

Service Manual: ENGINE EXHAUST SYSTEM

SPECIFICATIONS > FASTENER SPECIFICATIONS

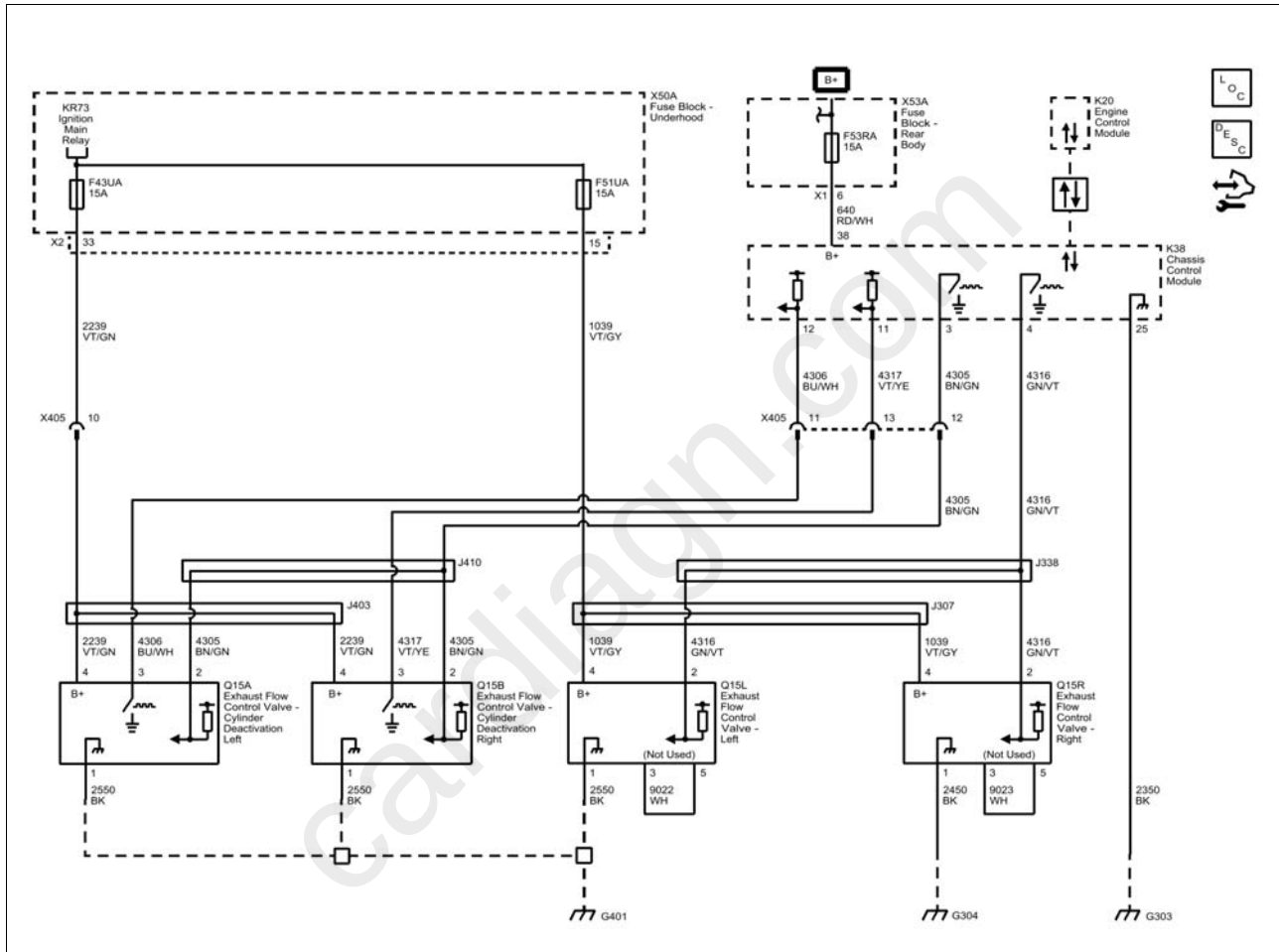
Application	Specification	
	Metric	English
Catalytic Converter Brace (LTG)	22 N.m	16 lb ft
Catalytic Converter Brace Bracket (LGX, LT1)	22 N.m	16 lb ft
Catalytic Converter to Cylinder Head (LGX)	46 N.m	34 lb ft
Catalytic Converter to Exhaust Manifold (LT1)	50 N.m	37 lb ft
Catalytic Converter to Turbocharger Fasteners (LTG)	50 N.m	37 lb ft
Exhaust Clamp (Torca) - Service	50 N.m	37 lb ft
Exhaust Manifold Brace (LTG)	25 N.m	18 lb ft
Exhaust Manifold Fasteners (LTG)		
First Pass	20 N.m	15 lb ft
Second Pass	20 N.m	15 lb ft
Final Pass	20 N.m	15 lb ft
Exhaust Manifold Fasteners (LT1)		
Existing Cylinder Head	23 N.m	17 lb ft
New Cylinder Head	27 N.m	20 lb ft
Exhaust Control Valve Actuator (LT1)	6 N.m	53 lb in
Exhaust Manifold Heat Shield Fasteners (LTG)	14 N.m	10 lb ft
Exhaust Manifold Heat Shield Fasteners (LT1)	10 N.m	89 lb in
Exhaust Muffler to Catalytic Converter (LGX, LT1)	50 N.m	37 lb ft
Exhaust Rear Muffler Hanger Bracket Fasteners	40 N.m	30 lb ft
Floor Panel Cross Bar Fasteners	22 N.m	16 lb ft
Front Axle Propeller Shaft Heat Shield	9 N.m	80 lb in
Front Body Exhaust Heat Shield Fasteners	9 N.m	80 lb in
Intermediate Body Exhaust Heat Shield Fasteners	9 N.m	80 lb in
Rear Body Exhaust Heat Shield to Body Fasteners	9 N.m	80 lb in
Rear Body Exhaust Heat Shield to Fascia Fasteners	3 N.m	26 lb in

SPECIFICATIONS > ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number
Anti-Seize	Lubricant	Refer to Electronics Parts Catalog

SCHEMATIC WIRING DIAGRAMS > EXHAUST SYSTEM WIRING SCHEMATICS > ENGINE EXHAUST FLOW CONTROL

Fig 1: Engine Exhaust Flow Control



Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > DTC DESCRIPTORS



NOTE:

Bank 1 refers to a valve on the left side of the vehicle. Bank 2 refers to a valve on the right side of the vehicle.

DTC P12E3

Cylinder Deactivation Exhaust Flow Valve Control Circuit Open

DTC P12E5

Cylinder Deactivation Exhaust Flow Valve Control Circuit High Voltage

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

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)

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE

> DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Run/Crank Ignition 1 Voltage	-	P12E3, P12E7, P12EB, P12F4, P12F8	-	-
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, P12E5, P12F2, P12FF	-
Ground	-	-	-	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > CONDITIONS FOR RUNNING THE DTC

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > 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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON.

2. Verify DTCs U0109, P2534 or P2535 are not set.

1. If any of these DTCs are set

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

1. If none of these DTCs are set

3. Verify that the cylinder deactivation exhaust flow control valve position not learned DTCs P12F1 or P12FE are not set.

1. If DTC P12F1 or P12FE are set

Perform the Exhaust Flow Control Valve Learn (Cylinder Deactivation Exhaust Flow Control Valve) Exhaust Flow Control Valve Learn (Tail Pipe Exhaust Flow Control Valve) .

1. If DTC P12F1 or P12FE are not set

4. Verify that nothing is preventing the cylinder deactivation exhaust flow control valves from moving freely. Such as debris, binding shafts or any type of damage.

1. If the cylinder deactivation exhaust flow control valves do not move freely

Repair the condition that is preventing the valves from moving freely.

1. If the cylinder deactivation exhaust flow control valves move freely

5. 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. Command the valves open and closed through two key cycles and verify the DTC resets. The valves will make an audible noise when moving.

1. If the cylinder deactivation exhaust flow control valves do not open and close and DTC resets

Refer to Circuit/System Testing

1. If the cylinder deactivation exhaust flow control valves open and close and DTC does not reset

6. All OK.

Cylinder Deactivation Exhaust Flow Control Valve Feedback Circuit
Valve 1 or Valve 2 Scan Tool Position Parameter Conversion Table

Out of Range	Valve Open	In Transition	Valve Closed	Out of Range
0-3	4-27	28-63	64-92	93-100

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > CIRCUIT/SYSTEM TESTING



NOTE:

You must perform the Circuit/System Verification before proceeding with Circuit/System Testing.



NOTE:

Do not replace the chassis control module based on a DTC stored in history. The DTC may be stored but that does not indicate a failure of the chassis control module. Refer to Strategy Based Diagnosis for further history DTC diagnostics.

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connectors at the Q15A Exhaust Flow Control Valve - Cylinder Deactivation Left and the Q15B Exhaust Flow Control Valve - Cylinder Deactivation Right. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 5 Ω between the Q15A Exhaust Flow Control Valve - Cylinder Deactivation Left terminal 1 and ground.

1. If 5 Ω or greater

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

1. If less than 5 Ω

3. Test for less than 5 Ω between the Q15B Exhaust Flow Control Valve - Cylinder Deactivation Right terminal 1 and ground.

1. If 5 Ω or greater

1. Ignition OFF.

2. Test for less than 2 Ω in the ground circuit end to end.

1. If 2 Ω or greater, repair the open/high resistance in the circuit.

2. If less than 2 Ω , repair the open/high resistance in the ground connection.

1. If less than 5 Ω

4. Verify a test lamp illuminates between the Q15A Exhaust Flow Control Valve - Cylinder Deactivation Left Ignition circuit terminal 4 and ground.

1. If the test lamp does not illuminate and the circuit fuse is good

1. Ignition OFF, remove the test lamp.

2. Test for less than 2 Ω in the ignition circuit end to end.

1. If 2 Ω or greater, repair the open/high resistance in the circuit.

2. If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

1. If the test lamp does not illuminate and the circuit fuse is open

1. Ignition OFF, remove the test lamp.

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

1. If less than infinite resistance, repair the short to ground on the circuit.

2. If infinite resistance, replace the Q15A Exhaust Flow Control Valve - Cylinder Deactivation Left.

1. If the test lamp illuminates

5. Verify a test lamp illuminates between the Q15B Exhaust Flow Control Valve - Cylinder Deactivation Right Ignition circuit terminal 4 and ground.

1. If the test lamp does not illuminate and the circuit fuse is good

1. Ignition OFF, remove the test lamp.

2. Test for less than 2 Ω in the ignition circuit end to end.

1. If 2 Ω or greater, repair the open/high resistance in the circuit.

2. If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

1. If the test lamp does not illuminate and the circuit fuse is open

1. Ignition OFF, remove the test lamp.

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

1. If less than infinite resistance, repair the short to ground on the circuit.

2. If infinite resistance, replace the Q15B Exhaust Flow Control Valve - Cylinder Deactivation Left.

1. If the test lamp illuminates

6. Connect a test lamp between the Q15A Exhaust Flow Control Valve - Cylinder Deactivation Left control circuit terminal 2 and B+, ignition ON.
7. Verify the test lamp transitions between dimly illuminated and brightly illuminated when commanding the Cylinder Deactivation Exhaust Flow Control Valves Open and Closed with a scan tool.

1. If the test lamp is always OFF

1. Ignition OFF, disconnect the harness connector at the K38 Chassis Control Module.
2. Test for less than 1 V between the control circuit and ground.
 1. If 1 V or greater, repair the short to voltage on the circuit.
 1. If less than 1 V, replace the K38 Chassis Control Module.
3. Test for less than 2 Ω in the control circuit end to end.
 1. If 2 Ω or greater, repair the open/high resistance in the circuit.
 2. If less than 2 Ω , replace the K38 Chassis Control Module.

1. If the test lamp is always ON

8. Connect a test lamp between the Q15B Exhaust Flow Control Valve - Cylinder Deactivation Right control circuit terminal 2 and B+, ignition ON.
9. Verify the test lamp transitions between dimly illuminated and brightly illuminated when commanding the Cylinder Deactivation Exhaust Flow Control Valves Open and Closed with a scan tool.

1. If the test lamp is always OFF

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 and ground.
 1. If 1 V or greater, repair the short to voltage on the circuit.
 1. If less than 1 V, replace the K38 Chassis Control Module.
3. Test for less than 2 Ω in the control circuit end to end.
 1. If 2 Ω or greater, repair the open/high resistance in the circuit.
 2. If less than 2 Ω , replace the K38 Chassis Control Module.

1. If the test lamp is always ON

1. Ignition OFF, disconnect the harness connector at the K38 Chassis Control Module.
2. Test for infinite resistance between the control circuit and ground.
 1. If less than infinite resistance, repair the short to ground on the circuit.
 2. If infinite resistance, replace the K38 Chassis Control Module.

1. If the test lamp transitions between dimly illuminated and brightly illuminated

10. Ignition OFF and all vehicle systems OFF, disconnect the harness connectors at the left and right Q15 Exhaust Flow Control Valve-Cylinder Deactivation and the K38 Chassis Control Module, ignition ON.

11. Test for less than 1 V between the exhaust flow control valve-cylinder deactivation feedback circuit terminals listed below and ground:

1. K38 Chassis Control Module connector X1 terminal 10

2. K38 Chassis Control Module connector X1 terminal 7

1. If 1 V or greater

Repair the short to voltage on the circuit.

1. If less than 1 V

12. Ignition OFF.

13. Test for infinite resistance between the exhaust flow control valve-cylinder deactivation feedback circuit terminals listed below and ground:

1. K38 Chassis Control Module connector X1 terminal 10

2. K38 Chassis Control Module connector X1 terminal 7

1. If less than infinite resistance

Repair the short to ground on the circuit.

1. If infinite resistance

14. Test for less than 2 Ω between the exhaust flow control valve-cylinder deactivation feedback circuit terminals listed below:

1. K38 Chassis Control Module connector X1 terminal 10 and Q15A Exhaust Flow Control Valve-Cylinder Deactivation Left terminal 3

2. K38 Chassis Control Module connector X1 terminal 7 and Q15B Exhaust Flow Control Valve-Cylinder Deactivation Right terminal 3

1. If 2 Ω or greater

Repair the open/high resistance in the circuit.

1. If less than 2 Ω

15. Replace the appropriate exhaust flow control valve-cylinder deactivation actuator left or right (Bank 1 or Bank 2) as referred to by the DTC that is set.

16. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.

1. If the DTC sets

Replace the K38 Chassis Control Module.

1. If the DTC does not set

17. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P12E3-P12E9, P12EA-P12EF, P12F0-P12F9, OR P12FA-P12FF: CYLINDER DEACTIVATION EXHAUST FLOW VALVE > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Exhaust Control Valve Actuator Replacement (Front Valves with Performance Exhaust) Exhaust Control Valve Actuator Replacement (Rear Valves with Performance Exhaust)
- Exhaust Flow Control Valve Learn (Cylinder Deactivation Exhaust Flow Control Valve) Exhaust Flow Control Valve Learn (Tail Pipe Exhaust Flow Control Valve)
- Control Module References for chassis control module replacement, programming, and setup.

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - ENGINE EXHAUST

- Review the exhaust system description in order to familiarize yourself with the exhaust system components and the intended function of the components.
- All diagnostics on a vehicle should follow a logical process. Strategy Based Diagnostics is a uniform approach for repairing all systems. The diagnostic flow is the place to start when repairs are necessary and may always be used in order to resolve a system problem. For a detailed explanation, refer to Strategy Based Diagnosis .

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - ENGINE EXHAUST > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - ENGINE EXHAUST > INTERMITTENT

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

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - ENGINE EXHAUST > 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
- Exhaust note not changing - Bi-modal exhaust system, if equipped.
Refer to Exhaust Flow Control System Malfunction
- Exhaust squeaking or rattle - Bi-modal exhaust system, if equipped.
Refer to Exhaust Tail Pipe Flow Control System Description and Operation

DIAGNOSTIC INFORMATION AND PROCEDURES > EXHAUST FLOW CONTROL SYSTEM MALFUNCTION > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > EXHAUST FLOW CONTROL SYSTEM MALFUNCTION > DIAGNOSTIC FAULT INFORMATION

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

DIAGNOSTIC INFORMATION AND PROCEDURES > EXHAUST FLOW CONTROL SYSTEM MALFUNCTION > CIRCUIT/SYSTEM DESCRIPTION

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

DIAGNOSTIC INFORMATION AND PROCEDURES > EXHAUST FLOW CONTROL SYSTEM MALFUNCTION > 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

DIAGNOSTIC INFORMATION AND PROCEDURES > EXHAUST FLOW CONTROL SYSTEM MALFUNCTION > 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.

1. If the exhaust flow control valves do not open and close

Refer to Circuit/System Testing

1. If the exhaust flow control valves open and close

3. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > EXHAUST FLOW CONTROL SYSTEM MALFUNCTION > 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.
 1. If any of these DTCs are set

Refer to Diagnostic Trouble Code (DTC) List - Vehicle .
 1. If none of these DTCs are set
3. Ignition OFF, disconnect the harness connectors at the components listed below.
 1. Q15L Exhaust Flow Control Valve - Left
 2. Q15R Exhaust Flow Control Valve - Right
4. Test for less than 5 Ω between each ground circuit terminal 1 and ground.

1. If 5 Ω or greater

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

1. If less than 5 Ω

5. Verify a test lamp illuminates between the ignition circuit terminal 4 and ground.

1. If the test lamp does not illuminate and the circuit fuse is good

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

1. 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.
 1. If less than infinite resistance, repair the short to ground on the circuit.
 2. If infinite resistance, test or replace the appropriate exhaust flow control valve.

1. 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.

1. 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.
 1. If less than infinite resistance, repair the short to ground on the circuit.
 1. If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
 1. If 2 Ω or greater, repair the open/high resistance in the circuit.
 2. If less than 2 Ω , replace the K38 Chassis Control Module.

1. 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.
 1. If 1 V or greater, repair the short to voltage on the circuit.
 2. If less than 1 V, replace the K38 Chassis Control Module.

1. If the test lamp turns ON and OFF

8. Test or replace the appropriate exhaust flow control valve.

DIAGNOSTIC INFORMATION AND PROCEDURES > EXHAUST FLOW CONTROL SYSTEM MALFUNCTION > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

Control Module References for control module replacement, programming, and setup.

DIAGNOSTIC INFORMATION AND PROCEDURES > RESTRICTED EXHAUST > DIAGNOSTIC AIDS



WARNING:

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

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



NOTE:

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

DIAGNOSTIC INFORMATION AND PROCEDURES > RESTRICTED EXHAUST > TEST DESCRIPTION

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

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. 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.	14 kPa (2 psi)	Go to Step 6	Go to Step 7

	- Remove the J-35314-A Exhaust Back Pressure Gauge. - Re-install the AIR check valve/HO2S sensor. Refer to the affected component's service procedure. - Remove the post-catalyst HO2S sensor. Refer to the affected component's service procedure. - Install the J-35314-A Exhaust Back Pressure Gauge in place of the post HO2S sensor. - Start the engine. - Increase and monitor the engine speed at 2,000 RPM. - Observe the exhaust system back pressure reading on the gauge. Does the reading exceed the specified value?			
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	- Remove the J-35314-A Exhaust Back Pressure Gauge. - Reinstall the AIR check valve or the post-catalyst HO2S sensor. Refer to the affected component's service procedure - Clear any codes. - Road test the vehicle in order to	-	System OK	Go to Step 2

	verify the repair.			
	Did you correct the condition?			

DIAGNOSTIC INFORMATION AND PROCEDURES > EXHAUST LEAKAGE

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

Irregularities at the mating surfaces on the flange connections	Repair as required or replace the affected component. Refer to the affected components procedure for service.
Exhaust manifold cracked or broken	Replace the exhaust manifold. Refer to the affected component's procedure for service.
Exhaust system component connection welds leaking	Replace the leaking component. Refer to the affected component's procedure for service.
Muffler or resonator (if equipped) damaged or leaking at the seams	Replace the affected muffler or resonator. Refer to the affected component's procedure for service.

DIAGNOSTIC INFORMATION AND PROCEDURES > EXHAUST NOISE

Condition	Action
WARNING: <i>While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system.</i>	
DEFINITION: An audible or physical noise due to a faulty component or damaged components causing a loose or misaligned exhaust system resulting in a rattle or vibration noise, i.e. buzz, groan, hum. Refer to Symptoms - Engine Exhaust prior to beginning this table.	
Popping or hissing noise	Exhaust leak. Refer to Exhaust Leakage .
Loud exhaust	1. Compare to a known good vehicle. 2. Inspect for a damaged or failed muffler. 3. Repair or replace the affected component. Refer to the affected component's service procedure.
External rattle or vibration noise	1. Inspect for a bent or loose hanger, loose heat shield, or loose clamp. 2. Inspect for an exhaust pipe causing interference. 3. Repair or replace the affected component. Refer to the affected component's service procedure.
Internal rattle	1. Test the components by tapping with a

rubber mallet to confirm a rattle.

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

REPAIR INSTRUCTIONS > EXHAUST 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.

REPAIR INSTRUCTIONS > EXHAUST FLOW CONTROL VALVE LEARN (CYLINDER DEACTIVATION EXHAUST FLOW CONTROL VALVE) > 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.

REPAIR INSTRUCTIONS > 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.

REPAIR INSTRUCTIONS > EXHAUST FLOW CONTROL VALVE LEARN (TAIL PIPE EXHAUST FLOW CONTROL VALVE) > 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.

REPAIR INSTRUCTIONS > EXHAUST MANIFOLD REPLACEMENT (LTG) > REMOVAL PROCEDURE

 WARNING:

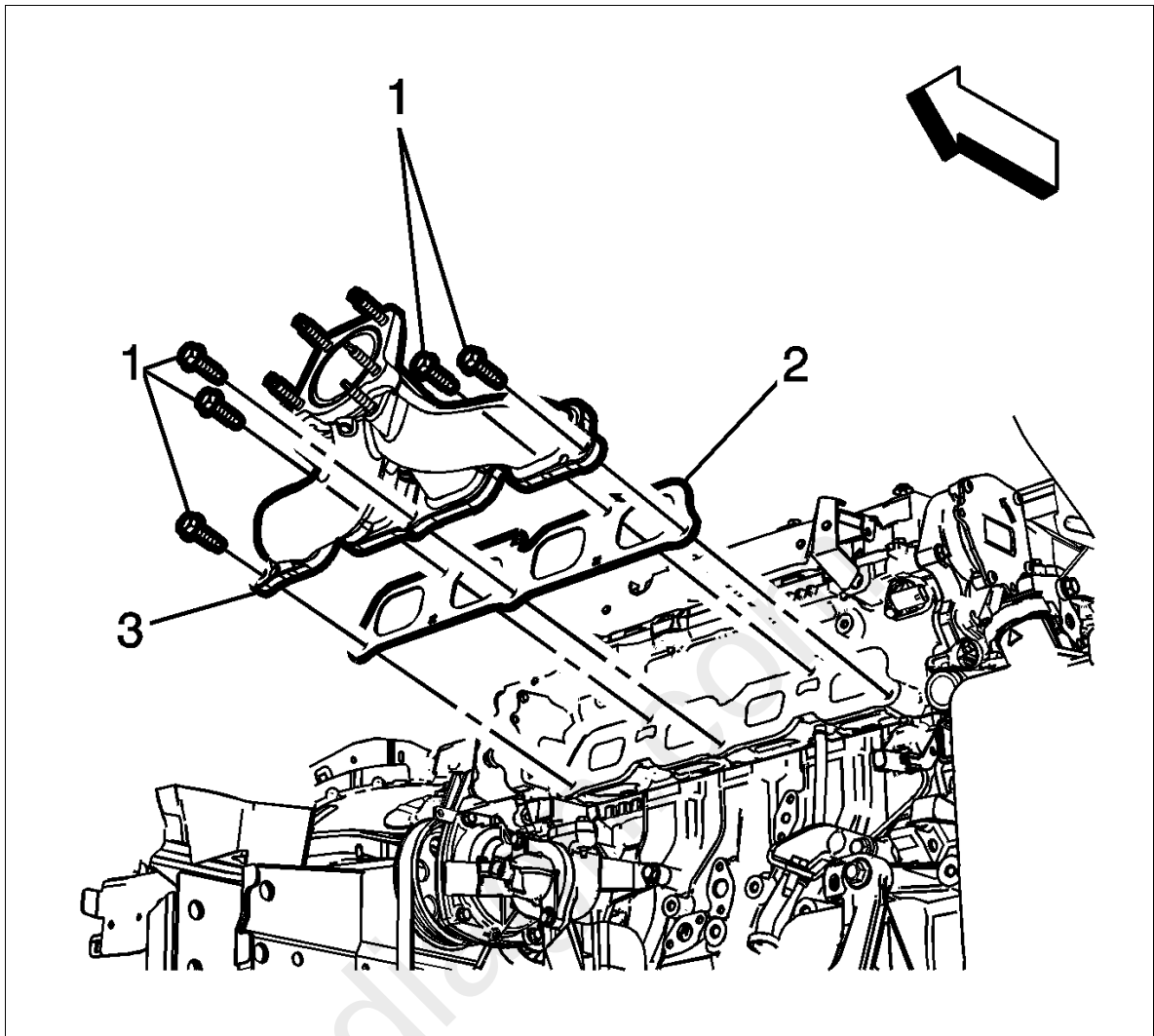
Refer to Exhaust Service Warning .

 WARNING:

Refer to Eye Protection Warning .

1. Remove the exhaust manifold heat shield. Refer to Exhaust Manifold Heat Shield Replacement (LTG) .
2. Remove the turbocharger. Refer to Turbocharger Replacement .
3. Remove the exhaust manifold brace. Refer to Exhaust Manifold Brace Replacement (LTG) .

Fig 1: Exhaust Manifold



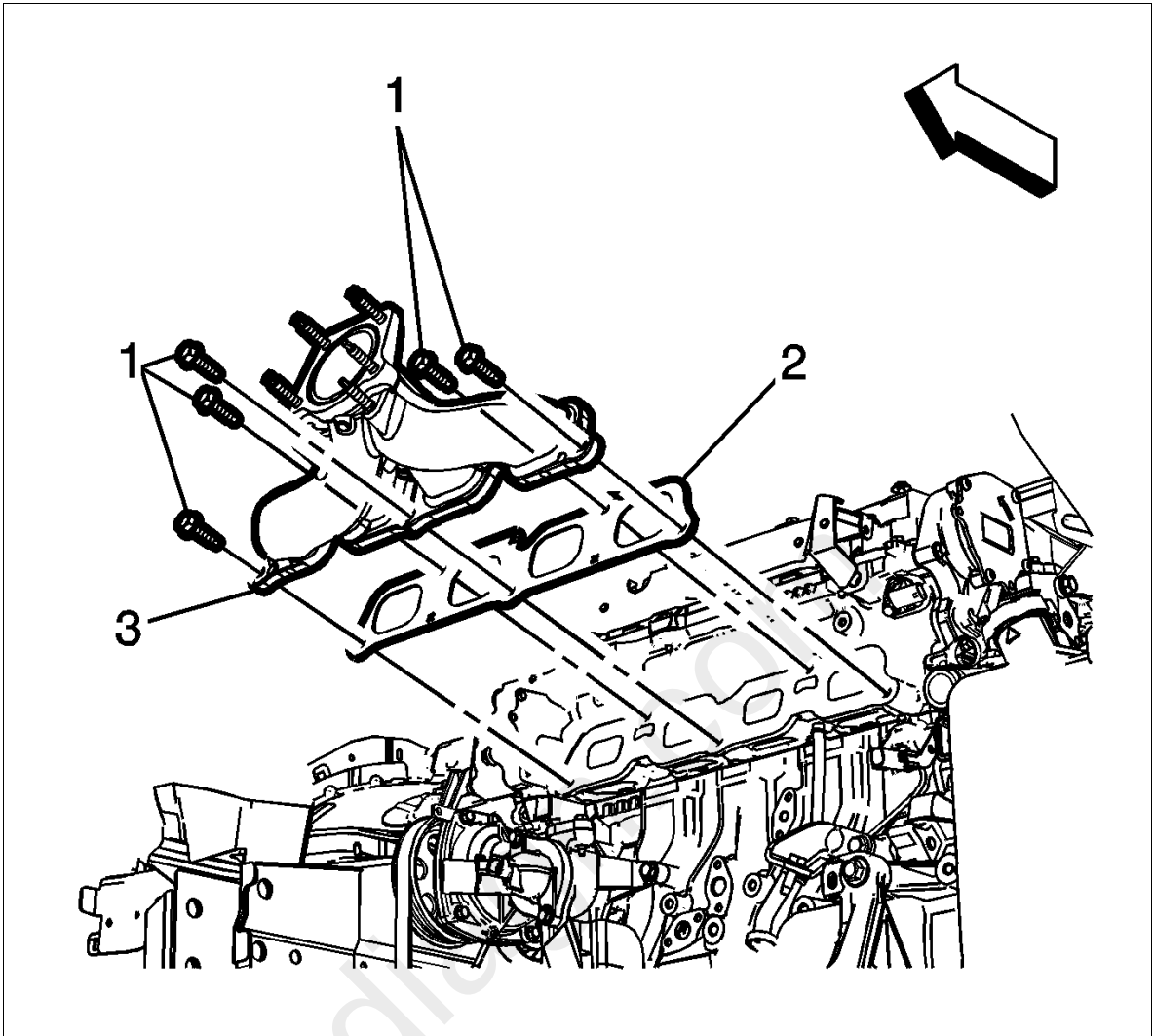
Courtesy of GENERAL MOTORS COMPANY

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

REPAIR INSTRUCTIONS > EXHAUST MANIFOLD REPLACEMENT (LTG) > INSTALLATION PROCEDURE

1. Clean all mating surfaces.

Fig 1: Exhaust Manifold



Courtesy of GENERAL MOTORS COMPANY

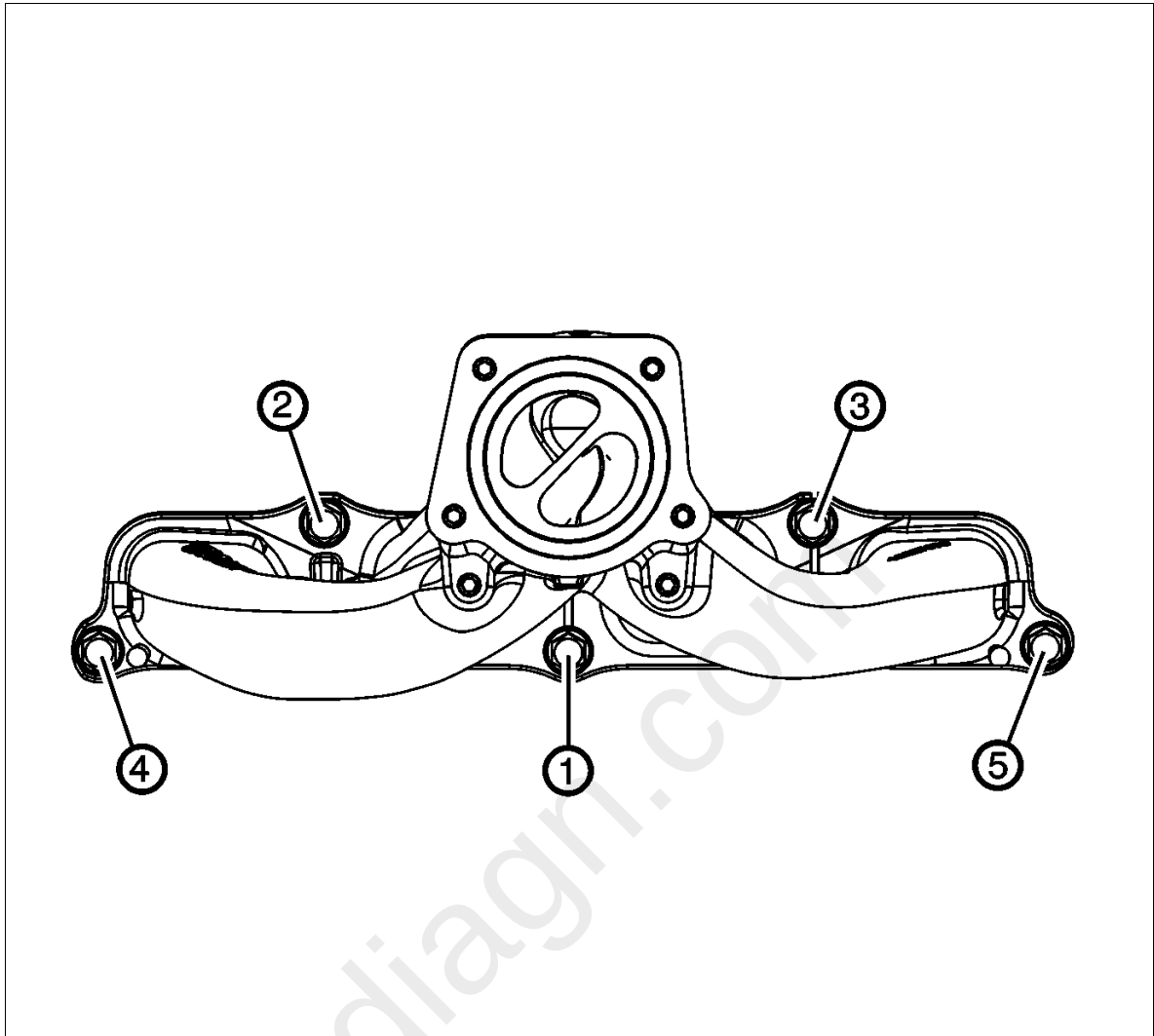
2. Install the exhaust manifold (3) to the cylinder head with a NEW gasket (2).

 NOTE:

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

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

Fig 2: Exhaust Manifold Bolt Tightening Sequence



Courtesy of GENERAL MOTORS COMPANY

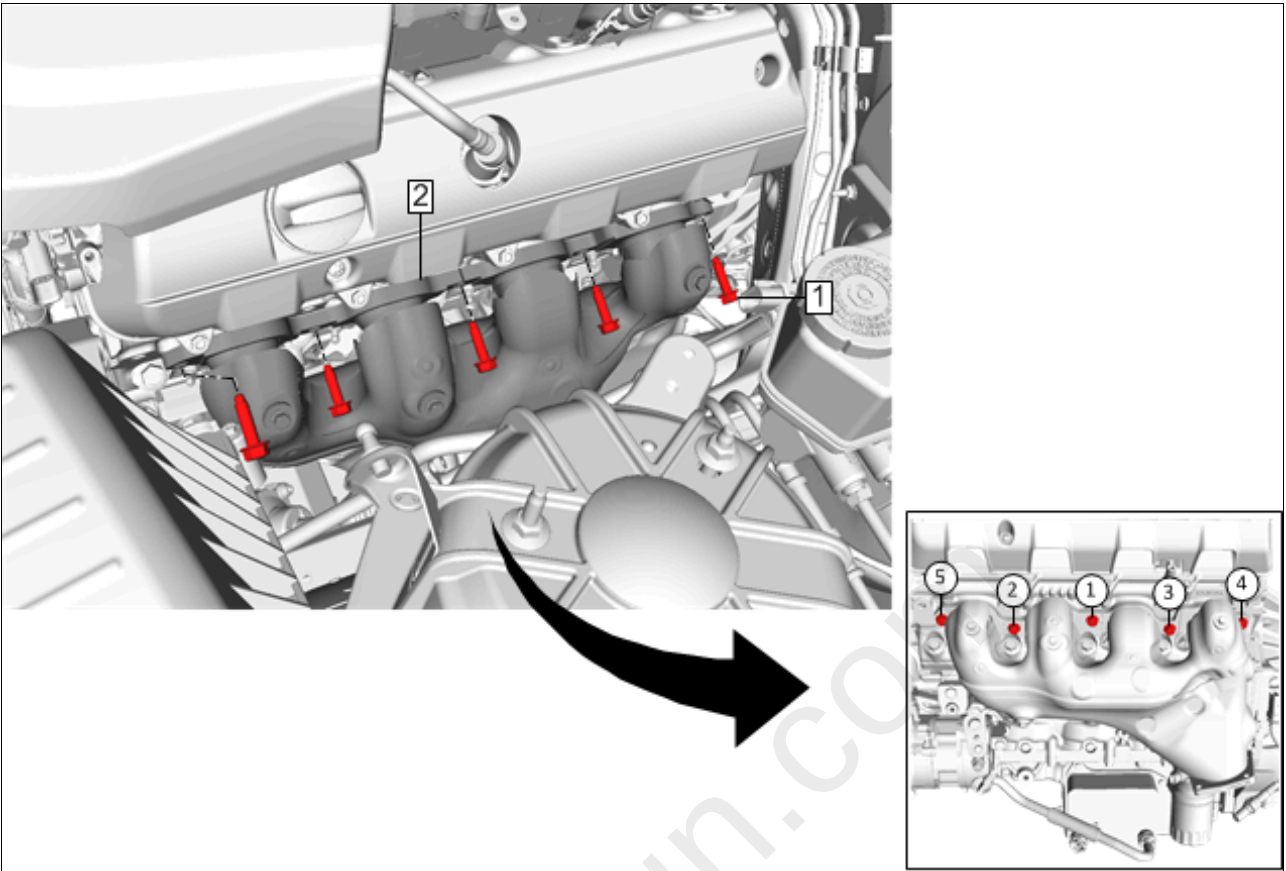


CAUTION:

Refer to Fastener Caution .

4. Tighten the exhaust manifold fasteners in 3 passes in the sequence shown to 20 N.m (15 lb ft).
5. Install the exhaust manifold brace. Refer to Exhaust Manifold Brace Replacement (LTG) .
6. Install the turbocharger. Refer to Turbocharger Replacement .
7. Install the exhaust manifold heat shield. Refer to Exhaust Manifold Heat Shield Replacement (LTG) .

Fig 1: Exhaust Manifold - Left Side



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: <i>Refer to Hot Exhaust System Warning .</i>	
Preliminary Procedures 1. Air Cleaner Assembly Replacement 2. Disconnect Spark Plug Wire at Spark Plug - Spark Plug Wire Replacement 3. Disconnect Catalytic Converter at Exhaust Manifold - Catalytic Converter Replacement - Left Side (LT1) 4. Exhaust Manifold Heat Shield Replacement - Left Side (LT1, Upper) Exhaust Manifold Heat Shield Replacement - Left Side (LT1, Lower)	
1	Exhaust Manifold Fastener (Qty: 5)

CAUTION:

Refer to Fastener Caution .

Tighten in sequence

- Existing Cylinder Head - 23 N.m (17 lb ft)
- NEW Cylinder Head - 27 N.m (20 lb ft)

2

Exhaust Manifold

Procedure

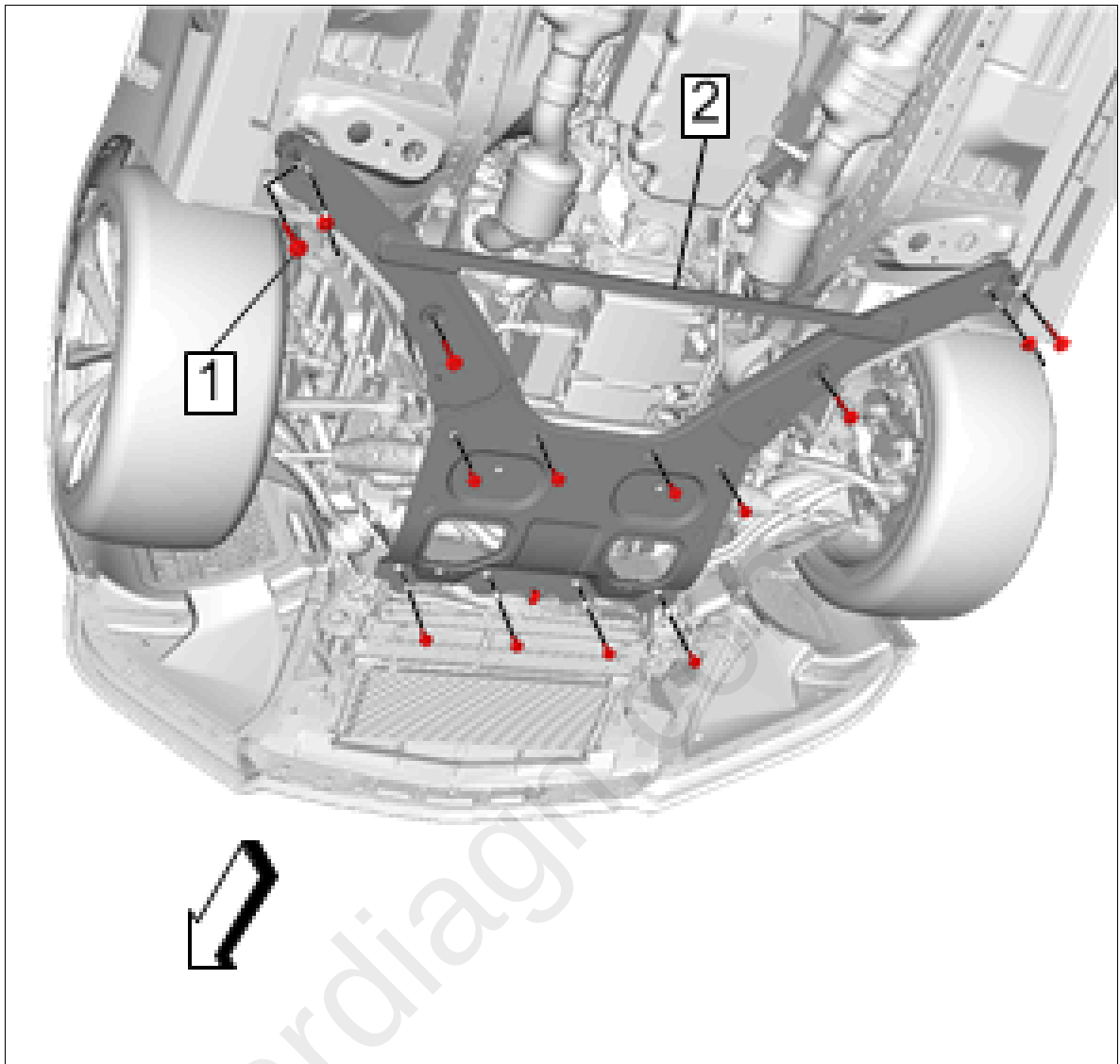
1. Clean the exhaust manifold sealing surface.
2. Install a NEW exhaust manifold gasket.

**REPAIR INSTRUCTIONS > EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE (LT1)
> REMOVAL PROCEDURE**

 WARNING:

Refer to Hot Exhaust System Warning .

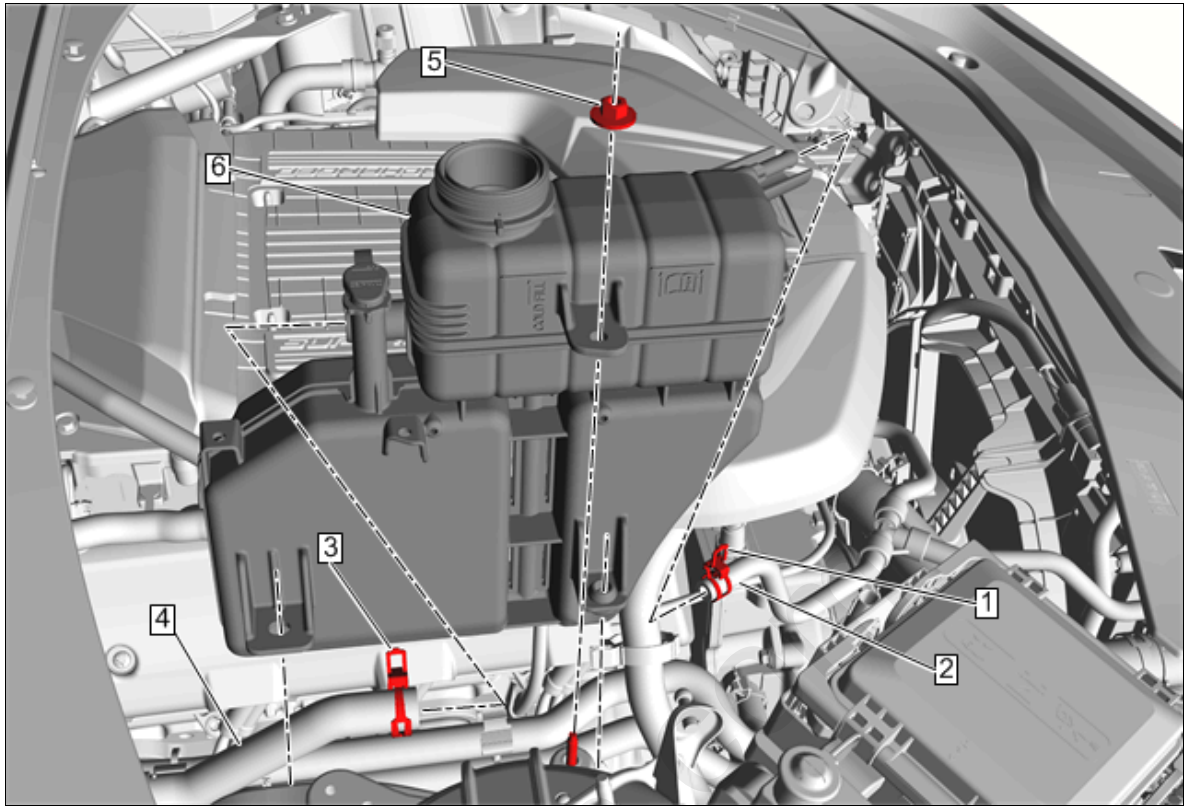
Fig 1: Front Cradle Shear Plate Fastener



Courtesy of GENERAL MOTORS COMPANY

1. Remove Front Cradle Shear Plate (2) - Front Cradle Shear Plate Replacement

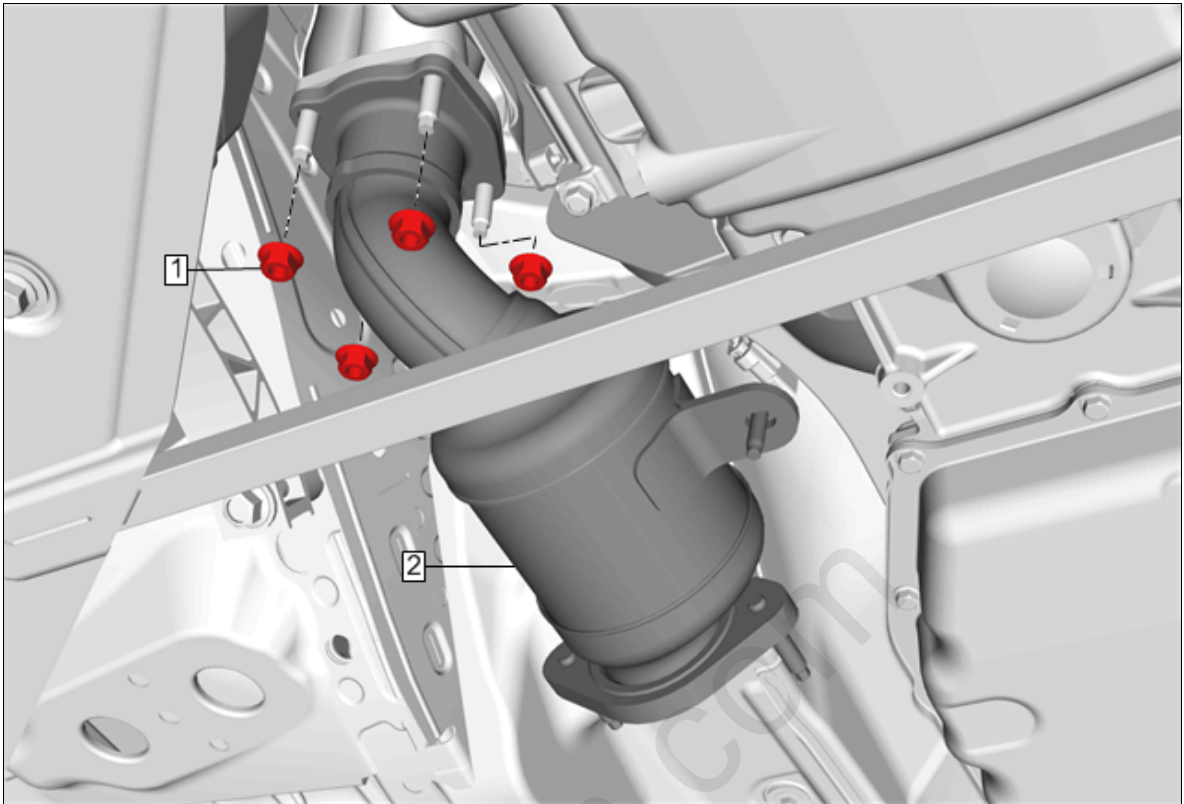
Fig 2: Radiator Surge Tank



Courtesy of GENERAL MOTORS COMPANY

2. Reposition Radiator Surge Tank (6) - Radiator Surge Tank Replacement (LT1)

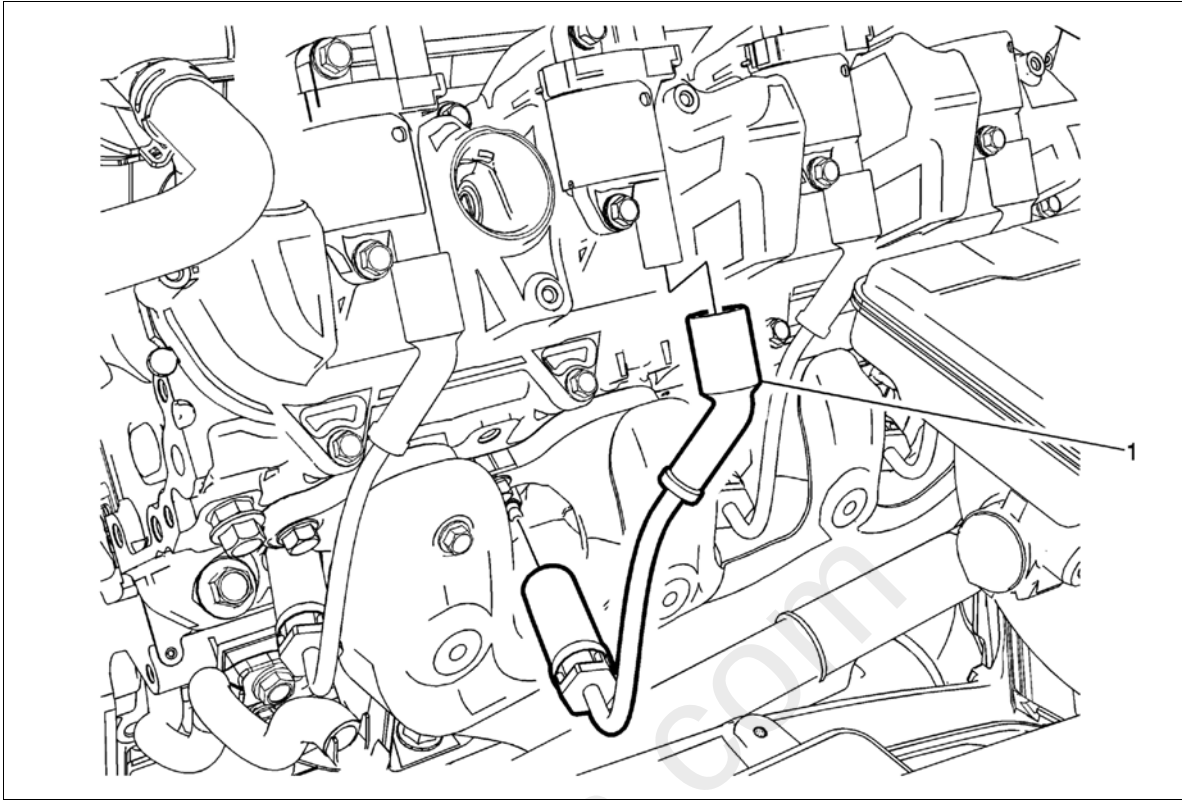
Fig 3: Catalytic Converter - Right Side (LT4)



Courtesy of GENERAL MOTORS COMPANY

3. Disconnect Catalytic Converter (2) at Exhaust Manifold - Catalytic Converter Replacement - Right Side (LT1)

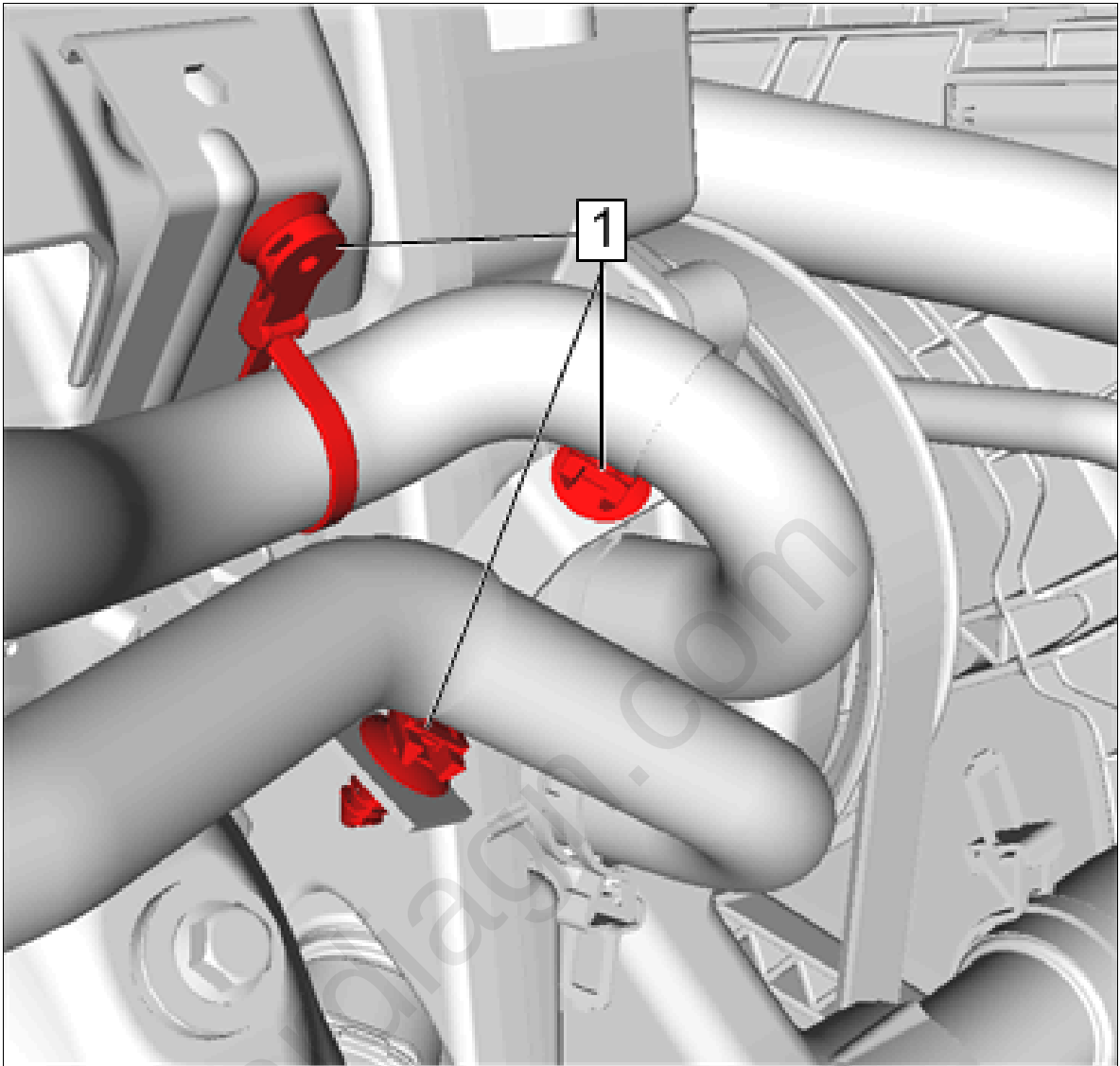
Fig 4: Spark Plug Wire



Courtesy of GENERAL MOTORS COMPANY

4. Remove Spark Plug Wire (1) - Spark Plug Wire Replacement

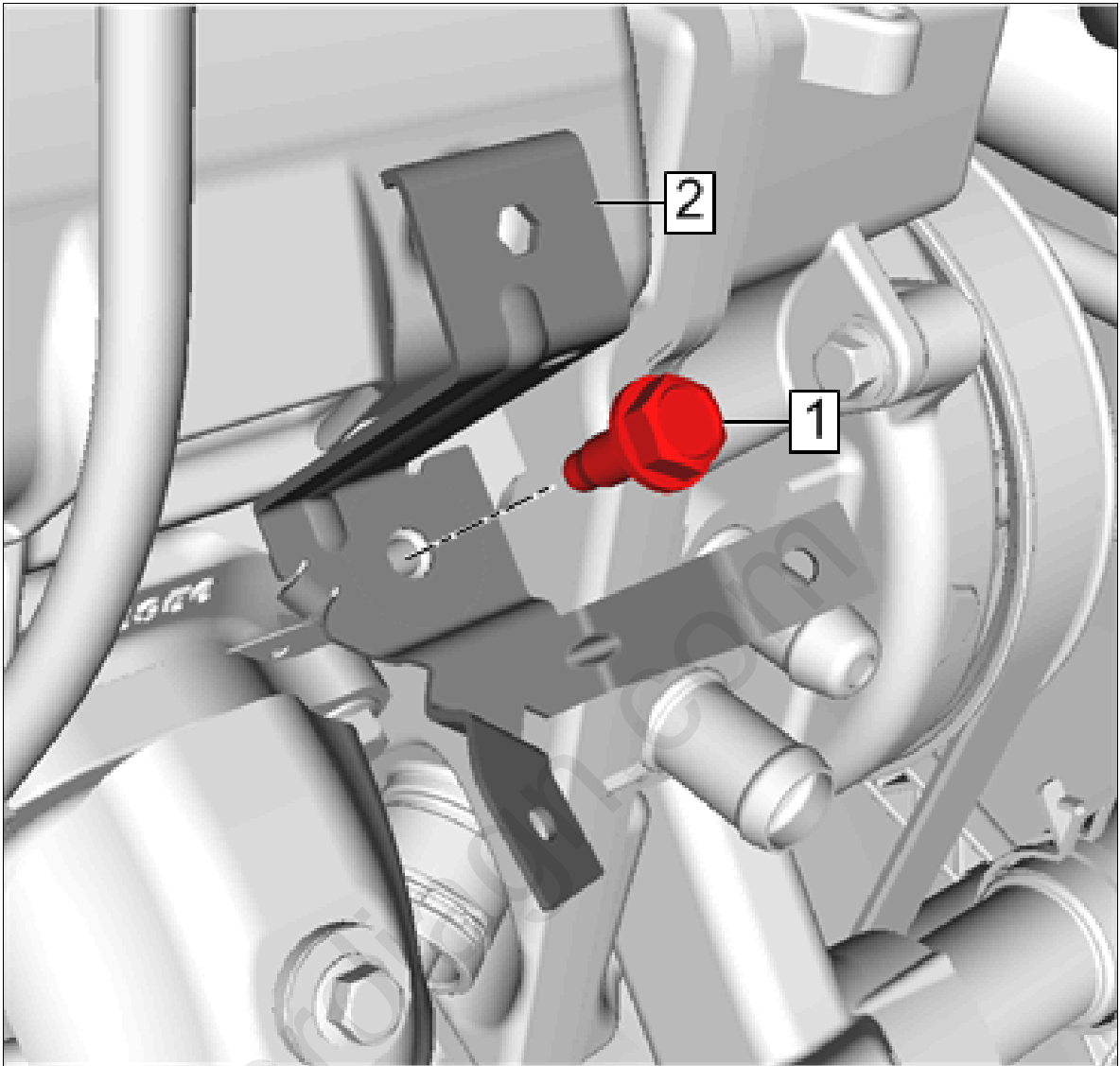
Fig 5: Heater Hose Retainer Clips



Courtesy of GENERAL MOTORS COMPANY

5. Disconnect the heater hose retainer clips (1) from the heater hose bracket.

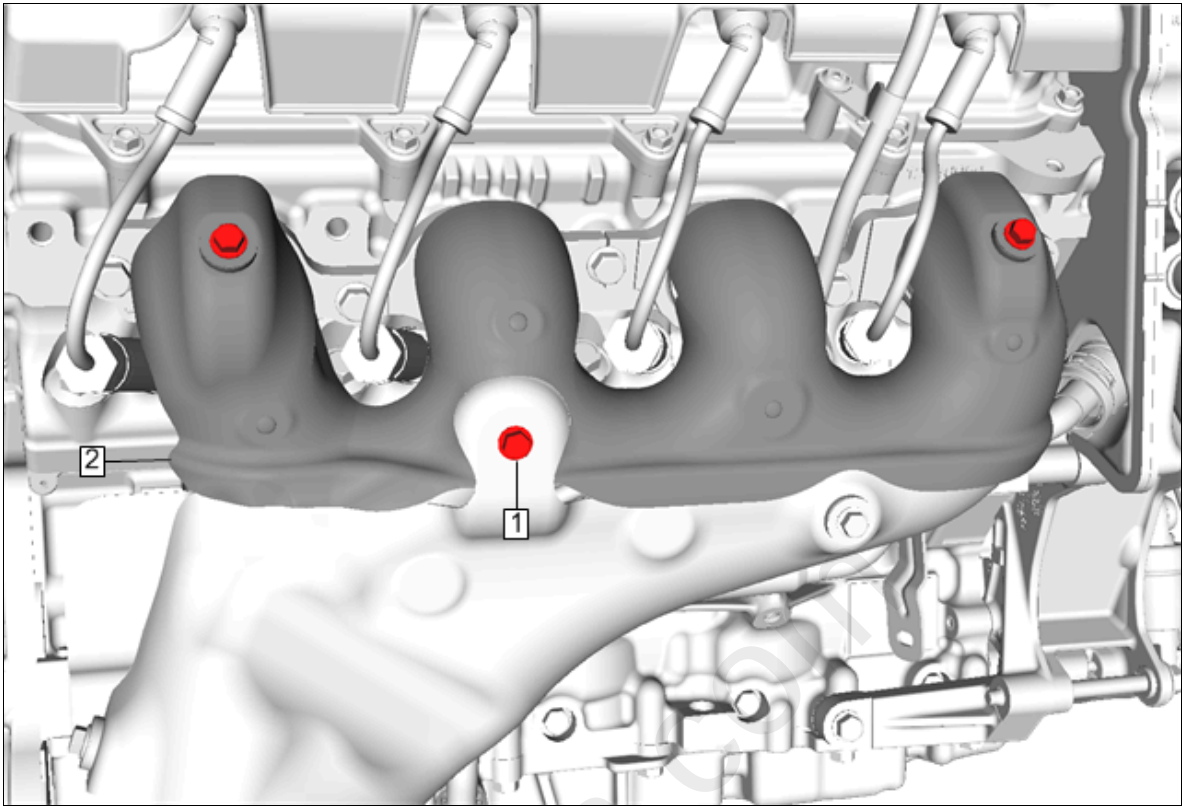
Fig 6: Heater Hose Bracket And Bolt



Courtesy of GENERAL MOTORS COMPANY

6. Remove Heater Hose Bracket Bolt (1)
7. Remove Heater Hose Bracket (2)

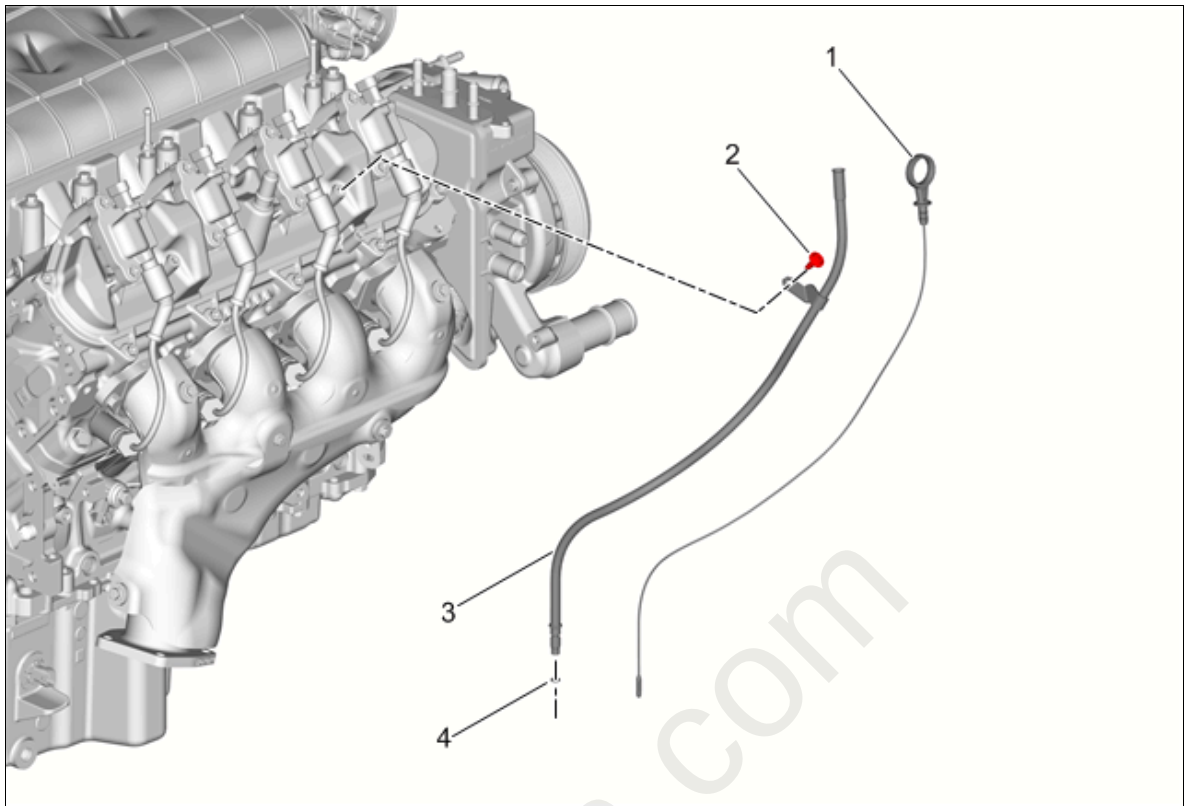
Fig 7: Exhaust Manifold Heat Shield - Right Side (Upper - LT1)



