

2004 Isuzu Ascender LS

2004 ENGINE Engine Exhaust - Ascender

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Engine Exhaust - Ascender

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter Heat Shield Bolts	7 N.m	62 lb in
Exhaust Muffler Nuts	45 N.m	33 lb ft
Exhaust Manifold Bolts (4.2L)		
• First Pass	25 N.m	18 lb ft
• Second Pass	25 N.m	18 lb ft
• Final Pass	25 N.m	18 lb ft
Exhaust Manifold Bolt (5.3L)		
• First Pass	15 N.m	11 lb ft
• Final Pass	25 N.m	18 lb ft
Exhaust Manifold Heat Shield Bolt (5.3L)	9 N.m	80 lb in
Exhaust Manifold Heat Shield Nut (4.2L)	5 N.m	44 lb in
Exhaust Manifold Heat Shield Stud (4.2L)	10 N.m	89 lb in
Exhaust Muffler Heat Shield Bolt	7 N.m	62 lb in
Exhaust Pipe Clamp Nut	50 N.m	37 lb ft
Exhaust Pipe Nut	50 N.m	37 lb ft
Heated Oxygen Sensor (HO2S) (5.3L)	42 N.m	31 lb ft
Transmission Filler Tube Bracket Nut (4.2L)	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**.

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

Visual/Physical Inspection

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

Intermittent

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

Symptom List

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

- Loss of Power

Refer to **Restricted Exhaust**.

- Poor acceleration

Refer to **Restricted Exhaust**.

- Poor fuel economy

Refer to **Restricted Exhaust**.

- Excessive smoke (diesel)

Refer to **Restricted Exhaust**.

- Exhaust hissing noise

Refer to **Exhaust Leakage**.

- Exhaust popping noise

Refer to **Exhaust Leakage**.

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- 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

Tools Required

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

Diagnostic Aids

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

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

5: If high back pressure is not found at idle, increasing the engine speed may help find a restriction. Perform operational check before returning vehicle to customer.

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

9: 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	-
	Did you review the exhaust symptoms diagnostic information and perform the necessary			Go to Symptoms -

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2	inspections?	-	Go to Step 3	<u>Engine Exhaust</u>
3	Is the system equipped with dual exhaust?	-	Go to Diagnostic Aids	Go to Step 4
4	<ol style="list-style-type: none"> 1. Remove the AIR check valve or the HO2S that is in front of and closest to the catalytic converter. 2. Install the J 35314-A in place of the AIR check valve or HO2S sensor. See <u>Special Tools and Equipment</u>. 3. Start and run the vehicle. 4. With the engine idling at normal operating temperature, record the exhaust system back pressure reading on the gauge. <p>Does the reading exceed the specified value?</p>	8.6 kPa (1.25 psi)	Go to Step 6	Go to Step 5
5	<ol style="list-style-type: none"> 1. With the J 35314-A still installed increase and monitor engine speed to 2000 RPM. See <u>Special Tools and Equipment</u>. 2. Observe the exhaust system back pressure reading on the gage. <p>Does the reading exceed the specified value?</p>	20.7 kPa (3 psi)	Go to Step 6	Go to Step 9
6	<ol style="list-style-type: none"> 1. Turn the engine off and place the ignition in the lock position. 2. Remove the J 35314-A . See <u>Special Tools and Equipment</u>. 3. Re-install the AIR check valve/HO2S sensor. 4. Remove the post-catalyst HO2S sensor. 5. Install the J 35314-A in place of the post HO2S sensor. See <u>Special Tools and Equipment</u>. 6. Start and idle the engine and monitor the engine speed to 2000 RPM. 7. Observe the exhaust system back pressure reading on the gauge. <p>Does the reading exceed the specified value?</p>	20.7 kPa (3 psi)	Go to Step 7	Go to Step 8
	Inspect the exhaust system for the following conditions:			

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7	<ul style="list-style-type: none"> • Damage in the exhaust pipe • Debris in the exhaust pipe • Muffler or resonator internal failure • Two-layer exhaust pipe separation 	-		
	Did you find and correct the condition?		Go to Step 9	-
8	Replace the catalytic converter. Refer to <u>Catalytic Converter Replacement (4.2L Engine)</u> or <u>Catalytic Converter Replacement (5.3L Engine)</u> .	-		
	Did you find and correct the condition?		Go to Step 9	-
9	<ol style="list-style-type: none"> 1. Remove the J 35314-A and reinstall the AIR check valve or the HO2S sensor. See <u>Special Tools and Equipment</u>. 2. Clear any codes. 3. 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 <u>Symptoms - Engine Exhaust</u> prior to beginning this table.	
Misaligned or improperly installed exhaust system components.	NOTE: Refer to Fastener Notice in Cautions and Notices . Align and tighten the components to the specifications. Refer to <u>Fastener Tightening Specifications</u> .
Exhaust leaks at the following connections: <ul style="list-style-type: none"> • Exhaust manifold to pipe • Flanges • Pipe clamps 	Tighten the components to the specifications. Refer to <u>Fastener Tightening Specifications</u> .

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Seals or gaskets leaking. <ul style="list-style-type: none"> • Exhaust manifold to cylinder head • Exhaust pipes to exhaust manifold • Catalytic converter connection • EGR connections • AIR connections to the exhaust manifold or cylinder head 	Replace the leaking seal or gasket. Refer to the affected components procedure for service.
Exhaust manifold cracked or broken.	Replace the exhaust manifold. Refer to <u>Exhaust Manifold Replacement (4.2L Engine)</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 or resonator. 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 (buzz, groan, hum). Refer to <u>Symptoms - Engine Exhaust</u> prior to beginning this table.	
Popping or hissing noise	Exhaust leak Refer to <u>Exhaust Leakage</u>
Loud exhaust	<ol style="list-style-type: none"> 1. Compare to a known good vehicle. 2. Inspect for a damaged or failed muffler or resonator. 3. Replace the faulty muffler or resonator. Refer to <u>Muffler Replacement</u>.
External rattle or vibration noise	<ol style="list-style-type: none"> 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

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Internal rattle	procedure. <ol style="list-style-type: none">1. Test the components by tapping with a rubber mallet to confirm a rattle.2. Replace the faulty catalytic converter, resonator, or muffler. Refer to one of the following procedures:<ul style="list-style-type: none">• <u>Catalytic Converter Replacement (4.2L Engine)</u> or <u>Catalytic Converter Replacement (5.3L Engine)</u>• <u>Muffler Replacement</u>
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REPAIR INSTRUCTIONS

EXHAUST MANIFOLD REPLACEMENT (4.2L ENGINE)

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

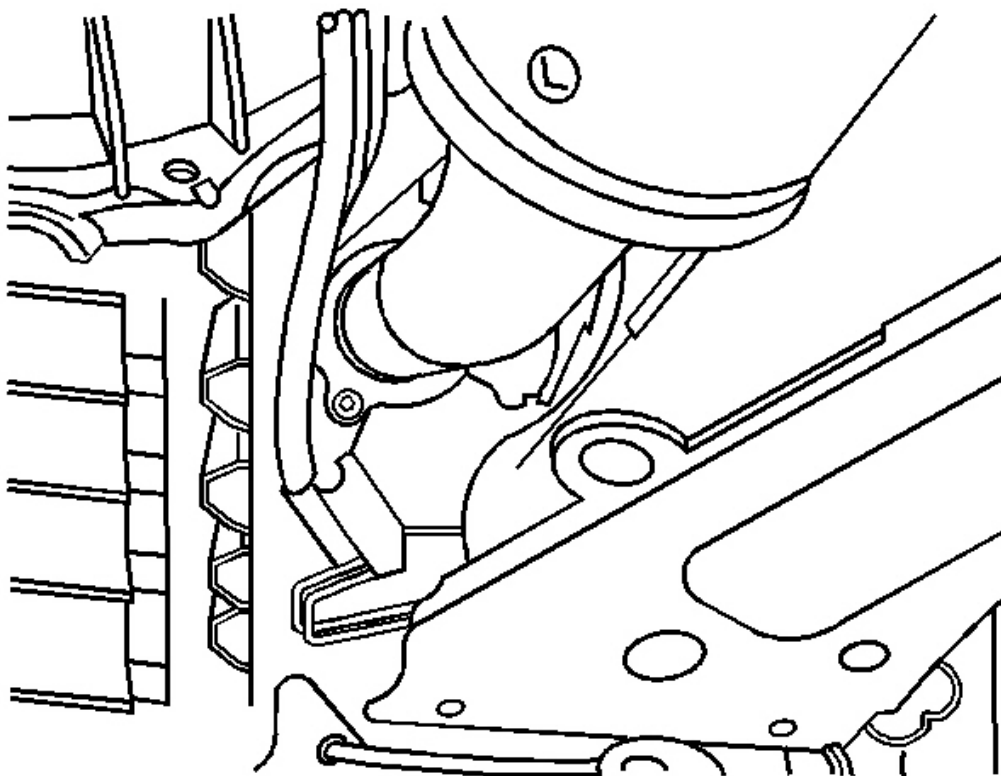


Fig. 1: View Of Exhaust Pipe Bolts
Courtesy of GENERAL MOTORS CORP.

2. Loosen and remove the exhaust pipe bolts from the exhaust manifold.
3. Lower the vehicle.
4. Remove the manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement**.

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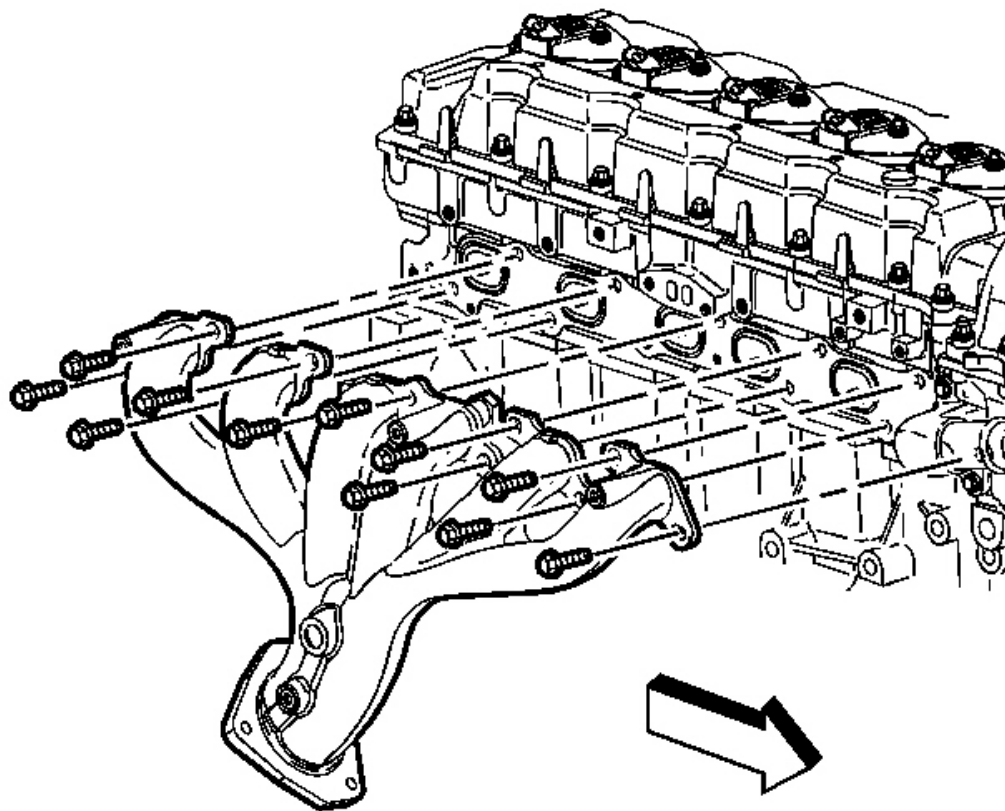


Fig. 2: View Of Exhaust Manifold - 4.2L
Courtesy of GENERAL MOTORS CORP.

5. Loosen and remove the exhaust manifold bolts.
6. Remove the exhaust manifold.
7. Remove the exhaust manifold gasket.

Installation Procedure

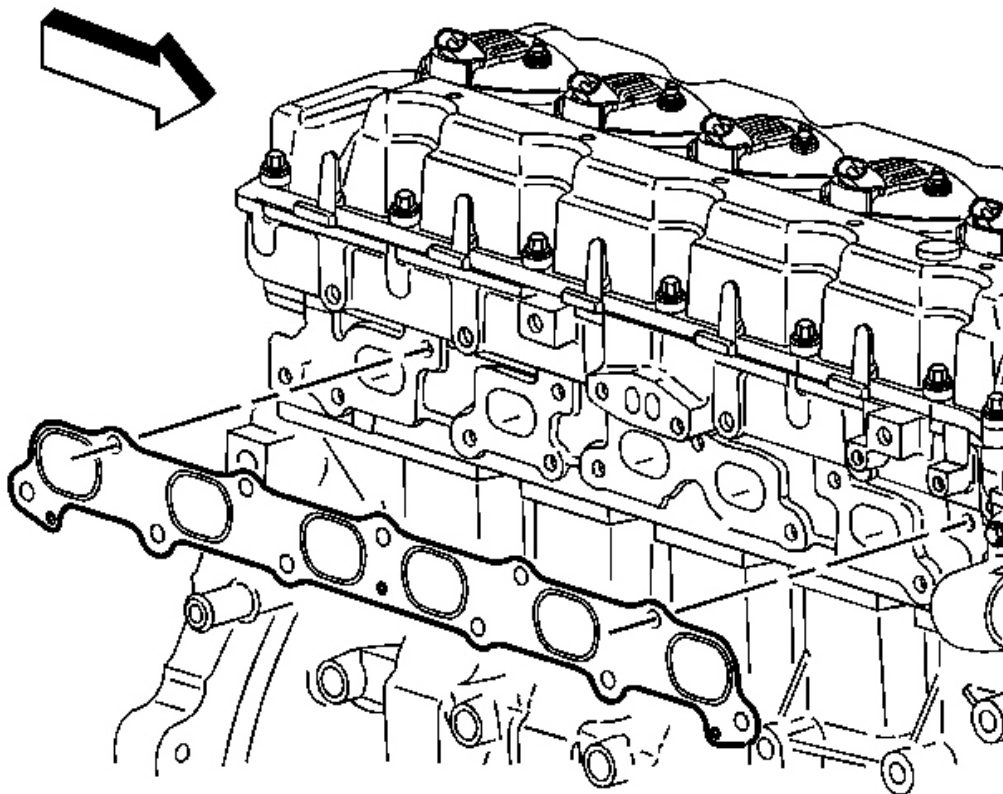


Fig. 3: View Of Exhaust Manifold Gasket - 4.2L
Courtesy of GENERAL MOTORS CORP.

1. Install a new exhaust manifold gasket.

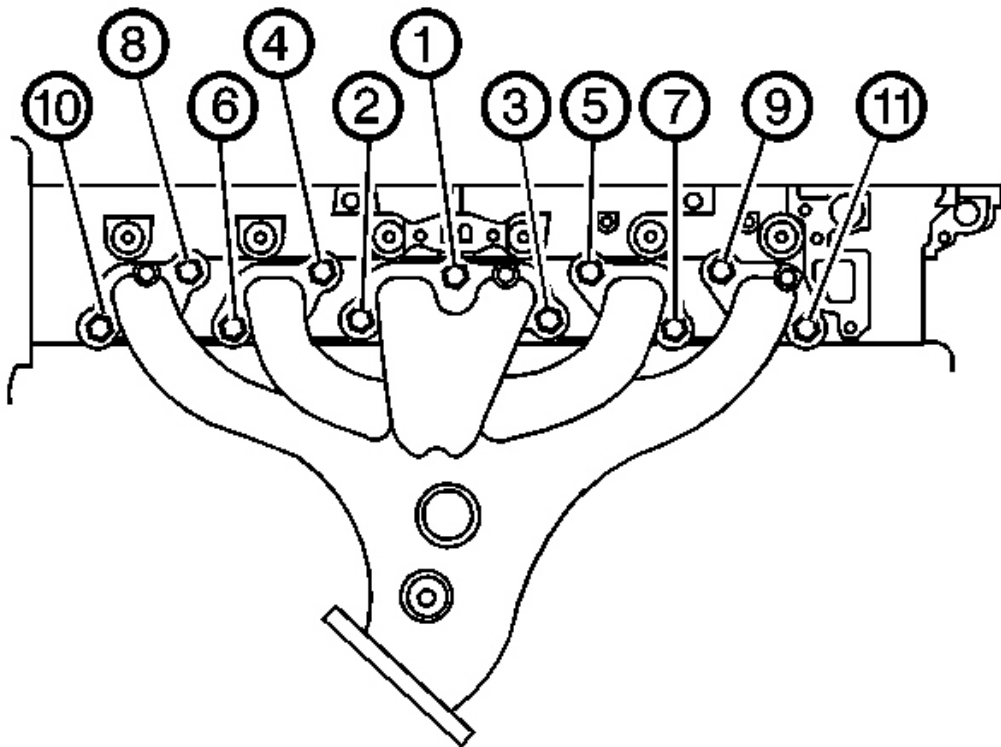


Fig. 4: Installing Exhaust Manifold Bolts - 4.2L
Courtesy of GENERAL MOTORS CORP.

2. Install the exhaust manifold.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. With threadlock GM P/N 12345493 (Canadian P/N 10953488) on the manifold bolts, install the bolts onto the manifold.

Tighten:

1. Tighten the exhaust manifold bolts first pass in sequence to 20 N.m (15 lb ft).
2. Tighten the exhaust manifold bolts second pass in sequence to 20 N.m (15 lb ft).
3. Tighten the exhaust manifold bolts final pass in sequence to 20 N.m (15 lb ft).

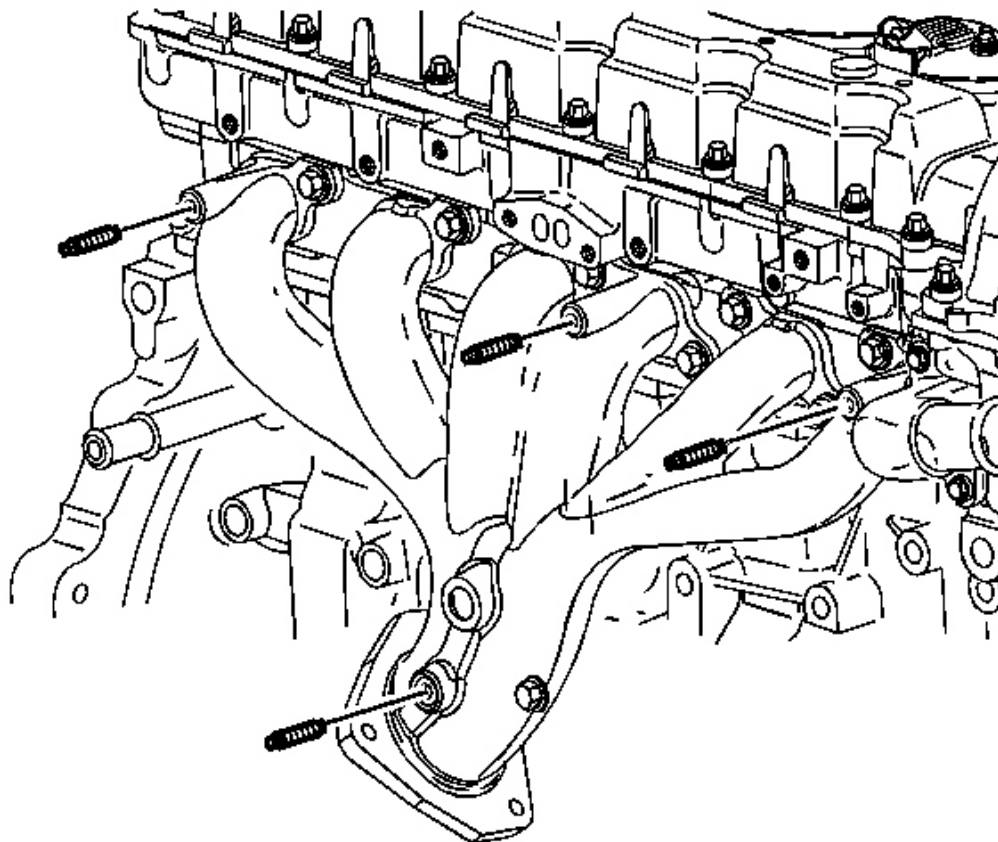


Fig. 5: View Of Exhaust Manifold Heat Shield Studs - 4.2L
Courtesy of GENERAL MOTORS CORP.

4. Install the exhaust manifold heat shield studs, if required.

Tighten: Tighten the heat shield studs to 10 N.m (89 lb in).

5. Install the manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement.**
6. Raise the vehicle.

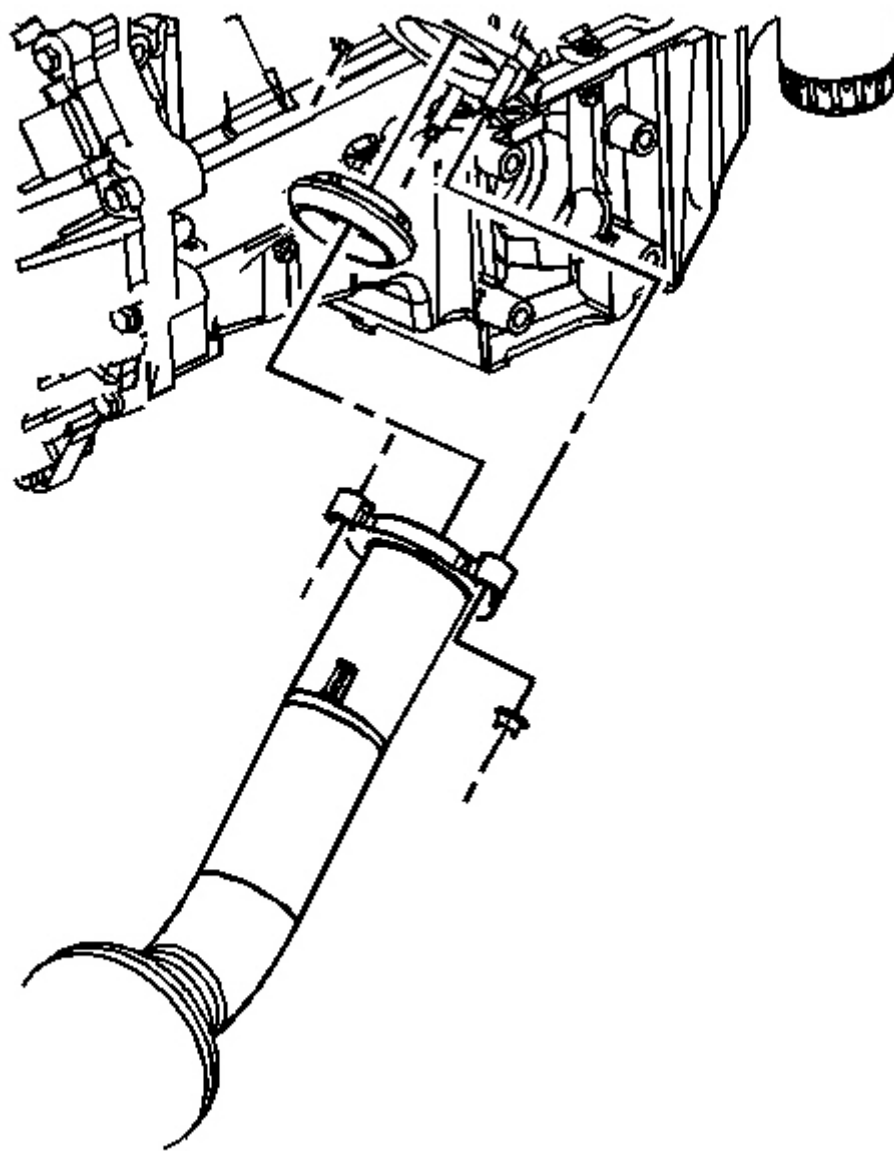


Fig. 6: Installing Exhaust Pipe To Manifold With Seal - 4.2L
Courtesy of GENERAL MOTORS CORP.

