2007 ENGINE

Engine Exhaust - Outlook

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter Brace Bolt	41 N.m	30 lb ft
Catalytic Converter to Exhaust Flexible Pipe Nut	28 N.m	21 lb ft
Catalytic Converter to Exhaust Manifold Nut	50 N.m	37 lb ft
Exhaust Flexible Pipe to Muffler Nut	50 N.m	37 lb ft
Exhaust Manifold Bolt	20 N.m	15 lb ft
Exhaust Manifold Heat Shield Bolt	10 N.m	89 lb in
Exhaust Manifold Lower Heat Shield Bolt	15 lb ft	89 lb in
Exhaust Manifold Lower Heat Shield Bolt	50 N.m	37 lb ft
Exhaust Muffler Heat Shield Nut	9 N.m	80 lb in

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - ENGINE EXHAUST

Begin the system diagnosis by reviewing the exhaust system description. Reviewing the exhaust system description information will help familiarize you with the components of the exhaust system and the components intended function. Refer to **Exhaust System Description**. Also reviewing the engine exhaust symptoms information will help you determine if the condition described by the customer is normal operation or if a malfunction exists. Refer to **Symptoms - Engine Exhaust** in order to identify the correct procedure for diagnosing the system and where the diagnostic procedure is located.

SYMPTOMS - ENGINE EXHAUST

- Review the exhaust system description in order to familiarize yourself with the exhaust system components and the intended function of the components. 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** .

Visual/Physical Inspection

- Inspect for aftermarket or non-OEM devices such as, but not limited to; tailpipe extensions, headers and exhaust cutouts. Any aftermarket exhaust system devices 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, humm noise

  Refer to **Exhaust Noise**

RESTRICTED EXHAUST

Tools Required

J 35314-A Exhaust Back Pressure Gage. See **Special Tools**.

Diagnostic Aids

CAUTION: Refer to Hot Exhaust System Caution .

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 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** . Removing the HO2S sensor may set a DTC. When finishing this diagnostic table, be sure to clear all codes. See **Special Tools**.

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.

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**
3	Is the system equipped with dual exhaust?	-	Go to Diagnostic Aids	Go to **Step 4**
4	1. Remove the heated oxygen sensor (HO2S) that is in front of the catalytic converter. Refer to the appropriate procedure. Refer to **Heated Oxygen Sensor Replacement - Bank 1 Sensor 1** or **Heated Oxygen Sensor Replacement - Bank 2 Sensor 1** . 2. Install the **J 35314-A** Exhaust Back Pressure Gage in place of the HO2S sensor. See **Special Tools**. 3. Start the engine. 4. Increase and monitor the engine speed at 2,500 RPM. 5. 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 8**

5	1. Turn the engine OFF and place the ignition in the lock position. 2. Remove the **J 35314-A** . See **Special Tools**. 3. Reinstall the HO2S sensor. Refer to **Heated Oxygen Sensor Replacement - Bank 1 Sensor 1** or **Heated Oxygen Sensor Replacement - Bank 2 Sensor 1** . 4. Remove the post-catalyst HO2S sensor. Refer to the appropriate procedure. Refer to **Heated Oxygen Sensor Replacement - Bank 1 Sensor 2** or **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2** . 5. Install the **J 35314-A** in place of the post HO2S sensor. See **Special Tools**. 6. Start 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**
	Inspect the exhaust system for the following conditions: • Damage in the exhaust pipe • Debris in the exhaust pipe • Muffler or resonator internal			

6	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 - Left Side** or **Catalytic Converter Replacement - Right Side**. Did you find and correct the condition?	-	Go to **Step 8**	-
8	1. Remove the **J 35314-A** . See **Special Tools**. 2. Reinstall the applicable HO2S sensor. Refer to **Heated Oxygen Sensor Replacement - Bank 1 Sensor 2** or **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2** . 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

Condition	Action
CAUTION: **Refer to Hot Exhaust System Caution .** 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 exhaust system 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	Replace the leaking seal or gasket. Refer to the affected components procedure for service.
Irregularities at the mating surfaces on the flange connections	Repair as required or replace the affected component. Refer to the affected components procedure for service.
Exhaust manifold cracked or broken	Replace the exhaust manifold. Refer to **Exhaust Manifold Replacement - Left Side** or **Exhaust Manifold Replacement - Right Side**.
Exhaust system component connection welds leaking	Replace the leaking component. Refer to the affected component's procedure for service.
Muffler or resonator, if equipped, damaged or leaking at the seams	Replace the affected muffler or resonator, if equipped. Refer to **Muffler Replacement (NB5)** or **Muffler Replacement (NEA/NEB)**.

EXHAUST NOISE

Exhaust Noise

Condition	Action

CAUTION:
Refer to Hot Exhaust System Caution .

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, i.e. 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, if equipped. 3. Replace the faulty muffler or resonator (if equipped). Refer to **Muffler Replacement (NB5)** or **Muffler Replacement (NEA/NEB)**.
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, if equipped or muffler. Refer to **Muffler Replacement (NB5)** or **Muffler Replacement (NEA/NEB)**.

REPAIR INSTRUCTIONS

EXHAUST MANIFOLD REPLACEMENT - LEFT SIDE

Removal Procedure

CAUTION: Refer to Exhaust Service Caution .

CAUTION: Refer to Protective Goggles and Glove Caution .

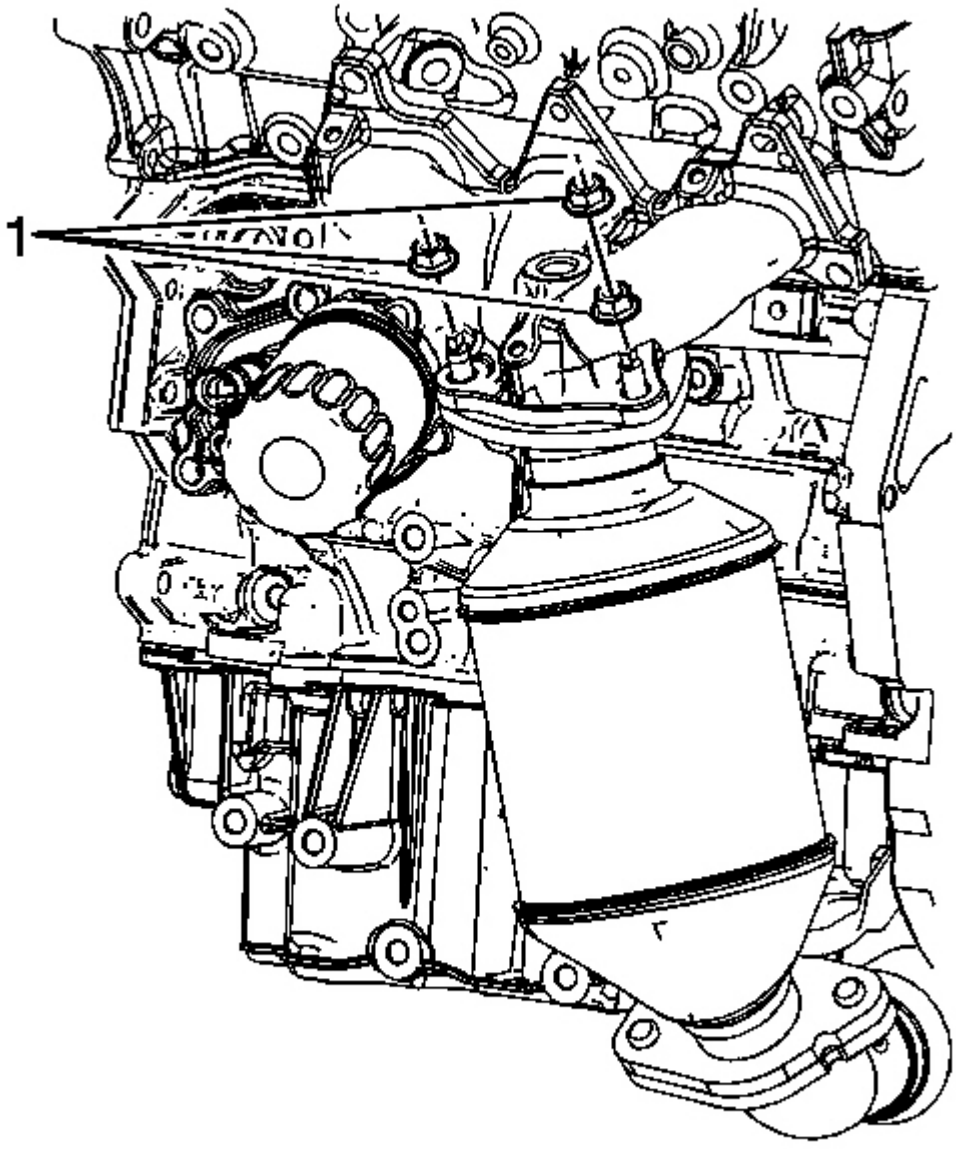


Fig. 1: Identifying Catalytic Converter To Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the exhaust manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement - Left Side**.
2. Remove the oil level indicator. Refer to **Oil Level Indicator and Tube Replacement** .

3. Remove the catalytic converter to exhaust manifold nuts (1).

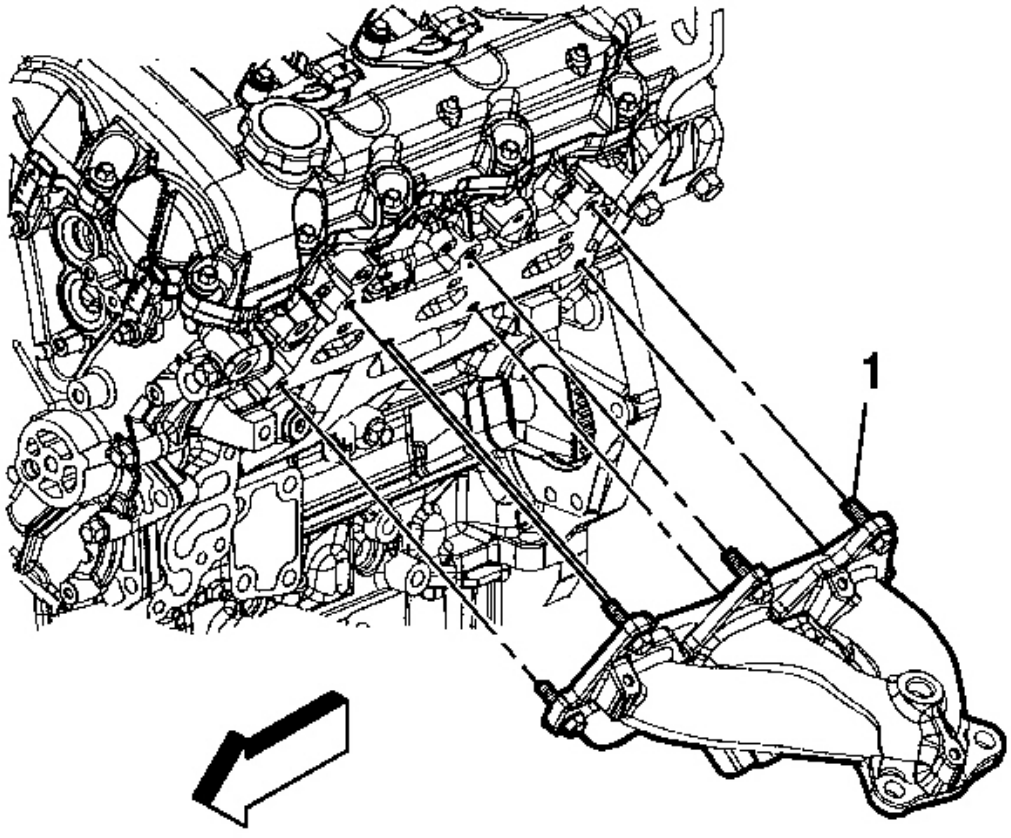


Fig. 2: Identifying Exhaust Manifold Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the exhaust manifold bolts (1).

IMPORTANT: Do not reuse the gasket.

5. Remove the exhaust manifold and gasket. Discard the gasket.

Installation Procedure

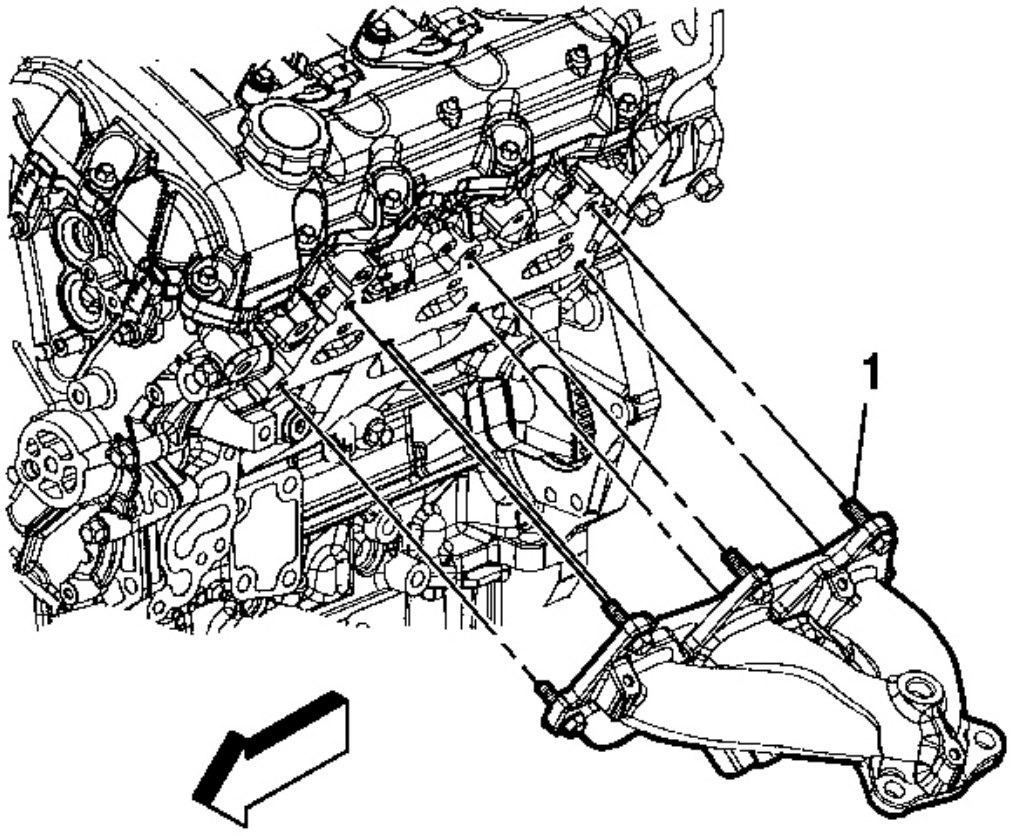


Fig. 3: Identifying Exhaust Manifold Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install one exhaust manifold bolt (1) to the exhaust manifold.
2. Install the NEW exhaust manifold gasket onto the exhaust manifold and bolt.
3. Install the exhaust manifold (with gasket) to the cylinder head and the catalytic converter.

NOTE: Refer to Fastener Notice .

