

EXHAUST SYSTEM

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DESCRIPTION AND OPERATION

EXHAUST SYSTEM

The exhaust system consist of an under floor catalytic converter, a close coupled catalytic converter (ULEV only), intermediate pipe, and a muffler (Fig. 1).

EXHAUST FLEX-JOINT COUPLING

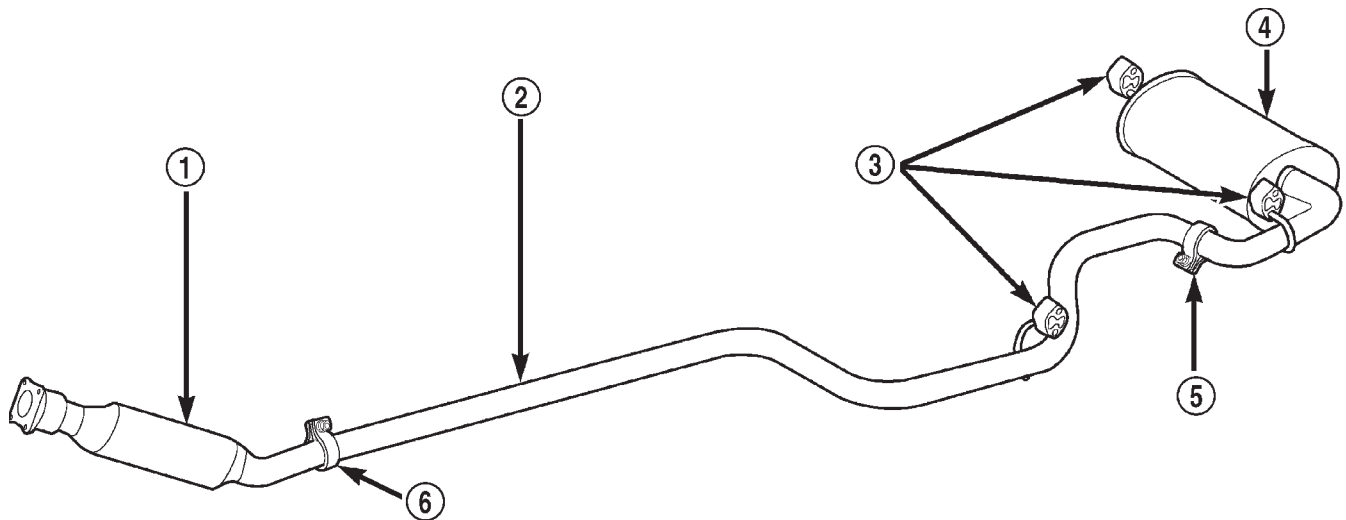
An exhaust flex-joint coupling is used to secure the catalytic converter to the exhaust manifold by using four fasteners and a gasket for sealing (Fig. 2). This coupling actually moves back and forth as the engine

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 pipe.

CATALYTIC CONVERTER

An under-floor catalytic converter is used on all three emission packages; Federal Emission, Low Emission Vehicle (LEV) and Ultra Low Emission Vehicle (ULEV) (Fig. 3). The ULEV emission package utilizes two catalytic converters. One is a close-coupled catalytic converter that is integral to the



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Fig. 1 Exhaust System

- | | |
|---------------------------------------|----------------|
| 1 - CATALYTIC CONVERTER (UNDER FLOOR) | 4 - MUFFLER |
| 2 - EXHAUST INTERMEDIATE PIPE | 5 - BAND CLAMP |
| 3 - ISOLATORS | 6 - BAND CLAMP |

DESCRIPTION AND OPERATION (Continued)

exhaust manifold, the other is a unique under-floor catalytic converter (Fig. 3).

