SERVICE MANUAL SECTION

CF 500, CF 600 Exhaust System

Truck Model: CF 500

Truck Model: CF 600

Unit Code: 07ADR

S07002

04/28/2005

Table of Contents

Safety Information

NOTE: Read the following before starting the service procedure.

The information contained in this International Service Manual Section was current at the time of printing and is subject to change without notice or liability.

You must follow your company safety procedures when you service or repair equipment. Be sure to understand all of the procedures and instructions before you begin work on the unit.

International uses the following types of notations to give warning of possible safety problems and to give information that will prevent damage to the equipment being serviced or repaired.

WARNING: A warning indicates procedures that must be followed exactly. Personal injury or possible death can occur if the procedure is not followed.

CAUTION: A caution indicates procedures that must be followed exactly. If the procedure is not followed, damage to equipment or components can occur.

NOTE: A note indicates an operation, procedure or instruction that is important for correct service.

Some procedures require the use of special tools for safe and correct service. Failure to use these special tools when required can cause injury to service personnel or damage to vehicle components.

This service manual section is intended for use by professional technicians, NOT a "**do-it-yourselfer**." It is written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the service section applies to your vehicle. See your International Truck Dealer for information on whether this service section applies to your vehicle.

Exhaust System

Specifications

Table 1 Torque Specifications

Description	Nm	lbf-ft
Low pressure turbocharger exhaust outlet studs	22	16
Transmission indicator tube bolt	47	35
Turbocharger adapter pipe-to-exhaust manifold nuts	Refer to procedure	
Turbocharger flange-to-turbocharger adapter pipe bolts	49	36
Exhaust gas recirculation (EGR) cooler V-band clamp	12	9
Turbocharger-to-exhaust pipe nuts	45	33
Exhaust pipe-to-catalytic converter and muffler assembly coupling	61	45

Description and Operation

Exhaust System

The exhaust system will vary by wheelbase. The exhaust system provides an exit for exhaust gases and reduces engine noise by passing exhaust gases through a catalytic converter and muffler assembly. Rubber exhaust hanger isolators attach the exhaust system to the mounting hooks.

Catalytic Converter

The catalytic converter is part of the catalytic converter and muffler assembly and plays a major role in the emission control system. The catalytic converter operates as a gas reactor. Its catalytic function is to speed the heat-producing chemical reaction of components in the exhaust gases in order 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 for the catalytic converter.

Precautions

WARNING: The normal operating temperature of the exhaust system is very high. Never work around or attempt to repair any part of the exhaust system until it has cooled. Use special care when working around the catalytic converter. The catalytic converter heats to a high temperature after only a short period of engine operation. Failure to follow these instructions may result in personal injury.

WARNING: Exhaust gases can be harmful to health and are potentially lethal. Exhaust system leaks should be repaired immediately. Never operate the engine in enclosed areas. Failure to follow these instructions may result in personal injury.

CAUTION: 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.

Apply anti-seize lubricant to the threads of the turbocharger adapter pipe bolts and the turbocharger-to-exhaust pipe studs.

Exhaust System Diagnosis and Testing

Inspection and Verification

1. Verify the concern by running the engine (with the vehicle on the ground) or road testing the vehicle to duplicate the condition.
2. Visually inspect the components of the exhaust system and related controls that may affect exhaust gas quality or loss of power.
3. Visually inspect for obvious signs of mechanical damage. Refer to the following chart.

Table 2 Visual Inspection Chart

Mechanical
• Exhaust pipe pinched or crushed
• Damaged catalytic converter and muffler assembly
• Broken or damaged exhaust hanger brackets
• Cracked exhaust manifold
• Dirty engine air cleaner

4. Verify that the exhaust system is installed correctly, with the coupling correctly located and tightened to specification.
5. If the fault is not visually evident, determine the symptom. GO to the Symptom Chart.

