

# EXHAUST SYSTEM

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### DESCRIPTION AND OPERATION

#### EXHAUST SYSTEM

##### DESCRIPTION

**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.**

**CAUTION: Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan heat shields. Light overspray near the edges is permitted. Application of coating will result in excessive floor pan temperatures and objectionable fumes.**

The exhaust system uses a single muffler with a welded tail pipe.

The 4.0L and 4.7L Federal Emissions vehicles use a single catalytic converter, while the California models use two additional mini catalytic converters inline with the exhaust pipe below the exhaust manifolds.

The 4.0L and 4.7L exhaust manifolds are equipped with ball flange outlets to assure a tight seal and strain free connections.

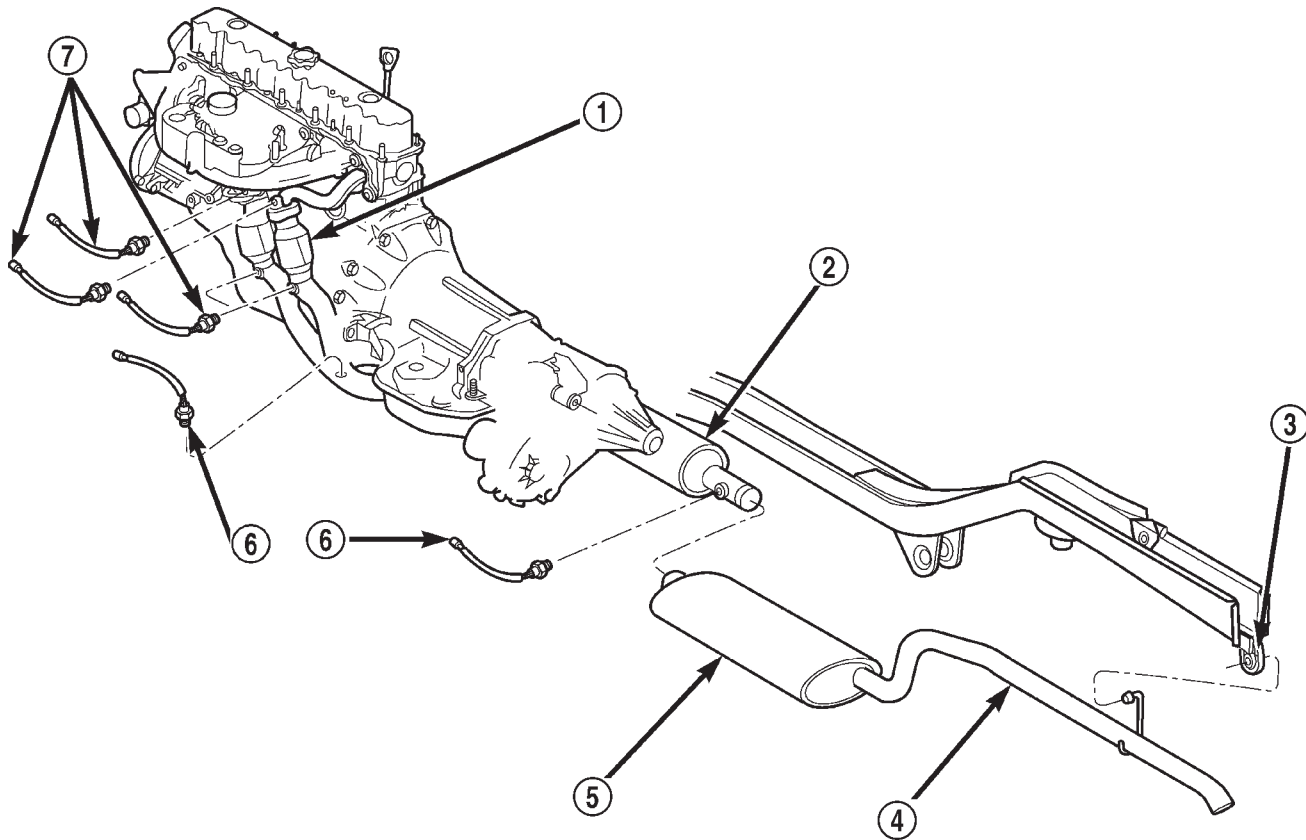
The exhaust system must be properly aligned to prevent stress, leakage and body contact. If the system contacts any body panel, it may amplify objectionable noises originating from the engine or body.

When inspecting an exhaust system, critically inspect for cracked or loose joints, stripped screw or bolt threads, corrosion damage and worn, cracked or broken hangers. Replace all components that are badly corroded or damaged. **DO NOT** attempt to repair.

When replacement is required, use original equipment parts (or their equivalent). This will assure proper alignment and provide acceptable exhaust noise levels.

## DESCRIPTION AND OPERATION (Continued)

The basic exhaust system consists of exhaust manifold(s), exhaust pipe with oxygen sensors, catalytic converter(s), heat shield(s), muffler and tailpipe (Fig. 1) (Fig. 2).

