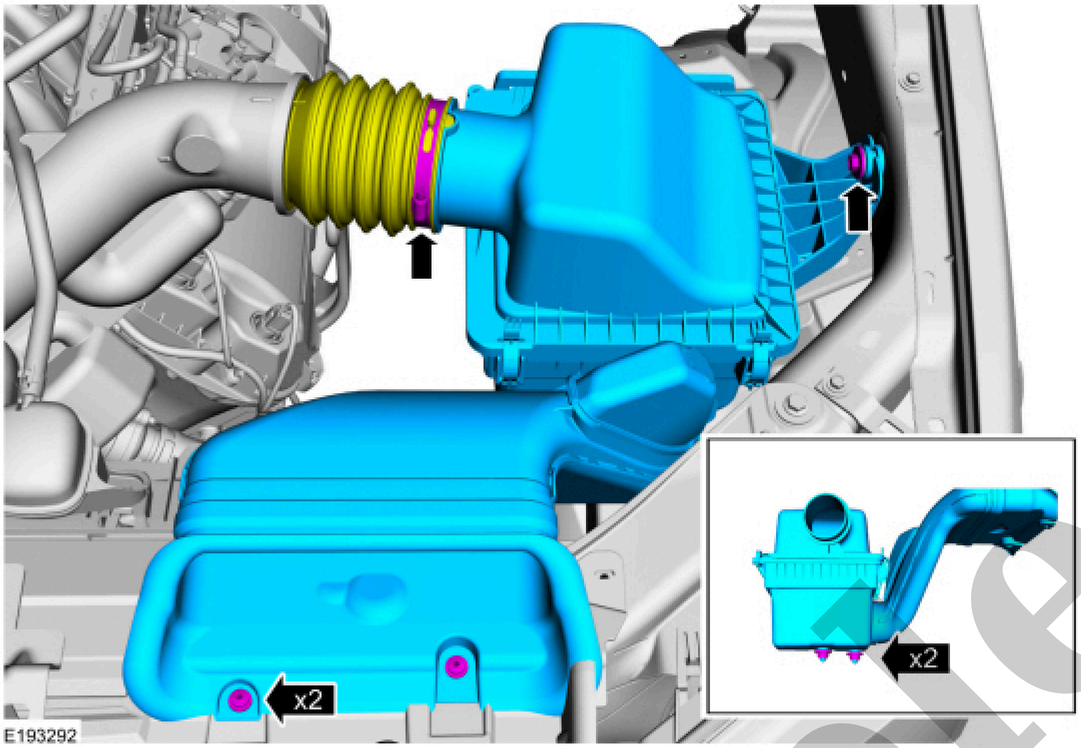

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Installation

1. To install, reverse the removal procedure.

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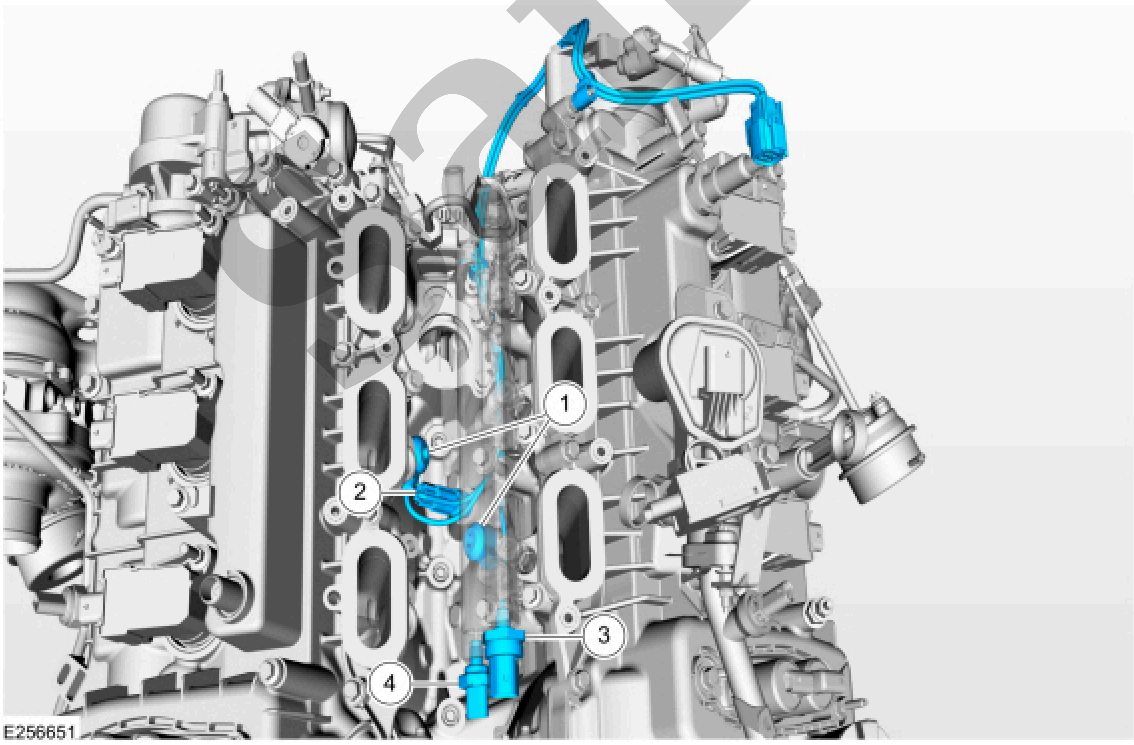
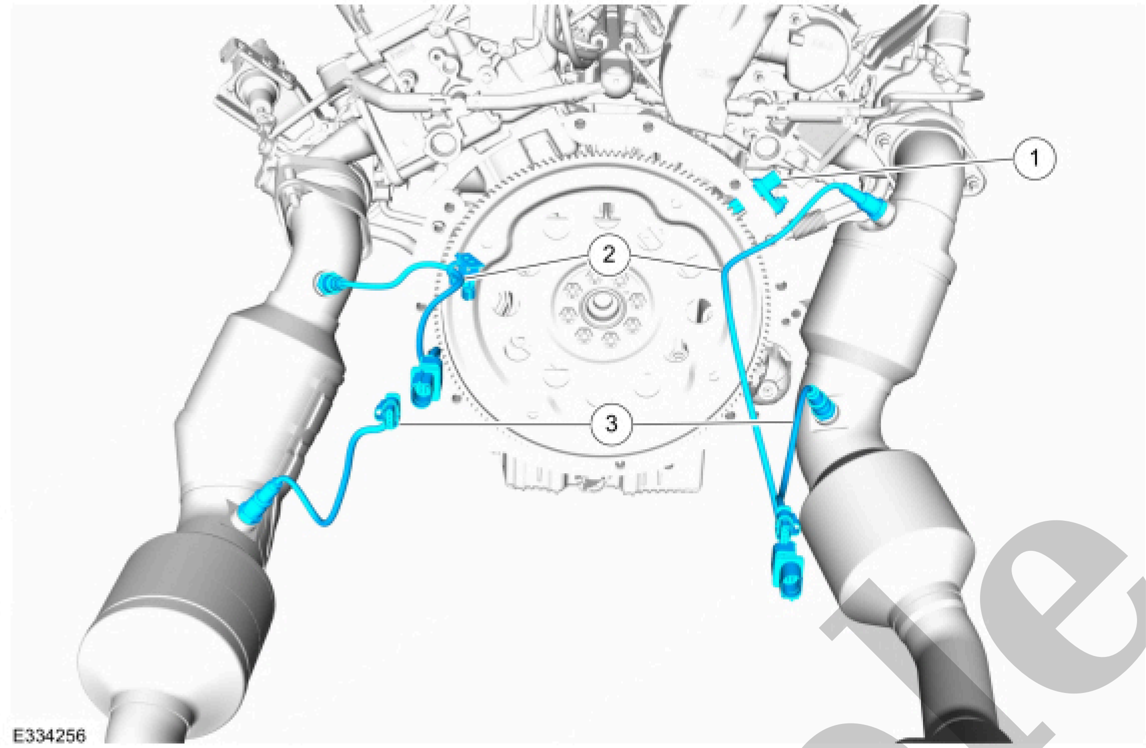
2	CHT (cylinder head temperature) (CHT2) sensor
3	Crankcase Pressure Sensor
4	Left hand VCT (variable camshaft timing) oil control solenoids
5	Exhaust Pressure sensor
6	IAT (intake air temperature) sensor
7	Turbocharger Boost Pressure (TCBP) and Charger Air Cooler Temperature (CACT) Sensor
8	Right hand VCT (variable camshaft timing) oil control solenoids
9	EOP (engine oil pressure) sensor
10	MAP (manifold absolute pressure) sensor
11	Right hand CMP (camshaft position) sensors

Electronic Engine Controls- Top



Item	Description

sample



Item	Description
1	CKP (crankshaft position) sensor
2	HO2S (heated oxygen sensor)
3	Catalyst monitor sensors

