

EXHAUST SYSTEM

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DESCRIPTION AND OPERATION

EXHAUST SYSTEM

DESCRIPTION

The exhaust system is produced in one configuration (Fig. 1). The system has a front mounted catalytic converter, muffler and resonator. Tail pipes, mufflers, and resonators are tuned to each power-train combination.

CATALYTIC CONVERTER

DESCRIPTION

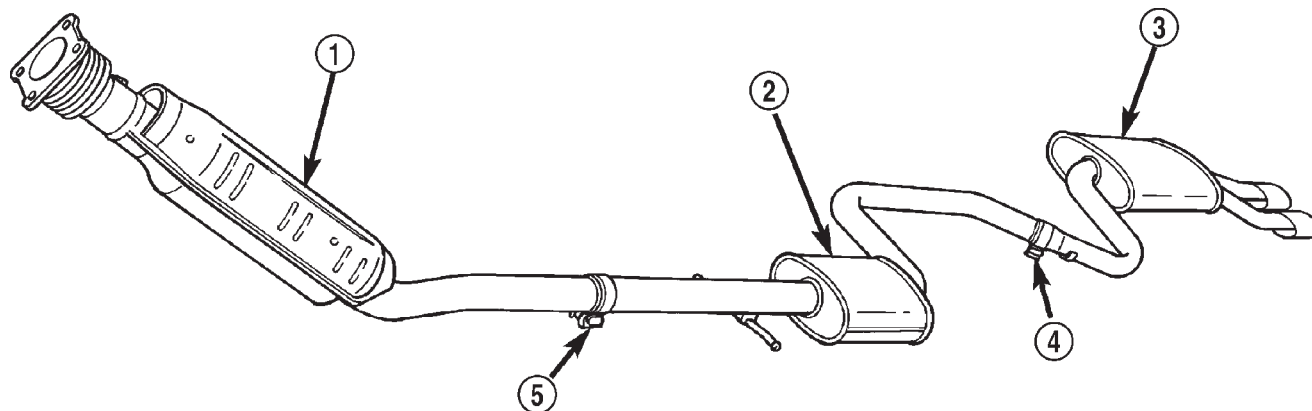
The under-floor, three-way catalytic converter inlet is connected to the exhaust manifold by use of a flex

joint and gasket. The outlet connects to the exhaust system.

OPERATION

The three-way catalytic converter simultaneously converts three exhaust emissions into harmless gases. Specifically, HC and CO emissions are converted into water (H₂O) and carbon dioxide (CO₂). Oxides of Nitrogen (NO_x) are converted into elemental Nitrogen (N) and water. The three-way catalyst is most efficient in converting HC, CO and NO_x at the stoichiometric air fuel ratio of 14.7:1.

The oxygen content in a catalyst is important for efficient conversion of exhaust gases. When a high oxygen content (lean) air/fuel ratio is present for an extended period, oxygen content in a catalyst can



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Fig. 1 Exhaust System

- 1 – CATALYTIC CONVERTER
2 – RESONATOR
3 – MUFFLER
- 4 – CLAMP
5 – CLAMP

DESCRIPTION AND OPERATION (Continued)

reach a maximum. When a rich air/fuel ratio is present for an extended period, the oxygen content in the catalyst can become totally depleted. When this occurs, the catalyst fails to convert the gases. This is known as catalyst "punch through."

Catalyst operation is dependent on its ability to store and release the oxygen needed to complete the emissions-reducing chemical reactions. As a catalyst deteriorates, its ability to store oxygen is reduced. Since the catalyst's ability to store oxygen is somewhat related to proper operation, oxygen storage can be used as an indicator of catalyst performance. Refer to the appropriate Powertrain Diagnostic Procedure for diagnosis of a catalyst related Diagnostic Trouble Code (DTC).

The combustion reaction caused by the catalyst releases additional heat in the exhaust system, causing temperature increases in the area of the reactor under severe operating conditions. Such conditions can exist when the engine misfires or otherwise does not operate at peak efficiency. **Do not** remove spark plug wires from plugs or by any other means short out cylinders, if exhaust system is equipped with a catalytic converter. Failure of the catalytic converter can occur due to temperature increases caused by unburned fuel passing through the converter. This deterioration of the catalyst core can result in excessively high emission levels, noise complaints, and exhaust restrictions.

