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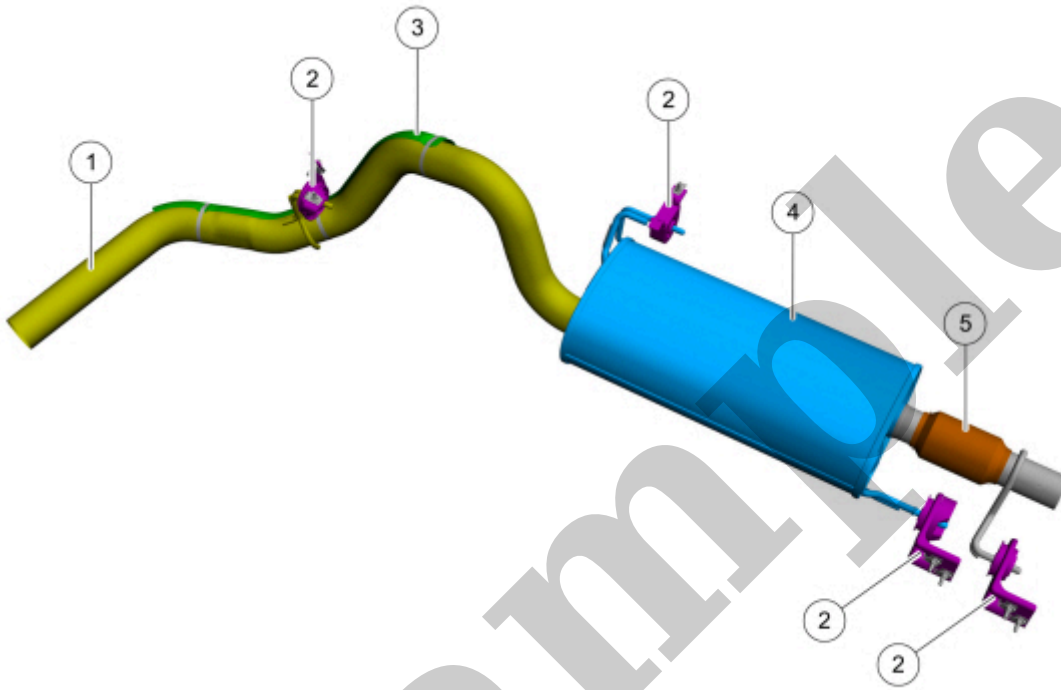
FactoryManuals.net is a great resource for anyone who wants to save money on repairs by doing their own work. The manuals provide detailed instructions and diagrams that make it easy to understand how to fix a vehicle.

2017 Ford F-350 Super Duty Service and Repair Manual

[Go to manual page](#)

Exhaust intermediate pipe

Item	Description
1	Exhaust clamp
2	Resonator



E330372

Muffler and tailpipe assembly

Item	Description
1	Tailpipe
2	Isolators
3	Heat shield
4	Muffler
5	Exhaust Flexible pipe

Exhaust System - Overview

309-00C Exhaust System - 3.5L EcoBoost (BM)	2022 F-150
Description and Operation	Procedure revision date: 07/23/2020

Exhaust System - Overview

Overview

The exhaust system provides an exit for exhaust gases and reduces engine noise by passing exhaust gases through the catalytic converters and a muffler assembly.

The exhaust system consists of:

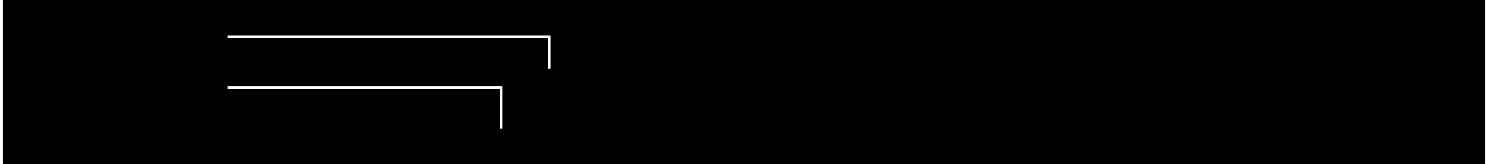
- Two catalytic converters (one integrated into the exhaust Y-pipe)
- An intermediate muffler and muffler inlet pipe assembly
- A muffler and tailpipe assembly
- Exhaust isolators/hangers mounted on the vehicle frame

The catalytic converter plays a major role in the emission control system by operating as a gas reactor. Its function is to speed the heat-producing chemical reaction of components in the exhaust gases to reduce air pollutants.