7. Install the exhaust pipe to the manifold with seal and secure the pipe with the nuts.

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

8. Lower the vehicle.

EXHAUST MANIFOLD REPLACEMENT - LEFT (5.3L ENGINE)

Removal Procedure

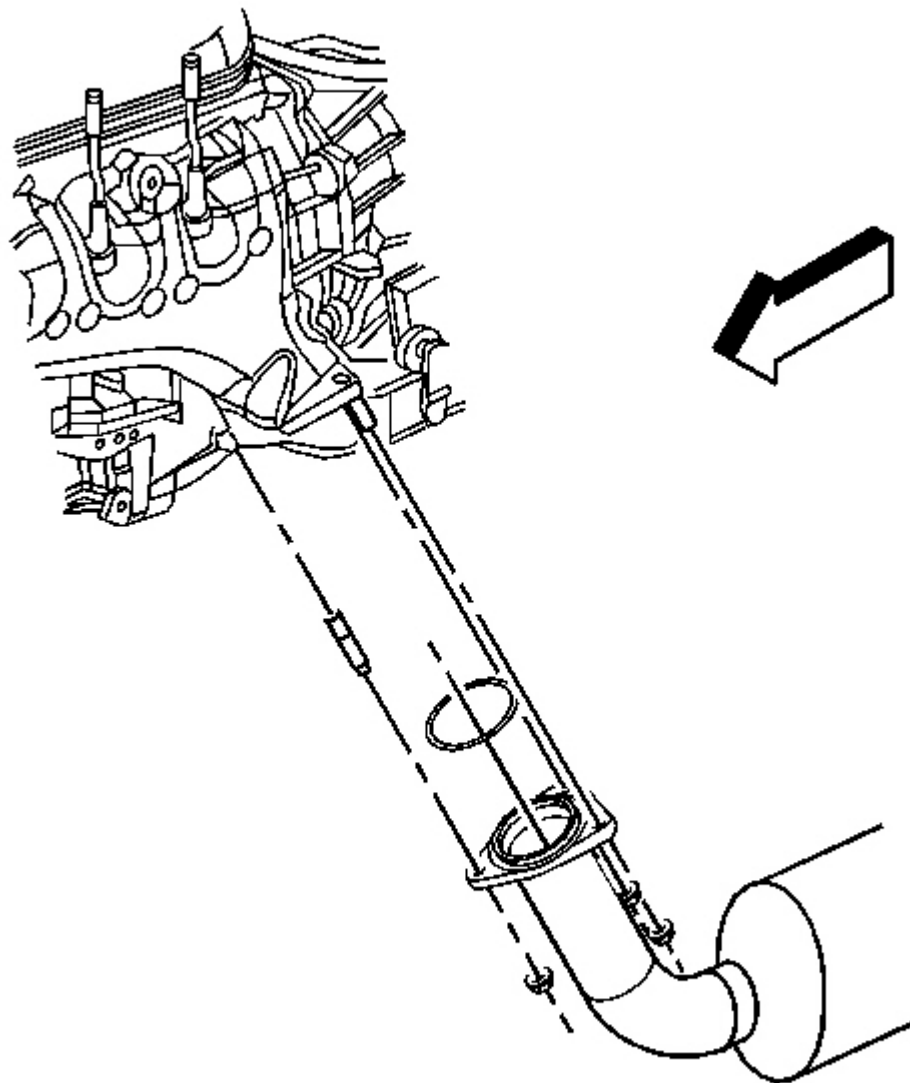


Fig. 7: View Of Left Catalytic Converter To The Exhaust Manifold Connection
Courtesy of GENERAL MOTORS CORP.

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1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the exhaust manifold pipe nuts.
3. Lower the vehicle.
4. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.

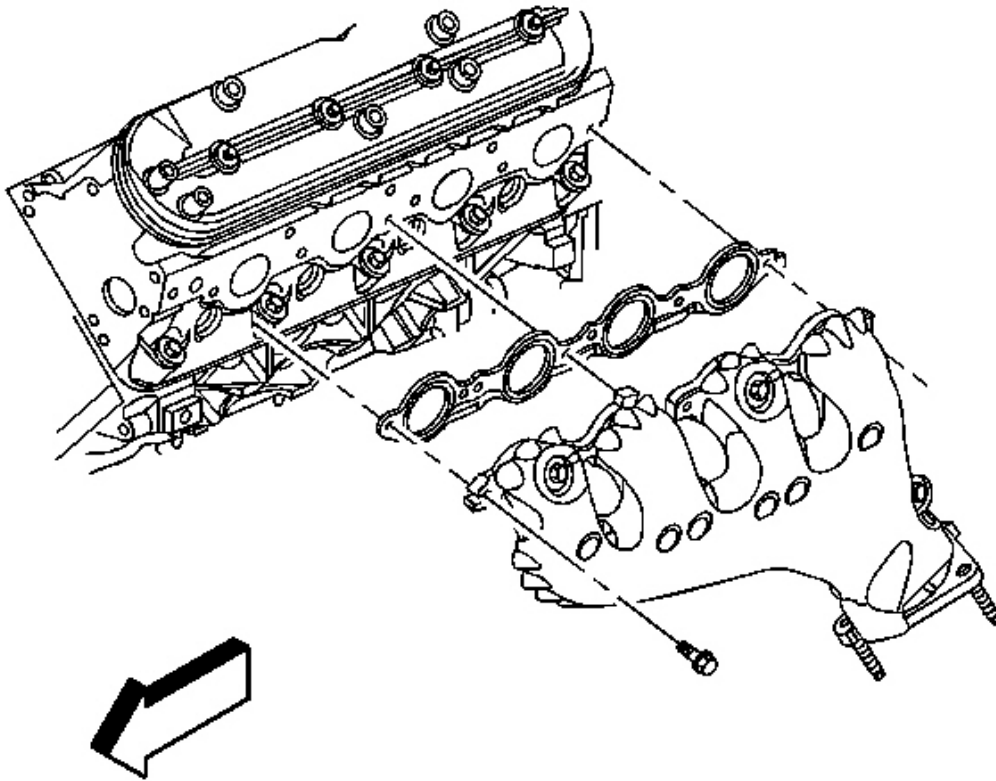


Fig. 8: View Of Left Exhaust Manifold - 5.3L
Courtesy of GENERAL MOTORS CORP.

5. Remove the heat shield bolts, and shield from the exhaust manifold.
6. Remove the exhaust manifold bolts, manifold, and gasket.
7. Discard the gasket.
8. Clean and inspect the exhaust manifold. Refer to **Exhaust Manifold Cleaning and Inspection** .

Installation Procedure

IMPORTANT:

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- 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.

IMPORTANT: Do not apply sealant to the first three threads of the bolt.

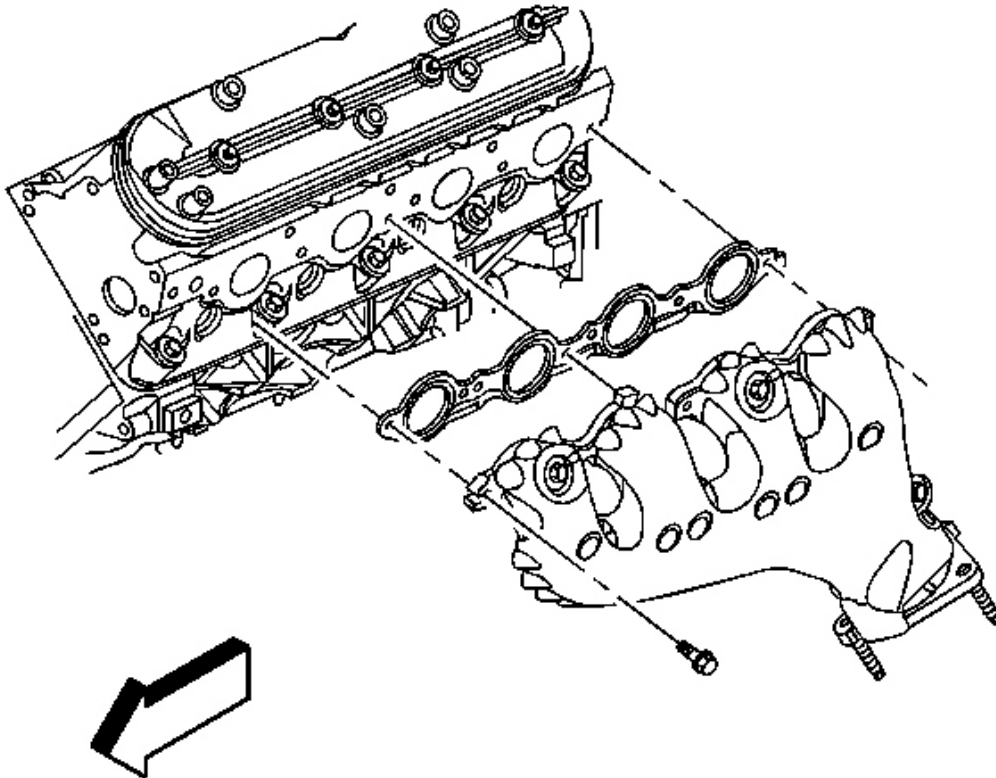


Fig. 9: View Of Left Exhaust Manifold - 5.3L
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

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

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

Tighten:

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

3. Install the heat shield, and bolts to the exhaust manifold.

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

4. Using a flat punch, bend over the exposed edge of the exhaust manifold gasket at the rear of the left cylinder head.
5. Install the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.
6. Raise the vehicle.

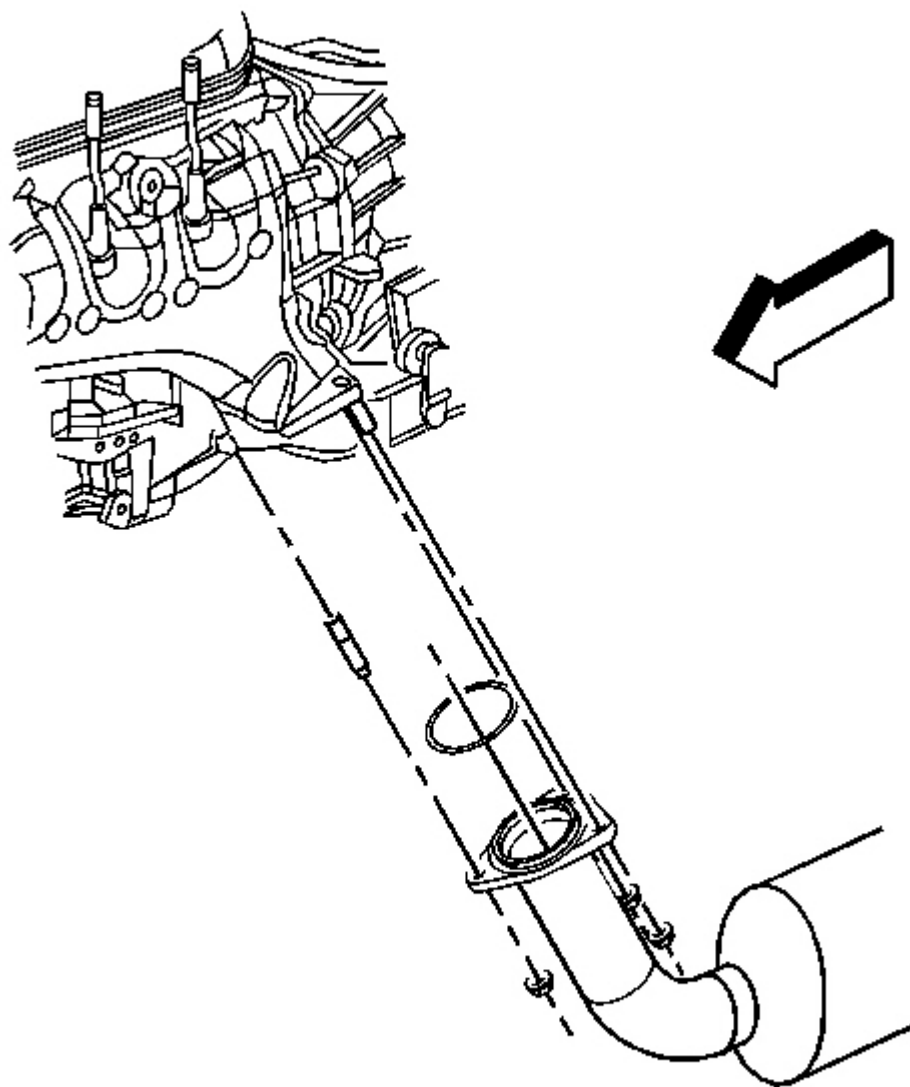


Fig. 10: View Of Left Catalytic Converter To The Exhaust Manifold Connection
Courtesy of GENERAL MOTORS CORP.

7. Install the exhaust manifold pipe nuts.

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

8. Lower the vehicle.

EXHAUST MANIFOLD REPLACEMENT - RIGHT (5.3L ENGINE)

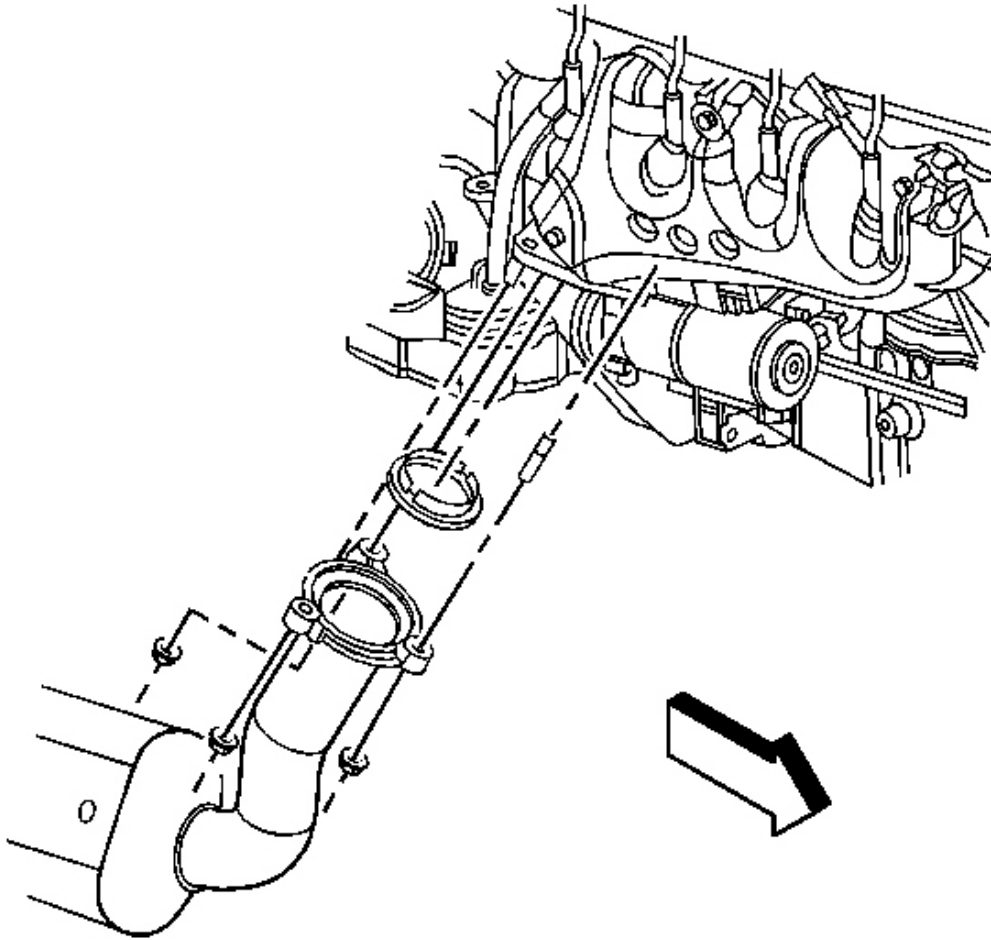


Fig. 11: View Of Right Catalytic Converter To The Exhaust Manifold Connection
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the exhaust manifold pipe nuts.
3. Lower the vehicle.
4. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.

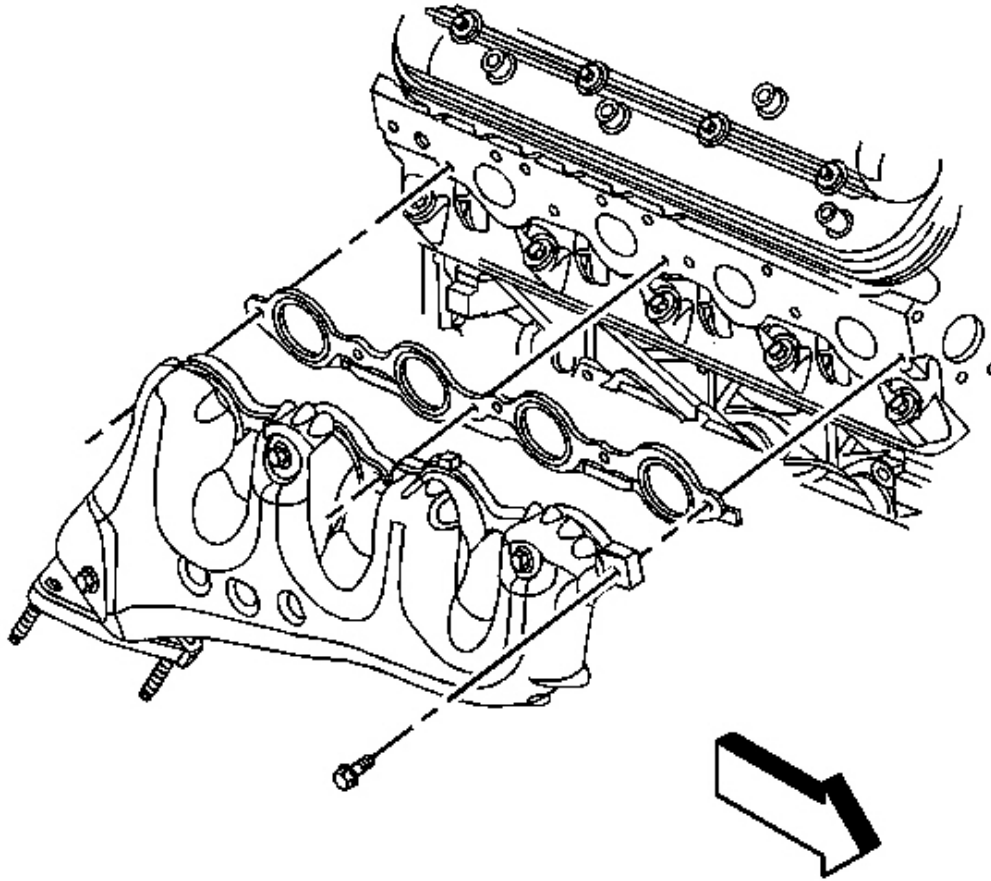


Fig. 12: View Of Right Exhaust Manifold - 5.3L
Courtesy of GENERAL MOTORS CORP.

5. Remove the heat shield bolts, and shield from the exhaust manifold.
6. Remove the exhaust manifold bolts, manifold, and gasket.
7. Discard the gasket.
8. Clean and inspect the exhaust manifold. Refer to **Exhaust Manifold Cleaning and Inspection** .

Installation Procedure

IMPORTANT:

- **Tighten the exhaust manifold bolts as specified in the service procedure. Improperly installed and/or leaking exhaust manifold gaskets may affect vehicle emissions and/or On-Board Diagnostics (OBD) II system performance.**

- The cylinder head exhaust manifold bolt hole threads must be clean and free of debris or threadlocking material.

IMPORTANT: Do not apply sealant to the first three threads of the bolt.