Courtesy of GENERAL MOTORS COMPANY

8. Remove Exhaust Manifold Heat Shield (2) - Exhaust Manifold Heat Shield Replacement - Right Side (Upper, LT1) Exhaust Manifold Heat Shield Replacement - Right Side (Lower, LT1)

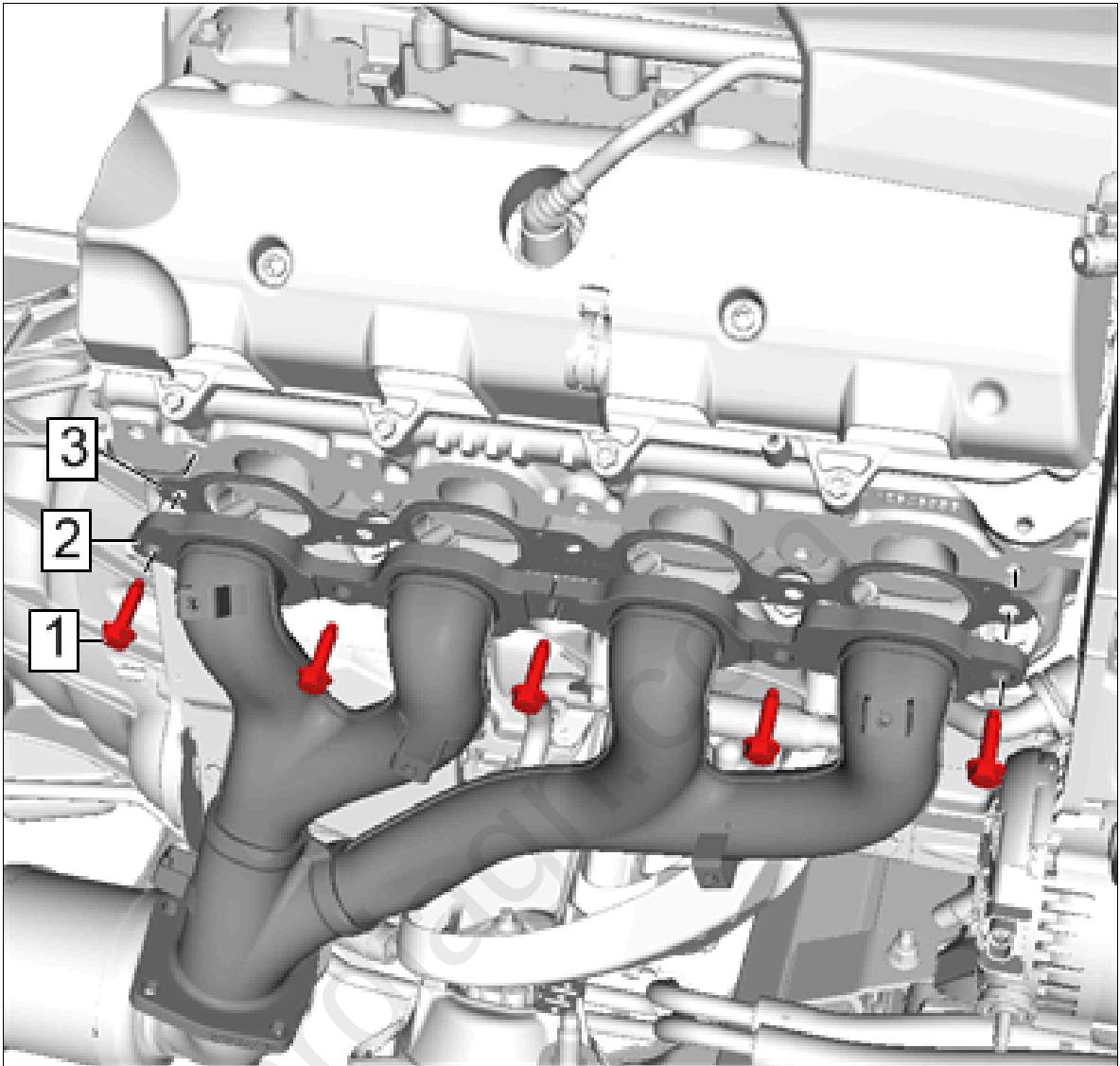
Fig 8: Oil Level Indicator Tube



Courtesy of GENERAL MOTORS COMPANY

9. Remove Oil Level Indicator Tube (3) - Oil Level Indicator Tube Replacement

Fig 9: Exhaust Manifold, Fastener And Gasket

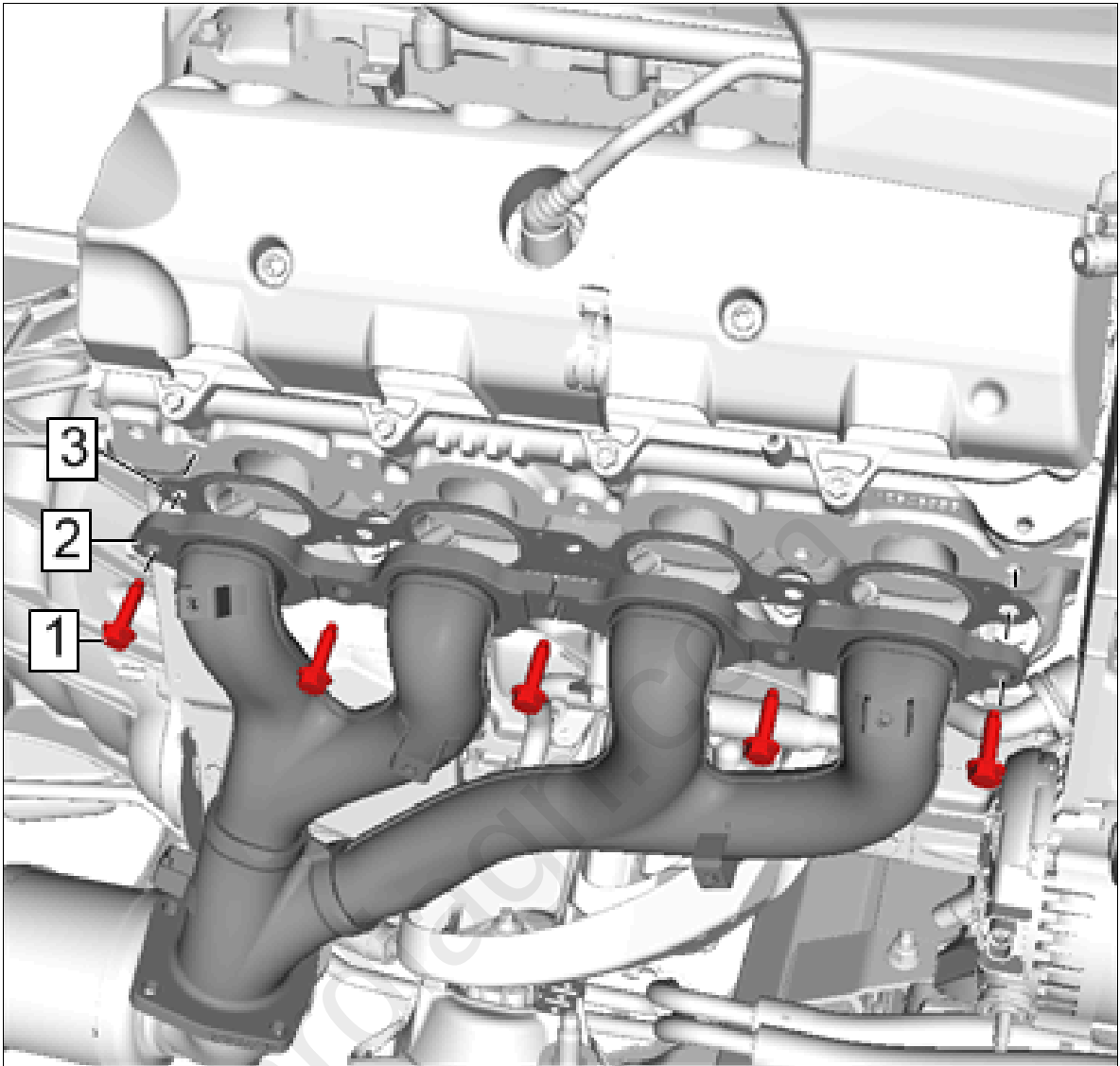


Courtesy of GENERAL MOTORS COMPANY

10. Remove Exhaust Manifold Fastener (1) (Qty: 5)
11. Remove Exhaust Manifold (2)
12. Remove Exhaust Manifold Gasket (3) and DISCARD

**REPAIR INSTRUCTIONS > EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE (LT1)
> INSTALLATION PROCEDURE**

Fig 1: Exhaust Manifold, Fastener And Gasket



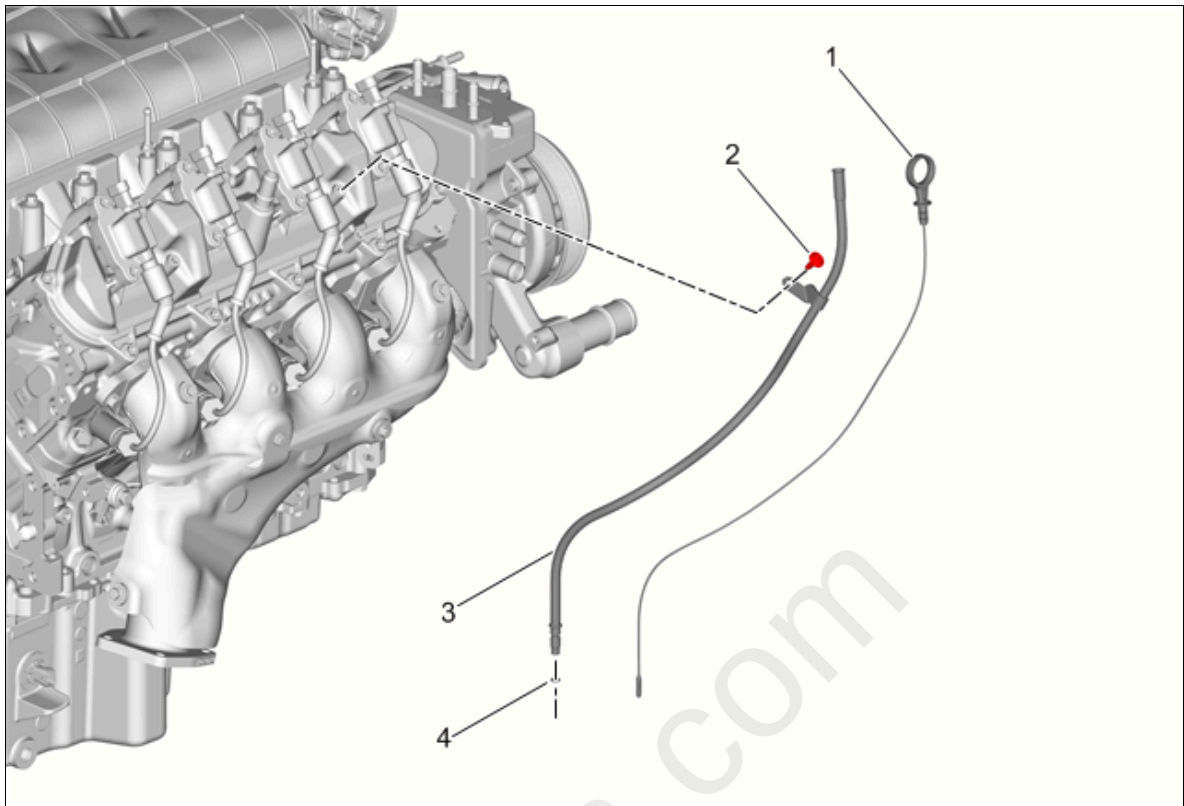
Courtesy of GENERAL MOTORS COMPANY

 **NOTE:**

Install a NEW exhaust manifold gasket.

1. Install Exhaust Manifold Gasket (3)
2. Install Exhaust Manifold (2)
3. Install Exhaust Manifold Fastener (1) (Qty: 5) and hand tighten

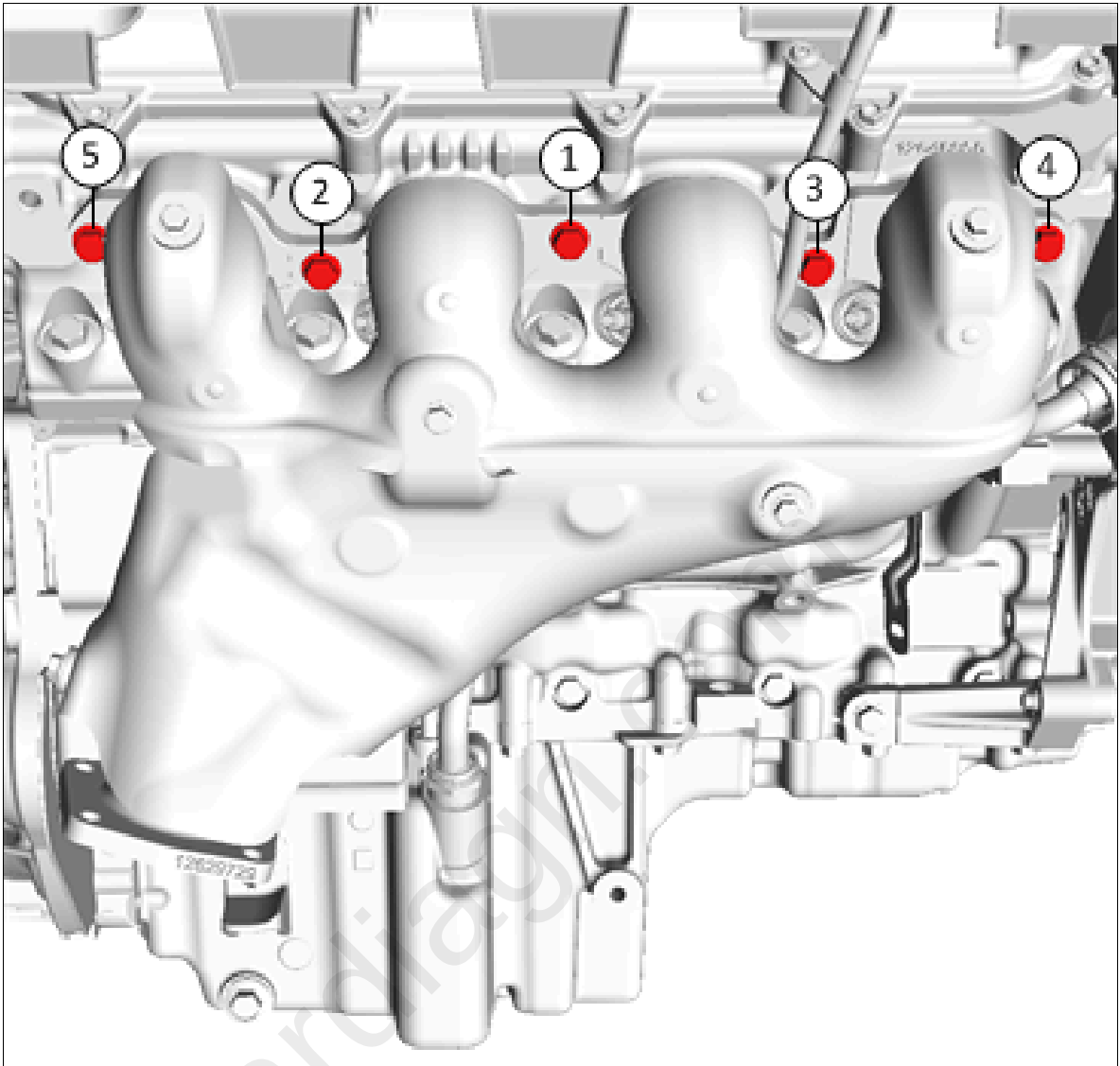
Fig 2: Oil Level Indicator Tube



Courtesy of GENERAL MOTORS COMPANY

4. Install Oil Level Indicator Tube (3) - Oil Level Indicator Tube Replacement

Fig 3: Exhaust Manifold Fasteners



Courtesy of GENERAL MOTORS COMPANY

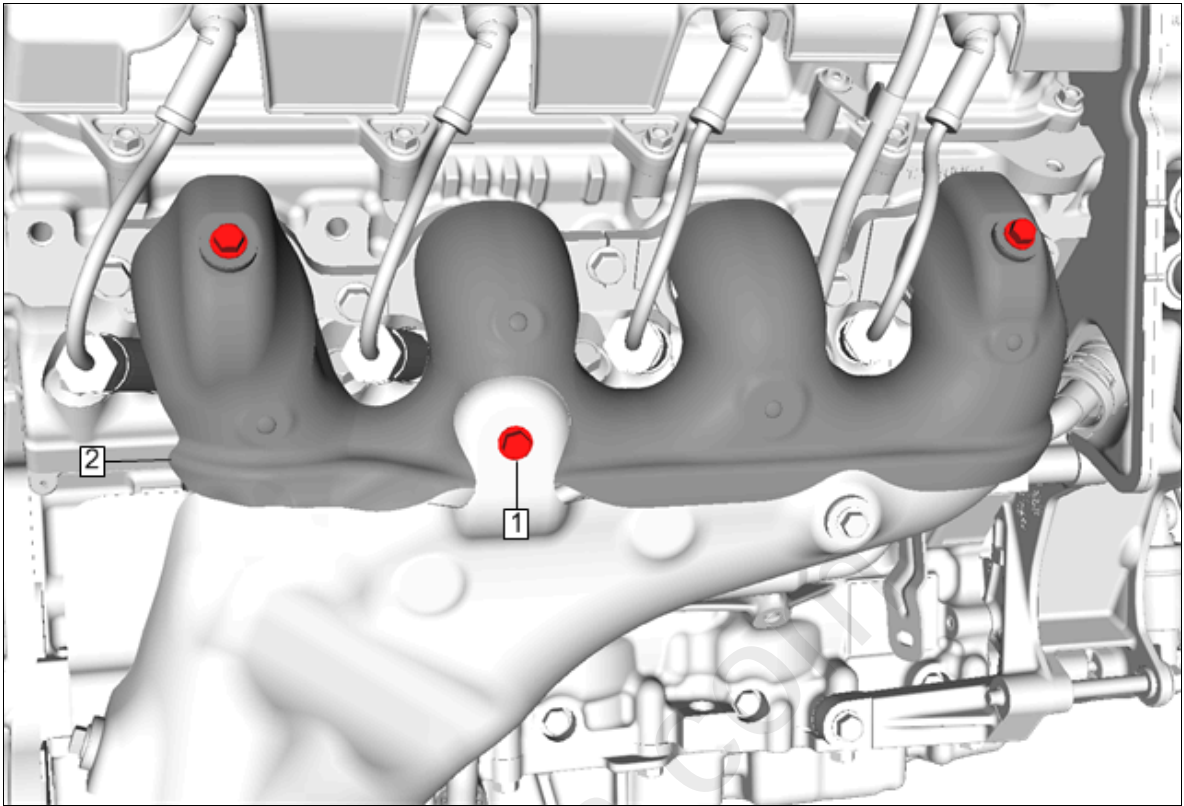
 **CAUTION:**

Refer to Fastener Caution .

5. Tighten the exhaust manifold fasteners in the sequence shown.

1. Existing Cylinder Head - 23 N.m (17 lb ft)
2. NEW Cylinder Head - 27 N.m (20 lb ft)

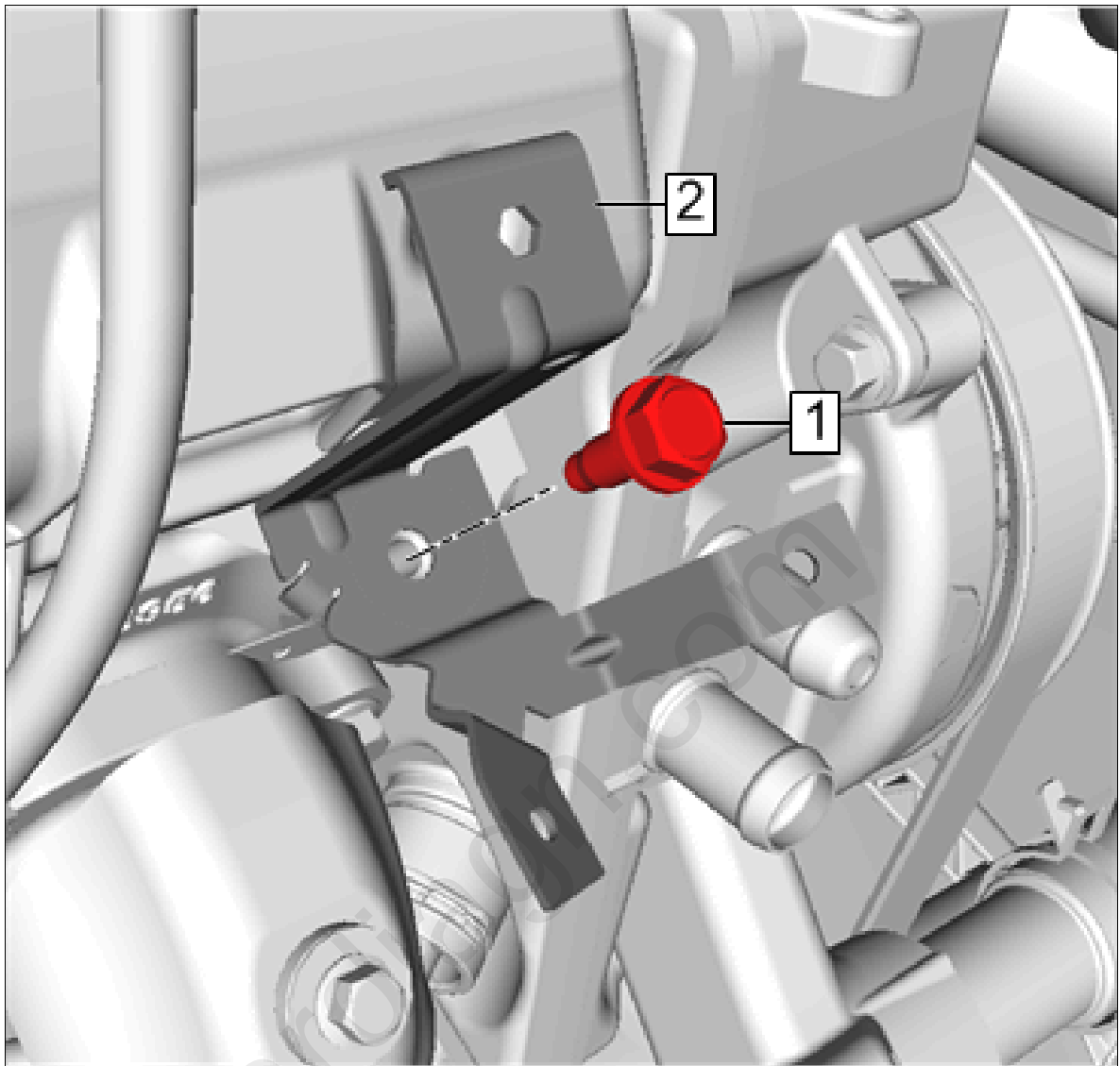
Fig 4: Exhaust Manifold Heat Shield - Right Side (Upper - LT1)



Courtesy of GENERAL MOTORS COMPANY

6. Install Exhaust Manifold Heat Shield (2) - Exhaust Manifold Heat Shield Replacement - Right Side (Upper, LT1) Exhaust Manifold Heat Shield Replacement - Right Side (Lower, LT1)

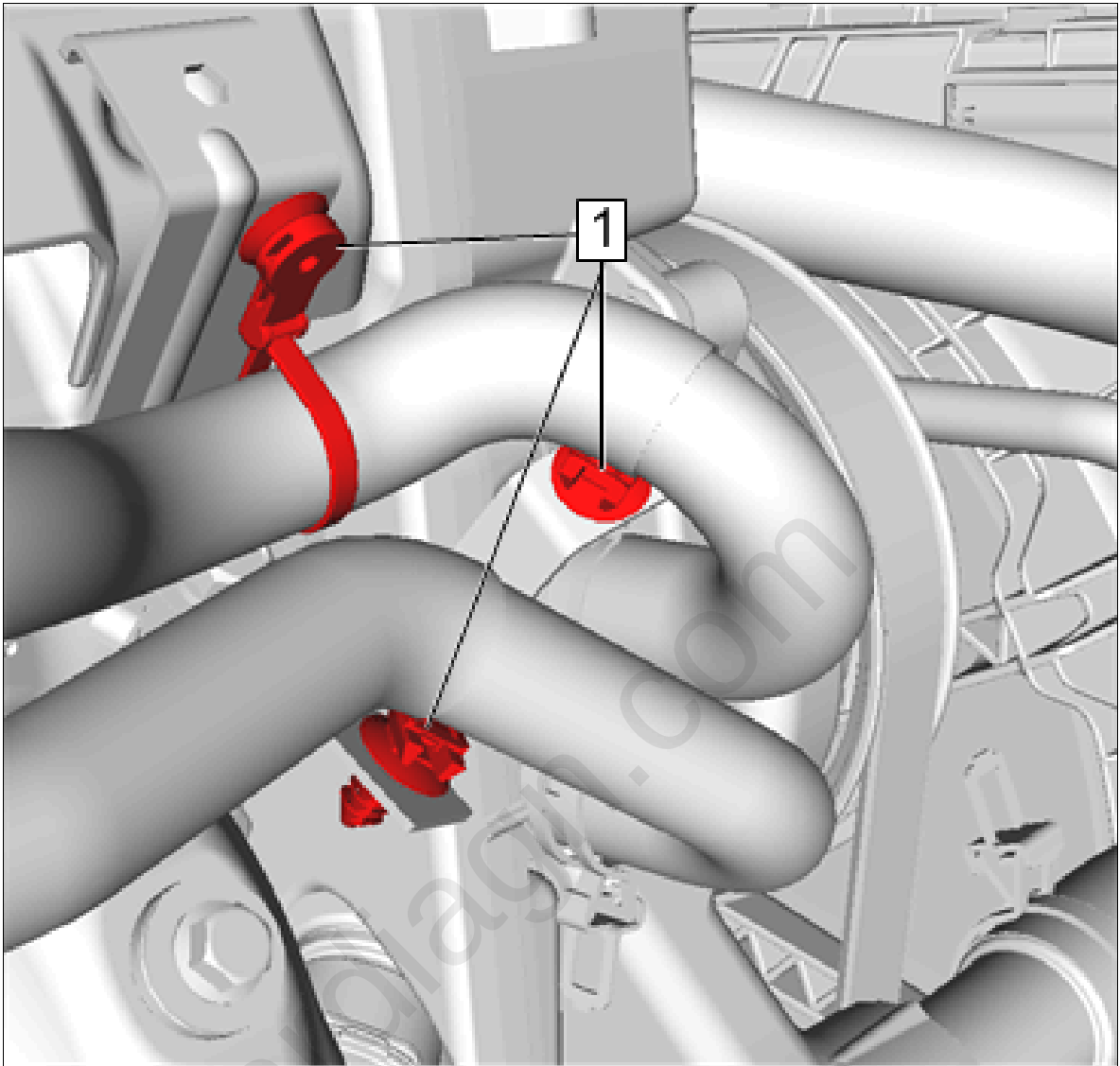
Fig 5: Heater Hose Bracket And Bolt



Courtesy of GENERAL MOTORS COMPANY

7. Install Heater Hose Bracket (2)
8. Install Heater Hose Bracket Bolt (1) and tighten 10 N.m (89 lb in)

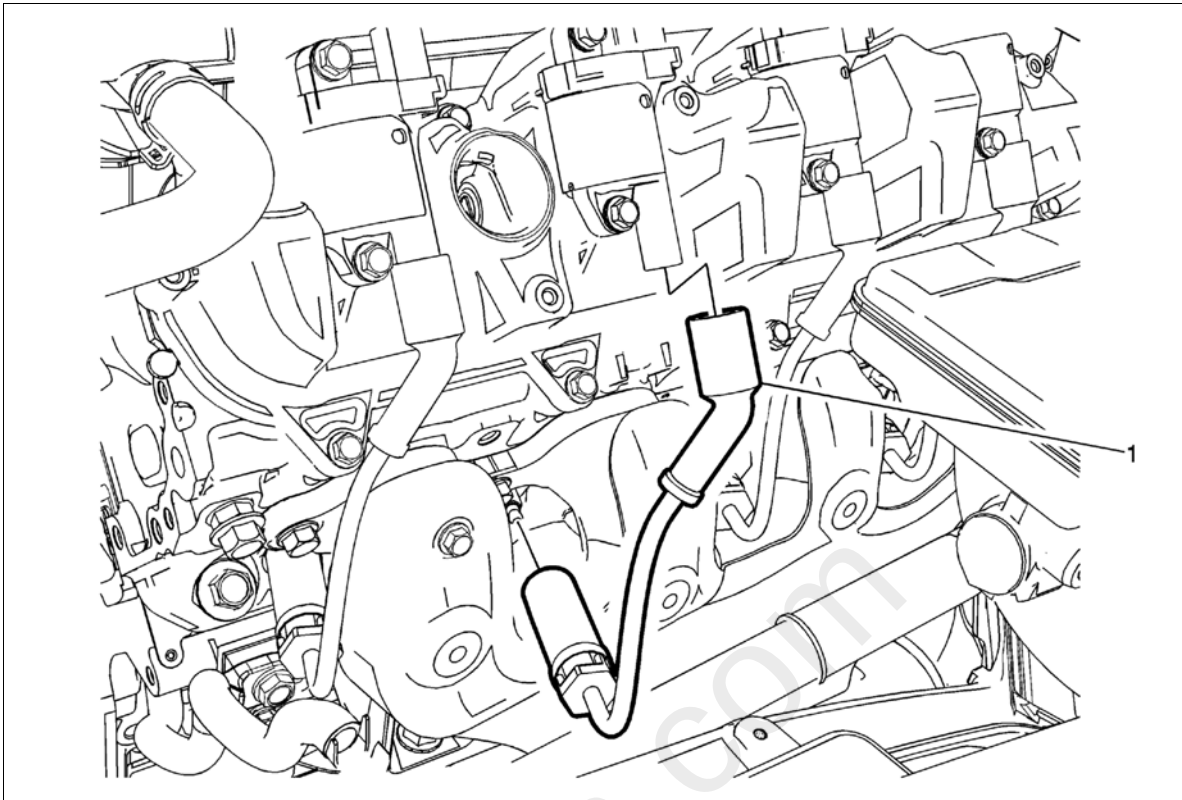
Fig 6: Heater Hose Retainer Clips



Courtesy of GENERAL MOTORS COMPANY

9. Connect the heater hose retainer clips (1) to the heater hose bracket.

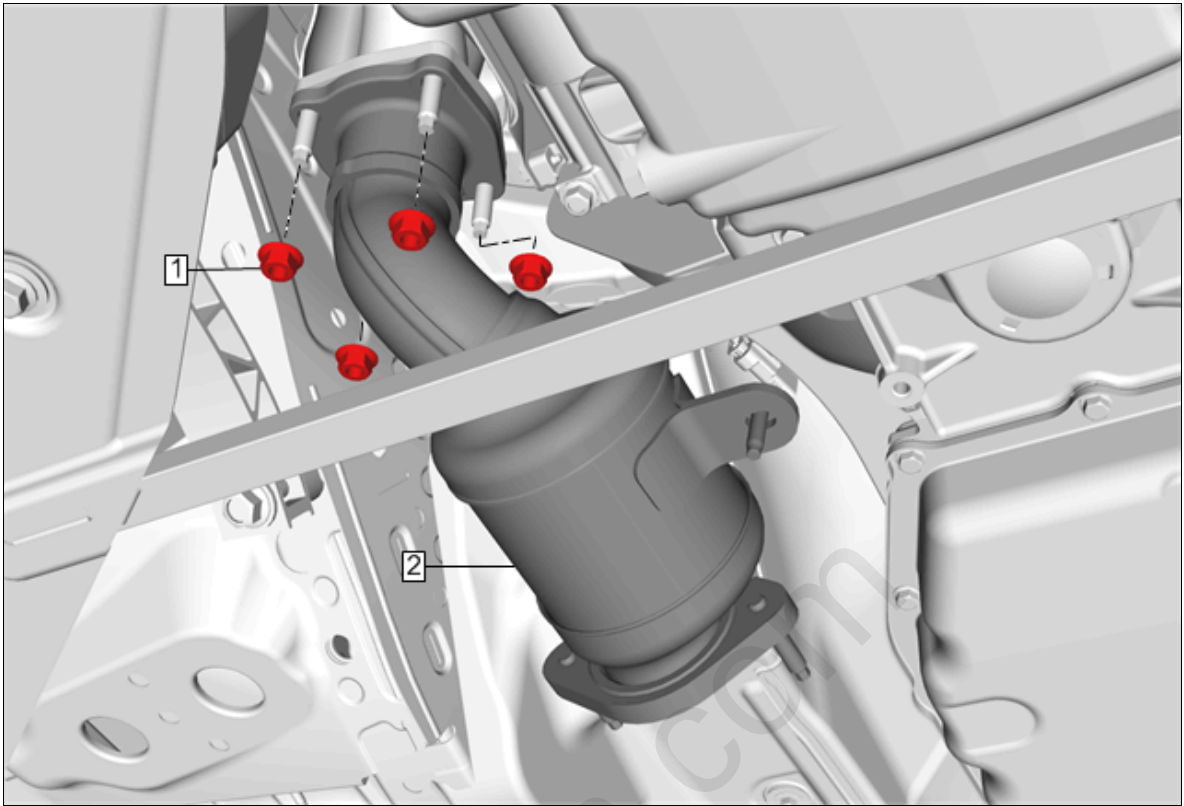
Fig 7: Spark Plug Wire



Courtesy of GENERAL MOTORS COMPANY

10. Install Spark Plug Wire (1) - Spark Plug Wire Replacement

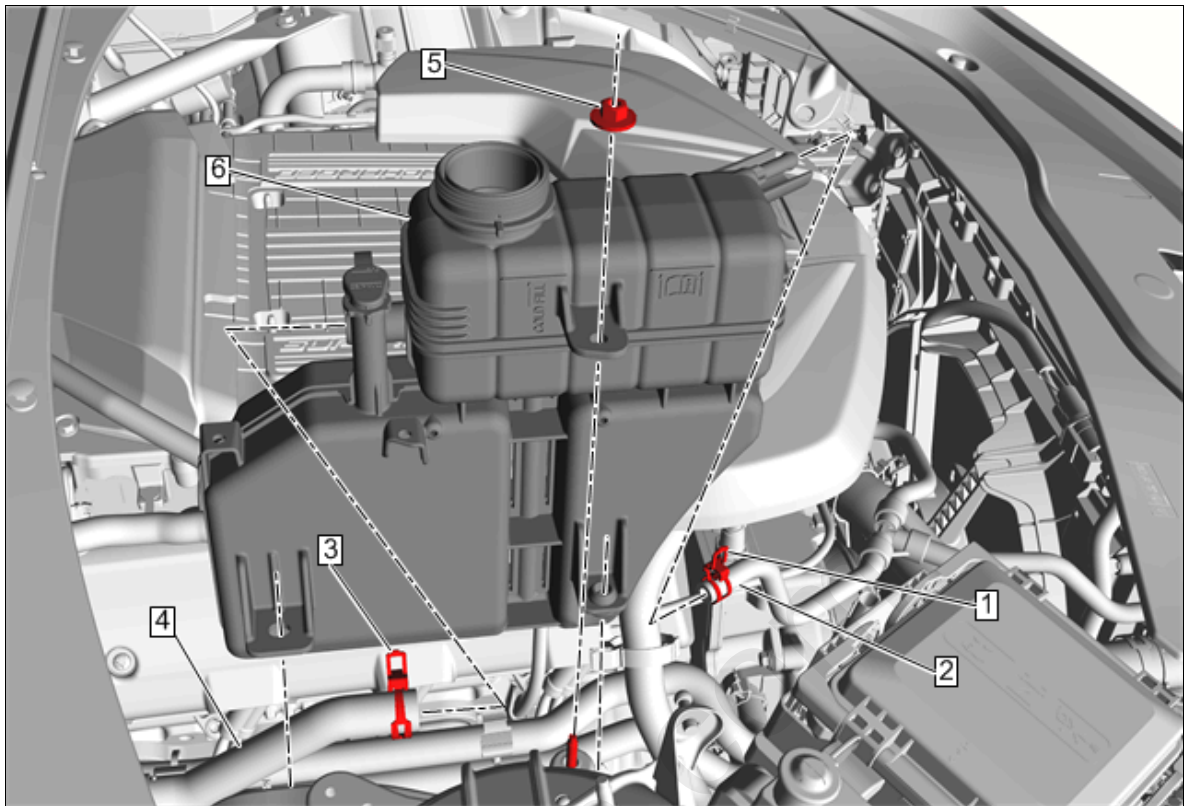
Fig 8: Catalytic Converter - Right Side



Courtesy of GENERAL MOTORS COMPANY

11. Connect Catalytic Converter (2) at Exhaust Manifold - Catalytic Converter Replacement - Right Side (LT1)

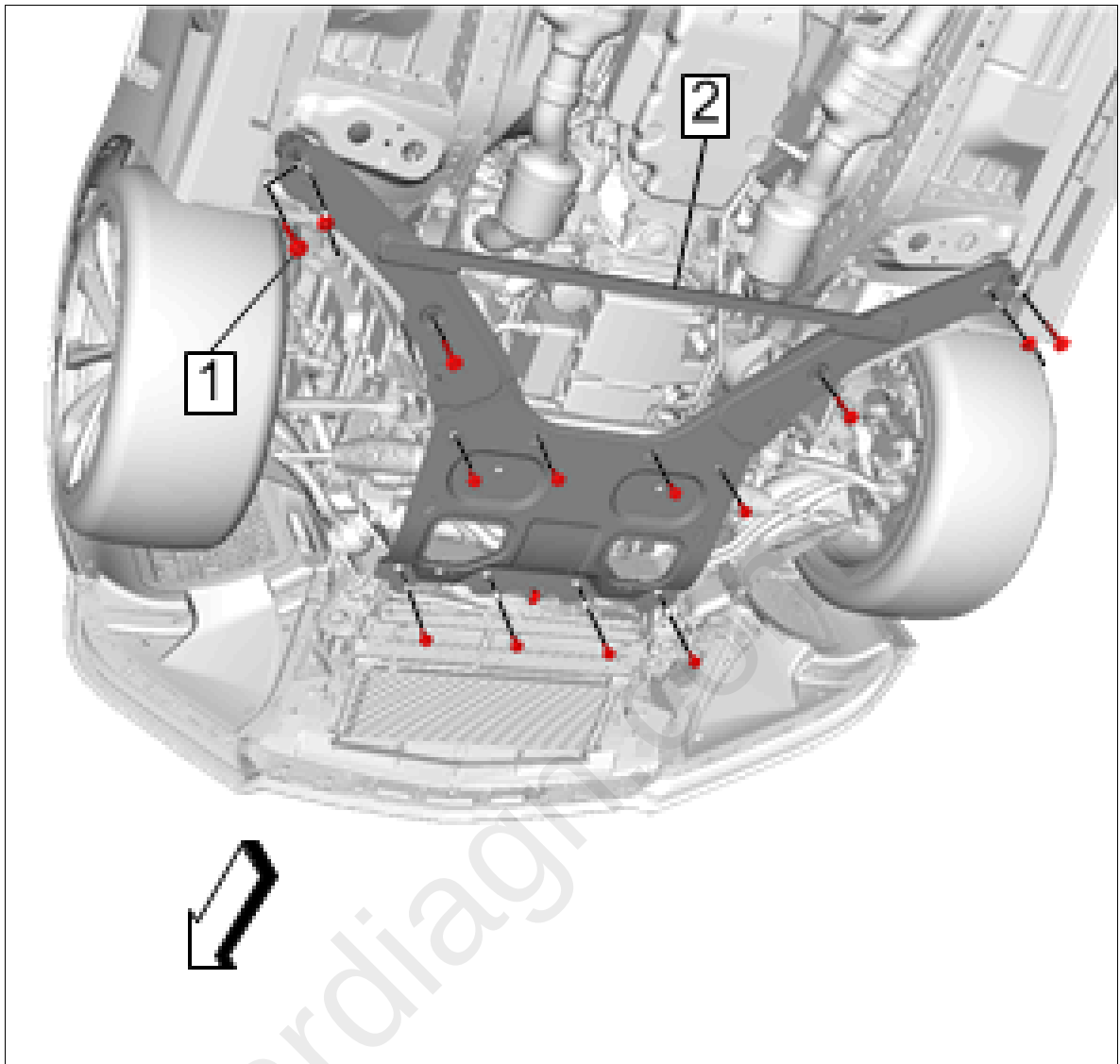
Fig 9: Radiator Surge Tank



Courtesy of GENERAL MOTORS COMPANY

12. Install Radiator Surge Tank (6) - Radiator Surge Tank Replacement (LT1)

Fig 10: Front Cradle Shear Plate Fastener

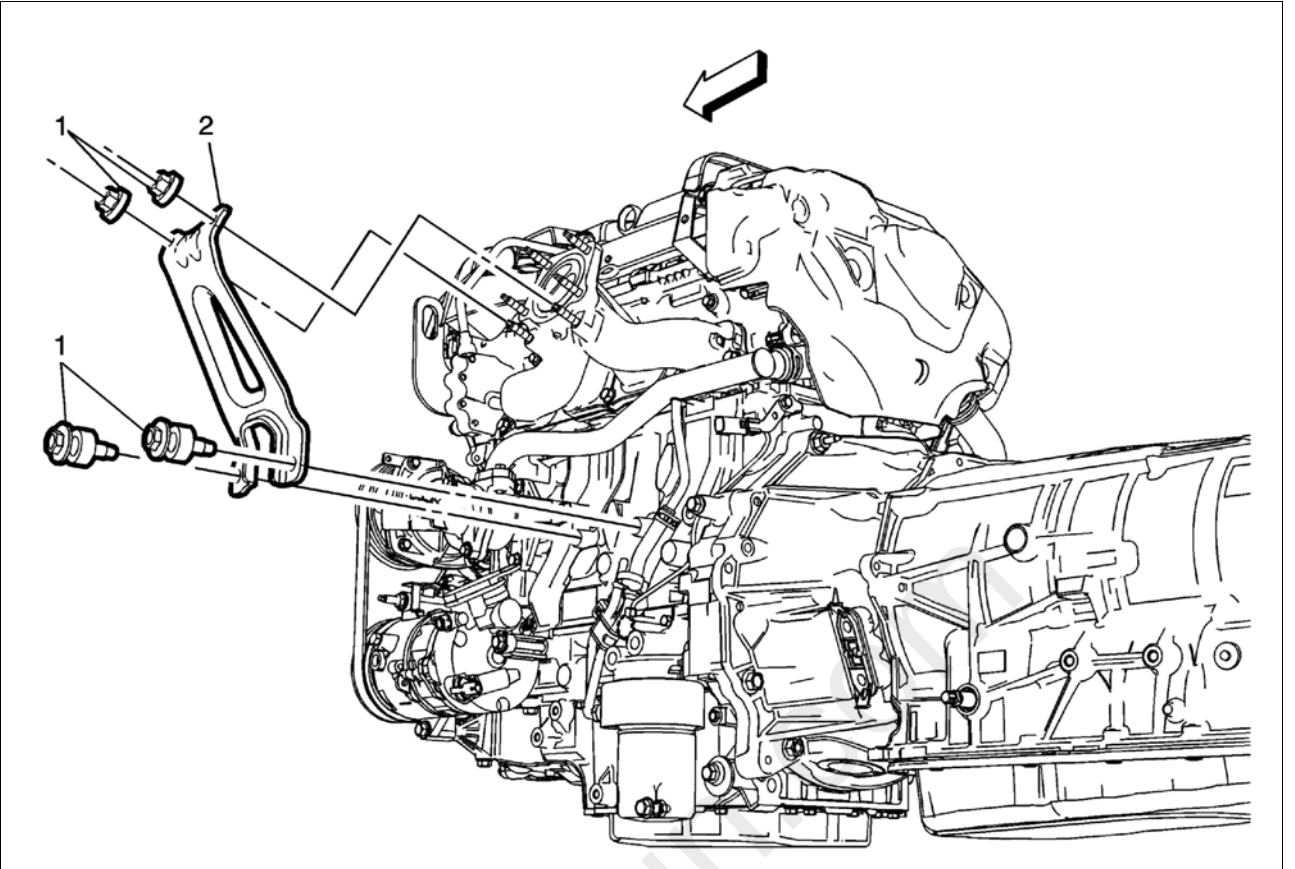


Courtesy of GENERAL MOTORS COMPANY

13. Install Front Cradle Shear Plate (2) - Front Cradle Shear Plate Replacement

REPAIR INSTRUCTIONS > EXHAUST MANIFOLD BRACE REPLACEMENT (LTG)

Fig 1: Exhaust Manifold Brace (LTG)

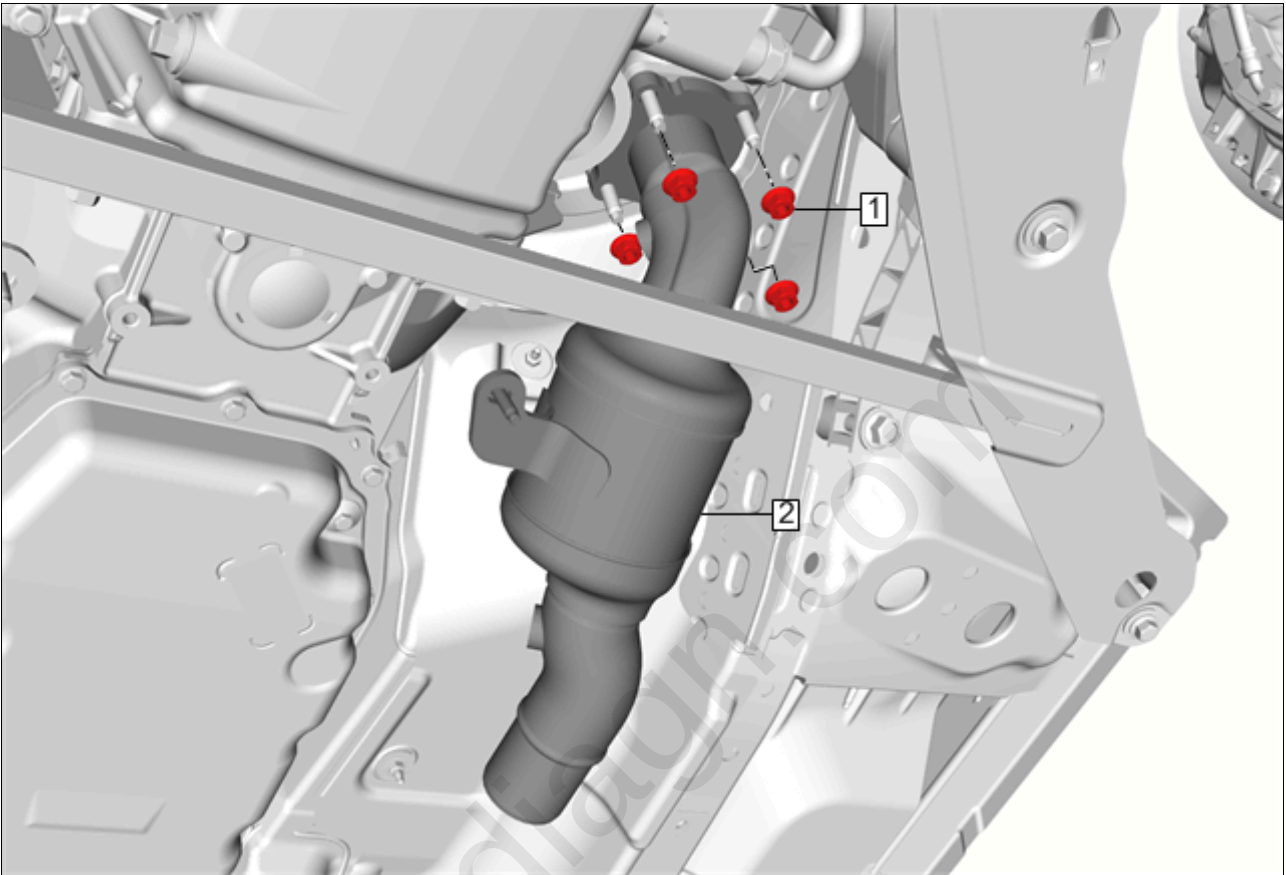


Courtesy of GENERAL MOTORS COMPANY

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

REPAIR INSTRUCTIONS > CATALYTIC CONVERTER REPLACEMENT - LEFT SIDE
(LT1)

Fig 1: Catalytic Converter - Left Side (LT1)



Courtesy of GENERAL MOTORS COMPANY

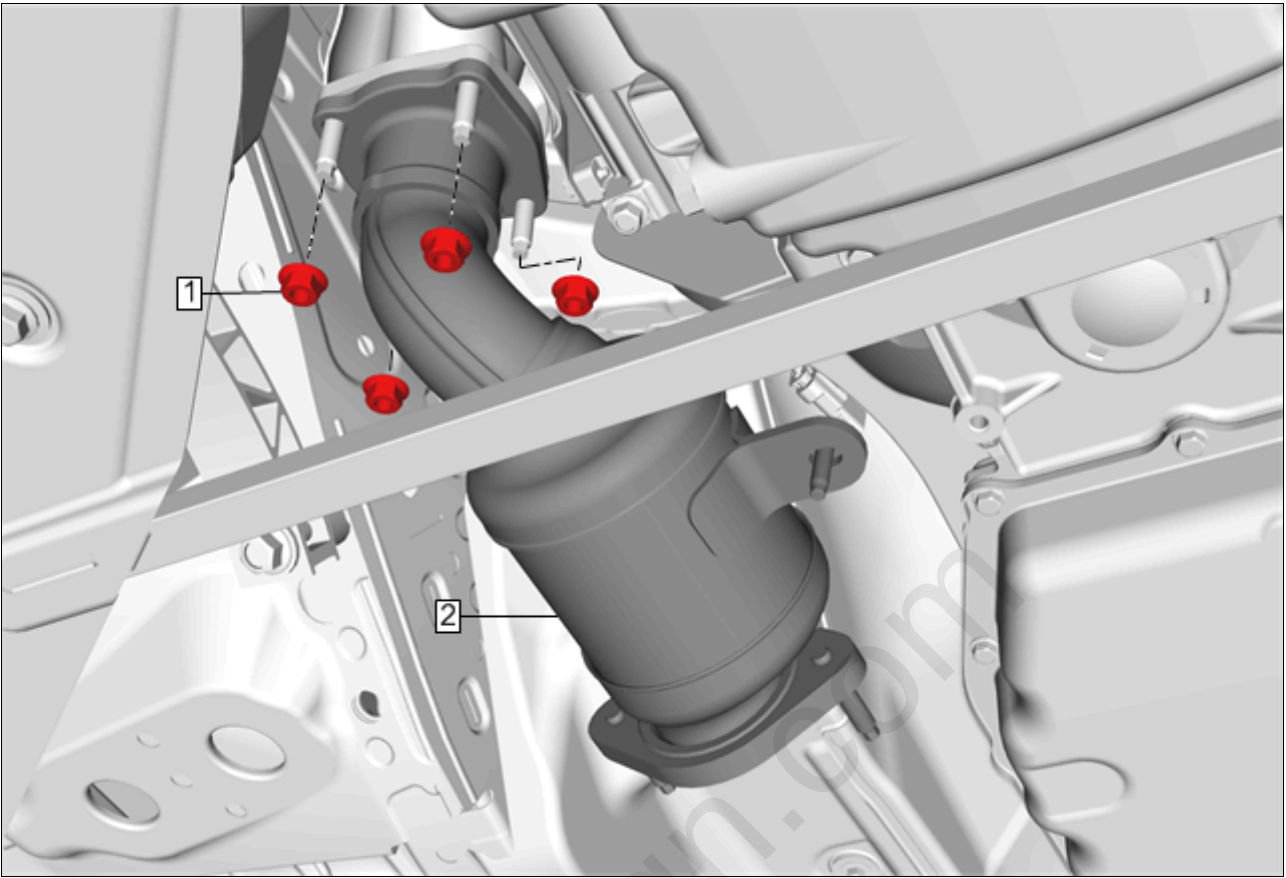
Callout	Component Name
WARNING: <i>In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.</i>	
WARNING: <i>Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid personal injury.</i>	
Preliminary Procedure	

1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)
2. Disconnect the oxygen sensor electrical connectors.
3. Remove Catalytic Converter Brace Bracket - Catalytic Converter Brace Bracket Replacement (LT1)
4. Disconnect Exhaust Muffler at Catalytic Converter - Exhaust Muffler Replacement (LT1, Coupe) Exhaust Muffler Replacement (LT1, Convertible)

1	Catalytic Converter Nut (Qty: 4) CAUTION: <i>Refer to Fastener Caution .</i> Tighten 50 N.m (37 lb ft)
2	Catalytic Converter Preliminary Procedures 1. Install a NEW catalytic converter gasket. 2. Transfer components as necessary.

REPAIR INSTRUCTIONS > CATALYTIC CONVERTER REPLACEMENT - RIGHT SIDE (LT1)

Fig 1: Catalytic Converter - Right Side (LT1)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: <i>In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.</i>	
WARNING: <i>Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid personal injury.</i>	
Preliminary Procedures 1. Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP) 2. Disconnect the oxygen sensor electrical connector. 3. Remove Catalytic Converter Brace Bracket - Catalytic Converter Brace Bracket Replacement	

(LT1)

4. Disconnect Exhaust Muffler at Catalytic Converter - Exhaust Muffler Replacement (LT1, Coupe) Exhaust Muffler Replacement (LT1, Convertible)

1

Catalytic Converter Nut (Qty: 4)

CAUTION:

Refer to Fastener Caution .

Tighten

50 N.m (37 lb ft)

2

Catalytic Converter

Procedure

Install a NEW catalytic converter gasket.

REPAIR INSTRUCTIONS > WARM UP THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LH - LGX) > 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.

