

2018 ENGINE

Exhaust - Equinox & Terrain

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	
Exhaust Gasket	
Exhaust Manifold 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)
Catalytic Converter Clamp (LH7)	6 N.m (53 lb in)
Exhaust Manifold Bolt (LTG)	20 N.m (15 lb ft)
Exhaust Manifold Bolt (LH7)	
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 (LTG, LYX)	22 N.m (16 lb ft)
Catalytic Converter Brace Bracket Nut (LYX)	22 N.m (16 lb ft)
Catalytic Converter Brace Bracket Nut (LH7)	22 N.m (16 lb ft)
Catalytic Converter Brace Bracket Nut @ Transmission Housing Stud (LYX)	58 N.m (43 lb ft)
Catalytic Converter Brace Nut {LH7}	22 N.m (16 lb ft)
Catalytic Converter Clamp (LH7)	25 N.m (18 lb ft)
Catalytic Converter Clamp Bolt (LYX)	15 N.m (11 lb ft)
Catalytic Converter Heat Shield Bolt (LTG)	10 N.m (89 lb in)
Catalytic Converter Heat Shield Bolt (LH7)	10 N.m (89 lb in)
Catalytic Converter Nut (LTG, LYX)	22 N.m (16 lb ft)
Catalytic Converter Nut @Turbocharger (LTG)	50 N.m (37 lb ft)
Catalytic Converter Stud (LH7)	9 N.m (80 lb in)
Exhaust Front Pipe Bracket Bolt (LTG)	22 N.m (16 lb ft)
Exhaust Front Pipe Hanger Bracket Bolt (LTG)	22 N.m (16 lb ft)

NOTE:

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

Application	Specification
	Metric (English)
Exhaust Front Pipe Nut (LH7)	22 N.m (16 lb ft)
Exhaust Front Pipe Nut (LTG, LYX)	22 N.m (16 lb ft)
Exhaust Front Underbody Heat Shield Retainer	1.5 N.m (13 lb in)
Exhaust Gas Recirculation Pipe Bolt (LH7)	10 N.m (89 lb in)
Exhaust Gas Recirculation Cooler Temperature Sensor-Position 1 (LH7)	45 N.m (33 lb ft)
Exhaust Intermediate Underbody Heat Shield Retainer	1.5 N.m (13 lb in)
Exhaust Manifold Brace Bolt (LTG)	25 N.m (18 lb ft)
Exhaust Manifold Brace Nut (LTG)	25 N.m (18 lb ft)
Exhaust Manifold Heat Shield Fastener (LTG)	14 N.m (10 lb ft)
Exhaust Muffler Heat Shield Retainer	1.5 N.m (13 lb in)
Exhaust Rear Muffler Insulator Bolt (LYX)	22 N.m (16 lb ft)
Exhaust Rear Underbody Heat Shield Retainer (LH7)	1.5 N.m (13 lb in)
Front Cradle Brace Bolt (LTG)	58 N.m (43 lb ft)
Turbocharger Heat Shield Bolt (LH7)	9 N.m (80 lb in)
Turbocharger Heat Shield Nut (LH7)	9 N.m (80 lb in)

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	-
2	Did you review the exhaust symptoms diagnostic information and perform the necessary inspections?	-	Go to Step 3	Go to Symptoms - Engine Exhaust

Step	Action	Value(s)	Yes	No
3	Is the system equipped with dual exhaust?	-	Go to Diagnostic Aids	Go to Step 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.	14 kPa (2 psi)		
	Does the reading exceed the specified value?		Go to Step 5	Go to Step 8
5	1. Turn the engine off and place the ignition in the lock position. 2. Remove the J-35314-A 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.	14 kPa (2 psi)		
	Does the reading exceed the specified value?		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.
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 (LH7)

Removal Procedure

1. Remove Turbocharger - [Turbocharger Replacement](#)

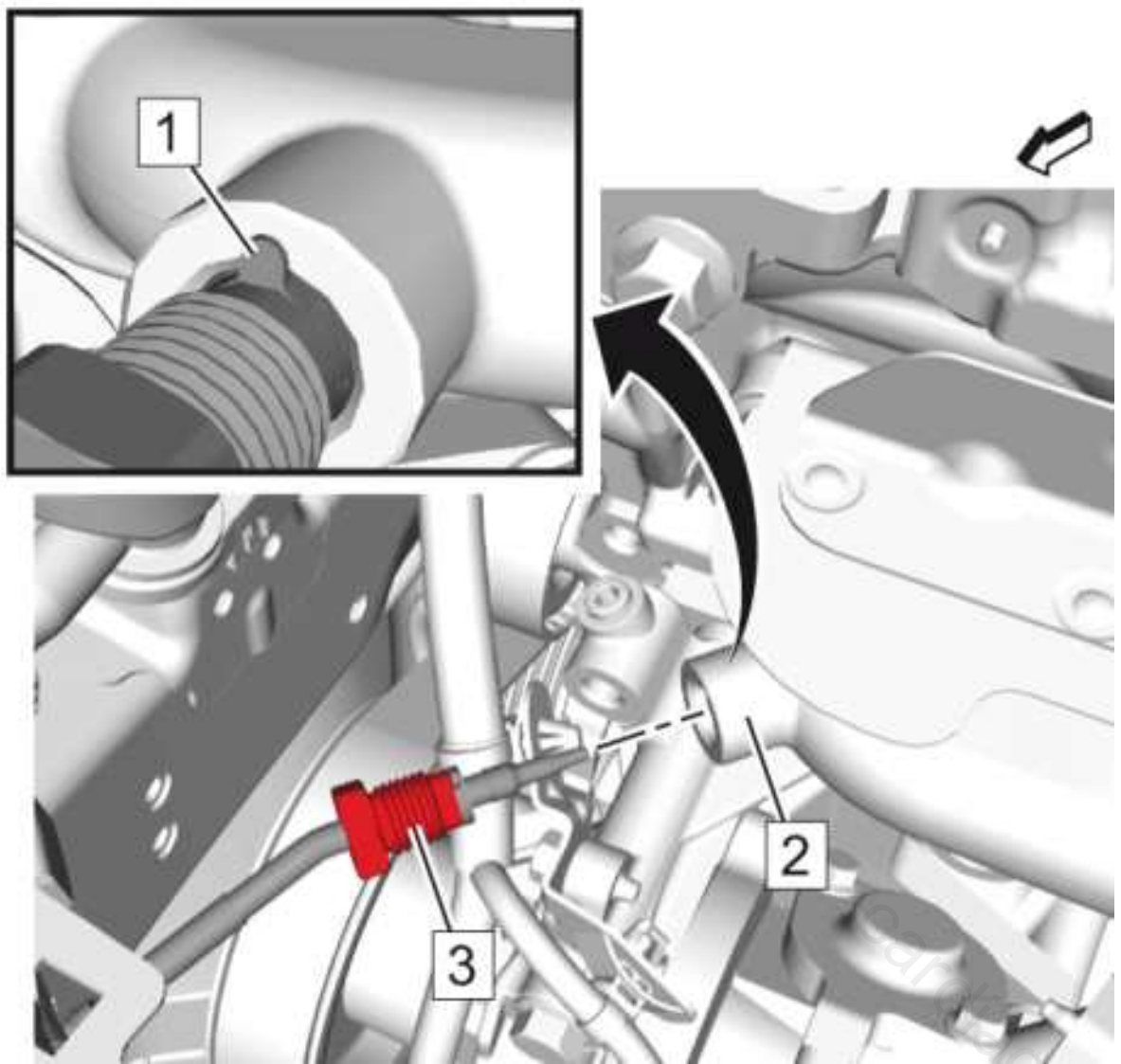


Fig. 1: Exhaust Gas Recirculation Cooler Temperature Sensor
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Exhaust Gas Recirculation Cooler Temperature Sensor- Position 1(1) @Exhaust Manifold (2).

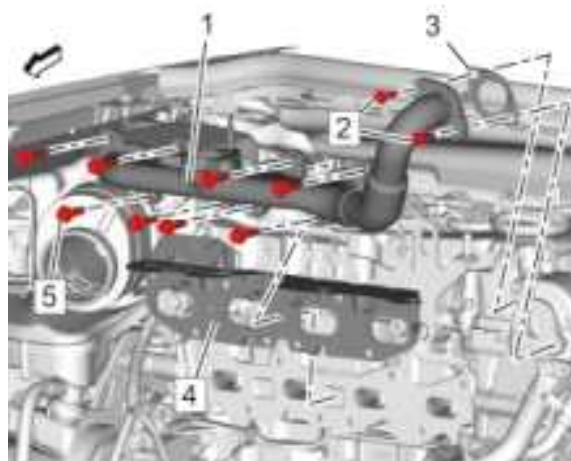


Fig. 2: Exhaust Gas Recirculation Pipe Bolt And Exhaust Manifold Bolt
 Courtesy of GENERAL MOTORS COMPANY

3. Remove Exhaust Gas Recirculation Pipe Bolt (2) - [2x]
4. Remove Exhaust Manifold Bolt (5) and DISCARD[8x]

NOTE: Do NOT bend the exhaust gas recirculation pipe.

5. Remove Exhaust Manifold (1).

6. Remove and DISCARD the exhaust manifold gasket. (4)
7. Remove Exhaust Gas Recirculation Pipe Gasket (3) and DISCARD

Installation Procedure

1. Re-cut the thread at the cylinder head for the 8 exhaust manifold bolts.

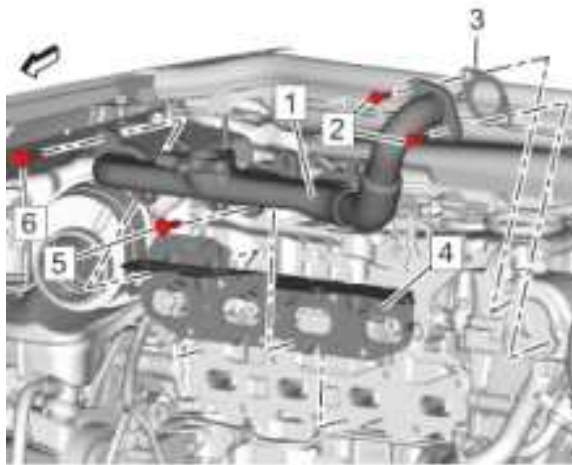


Fig. 3: Gas Recirculation Pipe Gasket

Courtesy of GENERAL MOTORS COMPANY

2. Install NEW Exhaust Gas Recirculation Pipe Gasket (3).
3. Install a NEW exhaust manifold gasket. (4)

NOTE: Do NOT grab the exhaust manifold during the assembly procedure at the EGR pipe as this is a sensitive part.

4. Install Exhaust Manifold (1).

NOTE: The service may offer bolts that are not microencapsulated. If this is the case apply thread lock agent to the bolt. If the fastener is microencapsulated, install NEW exhaust manifold bolts. DO NOT reuse the old bolts.

5. Install loosely the NEW 2 exhaust manifold bolts (5, 6).
6. Install loosely the 2 exhaust gas recirculation pipe bolts (2).

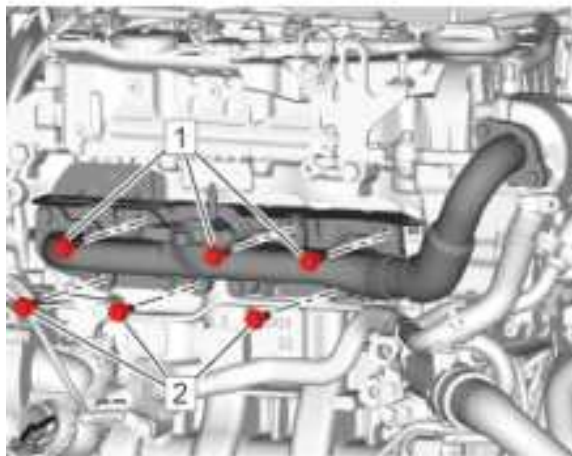


Fig. 4: Exhaust Manifold Bolts

Courtesy of GENERAL MOTORS COMPANY

7. Install loosely the NEW 6 exhaust manifold bolts (1, 2).

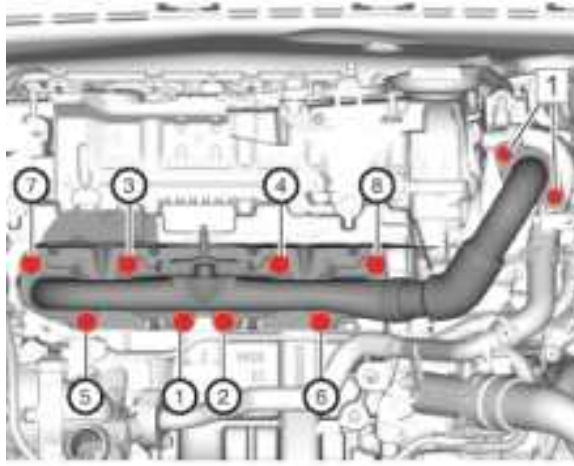


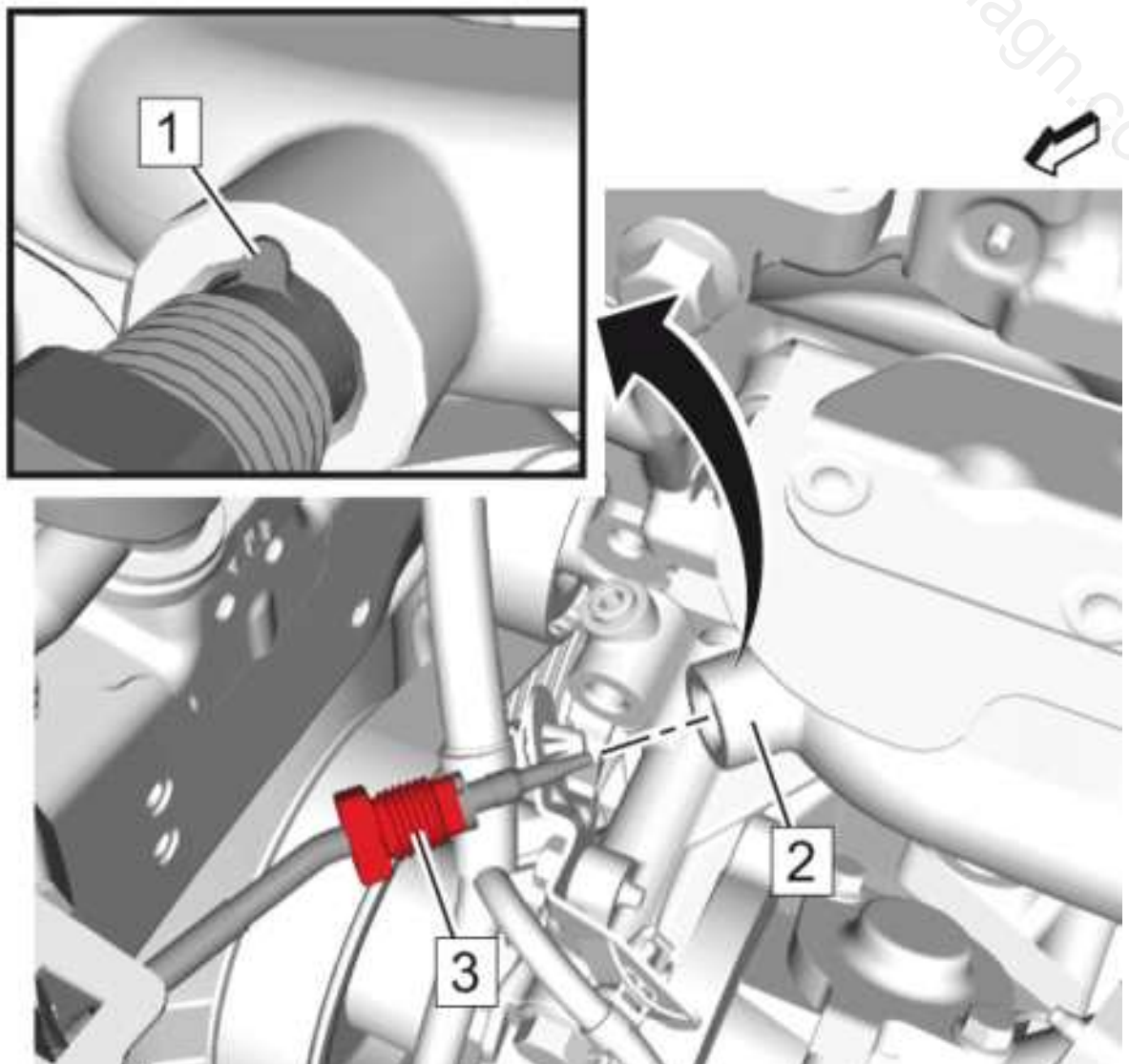
Fig. 5: Exhaust Manifold Bolt - Tighten In Sequence

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

NOTE: The complete tightening procedure should be completed within 10 minutes.

8. Exhaust Manifold Bolt - Tighten in sequence [8x]
 1. First Pass: 27 N.m (20 lb ft)
 2. Second Pass: 27 N.m (20 lb ft)
 3. Final Pass: 27 N.m (20 lb ft)
9. Exhaust Gas Recirculation Pipe Bolt (1) - Tighten [2x] 10 N.m (89 lb in)



NOTE: The guide lug (1) must fit the groove.

10. Install Exhaust Gas Recirculation Cooler Temperature Sensor- Position 1 (3) and tighten 45 N.m (33 lb ft)
11. Install Turbocharger - [Turbocharger Replacement](#)

EXHAUST MANIFOLD REPLACEMENT (LTG)

Removal Procedure

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

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

1. Remove Exhaust Manifold Heat Shield - [Exhaust Manifold Heat Shield Replacement \(LTG\)](#)
2. Remove Turbocharger - [Turbocharger Replacement \(1st Design Tamper-Proof PCV System\)](#)
3. Remove Exhaust Manifold Brace - [Exhaust Manifold Brace Replacement \(LTG\)](#)

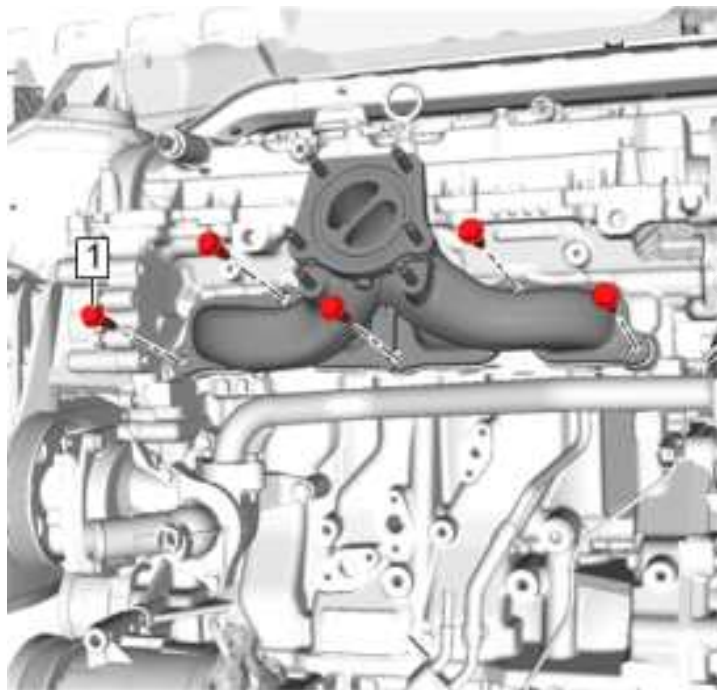


Fig. 7: Exhaust Manifold Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Remove Exhaust Manifold Bolt (1) and DISCARD

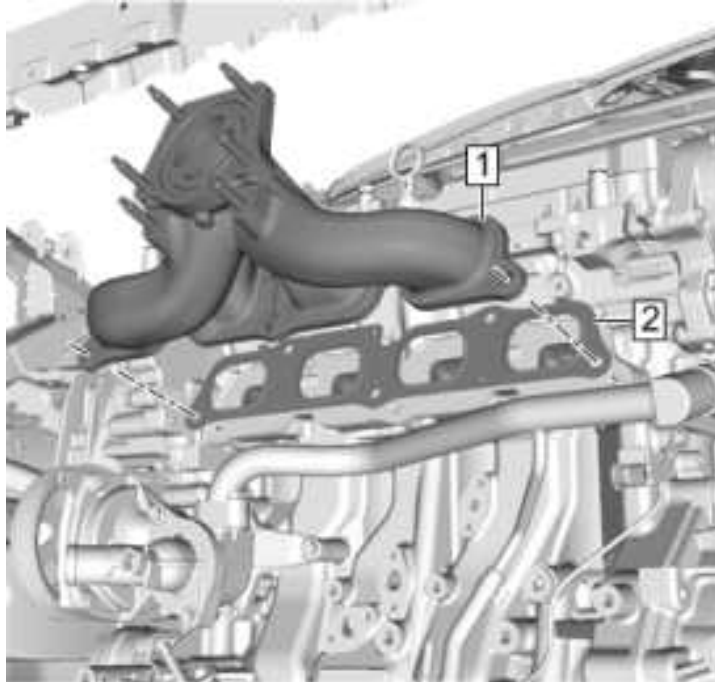


Fig. 8: Exhaust Manifold And Gasket
Courtesy of GENERAL MOTORS COMPANY

5. Remove Exhaust Manifold (1)
6. Remove Exhaust Manifold Gasket (2) and DISCARD

Installation Procedure

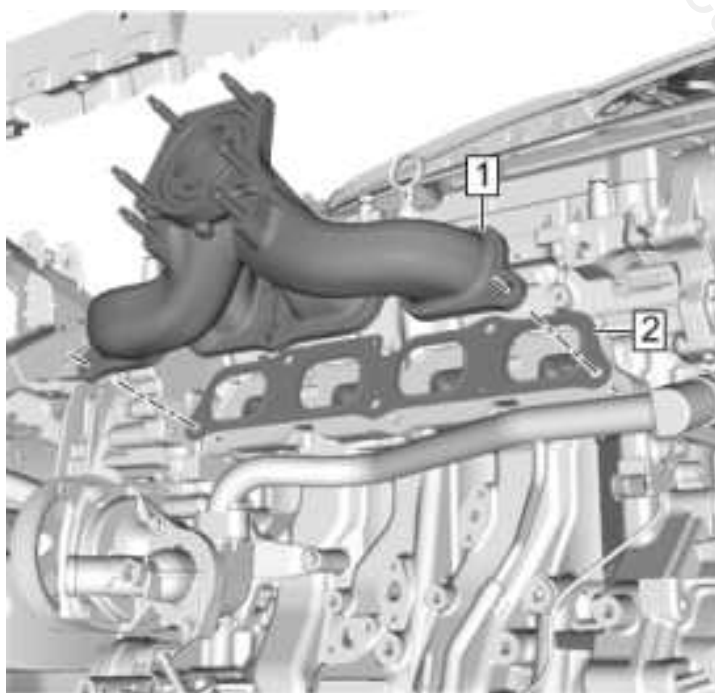


Fig. 9: Exhaust Manifold And Gasket
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a **NEW** exhaust manifold gasket.

1. Install Exhaust Manifold Gasket (2).
2. Install Exhaust Manifold (1).

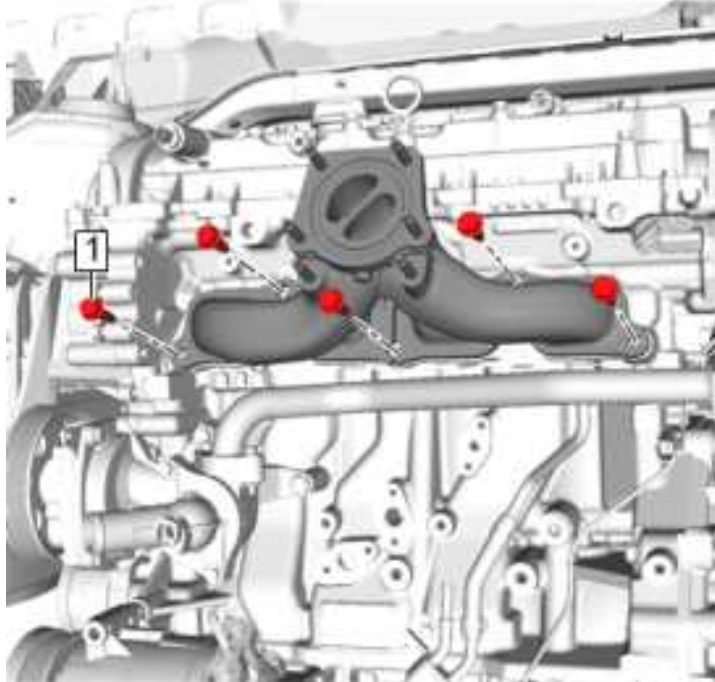


Fig. 10: Exhaust Manifold Bolt

Courtesy of GENERAL MOTORS COMPANY

NOTE:

- Install **NEW** exhaust manifold bolts.
- Fasteners have adhesive patch and must be tightened to final torque within 5 minutes.