Symptom Chart

Table 3 Symptom Chart

Condition	Possible Sources	Action
Rattle, squeaks or buzz type noise — from the bottom of vehicle	A. Loose or damaged exhaust isolators. B. Damaged exhaust isolator hanger bracket. C. Loose or damaged catalytic converter and muffler assembly. D. Exhaust grounded to chassis.	A. CHECK to make sure the exhaust isolators are correctly installed. INSPECT the exhaust isolators for wear or damage. INSTALL new isolators as necessary. B. INSPECT the exhaust system components for damage or broken hangers. INSTALL new components as necessary. CHECK for loose or damaged exhaust hanger brackets or fasteners. TIGHTEN the bolts to specification or INSTALL new components as necessary. C. MOVE the exhaust system to simulate the bouncing action of the vehicle, checking for exhaust-to-body contact while moving the exhaust system. Using a rubber mallet, TAP on the exhaust components to duplicate the noise concern. Lightly tap on the catalytic converter and muffler assembly. Determine if there are loose or broken baffles in the muffler, or a loose or broken element in the catalytic converter. REPAIR or INSTALL a new component as necessary. D. INSPECT for signs of exhaust components-to-body contact. If necessary, CARRY OUT the Exhaust System Alignment in this section.
Drone or clunk type noise — from bottom of vehicle	A. Loose or damaged exhaust isolators. B. Exhaust grounded to chassis.	A. INSPECT the exhaust isolators for wear or damage. INSTALL new isolators as necessary. B. INSPECT for signs of exhaust components-to-body contact. If necessary, CARRY OUT the Exhaust System Alignment in this section.

Table 3 Symptom Chart (cont.)

Whistles, boom, hum or ticking type noise — noise tends to change as engine warms. Noises are often accompanied by exhaust fumes	A. Punctures in the muffler. Broken, loose or missing exhaust manifold fasteners or gaskets. B. Exhaust system leak. C. Catalytic converter and muffler assembly.	A. REPAIR as necessary. B. INSPECT the entire exhaust system for leaks. CHECK for punctures, loose or damaged clamps/fasteners or broken welds. EXAMINE the chassis for grayish-white or black exhaust soot, which would indicate exhaust leakage at that point. To magnify a small leak, have an assistant hold a rag over the tailpipe outlet, while listening for a leak. REPAIR or INSTALL new components as necessary. C. MOVE the exhaust system to simulate the bouncing action of the vehicle, checking for exhaust-to-body contact while moving the exhaust system. Using a rubber mallet, TAP on the exhaust components to duplicate the noise concern. Lightly TAP on the catalytic converter and muffler assembly. DETERMINE if there are loose or broken baffles in the muffler, or a loose or broken element in the catalytic converter. REPAIR or INSTALL a new component as necessary.
Hissing or rushing noise — high frequency sound. Vehicle performance is unaffected	Exhaust system. Exhaust flow through pipes.	CHECK the exhaust system for leaks. Using a rubber mallet, TAP on the exhaust components to duplicate the noise concern. Lightly TAP on the catalytic converter and muffler assembly. DETERMINE if there are loose or broken baffles in the muffler, or a loose or broken element in the catalytic converter. REPAIR or INSTALL new components as necessary.
Pinging noise — occurs when exhaust system is hot, engine turned off	Catalytic converter and muffler assembly/exhaust system.	Cool down pinging is the exhaust system expanding and contracting during heating and cooling. Condition is normal.

Table 3 Symptom Chart (cont.)

Vibration — occurs at idle and at low speeds. Also accompanied by clunk or buzz type noise	A. Loose or damaged exhaust isolators. B. Loose or damaged exhaust isolator hanger brackets. C. Exhaust system grounded to chassis.	A. INSPECT the exhaust isolators for wear or damage. INSTALL new isolators as necessary. B. INSPECT the exhaust isolator hanger brackets for wear or damage. INSTALL or REPAIR as necessary. C. CARRY OUT the Exhaust System Alignment in this section.
Vehicle has low or no power — vehicle performance complaint	A. Exhaust pipe pinched or crushed. Damaged catalytic converter and muffler assembly. Loose obstruction in exhaust. B. Restricted exhaust (possible frozen condensate in muffler).	A. GO to Pinpoint Test A to test for restricted exhaust. B. PARK the vehicle inside to thaw. TEST the vehicle for normal operation. If concern is still present, GO to Pinpoint Test A.
Burning smell — usually occurs at idle, with possible traces of smoke	Foreign material caught in exhaust system.	INSPECT the exhaust system for foreign material or missing heat shields. REPAIR or INSTALL new components as necessary.
Visible rust on surface of exhaust pipes	Catalytic converter and muffler assembly/exhaust system.	Surface rust is a characteristic of materials used on exhaust systems. Exposure to heat or road salt may result in surface rust. INSPECT for perforations. If there are no perforations, condition is normal.