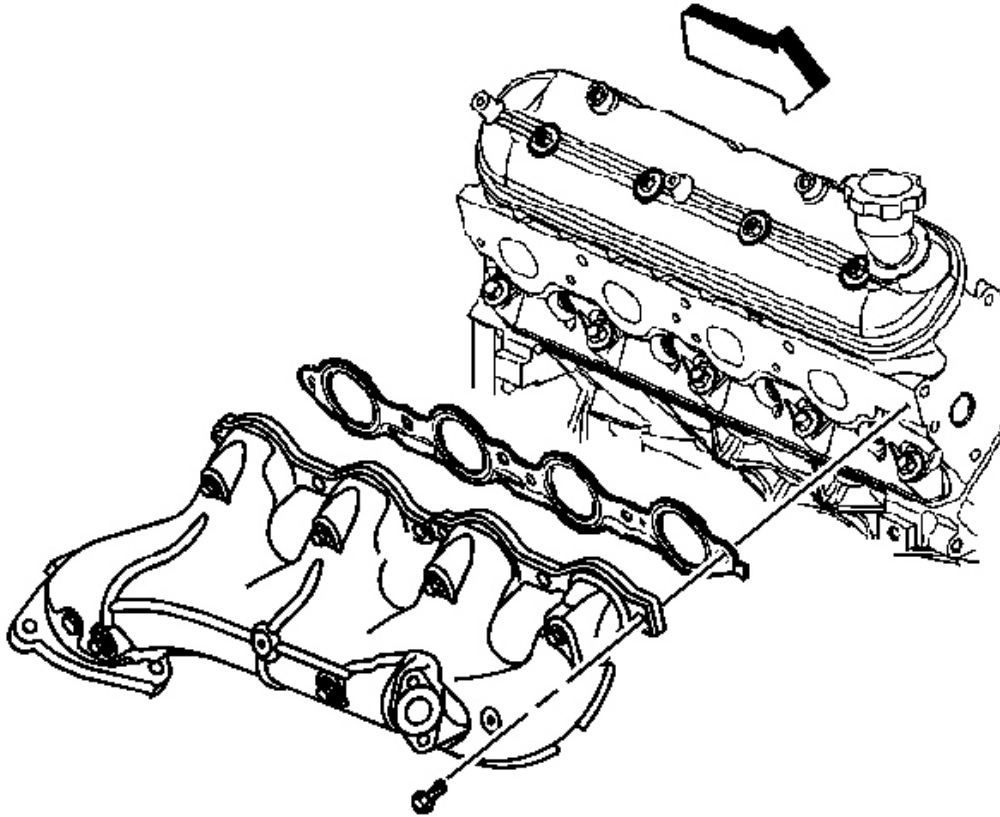


Fig. 13: Installing Right Exhaust Manifold & Gasket - 5.3
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Apply a 5 mm (0.2 in) wide band of threadlock GM P/N 12345493 (Canadian P/N 10953488), or equivalent to the threads of the exhaust manifold bolts.
2. 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 bolts beginning with the center 2 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 bolts beginning with the center 2 bolts. Alternate from side-to-side, and work toward the outside bolts.
3. Install the heat shield, and bolts to the exhaust manifold.

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

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. Raise the vehicle.

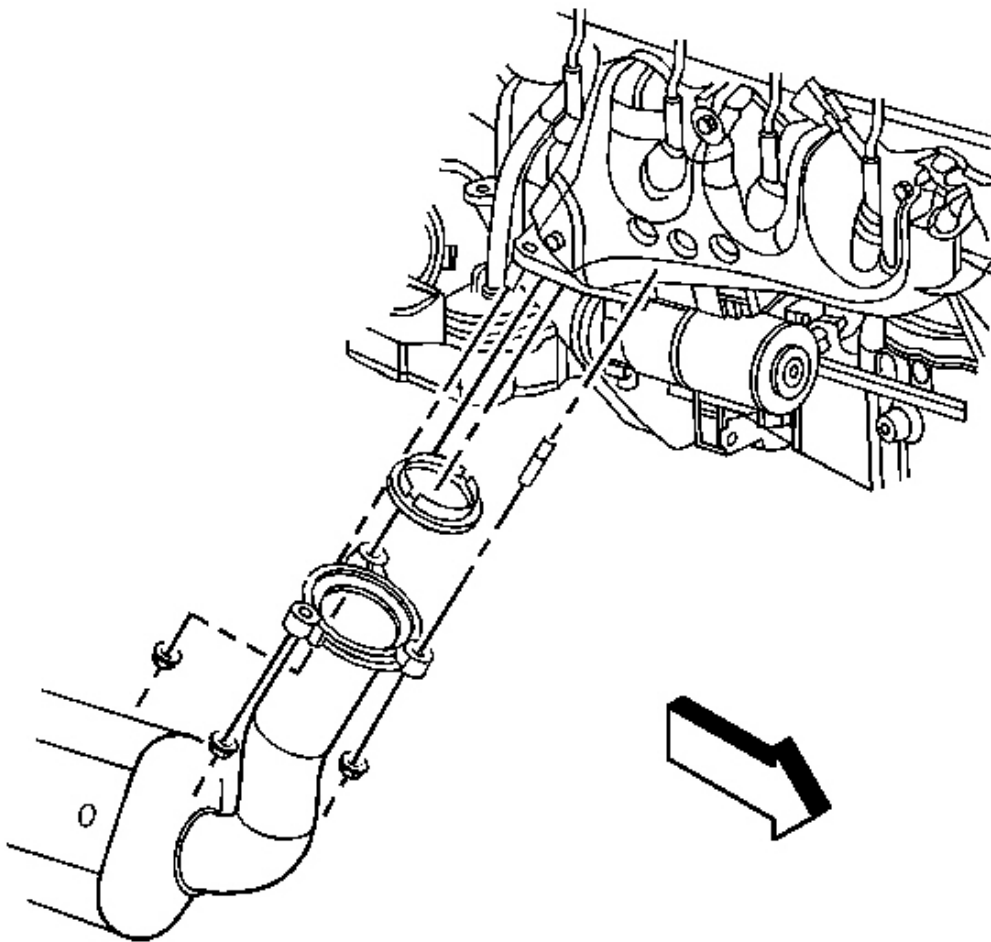


Fig. 14: View Of Right Catalytic Converter To The Exhaust Manifold Connection
Courtesy of GENERAL MOTORS CORP.

7. Install the exhaust manifold pipe nuts.

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

8. Lower the vehicle.

EXHAUST SYSTEM REPLACEMENT

Removal Procedure

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the frame brace. Refer to **Frame Brace Replacement (Short Wheelbase)** or **Frame Brace Replacement (Long Wheelbase)** in Frame and Underbody.
3. Remove the spare tire assembly.
4. Remove the rear axle tie rod. Refer to **Rear Axle Tie Rod Replacement** in Rear Suspension.
5. Remove the rear axle brace. Refer to **Rear Axle Brace Replacement** in Rear Suspension.

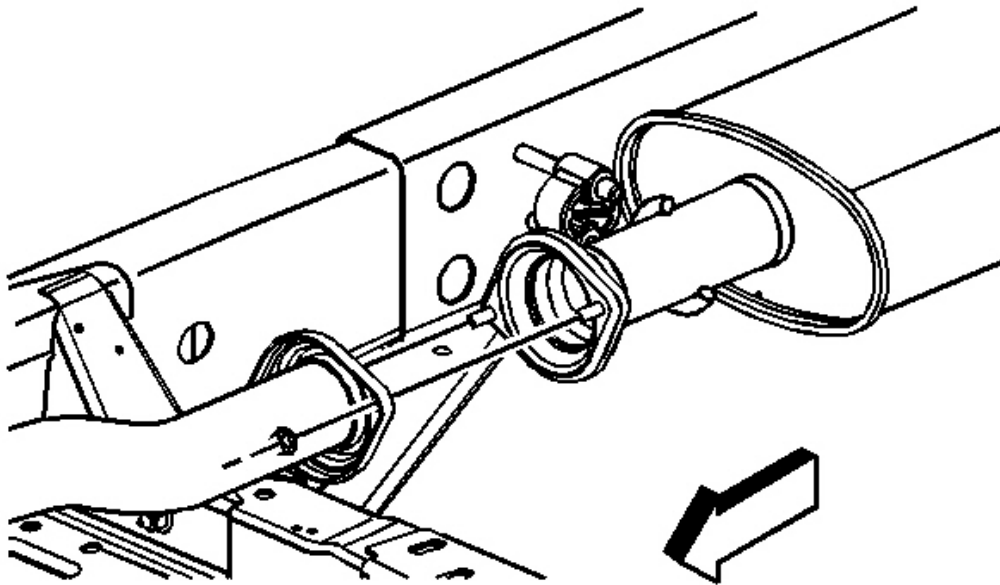


Fig. 15: Exhaust Pipe To Muffler Joint
Courtesy of GENERAL MOTORS CORP.

6. Remove the nuts that secure the muffler to the catalytic converter.

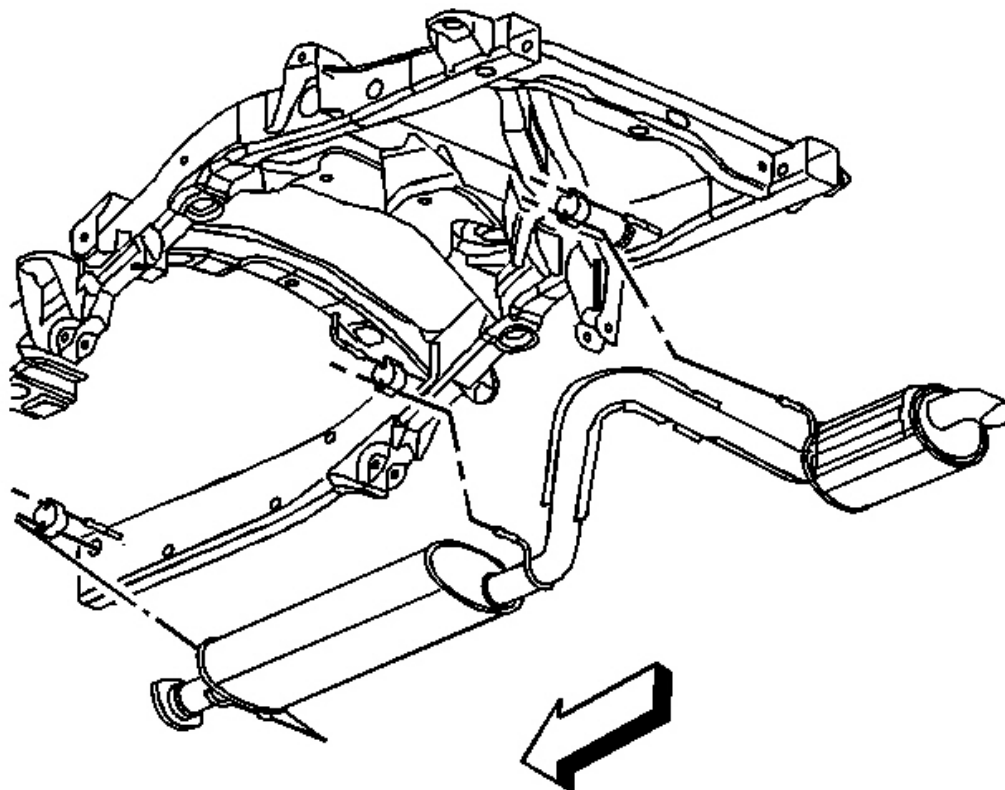


Fig. 16: Locating Exhaust Hangers

Courtesy of GENERAL MOTORS CORP.

7. Separate the exhaust system from the exhaust hanger insulators.
8. Remove the exhaust system.

Installation Procedure

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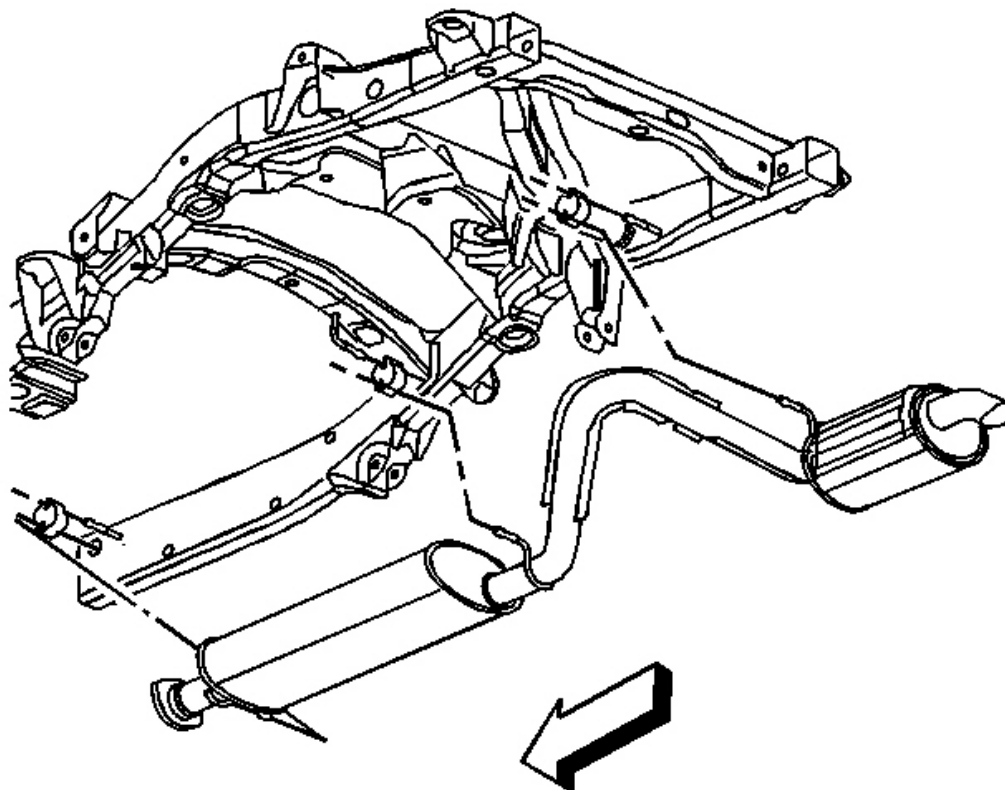


Fig. 17: Locating Exhaust Hangers

Courtesy of GENERAL MOTORS CORP.

1. Install the exhaust system to the vehicle and secure with the exhaust system hanger insulators.

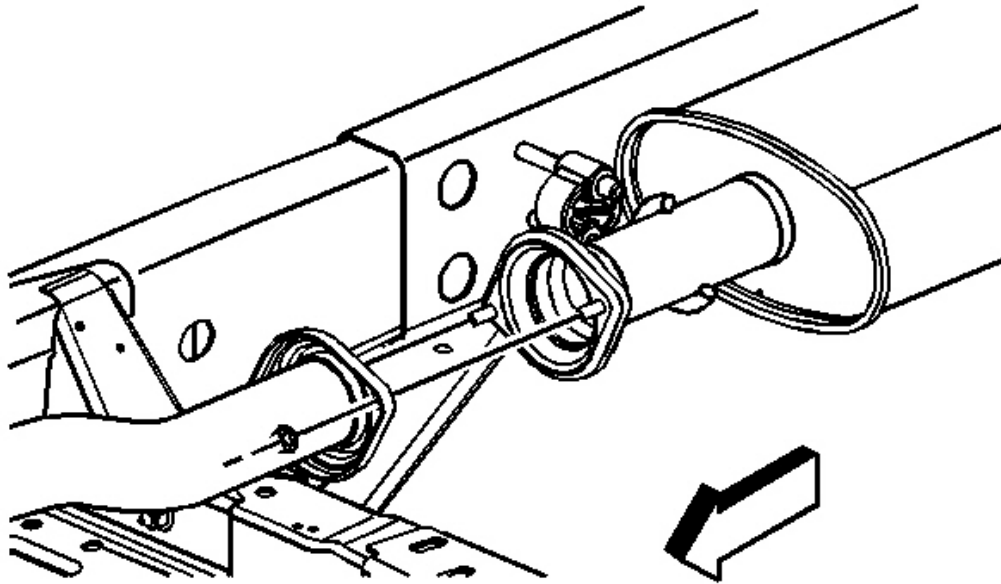


Fig. 18: Exhaust Pipe To Muffler Joint
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the muffler to the catalytic converter and secure with the nuts.

Tighten: Tighten the nuts to 45 N.m (33 lb ft).

3. Inspect the exhaust system for leaks and underbody contact.
4. Install the rear axle brace. Refer to **Rear Axle Brace Replacement** in Rear Suspension.
5. Install the rear axle tie rod. Refer to **Rear Axle Tie Rod Replacement** in Rear Suspension.
6. Install the spare tire assembly.
7. Install the frame brace. Refer to **Frame Brace Replacement (Short Wheelbase)** or **Frame Brace Replacement (Long Wheelbase)** in Frame and Underbody.
8. Lower the vehicle.

CATALYTIC CONVERTER REPLACEMENT (4.2L ENGINE)

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

2. Remove the heated oxygen sensor (H2OS). Refer to Heated Oxygen Sensor Replacement - Position 2 in Engine Controls - 4.2L.

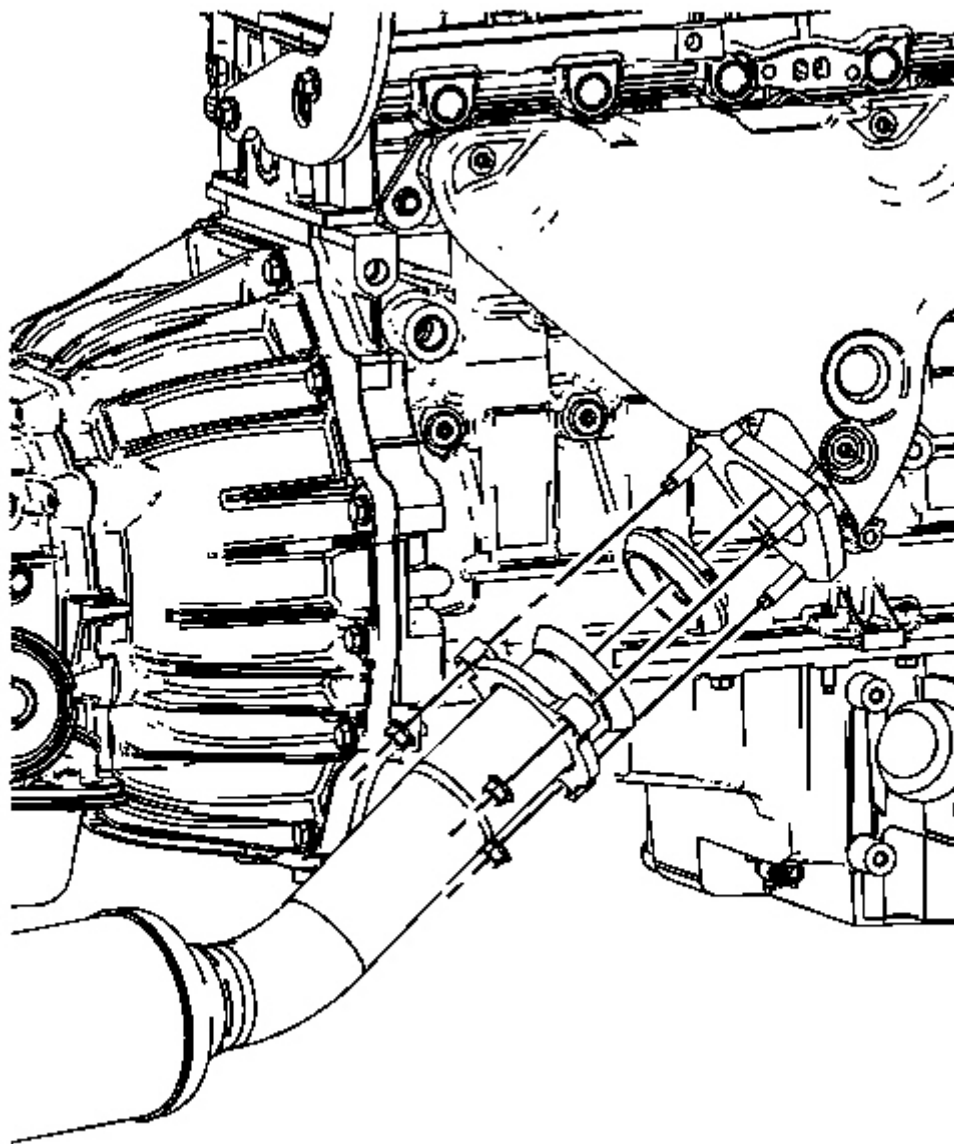


Fig. 19: View Of Catalytic Converter Pipe - 4.2L
Courtesy of GENERAL MOTORS CORP.

3. Remove the nuts that secure the catalytic converter pipe to the exhaust manifold.

4. Discard the old exhaust seal. Do NOT reuse the seal.

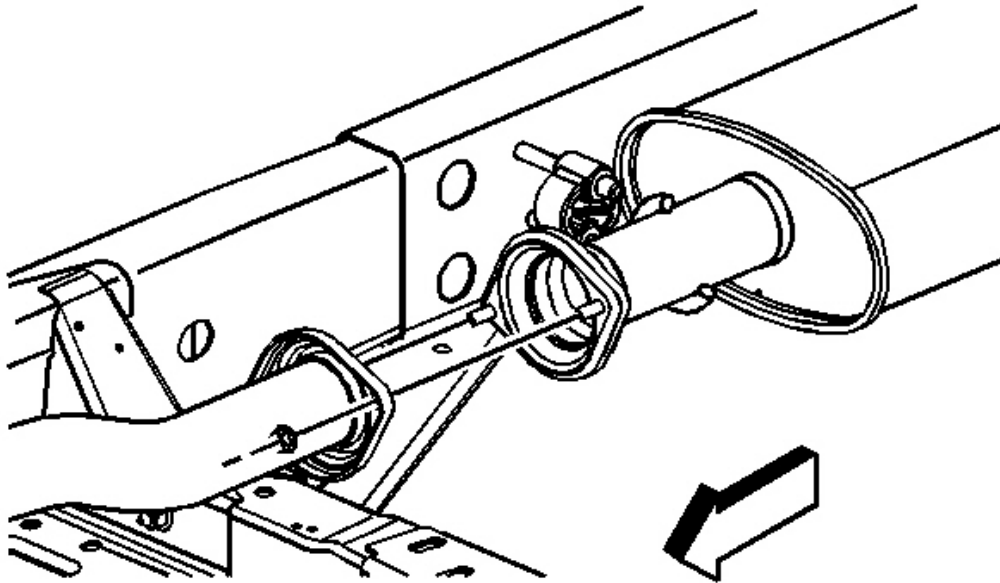


Fig. 20: Exhaust Pipe To Muffler Joint
Courtesy of GENERAL MOTORS CORP.

5. Remove the nuts that secure the catalytic converter pipe to the muffler.
6. Remove the transmission mount. Refer to **Transmission Mount Replacement (4.2L)** or **Transmission Mount Replacement (5.3L)** in Automatic Transmission-4L60-E/4L65-E.
7. Remove the catalytic converter pipe from the vehicle.

