

2013 ENGINE

Engine Exhaust - Malibu

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter-to-Front Pipe Fastener (LCV, LUK)	18	13 lb ft
Catalytic Converter-to- Exhaust Manifold (LCV)	58	43 lb ft
Catalytic Converter-to- Exhaust Manifold (LUK)	50	37 lb ft
Catalytic Converter Brace Fastener (LCV)	22	16 lb ft
Catalytic Converter Brace Fastener (LUK)	58	43 lb ft
Catalytic Converter Brace Bracket Fastener (LUK)	25	18 lb ft
Exhaust Front Pipe-to Catalytic Converter (LCV, LUK)	28	21 lb ft
Exhaust Front Pipe Hanger Bracket Fasteners	60 + 30 Degrees	44 lb ft + 30 Degrees
Exhaust Front Pipe Retainer Fastener (LCV)	22	16 lb ft
Exhaust Isolator-to-Bracket Fasteners	22	16 lb ft
Exhaust Manifold Fastener (LCV)	20	15 lb ft
Exhaust Manifold Fastener (LUK)		
• First Pass	14	10 lb ft
• Final Pass	14	124 lb in
Exhaust Manifold Heat Shield Fastener (LCV, LTG)	14	10 lb ft
Exhaust Manifold Heat Shield Fastener (LUK)	10	89 lb in
Exhaust Muffler Rear Hanger Bracket Fastener	22	16 lb ft
Exhaust Pipe Heat Shield Fastener	2	18 lb in
Exhaust Rear Muffler Heat Shield Fastener	2	18 lb in

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada
Anti-Seize	Lubricant	88862477	88862478

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

Visual/Physical Inspection

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

Intermittent

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

Symptom List

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

- Loss of power - Refer to **Restricted Exhaust**.
- Poor acceleration - Refer to **Restricted Exhaust**.
- Poor fuel economy - Refer to **Restricted Exhaust**.
- Excessive smoke diesel - Refer to **Restricted Exhaust**.
- Exhaust hissing noise - Refer to **Exhaust Leakage**.
- Exhaust popping noise - Refer to **Exhaust Leakage**.
- Exhaust rattle noise - Refer to **Exhaust Noise**.
- Loud exhaust noise - Refer to **Exhaust Noise**.
- Exhaust buzz, groan, hum noise - Refer to **Exhaust Noise**.

RESTRICTED EXHAUST

Special Tools

EN-35314 Exhaust Pressure Gauge

For equivalent regional special tools, refer to **Special Tools**.

Diagnostic Aids

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

For dual exhaust systems a quick check of exhaust flow will help determine which side of the exhaust system is restricted. The side that has less exhaust flow is the side that will be suspect, and diagnosis should begin there.

Test Description

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

4

The exhaust system has very low back pressure under normal conditions. If the exhaust system is restricted, a significant increase in the exhaust pressure is noticed on the **EN-35314** gauge.

Removing the 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.

Restricted Exhaust

Step	Action	Value(s)	Yes	No
1	Did you verify the customers complaint?	-	Go to Step 2	-
2	Did you review the exhaust symptoms diagnostic information and perform the necessary inspections?	-	Go to Step 3	Go to <u>Symptoms - Engine Exhaust</u>
3	Is the system equipped with dual exhaust?	-	Go to Diagnostic Aids	Go to Step 4
	1. Remove the heated oxygen sensor (HO2S) that is in front of the catalytic converter. Refer to the appropriate procedure.			

4	2. Install the EN-35314 Exhaust Back Pressure Gauge in place of the HO2S sensor. 3. Start the engine. 4. Increase and monitor the engine speed at 2, 500 RPM. 5. Observe the exhaust system back pressure reading on the gauge. Does the reading exceed the specified value?	9 kPa (1.25 psi)	Go to Step 5	Go to Step 8
5	1. Turn the engine OFF and place the ignition in the lock position. 2. Remove the EN-35314 gauge. 3. Reinstall the HO2S sensor. Refer to affected component's service procedure. 4. Remove the post-catalyst HO2S sensor. Refer to the appropriate procedure. 5. Install the EN-35314 gauge in place of the post HO2S sensor. 6. Start the engine. 7. Increase and monitor the engine speed at 2, 500 RPM. 8. Observe the exhaust system back pressure reading on the gauge. Does the reading exceed the specified value?	9 kPa (1.25 psi)	Go to Step 6	Go to Step 7
6	Inspect the exhaust system for the following conditions: • Secondary catalytic converter restricted • 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	-
8	1. Remove the EN-35314 gauge. 2. Reinstall the applicable 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

Exhaust Leakage

Condition	Action
WARNING: Refer to Hot Exhaust System Warning .	
DEFINITION: An exhaust leak may show stains at the area of the leak. The leak may be felt by holding a hand close to the suspected areas or using a smoke pencil. The leak may make a popping or hissing noise. Refer to Symptoms - Engine Exhaust prior to beginning this table.	
Misaligned or improperly installed exhaust system components	• Align and tighten the exhaust system components to the specifications. Refer to Fastener Tightening Specifications. • Ensure the exhaust hangers are in the proper locations and not loose.
Exhaust leaks at the following connections: • Exhaust manifold to pipe • Flanges • Pipe clamps	Tighten the components to the specifications. Refer to Fastener Tightening Specifications .
Seals or gaskets leaking: • Exhaust manifold to cylinder head	Replace the leaking seal or gasket. Refer to the affected components procedure for service.

- Exhaust pipes to exhaust manifold - Catalytic converter connection	
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.
Catalytic Converter cracked or broken	Replace the catalytic converter. Refer to the affected component's service procedure.
Exhaust system component connection welds leaking	Replace the leaking component. Refer to the affected component's procedure for service.
Muffler or resonator, if equipped, damaged or leaking at the seams	Replace the affected muffler or resonator, if equipped. Refer to <u>Exhaust Muffler Replacement (LCV, LUK)</u> , <u>Exhaust Muffler Replacement (LTG)</u> .

EXHAUST NOISE

Exhaust Noise

Condition	Action
WARNING: Refer to <u>Hot Exhaust System Warning</u> .	
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 <u>Symptoms - Engine Exhaust</u> prior to beginning this table.	
Popping or hissing noise	Exhaust leak-Refer to <u>Exhaust Leakage</u> .
Loud exhaust	- Compare to a known good vehicle. - Inspect for a damaged or failed muffler or resonator, if equipped. - Replace the faulty muffler or resonator (if equipped). Refer to <u>Exhaust Muffler Replacement (LCV, LUK)</u>, <u>Exhaust Muffler Replacement (LTG)</u>.
External rattle or vibration noise	- Inspect for a bent or loose hanger, loose heat shield, or loose clamp. - Inspect for a exhaust pipe causing interference. - Repair or replace the affected component. Refer to the affected component's service procedure.
Internal rattle	- Test the components by tapping with a rubber mallet to confirm a rattle. - Replace the faulty catalytic converter, resonator, if equipped, or muffler. Refer to <u>Exhaust Muffler Replacement (LCV, LUK)</u>, <u>Exhaust Muffler Replacement (LTG)</u>.

REPAIR INSTRUCTIONS

EXHAUST MANIFOLD REPLACEMENT (LUK)

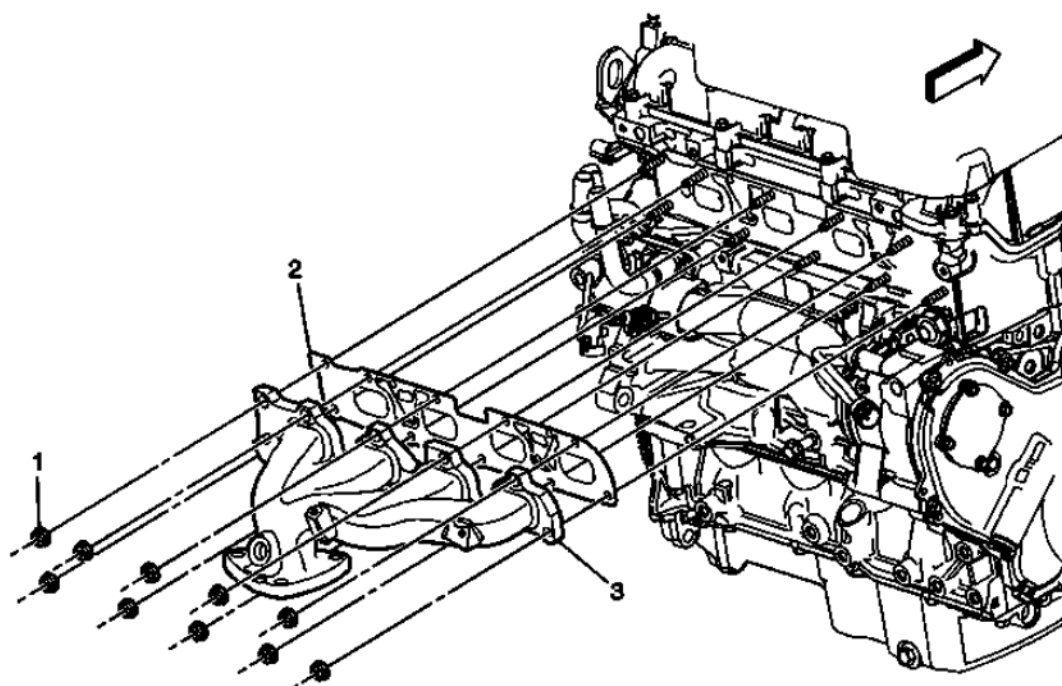


Fig. 1: Exhaust Manifold (L4)

Courtesy of GENERAL MOTORS COMPANY

Exhaust Manifold Replacement (LUK)

Callout	Component Name
WARNING: Refer to <u>Hot Exhaust System Warning</u> .	
Preliminary Procedures	
1. Remove the catalytic converter. Refer to <u>Catalytic Converter Replacement (LUK)</u> , <u>Catalytic Converter Replacement (LCV)</u> , <u>Catalytic Converter Replacement (LTG)</u> .	
2. Remove the exhaust manifold heated oxygen sensor. Refer to <u>Heated Oxygen Sensor Replacement - Sensor 1</u> .	
3. Remove both secondary air injection valves, if equipped. Refer to <u>Secondary Air Injection Check Valve Replacement - Left Side</u> , and <u>Secondary Air Injection Check Valve Replacement - Right Side</u> .	
	Exhaust Manifold Nut (Qty: 10) CAUTION: Refer to <u>Fastener Caution</u> .

1	NOTE: Perform two torque sequence passes at the same torque specification. The exhaust manifold gasket will relax between passes. Tighten • First Pass: 14 (10 lb ft) • Final Pass: 14 (10 lb ft)
2	Exhaust Manifold Gasket NOTE: Replace with a NEW exhaust manifold gasket. Procedure Remove the secondary air injection check valve pipe adapters, if equipped. Refer to <u>Secondary Air Injection Check Valve Pipe Adapter Replacement - Left Side</u>.
3	Exhaust Manifold Procedure 1. Remove and discard the exhaust manifold gasket. 2. Clean any exhaust manifold gasket debris from the cylinder head and exhaust manifold. 3. Install new exhaust manifold gasket. 4. Tighten the exhaust manifold fasteners working from the center out. 5. Perform two torque sequence passes at the same torque specification.

EXHAUST MANIFOLD REPLACEMENT (LCV)

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 (LUK)**, **Exhaust Manifold Heat Shield Replacement (LCV)**, **Exhaust Manifold Heat Shield Replacement (LTG)**.

2. If replacing the exhaust manifold, remove the heated oxygen sensor - sensor 1. Refer to **Heated Oxygen Sensor Replacement - Sensor 1 (LCV)** , **Heated Oxygen Sensor Replacement - Sensor 1 (LTG)** .
3. Remove the catalytic converter from the exhaust manifold. Refer to **Catalytic Converter Replacement (LUK)**, **Catalytic Converter Replacement (LCV)**, **Catalytic Converter Replacement (LTG)**.

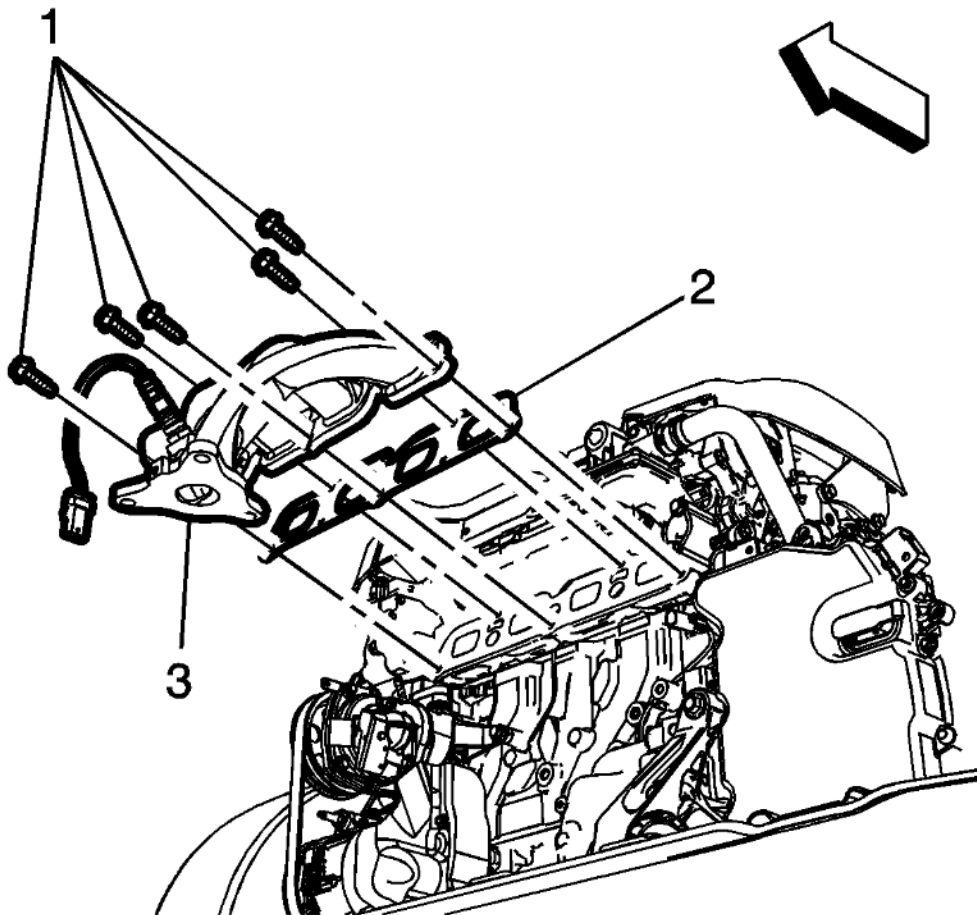


Fig. 2: Exhaust Manifold And Exhaust Manifold Fasteners
Courtesy of GENERAL MOTORS COMPANY

4. Remove and discard the exhaust manifold fasteners (1).
5. Remove the exhaust manifold (3) and discard the exhaust manifold gasket (2).

Installation Procedure

1. Clean all mating surfaces.

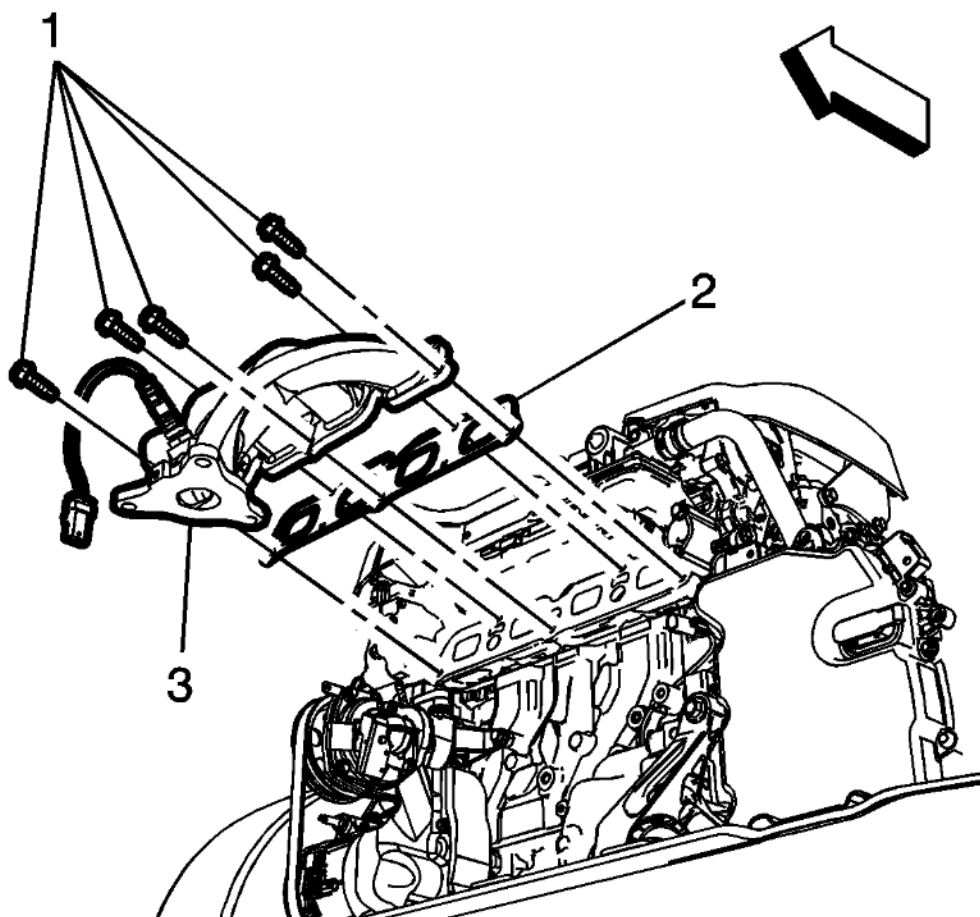


Fig. 3: Exhaust Manifold And Exhaust Manifold Fasteners
Courtesy of GENERAL MOTORS COMPANY

2. Install the exhaust manifold (3) to the cylinder head with a NEW gasket (2).

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

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

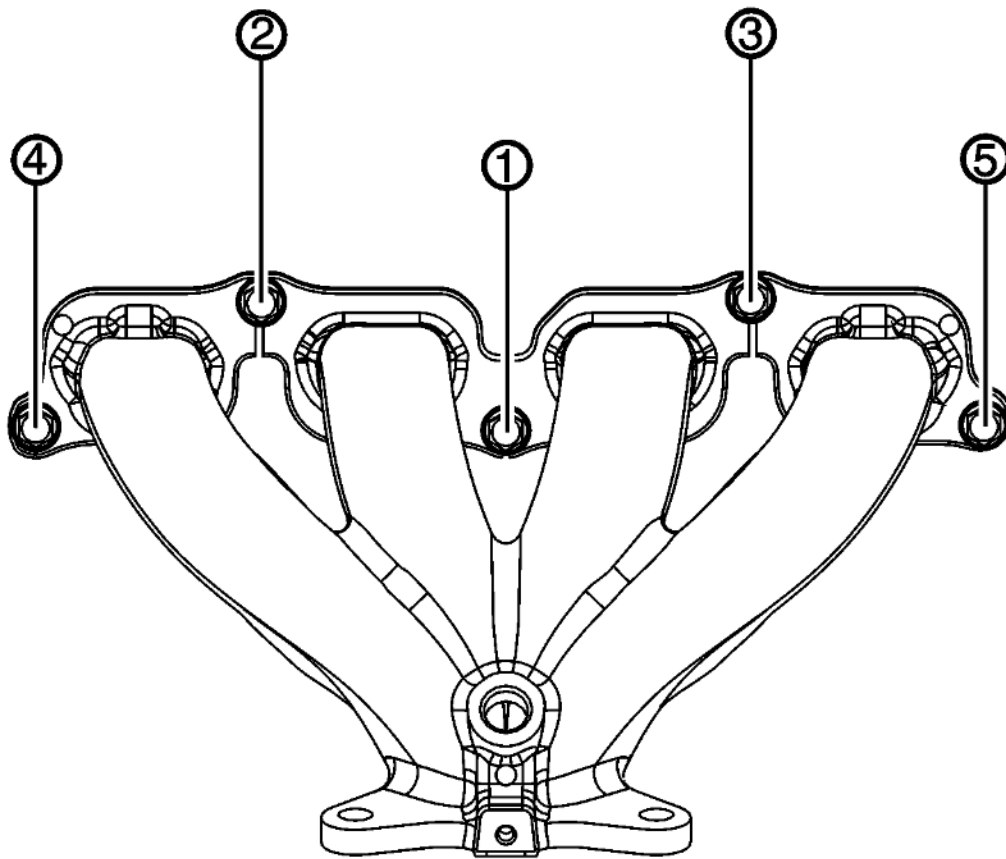


Fig. 4: Cylinder Head Bolts In Sequence
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Tighten the exhaust manifold fasteners in 3 passes in the sequence shown to 20 (15 lb ft).
5. Install the catalytic converter to the exhaust manifold. Refer to Catalytic Converter Replacement (LUK), Catalytic Converter Replacement (LCV), Catalytic Converter Replacement (LTG).
6. Install the heated oxygen sensor - sensor 1. Refer to Heated Oxygen Sensor Replacement - Sensor 1 (LCV) , Heated Oxygen Sensor Replacement - Sensor 1 (LTG) .
7. Install the exhaust manifold heat shield. Refer to Exhaust Manifold Heat Shield Replacement (LUK), Exhaust Manifold Heat Shield Replacement (LCV), Exhaust Manifold Heat Shield Replacement (LTG).

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 (LUK), Exhaust Manifold Heat Shield Replacement (LCV), Exhaust Manifold Heat Shield Replacement (LTG).
2. Remove the turbocharger. Refer to Turbocharger Replacement .
3. Remove the exhaust manifold brace. Refer to Exhaust Manifold Brace Replacement (LTG).

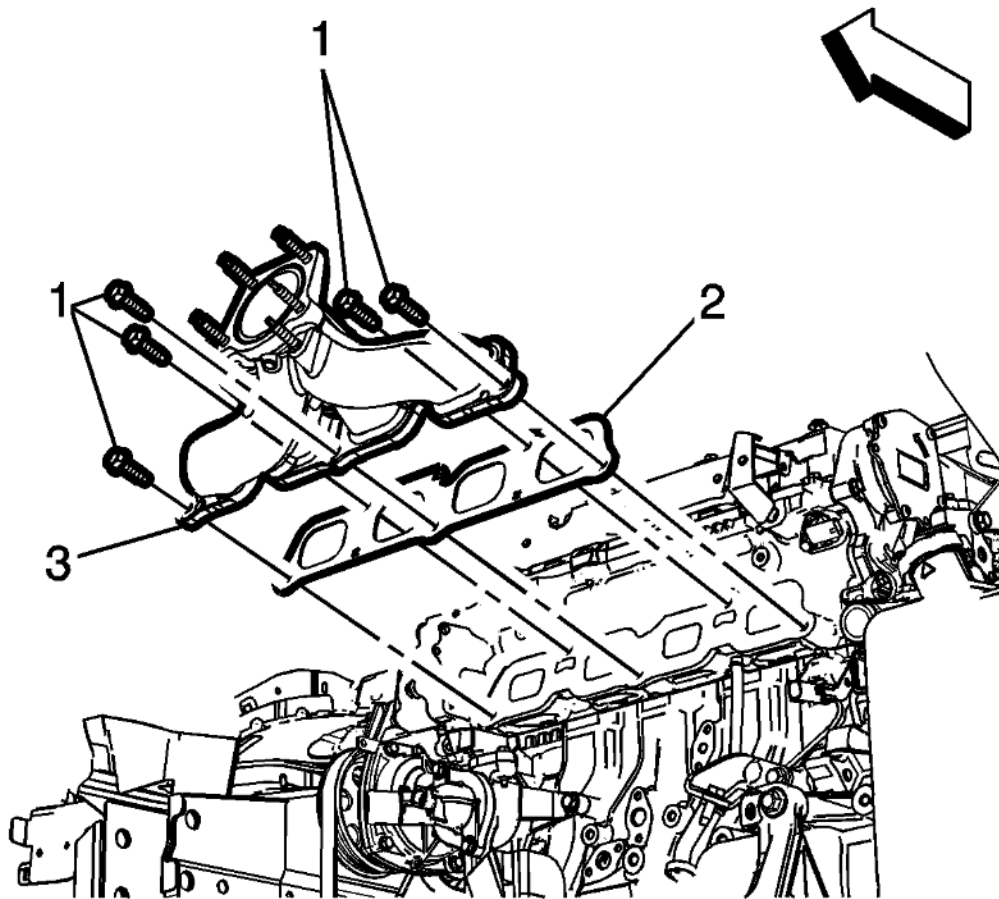


Fig. 5: Exhaust Manifold Fasteners
Courtesy of GENERAL MOTORS COMPANY

4. Remove the exhaust manifold fasteners (1) and discard.
5. Remove the exhaust manifold (3) and discard the exhaust manifold gasket (2).