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 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, caus-

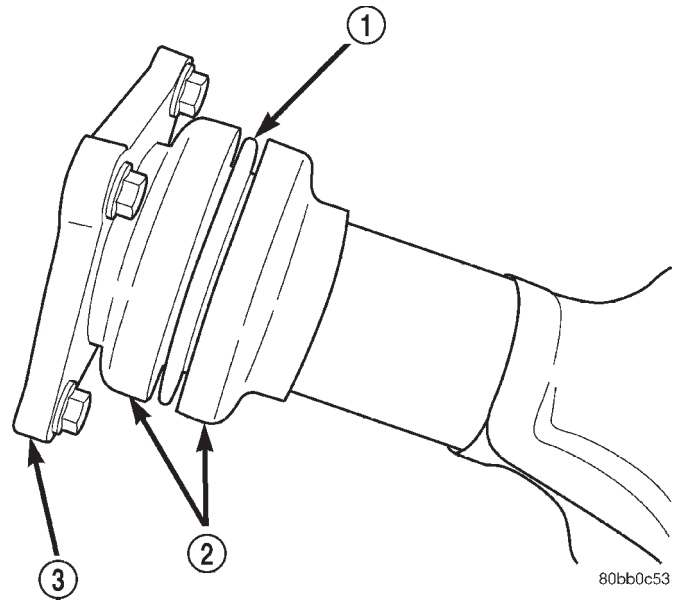


Fig. 2 Flex-Joint

- 1 - BELLOWS
- 2 - PROTECTIVE ENDCAPS
- 3 - FLANGE

ing 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

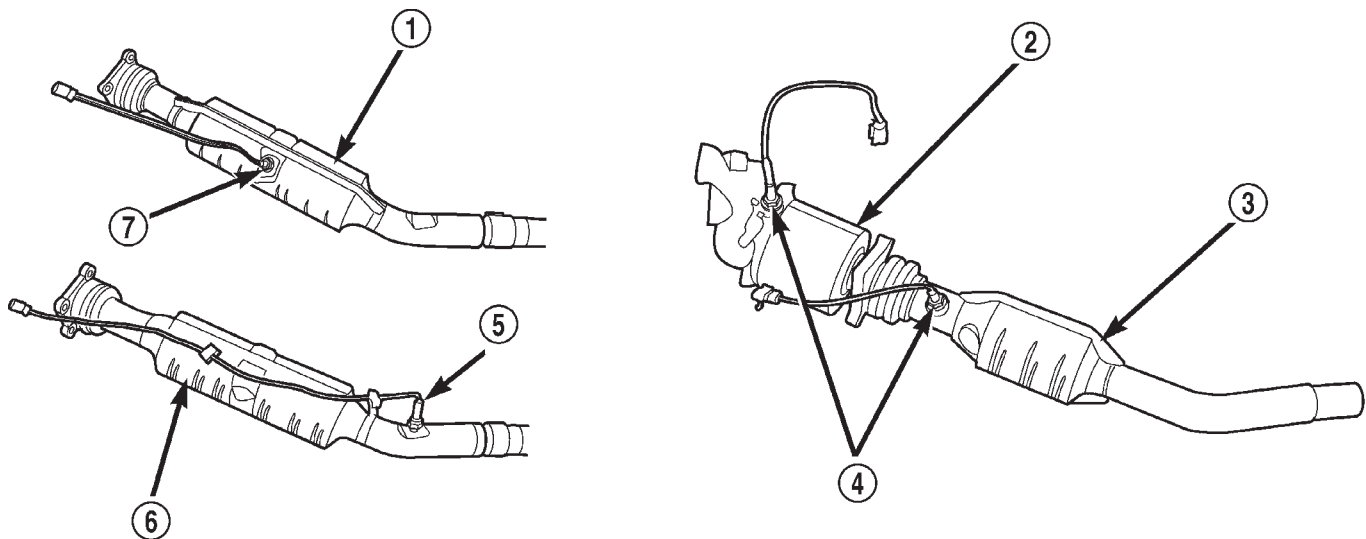


Fig. 3 Catalytic Converters

- 1 - CATALYTIC CONVERTER (LEV EMISSION)
- 2 - CLOSE-COUPLED CATALYTIC CONVERTER (ULEV EMISSION)
- 3 - UNDER-FLOOR CATALYTIC CONVERTER (ULEV EMISSION)
- 4 - OXYGEN SENSORS
- 5 - OXYGEN SENSOR
- 6 - CATALYTIC CONVERTER (FEDERAL EMISSION)
- 7 - OXYGEN SENSOR

DESCRIPTION AND OPERATION (Continued)

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.

