

2017 ENGINE
Exhaust - Encore, Trax

SPECIFICATIONS

FASTENER SPECIFICATIONS

Single Use Non-Threaded Fasteners/Components

NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>	
Application	
Catalytic Converter Gasket	
Catalytic Converter Seal	
Exhaust Front Pipe Gasket	
Exhaust Gasket	
Exhaust Manifold Gasket	
Exhaust Muffler Gasket	
Turbocharge Oil Feed Pipe Seal Rings	
Warm Up Three-Way Catalytic Converter 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 (LE2)	15 N.m (11 lb ft)
Turbocharger Clamp Fastener (LUV)	13 N.m (115 lb in)

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 (LE2)	22 N.m (16 lb ft)
Catalytic Converter Brace Bracket Nut (LE2)	22 N.m (16 lb ft)
Catalytic Converter Brace Bracket Nut @ Transmission (LE2)	58 N.m (43 lb ft)
Catalytic Converter Brace Fastener (LUV)	22 N.m (16 lb ft)
Catalytic Converter @ Cylinder Head Fastener (2H0)	20 N.m (15 lb ft)
Catalytic Converter @ Exhaust Front Pipe Fastener (2H0)	22 N.m (16 lb ft)
Catalytic Converter Front Heat Shield Fastener	3 N.m (27 lb in)
Catalytic Converter Nut (LE2)	22 N.m (16 lb ft)
Exhaust Clamp Fastener (LUV, 2H0)	50 N.m (37 lb ft)
Exhaust Crossover Pipe Heat Shield Fastener	3 N.m (27 lb in)
Exhaust Front Pipe @ Catalytic Converter Fastener (LUV)	22 N.m (16 lb ft)
Exhaust Front Pipe @ Exhaust Muffler Fastener (2H0)	17 N.m (13 lb ft)
Exhaust Front Pipe Fastener (LUV, 2H0)	22 N.m (16 lb ft)
Exhaust Front Pipe Nut (LE2)	17 N.m (13 lb ft)

NOTE:

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

Application	Specification
	Metric (English)
Exhaust Front Pipe @ Warm Up 3-Way Catalytic Converter Fastener (LUV)	17 N.m (13 lb ft)
Exhaust Manifold Brace Fastener (2H0)	20 N.m (15 lb ft)
Exhaust Manifold Heat Shield Bolt (LUV)	8 N.m (71 lb in)
Exhaust Manifold Heat Shield Fastener (2H0)	8 N.m (71 lb in)
Exhaust Muffler Clamp (LUV)	50 N.m (37 lb ft)
Exhaust Muffler Fastener (2H0)	17 N.m (13 lb ft)
Exhaust Pipe Clamp (LE2)	50 N.m (37 lb ft)
Exhaust Rear Muffler Heat Shield Retainer	3 N.m (27 lb in)
Heated Oxygen Sensor (2H0)	42 N.m (31 lb ft)
Wiring Harness Bracket Fastener (2H0)	15 N.m (11 lb ft)

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
3	Is the system equipped with dual exhaust?	-	Go to Diagnostic Aids	Go to Step 4

Step	Action	Value(s)	Yes	No
4	1. Remove the secondary air injection (AIR) check valve or the heated oxygen sensor (HO2S) that is in front of and closest to the catalytic converter. Refer to the affected component's service procedure. 2. Install the J-35314-A Exhaust Back Pressure Gauge in place of the AIR check valve or HO2S sensor. 3. Start the engine. 4. Increase and monitor the engine speed at 2, 000 RPM. 5. Observe the exhaust system back pressure reading on the gauge. Does the reading exceed the specified value?	14 kPa (2 psi)	Go to Step 5	Go to Step 8
5	1. Turn the engine off and place the ignition in the lock position. 2. Remove the J-35314-A Exhaust Back Pressure Gauge. 3. Re-install the AIR check valve/HO2S sensor. Refer to the affected component's service procedure. 4. Remove the post-catalyst HO2S sensor. Refer to the affected component's service procedure. 5. Install the J-35314-A Exhaust Back Pressure Gauge in place of the post HO2S sensor. 6. Start the engine. 7. Increase and monitor the engine speed at 2, 000 RPM. 8. Observe the exhaust system back pressure reading on the gauge. Does the reading exceed the specified value?	14 kPa (2 psi)	Go to Step 6	Go to Step 7
6	Inspect the exhaust system for the following conditions: • Damage in the exhaust pipe • Debris in the exhaust pipe • Muffler or resonator internal failure • Two-layer exhaust pipe separation Did you find and correct the condition?	-	Go to Step 8	-
7	Replace the catalytic converter. Refer to the affected component's service procedure. Did you find and correct the condition?	-	Go to Step 8	-

Step	Action	Value(s)	Yes	No
8	1. Remove the J-35314-A Exhaust Back Pressure Gauge. 2. Reinstall the AIR check valve or the post-catalyst HO2S sensor. Refer to the affected component's service procedure 3. Clear any codes. 4. Road test the vehicle in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 2

EXHAUST LEAKAGE

Problem	Action
WARNING: While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system.	
DEFINITION: An exhaust leak may show stains at the area of the leak. The leak may be felt by holding a hand close to the suspected areas or using a smoke pencil. The leak may make a popping or hissing noise. Refer to Symptoms - Engine Exhaust prior to beginning this table.	
Misaligned or improperly installed exhaust system components	• Align and tighten the exhaust system components to the specifications. Refer to Fastener Specifications. • Ensure the exhaust hangers are in the proper locations and not loose.
Exhaust leaks at the following connections: • Exhaust manifold to pipe • Flanges • Pipe clamps	Tighten the components to the specifications. Refer to Fastener Specifications .
Seals or gaskets leaking • Exhaust manifold to cylinder head • Exhaust pipes to exhaust manifold • Catalytic converter connection • EGR connections • AIR connections to the exhaust manifold or cylinder head	Replace the leaking seal or gasket. Refer to the affected components procedure for service.
Irregularities at the mating surfaces on the flange connections	Repair as required or replace the affected component. Refer to the affected components procedure for service.
Exhaust manifold cracked or broken	Replace the exhaust manifold. Refer to the affected component's procedure for service.
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 FRONT PIPE REPLACEMENT (LUV)

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. Disconnect the heated oxygen sensor - position 2 from the exhaust front pipe.

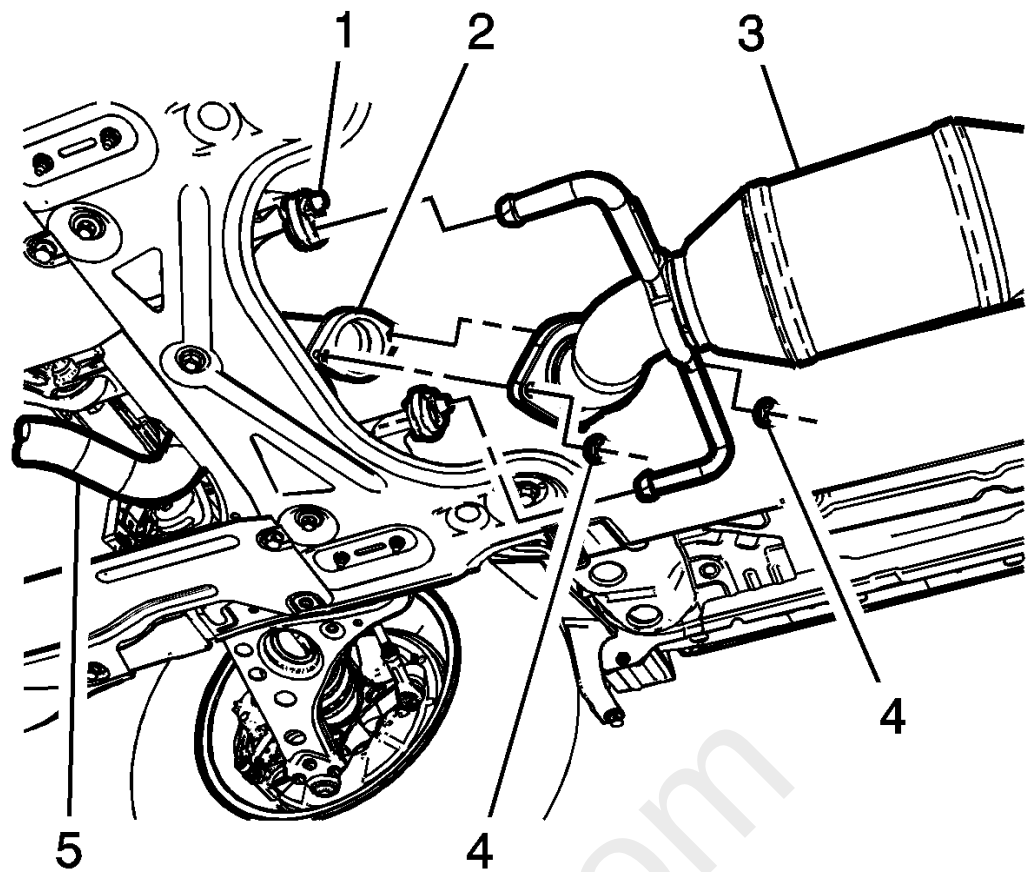


Fig. 1: Catalytic Converter And Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

3. Remove the 2 fasteners (4) securing the warm up 3 way catalytic converter (3) to the exhaust front pipe (5).
4. Discard the exhaust front pipe gasket (2).

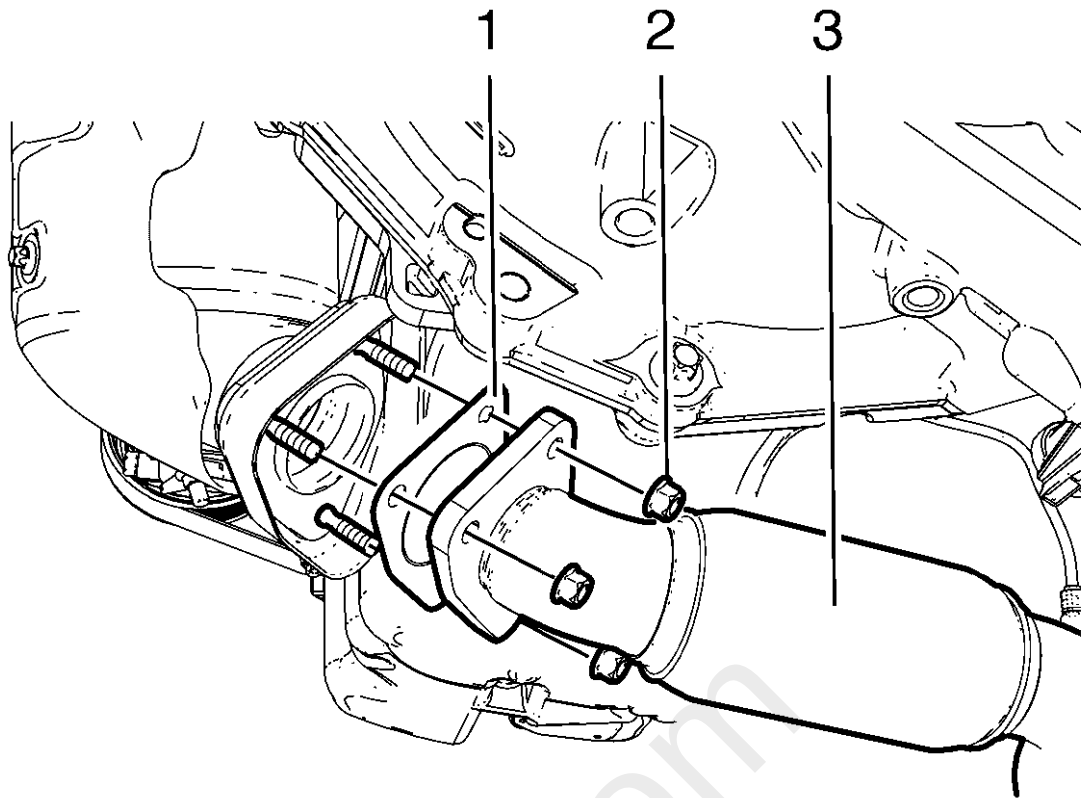


Fig. 2: Catalytic Converter

Courtesy of GENERAL MOTORS COMPANY

5. Remove the 3 fasteners (2) securing the exhaust front pipe (3) to the catalytic converter.
6. Discard the exhaust front pipe gasket (1).
7. Remove the exhaust front pipe (3).
8. If you are replacing the exhaust front pipe, transfer the heated oxygen sensor.

Installation Procedure

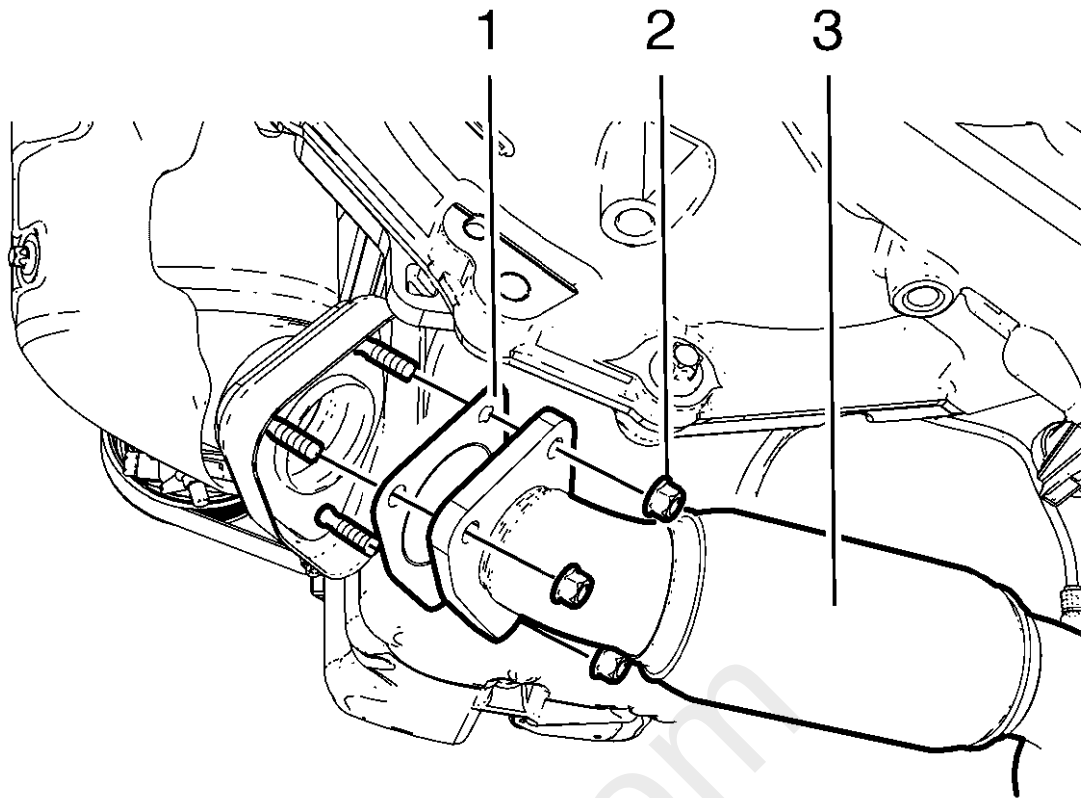


Fig. 3: Catalytic Converter

Courtesy of GENERAL MOTORS COMPANY

1. Install the exhaust front pipe (3) to the catalytic converter with a NEW gasket (1) and hand tighten the fasteners (2).

