2004 ENGINE

Engine Exhaust - C/K SUV

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Engine Shield Bolt	20 N.m	15 lb ft
Engine Coolant Temperature (ECT) Sensor	20 N.m	15 lb ft
EGR Pipe Bracket Bolt - 8.1L Engine	50 N.m	37 lb ft
EGR Pipe Nut - 8.1L Engine	30 N.m	22 lb ft
Exhaust Heat Shield Bolt	9 N.m	80 lb in
Exhaust Heat Shield Nut (Body Panel)	9 N.m	80 lb in
Exhaust Manifold Bolts - 4.8L, 5.3L, and 6.0L Engines		
• First Pass in Sequence	15 N.m	11 lb ft
• Final Pass in Sequence	25 N.m	18 lb ft
Exhaust Manifold Center Bolt - 8.1L Engine	35 N.m	26 lb ft
Exhaust Manifold Heat Shield Bolt - 4.8L, 5.3L, and 6.0L Engines	9 N.m	80 lb in
Exhaust Manifold Heat Shield Bolt/Nut - 8.1L Engine	25 N.m	18 lb ft
Exhaust Manifold Nut - 8.1L Engine	16 N.m	12 lb ft
Exhaust Pipe Hanger Bracket Bolt	12 N.m	106 lb in
Exhaust Manifold Pipe Nut	50 N.m	37 lb ft
Exhaust Muffler Hanger Nut	50 N.m	39 lb ft
Exhaust Muffler Nut	40 N.m	30 lb ft
Exhaust Pipe Clamp	40 N.m	30 lb ft
Oil Pan Skid Plate Bolt	20 N.m	15 lb ft
Oxygen Sensor	42 N.m	31 lb ft
Rear Shock Absorber Lower Bolt	95 N.m	70 lb ft
Transmission Mount Nut	40 N.m	30 lb ft
Transmission Support Crossmember Bolt	70 N.m	52 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

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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**.

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- 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

Test Description

CAUTION: While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system.

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

3: 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** . See **Special Tools and Equipment**. Removing the heater oxygen sensor (HO2S) sensor may set a DTC. When finishing this diagnostic table, be sure to clear all codes.

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

7: 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.

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**

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3	1. Remove the heated oxygen sensor (HO2S) that is in front of and closest to the catalytic converter. Refer to: • **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1** or **Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 1** in Engine Controls - 4.8L, 5.3L, and 6.0L. • **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1** or **Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 1** in Engine Controls - 8.1L. 2. Install the **J 35314-A** in place of the HO2S sensor. See **Special Tools and Equipment**. 3. Start the engine. 4. Increase and monitor the engine speed at 2000 RPM. 5. Observe the exhaust system back pressure reading on the gage. Does the reading exceed the specified value?	20 kPa (3 psi) If equipped with a 4.8L, 5.3L, or 6.0L - 3.4 kPa (0.5 psi)	Go to **Step 4**	Go to **Step 7**
4	1. Turn the engine off and place the ignition in the lock position. 2. Remove the **J 35314-A** . See **Special Tools and Equipment**. 3. Re-install the HO2S sensor. Refer to: • **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1** or **Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 1** in Engine Controls - 4.8L, 5.3L, and 6.0L. • **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1** or **Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 1** in Engine Controls - 8.1L. 4. Remove the post-catalyst HO2S sensor. Refer to • **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 2** or	20 kPa (3 psi) If equipped with a 4.8L, 5.3L, or 6.0L -		

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	Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 2 in Engine Controls 4.8L, 5.3L, and 6.0L. • **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 2** or **Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 2** in Engine Controls - 8.1L. 5. Install the **J 35314-A** in place of the post HO2S sensor. See **Special Tools and Equipment**. 6. Start the engine. 7. Increase and monitor the engine speed at 2000 RPM. 8. Observe the exhaust system back pressure reading on the gage. Does the reading exceed the specified value?	3.4 kPa (0.5 psi)	Go to **Step 5**	Go to **Step 6**
5	Inspect the exhaust system for the following conditions: • Damage in the exhaust pipe. • Debris in the exhaust pipe • Muffler internal failure. • Two-layer exhaust pipe separation. Did you find and correct the condition?	-	Go to **Step 7**	-
6	Replace the catalytic converter. Refer to **Catalytic Converter Replacement (4.8L and 5.3L Engines)** or **Catalytic Converter Replacement (6.0L and 8.1L Engines)**. Did you find and correct the condition?	-	Go to **Step 7**	-
7	1. Remove the **J 35314-A** . See **Special Tools and Equipment**. 2. Re-install the HO2S sensor. Refer to: • **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 2** or **Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 2** in Engine Controls - 4.8L, 5.3L, and 6.0L. • **Heated Oxygen Sensor (HO2S)**	-		

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	Replacement Bank 1 Sensor 2 or **Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 2** in Engine Controls - 8.1L. 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**

EXHAUST LEAKAGE

Exhaust Leakage

Problem	Action
CAUTION: **While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system.** 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.Refer to **Symptoms - Engine Exhaust** prior to beginning this table.	
Misaligned or improperly installed exhaust system components.	• Align and tighten the components to the specifications. Refer to **Fastener Tightening Specifications**. • Ensure the exhaust hangers are in the proper locations and not loose.
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, if equipped	Replace the leaking seal or gasket. Refer to the affected components procedure for service.
Irregularities at the mating surfaces on the flange	Repair as required or replace the affected component. Refer to the affected components procedure for service.

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connections.	
Exhaust manifold cracked or broken.	Replace the exhaust manifold. Refer to • **Exhaust Manifold Replacement - Left (4.8L, 5.3L, and 6.0L Engines)** or **Exhaust Manifold Replacement - Left (8.1L Engine)** • **Exhaust Manifold Replacement - Right (4.8L, 5.3L, and 6.0L Engines)** or **Exhaust Manifold Replacement - Right (8.1L Engine)**.
Exhaust system component connection welds leaking.	Replace the leaking component. Refer to the affected component's procedure for service.
Muffler damaged or leaking at the seams.	Replace the affected muffler. Refer to **Muffler Replacement (4.8L and 5.3L Engines)** or **Muffler Replacement (6.0L and 8.1L Engines)**.

EXHAUST NOISE

Exhaust Noise

Condition	Action
CAUTION: **While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system.** 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 (buzz, groan, hum).Refer to **Symptoms - Engine Exhaust** prior to beginning this table.	
Popping or hissing noise	Exhaust leak. Refer to **Exhaust Leakage**.
Loud exhaust	1. Compare to a known good vehicle. 2. Inspect for a damaged or failed muffler or resonator. 3. Replace the faulty muffler. Refer to **Muffler Replacement (4.8L and 5.3L Engines)** or **Muffler Replacement (6.0L and 8.1L Engines)**.
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, or muffler. Refer to one of the following procedures: • **Catalytic Converter Replacement (4.8L and 5.3L**

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	Engines) or **Catalytic Converter Replacement (6.0L and 8.1L Engines)** • **Muffler Replacement (4.8L and 5.3L Engines)** or **Muffler Replacement (6.0L and 8.1L Engines)**

REPAIR INSTRUCTIONS

EXHAUST MANIFOLD REPLACEMENT - LEFT (4.8L, 5.3L, AND 6.0L ENGINES)

Removal Procedure

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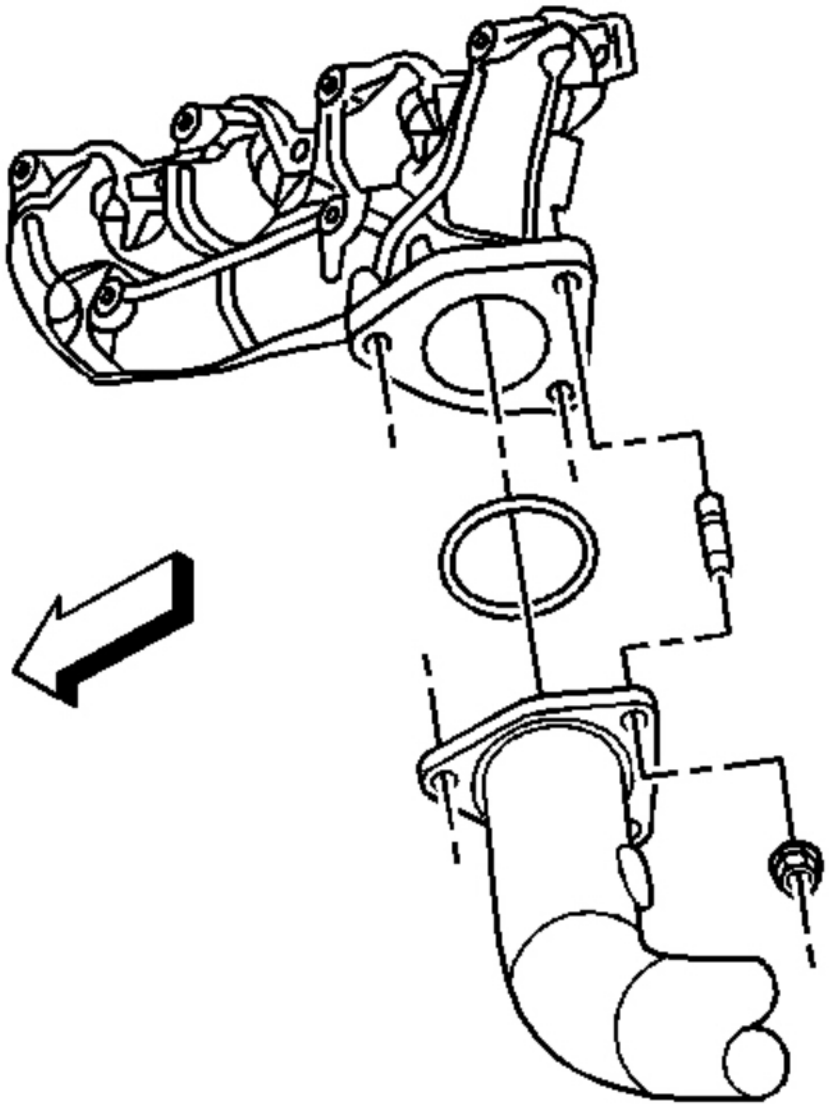


Fig. 1: View Of Left Exhaust Manifold Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the ignition coils. Refer to **Ignition Coil(s) Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.
2. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

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4. Remove the exhaust manifold pipe nuts.
5. Lower the vehicle.

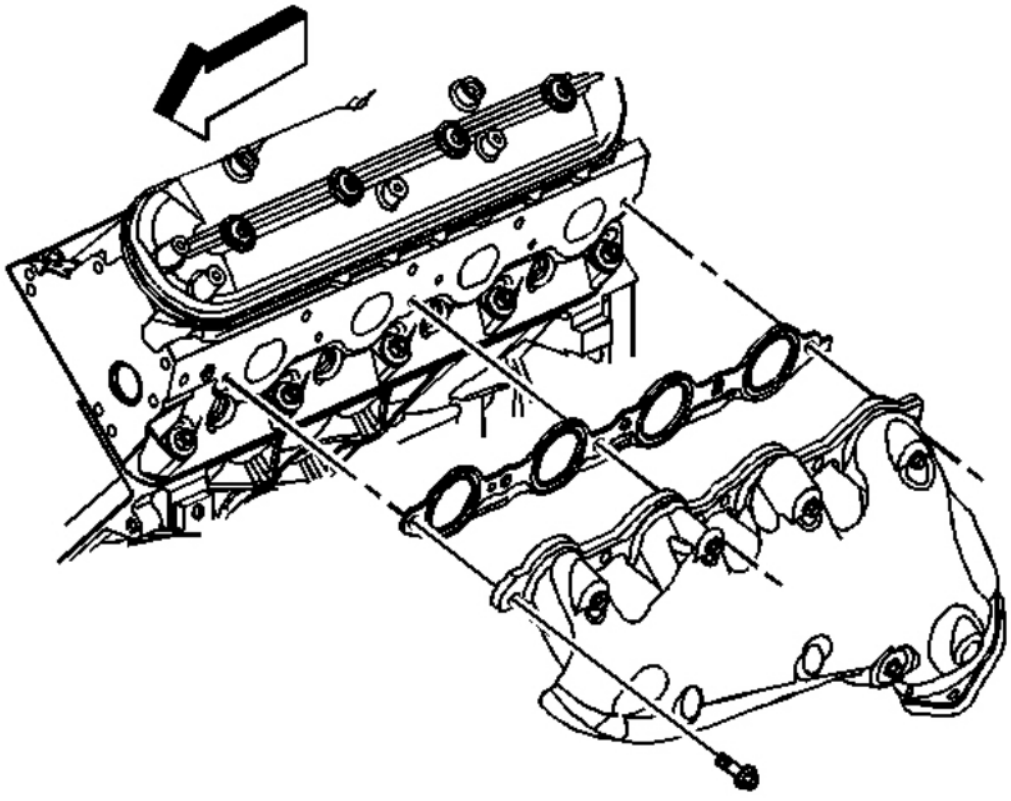


Fig. 2: View Of Exhaust Manifold, Bolts & Gasket - Left (4.8L, 5.3L & 6.0L)
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6. Remove the exhaust manifold bolts, manifold, and gasket.
7. Discard the gasket.

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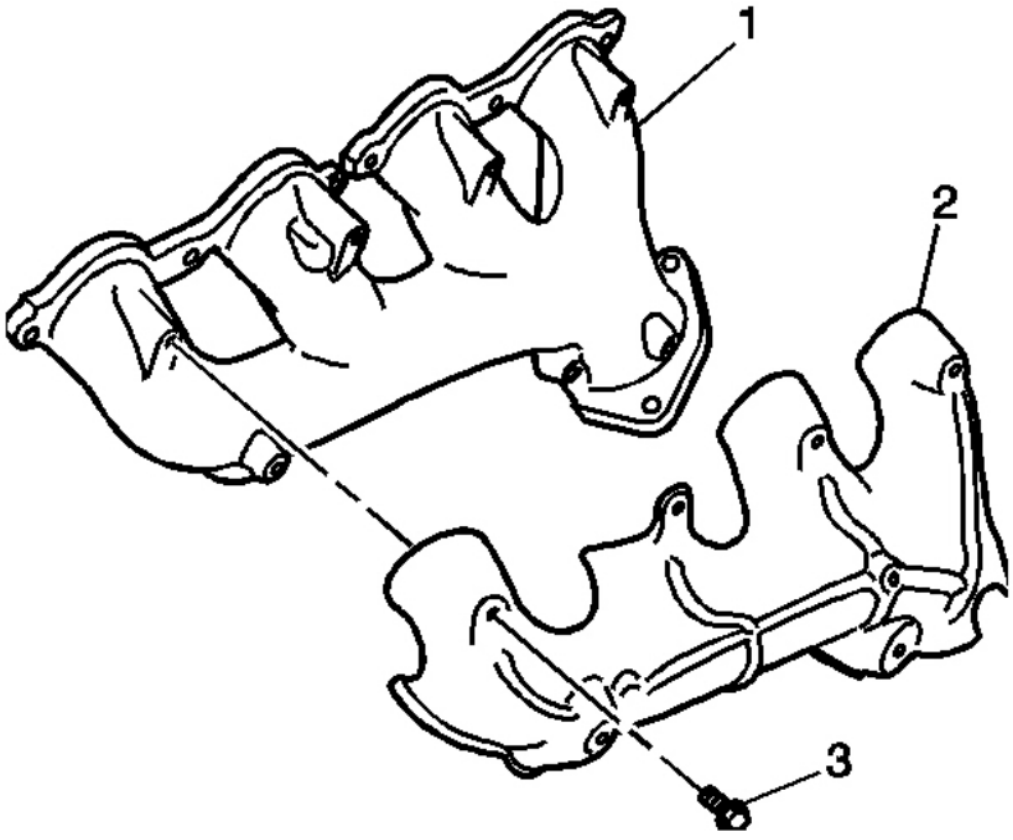


Fig. 3: View Of Left Exhaust Manifold Heat Shield & Bolts
Courtesy of GENERAL MOTORS CORP.

8. Remove the heat shield bolts (3), and shield (2) from the exhaust manifold (1), if necessary.
9. Clean and inspect the exhaust manifold, if the manifold is not being replaced. Refer to **Exhaust Manifold Cleaning and Inspection** in Engine Mechanical - 4.8L, 5.3L, and 6.0L.

Installation Procedure

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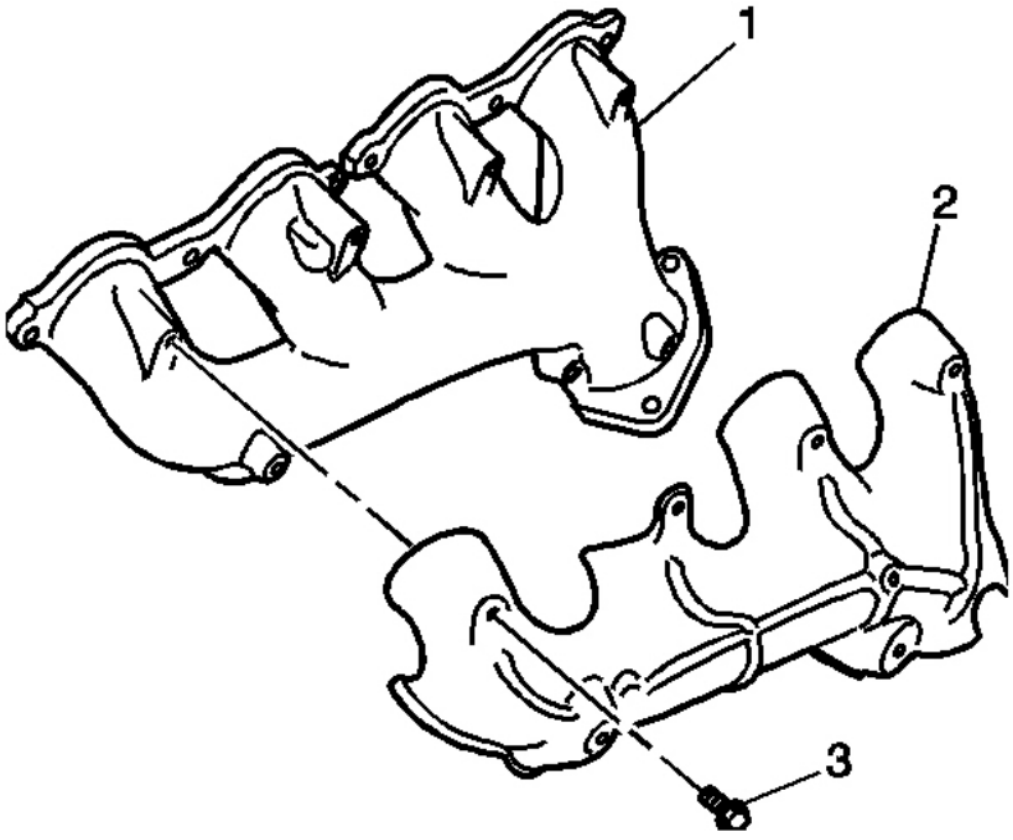


Fig. 4: View Of Left Exhaust Manifold Heat Shield & Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the heat shield (2), and bolts (3) to the exhaust manifold (1), if necessary.

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

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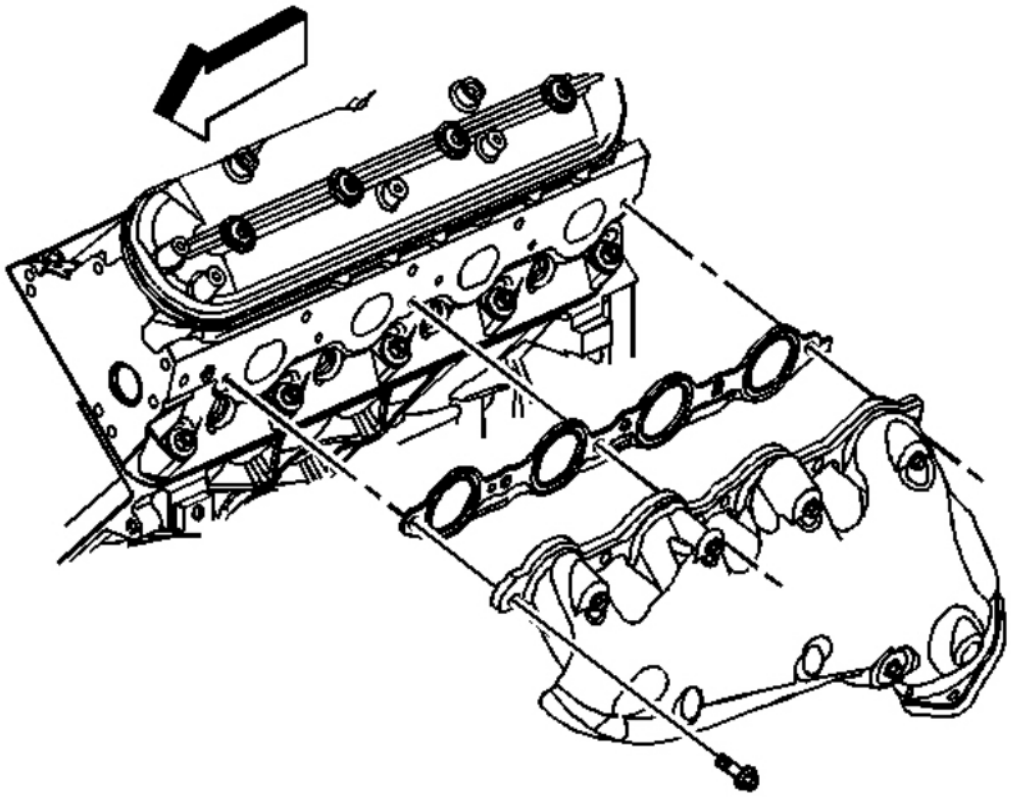


Fig. 5: View Of Exhaust Manifold, Bolts & Gasket - Left (4.8L, 5.3L & 6.0L)
Courtesy of GENERAL MOTORS CORP.

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 Diagnostics (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 sealant to the first three threads of the bolt.**

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

Tighten:

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1. Tighten the bolts a first pass to 15 N.m (11 lb ft). Tighten the exhaust manifold bolts beginning with the center two bolts. Alternate from side-to-side, and work toward the outside bolts.
2. Tighten the bolts a final pass to 25 N.m (18 lb ft). Tighten the exhaust manifold bolts beginning with the center two bolts. Alternate from side-to-side, and work toward the outside bolts.

4. Using a flat punch, bend over the exposed edge of the exhaust manifold gasket at the rear of the left cylinder head.
5. Raise the vehicle.

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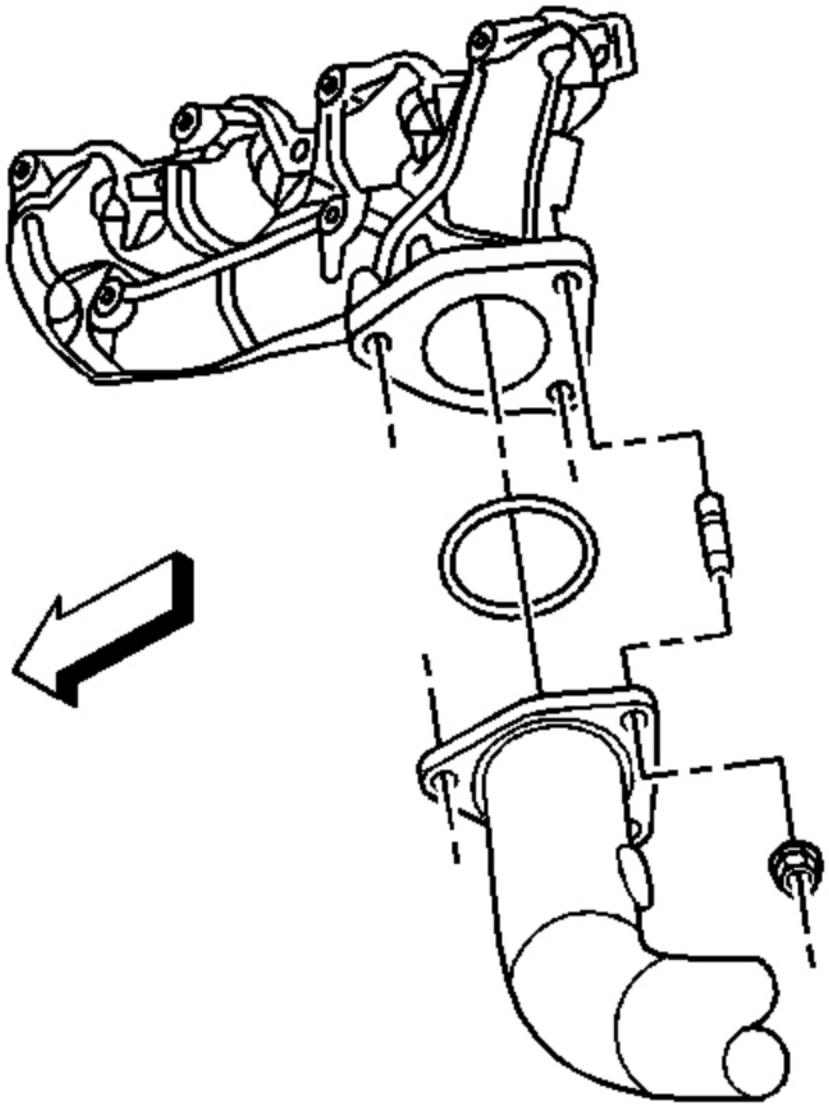


Fig. 6: View Of Left Exhaust Manifold Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

6. Install the exhaust manifold pipe nuts.

   Tighten: Tighten the nuts to 50 N.m (37 lb ft).

7. Lower the vehicle.

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8. Install the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.
9. Install the ignition coils. Refer to **Ignition Coil(s) Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.

EXHAUST MANIFOLD REPLACEMENT - LEFT (8.1L ENGINE)

Removal Procedure

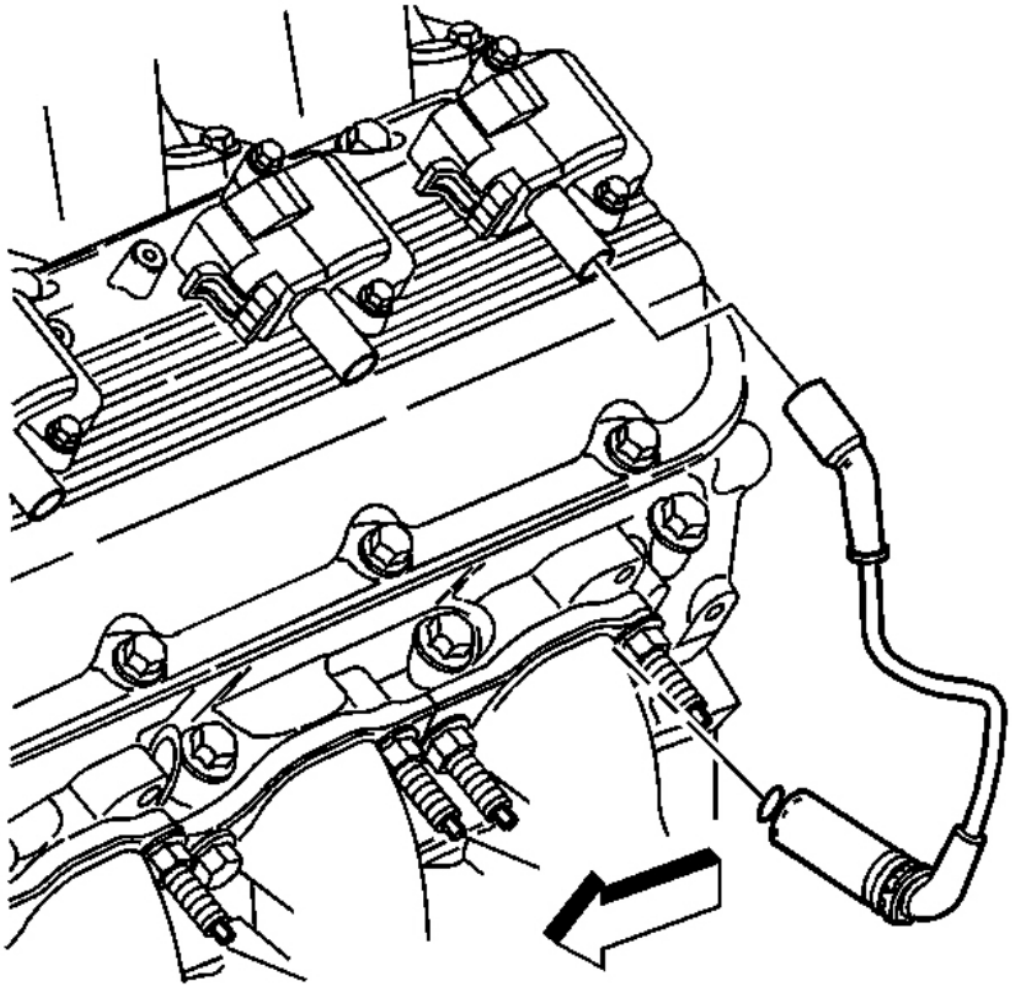


Fig. 7: View Of Spark Plug Wire
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Twist the spark plug boot one-half turn in order to release the boot. Pull

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on the spark plug boot only. Do not pull on the spark plug wire or the wire could be damaged.

1. Remove the wheelhouse panel. Refer to **Wheelhouse Panel Replacement** in Body Front End.
2. Remove the spark plug wires from the spark plugs and ignition coils.
3. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 8.1L.

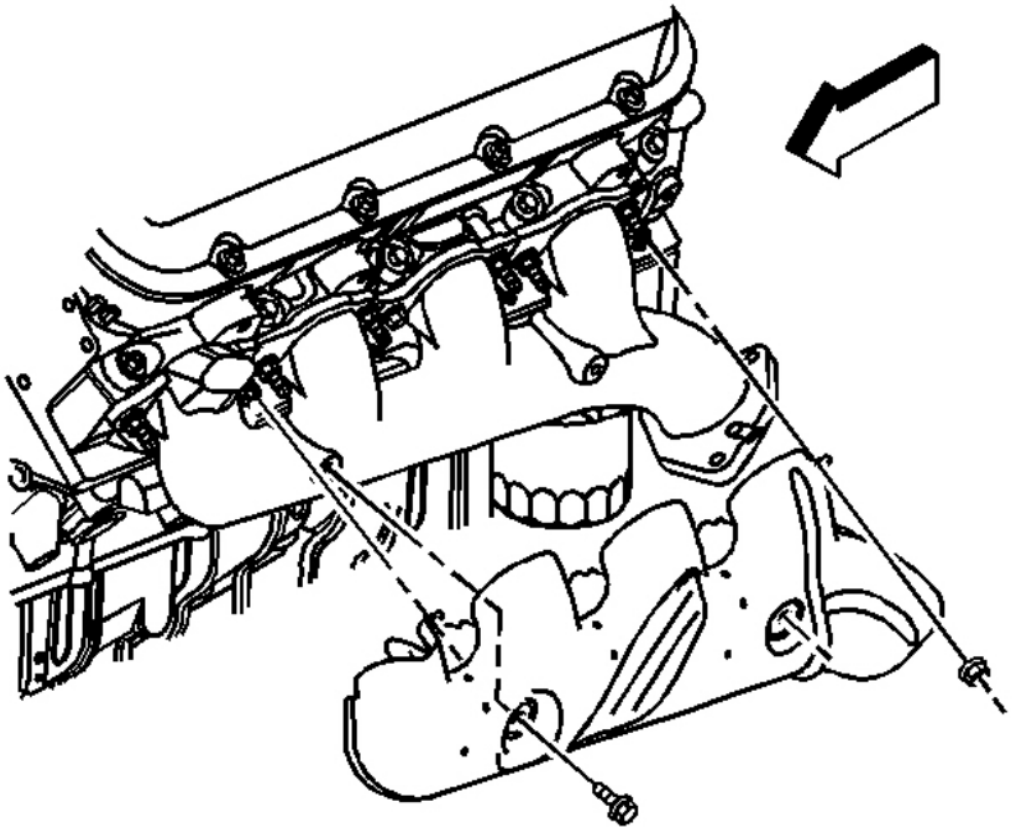


Fig. 8: View Of Exhaust Manifold Heat Shield, Bolts & Nuts - Left (8.1L)
Courtesy of GENERAL MOTORS CORP.

4. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
5. Remove the exhaust manifold heat shield bolts and nuts.
6. Remove the left exhaust manifold heat shield.
7. Lower the vehicle.

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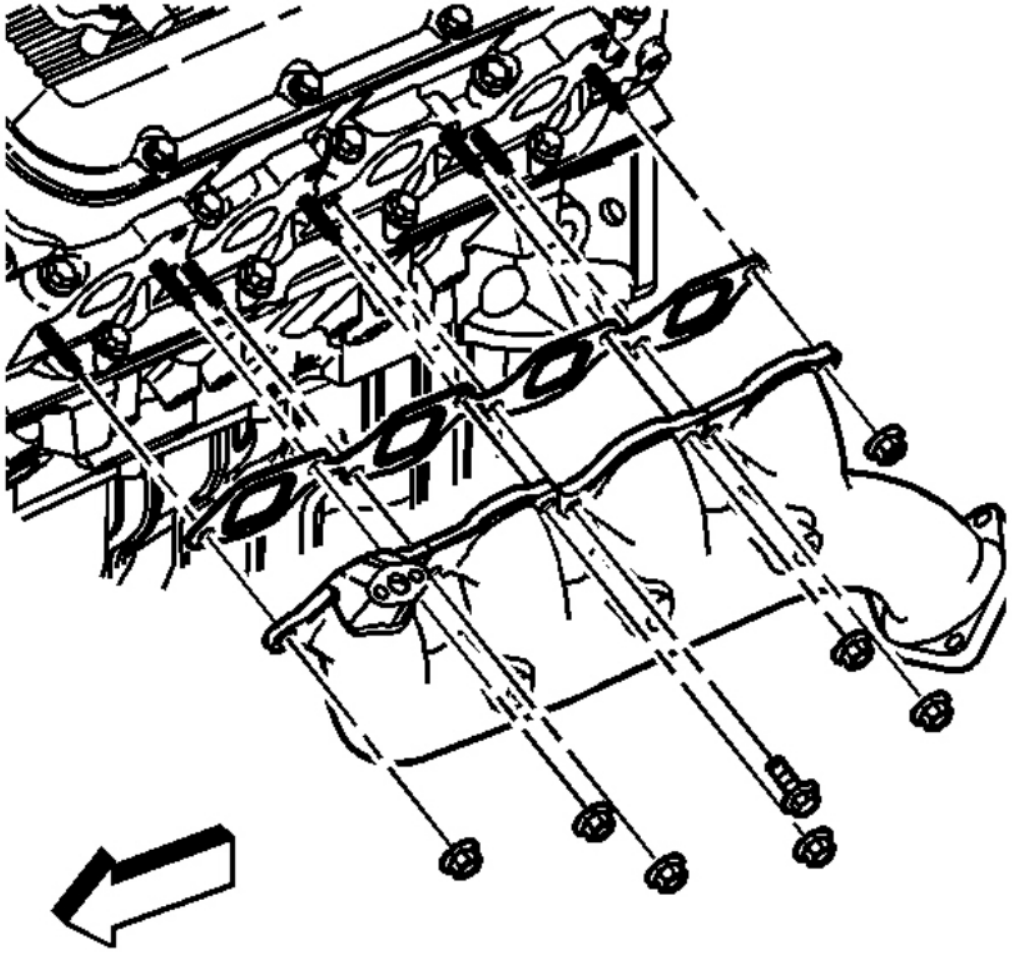


Fig. 9: View Of Left Exhaust Manifold, Gasket, Bolts And Nuts
Courtesy of GENERAL MOTORS CORP.

8. Remove the exhaust manifold bolt and nuts.
9. Remove the exhaust manifold.
10. Remove and discard the exhaust manifold gasket.
11. Clean and inspect the exhaust manifold. Refer to **Exhaust Manifold Cleaning and Inspection** .

Installation Procedure

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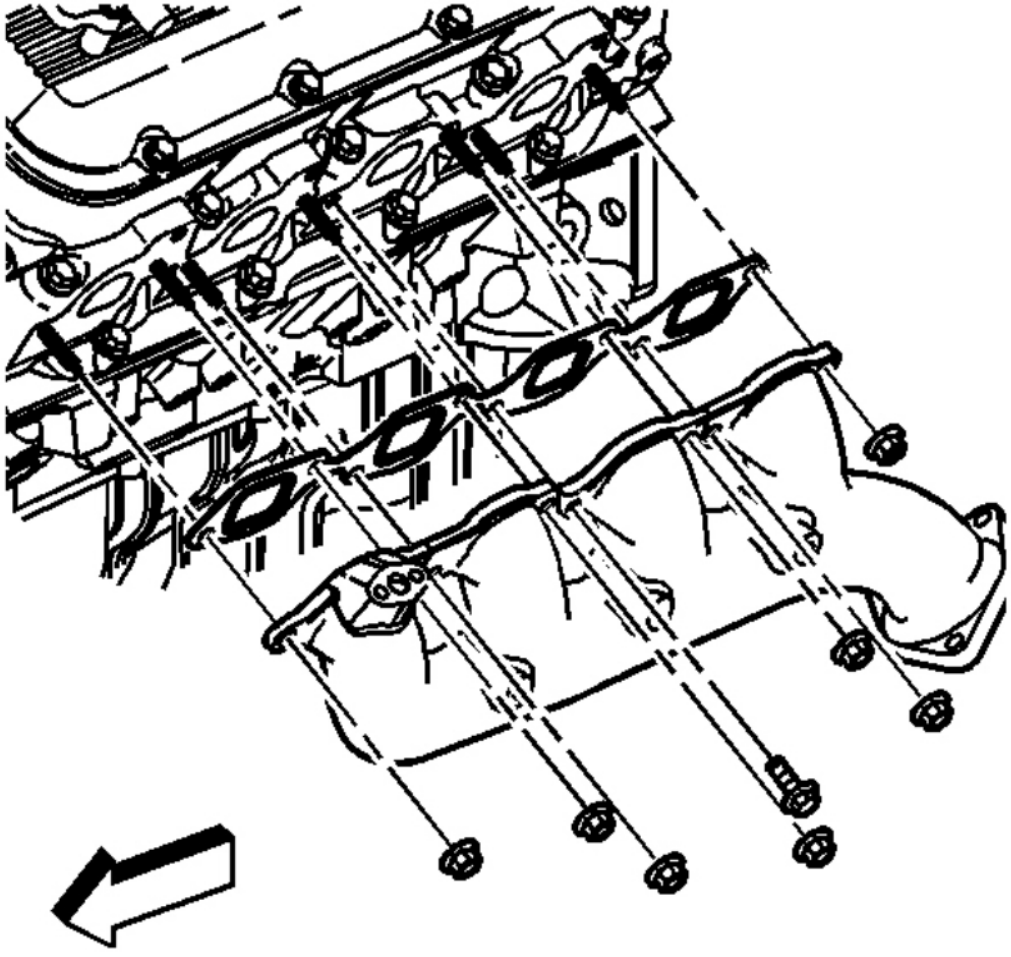


Fig. 10: View Of Left Exhaust Manifold, Gasket, Bolts And Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW exhaust manifold gasket.
2. Install the exhaust manifold.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the exhaust manifold bolt and nuts.

Tighten:

- Tighten the bolt to 35 N.m (26 lb ft).

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- Tighten the nuts to 16 N.m (12 lb ft).

4. Raise the vehicle.

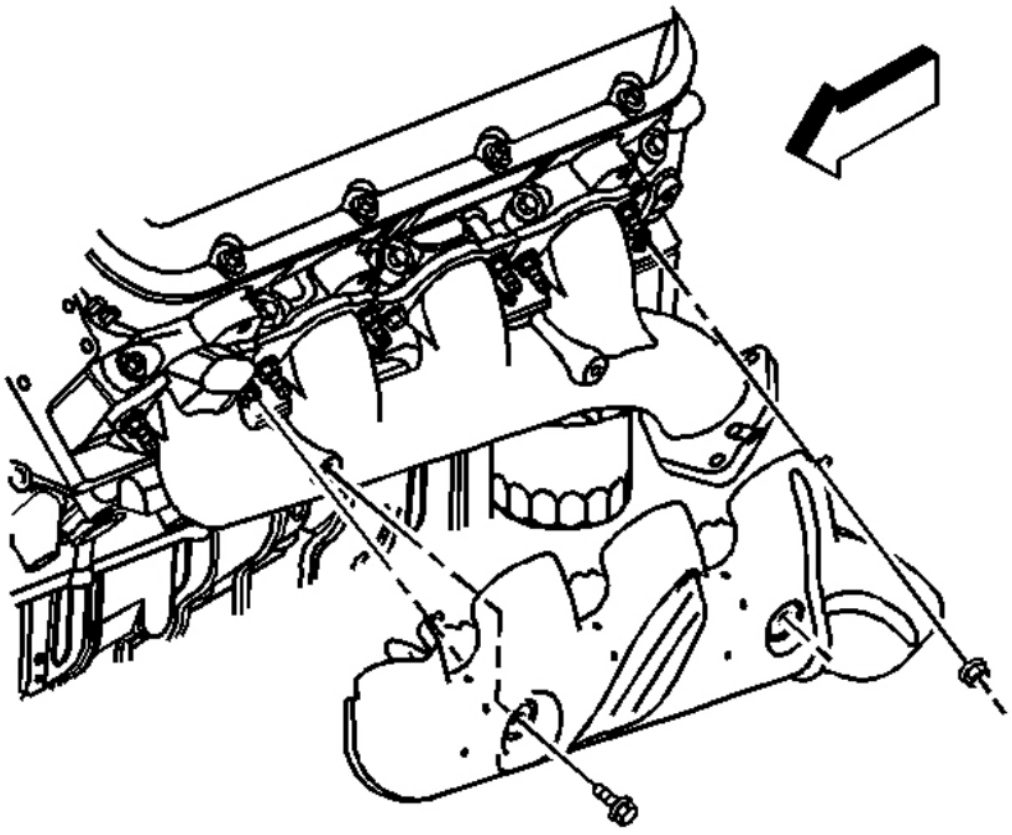


Fig. 11: View Of Exhaust Manifold Heat Shield, Bolts & Nuts - Left (8.1L)
Courtesy of GENERAL MOTORS CORP.

