

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

2006 ENGINE

Engine Exhaust - HHR

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Cleaner Bracket Nut	25 N.m	18 lb ft
Catalytic Converter Nut	46 N.m	34 lb ft
Exhaust Heat Shield Nut	10 N.m	89 lb in
Exhaust Manifold Heat Shield Stud	22 N.m	16 lb ft
Exhaust Manifold Nut	14 N.m	10 lb ft
Exhaust Muffler Nut	46 N.m	37 lb ft
Wheel Drive Shaft Heat Shield-to-Engine Block Bolt	30 N.m	22 lb ft
Wheel Drive Shaft Heat Shield-to-Transaxle Mount Bracket Bolt	10 N.m	89 lb in

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - ENGINE EXHAUST

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

SYMPTOMS - ENGINE EXHAUST

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

Visual/Physical Inspection

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

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

Intermittent

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

Symptom List

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

- Loss of Power

Refer to **Restricted Exhaust**.

- Poor acceleration

Refer to **Restricted Exhaust**.

- Poor fuel economy

Refer to **Restricted Exhaust**.

- Excessive smoke-diesel

Refer to **Restricted Exhaust**.

- Exhaust hissing noise

Refer to **Exhaust Leakage**.

- Exhaust popping noise

Refer to **Exhaust Leakage**.

- Exhaust rattle noise

Refer to **Exhaust Noise**.

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

- Loud exhaust noise

Refer to **Exhaust Noise**.

- Exhaust buzz, groan, hum noise

Refer to **Exhaust Noise**.

RESTRICTED EXHAUST

Diagnostic Aids

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

Test Description

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 **SA9127E** , or the **J 35314-A** . See **Special Tools**. Removing the heated 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
	1. Remove the pre catalyst heated oxygen sensor (HO2S). Refer to Heated Oxygen Sensor Replacement - Position 1 or Heated Oxygen Sensor			

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

3	<u>Replacement - Position 1</u> . 2. Install the SA9127E or J 35314-A in place of the HO2S sensor. See Special Tools. 3. Start the engine. 4. Increase and monitor the engine speed at 2,000 RPM. 5. Observe the exhaust system back pressure reading on the gage. Does the reading exceed the specified value?	14 kPa (2 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 SA9127E or J 35314-A . See Special Tools. 3. Install the pre catalyst HO2S sensor. Refer to Heated Oxygen Sensor Replacement - Position 1 or Heated Oxygen Sensor Replacement - Position 1 . 4. Remove the post catalyst HO2S sensor. Refer to Heated Oxygen Sensor Replacement - Position 2 or Heated Oxygen Sensor Replacement - Position 2 . 5. Install the SA9127E or 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 2,000 RPM. 8. Observe the exhaust system back pressure reading on the gage. Does the reading exceed the specified value?	14 kPa (2 psi)	Go to Step 5	Go to Step 6
	Inspect the exhaust system for the following conditions: • Damage in the exhaust pipe			

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

5	• Debris in the exhaust pipe • Muffler or resonator internal failure • Two-layer exhaust pipe separation	-	-	-
	Did you find and correct the condition?		Go to Step 7	
6	Replace the catalytic converter. Refer to Catalytic Converter Replacement . Did you find and correct the condition?	-	Go to Step 7	-
7	1. Remove the SA9127E or J 35314-A. See Special Tools. 2. Install the post catalyst HO2S sensor. Refer to Heated Oxygen Sensor Replacement - Position 2 or Heated Oxygen Sensor Replacement - Position 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

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 .
Exhaust leaks at the following connections:	Tighten the components to the specifications. Refer to Fastener Tightening Specifications .
• Exhaust manifold to	

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

pipe • Flanges • Pipe clamps	
Seals or gaskets leaking. • Exhaust manifold to cylinder head • Exhaust pipes to exhaust manifold • Catalytic converter connection • EGR connections • AIR connections to the exhaust manifold or cylinder head	Replace the leaking seal or gasket. Refer to the affected components procedure for service.
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 <u>Exhaust Manifold Replacement</u> .
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. Refer to <u>Muffler Replacement</u> .

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, i.e. buzz, groan, hum. Refer to Symptoms - Engine Exhaust prior to beginning this table.	
Popping or hissing noise	Exhaust leak. Refer to <u>Exhaust Leakage</u> .
	1. Compare to a known good vehicle. 2. Inspect for a damaged or failed

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

Loud exhaust	muffler. 3. Replace the faulty muffler. Refer to <u>Muffler Replacement</u> .
External rattle or vibration noise	1. Inspect for a bent or loose hanger, loose heat shield, or loose clamp. 2. Inspect for an 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: • <u>Catalytic Converter Replacement</u> • <u>Muffler Replacement</u>

REPAIR INSTRUCTIONS

EXHAUST MANIFOLD REPLACEMENT

Removal Procedure

1. Remove the exhaust manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement**.
2. Remove the pre catalyst heated oxygen sensor (HO2S). Refer to **Heated Oxygen Sensor Replacement - Position 1** or **Heated Oxygen Sensor Replacement - Position 1**.
3. Remove the catalytic converter. Refer to **Catalytic Converter Replacement**.
4. Remove and discard the exhaust manifold nuts.

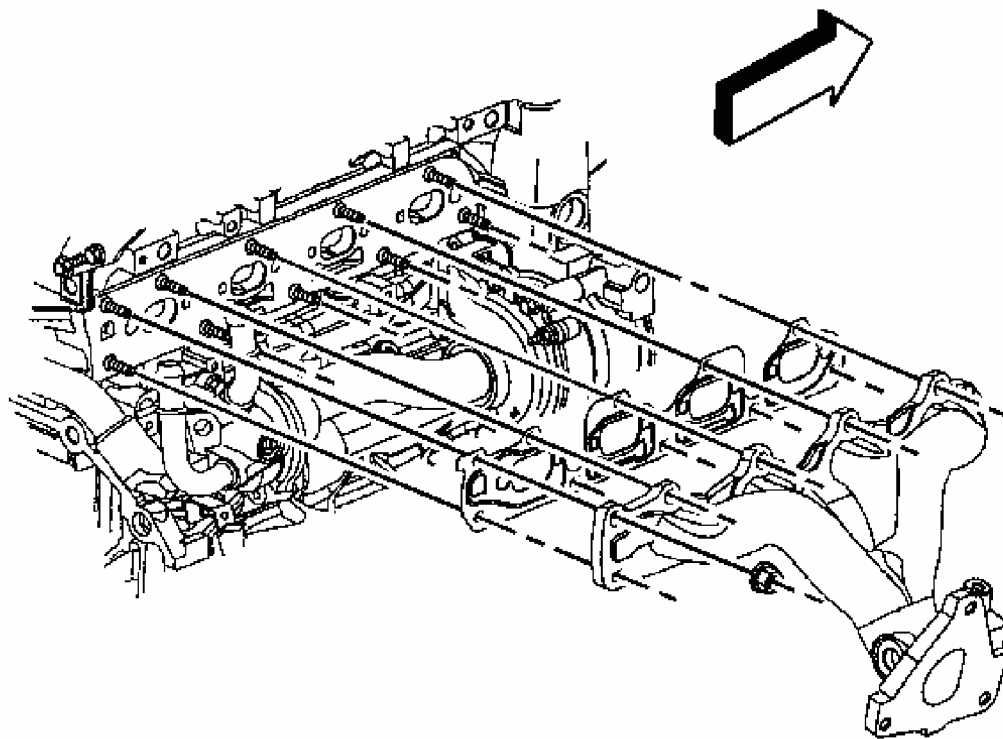


Fig. 1: Identifying Exhaust Manifold
Courtesy of GENERAL MOTORS CORP.

