SPECIFICATIONS

FASTENER SPECIFICATIONS

Single Use Non-Threaded Fasteners/Components

NOTE: *All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.*
Application
Catalytic Converter Seal
Exhaust Front Pipe Gasket
Exhaust Gasket
Exhaust Manifold Gasket
Exhaust Muffler Flange Gasket
Exhaust Particulate Filter Gasket
Exhaust Pipe Seal
Exhaust Turbocharger Inlet Pipe Gasket
Exhaust Seal

Single Use Threaded Fastener/Component Tightening Specifications

NOTE: *All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.*	
Application	**Specification** **Metric (English)**
Catalytic Converter Band Clamp (L5P)	
• First Pass:	7-12 N.m (62-106 lb in)
• Second Pass:	Loosen approximately 2 turns.
• Final Pass:	12 N.m (106 lb in)

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NOTE:
All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application	Specification Metric (English)
Exhaust Muffler Clamp (LV3, L83, L8B, L86)	28 N.m (21 lb ft)
Turbocharger to Catalytic Converter Band Clamp (L5P)	
• First Pass:	7-12 N.m (62-106 lb in)
• Second Pass:	Loosen approximately 2 turns.
• Final Pass:	12 N.m (106 lb in)

Reusable Threaded Fastener Tightening Specifications

Note: All fasteners listed in this table can be reused after removal.	
Application	Specification Metric (English)
Catalytic Converter to Exhaust Manifold Nut (LC8, LV3, L83, L8B, L86, L96)	50 N.m (37 lb ft)
Catalytic Converter Heat Shield Bolt (L5P, Long Bolt)	10 N.m (89 lb in)
Catalytic Converter Heat Shield Bolt (L5P, Short Bolt)	25 N.m (18 lb ft)
Catalytic Converter to Muffler Nut (LC8, LV3, L83, L8B, L86, L96)	45 N.m (33 lb ft)
Exhaust Front Bracket Bolt (L5P)	25 N.m (18 lb ft)
Exhaust Front Bracket Nut (L5P)	50 N.m (37 lb ft)
Exhaust Front Pipe Nut (L5P)	50 N.m (37 lb ft)
Exhaust Heat Shield Nut	9 N.m (80 lb in)
Exhaust Manifold Bolt (LV3, L83, L8B, L86)	
Existing Cylinder Head	23 N.m (17 lb ft)
New Cylinder Head	27 N.m (20 lb ft)
Exhaust Manifold Bolt (L5P)	20 N.m (15 lb ft)
Exhaust Manifold Bolt (L96, LC8)	
First Pass:	15 N.m (11 lb ft)
Final Pass:	20 N.m (15 lb ft)
Exhaust Manifold Heat Shield Bolt (LC8, L96)	20 N.m (15 lb ft)
Exhaust Manifold Heat Shield Fastener (LV3, L83, L86, L8B)	12 N.m (106 lb in)
Exhaust Manifold Heat Shield Bolt (L5P)	10 N.m (89 lb in)

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Exhaust Manifold Nut (L5P)	25 N.m (18 lb ft)
Exhaust Muffler Clamp Nut	28 N.m (21 lb ft)
Exhaust Muffler Nut	45 N.m (33 lb ft)
Exhaust Particulate Filter Nut (L5P)	45 N.m (33 lb ft)
Exhaust Turbocharger Inlet Pipe Adapter Bolt (L5P)	58 N.m (43 lb ft)
Exhaust Turbocharger Inlet Pipe Bolt (L5P)	25 N.m (18 lb ft)
Front Body Exhaust Heat Shield Fastener	9 N.m (80 lb in)
Rear Body Exhaust Heat Shield Fastener	9 N.m (80 lb in)
Shock Absorber Lower Bolt and Nut	95 N.m (70 lb ft)
Turbocharger Heat Shield Bolt (L5P)	10 N.m (89 lb in)
Warm Up Nitrogen Oxides Catalytic Converter Nut (L5P)	45 N.m (33 lb ft)
Surge Tank Nut (LC8, L96)	9 N.m (80 lb in)
Surge Tank Nut (L83, L86, LV3)	10 N.m (89 lb in)
Thermostat Bypass Pipe Bolt (L5P)	25 N.m (18 lb ft)
Turbocharger Coolant Feed Pipe Bolt (Large, L5P)	25 N.m (18 lb ft)
Turbocharger Coolant Feed Pipe Bolt (Small, L5P)	10 N.m (89 lb in)
Turbocharger Coolant Return Pipe Bolt (L5P)	10 N.m (89 lb in)
Water Outlet Bolt (L5P)	25 N.m (18 lb ft)
Water Pump Bolt (LV3, L8B, L83)	10 N.m (89 lb in)
Water Pump Bolt (L96, LC8)	
First Pass:	15 N.m (11 lb ft)
Final Pass:	30 N.m (22 lb ft)
Water Pump Bolt (L5P)	25 N.m (18 lb ft)
Water Pump Nut (L5P)	25 N.m (18 lb ft)
Water Pump Outlet Pipe Nut (L5P)	25 N.m (18 lb ft)
Water Pump Outlet Pipe Stud (L5P)	9 N.m (80 lb in)

SCHEMATIC WIRING DIAGRAMS

EXHAUST SYSTEM WIRING SCHEMATICS

Exhaust Brake (K40)

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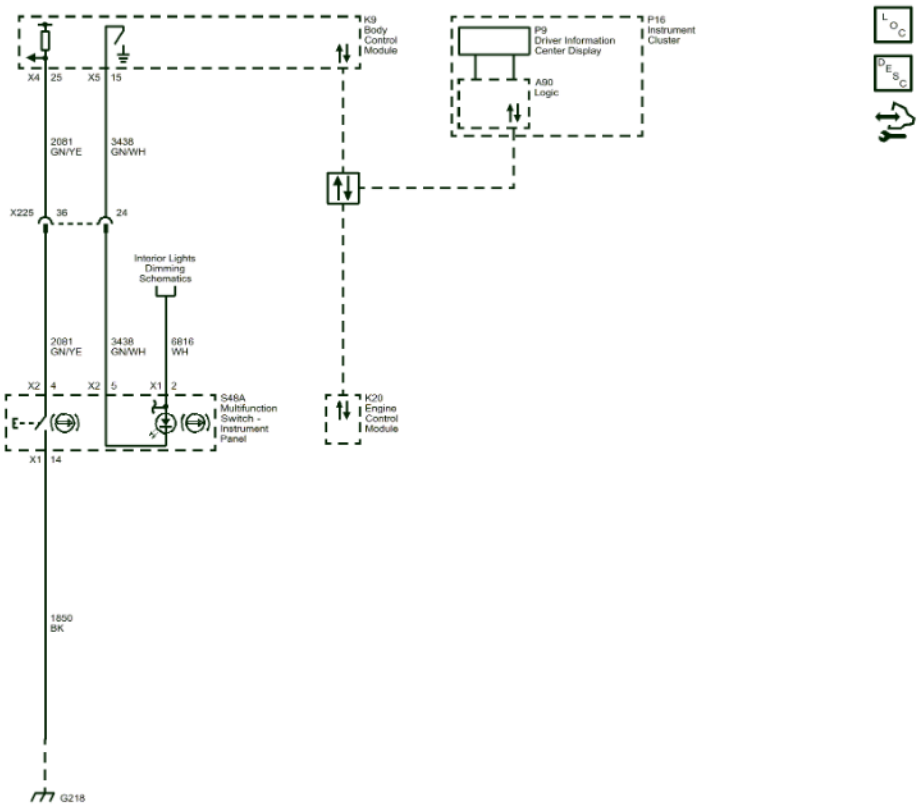


Fig. 1: Exhaust Brake (K40)
Courtesy of GENERAL MOTORS COMPANY

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

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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: **Refer to Exhaust Service Warning .**

NOTE: **Do not replace a restricted particulate filter. Repair the engine condition that clogged the particulate filter, and then attempt to perform a service regeneration. Refer to Diesel Particulate Filter (DPF) Service Regeneration .**

If the vehicle is equipped with a 6.6 L diesel engine do not perform this

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diagnostic. The exhaust system does not have a location for installing the J 35314-A exhaust back pressure gauge. Instead remove the suspect component, operate the vehicle, verify for improved performance. If performance is improved then replace the faulty component.

NOTE: **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. 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**
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.	14 kPa (2 psi)	Go to **Step 5**	Go to **Step 8**

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Step	Action	Value(s)	Yes	No
	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?			
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**	-
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.	-	System OK	Go to **Step 2**

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Step	Action	Value(s)	Yes	No
	4. Road test the vehicle in order to verify the repair. Did you correct the condition?			

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	Replace the leaking seal or gasket. Refer to the affected components procedure for service.

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Problem	Action
exhaust manifold or cylinder head	
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.

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Condition	Action
	2. Repair or replace the affected component. Refer to the affected component's service procedure.

REPAIR INSTRUCTIONS

EXHAUST SYSTEM ALIGNMENT (L5P)

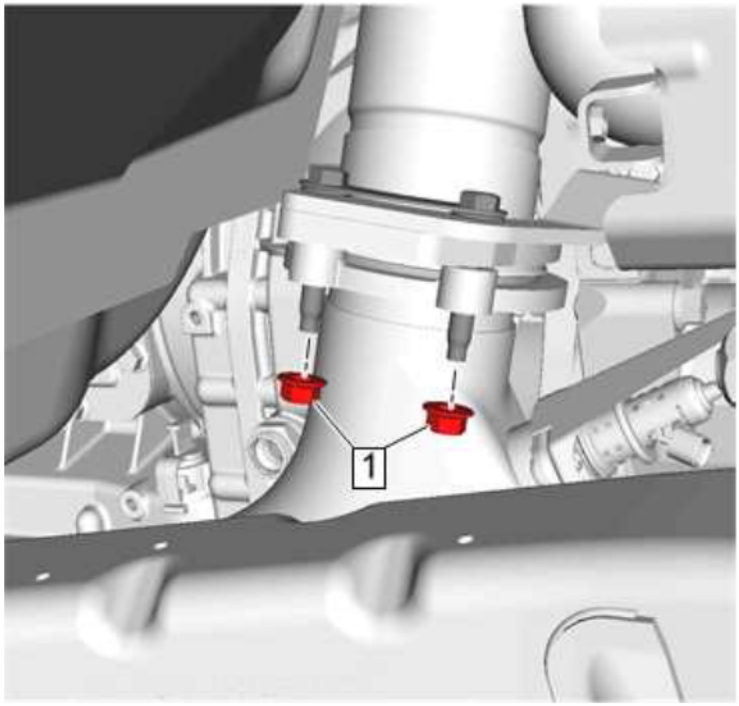


Fig. 2: Exhaust Front Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

1. Exhaust Front Pipe Nut 1 - Remove

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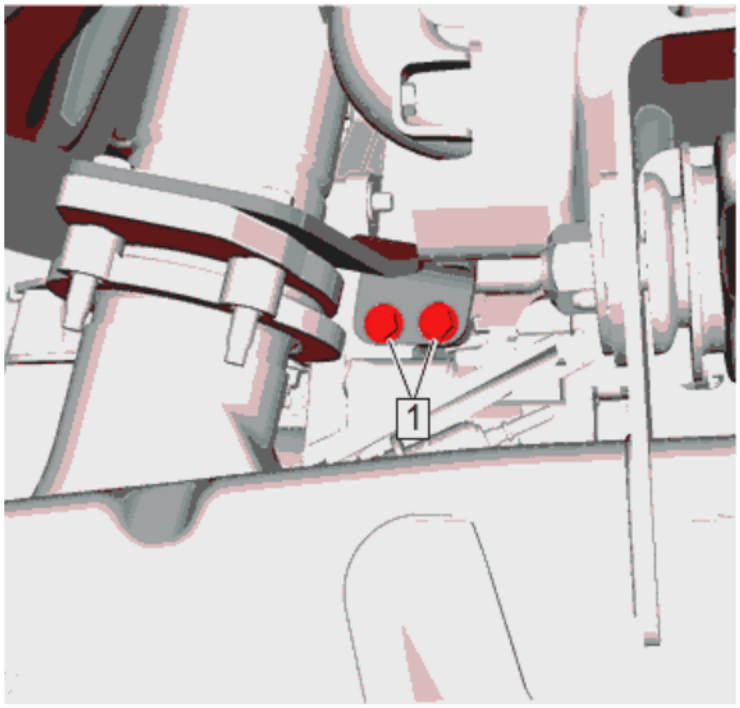


Fig. 3: Lower Exhaust Front Bracket To Flywheel Housing Bolts
Courtesy of GENERAL MOTORS COMPANY

2. Loosen the lower exhaust front bracket to flywheel housing bolts (1) 1/4 turn each.

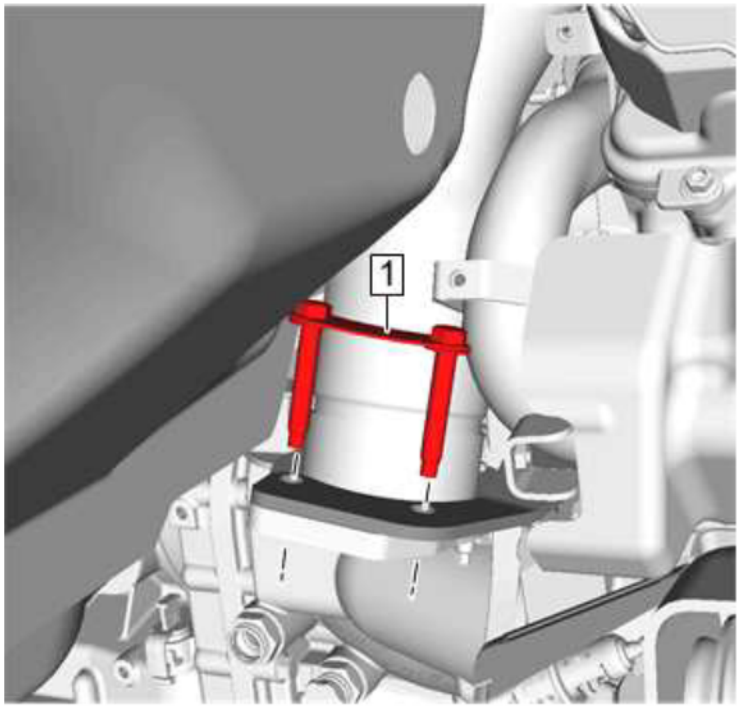


Fig. 4: Stud Plate Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **If the stud plate assembly cannot be removed, further loosen the lower exhaust front bracket to flywheel housing bolts, remove the stud plate assembly, then hand tighten the bolts and reverse 1/4 turn.**

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3. Exhaust Front Pipe Stud Plate Assembly 1 - Remove

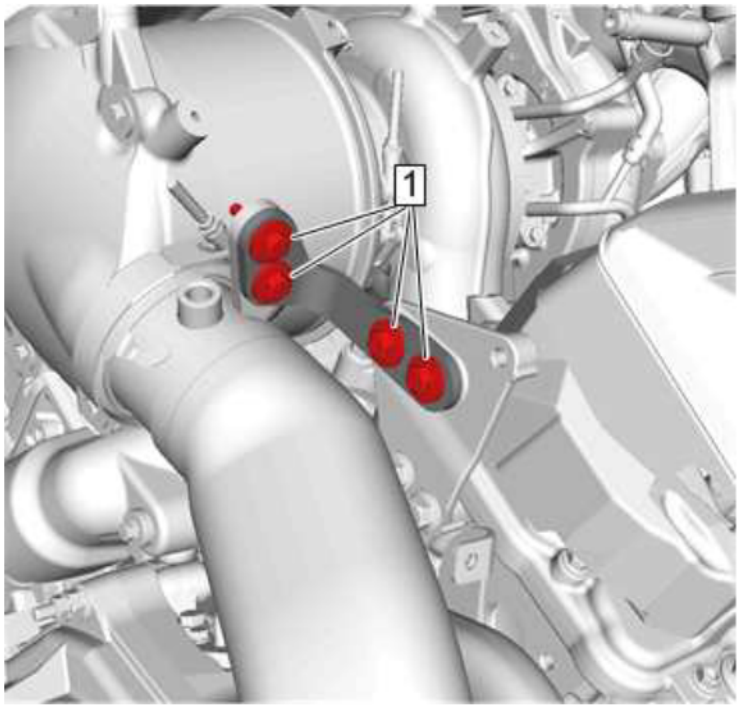


Fig. 5: Upper Exhaust Front Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

4. Loosen the upper exhaust front bracket bolts (1).

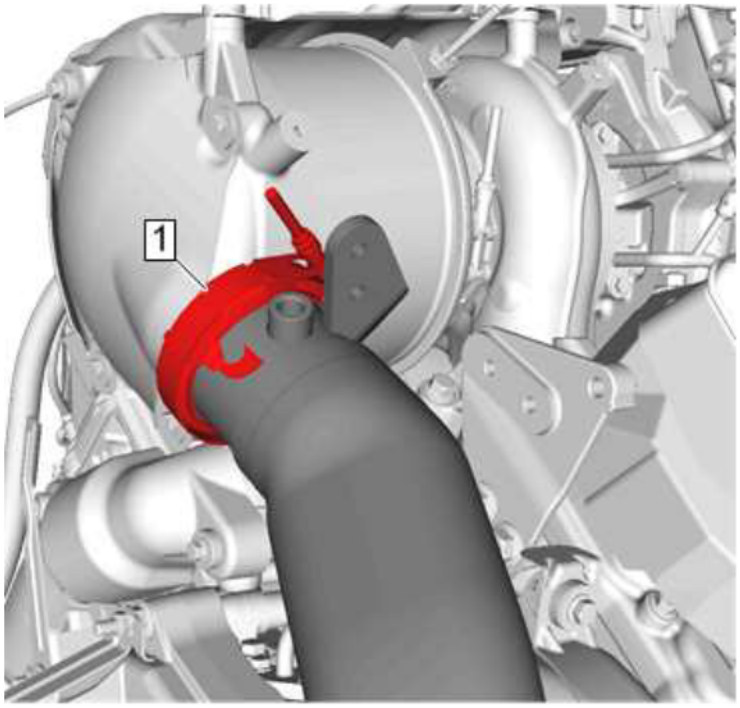


Fig. 6: Catalytic Converter Band Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Loosen the catalytic converter clamp (1) approximately 3.5 turns or just enough to allow the exhaust front pipe flange to rotate.

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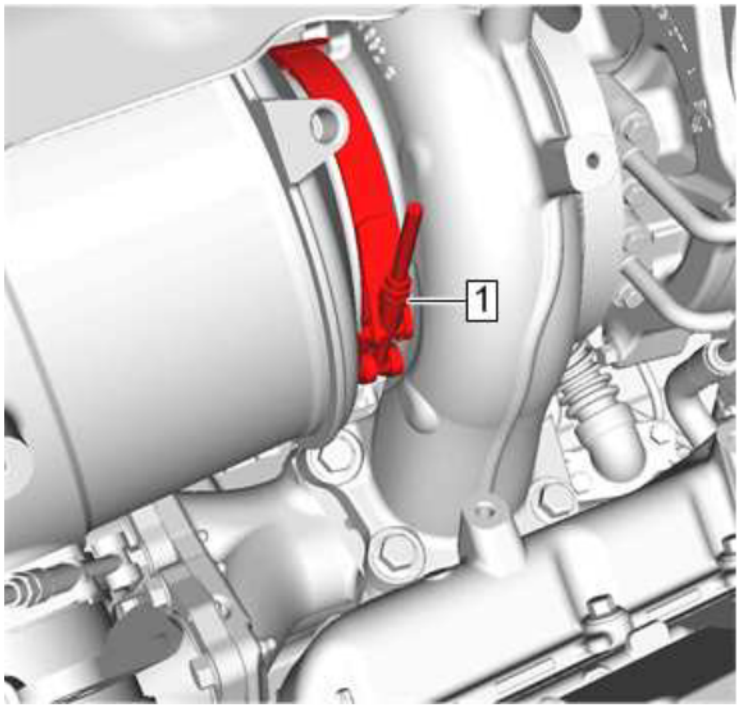


Fig. 7: Turbocharger To Catalytic Converter Band Clamp
Courtesy of GENERAL MOTORS COMPANY

6. Loosen the turbocharger to catalytic converter band clamp (1) approximately 3.5 turns or just enough to allow the converter flange to rotate.

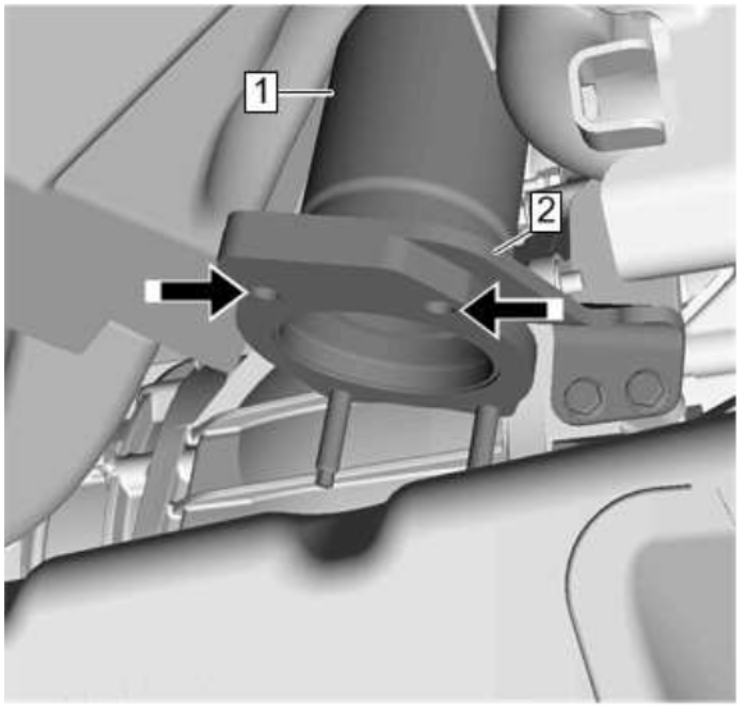


Fig. 8: Exhaust Front Pipe Alignment
Courtesy of GENERAL MOTORS COMPANY

7. Adjust the alignment of the exhaust front pipe (1) to catalytic converter by rotating, raising or lowering the pipe until the holes of the lower flange align with the lower exhaust front bracket (2).

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Use vise grips to clamp the lower exhaust front bracket to the exhaust front pipe flange.

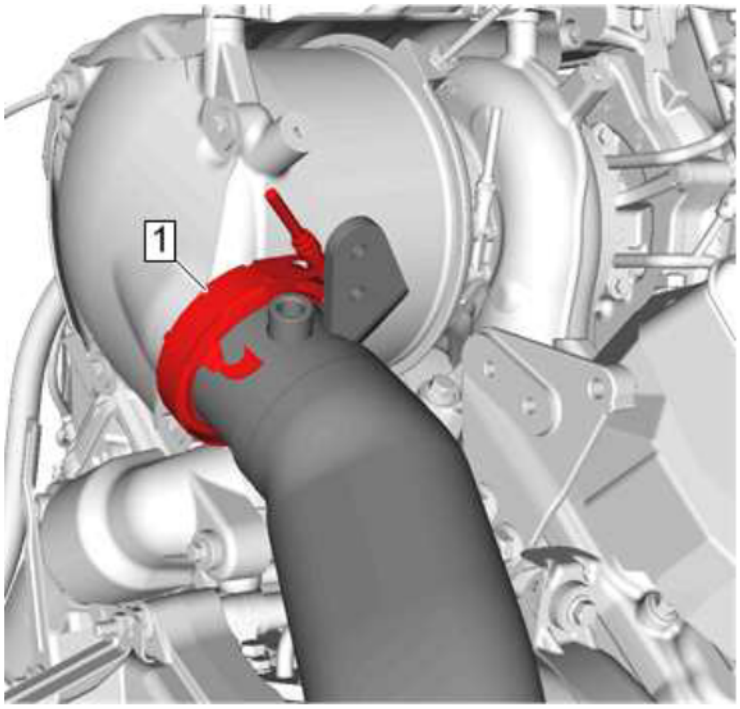
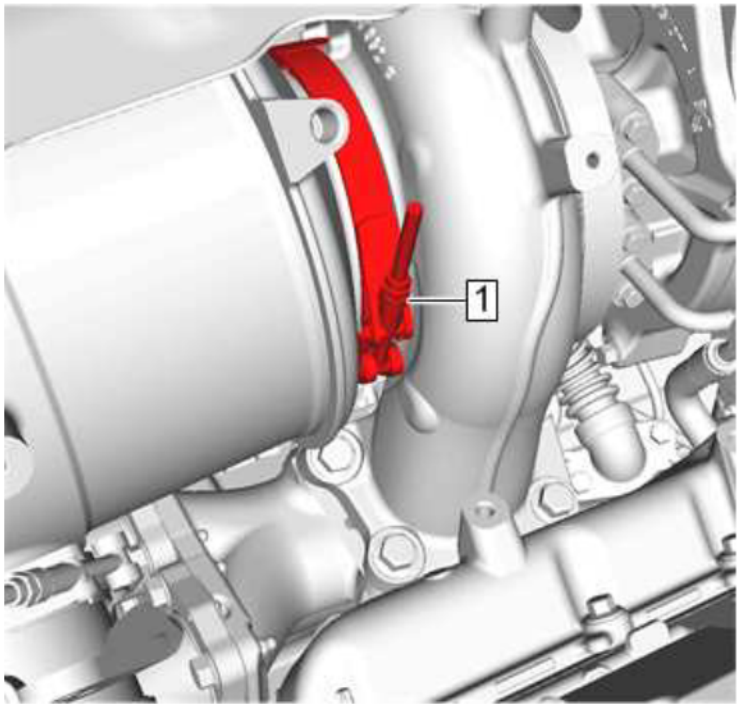


Fig. 9: Catalytic Converter Band Clamp
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

8. Tighten the catalytic converter band clamp (1).
    - First Pass: 7-12 N.m (62-106 lb in)
    - Second Pass: Loosen the clamp approximately 2 turns.
    - Final Pass: 12 N.m (106 lb in)



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Fig. 10: Turbocharger To Catalytic Converter Band Clamp
Courtesy of GENERAL MOTORS COMPANY

9. Tighten the turbocharger to catalytic converter band clamp (1).
    - First Pass: 7 - 12 N.m (62-106 lb in)
    - Second Pass: Loosen the clamp approximately 2 turns.
    - Final Pass: 12 N.m (106 lb in)

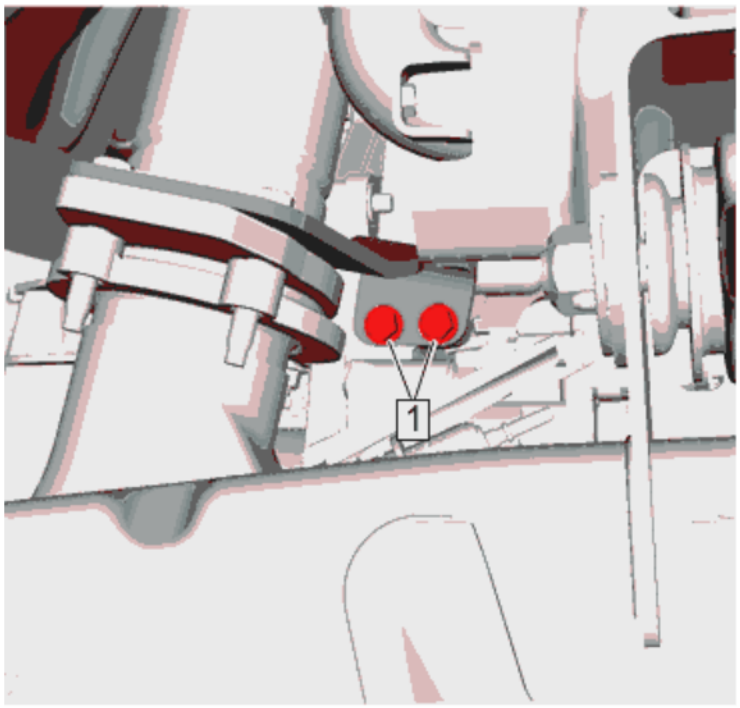


Fig. 11: Lower Exhaust Front Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

10. Tighten the lower exhaust front bracket bolts (2) to 25 N.m (18 lb ft).
11. Remove the vise grips.

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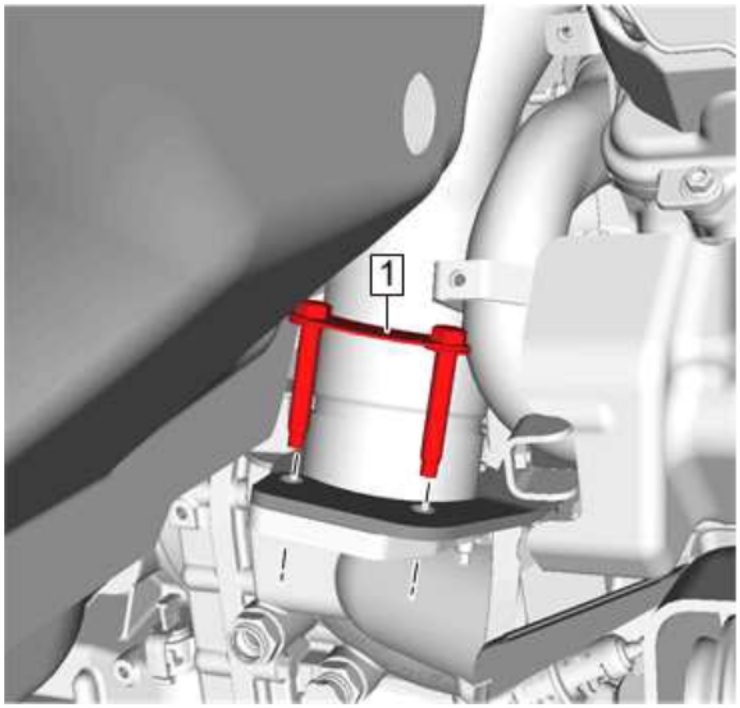


Fig. 12: Stud Plate Assembly
Courtesy of GENERAL MOTORS COMPANY

12. Drop the stud plate assembly (1) through the exhaust front bracket and exhaust front pipe flange holes.

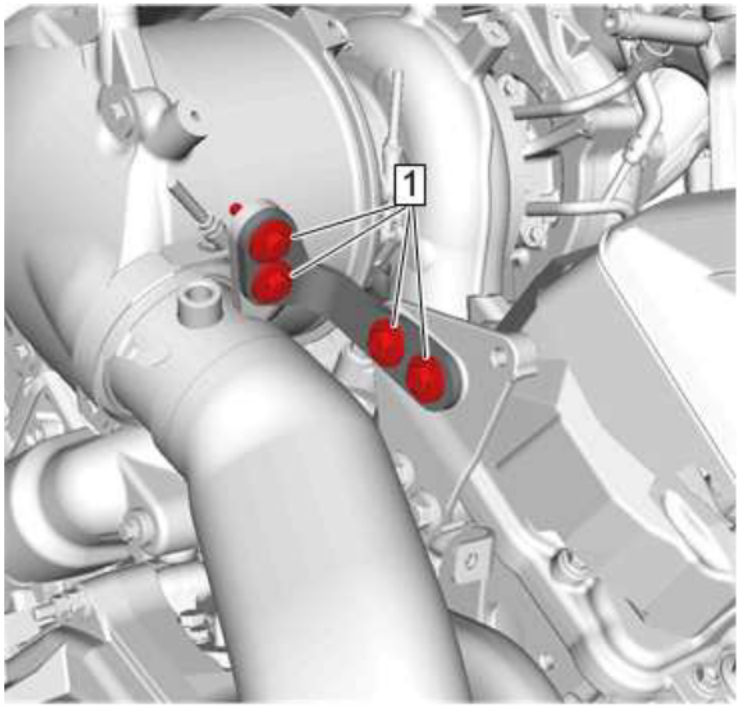


Fig. 13: Upper Exhaust Front Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

13. Tighten the upper exhaust front bracket bolts (1) to 25 N.m (18 lb ft).

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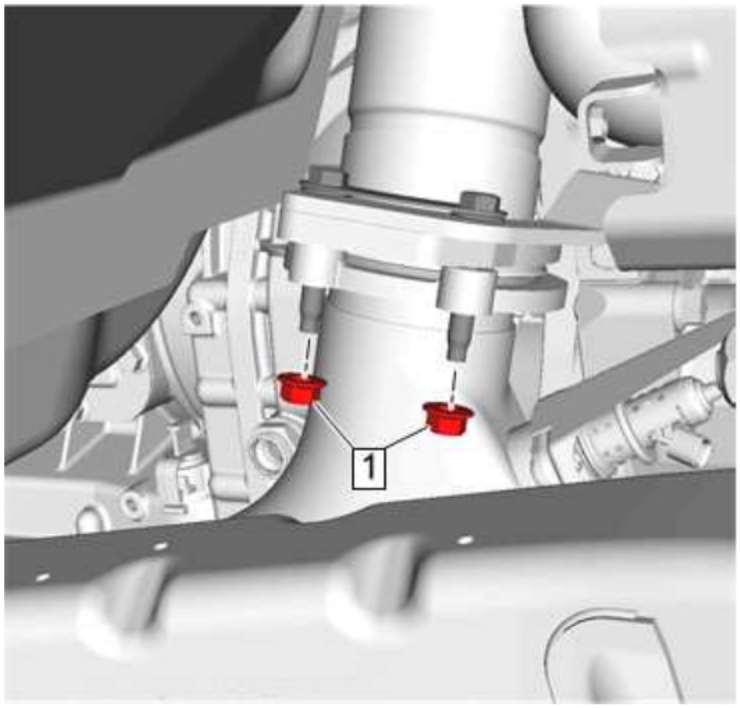


Fig. 14: Exhaust Front Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

14. Exhaust Front Pipe Nut 1 - Install and tighten 50 N.m (37 lb ft)

EXHAUST MANIFOLD REPLACEMENT - LEFT SIDE (L96, LC8)

Special Tools

J 42640 Steering Column Anti-Rotation Pin

Removal Procedure

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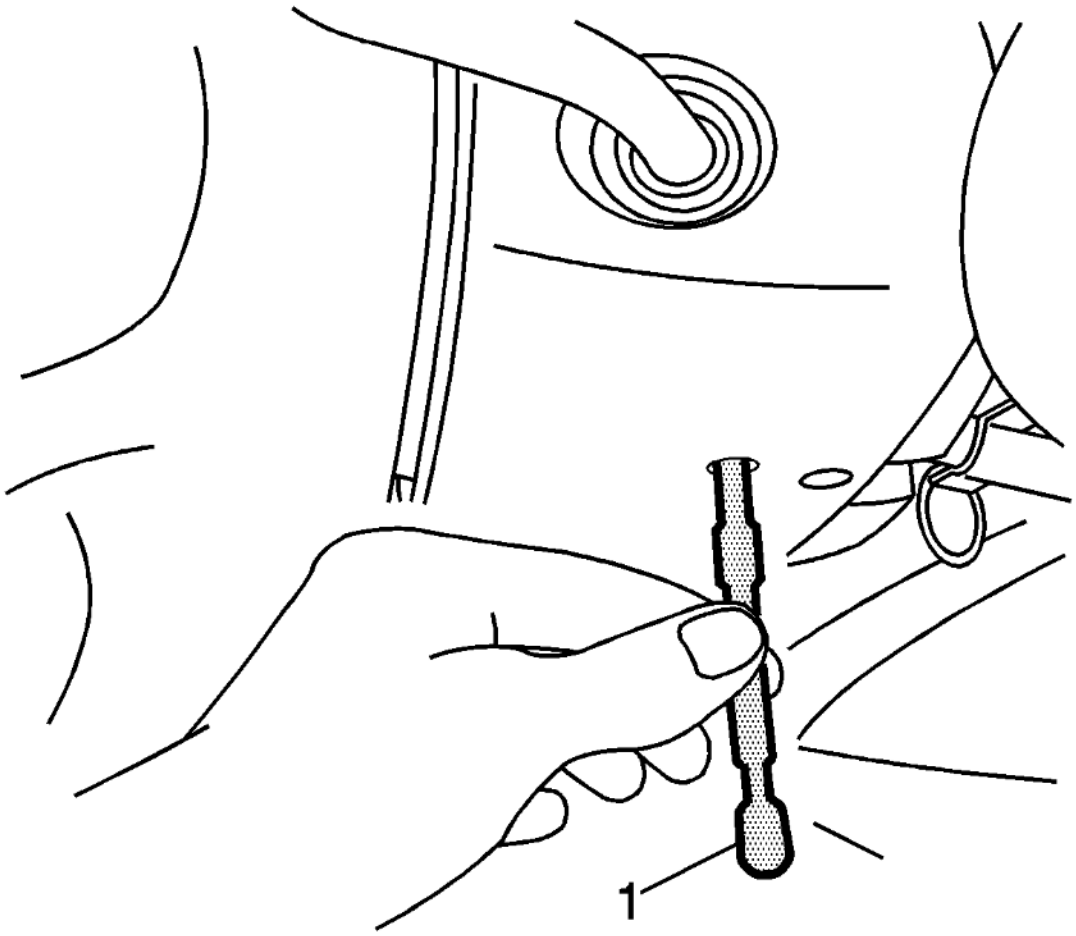


Fig. 15: Locking/Unlocking Steering Column
Courtesy of GENERAL MOTORS COMPANY

1. Install the **J 42640** steering column anti-rotation pin into the steering column lower access hole.
2. Remove the left wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement - Left Side** .
3. Fully raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

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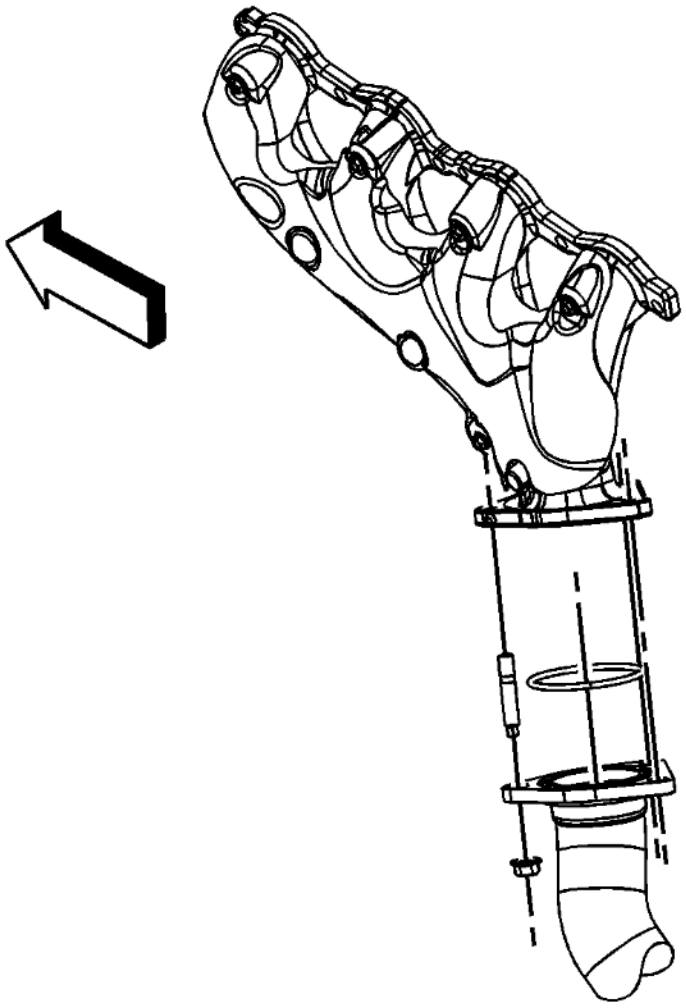


Fig. 16: View Of Exhaust Manifold, Gasket & Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

4. Remove the catalytic converter to exhaust manifold nuts. (1500 series shown, 2500 series similar).
5. Lower the vehicle part way in order to work through the wheel opening.

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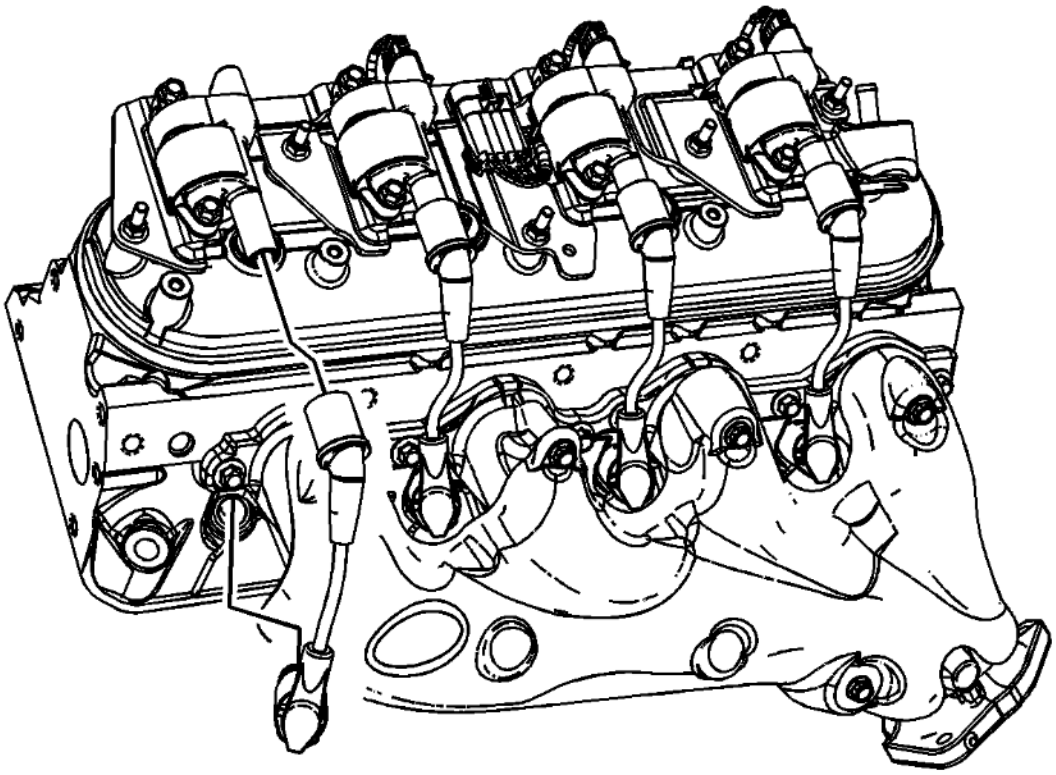


Fig. 17: View of Spark Plug Wires
Courtesy of GENERAL MOTORS COMPANY

6. Remove the spark plug wires from the spark plugs.
    1. Twist the spark plug wire boot a 1/2 turn.
    2. Pull only on the boot in order to remove the wire from the spark plug.
7. Remove the spark plug wires from the ignition coils.
    1. Twist the spark plug wire boot a 1/2 turn.
    2. Pull only on the boot in order to remove the wire from the ignition coil.

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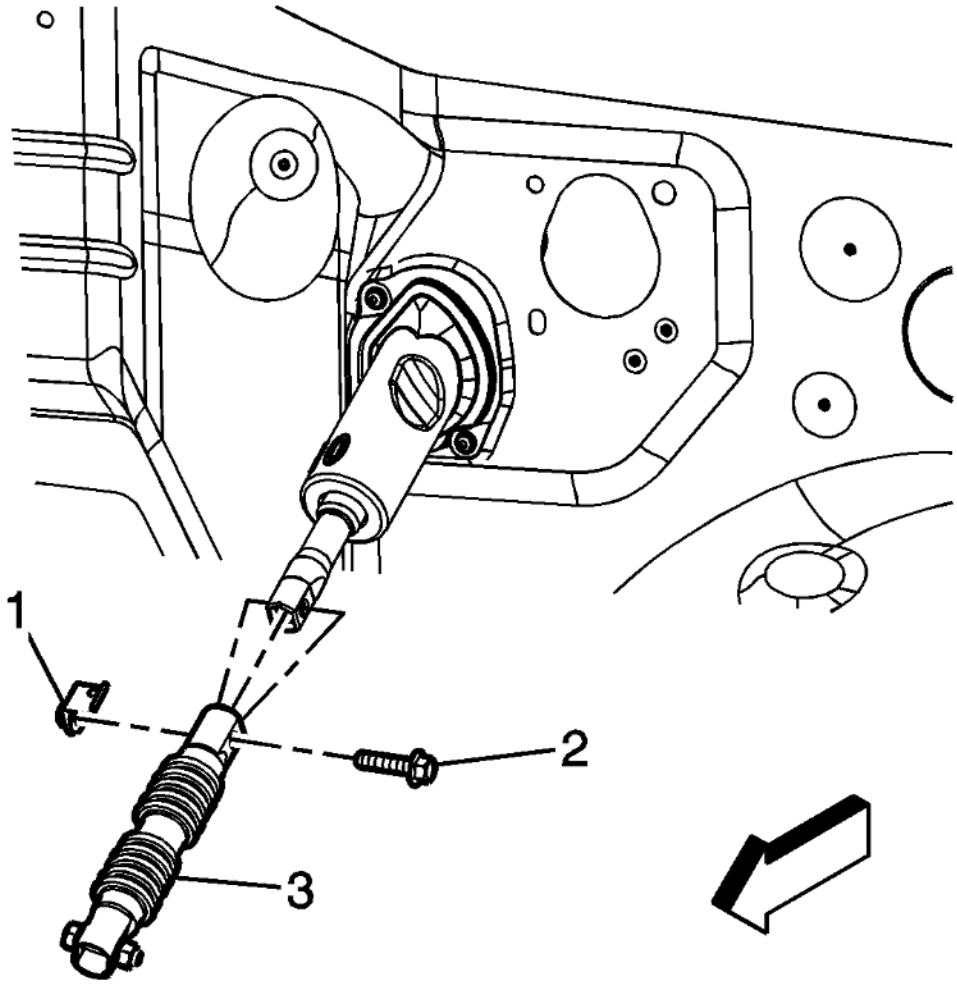


Fig. 18: View Of Steering Shaft, Coupling Bolt & Nut
Courtesy of GENERAL MOTORS COMPANY

8. Mark the relationship of the upper intermediate steering shaft to the steering column.
9. Disconnect the intermediate steering shaft. Refer to **Intermediate Steering Shaft Replacement (Light Duty)** **Intermediate Steering Shaft Replacement (Heavy Duty)** .
10. Separate the upper intermediate steering shaft (3) from the steering column, position both shafts out of the way.

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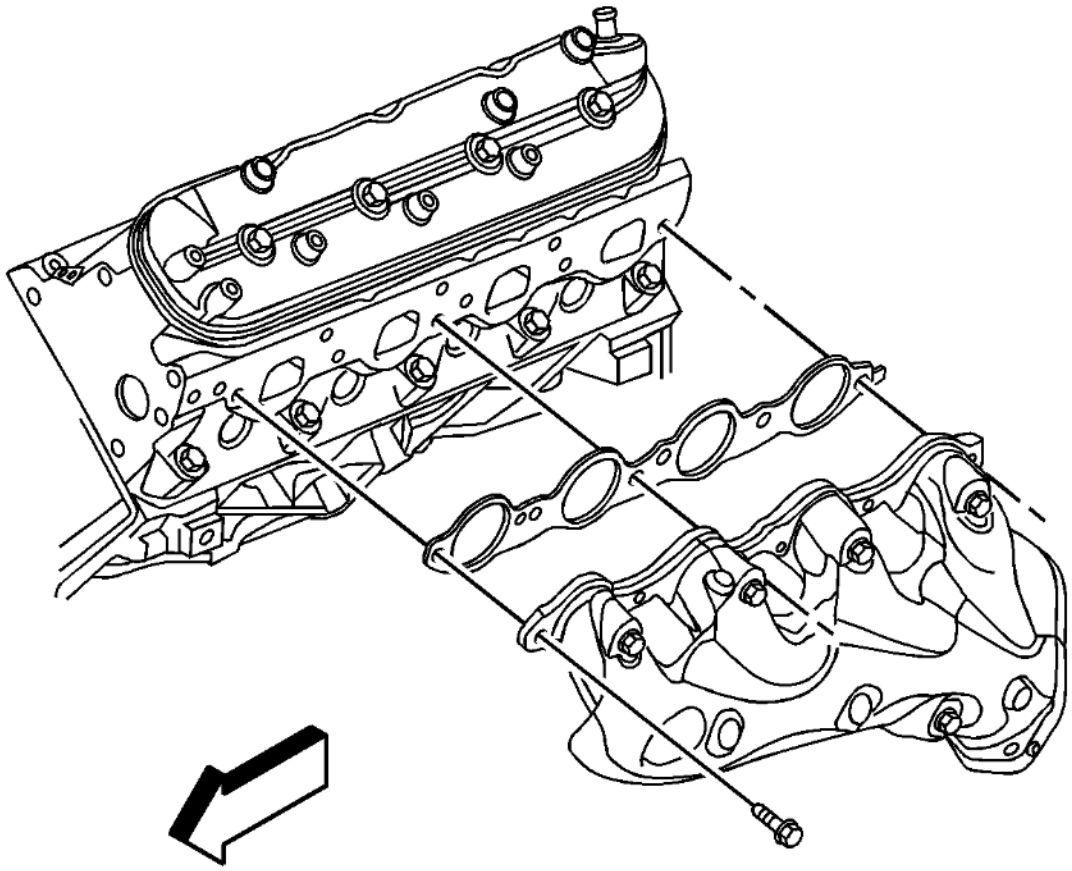


Fig. 19: View Of Exhaust Manifold, Manifold Bolts & Gasket
Courtesy of GENERAL MOTORS COMPANY

11. Remove the exhaust manifold bolts, and exhaust manifold.
12. Remove and discard the exhaust manifold gasket.
13. Remove and discard the catalytic converter seal.

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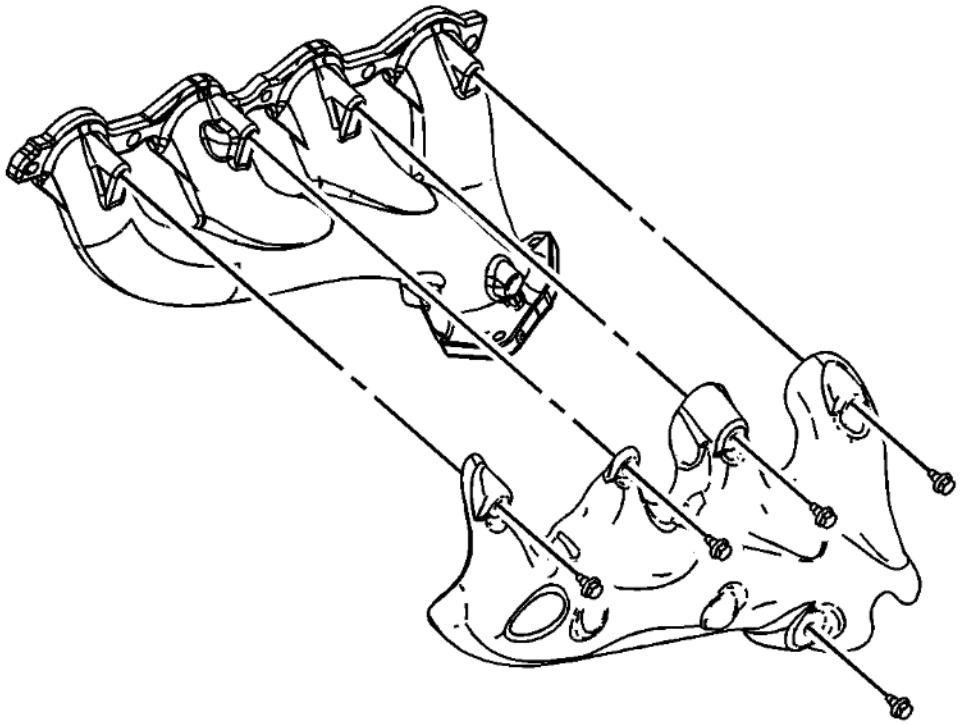


Fig. 20: View Of Exhaust Manifold Heat Shield & Bolts
Courtesy of GENERAL MOTORS COMPANY

14. If replacing the exhaust manifold, remove the exhaust manifold heat shield bolts, and shield from the exhaust manifold.

Installation Procedure

NOTE:

- **Tighten the exhaust manifold bolts as specified in the service procedure. Improperly installed and/or leaking exhaust manifold gaskets may affect vehicle emissions and/or On-Board Diagnostic (OBD) II system performance.**
- **The cylinder head exhaust manifold bolt hole threads must be clean and free of debris or threadlocking material.**
- **Do not apply sealant to the first 3 threads of the bolt.**

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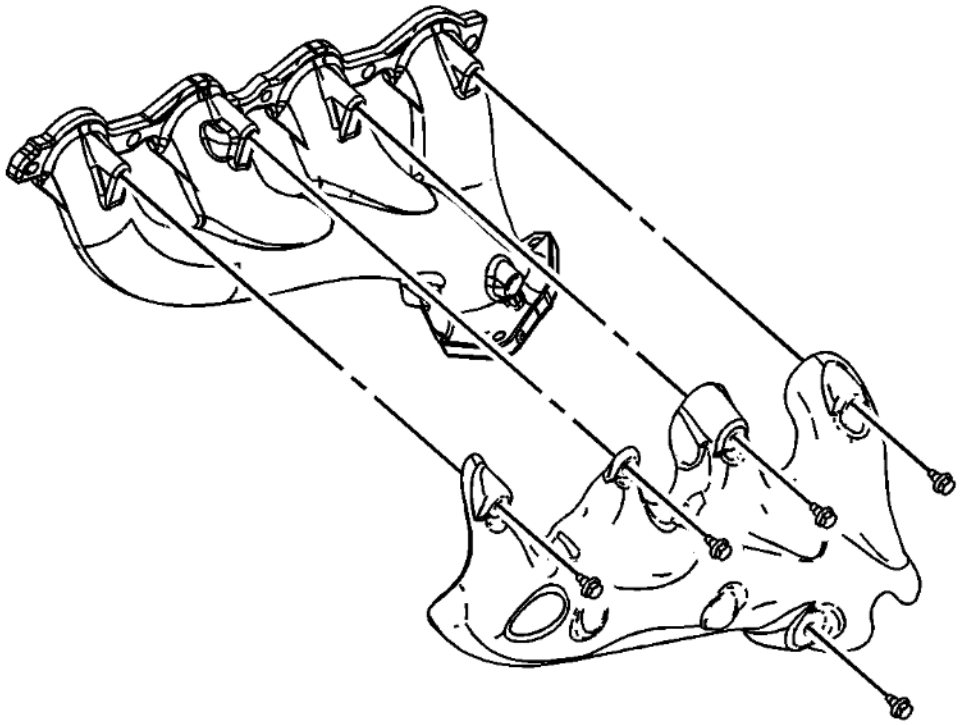


Fig. 21: View Of Exhaust Manifold Heat Shield & Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

1. If the exhaust manifold was replaced, position and install the exhaust manifold heat shield, and bolts to the exhaust manifold.

Tighten

Tighten the bolts to 9 N.m (80 lb in).

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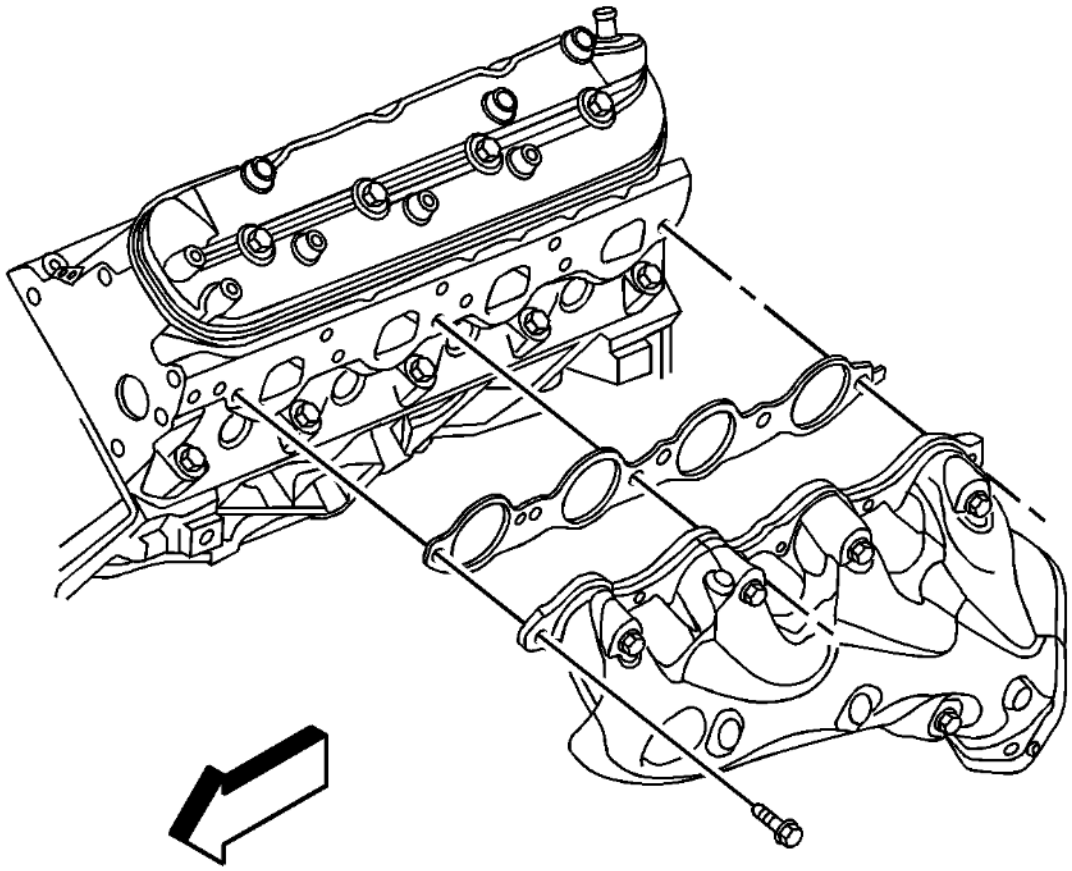


Fig. 22: View Of Exhaust Manifold, Manifold Bolts & Gasket
Courtesy of GENERAL MOTORS COMPANY

2. Clean the threads of the exhaust manifold bolts.
3. Apply a 5 mm (0.2 in) wide band of threadlock GM P/N 12345493 (Canadian P/N 10953488), or equivalent to the threads of the exhaust manifold bolts.
4. Install a NEW catalytic converter seal to the catalytic converter.
5. Position the NEW exhaust manifold gasket and exhaust manifold to the cylinder head.
6. Ensure that the exhaust manifold is seated to the catalytic converter.
7. Install the exhaust manifold bolts.

Tighten

1. Tighten the bolts a first pass to 15 N.m (11 lb ft). Tighten the exhaust manifold bolts beginning with the center 2 bolts. Alternate from side-to-side, and work toward the outside bolts.
2. Tighten the bolts a final pass to 20 N.m (18 lb ft). Tighten the exhaust manifold bolts beginning with the center 2 bolts. Alternate from side-to-side, and work toward the outside bolts.

8. Using a flat punch, bend the gasket tab at the rear of the gasket around the cylinder head edge.

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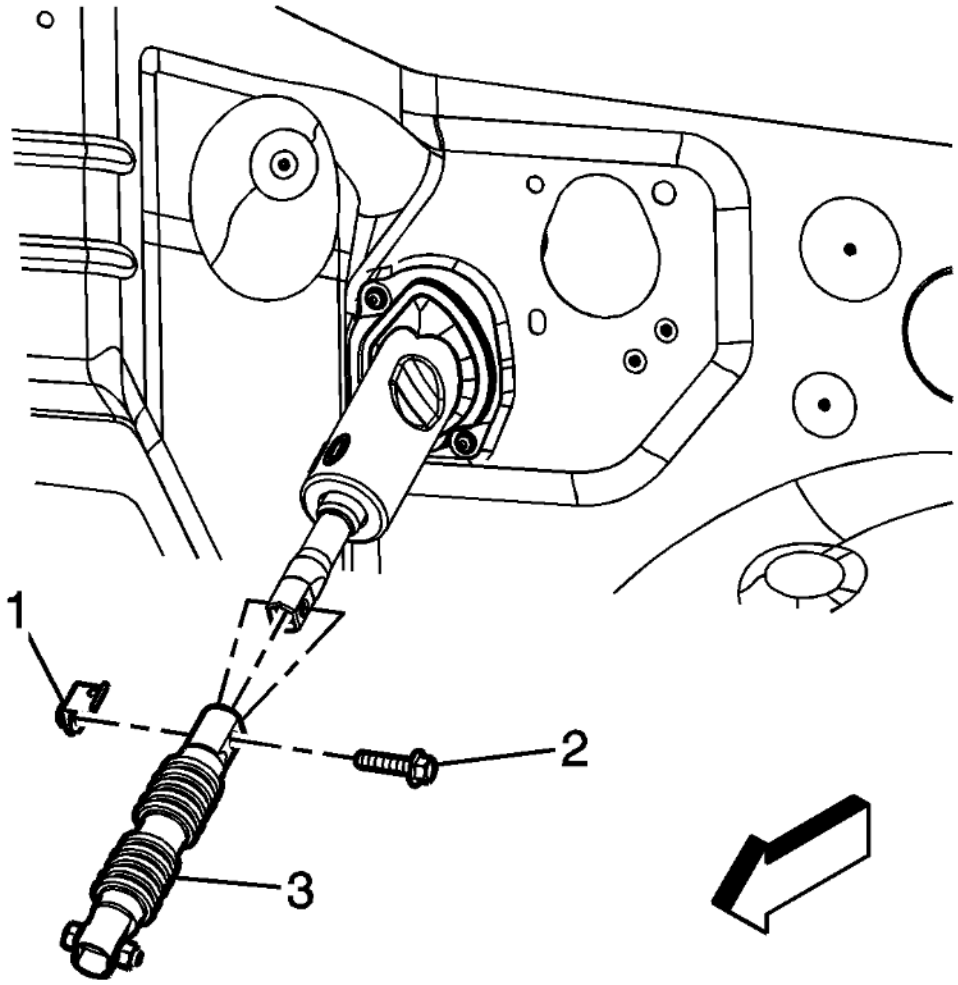


Fig. 23: View Of Steering Shaft, Coupling Bolt & Nut
Courtesy of GENERAL MOTORS COMPANY

9. Position and align the marks on the upper intermediate steering shaft and the steering column.
10. Install the upper intermediate steering shaft (3) to the steering column.
11. Connect the intermediate steering shaft. Refer to **Intermediate Steering Shaft Replacement (Light Duty)** **Intermediate Steering Shaft Replacement (Heavy Duty)** .

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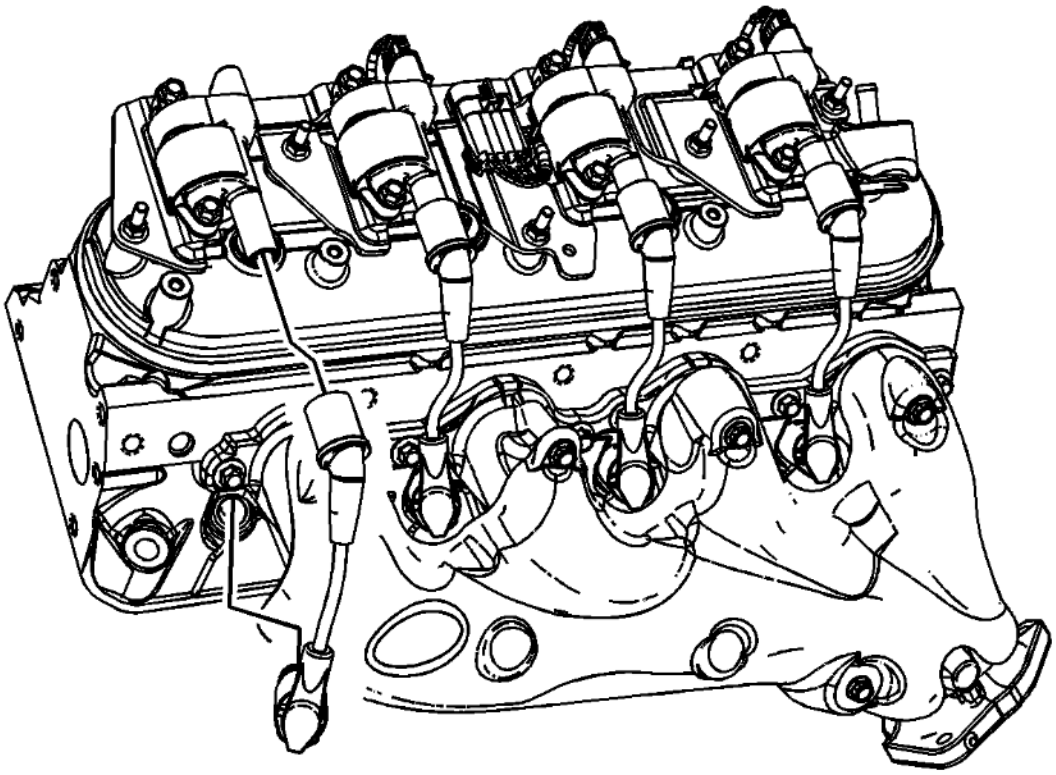


Fig. 24: View of Spark Plug Wires
Courtesy of GENERAL MOTORS COMPANY

12. Install the spark plug wires to the spark plugs.
13. Install the spark plug wires to the ignition coils.
14. Inspect the spark plug wires for proper installation.
    1. Push sideways on each boot in order to inspect the seating.
    2. Reinstall any loose boot.
15. Fully raise and support the vehicle.