Installation Procedure

1. Clean all mating surfaces.

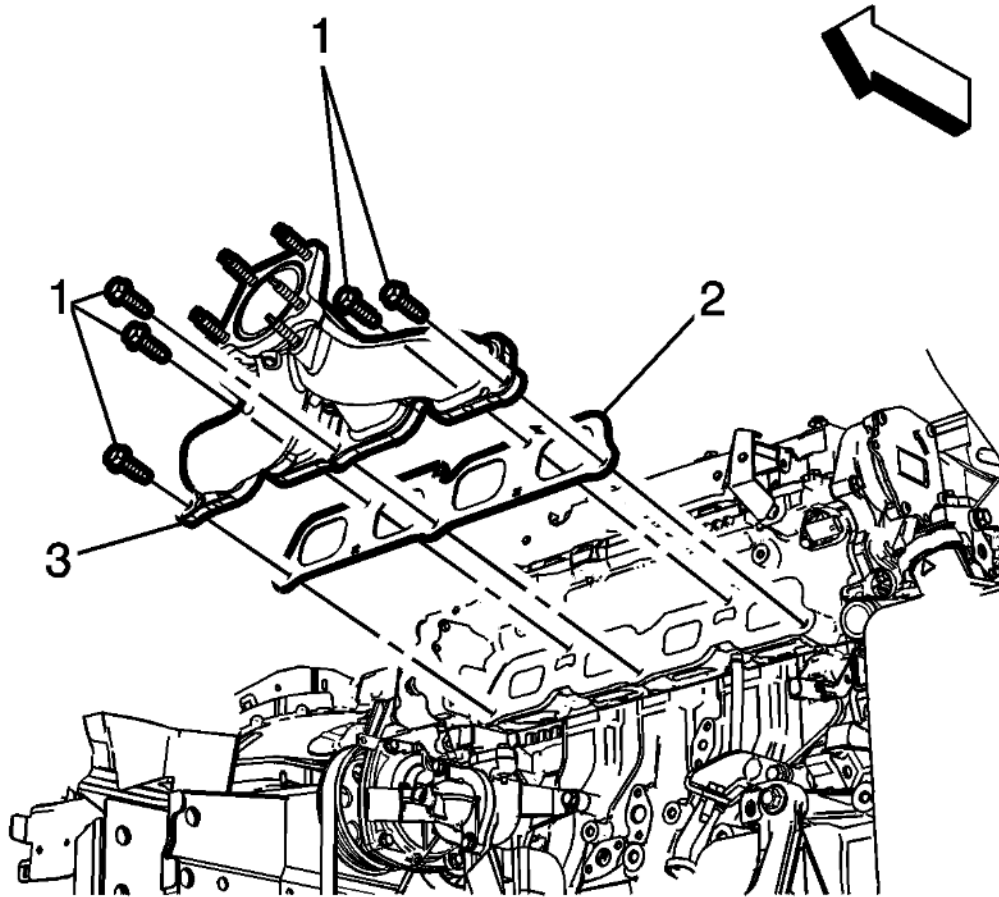


Fig. 6: Exhaust Manifold

Courtesy of GENERAL MOTORS COMPANY

2. Install the exhaust manifold (3) to the cylinder head with a NEW gasket (2).

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

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

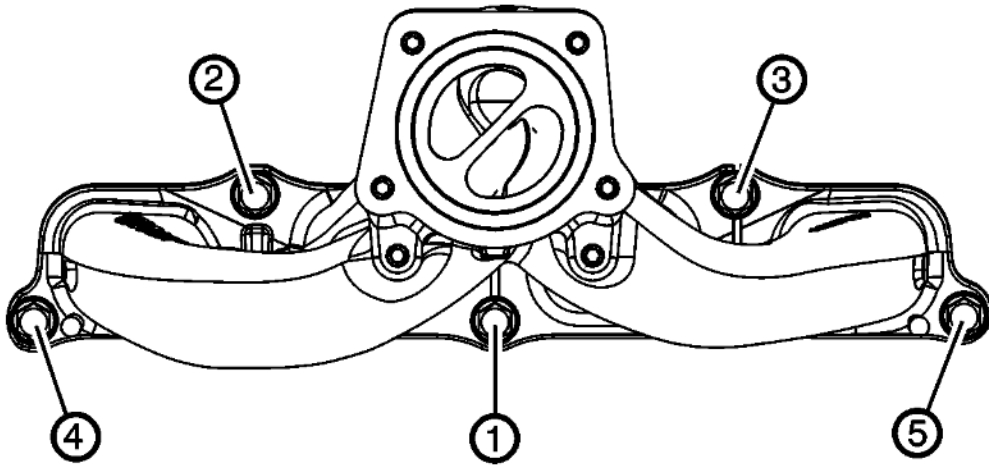


Fig. 7: Cylinder Head Retaining Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Tighten the exhaust manifold fasteners in 3 passes in the sequence shown to 20 (15 lb ft).
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 (LUK), Exhaust Manifold Heat Shield Replacement (LCV), Exhaust Manifold Heat Shield Replacement (LTG).

EXHAUST MANIFOLD BRACE REPLACEMENT (LTG)

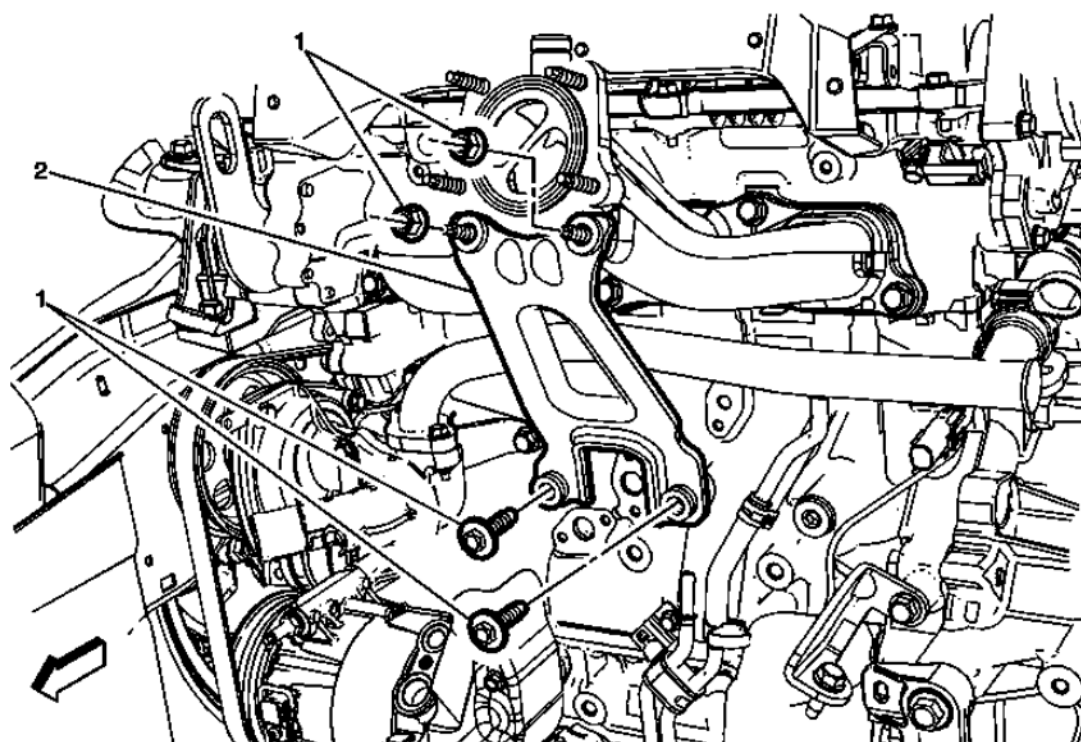


Fig. 8: Exhaust Manifold Brace (LTG)
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Manifold Brace Replacement (LTG)

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

EXHAUST FRONT PIPE REPLACEMENT (LUK)

Removal Procedure

WARNING: Refer to Hot Exhaust System Warning .

WARNING: Refer to Safety Glasses Warning .

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Disconnect the oxygen sensors after the catalytic converter.

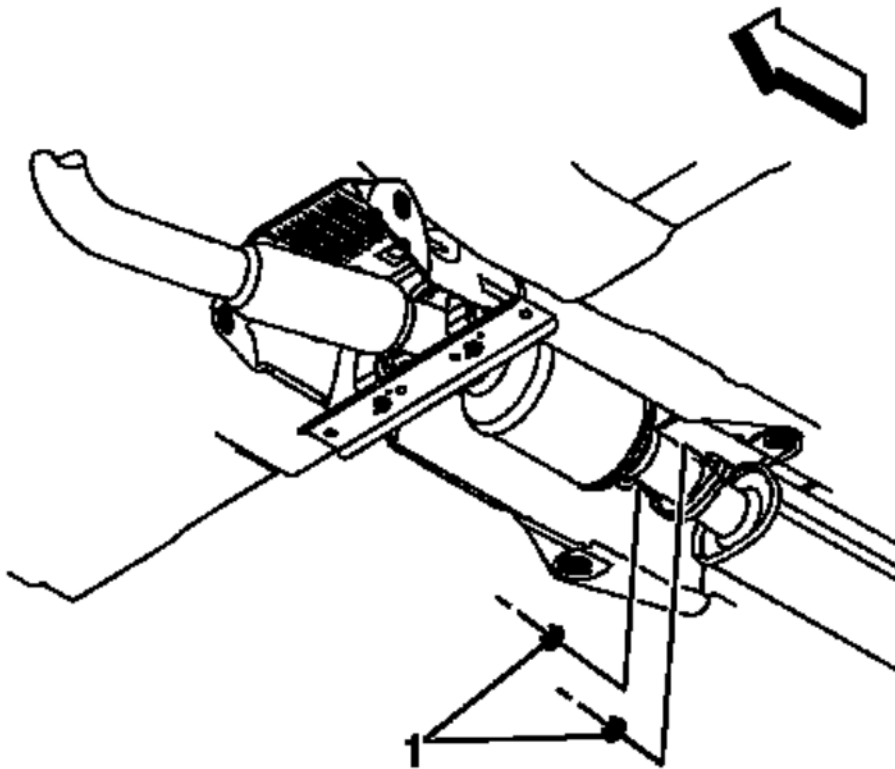


Fig. 9: Front Exhaust Nuts At Rear Muffler Pipe
Courtesy of GENERAL MOTORS COMPANY

3. Remove the front exhaust nuts (1) from the rear muffler pipe.
4. Support the exhaust muffler with a suitable jack or mechanics wire.

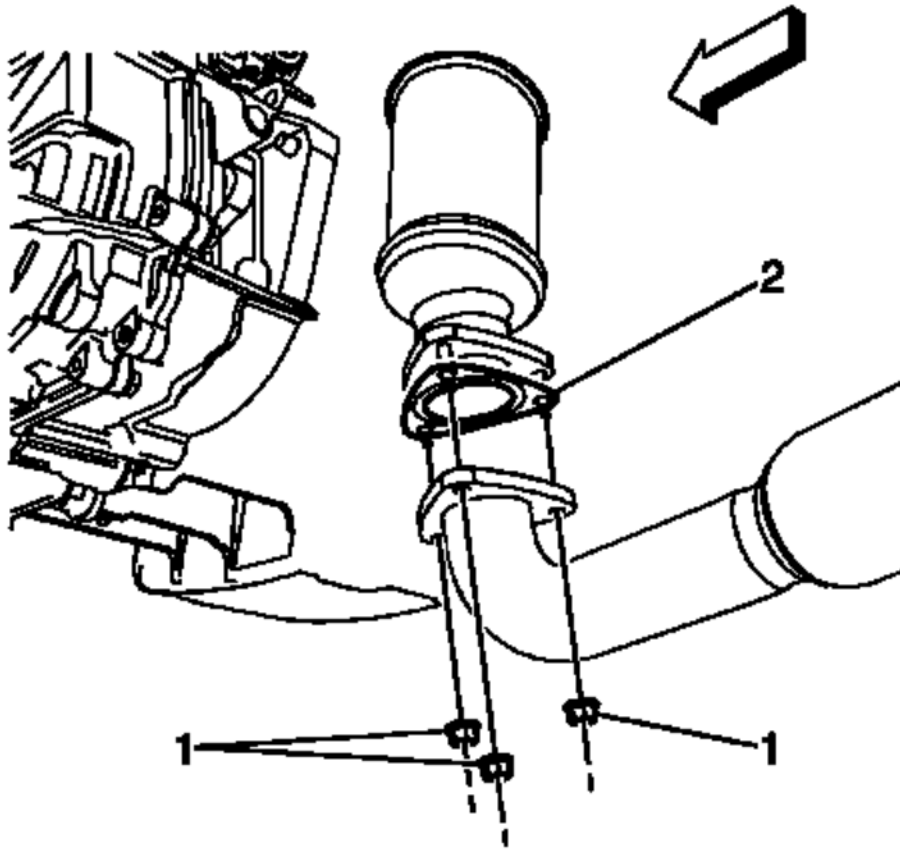


Fig. 10: Lower Catalytic Converter, Nuts And Gasket
Courtesy of GENERAL MOTORS COMPANY

NOTE: Cut and remove the front two studs for service if damaged. Replace with M8x1.25x45mm stainless steel fasteners. Refer to parts catalog for service part numbers.

5. Remove the nuts (1) and gasket (2) from the lower catalytic converter.

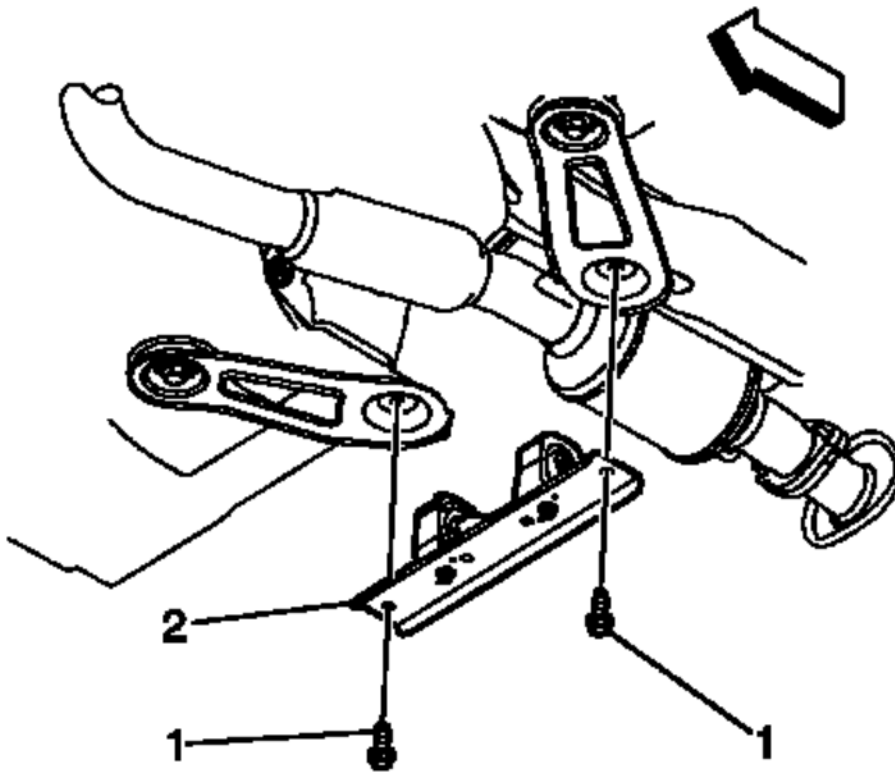


Fig. 11: Front Exhaust Pipe Hanger Bracket And Bolts
Courtesy of GENERAL MOTORS COMPANY

6. Remove the bolts (1) from the front exhaust pipe hanger bracket (2).

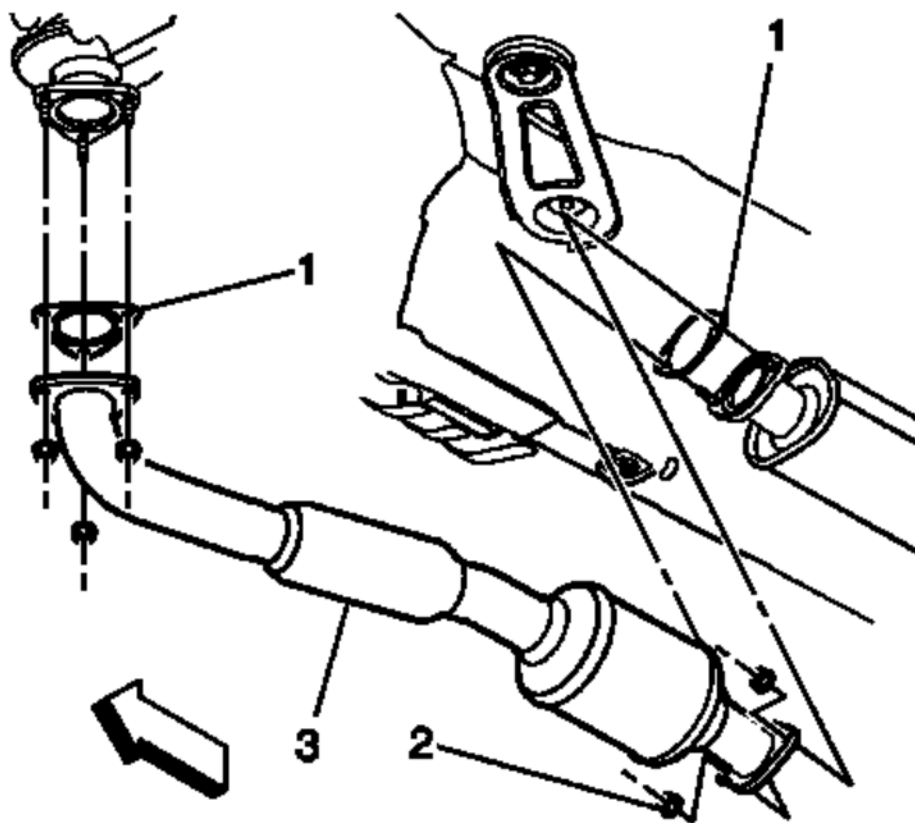


Fig. 12: Front Exhaust Pipe Components
Courtesy of GENERAL MOTORS COMPANY

7. Carefully lower the front exhaust pipe (3).

Installation Procedure

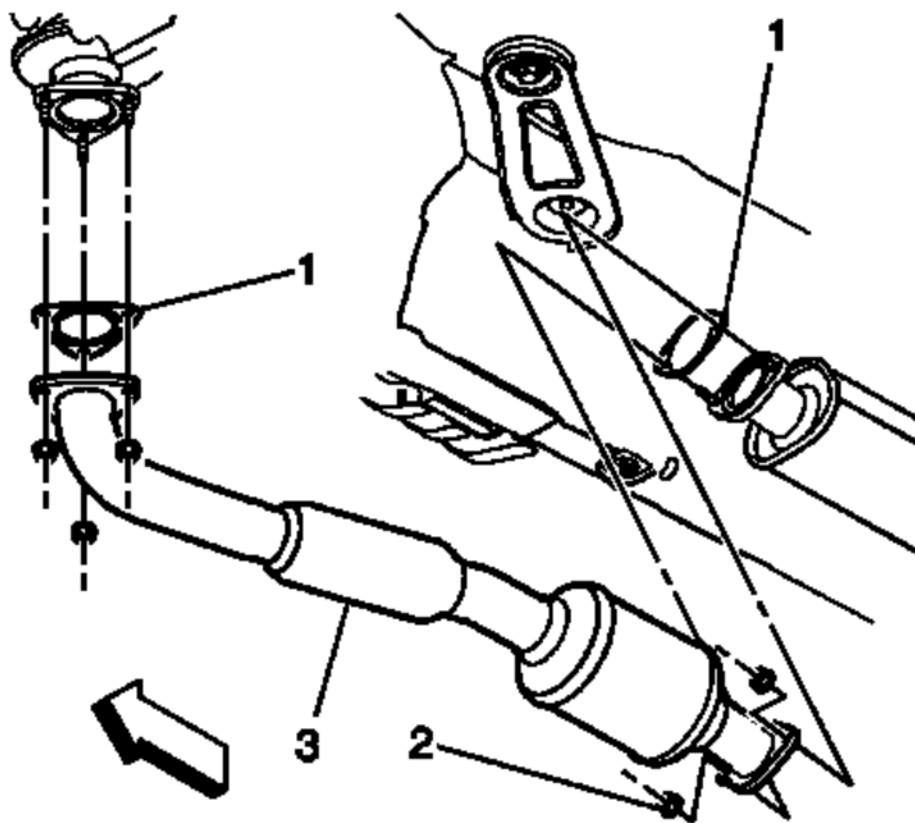


Fig. 13: Front Exhaust Pipe Components
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

1. Install the front exhaust pipe nuts (2) and NEW gasket (1), to the rear muffler pipe and tighten to 18 N.m (13 lb ft).

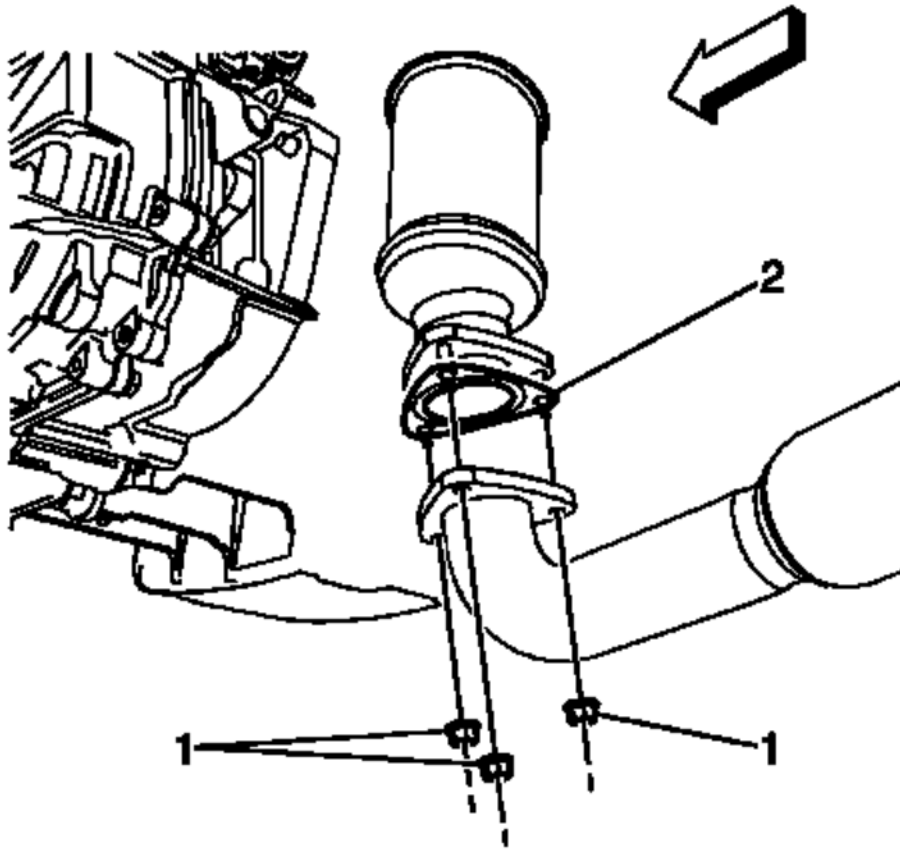


Fig. 14: Lower Catalytic Converter, Nuts And Gasket
Courtesy of GENERAL MOTORS COMPANY

2. Install the nuts (1) of the front exhaust pipe to the lower catalytic converter and tighten to 28 N.m (21 lb ft).

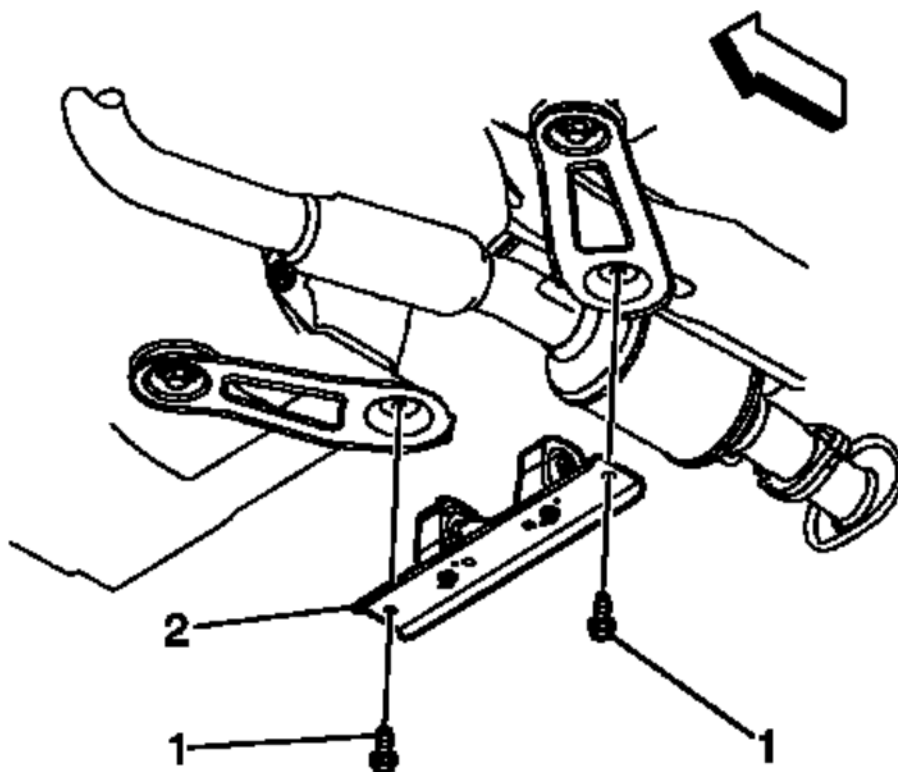


Fig. 15: Front Exhaust Pipe Hanger Bracket And Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Install the bolts (1) to the front exhaust pipe hanger bracket (2) and tighten to 60 N.m + 30 Degrees (44 lb ft + 30 Degrees).
4. Connect the oxygen sensor electrical sensors.
5. Inspect the exhaust system for leaks.