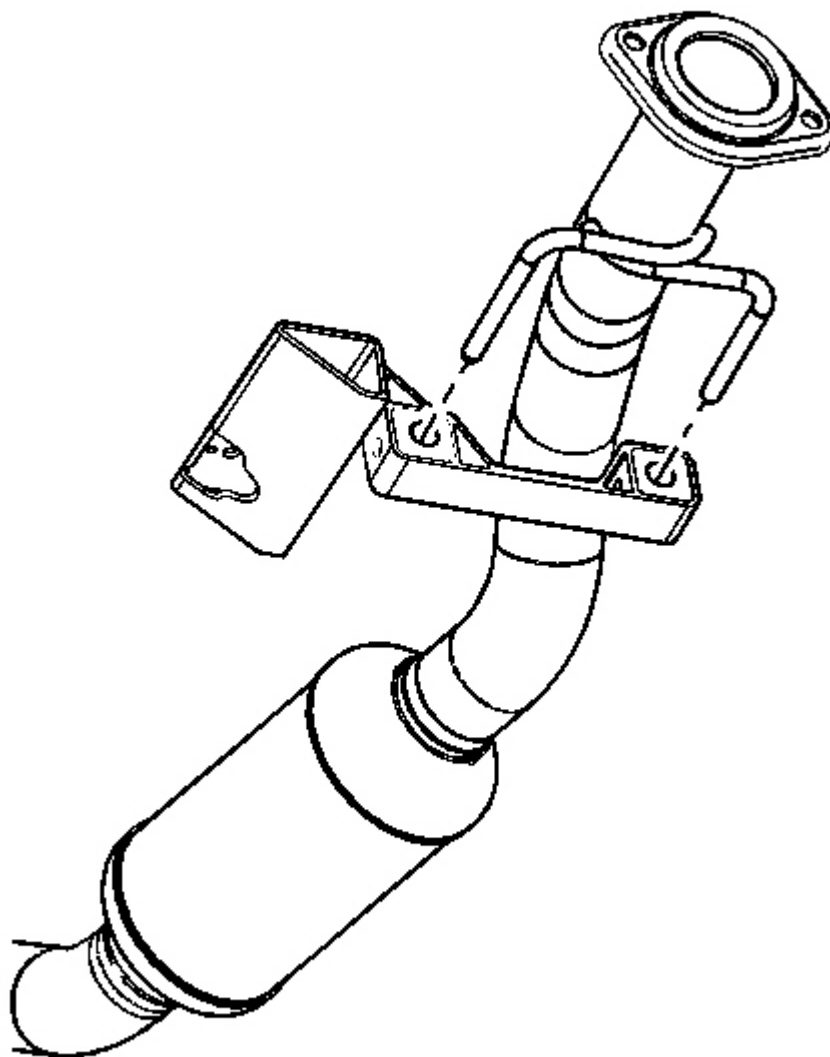


Fig. 21: View Of Exhaust Hanger
Courtesy of GENERAL MOTORS CORP.

8. Remove the exhaust hanger from the catalytic converter pipe.

Installation Procedure

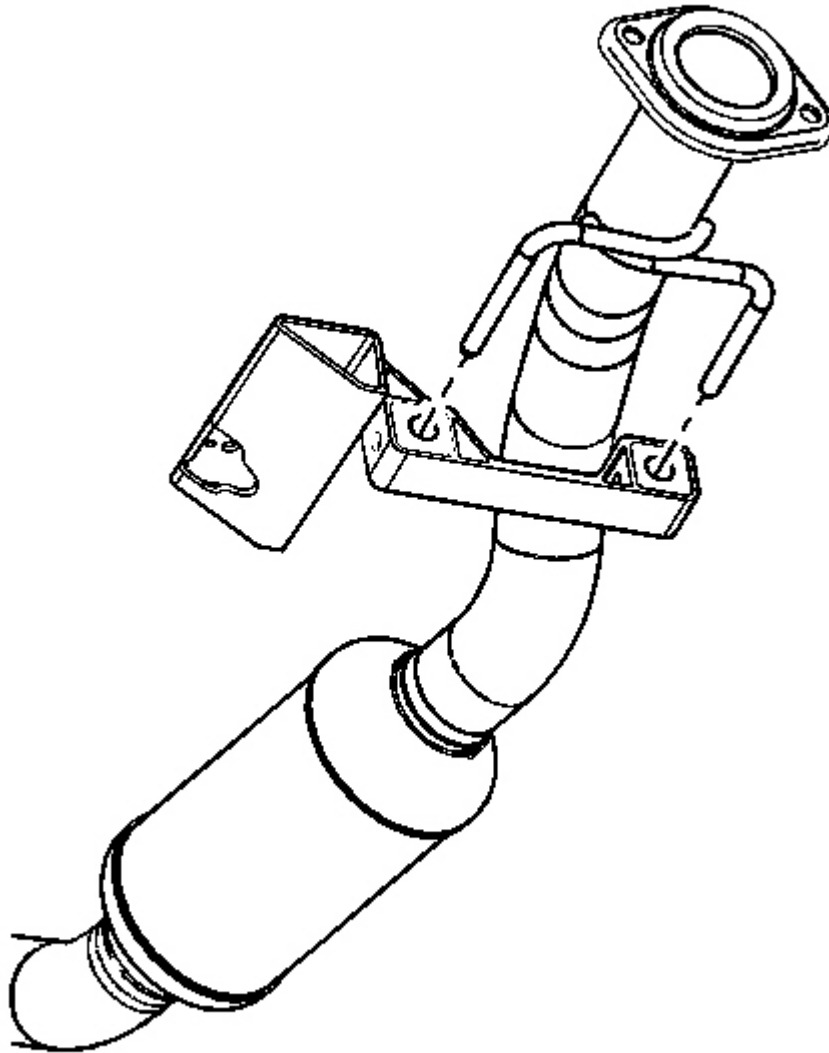


Fig. 22: View Of Exhaust Hanger
Courtesy of GENERAL MOTORS CORP.

1. Install the exhaust hanger to the catalytic converter pipe.
2. Install the catalytic converter pipe to the vehicle.
3. Install the transmission mount. Refer to **Transmission Mount Replacement (4.2L)** or **Transmission Mount Replacement (5.3L)** in Automatic Transmission-4L60-E/4L65-E.
4. Install the converter pipe to the muffler.

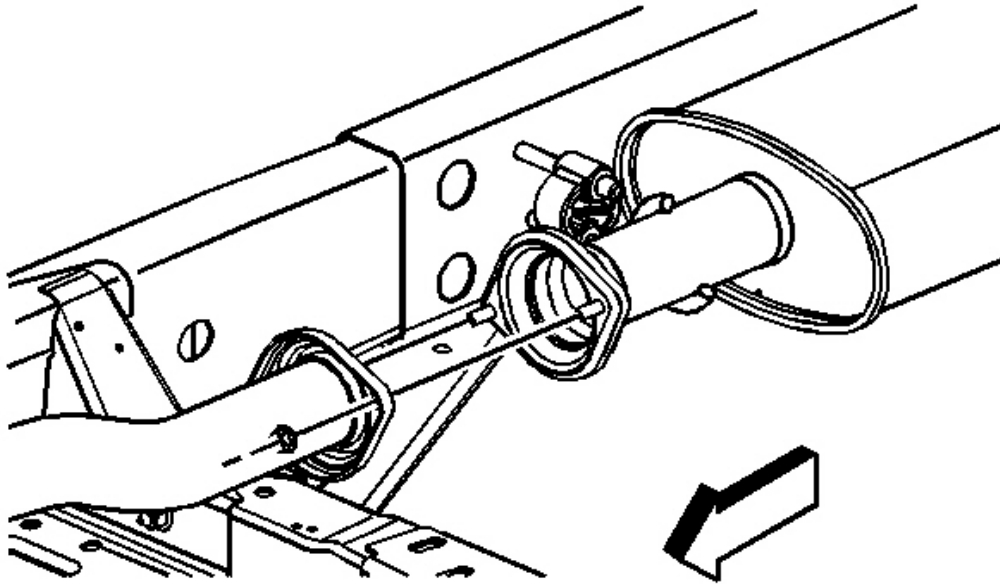


Fig. 23: Exhaust Pipe To Muffler Joint
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: The exhaust flange nuts must be tightened evenly to align the joint and prevent exhaust leaks.

5. Hand thread both nuts evenly until they contact the exhaust flange.

Tighten: Tighten the nuts to 45 N.m (33 lb ft).

IMPORTANT: Do NOT reuse the old exhaust seal. ALWAYS replace the exhaust seal to prevent exhaust leaks.

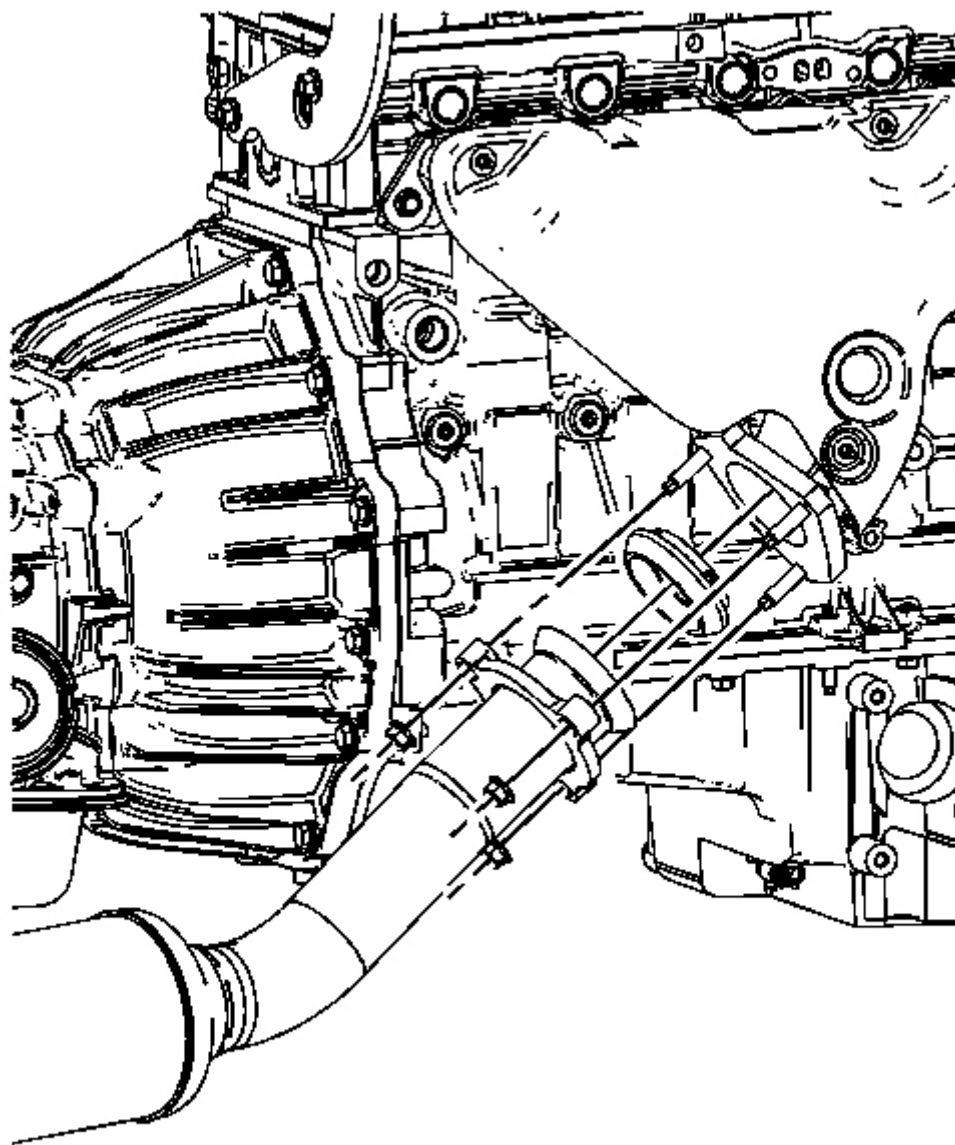


Fig. 24: View Of Catalytic Converter Pipe - 4.2L
Courtesy of GENERAL MOTORS CORP.

6. Install the converter pipe to the exhaust manifold with a NEW exhaust seal.
7. Hand thread the nuts evenly against the exhaust flange until the pipe is secure.

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

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8. Install the H2OS. Refer to **Heated Oxygen Sensor Replacement - Position 2** in Engine Controls - 4.2L.
9. Lower the vehicle.

CATALYTIC CONVERTER REPLACEMENT (5.3L ENGINE)

Removal Procedure

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

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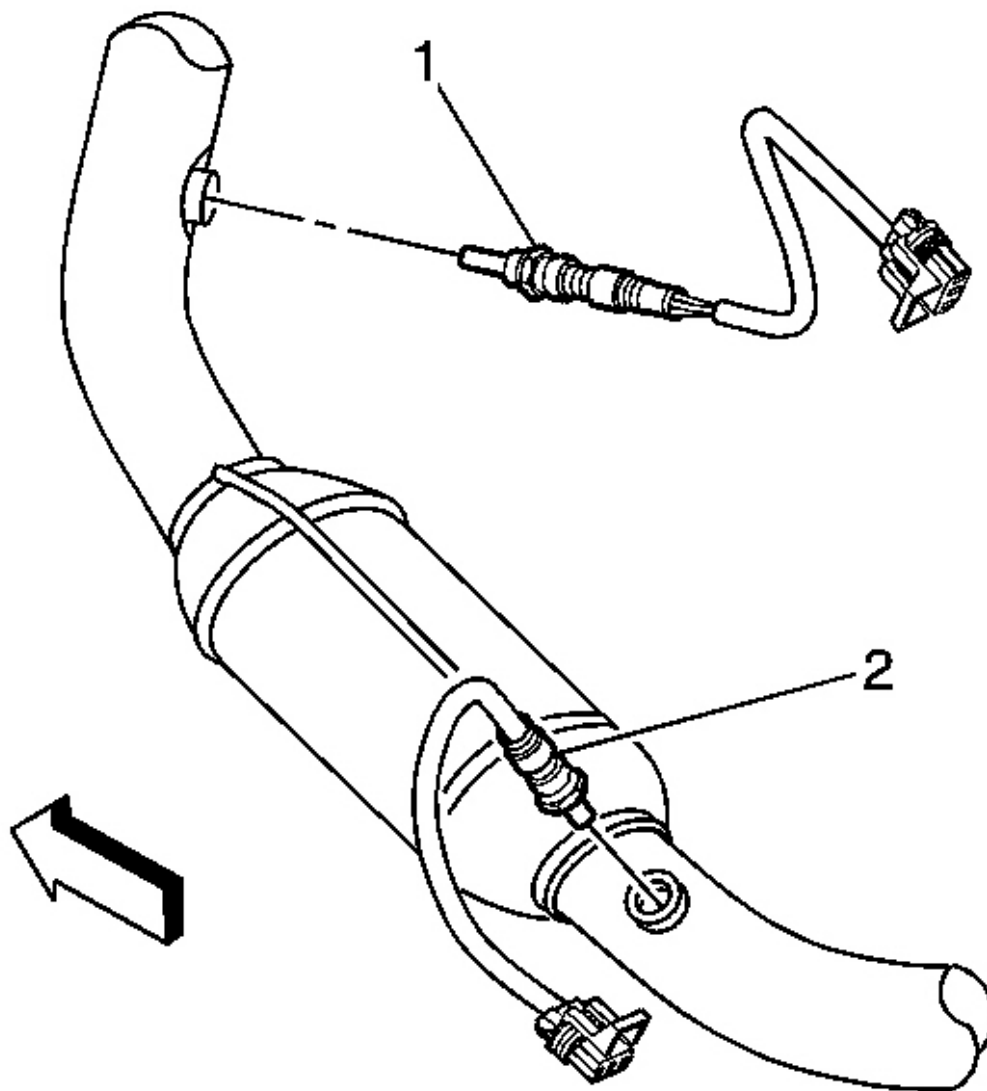


Fig. 25: View Of HO2S Sensors
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Heated Oxygen and Oxygen Sensor Notice in Cautions and Notices.

NOTE: Refer to Excessive Force and Oxygen Sensor Notice in Cautions and Notices.

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2. Unscrew both front heated oxygen sensor (HO2S) sensors (1) from the catalytic converter.
3. Unscrew both rear HO2S sensors (2) from the catalytic converter.
4. Remove the rear propeller shaft. Refer to **Propeller Shaft Replacement - Rear** in Propeller Shaft.
5. If equipped with four wheel drive (4WD), Remove the front propeller shaft. Refer to **Propeller Shaft Replacement - Front** in Propeller Shaft.
6. Support the transmission with a transmission jack.
7. Remove the transmission support. Refer to **Transmission Support Replacement** in Frame and Underbody.

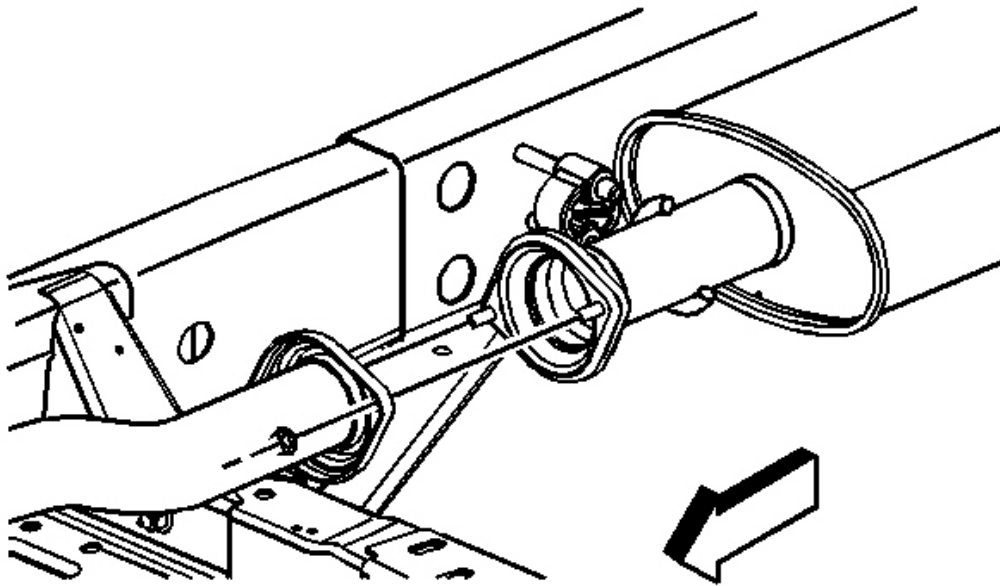


Fig. 26: Exhaust Pipe To Muffler Joint
Courtesy of GENERAL MOTORS CORP.

8. Remove the exhaust muffler nuts.

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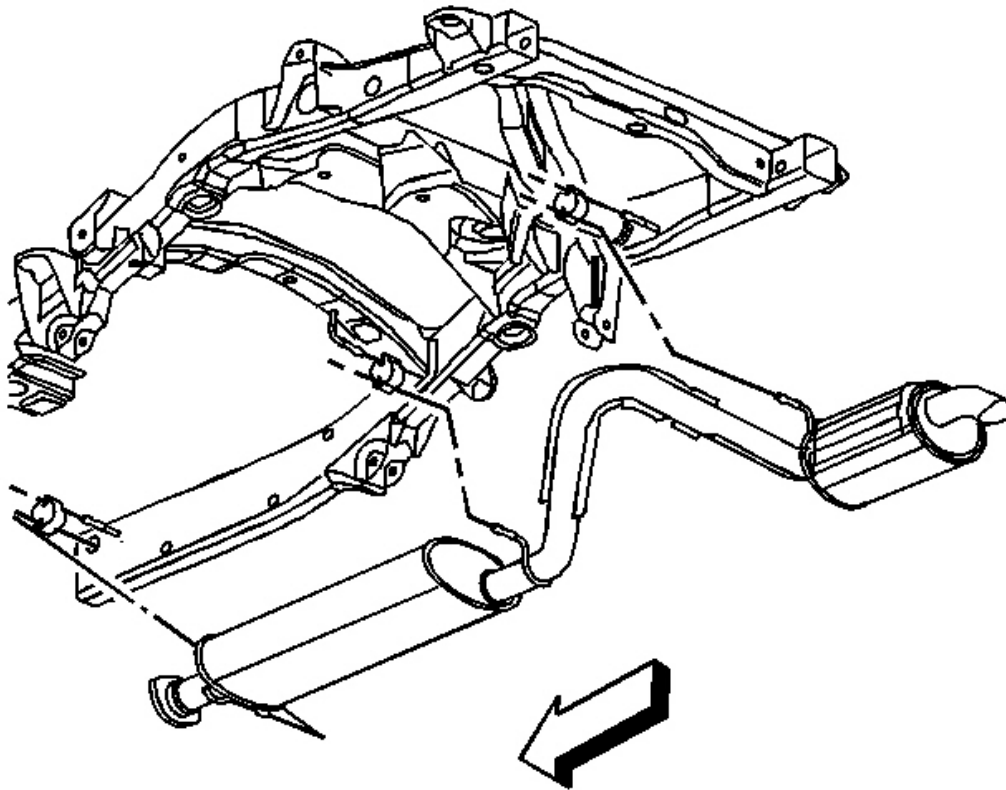


Fig. 27: Locating Exhaust Hangers

Courtesy of GENERAL MOTORS CORP.

9. Separate the exhaust hanger insulators from the exhaust system and position the exhaust system rearward for additional clearance.

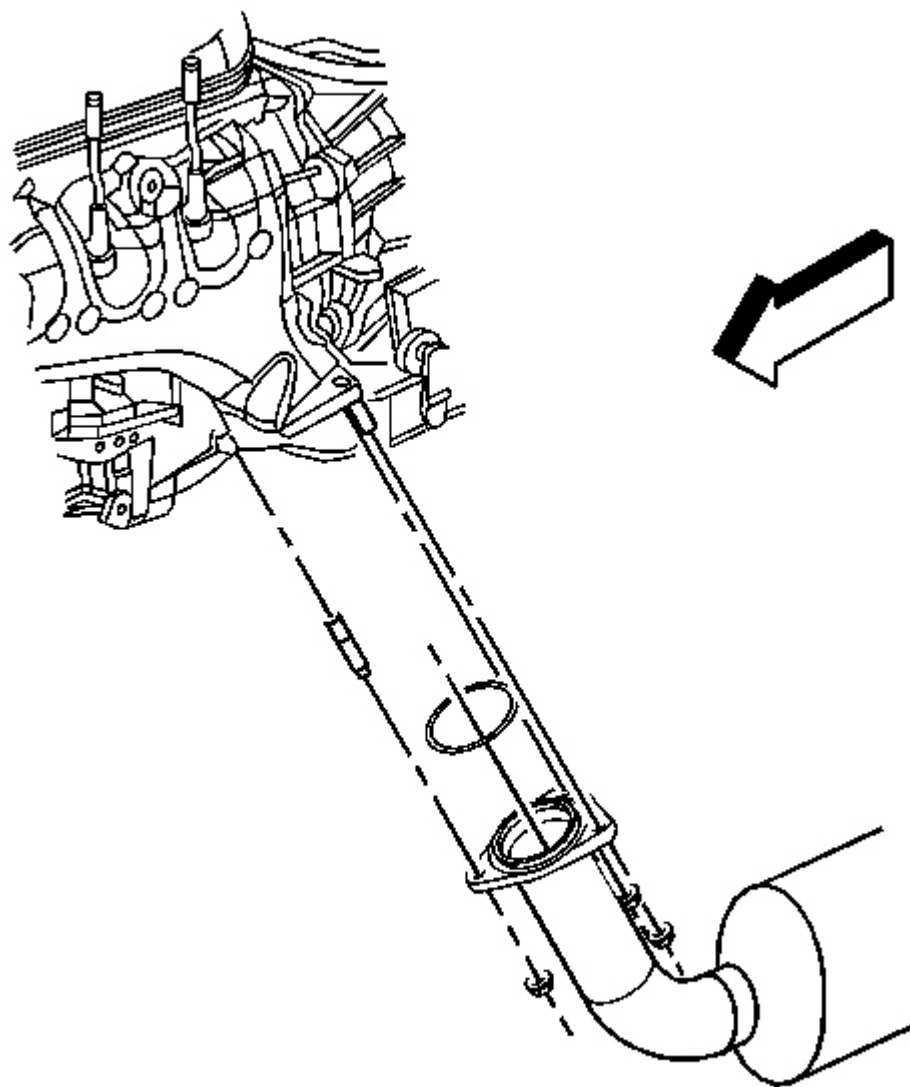


Fig. 28: View Of Left Catalytic Converter To The Exhaust Manifold Connection
Courtesy of GENERAL MOTORS CORP.