4. Install the remaining exhaust manifold bolts.

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

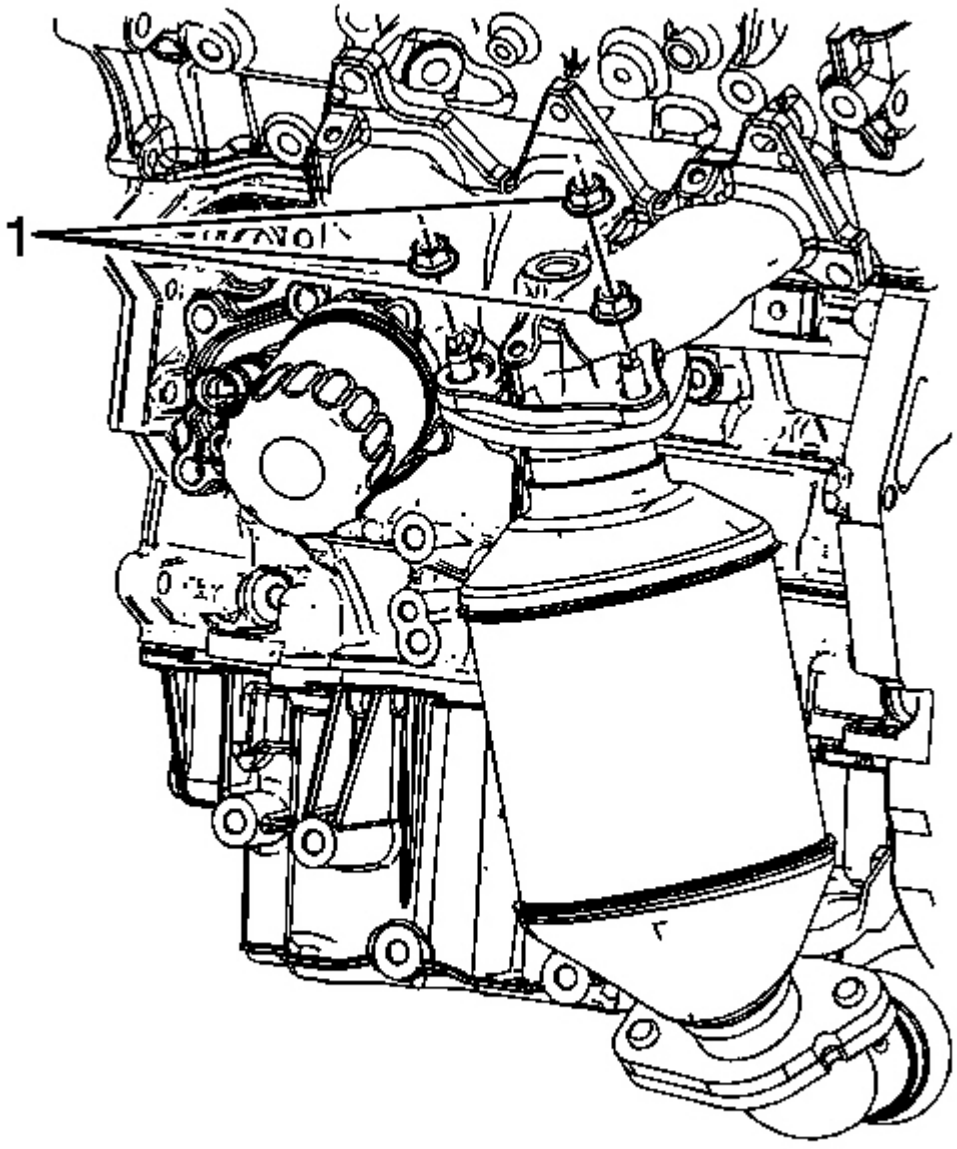


Fig. 4: Identifying Catalytic Converter To Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

5. Install the catalytic converter to exhaust manifold nuts (1).

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

6. Install the oil level indicator. Refer to **Oil Level Indicator and Tube Replacement** .
7. Install the exhaust manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement - Left Side**.

EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE

Removal Procedure

CAUTION: Refer to Exhaust Service Caution .

CAUTION: Refer to Protective Goggles and Glove Caution .

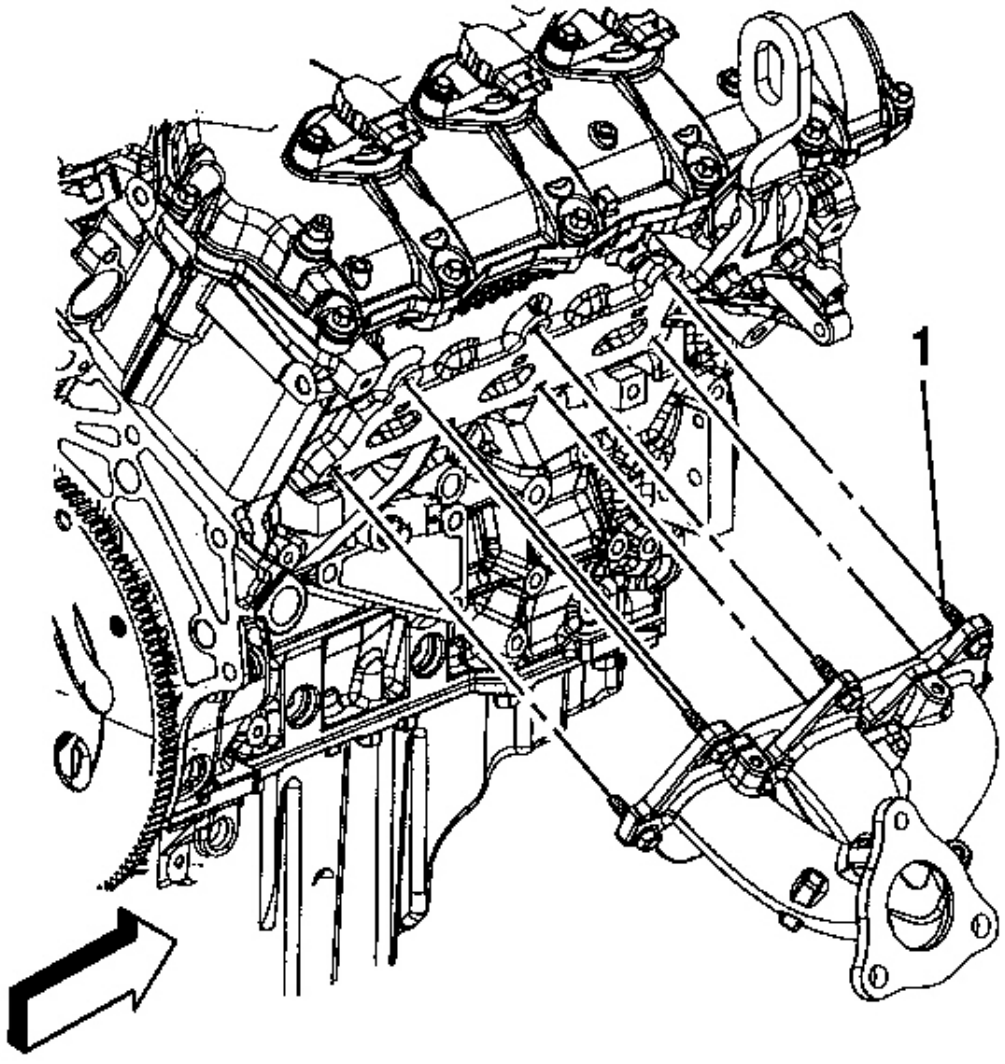


Fig. 5: Identifying Exhaust Manifold Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the catalytic converter. Refer to **Catalytic Converter Replacement - Right Side**.
2. Remove the exhaust manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement - Right Side**.
3. Remove the exhaust manifold bolts (1).

IMPORTANT: Do not reuse the gasket.

4. Remove the exhaust manifold and gasket out from vehicle. Discard the gasket.

Installation Procedure

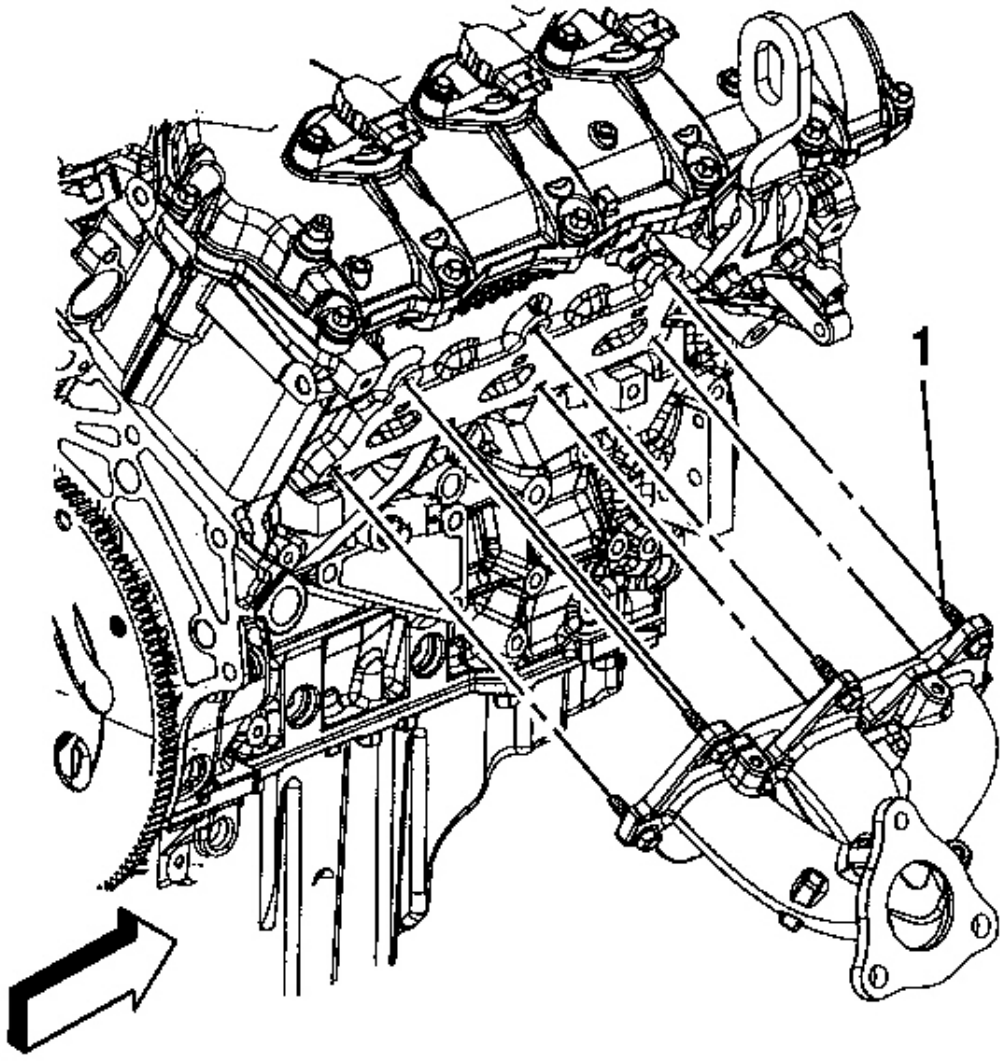


Fig. 6: Identifying Exhaust Manifold Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install one exhaust manifold bolt (1) to the exhaust manifold.
2. Install the NEW exhaust manifold gasket onto the cylinder head and bolt.
3. Install the exhaust manifold (with gasket) to the catalytic converter and the cylinder head.

NOTE: Refer to Fastener Notice .

4. Install the exhaust manifold bolts.

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

5. Install the exhaust manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement - Right Side**.
6. Install the catalytic converter. Refer to **Catalytic Converter Replacement - Right Side**.

EXHAUST FLEXIBLE PIPE REPLACEMENT

Removal Procedure

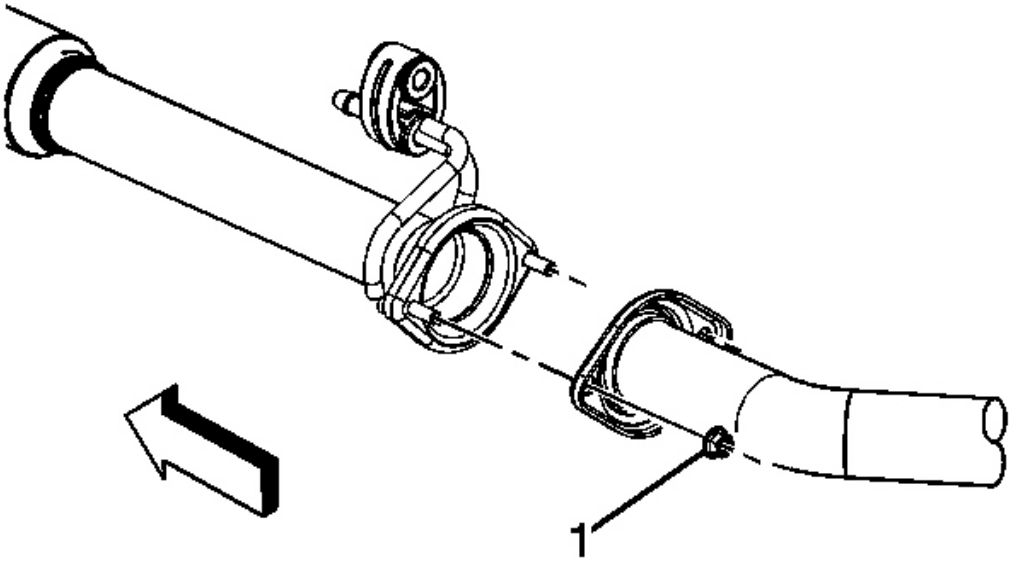


Fig. 7: Identifying Exhaust Flexible Pipe To Muffler Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the heated oxygen sensors (HO2S). Refer to **Heated Oxygen Sensor Replacement - Bank 1 Sensor 2** and **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2** .
2. Remove the exhaust flexible pipe to muffler nuts (1).
3. Pull back and separate the muffler pipe from the exhaust flexible pipe studs.

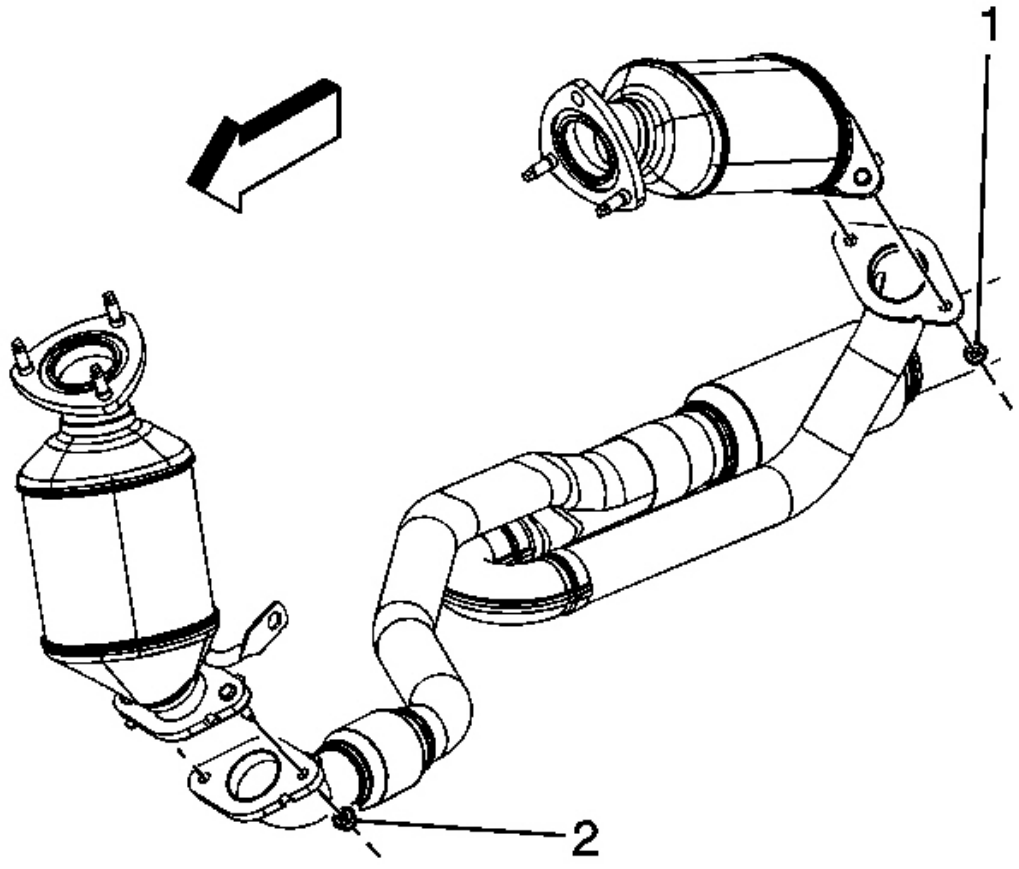


Fig. 8: Identifying Catalytic Converter To Exhaust Flexible Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

4. Remove the catalytic converter to exhaust flexible pipe nuts (1, 2).
5. Remove the exhaust flexible pipe insulator from the underbody hanger.