5. Install the exhaust manifold heat shield.
6. Install the exhaust manifold heat shield bolts and nuts.

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

7. Lower the vehicle.
8. Install the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 8.1L.

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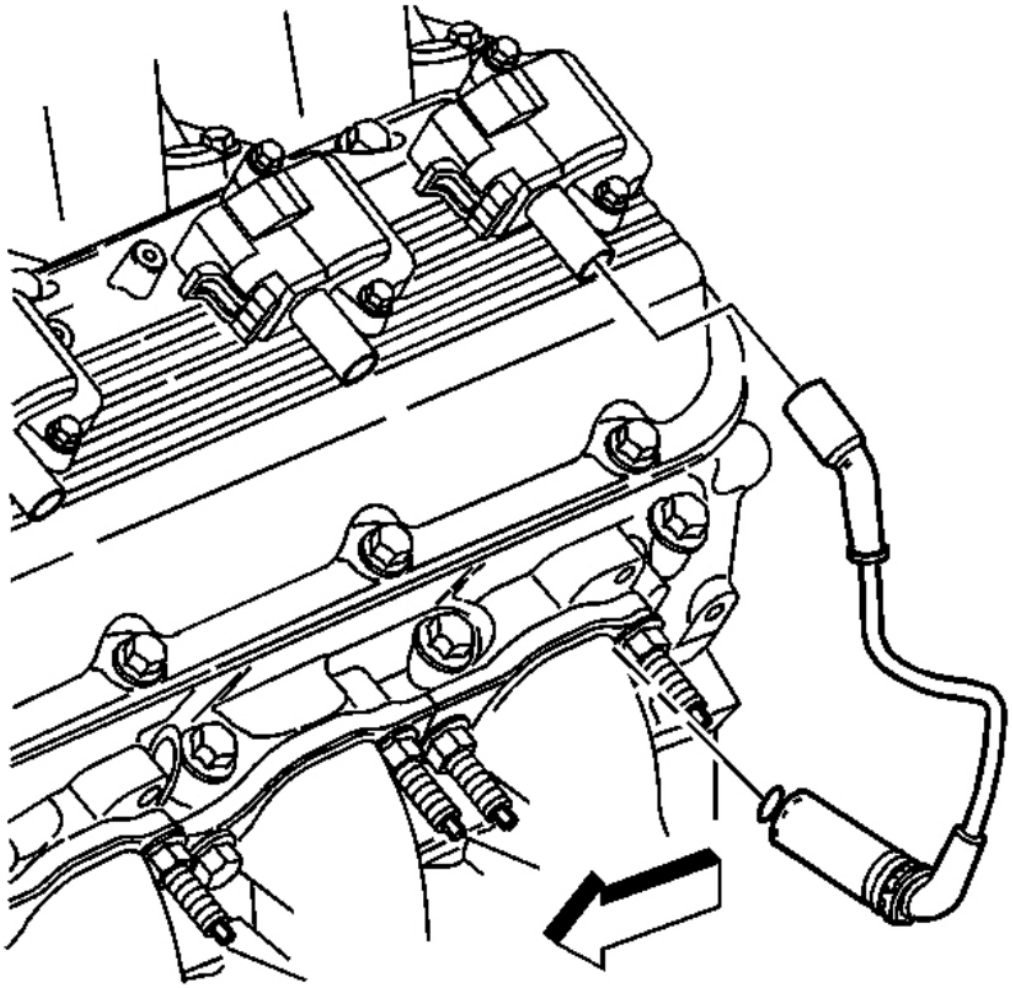


Fig. 12: View Of Spark Plug Wire
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Fully install the spark plug wire by pushing on the exposed end of the spark plug boot. Do not push the spark plug wire on to the spark plug by using the metal heat shield.

9. Install the spark plug wires to the spark plugs and ignition coils.
10. Install the wheelhouse panel. Refer to **Wheelhouse Panel Replacement** in Body Front End.

EXHAUST MANIFOLD REPLACEMENT - RIGHT (4.8L, 5.3L, AND 6.0L ENGINES)

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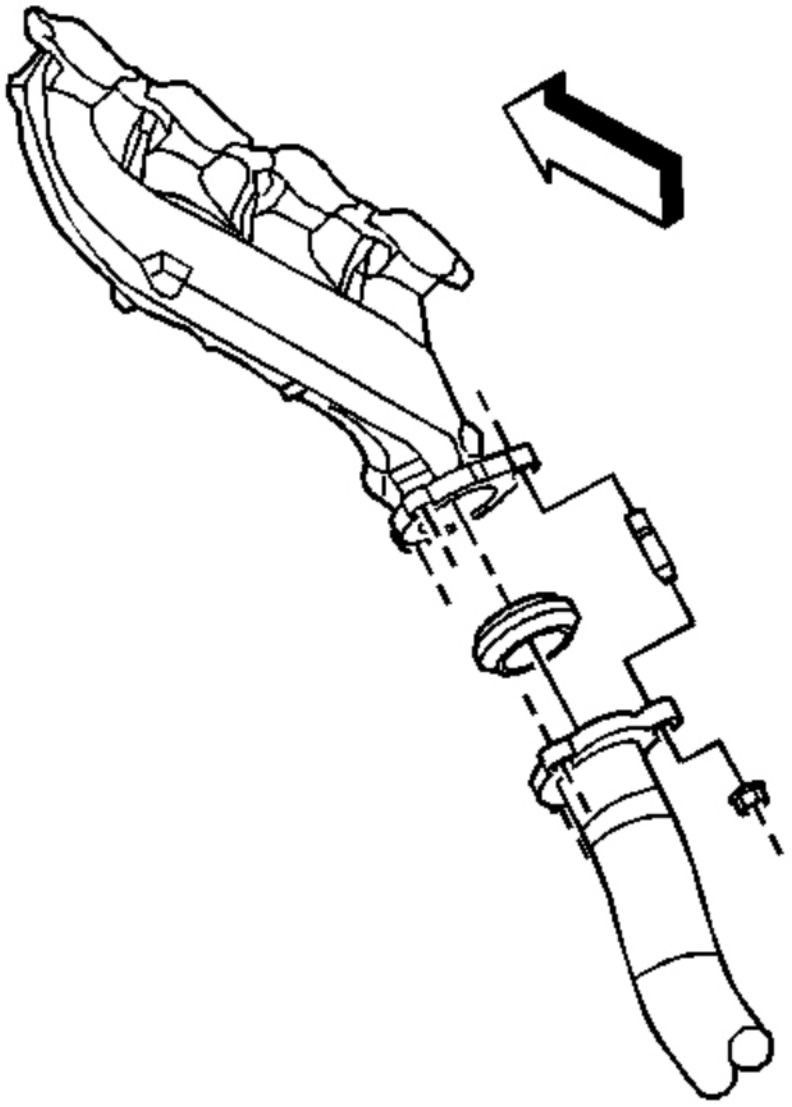


Fig. 13: View Of Right Exhaust Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the ignition coils. Refer to **Ignition Coil(s) Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.
2. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

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4. Remove the exhaust manifold pipe nuts.
5. Lower the vehicle.

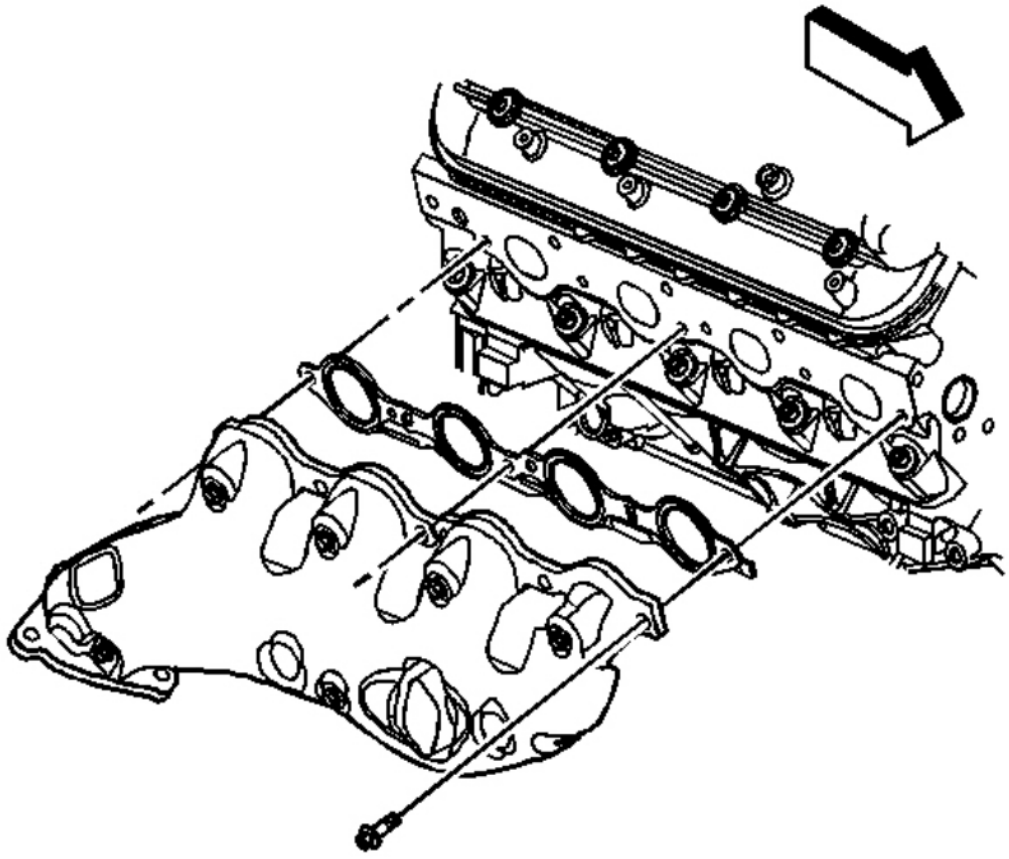


Fig. 14: View Of Exhaust Manifold, Bolts & Gasket - Right (4.8L, 5.3L & 6.0L)
Courtesy of GENERAL MOTORS CORP.

6. Remove the exhaust manifold bolts, manifold, and gasket.
7. Discard the gasket.

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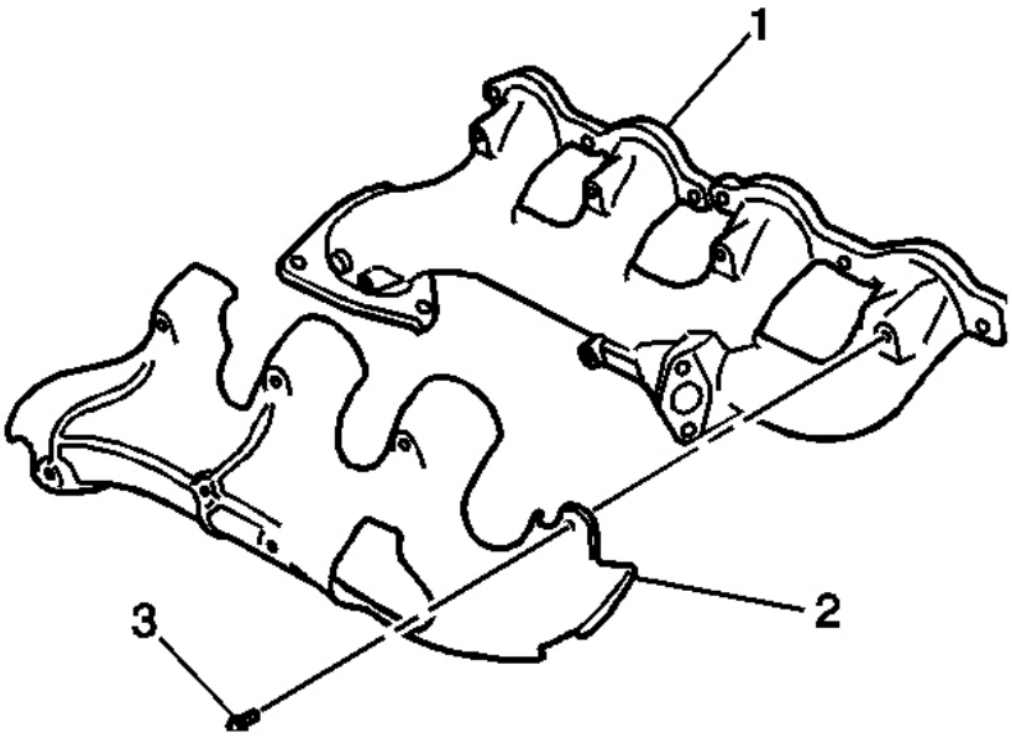


Fig. 15: View Of Heat Shield Bolts, Shield & Exhaust Manifold - Right (4.8L, 5.3L & 6.0L)
Courtesy of GENERAL MOTORS CORP.

8. Remove the heat shield bolts (1), and shield (2) from the exhaust manifold (1), if necessary.
9. Clean and inspect the exhaust manifold, if the manifold is not being replaced. Refer to **Exhaust Manifold Cleaning and Inspection** in Engine Mechanical - 4.8L, 5.3L, and 6.0L.

Installation Procedure

NOTE: Refer to Fastener Notice in Cautions and Notices.

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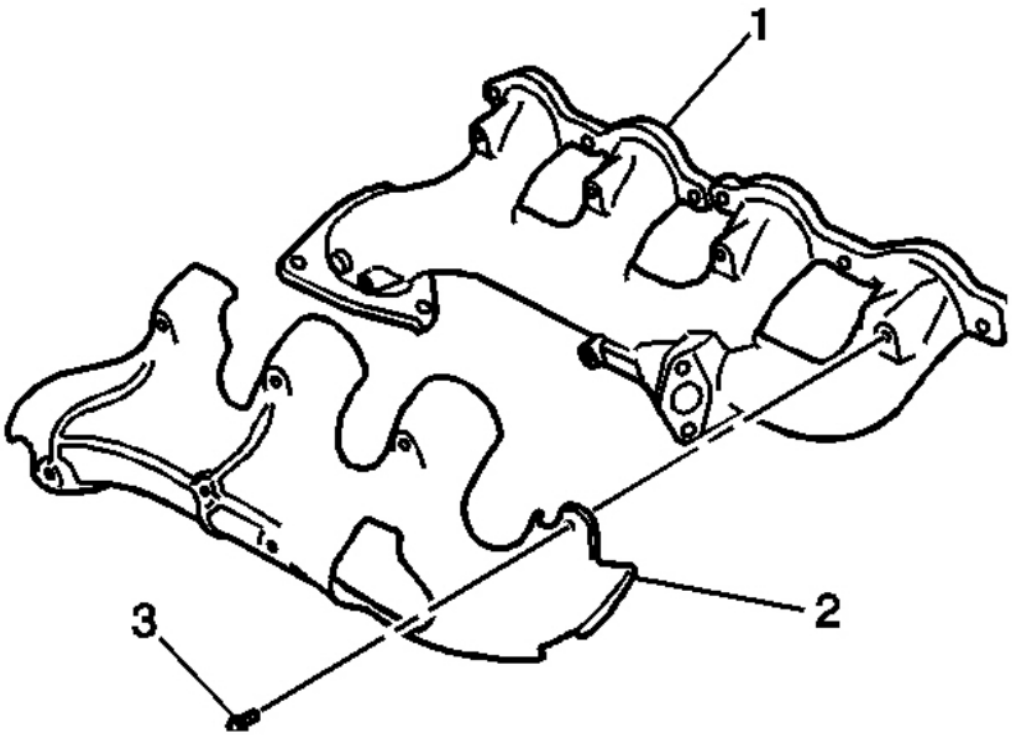


Fig. 16: View Of Heat Shield Bolts, Shield & Exhaust Manifold - Right (4.8L, 5.3L & 6.0L)
Courtesy of GENERAL MOTORS CORP.

1. Install the heat shield (2), and bolts (1) to the exhaust manifold (1), if necessary.

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

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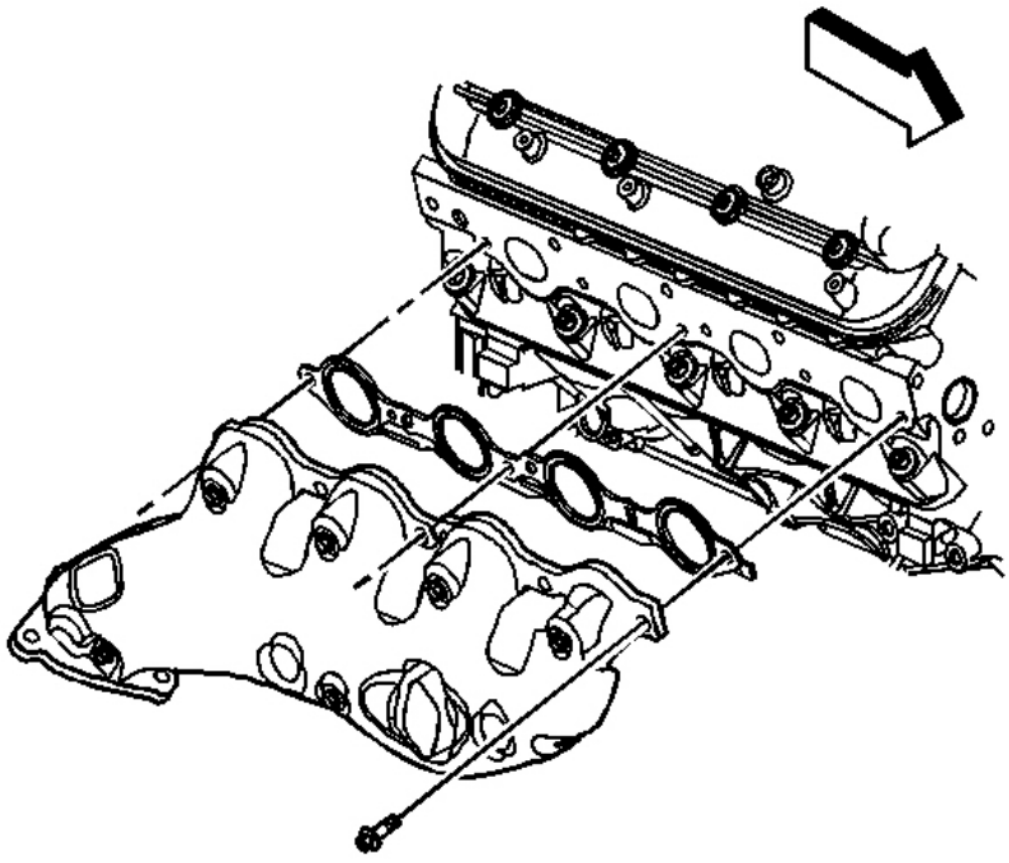


Fig. 17: View Of Exhaust Manifold, Bolts & Gasket - Right (4.8L, 5.3L & 6.0L)
Courtesy of GENERAL MOTORS CORP.

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 Diagnostics (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 sealant to the first three threads of the bolt.**

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

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Tighten:

1. Tighten the bolts a first pass to 15 N.m (11 lb ft). Tighten the exhaust manifold bolts beginning with the center two bolts. Alternate from side-to-side, and work toward the outside bolts.
2. Tighten the bolts a final pass to 25 N.m (18 lb ft). Tighten the exhaust manifold bolts beginning with the center two bolts. Alternate from side-to-side, and work toward the outside bolts.

4. Using a flat punch, bend over the exposed edge of the exhaust manifold gasket at the front of the right cylinder head.
5. Install the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.
6. Install the ignition coils. Refer to **Ignition Coil(s) Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.
7. Raise the vehicle.

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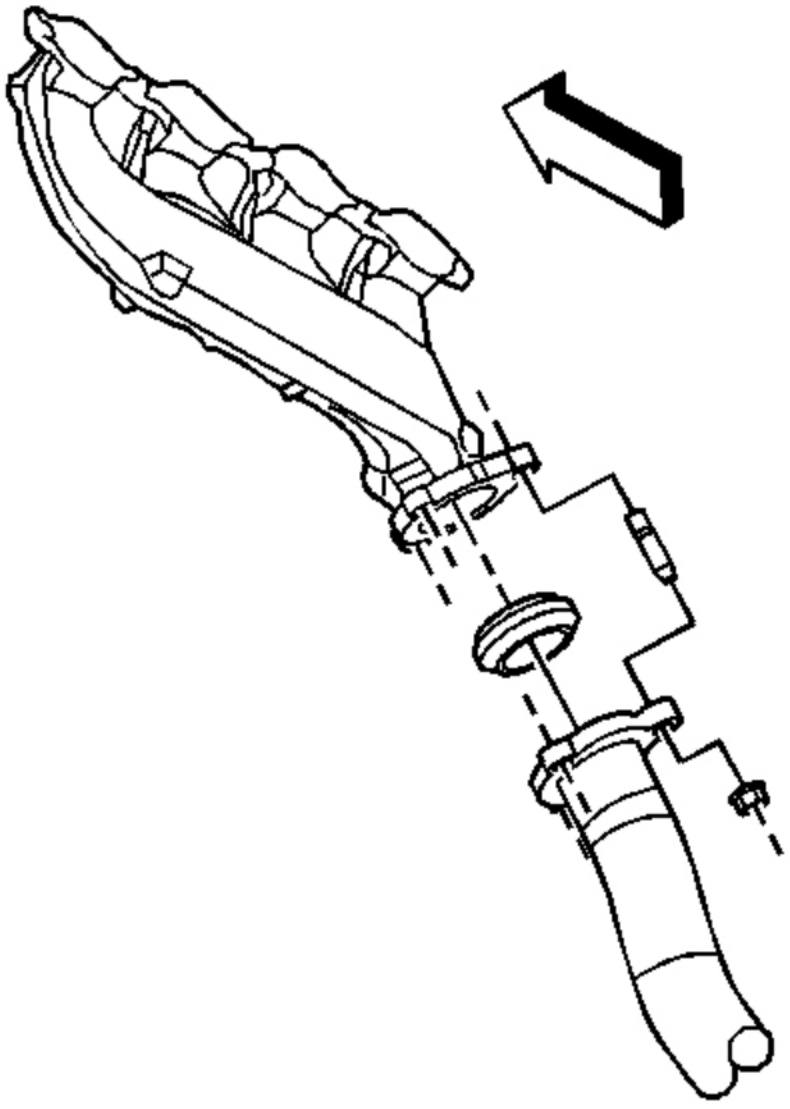


Fig. 18: View Of Right Exhaust Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

8. Install the exhaust manifold pipe nuts.

   Tighten: Tighten the nuts to 50 N.m (37 lb ft).

9. Lower the vehicle.

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EXHAUST MANIFOLD REPLACEMENT - RIGHT (8.1L ENGINE)

Removal Procedure

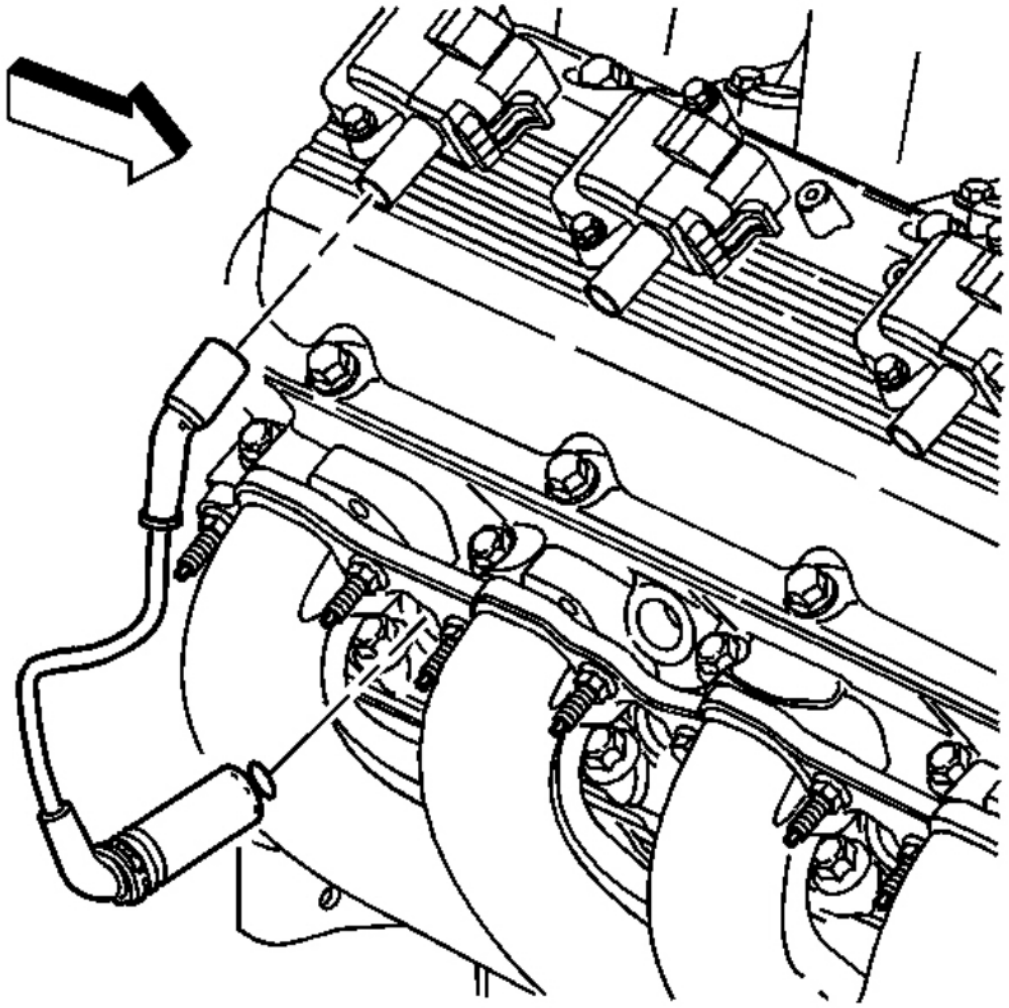


Fig. 19: View Of Spark Plug Wires (Right)
Courtesy of GENERAL MOTORS CORP.

1. Remove the wheelhouse panel. Refer to **Wheelhouse Panel Replacement** in Body Front End.
2. Remove the oil level indicator. Refer to **Oil Level Indicator and Tube Replacement** in Engine Mechanical - 8.1L.

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IMPORTANT: Twist the spark plug boot one-half turn in order to release the boot. Pull on the spark plug boot only. Do not pull on the spark plug or the wire could be damaged.

3. Remove the spark plug wires from the spark plugs and ignition coils.
4. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 8.1L.
5. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

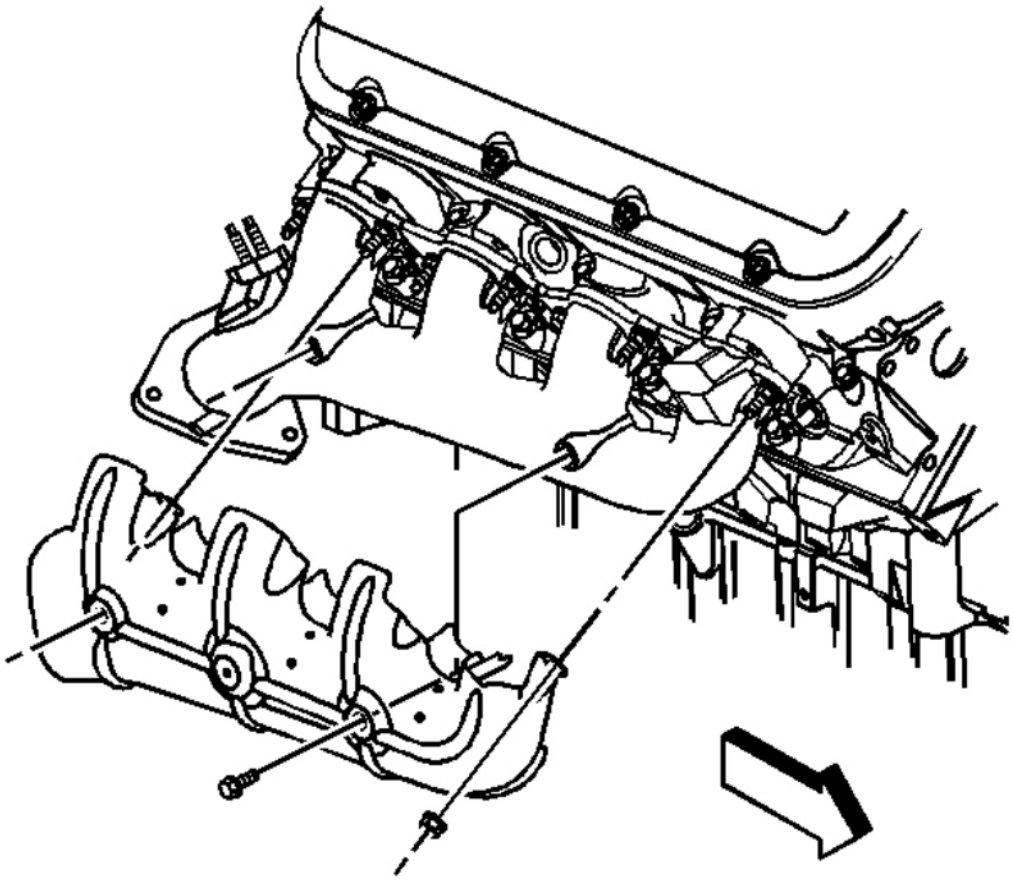


Fig. 20: View Of Exhaust Manifold Heat Shield, Bolts & Nuts - Right (8.1L)
Courtesy of GENERAL MOTORS CORP.

6. Remove the exhaust manifold heat shield bolts and nuts.
7. Remove the exhaust manifold heat shield.
8. Lower the vehicle.

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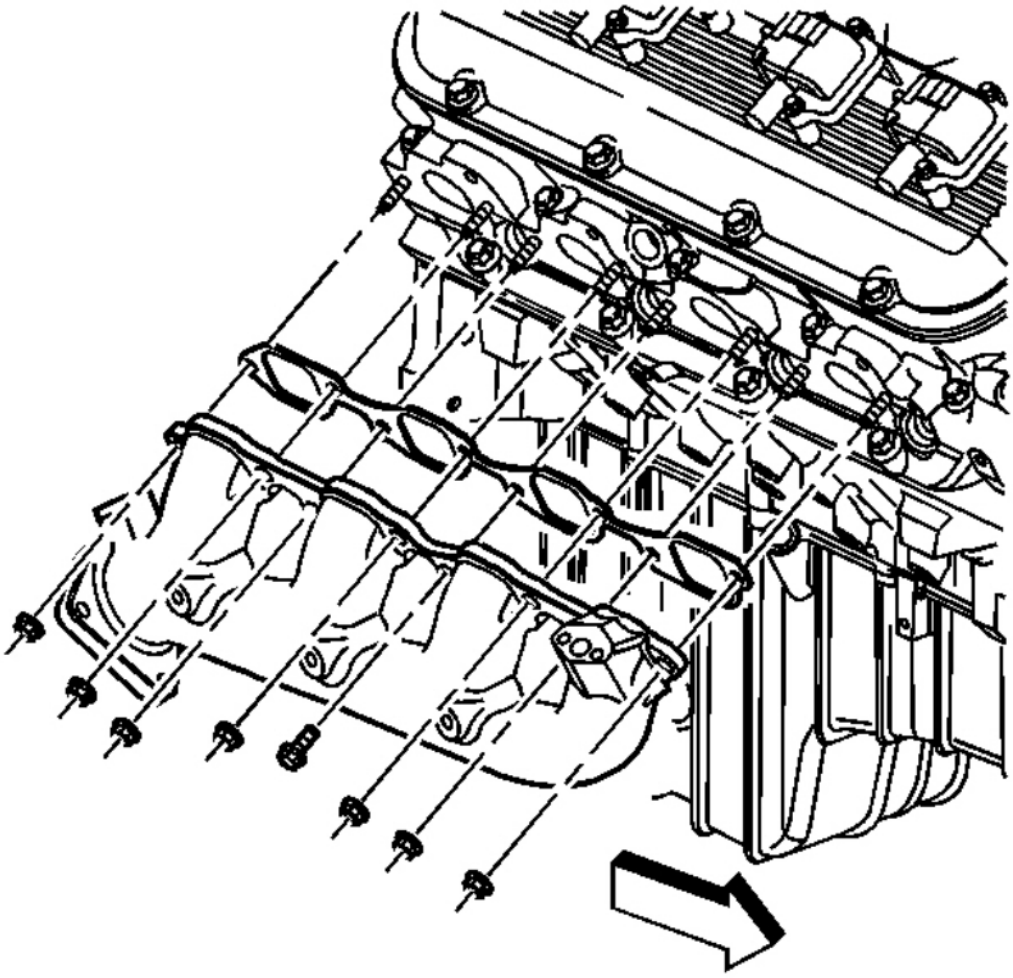


Fig. 21: View Of Exhaust Manifold, Bolt & Nuts - Right (8.1L)
Courtesy of GENERAL MOTORS CORP.

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

Installation Procedure

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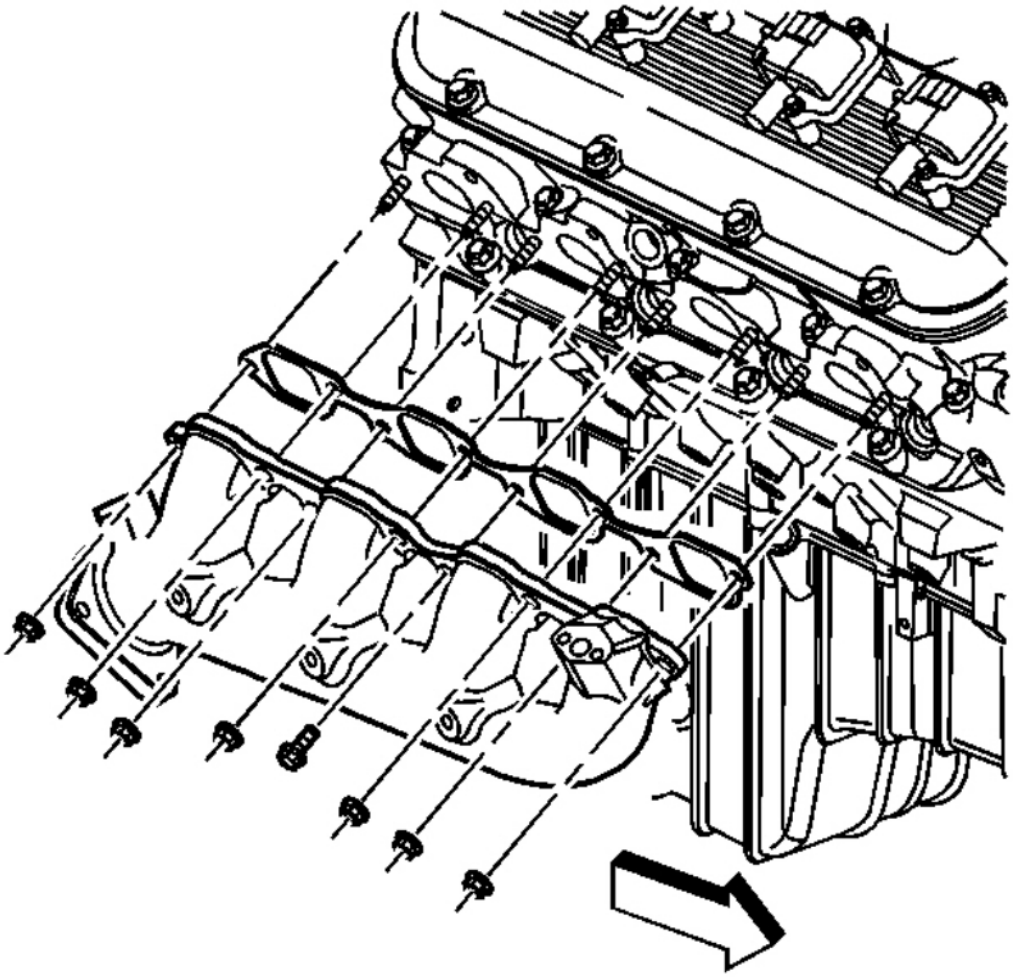


Fig. 22: View Of Exhaust Manifold, Bolt & Nuts - Right (8.1L)
Courtesy of GENERAL MOTORS CORP.

1. Install the a NEW exhaust manifold gasket.
2. Install the exhaust manifold.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the exhaust manifold bolt and nuts.

Tighten:

- Tighten the bolt to 35 N.m (26 lb ft).

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- Tighten the nuts to 16 N.m (12 lb ft).

4. Raise and suitably support the vehicle with safety stands.

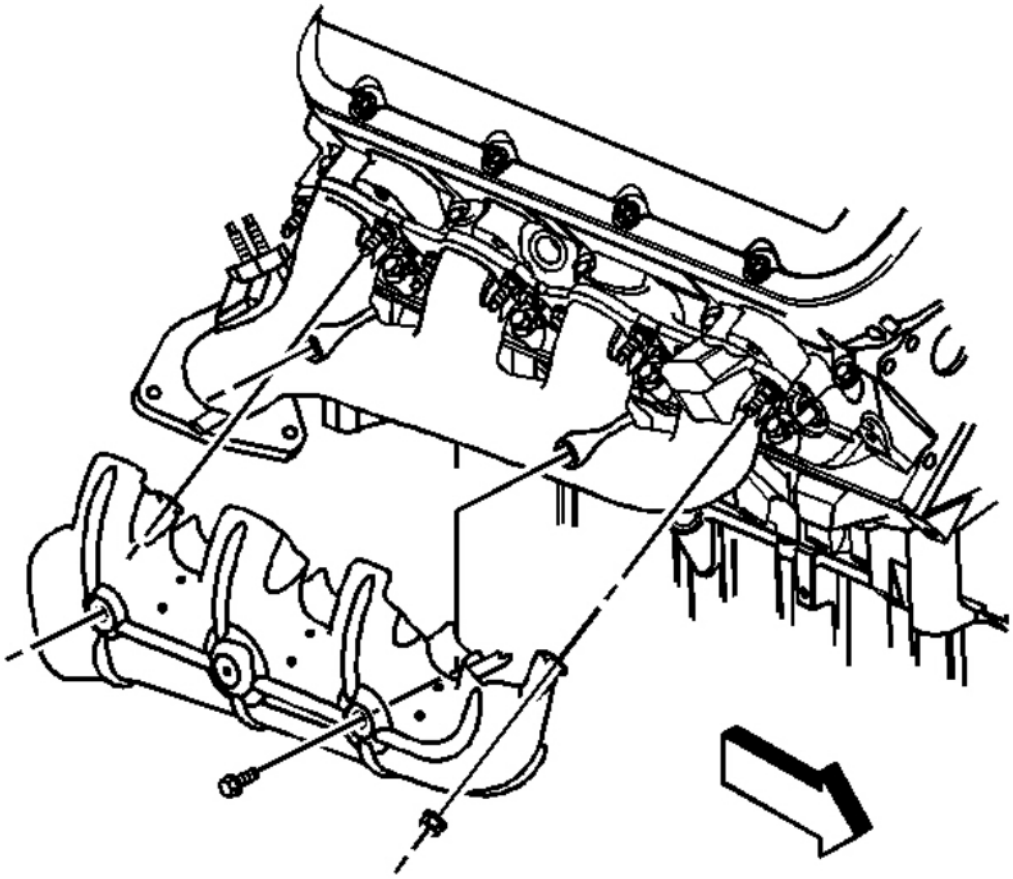


Fig. 23: View Of Exhaust Manifold Heat Shield, Bolts & Nuts - Right (8.1L)
Courtesy of GENERAL MOTORS CORP.

5. Install the exhaust manifold heat shield.
6. Install the exhaust manifold heat shield bolts and nuts.

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

7. Lower the vehicle.
8. Install the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 8.1L.

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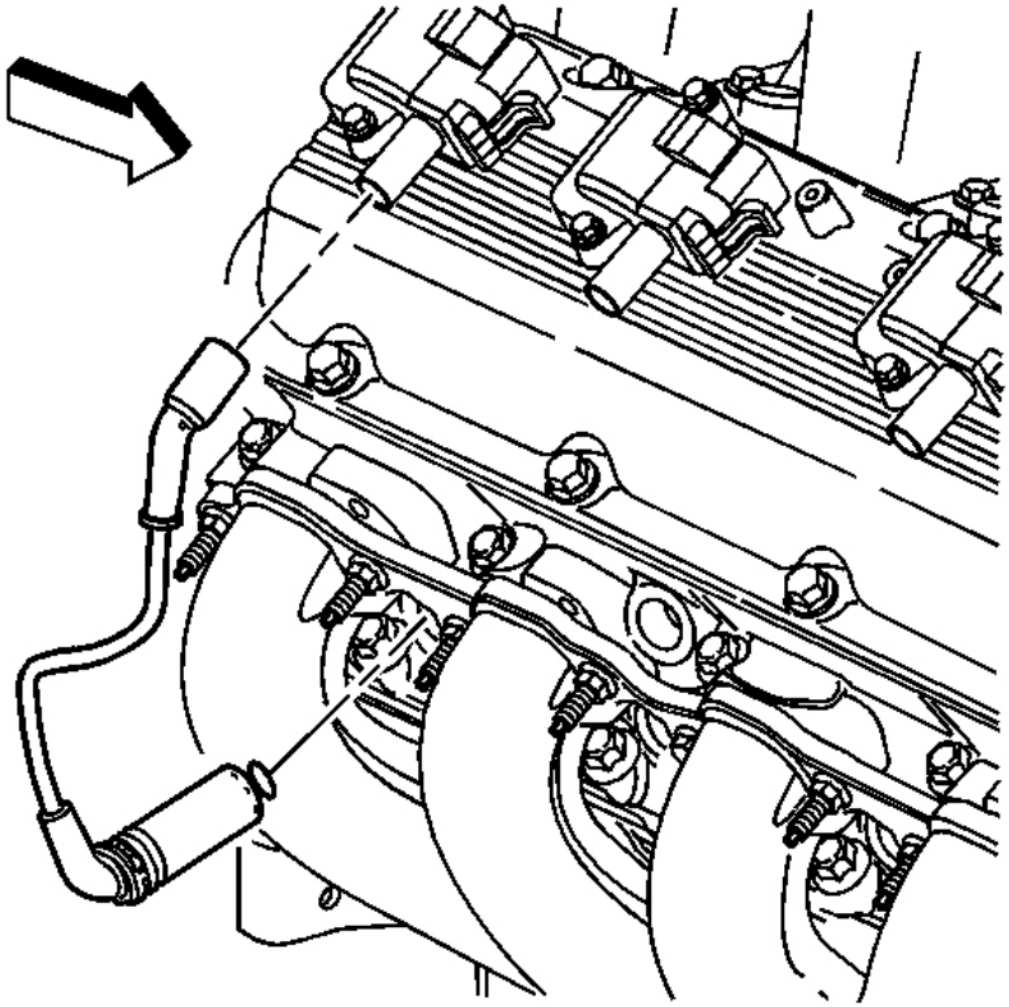


Fig. 24: View Of Spark Plug Wires (Right)
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Fully install the spark plug wires by pushing on the exposed end of the spark plug boot. Do not push the spark plug wire on to the spark plug by using the metal heat shield.