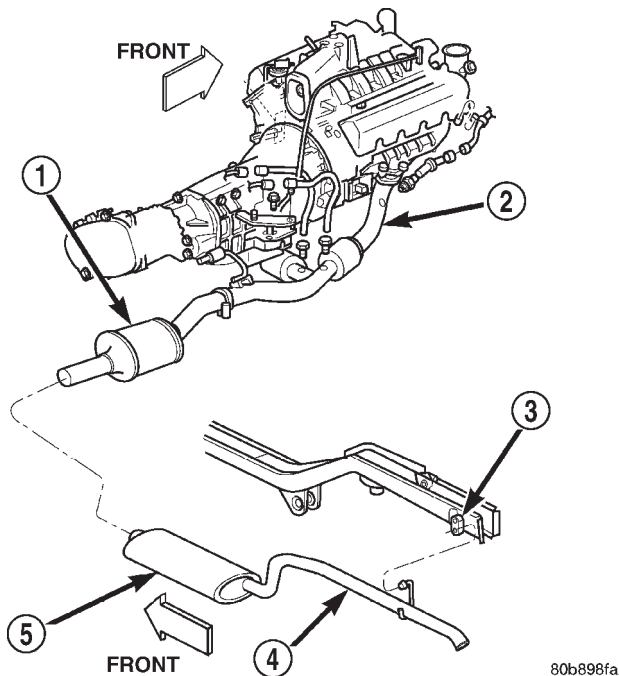


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**Fig. 1 Exhaust System—4.0L**

- |  |                                      |
|--|--------------------------------------|
| 1 - MINI CONVERTERS (2)                  | 5 - MUFFLER                          |
| 2 - CATALYTIC CONVERTER                  | 6 - OXYGEN SENSORS (FEDERAL)         |
| 3 - TAILPIPE HANGER REAR MOUNT INSULATOR | 7 - OXYGEN SENSORS (CALIFORNIA ONLY) |
| 4 - TAILPIPE                             |                                      |

DESCRIPTION AND OPERATION (Continued)



**Fig. 2 Exhaust System—4.7L**

- 1 - CATALYTIC CONVERTER
- 2 - EXHAUST PIPE
- 3 - TAIL PIPE HANGER REAR MOUNT INSULATOR
- 4 - TAILPIPE
- 5 - MUFFLER

**CATALYTIC CONVERTER**

**DESCRIPTION**

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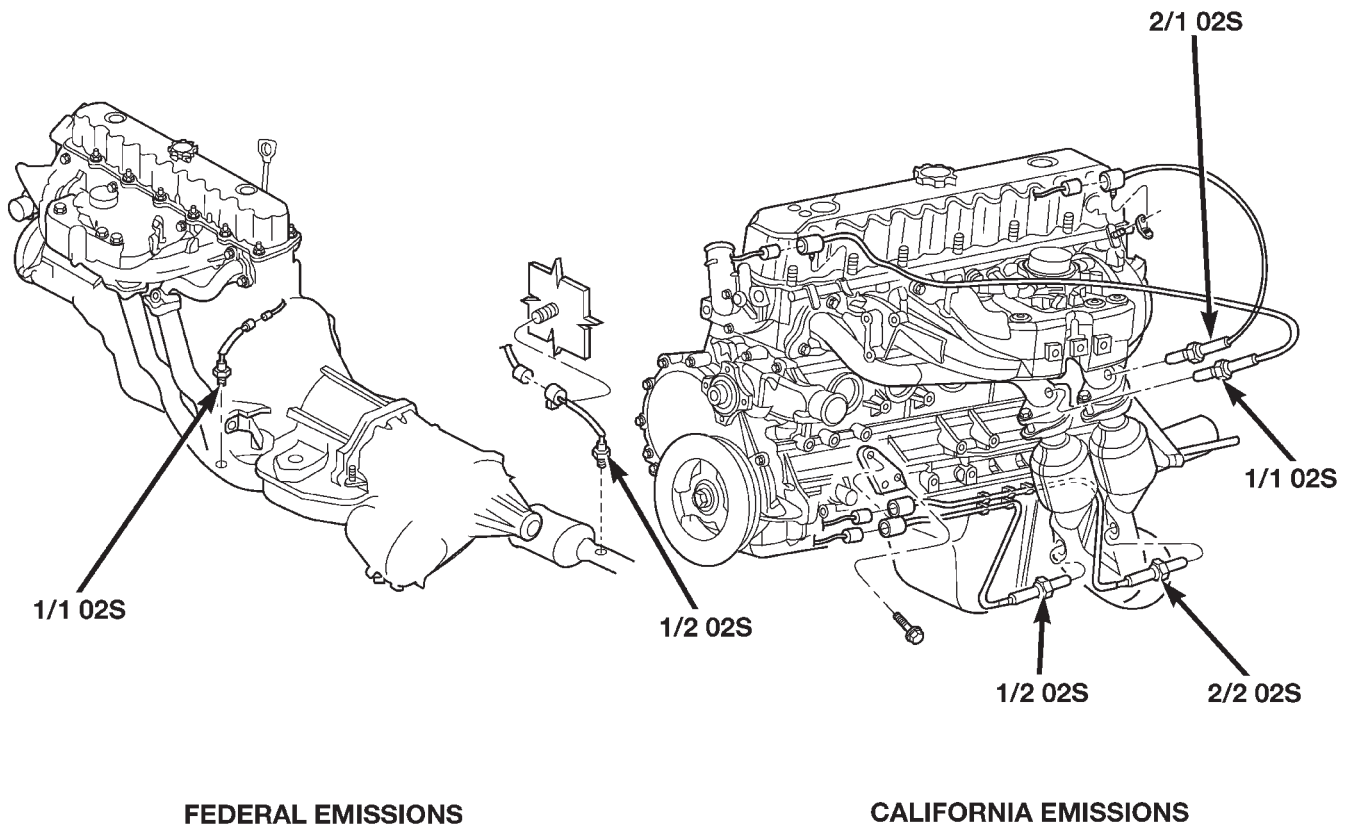
**CAUTION:** DO NOT remove spark plug wires from plugs or by any other means short out cylinders. Failure of the catalytic converter can occur due to a temperature increase caused by unburned fuel passing through the converter.

The stainless steel catalytic converter body is designed to last the life of the vehicle. Excessive heat can result in bulging or other distortion, but excessive heat will not be the fault of the converter. If unburned fuel enters the converter, overheating may occur. If a converter is heat-damaged, correct the cause of the damage at the same time the converter is replaced. Also, inspect all other components of the exhaust system for heat damage.

