

# EXHAUST SYSTEM

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## DESCRIPTION AND OPERATION EXHAUST SYSTEM

**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.**

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. The 2.5L engine model has an oval exhaust tip.

### CATALYTIC CONVERTERS

There is no regularly scheduled maintenance on the catalytic converter. If damaged, the converter must be replaced.

**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).

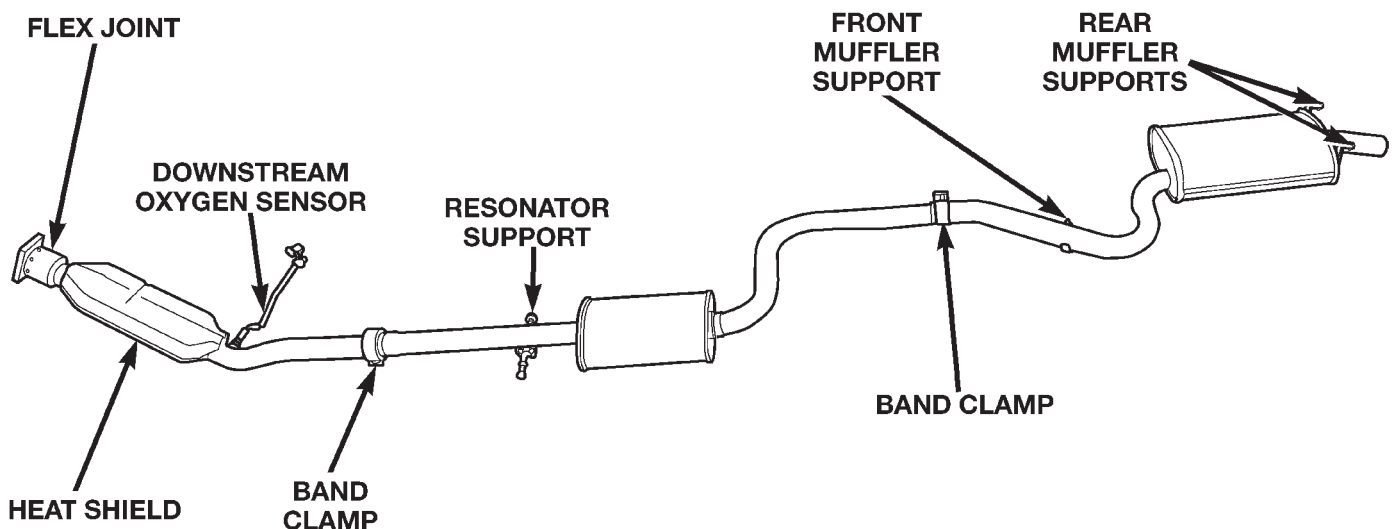


Fig. 1 Exhaust System

## DESCRIPTION AND OPERATION (Continued)

**EXHAUST GAS RECIRCULATION (EGR)**

To assist in the control of oxides of nitrogen (NO<sub>x</sub>) in engine exhaust, all engines are equipped with an exhaust gas recirculation system. The use of exhaust gas to dilute incoming air/fuel mixtures lowers peak flame temperatures during combustion, thus limiting the formation of NO<sub>x</sub>.

Exhaust gases are taken from opening in the exhaust manifold passage to the intake manifold. Refer to Group 25, Emission Control Systems for a complete Description, Diagnosis, and Service Procedures on the exhaust gas recirculation system and components.

**HEAT SHIELDS**

Heat shields (Fig. 2) are needed to protect both the vehicle and the environment from the high temperatures developed near the catalytic converters. All engines 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.**

The combustion reaction caused by the catalyst releases additional heat in the exhaust system. Causing temperature increases in the area of the catalytic converter under severe operating conditions. Such conditions can exist when the engine misfires or oth-

erwise 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 catalytic converter. Failure of the catalytic converter can occur due to temperature increases caused by unburned fuel passing through the converter.

The use of the catalysts also involves some non-automotive problems. Unleaded gasoline must be used to avoid poisoning the catalyst core. Do not allow engine to operate at fast idle for extended periods (over 5 minutes). This condition may result in excessive exhaust system and floor pan temperatures.

