

Exhaust System Description

Note: Use of Non-OEM parts may cause driveability concerns.

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

In order to secure the exhaust pipe to the exhaust manifold, a flange and seal-joint coupling is utilized.

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

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

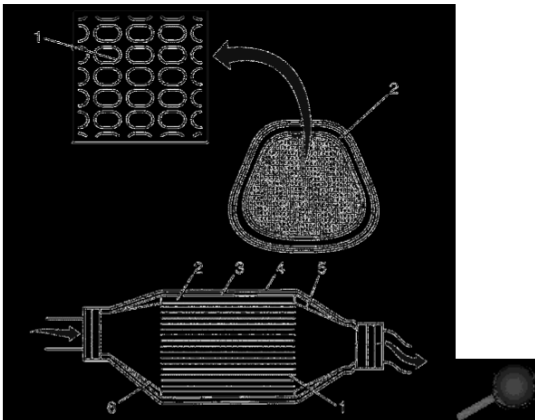
Exhaust heat shields are used to protect the body and other components from damage due to the heat from the exhaust system.

The exhaust system may be comprised of the following components:

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

Catalytic Converter

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



The catalytic converter is similar to a muffler in appearance however, within the outer stainless steel shell (4), there is a ceramic monolith (1) which is honeycombed in the direction of the exhaust, as shown. The ceramic monolith is surrounded by a mat (2), which has the primary

© 2014 General Motors. All rights reserved.

function of holding the monolith firmly in place to prevent any contact with the inner shell (3). A mesh (5 and 6) at each end of the converter prevents exhaust gases from fouling and eroding the mat.

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

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

Service Notes

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

Note: Catalytic converter can be damaged or rendered ineffective, if:

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

Resonator

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

Muffler

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

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

Symptoms - Engine Exhaust

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

Visual/Physical Inspection

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

Intermittent

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

Symptom List

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

- Loss of power
Refer to [Restricted Exhaust](#)
- Poor acceleration
Refer to [Restricted Exhaust](#)
- Poor fuel economy
Refer to [Restricted Exhaust](#)
- Excessive smoke diesel
Refer to [Restricted Exhaust](#)
- Exhaust hissing noise
Refer to [Exhaust Leakage](#)
- Exhaust popping noise
Refer to [Exhaust Leakage](#)
- Exhaust rattle noise
Refer to [Exhaust Noise](#)
- Loud exhaust noise
Refer to [Exhaust Noise](#)
- Exhaust buzz, groan, hum noise
Refer to [Exhaust Noise](#)

Restricted Exhaust

Diagnostic Aids

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

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

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

Test Description

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

4. [The exhaust system has very low back pressure under normal conditions. If the exhaust system is restricted, a significant increase in the exhaust pressure is noticed on the J-35314-A Exhaust Back Pressure Gauge.](#)
[Removing the AIR check valve or HO2S sensor may set a DTC. When finishing this diagnostic table, be sure to clear all codes.](#)
5. [This step will isolate the catalytic converter from the remainder of the exhaust system.](#)
8. [Confirming that the condition has been fixed is essential. If the symptom still exists and the vehicle has a dual exhaust system, proceed to Step 2 and repeat diagnostic procedure on the opposite exhaust pipe.](#)

Restricted Exhaust

Step	Action	Value(s)	Yes	No
1	Did you verify the customers complaint?	—	Go to Step 2	—
2	Did you review the exhaust symptoms diagnostic information and perform the necessary inspections?	—	Go to Step 3	Go to Symptoms - Engine Exhaust
3	Is the system equipped with dual exhaust?	—	Go to Diagnostic Aids	Go to Step 4
4	1. Remove the secondary air injection (AIR) check valve or the heated oxygen sensor (HO2S) that is in front of and closest to the catalytic converter. Refer to the affected component's service procedure. 2. Install the J-35314-A Exhaust Back Pressure Gauge in place of the AIR check valve or HO2S sensor. 3. Start the engine. 4. Increase and monitor the engine speed at 2,000 RPM.	14 kPa (2 psi)	Go to Step 5	Go to Step 8

© 2014 General Motors. All rights reserved.