**Unleaded gasoline must be used to avoid contaminating the catalyst core.**

DESCRIPTION AND OPERATION (Continued)

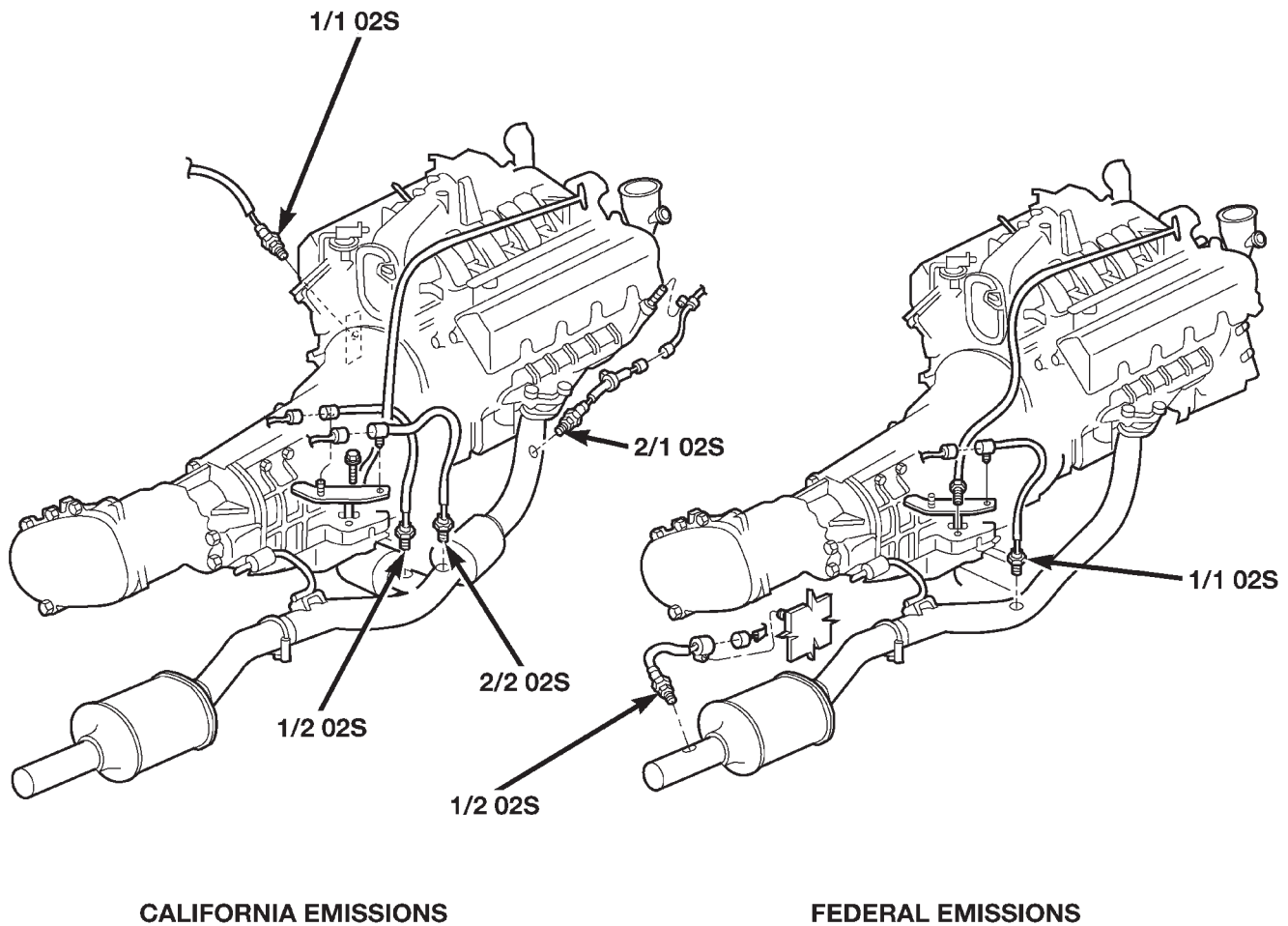
Federal emission vehicles use only one catalytic converter. However, California emission vehicles incorporate two mini catalytic converters located after the exhaust manifolds and before the inline catalytic converter (Fig. 3) (Fig. 4).



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**Fig. 3 4.0L Catalytic Converter and O2 Sensor Configuration—California and Federal Emissions**

DESCRIPTION AND OPERATION (Continued)



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**Fig. 4 4.7L Catalytic Converter and O2 Sensor Configuration—California and Federal Emissions**

**MUFFLER**

**DESCRIPTION**

Both the 4.0L and 4.7L engines use a stainless steel muffler to control exhaust noise levels and exhaust back pressure. The muffler and tailpipe are a one piece assembly.

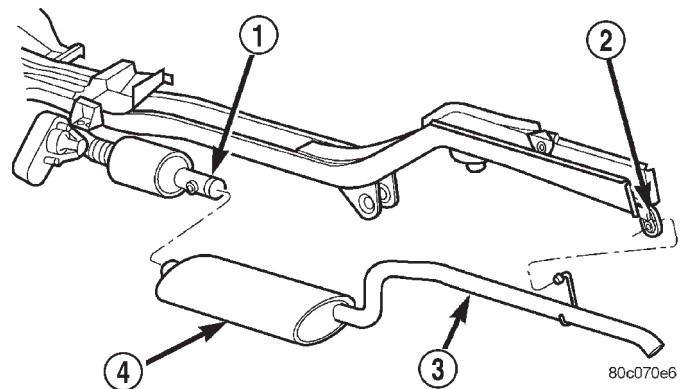
**TAILPIPE**

**DESCRIPTION**

The tailpipe is also made of stainless steel (Fig. 5).