EXHAUST FRONT PIPE REPLACEMENT (LCV)

Removal Procedure

WARNING: Refer to Exhaust Service Warning .

WARNING: Refer to Protective Goggles and Glove Warning .

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the heated oxygen sensor - position 2 from the exhaust front pipe. Refer to Heated Oxygen

Sensor Replacement - Sensor 2 (LCV) , Heated Oxygen Sensor Replacement - Sensor 2 (LTG) .

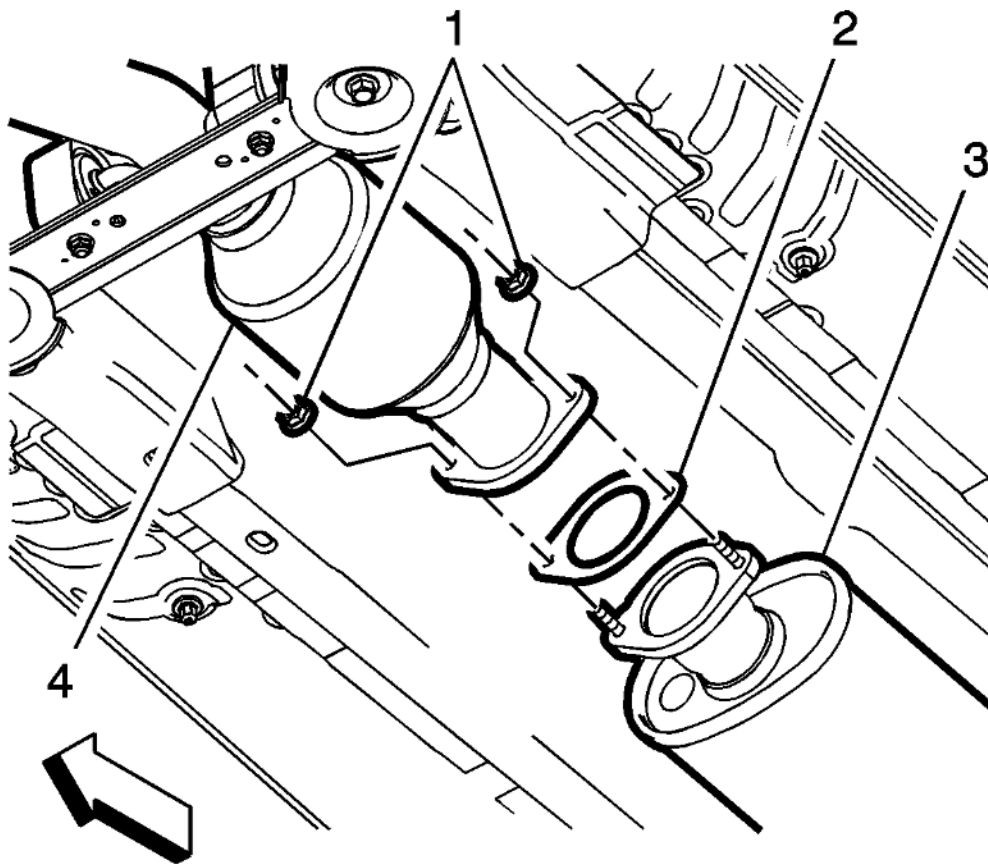


Fig. 16: Exhaust Muffler And Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

3. Remove the 2 fasteners (1) securing the exhaust muffler (3) to the exhaust front pipe (4).
4. Discard the exhaust front pipe gasket (2).
5. Support the exhaust muffler (3) with a suitable jack or mechanics wire.

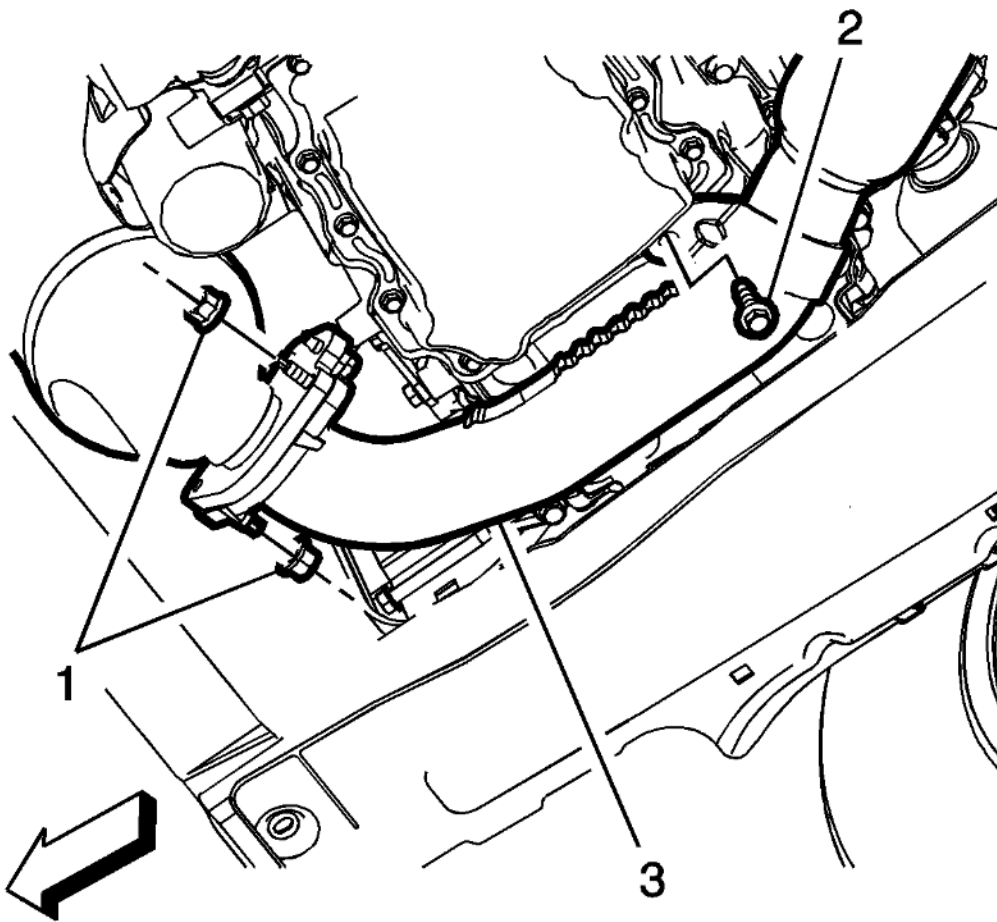


Fig. 17: Exhaust Front Pipe Retainer Fastener
Courtesy of GENERAL MOTORS COMPANY

6. Remove the 2 fasteners (1) securing the exhaust front pipe (3) to the catalytic converter.
7. Remove the exhaust front pipe retainer fastener (2).

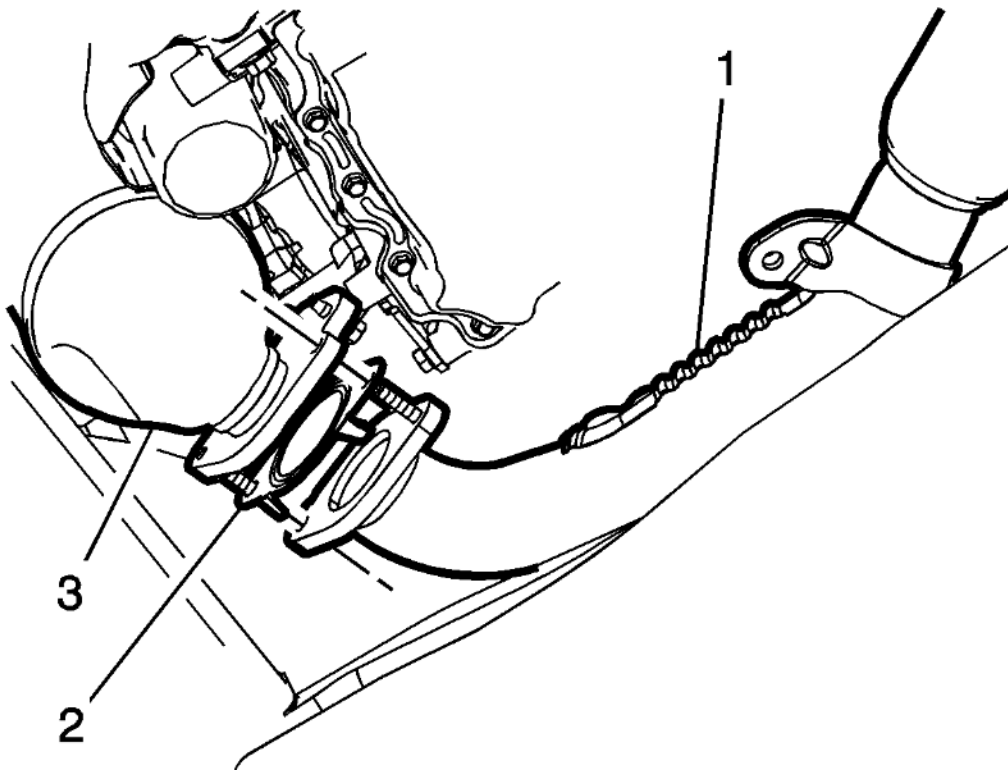


Fig. 18: Exhaust Front Pipe And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

8. Separate the exhaust front pipe (1) from the catalytic converter (3) and discard the exhaust gasket (2).

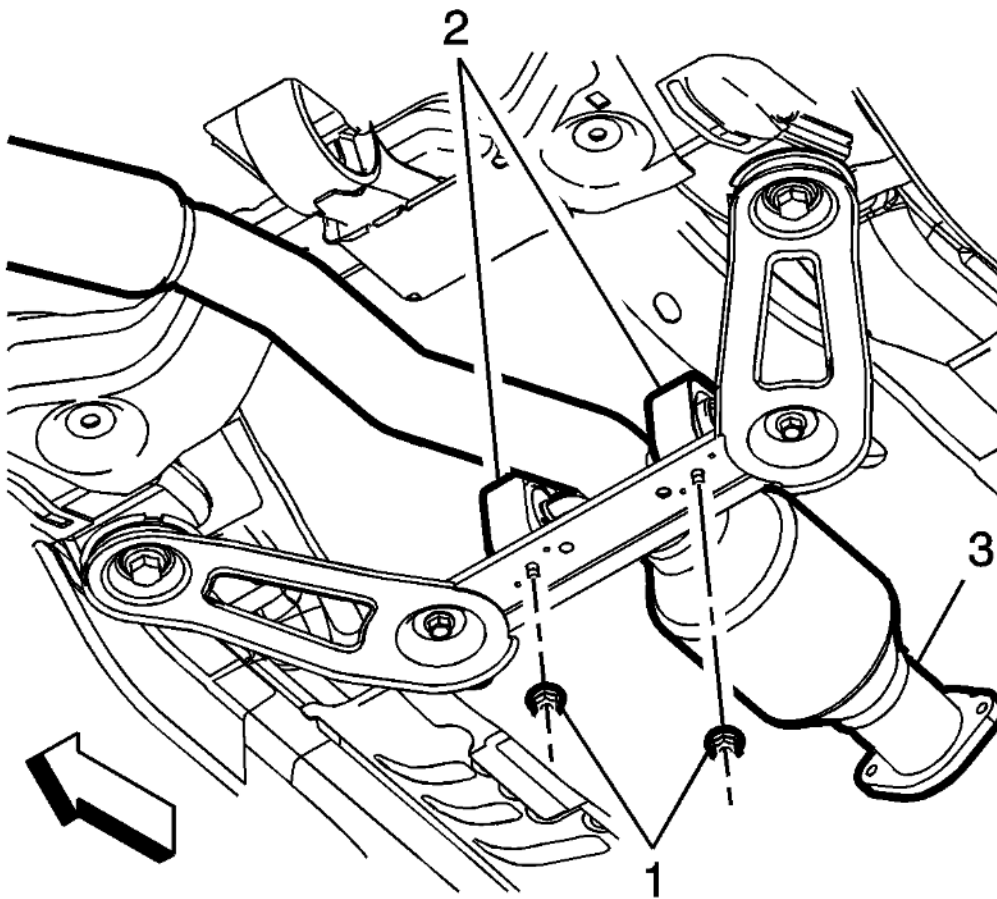


Fig. 19: Fasteners And Exhaust Isolators
Courtesy of GENERAL MOTORS COMPANY

9. Remove the fasteners (1) securing the exhaust isolators (2) to the exhaust front pipe hanger bracket.

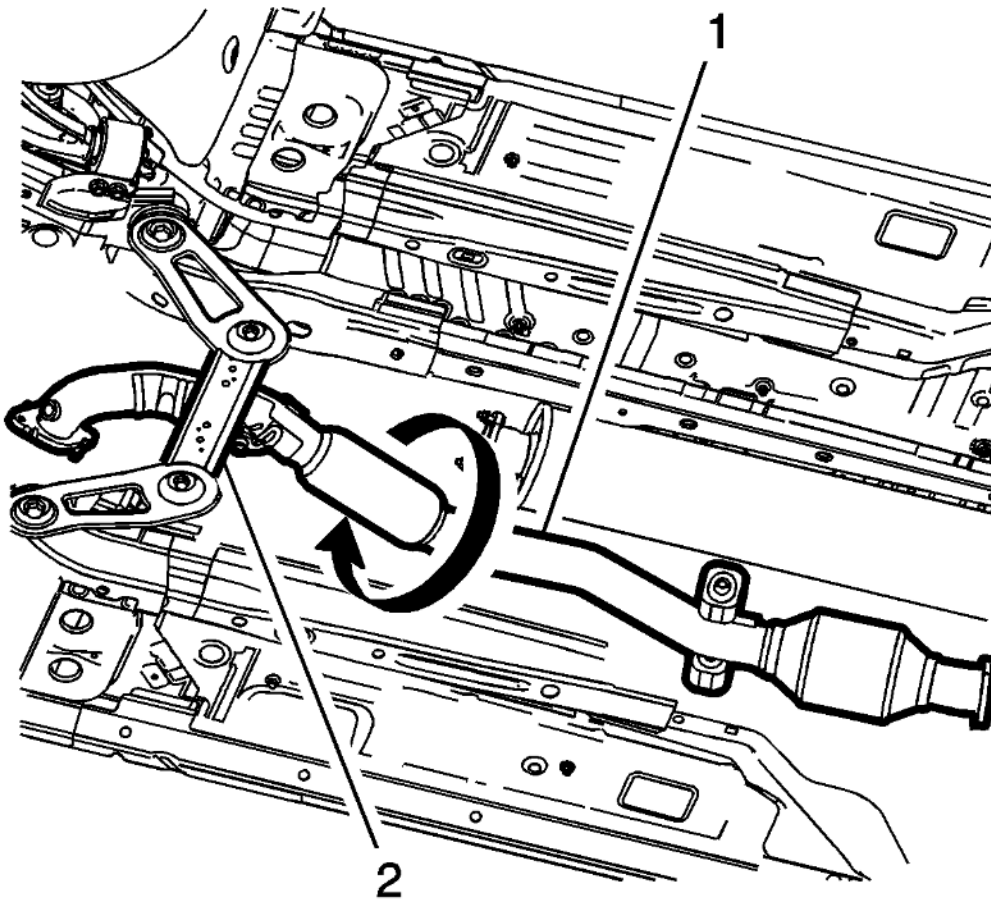


Fig. 20: Exhaust Front Pipe Hanger Bracket
Courtesy of GENERAL MOTORS COMPANY

10. Rotate the exhaust front pipe out and away from the exhaust front pipe hanger bracket (2).

Installation Procedure

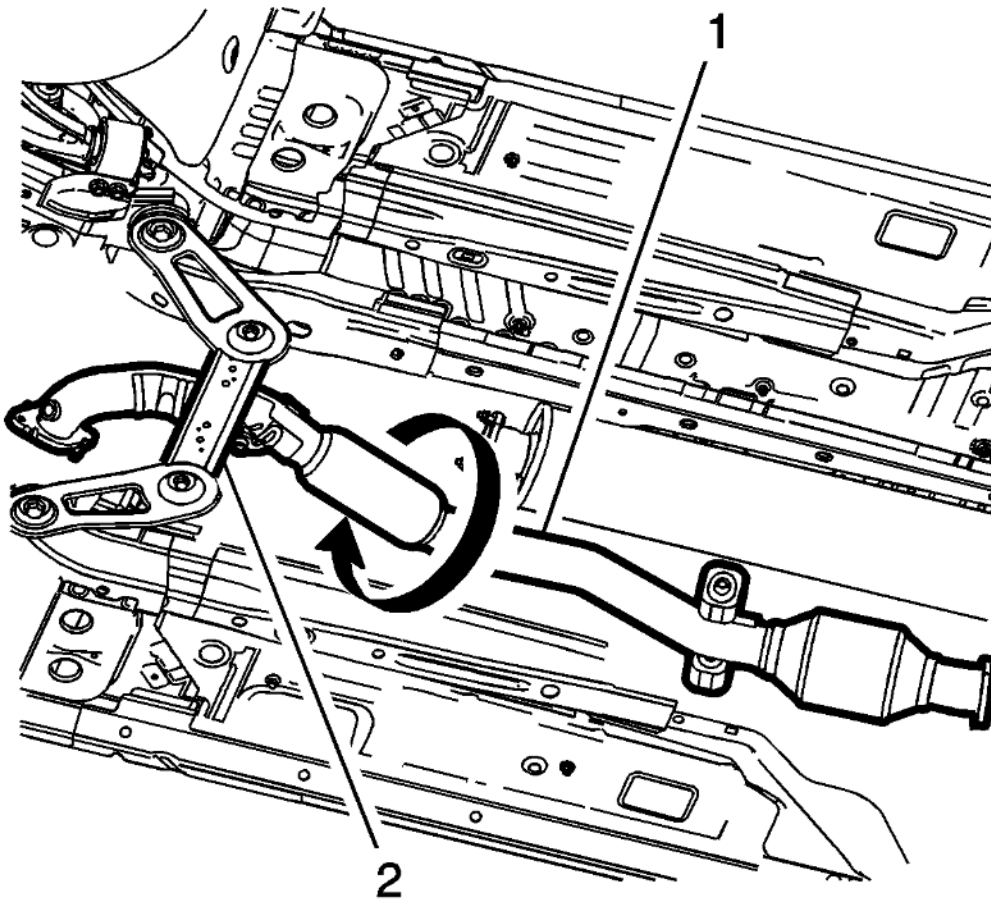


Fig. 21: Exhaust Front Pipe Hanger Bracket
Courtesy of GENERAL MOTORS COMPANY

1. Install the exhaust front pipe (1) over the exhaust front pipe hanger bracket (2).

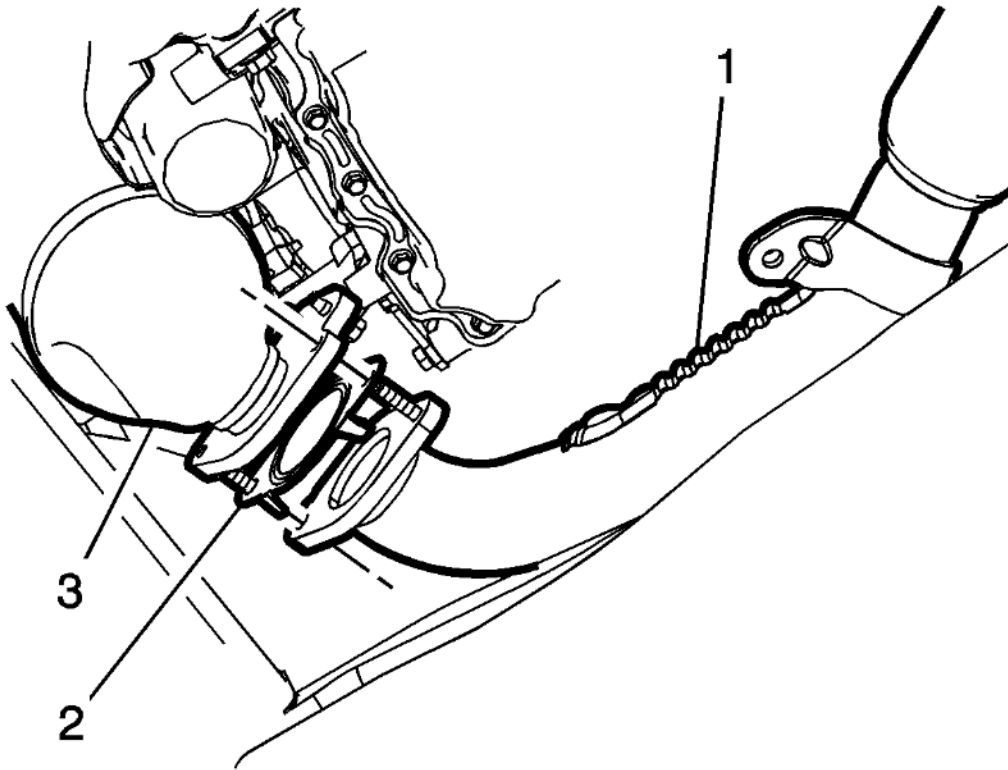


Fig. 22: Exhaust Front Pipe And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

2. Position the exhaust front pipe into the catalytic converter with a NEW exhaust gasket (2).

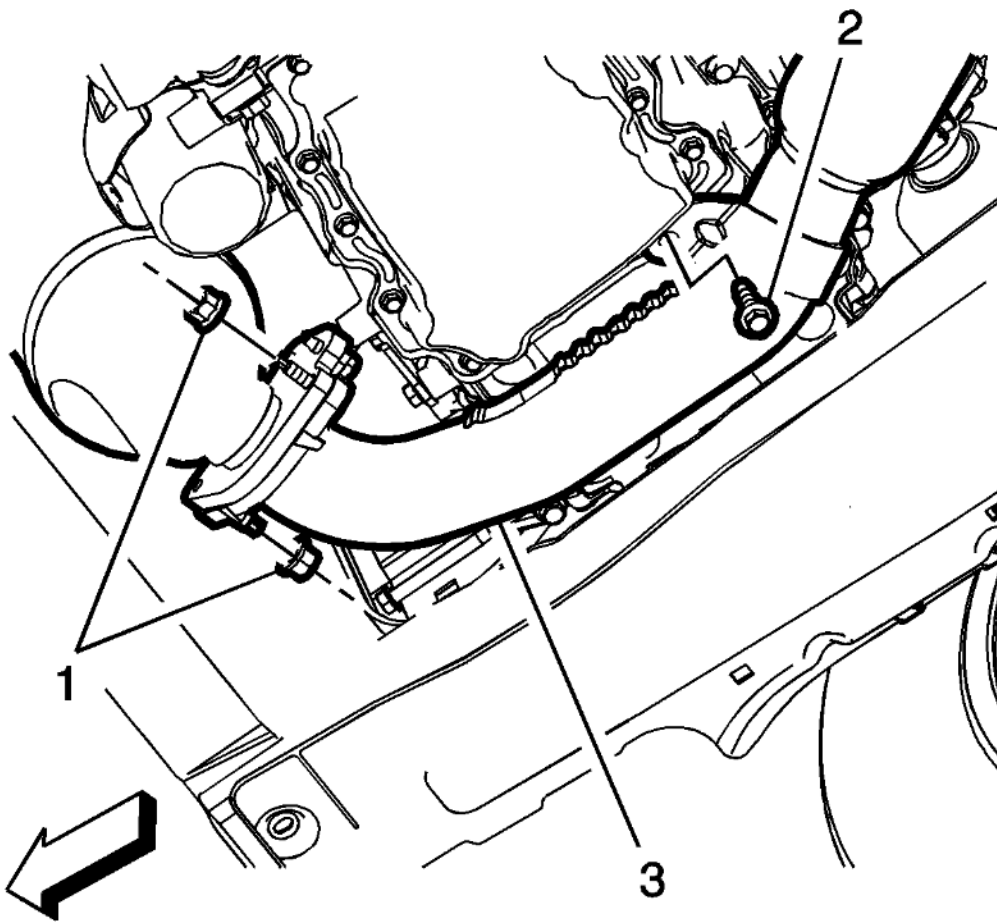


Fig. 23: Exhaust Front Pipe Retainer Fastener
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the exhaust front pipe retainer fastener (2) and tighten to 22 (16 lb ft).
4. Install the catalytic converter fasteners (1) and tighten to 28 (21 lb ft).