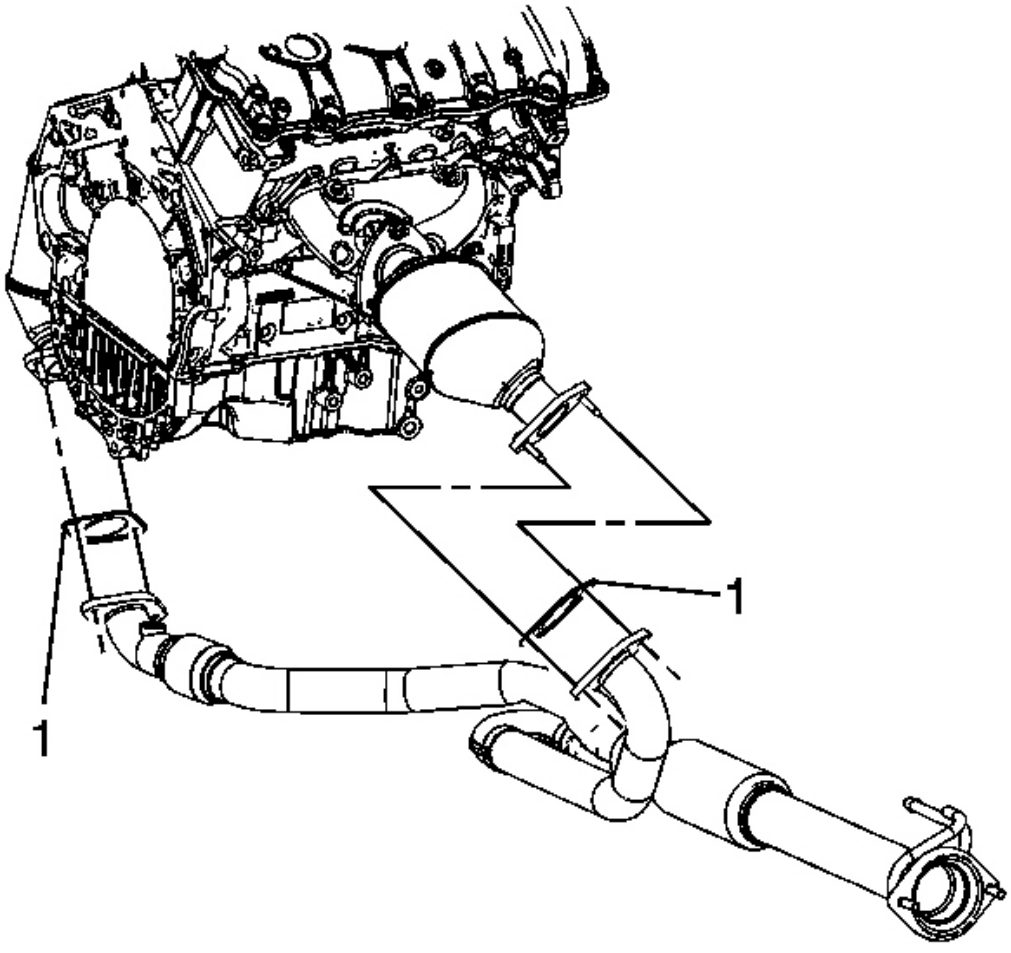


Fig. 9: Identifying Catalytic Converter Gaskets
Courtesy of GENERAL MOTORS CORP.

6. Separate the exhaust flexible pipe from the catalytic converters.
7. Remove and discard the catalytic converter gaskets (1).

Installation Procedure

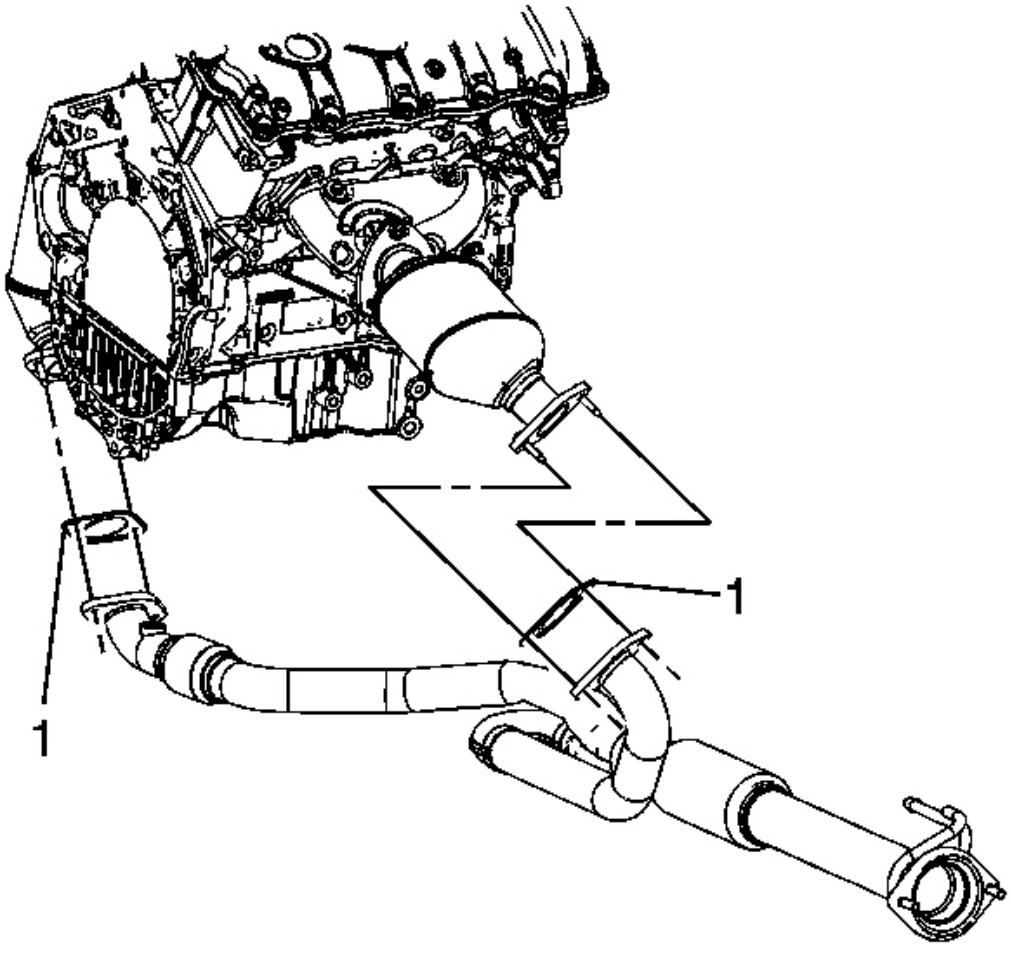


Fig. 10: Identifying Catalytic Converter Gaskets
Courtesy of GENERAL MOTORS CORP.

1. Install NEW catalytic converter gaskets (1) onto the catalytic converter studs.
2. Install the exhaust flexible pipe to the catalytic converters.

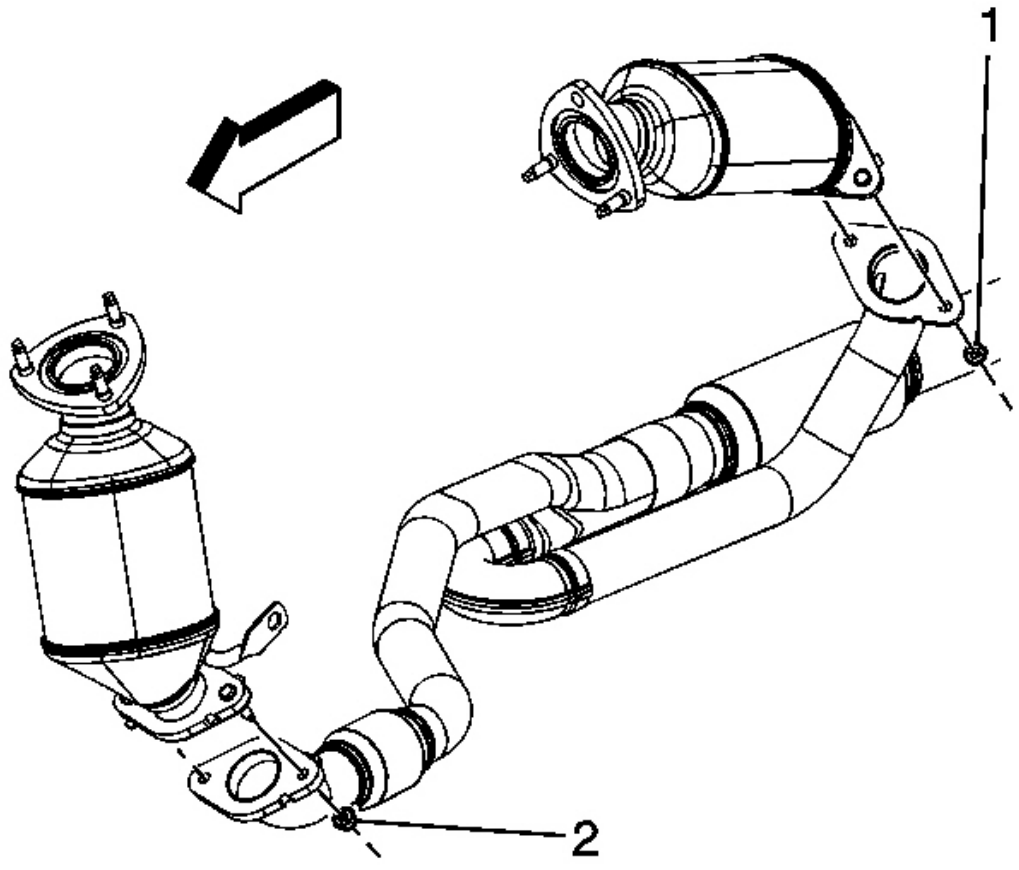


Fig. 11: Identifying Catalytic Converter To Exhaust Flexible Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

3. Install the catalytic converter to exhaust flexible pipe nuts (1, 2).

   Tighten: Tighten the nuts to 28 N.m (21 lb ft).

4. Install the flexible pipe insulator to the underbody hanger.

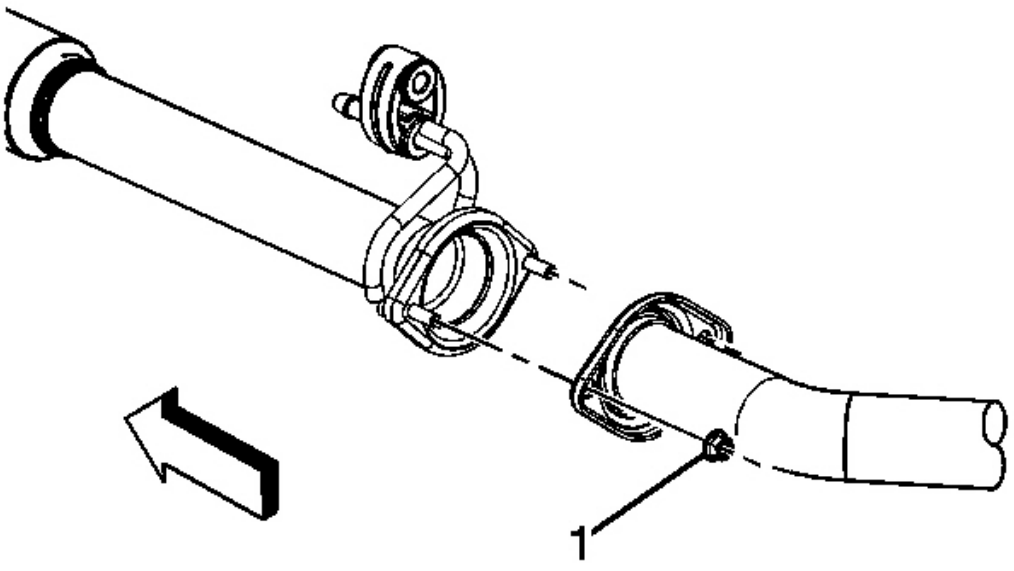


Fig. 12: Identifying Exhaust Flexible Pipe To Muffler Nuts
Courtesy of GENERAL MOTORS CORP.

5. Pull back the muffler pipe and install the pipe to the exhaust flexible pipe studs.
6. Install the exhaust flexible pipe to muffler nuts (1).

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

7. Install the HO2S. Refer to **Heated Oxygen Sensor Replacement - Bank 1 Sensor 2** and **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2** .

CATALYTIC CONVERTER REPLACEMENT - LEFT SIDE

Removal Procedure

CAUTION: Refer to Exhaust Service Caution .

CAUTION: Refer to Protective Goggles and Glove Caution .

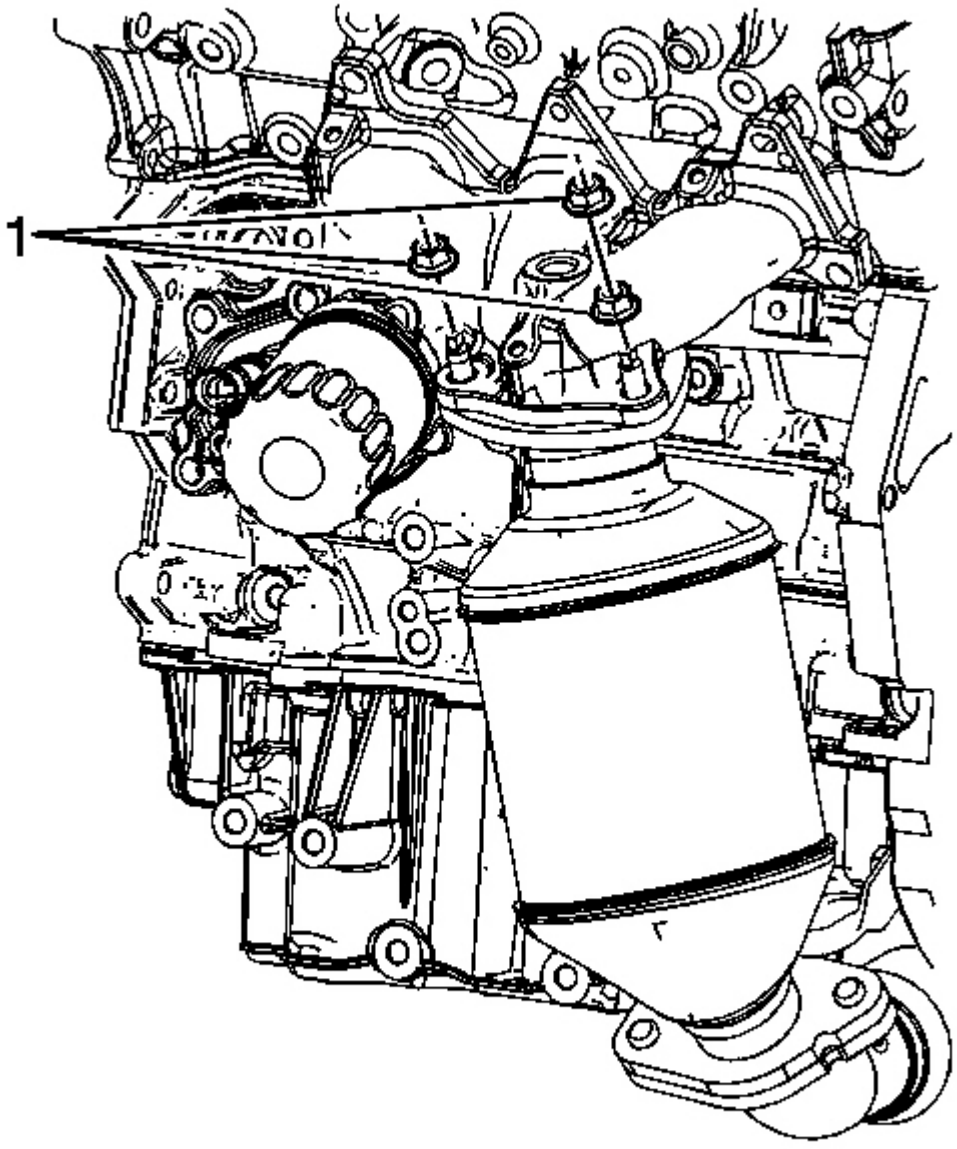


Fig. 13: Identifying Catalytic Converter To Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the exhaust manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement - Left Side**.
2. Remove the catalytic converter to exhaust manifold nuts (1).

