

2006 ENGINE

Engine Exhaust - Impala

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter Nut	60 N.m	44 lb ft
Catalytic Converter Pipe Stud Nut	35 N.m	26 lb ft
Exhaust Crossover Pipe Nut (LS4)	25 N.m	18 lb ft
Exhaust Hanger Bracket Bolt	25 N.m	18 lb ft
Exhaust Manifold Bolt (LS4)		
• First Pass	15 N.m	11 lb ft
• Final Pass	20 N.m	15 lb ft
Exhaust Manifold Heat Shield Bolt (LS4)	9 N.m	80 lb in
Exhaust Pipe Rear Hanger Bolt	25 N.m	18 lb ft
Rear Bumper Impact Bar Bolt	25 N.m	18 lb ft
Tail Pipe Extension Clamp	68 N.m	50 lb ft

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - ENGINE EXHAUST

Begin the system diagnosis by reviewing the system Description and Operation. Reviewing the information will help you determine the correct symptom diagnostic procedure when a malfunction exists. It will also help you determine if the condition described by the customer is normal operation. Refer to **Symptoms - Engine Exhaust** in order to identify the correct procedure for diagnosing the system.

SYMPTOMS - ENGINE EXHAUST

- Review the Exhaust System Description and Operation in order to familiarize yourself with the system functions. Refer to **Exhaust System Description**.
- All diagnostics on a vehicle should follow a logical process. Strategy Based Diagnostics is a uniform approach for repairing all systems. The diagnostic flow is the place to start when repairs are necessary and may always be used in order to resolve a system problem. For a detailed explanation, refer to **Strategy Based Diagnosis** in General Information.

Visual/Physical Inspection

- Inspect for aftermarket or non-OEM devices such as, but not including; tailpipe extensions, headers, and exhaust cutouts. This could affect the operation and proper performance of the exhaust system.
- Verify the exact operating conditions under which the concern exists. Note factors such as engine RPM, engine temperature, engine load, and frequency of concern.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause any symptom.

Intermittent

Test the vehicle under the same conditions that the customer reported in order to verify the system is operating as designed.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Loss of Power

Refer to **Restricted Exhaust**.

- Poor acceleration

Refer to **Restricted Exhaust**.

- Poor fuel economy

Refer to **Restricted Exhaust**.

- Excessive smoke-diesel

Refer to **Restricted Exhaust**.

- Exhaust hissing noise

Refer to **Exhaust Leakage**.

- Exhaust popping noise

Refer to **Exhaust Leakage**.

- Exhaust rattle noise

Refer to **Exhaust Noise**.

- Loud exhaust noise

Refer to **Exhaust Noise**.

- Exhaust buzz, groan, hum noise

Refer to **Exhaust Noise**.

RESTRICTED EXHAUST

Diagnostic Aids

For dual exhaust systems a quick check of exhaust flow will help determine which side of the exhaust system is restricted. The side that has less exhaust flow is the side that will be suspect, and the diagnosis should begin there.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4: The exhaust system has very low back pressure under normal conditions. If the exhaust system is restricted, a significant increase in the exhaust pressure is noticed on the **J 35314-A** Exhaust Back Pressure Gage. See **Special Tools**. Removing the heated oxygen sensor (HO2S) may set a DTC. When finishing this diagnostic table, be sure to clear all codes.

5: This step will isolate the catalytic converter from the remainder of the exhaust system.

8: Confirming that the condition has been fixed is essential. If the symptom still exists and the vehicle has a dual exhaust system, proceed to Step 2 and repeat diagnostic procedure on the opposite exhaust pipe.

9: Confirming that the condition has been fixed is essential. If the symptom still exists, proceed to Step 2 and repeat the diagnostic procedure.

Restricted Exhaust

Step	Action	Value(s)	Yes	No
1	Did you verify the customers complaint?	-	Go to Step 2	-
2	Did you review the exhaust symptoms diagnostic information and perform the necessary inspections?	-	Go to Step 3	Go to Symptoms - Engine Exhaust
	Is the system equipped with dual		Go to	

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3	exhaust?	-	Diagnostic Aids	Go to Step 4
4	CAUTION: While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system. - Remove the pre-catalyst heated oxygen sensor (HO2S). Refer to one of the following: <u>Heated Oxygen Sensor Replacement - Position 1</u> <u>Heated Oxygen Sensor Replacement - Position 1</u> <u>Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1</u> - Install the J 35314-A in place of the HO2S sensor. See Special Tools. - Start and run the engine. - Increase and monitor the engine speed at 2,500 RPM. - Observe the exhaust system back pressure reading on the gage. Does the reading exceed the specified value?	9 kPa (1.25 psi)	Go to Step 5	Go to Step 9
	- Turn the engine OFF and place the ignition in the lock position. - Remove the J 35314-A . See Special Tools. - Install the pre-catalyst HO2S. Refer to one of the following: <u>Heated Oxygen Sensor Replacement - Position 1</u> <u>Heated Oxygen Sensor Replacement - Position 1</u> <u>Heated Oxygen Sensor (HO2S) Replacement Bank</u>			

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5	1 Sensor 1 4. Remove the post-catalyst HO2S. Refer to one of the following: • Heated Oxygen Sensor Replacement - Position 2 • Heated Oxygen Sensor Replacement - Position 2 • Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 2 5. Install the J 35314-A in place of the post HO2S sensor. See Special Tools. 6. Start and run the engine. 7. Increase and monitor the engine speed at 2,500 RPM. 8. Observe the exhaust system back pressure reading on the gage. Does the reading exceed the specified value?	9 kPa (1.25 psi)	Go to Step 6	Go to Step 7
6	Inspect the exhaust system for the following conditions: • Damage in the exhaust pipe • Debris in the exhaust pipe • Muffler or resonator internal failure • Two-layer exhaust pipe separation Did you find and correct the condition?	-	Go to Step 8	-
7	Replace the catalytic converter. Refer to Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9) or Catalytic Converter Replacement (RPO LS4). Did you find and correct the condition?	-	Go to Step 8	-
	1. Remove the J 35314-A . See Special Tools. 2. Install the post-catalyst HO2S.			

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8	Refer to one of the following: • <u>Heated Oxygen Sensor Replacement - Position 2</u> • <u>Heated Oxygen Sensor Replacement - Position 2</u> • <u>Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 2</u> 3. Clear any codes. 4. Road test the vehicle in order to verify the repair. Did you correct the condition?	-		
9	1. Remove the J 35314-A . See Special Tools. 2. Install the pre-catalyst HO2S. Refer to one of the following: • <u>Heated Oxygen Sensor Replacement - Position 1</u> • <u>Heated Oxygen Sensor Replacement - Position 1</u> • <u>Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1</u> 3. Clear any codes. 4. Road test the vehicle in order to verify the repair. Did you correct the condition?	-		
			System OK	Go to Step 2
			System OK	Go to Step 2

EXHAUST LEAKAGE

Exhaust Leakage

Problem	Action
CAUTION: Refer to <u>Hot Exhaust System Caution</u> in Cautions and Notices. IMPORTANT: Refer to <u>Symptoms - Engine Exhaust</u> prior to beginning this table.	

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DEFINITION: An exhaust leak may show stains at the area of the leak. The leak may be felt by holding a hand close to the suspected areas or using a smoke pencil. The leak may make a popping or hissing noise.

Misaligned or improperly installed exhaust system components

NOTE:

Refer to **FASTENER NOTICE** in Cautions and Notices.

Align and tighten the components to the specifications. Refer to **Fastener Tightening Specifications**.

Exhaust leaks at the following connections:

- Exhaust manifold to pipe
- Flanges
- Pipe clamps

Tighten the components to the specifications. Refer to **Fastener Tightening Specifications**.

Seals or gaskets leaking:

- Exhaust manifold to cylinder head
- Exhaust pipes to exhaust manifold
- Catalytic converter connection
- EGR connections
- AIR connections to the exhaust manifold or cylinder head

Replace the leaking seal or gasket. Refer to the affected components procedure for service.

Exhaust manifold cracked or broken

Replace the exhaust manifold. Refer to **Exhaust Manifold Replacement - Left (RPOs LZE/LZ4/LZ9)** or **Exhaust Manifold Replacement - Left (RPO LS4)** or **Exhaust Manifold Replacement - Right (RPOs LZE/LZ4/LZ9)** or **Exhaust Manifold Replacement - Right (RPO LS4)**.

Exhaust system component connection welds leaking

Replace the leaking component. Refer to the affected component's procedure for service.

Muffler is damaged or leaking at the seams

Replace the affected muffler. Refer to **Muffler Replacement (Single Outlet)** or **Muffler Replacement (Dual Outlet)**.

EXHAUST NOISE

Exhaust Noise

Condition	Action
CAUTION: Refer to <u>Hot Exhaust System Caution</u> in Cautions and Notices.	
IMPORTANT: Refer to <u>Symptoms - Engine Exhaust</u> prior to beginning this table.	
DEFINITION: An audible or physical noise due to a faulty component or damaged components causing a loose or misaligned exhaust system resulting in a rattle or vibration noise.	
Popping or hissing noise	Exhaust leak. Refer to <u>Exhaust Leakage</u> .
Loud exhaust	1. Compare to a known good vehicle. 2. Inspect for a damaged or failed muffler. 3. Replace the faulty muffler. Refer to <u>Muffler Replacement (Single Outlet)</u> or <u>Muffler Replacement (Dual Outlet)</u>.
External rattle or vibration noise	1. Inspect for a bent or loose hanger, loose heat shield, or loose clamp. 2. Inspect for a exhaust pipe causing interference. 3. Repair or replace the affected component. Refer to the affected component's service procedure.
Internal rattle	1. Test the components by tapping with a rubber mallet to confirm a rattle. 2. Replace the faulty catalytic converter, resonator, or muffler. Refer to one of the following procedures: • <u>Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)</u><u>Catalytic Converter Replacement (RPO LS4)</u> • <u>Muffler Replacement (Single Outlet)</u><u>Muffler Replacement (Dual Outlet)</u>

REPAIR INSTRUCTIONS

EXHAUST MANIFOLD REPLACEMENT - LEFT (RPOS LZE/LZ4/LZ9)

Removal Procedure

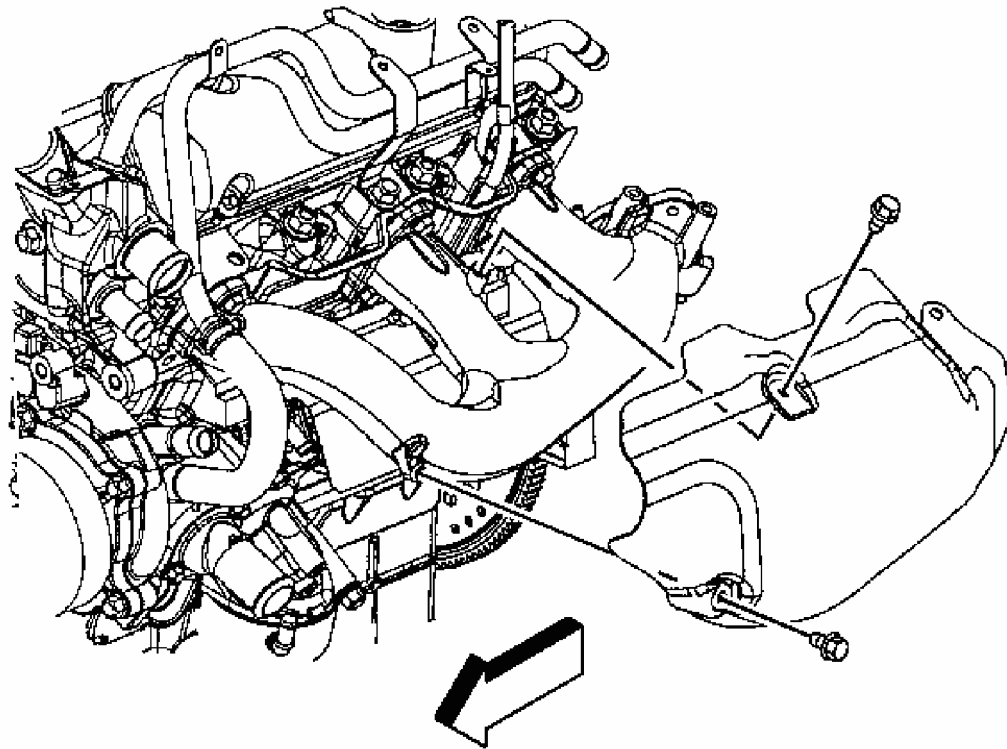


Fig. 1: Identifying Exhaust Manifold Heat Shield - Left
Courtesy of GENERAL MOTORS CORP.

1. Remove the engine mount strut bracket. Refer to **Engine Mount Strut Bracket Replacement - Left** .
2. Remove the exhaust manifold heat shield bolts.
3. Remove the exhaust manifold heat shield.

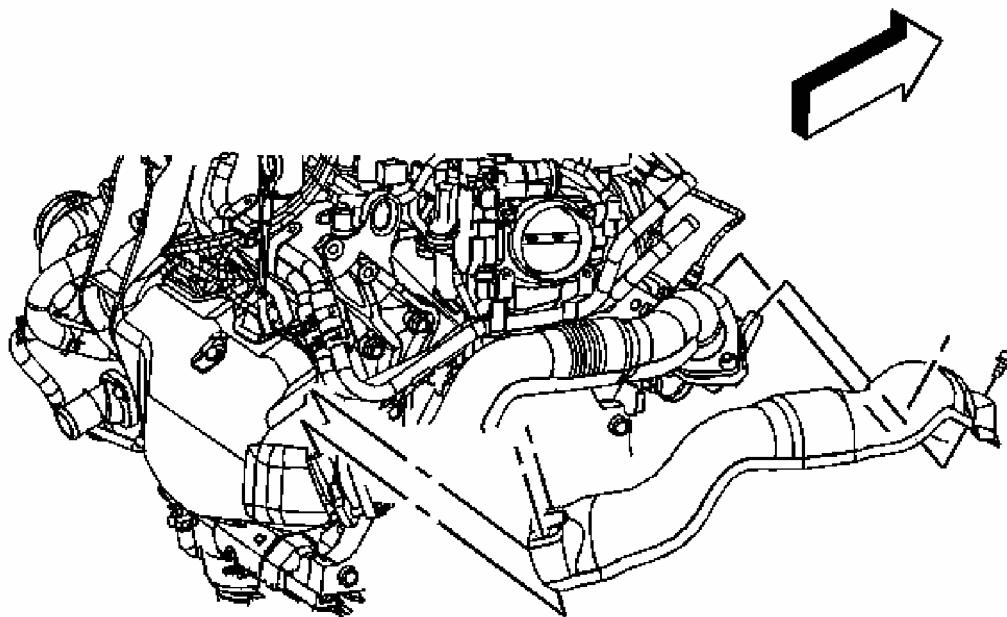


Fig. 2: Identifying Exhaust Crossover Pipe Heat Shield
Courtesy of GENERAL MOTORS CORP.

4. Remove the exhaust crossover pipe heat shield bolts.
5. Remove the exhaust crossover pipe heat shield.

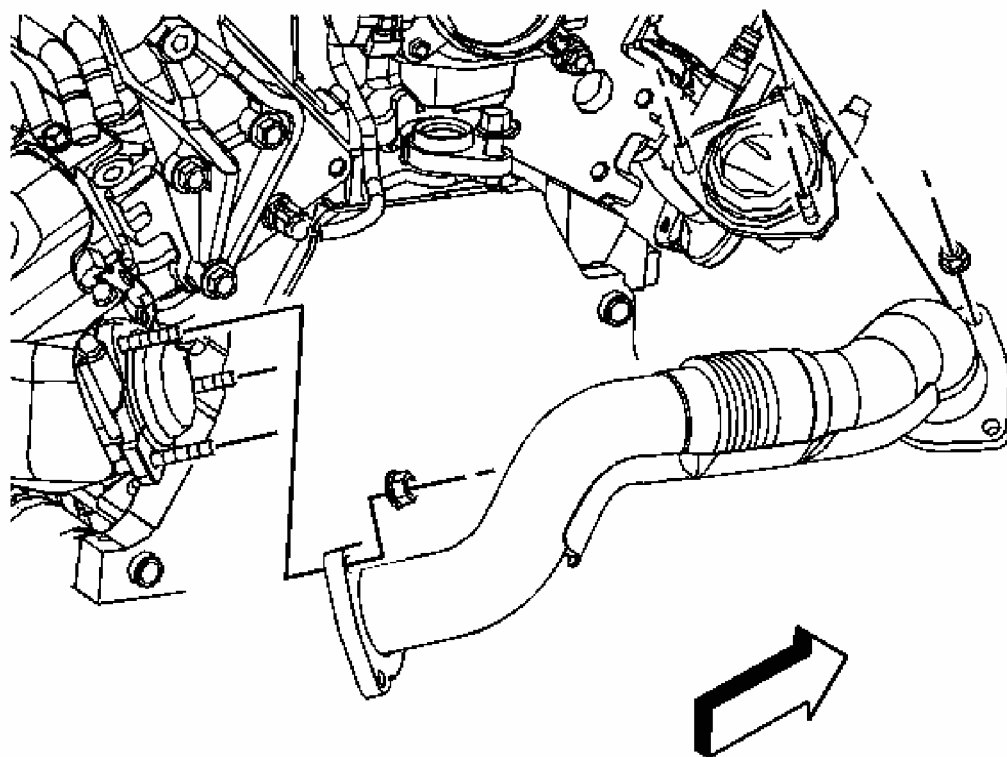


Fig. 3: Locating Exhaust Crossover Pipe & Left Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

6. Remove the exhaust crossover pipe to left exhaust manifold nuts.

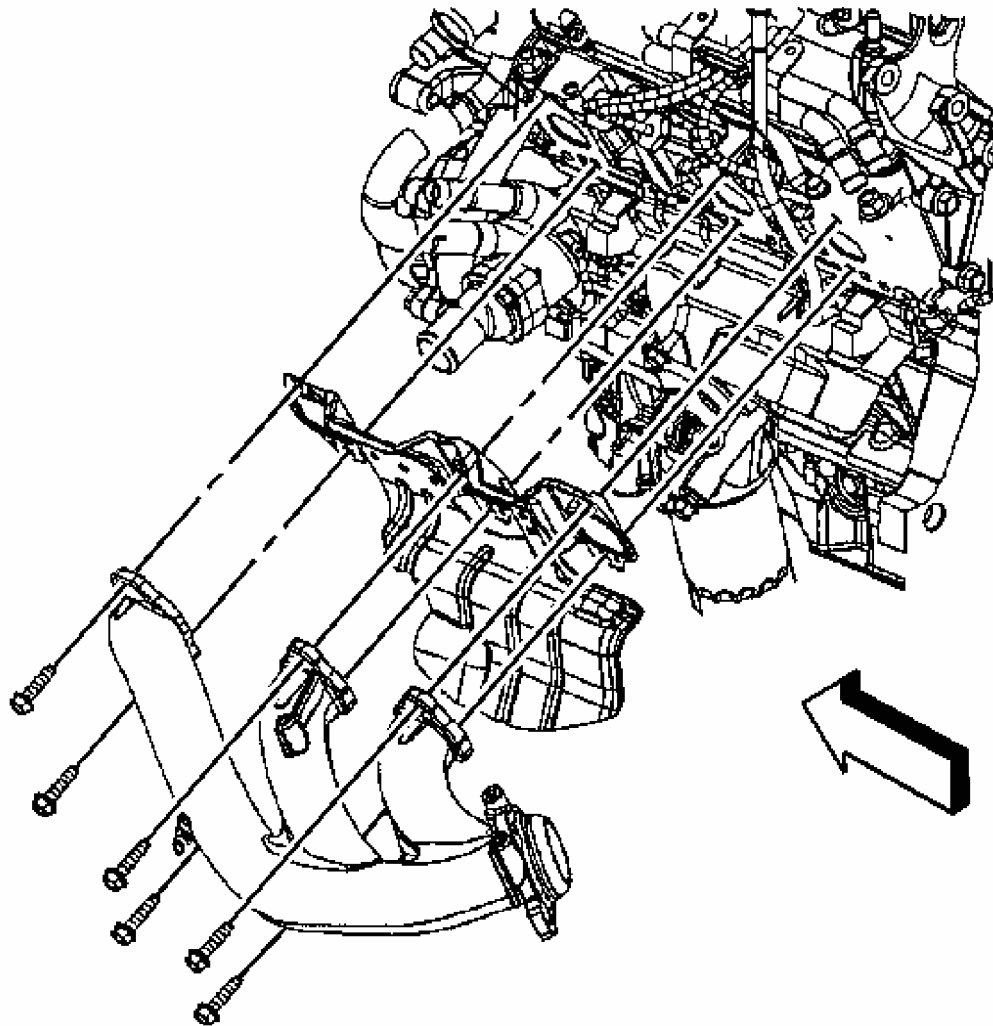


Fig. 4: Identifying Exhaust Manifold Bolts - Left
Courtesy of GENERAL MOTORS CORP.

7. Remove the exhaust manifold bolts.
8. Remove the exhaust manifold bolts.
9. Remove the exhaust manifold.
10. Remove and discard the exhaust manifold gasket.

Installation Procedure

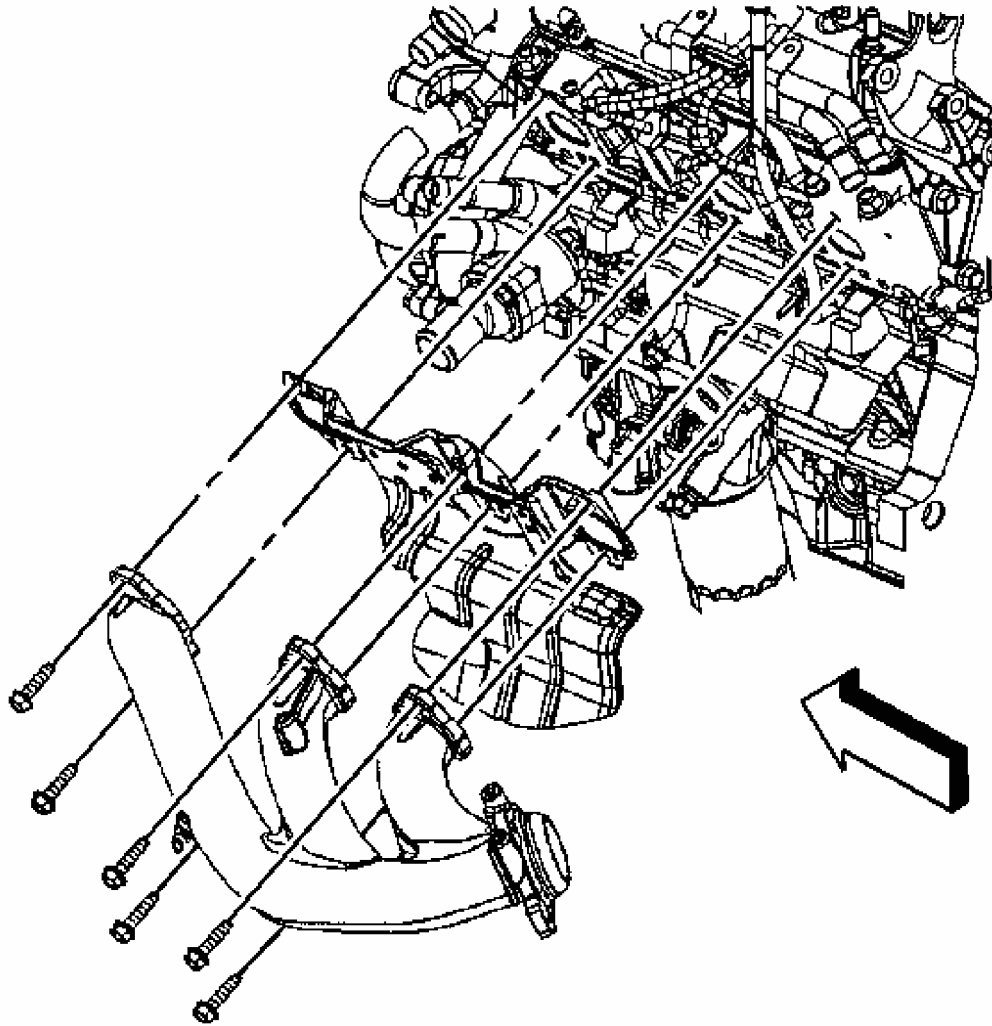


Fig. 5: Identifying Exhaust Manifold Bolts - Left
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW exhaust manifold gasket onto the cylinder head studs.
2. Install the exhaust manifold.

NOTE: Refer to Fastener Notice .

3. Install the exhaust manifold bolts.

Tighten: Tighten the bolts to 20 N.m (15 lb ft).

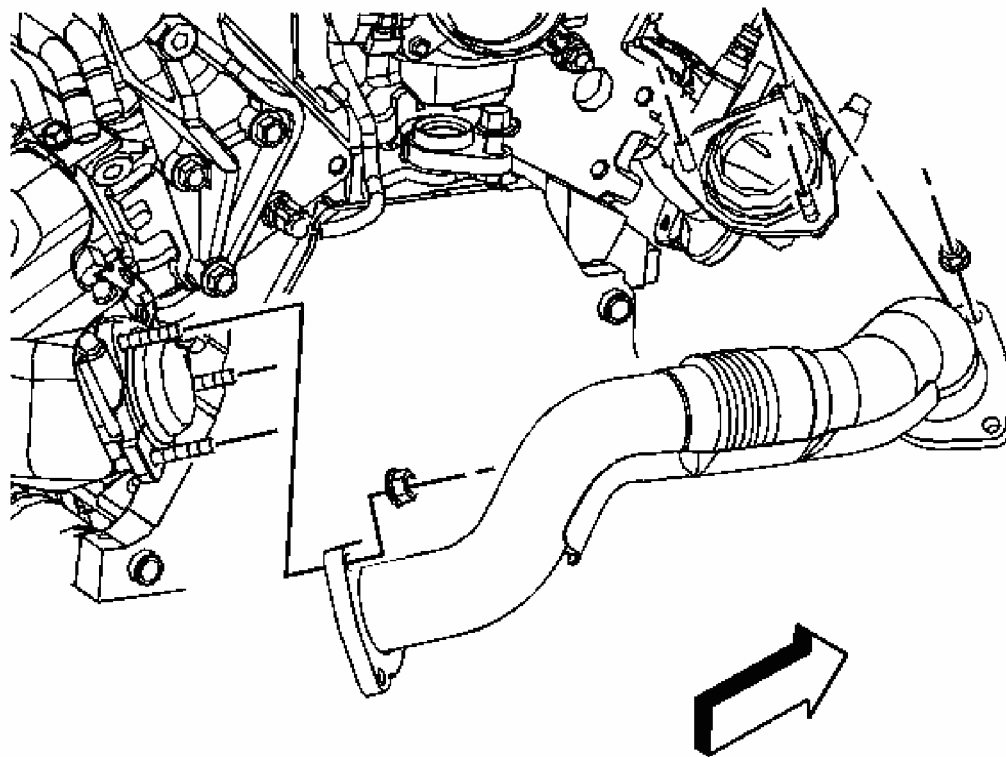


Fig. 6: Locating Exhaust Crossover Pipe & Left Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

4. Install the exhaust crossover pipe to left exhaust manifold nuts.

Tighten: Tighten the nuts to 20 N.m (15 lb ft).

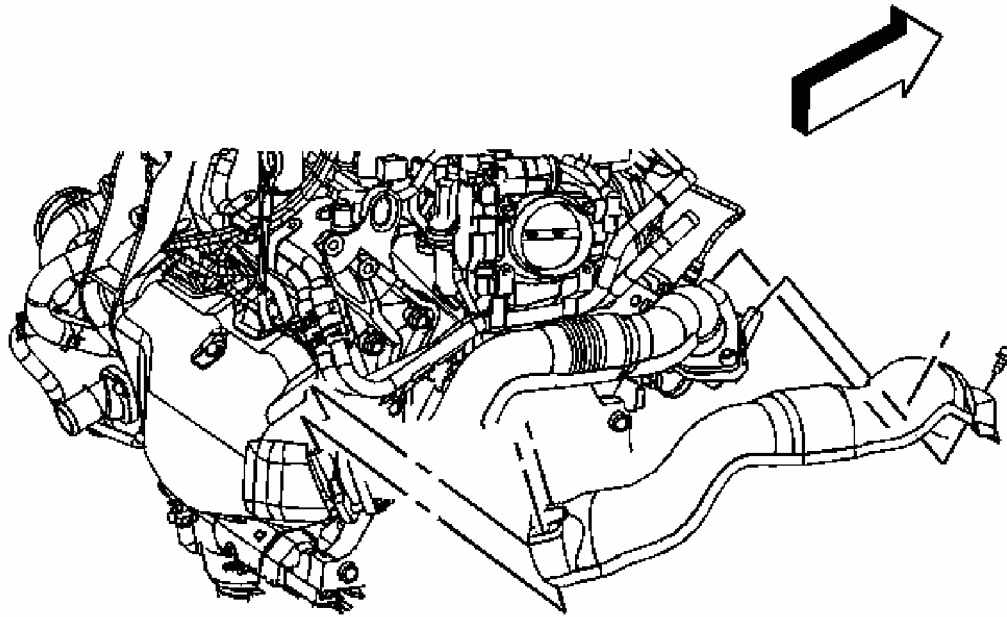


Fig. 7: Identifying Exhaust Crossover Pipe Heat Shield
Courtesy of GENERAL MOTORS CORP.

5. Install the exhaust crossover pipe heat shield.
6. Install the exhaust crossover pipe heat shield bolts.

Tighten: Tighten the bolts to 10 N.m (89 lb in).

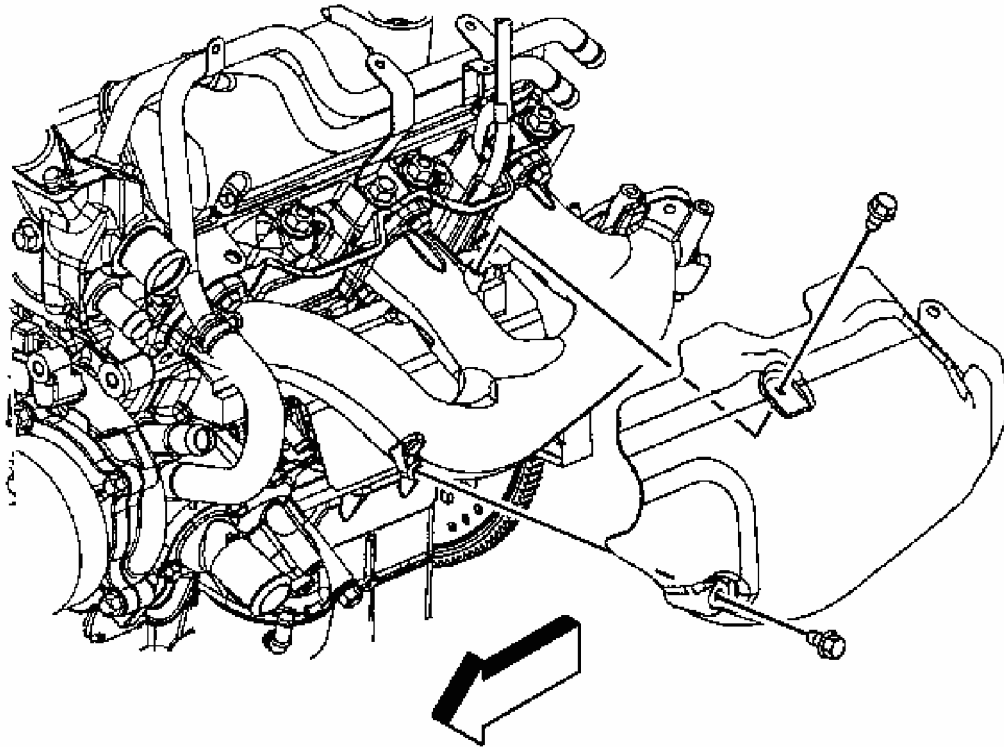


Fig. 8: Identifying Exhaust Manifold Heat Shield - Left
Courtesy of GENERAL MOTORS CORP.