9. Install the spark plug wires to the spark plugs and ignition coils.
10. Install the oil level indicator. Refer to **Oil Level Indicator and Tube Replacement** in Engine Mechanical - 8.1L.
11. Install the wheelhouse panel. Refer to **Wheelhouse Panel Replacement** in Body Front End.

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EXHAUST MANIFOLD PIPE REPLACEMENT (6.0L AND 8.1L ENGINES)

Removal Procedure

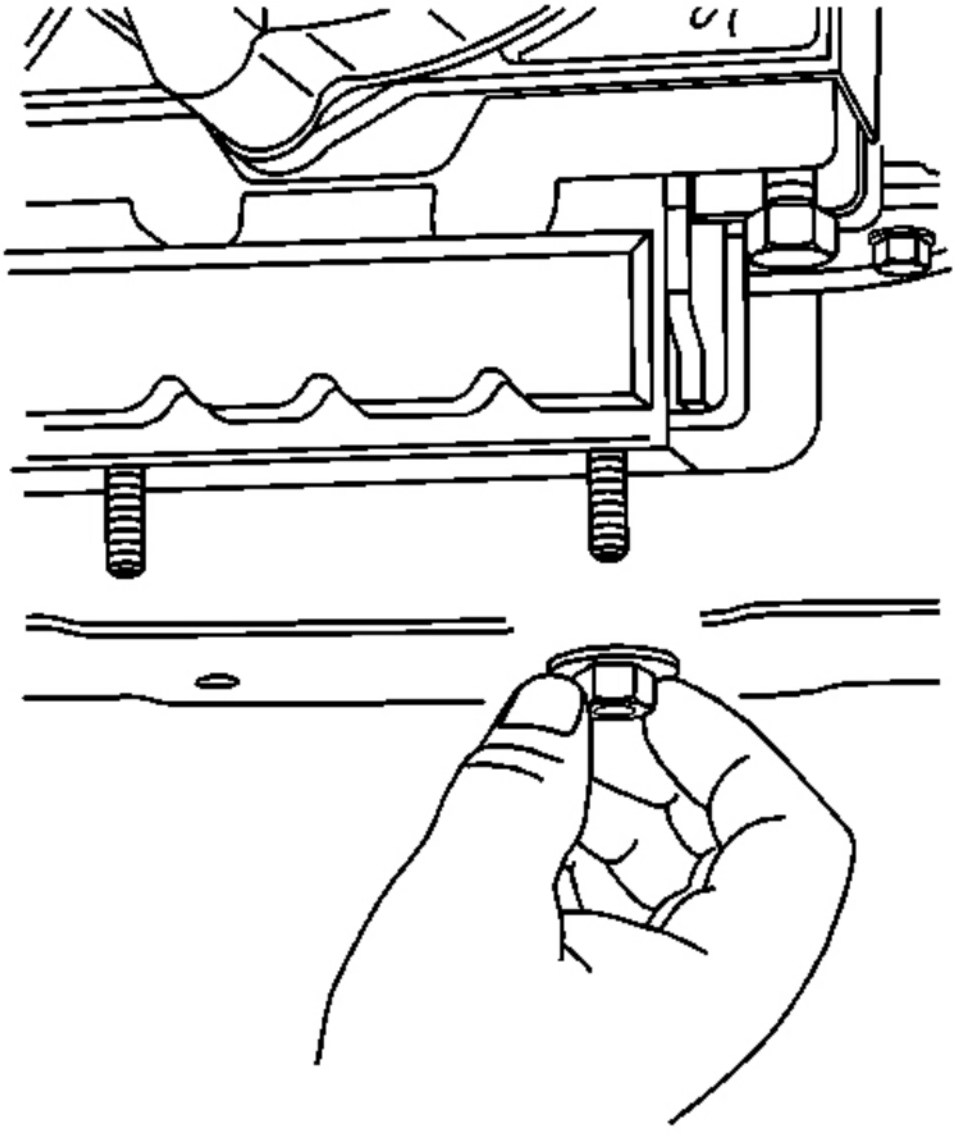


Fig. 25: Identifying Transmission Mount Nuts
Courtesy of GENERAL MOTORS CORP.

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1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Support the transmission with a suitable transmission jack.
3. Remove the transmission mount to transmission support nuts.
4. Raise the transmission off of the transmission support.

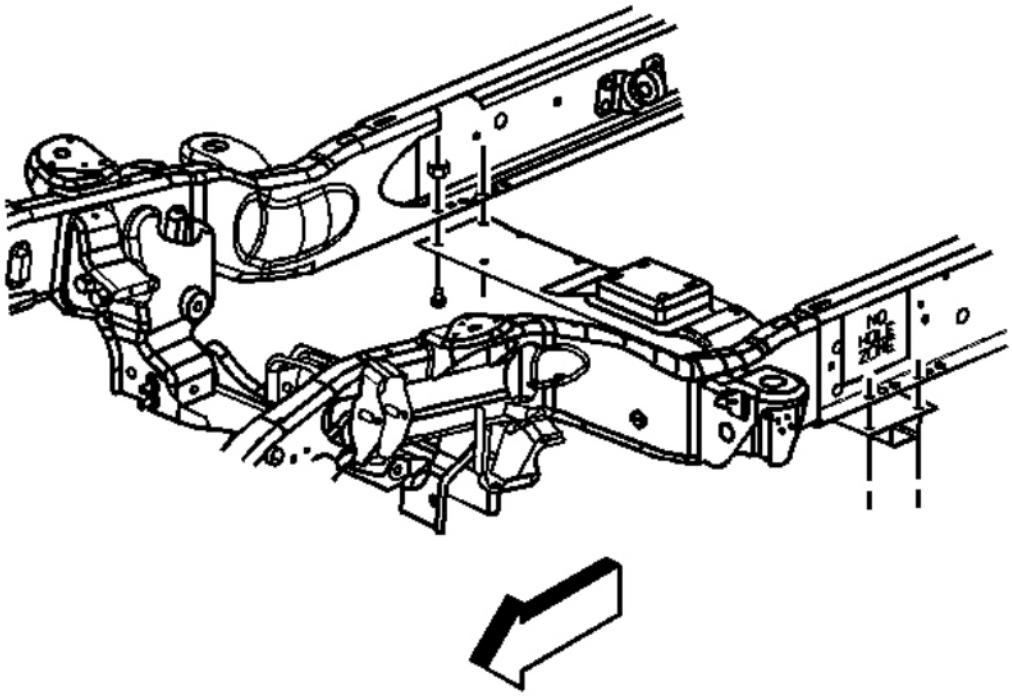


Fig. 26: View Of Transmission Support Crossmember & Bolts (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

5. Remove the transmission support crossmember bolts.
6. Remove the transmission support crossmember.

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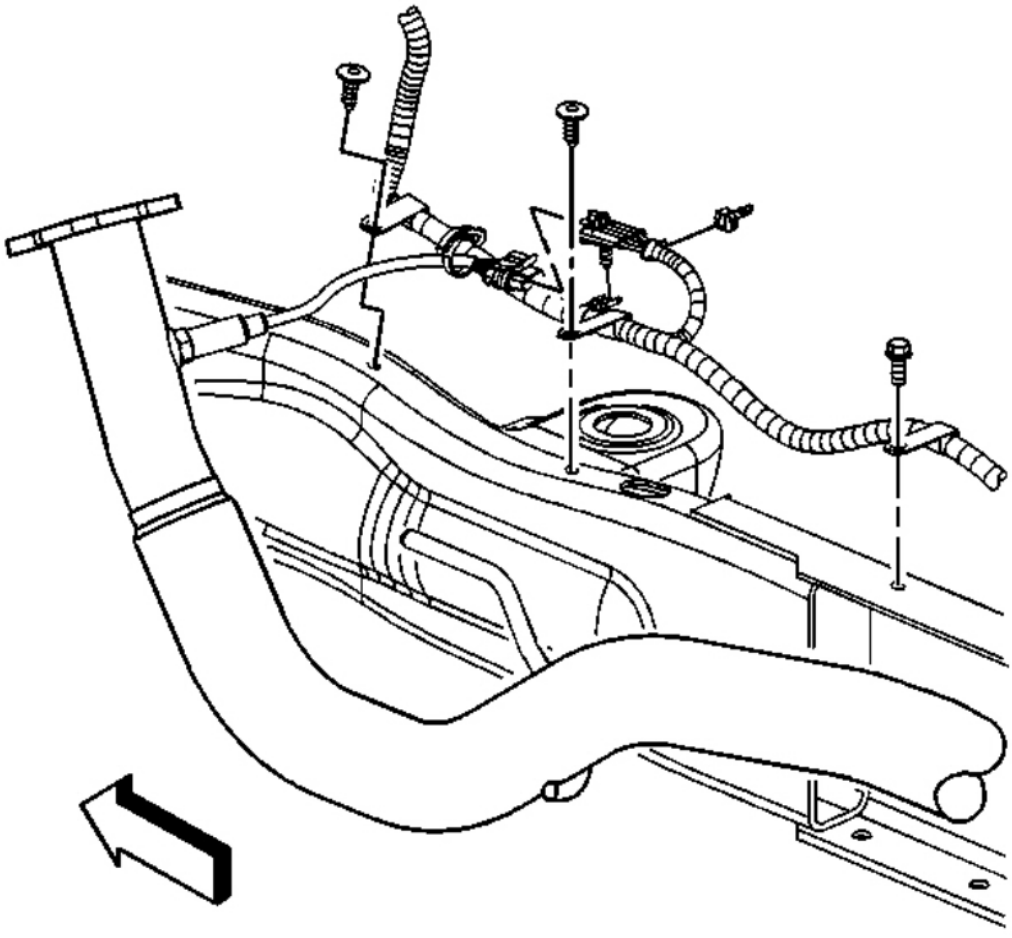


Fig. 27: View Of O2 Sensor, Connector, Harness And Retainers
Courtesy of GENERAL MOTORS CORP.

7. Remove the exhaust muffler. Refer to **Muffler Replacement (4.8L and 5.3L Engines)** or **Muffler Replacement (6.0L and 8.1L Engines)**.
8. Remove the clip around the engine harness and the oxygen sensor pigtail.
9. Disconnect the connector position assurance (CPA) retainer.
10. Disconnect the oxygen sensor electrical connector.
11. Remove the oxygen sensor.

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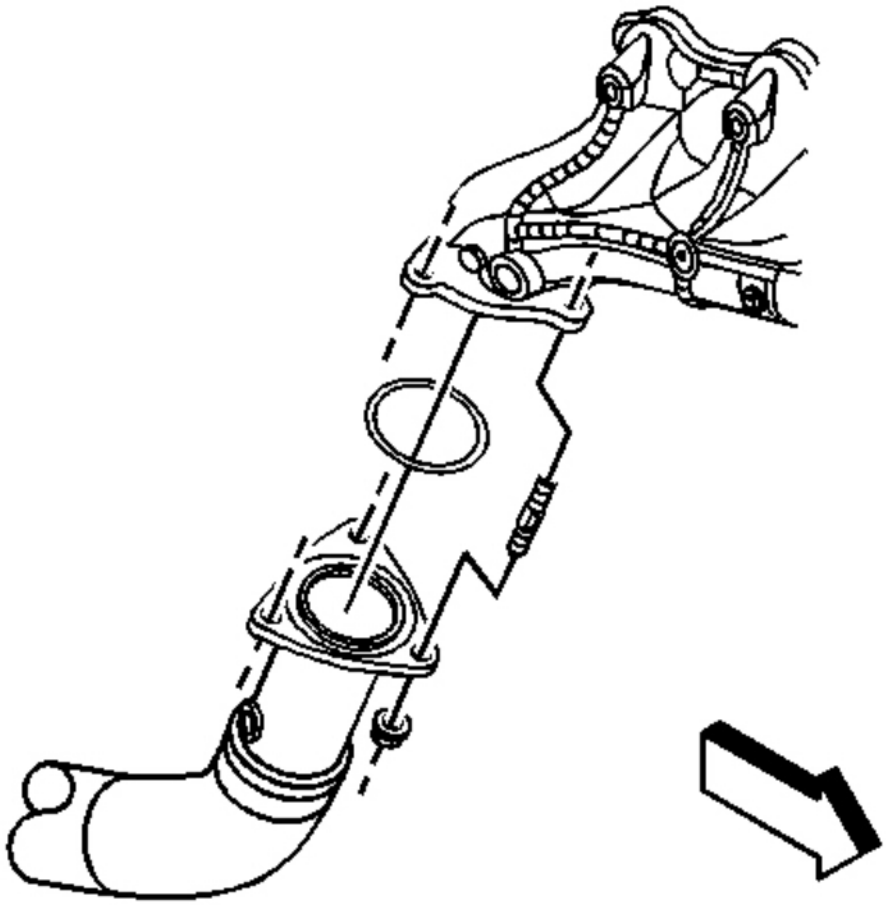


Fig. 28: View Of Exhaust Pipe Nuts (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

12. Remove the exhaust manifold pipe nuts.
13. Using the transmission jack, lower the transmission slightly.

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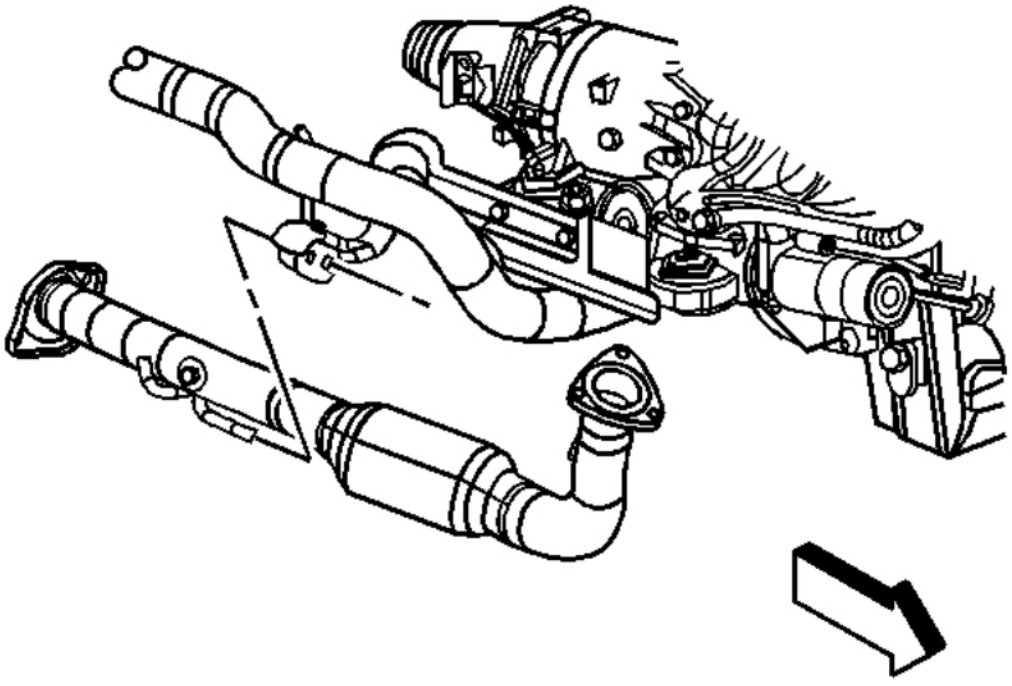


Fig. 29: View Of Exhaust Manifold Pipe (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

14. Remove the exhaust manifold pipe.
15. Discard the exhaust manifold pipe seal.

Installation Procedure

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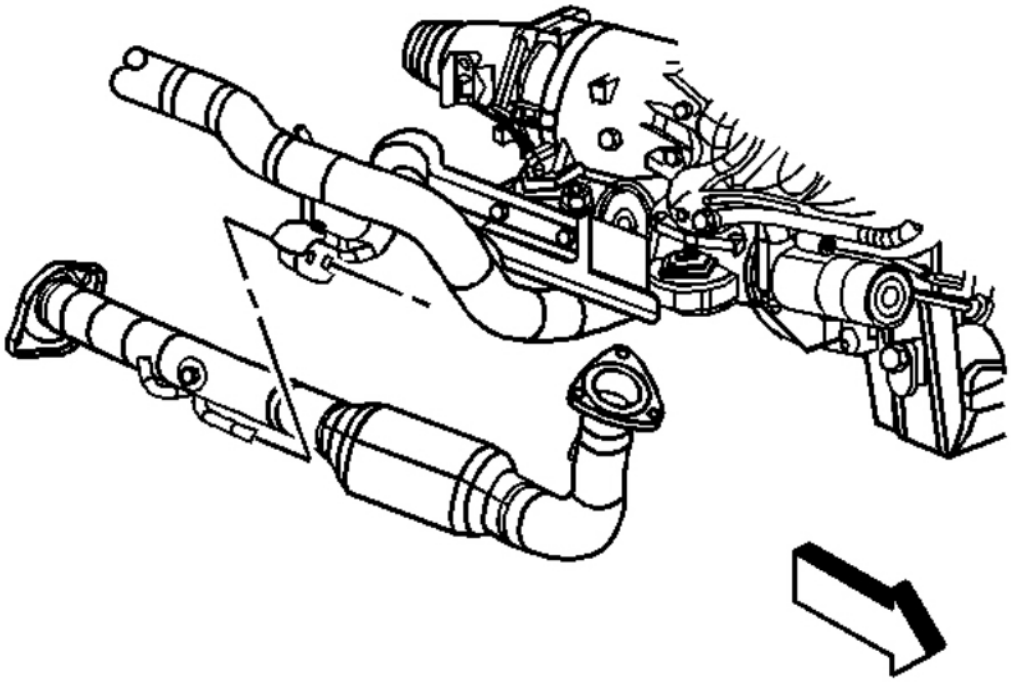


Fig. 30: View Of Exhaust Manifold Pipe (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW exhaust manifold pipe seal to the exhaust manifold pipe.
2. Install the exhaust manifold pipe.
3. Using the transmission jack, raise the transmission.

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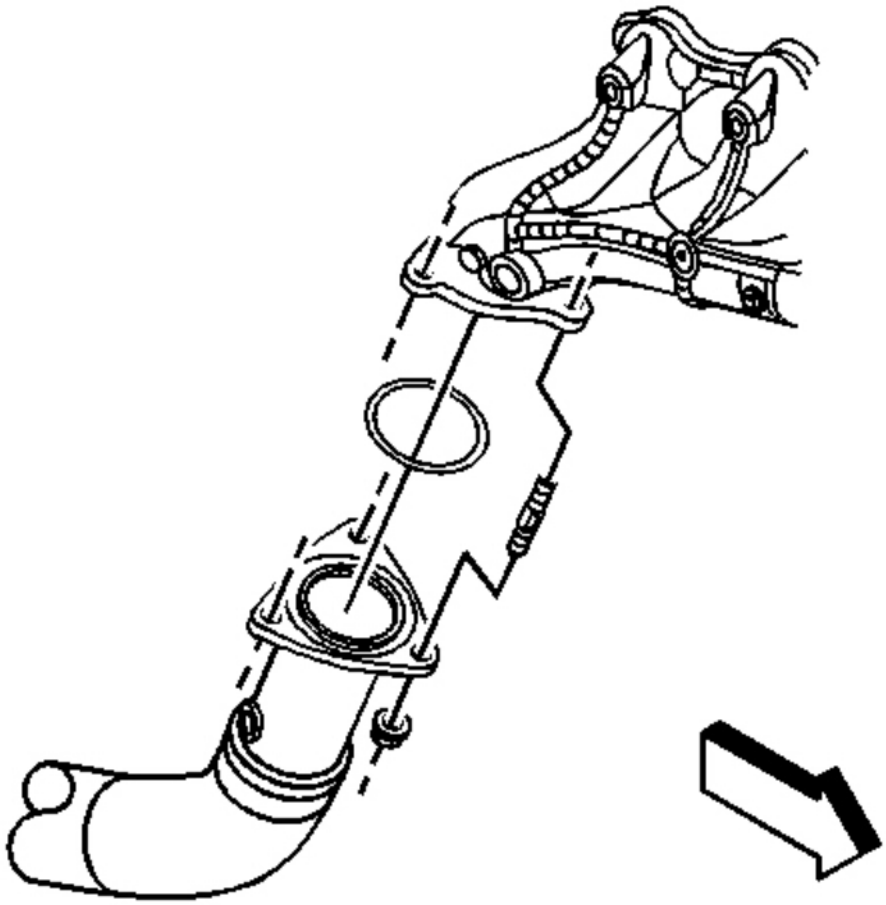


Fig. 31: View Of Exhaust Pipe Nuts (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the exhaust manifold pipe nuts.

   Tighten: Tighten the nuts to 50 N.m (39 lb ft).

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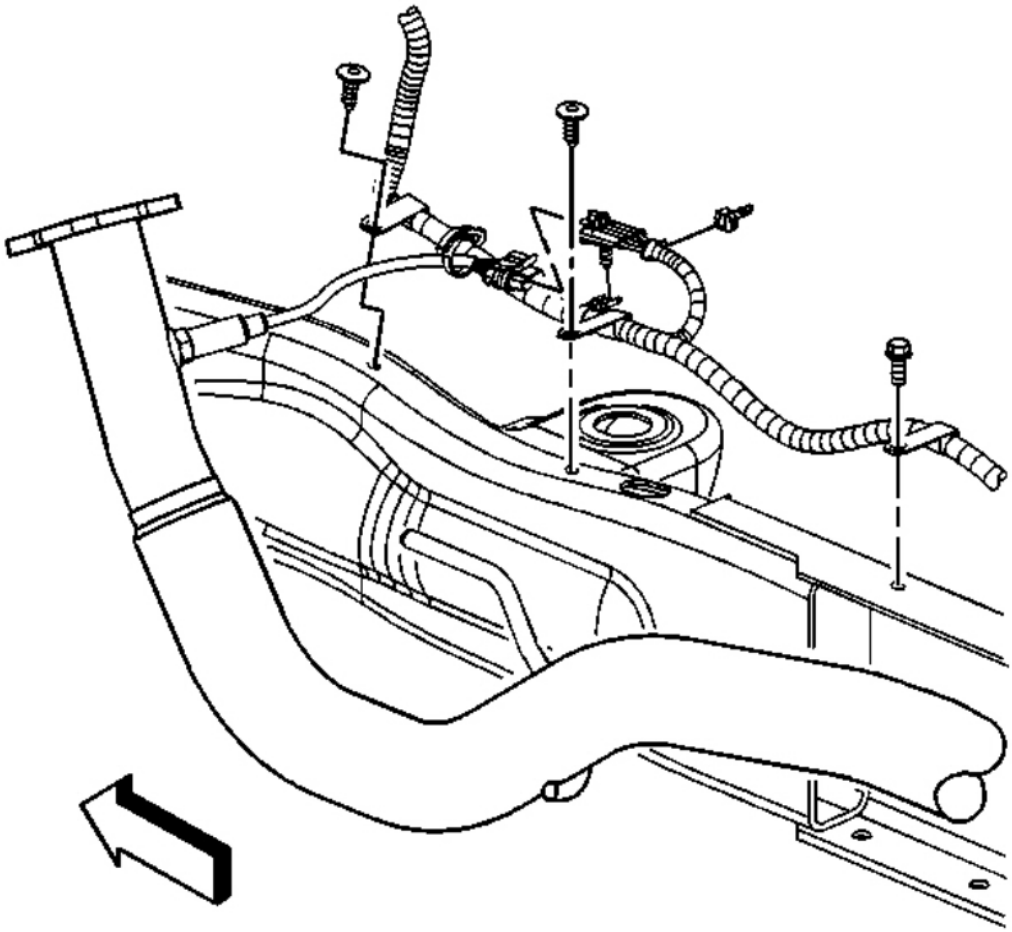


Fig. 32: View Of O2 Sensor, Connector, Harness And Retainers
Courtesy of GENERAL MOTORS CORP.

5. If the old oxygen sensor is being reused, apply anti-seize compound GM P/N 12377953 or equivalent to the threads.
6. Install the oxygen sensor.

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

7. Connect the oxygen sensor electrical connector.
8. Connect the CPA retainer.
9. Install the clip around the engine harness and the oxygen sensor pigtail.
10. Install the exhaust muffler. Refer to **Muffler Replacement (4.8L and 5.3L Engines)** or **Muffler**

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Replacement (6.0L and 8.1L Engines).

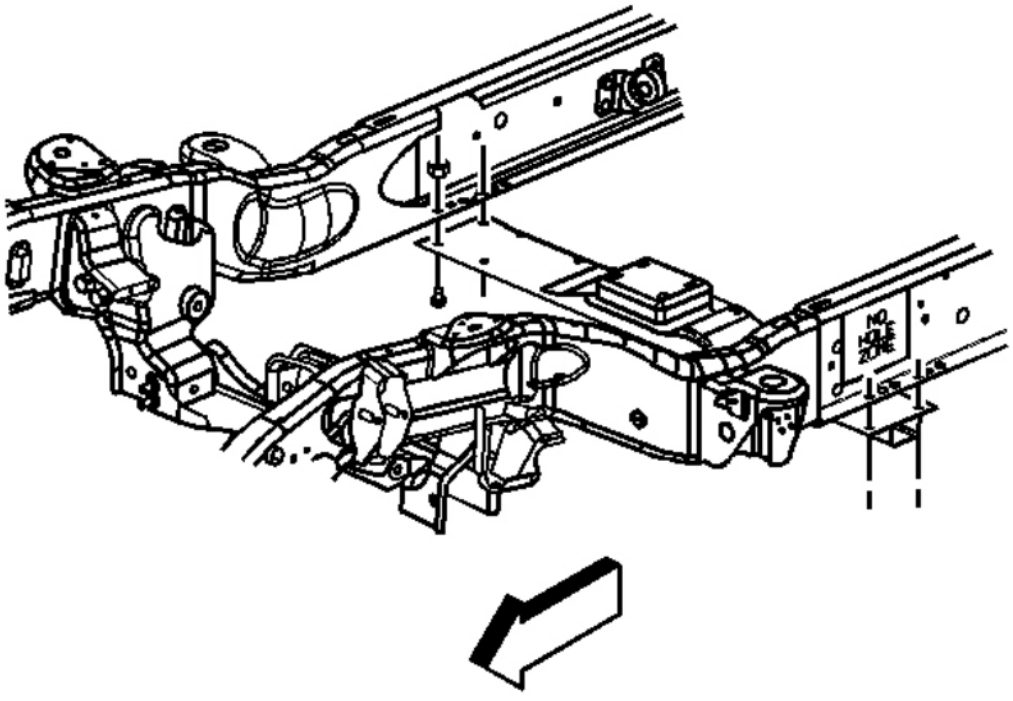


Fig. 33: View Of Transmission Support Crossmember & Bolts (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

11. Install the transmission support crossmember.
12. Install the transmission support crossmember bolts.

Tighten: Tighten the bolts to 95 N.m (70 lb ft).

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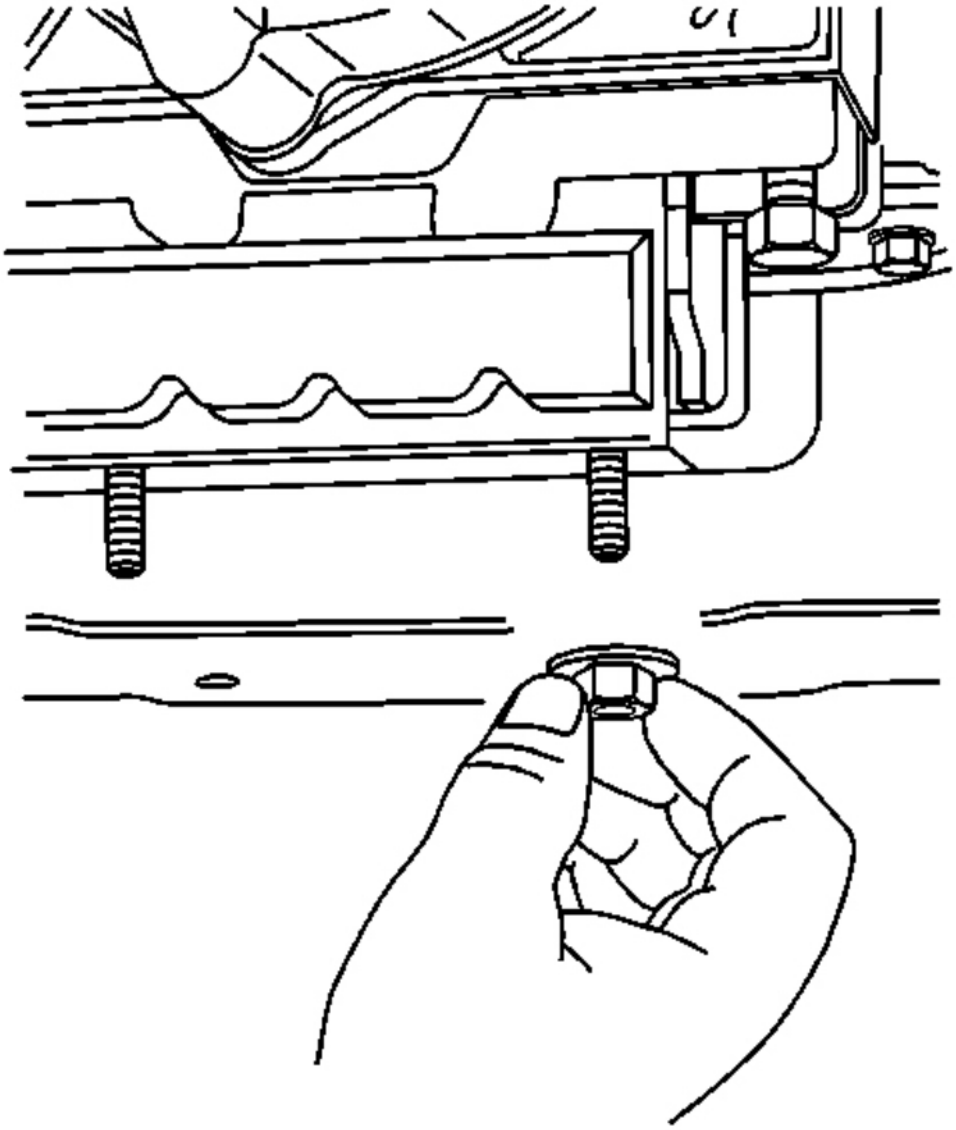


Fig. 34: Identifying Transmission Mount Nuts
Courtesy of GENERAL MOTORS CORP.

13. Lower the transmission onto the transmission support.
14. Install the transmission mount to transmission support nuts.

Tighten: Tighten the nuts to 40 N.m (30 lb ft).

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15. Remove the transmission jack.
16. Lower the vehicle.

EXHAUST SEAL REPLACEMENT

Removal Procedure

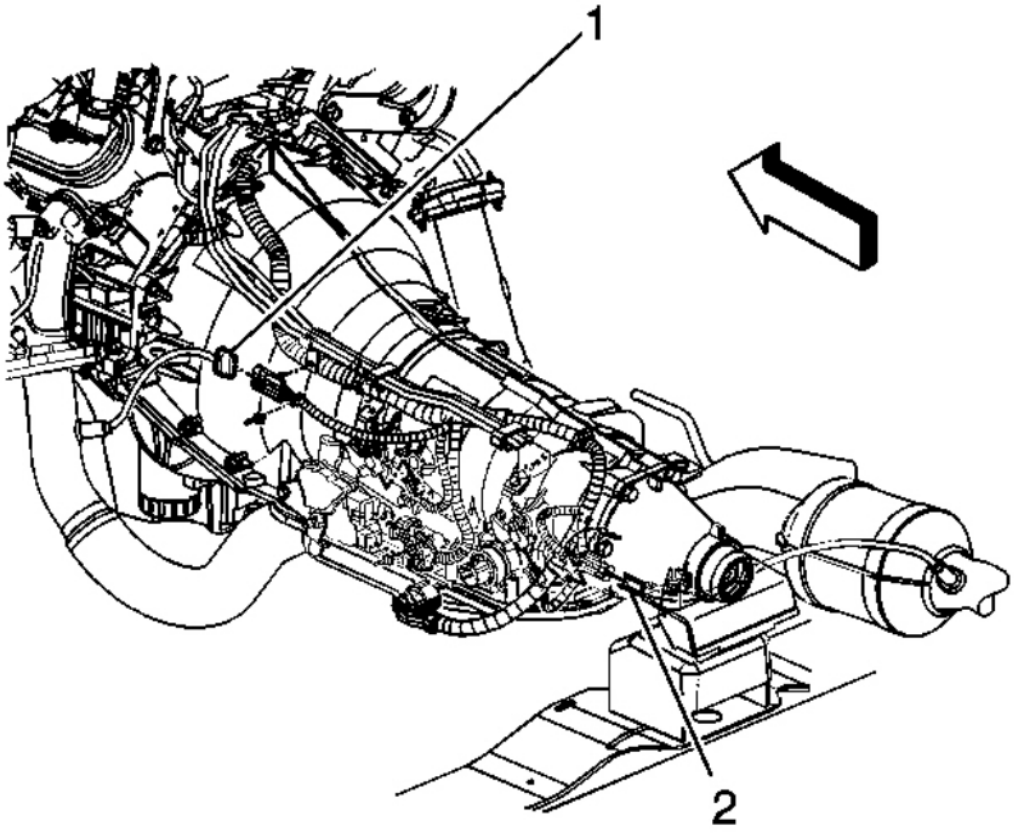


Fig. 35: View Of Transmission & HO2S Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Disconnect the connector position assurance (CPA) retainer.
3. Disconnect the oxygen sensor electrical connector (1).
4. Support the catalytic converter or exhaust manifold pipe with adjustable jackstands.

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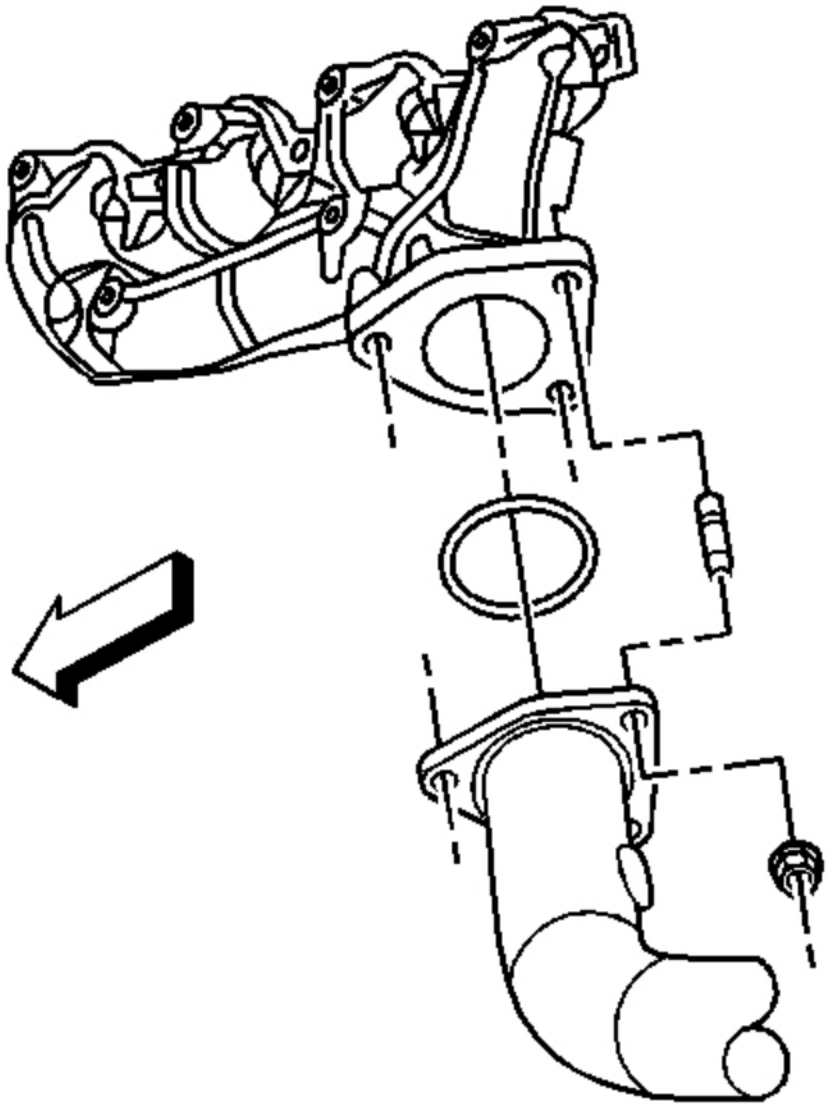


Fig. 36: View Of Left Exhaust Manifold Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

5. Remove the right exhaust manifold pipe nuts.

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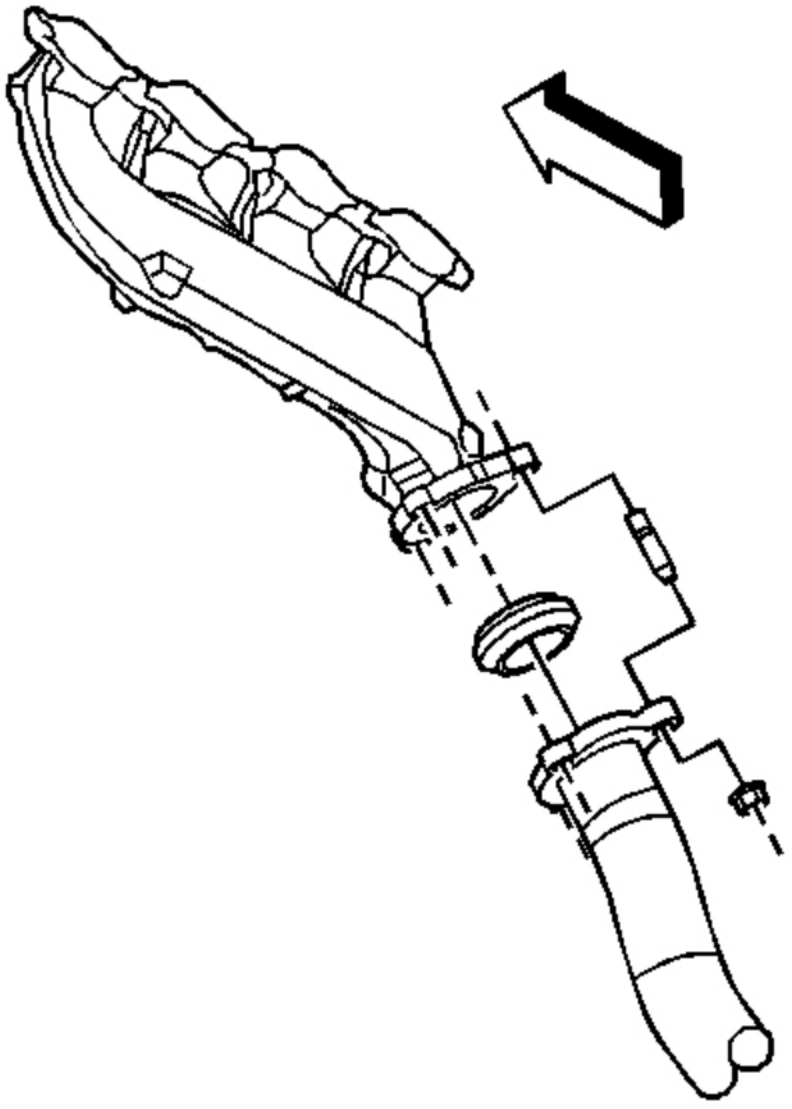


Fig. 37: View Of Right Exhaust Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

6. Remove the left exhaust manifold pipe nuts.
7. Remove the exhaust hanger mounting bracket bolts.
8. Lower the catalytic converter or exhaust manifold pipe using the adjustable jackstands.
9. Remove the exhaust manifold pipe seal(s).

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Installation Procedure

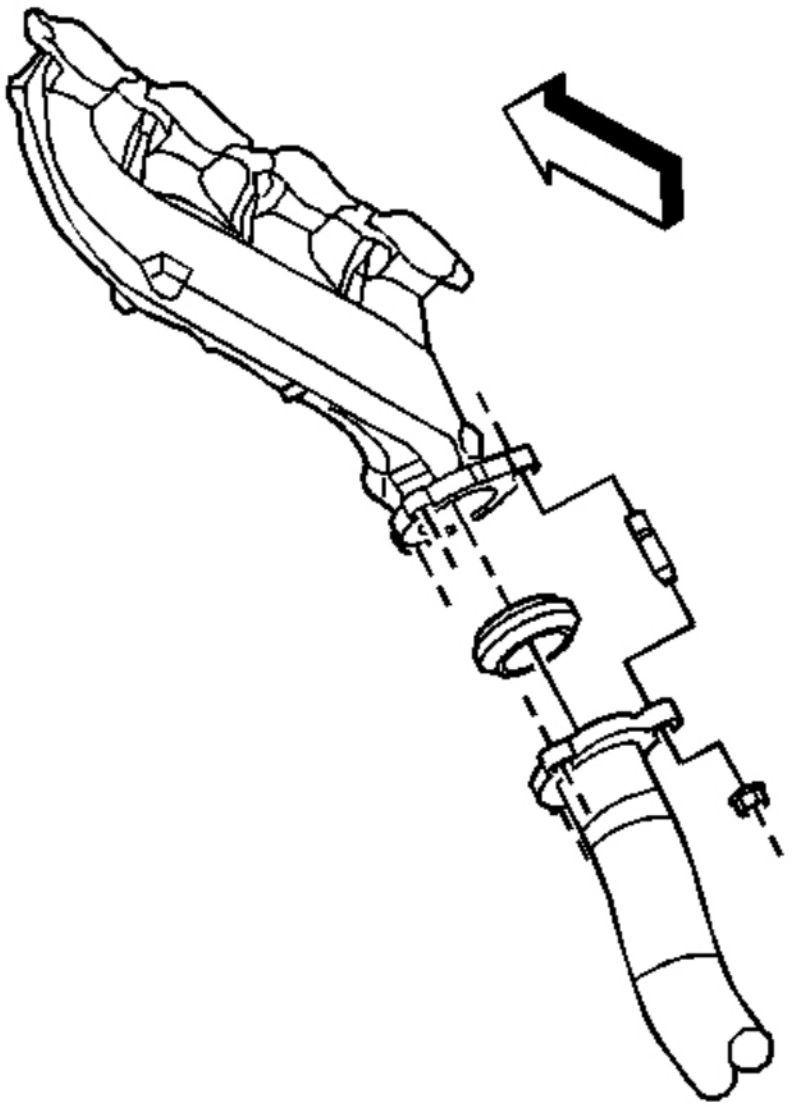


Fig. 38: View Of Right Exhaust Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the exhaust manifold pipe seal(s).
2. Raise the catalytic converter or exhaust manifold pipe using the adjustable jackstands.
3. Install the exhaust hanger mounting bracket bolts.