3. Remove the exhaust flexible pipe. Refer to **Exhaust Flexible Pipe Replacement**.

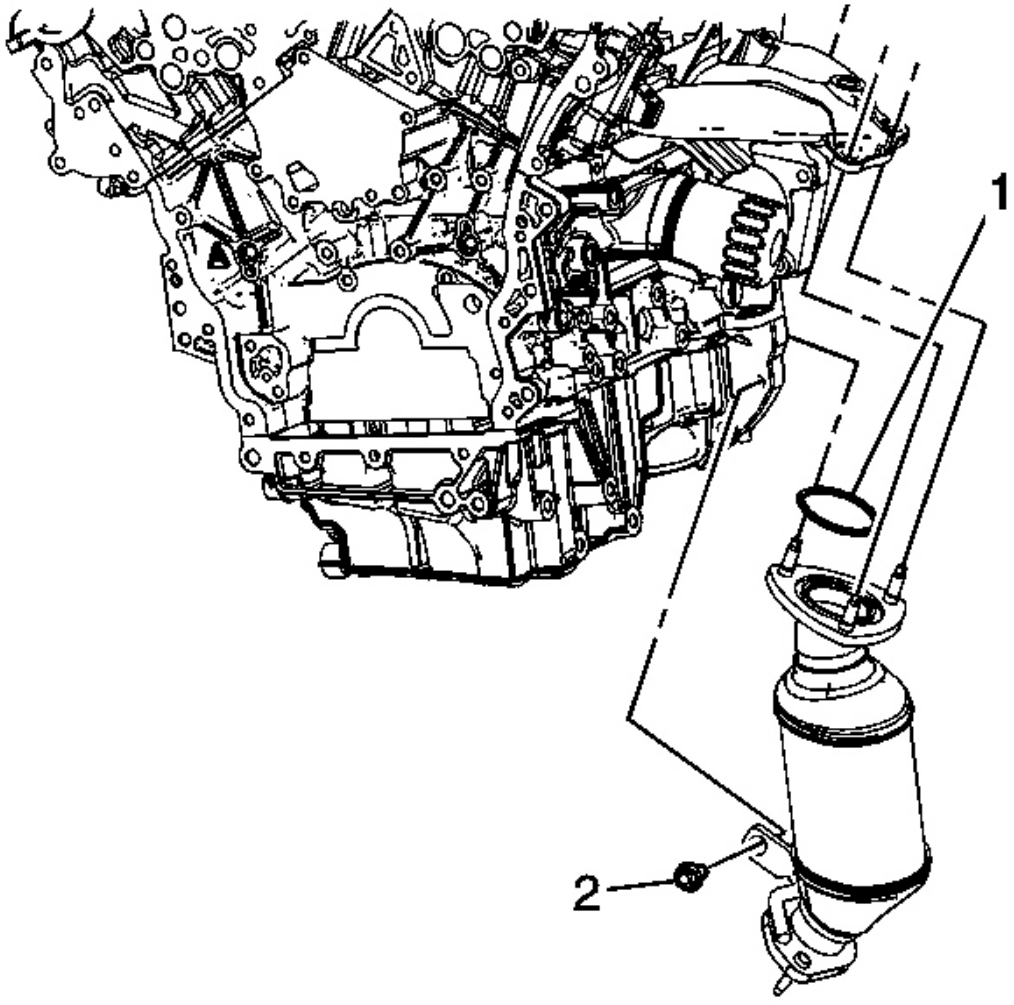


Fig. 14: Identifying Catalytic Converter Brace Bolt
Courtesy of GENERAL MOTORS CORP.

4. Remove the catalytic converter brace bolt (2).
5. Remove the catalytic converter from the exhaust manifold.
6. Remove and discard the catalytic converter to exhaust manifold seal (1).

Installation Procedure

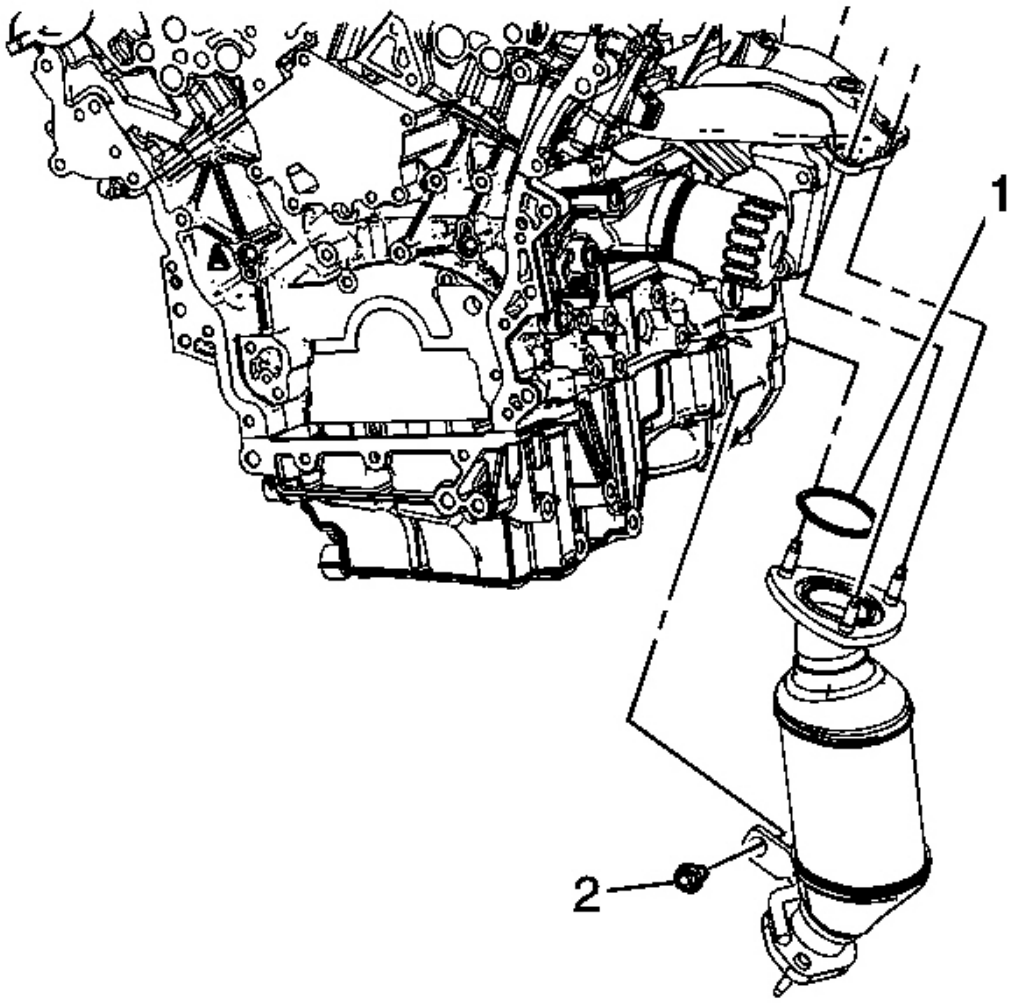


Fig. 15: Identifying Catalytic Converter Brace Bolt
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW exhaust manifold seal (1) onto the catalytic converter.
2. Install the catalytic converter to the exhaust manifold.

NOTE: Refer to Fastener Notice .

3. Install the catalytic converter brace bolt (2).

Tighten: Tighten the bolt to 41 N.m (30 lb ft).

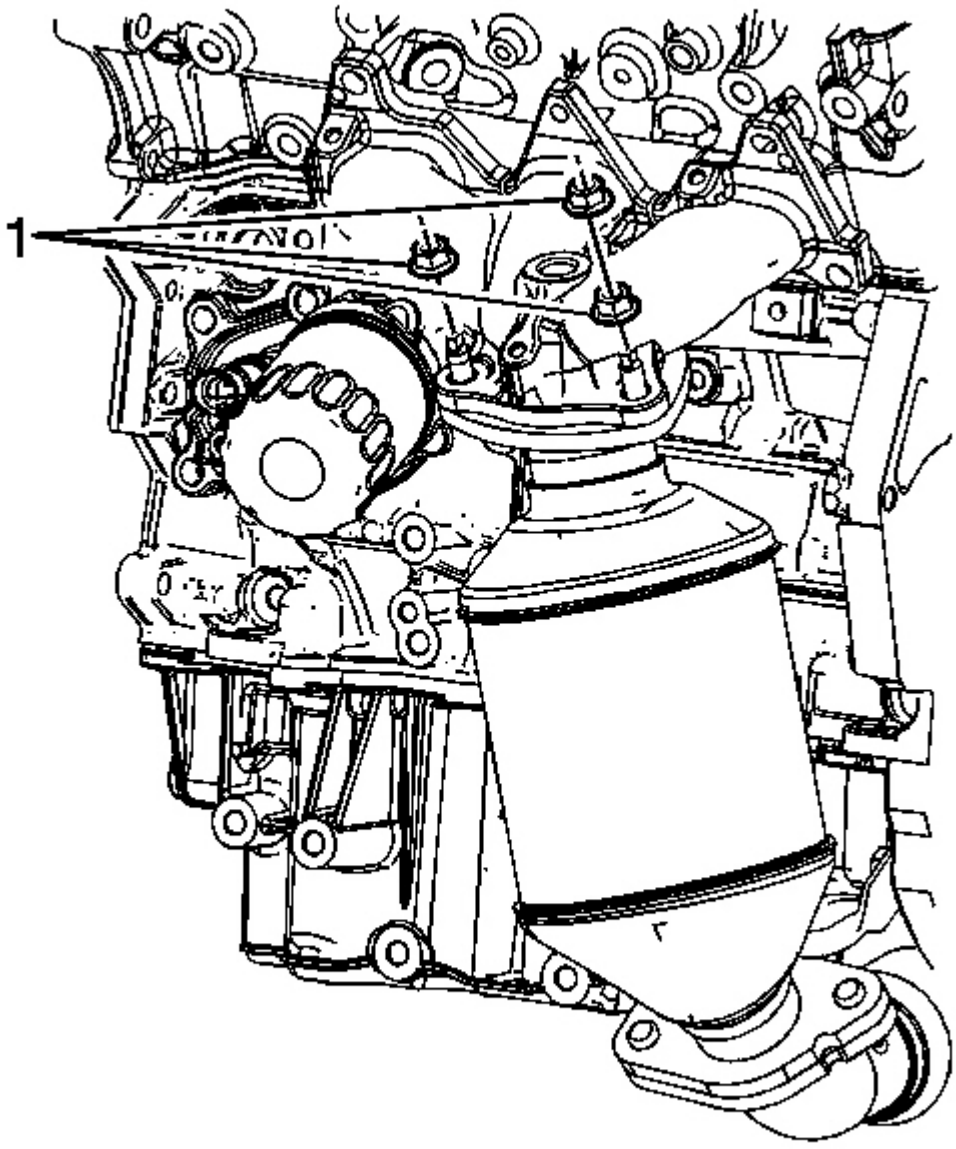


Fig. 16: Identifying Catalytic Converter To Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

4. Install the exhaust flexible pipe. Refer to **Exhaust Flexible Pipe Replacement**.

5. Install the catalytic converter to exhaust manifold nuts (1).

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

6. Install the exhaust manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement - Left Side**.

CATALYTIC CONVERTER REPLACEMENT - RIGHT SIDE

Removal Procedure

CAUTION: Refer to Exhaust Service Caution .

CAUTION: Refer to Protective Goggles and Glove Caution .

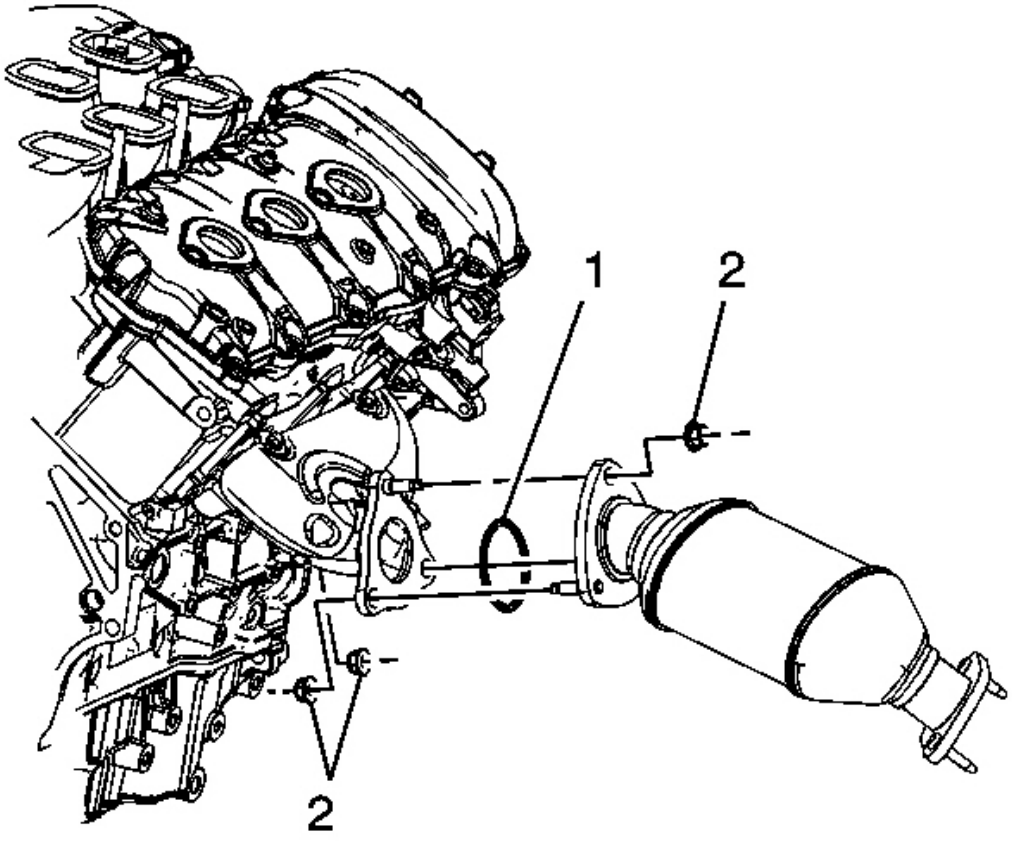


Fig. 17: Identifying Catalytic Converter To Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the exhaust flexible pipe. Refer to **Exhaust Flexible Pipe Replacement**.
2. Remove the catalytic converter to exhaust manifold nuts (2).
3. Remove the catalytic converter from the exhaust manifold.
4. Remove and discard the catalytic converter to exhaust manifold seal (1).

Installation Procedure

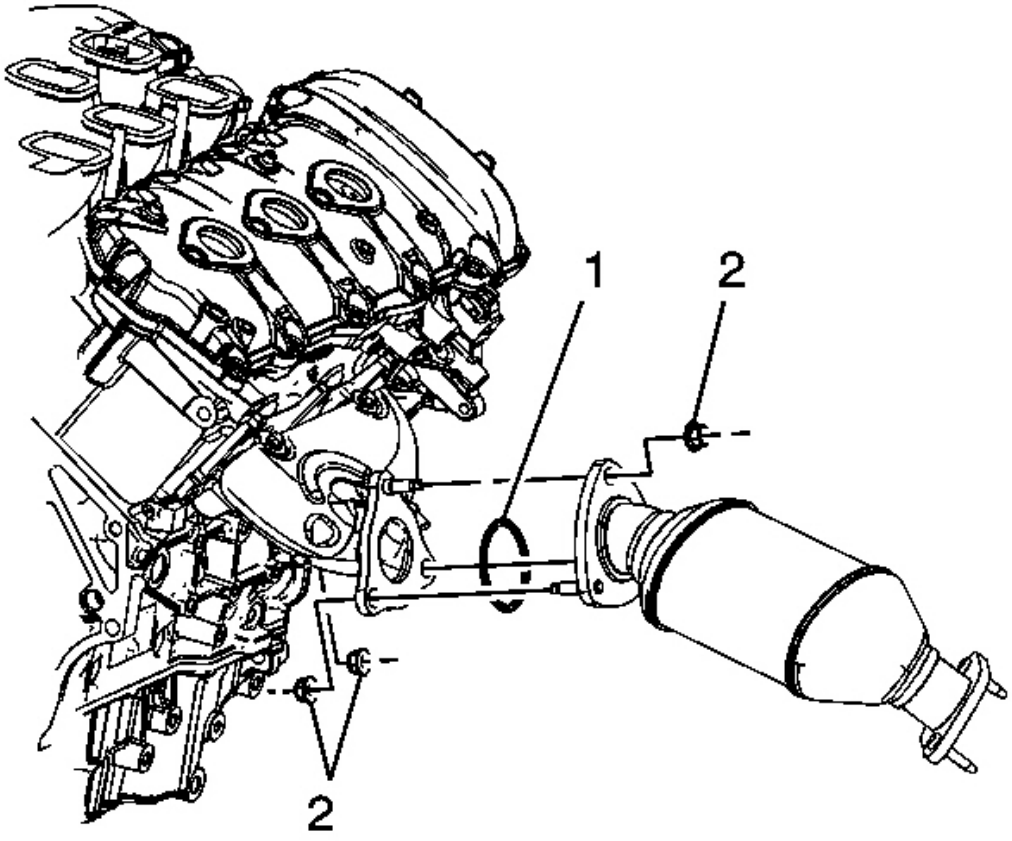


Fig. 18: Identifying Catalytic Converter To Exhaust Manifold Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW catalytic converter to exhaust manifold seal (1) onto the catalytic converter.
2. Install the catalytic converter to the exhaust manifold.