7. Install the exhaust manifold heat shield.
8. Install the exhaust manifold heat shield bolts.

Tighten: Tighten the bolts to 10 N.m (89 lb in).

9. Install the engine mount strut bracket. Refer to **Engine Mount Strut Bracket Replacement - Left**.

EXHAUST MANIFOLD REPLACEMENT - LEFT (RPO LS4)

Removal Procedure

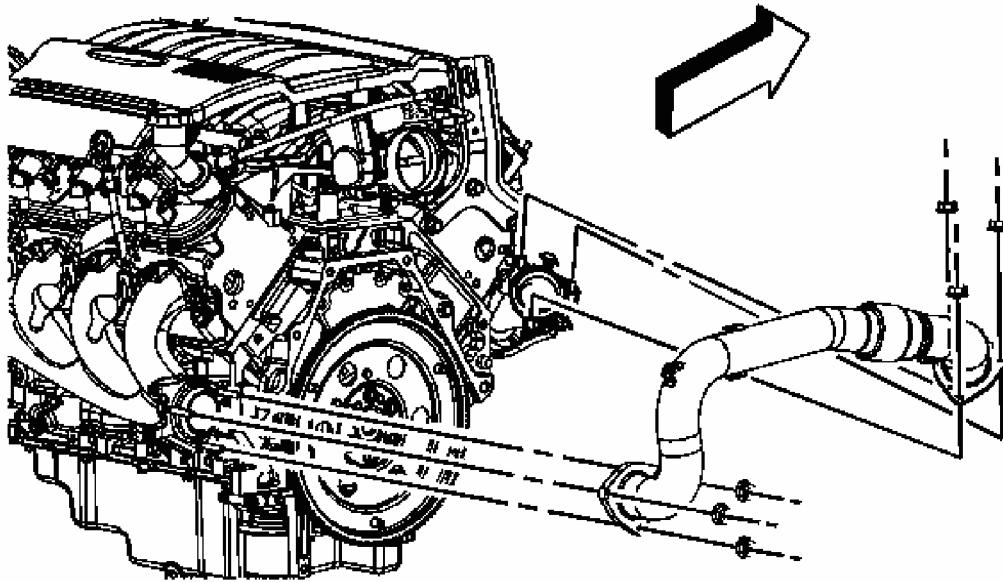


Fig. 9: Exhaust Crossover Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement** .
2. Remove the exhaust crossover pipe heat shield in order to access the cross pipe to the exhaust manifold nuts.
3. Remove the exhaust crossover pipe nuts from the left exhaust manifold.
4. Remove the left side spark plugs. Refer to **Spark Plug Replacement** .
5. Remove the oil level indicator tube. Refer to **Oil Level Indicator and Tube Replacement** .

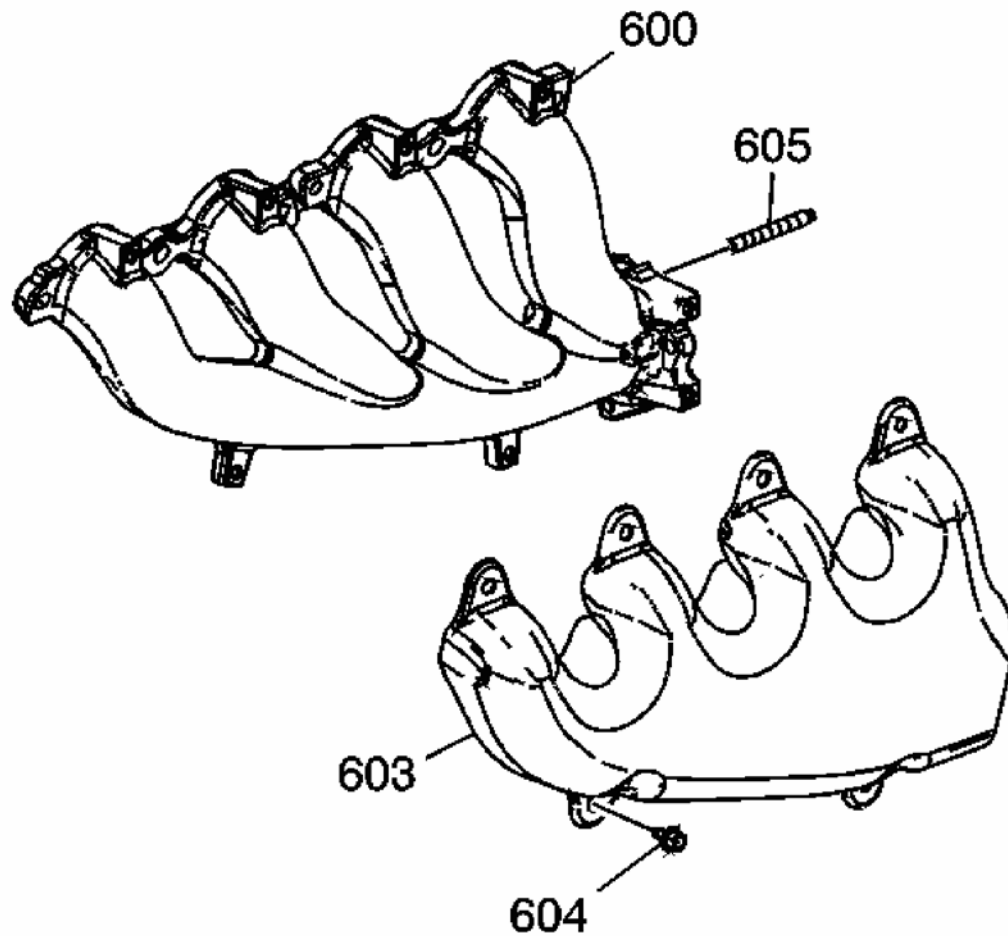


Fig. 10: Heat Shield & Bolts

Courtesy of GENERAL MOTORS CORP.

6. Remove the exhaust manifold heat shield bolts (604).
7. Remove the exhaust manifold heat shield (603).
8. Remove the heater hose retainer bolts in order to be able to remove the manifold.

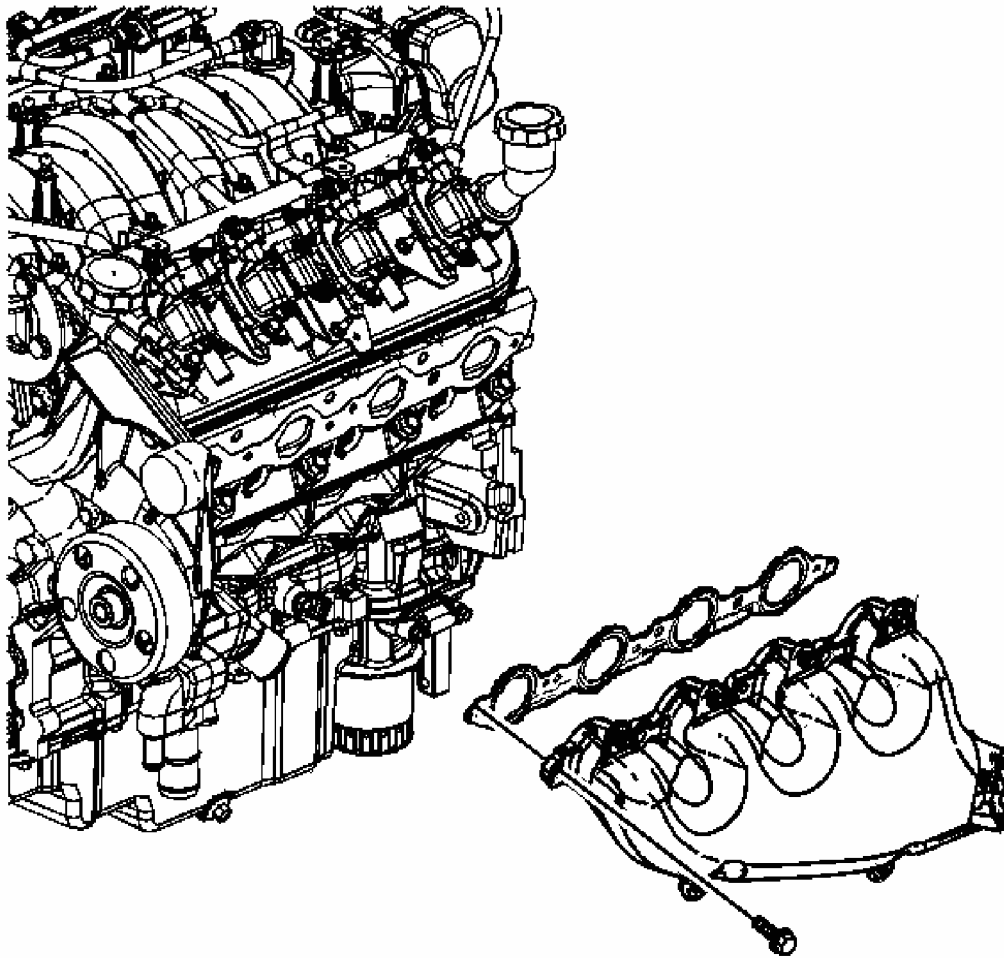


Fig. 11: Exhaust Manifold
Courtesy of GENERAL MOTORS CORP.

9. Remove the exhaust manifold bolts.
10. Remove the exhaust manifold.
11. Remove and discard the exhaust manifold gasket.
12. Clean and inspect the left exhaust manifold. Refer to **Exhaust Manifold Cleaning and Inspection** .

Installation Procedure

- IMPORTANT:**
- Tighten the exhaust manifold bolts as specified in the service procedure. Improperly installed and/or leaking exhaust manifold gaskets may affect vehicle emissions

and/or On Board Diagnostic (OBD) II system performance.

- The cylinder head exhaust manifold bolt hole threads must be clean and free of debris or threadlocking material.
- DO NOT apply threadlock to the first three thread of the bolts.

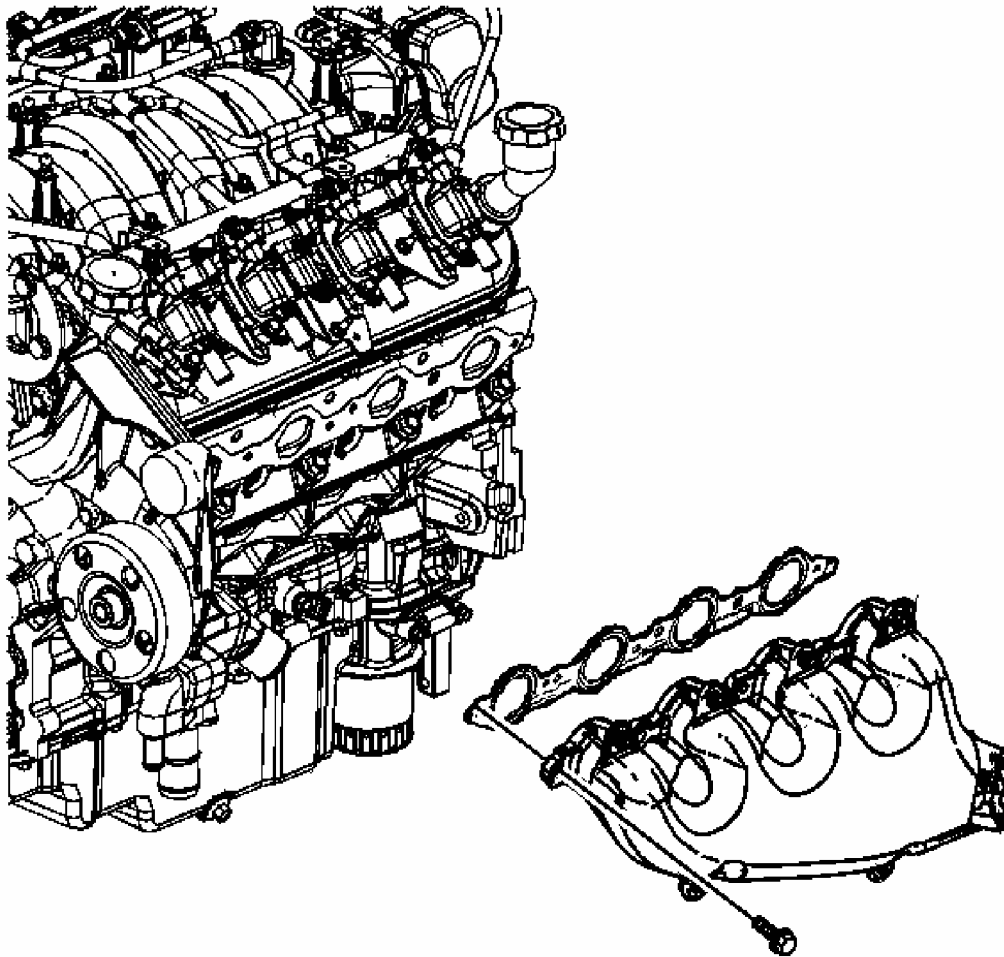


Fig. 12: Exhaust Manifold

Courtesy of GENERAL MOTORS CORP.

1. Apply a 5 mm (0.2 in) wide band of threadlock GM P/N 12345493 (Canadian P/N 10953488) or equivalent to the threads of the exhaust manifold bolts.

NOTE: Refer to Fastener Notice .

2. Install a NEW exhaust manifold gasket, the exhaust manifold and bolts.

Tighten:

- Tighten the bolts a first pass to 15 N.m (11 lb ft). Tighten the bolts beginning with the center 2 bolts. Alternate from side to side, and work toward the outside.
 - Tighten the bolts a final pass to 20 N.m (15 lb ft). Tighten the bolts beginning with the center 2 bolts. Alternate from side to side, and work toward the outside.
3. Using a flat punch, bend over the exposed edge of the exhaust manifold gasket at the rear of the left cylinder head.

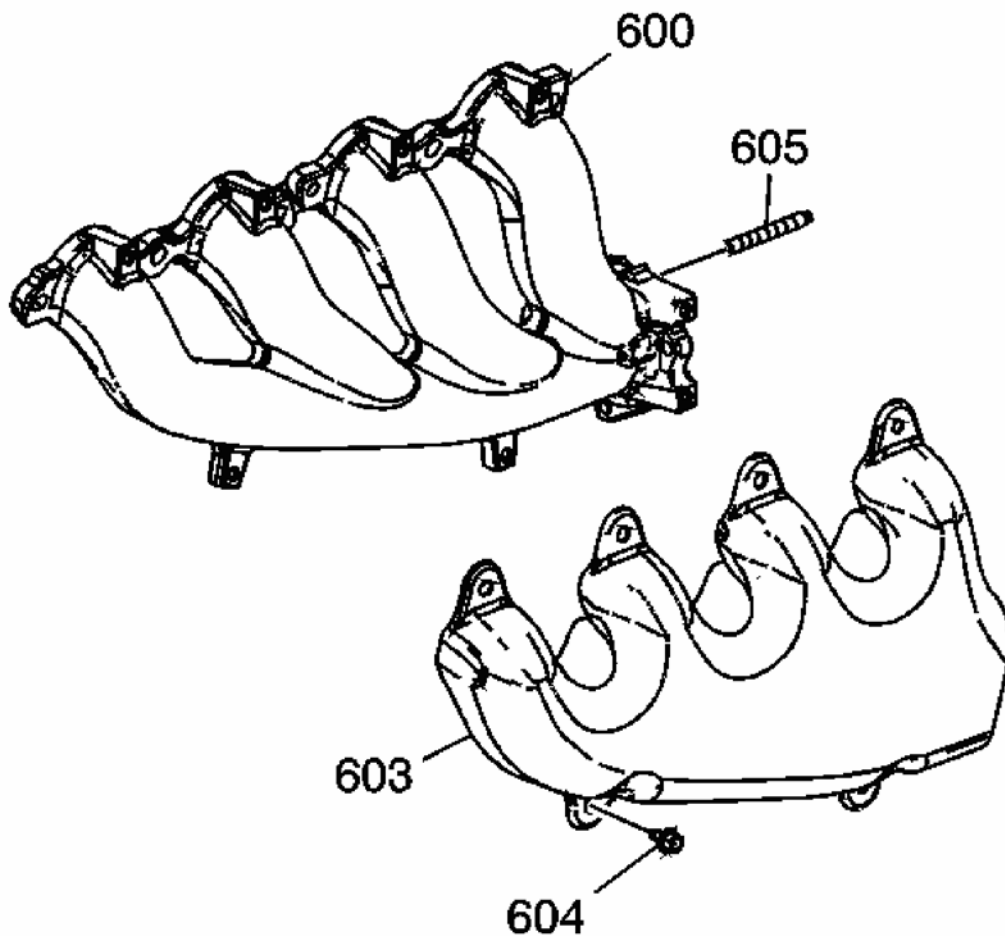


Fig. 13: Heat Shield & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the exhaust manifold heat shield (603).

5. Install the exhaust manifold heat shield bolts (604).

Tighten: Tighten the bolts to 9 N.m (80 lb in).

6. Install the oil level indicator tube. Refer to Oil Level Indicator and Tube Replacement .
7. Install the left side spark plugs. Refer to Spark Plug Replacement .

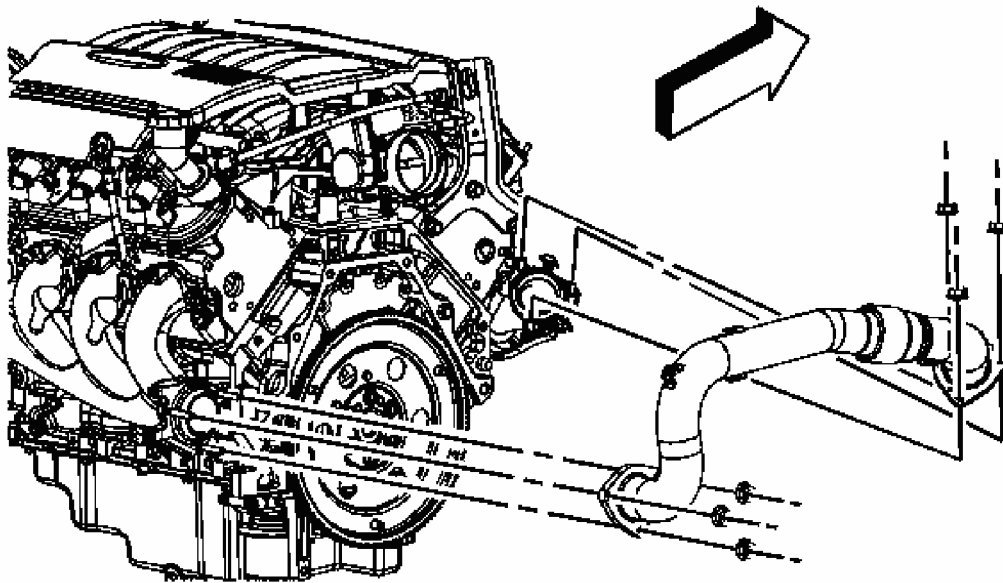


Fig. 14: Exhaust Crossover Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

8. Install the exhaust crossover pipe nuts from the left exhaust manifold.

Tighten: Tighten the nuts to 25 N.m (18 lb ft).

9. Install the exhaust crossover pipe heat shield.
10. Install the heater pipe retainer bolts.

Tighten: Tighten the bolts to 16 N.m (12 lb ft).

11. Install the engine sight shield. Refer to Engine Sight Shield Replacement .

Tools Required

J 39194-B Heated Oxygen Sensor Socket. See **Special Tools**.

Removal Procedure

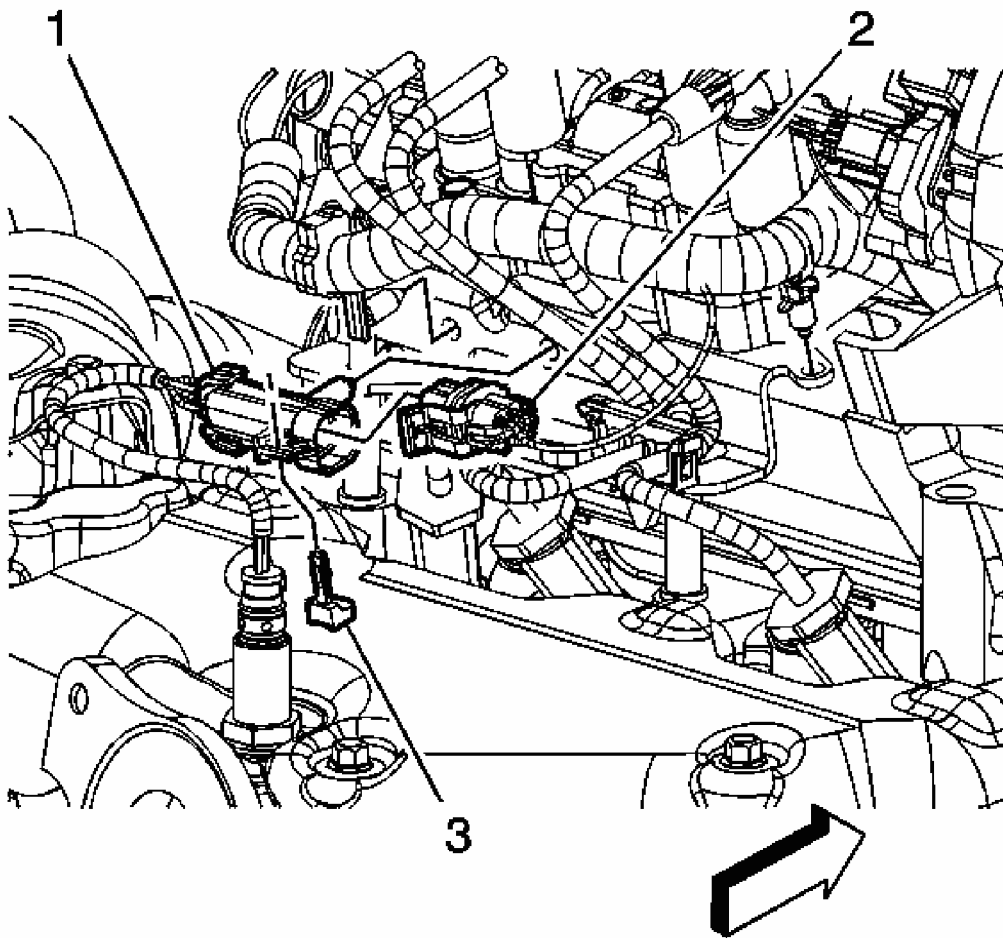


Fig. 15: Identifying The HO2S Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Remove the generator. Refer to **Generator Replacement (RPOs LZE/LZ4/LZ9)** or **Generator Replacement (RPO LS4)**.
2. Remove the connector position assurance (CPA) retainer (3).
3. Disconnect the heated oxygen sensor (HO2S) electrical connector (2).
4. Remove the HO2S clip (1) from the ignition coil bracket.

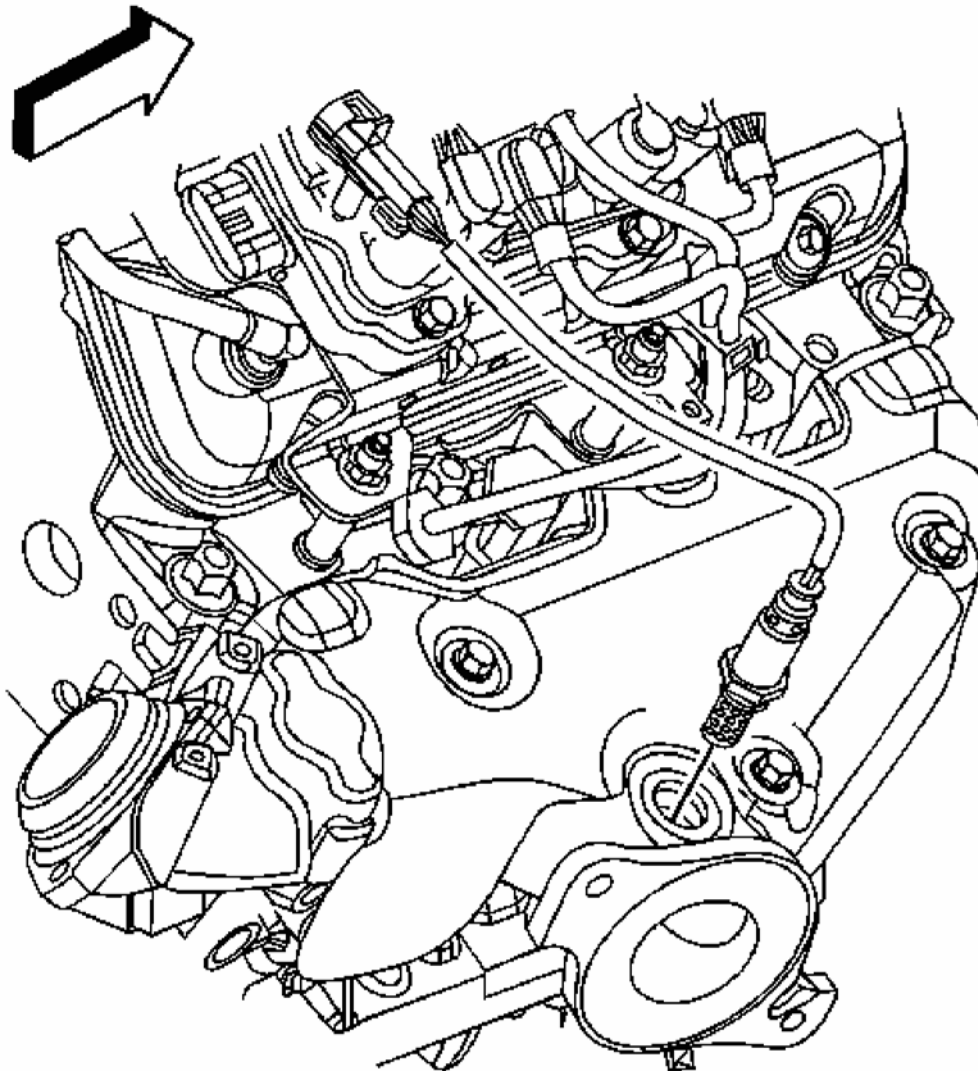


Fig. 16: View Of HO2S & J 39194-B
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The HO2S uses a permanently attached pigtail and connector. This pigtail should not be removed from the sensor. Damage or removal of the pigtail or connector will affect proper operation of the sensor.

5. Remove the HO2S using the J 39194-B . See Special Tools.

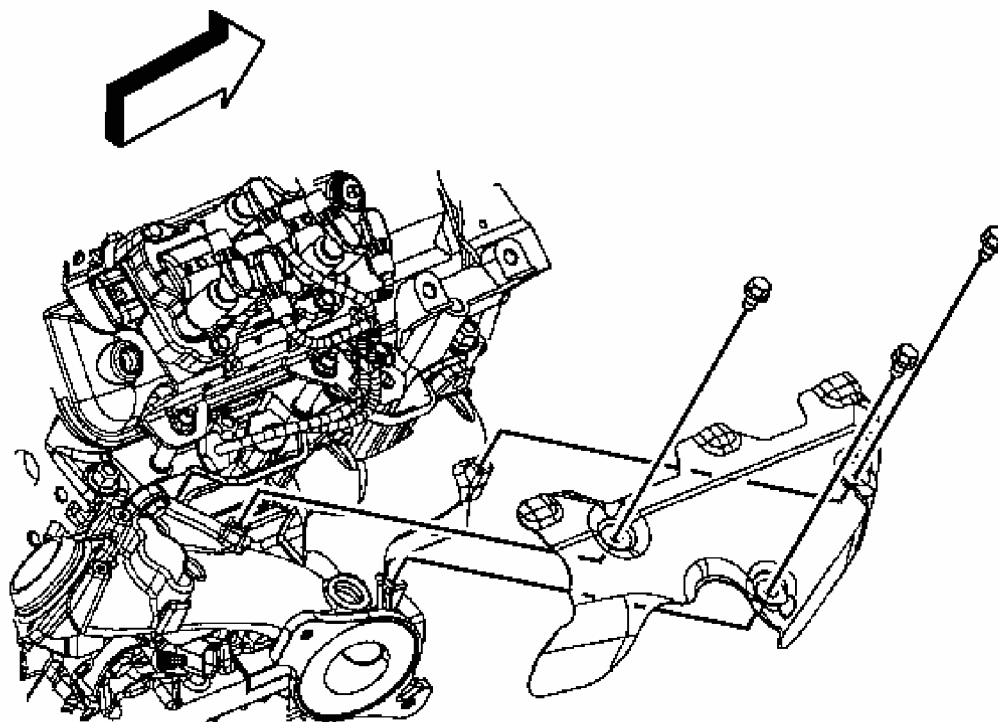


Fig. 17: Identifying Exhaust Manifold Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the exhaust manifold shield bolts.
7. Remove the exhaust manifold shield.

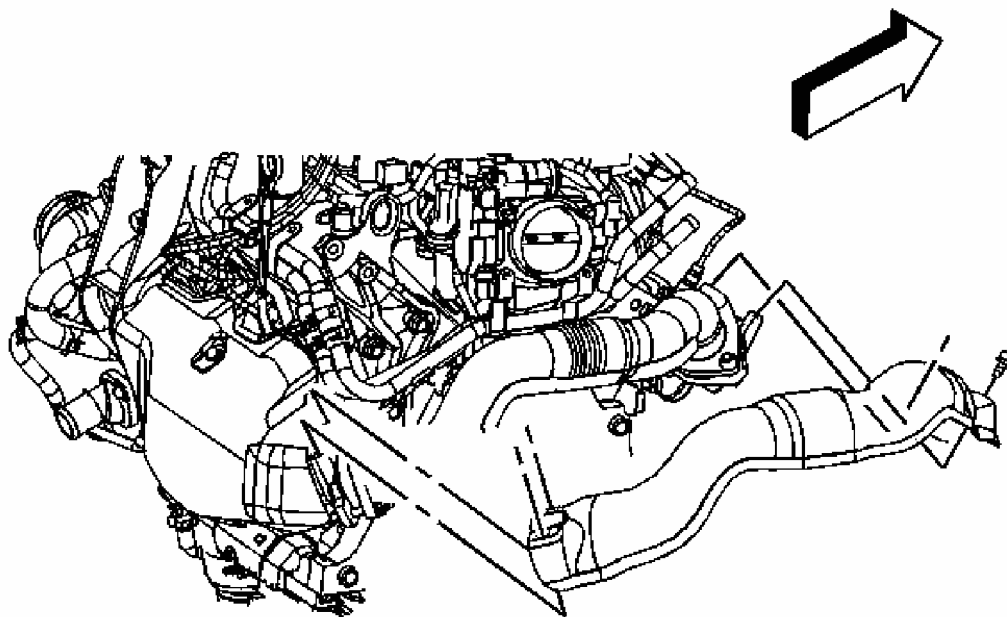


Fig. 18: Identifying Exhaust Crossover Pipe Heat Shield
Courtesy of GENERAL MOTORS CORP.