3. Install Exhaust Manifold Bolt and hand tighten

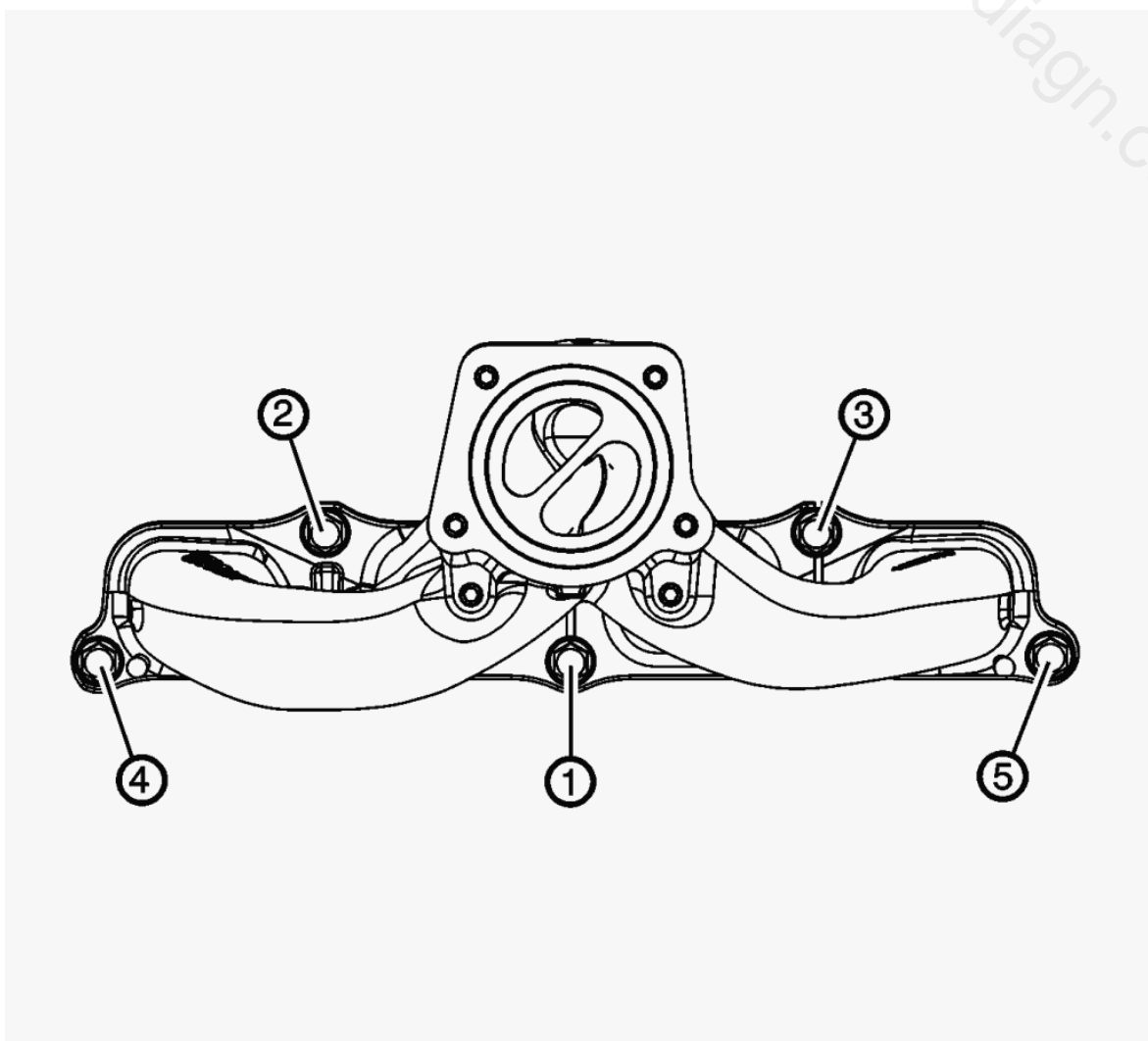


Fig. 11: Exhaust Manifold Bolt Tightening Sequence

Courtesy of GENERAL MOTORS COMPANY

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

4. Exhaust Manifold Bolt - Tighten in sequence
 1. First Pass: 20 N.m (15 lb ft)
 2. Second Pass: 20 N.m (15 lb ft)
 3. Final Pass: 20 N.m (15 lb ft)
5. Install Exhaust Manifold Brace - [Exhaust Manifold Brace Replacement \(LTG\)](#)
6. Install Turbocharger - [Turbocharger Replacement \(1st Design Tamper-Proof PCV System\)](#)
7. Install Exhaust Manifold Heat Shield - [Exhaust Manifold Heat Shield Replacement \(LTG\)](#)

EXHAUST MANIFOLD BRACE REPLACEMENT (LTG)

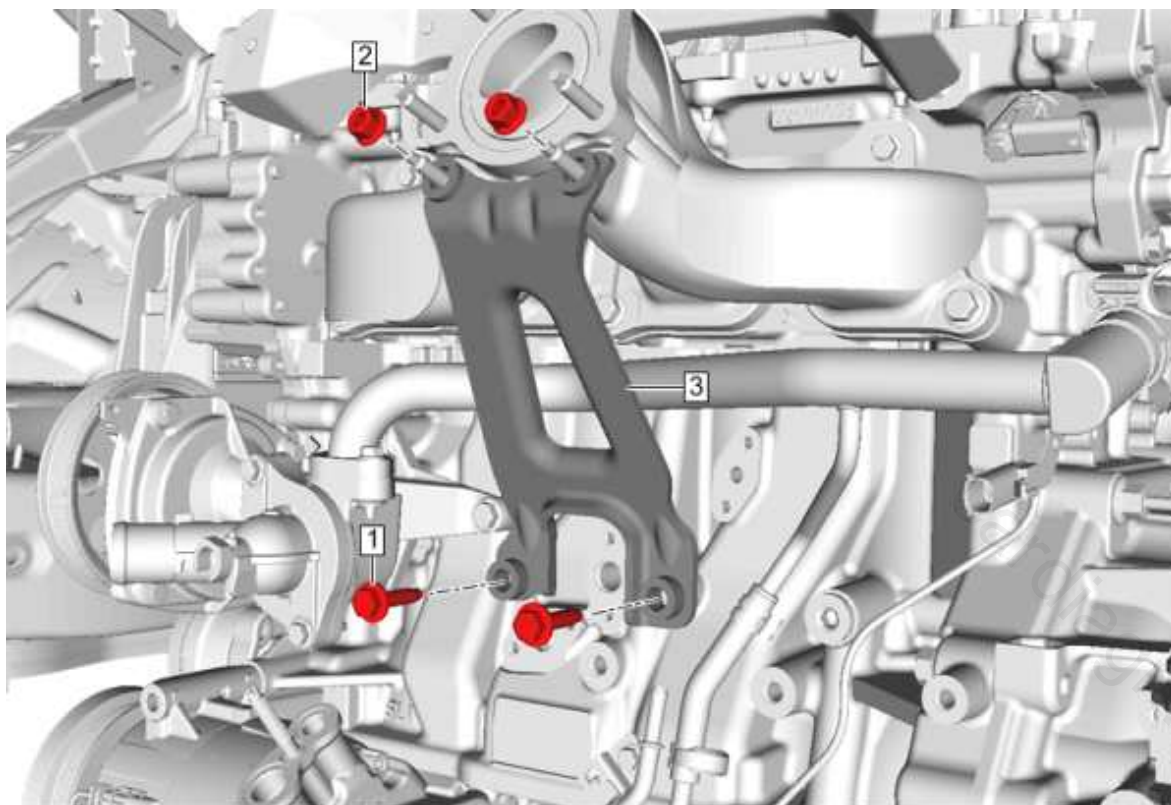


Fig. 12: Exhaust Manifold Brace

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Hot Exhaust System Warning .	
Preliminary Procedure Turbocharger Replacement (1st Design Tamper-Proof PCV System)	
1	Exhaust Manifold Brace Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten: 25 N.m (18 lb ft)
2	Exhaust Manifold Brace Nut (Qty: 2) Tighten: 25 N.m (18 lb ft)
3	Exhaust Manifold Brace

EXHAUST FRONT PIPE REPLACEMENT (LTG)

Removal Procedure

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

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

1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)

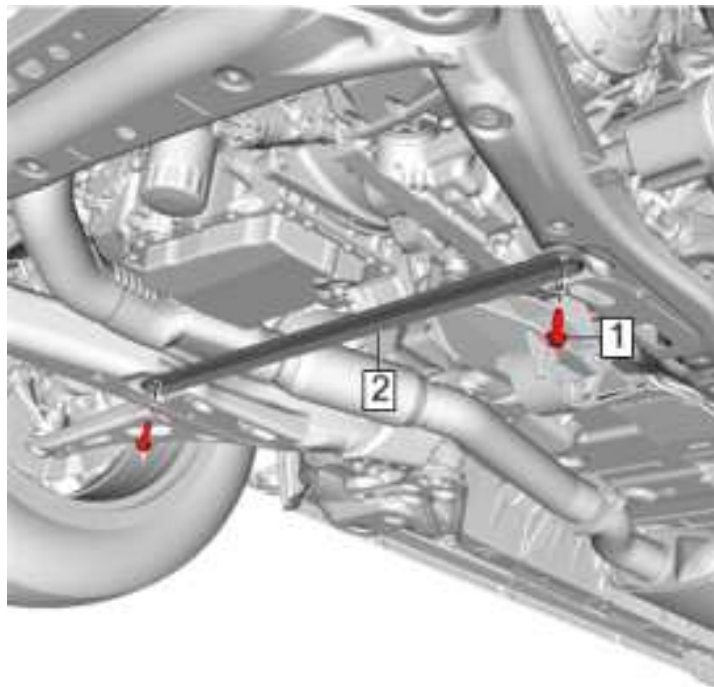


Fig. 13: Front Cradle Brace And Bolt

Courtesy of GENERAL MOTORS COMPANY

2. Remove Front Cradle Brace Bolt (1)
3. Remove Front Cradle Brace (2)

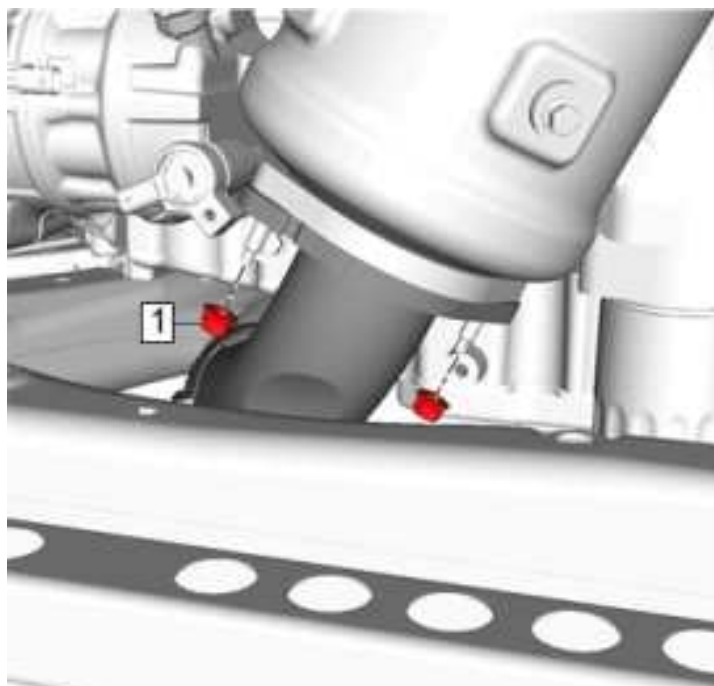


Fig. 14: Catalytic Converter Nut

Courtesy of GENERAL MOTORS COMPANY

4. Remove Catalytic Converter Nut (1).

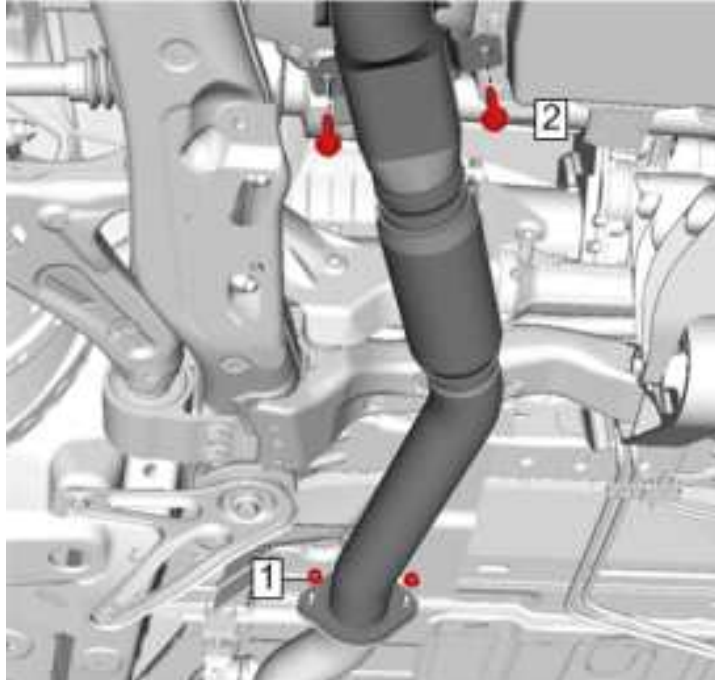


Fig. 15: Exhaust Front Pipe Nut

Courtesy of GENERAL MOTORS COMPANY

5. Remove Exhaust Front Pipe Nut (1)
6. Remove Exhaust Front Pipe Bracket Bolt (2)

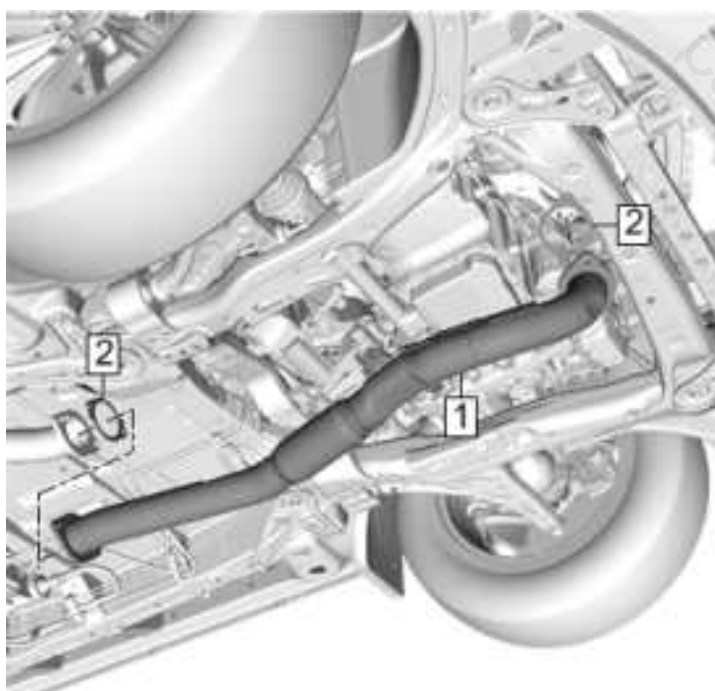


Fig. 16: Exhaust Front Pipe And Exhaust Gasket

Courtesy of GENERAL MOTORS COMPANY

7. Remove Exhaust Front Pipe (1).
8. Remove Exhaust Gasket (2) and DISCARD

Installation Procedure

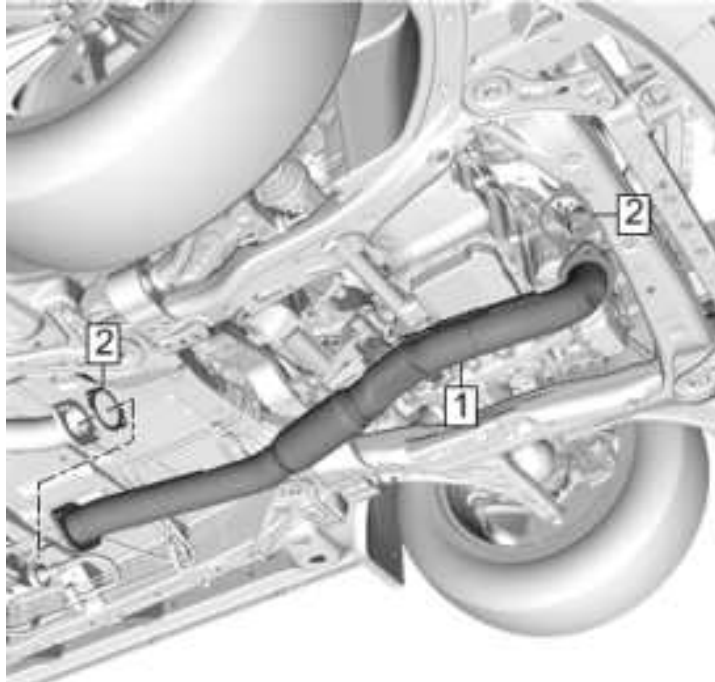


Fig. 17: Exhaust Front Pipe And Exhaust Gasket
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW gasket.

1. Install Exhaust Gasket (2)
2. Install Exhaust Front Pipe (1)

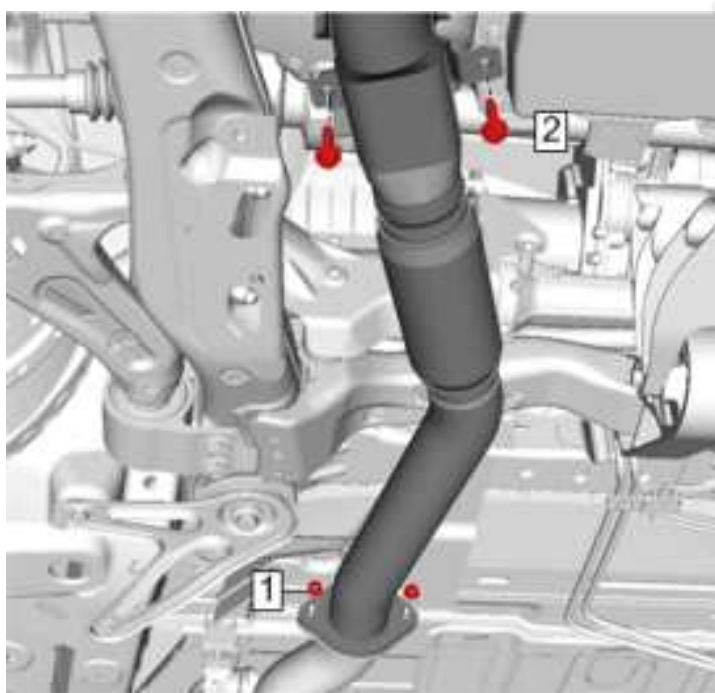


Fig. 18: Exhaust Front Pipe Nut
 Courtesy of GENERAL MOTORS COMPANY

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

3. Install Exhaust Front Pipe Bracket Bolt (2) and tighten 22 N.m (16 lb ft)
4. Install Exhaust Front Pipe Nut (1) and tighten 22 N.m (16 lb ft)

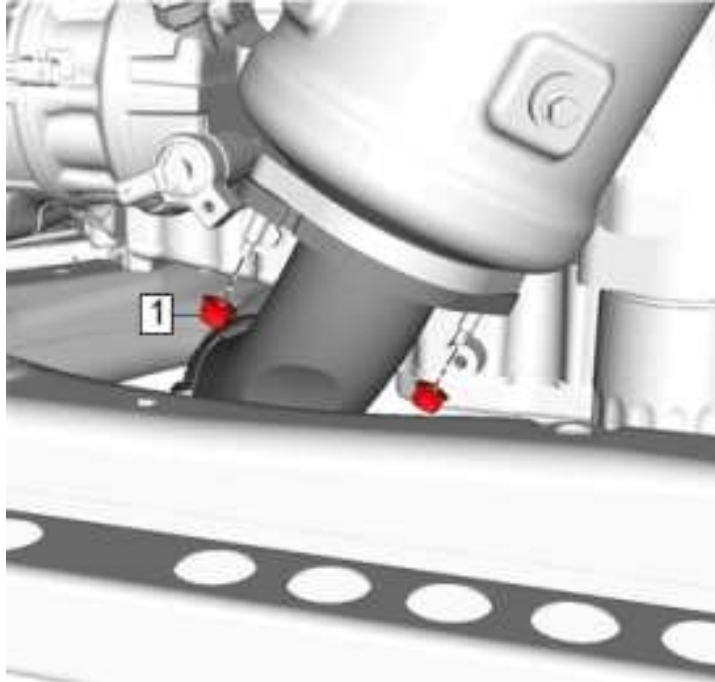


Fig. 19: Catalytic Converter Nut
Courtesy of GENERAL MOTORS COMPANY

5. Install Catalytic Converter Nut (1) and tighten 22 N.m (16 lb ft)

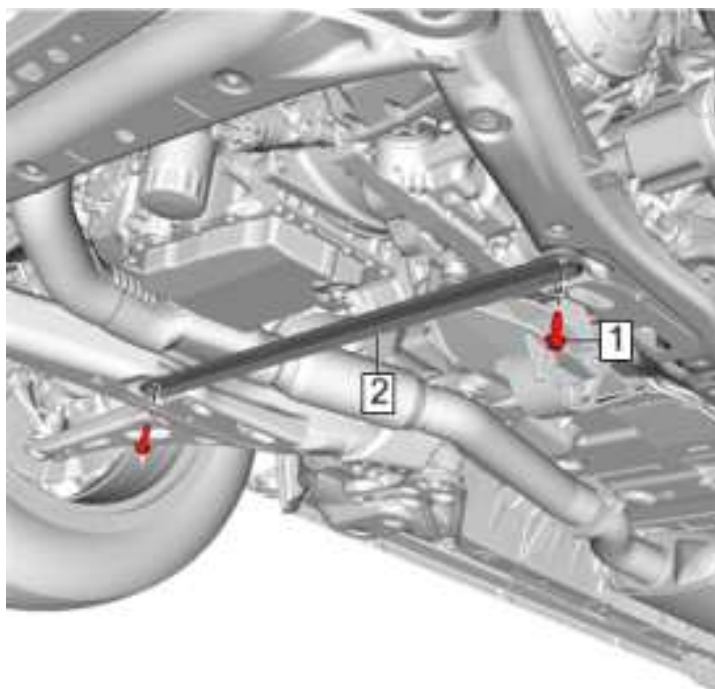


Fig. 20: Front Cradle Brace And Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Install Front Cradle Brace (2)
7. Install Front Cradle Brace Bolt (1) and tighten 58 N.m (43 lb ft)
8. Start the engine and check for exhaust leaks.

EXHAUST FRONT PIPE REPLACEMENT (LYX)

Removal Procedure

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

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

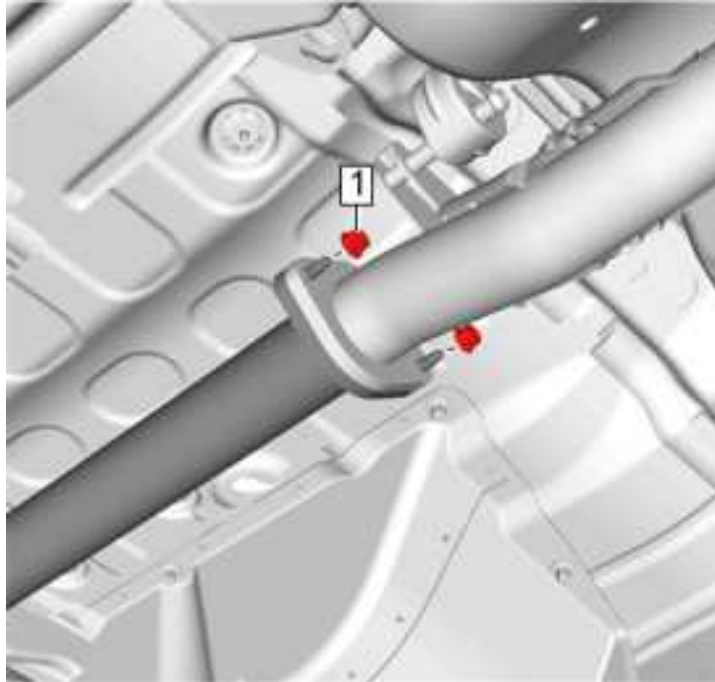


Fig. 21: Exhaust Front Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

1. Remove Exhaust Front Pipe Nut (1).

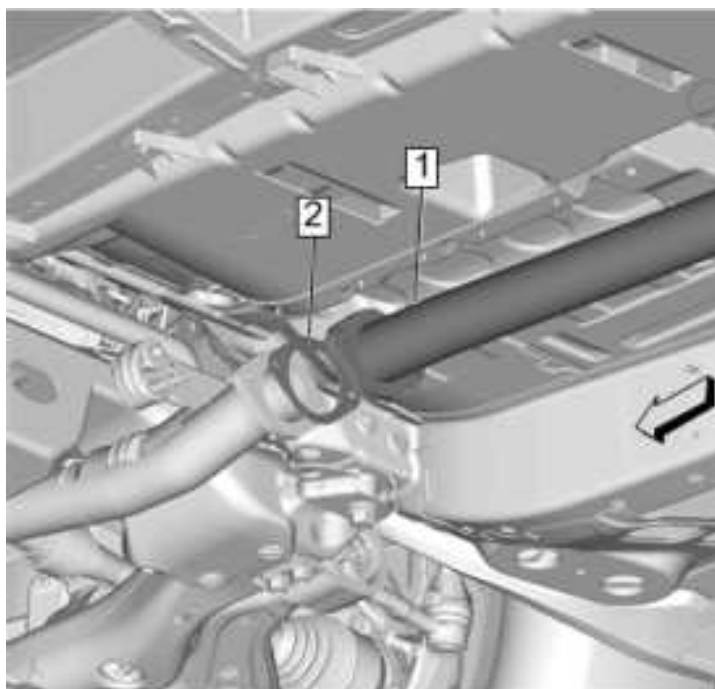


Fig. 22: Exhaust Muffler Assembly And Exhaust Gasket
Courtesy of GENERAL MOTORS COMPANY

2. Separate Exhaust Muffler Assembly (1) @Exhaust Front Pipe
3. Remove Exhaust Gasket (2) and DISCARD

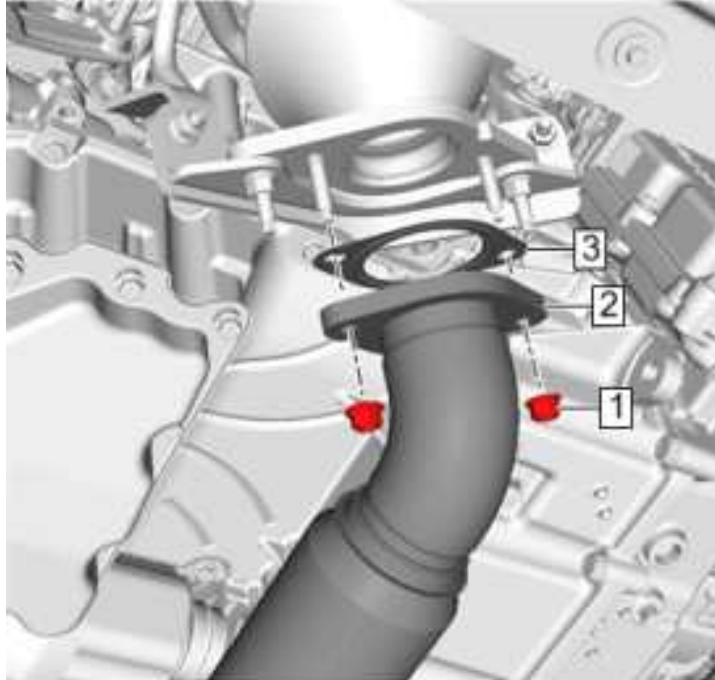


Fig. 23: Catalytic Converter Nut And Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

4. Remove Catalytic Converter Nut (1)
5. Remove Exhaust Front Pipe (2)
6. Remove Exhaust Gasket (3) and DISCARD

Installation Procedure

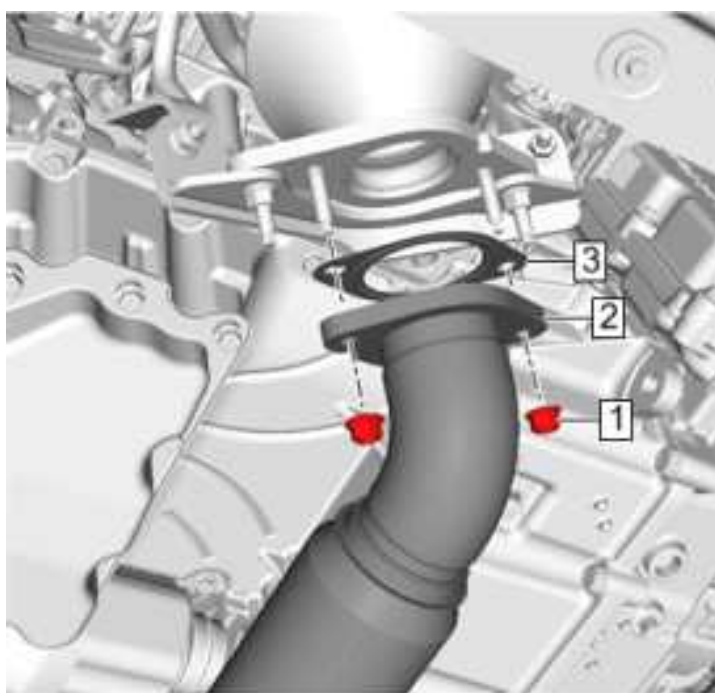


Fig. 24: Catalytic Converter Nut And Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW Exhaust Gasket (3).
2. Install Exhaust Front Pipe (2).

