

2017 ENGINE
Exhaust - Impala

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 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 to Cylinder Head (LFX)	
• First Pass:	20 N.m (15 lb ft)
• Second Pass:	46 N.m (34 lb ft)
Exhaust Manifold to Cylinder Head Fasteners (LCV)	
• First Pass:	20 N.m (15 lb ft)
• Second 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 Fastener (LFX)	58 N.m (43 lb ft)
Catalytic Converter Brace Fastener (LCV)	22 N.m (16 lb ft)
Catalytic Converter to Exhaust Manifold (LCV)	50 N.m (37 lb ft)
Drivetrain and Front Suspension Support Fasteners (Front Hanger Bracket)	60 N.m (44 lb ft)
Drivetrain and Front Suspension Support Fasteners (Front Suspension Frame)	160 N.m (118 lb ft)
Exhaust Front Pipe to Catalytic Converter Fastener (LFX)	50 N.m (37 lb ft)

NOTE:

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

Application	Specification
	Metric (English)
Exhaust Front Pipe to Catalytic Converter Fastener (LCV)	25 N.m (18 lb ft)
Exhaust Front Pipe to Muffler Fastener (LFX, LCV)	18 N.m (13 lb ft)
Exhaust Pipe Front Hanger Bracket Isolator Fastener	9 N.m (80 lb in)
Exhaust Manifold Heat Shield Fasteners (LCV)	14 N.m (124 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
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 MANIFOLD REPLACEMENT

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

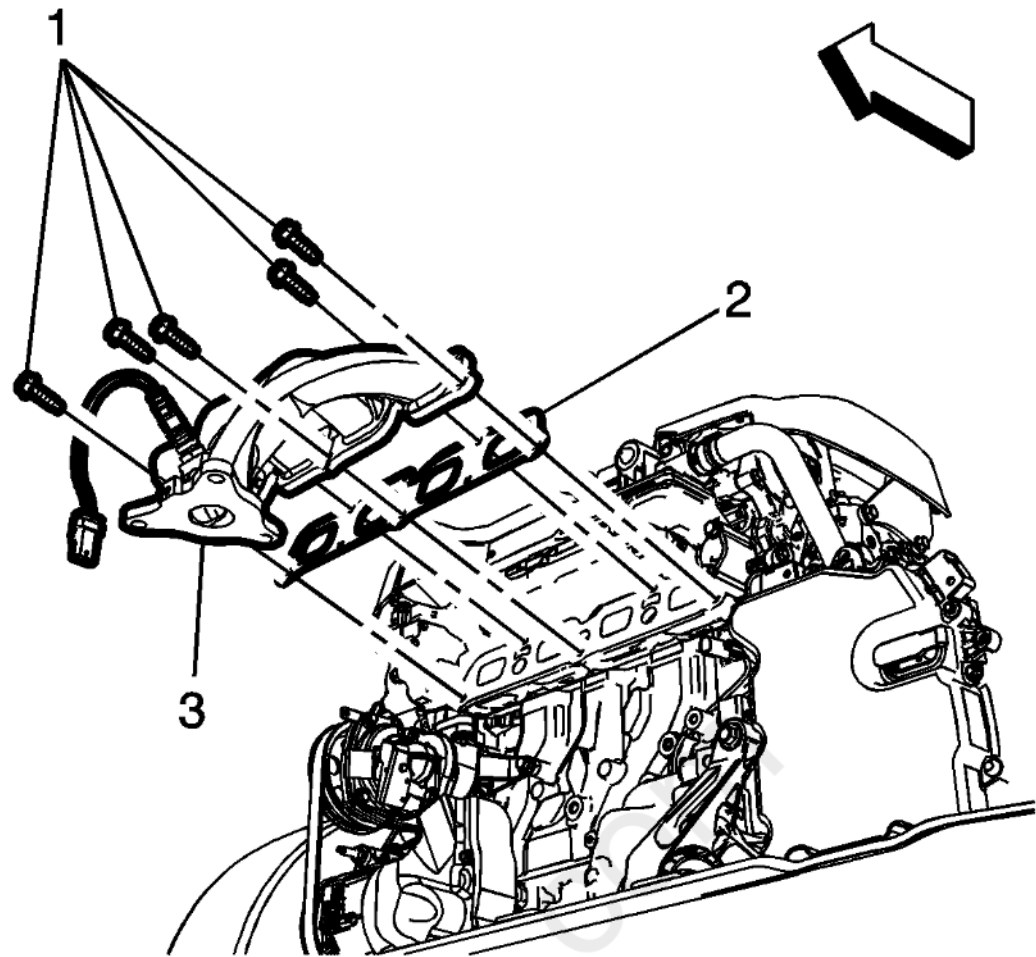


Fig. 1: Exhaust Manifold, Fasteners And Gasket
Courtesy of GENERAL MOTORS COMPANY

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.

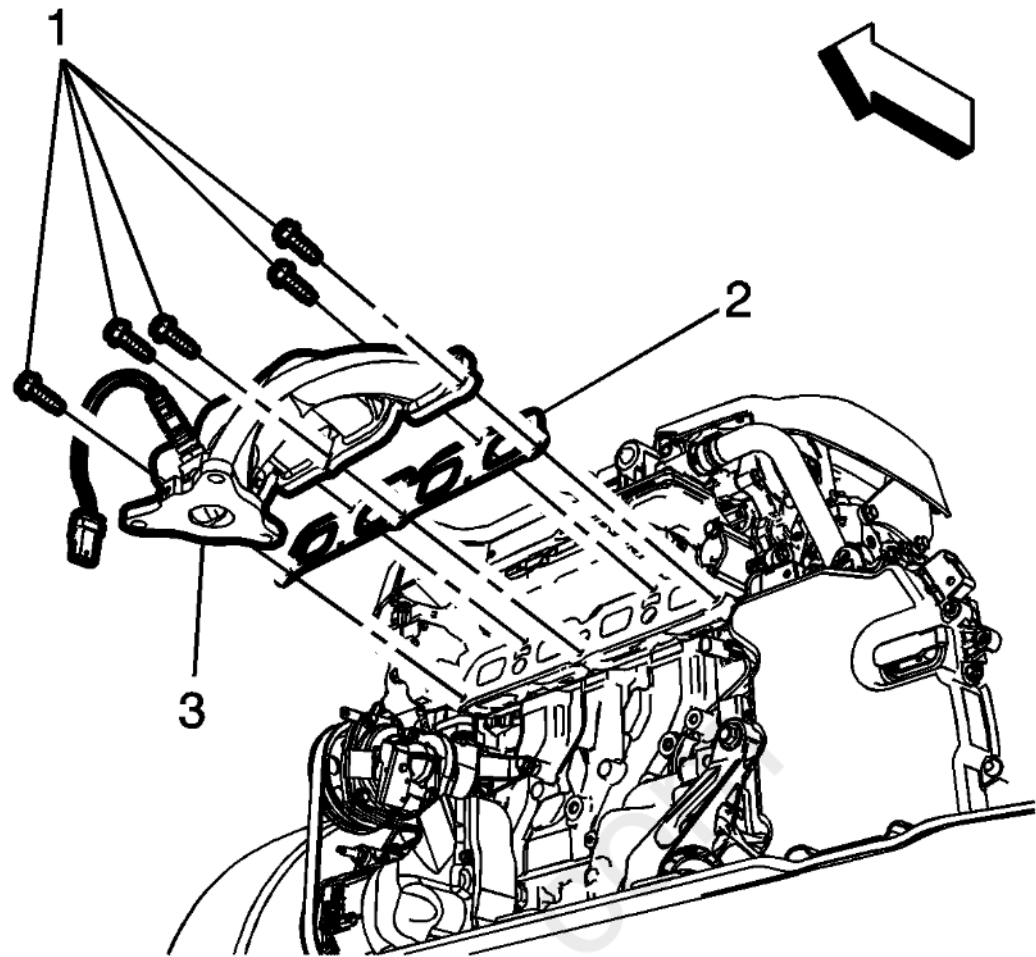


Fig. 2: Exhaust Manifold, Fasteners And Gasket
Courtesy of GENERAL MOTORS COMPANY

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.

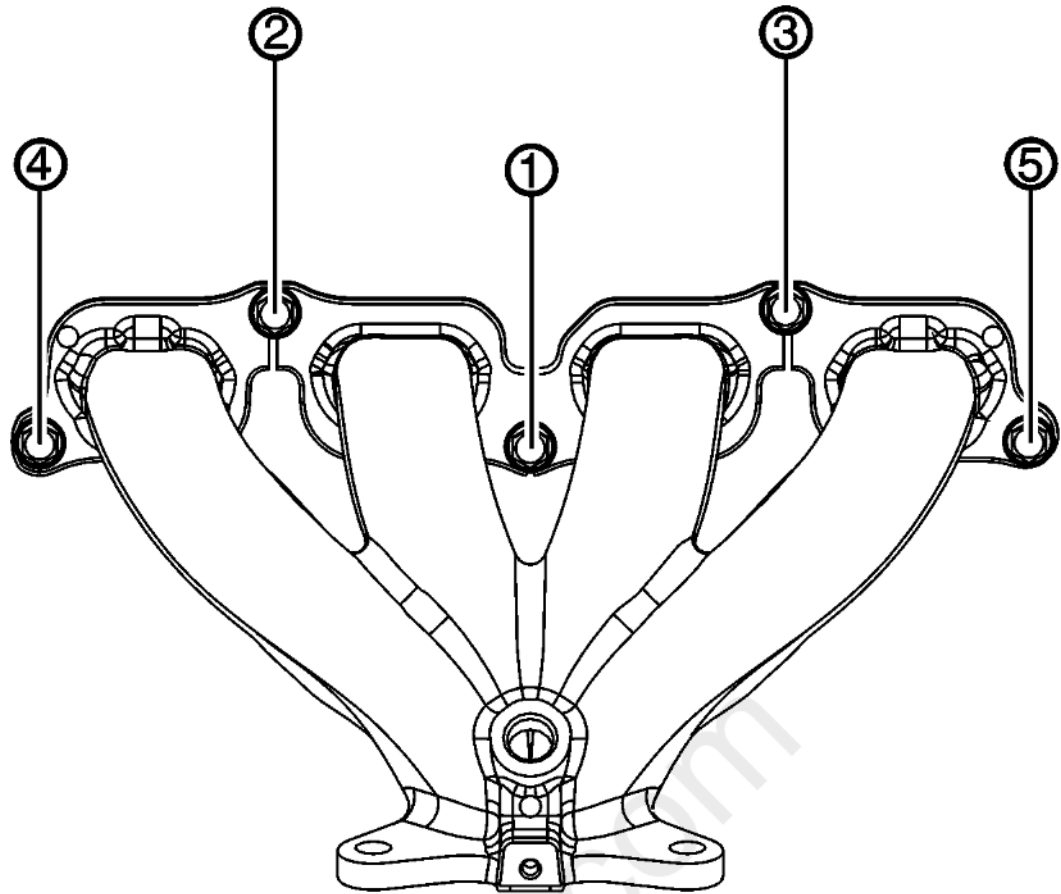


Fig. 3: Exhaust Manifold Bolt Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

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

EXHAUST PIPE FRONT HANGER INSULATOR REPLACEMENT

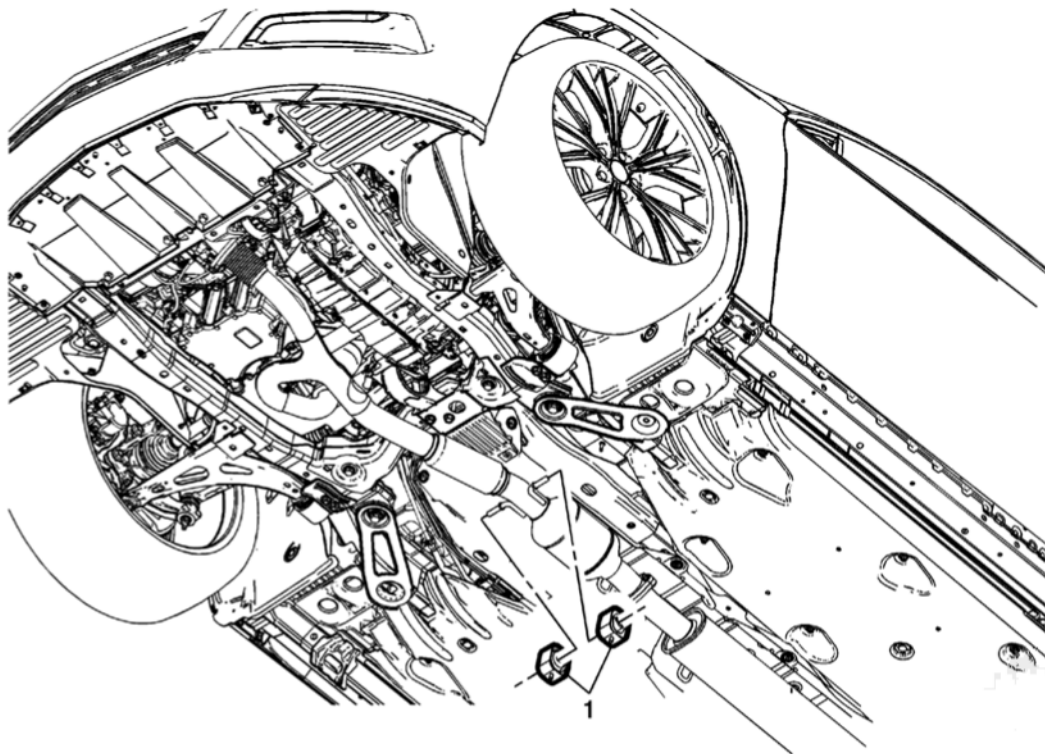


Fig. 4: Exhaust Pipe Front Hanger Insulators
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Moving Parts and Hot Surfaces Warning . WARNING: Refer to Safety Glasses Warning . Preliminary Procedure Remove the exhaust pipe front hanger bracket. Refer to Exhaust Pipe Front Hanger Bracket Replacement .	
1	Exhaust Pipe Front Hanger Insulators (Qty: 2) NOTE: Clean and lubricate the exhaust isolator rods for ease of installation.

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](#) .

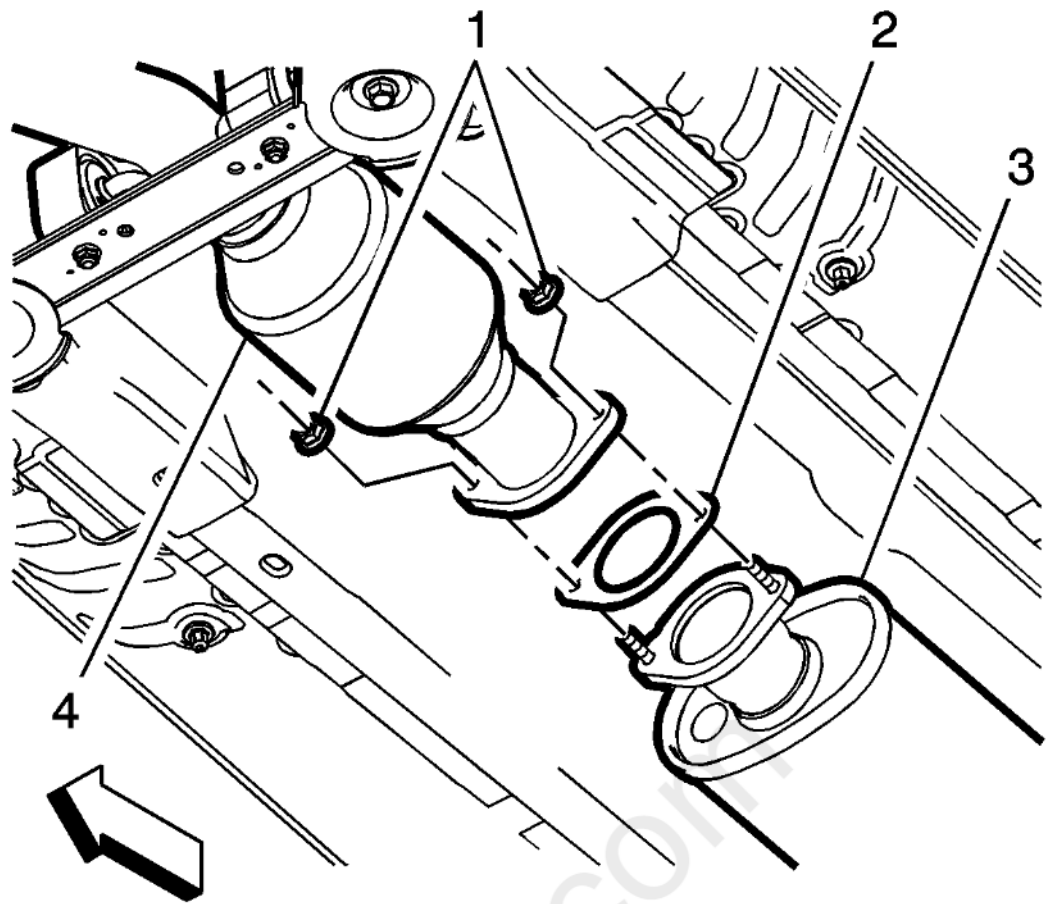


Fig. 5: Exhaust Muffler, Exhaust Front Pipe, Fasteners And Gasket
Courtesy of GENERAL MOTORS COMPANY

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.

