

ENGINE

Exhaust - Corvette

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter to Exhaust Manifold Nut	50 N.m	37 lb ft
Catalytic Converter to Exhaust Manifold Stud	22 N.m	16 lb ft
Exhaust Clamp Bolts	44 N.m	32 lb ft
Exhaust Control Valve Actuator Replacement	6 N.m	53 lb in
Exhaust Heat Shield - Rear Fascia	25 N.m	18 lb ft
Exhaust Manifold Bolt		
• Existing Cylinder Head	23 N.m	17 lb ft
• New Cylinder Head	27 N.m	20 lb ft
Exhaust Manifold Heat Shield Bolt	10 N.m	89 lb in
Exhaust Muffler Bolt	22 N.m	16 lb ft
Exhaust Muffler Hanger Bracket Bolt	25 N.m	18 lb ft
Exhaust Pipe Hanger Nut	14 N.m	10 lb ft
Intermediate Pipe to Catalytic Converter Pipe Nut	25 N.m	18 lb ft
Intermediate Pipe Hanger Bracket Assembly Bolts	22 N.m	16 lb ft
Rear Body Exhaust Heat Shield	2.5 N.m	22 lb in

SCHEMATIC WIRING DIAGRAMS

EXHAUST SYSTEM WIRING SCHEMATICS

Engine Exhaust Flow Control Wiring Schematic

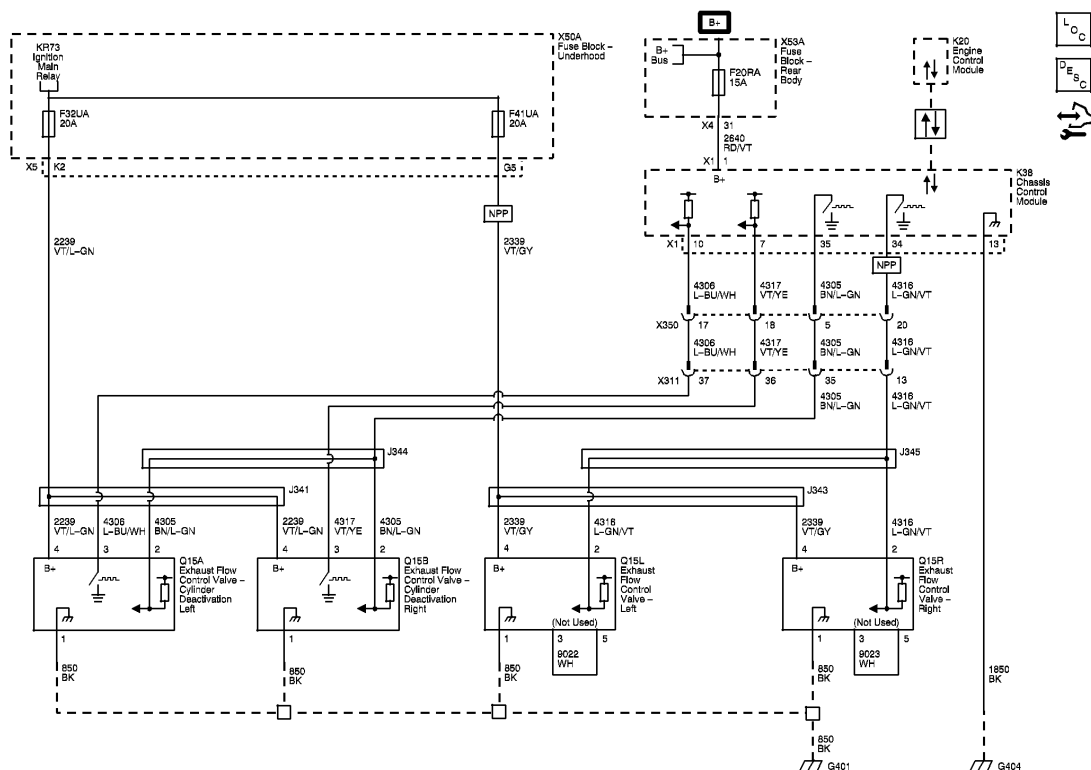


Fig. 1: Engine Exhaust Flow Control Wiring Schematic
 Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
	DTC P12E3 Cylinder Deactivation Exhaust Flow Valve Control Circuit Open
	DTC P12E7 Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Low Duty Cycle (Bank 1)
	DTC P12E8 Cylinder Deactivation Exhaust Flow Valve Feedback Circuit High Duty Cycle (Bank 1)
	DTC P12E9 Cylinder Deactivation Exhaust Flow Valve Open Position (Bank 1)
	DTC P12EA Cylinder Deactivation Exhaust Flow Valve Closed Position (Bank 1)
	DTC P12EB Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Low Frequency (Bank 1)

<u>DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9 or P12FA-P12FF</u>	Valve Feedback Circuit High Frequency (Bank 1) DTC P12ED Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Incorrect Frequency (Bank 1) DTC P12EF Cylinder Deactivation Exhaust Flow Valve Stuck Closed (Bank 1) DTC P12F0 Cylinder Deactivation Exhaust Flow Valve Stuck Open (Bank 1) DTC P12F1 Cylinder Deactivation Exhaust Flow Valve Position Not Learned (Bank 1) DTC P12F2 Cylinder Deactivation Exhaust Flow Valve Actuator Performance (Bank 1) DTC P12F4 Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Low Duty Cycle (Bank 2) DTC P12F5 Cylinder Deactivation Exhaust Flow Valve Feedback Circuit High Duty Cycle (Bank 2) DTC P12F6 Cylinder Deactivation Exhaust Flow Valve Open Position (Bank 2) DTC P12F7 Cylinder Deactivation Exhaust Flow Valve Closed Position (Bank 2) DTC P12F8 Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Low Frequency (Bank 2) DTC P12F9 Cylinder Deactivation Exhaust Flow Valve Feedback Circuit High Frequency (Bank 2) DTC P12FA Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Incorrect Frequency (Bank 2) DTC P12FC Cylinder Deactivation Exhaust Flow Valve Stuck Closed (Bank 2) DTC P12FD Cylinder Deactivation Exhaust Flow Valve Stuck Open (Bank 2) DTC P12FE Cylinder Deactivation Exhaust Flow Valve Position Not Learned (Bank 2) DTC P12FF Cylinder Deactivation Exhaust Flow Valve Actuator Performance (Bank 2)
<u>DTC P26C5</u>	DTC P26C5 Exhaust Flow Control Valve Control Circuit

DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9 OR P12FA-P12FF

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.

- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P12E3

Cylinder Deactivation Exhaust Flow Valve Control Circuit Open

DTC P12E7

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Low Duty Cycle (Bank 1)

DTC P12E8

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit High Duty Cycle (Bank 1)

DTC P12E9

Cylinder Deactivation Exhaust Flow Valve Open Position (Bank 1)

DTC P12EA

Cylinder Deactivation Exhaust Flow Valve Closed Position (Bank 1)

DTC P12EB

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Low Frequency (Bank 1)

DTC P12EC

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit High Frequency (Bank 1)

DTC P12ED

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Incorrect Frequency (Bank 1)

DTC P12EF

Cylinder Deactivation Exhaust Flow Valve Stuck Closed (Bank 1)

DTC P12F0

Cylinder Deactivation Exhaust Flow Valve Stuck Open (Bank 1)

DTC P12F1

DTC P12F2

Cylinder Deactivation Exhaust Flow Valve Actuator Performance (Bank 1)

DTC P12F4

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Low Duty Cycle (Bank 2)

DTC P12F5

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit High Duty Cycle (Bank 2)

DTC P12F6

Cylinder Deactivation Exhaust Flow Valve Open Position (Bank 2)

DTC P12F7

Cylinder Deactivation Exhaust Flow Valve Closed Position (Bank 2)

DTC P12F8

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Low Frequency (Bank 2)

DTC P12F9

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit High Frequency (Bank 2)

DTC P12FA

Cylinder Deactivation Exhaust Flow Valve Feedback Circuit Incorrect Frequency (Bank 2)

DTC P12FC

Cylinder Deactivation Exhaust Flow Valve Stuck Closed (Bank 2)

DTC P12FD

Cylinder Deactivation Exhaust Flow Valve Stuck Open (Bank 2)

DTC P12FE

Cylinder Deactivation Exhaust Flow Valve Position Not Learned (Bank 2)

DTC P12FF

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Run/Crank Ignition 1 Voltage	-	-	-	-
Exhaust Flapper Valve Feedback Signal	P12E7, P12E8, P12EB, P12EC, P12ED, P12F4, P12F5, P12F8, P12F9, P12FA	P12E7, P12E8, P12EB, P12EC, P12ED, P12F4, P12F5, P12F8, P12F9, P12FA	P12E7, P12E8, P12EB, P12EC, P12ED, P12F4, P12F5, P12F8, P12F9, P12FA	P12F2, P12FF
Exhaust Flapper Valve Control	P12E3	P12E3	P12E3	-
Ground	-	-	-	-

Circuit/System Description

The cylinder deactivation exhaust flow control system consists of valves installed at the inlet of the muffler. The exhaust flow control system is used to tune the exhaust note.

Conditions for Running the DTC

- Battery voltage must be between 9-16 V.
- The engine must be running.

Conditions for Setting the DTC

The chassis control module detects an open, short to ground or short to B+ on the cylinder deactivation exhaust flow control valve control circuit.

Actions Taken When the DTC Sets

- The cylinder deactivation exhaust flow control valves are disabled for the remainder of the ignition cycle.
- DTCs P12E3, P12E7, P12E8, P12E9, P12EA, P12EB, P12EC, P12ED, P12EF, P12F0, P12F1, P12F2, P12F4, P12F5, P12F6, P12F7, P12F8, P12F9, P12FA, P12FC, P12FD, P12FE and P12FF are all type B DTCs.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 40 consecutive malfunction-free ignition cycles have occurred.
- DTCs P12E3, P12E7, P12E8, P12E9, P12EA, P12EB, P12EC, P12ED, P12EF, P12F0, P12F1,

P12F2, P12F4, P12F5, P12F6, P12F7, P12F8, P12F9, P12FA, P12FC, P12FD, P12FE and P12FF are all type B DTCs.

Reference Information

Schematic Reference

Exhaust System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Exhaust Tail Pipe Flow Control System Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the cylinder deactivation exhaust flow control valves open and close when commanding the Cylinder Deactivation Exhaust Flow Valve On and Off with a scan tool.
 - **If the cylinder deactivation exhaust flow control valves do not open and close**

Refer to Circuit/System Testing
 - **If the cylinder deactivation exhaust flow control valves open and close**
3. All OK.

Circuit/System Testing

1. Ignition ON.
2. Verify DTC U0109, P2534 or P2535 are not set.
 - **If any of these DTCs are set**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

- **If none of these DTCs are set**

3. Ignition OFF, disconnect the harness connectors at the components listed below.
 - Q15A Exhaust Flow Control Valve - Cylinder Deactivation Left
 - Q15B Exhaust Flow Control Valve - Cylinder Deactivation Right
4. Test for less than 5 ohms between each ground circuit terminal 1 and ground.
 - **If 5 ohms or greater**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the ground circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, repair the open/high resistance in the ground connection.
 - **If less than 5 ohms**
5. Verify a test lamp illuminates between the B+ circuit terminal 4 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the ignition circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, verify the fuse is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the appropriate cylinder deactivation exhaust flow control valve.
 - **If the test lamp illuminates**
6. Connect a test lamp between each control circuit terminal 2 and ground, ignition ON.
7. Verify the test lamp turns ON and OFF when commanding the cylinder deactivation exhaust flow control valves Open and Closed with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the harness connector at the K38 Chassis Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 ohms in the control circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K38 Chassis Control Module.
 - **If the test lamp is always ON**

1. Ignition OFF, disconnect the harness connector at the K38 Chassis Control Module, ignition ON.
2. Test for less than 1 V between the control circuit terminal and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K38 Chassis Control Module.
- **If the test lamp turns ON and OFF**
8. Verify the scan tool Cylinder Deactivation Exhaust Flow Valve 1 Position parameter is 0°.
 - **If not 0°**
 1. Ignition OFF, disconnect the harness connector at the Q15A Exhaust Flow Control Valve-Cylinder Deactivation, Ignition ON.
 2. Test for less than 1 V between the signal circuit terminal 3 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K38 Chassis Control Module.
 - **If 0°**
9. Install a 3 A fused jumper wire between the signal circuit terminal 3 and the control circuit terminal 2.
10. Verify the Cylinder Deactivation Exhaust Flow Valve 1 parameter is 128°.
 - **If not 128°**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K38 Chassis Control Module.
 2. Test for less than 2 ohms in the signal circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K38 Chassis Control Module.
 - **If 128°**
11. Test or replace the Q15A Exhaust Flow Control Valve-Cylinder Deactivation Left.
12. Verify the scan tool Cylinder Deactivation Exhaust Flow Valve 2 Position parameter is 0°.
 - **If not 0°**
 1. Ignition OFF, disconnect the harness connector at the Q15B Exhaust Flow Control Valve-Cylinder Deactivation, Ignition ON.
 2. Test for less than 1 V between the signal circuit terminal 3 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K38 Chassis Control Module.
 - **If 0°**
13. Install a 3 A fused jumper wire between the signal circuit terminal 3 and the control circuit terminal 2.
14. Verify the Cylinder Deactivation Exhaust Flow Valve 2 parameter is 128°.
 - **If not 128°**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K38 Chassis Control Module

2. Test for less than 2 ohms in the signal circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K38 Chassis Control Module.
 - **If 128°**

15. Test or replace the Q15B Exhaust Flow Control Valve-Cylinder Deactivation Right.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Exhaust Control Valve Actuator Replacement (Tail Pipe), Exhaust Control Valve Actuator Replacement (Cylinder Deactivation)**
- **Control Module References** for chassis control module replacement, programming and setup.

DTC P26C5

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P26C5

Exhaust Flow Control Valve Control Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Run/Crank Ignition 1 Voltage	P26C5	P26C5	-	-
Exhaust Flapper Valve Control #2	P26C5	P26C5	P26C5	-
Ground	-	P26C5	-	-

Circuit/System Description

The exhaust flow control system consists of two sound quality valves installed in the low restriction exhaust path of a duel outlet muffler near the exhaust tip. The exhaust flow control system is used to tune the exhaust note.

Conditions for Running the DTC

- Battery voltage must be between 9-16 V.

- The engine must be running.

Conditions for Setting the DTC

The chassis control module detects an open, short to ground or short to B+ on the exhaust flow control valve control circuit.