8. Remove the exhaust crossover pipe heat shield bolts.
9. Remove the exhaust crossover pipe heat shield.

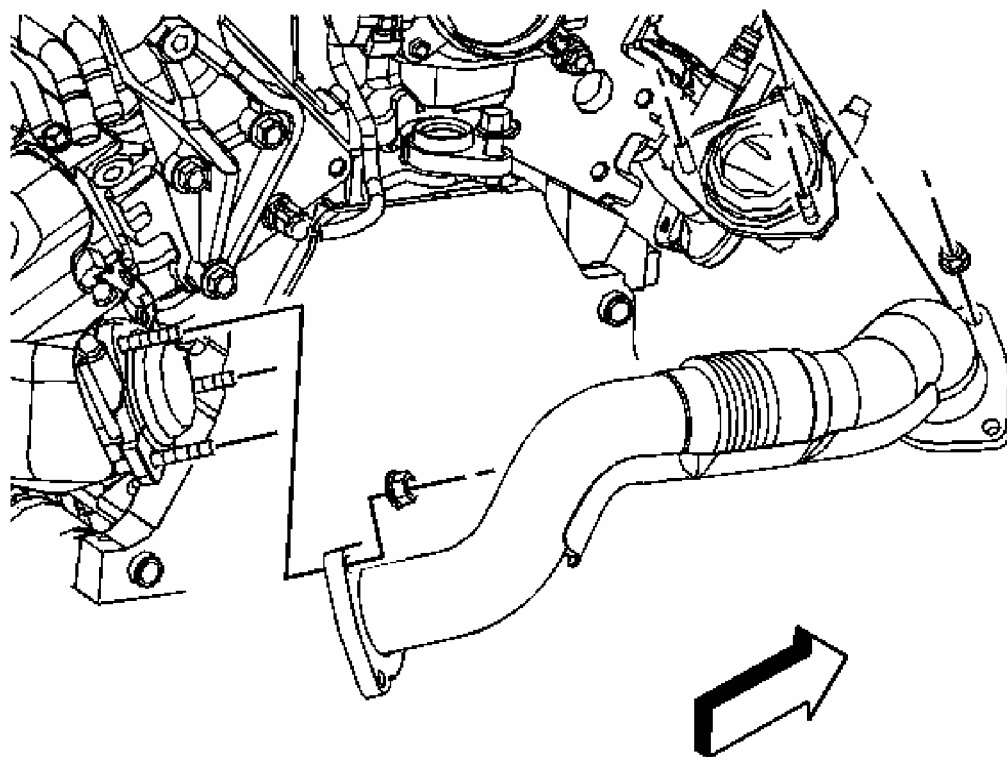


Fig. 19: Locating Exhaust Crossover Pipe & Left Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

10. Remove the exhaust crossover pipe to right exhaust manifold nuts.

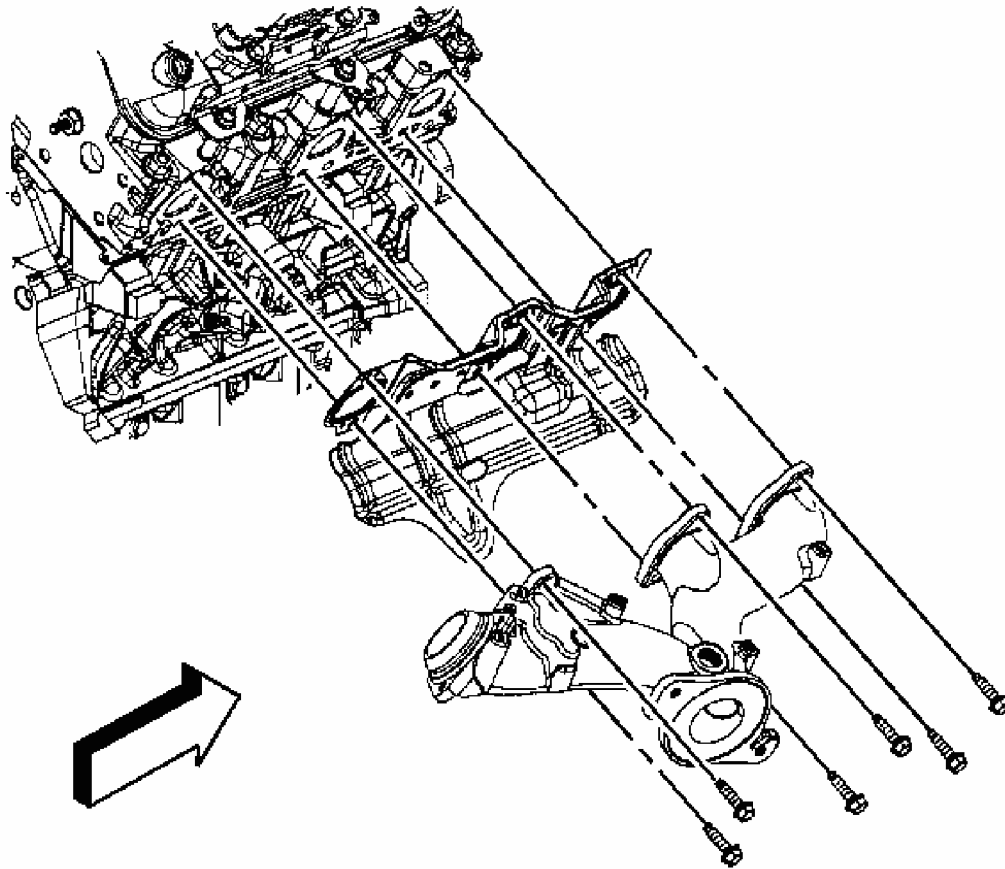


Fig. 20: Identifying Exhaust Manifold & Heat Shield Bolts
Courtesy of GENERAL MOTORS CORP.

11. Remove the upper exhaust manifold bolts.
12. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.
13. Remove the lower exhaust manifold bolts.
14. Remove the exhaust manifold.
15. Remove and discard the exhaust manifold gasket.

Installation Procedure

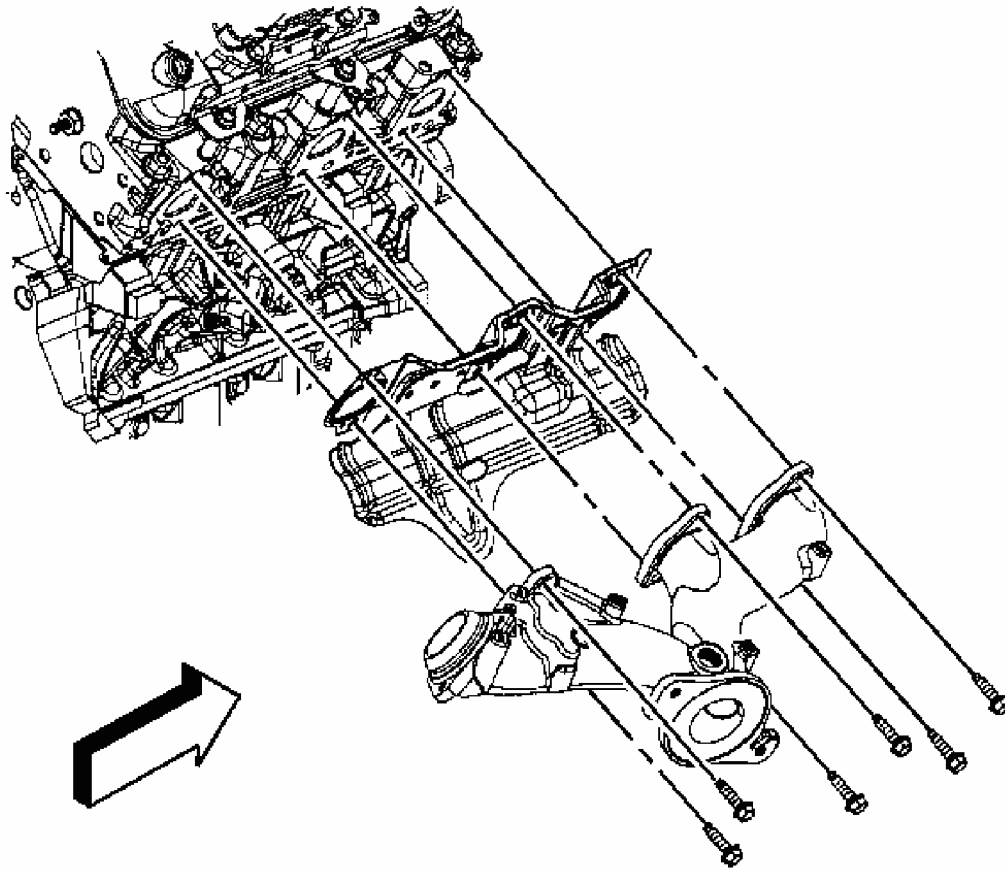


Fig. 21: Identifying Exhaust Manifold & Heat Shield Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW exhaust manifold gasket onto the cylinder head studs.
2. Install the exhaust manifold.

NOTE: Refer to Fastener Notice .

3. Install the lower exhaust manifold bolts.

Tighten: Tighten the bolts to 20 N.m (15 lb ft).

4. Install the catalytic converter. Refer to Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9) or Catalytic Converter Replacement (RPO LS4).
5. Lower the vehicle.

6. Install the upper exhaust manifold bolts.

Tighten: Tighten the bolts to 20 N.m (15 lb ft).

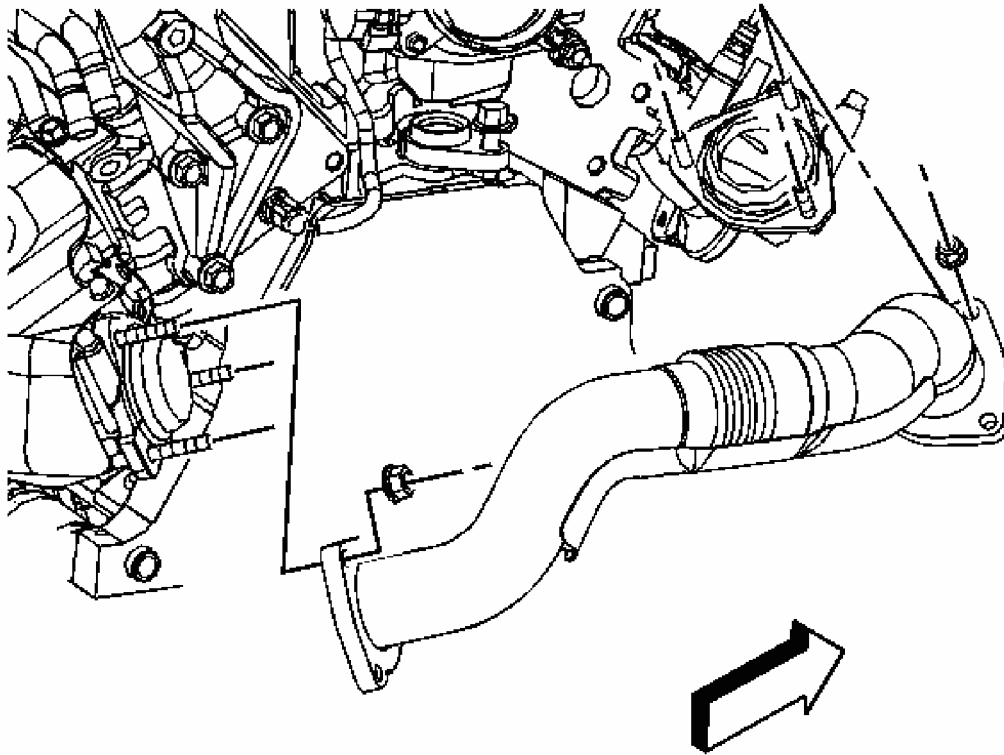


Fig. 22: Locating Exhaust Crossover Pipe & Left Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

7. Install the exhaust crossover pipe to right exhaust manifold nuts.

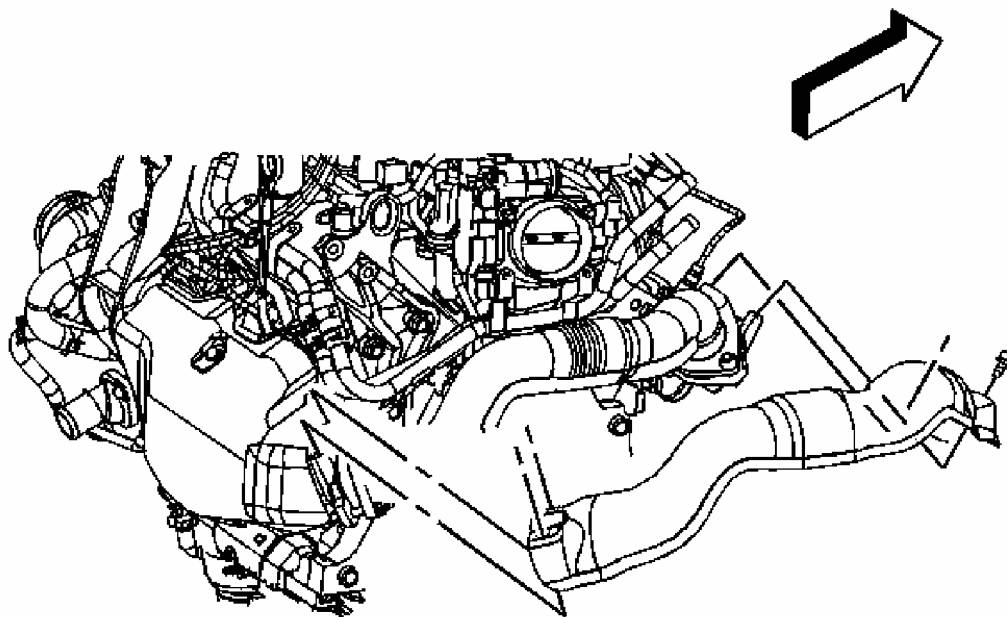


Fig. 23: Identifying Exhaust Crossover Pipe Heat Shield
Courtesy of GENERAL MOTORS CORP.

8. Install the exhaust crossover pipe heat shield.
9. Install the exhaust crossover pipe heat shield bolts.

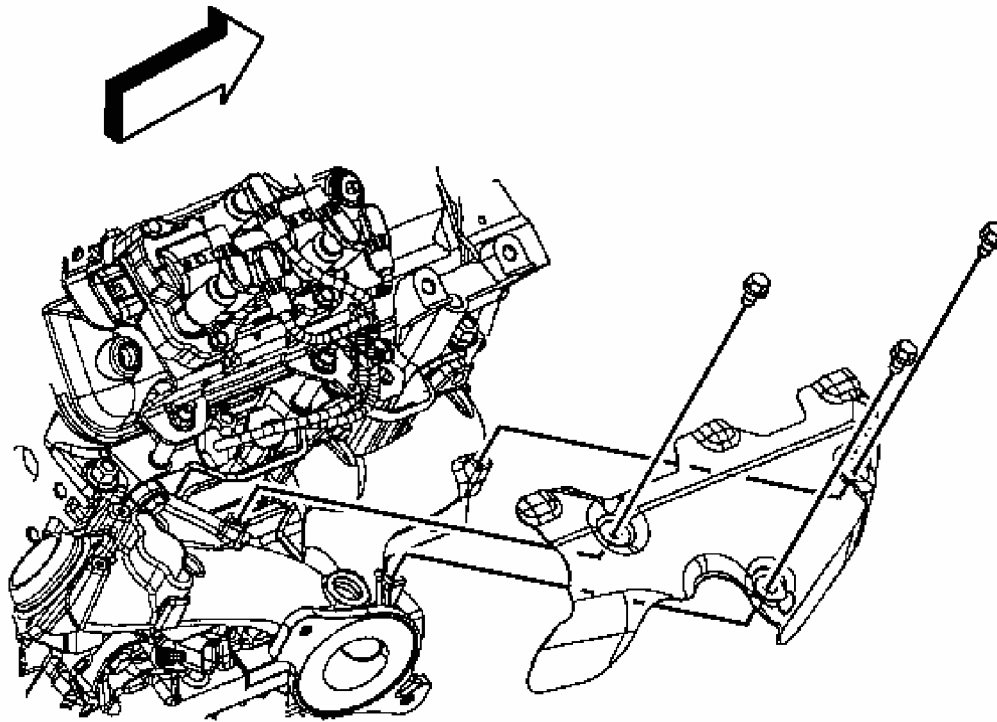


Fig. 24: Identifying Exhaust Manifold Bolts
Courtesy of GENERAL MOTORS CORP.

10. Install the exhaust manifold shield.
11. Install the exhaust manifold shield bolts.

Tighten: Tighten the bolts to 10 N.m (89 lb in).

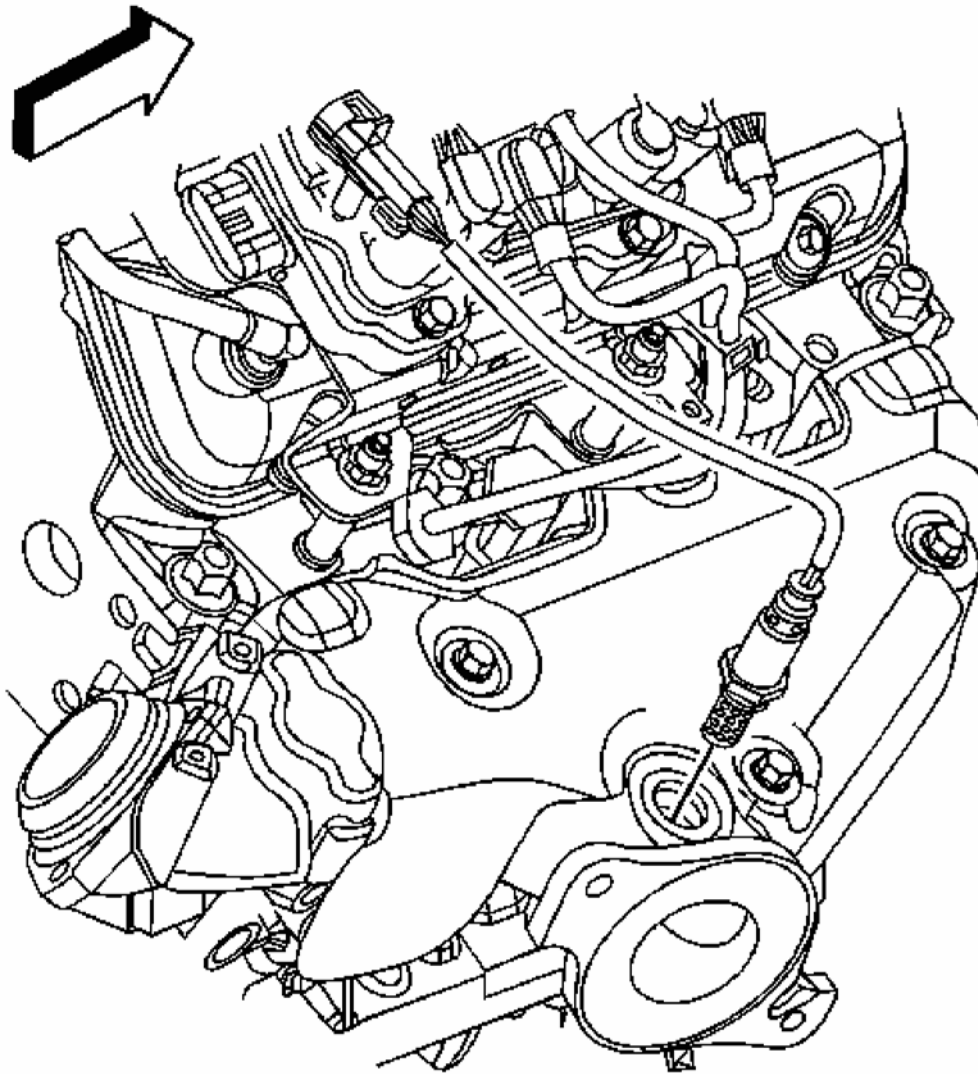


Fig. 25: Locating HO2S & J 39194-B
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Whenever the oxygen sensor is removed, coat the threads with nickel-based anti-seize compound such as GM P/N 5613695 (or equivalent).

12. Install the HO2S using J 39194-B . See Special Tools.

Tighten: Tighten the sensor to 42 N.m (31 lb ft).

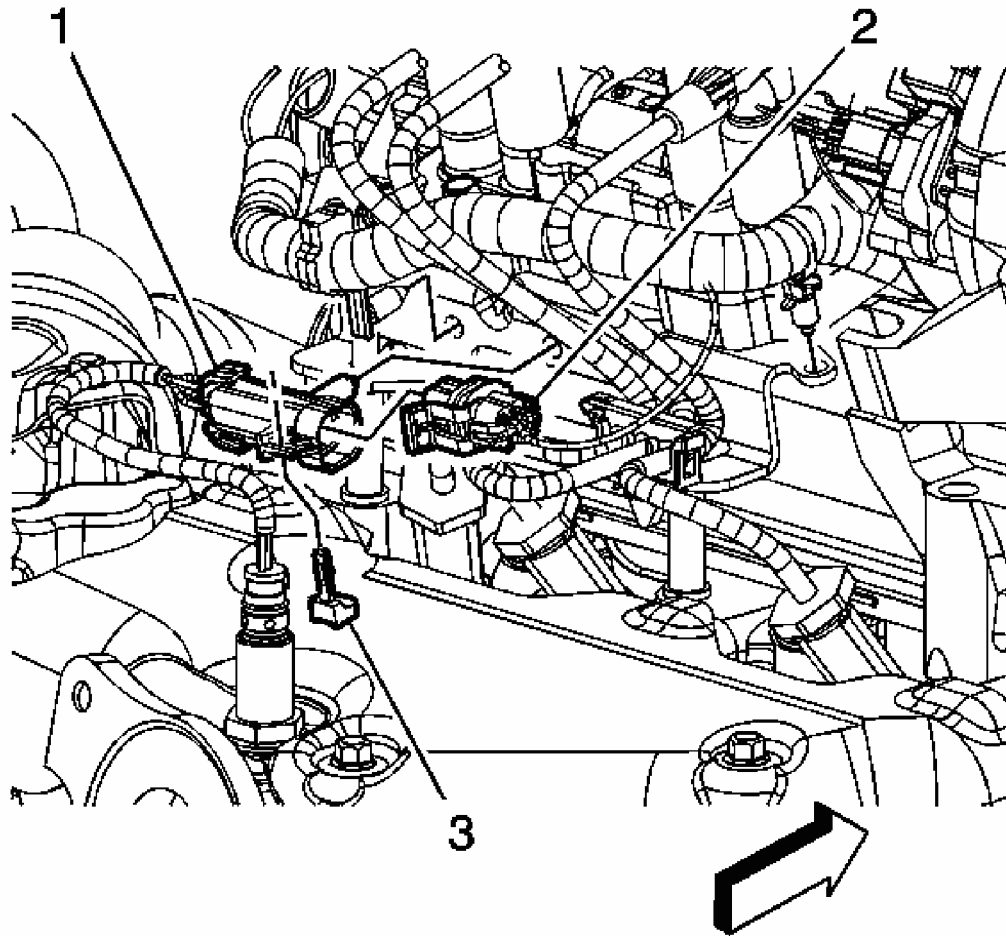


Fig. 26: Identifying The HO2S Electrical Connector
Courtesy of GENERAL MOTORS CORP.

13. Connect the HO2S electrical connector (2).
14. Install the CPA retainer (3).
15. Install the HO2S clip (1) to the ignition coil bracket.
16. Install the generator. Refer to **Generator Replacement (RPOs LZE/LZ4/LZ9)** or **Generator Replacement (RPO LS4)** .

EXHAUST MANIFOLD REPLACEMENT - RIGHT (RPO LS4)

Removal Procedure

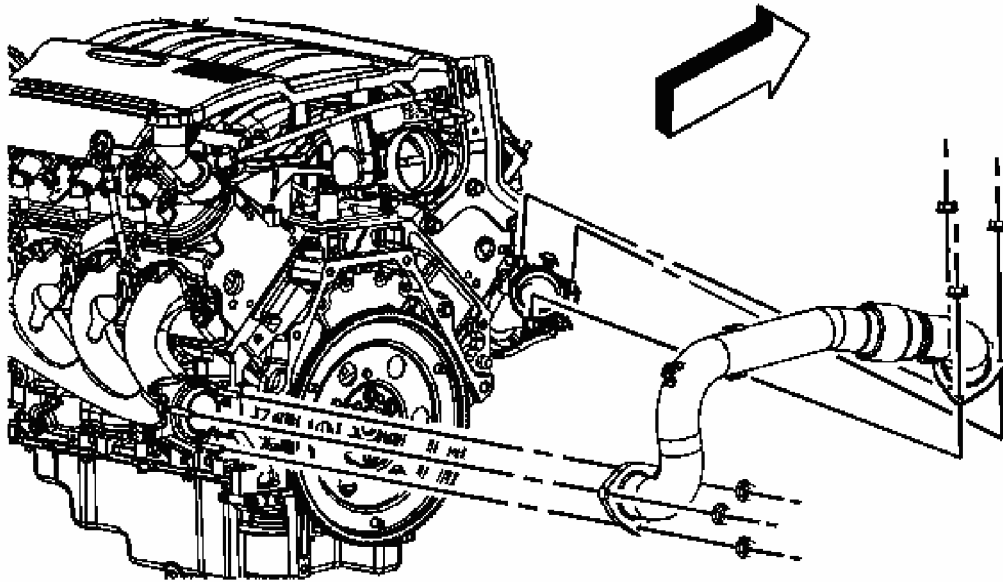


Fig. 27: Exhaust Crossover Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement** .
2. Remove the spark plugs. Refer to **Spark Plug Replacement** .
3. Remove the exhaust crossover pipe nuts from the right exhaust manifold.
4. Disconnect the catalytic converter from the exhaust manifold. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.
5. Support the catalytic converter and exhaust system with the mechanics wire.
6. Lower the vehicle.
7. Remove the ignition coil. Refer to **Ignition Coil(s) Replacement** .
8. Remove the O2 sensors. Refer to **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1** .

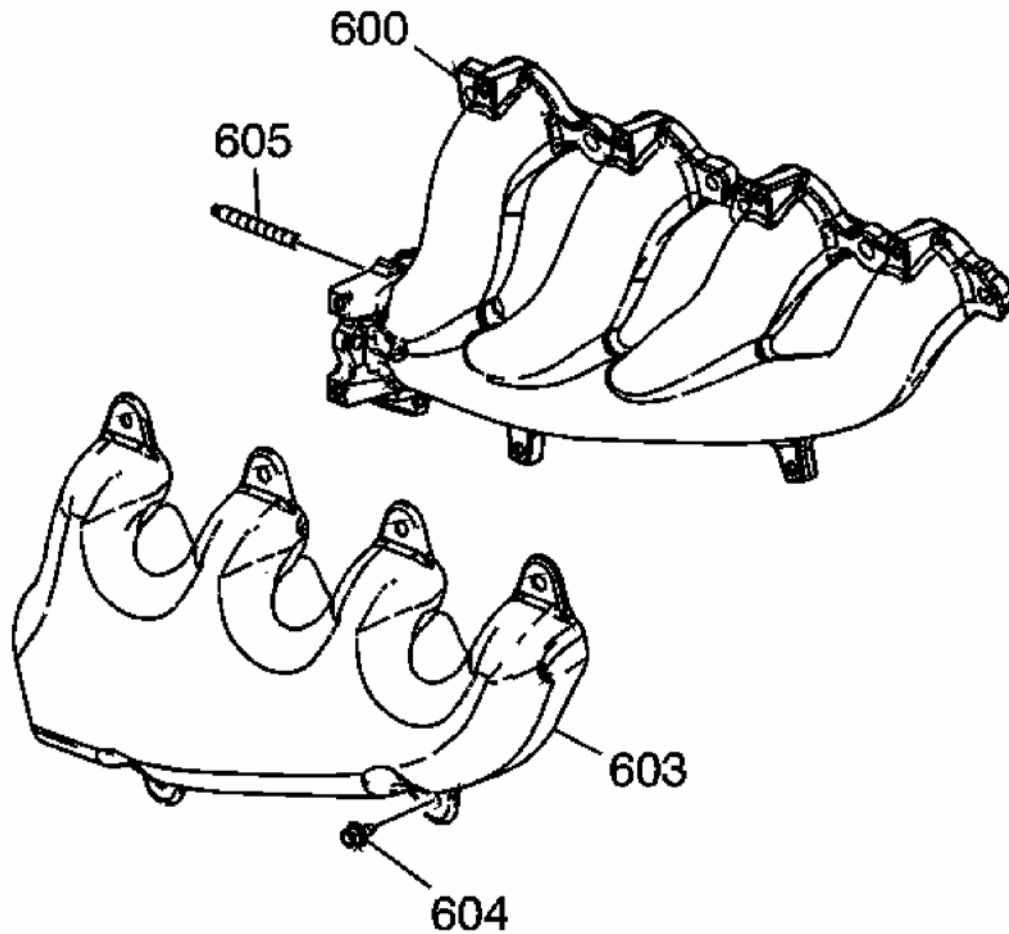


Fig. 28: Heat Shield & Bolts

Courtesy of GENERAL MOTORS CORP.

9. Remove the exhaust manifold heat shield bolts (604).
10. Remove the exhaust manifold heat shield (603).

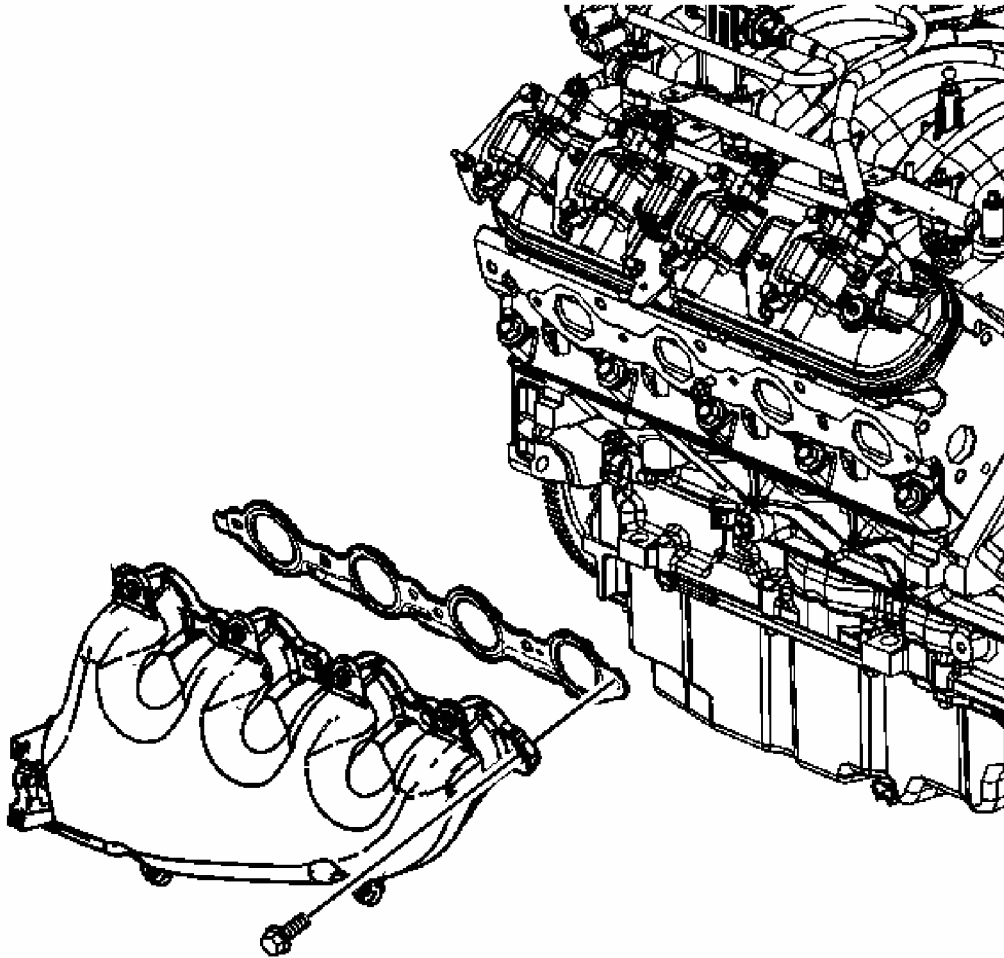


Fig. 29: Exhaust Manifold
Courtesy of GENERAL MOTORS CORP.