Pinpoint Test

NOTE: The vehicle can have a lack/loss of power, odor, a noise or a "no start" concern. These concerns may be related to the exhaust system. Carry out the following test, if no trouble codes were stored. This test is for diagnosing the source for these conditions.

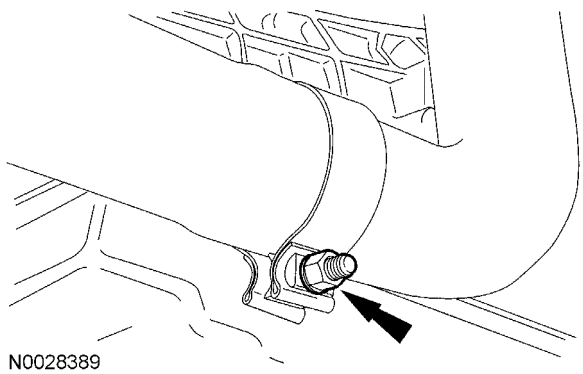
Table 4 PINPOINT TEST A: RESTRICTED EXHAUST SYSTEM TEST

Test Step	Result / Action to Take
A1 EXHAUST SYSTEM INSPECTION • Inspect the exhaust system for damage or deterioration. Look for cracks, punctures, leaks, loose connections, dents or unusual bending. **Is the exhaust system OK?**	**Yes** GO to A2. **No** REPAIR or INSTALL any damaged or deteriorated exhaust components. TEST the system for normal operation.
A2 BACK PRESSURE TEST • Position the vehicle on a hoist. Refer to Jacking and Lifting in S10019. • Remove the catalytic converter and muffler assembly. Refer to Exhaust System in this section. • Start the engine and gradually increase the engine speed to 2,000 rpm with the transmission in NEUTRAL. **Is the restriction gone?**	**Yes** Install a new catalytic converter and muffler assembly. **No** No indications of a restriction have been detected. CONDUCT a diagnosis on other suspect systems. CLEAR the DTCs.

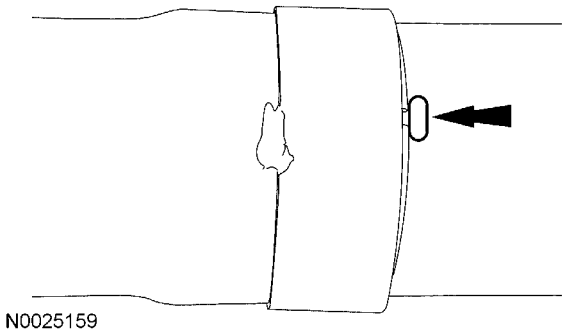
General Procedures

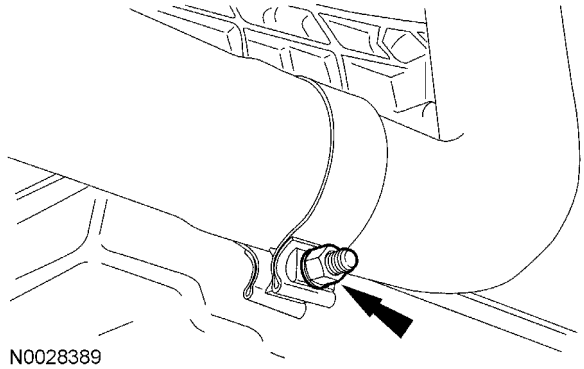
Exhaust System Alignment

1. Raise and support the vehicle with the transmission in NEUTRAL. For additional information, refer to Jacking and Lifting in S10019.
2. Loosen the coupling at the exhaust pipe-to-catalytic converter and muffler assembly joint.


N0028389

3. Beginning at the rear of the vehicle, align the exhaust system to establish the maximum clearance. Make sure all fit pipes are pushed all the way into the preceding pipe up to the stop.