5. Remove the exhaust manifold.
6. Remove and discard the exhaust manifold gasket.
7. Clean the sealing surface of the engine block.

Installation Procedure

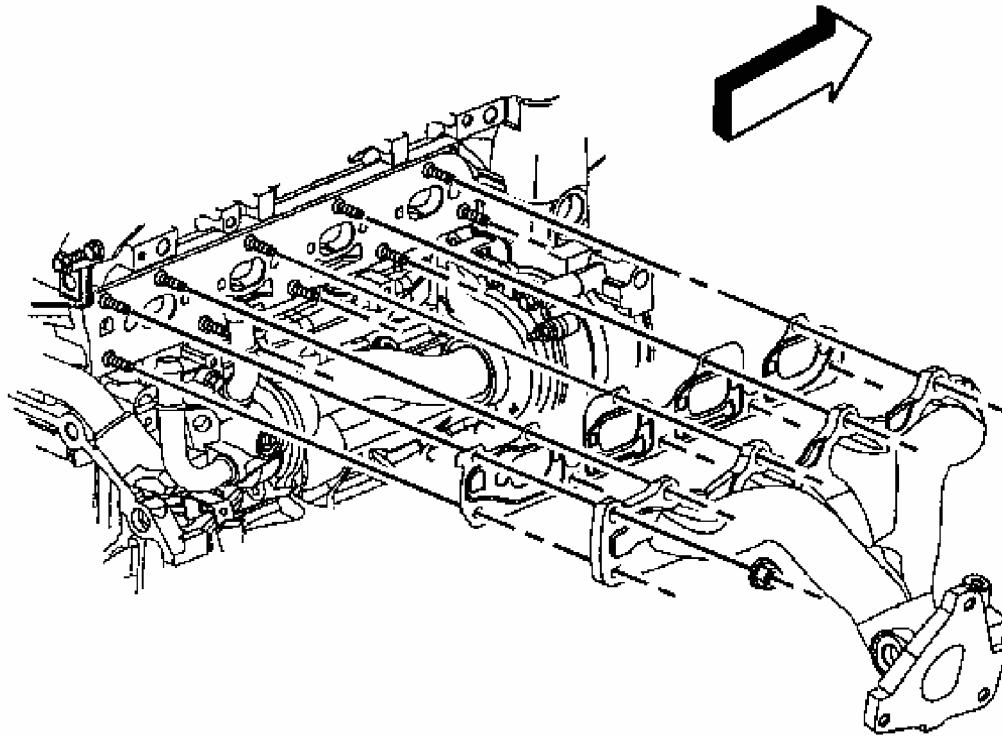


Fig. 2: Identifying Exhaust Manifold
Courtesy of GENERAL MOTORS CORP.

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

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

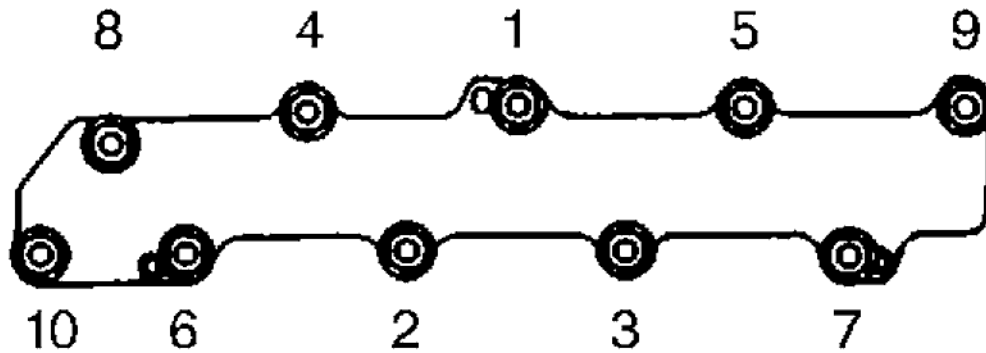


Fig. 3: Exhaust Manifold Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Install the new exhaust nuts.

3. Install NEW exhaust manifold nuts.

Tighten: Tighten the nuts in the sequence shown to 14 N.m (10 lb ft).

4. Install the catalytic converter. Refer to Catalytic Converter Replacement.
5. Install the pre catalyst HO2S. Refer to Heated Oxygen Sensor Replacement - Position 1 or Heated Oxygen Sensor Replacement - Position 1.
6. Install the exhaust manifold heat shield. Refer to Exhaust Manifold Heat Shield Replacement.

CATALYTIC CONVERTER REPLACEMENT

Removal Procedure

NOTE: Do not bend the exhaust flex decoupler more than 3 degrees in any direction. Movement of more than 3 degrees will damage the exhaust flex decoupler.

1. Remove the muffler. Refer to Muffler Replacement.

2. Remove the post catalyst heated oxygen sensor (HO2S). Refer to **Heated Oxygen Sensor Replacement - Position 2** or **Heated Oxygen Sensor Replacement - Position 2**.
3. Remove the catalytic converter nuts.