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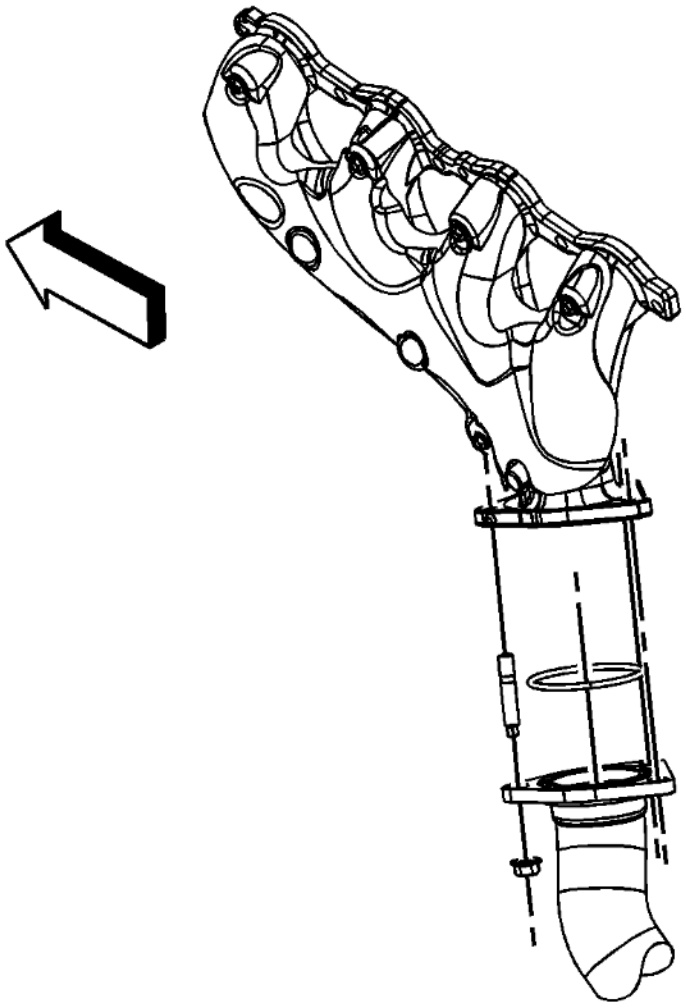


Fig. 25: View Of Exhaust Manifold, Gasket & Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

16. Install the catalytic converter to exhaust manifold nuts. (1500 series shown, 2500 series similar).

    Tighten

    Tighten the nuts to 50 N.m (37 lb ft).

17. Partially lower the vehicle.

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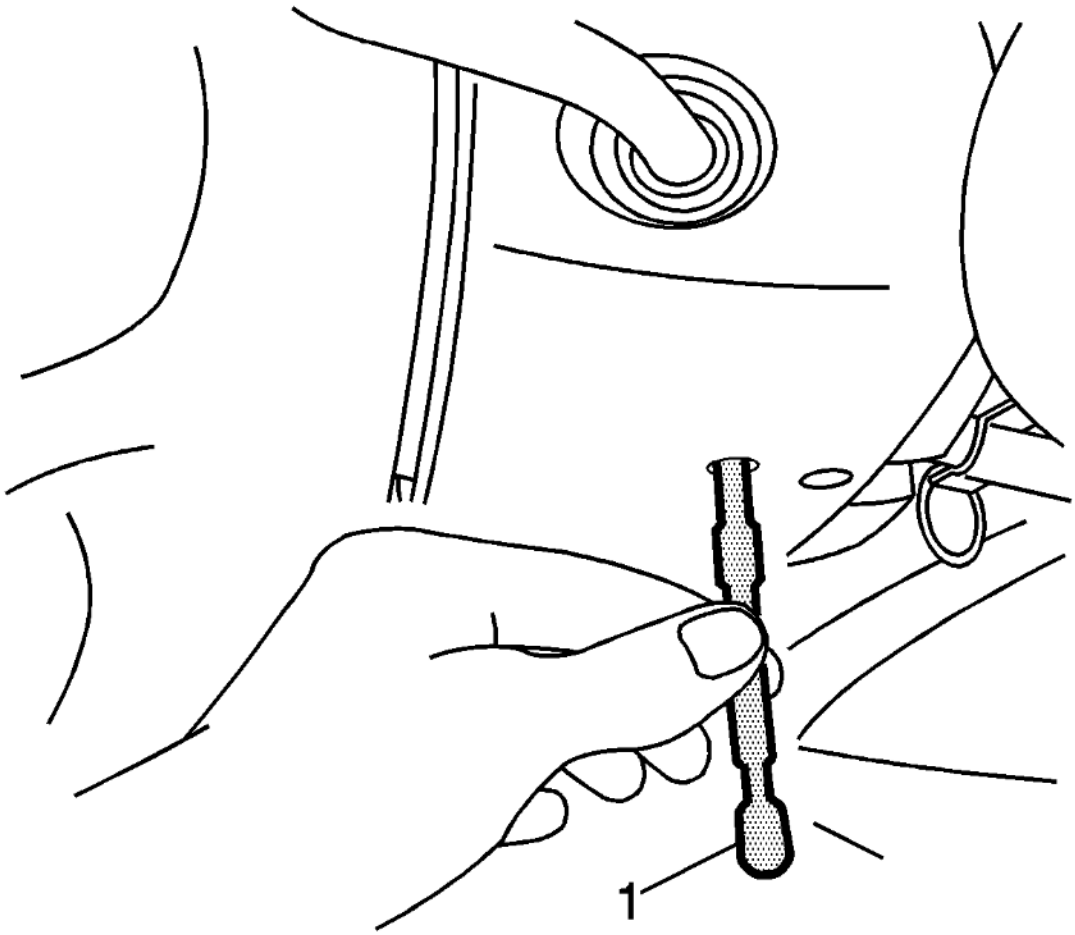


Fig. 26: Locking/Unlocking Steering Column
Courtesy of GENERAL MOTORS COMPANY

18. Install the left wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement - Left Side** .
19. Remove the **J 42640** steering column anti-rotation pin from the steering column lower access hole.

EXHAUST MANIFOLD REPLACEMENT - LEFT SIDE (LV3)

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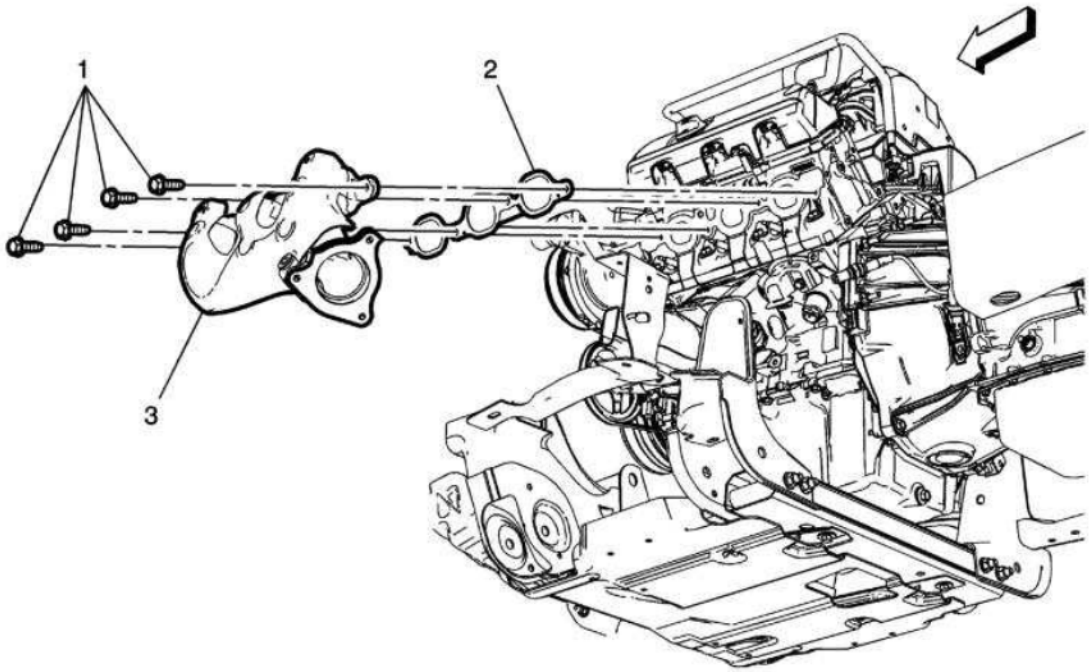


Fig. 27: Exhaust Manifold - Left Side (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. **Lifting and Jacking the Vehicle** 2. Remove the three-way catalytic converter. **Three-Way Catalytic Converter Replacement (LV3, L83, L8B, or L86)** 3. Remove the intermediate steering shaft. **Intermediate Steering Shaft Replacement (Light Duty)** **Intermediate Steering Shaft Replacement (Heavy Duty)** 4. Remove the spark plug wire from the spark plug.	
1	Exhaust Manifold - Left Fastener (Qty: 4) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** • When installing exhaust manifold to the existing cylinder head:

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Callout	Component Name
	Tighten 23 N.m (17 lb ft) • When installing exhaust manifold to a NEW cylinder head: **Tighten** 27 N.m (20 lb ft)
2	Exhaust Manifold Gasket **NOTE:** **Replace with a NEW exhaust manifold gasket.**
3	Exhaust Manifold - Left

EXHAUST MANIFOLD REPLACEMENT - LEFT SIDE (L83, L8B, L86)

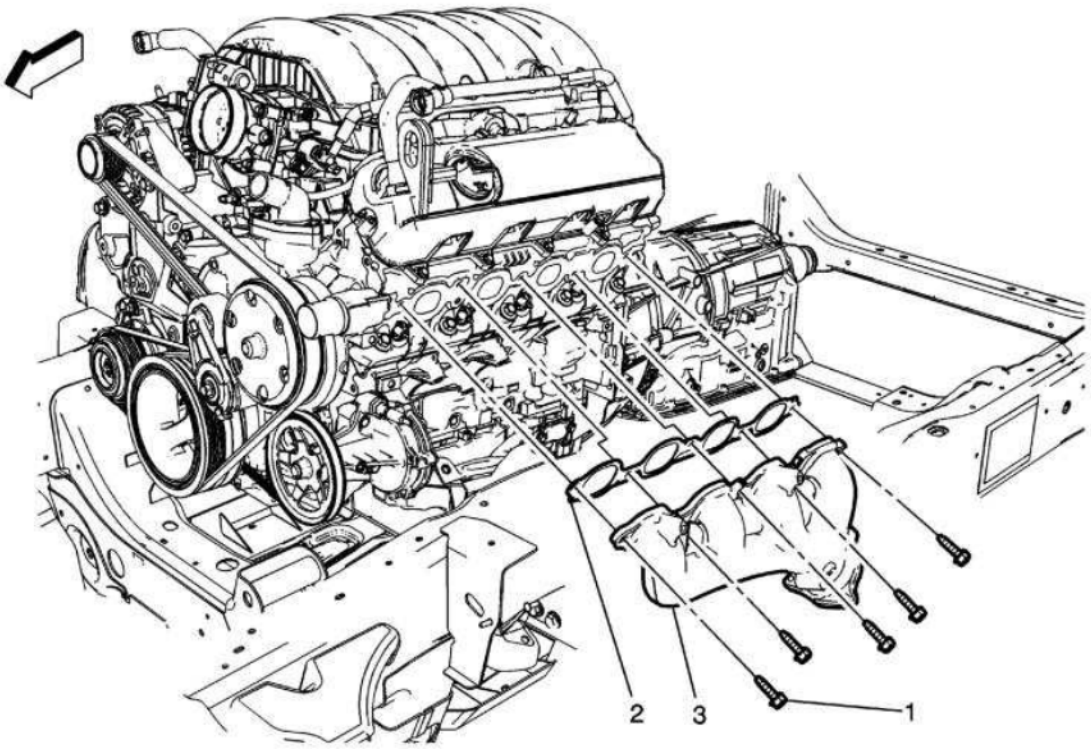


Fig. 28: Exhaust Manifold - Left Side (L83, L8B, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures	

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Callout	Component Name
1. Remove the exhaust manifold heat shield. **Exhaust Manifold Heat Shield Replacement - Left Side (L83, L8B, L86)** 2. Remove the three-way catalytic converter. **Three-Way Catalytic Converter Replacement (LV3, L83, L8B, or L86)** 3. Remove the intermediate steering shaft. **Intermediate Steering Shaft Replacement (Light Duty)** **Intermediate Steering Shaft Replacement (Heavy Duty)** 4. Remove the spark plug wire from the spark plug.	
1	Exhaust Manifold - Left Fastener (Qty: 5) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** • When installing exhaust manifold to the existing cylinder head: **Tighten** 23 N.m (17 lb ft) • When installing exhaust manifold to a NEW cylinder head: **Tighten** 27 N.m (20 lb ft)
2	Exhaust Manifold Gasket **NOTE:** **Replace with a NEW exhaust manifold gasket.**
3	Exhaust Manifold - Left

EXHAUST MANIFOLD REPLACEMENT - LEFT SIDE (L5P)

Removal Procedure

WARNING: Refer to Hot Exhaust System Warning .

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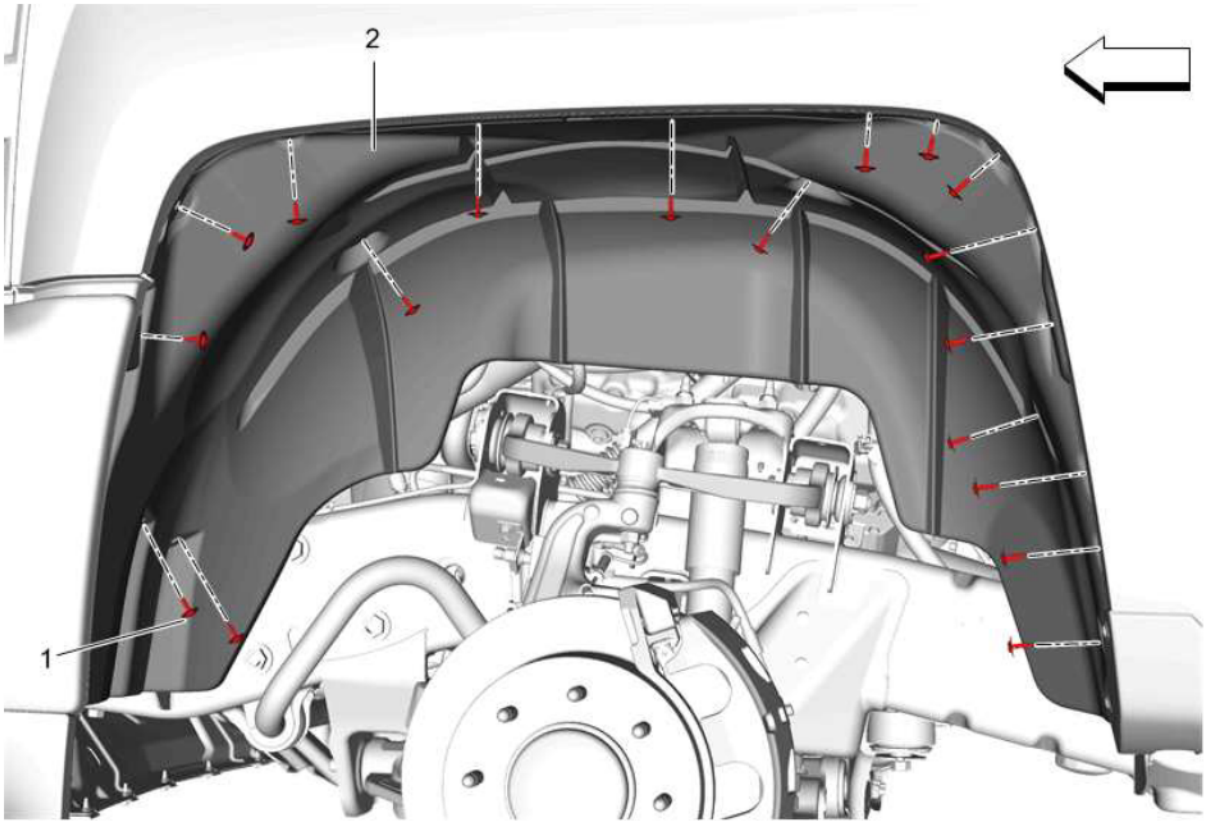


Fig. 29: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

1. Front Wheelhouse Liner-Left Side 2 - Remove **Front Wheelhouse Liner Replacement - Left Side**

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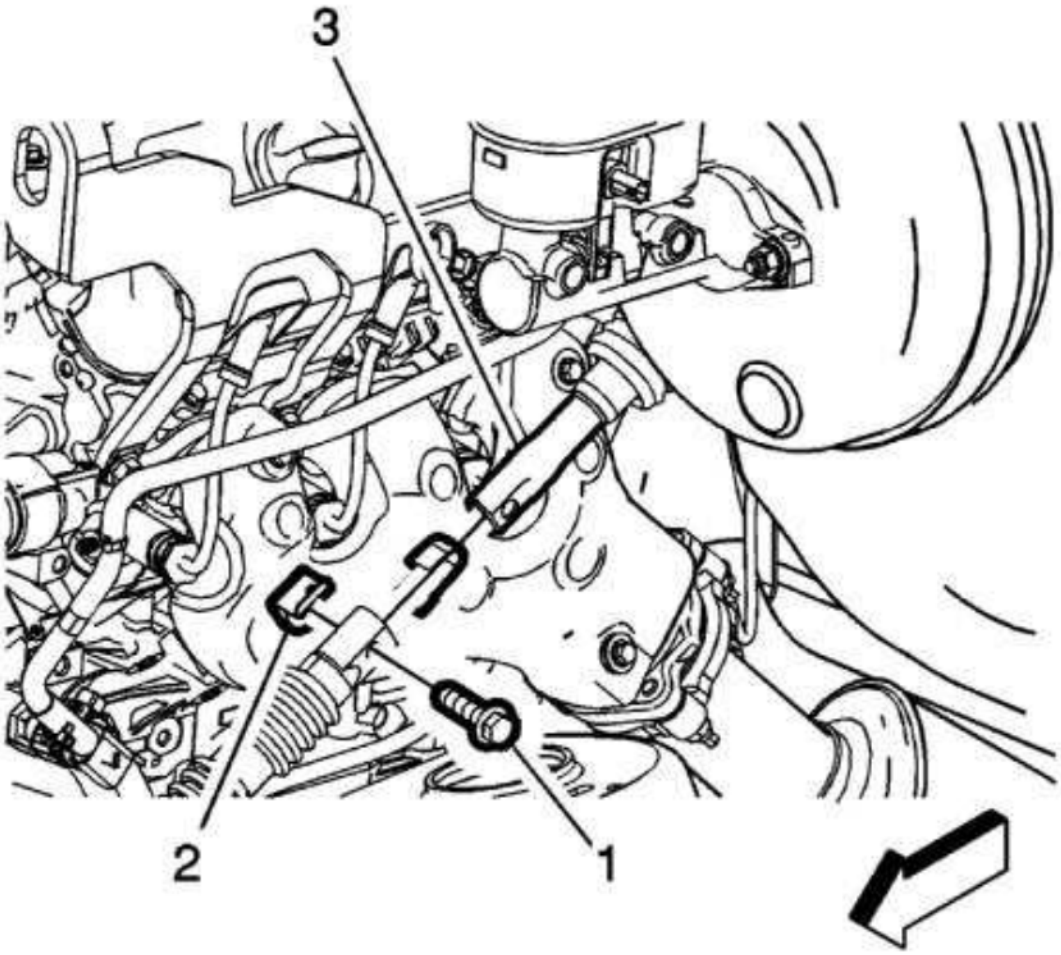


Fig. 30: Intermediate Steering Shaft Upper Bolt And Nut
Courtesy of GENERAL MOTORS COMPANY

2. Intermediate Steering Shaft 3 - Disconnect **Intermediate Steering Shaft Replacement (Light Duty)** **Intermediate Steering Shaft Replacement (Heavy Duty)**
3. Oil Level Indicator Tube - Remove **Oil Level Indicator Tube Replacement**

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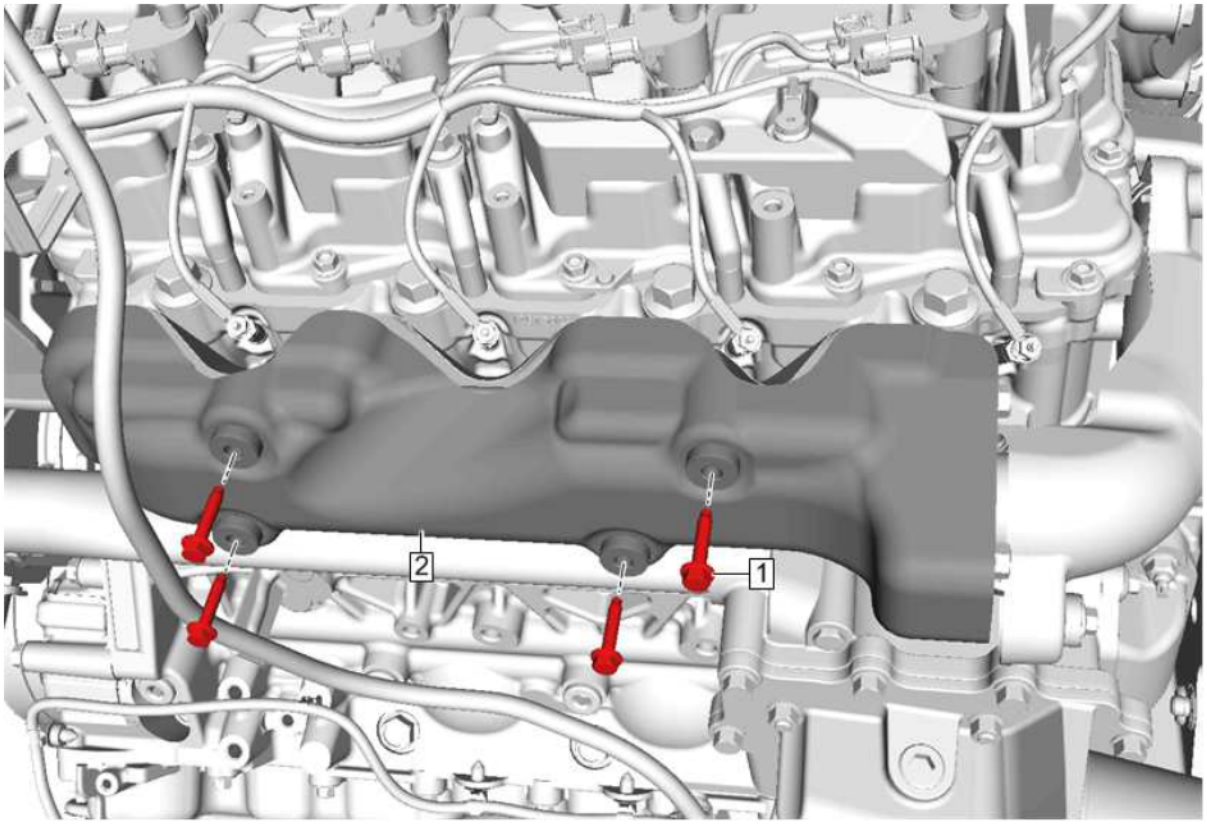
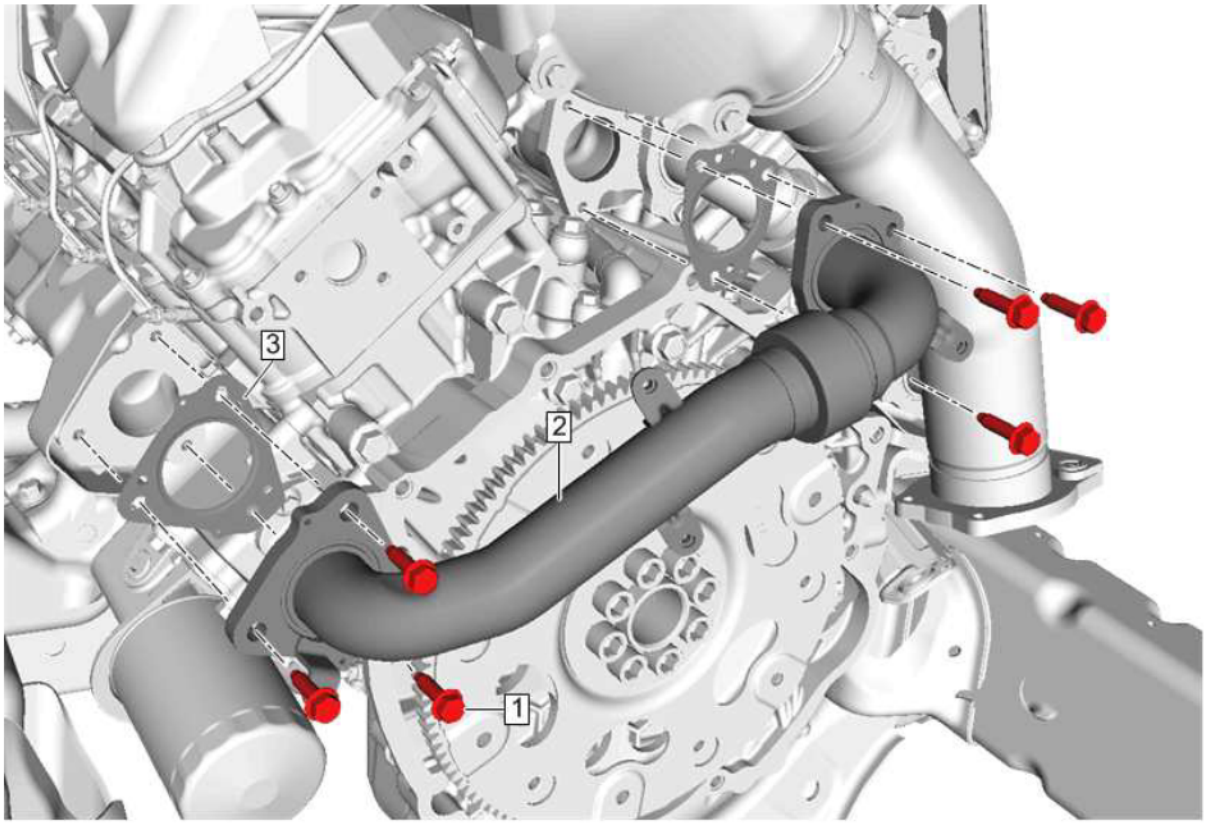


Fig. 31: Exhaust Manifold Heat Shield - Left Side (L5P)
Courtesy of GENERAL MOTORS COMPANY

4. Exhaust Manifold Heat Shield-Left Side 2 - Remove **Exhaust Manifold Heat Shield Replacement - Left Side (L5P)**



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Fig. 32: Exhaust Turbocharger Inlet Pipe
Courtesy of GENERAL MOTORS COMPANY

5. Exhaust Turbocharger Inlet Pipe-Left Side 2 @Exhaust Manifold - Remove **Exhaust Turbocharger Inlet Pipe Replacement - Left Side (L5P)**

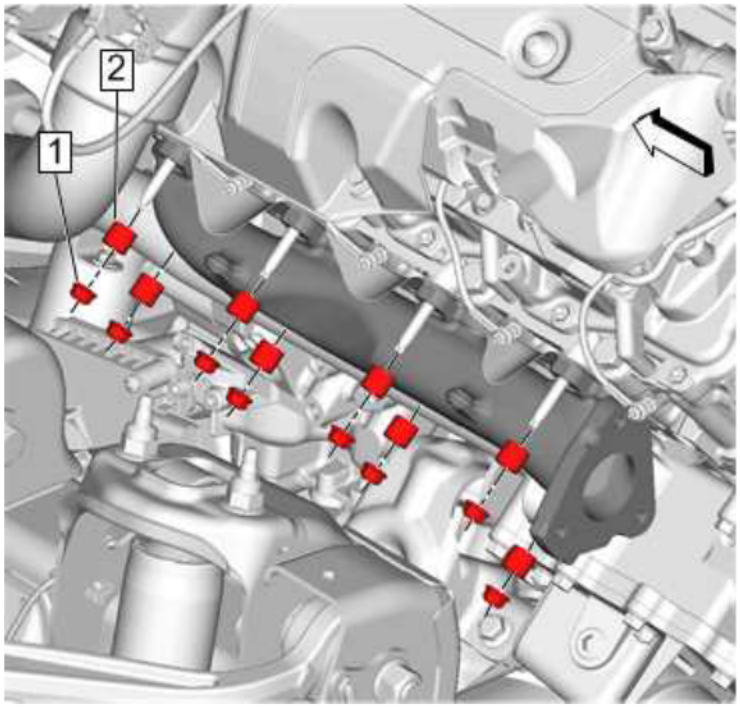
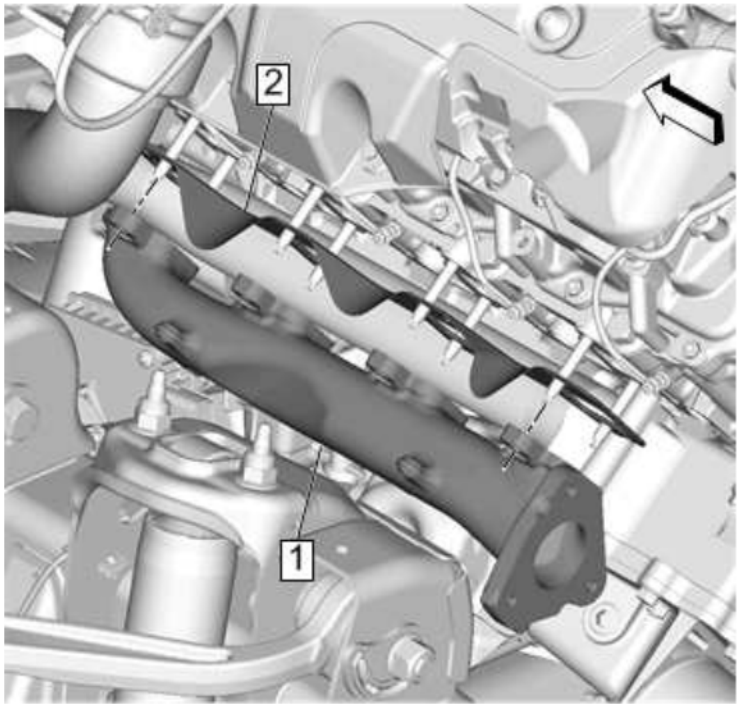


Fig. 33: Exhaust Manifold Stud Spacer
Courtesy of GENERAL MOTORS COMPANY

6. Exhaust Manifold Nut 1 - Remove
7. Exhaust Manifold Stud Spacer 2 - Remove



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Fig. 34: Exhaust Manifold
Courtesy of GENERAL MOTORS COMPANY

8. Exhaust Manifold 1 - Remove
9. Exhaust Manifold Gasket 2 - Remove and DISCARD

Installation Procedure

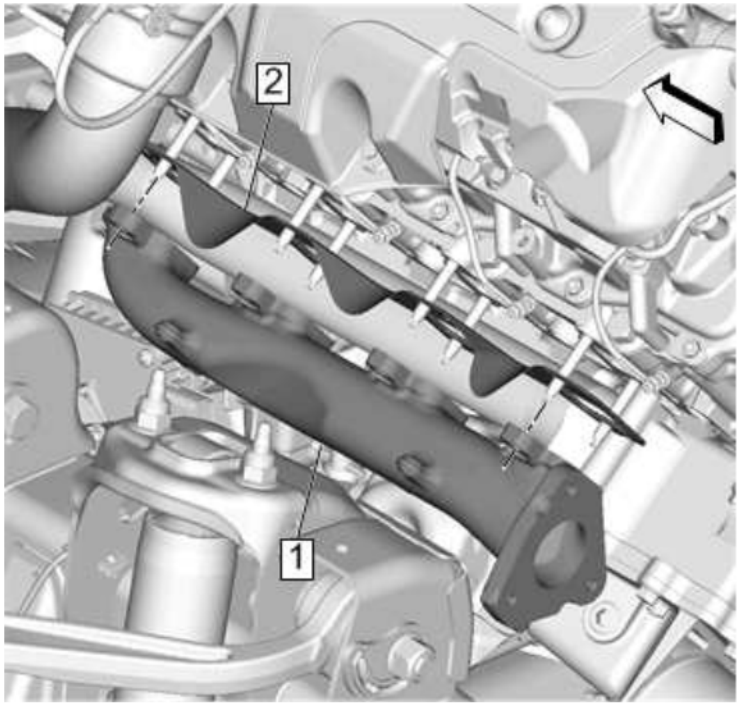


Fig. 35: Exhaust Manifold
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install a NEW exhaust manifold gasket.

1. Exhaust Manifold Gasket 2 - Install a NEW gasket.
2. Exhaust Manifold 1 - Install

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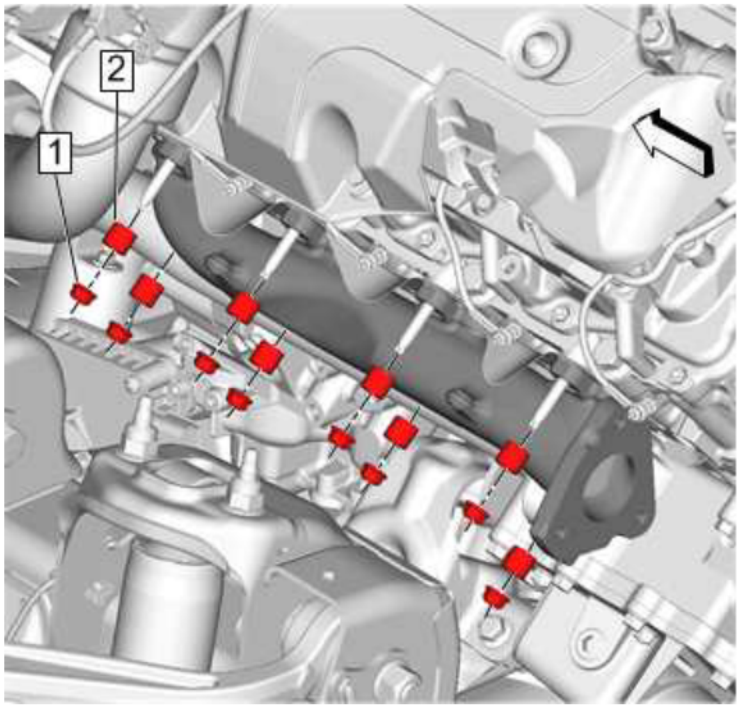


Fig. 36: Exhaust Manifold Stud Spacer
Courtesy of GENERAL MOTORS COMPANY

3. Exhaust Manifold Stud Spacer 2 - Install
4. Exhaust Manifold Nut 1 - Install and hand tighten

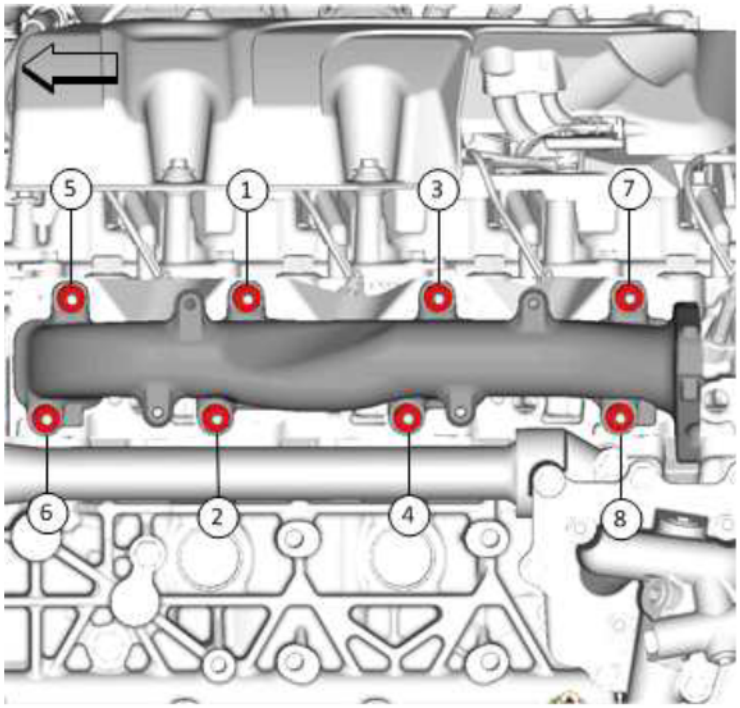


Fig. 37: Exhaust Manifold Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Tighten in the sequence shown. 20 N.m (15 lb ft)

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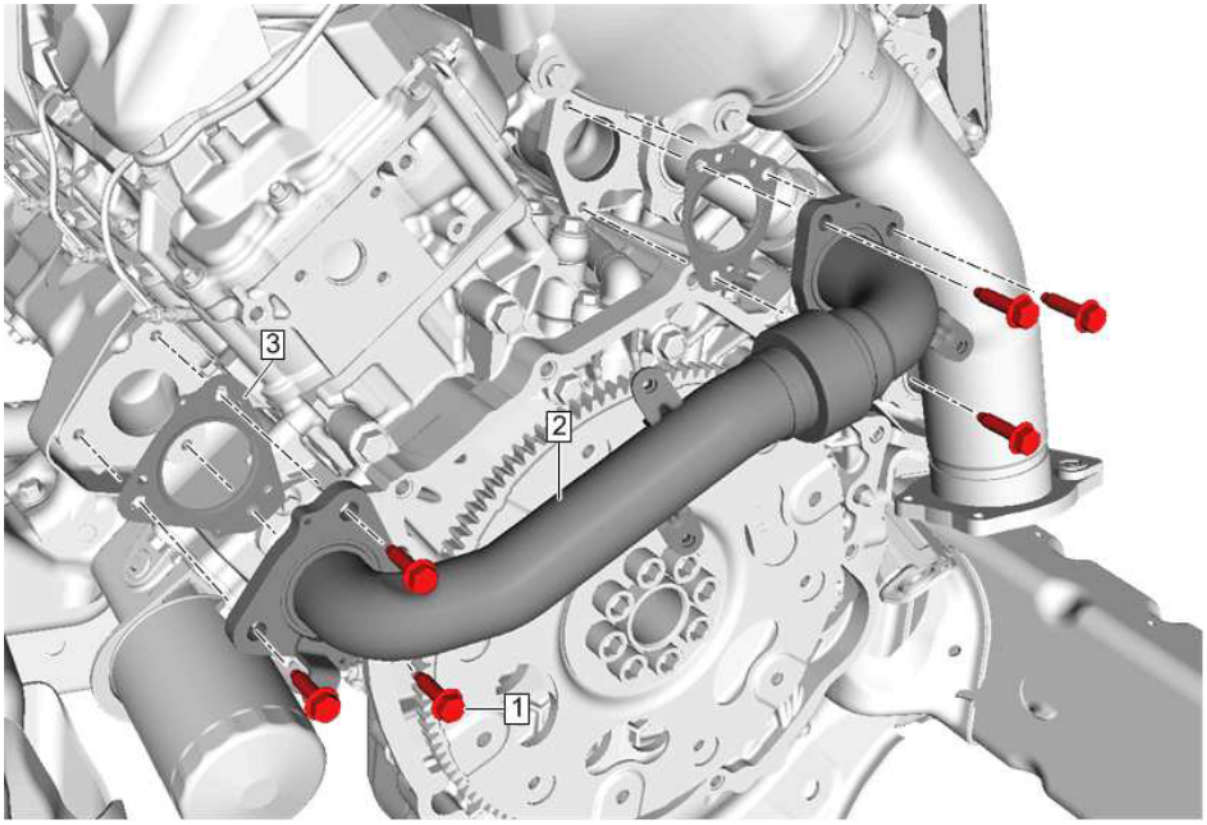
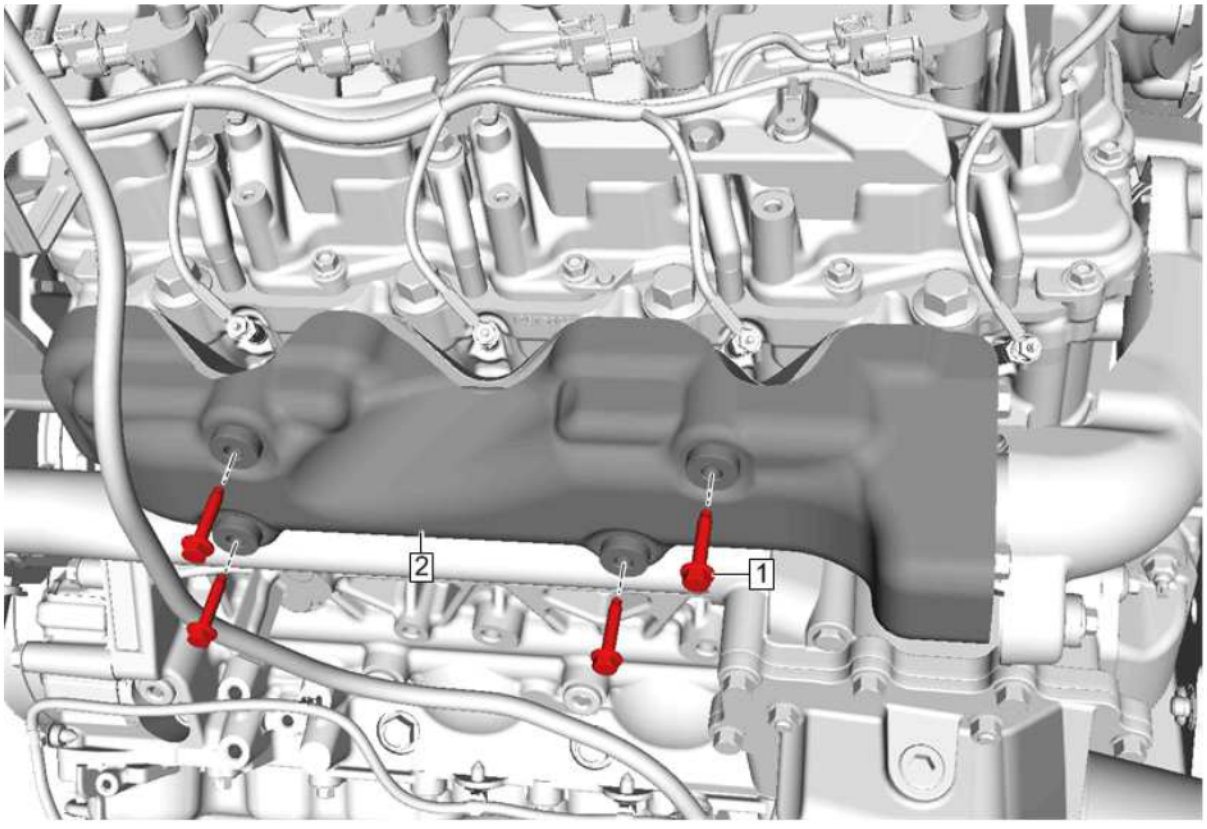


Fig. 38: Exhaust Turbocharger Inlet Pipe
Courtesy of GENERAL MOTORS COMPANY

6. Exhaust Turbocharger Inlet Pipe-Left Side 2 @Exhaust Manifold - Install **Exhaust Turbocharger Inlet Pipe Replacement - Left Side (L5P)**



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Fig. 39: Exhaust Manifold Heat Shield - Left Side (L5P)
Courtesy of GENERAL MOTORS COMPANY

7. Exhaust Manifold Heat Shield-Left Side 2 - Install **Exhaust Manifold Heat Shield Replacement - Left Side (L5P)**
8. Oil Level Indicator Tube - Install **Oil Level Indicator Tube Replacement**

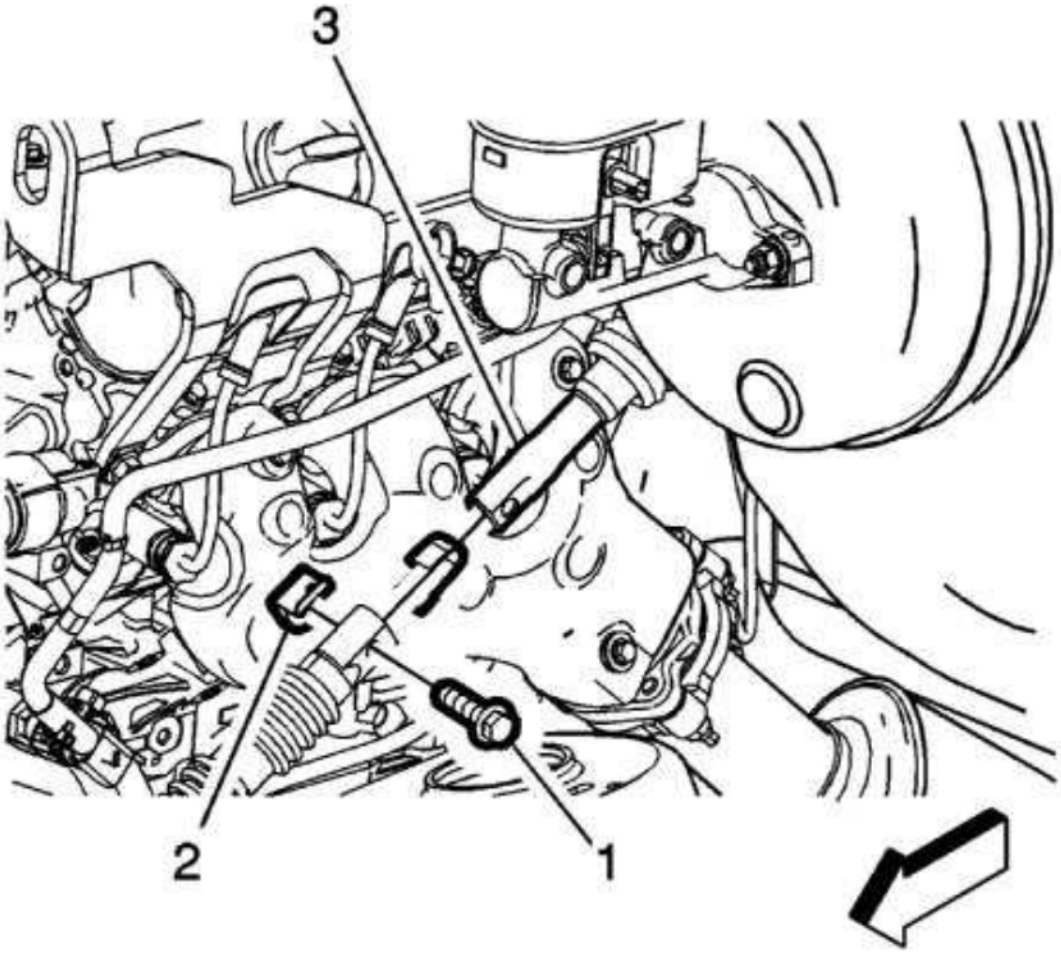


Fig. 40: Intermediate Steering Shaft Upper Bolt And Nut
Courtesy of GENERAL MOTORS COMPANY

9. Intermediate Steering Shaft 3 - Connect **Intermediate Steering Shaft Replacement (Light Duty)** **Intermediate Steering Shaft Replacement (Heavy Duty)**

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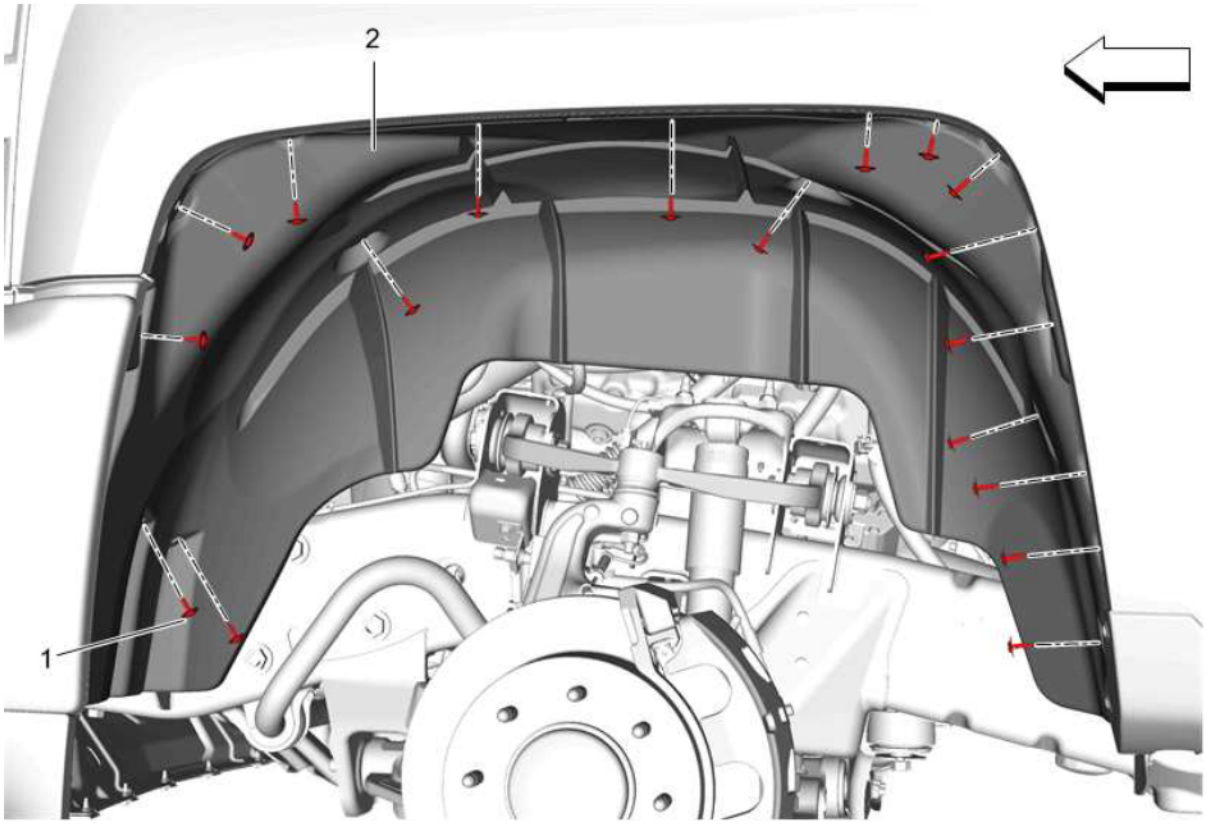
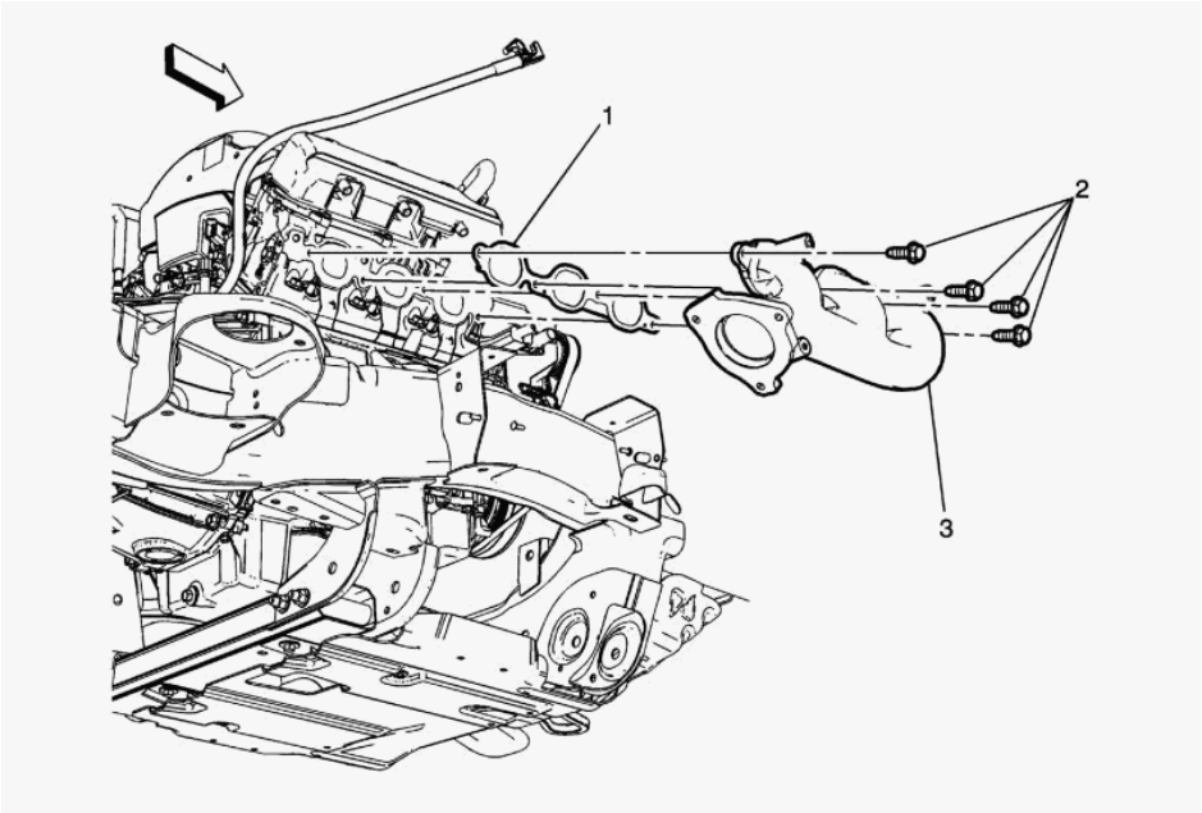


Fig. 41: Front Wheelhouse Liner-Left Side
Courtesy of GENERAL MOTORS COMPANY

10. Front Wheelhouse Liner-Left Side 2 - Install **Front Wheelhouse Liner Replacement - Left Side**

EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE (LV3)



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Fig. 42: Exhaust Manifold - Right Side (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. **Lifting and Jacking the Vehicle** 2. Remove the three-way catalytic converter. **Three-Way Catalytic Converter Replacement (LV3, L83, L8B, or L86)** 3. Remove the heater inlet and outlet hose bracket and set aside the hoses. 4. Remove the spark plug wire from the spark plug.	
1	Exhaust Manifold - Right Fastener (Qty: 4) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** • When installing exhaust manifold to the existing cylinder head: **Tighten** 23 N.m (17 lb ft) • When installing exhaust manifold to a NEW cylinder head: **Tighten** 27 N.m (20 lb ft)
2	Exhaust Manifold Gasket **NOTE:** **Replace with a NEW exhaust manifold gasket.**
3	Exhaust Manifold - Right

EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE (L83, L8B, L86)

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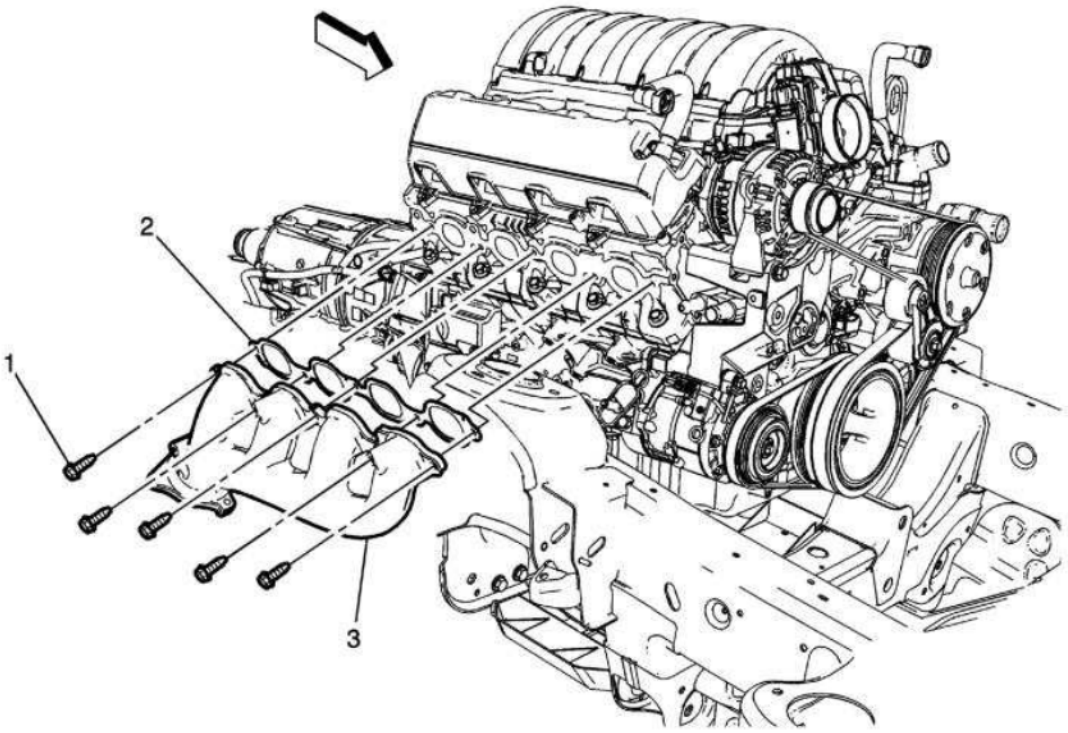


Fig. 43: Exhaust Manifold - Right Side (L83, L8B, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. **Lifting and Jacking the Vehicle** 2. Remove the three-way catalytic converter. **Three-Way Catalytic Converter Replacement (LV3, L83, L8B, or L86)** 3. Remove the heater inlet and outlet hose retainer from the hose bracket and set aside the hoses. 4. Remove the spark plug wire from the spark plug.	
1	Exhaust Manifold - Right Fastener (Qty: 5) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** • When installing exhaust manifold to the existing cylinder head:

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Callout	Component Name
	Tighten 23 N.m (17 lb ft) • When installing exhaust manifold to a NEW cylinder head: **Tighten** 27 N.m (20 lb ft)
2	Exhaust Manifold Gasket **NOTE:** **Replace with a NEW exhaust manifold gasket.**
3	Exhaust Manifold - Right

EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE (L96, LC8)

Removal Procedure

1. Remove the right front wheel and tire assembly. **Tire and Wheel Removal and Installation (6-Lug Wheel)** **Tire and Wheel Removal and Installation (8-Lug Wheel)** **Tire and Wheel Removal and Installation (Dual Rear Wheels)** .
2. Fully raise and suitably support the vehicle. **Lifting and Jacking the Vehicle** .

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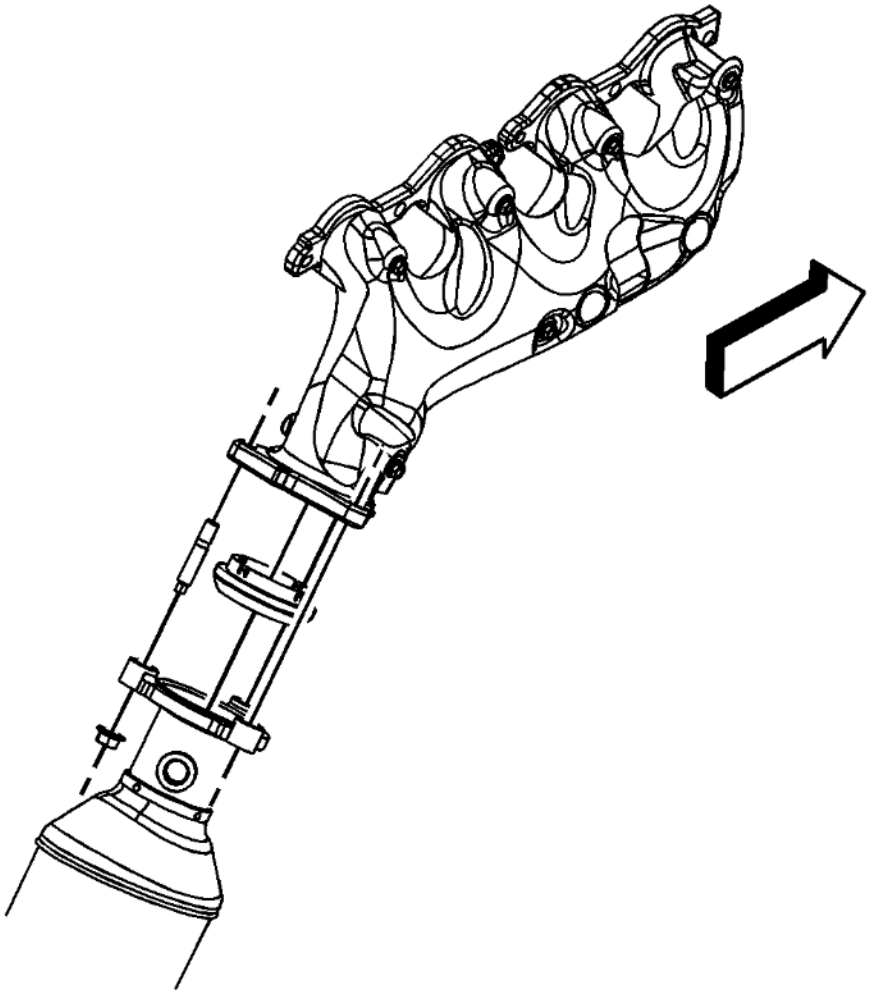


Fig. 44: View Of Exhaust Manifold, Gasket & Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

3. Remove the catalytic converter to exhaust manifold nuts, 1500 series shown, 2500 series similar.

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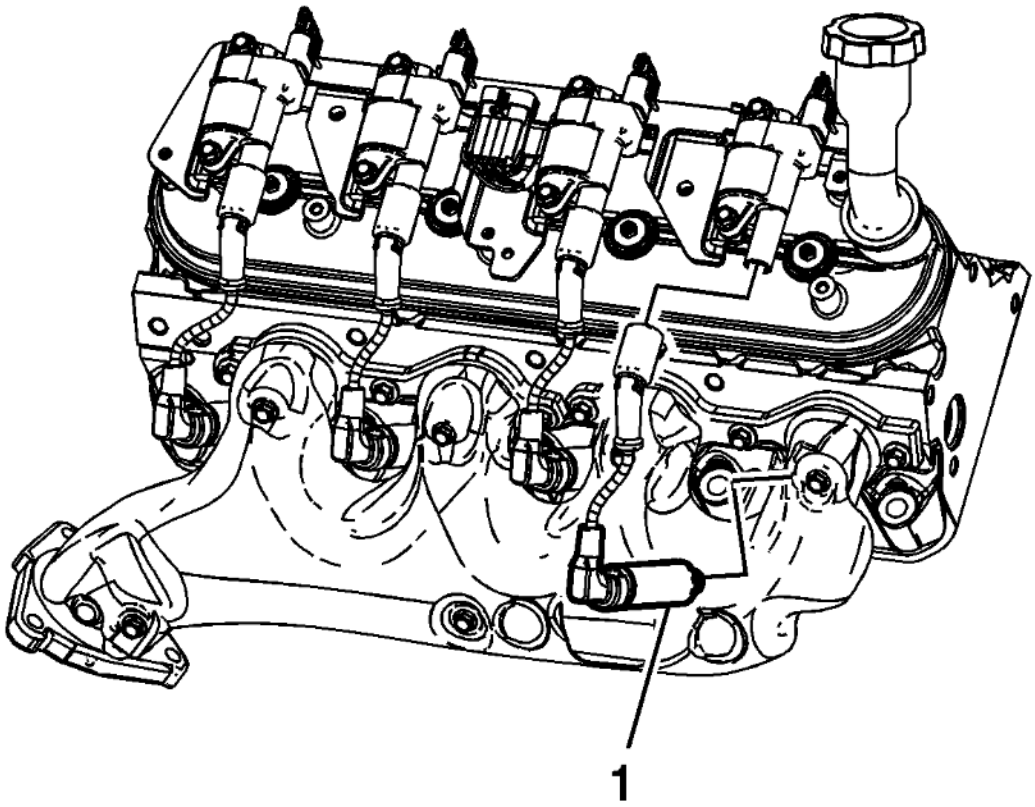


Fig. 45: Locating Spark Plug Wires
Courtesy of GENERAL MOTORS COMPANY

4. Remove the spark plug wires (1) from the spark plugs.
    1. Twist the spark plug wire boot a 1/2 turn.
    2. Pull only on the boot in order to remove the wire from the spark plug.
5. Remove the spark plug wires from the ignition coils.
    1. Twist the spark plug wire boot a 1/2 turn.
    2. Pull only on the boot in order to remove the wire from the ignition coil.