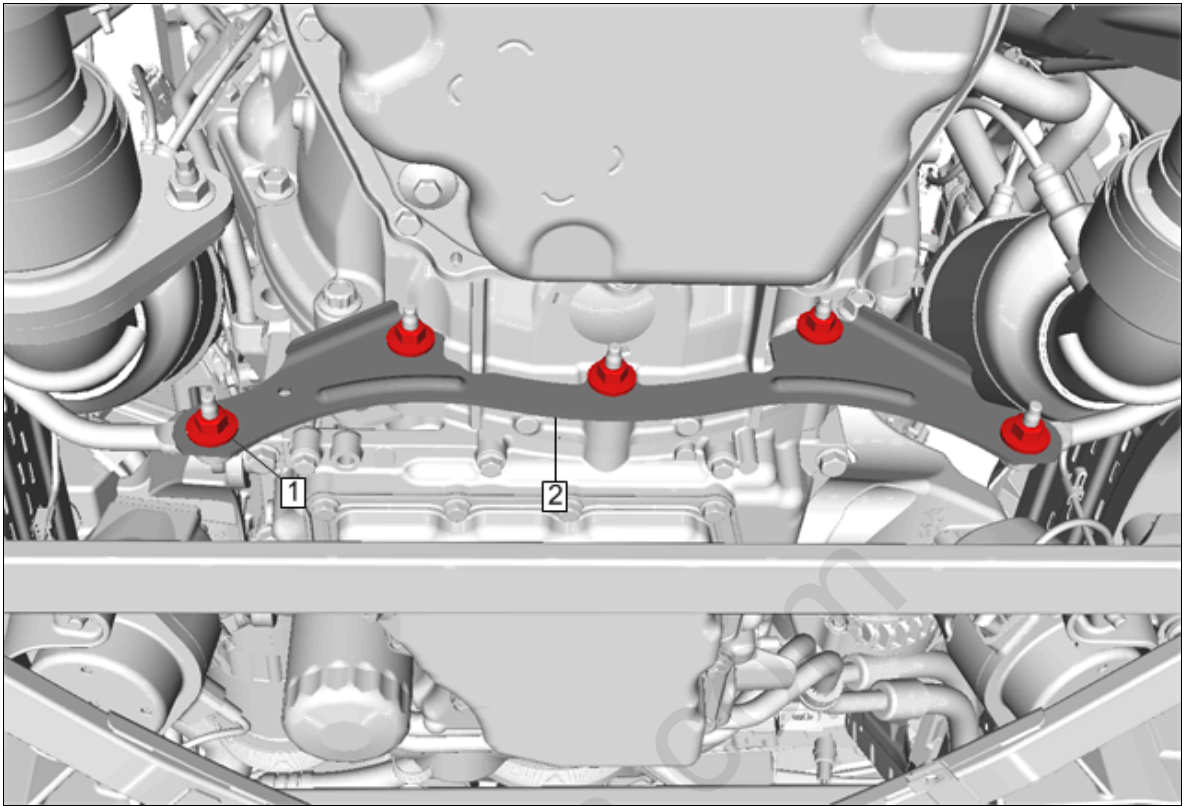


WARNING:

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

1. Remove Intake Manifold Cover Replacement
2. Remove Front Compartment Lower Noise Shield Replacement (Coupe - LGX, LTG)
3. Remove Exhaust Muffler Replacement (LGX, Coupe) Exhaust Muffler Replacement (LGX, Convertible)

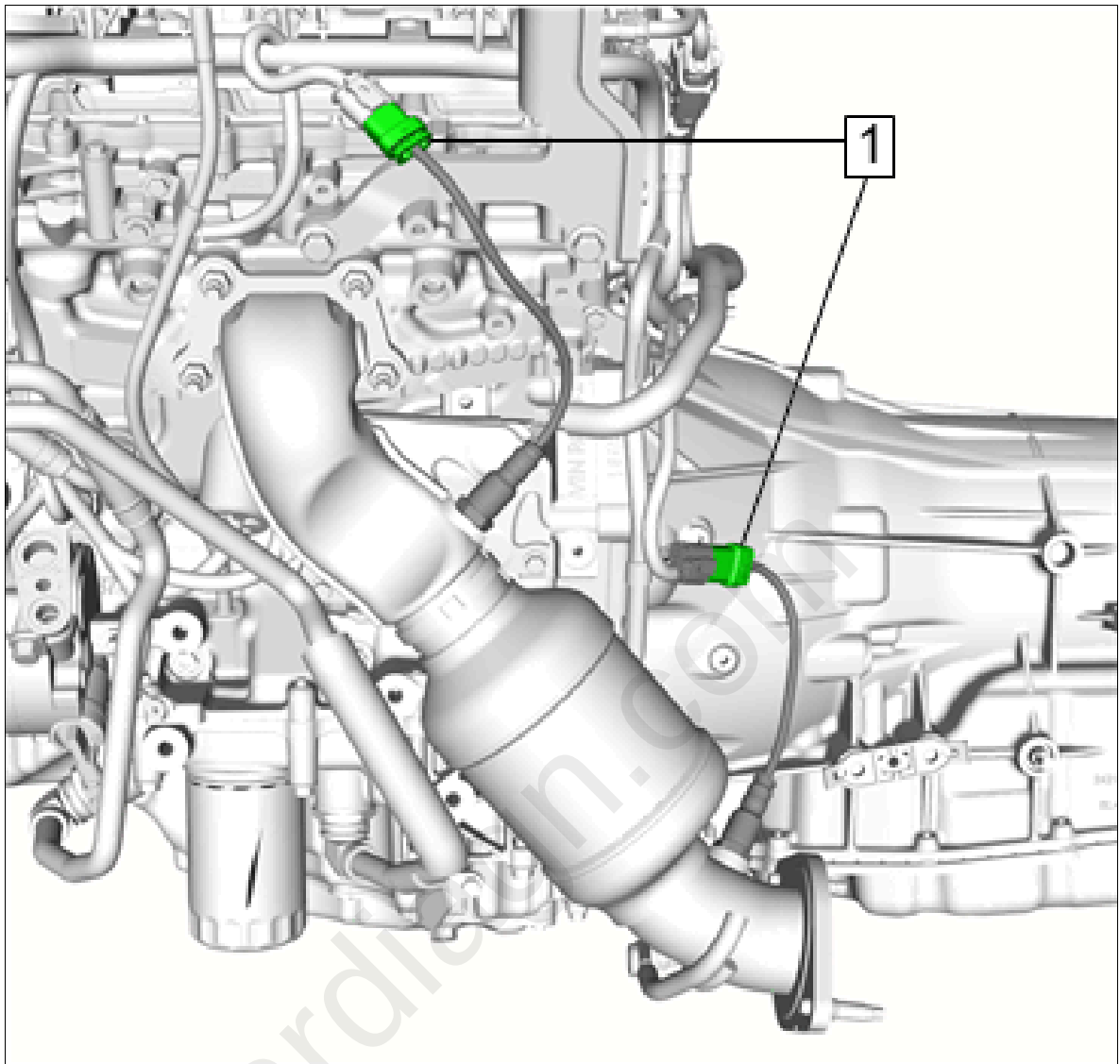
Fig 1: Catalytic Converter Brace Bracket (LGX)



Courtesy of GENERAL MOTORS COMPANY

4. Remove Catalytic Converter Brace Bracket - Catalytic Converter Brace Bracket Replacement (LGX)

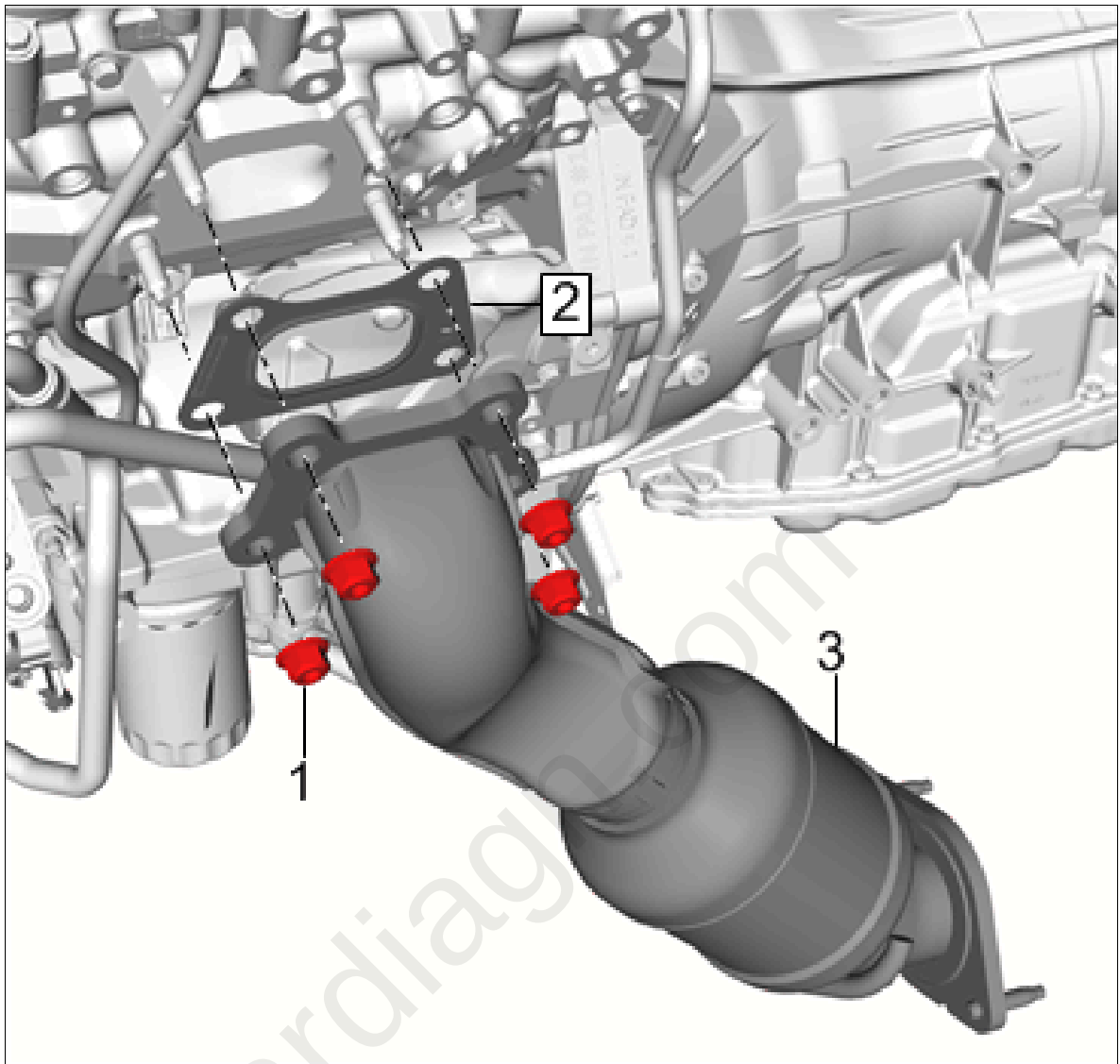
Fig 2: Heated Oxygen Sensor Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

5. Disconnect Heated Oxygen Sensor Electrical Connector (1) (Qty: 2)

Fig 3: Catalytic Converter Nut

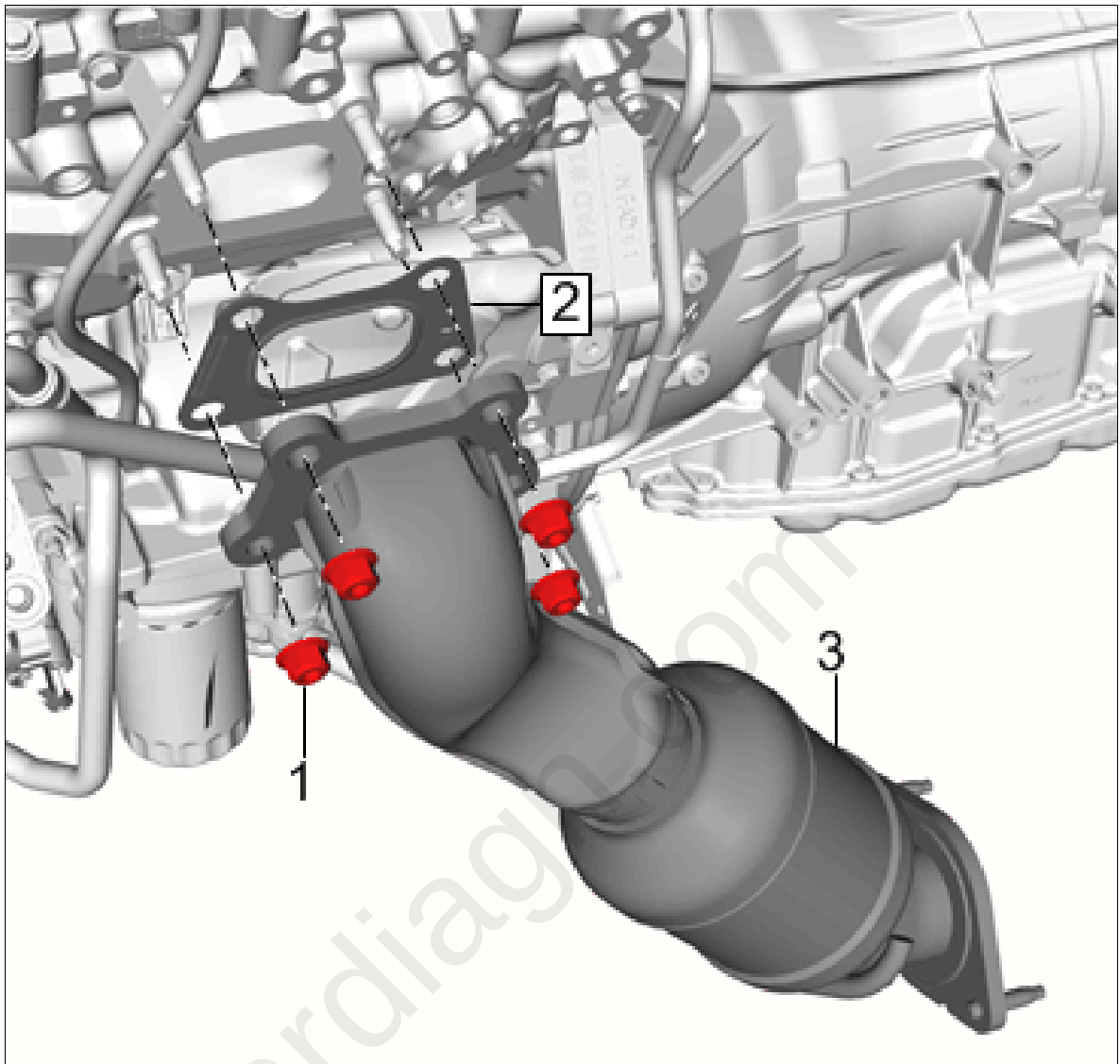


Courtesy of GENERAL MOTORS COMPANY

6. Remove Catalytic Converter Nut (1) (Qty: 4)
7. Remove Catalytic Converter Gasket (2) and DISCARD
8. Remove Catalytic Converter (3)
9. Transfer components as necessary.

**REPAIR INSTRUCTIONS > WARM UP THREE-WAY CATALYTIC CONVERTER
REPLACEMENT (LH - LGX) > INSTALLATION PROCEDURE**

Fig 1: Catalytic Converter



Courtesy of GENERAL MOTORS COMPANY

1. Install Catalytic Converter (3)

 **NOTE:**

Install a NEW catalytic converter gasket.

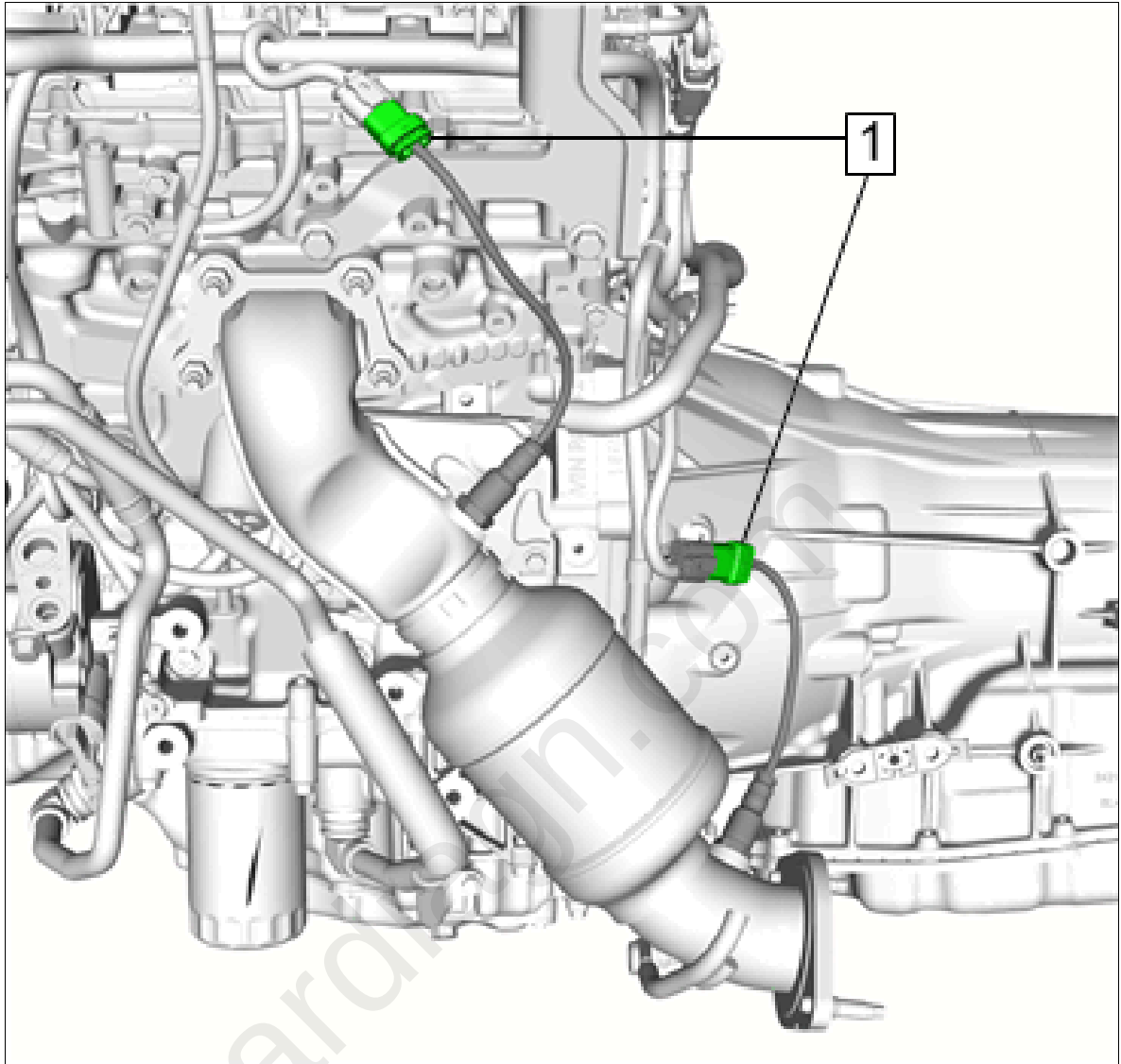
2. Install Catalytic Converter Gasket (2)

 **CAUTION:**

Refer to Fastener Caution .

3. Install Catalytic Converter Nut (1) (Qty: 4) and tighten to 46 N.m (34 lb ft)

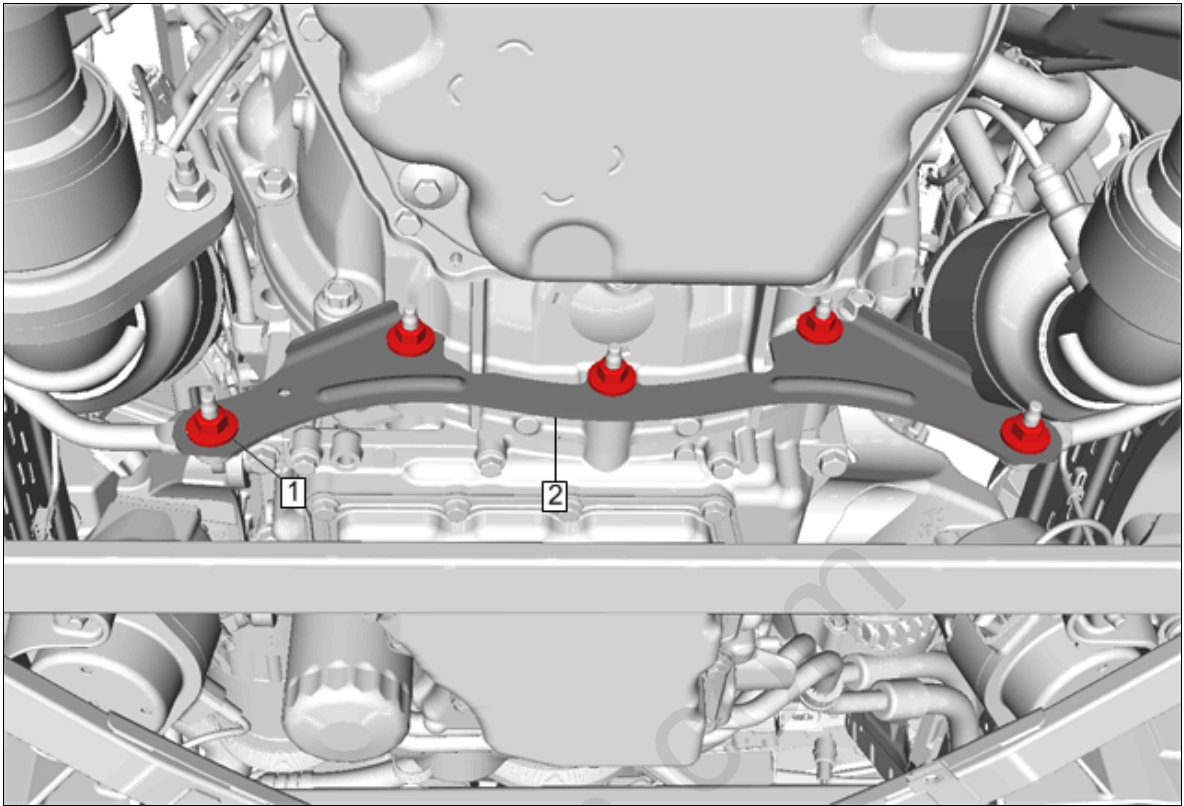
Fig 2: Heated Oxygen Sensor Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

4. Connect Heated Oxygen Sensor Electrical Connector (1) (Qty: 2)

Fig 3: Catalytic Converter Brace Bracket (LGX)



Courtesy of GENERAL MOTORS COMPANY

5. Install Catalytic Converter Brace Bracket - Catalytic Converter Brace Bracket Replacement (LGX)
6. Install Exhaust Muffler Replacement (LGX, Coupe) Exhaust Muffler Replacement (LGX, Convertible)
7. Install Front Compartment Lower Noise Shield Replacement (Coupe - LGX, LTG)
8. Install Intake Manifold Cover Replacement
9. Start the engine and check for exhaust leaks.

REPAIR INSTRUCTIONS > WARM UP THREE-WAY CATALYTIC CONVERTER REPLACEMENT (LTG) > REMOVAL PROCEDURE

WARNING:

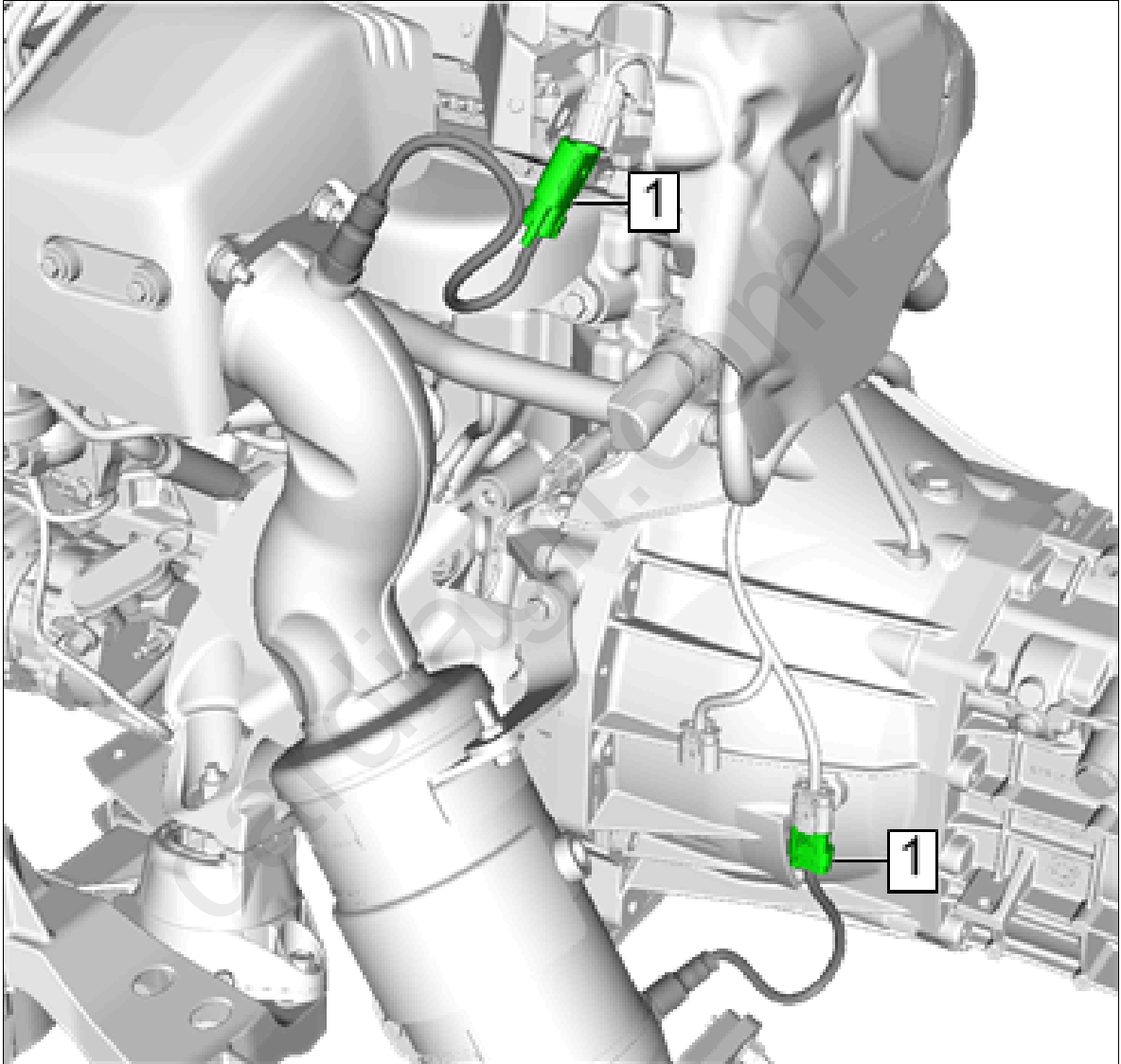
In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

WARNING:

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

1. Remove Turbocharger Heat Shield - Turbocharger Heat Shield Replacement
2. Remove Exhaust Muffler - Exhaust Muffler Replacement (LTG, Coupe) Exhaust Muffler Replacement (LTG, Convertible)

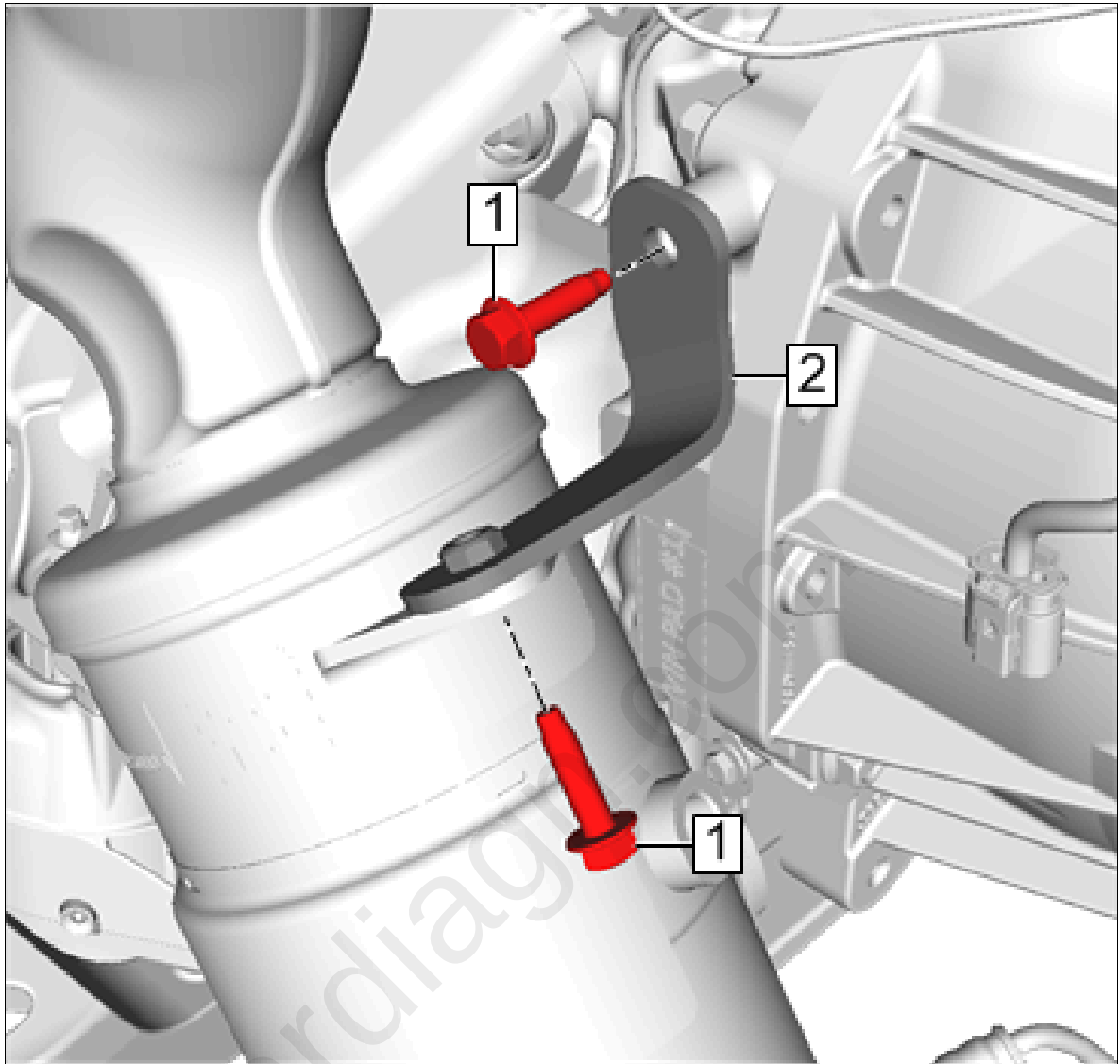
Fig 1: Heated Oxygen Sensor Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

3. Disconnect Heated Oxygen Sensor Electrical Connector (1) (Qty: 2)

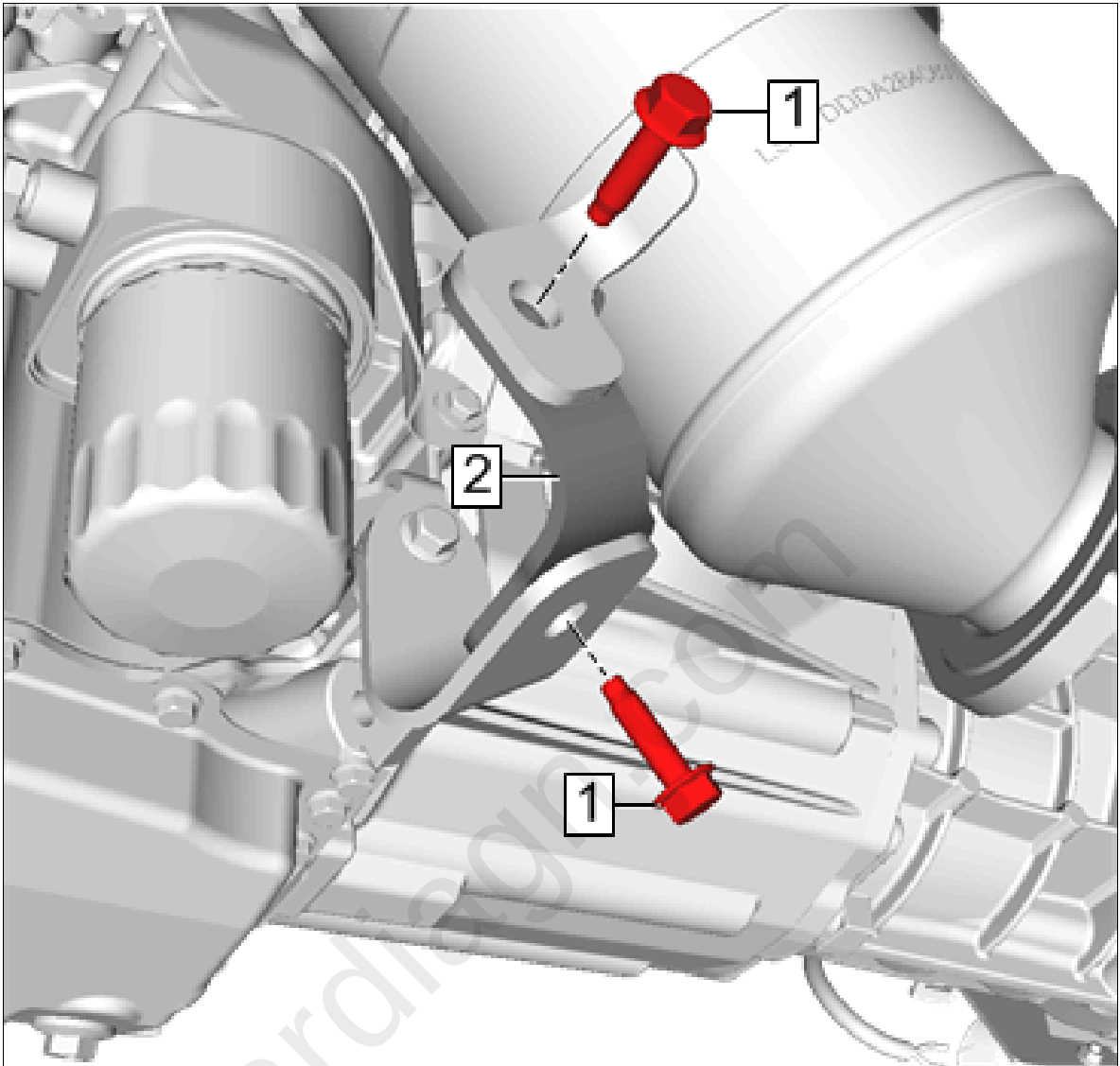
Fig 2: Catalytic Converter Brace Bracket



Courtesy of GENERAL MOTORS COMPANY

4. Remove Catalytic Converter Brace Bracket Bolt (1) (Qty: 2)
5. Remove Catalytic Converter Brace Bracket-Upper (2)

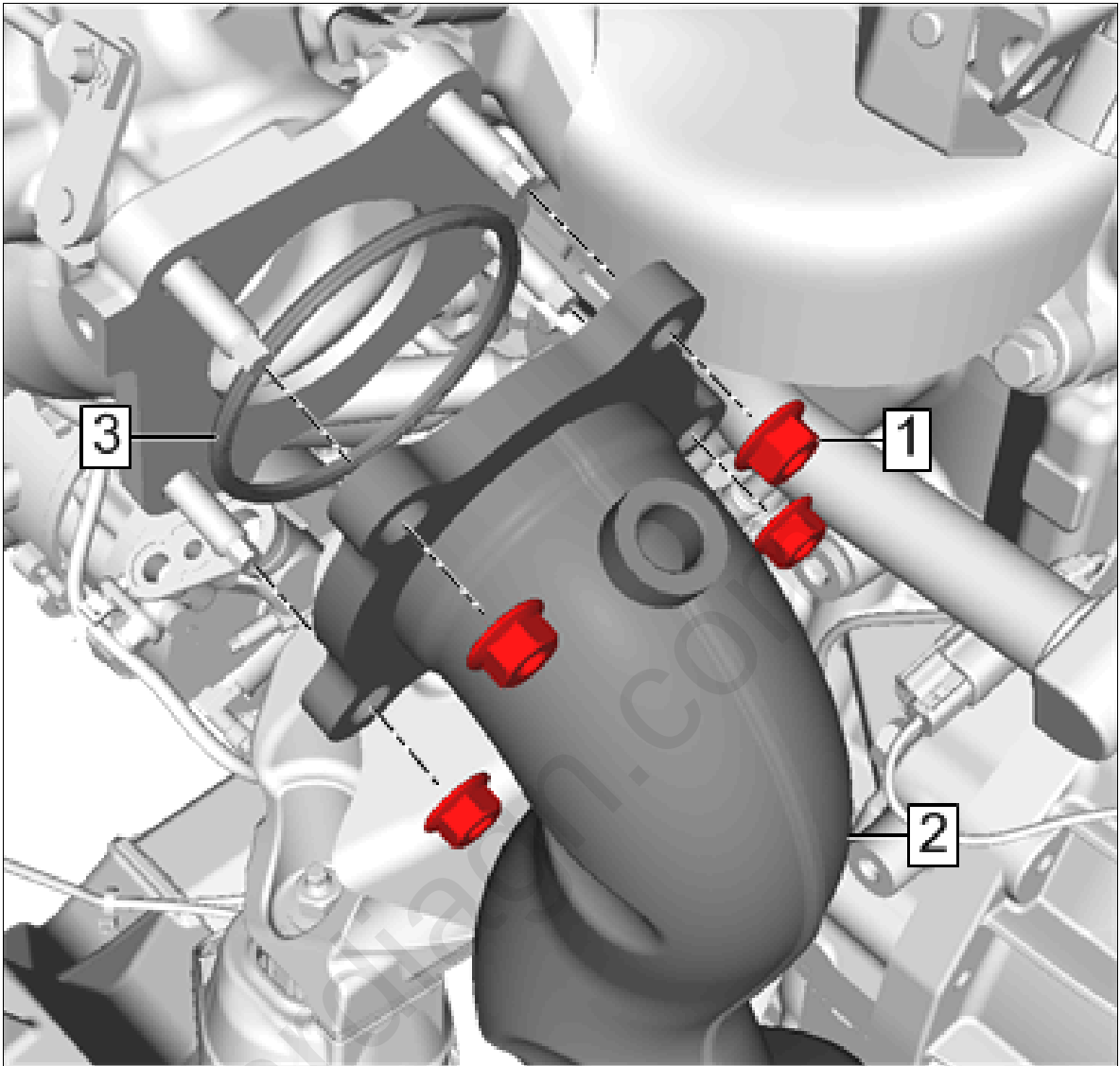
Fig 3: Catalytic Converter Brace Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

6. Remove Catalytic Converter Brace Bracket Bolt (1) (Qty: 2)
7. Remove Catalytic Converter Brace Bracket-Lower (2)

Fig 4: Catalytic Converter Seal

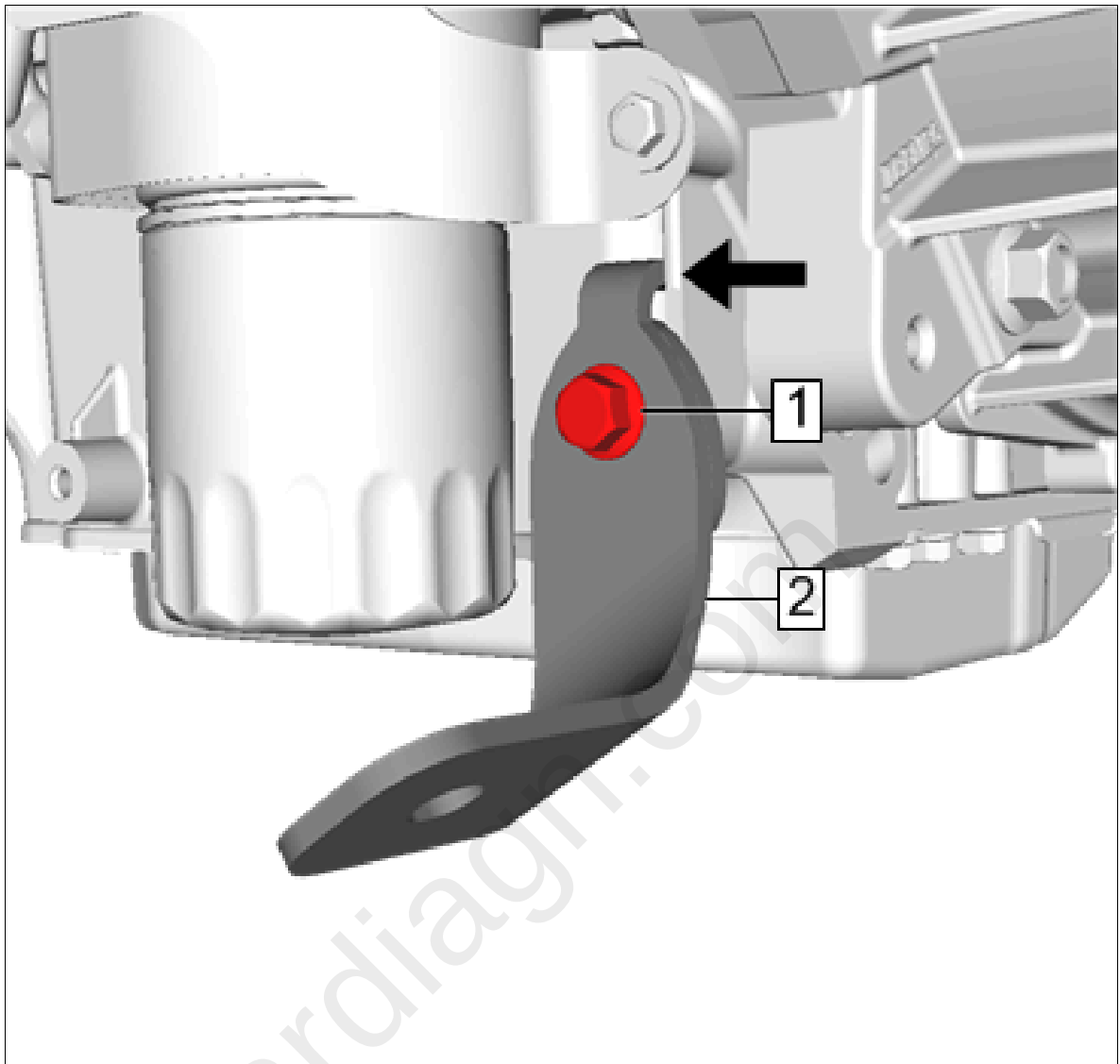


Courtesy of GENERAL MOTORS COMPANY

8. Remove Catalytic Converter Nut (1) (Qty: 4)
9. Remove Warm Up Three-Way Catalytic Converter (2)
10. Remove Catalytic Converter Seal (3) and DISCARD

**REPAIR INSTRUCTIONS > WARM UP THREE-WAY CATALYTIC CONVERTER
REPLACEMENT (LTG) > INSTALLATION PROCEDURE**

Fig 1: Anti-Rotation Tab



Courtesy of GENERAL MOTORS COMPANY

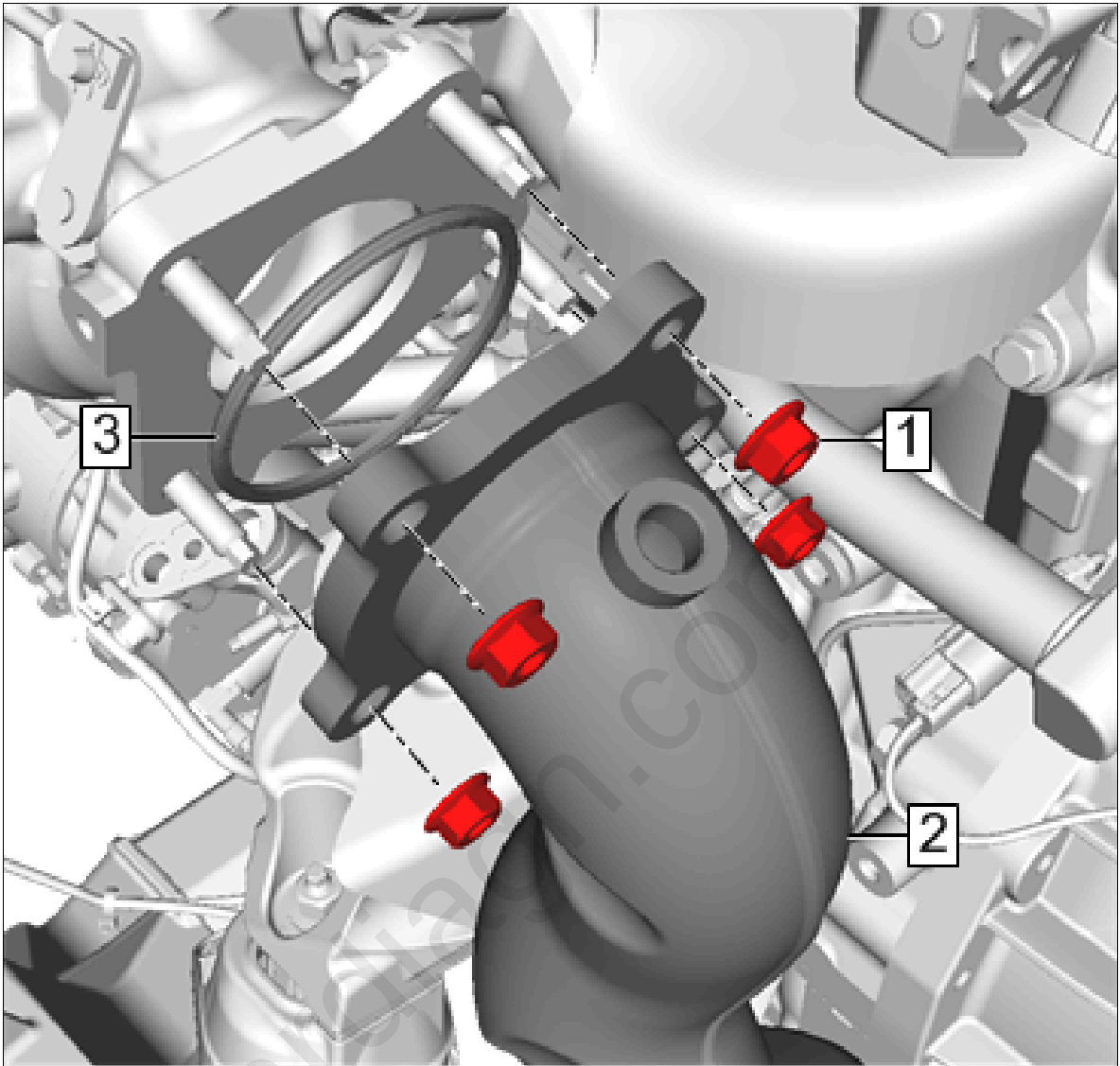
1. Inspect the anti-rotation tab of the lower brace bracket (2) to ensure that the tab is flush with the oil pan rib.

 **CAUTION:**

Refer to Fastener Caution .

2. If the brace bracket has been removed or adjustment is required, position the bracket and tighten the bolt (1) to 22 N.m (16 lb ft).

Fig 2: Catalytic Converter Seal



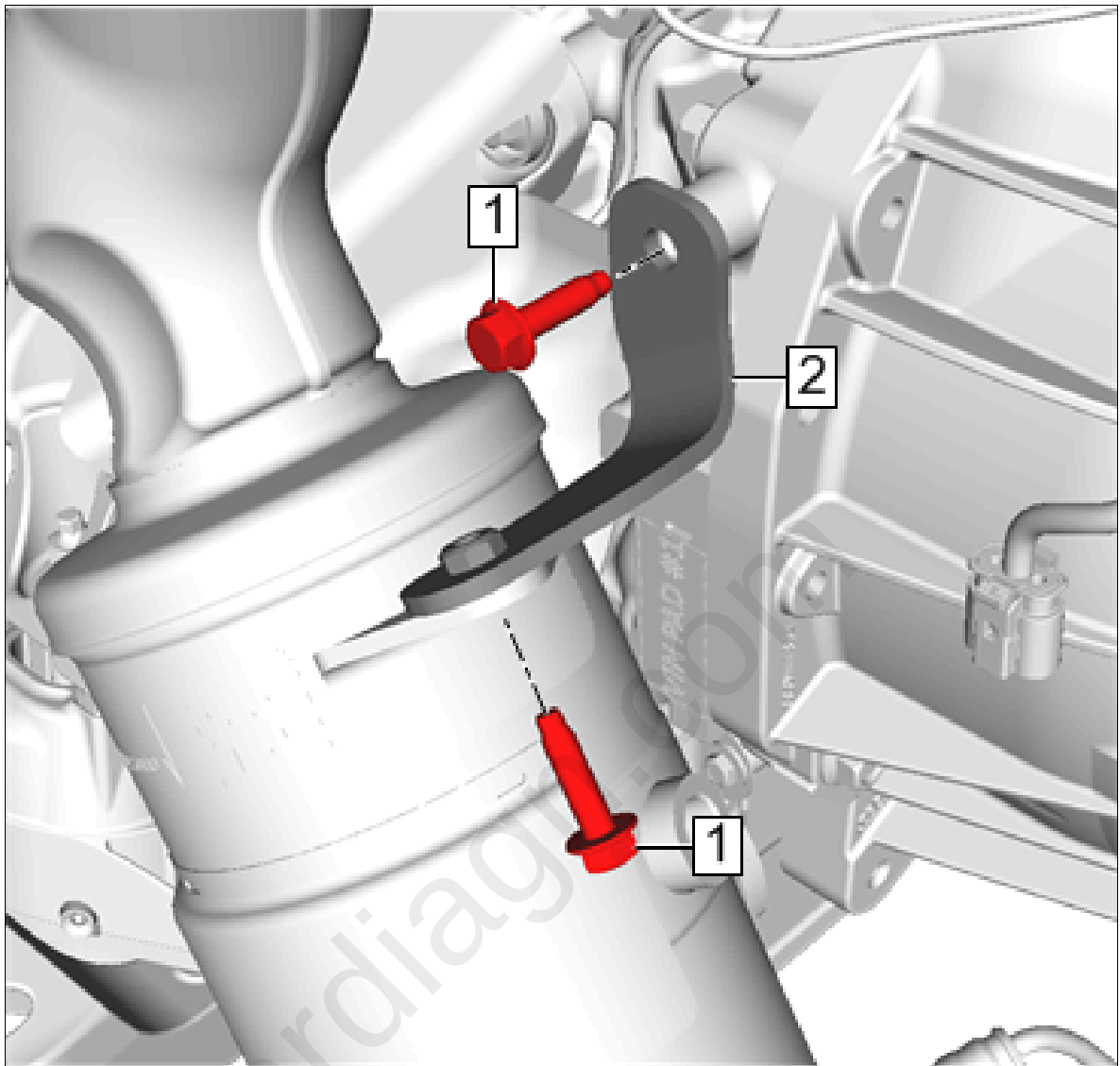
Courtesy of GENERAL MOTORS COMPANY

 NOTE:

Install a NEW catalytic converter seal.

3. Install Catalytic Converter Seal (3)
4. Install Warm Up Three-Way Catalytic Converter (2)
5. Hand tighten Catalytic Converter Nut (1) (qty: 4)

Fig 3: Catalytic Converter Brace Bracket



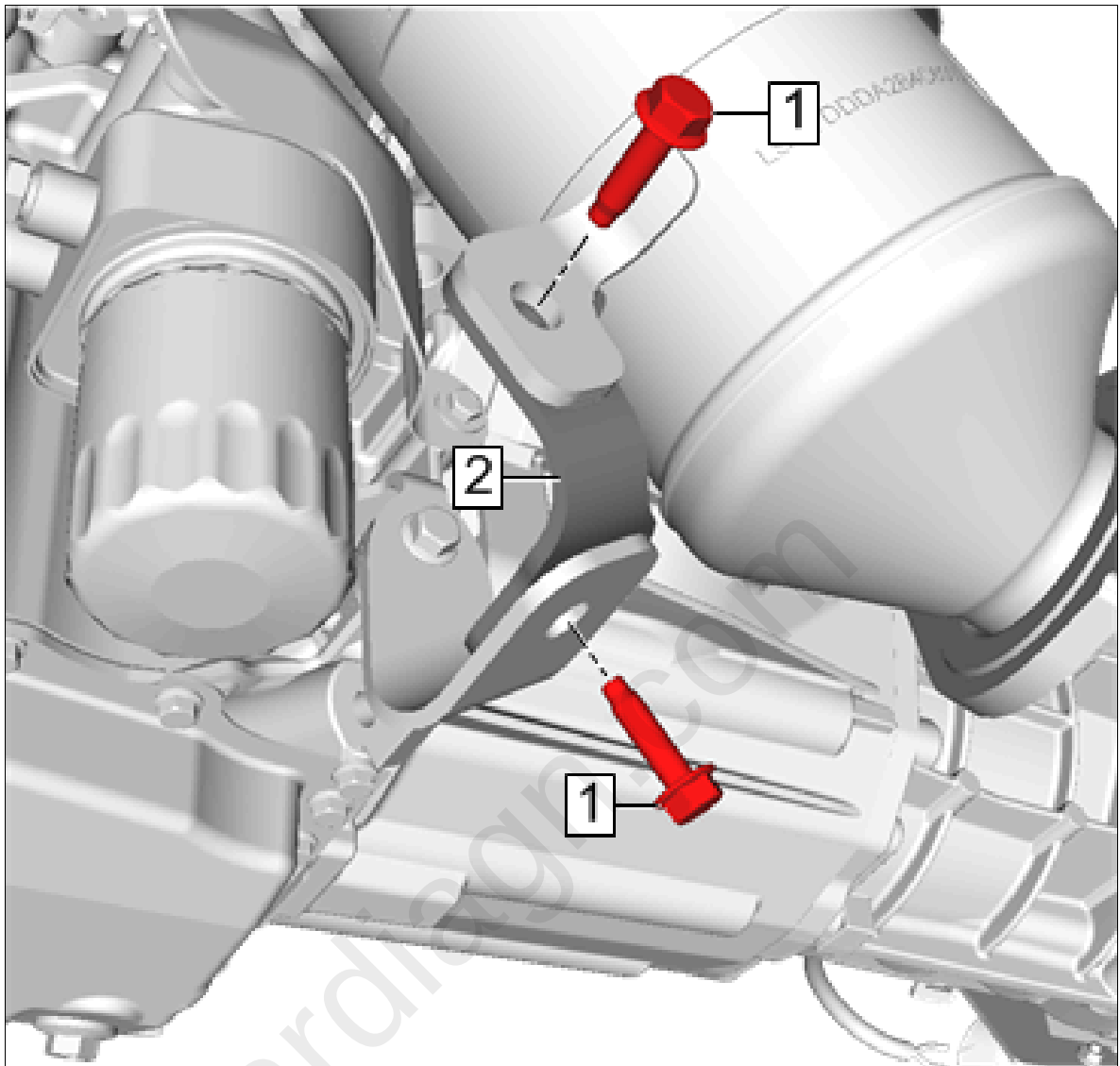
Courtesy of GENERAL MOTORS COMPANY

 NOTE:

Ensure the brace bracket is flush with the engine block boss.

6. Install Catalytic Converter Brace Bracket-Upper (2)
7. Hand tighten Catalytic Converter Brace Bracket Bolt (1) (Qty: 2)

Fig 4: Catalytic Converter Brace Bracket Bolt



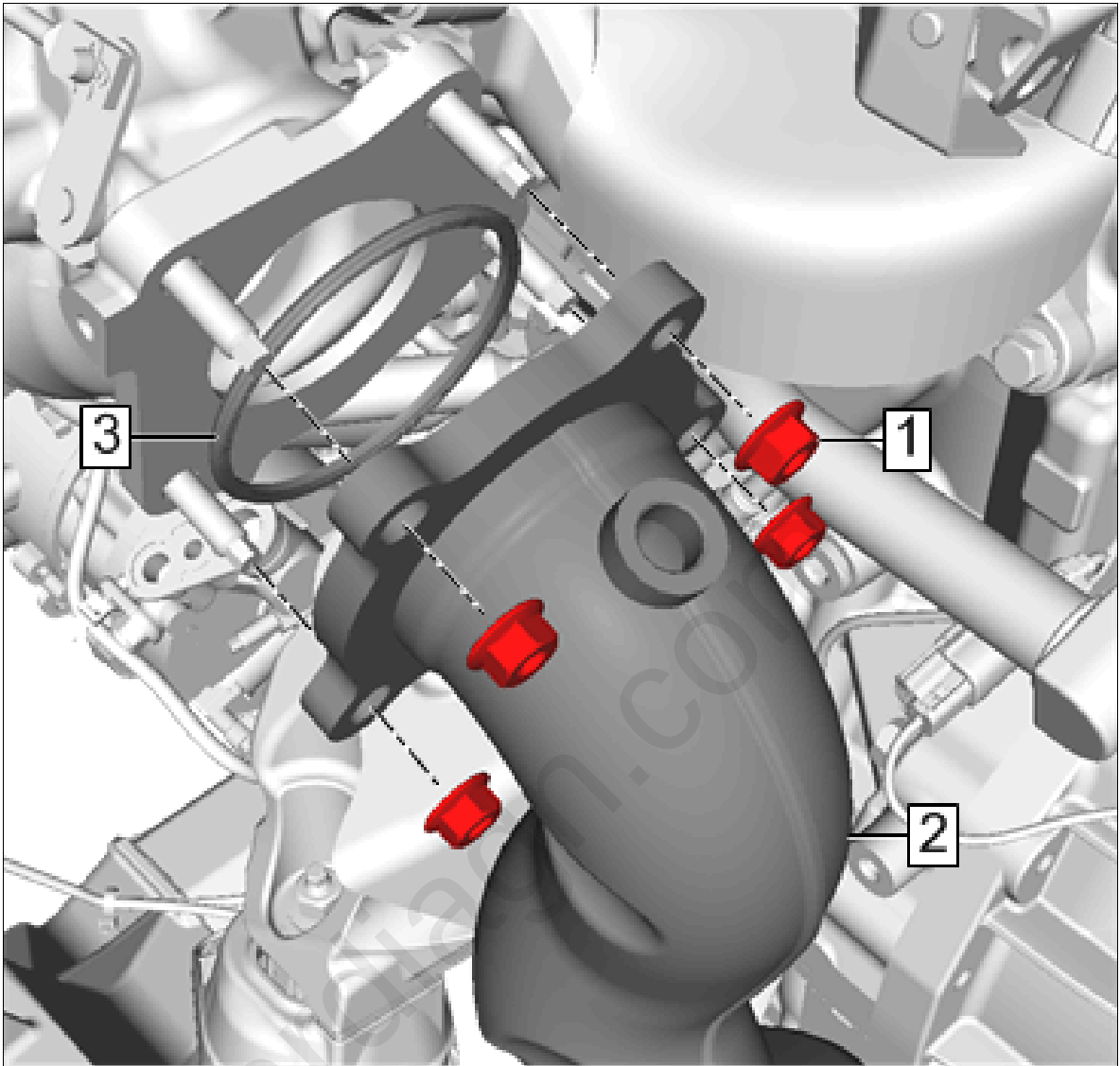
Courtesy of GENERAL MOTORS COMPANY

 NOTE:

Ensure the brace bracket is flush with the catalytic converter tab.

8. Install Catalytic Converter Brace Bracket-Lower (2)
9. Hand tighten Catalytic Converter Brace Bracket Bolt (1) (Qty: 2)

Fig 5: Catalytic Converter Seal



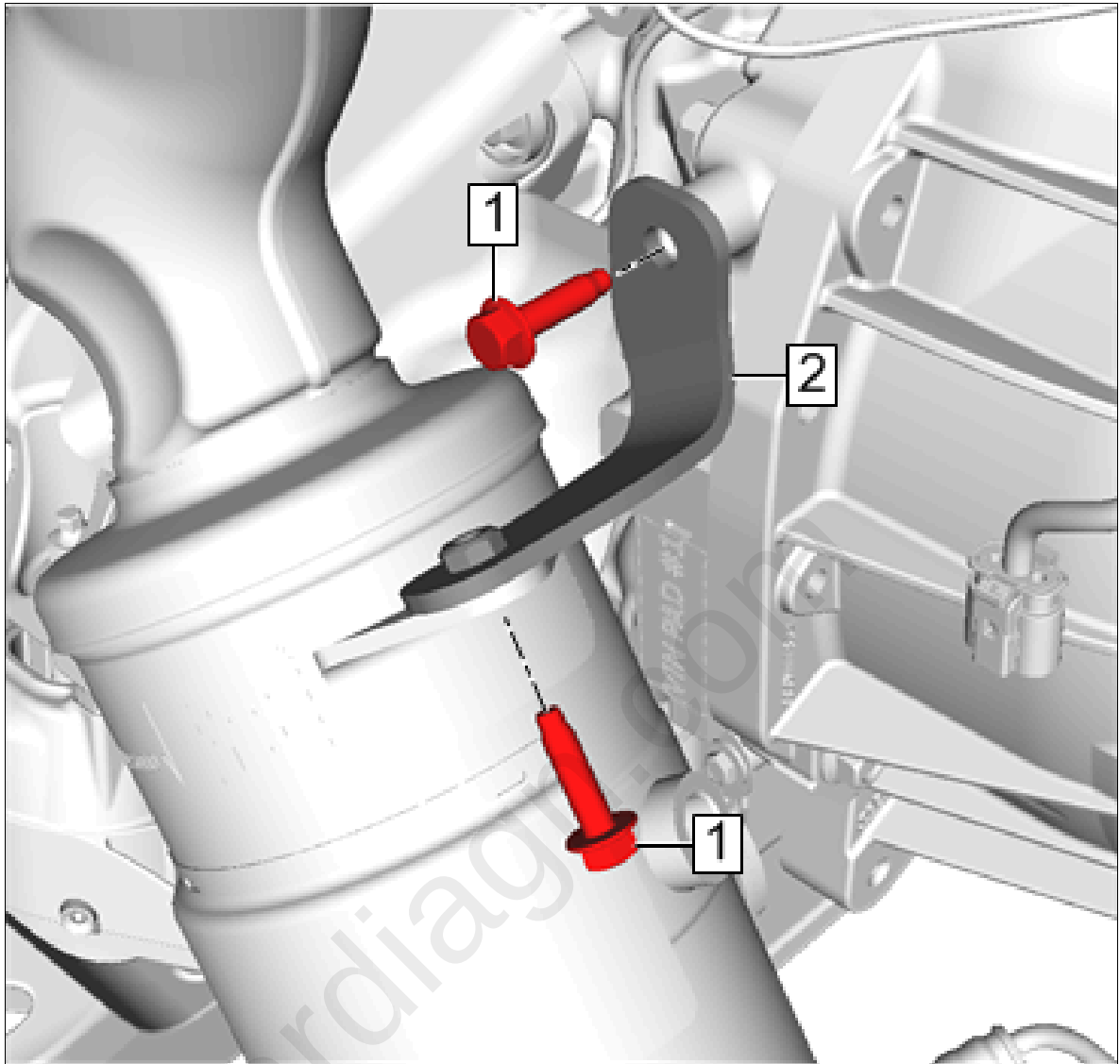
Courtesy of GENERAL MOTORS COMPANY

 NOTE:

Tighten the catalytic converter nuts in a cross pattern.