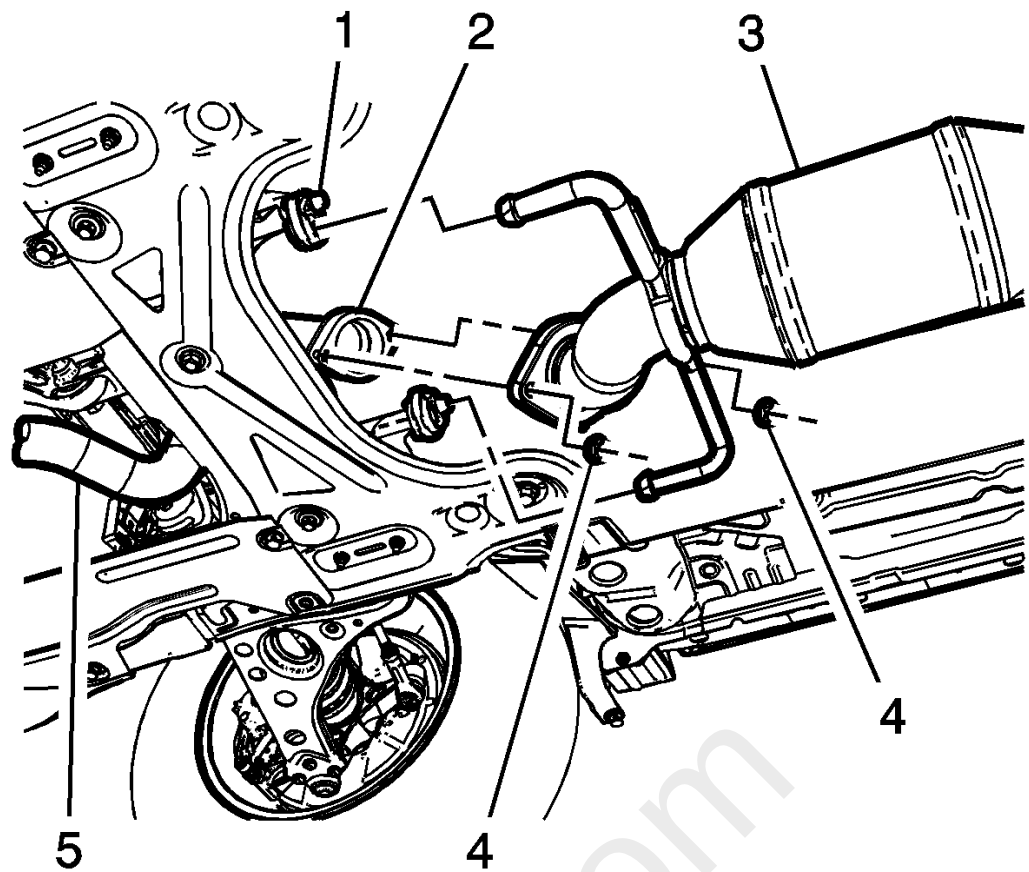


Fig. 4: Catalytic Converter And Exhaust Front Pipe

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Flex Decoupler Caution](#) .

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

2. Install the exhaust front pipe (5) to the warm up 3 way catalytic converter (3) with a NEW gasket (2) and tighten the fasteners (4) to 17 N.m (13 lb ft).

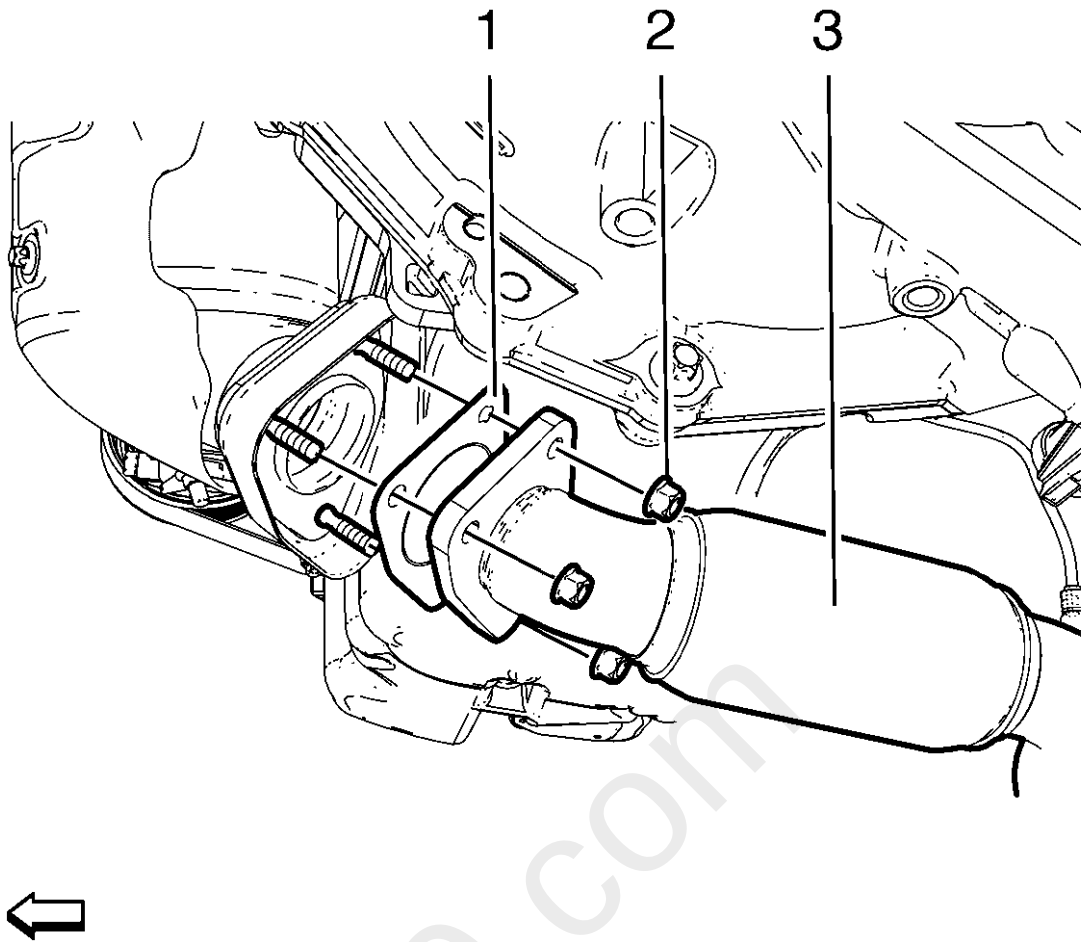


Fig. 5: Catalytic Converter

Courtesy of GENERAL MOTORS COMPANY

3. Tighten the exhaust front pipe fasteners (2) to 22 N.m (16 lb ft).
4. Connect the heated oxygen sensor - position 2 to the engine wiring harness.
5. Start the engine and check for exhaust leaks.

EXHAUST FRONT PIPE REPLACEMENT (2H0)

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. Disconnect the heated oxygen sensor - position 2 harness connector.

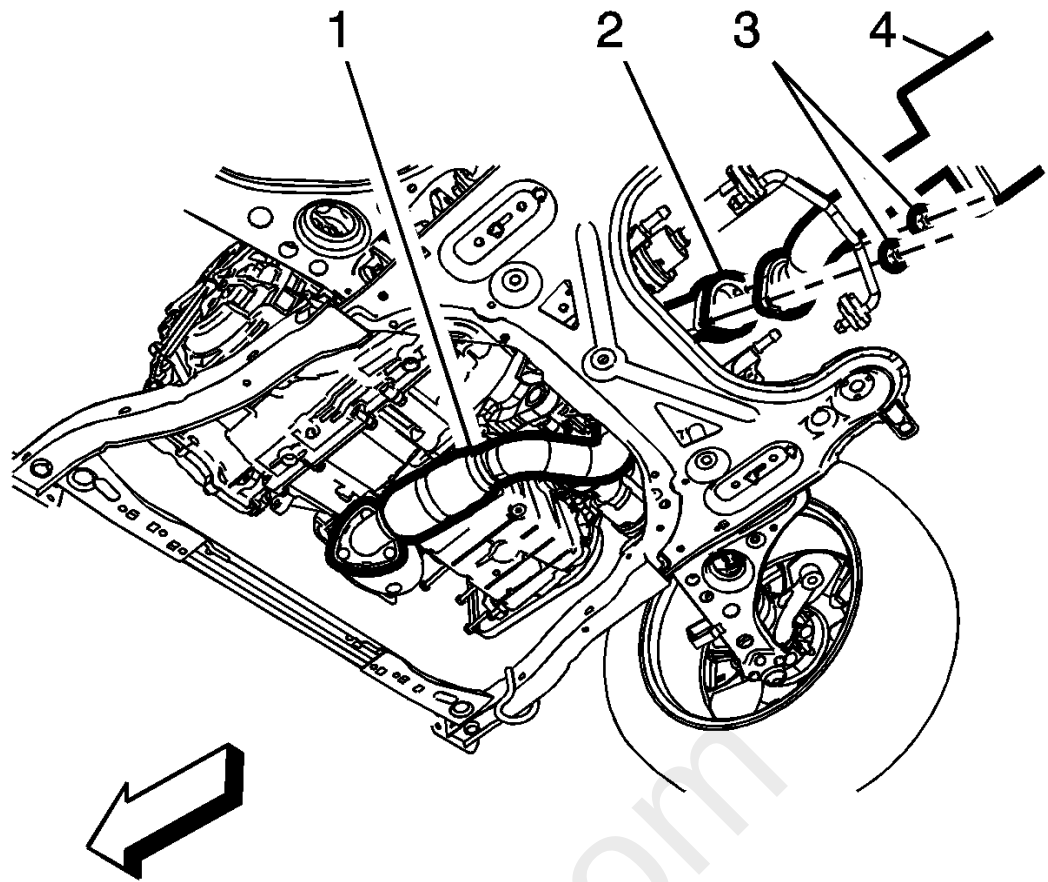


Fig. 6: Muffler And Exhaust Pipe

Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not twist or damage the flex coupling.

3. Remove the 2 fasteners (3) securing the exhaust muffler (4) to the exhaust front pipe (1).
4. Discard the exhaust front pipe gasket (2).

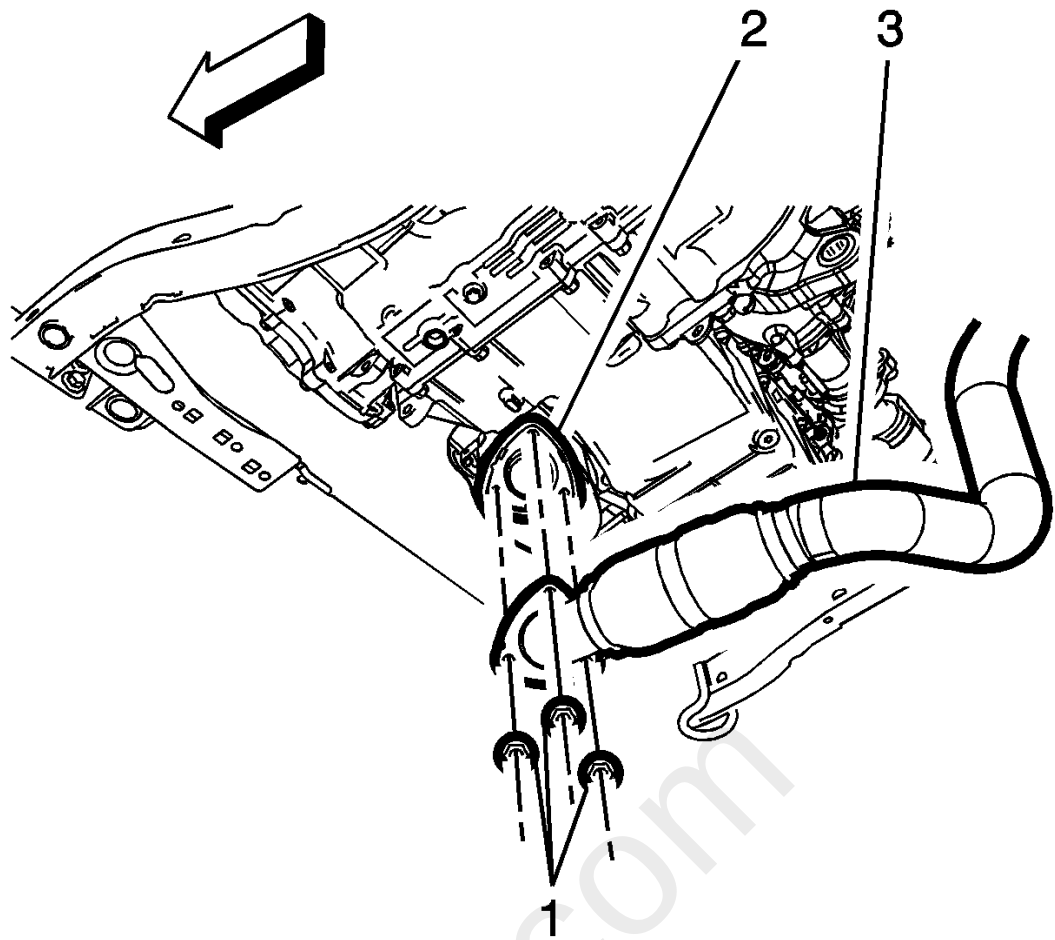


Fig. 7: Pipe Gasket And Fasteners

Courtesy of GENERAL MOTORS COMPANY

5. Remove the 3 fasteners (1) securing the exhaust front pipe (3) to the catalytic converter.
6. Discard the exhaust front pipe gasket (2).
7. Remove the exhaust front pipe (3).
8. If you are replacing the exhaust front pipe, transfer the heated oxygen sensor.

Installation Procedure

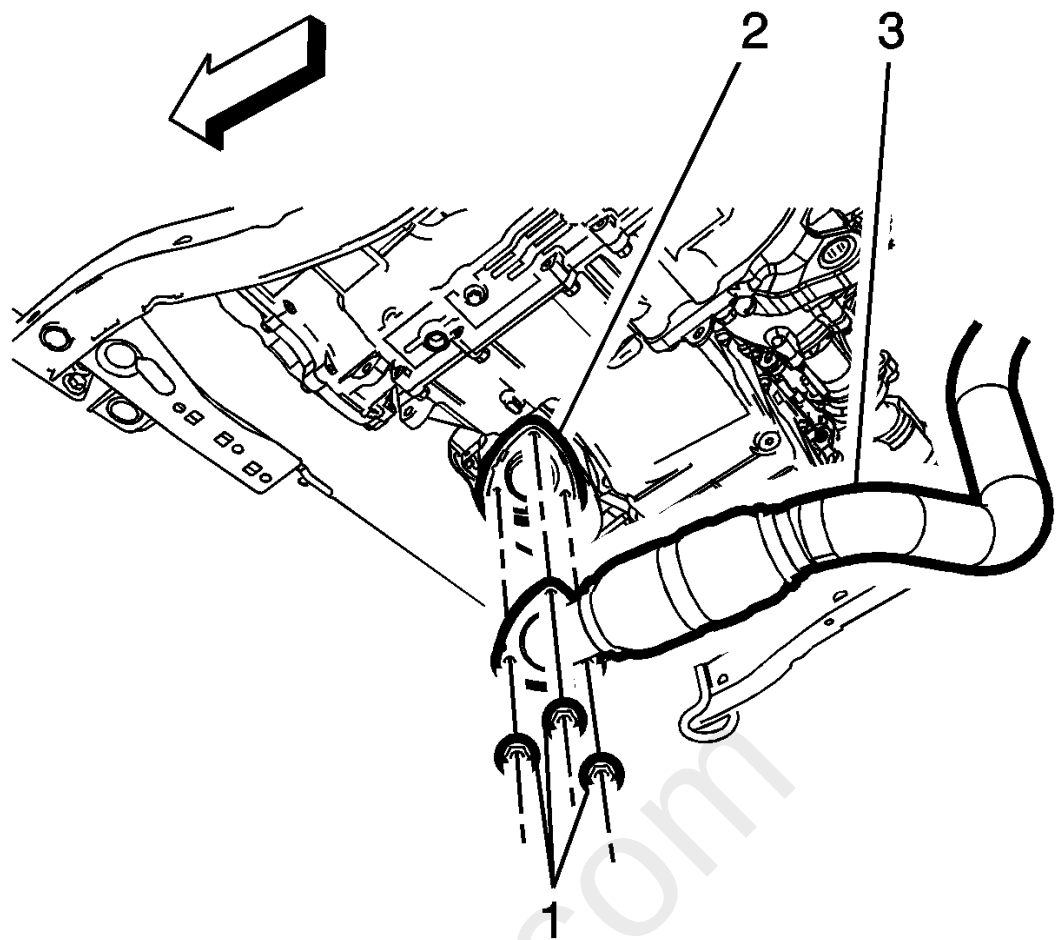


Fig. 8: Pipe Gasket And Fasteners

Courtesy of GENERAL MOTORS COMPANY

1. Install the exhaust front pipe (3) to the catalytic converter with a NEW gasket (2) and hand tighten the fasteners (1).