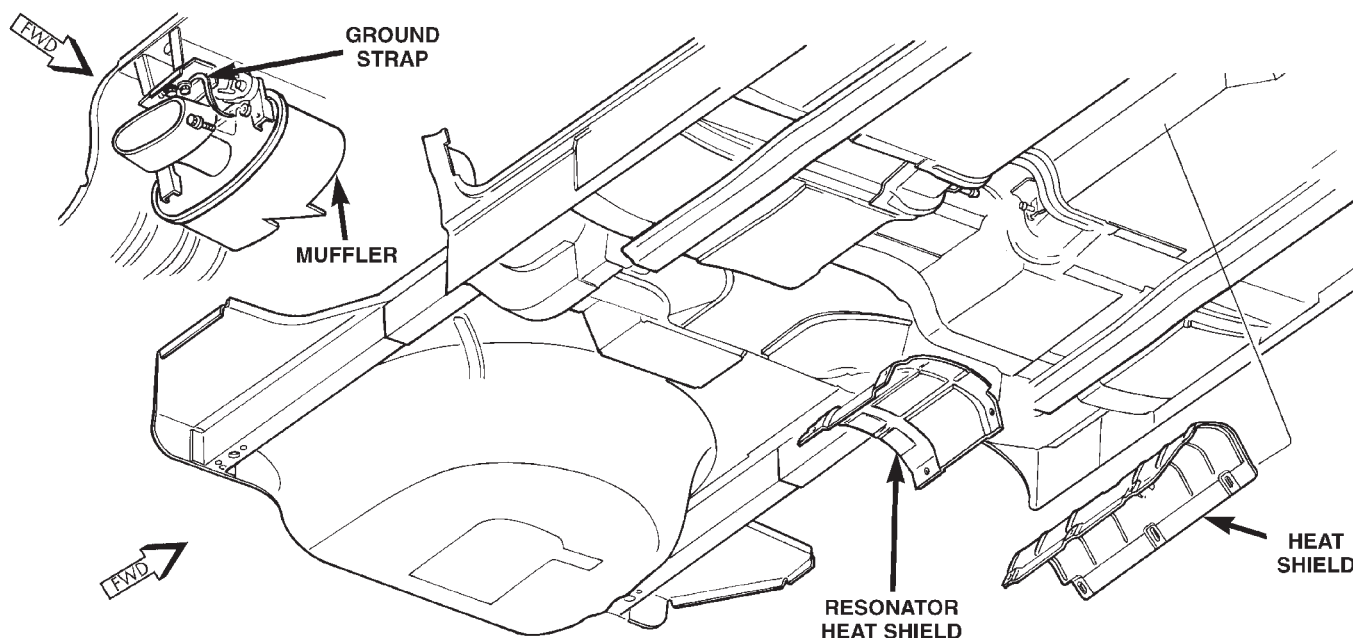
**EXHAUST SYSTEM GROUND STRAP**

All vehicles are equipped with a ground strap on the exhaust system. The ground strap is attached from the rear muffler bracket to the body (Fig. 2). The ground strap is used to suppress radio frequency interference/static.

**EXHAUST FLEX-JOINT COUPLING**

A exhaust flex-joint coupling (Fig. 3) and (Fig. 4) is used to secure the catalytic converter to the engine manifold. 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.

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

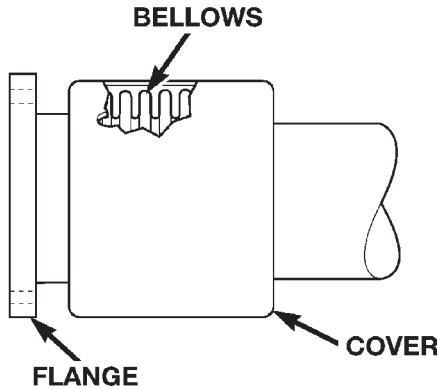


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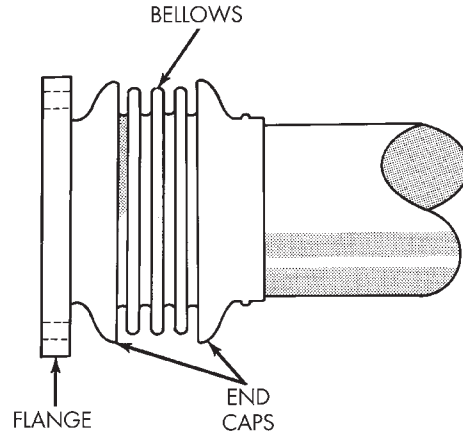
Fig. 2 Heat Shields

