

Exhaust System - Overview

Overview

WARNING: Manual regeneration of the diesel particulate filter causes the exhaust gas to get very hot quickly. Initiate a manual regeneration only when the vehicle is on the ground with the area around the tailpipe free of people, obstructions, foreign material or other items. Failure to follow these instructions may result in serious personal injury.

NOTICE: Do not use silicone based sprays or lubricants on any components installed onto or around the diesel exhaust system or intake air distribution and filtering system. Silicone reacts with the Nitrogen Oxides (NOx) sensor and may cause permanent damage to the NOx sensor.

NOTICE: For areas where ultra low sulfur diesel fuel (15 ppm sulfur maximum) is required, use only ultra low sulfur diesel fuel in diesel vehicles equipped with an Oxidation Catalytic Converter (OC) and Diesel Particulate Filter (DPF). In a diesel vehicle that is continually misfueled by using low sulfur (16-500 ppm) or high sulfur (500 ppm or greater) diesel fuel, the sulfur can effectively poison the catalyst. Continuous use of low sulfur or high sulfur can destroy the catalyst and render the catalyst useless.

NOTICE: Do not use oil or grease-based lubricants on the isolators. These lubricants may cause deterioration of the rubber. This can lead to separation of the isolator from the exhaust hanger bracket during vehicle operation.

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 catalytic converters also play a major role in reducing air pollutants.

The exhaust system consists of:

- LH and RH turbocharger inlet pipes are located on the backside of the engine
- upper and lower exhaust downpipes are located on the backside of the engine
- Catalyst and particulate filter assembly is located along the RH frame rail
- Intermediate pipe is located along the RH frame rail
- Tail pipe is located along the RH frame rail

The 6.7L Diesel engine allows the turbocharger inlet pipes to transport the exhaust gas from the exhaust manifolds to the turbocharger. The expansion joint (bellows) in the turbocharger inlet pipes is to accommodate thermal growth in the turbocharger inlet pipes and is not an assembly aid. The turbocharger inlet pipe bellows should not be bent or twisted during removal or installation. The upper and lower exhaust downpipes deliver the exhaust gas from the turbocharger to the Oxidation Catalytic Converter (OC).

The Catalyst and Particulate Filter Assembly contains the Oxidation Catalytic Converter (OC), Diesel Particulate Filter (DPF) and the selective reduction catalyst in one assembly. There are 2 different designs of the catalyst and particulate filter assembly, one for the F-250, F-350 and F-450 pick-ups and one for the F-350, F-450 and F-550 and chassis frame models.

The OC is a ceramic catalytic converter which oxidizes hydrocarbons in the exhaust and generates heat for DPF regeneration. The DPF is a highly engineered silicon carbide wall-flow catalyst that traps particulates. As soot gathers in the system it begins to restrict the filter and the filter needs to be periodically cleaned. The soot can be cleaned in 2 different ways: Passive regeneration and active regeneration. Both methods occur automatically and require no action from the driver/operator.

Passive regeneration occurs naturally as a result of normal engine operating conditions. During passive regeneration, the exhaust constituents/temperature are at an appropriate level where some soot can be reduced or oxidized (burned) thus cleaning the filter.

Active regeneration, which is initiated by the PCM, will occur when there is not enough passive regeneration occurring due to vehicle drive patterns. In an active regeneration, the DPF is cleaned by raising the exhaust temperature to a point where the soot is burned away. After the soot is burned off, the exhaust temperature and back pressure (restriction) fall back to normal levels.

The Selective Catalytic Reduction (SCR) improves the exhaust emissions by injecting a diesel exhaust fluid into the exhaust system. Diesel exhaust fluid, is a 32.5% solution of urea in deionized water. At the inlet of the SCR, there is a port for diesel exhaust fluid injection which is followed by a twist mixer. When diesel exhaust fluid is introduced into the system, it atomizes and mixes evenly with exhaust gases in the twist mixer. During this time, the heat of the exhaust gases causes the urea in the diesel exhaust fluid to split into Carbon Dioxide (CO₂) and ammonia. As the ammonia and nitrogen oxide (NOx) pass over the catalyst, a reduction reaction takes place and the ammonia and NOx are converted to nitrogen and water. For additional information about the reduction system, refer to Refer to: Engine Emission Control - Component Location (303-08B Engine Emission Control - 6.7L Power Stroke Diesel, Description and Operation).

Insulator heat shields are attached to the exhaust system to 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 insulator heat shield is damaged or shows evidence of deterioration, install a new sound insulator heat shield. The insulator heat shields for the OC, DPF, SCR catalyst 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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