11. Remove the exhaust manifold bolts.
12. Remove the exhaust manifold.
13. Remove and discard the exhaust manifold gasket.
14. Clean and inspect the left exhaust manifold. Refer to **Exhaust Manifold Cleaning and Inspection** .

Installation Procedure

- IMPORTANT:**
- Tighten the exhaust manifold bolts as specified in the service procedure. Improperly installed and/or leaking exhaust manifold gaskets may affect vehicle emissions

and/or On Board Diagnostic (OBD) II system performance.

- The cylinder head exhaust manifold bolt hole threads must be clean and free of debris or threadlocking material.
- DO NOT apply threadlock to the first three thread of the bolts.

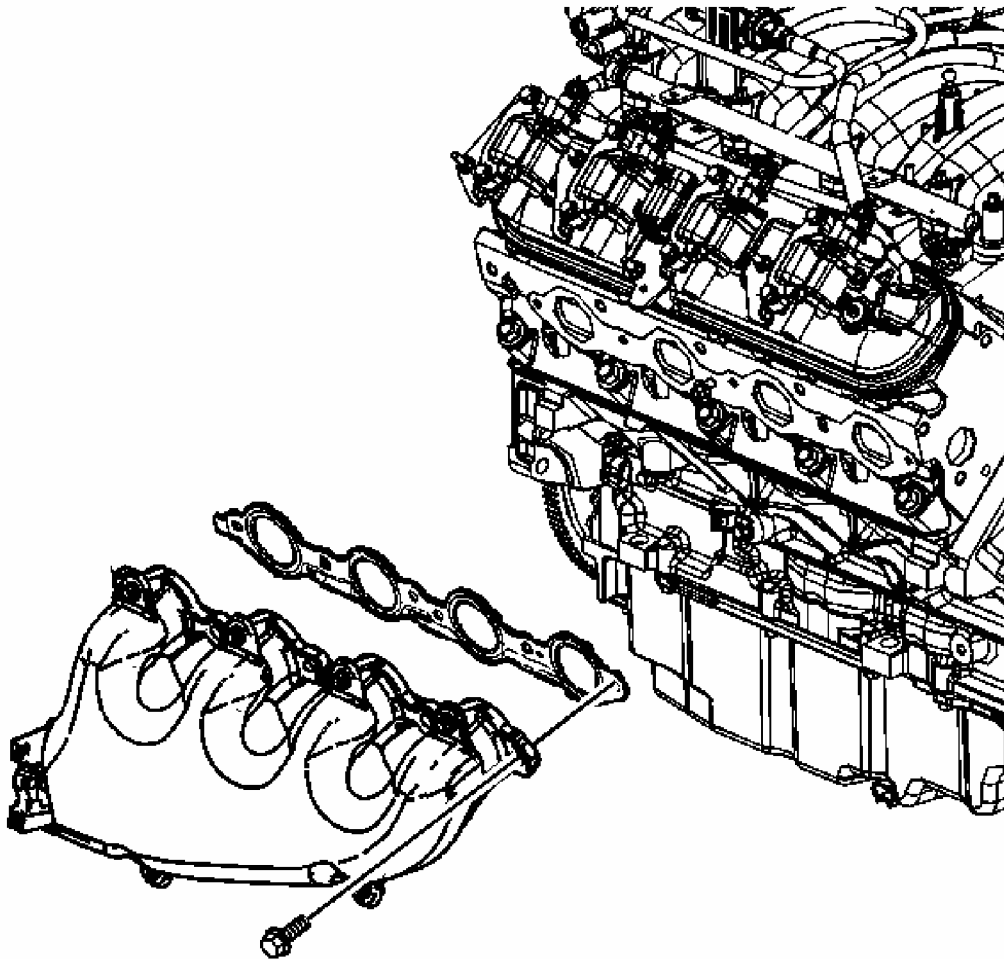


Fig. 30: Exhaust Manifold

Courtesy of GENERAL MOTORS CORP.

1. Apply a 5 mm (0.2 in) wide band of threadlock GM P/N 12345493 (Canadian P/N 10953488) or equivalent to the threads of the exhaust manifold bolts.

NOTE: Refer to Fastener Notice .

2. Install a NEW exhaust manifold gasket, the exhaust manifold and bolts.

Tighten:

- Tighten the bolts a first pass to 15 N.m (11 lb ft). Tighten the bolts beginning with the center 2 bolts. Alternate from side to side, and work toward the outside.
 - Tighten the bolts a final pass to 20 N.m (15 lb ft). Tighten the bolts beginning with the center 2 bolts. Alternate from side to side, and work toward the outside.
3. Using a flat punch, bend over the exposed edge of the exhaust manifold gasket at the rear of the right cylinder head.

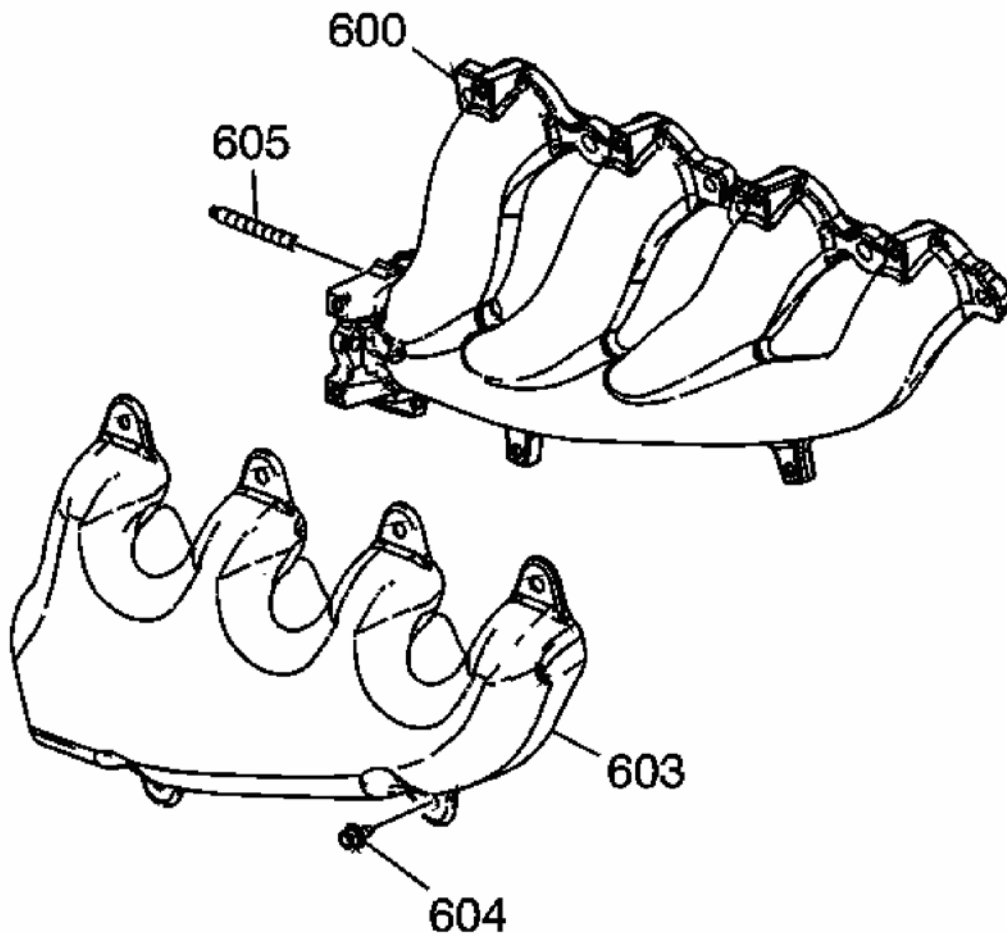


Fig. 31: Heat Shield & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the exhaust manifold heat shield (603).

5. Install the exhaust manifold heat shield bolts (604).

Tighten: Tighten the bolts to 9 N.m (80 lb in).

6. Install the O2 sensor. Refer to **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1**.
7. Raise the vehicle.
8. Remove the mechanics wire from the exhaust system and connect the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.

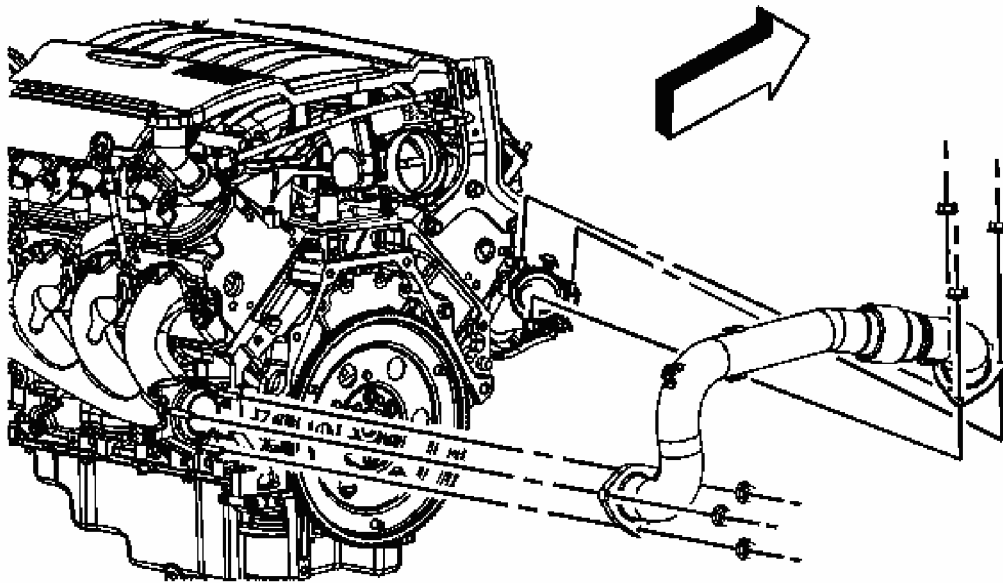


Fig. 32: Exhaust Crossover Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

9. Install the exhaust crossover pipe nuts to the right exhaust manifold.

Tighten: Tighten the nuts to 25 N.m (18 lb ft).

10. Install the ignition coil. Refer to **Ignition Coil(s) Replacement**.
11. Install the spark plugs. Refer to **Spark Plug Replacement**.
12. Install the fuel injector sight shield. Refer to **Engine Sight Shield Replacement**.

EXHAUST CROSSOVER PIPE REPLACEMENT (RPOS LZE/LZ4/LZ9)

Removal Procedure

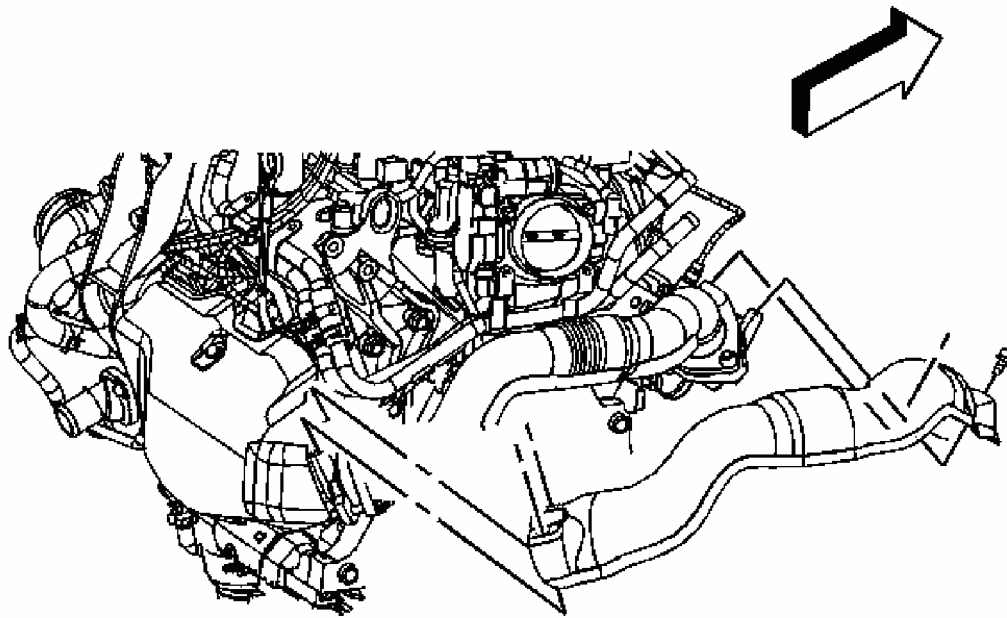


Fig. 33: Identifying Exhaust Crossover Pipe Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Remove the air cleaner intake duct. Refer to **Air Cleaner Resonator Outlet Duct Replacement** .
2. Remove the exhaust crossover pipe heat shield bolts.
3. Remove the exhaust crossover pipe heat shield.

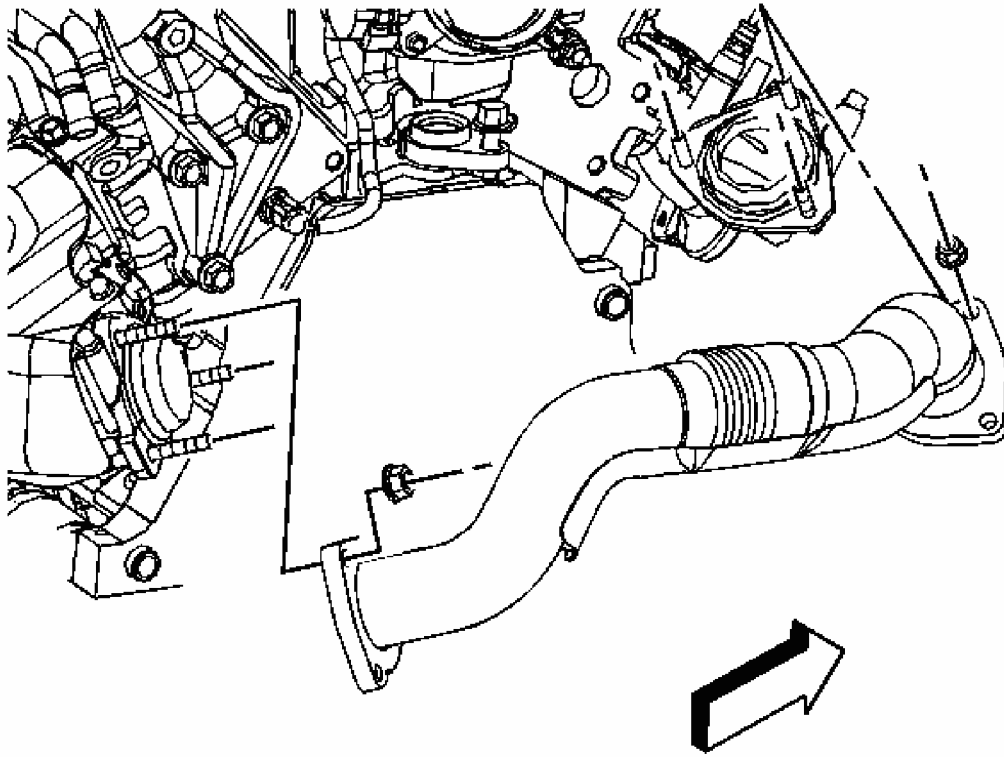


Fig. 34: Locating Exhaust Crossover Pipe & Left Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

4. Remove the exhaust crossover pipe nuts.
5. Remove the exhaust crossover pipe.
6. Remove the exhaust crossover pipe seals.

Installation Procedure

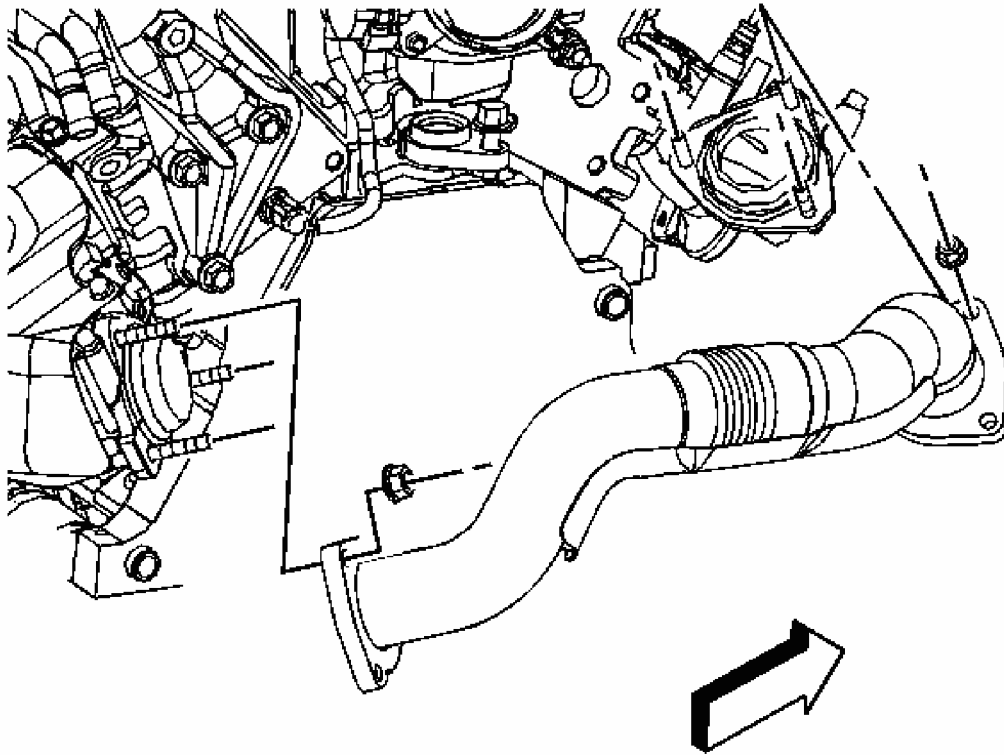


Fig. 35: Locating Exhaust Crossover Pipe & Left Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the exhaust crossover pipe seals to the exhaust manifolds.
2. Install the exhaust crossover pipe.

NOTE: Refer to Fastener Notice .

3. Install the exhaust crossover pipe nuts.

Tighten: Tighten the nuts to 20 N.m (15 lb ft).

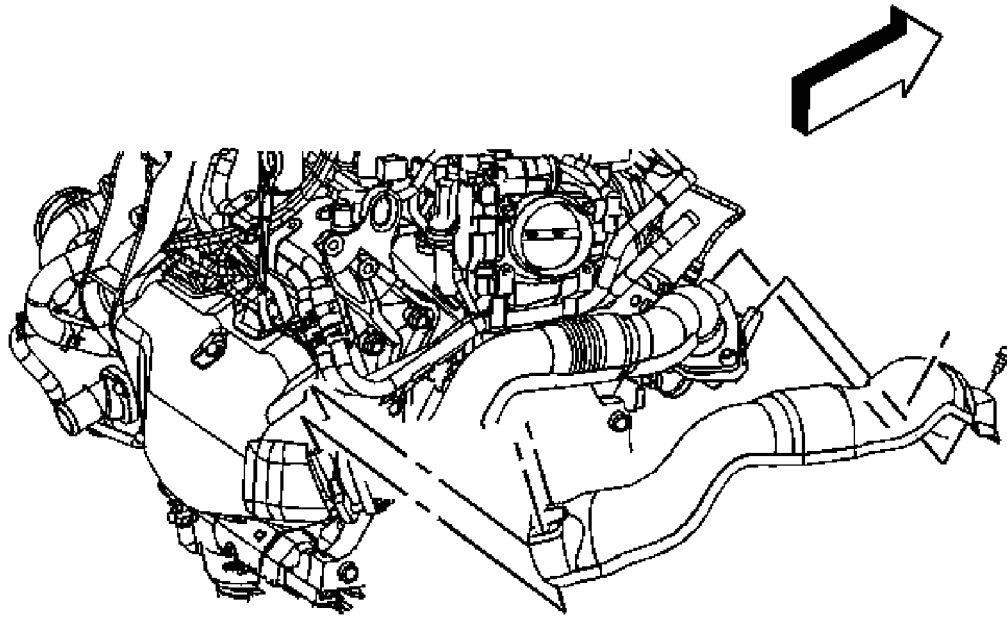


Fig. 36: Identifying Exhaust Crossover Pipe Heat Shield
Courtesy of GENERAL MOTORS CORP.

4. Install the exhaust crossover pipe heat shield.
5. Install the exhaust crossover pipe heat shield bolts.

Tighten: Tighten the bolts to 10 N.m (89 lb in).

6. Install the air cleaner intake duct. Refer to **Air Cleaner Resonator Outlet Duct Replacement** .

EXHAUST CROSSOVER PIPE REPLACEMENT (RPO LS4)

Removal Procedure

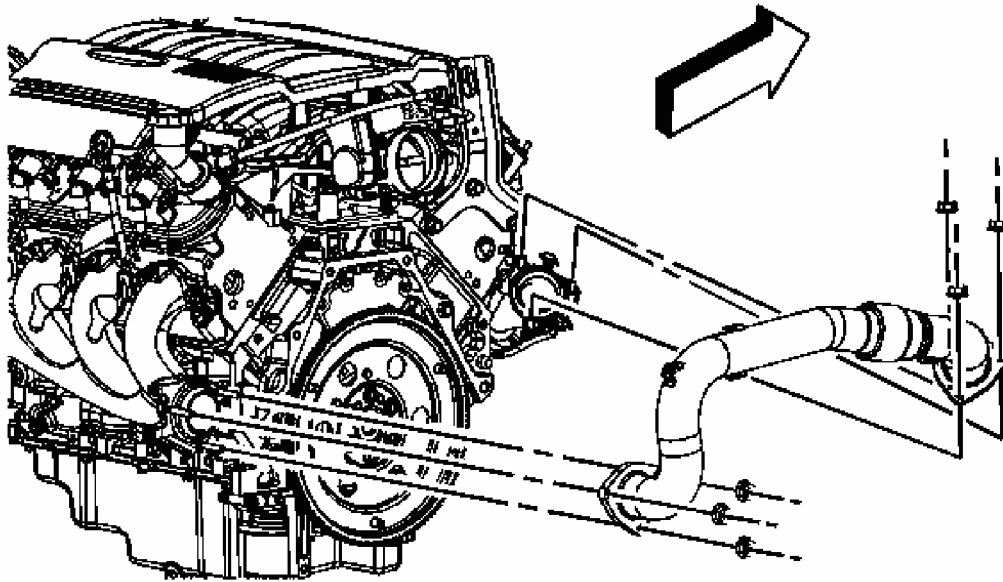


Fig. 37: Exhaust Crossover Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement** .
2. Remove the air cleaner intake duct. Refer to **Air Cleaner Resonator Outlet Duct Replacement** .
3. Remove the exhaust crossover pipe heat shield.
4. Remove the exhaust crossover pipe nuts.
5. Remove the exhaust crossover pipe.
6. Remove the exhaust crossover pipe seal.

Installation Procedure

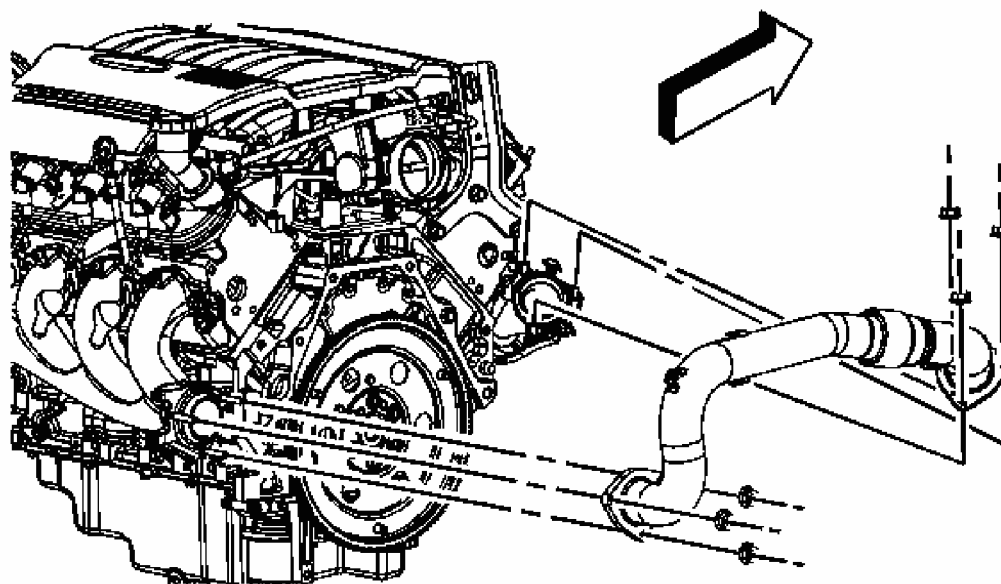


Fig. 38: Exhaust Crossover Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the exhaust crossover pipe seal to the exhaust crossover pipe at the right exhaust manifold connection.
2. Install the exhaust crossover pipe.

NOTE: Refer to Fastener Notice .

3. Install the exhaust crossover pipe nuts.

Tighten: Tighten the nuts to 25 N.m (18 lb ft).

4. Install the exhaust crossover pipe heat shield.
5. Install the air cleaner intake duct. Refer to Air Cleaner Resonator Outlet Duct Replacement .
6. Install the engine sight shield. Refer to Engine Sight Shield Replacement .

EXHAUST SEAL REPLACEMENT

Removal Procedure

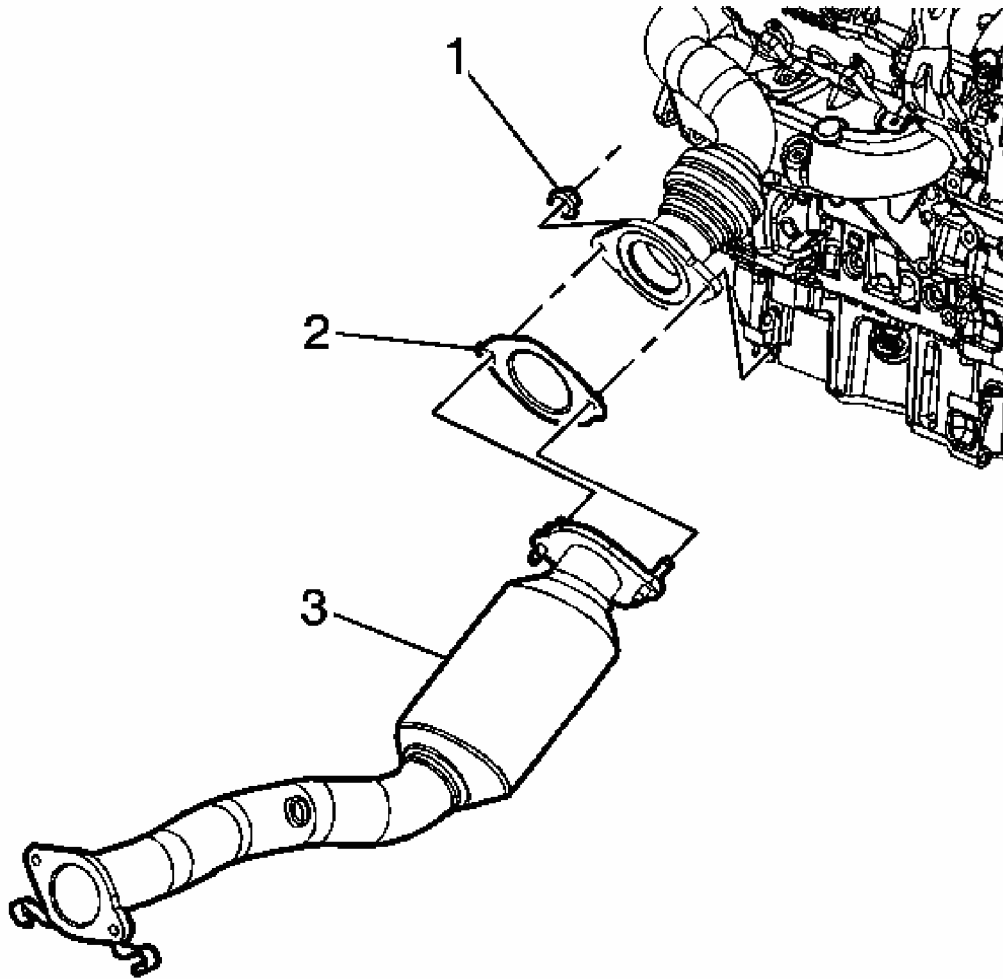


Fig. 39: Identifying The Catalytic Converter
Courtesy of GENERAL MOTORS CORP.

1. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.
2. Remove and discard the exhaust manifold pipe gasket (2), if equipped with regular production options (RPOs) LZE/LZ9.