Actions Taken When the DTC Sets

The exhaust flow control valves are disabled for the remainder of the ignition cycle.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 100 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

Exhaust System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Exhaust Tail Pipe Flow Control System Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the exhaust flow control valves open and close when commanding the Exhaust Flow Control Valve On and Off with a scan tool.

- **If the exhaust flow control valves do not open and close**

Refer to Circuit/System Testing

- **If the exhaust flow control valves open and close**

3. All OK.

Circuit/System Testing

NOTE: Before performing any Circuit/System Testing verify the Engine Sound Management System is in the Auto mode. To verify this, press Settings on the IPC home page. Select Driving Mode, then select Engine Sound Management and verify Auto is enabled. If the Engine Sound Management System is in the Off mode the exhaust flow control valves will remain in the open position.

1. Ignition ON.
2. Verify DTC U0109, P2534 or P2535 are not set.

- **If any of these DTCs are set**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

- **If none of these DTCs are set**

3. Ignition OFF, disconnect the harness connectors at the components listed below.

- Q15L Exhaust Flow Control Valve - Left
- Q15R Exhaust Flow Control Valve - Right

4. Test for less than 5 ohms between each ground circuit terminal 1 and ground.

- **If 5 ohms or greater**

1. Ignition OFF.
2. Test for less than 2 ohms in the ground circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, repair the open/high resistance in the ground connection.

- **If less than 5 ohms**

5. Verify a test lamp illuminates between the B+ circuit terminal 2 and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF.
2. Test for less than 2 ohms in the ignition circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, verify the fuse is not open and there is voltage at the fuse.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF.
2. Test for infinite resistance between the ignition circuit and ground

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the appropriate exhaust flow control valve.
- **If the test lamp illuminates**
- 6. Connect a test lamp between each control circuit terminal 2 and ground, ignition ON.
- 7. Verify the test lamp turns ON and OFF when commanding the exhaust flow control valves Open and Closed with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the X1 harness connector at the K38 Chassis Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 ohms in the control circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K38 Chassis Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the X1 harness connector at the K38 Chassis Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit terminal and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K38 Chassis Control Module.
 - **If the test lamp turns ON and OFF**
- 8. Test or replace the appropriate exhaust flow control valve.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Exhaust Control Valve Actuator Replacement (Tail Pipe), Exhaust Control Valve Actuator Replacement (Cylinder Deactivation)**
- **Control Module References** for chassis control module replacement, programming and setup.

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**.

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

Intermittent

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

Symptom List

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

- Loss of power

Refer to **Restricted Exhaust**

- Poor acceleration

Refer to **Restricted Exhaust**

- Poor fuel economy

Refer to **Restricted Exhaust**

- Excessive smoke diesel

Refer to **Restricted Exhaust**

- Exhaust hissing noise

Refer to **Exhaust Leakage**

- Exhaust popping noise

Refer to **Exhaust Leakage**

- Exhaust rattle noise

Refer to **Exhaust Noise**

- Loud exhaust noise

Refer to **Exhaust Noise**

- Exhaust buzz, groan, hum noise

Refer to **Exhaust Noise**

RESTRICTED EXHAUST

Diagnostic Aids

WARNING: Refer to **Exhaust Service Warning** .

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

NOTE: This will not apply if the dual exhaust is equipped with an "H" pipe or similar configuration in which the exhaust flow would be equalized.

Test Description

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

4

The exhaust system has very low back pressure under normal conditions. If the exhaust system is restricted, a significant increase in the exhaust pressure is noticed on the **J-35314-A** Exhaust Back Pressure Gauge.

Removing the AIR check valve or HO2S sensor may set a DTC. When finishing this diagnostic table, be sure to clear all codes.

5

This step will isolate the catalytic converter from the remainder of the exhaust system.

8

Confirming that the condition has been fixed is essential. If the symptom still exists and the vehicle has a dual exhaust system, proceed to Step 2 and repeat diagnostic procedure on the opposite exhaust pipe.

Restricted Exhaust

Step	Action	Value(s)	Yes	No
1	Did you verify the customers complaint?	-	Go to Step 2	-

2	Did you review the exhaust symptoms diagnostic information and perform the necessary inspections?	-	Go to Step 3	Go to 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. 4. Increase and monitor the engine speed at 2, 000 RPM. 5. Observe the exhaust system back pressure reading on the gauge. Does the reading exceed the specified value?	14 kPa (2 psi)	Go to Step 5	Go to Step 8
5	1. Turn the engine off and place the ignition in the lock position. 2. Remove the J-35314-A Exhaust Back Pressure Gauge. 3. Re-install the AIR check valve/HO2S sensor. Refer to the affected component's service procedure. 4. Remove the post-catalyst HO2S sensor. Refer to the affected component's service procedure. 5. Install the J-35314-A Exhaust Back Pressure Gauge in place of the post HO2S sensor. 6. Start the engine. 7. Increase and monitor the engine speed at 2, 000 RPM. 8. Observe the exhaust system back pressure reading on the gauge.	14 kPa (2 psi)		

	Does the reading exceed the specified value?		Go to Step 6	Go to Step 7
6	Inspect the exhaust system for the following conditions: • Damage in the exhaust pipe • Debris in the exhaust pipe • Muffler or resonator internal failure • Two-layer exhaust pipe separation Did you find and correct the condition?	-	Go to Step 8	-
7	Replace the catalytic converter. Refer to the affected component's service procedure. Did you find and correct the condition?	-	Go to Step 8	-
8	1. Remove the J-35314-A Exhaust Back Pressure Gauge. 2. Reinstall the AIR check valve or the post-catalyst HO2S sensor. Refer to the affected component's service procedure 3. Clear any codes. 4. Road test the vehicle in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 2

EXHAUST LEAKAGE

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 Tightening Specifications. • Ensure the exhaust hangers are in the proper locations

	and not loose.
Exhaust leaks at the following connections: • Exhaust manifold to pipe • Flanges • Pipe clamps	Tighten the components to the specifications. Refer to <u>Fastener Tightening Specifications</u> .
Seals or gaskets leaking • Exhaust manifold to cylinder head • Exhaust pipes to exhaust manifold • Catalytic converter connection • EGR connections • AIR connections to the exhaust manifold or cylinder head	Replace the leaking seal or gasket. Refer to the affected components procedure for service.
Irregularities at the mating surfaces on the flange connections	Repair as required or replace the affected component. Refer to the affected components procedure for service.
Exhaust manifold cracked or broken	Replace the exhaust manifold. Refer to the affected component's procedure for service.
Exhaust system component connection welds leaking	Replace the leaking component. Refer to the affected component's procedure for service.
Muffler or resonator (if equipped) damaged or leaking at the seams	Replace the affected muffler or resonator. Refer to the affected component's procedure for service.

EXHAUST NOISE

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 <u>Exhaust Leakage</u> .

Loud exhaust	2. Inspect for a damaged or failed muffler. 3. Repair or replace the affected component. Refer to the affected component's service procedure.
External rattle or vibration noise	1. Inspect for a bent or loose hanger, loose heat shield or loose clamp. 2. Inspect for an exhaust pipe causing interference. 3. Repair or replace the affected component. Refer to the affected component's service procedure.
Internal rattle	1. Test the components by tapping with a rubber mallet to confirm a rattle. 2. Repair or replace the affected component. Refer to the affected component's service procedure.

REPAIR INSTRUCTIONS

EXHAUST FLOW CONTROL VALVE LEARN (CYLINDER DEACTIVATION EXHAUST FLOW CONTROL VALVE)

Procedures Requiring A Cylinder Deactivation Exhaust Flow Control Valve Learn

The calibration procedure for the cylinder deactivation exhaust flow control valve actuator may be required after certain service procedures are performed. Some of these procedures are as follows:

- Replacement of the chassis control module.
- Replacement of the cylinder deactivation exhaust flow control valve actuator.

Cylinder Deactivation Exhaust Flow Control Valve Learn Procedure

The cylinder deactivation exhaust flow control valve learn procedure is performed with a scan tool using the following steps:

1. Place the vehicle on a level surface.
2. Connect a scan tool to the data link connector.
3. Turn the ignition ON, with the engine OFF.
4. Select Cylinder Deactivation Exhaust Flow Control Valve Learn in the Chassis Control Module Configuration/Reset Function list.
5. Follow the scan tool directions to complete the calibration procedure.
6. Clear any DTCs that may have set.
7. Road test the vehicle and verify proper operation of the exhaust flow control system.

EXHAUST FLOW CONTROL VALVE LEARN (TAIL PIPE EXHAUST FLOW CONTROL VALVE)

Procedures Requiring An Exhaust Flow Control Valve Learn

The calibration procedure for the exhaust flow control valve actuator may be required after certain service procedures are performed. Some of these procedures are as follows:

- Replacement of the chassis control module.
- Replacement of the exhaust flow control valve actuator.

Exhaust Flow Control Valve Learn Procedure

The exhaust flow control valve learn procedure is performed with a scan tool using the following steps:

1. Place the vehicle on a level surface.
2. Connect a scan tool to the data link connector.
3. Turn the ignition ON, with the engine OFF.
4. Select Exhaust Flow Control Valve Learn in the Chassis Control Module Configuration/Reset Function list.
5. Follow the scan tool directions to complete the calibration procedure.
6. Perform the scan tool Exhaust Flow Control Valve test in the chassis control module control function list.
7. Clear any DTCs that may have set.
8. Road test the vehicle and verify proper operation of the exhaust flow control system.

EXHAUST MANIFOLD REPLACEMENT - LEFT SIDE

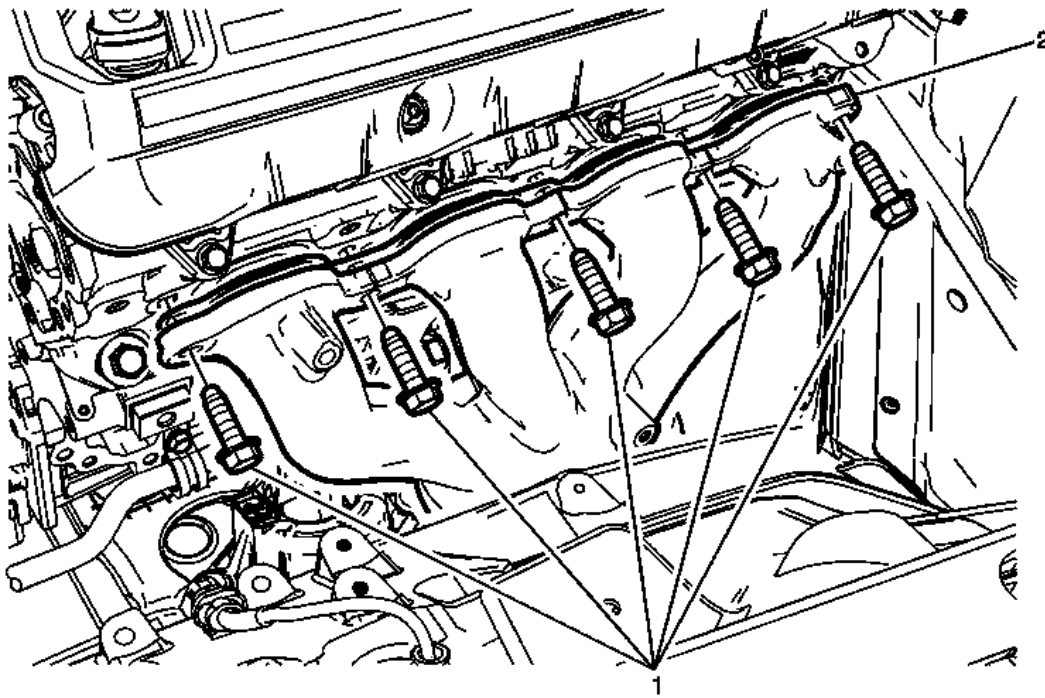


Fig. 2: Exhaust Manifold - Left Side
Courtesy of GENERAL MOTORS COMPANY

Exhaust Manifold Replacement - Left Side

Callout	Component Name
CAUTION: The oxygen sensor may be difficult to remove when the engine temperature is below 48°C (120°F). Excessive force may damage threads in the exhaust manifold or the exhaust pipe.	
Preliminary Procedure 1. Remove the upper intake manifold cover. Refer to <u>Upper Intake Manifold Cover Replacement</u> . 2. Remove the oil level indicator tube. Refer to <u>Oil Level Indicator Tube Replacement</u> . 3. Remove the spark plugs. Refer to <u>Spark Plug Replacement</u> . 4. Remove the exhaust manifold heat shield. Refer to <u>Exhaust Manifold Heat Shield Replacement - Left Side</u>. 5. Remove the catalytic converter. Refer to <u>Catalytic Converter Replacement - Left Side</u>.	
	Exhaust Manifold Fasteners (Qty: 5) CAUTION: Refer to <u>Fastener Caution</u> .

1	1. Using NEW fasteners, apply a 5 mm (0.2 in) wide band thread of threadlock to the threads. 2. Tighten the fasteners starting at in the center, alternating side-to-side, working outward. Tighten • If installing on an existing cylinder head - 23 (17 lb ft) • If installing on a NEW cylinder head - 27 (20 lb ft)
2	Exhaust Manifold Procedure 1. Remove and DISCARD the exhaust manifold gasket. 2. Clean the exhaust manifold and cylinder head gasket surfaces and install a NEW exhaust manifold gasket.

EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE

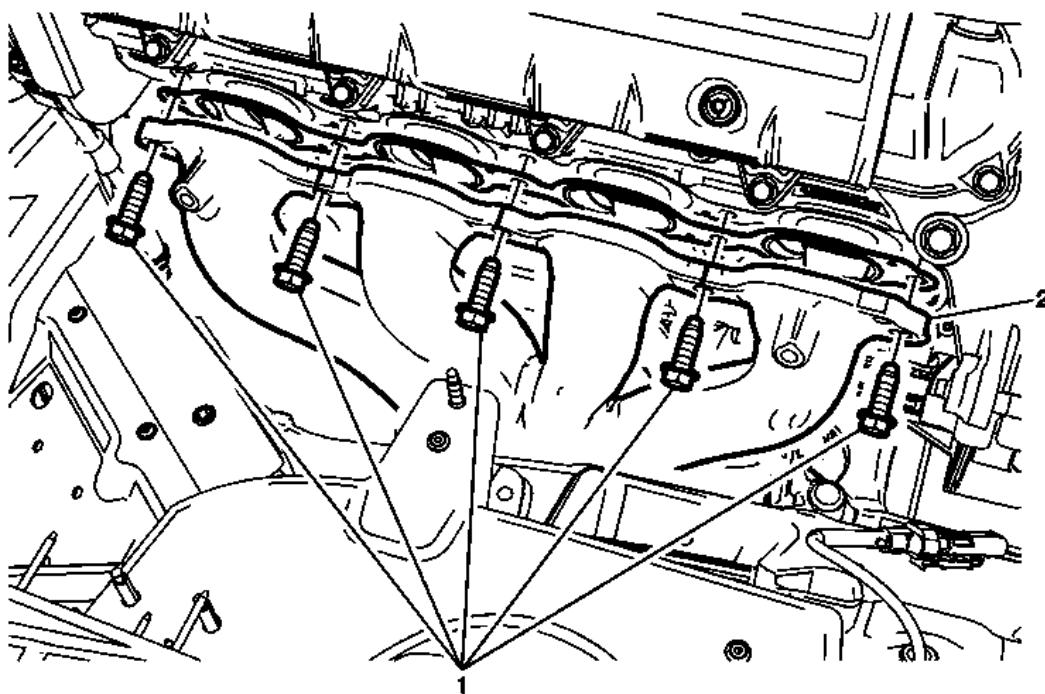


Fig. 3: Exhaust Manifold - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Manifold Replacement - Right Side

Callout	Component Name
CAUTION: The oxygen sensor may be difficult to remove when the engine temperature is below 48°C (120°F). Excessive force may damage threads in the exhaust manifold or the exhaust pipe.	
Preliminary Procedure 1. Remove the upper intake manifold cover. Refer to <u>Upper Intake Manifold Cover Replacement</u> . 2. Remove the spark plugs. Refer to <u>Spark Plug Replacement</u> . 3. Remove the exhaust manifold heat shield. Refer to <u>Exhaust Manifold Heat Shield Replacement - Right Side</u>. 4. Remove the catalytic converter. Refer to <u>Catalytic Converter Replacement - Right Side</u>.	
1	Exhaust Manifold Fasteners (Qty: 5) CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Using NEW fasteners, apply a 5 mm (0.2 in) wide band thread of threadlock to the threads. 2. Tighten the fasteners starting at in the center, alternating side-to-side, working outward. Tighten • If installing on an existing cylinder head - 23 (17 lb ft) • If installing on a NEW cylinder head - 27 (20 lb ft)
2	Exhaust Manifold Procedure 1. Remove and DISCARD the exhaust manifold gasket. 2. Clean the exhaust manifold and cylinder head gasket surfaces and install a NEW exhaust manifold gasket.

INTERMEDIATE PIPE REPLACEMENT

Removal Procedure

WARNING: Refer to **Exhaust Service Warning** .

WARNING: Refer to Protective Goggles and Glove Warning .

1. Raise and properly support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the floor panel tunnel panel reinforcement. Refer to Floor Panel Tunnel Panel Reinforcement Replacement .
3. Install a jack stand under the intermediate pipe.

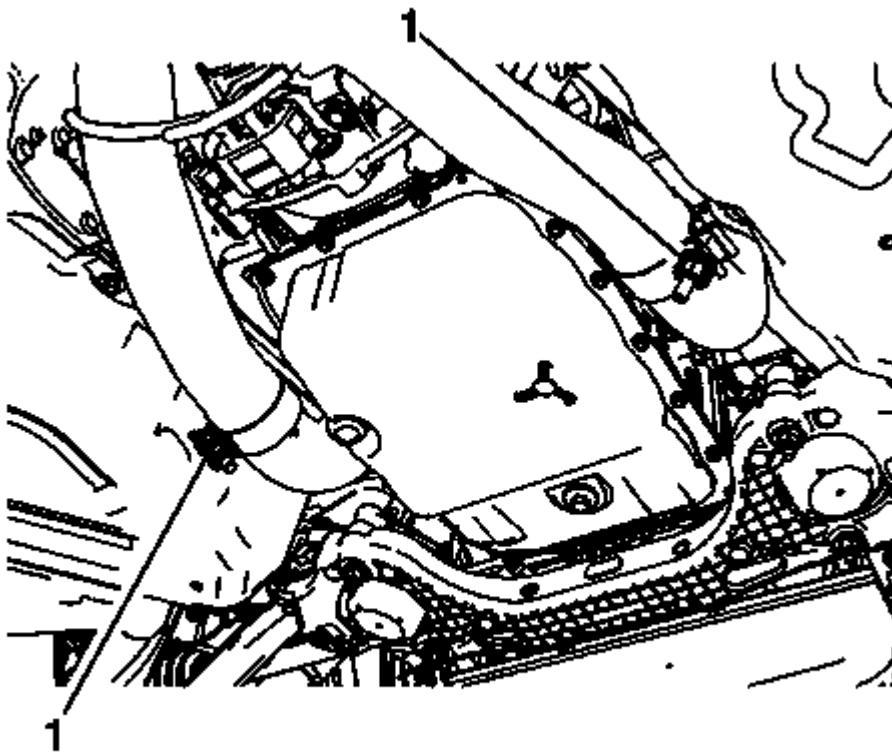


Fig. 4: Exhaust Muffler Band Clamps
Courtesy of GENERAL MOTORS COMPANY

4. Loosen the exhaust muffler band clamps (1).

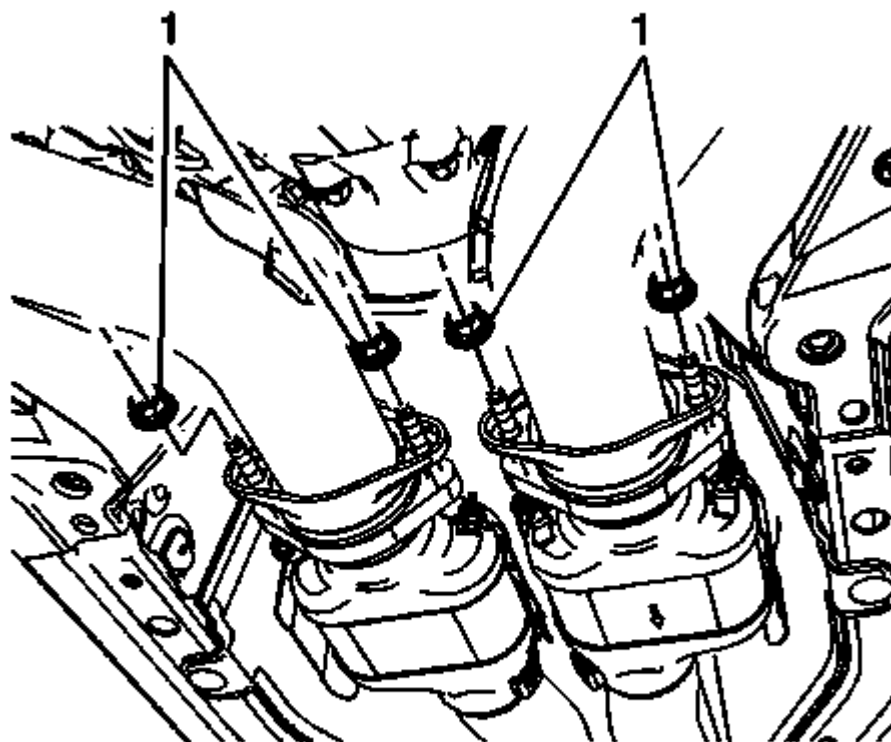


Fig. 5: Intermediate Pipe-To-Catalytic Converter Pipe Fasteners And Exhaust Pipe Seals
Courtesy of GENERAL MOTORS COMPANY

5. Remove the intermediate pipe-to-catalytic converter pipe fasteners (1) and DISCARD the exhaust pipe seals.

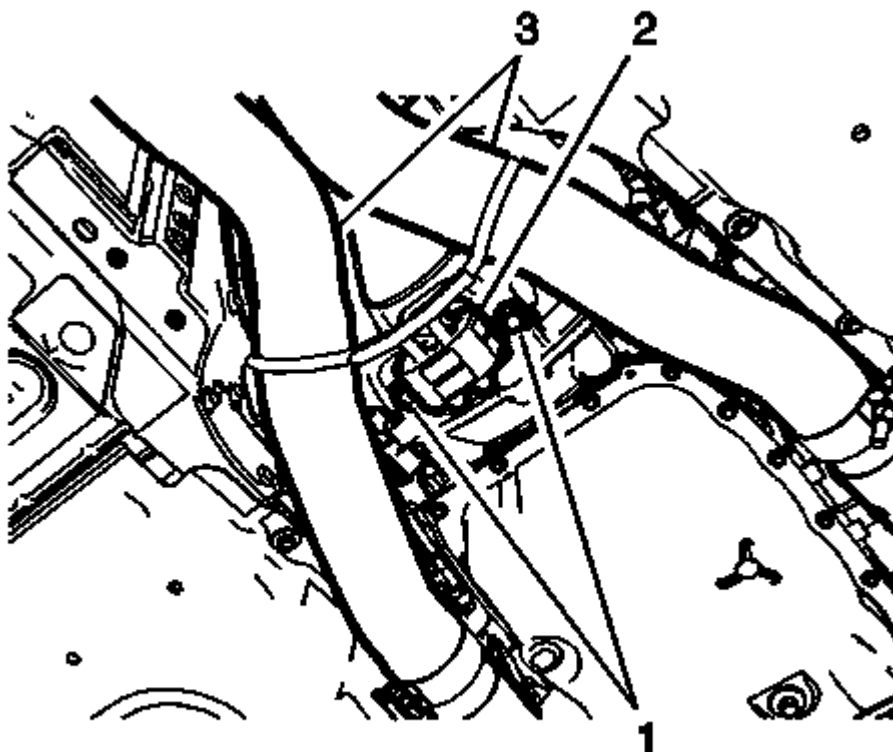


Fig. 6: Fasteners And Intermediate Pipe Hanger
Courtesy of GENERAL MOTORS COMPANY

6. Remove the fasteners (1) securing the intermediate pipe hanger (2) to the vehicle.
7. Separate the intermediate pipe (3) from the exhaust mufflers.
8. Lower the jack stand with the intermediate pipe.
9. If replacing the intermediate pipe, remove the hanger bracket assembly and transfer to new part.

Installation Procedure

WARNING: Refer to Protective Goggles and Glove Warning .

NOTE: If reinstalling the original intermediate pipe, the tail pipe/muffler band clips must be replaced. Mark the position of the band clips on the intermediate exhaust pipe. Remove the band clips by grinding the welds. Install new band clips on the intermediate pipe. Position the new band clips using the alignment mark created previously.

1. Using a wire brush, clean the contact area of the left and right mufflers to the intermediate pipe.
2. Apply a small amount of lubricant on the intermediate pipes and the left and right mufflers
3. Position the intermediate pipe on the jack stand and raise into position fitting the intermediate pipe to the mufflers.
4. Install the NEW exhaust pipe seals.

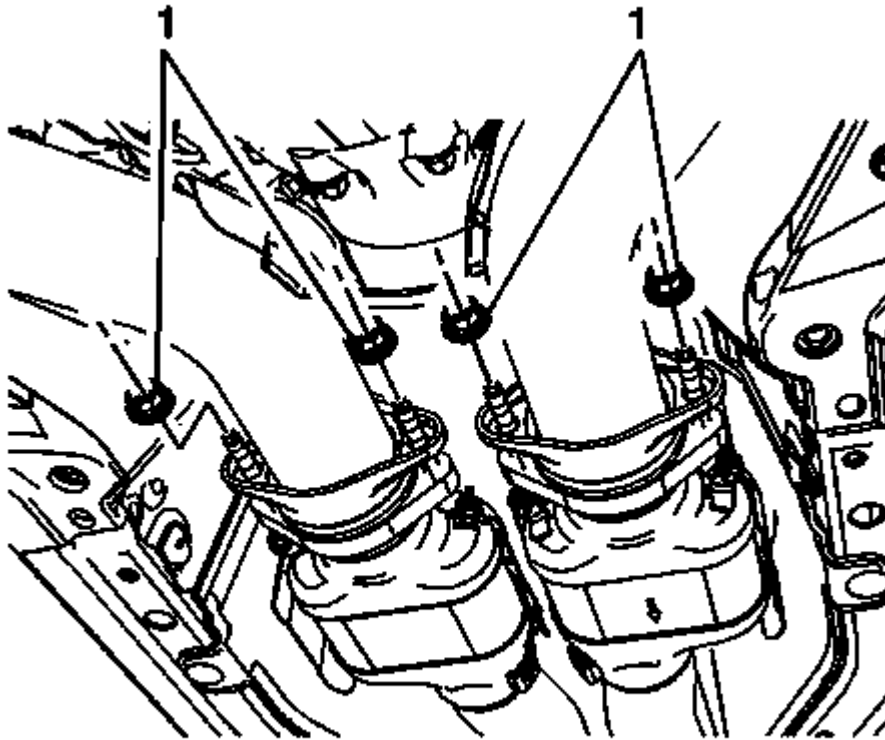


Fig. 7: Intermediate Pipe-To-Catalytic Converter Pipe Fasteners And Exhaust Pipe Seals
Courtesy of GENERAL MOTORS COMPANY

NOTE: When installing the intermediate pipe-to-catalytic converter pipe fasteners, hand tighten only to allow for proper alignment of the exhaust system prior to the final assembly.

5. Install the intermediate pipe-to-catalytic converter pipe fasteners (1).

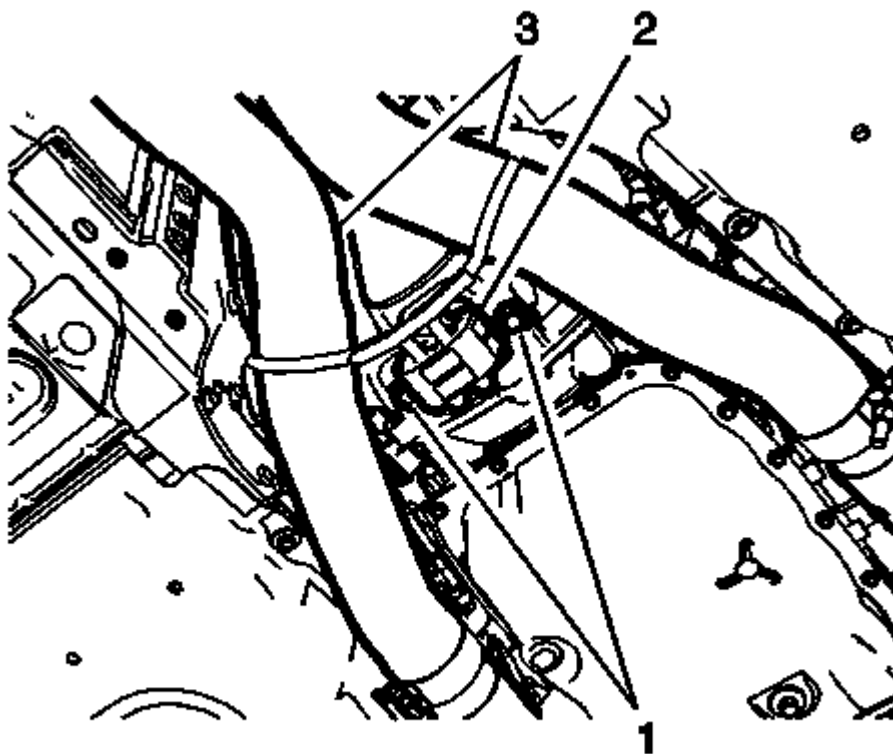


Fig. 8: Fasteners And Intermediate Pipe Hanger
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

6. Install the fasteners (1) securing the intermediate pipe hanger bracket assembly (2) to the vehicle and tighten to 22 (16 lb ft).
7. Remove the adjustable jack stand.