NOTE: Refer to Fastener Notice .

3. Install the catalytic converter to exhaust manifold nuts (2).

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

4. Install the exhaust flexible pipe. Refer to **Exhaust Flexible Pipe Replacement**.

MUFFLER REPLACEMENT (NB5)

Removal Procedure

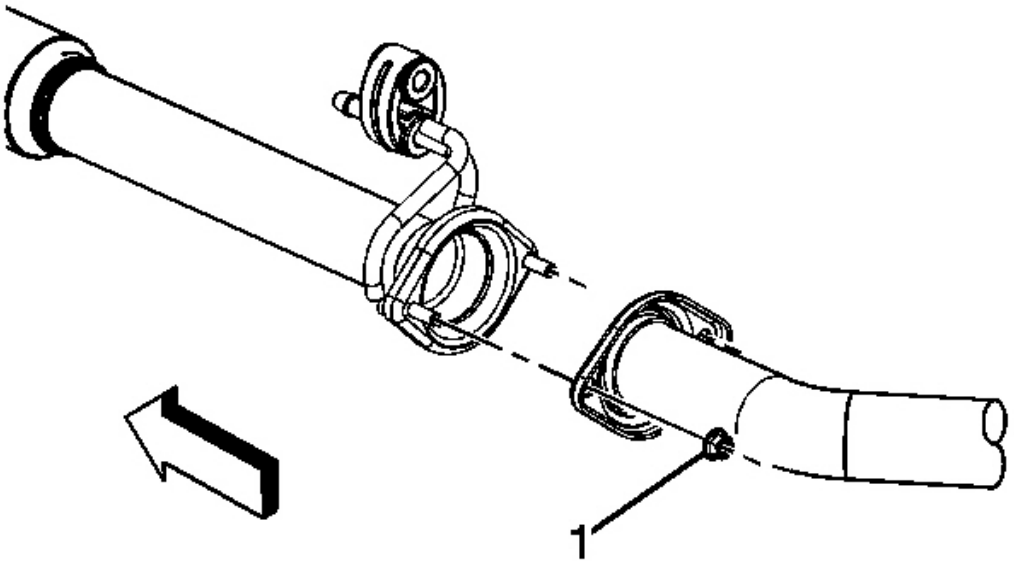


Fig. 19: Identifying Exhaust Flexible Pipe To Muffler Nuts
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the exhaust flexible pipe to muffler nuts (1).

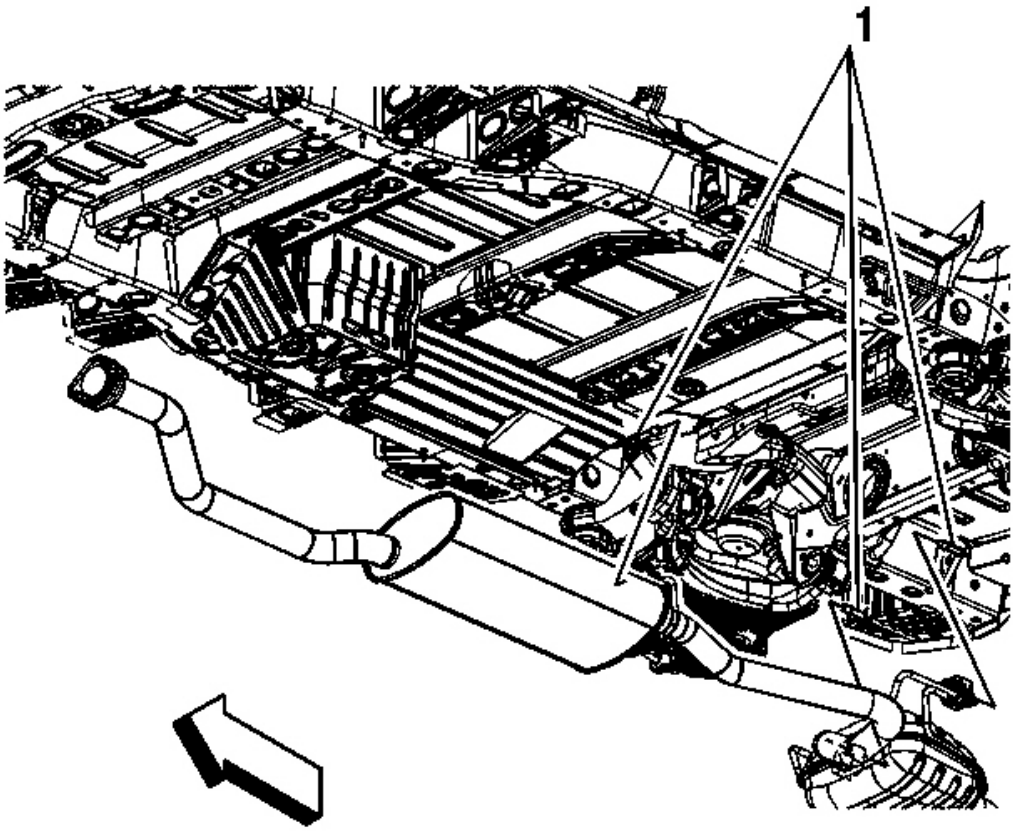


Fig. 20: Identifying Exhaust Underbody Hangers
Courtesy of GENERAL MOTORS CORP.

3. With the aid of an assistant, separate the rubber insulators from the exhaust underbody hangers (1).
4. With the aid of an assistant, remove the muffler assembly from exhaust flexible pipe and the vehicle.

Installation Procedure

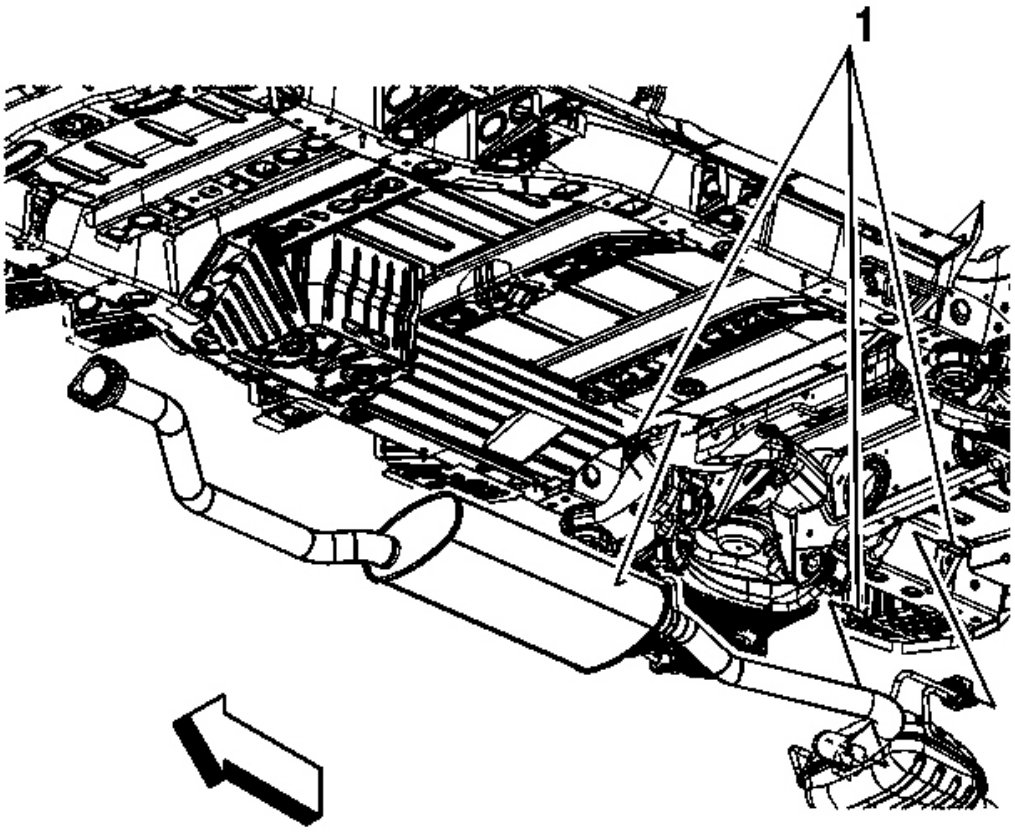


Fig. 21: Identifying Exhaust Underbody Hangers
Courtesy of GENERAL MOTORS CORP.

1. With the aid of an assistant, install the muffler assembly to the vehicle and the exhaust flexible pipe.
2. With the aid of an assistant, install the rubber insulators to the exhaust underbody hangers (1).

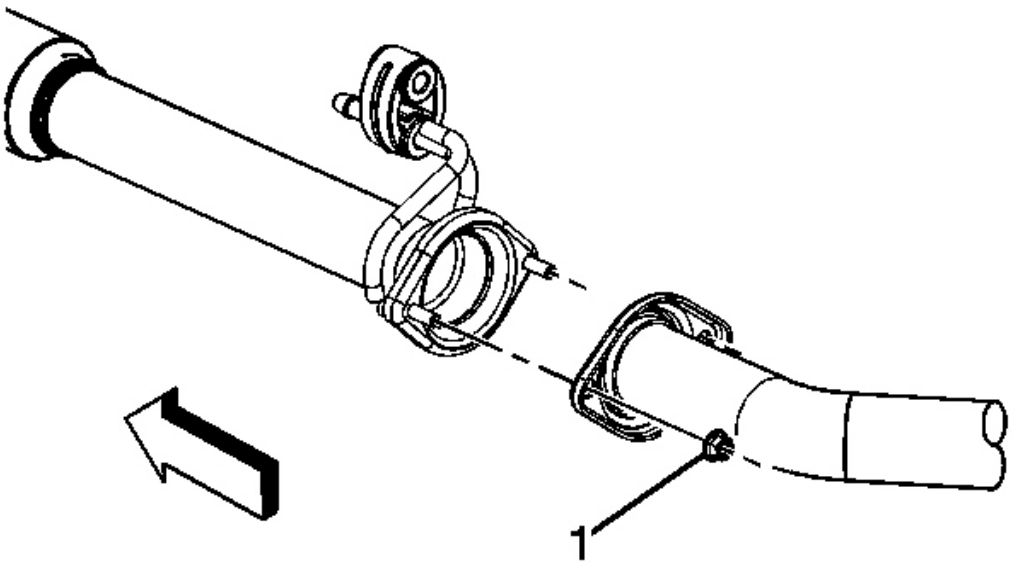


Fig. 22: Identifying Exhaust Flexible Pipe To Muffler Nuts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

3. Install the exhaust flexible pipe to muffler nuts (1)

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

4. Lower the vehicle.

MUFFLER REPLACEMENT (NEA/NEB)

Removal Procedure

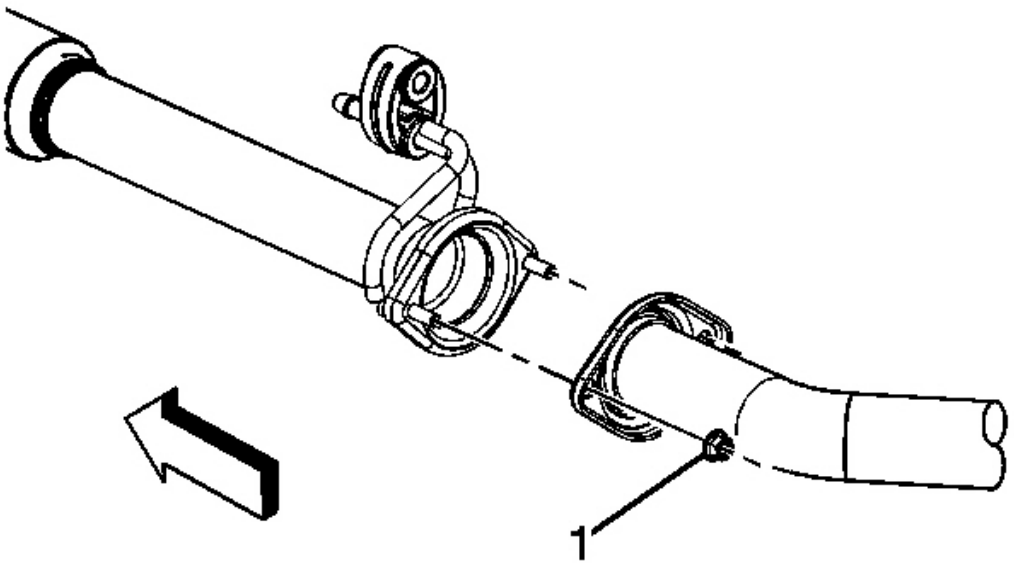


Fig. 23: Identifying Exhaust Flexible Pipe To Muffler Nuts
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the exhaust flexible pipe to muffler nuts (1).

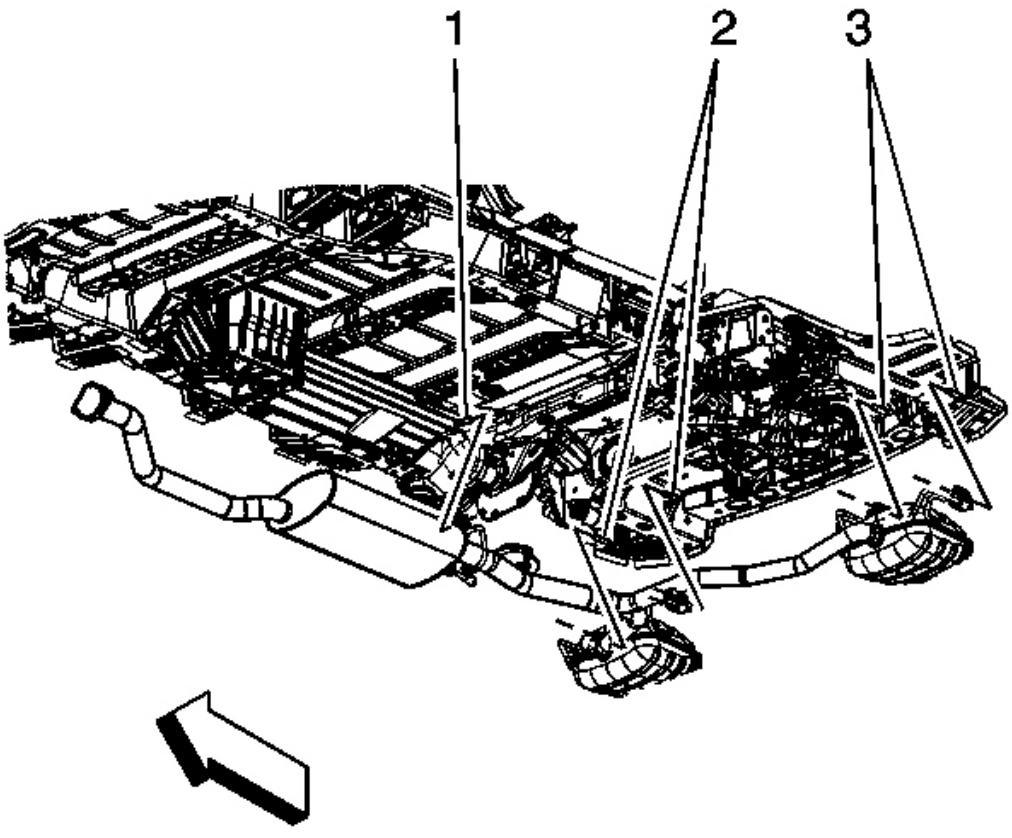


Fig. 24: Identifying Exhaust Underbody Hangers
Courtesy of GENERAL MOTORS CORP.

3. With the aid of an assistant, separate the rubber insulators from the exhaust underbody hangers (1, 2 and 3).
4. With the aid of an assistant, remove the muffler assembly from exhaust flexible pipe and the vehicle.

