

2017 ENGINE**Exhaust - CT6****SPECIFICATIONS****FASTENER SPECIFICATIONS****Single Use Non-Threaded Fasteners/Components**

NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>	
Application	
Catalytic Converter Gasket	
Catalytic Converter Seal	
Exhaust Manifold Gasket	
Exhaust Muffler Gasket	

Single Use Threaded Fastener/Component Tightening Specifications

NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>	
Application	Specification
	Metric (English)
Exhaust Manifold Fasteners (LTG)	
• First Pass:	20 N.m (15 lb ft)
• Second Pass:	20 N.m (15 lb ft)
• Final Pass:	20 N.m (15 lb ft)

Reusable Threaded Fastener Tightening Specifications

NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Application	Specification
	Metric (English)
Catalytic Converter Brace Bracket Bolt (LGW, LTG)	22 N.m (16 lb ft)
Catalytic Converter Brace Bracket Nut (LGW, LGX)	22 N.m (16 lb ft)
Catalytic Converter to Cylinder Head Nut (LGW, LGX)	50 N.m (37 lb ft)
Catalytic Converter to Turbocharger Nut (LTG)	50 N.m (37 lb ft)
Exhaust Manifold Brace Fastener (LTG)	25 N.m (18 lb ft)
Exhaust Manifold Heat Shield Bolt (LTG)	10 N.m (89 lb in)
Exhaust Muffler to Catalytic Converter Nut (LGW, LGX, LTG)	50 N.m (37 lb ft)
Exhaust Pipe Clamp Nut (LGW, LGX)	50 N.m (37 lb ft)
Exhaust Rear Muffler Rear Hanger Bolt	22 N.m (16 lb ft)

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Floor Panel Number 2 Cross Bar Reinforcement Bolt (LGW, LGX, LTG)	22 N.m (16 lb ft)
Floor Panel Number 4 Bar Fastener (LGW, LGX, LTG)	22 N.m (16 lb ft)
Front Body Exhaust Heat Shield Bolt	9 N.m (80 lb in)
Front Body Exhaust Heat Shield Retainers	1.75 N.m (15 lb in)
Intermediate Body Exhaust Heat Shield Fasteners	1.75 N.m (15 lb in)
Turbocharger Heat Shield Bolt (LGW)	10 N.m (89 lb in)

ADHESIVES, FLUIDS, LUBRICANTS AND SEALERS

Application	Type of Material	GM Part Number
Anti-Seize	Lubricant	Refer to Electronics Parts Catalog

DIAGNOSTIC INFORMATION AND PROCEDURES

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.
- 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, hum noise

Refer to [Exhaust Noise](#)

RESTRICTED EXHAUST

Diagnostic Aids

WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

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.

NOTE: This will not apply if the dual exhaust is equipped with an "H" pipe or similar configuration in which the exhaust flow would be equalized.

Test Description

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

4

The exhaust system has very low back pressure under normal conditions. If the exhaust system is restricted, a significant increase in the exhaust pressure is noticed on the **J-35314-A** Exhaust Back Pressure Gauge.

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

5

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

8

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

Step	Action	Value(s)	Yes	No
1	Did you verify the customers complaint?	-	Go to Step 2	-

Step	Action	Value(s)	Yes	No
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 4
4	1. Remove the secondary air injection (AIR) check valve or the heated oxygen sensor (HO2S) that is in front of and closest to the catalytic converter. Refer to the affected component's service procedure. 2. Install the J-35314-A Exhaust Back Pressure Gauge in place of the AIR check valve or HO2S sensor. 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 gauge. Does the reading exceed the specified value?	14 kPa (2 psi)	Go to Step 5	Go to Step 8

Step	Action	Value(s)	Yes	No
5	1. Turn the engine off and place the ignition in the lock position. 2. Remove the J-35314-A Exhaust Back Pressure Gauge. 3. Re-install the AIR check valve/HO2S sensor. Refer to the affected component's service procedure. 4. Remove the post-catalyst HO2S sensor. Refer to the affected component's service procedure. 5. Install the J-35314-A Exhaust Back Pressure Gauge in place of the post HO2S sensor. 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 gauge. Does the reading exceed the specified value?	14 kPa (2 psi)	Go to Step 6	Go to Step 7
6	Inspect the exhaust system for the following conditions: • Damage in the exhaust pipe • Debris in the exhaust pipe • Muffler or resonator internal failure • Two-layer exhaust pipe separation Did you find and correct the condition?	-	Go to Step 8	-
7	Replace the catalytic converter. Refer to the affected component's service procedure. Did you find and correct the condition?	-	Go to Step 8	-

Step	Action	Value(s)	Yes	No
8	1. Remove the J-35314-A Exhaust Back Pressure Gauge. 2. Reinstall the AIR check valve or the post-catalyst HO2S sensor. Refer to the affected component's service procedure 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

Problem	Action
WARNING: 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 exhaust system components to the specifications. Refer to Fastener 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 Specifications .
Seals or gaskets leaking • Exhaust manifold to cylinder head • Exhaust pipes to exhaust manifold • Catalytic converter connection • EGR connections • AIR connections to the exhaust manifold or cylinder head	Replace the leaking seal or gasket. Refer to the affected components procedure for service.
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 the affected component's procedure for service.

Problem	Action
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 the affected component's procedure for service.

EXHAUST NOISE

Condition	Action
WARNING: 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 Exhaust Leakage .
Loud exhaust	1. Compare to a known good vehicle. 2. Inspect for a damaged or failed muffler. 3. Repair or replace the affected component. Refer to the affected component's service procedure.
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. Repair or replace the affected component. Refer to the affected component's service procedure.

REPAIR INSTRUCTIONS

EXHAUST MANIFOLD REPLACEMENT (LTG)

Removal Procedure

WARNING: Refer to [Exhaust Service Warning](#) .

WARNING: Refer to [Eye Protection Warning](#) .

1. Remove the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement \(Upper, LTG\)](#).
2. Remove the turbocharger. Refer to [Turbocharger Replacement](#) .
3. Remove the exhaust manifold brace. Refer to [Exhaust Manifold Brace Replacement \(LTG\)](#).
4. Remove the exhaust manifold fasteners (1) and discard.

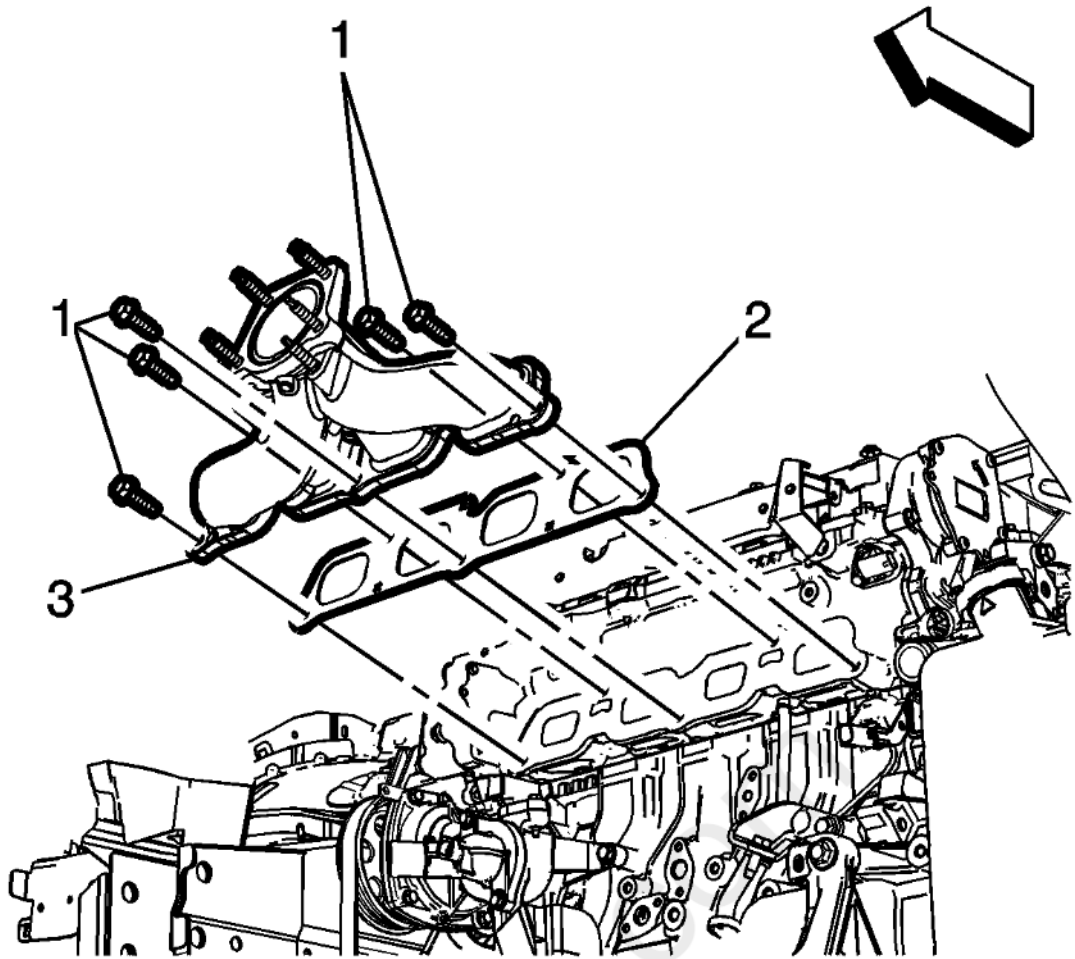


Fig. 1: Exhaust Manifold

Courtesy of GENERAL MOTORS COMPANY

5. Remove the exhaust manifold (3) and discard the exhaust manifold gasket (2).

Installation Procedure

1. Clean all mating surfaces.
2. Install the exhaust manifold (3) to the cylinder head with a NEW gasket (2).

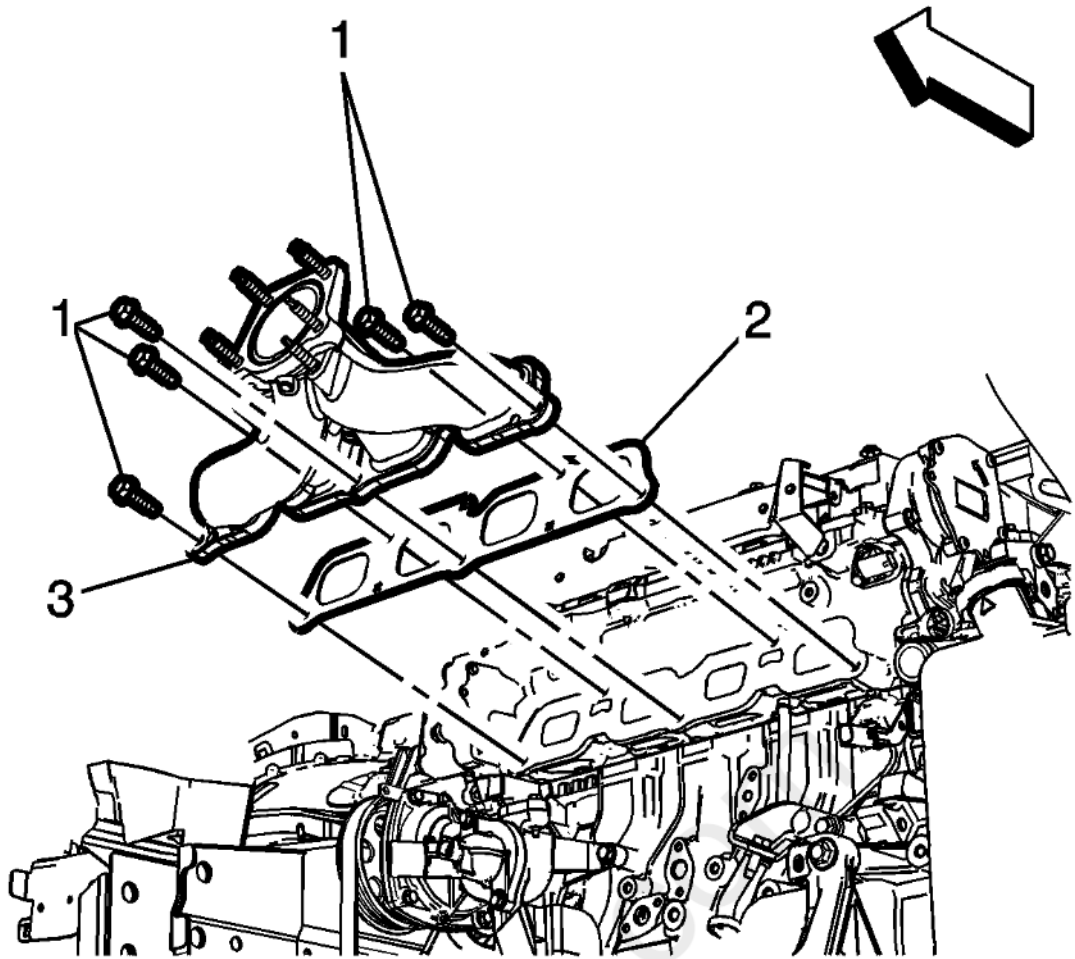


Fig. 2: Exhaust Manifold

Courtesy of GENERAL MOTORS COMPANY

3. Install NEW fasteners (1) and hand tighten.

NOTE: Fasteners have adhesive patch and must be tightened to final torque within 5 minutes.

4. Tighten the exhaust manifold fasteners in 3 passes in the sequence shown to 20 N.m (15 lb ft).

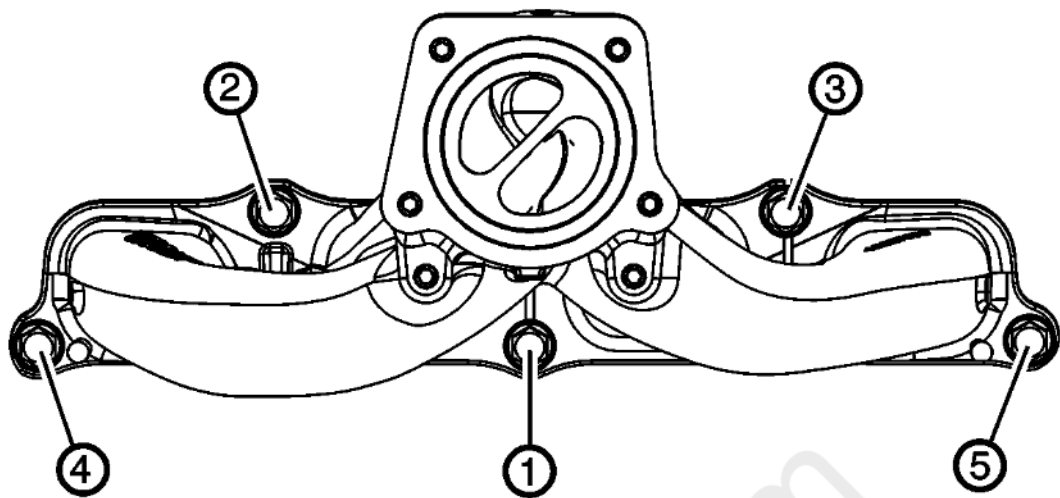


Fig. 3: Exhaust Manifold Bolt Tightening Sequence

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

5. Install the exhaust manifold brace. Refer to [Exhaust Manifold Brace Replacement \(LTG\)](#).
6. Install the turbocharger. Refer to [Turbocharger Replacement](#) .
7. Install the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement \(Upper, LTG\)](#).

EXHAUST MANIFOLD BRACE REPLACEMENT (LTG)

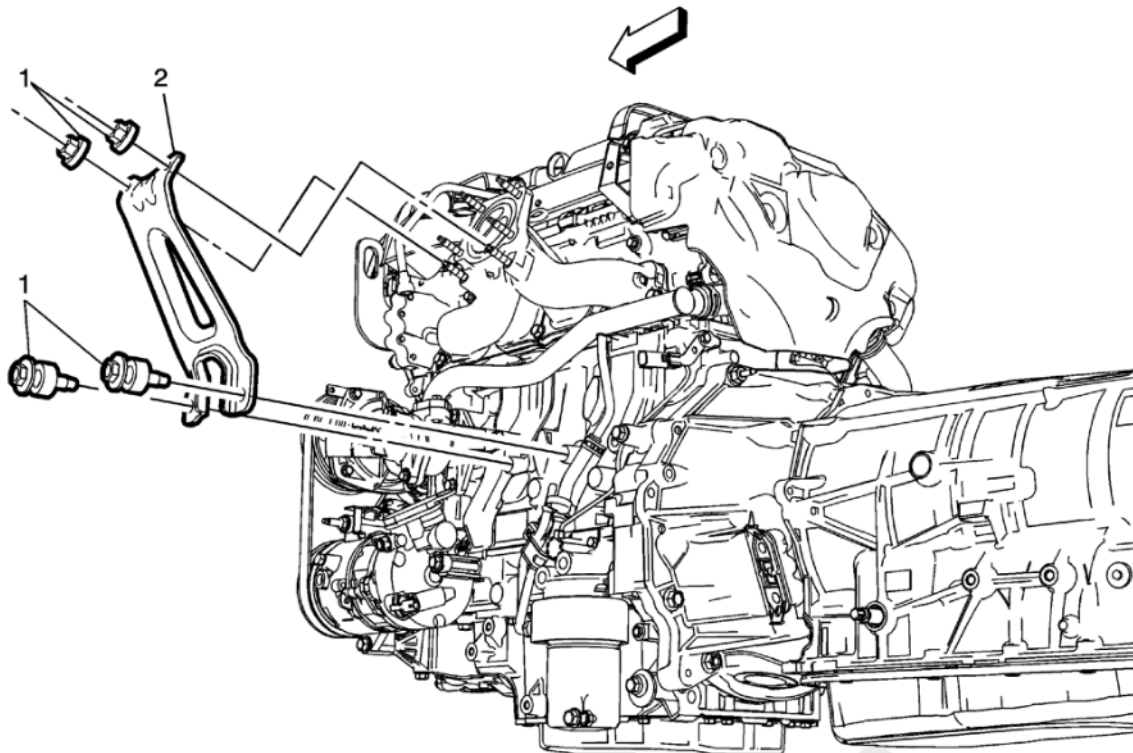


Fig. 4: Exhaust Manifold Brace (LTG)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Hot Exhaust System Warning .	
Preliminary Procedure Remove the turbocharger. Refer to Turbocharger Replacement .	
1	Exhaust Manifold Brace Fasteners (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 25 N.m (18 lb ft)
2	Exhaust Manifold Brace

WARM UP THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LEFT, LGW)

Removal Procedure

WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

WARNING: Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid personal injury.

1. Drivetrain and Front Suspension Cradle Plate» Remove - [Drivetrain and Front Suspension Cradle Plate Replacement](#)

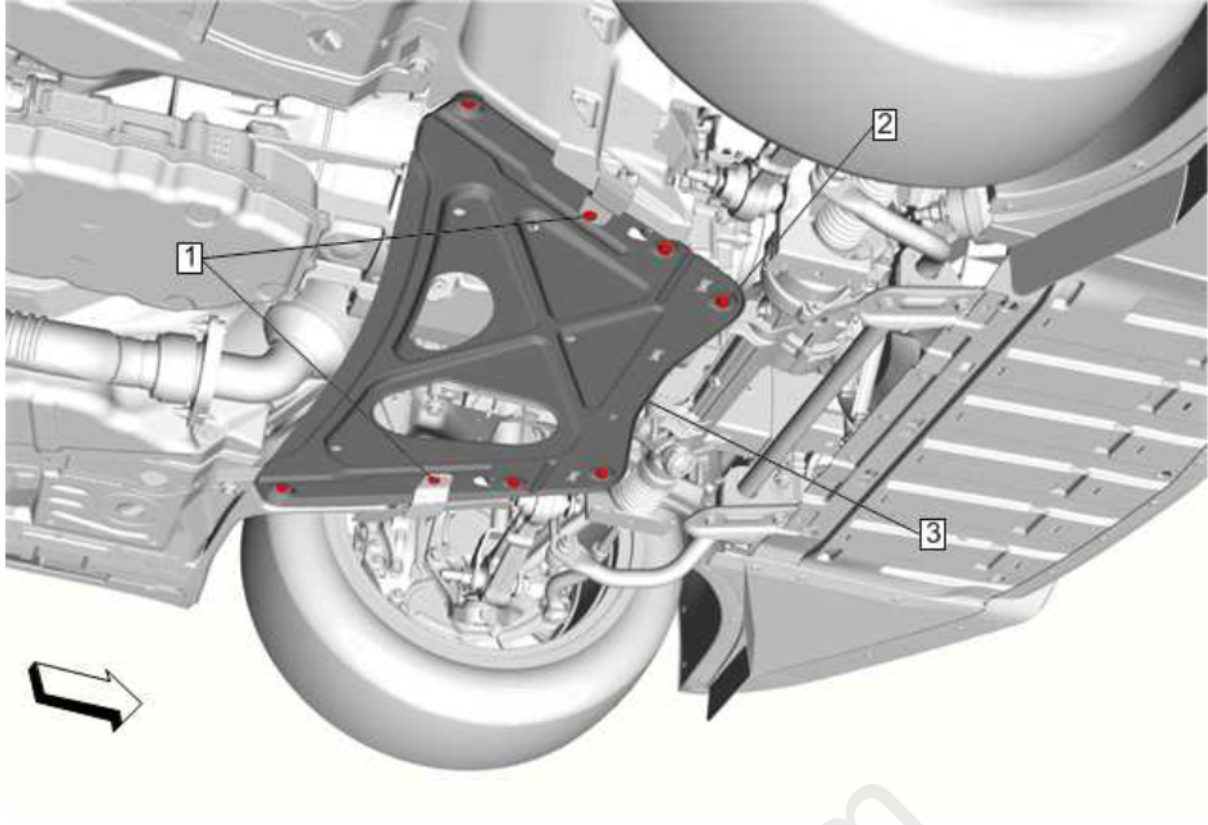


Fig. 5: Drivetrain and Front Suspension Cradle Plate

Courtesy of GENERAL MOTORS COMPANY

2. Exhaust Muffler (3) » Remove - **Exhaust Muffler Replacement (LGW, LGX)**

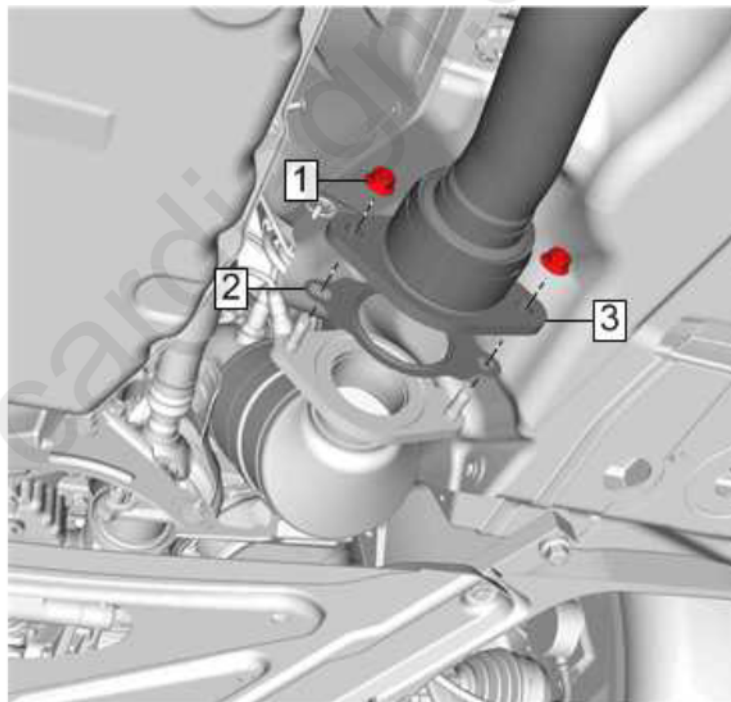


Fig. 6: Exhaust Muffler

Courtesy of GENERAL MOTORS COMPANY

3. Catalytic Converter Brace Bracket (2) » Remove - **Catalytic Converter Brace Bracket Replacement (LGW, LGX)**

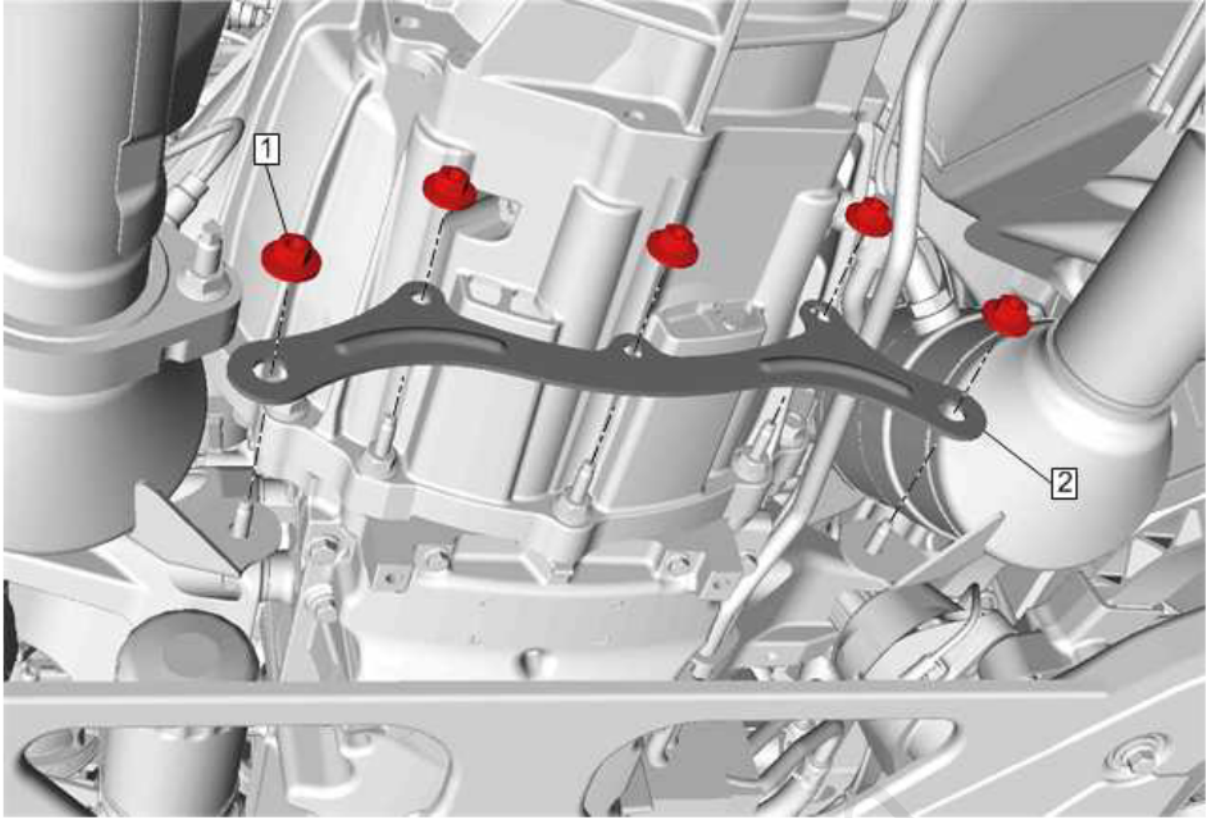


Fig. 7: Catalytic Converter Brace Bracket
 Courtesy of GENERAL MOTORS COMPANY

4. Front Body Exhaust Heat Shield - Left (3) » Remove - **Front Body Exhaust Heat Shield Replacement (Right Side, LGW, LGX)** **Front Body Exhaust Heat Shield Replacement (Left Side, LGW, LGX)**