There is no regularly scheduled maintenance on any DaimlerChrysler 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.

EXHAUST HEAT SHIELDS

The heat shields (Fig. 4), (Fig. 5), and (Fig. 6) are needed to protect both the vehicle and the environment from the high temperatures developed in the vicinity of the catalytic converter.

CAUTION: Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan heat shield on cars if 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.

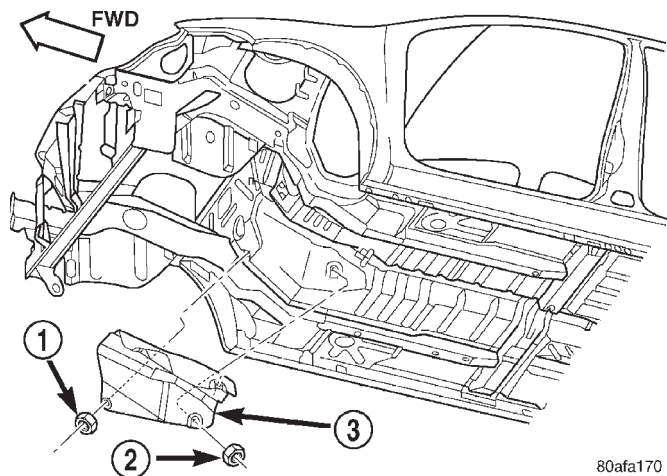


Fig. 4 Heat Shield—Catalytic Converter

- 1 - NUT
- 2 - NUT
- 3 - HEAT SHIELD

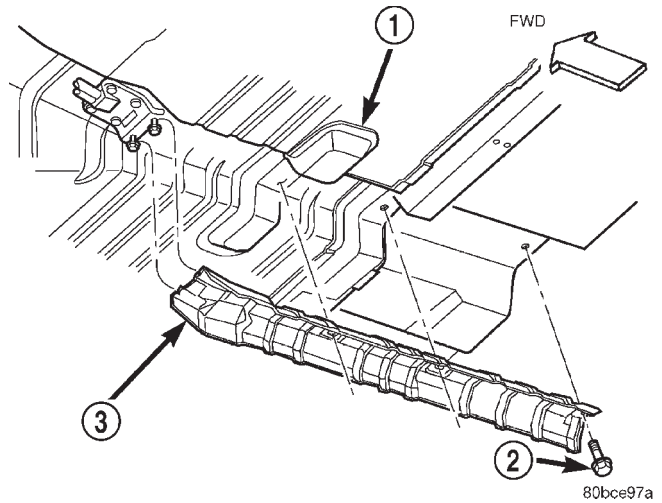


Fig. 5 Heat Shield—Intermediate Pipe

- 1 - UNDER BODY
- 2 - SCREWS
- 3 - HEAT SHIELD

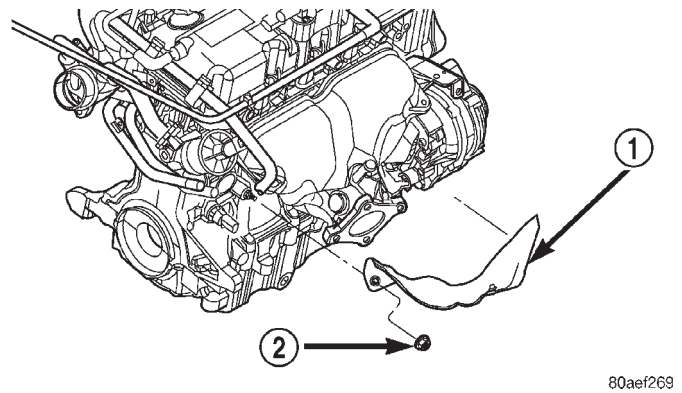


Fig. 6 Heat Shield—Engine Wire Harness

- 1 - HEAT SHIELD
- 2 - NUT (QTY. 2)

DIAGNOSIS AND TESTING

EXHAUST SYSTEM DIAGNOSIS CHART

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

REMOVAL AND INSTALLATION

EXHAUST PIPE AND MUFFLER

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 OPERATING TIME.