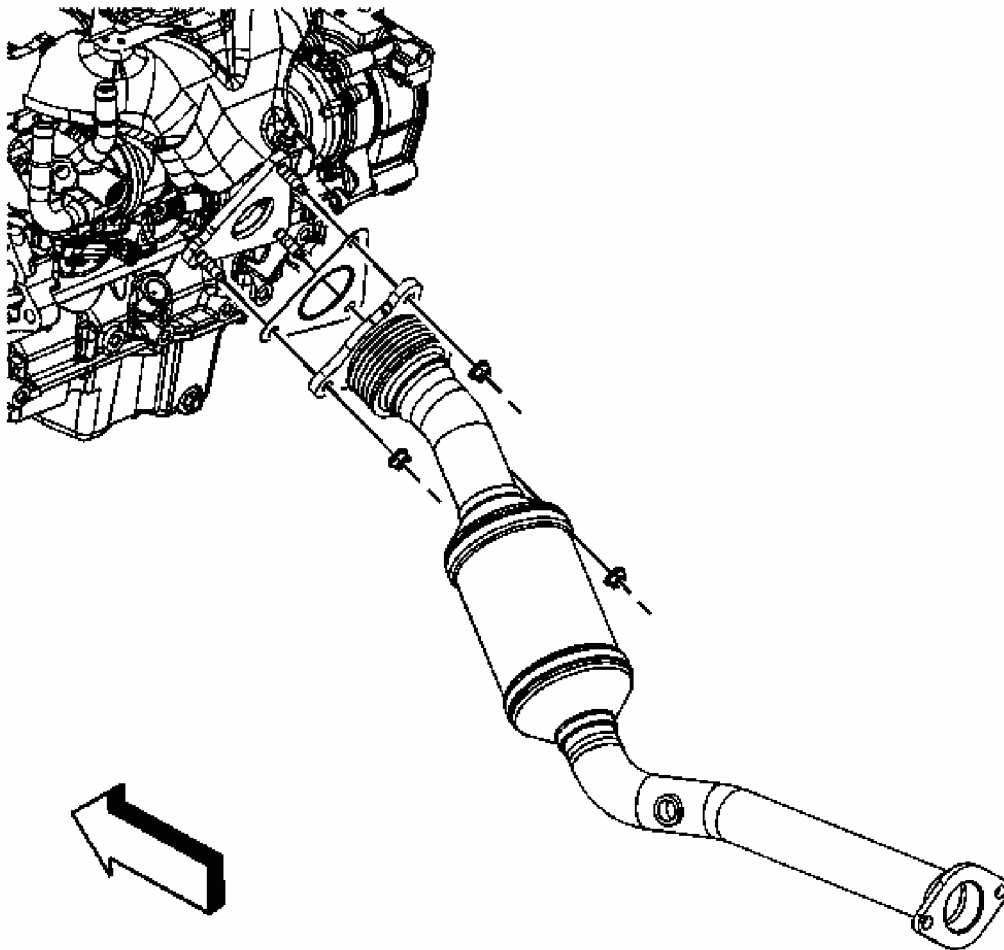


Fig. 4: Catalytic Converter
Courtesy of GENERAL MOTORS CORP.

4. Remove the catalytic converter from the exhaust manifold.
5. Remove and discard the catalytic converter to exhaust manifold gasket.

Installation Procedure

NOTE: Do not bend the exhaust flex decoupler more than 3 degrees in any direction. Movement of more than 3 degrees will damage the

exhaust flex decoupler.

1. Install a NEW gasket to the exhaust manifold studs.

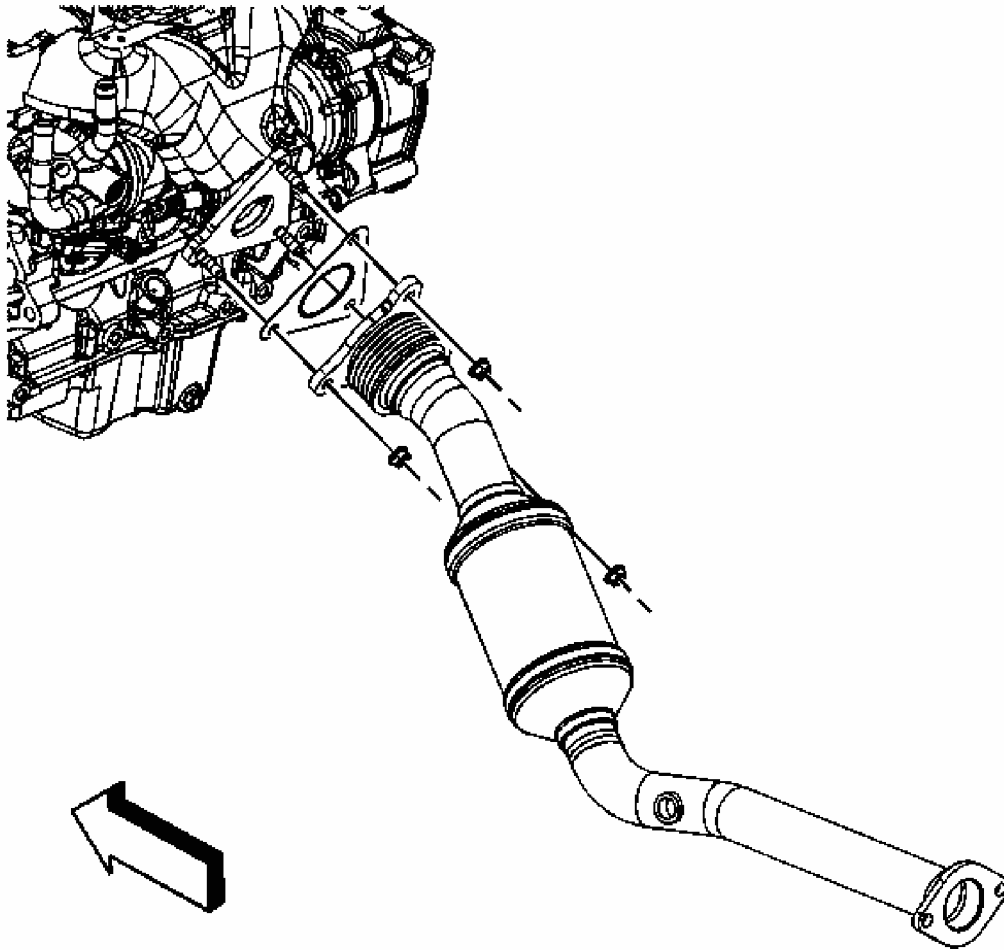


Fig. 5: Catalytic Converter
Courtesy of GENERAL MOTORS CORP.

2. Install the catalytic converter to the exhaust manifold.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the catalytic converter nuts.

Tighten: Tighten the nuts to 46 N.m (34 lb ft).

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

4. Install the post catalyst HO2S. Refer to **Heated Oxygen Sensor Replacement - Position 2** or **Heated Oxygen Sensor Replacement - Position 2** .
5. Install the muffler. Refer to **Muffler Replacement**.

MUFFLER REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the exhaust muffler nuts.
3. To aid in removal, spray lubricant onto the hanger insulators.