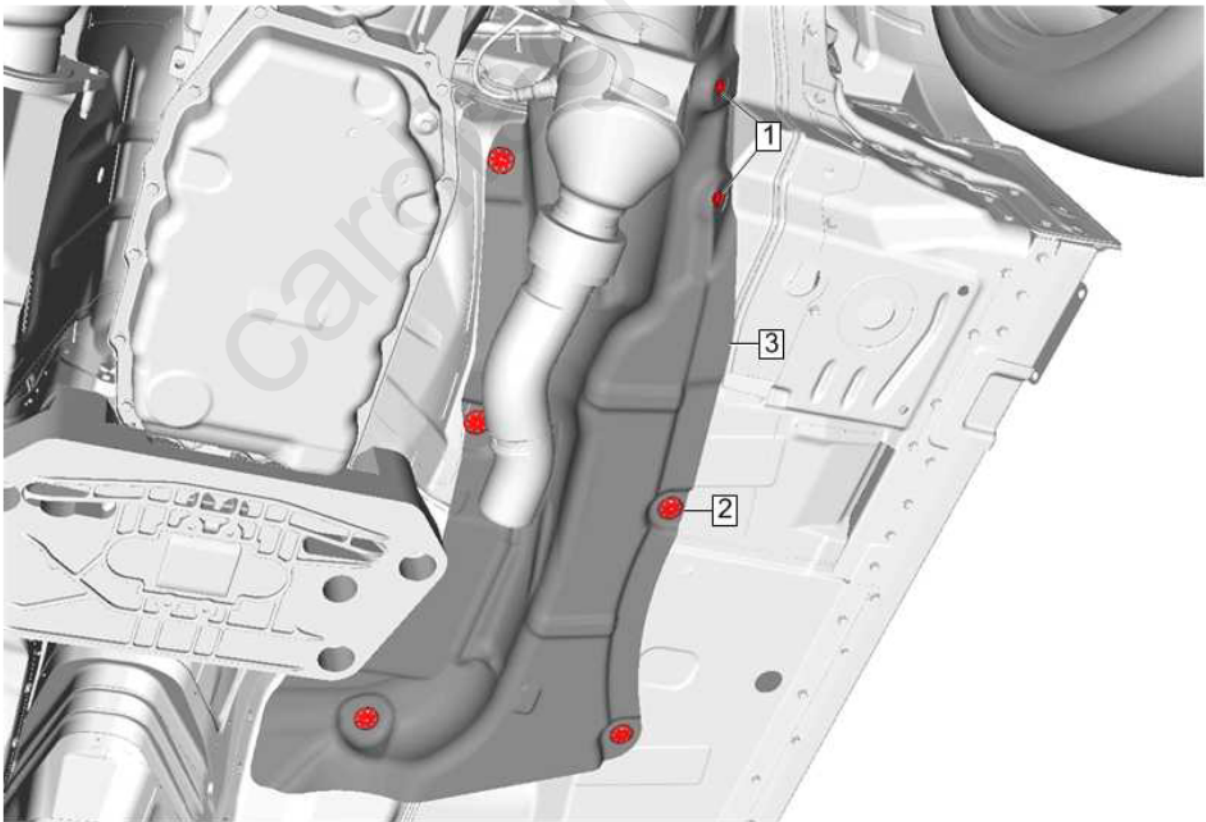


Fig. 8: Front Body Exhaust Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

5. Catalytic Converter Nut (1) » Remove [3x]

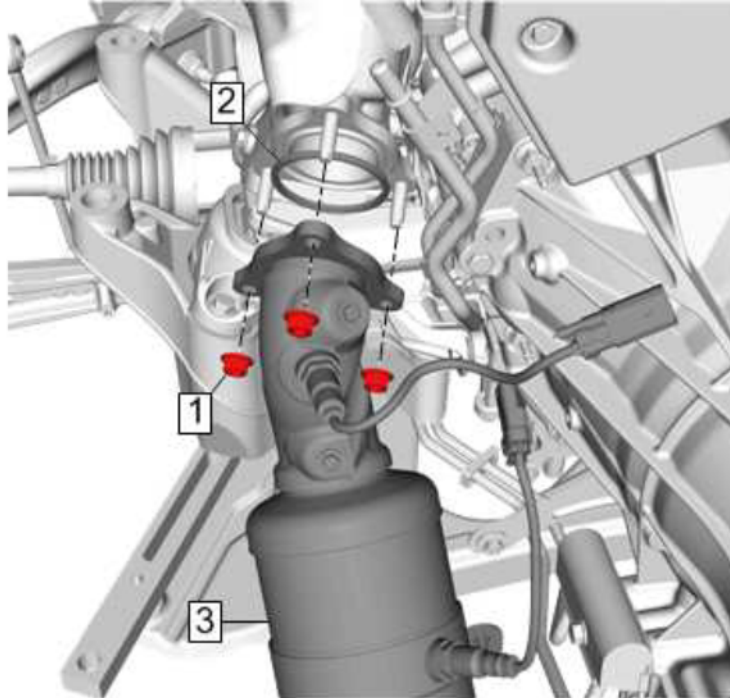


Fig. 9: Catalytic Converter Nut And Converter
 Courtesy of GENERAL MOTORS COMPANY

6. Catalytic Converter (3)» Remove
7. Heated Oxygen Sensor Electrical Connector (1)» Disconnect [2x]

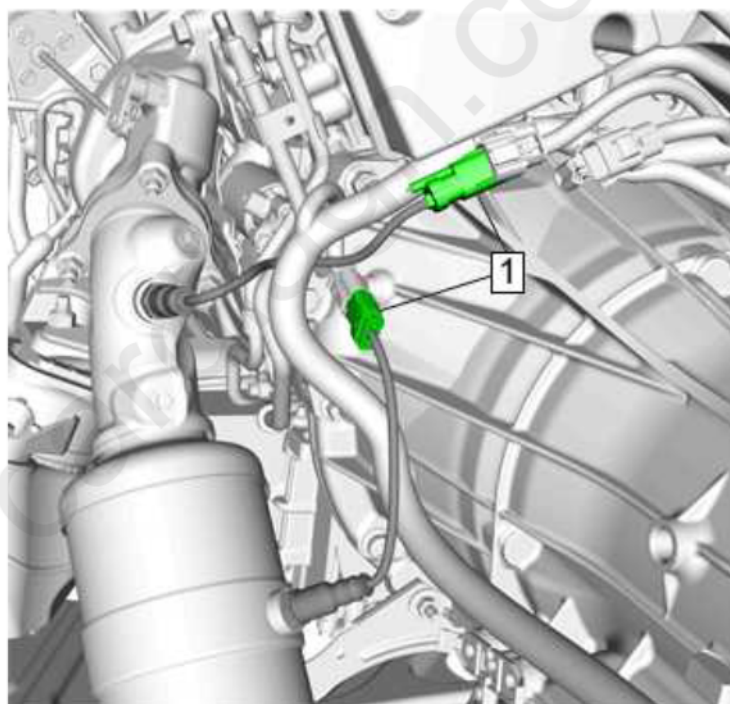


Fig. 10: Heated Oxygen Sensor Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

NOTE: To access the heated oxygen sensor electrical connectors, this step must be preformed while lowering the catalytic convert from the vehicle.

8. Catalytic Converter Gasket (2)» Remove and DISCARD

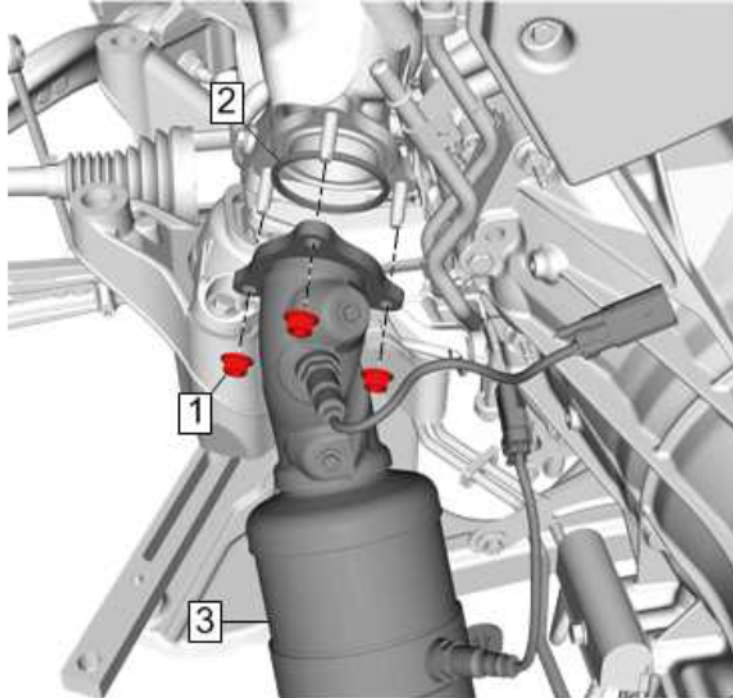


Fig. 11: Catalytic Converter Nut And Converter
 Courtesy of GENERAL MOTORS COMPANY

Installation Procedure

1. Catalytic Converter Gasket (2)» Install

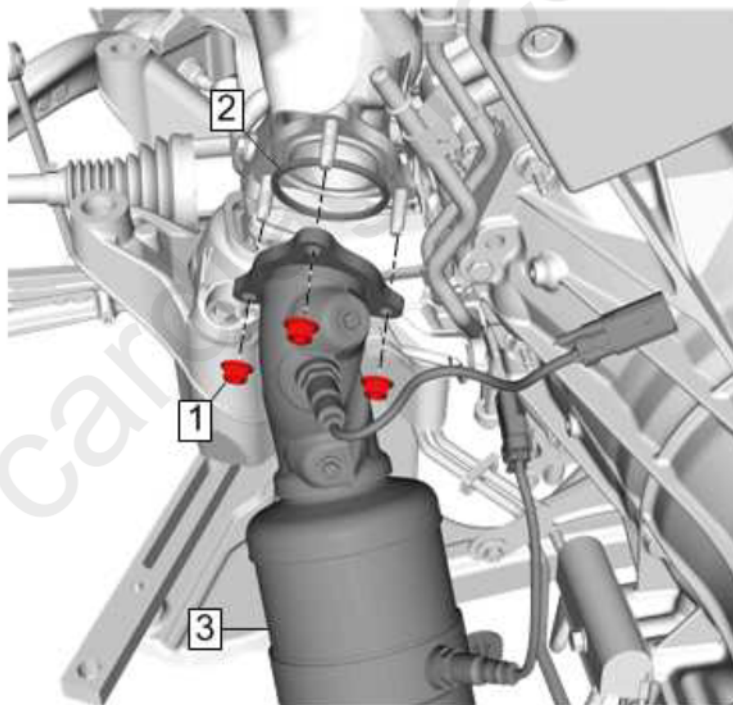


Fig. 12: Catalytic Converter Nut And Converter
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW catalytic converter gasket.

2. Heated Oxygen Sensor Electrical Connector (1)» Connect [2x]

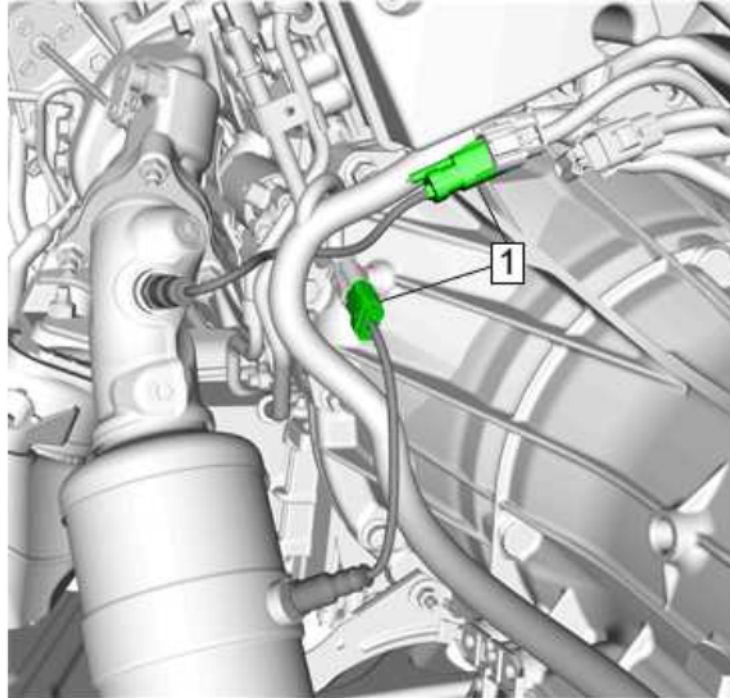


Fig. 13: Heated Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

NOTE: To access the heated oxygen sensor electrical connectors, this step must be performed while raising the catalytic converter to the vehicle.

3. Catalytic Converter (3) » Install

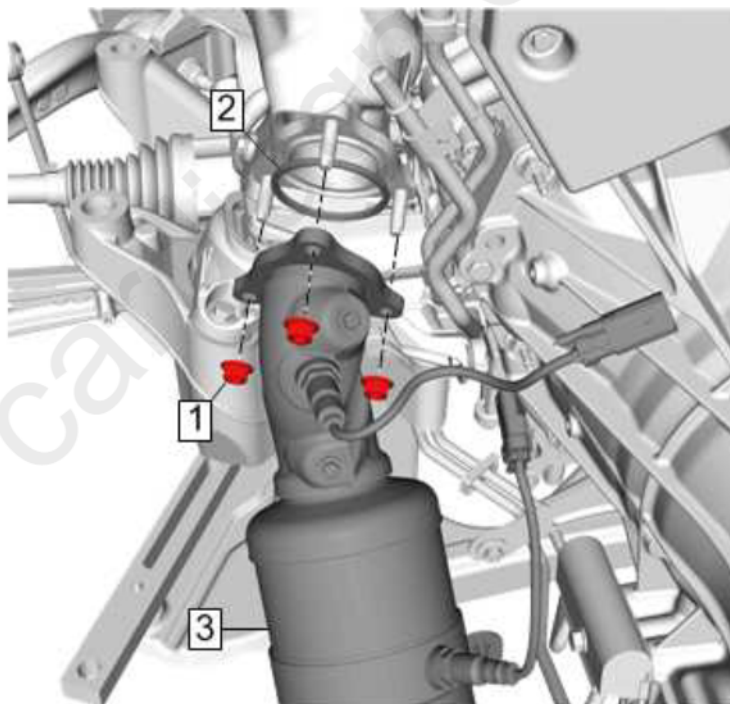


Fig. 14: Catalytic Converter Nut And Converter
Courtesy of GENERAL MOTORS COMPANY

4. Catalytic Converter Nut (1) » Install and tighten [3x] 50 N.m (37 lb ft)

CAUTION: Refer to **Fastener Caution** .

5. Front Body Exhaust Heat Shield - Left (3) » Install - **Front Body Exhaust Heat Shield Replacement (Right Side, LGW, LGX)Front Body Exhaust Heat Shield Replacement (Left Side, LGW, LGX)**



Fig. 15: Front Body Exhaust Heat Shield

Courtesy of GENERAL MOTORS COMPANY

6. Catalytic Converter Brace Bracket (2)» Install - **Catalytic Converter Brace Bracket Replacement (LGW, LGX)**

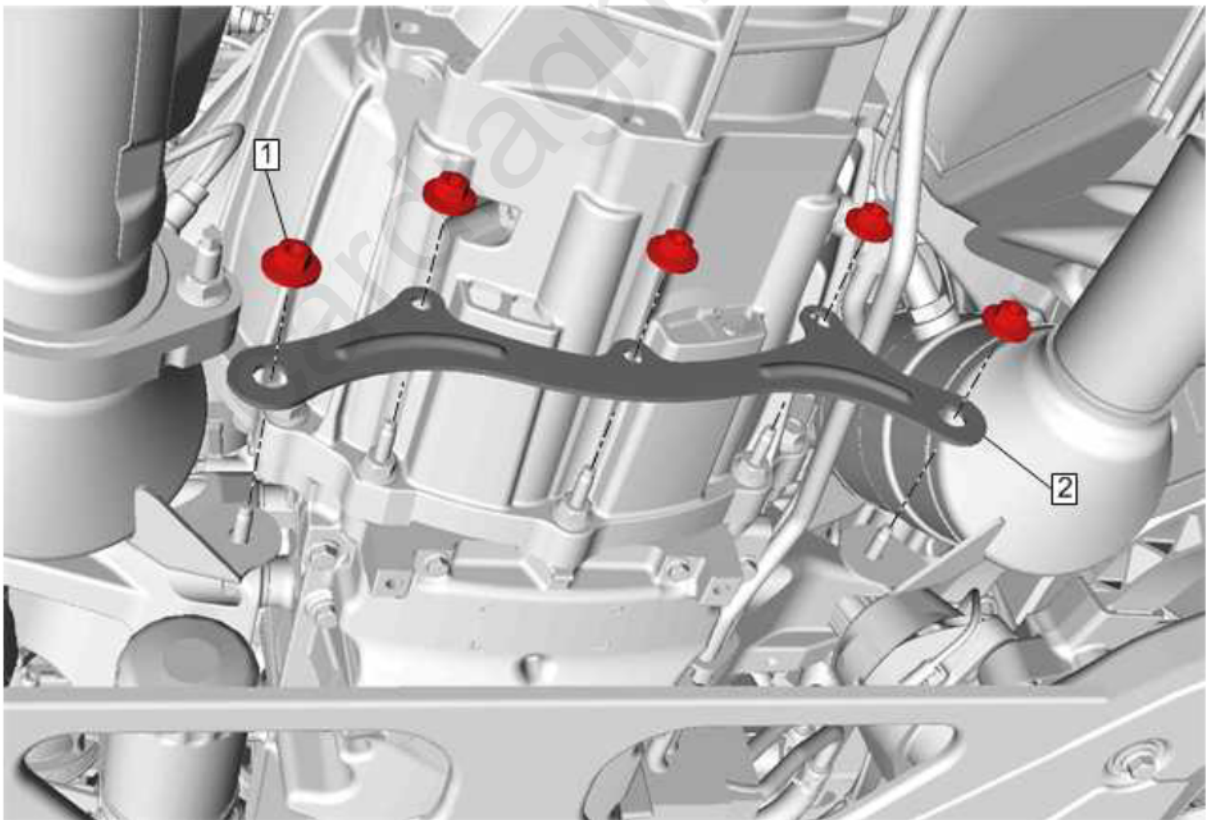


Fig. 16: Catalytic Converter Brace Bracket

Courtesy of GENERAL MOTORS COMPANY

7. Drivetrain and Front Suspension Cradle Plate (3)» Install - **Drivetrain and Front Suspension Cradle Plate Replacement**

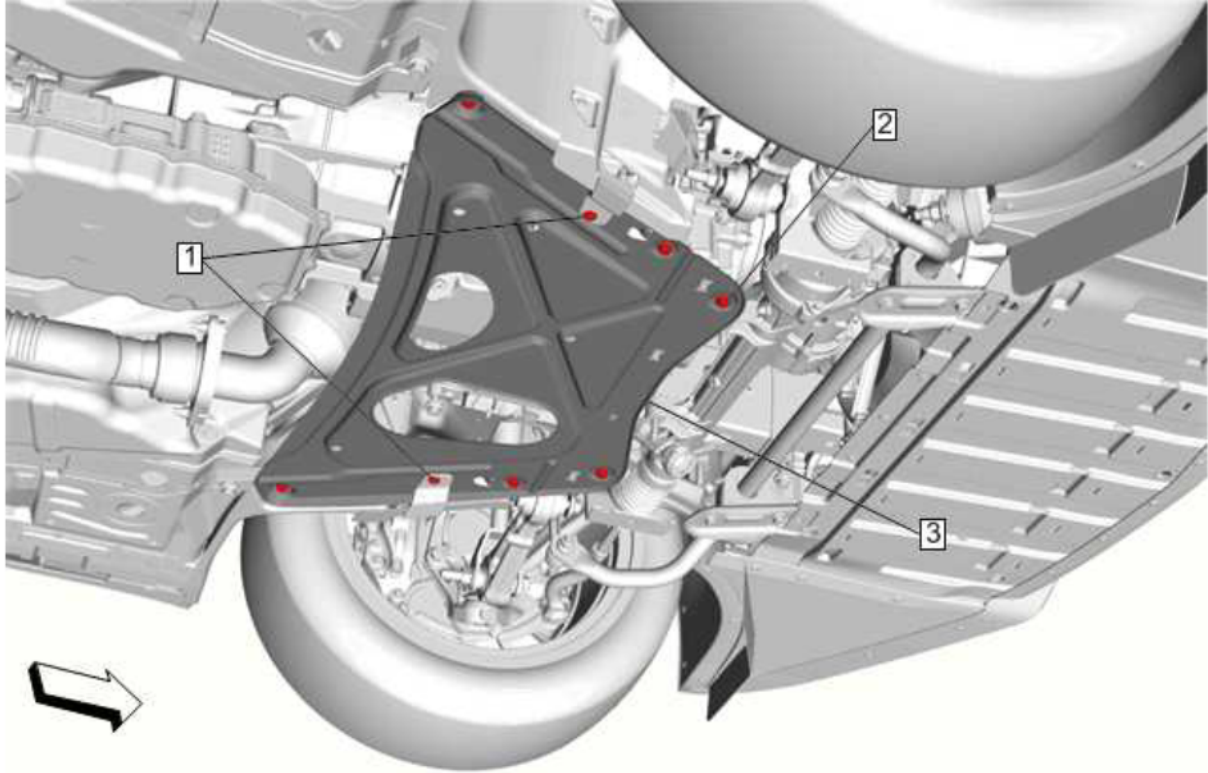


Fig. 17: Drivetrain and Front Suspension Cradle Plate
Courtesy of GENERAL MOTORS COMPANY

8. Start the engine and check for exhaust leaks.

WARM UP THREE-WAY CATALYTIC CONVERTER REPLACEMENT (RIGHT, LGW)

Removal Procedure

WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

WARNING: Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid personal injury.