N0025159

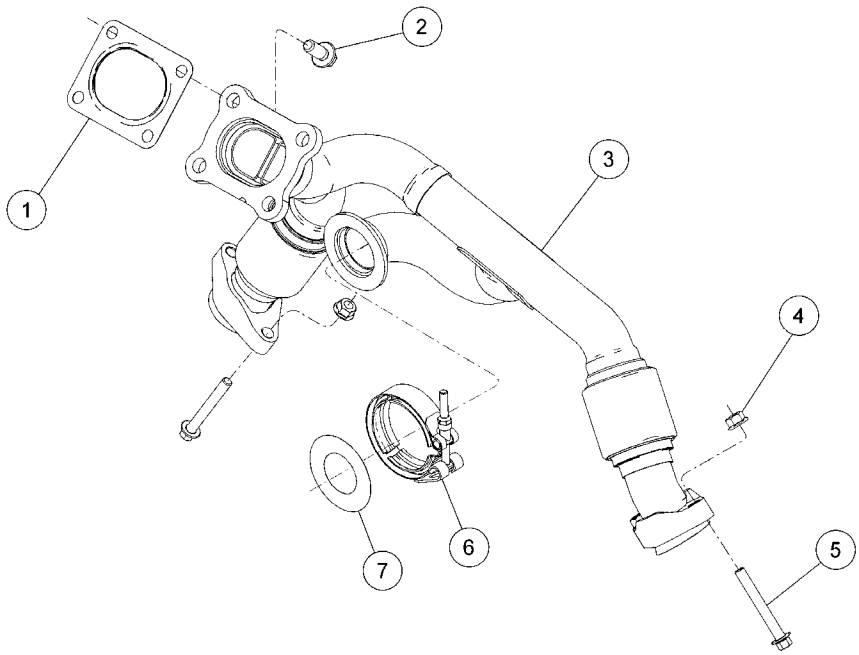

N0028389

4. Tighten the coupling to specification.
   - Tighten to 61 Nm (45 lb-ft)
5. Start the engine and check the exhaust system for leaks.

Removal and Installation

Turbocharger Inlet Y-Pipe — Removal

NOTE: The names Turbocharger Inlet Y-Pipe and Turbocharger Adapter Pipe refer to the same component.



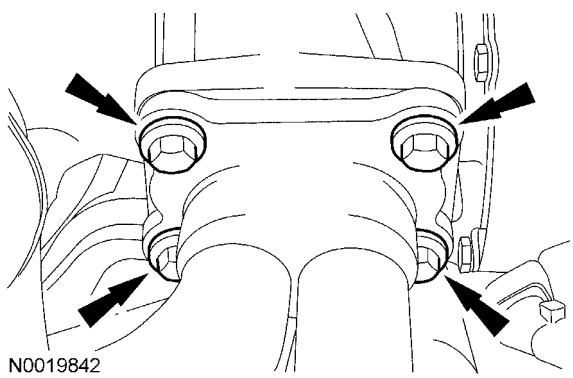
N0028398

Figure 4

1. Turbocharger inlet gasket
2. Turbocharger adapter pipe bolts (4 required)
3. Turbocharger adapter pipe
4. Turbocharger adapter pipe nut (4 required)
5. Turbocharger adapter pipe bolt (4 required)
6. Exhaust gas recirculation (EGR) cooler V-band clamp
7. EGR cooler gas inlet gasket

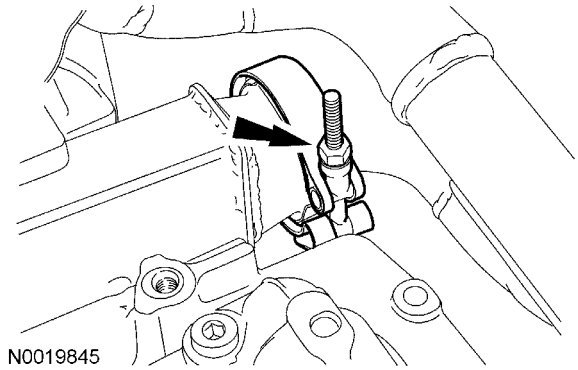
1. Raise and support the vehicle with the transmission in NEUTRAL. For additional information, refer to Jacking and Lifting in S10019.
2. Remove the exhaust system. For additional information, refer to Exhaust System in this section.
3. Remove the turbocharger adapter pipe bolts.

   • Remove and discard the turbocharger inlet gasket.