The use of catalysts also involves some non-automotive problems. Unleaded gasoline must be used to avoid poisoning the catalyst core. Do not allow engine to operate above 1200 RPM in neutral for extended periods over 5 minutes. This condition may result in excessive exhaust system/floor pan temperatures because of no air movement under the vehicle.

CAUTION: Due to exterior physical similarities of some catalytic converters with pipe assemblies, extreme care should be taken with replacement parts. There are internal converter differences required in some parts of the country (particularly vehicles built for States with strict emission requirements).

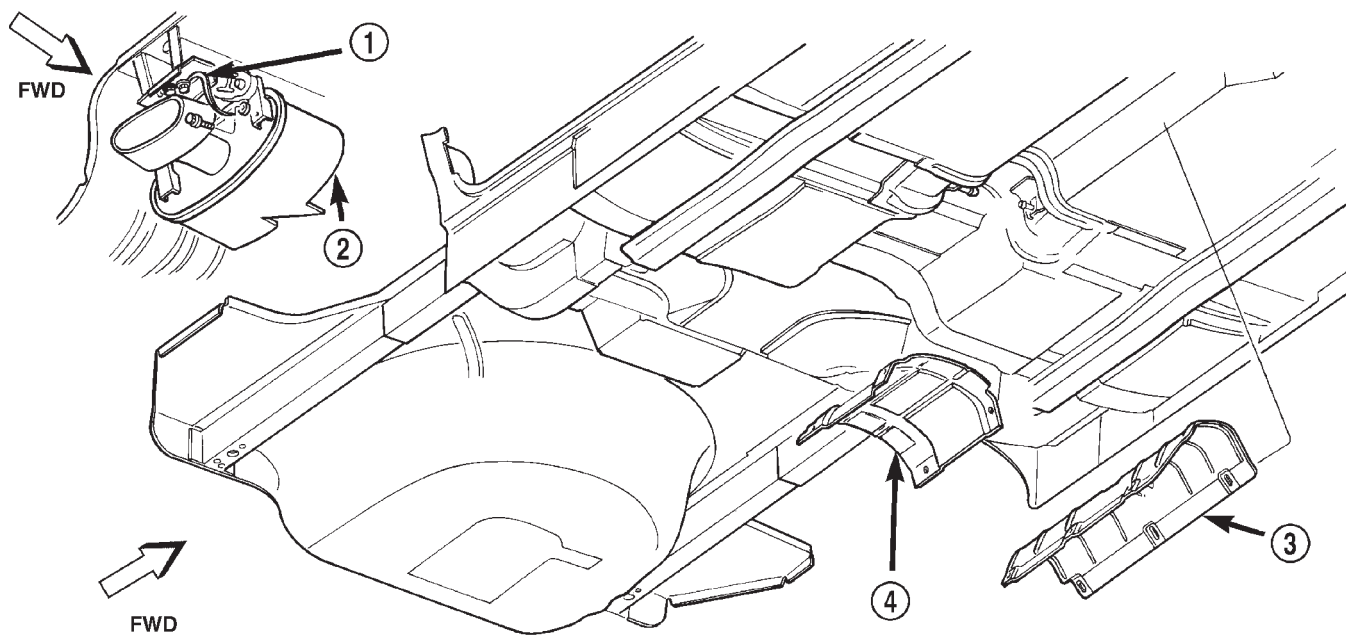
HEAT SHIELDS

DESCRIPTION

The exhaust system heat shields are attached to the under body of the vehicle (Fig. 2). All engines are equipped with a heat shield crimped on the top of the catalytic converter.

OPERATION

Heat shields are needed to protect both the vehicle and the environment from the high temperatures developed near the catalytic converter. All engines



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Fig. 2 Heat Shields

1 - GROUND STRAP
2 - MUFFLER

3 - HEAT SHIELD
4 - RESONATOR HEAT SHIELD

DESCRIPTION AND OPERATION (Continued)

are equipped with a heat shield crimped on the top of the converter.

Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan heat shields on cars so equipped. Light over spray near the edges is permitted. Application of coating will greatly reduce the efficiency of the heat shields resulting in excessive floor pan temperatures and objectionable fumes.