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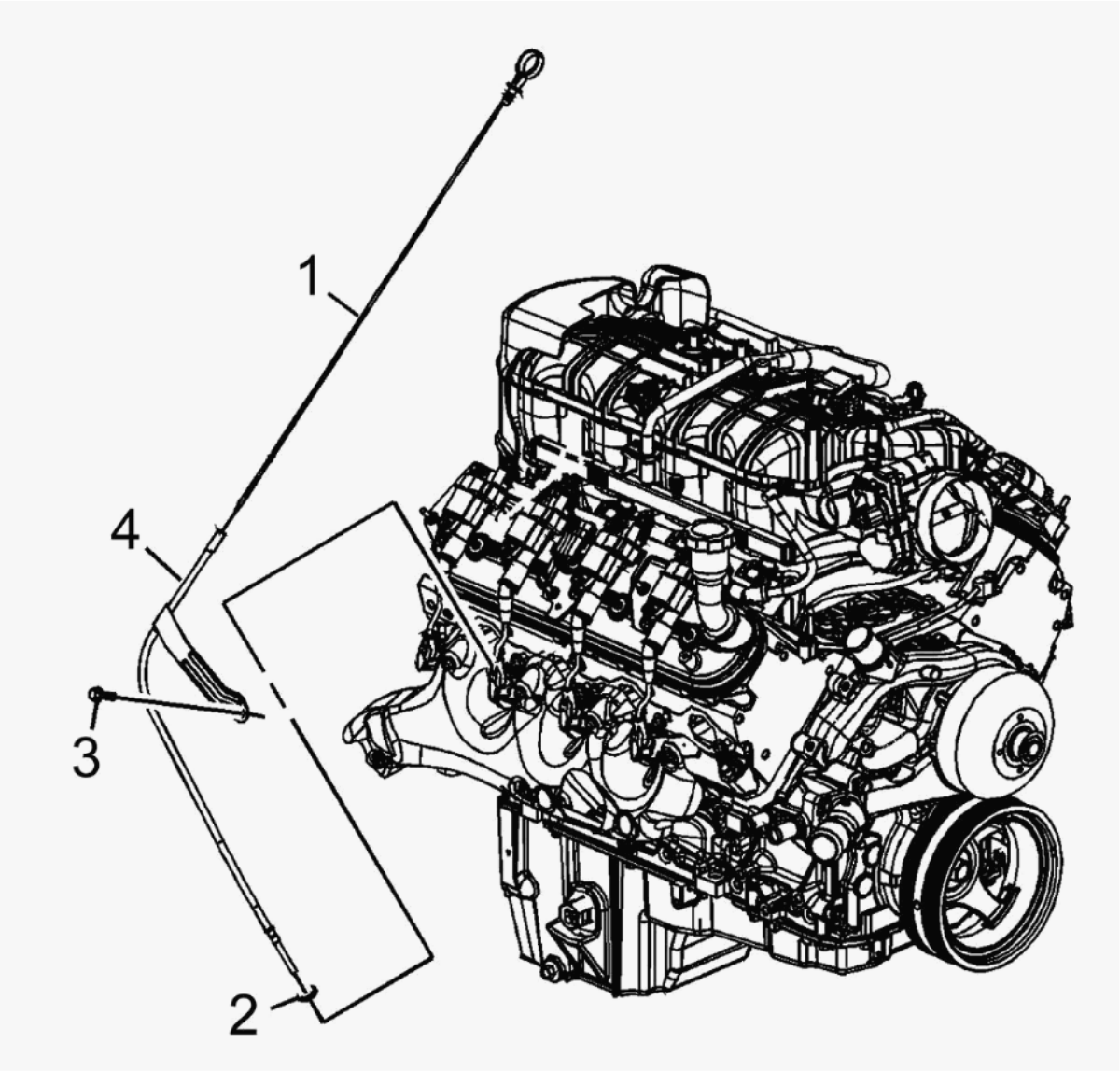


Fig. 46: Oil Level Indicator Tube O-Ring Seal
Courtesy of GENERAL MOTORS COMPANY

6. Remove the oil level indicator tube bolt (3).
7. Remove the oil level indicator tube (4) from the engine block.

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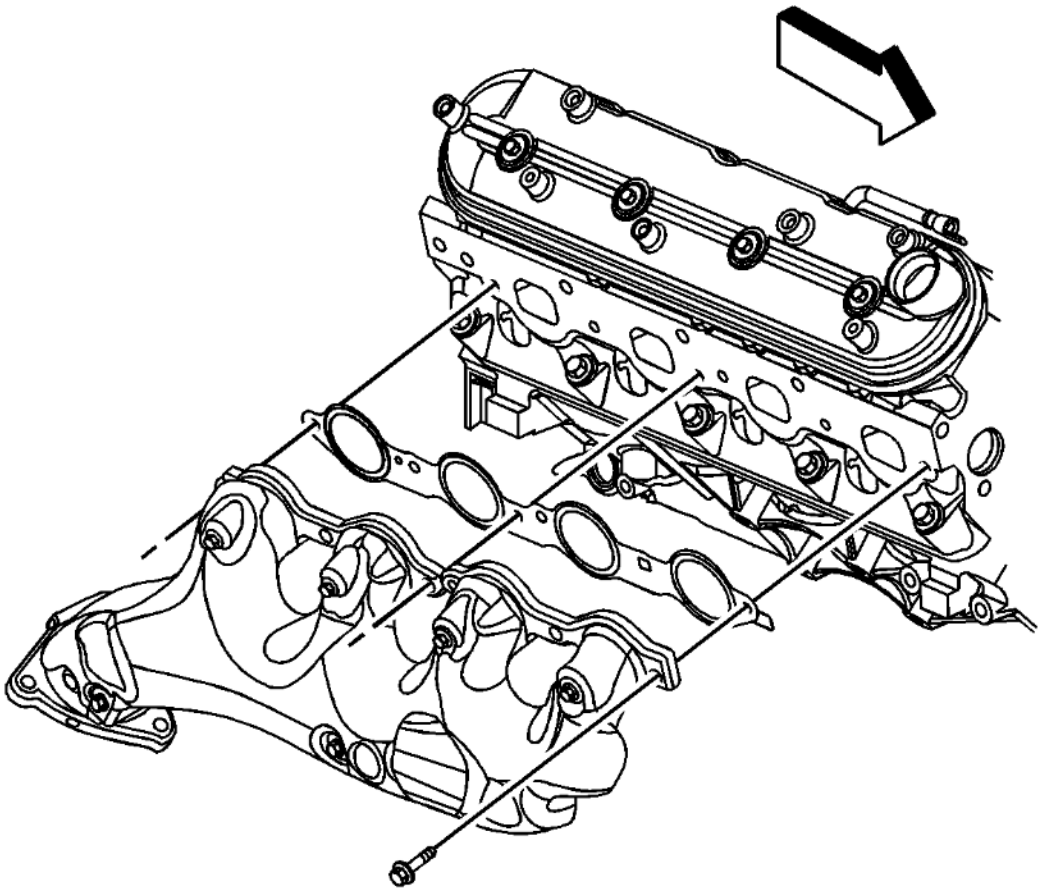


Fig. 47: View Of Exhaust Manifold, Gasket & Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Remove the exhaust manifold bolts and exhaust manifold.
9. Remove and discard the exhaust manifold gasket.
10. Remove and discard the exhaust manifold seal.

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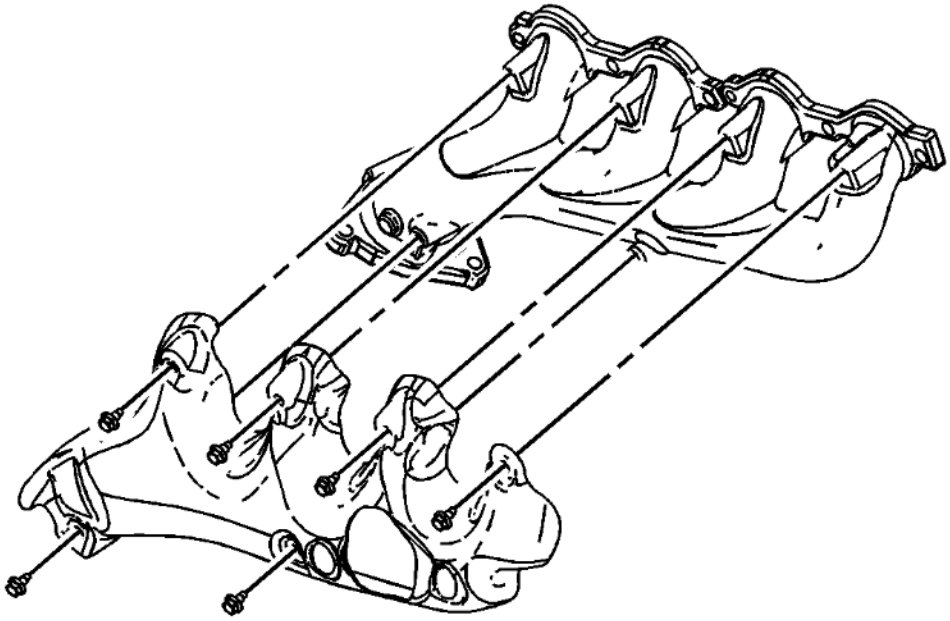


Fig. 48: View Of Exhaust Manifold Heat Shield & Bolts
Courtesy of GENERAL MOTORS COMPANY

11. If replacing the exhaust manifold, remove the exhaust manifold heat shield bolts, and shield from the exhaust manifold.

Installation Procedure

NOTE:

- **Tighten the exhaust manifold bolts as specified in the service procedure. Improperly installed and/or leaking exhaust manifold gaskets may affect vehicle emissions and/or On-Board Diagnostics (OBD) II system performance.**
- **The cylinder head exhaust manifold bolt hole threads must be clean and free of debris or threadlocking material.**
- **Do not apply sealant to the first 3 threads of the bolt.**

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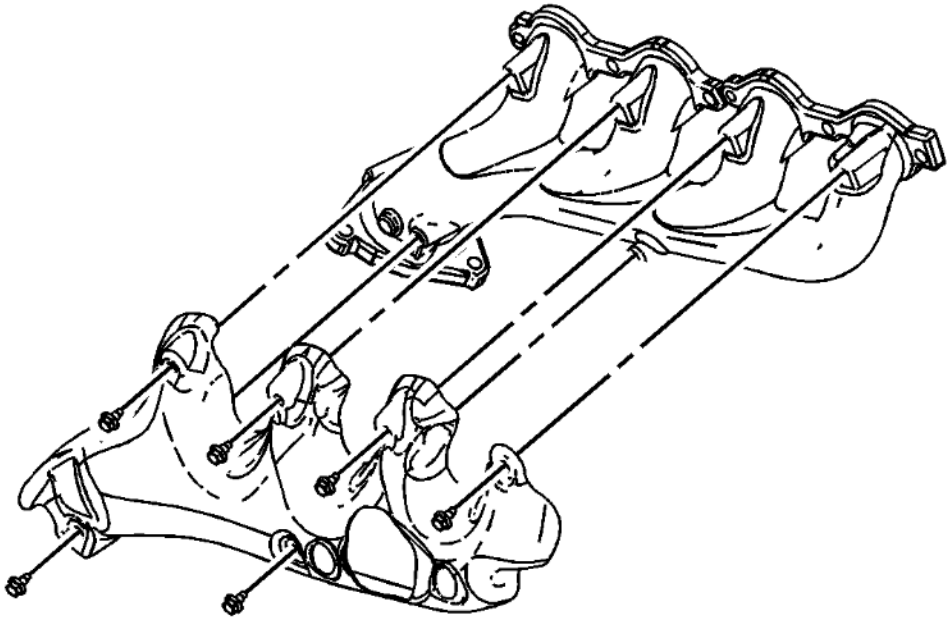


Fig. 49: View Of Exhaust Manifold Heat Shield & Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

1. If the exhaust manifold was replaced, position and install the exhaust manifold heat shield, and bolts to the exhaust manifold.

Tighten

Tighten the bolts to 9 N.m (80 lb in).

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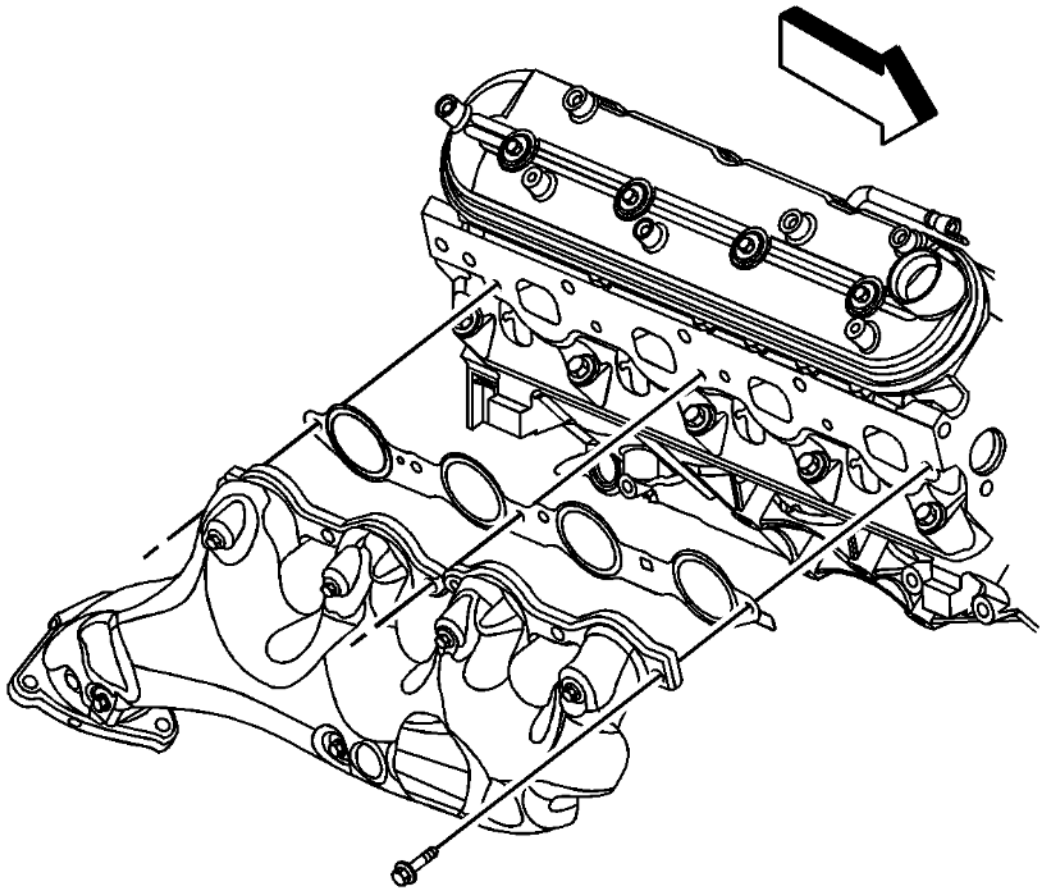


Fig. 50: View Of Exhaust Manifold, Gasket & Bolts
Courtesy of GENERAL MOTORS COMPANY

2. Clean the threads of the exhaust manifold bolts.
3. Apply a 5 mm (0.2 in) wide band of threadlock GM P/N 12345493 (Canadian P/N 10953488), or equivalent to the threads of the exhaust manifold bolts.
4. Install a NEW catalytic converter seal to the exhaust manifold.
5. Position the NEW exhaust manifold gasket and exhaust manifold to the cylinder head.
6. Ensure that the catalytic converter seal is seated to the catalytic converter.
7. Install the exhaust manifold bolts.

Tighten

1. Tighten the bolts a first pass to 15 N.m (11 lb ft). Tighten the exhaust manifold bolts beginning with the center 2 bolts. Alternate from side-to-side, and work toward the outside bolts.
2. Tighten the bolts a final pass to 20 N.m (18 lb ft). Tighten the exhaust manifold bolts beginning with the center 2 bolts. Alternate from side-to-side, and work toward the outside bolts.

8. Using a flat punch, bend the gasket tab at the rear of the gasket around the cylinder head edge.

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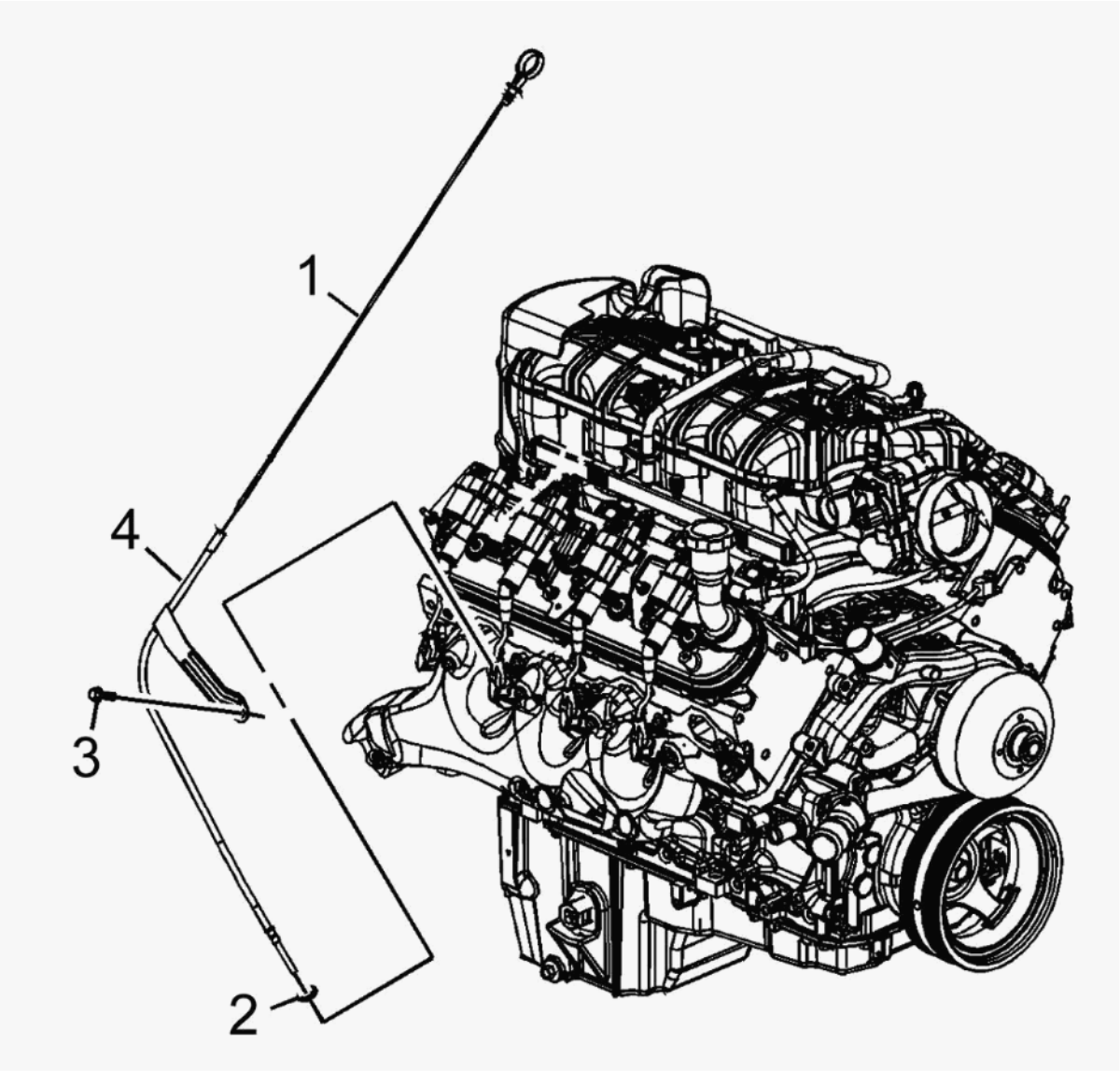


Fig. 51: Oil Level Indicator Tube O-Ring Seal
Courtesy of GENERAL MOTORS COMPANY

NOTE: **The O-ring seal may be reused if not cut or damaged.**

9. Inspect the O-ring seal (2) for cuts or damage, replace as necessary.
10. Lubricate the O-ring seal (2) with clean engine oil.
11. Install the oil level indicator tube (4) to the engine block.
12. Install the oil level indicator tube bolt (3).

Tighten

Tighten the bolt 25 N.m (18 lb ft).

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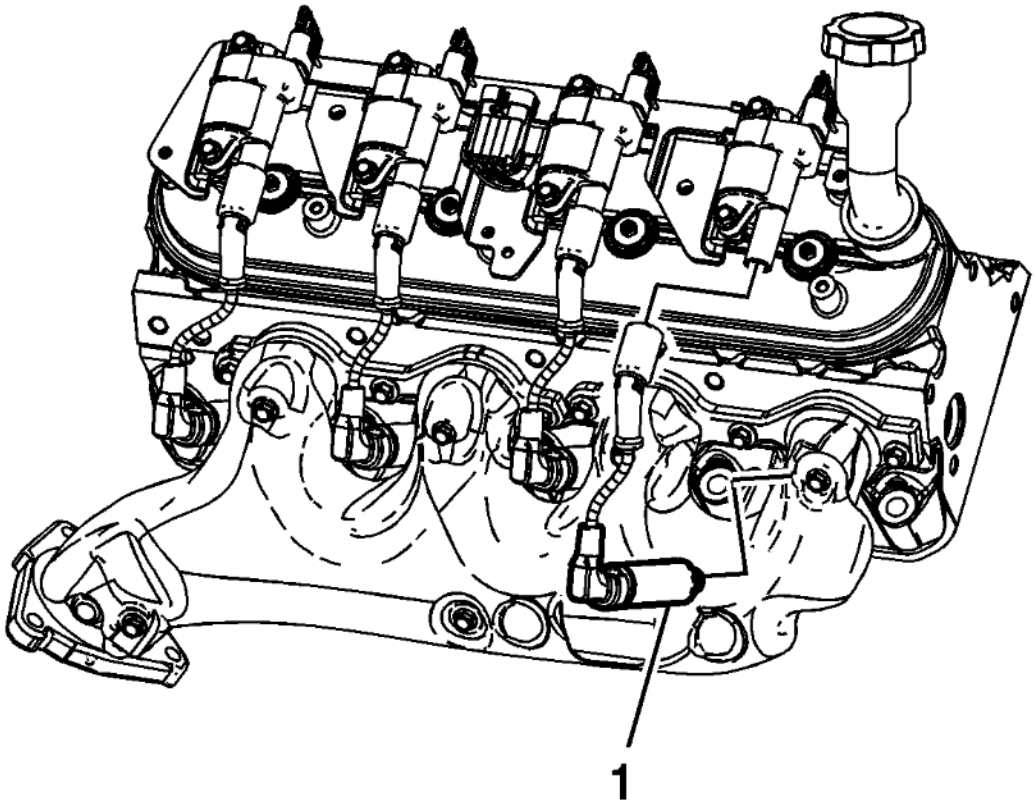


Fig. 52: Locating Spark Plug Wires
Courtesy of GENERAL MOTORS COMPANY

13. Install the spark plug wires (1) to the spark plugs.
14. Install the spark plug wires to the ignition coils.
15. Inspect the spark plug wires for proper installation.
    1. Push sideways on each boot in order to inspect the seating.
    2. Reinstall any loose boot.
16. Fully raise and support the vehicle.

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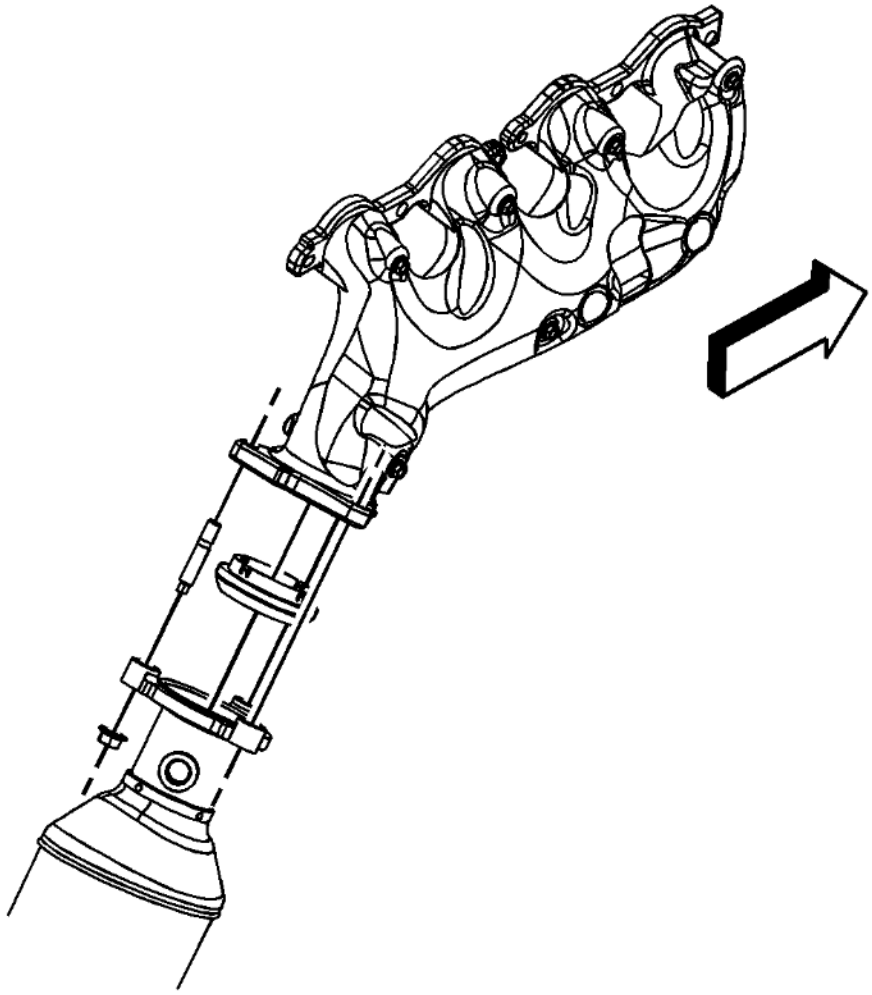


Fig. 53: View Of Exhaust Manifold, Gasket & Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

17. Install the catalytic converter to exhaust manifold nuts, 1500 series shown, 2500 series similar.

    Tighten

    Tighten the nuts to 50 N.m (37 lb ft).

18. Install the right front wheel and tire assembly. **Tire and Wheel Removal and Installation (6-Lug Wheel)** **Tire and Wheel Removal and Installation (8-Lug Wheel)** **Tire and Wheel Removal and Installation (Dual Rear Wheels)** .

EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE (L5P)

Removal Procedure

WARNING: Refer to Hot Exhaust System Warning .

1. Exhaust Gas Recirculation Valve - Remove **Exhaust Gas Recirculation Valve Replacement**
2. Exhaust Gas Recirculation Valve Temperature Sensor-Position 2 - Remove **Exhaust Gas Recirculation Valve Temperature Sensor Replacement - Position 2**

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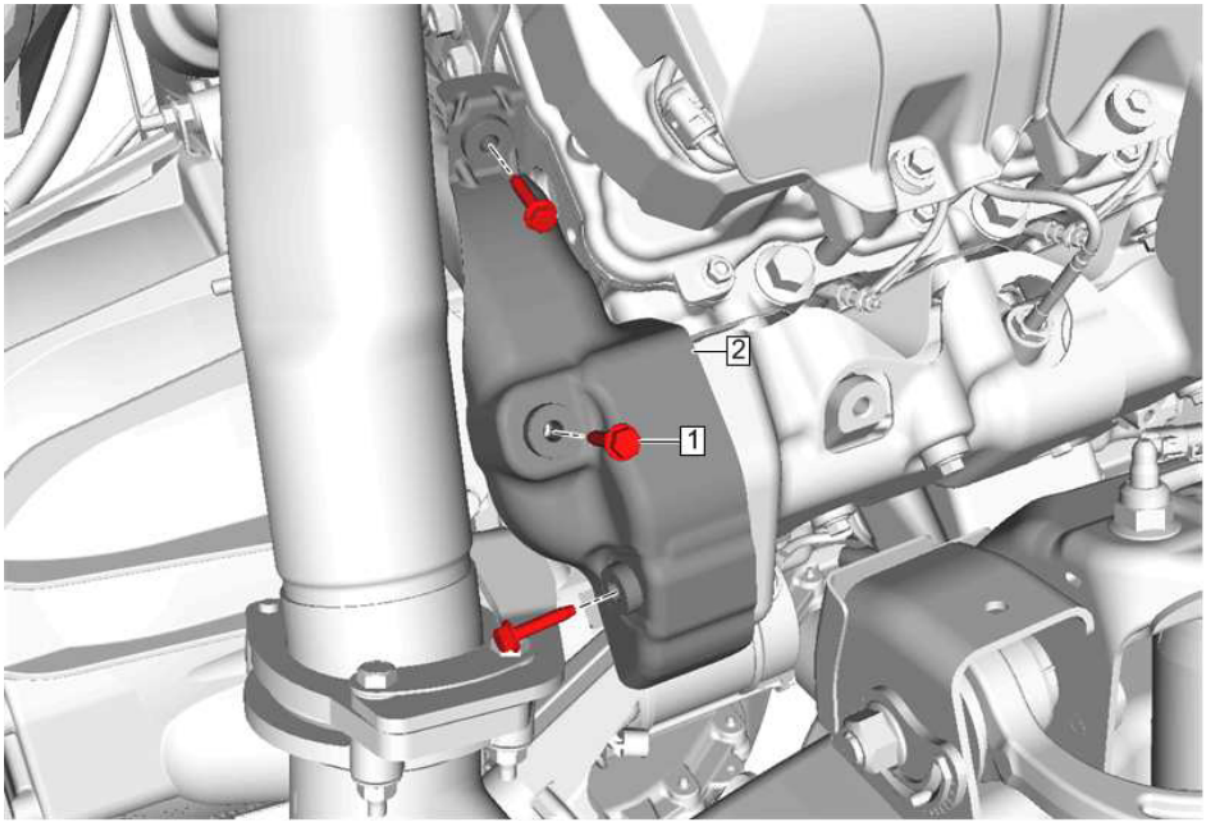
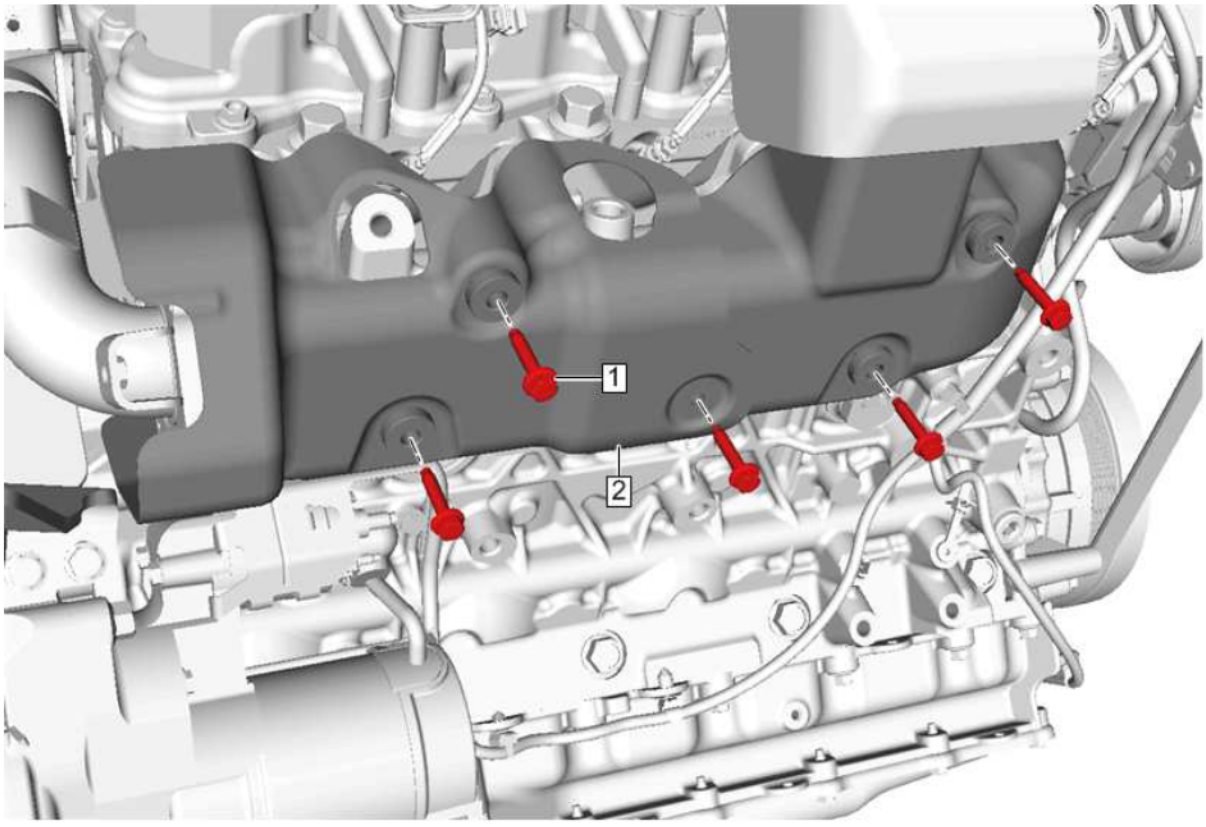


Fig. 54: Exhaust Pipe Heat Shield-Right Side
Courtesy of GENERAL MOTORS COMPANY

3. Exhaust Pipe Heat Shield-Bank 1 (2) - Remove **Exhaust Pipe Heat Shield Replacement - Right Side (L5P)**



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Fig. 55: Exhaust Manifold Heat Shield-Right Side
Courtesy of GENERAL MOTORS COMPANY

4. Exhaust Manifold Heat Shield-Right Side 2 - Remove **Exhaust Manifold Heat Shield Replacement - Right Side (L5P)**

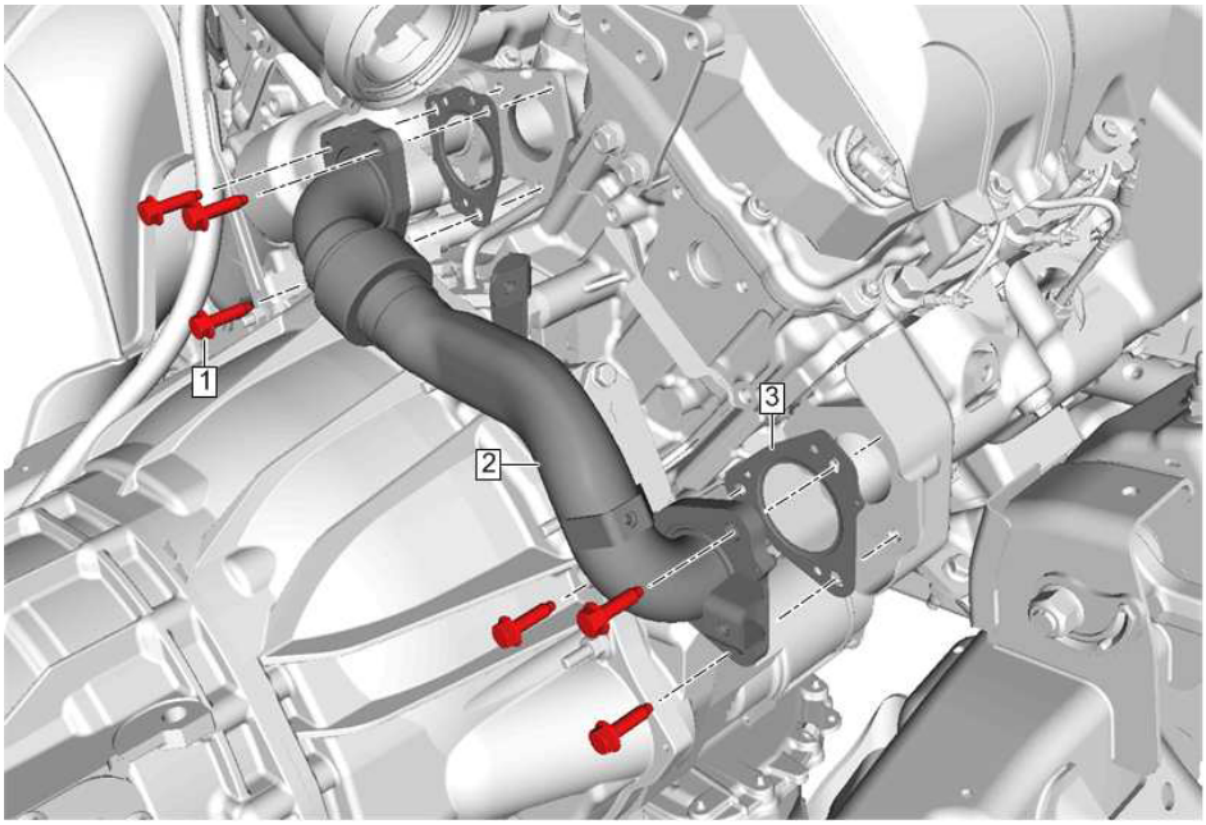


Fig. 56: Exhaust Turbocharger Inlet Pipe-Right Side
Courtesy of GENERAL MOTORS COMPANY

5. Exhaust Turbocharger Inlet Pipe-Right Side 2 @Exhaust Manifold - Remove **Exhaust Turbocharger Inlet Pipe Replacement - Right Side (L5P)**

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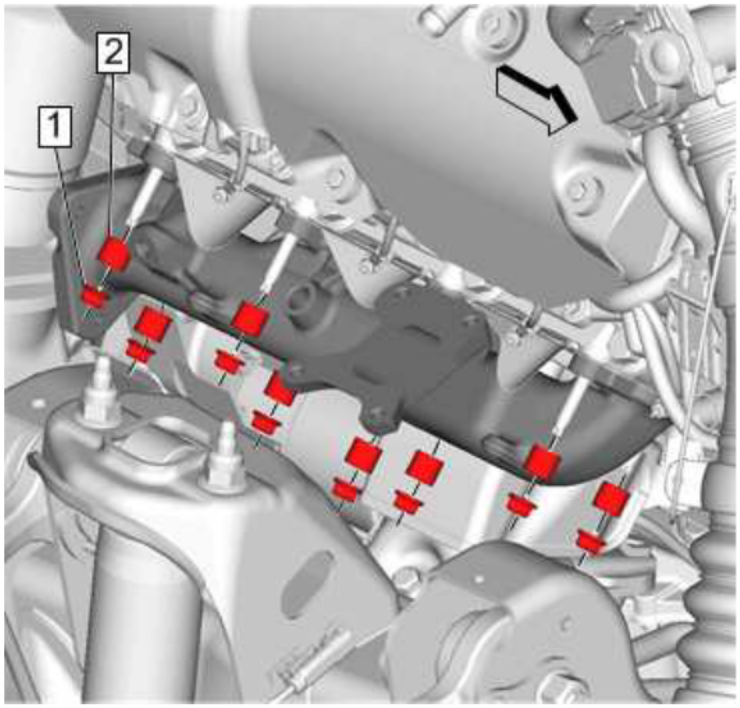


Fig. 57: Exhaust Manifold Stud Spacer
Courtesy of GENERAL MOTORS COMPANY

6. Exhaust Manifold Nut 1 - Remove
7. Exhaust Manifold Stud Spacer 2 - Remove

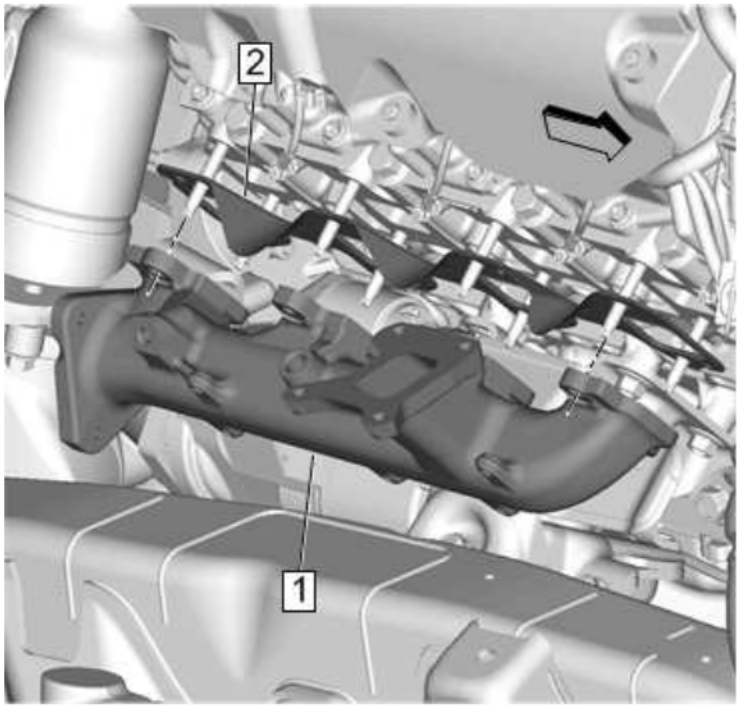


Fig. 58: Exhaust Manifold
Courtesy of GENERAL MOTORS COMPANY

8. Exhaust Manifold 1 - Remove
9. Exhaust Manifold Gasket 2 - Remove and DISCARD

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Installation Procedure

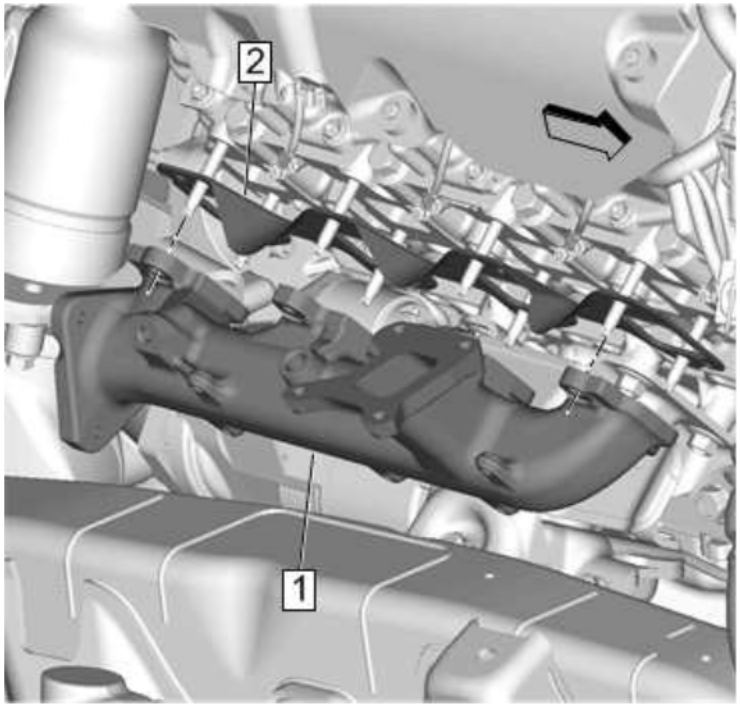


Fig. 59: Exhaust Manifold
Courtesy of GENERAL MOTORS COMPANY

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

1. Exhaust Manifold Gasket 2 - Install a NEW gasket.
2. Exhaust Manifold 1 - Install

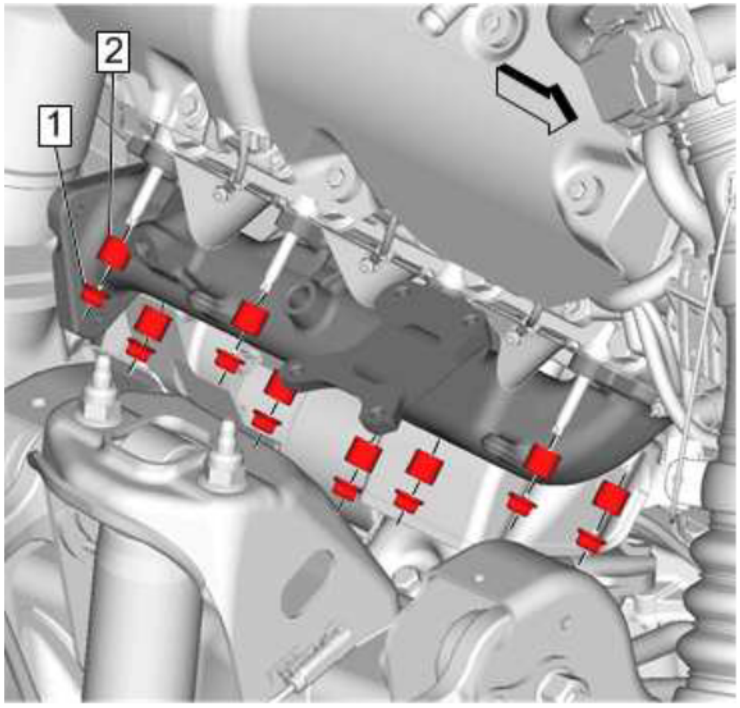


Fig. 60: Exhaust Manifold Stud Spacer
Courtesy of GENERAL MOTORS COMPANY

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3. Exhaust Manifold Stud Spacer 2 - Install
4. Exhaust Manifold Nut 1 - Install and hand tighten

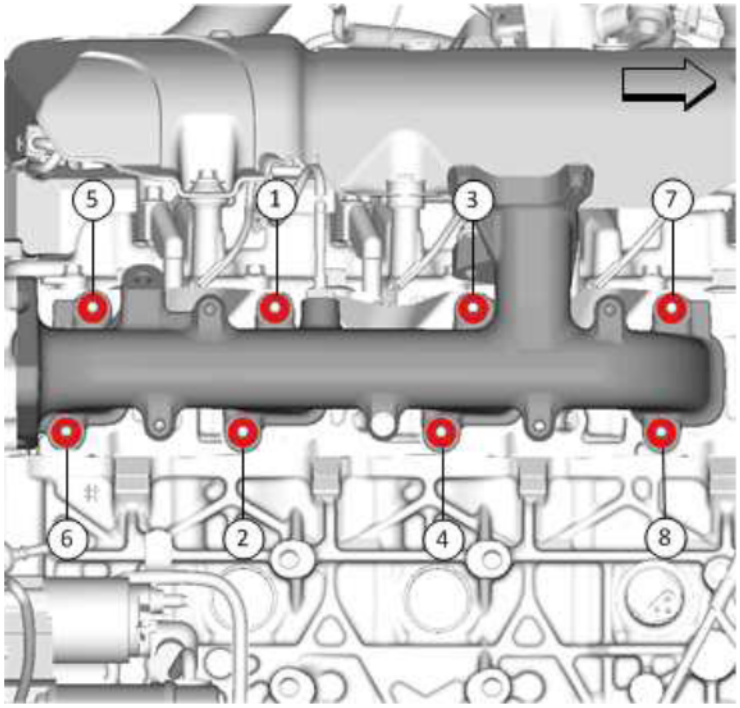


Fig. 61: Exhaust Manifold Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

5. Tighten in the sequence shown.20 N.m (15 lb ft)

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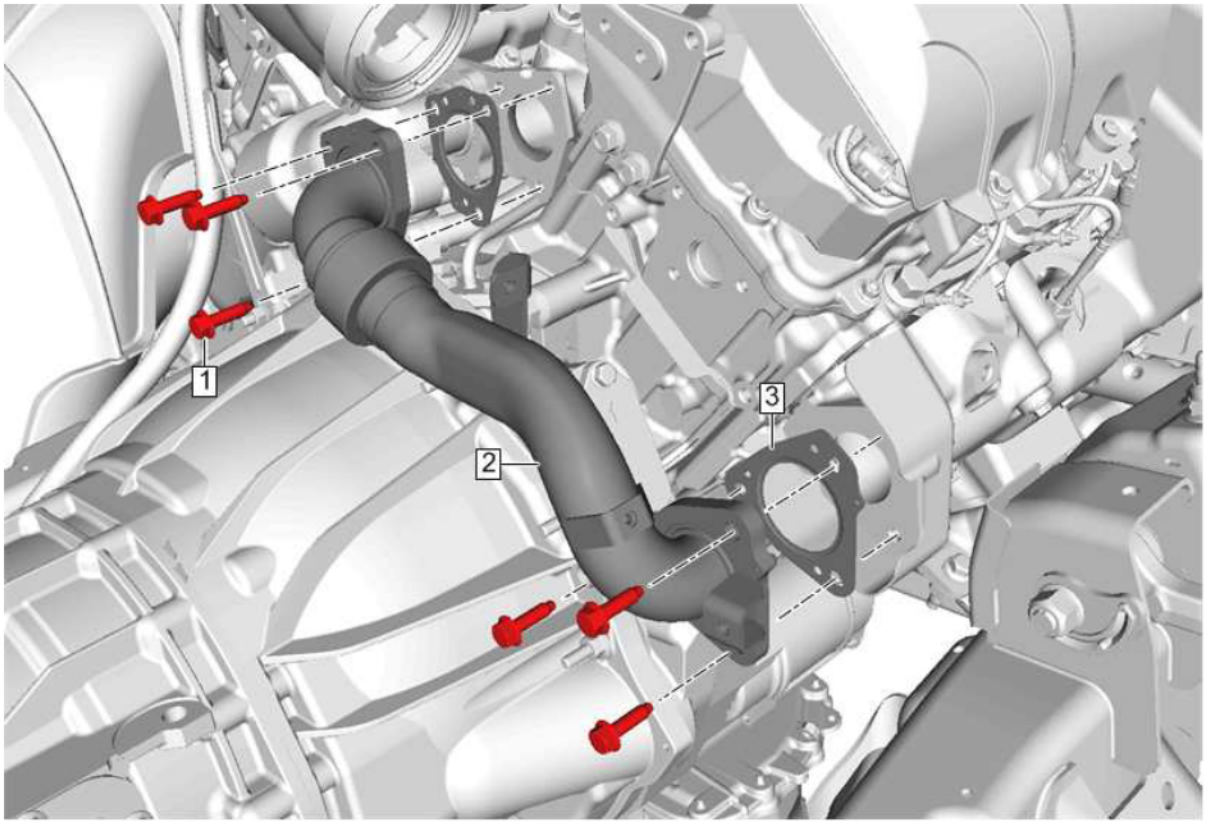
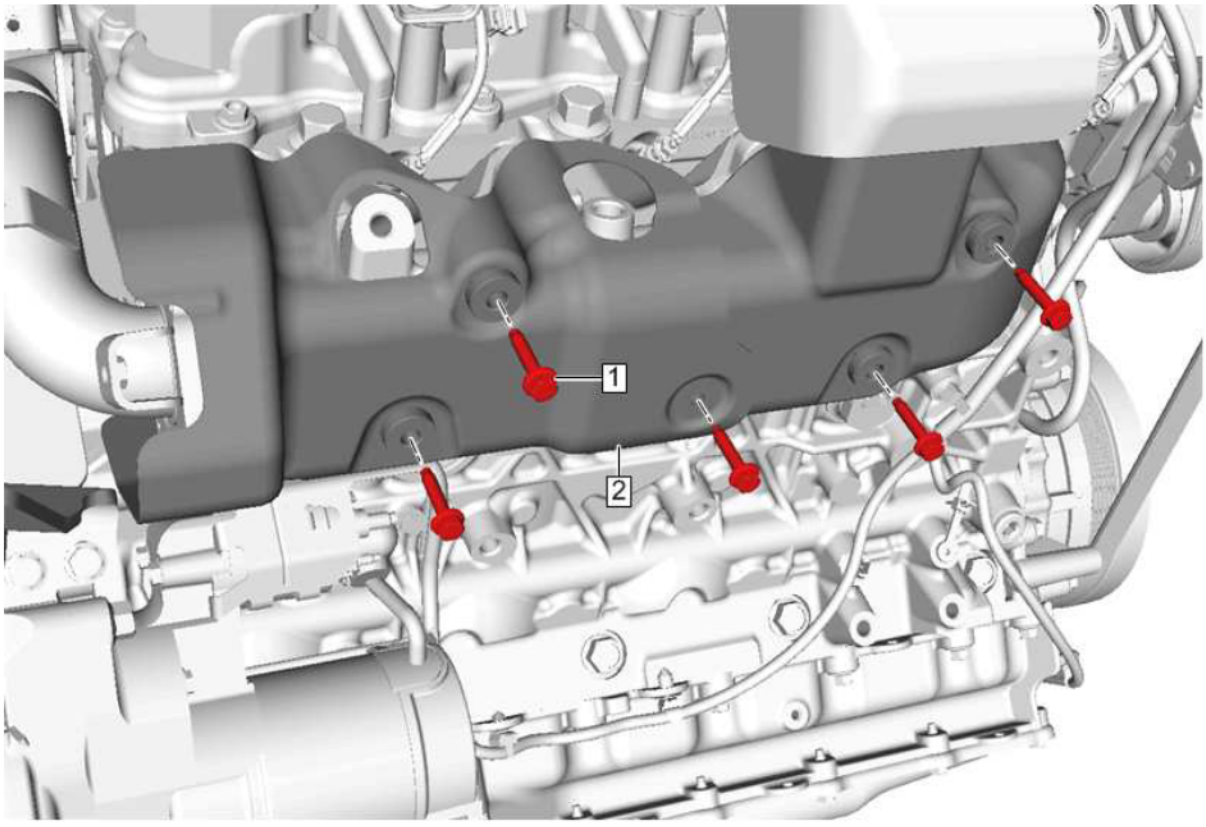


Fig. 62: Exhaust Turbocharger Inlet Pipe-Right Side
Courtesy of GENERAL MOTORS COMPANY

6. Exhaust Turbocharger Inlet Pipe-Right Side 2 @Exhaust Manifold - Install **Exhaust Turbocharger Inlet Pipe Replacement - Right Side (L5P)**



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Fig. 63: Exhaust Manifold Heat Shield-Right Side
Courtesy of GENERAL MOTORS COMPANY

7. Exhaust Manifold Heat Shield-Right Side 2 - Install **Exhaust Manifold Heat Shield Replacement - Right Side (L5P)**

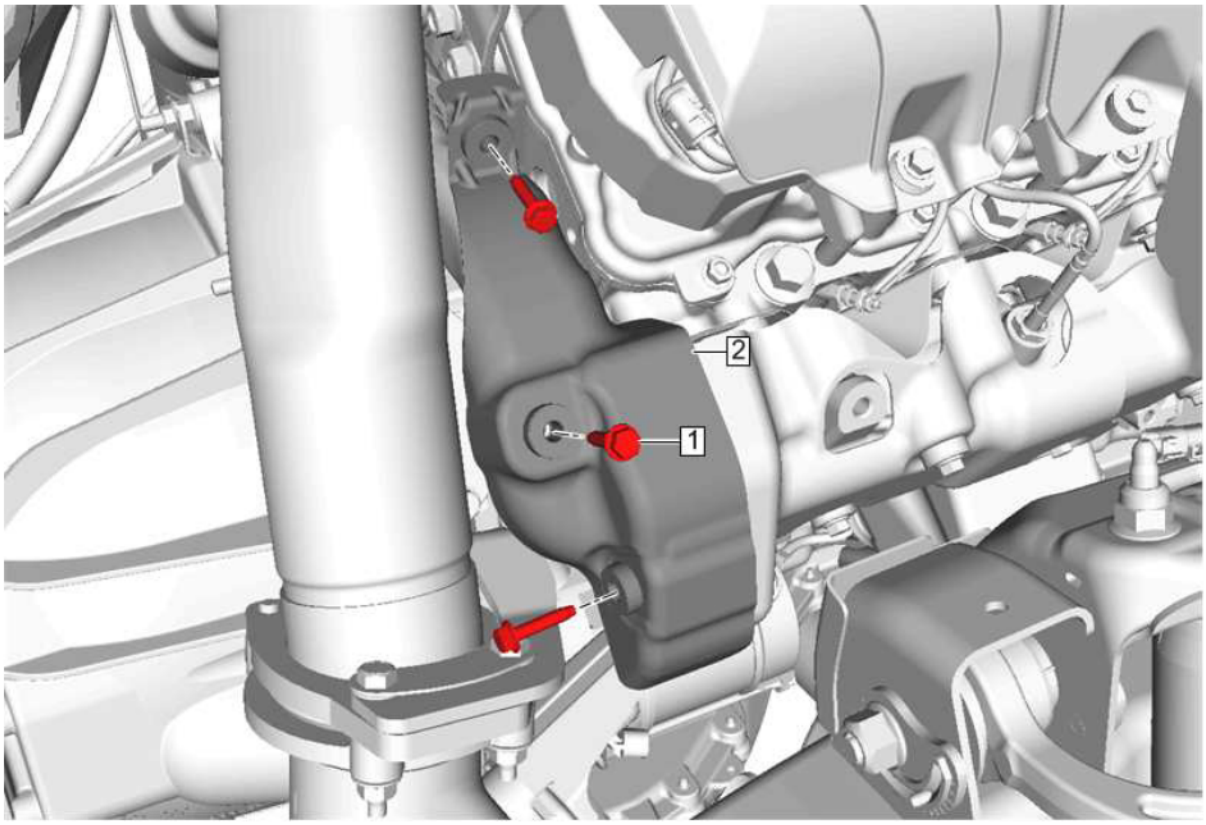


Fig. 64: Exhaust Pipe Heat Shield-Right Side
Courtesy of GENERAL MOTORS COMPANY

8. Exhaust Pipe Heat Shield-Bank 1 (2) - Install **Exhaust Pipe Heat Shield Replacement - Right Side (L5P)**
9. Exhaust Gas Recirculation Valve Temperature Sensor-Position 2 - Install **Exhaust Gas Recirculation Valve Temperature Sensor Replacement - Position 2**
10. Exhaust Gas Recirculation Valve - Install **Exhaust Gas Recirculation Valve Replacement**

EXHAUST TURBOCHARGER INLET PIPE ADAPTER REPLACEMENT (L5P)

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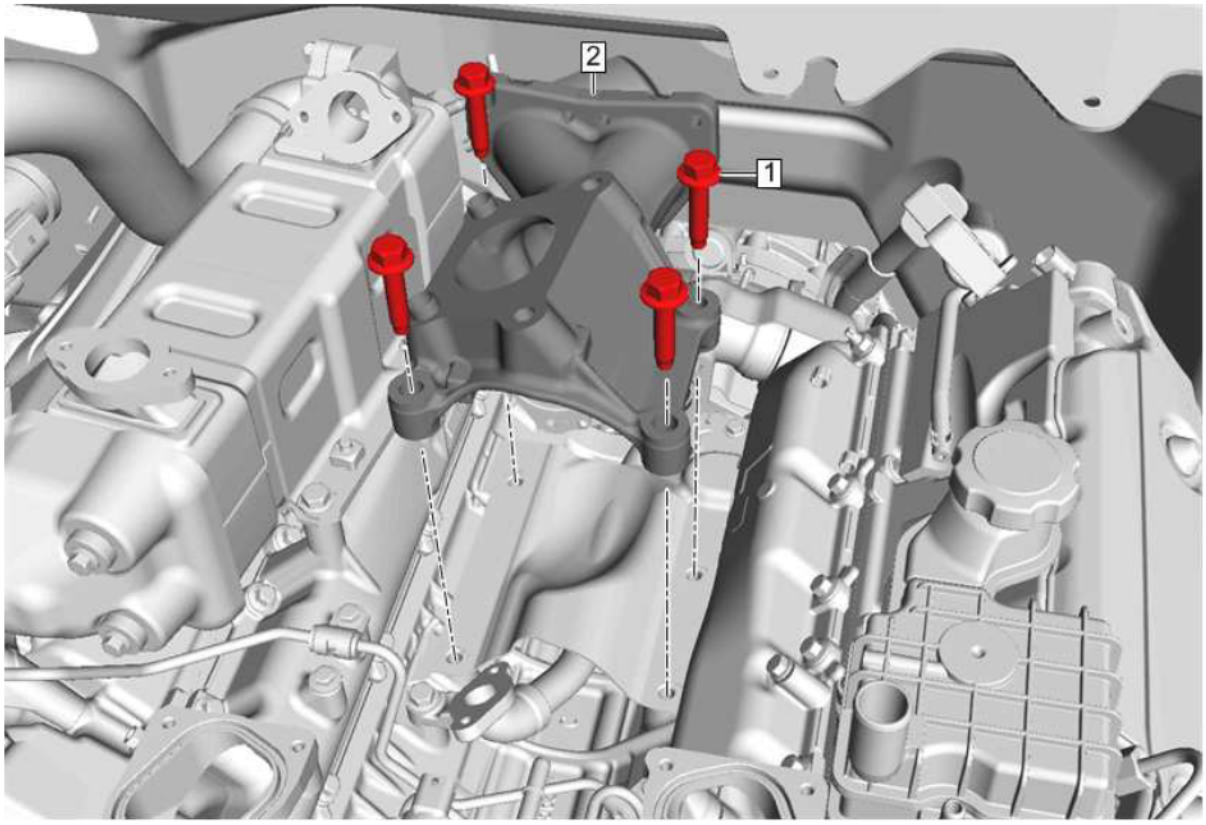


Fig. 65: Exhaust Turbocharger Inlet Pipe (L5P)
Courtesy of GENERAL MOTORS COMPANY

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**	

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Callout	Component Name
personal injury. **Preliminary Procedures** 1. **Oxidation Catalytic Converter Replacement (L5P)** 2. Exhaust Turbocharger Inlet Pipe-Left Side @Exhaust Turbocharger Inlet Pipe Adapter - Disconnect **Exhaust Turbocharger Inlet Pipe Replacement - Left Side (L5P)** 3. Exhaust Turbocharger Inlet Pipe-Right Side @Exhaust Turbocharger Inlet Pipe Adapter - Disconnect **Exhaust Turbocharger Inlet Pipe Replacement - Right Side (L5P)**	
1	Exhaust Turbocharger Inlet Pipe Adapter Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 58 N.m (43 lb ft)
2	Exhaust Turbocharger Inlet Pipe Adapter

EXHAUST TURBOCHARGER INLET PIPE REPLACEMENT - LEFT SIDE (L5P)

