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2021 Ford F-350 Super Duty Service and Repair Manual

Go to manual page

Sample

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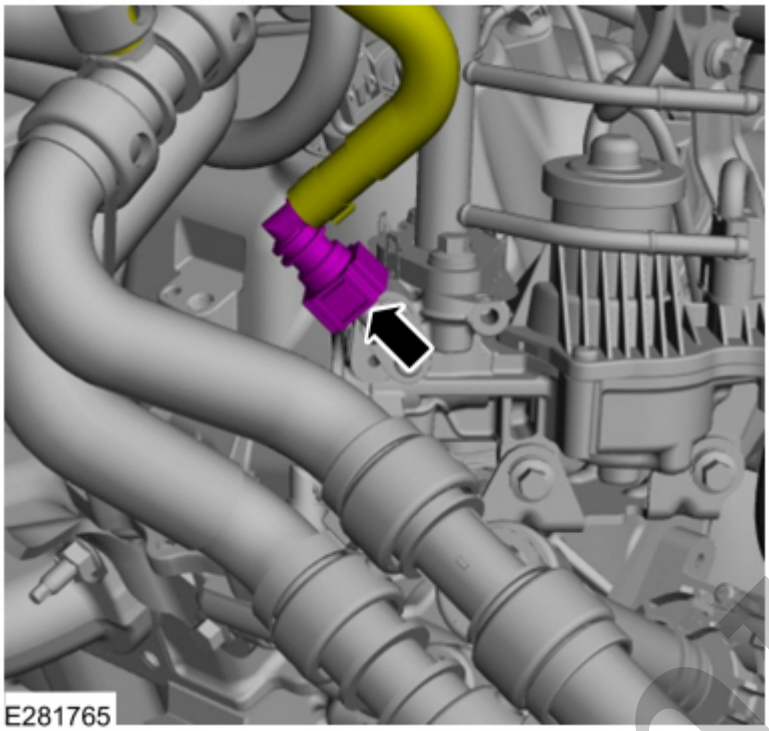
16. Connect the quick release coupling.

    Refer to: Quick Release Coupling(310-00B Fuel System - General Information - 3.3L Duratec-V6, General Procedures).



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

17. - Install the hoses, EGR (exhaust gas recirculation) transducer and the bolt.

      Torque : 80 lb.in (9 Nm)

    - Connect the EGR (exhaust gas recirculation) transducer electrical connector.

Sample

Positive Crankcase Ventilation (PCV) Valve

303-08B Engine Emission Control - 3.3L Duratec-V6	***2022 F-150***
Removal and Installation	***Procedure revision date: 09/23/2020***