(1) Raise vehicle on hoist and apply penetrating oil to band clamp fastener of component being removed.

NOTE: Do not use petroleum-based lubricants when removing/installing muffler or exhaust pipe isolators as it may compromise the life of the part. A suitable substitute is a mixture of liquid dish soap and water.

(2) Remove exhaust system ground strap.

(3) Loosen band clamp and remove support isolators at muffler. Remove muffler from exhaust pipe (Fig. 7).

(4) Loosen band clamp at the catalytic converter to intermediate pipe joint (Fig. 7)

(5) Remove intermediate pipe support isolator. Separate at slip joint and remove intermediate pipe (Fig. 7).

(6) Clean ends of pipes and muffler to assure mating of all parts. Discard broken or worn isolators, rusted or overused clamps, supports, and attaching parts.

NOTE: When replacement is required on any component of the exhaust system, you must use original equipment parts (or their equivalent).

INSTALLATION

When assembling exhaust system **do not** tighten clamps until components are aligned and clearances are checked.

(1) Assemble intermediate pipe to catalytic converter and the isolator support to the underbody (Fig. 7).

(2) Install the muffler to intermediate pipe and the isolator supports to the underbody.

(3) Working from the front of system; align each component to maintain position and proper clearance with underbody parts (Fig. 9). Tighten band clamps to 47 N·m (35 ft. lbs.) (Fig. 8).

REMOVAL AND INSTALLATION (Continued)