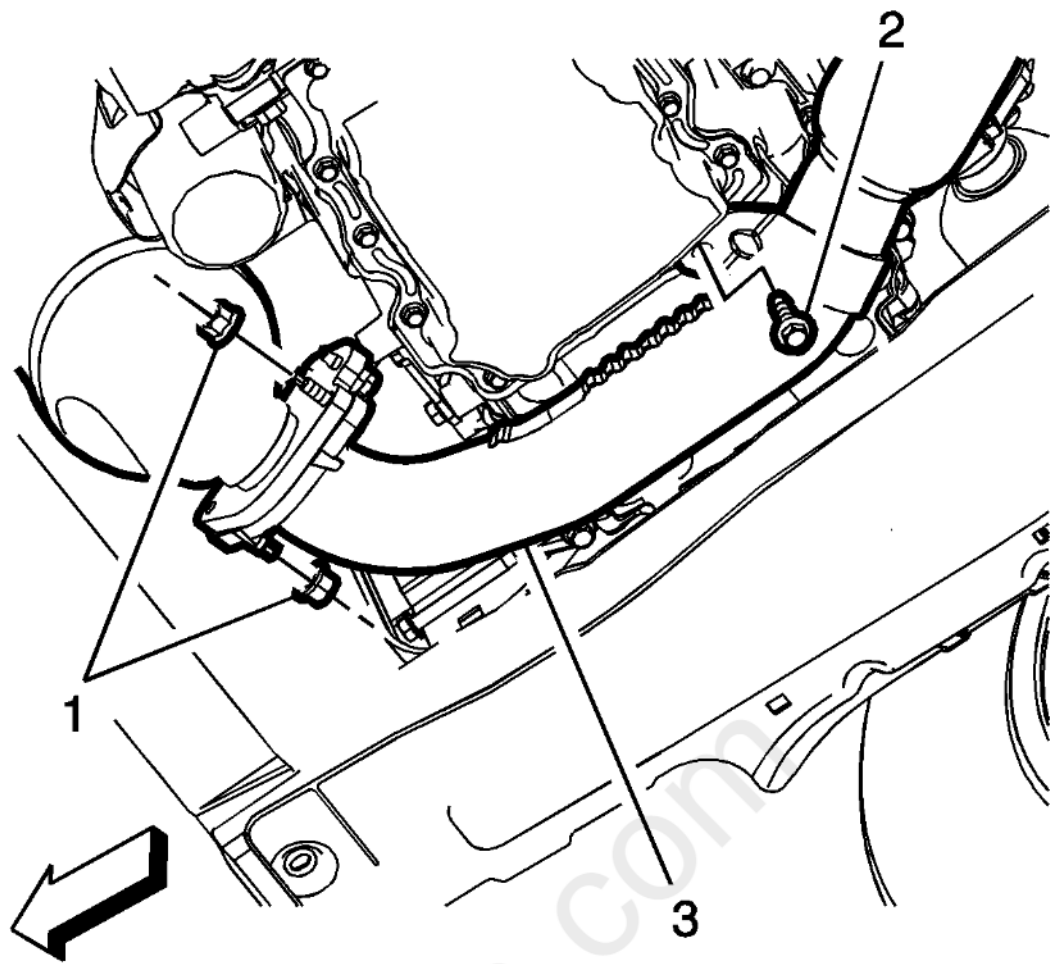


Fig. 6: Exhaust Front Pipe And Fasteners

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).

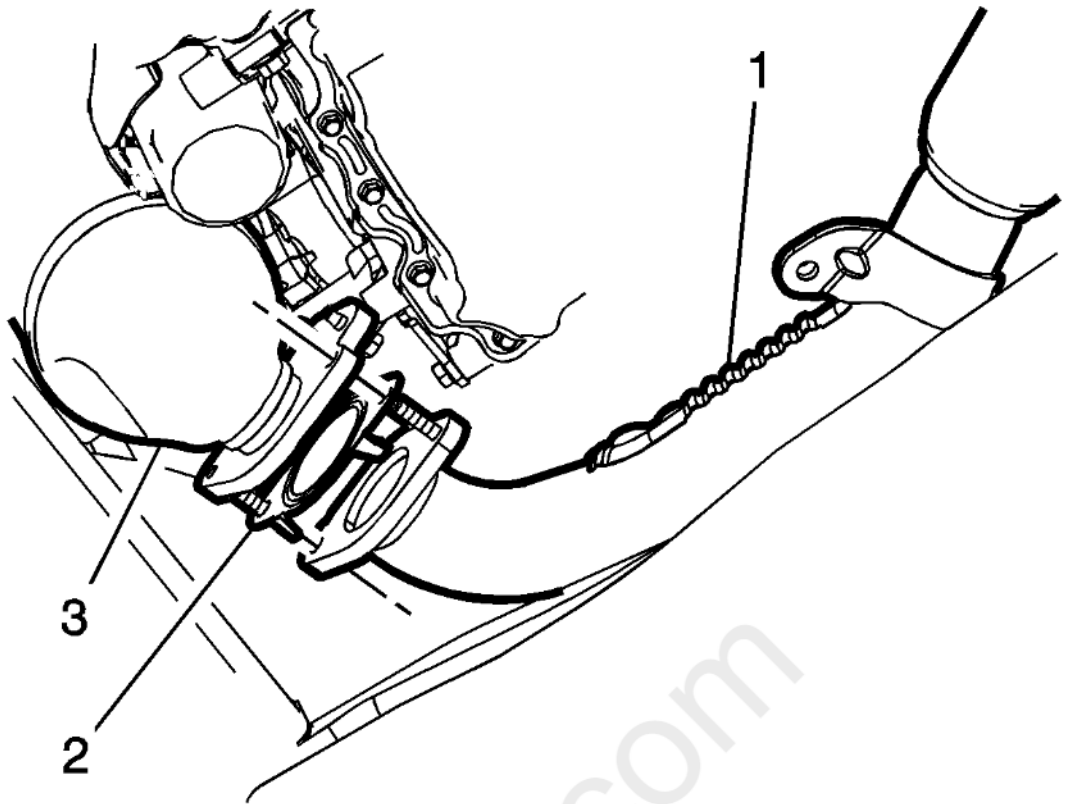


Fig. 7: Exhaust Front Pipe, Catalytic Converter And Gasket
Courtesy of GENERAL MOTORS COMPANY

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

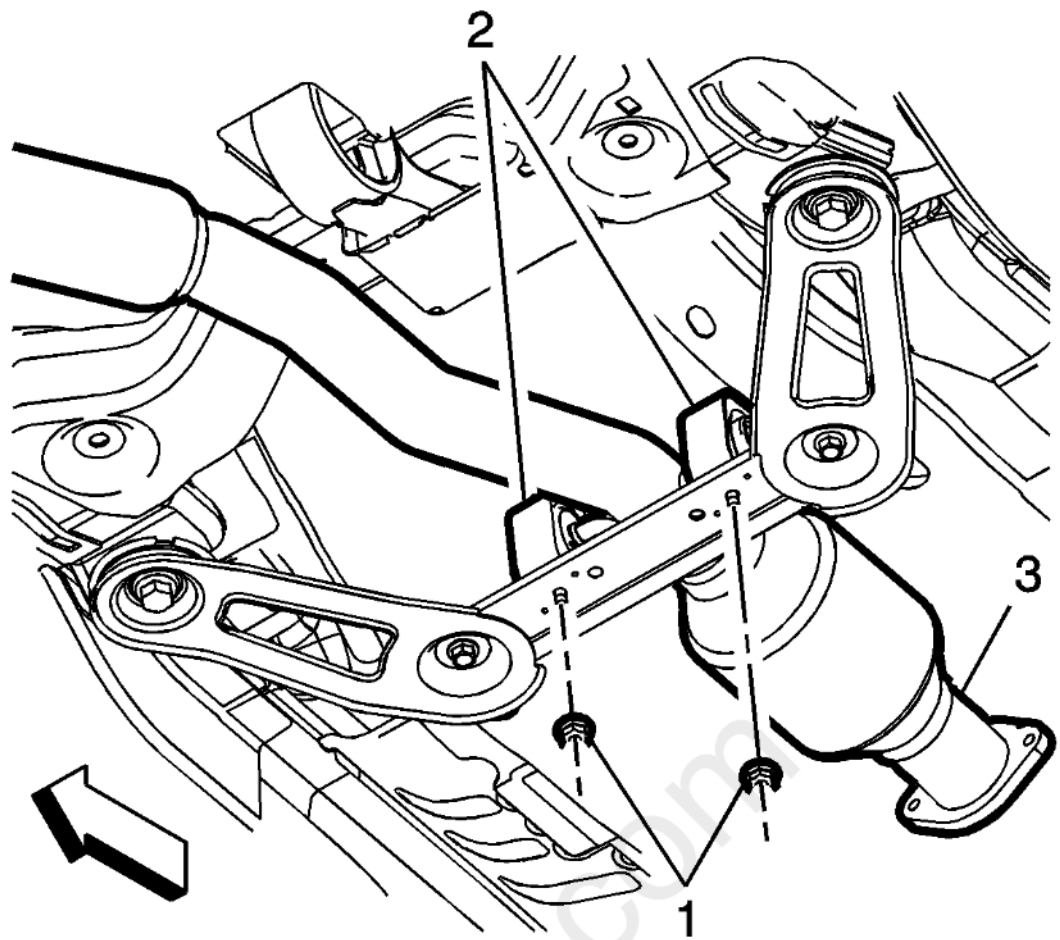


Fig. 8: Fasteners And Exhaust Isolators

Courtesy of GENERAL MOTORS COMPANY

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

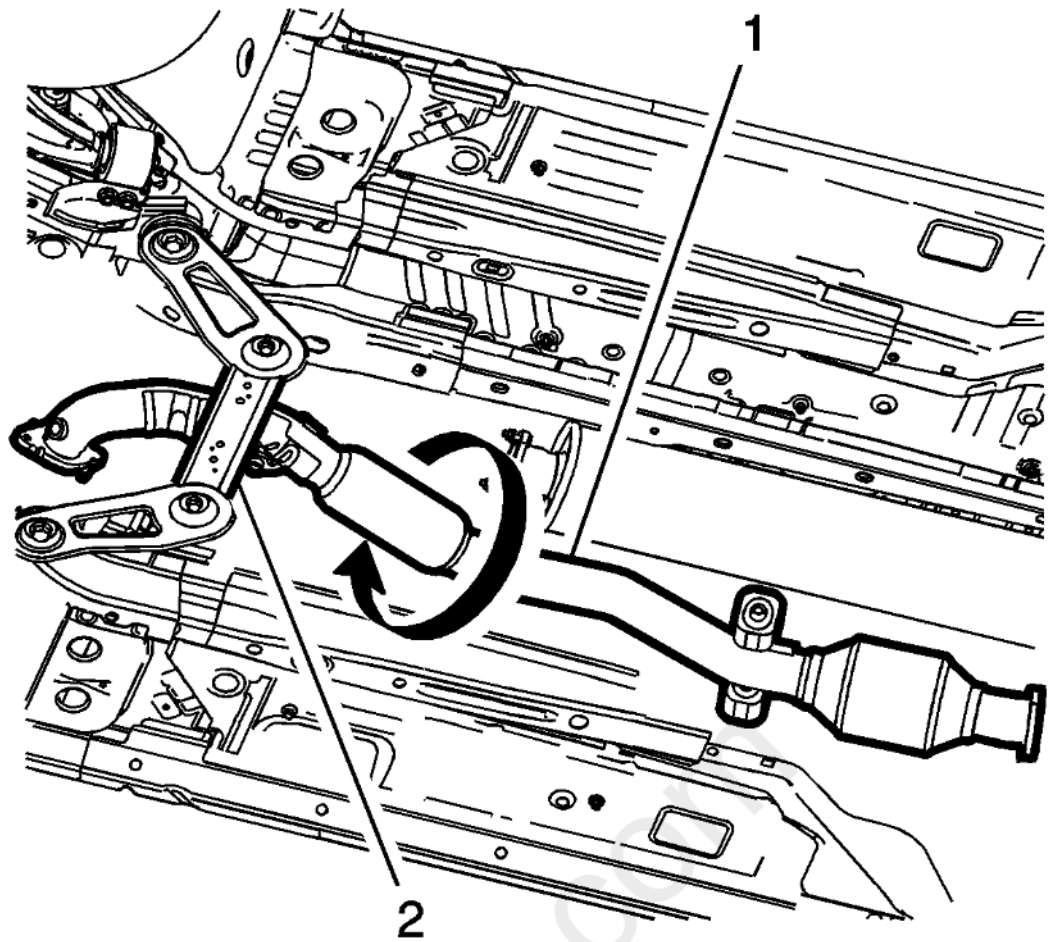


Fig. 9: Exhaust Front Pipe Hanger Bracket
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