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NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the left exhaust manifold pipe nuts.

Tighten:

- Tighten the exhaust pipe hanger bracket bolts to 12 N.m (106 lb in).
- Tighten the exhaust manifold pipe nuts to 50 N.m (39 lb ft).

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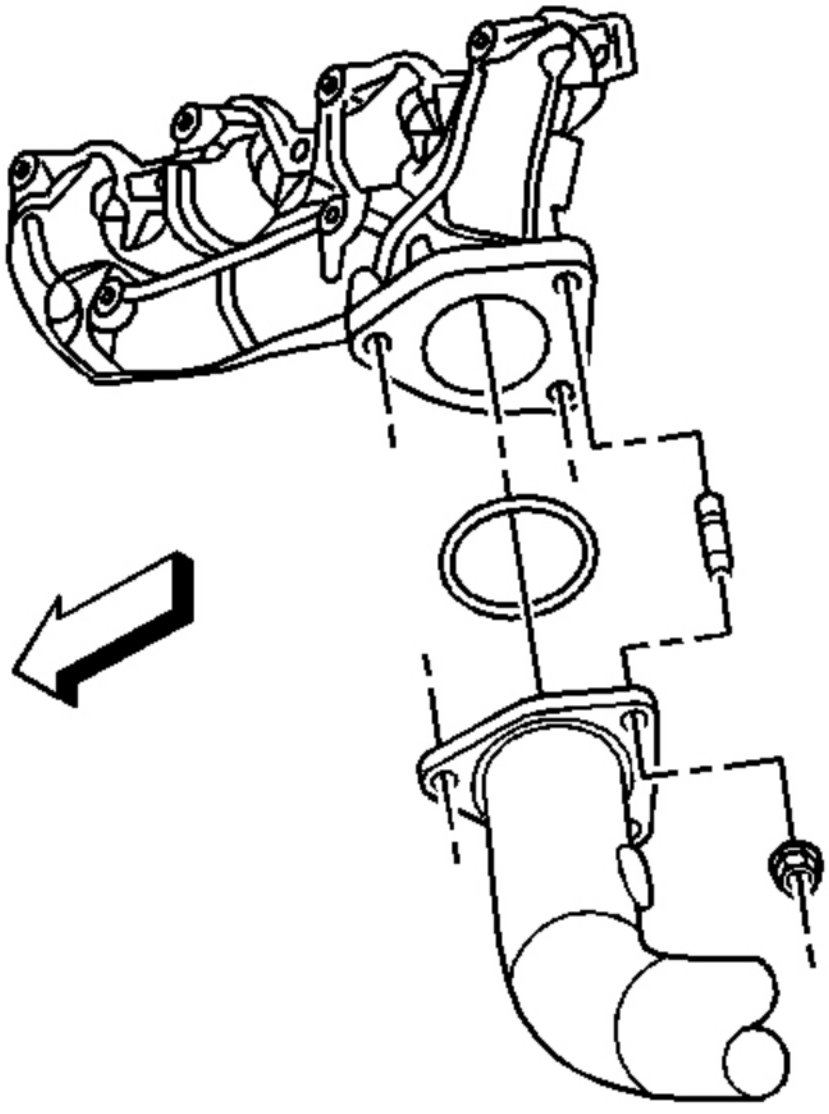


Fig. 39: View Of Left Exhaust Manifold Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

5. Install the right exhaust manifold pipe nuts.

   Tighten: Tighten the nuts to 50 N.m (39 lb ft).

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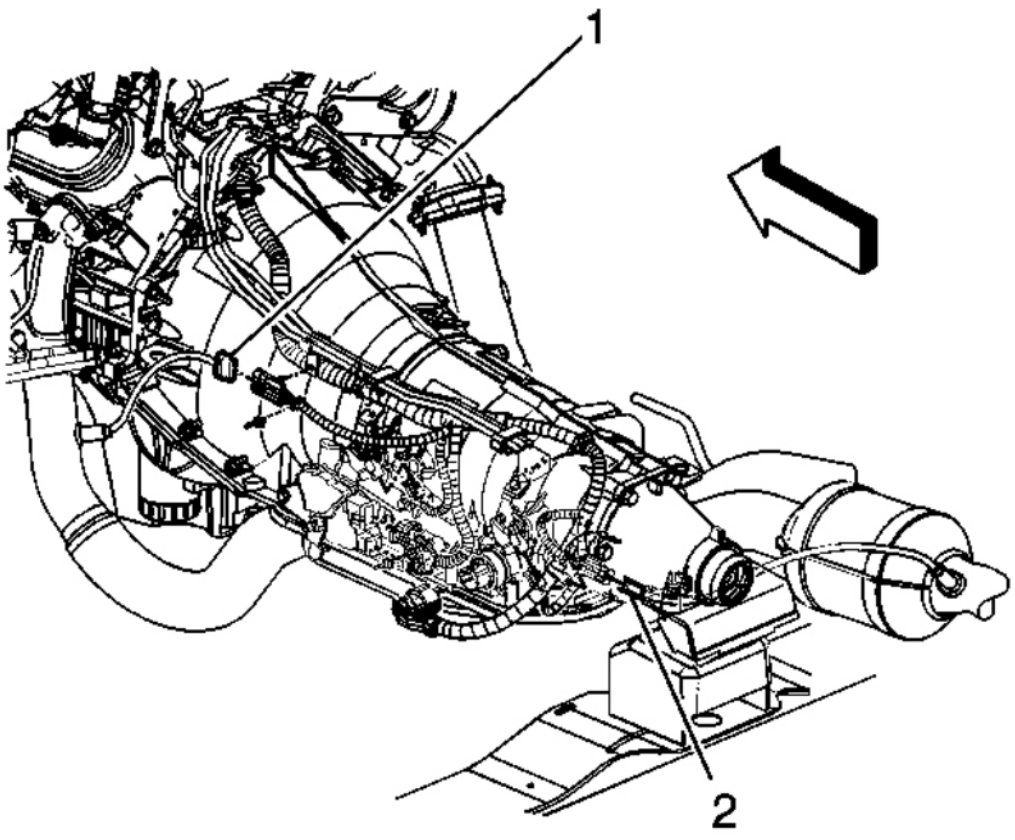


Fig. 40: View Of Transmission & HO2S Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

6. Connect the oxygen sensor electrical connector (1).
7. Connect the CPA retainer.
8. Remove the adjustable jackstands from catalytic converter or exhaust manifold pipe.
9. Lower the vehicle.

CATALYTIC CONVERTER REPLACEMENT (4.8L AND 5.3L ENGINES)

Removal Procedure

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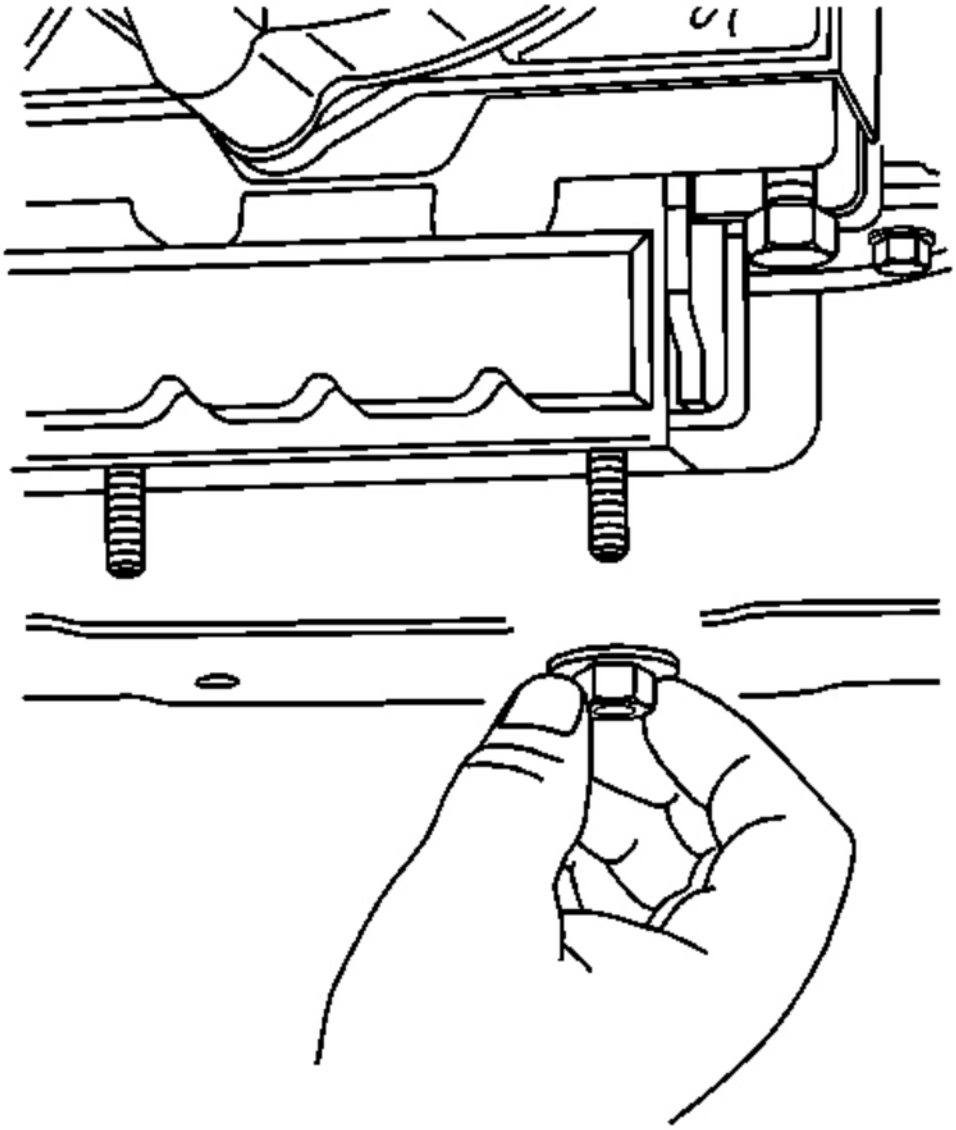


Fig. 41: Identifying Transmission Mount Nuts
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Support the transmission with a suitable transmission jack.
3. Remove the transmission mount to transmission support nuts.
4. Raise the transmission off of the transmission support.

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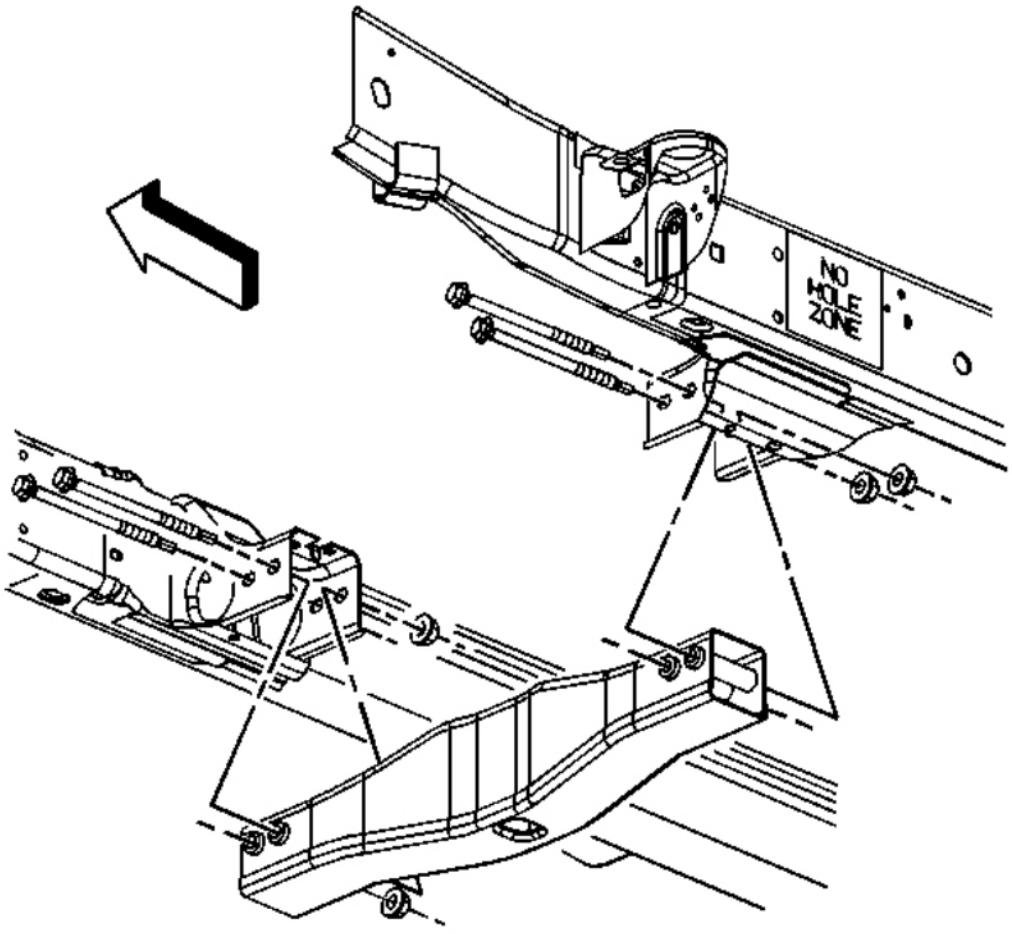


Fig. 42: View Of Transmission Crossmember
Courtesy of GENERAL MOTORS CORP.

5. Remove the transmission support crossmember bolts and nuts.
6. Remove the transmission support crossmember.

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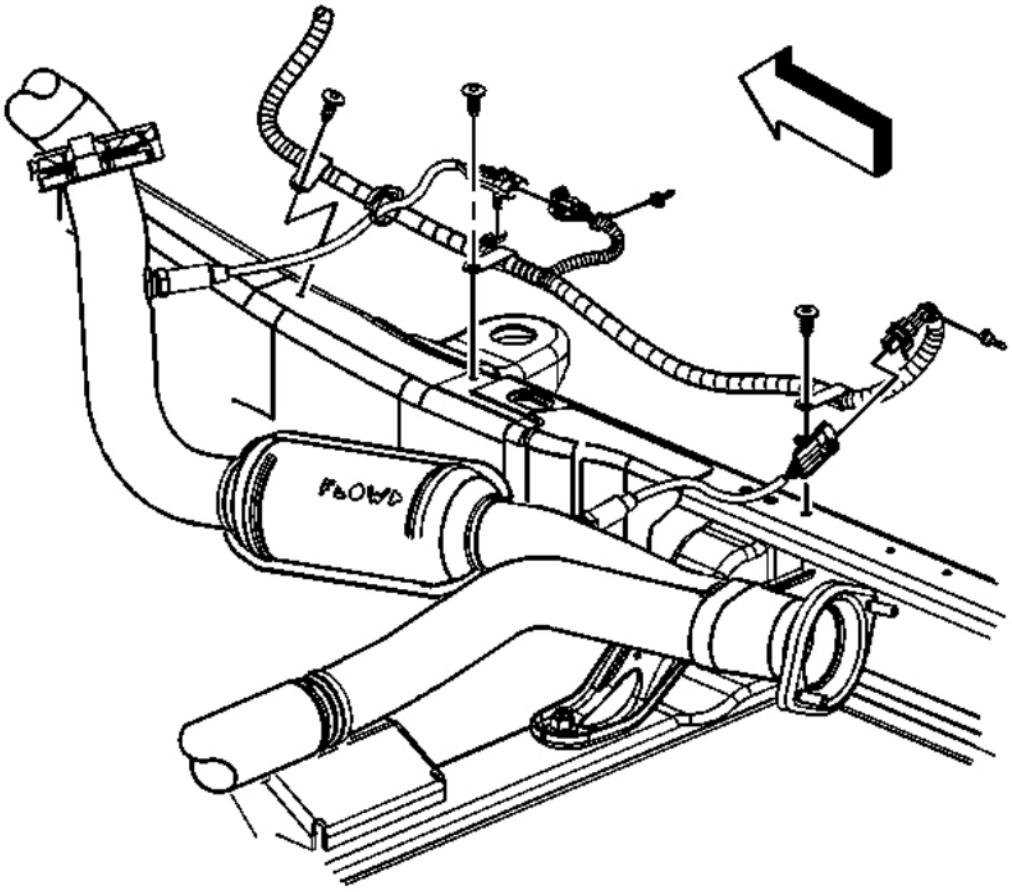


Fig. 43: View Of O2 Sensor Harness Routing And Harness Mounting Brackets
Courtesy of GENERAL MOTORS CORP.

7. Remove the clip from around the engine harness and the oxygen sensor pigtail.
8. Disconnect the connector position assurance (CPA) retainers.
9. Disconnect the oxygen sensor electrical connectors.

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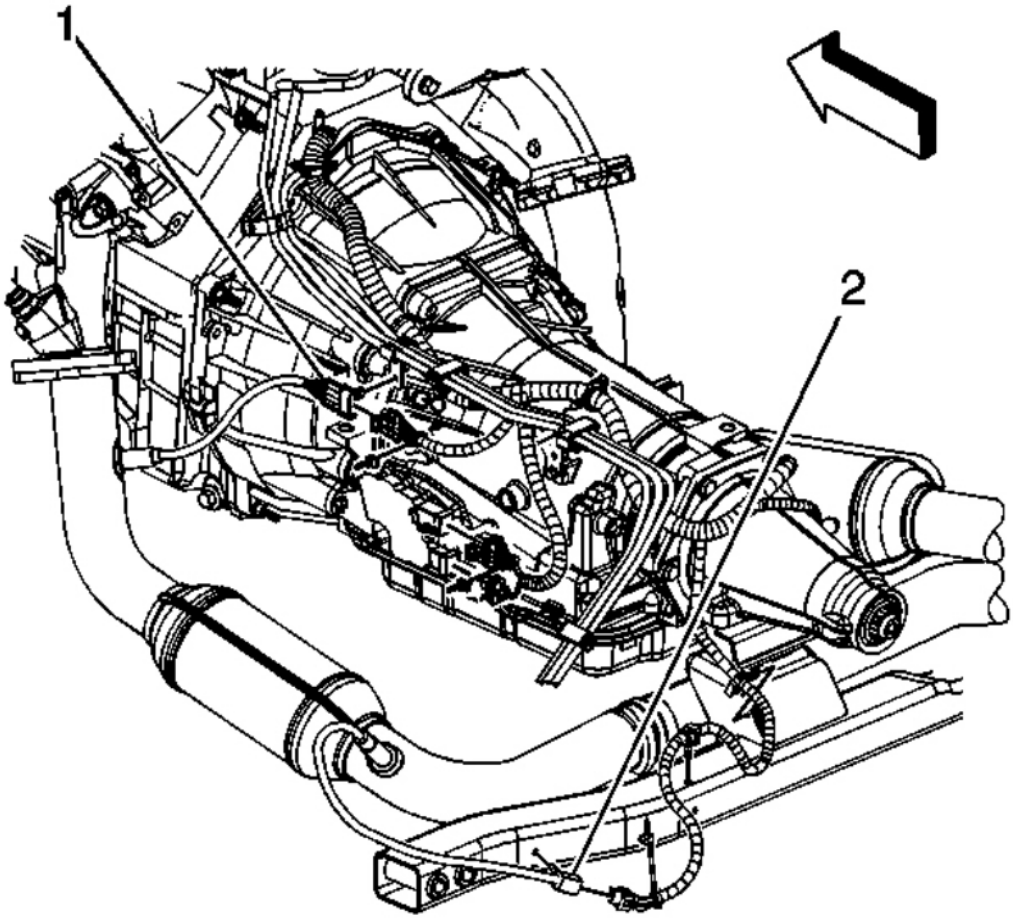


Fig. 44: View Of O2 Sensor Harness Routing
Courtesy of GENERAL MOTORS CORP.

10. Unclip the oxygen sensor electrical connectors from the following:
    - Hose clip
    - Transmission crossmember
11. Disconnect the CPA retainers.
12. Disconnect the oxygen sensor electrical connectors (1, 2).

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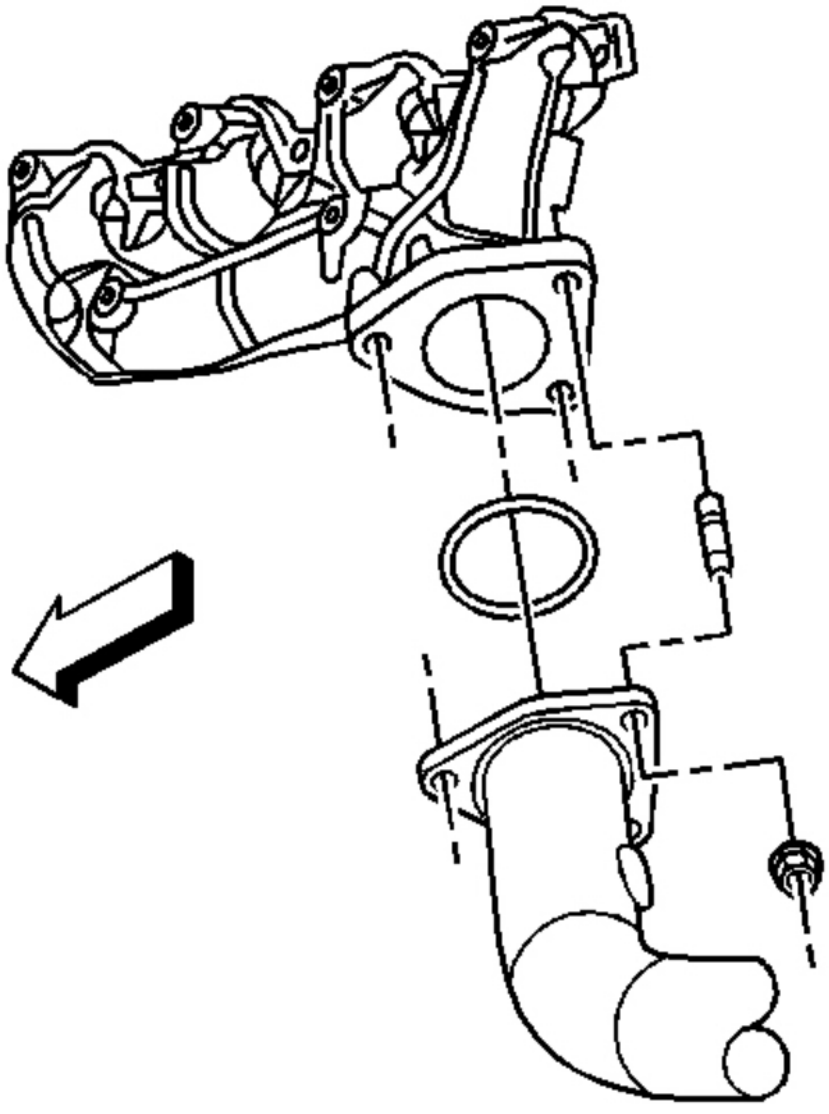


Fig. 45: View Of Left Exhaust Manifold Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

13. Remove the left exhaust manifold pipe nuts.

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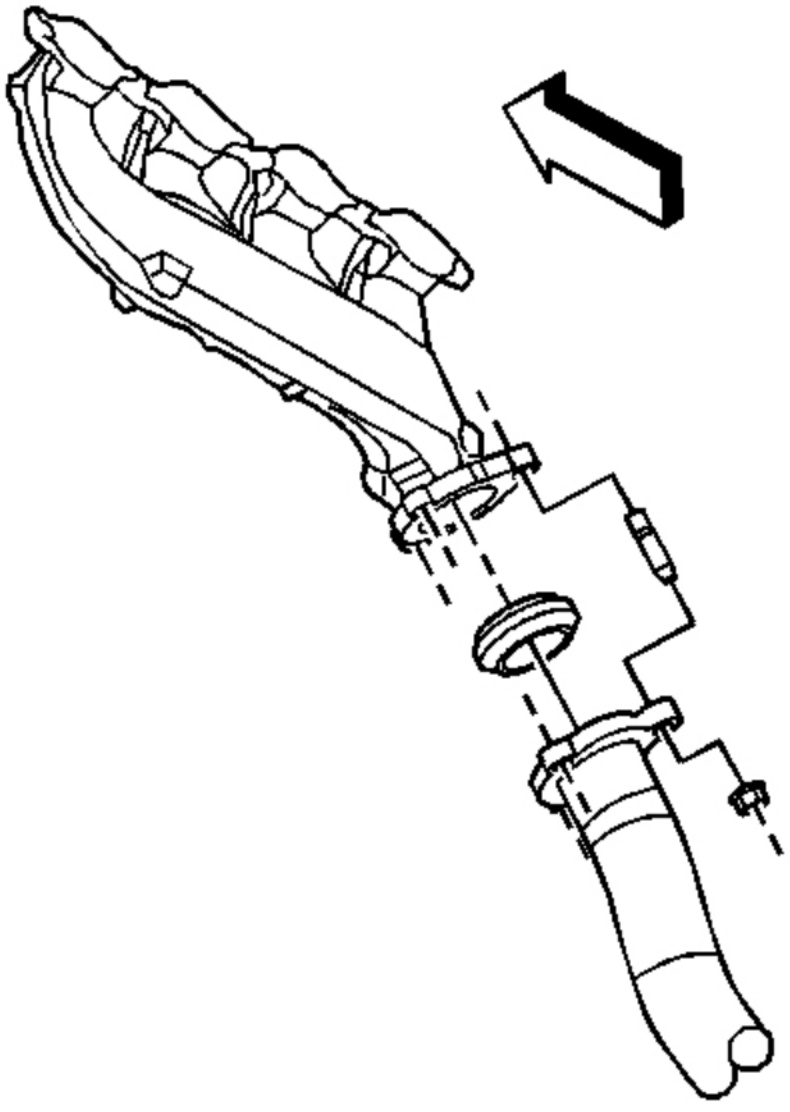


Fig. 46: View Of Right Exhaust Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

14. Remove the right exhaust manifold pipe nuts.

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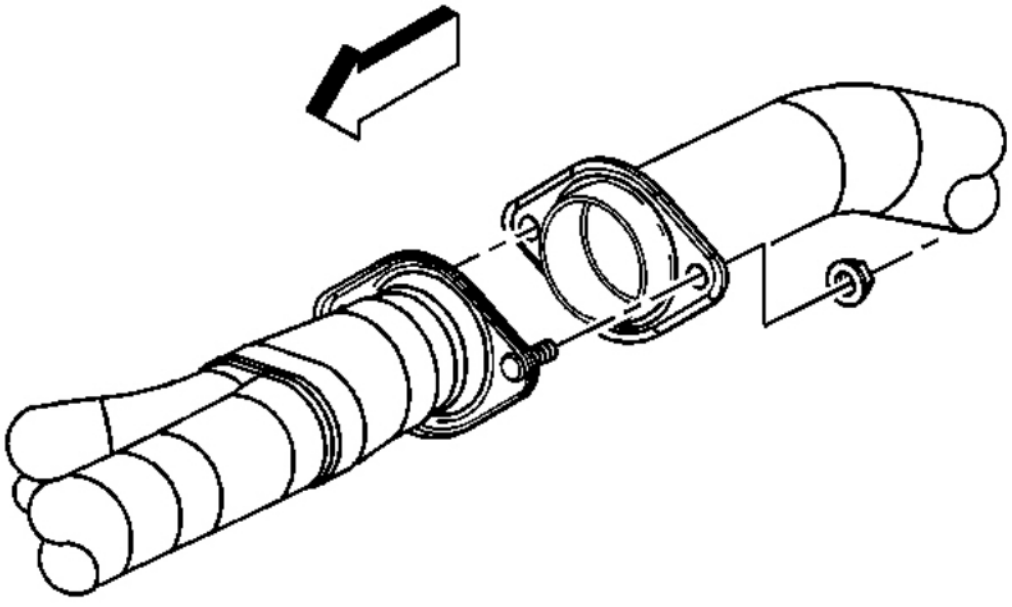


Fig. 47: View Of Exhaust Muffler Nuts
Courtesy of GENERAL MOTORS CORP.

15. Remove the exhaust muffler nuts.
16. Remove the catalytic converter.

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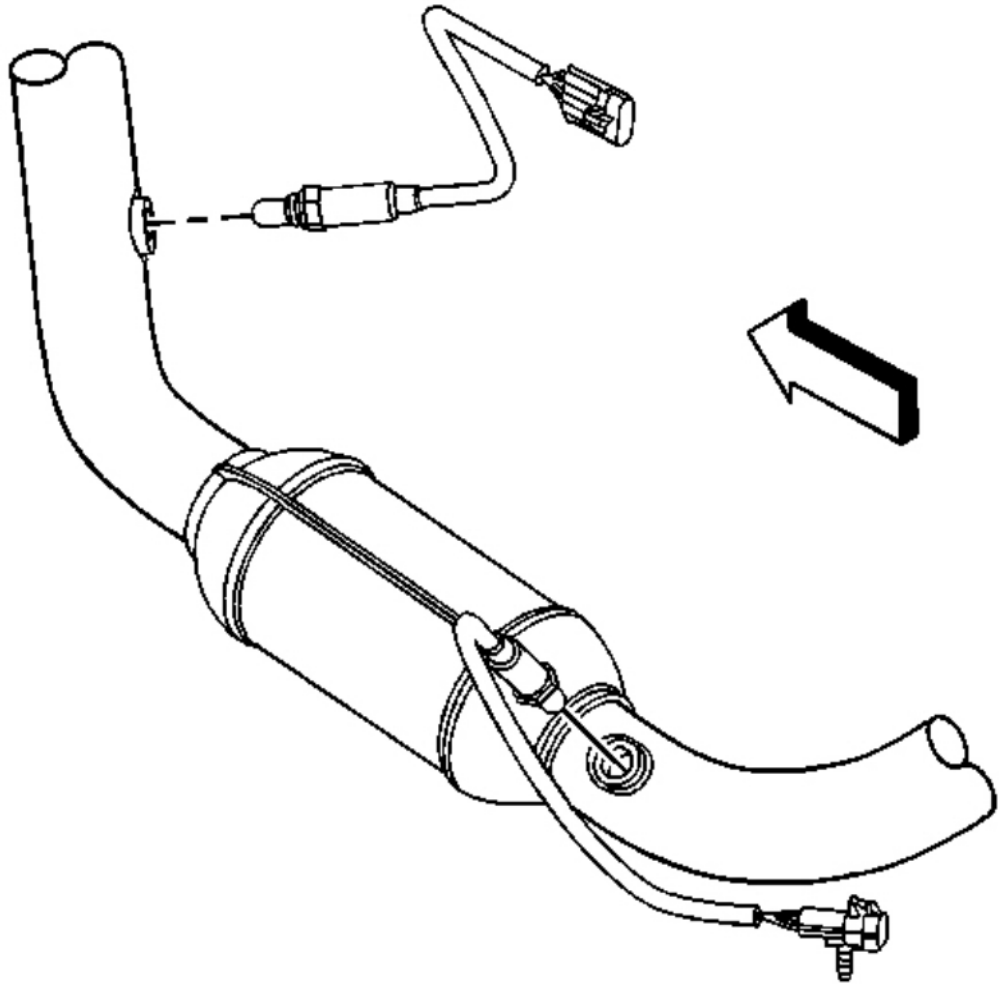


Fig. 48: View Of Oxygen Sensors
Courtesy of GENERAL MOTORS CORP.

17. Remove the oxygen sensors if the catalytic converter is to be replaced.

Installation Procedure

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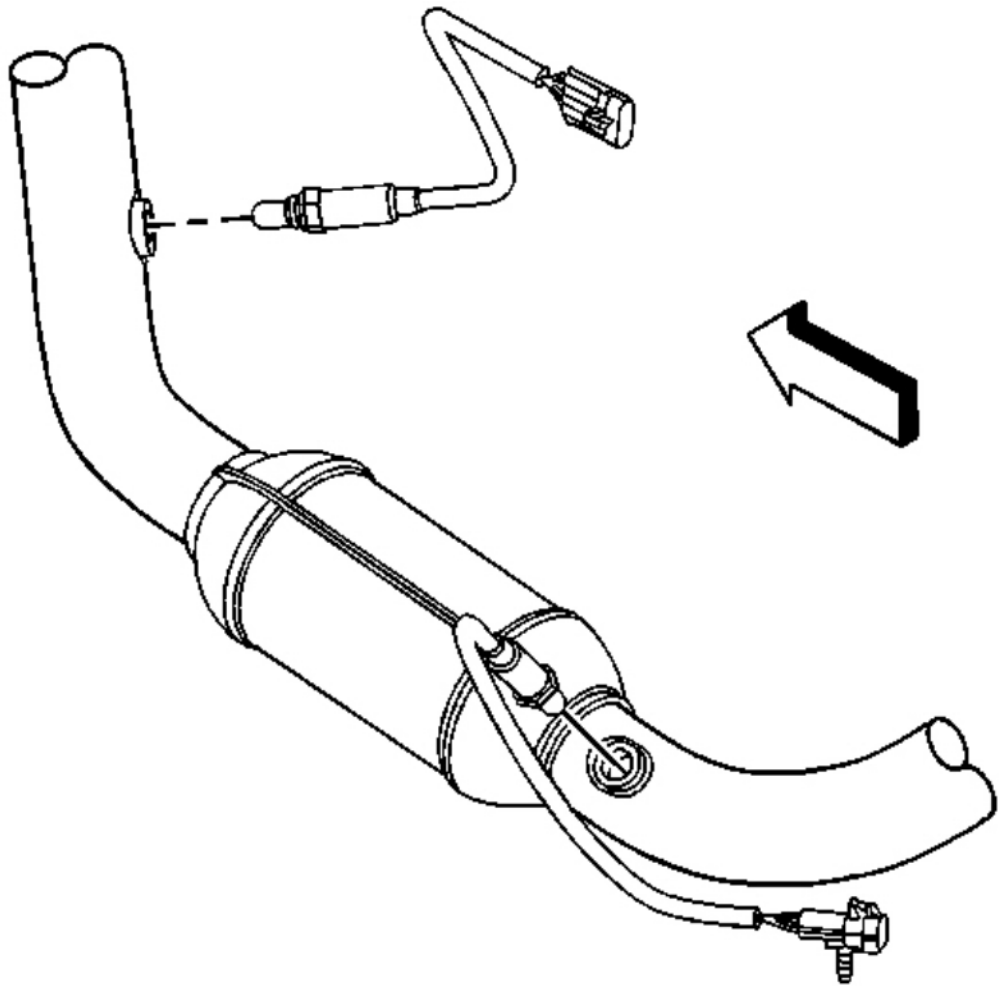


Fig. 49: View Of Oxygen Sensors
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. If the catalytic converter was replaced, perform the following:
    1. Apply anti-seize compound GM P/N 12377953 or equivalent to the threads of the old oxygen sensors.
    2. Install the oxygen sensors.

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

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2. Install the catalytic convertor.

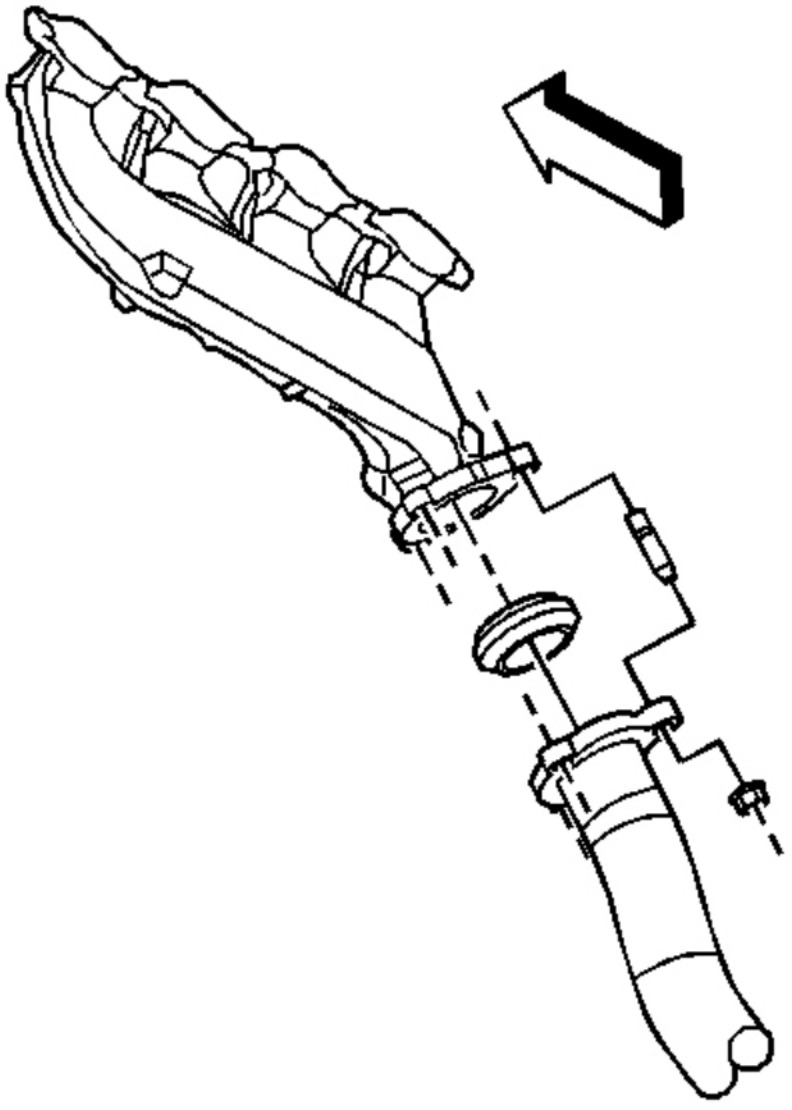


Fig. 50: View Of Right Exhaust Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

3. Install NEW exhaust manifold pipe seals to the exhaust manifolds.
4. Install the right exhaust manifold pipe nuts until sung.

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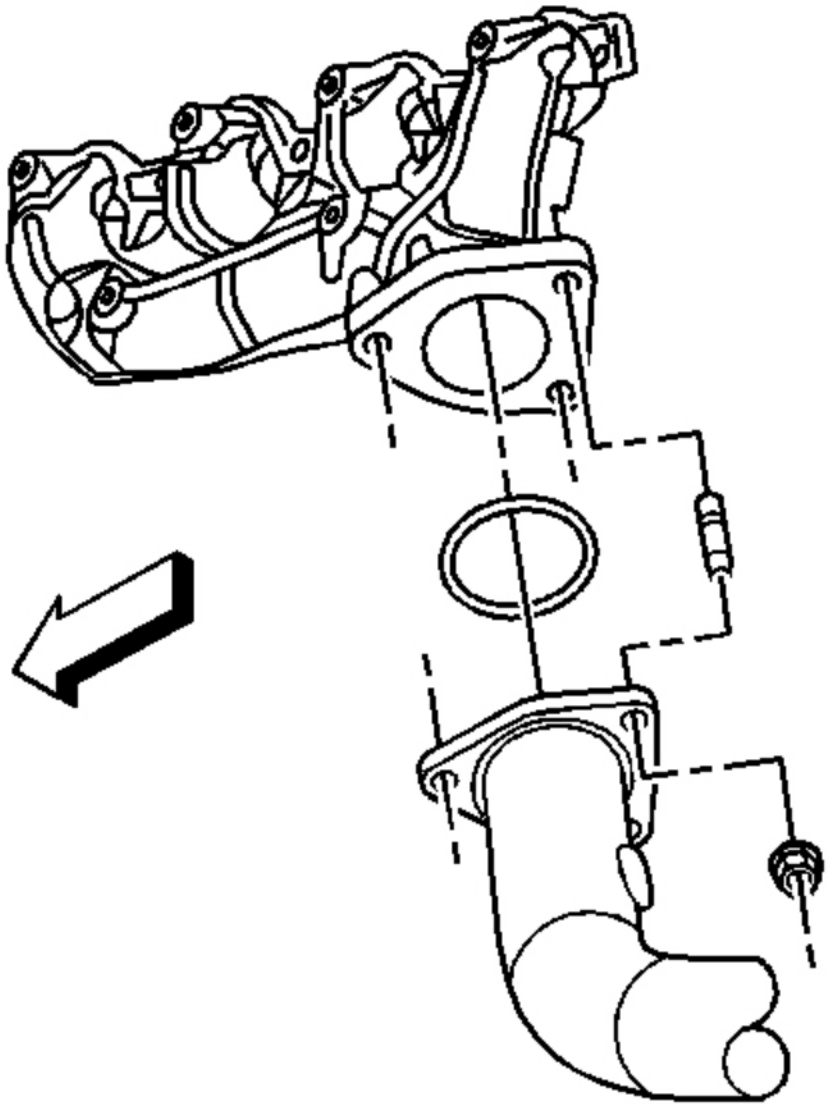


Fig. 51: View Of Left Exhaust Manifold Pipe & Nuts
Courtesy of GENERAL MOTORS CORP.

5. Install the left exhaust manifold pipe nuts until snug.
6. Tighten the right and left exhaust manifold pipe nuts.

Tighten: Tighten the nuts to 50 N.m (39 lb ft).