10. Tighten Catalytic Converter Nut (1) (Qty: 4) to 50 N.m (37 lb ft)

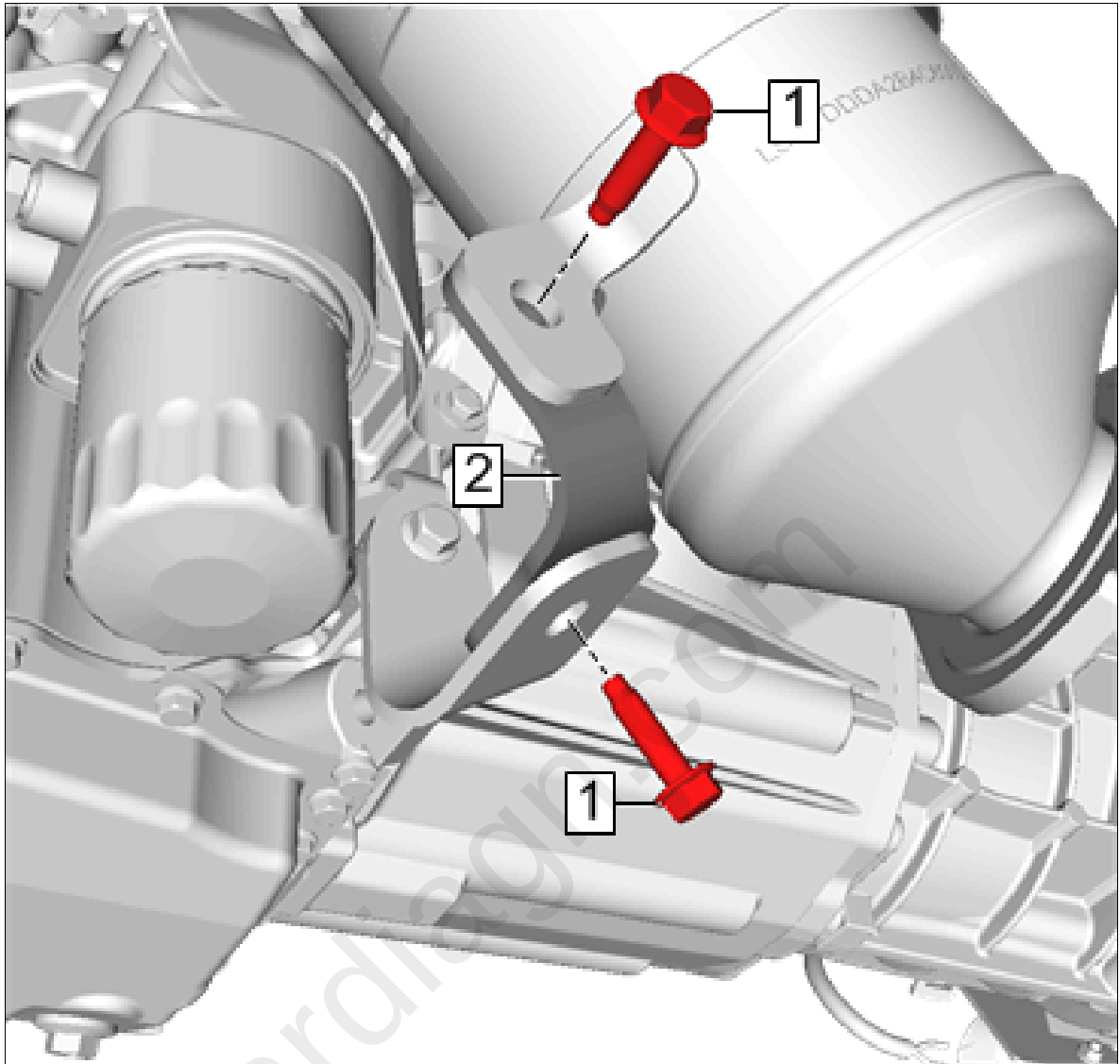
Fig 6: Catalytic Converter Brace Bracket



Courtesy of GENERAL MOTORS COMPANY

11. Tighten Catalytic Converter Brace Bracket Bolt (Qty: 2) to 22 N.m (16 lb ft)

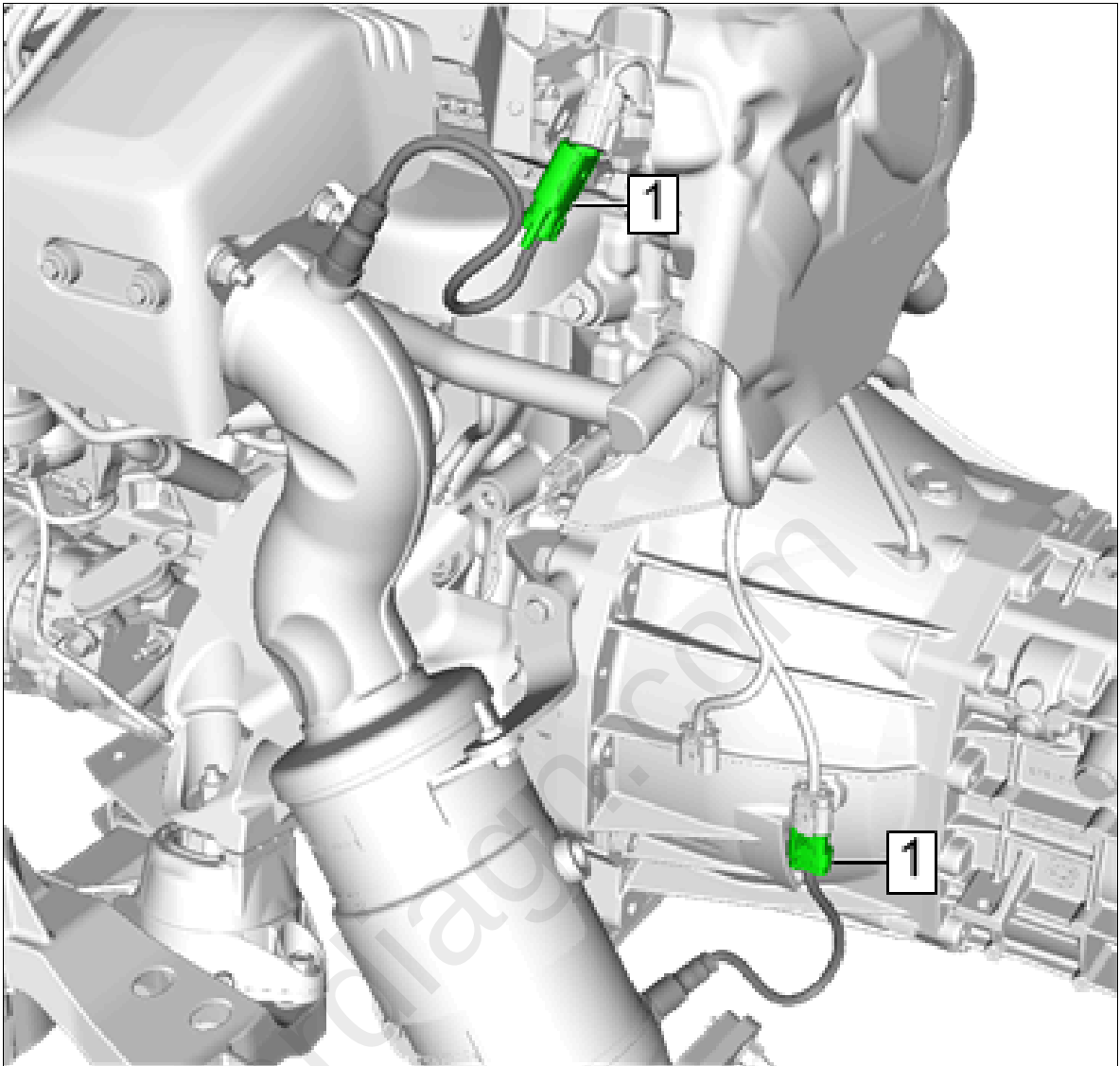
Fig 7: Catalytic Converter Brace Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

12. Tighten Catalytic Converter Brace Bracket Bolt (Qty: 2) to 22 N.m (16 lb ft)

Fig 8: Heated Oxygen Sensor Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

13. Connect Heated Oxygen Sensor Electrical Connector (1) (Qty: 2)
14. Install Exhaust Muffler - Exhaust Muffler Replacement (LTG, Coupe) Exhaust Muffler Replacement (LTG, Convertible)
15. Install Turbocharger Heat Shield - Turbocharger Heat Shield Replacement

**REPAIR INSTRUCTIONS > WARM UP THREE-WAY CATALYTIC CONVERTER
REPLACEMENT (RH - LGX) > REMOVAL PROCEDURE**

⊗ WARNING:

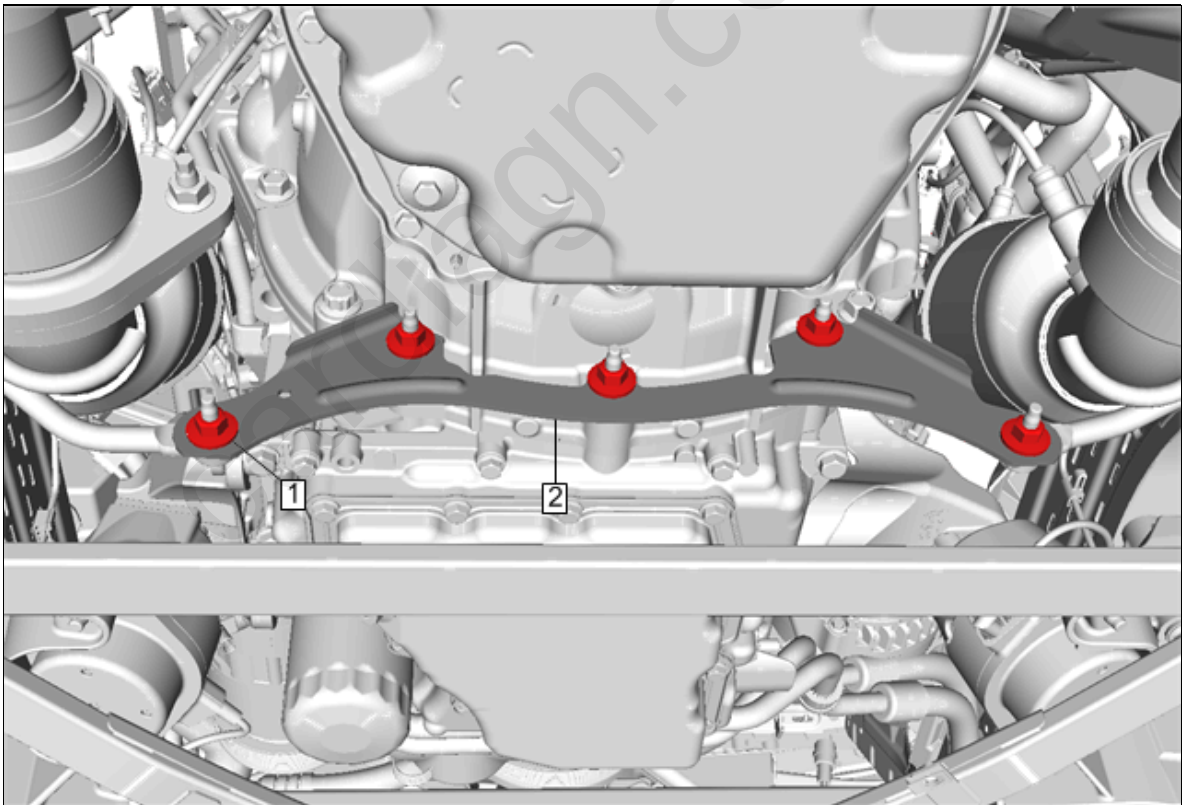
In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

⊗ WARNING:

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

1. Remove Intake Manifold Cover Replacement
2. Remove Front Compartment Lower Noise Shield Replacement (Coupe - LGX, LTG)
3. Remove Exhaust Muffler Replacement (LGX, Coupe) Exhaust Muffler Replacement (LGX, Convertible)

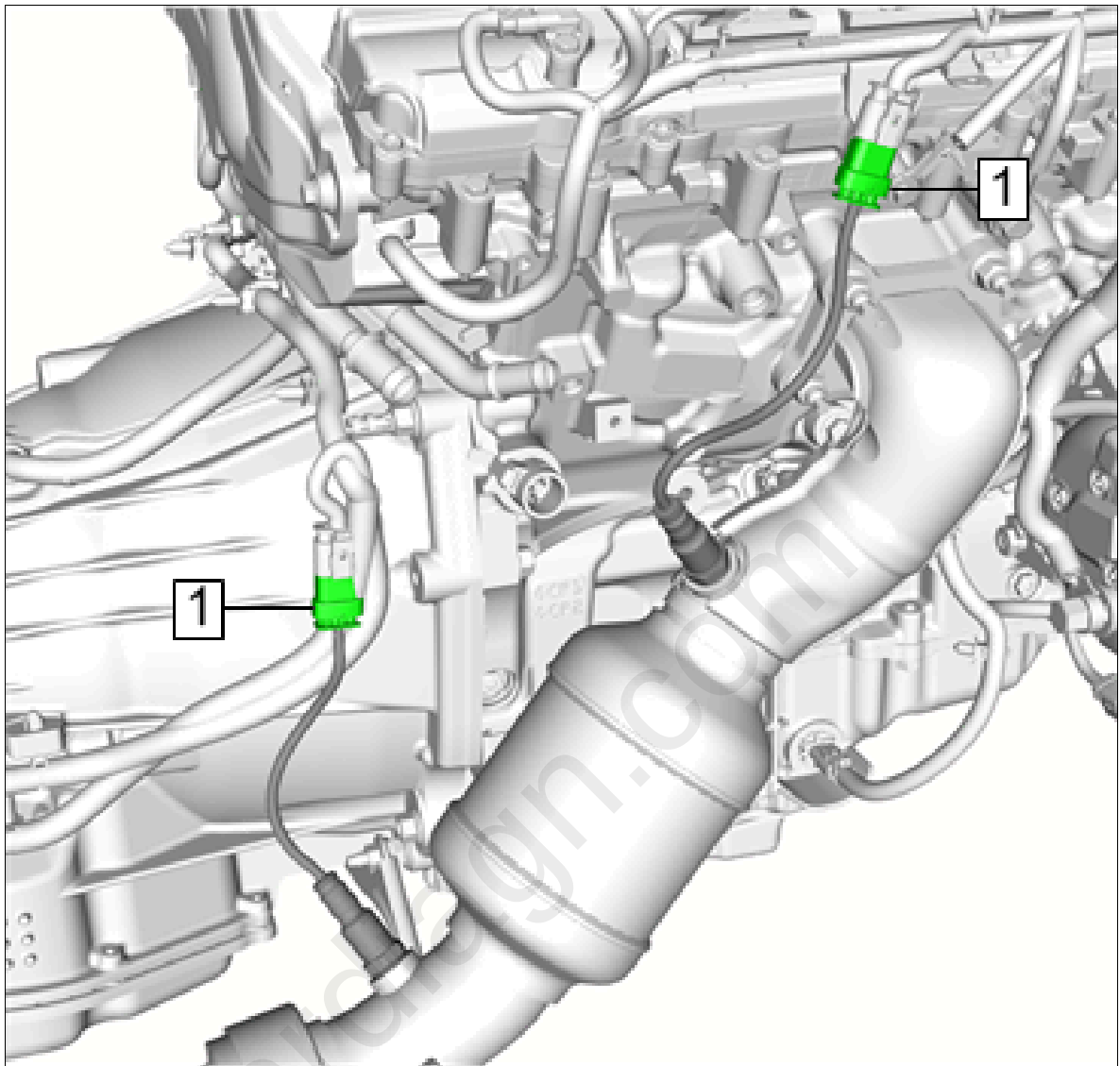
Fig 1: Catalytic Converter Brace Bracket (LGX)



Courtesy of GENERAL MOTORS COMPANY

4. Remove Catalytic Converter Brace Bracket(2) - Catalytic Converter Brace Bracket Replacement (LGX)

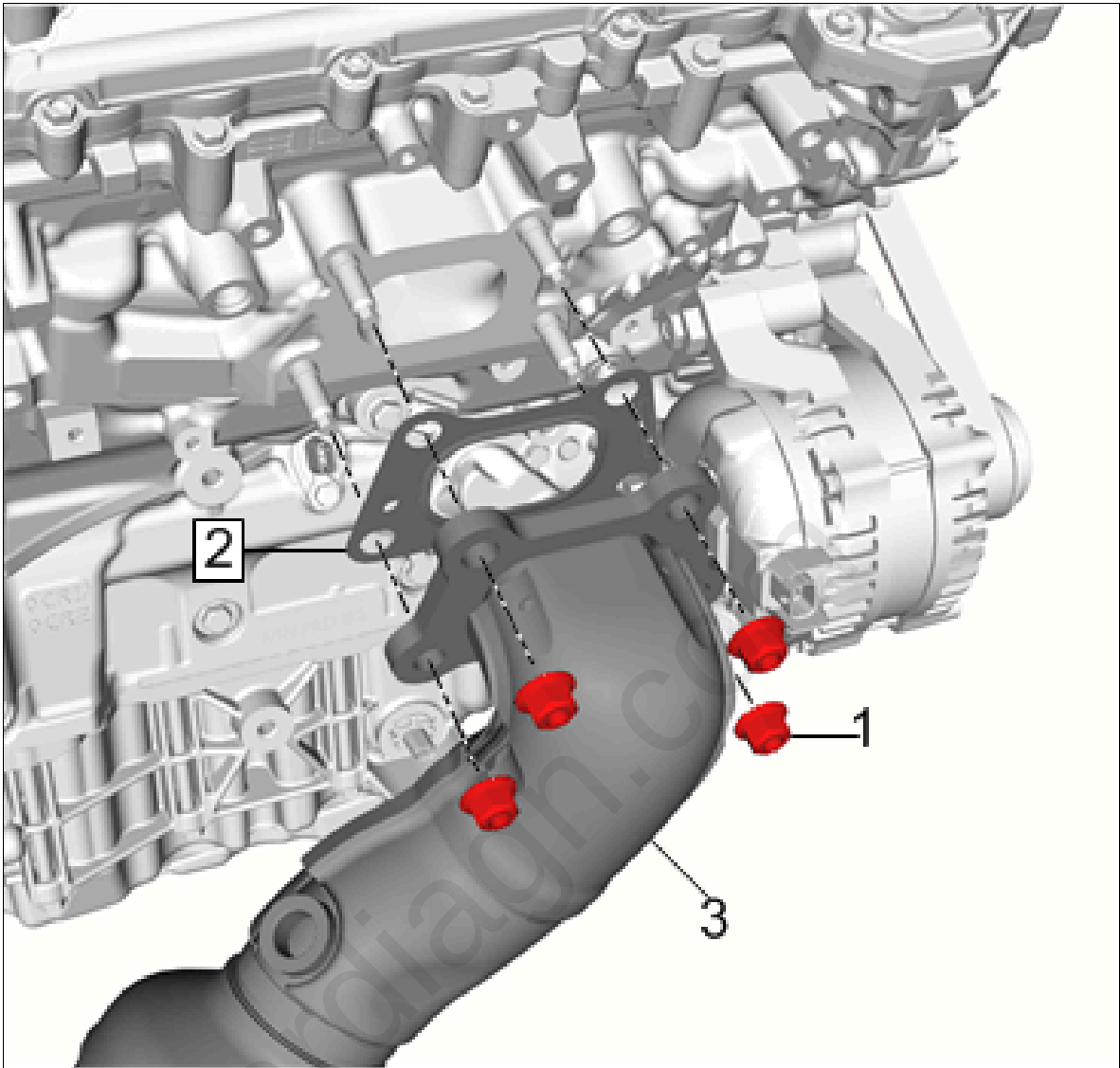
Fig 2: Heated Oxygen Sensor Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

5. Disconnect Heated Oxygen Sensor Electrical Connector (1) (Qty: 2)

Fig 3: Catalytic Converter Nut

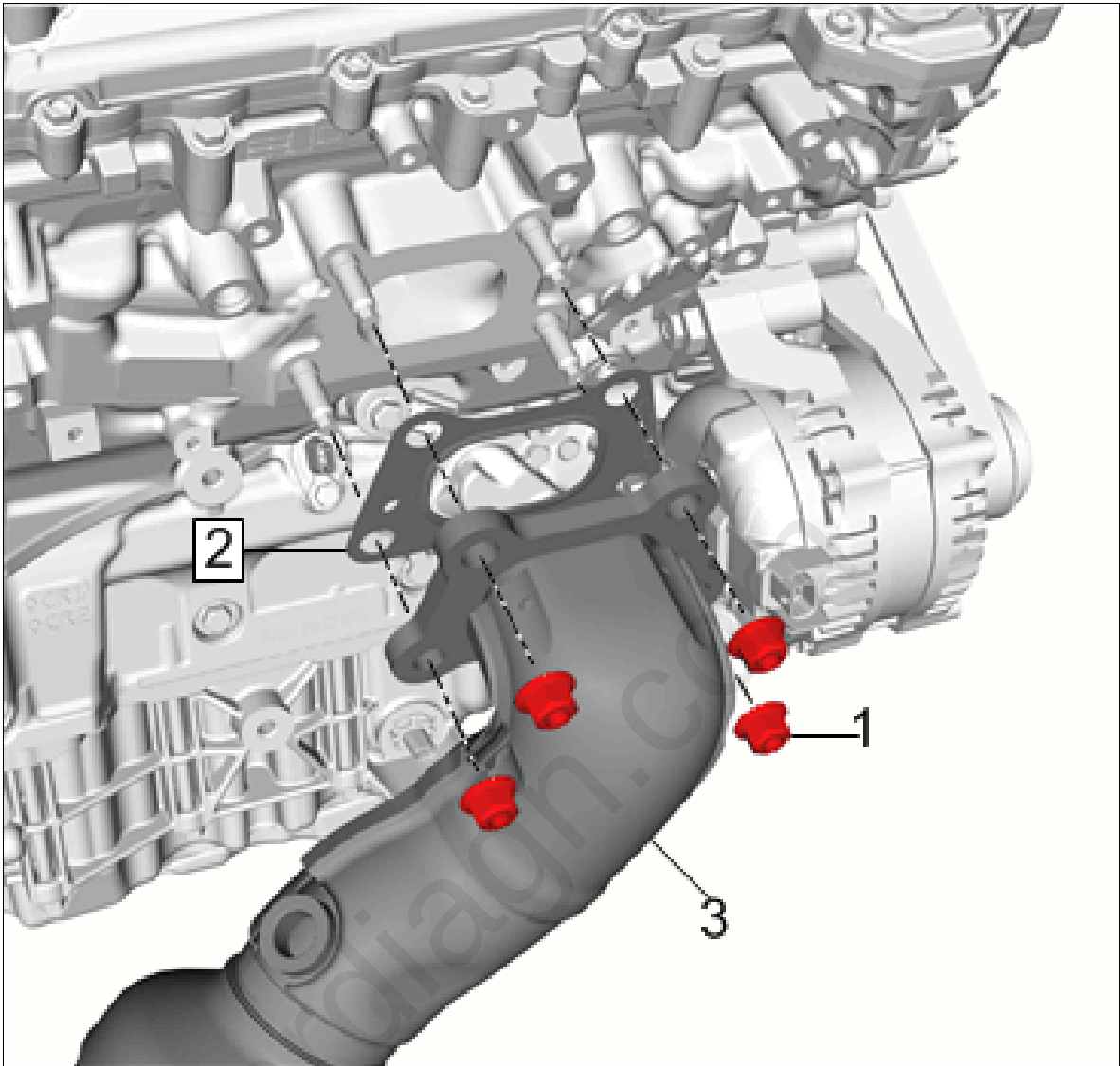


Courtesy of GENERAL MOTORS COMPANY

6. Remove Catalytic Converter Nut (1) (Qty: 4)
7. Remove Catalytic Converter Gasket (2) and DISCARD
8. Remove Catalytic Converter (3)
9. Transfer components as necessary.

**REPAIR INSTRUCTIONS > WARM UP THREE-WAY CATALYTIC CONVERTER
REPLACEMENT (RH - LGX) > INSTALLATION PROCEDURE**

Fig 1: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

1. Install Catalytic Converter (3)

 **NOTE:**

Install a NEW catalytic converter gasket.

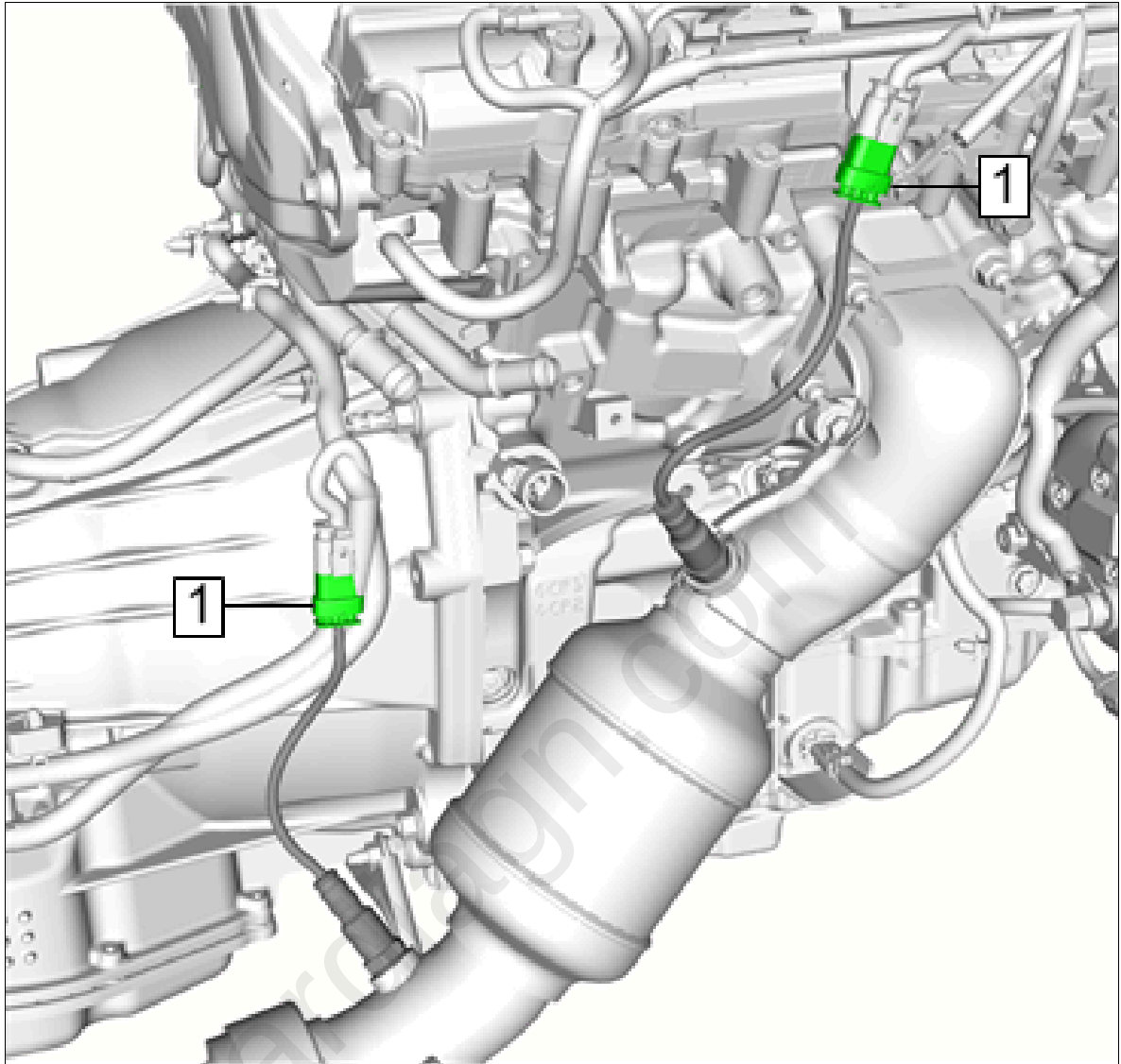
2. Install Catalytic Converter Gasket (2)

 **CAUTION:**

Refer to Fastener Caution .

3. Install Catalytic Converter Nut (1) (Qty: 4) and tighten to 46 N.m (34 lb ft)

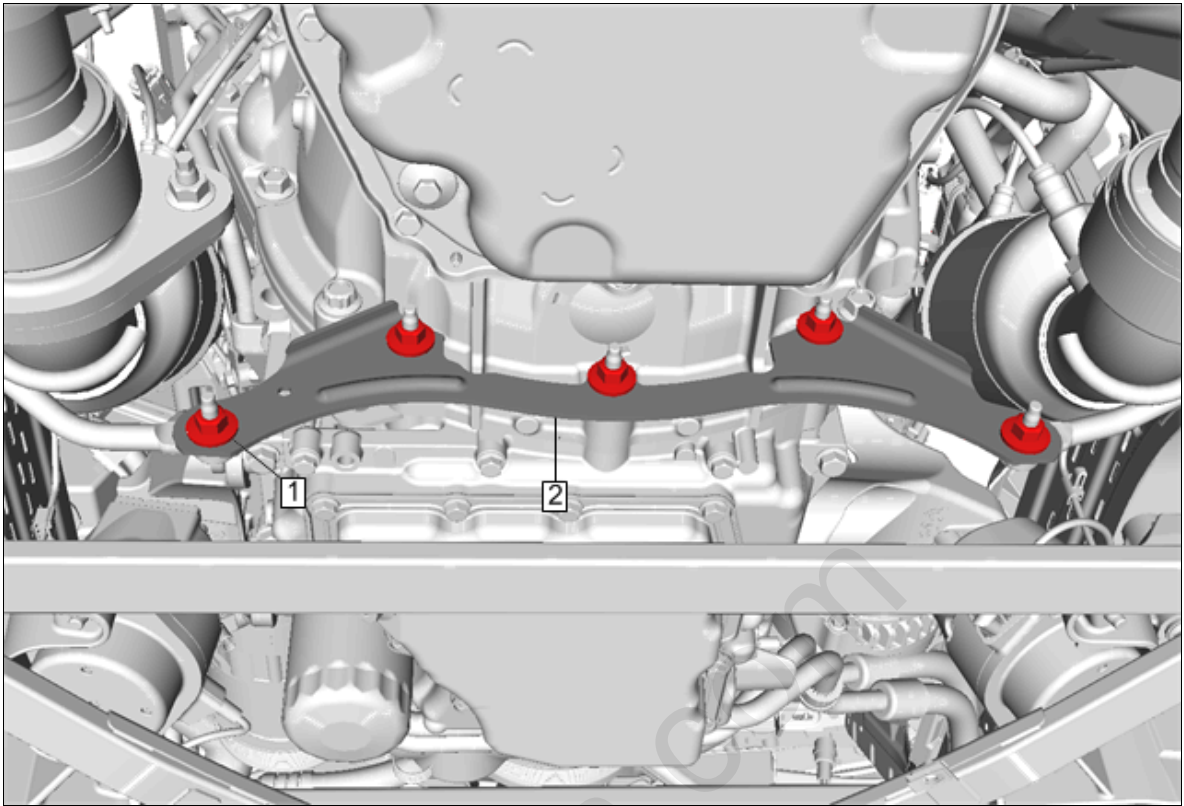
Fig 2: Heated Oxygen Sensor Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

4. Connect Heated Oxygen Sensor Electrical Connector (1) (Qty: 2)

Fig 3: Catalytic Converter Brace Bracket (LGX)

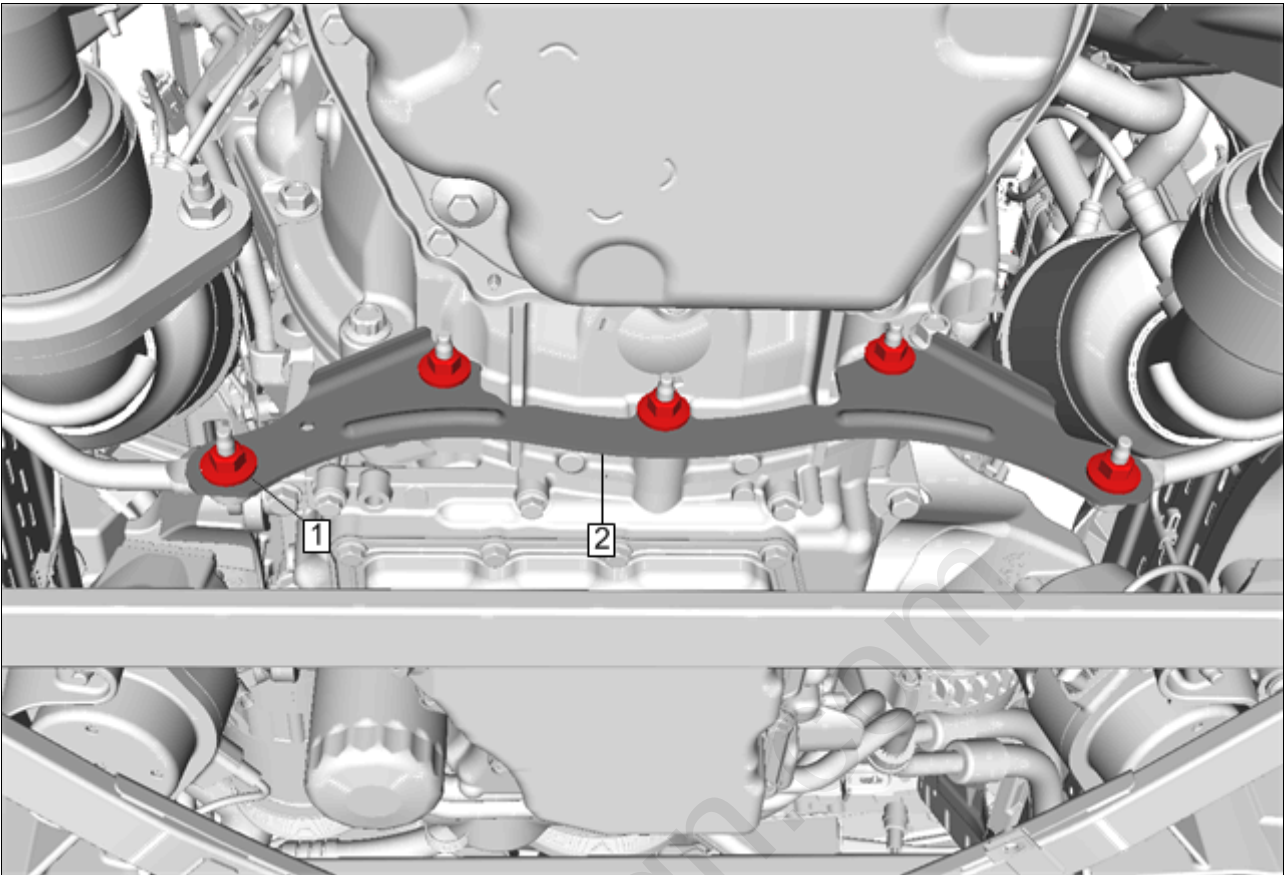


Courtesy of GENERAL MOTORS COMPANY

5. Install Catalytic Converter Brace Bracket (2) - Catalytic Converter Brace Bracket Replacement (LGX)
6. Install Exhaust Muffler Replacement (LGX, Coupe) Exhaust Muffler Replacement (LGX, Convertible)
7. Install Front Compartment Lower Noise Shield Replacement (Coupe - LGX, LTG)
8. Install Intake Manifold Cover Replacement
9. Start the engine and check for exhaust leaks.

REPAIR INSTRUCTIONS > CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (LGX)

Fig 1: Catalytic Converter Brace Bracket (LGX)

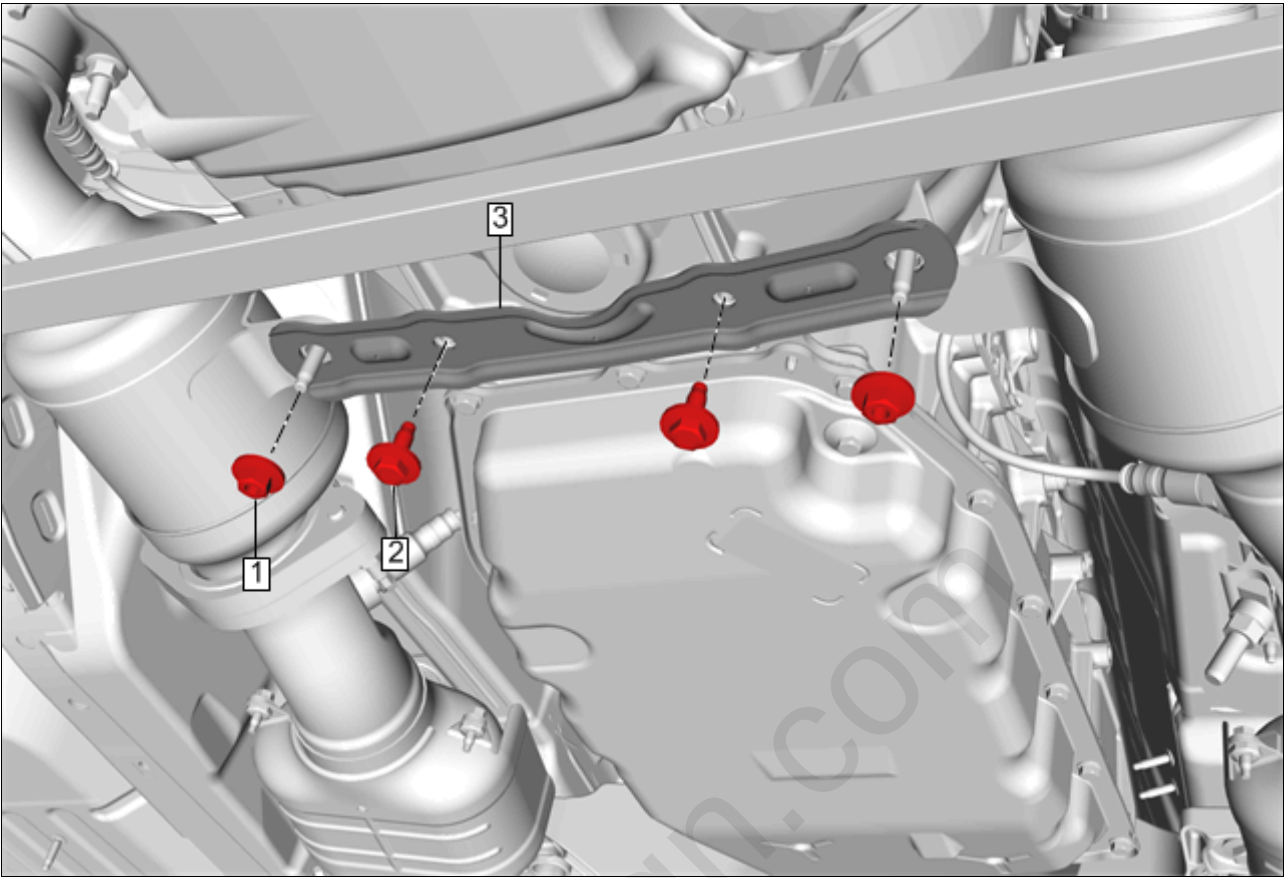


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP)	
1	Catalytic Converter Brace Bracket Nut (Qty: 5)
	CAUTION: Refer to Fastener Caution .
	Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Brace Bracket

**REPAIR INSTRUCTIONS > CATALYTIC CONVERTER BRACE BRACKET
REPLACEMENT (LT1)**

Fig 1: Catalytic Converter Brace Bracket (LT1)



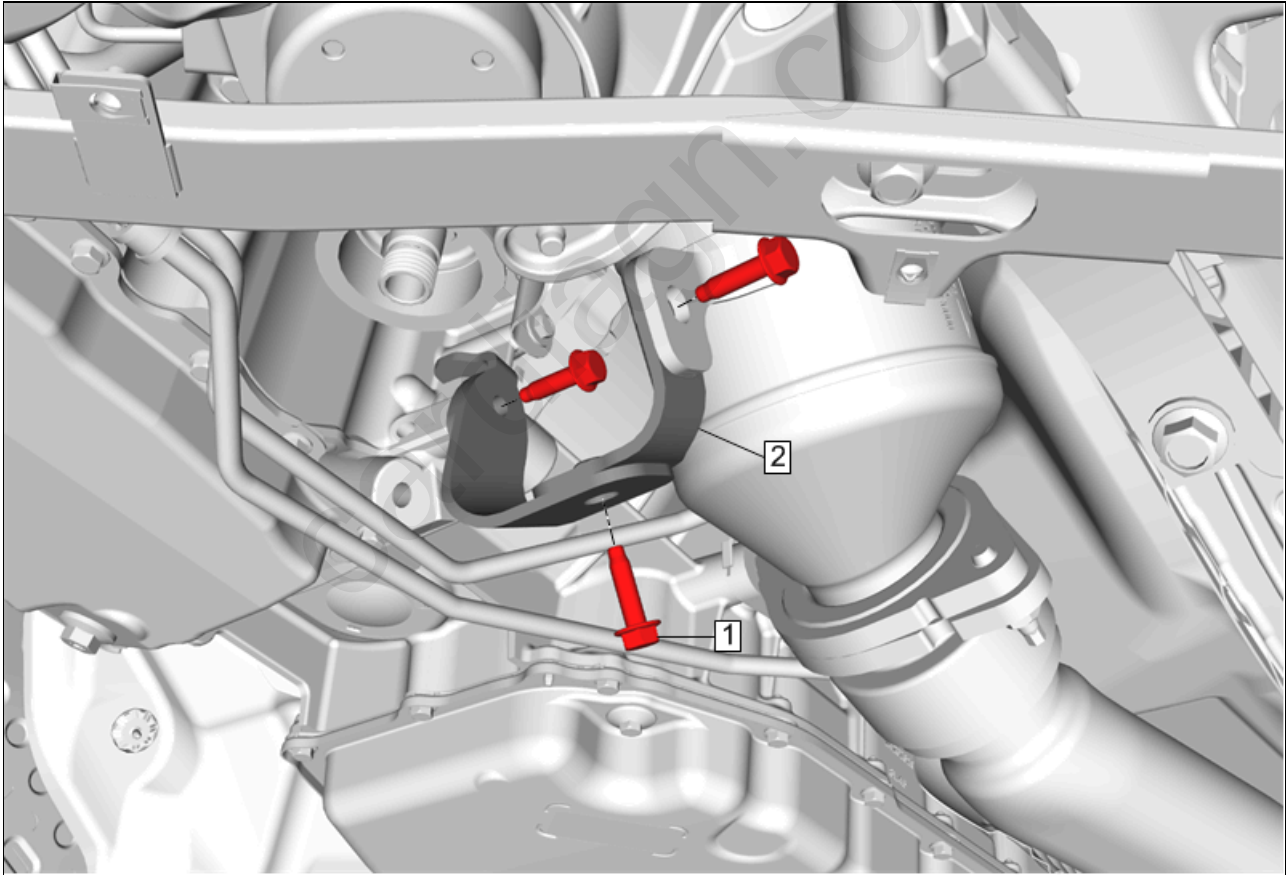
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP)	
1	Catalytic Converter Brace Bracket Nut (Qty: 2)
	CAUTION: Refer to Fastener Caution .
	Tighten 22 N.m (16 lb ft)

2	Catalytic Converter Brace Bracket Bolt (Qty: 2)
	CAUTION: <i>Refer to Fastener Caution .</i>
	Tighten 22 N.m (16 lb ft)
3	Catalytic Converter Brace Bracket

REPAIR INSTRUCTIONS > CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (LOWER, LTG)

Fig 1: Catalytic Converter Brace Bracket (Lower, LTG)



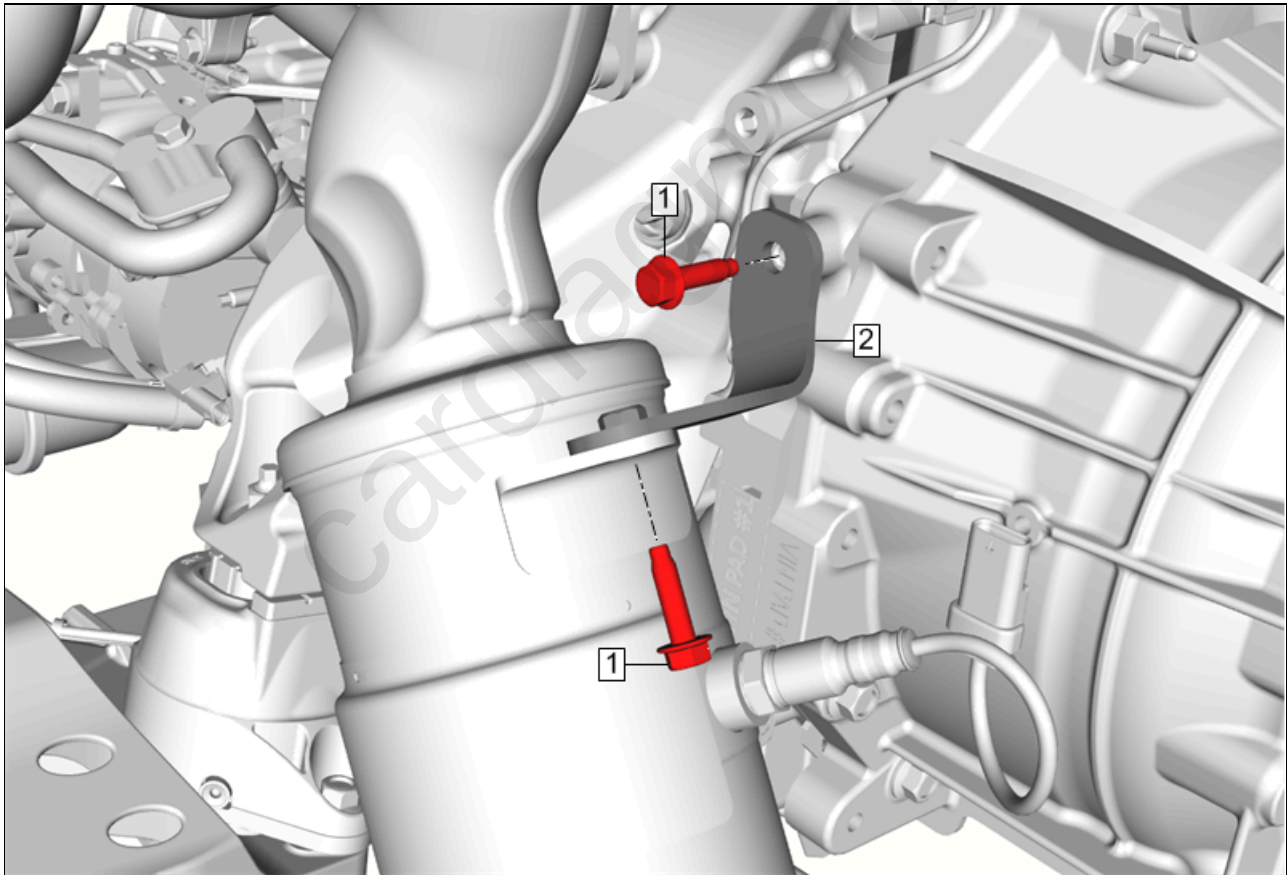
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP)	

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

REPAIR INSTRUCTIONS > CATALYTIC CONVERTER BRACE BRACKET REPLACEMENT (UPPER, LTG)

Fig 1: Catalytic Converter Brace Bracket (Upper, LTG)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP)	

1	Catalytic Converter Brace Bracket Bolt (Qty: 2) CAUTION: <i>Refer to Fastener Caution .</i> Tighten 22 N.m (16 lb ft)
2	Catalytic Converter Brace Bracket

REPAIR INSTRUCTIONS > EXHAUST REAR MUFFLER REAR HANGER REPLACEMENT (LGX, LT1) > 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.

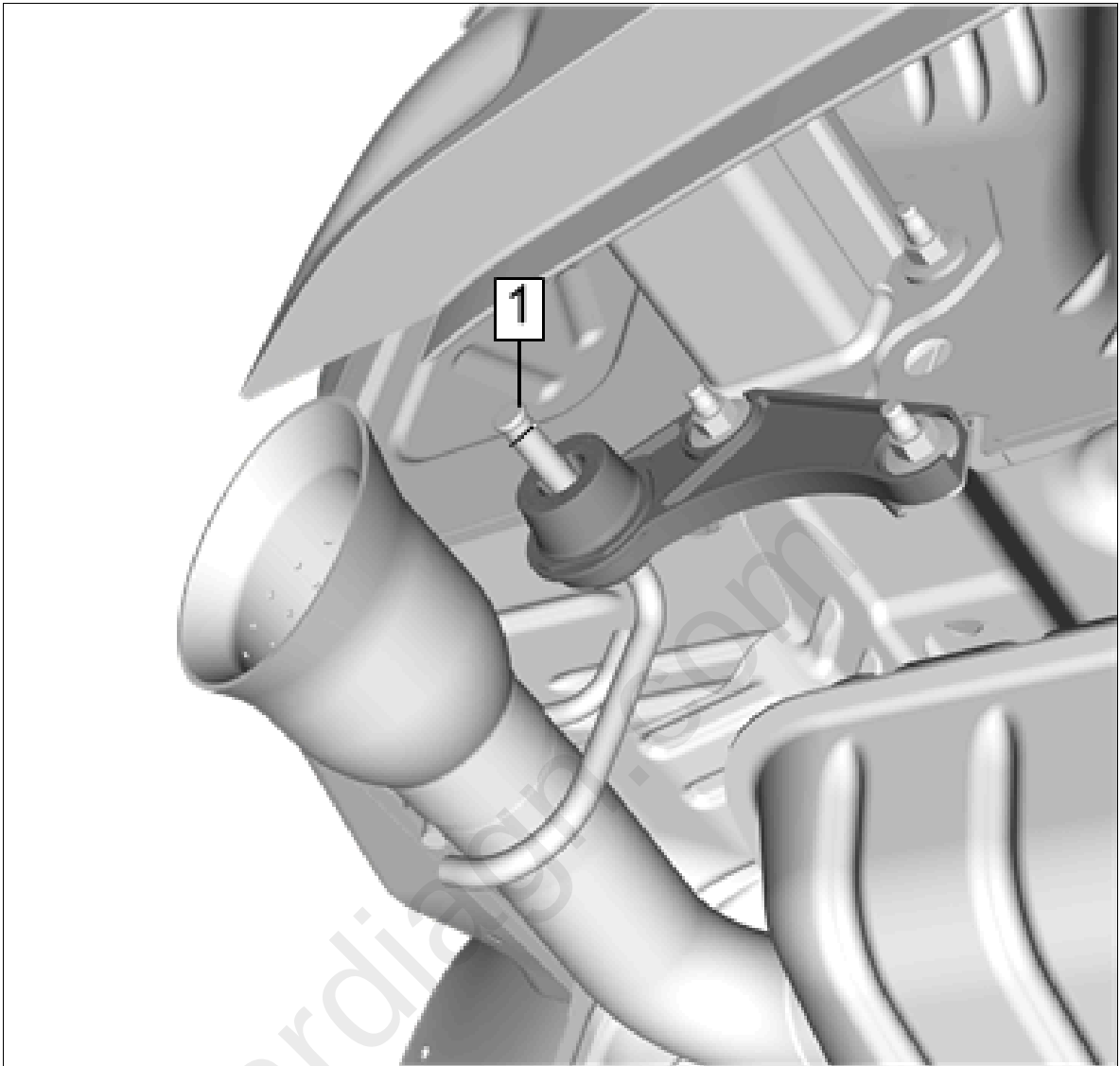


WARNING:

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

1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)

Fig 1: Flared Section Of Exhaust Rod



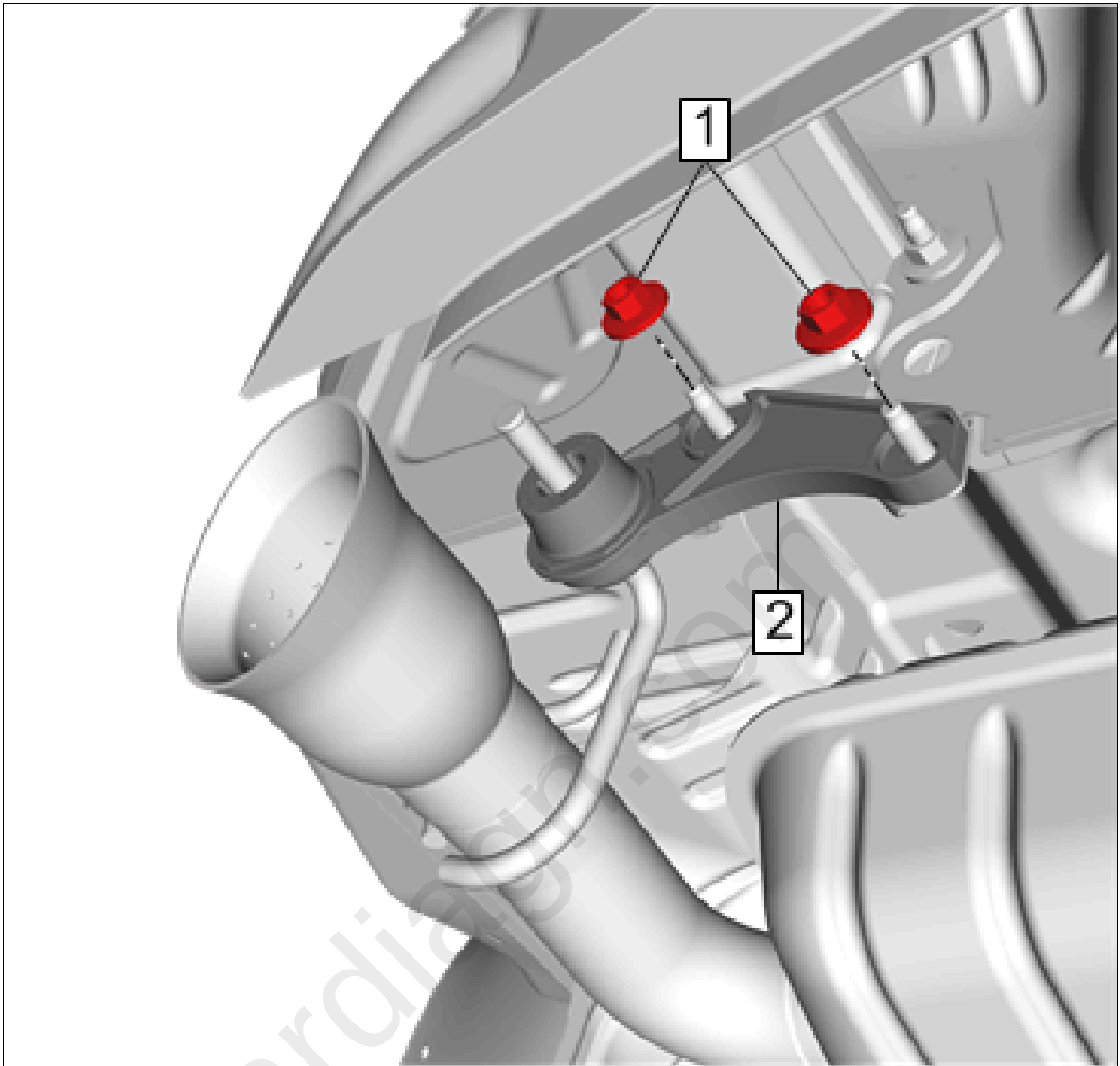
Courtesy of GENERAL MOTORS COMPANY

 IMPORTANT:

The exhaust muffler rod must be cut prior to removing the exhaust rear muffler insulator to avoid damage to the rubber insulator.

2. Cut the flared section of the exhaust rod at the location shown (1)

Fig 2: Exhaust Rear Muffler Insulator Nut

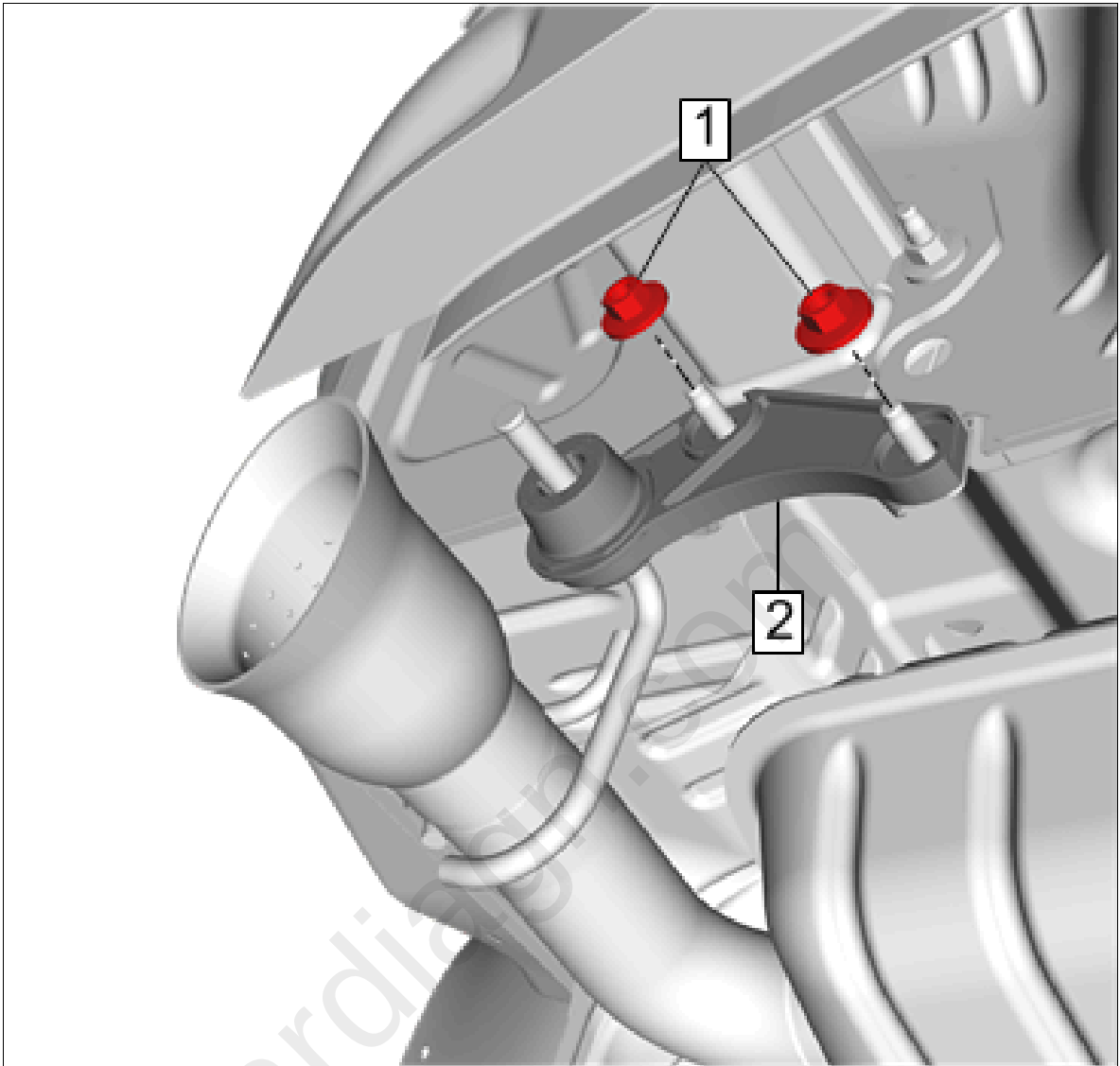


Courtesy of GENERAL MOTORS COMPANY

3. Remove Exhaust Rear Muffler Insulator Nut (1) (Qty: 2)
4. Remove Exhaust Rear Muffler Insulator (2)

**REPAIR INSTRUCTIONS > EXHAUST REAR MUFFLER REAR HANGER
REPLACEMENT (LGX, LT1) > INSTALLATION PROCEDURE**

Fig 1: Exhaust Rear Muffler Insulator Nut



Courtesy of GENERAL MOTORS COMPANY

1. Install Exhaust Rear Muffler Insulator (2)

 **CAUTION:**

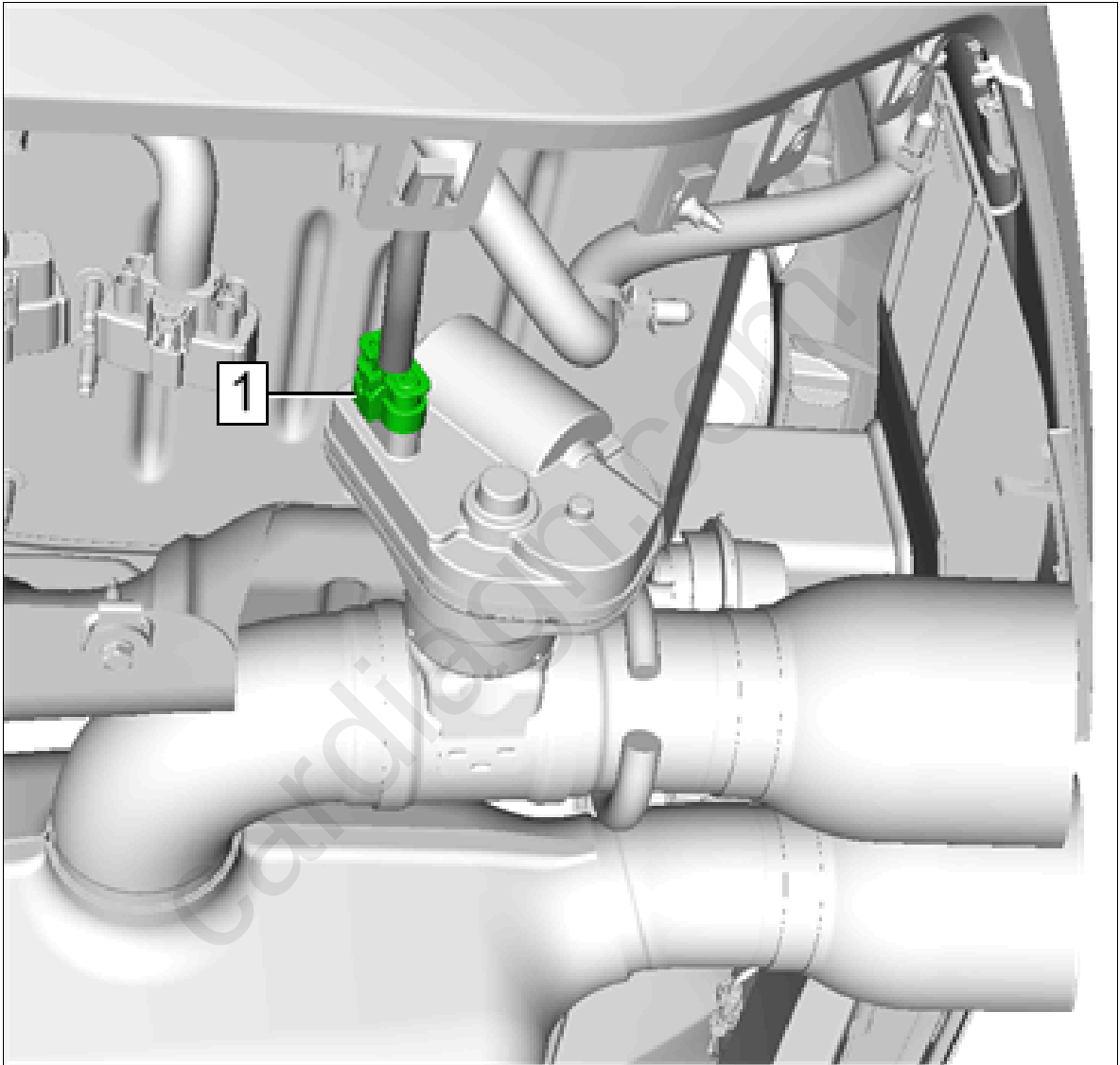
Refer to Fastener Caution .