Removal Procedure

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

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

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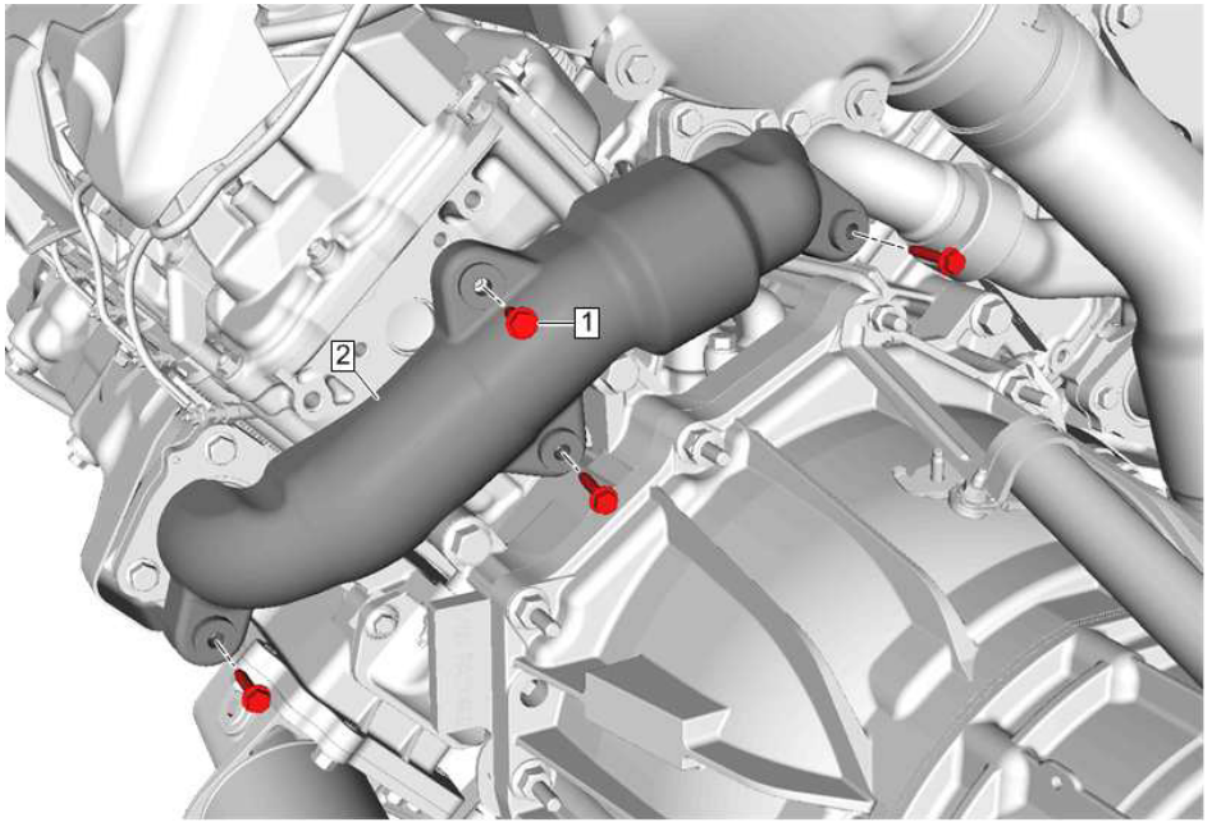
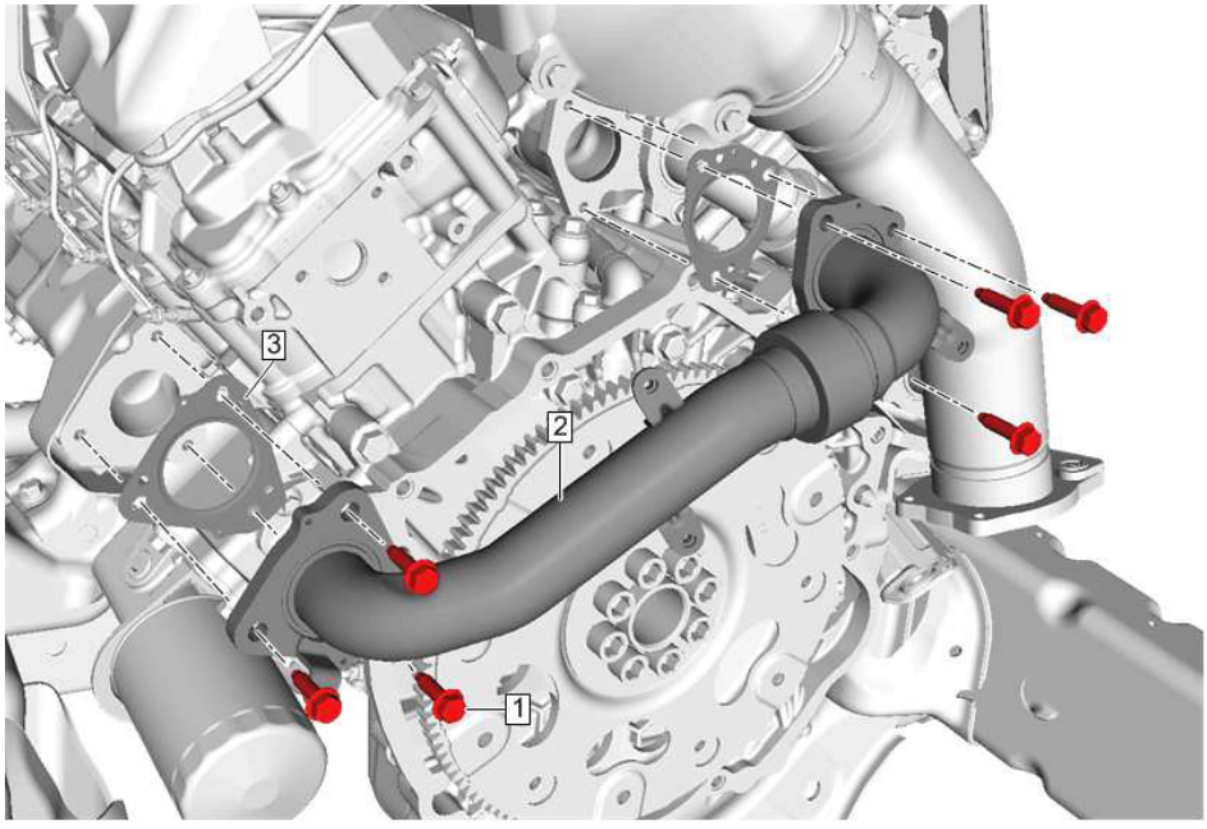


Fig. 66: Exhaust Pipe Heat Shield-Left Side
Courtesy of GENERAL MOTORS COMPANY

1. Exhaust Pipe Heat Shield-Left Side 2 - Remove **Exhaust Pipe Heat Shield Replacement - Left Side (L5P)**



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Fig. 67: Exhaust Turbocharger Inlet Pipe
Courtesy of GENERAL MOTORS COMPANY

2. Exhaust Turbocharger Inlet Pipe Bolt 1 - Remove
3. Exhaust Turbocharger Inlet Pipe 2 - Remove
4. Exhaust Turbocharger Inlet Pipe Gasket 3 - Remove and DISCARD

Installation Procedure

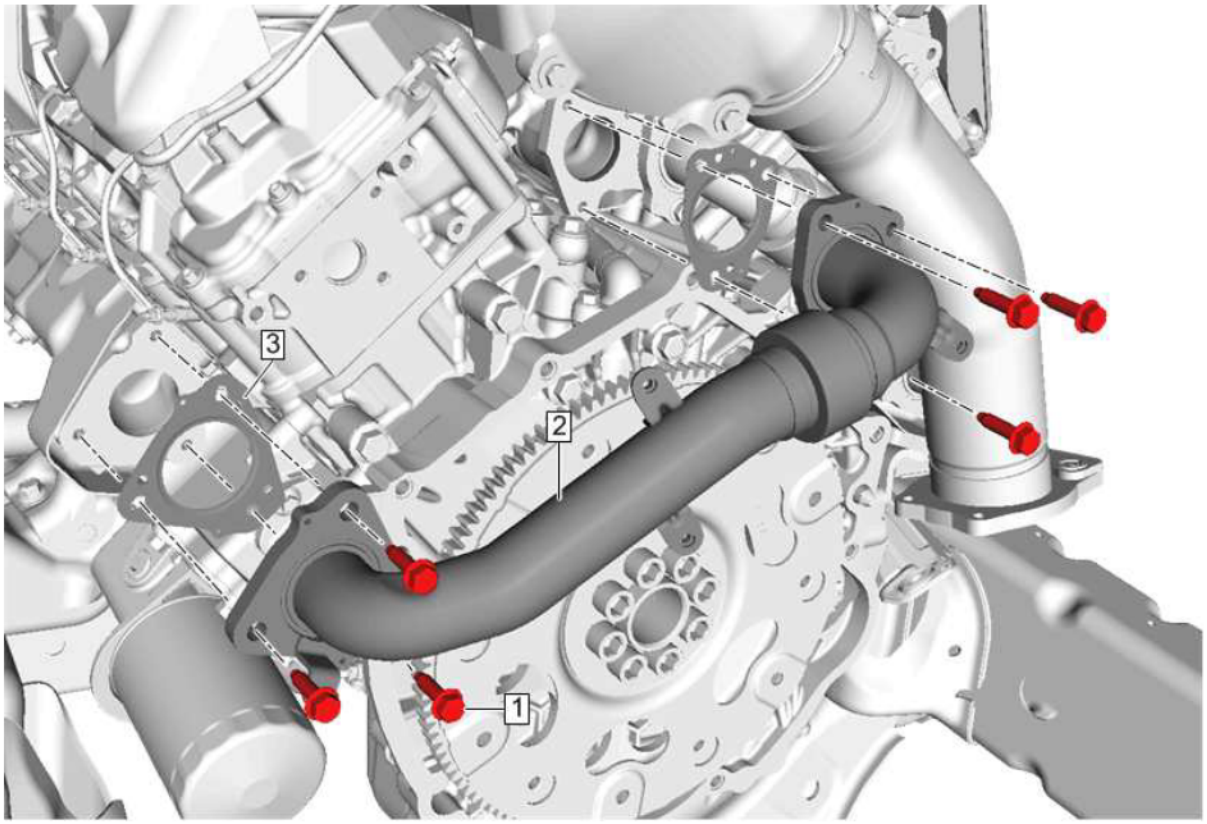


Fig. 68: Exhaust Turbocharger Inlet Pipe
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install a NEW exhaust turbocharger inlet pipe gasket.**

1. Exhaust Turbocharger Inlet Pipe Gasket 3 - Install
2. Exhaust Turbocharger Inlet Pipe 2 - Install
3. Exhaust Turbocharger Inlet Pipe Bolt 1 - Install and hand tighten

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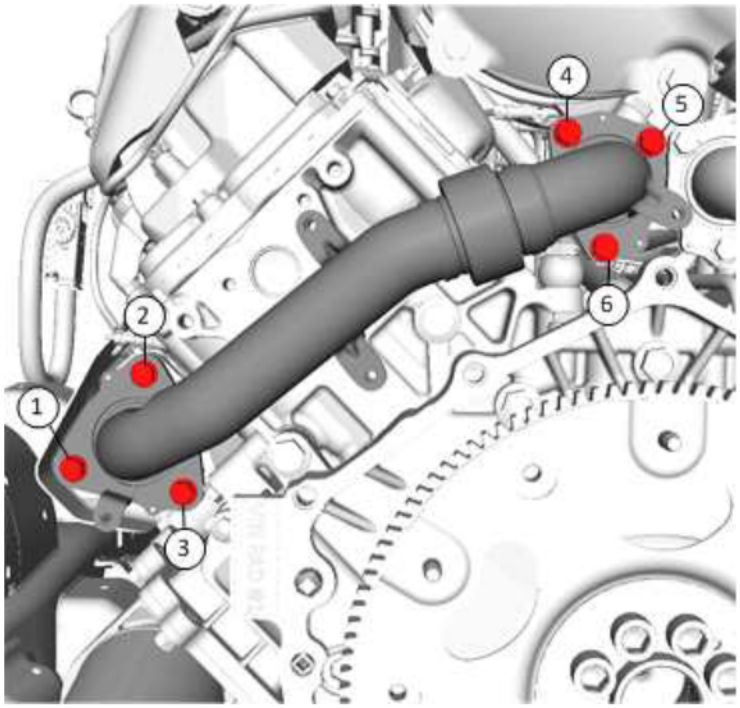


Fig. 69: Exhaust Turbocharger Inlet Pipe Bolt Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

4. Exhaust Turbocharger Inlet Pipe Bolt - Tighten in sequence 25 N.m (18 lb ft)

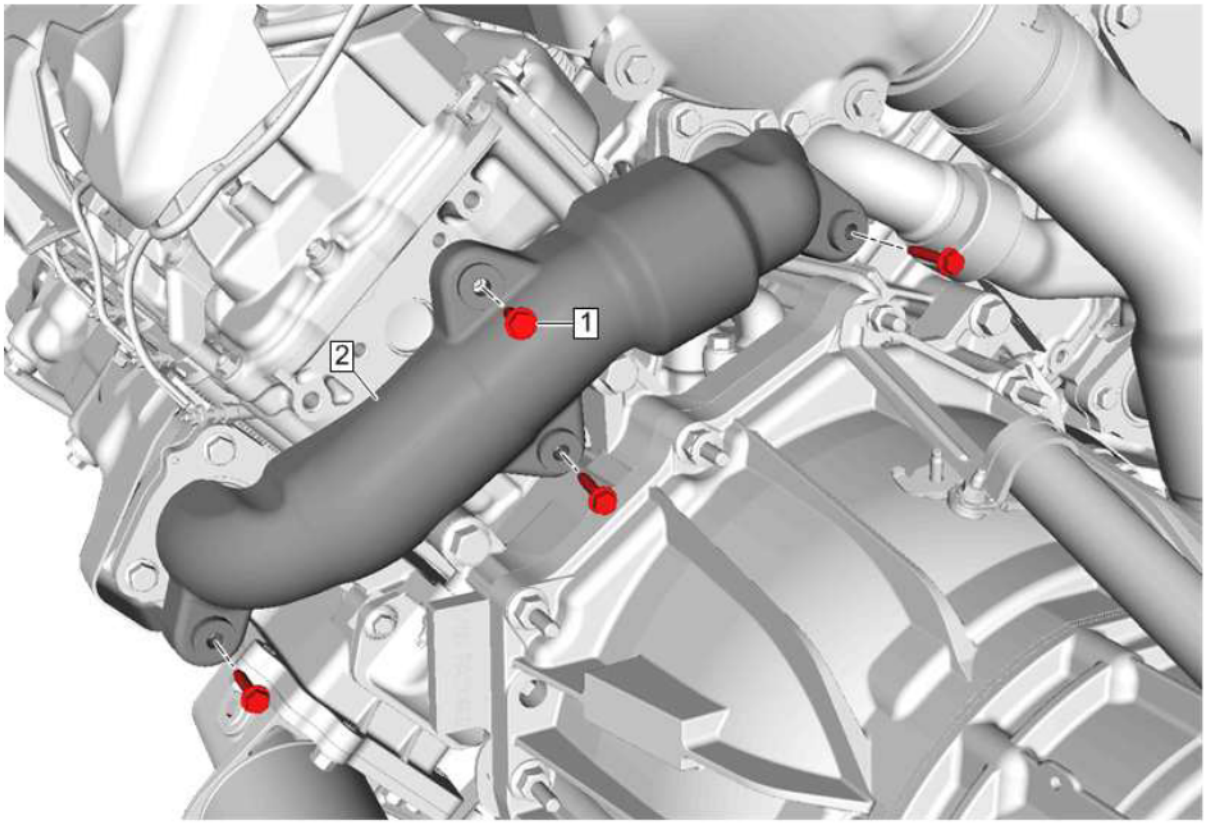


Fig. 70: Exhaust Pipe Heat Shield-Left Side
Courtesy of GENERAL MOTORS COMPANY

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5. Exhaust Pipe Heat Shield-Left Side 2 - Install **Exhaust Pipe Heat Shield Replacement - Left Side (L5P)**

EXHAUST TURBOCHARGER INLET PIPE REPLACEMENT - RIGHT SIDE (L5P)

Removal Procedure

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

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

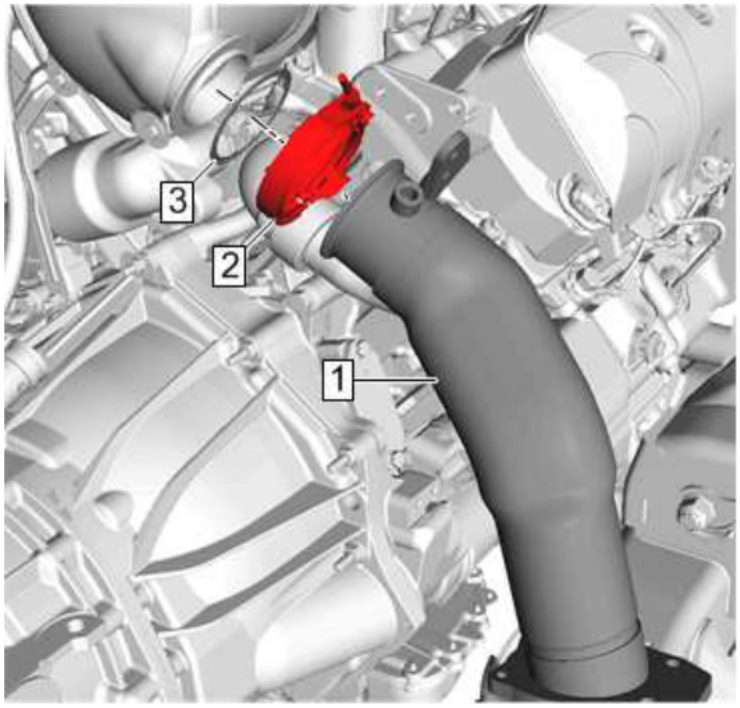


Fig. 71: Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

1. Exhaust Front Pipe 1 - Remove **Exhaust Front Pipe Replacement (L5P)**

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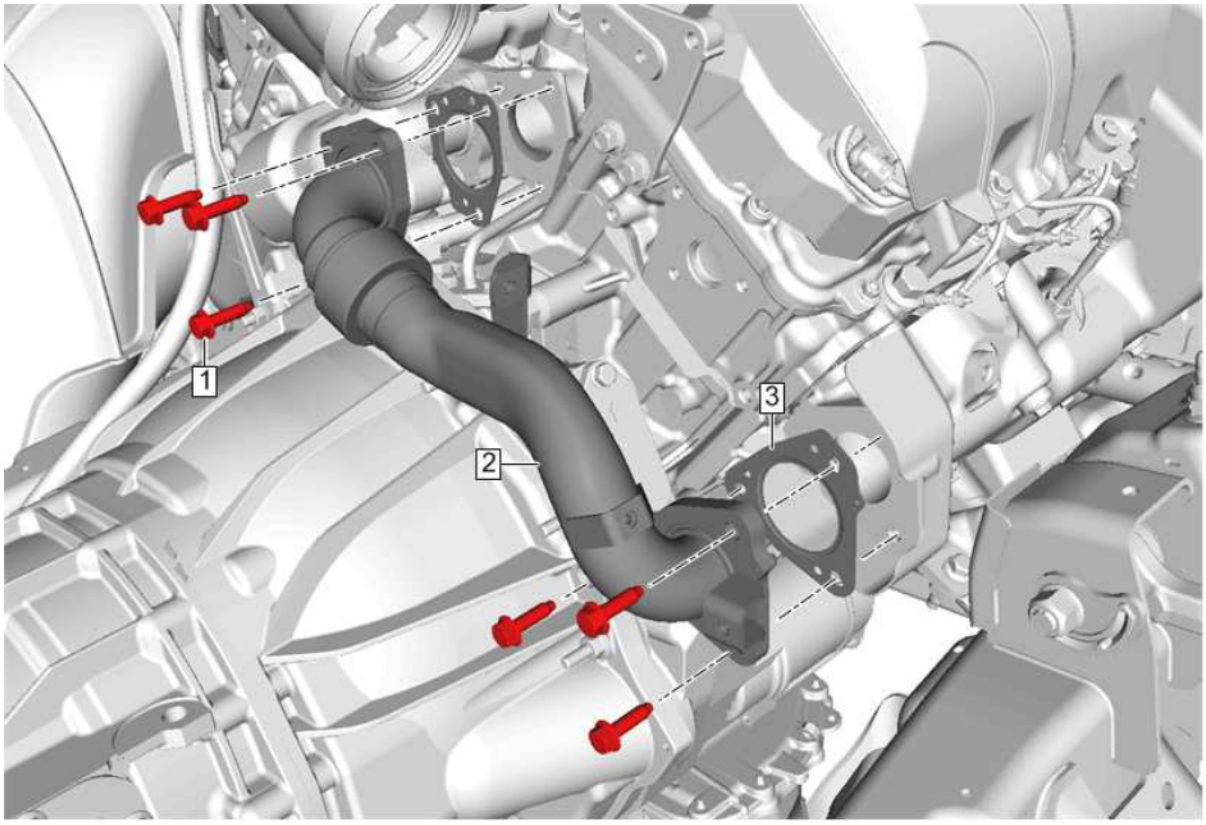


Fig. 72: Exhaust Turbocharger Inlet Pipe-Right Side
Courtesy of GENERAL MOTORS COMPANY

2. Exhaust Turbocharger Inlet Pipe Bolt 1 - Remove
3. Exhaust Turbocharger Inlet Pipe 2 - Remove
4. Exhaust Turbocharger Inlet Pipe Gasket 3 - Remove and DISCARD

Installation Procedure

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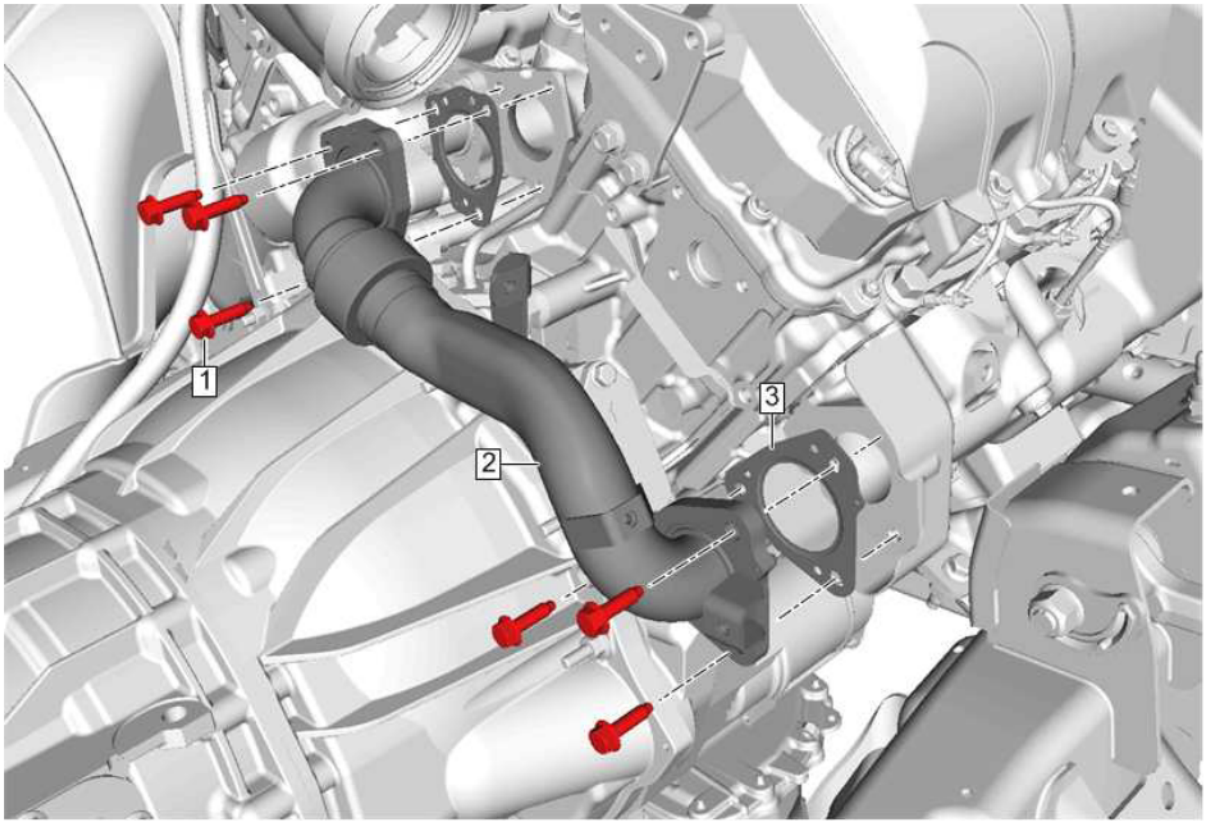
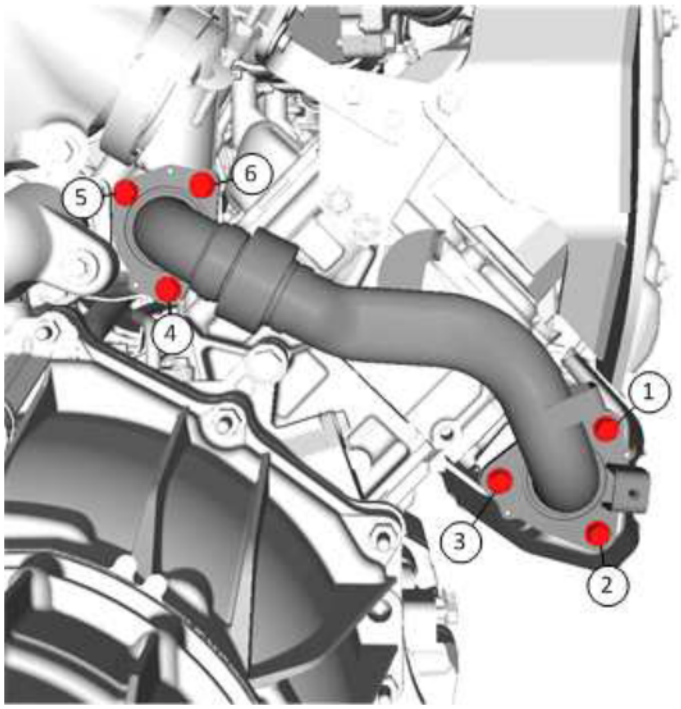


Fig. 73: Exhaust Turbocharger Inlet Pipe-Right Side
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install a NEW exhaust turbocharger inlet pipe gasket.**

1. Exhaust Turbocharger Inlet Pipe Gasket 3 - Install
2. Exhaust Turbocharger Inlet Pipe 2 - Install
3. Exhaust Turbocharger Inlet Pipe Bolt 1 - Install and hand tighten



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Fig. 74: Exhaust Turbocharger Inlet Pipe Bolt Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Exhaust Turbocharger Inlet Pipe Bolt - Tighten in sequence 25 N.m (18 lb ft)

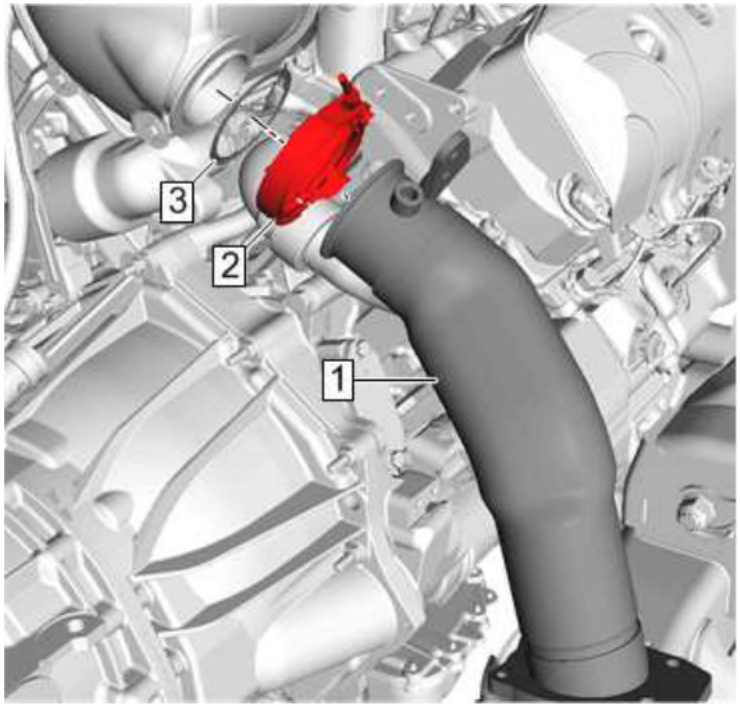


Fig. 75: Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

5. Exhaust Front Pipe 1 - Install **Exhaust Front Pipe Replacement (L5P)**

EXHAUST FRONT PIPE REPLACEMENT (L5P)

Removal Procedure

1. Exhaust Gas Recirculation Cooler - Remove **Exhaust Gas Recirculation Cooler Replacement**
2. Exhaust Temperature Sensor - Position 2 - Remove **Exhaust Temperature Sensor Replacement - Position 2**

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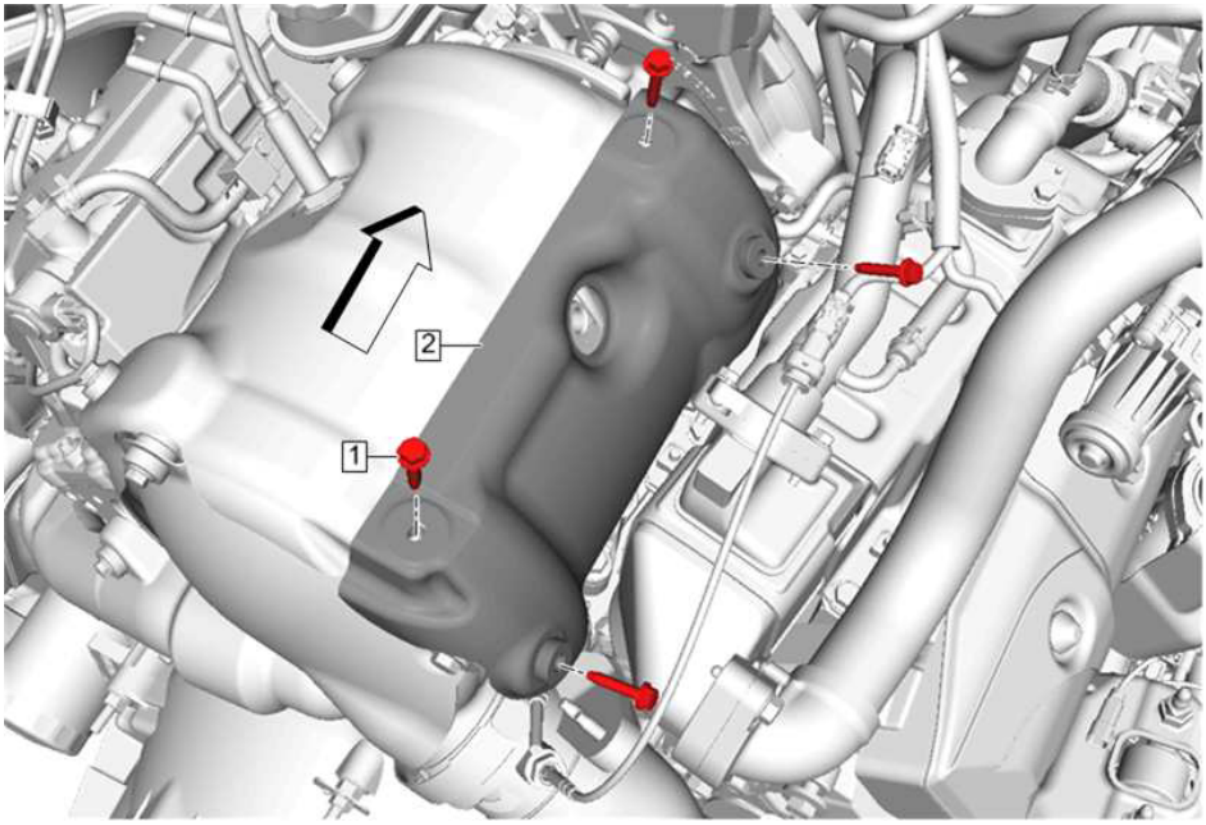
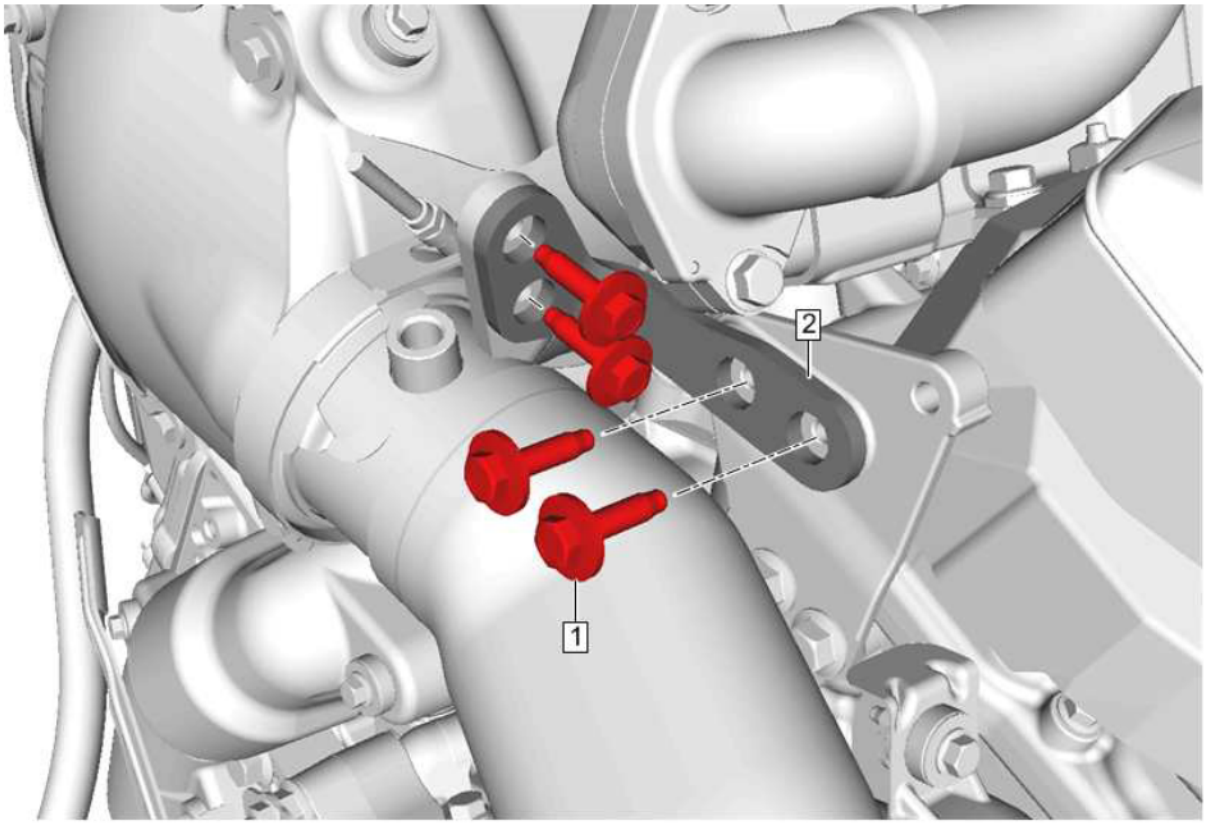


Fig. 76: Turbocharger Heat Shield - Right Side
Courtesy of GENERAL MOTORS COMPANY

3. Turbocharger Heat Shield - Right Side 2 - Remove **Turbocharger Heat Shield Replacement - Right Side (L5P)**



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Fig. 77: Exhaust Front Bracket
Courtesy of GENERAL MOTORS COMPANY

4. Exhaust Front Bracket-Upper 2 - Remove **Exhaust Front Bracket Replacement - Upper (L5P)**

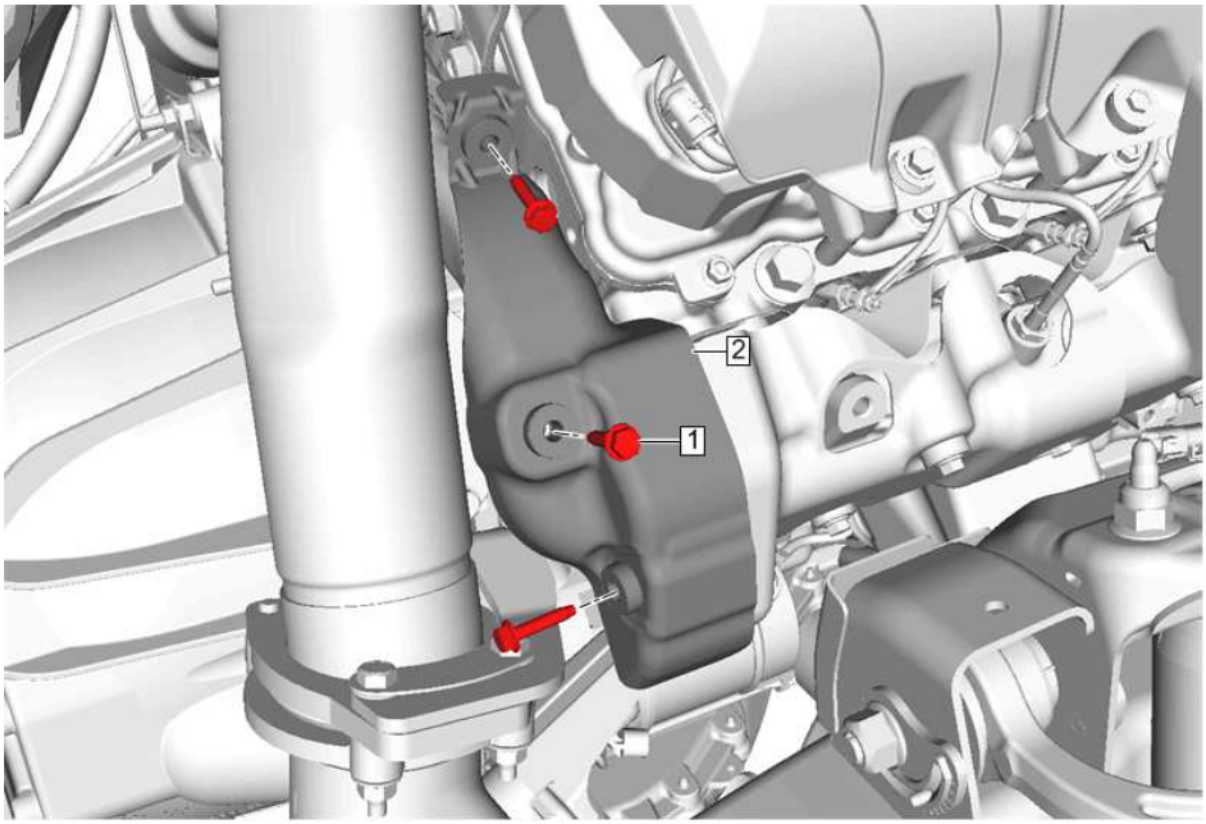


Fig. 78: Exhaust Pipe Heat Shield-Right Side
Courtesy of GENERAL MOTORS COMPANY

5. Exhaust Pipe Heat Shield-Right Side 2 - Remove **Exhaust Pipe Heat Shield Replacement - Right Side (L5P)**

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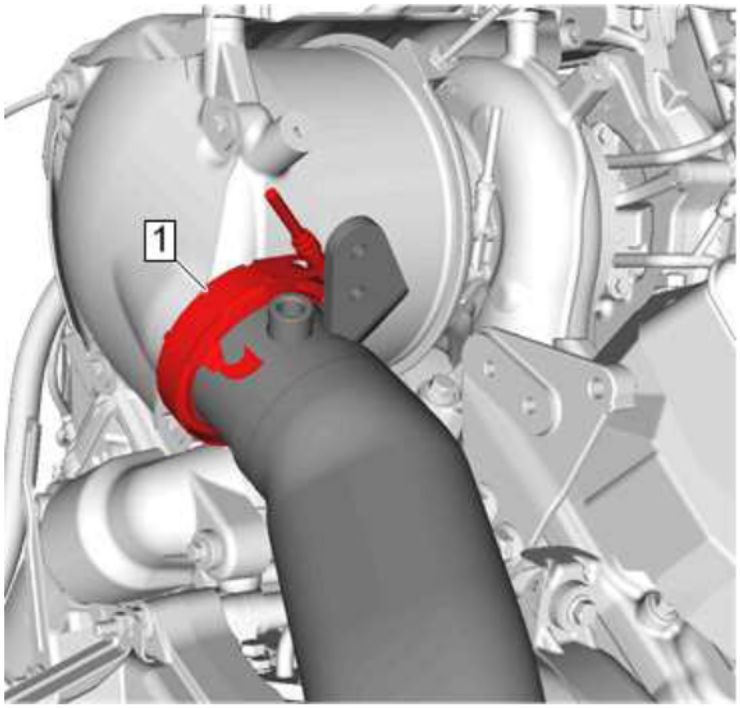


Fig. 79: Catalytic Converter Band Clamp
Courtesy of GENERAL MOTORS COMPANY

6. Catalytic Converter Band Clamp 1 - Loosen

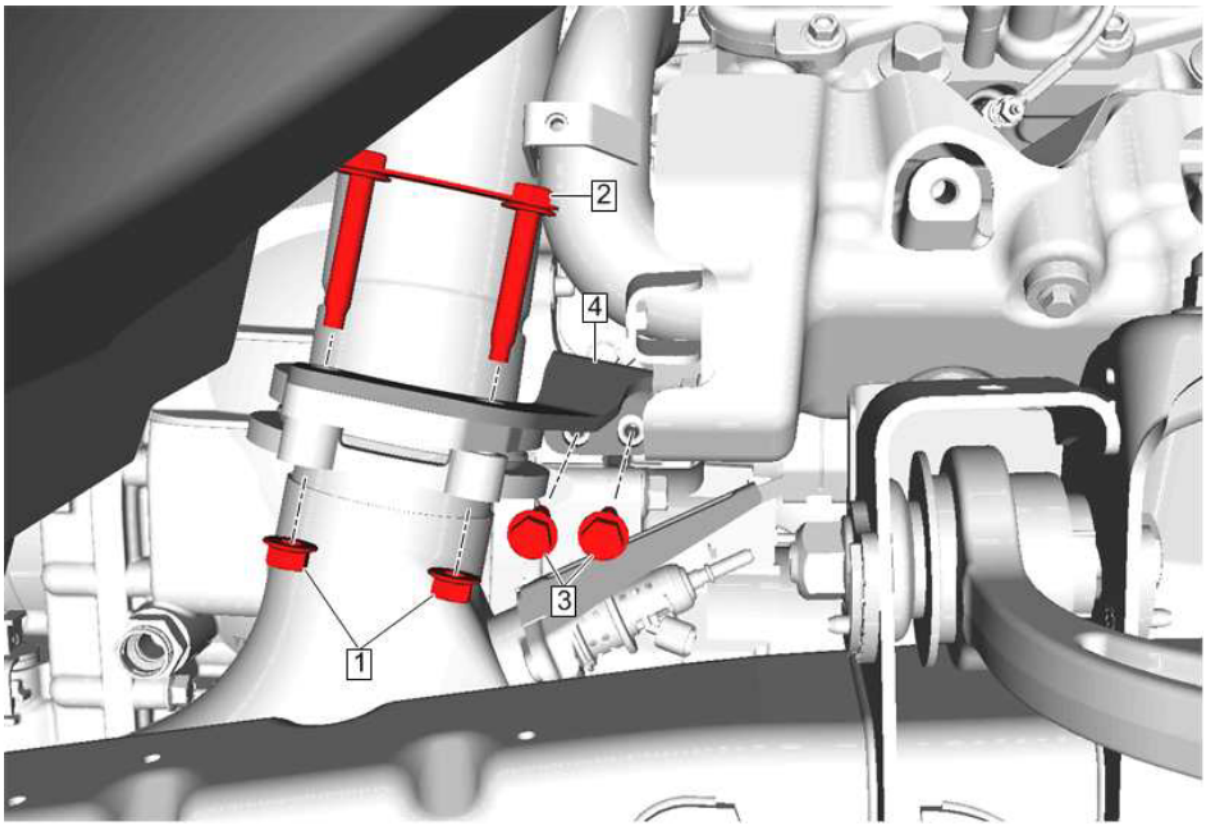


Fig. 80: Exhaust Front Bracket-Lower
Courtesy of GENERAL MOTORS COMPANY

7. Exhaust Front Bracket-Lower 4 - Remove **Exhaust Front Bracket Replacement - Lower (L5P)**

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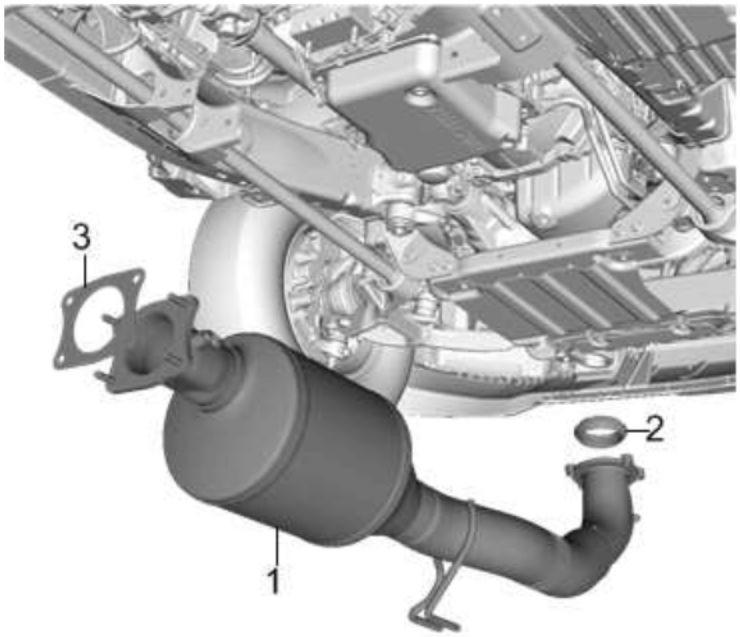


Fig. 81: Warm Up Nitrogen Oxides Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

8. Warm Up Nitrogen Oxides Catalytic Converter 1 - Remove **Warm Up Nitrogen Oxides Catalytic Converter Replacement (L5P)**

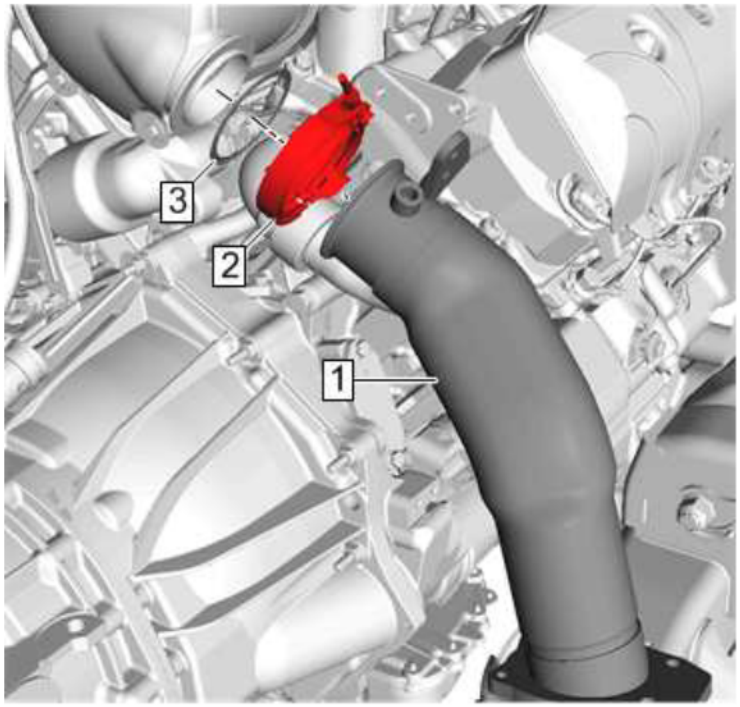


Fig. 82: Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

9. Exhaust Front Pipe 1 - Remove
10. Catalytic Converter Band Clamp 1 - Remove and DISCARD
11. Exhaust Front Pipe Gasket 3 - Remove and DISCARD

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Installation Procedure

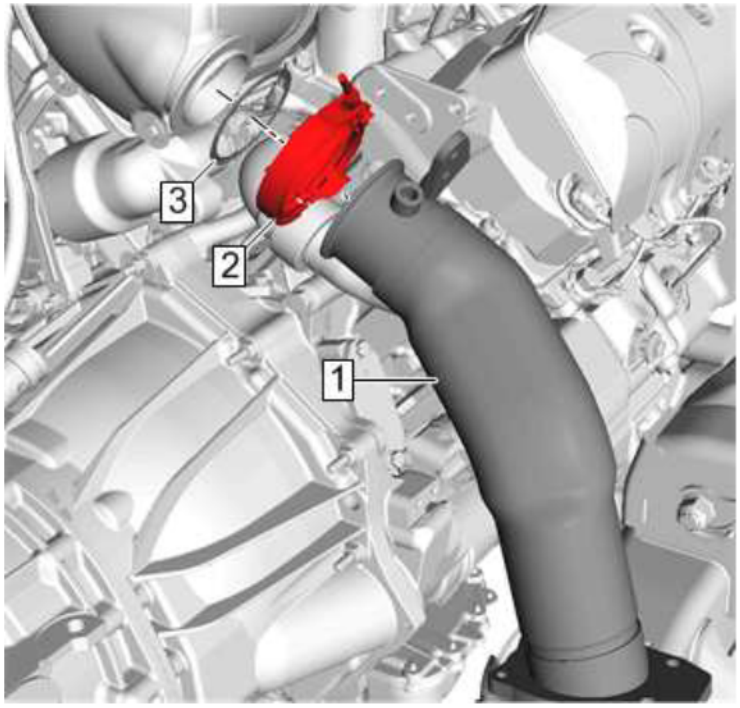


Fig. 83: Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install a NEW gasket.**

1. Exhaust Front Pipe Gasket 3 - Install

NOTE: **Install a NEW clamp.**

2. Catalytic Converter Band Clamp 2 - Install

NOTE: **With the aid of an assistant, install the exhaust front pipe to the engine. DO NOT torque the catalytic converter clamp at this time.**

3. Exhaust Front Pipe 1 - Install

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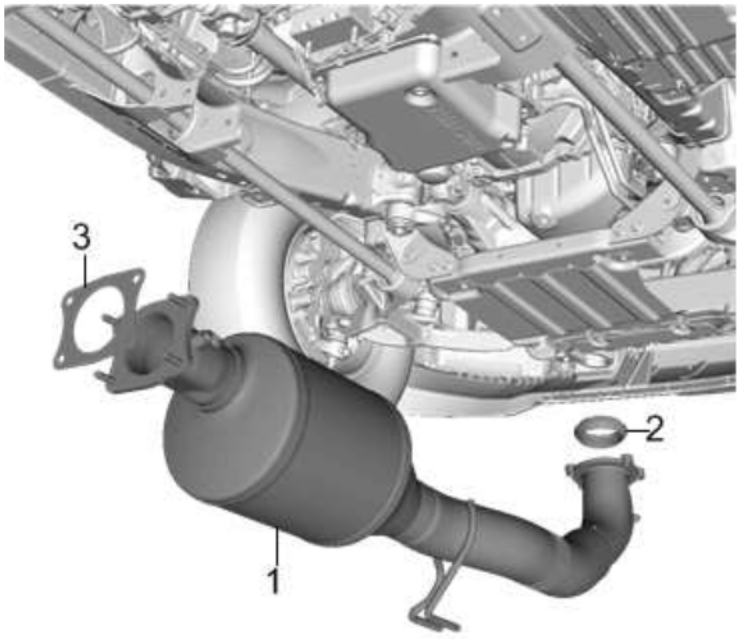


Fig. 84: Warm Up Nitrogen Oxides Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

4. Warm Up Nitrogen Oxides Catalytic Converter 1 - Install **Warm Up Nitrogen Oxides Catalytic Converter Replacement (L5P)**

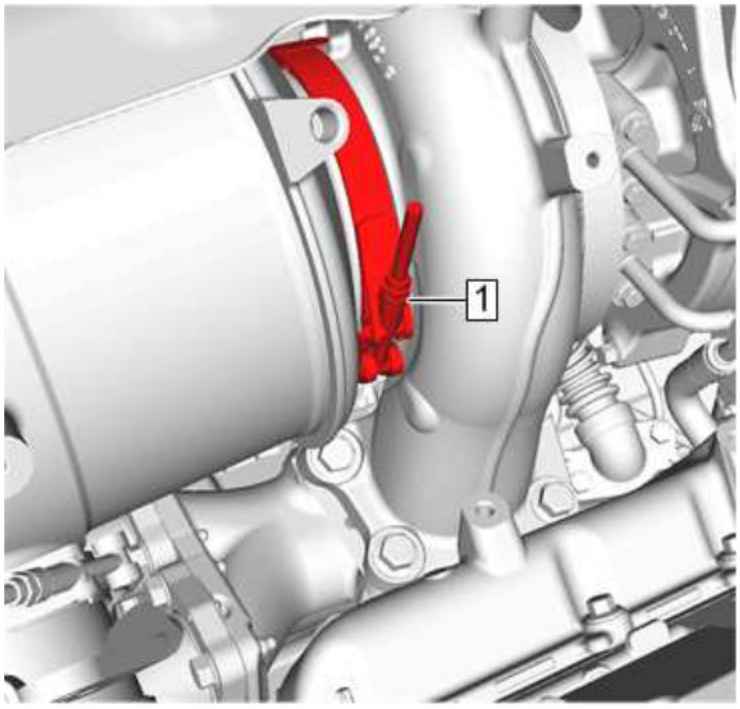


Fig. 85: Turbocharger To Catalytic Converter Band Clamp
Courtesy of GENERAL MOTORS COMPANY

5. Loosen the turbocharger to catalytic converter band clamp (1) approximately 3.5 turns or just enough to allow the converter flange to rotate.

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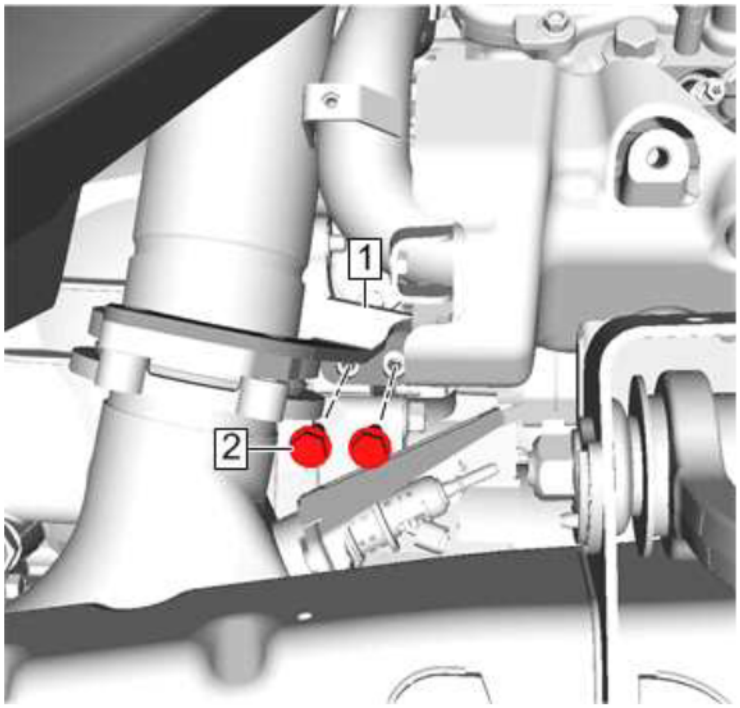


Fig. 86: Lower Exhaust Front Bracket
Courtesy of GENERAL MOTORS COMPANY

6. Position the lower exhaust front bracket (1) to the flywheel housing.
7. Hand tighten the lower exhaust front bracket to flywheel housing bolts (2) then back out 1/4 turn each.
8. Loosen the catalytic converter band clamp approximately 3.5 turns or just enough to allow the exhaust front pipe flange to rotate.

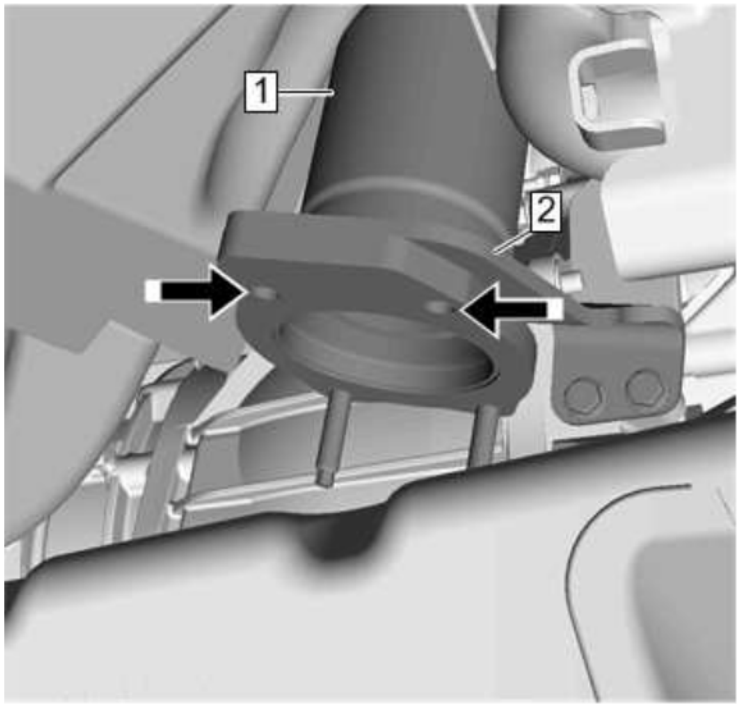


Fig. 87: Exhaust Front Pipe
Courtesy of GENERAL MOTORS COMPANY

9. Adjust the alignment of the exhaust front pipe (1) to catalytic converter by rotating, raising or lowering

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the pipe until the holes of the lower flange align with the lower exhaust front bracket (2).

Use vise grips to clamp the lower exhaust front bracket to the exhaust front pipe flange.

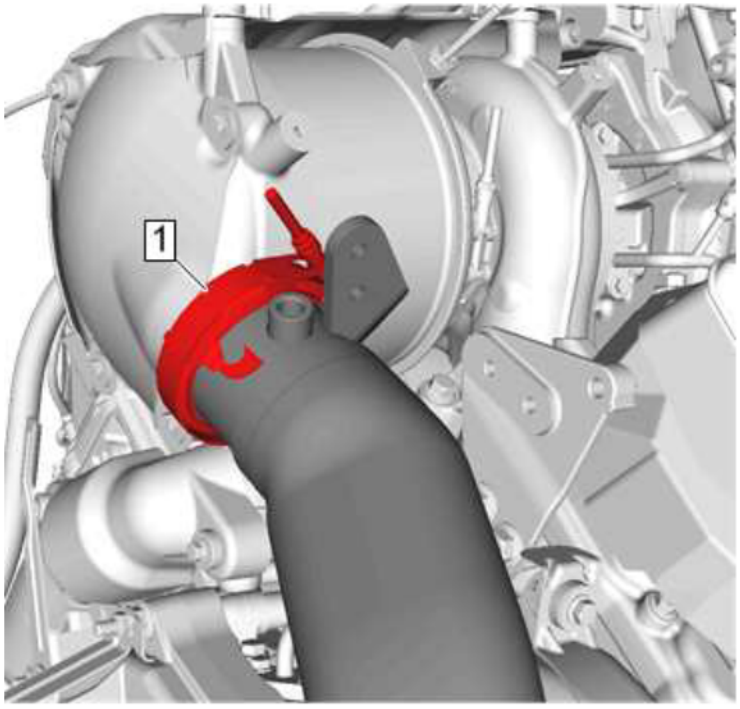


Fig. 88: Catalytic Converter Band Clamp
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

10. Tighten the catalytic converter band clamp (1).
    - First Pass: 7-12 N.m (62-106 lb in)
    - Second Pass: Loosen the clamp approximately 2 turns.
    - Final Pass: 12 N.m (106 lb in)

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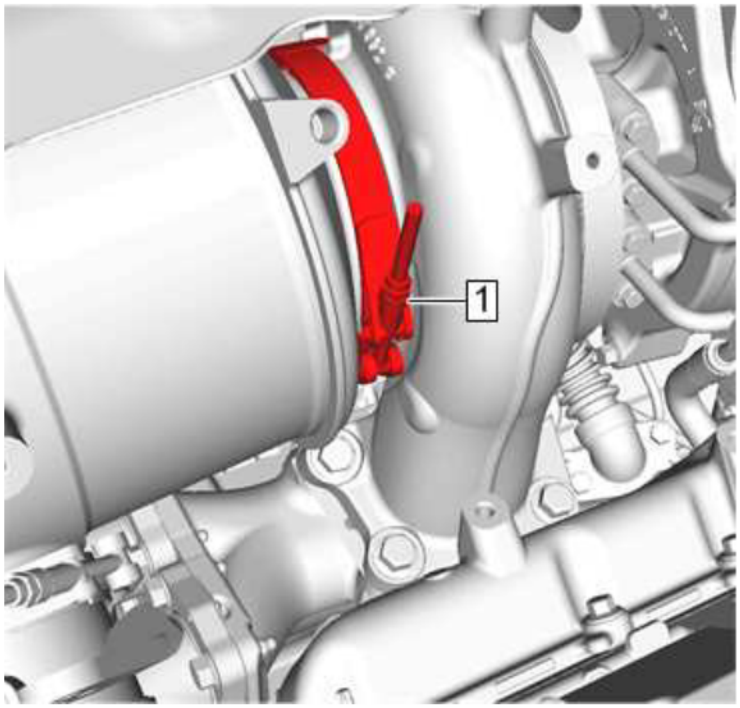


Fig. 89: Turbocharger To Catalytic Converter Band Clamp
Courtesy of GENERAL MOTORS COMPANY

11. Tighten the turbocharger to catalytic converter band clamp (1).
    - First Pass: 7-12 N.m (62-lb in)
    - Second Pass: Loosen the clamp approximately 2 turns.
    - Final Pass: 12 N.m (106 lb in)

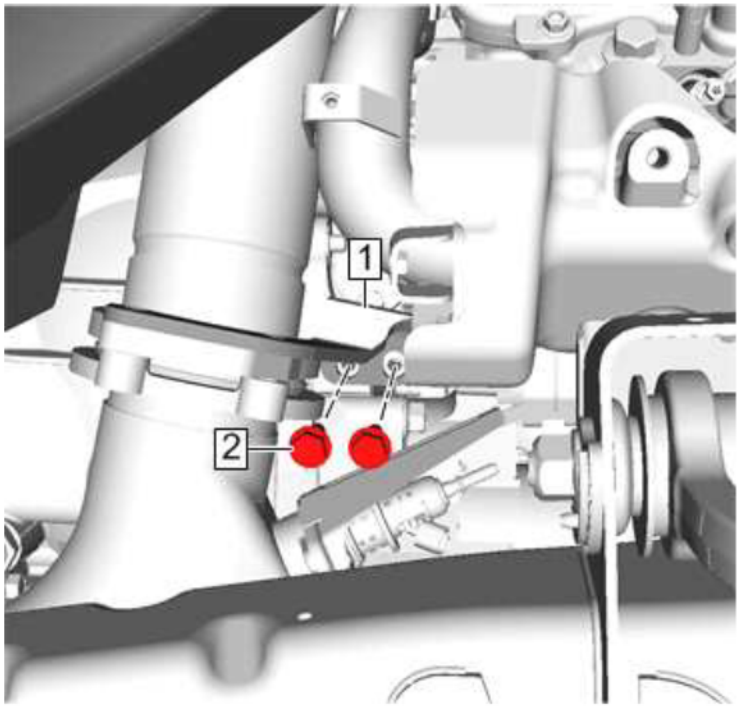


Fig. 90: Lower Exhaust Front Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

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12. Tighten the lower exhaust front bracket bolts (2) to 25 N.m (18 lb ft).
13. Remove the vise grips.