DESCRIPTION AND OPERATION (Continued)

**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.



**Fig. 3 Flex-Joint Coupling—2.0/2.4L**



**Fig. 4 Flex-Joint Coupling—2.5L**

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DIAGNOSIS AND TESTING  
EXHAUST SYSTEM

CONDITION	POSSIBLE CAUSES	CORRECTION
<b>EXCESSIVE EXHAUST NOISE (UNDER HOOD)</b>	<ol style="list-style-type: none"> <li>1. Exhaust manifold cracked or broken.</li> <li>2. Manifold to cylinder head leak.</li> <li>3. EGR Valve to manifold gasket leakage.</li> <li>4. EGR Valve to EGR tube gasket leakage.</li> <li>5. EGR tube to manifold tube leakage.</li> <li>6. Exhaust flex-joint to manifold leak.</li> <li>7. Exhaust flex-joint.</li> <li>8. Pipe and shell noise from front exhaust pipe.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace manifold.</li> <li>2. Tighten manifold and/or replace gasket.</li> <li>3. Tighten fasteners or replace gasket.</li> <li>4. Tighten fasteners or replace gasket.</li> <li>5. Tighten tube nut.</li> <li>6. Tighten joint fasteners and/or replace gasket.</li> <li>7. Replace catalytic converter assembly.</li> <li>8. Characteristic of single wall pipe.</li> </ol>
<b>EXCESSIVE EXHAUST NOISE</b>	<ol style="list-style-type: none"> <li>1. Leak at exhaust pipe joints.</li> <li>2. Burned or rusted out muffler assembly or exhaust pipe.</li> <li>3. Burned or rusted out resonator.</li> <li>4. Restriction in exhaust system.</li> <li>5. Converter material in muffler.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten clamps at leaking joints.</li> <li>2. Replace muffler resonator tailpipe assembly or exhaust pipe with catalytic converter assembly.</li> <li>3. Replace muffler resonator tailpipe assembly .</li> <li>4. Remove restriction, if possible, or replace as necessary.</li> <li>5. Replace muffler and converter assemblies. Check fuel injection and ignition systems for proper operation.</li> </ol>

## 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. 5).

(2) Loosen clamp at muffler to resonator/pipe assembly (Fig. 5).

**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. 5). Separate at slip joint and remove the resonator assembly.

(7) Disconnect downstream heated oxygen sensor from the catalytic converter pipe (Fig. 1).

(8) Vehicle equipped with 2.5L engine disconnect upstream heated oxygen sensor.

(9) Remove catalytic converter to exhaust manifold attaching fasteners (Fig. 6). Remove catalytic converter from vehicle.