Positive Crankcase Ventilation (PCV) Valve

Removal

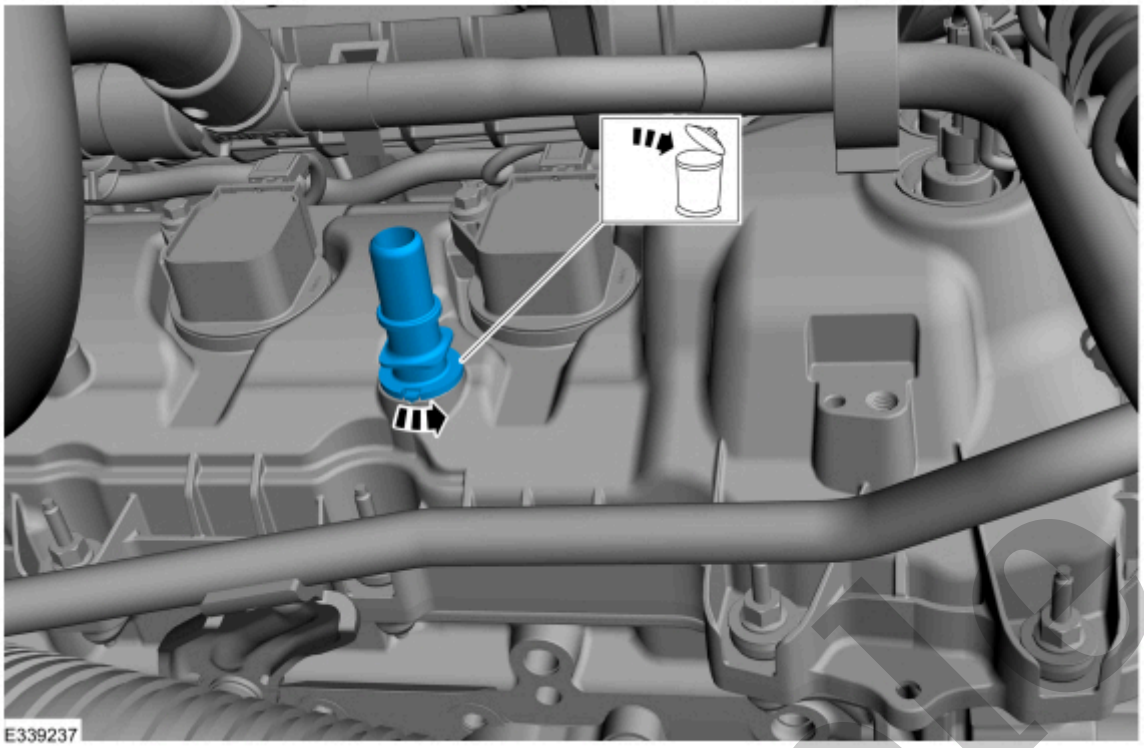
NOTE

Removal steps in this procedure may contain installation details.

1. Disconnect the PCV (positive crankcase ventilation) valve quick release coupling.

   Refer to: Quick Release Coupling(310-00B Fuel System - General Information - 3.3L Duratec-V6, General Procedures).

Sample

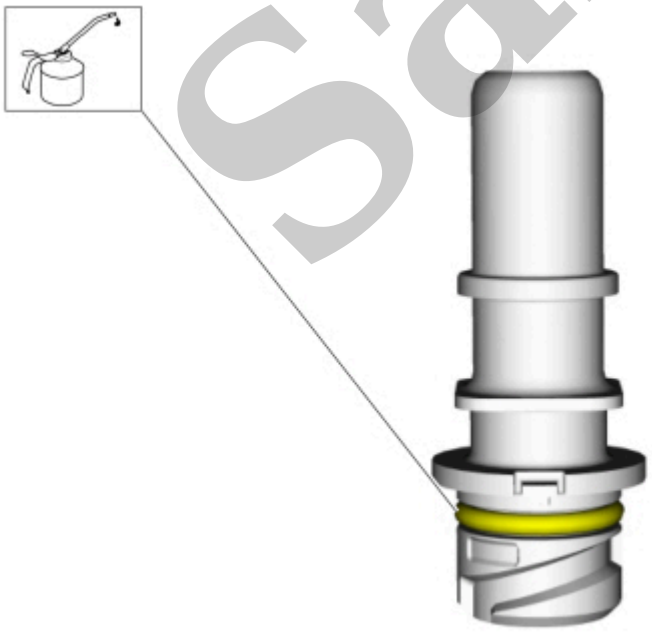


Click here to learn about symbols, color coding, and icons used in this manual.

Installation

1. Lubricate the new PCV (positive crankcase ventilation) valve O-ring seal with clean engine oil.

   Material : Engine Oil - SAE 5W-20 - Synthetic Blend Motor Oil / XO-5W20-Q1SP (WSS-M2C945-B1)