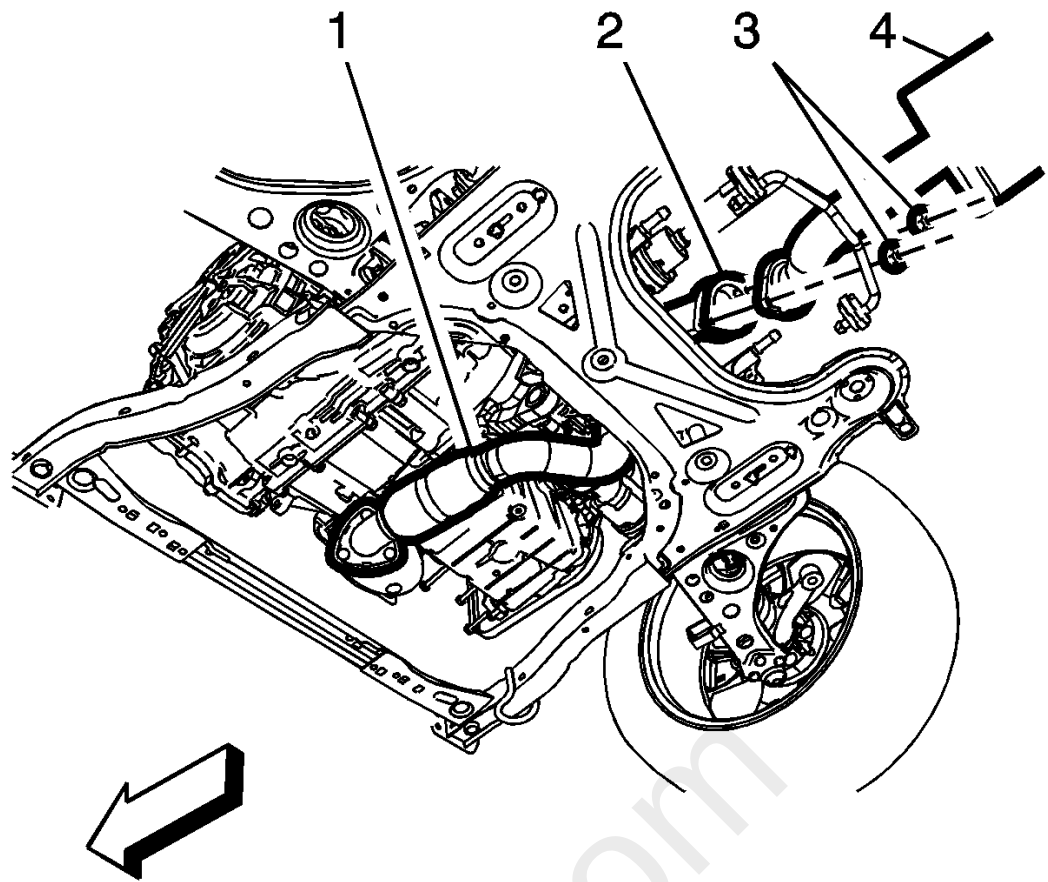


Fig. 9: Muffler And Exhaust Pipe

Courtesy of GENERAL MOTORS COMPANY

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

NOTE: Do not twist or damage the flex coupler.

2. Install the exhaust front pipe (1) to the exhaust muffler (4) with a NEW gasket (2) and tighten the fasteners (3) to 17 N.m (13 lb ft).

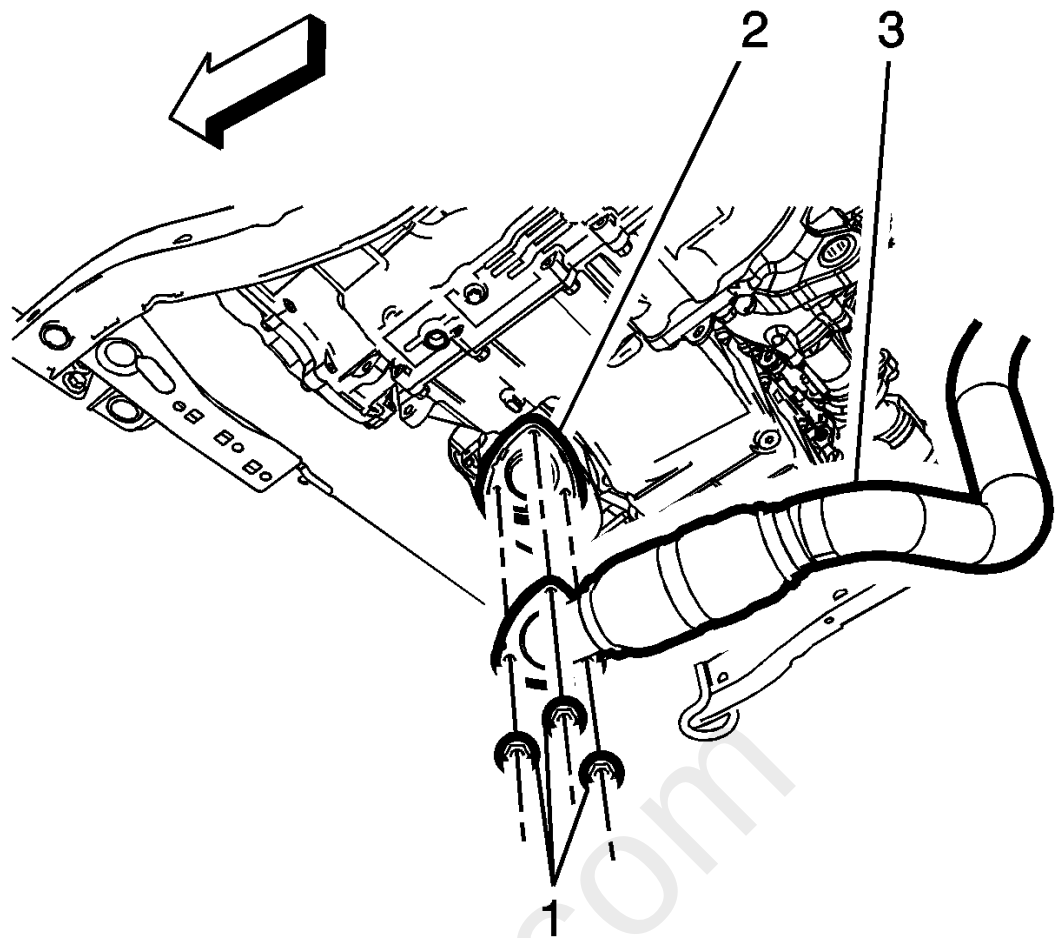


Fig. 10: Pipe Gasket And Fasteners

Courtesy of GENERAL MOTORS COMPANY

3. Tighten the exhaust front pipe fasteners (1) to 22 N.m (16 lb ft).
4. Connect the heated oxygen sensor - position 2 to the engine wiring harness.
5. Start the engine and check for exhaust leaks.

EXHAUST FRONT PIPE REPLACEMENT (LE2)

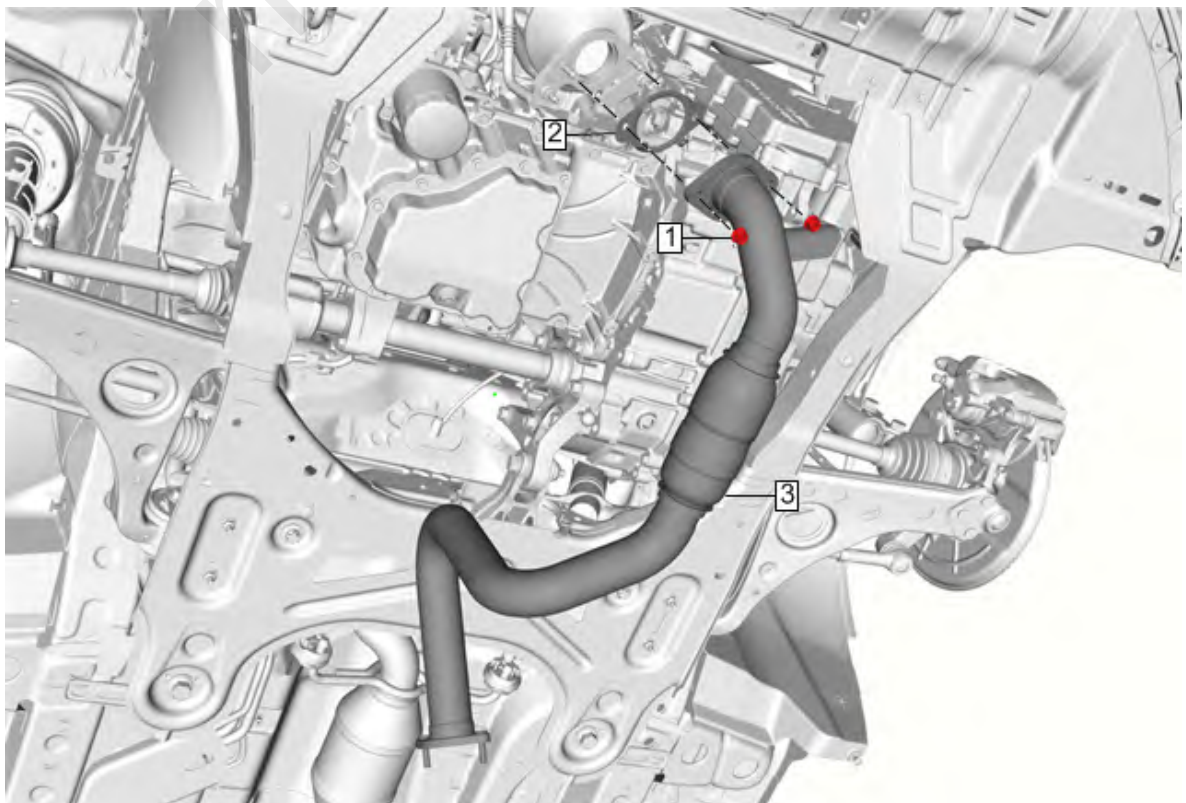


Fig. 11: Exhaust Front Pipe (LE2)
 Courtesy of GENERAL MOTORS COMPANY

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 Procedures 1. Disconnect Heated Oxygen Sensor Replacement - Sensor 2 2. Disconnect Exhaust Front Pipe@Warm Up Three-Way Catalytic Converter - Warm Up Three-Way Catalytic Converter Replacement (LUV, 2H0)Warm Up Three-Way Catalytic Converter Replacement (LE2)	
1	Catalytic Converter Nut (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Gasket Procedure Install a NEW gasket.
3	Exhaust Front Pipe Procedure If replacing the exhaust front pipe, transfer heated oxygen sensors.

CATALYTIC CONVERTER REPLACEMENT (2H0)

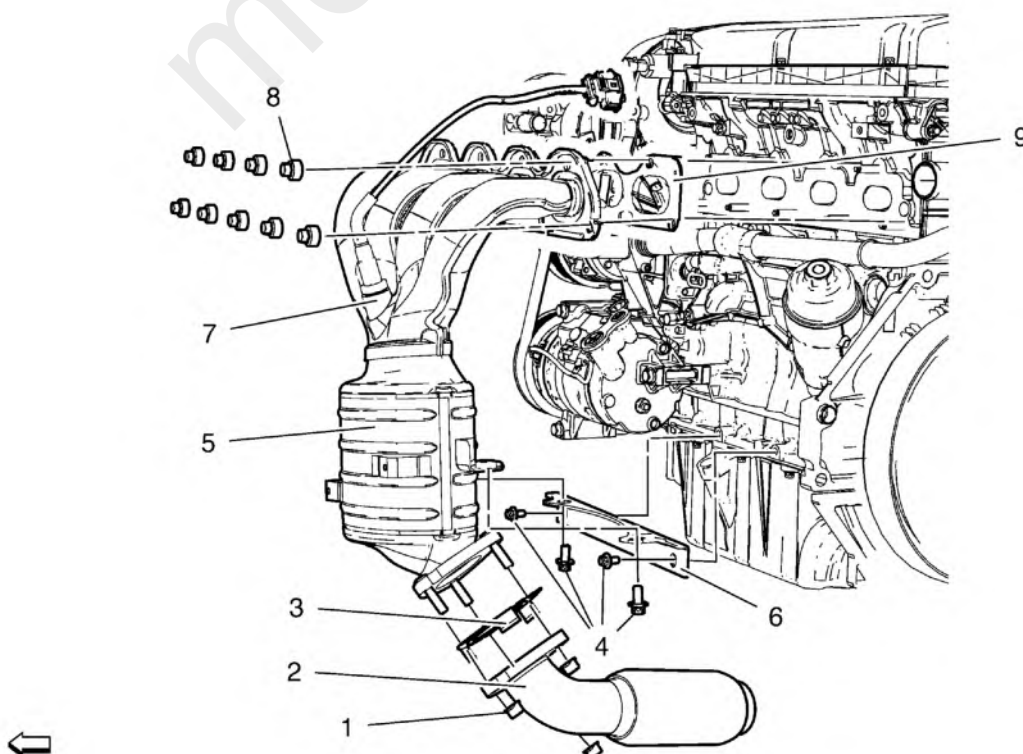


Fig. 12: Locating Catalytic Converter Components (2H0)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Exhaust Service Warning .	
WARNING: Refer to Protective Goggles and Glove Warning .	
Preliminary Procedure Remove the catalytic converter heat shield. Refer to Catalytic Converter Heat Shield Replacement .	
1	Catalytic Converter to Exhaust Front Pipe Fastener (Qty: 3) CAUTION: Refer to Fastener Caution Tighten 22 N.m (16 lb ft)
2	Exhaust Front Pipe
3	Catalytic Converter to Exhaust front Pipe Gasket
4	Exhaust Manifold Brace Fastener (Qty: 4) Tighten 20 N.m (15 lb ft)
5	Catalytic Converter
6	Exhaust Manifold Brace
7	Heated Oxygen Sensor Tighten 42 N.m (31 lb ft)
8	Catalytic Converter to Cylinder Head Fastener (Qty: 9) Tighten 20 N.m (15 lb ft)
9	Catalytic Converter to Cylinder Head Gasket

CATALYTIC CONVERTER REPLACEMENT (LUV)

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 \(LUV\)](#).
2. Remove the catalytic converter heated oxygen sensor - 1. Refer to [Heated Oxygen Sensor Replacement - Sensor 1](#) .
3. Remove the catalytic converter to the turbocharger clamp fastener and discard the clamp.
4. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .

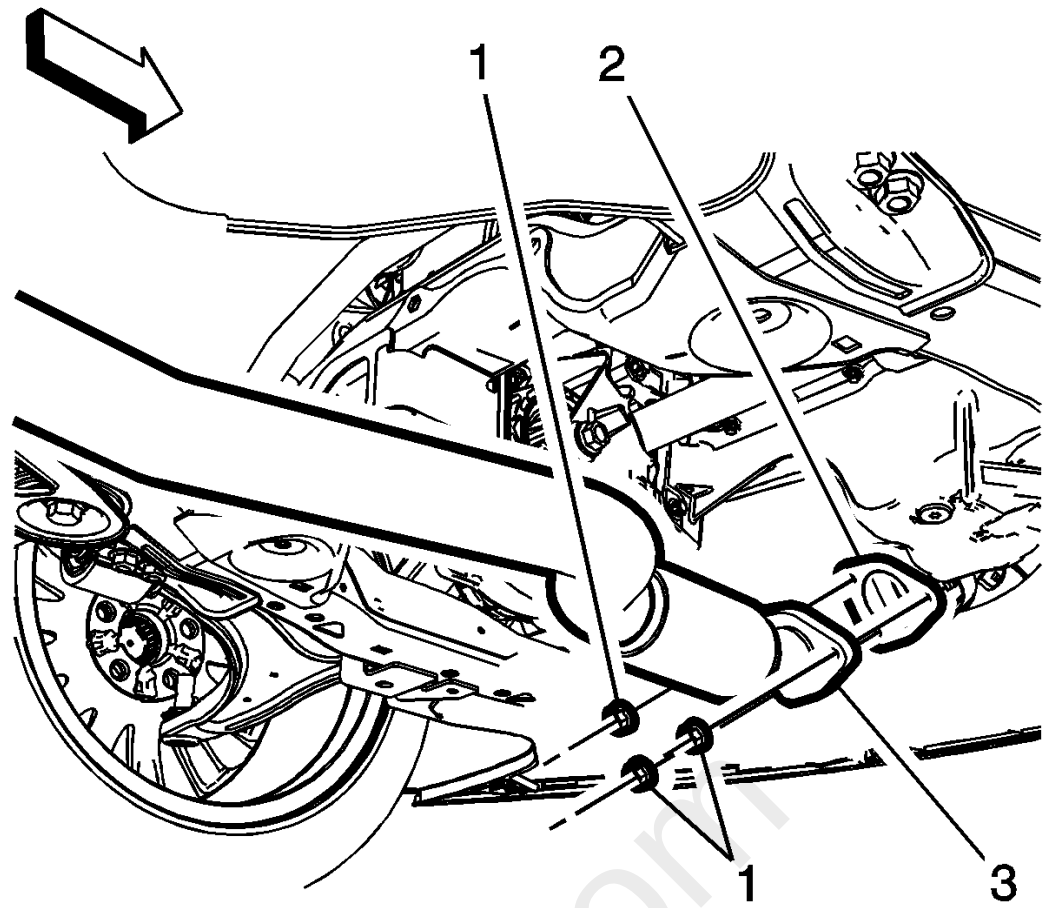


Fig. 13: Exhaust Front Pipe Fasteners & Gasket
Courtesy of GENERAL MOTORS COMPANY

5. Remove the exhaust front pipe fasteners (1) and discard the exhaust gasket (2).

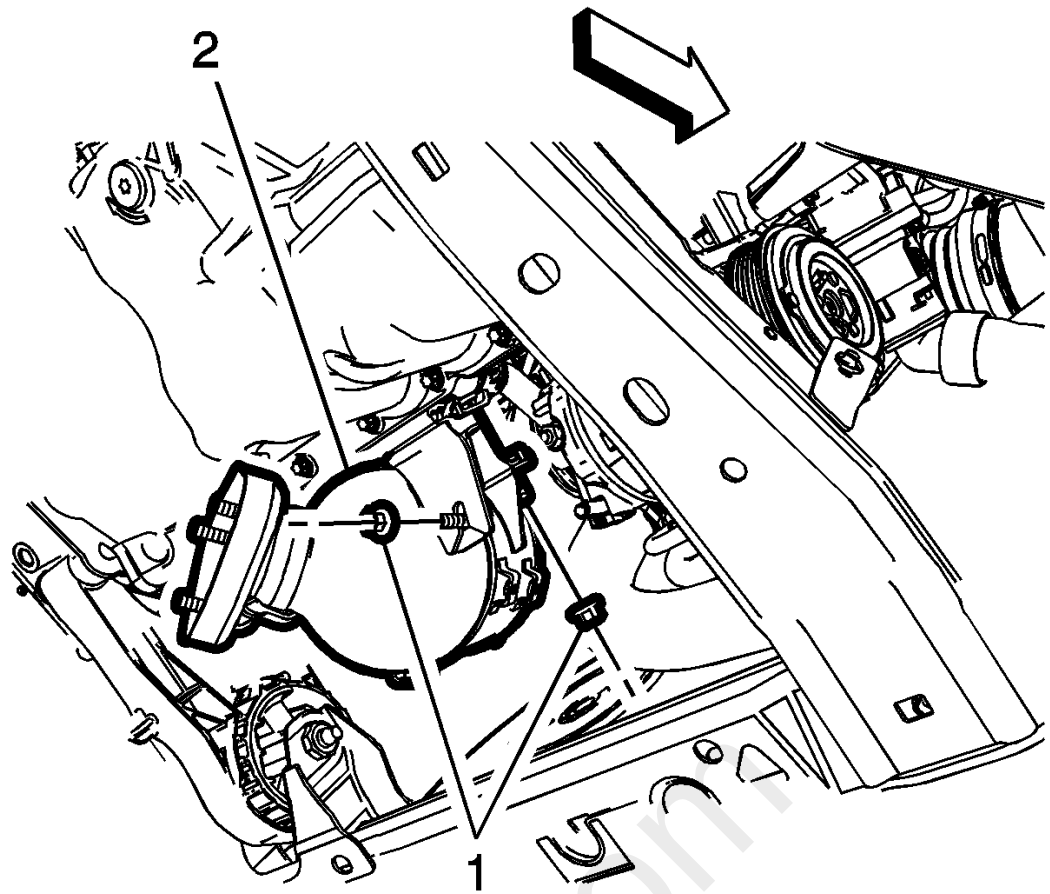


Fig. 14: Catalytic Converter Brace & Fasteners
Courtesy of GENERAL MOTORS COMPANY

6. Remove the catalytic converter brace fasteners (1) from the catalytic converter brace (2).
7. Remove the catalytic converter.

Installation Procedure

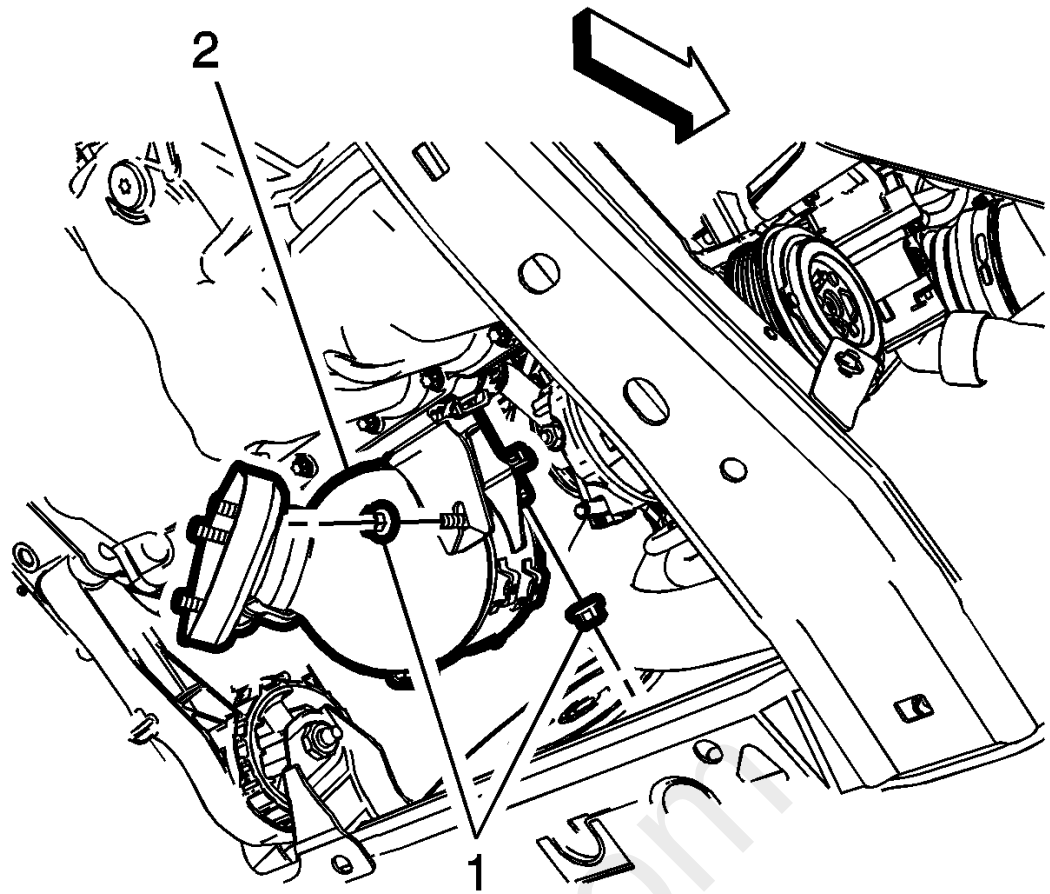


Fig. 15: Catalytic Converter Brace & Fasteners
Courtesy of GENERAL MOTORS COMPANY

1. Install the catalytic converter into the catalytic converter brace (2) and loosely tighten the fasteners (1).

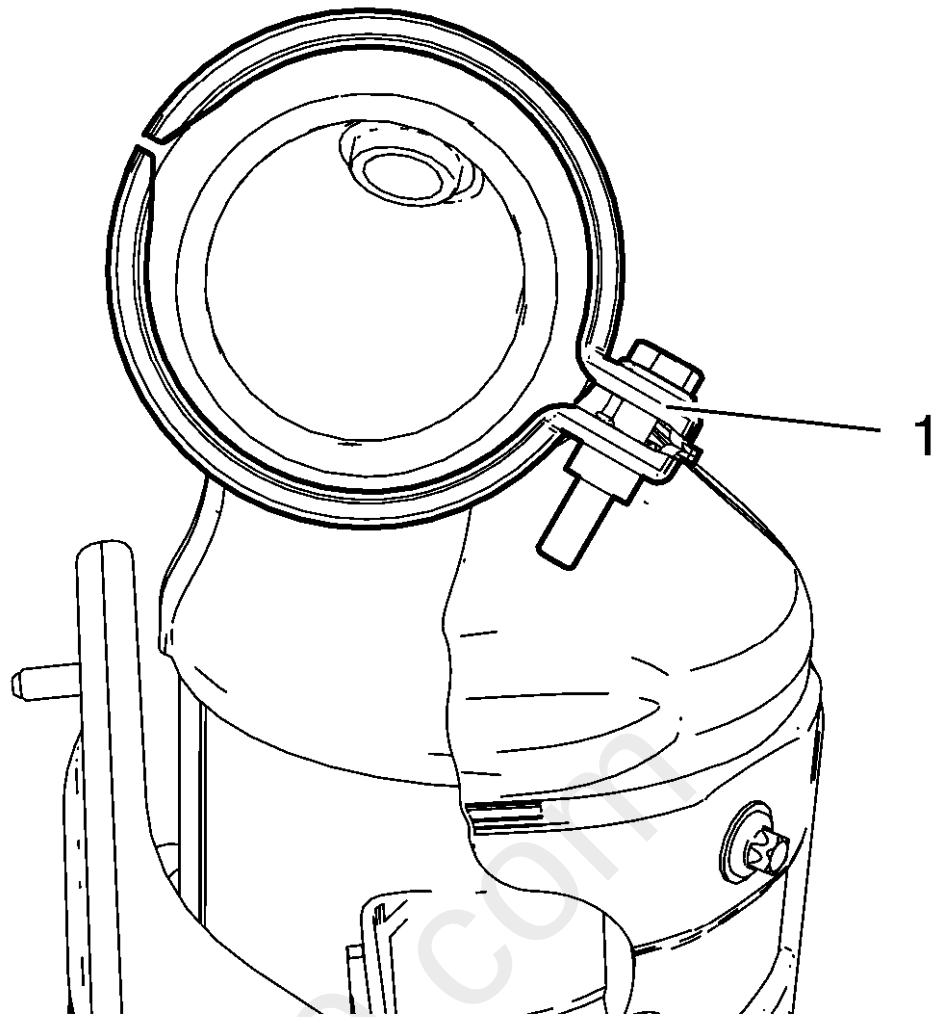


Fig. 16: Catalytic Converter V-Clamp

Courtesy of GENERAL MOTORS COMPANY

2. Install a NEW clamp into the position shown and loosely tighten the clamp fastener (1).

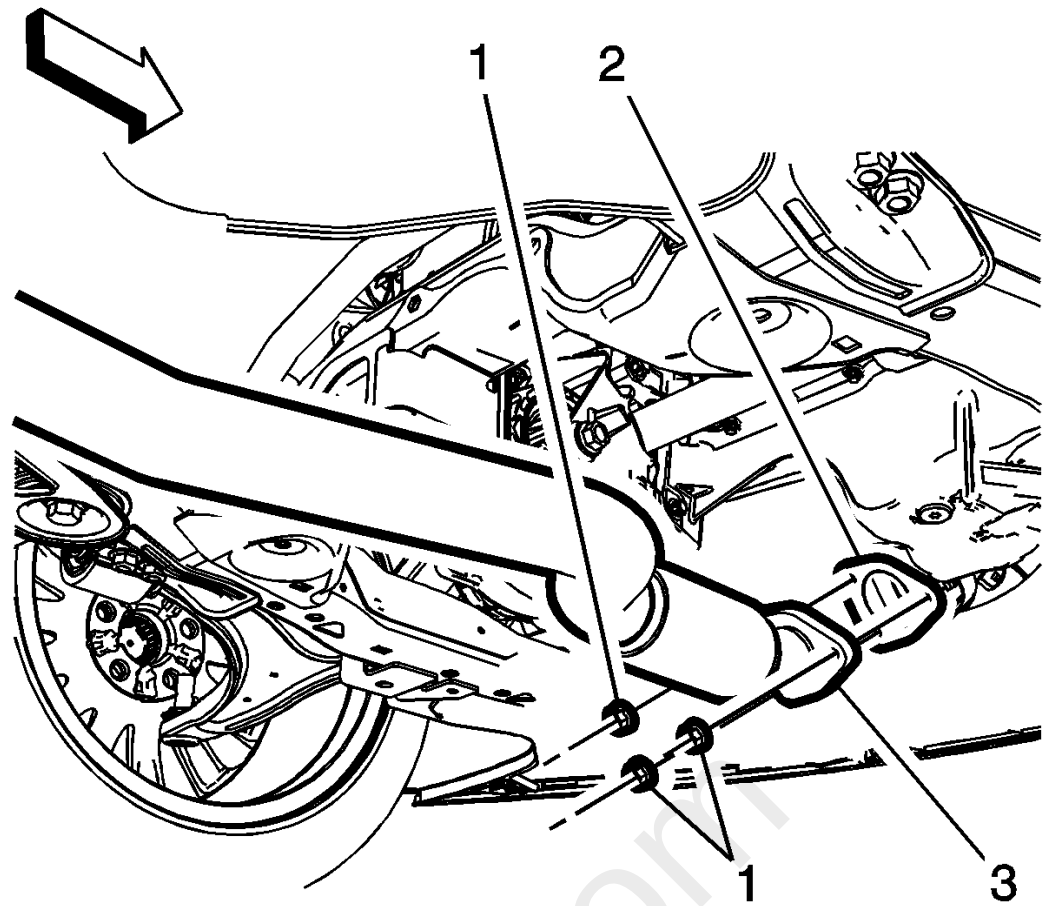


Fig. 17: Exhaust Front Pipe Fasteners & Gasket
Courtesy of GENERAL MOTORS COMPANY

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

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

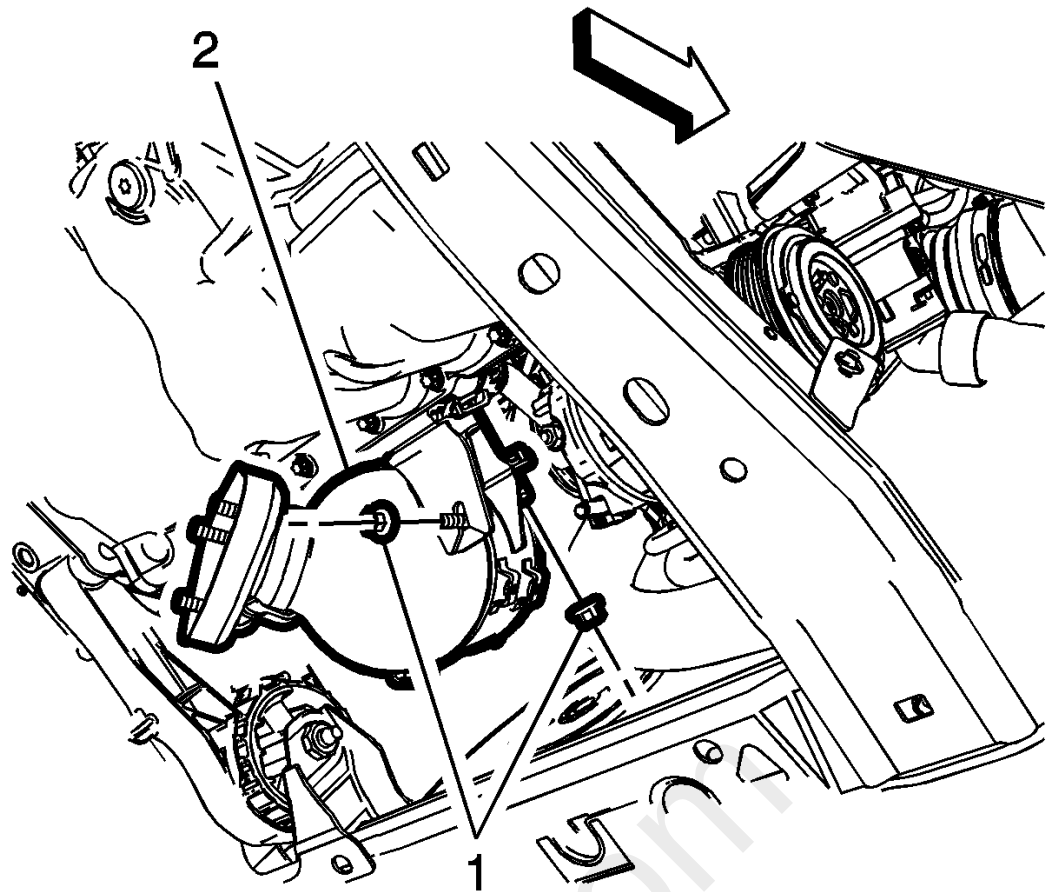


Fig. 18: Catalytic Converter Brace & Fasteners
Courtesy of GENERAL MOTORS COMPANY

4. Tighten the catalytic converter brace fasteners (1) to 22 N.m (16 lb ft).
5. Lower the vehicle.
6. Tighten the turbocharge clamp fastener to 13 N.m (115 lb in).
7. Install the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement \(LUV\)](#).
8. Install the catalytic converter heated oxygen sensor - 1. Refer to [Heated Oxygen Sensor Replacement - Sensor 1](#).
9. Start the engine and check for exhaust leaks.