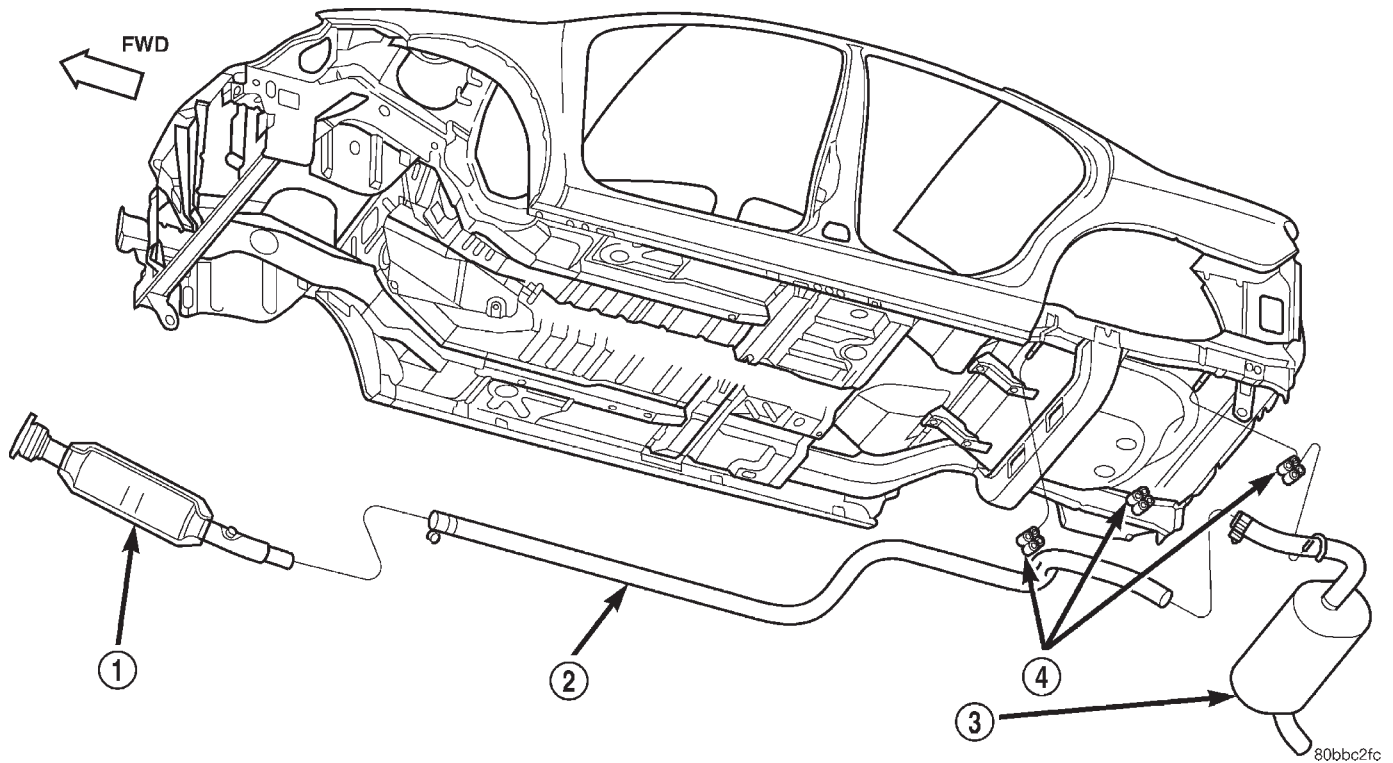


Fig. 7 Catalytic Converter, Intermediate Pipe, and Muffler

- 1 - CATALYTIC CONVERTER
- 2 - INTERMEDIATE PIPE

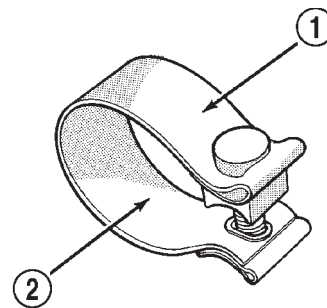
- 3 - MUFFLER
- 4 - ISOLATORS

CAUTION: Band clamps should never be tightened such that the two sides of the clamps are bottomed out against the center hourglass shaped center block. Once this occurs, the clamp band has been stretched and has lost its clamping force and must be replaced.*

* To replace the band clamp; remove the nut and peel back the ends of the clamp until spot weld breaks.

NOTE: Maintain proper clamp orientation when replacing with new clamp.

(4) Connect the exhaust system ground strap.