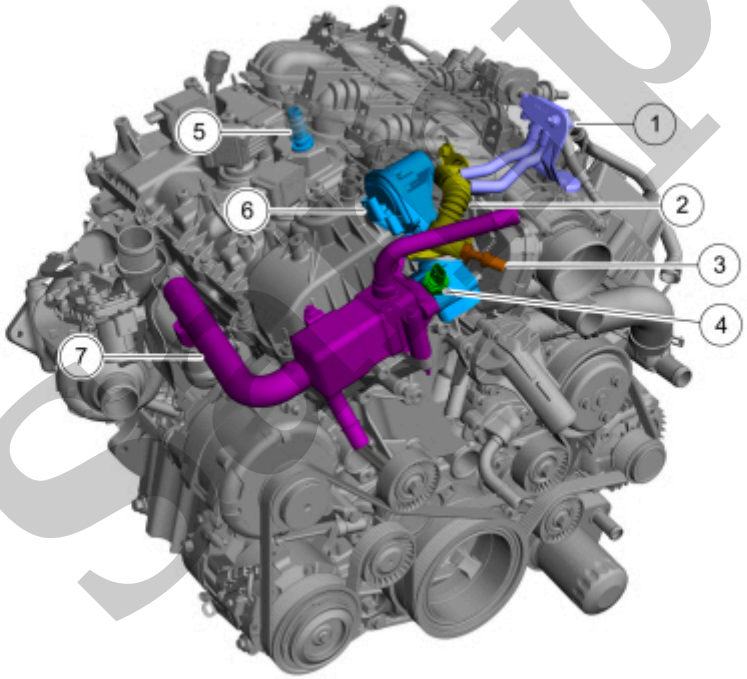


Sample

Engine Emission Control - Component Location

303-08C Engine Emission Control - 3.5L EcoBoost (BM)	***2022 F-150***
Description and Operation	***Procedure revision date: 09/23/2020***

Engine Emission Control - Component Location



E332084

Item	Description
1	Differential pressure feedback EGR (exhaust gas recirculation) sensor.
2	EGR (exhaust gas recirculation) outlet tube.

Sample

Engine Emission Control - System Operation and Component Description

303-08C Engine Emission Control - 3.5L EcoBoost (BM)	***2022 F-150***
Description and Operation	***Procedure revision date: 11/17/2020***

Sample

Engine Emission Control - System Operation and Component Description

System Operation

Exhaust Gas Recirculation (EGR) System

Overview

The EGR (exhaust gas recirculation) system controls the NOX (oxides of nitrogen) emissions. Small amounts of exhaust gases are recirculated back into the combustion chamber to mix with the air to fuel charge. The combustion chamber temperature is reduced, lowering NOX (oxides of nitrogen) emissions.

Exhaust Gas Recirculation (EGR) System

The EGR (exhaust gas recirculation) system consists of an electric motor EGR (exhaust gas recirculation) valve integrated assembly, a MAP (manifold absolute pressure) sensor, differential pressure feedback EGR (exhaust gas recirculation) sensor, PCM (powertrain control module) , EGR (exhaust gas recirculation) cooler, exhaust pressure (EP) sensor, and exhaust gas recirculation temperature bank 1, sensor 2 (EGRT12). Operation of the system is as follows:

The EGR (exhaust gas recirculation) system receives signals from the CHT (cylinder head temperature) sensor, TP (throttle position) sensor, CKP (crankshaft position) sensor, and the MAP (manifold absolute pressure) sensor to provide information on engine operating conditions to the PCM (powertrain control module) . The engine must be warm, stable, and running at a moderate load and RPM (revolutions per minute) before the EGR (exhaust gas recirculation) system is activated. The PCM (powertrain control module) deactivates the EGR (exhaust gas recirculation) during idle, extended wide open throttle (WOT), or whenever a concern is detected in an EGR (exhaust gas recirculation) component or EGR (exhaust gas recirculation) required input. The PCM (powertrain control module) calculates the desired amount of EGR (exhaust gas recirculation) for a given set of engine operating conditions.

(exhaust gas recirculation) flow diagnostics execute once per driving cycle and are designed to set a DTC when the total mass flow error results in an emissions increase above a calibrated level.

The EGR (exhaust gas recirculation) system uses inputs from the CHT (cylinder head temperature) sensor, the IAT (intake air temperature) sensor, the CKP (crankshaft position) sensor, the MAP (manifold absolute pressure) sensor, exhaust gas recirculation temperature bank 1, sensor 2 (EGRT12), exhaust pressure (EP) sensor, differential pressure feedback EGR (exhaust gas recirculation) sensor and vehicle speed to provide information about engine operating conditions to the PCM (powertrain control module) .