2. Install Exhaust Rear Muffler Insulator Nut (1) (Qty: 2) and tighten to 40 N.m (30 lb ft)
3. Lower the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)

**REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LGX, COUPE) >
REMOVAL PROCEDURE**

1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)
2. Support the exhaust muffler with a suitable jack.
3. Remove Floor Panel Number 4 Cross Bar Replacement
4. Remove Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)

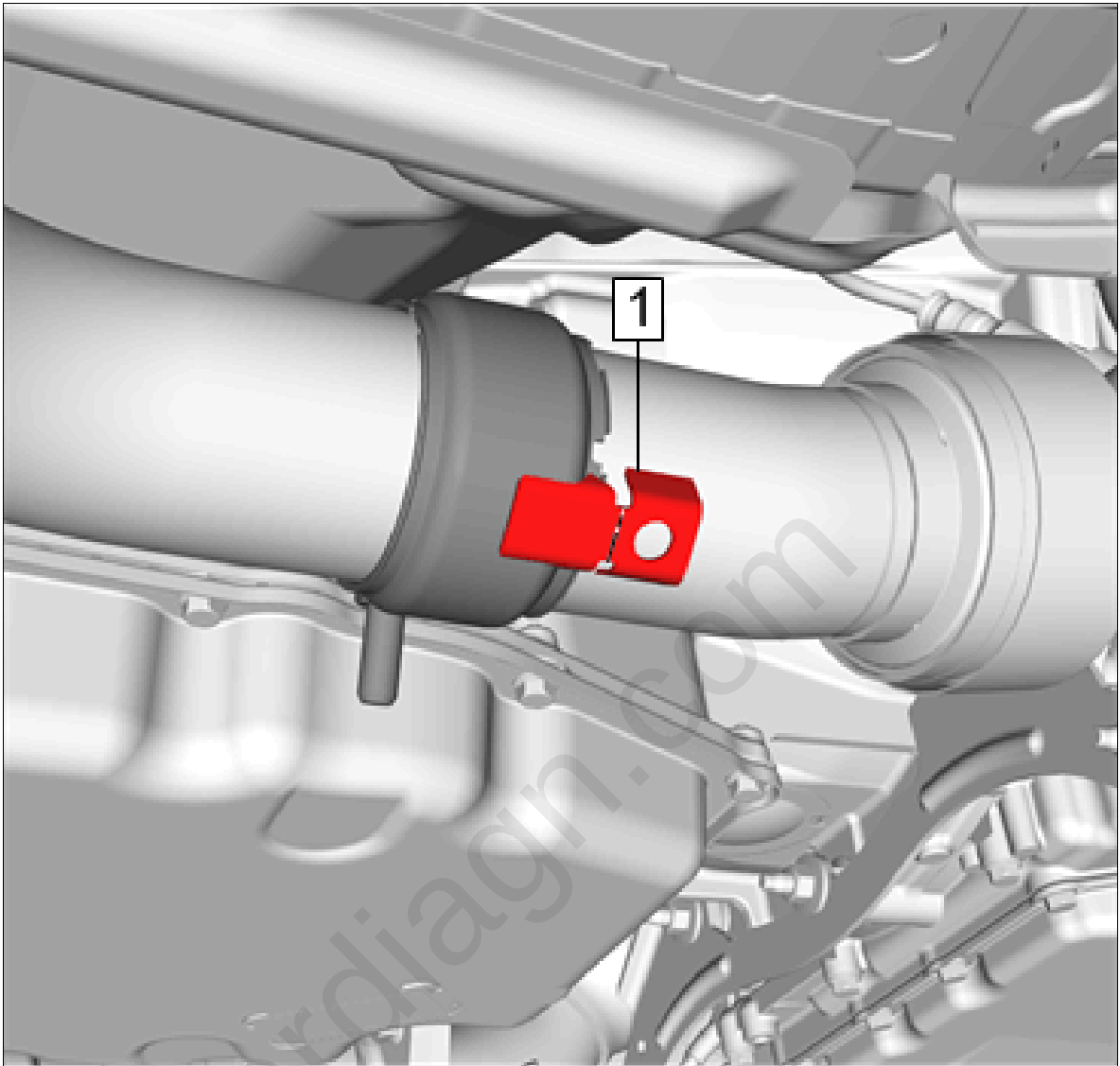
Fig 1: Exhaust Control Valve Actuator Electrical Wiring Harness Connectors



Courtesy of GENERAL MOTORS COMPANY

5. If equipped with performance exhaust, disconnect the exhaust control valve actuator electrical wiring harness connectors (1).

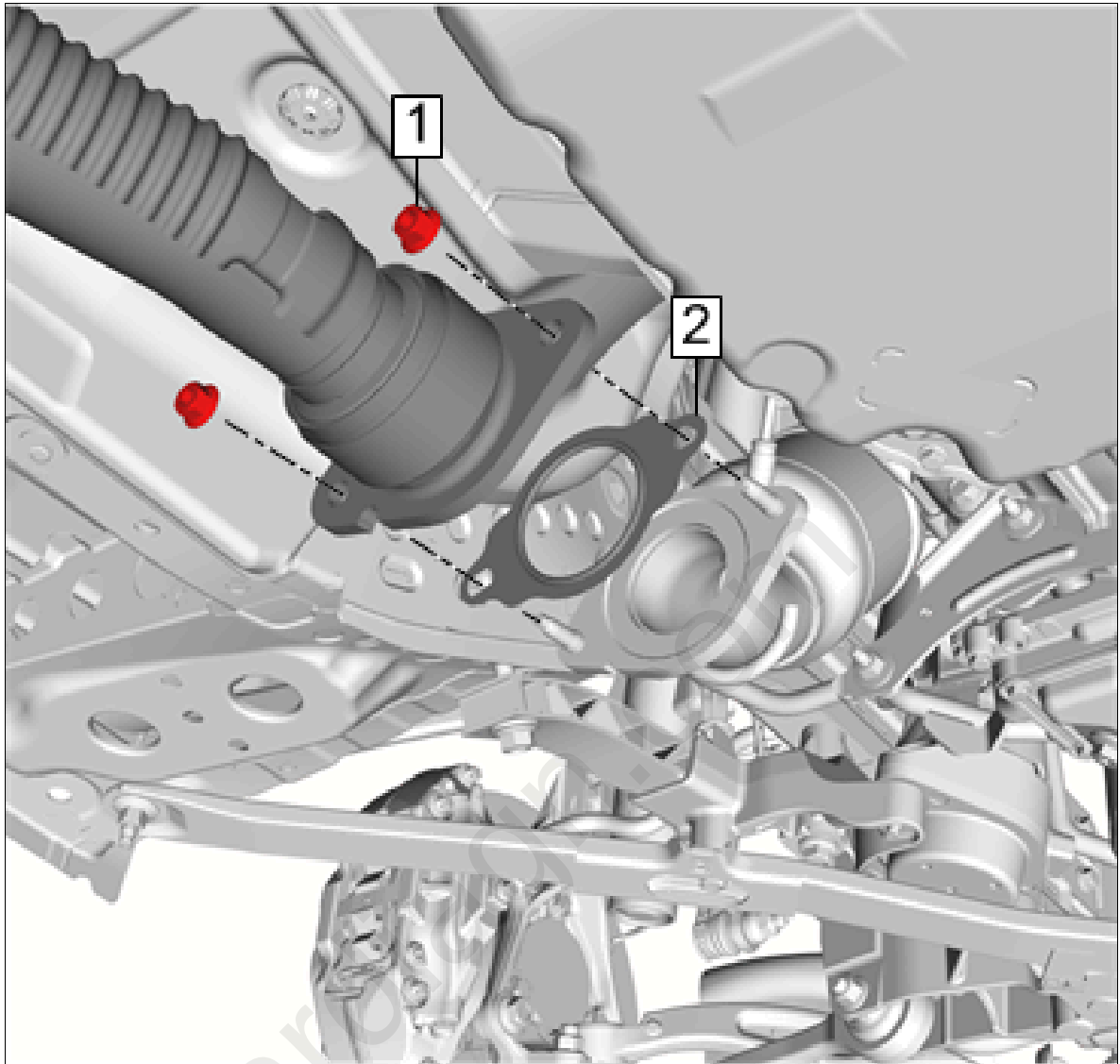
Fig 2: Exhaust Clamp



Courtesy of GENERAL MOTORS COMPANY

6. Using a suitable tool, cut the exhaust clamp at the location shown (1)

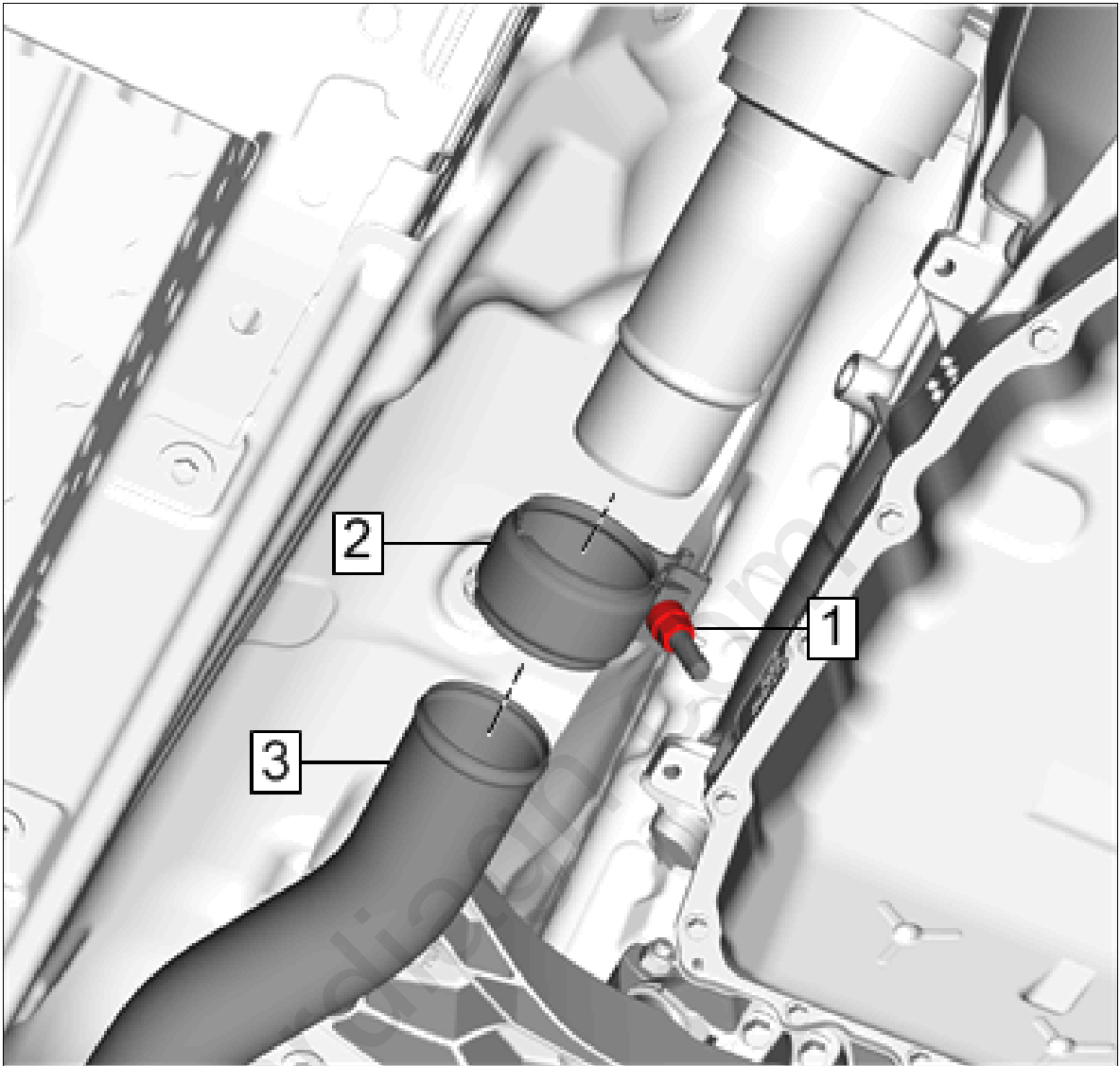
Fig 3: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

7. Remove Catalytic Converter Nut (1) (Qty: 2)
8. Remove Exhaust Gasket (2) and DISCARD

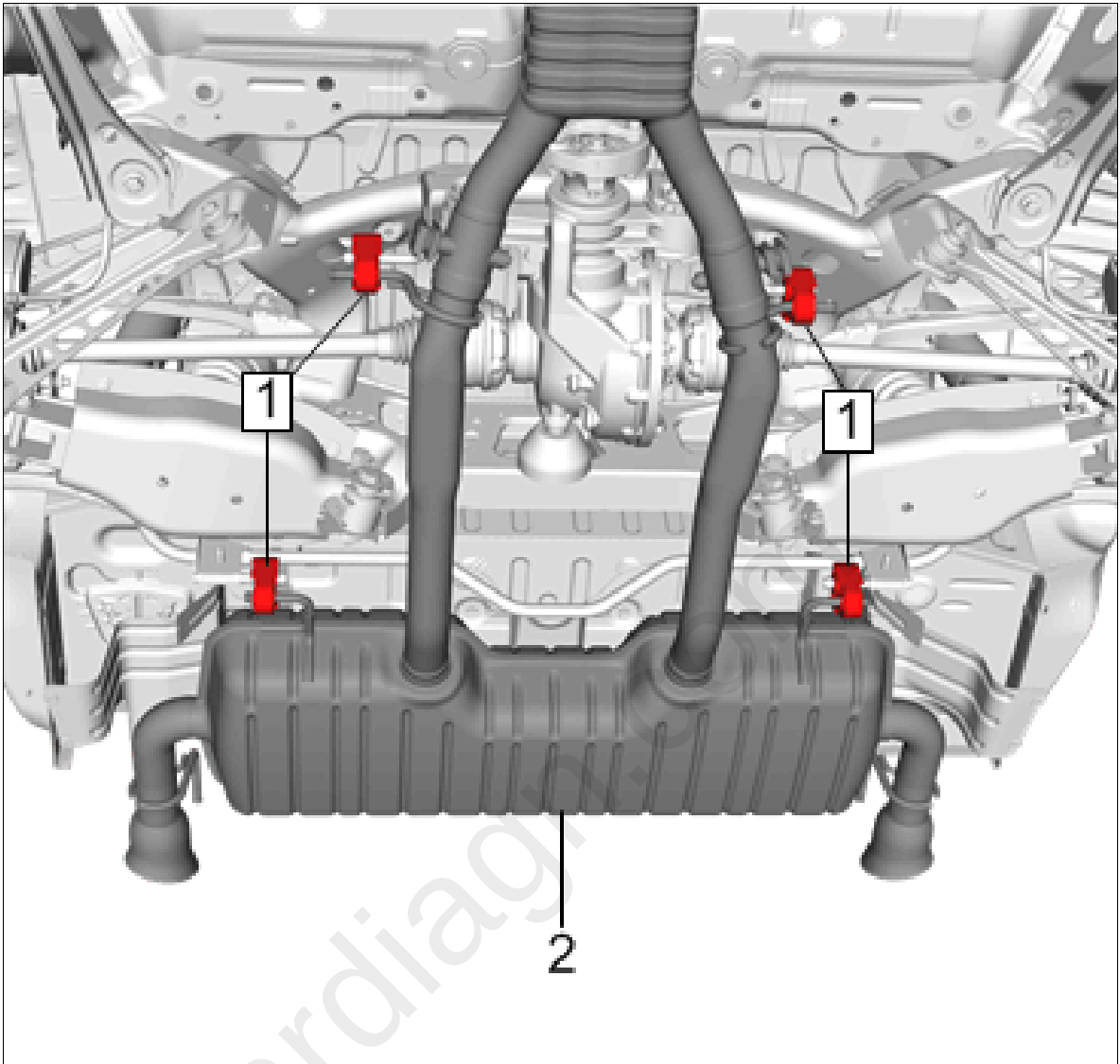
Fig 4: Exhaust Pipe Clamp Nut



Courtesy of GENERAL MOTORS COMPANY

9. Loosen Exhaust Pipe Clamp Nut (1)
10. Remove Exhaust Pipe Clamp (2) and DISCARD
11. Disconnect Exhaust Muffler (3) at Catalytic Converter
12. Clean the connection at the catalytic converters of any remaining gasket material.

Fig 5: Exhaust Muffler Isolator

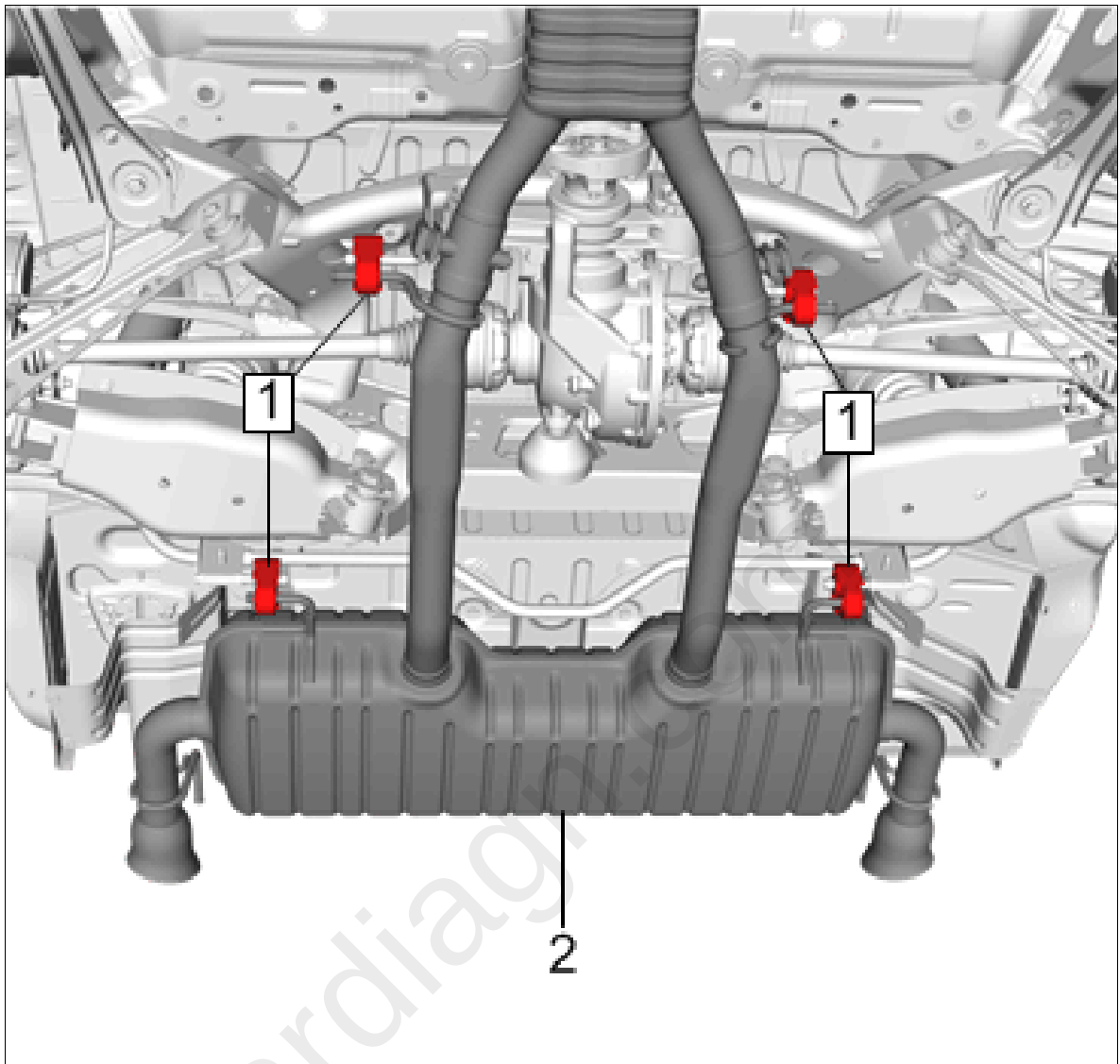


Courtesy of GENERAL MOTORS COMPANY

13. Disconnect Exhaust Muffler Isolator (1) (Qty: 4)
14. With the aid of an assistant, lower the exhaust system from the vehicle (2)

**REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LGX, COUPE) >
INSTALLATION PROCEDURE**

Fig 1: Exhaust Isolators



Courtesy of GENERAL MOTORS COMPANY

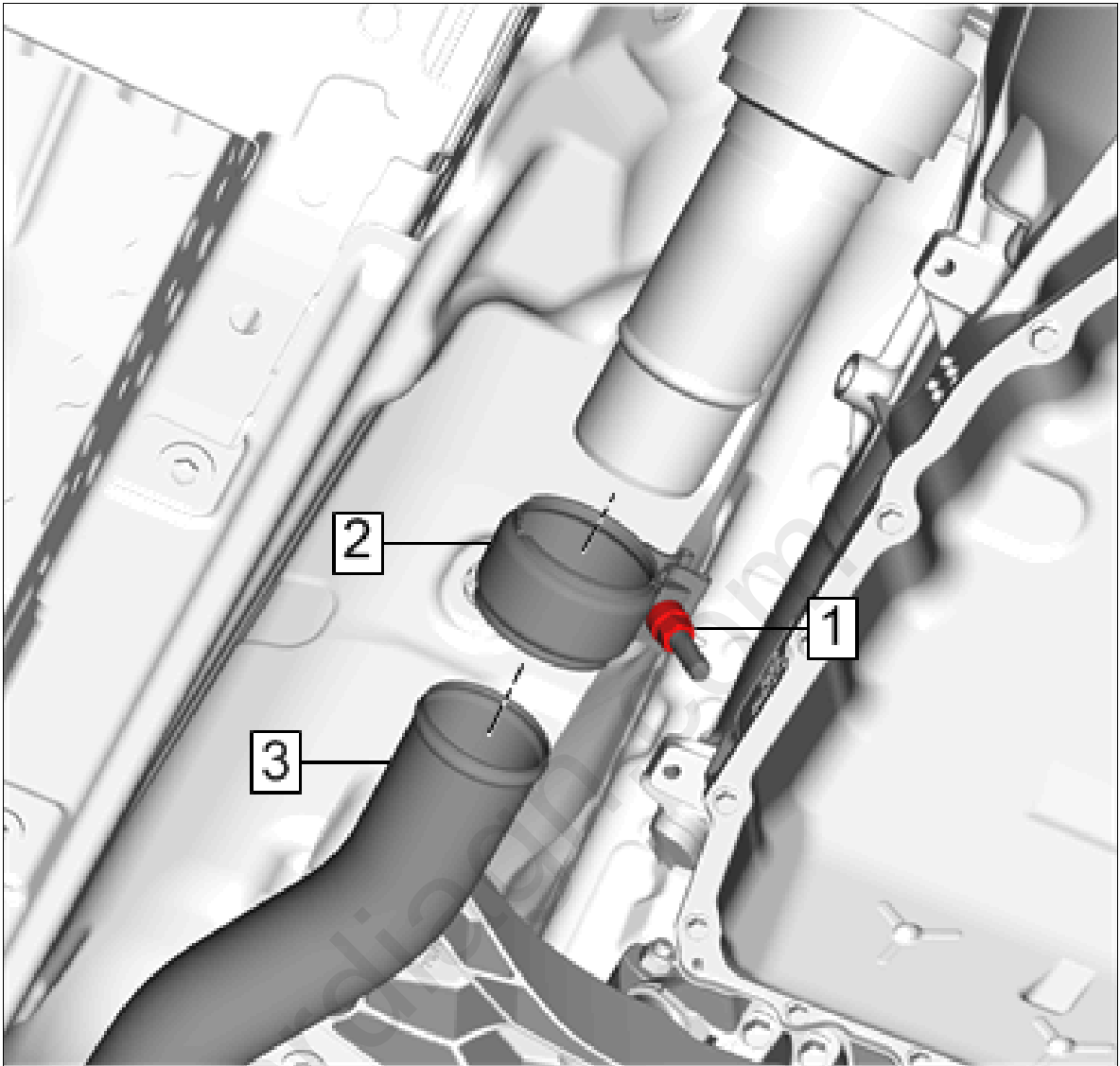
1. With the aid of an assistant, install the exhaust system to the vehicle (2)

 **NOTE:**

Clean and lubricate the exhaust isolators for ease of installation.

2. Connect Exhaust Muffler Isolator (1) (Qty: 4)

Fig 2: Exhaust Pipe Clamp



Courtesy of GENERAL MOTORS COMPANY

 NOTE:

Install a NEW exhaust pipe clamp.

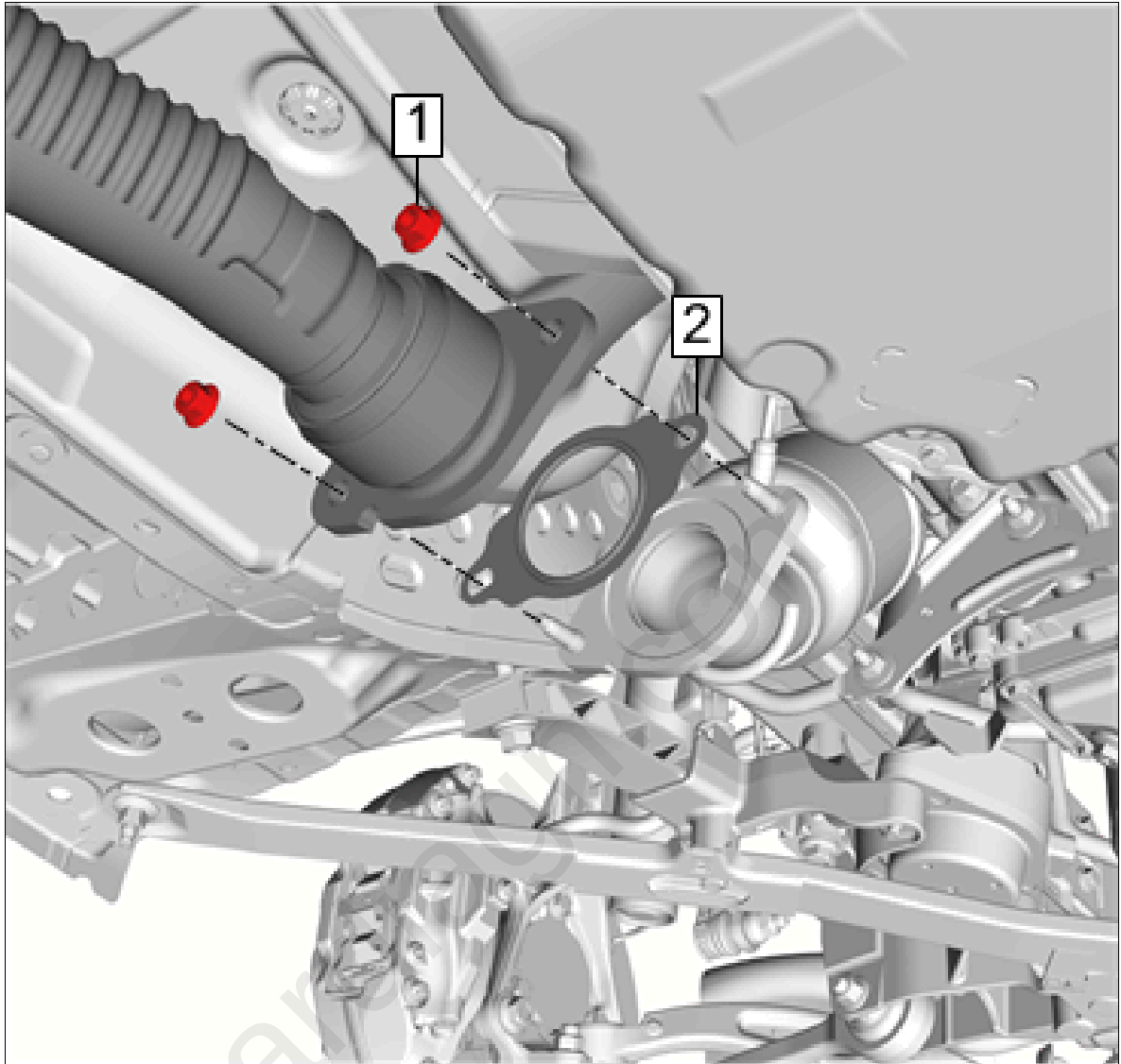
3. Install Exhaust Pipe Clamp (2)
4. Connect Exhaust Muffler (3) at Catalytic Converter

 CAUTION:

Refer to Fastener Caution .

5. Install Exhaust Pipe Clamp Nut (1) and tighten to 50 N.m (37 lb ft)

Fig 3: Catalytic Converter Nut



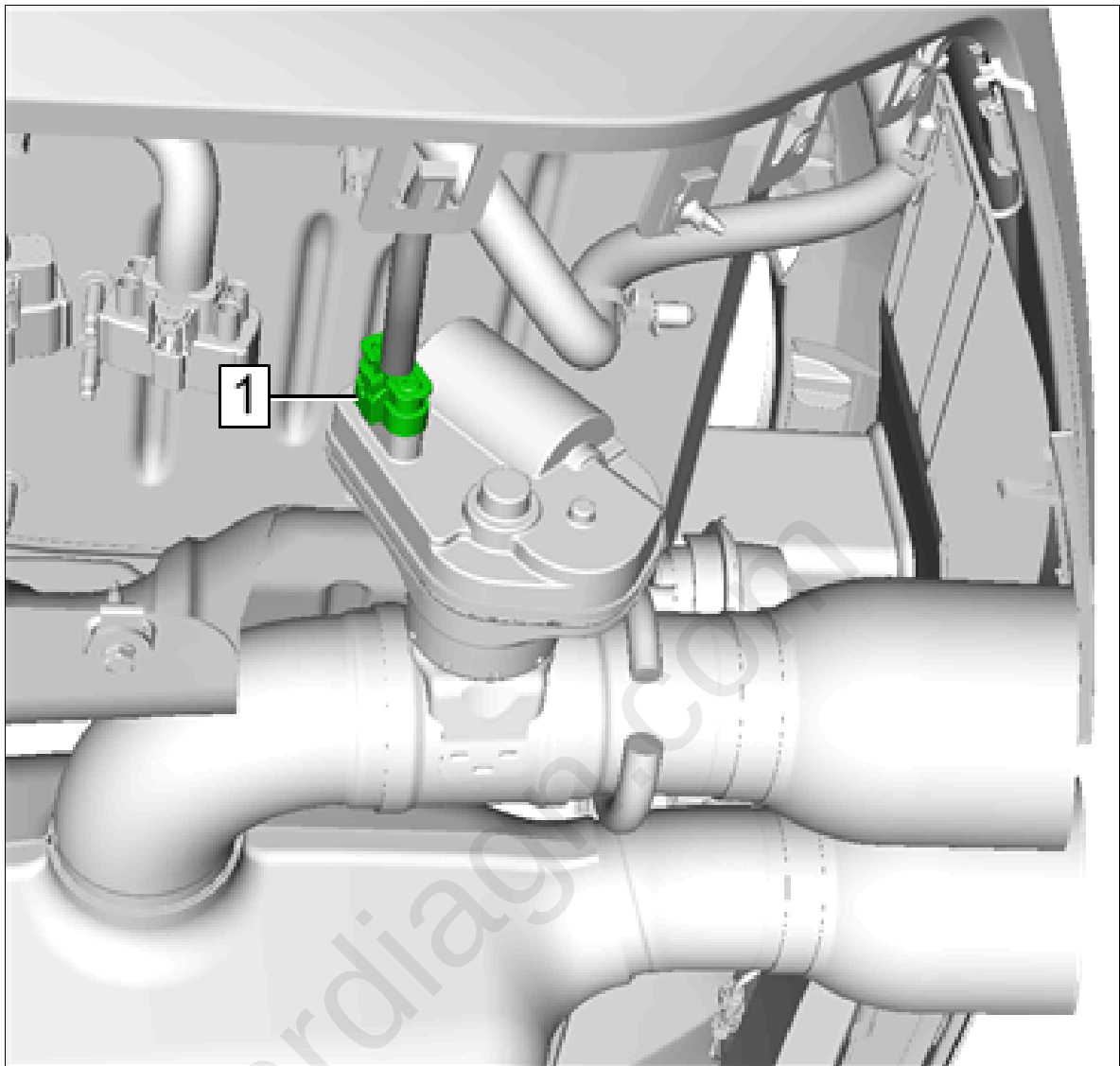
Courtesy of GENERAL MOTORS COMPANY

 **NOTE:**

Install a NEW gasket.

6. Install Exhaust Gasket (2)
7. Install Catalytic Converter Nut (1) (Qty: 2) and tighten to 50 N.m (37 lb ft)

Fig 4: Exhaust Control Valve Actuator Electrical Wiring Harness Connectors



Courtesy of GENERAL MOTORS COMPANY

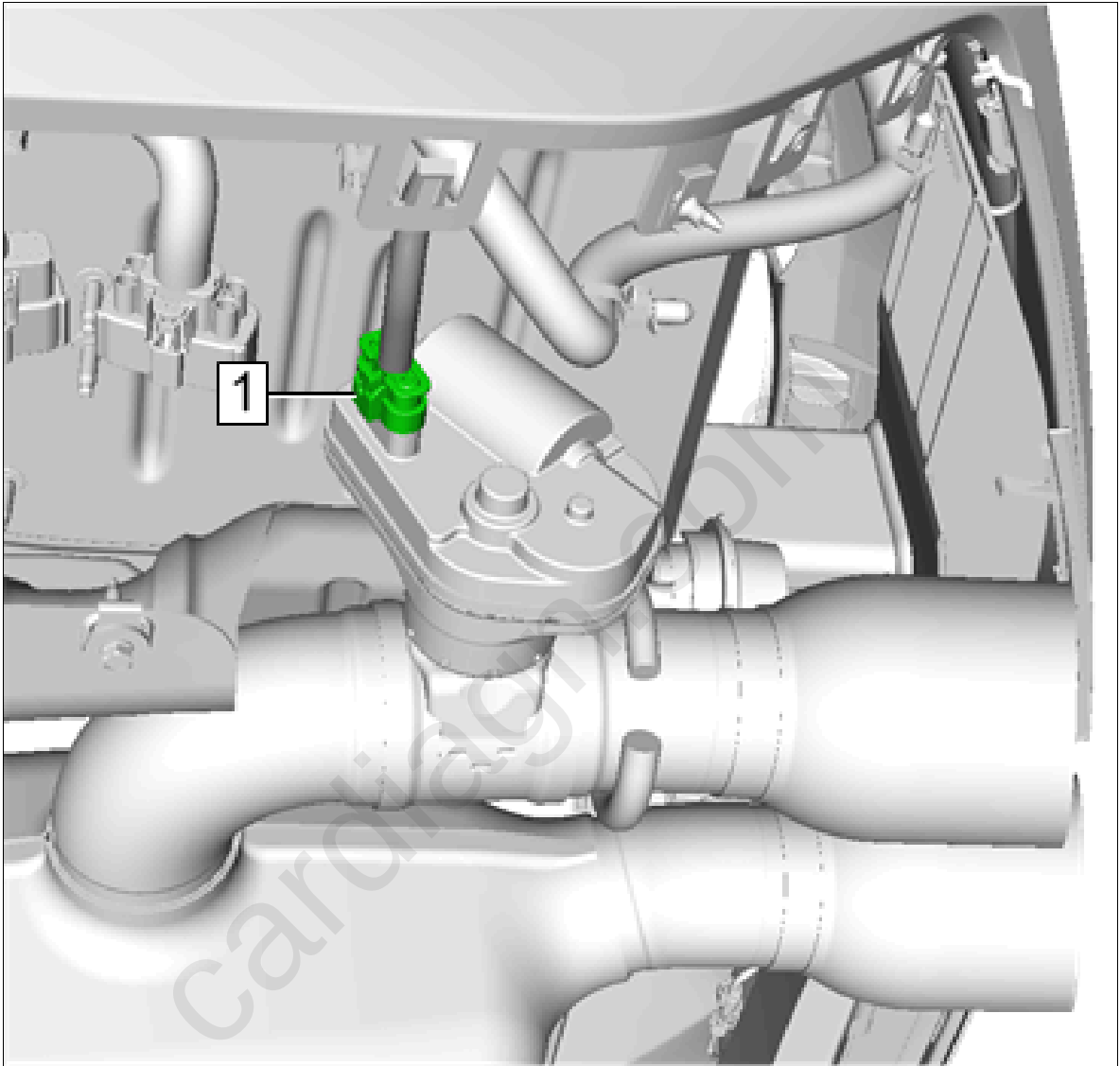
8. If equipped with performance exhaust, connect the exhaust control valve actuator electrical wiring harness connectors (1).
9. Install Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)
10. Install Floor Panel Number 4 Cross Bar Replacement

REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LGX, CONVERTIBLE) > REMOVAL PROCEDURE

1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)
2. Support the exhaust muffler with a suitable jack.

3. Remove Underbody Rear Brace Replacement (Convertible)
4. Remove Floor Panel Number 4 Cross Bar Replacement
5. Remove Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)

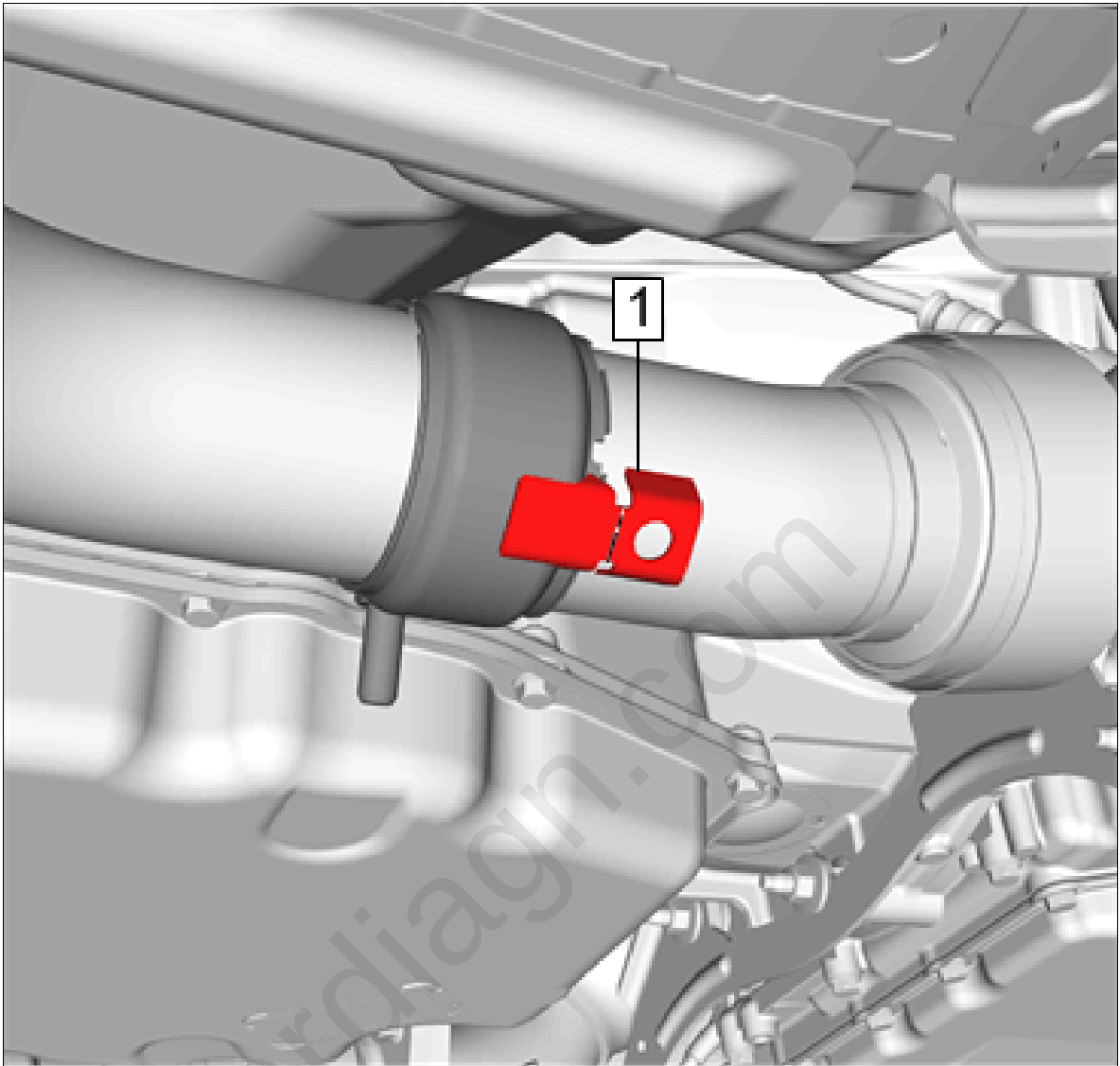
Fig 1: Exhaust Control Valve Actuator Electrical Wiring Harness Connectors



Courtesy of GENERAL MOTORS COMPANY

6. If equipped with performance exhaust, disconnect the exhaust control valve actuator electrical wiring harness connectors (1).

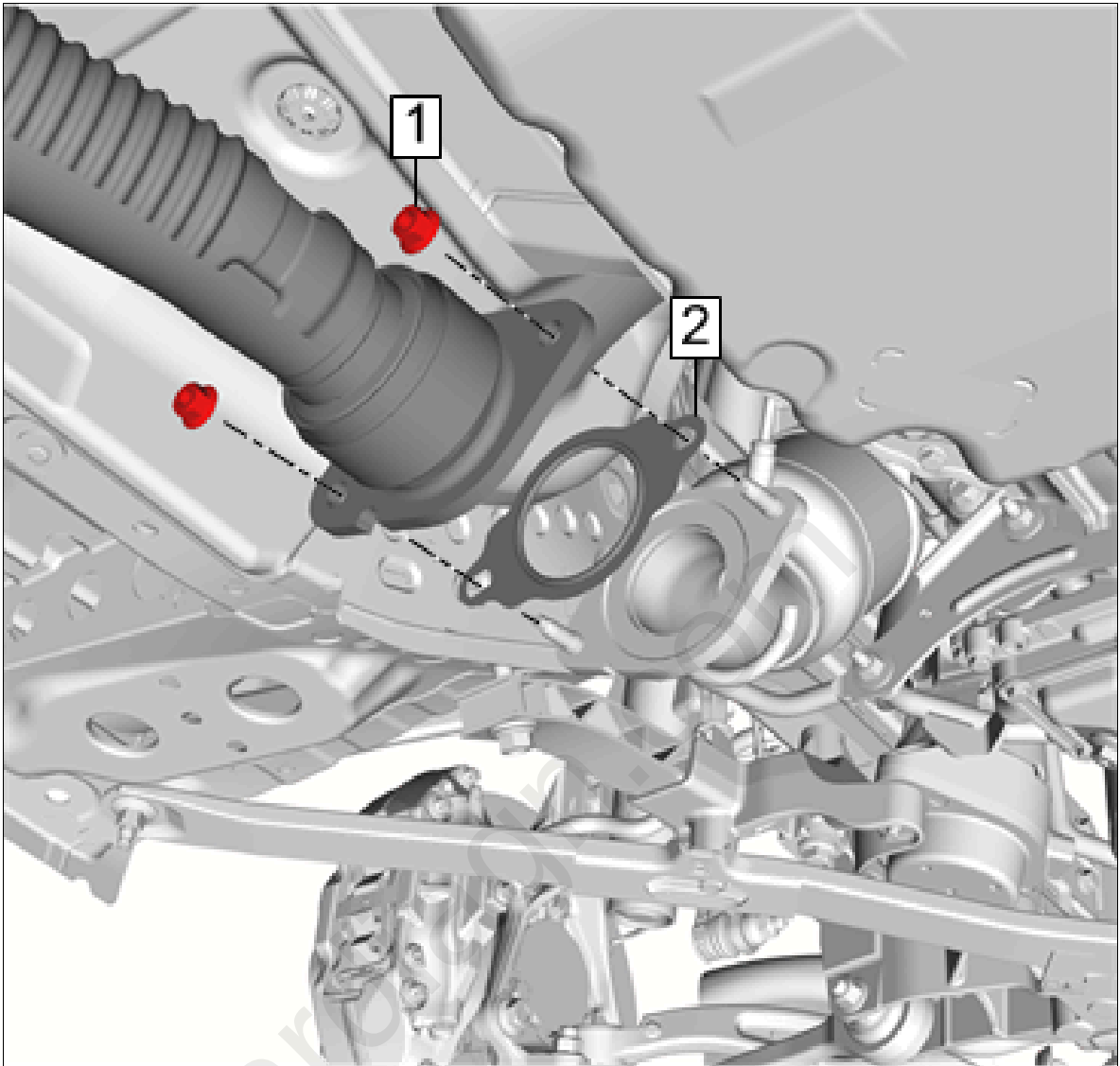
Fig 2: Exhaust Clamp



Courtesy of GENERAL MOTORS COMPANY

7. Using a suitable tool, cut the exhaust clamp at the location shown (1)

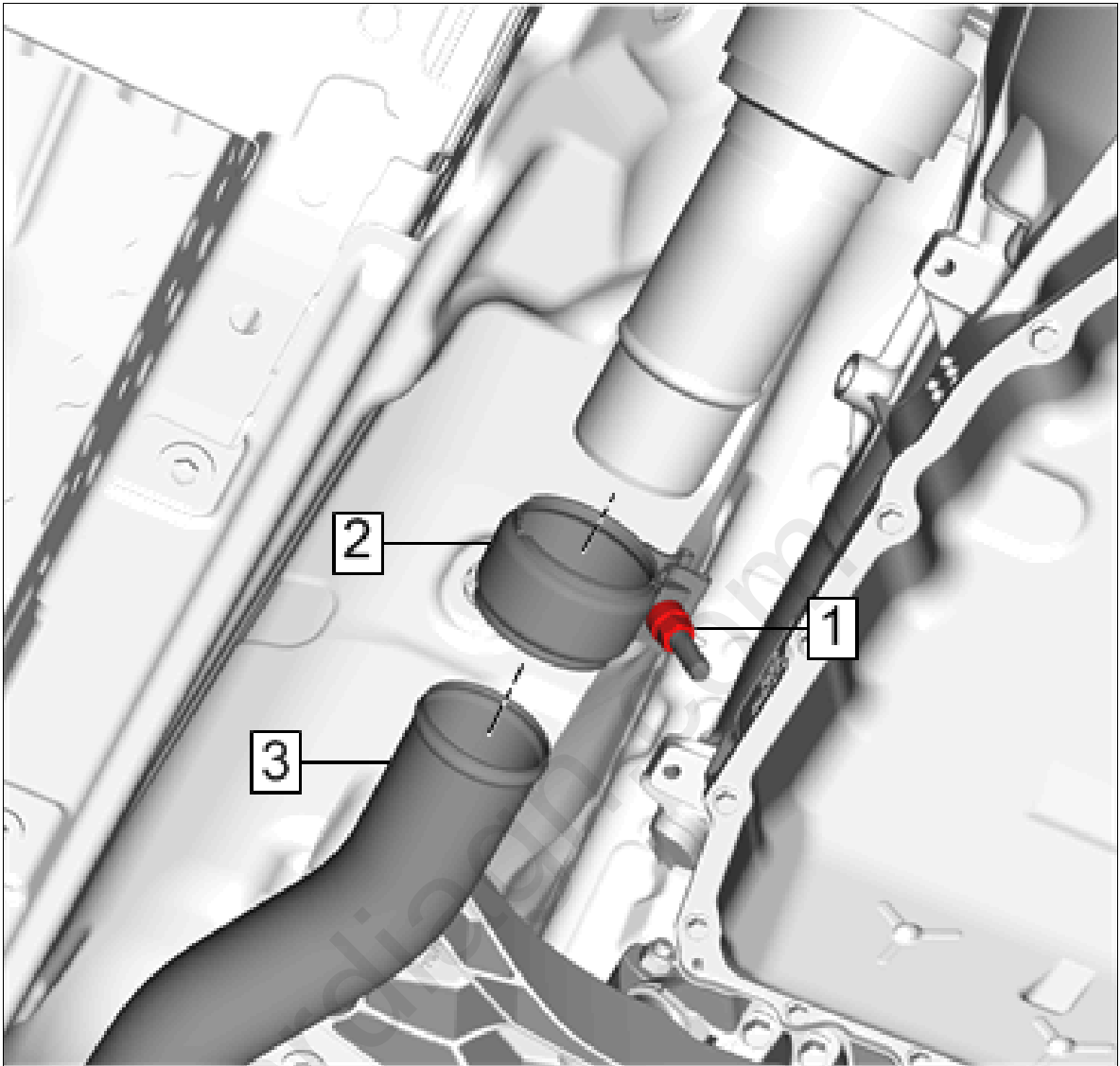
Fig 3: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

8. Remove Catalytic Converter Nut (1) (Qty: 2)
9. Remove Exhaust Gasket (2) and DISCARD

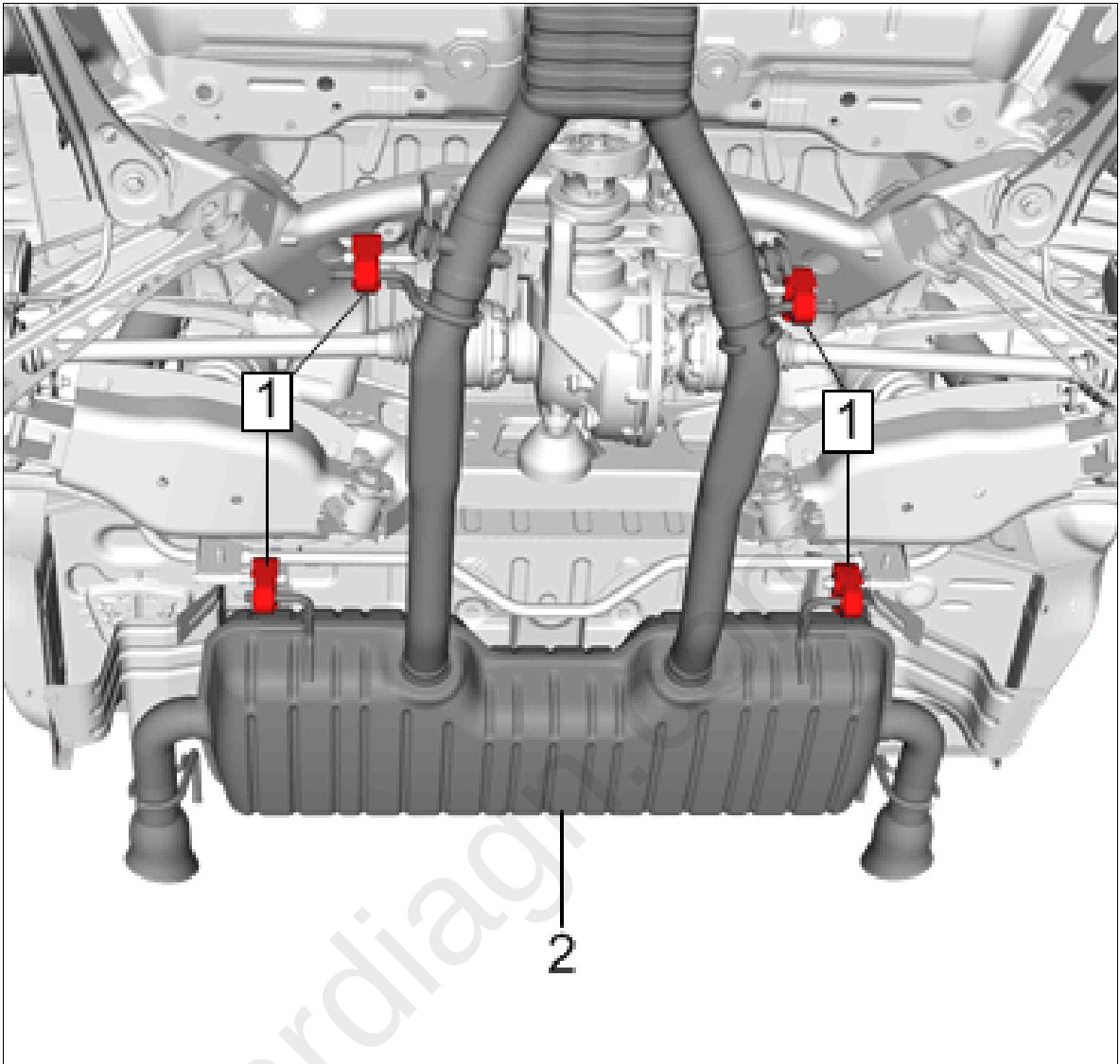
Fig 4: Exhaust Pipe Clamp Nut



Courtesy of GENERAL MOTORS COMPANY

10. Loosen Exhaust Pipe Clamp Nut (1)
11. Remove Exhaust Pipe Clamp (2) and DISCARD
12. Disconnect Exhaust Muffler (3) at Catalytic Converter
13. Clean the connection at the catalytic converters of any remaining gasket material.

Fig 5: Exhaust Muffler Isolator

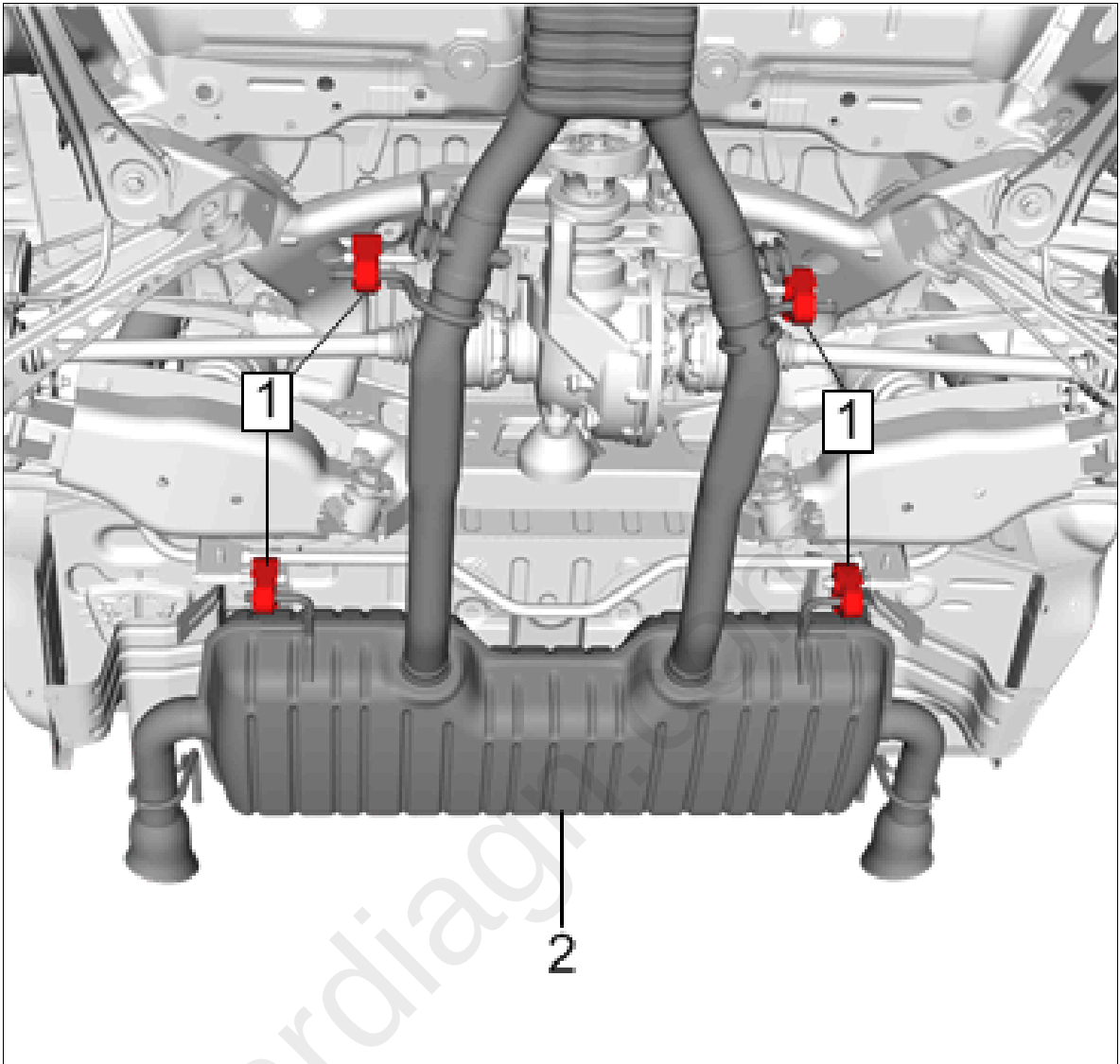


Courtesy of GENERAL MOTORS COMPANY

14. Disconnect Exhaust Muffler Isolator (1) (Qty: 4)
15. With the aid of an assistant, lower the exhaust system from the vehicle (2)

**REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LGX,
CONVERTIBLE) > INSTALLATION PROCEDURE**

Fig 1: Exhaust Isolators



Courtesy of GENERAL MOTORS COMPANY

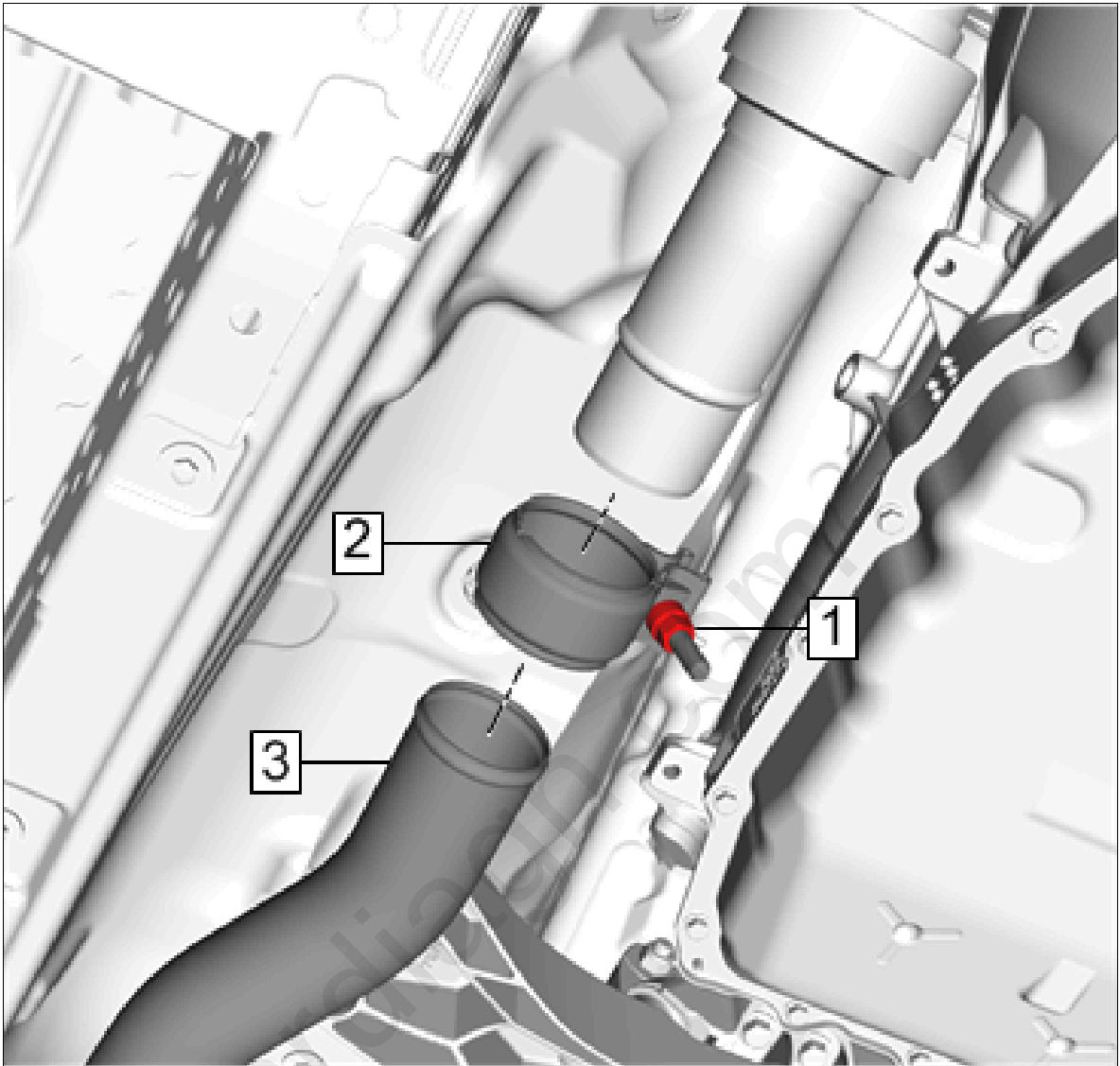
1. With the aid of an assistant, install the exhaust system to the vehicle (2)

 **NOTE:**

Clean and lubricate the exhaust isolators for ease of installation.