1. Drivetrain and Front Suspension Cradle Plate Replacement Â» Remove
2. Exhaust Muffler Replacement (LGW, LGX) Â» Remove
3. Catalytic Converter Brace Bracket Replacement (LGW, LGX) Â» Remove
4. Heated Oxygen Sensor Electrical Connector (1) Â» Disconnect [2x]

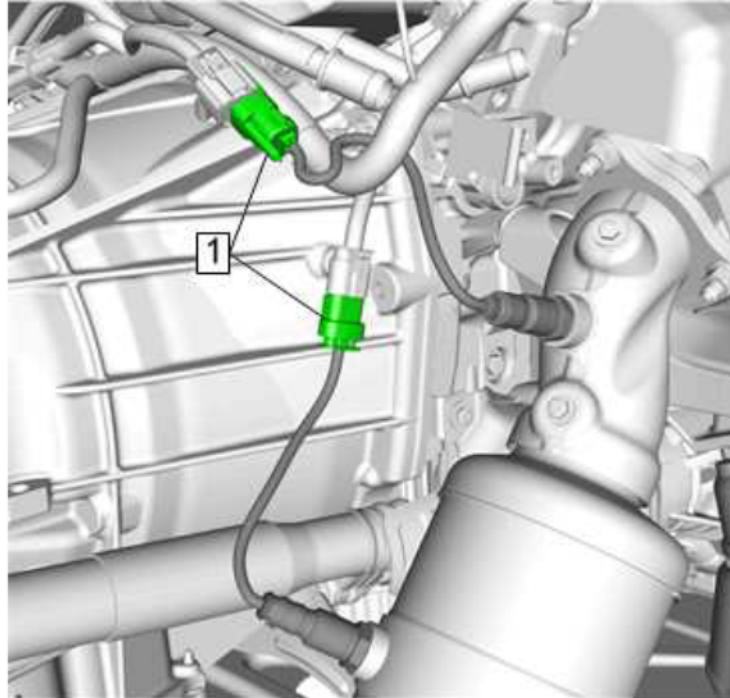


Fig. 18: Heated Oxygen Sensor Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

5. Catalytic Converter Nut (1)» Remove [3x]

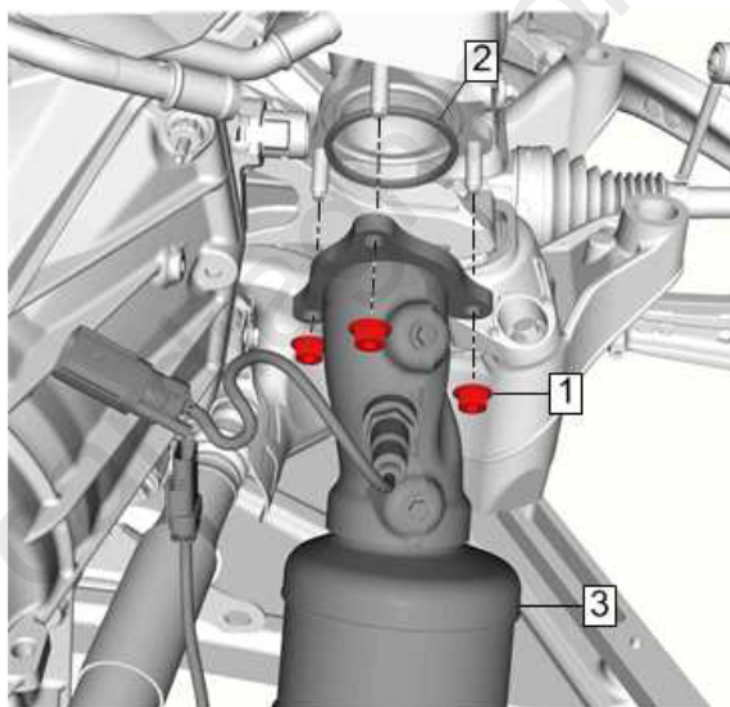


Fig. 19: Catalytic Converter Gasket And Converter
 Courtesy of GENERAL MOTORS COMPANY

6. Catalytic Converter Gasket (2)» Remove and DISCARD
7. Catalytic Converter (3)» Remove

Installation Procedure

1. Catalytic Converter Gasket (2)» Install

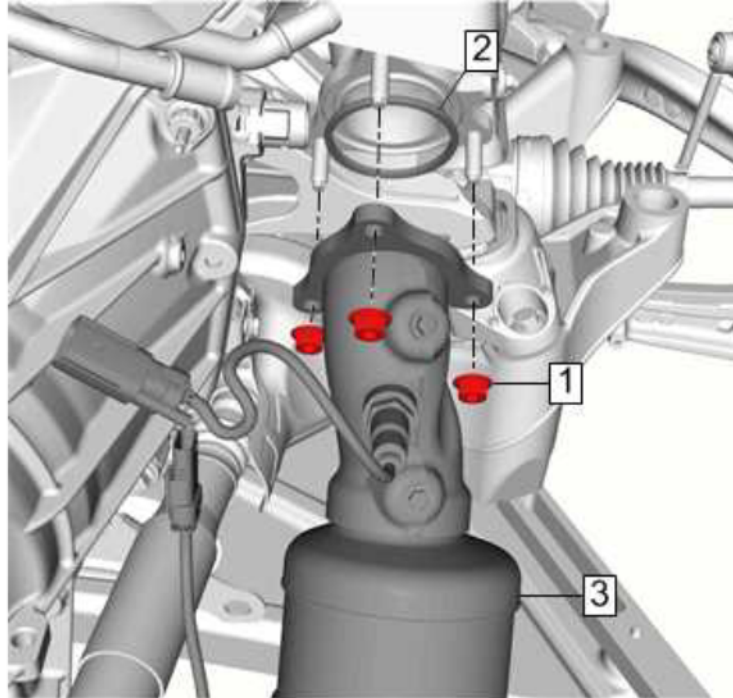


Fig. 20: Catalytic Converter Gasket And Converter
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a **NEW** catalytic converter gasket.

2. Catalytic Converter (3)» Install
3. Catalytic Converter Nut (1)» Install and tighten [3x] 50 N.m (37 lb ft)

CAUTION: Refer to **Fastener Caution** .

4. Heated Oxygen Sensor Electrical Connector (1)» Connect [2x]

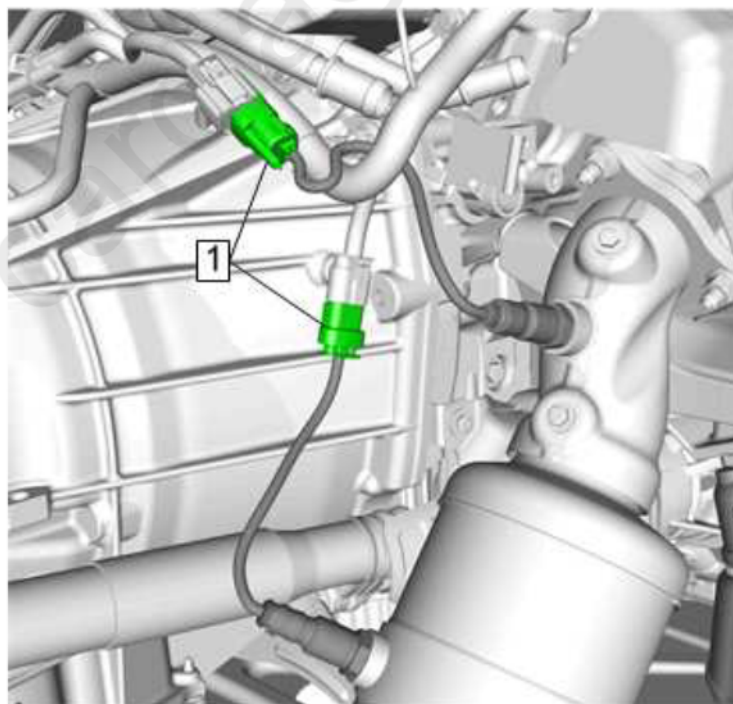


Fig. 21: Heated Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. **Catalytic Converter Brace Bracket Replacement (LGW, LGX)**» Install
6. **Exhaust Muffler Replacement (LGW, LGX)**» Install
7. **Drivetrain and Front Suspension Cradle Plate Replacement** » Install
8. Start the engine and check for exhaust leaks.

Removal Procedure

WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

WARNING: Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid personal injury.

1. Drivetrain and Front Suspension Cradle Plate Replacement Â» Remove
2. Exhaust Muffler Replacement (LGW, LGX) Â» Remove
3. Catalytic Converter Brace Bracket Replacement (LGW, LGX) Â» Remove
4. Heated Oxygen Sensor Electrical Connector (1) Â» Disconnect [2x]

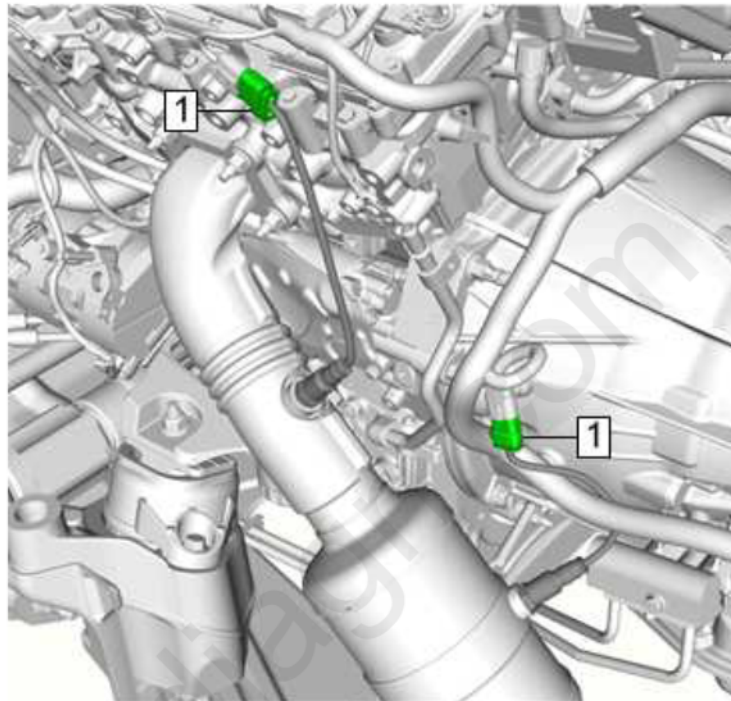


Fig. 22: Heated Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Catalytic Converter Nut (1) Â» Remove [4x]

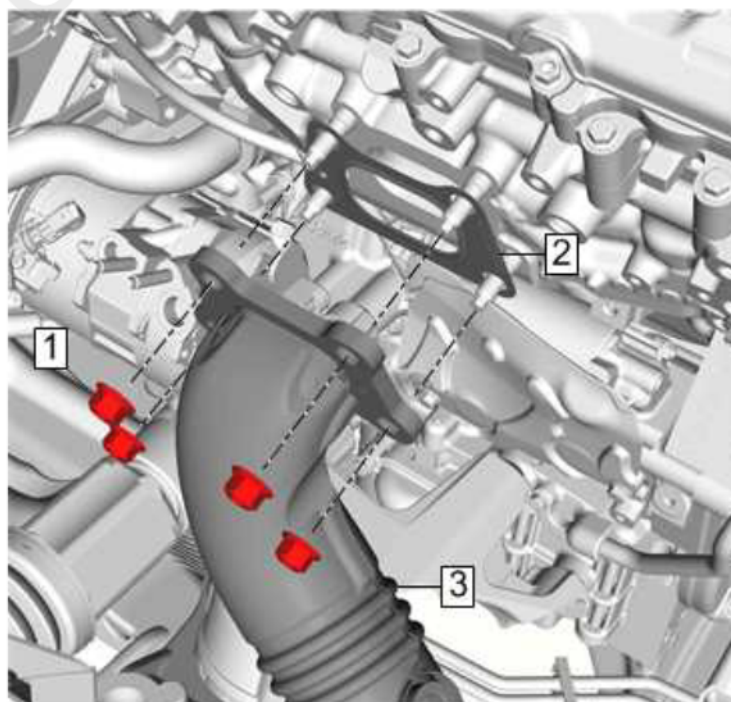


Fig. 23: Catalytic Converter Gasket And Converter
Courtesy of GENERAL MOTORS COMPANY

6. Catalytic Converter Gasket (2)» Remove and DISCARD
7. Catalytic Converter (3)» Remove

Installation Procedure

1. Catalytic Converter Gasket (2)» Install

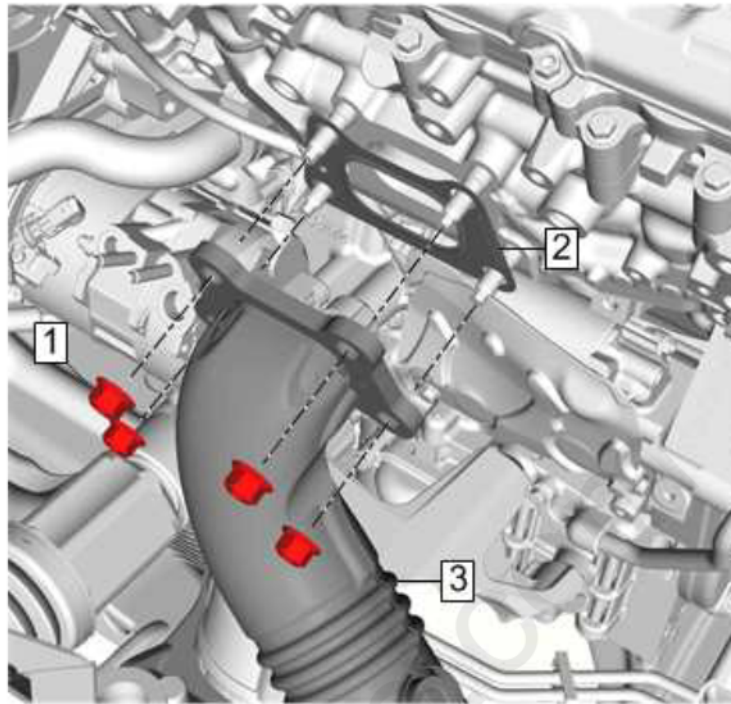


Fig. 24: Catalytic Converter Gasket And Converter
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW catalytic converter gasket.

2. Catalytic Converter (3)» Install
3. Catalytic Converter Nut (1)» Install and tighten [4x] 50 N.m (37 lb ft)

CAUTION: Refer to **Fastener Caution** .

4. Heated Oxygen Sensor Electrical Connector (1)» Connect [2x]

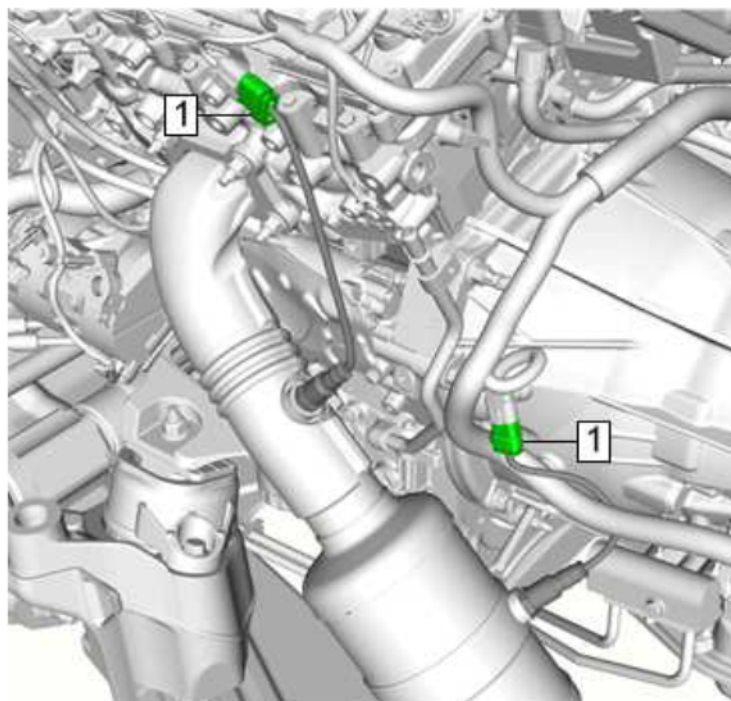


Fig. 25: Heated Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. **Catalytic Converter Brace Bracket Replacement (LGW, LGX)** Â» Install
6. **Exhaust Muffler Replacement (LGW, LGX)** Â» Install
7. **Drivetrain and Front Suspension Cradle Plate Replacement** Â» Install
8. Start the engine and check for exhaust leaks.

WARM UP THREE-WAY CATALYTIC CONVERTER REPLACEMENT (RIGHT, LGX)

Removal Procedure

WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

WARNING: Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid personal injury.

1. **Drivetrain and Front Suspension Cradle Plate Replacement** Â» Remove
2. **Exhaust Muffler Replacement (LGW, LGX)** Â» Remove
3. **Catalytic Converter Brace Bracket Replacement (LGW, LGX)** Â» Remove
4. Heated Oxygen Sensor Electrical Connector (1) Â» Disconnect [2x]

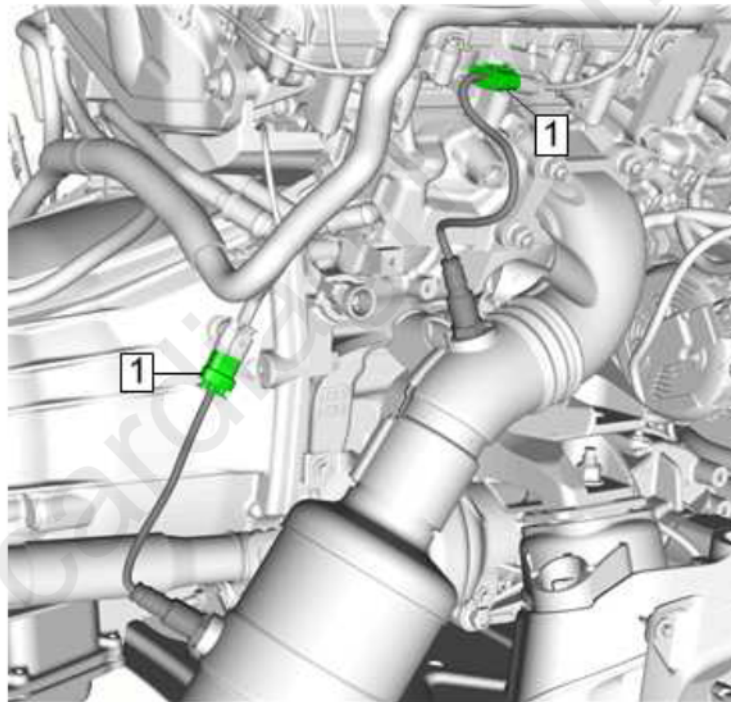


Fig. 26: Heated Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Catalytic Converter Nut (1) Â» Remove [4x]

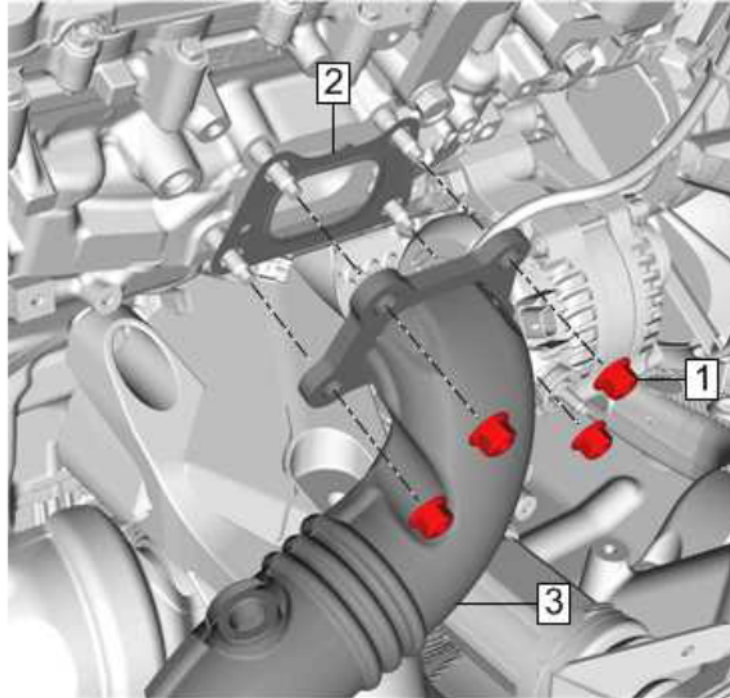


Fig. 27: Catalytic Converter Gasket And Converter
Courtesy of GENERAL MOTORS COMPANY

6. Catalytic Converter Gasket (2)» Remove and DISCARD
7. Catalytic Converter (3)» Remove

Installation Procedure

1. Catalytic Converter Gasket (2)» Install

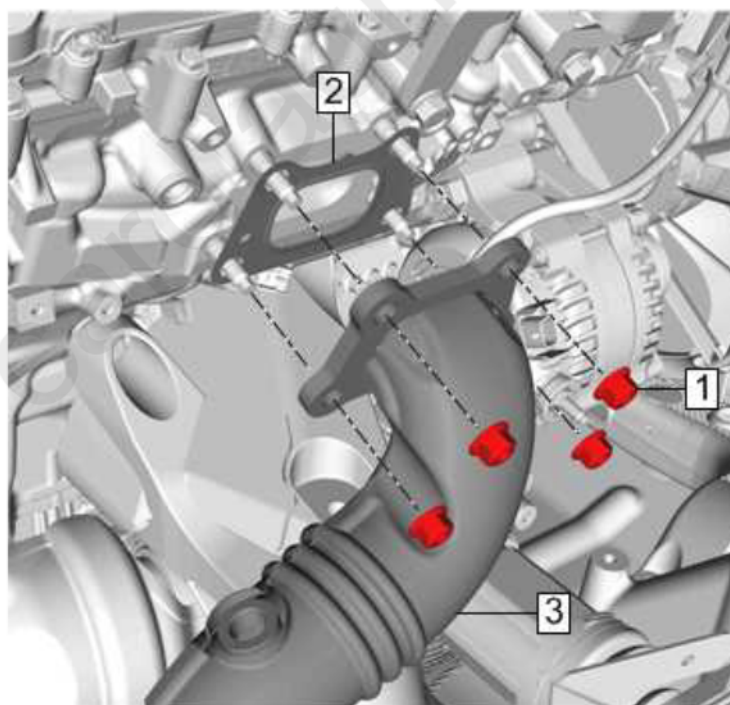


Fig. 28: Catalytic Converter Gasket And Converter
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW catalytic converter gasket.

2. Catalytic Converter (3)» Install
3. Catalytic Converter Nut (1)» Install and tighten [4x] 50 N.m (37 lb ft)

CAUTION: Refer to **Fastener Caution** .

4. Heated Oxygen Sensor Electrical Connector (1)» Connect [2x]

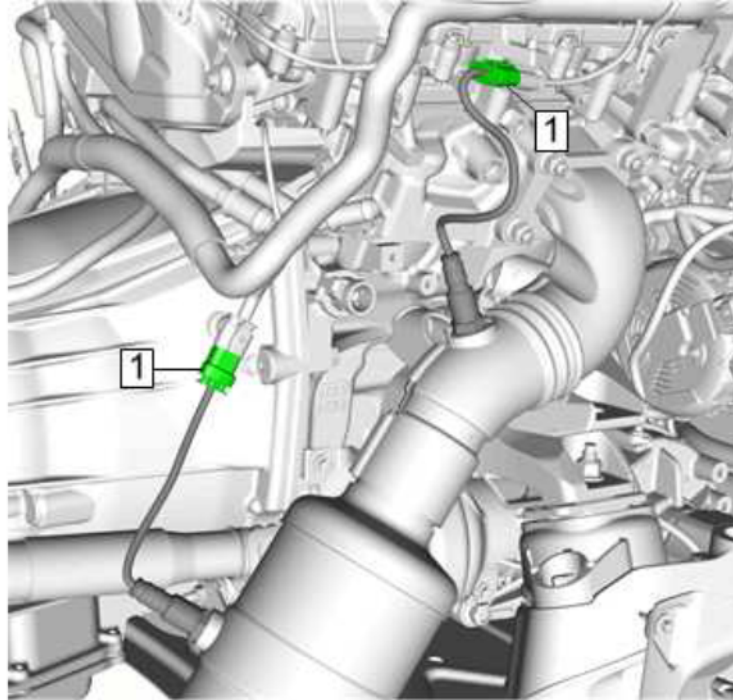


Fig. 29: Heated Oxygen Sensor Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

5. **Catalytic Converter Brace Bracket Replacement (LGW, LGX)** » Install
6. **Exhaust Muffler Replacement (LGW, LGX)** » Install
7. **Drivetrain and Front Suspension Cradle Plate Replacement** » Install
8. Start the engine and check for exhaust leaks.

WARM UP THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LTG)

Removal Procedure

WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

WARNING: Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid personal injury.