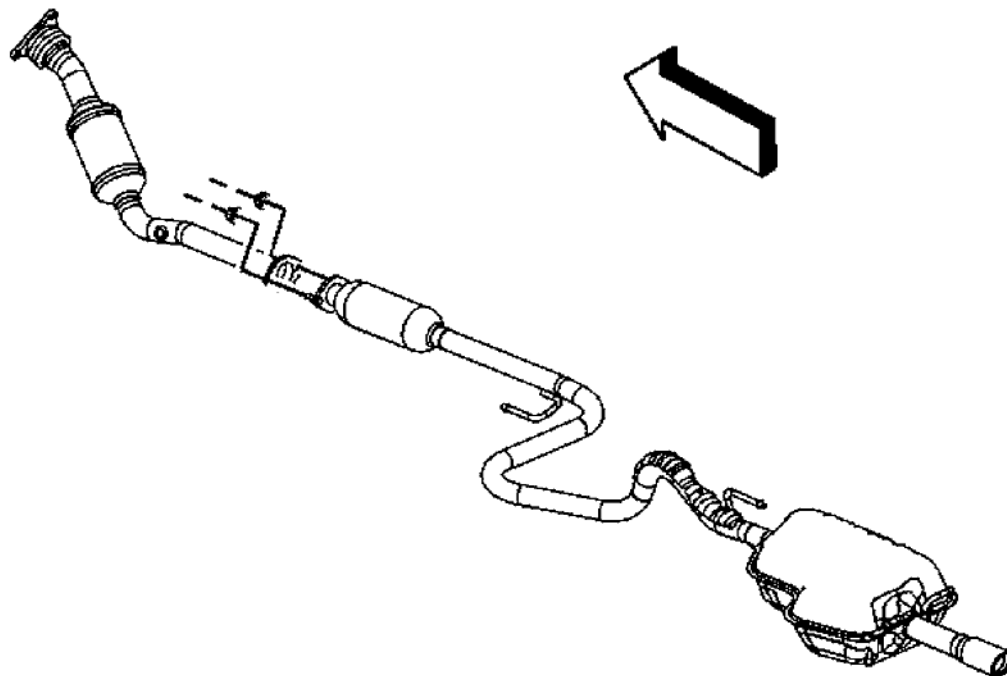


Fig. 6: Exhaust Muffler Assembly
Courtesy of GENERAL MOTORS CORP.

4. With an assistant supporting the exhaust muffler assembly, separate the exhaust hanger insulators from the underbody exhaust hangers.

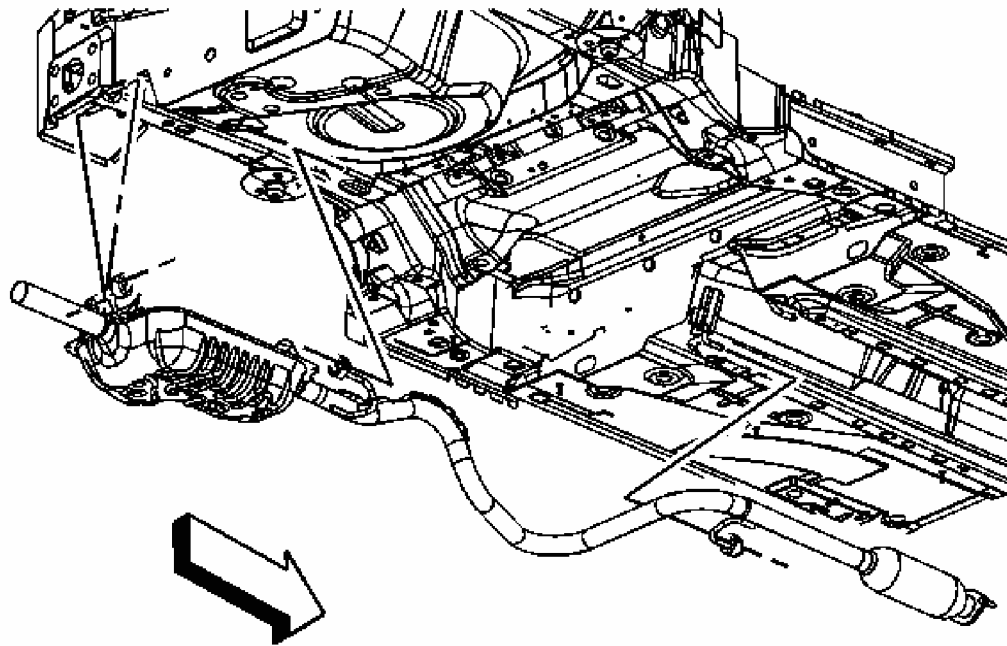


Fig. 7: Exhaust Muffler Assembly
Courtesy of GENERAL MOTORS CORP.

5. With the aid of the assistant, remove the exhaust muffler assembly.

Installation Procedure

1. To aid in installation, spray lubricant onto the hanger insulators.

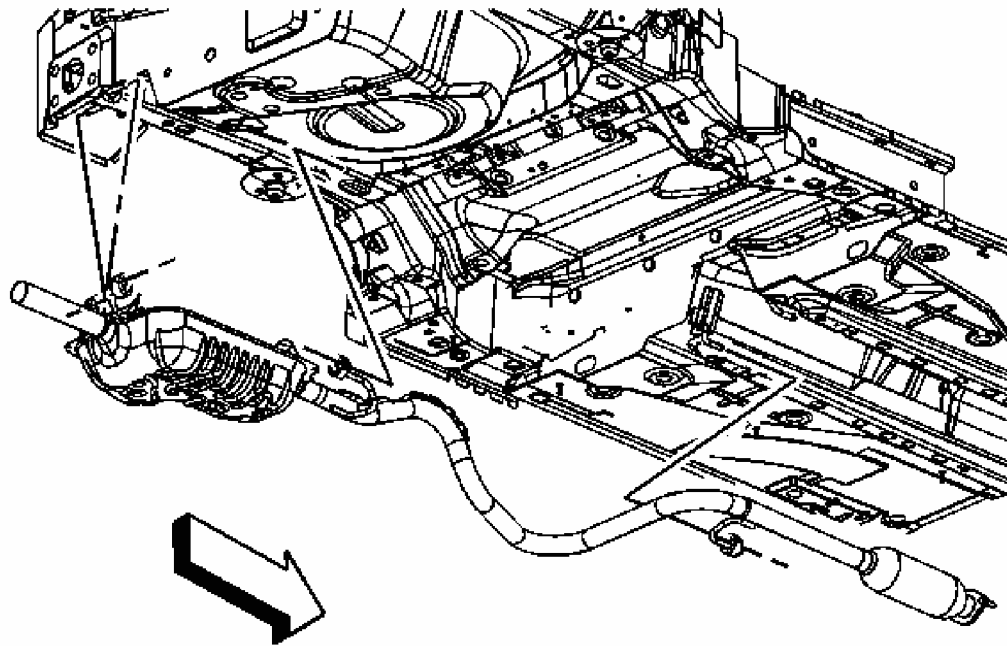


Fig. 8: Exhaust Muffler Assembly
Courtesy of GENERAL MOTORS CORP.