**OPERATION**

The Tailpipe channels the exhaust out of the muffler and out from under the vehicle to control noise and prevent exhaust gas fumes from entering the passenger compartment



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**Fig. 5 Muffler and Tailpipe Assembly**

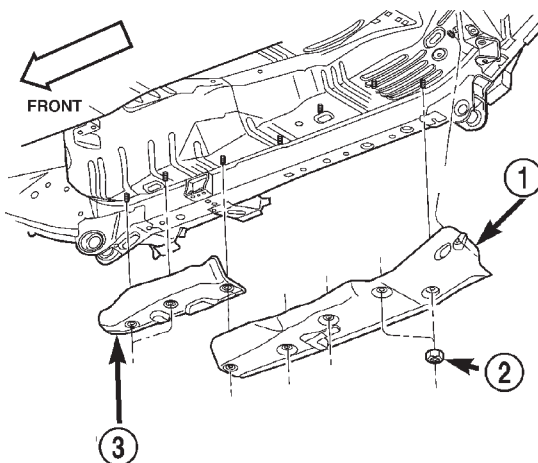
- 1 - CATALYTIC CONVERTER
- 2 - TAILPIPE HANGER
- 3 - TAILPIPE
- 4 - MUFFLER

DESCRIPTION AND OPERATION (Continued)

HEAT SHIELDS

DESCRIPTION

Heat shields are needed to protect both the vehicle and the environment from the high temperatures developed by the catalytic converter. The catalytic converter releases additional heat into the exhaust system. Under severe operating conditions, the temperature increases in the area of the converter. Such conditions can exist when the engine misfires or otherwise does not operate at peak efficiency (Fig. 6).



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**Fig. 6 Front and Rear Floor Pan Heat Shields**

- 1 - REAR FLOOR PAN HEAT SHIELD
- 2 - HEAT SHIELD RETAINING NUTS (QTY 8) TIGHTEN TO 2 N·m (20 IN. LBS.)
- 3 - FRONT FLOOR PAN HEAT SHIELD

DIAGNOSIS AND TESTING

EXHAUST SYSTEM DIAGNOSIS

EXHAUST SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
<b>EXCESSIVE EXHAUST NOISE</b>	<ol style="list-style-type: none"> <li>1. Leaks at pipe joints.</li> <li>2. Burned or blown out muffler.</li> <li>3. Burned or rusted-out exhaust pipe.</li> <li>4. Exhaust pipe leaking at manifold flange.</li> <li>5. Exhaust manifold cracked or broken.</li> <li>6. Leak between exhaust manifold and cylinder head.</li> <li>7. Restriction in muffler or tailpipe.</li> <li>8. Exhaust system contacting body or chassis.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten clamps at leaking joints.</li> <li>2. Replace muffler assembly. Check exhaust system.</li> <li>3. Replace exhaust pipe.</li> <li>4. Tighten connection attaching nuts.</li> <li>5. Replace exhaust manifold.</li> <li>6. Tighten exhaust manifold to cylinder head stud nuts or bolts.</li> <li>7. Remove restriction, if possible. Replace muffler or tailpipe, as necessary.</li> <li>8. Re-align exhaust system to clear surrounding components.</li> </ol>
<b>LEAKING EXHAUST GASES</b>	<ol style="list-style-type: none"> <li>1. Leaks at pipe joints.</li> <li>2. Damaged or improperly installed gaskets (4.0L only).</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten/replace clamps at leaking joints.</li> <li>2. Replace gaskets as necessary (4.0L only).</li> </ol>

REMOVAL AND INSTALLATION

EXHAUST PIPE

REMOVAL

**WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.**

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- (1) Raise and support the vehicle.
- (2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.
- (3) Remove the oxygen sensor from the exhaust pipe (Fig. 7) (Fig. 8).
- (4) Heat the exhaust pipe and catalytic converter connection with a torch until the metal becomes cherry red. While the metal is still cherry red, twist the catalytic converter back and forth to separate it from the exhaust pipe (Fig. 9).