The PCM (powertrain control module) uses the sensor inputs to determine the desired amount of EGR (exhaust gas recirculation) gas flow and controls the EGR (exhaust gas recirculation) valve to achieve the desired EGR (exhaust gas recirculation) flow rate.

The EP sensor measures the exhaust pressure by comparing the EP sensor calibrated value to the actual EP sensor value. The EP sensor is used primarily to determine EGR (exhaust gas recirculation) cooler effectiveness and is also used for converting EGR (exhaust gas recirculation) flow to EGR (exhaust gas recirculation) valve position.

The EGRT12 sensor measures the exhaust gas temperature downstream of the EGR (exhaust gas recirculation) cooler and is monitored by comparing the EGRT12 sensor calibrated value to the actual EGRT12 sensor value. The EGRT12 sensor is primarily used for EGR (exhaust gas recirculation) flow calculation and is also used for EGR (exhaust gas recirculation) cooler diagnostics.

The monitor checks the electric EGR (exhaust gas recirculation) valve circuits for opens and shorts. The monitor compares the differential pressure feedback EGR (exhaust gas recirculation) sensor to a calibrated value and the electric EGR (exhaust gas recirculation) valve commanded position to determine if EGR (exhaust gas recirculation) flow is present.

The monitor checks for the differential pressure feedback EGR (exhaust gas recirculation) sensor for opens and shorts. The differential pressure feedback EGR (exhaust gas recirculation) sensor hoses are tested for connection and restriction at idle. The PCM (powertrain control module) commands the EGR (exhaust gas recirculation) valve closed and the monitor tests for the differential pressure feedback EGR (exhaust gas recirculation) sensor to indicate no flow is present. The PCM (powertrain control module) commands the EGR (exhaust gas recirculation) valve open and the monitor tests the differential pressure feedback EGR (exhaust gas recirculation) sensor voltage to indicate flow is present. The stop start option on some vehicles requires these hose tests to run during off idle conditions.

The intake manifold pressure is higher when the EGR (exhaust gas recirculation) is flowing than when it is not flowing. When the exhaust gas is delivered into the intake manifold, the MAP (manifold absolute pressure) sensor reading increases.

The exhaust manifold provides a source of exhaust gas to the EGR (exhaust gas recirculation) cooler, EGR (exhaust gas recirculation) orifice tube and EGR (exhaust gas recirculation) valve.

The EGR (exhaust gas recirculation) cooler is monitored by comparing the EGRT12 and EP sensors calibrated value to the actual EGRT12 and EP sensor values. Under cooling and over cooling conditions are monitored.

Sample

The crankcase pressure sensor has one digital signal output from the sensor. There is one reference voltage circuit and one signal return circuit for the sensor.

Differential Pressure Feedback Exhaust Gas Recirculation (EGR) Sensor

The differential pressure feedback EGR (exhaust gas recirculation) sensor is a piezo resistive type pressure transducer that monitors the differential pressure across a metering orifice located in the orifice tube assembly. The differential pressure feedback EGR (exhaust gas recirculation) sensor receives this signal through 2 hoses referred to as the downstream pressure hose (REF signal) and upstream pressure hose (HI signal). The HI and REF hose connections are marked on the differential pressure feedback EGR (exhaust gas recirculation) sensor housing for identification (note the HI signal uses a larger diameter hose). The differential pressure feedback EGR (exhaust gas recirculation) sensor outputs a voltage proportional to the pressure drop across the metering orifice and supplies it to the PCM (powertrain control module) as EGR (exhaust gas recirculation) flow rate feedback.

Electric Exhaust Gas Recirculation (EGR) Valve

The motor is commanded to move in 52 discrete steps as it acts directly on the EGR (exhaust gas recirculation) valve. The position of the valve determines the rate of EGR (exhaust gas recirculation) flow. The spring works to close the valve against the motor opening force.