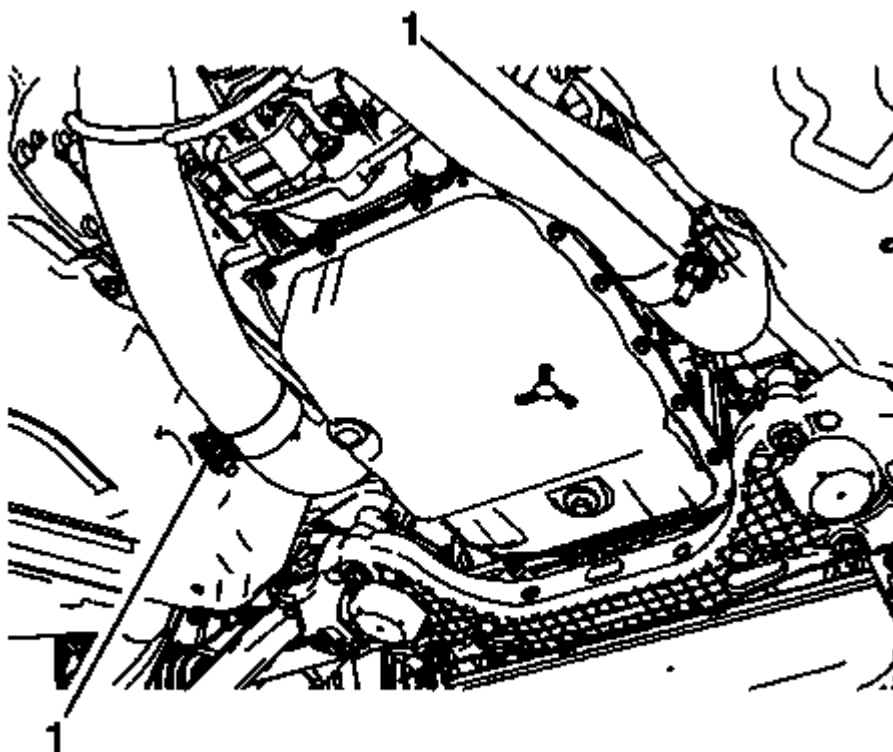


Fig. 9: Exhaust Muffler Band Clamps
Courtesy of GENERAL MOTORS COMPANY

8. Tighten the exhaust pipe/muffler clamps (1) to 44 (32 lb ft).

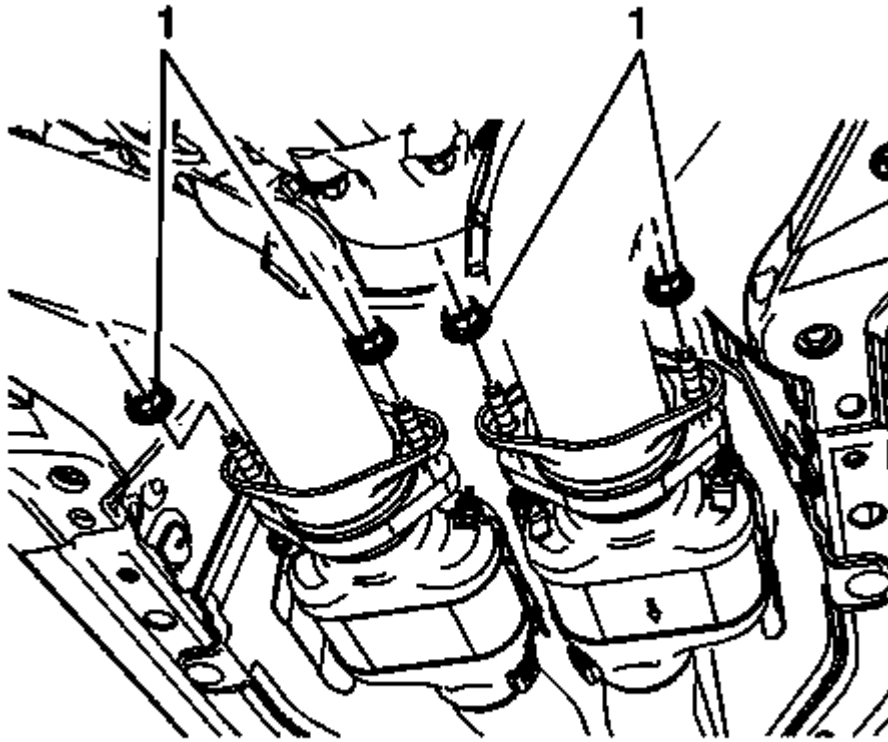


Fig. 10: Intermediate Pipe-To-Catalytic Converter Pipe Fasteners And Exhaust Pipe Seals
Courtesy of GENERAL MOTORS COMPANY

9. Tighten the intermediate pipe to catalytic converter fasteners (1) to 25 (18 lb ft).
10. Install the floor panel tunnel panel reinforcement. Refer to **Floor Panel Tunnel Panel Reinforcement Replacement** .
11. Lower the vehicle.

CATALYTIC CONVERTER REPLACEMENT - LEFT SIDE

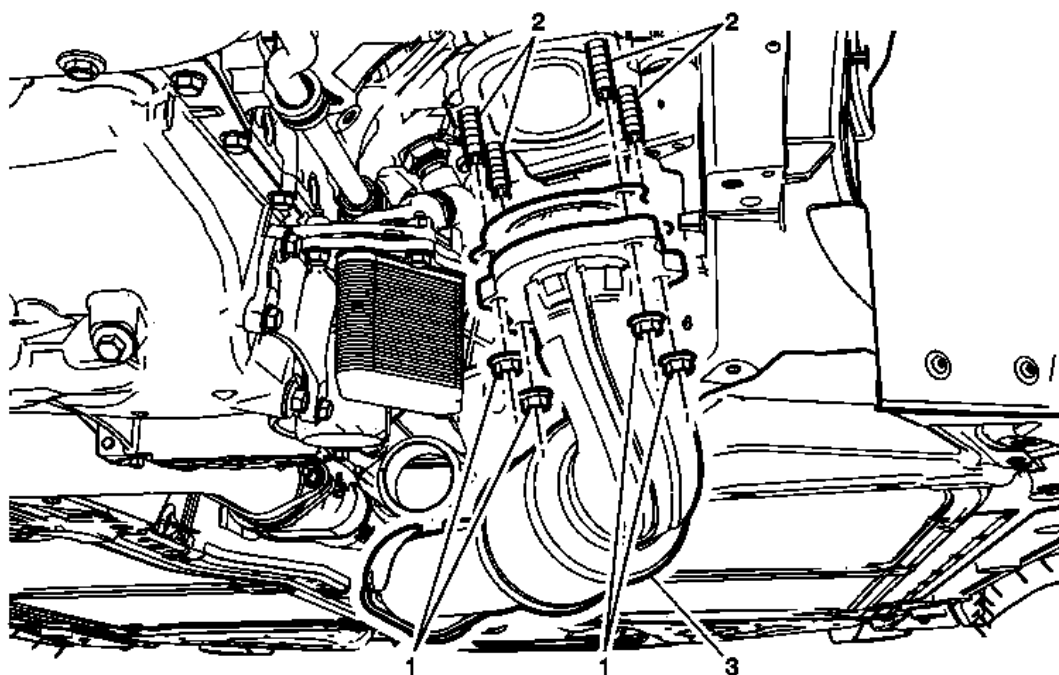


Fig. 11: Catalytic Converter - Left Side
Courtesy of GENERAL MOTORS COMPANY

Catalytic Converter Replacement - Left Side

Callout	Component Name
Preliminary Procedure 1. Remove the floor panel tunnel panel reinforcement. Refer to <u>Floor Panel Tunnel Panel Reinforcement Replacement</u> . 2. Remove the heated oxygen sensor. Refer to <u>Heated Oxygen Sensor Replacement - Bank 1 Sensor 2</u> . 3. Place an adjustable jack stand underneath the intermediate pipe to support the exhaust system during service. 4. Disconnect the catalytic converter from the intermediate pipe. Refer to <u>Intermediate Pipe Replacement</u>.	
1	Catalytic Converter-to-Exhaust Manifold Fasteners (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Remove the exhaust manifold fasteners and DISCARD.

	Tighten 50 (37 lb ft)
2	Exhaust Manifold Studs Procedure 1. Remove the exhaust manifold studs and DISCARD. 2. Install NEW exhaust manifold studs. Tighten 22 (16 lb ft)
3	Catalytic Converter Procedure Install a NEW exhaust manifold gasket.

CATALYTIC CONVERTER REPLACEMENT - RIGHT SIDE

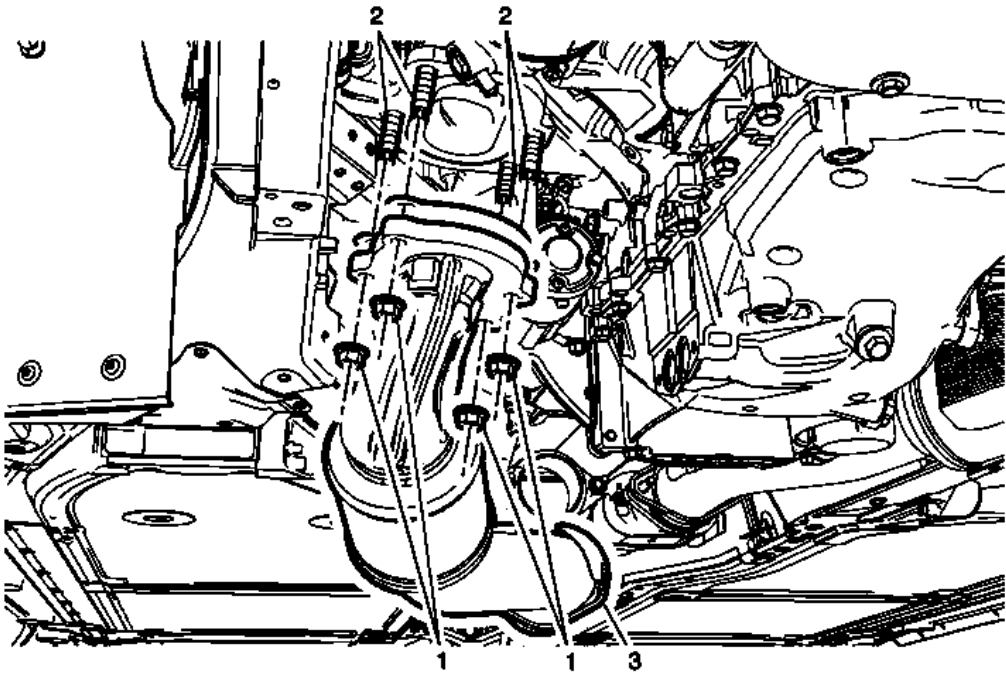


Fig. 12: Catalytic Converter - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Catalytic Converter Replacement - Right Side

Callout	Component Name
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Preliminary Procedure

1. Remove the floor panel tunnel panel reinforcement. Refer to **Floor Panel Tunnel Panel Reinforcement Replacement** .
2. Remove the heated oxygen sensor. Refer to **Heated Oxygen Sensor Replacement - Bank 2 Sensor 2** .
3. Place an adjustable jack stand underneath the intermediate pipe to support the exhaust system during service.
4. Disconnect the catalytic converter from the intermediate pipe. Refer to **Intermediate Pipe Replacement**.

1	Catalytic Converter-to-Exhaust Manifold Fasteners (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Remove the exhaust manifold fasteners and DISCARD. 2. Install NEW exhaust manifold fasteners. Tighten 50 (37 lb ft)
2	Exhaust Manifold Studs Procedure 1. Remove the exhaust manifold studs and DISCARD. 2. Install NEW exhaust manifold studs. Tighten 22 (16 lb ft)
3	Catalytic Converter Procedure Install a NEW exhaust manifold gasket.

EXHAUST SYSTEM INSULATOR, HANGER, BRACKET REPLACEMENT (MUFFLER)

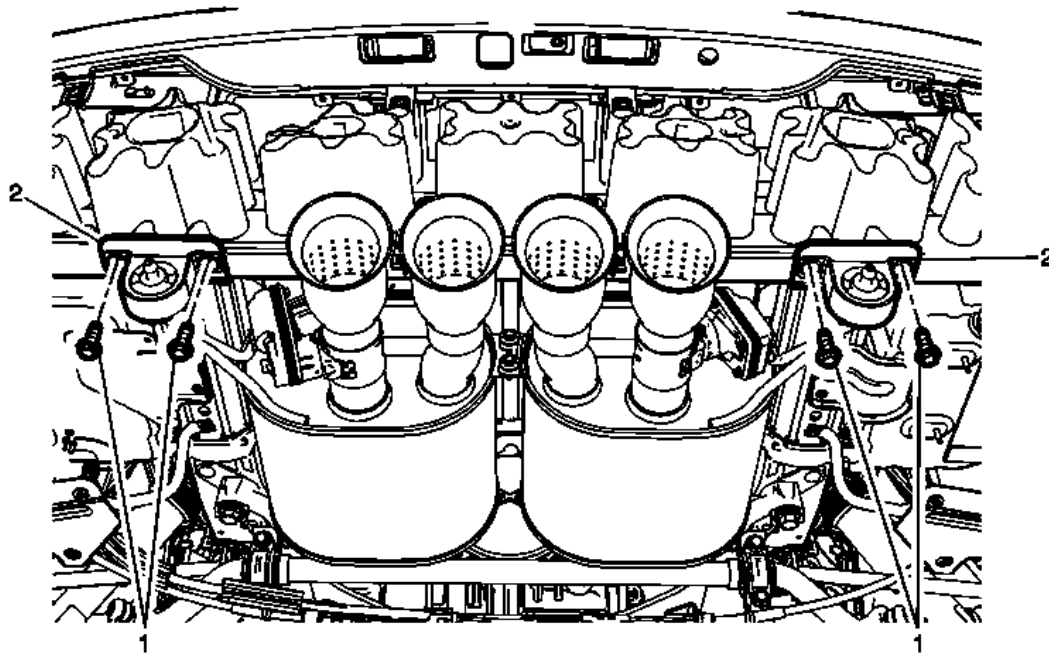


Fig. 13: Exhaust System Insulator, Hanger, Bracket (Muffler)
 Courtesy of GENERAL MOTORS COMPANY

Exhaust System Insulator, Hanger, Bracket Replacement (Muffler)

Callout	Component Name
WARNING: Refer to <u>Exhaust Service Warning</u> .	
Preliminary Procedure Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Exhaust Rear Muffler Hanger Bracket Fasteners (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 25 (18 lb ft)
2	Exhaust Rear Muffler Hanger Bracket (Qty: 2)

EXHAUST SYSTEM INSULATOR, HANGER, BRACKET REPLACEMENT (INTERMEDIATE PIPE)

Removal Procedure

1. Raise and properly support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the floor panel tunnel panel reinforcement. Refer to **Floor Panel Tunnel Panel Reinforcement Replacement** .
3. Install a jack stand under the intermediate pipe.