2. With the aid of the assistant, position the exhaust muffler assembly.

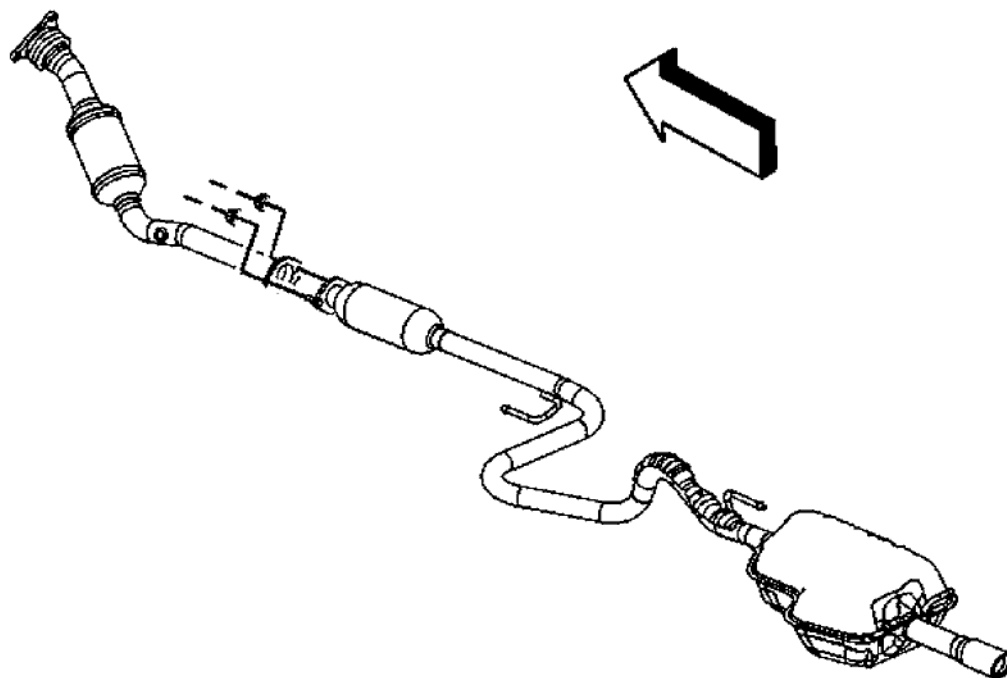


Fig. 9: Exhaust Hanger Insulators
Courtesy of GENERAL MOTORS CORP.

3. With the assistant supporting the exhaust muffler assembly, install the exhaust hanger insulators to the underbody exhaust hangers.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the exhaust muffler nuts.

Tighten: Tighten the nuts to 46 N.m (34 lb ft).

5. Lower the vehicle.

EXHAUST HEAT SHIELD REPLACEMENT

Removal Procedure

1. Remove the muffler. Refer to Muffler Replacement.
2. Drill out and remove the 4 heat shield rivets (1).

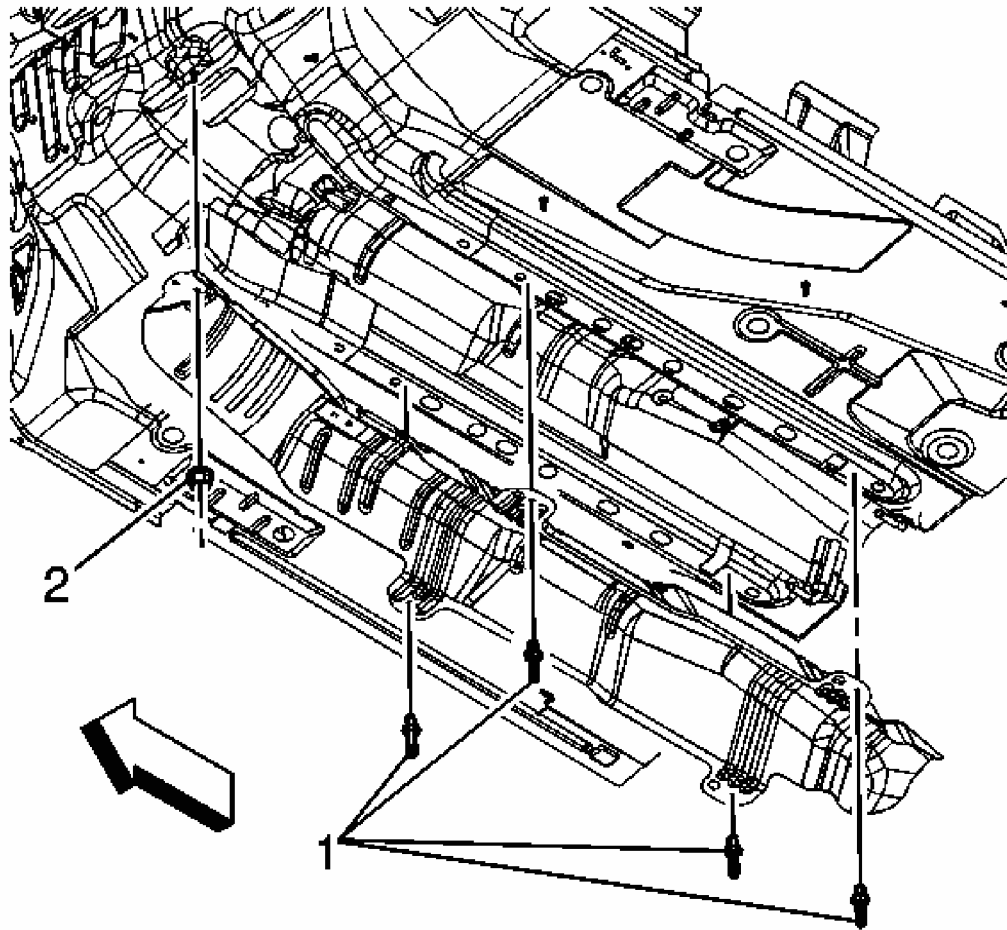


Fig. 10: View Of Heat Shield, Rivets & Nuts
Courtesy of GENERAL MOTORS CORP.