1. Turbocharger Heat Shield » Remove - **Turbocharger Heat Shield Replacement**
2. Exhaust Muffler » Remove - **Exhaust Muffler Replacement (LTG without HP9)****Exhaust Muffler Replacement (LTG with HP9)**
3. Heated Oxygen Sensor Electrical Connector (1) » Disconnect

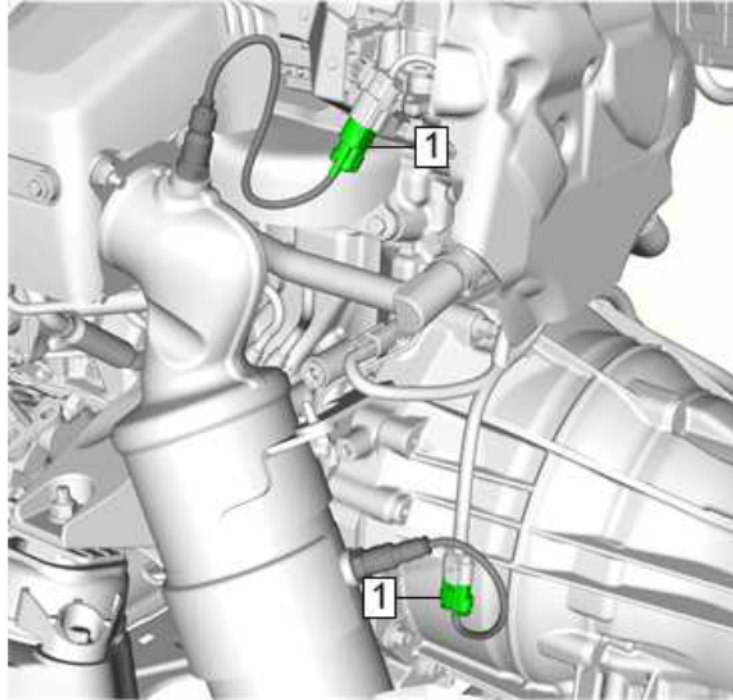


Fig. 30: Heated Oxygen Sensor Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

4. Catalytic Converter Brace Bracket Bolt (1) » Remove

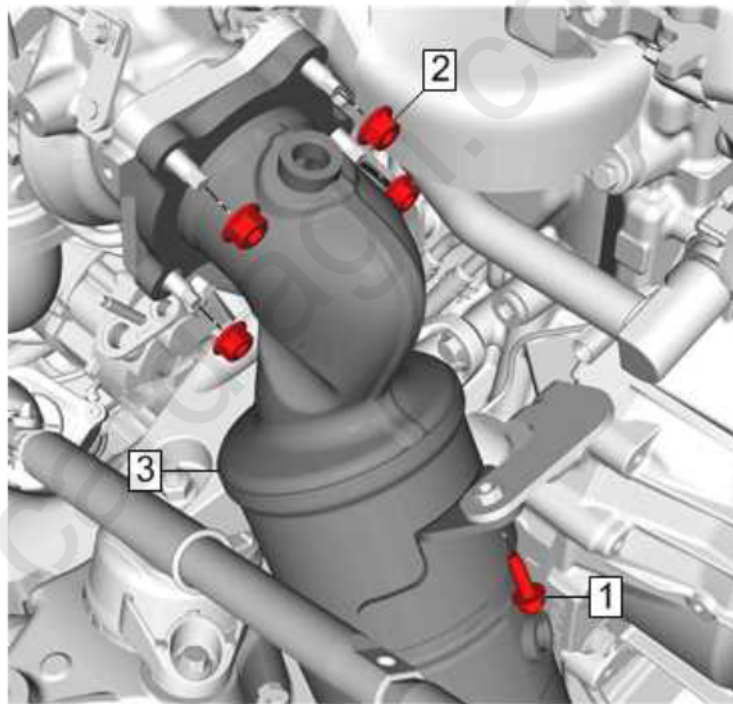


Fig. 31: Catalytic Converter Nut And Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

5. Catalytic Converter Nut (2) » Remove [4x]
 6. Catalytic Converter Brace Bracket Bolt (1) » Remove

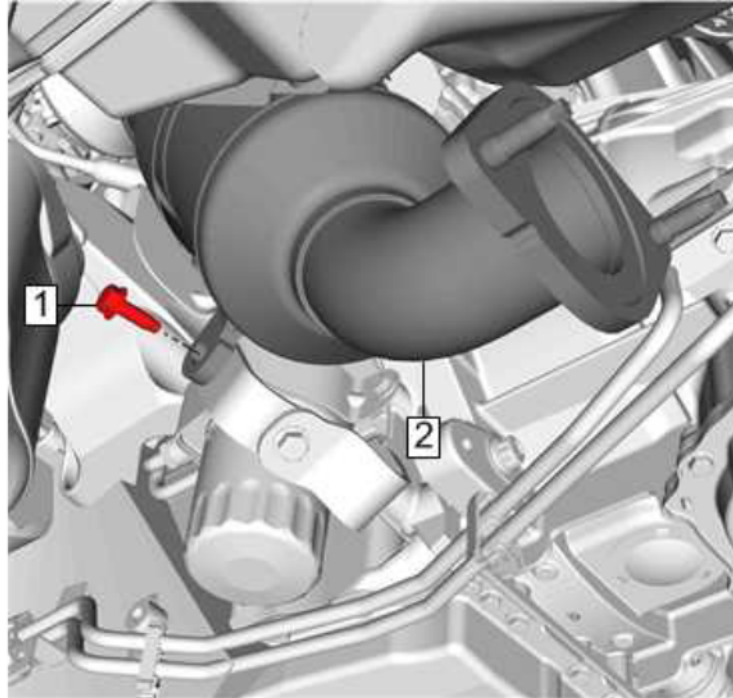


Fig. 32: Catalytic Converter Brace Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

7. Warm Up Three-Way Catalytic Converter (2)» Remove

Installation Procedure

1. Warm Up Three-Way Catalytic Converter (2)» Install

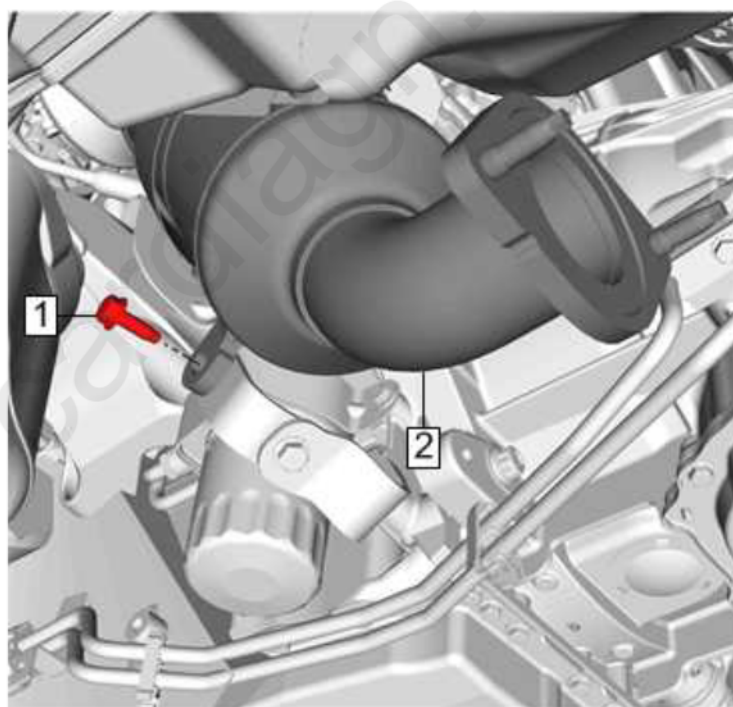


Fig. 33: Catalytic Converter Brace Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW catalytic converter gasket.

2. Catalytic Converter Brace Bracket Bolt (1)» Hand tighten

3. Catalytic Converter Nut (2)» Install and tighten [4x] 50 N.m (37 lb ft)

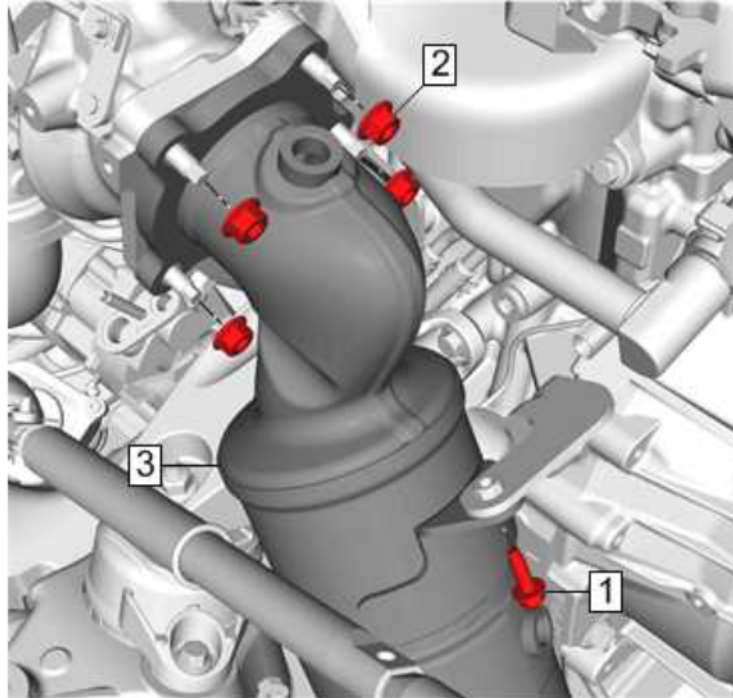


Fig. 34: Catalytic Converter Nut And Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

4. Catalytic Converter Brace Bracket Bolt (1)» Install and tighten 22 N.m (16 lb ft)
5. Catalytic Converter Brace Bracket Bolt (1)» Tighten 22 N.m (16 lb ft)

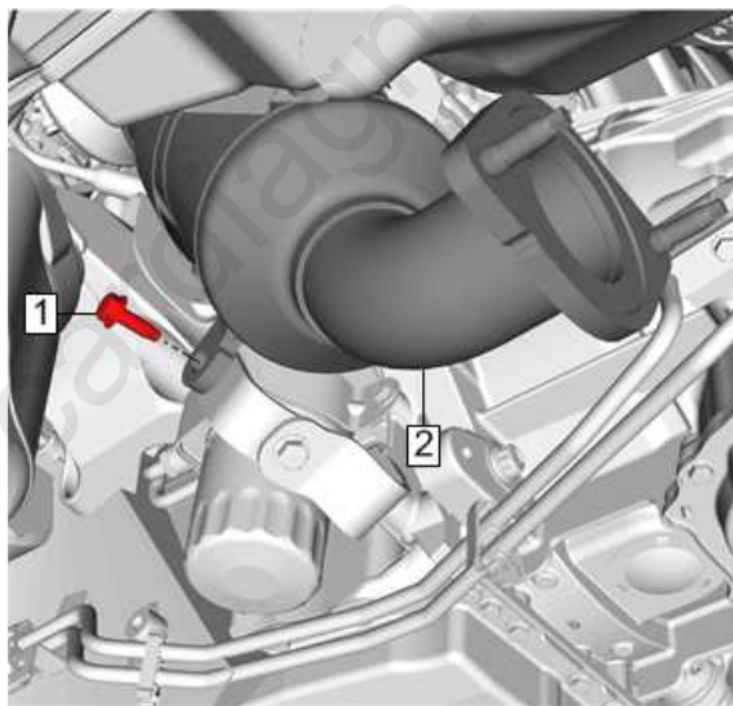


Fig. 35: Catalytic Converter Brace Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

6. Heated Oxygen Sensor Electrical Connector (1)» Connect

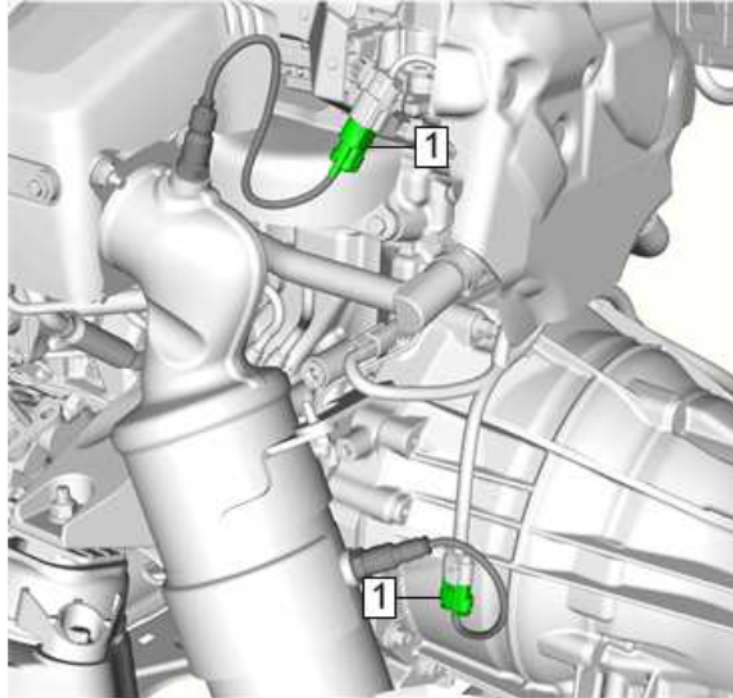


Fig. 36: Heated Oxygen Sensor Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

7. Exhaust Muffler» Install - **Exhaust Muffler Replacement (LTG without HP9)****Exhaust Muffler Replacement (LTG with HP9)**
8. Turbocharger Heat Shield» Install - **Turbocharger Heat Shield Replacement**

CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (LGW, LGX)

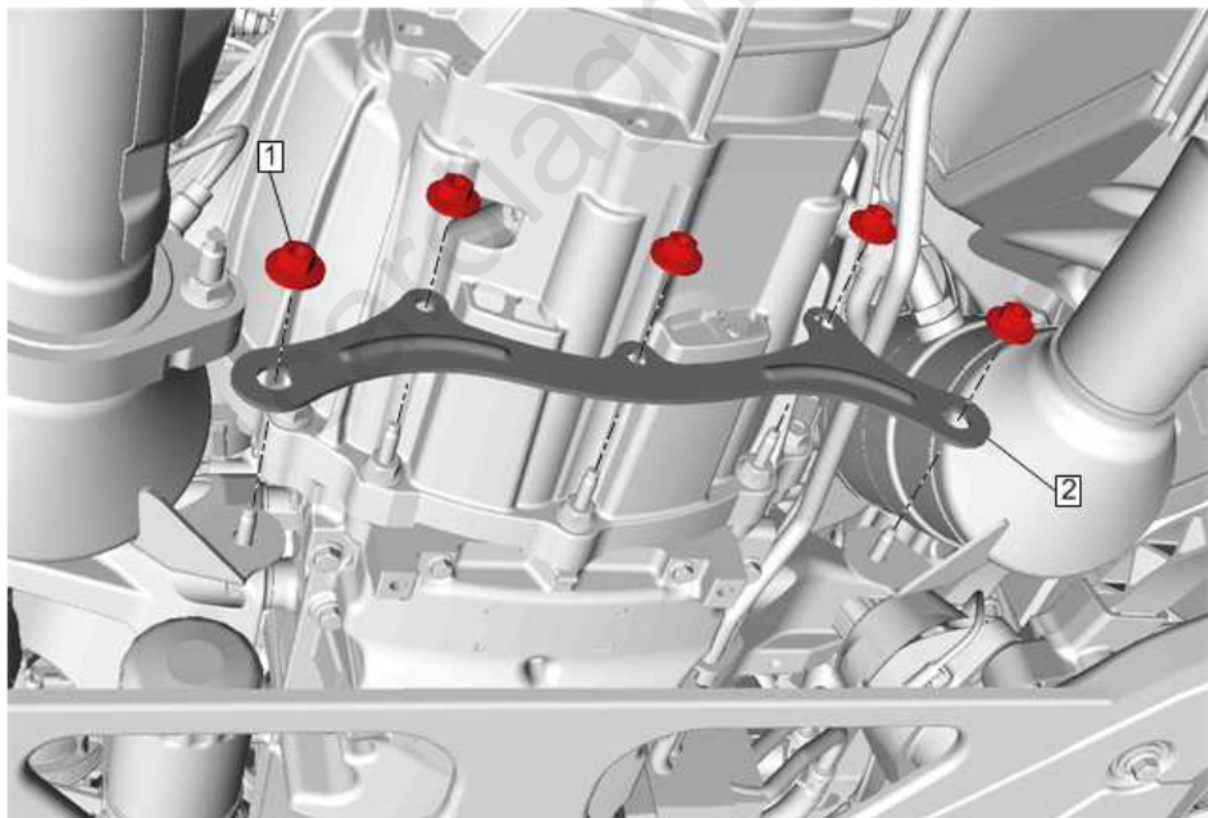


Fig. 37: Catalytic Converter Brace Bracket (LGW, LGX)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
<u>Lifting and Jacking the Vehicle</u>	

Callout	Component Name
1	Catalytic Converter Brace Nut [5x] CAUTION: Refer to Fastener Caution . Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Brace Bracket

CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (UPPER, LTG)

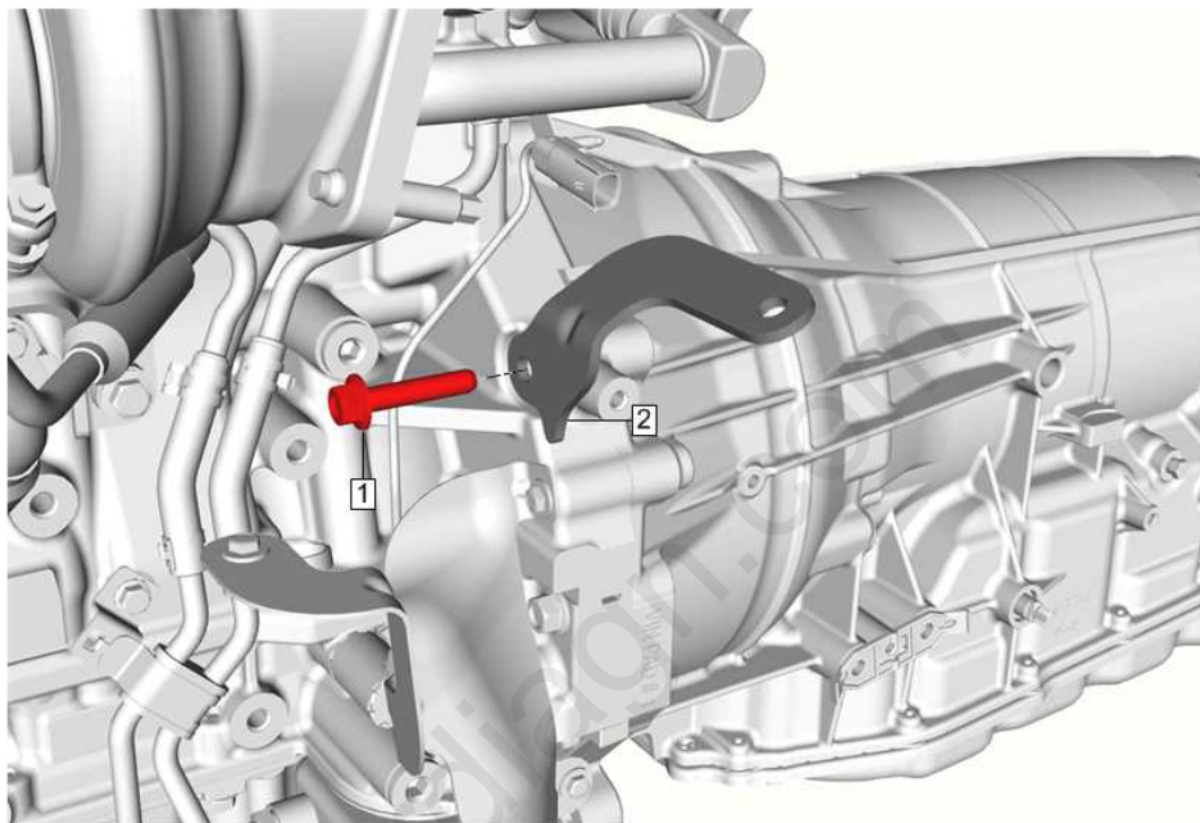


Fig. 38: Catalytic Converter Brace Bracket (Upper, LTG)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Warm Up Three-Way Catalytic Converter Replacement (LTG)	
1	Transmission Bolt CAUTION: Refer to Fastener Caution . Tighten 58 N.m (43 lb ft)
2	Catalytic Converter Brace Bracket

CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (LOWER, LTG)

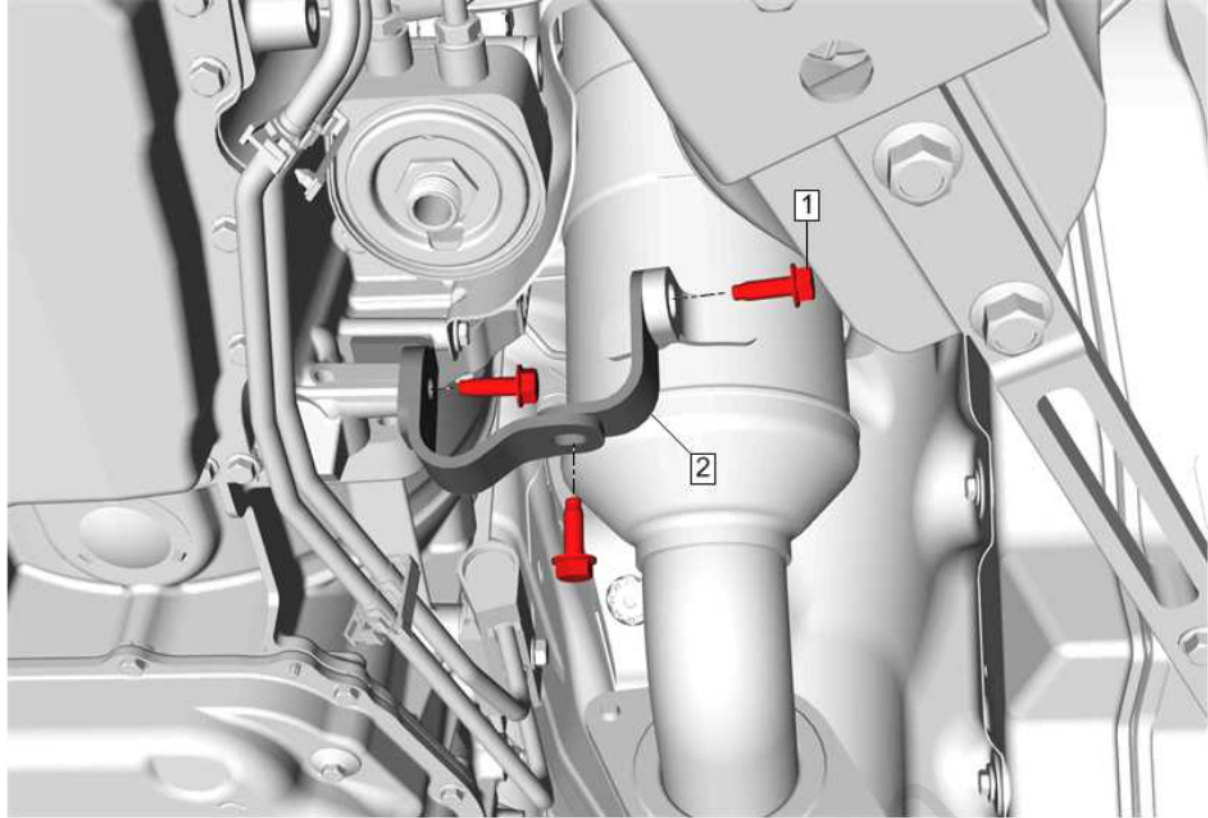


Fig. 39: Catalytic Converter Brace Bracket (Lower, LTG)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Lifting and Jacking the Vehicle</u>	
1	Catalytic Converter Brace Bracket Bolt [3x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Brace Bracket

EXHAUST REAR MUFFLER REAR HANGER REPLACEMENT (LGW, LGX, LTG)

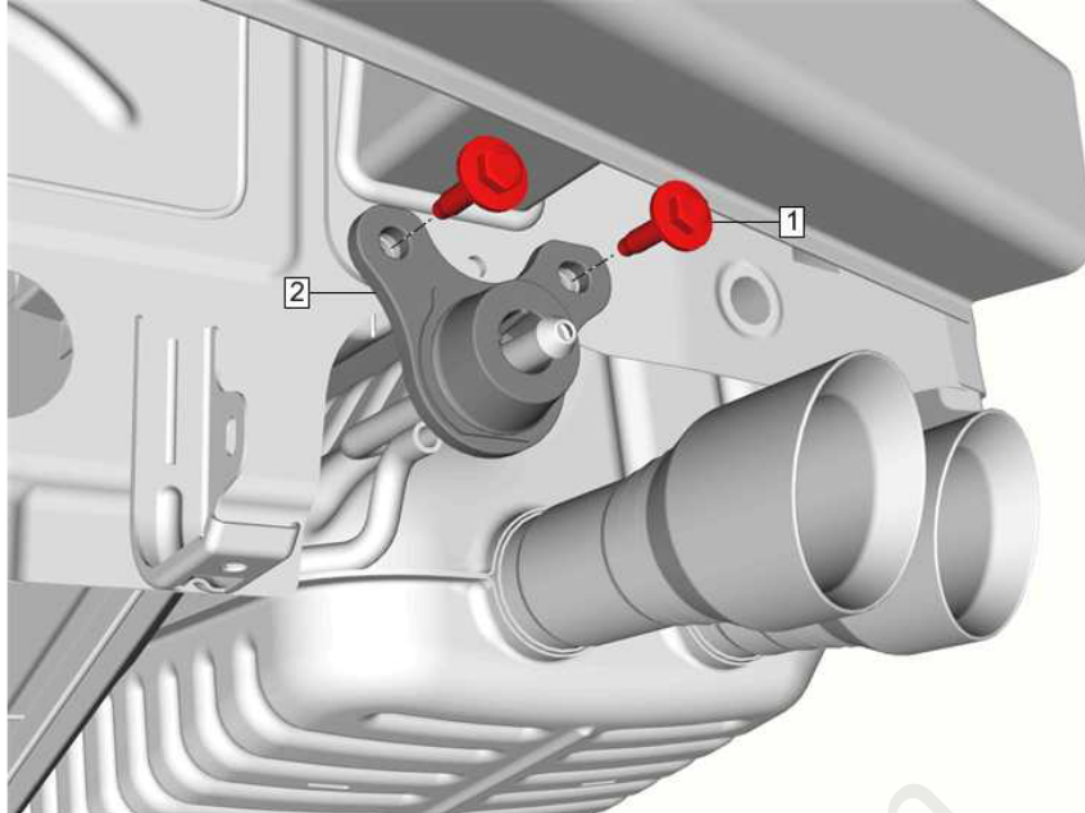


Fig. 40: Exhaust Rear Muffler Rear Hanger (LGW, LGX, LTG)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Lifting and Jacking the Vehicle</u>	
1	Exhaust Rear Muffler Rear Hanger Bolt [2x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 N.m (16 lb ft)
2	Exhaust Rear Muffler Rear Hanger

EXHAUST MUFFLER REPLACEMENT (LTG WITHOUT HP9)

Removal Procedure

WARNING: Refer to Moving Parts and Hot Surfaces Warning .