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

3. Install Catalytic Converter Nut (1) and tighten 22 N.m (16 lb ft)

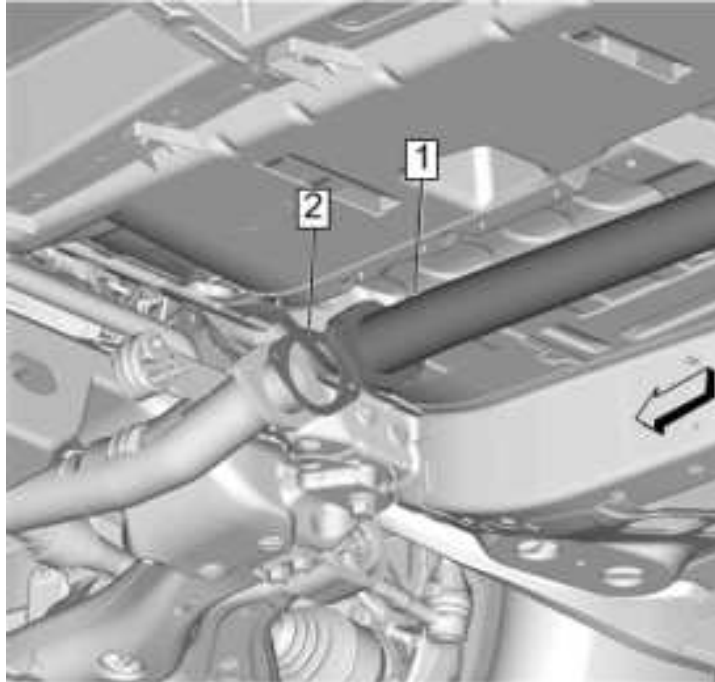


Fig. 25: Exhaust Muffler Assembly And Exhaust Gasket
Courtesy of GENERAL MOTORS COMPANY

4. Install a NEW Exhaust Gasket (2).
5. Install Exhaust Muffler Assembly (1) @ - Exhaust Front Pipe

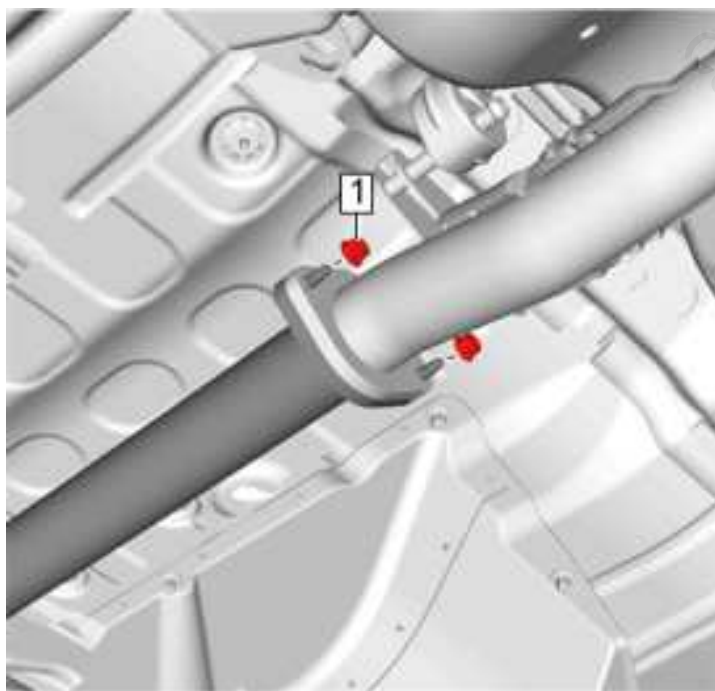


Fig. 26: Exhaust Front Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

6. Install Exhaust Front Pipe Nut (1) and tighten 22 N.m (16 lb ft)

EXHAUST FRONT PIPE REPLACEMENT (LH7)

Removal Procedure

WARNING: Protective Goggles and Glove Warning

WARNING: Exhaust Service Warning

1. Remove Front Cradle Brace -Front Cradle Brace Replacement

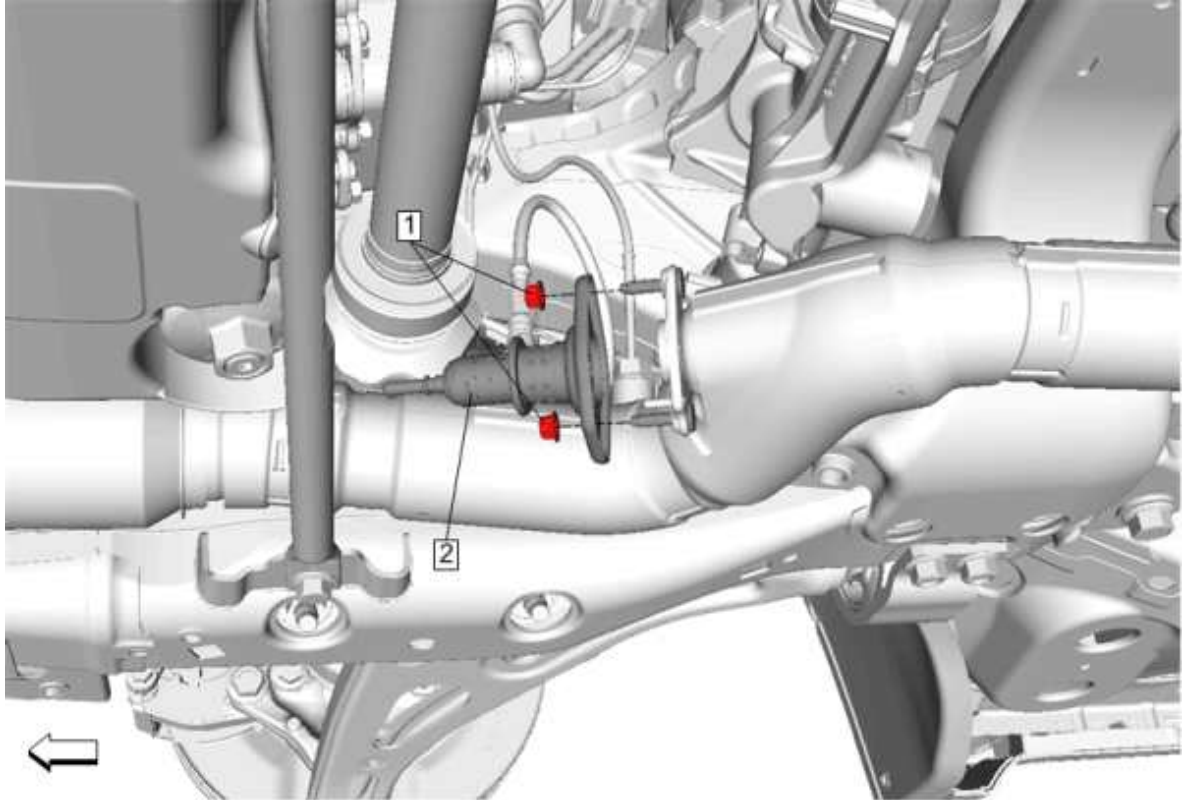


Fig. 27: Emission Reduction Fluid Injector Nut

Courtesy of GENERAL MOTORS COMPANY

2. Remove Emission Reduction Fluid Injector Nut (1) - [Emission Reduction Fluid Injector Replacement \(AWD\)](#) [Emission Reduction Fluid Injector Replacement \(FWD\)](#)
3. Position aside Emission Reduction Fluid Injector (2)
4. Remove Exhaust Particulate Sensor@Exhaust Front Pipe and position aside - [Exhaust Particulate Sensor Replacement](#)
5. Remove Exhaust Temperature Sensor - Position 3@Exhaust Front Pipe and position aside - [Exhaust Temperature Sensor Replacement - Position 3](#)

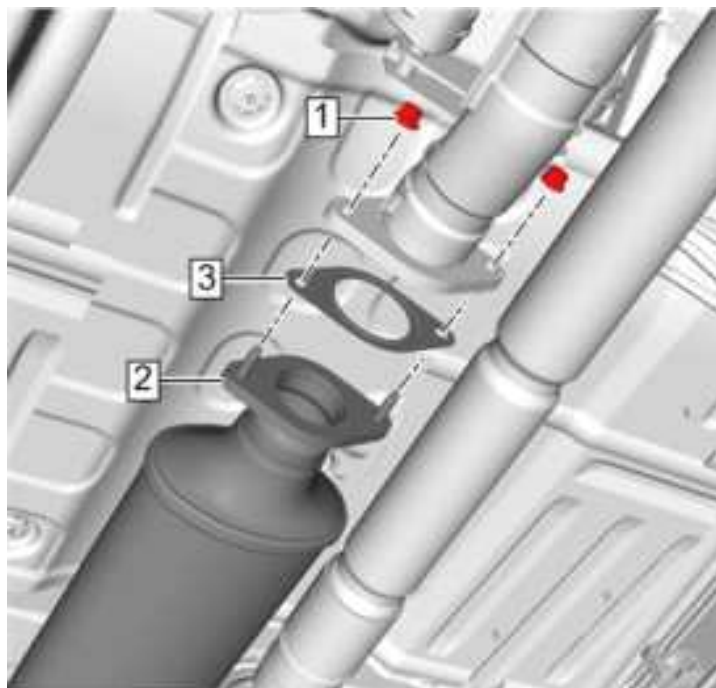


Fig. 28: Exhaust Front Pipe Nut

Courtesy of GENERAL MOTORS COMPANY

6. Remove Exhaust Front Pipe Nut (1) - [Exhaust Muffler Replacement \(LH7\)](#)
7. Position aside Exhaust Muffler (2).

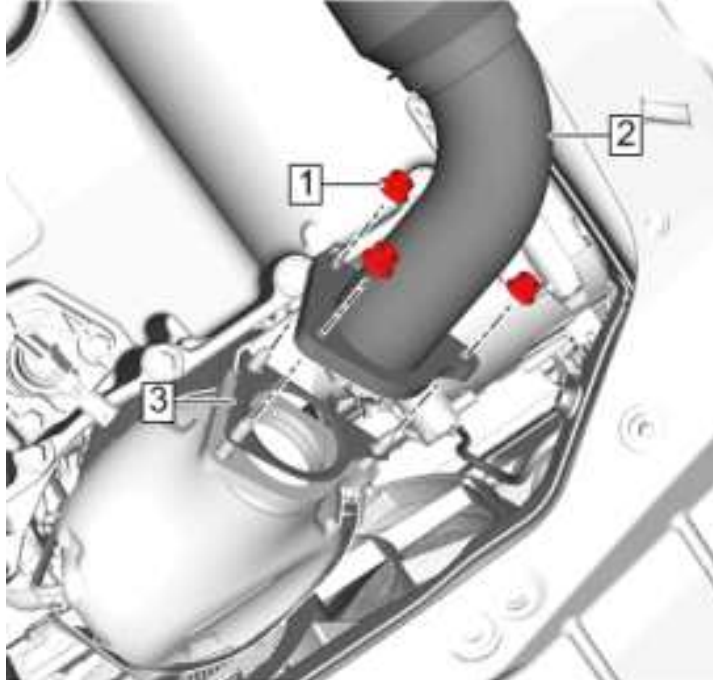


Fig. 29: Exhaust Front Pipe, Nut And Gasket
Courtesy of GENERAL MOTORS COMPANY

8. Remove Exhaust Front Pipe Nut (1)
9. Remove Exhaust Front Pipe (2).
10. Remove Exhaust Front Pipe Gasket (3) and DISCARD

Installation Procedure

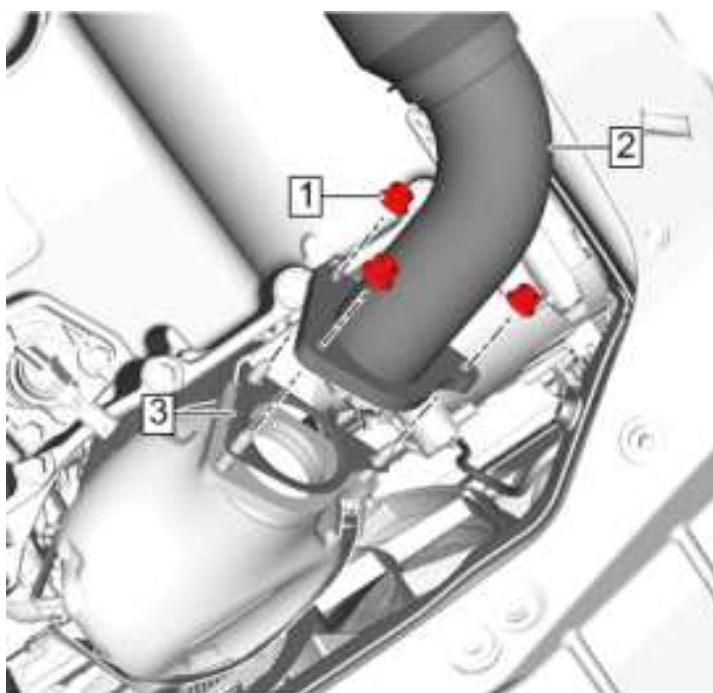


Fig. 30: Exhaust Front Pipe, Nut And Gasket
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW gasket.

1. Install Exhaust Front Pipe Gasket (3).
2. Install Exhaust Front Pipe (2).

CAUTION: Fastener Caution

3. Install Exhaust Front Pipe Nut (1) and tighten 22 N.m (16 lb ft)
4. Install Exhaust Muffler -Exhaust Muffler Replacement (LH7).

5. Install Exhaust Temperature Sensor - Position 3@Exhaust Front Pipe - [Exhaust Temperature Sensor Replacement - Position 3](#)
6. Install Exhaust Particulate Sensor@Exhaust Front Pipe - [Exhaust Particulate Sensor Replacement](#)
7. Install Emission Reduction Fluid Injector - [Emission Reduction Fluid Injector Replacement \(AWD\)](#), [Emission Reduction Fluid Injector Replacement \(FWD\)](#)
8. Install Front Cradle Brace - [Front Cradle Brace Replacement](#)

EXHAUST REAR MUFFLER INSULATOR REPLACEMENT

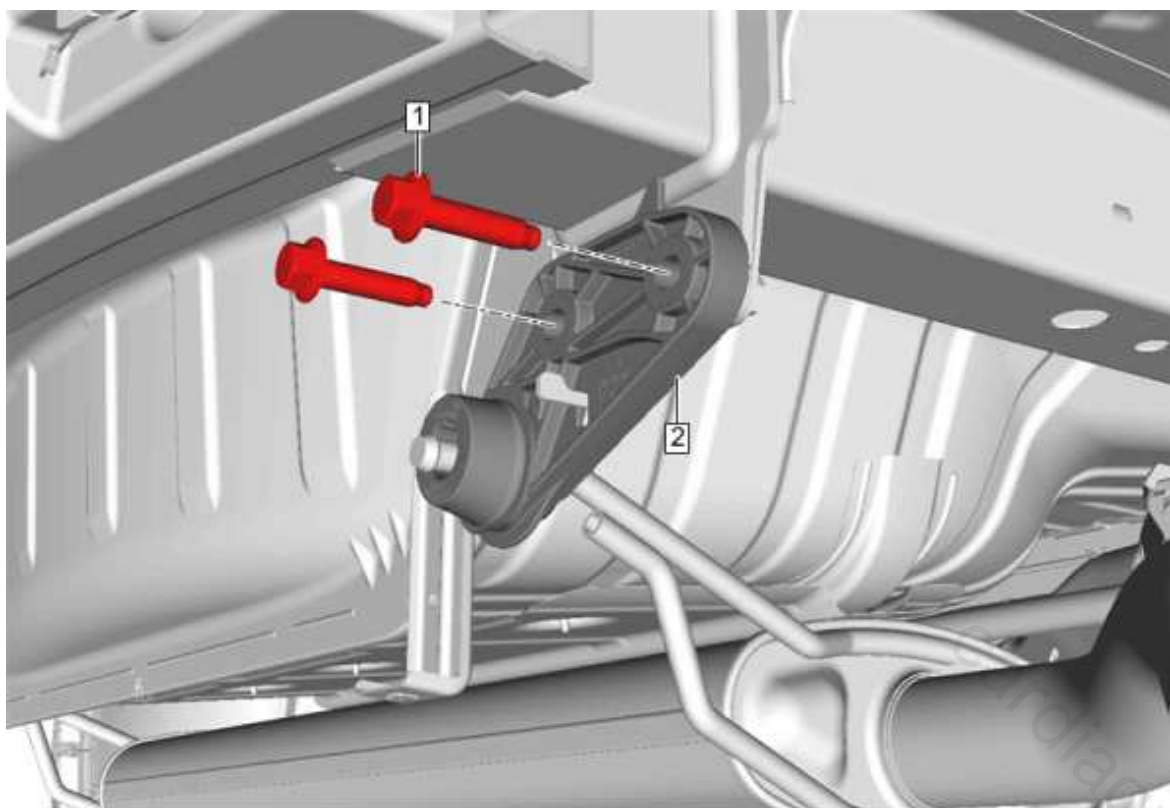


Fig. 31: Exhaust Rear Muffler Insulator Bolt-Right Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Lifting and Jacking the Vehicle	
1	Exhaust Muffler Insulator Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 22 N.m (16 lb ft)
2	Exhaust Muffler Insulator

OXIDATION CATALYTIC CONVERTER REPLACEMENT (LH7)

Removal Procedure

1. Remove Nitrogen Oxides Sensor- Position 1 - and position aside - [Nitrogen Oxides Sensor Replacement - Position 1](#)
2. Remove Turbocharger Heat Shield - [Turbocharger Heat Shield Replacement \(LH7\)](#)
3. Remove Catalytic Converter Heat Shield - [Catalytic Converter Heat Shield Replacement \(LH7\)](#)
4. Remove Exhaust Temperature Sensor-Position 1 @Oxidation Catalytic Converter - Remove and position aside - [Exhaust Temperature Sensor Replacement - Position 1](#)
5. Remove Exhaust Temperature Sensor-Position 2 @Oxidation Catalytic Converter - Remove and position aside - [Exhaust Temperature Sensor Replacement - Position 2](#)

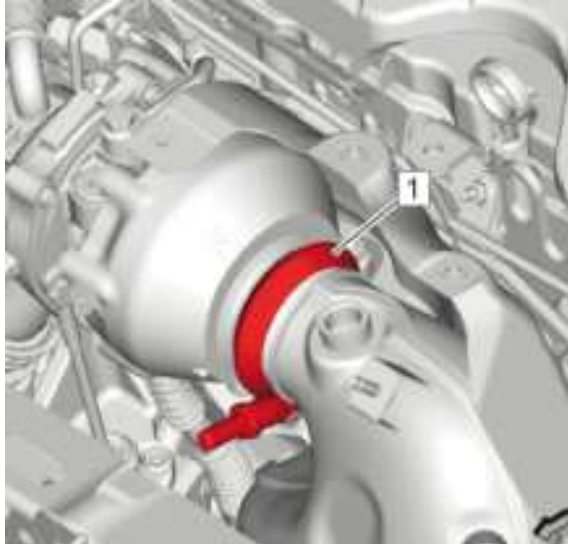


Fig. 32: Catalytic Converter Clamp

Courtesy of GENERAL MOTORS COMPANY

6. Loosen Catalytic Converter Clamp (1).
7. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)

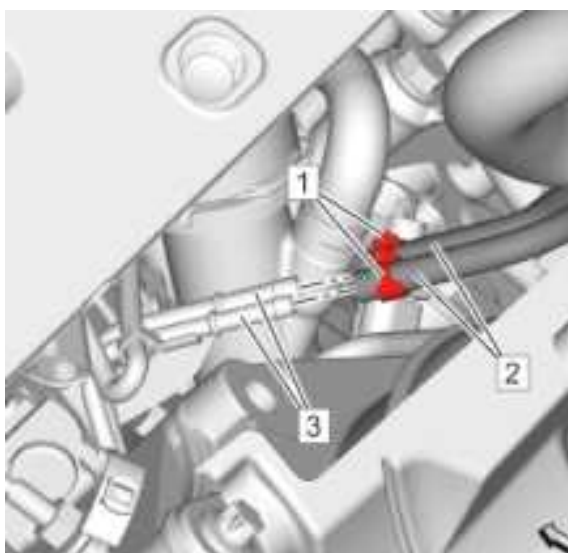


Fig. 33: Exhaust Pressure Differential Sensor Hoses And Pipes

Courtesy of GENERAL MOTORS COMPANY

8. Disengage Clamp (1) - [2x] - [Hose Clamp Replacement Guidelines - Spring Type](#)

NOTE: Mind the different hose diameters.

9. Remove the 2 exhaust pressure differential sensor hoses (2) from the exhaust pressure differential sensor pipes (3).

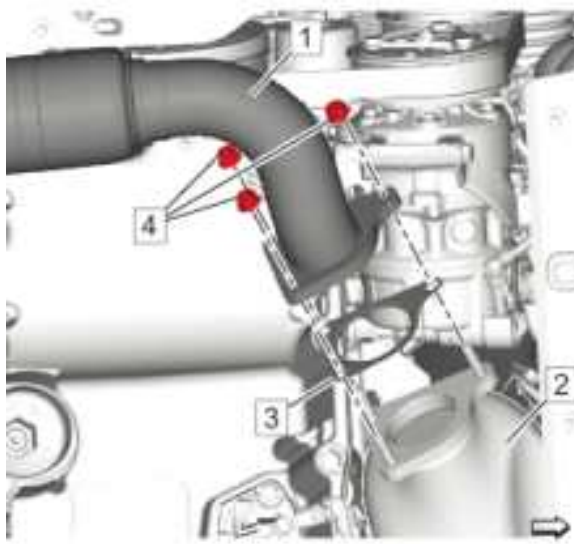


Fig. 34: Exhaust Front Pipe Gasket

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Do not bend the exhaust flex pipe more than 10 degrees in any direction. Bending of more than 10 degrees or twisting in a range of ± 0.5 degrees will damage the exhaust flex decoupler.