EXHAUST FLEX-JOINT COUPLING

DESCRIPTION

A exhaust flex-joint coupling (Fig. 3) is used to secure the catalytic converter to the engine manifold.

The exhaust flex-joint is welded to the catalytic converter.

OPERATION

This joint actually moves back and forth as the engine moves, preventing breakage that could occur from the back-and-forth motion of a transverse mounted engine.

DIAGNOSIS AND TESTING

EXHAUST SYSTEM

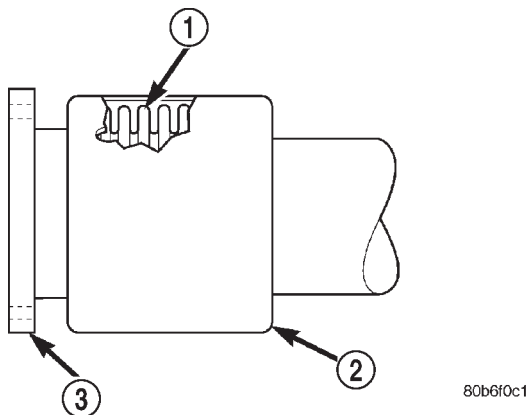


Fig. 3 Flex-Joint Coupling—2.0L

- 1 – BELLOWS
- 2 – COVER
- 3 – FLANGE

CAUTION: When servicing, care must be exercised not to dent or bend the bellows or bellows cover of the flex-joint. Should this occur, the flex-joint will eventually fail and require the catalytic converter be replaced.

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE EXHAUST NOISE (UNDER HOOD)	- Exhaust manifold cracked or broken. - Manifold to cylinder head leak. - EGR Valve to manifold gasket leakage. - EGR Valve to EGR tube gasket leakage. - EGR tube to manifold tube leakage. - Exhaust flex-joint to manifold leak. - Exhaust flex-joint. - Pipe and shell noise from front exhaust pipe.	- Replace manifold. - Tighten manifold and/or replace gasket. - Tighten fasteners or replace gasket. - Tighten fasteners or replace gasket. - Tighten tube nut. - Tighten joint fasteners and/or replace gasket. - Replace catalytic converter assembly. - Characteristic of single wall pipe.
EXCESSIVE EXHAUST NOISE	- Leak at exhaust pipe joints. - Burned or rusted out muffler assembly or exhaust pipe.	- Tighten clamps at leaking joints. - Replace muffler resonator tailpipe assembly or exhaust pipe with catalytic converter assembly.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Burned or rusted out resonator.	3. Replace muffler resonator tailpipe assembly.
	4. Restriction in exhaust system.	4. Remove restriction if possible, or replace component as necessary.
	5. Converter material in muffler.	5. Replace muffler and converter assemblies. Check fuel injection and ignition systems for proper operation.

REMOVAL AND INSTALLATION

EXHAUST SYSTEM

REMOVAL

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

(1) Raise vehicle on hoist and apply penetrating oil to clamp nuts of component being removed (Fig. 4).

(2) Loosen clamp at muffler to resonator/pipe assembly (Fig. 4).