WARNING: Refer to Safety Glasses Warning .

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle
2. Floor Panel Number 2 Cross Bar Reinforcement Bolt (1)» Remove [4x]

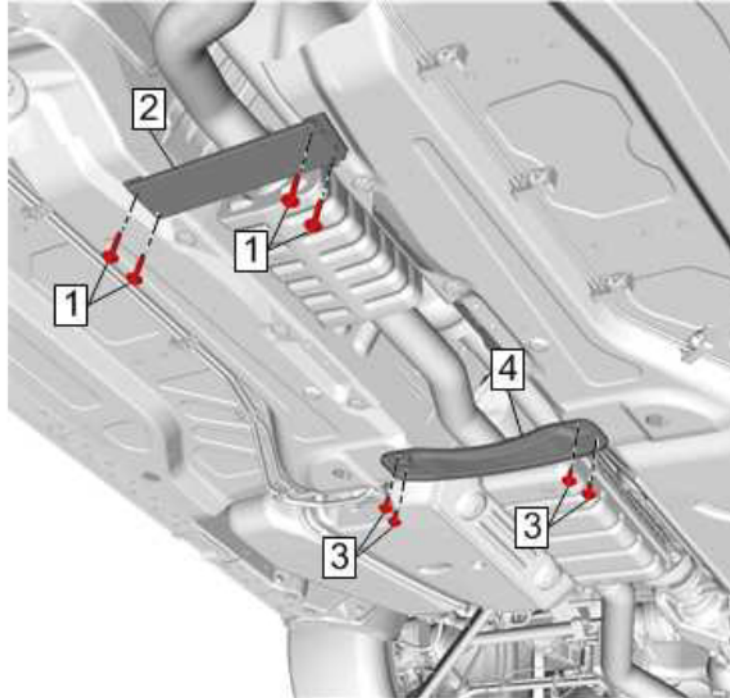


Fig. 41: Floor Panel Number 2, 4 Cross Bar Reinforcement Bolt
 Courtesy of GENERAL MOTORS COMPANY

3. Floor Panel Number 2 Cross Bar Reinforcement (2)» Remove
4. Floor Panel Number 4 Cross Bar Reinforcement Bolt (3)» Remove [4x]
5. Floor Panel Number 4 Cross Bar Reinforcement (4)» Remove
6. Support the exhaust system.
7. Catalytic Converter Nut (1)» Remove [2x]

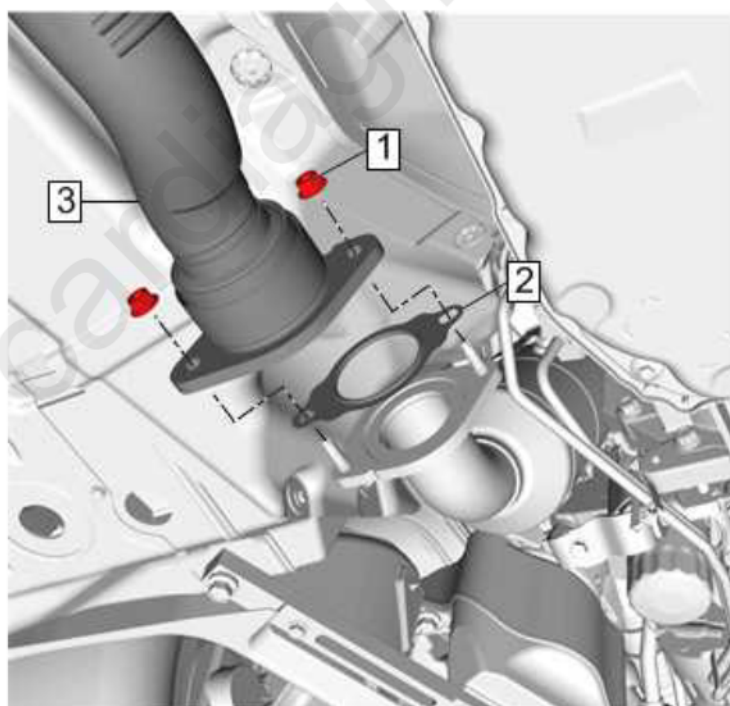


Fig. 42: Exhaust Gasket
 Courtesy of GENERAL MOTORS COMPANY

8. Exhaust Gasket (2)» Remove and DISCARD
9. Exhaust Muffler Assembly (3)» Remove
10. Exhaust Muffler Isolator (1)» Disengage [3x]

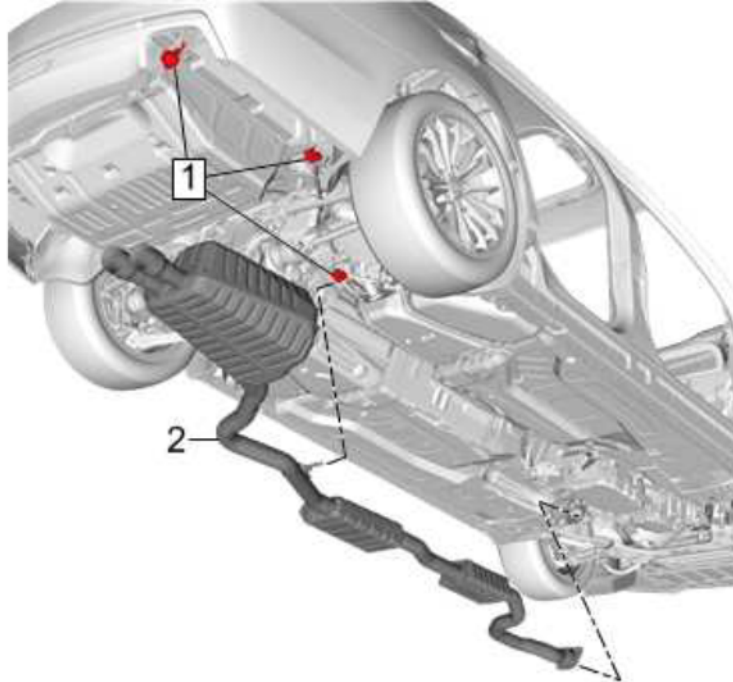


Fig. 43: Exhaust Muffler Isolator

Courtesy of GENERAL MOTORS COMPANY

11. With the aid of an assistant, lower the exhaust system from the vehicle. (2)

Installation Procedure

1. With the aid of an assistant, install the exhaust system to the vehicle. (2)

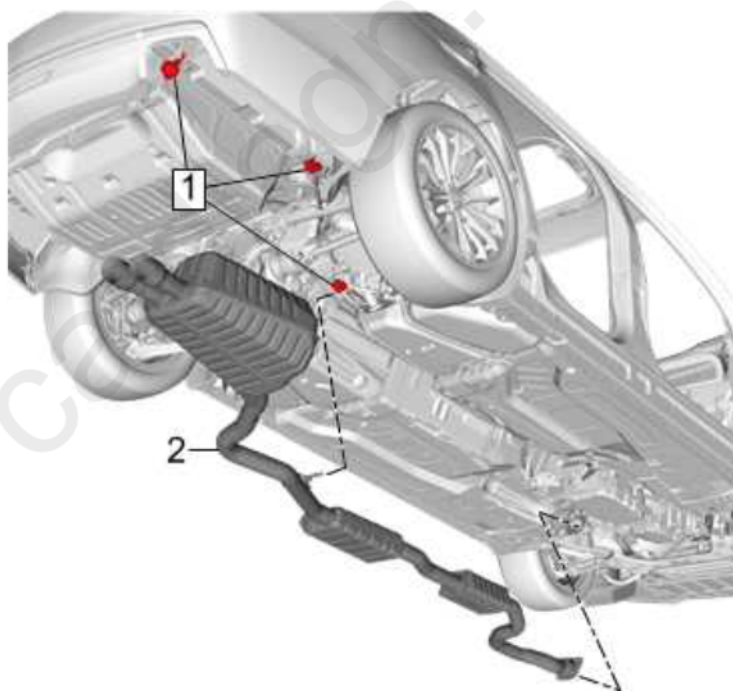


Fig. 44: Exhaust Muffler Isolator

Courtesy of GENERAL MOTORS COMPANY

2. Exhaust Muffler Isolator (1)» Install [3x]

NOTE: Clean and lubricate the exhaust isolators for ease of installation.

3. Support the exhaust system.
4. Exhaust Gasket (2)» Install

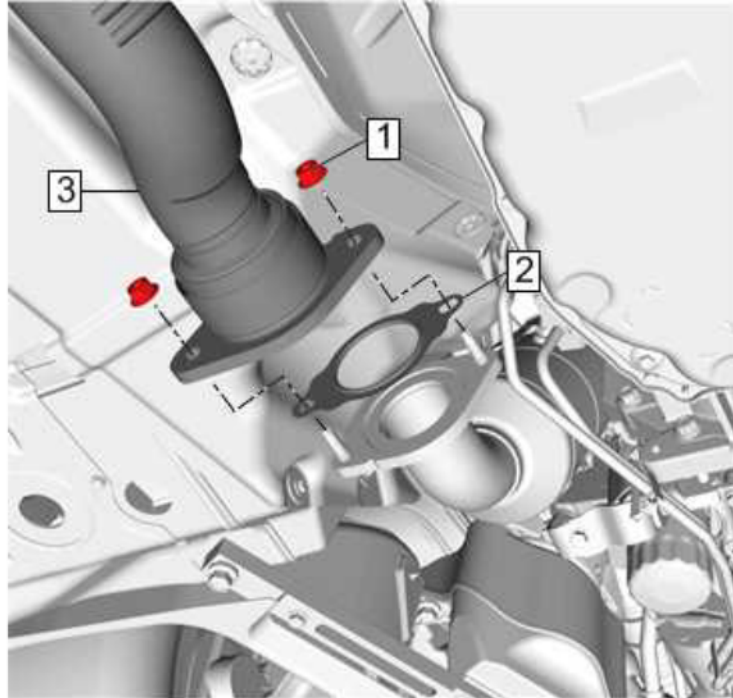


Fig. 45: Exhaust Gasket

Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a **NEW** gasket.

5. Exhaust Muffler Assembly (3)» Install
6. Catalytic Converter Nut (1)» Install and tighten [2x] 50 N.m (37 lb ft)

CAUTION: Refer to **Fastener Caution** .

7. Floor Panel Number 4 Bar (4)» Install

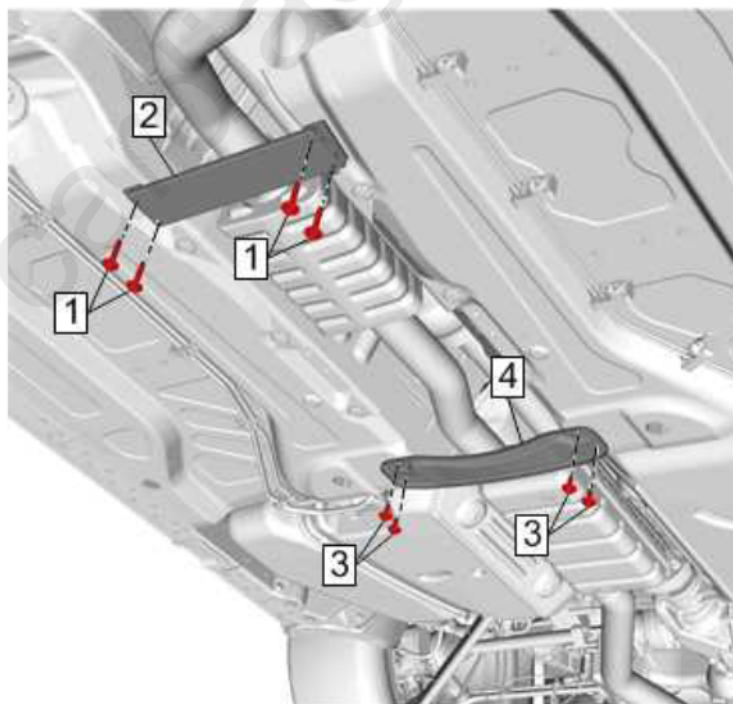


Fig. 46: Floor Panel Number 2, 4 Cross Bar Reinforcement Bolt

Courtesy of GENERAL MOTORS COMPANY

8. Floor Panel Number 4 Bar Fastener (3)» Install and tighten [4x] 22 N.m (16 lb ft)
9. Floor Panel Number 2 Cross Bar Reinforcement (2)» Install
10. Floor Panel Number 2 Cross Bar Reinforcement Bolt (1)» Install and tighten [5x] 22 N.m (16 lb ft)

EXHAUST MUFFLER REPLACEMENT (LGW, LGX)

Removal Procedure

WARNING: Refer to [Moving Parts and Hot Surfaces Warning](#) .

WARNING: Refer to [Safety Glasses Warning](#) .

1. [Exhaust Rear Muffler Rear Hanger Replacement \(LGW, LGX, LTG\)](#) » Remove
2. Floor Panel Number 2 Cross Bar Reinforcement Bolt (1) » Remove [4x]

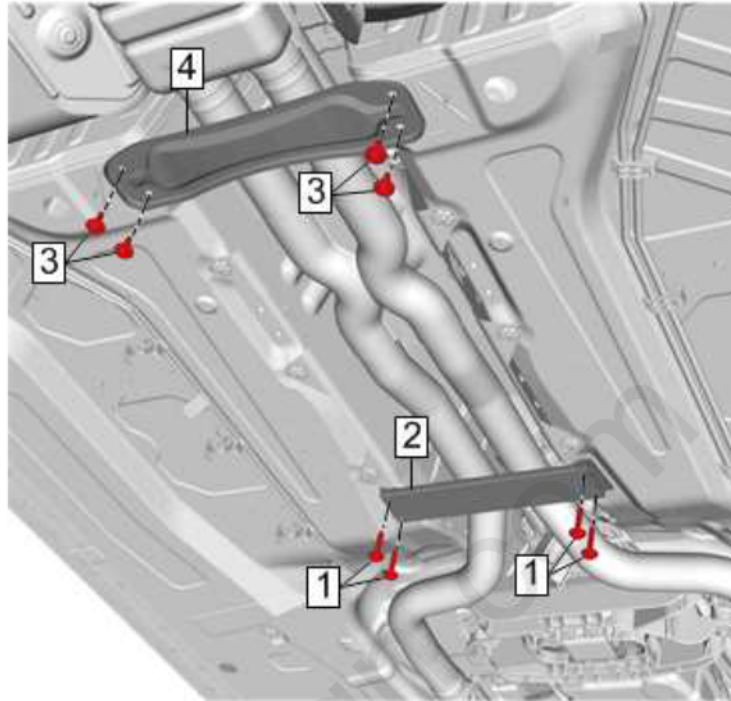


Fig. 47: Floor Panel Number 2, 4 Cross Bar Reinforcement
Courtesy of GENERAL MOTORS COMPANY

3. Floor Panel Number 2 Cross Bar Reinforcement (2) » Remove
4. Floor Panel Number 4 Cross Bar Reinforcement Bolt (3) » Remove [4x]
5. Floor Panel Number 4 Cross Bar Reinforcement (4) » Remove
6. Support the exhaust system.
7. Exhaust Pipe Clamp Nut (1) » Loosen [2x]

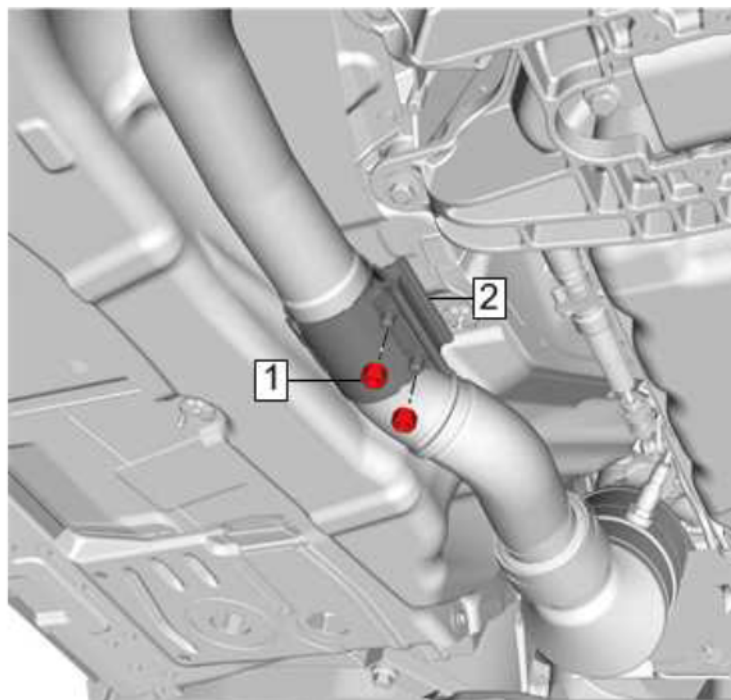


Fig. 48: Exhaust Pipe Clamp Nut And Clamp
Courtesy of GENERAL MOTORS COMPANY

8. Inspect and clean the exhaust clamp (2) and replace if necessary.
9. Exhaust Muffler Isolator (1) » Disconnect [4x]

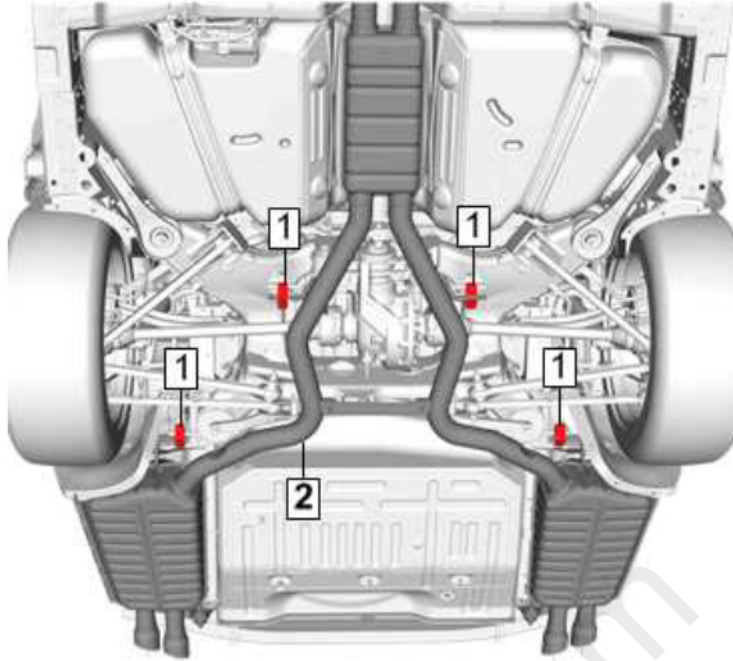


Fig. 49: Exhaust Muffler Assembly
Courtesy of GENERAL MOTORS COMPANY

10. Catalytic Converter Nut (1) » Remove [2x]

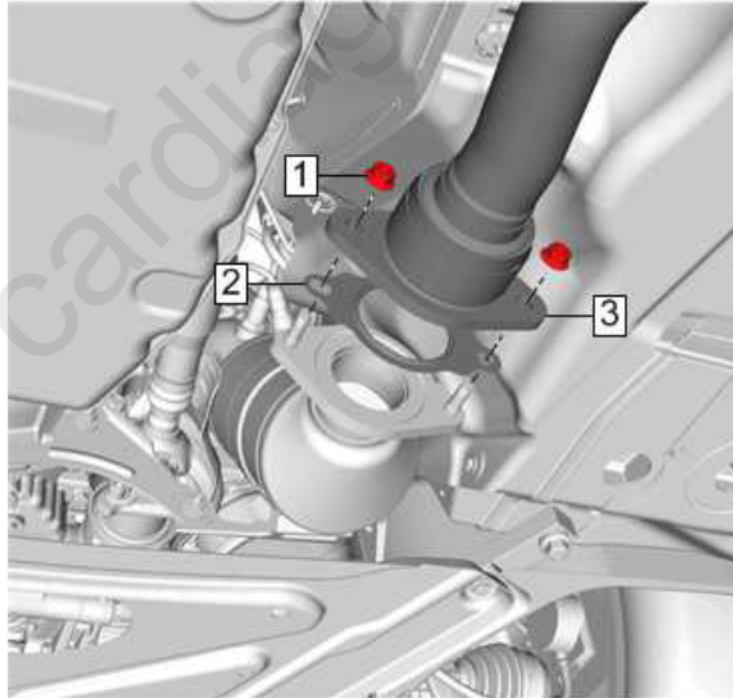


Fig. 50: Exhaust Muffler
Courtesy of GENERAL MOTORS COMPANY

11. Exhaust Muffler (3) @ Catalytic Converter » Disconnect
12. With the aid of an assistant, lower the exhaust system from the vehicle. (2)

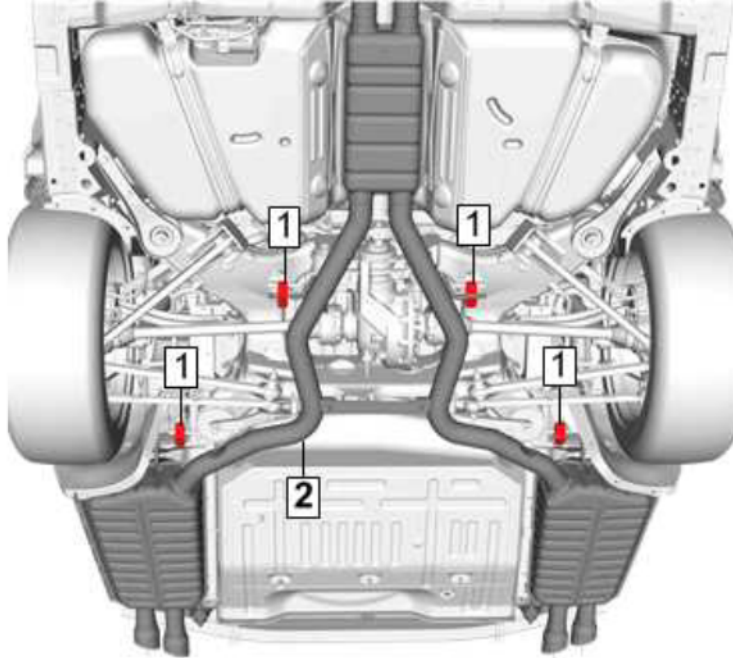


Fig. 51: Exhaust Muffler Assembly

Courtesy of GENERAL MOTORS COMPANY

13. Exhaust Gasket (2)» Remove and DISCARD

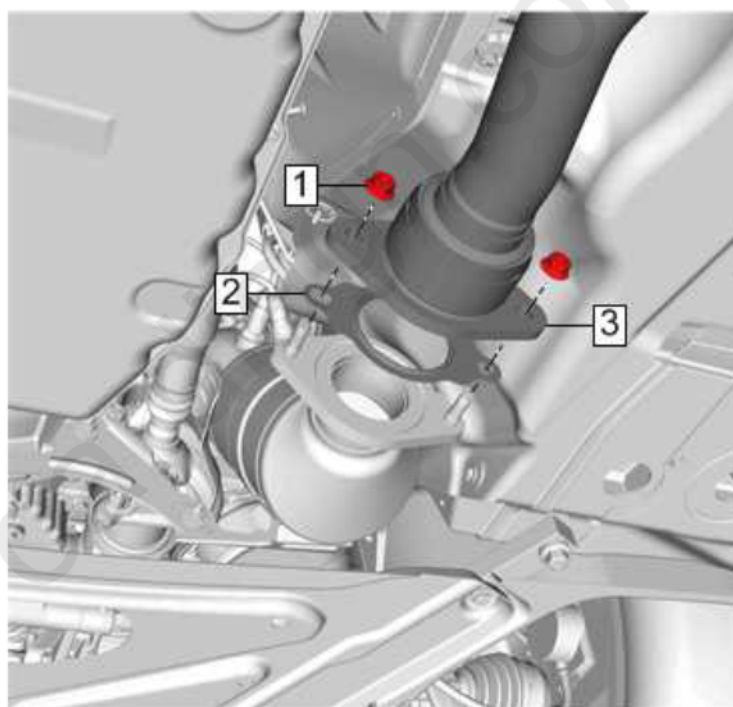


Fig. 52: Exhaust Muffler

Courtesy of GENERAL MOTORS COMPANY

Installation Procedure

1. Exhaust Gasket (2)» Install

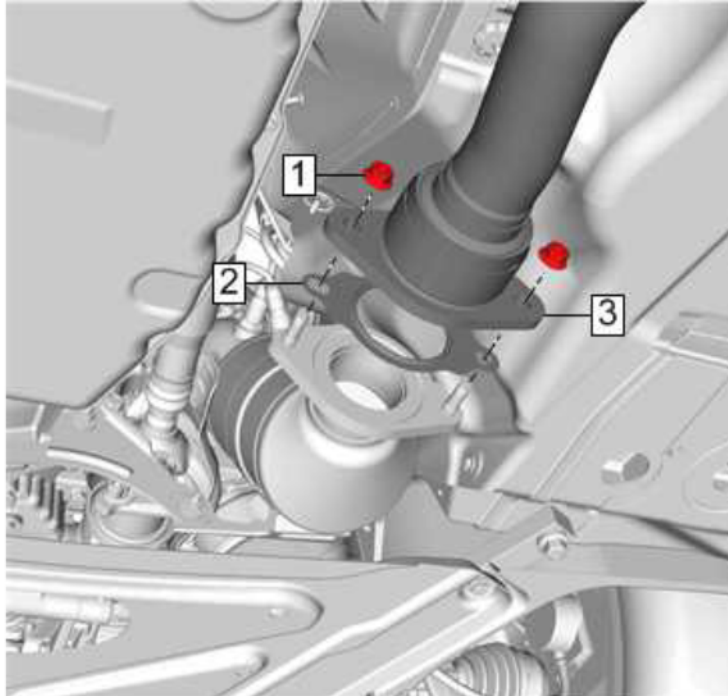


Fig. 53: Exhaust Muffler

Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW gasket.