10. Remove Exhaust Front Pipe Nut (4) - [3x]
11. Remove Exhaust Front Pipe (1) @Catalytic Converter (2).
12. Remove Exhaust Front Pipe Gasket (3) and DISCARD

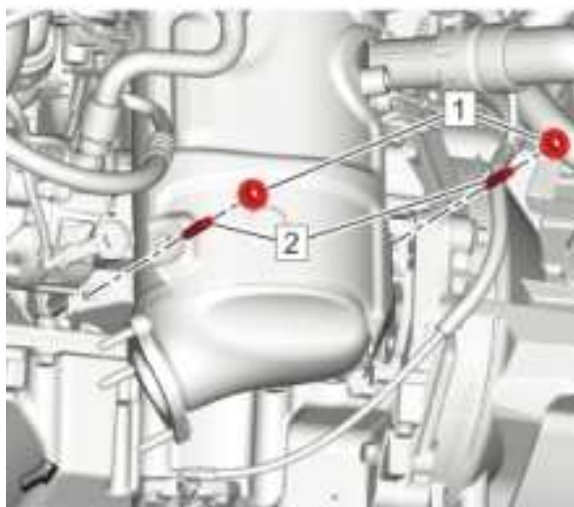


Fig. 35: Catalytic Converter Brace Nut And Catalytic Converter Stud

Courtesy of GENERAL MOTORS COMPANY

13. Remove Catalytic Converter Brace Nut (1) - [2 x]

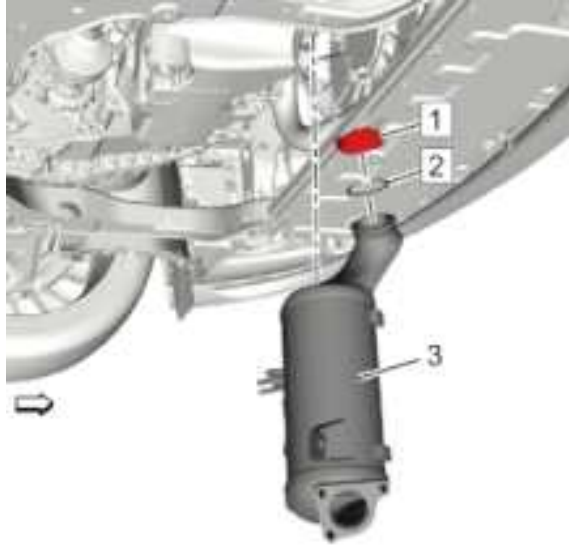


Fig. 36: Catalytic Converter, Clamp And Gasket
Courtesy of GENERAL MOTORS COMPANY

14. Remove Oxidation Catalytic Converter (3).
15. Remove Catalytic Converter Clamp (1) and DISCARD
16. Remove Catalytic Converter Gasket (2) and DISCARD



Fig. 37: Catalytic Converter Brace Bracket Nut
Courtesy of GENERAL MOTORS COMPANY

17. Loosen Catalytic Converter Brace Bracket Nut (1) @Catalytic Converter (2)

Installation Procedure

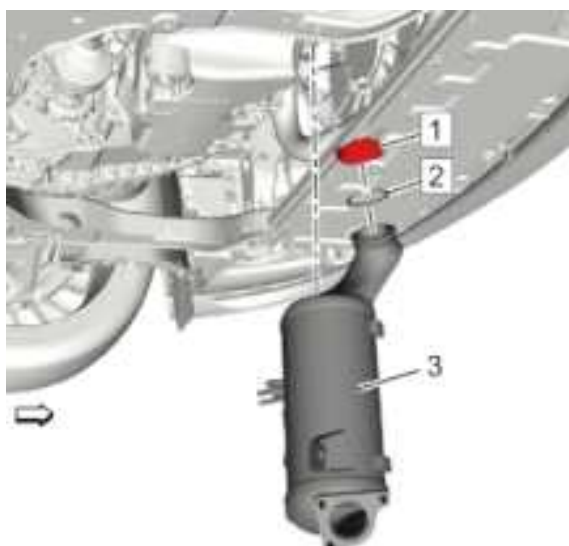


Fig. 38: Catalytic Converter, Clamp And Gasket
Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW Catalytic Converter Gasket (2).
2. Loosely install the NEW catalytic converter clamp (1) to the catalytic converter (3).
3. Install Oxidation Catalytic Converter (3).

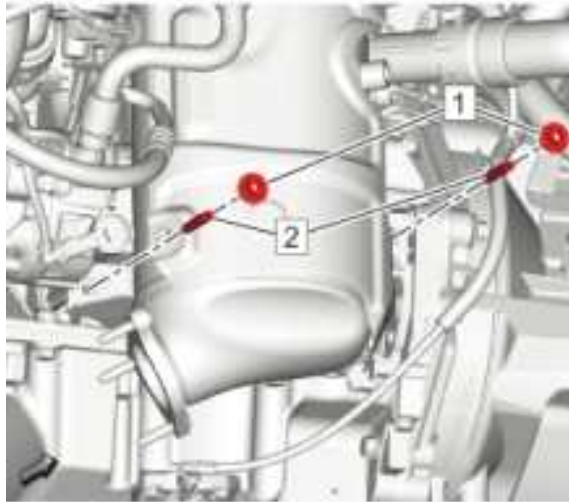


Fig. 39: Catalytic Converter Brace Nut And Catalytic Converter Stud
Courtesy of GENERAL MOTORS COMPANY

4. Install Catalytic Converter Brace Nut (1) and hand tighten [2x]
5. Lower the vehicle.

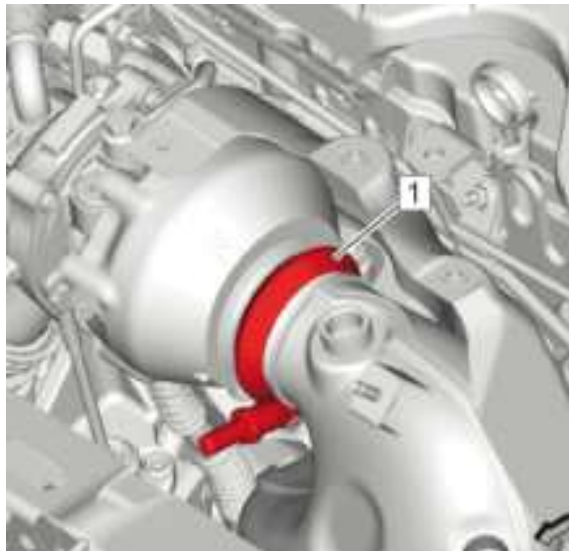


Fig. 40: Catalytic Converter Clamp
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

6. Position the NEW catalytic converter clamp (1) and tighten to 6 N.m (53 lb in)
7. Raise the vehicle.

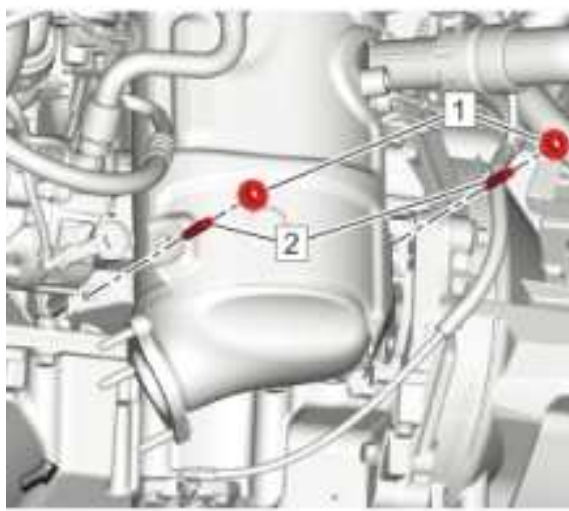


Fig. 41: Catalytic Converter Brace Nut And Catalytic Converter Stud
Courtesy of GENERAL MOTORS COMPANY

8. Install Catalytic Converter Brace Nut (1) and tighten [2x] 22 N.m (16 lb ft)

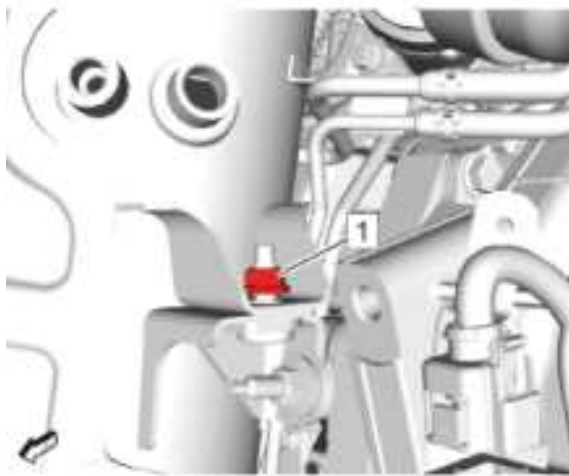


Fig. 42: Catalytic Converter Brace Bracket Nut
Courtesy of GENERAL MOTORS COMPANY

9. Catalytic Converter Brace Bracket Nut (1) - Tighten 22 N.m (16 lb ft)
10. Lower the vehicle.

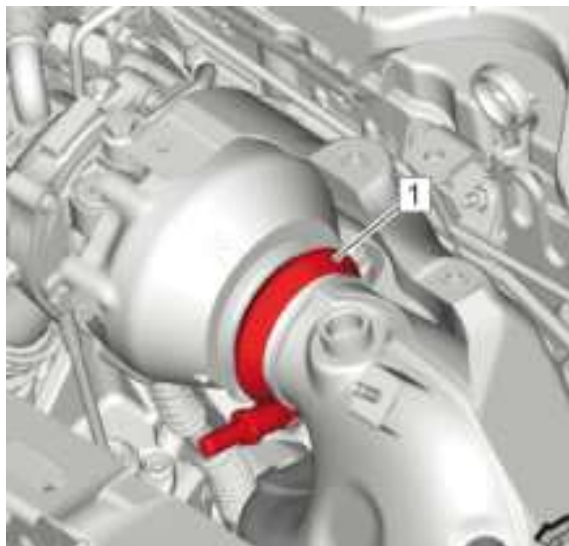


Fig. 43: Catalytic Converter Clamp
Courtesy of GENERAL MOTORS COMPANY

11. Catalytic Converter Clamp (1) - Tighten 25 N.m (18 lb ft)
12. Raise the vehicle.

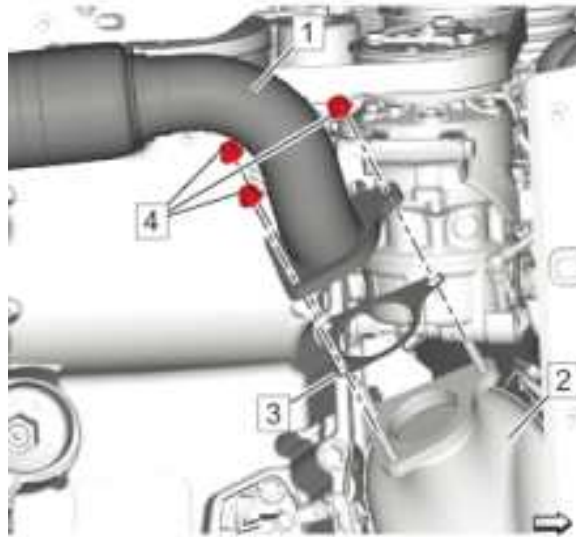


Fig. 44: Exhaust Front Pipe Gasket

Courtesy of GENERAL MOTORS COMPANY

13. Install Exhaust Front Pipe Gasket (1).

CAUTION: Do not bend the exhaust flex pipe more than 10 degrees in any direction. Bending of more than 10 degrees or twisting in a range of ± 0.5 degrees will damage the exhaust flex decoupler.

14. Install Exhaust Front Pipe (1)@Catalytic Converter (2).
15. Install Exhaust Front Pipe Nut (4) and tighten 22 N.m (16 lb ft) [3x]

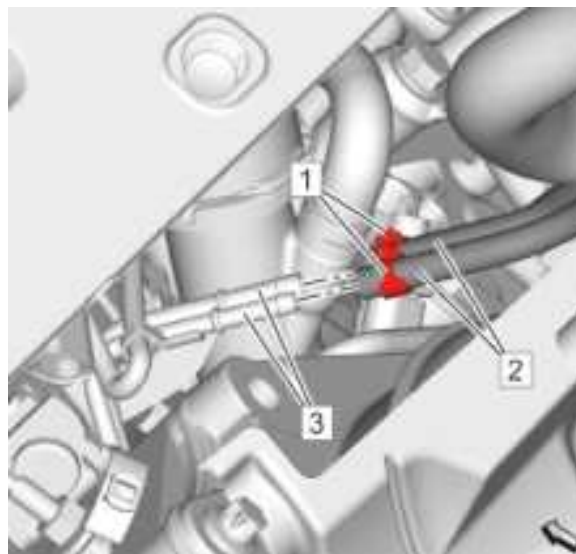


Fig. 45: Exhaust Pressure Differential Sensor Hoses And Pipes

Courtesy of GENERAL MOTORS COMPANY

NOTE: Mind the different hose diameters.

16. Install the 2 exhaust pressure differential sensor hoses (2) to the exhaust pressure differential sensor pipes (3).
17. Engage Clamp (1) - [Hose Clamp Replacement Guidelines - Spring Type](#)
18. Lower the vehicle.
19. Install Exhaust Temperature Sensor-Position 2 @Oxidation Catalytic Converter - [Exhaust Temperature Sensor Replacement - Position 2](#)
20. Install Exhaust Temperature Sensor-Position 1 @Oxidation Catalytic Converter - [Exhaust Temperature Sensor Replacement - Position 1](#)
21. Install Catalytic Converter Heat Shield - [Catalytic Converter Heat Shield Replacement \(LH7\)](#)

22. Install Turbocharger Heat Shield - [Turbocharger Heat Shield Replacement \(LH7\)](#).
23. Install Nitrogen Oxides Sensor- Position 1 - [Nitrogen Oxides Sensor Replacement - Position 1](#)
24. If the Oxidation Catalytic Converter is replaced with new, a DPF Reset will need to be performed. [DPF Reset](#)

WARM UP THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LYX)

Removal Procedure

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

1. Remove -[Turbocharger Heat Shield Replacement](#)
2. Disconnect -[Heated Oxygen Sensor Replacement - Sensor 1](#)
3. Disconnect -[Heated Oxygen Sensor Replacement - Sensor 2](#)

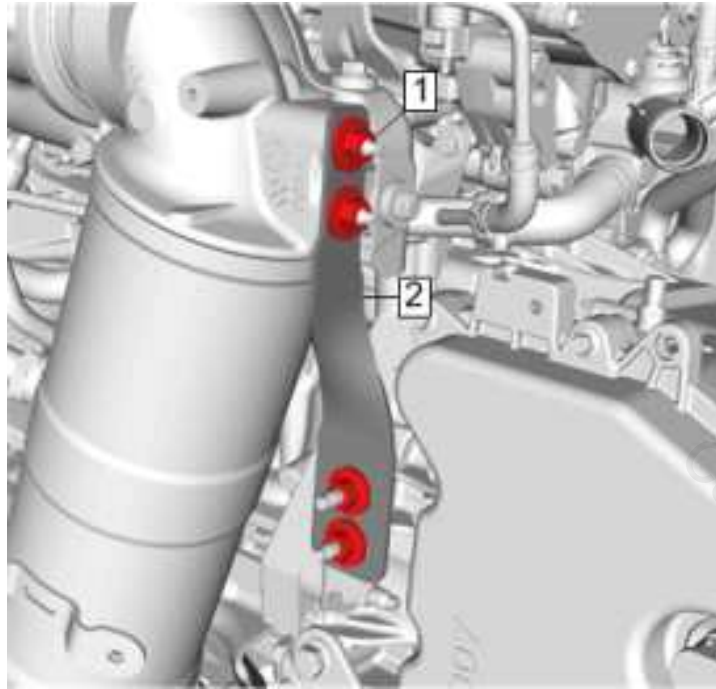


Fig. 46: Catalytic Converter Brace Bracket Nut
Courtesy of GENERAL MOTORS COMPANY

4. Remove Catalytic Converter Brace Bracket Nut (1)
5. Remove Catalytic Converter Brace Bracket (2)

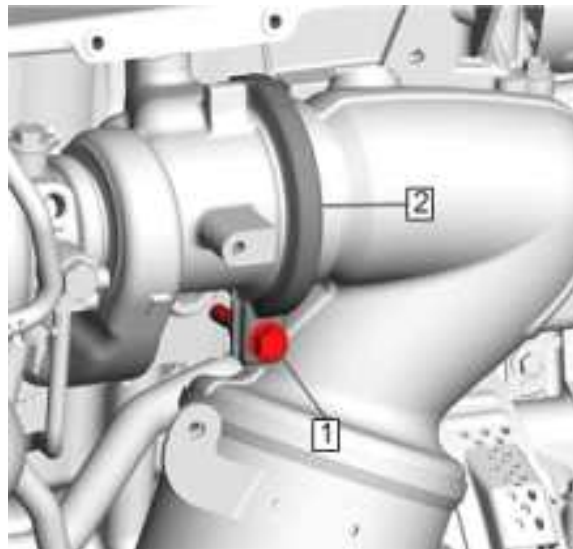


Fig. 47: Catalytic Converter Clamp Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Loosen Catalytic Converter Clamp Bolt (1)
7. Remove Catalytic Converter Clamp (2)

8. Disconnect Exhaust Front Pipe@Warm Up Three-Way Catalytic Converter - [Exhaust Front Pipe Replacement \(LYX\)](#)

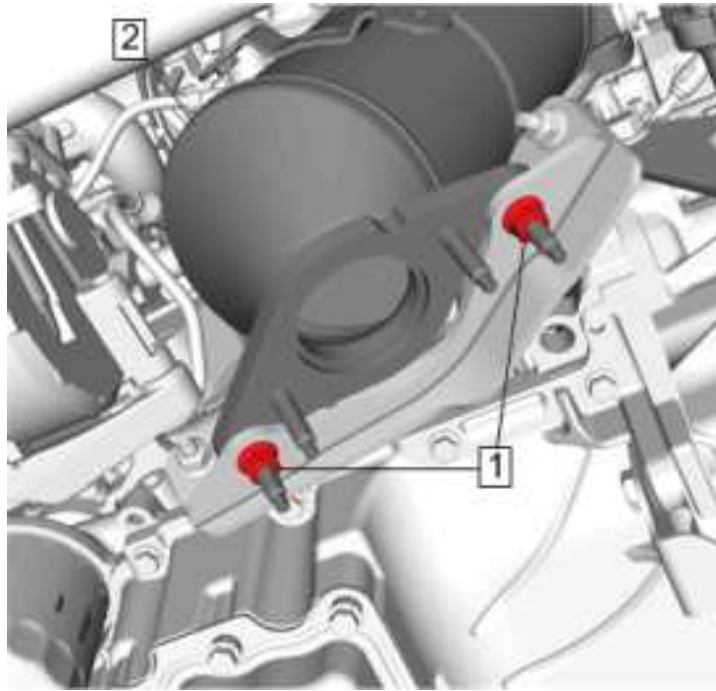


Fig. 48: Catalytic Converter Brace Bracket Nut
Courtesy of GENERAL MOTORS COMPANY

9. Remove Catalytic Converter Brace Bracket Nut (1)
10. Remove Catalytic Converter (2)

Installation Procedure

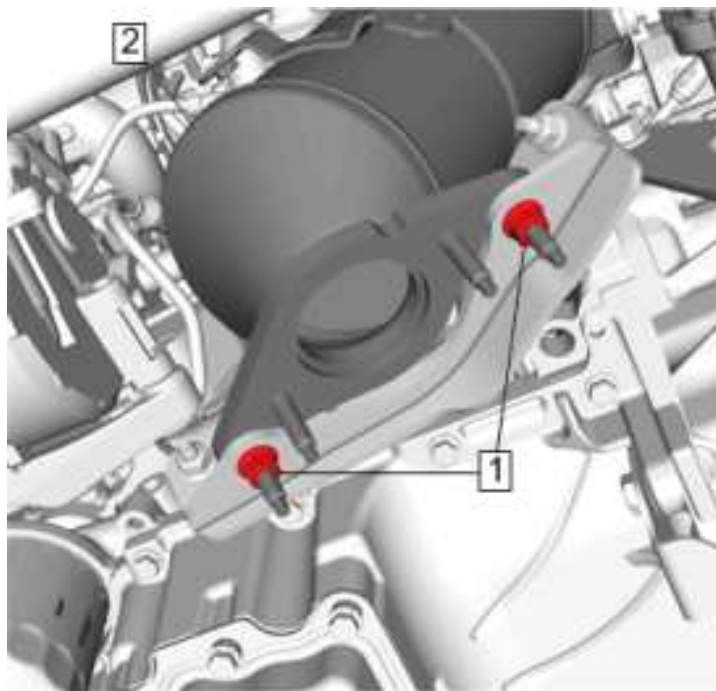


Fig. 49: Catalytic Converter Brace Bracket Nut
Courtesy of GENERAL MOTORS COMPANY

1. Install Catalytic Converter (2)

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

2. Install Catalytic Converter Brace Bracket Nut (1) and tighten 22 N.m (16 lb ft)
3. Disconnect Exhaust Front Pipe@Warm Up Three-Way Catalytic Converter - [Exhaust Front Pipe Replacement \(LYX\)](#)

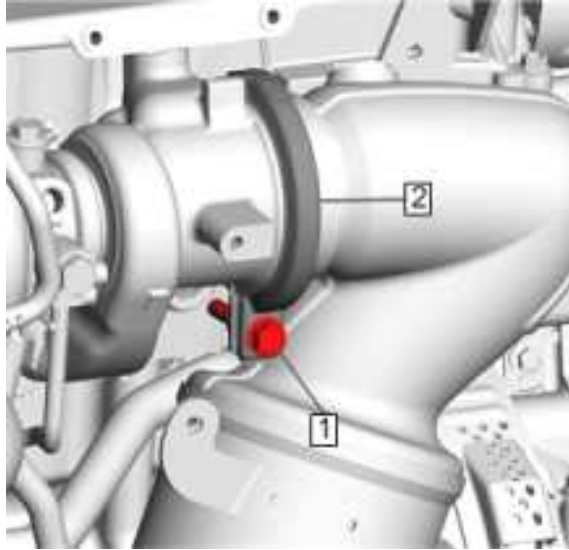


Fig. 50: Catalytic Converter Clamp Bolt

Courtesy of GENERAL MOTORS COMPANY

4. Install Catalytic Converter Clamp (2)
5. Catalytic Converter Clamp Bolt (1) - Tighten 15 N.m (11 lb ft)

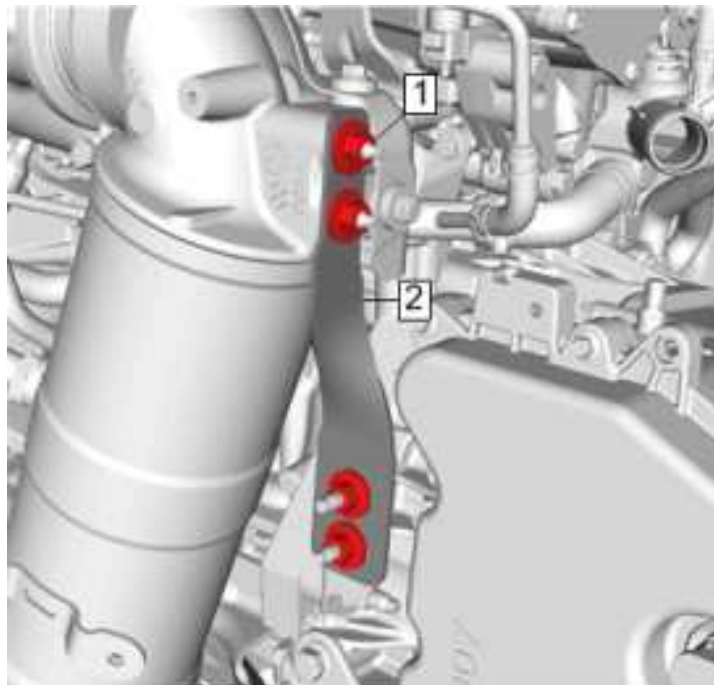


Fig. 51: Catalytic Converter Brace Bracket Nut

Courtesy of GENERAL MOTORS COMPANY

6. Install Catalytic Converter Brace Bracket (2)
7. Install Catalytic Converter Brace Bracket Nut (1) and tighten 22 N.m (16 lb ft)
8. Connect - [Heated Oxygen Sensor Replacement - Sensor 2](#) .
9. Connect - [Heated Oxygen Sensor Replacement - Sensor 1](#) .
10. Install - [Turbocharger Heat Shield Replacement](#)

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. Remove Exhaust Front Pipe - [Exhaust Front Pipe Replacement \(LTG\)](#).