10. Remove the left exhaust manifold pipe nuts.

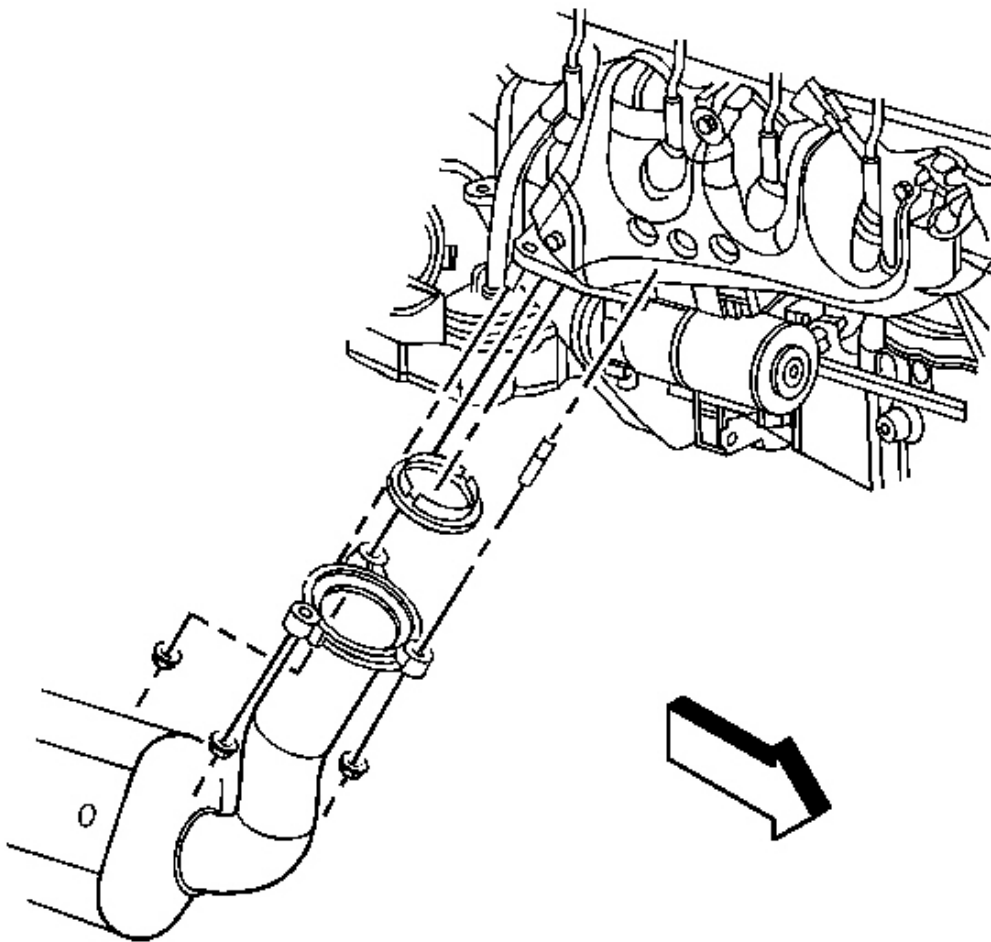


Fig. 29: View Of Right Catalytic Converter To The Exhaust Manifold Connection
Courtesy of GENERAL MOTORS CORP.

11. Remove the right exhaust manifold pipe nuts.

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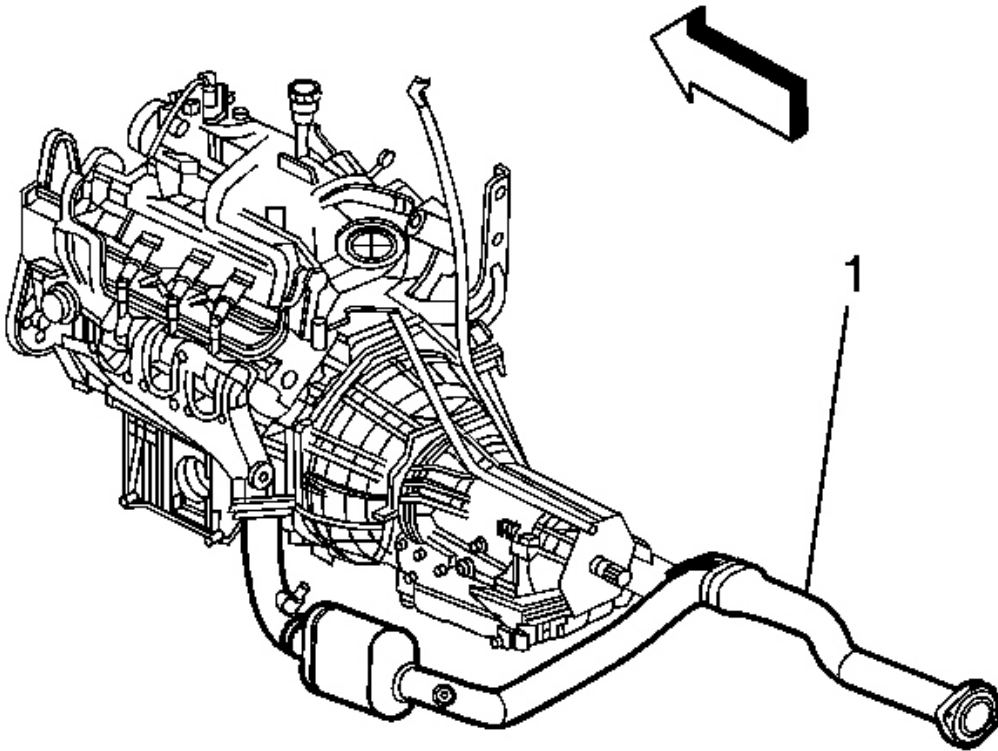


Fig. 30: View Of Catalytic Converter
Courtesy of GENERAL MOTORS CORP.

12. Raise the transmission with the transmission jack for additional catalytic converter pipe clearance.
13. Tilt the catalytic converter (1) in order to lower the left side catalytic converter pipe below the vehicle frame. Rotate the catalytic converter outlet pipe toward the left side of the vehicle to gain the necessary clearance for the right side catalytic converter pipe to clear the vehicle frame. Remove the catalytic converter (1) from the vehicle.

Installation Procedure

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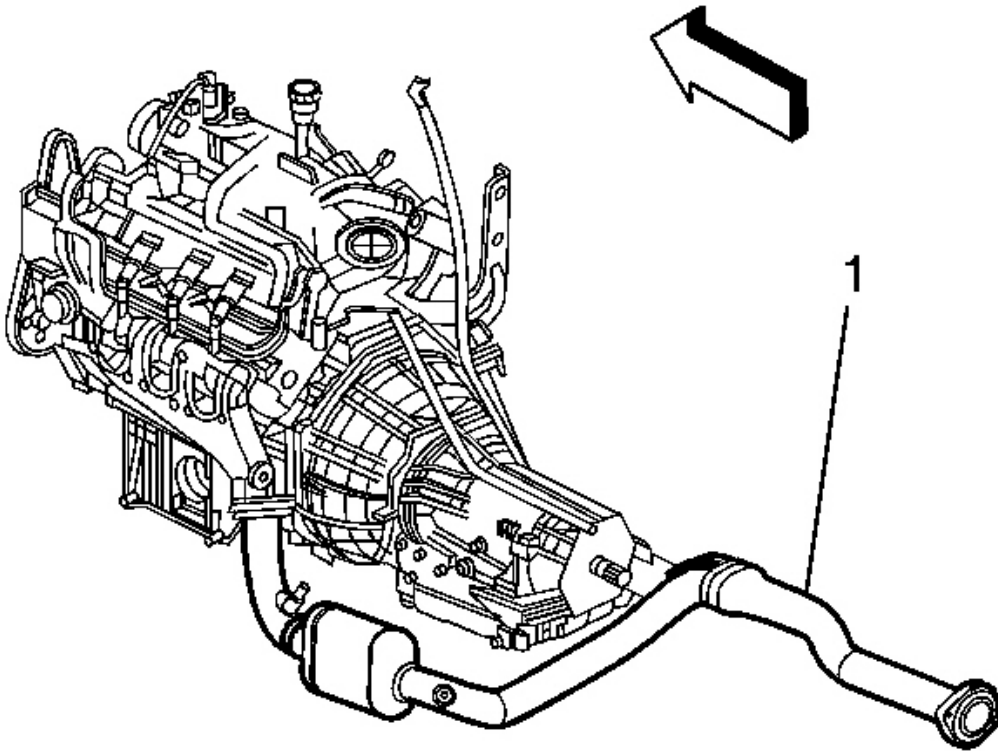


Fig. 31: View Of Catalytic Converter
Courtesy of GENERAL MOTORS CORP.

1. Install the catalytic converter (1) in reverse order of removal by starting with the catalytic converter outlet pipe angled toward the left side of the vehicle and positioning the right side catalytic converter pipe above the frame. Rotate the catalytic converter outlet pipe toward the rear of the vehicle and lift the left side catalytic converter pipe up above the frame. Then position the catalytic converter (1) to the exhaust manifolds.

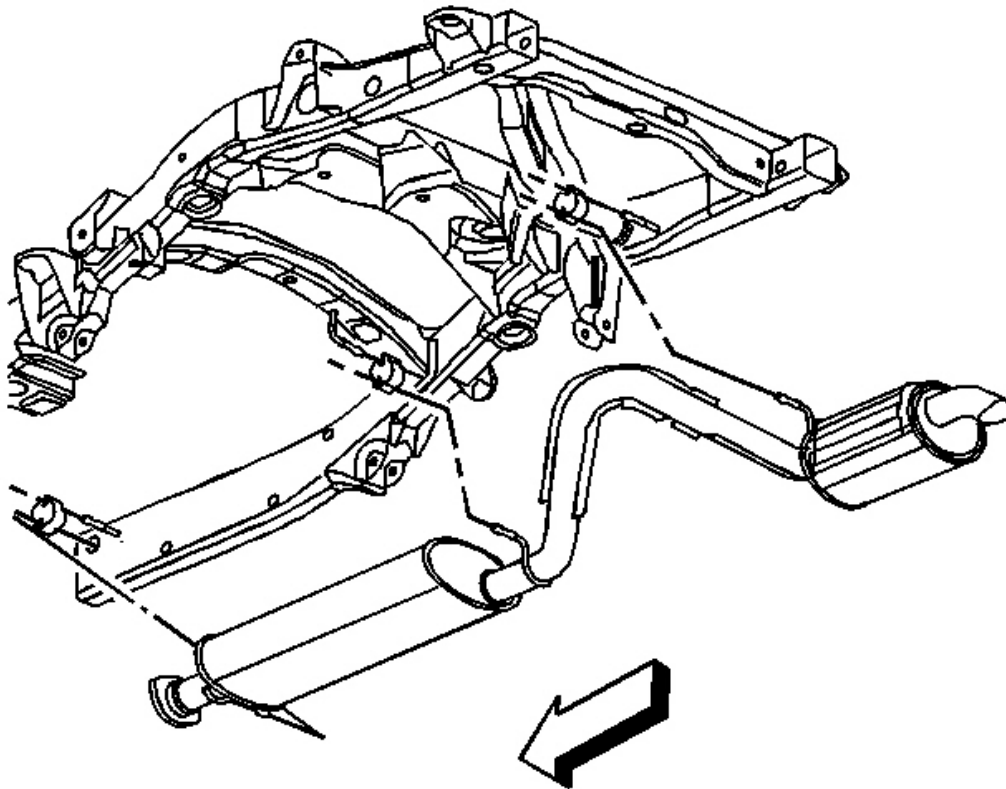


Fig. 32: Locating Exhaust Hangers

Courtesy of GENERAL MOTORS CORP.

2. Install the exhaust hanger insulators to the exhaust system.

NOTE: Refer to Fastener Notice in Cautions and Notices.

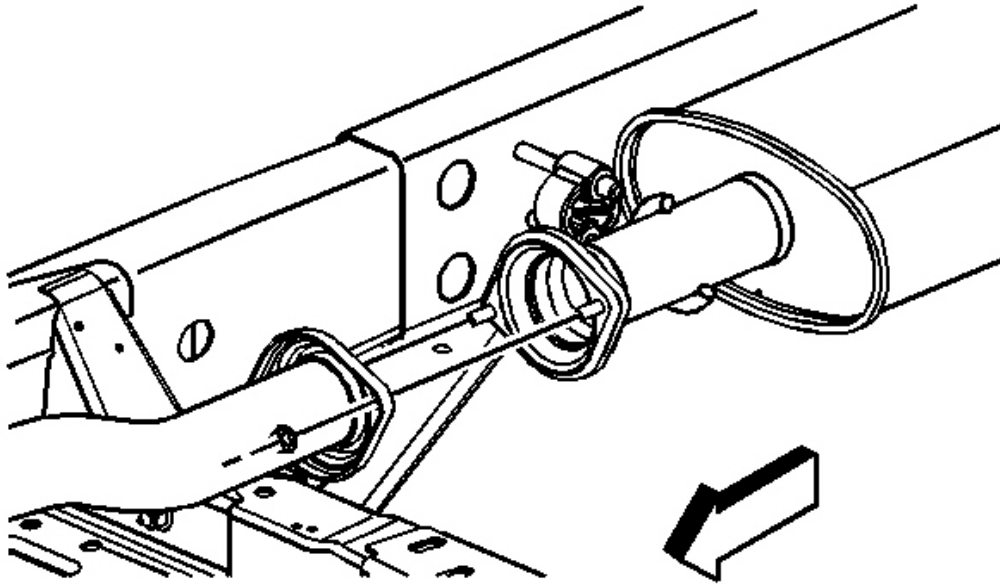


Fig. 33: Exhaust Pipe To Muffler Joint
Courtesy of GENERAL MOTORS CORP.

3. Install the exhaust muffler nuts. Ensure the catalytic converter is held in the installed position before tightening the nuts.

Tighten: Tighten the nuts to 45 N.m (33 lb ft).

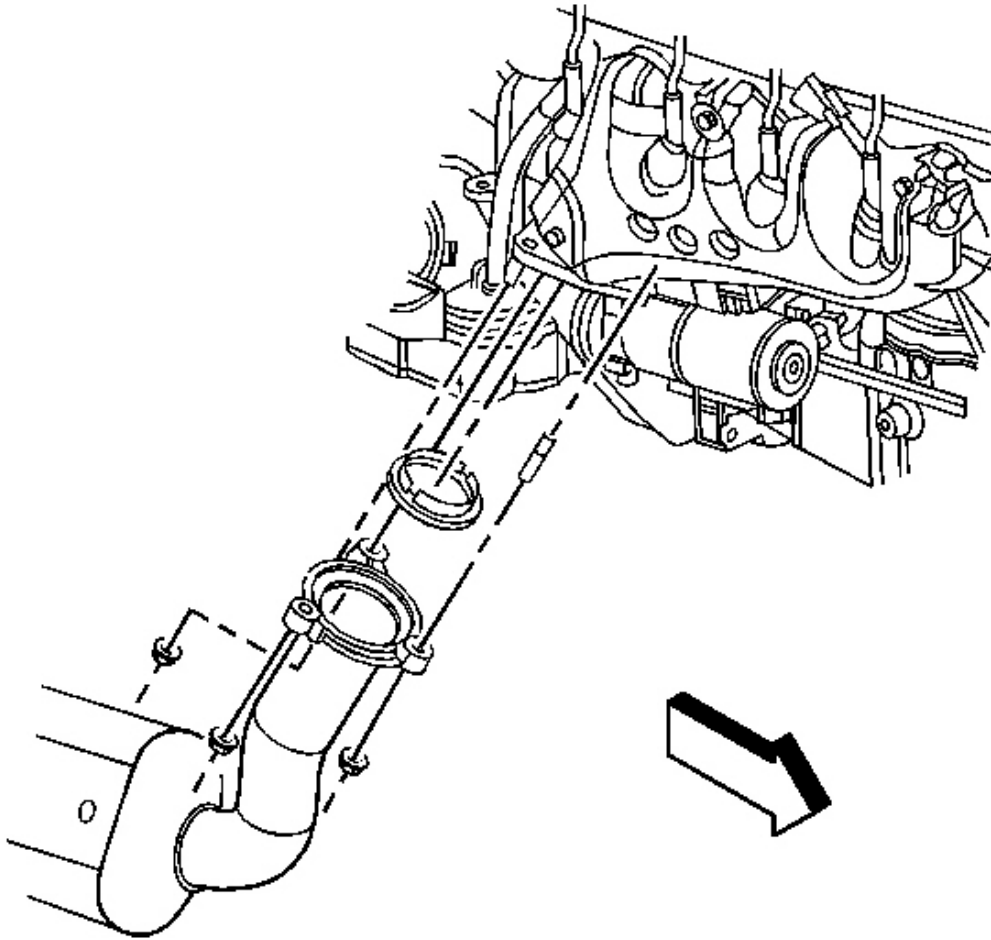


Fig. 34: View Of Right Catalytic Converter To The Exhaust Manifold Connection
Courtesy of GENERAL MOTORS CORP.

4. Install the right exhaust manifold pipe nuts. Ensure the catalytic converter is held in the installed position before tightening the nuts.

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

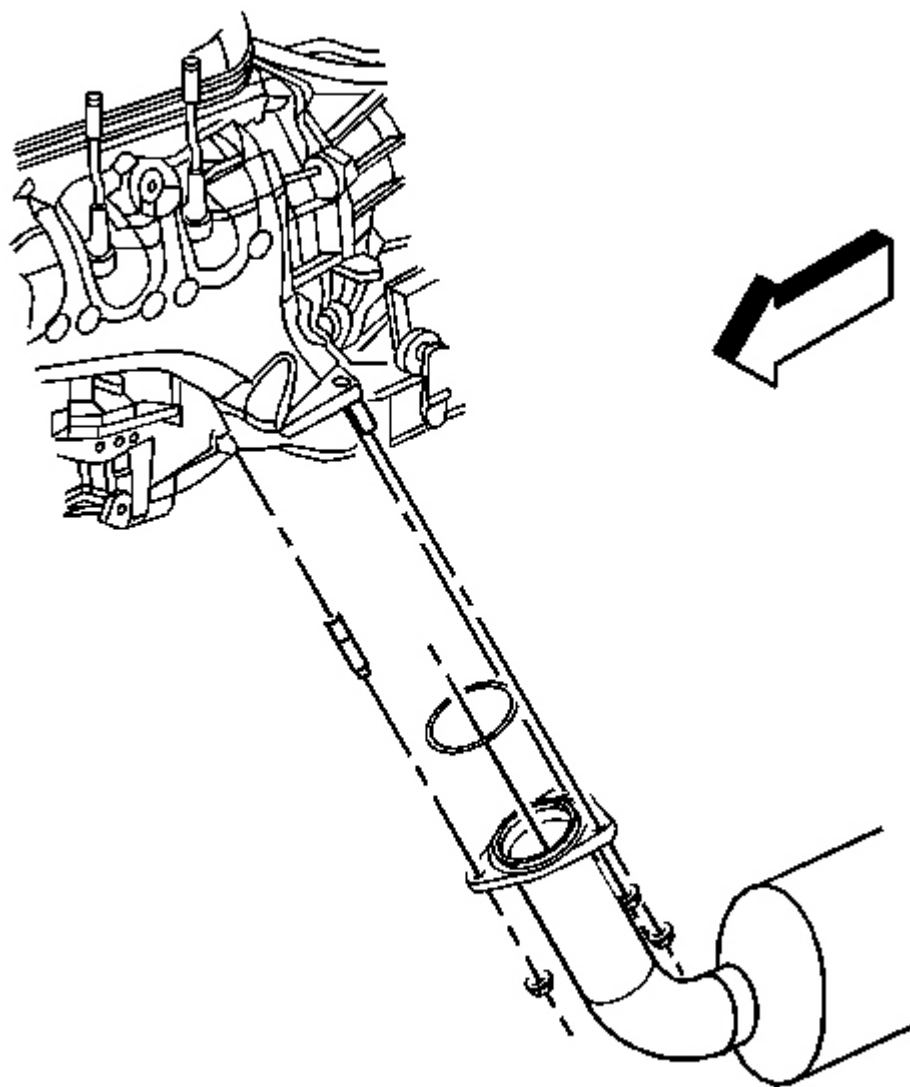


Fig. 35: View Of Left Catalytic Converter To The Exhaust Manifold Connection
Courtesy of GENERAL MOTORS CORP.

5. Install the left exhaust manifold pipe nuts.

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

6. Install the transmission support. Refer to **Transmission Support Replacement** in Frame and Underbody.

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7. Remove the transmission jack.
8. If equipped with 4WD, install the front propeller shaft. Refer to **Propeller Shaft Replacement - Front** in Propeller Shaft.
9. Install the rear propeller shaft. Refer to **Propeller Shaft Replacement - Rear** in Propeller Shaft.

IMPORTANT: A special anti-seize compound is used on the HO2S threads. The compound consists of liquid graphite and glass beads. The graphite tends to burn away, but the glass beads remain, making the sensor easier to remove. New, or service replacement sensors already have the compound applied to the threads. If the sensor is removed from an exhaust component and if for any reason the sensor is to be reinstalled, the threads must have anti-seize compound applied before the reinstallation.