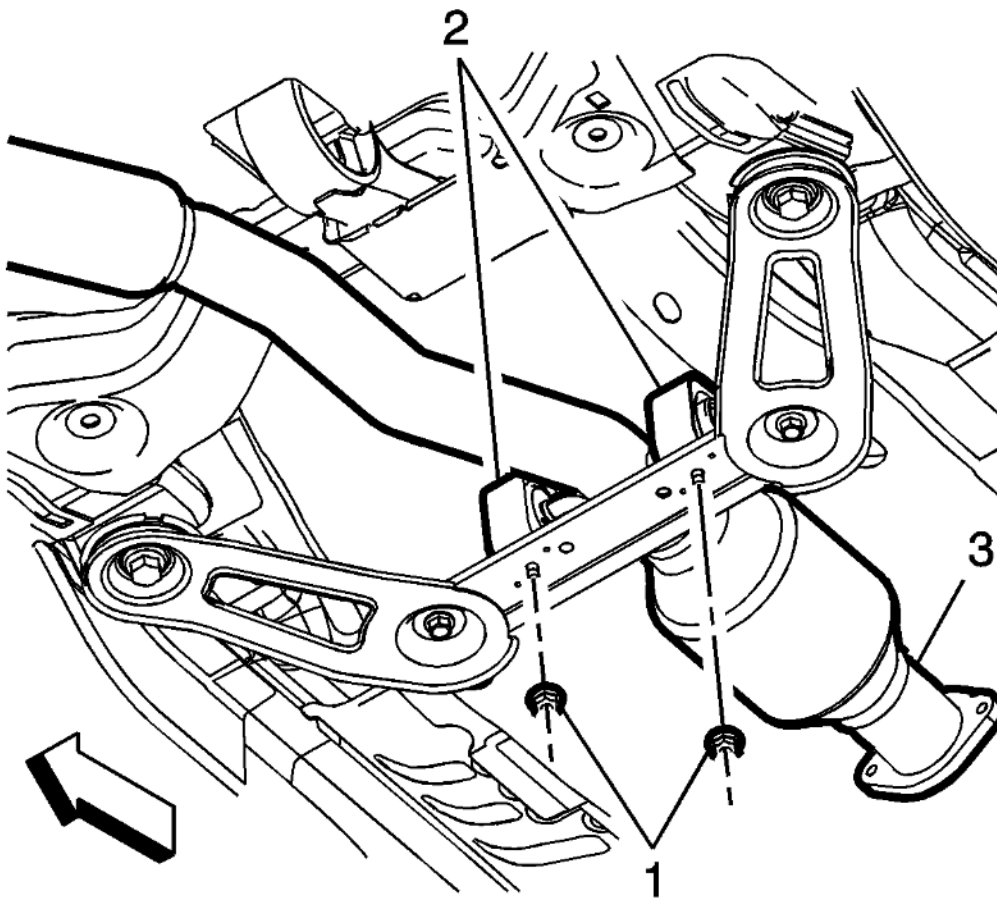


Fig. 24: Fasteners And Exhaust Isolators
Courtesy of GENERAL MOTORS COMPANY

5. Install the exhaust isolators (2) into the exhaust front pipe hanger bracket and tighten the fasteners (1) to 22 (16 lb ft).

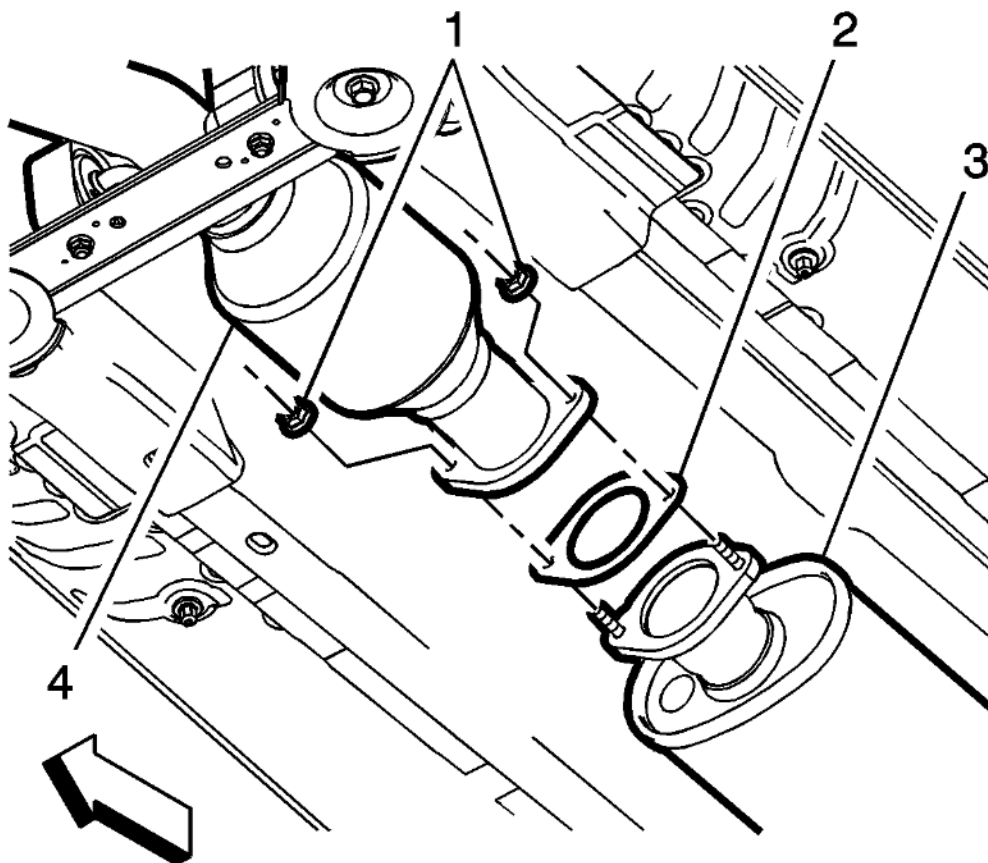


Fig. 25: Exhaust Muffler And Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

6. Install the exhaust front pipe (4) to the exhaust muffler (3) with a NEW gasket (2) and tighten the fasteners (1) to 18 (13 lb ft).
7. Install the heated oxygen sensor - position 2 to the exhaust front pipe. Refer to **Heated Oxygen Sensor Replacement - Sensor 2 (LCV)** , **Heated Oxygen Sensor Replacement - Sensor 2 (LTG)** .
8. Start the engine and check for exhaust leaks.

EXHAUST FRONT PIPE REPLACEMENT (LTG)

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 .

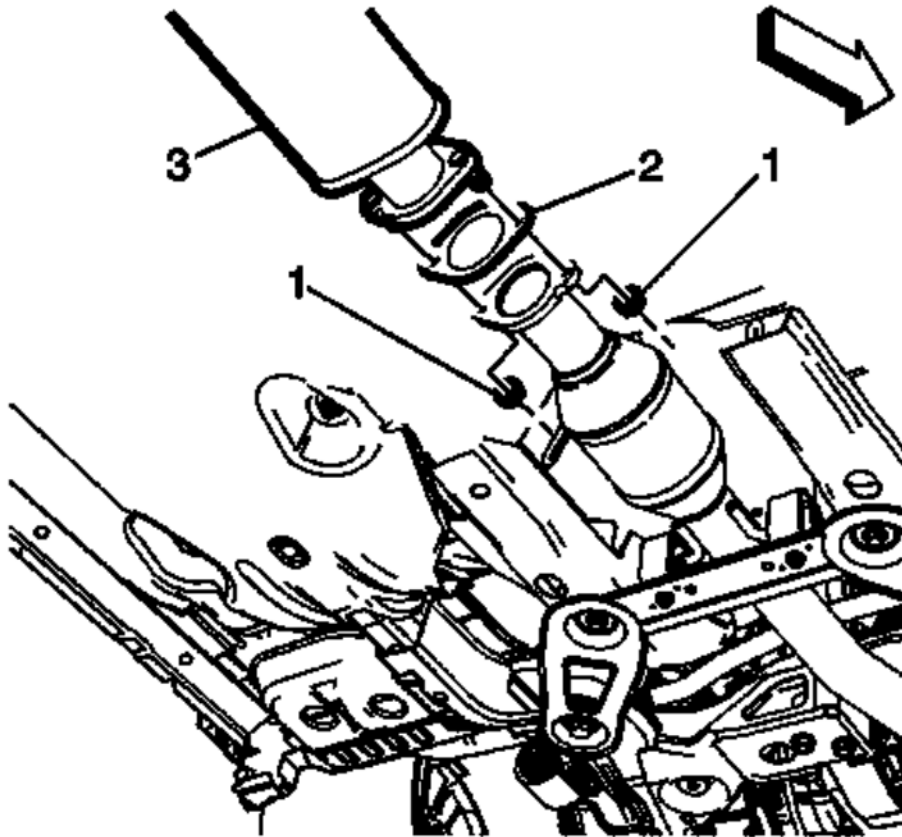


Fig. 26: Exhaust Front Pipe And Exhaust Muffler Fasteners
Courtesy of GENERAL MOTORS COMPANY

2. Remove the exhaust front pipe to the exhaust muffler fasteners (1) and discard the exhaust gasket (2).
3. Support the exhaust muffler (3) with mechanics wire.

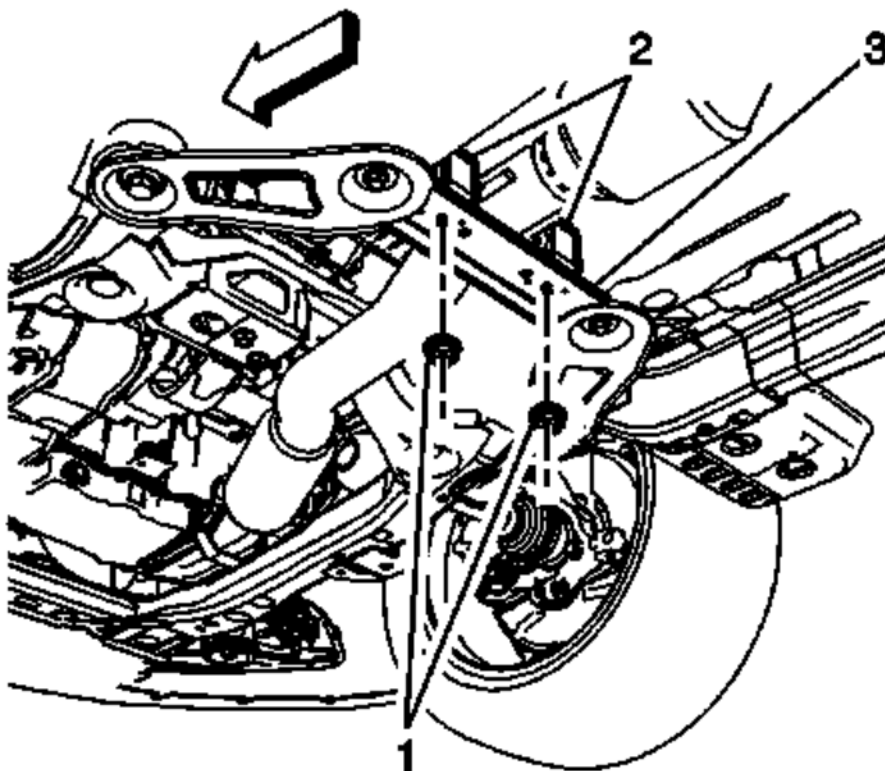


Fig. 27: Fasteners And Exhaust Isolators
Courtesy of GENERAL MOTORS COMPANY

4. Remove the fasteners (1) securing the exhaust isolators (2) to the front hanger bracket (3).

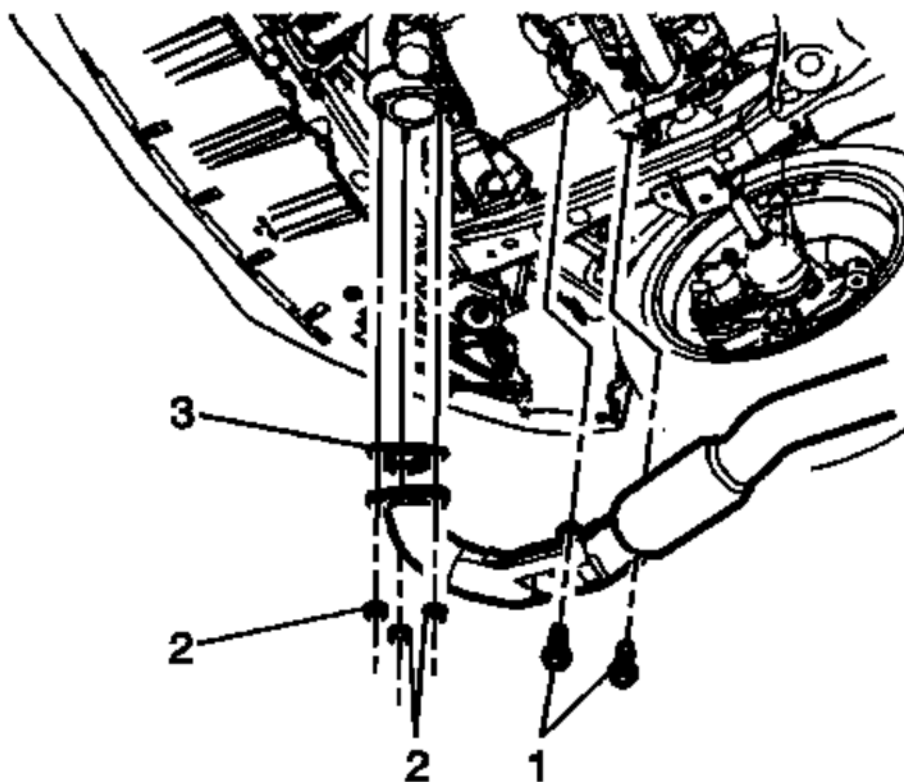


Fig. 28: Catalytic Converter Fasteners
Courtesy of GENERAL MOTORS COMPANY

5. Remove the catalytic converter fasteners (2) and discard the exhaust gasket (3).
6. Remove the exhaust front pipe bracket fasteners (1).

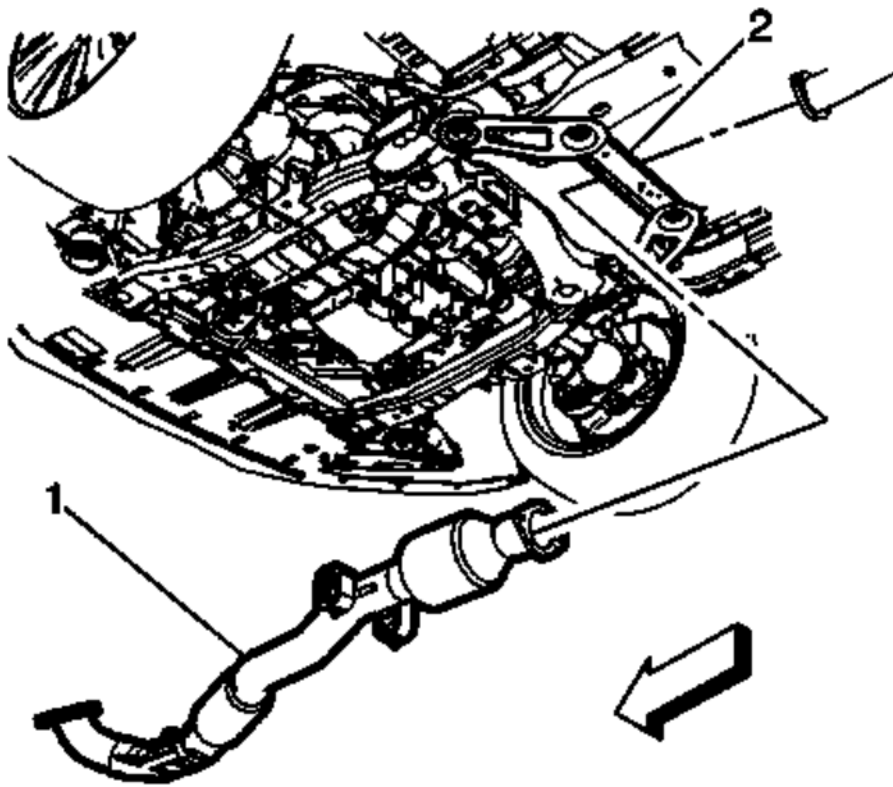


Fig. 29: Exhaust Front Pipe

Courtesy of GENERAL MOTORS COMPANY

7. Slide the exhaust front pipe (1) from above the front hanger bracket (2) and lower the exhaust front pipe to the floor.

Installation Procedure

1. Clean the exhaust front pipe mating surfaces.

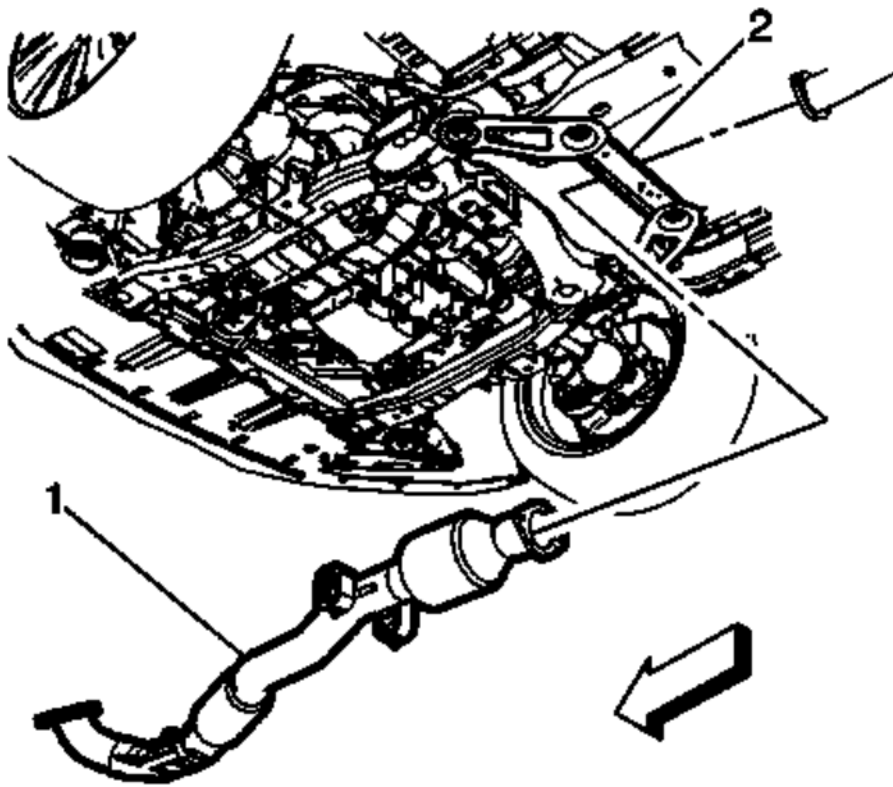


Fig. 30: Exhaust Front Pipe

Courtesy of GENERAL MOTORS COMPANY

2. Install the exhaust front pipe (1) into position above the exhaust front hanger bracket (2).

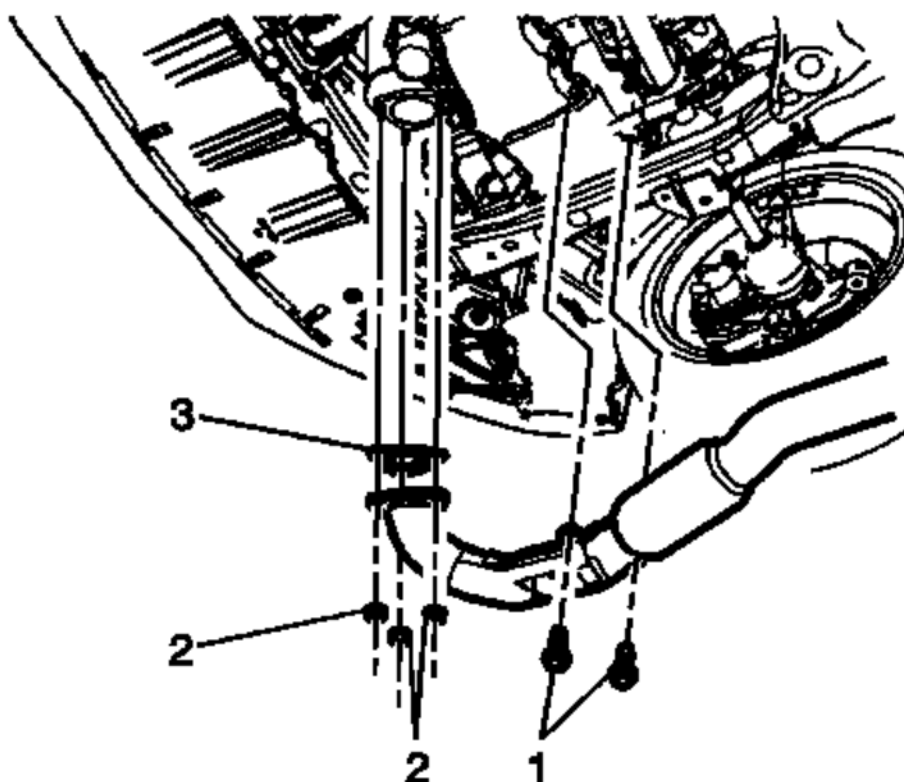


Fig. 31: Catalytic Converter Fasteners
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the exhaust front pipe (4) to the catalytic converter with a NEW gasket (3) and tighten the fasteners (2) to 25 (18 lb ft).
4. Install the exhaust front pipe bracket fasteners (1) and tighten to 22 (16 lb ft).