2. With the aid of an assistant, install the exhaust system to the vehicle. (2)

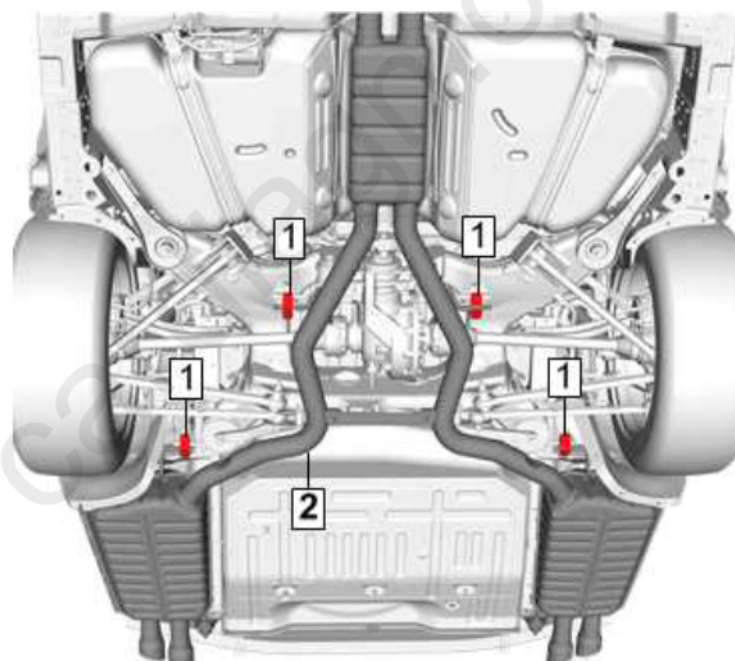


Fig. 54: Exhaust Muffler Assembly

Courtesy of GENERAL MOTORS COMPANY

3. Exhaust Muffler (3) @ Catalytic Converter» Connect

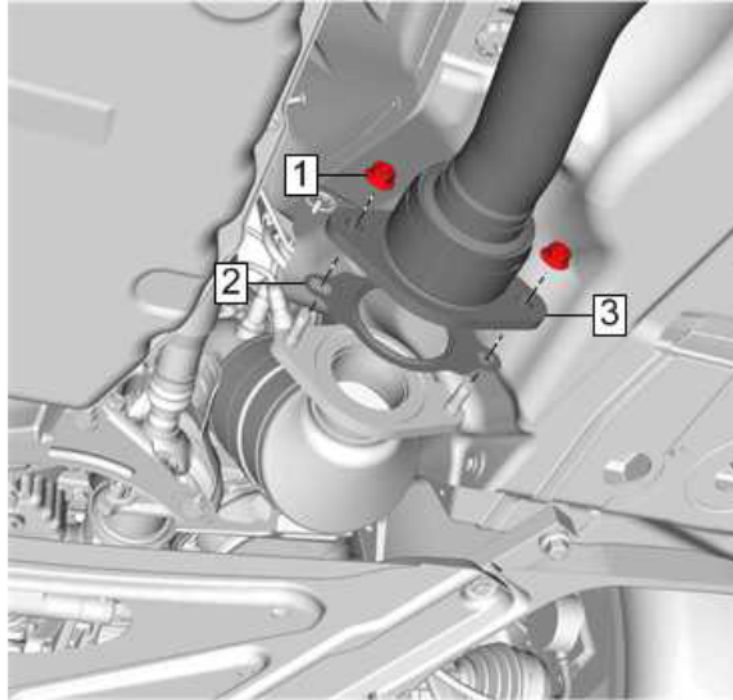


Fig. 55: Exhaust Muffler

Courtesy of GENERAL MOTORS COMPANY

4. Catalytic Converter Nut (1)» Install and tighten [2x] 50 N.m (37 lb ft)

CAUTION: Refer to **Fastener Caution** .

5. Exhaust Muffler Isolator (1)» Connect [4x]

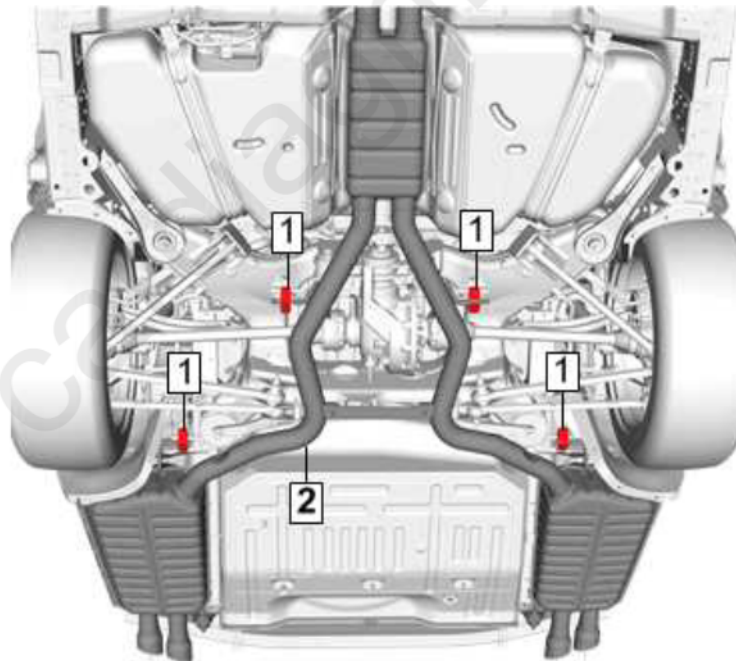


Fig. 56: Exhaust Muffler Assembly

Courtesy of GENERAL MOTORS COMPANY

NOTE: Clean and lubricate the exhaust isolators for ease of installation.

6. Exhaust Pipe Clamp Nut (1)» Tighten [2x] 50 N.m (37 lb ft)

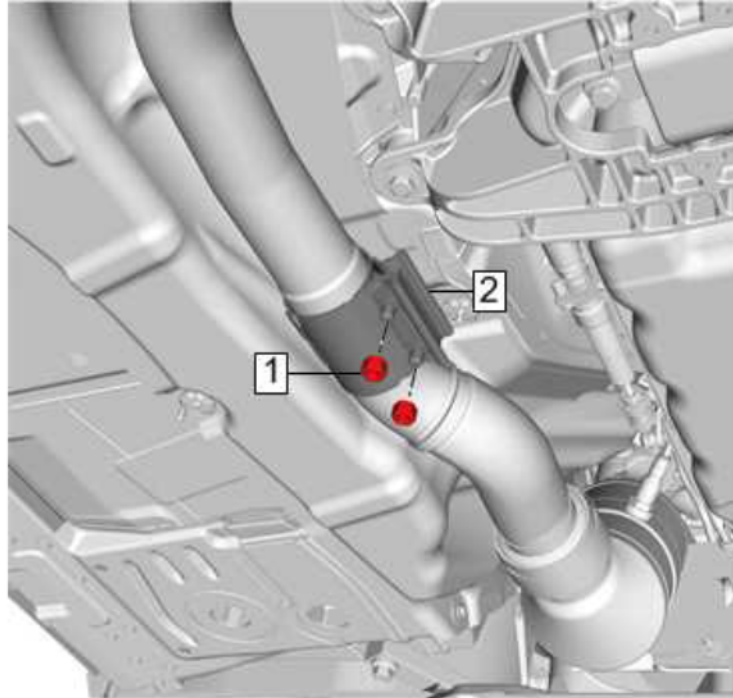


Fig. 57: Exhaust Pipe Clamp Nut And Clamp
Courtesy of GENERAL MOTORS COMPANY

7. Floor Panel Number 4 Bar (4)» Install

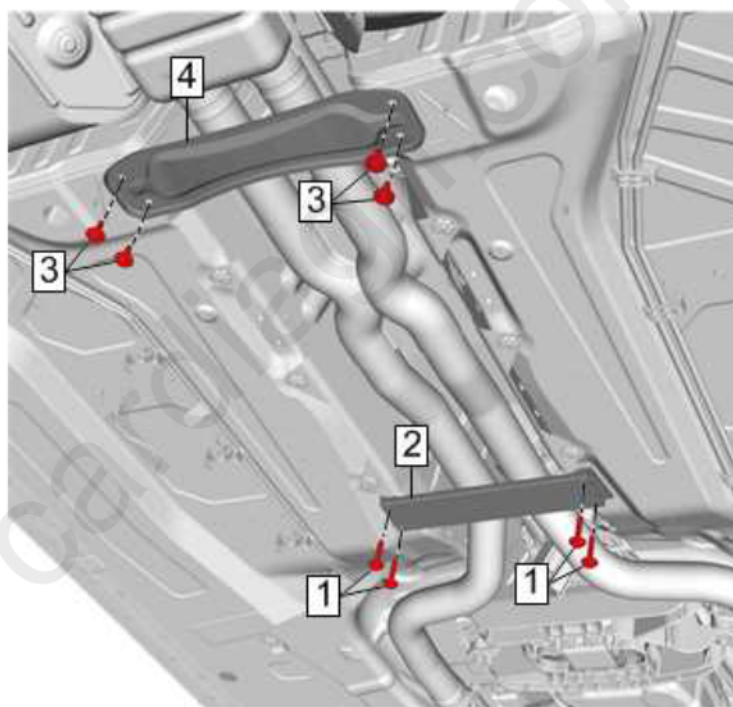


Fig. 58: Floor Panel Number 2, 4 Cross Bar Reinforcement
Courtesy of GENERAL MOTORS COMPANY

8. Floor Panel Number 4 Bar Fastener (3)» Install and tighten [4x] 22 N.m (16 lb ft)
9. Floor Panel Number 2 Cross Bar Reinforcement (2)» Install
10. Floor Panel Number 2 Cross Bar Reinforcement Bolt (1)» Install and tighten [4x] 22 N.m (16 lb ft)
11. **Exhaust Rear Muffler Rear Hanger Replacement (LGW, LGX, LTG)**» Install

EXHAUST MUFFLER REPLACEMENT (LTG WITH HP9)

Removal Procedure

WARNING: Refer to **Moving Parts and Hot Surfaces Warning** .

WARNING: Refer to **Safety Glasses Warning** .

1. Floor Panel Number 2 Cross Bar Reinforcement (2)» Remove - [Floor Panel Number 2 Cross Bar Reinforcement Replacement](#)

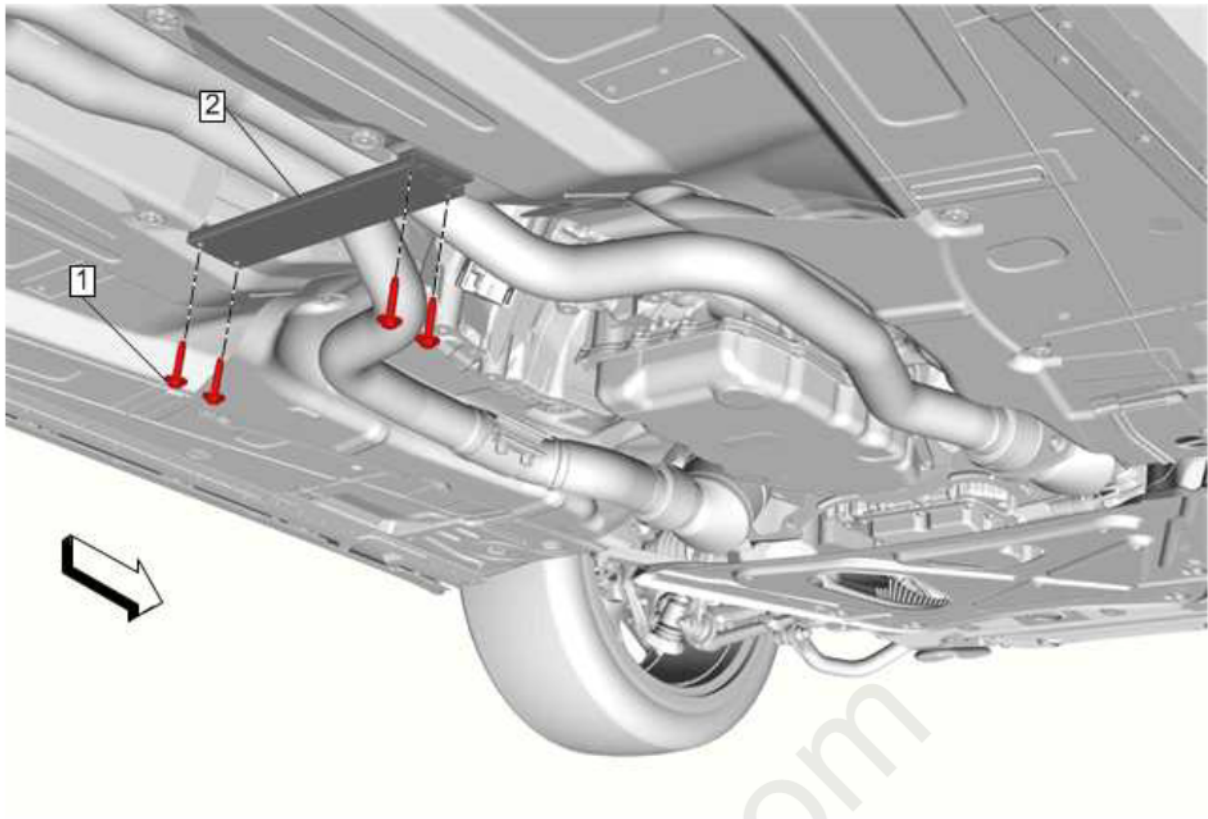


Fig. 59: Floor Panel Number 2 Cross Bar Reinforcement
Courtesy of GENERAL MOTORS COMPANY

2. Floor Panel Number 3 Cross Bar Reinforcement (2)» Remove - [Floor Panel Number 3 Cross Bar Reinforcement Replacement](#)

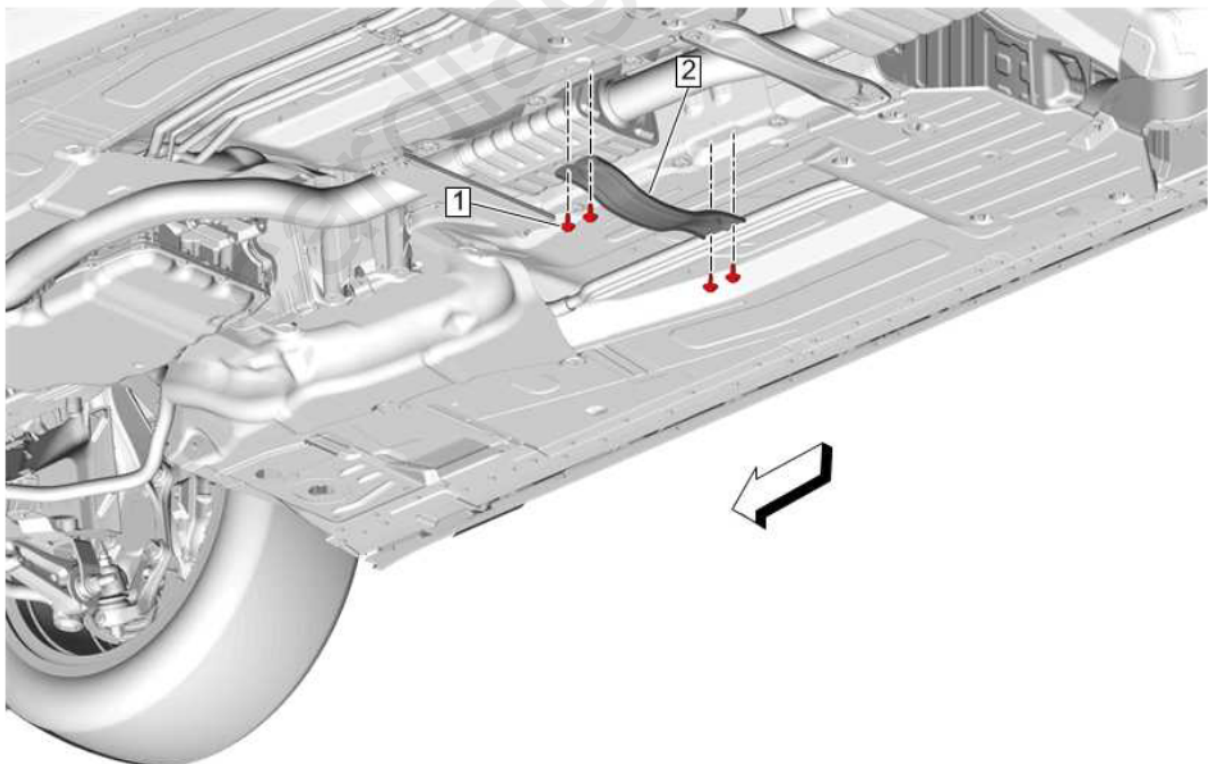


Fig. 60: Floor Panel Number 3 Cross Bar Reinforcement
Courtesy of GENERAL MOTORS COMPANY

3. Floor Panel Number 4 Cross Bar (2)» Remove - [Floor Panel Number 4 Cross Bar Replacement](#)

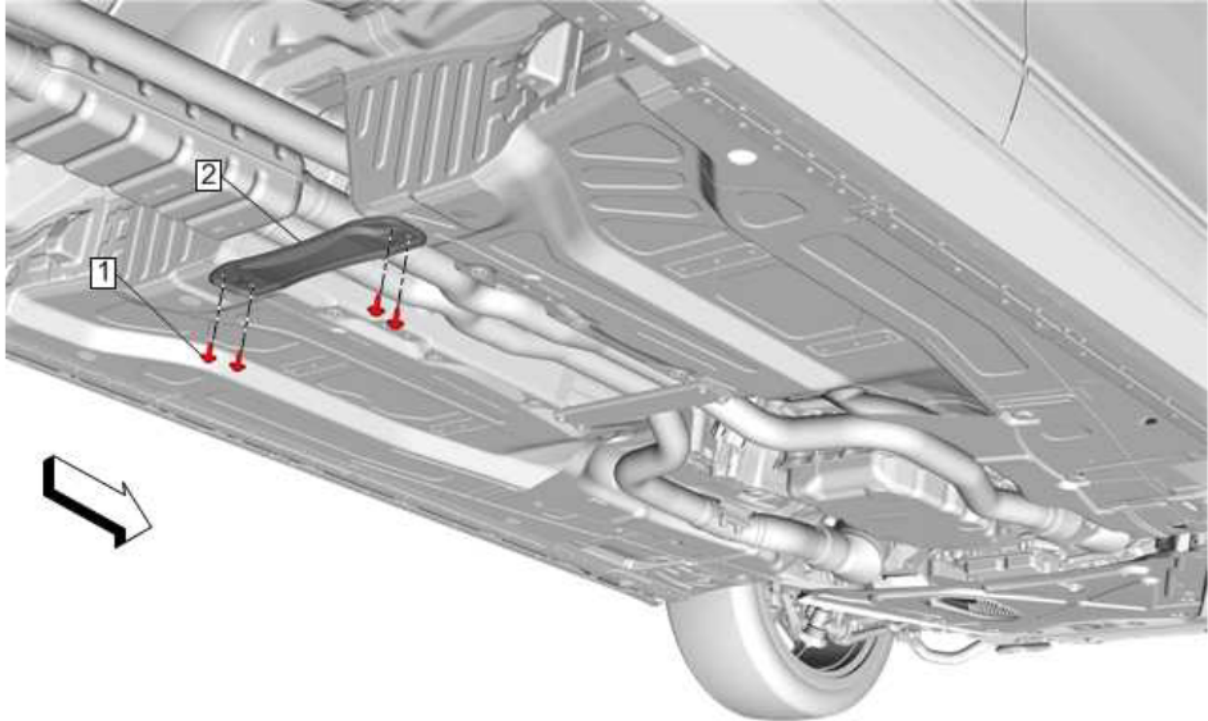


Fig. 61: Floor Panel Number 4 Cross Bar
 Courtesy of GENERAL MOTORS COMPANY

4. Support the exhaust system.
5. Catalytic Converter Nut (1)» Remove [2x]

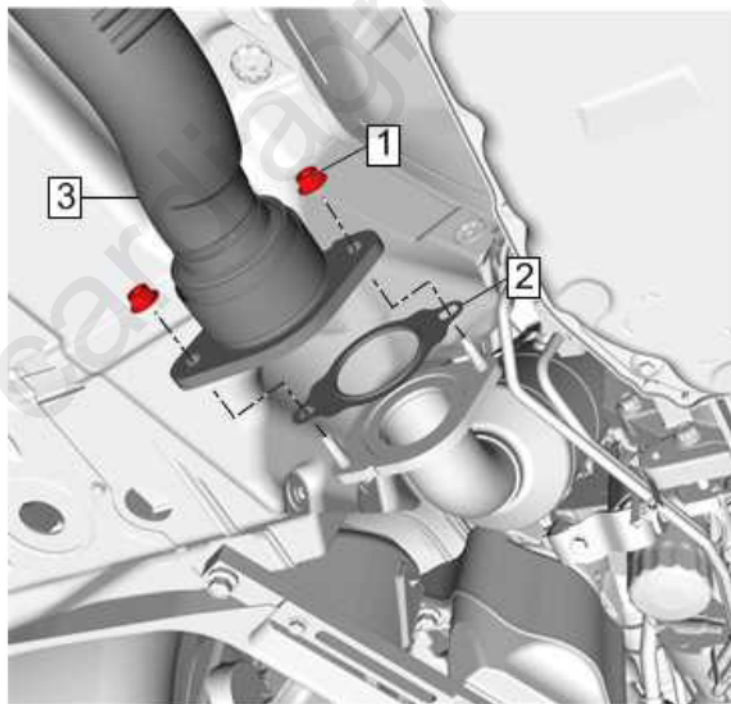


Fig. 62: Exhaust Gasket
 Courtesy of GENERAL MOTORS COMPANY

6. Exhaust Gasket (2)» Remove and DISCARD
7. Exhaust Muffler Assembly (3)» Remove
8. Exhaust Muffler Isolator (1)» Disengage [3x]

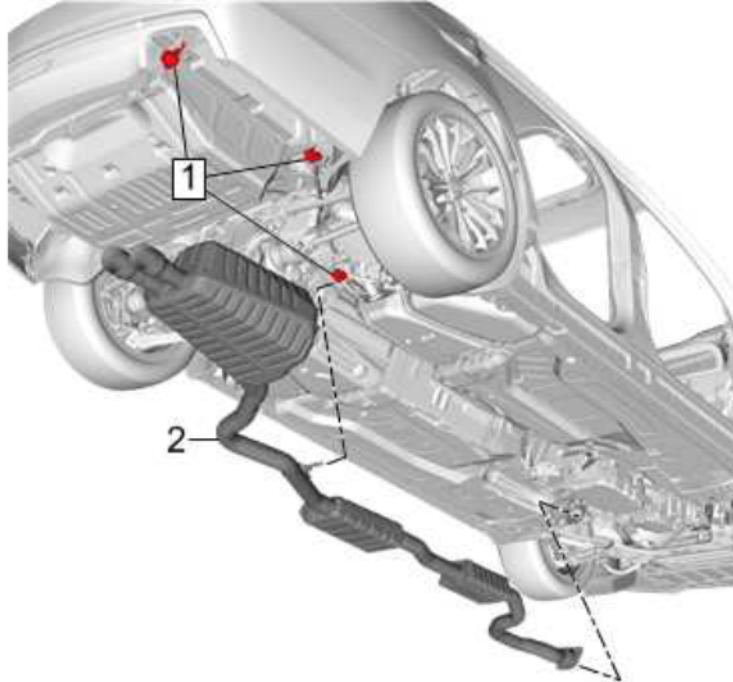


Fig. 63: Exhaust Muffler Isolator

Courtesy of GENERAL MOTORS COMPANY

9. With the aid of an assistant, lower the exhaust system from the vehicle. (2)

Installation Procedure

1. With the aid of an assistant, install the exhaust system to the vehicle. (2)

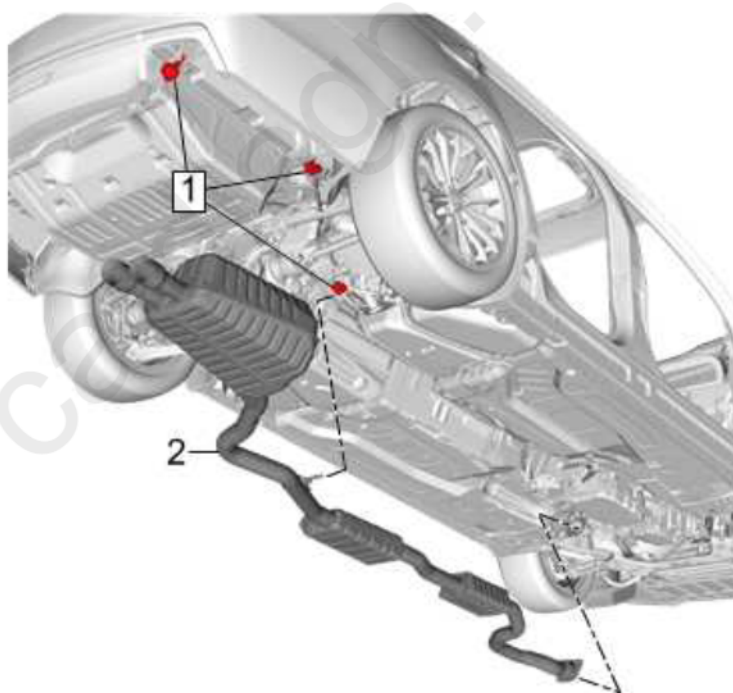


Fig. 64: Exhaust Muffler Isolator

Courtesy of GENERAL MOTORS COMPANY

2. Exhaust Muffler Isolator (1)» Install [3x]

NOTE: Clean and lubricate the exhaust isolators for ease of installation.