10. If reinstalling the old sensors, coat the threads with anti-seize compound GM P/N 12377953, or equivalent.

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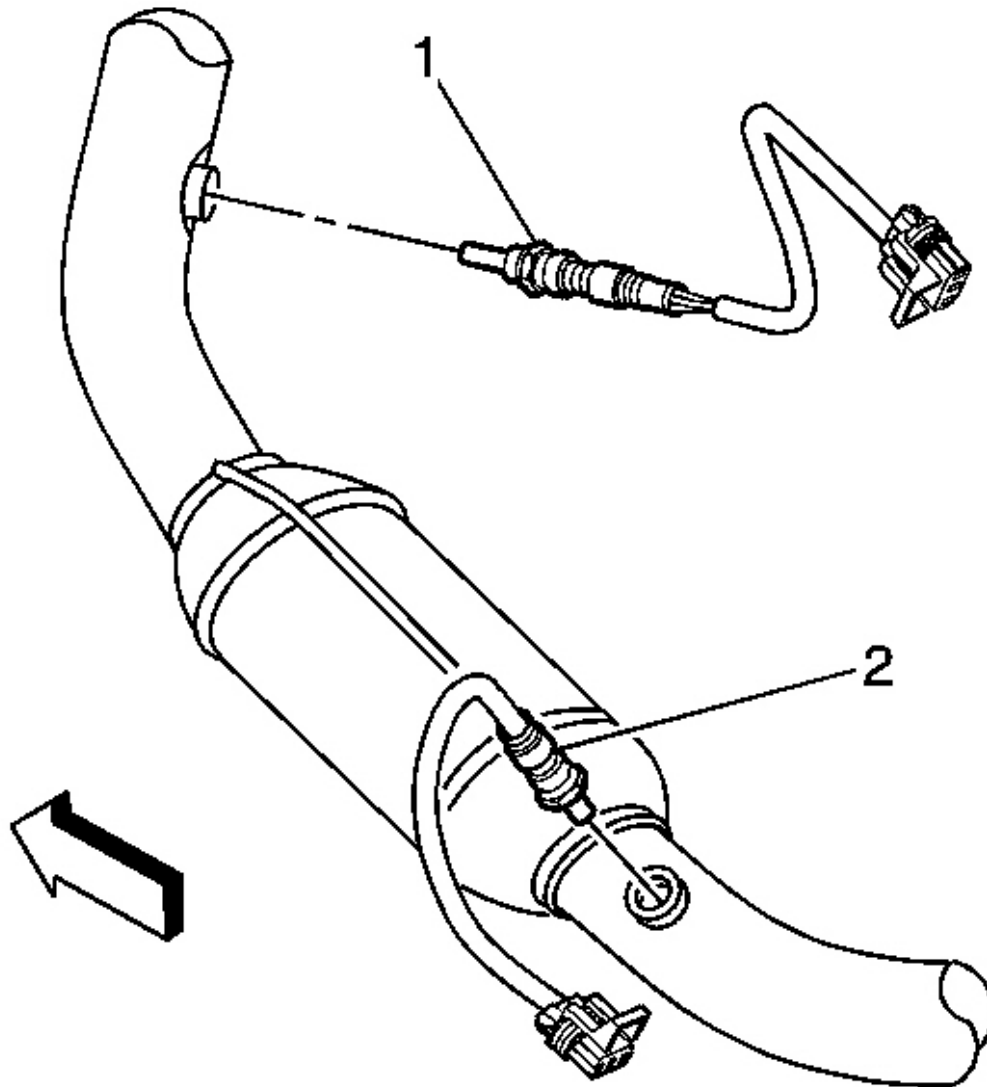


Fig. 36: View Of HO2S Sensors

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Component Fastener Tightening Notice in Cautions and Notices.

IMPORTANT: If the HO2S sensor is connected to the main wiring harness during installation. Rotate the HO2S sensor several turns counterclockwise before threading the HO2S sensor into the catalytic converter. This action

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of initially reverse winding of the pigtail wires will prevent a condition where the HO2S sensor pigtail wires become severely twisted or binding once the HO2S sensor is installed into the catalytic converter.

11. Install both front HO2S sensors (1) to the catalytic converter.

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

12. Install both rear HO2S (2) to the catalytic converter.

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

13. Lower the vehicle.

EXHAUST HANGER REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Disconnect the heated oxygen sensor (H2OS) electrical connector.
3. Remove the nuts that secure the catalytic converter pipe to the exhaust manifold.
4. Discard the old exhaust seal. Do NOT reuse the seal.
5. Remove the nuts that secure the catalytic converter pipe to the muffler.

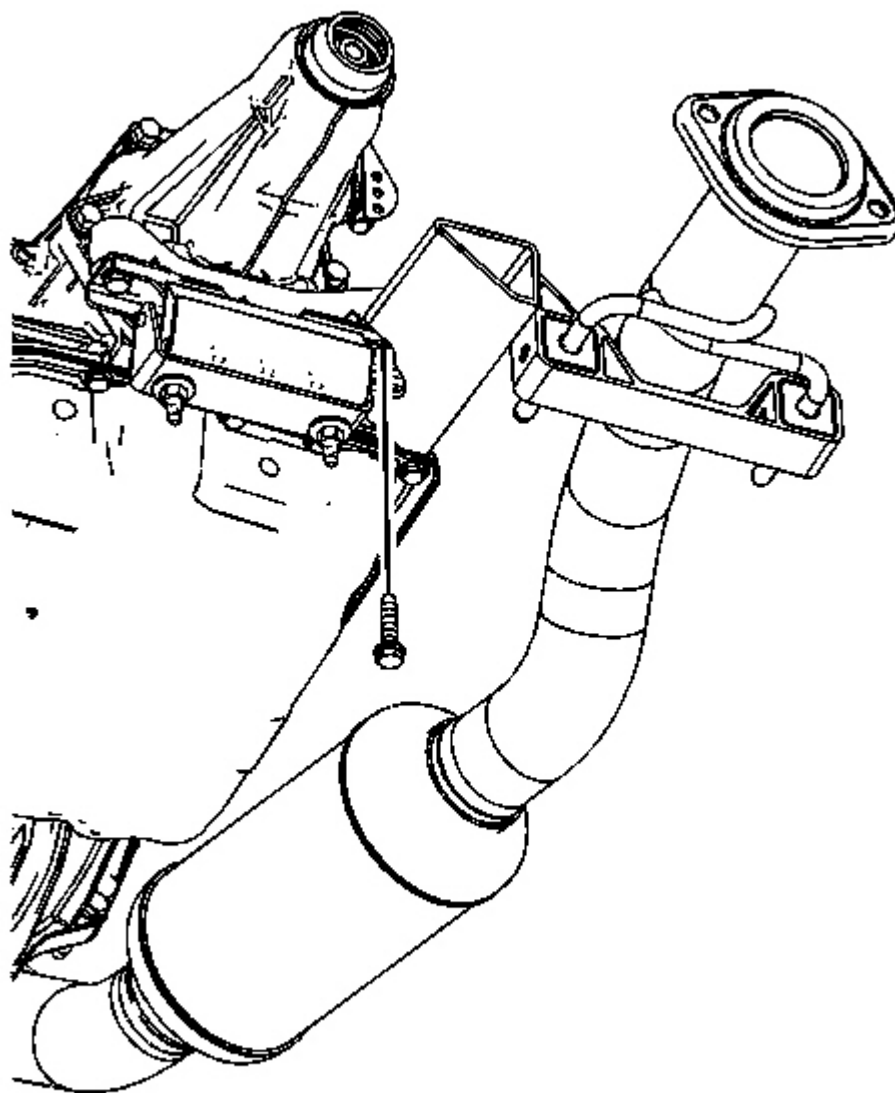


Fig. 37: View Of Exhaust Hanger-To-Transmission Mount Bolt
Courtesy of GENERAL MOTORS CORP.

6. Remove the bolt securing the exhaust hanger to the transmission mount.
7. Remove the transmission mount.
8. Remove the catalytic converter and exhaust hanger assembly from the vehicle.

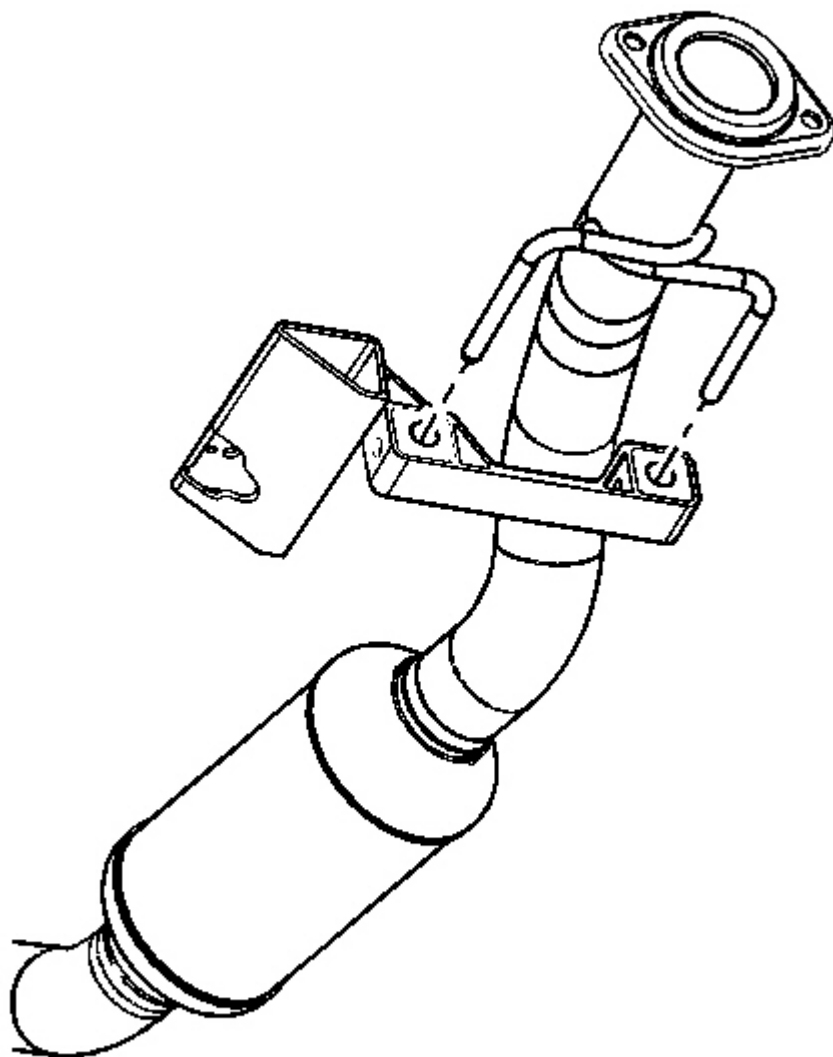


Fig. 38: View Of Exhaust Hanger
Courtesy of GENERAL MOTORS CORP.

9. Remove the exhaust hanger from the catalytic converter.

Installation Procedure

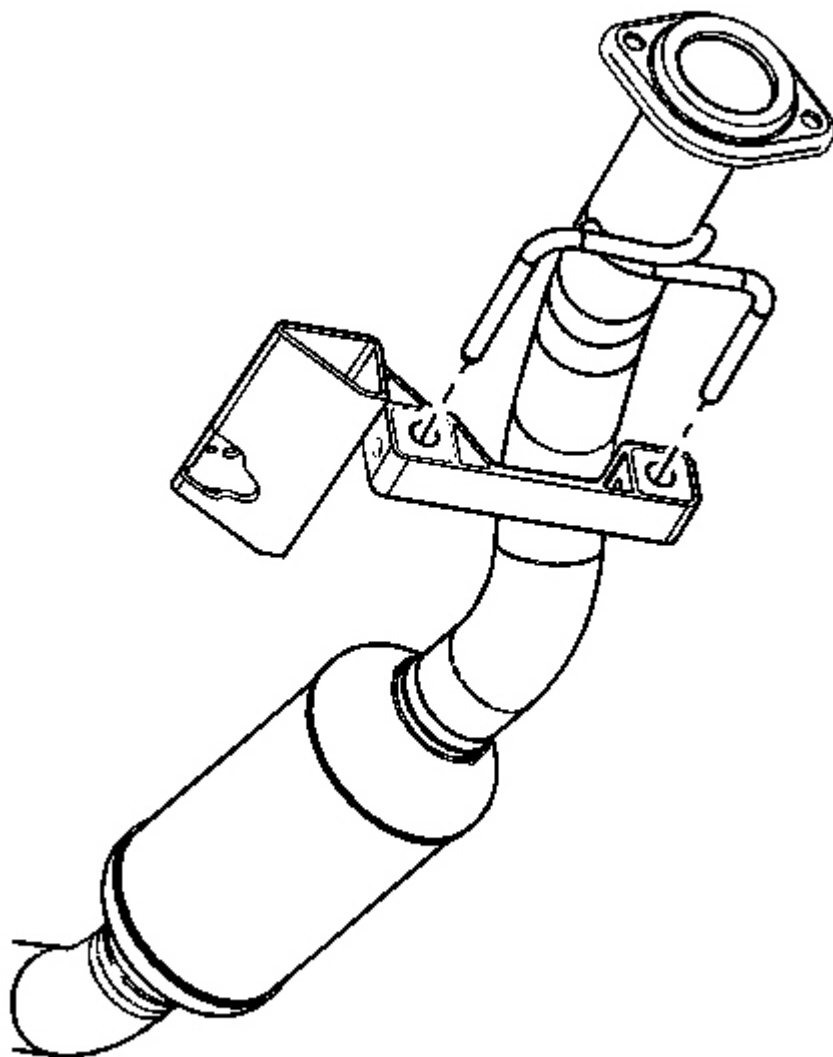


Fig. 39: View Of Exhaust Hanger
Courtesy of GENERAL MOTORS CORP.

1. Install the exhaust hanger to the catalytic converter.
2. Install the catalytic converter and exhaust hanger assembly to the vehicle.

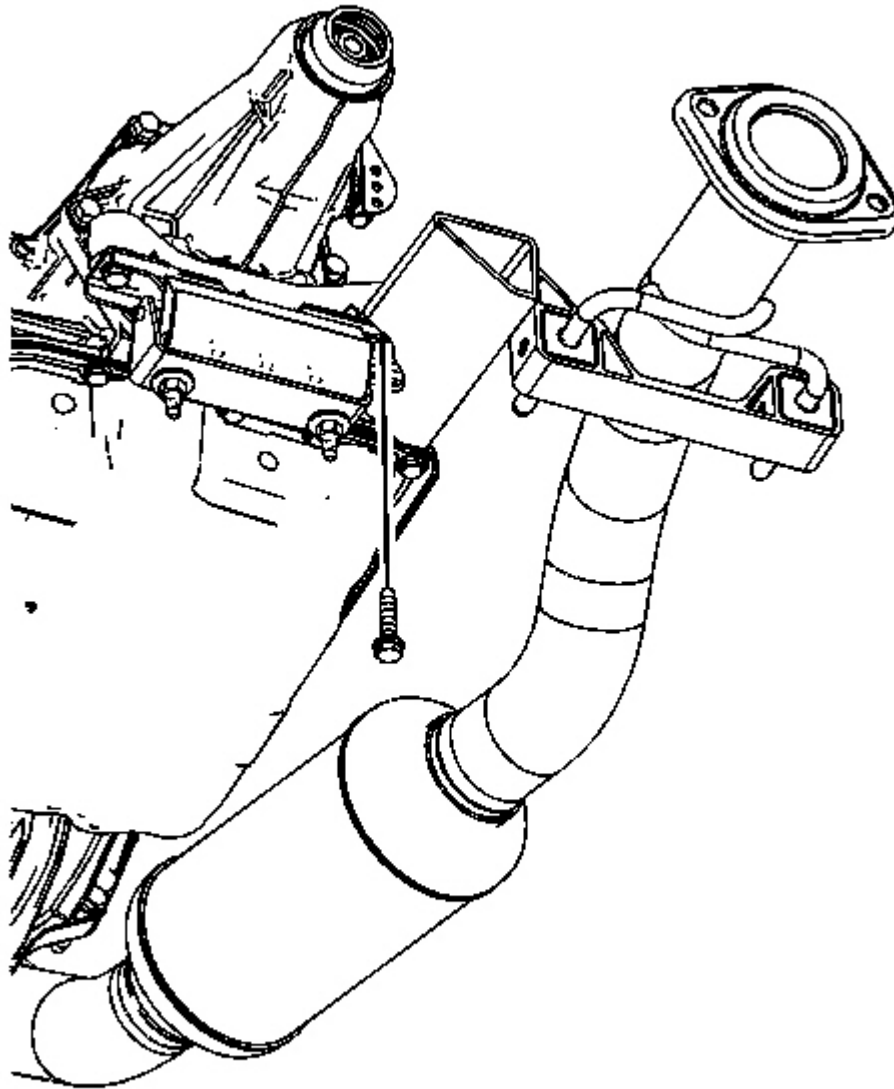


Fig. 40: View Of Exhaust Hanger-To-Transmission Mount Bolt
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

3. Install the bolt securing the catalytic converter pipe hanger to the transmission mount.

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

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4. Install the transmission mount.
5. Install the catalytic converter pipe to the exhaust manifold with a NEW exhaust seal.
6. Hand thread the nuts evenly against the exhaust flange until the pipe is secure.

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

7. Connect the H2OS electrical connector.
8. Lower the vehicle.

MUFFLER REPLACEMENT

Removal Procedure

1. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

IMPORTANT: Do not reuse any component of the exhaust system that is corroded or damaged.

IMPORTANT: When replacing the muffler in a vehicle with the LL8 engine, the resonator and tailpipe must also be ordered. The two pieces may be attached with a clamp.

2. Inspect the exhaust system components to determine if they can be reused.

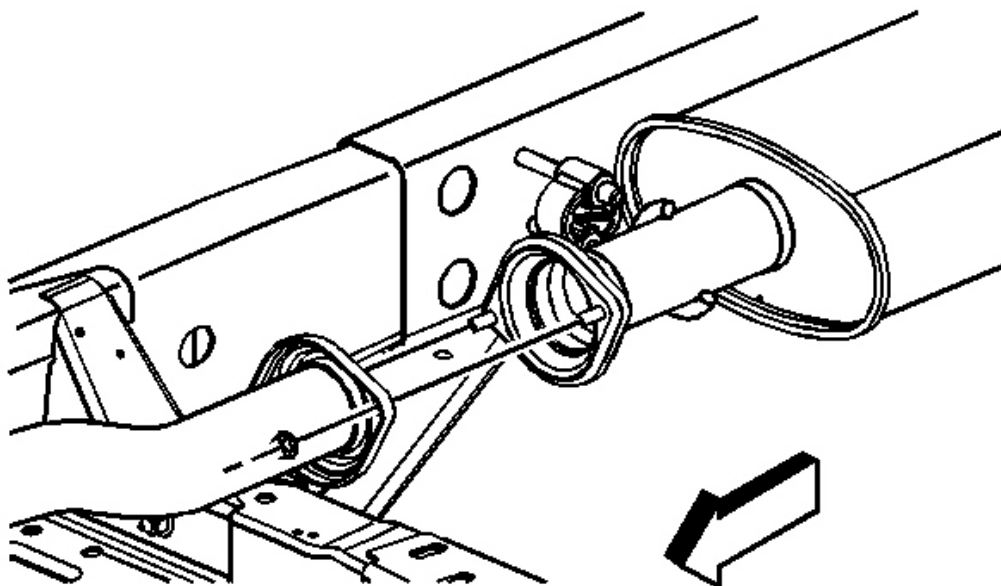


Fig. 41: Exhaust Pipe To Muffler Joint
Courtesy of GENERAL MOTORS CORP.

3. Remove the frame brace. Refer to **Frame Brace Replacement (Short Wheelbase)** or **Frame Brace Replacement (Long Wheelbase)** in Frame and Underbody.
4. Remove the nuts that secure the muffler to the catalytic converter pipe.

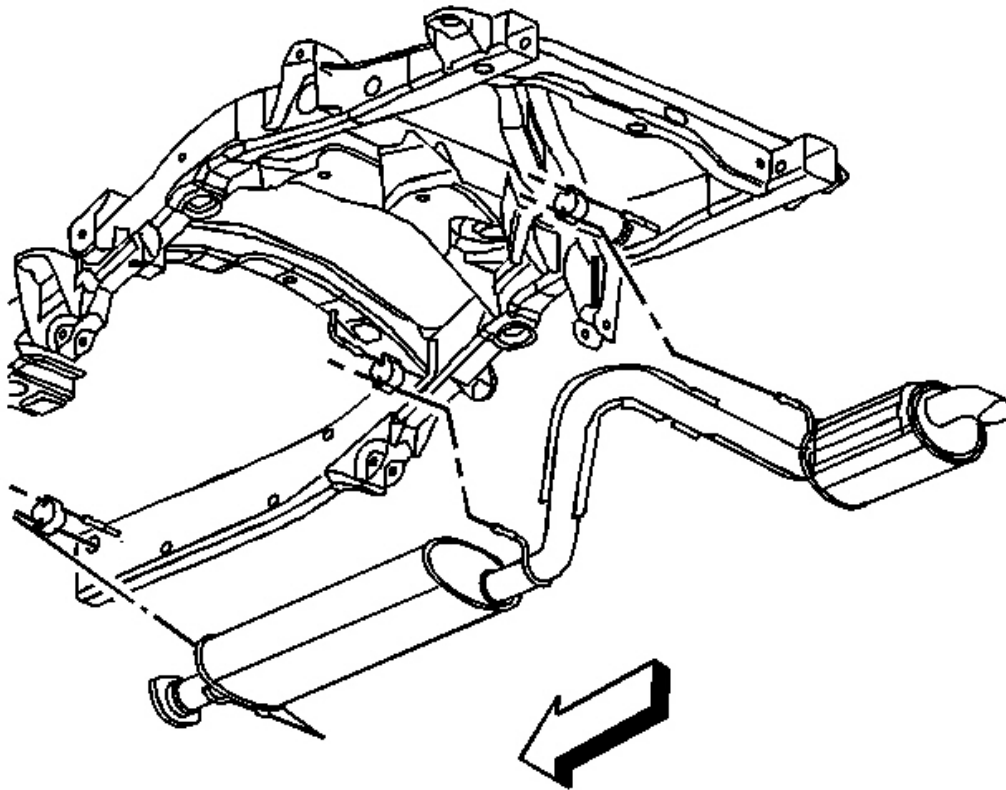


Fig. 42: Locating Exhaust Hangers

Courtesy of GENERAL MOTORS CORP.

5. Separate the muffler and the tail pipe assembly from the hanger insulators.
6. Lower the muffler and tail pipe assembly.