(10) 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.**

**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.

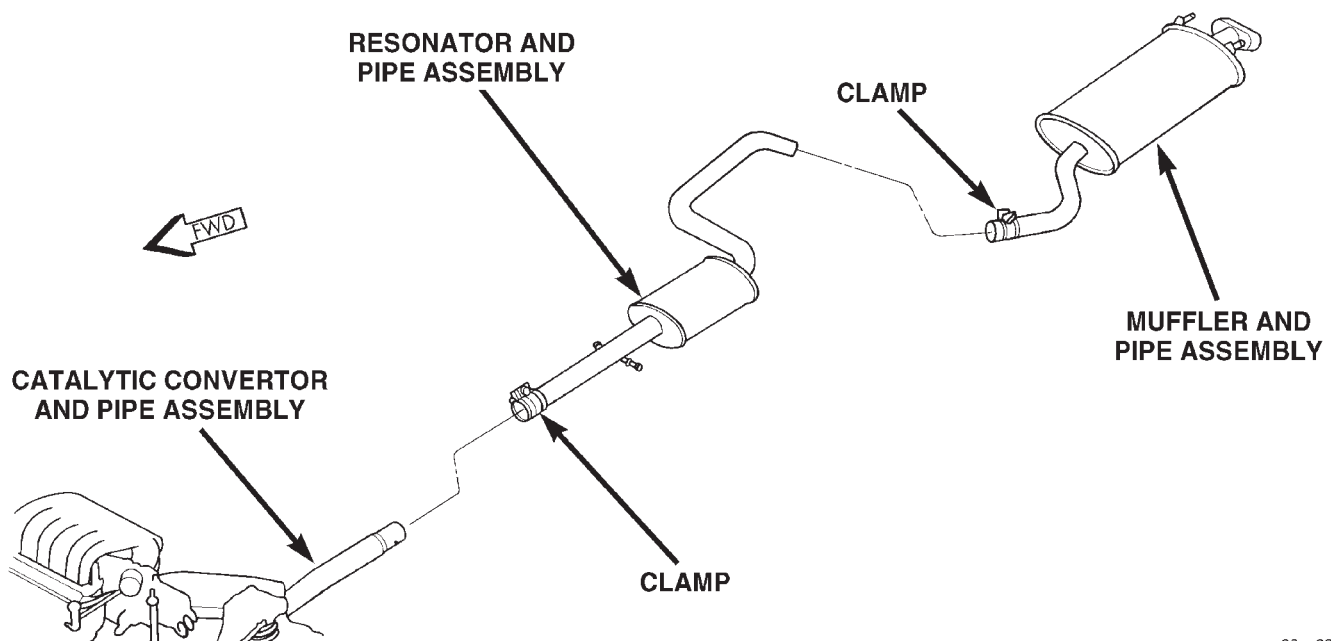


Fig. 5 Exhaust System Components

REMOVAL AND INSTALLATION (Continued)

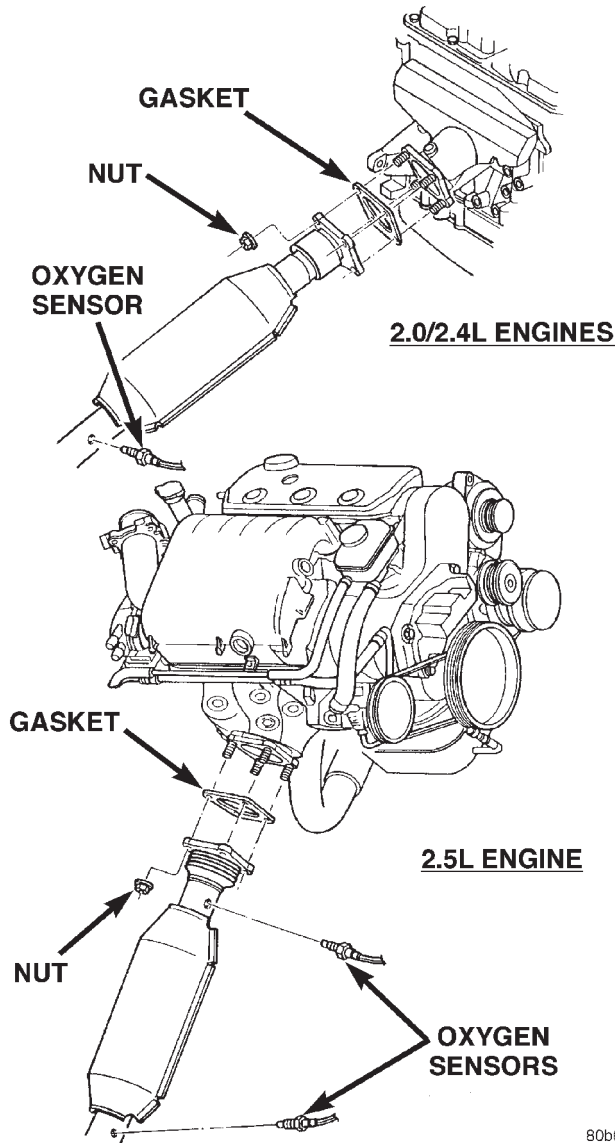


Fig. 6 Flex-Joint Connections

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. 6).

(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. 6). 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.

(7) Connect the downstream heated oxygen sensor.

(8) Connect the upstream heated oxygen sensor (2.5L engine).