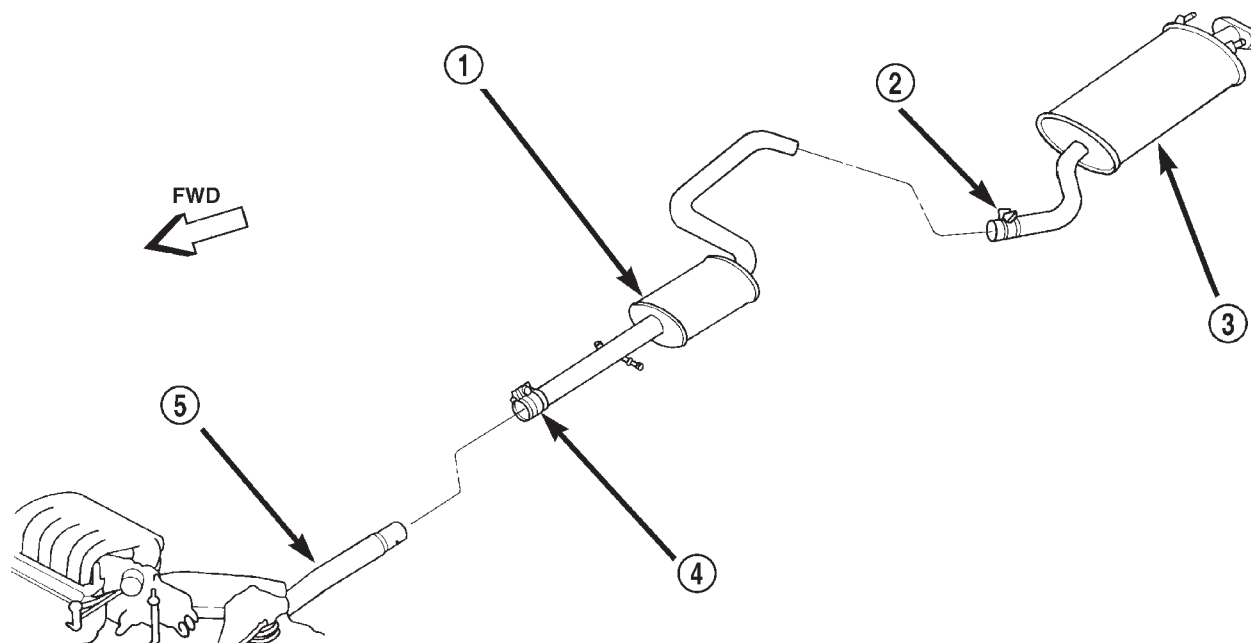
CAUTION: Do not use any tools to remove the rubber isolators—remove by hand only. Soapy water or silicone-based lubricant spray may be used to assist removal/installation of isolators. DO NOT use a petroleum-based lubricant on the isolators, as damage to the rubber material can occur.

(3) Remove support isolators from muffler supports.

(4) Remove ground strap from muffler (Fig. 7).

(5) Remove muffler assembly from resonator pipe.

(6) Remove clamp and supports at the resonator pipe to catalytic converter slip joint (Fig. 4). Separate at slip joint and remove the resonator assembly.



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Fig. 4 Exhaust System Components

- 1 - RESONATOR AND PIPE ASSEMBLY
- 2 - CLAMP
- 3 - MUFFLER AND PIPE ASSEMBLY

- 4 - CLAMP
- 5 - CATALYTIC CONVERTOR AND PIPE ASSEMBLY

REMOVAL AND INSTALLATION (Continued)

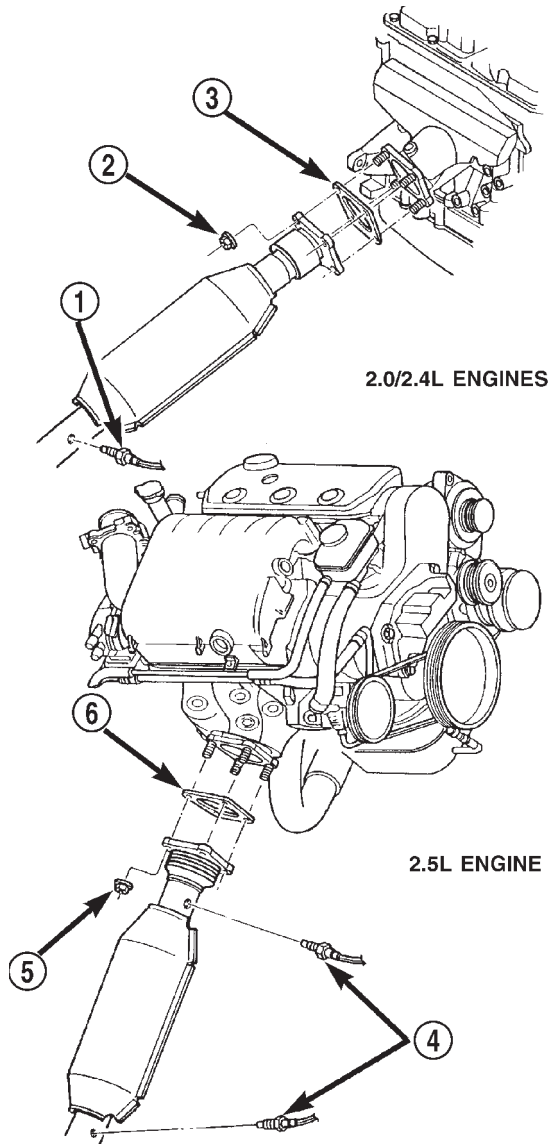


Fig. 5 Flex-Joint Connections

- 1 - OXYGEN SENSOR
- 2 - NUT
- 3 - GASKET
- 4 - OXYGEN SENSORS
- 5 - NUT
- 6 - GASKET

(7) Disconnect downstream heated oxygen sensor from the catalytic converter pipe (Fig. 6).