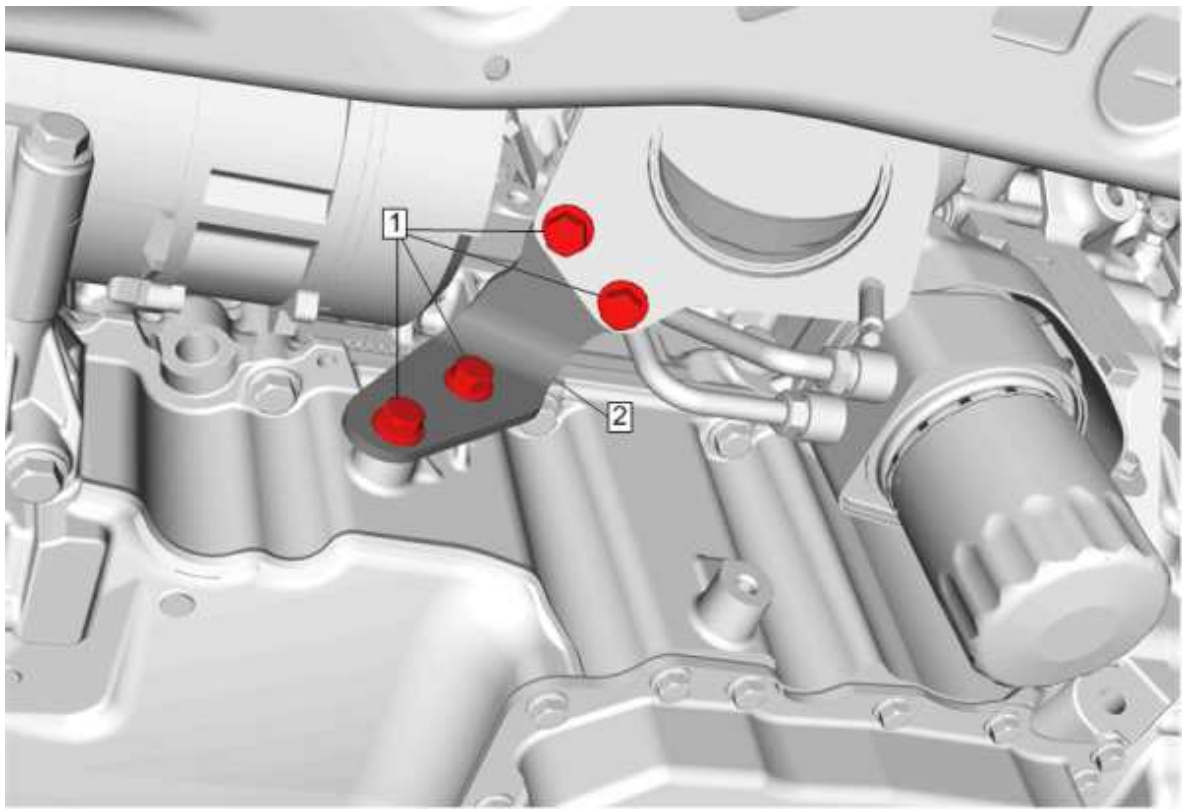


Fig. 52: Catalytic Converter Brace Bracket (LTG)
Courtesy of GENERAL MOTORS COMPANY

2. Remove Catalytic Converter Brace Bracket Bolt (1).
3. Remove Catalytic Converter Brace Bracket-Lower (2)

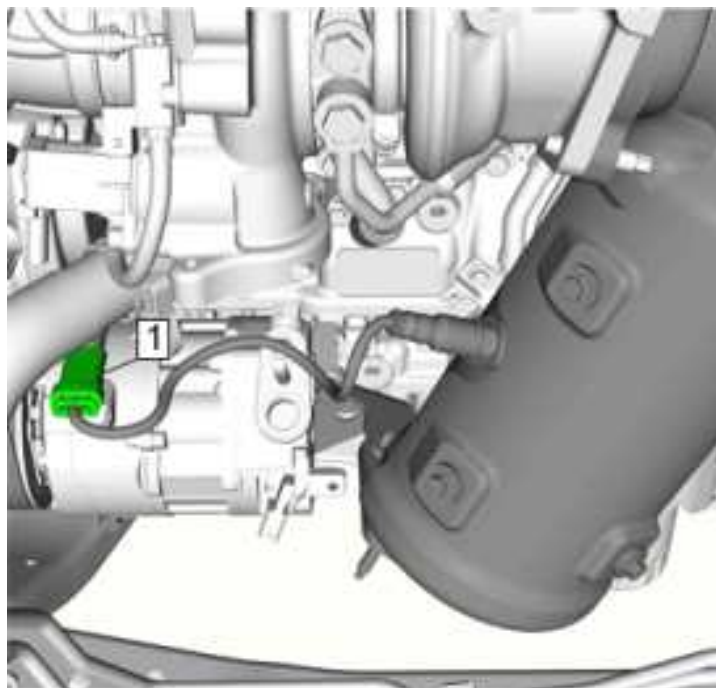


Fig. 53: Heated Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect Heated Oxygen Sensor Electrical Connector (1)
5. Lower the vehicle.
6. Remove Turbocharger Heat Shield - [Turbocharger Heat Shield Replacement](#)

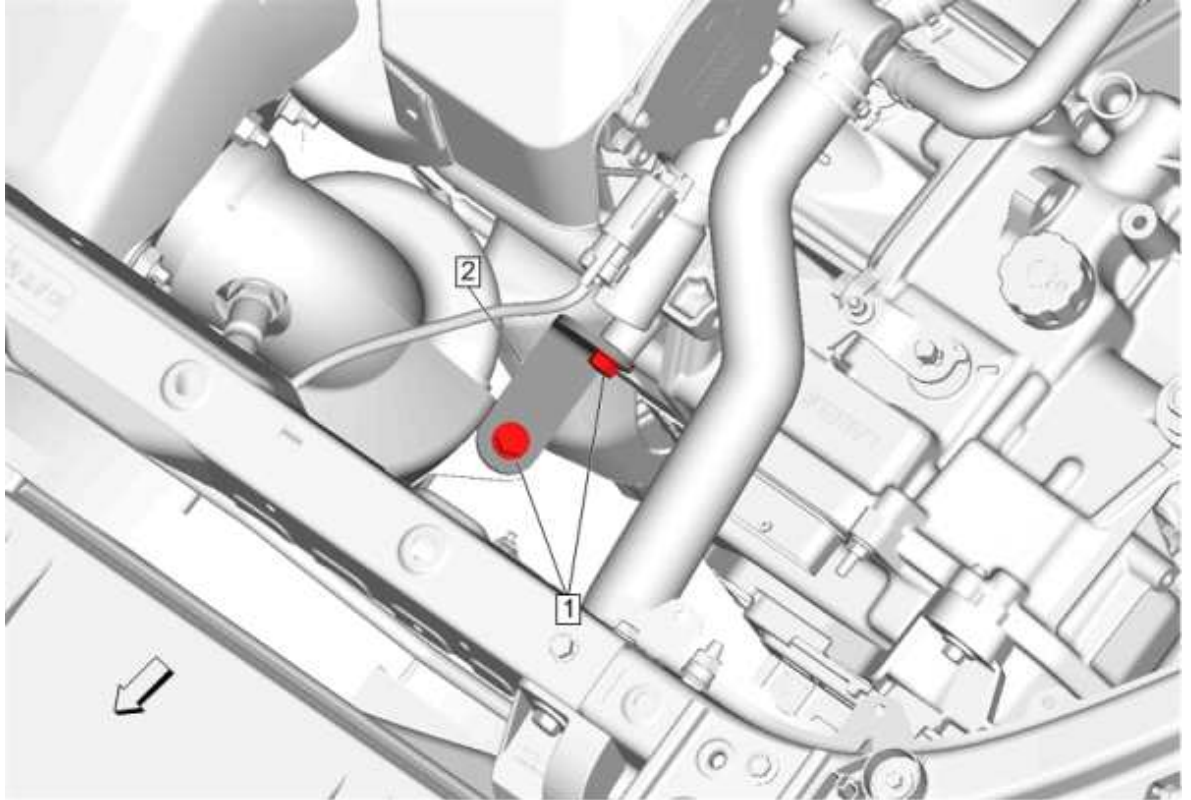


Fig. 54: Catalytic Converter Brace Bracket Bolt And Bracket-Upper
Courtesy of GENERAL MOTORS COMPANY

7. Remove Catalytic Converter Brace Bracket Bolt (1)
8. Remove Catalytic Converter Brace Bracket-Upper (2)



Fig. 55: Heated Oxygen Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

9. Disconnect Heated Oxygen Sensor Electrical Connector (1)
10. Remove Catalytic Converter Nut (3)

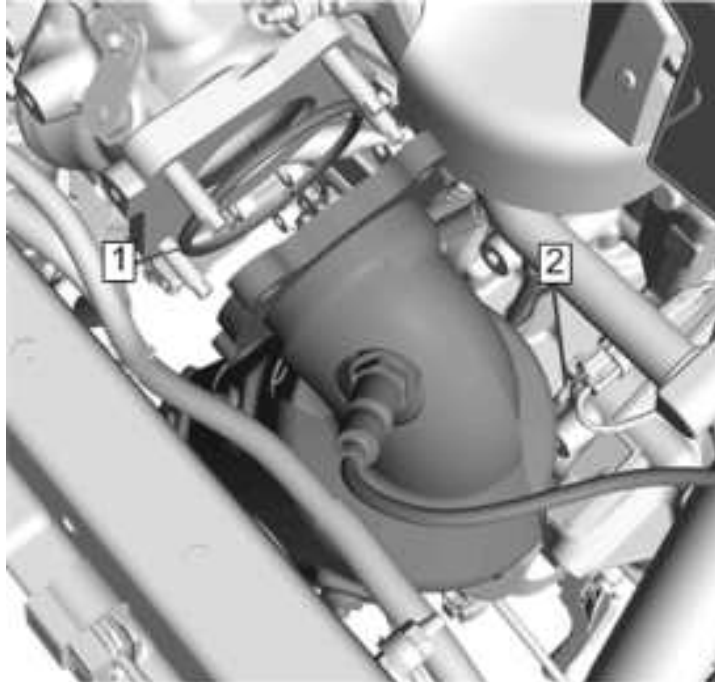


Fig. 56: Catalytic Converter Gasket

Courtesy of GENERAL MOTORS COMPANY

11. Remove Warm Up Three-Way Catalytic Converter (2)
12. Remove Catalytic Converter Gasket (1) and DISCARD
13. Transfer components as necessary.

Installation Procedure

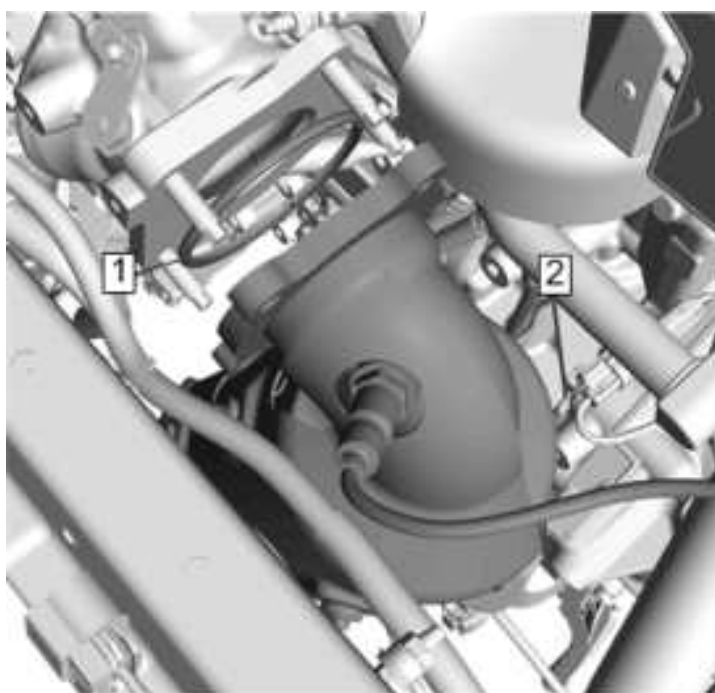


Fig. 57: Catalytic Converter Gasket

Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW Catalytic Converter Gasket (1)
2. Warm Up Three-Way Catalytic Converter (2).

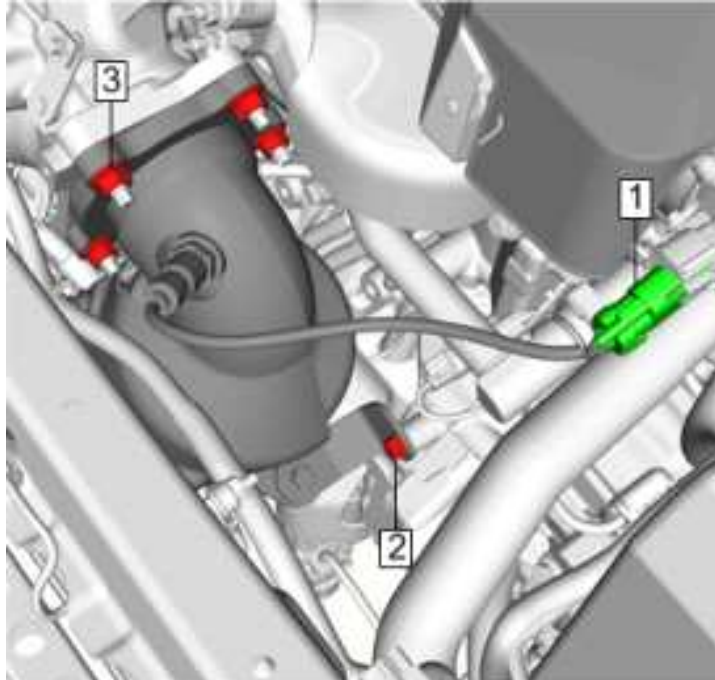


Fig. 58: Heated Oxygen Sensor Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

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

3. Install Catalytic Converter Nut (3) and tighten 50 N.m (37 lb ft)
4. Connect Heated Oxygen Sensor Electrical Connector (1).

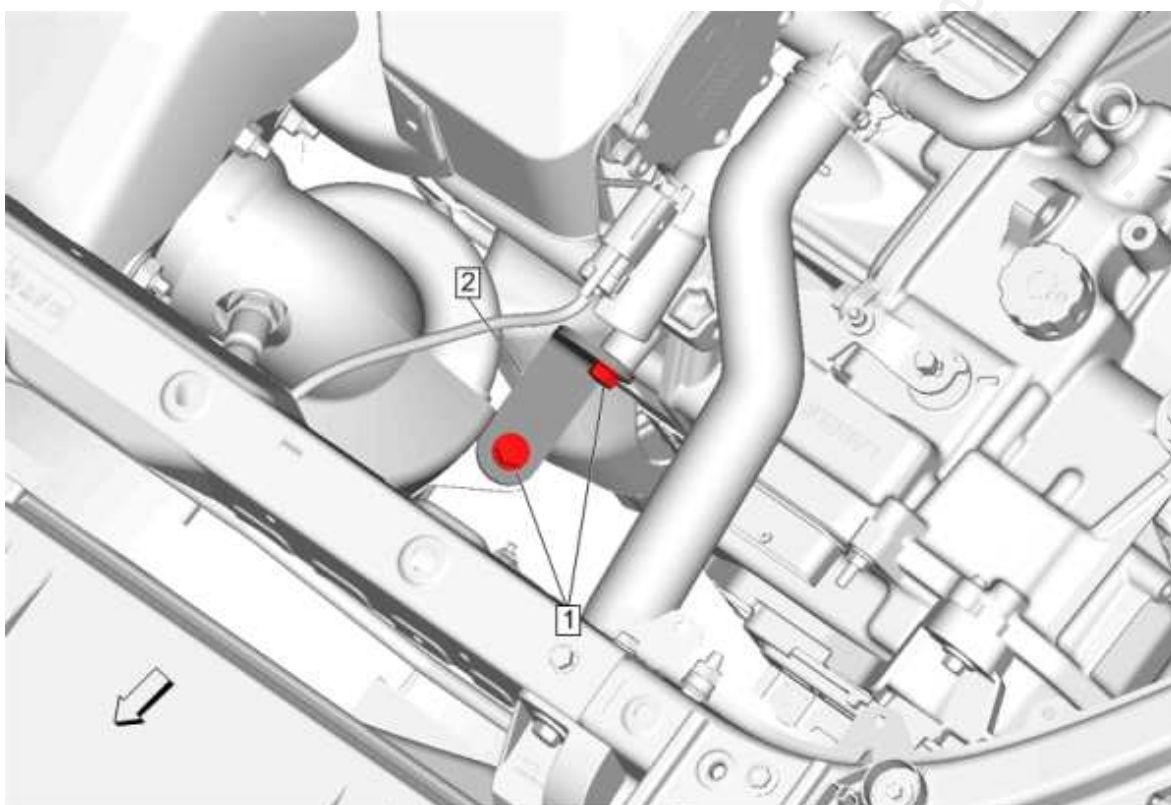


Fig. 59: Catalytic Converter Brace Bracket Bolt And Bracket-Upper
 Courtesy of GENERAL MOTORS COMPANY

5. Install Catalytic Converter Brace Bracket-Upper (2).
6. Install Catalytic Converter Brace Bracket Bolt (2) and tighten [2x] - [Catalytic Converter Brace Bracket Replacement \(LTG Lower\)](#)[Catalytic Converter Brace Bracket Replacement \(LTG Upper\)](#).
7. Install Turbocharger Heat Shield - [Turbocharger Heat Shield Replacement](#)
8. Raise and support the vehicle.

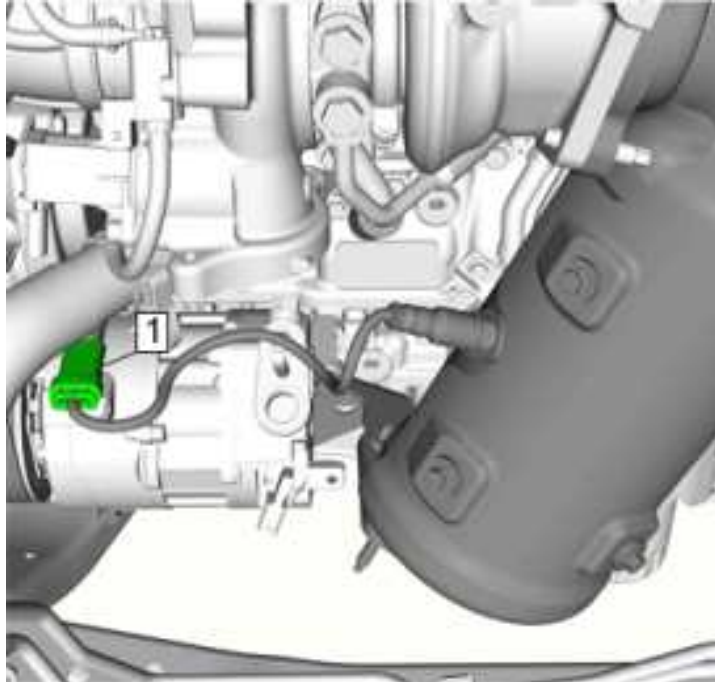


Fig. 60: Heated Oxygen Sensor Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

9. Heated Oxygen Sensor Electrical Connector (1)

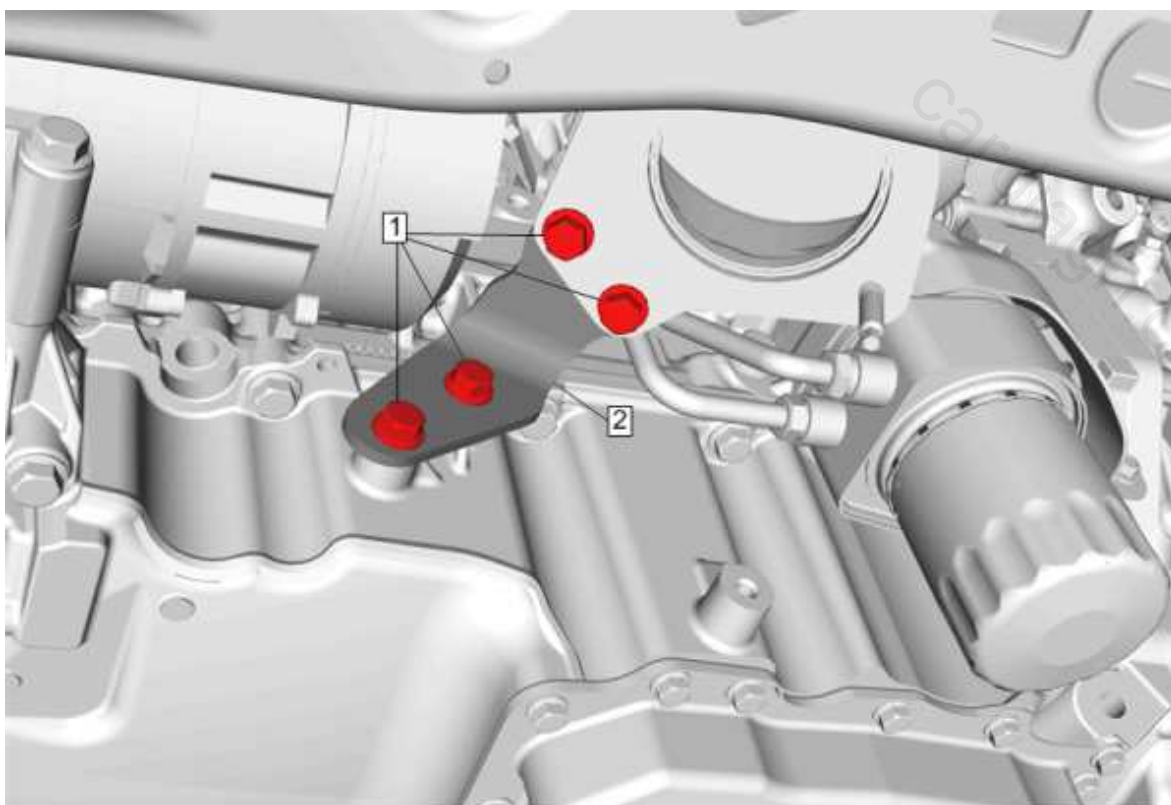


Fig. 61: Catalytic Converter Brace Bracket (LTG)
 Courtesy of GENERAL MOTORS COMPANY

10. Install Catalytic Converter Brace Bracket-Lower (2)
11. Install Catalytic Converter Brace Bracket Bolt (1) and tighten [4x] - **Catalytic Converter Brace Bracket Replacement (LTG Lower)****Catalytic Converter Brace Bracket Replacement (LTG Upper)**
12. Install Exhaust Front Pipe -**Exhaust Front Pipe Replacement (LTG)**
13. Start the engine and check for exhaust leaks.

CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (LOWER, LYX)

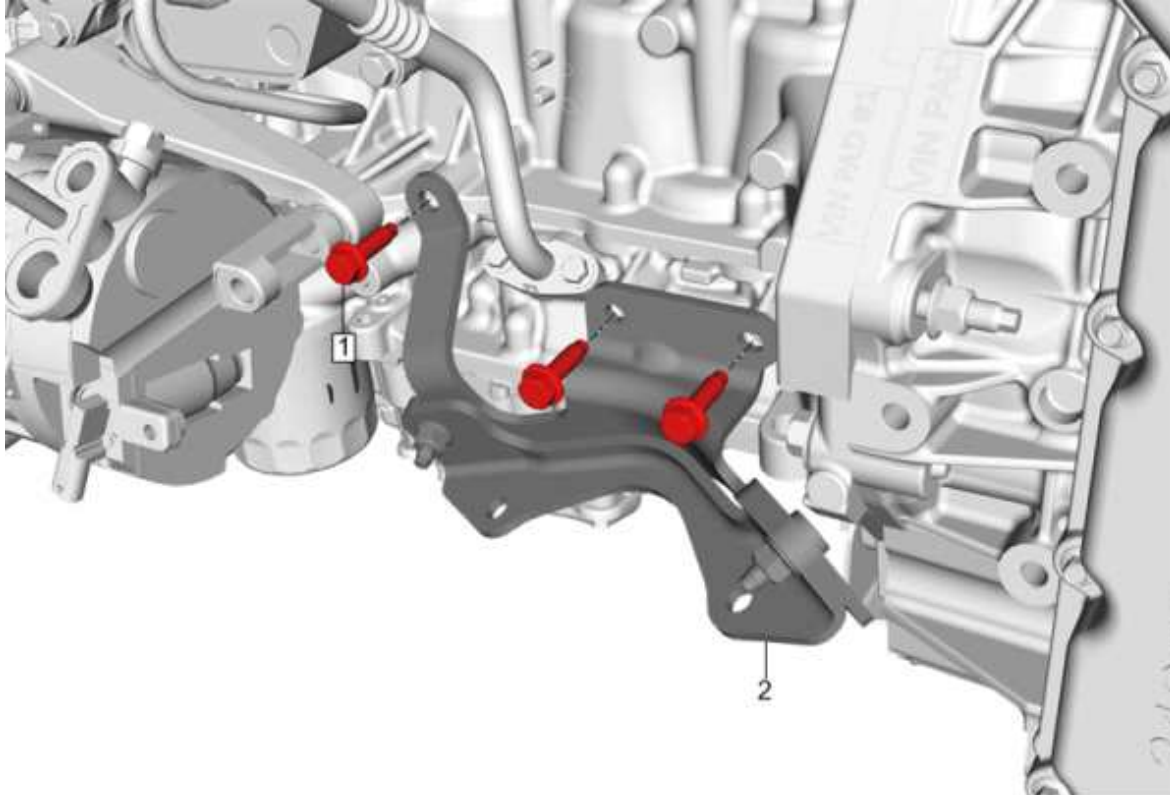


Fig. 62: Catalytic Converter Brace Bracket
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Warm Up Three-Way Catalytic Converter Replacement (LYX)</u>	
1	Catalytic Converter Brace Bracket Bolt (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Brace Bracket

CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (UPPER, LYX)