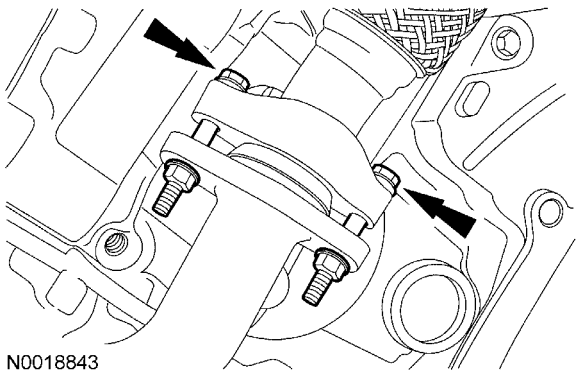
N0019842

4. Loosen the EGR cooler V-band clamp. Discard the gasket.



NOTE: LH shown, RH similar.

5. Remove the 4 turbocharger adapter pipe bolts.



6. Remove the turbocharger adapter pipe.

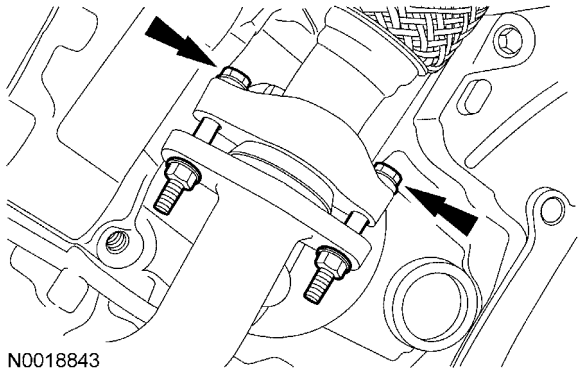
Turbocharger Inlet Y-Pipe — Installation

1. Install the turbocharger adapter pipe.

NOTE: Apply anti-seize lubricant to the bolt threads prior to installing.

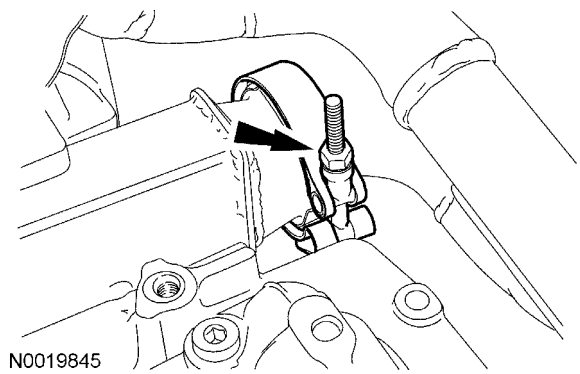
NOTE: LH shown, RH similar.

2. Tighten the 4 turbocharger adapter pipe bolts, alternating between bolts, in 3 stages:
   - Stage 1: Tighten all bolts to 9 Nm (80 lb-in).
   - Stage 2: Tighten all bolts and additional 18 Nm (13 lb-ft)
   - Stage 3: Tighten all bolts a final 27 Nm (20 lb-ft)



NOTE: Install a new turbocharger adapter pipe to EGR cooler gasket.

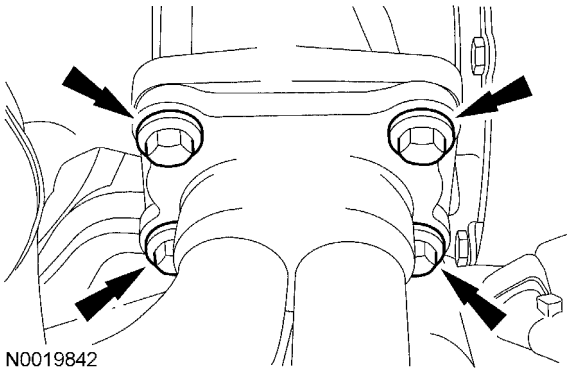
3. Position the EGR cooler gasket and install the EGR cooler V-band clamp.
   - Tighten to 12 Nm (9 lb-ft).

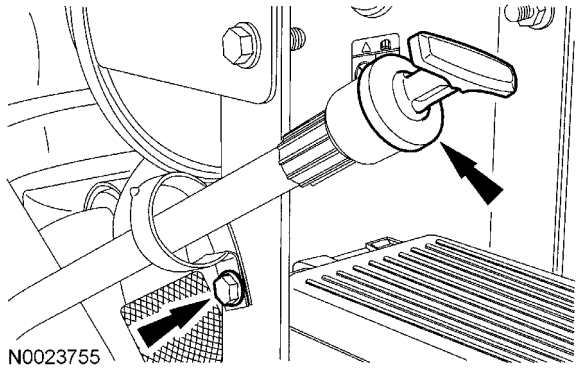


NOTE: Apply anti-seize lubricant to the bolt threads prior to installing.