3. Support the exhaust system.
4. Exhaust Gasket (2)» Install

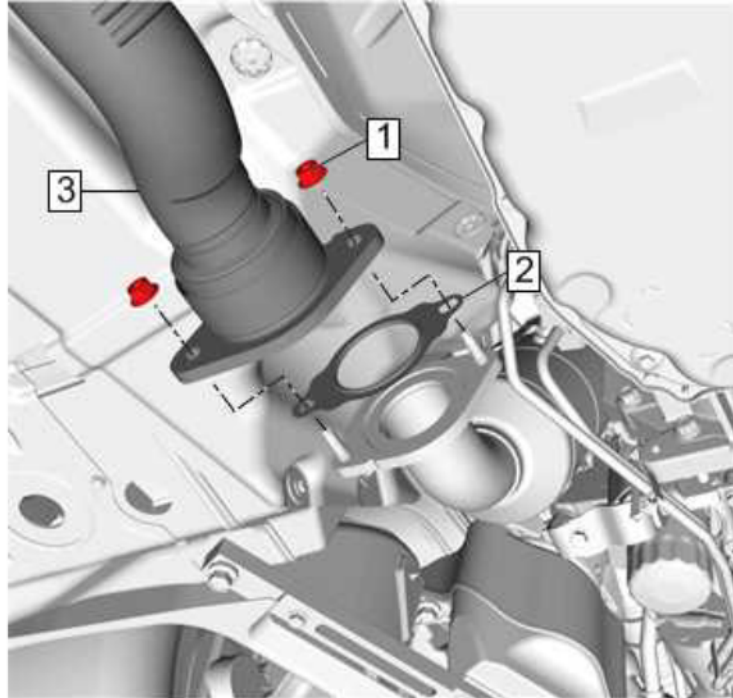


Fig. 65: Exhaust Gasket

Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a **NEW** gasket.

5. Exhaust Muffler Assembly (3)» Install
6. Catalytic Converter Nut (1)» Install and tighten [2x] 50 N.m (37 lb ft)

CAUTION: Refer to **Fastener Caution** .

7. Floor Panel Number 4 Cross Bar (2)» Install - **Floor Panel Number 4 Cross Bar Replacement**

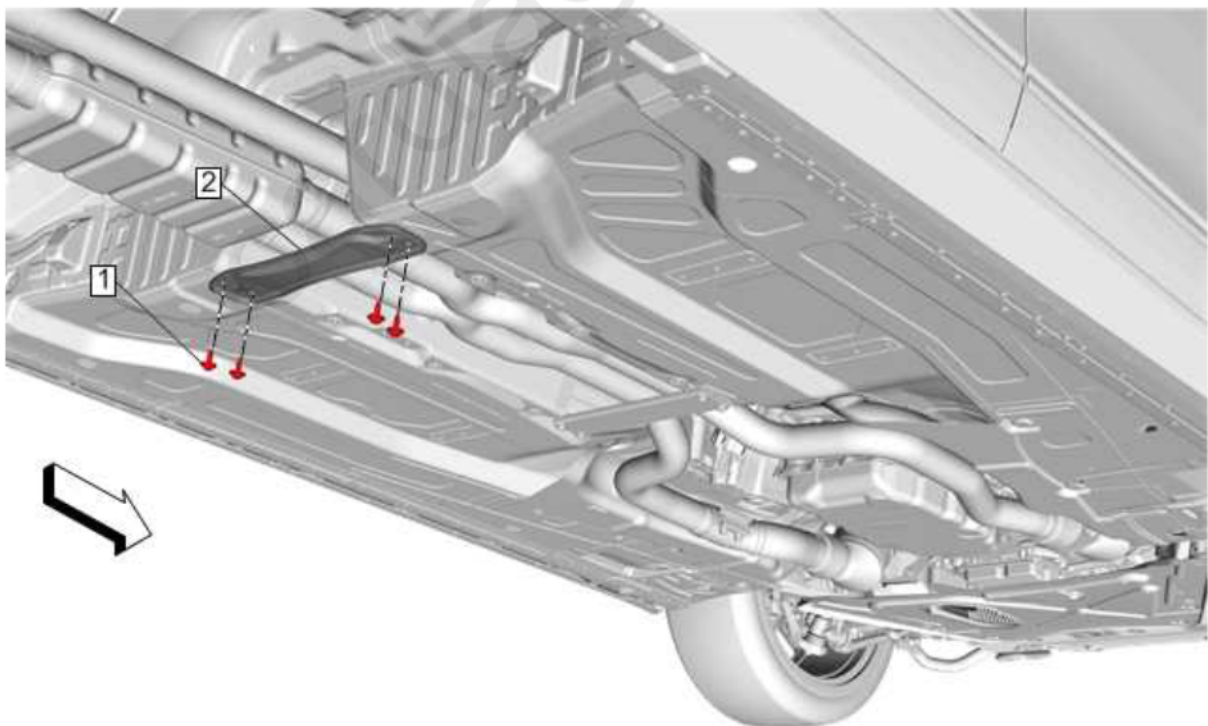


Fig. 66: Floor Panel Number 4 Cross Bar

Courtesy of GENERAL MOTORS COMPANY

8. Floor Panel Number 3 Cross Bar Reinforcement (2)» Install - **Floor Panel Number 3 Cross Bar Reinforcement Replacement**

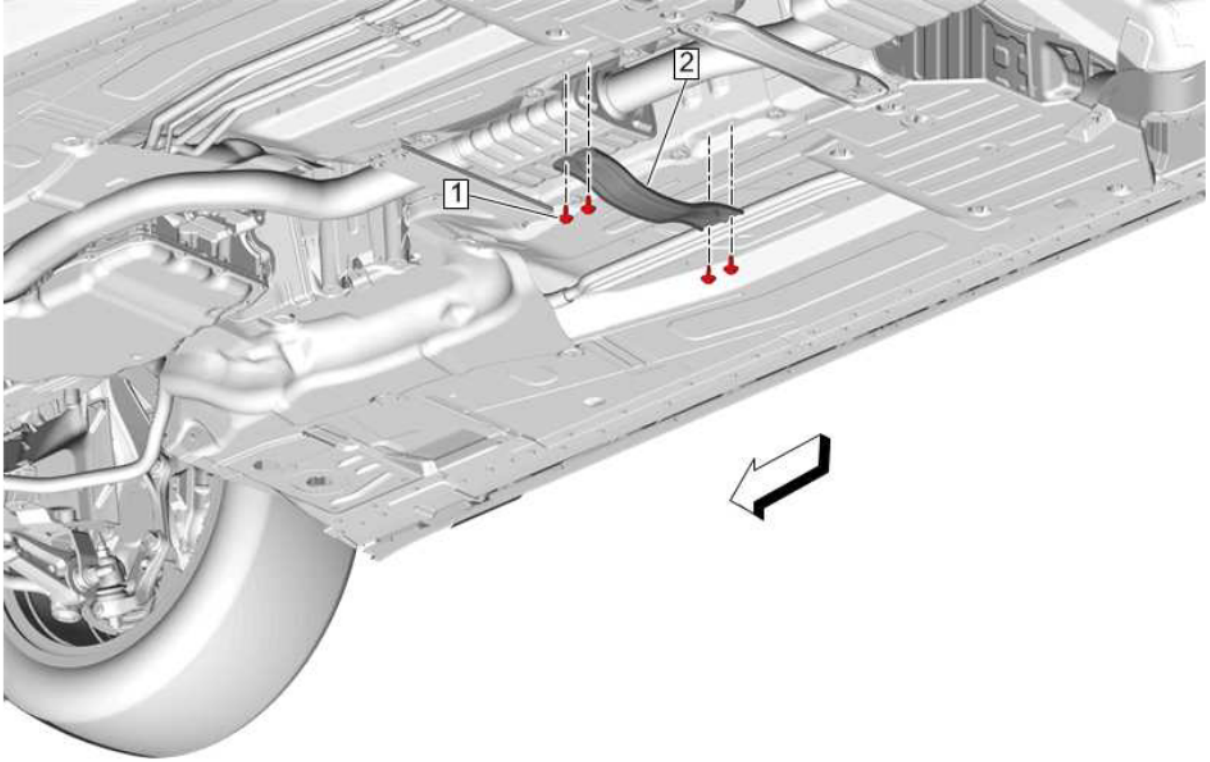


Fig. 67: Floor Panel Number 3 Cross Bar Reinforcement

Courtesy of GENERAL MOTORS COMPANY

9. Floor Panel Number 2 Cross Bar Reinforcement (2)» Install - **Floor Panel Number 2 Cross Bar Reinforcement Replacement**

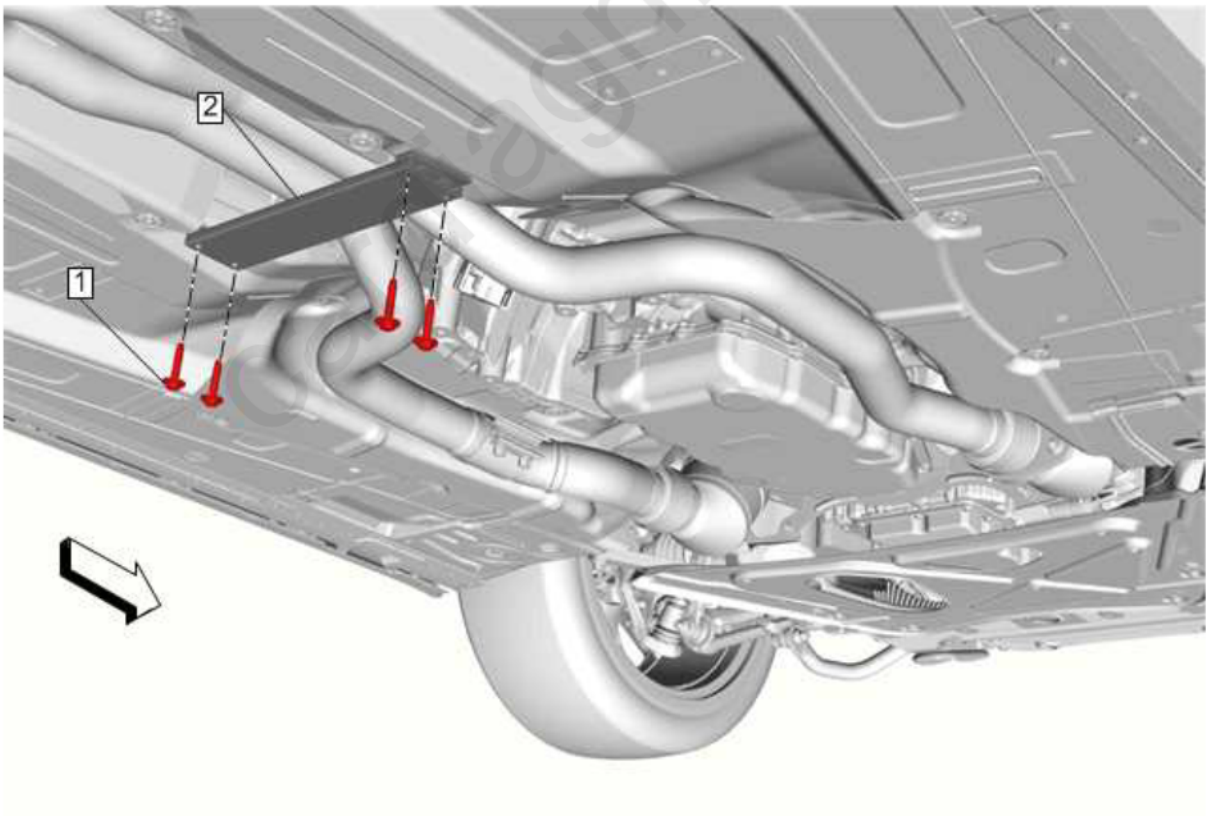


Fig. 68: Floor Panel Number 2 Cross Bar Reinforcement

Courtesy of GENERAL MOTORS COMPANY

INTERMEDIATE BODY EXHAUST HEAT SHIELD REPLACEMENT (LGW, LGX, LTG)

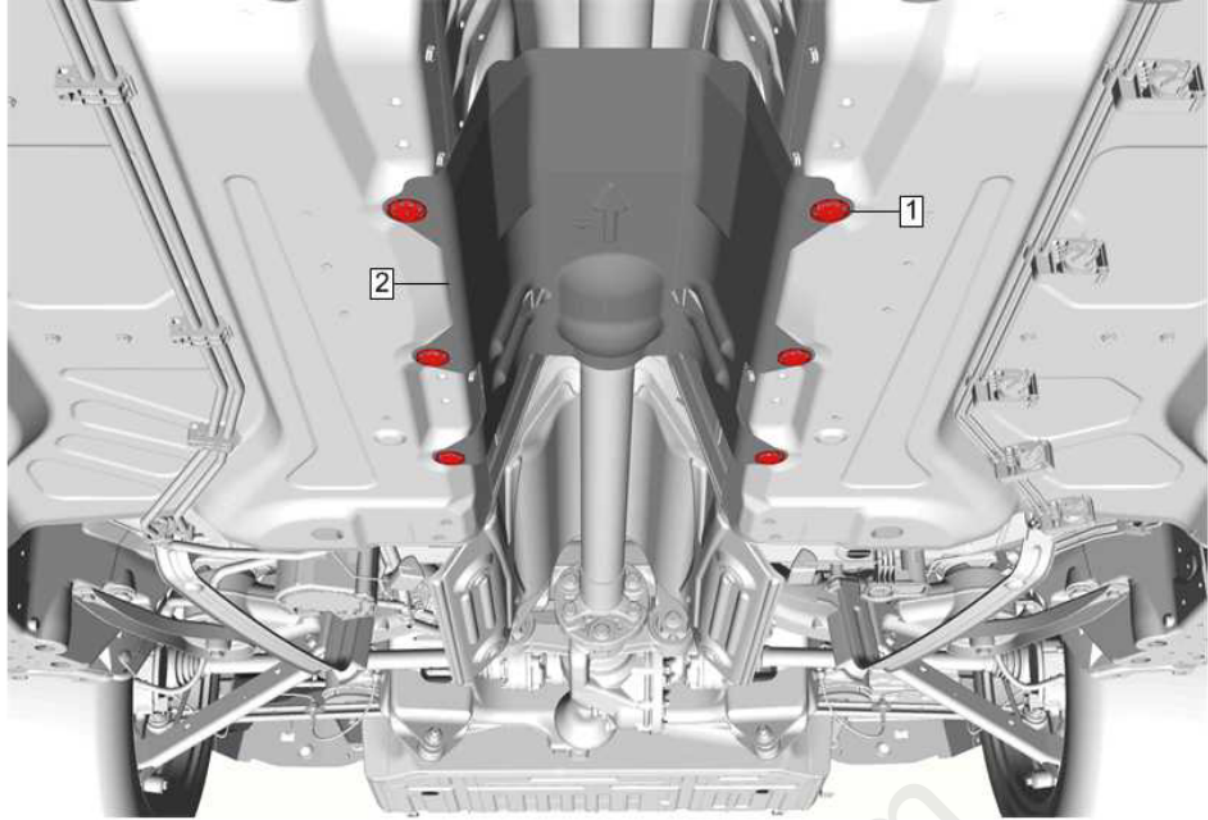


Fig. 69: Intermediate Body Exhaust Heat Shield (LGW, LGX, LTG)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Exhaust Muffler Replacement (LTG without HP9)</u> <u>Exhaust Muffler Replacement (LGW, LGX)</u> <u>Exhaust Muffler Replacement (LTG with HP9)</u>	
1	Intermediate Body Exhaust Heat Shield Retainer [6x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.75 N.m (15 lb in)
2	Intermediate Body Exhaust Heat Shield

FRONT BODY EXHAUST HEAT SHIELD REPLACEMENT (RIGHT SIDE, LTG)

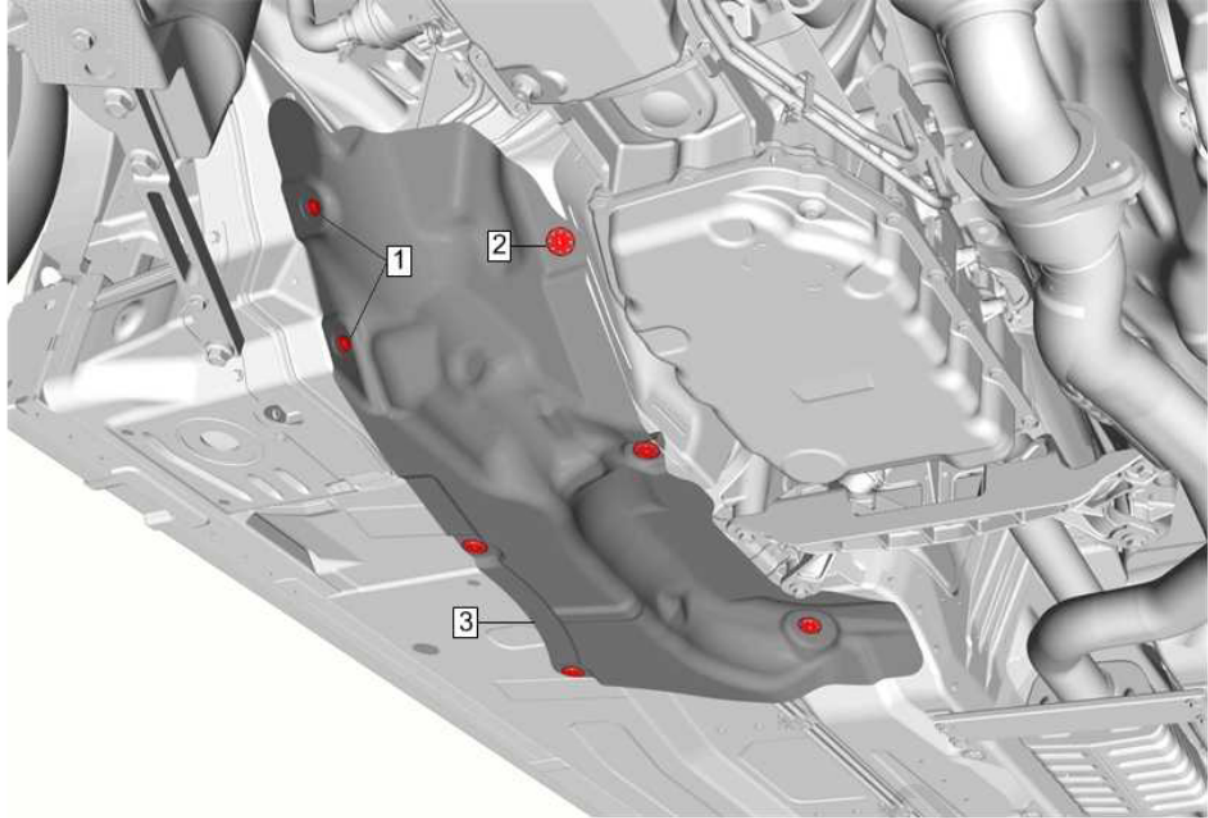


Fig. 70: Front Body Exhaust Heat Shield (Right Side, LTG)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Lifting and Jacking the Vehicle</u>	
1	Front Body Exhaust Heat Shield Bolt [2x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
2	Front Body Exhaust Heat Shield Retainer [5x] Tighten 1.75 N.m (15 lb in)
3	Front Body Exhaust Heat Shield

FRONT BODY EXHAUST HEAT SHIELD REPLACEMENT (LEFT SIDE, LTG)

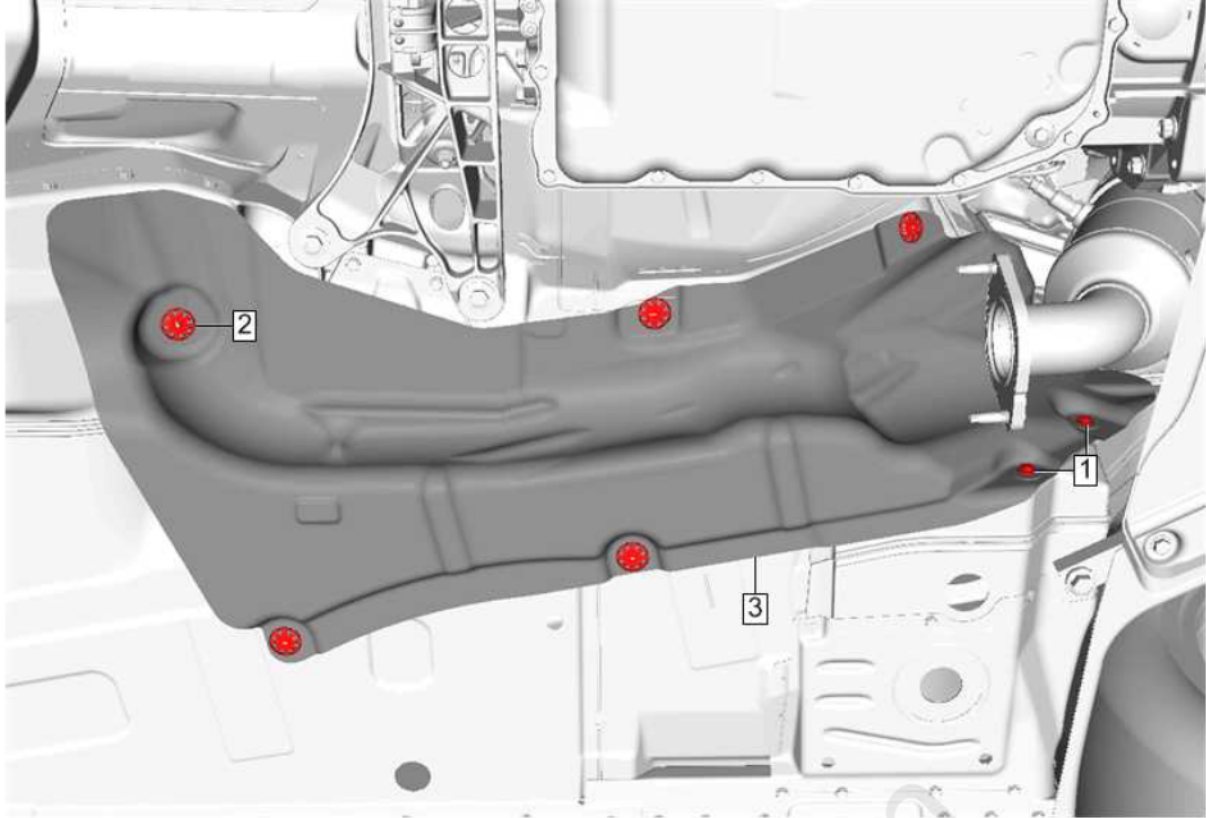


Fig. 71: Front Body Exhaust Heat Shield (Left Side, LTG)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Exhaust Muffler Replacement (LTG without HP9)</u> <u>Exhaust Muffler Replacement (LTG with HP9)</u>	
1	Front Body Exhaust Heat Shield Bolt [2x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
2	Front Body Exhaust Heat Shield Retainer [5x] Tighten 1.75 N.m (15 lb in)
3	Front Body Exhaust Heat Shield