Turbocharger Bypass Valve

Sample

Item	Description
1	PCM (powertrain control module)

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Electronic Engine Controls - System Operation and Component Description

303-14A Electronic Engine Controls - 2.7L EcoBoost (238kW/324PS)	***2022 F-150***
Description and Operation	***Procedure revision date: 08/17/2021***

Electronic Engine Controls - System Operation and Component Description

System Operation

Auto Start Stop

The auto start stop system helps reduce fuel consumption and decrease emissions by automatically shutting down the engine when the vehicle stops and the engine is idling, usually within 1500 ms (1.5 seconds). To initiate the auto start stop operation on automatic transmission equipped vehicles on automatic transmission equipped vehicles, the vehicle gear selector must be in DRIVE when the vehicle comes to a stop and the brake pedal must be fully applied. The engine automatically restarts when the brake pedal is released, usually within 500 ms (0.5 seconds), or when a vehicle system requires a restart, for example to recharge the battery or to maintain interior comfort settings.

To initiate the auto start stop operation on manual transmission equipped vehicles, the gear selector must be in NEUTRAL, and the clutch pedal fully released. An auto start is initiated when the clutch pedal is pressed.

The auto start stop system is defaulted to an ON state when the engine is started. To switch the auto start stop system OFF, press the auto start stop switch located on the center console. To turn the auto start stop system ON, press the auto start stop switch again. The auto start stop system can only be deactivated during the current ignition cycle.

The IPC (instrument panel cluster) auto start stop indicator illuminates when an auto start stop system inhibit or disable condition is present.

During normal operation the auto start stop system may not stop the engine under the following conditions:

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The CCM checks for concerns in any powertrain electronic component or circuit that provides input or output signals to the PCM (powertrain control module) that can affect emissions and is not monitored by another OBD (on-board diagnostic) monitor. Inputs and outputs are, at a minimum, monitored for circuit continuity or correct range of values. Where feasible, inputs are checked for rationality and outputs are checked for correct functionality.

The CCM covers many components and circuits and tests them in various ways depending on the hardware, function, and type of signal. For example, analog inputs such as throttle position or engine coolant temperature are typically checked for opens, shorts, and out of range values. This type of monitoring is carried out continuously. Some digital inputs like brake switch or crankshaft position rely on rationality checks that are checking to see if the input value makes sense at the current engine operating conditions. These types of tests may require monitoring several components and can only be carried out under the appropriate test conditions.

Outputs such as coil drivers are checked for opens and shorts by monitoring a feedback circuit or smart driver associated with the output. Other outputs, such as relays, require additional feedback circuits to monitor the secondary side of the relay. Some outputs are also monitored for correct function by observing the reaction of the control system to a given change in the output command. An idle air control solenoid can be functionally tested by monitoring the idle RPM (revolutions per minute) relative to the target idle RPM (revolutions per minute) . Some tests can only be carried out under the appropriate test conditions. For example, the transmission shift solenoids can only be tested when the PCM (powertrain control module) commands a shift.

The following is an example of some of the input and output components monitored by the CCM. The component monitor may belong to the engine, ignition, transmission, air conditioning, or any other PCM (powertrain control module) supported subsystem.

- Inputs:
    - Air conditioning pressure (ACP) sensor, CMP (camshaft position) sensor, CKP (crankshaft position) sensor, CHT (cylinder head temperature) sensor, ECT (engine coolant temperature) sensor, fuel rail pressure temperature (FRPT) sensor, fuel tank pressure (FTP) sensor, IAT (intake air temperature) sensor, MAF (mass air flow) sensor (if equipped), TP (throttle position) sensor.
- Outputs:
    - EVAP (evaporative emission) purge valve, EVAP (evaporative emission) canister vent valve, fuel injector, fuel pump (FP), shift solenoid, torque converter clutch (TCC) solenoid, VCT (variable camshaft timing) actuator, wide open throttle A/C (air conditioning) cutout (WAC).
- The CCM is enabled after the engine starts and is running. A DTC (diagnostic trouble code) is stored in KAM (keep alive memory) and the MIL (malfunction indicator lamp) is illuminated after 2 driving cycles when a concern is detected. Many of the CCM tests are also carried out during an on demand self-test.

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Failure Mode Effects Management (FMEM)

The FMEM is an alternate system strategy in the PCM (powertrain control module) designed to maintain engine operation if one or more sensor inputs fail.