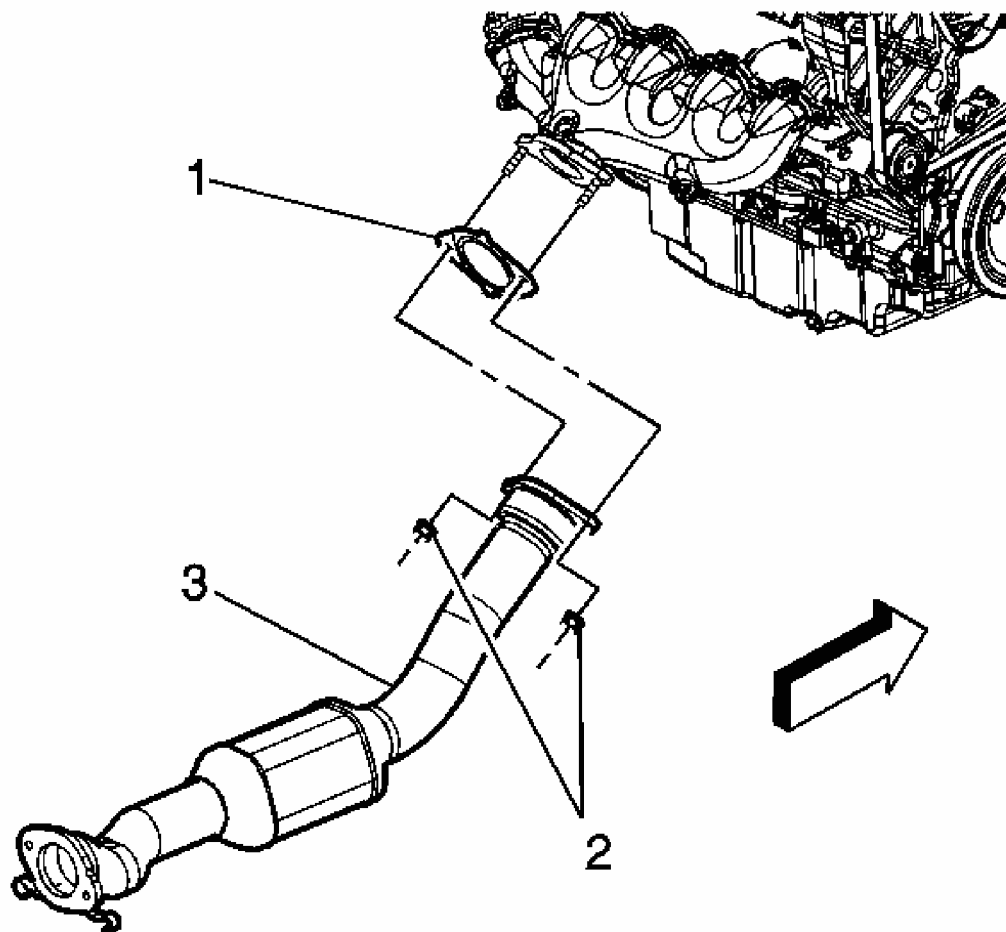


Fig. 40: Exhaust Manifold Pipe & Gasket
Courtesy of GENERAL MOTORS CORP.

3. Remove and discard the exhaust manifold pipe gasket (1), if equipped with RPO LS4.

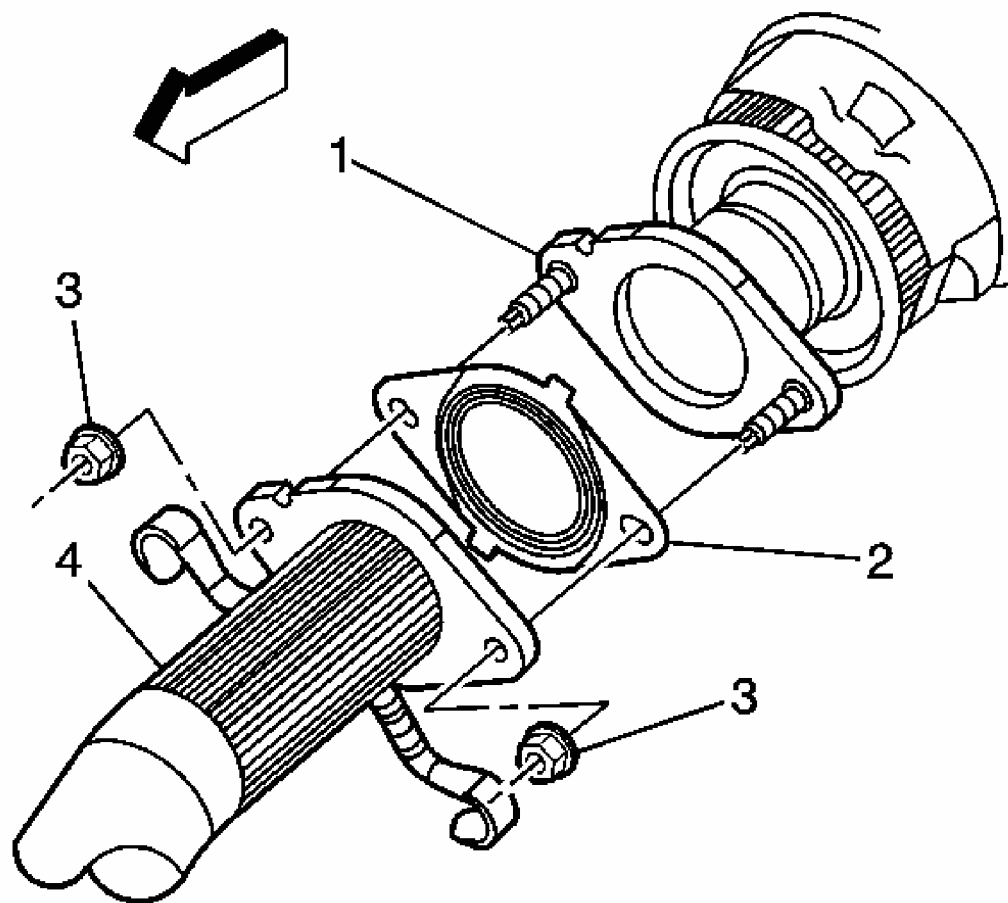


Fig. 41: Catalytic Converter To Muffler Components
Courtesy of GENERAL MOTORS CORP.

4. Remove and discard the catalytic converter to muffler gasket (2), if equipped with RPO LZE.

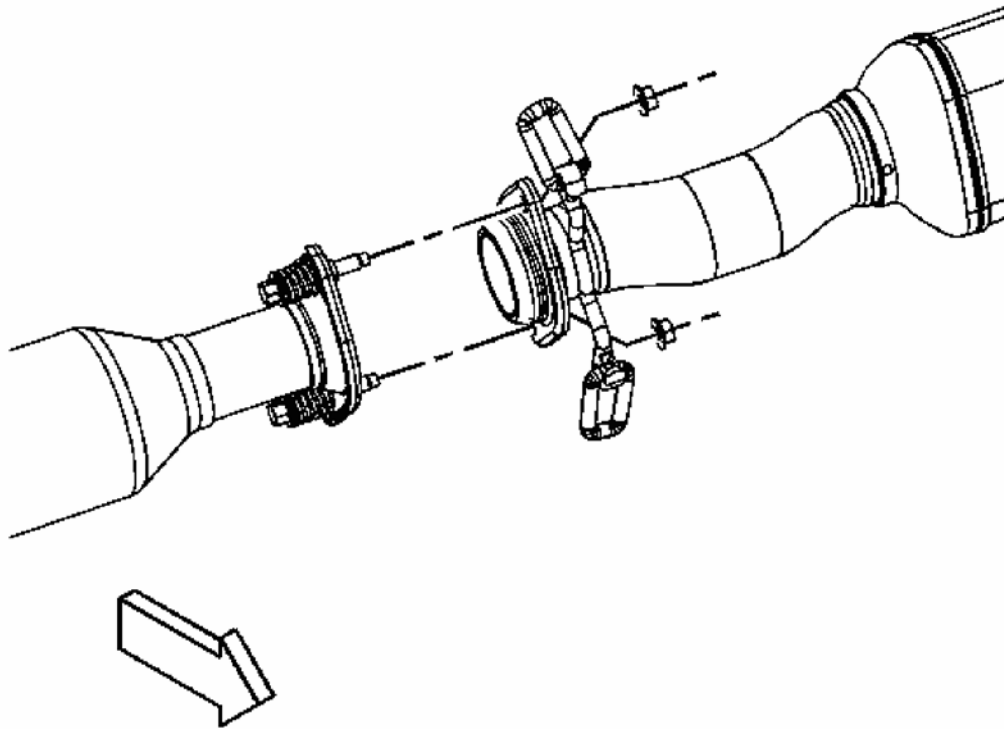


Fig. 42: View Of Catalytic Converter To Muffler Seal
Courtesy of GENERAL MOTORS CORP.

5. Remove and discard the catalytic converter to muffler seal, if equipped with RPOs LS4/LZ9.

Installation Procedure

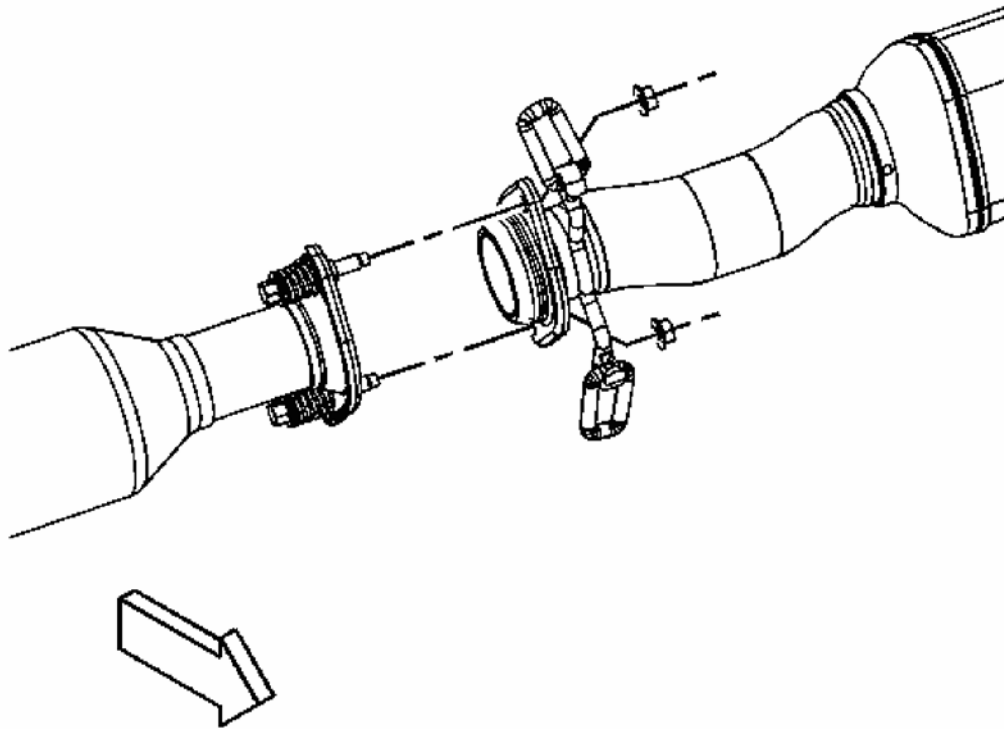


Fig. 43: View Of Catalytic Converter To Muffler Seal
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW catalytic converter to muffler seal, if equipped with RPOs LS4/LZ9.

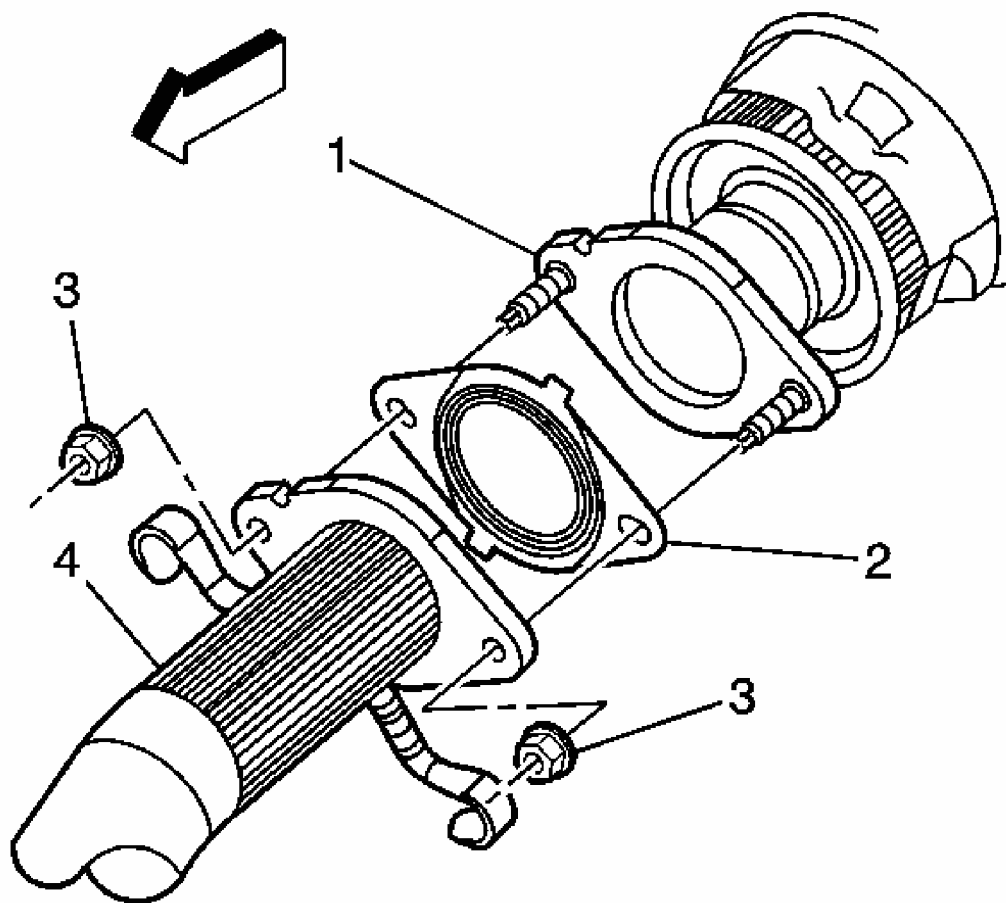


Fig. 44: Catalytic Converter To Muffler Components
Courtesy of GENERAL MOTORS CORP.

2. Install a NEW catalytic converter to muffler gasket (2), if equipped with RPO LZE.

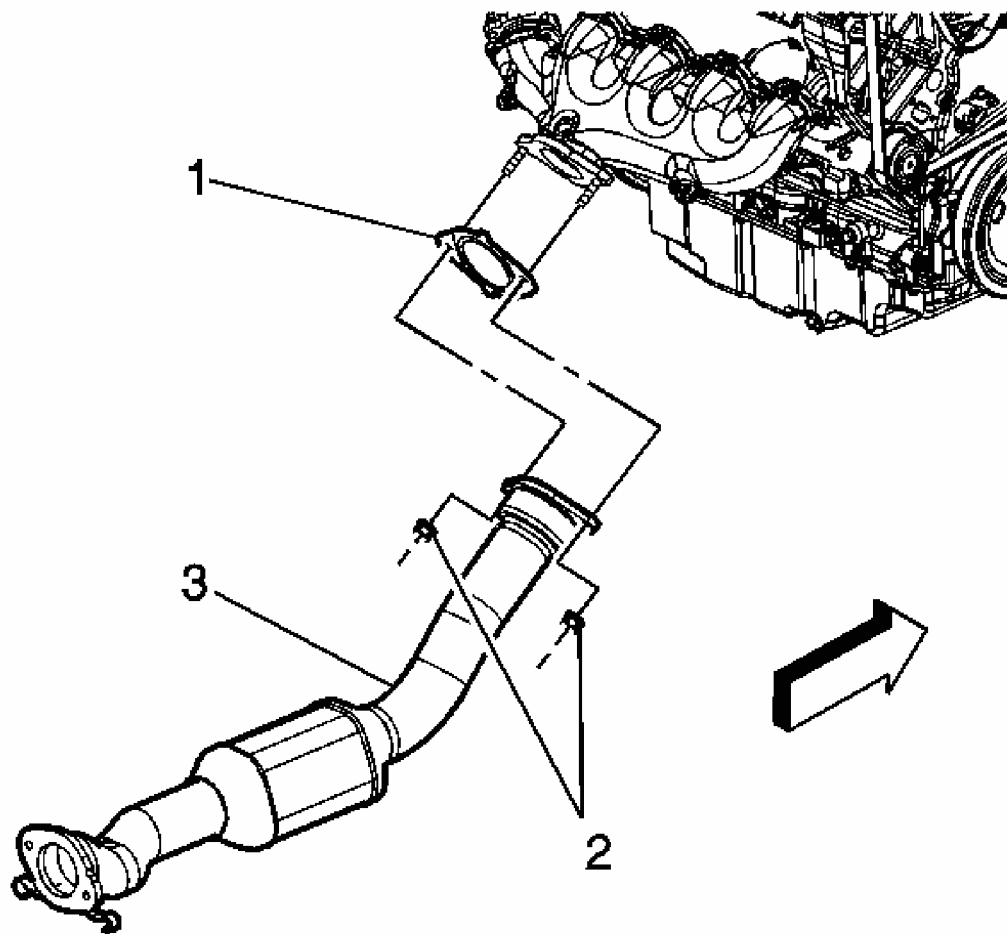


Fig. 45: Exhaust Manifold Pipe & Gasket
Courtesy of GENERAL MOTORS CORP.

3. Install a NEW exhaust manifold pipe gasket (1), if equipped with RPO LS4.

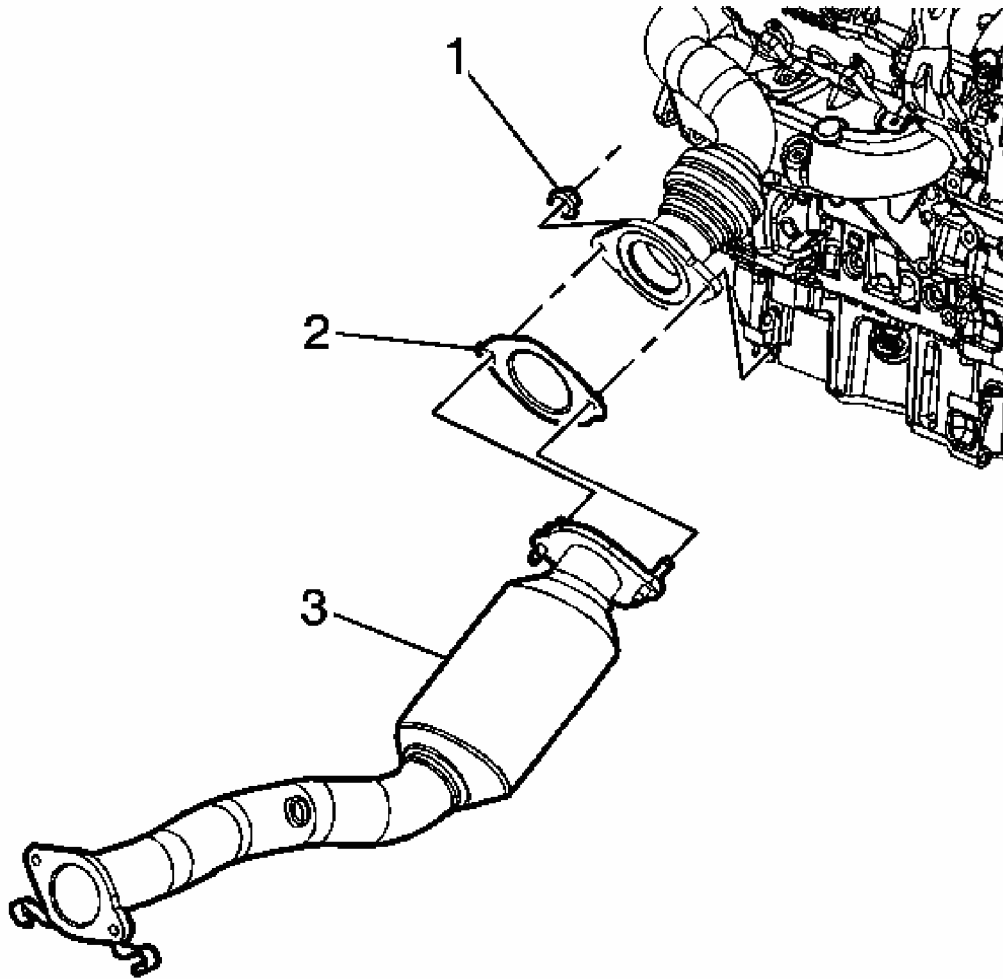


Fig. 46: View Of Exhaust Manifold Pipe Gasket
Courtesy of GENERAL MOTORS CORP.

4. Install a NEW exhaust manifold pipe gasket (2), if equipped with RPOs LZE/LZ9.
5. Install the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.

CATALYTIC CONVERTER REPLACEMENT (RPOS LZE/LZ4/LZ9)

Removal Procedure

IMPORTANT: The catalytic converter is serviced by replacing the entire assembly. Always replace the gaskets at the front and rear flanges when servicing the catalytic converter. Never install the

original gasket.

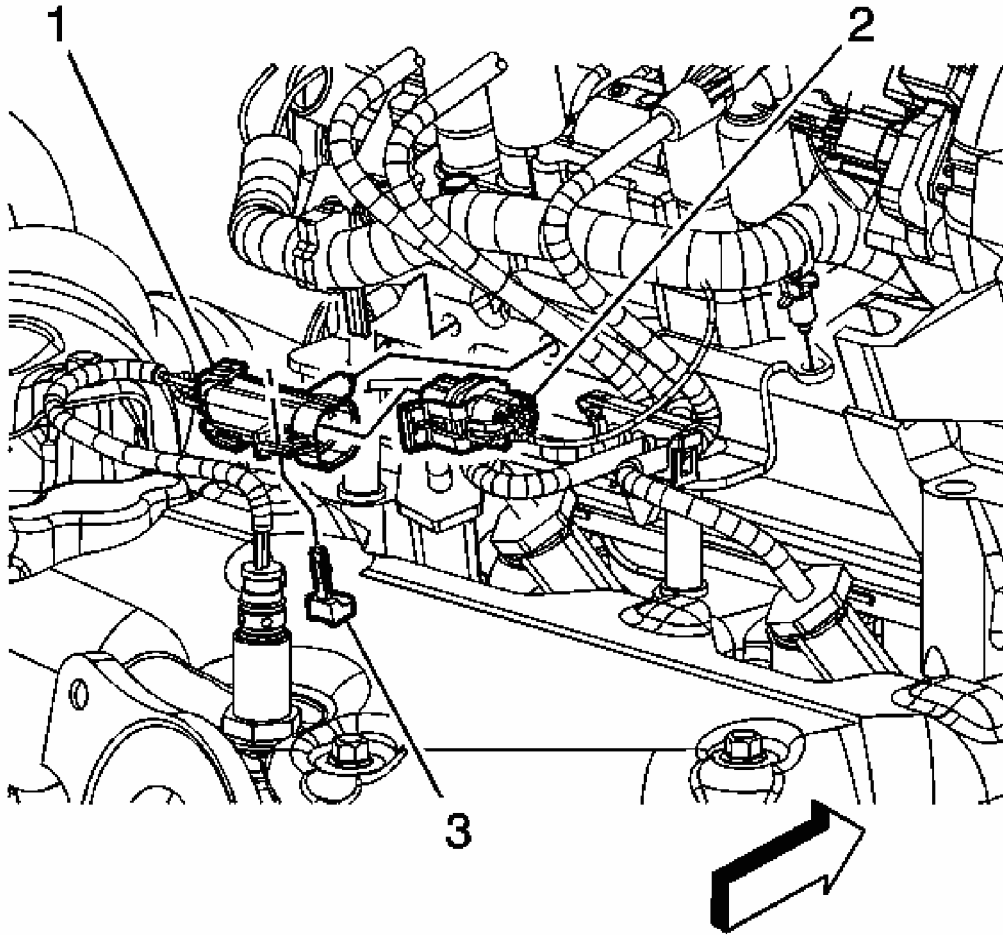


Fig. 47: Identifying The HO2S Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Remove the intake manifold cover. Refer to **Intake Manifold Cover Replacement** or **Intake Manifold Cover Replacement** .
2. Remove the connector position assurance (CPA) retainer (3).
3. Remove the heated oxygen sensor (HO2S) electrical connector clip (1) from the ignition coil bracket.
4. Disconnect the HO2S electrical connector (2).

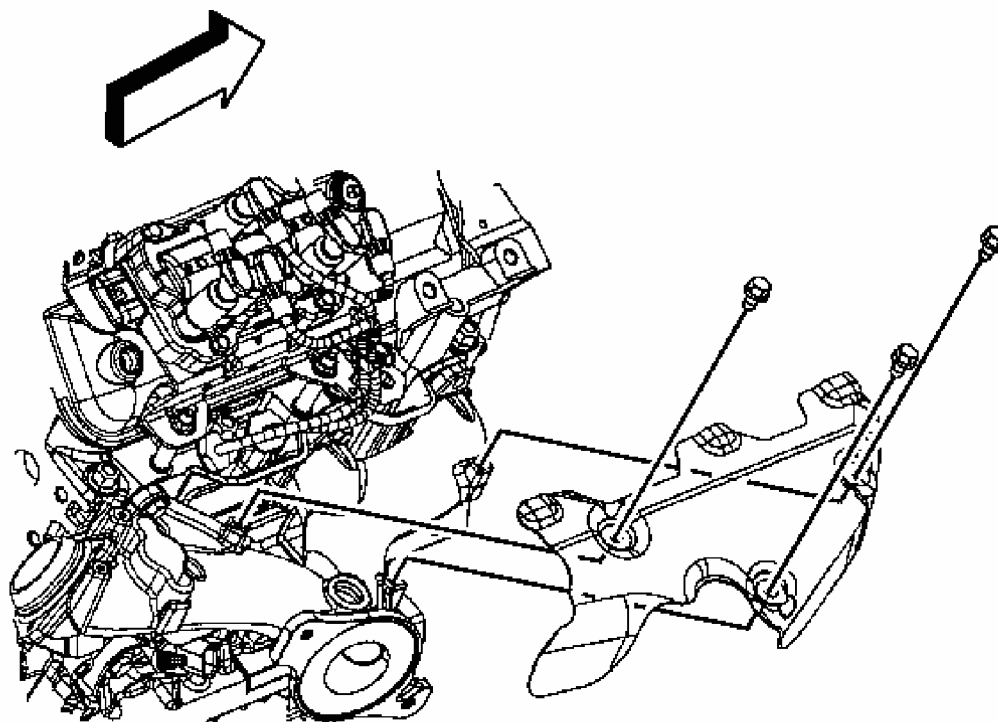


Fig. 48: Identifying Exhaust Manifold Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the exhaust manifold heat shield bolts.
6. Remove the exhaust manifold heat shield.

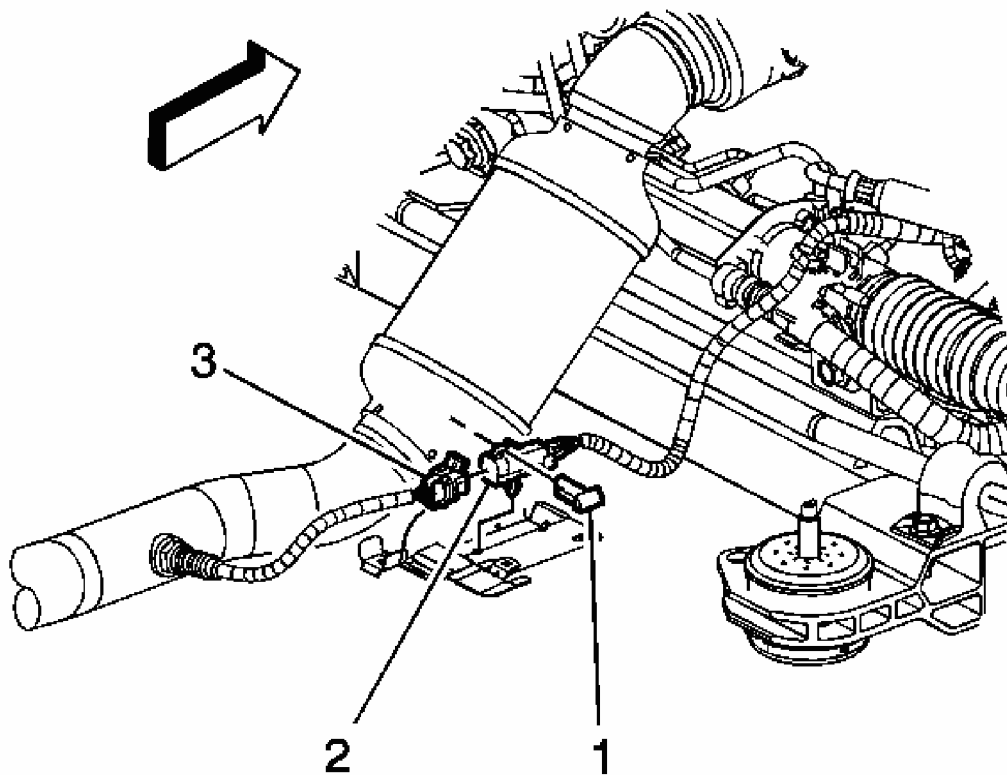


Fig. 49: Locating Upper Catalytic Converter & Exhaust Manifold Nut
Courtesy of GENERAL MOTORS CORP.

7. Remove the upper catalytic converter to exhaust manifold nut (1).

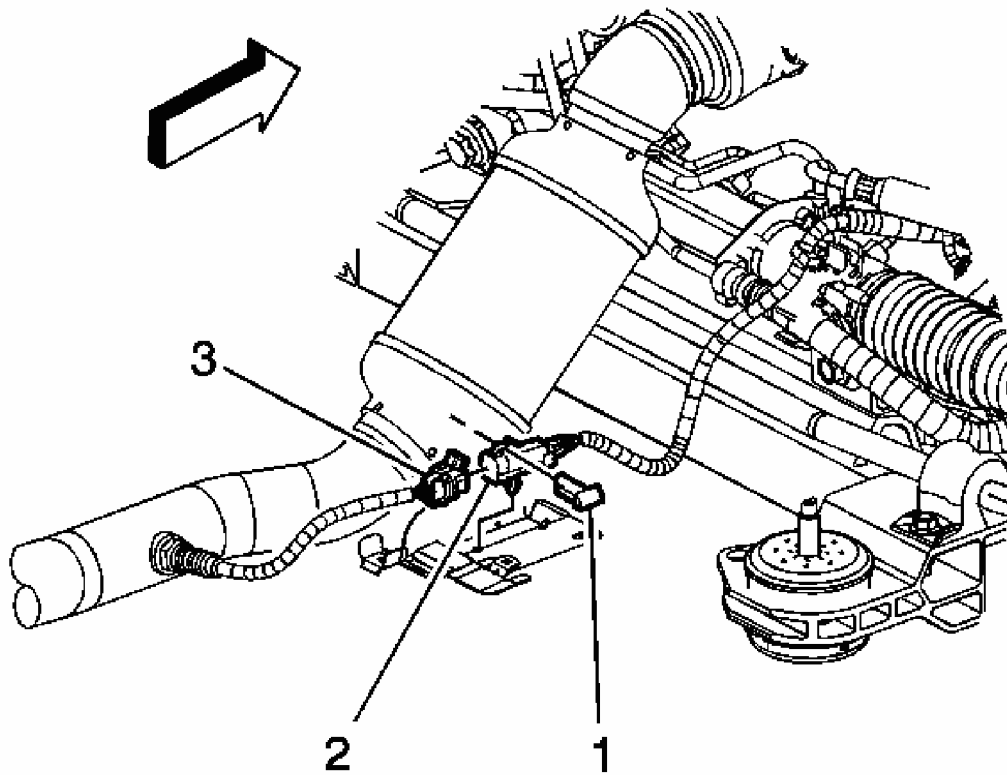


Fig. 50: Locating CPA Retainer
Courtesy of GENERAL MOTORS CORP.

8. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
9. Remove the CPA retainer (1).
10. Disconnect the HO2S electrical connector (3).