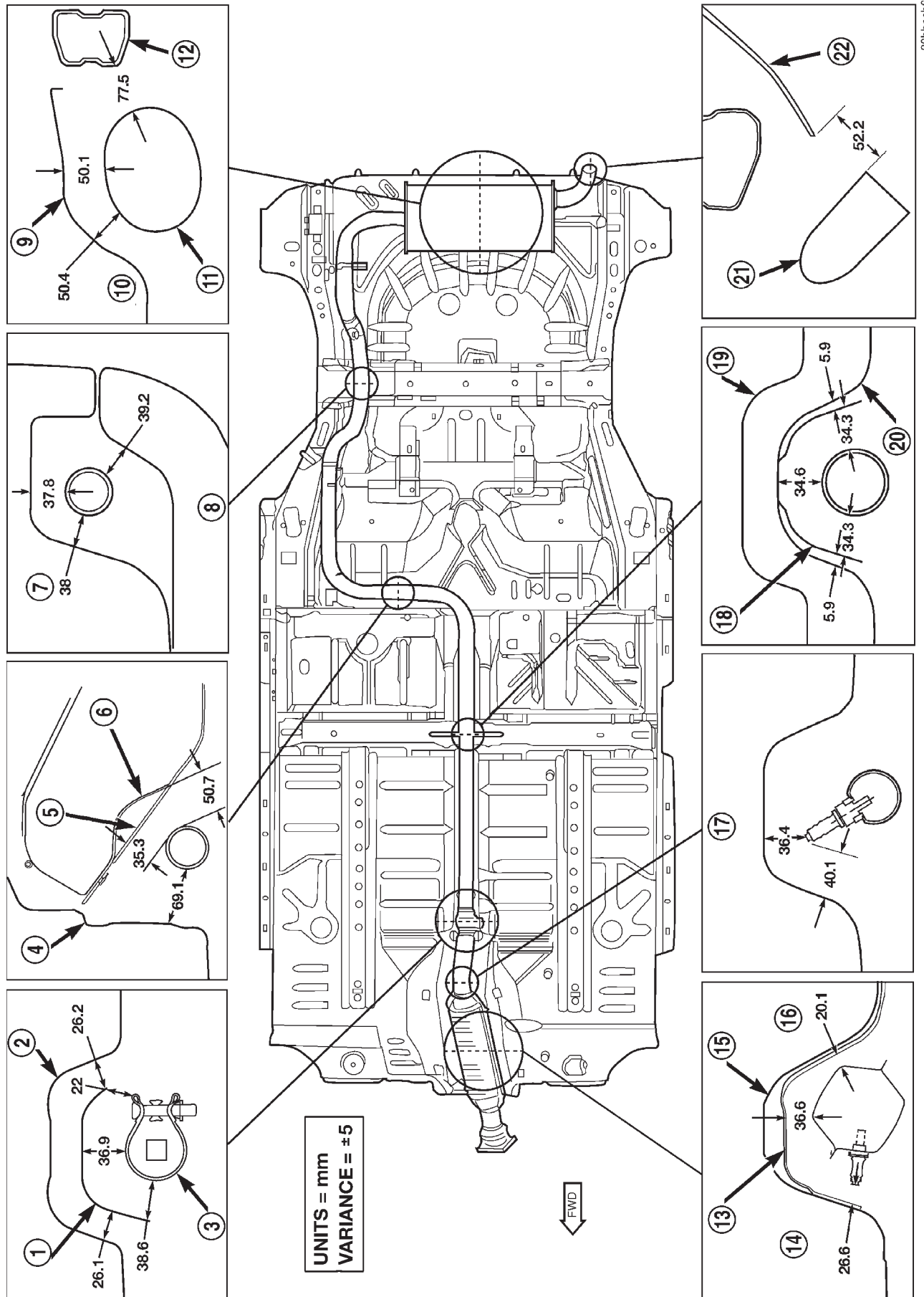


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Fig. 8 Band Clamp

- 1 - CLAMP SIZE
- 2 - TORQUE SPECIFICATION

REMOVAL AND INSTALLATION (Continued)



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Fig. 9 Exhaust Clearance

REMOVAL AND INSTALLATION (Continued)

- 1 - HEAT SHIELD
- 2 - FLOOR PAN
- 3 - BAND CLAMP
- 4 - FLOOR PAN
- 5 - TANK STRAP
- 6 - FUEL TANK
- 7 - SPARE TIRE TUB
- 8 - REAR SUSPENSION CROSSMEMBER
- 9 - FLOOR PAN
- 10 - SPARE TIRE TUB
- 11 - MUFFLER

- 12 - BUMPER BEAM
- 13 - HEAT SHIELD
- 14 - OXYGEN SENSOR CLEARANCE (LEV)
- 15 - FLOOR PAN
- 16 - FEDERAL & LEV
- 17 - OXYGEN SENSOR CLEARANCE (FEDERAL)
- 18 - HEAT SHIELD
- 19 - FLOOR PAN
- 20 - CROSSMEMBER
- 21 - TAIL PIPE
- 22 - FASCIA

CATALYTIC CONVERTER

REMOVAL

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER 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.

NOTE: Vehicles equipped with the ULEV emission package are equipped with an additional catalytic converter that is integral to the exhaust manifold. Refer to Exhaust Manifold in Group 9, Engine for procedure.

- (1) Remove muffler and exhaust pipe. Refer to procedure in this section.
- (2) Disconnect downstream oxygen sensor electrical connector.
- (3) Remove exhaust manifold support bracket (Federal and LEV only) (Fig. 10).
- (4) Remove catalytic converter to exhaust manifold attaching fasteners and remove converter from vehicle (Fig. 11) or (Fig. 12).
- (5) Remove and discard flange gasket.

NOTE: When replacement is required on any component of the exhaust system, original equipment parts (or equivalent) must be used.

INSTALLATION

NOTE: When assembling exhaust system do not tighten clamps until all components are aligned and clearances are checked.