The catalyst material inside the catalytic converter consists of a ceramic substrate.

The catalytic converter is designed to provide a long life. No maintenance is necessary.

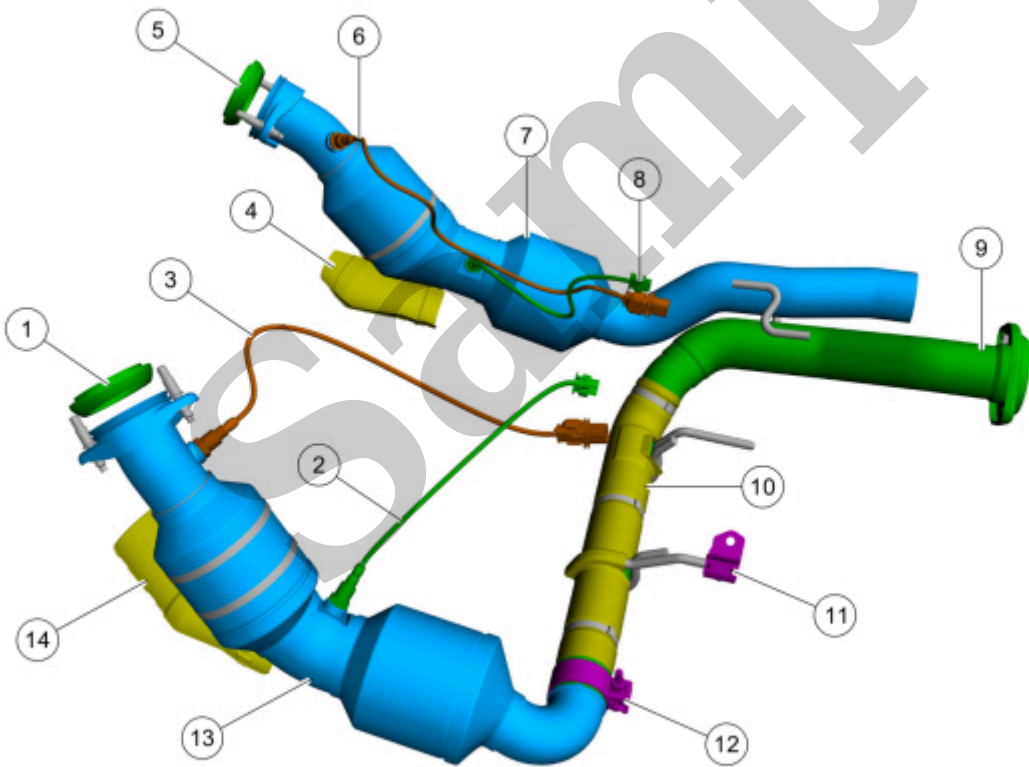
Sound insulators and shields, attached to the underbody, protect the vehicle from exhaust system heat and should be inspected at regular intervals to make sure they are not dented or out of position. If a sound insulator and shield is damaged or shows evidence of deterioration, install a new insulator and shield. The sound insulators and shields for the muffler, muffler pipe and catalytic converter pipe are installed separately.