2. Connect Exhaust Muffler Isolator (1) (Qty: 4)

Fig 2: Exhaust Pipe Clamp



Courtesy of GENERAL MOTORS COMPANY

 NOTE:

Install a NEW exhaust pipe clamp.

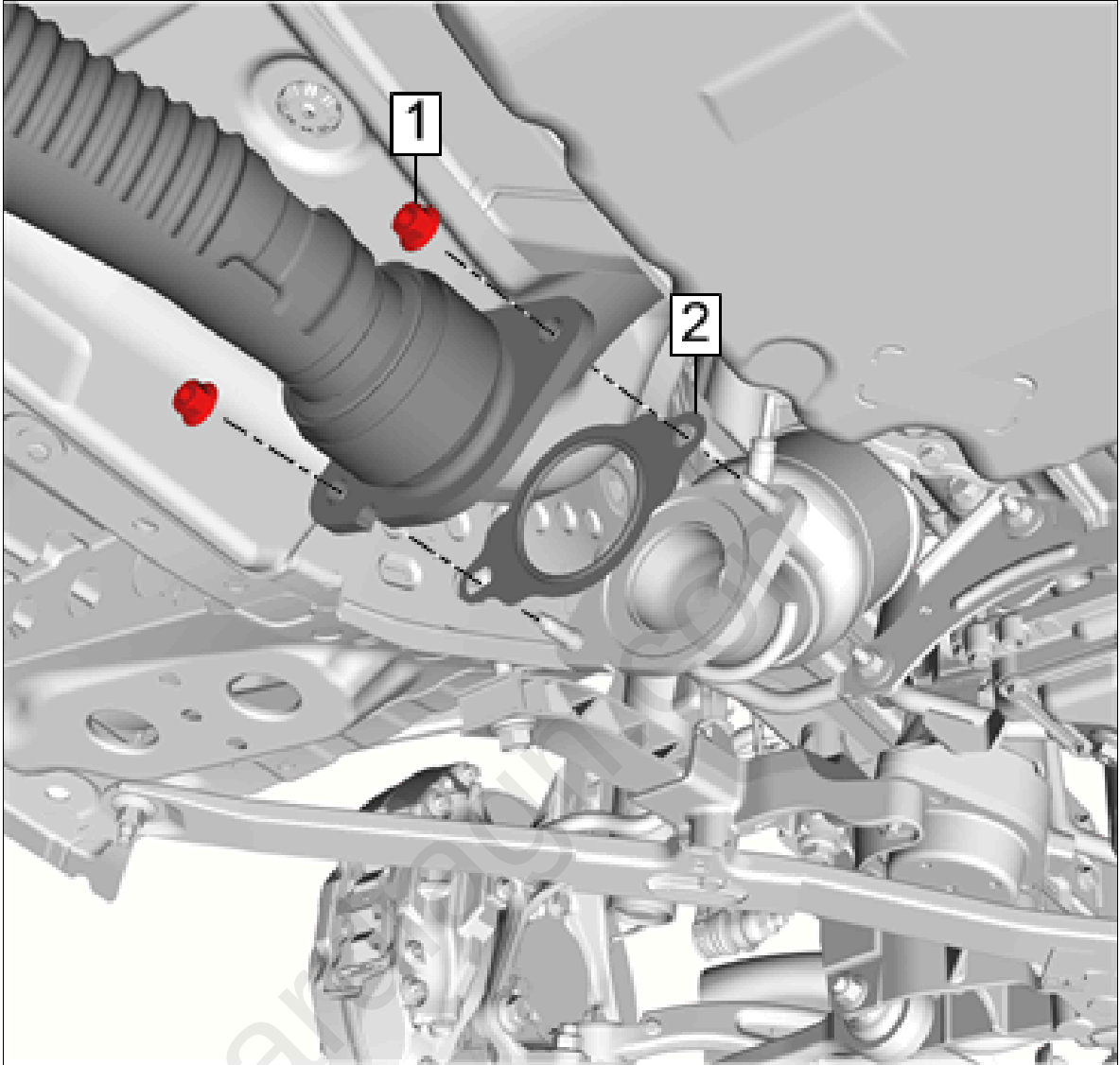
3. Install Exhaust Pipe Clamp (2)
4. Connect Exhaust Muffler (3) at Catalytic Converter»Connect

 CAUTION:

Refer to Fastener Caution .

5. Install Exhaust Pipe Clamp Nut (1) and tighten to 50 N.m (37 lb ft)

Fig 3: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

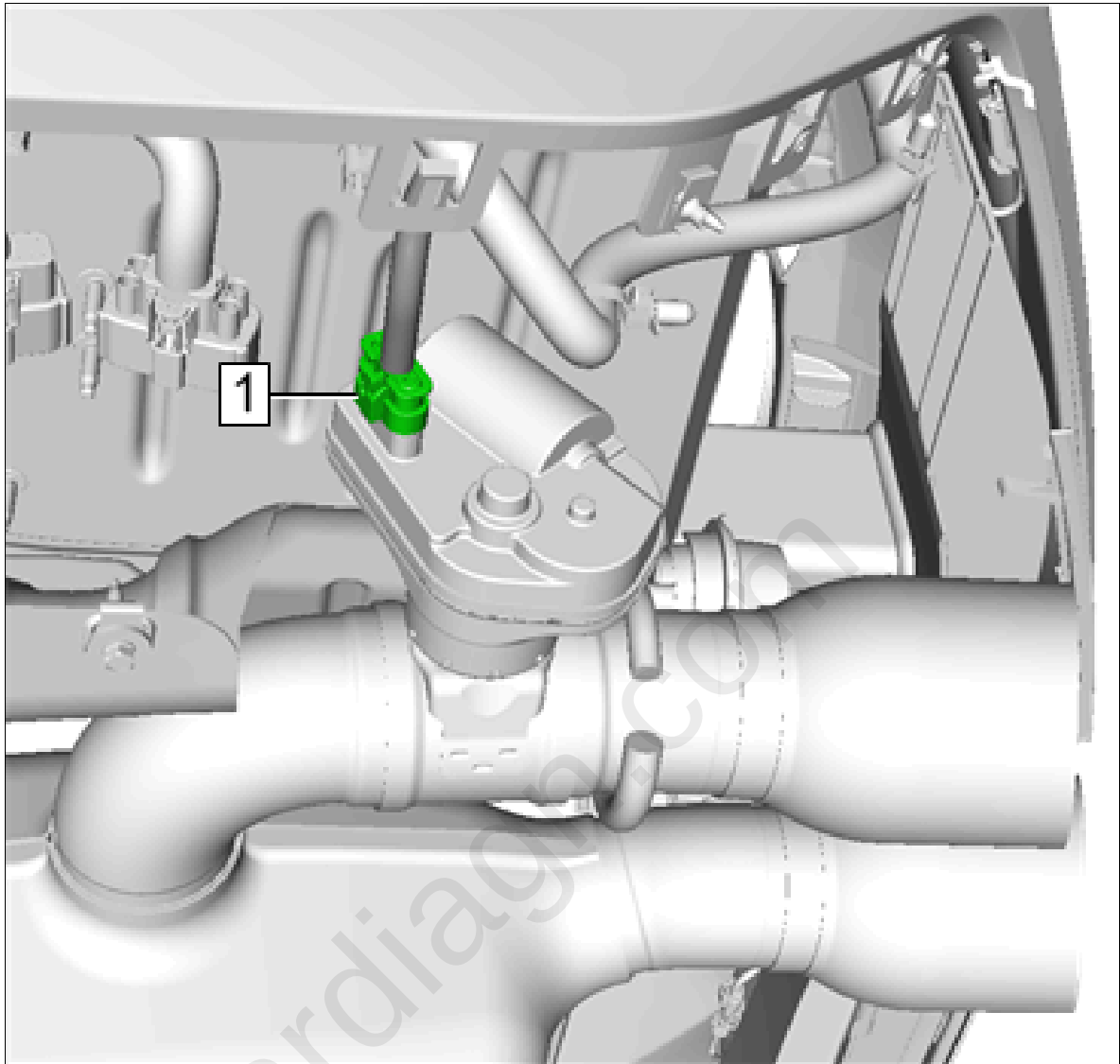


NOTE:

Install a NEW gasket.

6. Install Exhaust Gasket (2)
7. Install Catalytic Converter Nut (1) (Qty: 2) and tighten to 50 N.m (37 lb ft)

Fig 4: Exhaust Control Valve Actuator Electrical Wiring Harness Connectors



Courtesy of GENERAL MOTORS COMPANY

8. If equipped with performance exhaust, connect the exhaust control valve actuator electrical wiring harness connectors (1).
9. Install Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)
10. Install Floor Panel Number 4 Cross Bar Replacement
11. Install Underbody Rear Brace Replacement (Convertible)

REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LT1, COUPE) > REMOVAL PROCEDURE

 **WARNING:**

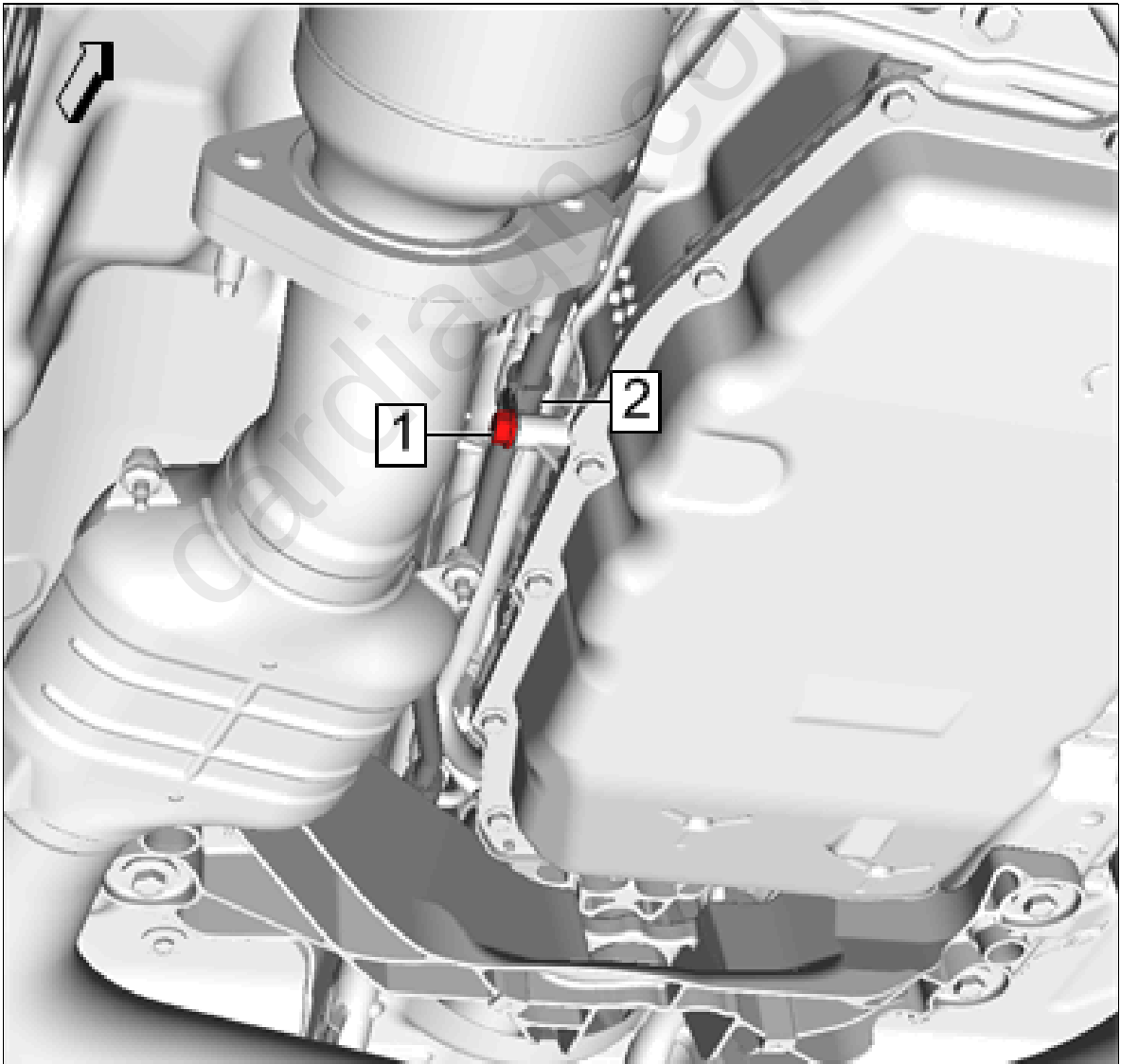
In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

⚠ WARNING:

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

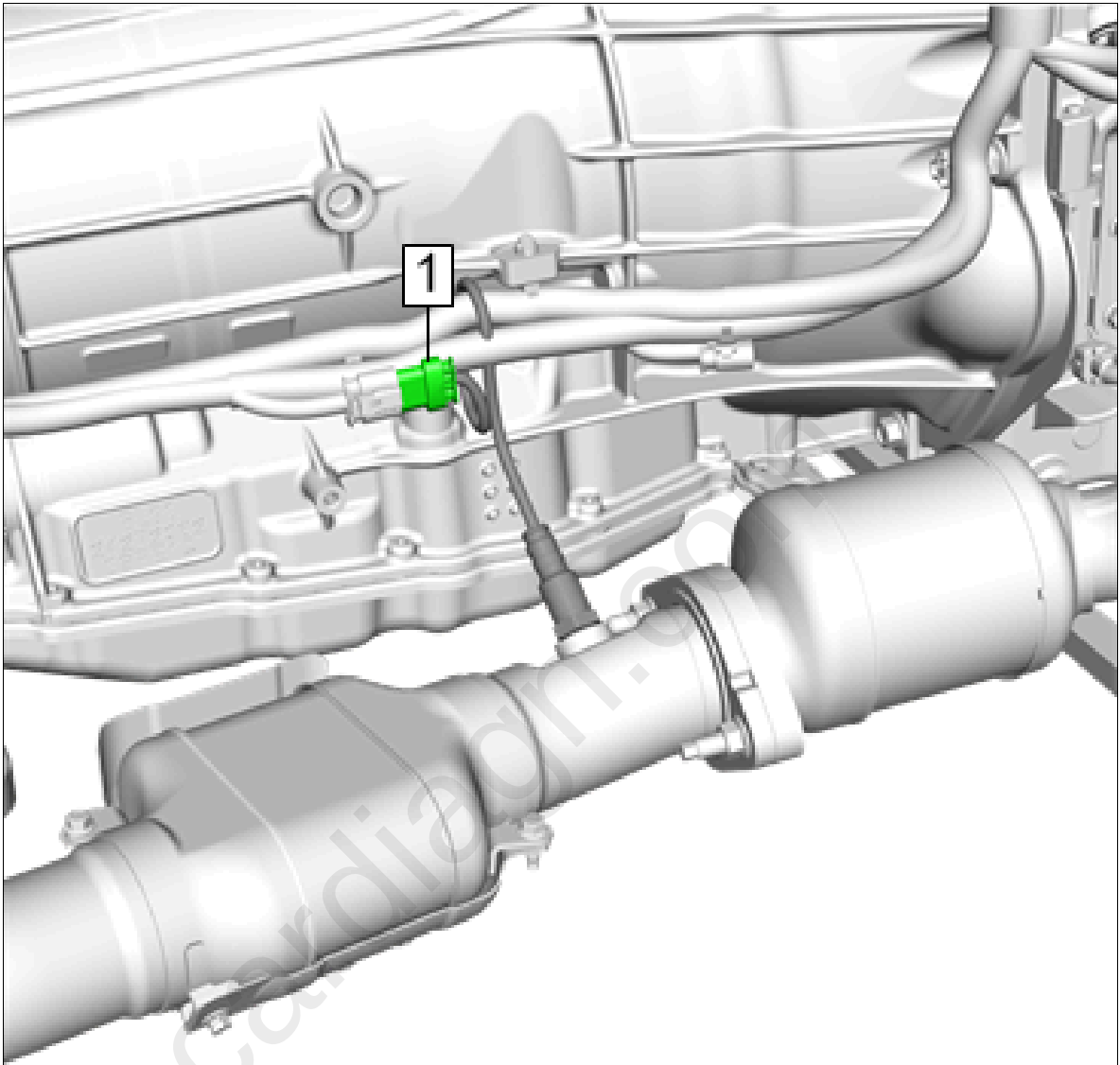
1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)
2. If equipped with performance exhaust, disconnect the rear exhaust control valve actuator electrical wiring harness connectors (1) - Exhaust Control Valve Actuator Replacement (Rear Valves with Performance Exhaust)

Fig 1: Transmission Fluid Coolant Pipe Bracket Bolt



3. If equipped with rear differential transmission fluid coolant pipes (2), loosen the transmission fluid coolant pipe bracket bolt (1) to aid in accessing the heated oxygen sensor electrical wiring harness connector.

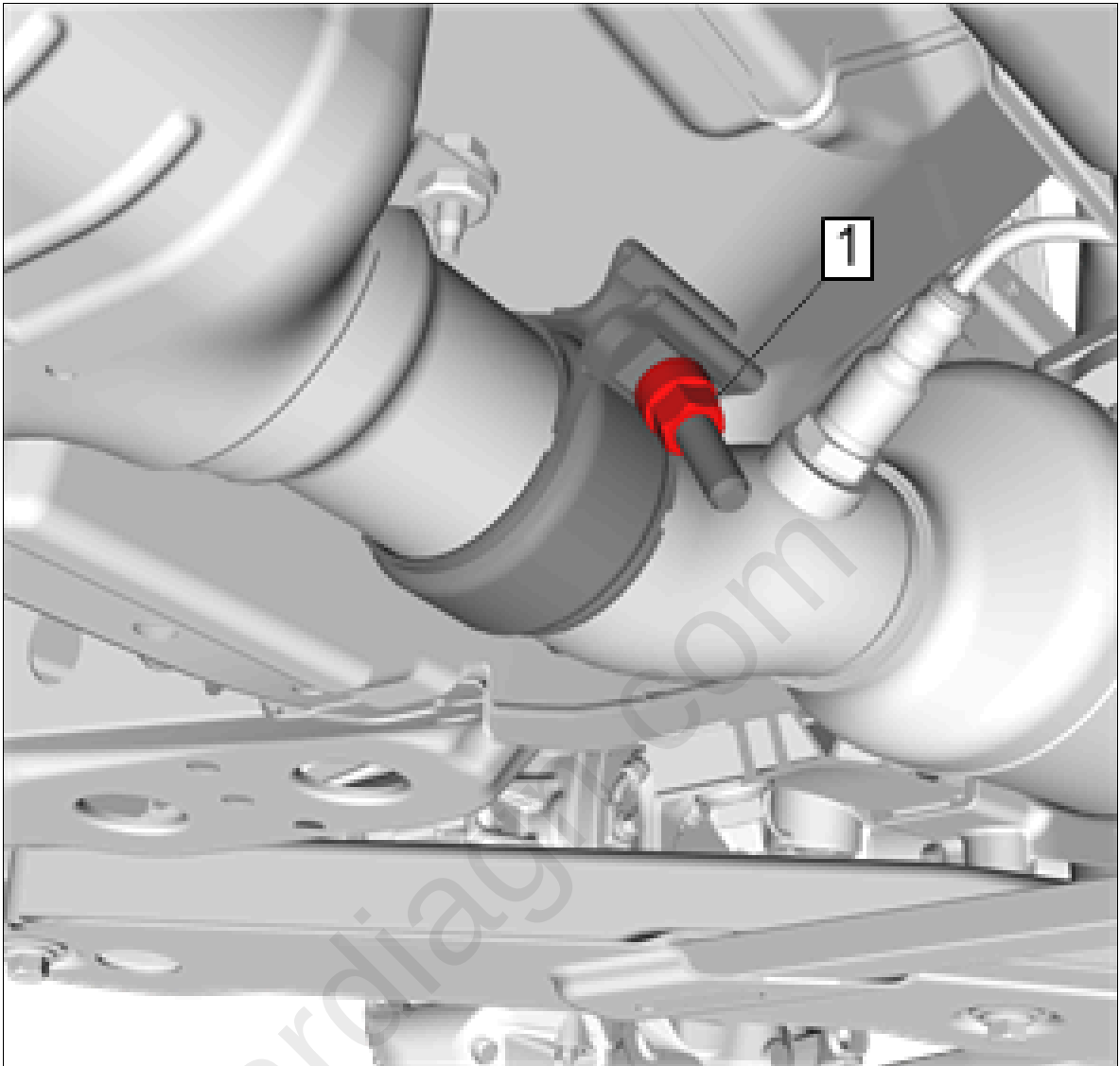
Fig 2: bank 2 Sensor 2 Heated Oxygen Sensor Electrical Wiring Harness Connector



Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the bank 2, sensor 2, heated oxygen sensor electrical wiring harness connector (1).
5. Remove Floor Panel Number 4 Cross Bar Replacement
6. Remove Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)

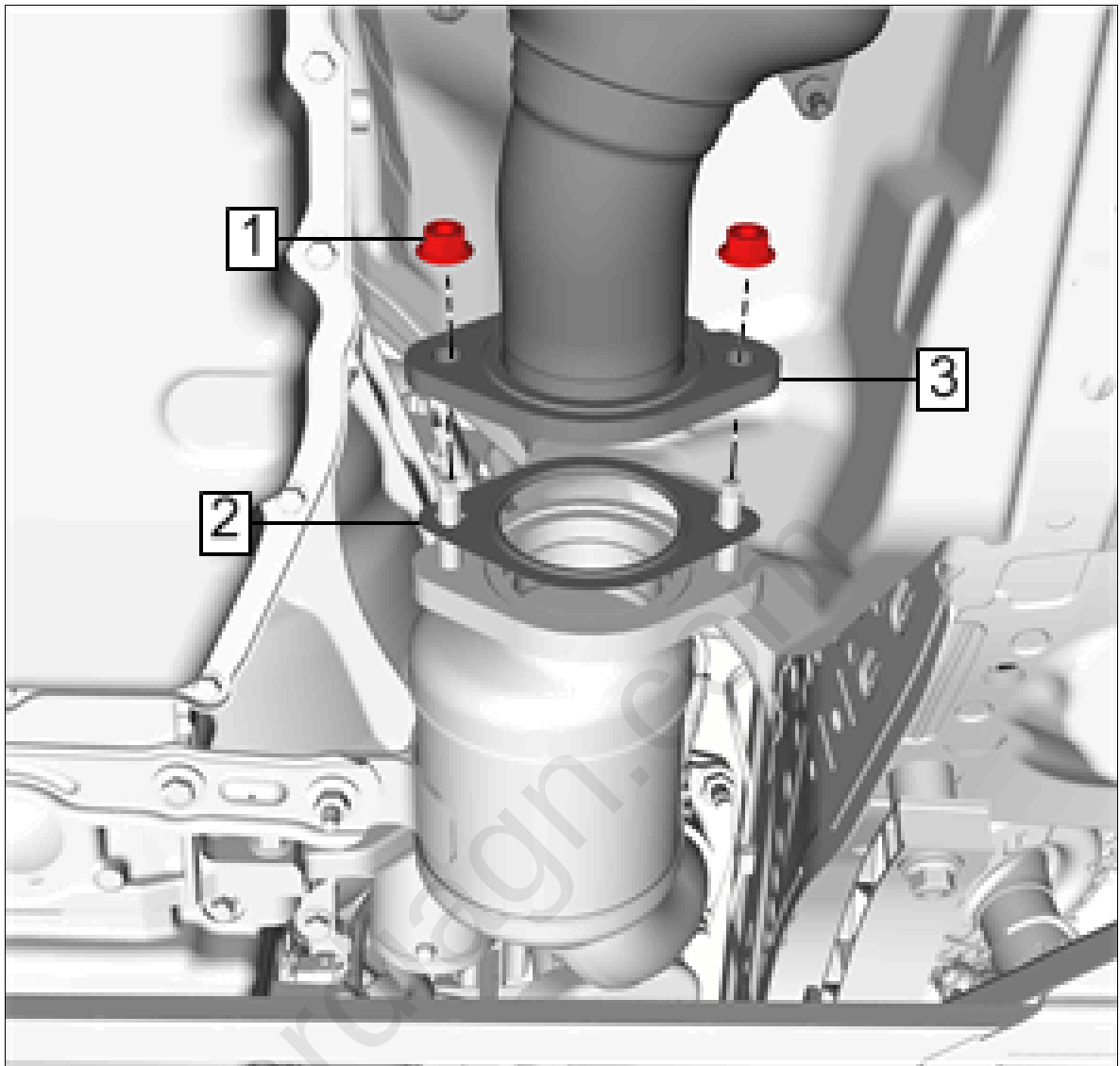
Fig 3: Catalytic Converter Clamp



Courtesy of GENERAL MOTORS COMPANY

7. Remove Catalytic Converter Clamp (1) and DISCARD

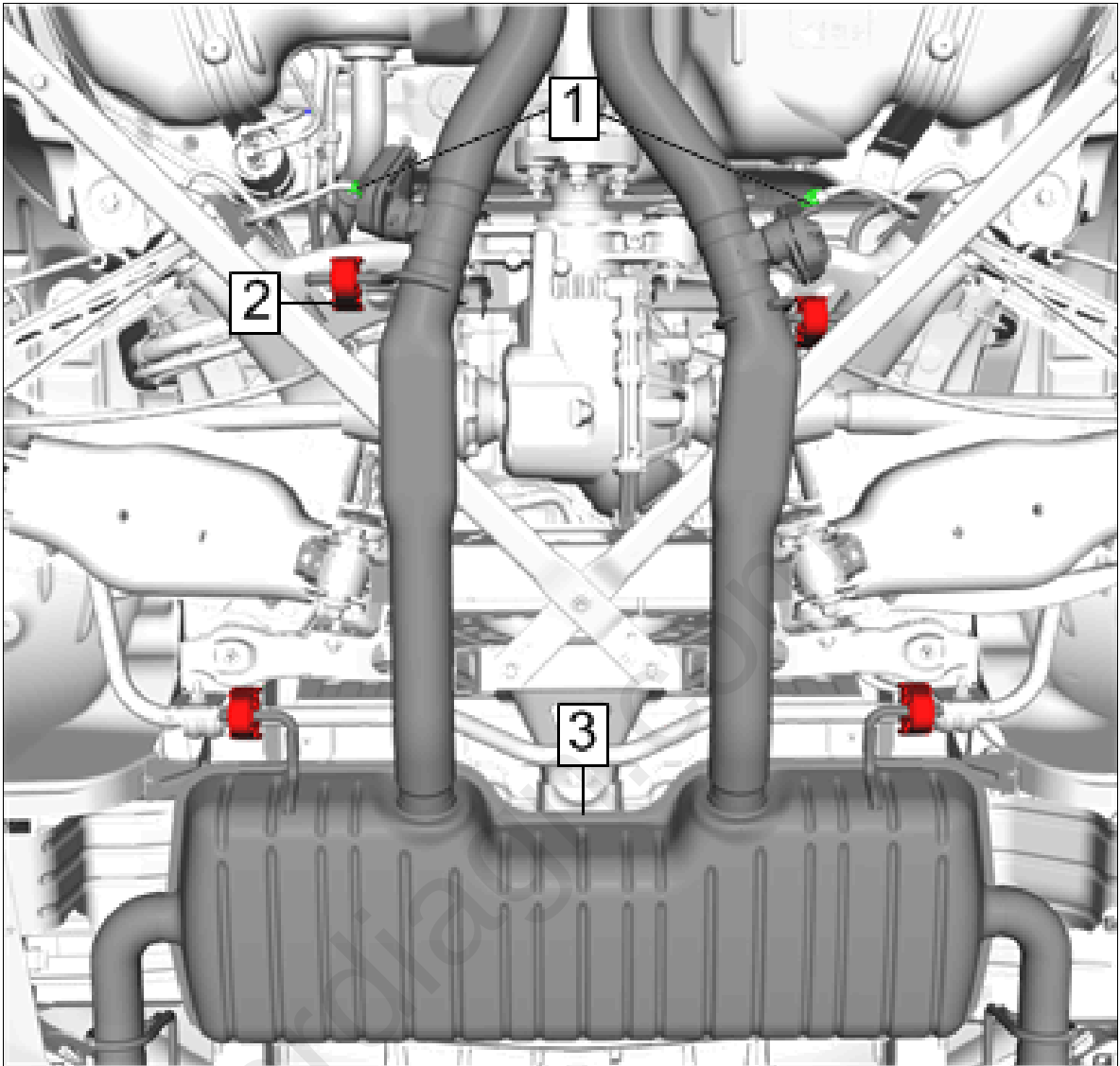
Fig 4: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

8. Remove Catalytic Converter Nut (1) (Qty: 2)
9. Separate Exhaust Muffler (3) at Catalytic Converter
10. DISCARD the gasket (2)

Fig 5: Exhaust Control Valve Actuator & Exhaust Isolator

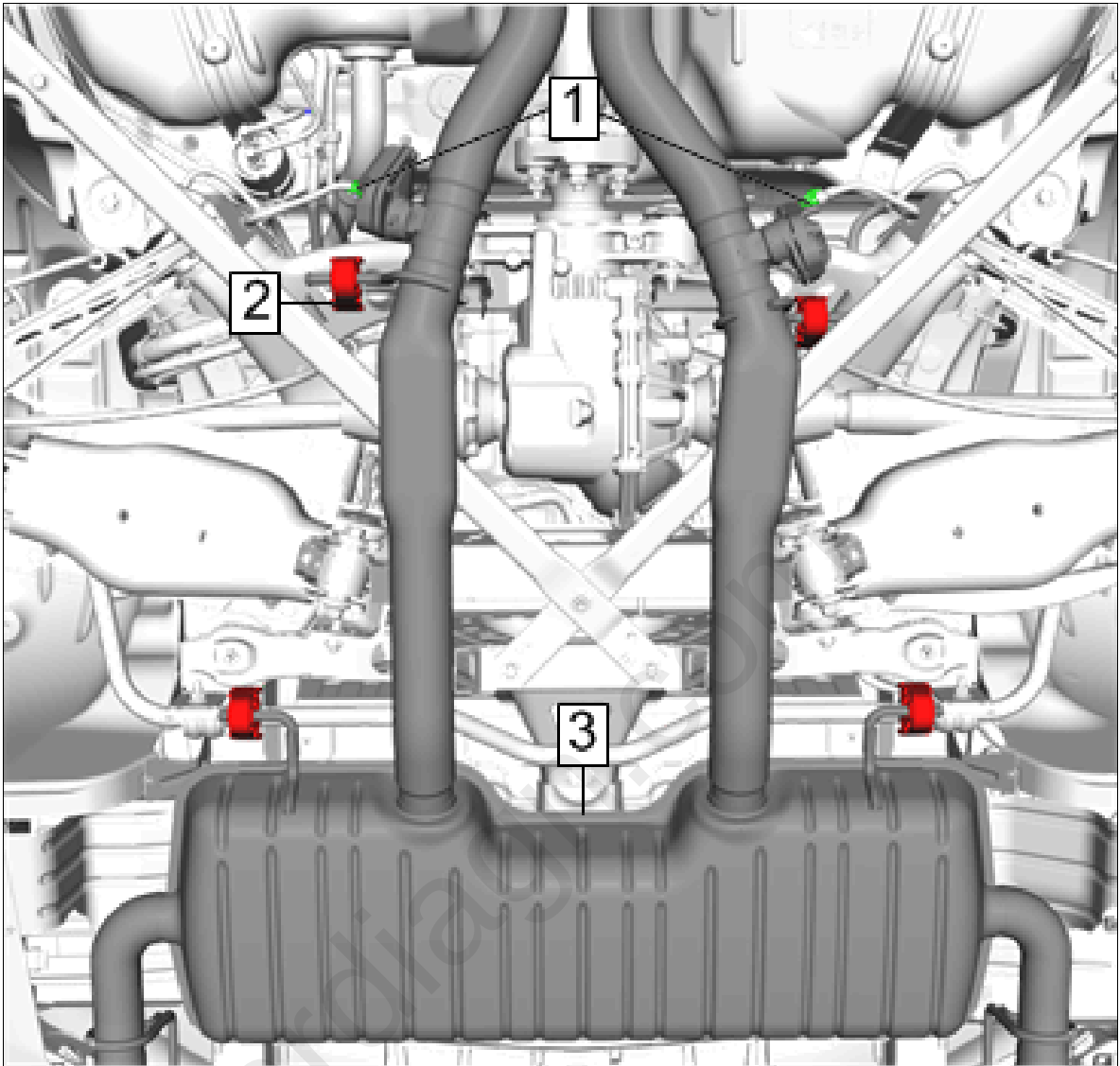


Courtesy of GENERAL MOTORS COMPANY

11. Disconnect Exhaust Control Valve Actuator (1) (Qty: 2)
12. Separate Exhaust Isolator (2) (Qty: 4)
13. Remove Exhaust Muffler Assembly (3)
14. Transfer components as necessary.

REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LT1, COUPE) > INSTALLATION PROCEDURE

Fig 1: Exhaust Control Valve Actuator & Exhaust Isolator



Courtesy of GENERAL MOTORS COMPANY

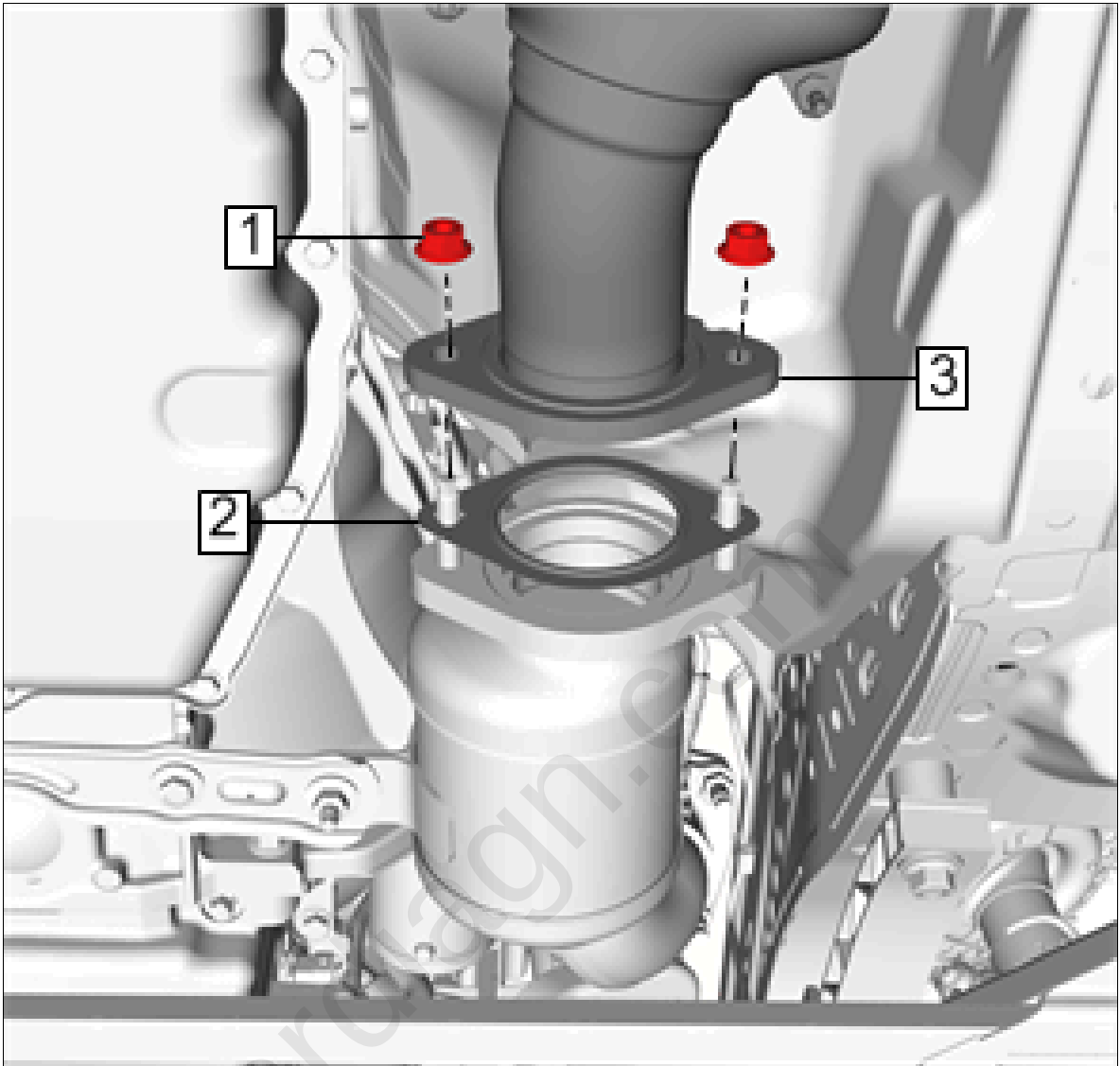
1. Install Exhaust Muffler Assembly (3)

 **NOTE:**

Clean and lubricate the exhaust isolators for ease of installation.

2. Connect Exhaust Isolator (2) (Qty: 4)
3. Connect Exhaust Control Valve Actuator (1) (Qty: 2)

Fig 2: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

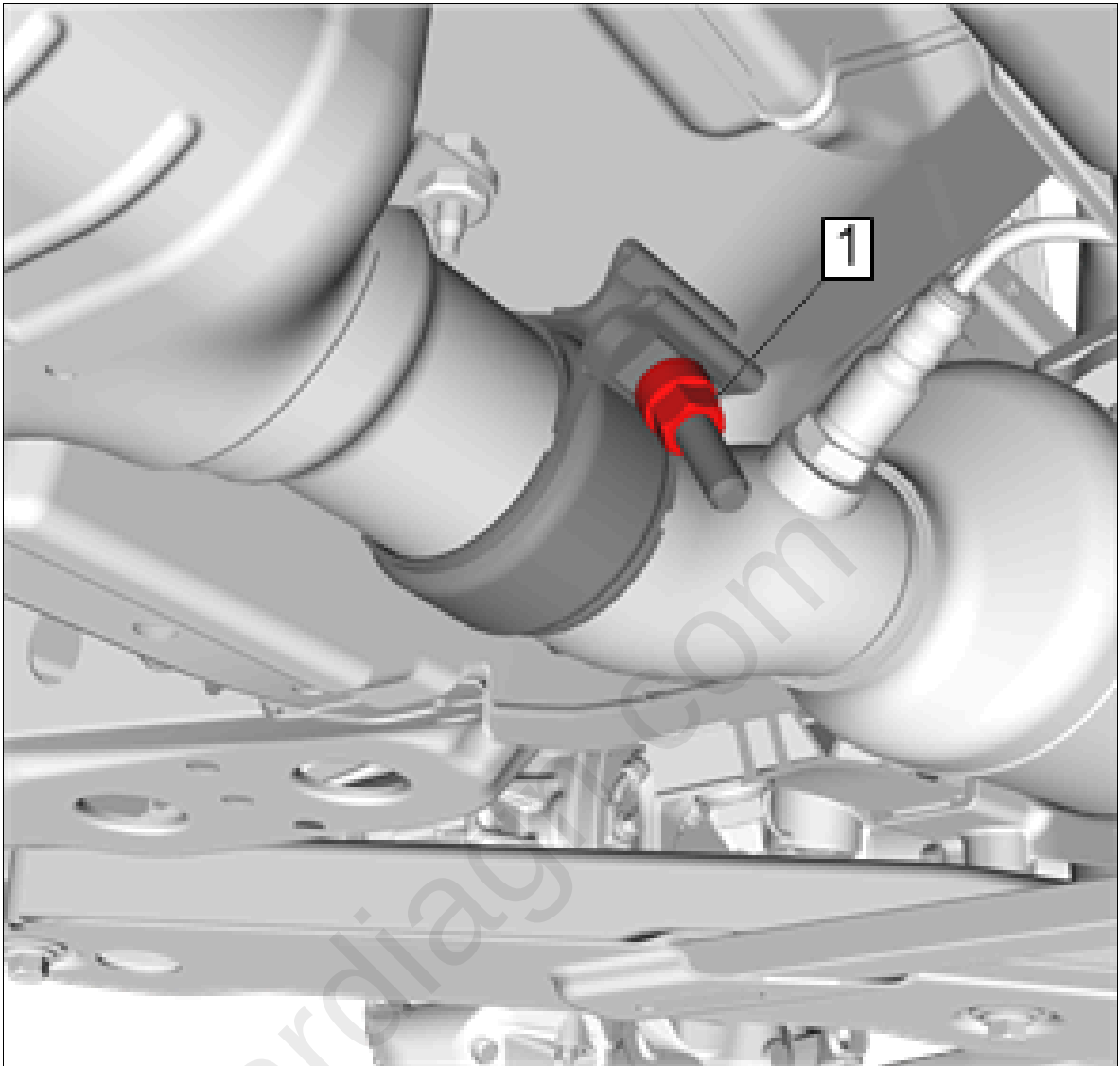
4. Install a NEW gasket (2)
5. Install Exhaust Muffler (3) at Catalytic Converter

 **CAUTION:**

Refer to Fastener Caution .

6. Tighten Catalytic Converter Nut (1) (Qty: 2) to 50 N.m (37 lb ft)

Fig 3: Catalytic Converter Clamp



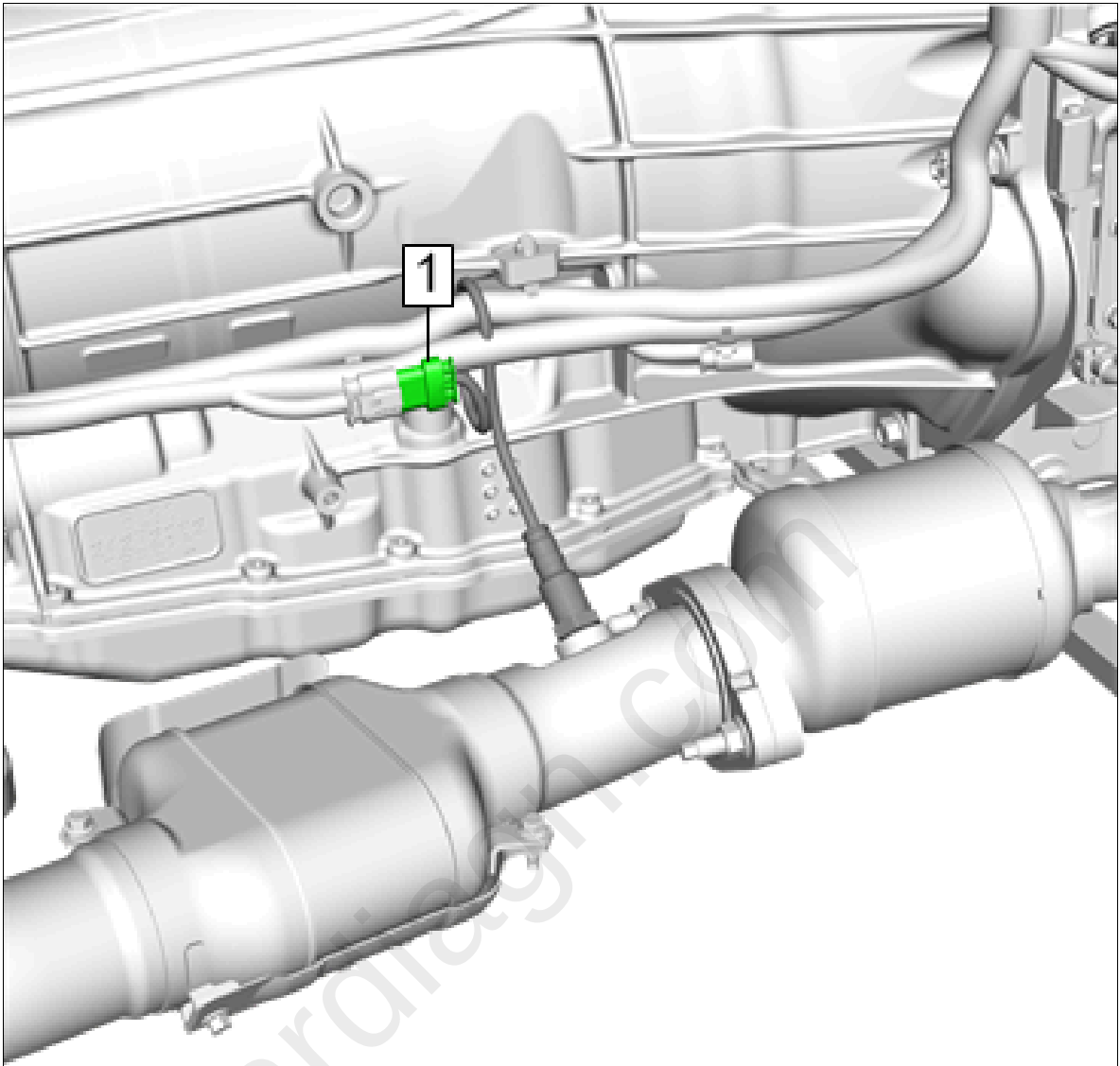
Courtesy of GENERAL MOTORS COMPANY

 **NOTE:**

Install a NEW clamp.

7. Install Catalytic Converter Clamp (1) and tighten to 22 N.m (16 lb ft)
8. Install Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)
9. Install Floor Panel Number 4 Cross Bar Replacement

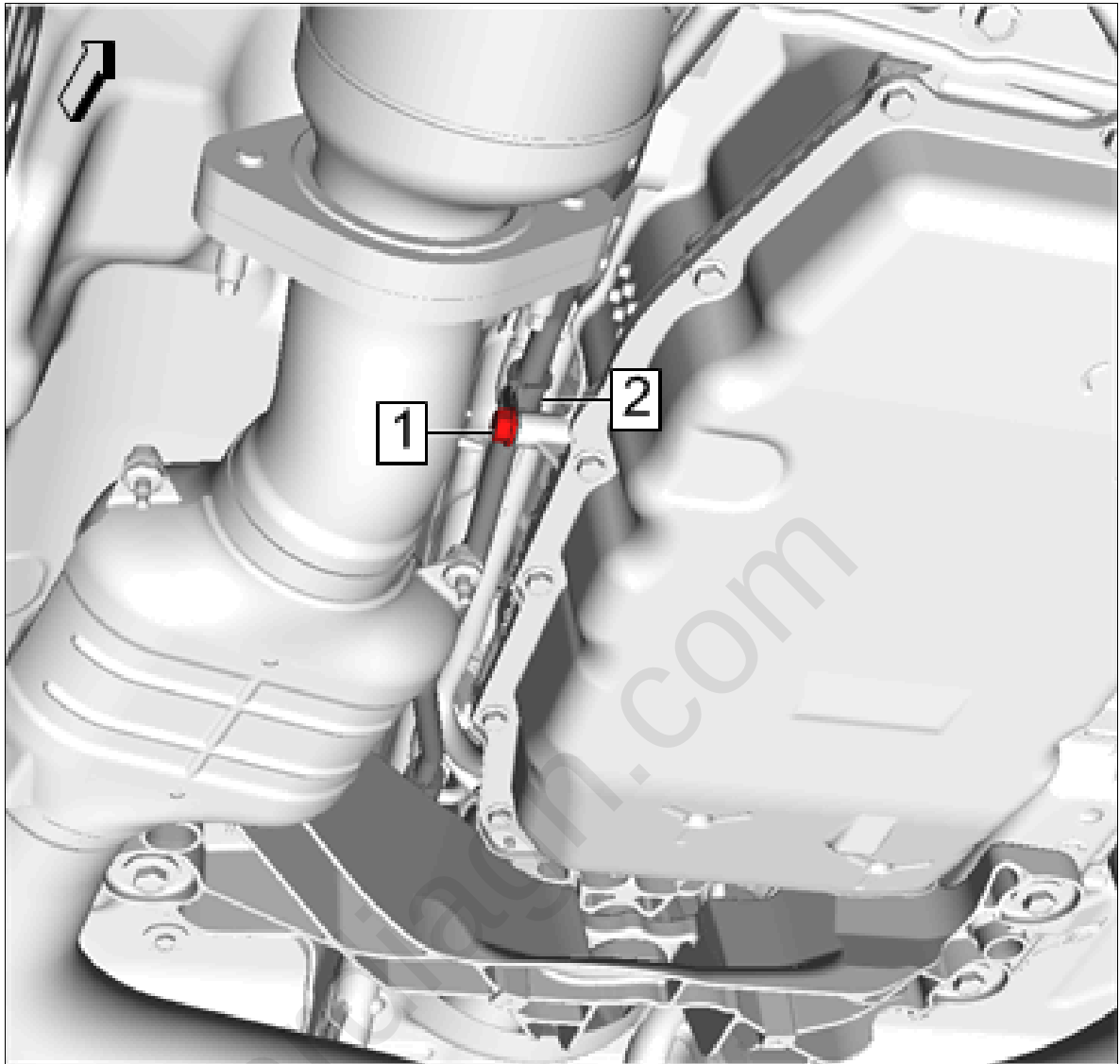
Fig 4: Bank 2 Sensor 2 Heated Oxygen Sensor Electrical Wiring Harness Connector



Courtesy of GENERAL MOTORS COMPANY

10. Connect the bank 2, sensor 2, heated oxygen sensor electrical wiring harness connector (1).

Fig 5: Transmission Fluid Coolant Pipe Bracket Bolt



Courtesy of GENERAL MOTORS COMPANY

11. If equipped with rear differential transmission fluid coolant pipes (2), tighten the transmission fluid coolant pipe bracket bolt (1) to 10 N.m (89 lb in).
12. If equipped with performance exhaust, connect the rear exhaust control valve actuator electrical wiring harness connectors (1) - Exhaust Control Valve Actuator Replacement (Rear Valves with Performance Exhaust)
13. Lower the vehicle.
14. Start the engine and check for exhaust leaks.

REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LT1, CONVERTIBLE) > REMOVAL PROCEDURE

⊗ WARNING:

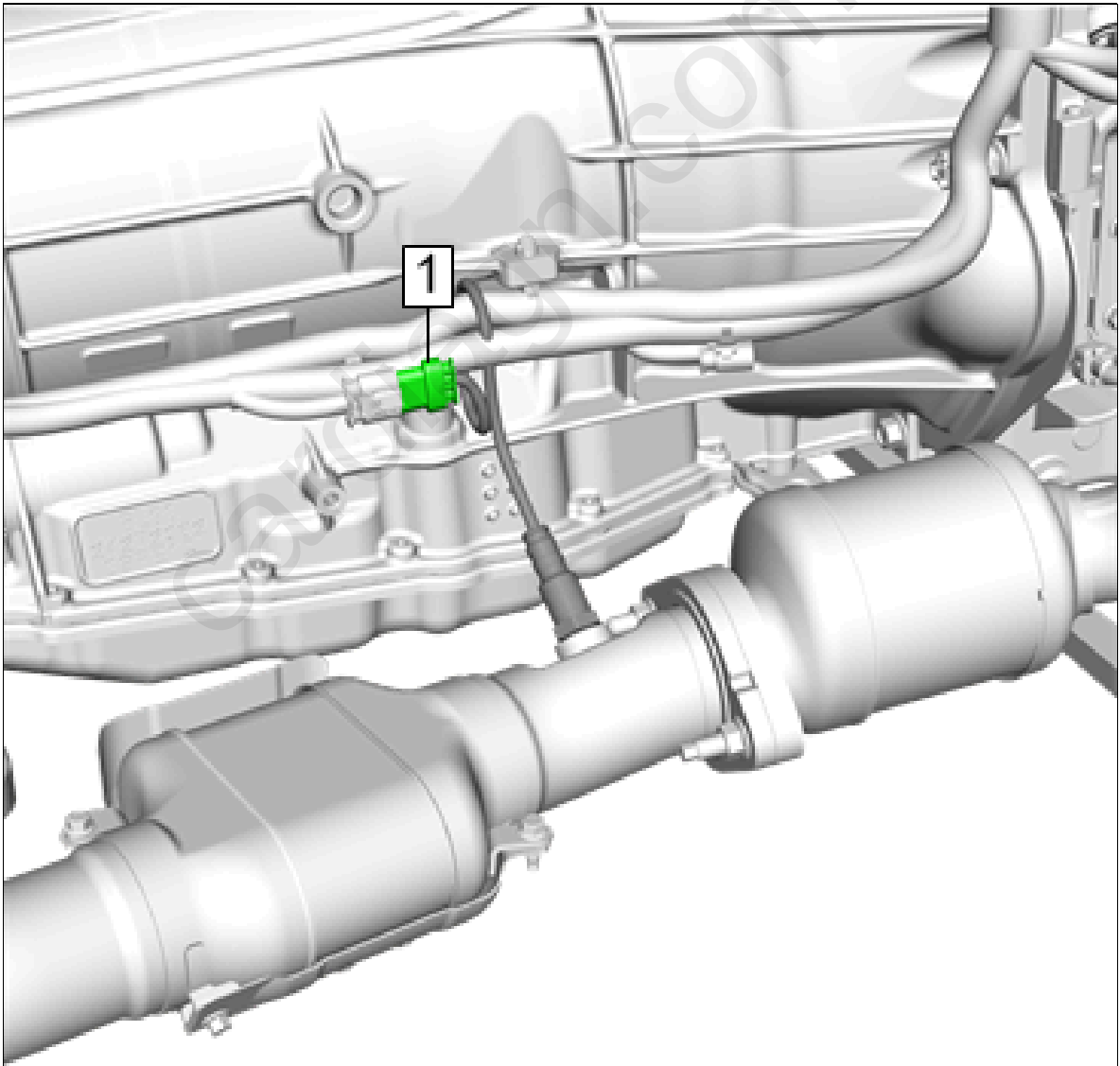
In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

⊗ WARNING:

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

1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)

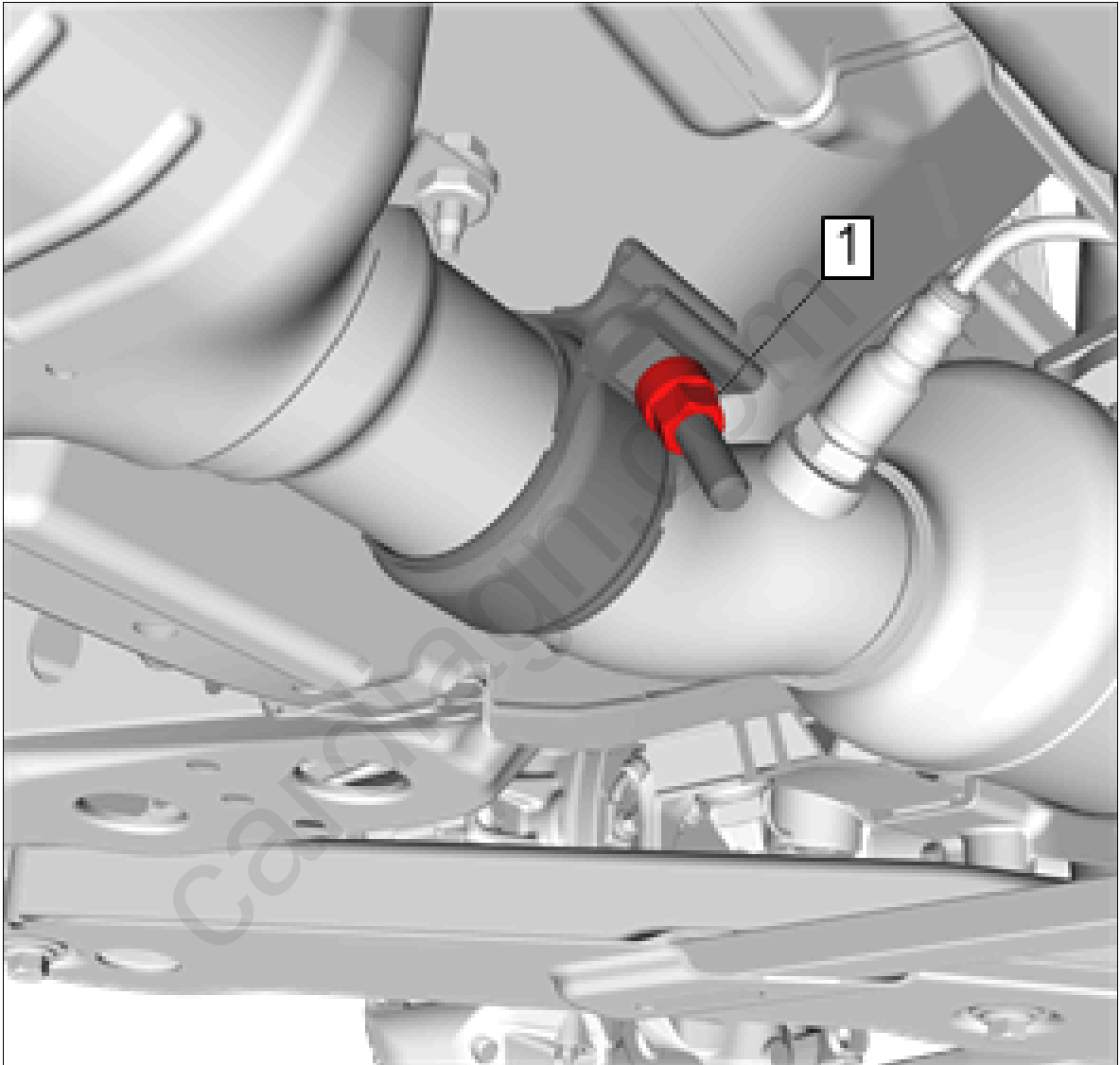
Fig 1: Bank 2 Sensor 2 Heated Oxygen Sensor Electrical Wiring Harness Connector



Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the bank 2, sensor 2, heated oxygen sensor electrical wiring harness connector (1).
3. Remove Underbody Rear Brace Replacement (Convertible)
4. Remove Floor Panel Number 4 Cross Bar Replacement
5. Remove Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)

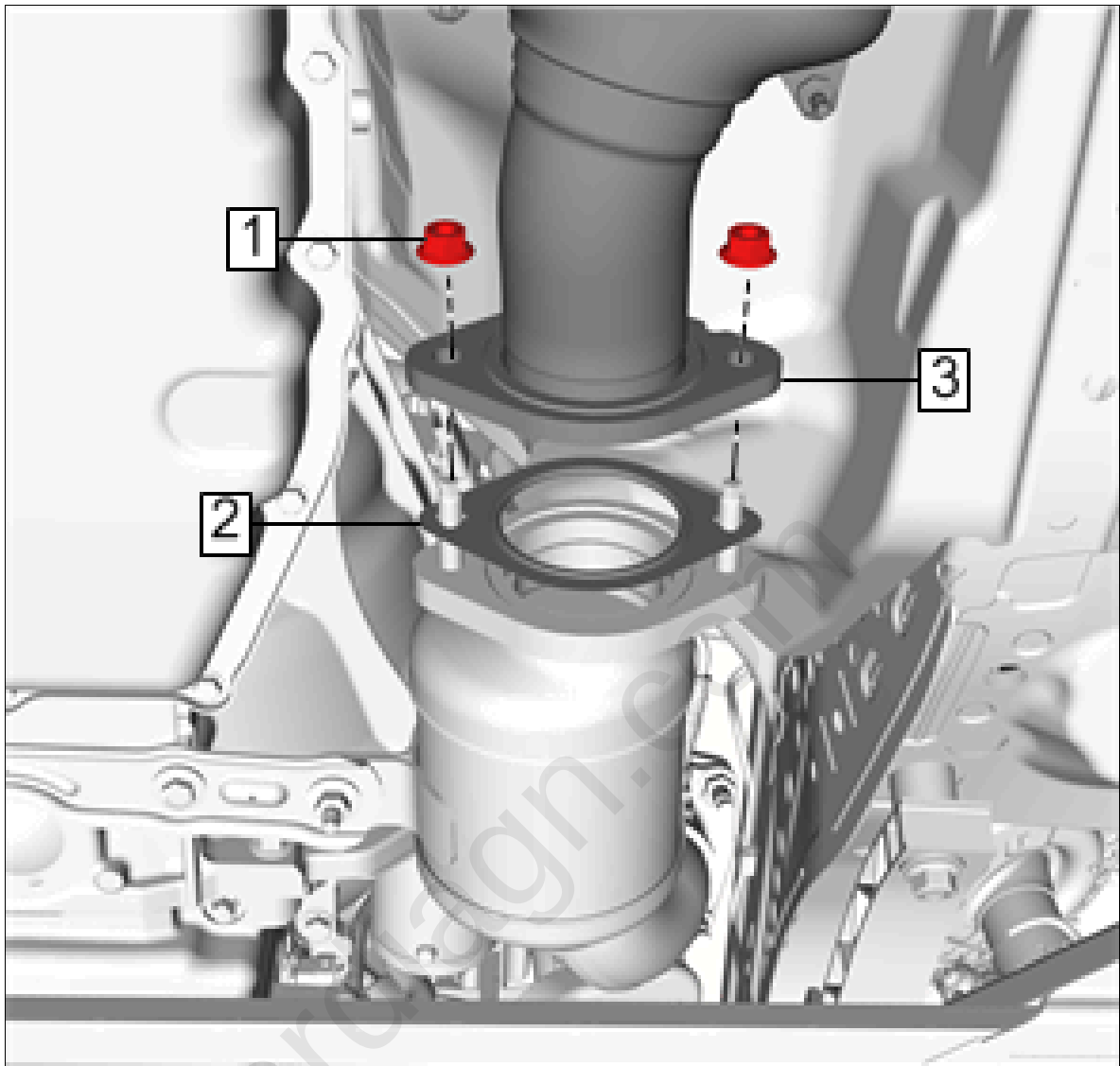
Fig 2: Catalytic Converter Clamp



Courtesy of GENERAL MOTORS COMPANY

6. Loosen Catalytic Converter Clamp (1)

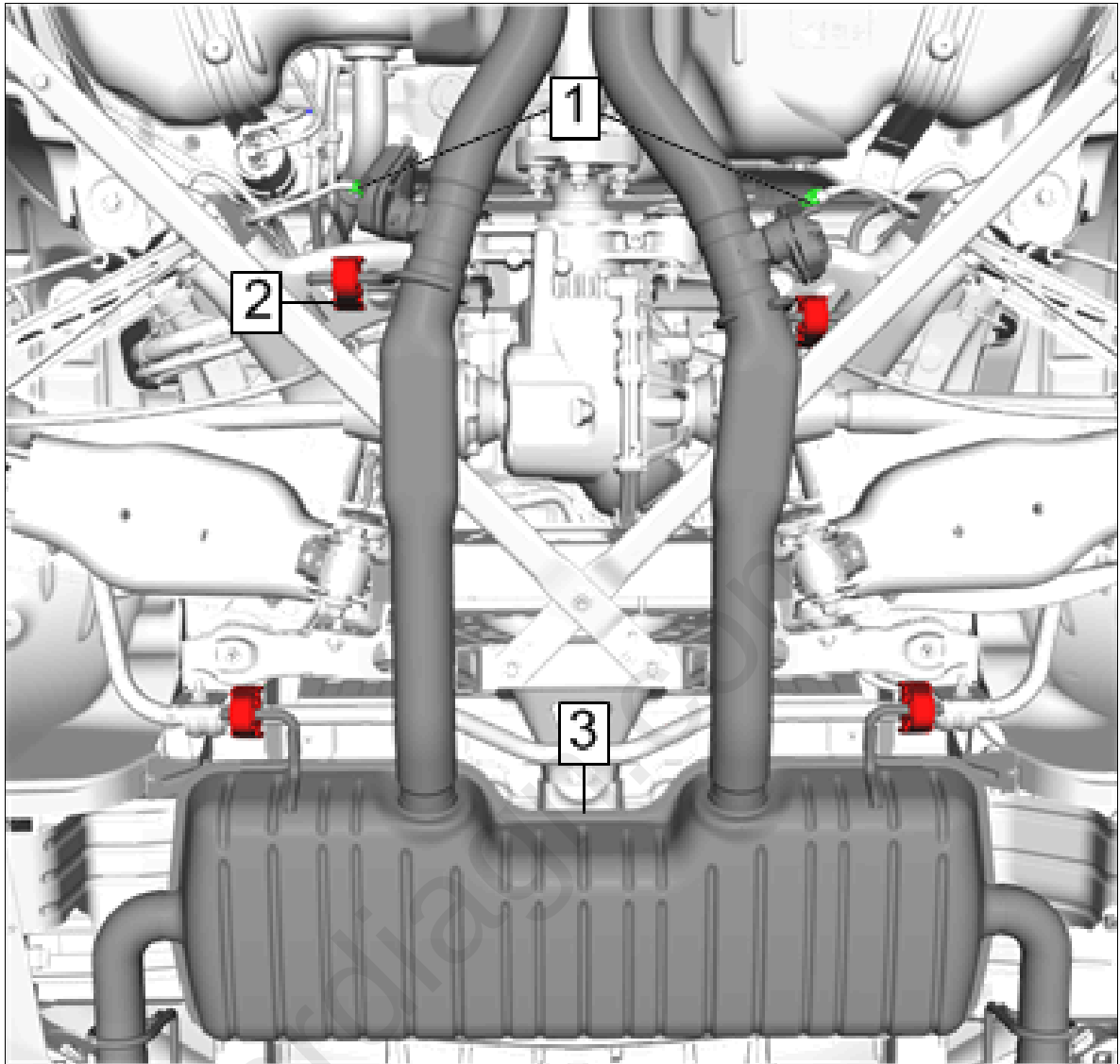
Fig 3: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

7. Remove Catalytic Converter Nut (1) (Qty: 2)
8. Separate Exhaust Muffler (3) at Catalytic Converter
9. DISCARD the gasket (2)

Fig 4: Exhaust Control Valve Actuator & Exhaust Isolator

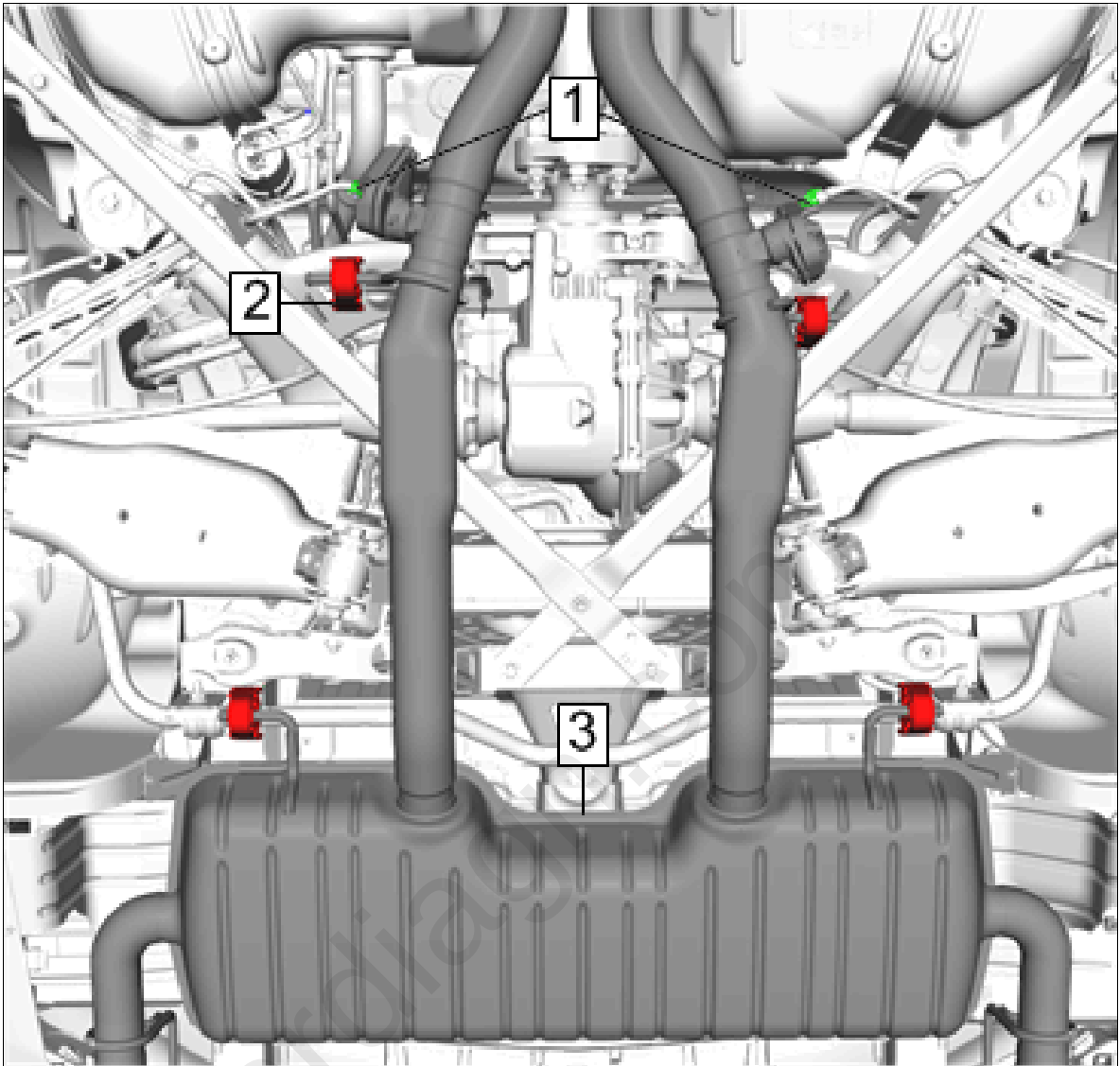


Courtesy of GENERAL MOTORS COMPANY

10. Disconnect Exhaust Control Valve Actuator (1) (Qty: 2)
11. Separate Exhaust Isolator (2) (Qty: 4)
12. Remove Exhaust Muffler Assembly (3)
13. Transfer components as necessary.

REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LT1, CONVERTIBLE) > INSTALLATION PROCEDURE

Fig 1: Exhaust Control Valve Actuator & Exhaust Isolator



Courtesy of GENERAL MOTORS COMPANY

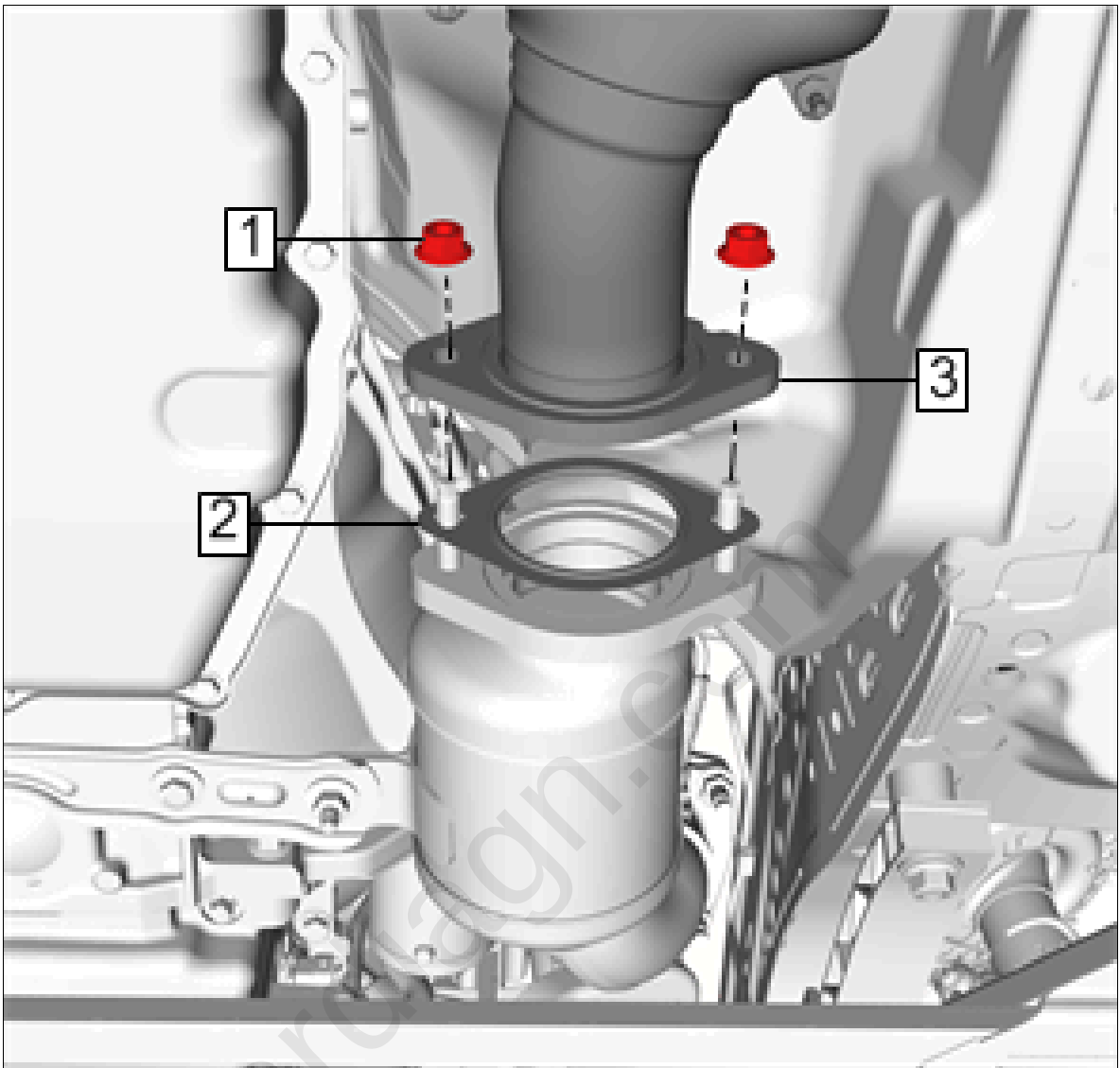
1. Install Exhaust Muffler Assembly (3)

 **NOTE:**

Clean and lubricate the exhaust isolators for ease of installation.

2. Connect Exhaust Isolator (2) (Qty: 4)
3. Connect Exhaust Control Valve Actuator (1) (Qty: 2)

Fig 2: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

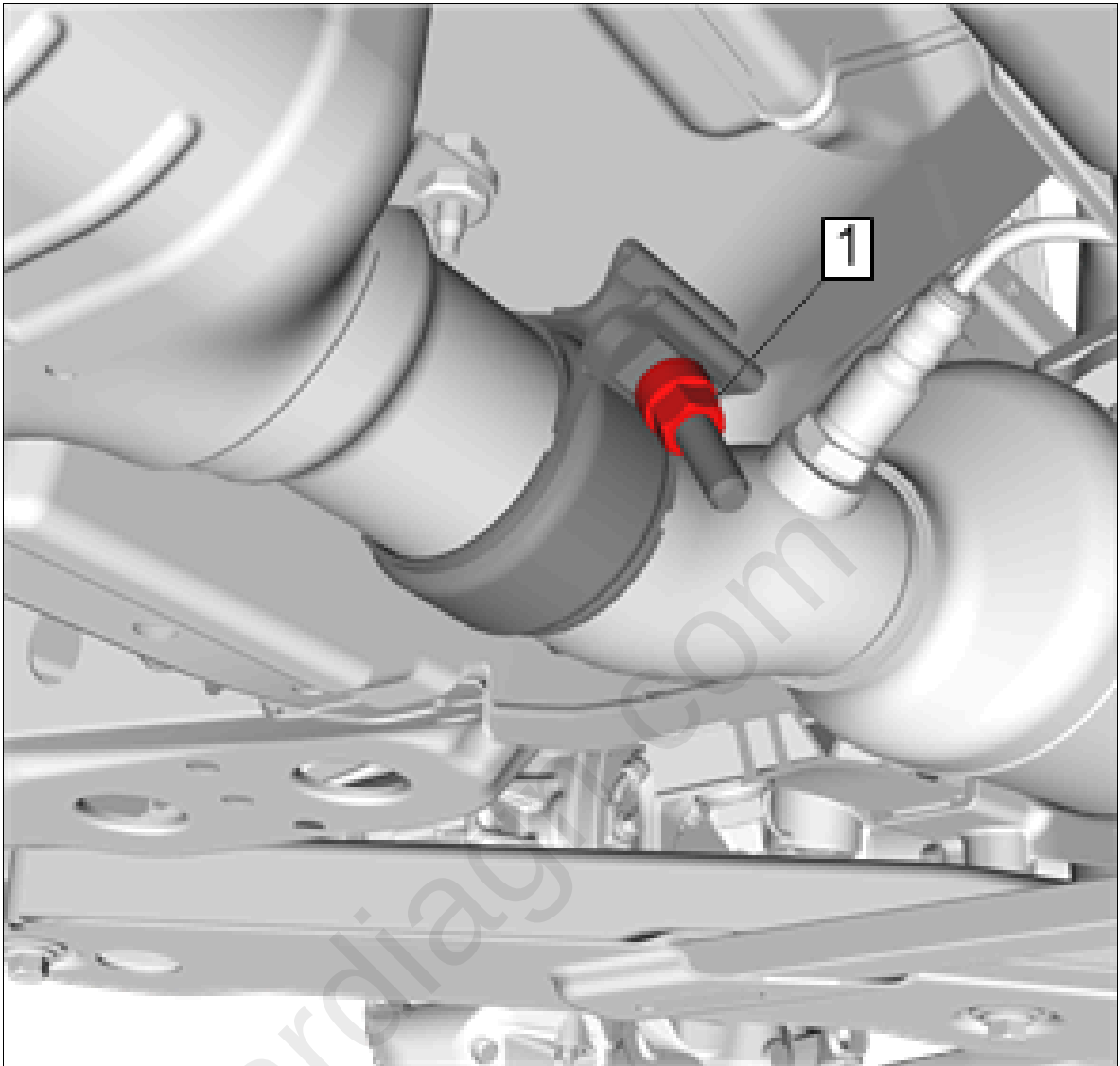
4. Install a NEW gasket (2)
5. Install Exhaust Muffler (3) at Catalytic Converter

 **CAUTION:**

Refer to Fastener Caution .

6. Tighten Catalytic Converter Nut (1) (Qty: 2) to 50 N.m (37 lb ft)

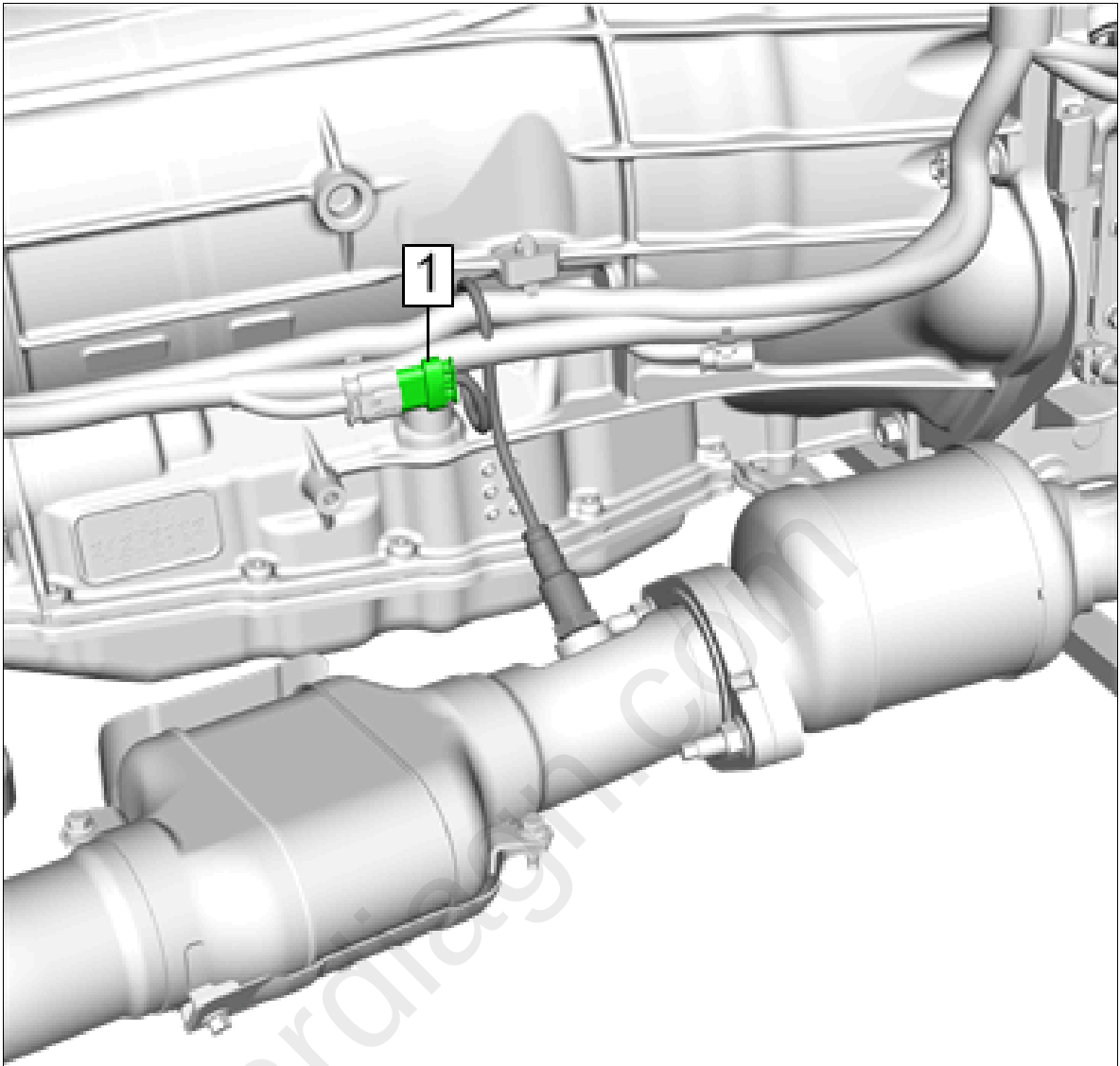
Fig 3: Catalytic Converter Clamp



Courtesy of GENERAL MOTORS COMPANY

7. Tighten Catalytic Converter Clamp (1) to 22 N.m (16 lb ft)
8. Install Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)
9. Install Floor Panel Number 4 Cross Bar Replacement
10. Install Underbody Rear Brace Replacement (Convertible)

Fig 4: Bank 2 Sensor 2 Heated Oxygen Sensor Electrical Wiring Harness Connector



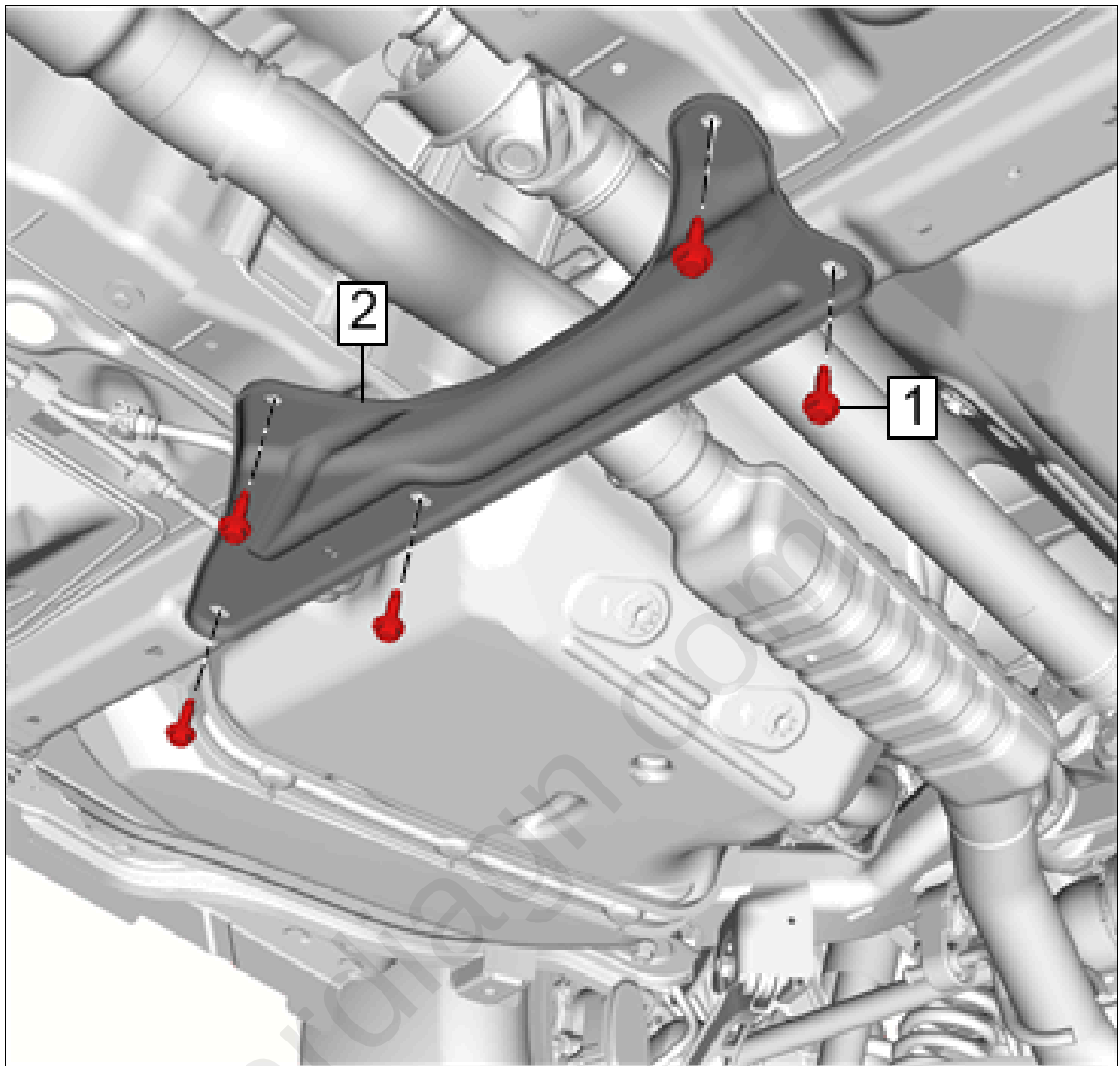
Courtesy of GENERAL MOTORS COMPANY

11. Connect the bank 2, sensor 2, heated oxygen sensor electrical wiring harness connector (1)
12. Lower the vehicle.
13. Start the engine and check for exhaust leaks.

REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LTG, COUPE) > REMOVAL PROCEDURE

1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)
2. Support the exhaust muffler with a suitable jack.
3. Remove Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)

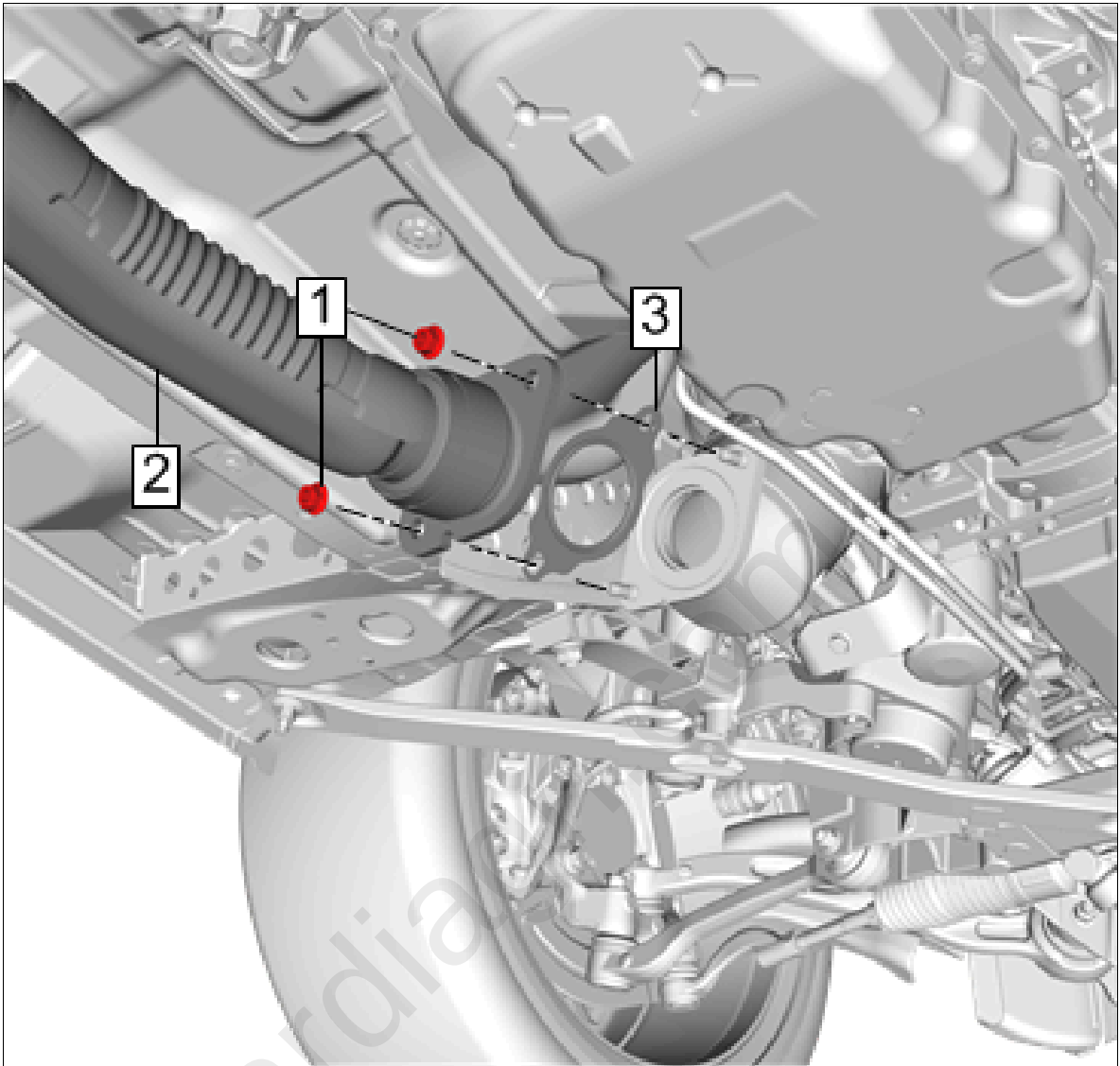
Fig 1: Floor Panel Number 4 Cross Bar Reinforcement Bolt



Courtesy of GENERAL MOTORS COMPANY

4. Remove Floor Panel Number 4 Cross Bar Reinforcement Bolt (1) (Qty: 4)
5. Remove Floor Panel Number 4 Cross Bar Reinforcement (2)

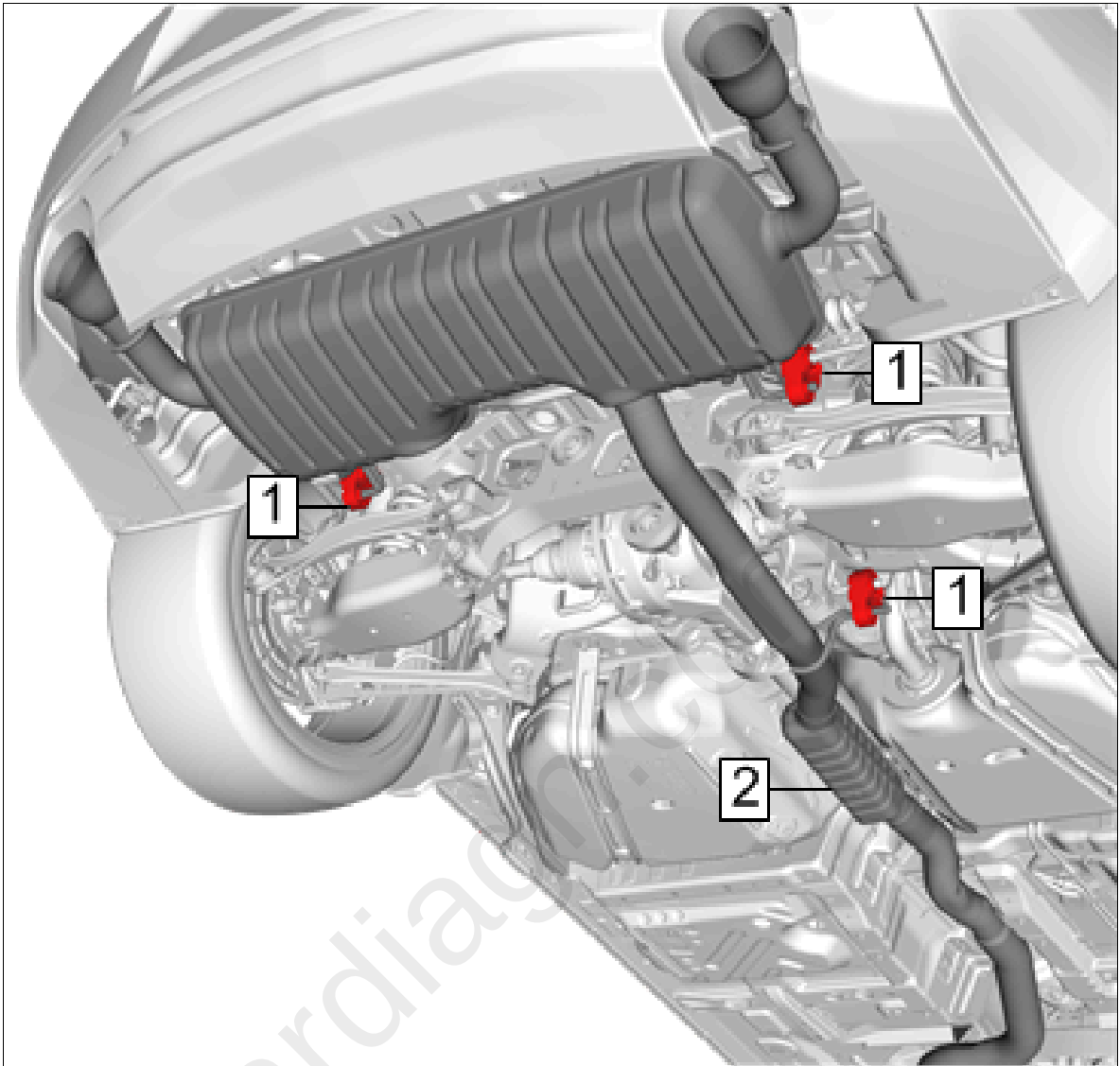
Fig 2: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

6. Remove Catalytic Converter Nut (1) (Qty: 2)
7. Disconnect Exhaust Muffler Assembly (2) at Catalytic Converter
8. Remove Exhaust Gasket (3) and DISCARD

Fig 3: Exhaust Muffler Isolator

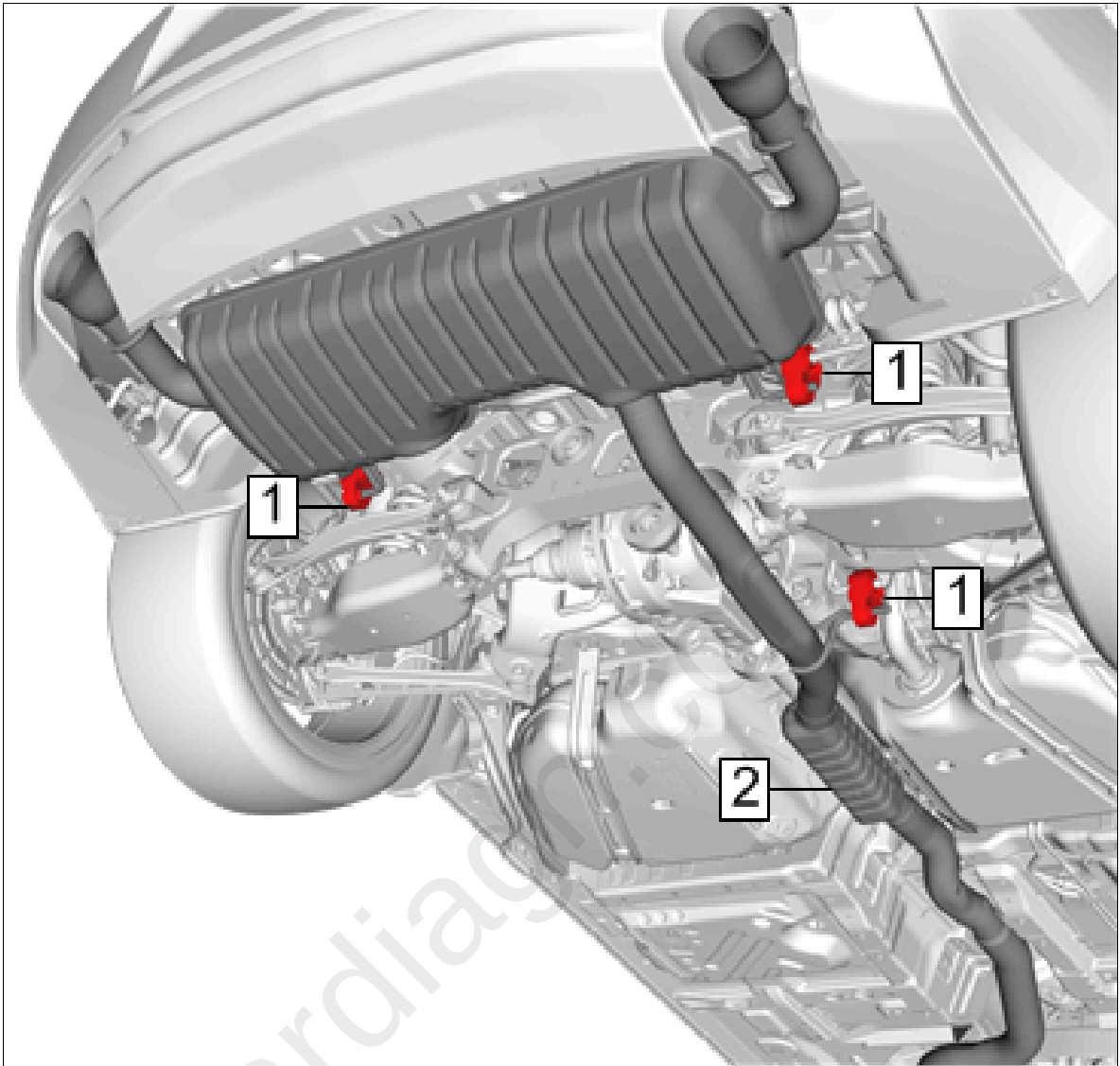


Courtesy of GENERAL MOTORS COMPANY

9. Disconnect Exhaust Muffler Isolator (1) (Qty: 3)
10. Carefully lower the exhaust system (2) from the vehicle.

**REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LTG, COUPE) >
INSTALLATION PROCEDURE**

Fig 1: Exhaust Muffler Isolator



Courtesy of GENERAL MOTORS COMPANY

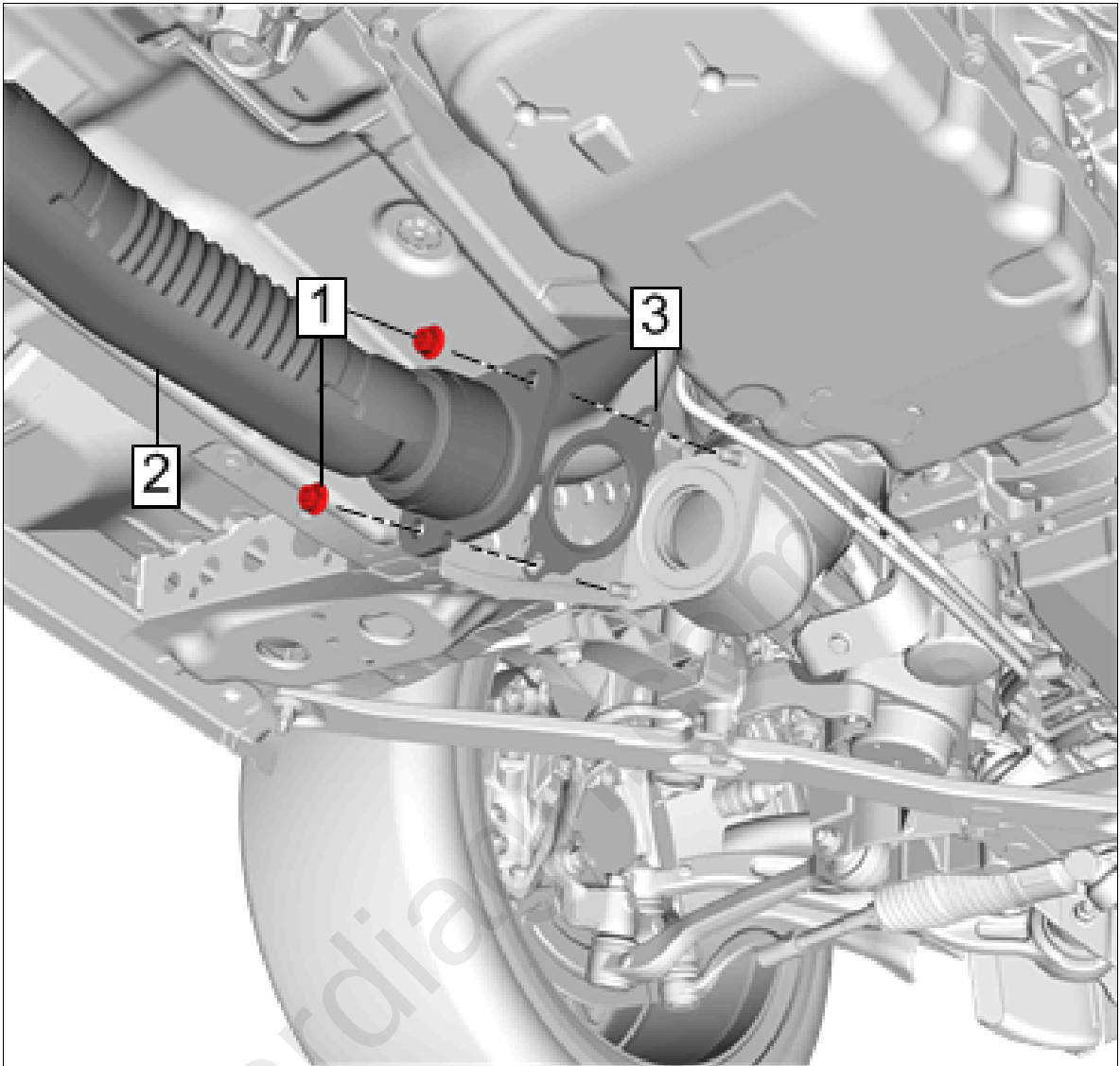
1. Carefully raise and install the exhaust system (2) to the vehicle.

 **NOTE:**

Clean and lubricate the exhaust isolators for ease of installation.

2. Connect Exhaust Muffler Isolator (1) (Qty: 3)

Fig 2: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

 **NOTE:**

Install a NEW gasket.

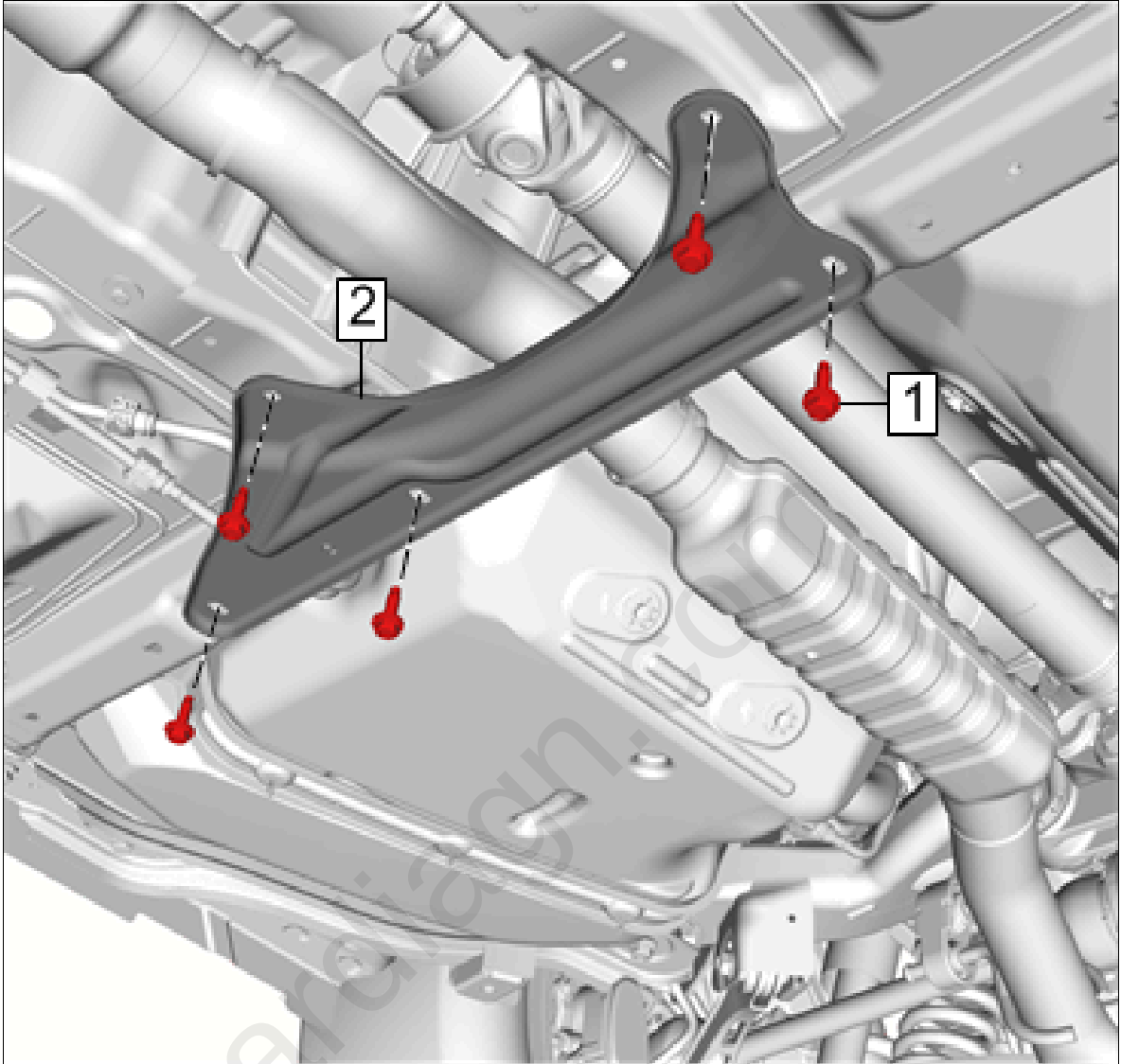
3. Install Exhaust Gasket (3)
4. Connect Exhaust Muffler Assembly (2) at Catalytic Converter

 **CAUTION:**

Refer to Fastener Caution .

5. Install Catalytic Converter Nut (1) (Qty: 2) and tighten to 50 N.m (37 lb ft)

Fig 3: Floor Panel Number 4 Cross Bar Reinforcement Bolt



Courtesy of GENERAL MOTORS COMPANY

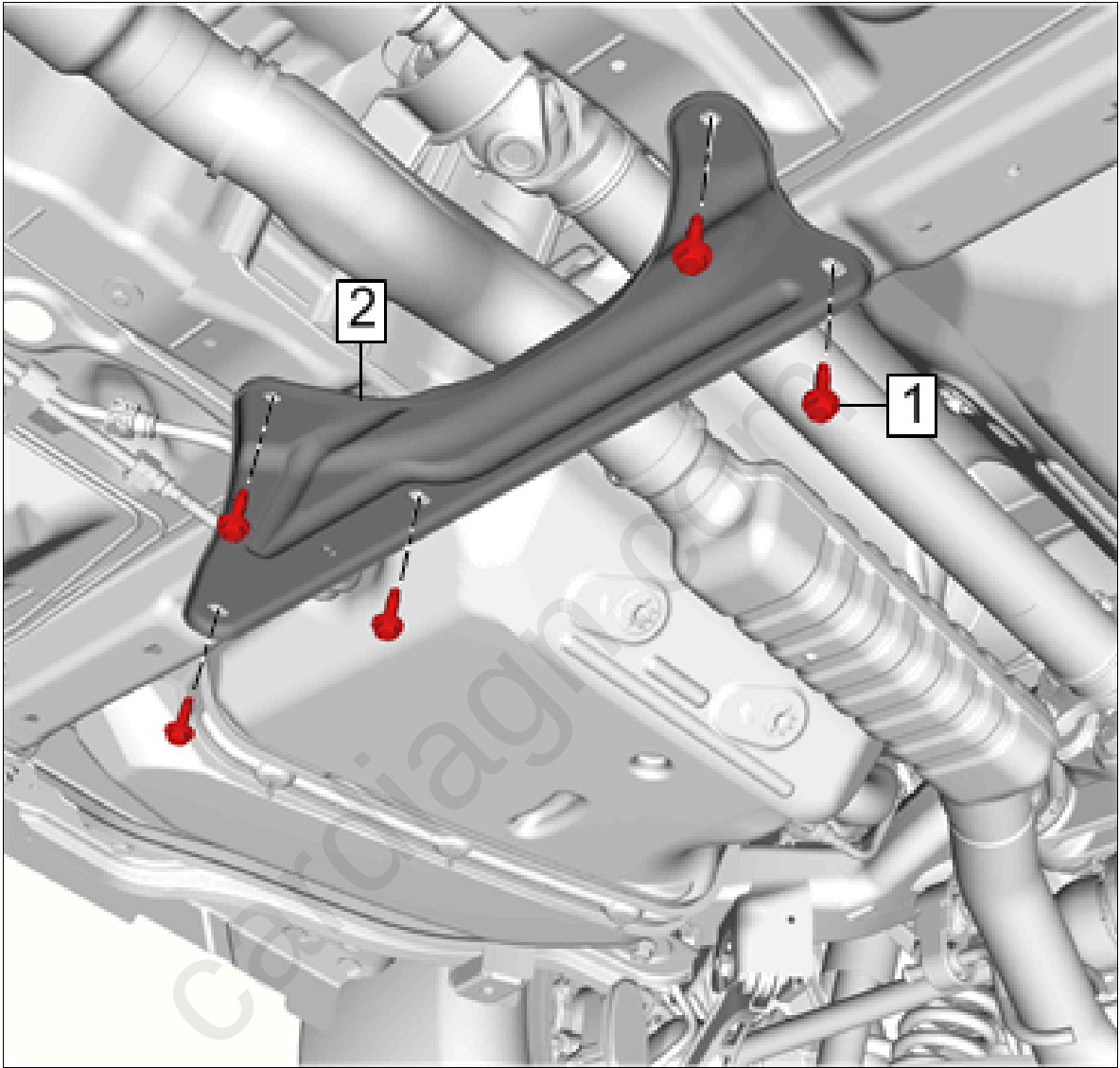
6. Install Floor Panel Number 4 Cross Bar Reinforcement (2)
7. Install Floor Panel Number 4 Cross Bar Reinforcement Bolt (1) (Qty: 4) and tighten to 22 N.m (16 lb ft)
8. Install Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)
9. Start the engine and check for exhaust leaks.

REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LTG, CONVERTIBLE) > REMOVAL PROCEDURE

1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)

2. Support the exhaust muffler with a suitable jack.
3. Remove Underbody Rear Brace Replacement (Convertible)
4. Remove Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1)

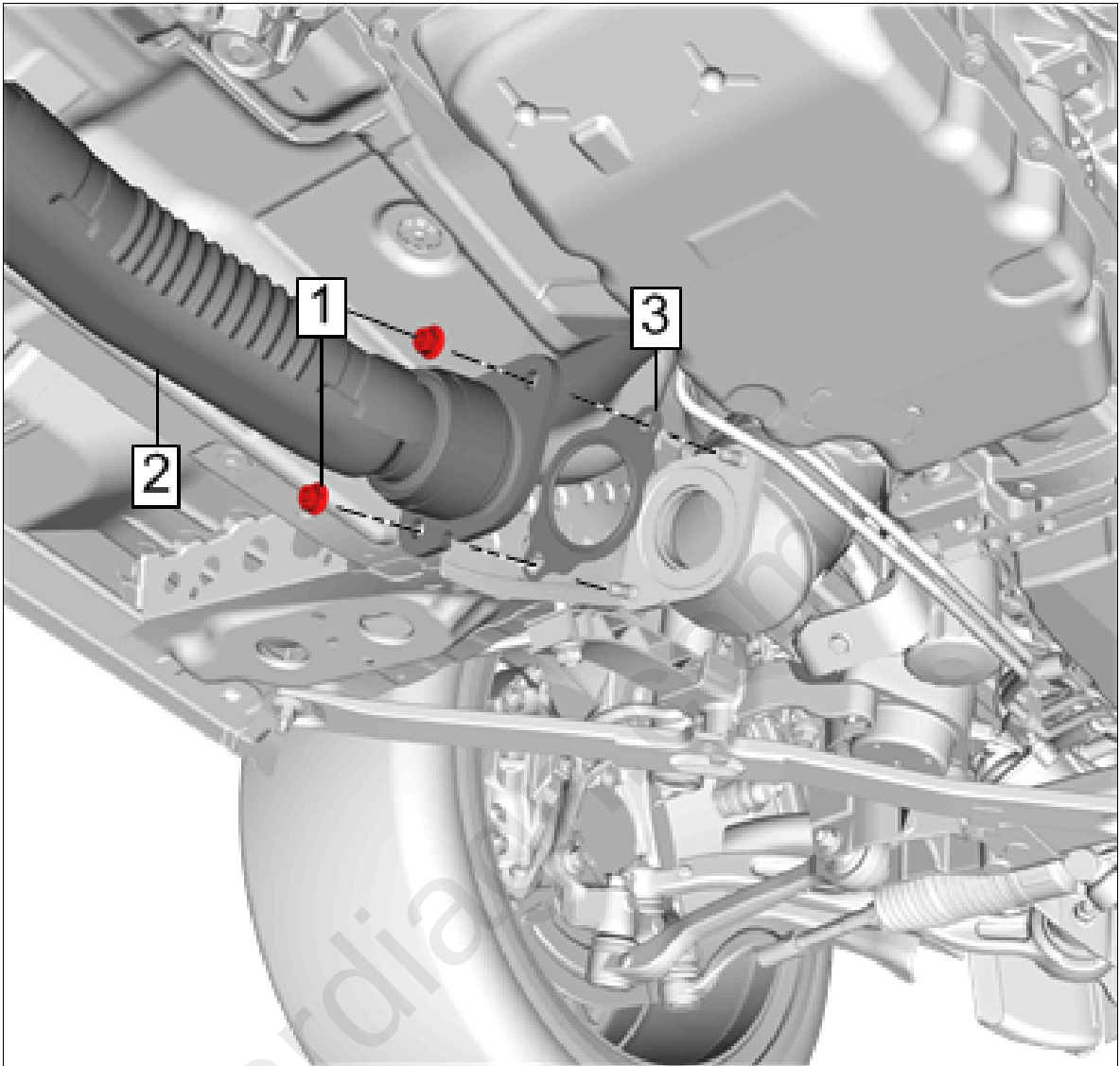
Fig 1: Floor Panel Number 4 Cross Bar Reinforcement Bolt



Courtesy of GENERAL MOTORS COMPANY

5. Remove Floor Panel Number 4 Cross Bar Reinforcement Bolt (1) (Qty: 4)
6. Remove Floor Panel Number 4 Cross Bar Reinforcement (2)

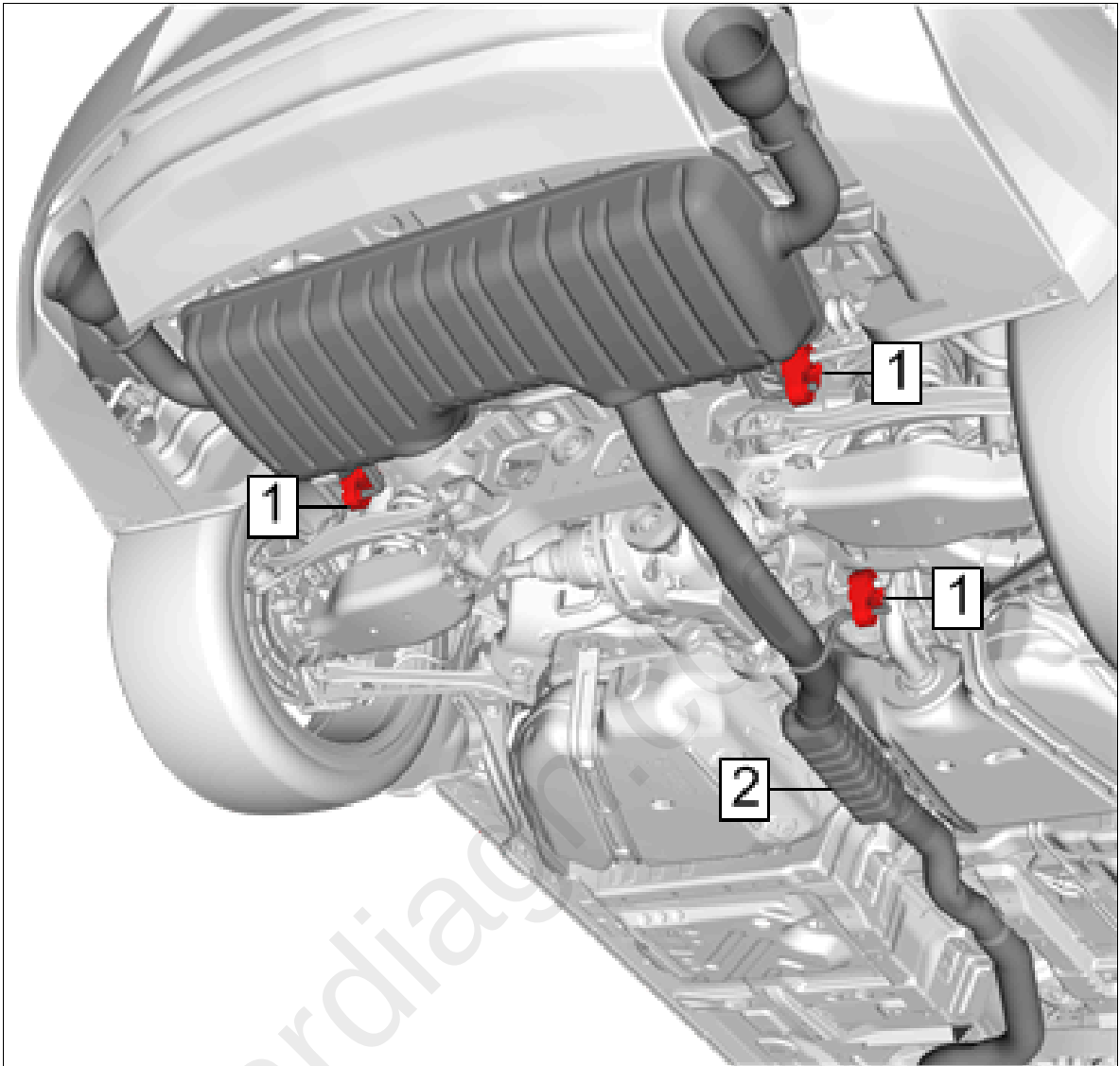
Fig 2: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

7. Remove Catalytic Converter Nut (1) (Qty: 2)
8. Disconnect Exhaust Muffler Assembly (2) at Catalytic Converter
9. Remove Exhaust Gasket (3) and DISCARD

Fig 3: Exhaust Muffler Isolator

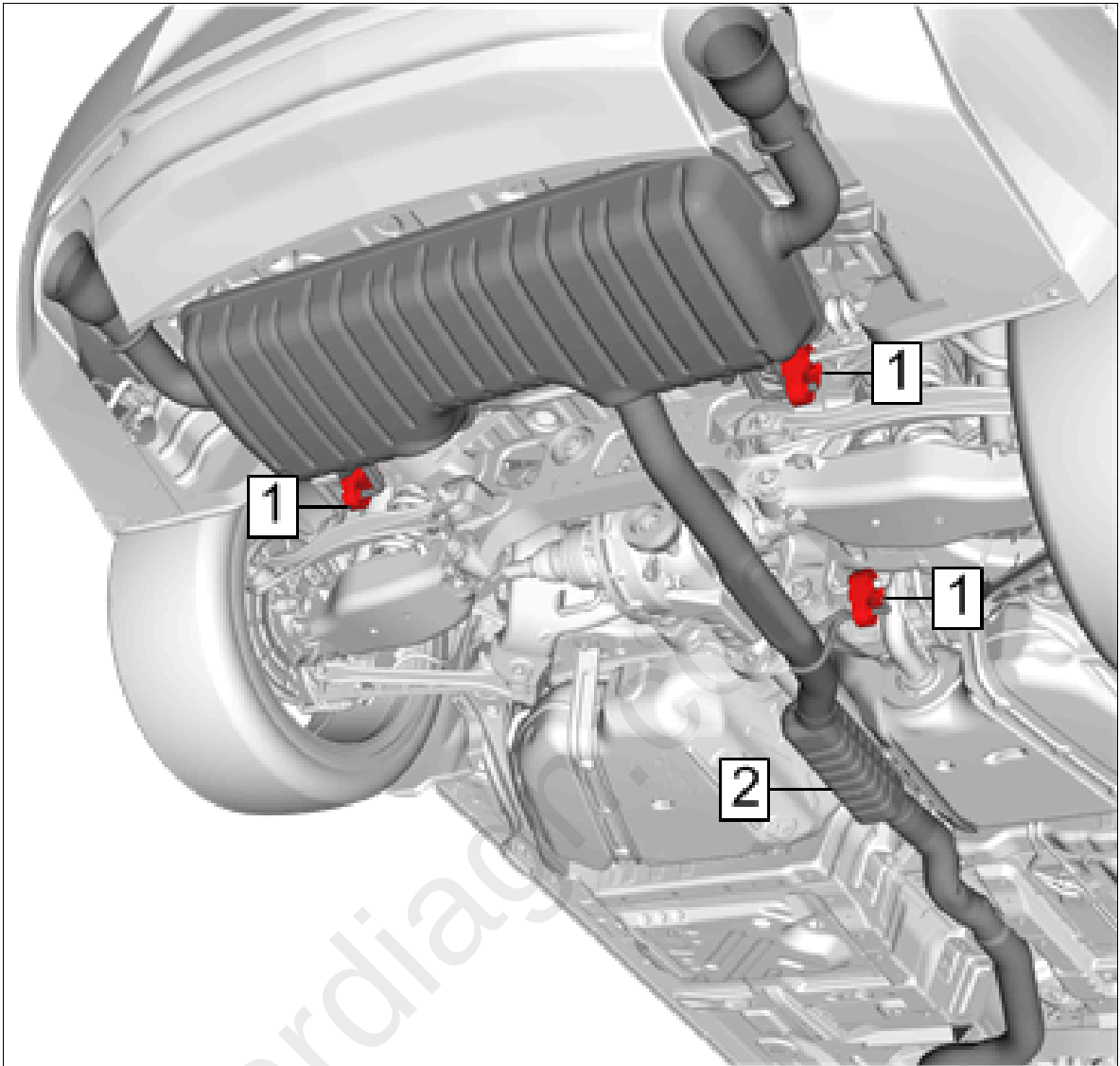


Courtesy of GENERAL MOTORS COMPANY

10. Disconnect Exhaust Muffler Isolator (1) (Qty: 3)
11. Carefully lower the exhaust system (2) from the vehicle.

REPAIR INSTRUCTIONS > EXHAUST MUFFLER REPLACEMENT (LTG, CONVERTIBLE) > INSTALLATION PROCEDURE

Fig 1: Exhaust Muffler Isolator



Courtesy of GENERAL MOTORS COMPANY

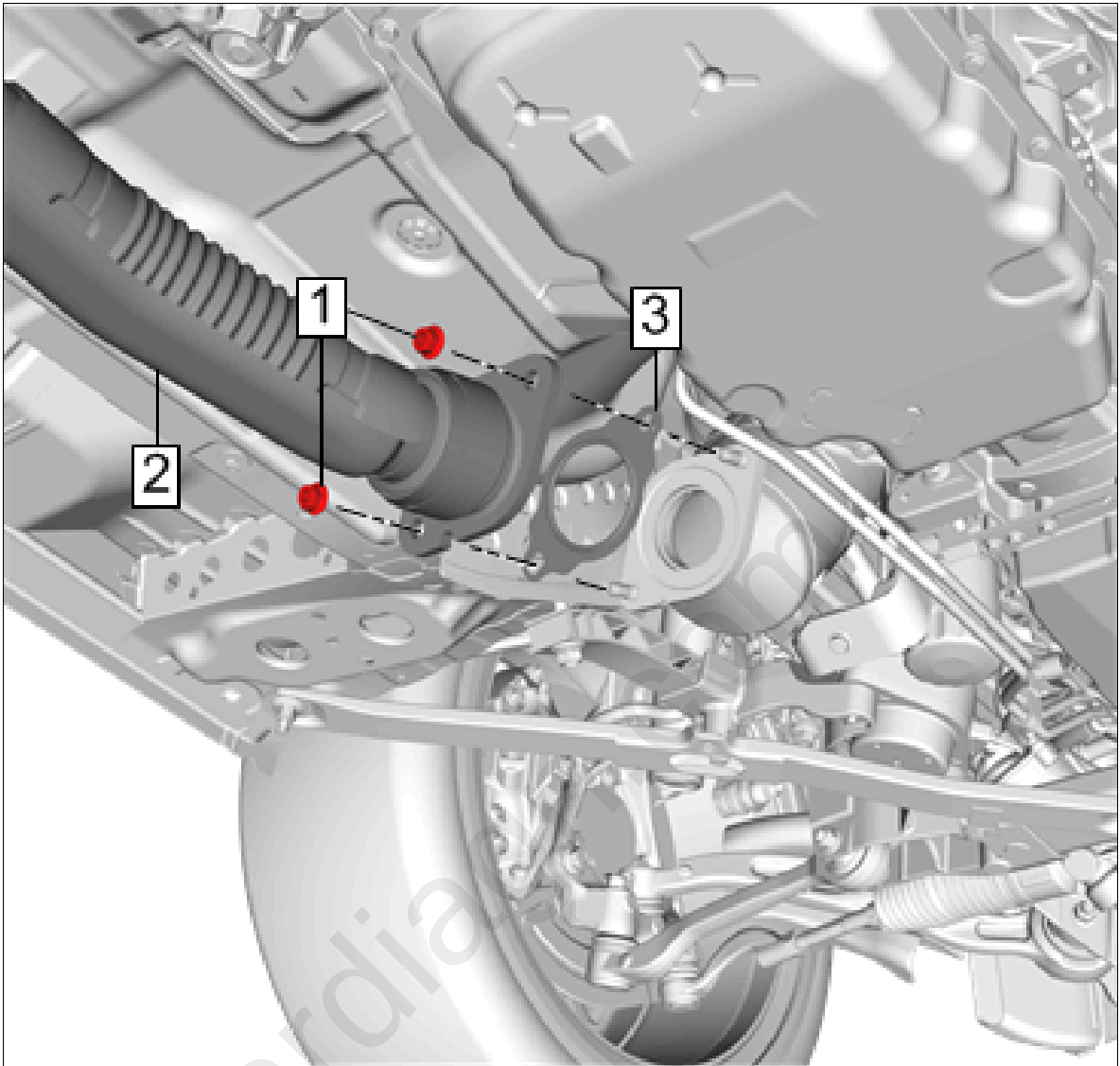
1. Carefully raise and install the exhaust system (2) to the vehicle.