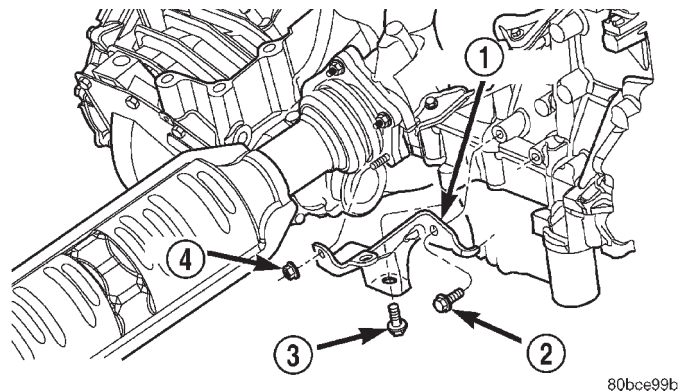


Fig. 10 Exhaust Manifold Support Bracket—Federal & LEV

- 1 - BRACKET
- 2 - BOLT (M10)
- 3 - BOLT (M12)
- 4 - NUT

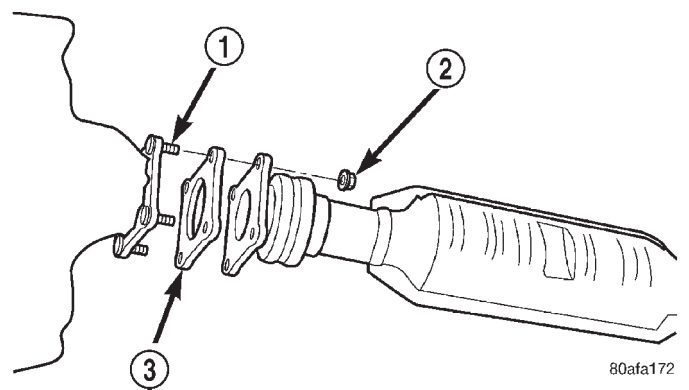


Fig. 11 Catalytic Converter to Exhaust Manifold Connection—Federal & LEV

- 1 - PRESSED-IN STUDS
- 2 - NUTS
- 3 - GASKET

- (1) Assemble catalytic converter to exhaust manifold connection. Use a new flange gasket.

REMOVAL AND INSTALLATION (Continued)

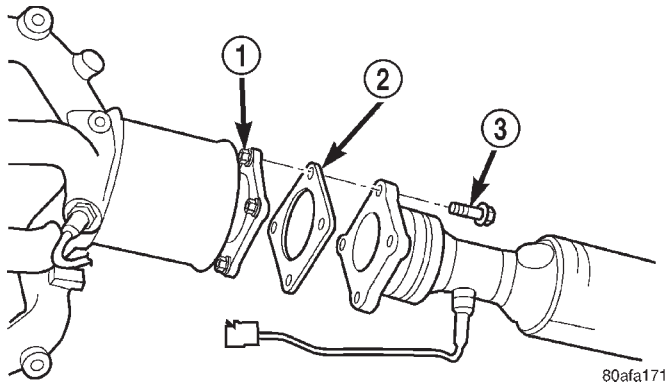


Fig. 12 Catalytic Converter to Exhaust Manifold Connection—ULEV

- 1 - PRESSED-IN NUTS
2 - GASKET
3 - BOLTS

(2) Install exhaust manifold support bracket (Federal and LEV only). Tighten M10 bolt to 54 N·m (40 ft. lbs.), M12 bolt to 95 N·m (70 ft. lbs.), and nut to 28 N·m (250 in. lbs.).

(3) Install bolt attaching manifold support bracket to the heat shield (Federal and LEV only). Tighten bolt to 28 N·m (250 in. lbs.).

(4) Assemble muffler and exhaust pipe to catalytic converter. Install muffler and pipe support isolators to the underbody.

(5) Tighten the catalytic converter to exhaust manifold fasteners to 28 N·m (250 in. lbs.) (Fig. 11) or (Fig. 12).

(6) Working from the front of the system—align each component to maintain position and proper clearance with under body components. Tighten all slip joint band clamps to 47 N·m (35 ft. lbs.).

CAUTION: Band (Torca) clamps should never be tightened such that the two sides of the clamps are bottomed out against the center hourglass shaped center block. Once this occurs, the clamp has lost clamping force and must be replaced.

- (7) If removed, install downstream oxygen sensor.
(8) Connect downstream oxygen sensor electrical connector.

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: 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

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. Refer to (Fig. 9) for clearance specifications:

- (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 SPECIFICATION CHART

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Band Clamps—Fastener	47	35	—
Catalytic Converter to Exhaust Manifold Flange—Fasteners	28	—	250