CATALYTIC CONVERTER REPLACEMENT (LE2)

Removal Procedure

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

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

1. Disconnect [Heated Oxygen Sensor Replacement - Sensor 1](#)
2. Remove Catalytic Converter Brace Bracket - Upper - [Catalytic Converter Brace Bracket Replacement \(Lower LE2\)](#)[Catalytic Converter Brace Bracket Replacement \(Upper LE2\)](#)
3. Disconnect Catalytic Converter Brace Bracket - Lower @Catalytic Converter - [Catalytic Converter Brace Bracket Replacement \(Lower LE2\)](#)[Catalytic Converter Brace Bracket Replacement \(Upper LE2\)](#)
4. Disconnect Exhaust Front Pipe@Catalytic Converter- [Exhaust Front Pipe Replacement \(LE2\)](#)

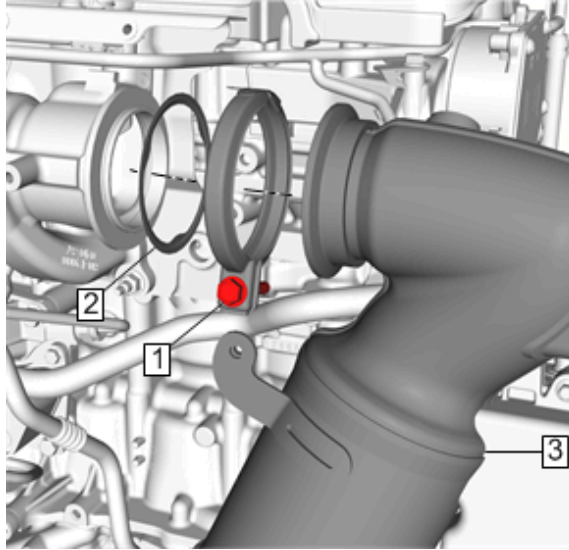


Fig. 19: Catalytic Converter

Courtesy of GENERAL MOTORS COMPANY

5. Remove Catalytic Converter Clamp (1) and DISCARD
6. Remove Catalytic Converter Gasket (2) and DISCARD
7. Remove Catalytic Converter (3)

Installation Procedure

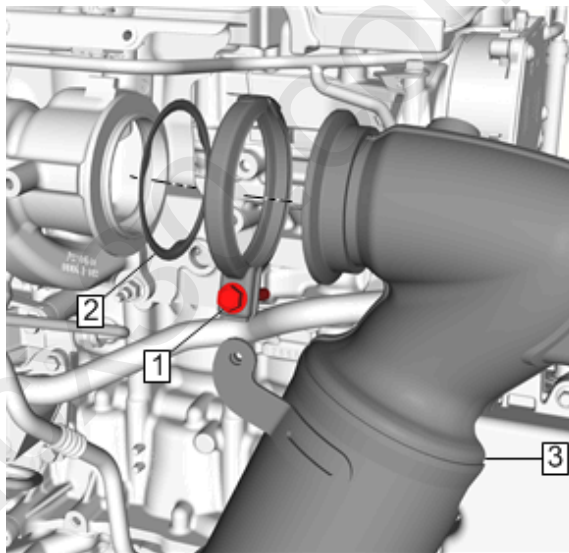


Fig. 20: Catalytic Converter

Courtesy of GENERAL MOTORS COMPANY

1. Install Catalytic Converter (3)
2. Install a NEW catalytic converter gasket. (2)
3. Loosely Install Catalytic Converter Clamp (1)
4. Connect Exhaust Front Pipe@Catalytic Converter - [Exhaust Front Pipe Replacement \(LE2\)](#)
5. Connect Catalytic Converter Brace Bracket - Lower @Catalytic Converter - [Catalytic Converter Brace Bracket Replacement \(Lower LE2\)](#)[Catalytic Converter Brace Bracket Replacement \(Upper LE2\)](#)

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

6. Catalytic Converter Clamp and Tighten 15 N.m (11 lb ft)
7. Install Catalytic Converter Brace Bracket - Upper - [Catalytic Converter Brace Bracket Replacement \(Lower LE2\)](#)[Catalytic Converter Brace Bracket Replacement \(Upper LE2\)](#)
8. Connect [Heated Oxygen Sensor Replacement - Sensor 1](#)

WARM UP THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LUV, 2H0)

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](#) .

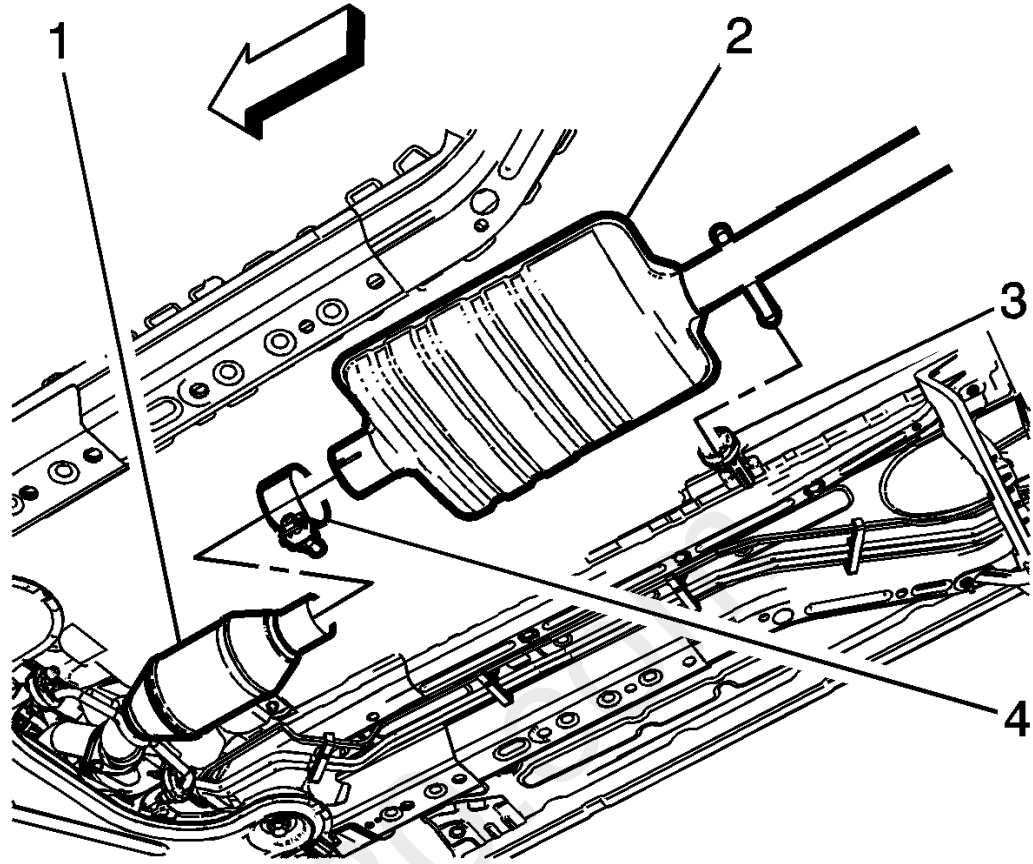


Fig. 21: Exhaust Muffler And Warm Up 3 Way Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

2. Loosen the exhaust clamp fastener (4) and remove the exhaust muffler (2), from the warm up 3 way catalytic converter (1), and the exhaust isolator (3).
3. Support the exhaust muffler (2) with mechanics wire.

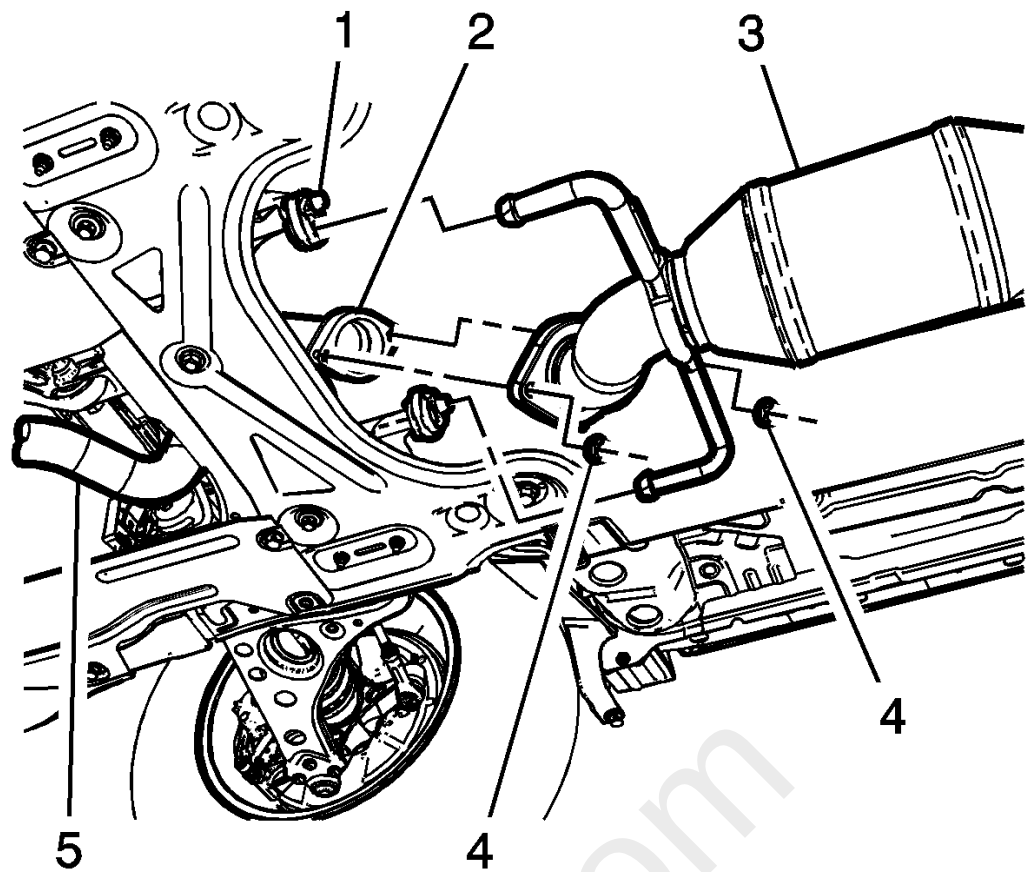


Fig. 22: Catalytic Converter And Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

4. Remove the 2 fasteners (4) securing the warm up 3 way catalytic converter (3) to the exhaust front pipe (5).
5. Remove the warm up 3 way catalytic converter (3) from the exhaust isolators (1) and remove the warm up 3 way catalytic converter from the vehicle.
6. Discard the exhaust front pipe gasket (2).

Installation Procedure

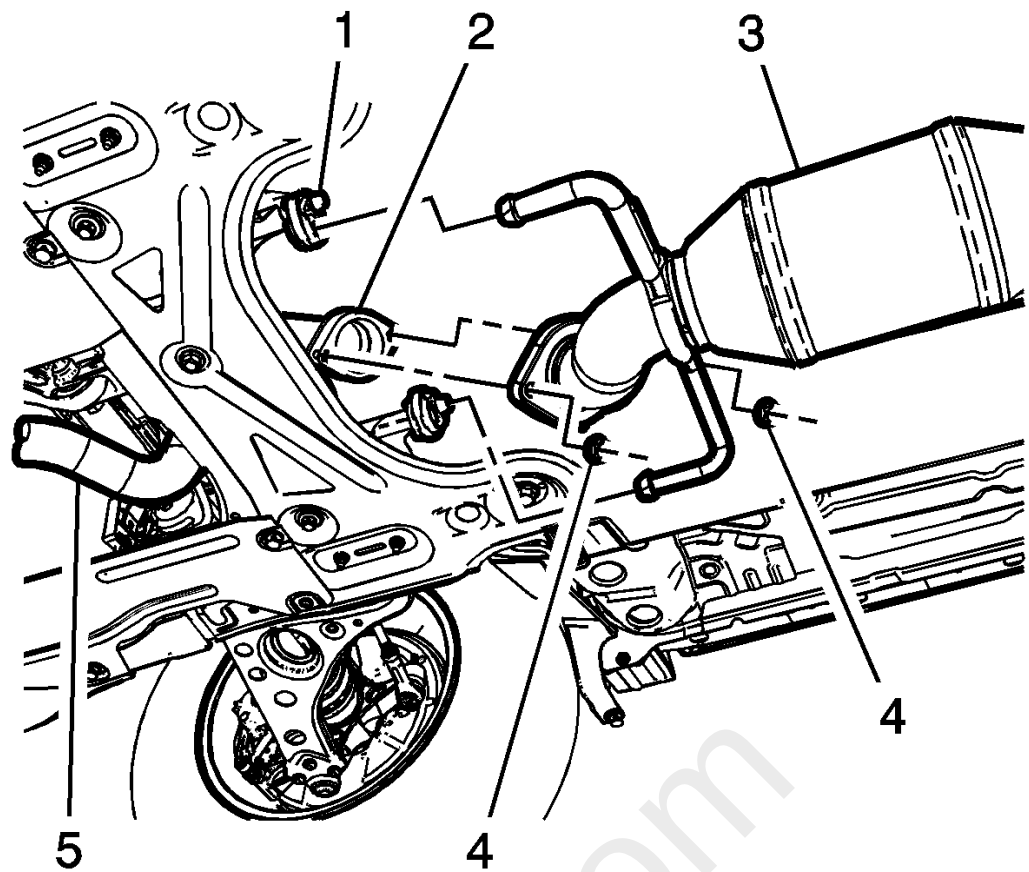


Fig. 23: Catalytic Converter And Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW exhaust gasket (2) onto the exhaust front pipe (5).

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

2. Install the warm up 3 way catalytic converter (3) into the exhaust isolators (1) and the onto the exhaust front pipe (5). Tighten the fasteners (4) to 22 N.m (16 lb ft).