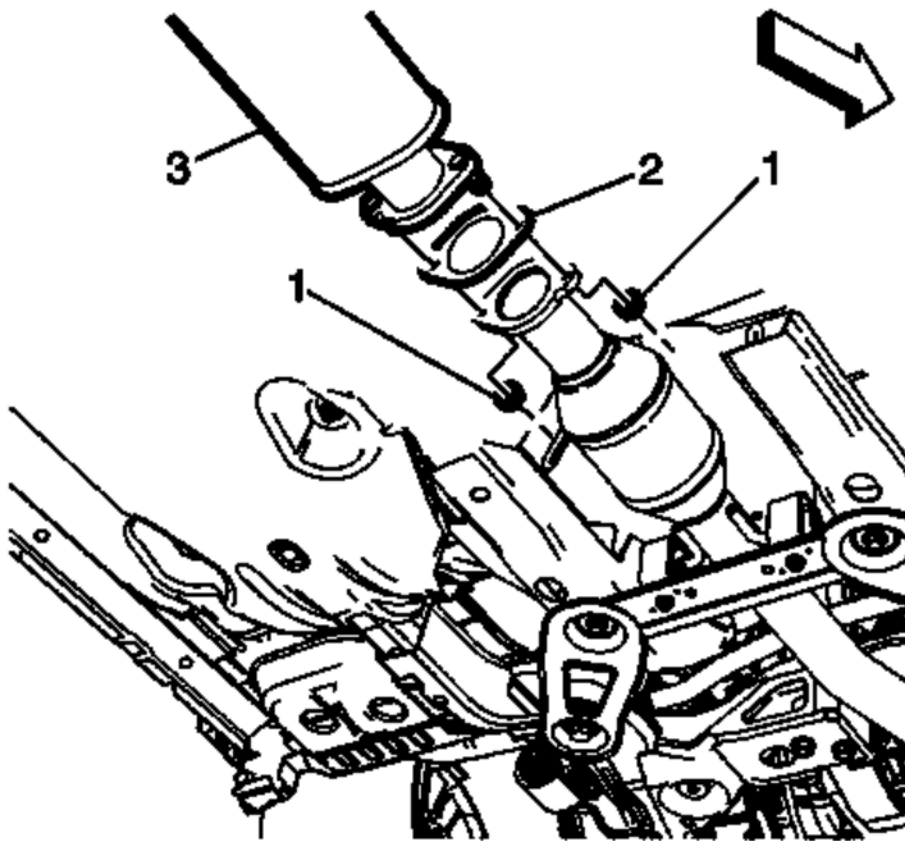


Fig. 32: Exhaust Front Pipe And Exhaust Muffler Fasteners
Courtesy of GENERAL MOTORS COMPANY

5. Install the exhaust front pipe to the muffler (3) with a NEW gasket (2) and tighten the fasteners (1) to 18 (13 lb ft).

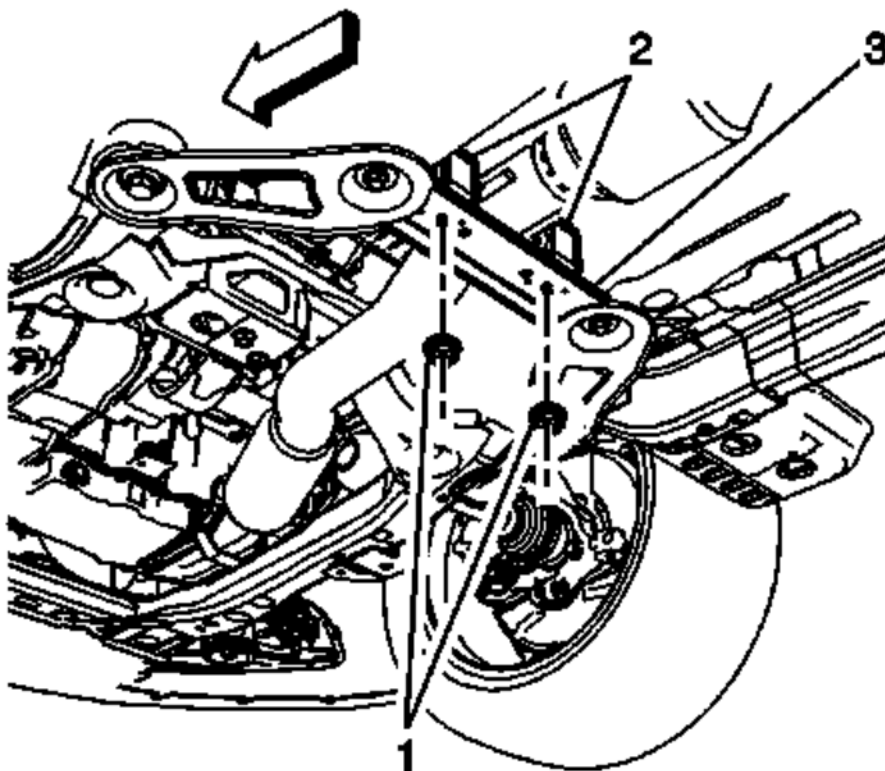


Fig. 33: Fasteners And Exhaust Isolators
Courtesy of GENERAL MOTORS COMPANY

6. Install the exhaust isolator fasteners (1) and tighten to 35 (26 lb ft).
7. Lower the vehicle.
8. Start the engine and check for exhaust leaks.

CATALYTIC CONVERTER REPLACEMENT (LUK)

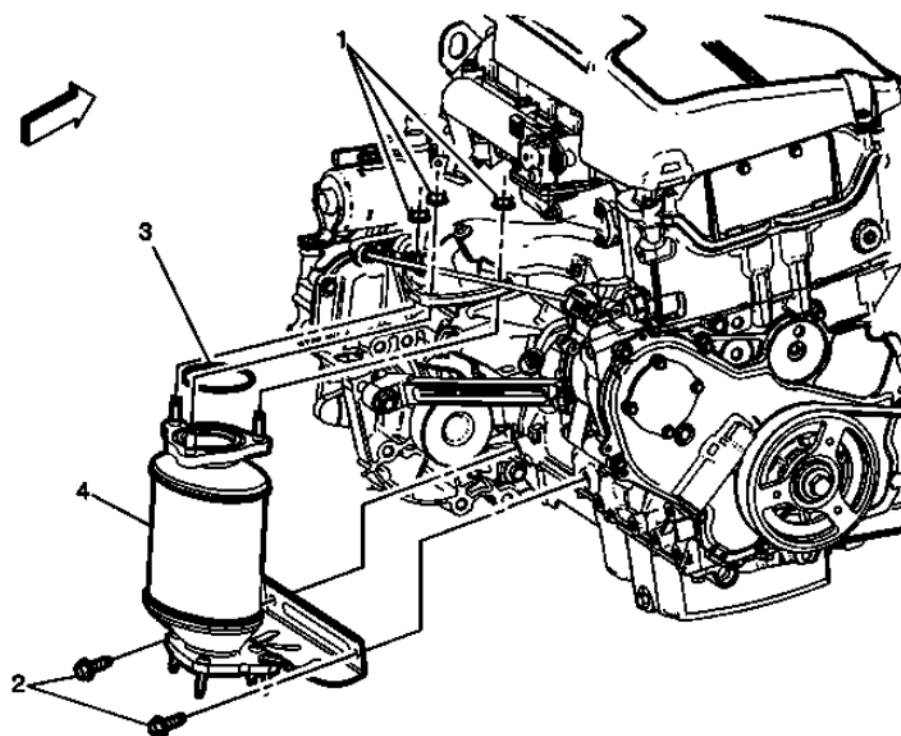


Fig. 34: Catalytic Converter Components (LUK)
 Courtesy of GENERAL MOTORS COMPANY

Catalytic Converter Replacement (LUK)

Callout	Component Name
WARNING: Refer to <u>Exhaust Service Warning</u> . WARNING: Refer to <u>Eye Protection Warning</u> .	
Preliminary Procedures 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the exhaust front pipe. Refer to <u>Exhaust Front Pipe Replacement (LUK)</u>, <u>Exhaust Front Pipe Replacement (LCV)</u>, <u>Exhaust Front Pipe Replacement (LTG)</u>. 3. Remove the exhaust manifold heat shield. Refer to <u>Exhaust Manifold Heat Shield Replacement (LUK)</u>, <u>Exhaust Manifold Heat Shield Replacement (LCV)</u>, <u>Exhaust Manifold Heat Shield Replacement (LTG)</u>.	
1	Catalytic Converter Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten 50 (36 lb ft).
2	Catalytic Converter Brace Fastener (Qty: 2) Tighten 58 (43 lb ft).
3	Exhaust Seal
4	Catalytic Converter NOTE: Transfer the catalytic converter brace as necessary.

CATALYTIC CONVERTER REPLACEMENT (LCV)

Removal Procedure

WARNING: Refer to Exhaust Service Warning .

WARNING: Refer to Protective Goggles and Glove Warning .

1. Remove the exhaust manifold heat shield. Refer to Exhaust Manifold Heat Shield Replacement (LUK), Exhaust Manifold Heat Shield Replacement (LCV), Exhaust Manifold Heat Shield Replacement (LTG).

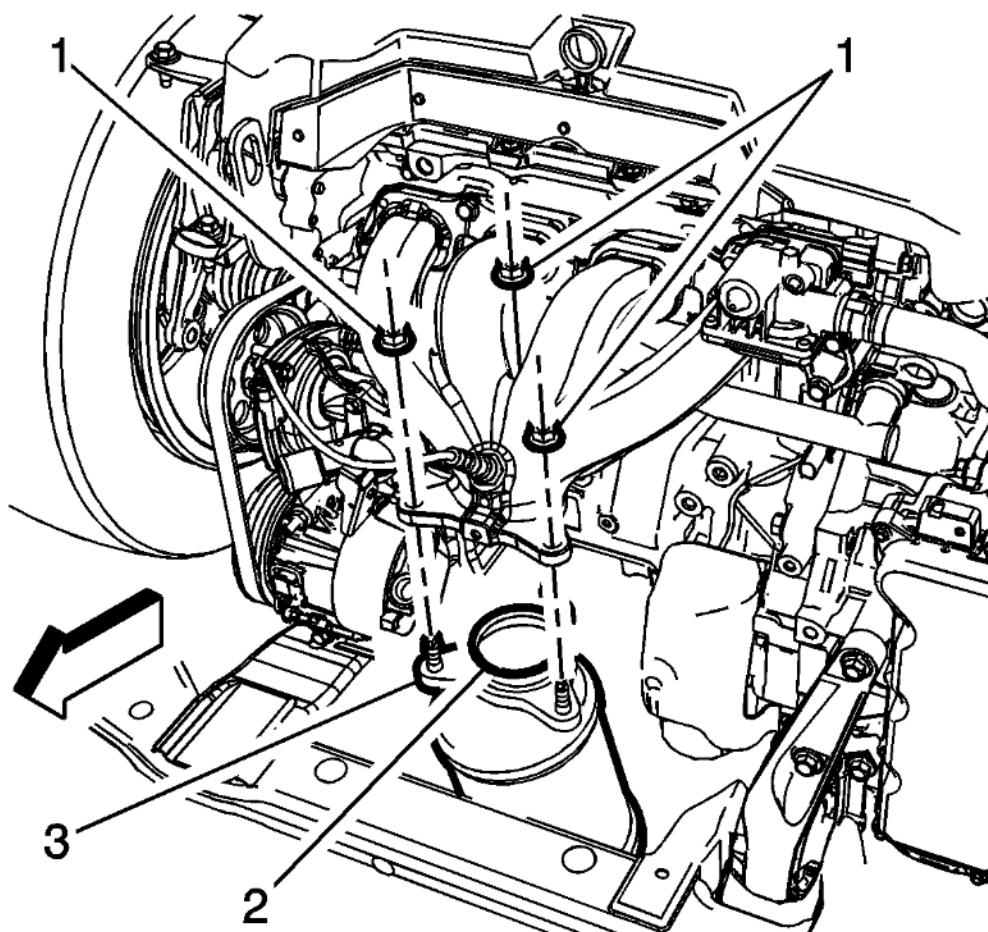


Fig. 35: Fasteners And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

2. Remove the 3 fasteners (1) securing the catalytic converter (3) to the exhaust manifold (1).
3. Discard the catalytic converter seal (2).
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

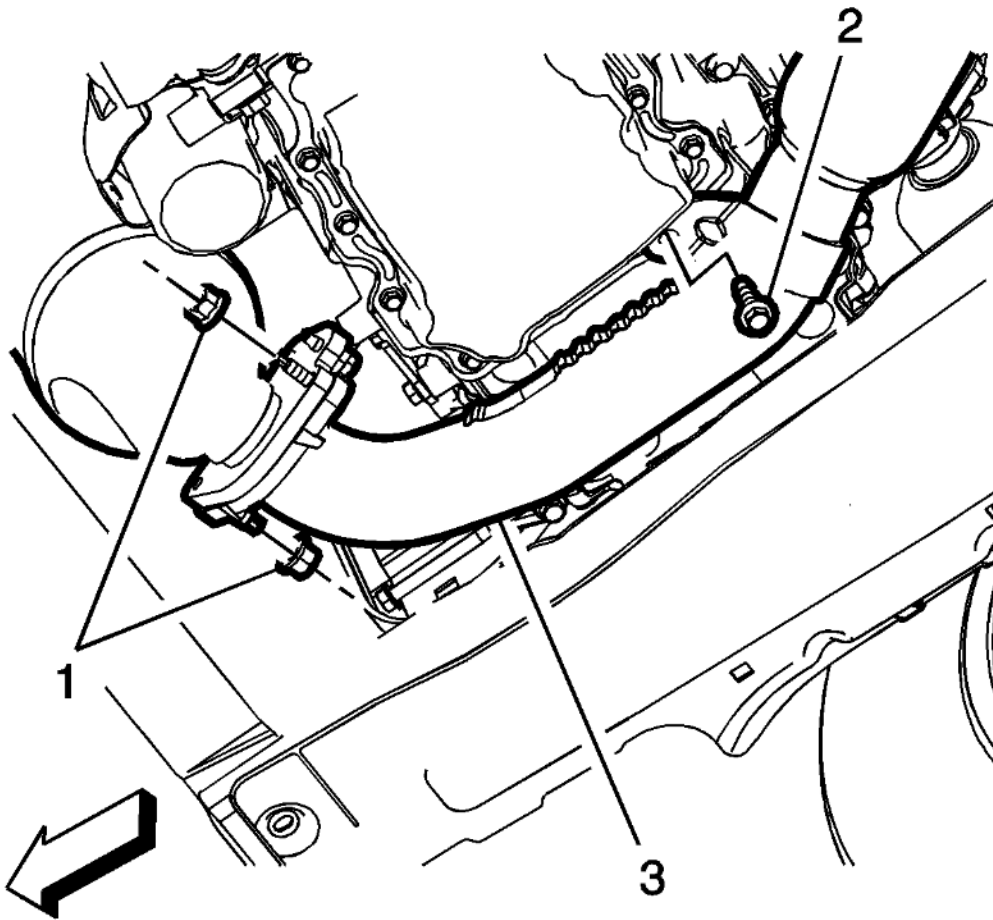


Fig. 36: Exhaust Front Pipe Retainer Fastener
Courtesy of GENERAL MOTORS COMPANY

5. Remove the 2 fasteners (1) securing the exhaust front pipe (3) to the catalytic converter.
6. Remove the exhaust front pipe retaining fastener (2).

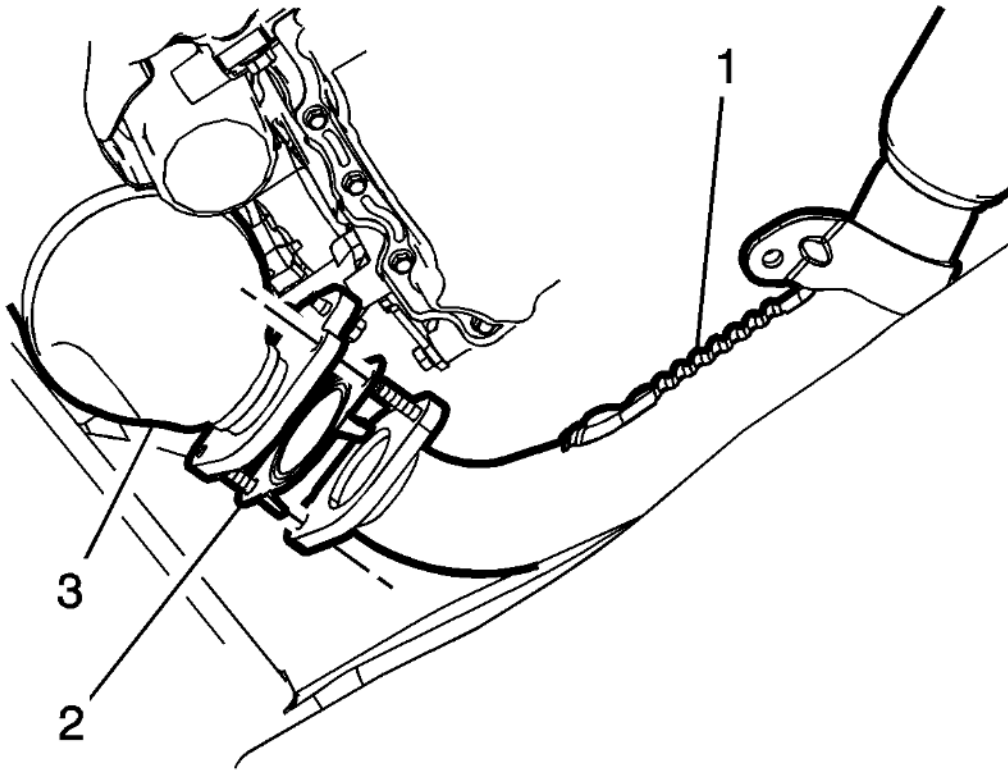


Fig. 37: Exhaust Front Pipe And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not twist or damage the flex coupling on the exhaust front pipe.

7. Remove the exhaust front pipe (1) from the catalytic converter (3).
8. Discard the catalytic converter exhaust gasket (2).

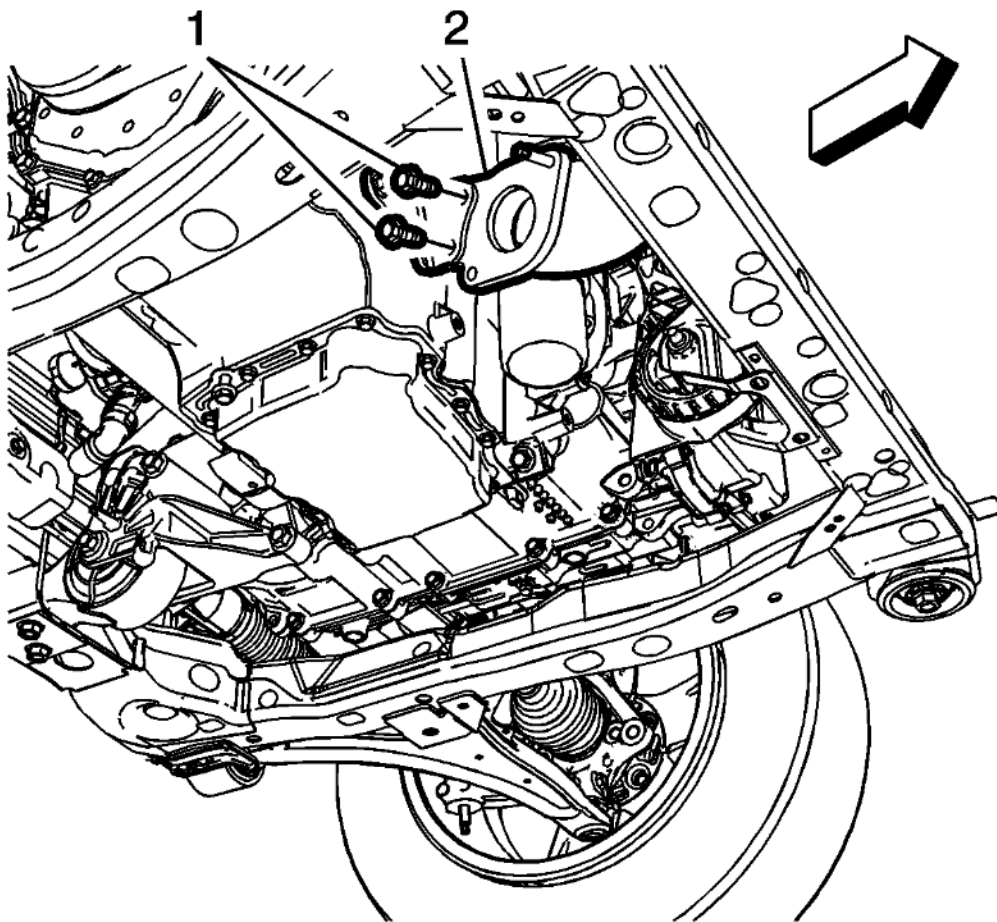


Fig. 38: Catalytic Converter Brace Fasteners
Courtesy of GENERAL MOTORS COMPANY

9. Remove the catalytic converter brace fasteners (1) and lower the catalytic converter (2) to the floor.

Installation Procedure

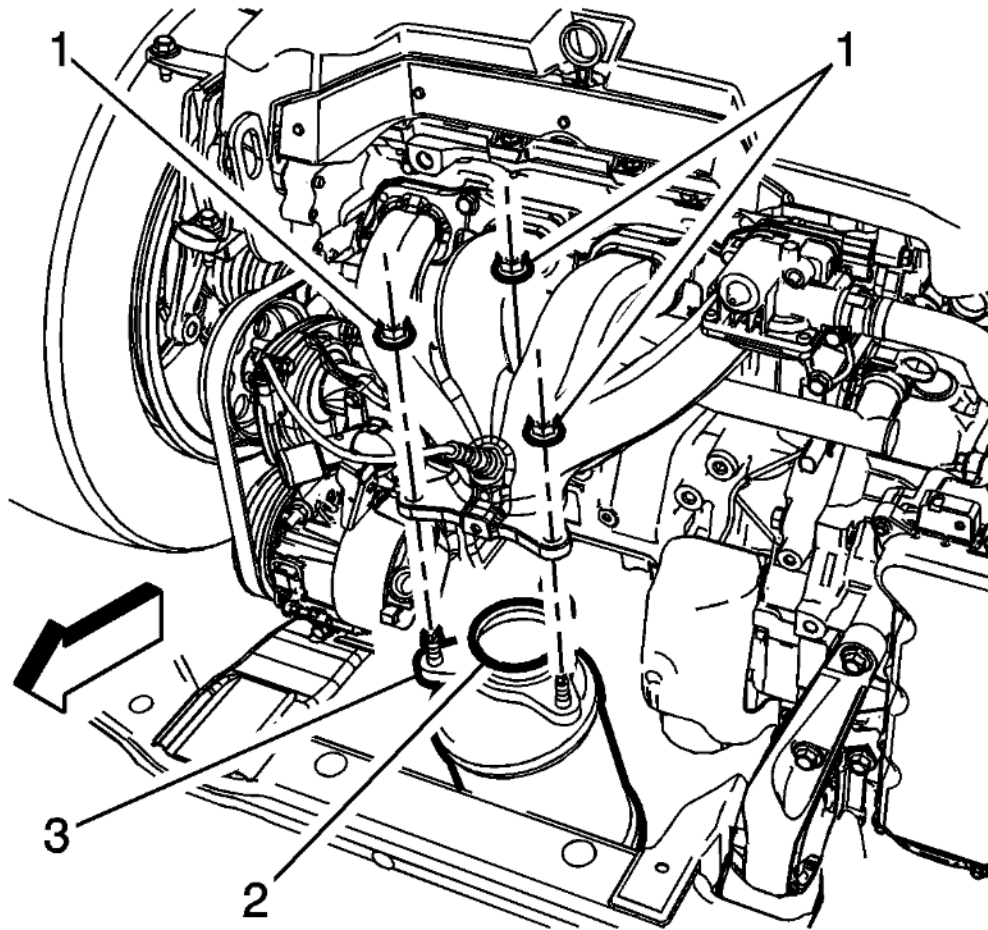


Fig. 39: Fasteners And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

1. Install the catalytic converter (3) to the exhaust manifold with a NEW catalytic converter seal (2).
2. Hand tighten the catalytic converter to exhaust manifold fasteners (1).

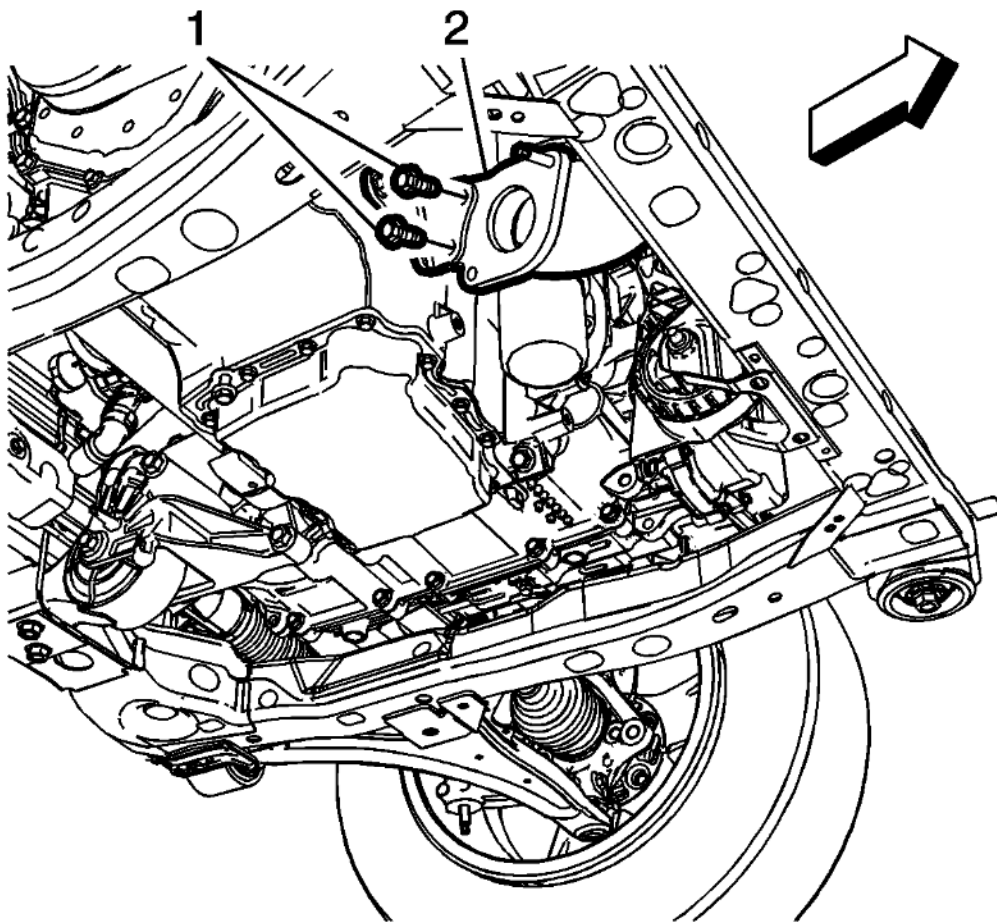


Fig. 40: Catalytic Converter Brace Fasteners
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the catalytic converter brace fasteners (1) and tighten to 22 (16 lb ft).