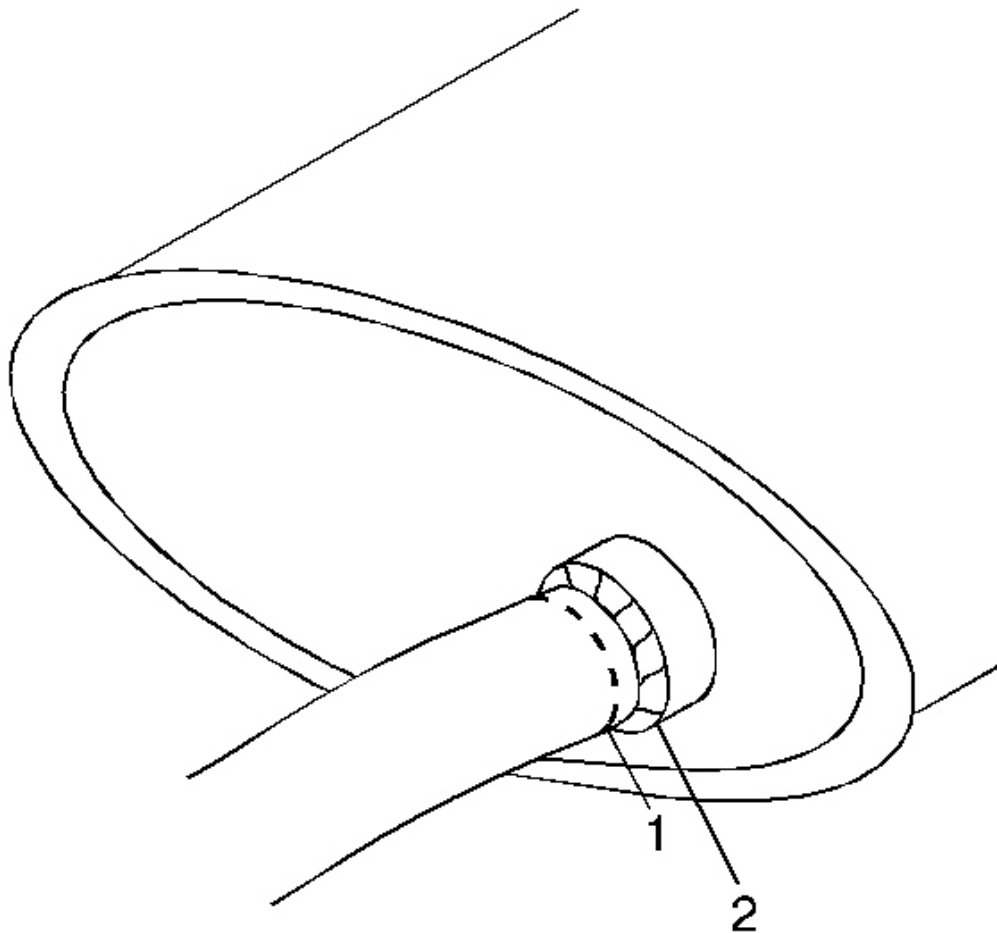


Fig. 43: Identifying Cutline On Intermediate Pipe
Courtesy of GENERAL MOTORS CORP.

7. Suitably support the exhaust system.
8. Cut the exhaust pipe at the dashed line (1).
9. Remove the muffler from the tail pipe.

Installation Procedure

1. Install the new muffler to the tail pipe.

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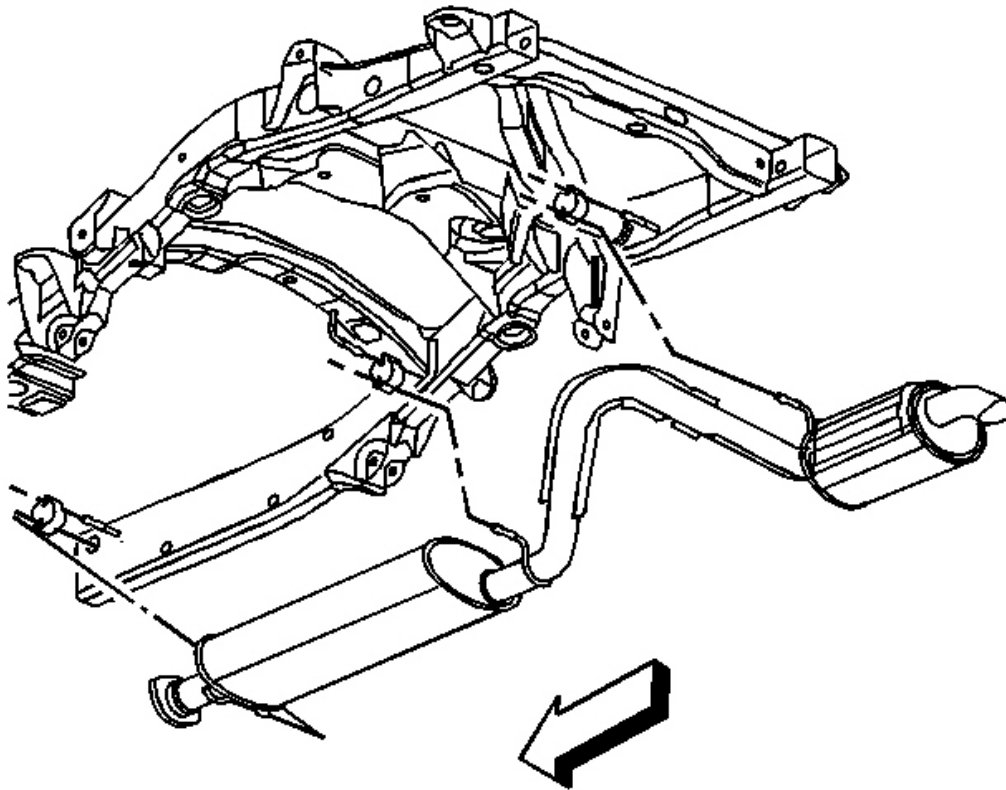


Fig. 44: Locating Exhaust Hangers

Courtesy of GENERAL MOTORS CORP.

2. Attach the muffler and tail pipe to the hanger insulators.

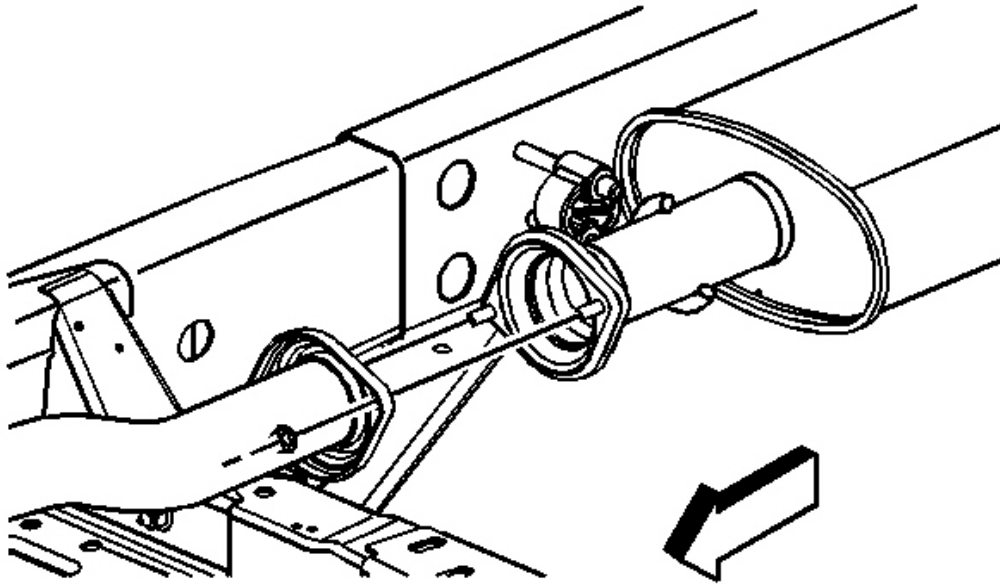


Fig. 45: Exhaust Pipe To Muffler Joint
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the muffler to the catalytic converter and secure with the nuts.

Tighten: Tighten the nuts to 45 N.m (33 lb ft).

4. Loosely install the clamp to secure the muffler to the tail pipe.
5. Align the tail pipe in the proper position.

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

6. Inspect the exhaust system for leaks and underbody contact.
7. Install the frame brace. Refer to Frame Brace Replacement (Short Wheelbase) or Frame Brace Replacement (Long Wheelbase) in Frame and Underbody.
8. Lower the vehicle.

RESONATOR REPLACEMENT

Removal Procedure

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

IMPORTANT: Do not reuse any component of the exhaust system that is corroded or damaged.

2. Inspect the exhaust system components to determine if they can be reused.

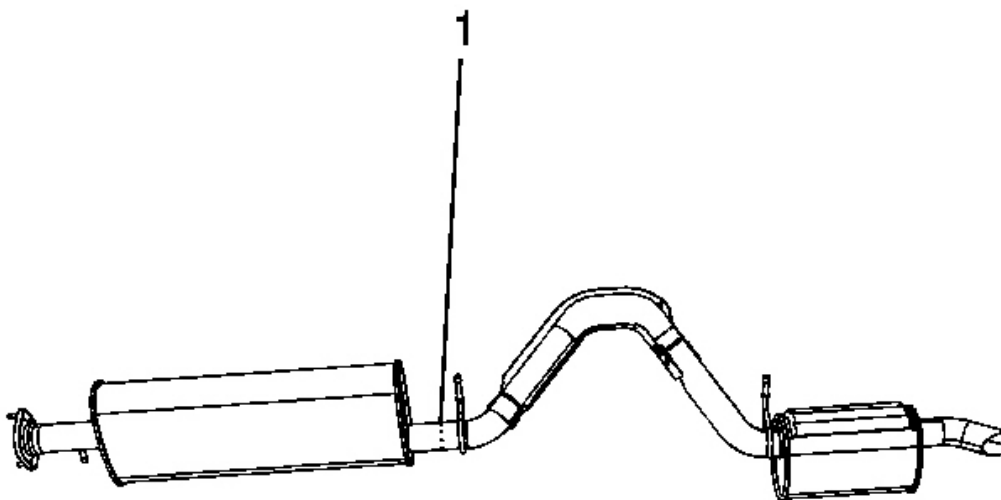


Fig. 46: Cutting Resonator Pipe
Courtesy of GENERAL MOTORS CORP.

3. Cut (1) the resonator pipe as close to the exhaust hanger as possible.
4. Separate the resonator and tailpipe assembly from the hanger insulators.
5. Remove the resonator and tailpipe assembly.

Installation Procedure

1. Install the new resonator and tailpipe assembly to the muffler.

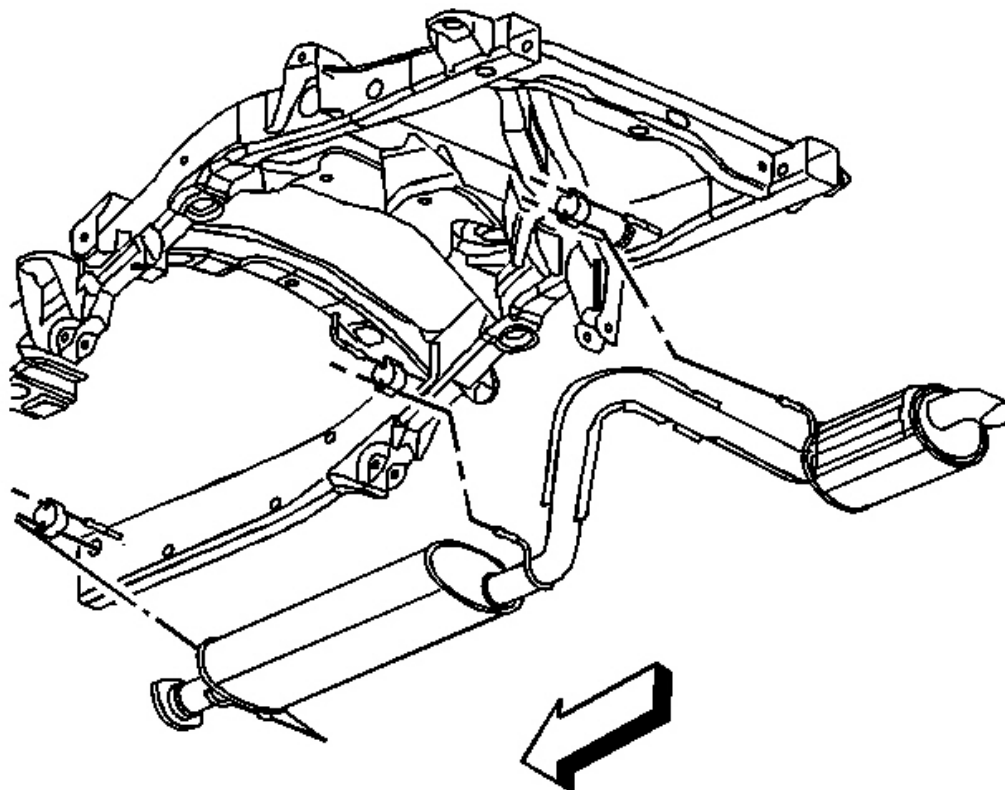


Fig. 47: Locating Exhaust Hangers
Courtesy of GENERAL MOTORS CORP.

2. Attach the resonator and tailpipe to the hanger insulators.
3. Loosely install the clamp to secure the resonator to the muffler.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Align the tailpipe in the proper position.

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

5. Inspect the exhaust system for leaks and underbody contact.
6. Lower the vehicle.

CATALYTIC CONVERTER HEAT SHIELD REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

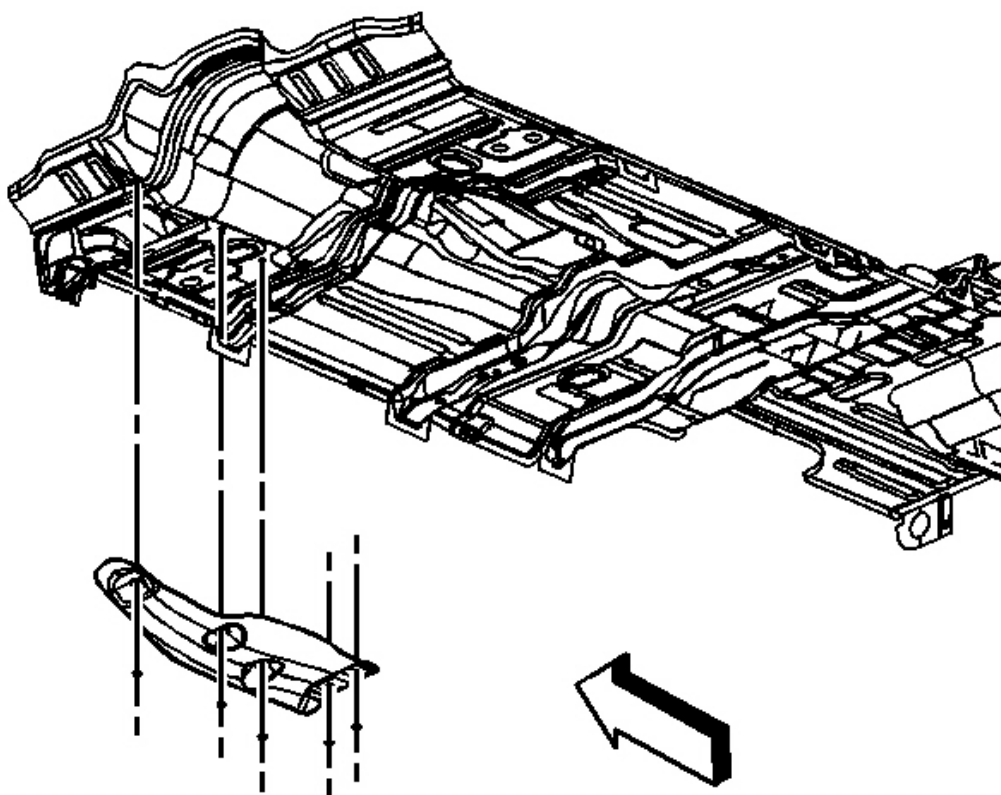


Fig. 48: View Of Catalytic Converter Heat Shield
Courtesy of GENERAL MOTORS CORP.

2. Remove the 5 bolts securing the heat shield to the floor panel studs.
3. Remove the heat shield from the vehicle.

Installation Procedure

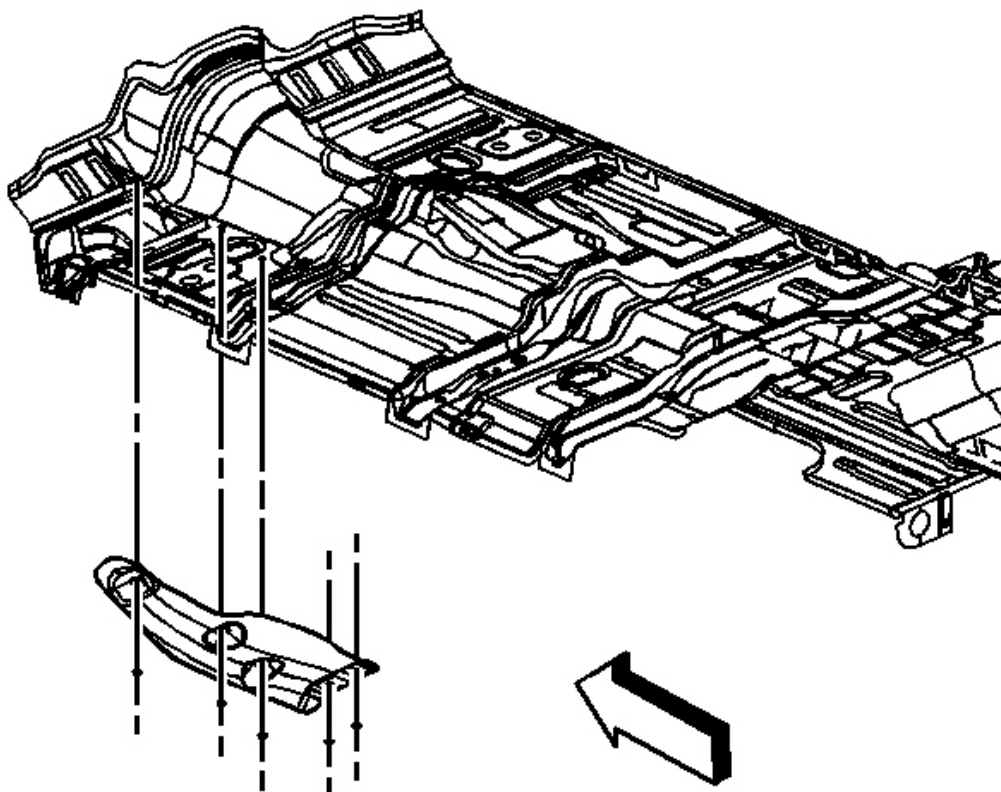


Fig. 49: View Of Catalytic Converter Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Place the catalytic converter heat shield onto the floor panel studs.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Secure the heat shield with the 5 bolts.

Tighten: Tighten the catalytic converter heat shield bolts to 7 N.m (62 lb in).

3. Lower the vehicle.

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT

Removal Procedure

1. Remove the air cleaner resonator outlet duct. Refer to **Air Cleaner Resonator Outlet Duct Replacement** in Engine Controls - 4.2L.
2. Remove the secondary air injection (AIR) solenoid valve. Refer to **Secondary Air Injection (AIR) Solenoid Valve Replacement** in Engine Controls - 4.2L.
3. Remove the oil level indicator tube. Refer to **Oil Level Indicator and Tube Replacement** .
4. Remove the oxygen sensor from the exhaust manifold. Refer to **Heated Oxygen Sensor Replacement - Position 1** in Engine Controls - 4.2L.

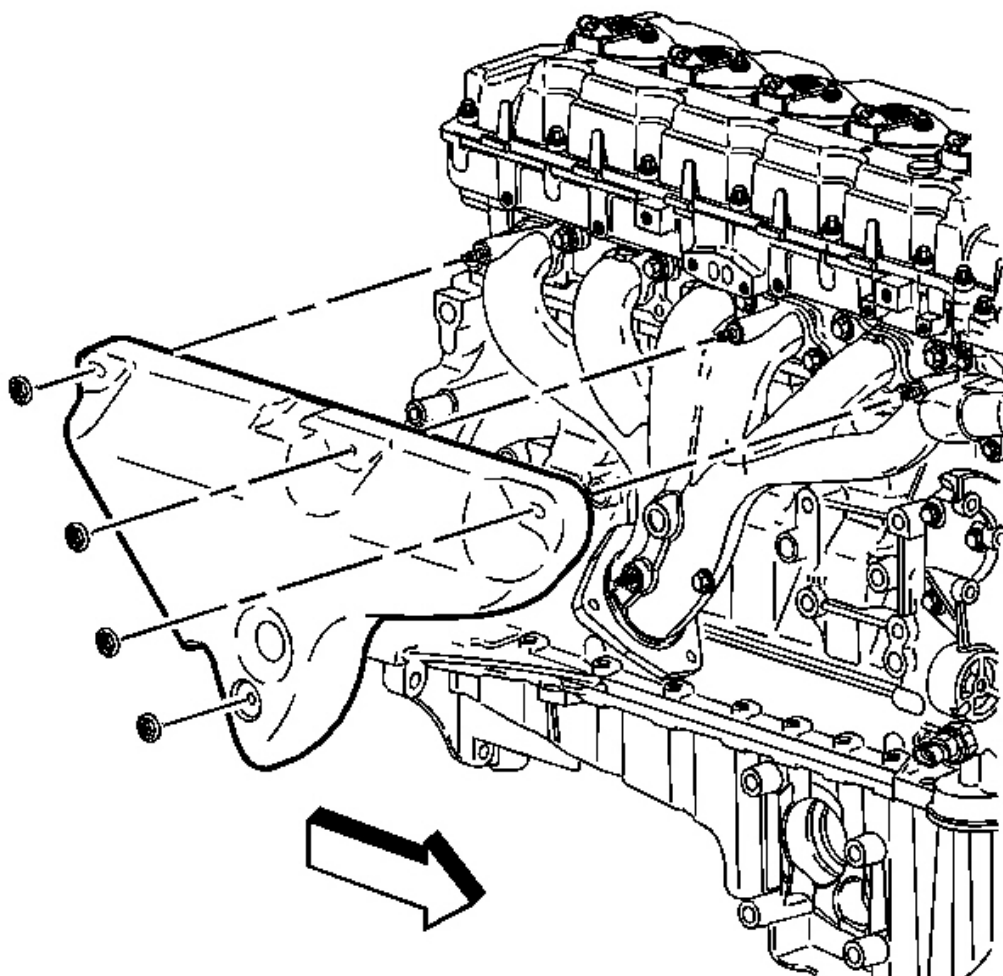


Fig. 50: View Of Exhaust Manifold Heat Shield
Courtesy of GENERAL MOTORS CORP.