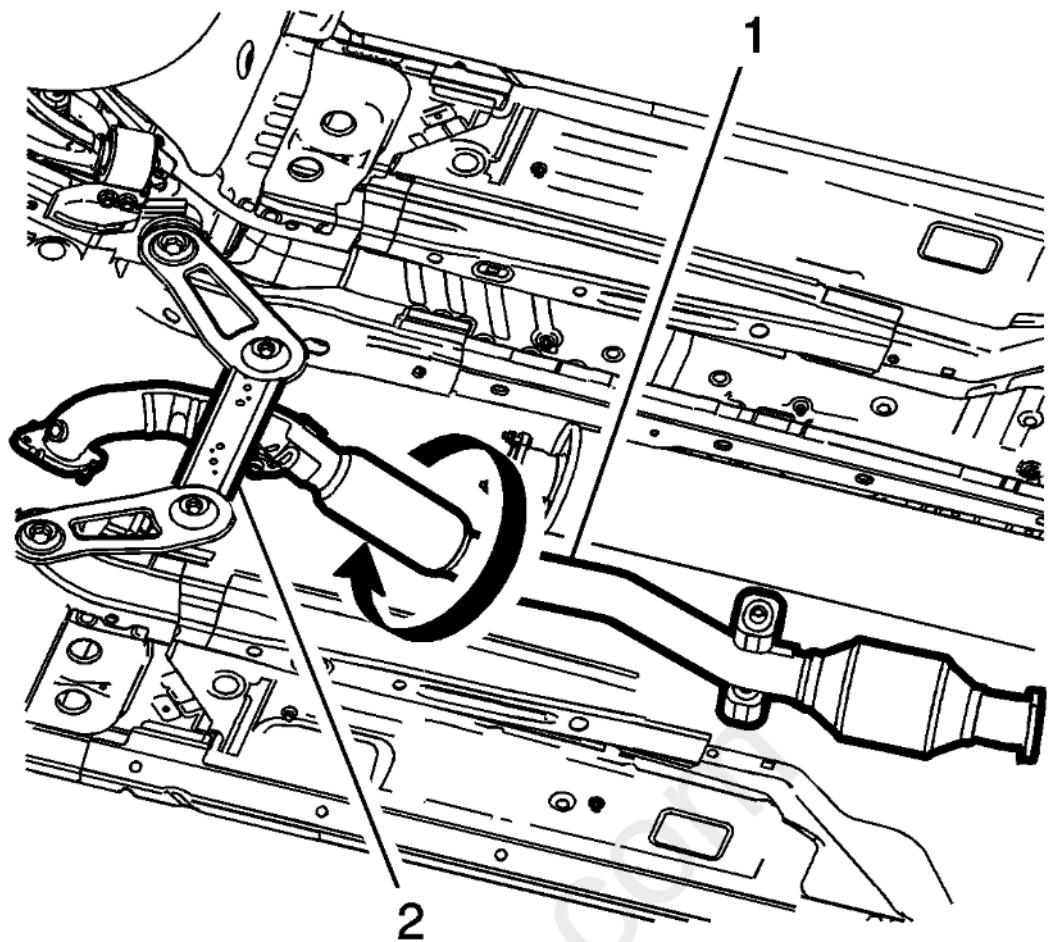


Fig. 10: Exhaust Front Pipe Hanger Bracket
Courtesy of GENERAL MOTORS COMPANY

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

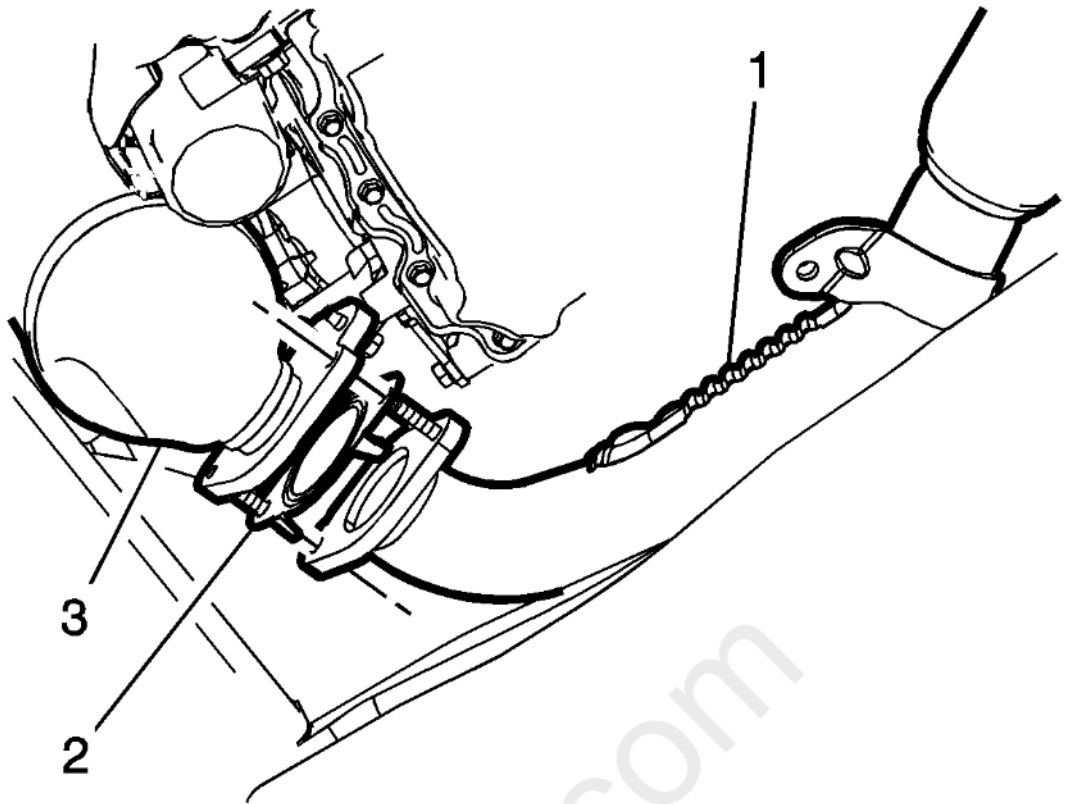


Fig. 11: Exhaust Front Pipe, Catalytic Converter And Gasket
Courtesy of GENERAL MOTORS COMPANY

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

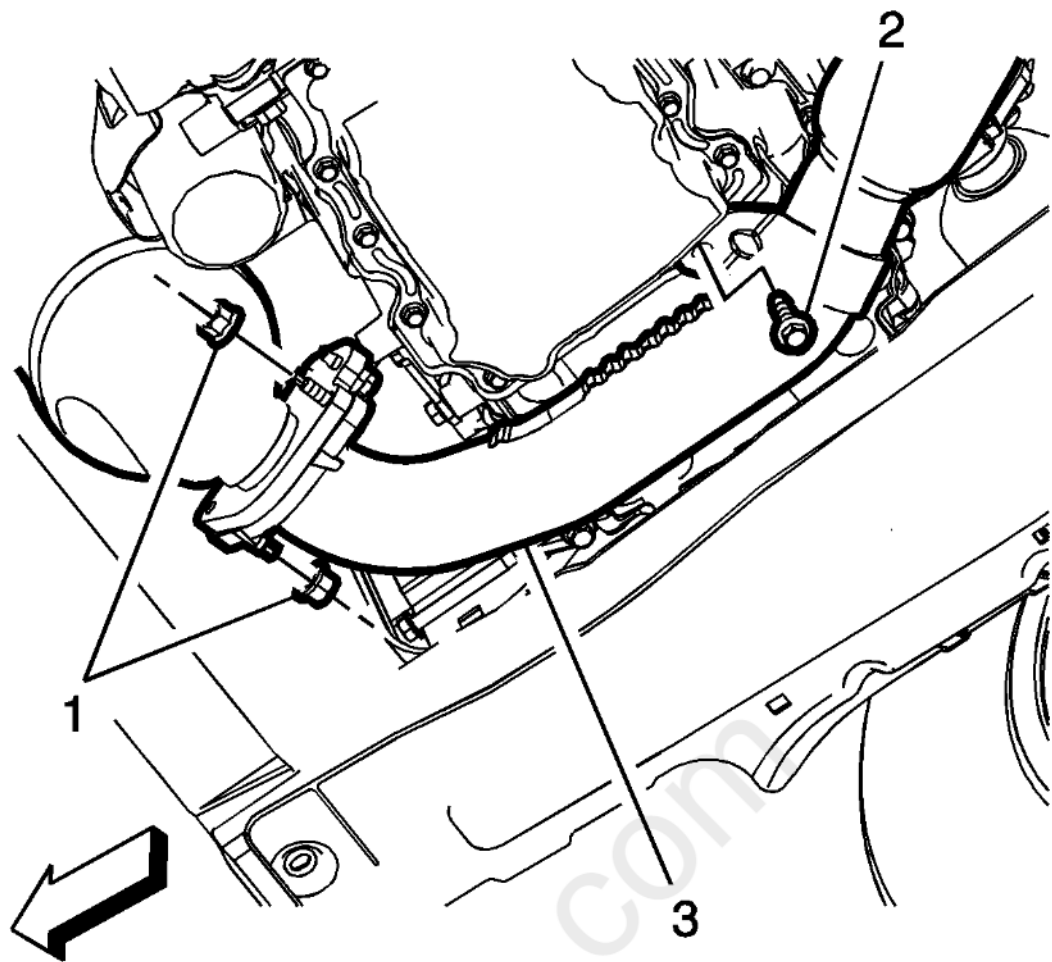


Fig. 12: Exhaust Front Pipe And Fasteners
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

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

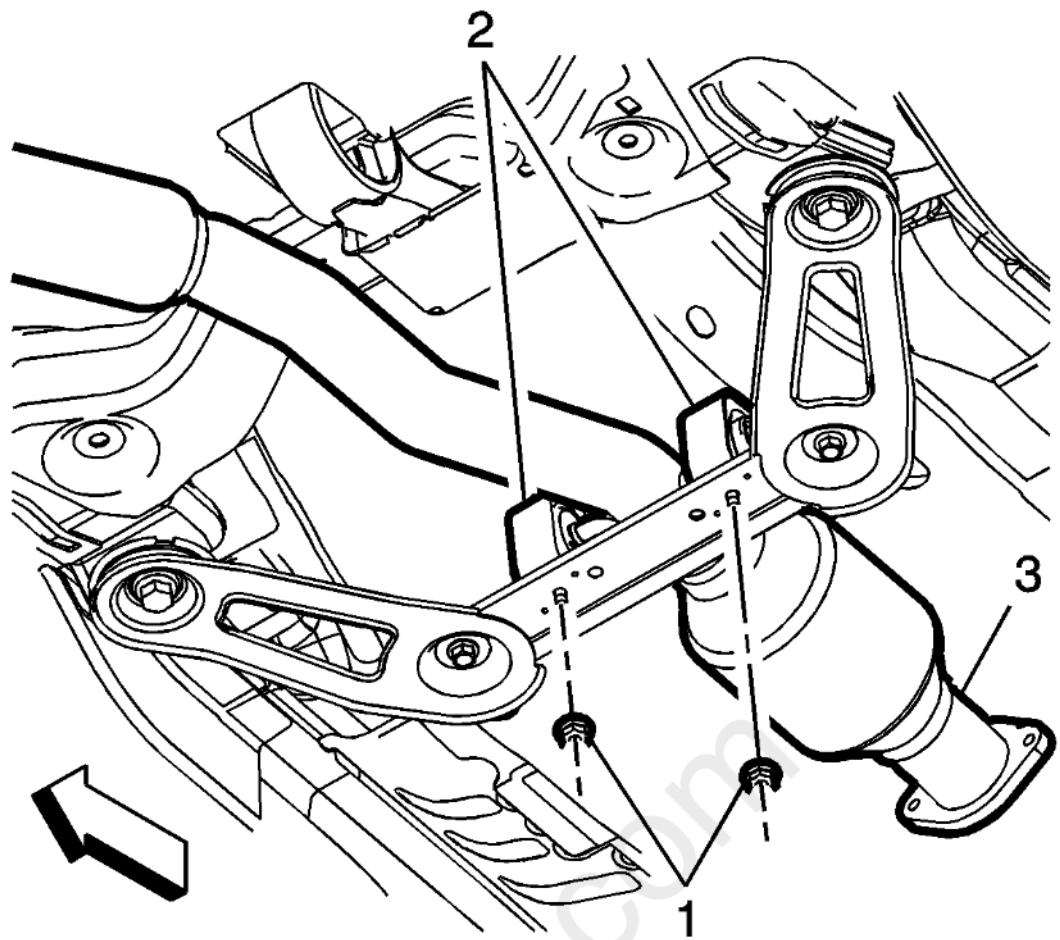


Fig. 13: Fasteners And Exhaust Isolators

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 N.m (16 lb ft).

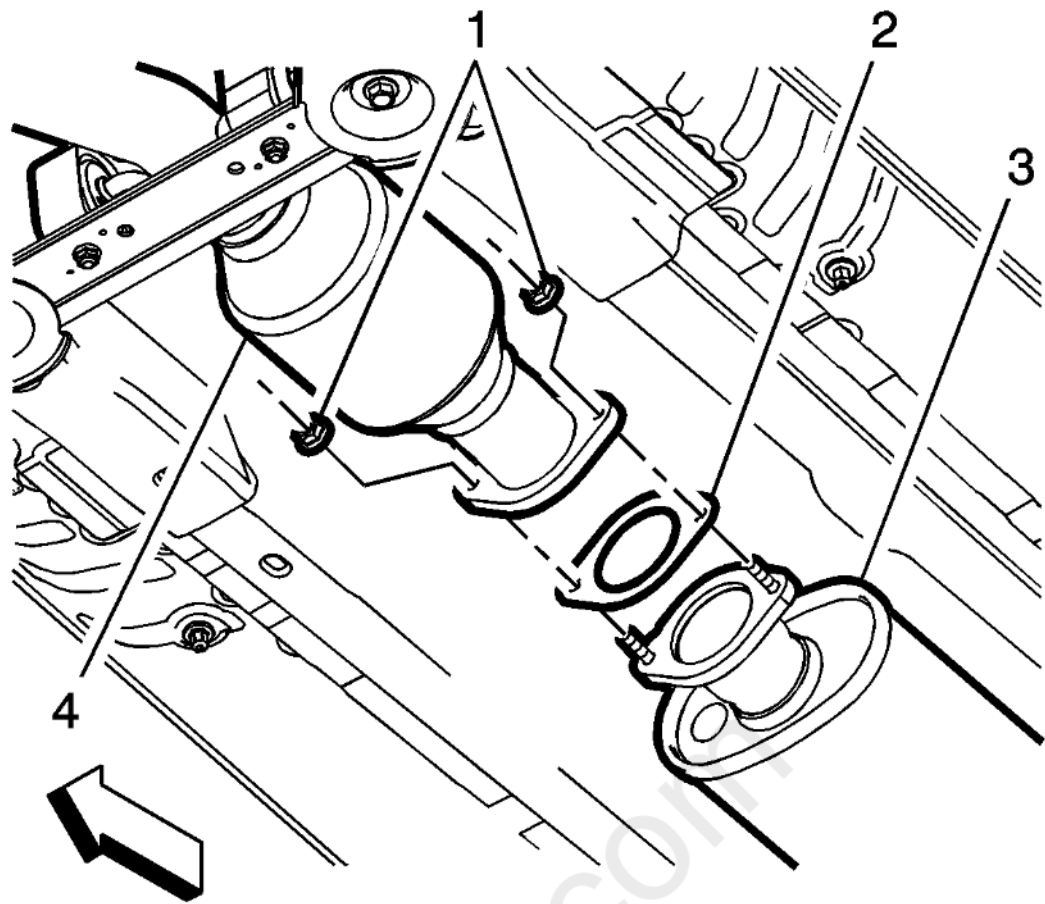


Fig. 14: Exhaust Muffler, Exhaust Front Pipe, Fasteners And Gasket
Courtesy of GENERAL MOTORS COMPANY

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

FRONT PIPE REPLACEMENT (LFX)

Removal Procedure

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Support the exhaust muffler with mechanics wire.