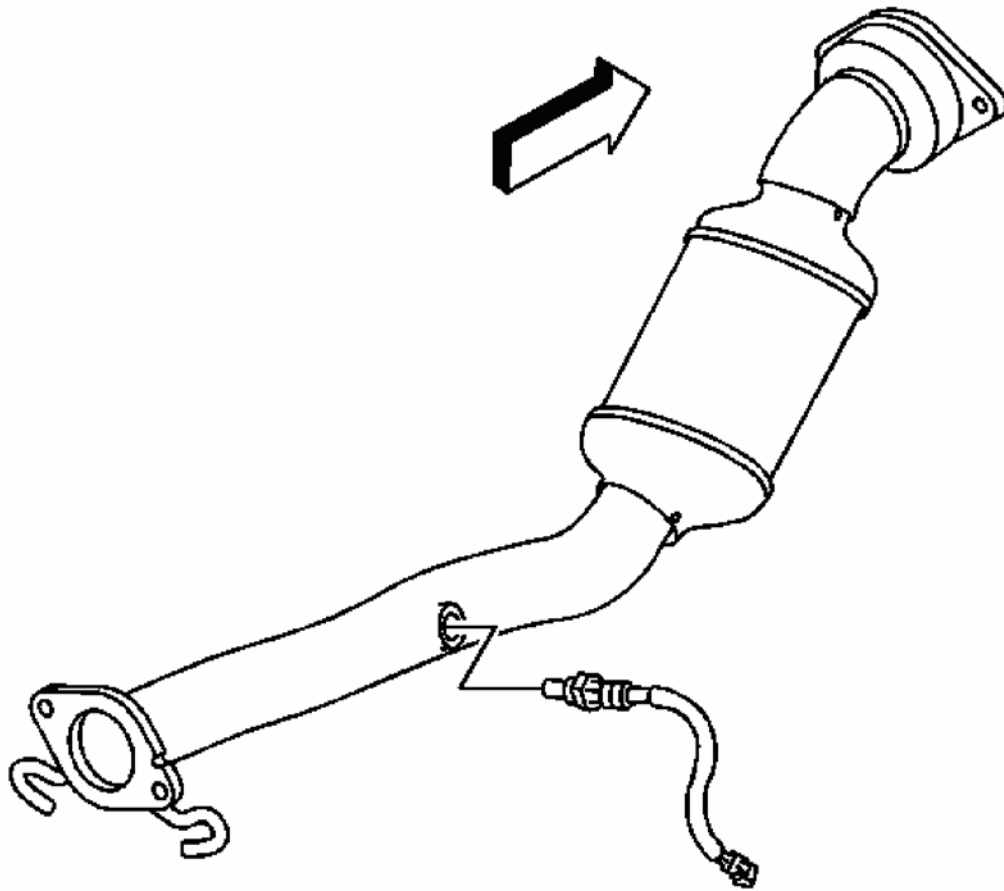


Fig. 51: Locating The HO2S
Courtesy of GENERAL MOTORS CORP.

11. Remove the HO2S. Refer to **Heated Oxygen Sensor Replacement - Position 2** or **Heated Oxygen Sensor Replacement - Position 2** .
12. Support the exhaust system.

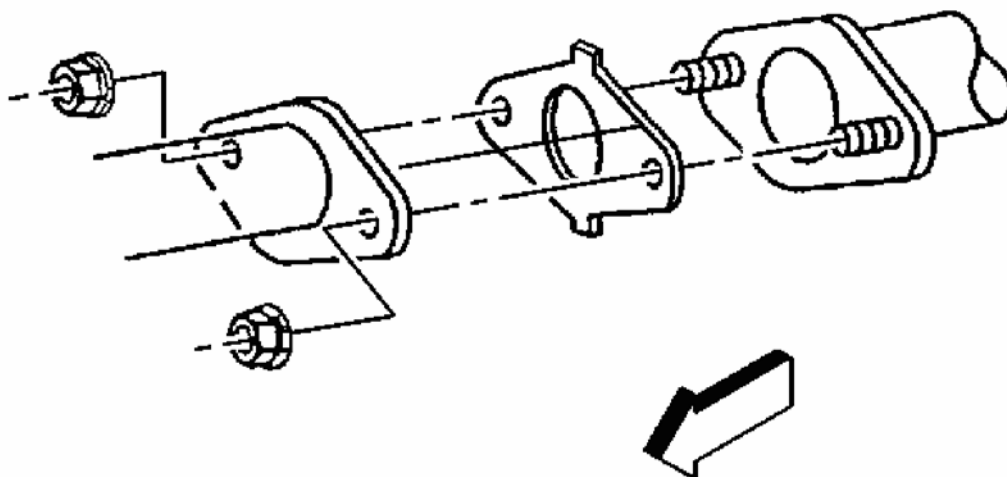


Fig. 52: View Of Catalytic Converter Mounting Nuts
Courtesy of GENERAL MOTORS CORP.

13. Remove the catalytic converter to muffler nuts.

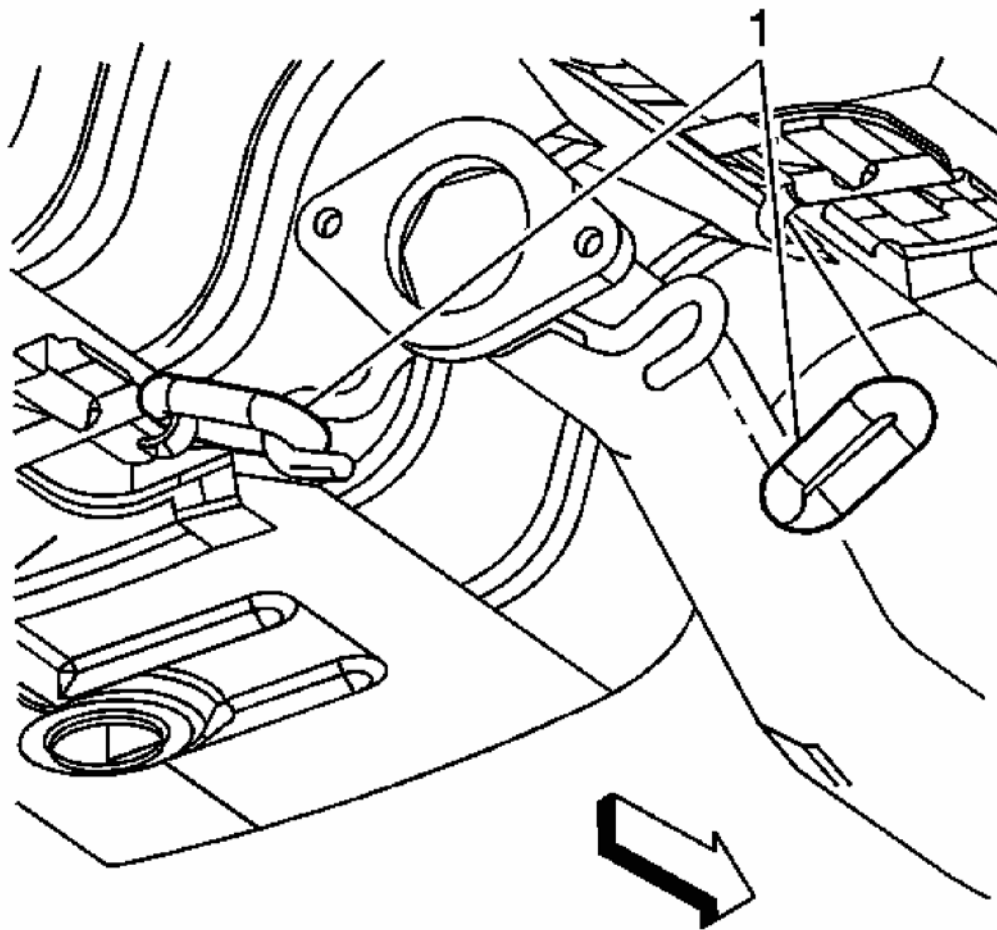


Fig. 53: Catalytic Converter Hangers
Courtesy of GENERAL MOTORS CORP.

14. Remove the catalytic converter insulators (1).

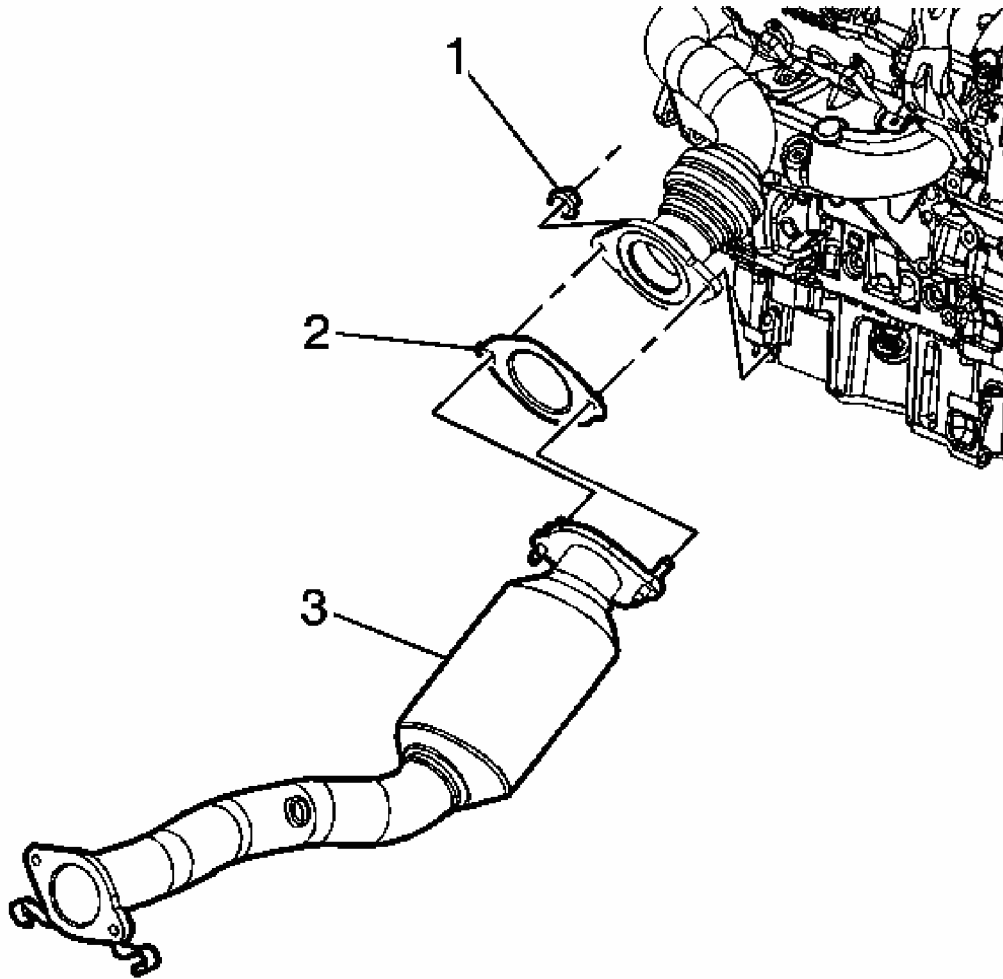


Fig. 54: Locating Catalytic Converter Lower Nut
Courtesy of GENERAL MOTORS CORP.

15. Remove the catalytic converter lower nut (3).
16. Reposition the muffler assembly rearward until the catalytic converter can be removed.
17. Remove the catalytic converter (3).
18. Remove the catalytic converter gasket (2).
19. Clean and inspect the exhaust manifold and the exhaust pipe gasket mating surfaces.

Installation Procedure

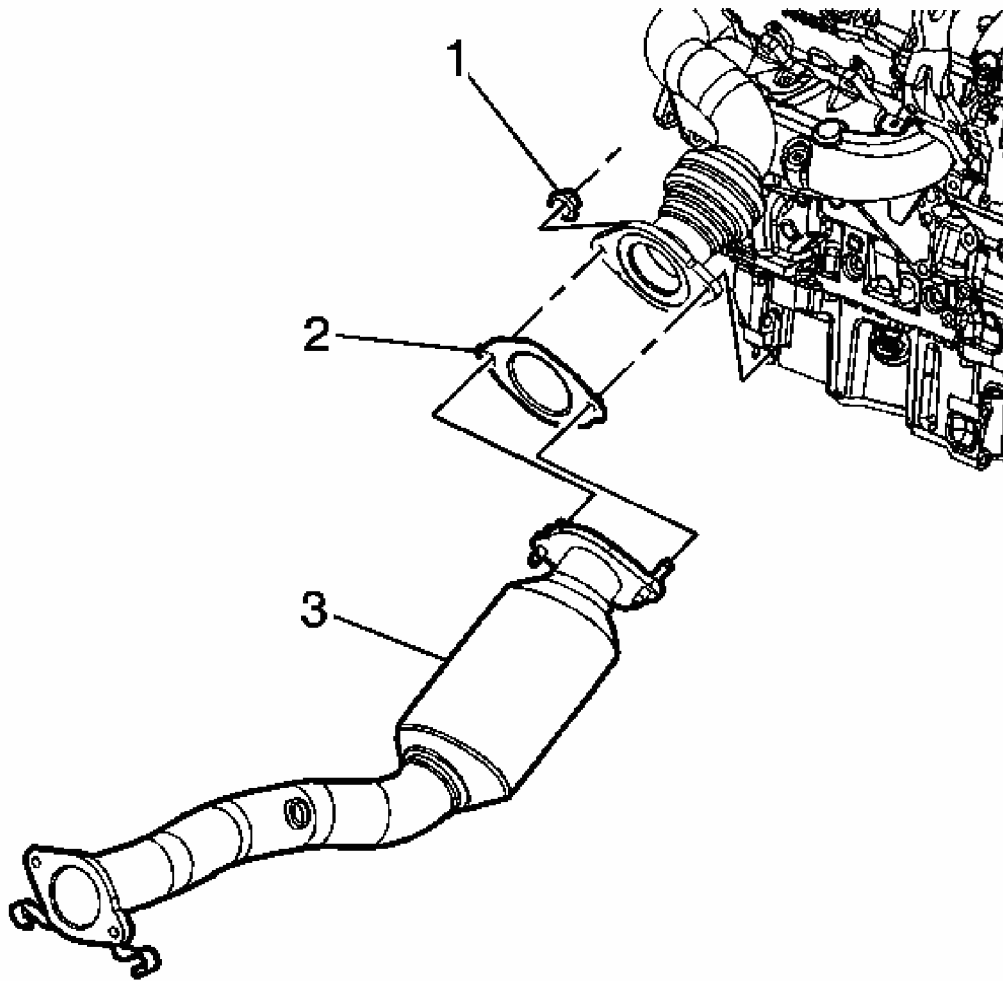


Fig. 55: Identifying Catalytic Converter Gasket
Courtesy of GENERAL MOTORS CORP.

1. Install the catalytic converter gasket (2) onto the catalytic converter.
2. Reposition the muffler assembly rearward until the catalytic converter can be installed.
3. Install the catalytic converter (3).

NOTE: Refer to Fastener Notice .

4. Install the catalytic converter lower nut (3).

Tighten: Tighten the nut to 35 N.m (26 lb ft).

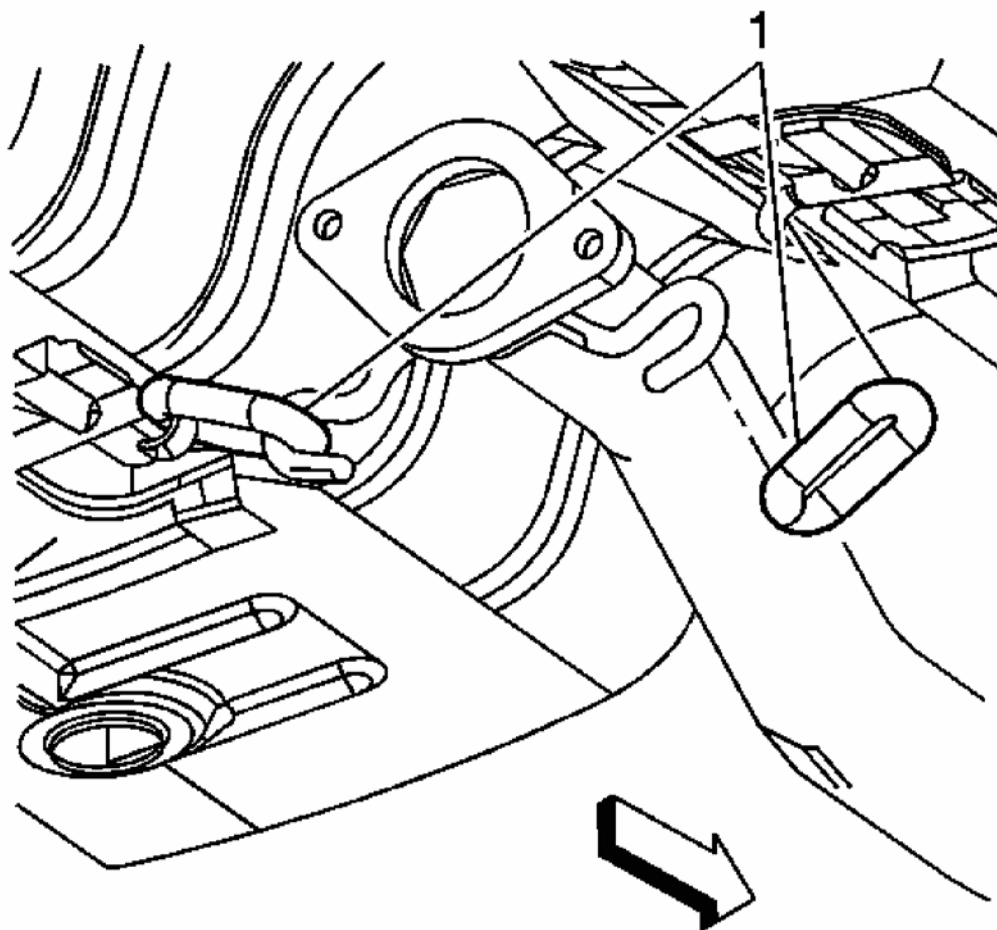


Fig. 56: Catalytic Converter Hangers
Courtesy of GENERAL MOTORS CORP.

5. Install the catalytic converter insulators (1).

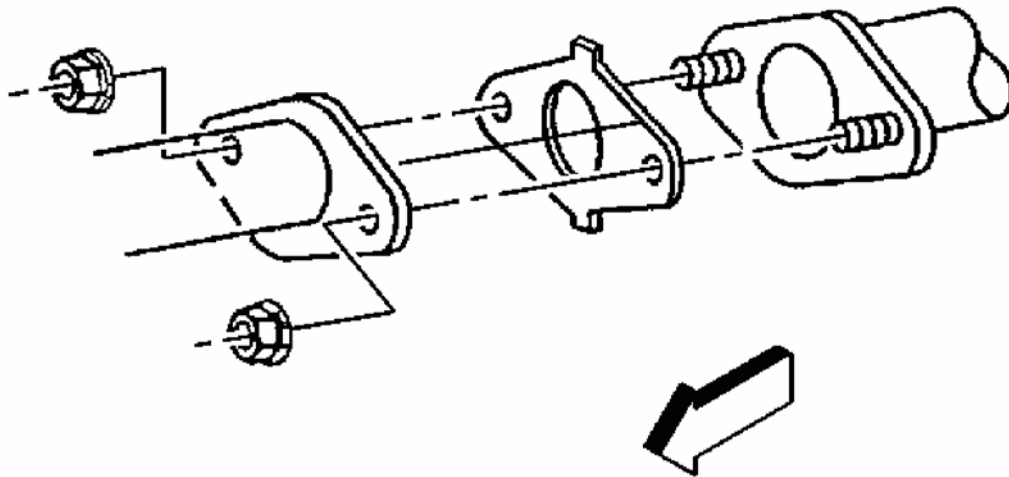


Fig. 57: View Of Catalytic Converter Mounting Nuts
Courtesy of GENERAL MOTORS CORP.

6. Install the catalytic converter to muffler nuts (3).

Tighten: Tighten the nuts to 60 N.m (44 lb ft).

7. Remove the support from the exhaust system.

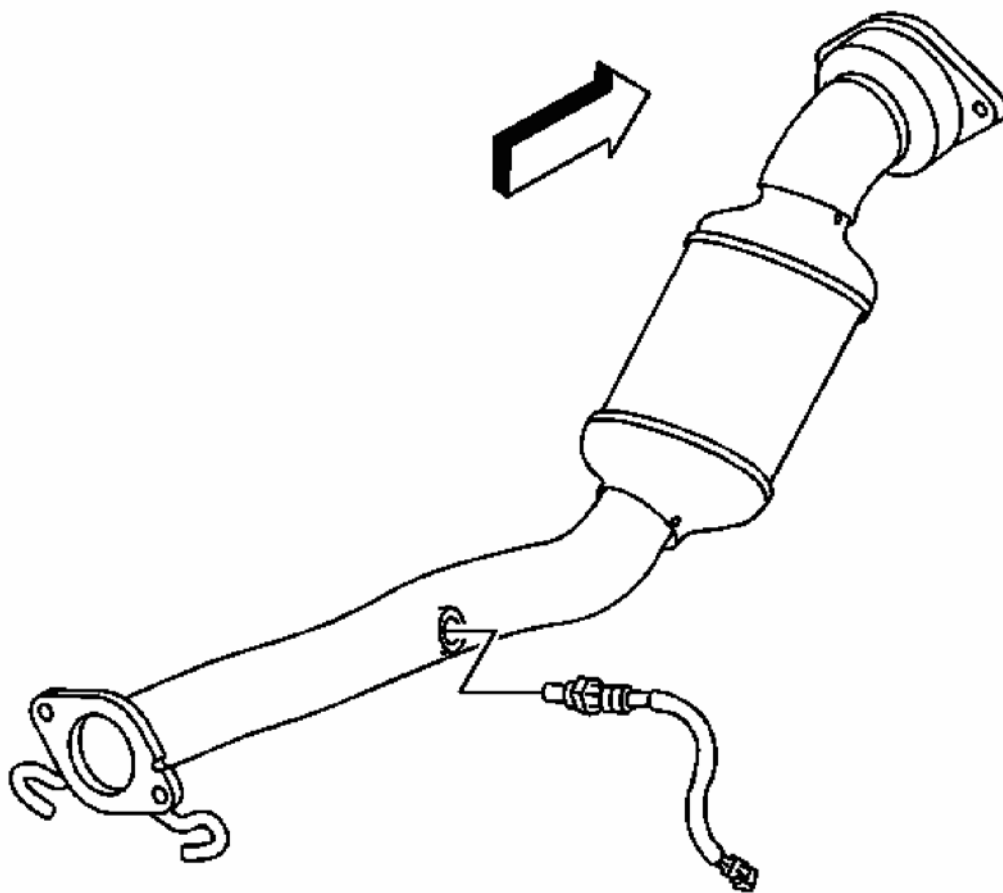


Fig. 58: Locating The HO2S
Courtesy of GENERAL MOTORS CORP.

8. Install the HO2S. Refer to Heated Oxygen Sensor Replacement - Position 2 or Heated Oxygen Sensor Replacement - Position 2 .

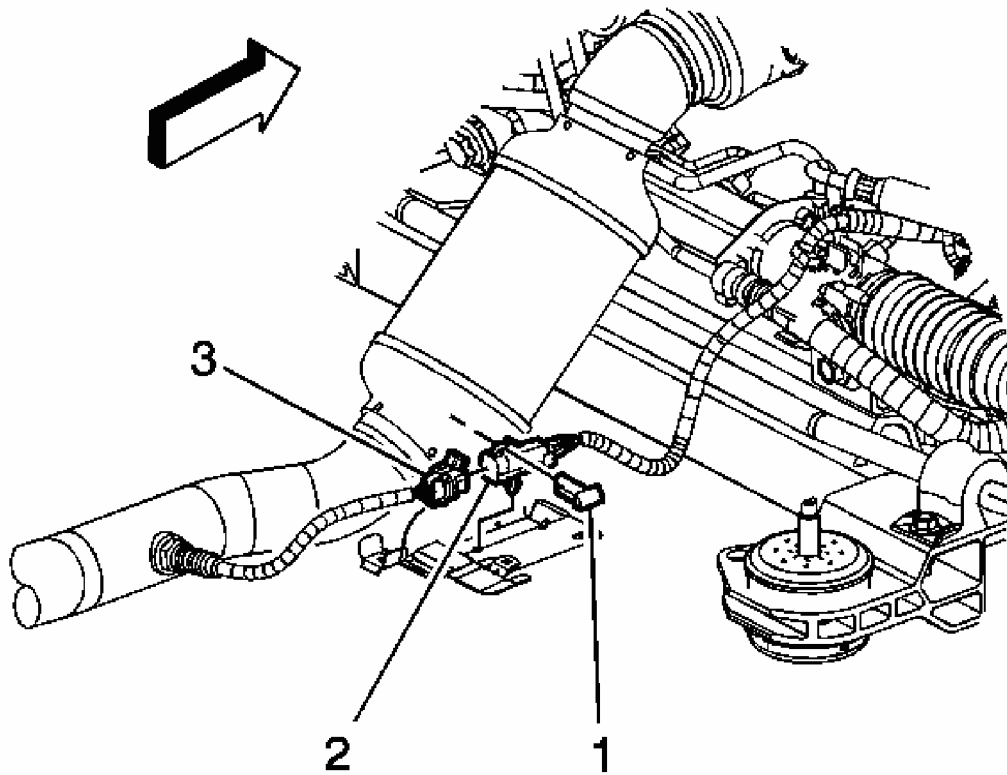


Fig. 59: View Of HO2S Electrical Connector
Courtesy of GENERAL MOTORS CORP.

9. Connect the HO2S electrical connector (3).
10. Install the CPA retainer (1).
11. Lower the vehicle.
12. Install the upper catalytic converter to exhaust manifold nut (1).

Tighten: Tighten the nut to 35 N.m (26 lb ft).

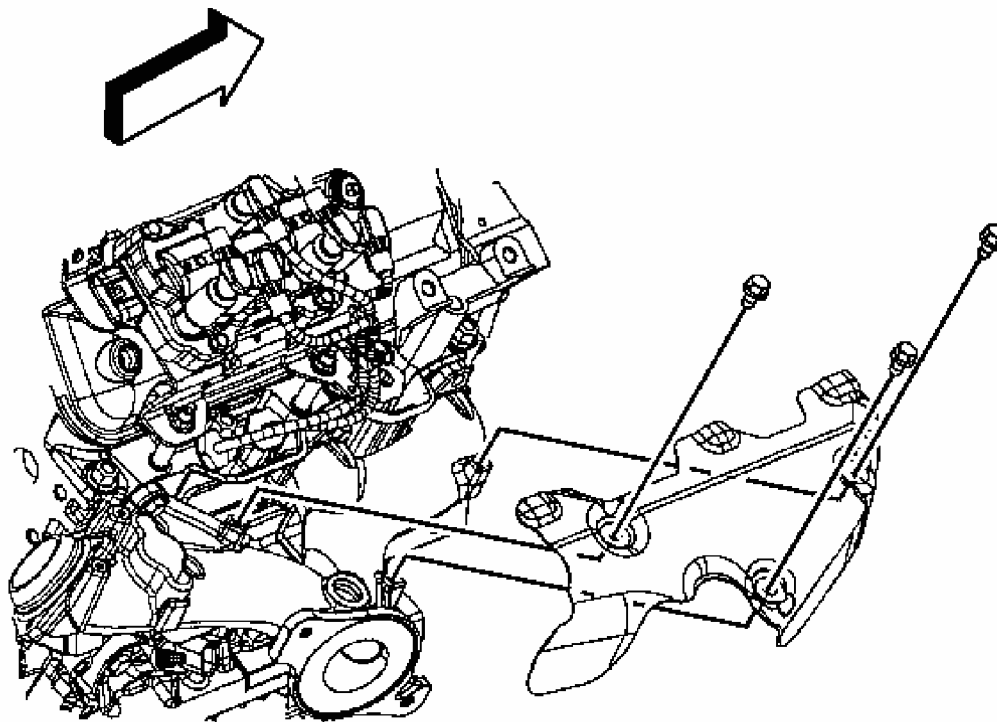


Fig. 60: Identifying Exhaust Manifold Bolts
Courtesy of GENERAL MOTORS CORP.

13. Install the exhaust manifold heat shield.
14. Install the exhaust manifold heat shield bolts.

Tighten: Tighten the nuts to 10 N.m (89 lb in).

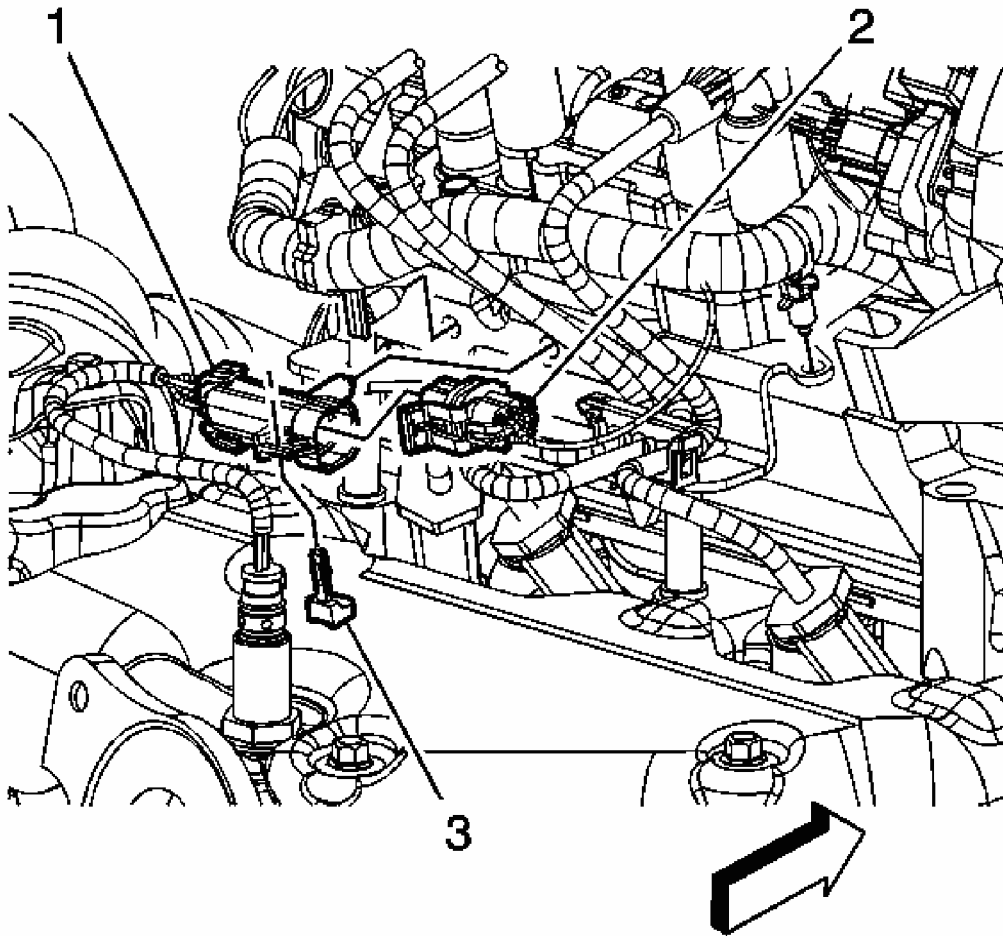


Fig. 61: Identifying The HO2S Electrical Connector
Courtesy of GENERAL MOTORS CORP.