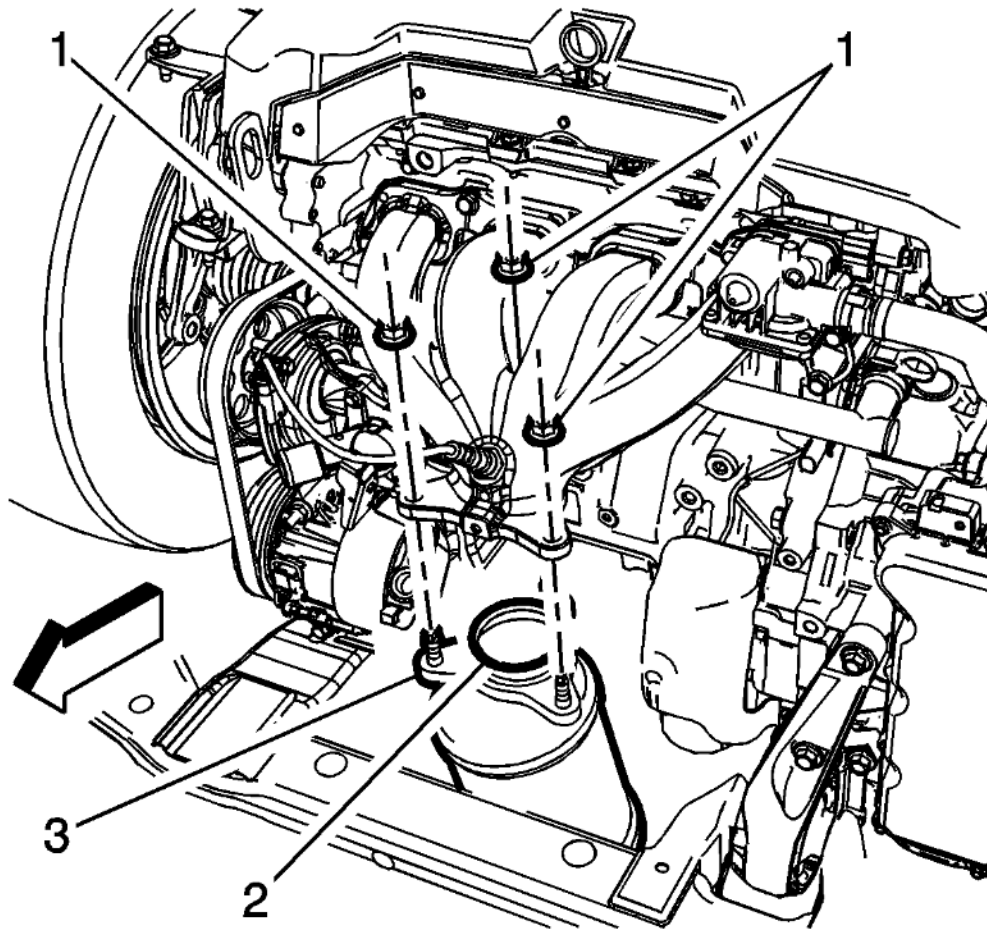


Fig. 41: Fasteners And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

4. Tighten the catalytic converter fasteners (1) to 58 (43 lb ft).
5. Install the exhaust manifold heat shield. Refer to **Exhaust Manifold Heat Shield Replacement (LUK)**, **Exhaust Manifold Heat Shield Replacement (LCV)**, **Exhaust Manifold Heat Shield Replacement (LTG)**.

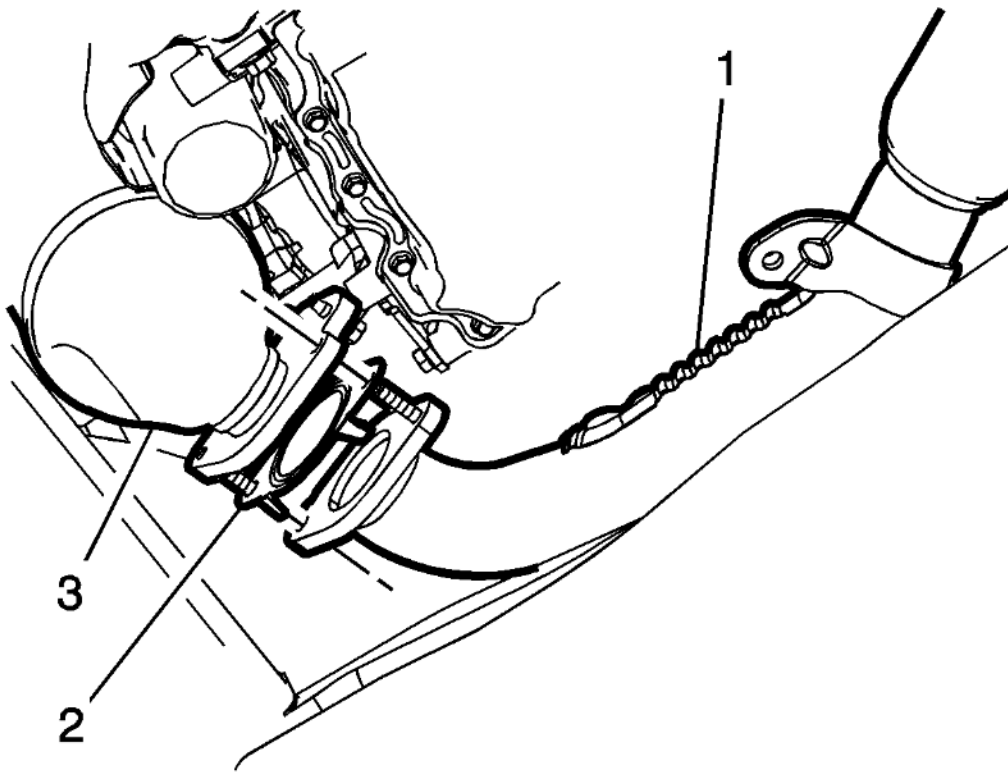


Fig. 42: Exhaust Front Pipe And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not twist or damage the flex coupling on the exhaust front pipe.

6. Install the exhaust front pipe (1) to the catalytic converter (3) with a NEW gasket (2).

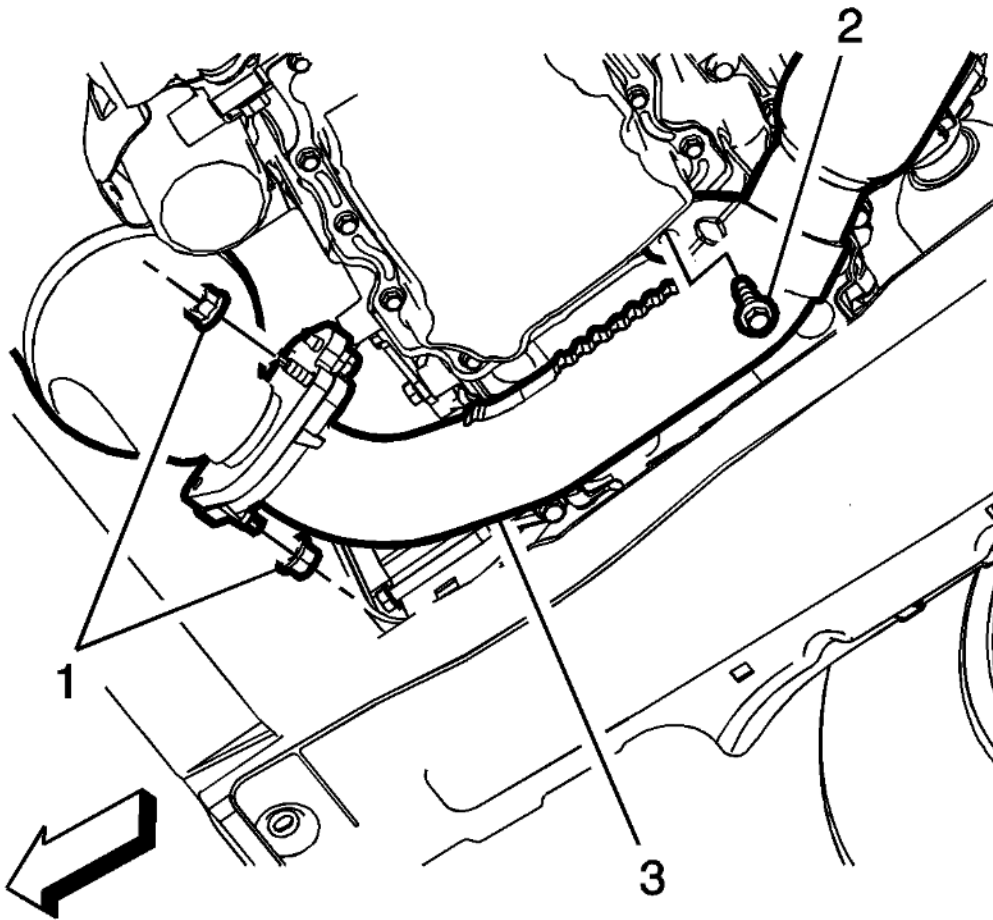


Fig. 43: Exhaust Front Pipe Retainer Fastener
Courtesy of GENERAL MOTORS COMPANY

7. Install the lower catalytic converter fasteners (1) and tighten to 28 (21 lb ft).
8. Install the exhaust front pipe retainer fastener (2) and tighten to 22 (16 lb ft).
9. Start the engine and check for exhaust leaks.

CATALYTIC CONVERTER REPLACEMENT (LTG)

Removal Procedure

WARNING: Refer to Exhaust Service Warning .

WARNING: Refer to Protective Goggles and Glove Warning .

1. Remove the turbocharger heat shield. Refer to [Turbocharger Heat Shield Replacement](#) .
2. Disconnect the heated oxygen sensor - 1. Refer to [Heated Oxygen Sensor Replacement - Sensor 1 \(LCV\)](#) , [Heated Oxygen Sensor Replacement - Sensor 1 \(LTG\)](#) .
3. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .

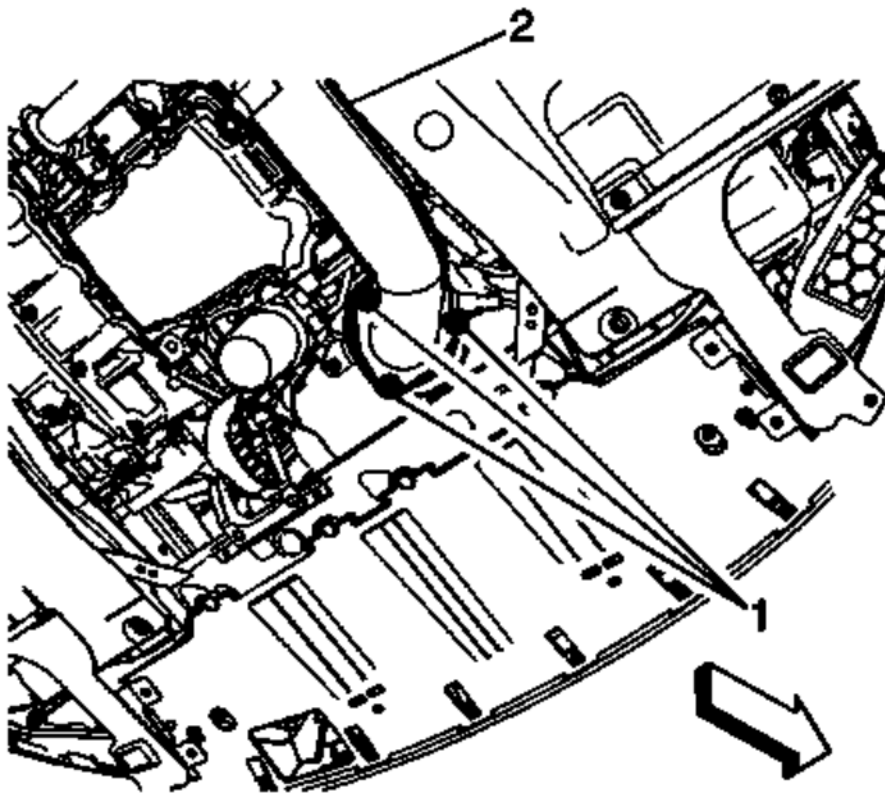


Fig. 44: Fasteners And Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

4. Remove the 3 fasteners (1) securing the exhaust front pipe (2) to the catalytic converter.

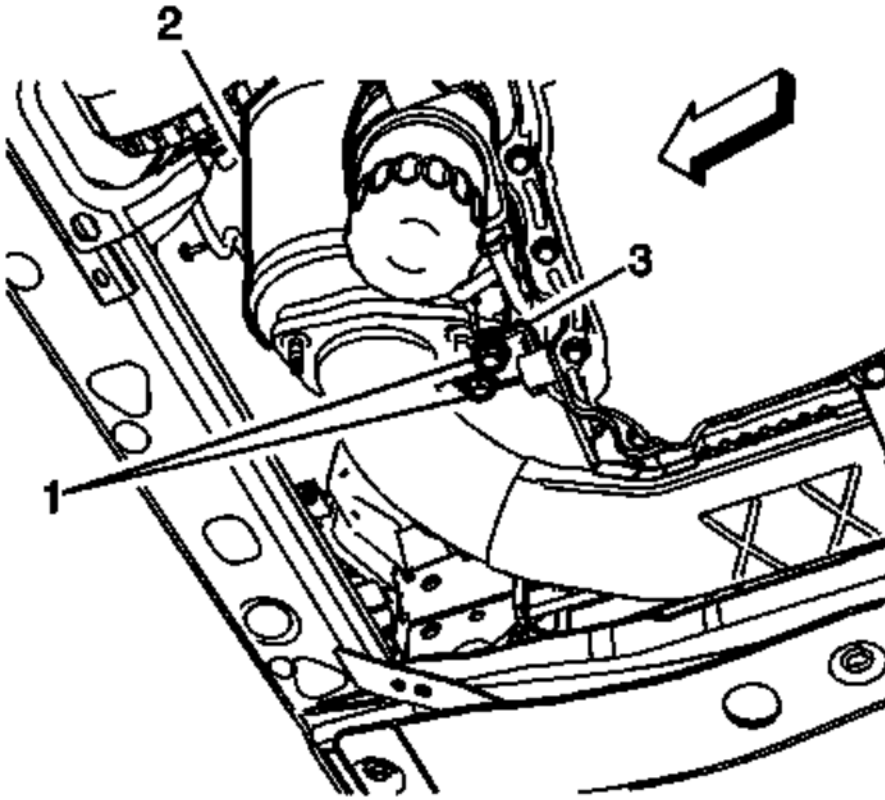


Fig. 45: Catalytic Converter Brace Fasteners
Courtesy of GENERAL MOTORS COMPANY

5. Remove the 2 fasteners (1) securing the catalytic converter (2) to the catalytic converter brace (3).
6. Lower the vehicle.

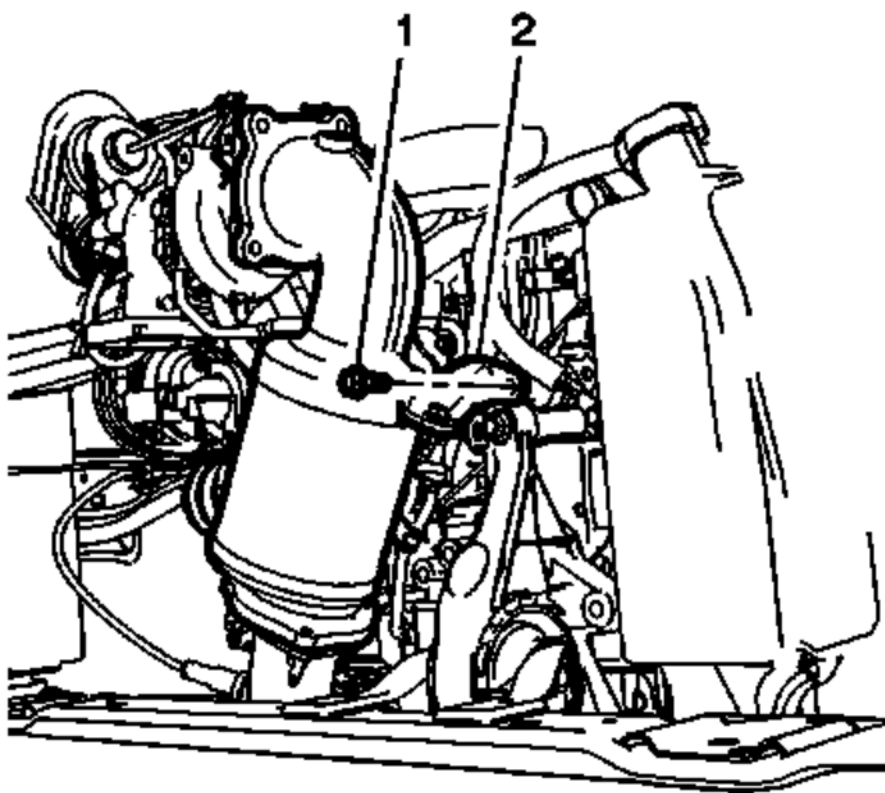


Fig. 46: Catalytic Converter Brace Bracket Fastener
Courtesy of GENERAL MOTORS COMPANY

7. Remove the catalytic converter brace bracket fastener (1) securing the catalytic converter to the engine block.

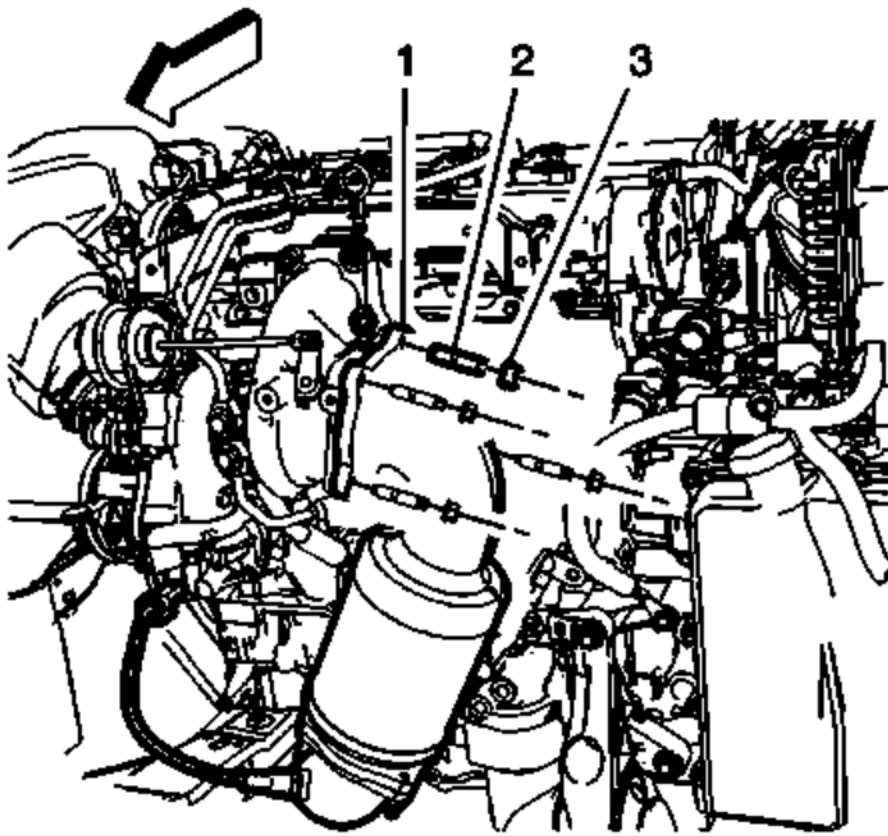


Fig. 47: Fasteners And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

8. Remove the 4 fasteners (3) and studs (2), securing the catalytic converter (1) to the turbocharger.

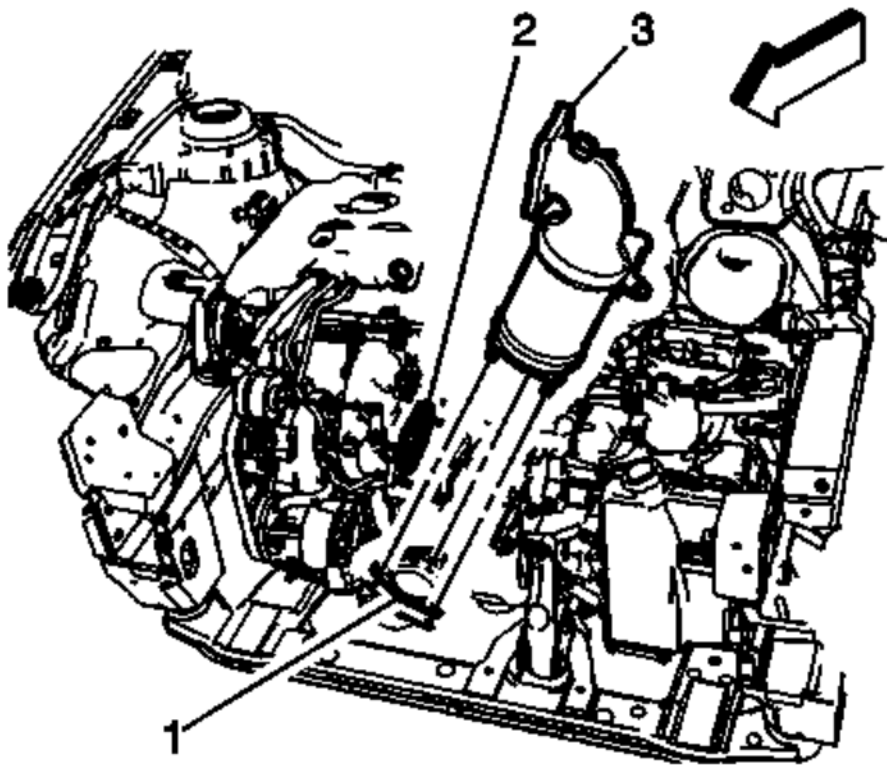


Fig. 48: Catalytic Converter

Courtesy of GENERAL MOTORS COMPANY

9. Remove the catalytic converter (3) from the engine compartment.
10. Discard the turbocharger seal (2) and the exhaust front pipe gasket (1).
11. If replacing the catalytic converter, transfer the catalytic converter brace to the NEW catalytic converter.