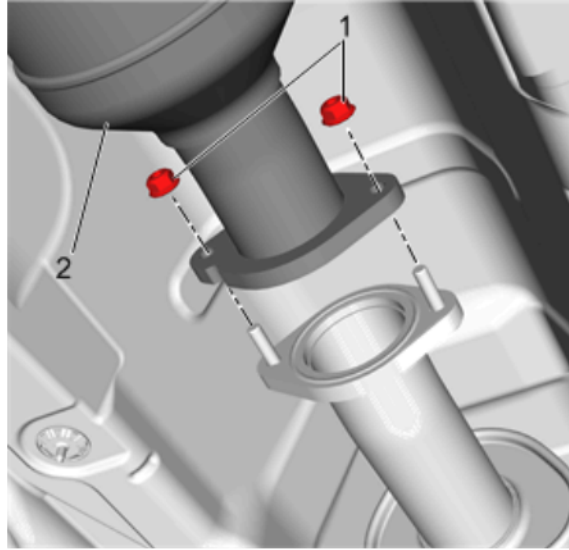


Fig. 15: Front Pipe To Exhaust Muffler Fasteners And Exhaust Front Pipe
 Courtesy of GENERAL MOTORS COMPANY

3. Remove the front pipe to exhaust muffler fasteners (1) and detach the exhaust front pipe (2).

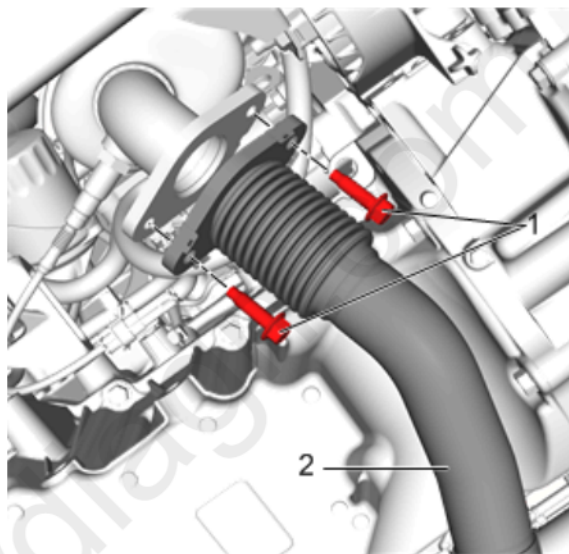


Fig. 16: Front Pipe And Fasteners
 Courtesy of GENERAL MOTORS COMPANY

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

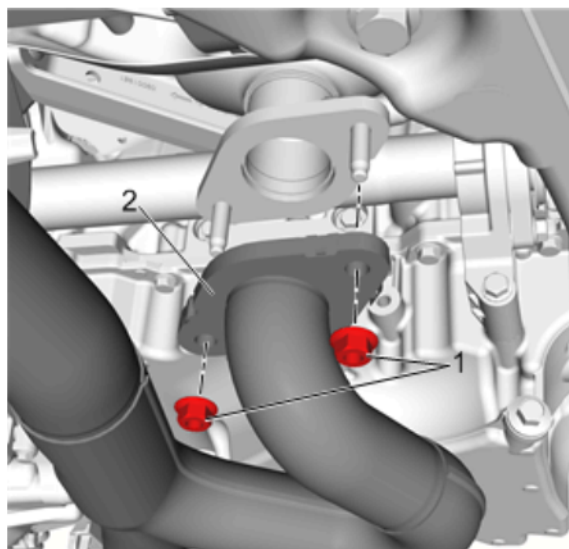


Fig. 17: Front Pipe And Fasteners
 Courtesy of GENERAL MOTORS COMPANY

5. Remove the fasteners (1) securing the front pipe (2) to the catalytic converter.

6. Support the drivetrain and front suspension rear frame with a support jack.

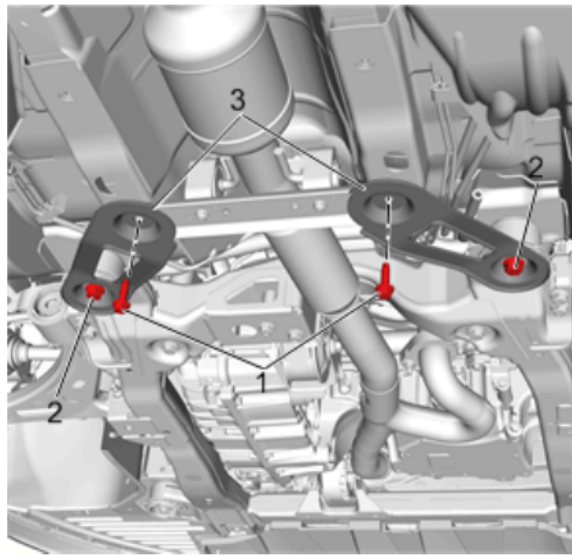


Fig. 18: Front Suspension Supports and Fasteners

Courtesy of GENERAL MOTORS COMPANY

7. Remove the drivetrain and front suspension support fasteners (1) and DISCARD.
8. Loosen the drivetrain and front suspension support fasteners (2).
9. Rotate the drivetrain and front suspension supports (3) away from the front hanger bracket and remove the front pipe.
10. If replacing the exhaust front pipe, transfer necessary parts.

Installation Procedure

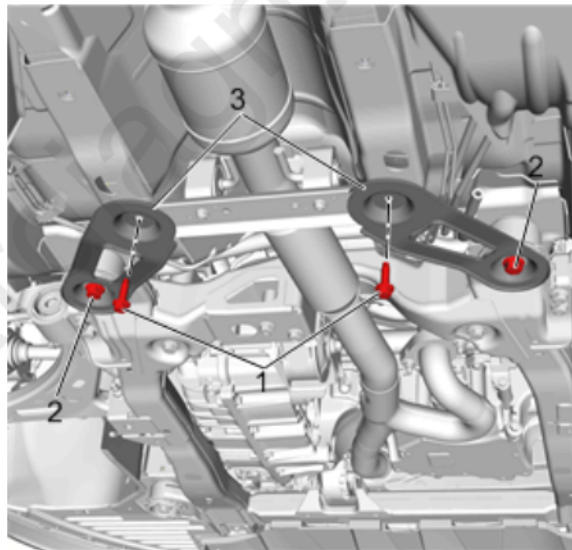


Fig. 19: Front Suspension Supports and Fasteners

Courtesy of GENERAL MOTORS COMPANY

1. Install the exhaust front pipe into place and rotate the drivetrain and front suspension supports (3) over the exhaust front hanger bracket.
2. Loosely install the drivetrain and front suspension support fasteners (1).

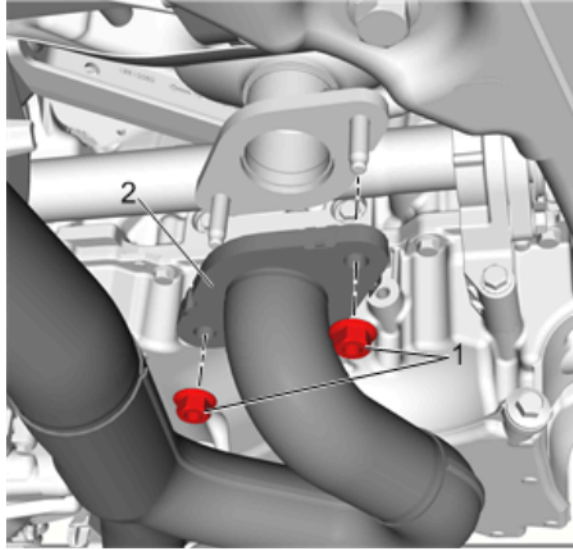


Fig. 20: Front Pipe And Fasteners

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

3. Using a NEW gasket, install the front pipe (2) to the catalytic converter and tighten the fasteners (1) to 50 N.m (37 lb ft).

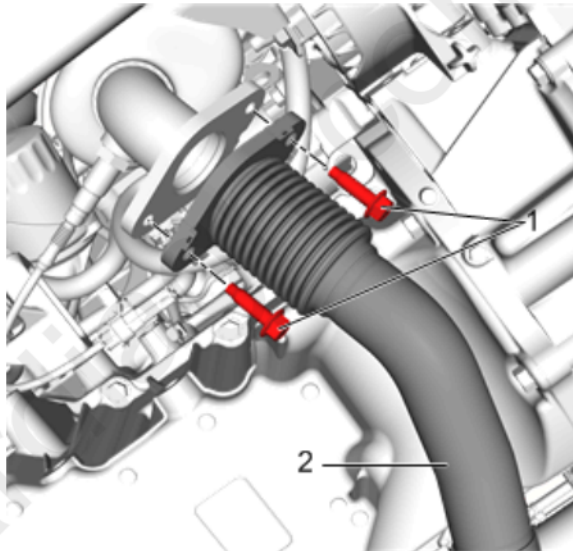
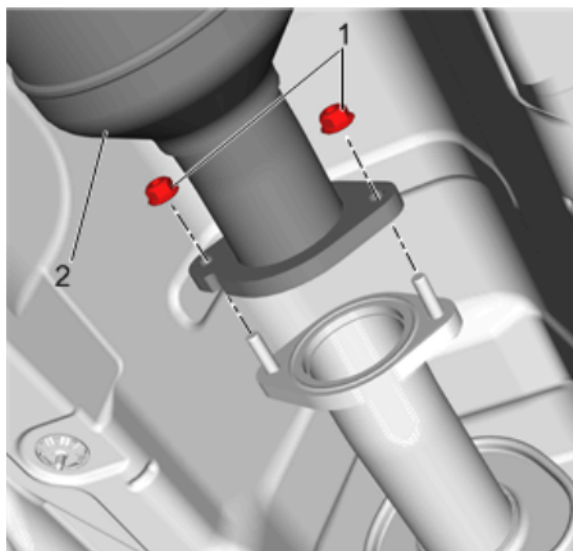


Fig. 21: Front Pipe And Fasteners

Courtesy of GENERAL MOTORS COMPANY

4. Using a NEW gasket, install the front pipe (2) to the catalytic converter and tighten the fasteners (1) to 50 N.m (37 lb ft).



5. Using a NEW gasket, install the front pipe (2) to the exhaust muffler and tighten the fasteners (1) to 18 N.m (13 lb ft).

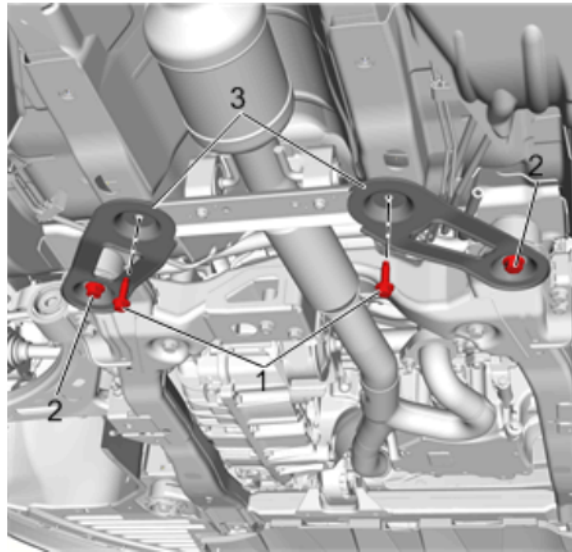


Fig. 23: Front Suspension Supports and Fasteners
Courtesy of GENERAL MOTORS COMPANY

CAUTION: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

6. Install NEW front drivetrain suspension support bolts (1) and tighten to 60 N.m (44 lb ft) plus 30 degrees.
7. Tighten the drivetrain and front suspension support bolts (2) to 160 N.m (118 lb ft).
8. Remove the mechanics wire and the drivetrain and front suspension support jack.
9. Start the engine and check for exhaust leaks.

CATALYTIC CONVERTER REPLACEMENT

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](#).

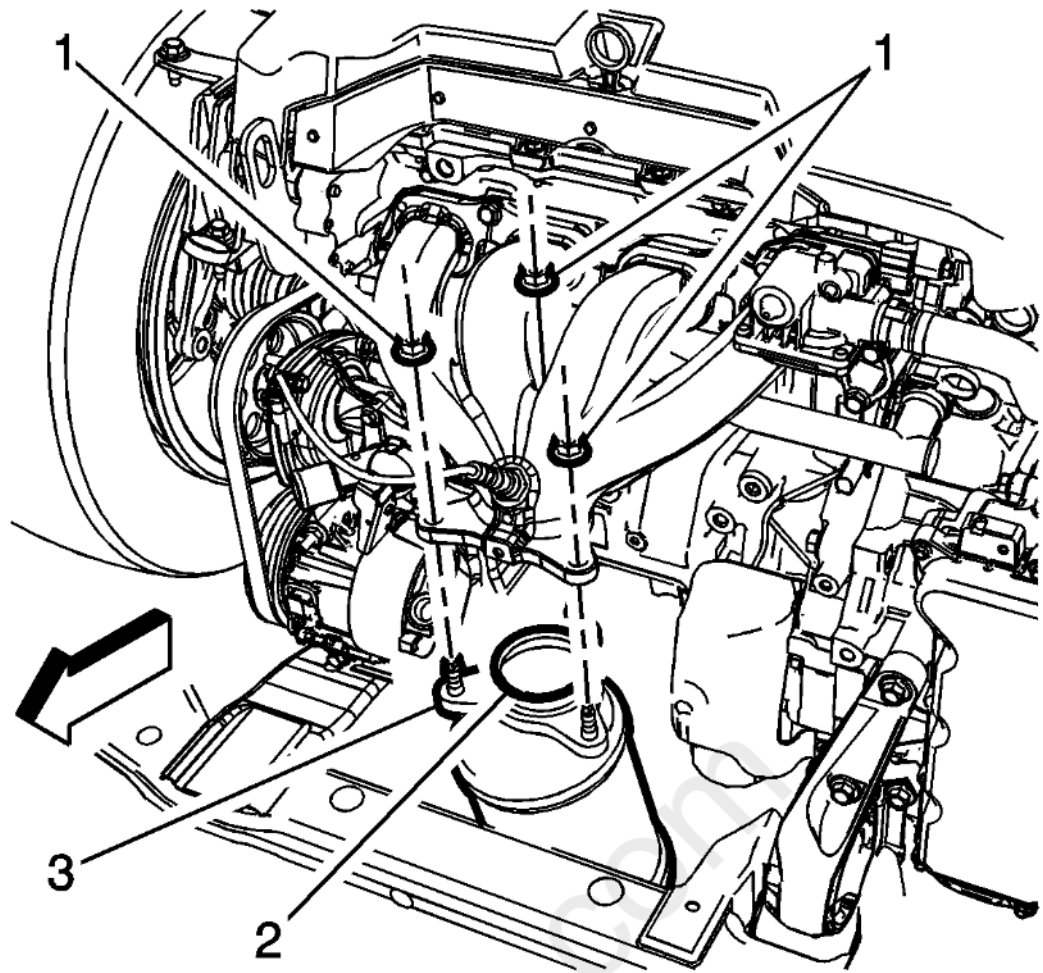


Fig. 24: Fasteners, Catalytic Converter And Seal
Courtesy of GENERAL MOTORS COMPANY

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](#) .

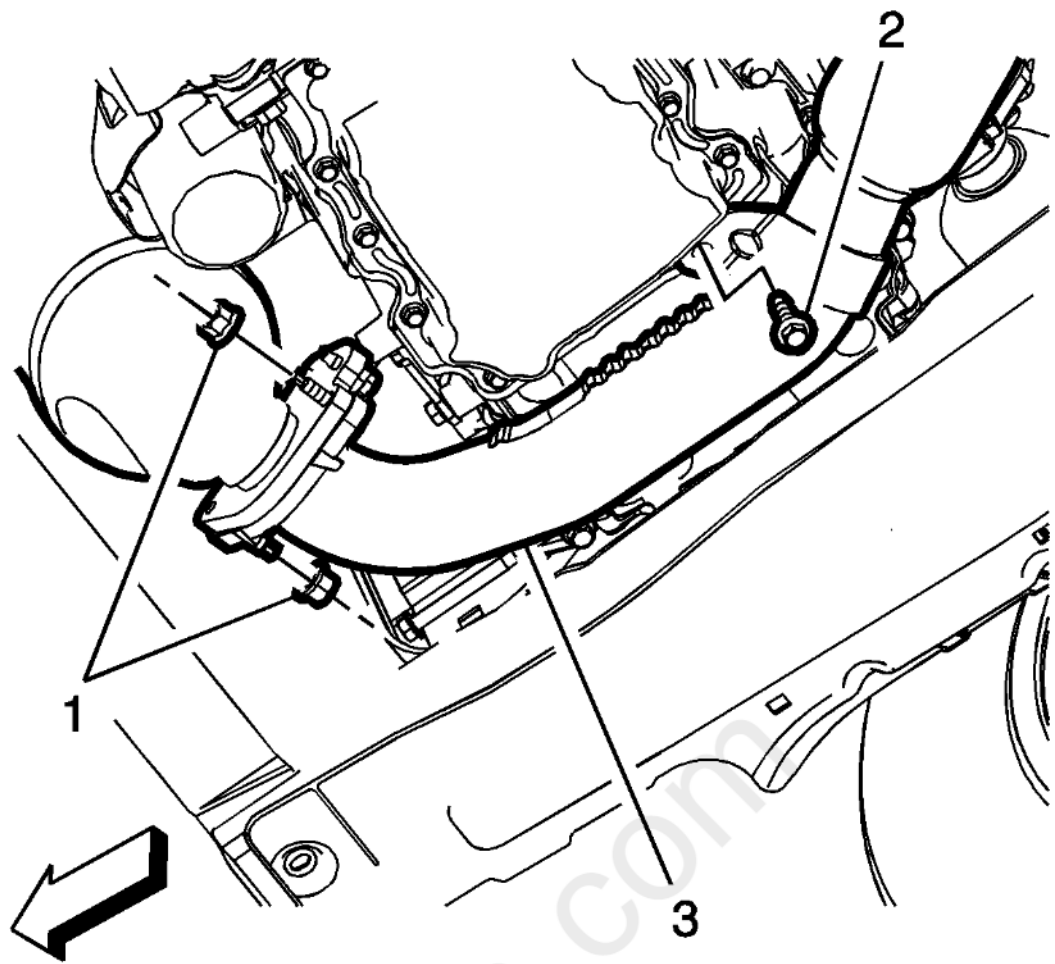


Fig. 25: Exhaust Front Pipe And Fasteners

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).