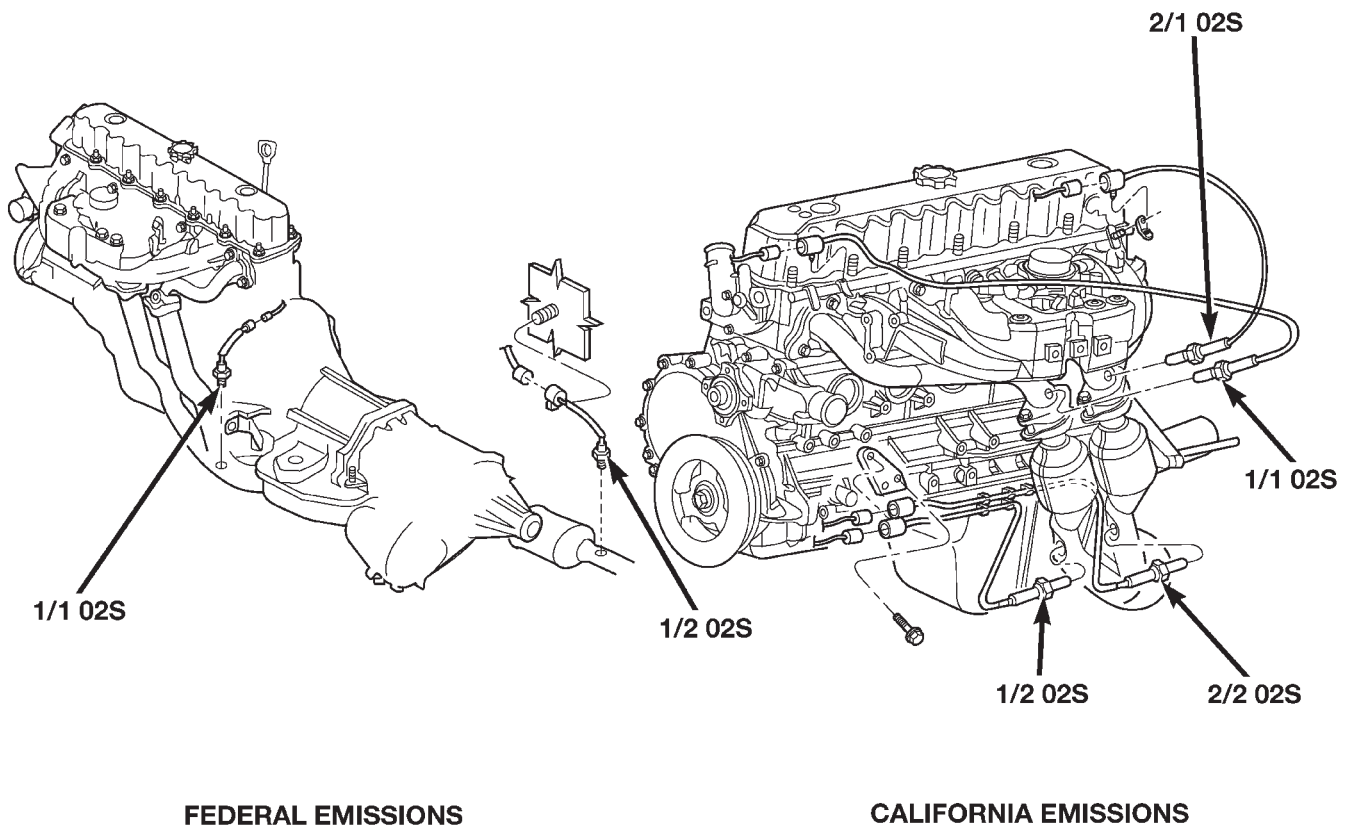
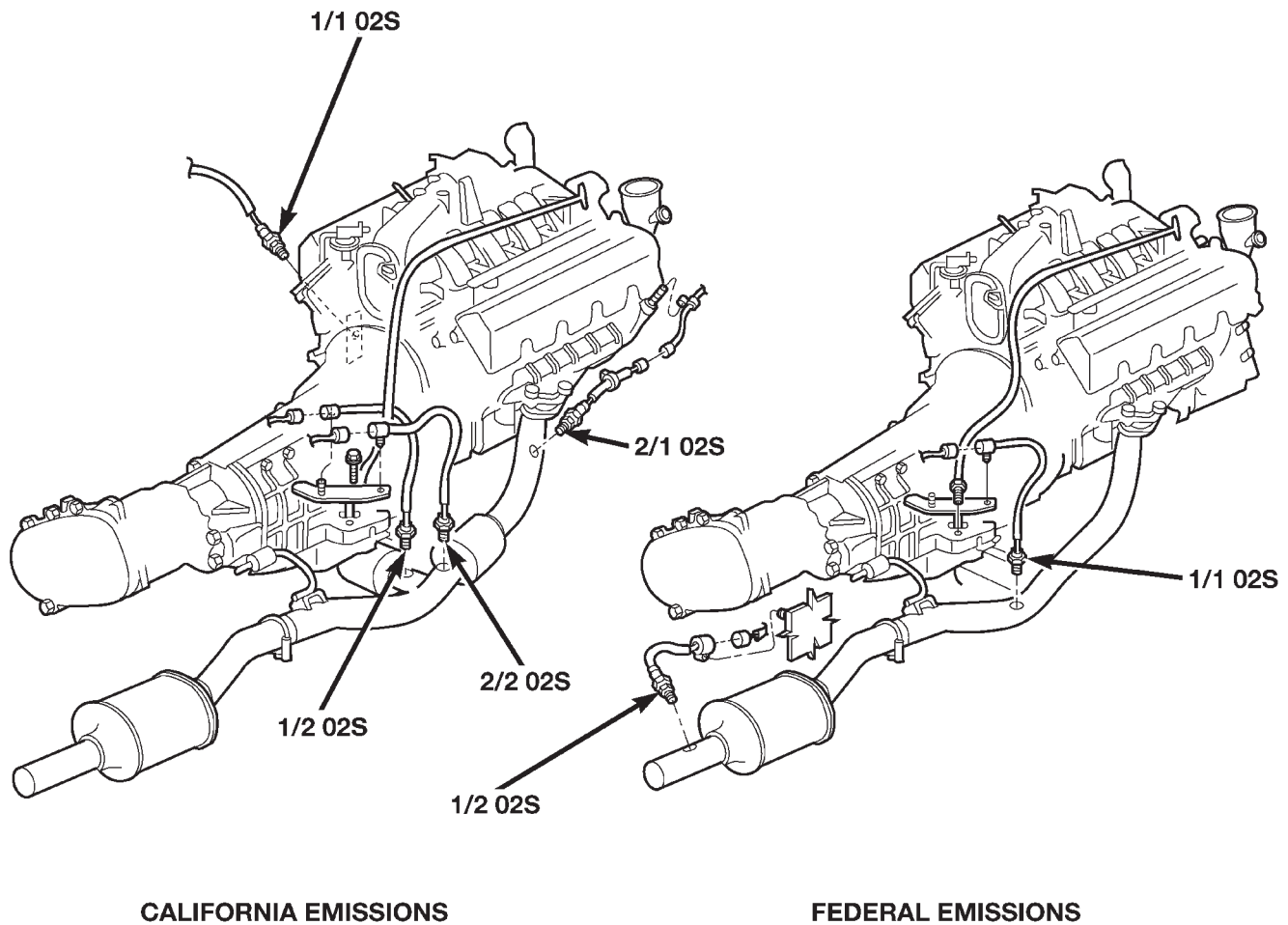