NOTE: Install a new turbocharger inlet gasket.

4. Position the turbocharger inlet gasket and install the turbocharger adapter pipe bolts.
   - Tighten to 49 Nm (36 lb-ft).


N0019842


N0023755

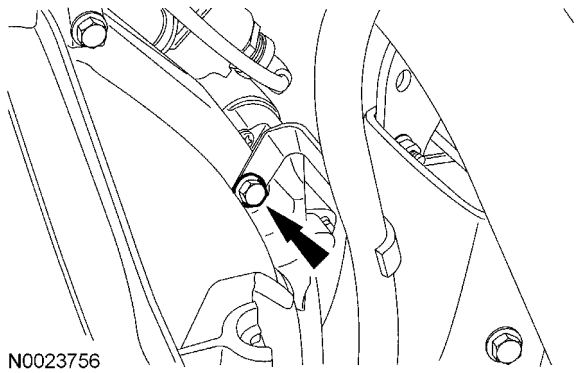
5. Install the exhaust system. For additional information, refer to Exhaust System in this section.

Exhaust System — Removal

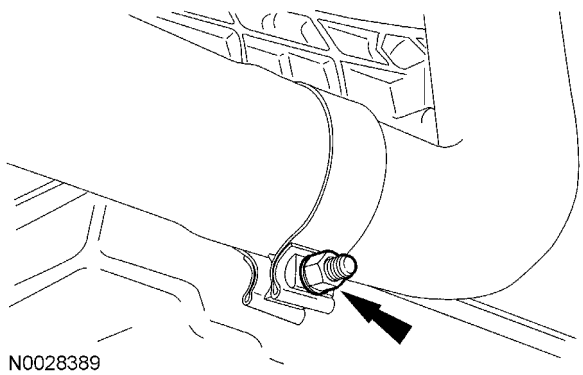
WARNING: The normal operating temperature of the exhaust system is very high. Never attempt to service any part of the system until it has cooled. Be especially careful when working around the catalytic converter and muffler assembly. The temperature of the catalytic converter and muffler assembly rises to a high level after only a few minutes of engine operation. Failure to follow these instructions may result in personal injury.

CAUTION: 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.

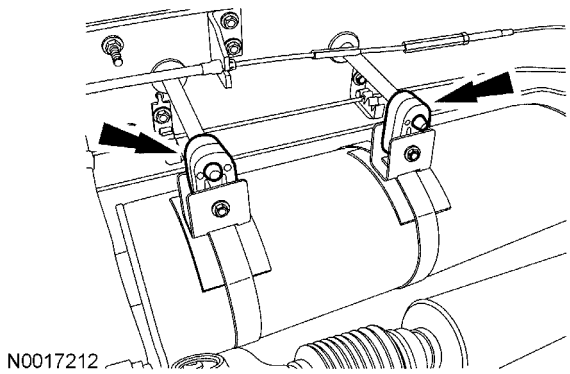
1. Raise and support the vehicle with the transmission in NEUTRAL. For additional information, refer to Jacking and Lifting in S10019.
2. Remove the transmission fluid indicator and bolt.
3. Loosen the bolt and remove the transmission indicator tube.
   - Plug or cap the opening as needed.


N0023756

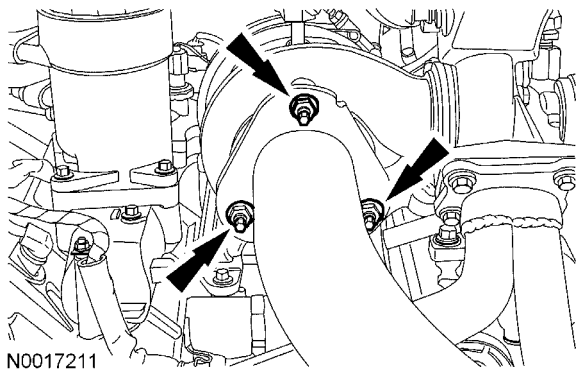
4. Support the exhaust pipe at the exhaust pipe-to-catalytic converter and muffler assembly joint.
5. Loosen the exhaust pipe-to-catalytic converter and muffler assembly coupling.