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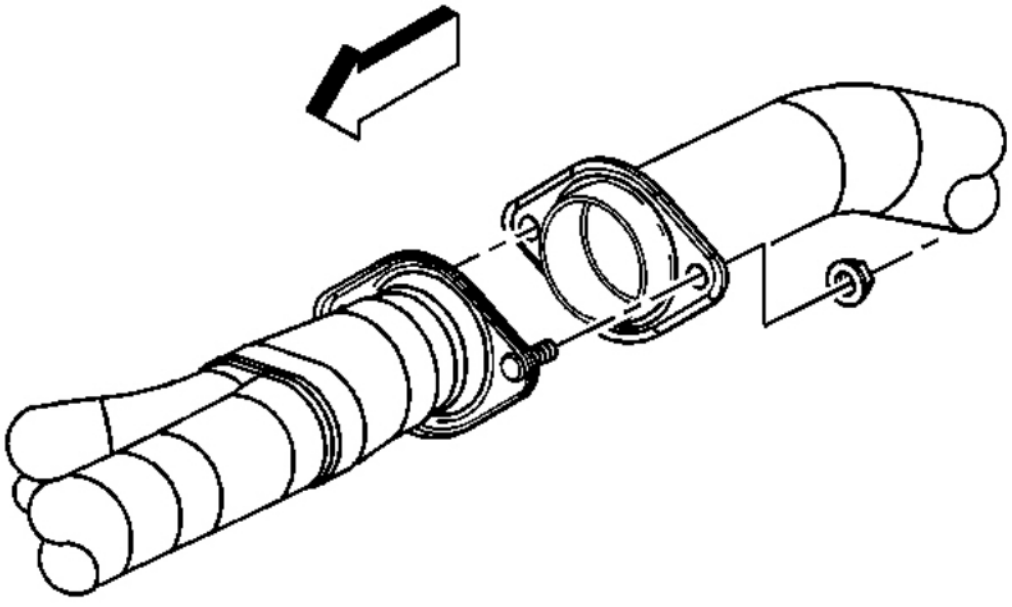


Fig. 52: View Of Exhaust Muffler Nuts
Courtesy of GENERAL MOTORS CORP.

7. Install the exhaust muffler nuts.

   Tighten: Tighten the nuts to 40 N.m (30 lb ft).

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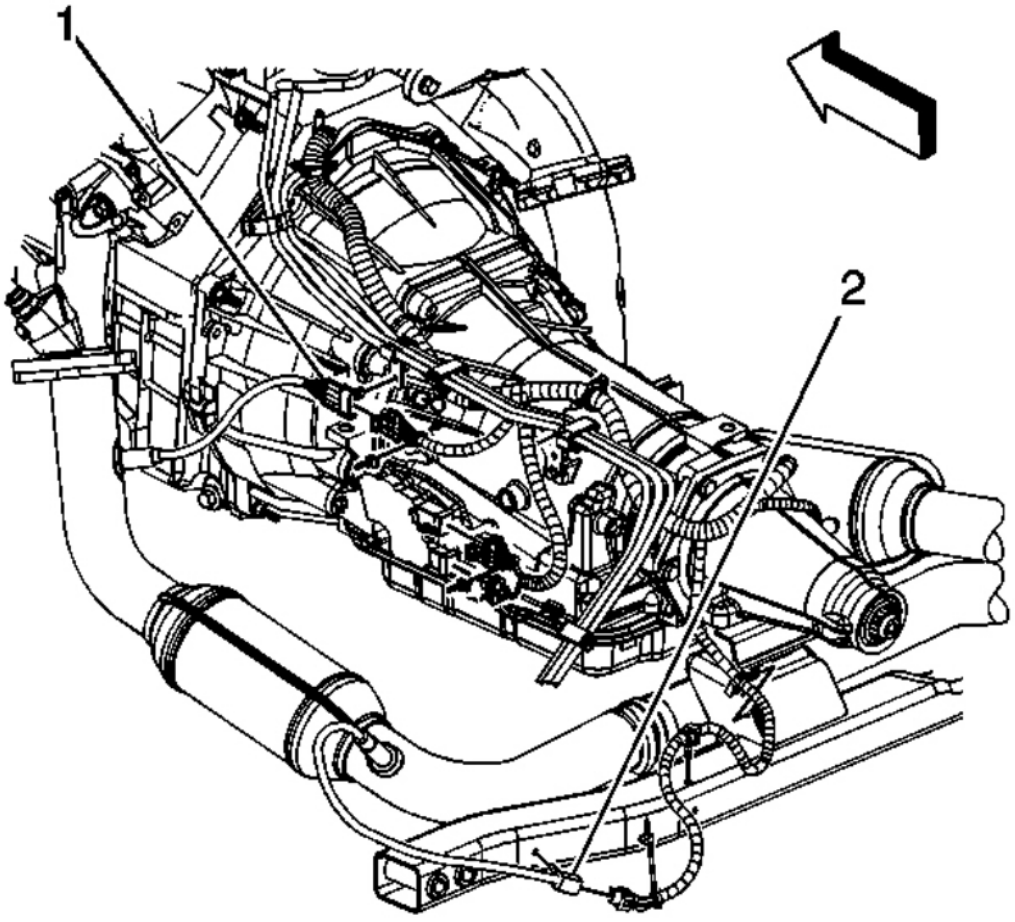


Fig. 53: View Of O2 Sensor Harness Routing
Courtesy of GENERAL MOTORS CORP.

8. Connect the oxygen sensor electrical connectors (1, 2).
9. Connect the CPA retainers.
10. Clip the oxygen sensors electrical connectors to the following:
    - Hose clip
    - Transmission crossmember

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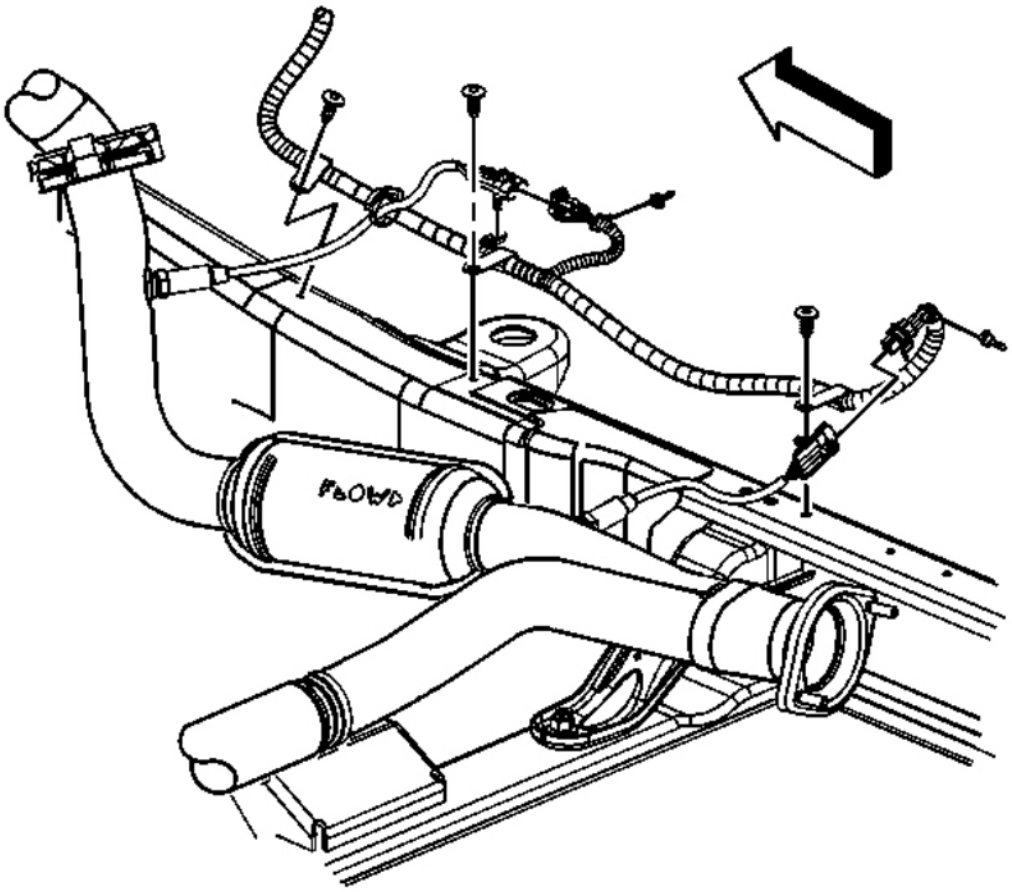


Fig. 54: View Of O2 Sensor Harness Routing And Harness Mounting Brackets
Courtesy of GENERAL MOTORS CORP.

11. Connect the oxygen sensor electrical connectors.
12. Connect the CPA retainers.
13. Install the clip around the engine harness and the oxygen sensor pigtail.

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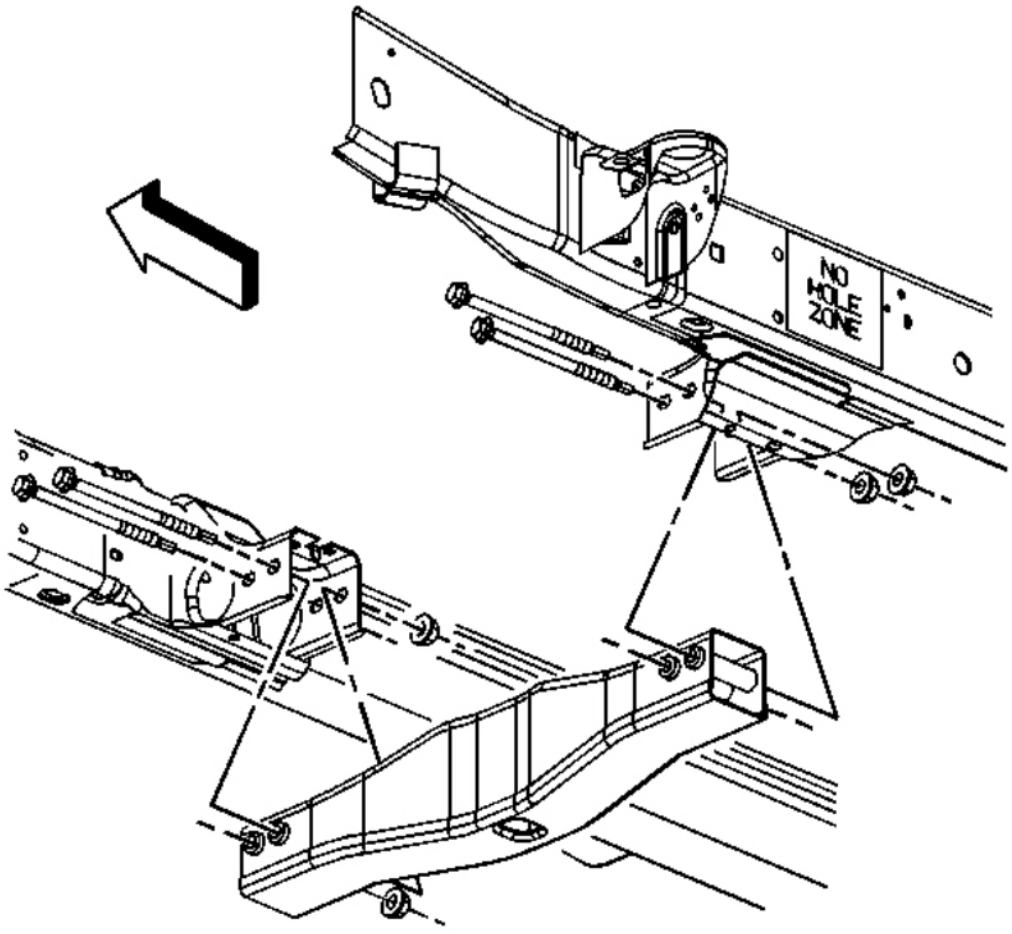


Fig. 55: View Of Transmission Crossmember
Courtesy of GENERAL MOTORS CORP.

14. Install the transmission support crossmember.
15. Install the transmission support crossmember bolts and nuts.

Tighten: Tighten the bolts to 95 N.m (70 lb ft).

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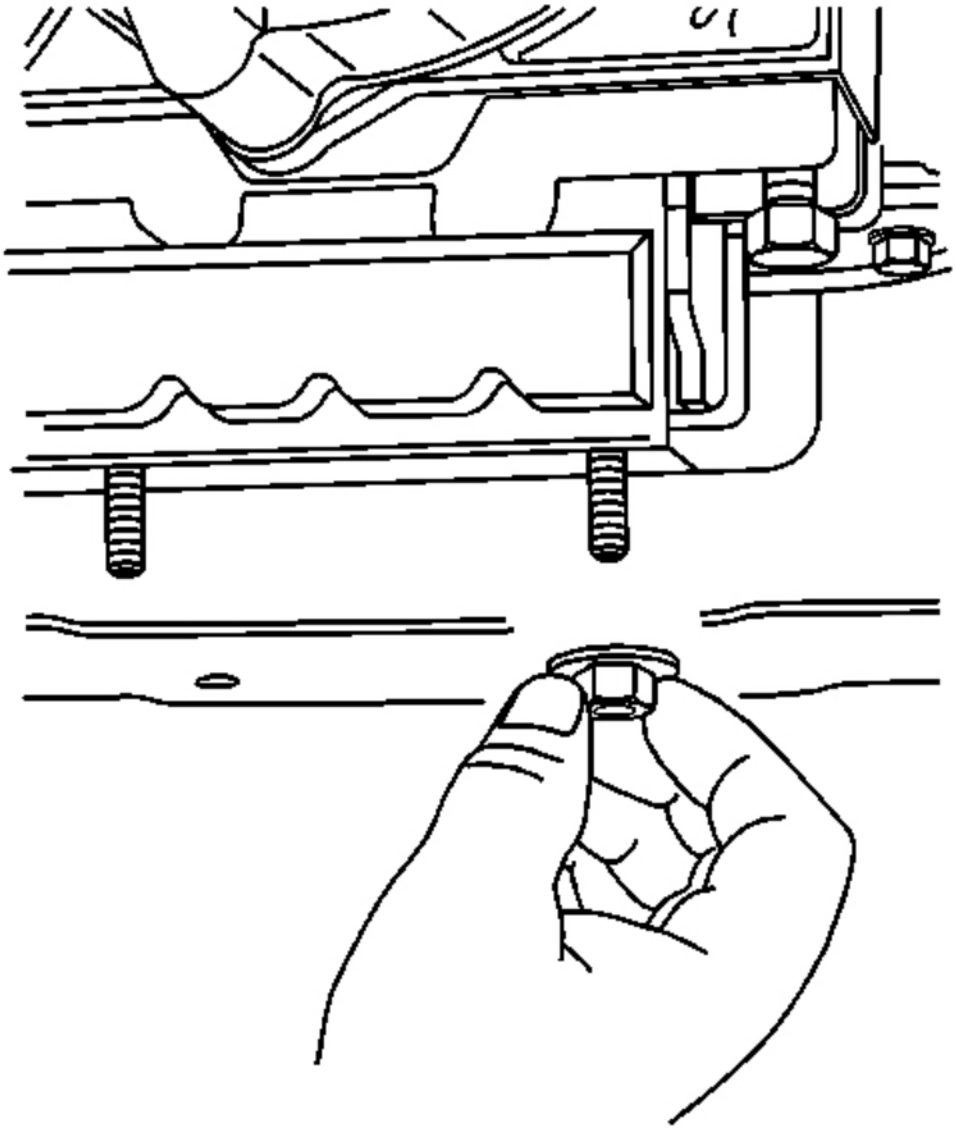


Fig. 56: Identifying Transmission Mount Nuts
Courtesy of GENERAL MOTORS CORP.

16. Lower the transmission onto the transmission support.
17. Install the transmission mount to transmission support nuts.

Tighten: Tighten the nuts to 40 N.m (30 lb ft).

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18. Remove the transmission jack.
19. Lower the vehicle.

CATALYTIC CONVERTER REPLACEMENT (6.0L AND 8.1L ENGINES)

Removal Procedure

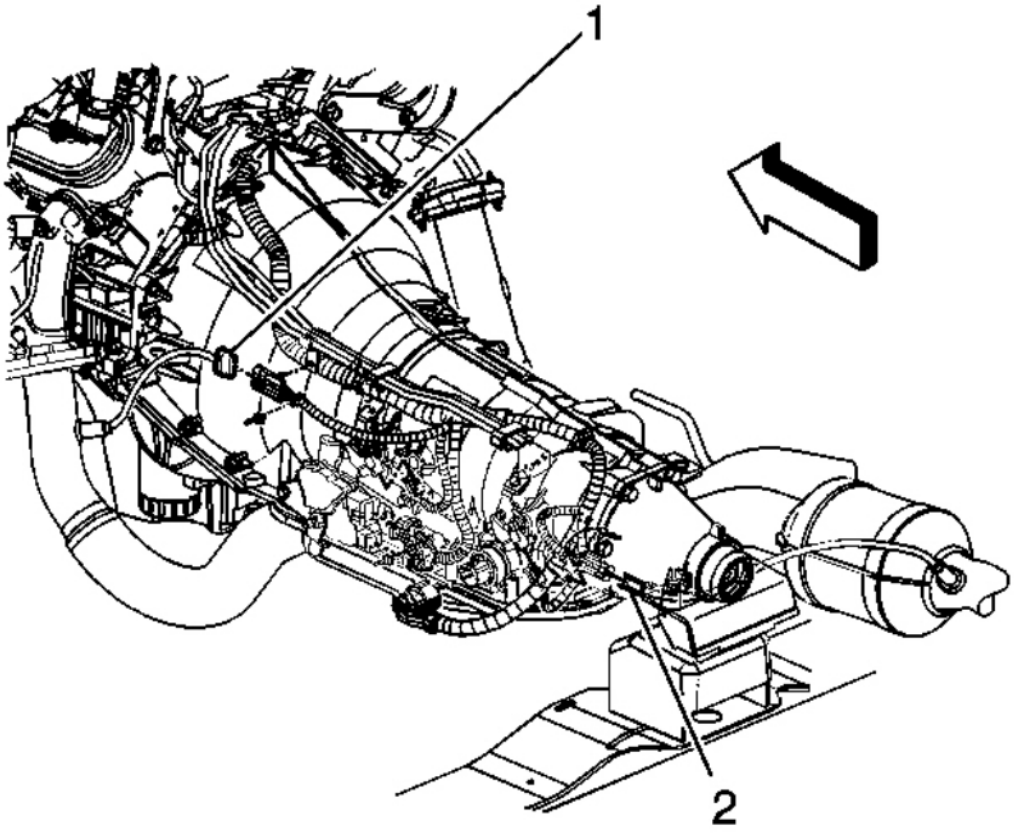


Fig. 57: View Of Transmission & HO2S Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the muffler. Refer to **Muffler Replacement (4.8L and 5.3L Engines)** or **Muffler Replacement (6.0L and 8.1L Engines)**.
3. Disconnect the connector position assurance (CPA) retainers.
4. Disconnect the oxygen sensor electrical connectors (1, 2).

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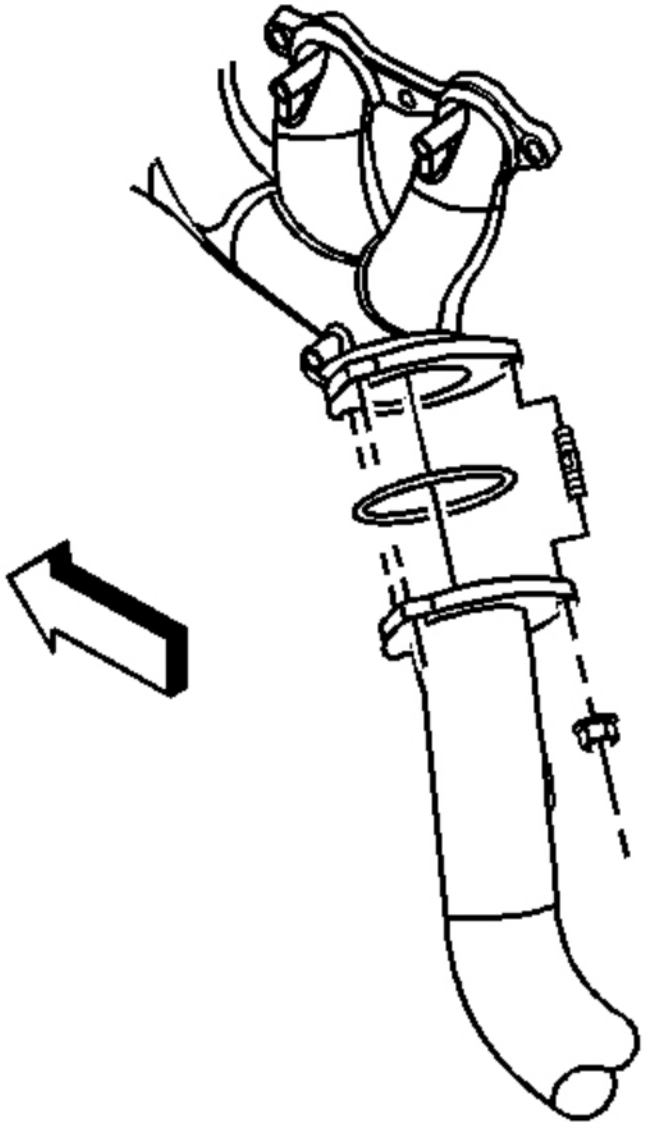


Fig. 58: View Of Left Exhaust Manifold Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

5. Remove the left exhaust manifold pipe nuts.

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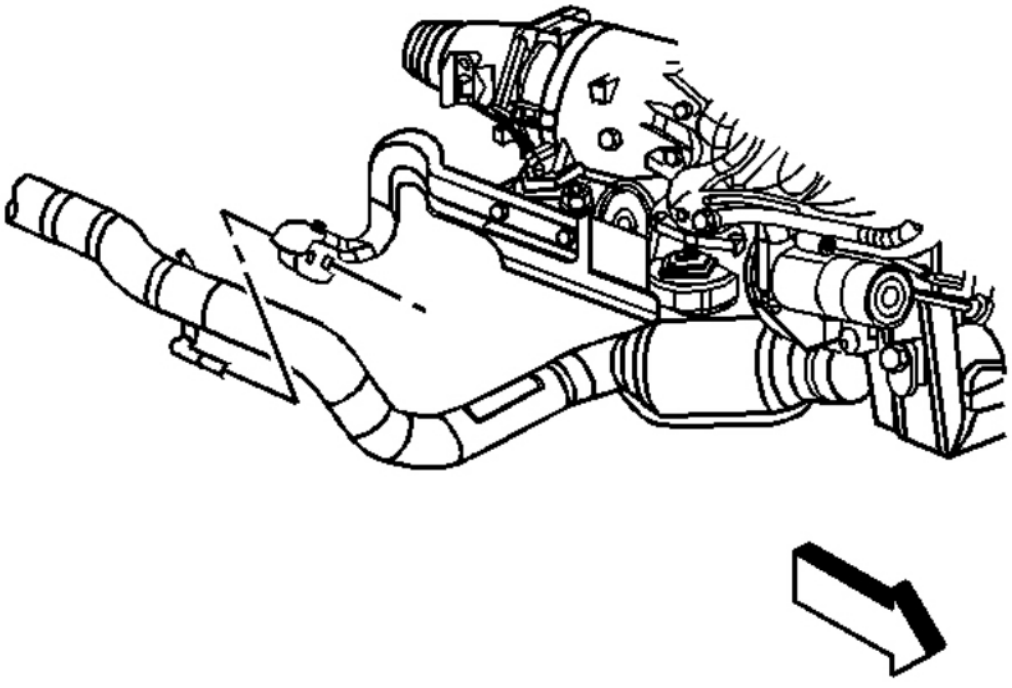


Fig. 59: View Of Catalytic Converter (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

6. Remove the catalytic converter.
7. Slide the catalytic converter hanger out of the exhaust pipe hanger bracket.

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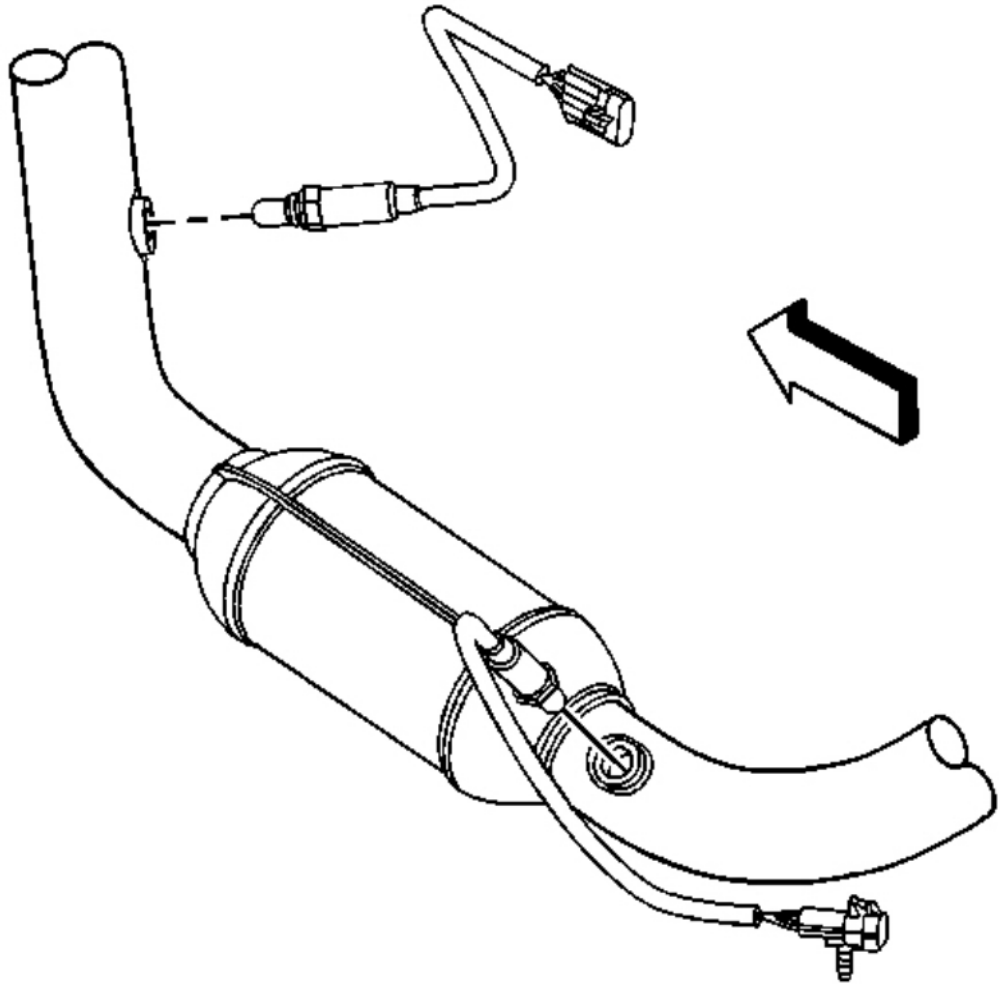


Fig. 60: View Of Oxygen Sensors
Courtesy of GENERAL MOTORS CORP.

8. Remove the oxygen sensors if the catalytic converter is to be replaced.

Installation Procedure

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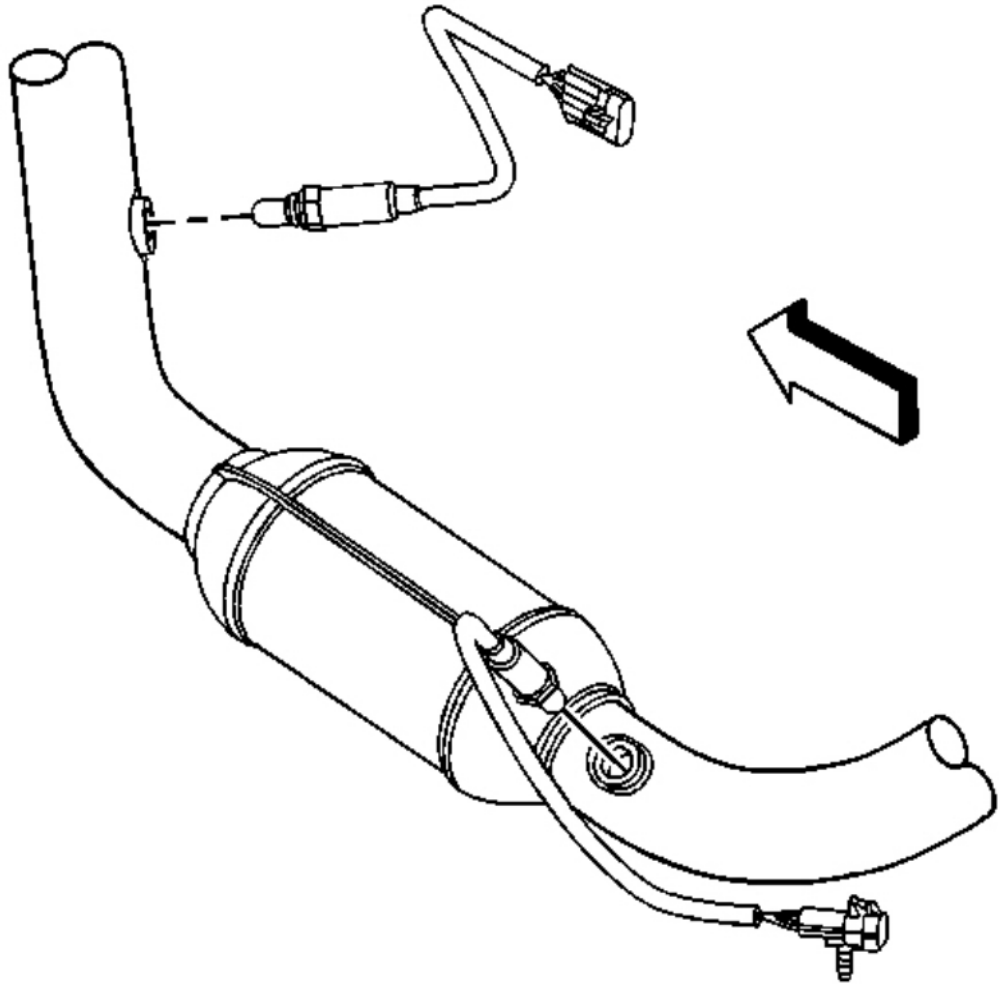


Fig. 61: View Of Oxygen Sensors
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. If the catalytic converter was replaced, perform the following:
    1. Apply anti-seize compound GM P/N 12377953 or equivalent to the threads of the old oxygen sensors.
    2. Install the oxygen sensors.

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

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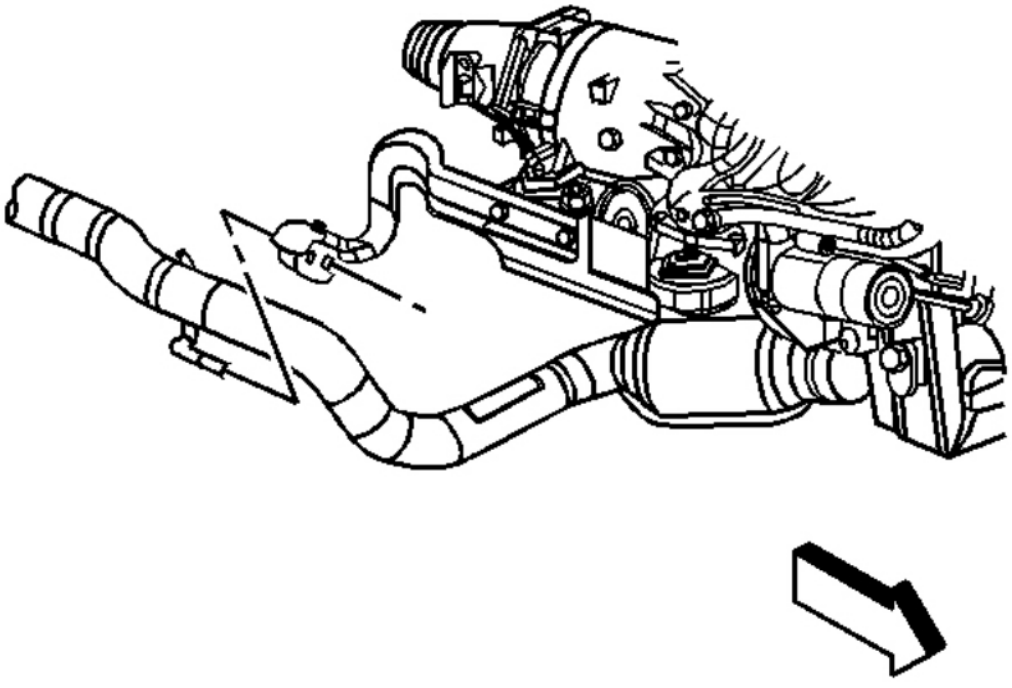


Fig. 62: View Of Catalytic Converter (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

2. Install a NEW exhaust seal to the exhaust manifold.
3. Install the catalytic converter.

   Slide the catalytic converter hanger into the exhaust pipe hanger bracket.

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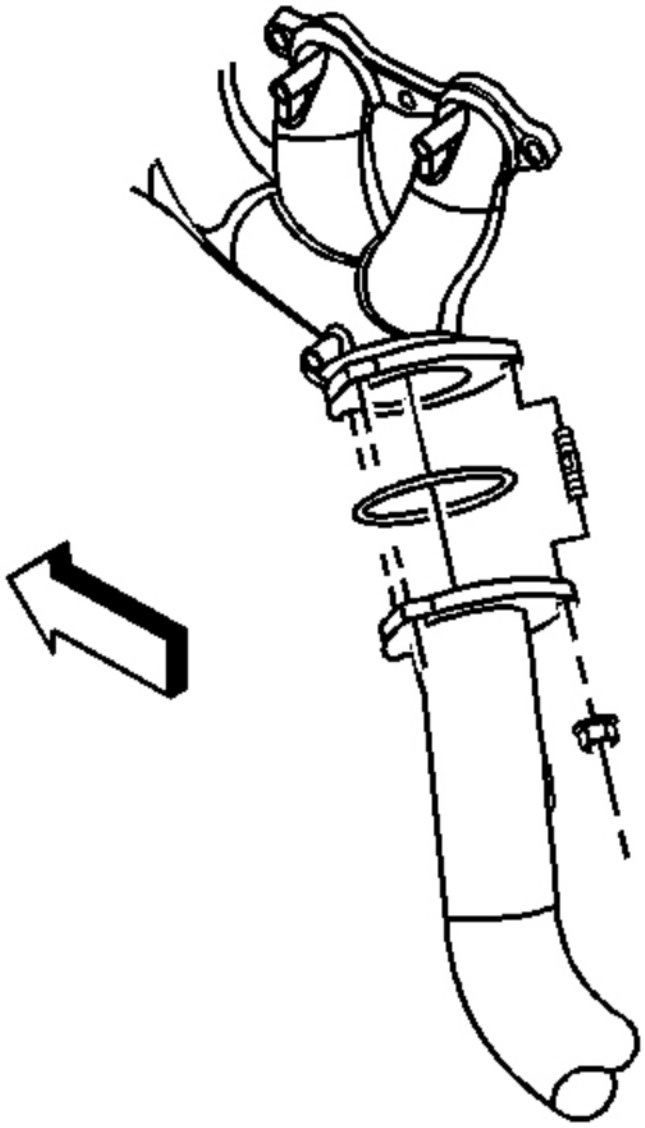


Fig. 63: View Of Left Exhaust Manifold Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

4. Install the left exhaust manifold pipe nuts.

   Tighten: Tighten the nuts to 50 N.m (39 lb ft).

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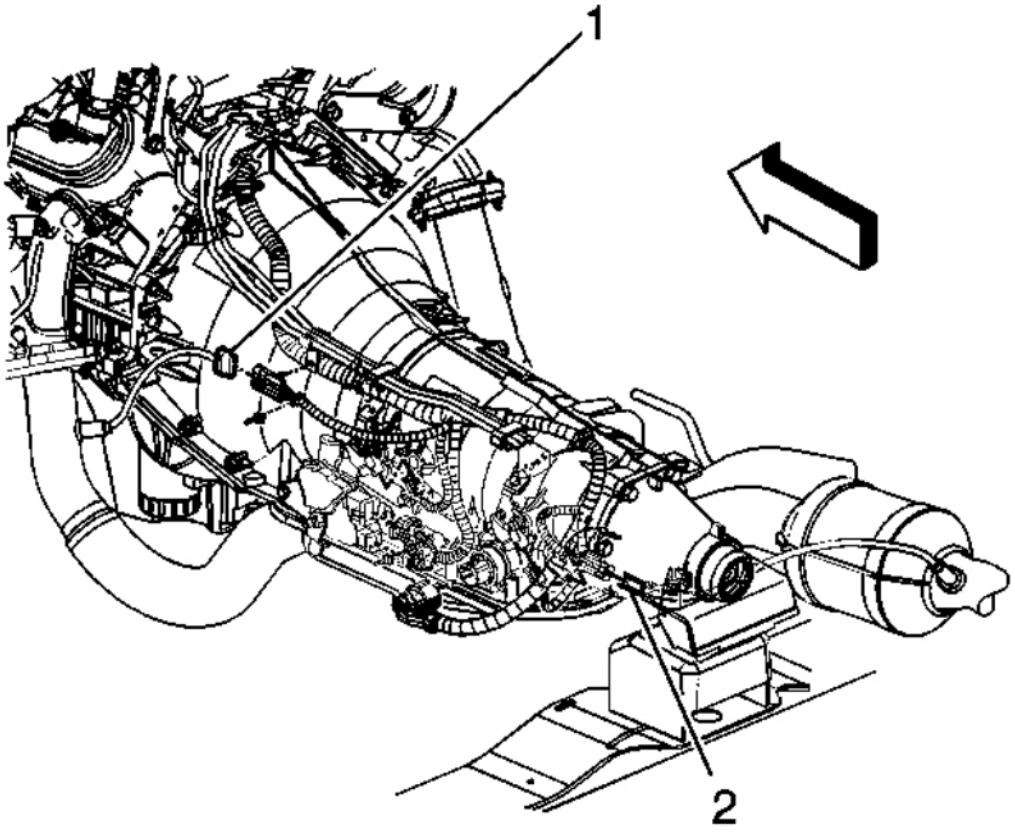


Fig. 64: View Of Transmission & HO2S Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

5. Connect the oxygen sensor electrical connectors (1, 2).
6. Connect the CPA retainers.
7. Install the muffler. Refer to **Muffler Replacement (4.8L and 5.3L Engines)** or **Muffler Replacement (6.0L and 8.1L Engines)**.
8. Lower the vehicle.

EXHAUST HANGER MOUNTING BRACKET REPLACEMENT (6.0L AND 8.1L ENGINES)

Removal Procedure

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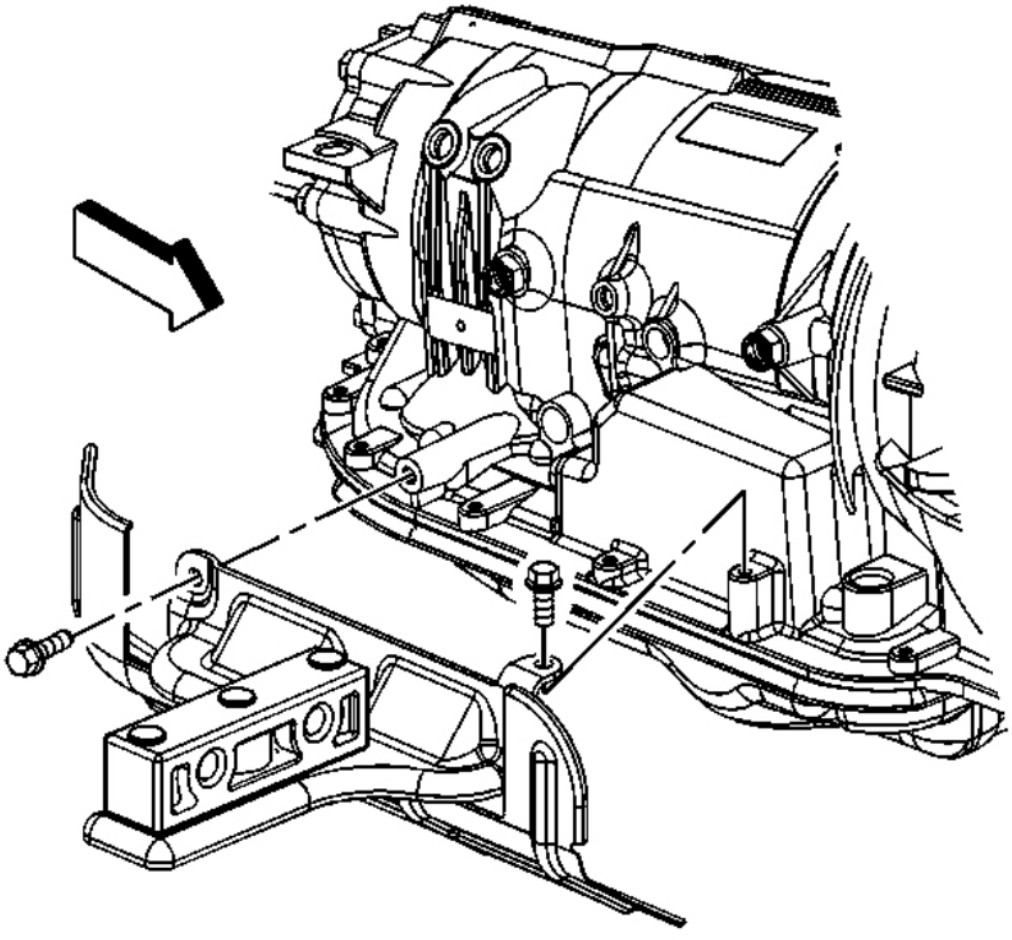


Fig. 65: View Of Exhaust Pipe Hanger Bracket & Bolts (4L80E Transmission)
Courtesy of GENERAL MOTORS CORP.

1. Remove the exhaust manifold pipe. Refer to **Exhaust Manifold Pipe Replacement (6.0L and 8.1L Engines)**.
2. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (4.8L and 5.3L Engines)** or **Catalytic Converter Replacement (6.0L and 8.1L Engines)**.
3. If equipped with a 4L80E transmission, remove the exhaust pipe hanger bracket bolts.