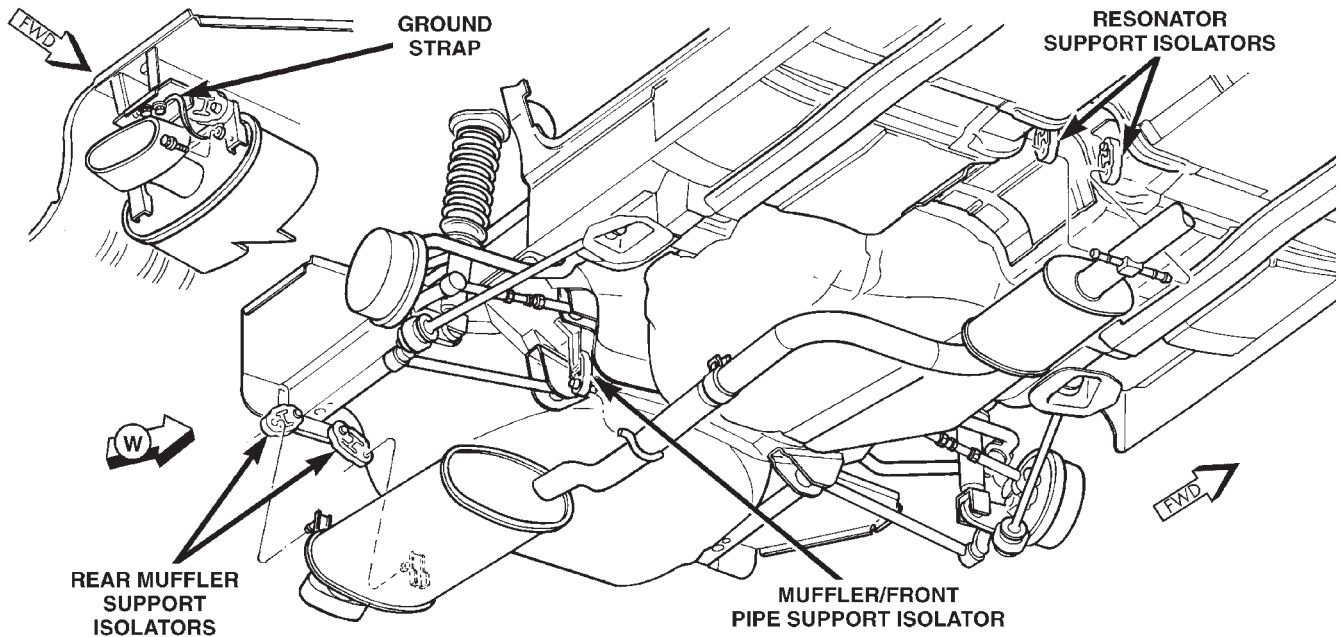
CLEANING AND INSPECTION

EXHAUST SYSTEM

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 brackets, and insulators for cracks and corrosion damage.

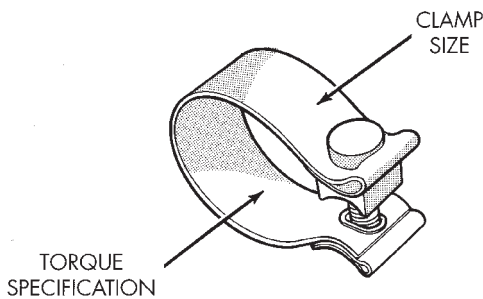
**NOTE:** Band clamps are spot welded to exhaust system. If a band clamp must be replaced, the spot weld must be ground off.

CLEANING AND INSPECTION (Continued)



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**Fig. 7 Exhaust System Support Isolators—Typical**



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**Fig. 8 Band Clamp**

**ADJUSTMENTS**

**EXHAUST SYSTEM 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, insulators, 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.

**SPECIFICATIONS**

**TORQUE**

DESCRIPTION	TORQUE
<b>Band Clamp</b>	
Fastener . . . . .	54 N·m (40 ft. lbs.)
<b>Body Heat Shields</b>	
Fasteners . . . . .	5 N·m (40 in. lbs.)
<b>Cross-Under Pipe</b>	
Fasteners . . . . .	31 N·m (275 in. lbs.)
<b>Exhaust Manifold Flange-2.0/2.4/2.5L</b>	
Fasteners . . . . .	28 N·m (250 in. lbs.)
<b>Exhaust Manifold Heat Shield-2.5L</b>	
Bolts . . . . .	13 N·m (115 in. lbs.)