Installation Procedure

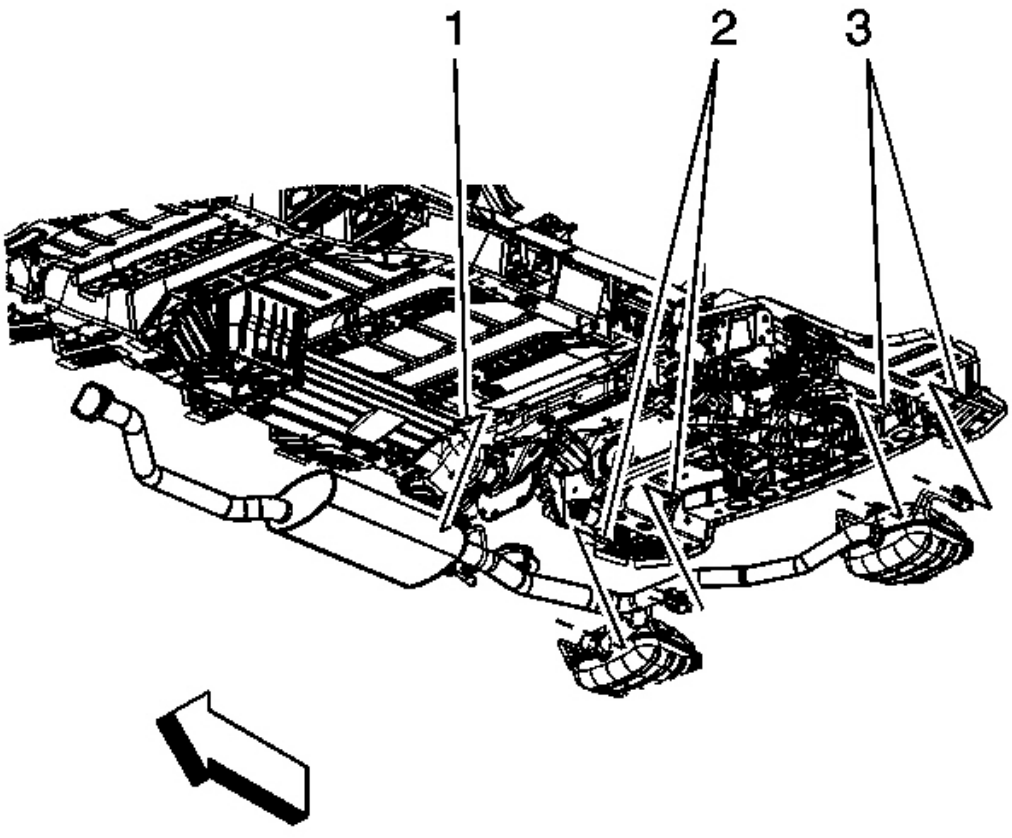


Fig. 25: Identifying Exhaust Underbody Hangers
Courtesy of GENERAL MOTORS CORP.

1. With the aid of an assistant, install the muffler assembly to the vehicle and the exhaust flexible pipe.
2. With the aid of an assistant, install the rubber insulators to the exhaust underbody hangers (1, 2 and 3).

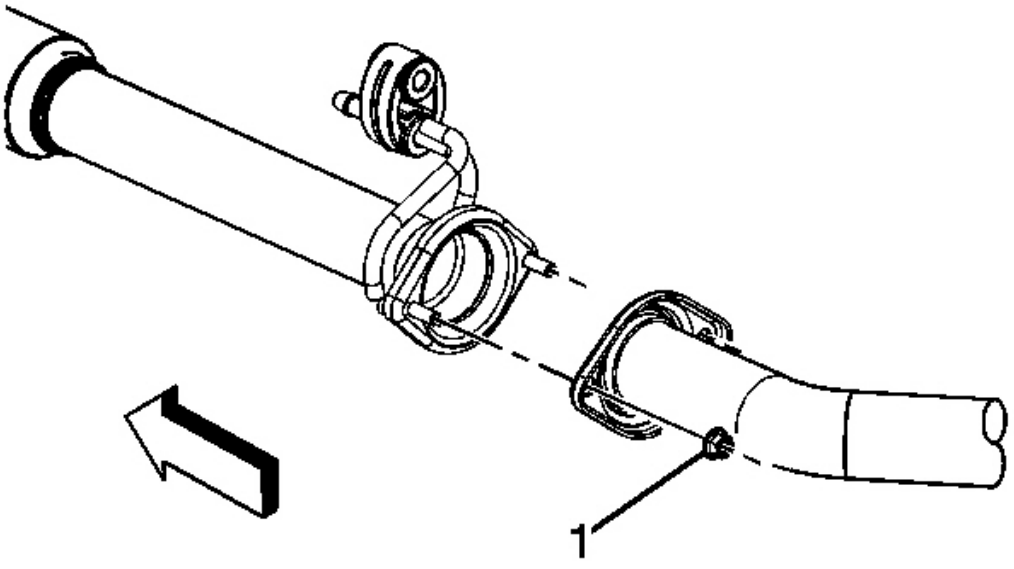


Fig. 26: Identifying Exhaust Flexible Pipe To Muffler Nuts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

3. Install the exhaust flexible pipe to muffler nuts (1)

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

4. Lower the vehicle.

EXHAUST MANIFOLD LOWER HEAT SHIELD REPLACEMENT

Removal Procedure

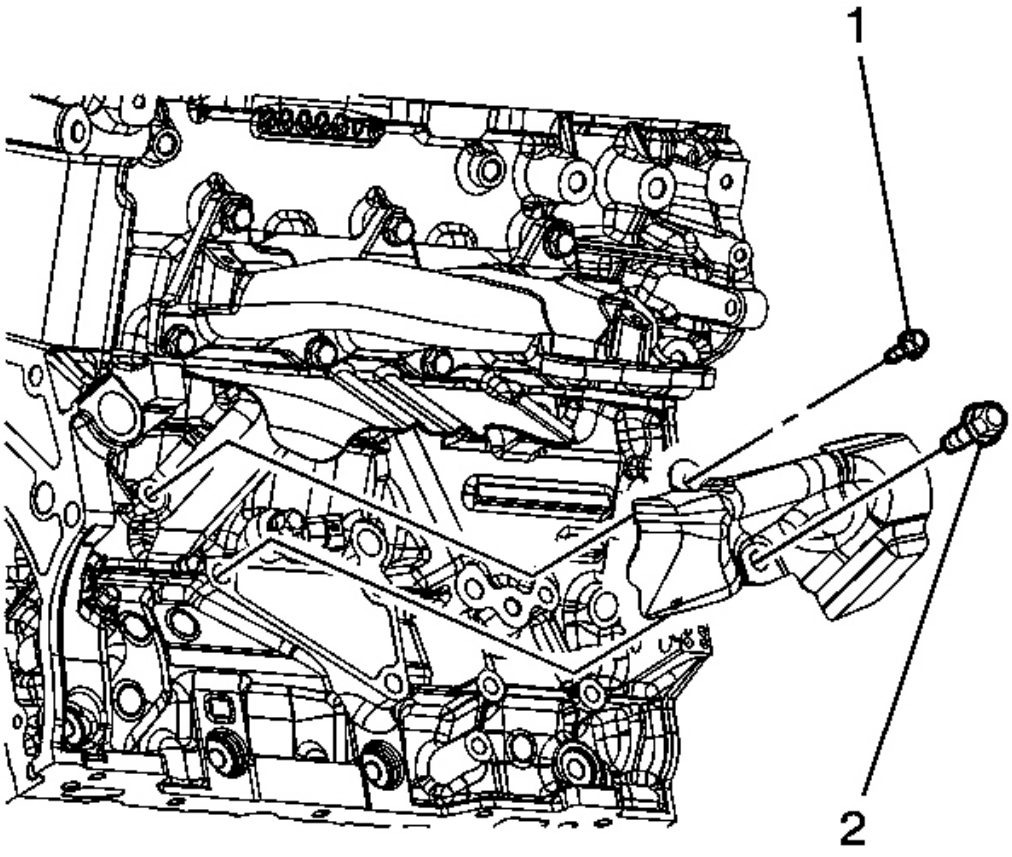


Fig. 27: Identifying Exhaust Manifold Lower Heat Shield Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the exhaust manifold lower heat shield bolts (1, 2).
2. Remove the exhaust manifold lower heat shield.

Installation Procedure

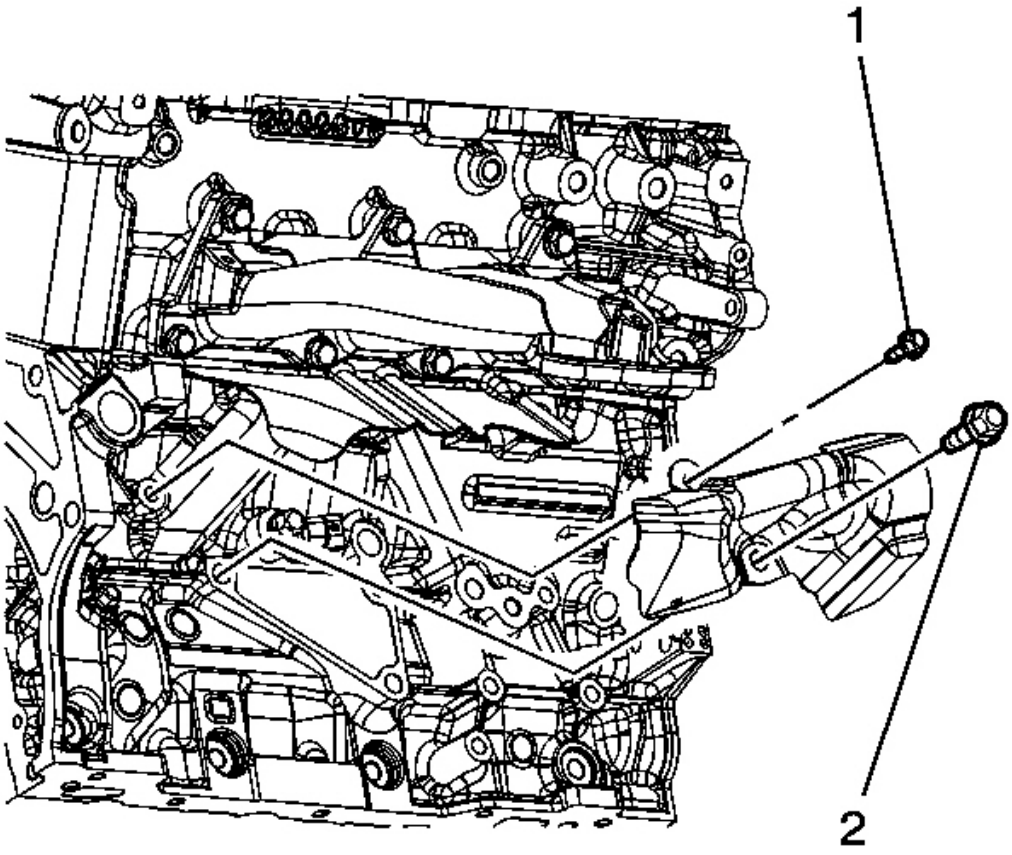


Fig. 28: Identifying Exhaust Manifold Lower Heat Shield Bolts
Courtesy of GENERAL MOTORS CORP.

1. Position the exhaust manifold lower heat shield to the engine.

NOTE: Refer to Fastener Notice .

2. Install the exhaust manifold lower heat shield bolts (1, 2).

Tighten:

- Tighten the bolt (1) to 10 N.m (89 lb in).
- Tighten the bolt (2) to 50 N.m (37 lb ft).

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - RIGHT SIDE

Removal Procedure

CAUTION: Refer to Exhaust Service Caution .

CAUTION: Refer to Protective Goggles and Glove Caution .

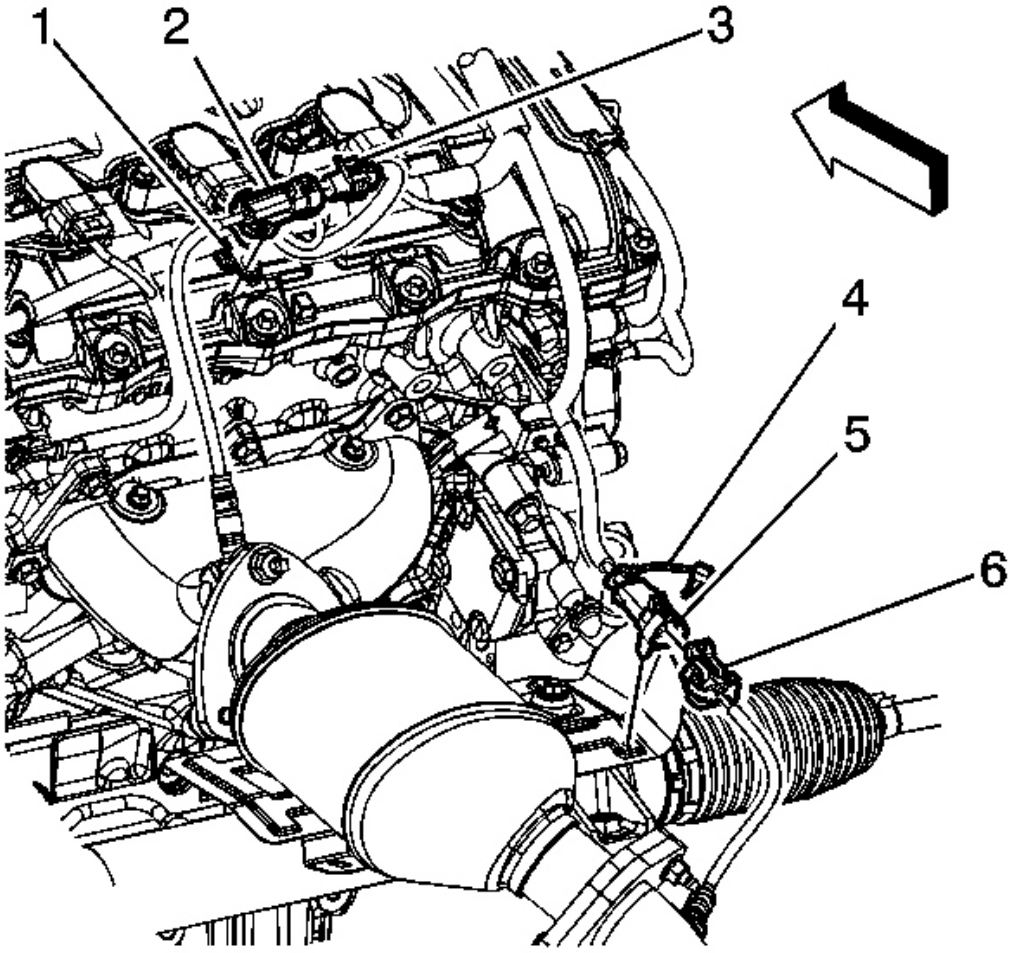


Fig. 29: View Of Heated Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Remove the exhaust flexible pipe. Refer to **Exhaust Flexible Pipe Replacement**.
2. Disconnect the engine wiring harness electrical connector (3) from the heated oxygen sensor (HO2S) electrical connector (2).
3. Remove the HO2S electrical connector retainer from the engine wiring harness clip (1).