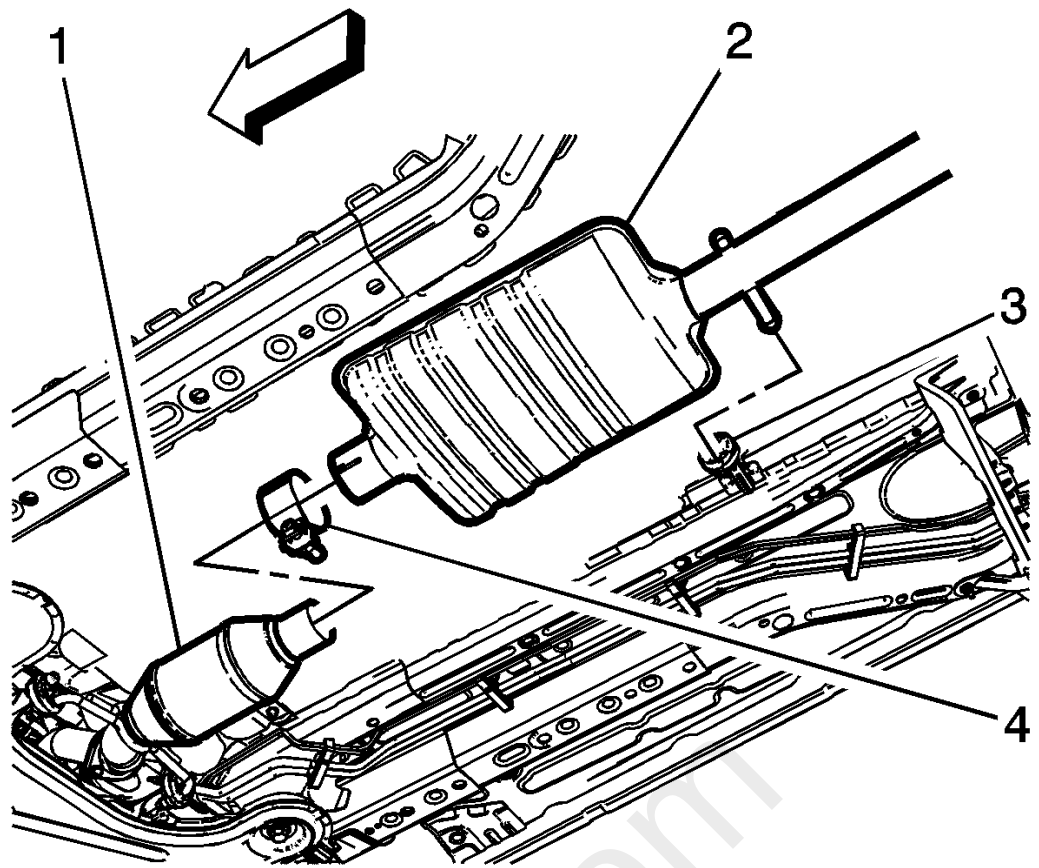


Fig. 24: Exhaust Muffler And Warm Up 3 Way Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

3. Install the exhaust muffler (2) into the exhaust isolator (3) and the warm up 3 way catalytic converter (1). Tighten the exhaust clamp fastener (4) to 50 N.m (37 lb ft).
4. Lower the vehicle.
5. Start the engine and check for exhaust leaks.

WARM UP THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LE2)

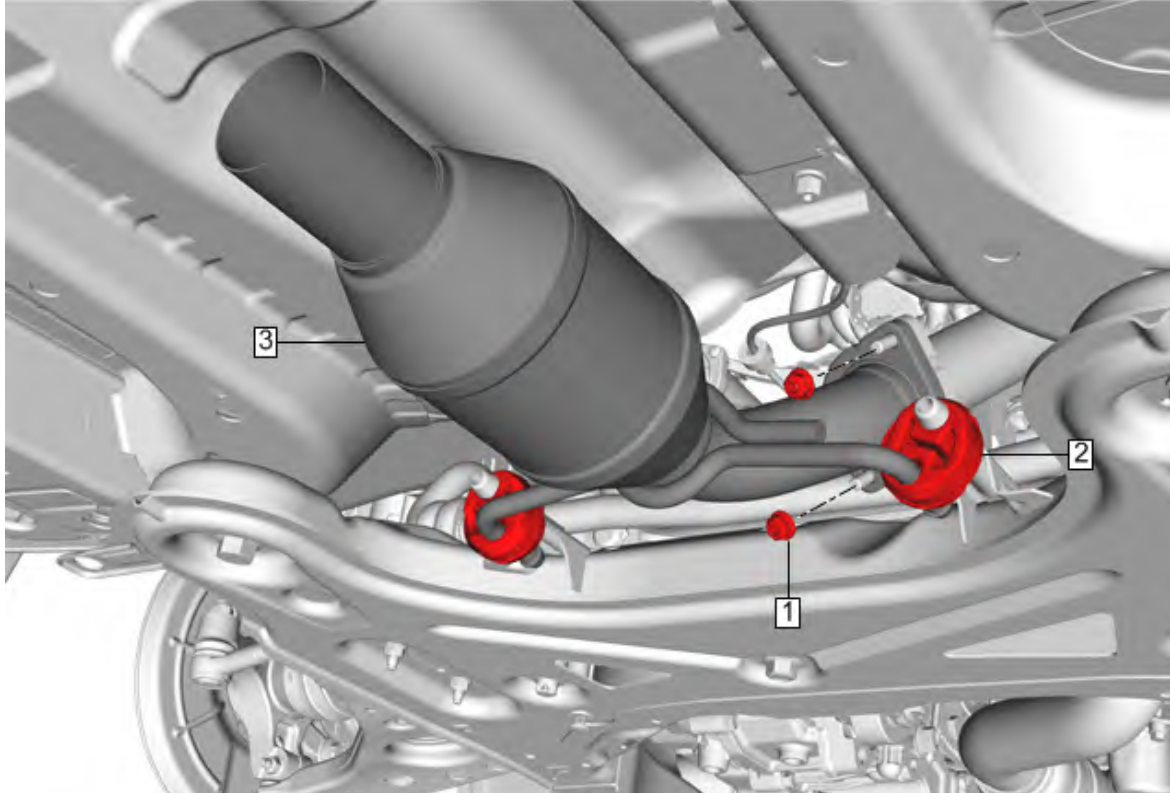


Fig. 25: Warm Up Three-Way Catalytic Converter (LE2)

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 <u>Exhaust Muffler Replacement (LE2)</u>	
1	Exhaust Front Pipe Nut (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 17 N.m (13 lb ft)
2	Exhaust Isolator (Qty: 3) Procedure Clean and lubricate the exhaust isolators for ease of installation.
3	Warm Up Three-Way Catalytic Converter Procedure Install a NEW gasket.

CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (LOWER LE2)

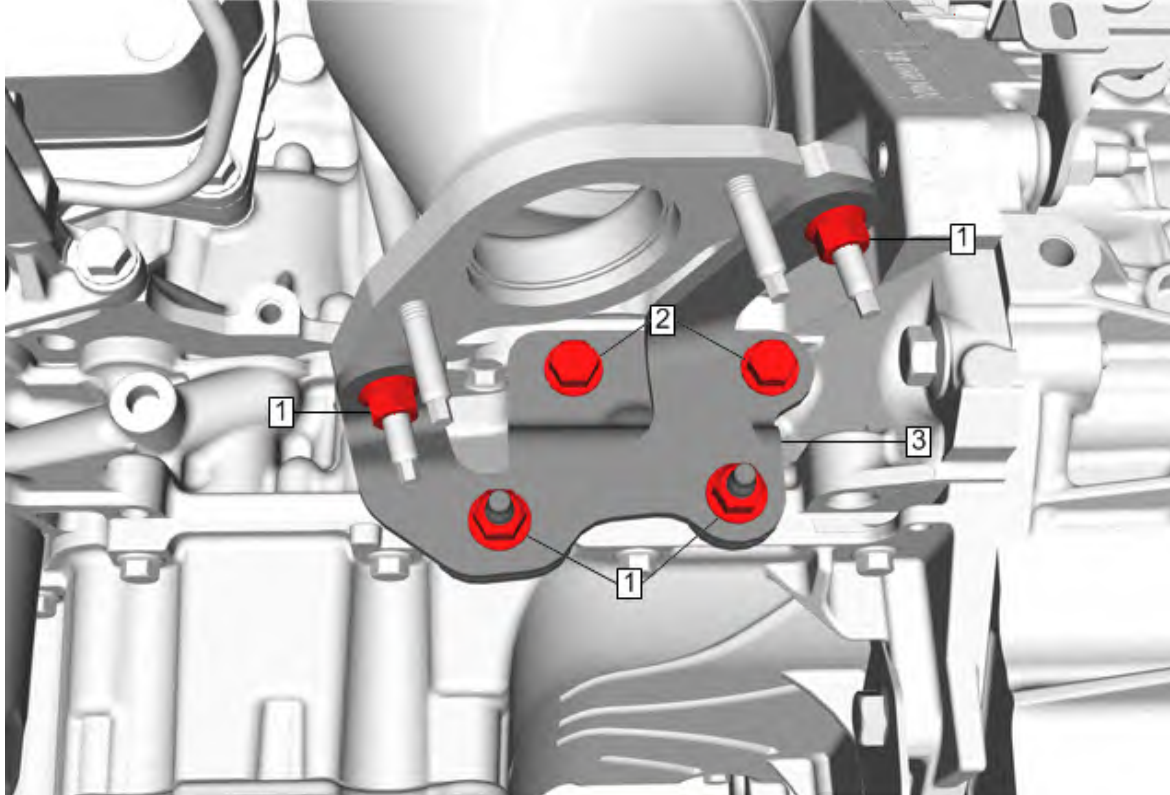


Fig. 26: Catalytic Converter Brace Bracket (Lower LE2)

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.	
1	Catalytic Converter Brace Bracket Nut (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Brace Bracket Bolt (Qty: 2) Tighten 22 N.m (16 lb ft)
3	Catalytic Converter Brace Bracket

CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (UPPER LE2)

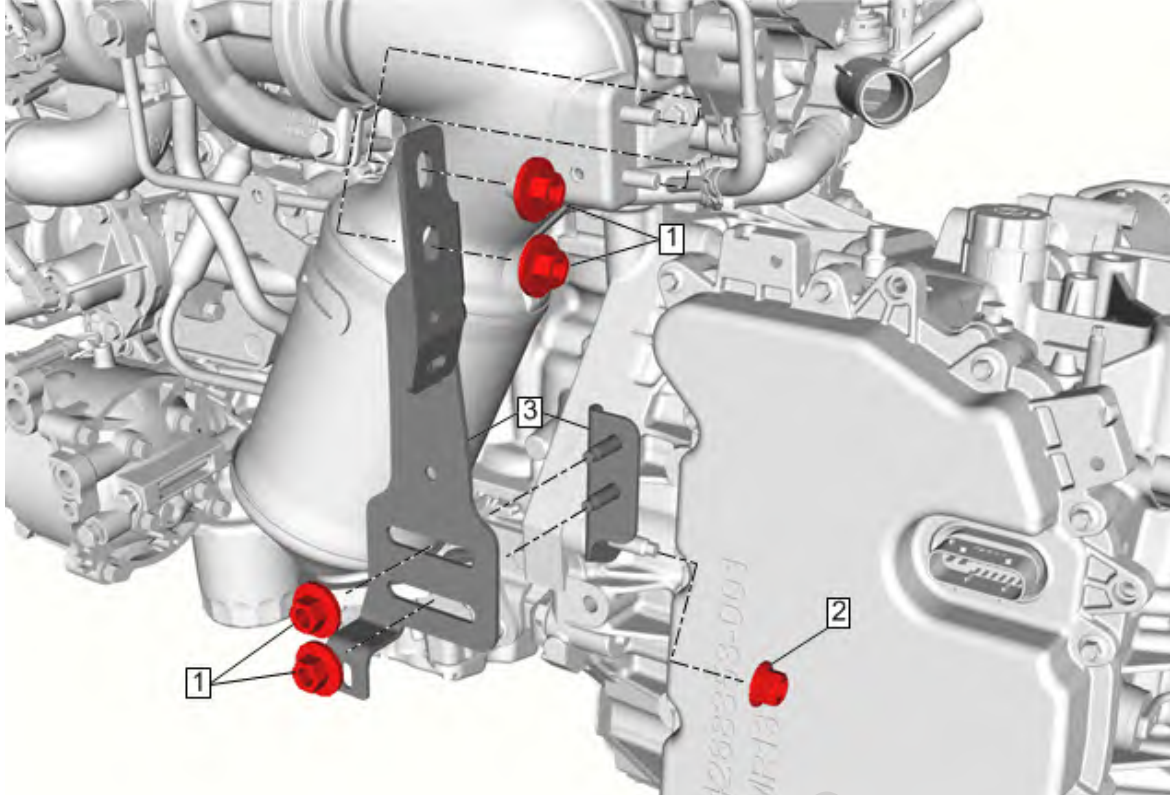


Fig. 27: Catalytic Converter Brace Bracket (Upper LE2)

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 Procedures Radiator Surge Tank Replacement (LUV, 2H0) Radiator Surge Tank Replacement (LE2) Turbocharger Heat Shield Replacement	
1	Catalytic Converter Brace Bracket Nut (Qty: 4) CAUTION: Refer to Fastener Caution . 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

EXHAUST MUFFLER REPLACEMENT (2H0)

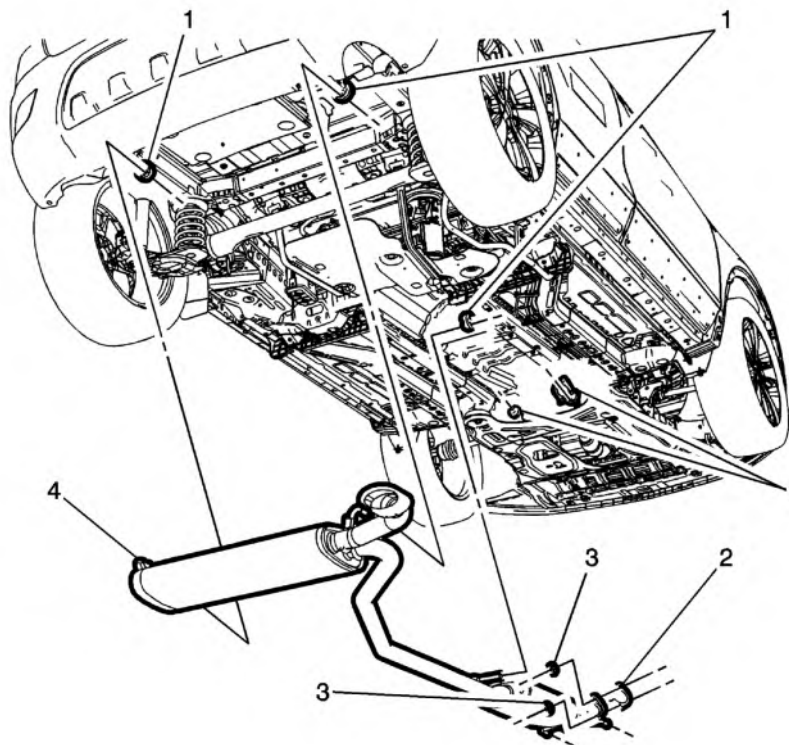


Fig. 28: Exhaust Muffler (2HO)

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 Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
1	Exhaust Isolator (Qty: 5) NOTE: Clean and lubricate the exhaust isolator rods for ease of installation.
2	Exhaust Gasket NOTE: Replace with a NEW gasket.
3	Exhaust Muffler Fasteners (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 17 N.m (13 lb ft)
4	Exhaust Muffler Procedure With the aid of an assistant, lower the exhaust system from the vehicle.

EXHAUST MUFFLER REPLACEMENT (LUV)

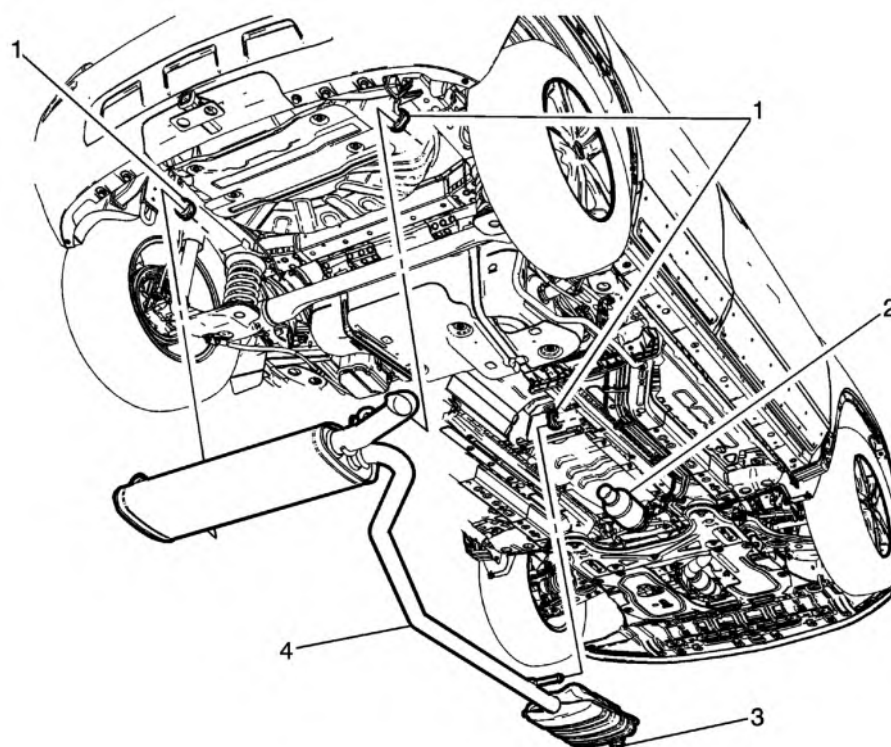


Fig. 29: Exhaust Muffler (LUV)

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 Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
1	Exhaust Isolators NOTE: Clean and lubricate the exhaust isolator rods for ease of installation.
2	Warm Up 3 Way Catalytic Converter
3	Exhaust Muffler Clamp CAUTION: Refer to Fastener Caution . Tighten: 50 N.m (37 lb ft)
4	Exhaust Muffler Procedure With the aid of an assistant, lower the exhaust system from the vehicle.