(8) Remove catalytic converter to exhaust manifold attaching fasteners (Fig. 5). Remove catalytic converter from vehicle.

(9) Clean ends of pipes and/or muffler to assure mating of all parts. Discard broken or worn insulators, rusted clamps, supports and attaching parts.

NOTE: Band clamps are spot welded to exhaust system. If a band clamp must be replaced, the spot weld must be ground off the exhaust pipe.

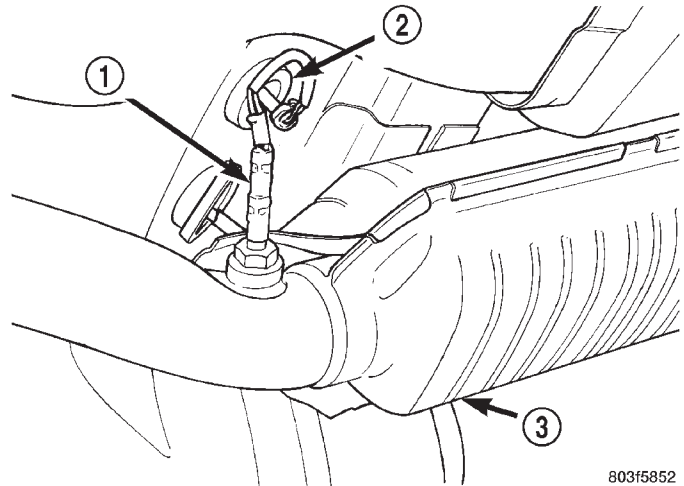


Fig. 6 Downstream Heated Oxygen Sensor

- 1 - DOWNSTREAM HEATED OXYGEN SENSOR
- 2 - RUBBER GROMMET
- 3 - CATALYTIC CONVERTER

NOTE: When replacement is required on any component of the exhaust system, it is most important that original equipment parts (or their equivalent) be used for the following reasons:

- To insure proper alignment with other parts in the system.
- Provide acceptable exhaust noise levels and does not change exhaust system back pressure that could affect emissions and performance.

INSTALLATION

When assembling exhaust system **do not** tighten clamps until components are aligned and supports have equal load on them (Fig. 7).

(1) Assemble catalytic convertor to exhaust manifold connection (Fig. 5).

(2) Assemble resonator pipe to catalytic convertor. Attach isolators to the supports on the underbody (Fig. 7).

(3) Install the muffler to resonator pipe. Attach isolators to the supports on the underbody (Fig. 7).