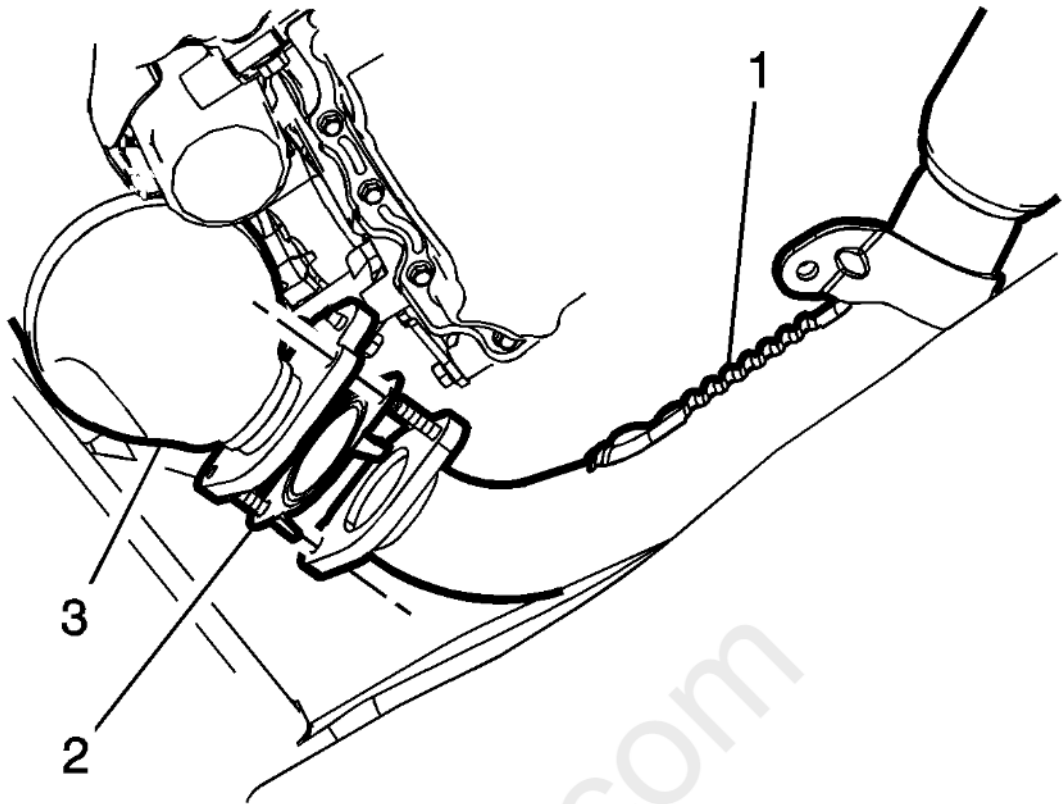


Fig. 26: Exhaust Front Pipe, Catalytic Converter And Gasket
Courtesy of GENERAL MOTORS COMPANY

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).

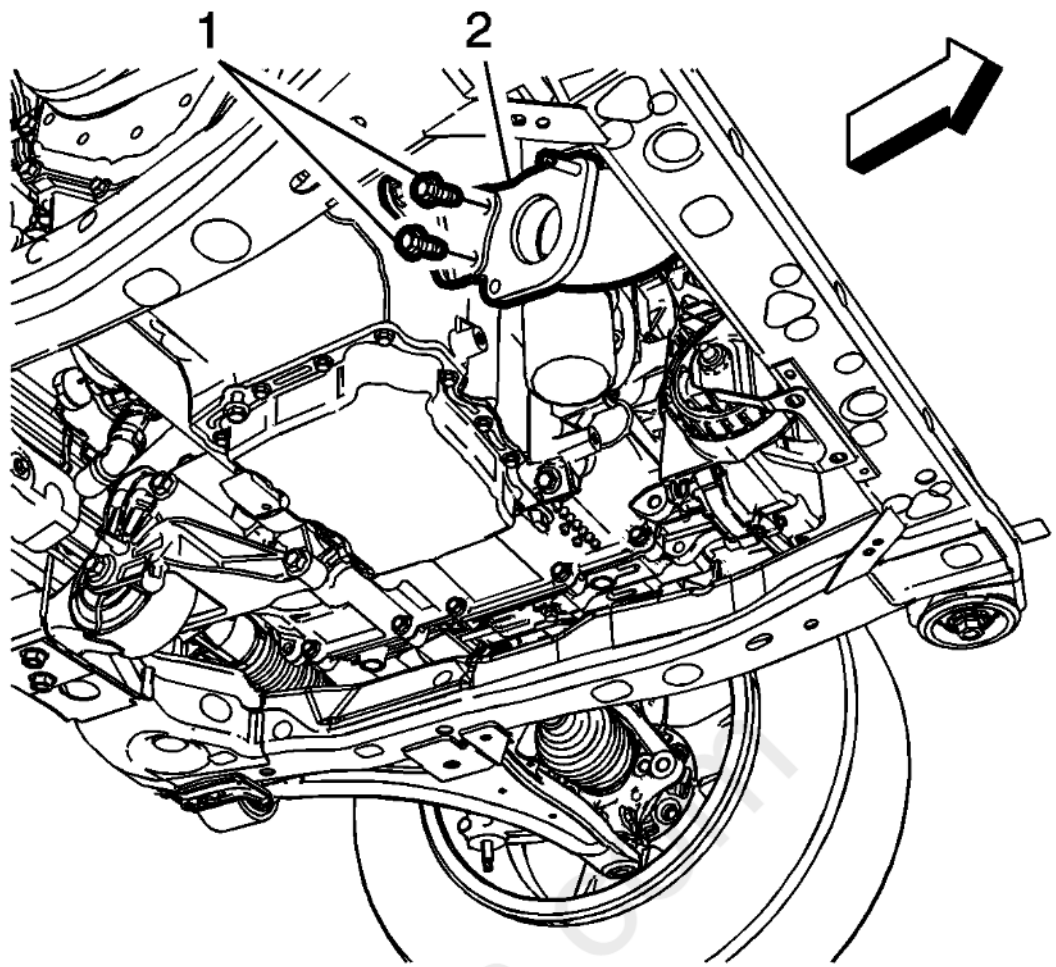


Fig. 27: Catalytic Converter Brace Fasteners And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

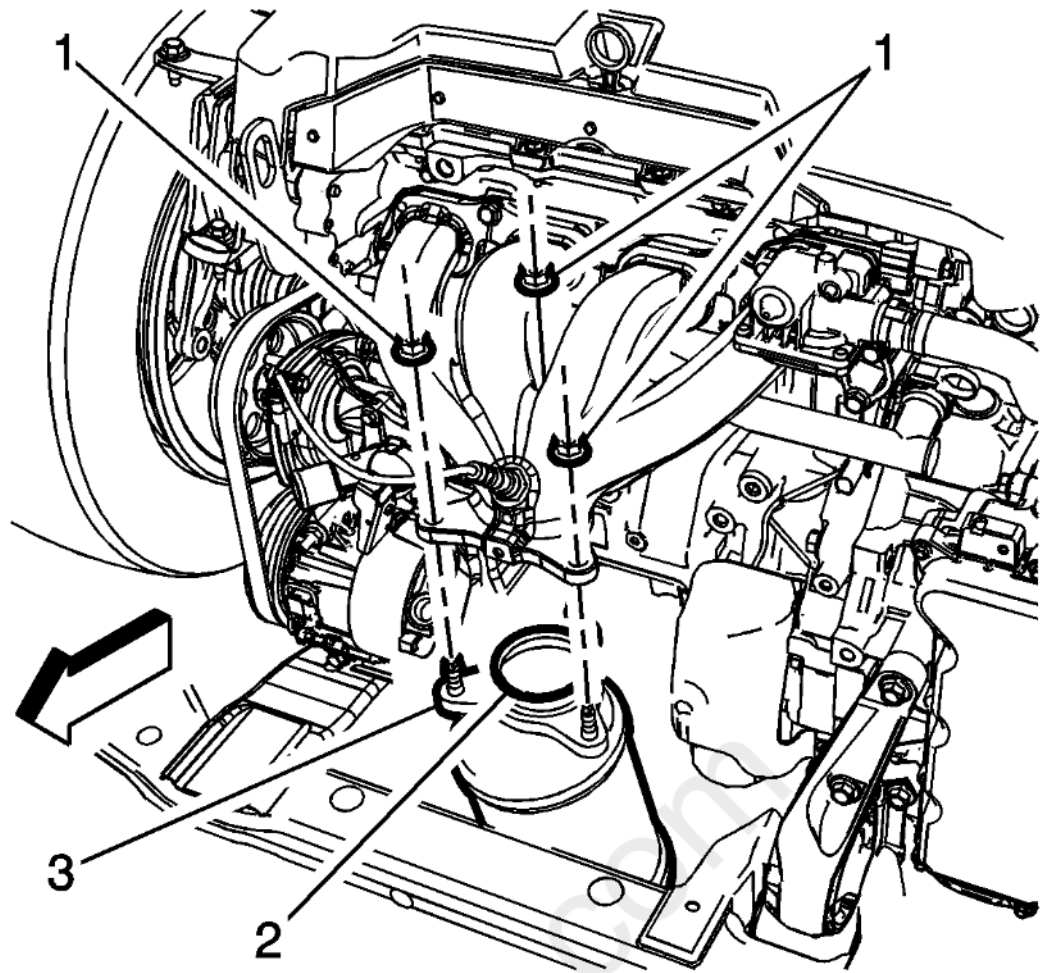


Fig. 28: Fasteners, Catalytic Converter And Seal
Courtesy of GENERAL MOTORS COMPANY

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).

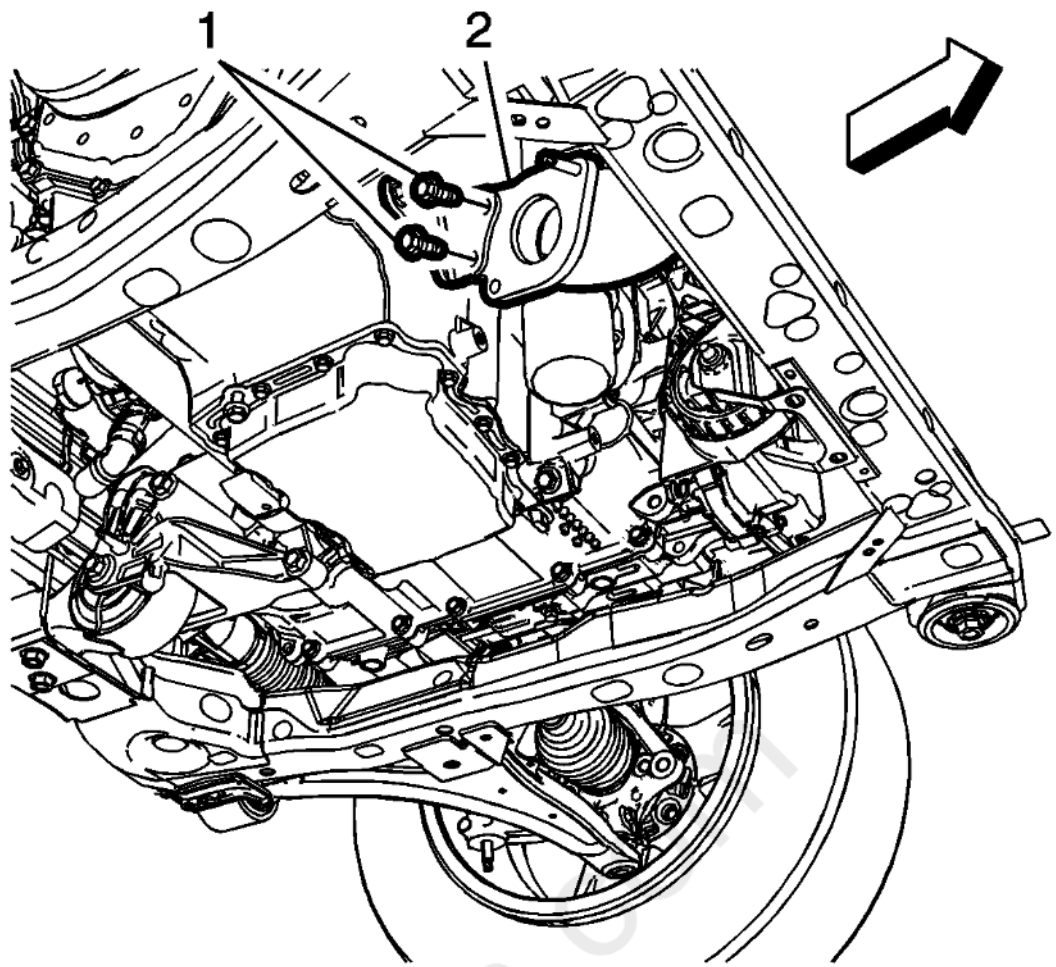


Fig. 29: Catalytic Converter Brace Fasteners And Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