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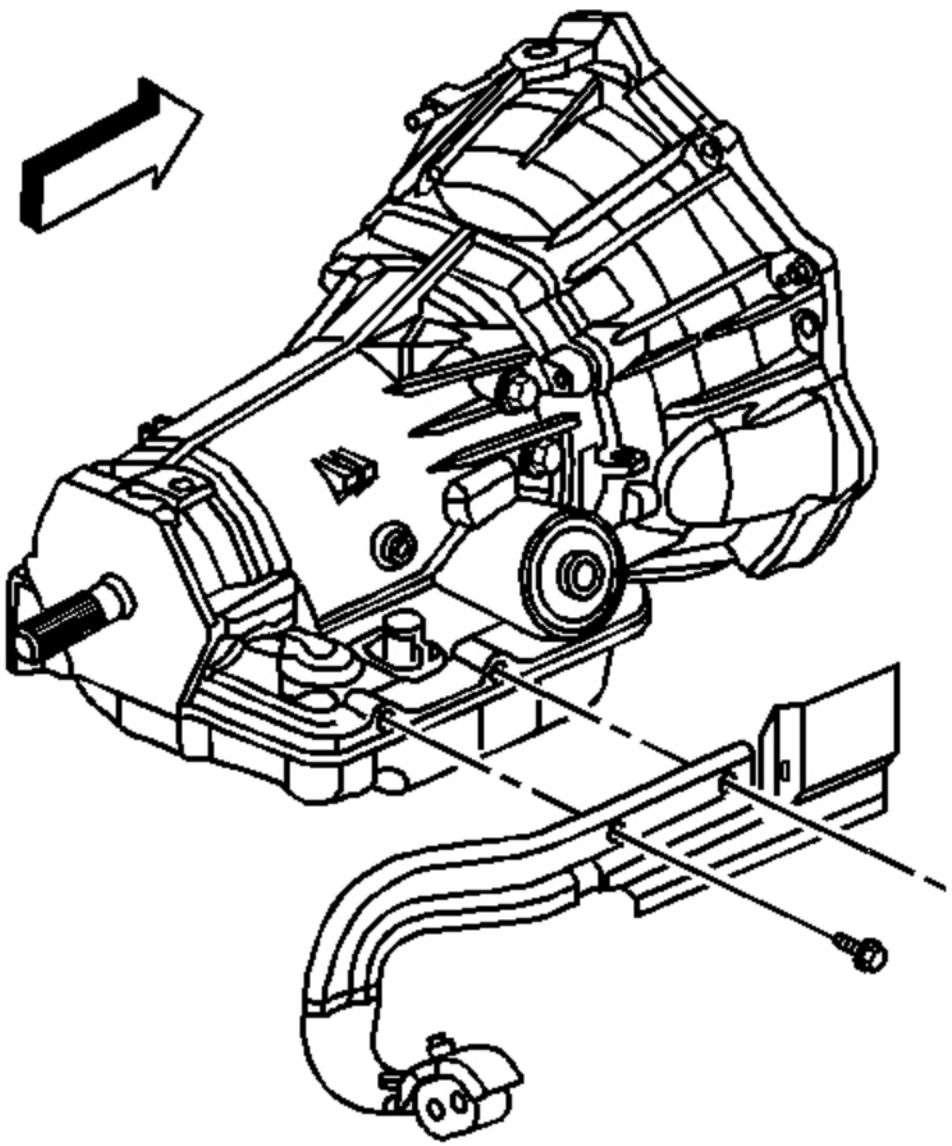


Fig. 66: View Of Heat Shield/Exhaust Pipe Hanger Bracket & Bolts
Courtesy of GENERAL MOTORS CORP.

4. If equipped with a 4L60E transmission, remove the exhaust pipe hanger bracket bolts.
5. Remove the exhaust manifold pipe bracket.

Installation Procedure

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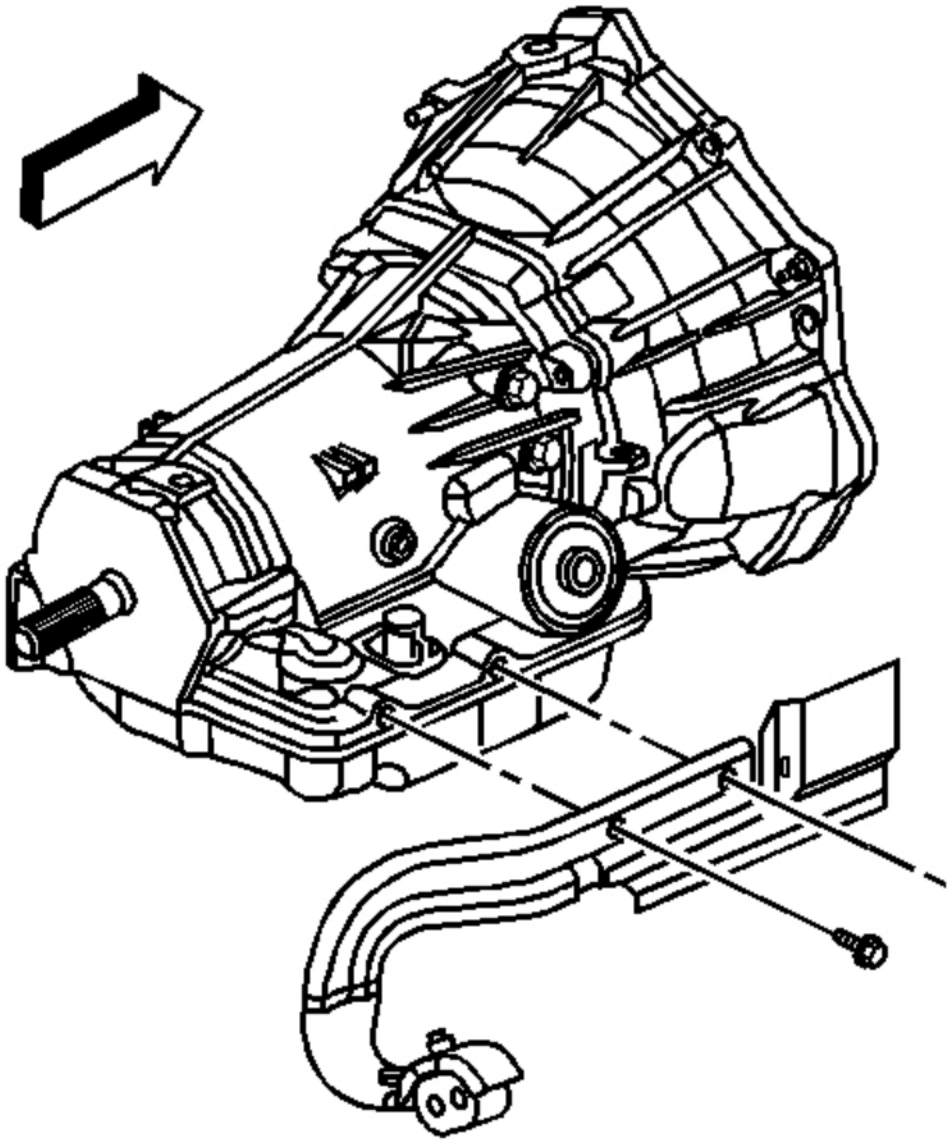


Fig. 67: View Of Heat Shield/Exhaust Pipe Hanger Bracket & Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the exhaust manifold pipe hanger bracket.

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2. If equipped with a 4L60E transmission, install the exhaust pipe hanger bracket bolts.

   Tighten: Tighten the bolts to 12 N.m (106 lb in).

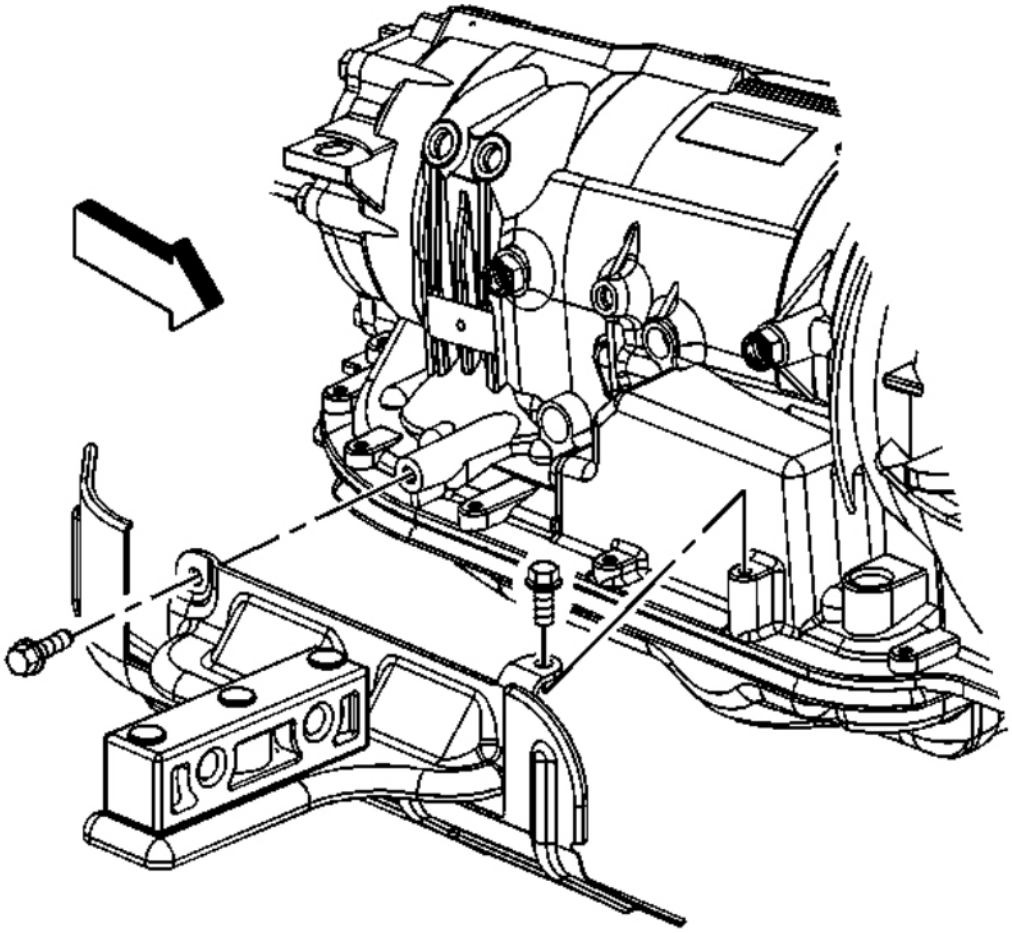


Fig. 68: View Of Exhaust Pipe Hanger Bracket & Bolts (4L80E Transmission)
Courtesy of GENERAL MOTORS CORP.

3. If equipped with a 4L80E transmission, install the exhaust pipe hanger bracket bolts.

   Tighten: Tighten the bolts to 12 N.m (106 lb in).

4. Install the catalytic converter. Refer to **Catalytic Converter Replacement (4.8L and 5.3L Engines)** or **Catalytic Converter Replacement (6.0L and 8.1L Engines)**.
5. Install the exhaust manifold pipe. Refer to **Exhaust Manifold Pipe Replacement (6.0L and 8.1L**

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Engines).

MUFFLER REPLACEMENT (4.8L AND 5.3L ENGINES)

Tools Required

J 38185 Hose Clamp Pliers. See **Special Tools and Equipment**.

Removal Procedure

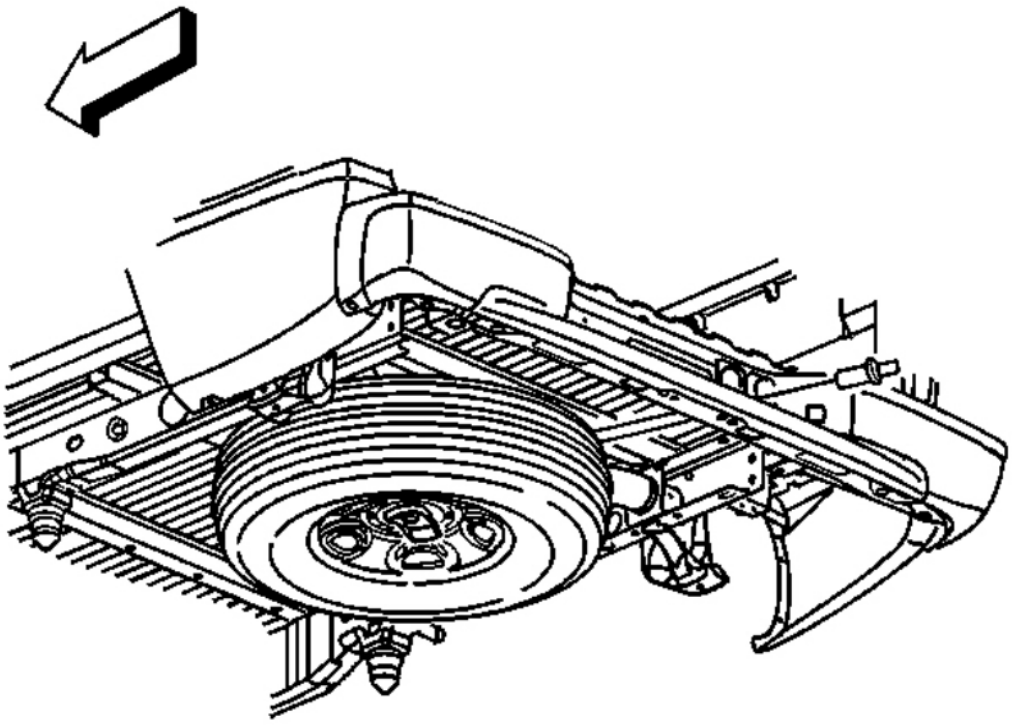


Fig. 69: Locating Spare Tire
Courtesy of GENERAL MOTORS CORP.

1. Remove the spare tire wheel stowage lock cylinder.

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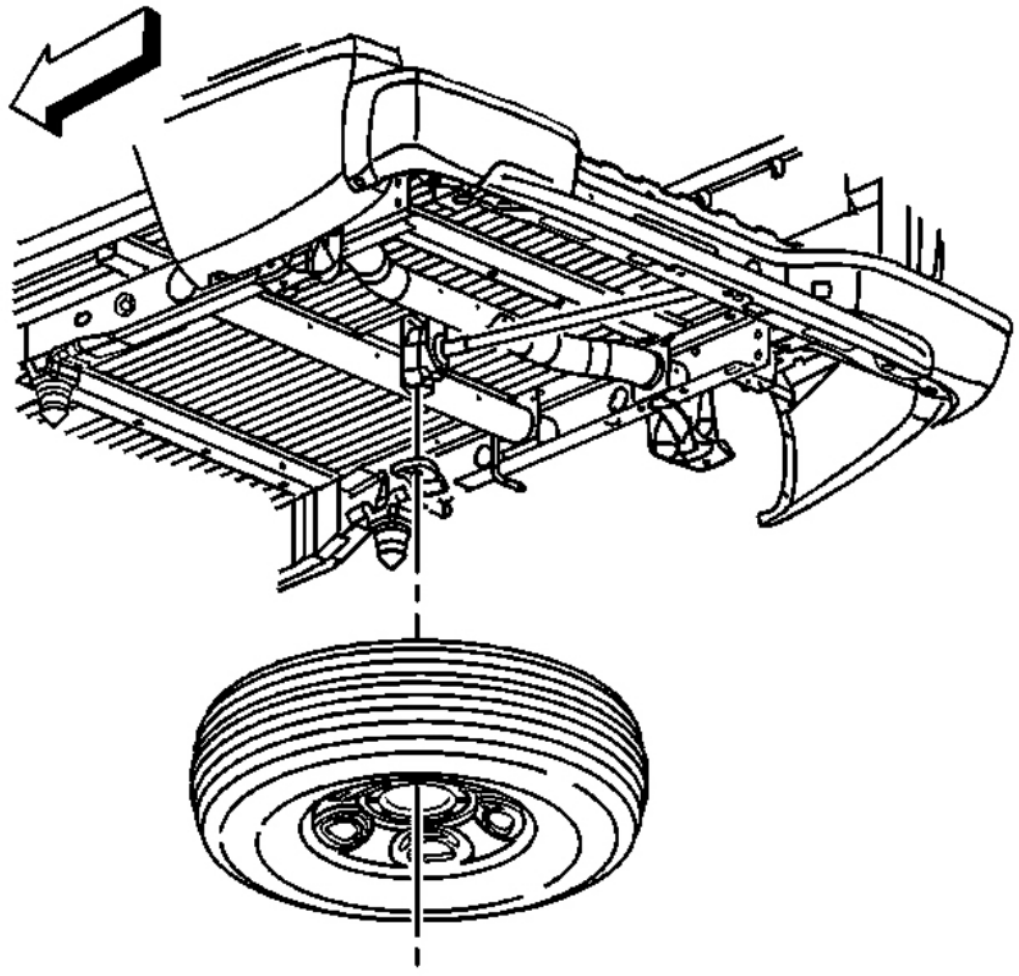


Fig. 70: View Of Spare Tire
Courtesy of GENERAL MOTORS CORP.

2. Remove the spare tire from the hoist.
3. Remove the rear tires and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

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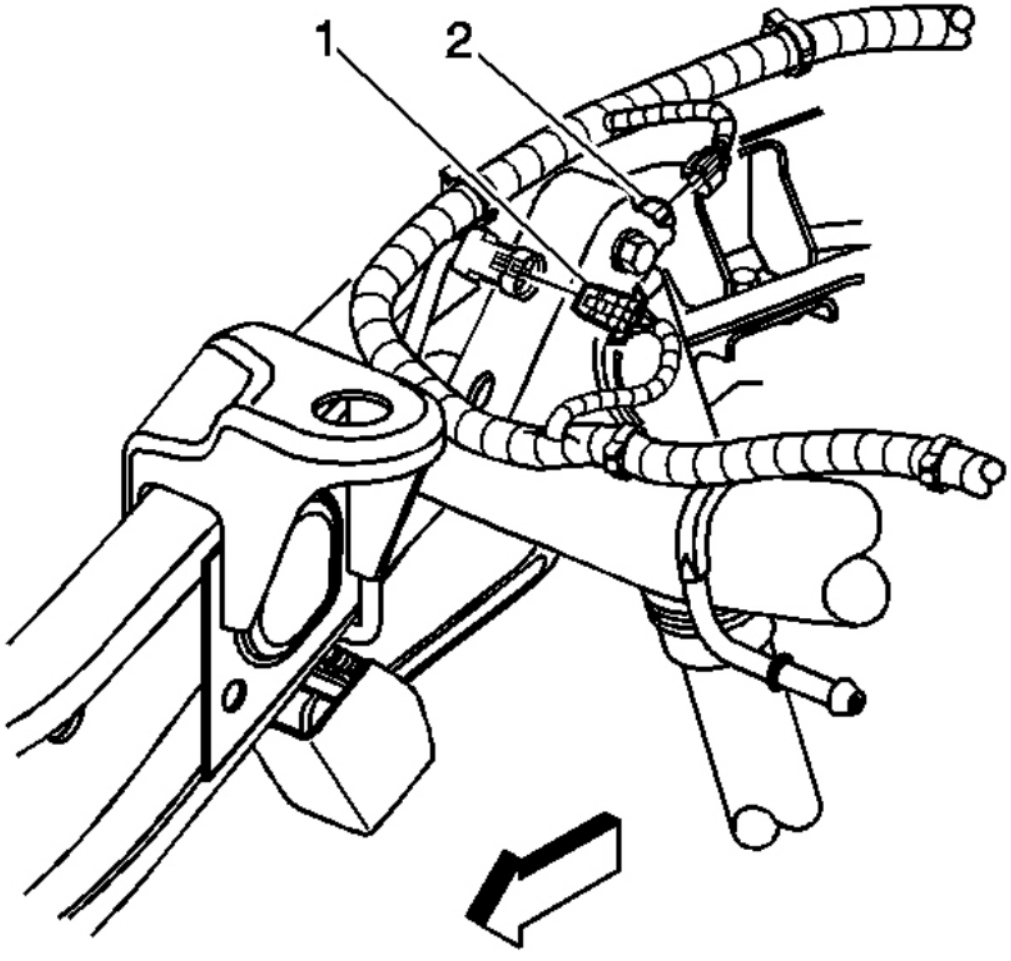


Fig. 71: View Of Electronic Suspension Rear Position Sensor & Rear Shock - Right Side (RPO Z55)
Courtesy of GENERAL MOTORS CORP.

4. If vehicle is equipped with regular production option (RPO) Z55, disconnect the following right side chassis harness electrical connectors:
   - Electronic suspension rear position sensor (1)
   - Rear shock (2)

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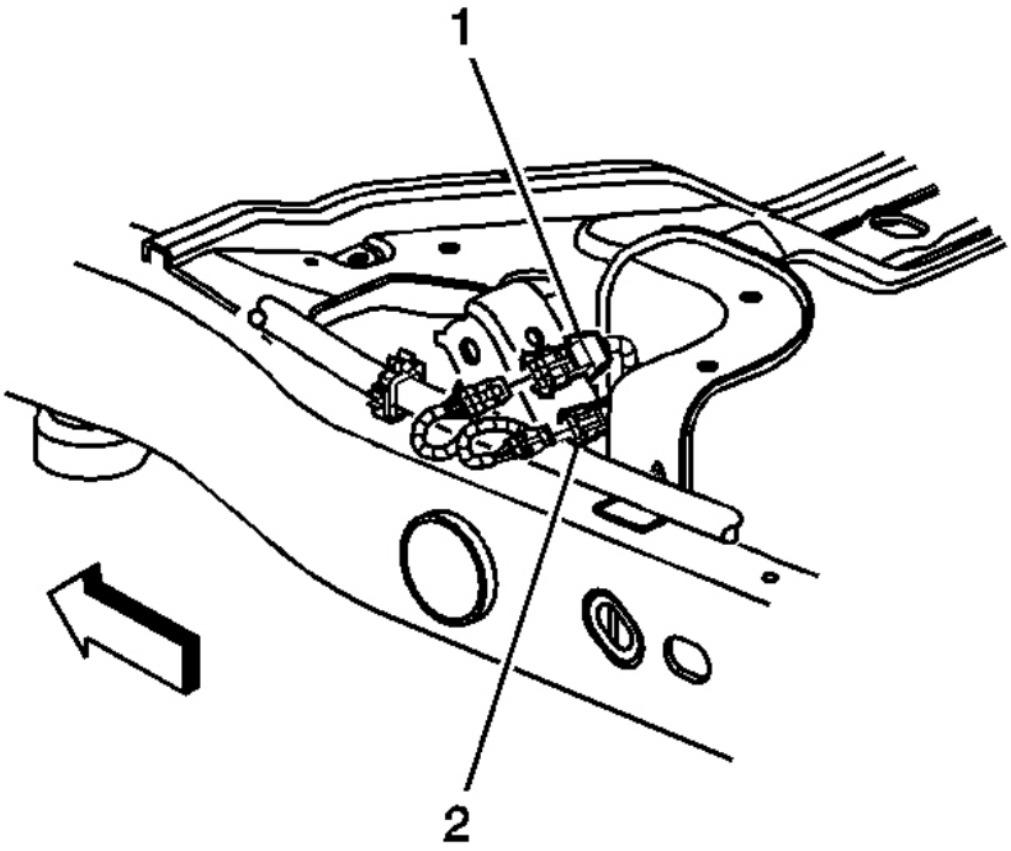


Fig. 72: View Of Electronic Suspension Rear Position Sensor & Rear Shock - Left Side (RPO Z55)
Courtesy of GENERAL MOTORS CORP.

5. If vehicle is equipped with RPO Z55, disconnect the following left side chassis harness electrical connectors:
   - Electronic suspension rear position sensor (1)
   - Rear shock (2)

IMPORTANT: Do not attempt to pry the rear suspension sensor link rod from the rear position sensor ball stud.

6. Remove the left and right sensor link rods from the sensors, perform the following:
   1. Support the sensor lever with your hand
   2. Twist the link rod in order to remove it from the ball stud
7. Install adjustable jack stands under the rear axle.

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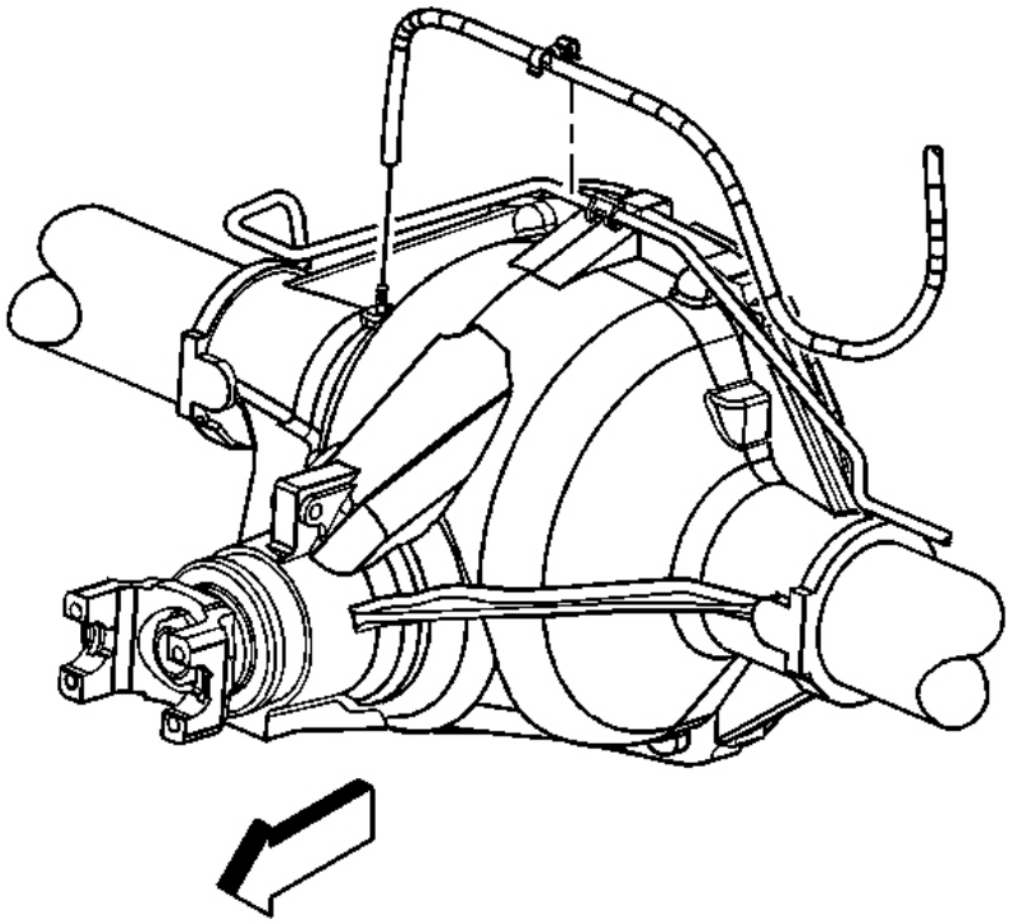


Fig. 73: View Of Rear Axle Vent Hose
Courtesy of GENERAL MOTORS CORP.

8. Remove the rear axle vent hose from the rear axle, if necessary.
9. Remove the vent hose swivel clip from the rear brake crossover pipe.

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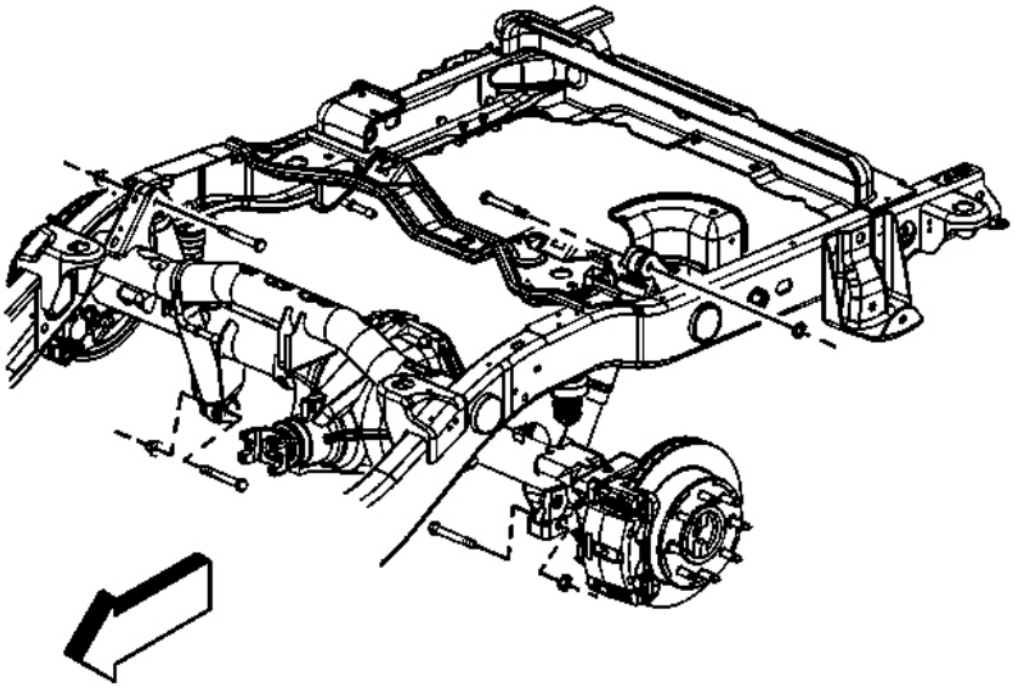


Fig. 74: View Of Rear Shock Absorbers Lower Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

10. Remove the rear shock absorbers lower bolts and nuts.
11. Lower the rear axle slightly, using the adjustable jack stands, in order to remove the muffler.

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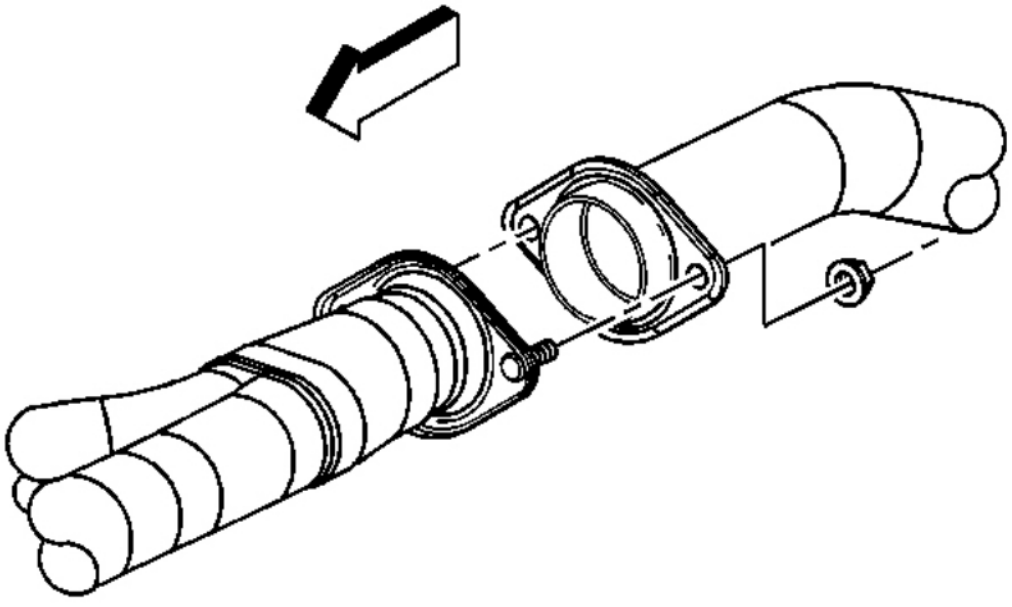


Fig. 75: View Of Exhaust Muffler Nuts (4.8L & 5.3L)
Courtesy of GENERAL MOTORS CORP.

12. Remove the exhaust muffler nuts.

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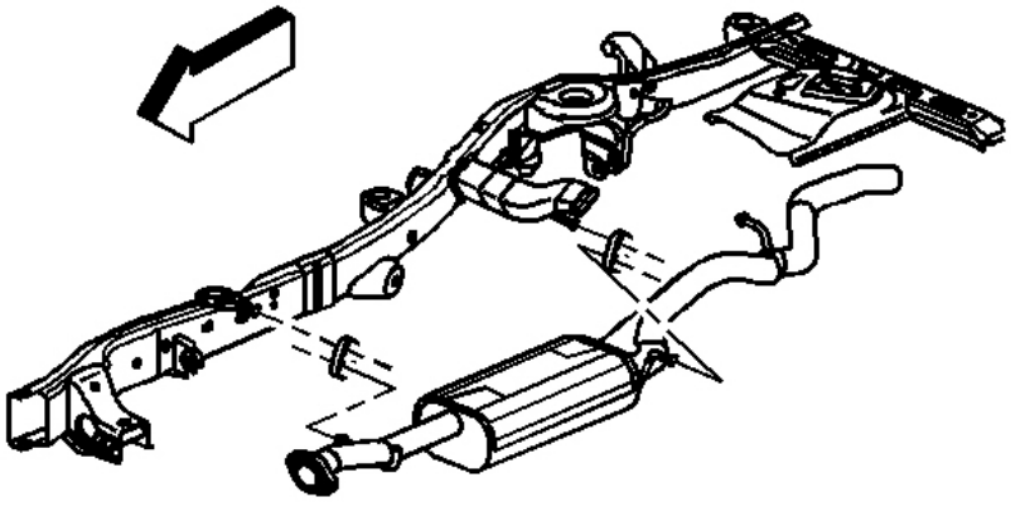


Fig. 76: View Of Exhaust Muffler (4.8L & 5.3L)
Courtesy of GENERAL MOTORS CORP.

13. Remove the muffler from the insulators.

Installation Procedure

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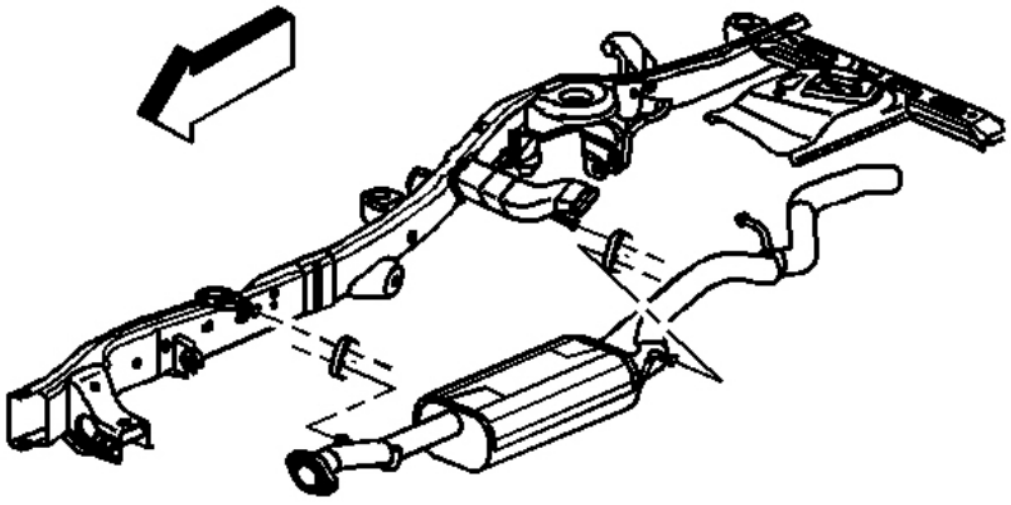


Fig. 77: View Of Exhaust Muffler (4.8L & 5.3L)
Courtesy of GENERAL MOTORS CORP.

1. Apply lubricant to the exhaust insulators in order to aid in installation.
2. Install the muffler to the insulators.

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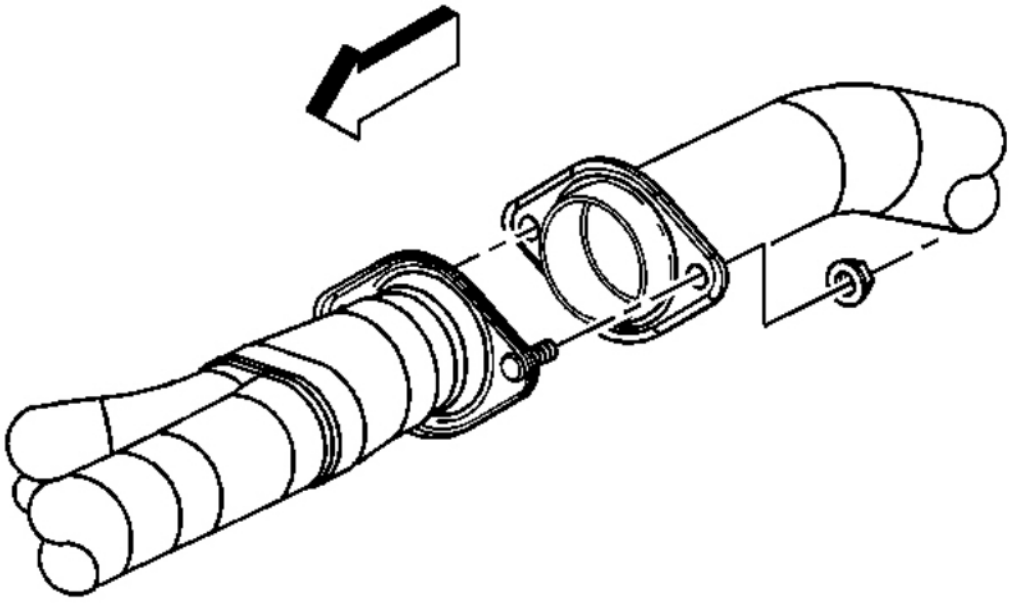


Fig. 78: View Of Exhaust Muffler Nuts (4.8L & 5.3L)
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the exhaust muffler nuts.

   Tighten: Tighten the nuts to 40 N.m (30 lb ft).

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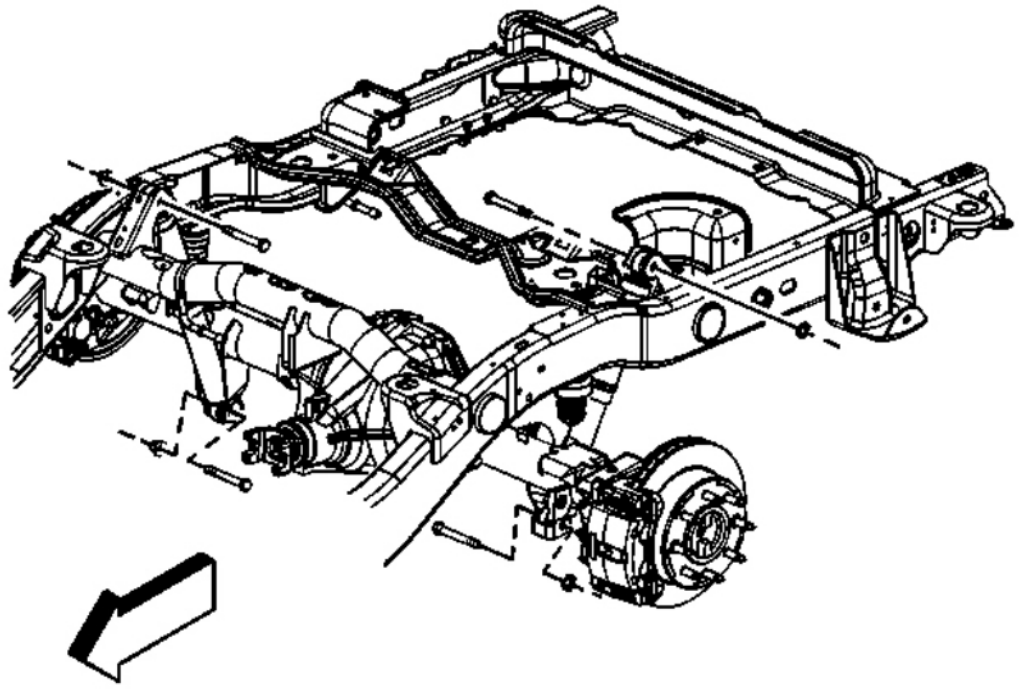


Fig. 79: View Of Rear Shock Absorbers Lower Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

4. Raise the rear axle, using the adjustable jackstands.
5. Install the lower bolts and nuts to the rear shock absorbers.

   Tighten: Tighten the bolts to 95 N.m (70 lb ft).

6. Remove the adjustable jack stands from under the rear axle.

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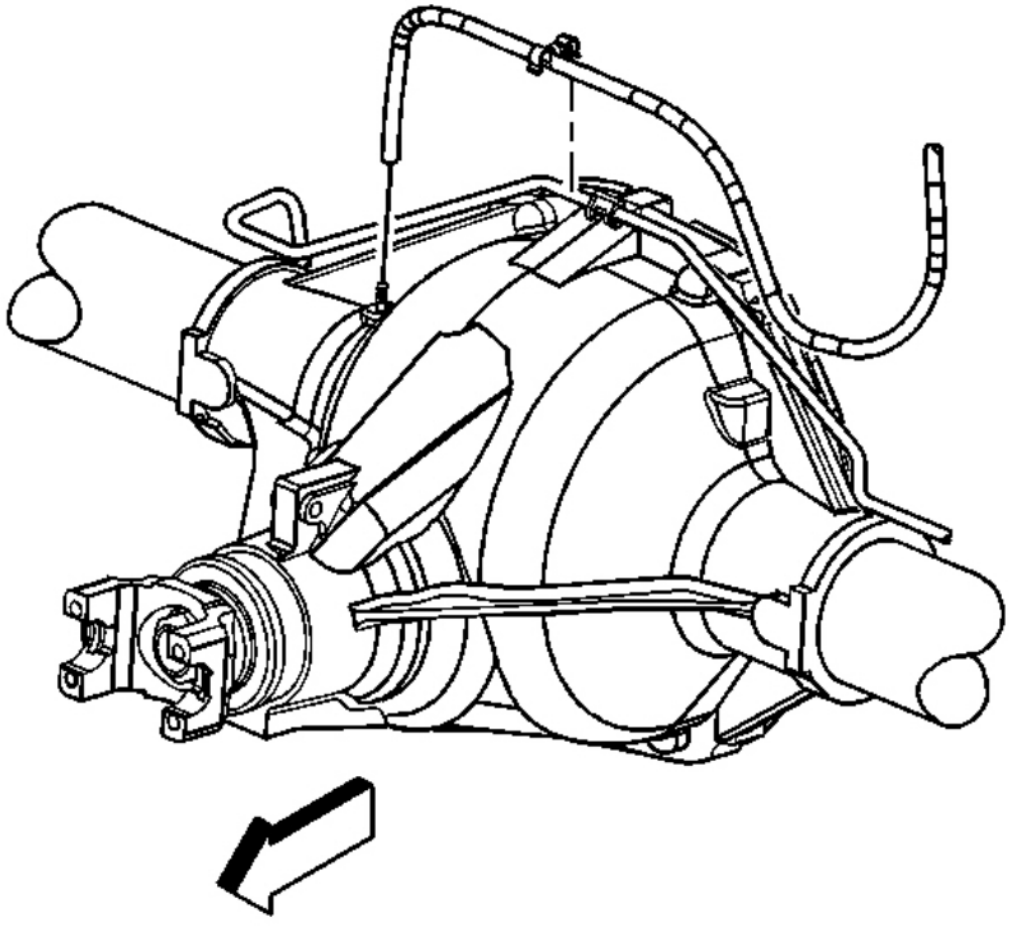


Fig. 80: View Of Rear Axle Vent Hose
Courtesy of GENERAL MOTORS CORP.