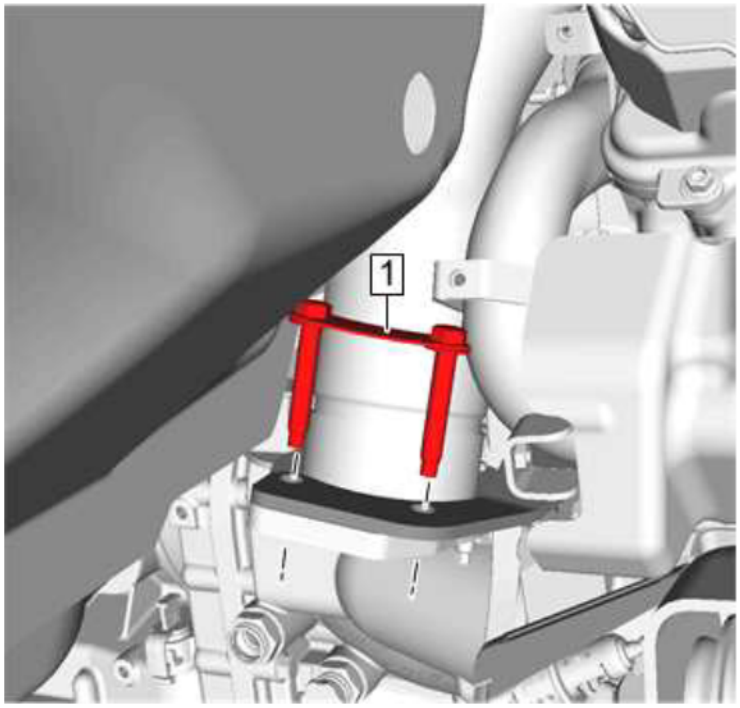


Fig. 91: Stud Plate Assembly
Courtesy of GENERAL MOTORS COMPANY

14. Drop the stud plate assembly (1) through the exhaust front bracket and exhaust front pipe flange holes.

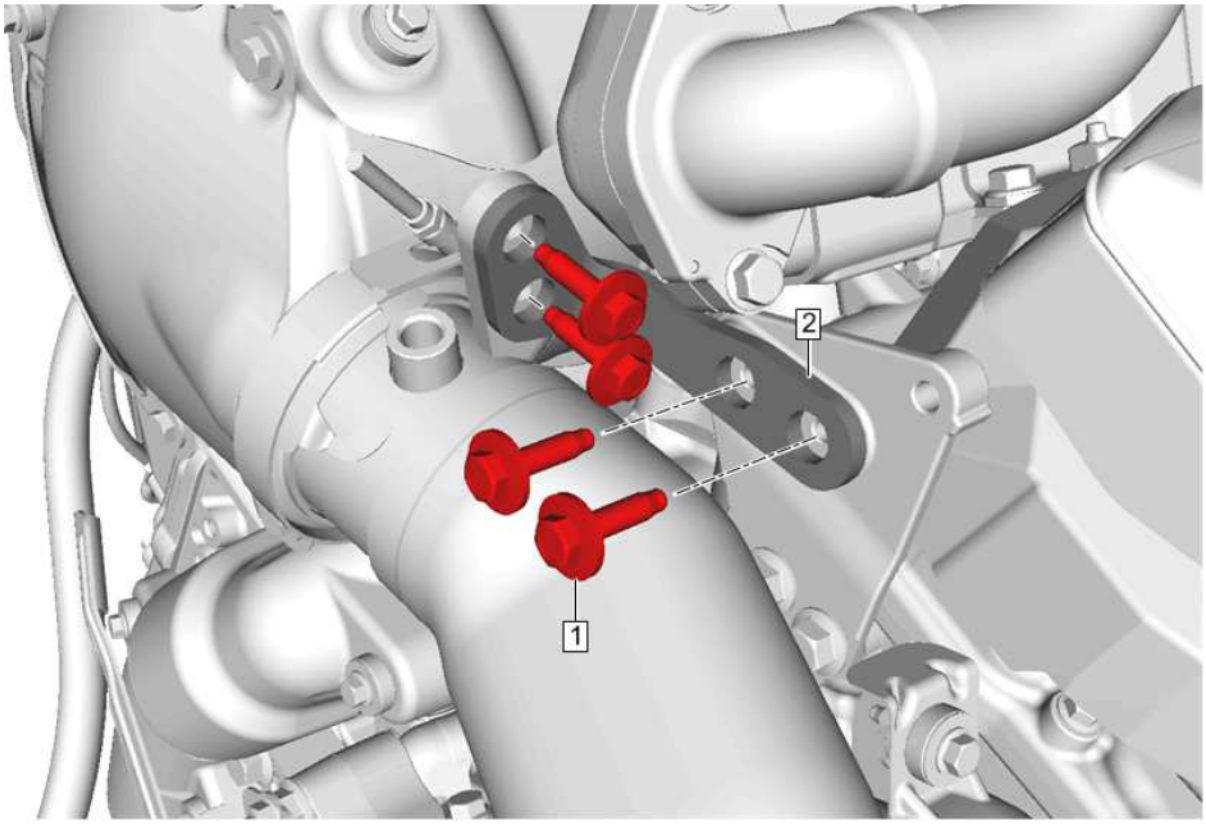


Fig. 92: Exhaust Front Bracket

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Courtesy of GENERAL MOTORS COMPANY

15. Exhaust Front Bracket -Upper 2 - Install **Exhaust Front Bracket Replacement - Upper (L5P)**

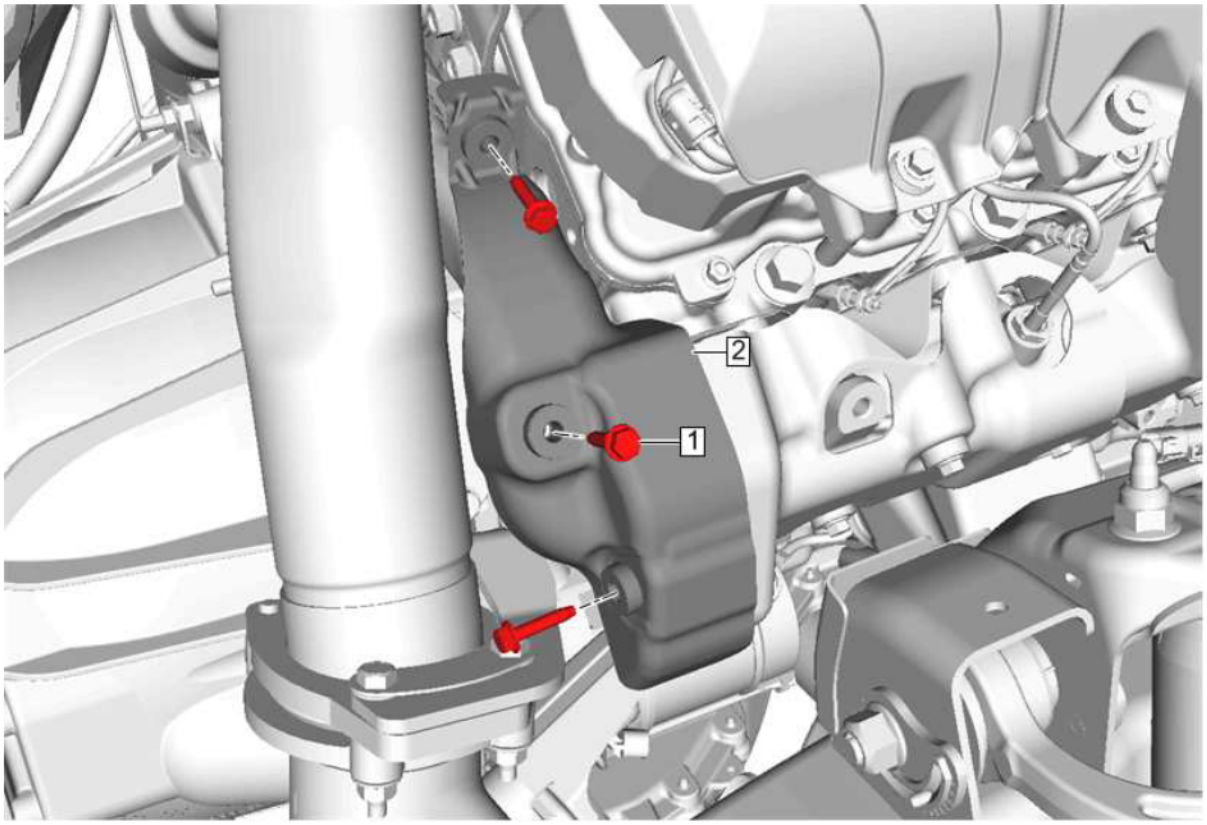


Fig. 93: Exhaust Pipe Heat Shield-Right Side
Courtesy of GENERAL MOTORS COMPANY

16. Exhaust Pipe Heat Shield-Right Side 2 - Install **Exhaust Pipe Heat Shield Replacement - Right Side (L5P)**

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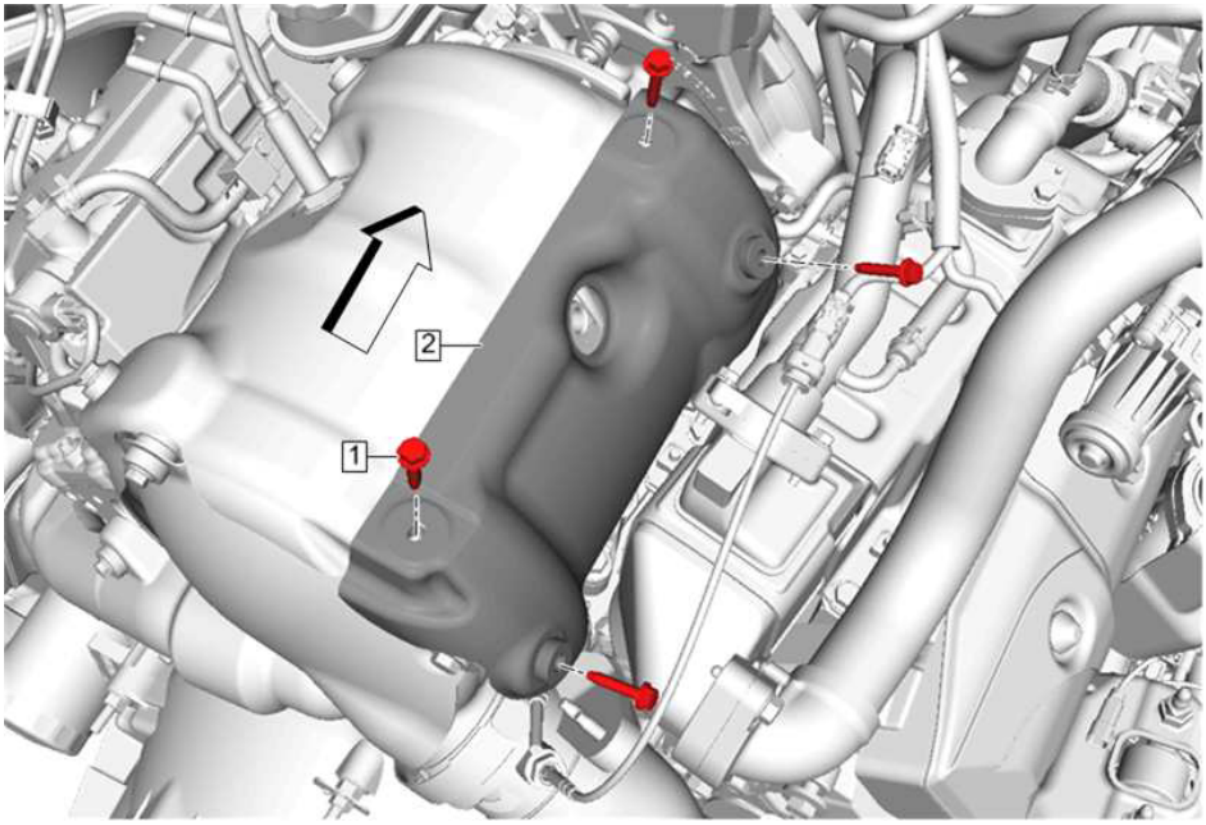


Fig. 94: Turbocharger Heat Shield - Right Side
Courtesy of GENERAL MOTORS COMPANY

17. Turbocharger Heat Shield - Right Side 3 - Install **Turbocharger Heat Shield Replacement - Right Side (L5P)**
18. Exhaust Gas Recirculation Cooler - Install **Exhaust Gas Recirculation Cooler Replacement**
19. Exhaust Temperature Sensor - Position 1 - Install **Exhaust Temperature Sensor Replacement - Position 1**

OXIDATION CATALYTIC CONVERTER REPLACEMENT (L5P)

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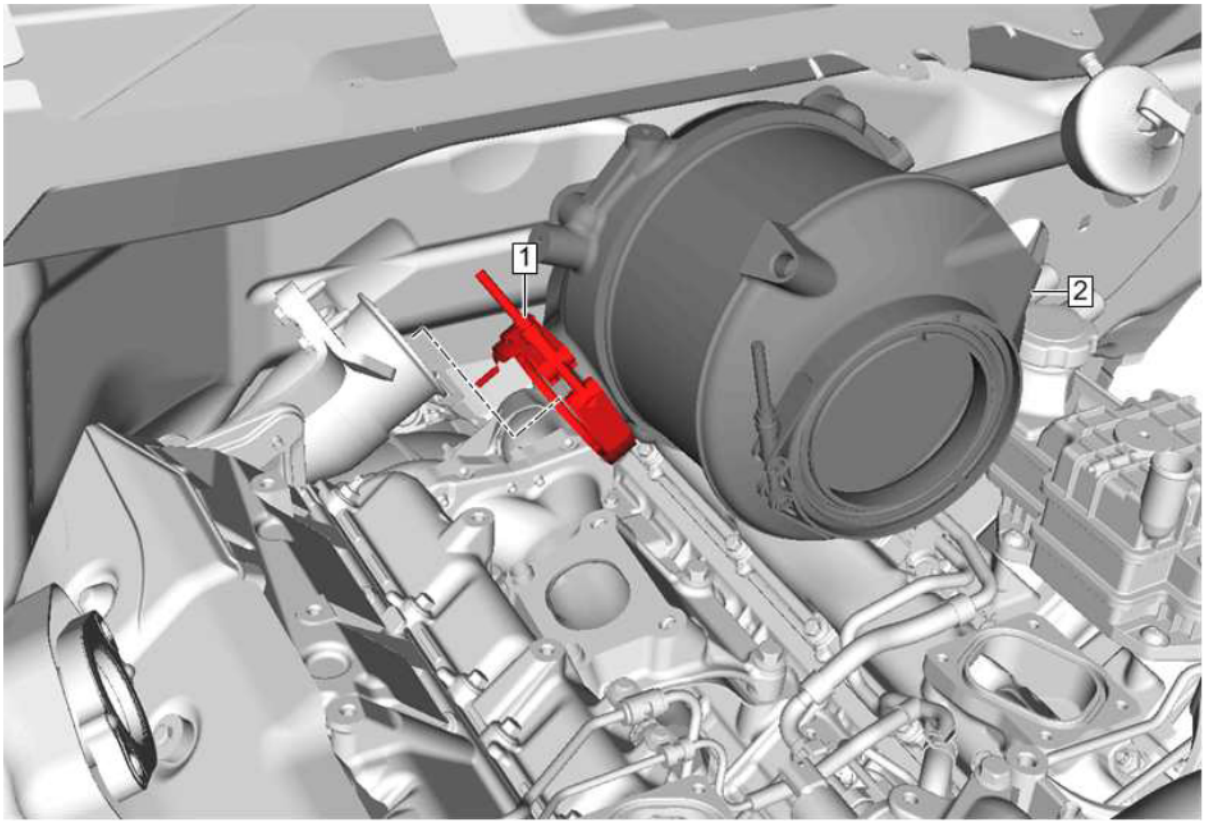


Fig. 95: Oxidation Catalytic Converter (L5P)
Courtesy of GENERAL MOTORS COMPANY

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	

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Callout	Component Name
personal injury. **Preliminary Procedure** Turbocharger Replacement	
1	Catalytic Converter Clamp **CAUTION:** **Refer to Fastener Caution .** **Tighten** 12 N.m (106 lb in)
2	Oxidation Catalytic Converter **Procedure** 1. If replacing with new, perform the catalyst reset procedure. Catalyst Reset 2. If replacing with new, perform the NOx Catalyst Reductant Loading Reset. NOx Catalyst Reductant Loading Reset

WARM UP NITROGEN OXIDES CATALYTIC CONVERTER REPLACEMENT (L5P)

Removal Procedure

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

1. Exhaust Front Bracket - Remove **Exhaust Front Bracket Replacement (L5P)**
2. Emission Reduction Fluid Injector - Remove **Emission Reduction Fluid Injector Replacement**

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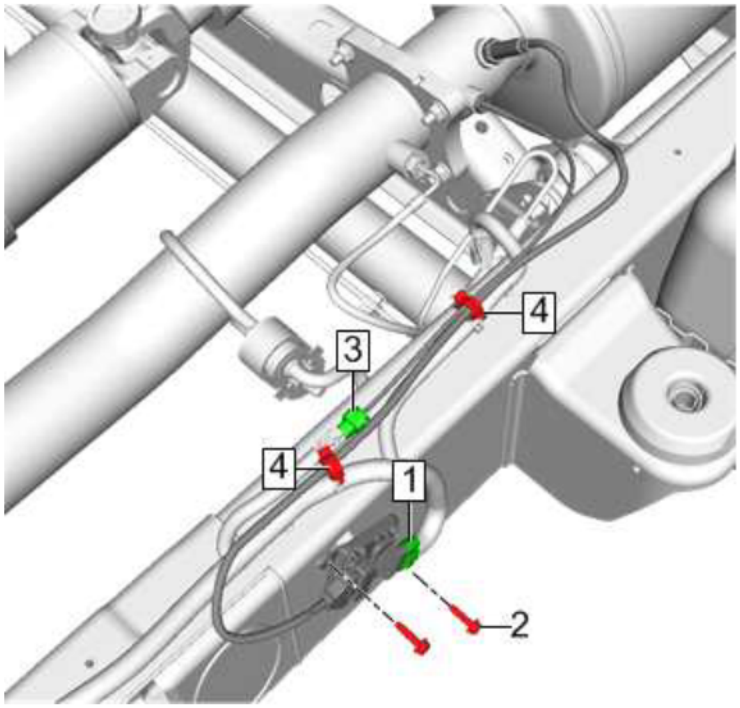


Fig. 96: Frame Rail Retaining Clips
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the nitrogen oxides sensor electrical wiring harness connector (1).
4. Nitrogen Oxides Sensor Bolt 2 - Remove **Nitrogen Oxides Sensor Replacement - Position 2**
5. Disconnect the exhaust temperature sensor electrical wiring harness connector (3).
6. Disconnect the nitrogen oxides sensor wiring from the frame rail retaining clips (4).

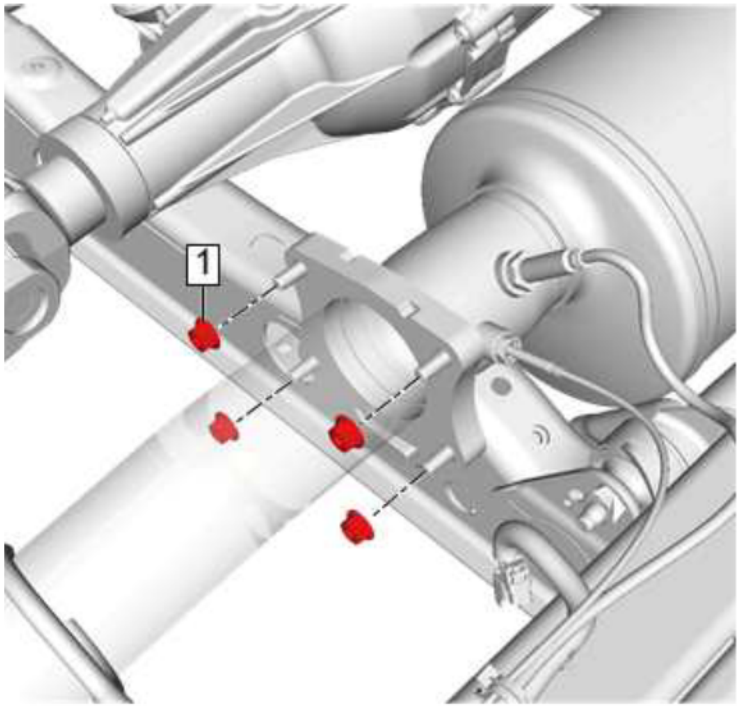


Fig. 97: Warm Up Nitrogen Oxides Catalytic Converter Nut
Courtesy of GENERAL MOTORS COMPANY

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7. Warm Up Nitrogen Oxides Catalytic Converter Nut 1 - Remove

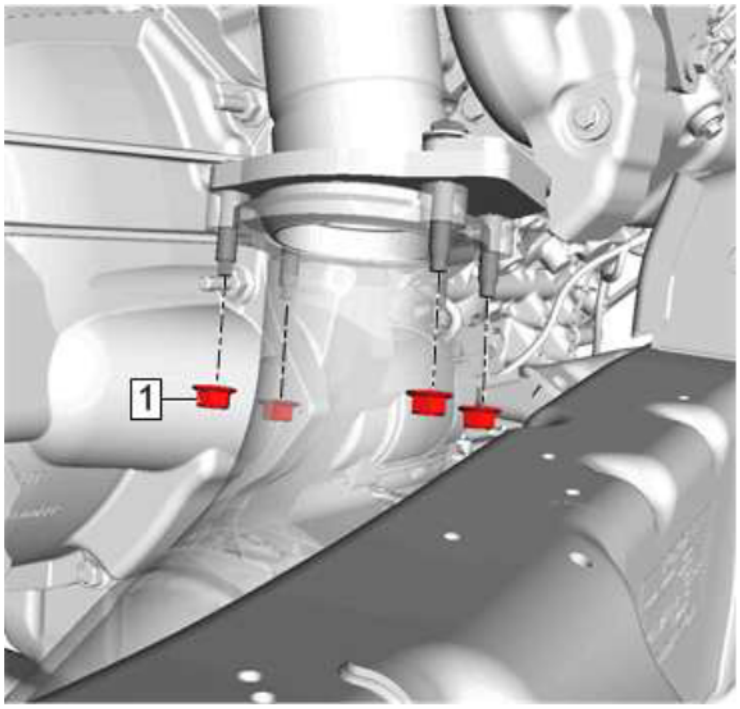


Fig. 98: Exhaust Front Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

8. Exhaust Front Pipe Nut 1 - Remove

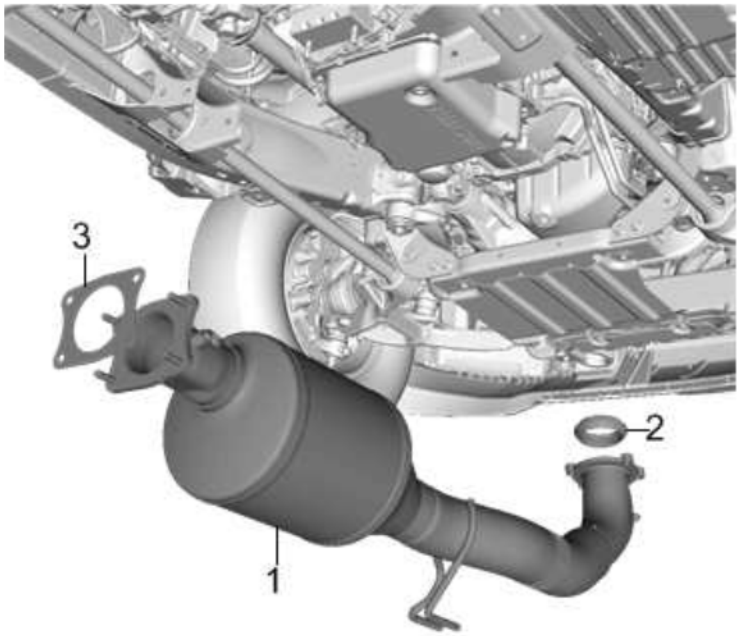


Fig. 99: Warm Up Nitrogen Oxides Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

9. With the aid of an assistant, lower the warm up nitrogen oxides catalytic converter (1) from the vehicle.
10. Exhaust Seal 2 - Remove and DISCARD

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11. Exhaust Gasket 3 - Remove and DISCARD
12. Transfer components as necessary.

Installation Procedure

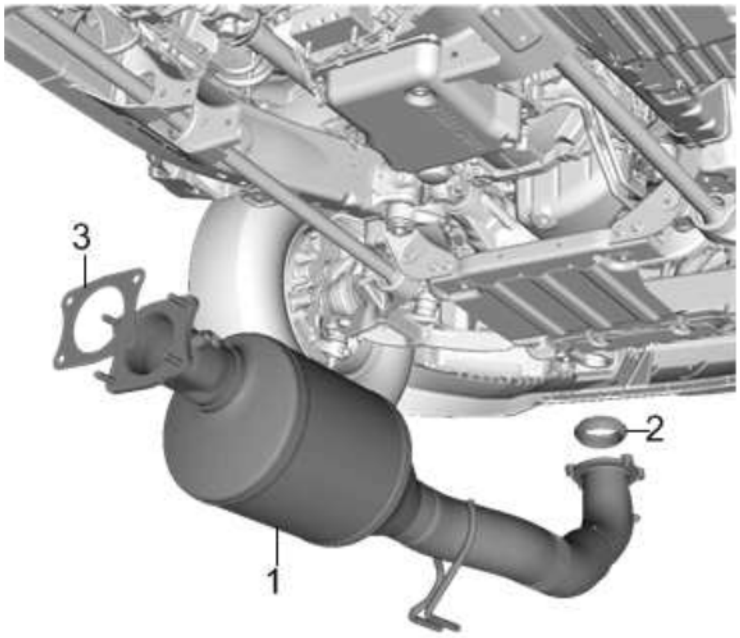


Fig. 100: Warm Up Nitrogen Oxides Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install a NEW Gasket.**

1. Exhaust Gasket 3 - Install
2. Exhaust Seal 2 - Install
3. With the aid of an assistant, install the warm up nitrogen oxides catalytic converter (1) to the vehicle.

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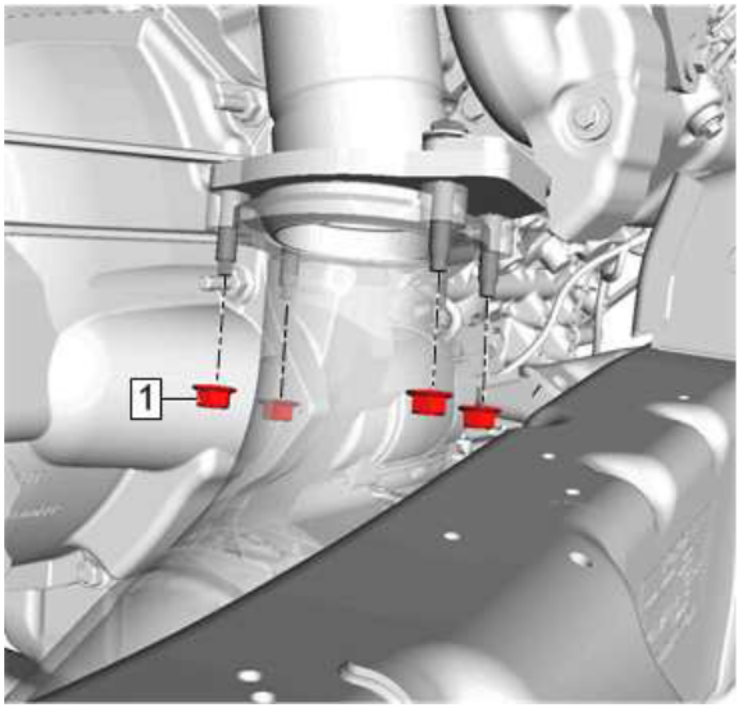


Fig. 101: Exhaust Front Pipe Nut
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

4. Exhaust Front Pipe Nut 1 - Install and tighten 50 N.m (37 lb ft)

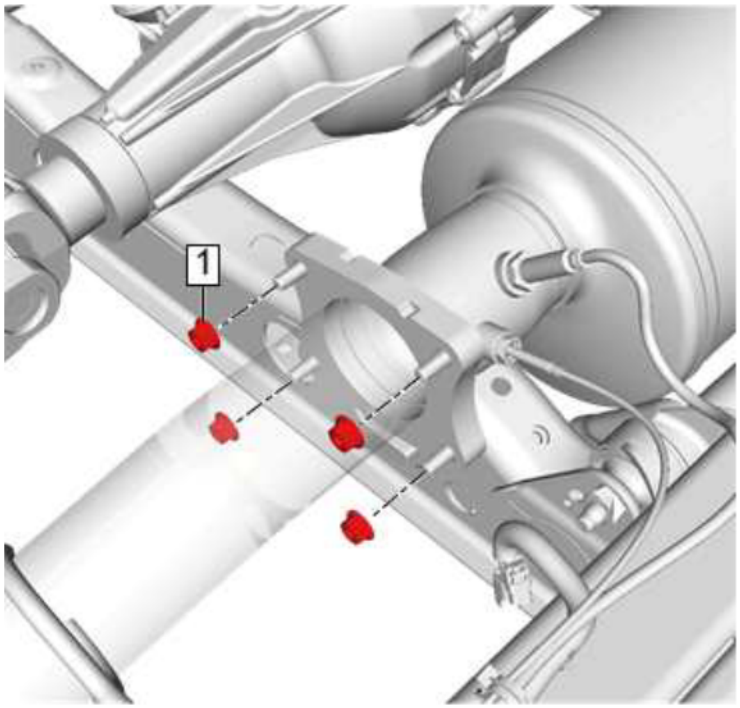


Fig. 102: Warm Up Nitrogen Oxides Catalytic Converter Nut
Courtesy of GENERAL MOTORS COMPANY

5. Warm Up Nitrogen Oxides Catalytic Converter Nut 1 - Install and tighten 45 N.m (33 lb ft)

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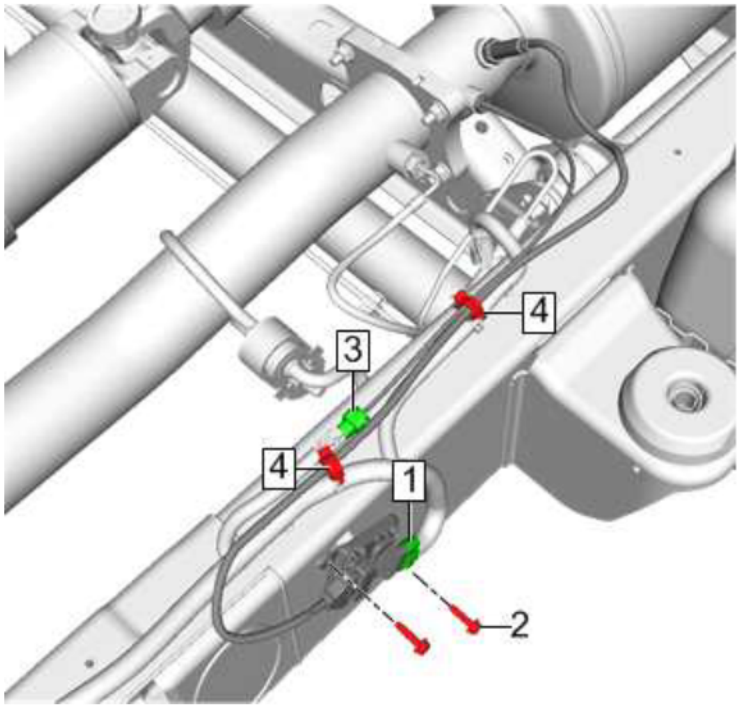


Fig. 103: Frame Rail Retaining Clips
Courtesy of GENERAL MOTORS COMPANY

6. Connect the nitrogen oxides sensor wiring to the frame rail retaining clips (4).
7. Connect the exhaust temperature sensor electrical wiring harness connector (3).
8. Nitrogen Oxides Sensor Bolt 2 - Install **Nitrogen Oxides Sensor Replacement - Position 2**
9. Connect the nitrogen oxides sensor electrical wiring harness connector (1).
10. Emission Reduction Fluid Injector - Install **Emission Reduction Fluid Injector Replacement**
11. Exhaust Front Bracket - Install **Exhaust Front Bracket Replacement (L5P)**
12. Start the engine and check for exhaust leaks.
13. Perform the NOx Catalyst Reset. **NOx Catalyst Reset**

THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LC8, L96)

Removal Procedure

WARNING: Refer to Exhaust Service Warning

WARNING: Refer to Hot Exhaust System Warning

1. Disconnect the heated oxygen sensor (HO2S). Refer to the following:
   - **Heated Oxygen Sensor Replacement - Bank 1 Sensor 1 (Cab/Chassis)** **Heated Oxygen Sensor Replacement - Bank 1 Sensor 1**
   - **Heated Oxygen Sensor Replacement - Bank 1 Sensor 2 (Cab/Chassis)** **Heated Oxygen Sensor Replacement - Bank 1 Sensor 2**
   - **Heated Oxygen Sensor Replacement - Bank 2 Sensor 1 (Cab/Chassis)** **Heated Oxygen Sensor Replacement - Bank 2 Sensor 1**
   - **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2** **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2 (Cab/Chassis)**

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2. Support the transmission with a suitable transmission jack.
3. Remove the transmission support crossmember. Refer to **Transmission Support Crossmember Replacement (2WD - Light Duty)** **Transmission Support Crossmember Replacement (2WD - Heavy Duty)** **Transmission Support Crossmember Replacement (4WD - Light Duty)** **Transmission Support Crossmember Replacement (4WD - Heavy Duty)**

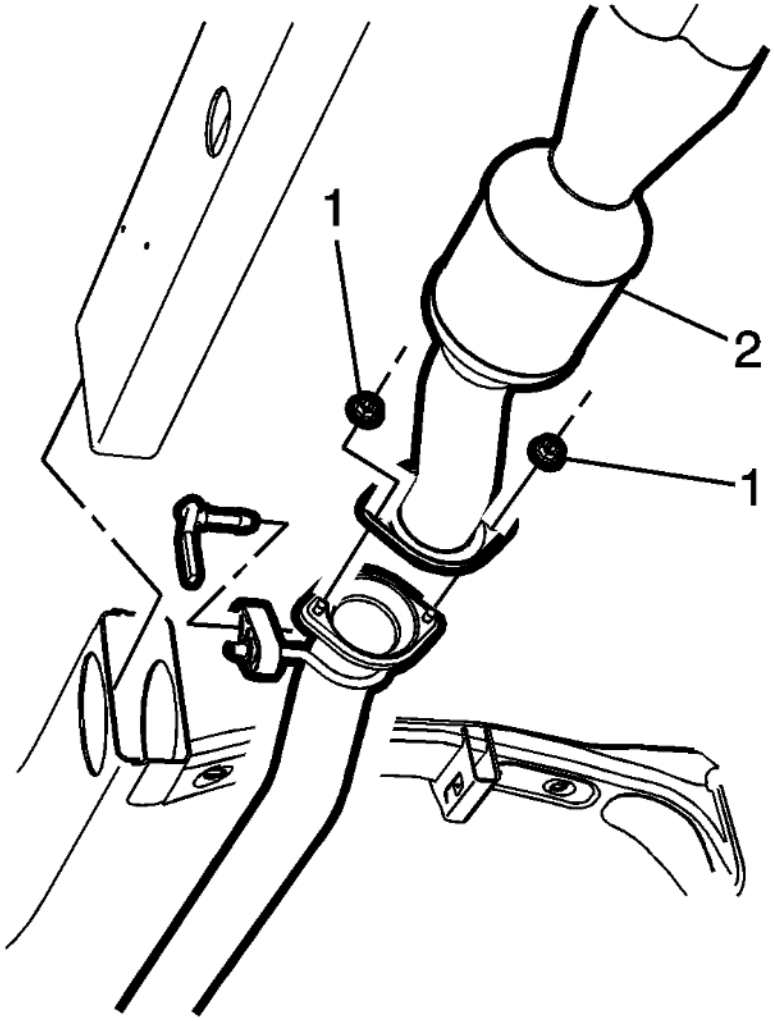


Fig. 104: Identifying Exhaust Manifold Pipe Nuts
Courtesy of GENERAL MOTORS COMPANY

4. Remove the exhaust muffler to exhaust manifold pipe nuts (1).

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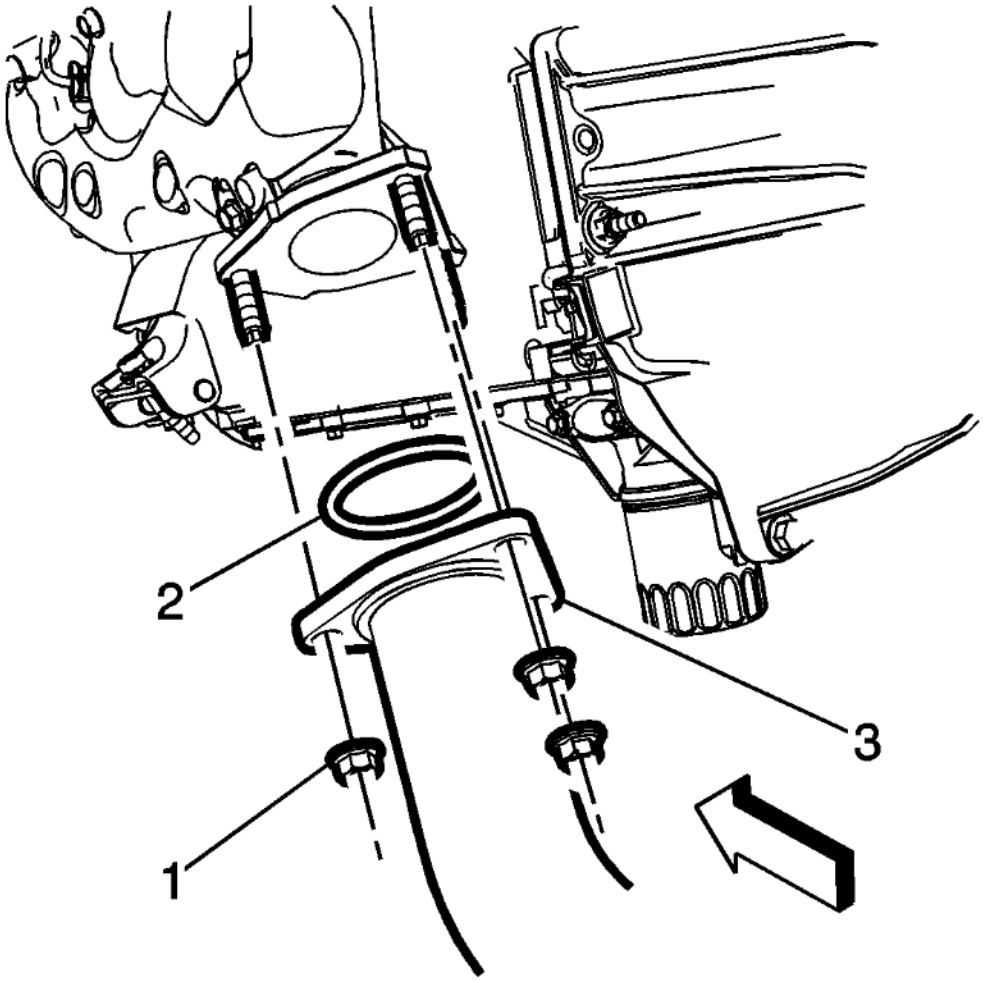


Fig. 105: Exhaust Manifold Nuts And Seal
Courtesy of GENERAL MOTORS COMPANY

5. Remove the exhaust manifold pipe to exhaust manifold nuts (1) and replace the seal (2) with a NEW one.

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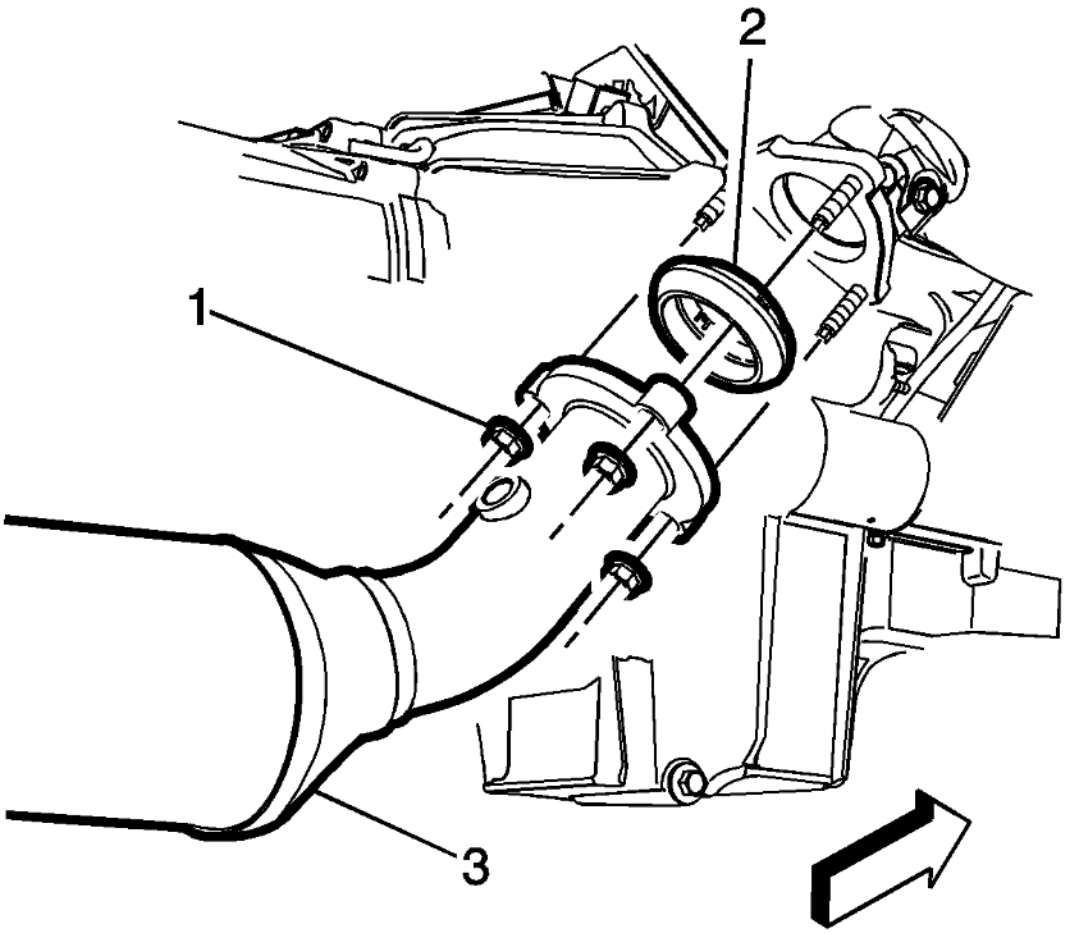


Fig. 106: Catalytic Converter And Nuts
Courtesy of GENERAL MOTORS COMPANY

6. Remove the right catalytic converter (3) from the exhaust manifold studs with the nuts (1).

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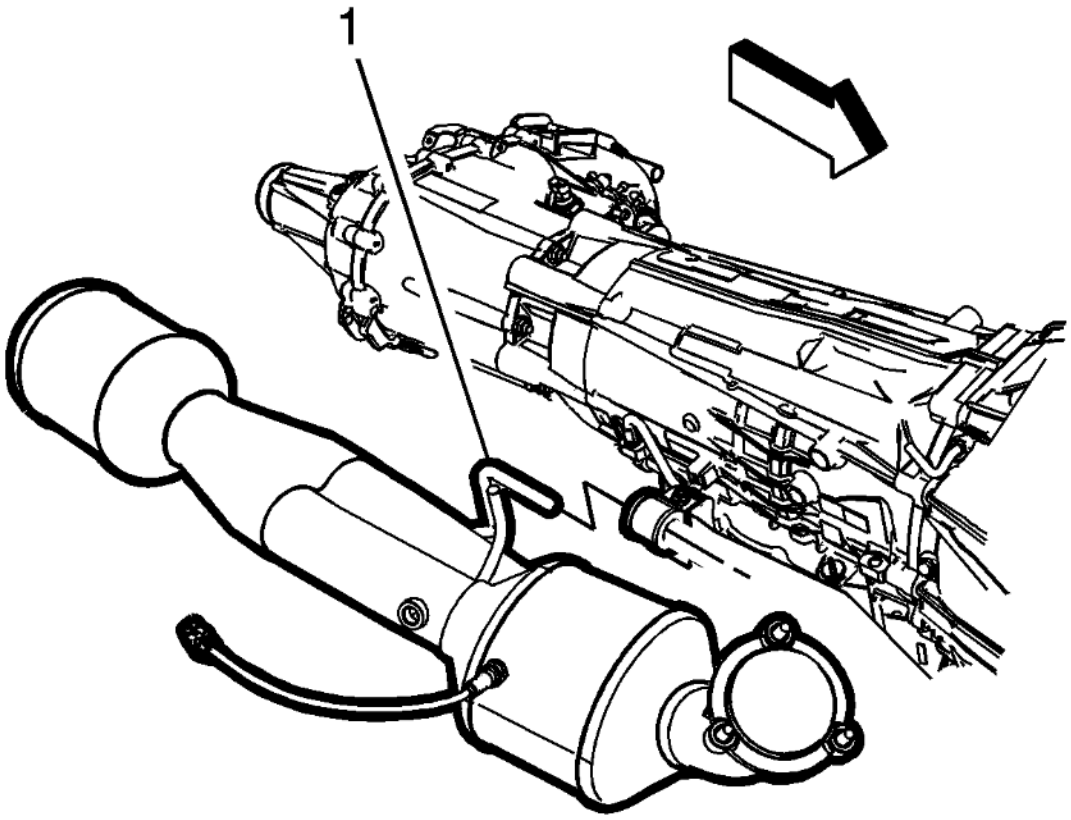


Fig. 107: Identifying Catalytic Converter Hanger Rod
Courtesy of GENERAL MOTORS COMPANY

7. Separate the catalytic converter hanger rod (1) from the exhaust isolator.

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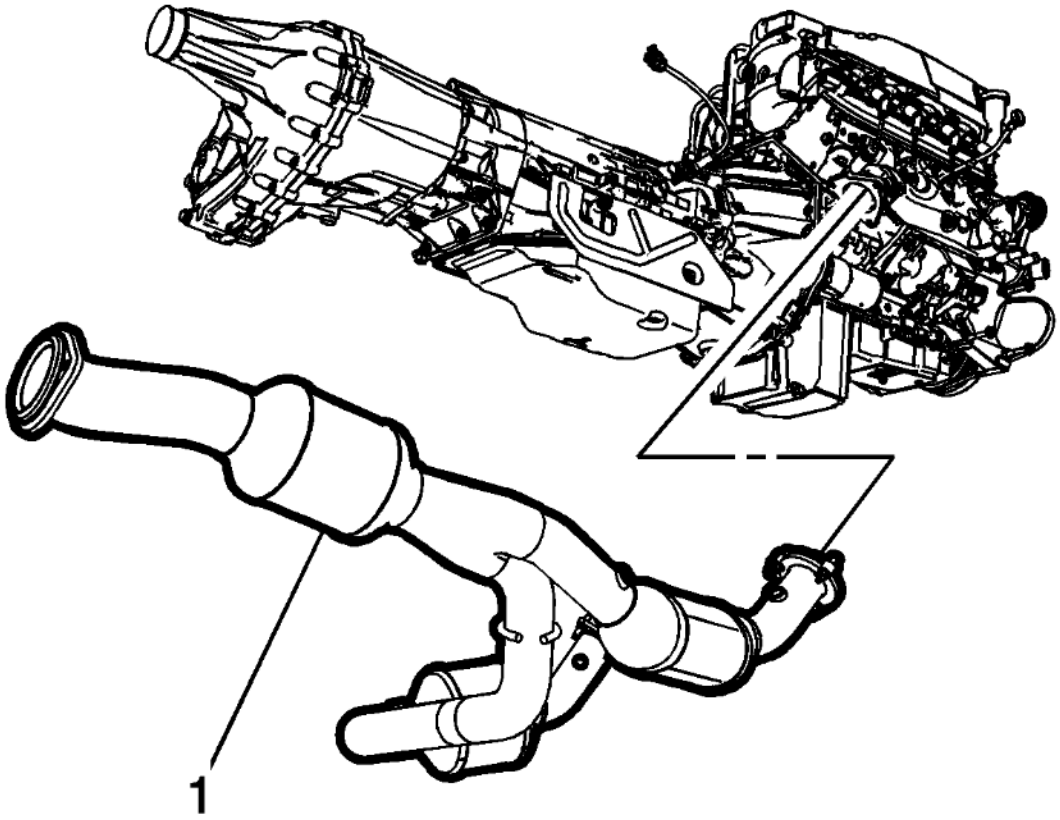


Fig. 108: Identifying Catalytic Converter
Courtesy of GENERAL MOTORS COMPANY

8. With the aid of an assistant, lower the catalytic converter (1) from the vehicle.
9. If replacing the catalytic converter, transfer the oxygen sensors.

Installation Procedure

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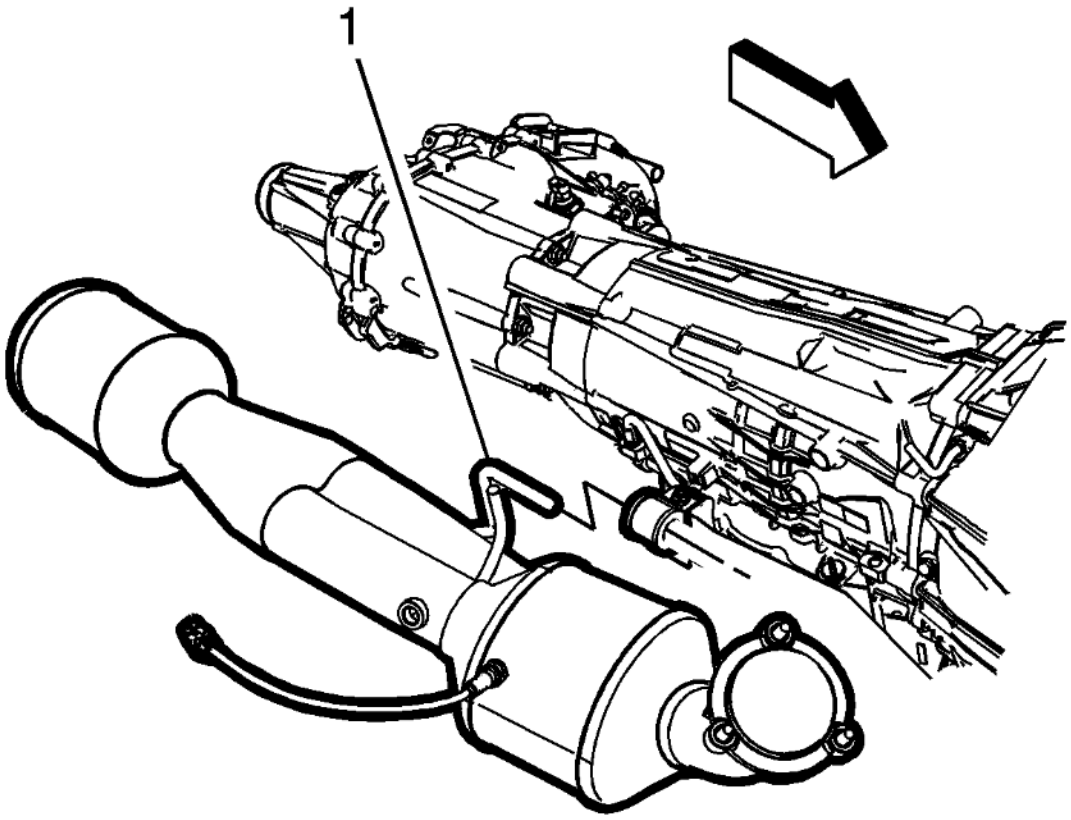


Fig. 109: Identifying Catalytic Converter Hanger Rod
Courtesy of GENERAL MOTORS COMPANY

1. Install the catalytic converter hanger rod (1) into the exhaust isolator.

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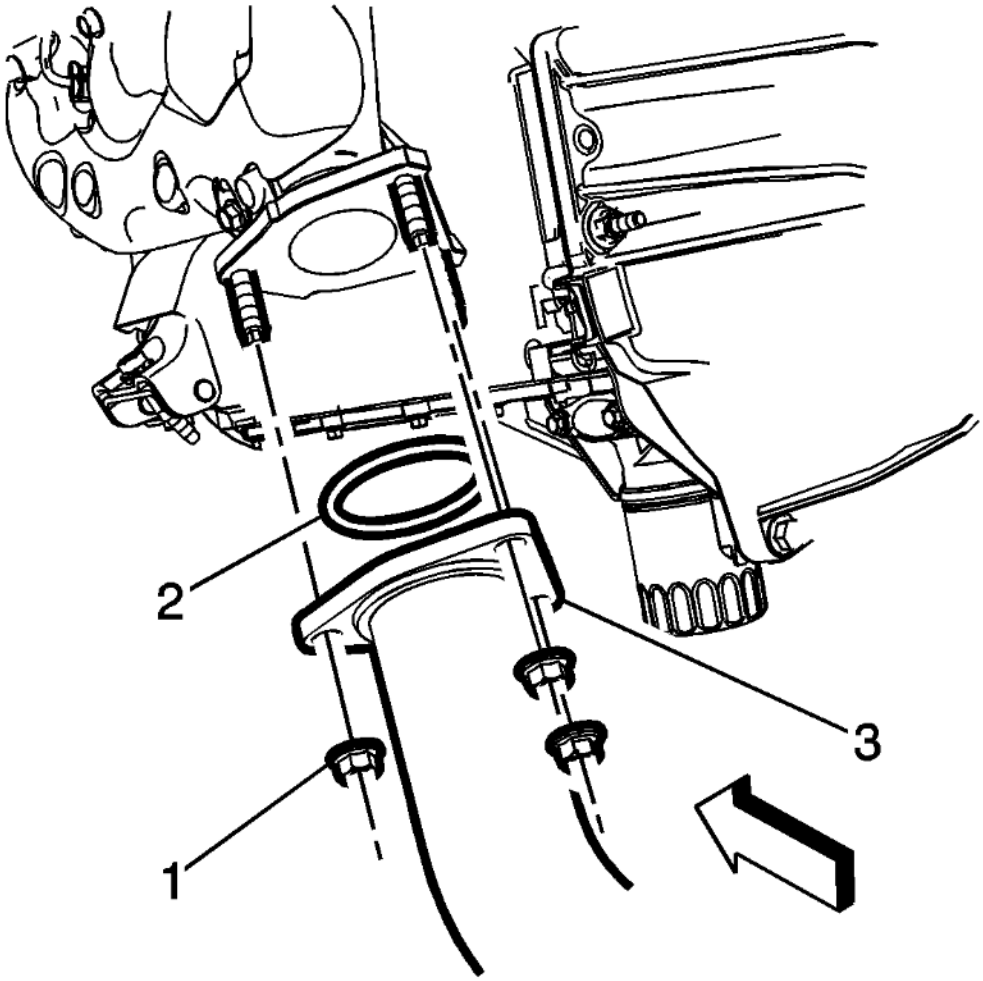


Fig. 110: Exhaust Manifold Nuts And Seal
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

2. Install a NEW seal (2) to the left manifold exhaust pipe. Tighten the nuts (1) to 50 N.m (37 lb ft)

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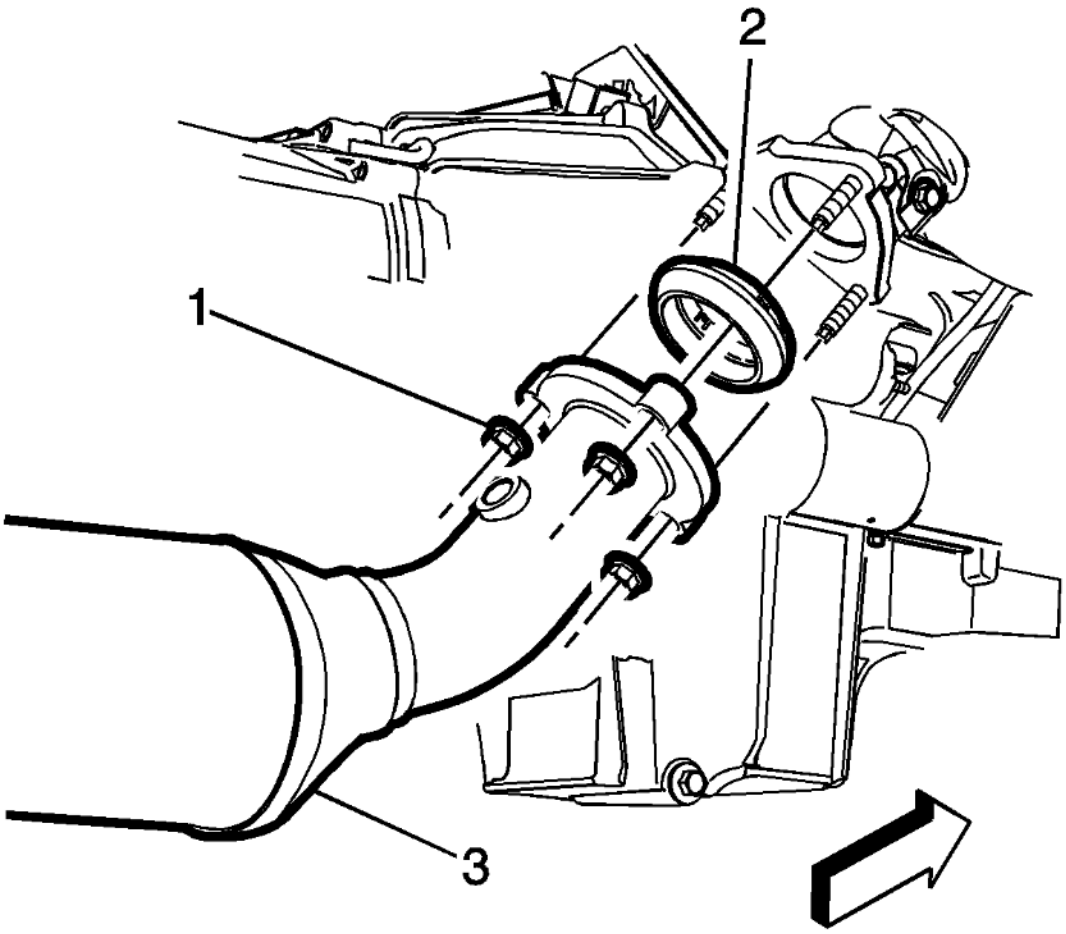


Fig. 111: Catalytic Converter And Nuts
Courtesy of GENERAL MOTORS COMPANY

3. Inspect the seal (2) and replace if worn or damaged.
4. Install the right catalytic converter to the exhaust manifold with nuts (1) and tighten to 50 N.m (37 lb ft).

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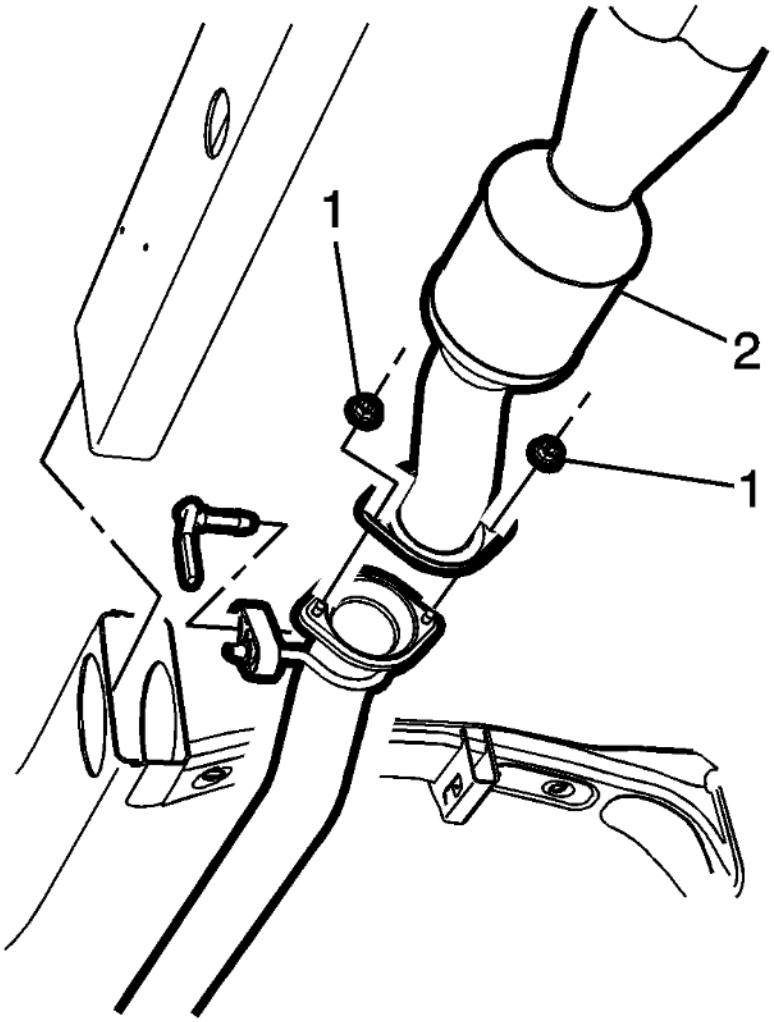


Fig. 112: Identifying Exhaust Manifold Pipe Nuts
Courtesy of GENERAL MOTORS COMPANY

5. Install the exhaust muffler to catalytic converter (2) with nuts (1) and tighten to 45 N.m (33 lb ft).
6. Install the transmission support crossmember. Refer to **Transmission Support Crossmember Replacement (2WD - Light Duty)** **Transmission Support Crossmember Replacement (2WD - Heavy Duty)** **Transmission Support Crossmember Replacement (4WD - Light Duty)** **Transmission Support Crossmember Replacement (4WD - Heavy Duty)**
7. Remove the support from the transmission.
8. Connect the HO2S sensors. Refer to the following:
   - **Heated Oxygen Sensor Replacement - Bank 1 Sensor 1 (Cab/Chassis)** **Heated Oxygen Sensor Replacement - Bank 1 Sensor 1**
   - **Heated Oxygen Sensor Replacement - Bank 1 Sensor 2 (Cab/Chassis)** **Heated Oxygen Sensor Replacement - Bank 1 Sensor 2**
   - **Heated Oxygen Sensor Replacement - Bank 2 Sensor 1 (Cab/Chassis)** **Heated Oxygen Sensor Replacement - Bank 2 Sensor 1**
   - **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2** **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2 (Cab/Chassis)**
9. Start the engine and check the front exhaust system for leaks.

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THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LV3, L83, L8B, OR L86)

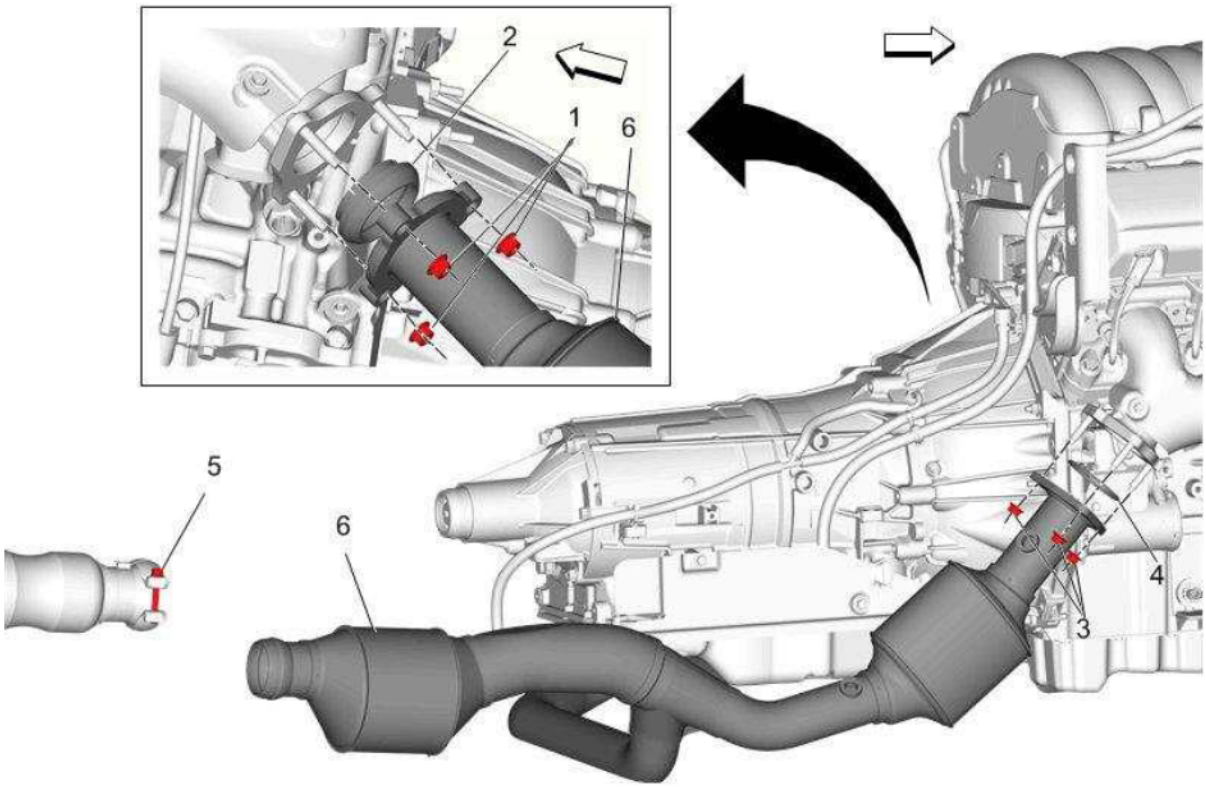


Fig. 113: Three-Way Catalytic Converter (LV3, L83, L8B, or L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

WARNING:

Refer to Exhaust Service Warning .

WARNING:

Refer to Hot Exhaust System Warning .

Preliminary Procedures

1. Remove the transmission support crossmember. Refer to Transmission Support Crossmember Replacement (2WD - Light Duty) Transmission Support Crossmember Replacement (2WD - Heavy Duty) Transmission Support Crossmember Replacement (4WD - Light Duty) Transmission Support Crossmember Replacement (4WD - Heavy Duty) .
2. If equipped with RPO LV3, disconnect the oxygen sensors. Refer to:
   - Heated Oxygen Sensor Replacement - Bank 1 Sensor 1
   - Heated Oxygen Sensor Replacement - Bank 1 Sensor 2

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Callout	Component Name
	• **Heated Oxygen Sensor Replacement - Bank 2 Sensor 1** • **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2** 3. If equipped with RPO L83 or L86, disconnect the oxygen sensors. Refer to: • **Heated Oxygen Sensor Replacement - Bank 1 Sensor 1** • **Heated Oxygen Sensor Replacement - Bank 2 Sensor 1** • **Heated Oxygen Sensor Replacement - Bank 1 Sensor 2** • **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2**
1	Left Exhaust Manifold Nut (Qty: 3) **CAUTION:** **Refer to Fastener Caution .** **Procedure** Torque the left rear nut first and then the remaining left catalytic converter nuts. **Tighten** 50 N.m (37 lb ft)
2	Exhaust Seal **NOTE:** **Use a NEW seal.**
3	Right Exhaust Manifold Nut (Qty: 3) **Tighten** 50 N.m (37 lb ft)
4	Exhaust Seal **NOTE:** **Use a NEW seal.**
5	Exhaust Muffler Clamp Nut **NOTE:** **Align the exhaust system prior to tightening the clamp.** **NOTE:** **Replace the exhaust muffler**

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Callout	Component Name
	clamp with a NEW clamp. **Tighten** 28 N.m (21 lb ft)
6	Catalytic Converter

EXHAUST PARTICULATE FILTER REPLACEMENT (L5P)

Removal Procedure

WARNING: Refer to Hot Exhaust System Warning .