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

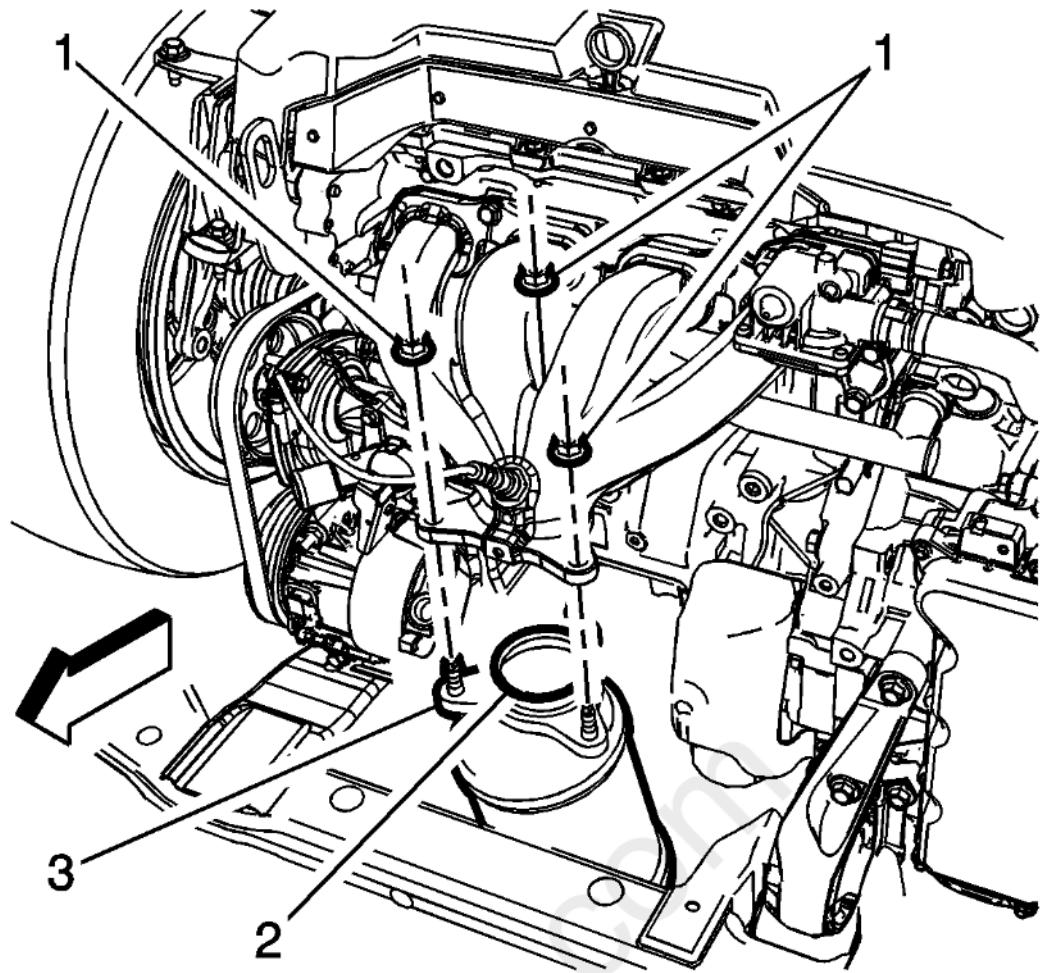


Fig. 30: Fasteners, Catalytic Converter And Seal
Courtesy of GENERAL MOTORS COMPANY

4. Tighten the catalytic converter fasteners (1) to 58 N.m (43 lb ft).
5. Install the exhaust manifold heat shield. Refer to [**Exhaust Manifold Heat Shield Replacement.**](#)

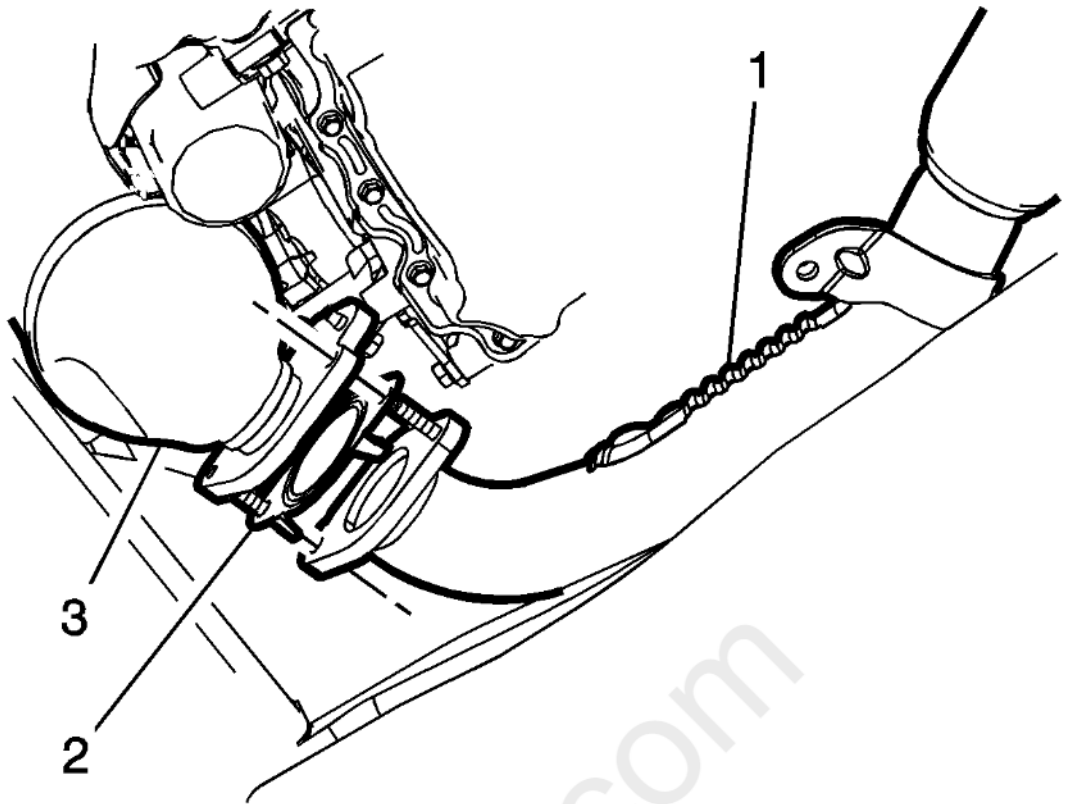


Fig. 31: Exhaust Front Pipe, Catalytic Converter And Gasket

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).

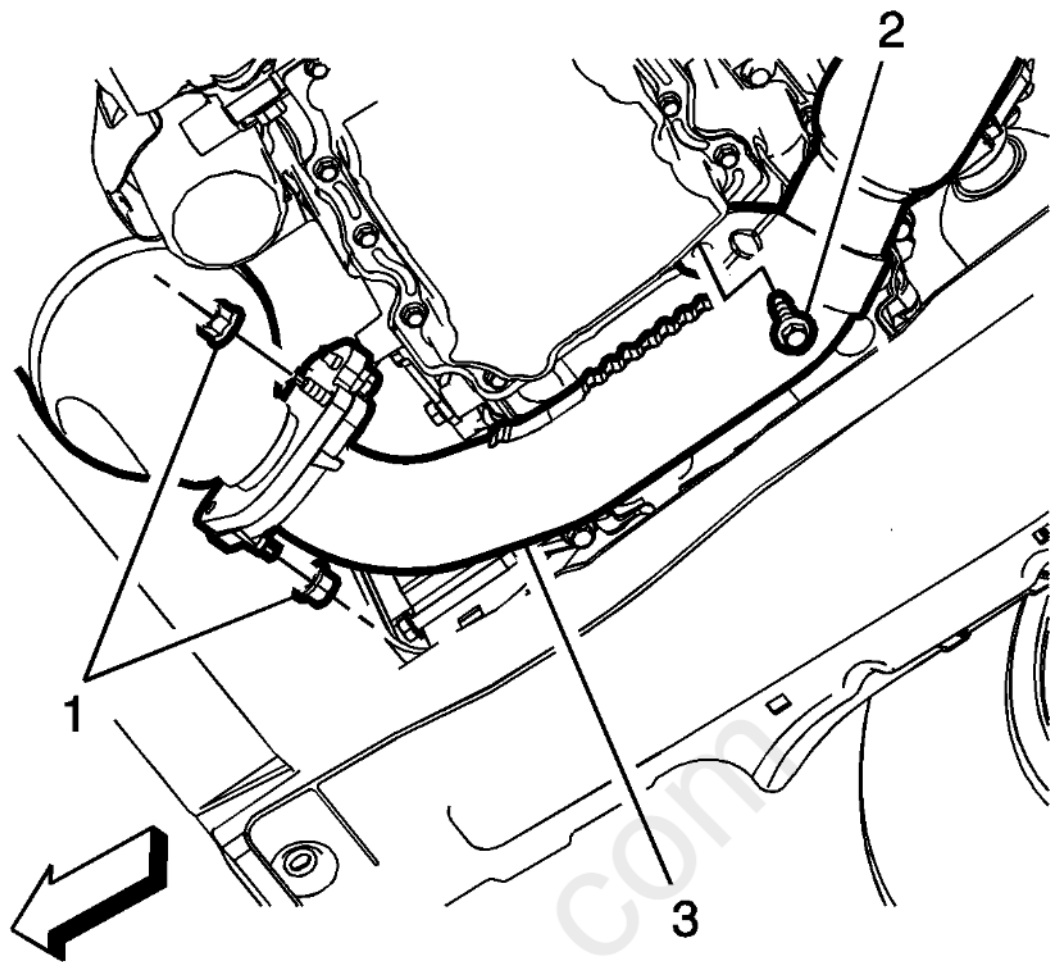
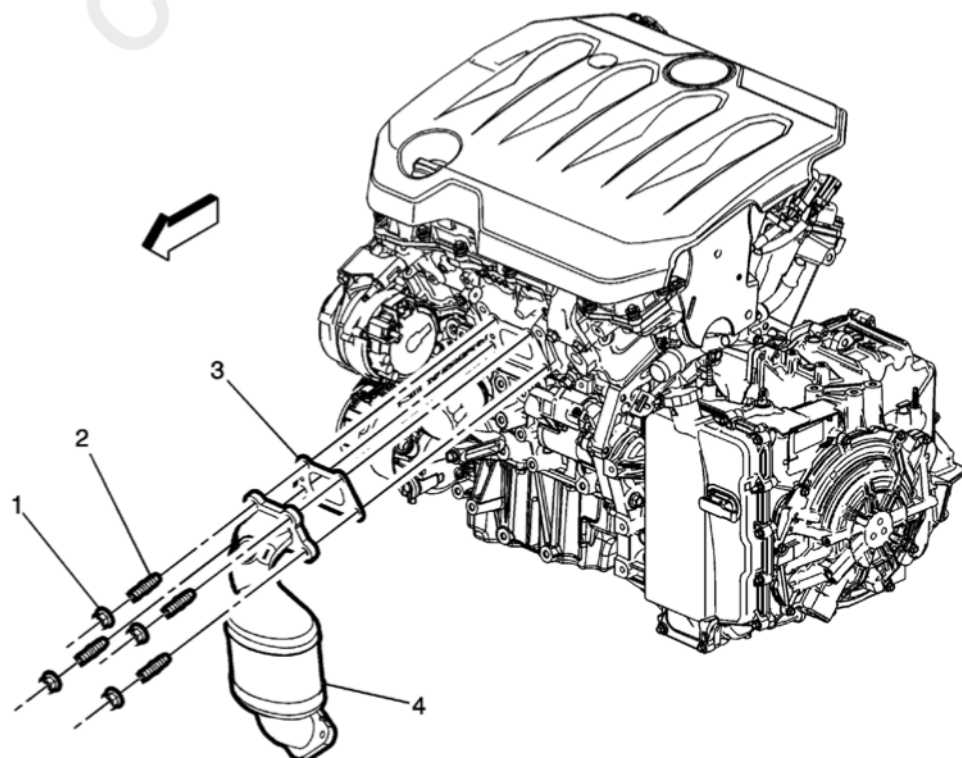


Fig. 32: Exhaust Front Pipe And Fasteners
 Courtesy of GENERAL MOTORS COMPANY

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

THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LFX - BANK 2)



Callout	Component Name
WARNING: Refer to Hot Exhaust System Warning . WARNING: Refer to Safety Glasses Warning . Preliminary Procedure 1. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement (LFX) . 2. Remove the secondary air injection bypass valve, if equipped. Refer to Secondary Air Injection Bypass Valve Replacement - Bank 2 . 3. Disconnect the exhaust front pipe from the catalytic converter. Refer to Front Pipe Replacement (LFX) . ã,â	
1	Catalytic Converter - Front Fasteners (Qty: 4) CAUTION: To prevent damage to the exhaust manifold flange or stud, make sure the flange is fully seated before tightening. CAUTION: Refer to Fastener Caution . Procedure 1. Disconnect the oxygen sensor electrical connectors. 2. Replace the exhaust front pipe fasteners with NEW fasteners. 3. Clean and inspect the studs on the engine cylinder head, replace as necessary. 4. Verify that the studs are fully seated. Stud collar should touch the surface of the engine cylinder head. 5. Tighten fasteners in a criss-cross pattern. Tighten 1. First Pass: 20 N.m (15 lb ft) 2. Final Pass: 45 N.m (33 lb ft)
2	Gasket NOTE: Replace the exhaust gasket with a NEW exhaust gasket.
3	Catalytic Converter Studs (Qty: 4) Tighten 14 N.m (124 lb in)
4	Catalytic Converter - Front NOTE: If replacing catalytic converter, transfer oxygen sensors.

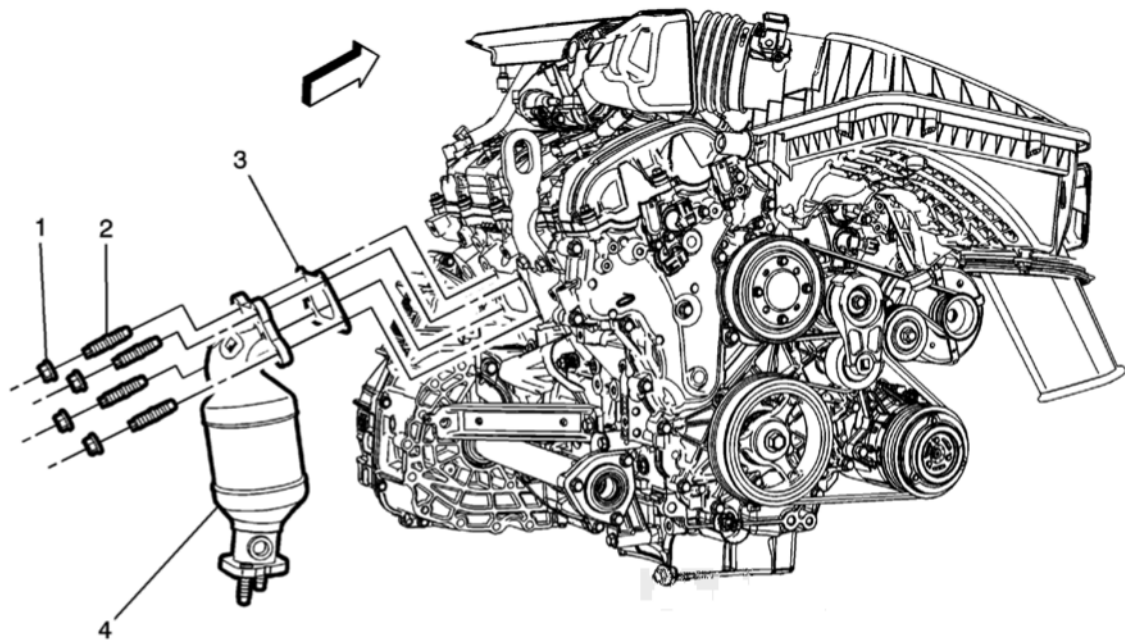


Fig. 34: Three-Way Catalytic Converter & Mounting Components (LFX - Bank 1)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Hot Exhaust System Warning .	
WARNING: Refer to Safety Glasses Warning .	
Preliminary Procedure	
1. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement (LFX) . 2. Remove the secondary air injection bypass valve, if equipped. Refer to Secondary Air Injection Bypass Valve Replacement - Bank 1 . 3. Remove the right front wheel. Refer to Tire and Wheel Removal and Installation . 4. Remove the exhaust front pipe. Refer to Front Pipe Replacement (LFX) .	
Ã,Ã	

Callout	Component Name
1	Catalytic Converter - Rear Fasteners (Qty: 4) CAUTION: To prevent damage to the exhaust manifold flange or stud, make sure the flange is fully seated before tightening. CAUTION: Refer to Fastener Caution . Procedure 1. Disconnect the oxygen sensor electrical connectors. 2. Replace the exhaust front pipe fasteners with NEW fasteners. 3. Clean and inspect the studs on the engine cylinder head, replace as necessary. 4. Verify that the studs are fully seated. Stud collar should touch the surface of the engine cylinder head. 5. Tighten fasteners in a criss-cross pattern. Tighten 1. First Pass: 20 N.m (15 lb ft) 2. Final Pass: 45 N.m (33 lb ft)
2	Gasket NOTE: Replace the exhaust gasket with a NEW exhaust gasket.
3	Catalytic Converter Studs (Qty: 4) Tighten 14 N.m (124 lb in)
4	Catalytic Converter - Rear NOTE: If replacing catalytic converter, transfer oxygen sensors.