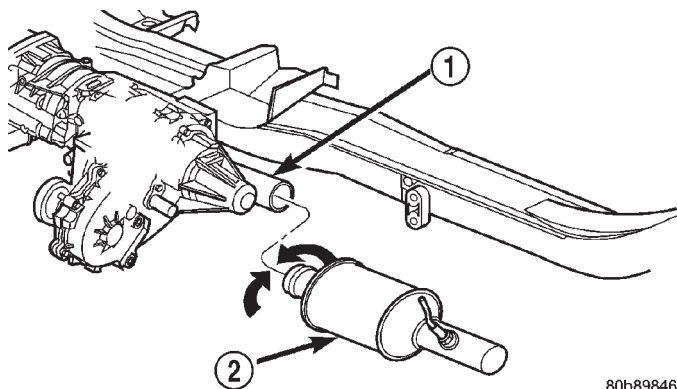
Fig. 7 O2 Sensor Location 4.0L

REMOVAL AND INSTALLATION (Continued)



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**Fig. 8 O2 Sensor Location 4.7L**



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**Fig. 9 Catalytic Converter—Removal**

- 1 - EXHAUST PIPE
- 2 - CATALYTIC CONVERTER

(5) Disconnect the exhaust pipe from the exhaust manifold. (Fig. 10) (Fig. 11).

(6) Remove the exhaust clamp from the muffler and catalytic converter connection. Disconnect the muffler from the catalytic converter. If needed:

(7) Disconnect the tail pipe from the hanger (Fig. 12).

(8) Remove the muffler and tail pipe.

**INSTALLATION**

**NOTE:** When servicing the exhaust system, replace the factory installed uni-clamp with standard u-bolt clamps.

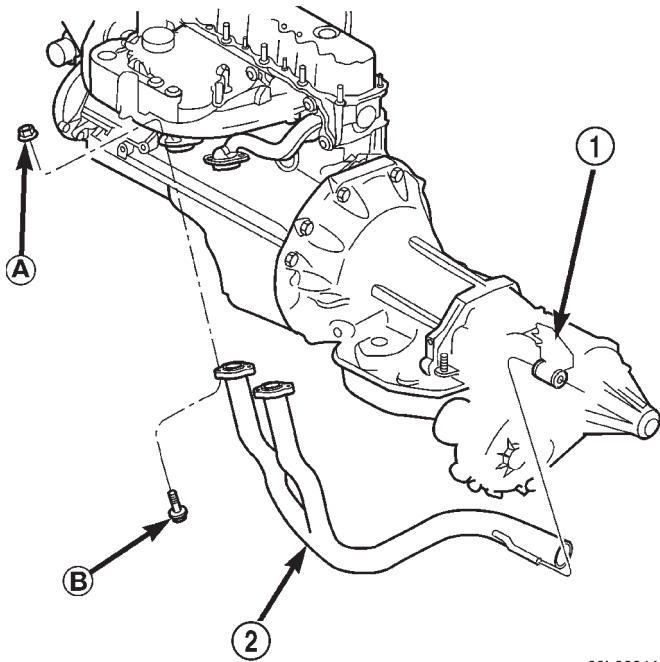
(1) If the catalytic converter was removed, Install the catalytic converter onto the exhaust pipe (Fig. 9).

(2) Position the muffler and tail pipe onto the catalytic converter.

(3) Connect the tail pipe hanger to the rear mount bracket insulator (Fig. 12).



REMOVAL AND INSTALLATION (Continued)

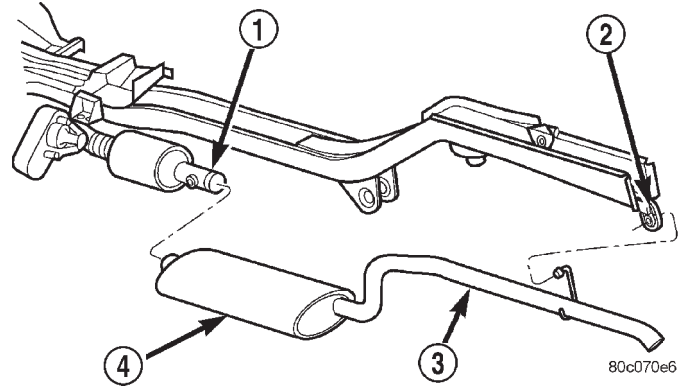


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**Fig. 10 Exhaust Pipe 4.0L**

- 1 - EXHAUST HANGER
- 2 - EXHAUST PIPE

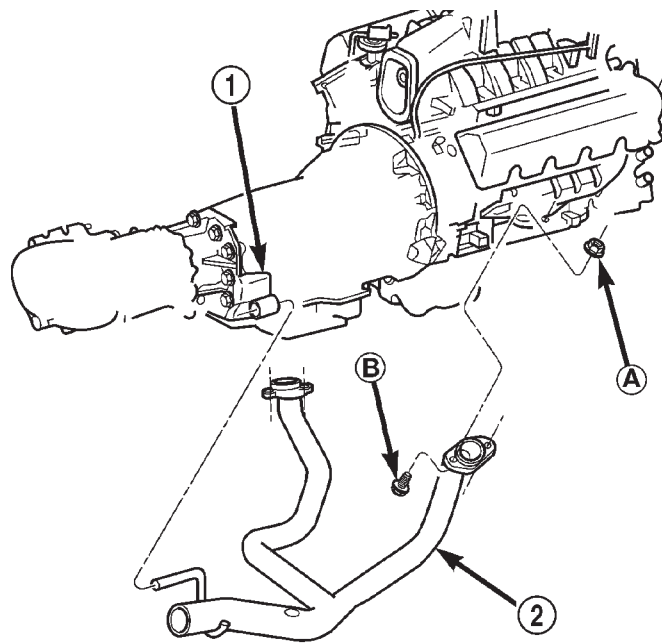
ITEM	DESCRIPTION
A	NUT Qty.4 Torque to 31 N·m (23 ft. lbs.)
B	BOLT Qty.4