EXHAUST MUFFLER REPLACEMENT (LE2)

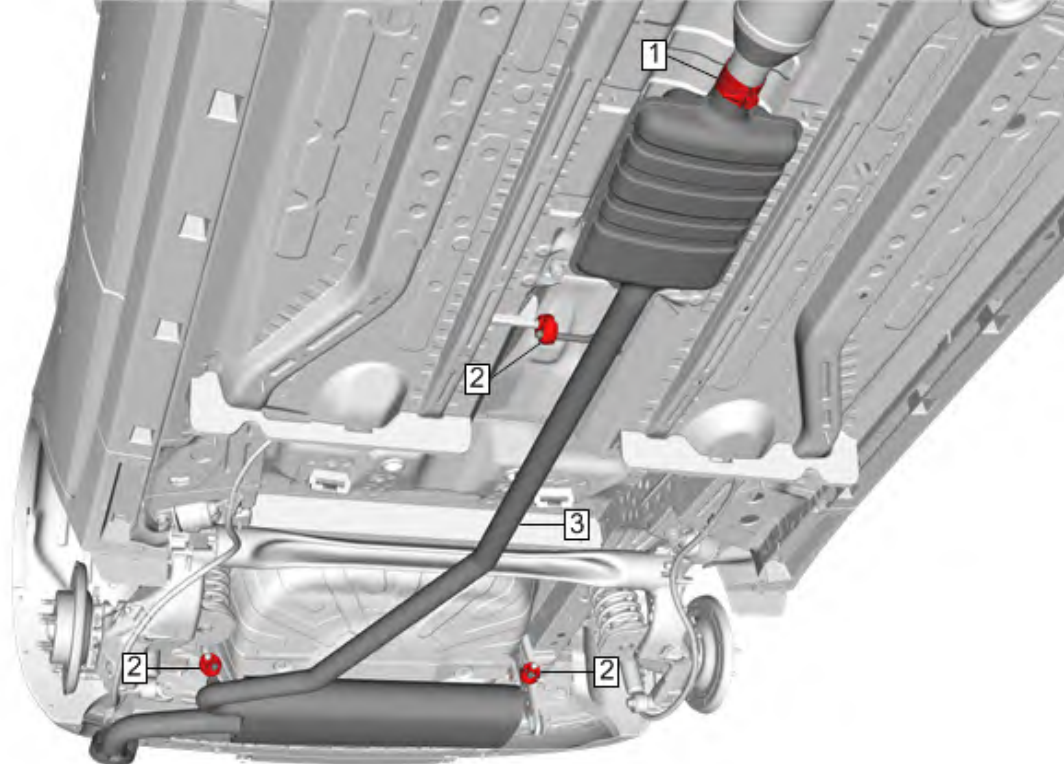


Fig. 30: Exhaust Muffler (LE2)

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 <u>Lifting and Jacking the Vehicle</u>	
1	Exhaust Pipe Clamp CAUTION: Refer to <u>Fastener Caution</u> . Tighten 50 N.m (37 lb ft)
2	Exhaust Isolator (Qty: 3) Procedure Clean and lubricate the exhaust isolators for ease of installation.
3	Exhaust Muffler Assembly Procedure Clean and lubricate the exhaust muffler isolator rods for ease of installation.

CATALYTIC CONVERTER HEAT SHIELD REPLACEMENT

Removal Procedure

WARNING: Refer to Exhaust Service Warning .

WARNING: Refer to Protective Goggles and Glove Warning .

1. Disconnect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection (without KL9) Battery Negative Cable Disconnection and Connection (with KL9) .

2. Disconnect the heated oxygen sensor wiring harness plug.
3. Remove the oil level indicator tube. Refer to [Oil Level Indicator Tube Replacement](#) .
4. Disconnect the air conditioning compressor hose from the air conditioning compressor assembly. Refer to [Air Conditioning Compressor Hose Replacement \(2H0\)](#), [Air Conditioning Compressor Hose Replacement \(LE2\)](#), [Air Conditioning Compressor Hose Replacement \(LUV\)](#) .
5. Disconnect the air conditioning condenser hose from the compressor assembly. Refer to [Air Conditioning Condenser Hose Replacement \(2H0\)](#), [Air Conditioning Condenser Hose Replacement \(LUV\)](#), [Air Conditioning Condenser Hose Replacement \(LE2\)](#) .

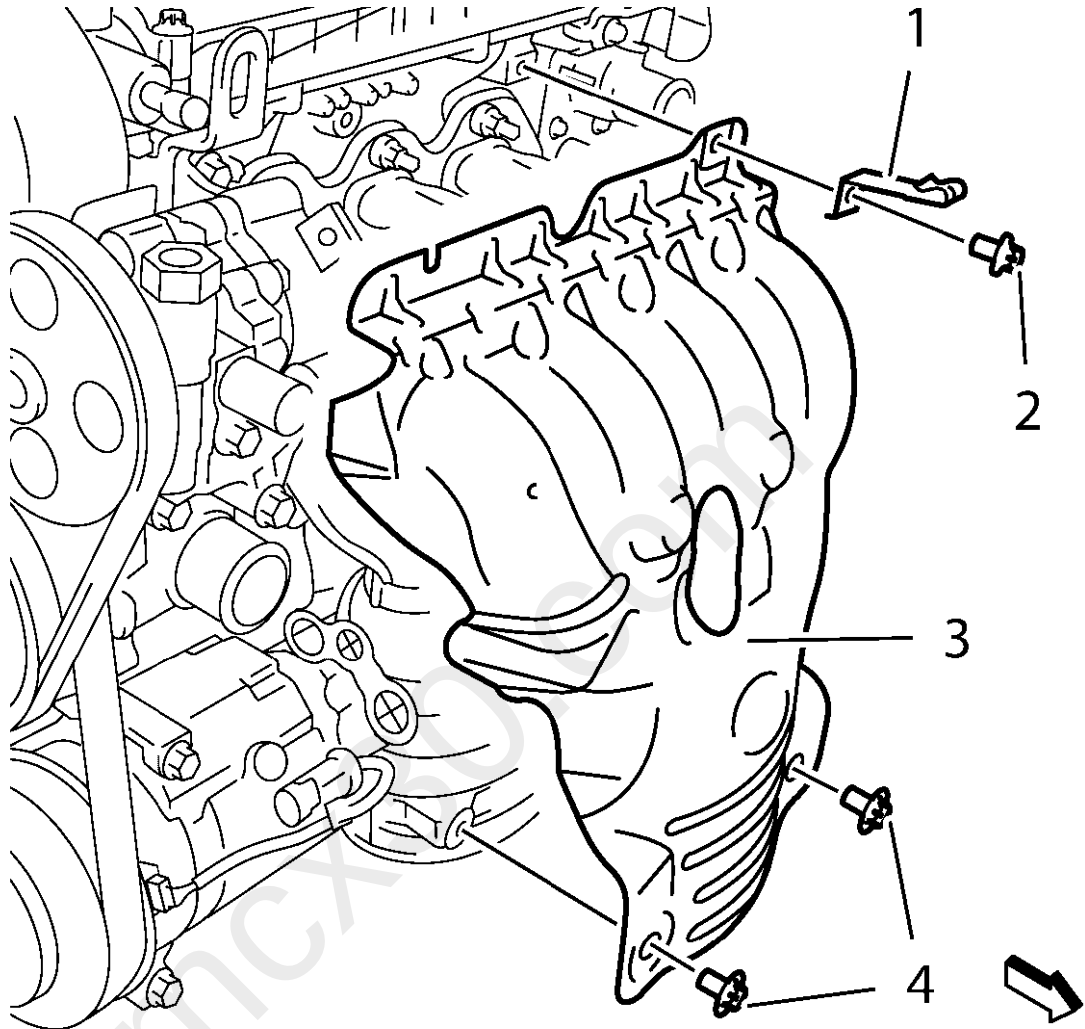


Fig. 31: Wiring Harness Bracket And Exhaust Manifold Heat Shield

Courtesy of GENERAL MOTORS COMPANY

6. Remove the wiring harness bracket fastener (2) and the wiring harness bracket (1).
7. Remove the 2 exhaust manifold heat shield fasteners (4).
8. Remove the exhaust manifold heat shield (3).

Installation Procedure

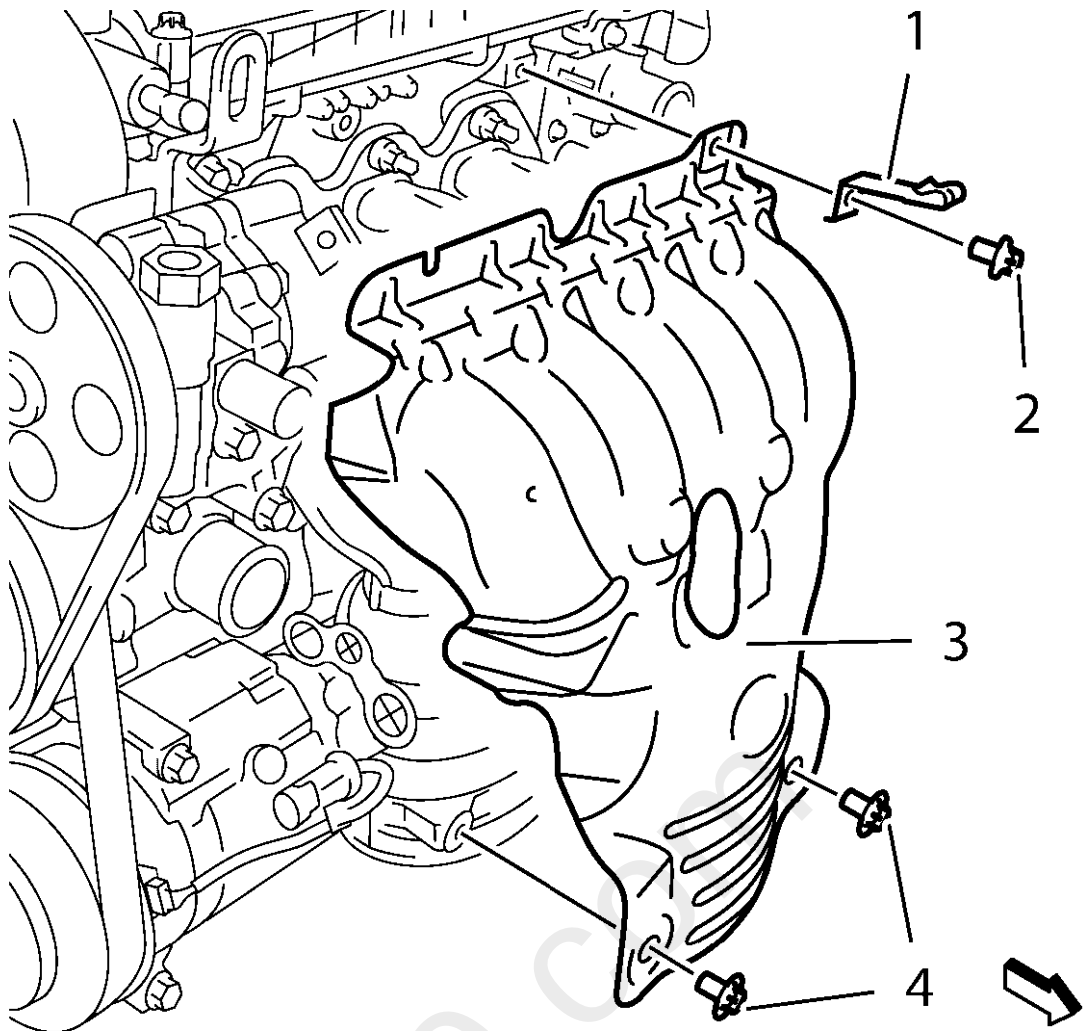


Fig. 32: Wiring Harness Bracket And Exhaust Manifold Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

1. Install the exhaust manifold heat shield (3).

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

2. Install the 2 exhaust manifold heat shield fasteners (4) and tighten to 8 N.m (71 lb in).
3. Install the wiring harness bracket (1) and the wiring harness bracket fastener (2) and tighten to 15 N.m (11 lb ft).
4. Install the oil level indicator tube. Refer to [Oil Level Indicator Tube Replacement](#) .
5. Connect the air conditioning compressor hose to the air conditioning compressor assembly. Refer to [Air Conditioning Compressor Hose Replacement \(2H0\)](#) [Air Conditioning Compressor Hose Replacement \(LE2\)](#) [Air Conditioning Compressor Hose Replacement \(LUV\)](#) .
6. Connect the air conditioning condenser hose to the compressor assembly. Refer to [Air Conditioning Condenser Hose Replacement \(2H0\)](#) [Air Conditioning Condenser Hose Replacement \(LUV\)](#) [Air Conditioning Condenser Hose Replacement \(LE2\)](#) .
7. Connect the heated oxygen sensor wiring harness plug.
8. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection \(without KL9\)](#) [Battery Negative Cable Disconnection and Connection \(with KL9\)](#) .

EXHAUST CROSSOVER PIPE HEAT SHIELD REPLACEMENT

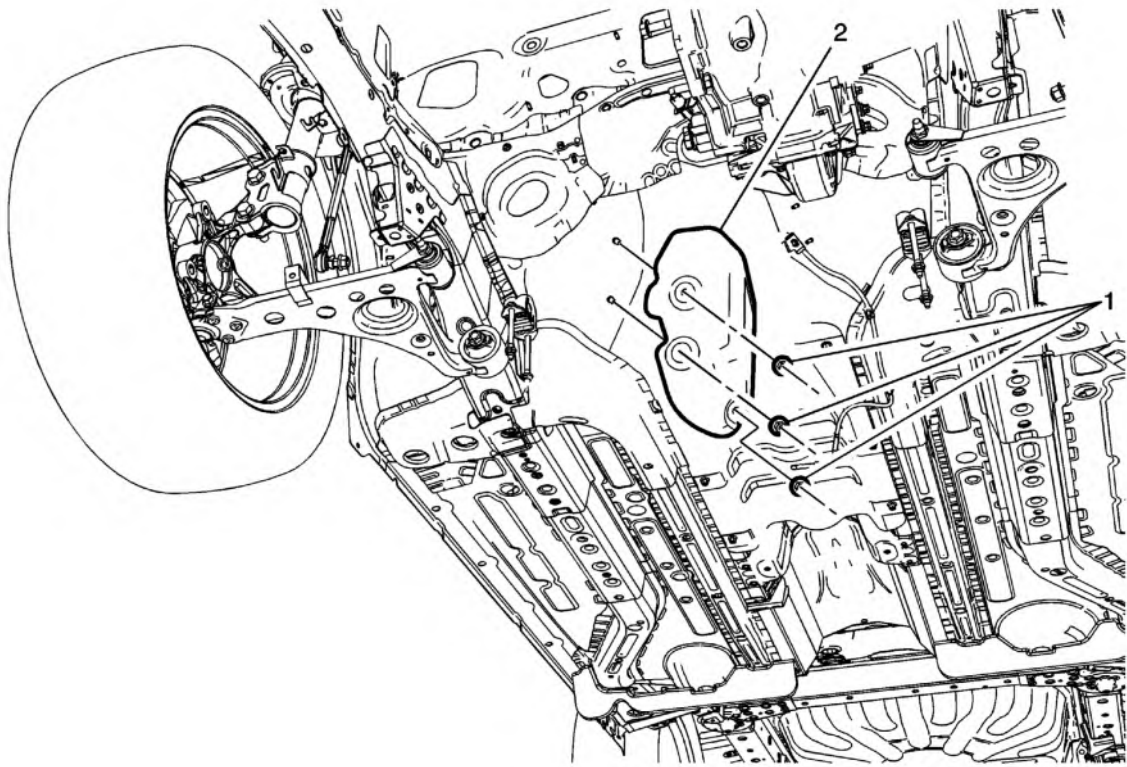


Fig. 33: Exhaust Crossover Pipe Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Exhaust Service Warning . WARNING: Refer to Eye Protection Warning . Preliminary Procedures Remove the exhaust muffler. Refer to Exhaust Muffler Replacement (2H0) Exhaust Muffler Replacement (LUV) Exhaust Muffler Replacement (LE2) .	
1	Exhaust Crossover Pipe Heat Shield Fastener (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 3 N.m (26 lb in)
2	Exhaust Crossover Pipe Heat Shield