7. Install the vent hose swivel clip to the rear brake crossover pipe.
8. Install the rear axle vent hose to the rear axle, if necessary.

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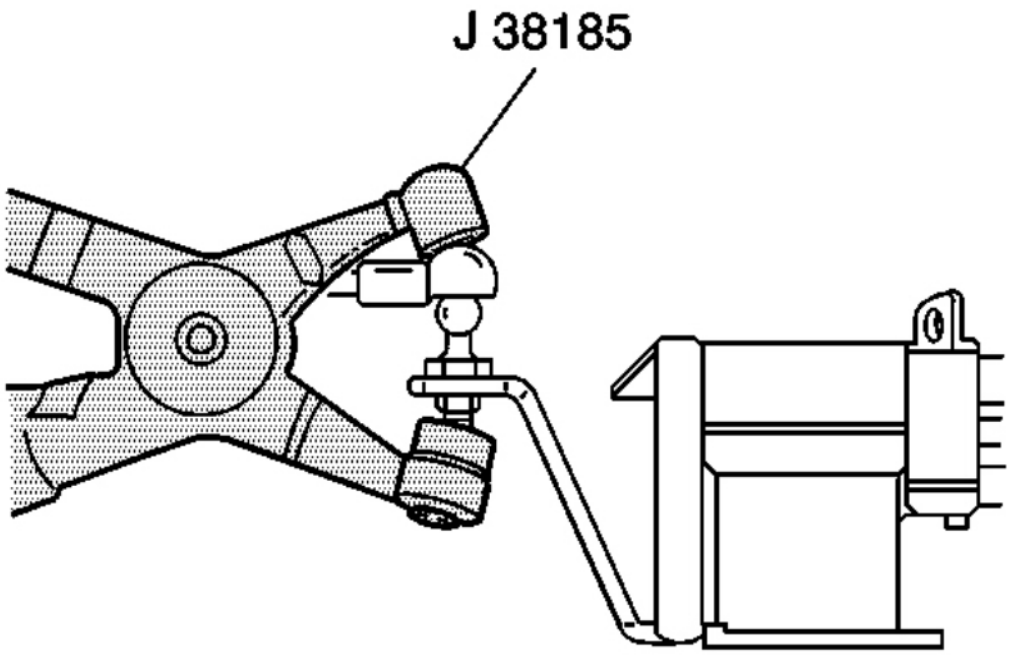


Fig. 81: Installing Link Rods To Ball Studs Using J 38185
Courtesy of GENERAL MOTORS CORP.

9. If vehicle is equipped with RPO Z55, install the left and right sensor link rods to the sensors.
10. Using **J 38185** install the link rods to the ball studs on the sensor levers. See **Special Tools and Equipment**.

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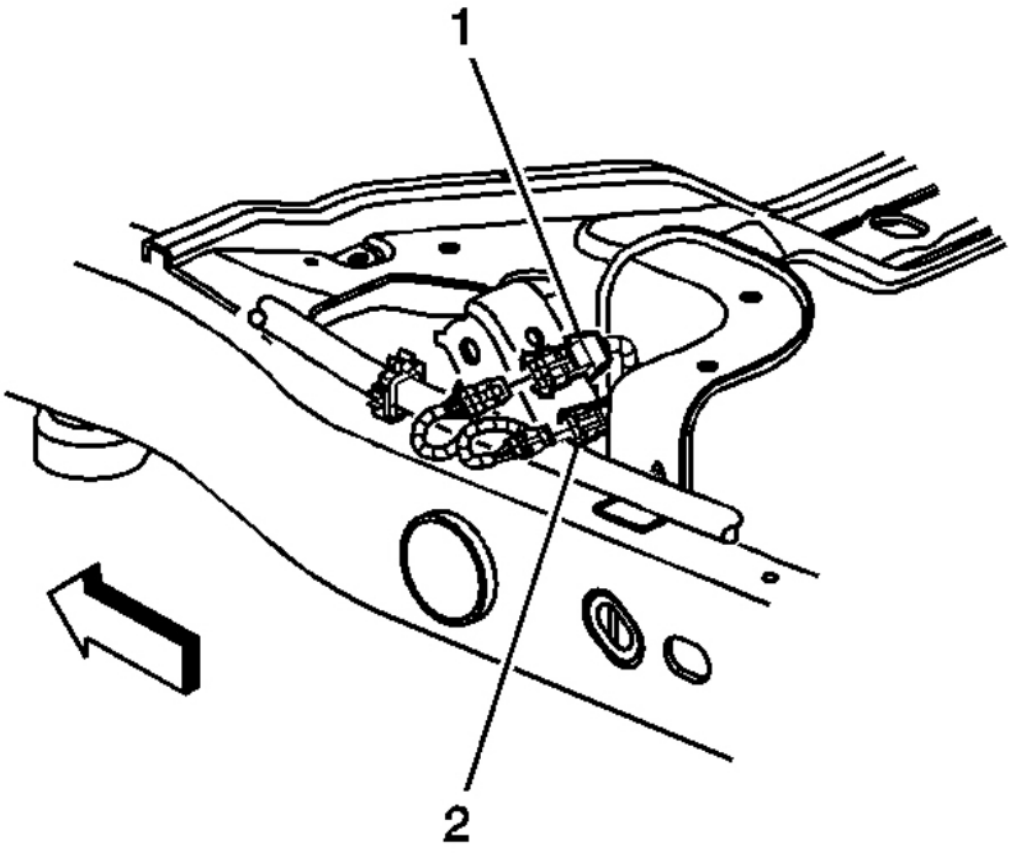


Fig. 82: View Of Electronic Suspension Rear Position Sensor & Rear Shock - Left Side (RPO Z55)
Courtesy of GENERAL MOTORS CORP.

11. If vehicle is equipped with RPO Z55, connect the following left side chassis harness electrical connectors:
    - Electronic suspension rear position sensor (1)
    - Rear shock (2)

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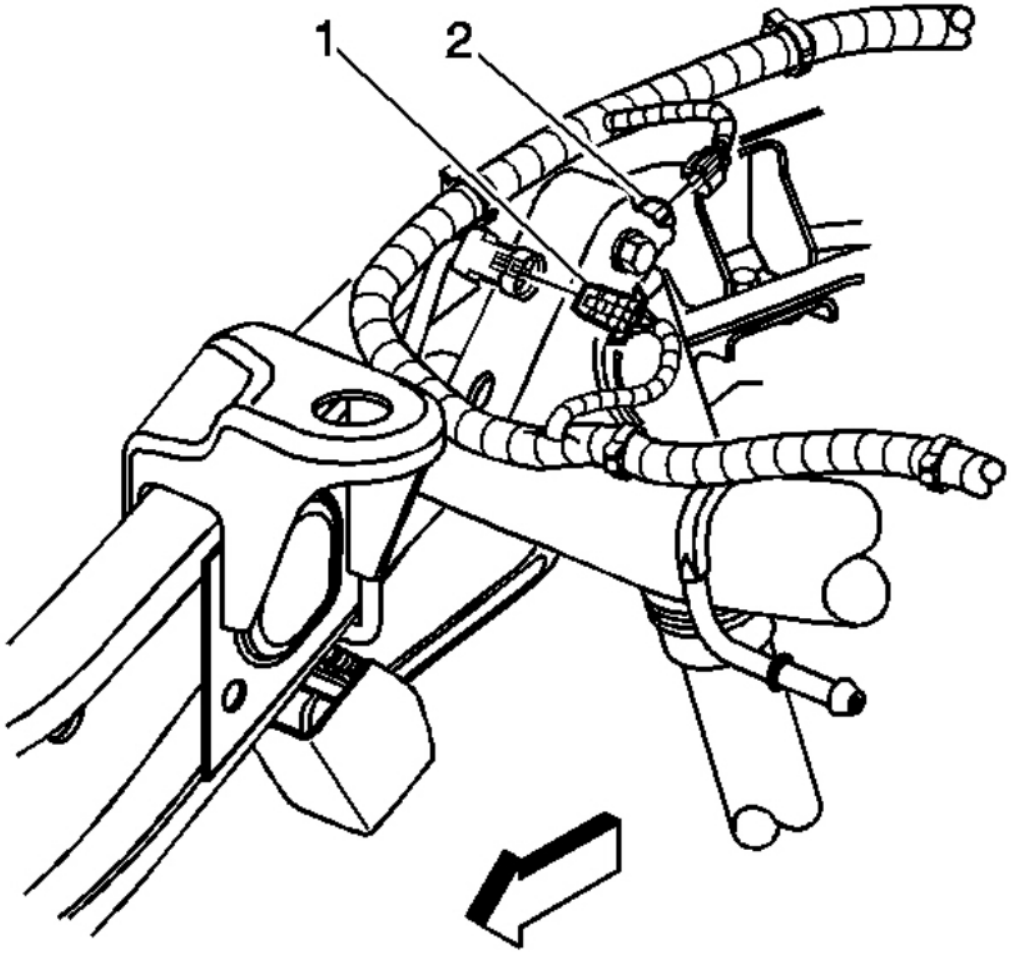


Fig. 83: View Of Electronic Suspension Rear Position Sensor & Rear Shock - Right Side (RPO Z55)
Courtesy of GENERAL MOTORS CORP.

12. If vehicle is equipped with RPO Z55, connect the following right side chassis harness electrical connectors:
    - Electronic suspension rear position sensor (1)
    - Rear shock (2)
13. Install the rear tires and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

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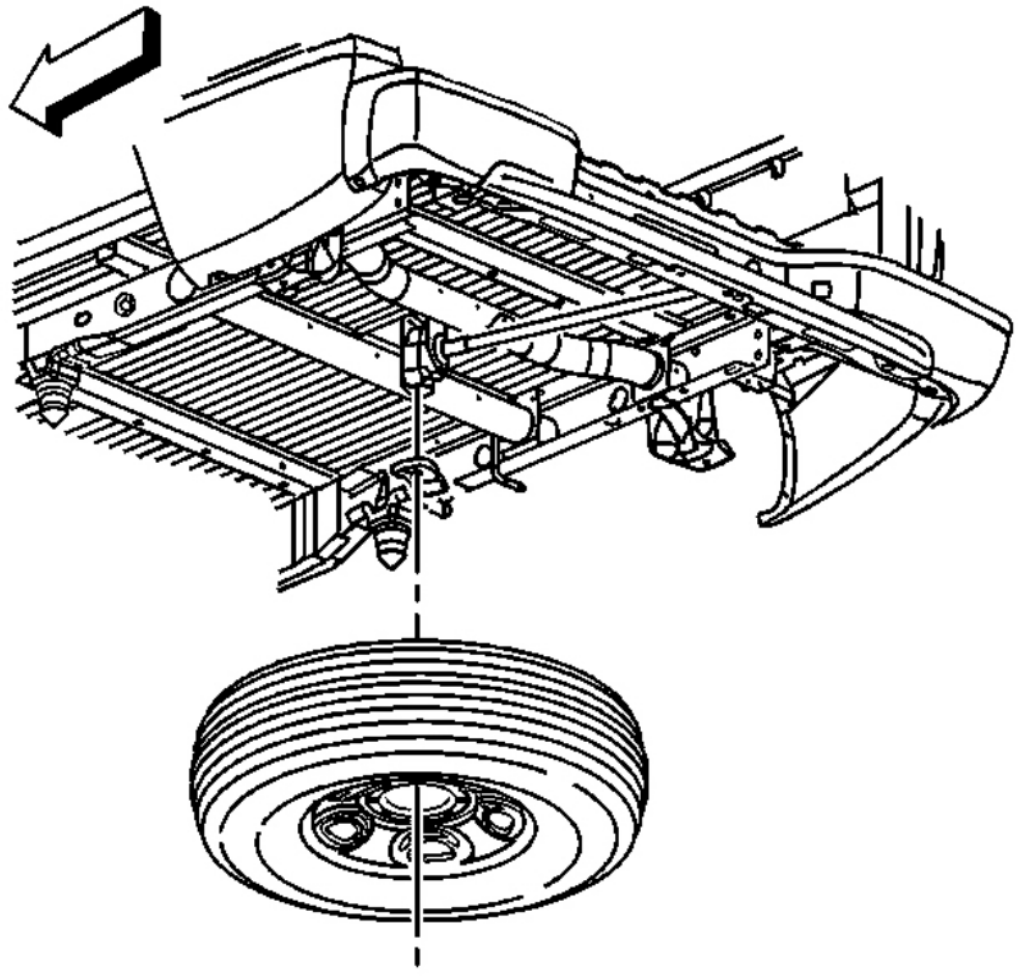


Fig. 84: View Of Spare Tire
Courtesy of GENERAL MOTORS CORP.

14. Install the spare tire to the hoist.

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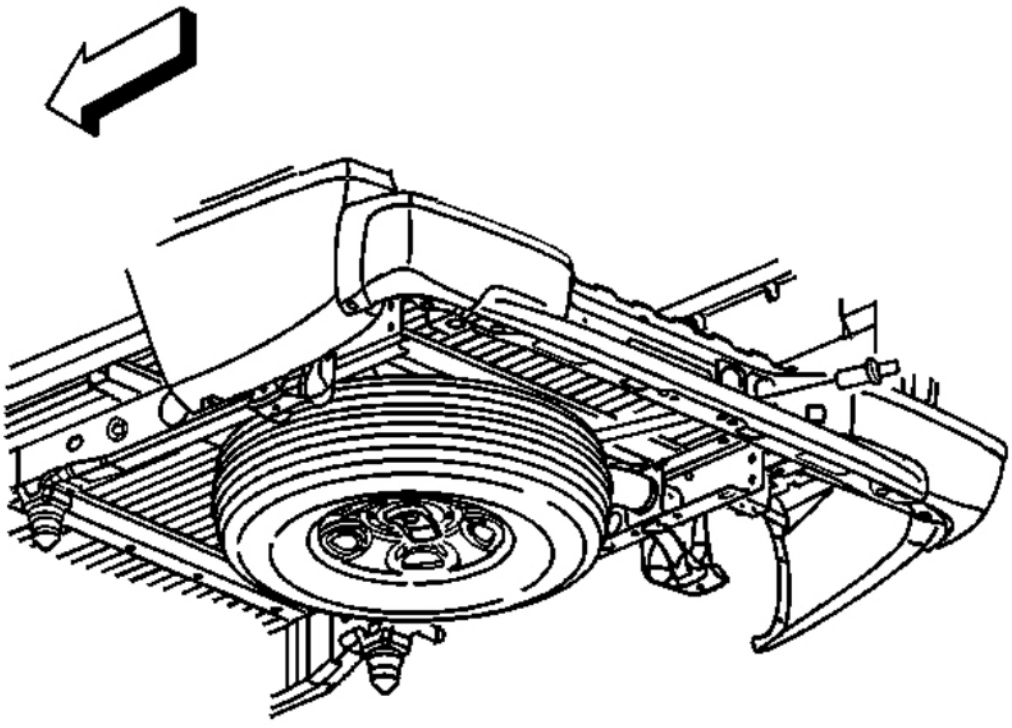


Fig. 85: Locating Spare Tire
Courtesy of GENERAL MOTORS CORP.

15. Install the spare tire wheel stowage lock cylinder.

MUFFLER REPLACEMENT (6.0L AND 8.1L ENGINES)

Removal Procedure

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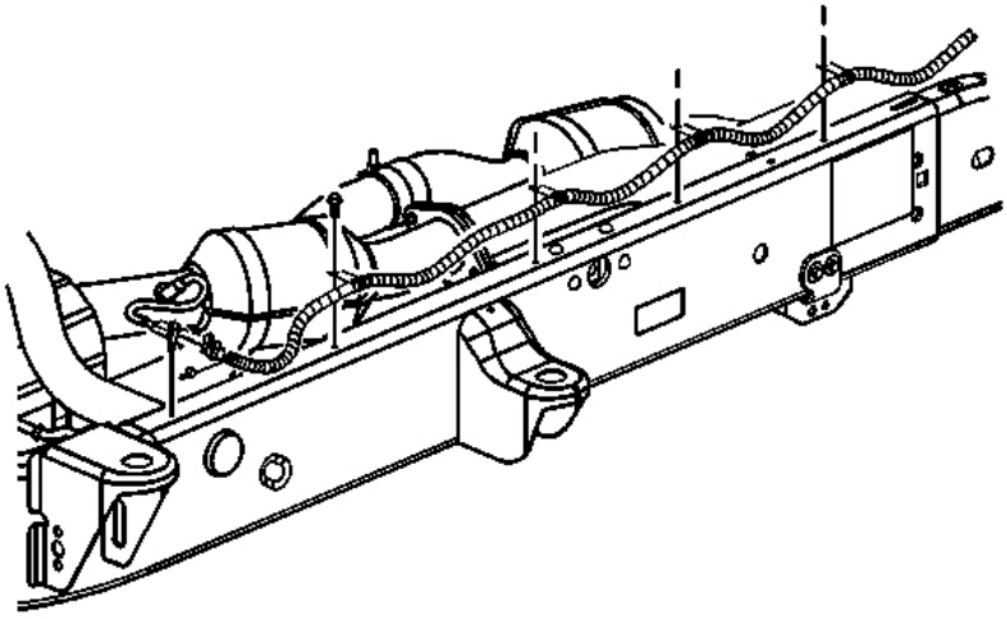


Fig. 86: View Of Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Unclip the oxygen sensor connector from the frame.
3. Disconnect the connector position assurance (CPA) retainer.
4. Disconnect the oxygen sensor electrical connector.

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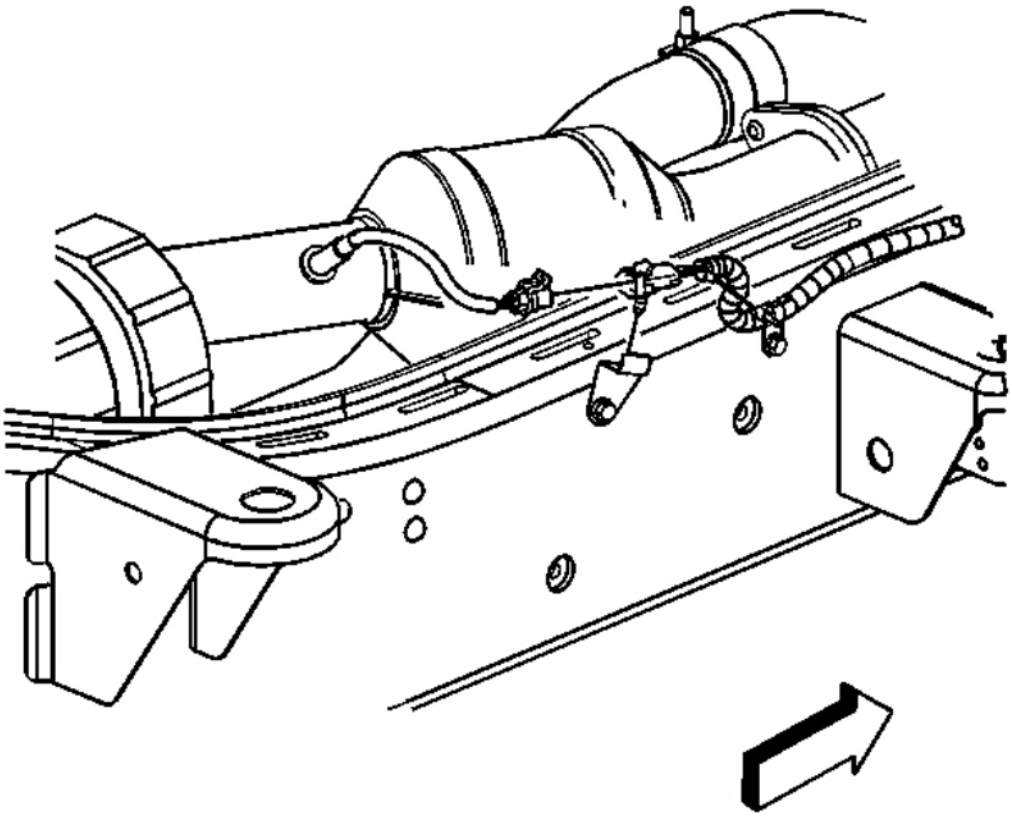


Fig. 87: View Of Oxygen Sensor Connector
Courtesy of GENERAL MOTORS CORP.

5. Unclip the oxygen sensor connector from the support.
6. Disconnect the CPA retainer.
7. Disconnect the oxygen sensor electrical connector.

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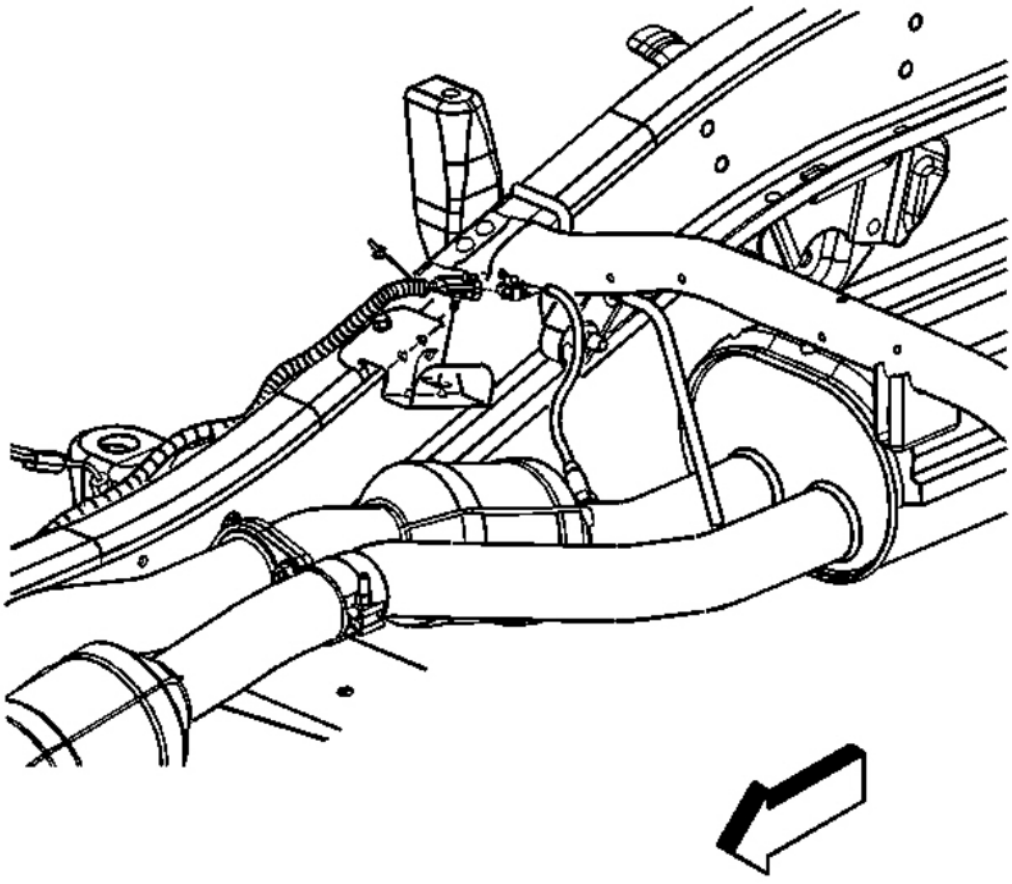


Fig. 88: View Of Oxygen Sensor Connector
Courtesy of GENERAL MOTORS CORP.

8. Unclip the oxygen sensor connector from the support.
9. Disconnect the CPA retainer.
10. Disconnect the oxygen sensor electrical connector.

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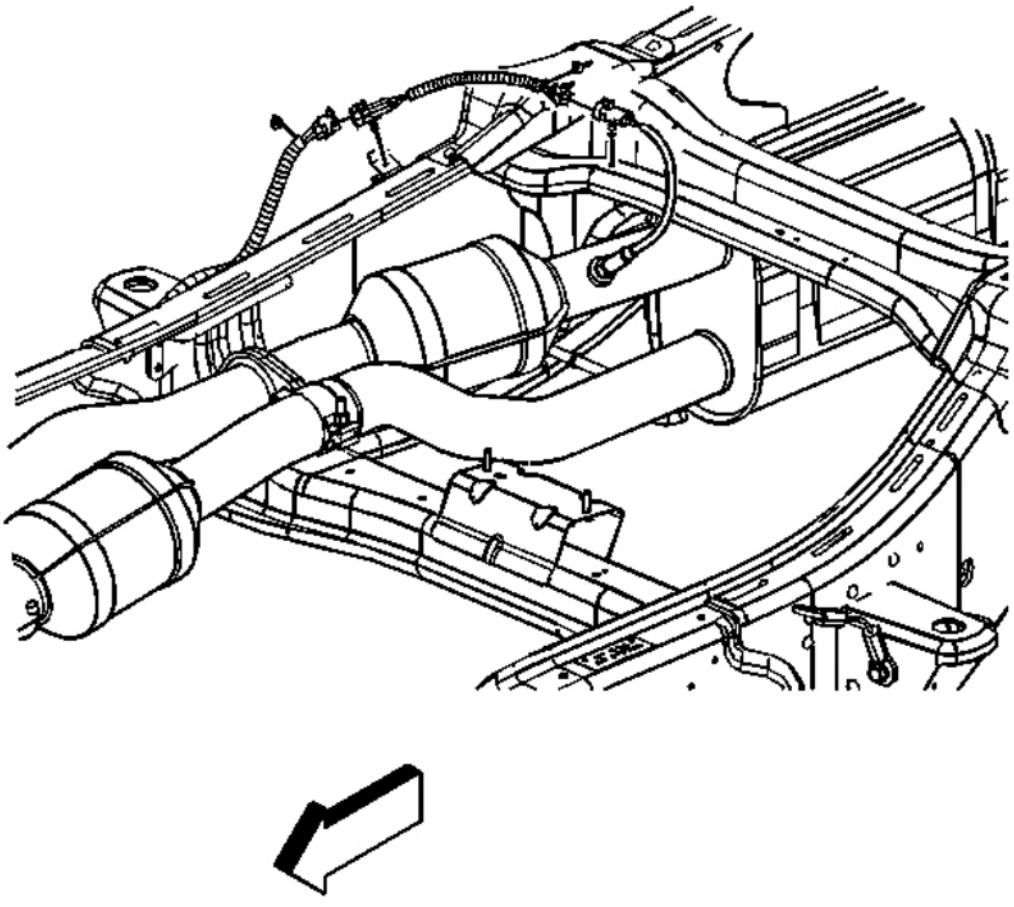


Fig. 89: View Of Oxygen Sensor Electrical Connector At Frame (6.0L)
Courtesy of GENERAL MOTORS CORP.

11. If equipped with a 6.0L engine, perform the following:
    - Unclip the oxygen sensor connector from the frame.
    - Disconnect the CPA retainer.
    - Disconnect the oxygen sensor electrical connector.

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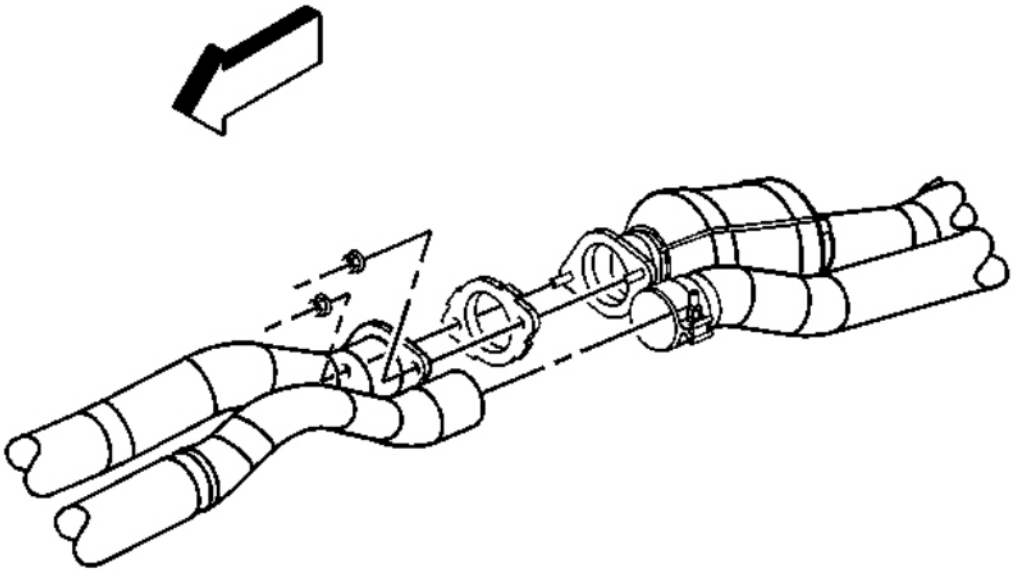


Fig. 90: View Of Exhaust Muffler Nuts (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

12. Remove the exhaust muffler nuts.
13. Loosen the exhaust pipe clamp.
14. With the aid of an assistant, support the exhaust muffler.

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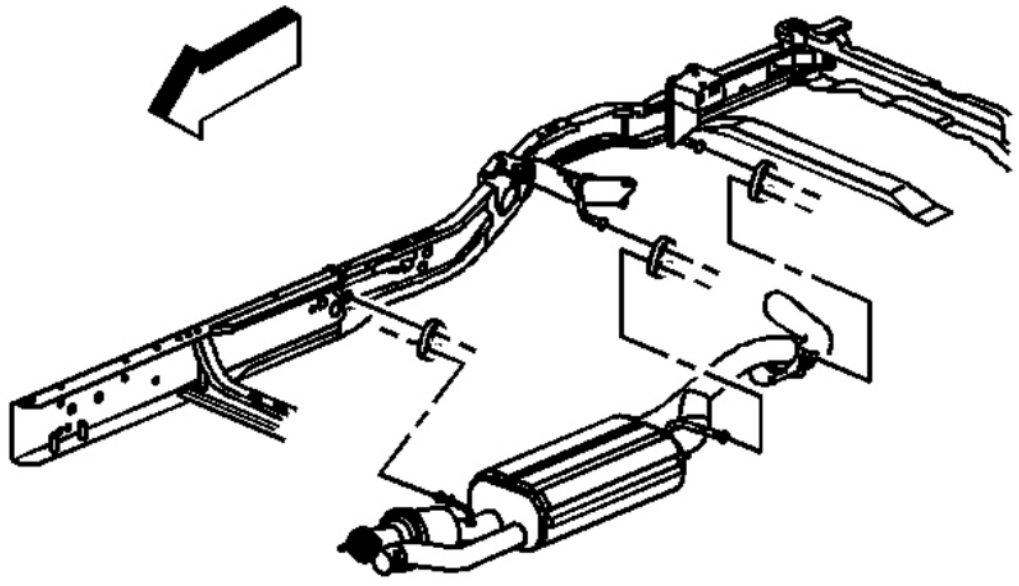


Fig. 91: View Of Exhaust Muffler (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

15. Remove the insulators from the frame hangers.
16. With the aid of an assistant, slide the muffler rearward in order to remove the muffler from the catalytic converter.
17. Remove the insulators from the muffler hangers.
18. Remove the exhaust manifold pipe gasket.

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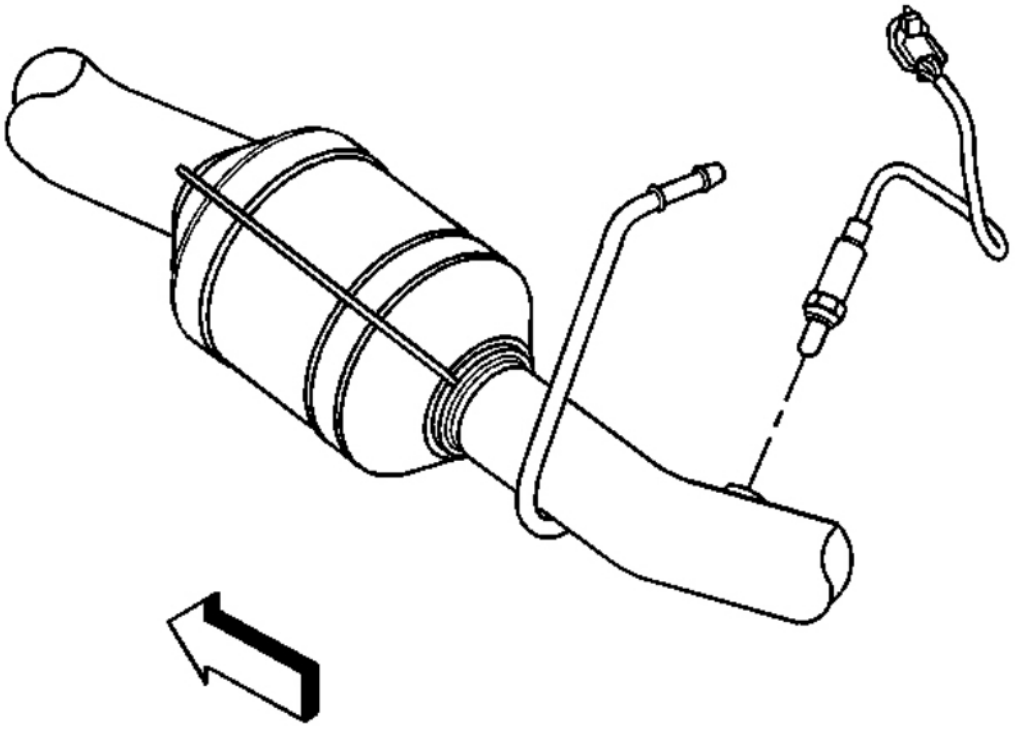


Fig. 92: View Of Oxygen Sensor
Courtesy of GENERAL MOTORS CORP.

19. Remove the oxygen sensor if the muffler is being replaced.
20. If the muffler is NOT being replaced as an assembly, the band clamp MUST be replaced. Perform the following:
    1. Mark the position of the band clamp on the intermediate exhaust pipe.
    2. Remove the band clamp from the exhaust pipe by grinding the weld.
    3. Install a NEW band clamp onto the exhaust pipe.

Installation Procedure

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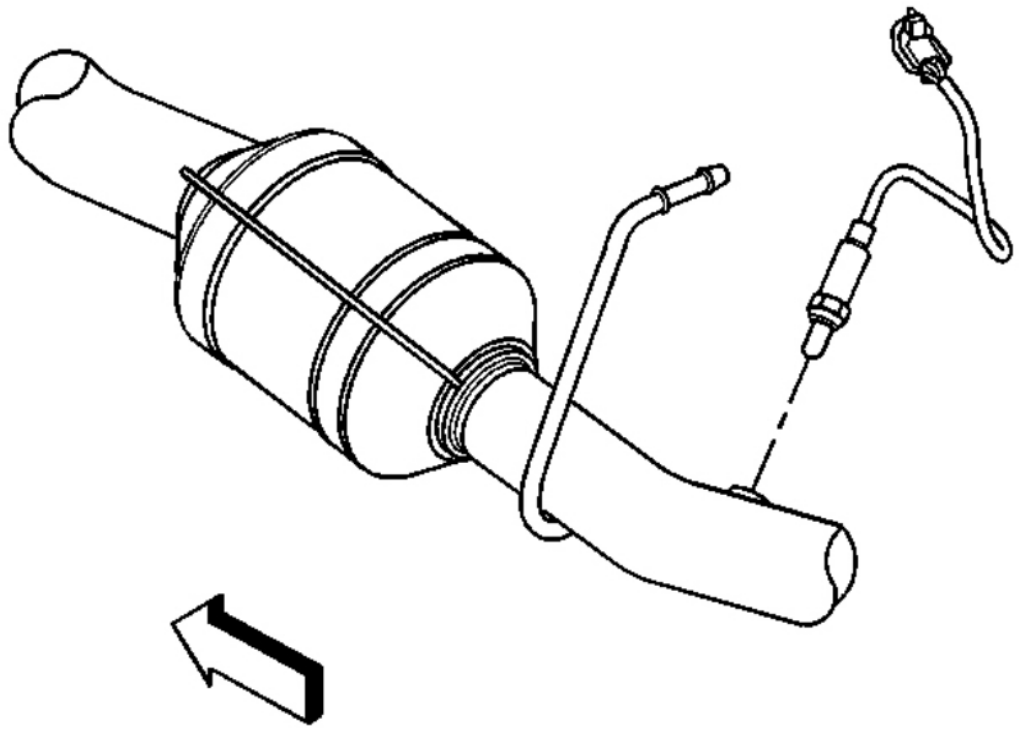


Fig. 93: View Of Oxygen Sensor
Courtesy of GENERAL MOTORS CORP.

1. If the muffler was replaced reinstall the old oxygen sensor.
2. Apply anti-seize compound GM P/N 12377953 or equivalent to the threads of the old oxygen sensor.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the oxygen sensor.

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

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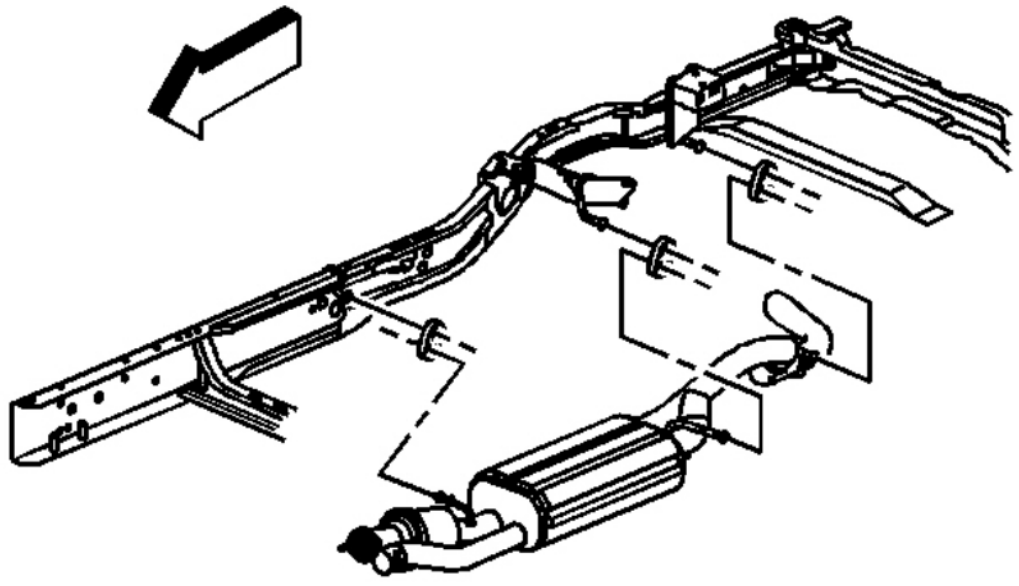


Fig. 94: View Of Exhaust Muffler (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Apply lubricant to the insulators to aid in installation.

4. Install the insulators to the muffler hangers.
5. Install a new exhaust manifold pipe gasket.
6. With the aid of an assistant, slide the muffler forward in order to install the muffler to the catalytic converter.
7. Install the insulators to the frame hangers.
8. Lower the vehicle.

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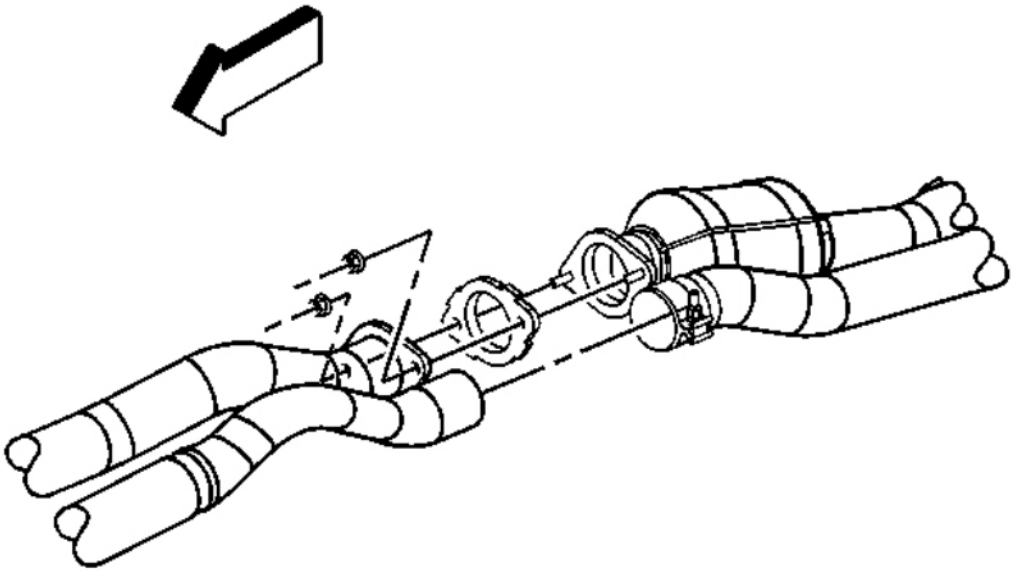


Fig. 95: View Of Exhaust Muffler Nuts (6.0L & 8.1L)
Courtesy of GENERAL MOTORS CORP.

9. Position the NEW band clamp on the intermediate exhaust pipe, using the alignment mark created previously. The band clamp bolt must NOT be positioned below the exhaust pipe.
10. Install the exhaust muffler nuts, until snug.
11. Tighten the exhaust pipe clamp bolt and muffler nuts.

Tighten:

- Tighten the nuts to 40 N.m (30 lb ft).
- Tighten the clamp to 44 N.m (33 lb ft).