When a sensor input is determined to be out of limits by the PCM (powertrain control module) , an alternative strategy is initiated. The PCM (powertrain control module) substitutes a fixed value for the incorrect input and continues to monitor the suspect sensor input. If the suspect sensor begins to operate within limits, the PCM (powertrain control module) returns to the normal engine operational strategy.

Flash Electrically Erasable Programmable Read Only Memory (EEPROM)

The flash EEPROM is an integrated circuit within the PCM (powertrain control module) . This integrated circuit contains the software code required by the PCM (powertrain control module) to control the powertrain. One feature of the EEPROM is that it can be electrically erased and then reprogrammed through the DLC (data link connector) without removing the PCM (powertrain control module) from the vehicle.

Intermittent Diagnostic Techniques

Intermittent diagnostic techniques help find and isolate the root cause of intermittent concerns associated with the EEC (electronic engine control)) system. The information is organized to help find the concern and carry out the repair. The process of finding and isolating an intermittent concern starts with recreating a fault symptom, accumulating PCM (powertrain control module) data, and comparing that data to typical values, then analyzing the results. Refer to the scan tool manufacturer's instruction manual for the functions described below.

Before proceeding, be sure that:

- Customary mechanical system tests and inspections do not reveal a concern. Mechanical component conditions can make a PCM (powertrain control module) system react abnormally.
- TSB (Technical Service Bulletin) and OASIS (Online Automotive Service Information System) messages, if available, are reviewed.
- Quick Test and associated diagnostic subroutines have been completed without finding a concern, and the symptom is still present.

Recreating the Fault

Recreating the concern is the first step in isolating the cause of the intermittent symptom. If freeze frame data is available, it may help in recreating the conditions at the time of a MIL (malfunction indicator lamp) DTC (diagnostic trouble code) . Listed below are some of the conditions for recreating the concern:

CONDITIONS TO RECREATE FAULT

Engine Type Conditions	Non-Engine Type Conditions

Sample

example, the ETC_ACT reading will always lag behind the ETC_DSD reading due to the physical time to move the throttle plate. This is an expected difference between ETC_ACT and ETC_DSD during these events.

Scroll through the PID (parameter identification) data while analyzing the information. Look for sudden drops or spikes in the values.

International Standards Organization (ISO) 14229 Diagnostic Trouble Code (DTC) Descriptions

The ISO 14229 is a global, diagnostic communication standard. The ISO 14229 is a set of standard diagnostic messages that can be used to diagnose any vehicle module in use and at the assembly plant. The ISO 14229 is similar to the Society of Automotive Engineers (SAE) J2190 diagnostic communication standard that was used by all original equipment manufacturers (OEMs) for previous communication protocols.

The ISO 14229 changes the way PID (parameter identification) s, DTC (diagnostic trouble code) s, and OSC (output state control) is processed internally in the PCM (powertrain control module) and in the scan tool software. Most of the changes are to make data transfer between electronic modules more efficient, and the amount and type of information that is available for each DTC (diagnostic trouble code) . This information may be helpful in diagnosing driveability concerns.

Historical Diagnostic Trouble Codes (DTCs)

Historical DTC (diagnostic trouble code) s use bit 5 (the DTC (diagnostic trouble code) test failed at least once since last code clear) to indicate that a DTC (diagnostic trouble code) is no longer confirmed or pending, but has failed at least once since the last time the DTC (diagnostic trouble code) s were cleared. The bit 5 is designed to eventually age out and clear in 80 drive cycles (255 in the future). The scan tool does not allow a technician to retrieve historical DTC (diagnostic trouble code) s unless there are no active DTC (diagnostic trouble code) s present. This information, in conjunction with manufacturer freeze frame and snapshot data, may be useful in diagnosing a noticeable fault that did not progress to MIL (malfunction indicator lamp) status, or an extended amount of time has occurred before diagnosis, and the confirmed DTC (diagnostic trouble code) has cleared.

DTC Structure

Like all digital signals, DTC (diagnostic trouble code) s are sent to the scan tool as a series of 1s and 0s. Each DTC (diagnostic trouble code) is made up of 2 data bytes, each consisting of 8 bits that can be set to 1 or 0. In order to display the DTC (diagnostic trouble code) s in the conventional format, the data is decoded by the scan tool to display each set of 4 bits as a hexadecimal number (0 to F). For example, P0420 Catalyst System Efficiency Below Threshold (Bank 1).

DTC Byte 1		DTC Byte 2	
0000	0100	0010	0000
P0	4	2	0

Sample