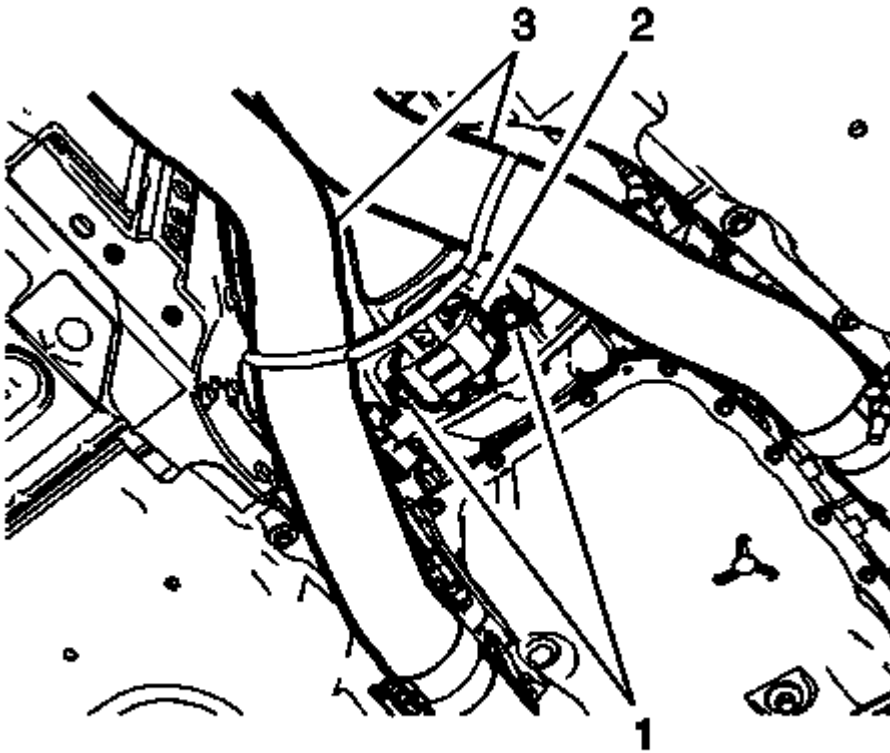


Fig. 14: Fasteners And Intermediate Pipe Hanger
Courtesy of GENERAL MOTORS COMPANY

4. Remove the fasteners (1) securing the intermediate pipe hanger bracket assembly (2) to the vehicle.
5. Separate the hanger bracket assembly from the intermediate pipe (3).

Installation Procedure

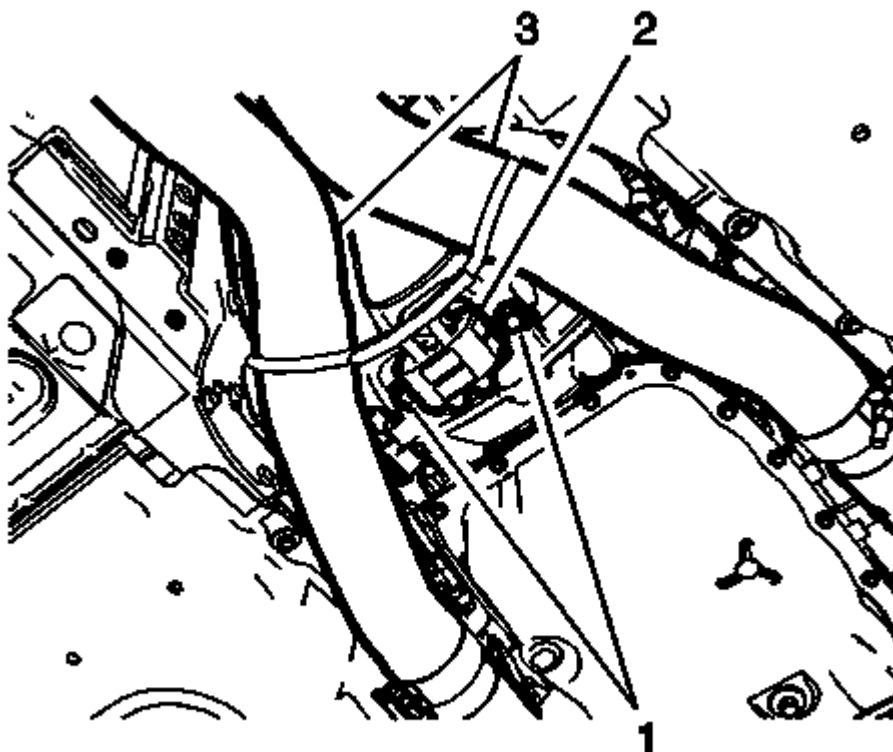


Fig. 15: Fasteners And Intermediate Pipe Hanger
Courtesy of GENERAL MOTORS COMPANY

1. Install the hanger bracket assembly to the intermediate pipe (3).

CAUTION: Refer to Fastener Caution .

2. Install the fasteners (1) securing the intermediate pipe hanger bracket assembly (2) to the vehicle and tighten to 22 (16 lb ft).
3. Remove the adjustable jack stand.
4. Install the floor panel tunnel panel reinforcement. Refer to Floor Panel Tunnel Panel Reinforcement Replacement .
5. Lower the vehicle.

EXHAUST MUFFLER REPLACEMENT - LEFT SIDE

Removal Procedure

WARNING: Refer to Exhaust Service Warning .

WARNING: Refer to Protective Goggles and Glove Warning .

1. Raise and properly support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the rear wheels. Refer to Tire and Wheel Removal and Installation .
3. Remove the rear bumper lower fascia. Refer to Rear Bumper Lower Fascia Replacement .
4. Disconnect the rear stabilizer shaft from the rear cradle. Refer to Stabilizer Shaft Replacement (with FE3 and FE4) .
5. Loosen the band clamp securing the intermediate pipe to the muffler. Refer to Intermediate Pipe Replacement.

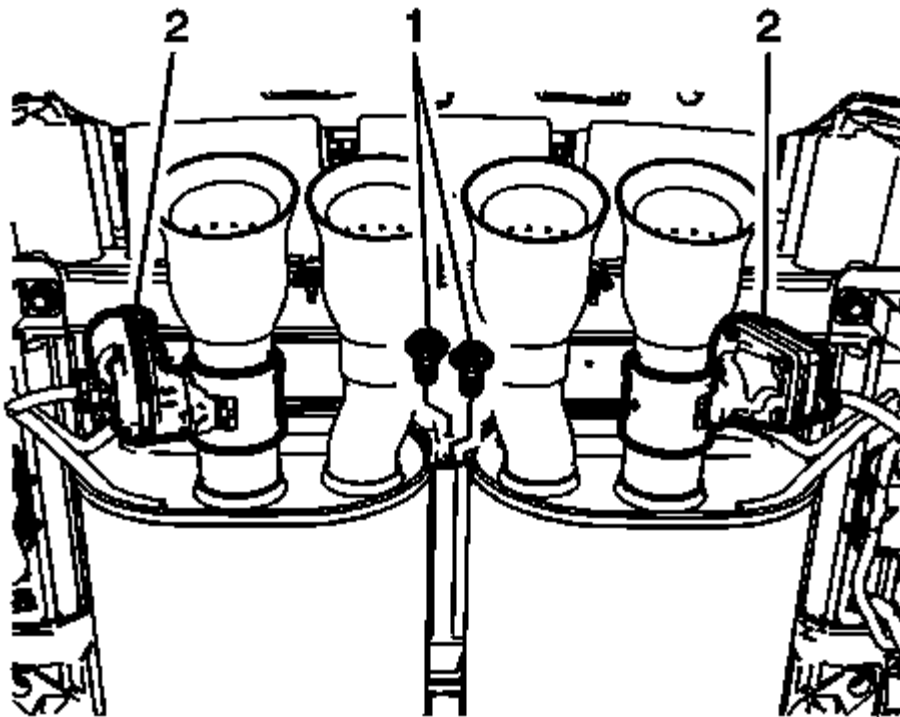


Fig. 16: Exhaust Muffler Fasteners
Courtesy of GENERAL MOTORS COMPANY

6. Remove the exhaust muffler fasteners (1) and separate the mufflers.
7. Disconnect the tailpipe exhaust control valve actuator electrical wiring harness connector (2), if equipped.

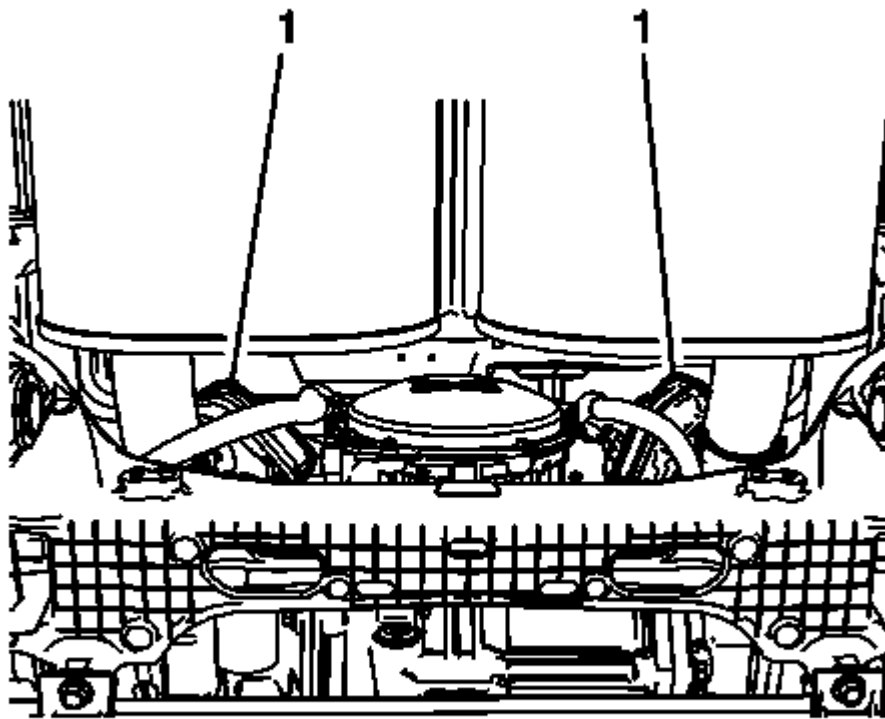


Fig. 17: Exhaust Control Valve Actuator Electrical Wiring Harness Connector
Courtesy of GENERAL MOTORS COMPANY

8. Disconnect the exhaust control valve actuator electrical wiring harness connector (1).
9. Remove the fasteners securing the rear insulator bracket to the vehicle. Refer to **Exhaust System Insulator, Hanger, Bracket Replacement (Muffler)**, **Exhaust System Insulator, Hanger, Bracket Replacement (Intermediate Pipe)**.
10. Remove the muffler assembly.

Installation Procedure

WARNING: Refer to Protective Goggles and Glove Warning .

1. Using a wire brush, clean the contact area of the intermediate pipe to the muffler.
2. Position the muffler to the vehicle installing the muffler assembly to the intermediate pipe.
3. Install the fasteners securing the rear insulator bracket to the vehicle. Refer to **Exhaust System Insulator, Hanger, Bracket Replacement (Muffler)**, **Exhaust System Insulator, Hanger, Bracket Replacement (Intermediate Pipe)**.