3. Remove the heat shield nut (2).
4. Remove the heat shield.

Installation Procedure

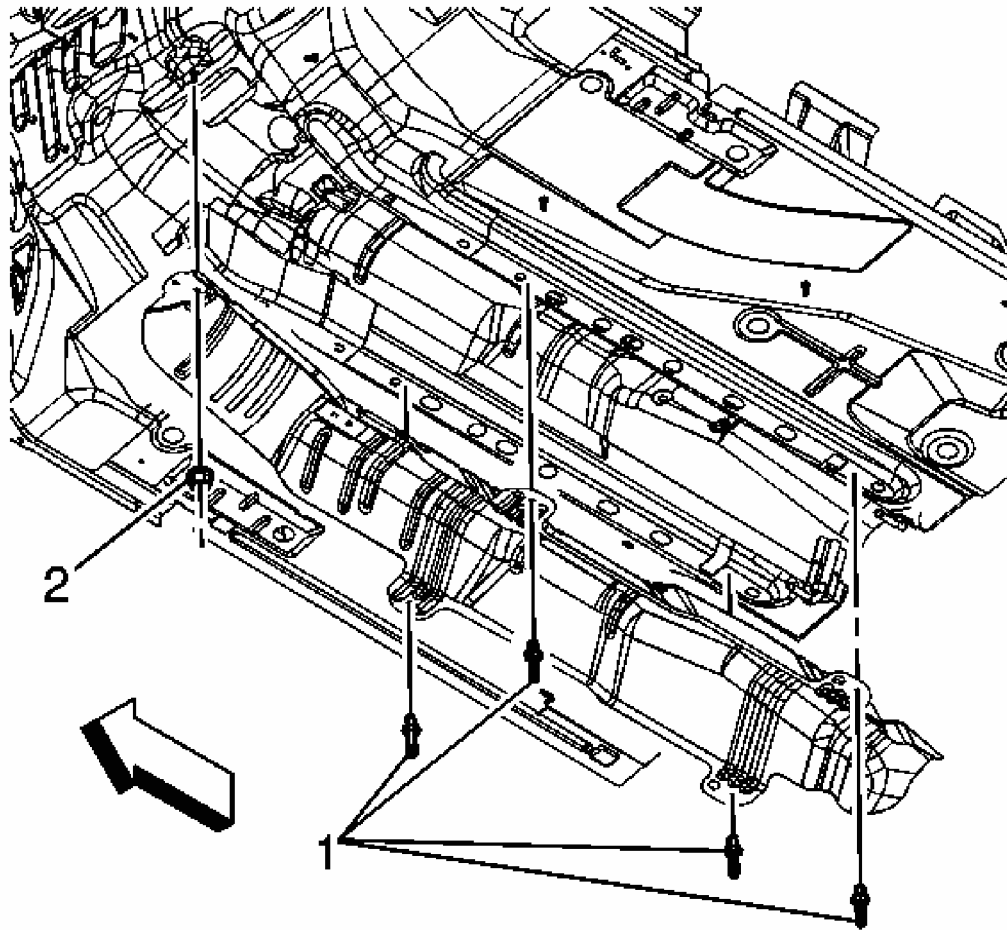


Fig. 11: View Of Heat Shield, Rivets & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Position the exhaust heat shield to the underbody.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the exhaust heat shield nut (2).

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

3. Install 4 NEW heat shield rivets (1).
4. Install the muffler. Refer to Muffler Replacement.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

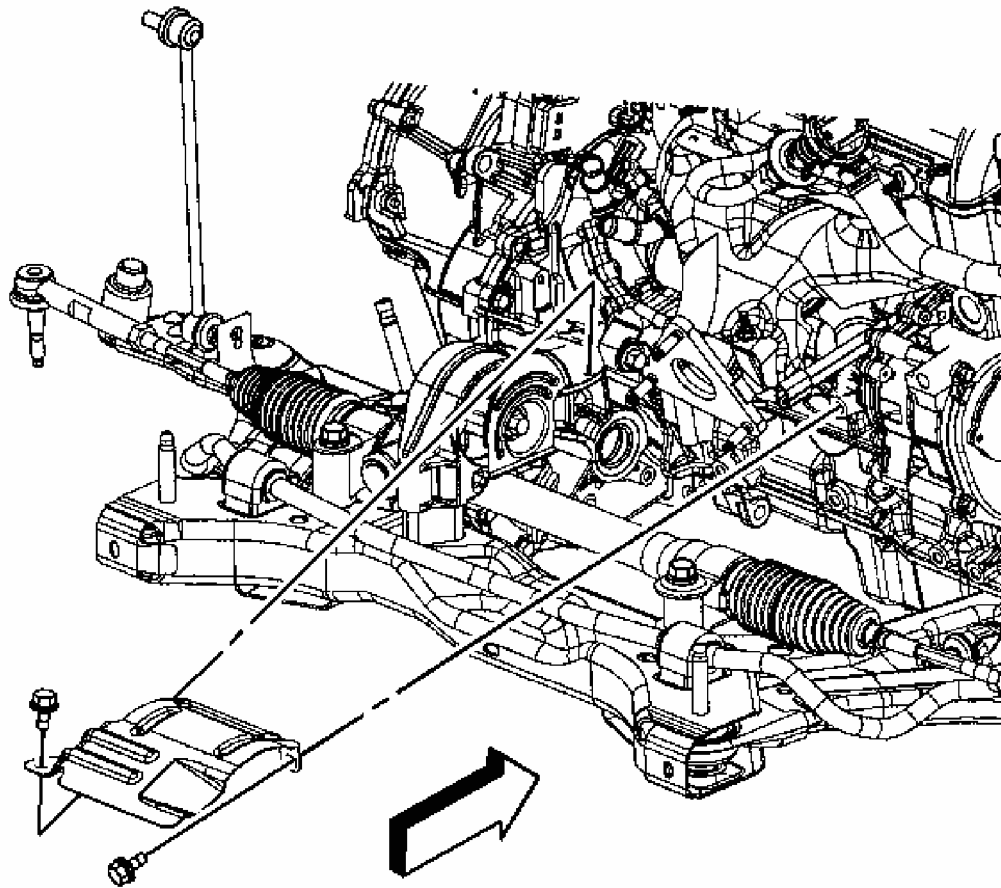


Fig. 12: Wheel Drive Shaft Heat Shield
Courtesy of GENERAL MOTORS CORP.

2. Remove the wheel drive shaft heat shield-to-transaxle mount bracket bolt.
3. Remove the drive shaft heat shield-to-engine block bolt.
4. Remove the wheel drive shaft heat shield.

Installation Procedure

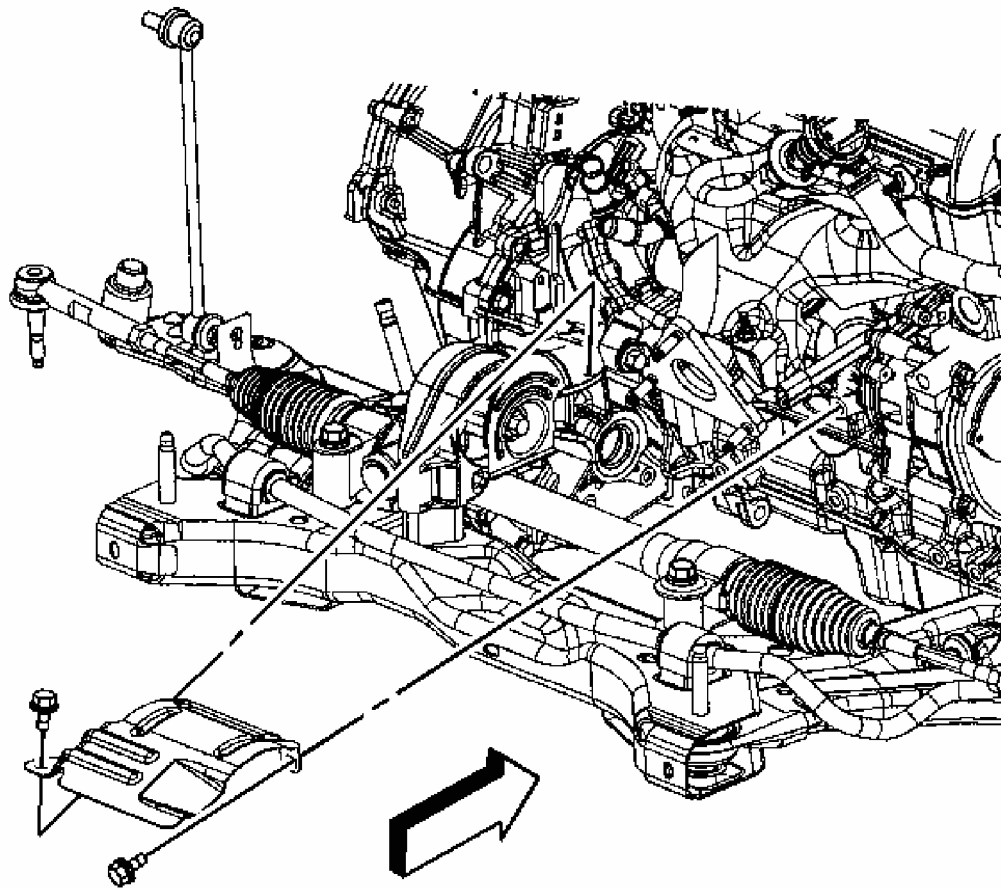


Fig. 13: Wheel Drive Shaft Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Position the wheel drive shaft heat shield onto the engine.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the wheel drive shaft heat shield-to-engine block bolt.