Installation Procedure

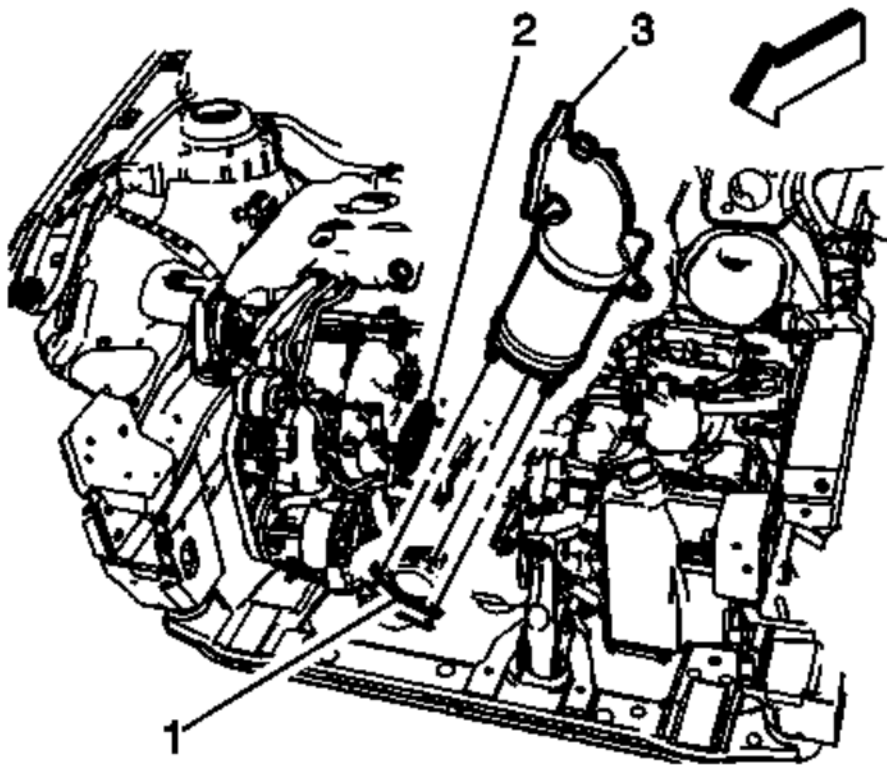


Fig. 49: Catalytic Converter

Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW seal (2) to the turbocharger and a NEW gasket (1) to the exhaust front pipe.
2. Install the catalytic converter (3) into the exhaust front pipe flange and the turbocharger.

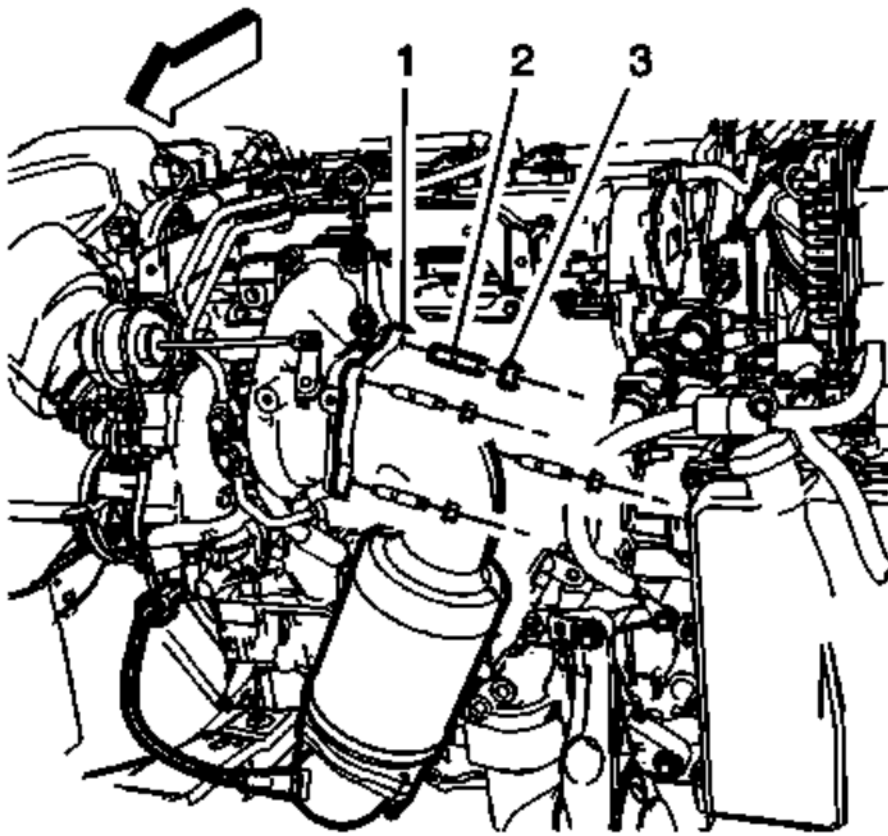


Fig. 50: Fasteners And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the turbocharger studs (2) and tighten to 10 (89 lb in).
4. Install the turbocharger fasteners (3) and tighten in a criss-cross pattern to 22 (16 lb ft).

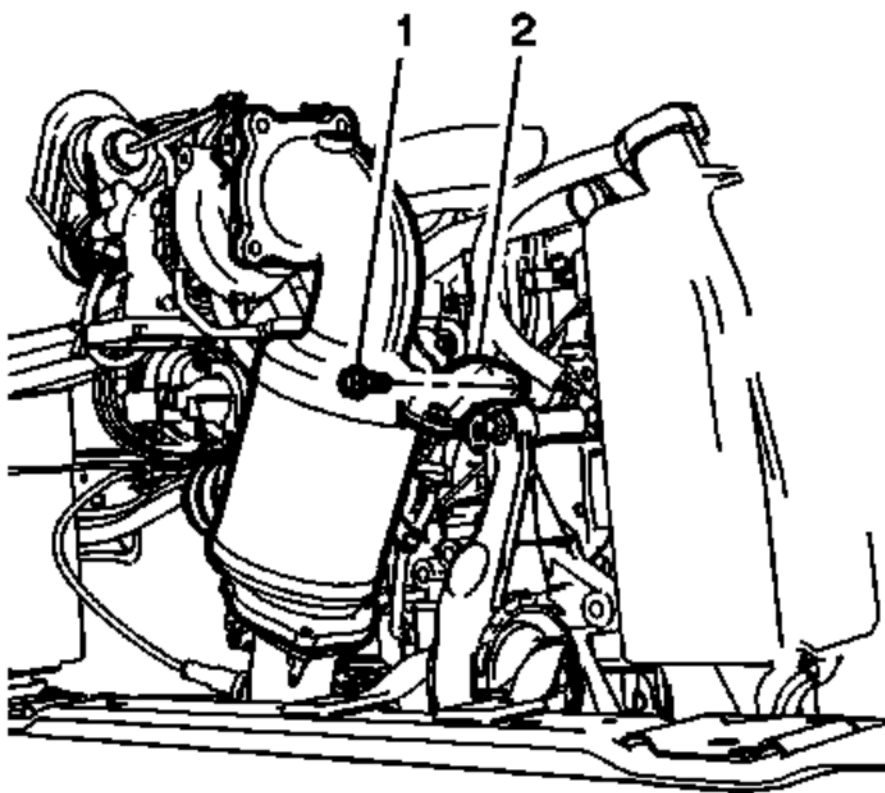


Fig. 51: Catalytic Converter Brace Bracket Fastener
Courtesy of GENERAL MOTORS COMPANY

5. Position the catalytic converter brace bracket (2), to the engine block, and tighten the fastener (1) to 22 (16 lb ft).
6. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

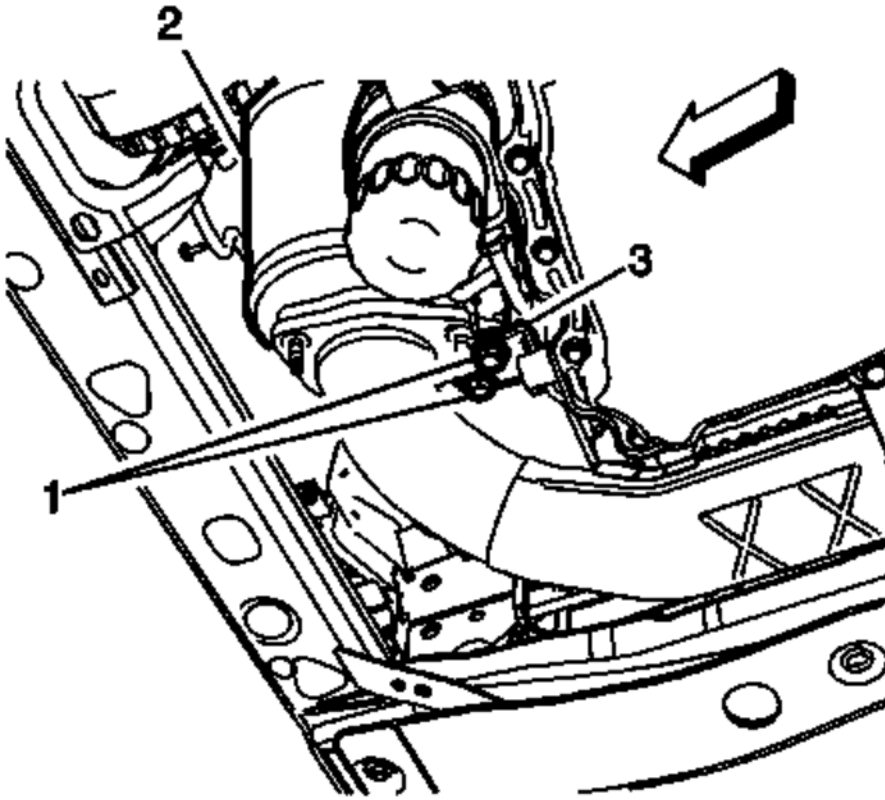


Fig. 52: Catalytic Converter Brace Fasteners
Courtesy of GENERAL MOTORS COMPANY

7. Install the catalytic converter brace fasteners (1) and tighten to 25 (18 lb ft).

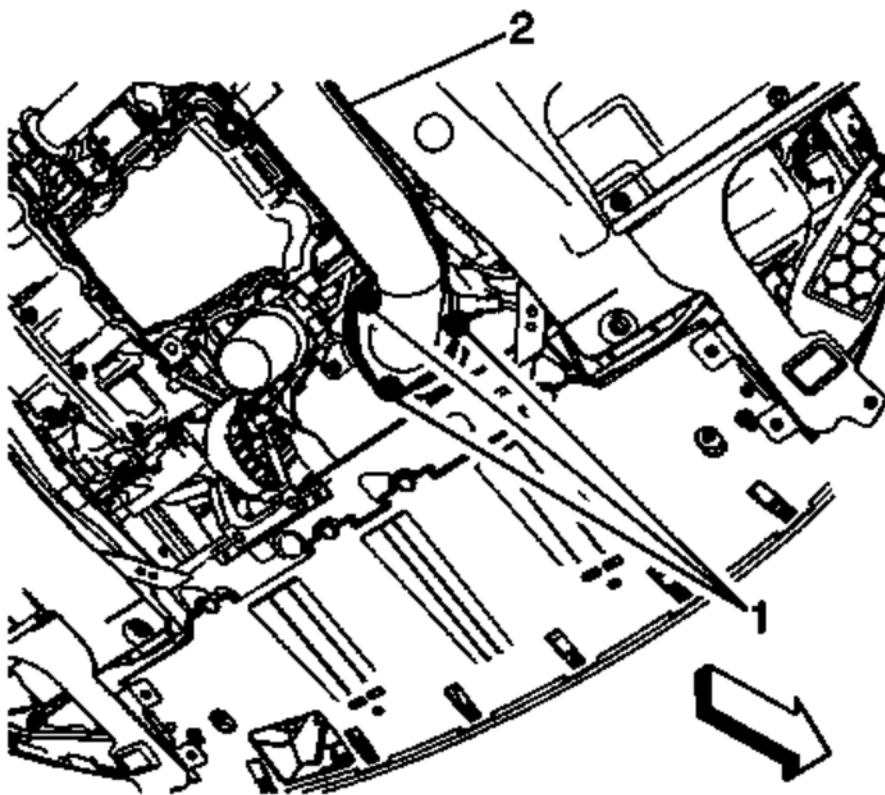


Fig. 53: Fasteners And Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

8. Install the catalytic converter fasteners (1) and tighten to 28 (21 lb ft).
9. Lower the vehicle.
10. Install the turbocharger heat shield. Refer to **Turbocharger Heat Shield Replacement** .
11. Connect the heated oxygen sensor - 1. Refer to **Heated Oxygen Sensor Replacement - Sensor 1 (LCV)** , **Heated Oxygen Sensor Replacement - Sensor 1 (LTG)** .
12. Start the engine and check for exhaust leaks.

EXHAUST PIPE FRONT HANGER BRACKET REPLACEMENT

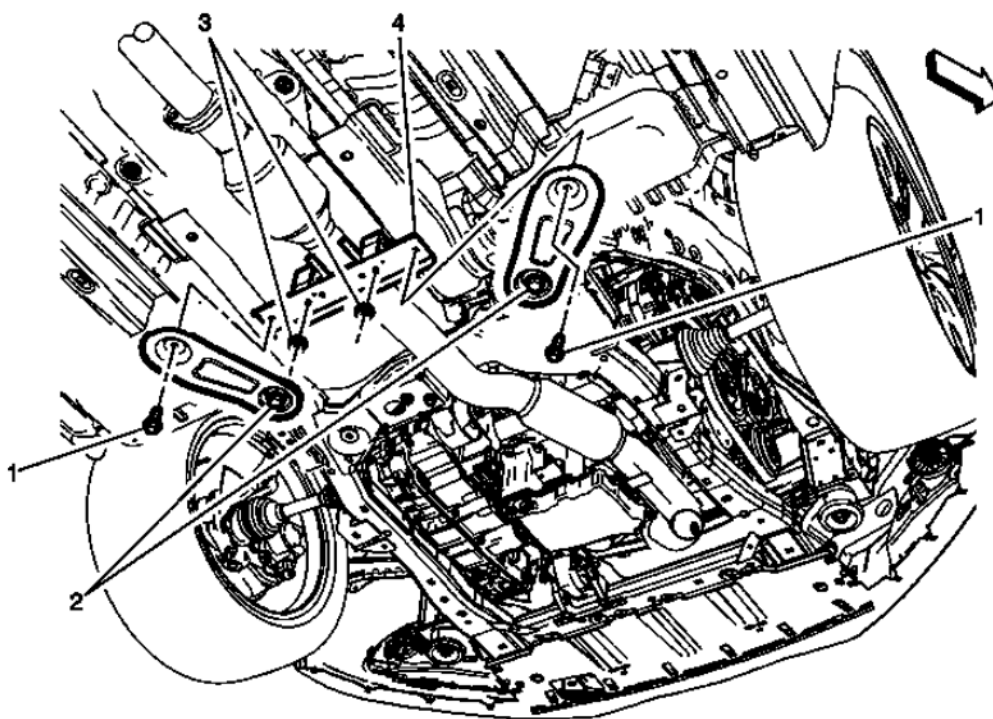


Fig. 54: Exhaust Pipe Front Hanger Bracket
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Pipe Front Hanger Bracket Replacement

Callout	Component Name
WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> . WARNING: Refer to <u>Safety Glasses Warning</u> .	
Preliminary Procedure Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Drivetrain and Front Suspension Frame Fasteners (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 60 (44 lb ft) + 30 Degrees
2	Drivetrain and Front Suspension Fasteners (Qty: 2) Tighten: 160 (118 lb ft)
	Exhaust Pipe Front Hanger Bracket Fasteners (Qty: 2)

3	Tighten: 35 (26 lb ft)
4	Exhaust Pipe Front Hanger Bracket

EXHAUST MUFFLER REPLACEMENT (LCV, LUK)

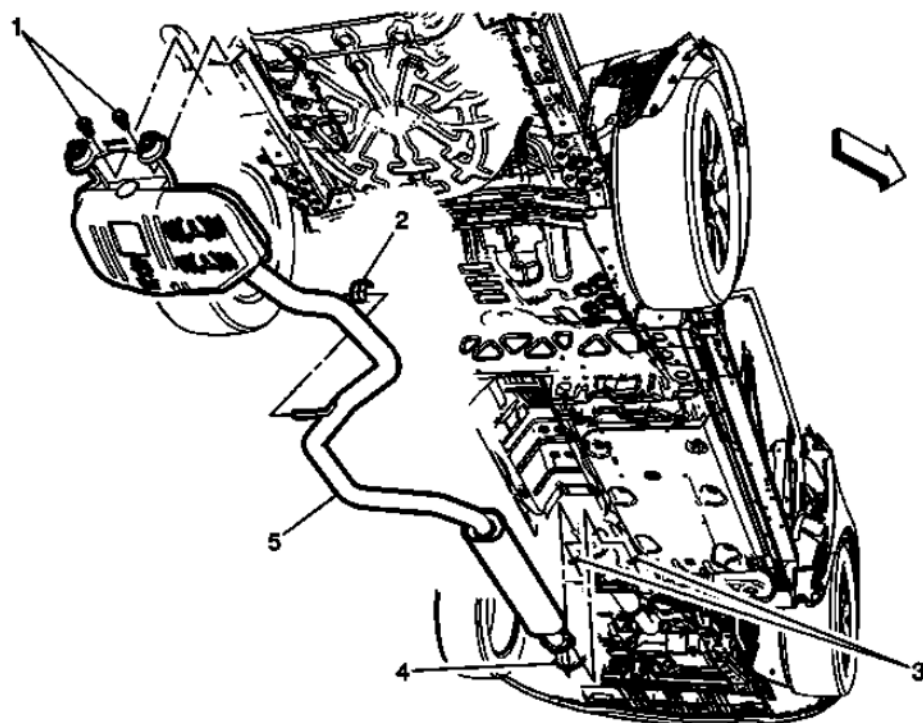


Fig. 55: Exhaust Muffler (Single)
Courtesy of GENERAL MOTORS COMPANY

Exhaust Muffler Replacement (LCV, LUK)

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
1	Exhaust Muffler Rear Hanger Fastener (Qty: 2) WARNING: Refer to Eye Protection Warning . WARNING: Refer to Hot Exhaust System Warning . CAUTION: Refer to Fastener Caution .

	Tighten 22 N.m (16 lb ft)
2	Exhaust Isolator
3	Exhaust Front Pipe Fastener Tighten 18 N.m (13 lb ft)
4	Exhaust Gasket NOTE: Replace the gasket with a NEW gasket.
5	Exhaust Muffler with Resonator

EXHAUST MUFFLER REPLACEMENT (LTG)

Removal Procedure

WARNING: Refer to Hot Exhaust System Warning .

WARNING: Refer to Safety Glasses Warning .

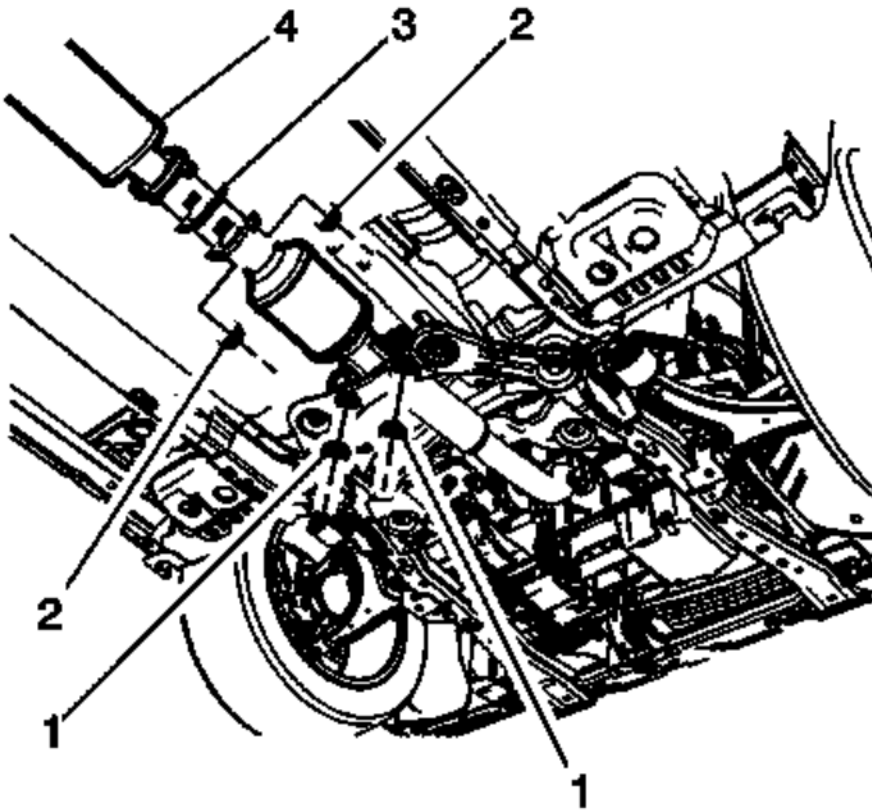


Fig. 56: Exhaust Front Pipe And Rear Muffler Assembly
Courtesy of GENERAL MOTORS COMPANY

1. Remove the exhaust front pipe fasteners (2) securing the rear muffler assembly (4) and discard the exhaust gasket (3).
2. Support the exhaust muffler with a suitable wire hanger.

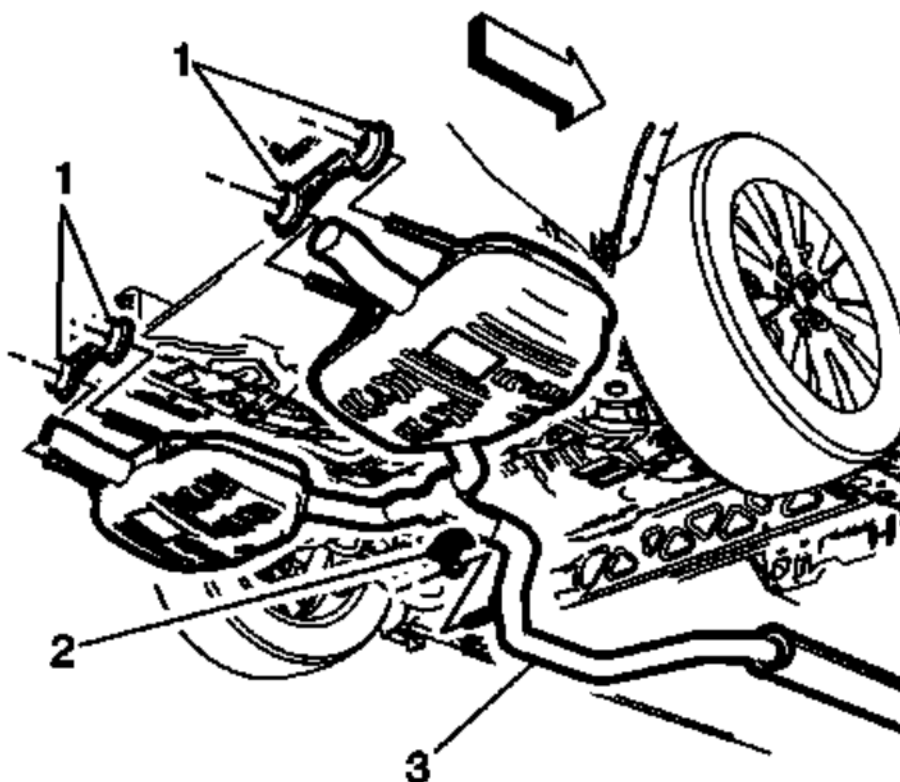


Fig. 57: Exhaust Muffler And Rear Exhaust Hanger Isolators
Courtesy of GENERAL MOTORS COMPANY

3. With the help of a second technician, remove the exhaust muffler (3) from the rear exhaust hanger isolators (1) and (2).