5. Remove the 4 manifold heat shield nuts and remove the heat shield.

Installation Procedure

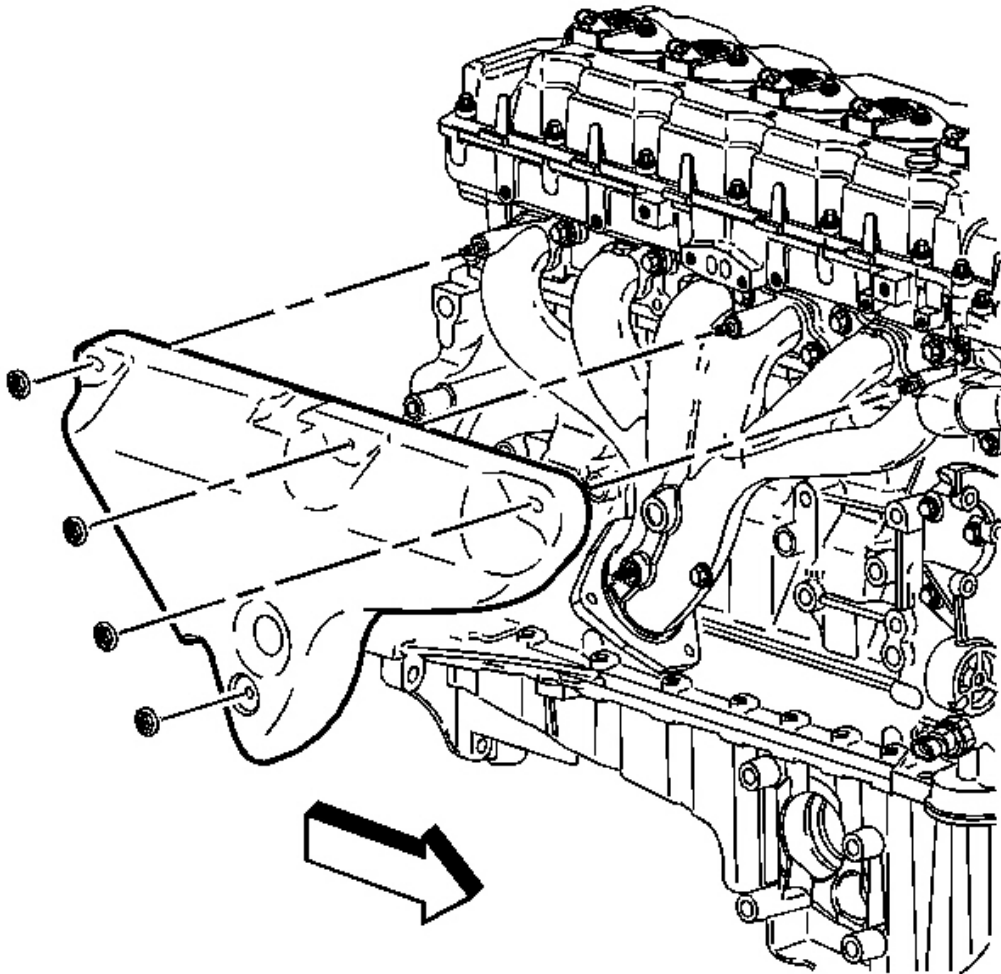


Fig. 51: View Of Exhaust Manifold Heat Shield
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the exhaust manifold heat shield with the 4 nuts.

Tighten: Tighten the exhaust manifold heat shield nuts to 10 N.m (89 lb in).

2. Install the oxygen sensor. Refer to Heated Oxygen Sensor Replacement - Position 1 in Engine Controls

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- 4.2L.

3. Install the oil level indicator. Refer to **Oil Level Indicator and Tube Replacement** .
4. Install the secondary air injection (AIR) solenoid valve. Refer to **Secondary Air Injection (AIR) Solenoid Valve Replacement** in Engine Controls - 4.2L.
5. Install the air cleaner resonator outlet duct. Refer to **Air Cleaner Resonator Outlet Duct Replacement** in Engine Controls - 4.2L.

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - RIGHT

1. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.

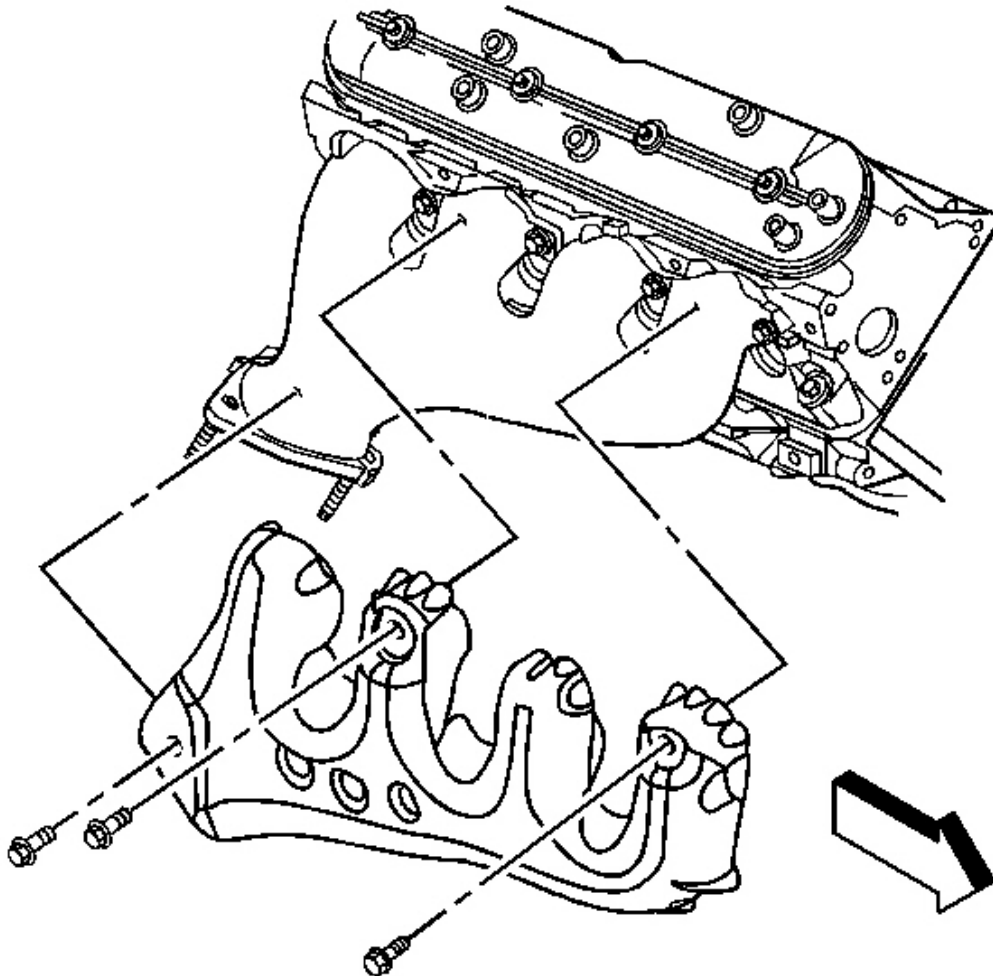


Fig. 52: View Of Right Exhaust Manifold Heat Shield
Courtesy of GENERAL MOTORS CORP.

2. Remove the heat shield bolts, and shield from the exhaust manifold.

Installation Procedure

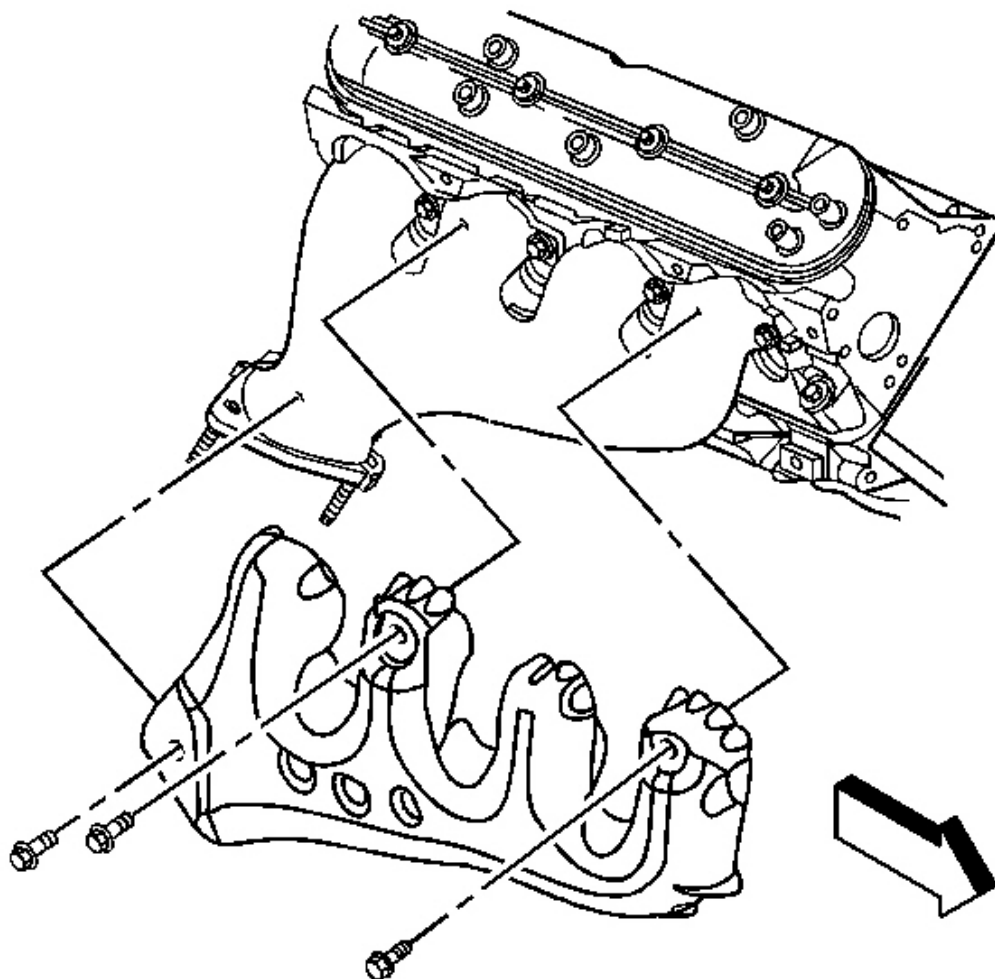


Fig. 53: View Of Right Exhaust Manifold Heat Shield
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the heat shield, and bolts to the exhaust manifold.

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

2. Install the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - LEFT

Removal Procedure

1. Remove the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.

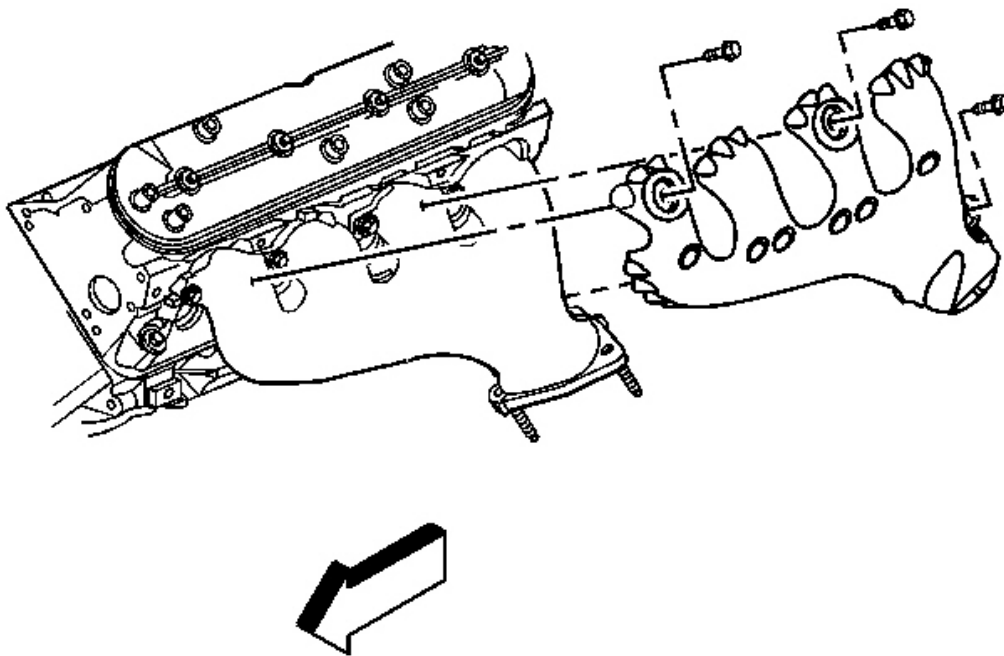


Fig. 54: View Of Left Exhaust Manifold Heat Shield
Courtesy of GENERAL MOTORS CORP.

2. Remove the heat shield bolts, and shield from the exhaust manifold.

Installation Procedure

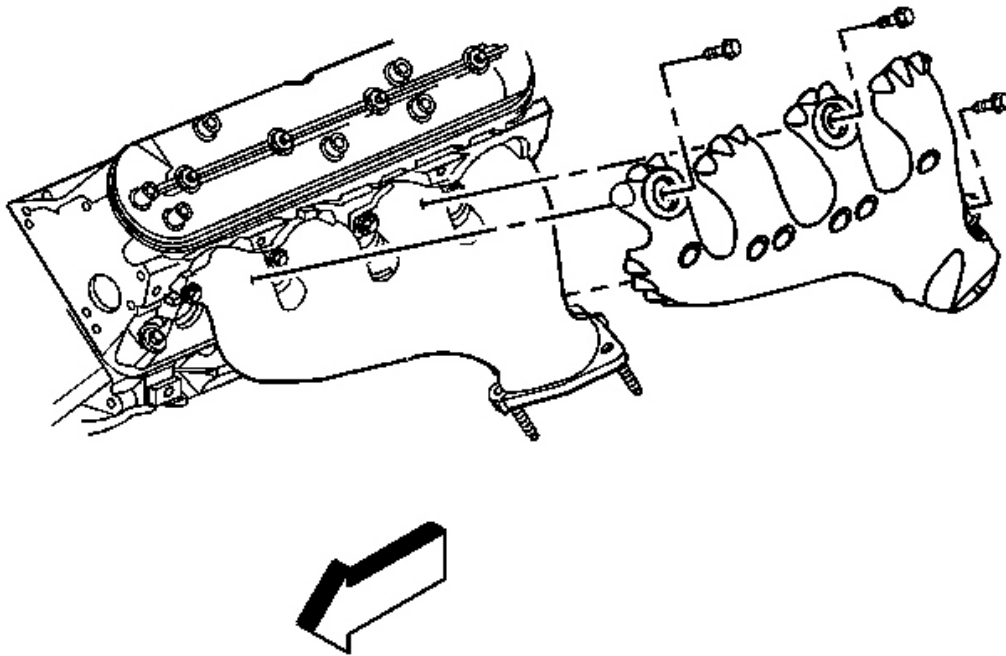


Fig. 55: View Of Left Exhaust Manifold Heat Shield
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to **Fastener Notice in Cautions and Notices.**

1. Install the heat shield, and bolts to the exhaust manifold.

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

2. Install the spark plugs. Refer to **Spark Plug Replacement** in Engine Controls - 4.8L, 5.3L, and 6.0L.

EXHAUST MUFFLER HEAT SHIELD REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

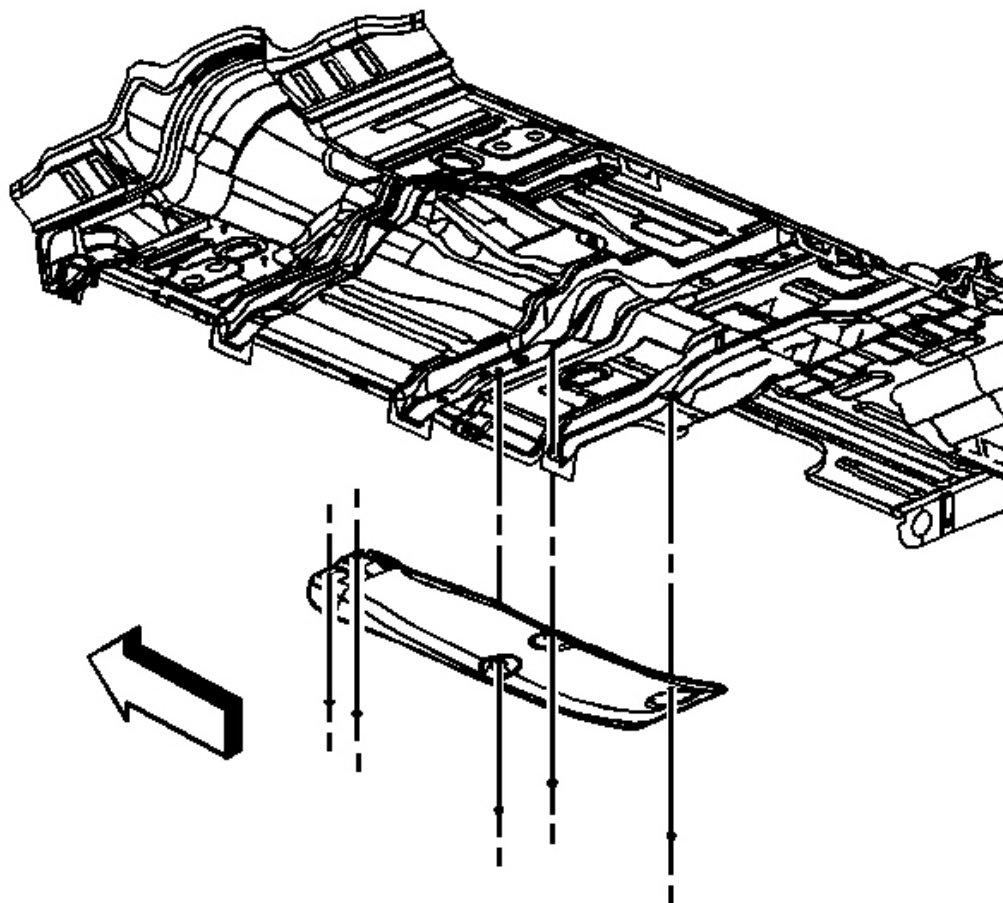


Fig. 56: View Of Exhaust Muffler Heat Shield
Courtesy of GENERAL MOTORS CORP.

2. Remove the catalytic converter heat shield rear 2 bolts where the catalytic converter heat shield connects to the muffler heat shield.
3. Remove the remaining exhaust muffler heat shield bolts and remove the heat shield from the floor panel studs.

Installation Procedure

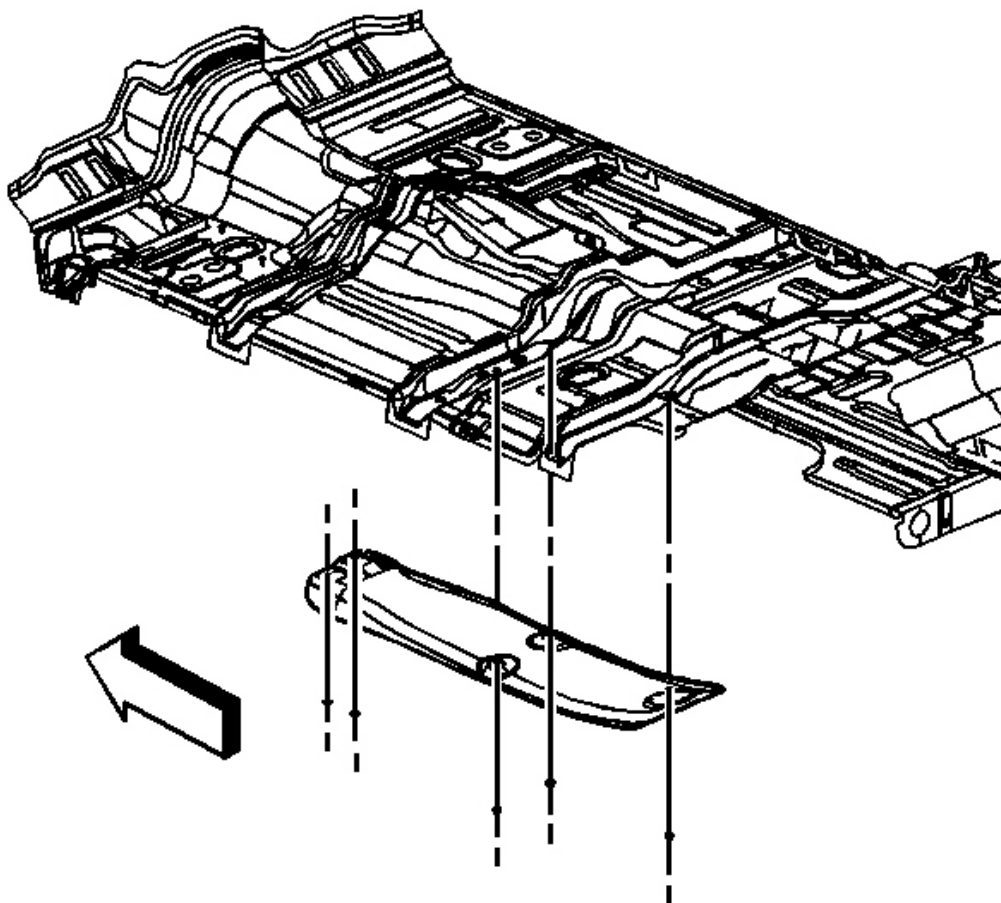


Fig. 57: View Of Exhaust Muffler Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Install the muffler heat shield to the floor panel studs placing the muffler heat shield under the rear part of the converter heat shield.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Secure the muffler heat shield with 5 bolts.

Tighten: Tighten the exhaust muffler heat shield bolts to 7 N.m (62 lb in).

3. Lower the vehicle.

DESCRIPTION AND OPERATION

EXHAUST SYSTEM DESCRIPTION

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

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

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

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

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

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

The exhaust system may be comprised of the following components:

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

Resonator

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

Catalytic Converter

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

The catalytic converter is comprised of a ceramic monolith substrate, supported in insulation and housed within

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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.

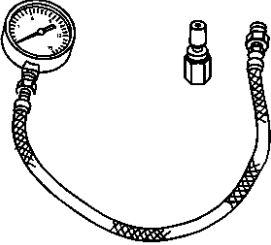
Muffler

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
	<p>J 35314-A Exhaust Back Pressure Gage</p>