Exhaust System - Raptor - Component Location

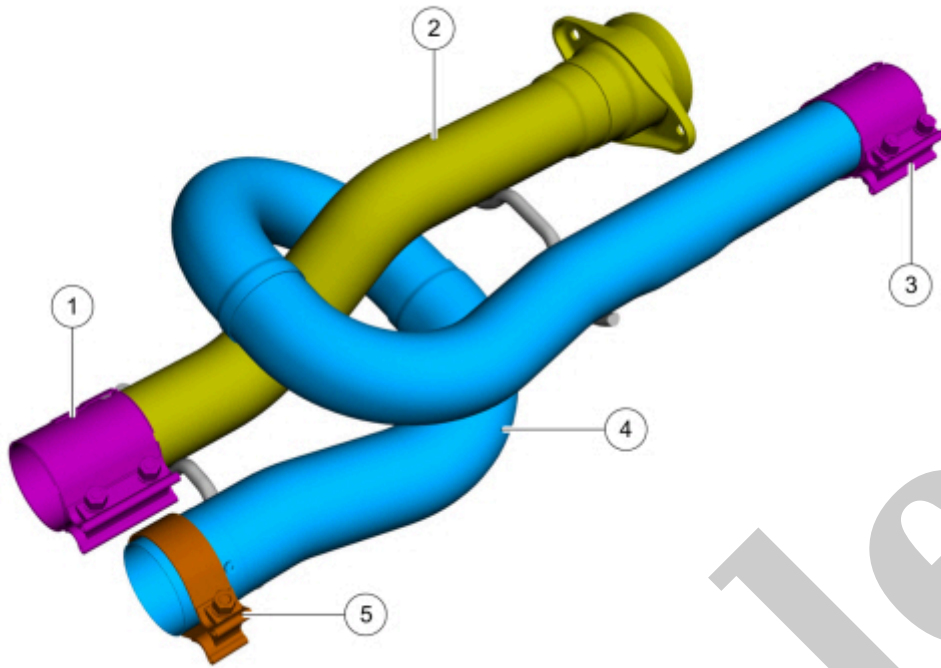
<i>309-00C Exhaust System - 3.5L EcoBoost (BM)</i>	<i>2022 F-150</i>
<i>Description and Operation</i>	<i>Procedure revision date: 06/24/2021</i>

Exhaust System - Raptor - Component Location



E355147

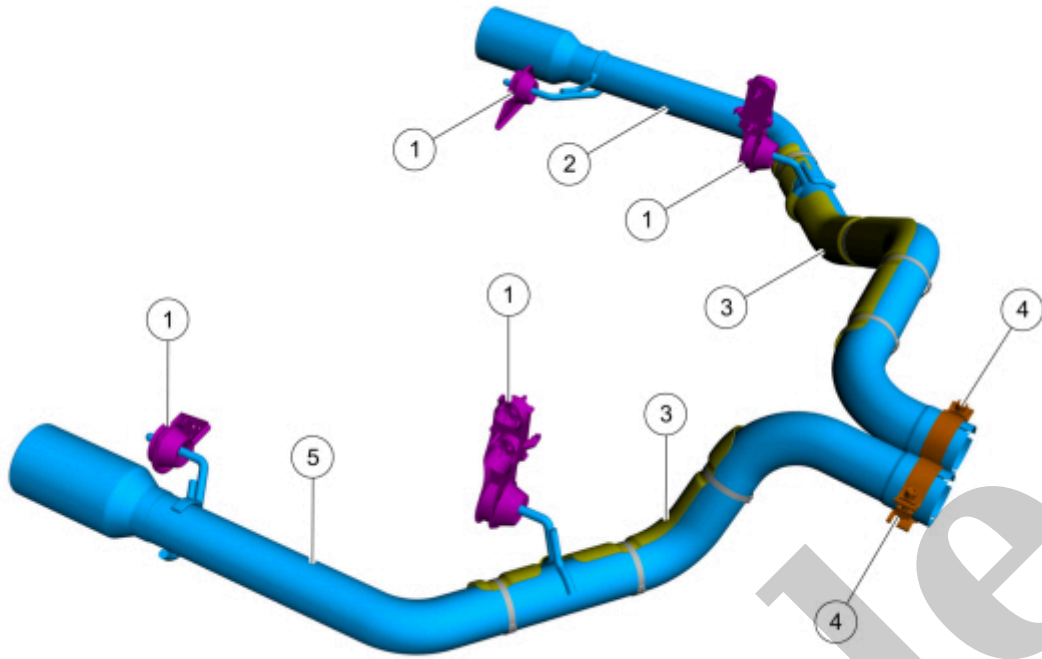
Exhaust hot end assembly



E355148

Exhaust intermediate pipe

Item	Description
1	Exhaust clamp
2	LH (left-hand) muffler inlet pipe
3	Exhaust clamp
4	RH (right-hand) muffler inlet pipe
5	Exhaust clamp



E355150

Tailpipe assembly

Item	Description
1	Isolators
2	LH (left-hand) tailpipe
3	Heat shields
4	Tailpipe clamps
5	RH (right-hand) tailpipe

Sound insulators and shields, attached to the underbody, protect the vehicle from exhaust system heat and should be inspected at regular intervals to make sure they are not dented or out of position. If a sound insulator and shield is damaged or shows evidence of deterioration, install a new insulator and shield. The sound insulators and shields for the muffler, muffler pipe and catalytic converter pipe are installed separately.