 **NOTE:**

Clean and lubricate the exhaust isolators for ease of installation.

2. Connect Exhaust Muffler Isolator<p01>»Connect <p01>

Fig 2: Catalytic Converter Nut



Courtesy of GENERAL MOTORS COMPANY

 NOTE:

Install a NEW gasket.

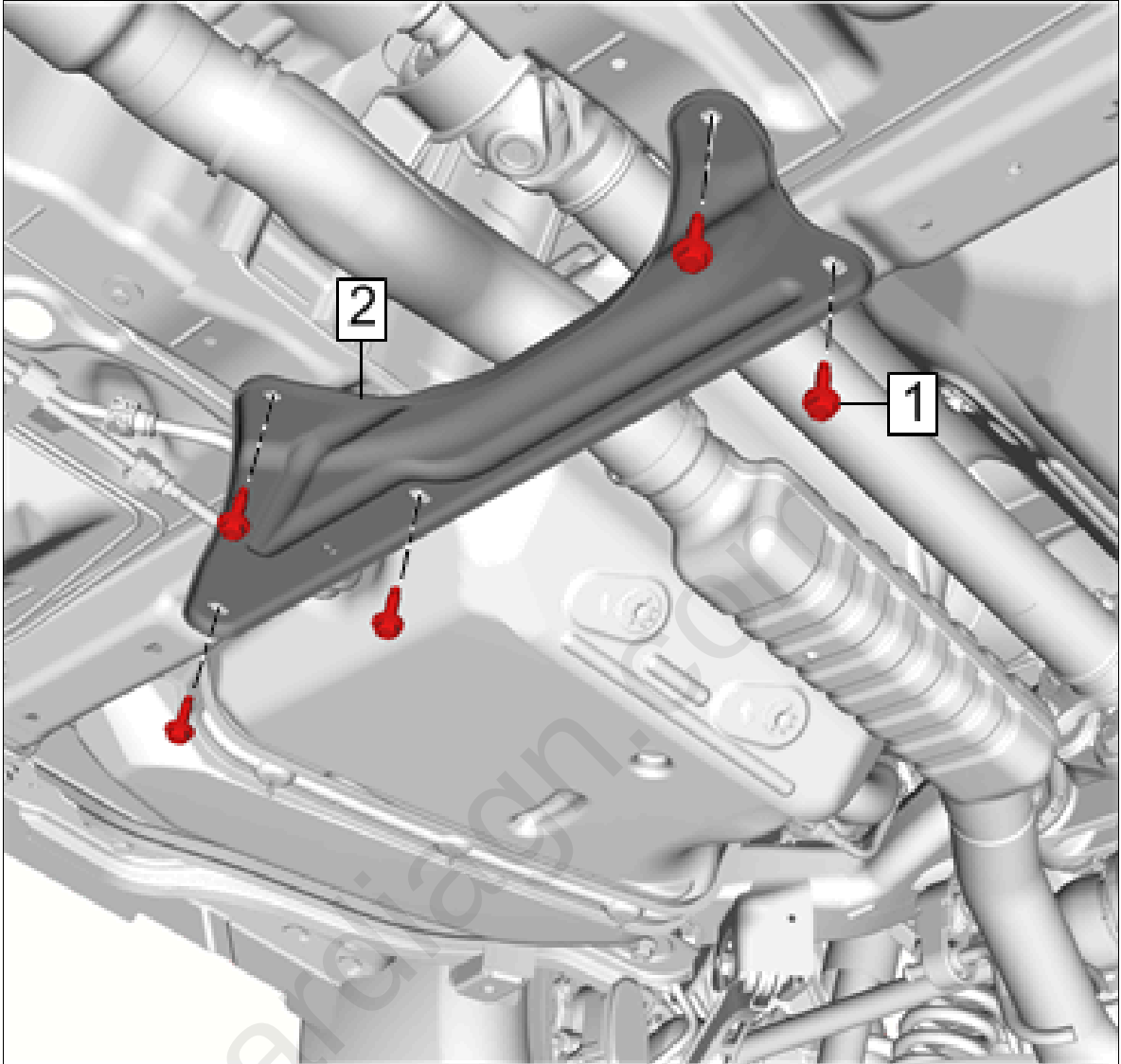
3. Install Exhaust Gasket (3).
4. Connect Exhaust Muffler Assembly (2) at Catalytic Converter.

 CAUTION:

Refer to Fastener Caution .

5. Install Catalytic Converter Nut (1) (Qty: 2) and tighten to 50 N.m (37 lb ft)

Fig 3: Floor Panel Number 4 Cross Bar Reinforcement Bolt

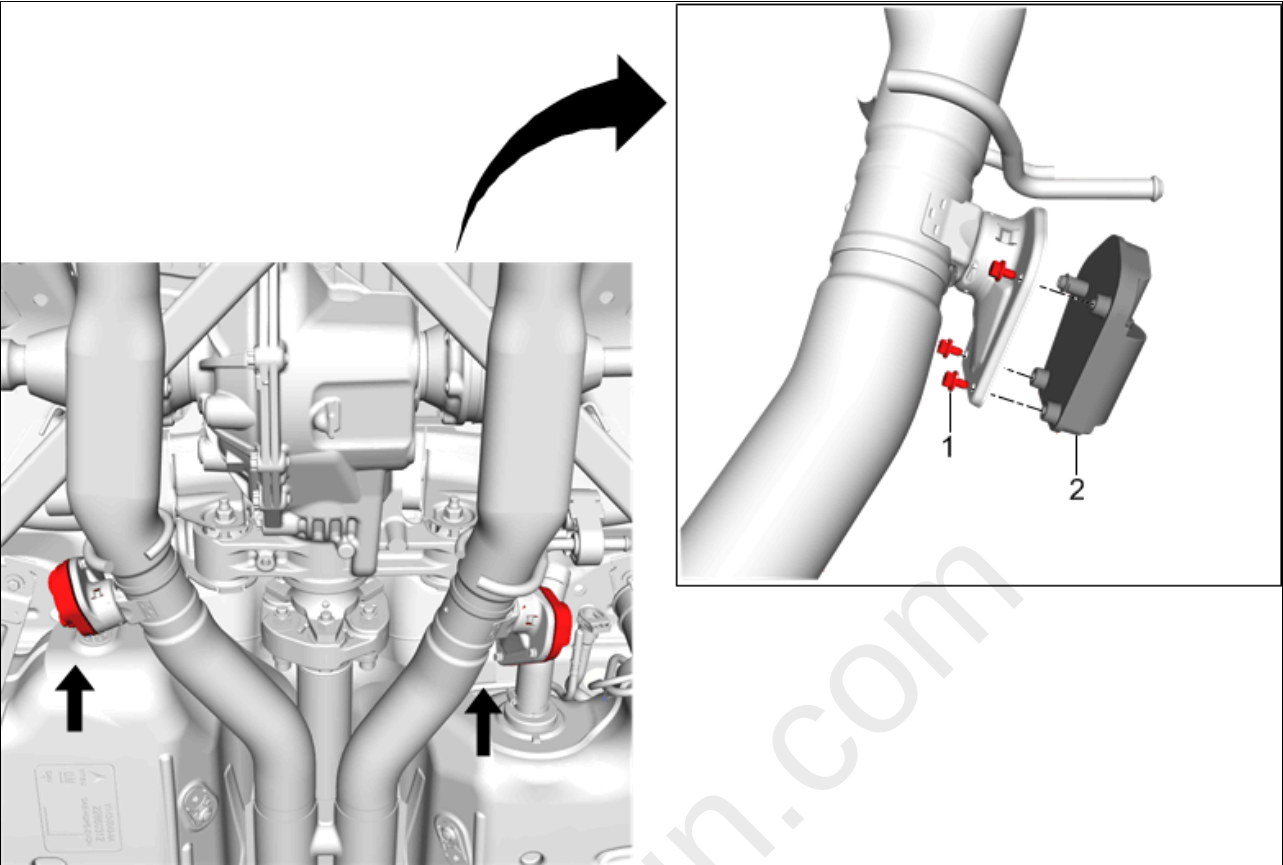


Courtesy of GENERAL MOTORS COMPANY

6. Install Floor Panel Number 4 Cross Bar Reinforcement (2).
7. Install Floor Panel Number 4 Cross Bar Reinforcement Bolt (1) (Qty: 5) and tighten to 22 N.m (16 lb ft)
8. Install Exhaust Rear Muffler Rear Hanger Replacement (LGX, LT1) .
9. Install Underbody Rear Brace Replacement (Convertible) .
10. Start the engine and check for exhaust leaks.

REPAIR INSTRUCTIONS > EXHAUST CONTROL VALVE ACTUATOR REPLACEMENT (FRONT VALVES WITH PERFORMANCE EXHAUST)

Fig 1: Exhaust Control Valve Actuator (Front Valves With Performance Exhaust)



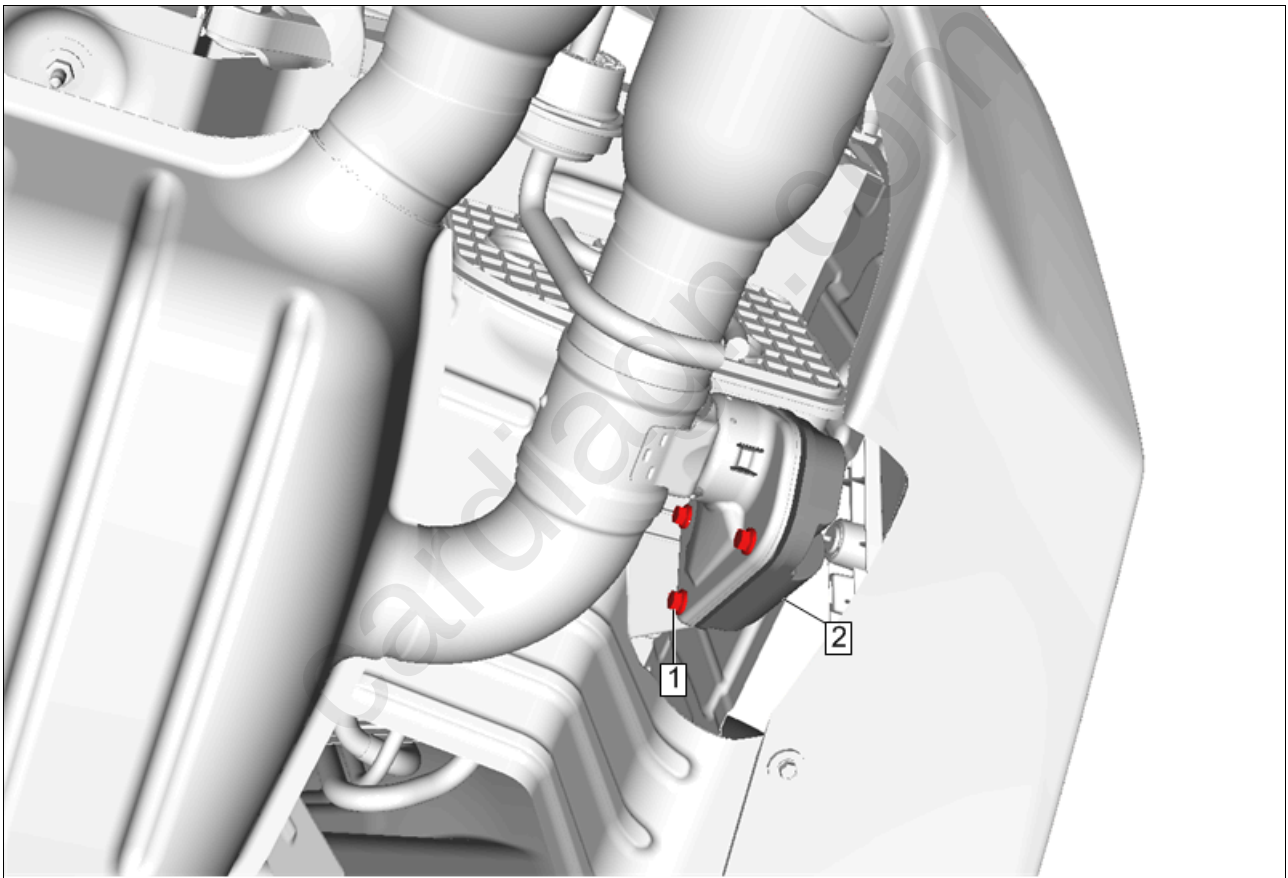
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: <i>Refer to Exhaust Service Warning .</i>	
Preliminary Procedure Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .	
1	Exhaust Control Valve Actuator Fastener (Qty: 3) CAUTION: <i>Refer to Fastener Caution .</i> Procedure Install NEW fasteners. Tighten

	6 N.m (53 lb in)
2	Exhaust Control Valve Actuator Procedure 1. Disconnect the electrical connector. 2. Perform the tail pipe exhaust flow control valve actuator re-learn procedure.

**REPAIR INSTRUCTIONS > EXHAUST CONTROL VALVE ACTUATOR REPLACEMENT
(REAR VALVES WITH PERFORMANCE EXHAUST)**

Fig 1: Exhaust Control Valve Actuator (Rear Valves with Performance Exhaust)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP)	
1	Exhaust Control Valve Actuator Fastener (Qty: 3) CAUTION:

Refer to Fastener Caution .

Tighten

6 N.m (53 lb in)

Exhaust Control Valve Actuator

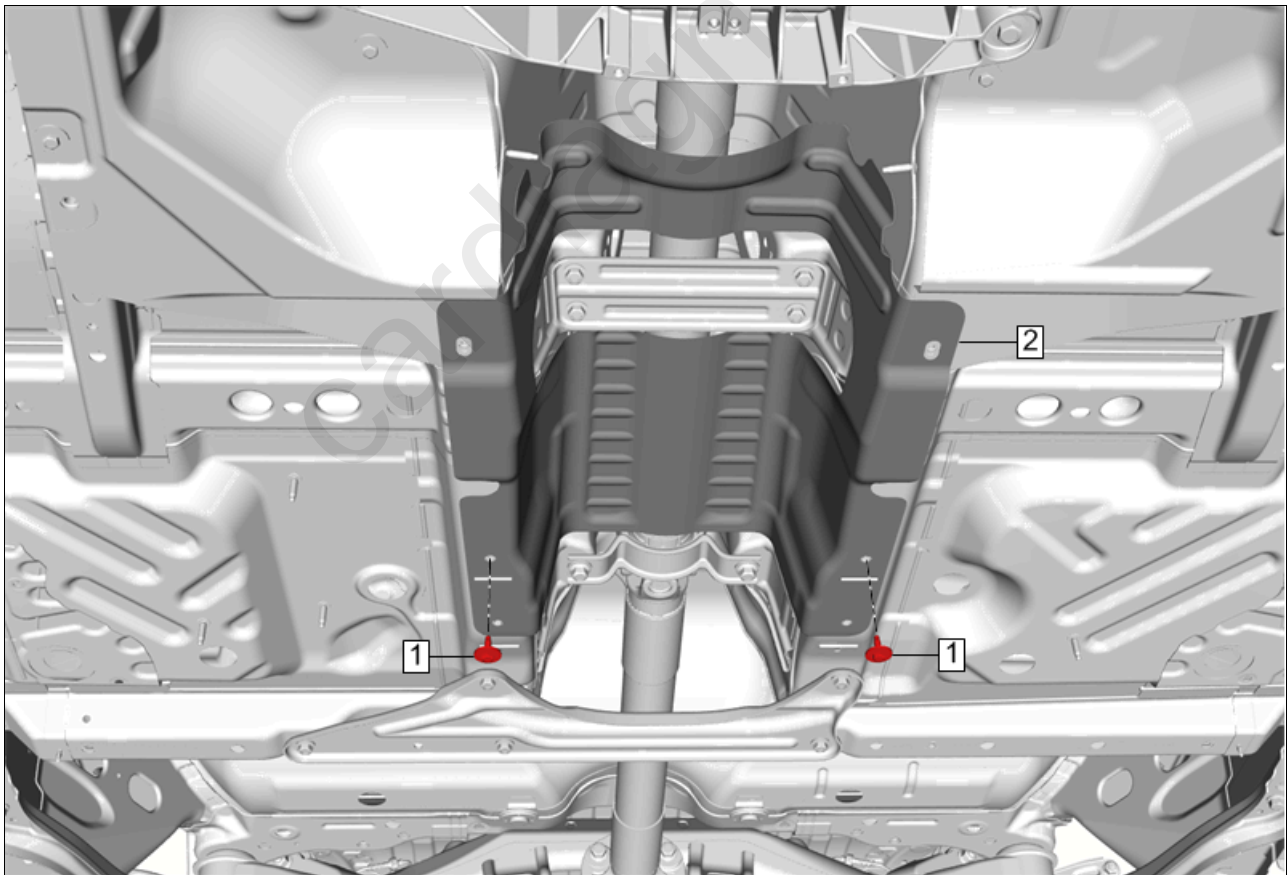
Procedure

2

1. Disconnect the electrical connector.
2. Perform the exhaust flow control valve actuator re-learn procedure. Exhaust Flow Control Valve Learn (Cylinder Deactivation Exhaust Flow Control Valve) Exhaust Flow Control Valve Learn (Tail Pipe Exhaust Flow Control Valve)

REPAIR INSTRUCTIONS > INTERMEDIATE BODY EXHAUST HEAT SHIELD REPLACEMENT

Fig 1: Intermediate Body Exhaust Heat Shield

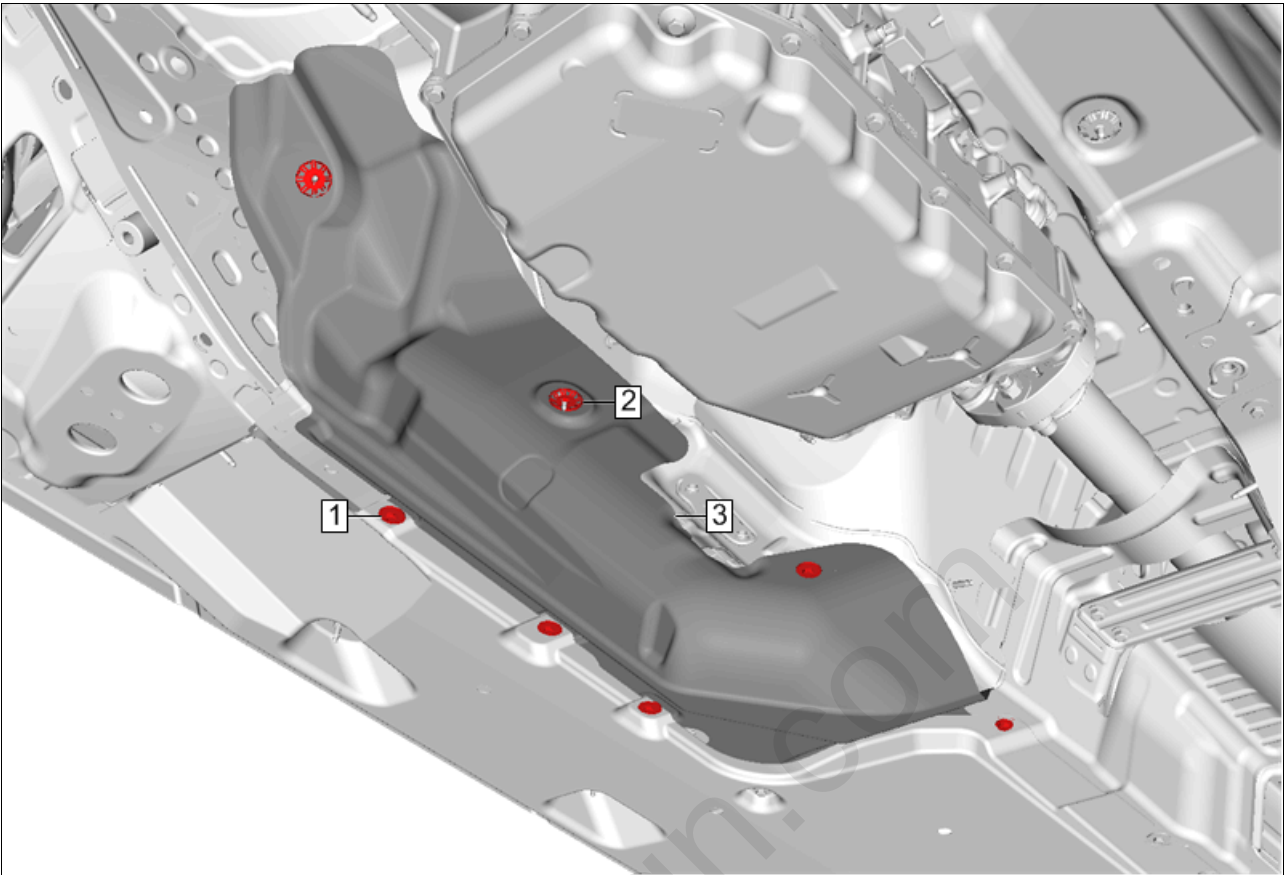


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: <i>Refer to Exhaust Service Warning .</i>	
WARNING: <i>Refer to Eye Protection Warning .</i>	
Preliminary Procedures - Underbody Front Air Deflector Replacement - Right Side - Underbody Front Air Deflector Replacement - Left Side - Exhaust Muffler Replacement (LGX, Coupe) Exhaust Muffler Replacement (LGX, Convertible) Exhaust Muffler Replacement (LT1, Coupe) Exhaust Muffler Replacement (LT1, Convertible) Exhaust Muffler Replacement (LTG, Coupe) Exhaust Muffler Replacement (LTG, Convertible)	
1	Intermediate Body Exhaust Heat Shield Bolt (Qty: 2) CAUTION: <i>Refer to Fastener Caution .</i> Tighten 9 N.m (80 lb in)
2	Intermediate Body Exhaust Heat Shield

REPAIR INSTRUCTIONS > FRONT BODY EXHAUST HEAT SHIELD REPLACEMENT (RIGHT)

Fig 1: Front Body Exhaust Heat Shield (Right)

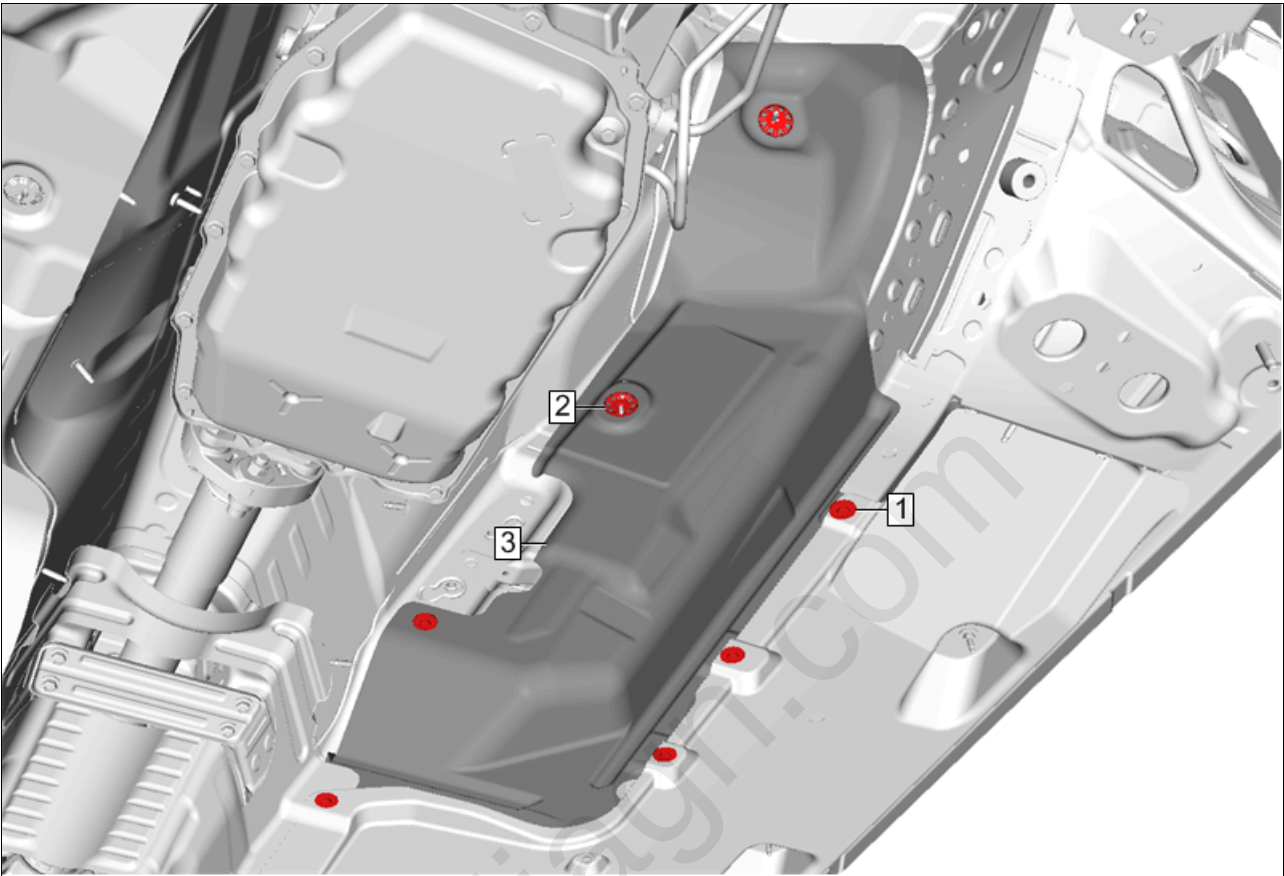


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP)	
1	Front Body Exhaust Heat Shield Bolt (Qty: 5)
	CAUTION: Refer to Fastener Caution .
	Tighten 9 N.m (80 lb in)
2	Front Body Exhaust Heat Shield Retainer (Qty: 2) Tighten 1.75 N.m (15 lb in)
3	Front Body Exhaust Heat Shield - Right

REPAIR INSTRUCTIONS > FRONT BODY EXHAUST HEAT SHIELD REPLACEMENT (LEFT)

Fig 1: Front Body Exhaust Heat Shield (Left)

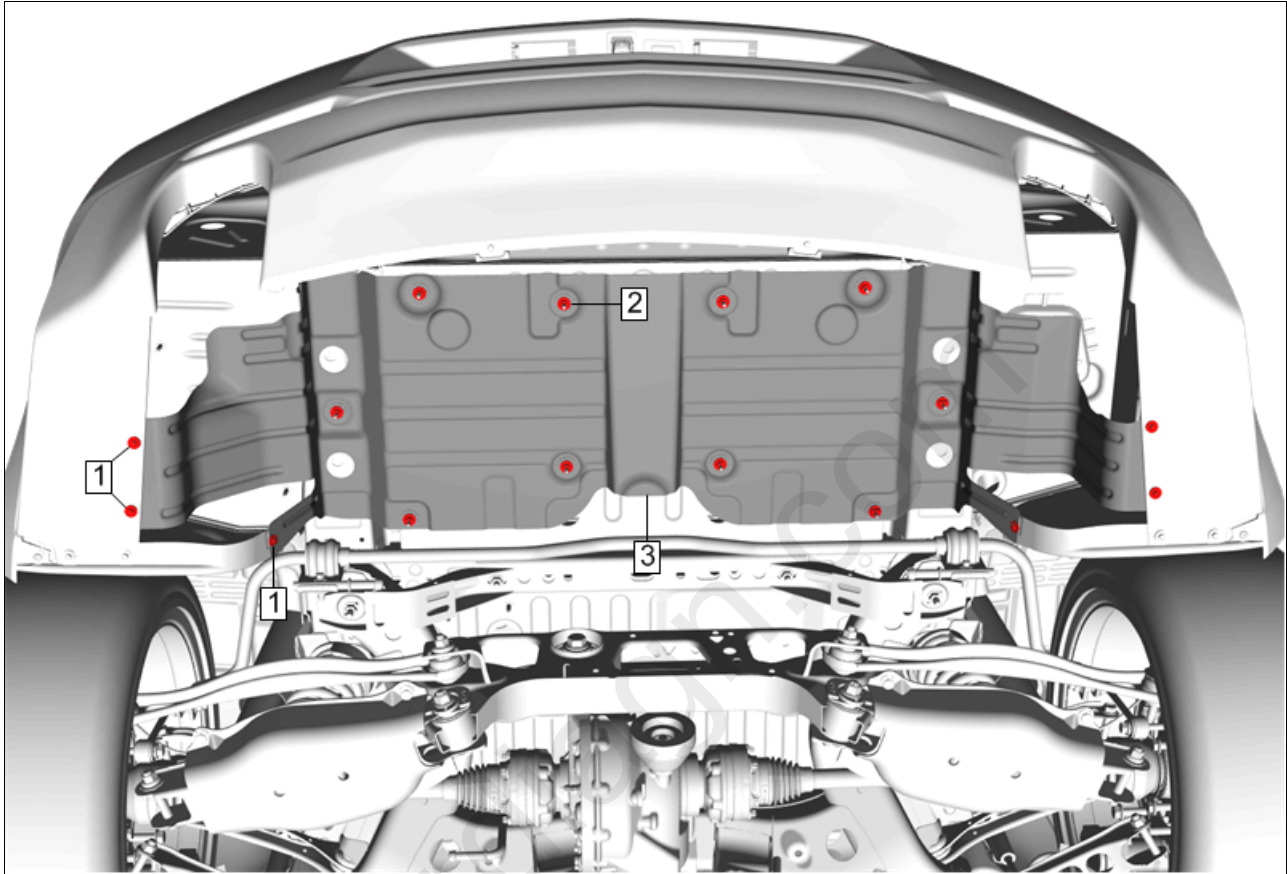


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP)	
1	Front Body Exhaust Heat Shield Bolt (Qty: 5) <i>CAUTION:</i> <i>Refer to Fastener Caution .</i> Tighten 9 N.m (80 lb in)
2	Front Body Exhaust Heat Shield Retainer (Qty: 2) Tighten 1.75 N.m (15 lb in)

REPAIR INSTRUCTIONS > REAR BODY EXHAUST HEAT SHIELD REPLACEMENT

Fig 1: Rear Body Exhaust Heat Shield



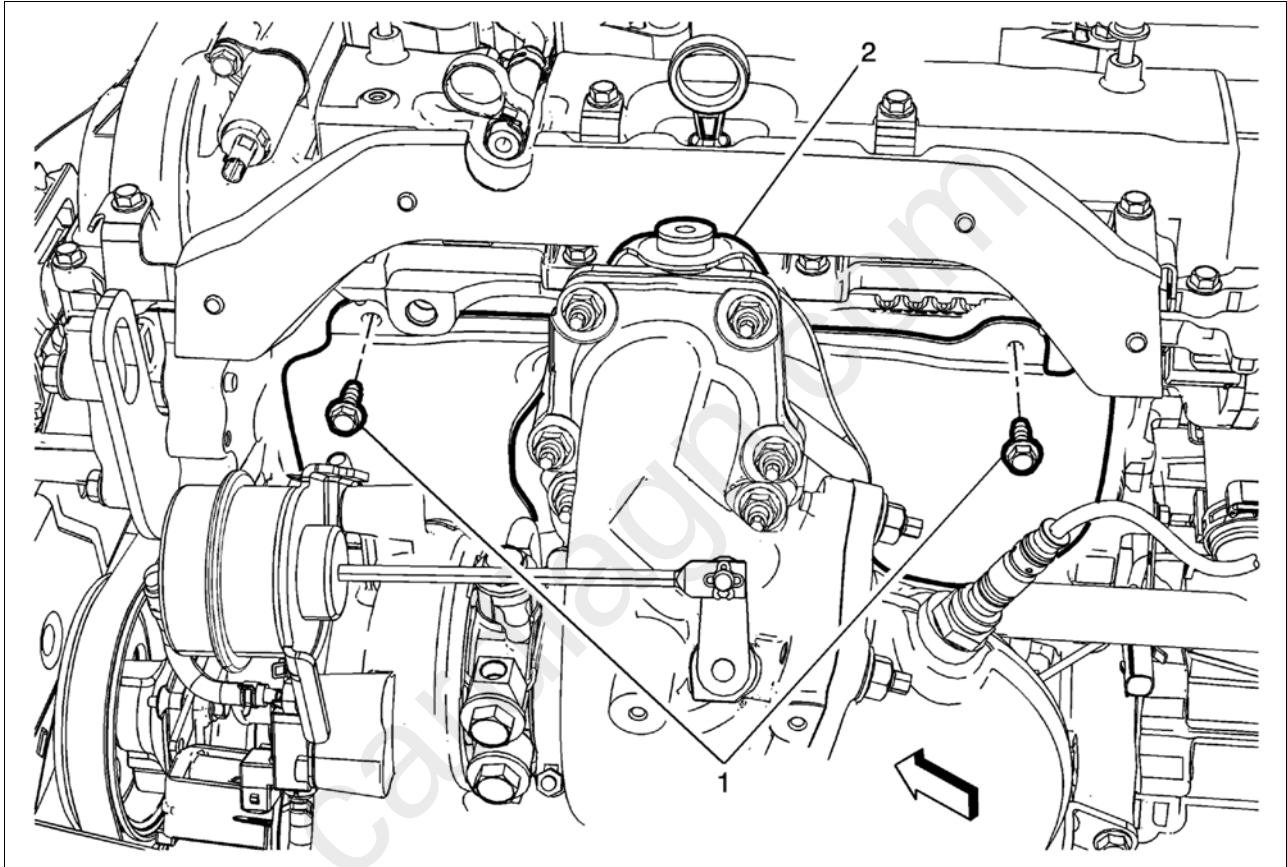
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Exhaust Muffler Replacement (LGX, Coupe) Exhaust Muffler Replacement (LGX, Convertible) Exhaust Muffler Replacement (LT1, Coupe) Exhaust Muffler Replacement (LT1, Convertible) Exhaust Muffler Replacement (LTG, Coupe) Exhaust Muffler Replacement (LTG, Convertible)	
1	Exhaust Rear Muffler Heat Shield Bolt (Qty: 6) CAUTION: <i>Refer to Fastener Caution .</i> Tighten 9 N.m (80 lb in)

2	Exhaust Rear Muffler Heat Shield Nut (Qty: 10) Tighten 9 N.m (80 lb in)
3	Exhaust Rear Muffler Heat Shield

REPAIR INSTRUCTIONS > EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT (LTG)

Fig 1: Exhaust Manifold Heat Shield (LTG)



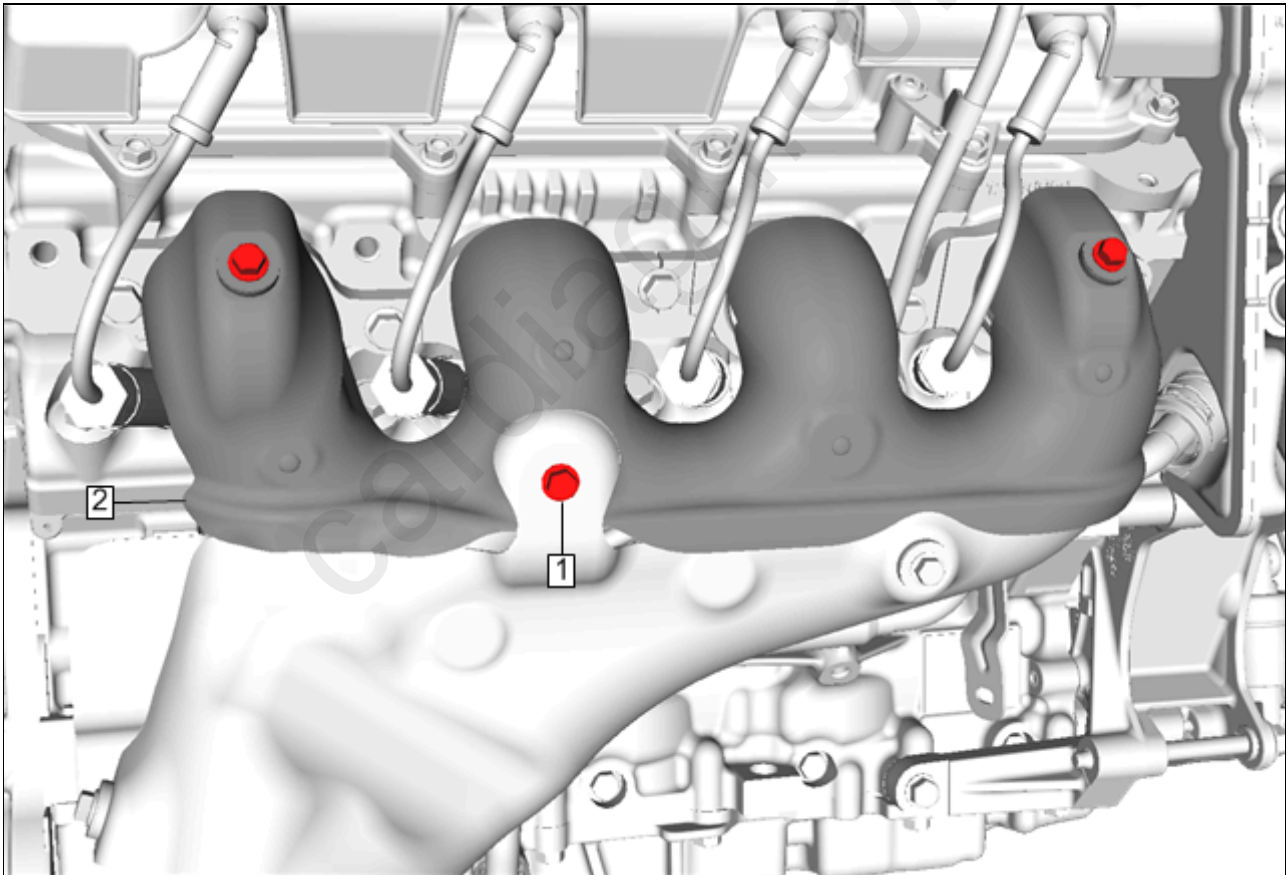
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: <i>Refer to Hot Exhaust System Warning .</i>	
Preliminary Procedure Remove the turbocharger. Refer to Turbocharger Replacement .	

1	Exhaust Manifold Heat Shield Fasteners (Qty: 2)
	CAUTION: <i>Refer to Fastener Caution .</i>
	Tighten 14 N.m (10 lb ft)
2	Exhaust Manifold Heat Shield

REPAIR INSTRUCTIONS > EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - RIGHT SIDE (UPPER, LT1)

Fig 1: Exhaust Manifold Heat Shield - Right Side (Upper - LT1)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING:	

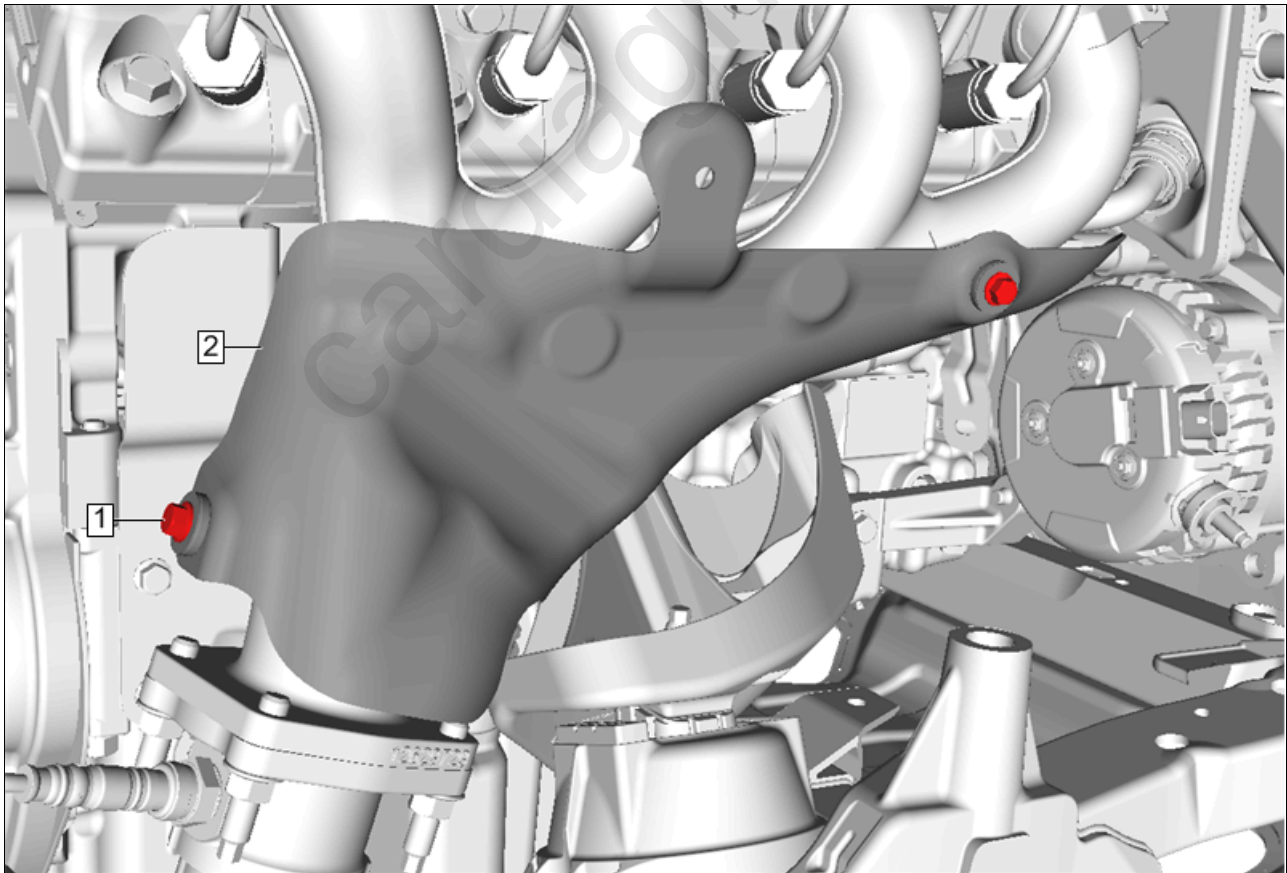
Refer to Hot Exhaust System Warning .

Preliminary Procedure Reposition Radiator Surge Tank Replacement (LT1)

1	Exhaust Manifold Heat Shield Bolt (Qty: 3)
	CAUTION: Refer to Fastener Caution .
	Tighten 10 N.m (89 lb in)
2	Exhaust Manifold Heat Shield - Upper

REPAIR INSTRUCTIONS > EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - RIGHT SIDE (LOWER, LT1)

Fig 1: Exhaust Manifold Heat Shield - Right Side (Lower - LT1)

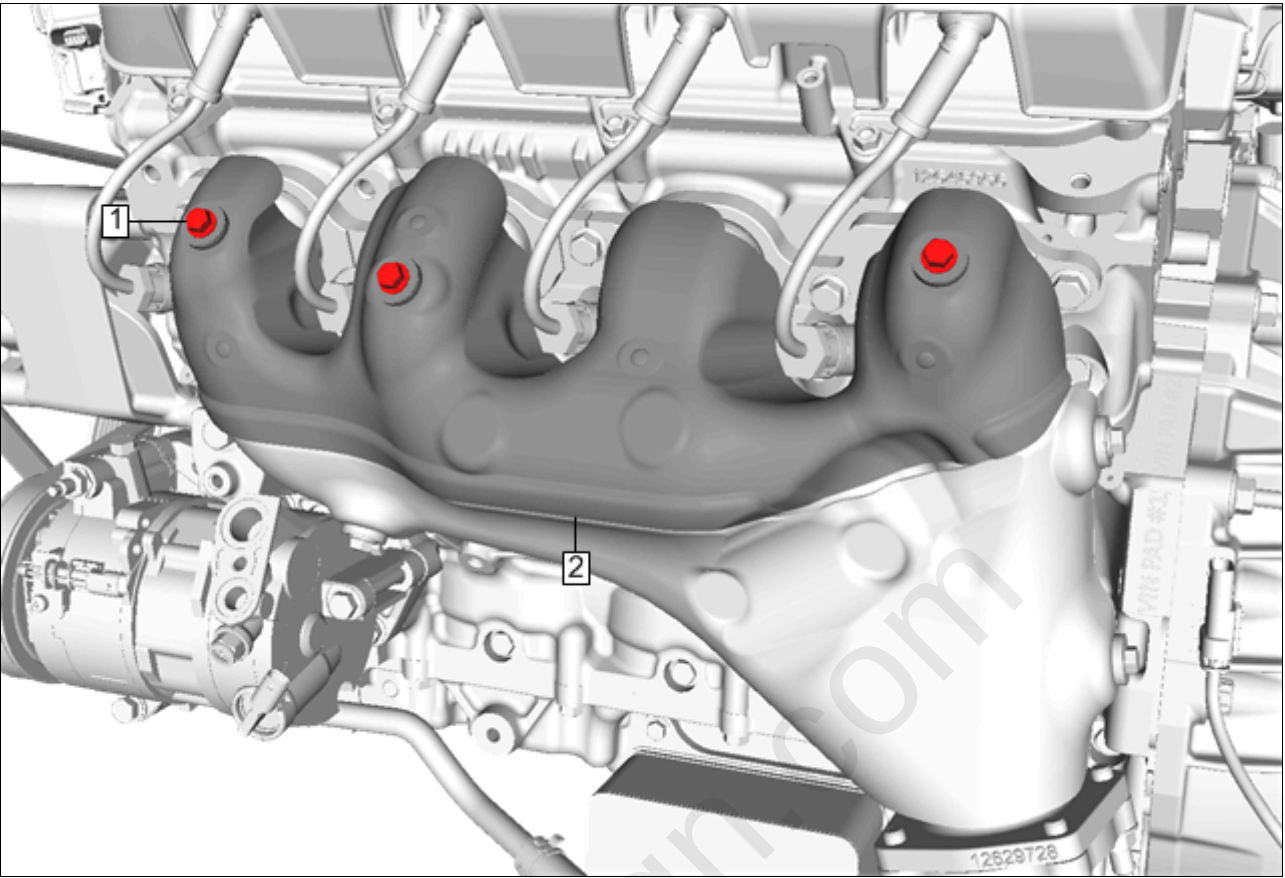


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: <i>Refer to Hot Exhaust System Warning .</i>	
Preliminary Procedures 1. Remove Exhaust Manifold Heat Shield - Upper- Exhaust Manifold Heat Shield Replacement - Right Side (Upper, LT1) Exhaust Manifold Heat Shield Replacement - Right Side (Lower, LT1) 2. Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP)	
1	Exhaust Manifold Heat Shield Bolt (Qty: 2) CAUTION: <i>Refer to Fastener Caution .</i> Tighten 10 N.m (89 lb in)
2	Exhaust Manifold Heat Shield - Lower

REPAIR INSTRUCTIONS > EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - LEFT SIDE (LT1, UPPER)

Fig 1: Exhaust Manifold Heat Shield - Left Side (LT1, Upper)

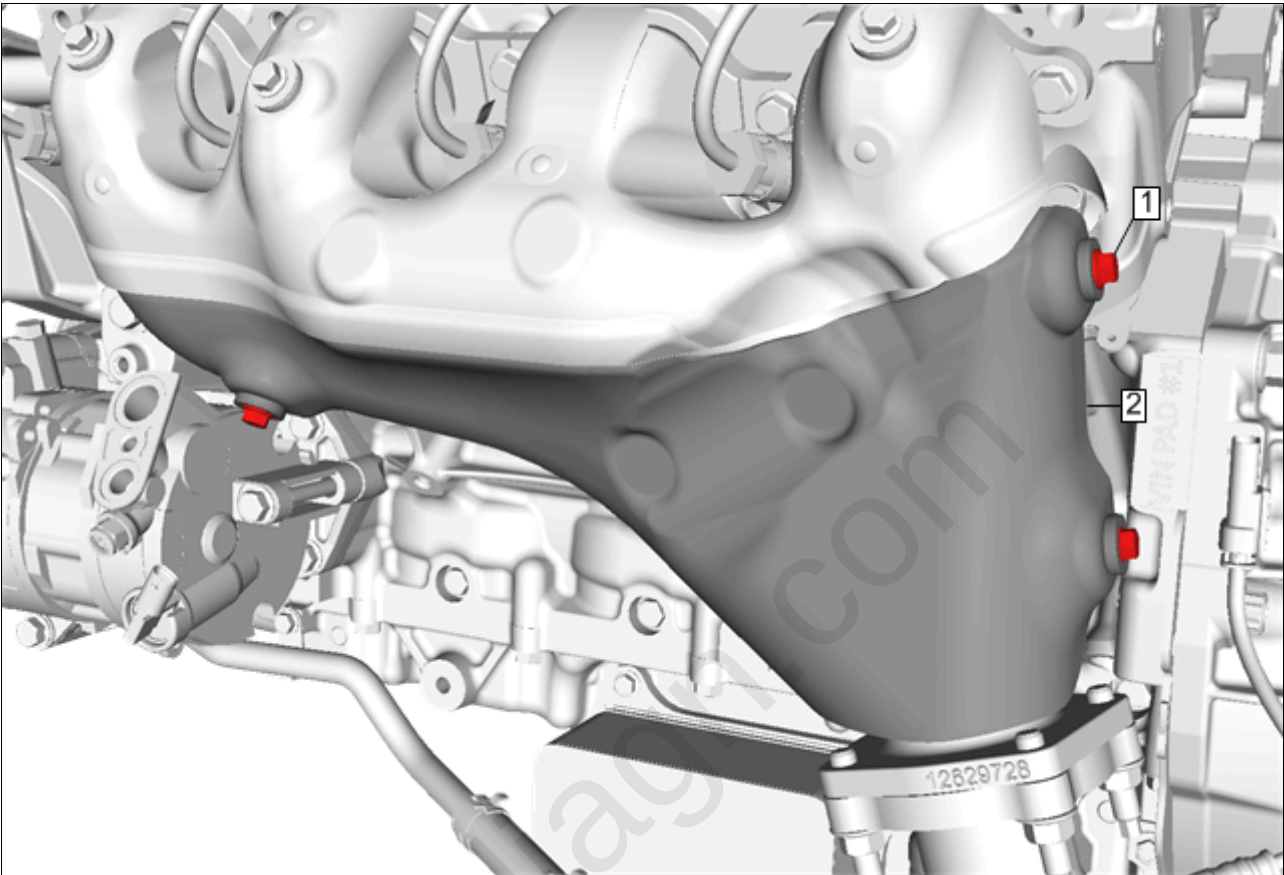


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: <i>Refer to Hot Exhaust System Warning .</i>	
1	Exhaust Manifold Heat Shield Bolt (Qty: 3)
	CAUTION: <i>Refer to Fastener Caution .</i> Tighten 10 N.m (89 lb in)
2	Exhaust Manifold Heat Shield - Upper

REPAIR INSTRUCTIONS > EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT - LEFT SIDE (LT1, LOWER)

Fig 1: Exhaust Manifold Heat Shield - Left Side (LT1, Lower)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: <i>Refer to Hot Exhaust System Warning .</i>	
Preliminary Procedures 1. Remove the upper exhaust manifold heat shield. Exhaust Manifold Heat Shield Replacement - Left Side (LT1, Upper) Exhaust Manifold Heat Shield Replacement - Left Side (LT1, Lower) 2. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)	
1	Exhaust Manifold Heat Shield Bolt (Qty: 3)

CAUTION:

Refer to Fastener Caution .

Tighten

10 N.m (89 lb in)

2

Exhaust Manifold Heat Shield - Lower

DESCRIPTION AND OPERATION > 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 (AFM) exhaust flow valve control system.

DESCRIPTION AND OPERATION > EXHAUST TAIL PIPE FLOW CONTROL SYSTEM

DESCRIPTION AND OPERATION > 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:



NOTE:

You may notice an exhaust tone change due to the AFM system activation. Review the cylinder deactivation exhaust flow control system operations for additional details.

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. See note above.
4. Track Mode: Exhaust tailpipe valves are open at all times. See note above.

It is possible to personalize the exhaust sound. When engine sound enhancement is turned off via the 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.

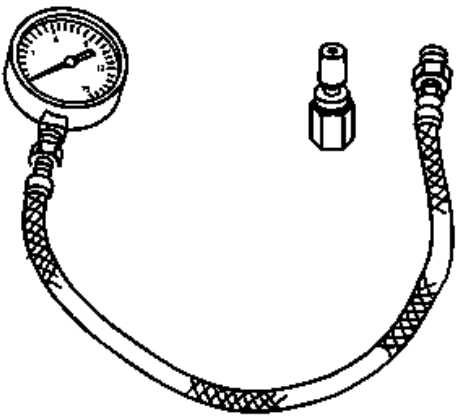
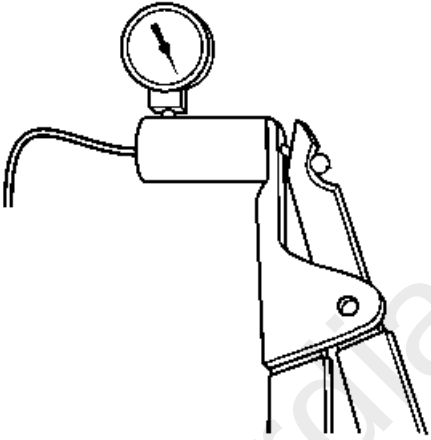
DESCRIPTION AND OPERATION > EXHAUST TAIL PIPE FLOW CONTROL SYSTEM

DESCRIPTION AND OPERATION > 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. When the active fuel management system is in operation, the cylinder deactivation exhaust flow control valve subsystem takes over control of the exhaust tailpipe flow control system. When active fuel management is operating, the exhaust tailpipe flow control valves are commanded shut resulting in a quieter exhaust note until the active fuel management system deactivates with increased throttle demand at which time the exhaust tailpipe flow control returns to the operational status determined by the vehicle specific mode that is being used.

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
 The illustration shows an exhaust back pressure gauge assembly. It consists of a circular gauge with a needle and a scale, connected to a flexible braided hose. A separate metal fitting is also shown above the hose.	EN 35314-A J 35314-A Exhaust Back Pressure Gauge
 The illustration shows a vacuum pump assembly. It features a cylindrical pump body with a gauge mounted on top. A flexible hose is connected to the side of the pump, and a metal bracket or handle is attached to the bottom.	J 35555 Vacuum Pump