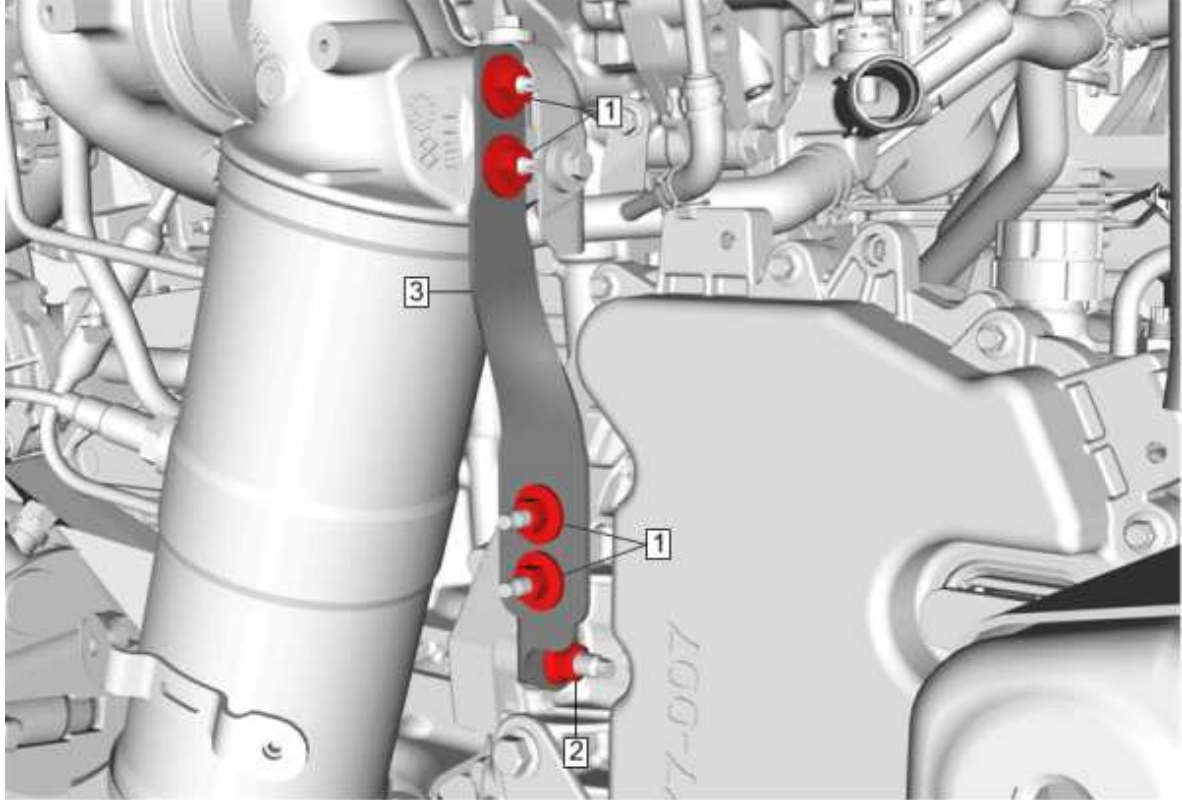


Fig. 63: Catalytic Converter Brace Bracket (Upper LFV)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Turbocharger Heat Shield Replacement</u>	
1	Catalytic Converter Brace Bracket Nut (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Brace Bracket Nut Tighten 58 N.m (43 lb ft)
3	Catalytic Converter Brace Bracket

CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (LTG LOWER)

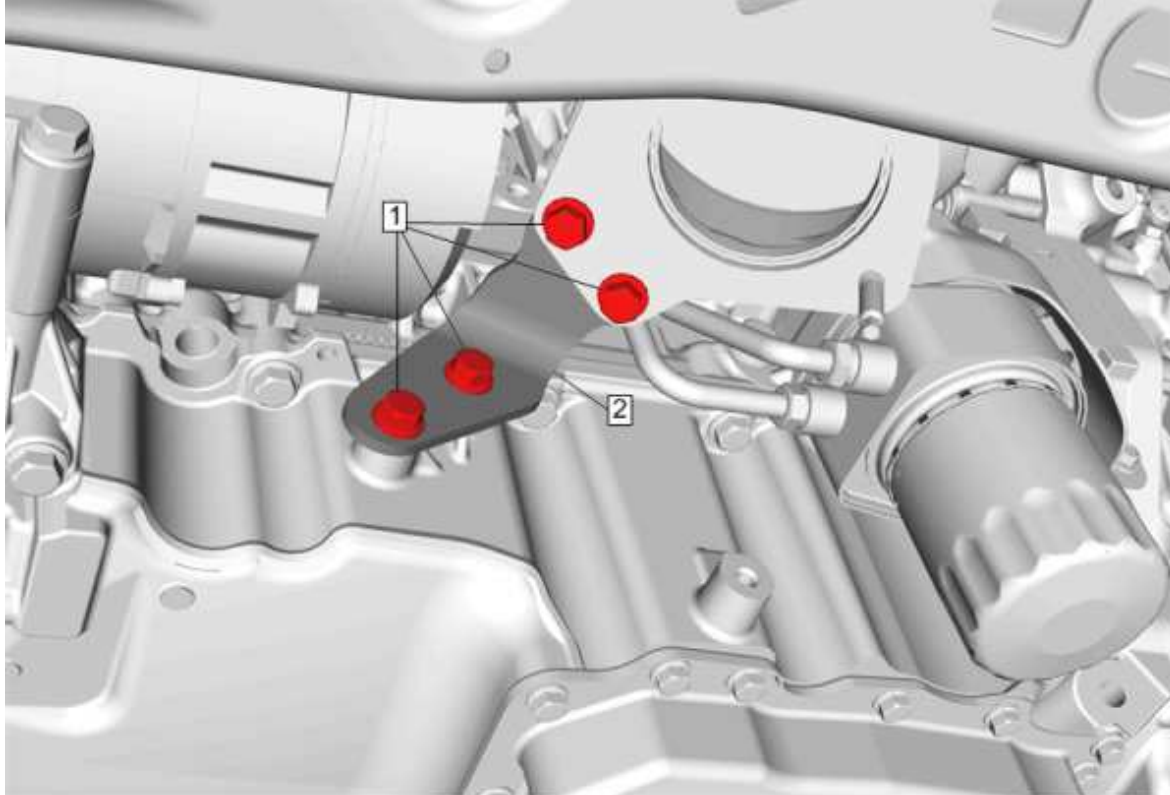


Fig. 64: Catalytic Converter Brace Bracket (LTG)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Lifting and Jacking the Vehicle</u>	
1	Exhaust Pipe Front Hanger Bracket Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Brace Bracket

CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (LTG UPPER)

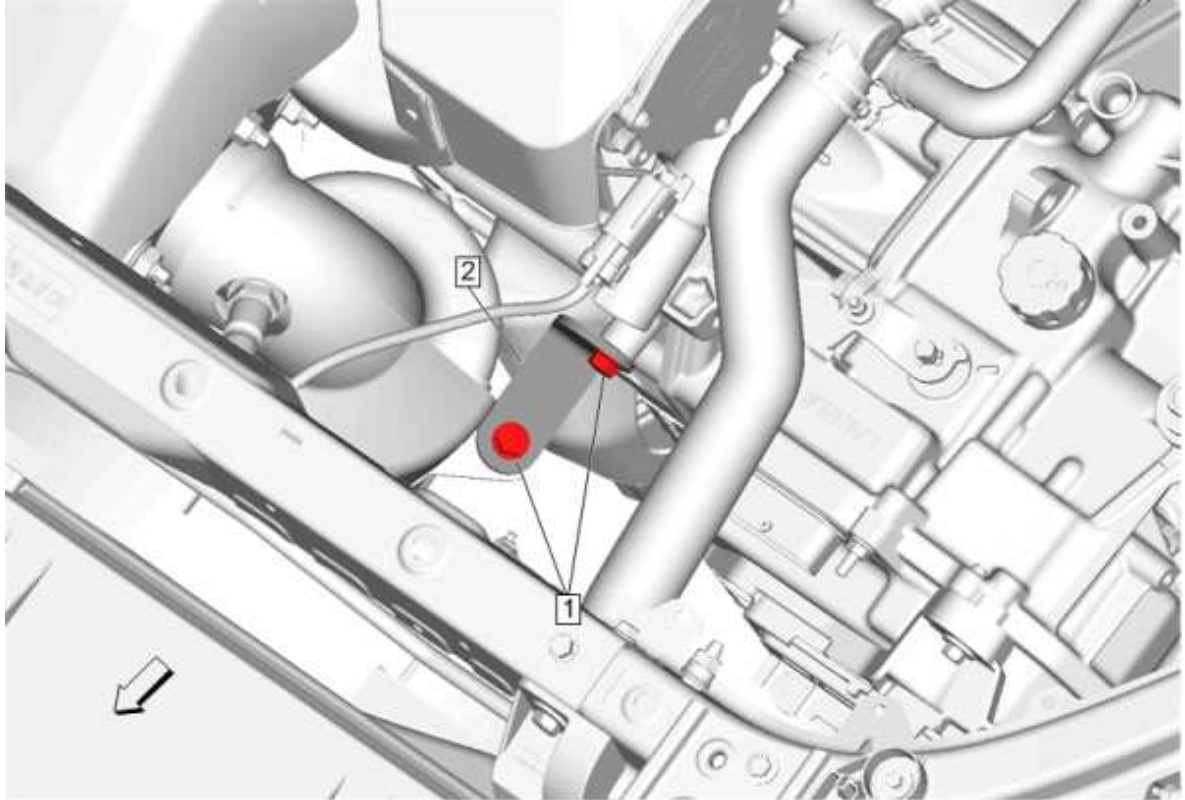


Fig. 65: Catalytic Converter Brace Bracket Bolt And Bracket-Upper

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Catalytic Converter Brace Bracket Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Brace Bracket

EXHAUST REAR MUFFLER REAR HANGER REPLACEMENT

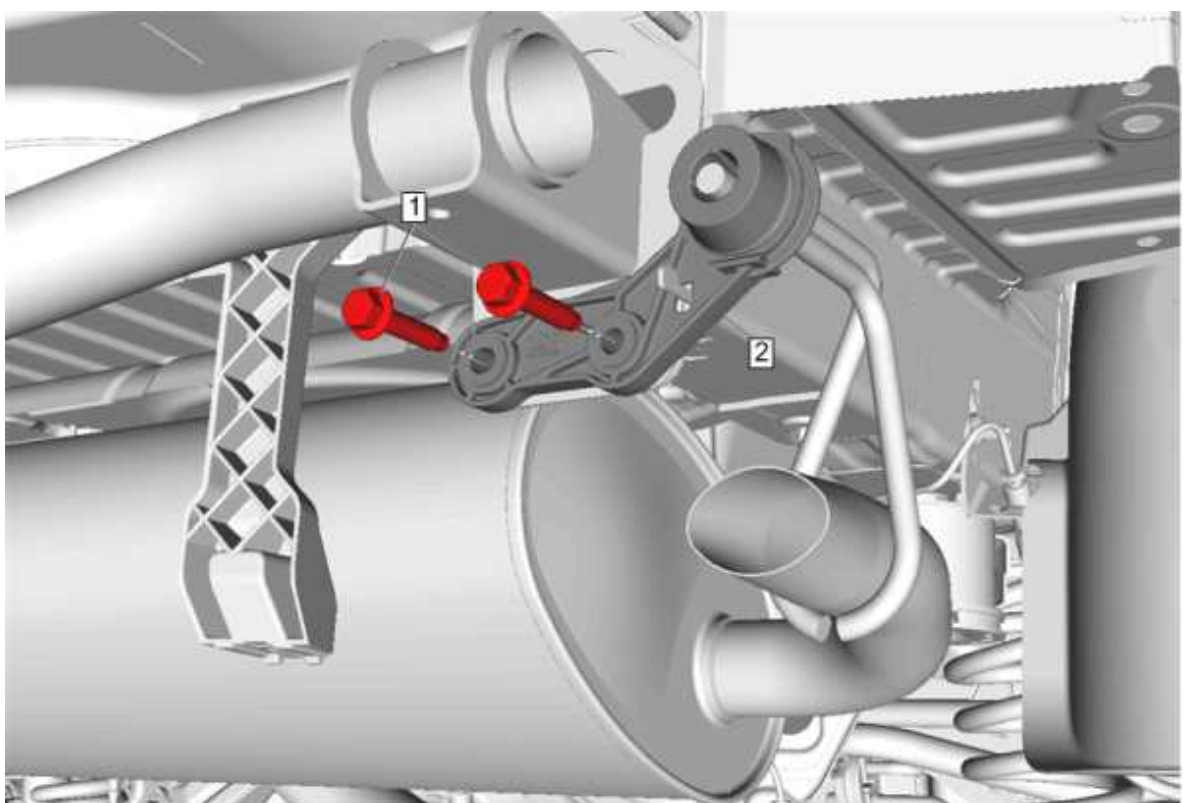


Fig. 66: Exhaust Rear Muffler Rear Hanger
 Courtesy of GENERAL MOTORS COMPANY

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

EXHAUST MUFFLER REPLACEMENT (LTG, LYX)

Removal Procedure

WARNING: Refer to **Hot Exhaust System Warning** .

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

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

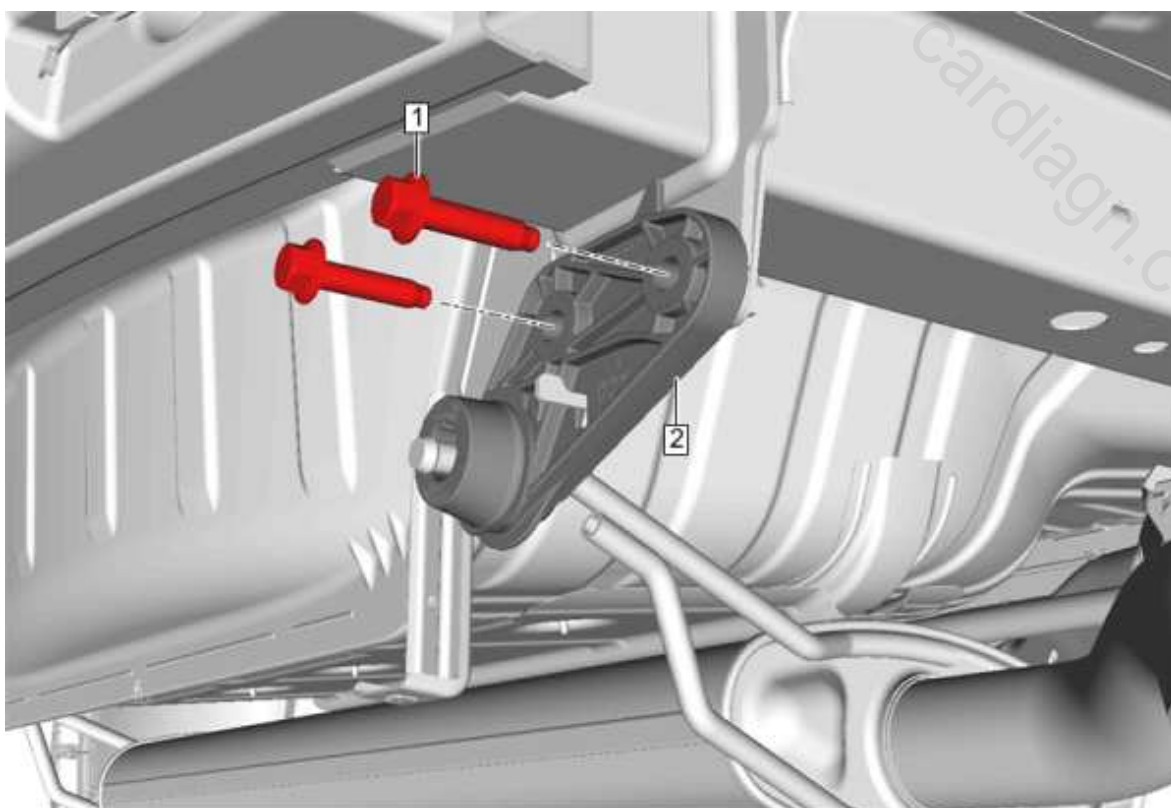


Fig. 67: Exhaust Rear Muffler Insulator Bolt-Right Side
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Exhaust Rear Muffler Insulator Bolt-Right Side (1)

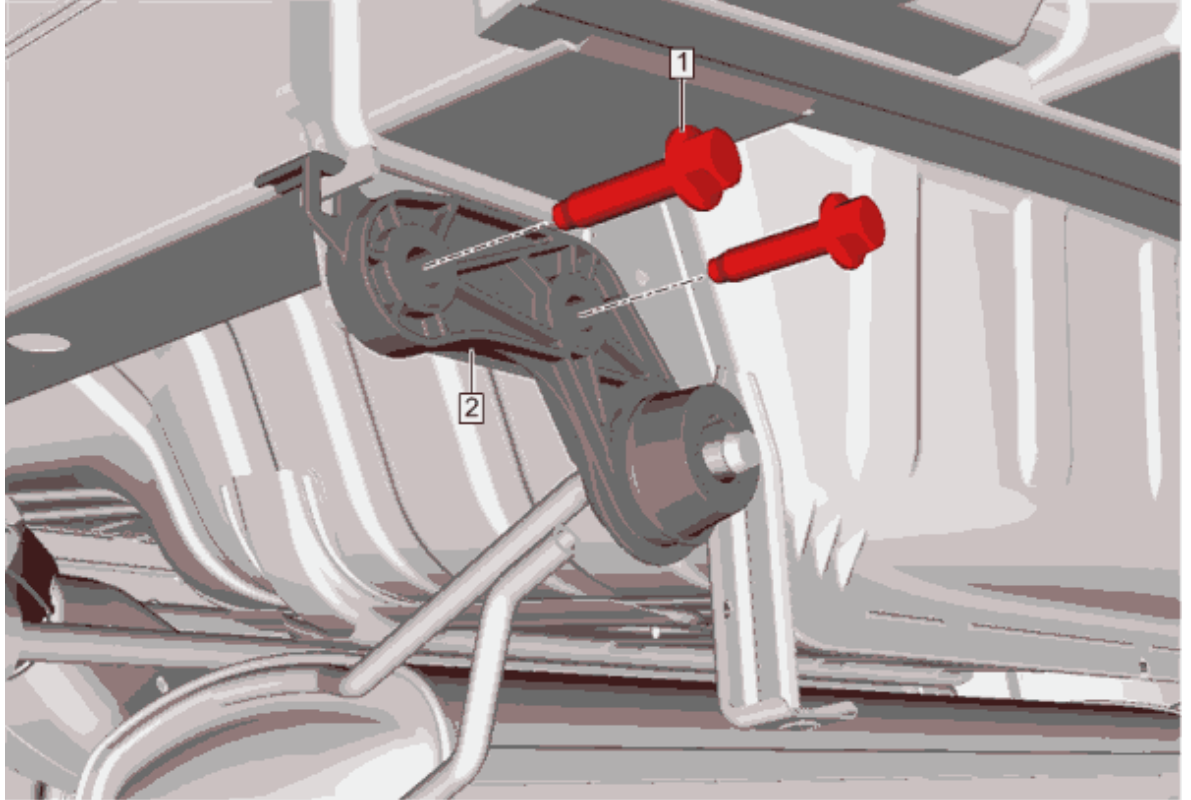


Fig. 68: Exhaust Rear Muffler Insulator Bolt-Left Side

Courtesy of GENERAL MOTORS COMPANY

3. Remove Exhaust Rear Muffler Insulator Bolt-Left Side (1)

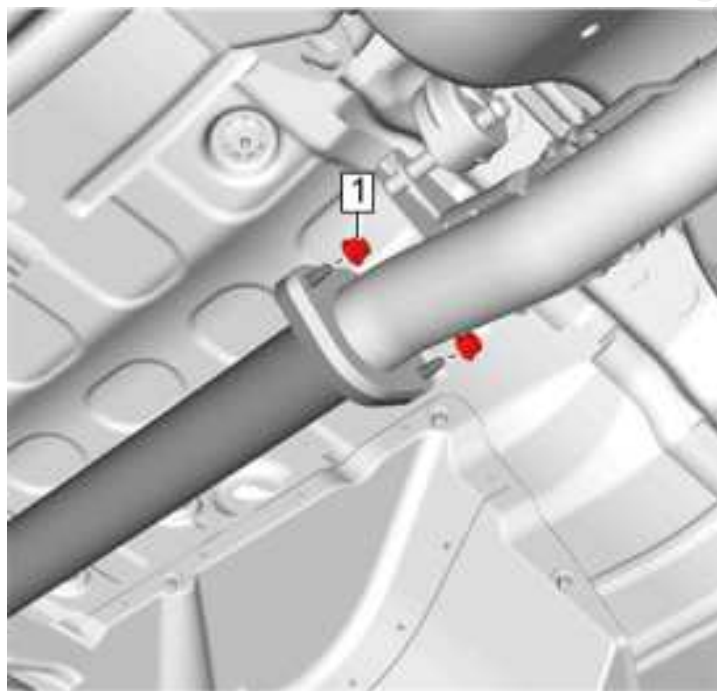


Fig. 69: Exhaust Front Pipe Nut

Courtesy of GENERAL MOTORS COMPANY

4. Remove Exhaust Front Pipe Nut (1)

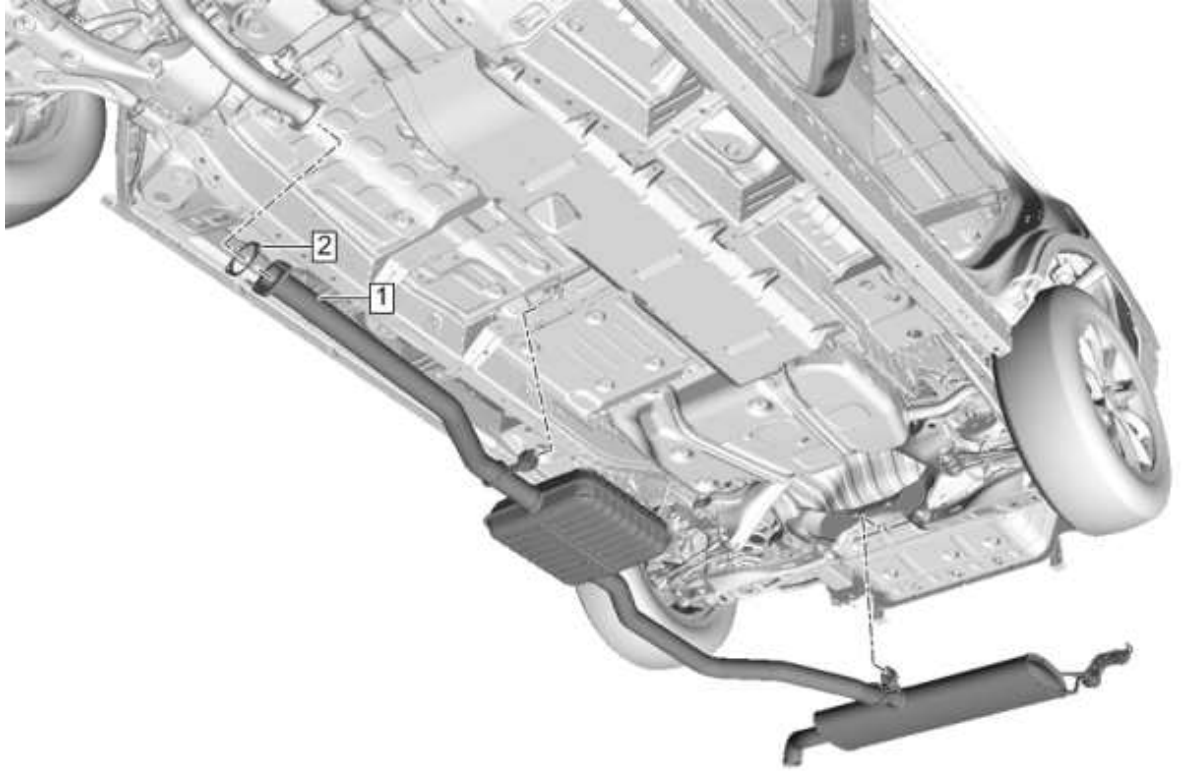


Fig. 70: Exhaust Muffler Assembly And Exhaust Gasket
Courtesy of GENERAL MOTORS COMPANY

5. Remove Exhaust Muffler Assembly (1)
6. Remove Exhaust Gasket (2) and DISCARD

Installation Procedure

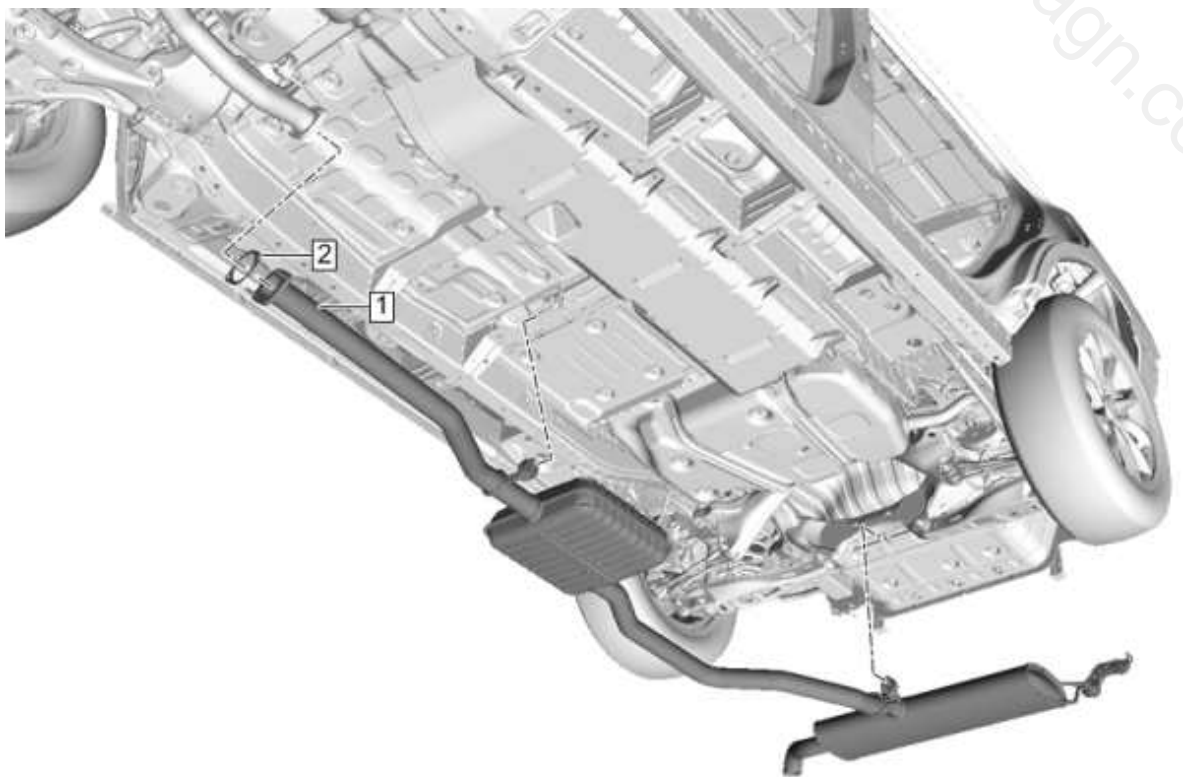


Fig. 71: Exhaust Muffler Assembly And Exhaust Gasket
Courtesy of GENERAL MOTORS COMPANY

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

NOTE: Install a NEW gasket.