Some exhaust fasteners must be discarded and new ones installed as indicated in the procedures. Discard any damaged or heavily corroded fasteners and install new ones as necessary. Some exhaust fasteners are of a prevailing torque design. Use only new fasteners with the same part number as the original. Tighten the fasteners to the specified torque during reassembly to make sure of correct retention of exhaust components.

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Sample

harmless products. The catalyst initiates and speeds up heat producing chemical reactions of the exhaust gas components so they are used up as much as possible.

Light Off Catalyst

As the catalyst heats up, converter efficiency rises rapidly. The point at which conversion efficiency exceeds 50% is called catalyst light off. For most catalysts this point occurs between 246°C to 302°C (475°F to 575°F). A light off catalyst is a three way catalytic (TWC) converter that is located as close to the exhaust manifold as possible. Because the light off catalyst is located close to the exhaust manifold it achieves the required temperature faster and reduces emissions more quickly than the catalyst located under the body. Once the catalyst lights off, it quickly reaches the maximum conversion efficiency for that catalyst.

Three Way Catalytic (TWC) Converter Conversion Efficiency

A TWC converter requires a stoichiometric air fuel ratio of 14.7 pounds of air to 1 pound of gasoline, or 14.7 to 1, for high conversion efficiency. To achieve these high efficiencies, the air to fuel ratio must be tightly controlled with a narrow window of stoichiometry. Deviations outside of this window greatly decrease the conversion efficiency. For example a rich mixture decreases the HC and CO conversion efficiency while a lean mixture decreases the NO_x conversion efficiency.

For vehicles using E85 the required air to fuel ratio is 9.8 to 1. Other gasoline/ethanol mixtures require a variable air to fuel ratio between 14.7 to 1 to 9.8 to 1 dependent on the percentage of ethanol content.

Exhaust System

The exhaust system conveys engine emissions from the exhaust manifold to the atmosphere. Engine exhaust emissions are directed from the engine exhaust manifold to the catalytic converter through the front exhaust pipe. A universal HO₂S (heated oxygen sensor) is mounted on the front exhaust pipe before the catalyst. The catalytic converter reduces the concentration of CO, unburned HCs, and NO_x in the exhaust emissions to an acceptable level. The reduced exhaust emissions are directed from the catalytic converter past another HO₂S (heated oxygen sensor) mounted in the rear exhaust pipe and then on into the muffler. Finally, the exhaust emissions are directed to the atmosphere through an exhaust tailpipe.

Underbody Catalyst

The underbody catalyst is located after the light off catalyst.

Three Way Catalytic (TWC) Converter

The TWC converter contains either platinum (Pt) and rhodium (Rh) or palladium (Pd) and rhodium (Rh). The TWC converter catalyzes the oxidation reactions of unburned HCs and CO and the reduction reaction of NO_x. The 3 way conversion can be best accomplished by always operating the engine air fuel ratio at or close to stoichiometry.

Catalyst Efficiency Monitor

The catalyst efficiency monitor uses an oxygen sensor before and after the catalyst to infer the HC (hydrocarbon) efficiency based on the oxygen storage capacity of the catalyst. Under normal closed loop fuel

- Engine RPM (revolutions per minute) 1,000 to 1,300 RPM (revolutions per minute)
- Engine load 15 to 35%
- Inferred catalyst temperature 454°C - 649°C (850°F - 1,200°F)
- Number of universal HO2S (heated oxygen sensor) switches is 50
- Second Airflow Cell
 - Engine RPM (revolutions per minute) 1,200 to 1,500 RPM (revolutions per minute)
 - Engine load 20 to 35%
 - Inferred catalyst temperature 482°C - 677°C (900°F - 1,250°F)
 - Number of universal HO2S (heated oxygen sensor) switches is 70
- Third Airflow Cell
 - Engine RPM (revolutions per minute) 1,300 to 1,600 RPM (revolutions per minute)
 - Engine load 20 to 40%
 - Inferred catalyst temperature 510°C - 704°C (950°F - 1,300°F)
 - Number of universal HO2S (heated oxygen sensor) switches is 30

Six drive cycles may be required to illuminate the MIL (malfunction indicator lamp) during normal customer driving, because an exponentially weighted moving average algorithm is used to determine a concern. If the KAM (keep alive memory) is reset, a concern illuminates the MIL (malfunction indicator lamp) in 2 drive cycles.