NOTE: **Clean and lubricate the exhaust hanger rods for ease of installation.**

4. Lower the exhaust muffler (3) to the floor.

Installation Procedure

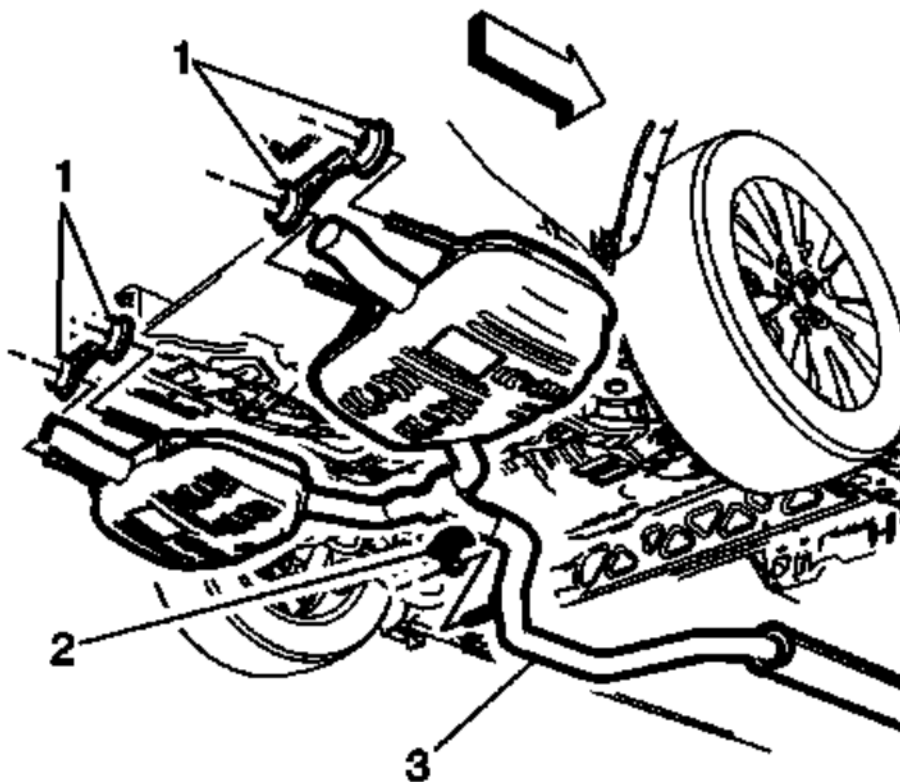


Fig. 58: Exhaust Muffler And Rear Exhaust Hanger Isolators
Courtesy of GENERAL MOTORS COMPANY

1. With the help of a technician, install the exhaust muffler (3) into the rear exhaust hanger isolators (1) and (2).

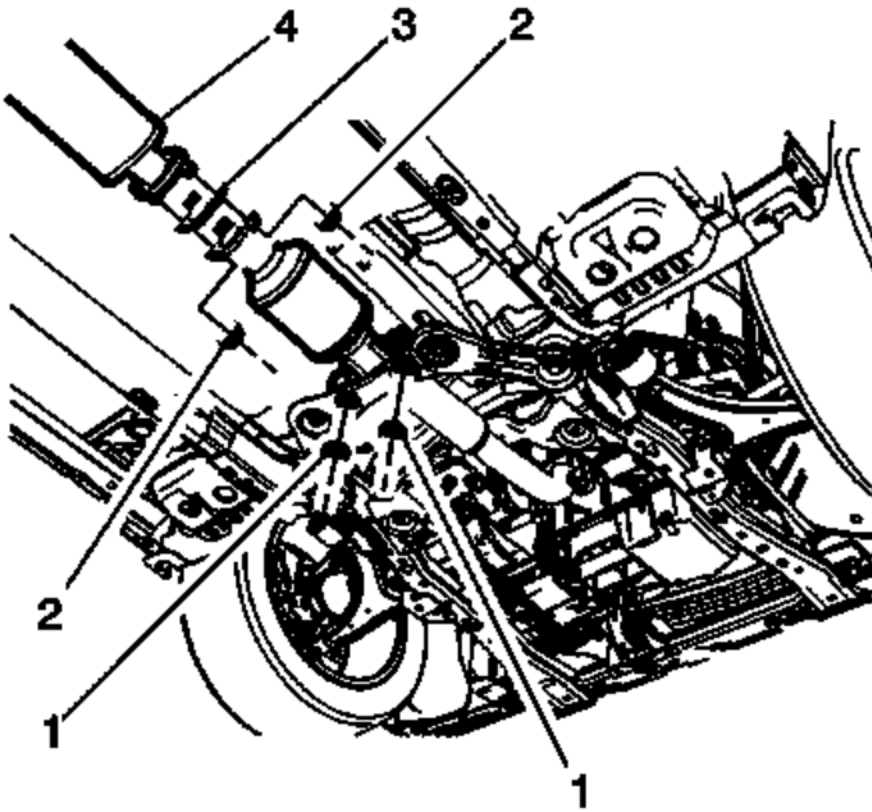


Fig. 59: Exhaust Front Pipe And Rear Muffler Assembly
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

2. Install the rear muffler (4) to the exhaust front pipe with a NEW gasket (3) and tighten the fasteners (2) to 18 N.m (13 lb ft).
3. Inspect the exhaust system for leaks.

EXHAUST MUFFLER INSULATOR, HANGER, AND BRACKET REPLACEMENT

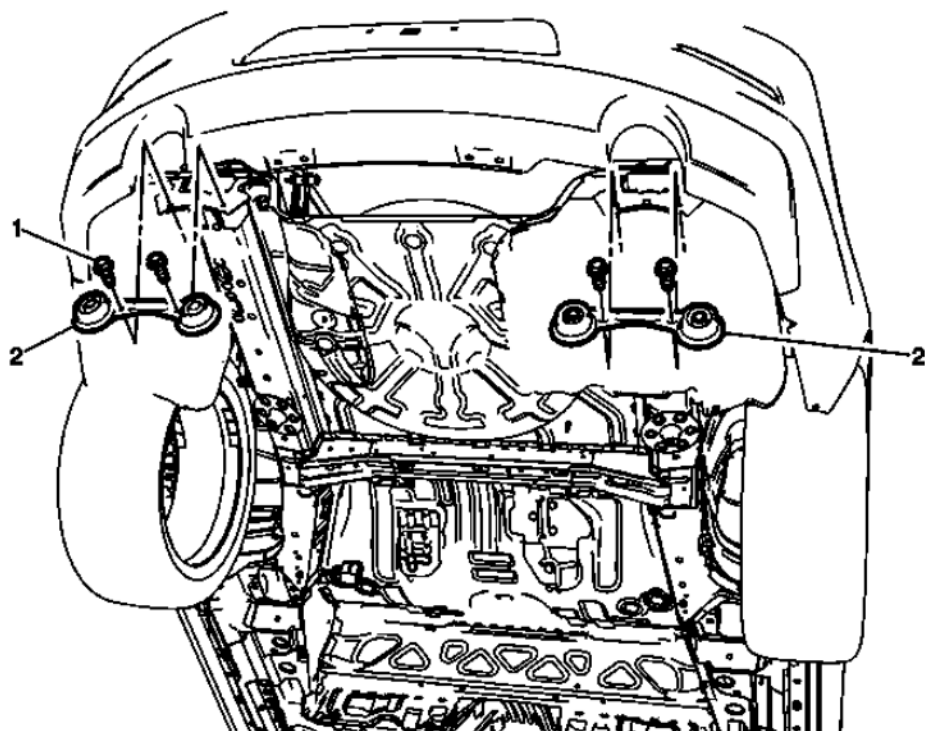


Fig. 60: Exhaust Muffler Insulator, Hanger, And Bracket
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Muffler Insulator, Hanger, and Bracket Replacement

Callout	Component Name
1	Exhaust Rear Muffler Rear Hanger Fastener (Qty: 4) WARNING: Refer to <u>Exhaust Service Warning</u> . WARNING: Refer to <u>Eye Protection Warning</u> . CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 22 (16 lb ft)
2	Exhaust Rear Muffler Rear Hanger

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT (LUK)

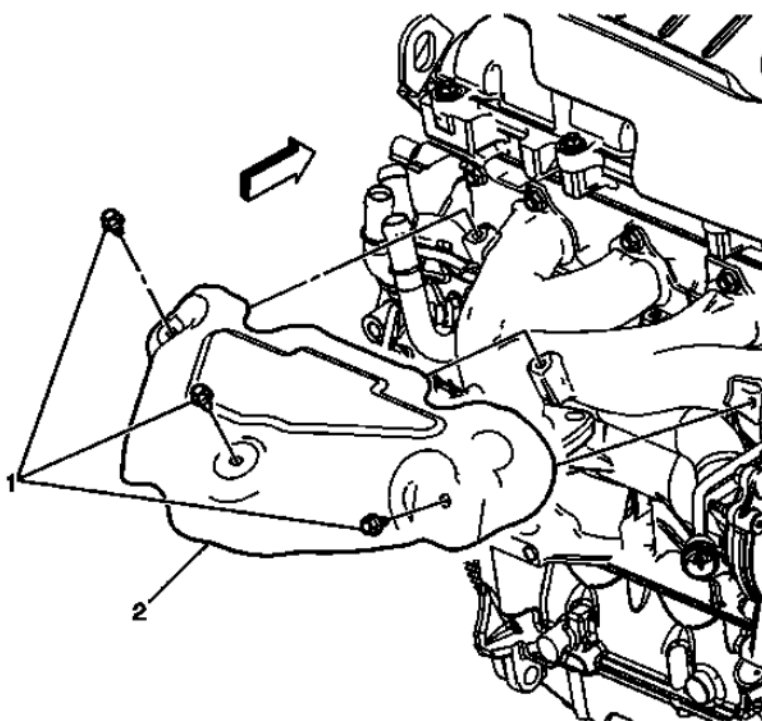


Fig. 61: View Of Exhaust Manifold Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Manifold Heat Shield Replacement (LUK)

Callout	Component Name
Preliminary Procedure Remove the intake manifold cover. Refer to <u>Intake Manifold Cover Replacement</u> .	
1	Exhaust Manifold Heat Shield Fastener (Qty 3) WARNING: Refer to <u>Hot Exhaust System Warning</u> . CAUTION: Refer to <u>Fastener Caution</u> . Tighten 10 N.m (89 lb in)
2	Exhaust Manifold Heat Shield

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT (LCV)

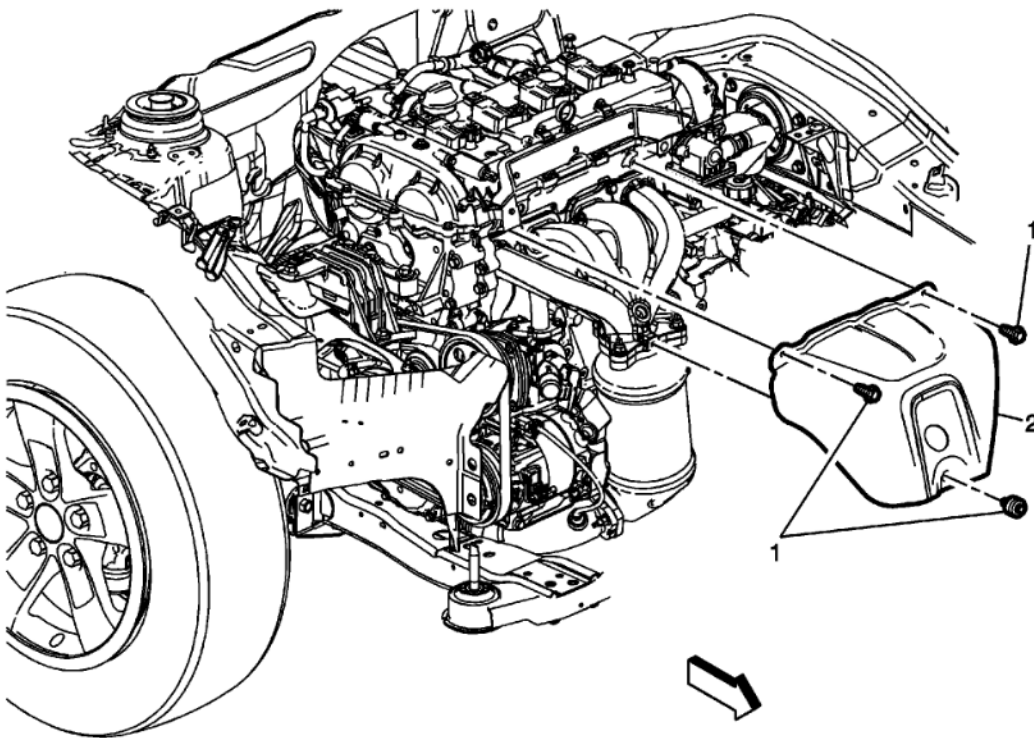


Fig. 62: Exhaust Manifold Heat Shield (LCV)
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Manifold Heat Shield Replacement (LCV)

Callout	Component Name
WARNING: Refer to <u>Exhaust Service Warning</u> .	
WARNING: Refer to <u>Eye Protection Warning</u> .	
Preliminary Procedure Disconnect the heated oxygen sensor.	
1	Exhaust Manifold Heat Shield Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 14 (10 lb ft)
2	Exhaust Manifold Heat Shield

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT (LTG)

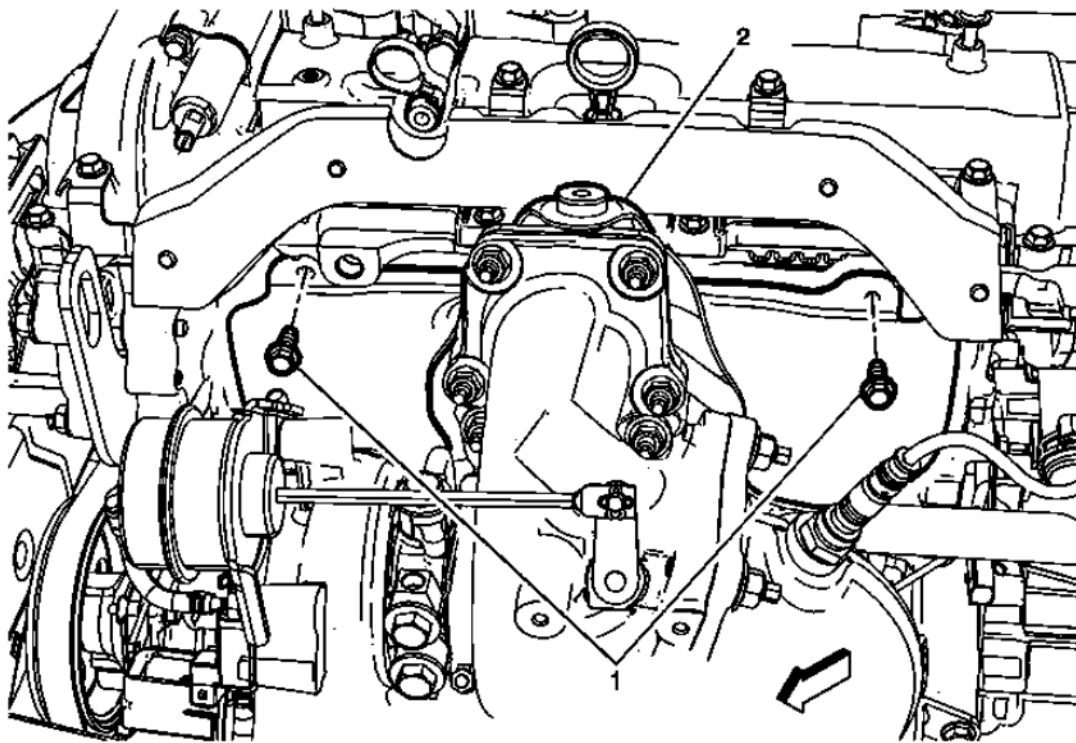


Fig. 63: Exhaust Manifold Heat Shield (LTG)
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Manifold Heat Shield Replacement (LTG)

Callout	Component Name
WARNING: Refer to <u>Hot Exhaust System Warning</u> .	
Preliminary Procedure	
1. Remove the turbocharger heat shield. Refer to <u>Turbocharger Heat Shield Replacement (LTG)</u> . 2. Remove the intake manifold cover. Refer to <u>Intake Manifold Cover Replacement (LCV)</u> , <u>Intake Manifold Cover Replacement (LTG)</u> .	
1	Exhaust Manifold Heat Shield Fasteners (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 14 (10 lb ft)
2	Exhaust Manifold Heat Shield

TURBOCHARGER HEAT SHIELD REPLACEMENT (LTG)

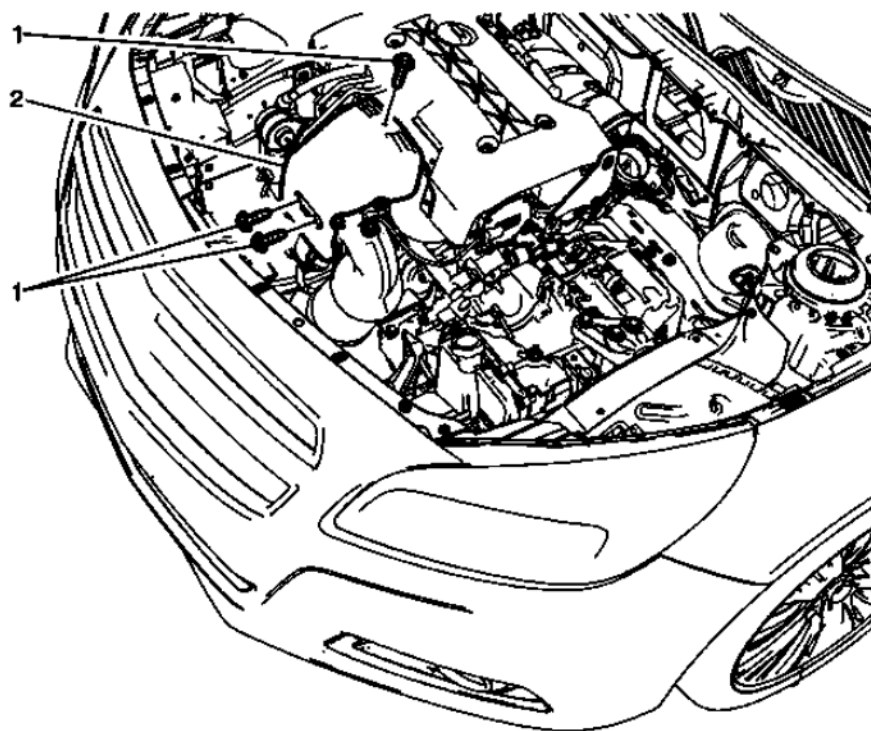


Fig. 64: Turbocharger Heat Shield (LTG)
 Courtesy of GENERAL MOTORS COMPANY

Turbocharger Heat Shield Replacement (LTG)

Callout	Component Name
1	Turbocharger Heat Shield Fastener (Qty: 3) WARNING: Refer to <u>Exhaust Service Warning</u> . CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 9 (80 lb in)
2	Turbocharger Heat Shield

EXHAUST MUFFLER HEAT SHIELD REPLACEMENT - RIGHT SIDE

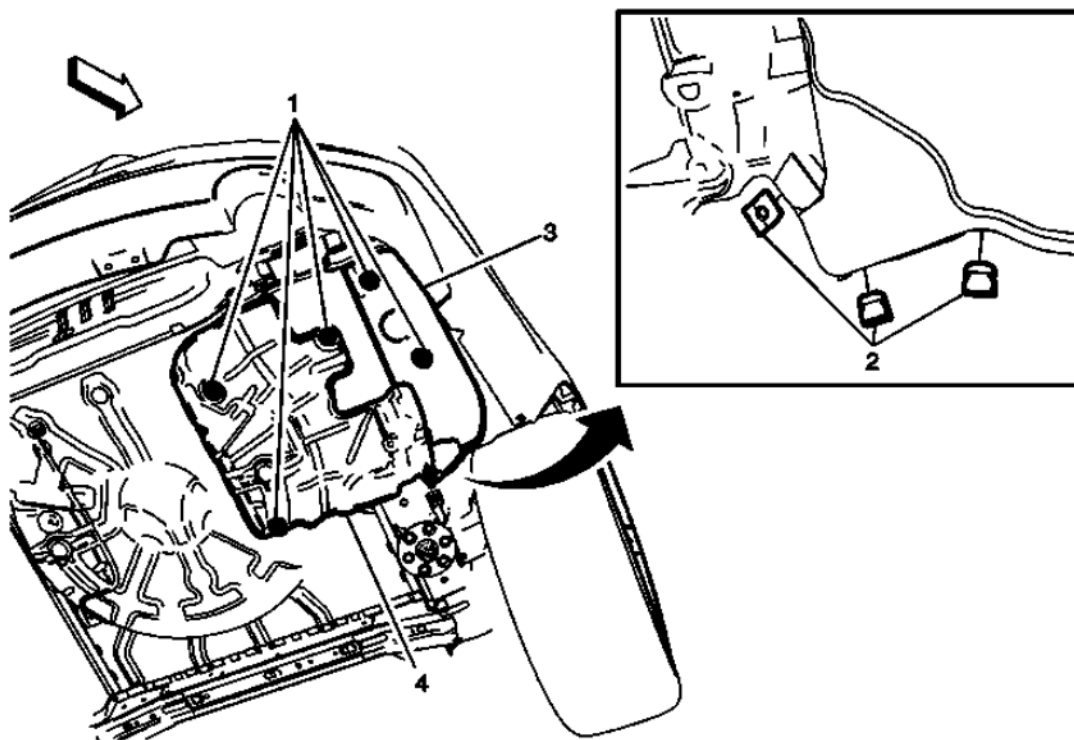


Fig. 65: Exhaust Muffler Heat Shield - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Muffler Heat Shield Replacement - Right Side

Callout	Component Name
WARNING: Refer to <u>Hot Exhaust System Warning</u> .	
WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> .	
Preliminary Procedure Remove the exhaust muffler. Refer to <u>Exhaust Muffler Replacement (LCV, LUK)</u> , <u>Exhaust Muffler Replacement (LTG)</u> .	
1	Heat Shield Retainers (Qty: 5) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 N.m (13 lb in)
2	Retainer Clips (Qty: 3)
3	Exhaust Muffler Heat Shield - Outer
4	Exhaust Muffler Heat Shield - Inner

EXHAUST MUFFLER HEAT SHIELD REPLACEMENT - LEFT SIDE

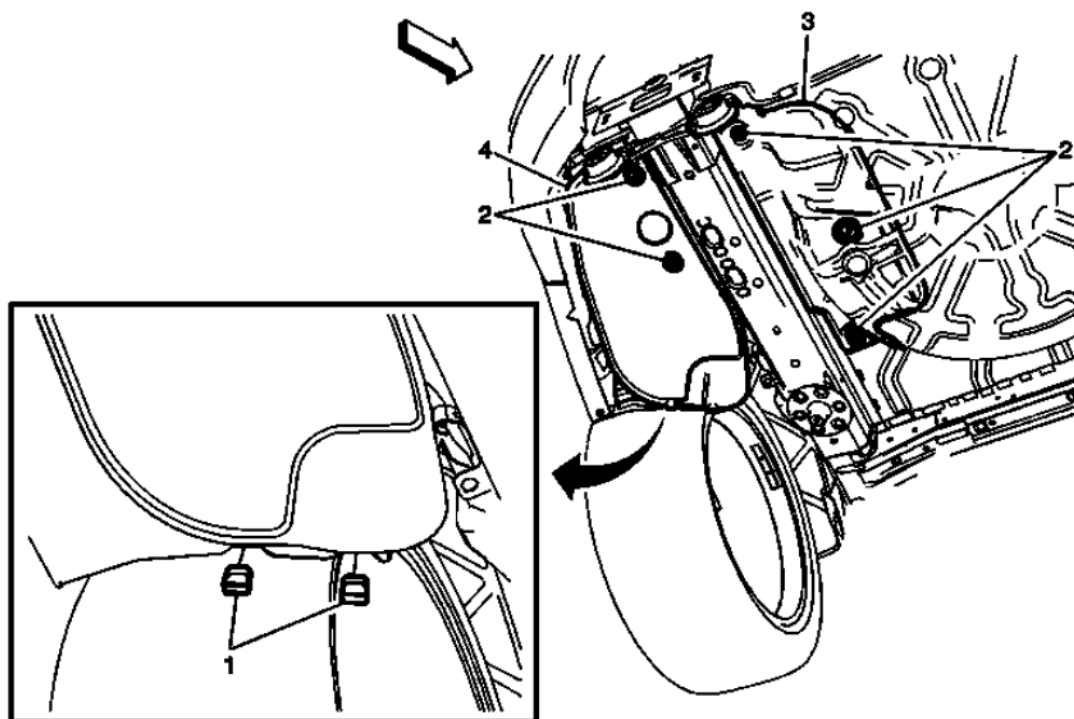


Fig. 66: Exhaust Muffler Heat Shield - Left Side
Courtesy of GENERAL MOTORS COMPANY

Exhaust Muffler Heat Shield Replacement - Left Side

Callout	Component Name
WARNING: Refer to <u>Hot Exhaust System Warning</u> .	
WARNING: Refer to <u>Moving Parts and Hot Surfaces Warning</u> .	
Preliminary Procedure Remove the exhaust muffler. Refer to <u>Exhaust Muffler Replacement (LCV, LUK)</u> , <u>Exhaust Muffler Replacement (LTG)</u> .	
1	Retainer Clips (Qty: 2)
2	Heat Shield Retainers (Qty: 5)
	CAUTION: Refer to <u>Fastener Caution</u> .
	Tighten 1.5 N.m (13 lb in)

3	Exhaust Muffler Heat Shield - Inner
4	Exhaust Muffler Heat Shield - Outer

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)

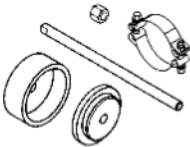
The catalyst in the catalytic converter is not serviceable.

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
	EN-35314-A J-35314-A Exhaust Back Pressure Gauge
	EN-6179 EN-39194-C KM-6179 J-39174-C EN-44626 J-44626 Heated Oxygen Sensor Remover/Installer
	CH-6614 MKM-6614 83 95 667 CH-0006785 3-0006785 Chain-type Pipe Cutter