1. Install Exhaust Gasket (2)

2. Exhaust Muffler Assembly (3)

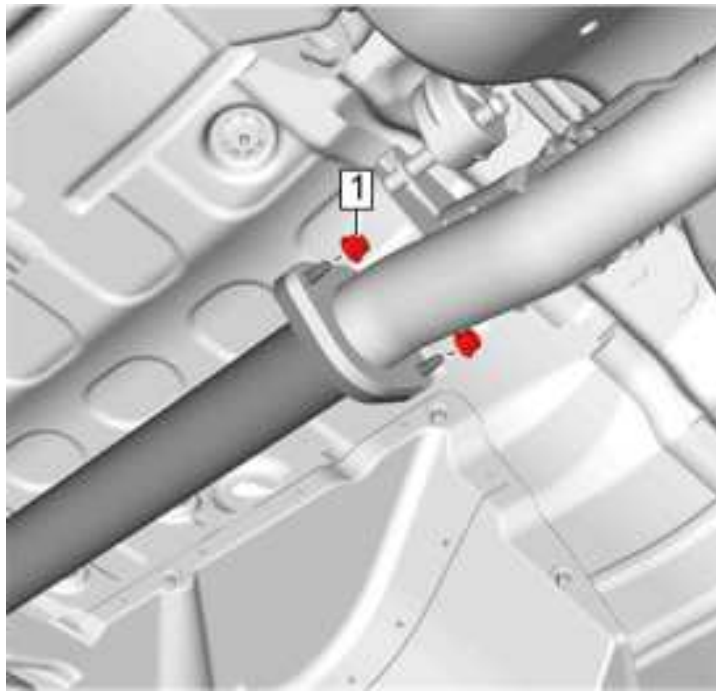


Fig. 72: Exhaust Front Pipe Nut

Courtesy of GENERAL MOTORS COMPANY

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

3. Install Exhaust Front Pipe Nut (1) and tighten 22 N.m (16 lb ft)

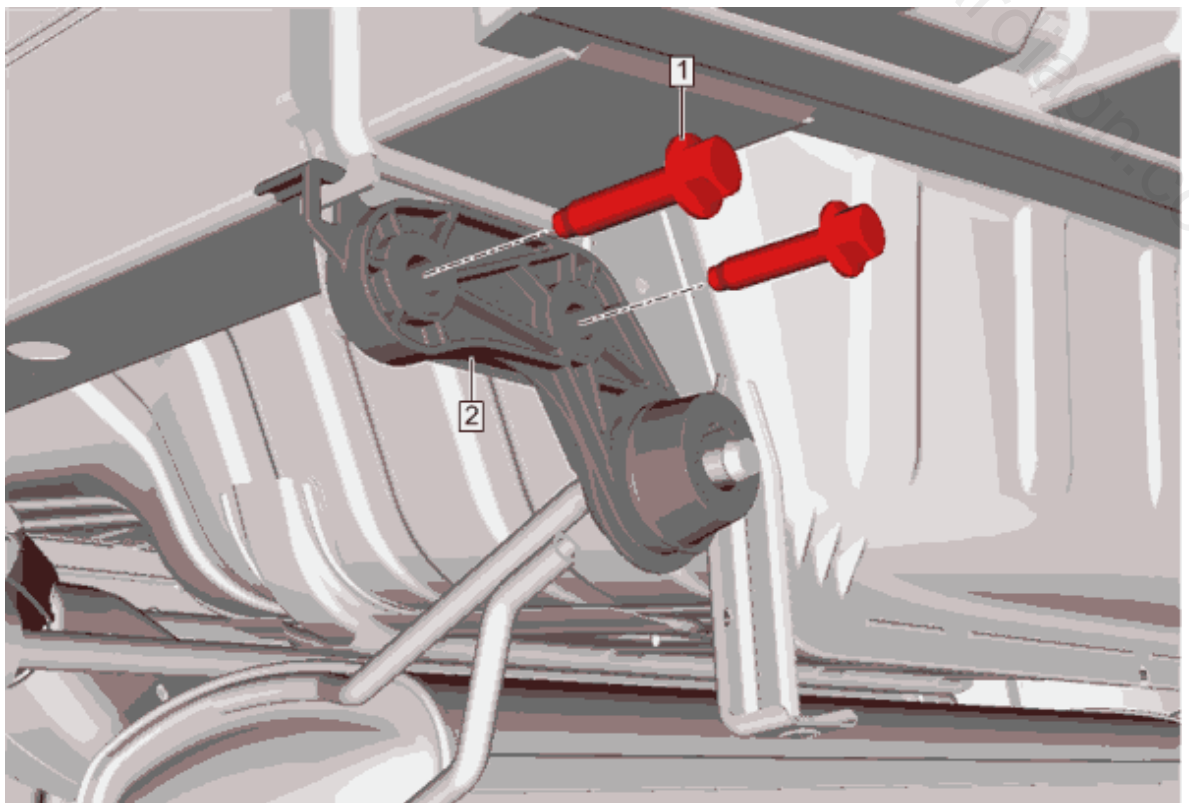


Fig. 73: Exhaust Rear Muffler Insulator Bolt-Left Side

Courtesy of GENERAL MOTORS COMPANY

4. Install Exhaust Rear Muffler Insulator Bolt-Left Side (1) and tighten 22 N.m (16 lb ft)

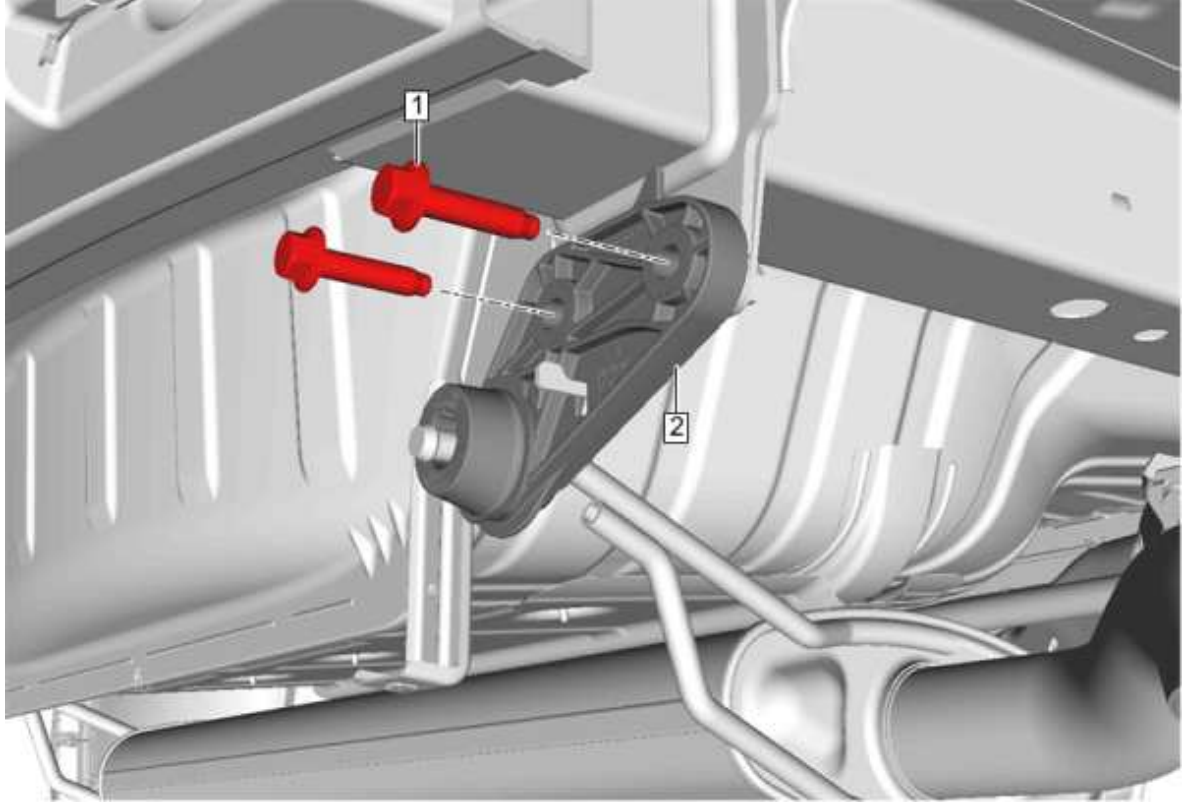


Fig. 74: Exhaust Rear Muffler Insulator Bolt-Right Side

Courtesy of GENERAL MOTORS COMPANY

5. Install Exhaust Rear Muffler Insulator Bolt-Right Side (1) and tighten 22 N.m (16 lb ft)
6. Lower the vehicle. [Lifting and Jacking the Vehicle](#)
7. Start the engine and check for exhaust leaks.

EXHAUST MUFFLER REPLACEMENT (LH7)

Removal Procedure

WARNING: [Protective Goggles and Glove Warning](#)

WARNING: [Exhaust Service Warning](#)

NOTE: Ensure care when repositioning Nitrogen Oxides Sensor 2. Do NOT bend the cable sharply at the base of either the sensing unit or sensor ECU in the final mounting position.

1. Remove Nitrogen Oxides Sensor-Position 2 and position aside - [Nitrogen Oxides Sensor Replacement - Position 2](#)

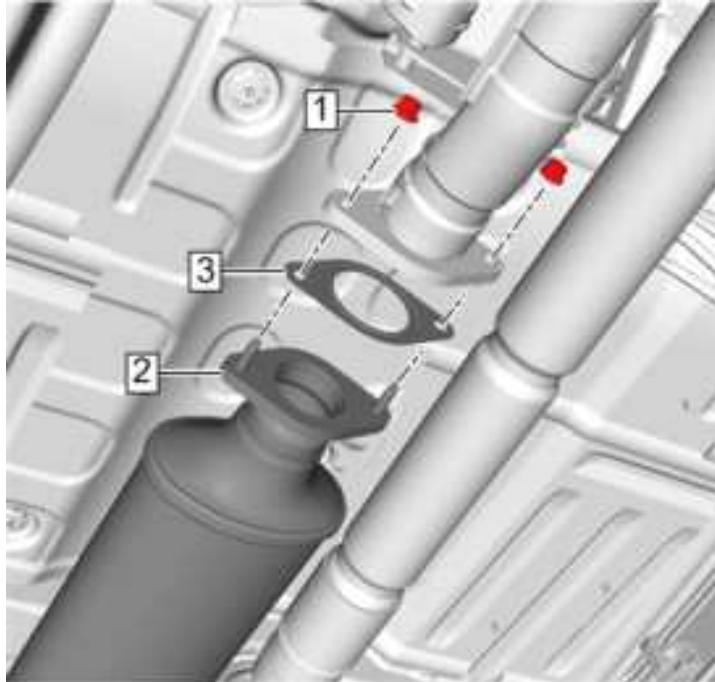


Fig. 75: Exhaust Front Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

2. Remove Exhaust Front Pipe Nut (1)
3. Remove Exhaust Muffler (2)
4. Remove Exhaust Front Pipe Gasket (3) and DISCARD

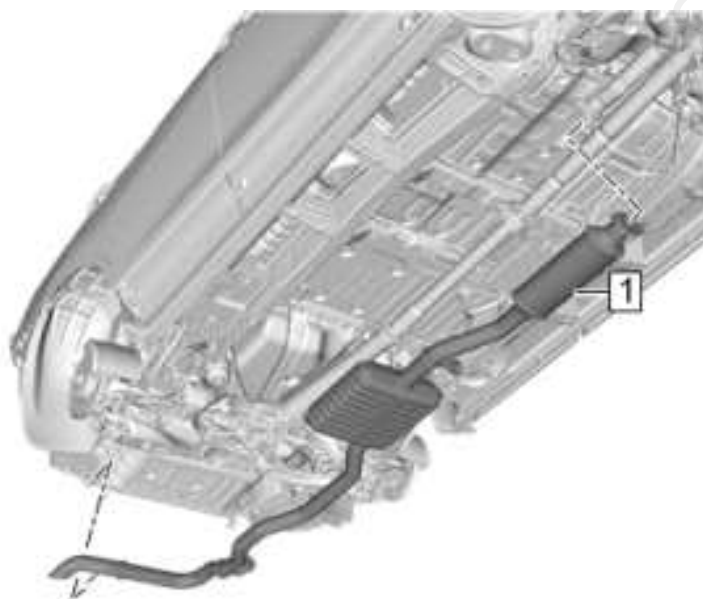


Fig. 76: Exhaust Muffler Assembly
Courtesy of GENERAL MOTORS COMPANY

5. Remove Exhaust Muffler Assembly (1)

Installation Procedure

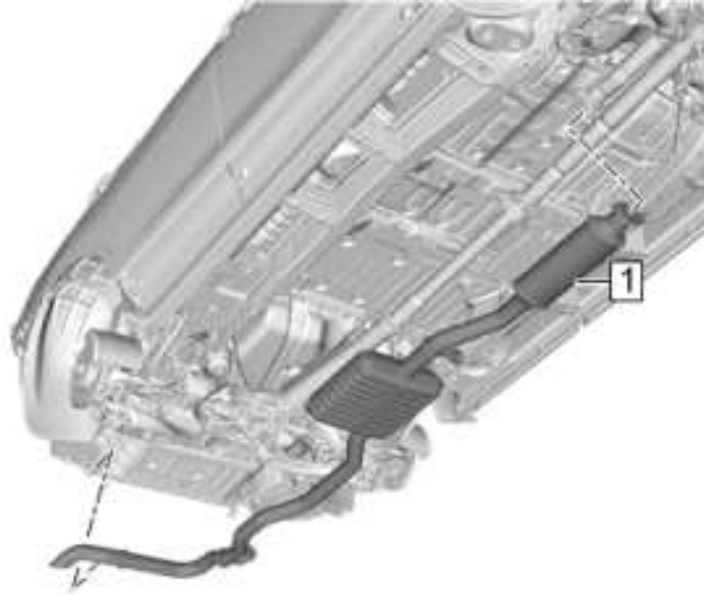


Fig. 77: Exhaust Muffler Assembly

Courtesy of GENERAL MOTORS COMPANY

1. With the aid of an assistant, position and install the exhaust muffler assembly.(1)

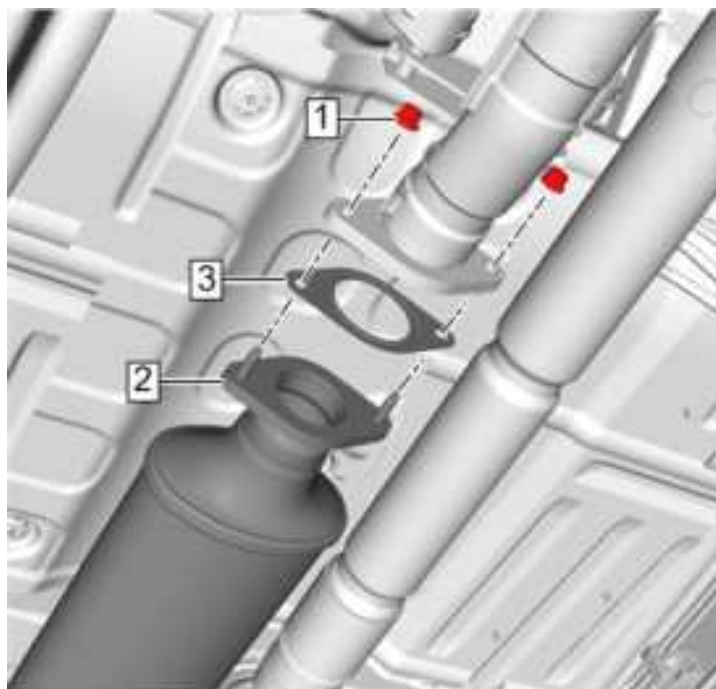


Fig. 78: Exhaust Front Pipe Nut

Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a **NEW** gasket.

2. Install Exhaust Front Pipe Gasket (3)
3. Install Exhaust Muffler (2)

CAUTION: **Fastener Caution**

4. Install Exhaust Front Pipe Nut (1) and tighten 22 N.m (16 lb ft)

NOTE: Ensure care when repositioning Nitrogen Oxides Sensor 2. Do NOT bend the cable sharply at the base of either the sensing unit or sensor ECU in the final mounting position.

5. Install Nitrogen Oxides Sensor-Position 2 - **Nitrogen Oxides Sensor Replacement - Position 2**

6. If the replacing the Exhaust Muffler with new, perform the NOx Catalyst Reset. [NOx Catalyst Reset](#)
7. If replacing the Exhaust Muffler with new, perform the Diesel Particulate Filter (DPF) Regeneration Enable. [Diesel Particulate Filter \(DPF\) Regeneration Enable](#)

CATALYTIC CONVERTER HEAT SHIELD REPLACEMENT (LTG)

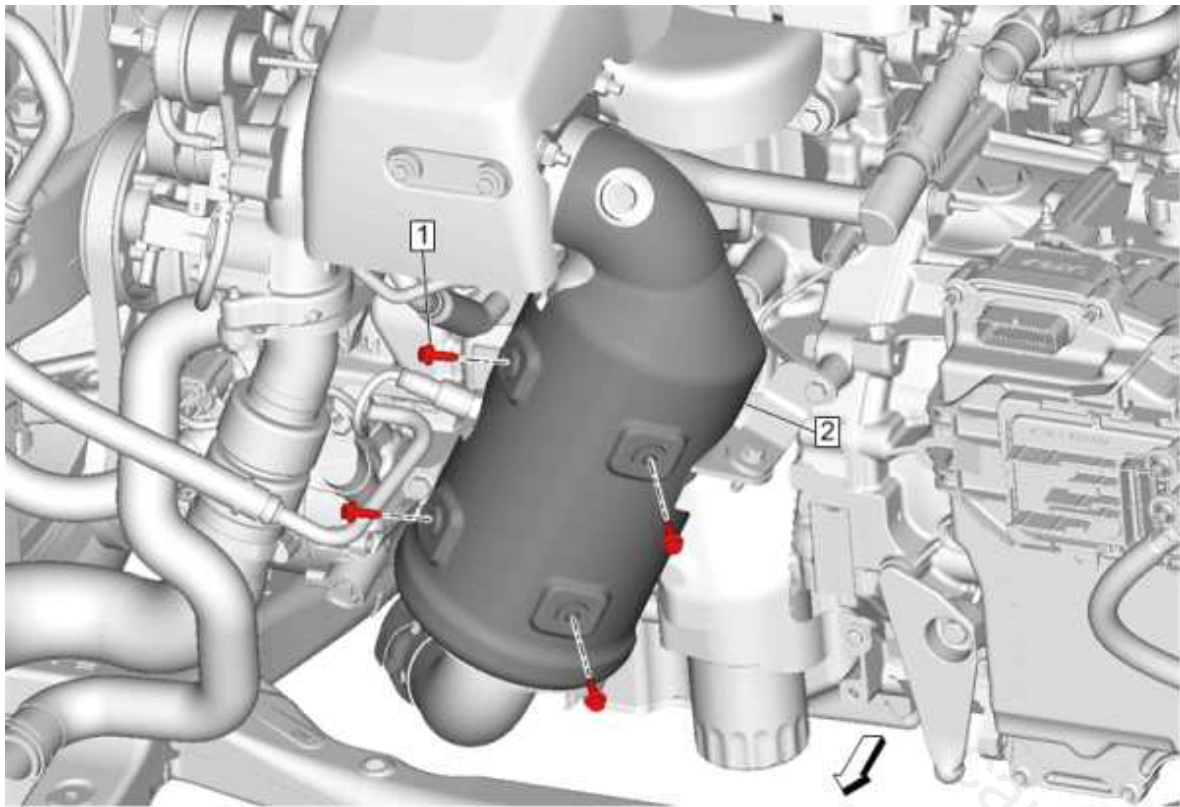


Fig. 79: Catalytic Converter Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

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 Heated Oxygen Sensor Replacement - Sensor 1	
1	Catalytic Converter Heat Shield Bolt (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 10 N.m (89 lb in)
2	Catalytic Converter Heat Shield

CATALYTIC CONVERTER HEAT SHIELD REPLACEMENT (LH7)

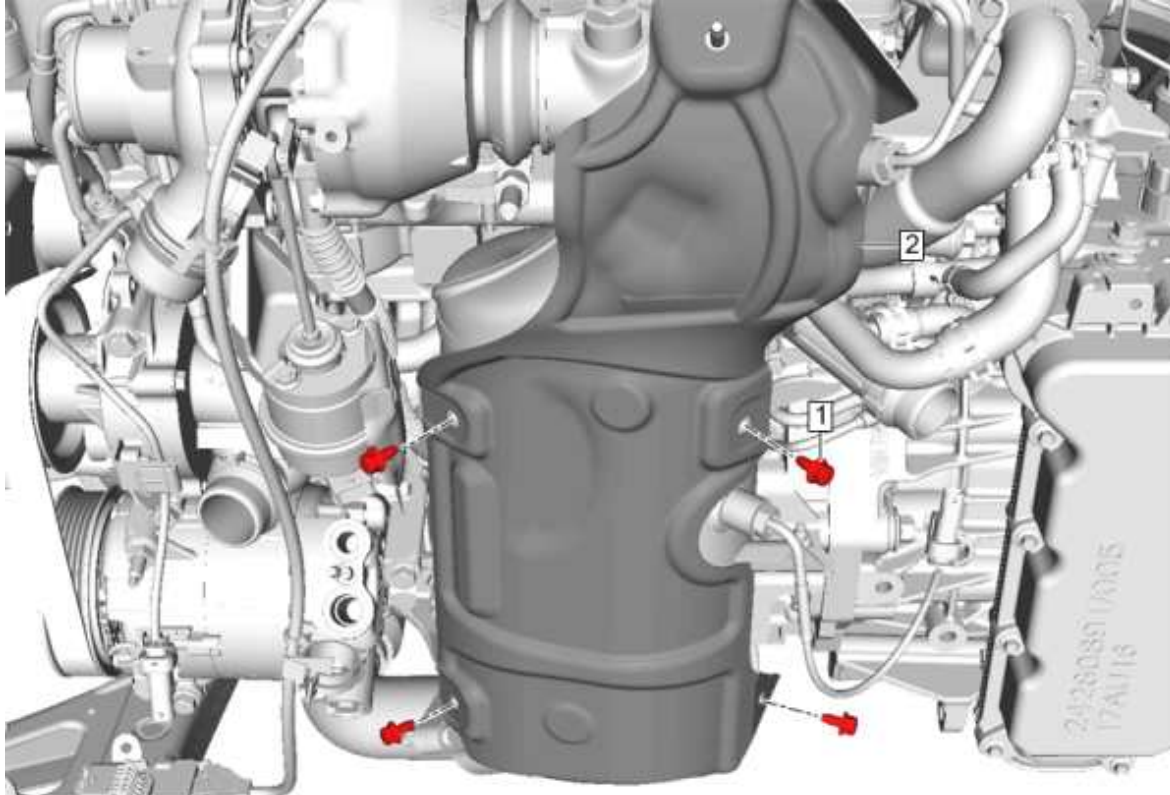


Fig. 80: Catalytic Converter Heat Shield

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Lifting and Jacking the Vehicle 2. Turbocharger Heat Shield Replacement (LH7)	
1	Catalytic Converter Heat Shield Bolt (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 10 N.m (89 lb in)
2	Catalytic Converter Heat Shield

EXHAUST FRONT UNDERBODY HEAT SHIELD REPLACEMENT

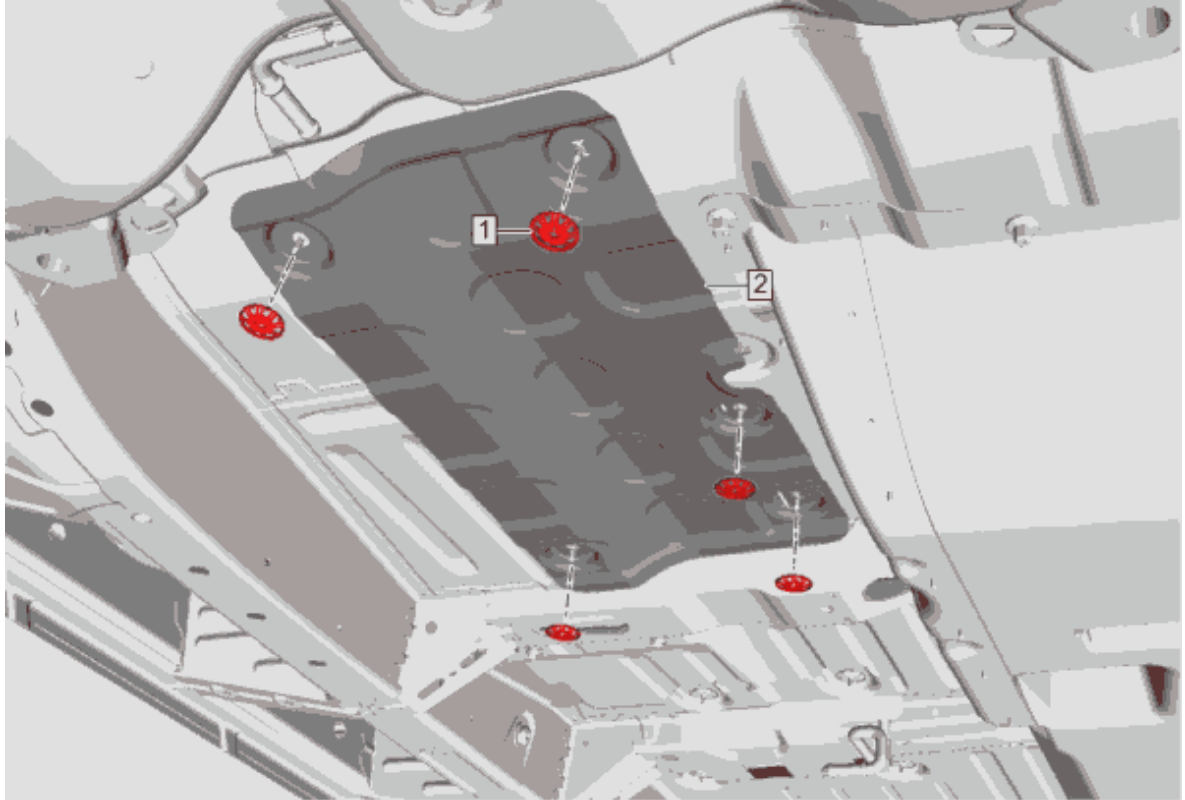


Fig. 81: Exhaust Front Underbody Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Lifting and Jacking the Vehicle</u>	
1	Exhaust Front Underbody Heat Shield Retainer (Qty: 5) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 N.m (13 lb in)
2	Exhaust Front Underbody Heat Shield