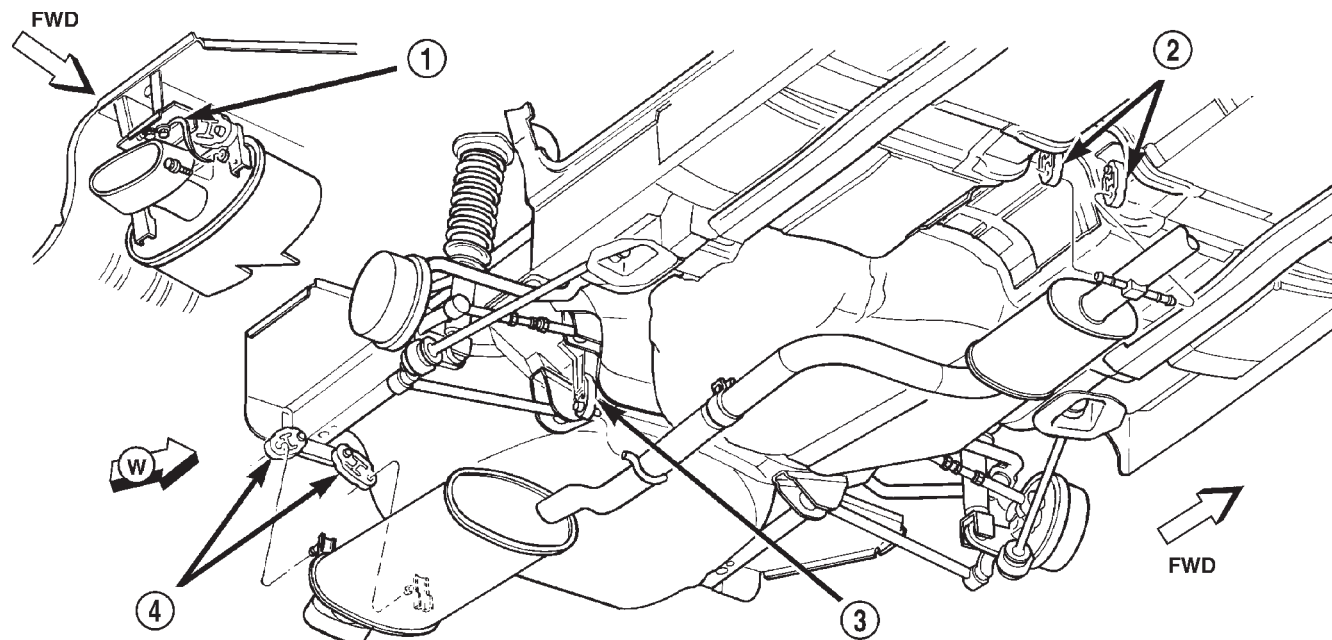
NOTE: Always work from the front to rear of exhaust system when aligning and tightening exhaust system components.

(4) Align and tighten the catalytic convertor to exhaust manifold fasteners (Fig. 5). Tighten fasteners to 28 N·m (250 in. lbs.).

(5) Align each component to maintain position and proper clearance with underbody parts. Also, all supports should have equal load on them. Tighten clamps to 54 N·m (40 ft. lbs.) (Fig. 8).

(6) Connect ground strap.

REMOVAL AND INSTALLATION (Continued)



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Fig. 7 Exhaust System Support Isolators—Typical

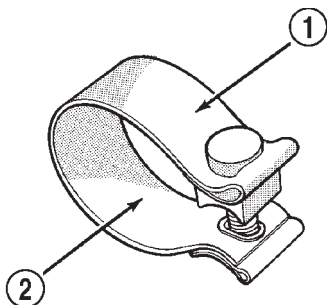
1 - GROUND STRAP

2 - RESONATOR SUPPORT ISOLATORS

3 - MUFFLER/FRONT PIPE SUPPORT ISOLATOR

4 - REAR MUFFLER SUPPORT ISOLATORS

(7) Connect the downstream heated oxygen sensor (Fig. 6).



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Fig. 8 Band Clamp

1 - CLAMP SIZE

2 - TORQUE SPECIFICATION

brackets, and insulators for cracks and corrosion damage.

NOTE: Slip joint band clamps are spot welded to exhaust system. If a band clamp must be replaced, the spot weld must be ground off.

ADJUSTMENTS**ALIGNMENT**

A misaligned exhaust system is usually indicated by a vibration, rattling noise, or binding of exhaust system components. These noises are sometimes hard to distinguish from other chassis noises. Inspect exhaust system for broken or loose clamps, heat shields, isolators, and brackets. Replace or tighten as necessary. It is important that exhaust system clearances and alignment be maintained.

Perform the following procedures to align the exhaust system:

(1) Loosen clamps and support brackets.

(2) Align the exhaust system starting at the front, working rearward.

(3) Tighten all clamps and brackets once alignment and clearances are achieved.

CLEANING AND INSPECTION**EXHAUST SYSTEM****INSPECTION**

Inspect the exhaust pipes, catalytic converters, muffler, and resonators for cracked joints, broken welds and corrosion damage that would result in a leaking exhaust system. Inspect the clamps, support

SPECIFICATIONS

TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Band Clamps—Fastener	54	40	—
Body Heat Shield—Fasteners	5	—	40
Catalytic Converter to Exhaust Manifold Flange—Fasteners	28	—	250