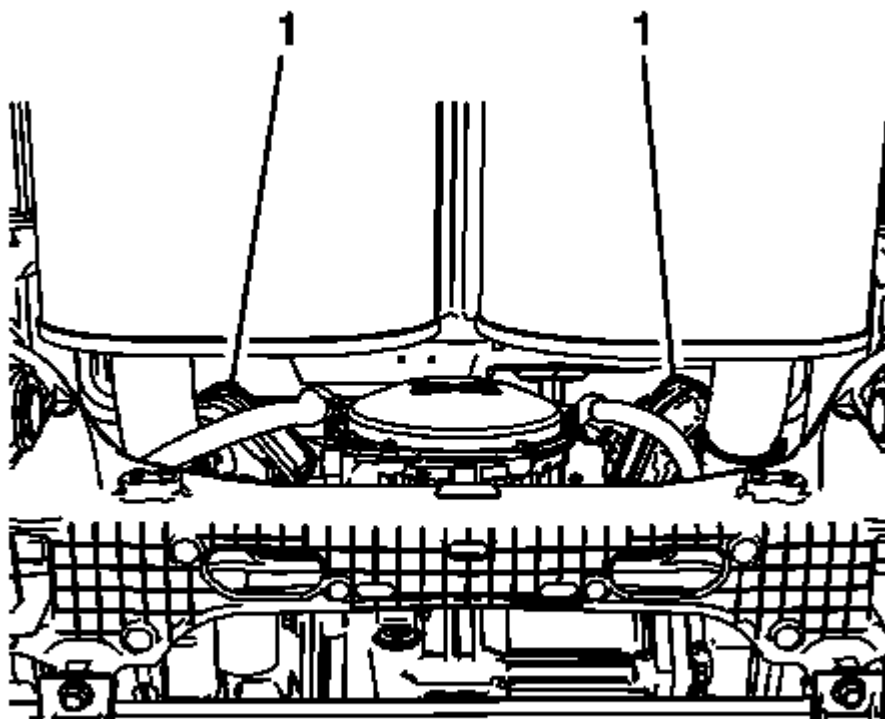


Fig. 18: Exhaust Control Valve Actuator Electrical Wiring Harness Connector
Courtesy of GENERAL MOTORS COMPANY

4. Connect the exhaust control valve actuator electrical wiring harness connector (1)

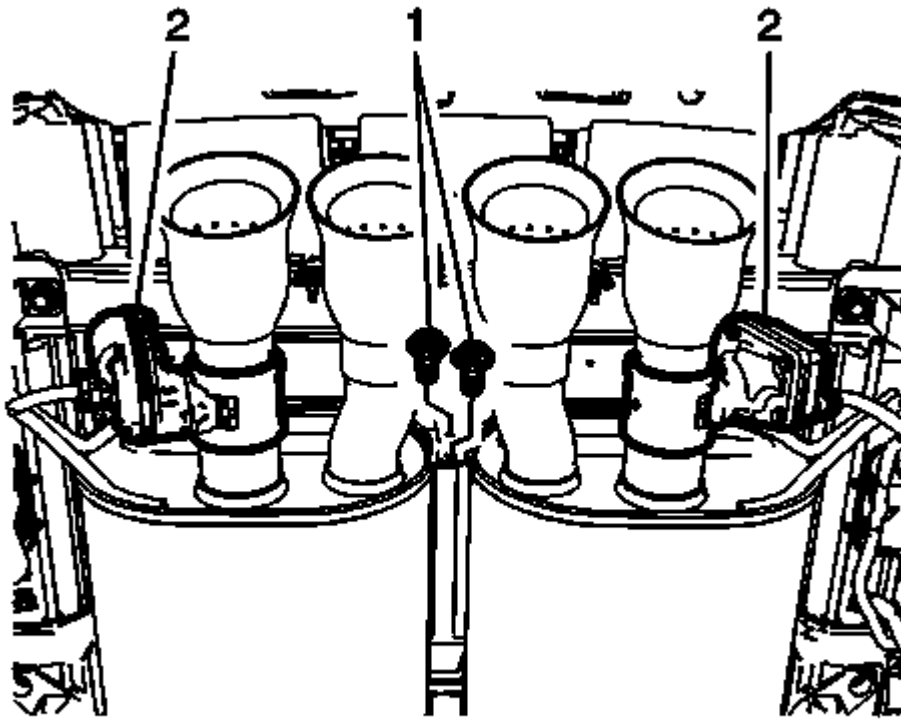


Fig. 19: Exhaust Muffler Fasteners
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Install the exhaust muffler fasteners (1) and tighten to 22 (16 lb ft).
6. Connect the tailpipe exhaust control valve actuator electrical wiring harness connector (2), if equipped.
7. Tighten the band clamp securing the intermediate pipe to the mufflers. Refer to Intermediate Pipe Replacement.
8. Connect the rear stabilizer shaft to the rear cradle. Refer to Stabilizer Shaft Replacement (with FE3 and FE4) .
9. Install the rear bumper lower fascia. Refer to Rear Bumper Lower Fascia Replacement .
10. Install the rear wheels. Refer to Tire and Wheel Removal and Installation .
11. Lower the vehicle.

EXHAUST MUFFLER REPLACEMENT - RIGHT SIDE

WARNING: Refer to Exhaust Service Warning .

WARNING: Refer to Protective Goggles and Glove Warning .

1. Raise and properly support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the rear wheels. Refer to Tire and Wheel Removal and Installation .
3. Remove the rear bumper lower fascia. Refer to Rear Bumper Lower Fascia Replacement .
4. Disconnect the rear stabilizer shaft from the rear cradle. Refer to Stabilizer Shaft Replacement (with FE3 and FE4) .
5. Loosen the band clamp securing the intermediate pipe to the muffler. Refer to Intermediate Pipe Replacement.

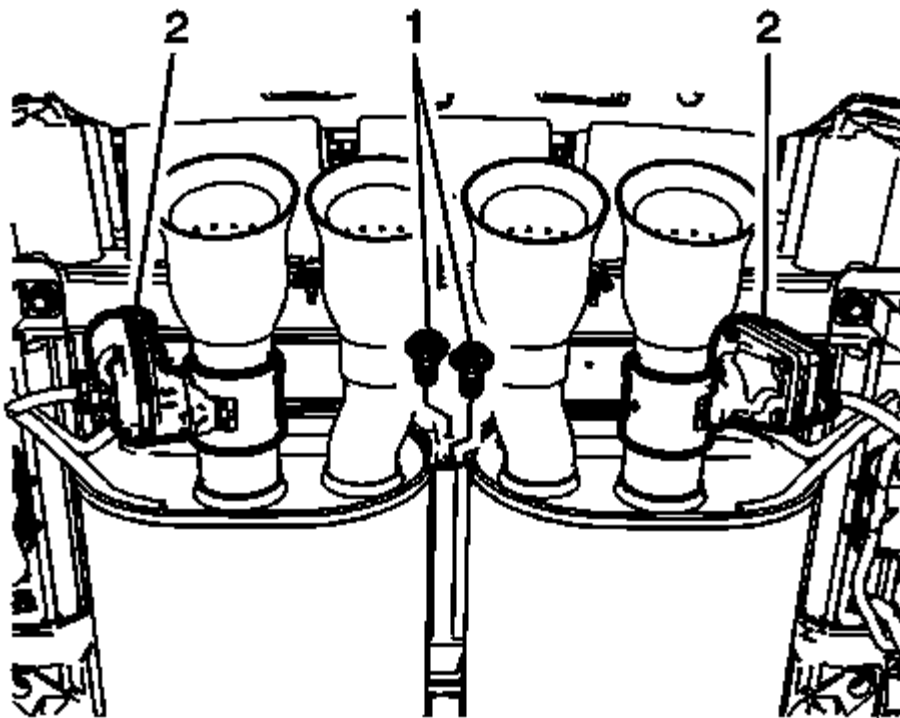


Fig. 20: Exhaust Muffler Fasteners
Courtesy of GENERAL MOTORS COMPANY

6. Remove the exhaust muffler fasteners (1) and separate the mufflers.
7. Disconnect the tailpipe exhaust control valve actuator electrical wiring harness connector (2). if

equipped.

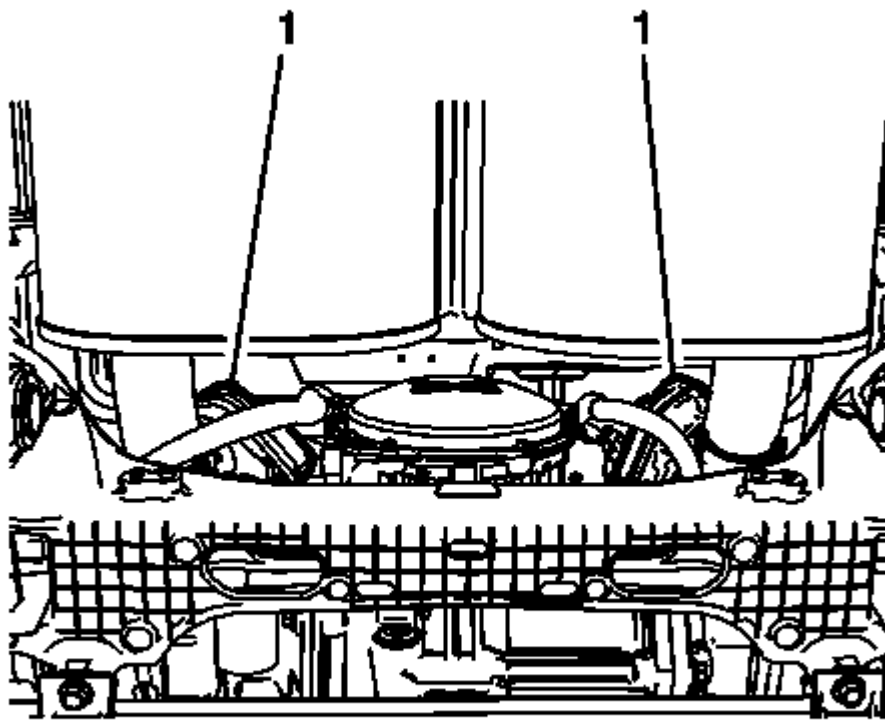


Fig. 21: Exhaust Control Valve Actuator Electrical Wiring Harness Connector
Courtesy of GENERAL MOTORS COMPANY

8. Disconnect the exhaust control valve actuator electrical wiring harness connector (1)
9. Remove the fasteners securing the rear insulator bracket to the vehicle. Refer to **Exhaust System Insulator, Hanger, Bracket Replacement (Muffler)**, **Exhaust System Insulator, Hanger, Bracket Replacement (Intermediate Pipe)**.
10. Remove the muffler assembly.

Installation Procedure

WARNING: Refer to **Protective Goggles and Glove Warning** .

1. Using a wire brush, clean the contact area of the intermediate pipe to the muffler.
2. Position the muffler to the vehicle installing the muffler assembly to the intermediate pipe.
3. Install the fasteners securing the rear insulator bracket to the vehicle. Refer to **Exhaust System Insulator, Hanger, Bracket Replacement (Muffler)**, **Exhaust System Insulator, Hanger,**

Bracket Replacement (Intermediate Pipe).

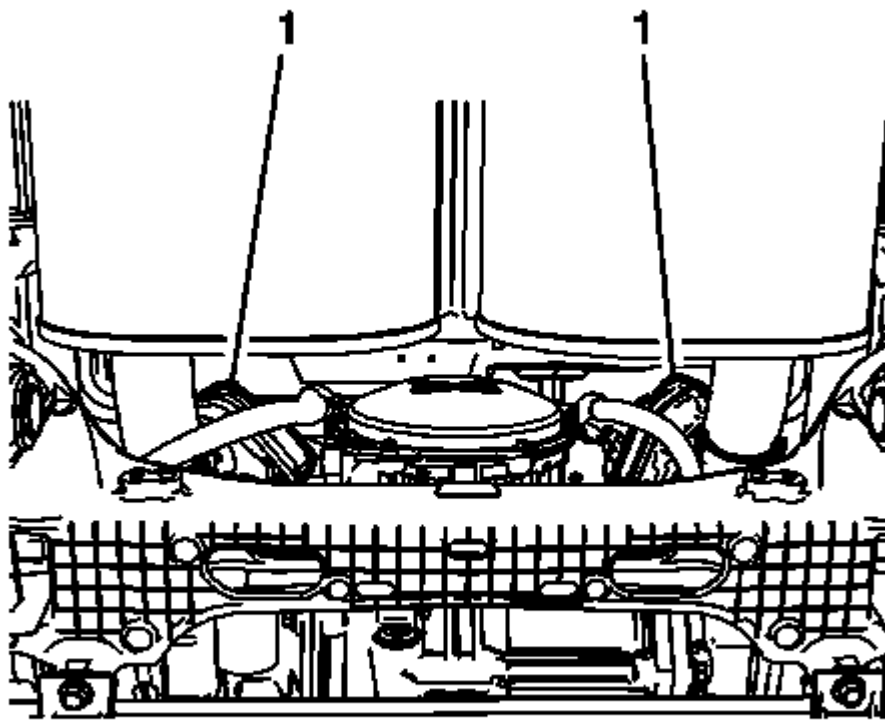


Fig. 22: Exhaust Control Valve Actuator Electrical Wiring Harness Connector
Courtesy of GENERAL MOTORS COMPANY

4. Connect the exhaust control valve actuator electrical wiring harness connector (1)

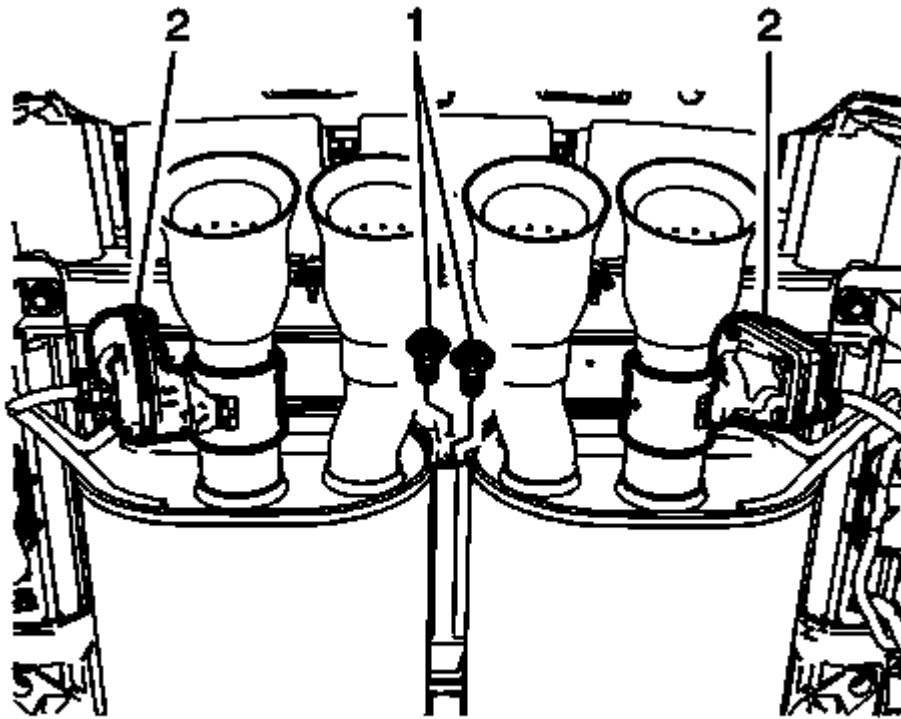


Fig. 23: Exhaust Muffler Fasteners
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Install the exhaust muffler fasteners (1) and tighten to 22 (16 lb ft).
6. Connect the tailpipe exhaust control valve actuator electrical wiring harness connector (2), if equipped.
7. Tighten the band clamp securing the intermediate pipe to the muffler. Refer to Intermediate Pipe Replacement.
8. Connect the rear stabilizer shaft to the rear cradle. Refer to Stabilizer Shaft Replacement (with FE3 and FE4) .
9. Install the rear bumper lower fascia. Refer to Rear Bumper Lower Fascia Replacement .
10. Install the rear wheels. Refer to Tire and Wheel Removal and Installation .
11. Lower the vehicle.