Tighten: Tighten the bolt to 30 N.m (22 lb ft).

3. Install the wheel drive shaft heat shield-to-transaxle mount bracket bolt.

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

4. Lower the vehicle.

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT

Removal Procedure

1. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** or **Air Cleaner Assembly Replacement** .

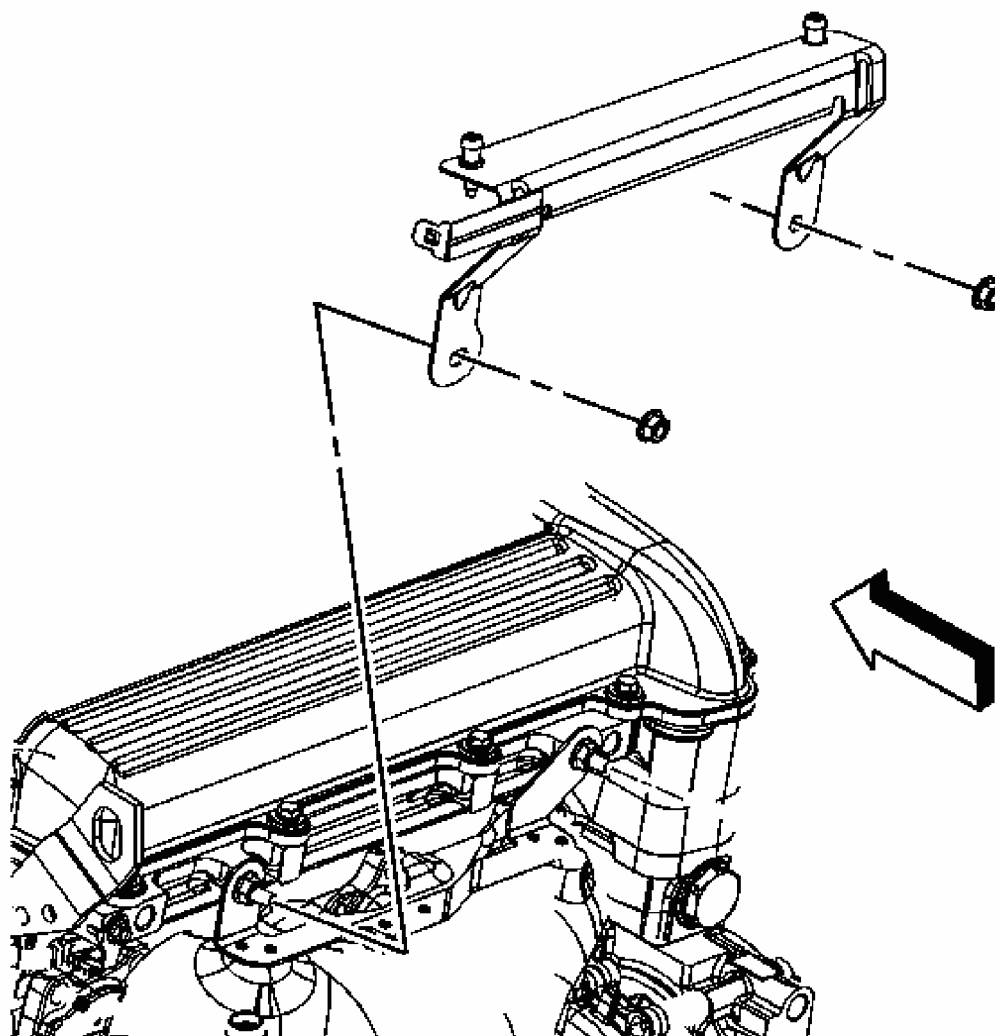


Fig. 14: Air Cleaner Bracket
Courtesy of GENERAL MOTORS CORP.

2. Remove the air cleaner bracket nuts.
3. Remove the air cleaner bracket.

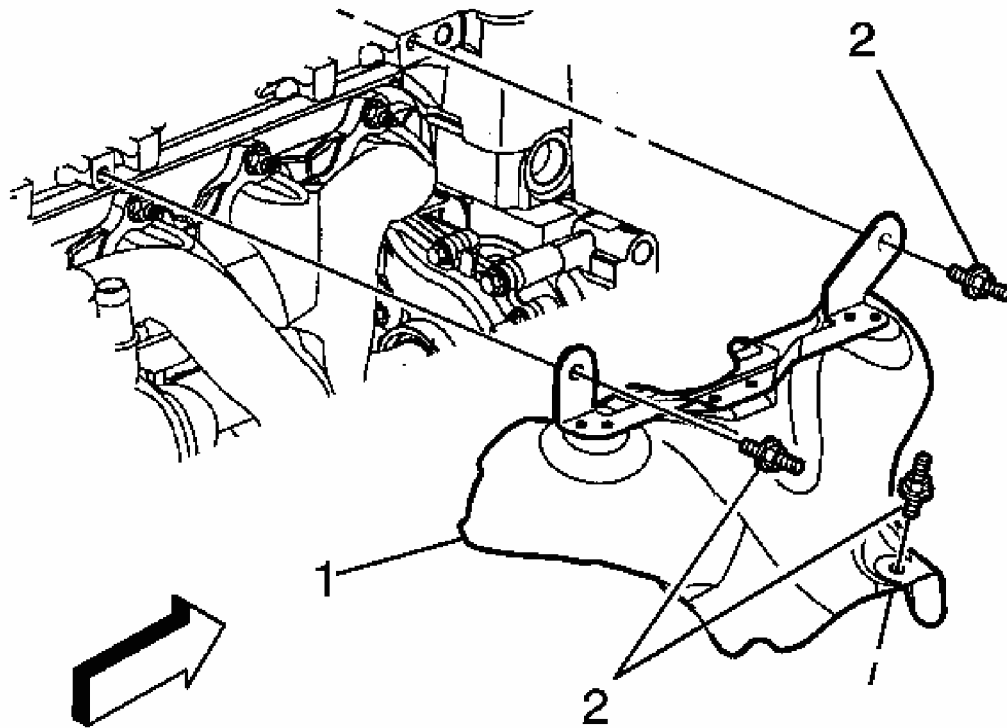


Fig. 15: Exhaust Manifold Heat Shield
Courtesy of GENERAL MOTORS CORP.