15. Connect the HO2S electrical connector (2).
16. Install the connector position assurance (CPA) retainer (3).
17. Install the heated oxygen sensor (HO2S) electrical connector clip (1) to the ignition coil bracket.
18. Install the intake manifold cover. Refer to **Intake Manifold Cover Replacement** or **Intake Manifold Cover Replacement**.

CATALYTIC CONVERTER REPLACEMENT (RPO LS4)

Removal Procedure

IMPORTANT: The catalytic converter is serviced by replacing the entire

assembly. Always replace the gaskets at the front and rear flanges when servicing the catalytic converter. Never install the original gaskets.

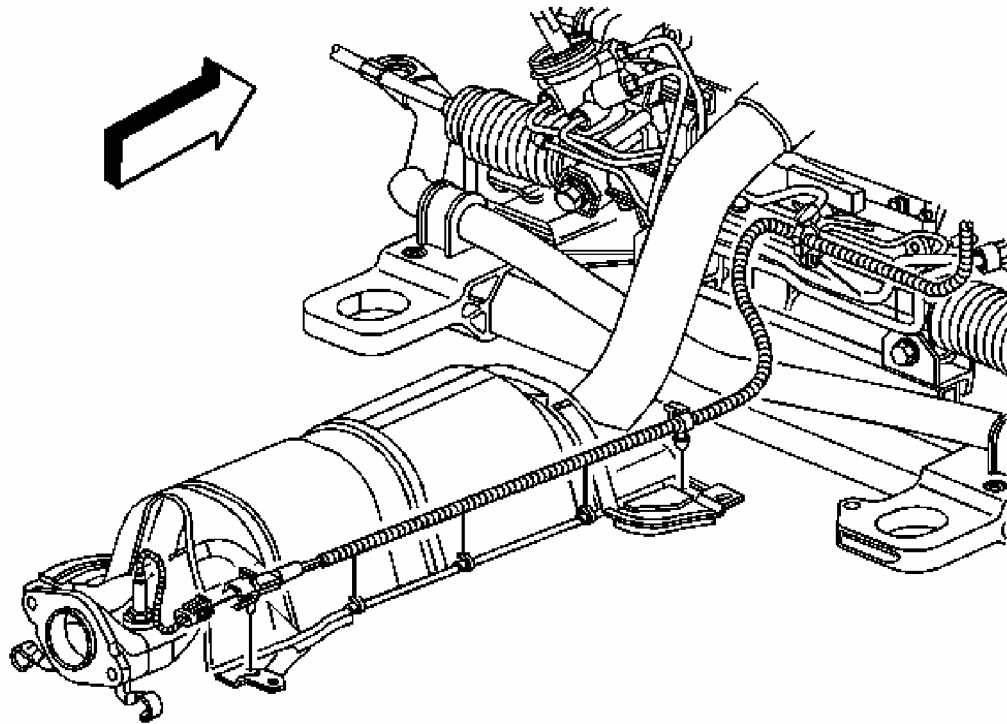


Fig. 62: Bank 2 Sensor 2 Electrical Harness Connector
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Disconnect the heated oxygen sensor (HO2S) electrical connector.

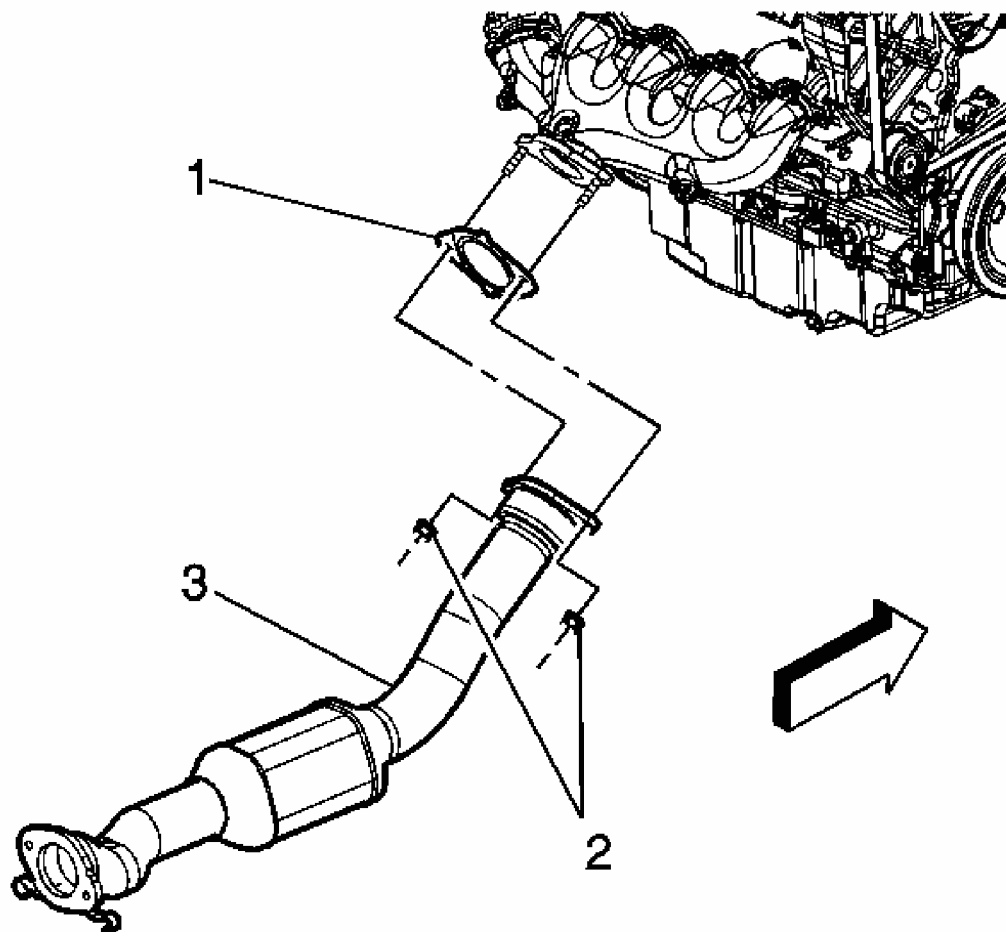


Fig. 63: Exhaust Manifold Pipe & Gasket
Courtesy of GENERAL MOTORS CORP.

3. Remove the catalytic converter pipe stud nuts (2).

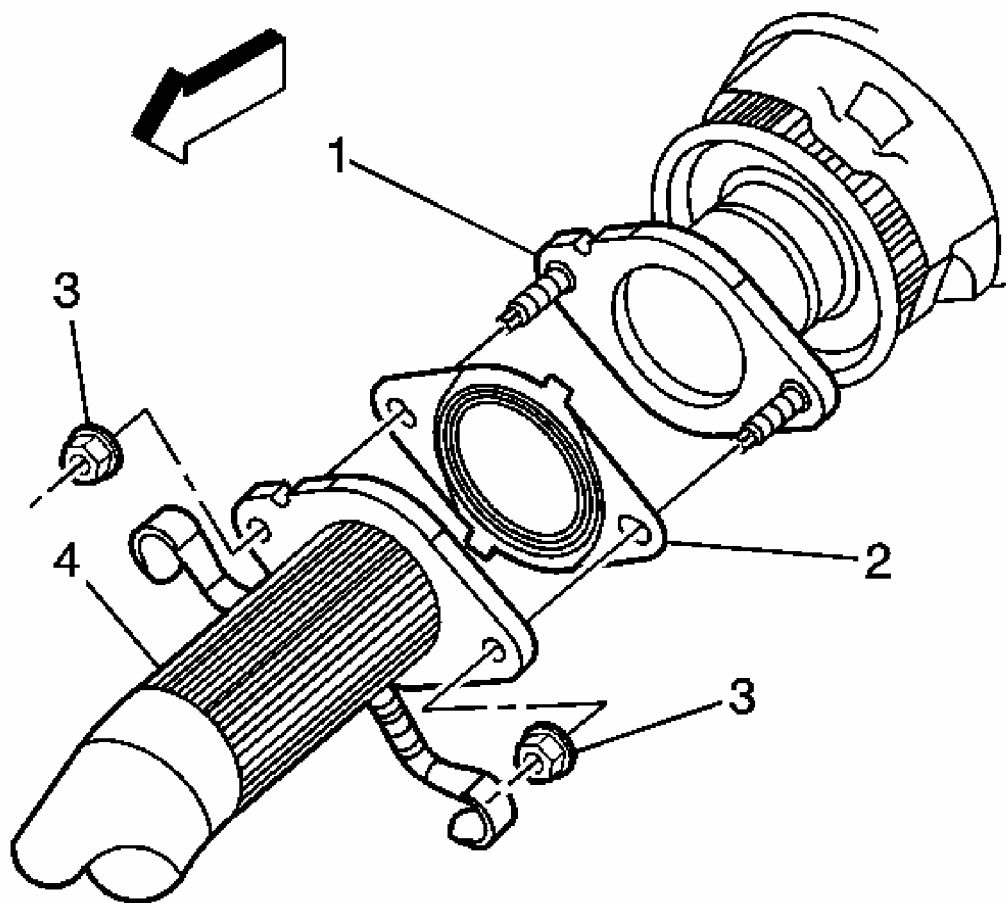


Fig. 64: Catalytic Converter To Muffler Components
Courtesy of GENERAL MOTORS CORP.

4. Remove the catalytic converter nuts (3).
5. Using a suitable adjustable jack, loosely support the exhaust system.

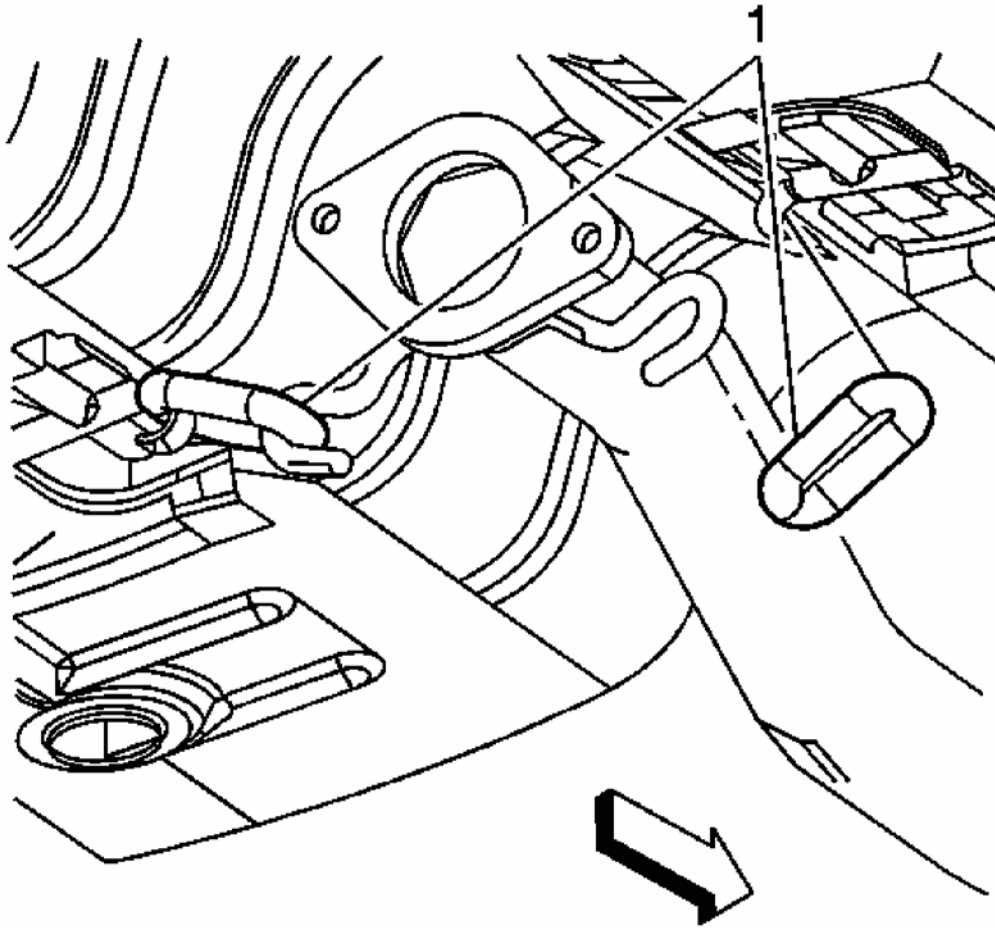


Fig. 65: Catalytic Converter Hangers
Courtesy of GENERAL MOTORS CORP.

6. Remove the catalytic converter hangers (1) from the converter.
7. Remove the catalytic converter.
8. Remove and discard the catalytic converter gaskets.

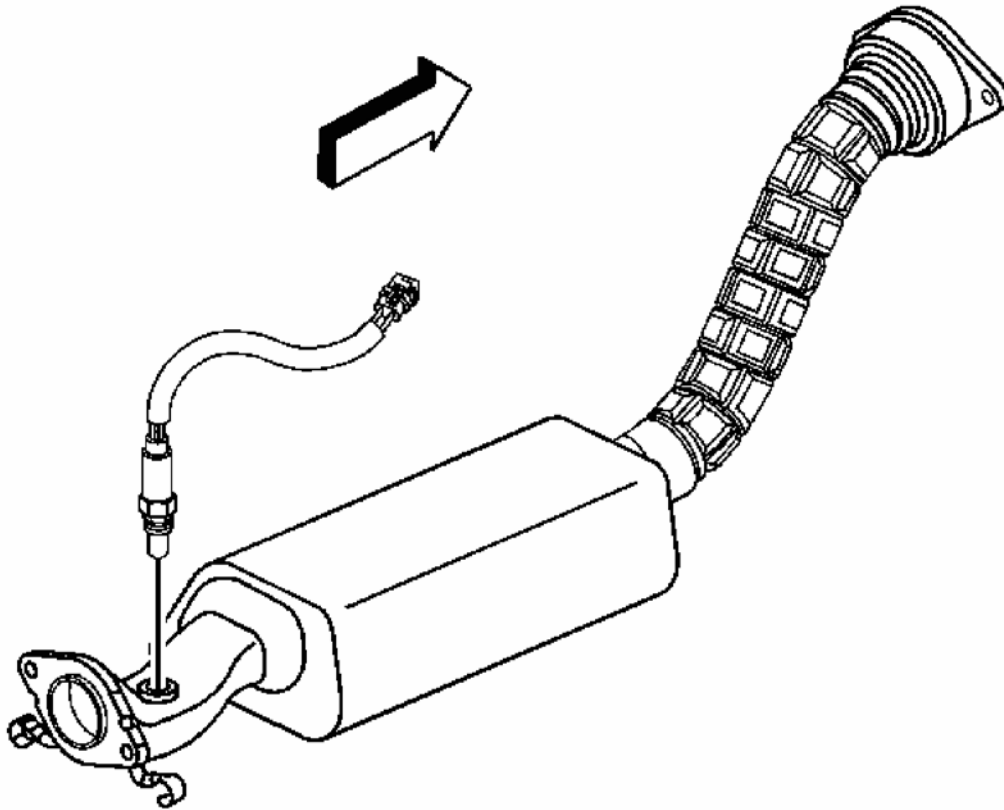


Fig. 66: Identifying The HO2S
Courtesy of GENERAL MOTORS CORP.

9. Remove the HO2S, if required.
10. Clean and inspect the exhaust manifold and the exhaust pipe mating surfaces.

Installation Procedure

NOTE: To prevent internal damage to the flexible coupling of the catalytic converter assembly, the converter must be supported. The vertical movement at the rear of the catalytic converter assembly must not exceed 6 degrees up or down.

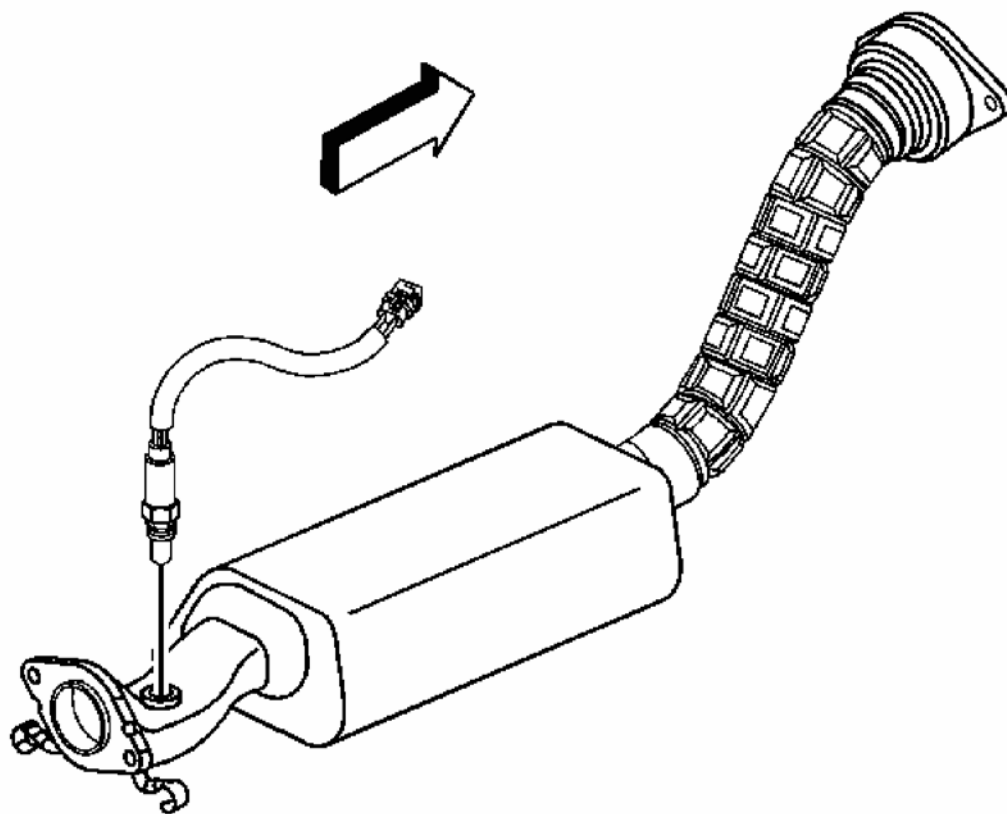


Fig. 67: Identifying The HO2S
Courtesy of GENERAL MOTORS CORP.

1. Install the HO2S, if required.

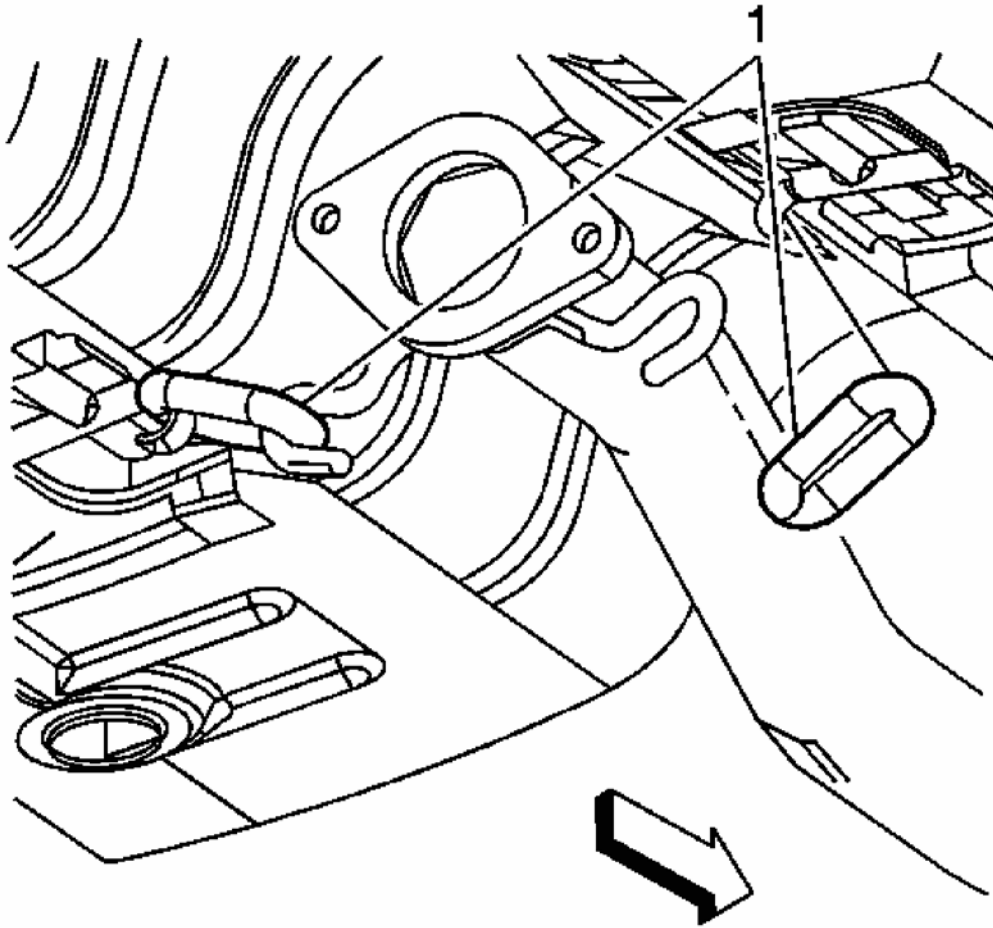


Fig. 68: Catalytic Converter Hangers
Courtesy of GENERAL MOTORS CORP.

2. Install NEW gaskets to the exhaust manifold and muffler studs.
3. Position the catalytic converter into place.
4. Install the catalytic converter hangers (1) to the converter.

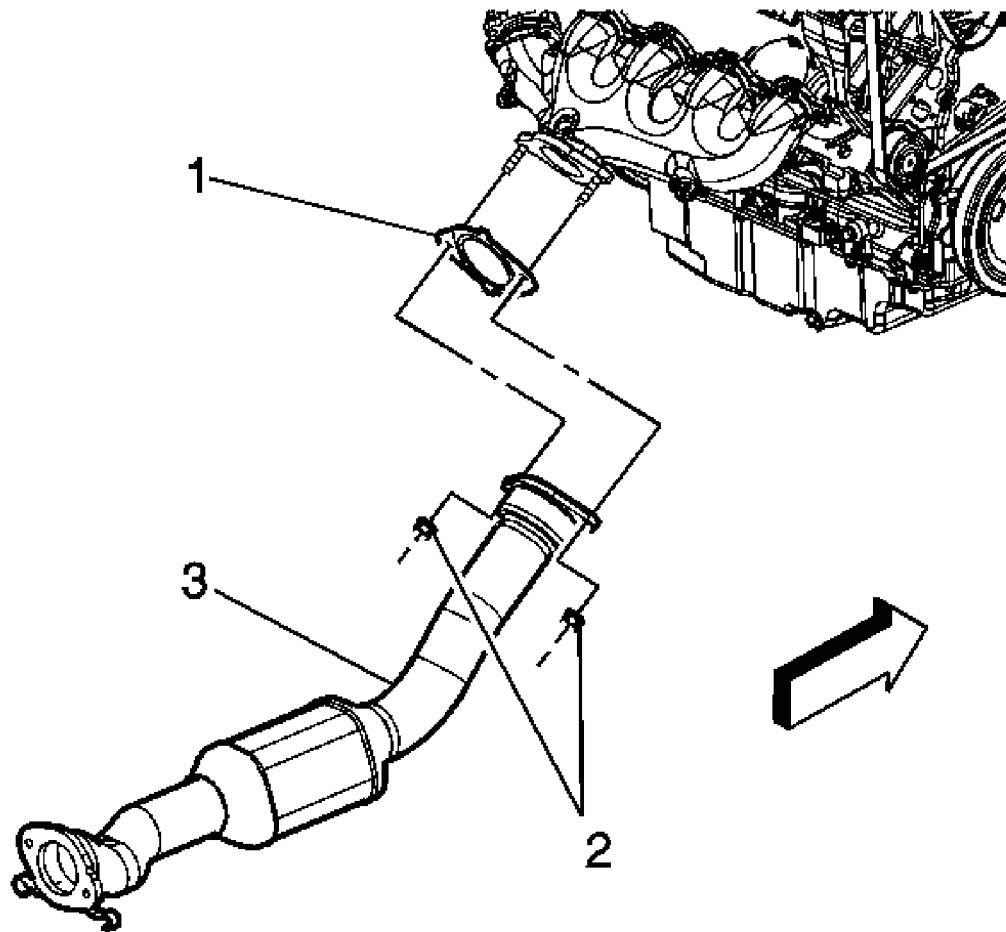


Fig. 69: Exhaust Manifold Pipe & Gasket
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the catalytic converter pipe stud nuts (2).

Tighten: Tighten the nuts to 35 N.m (26 lb ft).

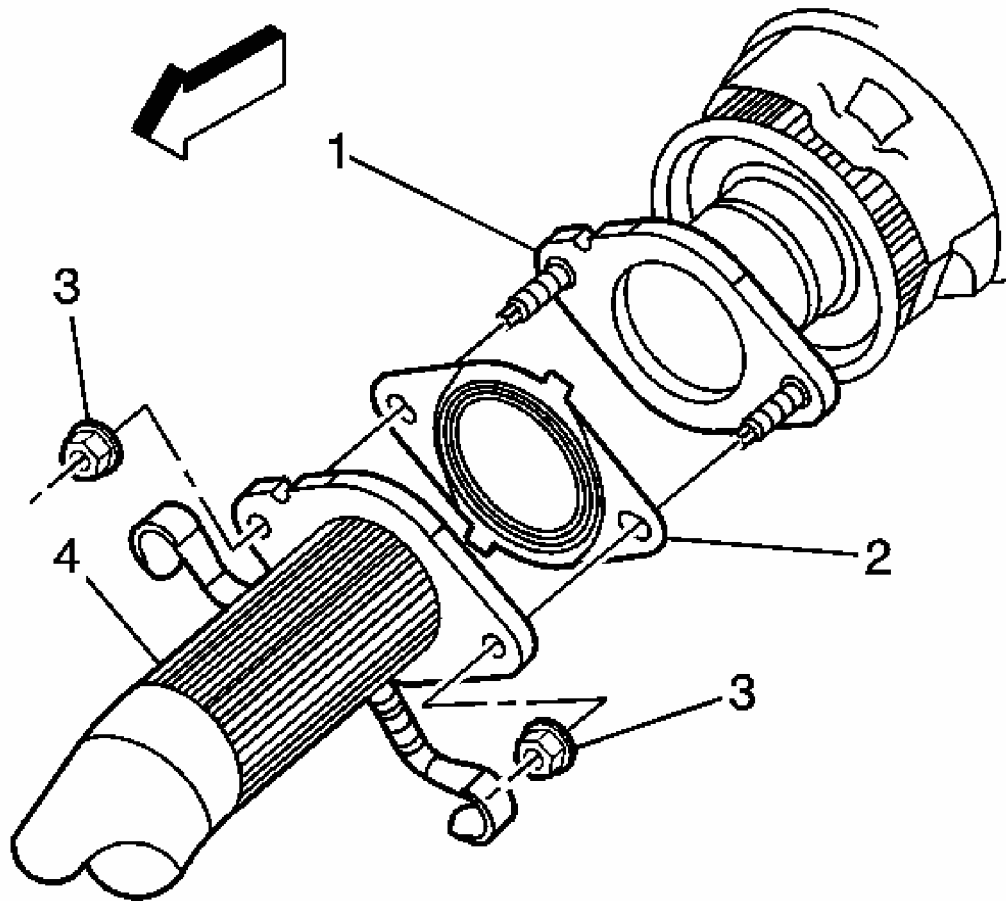


Fig. 70: Catalytic Converter To Muffler Components
Courtesy of GENERAL MOTORS CORP.

6. Install the catalytic converter nuts (3).

Tighten: Tighten the nuts to 60 N.m (44 lb ft).

7. Remove the exhaust system support.

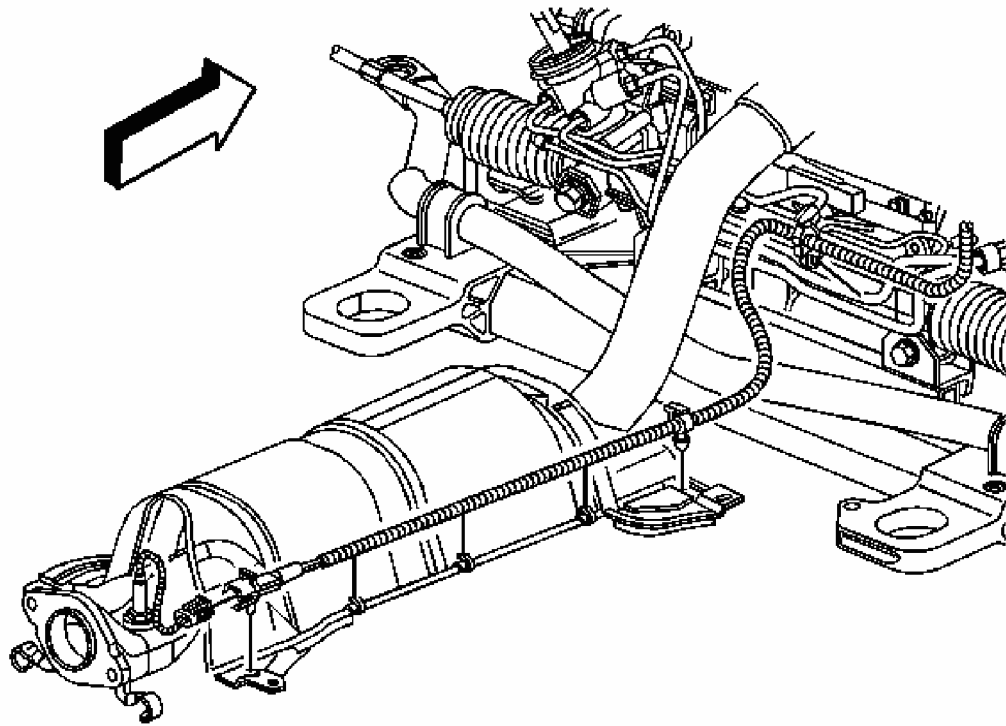


Fig. 71: Bank 2 Sensor 2 Electrical Harness Connector
Courtesy of GENERAL MOTORS CORP.

8. Connect the HO2S electrical connector.
9. Lower the vehicle.
10. Run the vehicle and inspect the exhaust system for leaks and underbody contact.

MUFFLER REPLACEMENT (SINGLE OUTLET)

Removal Procedure

IMPORTANT: The muffler is serviced as a complete assembly and cannot be serviced separately.