EXHAUST CONTROL VALVE ACTUATOR REPLACEMENT (TAIL PIPE)

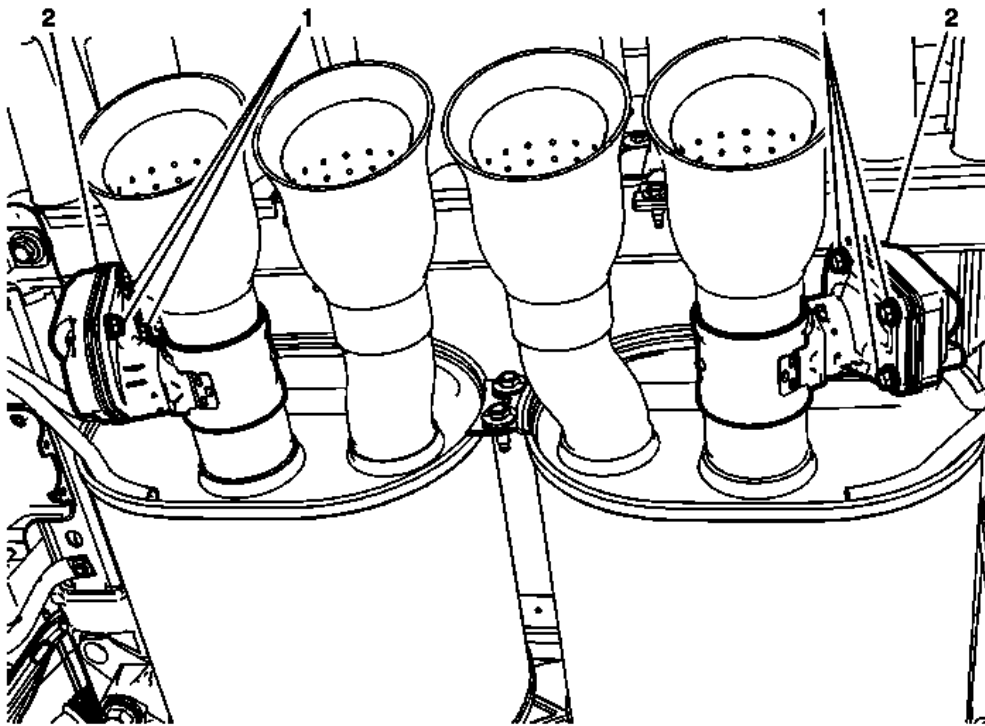


Fig. 24: Exhaust Control Valve Actuator (Tail Pipe)
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Control Valve Actuator Replacement (Tail Pipe)

Callout	Component Name
WARNING: Refer to <u>Exhaust Service Warning</u> .	
Preliminary Procedure Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Exhaust Control Valve Actuator Fasteners (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Procedure Install NEW fasteners. Tighten 6 (53 lb in)
2	Exhaust Control Valve Actuator 1. Disconnect the electrical wiring harness connector from the exhaust valve

2. Perform the tail pipe exhaust flow control valve actuator re-learn procedure. Refer to **Exhaust Flow Control Valve Learn (Cylinder Deactivation Exhaust Flow Control Valve)**, **Exhaust Flow Control Valve Learn (Tail Pipe Exhaust Flow Control Valve)**- Tail Pipe.

EXHAUST CONTROL VALVE ACTUATOR REPLACEMENT (CYLINDER DEACTIVATION)

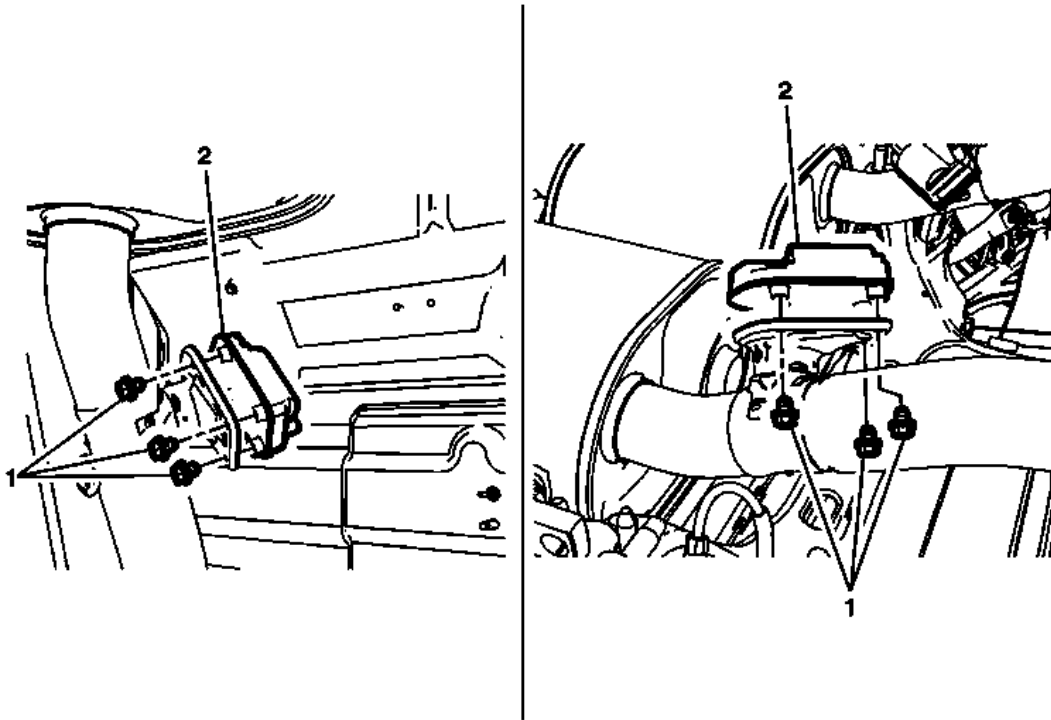


Fig. 25: Exhaust Control Valve Actuator (Cylinder Deactivation)
Courtesy of GENERAL MOTORS COMPANY

Exhaust Control Valve Actuator Replacement (Cylinder Deactivation)

Callout	Component Name
WARNING: Refer to <u>Exhaust Service Warning</u> .	
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the exhaust muffler. Refer to <u>Exhaust Muffler Replacement - Left Side</u> and <u>Exhaust Muffler Replacement - Right Side</u>.	
	Exhaust Control Valve Actuator Fasteners (Qty: 3)
	CAUTION:

1	Procedure Install NEW fasteners. Tighten 6 (53 lb in)
2	Exhaust Control Valve Actuator Procedure Perform the exhaust control valve actuator re-learn procedure. Refer to <u>Exhaust Flow Control Valve Learn (Cylinder Deactivation Exhaust Flow Control Valve)</u> , <u>Exhaust Flow Control Valve Learn (Tail Pipe Exhaust Flow Control Valve)</u> - Cylinder Deactivation.

CATALYTIC CONVERTER HEAT SHIELD REPLACEMENT

Removal Procedure

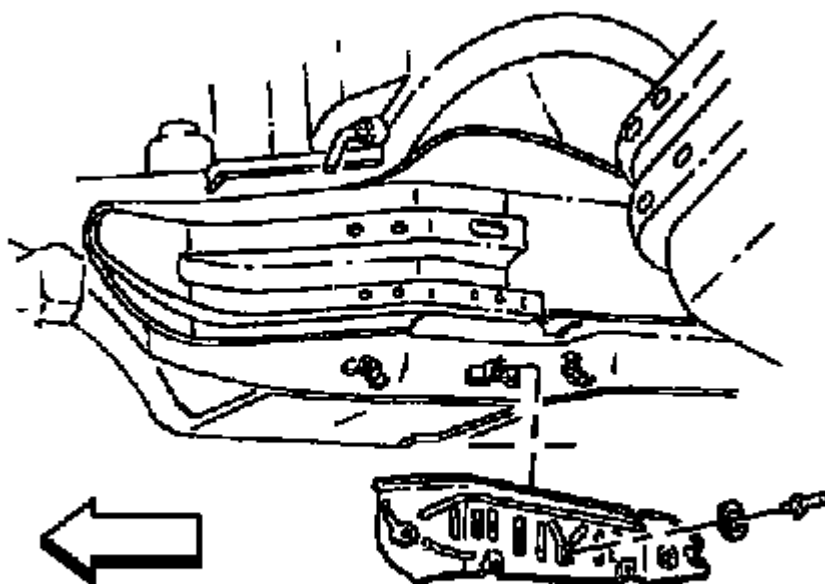


Fig. 26: View Of Exhaust Heat Shield
Courtesy of GENERAL MOTORS COMPANY

Catalytic Converter Replacement - Right Side.

2. Drill out the catalytic converter heat shield rivets.
3. Remove the catalytic converter heat shield.

Installation Procedure

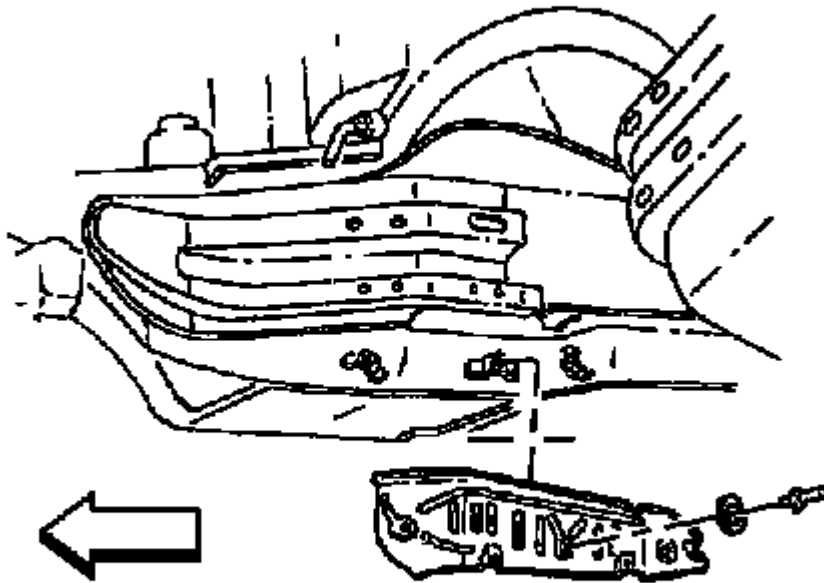


Fig. 27: View Of Exhaust Heat Shield
Courtesy of GENERAL MOTORS COMPANY

1. Install the catalytic converter heat shield.
2. Install new catalytic converter heat shield rivets.
3. Install the catalytic converters. Refer to **Catalytic Converter Replacement - Left Side** and **Catalytic Converter Replacement - Right Side.**

REAR BODY EXHAUST HEAT SHIELD REPLACEMENT

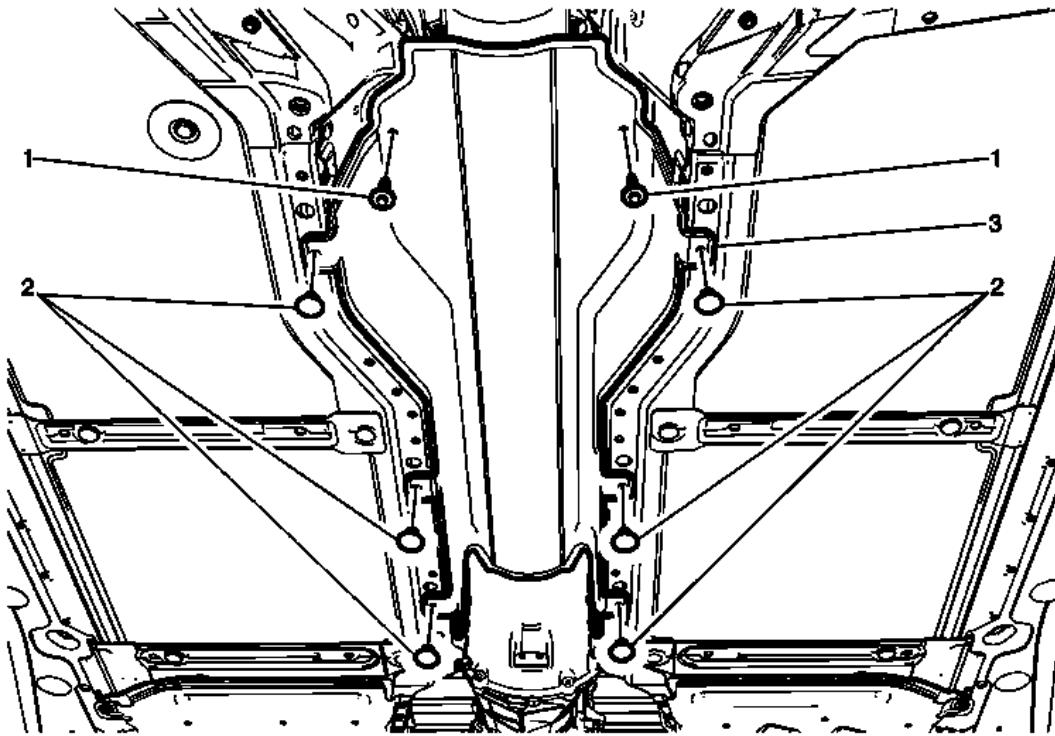


Fig. 28: Rear Body Exhaust Heat Shield
 Courtesy of GENERAL MOTORS COMPANY

Rear Body Exhaust Heat Shield Replacement

Callout	Component Name
Preliminary Procedure Remove the exhaust intermediate pipe. Refer to Intermediate Pipe Replacement .	
1	Rear Body Exhaust Heat Shield Fasteners (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 2.5 (22 lb in)
2	Rear Body Exhaust Heat Shield Plastic Retainers (Qty: 6)
3	Rear Body Exhaust Heat Shield

EXHAUST HEAT SHIELD REPLACEMENT - REAR FASCIA

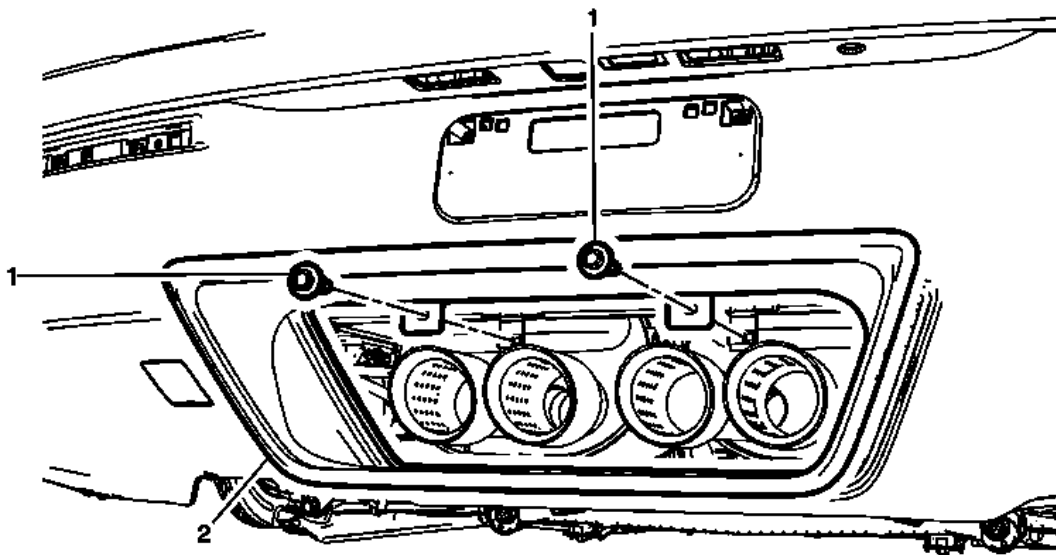


Fig. 29: Exhaust Heat Shield - Rear Fascia
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Heat Shield Replacement - Rear Fascia