FRONT BODY EXHAUST HEAT SHIELD REPLACEMENT (RIGHT SIDE, LGW, LGX)

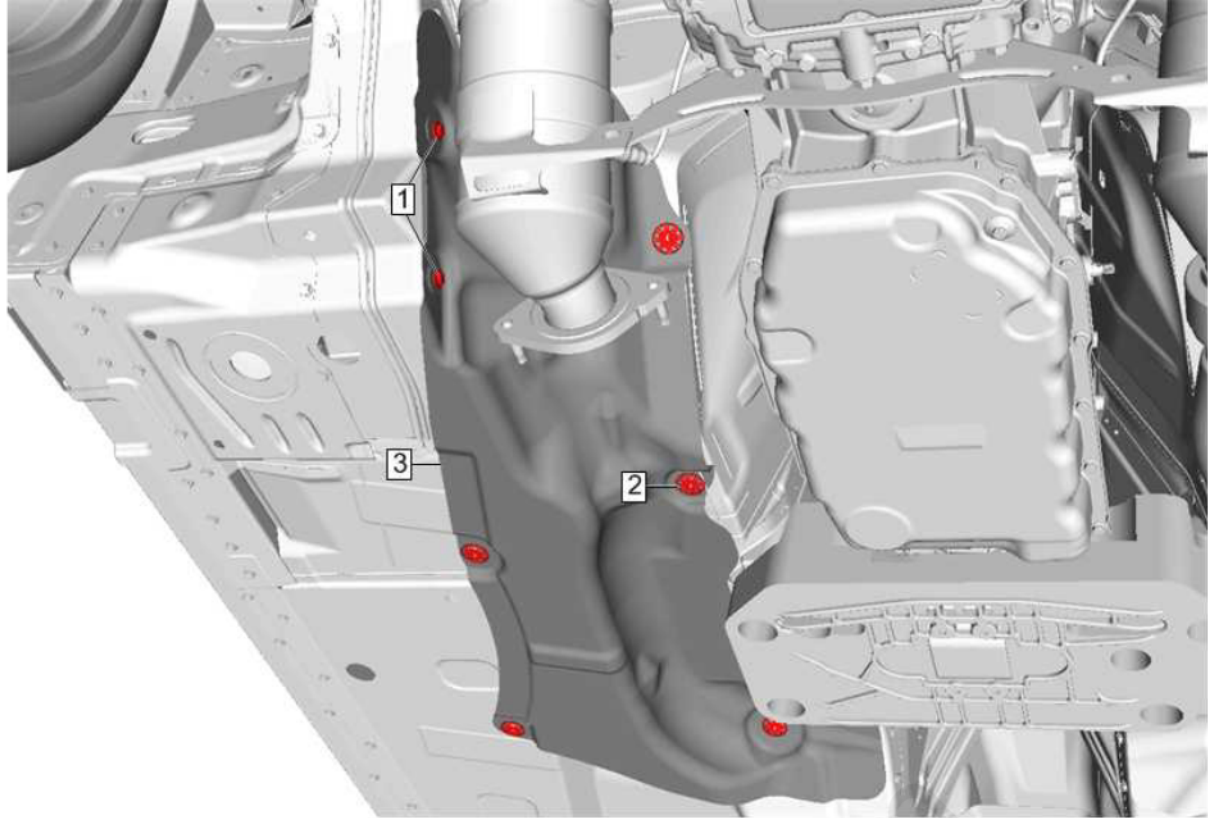


Fig. 72: Front Body Exhaust Heat Shield (Right Side, LGW, LGX)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Exhaust Muffler Replacement (LGW, LGX)</u>	
1	Front Body Exhaust Heat Shield Bolt [2x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
2	Front Body Exhaust Heat Shield Retainer [5x] Tighten 1.75 N.m (15 lb in)
3	Front Body Exhaust Heat Shield

FRONT BODY EXHAUST HEAT SHIELD REPLACEMENT (LEFT SIDE, LGW, LGX)

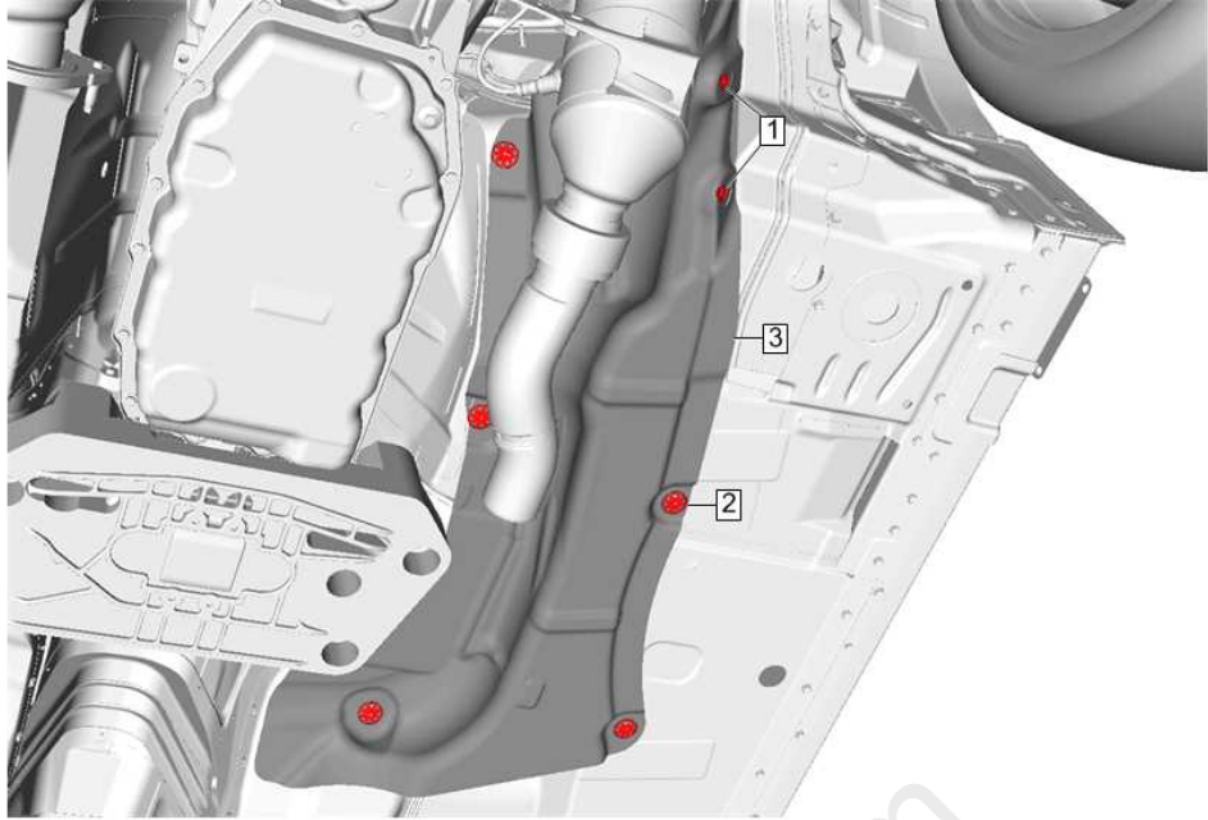


Fig. 73: Front Body Exhaust Heat Shield (Left Side, LGW, LGX)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Exhaust Muffler Replacement (LGW, LGX)	
1	Front Body Exhaust Heat Shield Bolt [2x] CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
2	Front Body Exhaust Heat Shield Retainer [5x] Tighten 1.75 N.m (15 lb in)
3	Front Body Exhaust Heat Shield

REAR BODY EXHAUST HEAT SHIELD REPLACEMENT

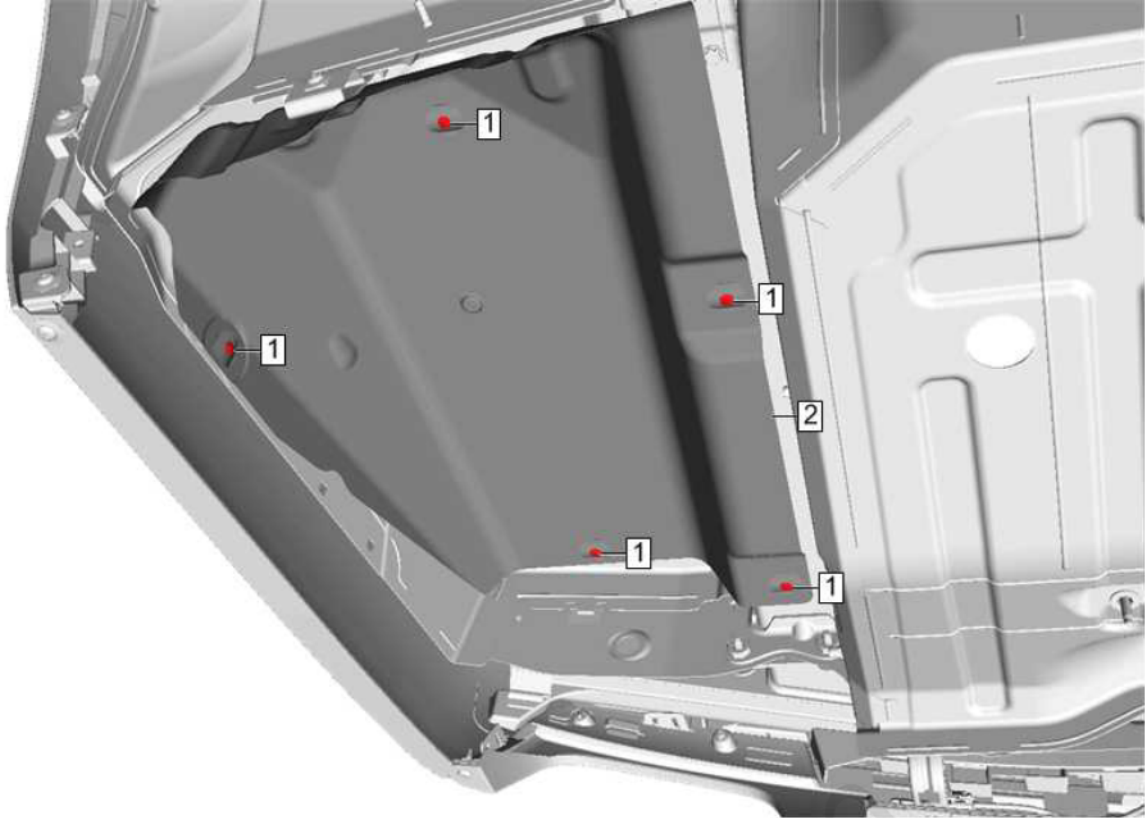


Fig. 74: Rear Body Exhaust Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Exhaust Muffler Replacement (LTG without HP9)</u> <u>Exhaust Muffler Replacement (LGW, LGX)</u> <u>Exhaust Muffler Replacement (LTG with HP9)</u>	
1	Rear Body Exhaust Heat Shield Rivet [5x] Procedure Drill out the rivets.
2	Rear Body Exhaust Heat Shield

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT (UPPER, LTG)

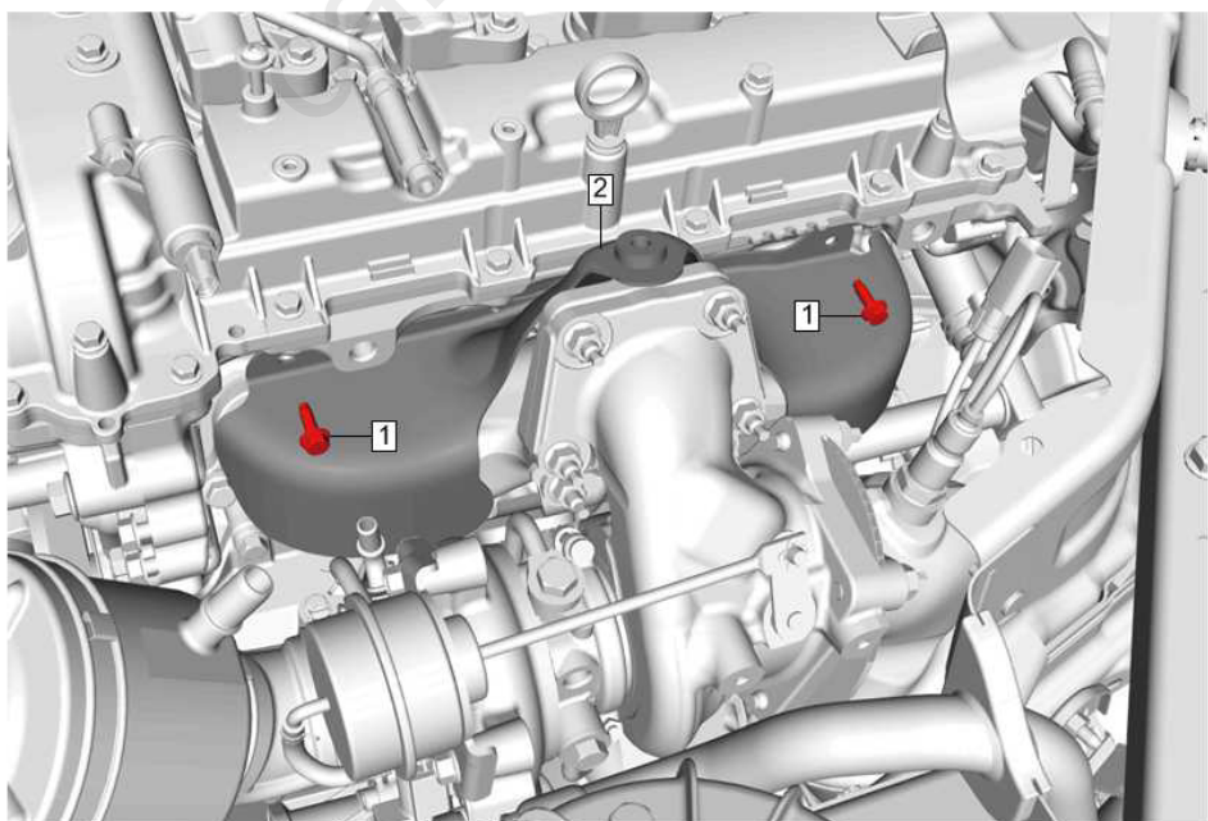


Fig. 75: Exhaust Manifold Heat Shield (Upper, LTG)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.	
WARNING: Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid personal injury.	
Preliminary Procedure Turbocharger Replacement	
1	Exhaust Manifold Heat Shield Bolt [2x] CAUTION: Refer to Fastener Caution . Tighten 10 N.m (89 lb in)
2	Exhaust Manifold Heat Shield - Upper

TURBOCHARGER HEAT SHIELD REPLACEMENT (LEFT, LGW)

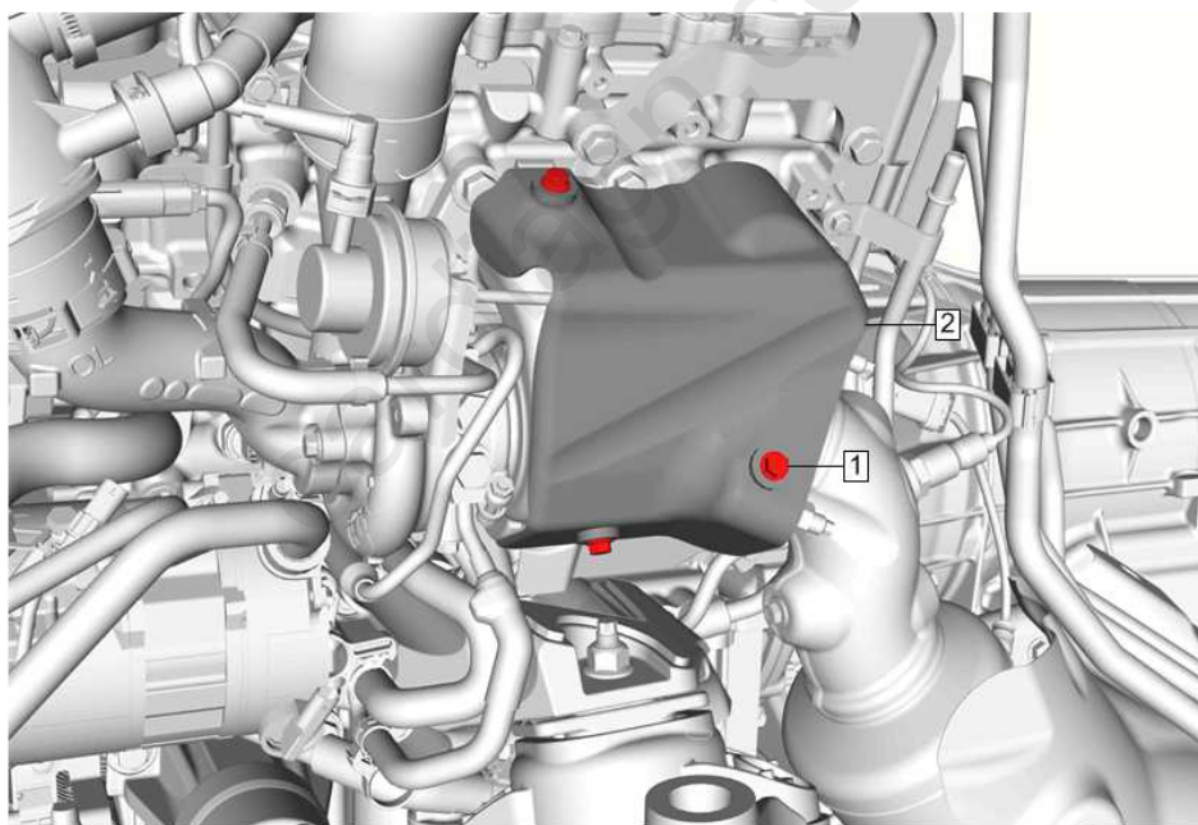


Fig. 76: Turbocharger Heat Shield (Left, LGW)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.	
Preliminary Procedures 1. Charge Air Cooler Inlet Air Tube Replacement (Left Side) 2. Warm Up Three-Way Catalytic Converter Replacement (Left, LGW) 3. Mid Intermediate Steering Shaft Replacement (LGW)	
1	Turbocharger Heat Shield Bolt [3x] CAUTION: Refer to Fastener Caution . Tighten 10 N.m (89 lb in)
2	Turbocharger Heat Shield

TURBOCHARGER HEAT SHIELD REPLACEMENT (RIGHT, LGW)

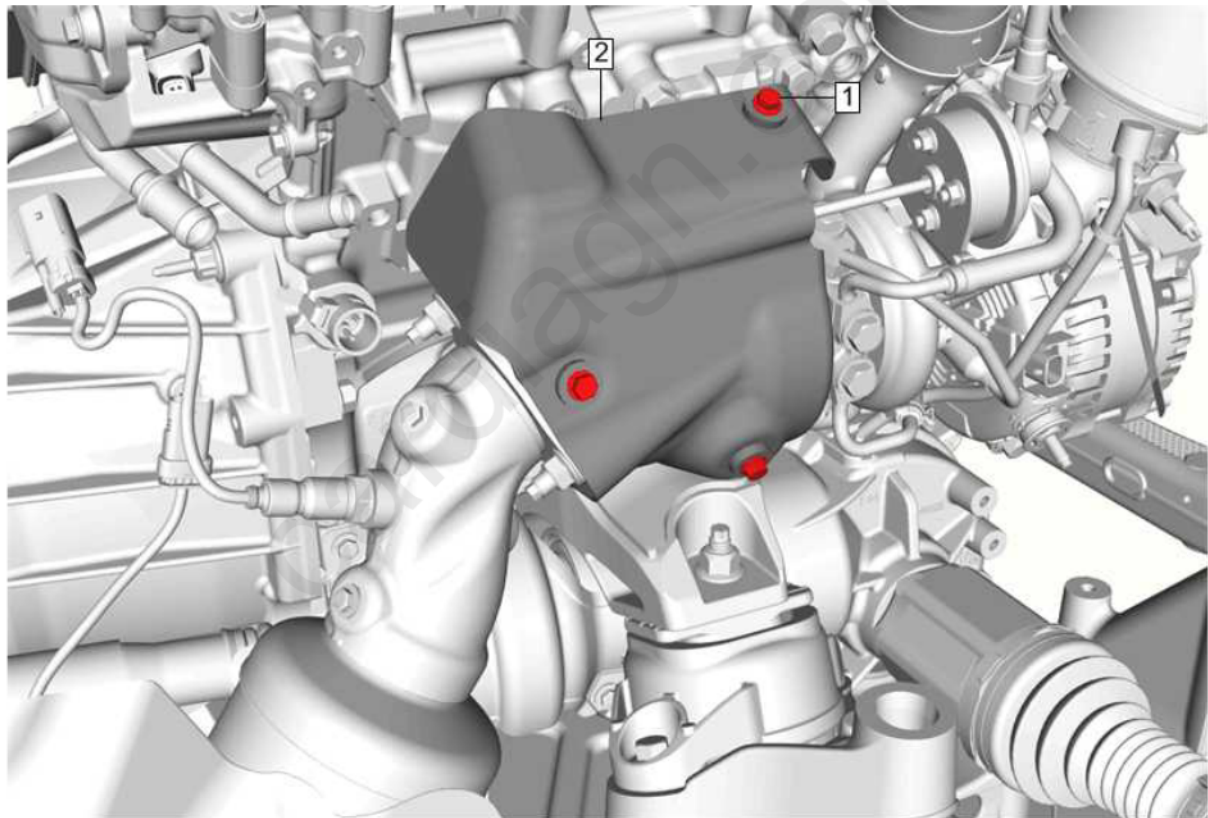


Fig. 77: Turbocharger Heat Shield (Right, LGW)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.	
Preliminary Procedures 1. Charge Air Cooler Inlet Air Tube Replacement (Right Side) 2. Warm Up Three-Way Catalytic Converter Replacement (Right, LGW)	

Callout	Component Name
1	Turbocharger Heat Shield Bolt [3x] CAUTION: Refer to Fastener Caution . Tighten 10 N.m (89 lb in)
2	Turbocharger Heat Shield

DESCRIPTION AND OPERATION

EXHAUST SYSTEM DESCRIPTION

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

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

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

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

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

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

The exhaust system may be comprised of the following components:

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

Resonator

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

Catalytic Converter

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

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

- Platinum (Pt)

- Palladium (Pd)
- Rhodium (Rh)

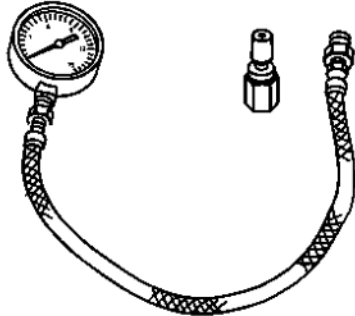
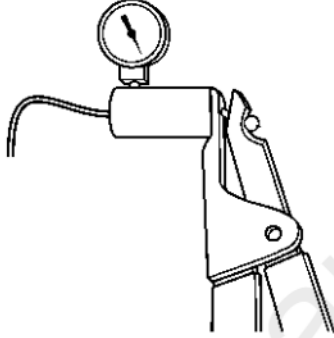
The catalyst in the converter is not serviceable.

Muffler

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

Illustration	Tool Number/Description
	EN 35314-A J 35314-A Exhaust Back Pressure Gauge
	J 35555 Vacuum Pump