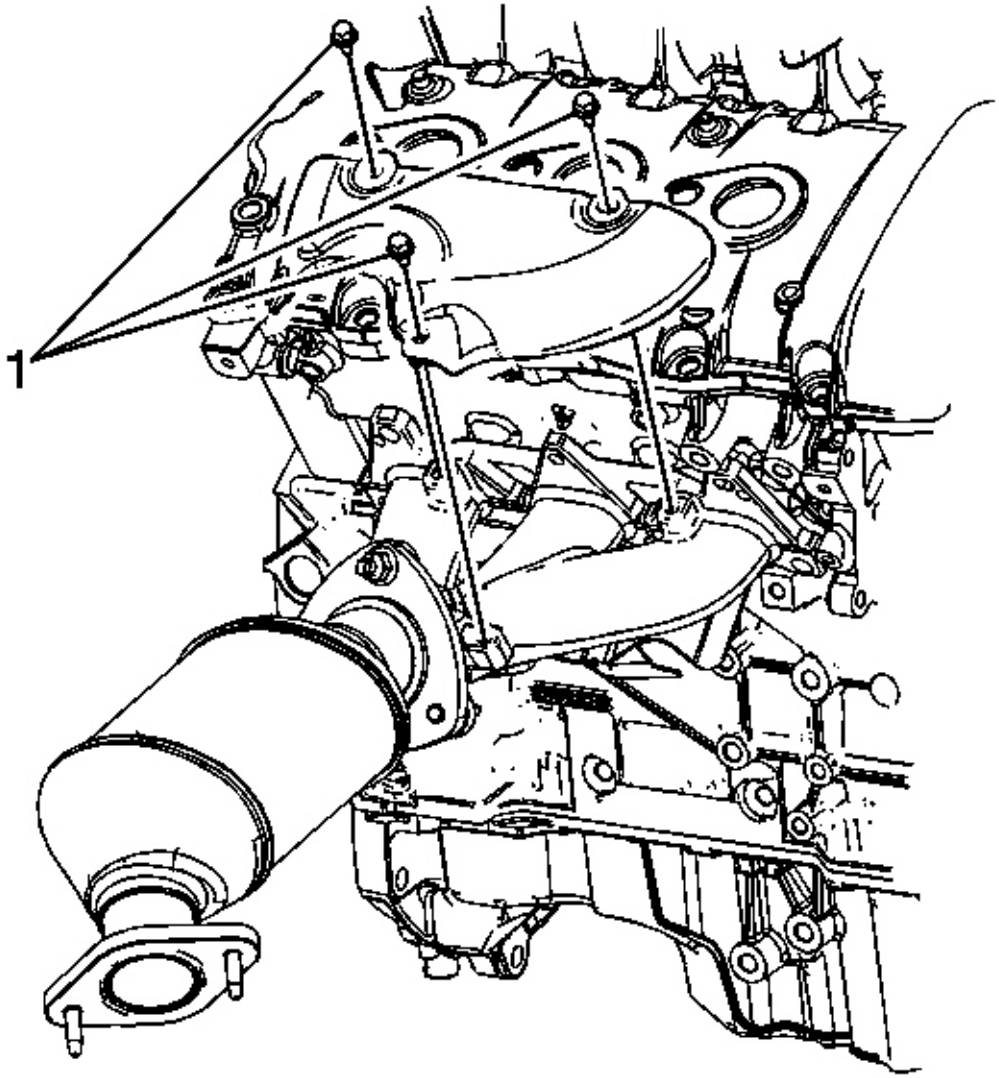


Fig. 30: Identifying Exhaust Manifold Heat Shield Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the exhaust manifold heat shield bolts (1).
5. Remove the exhaust manifold heat shield, sliding the shield up over the HO2S pigtail.

Installation Procedure

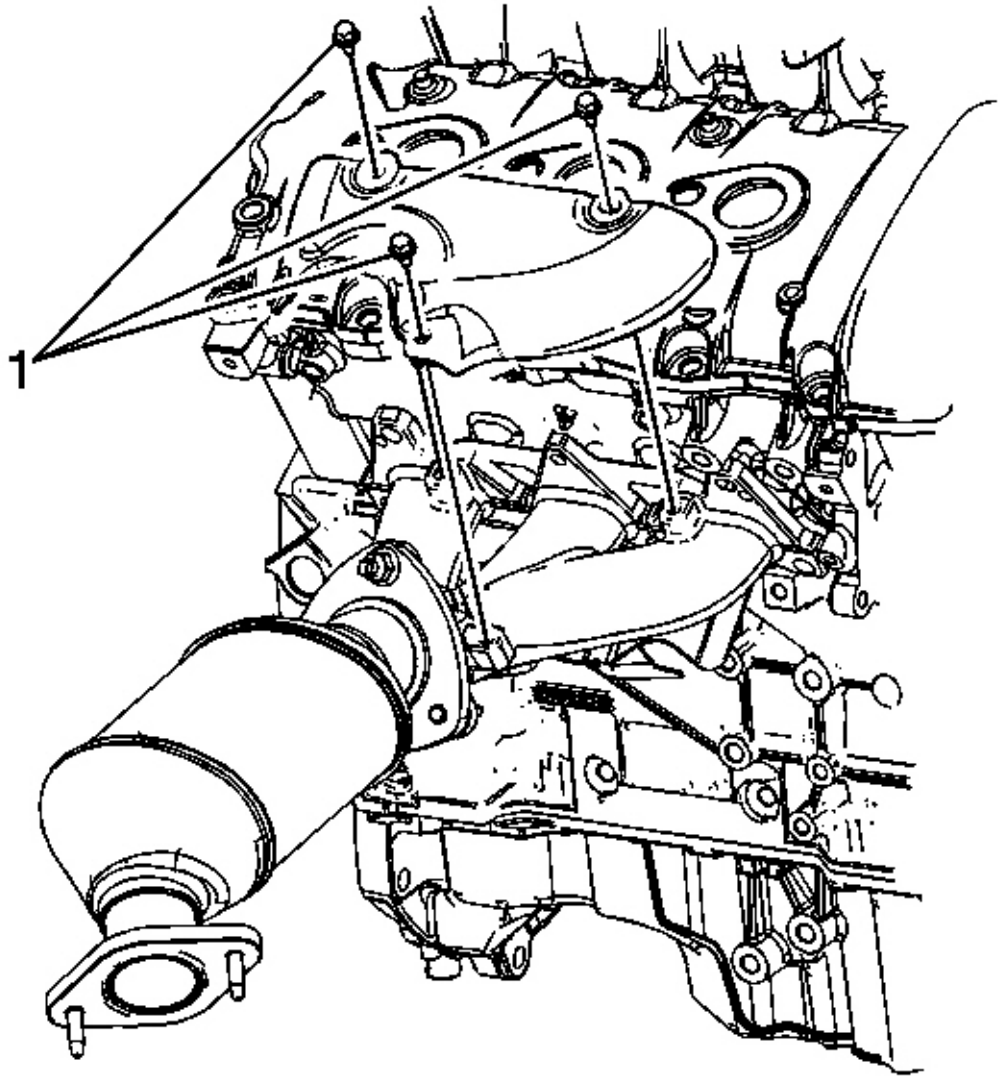


Fig. 31: Identifying Exhaust Manifold Heat Shield Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the exhaust manifold heat shield, sliding the shield down over the HO2S pigtail.

NOTE: Refer to Fastener Notice .

2. Install the exhaust manifold heat shield bolts (1).

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

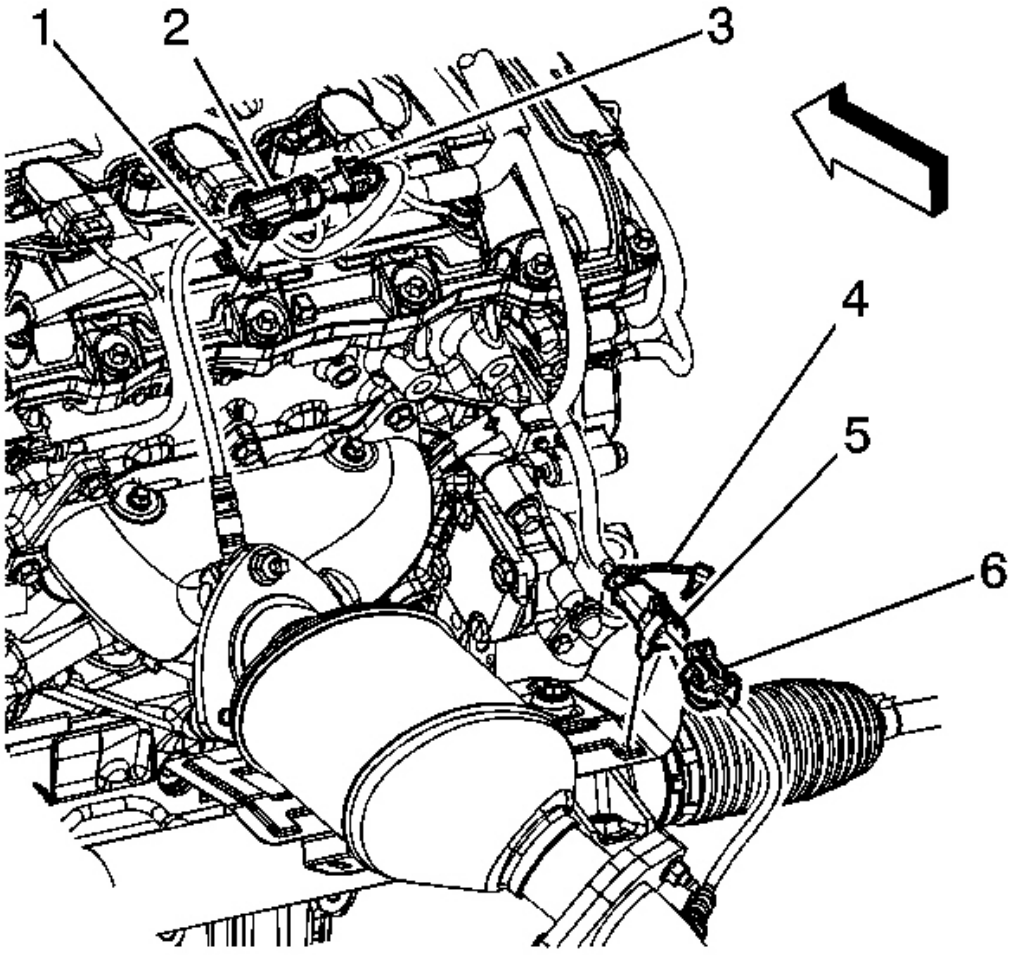


Fig. 32: View Of Heated Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Connect the engine wiring harness electrical connector (3) to the HO2S electrical connector (2).
4. Install the HO2S electrical connector retainer to the engine wiring harness clip (1).
5. Install the exhaust flexible pipe. Refer to **Exhaust Flexible Pipe Replacement**.

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - LEFT SIDE

Removal Procedure

CAUTION: Refer to Exhaust Service Caution .

CAUTION: Refer to Protective Goggles and Glove Caution .

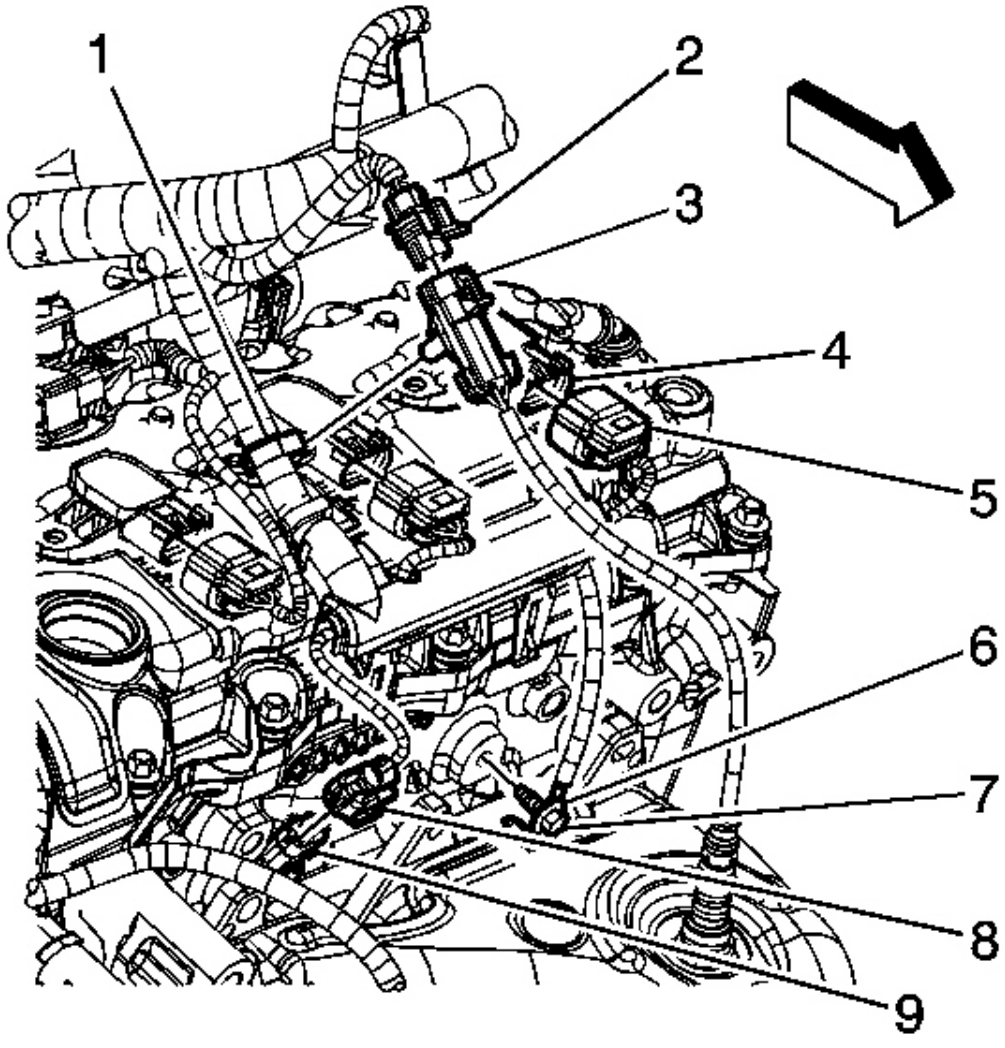


Fig. 33: Identifying Engine Wiring Harness Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Remove the fuel injector sight shield. Refer to **Fuel Injector Sight Shield Replacement** .
2. Disconnect the engine wiring harness electrical connector (2) from the heated oxygen sensor (HO2S) electrical connector (3).
3. Remove the HO2S electrical connector retainer from the engine wiring harness clip (1).

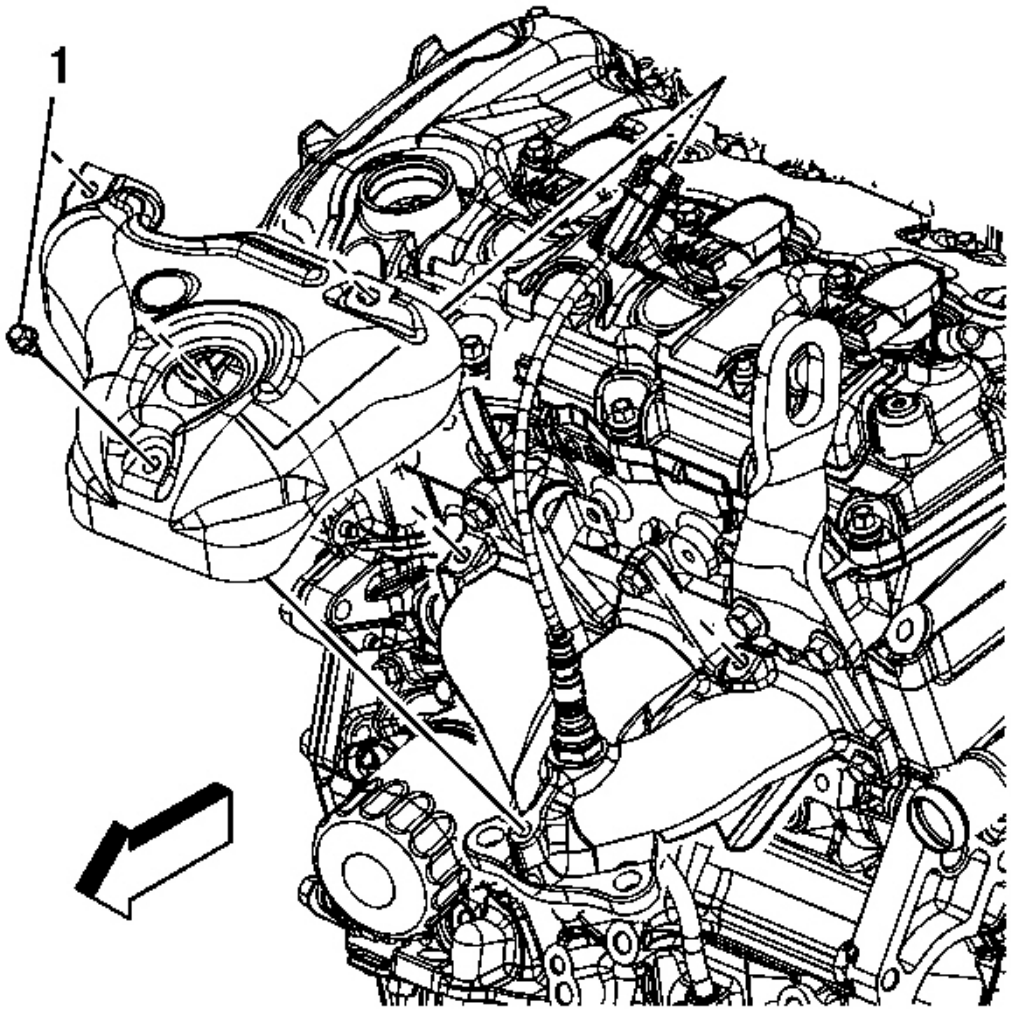


Fig. 34: Identifying Exhaust Manifold Heat Shield Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the exhaust manifold heat shield bolts (1).
5. Remove the exhaust manifold heat shield, sliding the shield up over the HO2S pigtail.