EXHAUST INTERMEDIATE UNDERBODY HEAT SHIELD REPLACEMENT

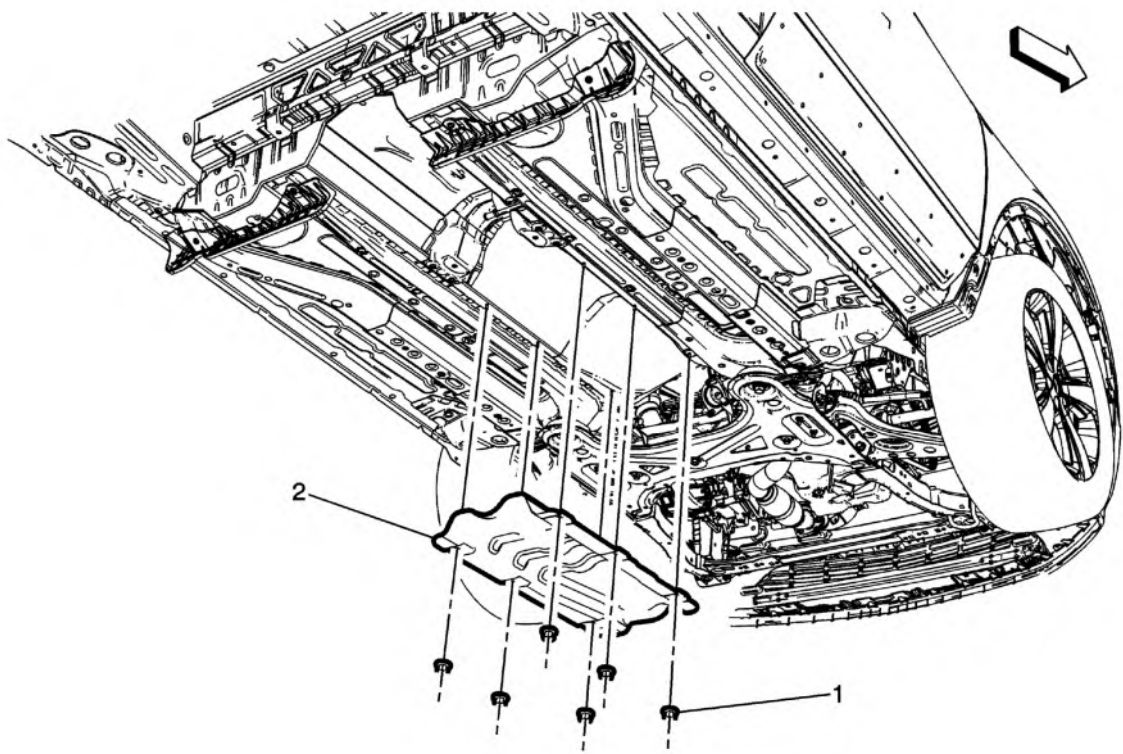


Fig. 34: Catalytic Converter Front Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Exhaust Service Warning . WARNING: Refer to Eye Protection Warning . Preliminary Procedure Raise and support the vehicle. Lifting and Jacking the Vehicle	
1	Exhaust Intermediate Underbody Heat Shield Fastener (Qty: 6) CAUTION: Refer to Fastener Caution . Tighten 3 N.m (26 lb in)
2	Exhaust Intermediate Underbody Heat Shield

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT (LUV)

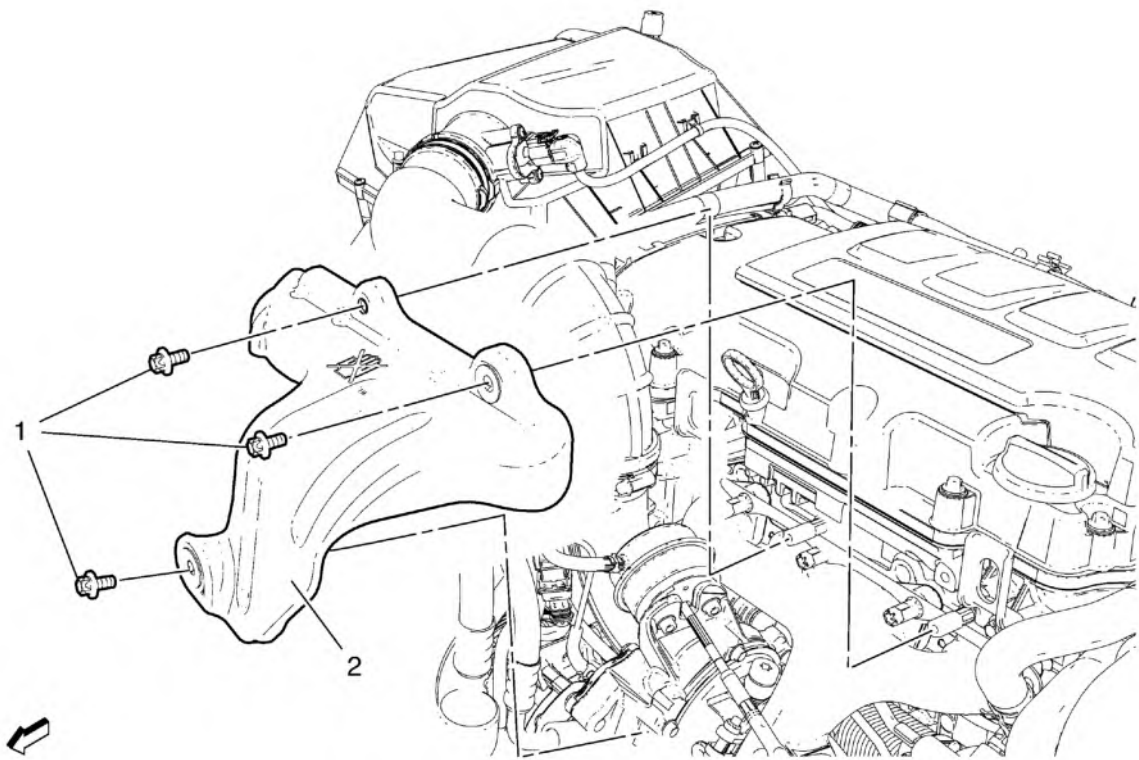


Fig. 35: Exhaust Manifold Heat Shield (LUV)
 Courtesy of GENERAL MOTORS COMPANY

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.	
1	Exhaust Manifold Heat Shield Bolts (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 8 N.m (71 lb in)
2	Exhaust Manifold Heat Shield

EXHAUST REAR MUFFLER HEAT SHIELD REPLACEMENT

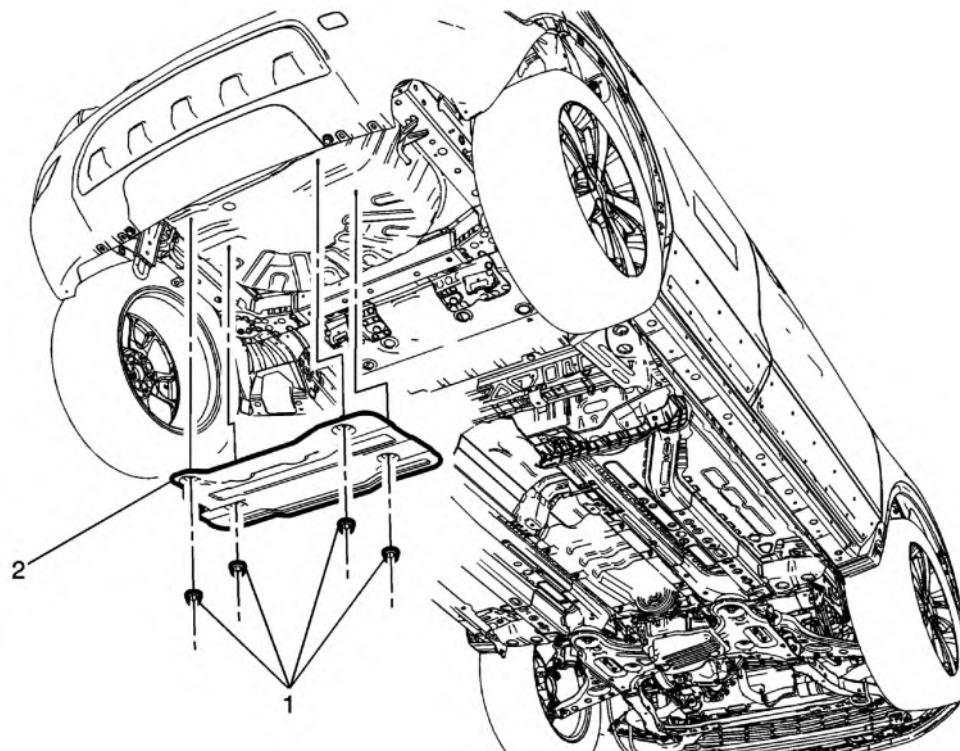


Fig. 36: Exhaust Rear Muffler Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Exhaust Service Warning . WARNING: Refer to Eye Protection Warning . Preliminary Procedure Raise and support the vehicle. Lifting and Jacking the Vehicle	
1	Exhaust Rear Muffler Heat Shield Retainer (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 3 N.m (26 lb in)
2	Exhaust Rear Muffler 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 added to the engine exhaust system in order to reduce hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx) pollutants from the exhaust gas.

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

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

The catalyst in the converter is not serviceable.

Muffler

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

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description

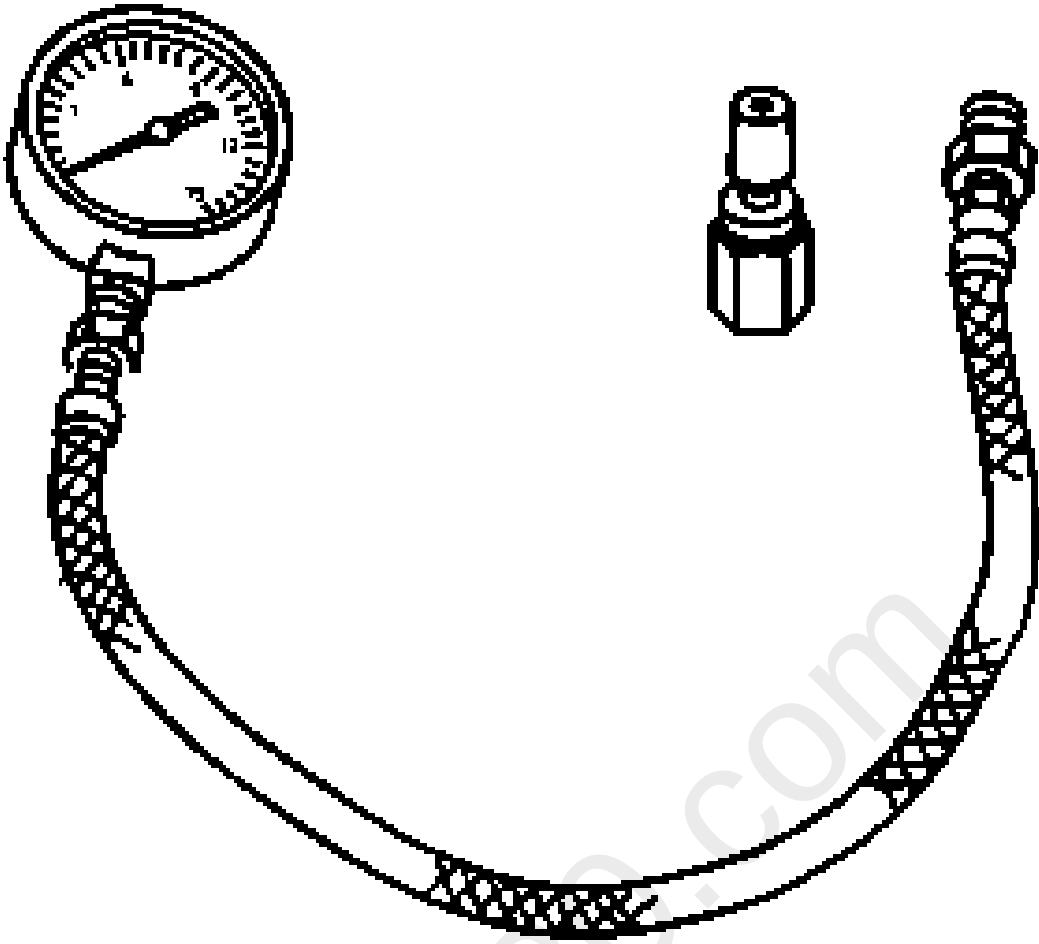
Illustration	Tool Number/Description
	EN-35314-A J-35314-A Exhaust Back Pressure Gauge

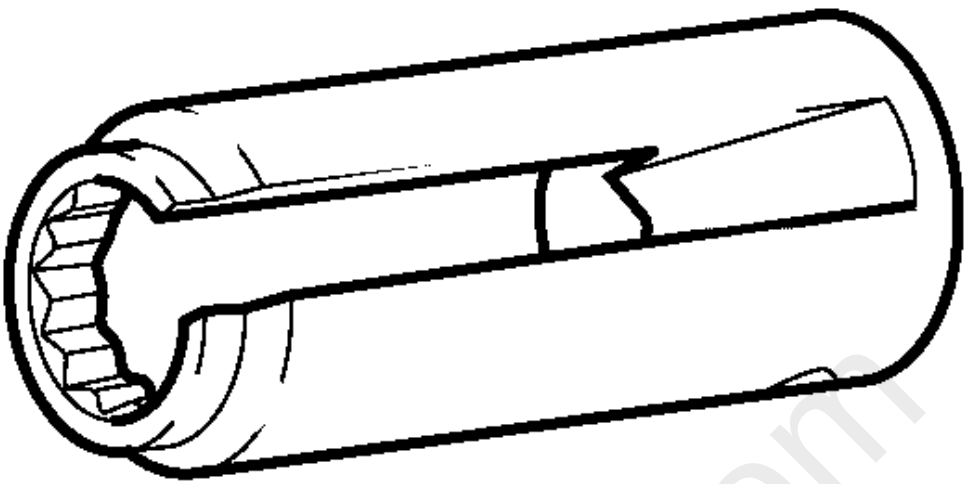
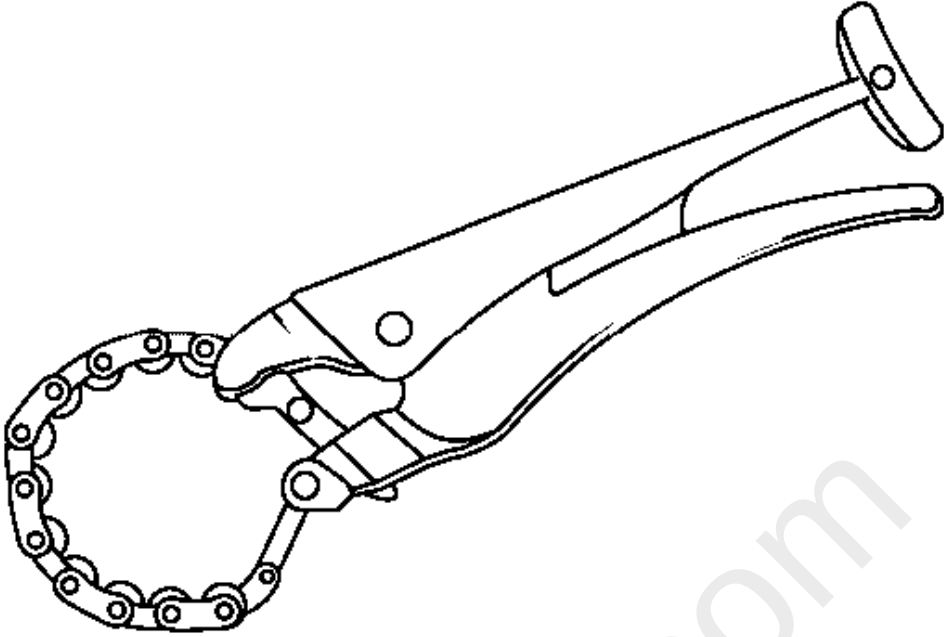
Illustration	Tool Number/Description
	CH-6179 KM-6179 Heated Oxygen Sensor Remover/Installer

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