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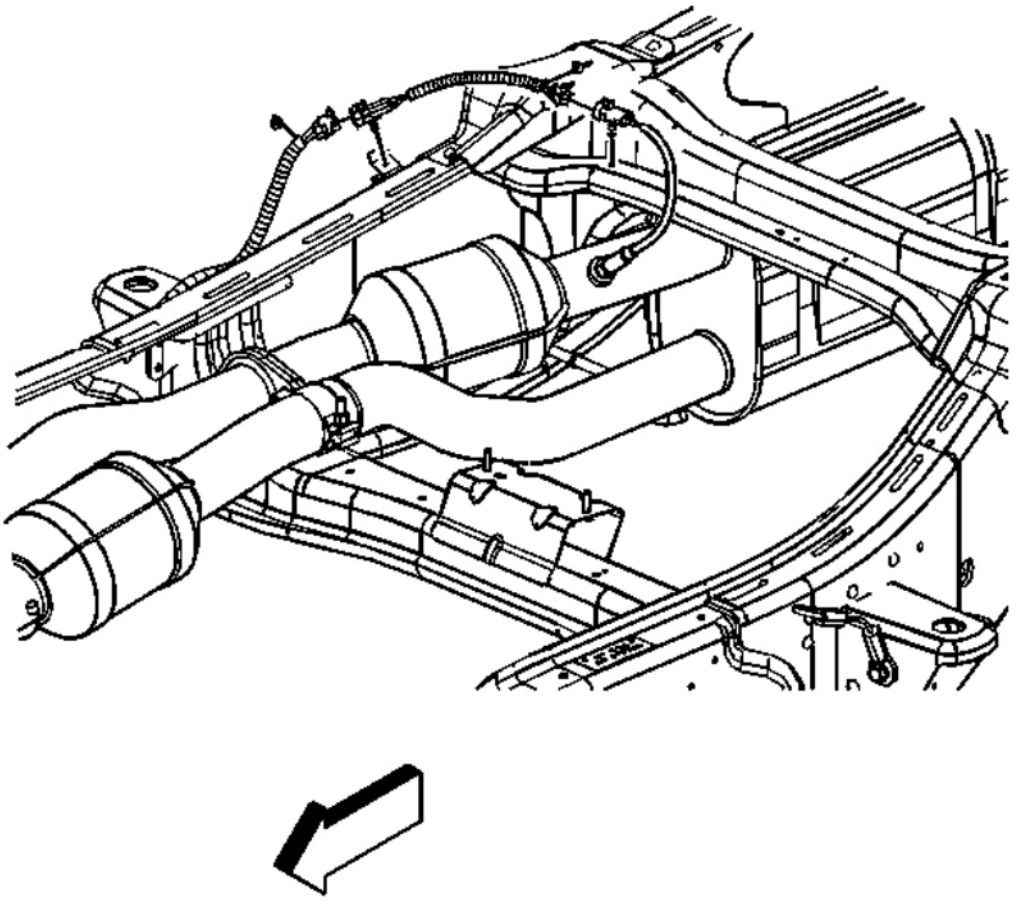


Fig. 96: View Of Oxygen Sensor Electrical Connector At Frame (6.0L)
Courtesy of GENERAL MOTORS CORP.

12. If equipped with a 6.0L engine, perform the following:
    - Connect the oxygen sensor electrical connector.
    - Connect the CPA retainer.
    - Clip the oxygen sensor connector to the frame.

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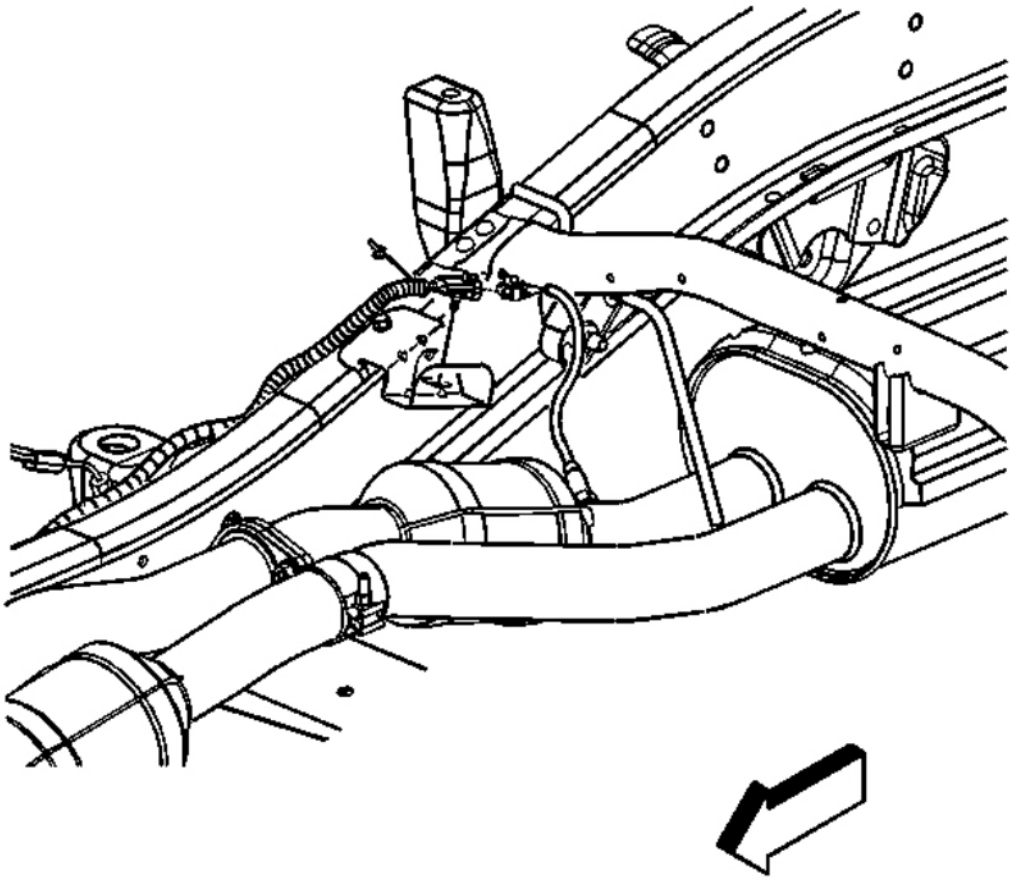


Fig. 97: View Of Oxygen Sensor Connector
Courtesy of GENERAL MOTORS CORP.

13. Connect the oxygen sensor electrical connector.
14. Connect the CPA retainer.
15. Clip the oxygen sensor connector to the support.

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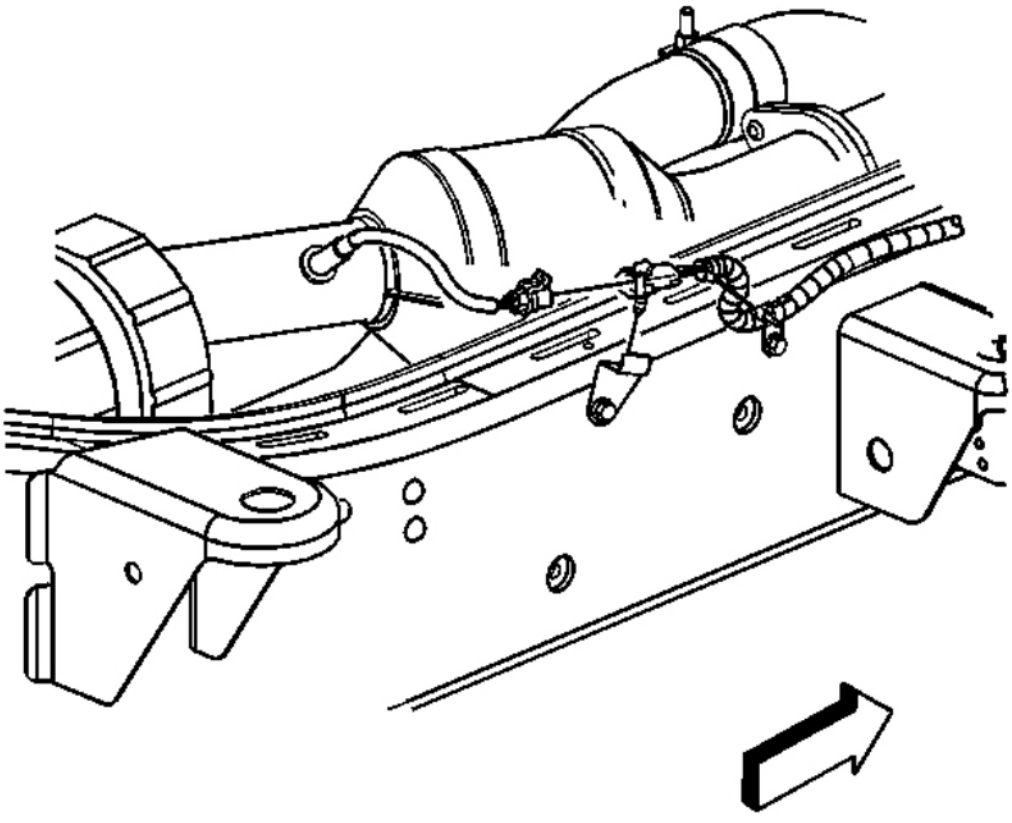


Fig. 98: View Of Oxygen Sensor Connector
Courtesy of GENERAL MOTORS CORP.

16. Connect the oxygen sensor electrical connector.
17. Connect the CPA retainer.
18. Clip the oxygen sensor connector to the support.

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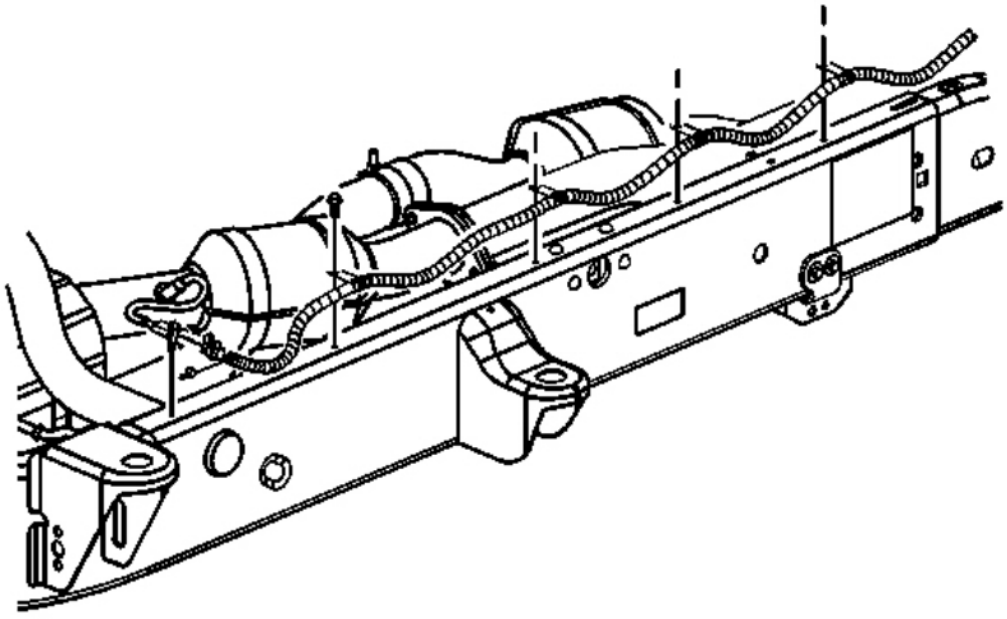


Fig. 99: View Of Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

19. Connect the oxygen sensor electrical connector.
20. Connect the CPA retainer.
21. Clip the oxygen sensor connector to the frame.

FLOOR PANEL HEAT SHIELD REPLACEMENT

Removal Procedure

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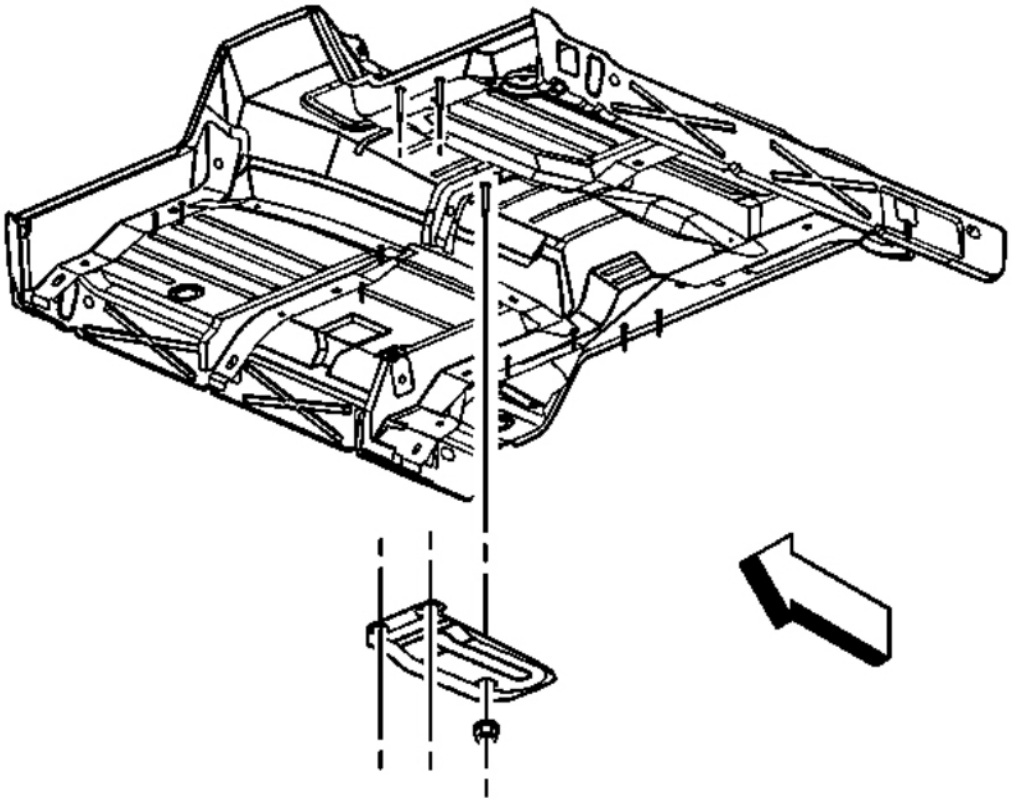


Fig. 100: View Of Exhaust Front Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Remove the exhaust manifold pipe, if necessary. Refer to **Exhaust Manifold Pipe Replacement (6.0L and 8.1L Engines)**.
2. Remove the catalytic converter, if necessary. Refer to **Catalytic Converter Replacement (4.8L and 5.3L Engines)** or **Catalytic Converter Replacement (6.0L and 8.1L Engines)**.
3. Remove the exhaust front heat shield nuts.
4. Remove the exhaust front heat shield from the studs.

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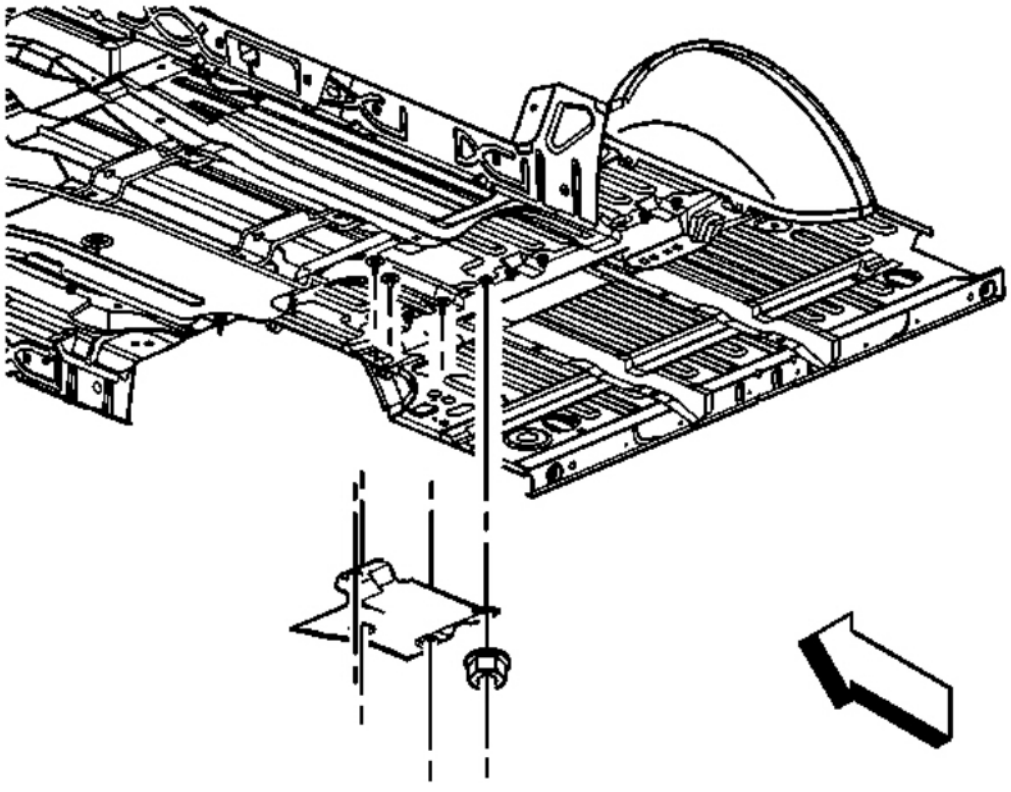


Fig. 101: View Of Exhaust Heat Shield
Courtesy of GENERAL MOTORS CORP.

5. Remove the exhaust heat shield nuts.
6. Remove the exhaust heat shield from the studs.

Installation Procedure

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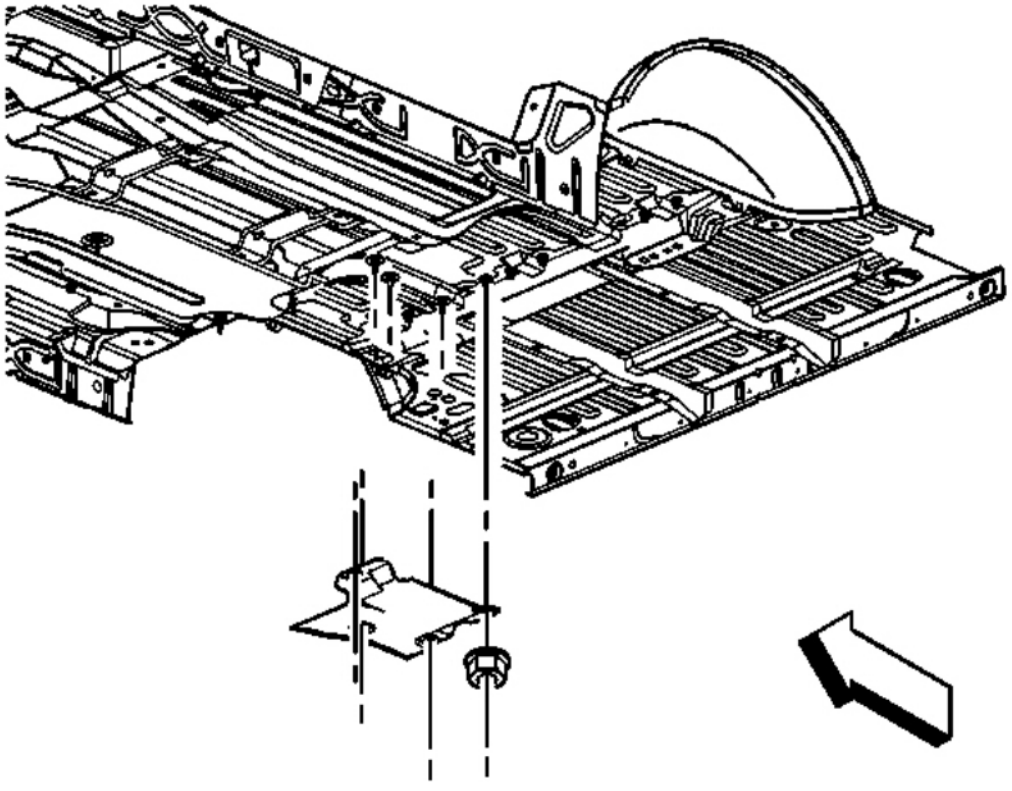


Fig. 102: View Of Exhaust Heat Shield
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the exhaust heat shield to the studs.
2. Install the exhaust heat shield nuts.

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

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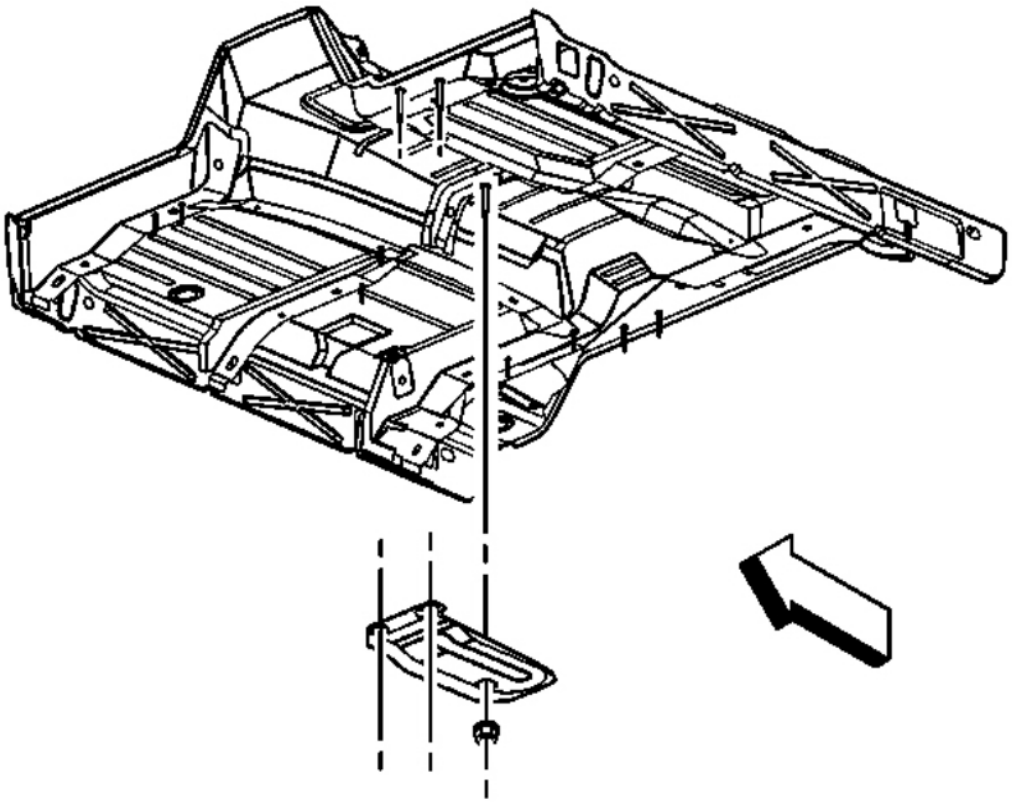


Fig. 103: View Of Exhaust Front Heat Shield
Courtesy of GENERAL MOTORS CORP.

3. Install the exhaust front heat shield to the studs.
4. Install the exhaust front heat shield nuts.

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

5. Install the catalytic converter, if necessary. Refer to **Catalytic Converter Replacement (4.8L and 5.3L Engines)** or **Catalytic Converter Replacement (6.0L and 8.1L Engines)**.
6. Install the exhaust manifold pipe, if necessary. Refer to **Exhaust Manifold Pipe Replacement (6.0L and 8.1L Engines)**.

EXHAUST HEAT SHIELD REPLACEMENT

Removal Procedure

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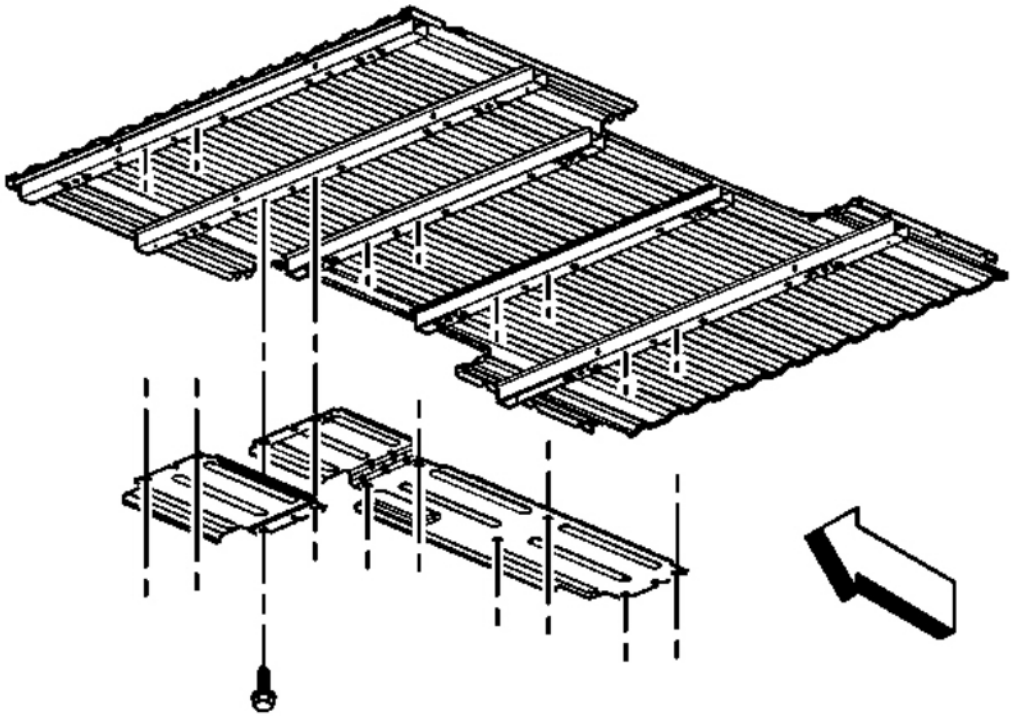


Fig. 104: View Of Exhaust Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Remove the exhaust muffler. Refer to **Muffler Replacement (4.8L and 5.3L Engines)** or **Muffler Replacement (6.0L and 8.1L Engines)**.
2. Remove the exhaust heat shield bolts.
3. Remove the exhaust heat shield.

Installation Procedure

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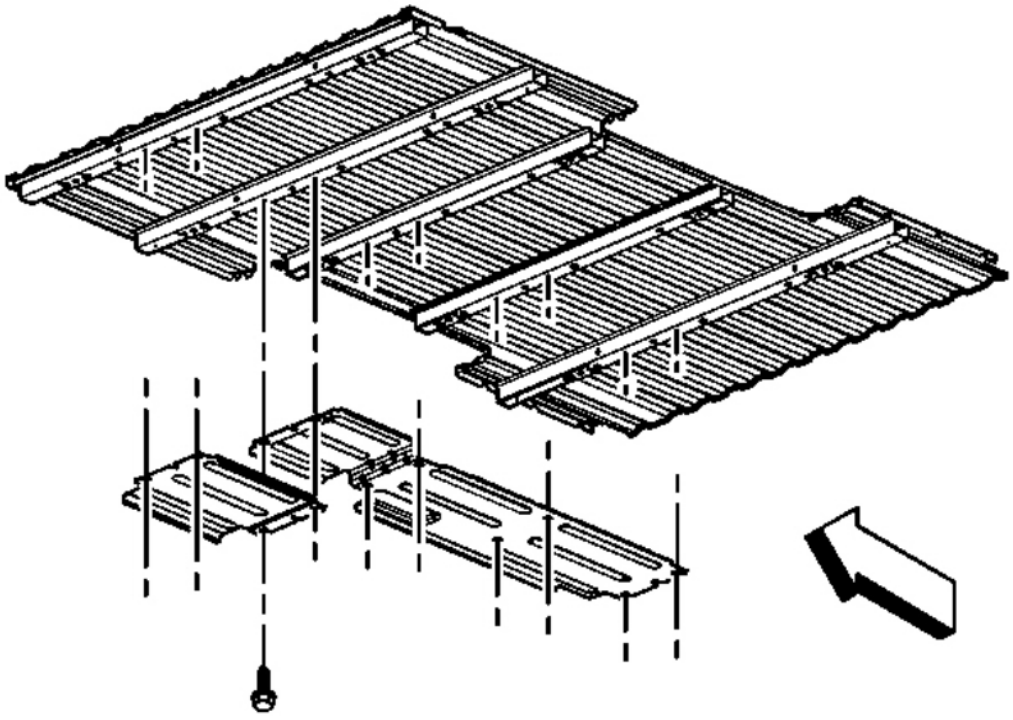


Fig. 105: View Of Exhaust Heat Shield
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the exhaust heat shield.
2. Install the exhaust heat shield bolts.

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

3. Install the exhaust muffler. Refer to **Muffler Replacement (4.8L and 5.3L Engines)** or **Muffler Replacement (6.0L and 8.1L Engines)**.

EXHAUST HEAT SHIELD REPLACEMENT - DASH PANEL

Removal Procedure

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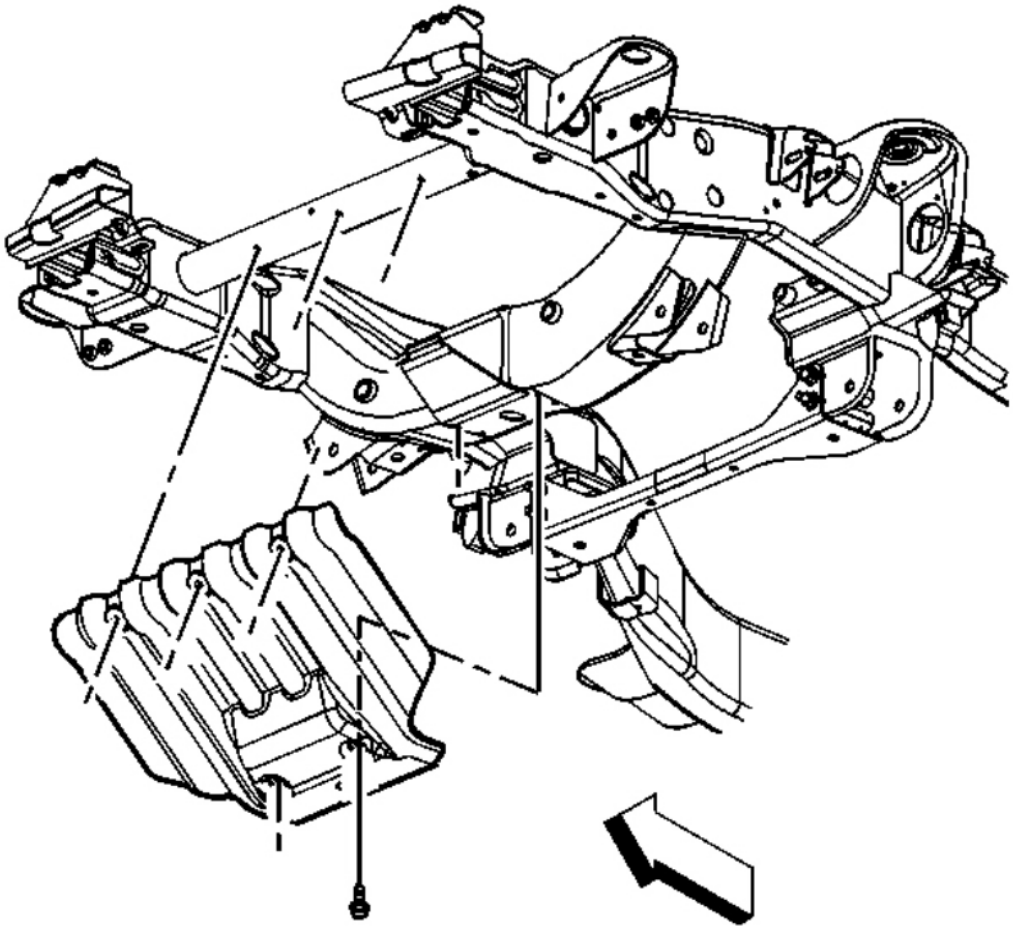


Fig. 106: Identifying Engine Shield And Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the engine shield bolts and shield, if necessary.

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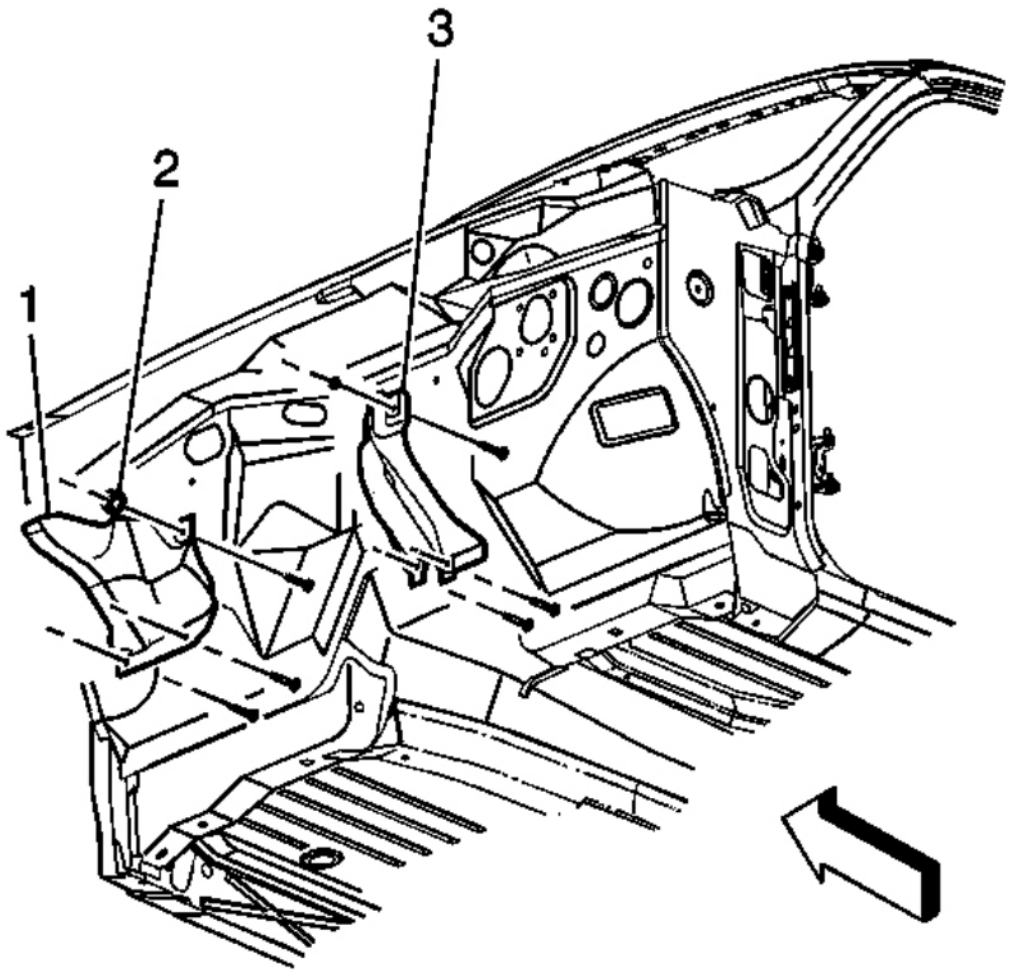


Fig. 107: View Of Left Exhaust Heat Shield & Nuts
Courtesy of GENERAL MOTORS CORP.

3. Remove the exhaust heat shield nuts.
4. Remove the exhaust heat shield (1, 3) from the dash panel studs.

Installation Procedure

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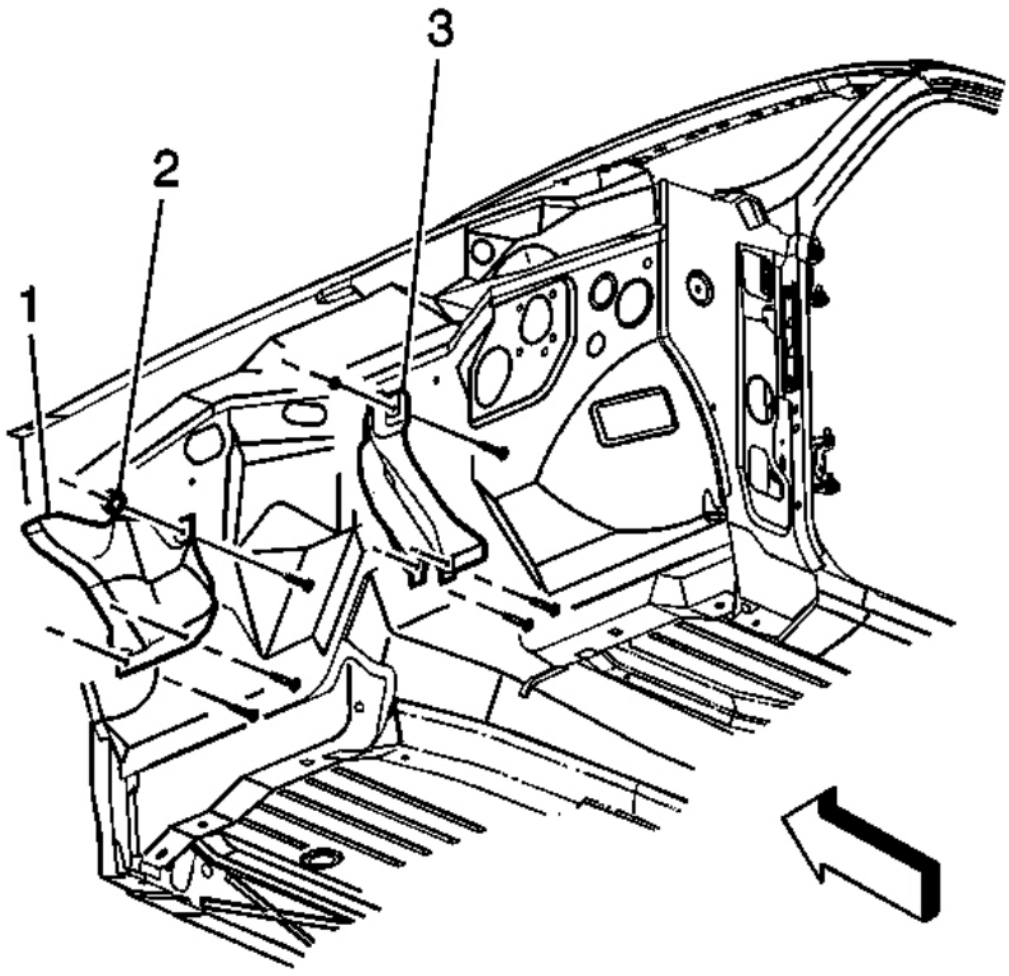


Fig. 108: View Of Left Exhaust Heat Shield & Nuts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the exhaust heat shield (1, 3) to the dash panel studs.
2. Install the exhaust heat shield nuts.

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

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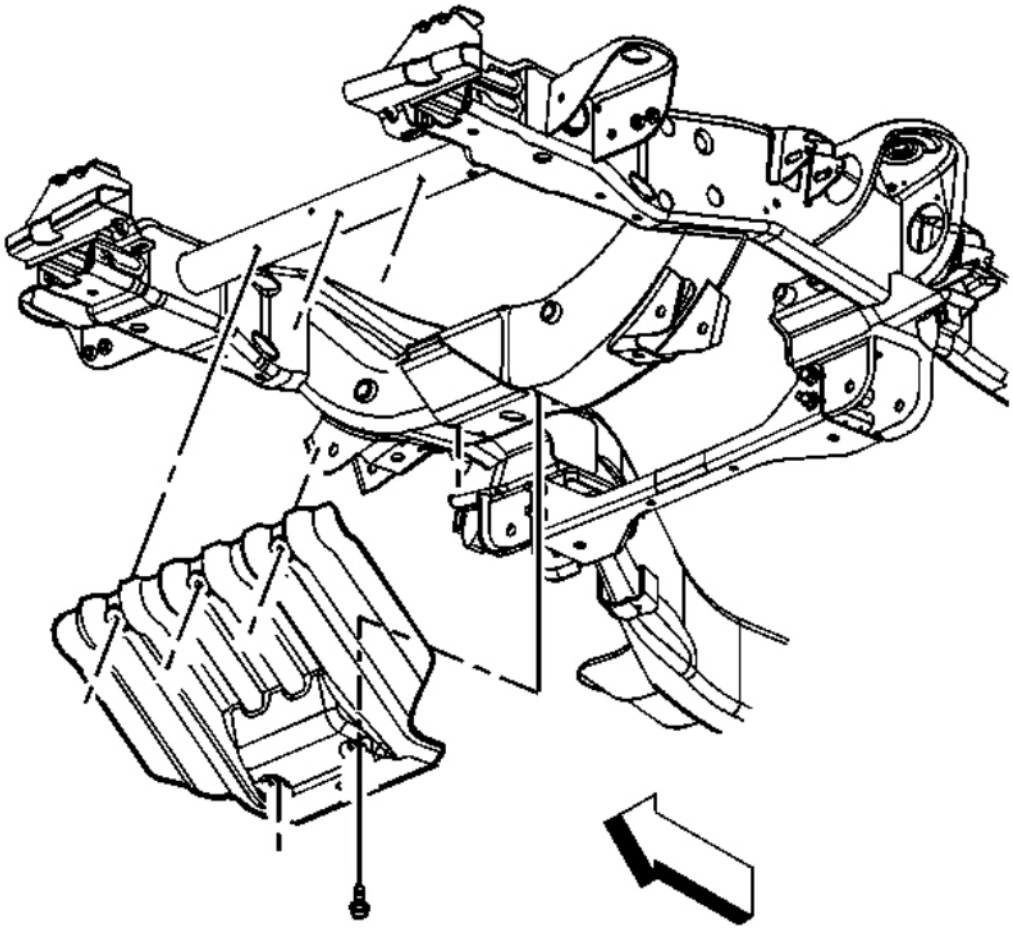


Fig. 109: Identifying Engine Shield And Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

3. Install the engine shield and bolts, if necessary.

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

4. Lower the vehicle.

DESCRIPTION AND OPERATION

EXHAUST SYSTEM DESCRIPTION

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

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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:

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

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The catalyst in the converter is not serviceable.

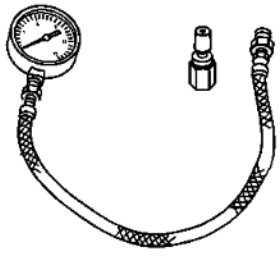
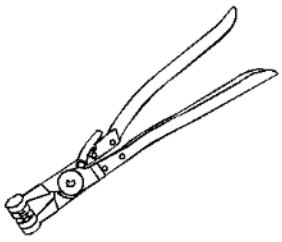
Muffler

The exhaust muffler reduces the noise levels of the engine exhaust by the use of tuning 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
	J 35314-A/BT-8515/BT-8515A Exhaust Back Pressure Tester
	J 38185 Hose Clamp Pliers

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