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**Fig. 12 Muffler and Tail Pipe**

- 1 - CATALYTIC CONVERTER
- 2 - TAILPIPE HANGER
- 3 - TAILPIPE
- 4 - MUFFLER



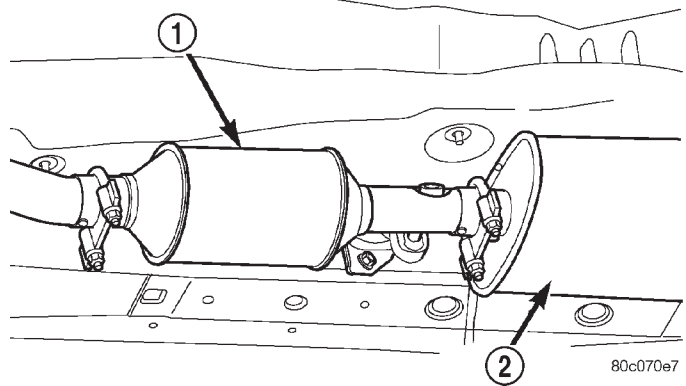
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**Fig. 11 Exhaust Pipe 4.7L**

- 1 - EXHAUST PIPE HANGER
- 2 - EXHAUST PIPE

**NOTE:** When servicing the exhaust system, replace the factory installed uni-clamp with standard u-bolt clamps.

(5) Position the exhaust clamp over the exhaust pipe/catalytic converter connection. Tighten clamp retaining nuts to 61 N·m (45 ft. lbs.). (Fig. 13)



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**Fig. 13 Installing Exhaust Clamps**

- 1 - CATALYTIC CONVERTER
- 2 - MUFFLER

(4) Connect the exhaust pipe to the engine exhaust manifold. Tighten the nuts to 31 N·m (23 ft. lbs.) (Fig. 10) (Fig. 11).

## REMOVAL AND INSTALLATION (Continued)

(6) Coat the oxygen sensor with anti-seize compound. Install the sensor and tighten the nut to 48 N·m (35 ft. lbs.) torque (Fig. 8) (Fig. 7).

(7) Lower the vehicle.

(8) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

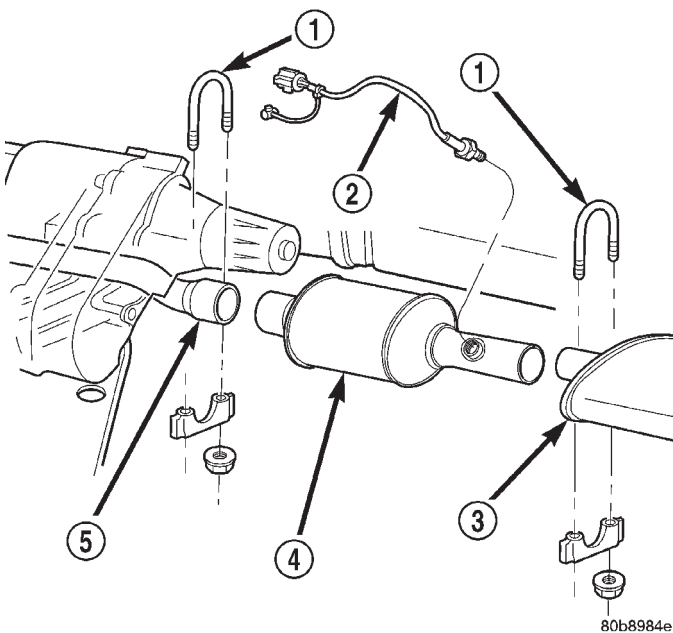
(9) After initial start-up, check the engine exhaust manifold to exhaust pipe nuts for proper torque.

## CATALYTIC CONVERTER

## REMOVAL

**WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.**

- (1) Raise and support the vehicle.
- (2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.
- (3) Remove exhaust clamp from the catalytic converter and exhaust pipe connection (Fig. 14).
- (4) Remove exhaust clamp from the catalytic converter and muffler connection (Fig. 14).
- (5) Disconnect oxygen sensor wiring (Fig. 14).

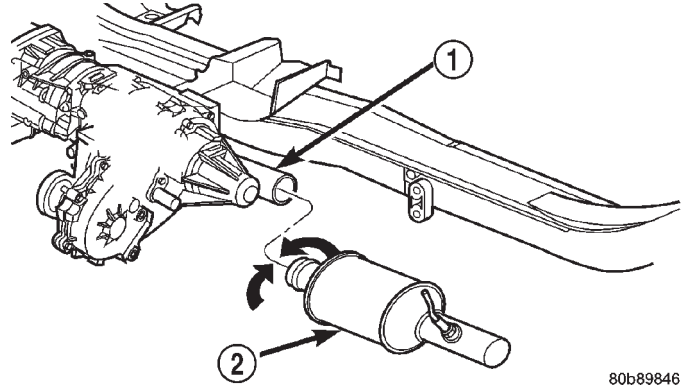


**Fig. 14 Exhaust Pipe-to-Catalytic Converter-to-Muffler Connection**

- 1 - EXHAUST CLAMP ASSEMBLY
- 2 - OXYGEN SENSOR
- 3 - MUFFLER
- 4 - CATALYTIC CONVERTER
- 5 - EXHAUST PIPE

(6) Heat the exhaust pipe, catalytic converter and muffler connections with a torch until the metal becomes cherry red.