1. Indirect Fuel Injector - Remove **Indirect Fuel Injector Replacement**

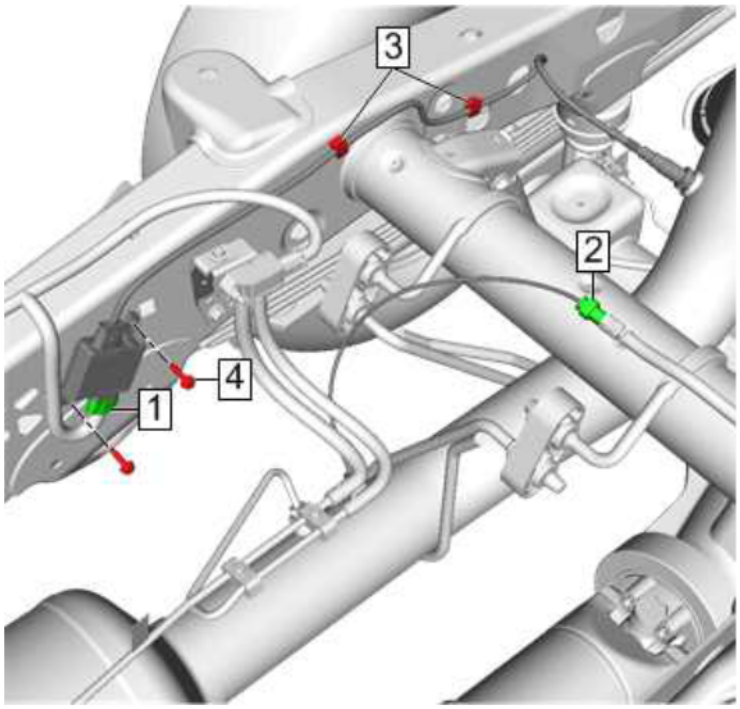


Fig. 114: Sensor Electrical Wiring Harness Connector
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the exhaust particulate sensor electrical wiring harness connector (1).
3. Disconnect the exhaust temperature sensor electrical wiring harness connector (2).
4. Disconnect the nitrogen oxides sensor wiring from the frame rail retaining clips (3).
5. Exhaust Particulate Sensor Bolt 4 - Remove **Exhaust Particulate Sensor Replacement**

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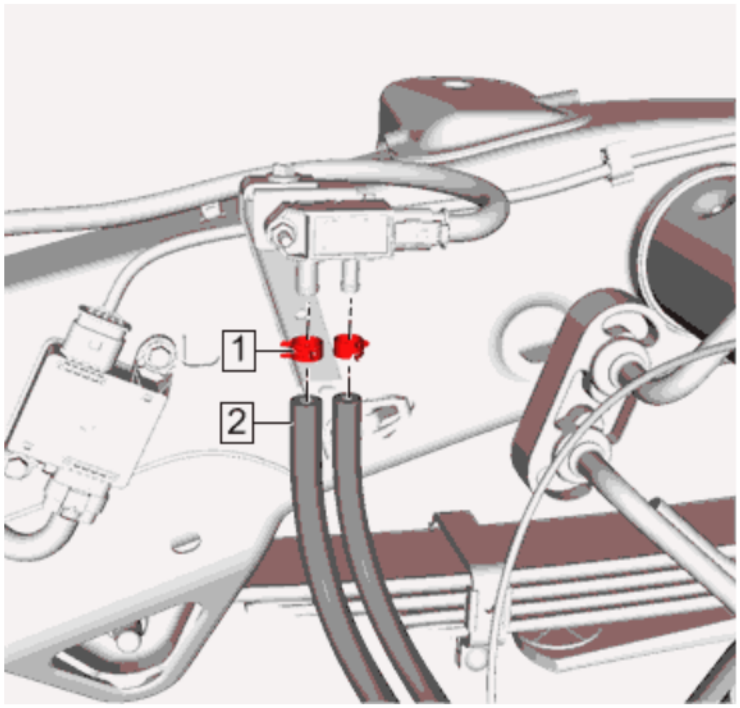


Fig. 115: Exhaust Pressure Differential Sensor Hose
Courtesy of GENERAL MOTORS COMPANY

6. Exhaust Pressure Differential Sensor Hose Clamp 1 - Disengage **Hose Clamp Replacement Guidelines - Spring Type**
7. Exhaust Pressure Differential Sensor Hose 2 - Disconnect

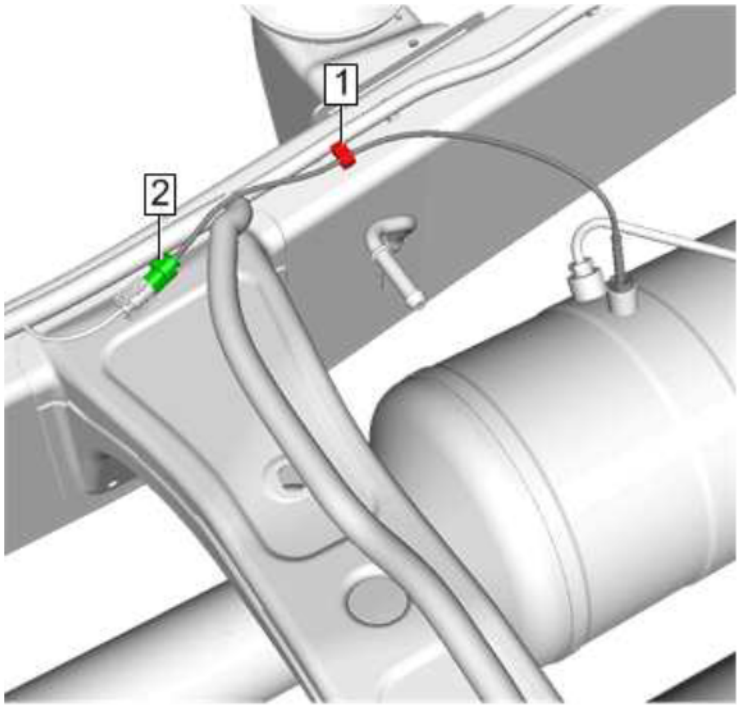


Fig. 116: Frame Rail Retaining Clip
Courtesy of GENERAL MOTORS COMPANY

8. Disconnect the exhaust temperature sensor wiring from the frame rail retaining clip (1).
9. Disconnect the exhaust temperature sensor electrical wiring harness connector (2).

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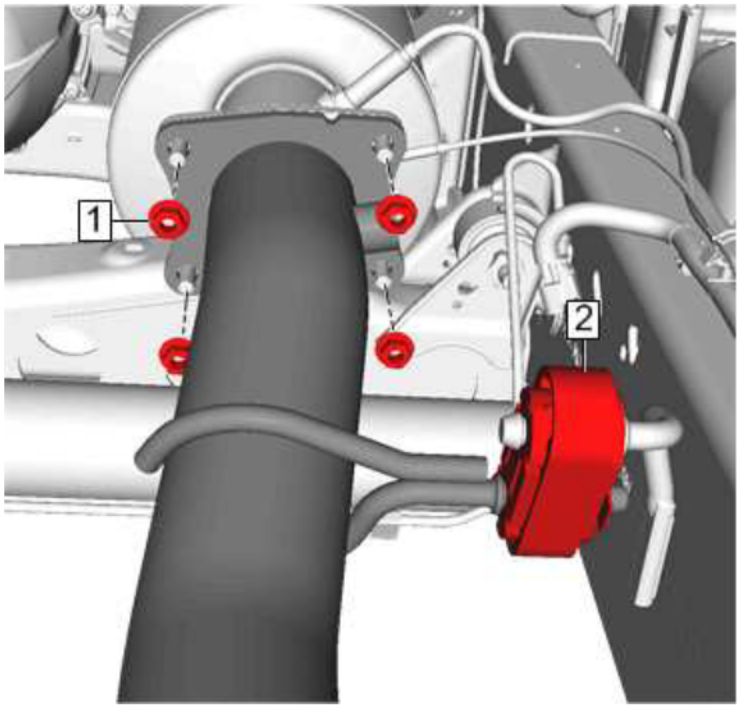


Fig. 117: Exhaust Particulate Filter Nut
Courtesy of GENERAL MOTORS COMPANY

10. Exhaust Particulate Filter Nut 1 - Remove

NOTE: **Location and quantity of exhaust hanger insulators vary depending on body style. Disengage all insulators.**

11. Exhaust Hanger Insulator 2 - Disengage

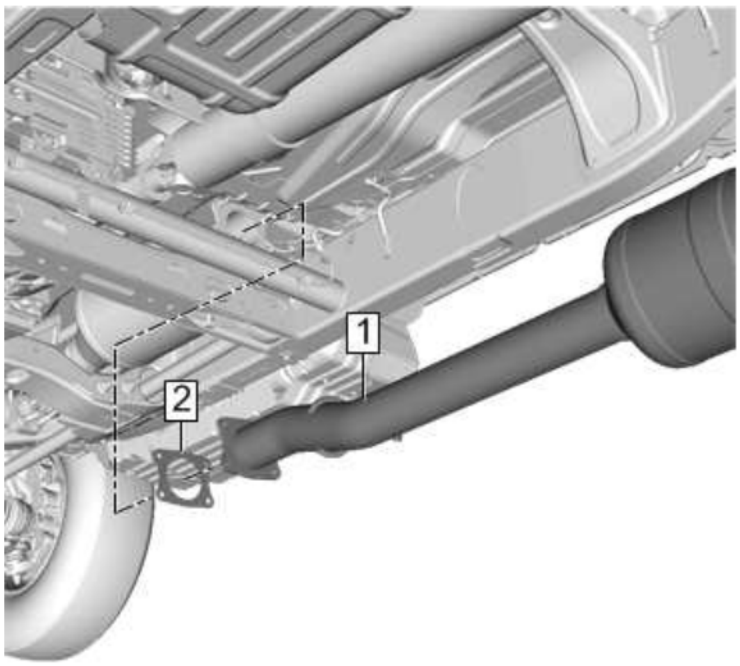


Fig. 118: Exhaust Particulate Filter
Courtesy of GENERAL MOTORS COMPANY

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12. If necessary, lower the rear axle. **Rear Axle Replacement (8.6, 9.5/9.76 Inch Axles)** **Rear Axle Replacement (10.5/11.5 Inch Axles)**
13. Exhaust Particulate Filter 1 - Remove
14. Exhaust Particulate Filter Gasket 2 - Remove and DISCARD
15. Transfer components as necessary.

Installation Procedure

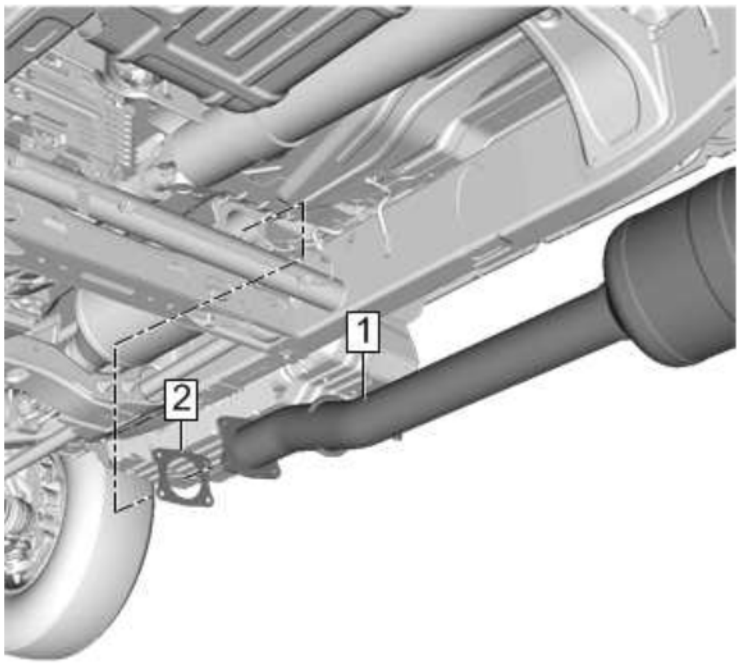


Fig. 119: Exhaust Particulate Filter
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Install a NEW Gasket.**

1. Exhaust Particulate Filter Gasket 2 - Install
2. Exhaust Particulate Filter 1 - Install

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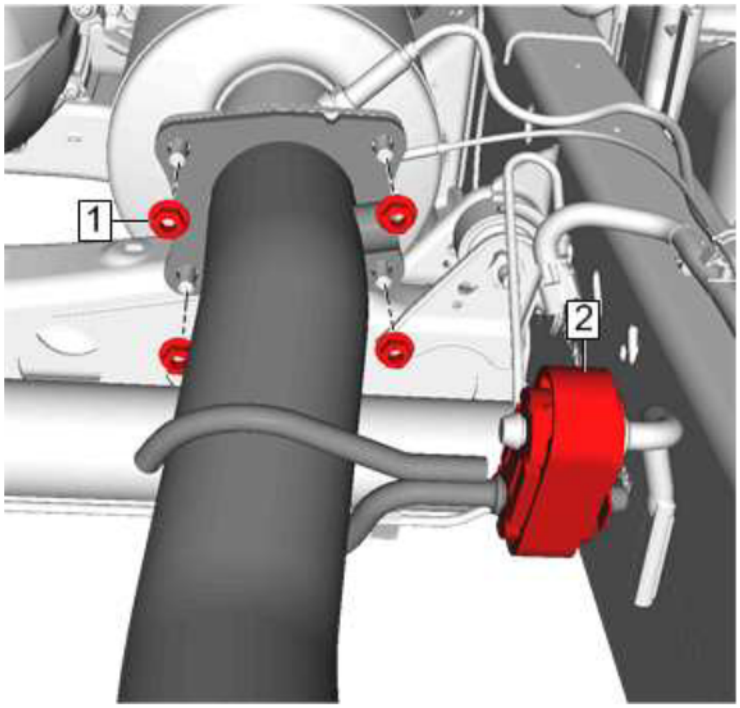


Fig. 120: Exhaust Hanger Insulator
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Location and quantity of exhaust hanger insulators vary depending on body style. Engage all insulators.**

3. Exhaust Hanger Insulator 2 - Engage

CAUTION: **Refer to Fastener Caution .**

4. Exhaust Particulate Filter Nut 1 - Install and tighten 45 N.m (33 lb ft)
5. If necessary, raise and attach the rear axle. **Rear Axle Replacement (8.6, 9.5/9.76 Inch Axles)** **Rear Axle Replacement (10.5/11.5 Inch Axles)**

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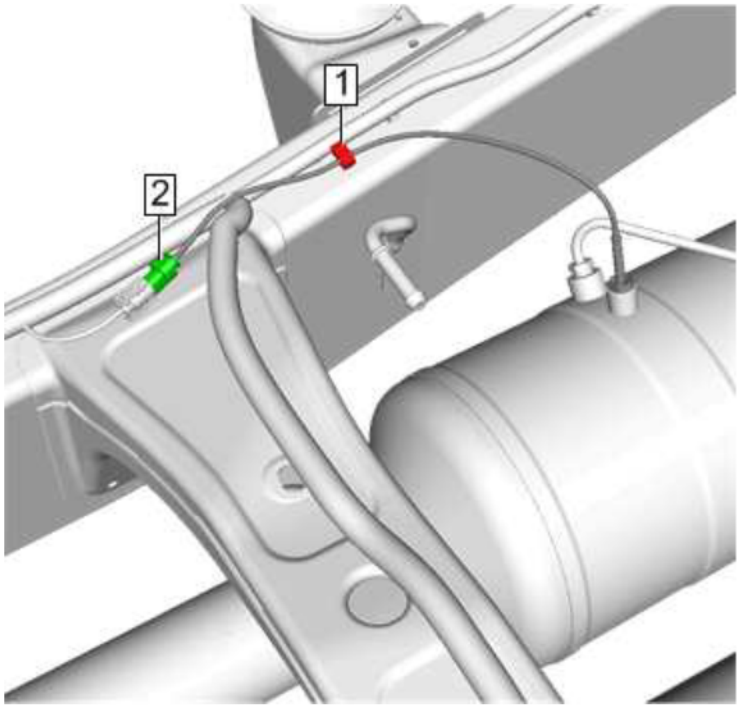


Fig. 121: Frame Rail Retaining Clip
Courtesy of GENERAL MOTORS COMPANY

6. Connect the exhaust temperature sensor electrical wiring harness connector (2).
7. Connect the exhaust temperature sensor wiring to the frame rail retaining clip (1).

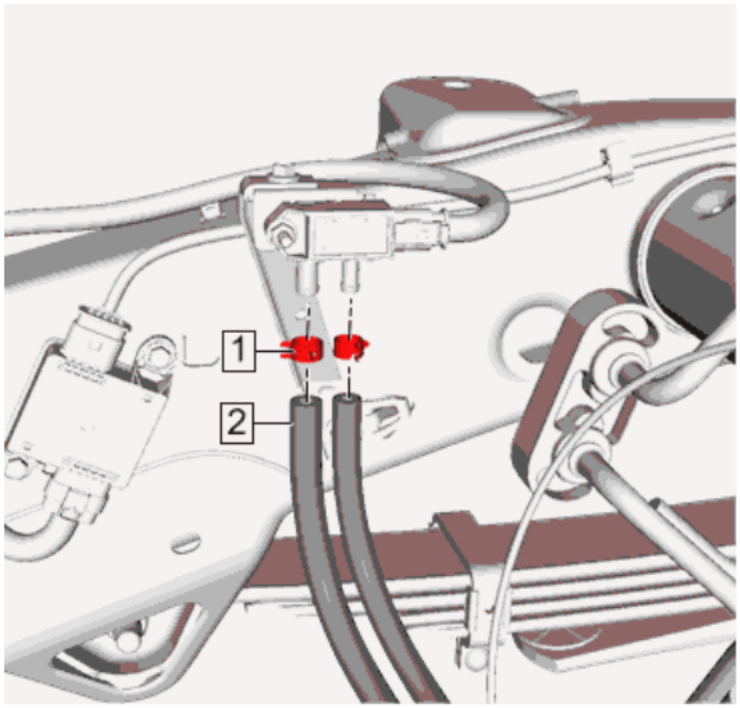


Fig. 122: Exhaust Pressure Differential Sensor Hose
Courtesy of GENERAL MOTORS COMPANY

8. Exhaust Pressure Differential Sensor Hose 2 - Connect
9. Exhaust Pressure Differential Sensor Hose Clamp 1 - Connect **Hose Clamp Replacement Guidelines - Spring Type**

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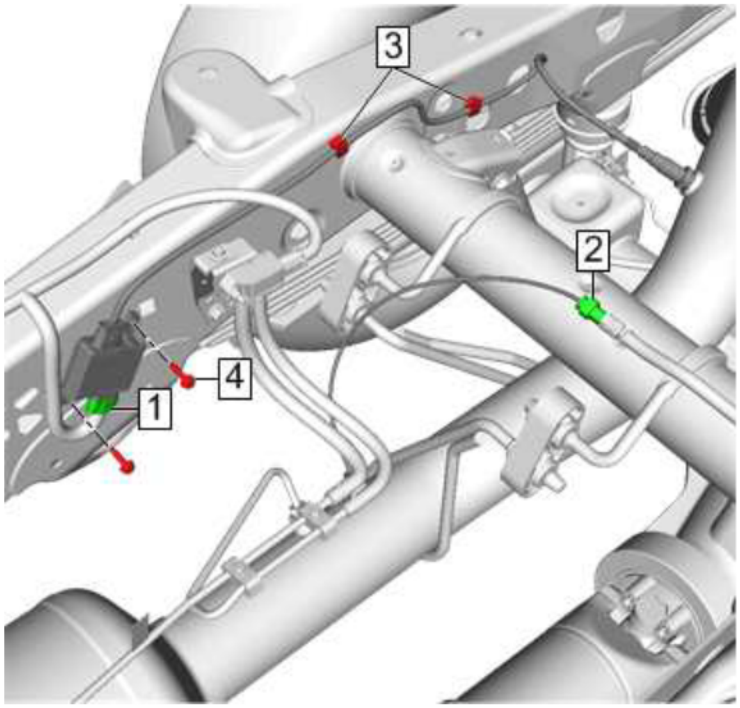


Fig. 123: Exhaust Particulate Sensor Bolt
Courtesy of GENERAL MOTORS COMPANY

10. Exhaust Particulate Sensor Bolt 4 - Install **Exhaust Particulate Sensor Replacement**
11. Connect the nitrogen oxides sensor wiring to the frame rail retaining clips (3).
12. Connect the exhaust temperature sensor electrical wiring harness connector (2).
13. Connect the exhaust particulate sensor electrical wiring harness connector (1).
14. Indirect Fuel Injector - Install **Indirect Fuel Injector Replacement**
15. Start the engine and check for exhaust leaks.

EXHAUST FRONT BRACKET REPLACEMENT (L5P)

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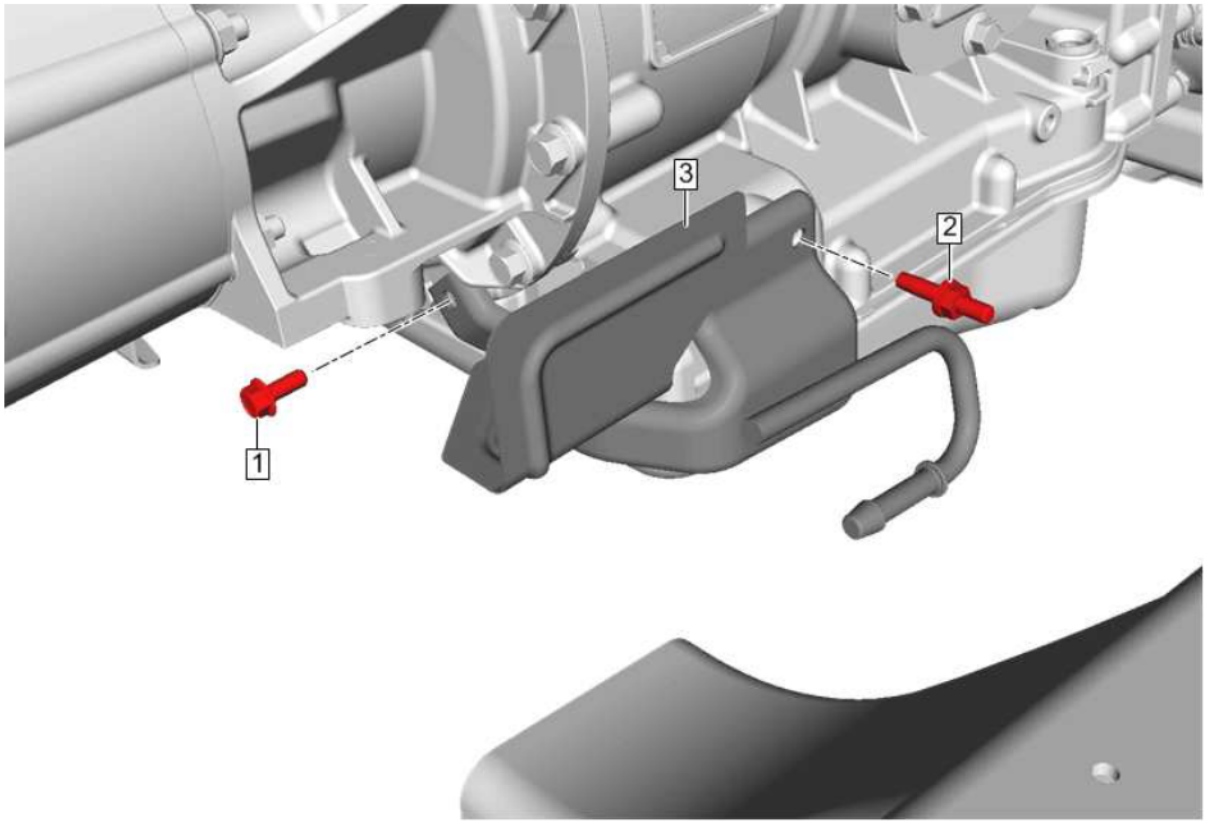


Fig. 124: Exhaust Front Bracket (L5P)
Courtesy of GENERAL MOTORS COMPANY

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	

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Callout	Component Name
personal injury. **Preliminary Procedure** Transmission Support Crossmember Replacement (2WD - Light Duty) Transmission Support Crossmember Replacement (2WD - Heavy Duty) Transmission Support Crossmember Replacement (4WD - Light Duty) Transmission Support Crossmember Replacement (4WD - Heavy Duty)	
1	Exhaust Front Bracket Bolt **CAUTION:** **Refer to** Fastener Caution . **Tighten** 10 N.m (89 lb in)
2	Exhaust Front Bracket Stud **Tighten** 10 N.m (89 lb in)
3	Exhaust Front Bracket

EXHAUST FRONT BRACKET REPLACEMENT - LOWER (L5P)

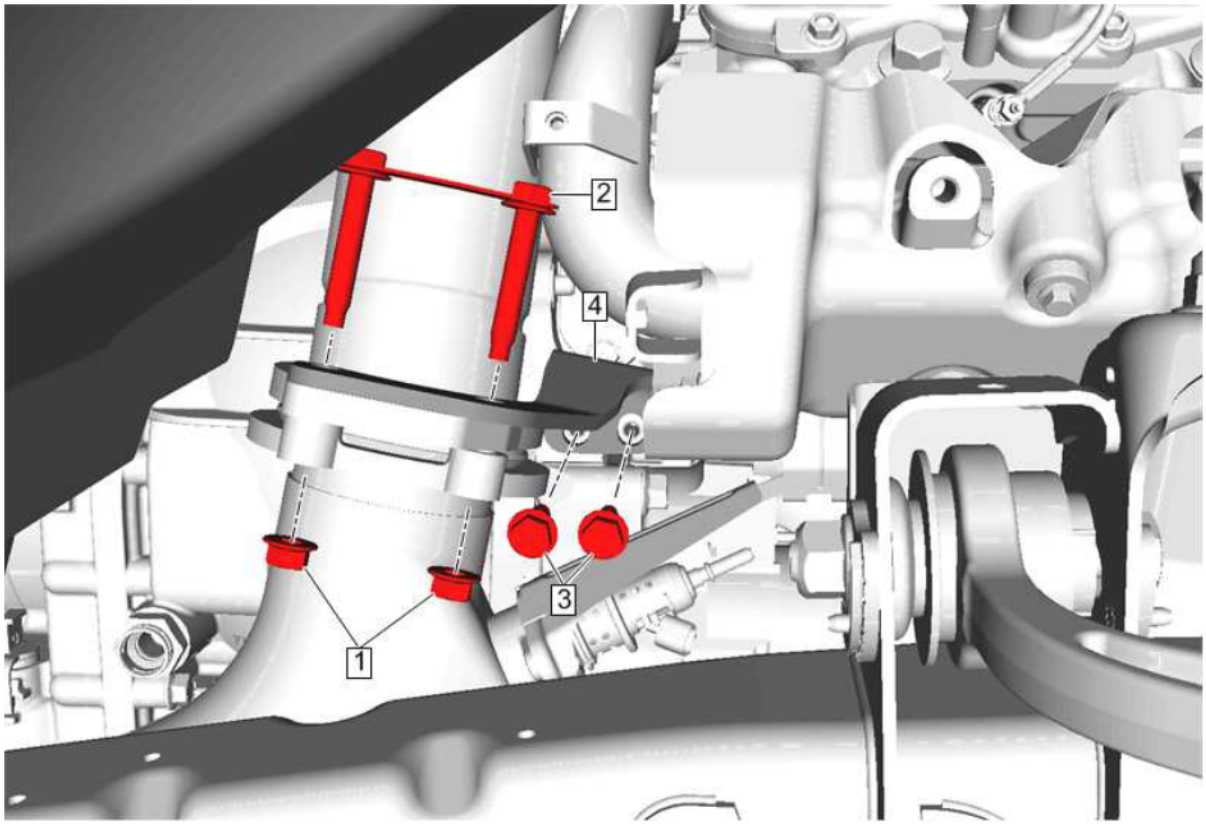


Fig. 125: Exhaust Front Bracket - Lower (L5P)
Courtesy of GENERAL MOTORS COMPANY

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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. **Front Wheelhouse Liner Replacement - Right Side** 2. **Exhaust Pipe Heat Shield Replacement - Right Side (L5P)**	
1	Exhaust Front Bracket Nut **CAUTION:** **Refer to Fastener Caution .** **Tighten** 50 N.m (37 lb ft)
2	Exhaust Front Bracket Bolt Assembly
3	Exhaust Front Bracket Bolt **Tighten** 25 N.m (18 lb ft)
4	Exhaust Front Bracket

EXHAUST FRONT BRACKET REPLACEMENT - UPPER (L5P)

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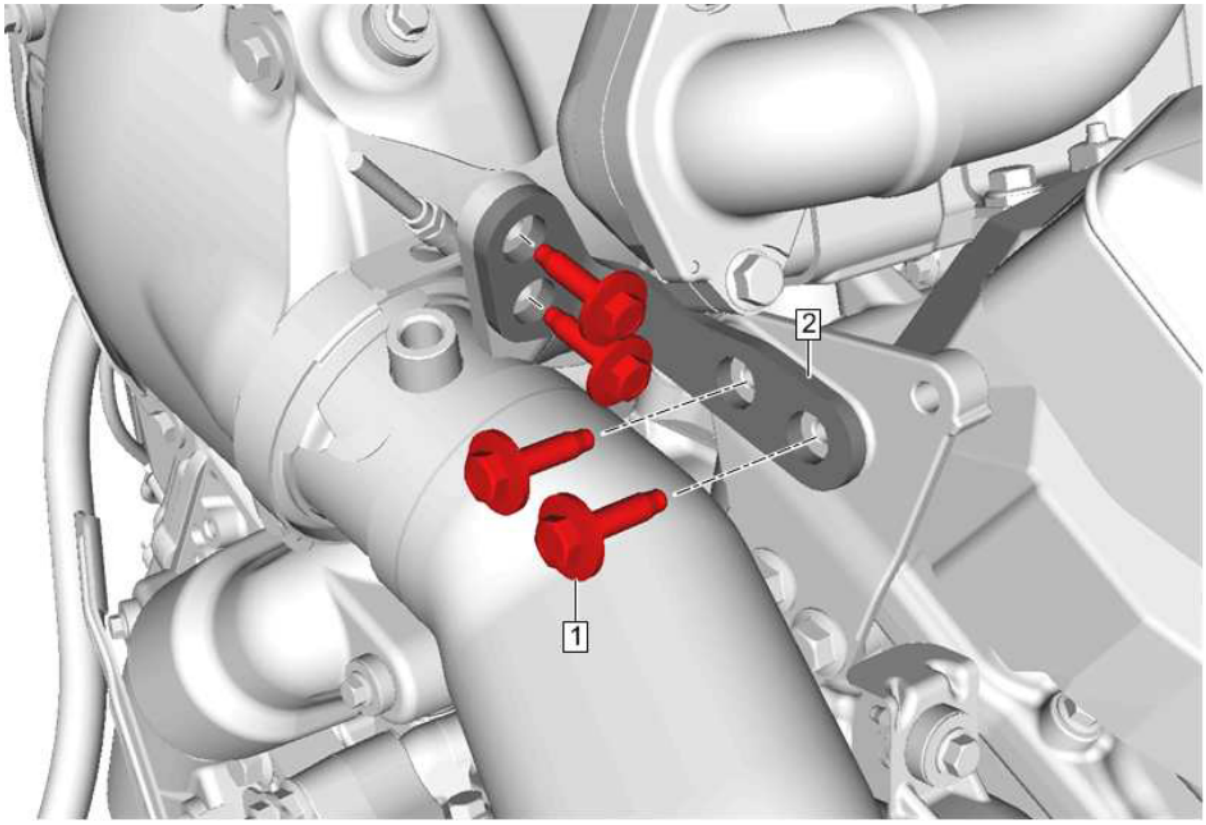


Fig. 126: Exhaust Front Bracket (L5P)
Courtesy of GENERAL MOTORS COMPANY

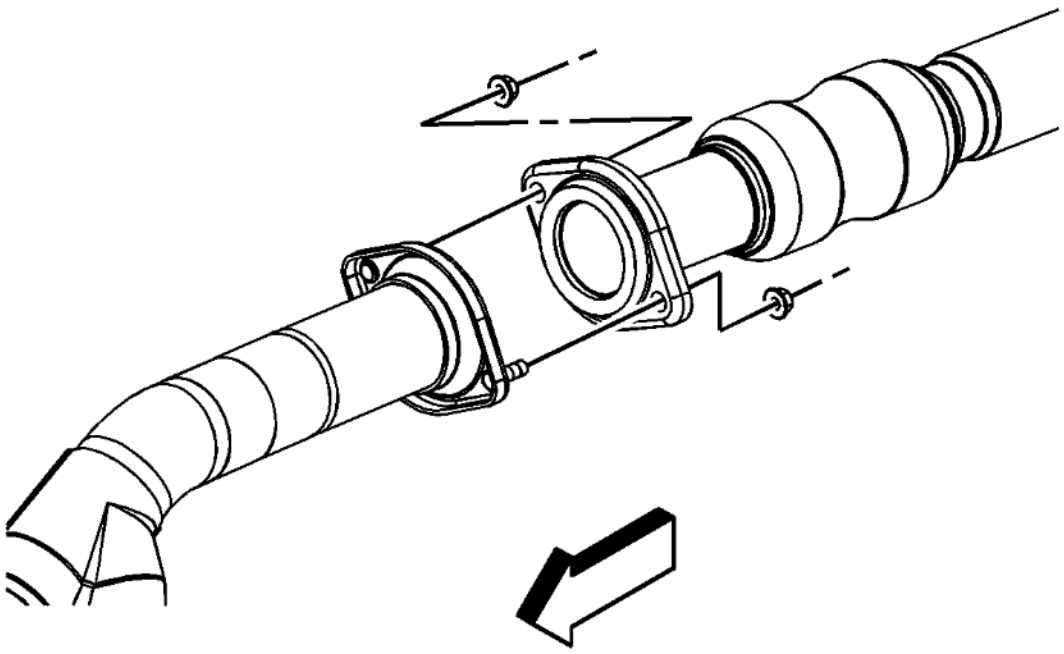
Callout	Component Name
WARNING: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool. **WARNING:** Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid	

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Callout	Component Name
personal injury. **Preliminary Procedure** Exhaust Gas Recirculation Cooler Replacement	
1	Exhaust Front Bracket Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 25 N.m (18 lb ft)
2	Exhaust Front Bracket

EXHAUST MUFFLER REPLACEMENT (1500 SERIES V6 OR V8)

Removal Procedure



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Fig. 127: View Of Catalytic Converter To Muffler Nuts
Courtesy of GENERAL MOTORS COMPANY

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Lower the spare tire.
3. Remove the catalytic converter to exhaust muffler nuts.

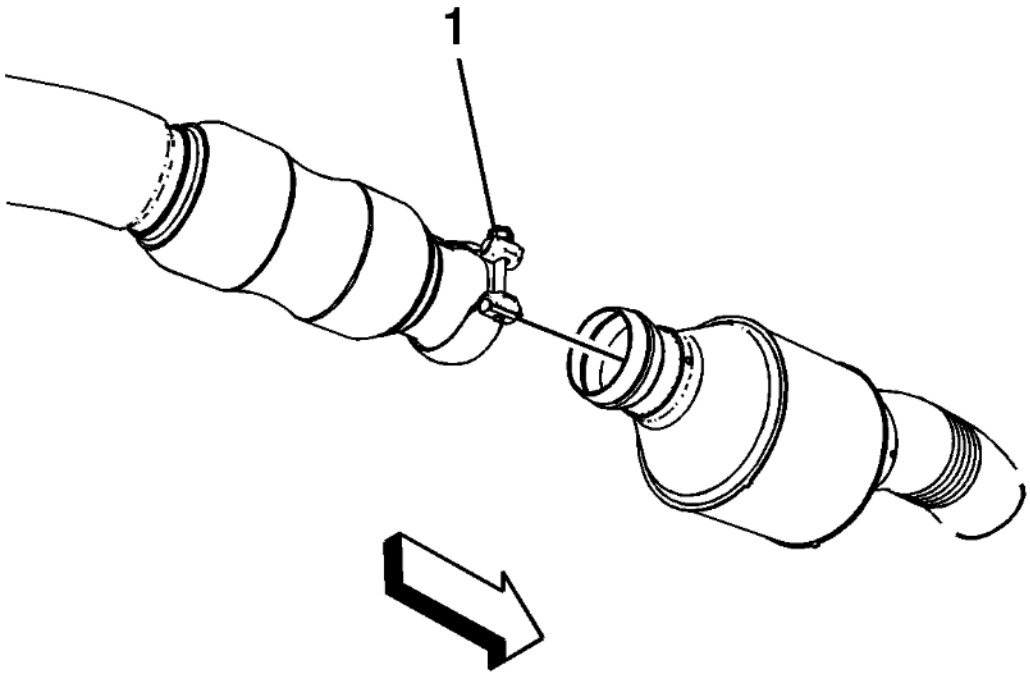


Fig. 128: Exhaust Muffler Clamp Nut
Courtesy of GENERAL MOTORS COMPANY

4. If equipped with a exhaust muffler clamp (Norma), loosen the catalytic to exhaust muffler clamp nut (1).

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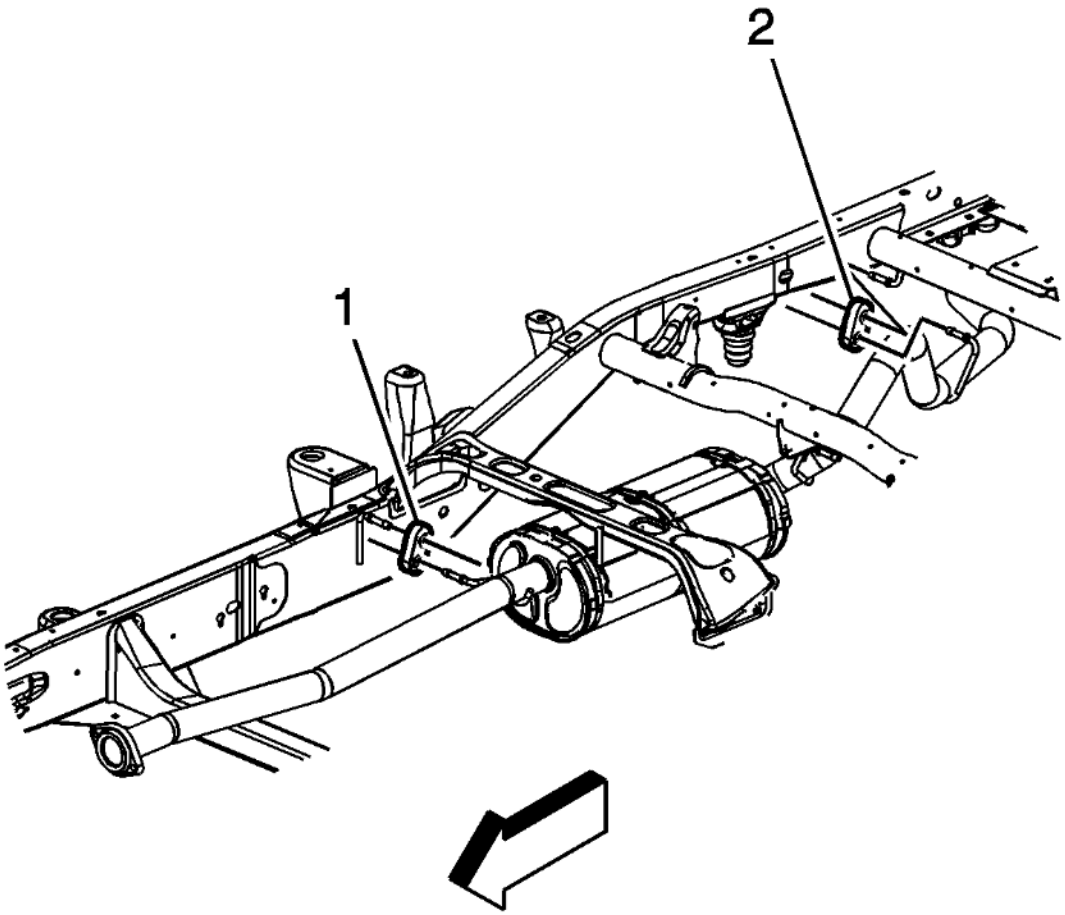


Fig. 129: View Of Rear Muffler Assembly Insulators
Courtesy of GENERAL MOTORS COMPANY

5. If equipped with a 4.8L engine, perform the following steps, otherwise proceed to step 7.
6. Lubricate the 3 insulators where the muffler assembly hangers are inserted in order to ease removal.
7. With the aid of an assistant, remove the insulators (1, 2) from the front and rear muffler assembly hangers.

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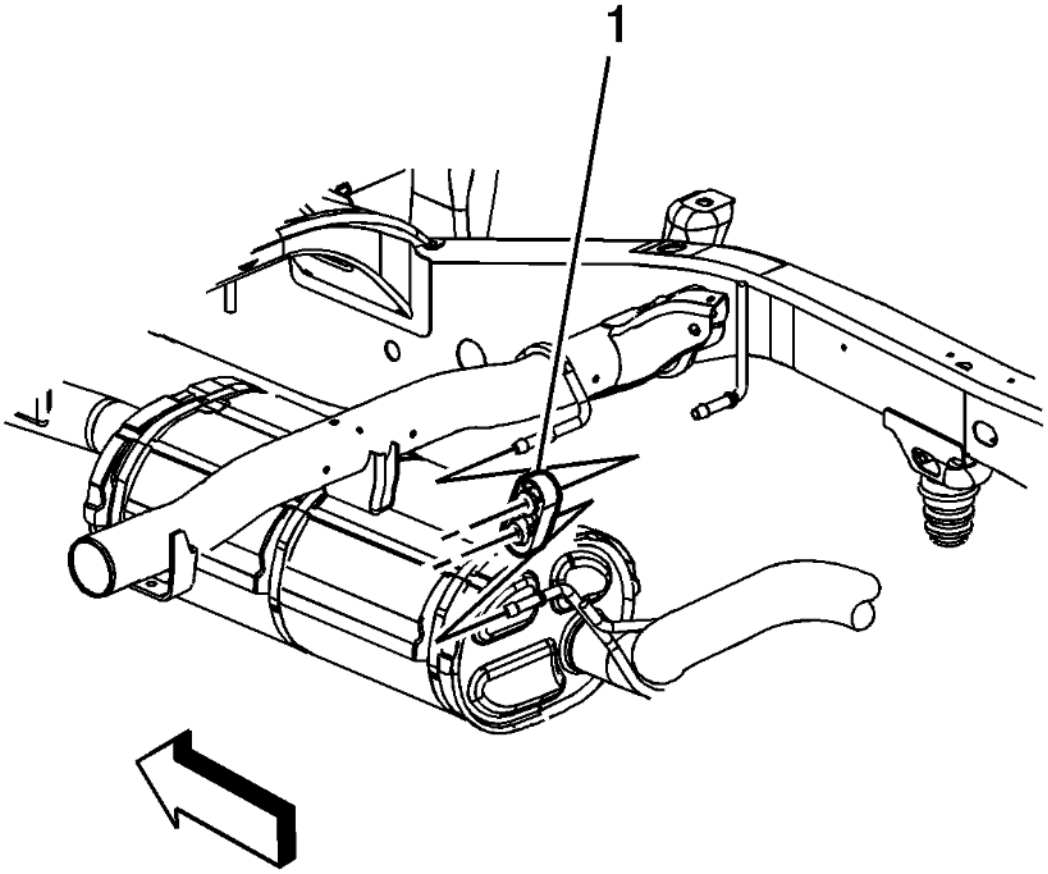


Fig. 130: View Of Intermediate Muffler Assembly Insulator
Courtesy of GENERAL MOTORS COMPANY

8. Remove the insulator (1) from the intermediate muffler assembly hanger and remove the muffler assembly.

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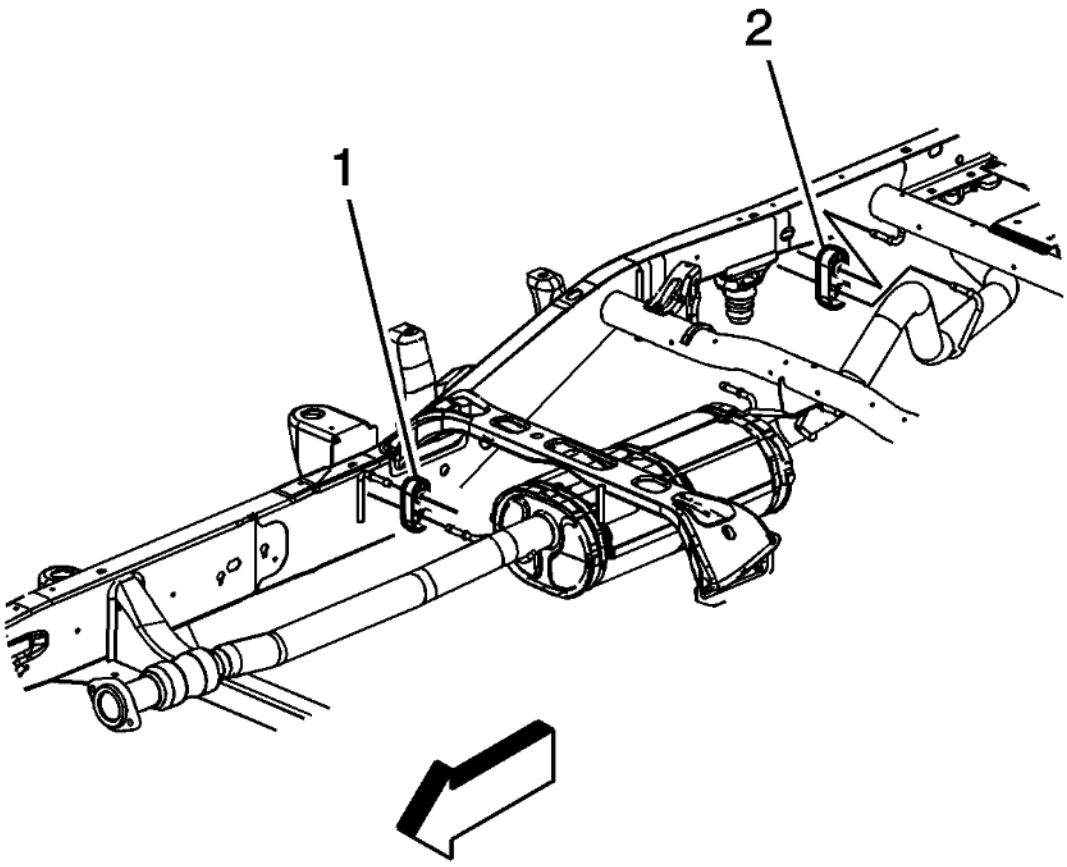


Fig. 131: View Of Front & Rear Muffler Assembly Insulators
Courtesy of GENERAL MOTORS COMPANY

9. If equipped with a 5.3L, or a 6.0L engine, lubricate the 3 insulators where the muffler assembly hangers are inserted in order to ease removal.
10. With the aid of an assistant, remove the insulators (1, 2) from the front and rear muffler assembly hangers.

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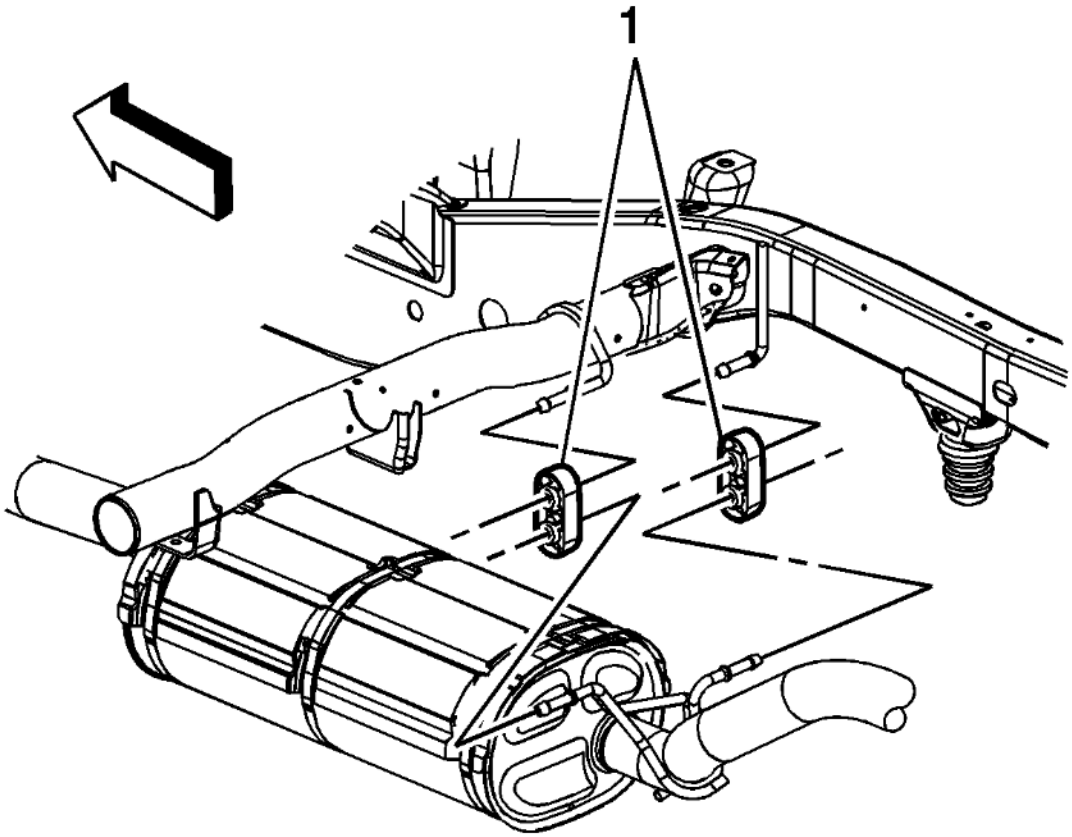


Fig. 132: View Of Intermediate Muffler Assembly Insulators
Courtesy of GENERAL MOTORS COMPANY

CAUTION: During removal or installation, do not over extend the flex couple as internal damage may occur.

11. Remove the insulators (1) from the intermediate muffler assembly hangers and remove the muffler assembly. Pull the muffler assembly rearward until the flange is able to clear the front frame crossmember, and remove the muffler toward the front of the vehicle.

Installation Procedure

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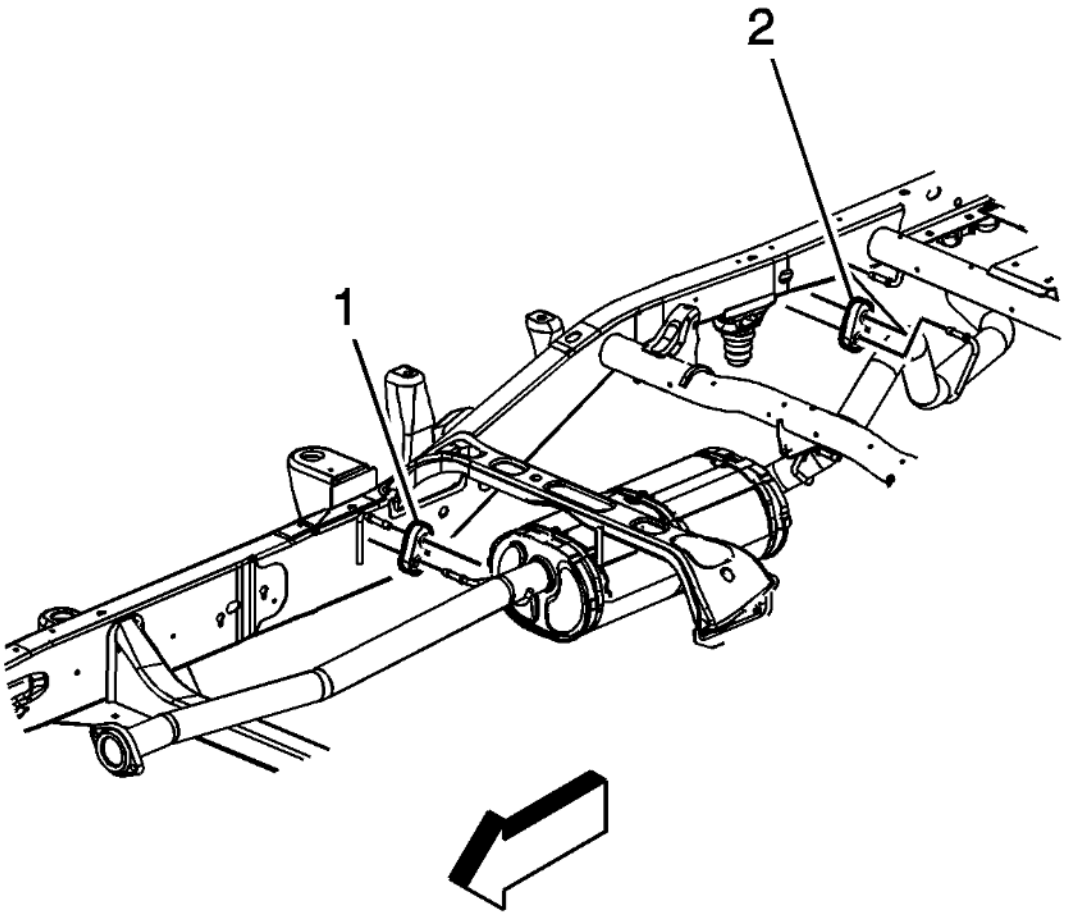


Fig. 133: View Of Rear Muffler Assembly Insulators
Courtesy of GENERAL MOTORS COMPANY

1. If equipped with a 4.8L engine, perform the following steps, otherwise proceed to step 6.
2. Lubricate the 3 insulators where the muffler assembly hangers are inserted in order to ease installation.

CAUTION: During removal or installation, do not over extend the flex couple as internal damage may occur.

3. With the aid of an assistant, position and install the muffler assembly.
4. Install the insulators (1, 2) to the front and rear muffler assembly hangers.

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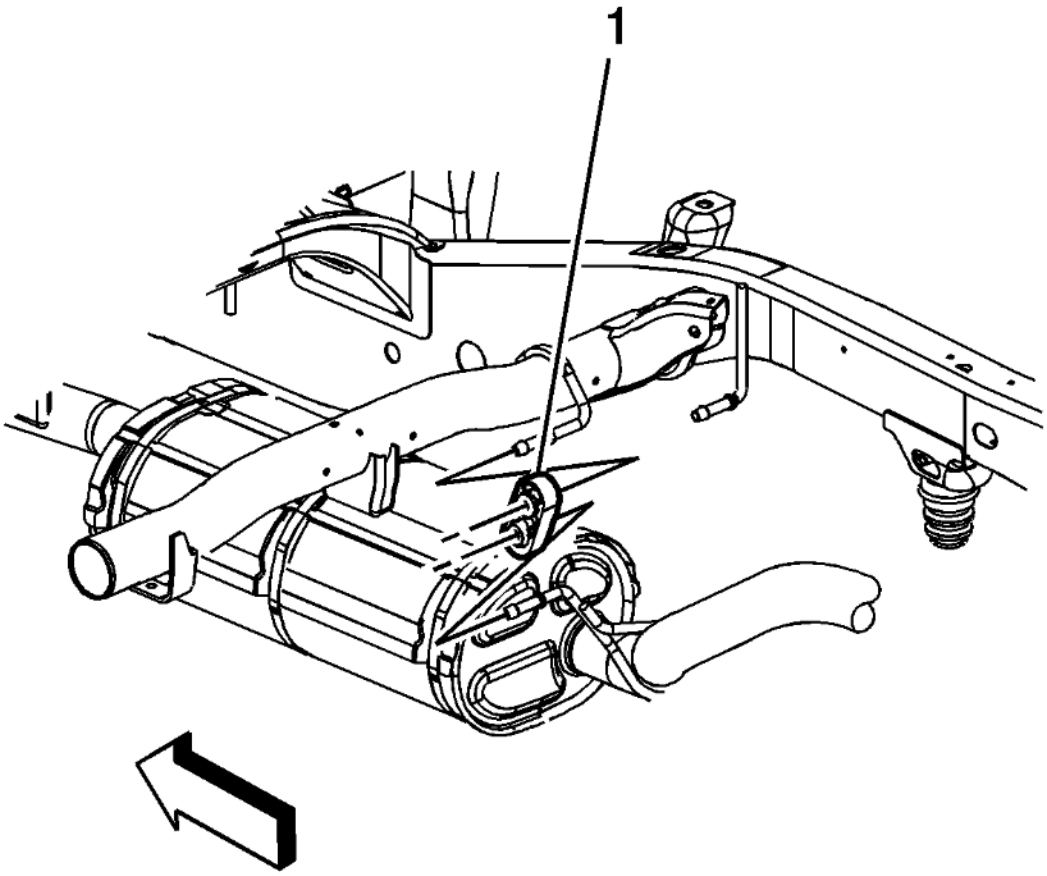


Fig. 134: View Of Intermediate Muffler Assembly Insulator
Courtesy of GENERAL MOTORS COMPANY

5. Install the insulator (1) to the intermediate muffler assembly hanger.

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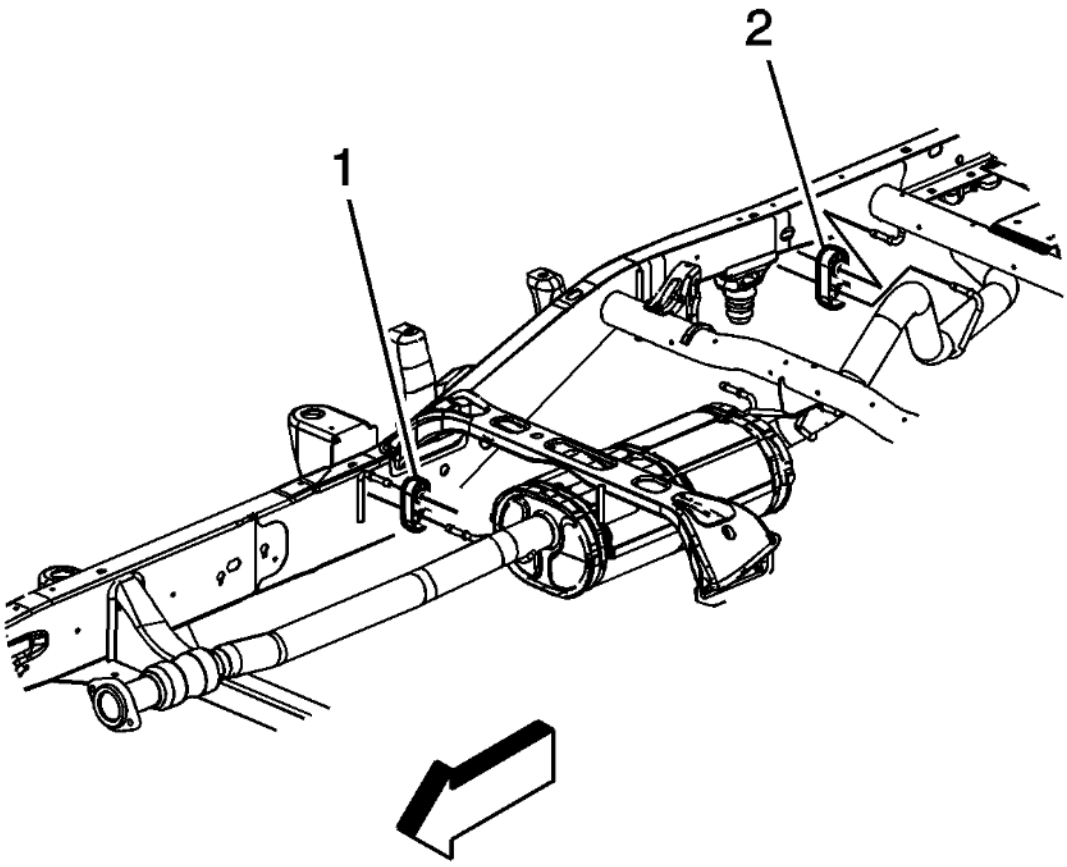


Fig. 135: View Of Front & Rear Muffler Assembly Insulators
Courtesy of GENERAL MOTORS COMPANY

6. If equipped with a 5.3L, or a 6.0L engine, lubricate the 3 insulators where the muffler assembly hangers are inserted in order to ease installation.
7. With the aid of an assistant, position and install the muffler assembly.
8. Install the insulators (1, 2) to the front and rear muffler assembly hangers.

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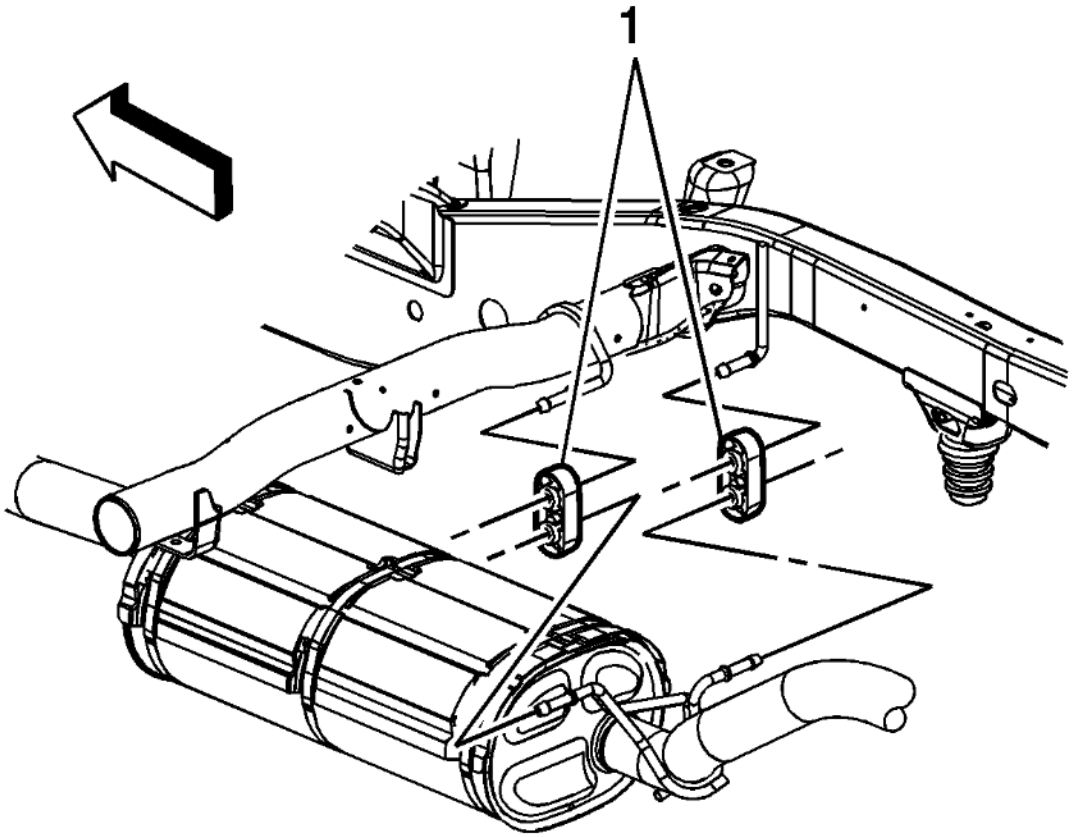


Fig. 136: View Of Intermediate Muffler Assembly Insulators
Courtesy of GENERAL MOTORS COMPANY

9. Install the insulator (1) to the intermediate muffler assembly hanger.

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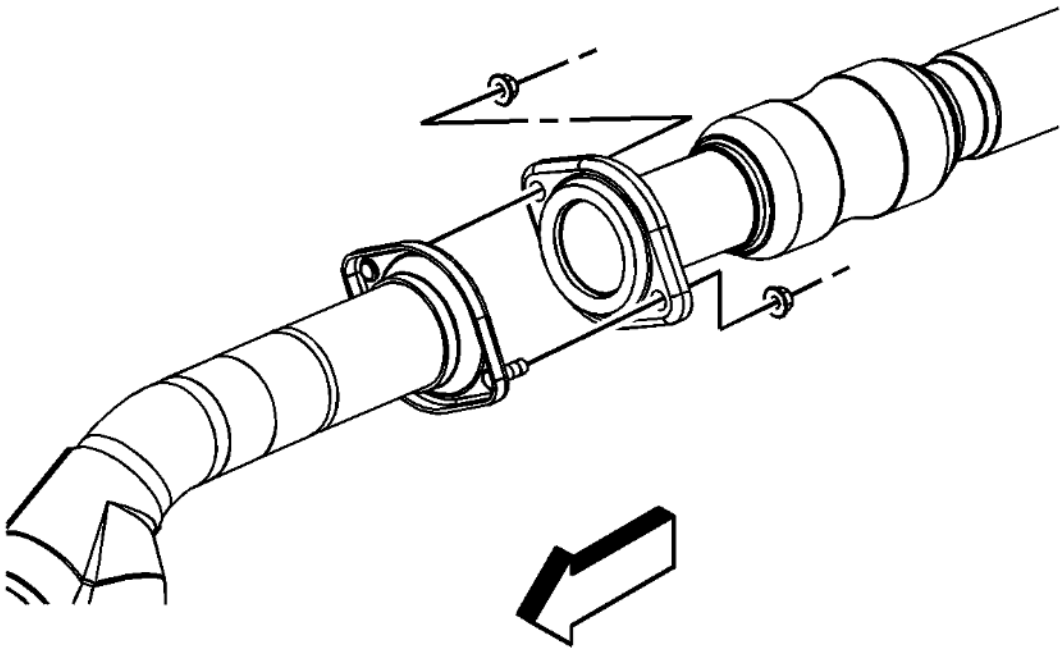


Fig. 137: View Of Catalytic Converter To Muffler Nuts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

10. Install the catalytic converter to exhaust muffler nuts and tighten to 45 N.m (33 lb ft).

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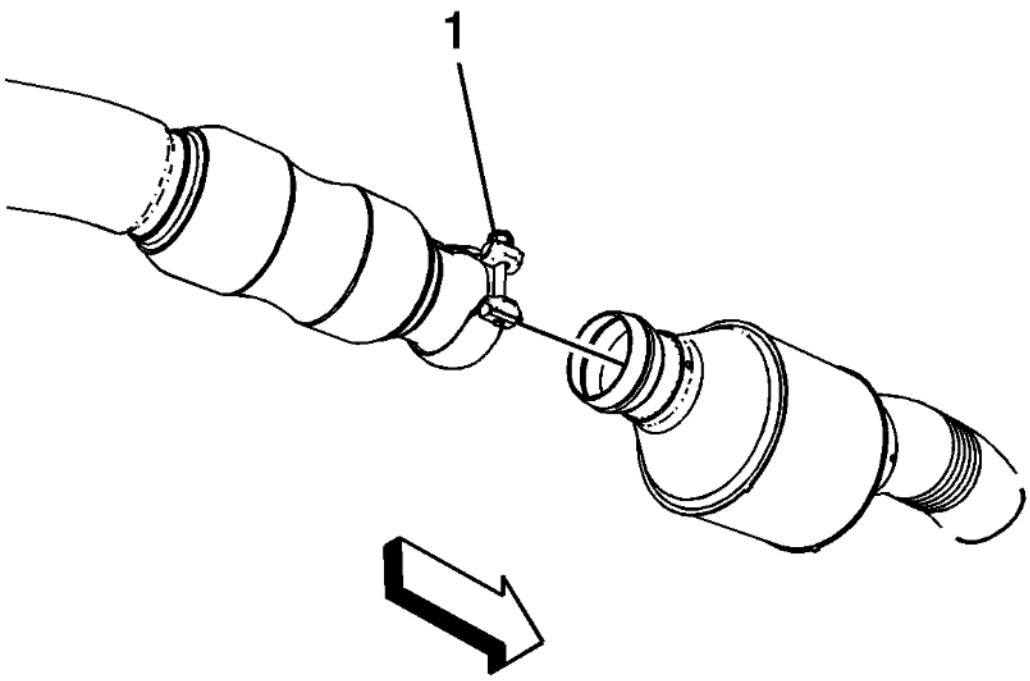


Fig. 138: Exhaust Muffler Clamp Nut
Courtesy of GENERAL MOTORS COMPANY

11. For mufflers using an exhaust clamp (Norma), install the catalytic converter to the exhaust muffler and tighten clamp nut (1) to 28 N.m (21 lb ft).
12. Return the spare tire to the original position.
13. Lower the vehicle.