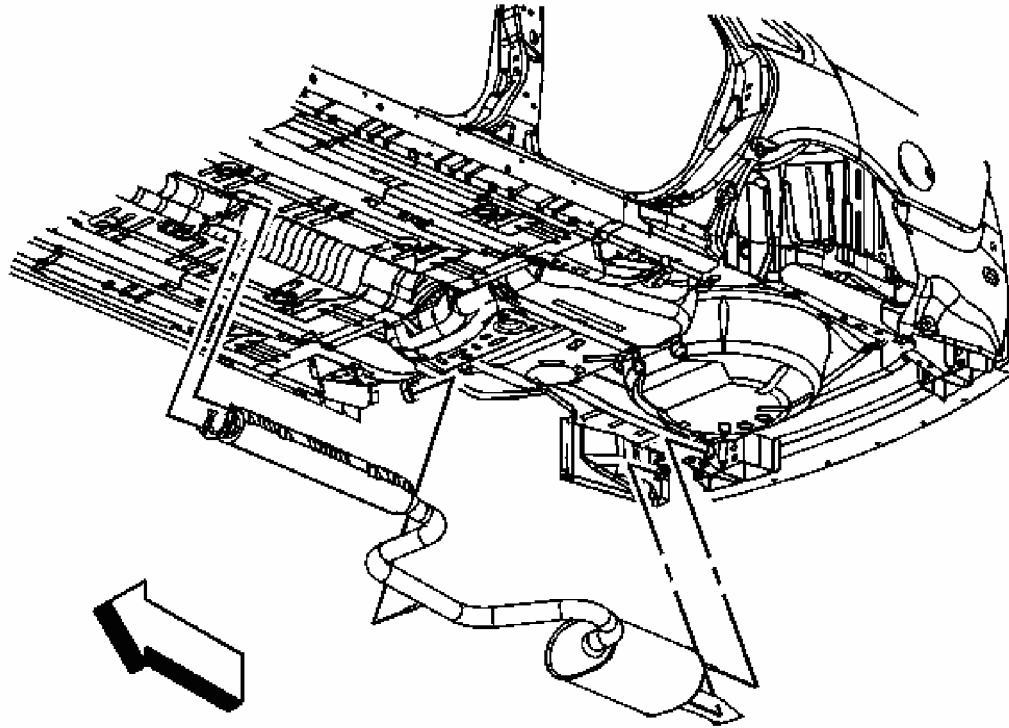


Fig. 72: View Of Muffler Assembly & Exhaust Insulators
Courtesy of GENERAL MOTORS CORP.

1. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.
2. Have an assistant support the muffler assembly.
3. Remove the muffler assembly from the exhaust insulators.
4. Clean the catalytic converter to muffler mating surfaces.

Installation Procedure

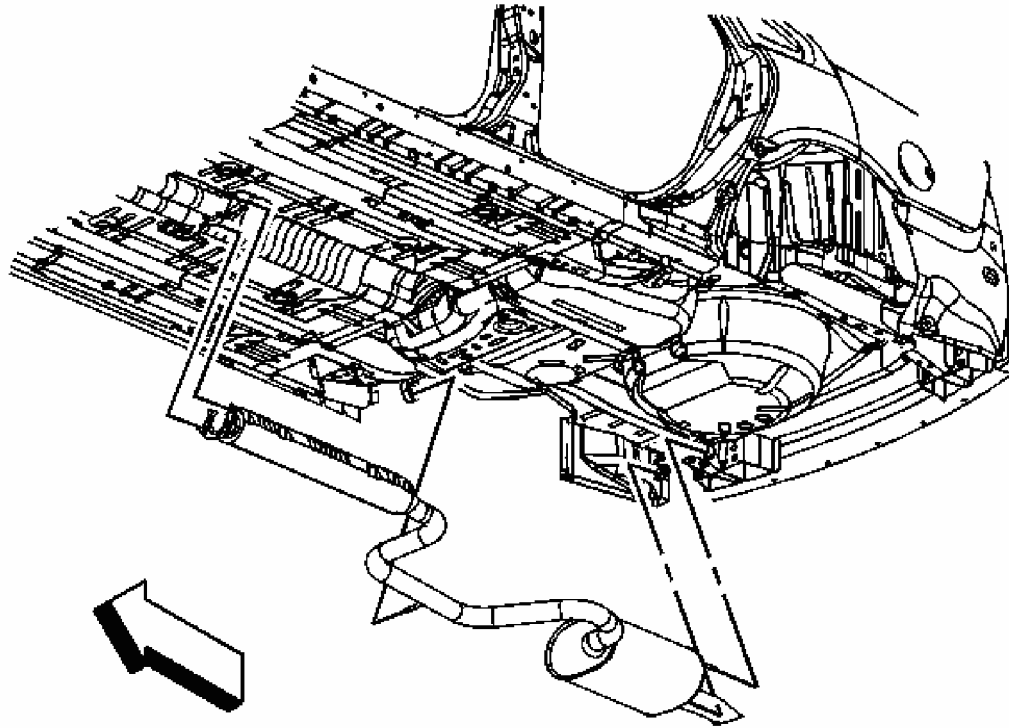


Fig. 73: View Of Muffler Assembly & Exhaust Insulators
Courtesy of GENERAL MOTORS CORP.

1. Lubricate the insulators with spray lubricant.
2. With the aid of an assistant, install the muffler assembly to the exhaust insulators.
3. Install the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.

MUFFLER REPLACEMENT (DUAL OUTLET)

Removal Procedure

IMPORTANT: The muffler is serviced as a complete assembly and cannot be serviced separately.

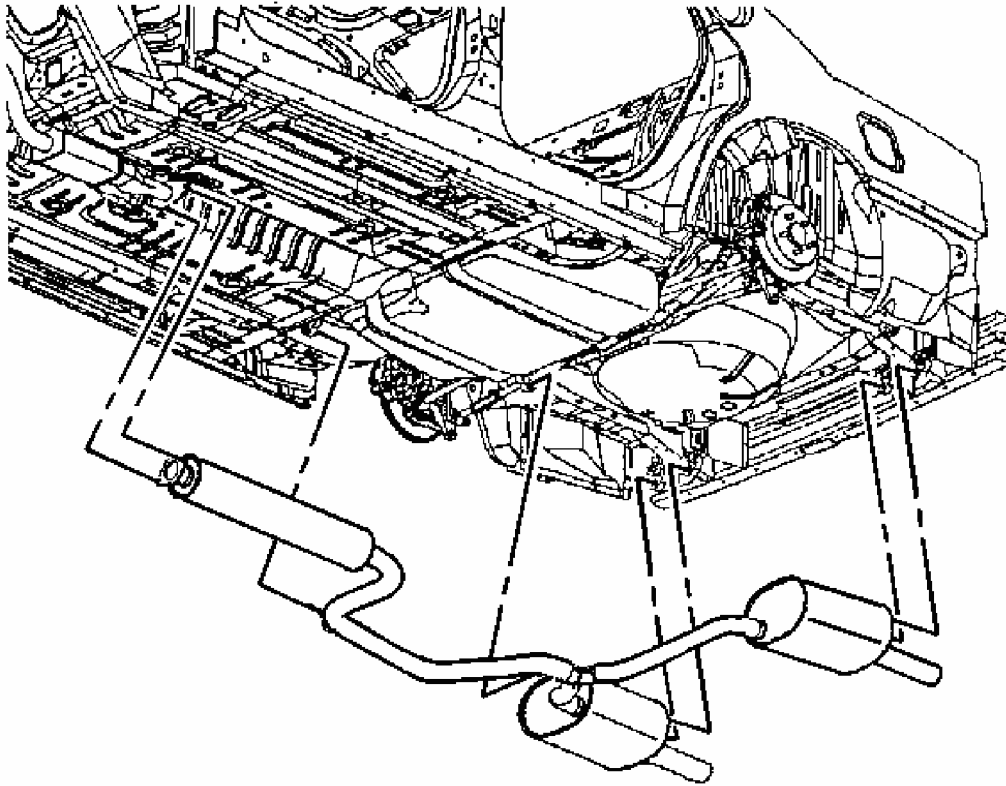


Fig. 74: Identifying Muffler (Dual)
Courtesy of GENERAL MOTORS CORP.

1. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.
2. Support the exhaust system.
3. With the aid of an assistant, remove the exhaust system from the exhaust hangers.
4. Clean the catalytic converter and the muffler mating surfaces.

Installation Procedure

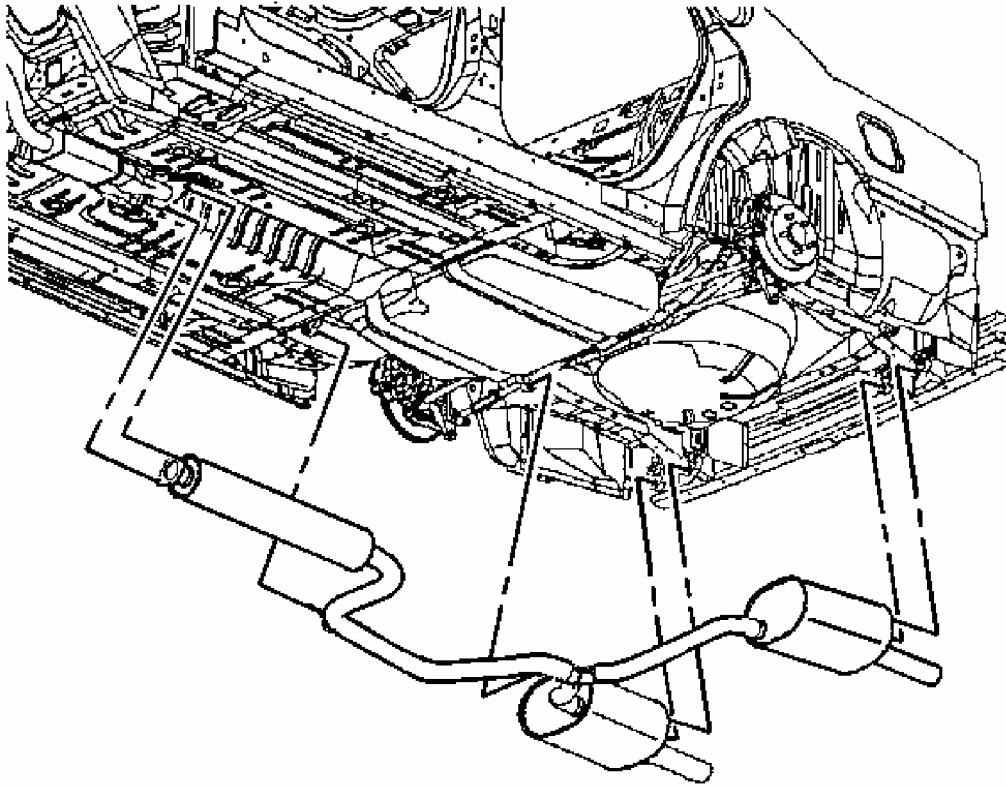


Fig. 75: Identifying Muffler (Dual)
Courtesy of GENERAL MOTORS CORP.

1. With the aid of an assistant, install the muffler to the exhaust hangers.
2. Remove the support from the exhaust system.
3. Install the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.

CONVERTER HANGER ASSEMBLY REPLACEMENT

Removal Procedure

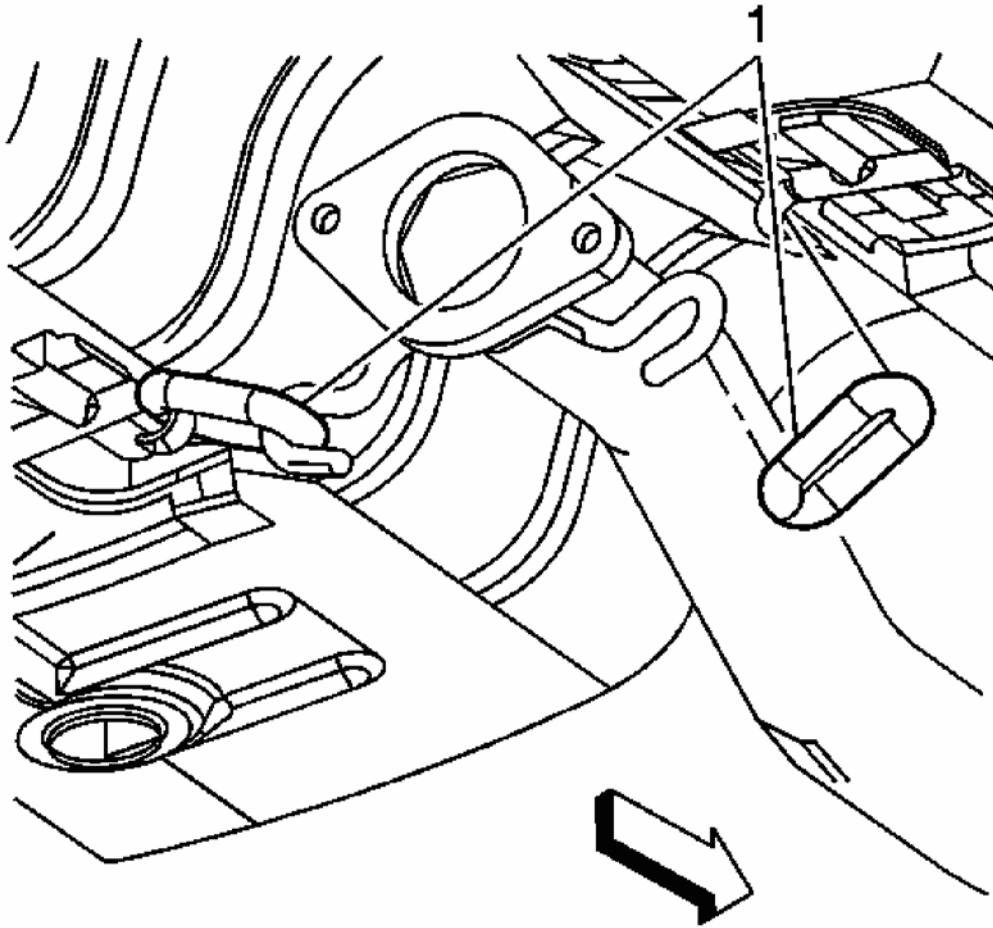


Fig. 76: Catalytic Converter Hangers
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Using a suitable jack, support the exhaust system, if necessary.
3. Remove and discard the catalytic converter pipe hangers (1), if necessary.

Installation Procedure

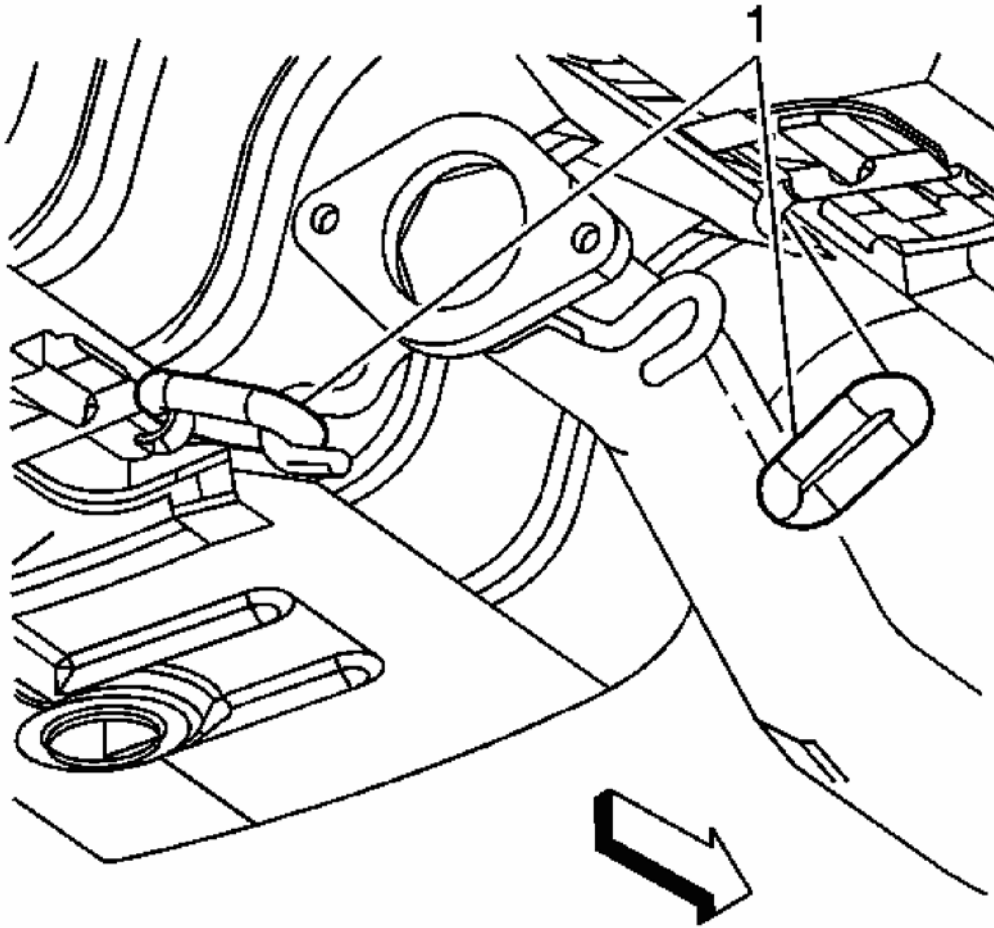


Fig. 77: Catalytic Converter Hangers
Courtesy of GENERAL MOTORS CORP.

1. Install the NEW catalytic converter pipe hangers (1), if necessary.
2. Remove the support from the exhaust system, if necessary.
3. Lower the vehicle.

CATALYTIC CONVERTER HEAT SHIELD REPLACEMENT

Removal Procedure

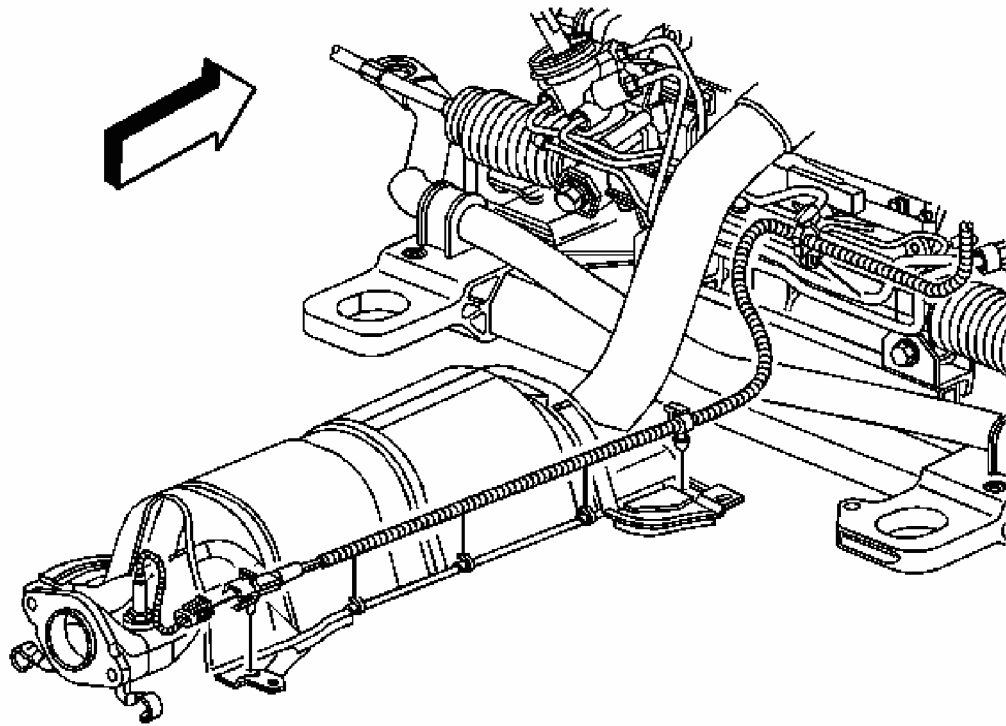


Fig. 78: Bank 2 Sensor 2 Electrical Harness Connector
Courtesy of GENERAL MOTORS CORP.

1. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.
2. Remove the heated oxygen sensor (HO2S) wiring harness from the clips on the catalytic converter heat shield.

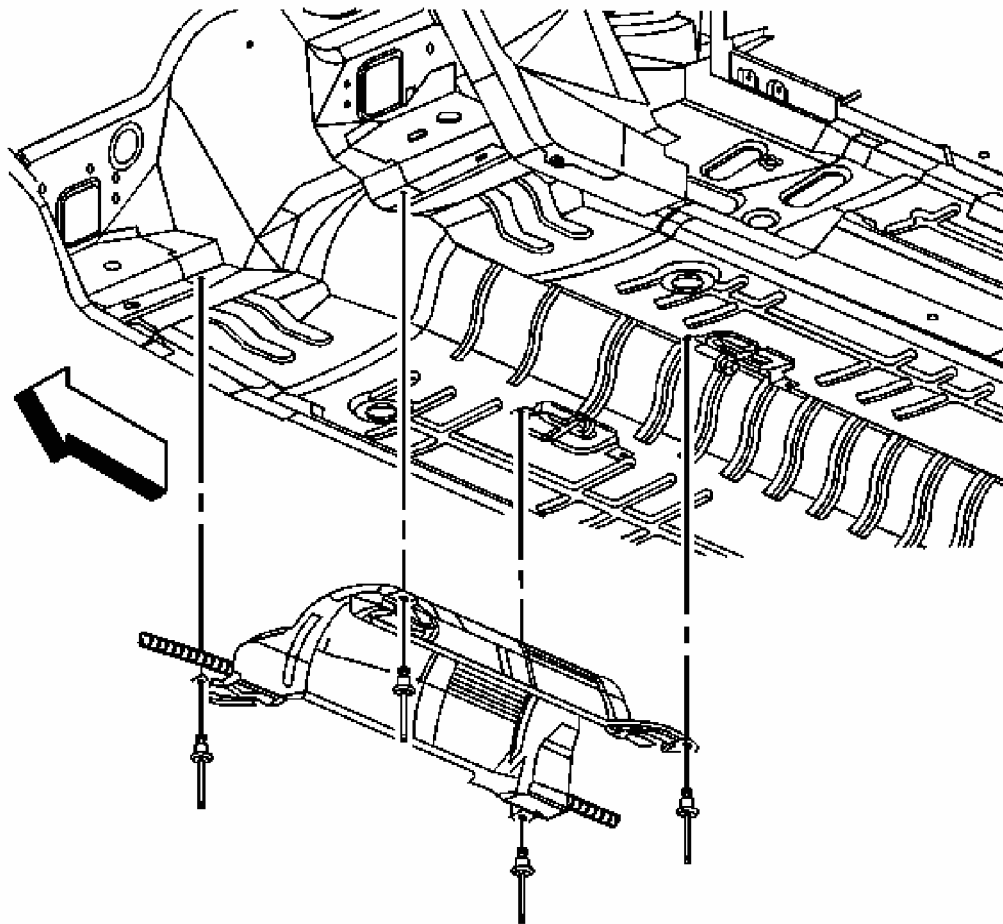


Fig. 79: Catalytic Converter Heat Shield
Courtesy of GENERAL MOTORS CORP.

3. Drill out the catalytic converter heat shield rivets.
4. Remove the catalytic converter heat shield.

Installation Procedure

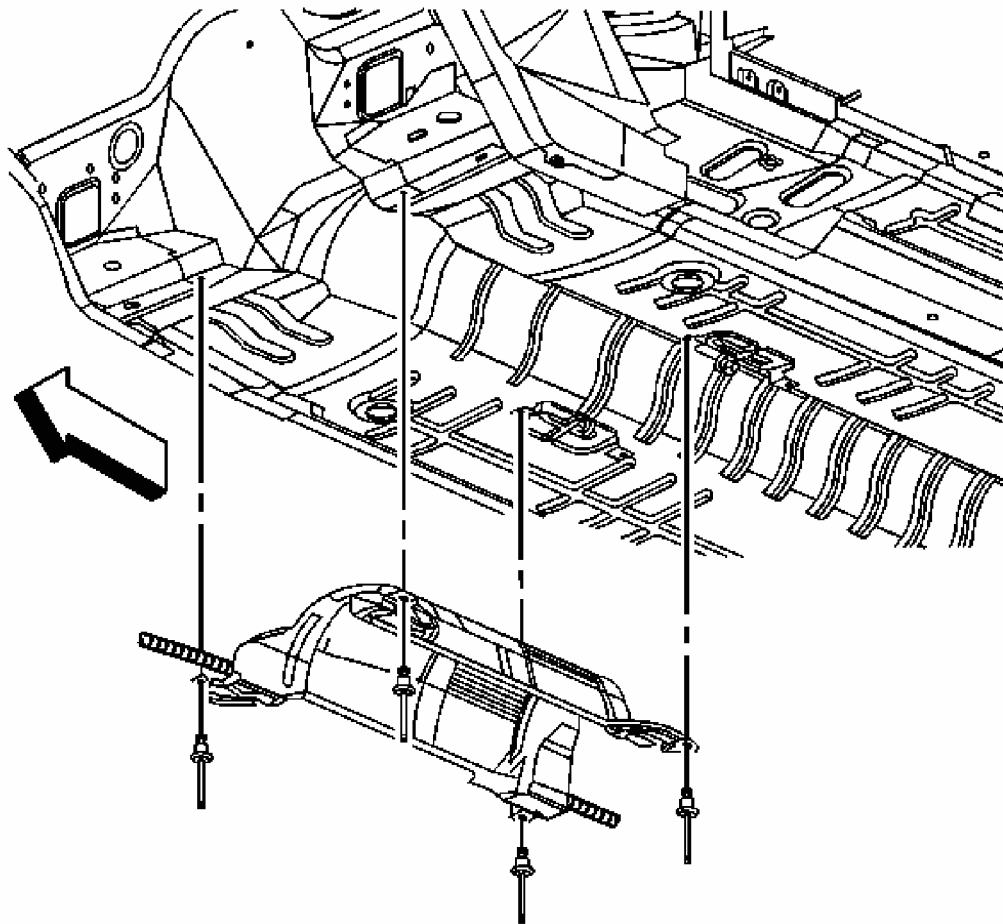


Fig. 80: Catalytic Converter Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Position the catalytic converter heat shield to the underbody.
2. Install NEW catalytic converter heat shield rivets.

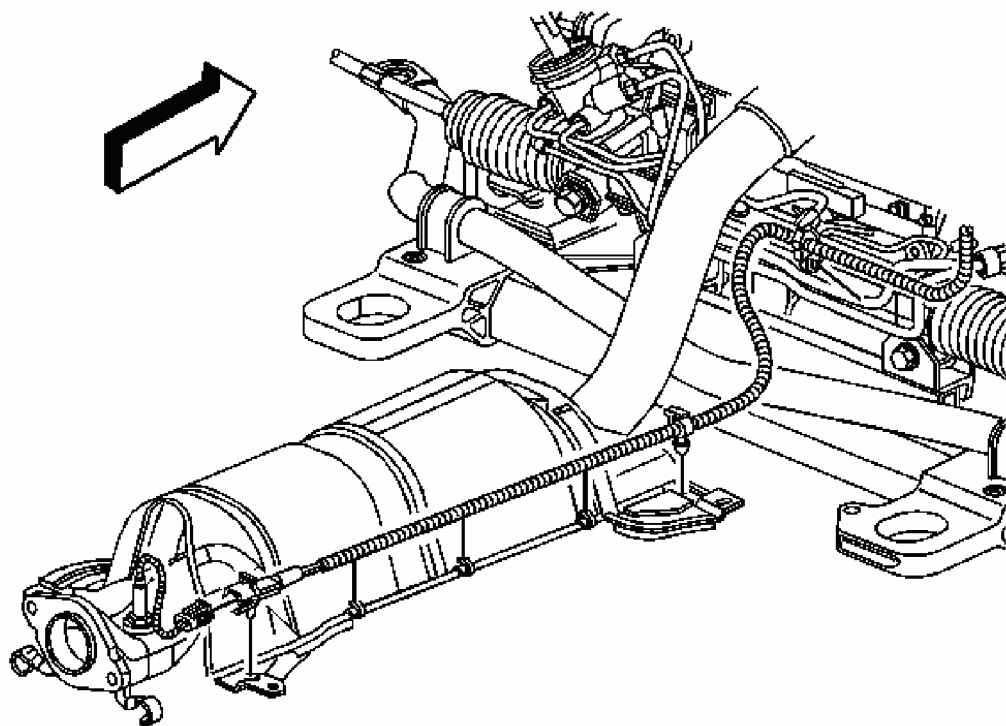


Fig. 81: Bank 2 Sensor 2 Electrical Harness Connector
Courtesy of GENERAL MOTORS CORP.

3. Install the HO2S wiring harness from the clips on the catalytic converter heat shield.
4. Install the catalytic converter. Refer to **Catalytic Converter Replacement (RPOs LZE/LZ4/LZ9)** or **Catalytic Converter Replacement (RPO LS4)**.

DESCRIPTION AND OPERATION

EXHAUST SYSTEM DESCRIPTION

IMPORTANT: Use of non-OEM parts may cause driveability concerns.

The exhaust system carries exhaust gases, treated by the catalytic converter, through a resonator, if applicable and into the exhaust muffler where exhaust noise is lessened.

In order to secure the exhaust pipe to the exhaust manifold, a flange and seal-joint coupling is utilized. The exhaust system may utilize a slip-joint coupling design with a clamp and a U-bolt or a flange connection with a gasket.

Exhaust hangers and rubber insulators help to support the weight of the exhaust pipe along with insulating any exhaust system vibration, rattle, or noise.

Exhaust hangers also space the exhaust system away from the underbody of the vehicle and allows the exhaust system to expand as the exhaust system warms up.

Exhaust heat shields are used to protect the body and other components from damage due to the heat from the exhaust system.

The exhaust system may be comprised of the following components:

- Exhaust manifold
- Exhaust pipes
- Catalytic converters
- Exhaust muffler
- Exhaust resonator, if equipped
- Exhaust tail pipe, if equipped
- Exhaust hangers
- Exhaust heat shields

Resonator

Some exhaust systems are equipped with a resonator. The resonator, located either before or after the muffler, allows the use of mufflers with less back pressure. Resonators are used when vehicle characteristics require specific exhaust tuning.

Catalytic Converter

The catalytic converter is an emission control device added to the engine exhaust system in order to reduce hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx) pollutants from the exhaust gas.

The catalytic converter is comprised of a ceramic monolith substrate, supported in insulation and housed within a sheet metal shell. The substrate may be washcoated with 3 noble metals:

- Platinum (Pt)
- Palladium (Pd)
- Rhodium (Rh)

The catalyst in the converter is not serviceable.

Muffler

The exhaust muffler reduces the noise levels of the engine exhaust by the use of tuning

2006 Chevrolet Impala LS

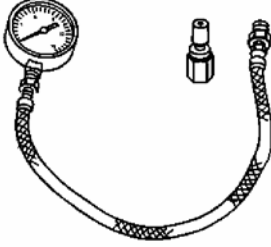
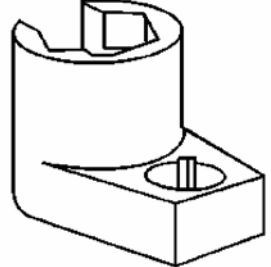
2006 ENGINE Engine Exhaust - Impala

tubes. The tuning tubes create channels inside the exhaust muffler that lower the sound levels created by the combustion of the engine.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/ Description
 A line drawing of an exhaust back pressure gage. It features a circular gauge with a needle and scale, connected by a flexible hose to a small, cylindrical fitting with a hexagonal base.	J 35314-A Exhaust Back Pressure Gage
 A line drawing of a heated oxygen sensor wrench. It is a specialized tool with a U-shaped, curved body and a flat base, designed to grip and turn the hexagonal base of an oxygen sensor.	J 39194-B Heated Oxygen Sensor Wrench