EXHAUST PIPE FRONT HANGER BRACKET REPLACEMENT

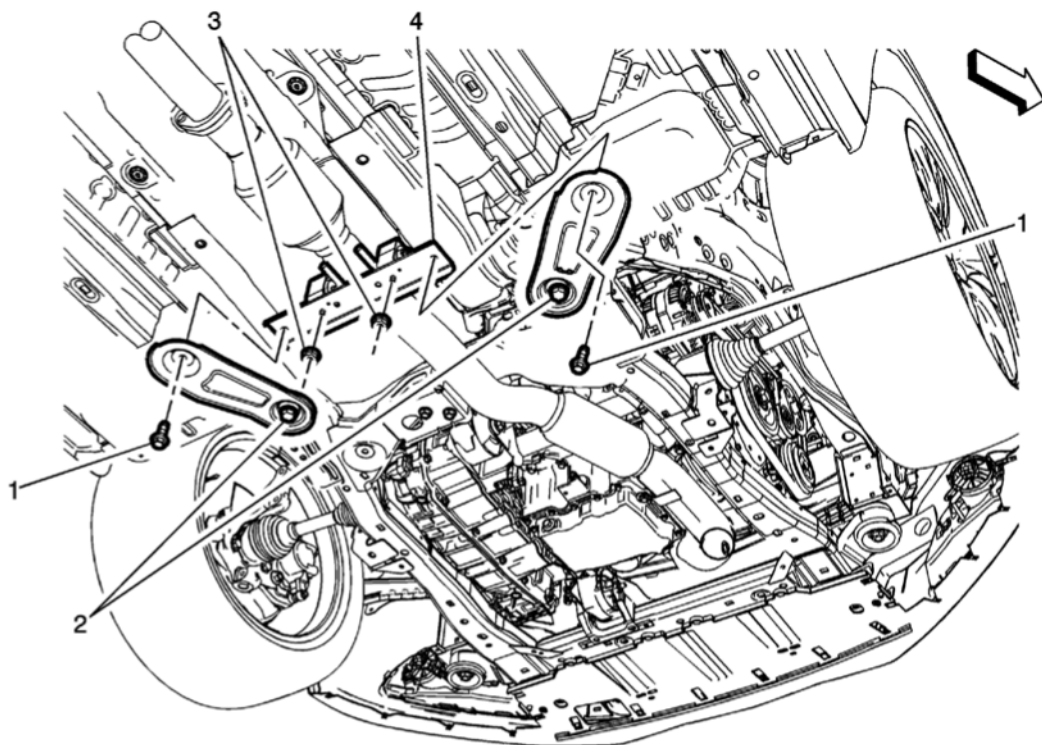


Fig. 35: Exhaust Pipe Front Hanger Bracket
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Moving Parts and Hot Surfaces Warning . WARNING: Refer to Safety Glasses Warning . Preliminary Procedure 1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Place a suitable jack under the drivetrain and front suspension frame.	
1	Drivetrain and Front Suspension Frame Fasteners (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 60 N.m (44 lb ft) + 30 Degrees
2	Drivetrain and Front Suspension Fasteners (Qty: 2) NOTE: It is only necessary to loosen the fasteners to allow the frame reinforcements to be rotated out of the way of the hanger bracket. Tighten 160 N.m (118 lb ft)
3	Exhaust Pipe Front Hanger Bracket Fasteners (Qty: 2) Tighten 35 N.m (26 lb ft)
4	Exhaust Pipe Front Hanger Bracket

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](#) .

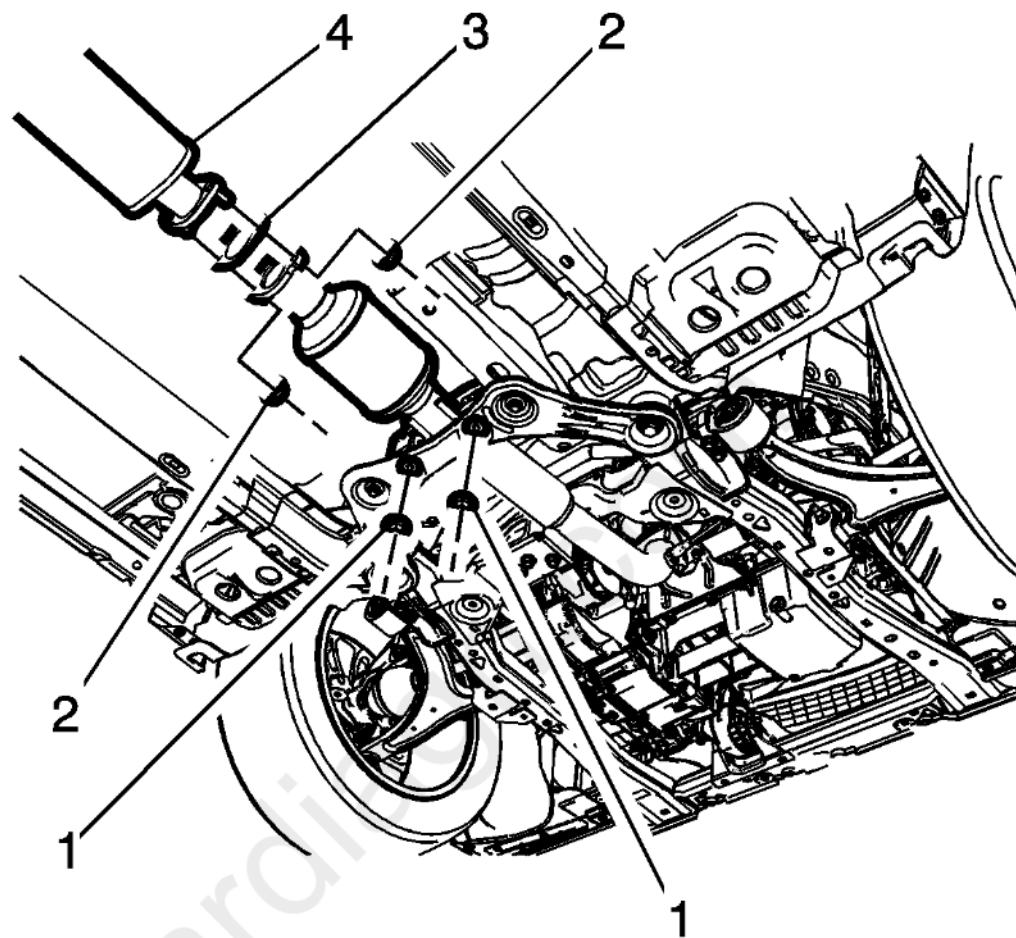


Fig. 36: Exhaust Front Pipe And Rear Muffler Assembly

Courtesy of GENERAL MOTORS COMPANY

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

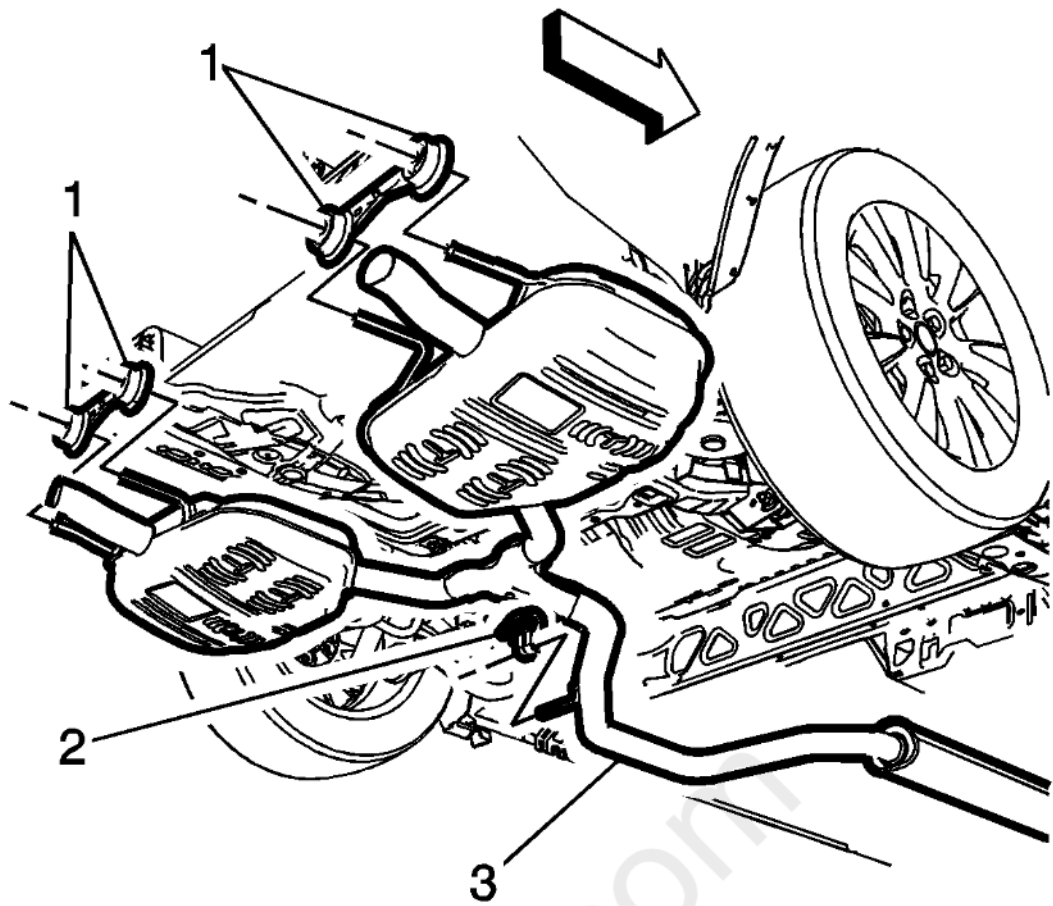


Fig. 37: Exhaust Muffler And Rear Exhaust Hanger Isolators

Courtesy of GENERAL MOTORS COMPANY

4. 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.

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

Installation Procedure

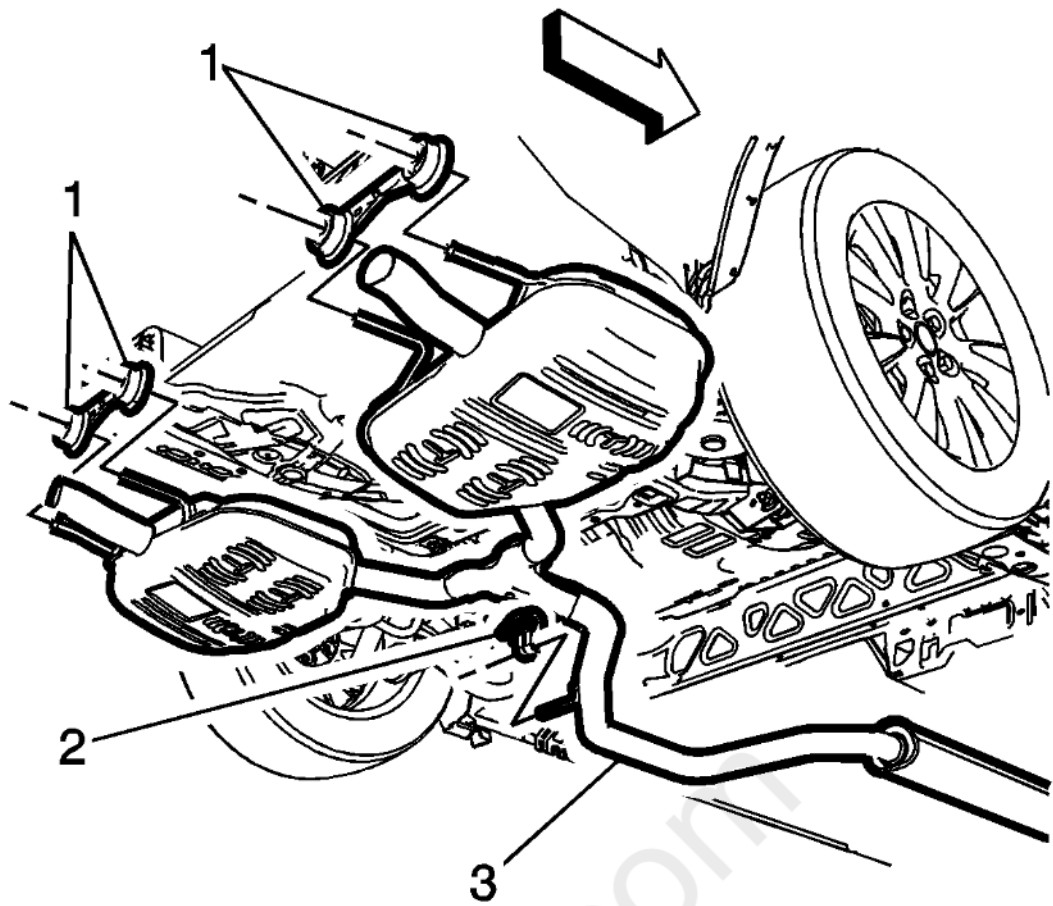


Fig. 38: Exhaust Muffler And Rear Exhaust Hanger Isolators

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).

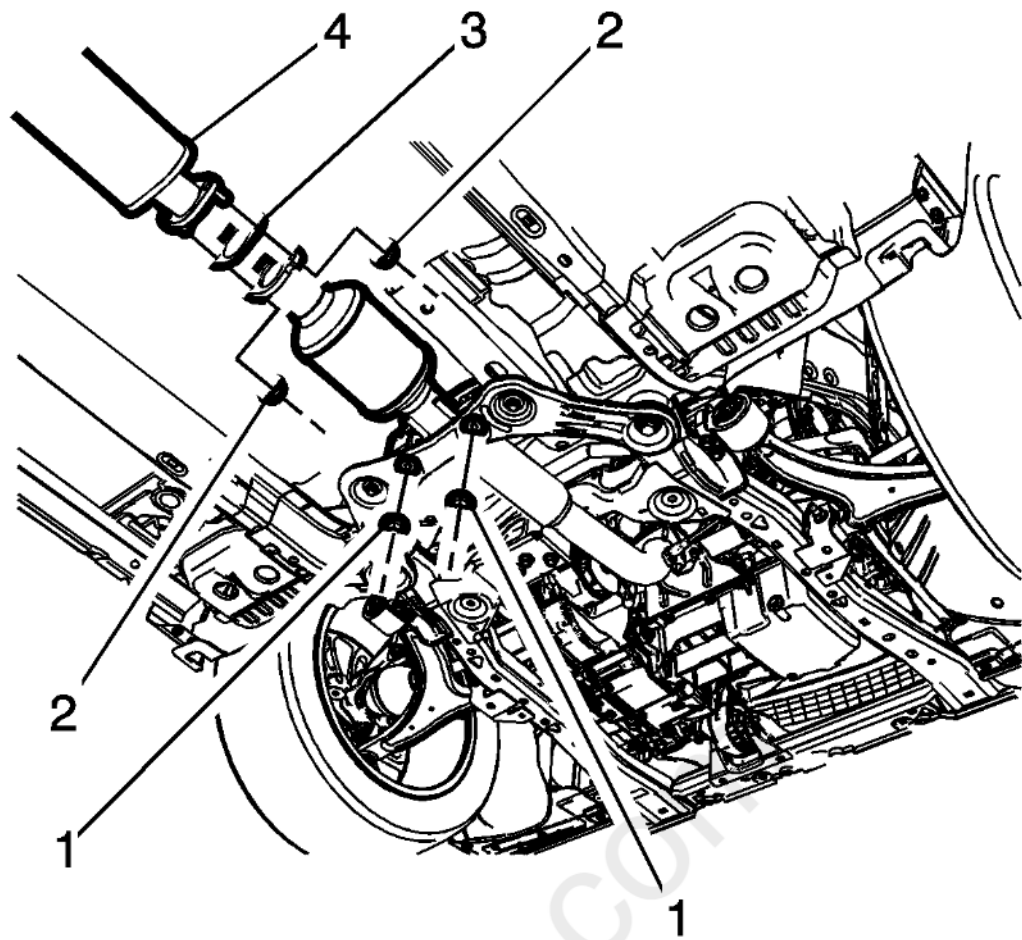


Fig. 39: Exhaust Front Pipe And Rear Muffler Assembly

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 MANIFOLD HEAT SHIELD REPLACEMENT