Exhaust Gas Recirculation (EGR) Cooler

The exhaust gases are directed through the EGR (exhaust gas recirculation) cooler to lower the exhaust gas temperature before entering the intake manifold. The EGR (exhaust gas recirculation) cooler uses engine coolant to reduce the exhaust gas temperature.

Exhaust Gas Recirculation (EGR) Orifice Tube Assembly

The EGR (exhaust gas recirculation) orifice tube assembly is a section of tubing between the exhaust manifold and the EGR (exhaust gas recirculation) valve. The assembly provides the flow path for the EGR (exhaust gas recirculation) to the intake manifold and also contains the metering orifice and 2 pressure pick up tubes. The internal metering orifice creates a measurable pressure drop as the EGR (exhaust gas recirculation) valve opens and closes. This pressure differential across the orifice is picked up by the differential pressure feedback EGR (exhaust gas recirculation) sensor which provides feedback to the PCM (powertrain control module) .

Exhaust Gas Recirculation Temperature (EGRT) Sensor

The EGRT bank 1, sensor 2 (EGRT12) is a thermistor device in which resistance changes with temperature. The EGRT12 sensor is an input to the PCM (powertrain control module) . The electrical resistance of the sensor increases as the temperature decreases, and the resistance decreases as the temperature increases. The varying resistance changes the voltage drop across the sensor terminals and provides electrical signals to the PCM (powertrain control module) corresponding to temperature.

The EGRT12 sensor is primarily used for EGR (exhaust gas recirculation) flow calculation and is also used for EGR (exhaust gas recirculation) cooler diagnostics. The EGRT12 sensor monitors the exhaust gas temperature

Sample

Crankcase Ventilation

303-08C Engine Emission Control - 3.5L EcoBoost (BM)	***2022 F-150***
Diagnosis and Testing	***Procedure revision date: 11/2/2020***

Crankcase Ventilation

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)	P04DB:00	Crankcase Ventilation System Disconnected: No Sub Type Information	GO to Pinpoint Test HG
PCM (powertrain control module)	P051A:00	Crankcase Pressure Sensor A Circuit: No Sub Type Information	GO to Pinpoint Test HG
PCM (powertrain control module)	P051B:00	Crankcase Pressure Sensor Circuit Range/Performance: No Sub Type Information	GO to Pinpoint Test HG
PCM (powertrain control module)	P2282:00	Air Leak Between Throttle Body And Intake Valve: No Sub Type Information	GO to Pinpoint Test HG
PCM (powertrain control module)	U060E:00	Lost Communication With Crankcase Pressure Sensor: No Sub Type Information	GO to Pinpoint Test HG

Sample

Driving Performance > Spark Knock > Cruise/ Steady Speed > Always	GO to Pinpoint Test HG
Driving Performance > Poor Fuel Economy > City Driving > Unloaded	GO to Pinpoint Test HG
Driving Performance > Poor Fuel Economy > Highway Driving > Unloaded	GO to Pinpoint Test HG
Driving Performance > Poor Fuel Economy > Combined > Unloaded	GO to Pinpoint Test HG
Driving Performance > Hesitates/Stumble > Cruise/ Steady Speed > Always	GO to Pinpoint Test HG
Driving Performance > Engine Surge > At Idle > Always	GO to Pinpoint Test HG
Driving Performance > Engine Surge > Acceleration > Always	GO to Pinpoint Test HG
Driving Performance > Engine Surge > Cruise/ Steady Speed > Always	GO to Pinpoint Test HG
Driving Performance > Engine Surge > Deceleration > Always	GO to Pinpoint Test HG

Pinpoint Tests

PINPOINT TEST HG : POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

NOTE

Refer to the appropriate Wiring Diagrams Cell for 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) P04DB:00	Crankcase Ventilation System Disconnected: No Sub Type Information	Sets when PCM (powertrain control module) detects the crankcase pressure sensor is disconnected. Verify the integrity of the PCV (positive crankcase ventilation) system.
PCM (powertrain	Crankcase Pressure Sensor 'A' Circuit: No Sub Type	Sets when PCM (powertrain control module) detects the crankcase pressure sensor voltage is greater than or less

Sample