EXHAUST MUFFLER REPLACEMENT (1500 SERIES 6.2L)

Removal Procedure

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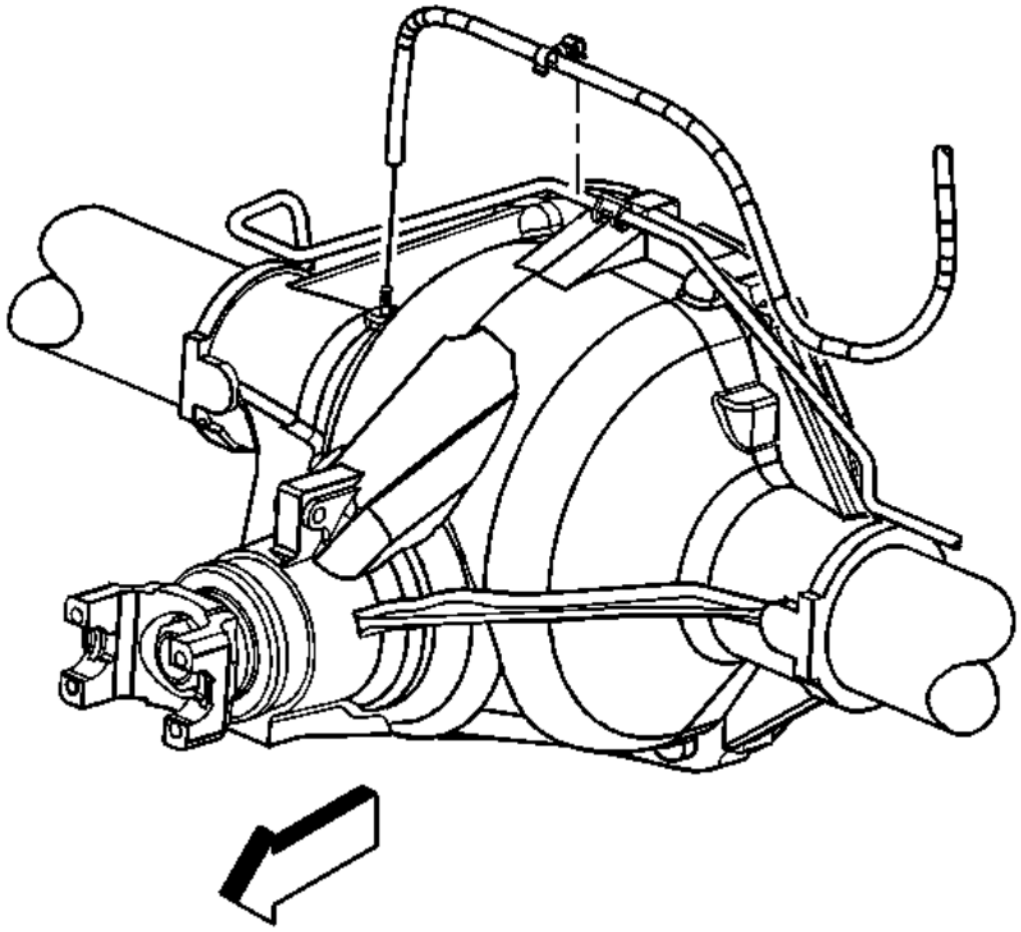


Fig. 139: Rear Axle Vent Hose
Courtesy of GENERAL MOTORS COMPANY

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the spare tire, if necessary.
3. Install adjustable jack stands under the rear axle, if necessary.
4. If equipped with a 8.6 or a 9.5 inch ring gear, remove the rear axle vent hose from the rear axle, if necessary.
5. Remove the vent hose swivel clip from the rear brake crossover pipe, if necessary.

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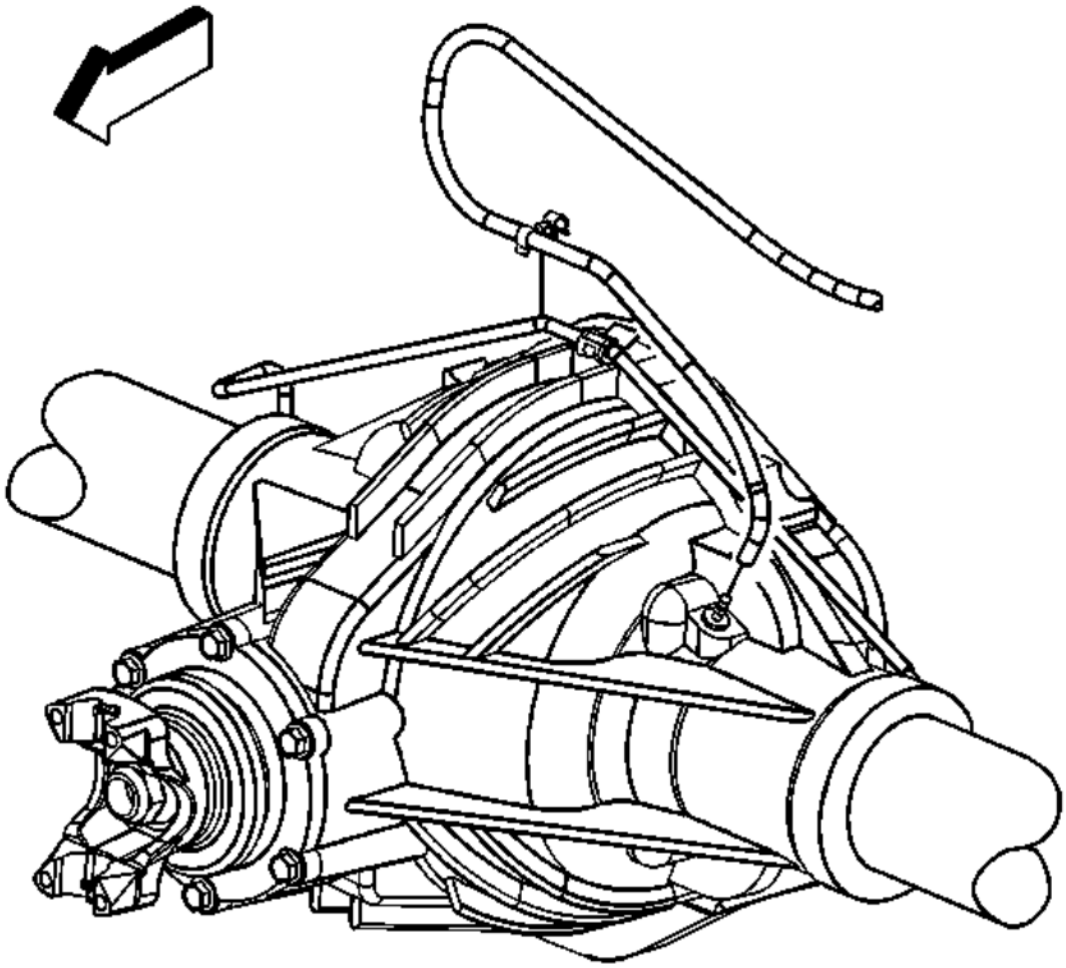


Fig. 140: Rear Axle Vent Hose (10.5 Inch Ring Gear)
Courtesy of GENERAL MOTORS COMPANY

6. If equipped with a 10.5 inch ring gear, remove the rear axle vent hose from the rear axle, if necessary.
7. Remove the vent hose swivel clip from the rear brake crossover pipe, if necessary.

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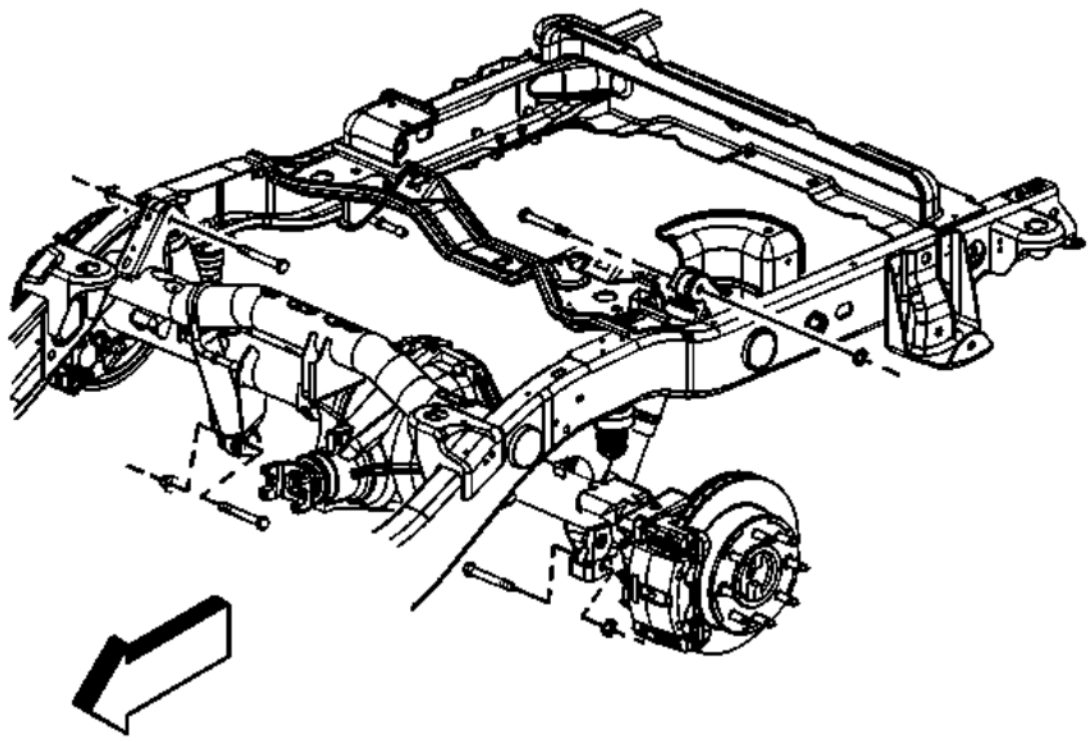


Fig. 141: Rear Shock Absorber Bolts And Nuts
Courtesy of GENERAL MOTORS COMPANY

8. Remove the rear shock absorber lower bolts and nuts, if necessary.
9. Lower the rear axle using the adjustable jack stands, if necessary.

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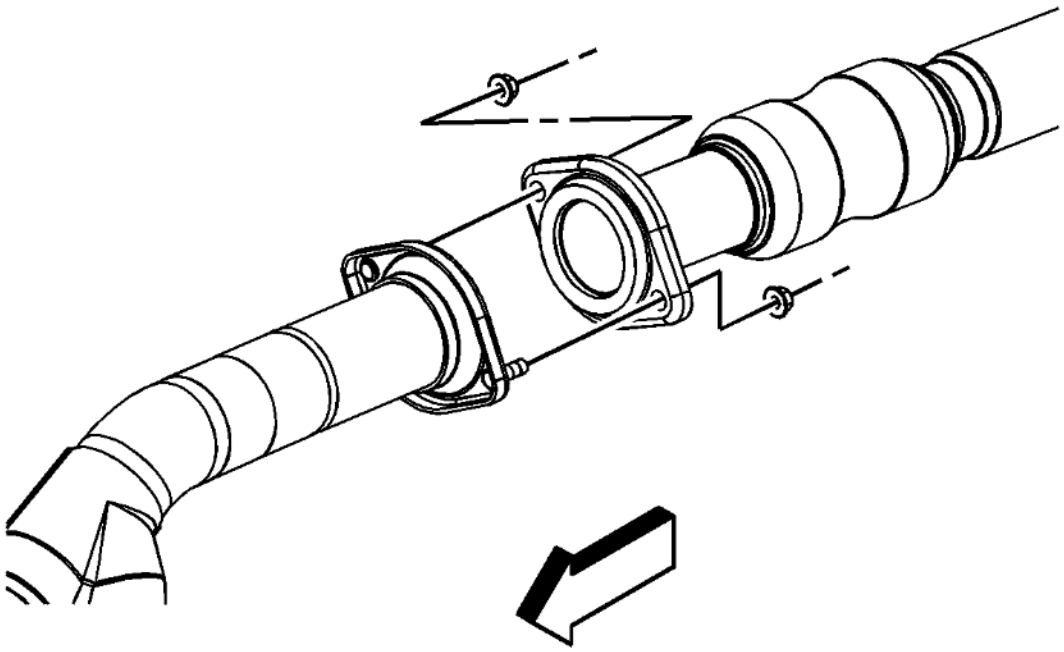


Fig. 142: View Of Catalytic Converter To Muffler Nuts
Courtesy of GENERAL MOTORS COMPANY

10. Remove the catalytic converter to muffler nuts.

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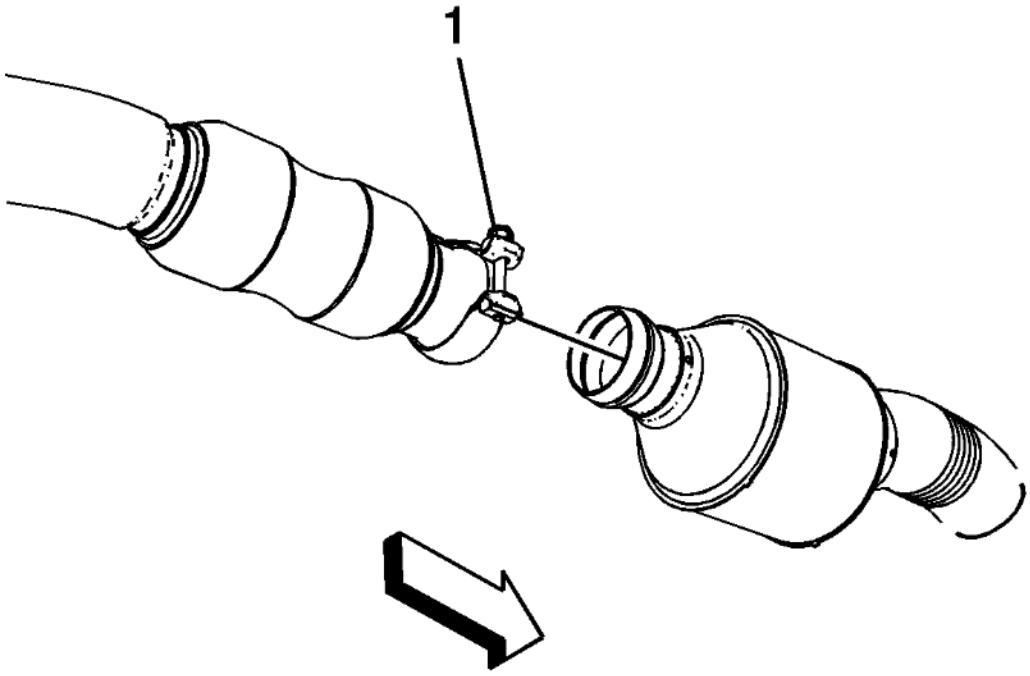


Fig. 143: Exhaust Muffler Clamp Nut
Courtesy of GENERAL MOTORS COMPANY

11. If equipped with a exhaust muffler clamp (Norma), loosen the catalytic to exhaust muffler clamp nut (1).

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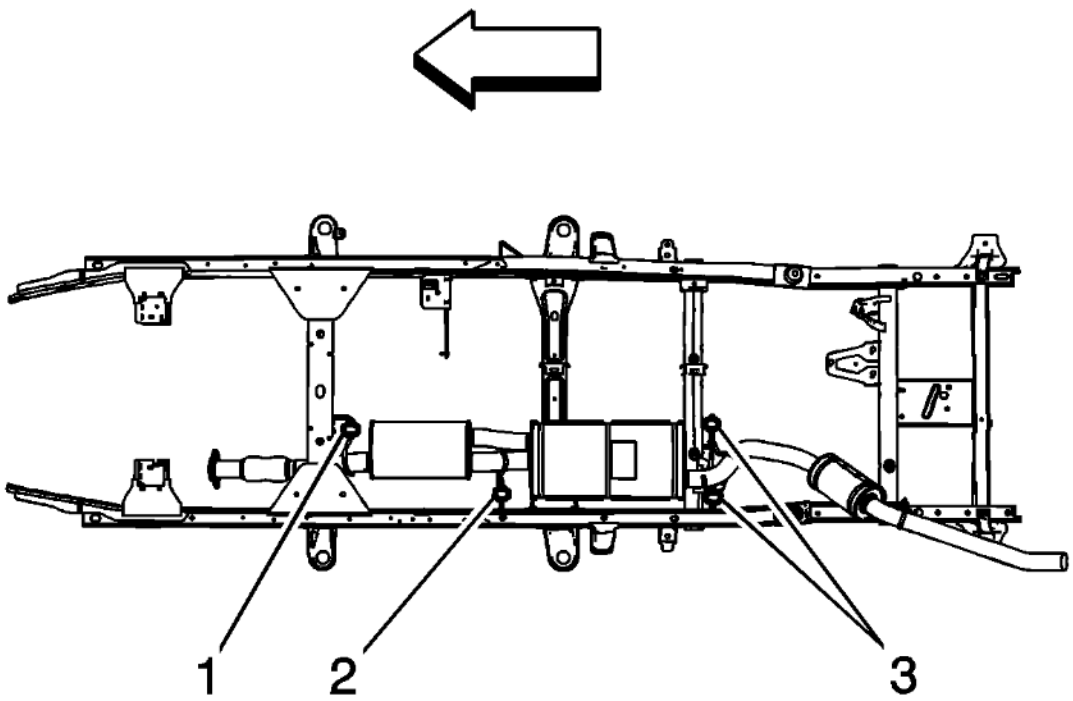


Fig. 144: View Of Muffler Assembly Insulators
Courtesy of GENERAL MOTORS COMPANY

12. Lubricate the 5 insulators where the muffler assembly hangers are inserted in order to ease removal.
13. With the aid of an assistant, remove the insulators (1-3) from the front, intermediate and rear muffler assembly hangers.

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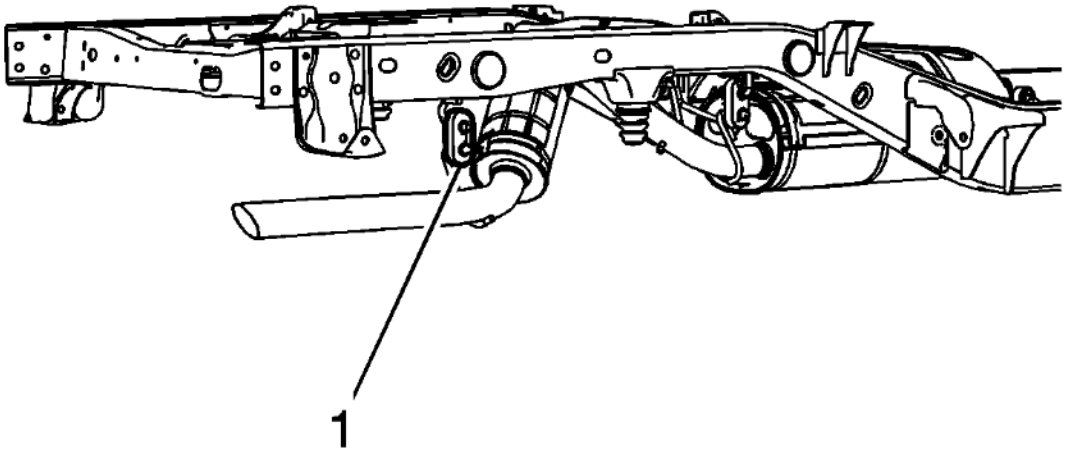


Fig. 145: View Of Tail Pipe Hanger Insulator
Courtesy of GENERAL MOTORS COMPANY

14. Remove the insulator (1) from the tail pipe hanger and remove the muffler assembly.

Installation Procedure

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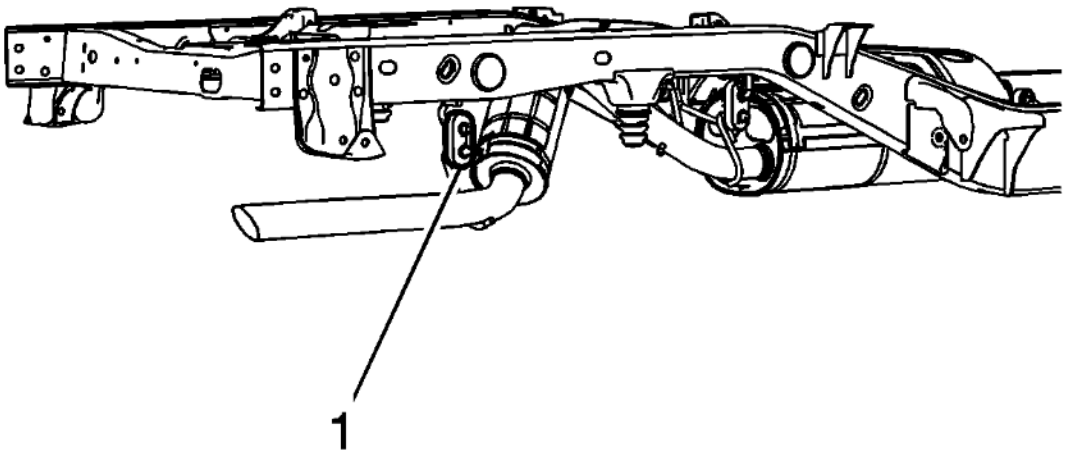


Fig. 146: View Of Tail Pipe Hanger Insulator
Courtesy of GENERAL MOTORS COMPANY

1. Lubricate the 5 insulators where the muffler assembly hangers are inserted in order to ease installation.
2. With the aid of an assistant, position and install the muffler assembly.
3. Install the insulator (1) to the rear tail pipe hanger.

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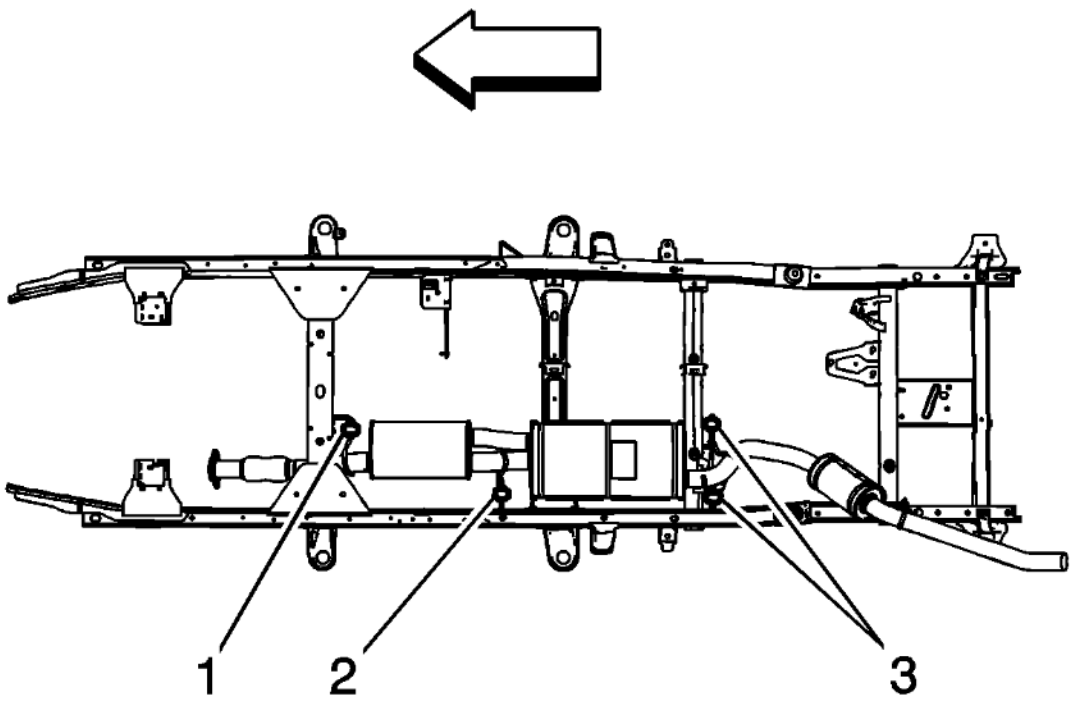


Fig. 147: View Of Muffler Assembly Insulators
Courtesy of GENERAL MOTORS COMPANY

4. Install the insulators (1-3) to the front, intermediate, and rear muffler assembly hangers.

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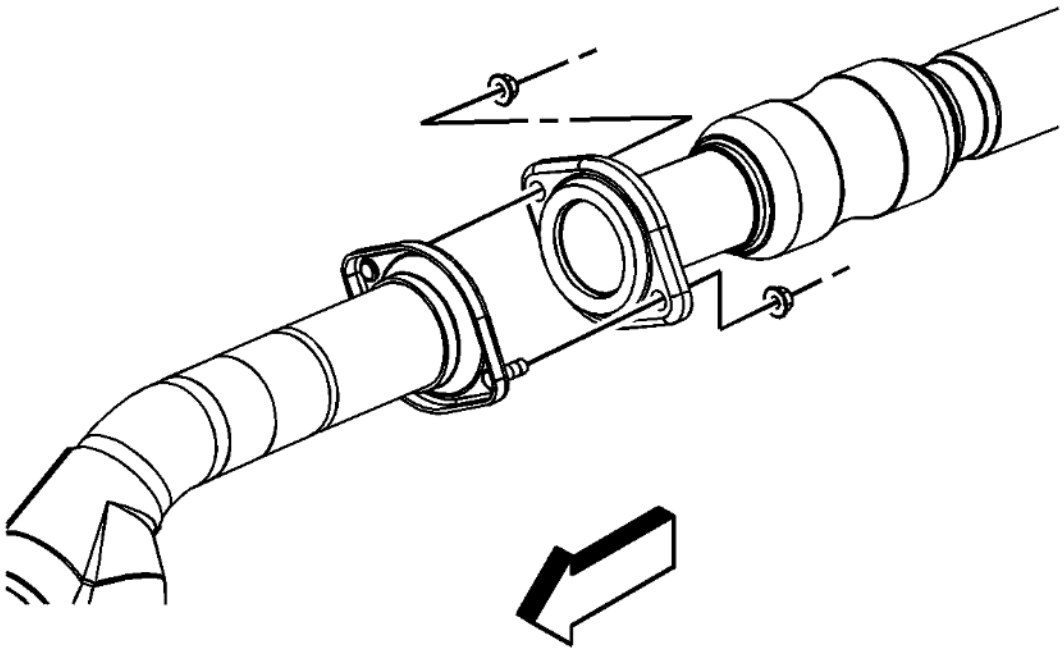


Fig. 148: View Of Catalytic Converter To Muffler Nuts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Refer to Fastener Caution .**

5. Install the catalytic converter to muffler nuts and tighten to 45 N.m (33 lb ft).

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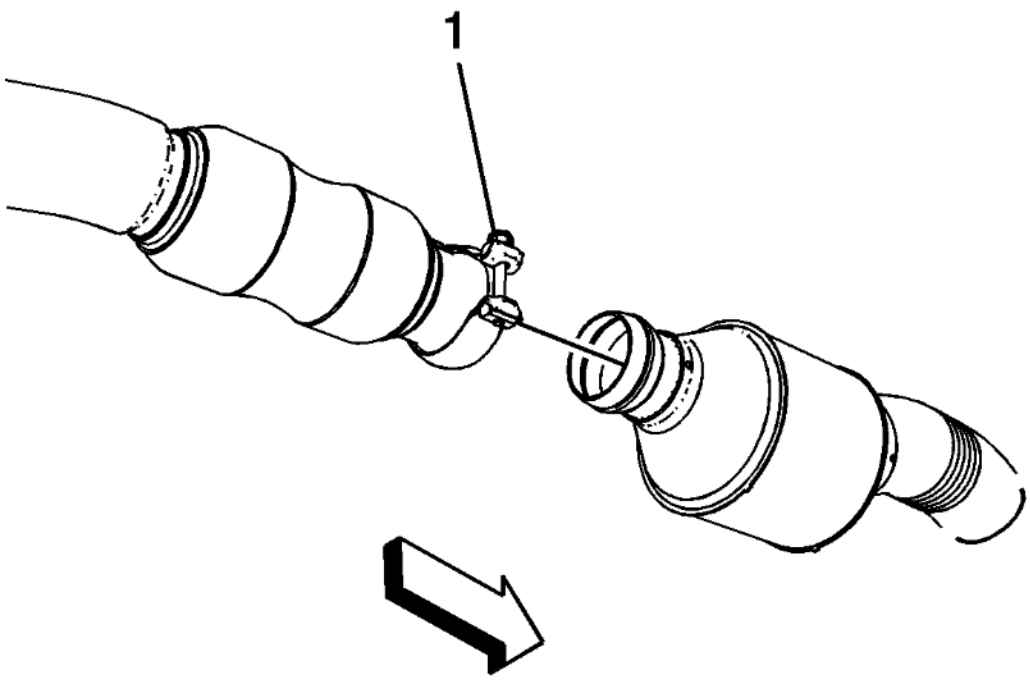


Fig. 149: Exhaust Muffler Clamp Nut
Courtesy of GENERAL MOTORS COMPANY

6. For mufflers using a exhaust muffler clamp (Norma), install the catalytic converter to the exhaust muffler nut (1) and tighten the clamp to 28 N.m (21 lb ft)

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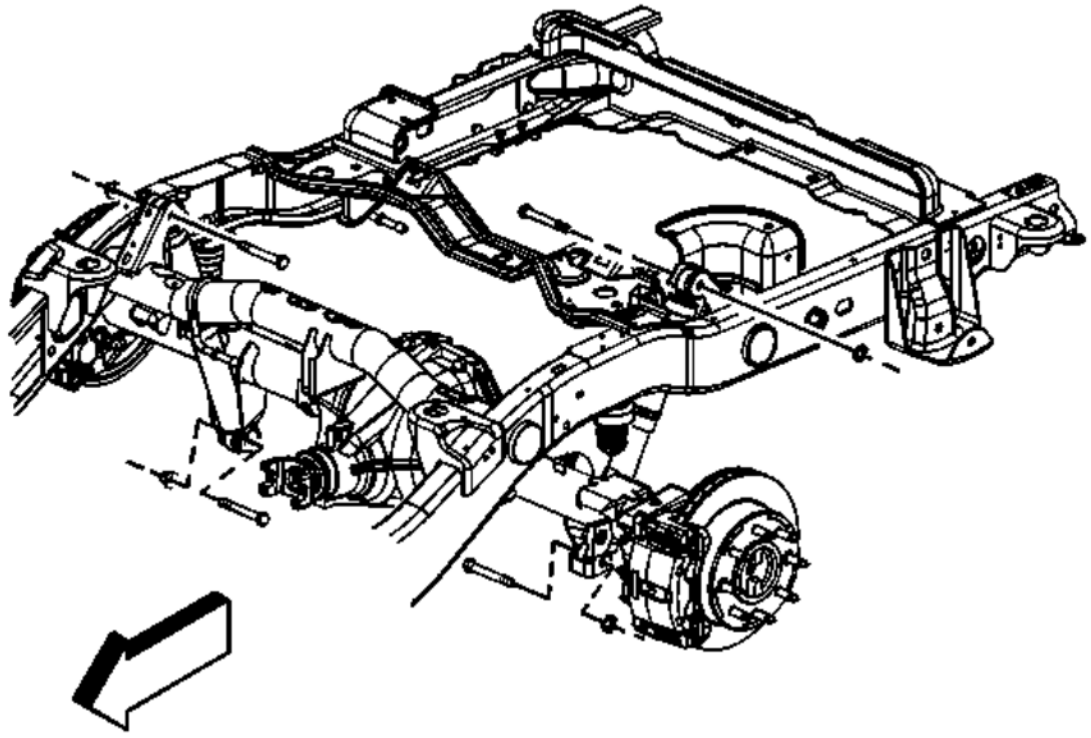


Fig. 150: Rear Shock Absorber Bolts And Nuts
Courtesy of GENERAL MOTORS COMPANY

7. Raise the rear axle using the adjustable jack stands, if necessary.
8. Install the rear shock absorber lower bolts and nuts, if necessary and tighten to 95 N.m (70 lb ft).

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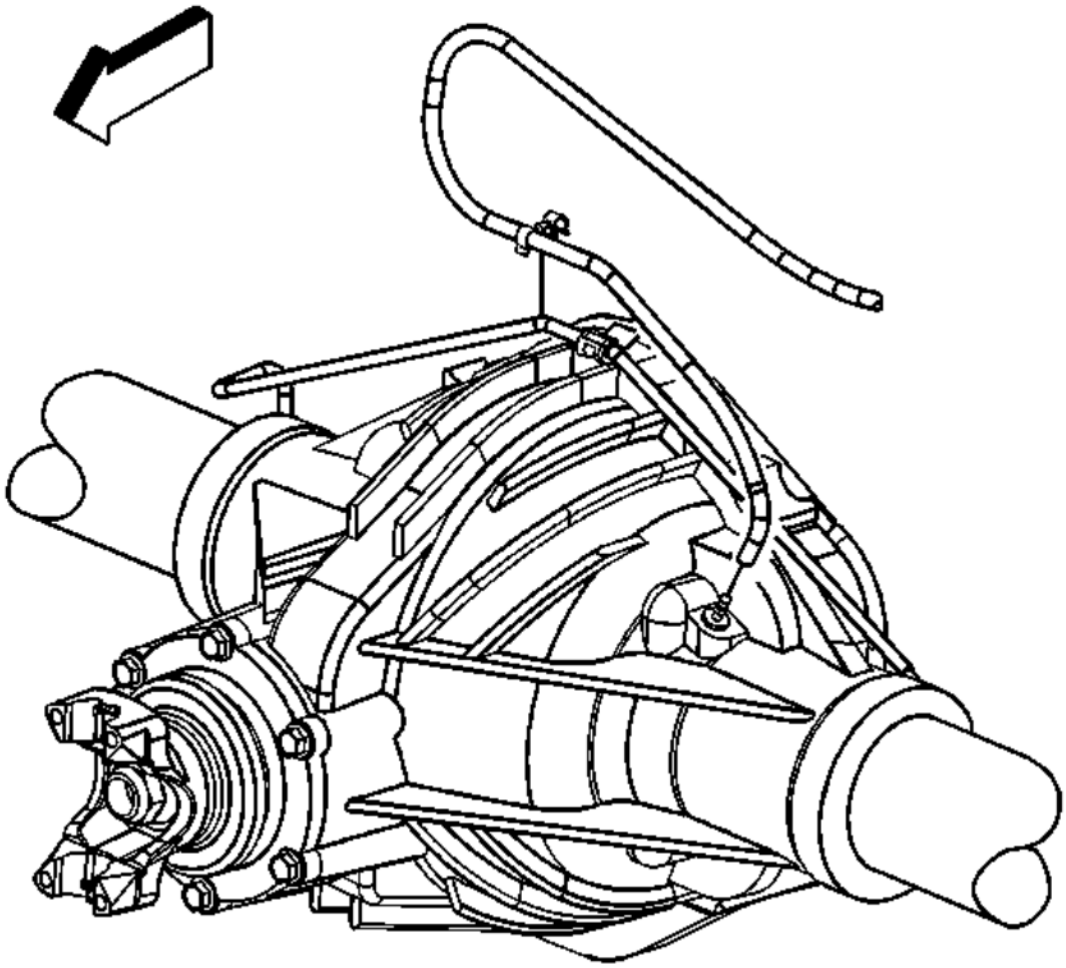


Fig. 151: Rear Axle Vent Hose (10.5 Inch Ring Gear)
Courtesy of GENERAL MOTORS COMPANY

9. If equipped with a 10.5 inch ring gear, install the rear axle vent hose to the rear axle, if necessary.
10. Connect the vent hose swivel clip to the rear brake crossover pipe, if necessary.

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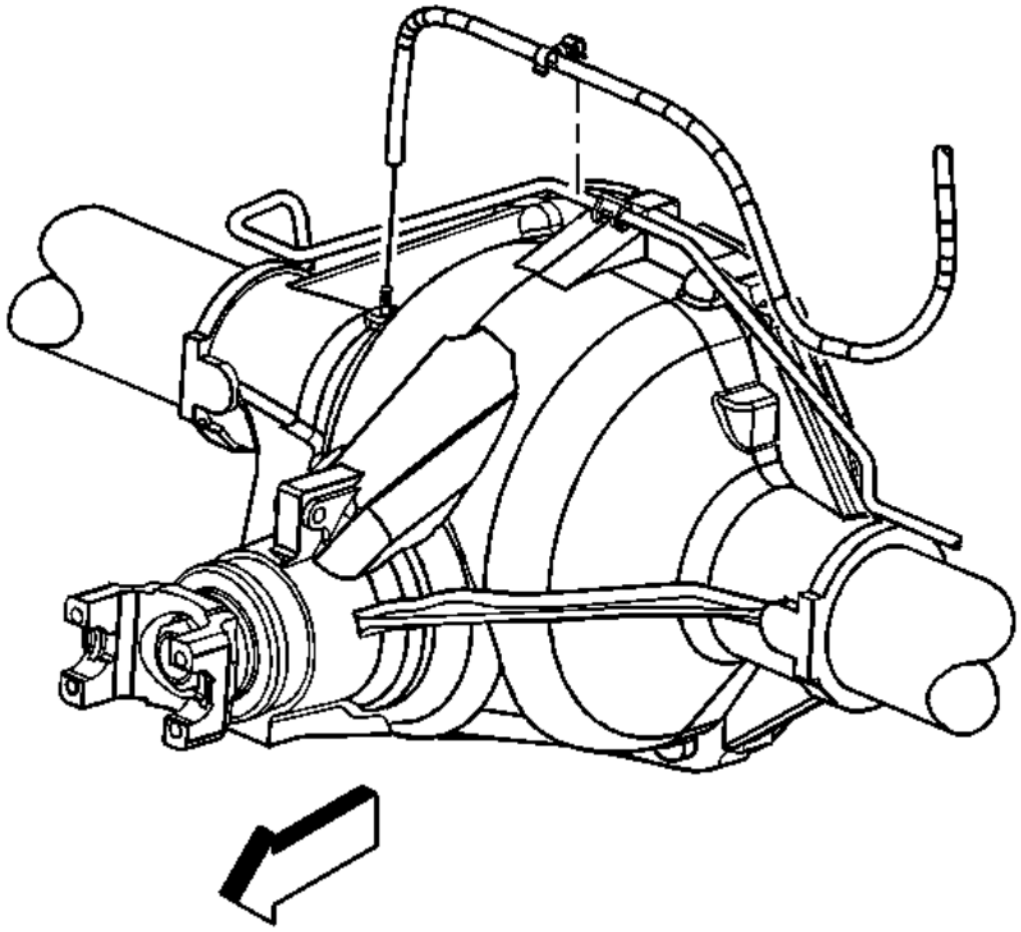


Fig. 152: Rear Axle Vent Hose (8.6 or 9.5 Inch Ring Gear)
Courtesy of GENERAL MOTORS COMPANY

11. If equipped with a 8.6 or a 9.5 inch ring gear, install the rear axle vent hose to the rear axle, if necessary.
12. Install the vent hose swivel clip to the rear brake crossover pipe, if necessary.
13. Remove the adjustable jack stands from under the rear axle, if necessary.
14. Install the spare tire, if necessary.
15. Lower the vehicle.

EXHAUST MUFFLER REPLACEMENT (L96 03 SERIES ZW9)

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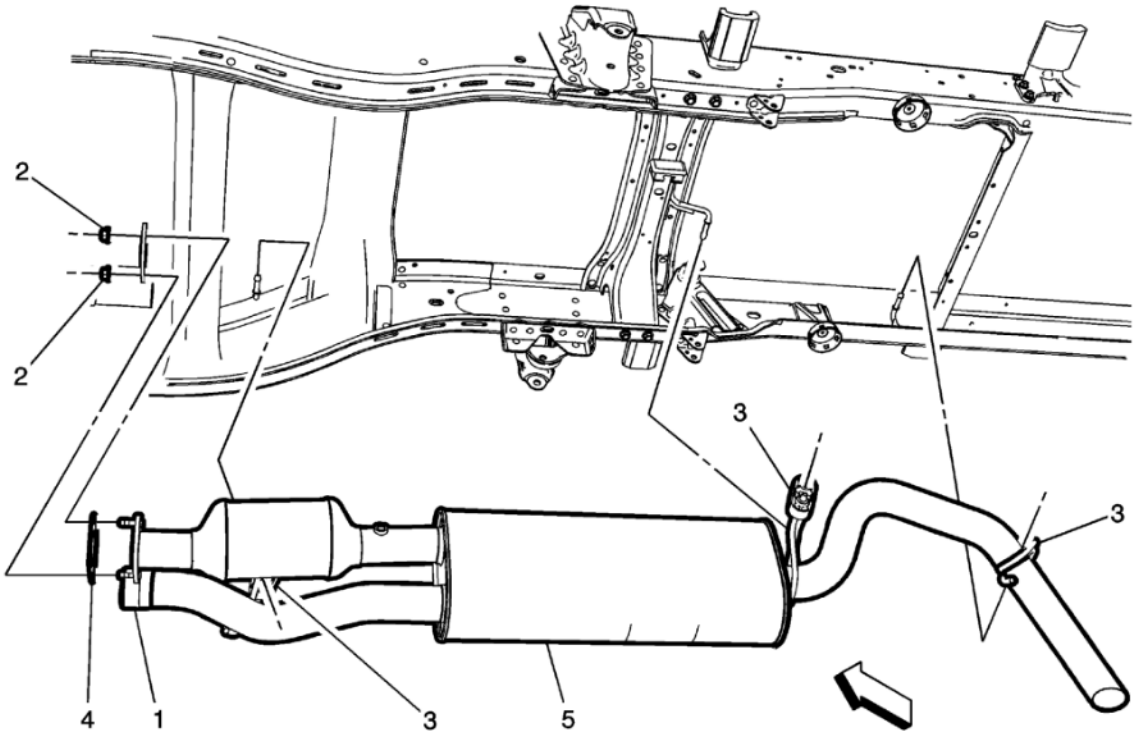


Fig. 153: Locating Exhaust Muffler Components (L96 03 Series ZW9)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Hot Exhaust System Warning . **Preliminary Procedure** Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
1	Exhaust Muffler Clamp Nut **CAUTION:** Refer to Fastener Caution . **Tighten** 28 N.m (21 lb ft)
2	Exhaust Muffler Nut (Qty: 2) **Tighten** 45 N.m (33 lb ft)
3	Exhaust Muffler Isolator **NOTE:**

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Callout	Component Name
	Lubricate the exhaust muffler rods before inserting into muffler exhaust isolators.
4	Gasket **Procedure** Replace with a NEW gasket.
5	Exhaust Muffler **Procedure** 1. Remove the rear shock absorber nuts, if necessary. Refer to **Shock Absorber Replacement (Z56, Z71)** **Shock Absorber Replacement (Z95)** . 2. Lower the rear axle using jack stands, if necessary. Refer to **Rear Axle Replacement (8.6, 9.5/9.76 Inch Axles)** **Rear Axle Replacement (10.5/11.5 Inch Axles)** .

EXHAUST MUFFLER REPLACEMENT (L96 43 SERIES ZW9)

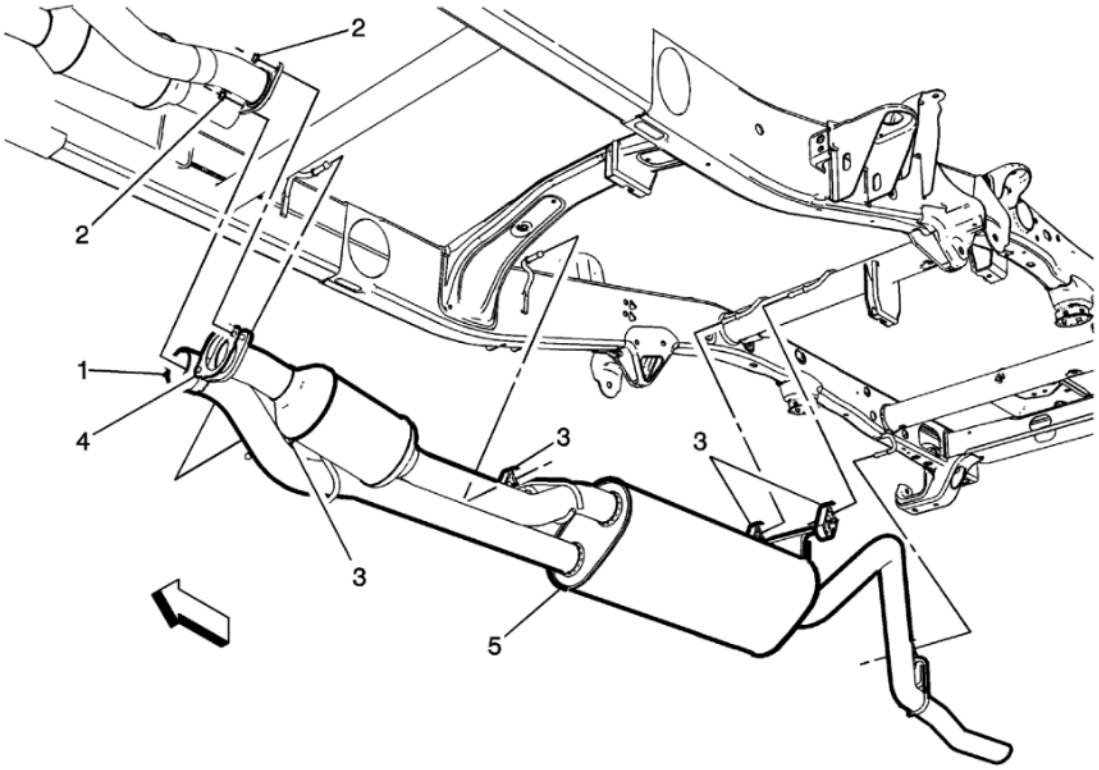


Fig. 154: Locating Exhaust Muffler Components (L96 43 Series ZW9)
Courtesy of GENERAL MOTORS COMPANY

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Callout	Component Name
WARNING: **Refer to Hot Exhaust System Warning .** **Preliminary Procedure** Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Exhaust Muffler Clamp Nut **CAUTION:** **Refer to Fastener Caution .** **Tighten** 28 N.m (21 lb ft)
2	Exhaust Muffler Nut (Qty: 2) **Tighten** 45 N.m (33 lb ft)
3	Exhaust Muffler Isolator **NOTE:** **Lubricate the exhaust muffler rods before inserting into muffler exhaust isolators.**
4	Gasket **Procedure** Replace the gasket with a NEW gasket.
5	Exhaust Muffler **Procedure** 1. Remove the rear shock absorber nuts, if necessary. Refer to **Shock Absorber Replacement (Z56, Z71)** **Shock Absorber Replacement (Z95)** . 2. Lower the rear axle using jack stands, if necessary. Refer to **Rear Axle Replacement (8.6, 9.5/9.76 Inch Axles)** **Rear Axle Replacement (10.5/11.5 Inch Axles)** .

EXHAUST MUFFLER REPLACEMENT (L96 53 SERIES ZW9)

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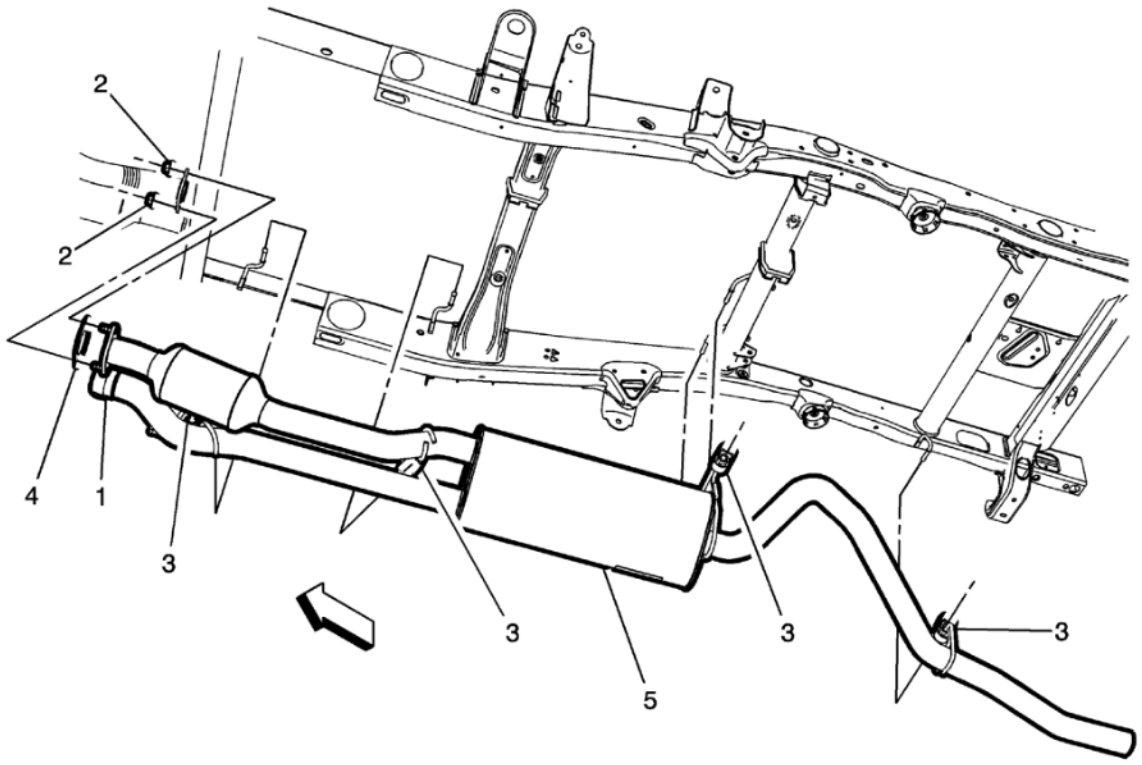


Fig. 155: Locating Exhaust Muffler Components (L96 53 Series ZW9)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Hot Exhaust System Warning . **Preliminary Procedure** Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Exhaust Muffler Clamp Nut **CAUTION:** Refer to Fastener Caution . **Tighten** 28 N.m (21 lb ft)
2	Exhaust Muffler Nut (Qty: 2) **Tighten** 45 N.m (33 lb ft)
3	Exhaust Muffler Isolator **NOTE:**

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Callout	Component Name
	Lubricate the exhaust muffler rods before inserting into muffler exhaust isolators.
4	Gasket **Procedure** Replace with a NEW gasket.
5	Exhaust Muffler **Procedure** 1. Remove the rear shock absorber nuts, if necessary. Refer to **Shock Absorber Replacement (Z56, Z71)** **Shock Absorber Replacement (Z95)** . 2. Lower the rear axle using jack stands, if necessary. Refer to **Rear Axle Replacement (8.6, 9.5/9.76 Inch Axles)** **Rear Axle Replacement (10.5/11.5 Inch Axles)** .

EXHAUST MUFFLER REPLACEMENT (L96 310/314 AND 03/43 SERIES ZW9)

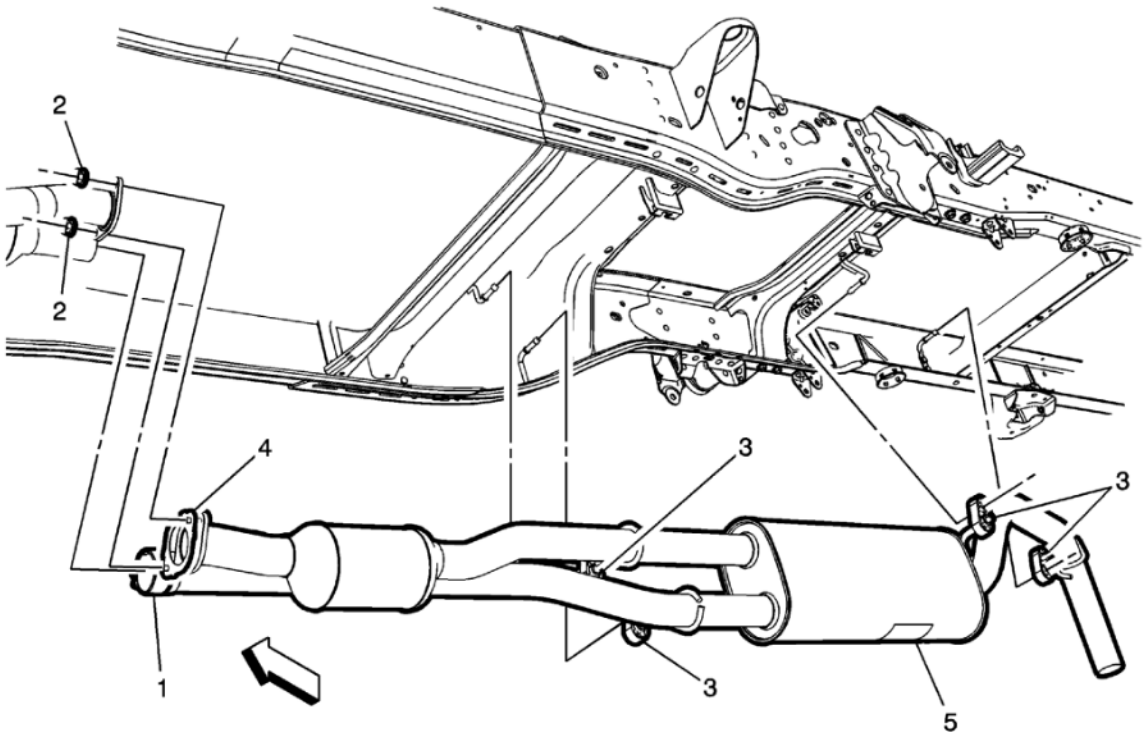


Fig. 156: Locating Exhaust Muffler Components (L96 310/314 and 03/43 Series ZW9)
Courtesy of GENERAL MOTORS COMPANY

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Callout	Component Name
WARNING: **Refer to Hot Exhaust System Warning .** **Preliminary Procedure** Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Exhaust Muffler Clamp Nut **CAUTION:** **Refer to Fastener Caution .** **Tighten** 28 N.m (21 lb ft)
2	Exhaust Muffler Nut (Qty: 2) **Tighten** 45 N.m (33 lb ft)
3	Exhaust Muffler Isolator **NOTE:** **Lubricate the exhaust muffler rods before inserting into muffler exhaust isolators.**
4	Gasket **Procedure** Replace with a NEW gasket.
5	Exhaust Muffler **Procedure** 1. Remove the rear shock absorber nuts, if necessary. Refer to **Shock Absorber Replacement (Z56, Z71)** **Shock Absorber Replacement (Z95)** . 2. Lower the rear axle using jack stands, if necessary. Refer to **Rear Axle Replacement (8.6, 9.5/9.76 Inch Axles)** **Rear Axle Replacement (10.5/11.5 Inch Axles)** .

EXHAUST MUFFLER REPLACEMENT (6.0L 03 SERIES E63)

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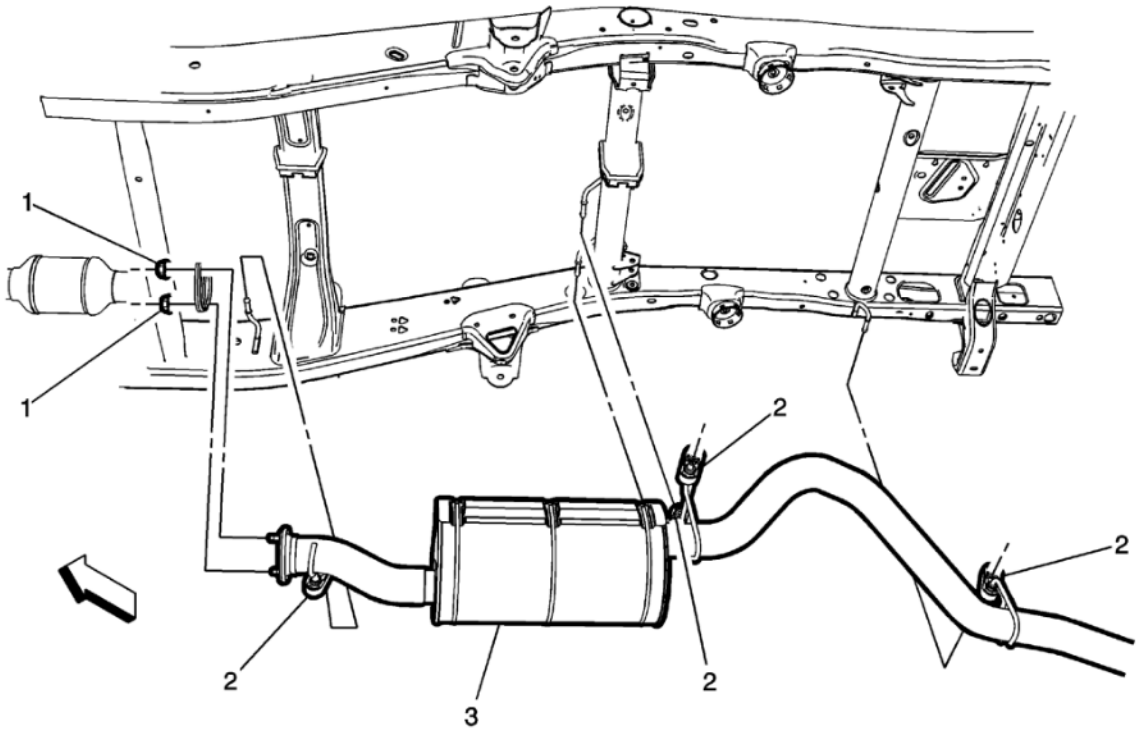


Fig. 157: Locating Exhaust Muffler Components (6.0L 03 Series E63)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to **Hot Exhaust System Warning** . **Preliminary Procedure** Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Exhaust Muffler Nut (Qty: 2) **CAUTION:** Refer to **Fastener Caution** . **Tighten** 45 N.m (33 lb ft)
2	Exhaust Muffler Isolator **NOTE:** Lubricate the exhaust muffler rods

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Callout	Component Name
	before inserting into muffler exhaust isolators.
3	Exhaust Muffler **Procedure** 1. Remove the rear shock absorber nuts, if necessary. Refer to **Shock Absorber Replacement (Z56, Z71)** **Shock Absorber Replacement (Z95)** . 2. Lower the rear axle using jack stands, if necessary. Refer to **Rear Axle Replacement (8.6, 9.5/9.76 Inch Axles)** **Rear Axle Replacement (10.5/11.5 Inch Axles)** .

EXHAUST MUFFLER REPLACEMENT (6.0L 43/53 SERIES E63)

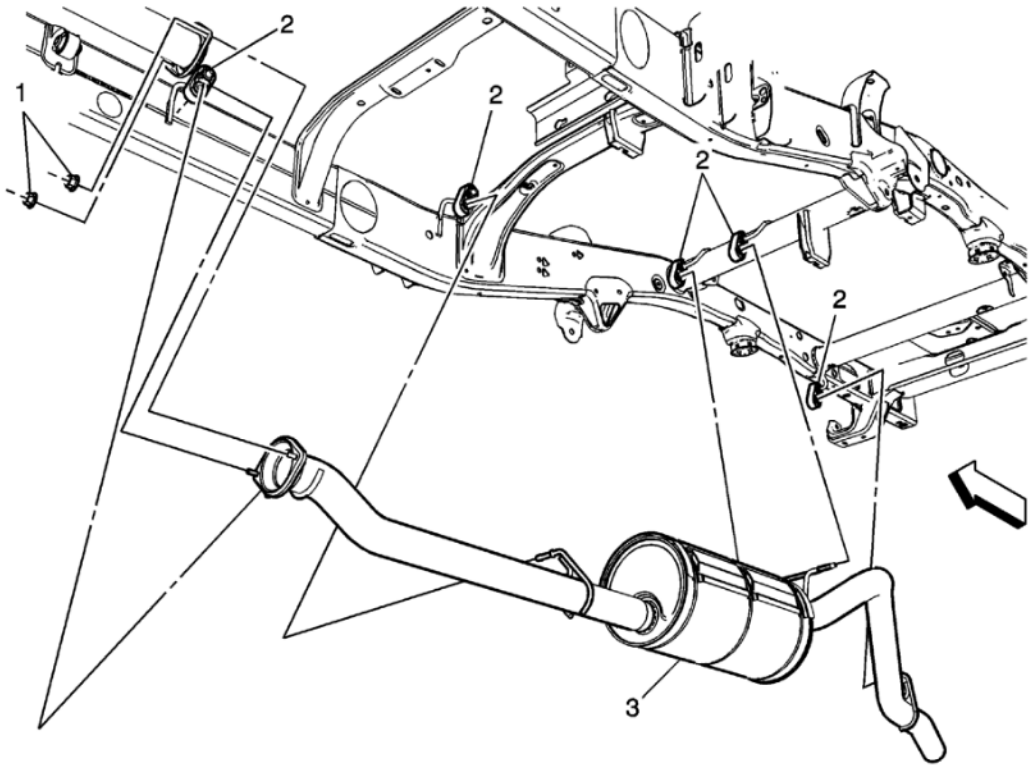


Fig. 158: Locating Exhaust Muffler Components (6.0L 43/53 Series E63)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to **Hot Exhaust System**	

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Callout	Component Name
Warning . **Preliminary Procedure** Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Exhaust Muffler Nut (Qty: 2) **CAUTION:** **Refer to Fastener Caution** . **Tighten** 45 N.m (33 lb ft)
2	Exhaust Muffler Isolator **NOTE:** **Lubricate the exhaust muffler rods before inserting into muffler exhaust isolators.**
3	Exhaust Muffler **Procedure** 1. Remove the rear shock absorber nuts, if necessary. Refer to **Shock Absorber Replacement (Z56, Z71)** **Shock Absorber Replacement (Z95)** . 2. Lower the rear axle using jack stands, if necessary. Refer to **Rear Axle Replacement (8.6, 9.5/9.76 Inch Axles)** **Rear Axle Replacement (10.5/11.5 Inch Axles)** .