Installation Procedure

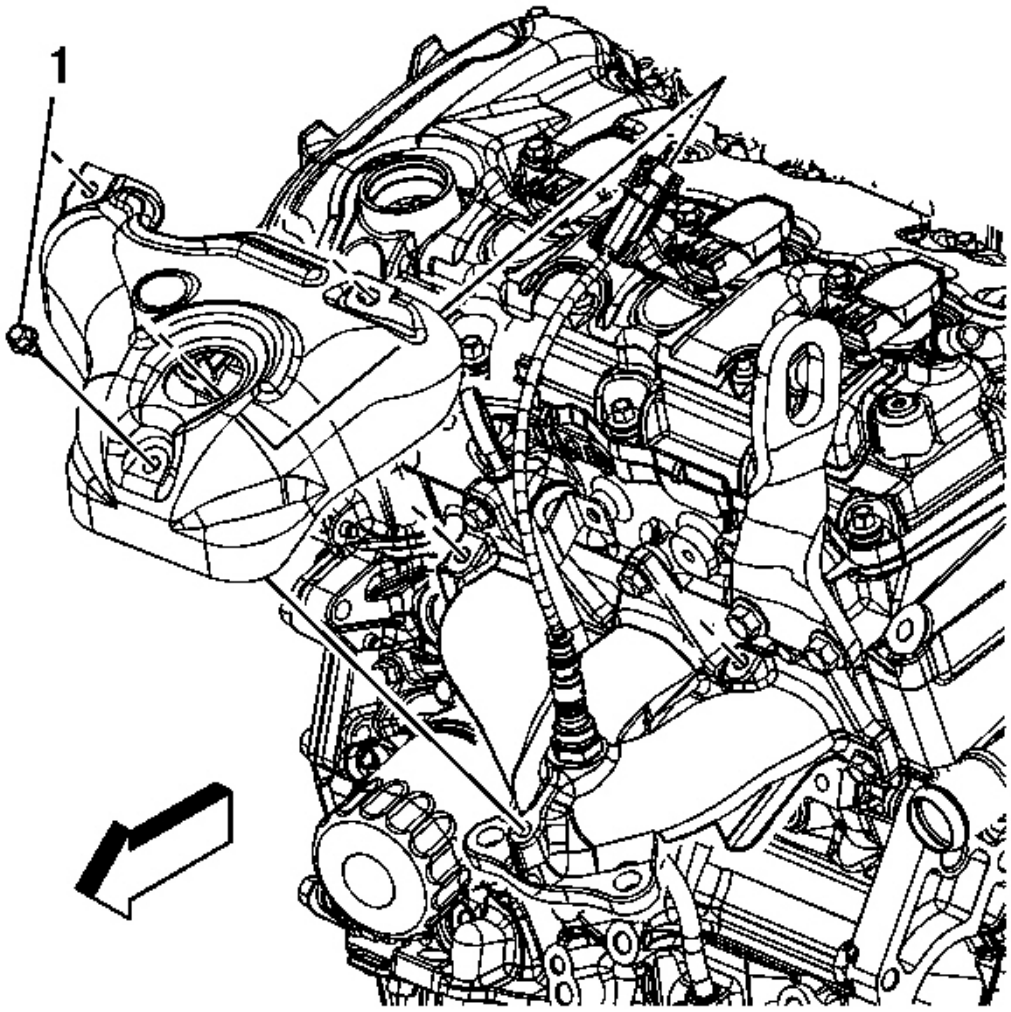


Fig. 35: Identifying Exhaust Manifold Heat Shield Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the exhaust manifold heat shield, sliding the shield down over the HO2S pigtail.

NOTE: Refer to Fastener Notice .

2. Install the exhaust manifold heat shield bolts (1).

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

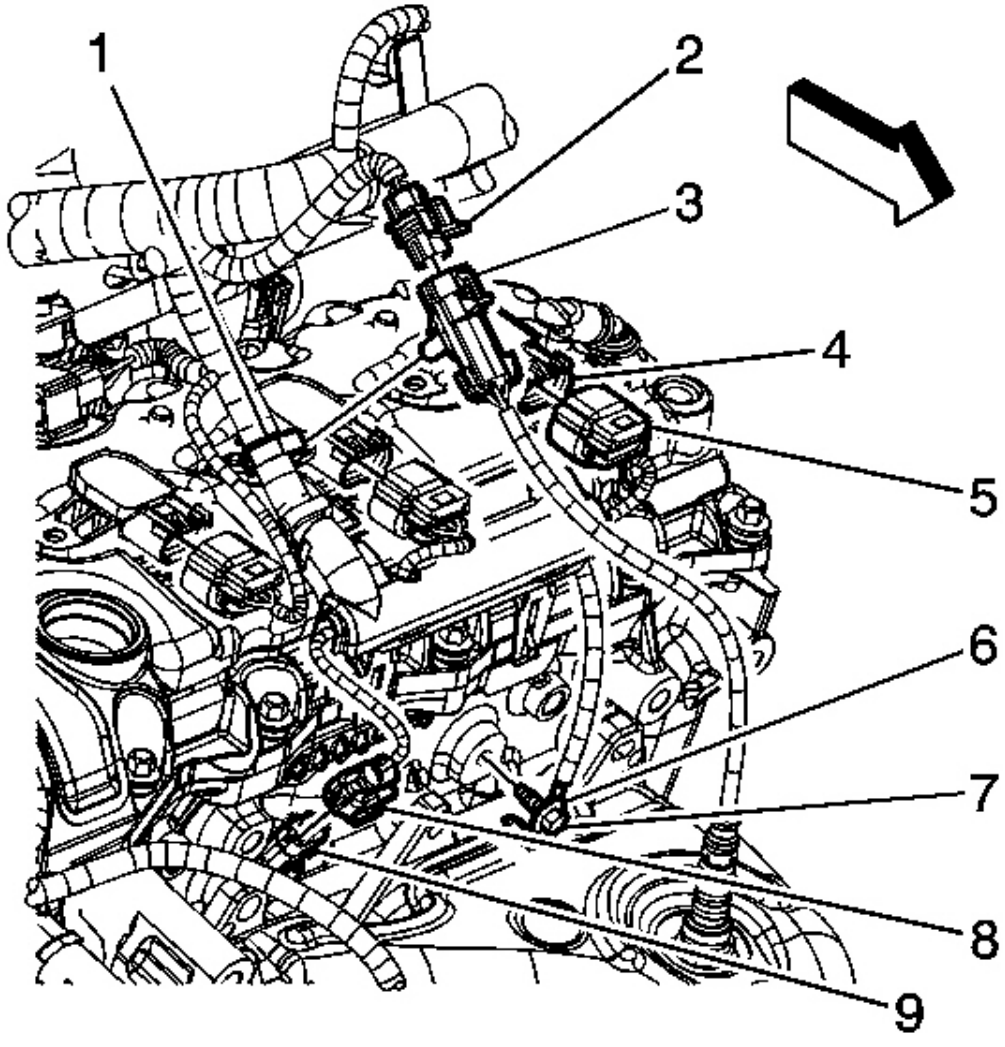


Fig. 36: Identifying Engine Wiring Harness Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Connect the engine wiring harness electrical connector (2) to the HO2S electrical connector (3).
4. Install the HO2S electrical connector retainer to the wiring harness clip (1).
5. Install the fuel injector sight shield. Refer to **Fuel Injector Sight Shield Replacement** .

EXHAUST MUFFLER HEAT SHIELD REPLACEMENT

Removal Procedure

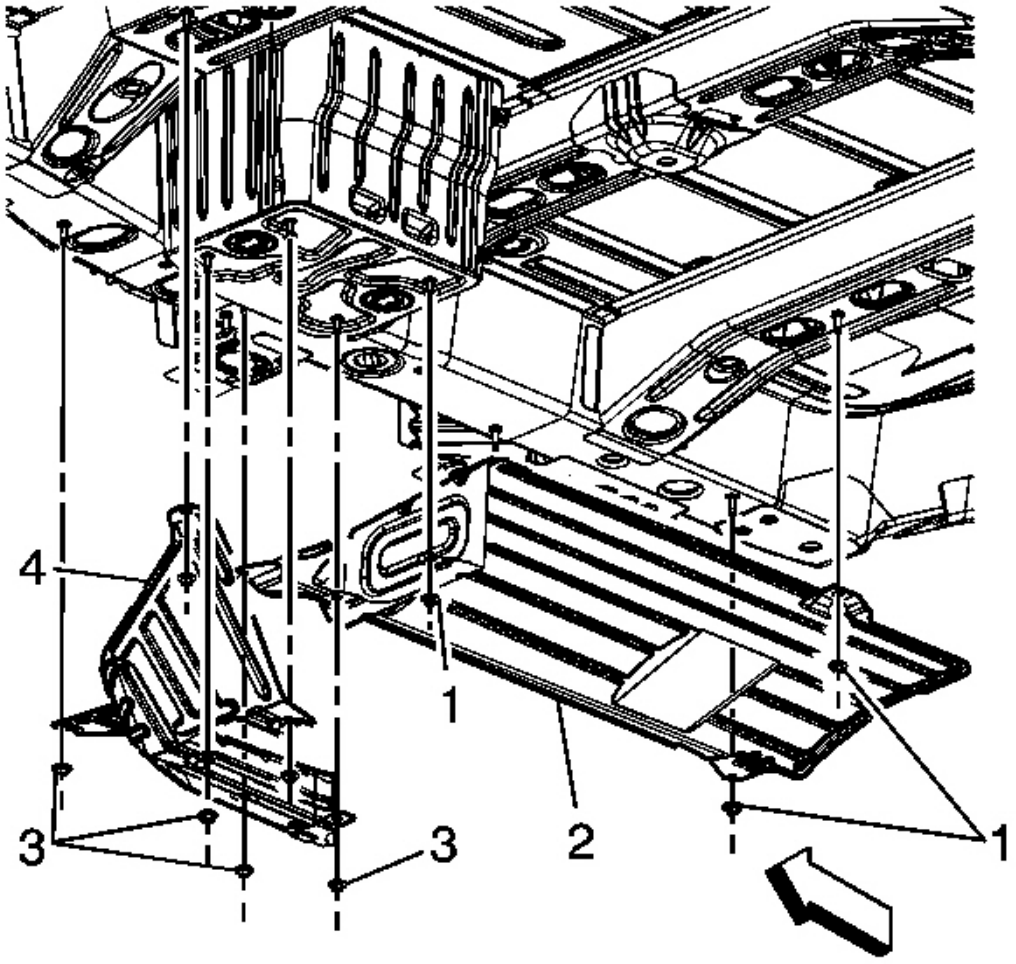


Fig. 37: Identifying Exhaust Muffler Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Remove the muffler assembly. Refer to **Muffler Replacement (NB5)** or **Muffler Replacement (NEA/NEB)**.
2. Remove the exhaust muffler front heat shield nuts (3).
3. Remove the exhaust muffler front heat shield (4).
4. Remove the exhaust muffler heat shield nuts (1).
5. Remove the exhaust muffler heat shield (2).

Installation Procedure

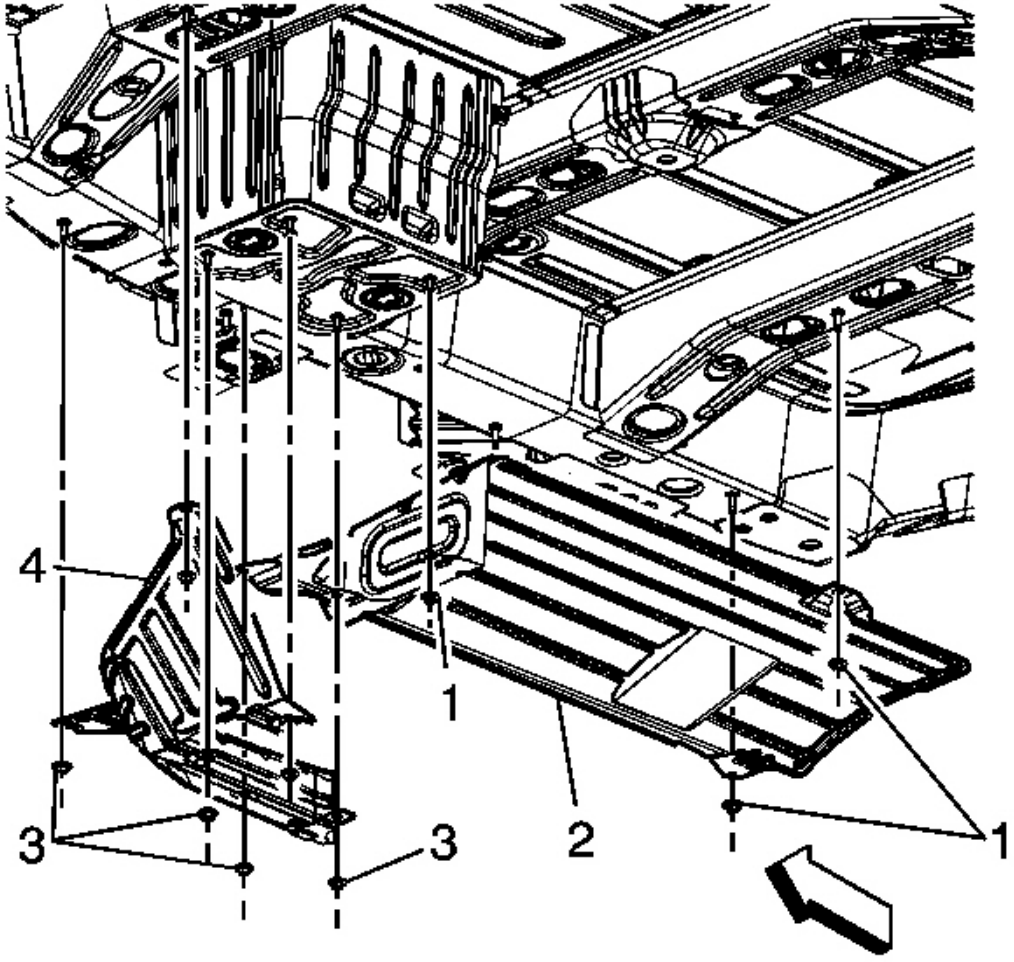


Fig. 38: Identifying Exhaust Muffler Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Position the exhaust muffler heat shield (2) to the floor panel.

   NOTE: Refer to Fastener Notice .

2. Install the exhaust muffler heat shield nuts (1).

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

3. Position the exhaust muffler front heat shield (4) to the floor panel.
4. Install the exhaust muffler front heat shield nuts (3).

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

5. Install the muffler assembly. Refer to **Muffler Replacement (NB5)** or **Muffler Replacement (NEA/NEB)**.

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 used 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)

The catalyst in the catalytic converter is not serviceable.

Muffler

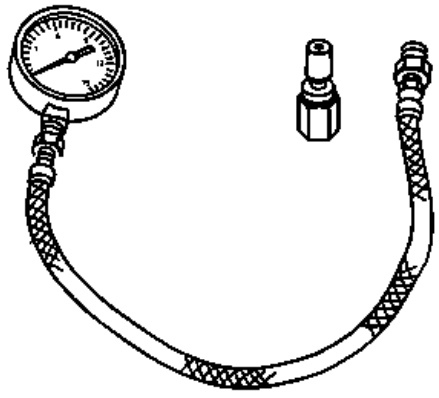
The exhaust muffler reduces the noise levels of the engine exhaust by the use of tuning tubes. The tuning tubes create channels inside the exhaust muffler that lower the sound levels created by the combustion of the engine.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description
	J 35314-A

	Exhaust Back Pressure Gage