General Catalyst Monitor Operation

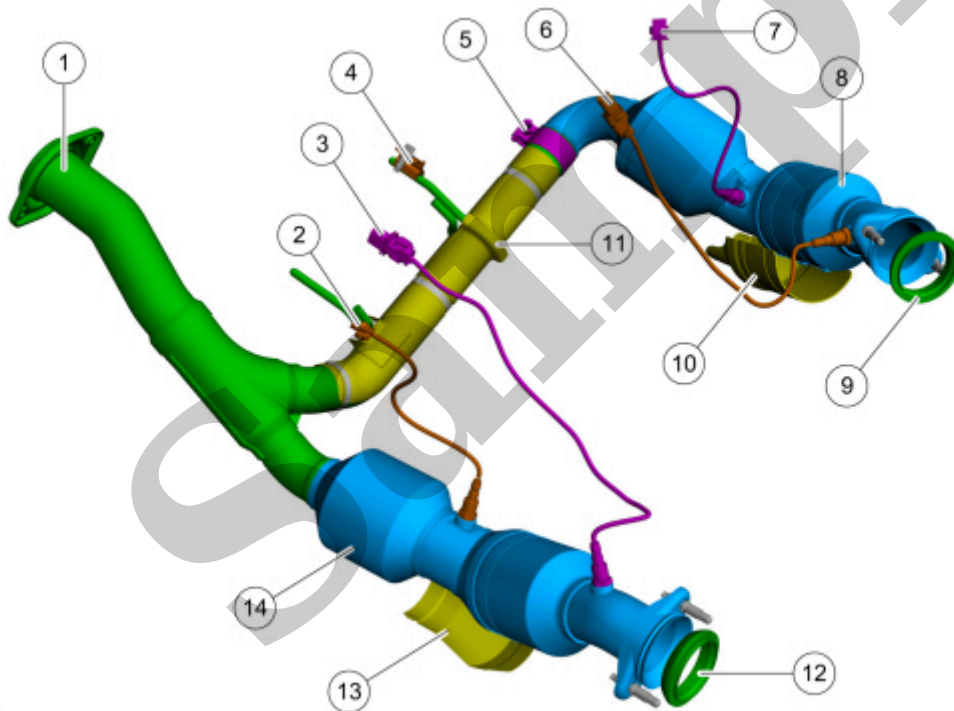
The catalyst monitor duration is 12 to 30 seconds, once per drive cycle. If the catalyst monitor conditions are met, the catalyst monitor may run and complete after all of the upstream HO2S (heated oxygen sensor) functional tests are complete and the EVAP (evaporative emission) system is functional, with no stored DTCs; however, the catalyst monitor may run and complete before the downstream HO2S (heated oxygen sensor) deceleration fuel shut off (DFSO) test is complete. In this case, the catalyst monitor inspection maintenance (I/M) readiness flag may indicate complete before the O2S I/M readiness flag indicates complete. If the catalyst monitor does not complete during a particular driving cycle, the already accumulated switch/signal data is retained in the KAM (keep alive memory) and is used during the next driving cycle to allow the catalyst monitor a better opportunity to complete.

Index ratios for ethanol (flex fuel) vehicles vary based on the changing concentration of alcohol in the fuel. The threshold to determine a concern typically increases as the percent of alcohol increases. For example, a

Exhaust System - Tremor - Component Location

309-00C Exhaust System - 3.5L EcoBoost (BM)	2022 F-150
Description and Operation	Procedure revision date: 09/30/2020

Exhaust System - Tremor - Component Location



E330805

Exhaust hot end assembly

Item	Description
1	Exhaust Y-pipe
2	RH (right-hand) exhaust gas oxygen sensor - downstream