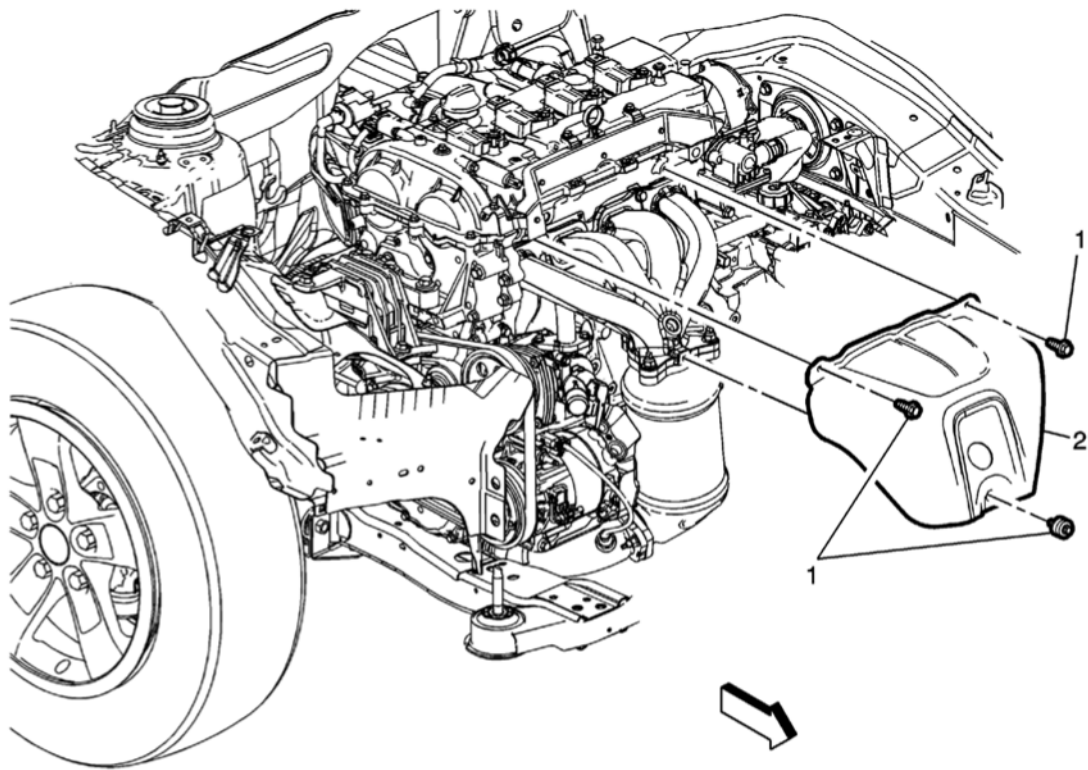


Fig. 40: Exhaust Manifold Heat Shield (LCV)
 Courtesy of GENERAL MOTORS COMPANY

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

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 hangers
- Exhaust heat shields

Catalytic Converter

Through developments in various emissions reduction system, significant reductions in emissions have been achieved. The developments have been primarily concerned with refinements in engine calibration and the optimization of exhaust system catalytic converter configurations.

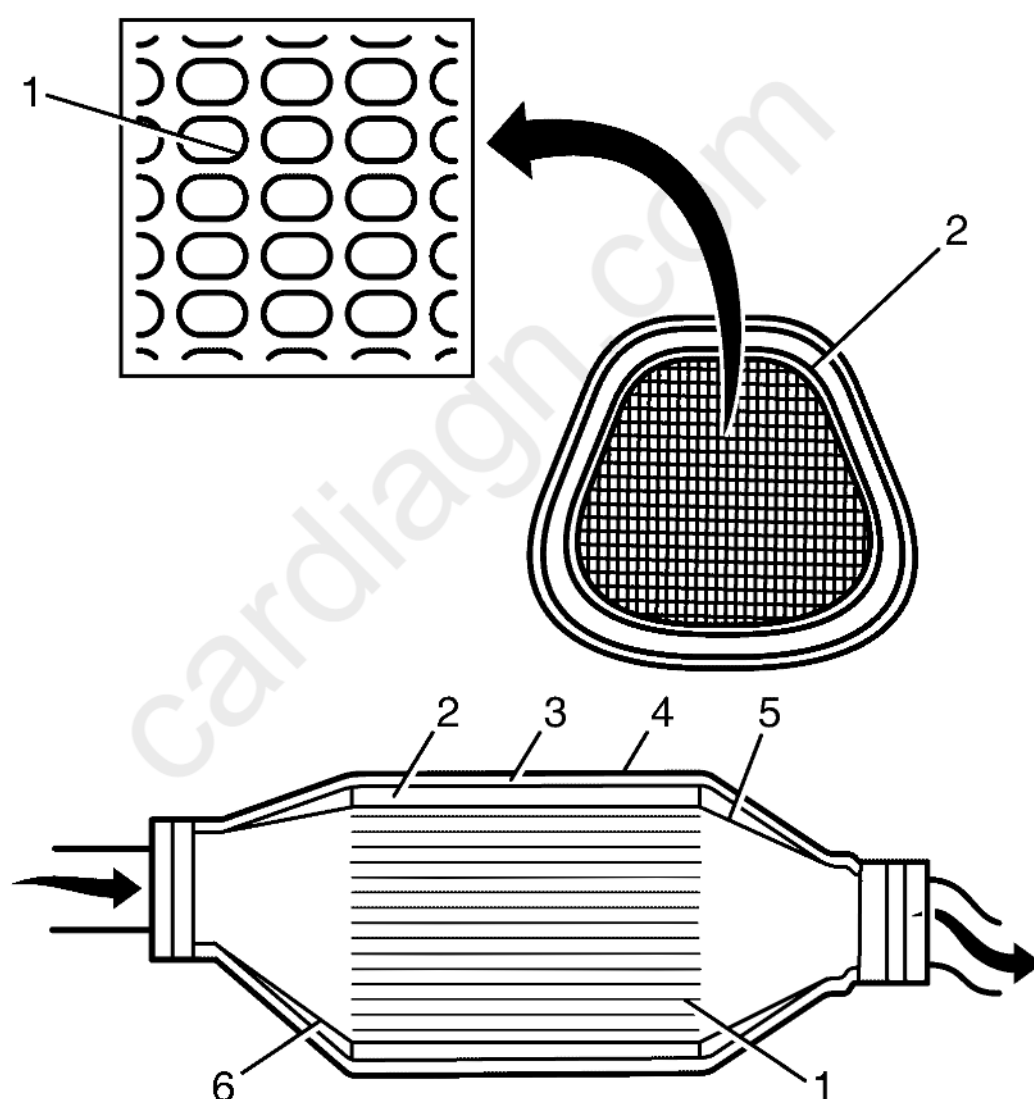


Fig. 41: Ceramic Monolith

Courtesy of GENERAL MOTORS COMPANY

The catalytic converter is similar to a muffler in appearance however, within the outer stainless steel shell (4), there is a ceramic monolith (1) which is honeycombed in the direction of the exhaust, as shown. The ceramic monolith is surrounded by a mat (2), which has the primary function of holding the monolith firmly in place to prevent any contact with the inner shell (3). A mesh (5 and 6) at each end of the converter prevents exhaust gases from fouling and eroding the mat.

Surfaces of the ceramic monolith that are exposed to exhaust gases are coated with a catalytic material. This material contains rhodium and platinum, which act to facilitate the chemical reactions necessary to oxidize carbon monoxide

and hydrocarbons into harmless carbon dioxide.

The catalytic converter is a substance that accelerates a chemical reaction without itself being changed. Engine exhaust gases contain carbon monoxide (CO), hydrocarbons (HC) and oxides of nitrogen (NOx). When the exhaust gases flow through the monolith, reactions with the catalytic converter occur. CO and HC are converted by oxidation with oxygen (O₂) in the exhaust gases to produce carbon dioxide (CO₂) and water vapor (H₂O). NOx is converted by reduction with CO to produce nitrogen (N₂). The catalytic converter is called a three - way type because it simultaneously converts three components of exhaust gas (CO, HC and NOx) to harmless natural gases.

Service Notes

- Vehicles fitted with a catalytic converter should not be operated with leaded petrol. Lead will contaminate the catalytic converter.
- Do not drop the catalytic converter as it will damage the ceramic monolith.
- Do not allow water, oil or fuel to enter the converter as the ceramic monolith will be contaminated.
- Do not drive the vehicle with the engine misfiring or with any of the spark plug leads disconnected.

NOTE: **Catalytic converter can be damaged or rendered infective, if:**

- Operated outside the limits of the closed loop mixture control system.
- The engine burns excessive amount of oil.
- The exhaust temperature at the converter is too high (exceeds 840°C).

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.

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.

The center mufflers on vehicles fitted with the LFW engine option contains a variable exhaust valve. The purpose of the valve is to reduce exhaust noise for minimal impact on performance and back pressure. The valve consists of a spring loaded flap which is closed at lower gas flow (lower engine speed/load) forcing the exhaust gasses through a more restrictive path therefore providing improved noise performance. As gas flow increases with higher engine load/speed, the valve opens providing a less restrictive path for the exhaust gases and therefore providing good wide open throttle performance.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description

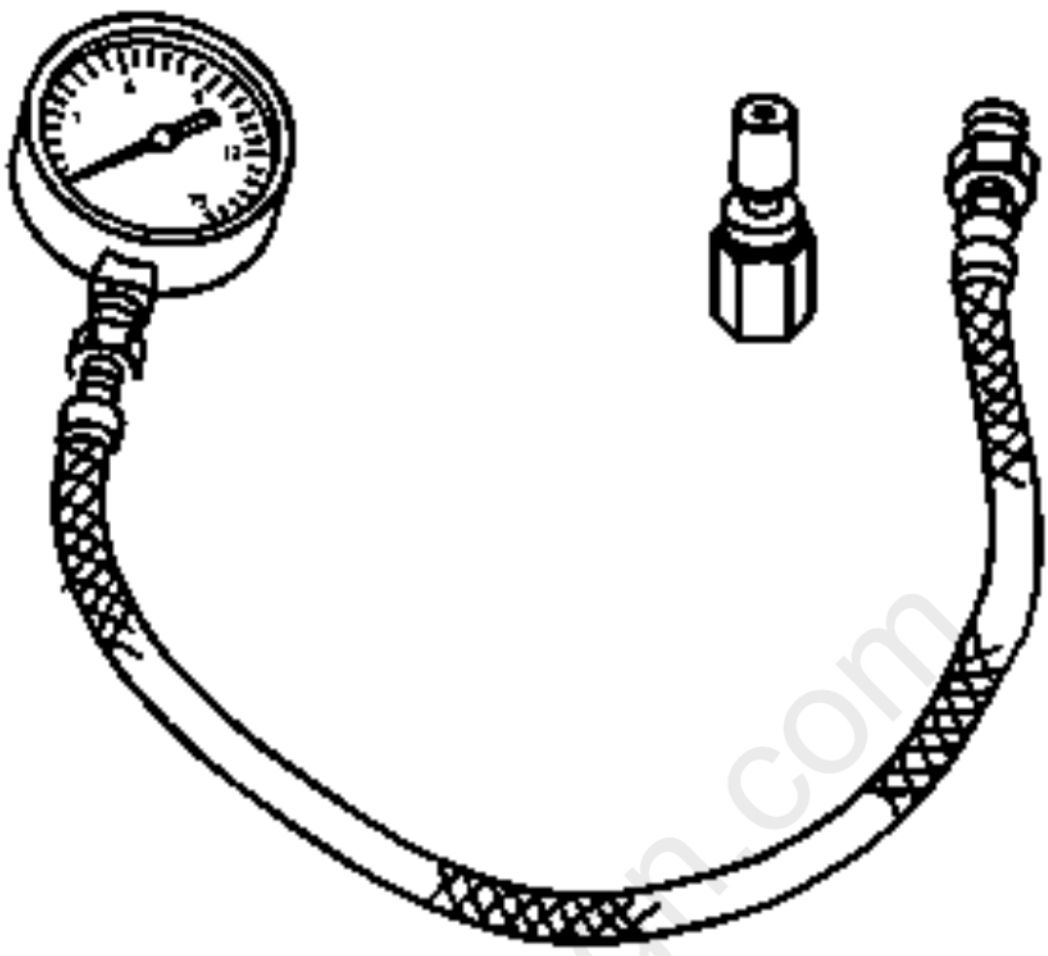
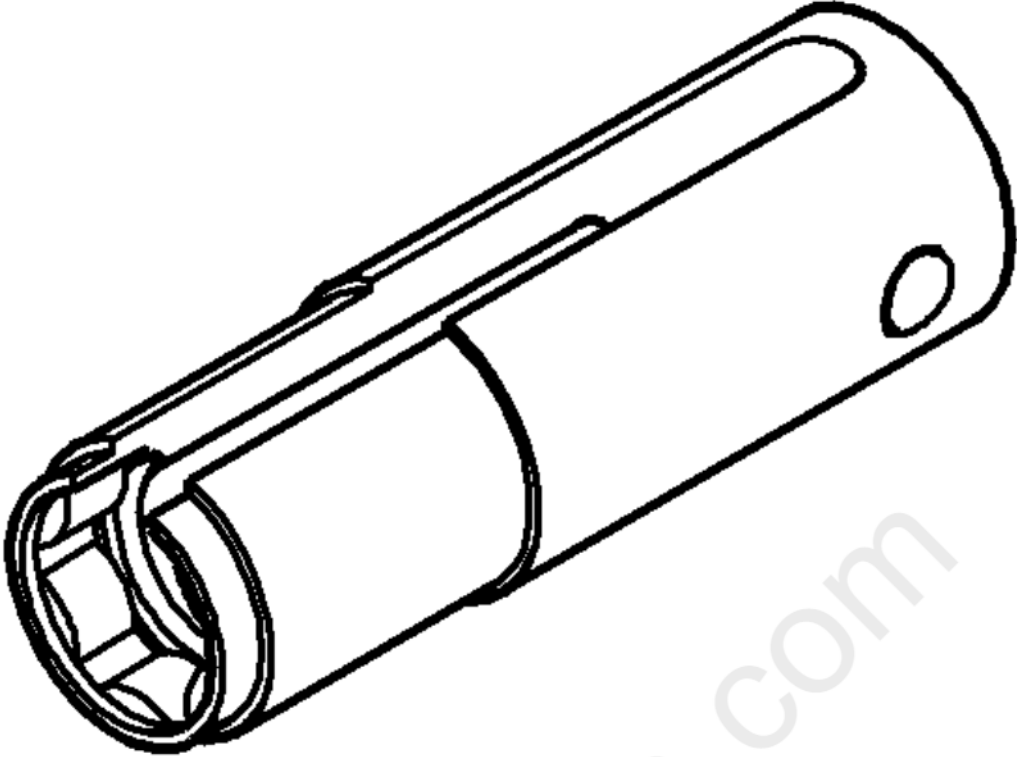
Illustration	Tool Number/Description
	J 35314-A Exhaust Back Pressure Gauge

Illustration	Tool Number/Description
	CH 39194-C Oxygen Sensor Remover/Installer