EXHAUST MUFFLER WITH RESONATOR, EXHAUST, AND TAIL PIPE REPLACEMENT (LV3)

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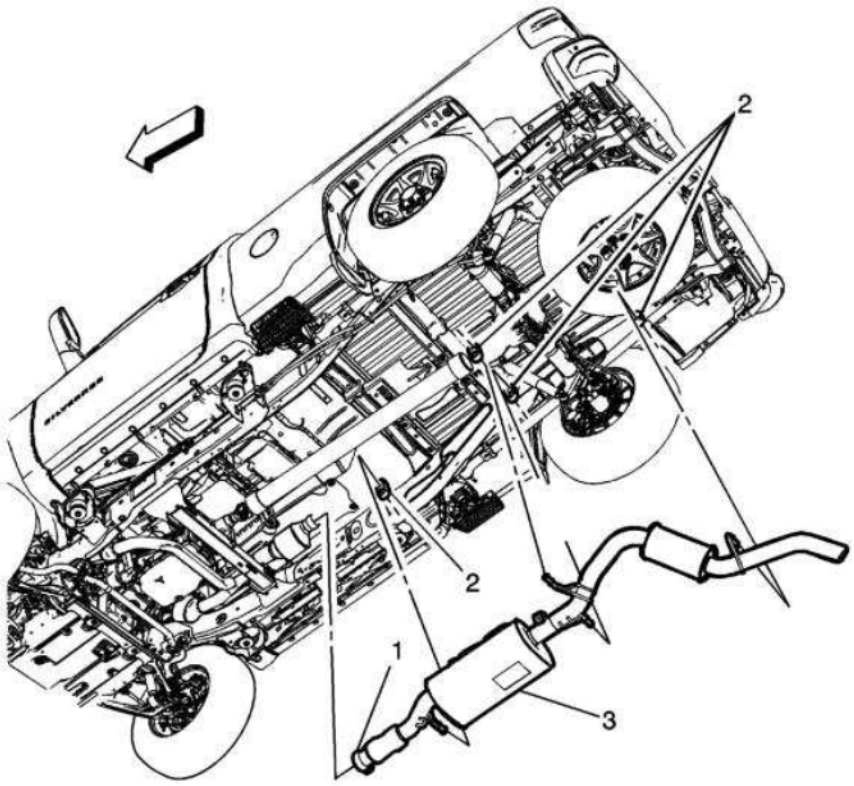


Fig. 159: Exhaust Muffler with Resonator, Exhaust and Tail Pipe (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Exhaust Muffler Clamp Fastener **WARNING:** **Refer to Hot Exhaust System Warning .** **WARNING:** **Refer to Eye Protection Warning .** **CAUTION:** **Refer to Fastener Caution .** **Tighten** 28 N.m (21 lb ft)

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Callout	Component Name
2	Exhaust Muffler Isolator **NOTE:** **Clean and lubricate the exhaust rods for ease of installation.**
3	Exhaust Muffler

EXHAUST MUFFLER WITH RESONATOR, EXHAUST, AND TAIL PIPE REPLACEMENT (L83, L86)

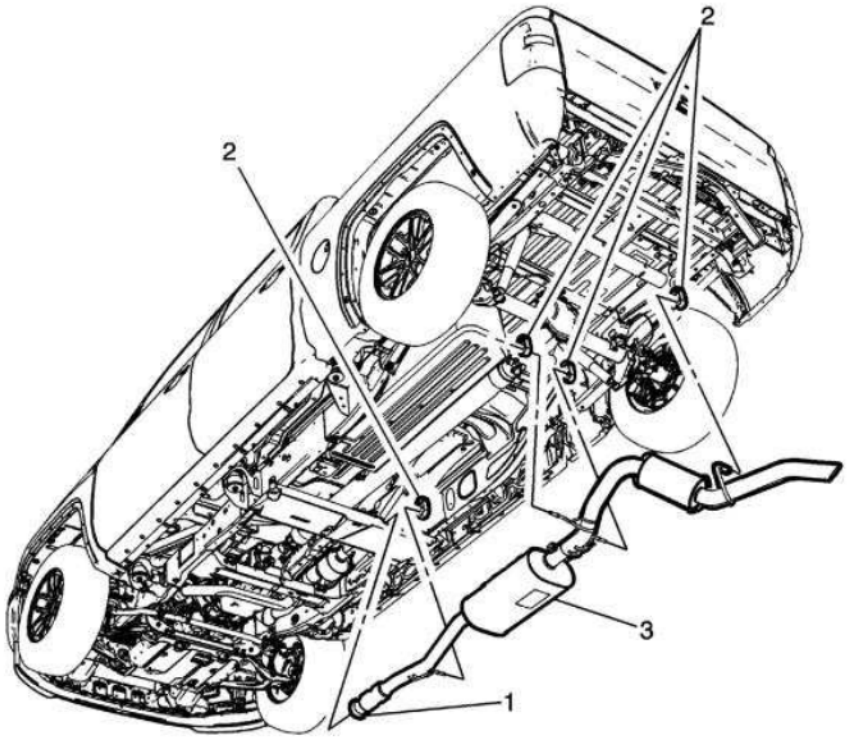


Fig. 160: Exhaust Muffler with Resonator, Exhaust and Tail Pipe (L83, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Exhaust Muffler Clamp Fastener **WARNING:** **Refer to Hot Exhaust System Warning .**

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Callout	Component Name
	WARNING: **Refer to Eye Protection Warning .** **CAUTION:** **Refer to Fastener Caution .** **Tighten** 28 N.m (21 lb ft)
2	Exhaust Muffler Isolator **NOTE:** **Clean and lubricate the exhaust rods for ease of installation.**
3	Exhaust Muffler

CATALYTIC CONVERTER HEAT SHIELD REPLACEMENT (L5P)

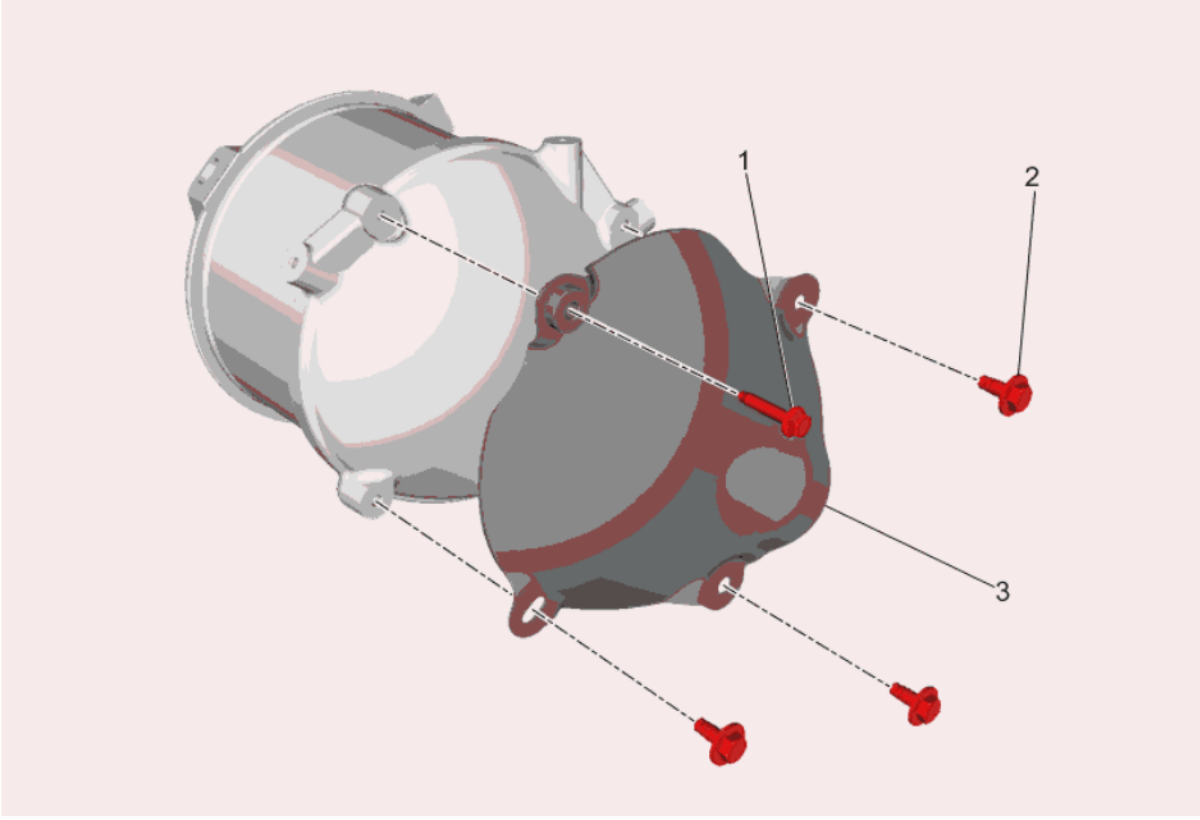


Fig. 161: Catalytic Converter Heat Shield (L5P)

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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** • Oxidation Catalytic Converter - Remove **Oxidation Catalytic Converter Replacement (L5P)**	
1	Catalytic Converter Heat Shield Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 10 N.m (89 lb in)
2	Catalytic Converter Heat Shield Bolt **Tighten** 25 N.m (18 lb ft)
3	Catalytic Converter Heat Shield

FRONT BODY EXHAUST HEAT SHIELD REPLACEMENT

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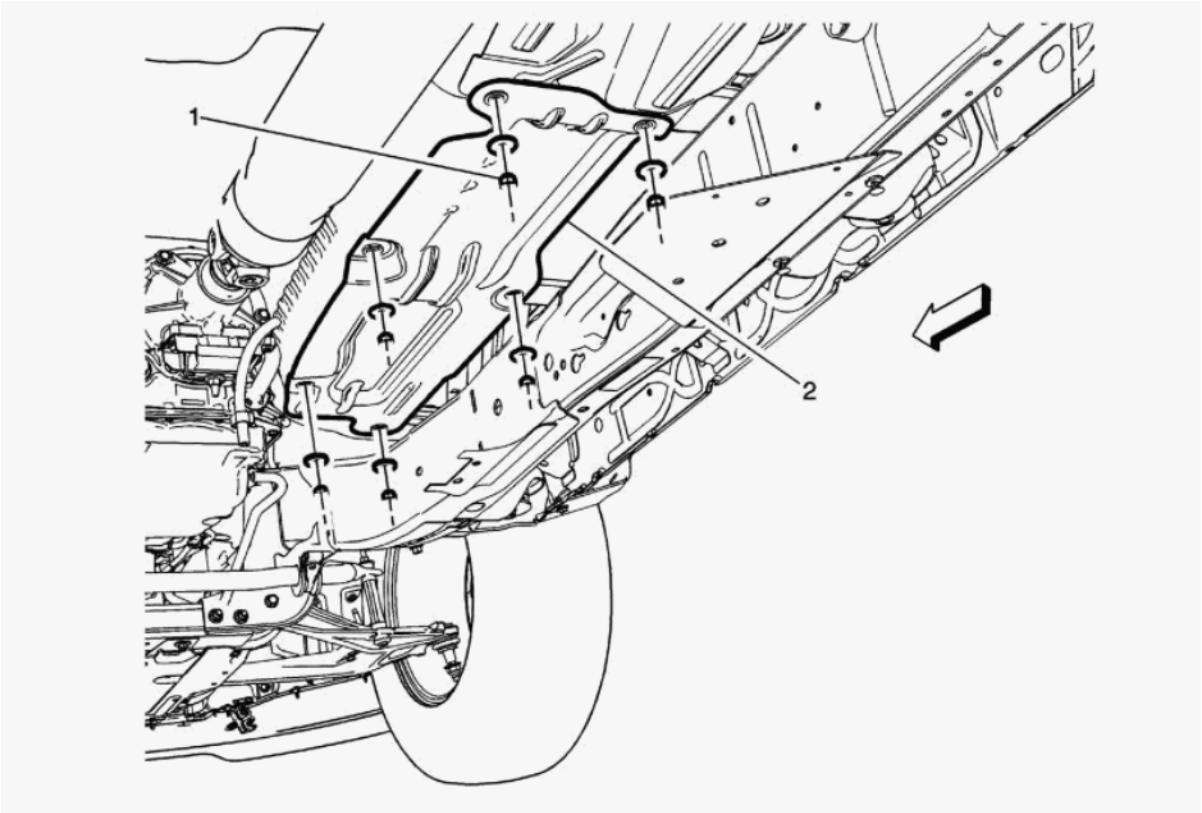


Fig. 162: Front Body Exhaust Heat Shield
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Front Body Exhaust Heat Shield Fastener (Qty: 6) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** **Tighten** 9 N.m (80 lb in)
2	Front Body Exhaust Heat Shield

REAR BODY EXHAUST HEAT SHIELD REPLACEMENT

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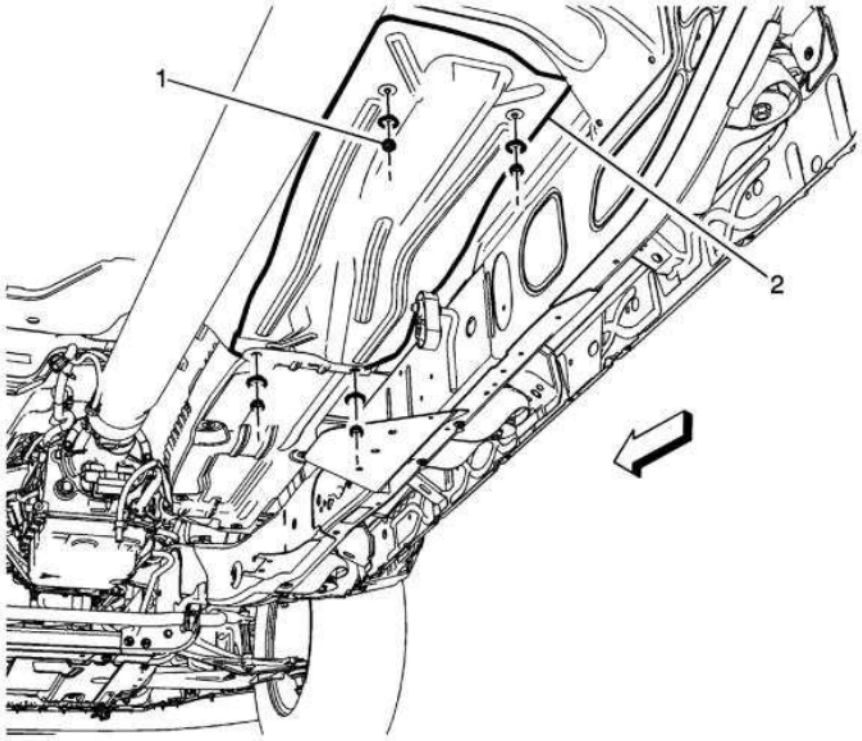


Fig. 163: Rear Body Exhaust Heat Shield
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the exhaust muffler. Refer to **Exhaust Muffler with Resonator, Exhaust, and Tail Pipe Replacement (LV3)Exhaust Muffler with Resonator, Exhaust, and Tail Pipe Replacement (L83, L86)**.	
1	Rear Body Exhaust Heat Shield Fastener (Qty: 4) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** **Tighten** 9 N.m (80 lb in)

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Callout	Component Name
2	Rear Body Exhaust Heat Shield

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - RIGHT SIDE (LV3)

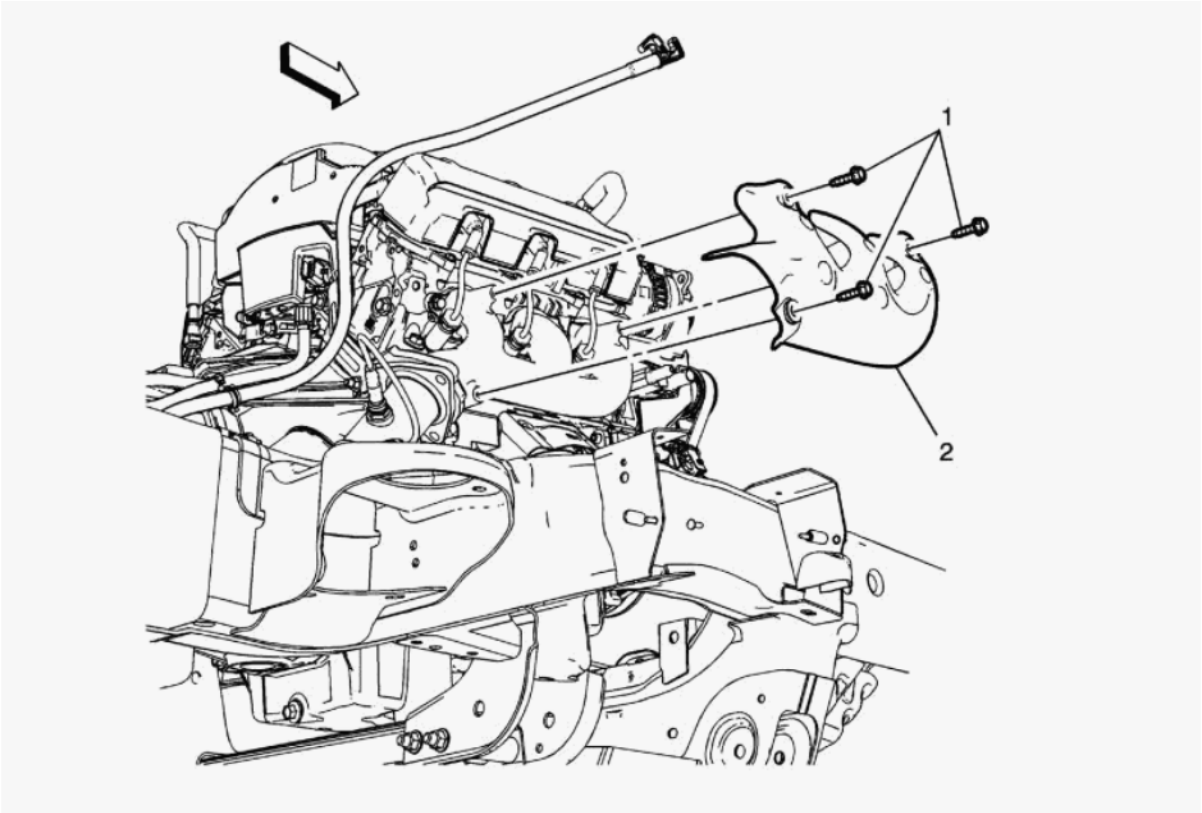


Fig. 164: Exhaust Manifold Heat Shield - Right Side (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Reposition the heater inlet and outlet hoses from the retaining bracket and set aside.	
1	Exhaust Manifold Heat Shield - Right Fastener (Qty: 3) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** **Tighten** 12 N.m (106 lb in)

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Callout	Component Name
2	Exhaust Manifold Heat Shield - Right

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - RIGHT SIDE (L83, L8B, L86)

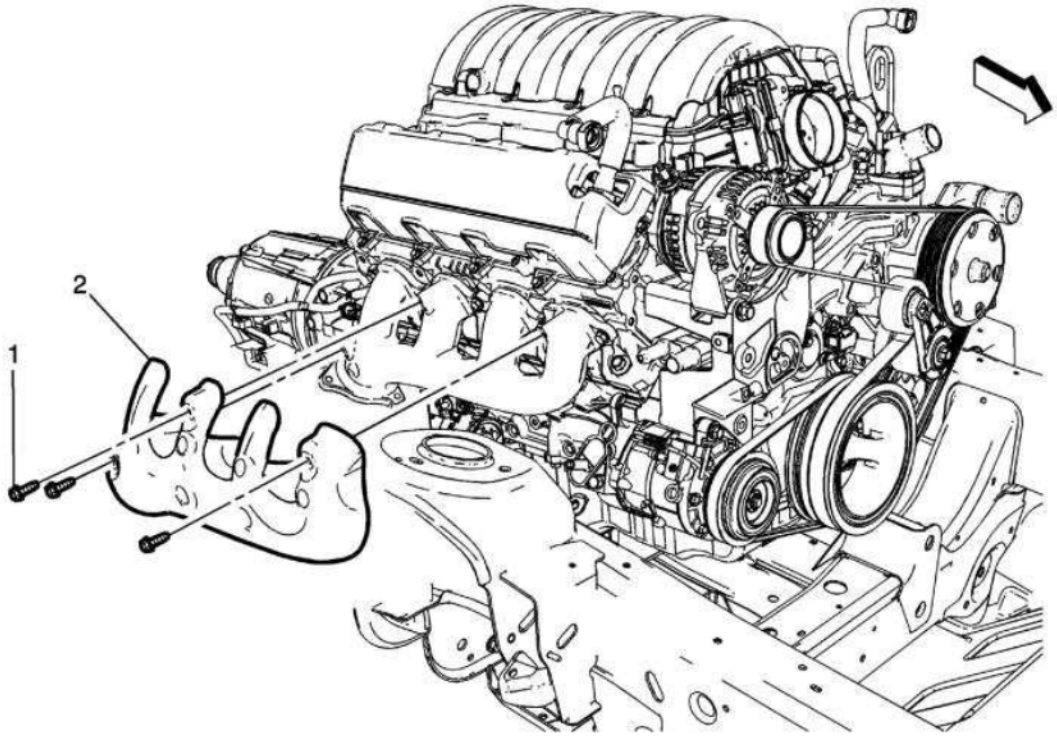


Fig. 165: Exhaust Manifold Heat Shield - Right Side (L83, L8B, L86)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Reposition the heater inlet and outlet hoses from the retaining bracket.	
1	Exhaust Manifold Heat Shield - Right Fastener (Qty: 3) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** **Tighten** 12 N.m (106 lb in)

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Callout	Component Name
2	Exhaust Manifold Heat Shield - Right

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - RIGHT SIDE (L5P)

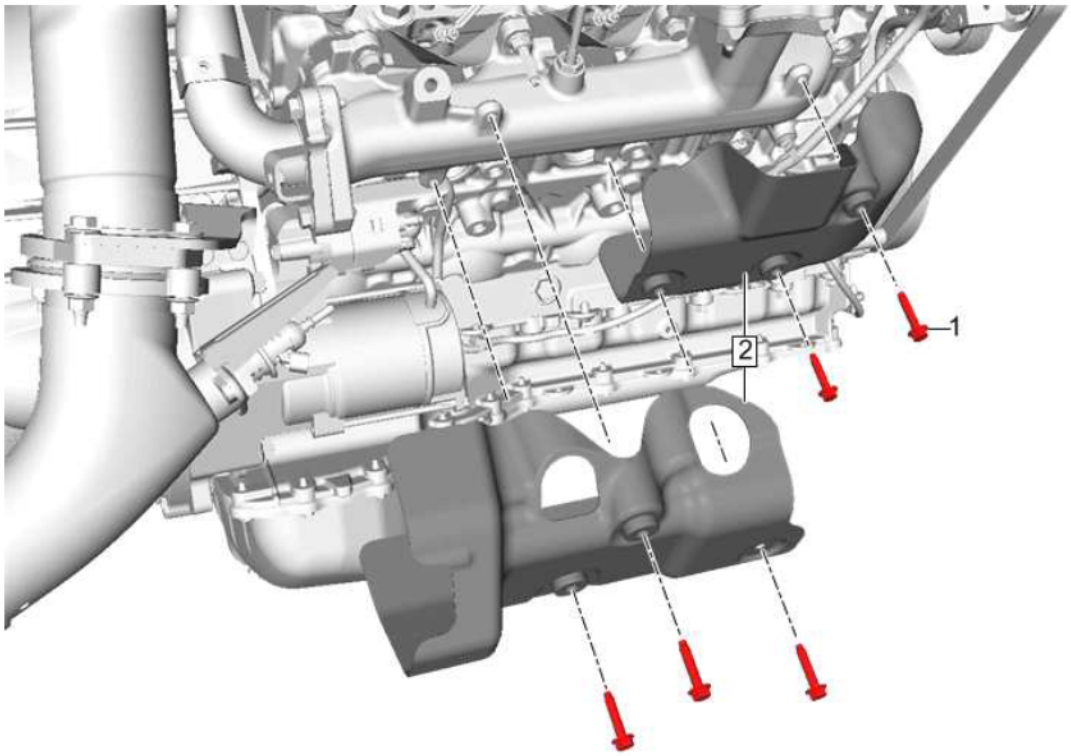


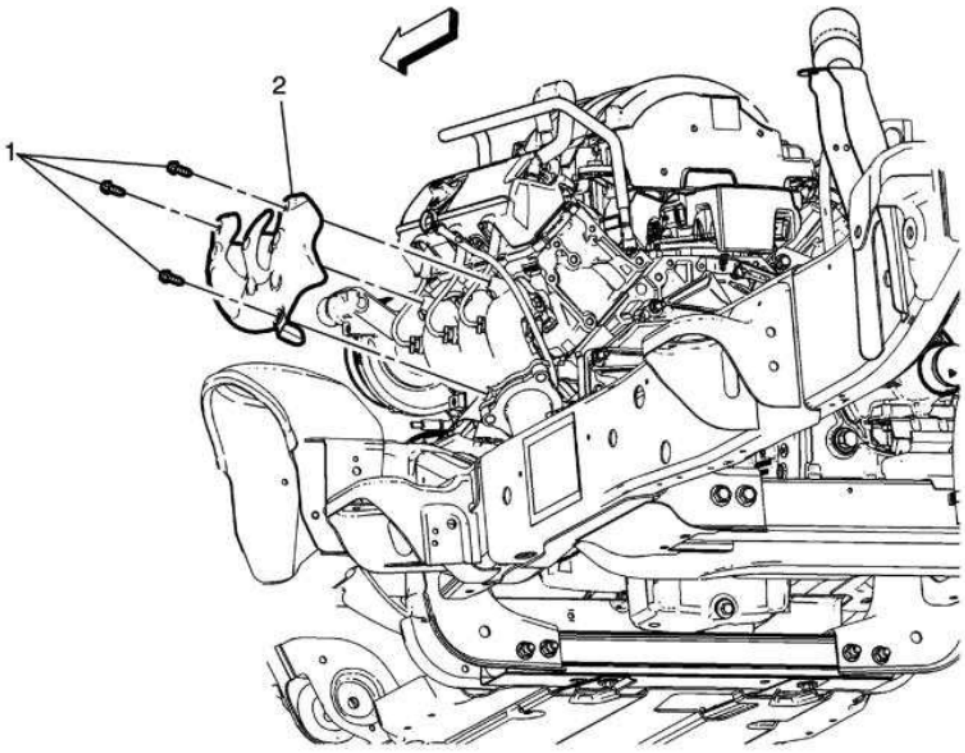
Fig. 166: Exhaust Manifold Heat Shield Replacement - Right Side (L5P)
Courtesy of GENERAL MOTORS COMPANY

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.**	

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Callout	Component Name
Wear safety glasses and protective gloves to avoid personal injury. **Preliminary Procedures** 1. **Exhaust Pipe Heat Shield Replacement - Right Side (L5P)** 2. **Exhaust Gas Recirculation Valve Temperature Sensor Replacement - Position 1**	
1	Exhaust Manifold Heat Shield Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 10 N.m (89 lb in)
2	Exhaust Manifold Heat Shield

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - LEFT SIDE (LV3)



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Fig. 167: Exhaust Manifold Heat Shield - Left Side (LV3)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Exhaust Manifold Heat Shield - Left Fastener (Qty: 3) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** **Tighten** 12 N.m (106 lb in)
2	Exhaust Manifold Heat Shield - Left

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - LEFT SIDE (L83, L8B, L86)

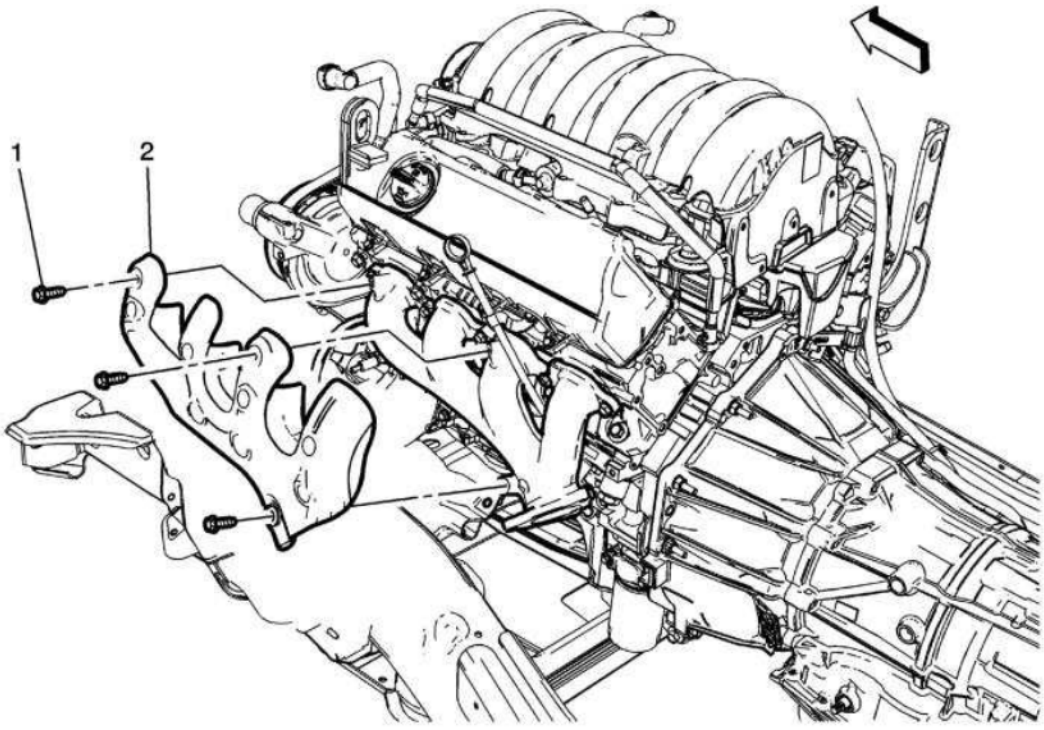


Fig. 168: Exhaust Manifold Heat Shield - Left Side (L83, L8B, L86)
Courtesy of GENERAL MOTORS COMPANY

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Callout	Component Name
1	Exhaust Manifold Heat Shield - Left Fastener (Qty: 3) **WARNING:** **Refer to Hot Exhaust System Warning .** **CAUTION:** **Refer to Fastener Caution .** **Tighten** 12 N.m (106 lb in)
2	Exhaust Manifold Heat Shield - Left

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - LEFT SIDE (L5P)

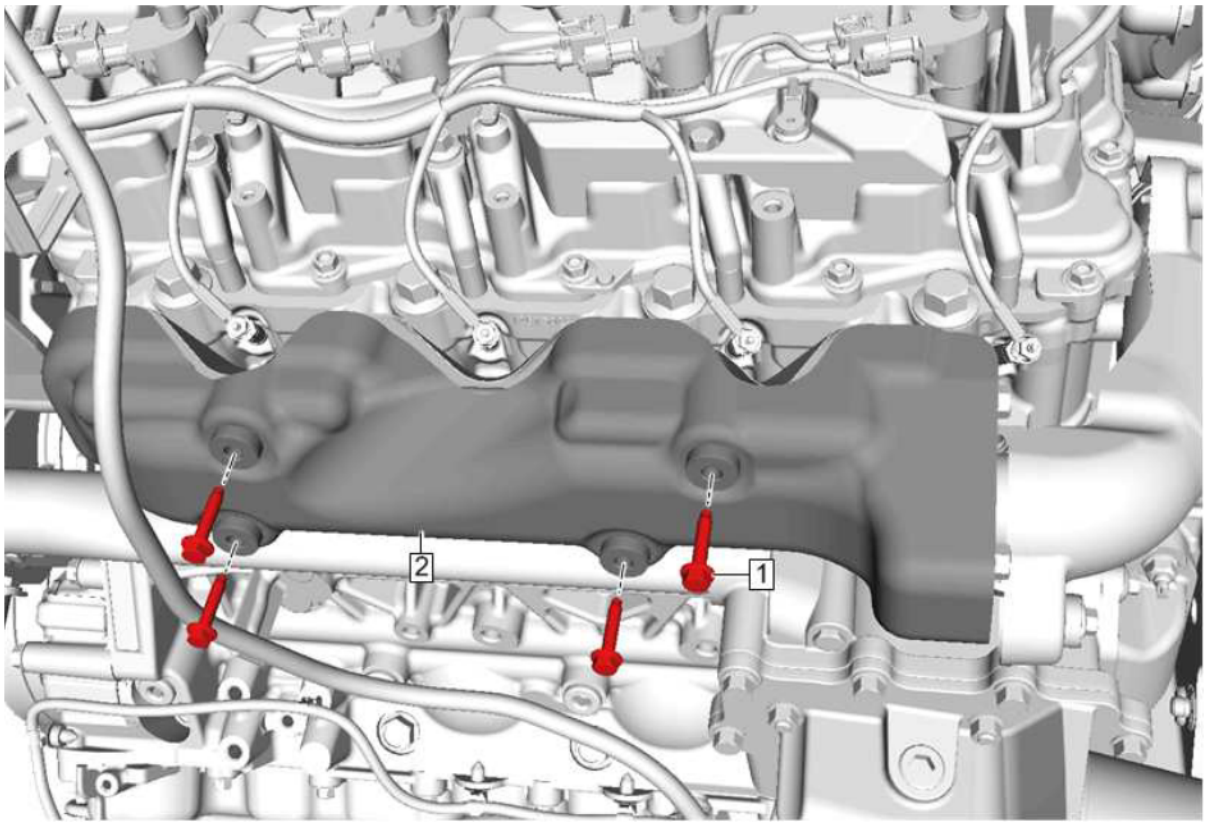


Fig. 169: Exhaust Manifold Heat Shield - Left Side (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING:	

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Callout	Component Name
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. **Front Wheelhouse Liner Replacement - Left Side** 2. **Intermediate Steering Shaft Replacement (Light Duty)** **Intermediate Steering Shaft Replacement (Heavy Duty)**	
1	Exhaust Manifold Heat Shield Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 10 N.m (89 lb in)
2	Exhaust Manifold Heat Shield

TURBOCHARGER HEAT SHIELD REPLACEMENT (L5P)

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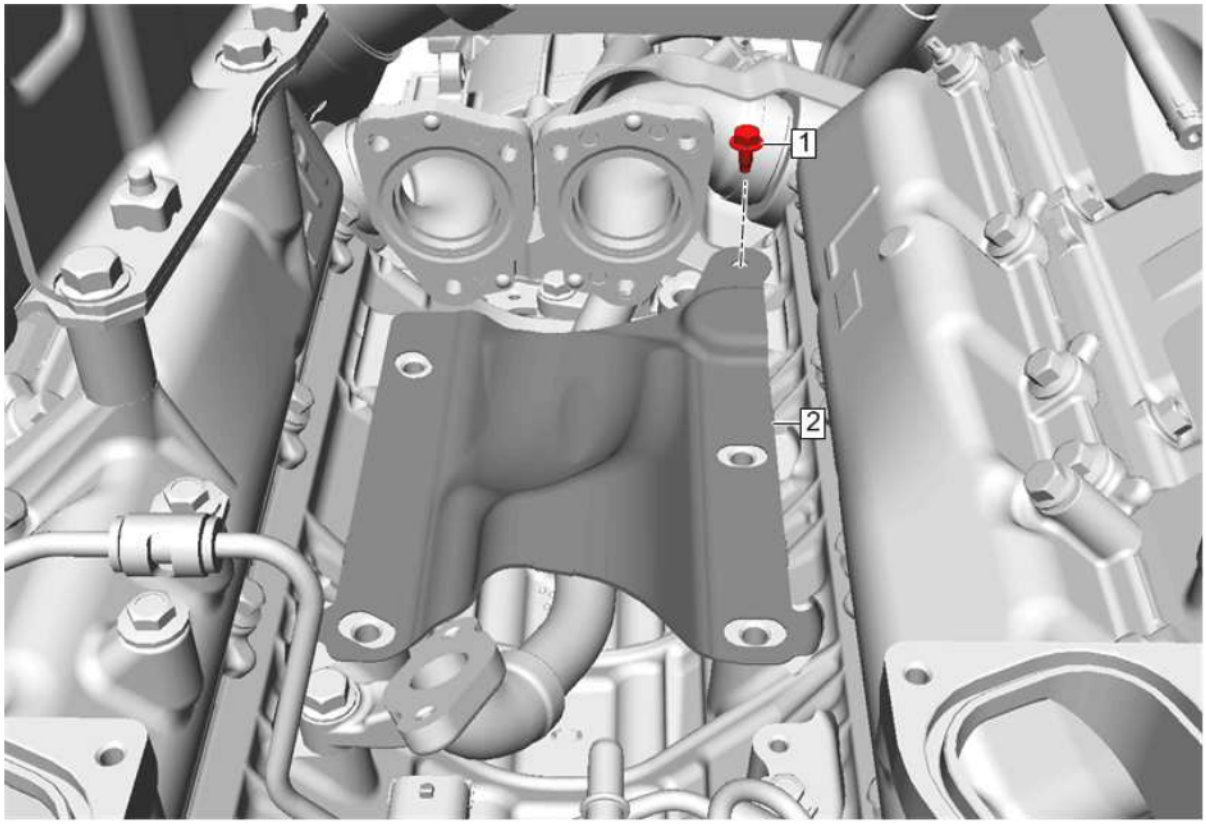


Fig. 170: Turbocharger Heat Shield (L5P)
Courtesy of GENERAL MOTORS COMPANY

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	

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Callout	Component Name
personal injury. **Preliminary Procedure** Exhaust Turbocharger Inlet Pipe Adapter Replacement (L5P)	
1	Turbocharger Heat Shield Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 10 N.m (89 lb in)
2	Turbocharger Heat Shield

TURBOCHARGER HEAT SHIELD REPLACEMENT - LEFT SIDE (L5P)

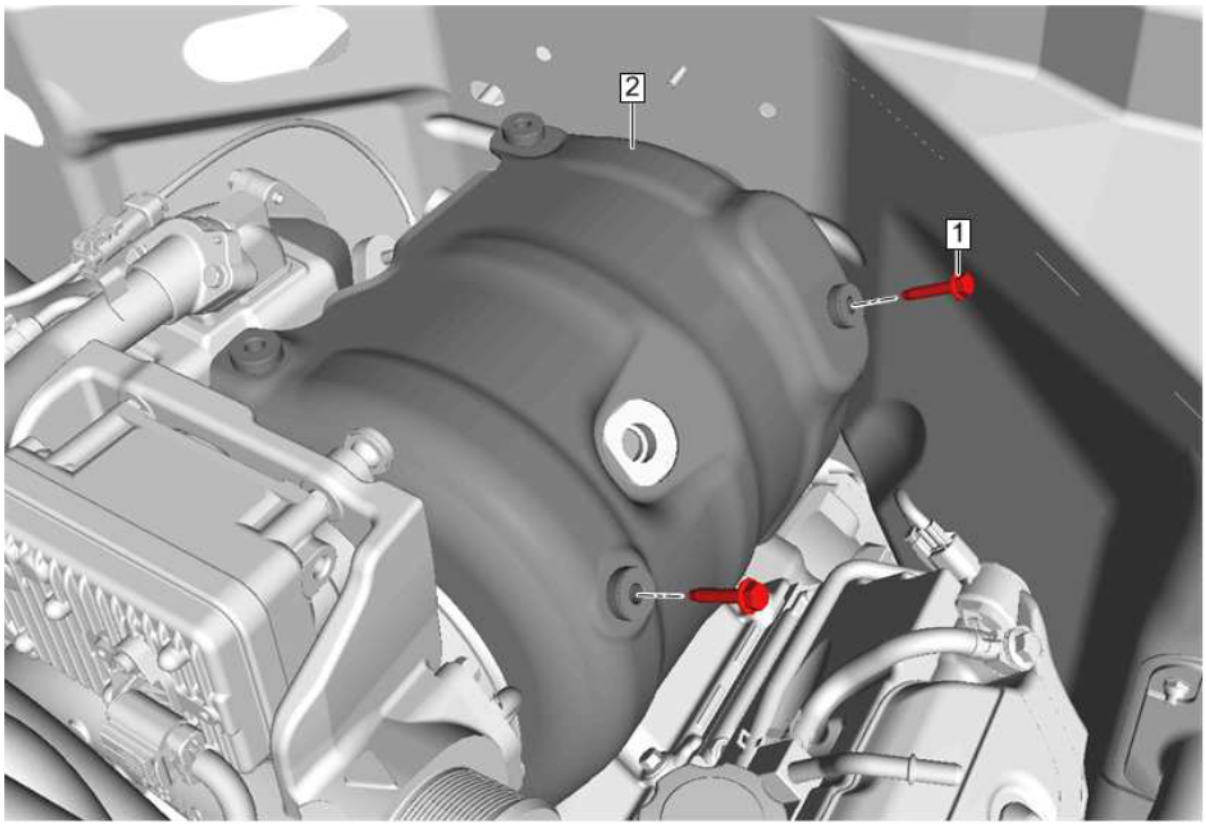


Fig. 171: Turbocharger Heat Shield - Left Side (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: In order to avoid being burned, do	

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Callout	Component Name
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. **Nitrogen Oxides Sensor Replacement - Position 1** 2. **Turbocharger Heat Shield Replacement - Right Side (L5P)** 3. Transmission Fluid Filler Tube - Reposition **Transmission Fluid Filler Tube and Seal Replacement** 4. **Turbocharger Air Inlet Adapter Replacement**	
1	Turbocharger Heat Shield Bolt **CAUTION:** Refer to **Fastener Caution** . **Tighten** 10 N.m (89 lb in)
2	Turbocharger Heat Shield

TURBOCHARGER HEAT SHIELD REPLACEMENT - RIGHT SIDE (L5P)

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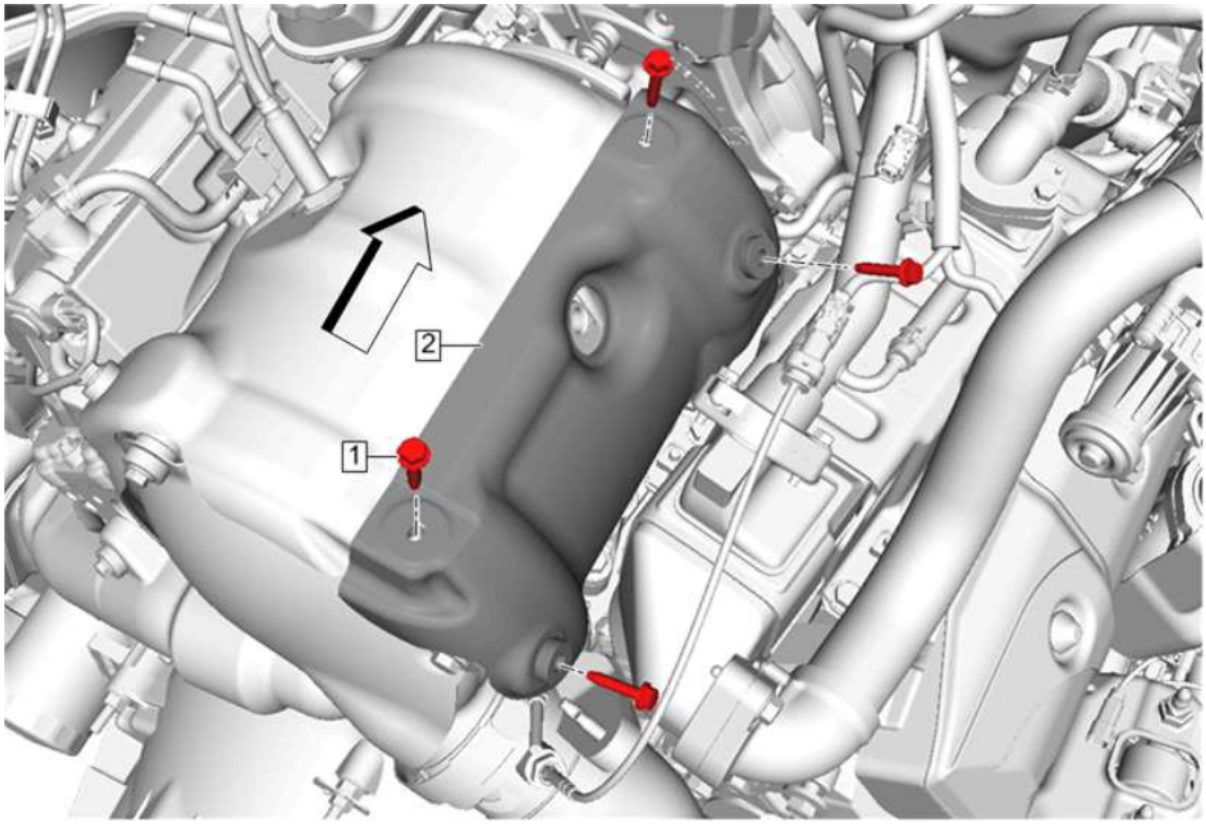


Fig. 172: Turbocharger Heat Shield - Right Side (L5P)
Courtesy of GENERAL MOTORS COMPANY

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	

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Callout	Component Name
personal injury. **Preliminary Procedure** Exhaust Temperature Sensor Replacement - Position 1	
1	Turbocharger Heat Shield Bolt **CAUTION:** Refer to Fastener Caution . **Tighten** 10 N.m (89 lb in)
2	Turbocharger Heat Shield

EXHAUST PIPE HEAT SHIELD REPLACEMENT - LEFT SIDE (L5P)

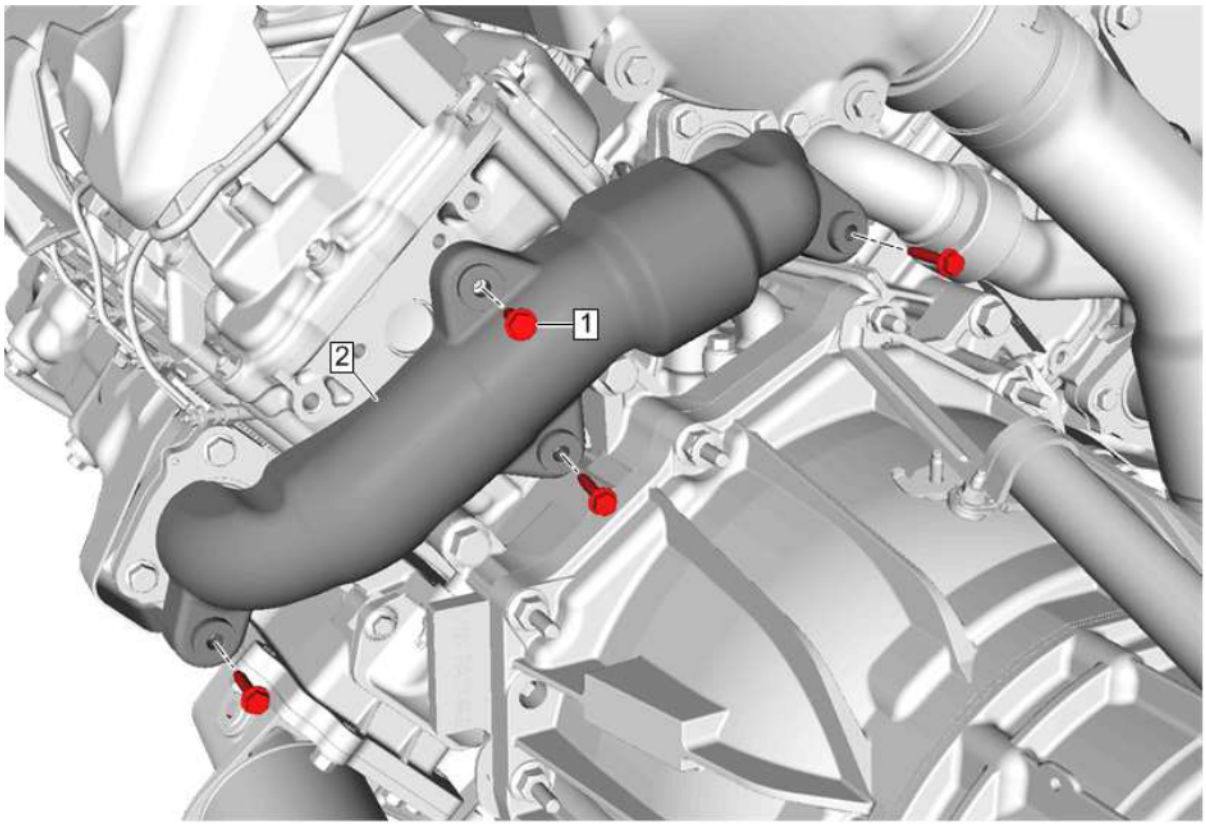


Fig. 173: Exhaust Pipe Heat Shield - Left Side (L5P)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: In order to avoid being burned, do	

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Callout	Component Name
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. Front Wheelhouse Liner Replacement - Left Side 2. Oxidation Catalytic Converter Replacement (L5P) 3. Transmission Fluid Filler Tube and Seal Replacement	
1	Exhaust Pipe Heat Shield Bolt **CAUTION:** Refer to Fastener Caution . **Tighten** 10 N.m (89 lb in)
2	Exhaust Pipe Heat Shield

EXHAUST PIPE HEAT SHIELD REPLACEMENT - RIGHT SIDE (L5P)

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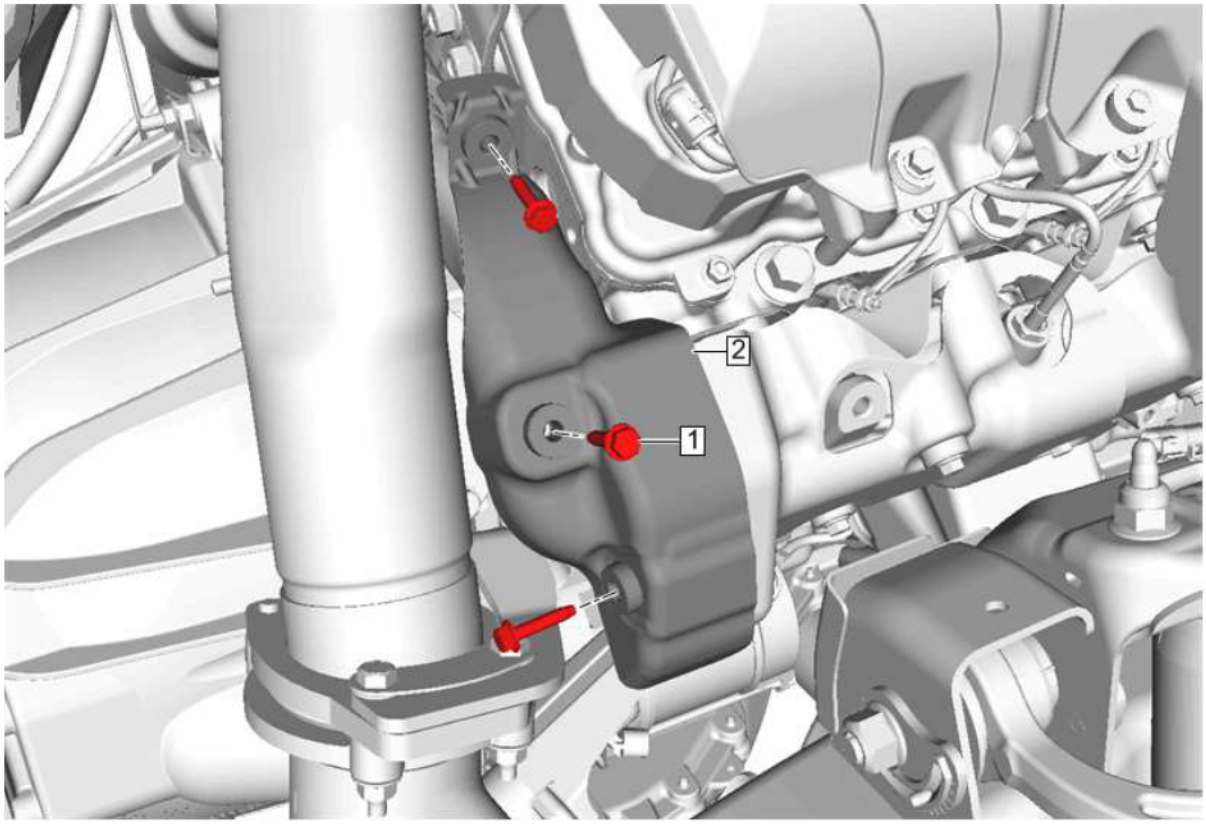


Fig. 174: Exhaust Pipe Heat Shield-Right Side (L5P)
Courtesy of GENERAL MOTORS COMPANY

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**	

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Callout	Component Name
personal injury. **Preliminary Procedure** **Front Wheelhouse Liner Replacement - Right Side**	
1	Exhaust Pipe Heat Shield Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten** 10 N.m (89 lb in)
2	Exhaust Pipe Heat Shield

DESCRIPTION AND OPERATION

EXHAUST SYSTEM DESCRIPTION

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

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

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

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

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

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

The exhaust system may be comprised of the following components:

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

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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.

Diesel Particulate Filter (DPF)

Exhaust Particulate Filter

The exhaust particulate filter (EPF) captures diesel exhaust gas particulates, preventing their release into the atmosphere. This is accomplished by forcing particulate-laden exhaust (1) through a filter substrate of porous cells, which removes the particulates from the exhaust gas. The exhaust gas enters the filter, but because every other cell of the filter is capped at the opposite end, the exhaust particulates cannot exit the cell. Instead, the exhaust gas passes through the porous walls of the cell leaving the particulates trapped on the cell wall. The cleaned exhaust gas exits the filter through the adjacent cell. The EPF is capable of reducing more than 90 percent of particulate matter (PM).

Diesel Oxidation Catalyst

The diesel oxidation catalyst (DOC) (7) has two functions. One function is to reduce emissions of non methane hydro-carbons (NMHC) and carbon monoxide (CO), from the exhaust gases. The other function is to help start a regeneration event by converting the fuel-rich exhaust gases to heat. The engine control module (ECM) monitors the functionally of the DOC by determining if the exhaust gas temperature (EGT) sensor 1 (1) reaches a predetermined temperature during a regeneration event. The Diesel Particulate Filter (DPF) System Description DOC and the exhaust particulate filter (EPF) (6) are downstream of the turbocharger, and are two separate components under the vehicle.

Differential Pressure Sensor (DPS) and Pressure Lines

The difference between the inlet and outlet of the exhaust particulate filter (EPF). When pressure difference has increased above a calibrated threshold, a high particulate loading condition is indicated. The ECM will command a regeneration event in order to restore the filter. If the pressure differential continues to increase across the exhaust filter without a regeneration event, the ECM will illuminate an EPF lamp or send a message to the driver information center (DIC) referring the customer to clean the exhaust filter. To clean the exhaust filter the vehicle must be driven under the conditions necessary for a regeneration to take place. If these lamps and messages are ignored, the ECM will eventually illuminate the malfunction indicator lamp (MIL) and revert to Reduced Engine Power which will require the vehicle to be serviced. The DPS sensor provides a voltage signal to the ECM on a signal circuit relative to the pressure differential changes in the EPF. The ECM converts

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the signal voltage input to a pressure value. The DPS pressure lines (2) are connected before and after the EPF. To provide the pressure sensor with accurate back pressure measurements, the DPS pressure lines should have a continuous downward gradient without any sharp bends.

Exhaust Gas Temperature Sensors

The ECM uses two exhaust gas temperature (EGT) sensors to measure the temperature of the exhaust gases at the inlet and outlet of the exhaust particulate filter (EPF). The EGT sensors are variable resistors, when the EGT sensors are cold, the sensor resistance is low, and as the temperature increases, the sensor resistance increases. When sensor resistance is high, the ECM detects a high voltage on the signal circuit. When sensor resistance is low, the ECM detects a lower voltage on the signal circuit. Proper EGTs at the inlet and outlet of the EPF are crucial for proper operation and for initiating the regeneration process. A temperature that is too high in the EPF will cause the EPF substrate to melt or crack. The ECM monitors the temperatures at the EPF inlet and outlet to regulate EPF temperatures.

Normal Regeneration

Regeneration is the process of removing the captured particulates through incineration within the exhaust particulate filer (EPF). Elevated temperatures are created in the diesel oxidation catalyst (DOC) through a calibrated strategy in the engine control system. Regeneration occurs when the ECM calculates that the particulate level in the filter has reached a calibrated threshold using a number of different factors, including engine run time, distance traveled, fuel used since the last regeneration, and the exhaust differential pressure. In general, the vehicle will need to be operating continuously at speeds above 48 km/h (30 mph) for approximately 20-30 minutes for a full and effective regeneration to complete. During regeneration the exhaust gases reach temperatures above 550Â°C (1,022Â°F). The ECM monitors the EGT sensors during regeneration. If the sensors indicate that regeneration temperatures are exceeding a calibrated threshold, regeneration will be temporally suspended until the sensors return to a normal temperature. If EGT temperatures fall below a normal calibrated threshold, regeneration will be terminated and a corresponding DTC should set. If a regeneration event is interrupted for any reason, it will continue, including the next key cycle, when the conditions are met for regeneration enablement. Normal regeneration is transparent to the customer.

Service Regeneration

A scan tool is an essential tool that is required for service regeneration. Commanding a service regeneration is accomplished using the output control function. The vehicle will need to be parked outside the facility and away from nearby objects, such as other vehicles and buildings, due to the elevated exhaust gas temperature at the tail pipe during regeneration. The service regeneration can be terminated by applying the brake pedal, commanding service regeneration OFF using the scan tool, or disconnecting the scan tool from the vehicle.

Regeneration Process

A number of engine components are required to function together for the regeneration process to be performed. These components are the fuel injectors, turbocharger, IA valve, fuel pressure control, and the intake air heater (IAH). The regeneration process consists of several stages: Warming up the diesel oxidation catalyst (DOC) to 350Â°C (662Â°F) by performing the following:

- Reducing air flow with the intake air valve
- Increasing or decreasing boost pressure with the turbocharger, depending on engine load
- Elevating the engine speed
- Reduce fuel rail pressure
- Retard fuel injection timing

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- Add late fuel injection pulses. The added fuel is not combusted but is oxidized by the DOC and exhaust particulate filter (EPF) to create heat.

Ash Loading

Ash is a non-combustible by product from normal oil consumption. Low Ash content engine oil (CJ-4 API) is required for vehicles with the exhaust particulate filter (EPF) system. Ash accumulation in the EPF will eventually cause a restriction in particulate filter. Regeneration will not burn off the ash, only particulate matter is burned off. An ash loaded EPF will need to be removed from the vehicle and cleaned or replaced.

Muffler

Muffler

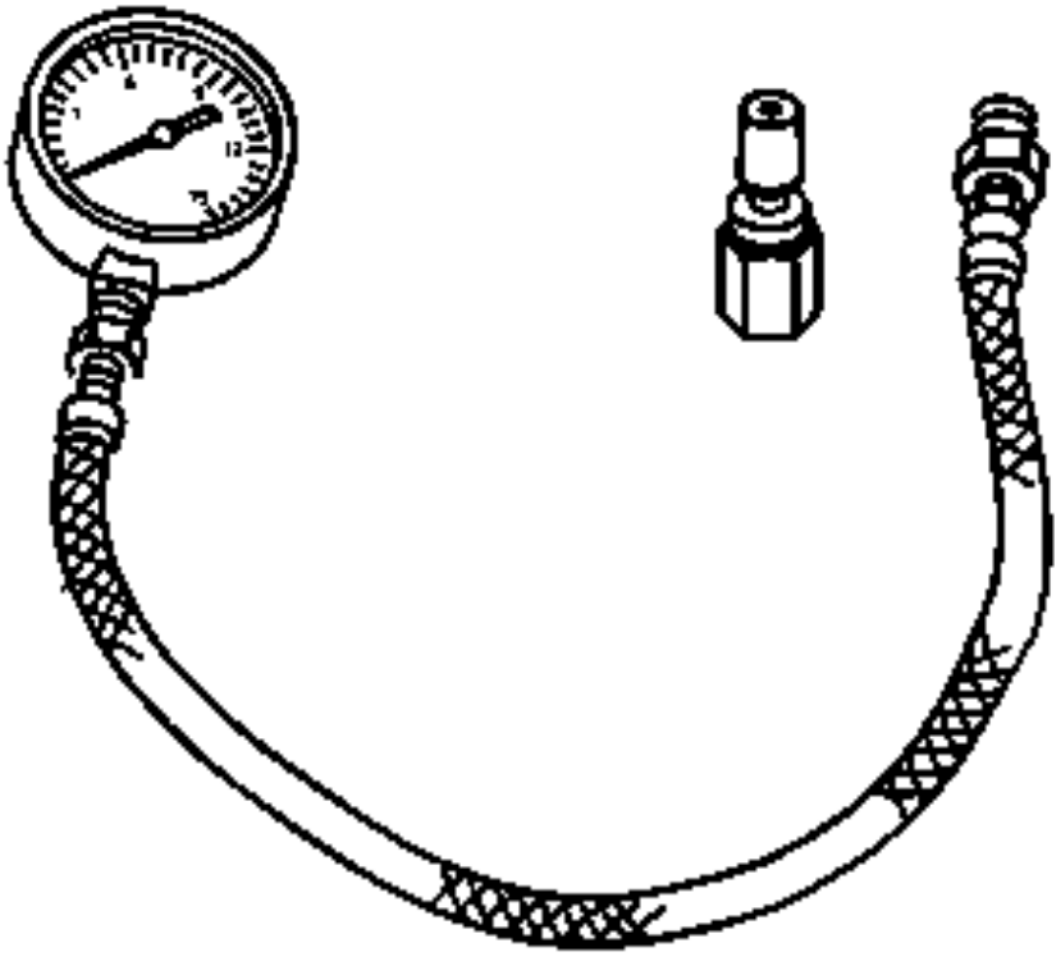
The exhaust muffler reduces the noise levels of the engine exhaust by the use of tuning tubes. The tuning tubes create channels inside the exhaust muffler that lower the sound levels created by the combustion of the engine.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description

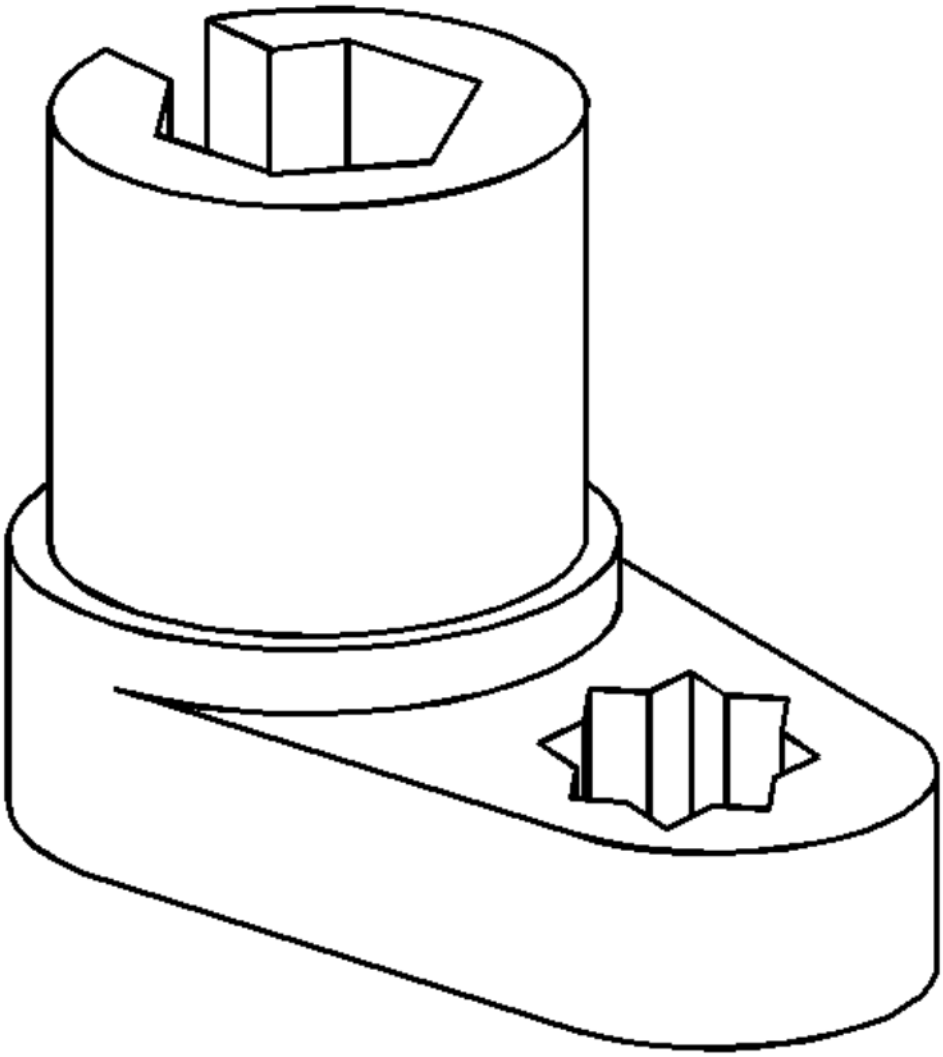
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Illustration	Tool Number/ Description
	J 35314-A/BT-8515/BT-8515A Exhaust Back Pressure Tester

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Illustration	Tool Number/ Description
	J 38185 Hose Clamp Pliers

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Illustration	Tool Number/ Description
	J 44626 Oxygen Sensor Socket

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