N0028389

6. Disconnect the 2 catalytic converter and muffler assembly isolator hangers, and remove the catalytic converter and muffler assembly.



7. Remove the exhaust pipe retaining nuts.



8. Remove the exhaust pipe and discard the turbocharger outlet gasket.

Exhaust System — Installation

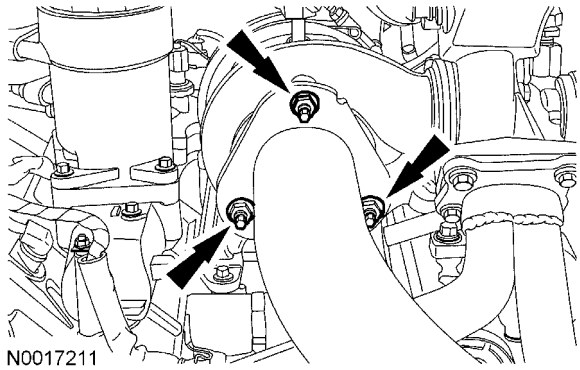
1. Clean the mating surface of the turbocharger-to-exhaust pipe.

NOTE: Install a new turbocharger outlet gasket.

2. Position the new turbocharger outlet gasket and the exhaust pipe.

NOTE: Apply anti-seize lubricant to the turbocharger-to-exhaust pipe stud threads prior to installing the nuts.

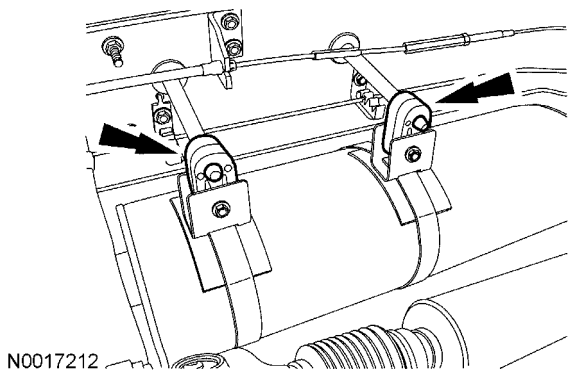
3. Install the exhaust pipe retaining nuts.
   - Tighten to 45 Nm (33 lb-ft).



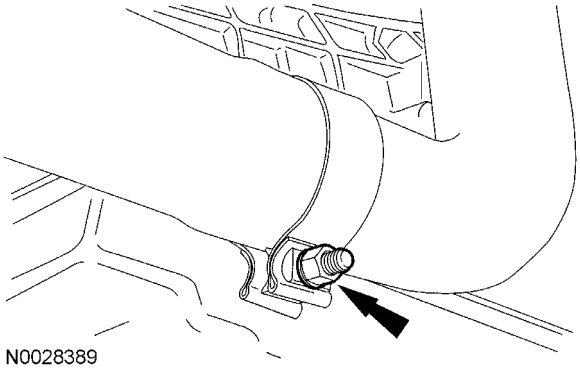
NOTE: Do not tighten the coupling until all components are assembled.

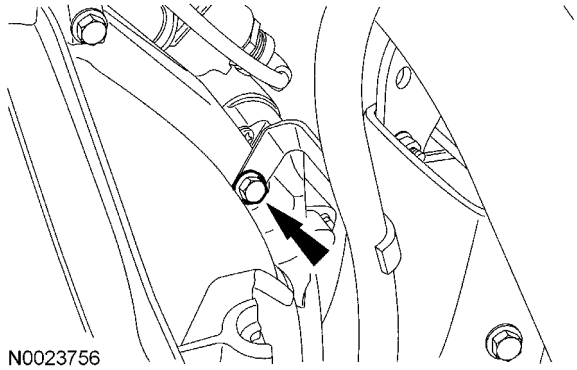
NOTE: Using an abrasive pad, clean the exhaust pipe-to-catalytic converter and muffler assembly mating surfaces of any surface rust.

4. Install the catalytic converter and muffler assembly.



5. Align the exhaust system. For additional information, refer to Exhaust System Alignment in this section.
6. Tighten the exhaust pipe-to-catalytic converter and muffler assembly coupling.
   - Tighten to 61 Nm (45 lb-ft).





7. Remove the cap or plug. Install the transmission indicator tube and tighten the bolt.
   - Tighten to 47 Nm (35 lb-ft).

8. Install the bolt and the transmission fluid indicator.