Callout	Component Name
1	Rear Body Exhaust Heat Shield Fasteners (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 25 (18 lb ft)
2	Rear Body Exhaust Heat Shield

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - RIGHT SIDE

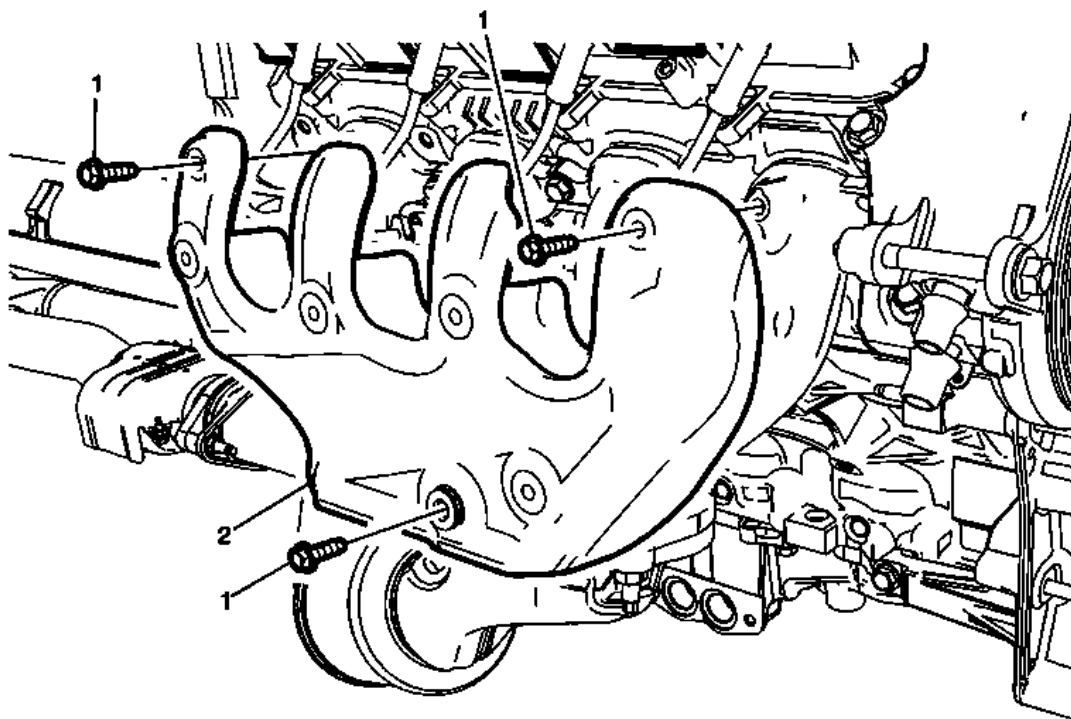


Fig. 30: Exhaust Manifold Heat Shield - Right Side
Courtesy of GENERAL MOTORS COMPANY

Exhaust Manifold Heat Shield Replacement - Right Side

Callout	Component Name
1	Exhaust Manifold Heat Shield Fasteners (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 10 (89 lb in)
2	Exhaust Manifold Heat Shield

EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - LEFT SIDE

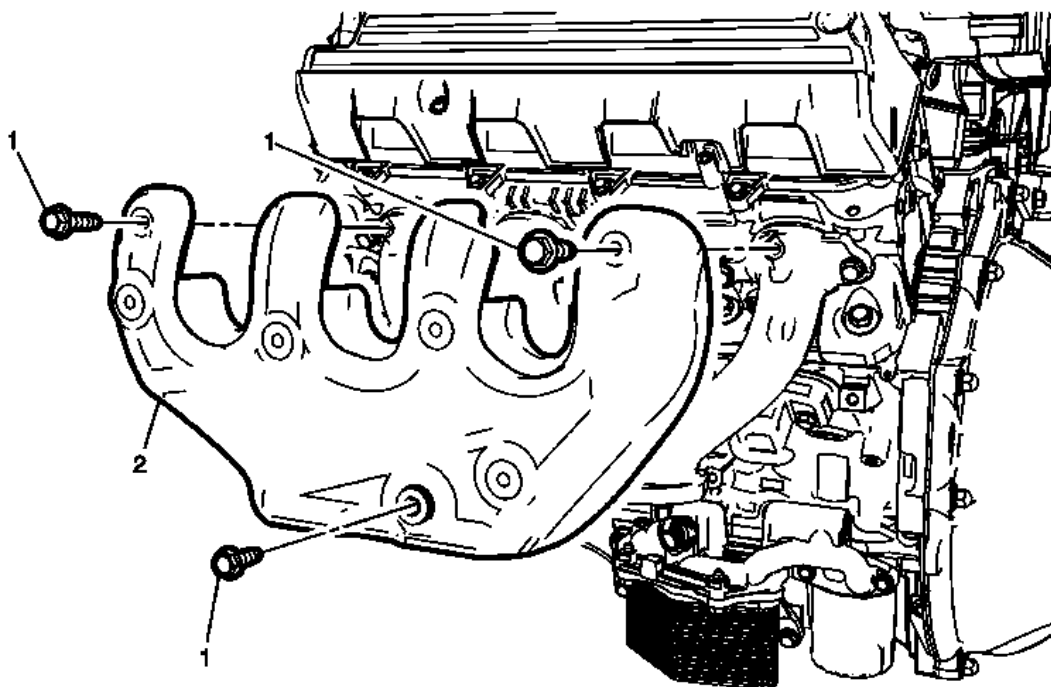


Fig. 31: Exhaust Manifold Heat Shield - Left Side
 Courtesy of GENERAL MOTORS COMPANY

Exhaust Manifold Heat Shield Replacement - Left Side

Callout	Component Name
1	Exhaust Manifold Heat Shield Fasteners (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 10 (89 lb in)
2	Exhaust Manifold 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

Resonator

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

Catalytic Converter

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

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

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

The catalyst in the converter is not serviceable.

Muffler

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

EXHAUST TAIL PIPE FLOW CONTROL SYSTEM DESCRIPTION AND OPERATION

Engine Exhaust Flow Valve System

The engine exhaust flow control valve system has two subsystems:

1. The exhaust tail pipe flow control valve system. Also known as the exhaust sound quality valve control system.
2. The cylinder deactivation exhaust flow control valve system. Also known as the active fuel management exhaust flow valve control system.

Exhaust Tailpipe Flow Control Valve System

The exhaust tailpipe flow control system is used to tune the exhaust note for high performance vehicles. The vehicle is equipped with two tailpipe exhaust valves. One in the left tailpipe and one in the right tailpipe. Each exhaust tailpipe valve is installed in the low restriction exhaust path of a dual outlet muffler, near the exhaust tip.

When a tailpipe exhaust valve is open, the low restriction exhaust path is opened to the atmosphere and the exhaust note becomes more aggressive.

An output circuit from the chassis control module is used to control the actuator that opens the left and right exhaust tailpipe valves. The exhaust flow control valve opens and closes when the chassis control module commands the actuator by pulse width modulation of the control signal.

To provide a more aggressive exhaust note when the vehicle is started, the exhaust tailpipe valves are opened during an engine crank event during specific modes of operation if that option is available. Once the engine is running, accelerator pedal position, transmission gear and engine speed are used to determine the commanded state (open or closed) of the exhaust tailpipe valves.

There are four specific exhaust performance modes that result in different behavior of the exhaust tailpipe valves. These modes are:

1. Winter/Eco Mode: Exhaust tailpipe valves will be closed at all times when the engine is running.
2. Tour Mode: Exhaust tailpipe valves are closed when the engine is idling and during normal/non-aggressive driving. Valves open during aggressive driving.
3. Sport Mode: Exhaust tailpipe valves are open when the engine is idling and during most driving scenarios.
4. Track Mode: Exhaust tailpipe valves are open at all times.

personalization menu, the exhaust tailpipe valves will be put into track mode no matter which vehicle mode (Winter/Eco, Tour, Sport or Track) is displayed on the drivers instrument panel.

Cylinder Deactivation Exhaust Flow Control Valve System

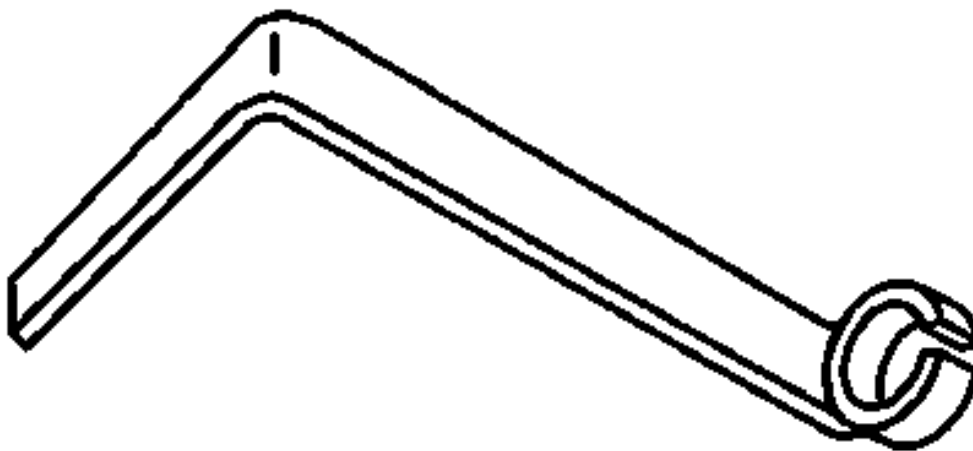
As a means to improve fuel economy, the engine management systems in some vehicle applications include provisions to deactivate half of the engine cylinders under certain operating conditions. For example, under a light load. The cylinder deactivation exhaust flow control valve subsystem is used to mitigate the impact that powertrain engine cylinder deactivation (active fuel management) has on the quality of the exhaust sound.

The cylinder deactivation exhaust flow control system controls the undesirable exhaust noise generated during the cylinder deactivation process. This is achieved through the use of up to two electronically actuated cylinder deactivation exhaust flow control valves in the vehicle exhaust system. The cylinder deactivation exhaust flow control valves are commanded to the closed position by a pulse width modulated signal from the chassis control module in response to active or pending engine cylinder deactivation. When the cylinder deactivation exhaust flow control valves are in the closed position, the engine exhaust flows through a hole machined in the plates integral to the valves. When the engine is operating on all cylinders, the cylinder deactivation exhaust flow control valves are commanded to the open position in order to minimize exhaust restriction. To provide some control hysteresis, once the cylinder deactivation exhaust flow control valves have been commanded to the closed position, they are not reopened until the engine torque reaches a calibrated minimum value that is determined as a function of the driver selectable performance mode.

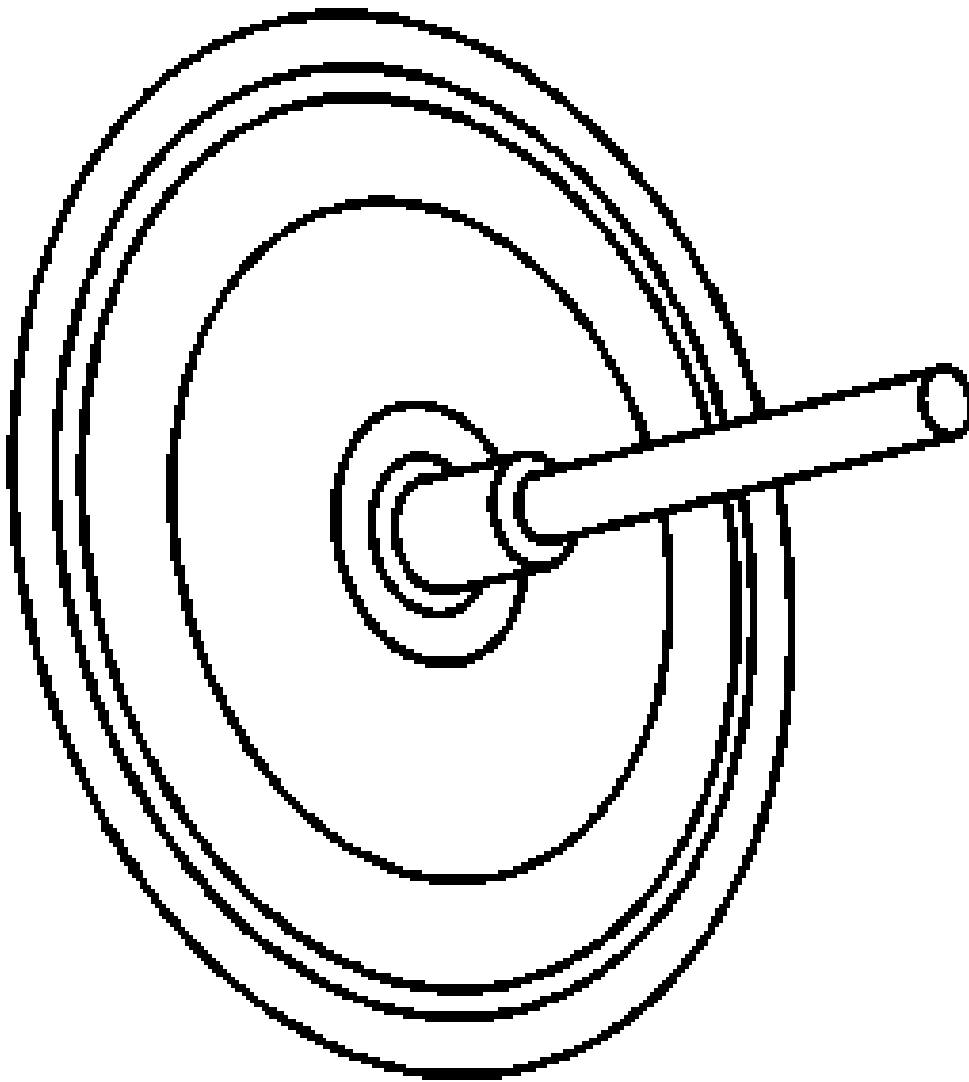
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description



J 35314-A
Exhaust
Back
Pressure
Gauge



J 35555
Vacuum
Pump