(7) While the metal is still cherry red, twist the catalytic converter back and forth to separate it from the exhaust pipe and the muffler (Fig. 15).



**Fig. 15 Catalytic Converter—Removal**

- 1 - EXHAUST PIPE
- 2 - CATALYTIC CONVERTER

## INSTALLATION

(1) Position the exhaust clamp over the exhaust pipe/catalytic converter connection (Fig. 14). Tighten the nuts to 61 N·m (45 ft. lbs.) torque.

(2) Install the muffler onto the catalytic converter until the alignment tab is inserted into the alignment slot.

(3) Install the exhaust clamp at the muffler and catalytic converter connection (Fig. 14). Tighten the clamp nuts to 47 N·m (35 ft. lbs.) torque.

(4) Connect oxygen sensor wiring (Fig. 14).

(5) Lower the vehicle.

(6) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

## MUFFLER AND TAILPIPE

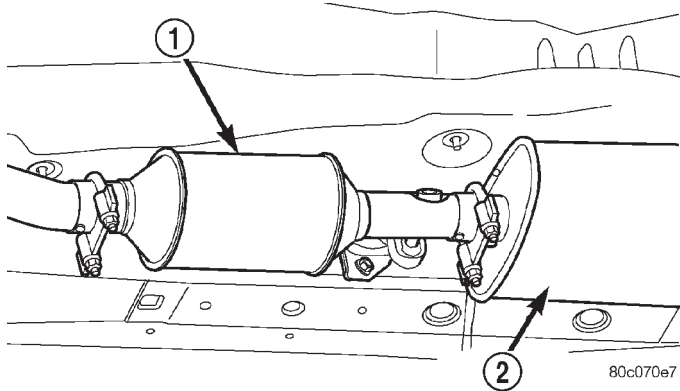
## REMOVAL

All original equipment exhaust systems are manufactured with the tailpipe welded to the muffler. Service replacement mufflers and tailpipes are either clamped together or welded together.

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- (1) Raise and support the vehicle.
- (2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.
- (3) Remove the exhaust clamp from the catalytic converter and muffler connection (Fig. 16).

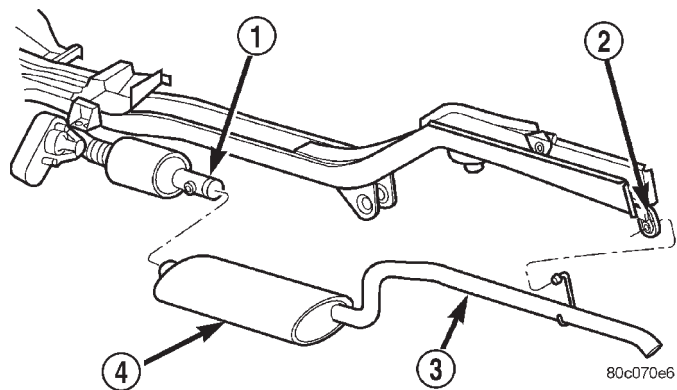
REMOVAL AND INSTALLATION (Continued)



**Fig. 16 Exhaust Pipe-to-Muffler Clamp**

- 1 - CATALYTIC CONVERTER
- 2 - MUFFLER

- (4) Heat the catalytic converter-to-muffler connection with a torch until the metal becomes cherry red.
- (5) While the metal is still cherry red, remove the tailpipe/muffler assembly from the catalytic converter.
- (6) Remove the tailpipe from the tailpipe hanger (Fig. 17).
- (7) Remove the tailpipe/muffler assembly (Fig. 17).



**Fig. 17 Muffler and TailPipe Assembly**

- 1 - CATALYTIC CONVERTER
- 2 - TAILPIPE HANGER
- 3 - TAILPIPE
- 4 - MUFFLER

**INSTALLATION**

- (1) If the tailpipe hanger assembly was removed, install the hanger to the frame. Tighten the bolts to 22 N·m (192 in. lbs.) torque.
- (2) Position the tailpipe and muffler onto the tailpipe hanger (Fig. 17).
- (3) Install the muffler onto the catalytic converter. Make sure that the tailpipe has sufficient clearance from the floor pan. Install exhaust clamp and tighten the nuts to 47 N·m (35 ft. lbs.) torque (Fig. 16).
- (4) Lower the vehicle.
- (5) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

**CLEANING AND INSPECTION**

**EXHAUST PIPE**

**CLEANING**

Clean ends of pipes to assure mating of all parts.

**INSPECTION**

Discard rusted clamps, broken or worn supports and attaching parts. Replace a component with original equipment parts, or equivalent. This will assure proper alignment with other parts in the system and provide acceptable exhaust noise levels.

**CATALYTIC CONVERTER**

**CLEANING**

Clean ends of pipes and muffler to assure a good seal at mating surfaces.

**INSPECTION**

Look at the stainless steel body of the converter, inspect for bulging or other distortion that could be a result of overheating. If the converter has a heat shield attached make sure it is not bent or loose.

If you suspect internal damage to the catalyst, tapping the bottom of the catalyst with a rubber mallet may indicate a damaged core.

## SPECIFICATIONS

## TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Catalytic Converter-to- Exhaust Pipe U-bolt rod clamp	61	45	—
Exhaust Pipe-to-Manifold— Nuts	31	23	—
Floor Pan Heat Shield— Bolts/Nuts	2.5	—	20
Muffler-to-Catalytic Converter U-bolt rod clamp	47	35	—
Rear Tailpipe Hanger— Bolts	22	—	192