EXHAUST INTERMEDIATE UNDERBODY HEAT SHIELD REPLACEMENT

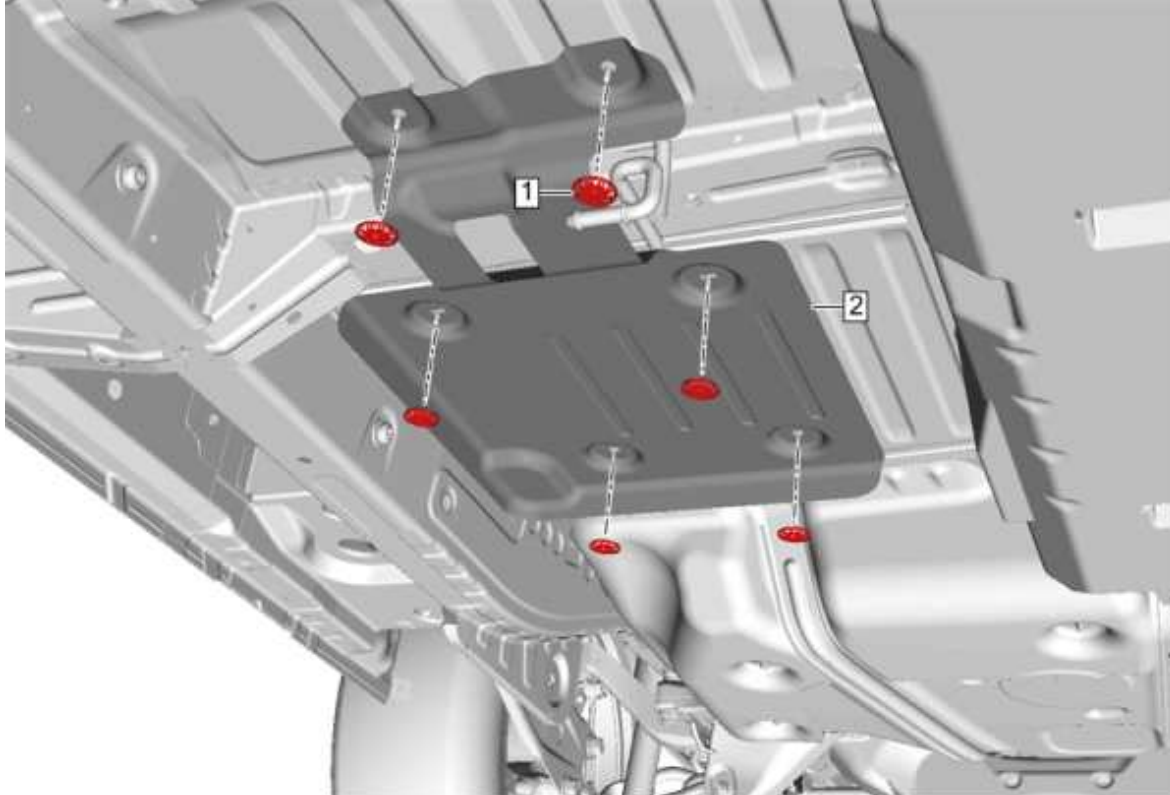


Fig. 82: Exhaust Intermediate Underbody Heat Shield

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Exhaust Muffler Replacement (LTG, LYX)Exhaust Muffler Replacement (LH7)</u>	
1	Exhaust Intermediate Underbody Heat Shield Retainer (Qty: 6) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 N.m (13 lb in)
2	Exhaust Intermediate Underbody Heat Shield

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT (LTG)

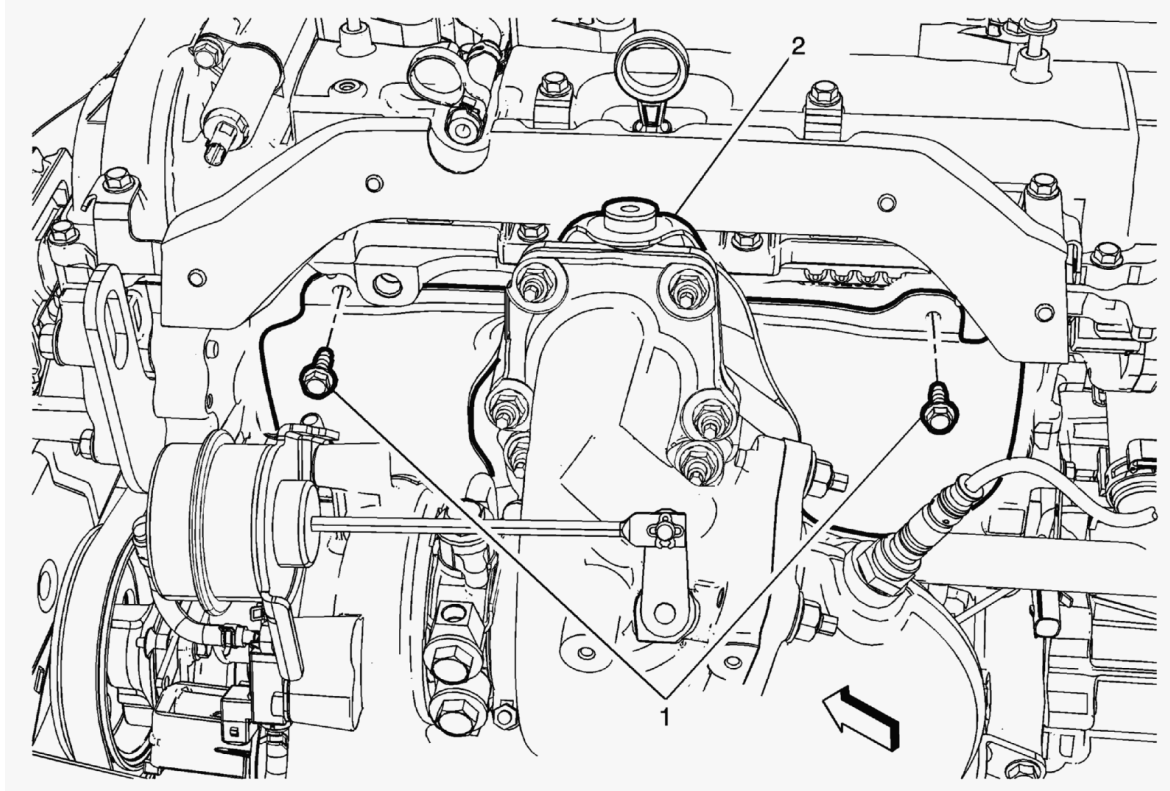


Fig. 83: Exhaust Manifold Heat Shield (LTG)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Hot Exhaust System Warning .	
Preliminary Procedure Remove the turbocharger. Refer to Turbocharger Replacement (1st Design Tamper-Proof PCV System) .	
1	Exhaust Manifold Heat Shield Fasteners (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 14 N.m (10 lb ft)
2	Exhaust Manifold Heat Shield

TURBOCHARGER HEAT SHIELD REPLACEMENT (LH7)

Removal Procedure

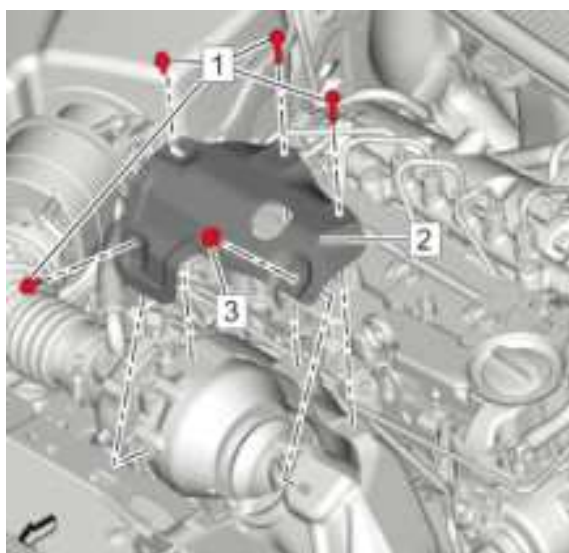


Fig. 84: Turbocharger Heat Shield, Bolts And Nut
Courtesy of GENERAL MOTORS COMPANY

1. Remove Turbocharger Heat Shield Bolt (1) - [4x]
2. Remove Turbocharger Heat Shield Nut (3).
3. Remove Turbocharger Heat Shield (2).
4. Remove Nitrogen Oxides Sensor-Position 1 @Oxidation Catalytic Converter and position aside - **Nitrogen Oxides Sensor Replacement - Position 1**

Installation Procedure

1. Install Nitrogen Oxides Sensor-Position 1 @Oxidation Catalytic Converter - **Nitrogen Oxides Sensor Replacement - Position 1**

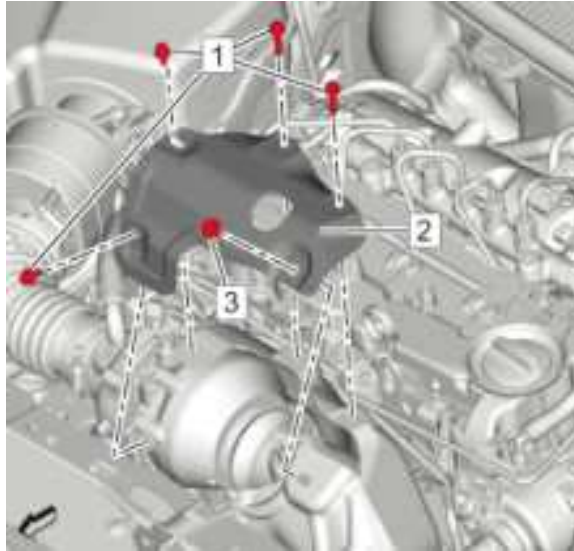


Fig. 85: Turbocharger Heat Shield, Bolts And Nut
Courtesy of GENERAL MOTORS COMPANY

2. Install Turbocharger Heat Shield (2).

CAUTION: **Fastener Caution**

3. Install Turbocharger Heat Shield Nut (3) and tighten 9N.m (80 lb in)
4. Install Turbocharger Heat Shield Bolt (1) and tighten [4x] 9N.m (80 lb in)

EXHAUST MUFFLER HEAT SHIELD REPLACEMENT

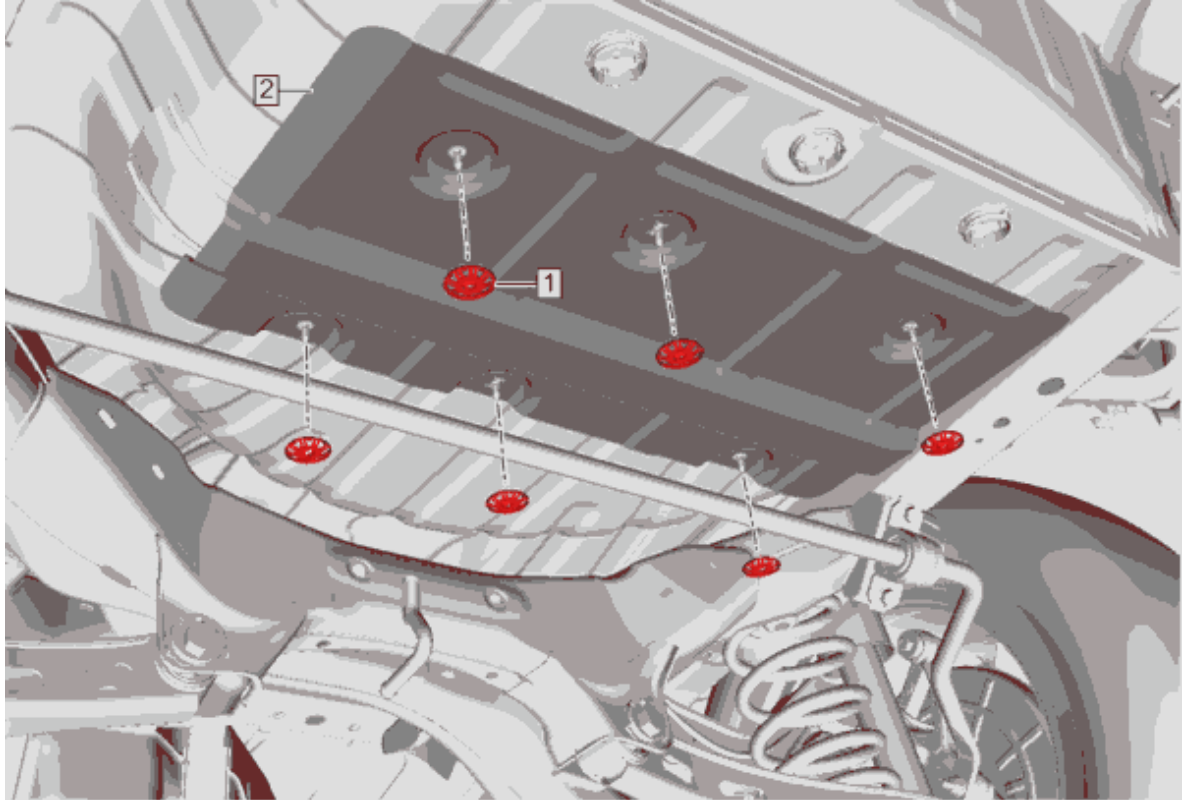


Fig. 86: Exhaust Muffler Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Exhaust Muffler Replacement (LTG, LYX)Exhaust Muffler Replacement (LH7)</u>	
1	Exhaust Muffler Heat Shield Retainer (Qty: 6) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 N.m (13 lb in)
2	Exhaust Muffler Heat Shield

EXHAUST REAR UNDERBODY HEAT SHIELD REPLACEMENT (LH7)

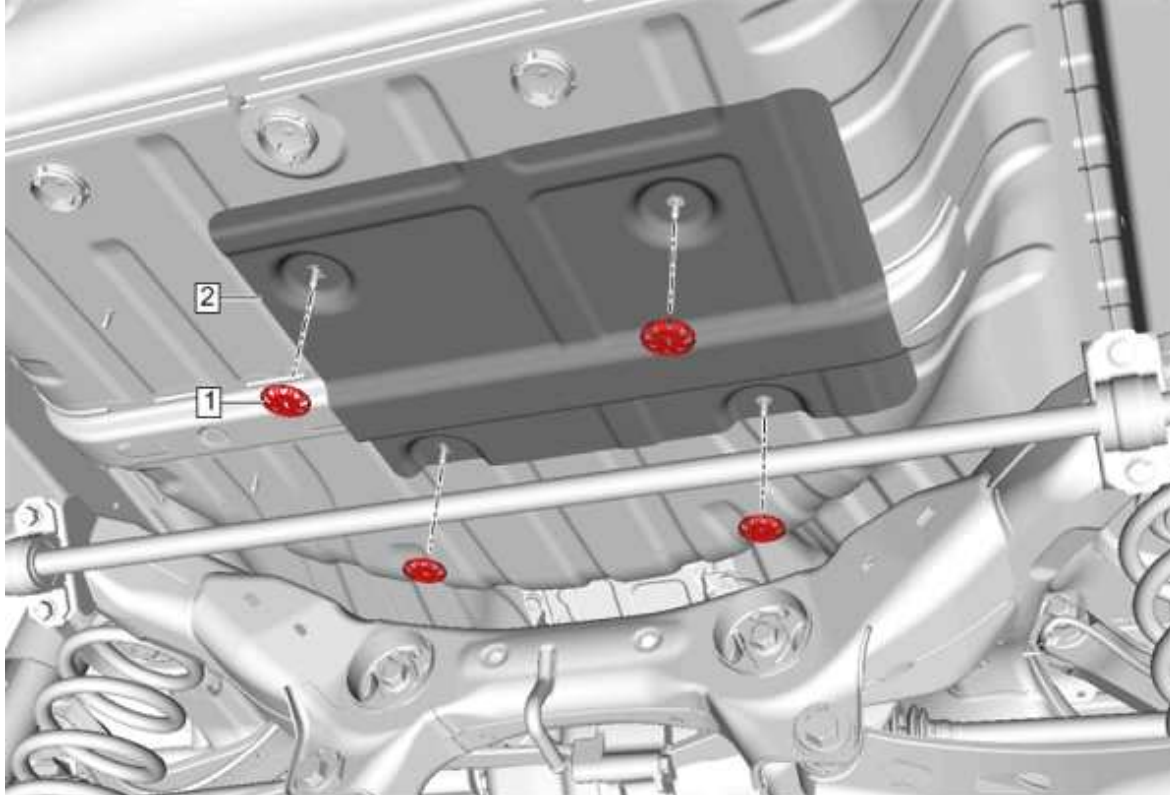


Fig. 87: Exhaust Rear Underbody Heat Shield
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. <u>Lifting and Jacking the Vehicle</u>	
1	Exhaust Rear Underbody Heat Shield Retainer (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 N.m (13 lb in)
2	Exhaust Rear Underbody Heat Shield

DESCRIPTION AND OPERATION

EXHAUST SYSTEM DESCRIPTION

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

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

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

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

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

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

The exhaust system may be comprised of the following components:

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

Resonator

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

Catalytic Converter

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

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

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

The catalyst in the catalytic converter is not serviceable.

Muffler

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

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description

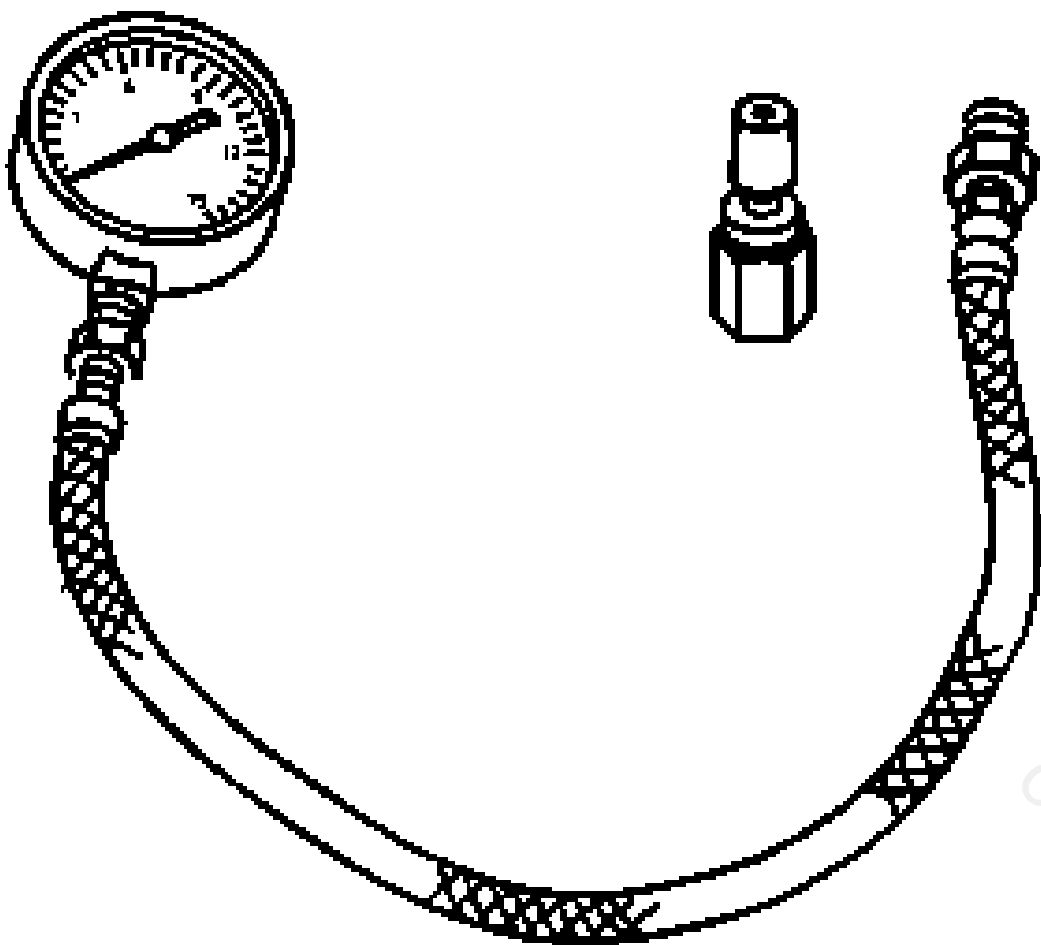
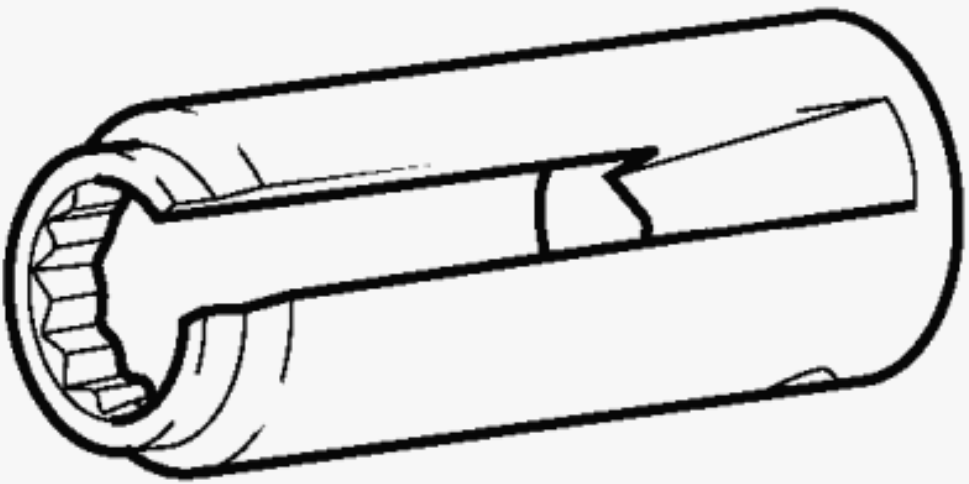
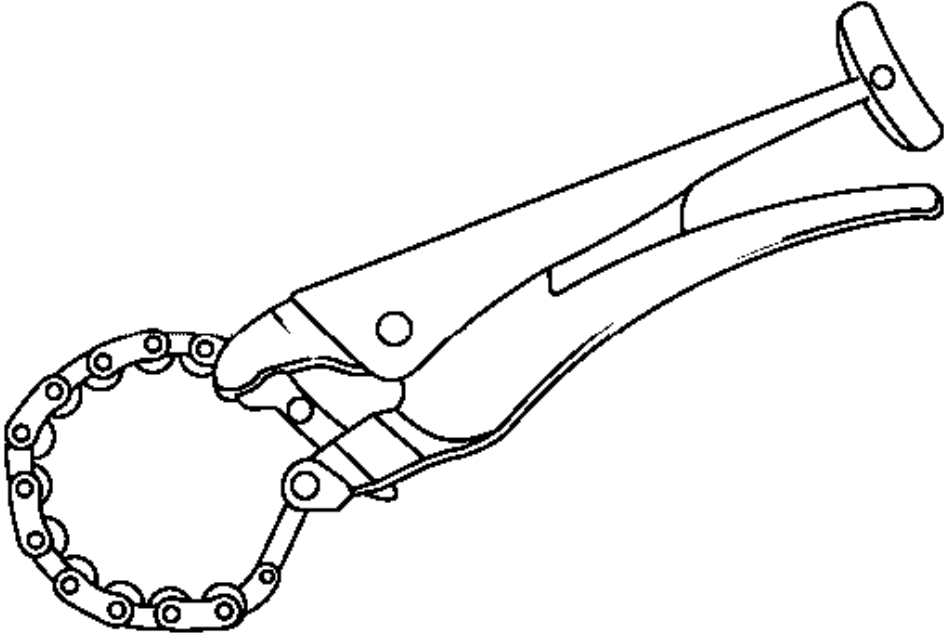
Illustration	Tool Number/Description
 The illustration shows a mechanical gauge assembly. On the left is a circular gauge with a needle pointing to approximately 10 on a scale from 0 to 15. A flexible braided hose is connected to the bottom of the gauge. The hose curves downwards and then upwards to the right, ending in a hexagonal fitting. A separate, identical hexagonal fitting is shown in the upper center of the illustration area. The entire drawing is in black and white line art style.	EN-35314-A J-35314-A Exhaust Back Pressure Gauge cardiagn.com

Illustration	Tool Number/Description
	EN-6179 EN-39194 - C KM-6179 J-39174-C EN-44626 J-44626 Heated Oxygen Sensor Remover/Installer

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Illustration	Tool Number/Description
	CH-6614 MKM-6614 83 95 667 CH-0006785 3 - 0006785 Chain-type Pipe Cutter