4. Remove the exhaust manifold heat shield studs (2).
5. Remove the exhaust manifold heat shield (1).

Installation Procedure

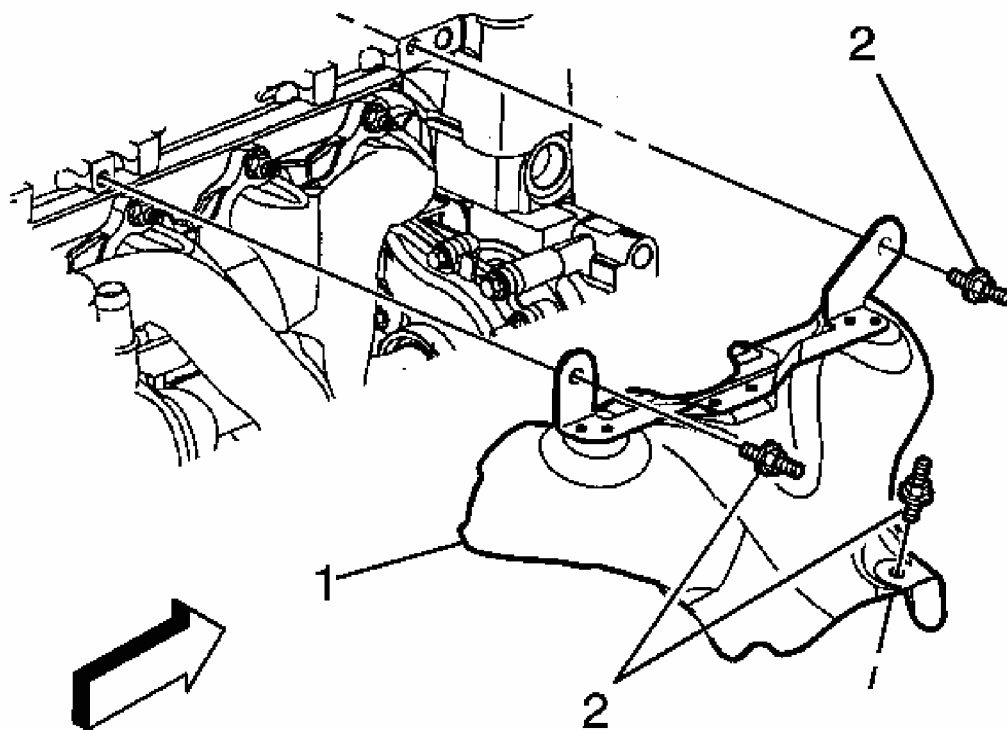


Fig. 16: Exhaust Manifold Heat Shield
Courtesy of GENERAL MOTORS CORP.

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

NOTE: Refer to Fastener Notice .

2. Install the exhaust manifold heat shield studs (2).

Tighten: Tighten the studs to 22 N.m (16 lb ft).

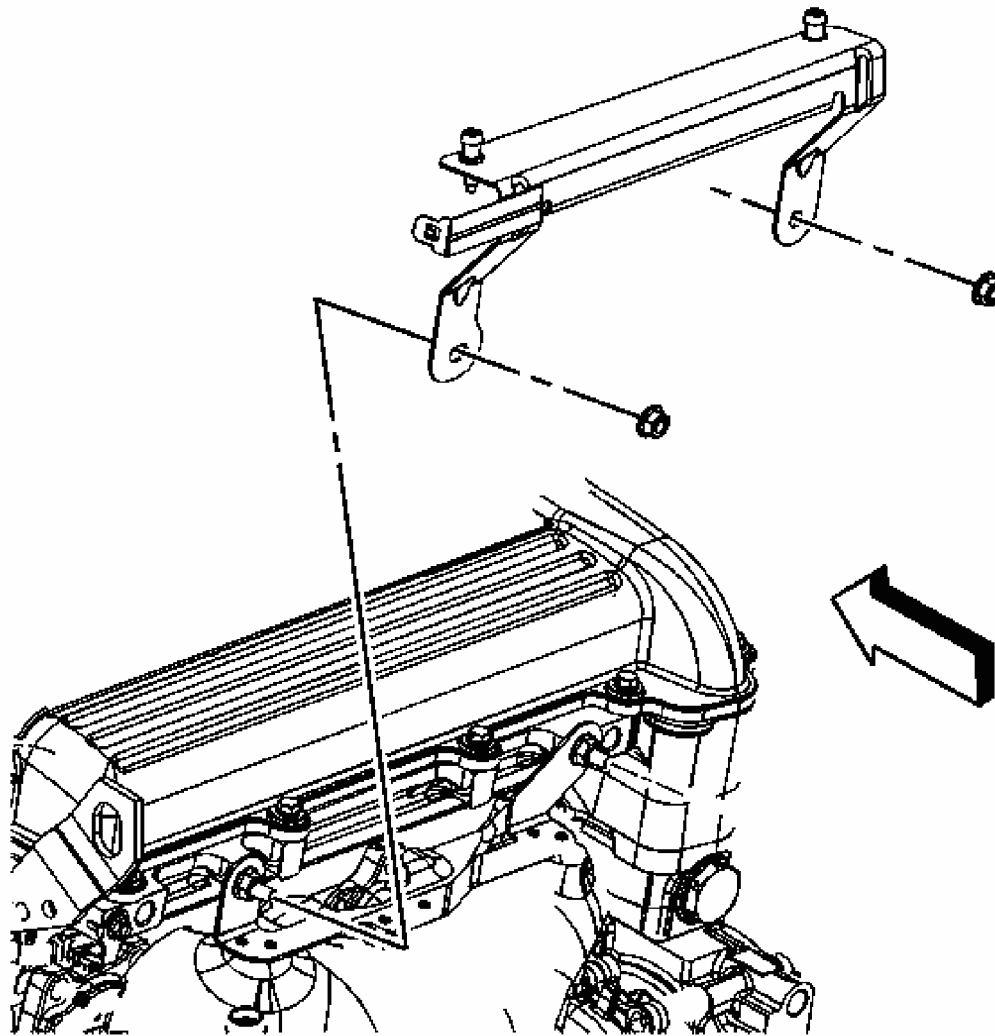


Fig. 17: Air Cleaner Bracket
Courtesy of GENERAL MOTORS CORP.

3. Install the air cleaner bracket.
4. Install the air cleaner bracket nuts.

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

5. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) or [Air Cleaner Assembly Replacement](#) .

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 tailpipe, 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.

2006 Chevrolet HHR LT

2006 ENGINE Engine Exhaust - HHR

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

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

The catalyst in the converter is not serviceable.

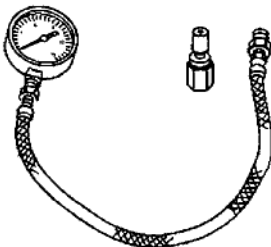
Muffler

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