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

Exhaust Leakage

Exhaust Leakage

Problem	Action
Warning: While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system. DEFINITION: An exhaust leak may show stains at the area of the leak. The leak may be felt by holding a hand close to the suspected areas or using a smoke pencil. The leak may make a popping or hissing noise. Refer to Symptoms - Engine Exhaust prior to beginning this table.	
Misaligned or improperly installed exhaust system components	- Align and tighten the exhaust system components to the specifications. Refer to Fastener Tightening Specifications. - Ensure the exhaust hangers are in the proper locations and not loose.
Exhaust leaks at the following connections: - Exhaust manifold to pipe - Flanges - Pipe clamps	Tighten the components to the specifications. Refer to Fastener Tightening 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.
© 2014 General Motors. All rights reserved.	

Problem	Action
Muffler or resonator (if equipped) damaged or leaking at the seams	Replace the affected muffler or resonator. Refer to the affected component's procedure for service.

Exhaust Noise

Exhaust Noise

Condition	Action
Warning: While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system. DEFINITION: An audible or physical noise due to a faulty component or damaged components causing a loose or misaligned exhaust system resulting in a rattle or vibration noise, i.e. buzz, groan, hum. Refer to Symptoms - Engine Exhaust prior to beginning this table.	
Popping or hissing noise	Exhaust leak. Refer to 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.

cardiagn.com

Exhaust System Alignment (LFX)

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

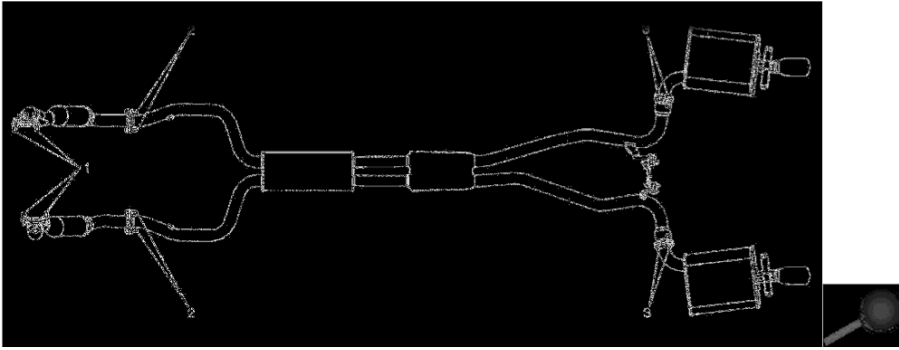
Warning: Refer to [Safety Glasses Warning](#).

Caution: Refer to [Exhaust System Inspection Caution](#).

Note: This procedure is only to be performed if the exhaust is incorrectly aligned or is not clear of all other components or chassis.

Note: Check for any physical damage to the exhaust system components that may be contributing to the misalignment.

Note: Make sure all exhaust retaining nuts and bolts are loose before conducting this procedure.



cardiagn.com

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

1. Tighten the catalytic converter to cylinder head retaining nuts (1) to **50 N•m (37 lb ft)**.
2. Tighten the exhaust crossover pipe to catalytic converter retaining nuts (2) to **40 N•m (30 lb ft)**.
3. Tighten the muffler to exhaust crossover pipe retaining bolts (3) to **45 N•m (33 lb ft)**.

Exhaust System Alignment (L77)

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

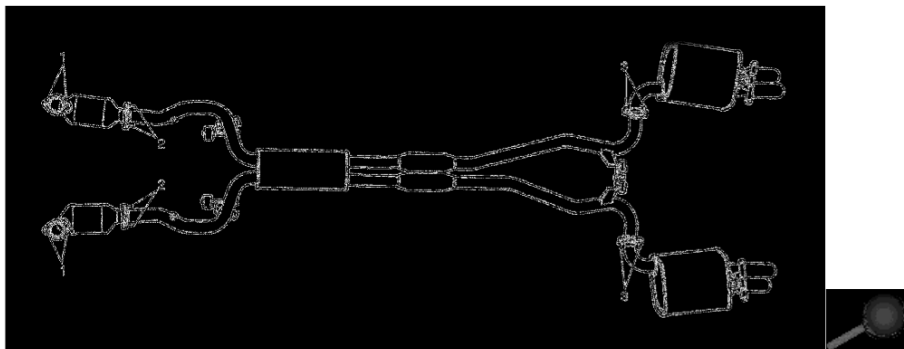
Warning: Refer to [Safety Glasses Warning](#).

Caution: Refer to [Exhaust System Inspection Caution](#).

Note: This procedure is only to be performed if the exhaust is incorrectly aligned or is not clear of all other components or chassis.

Note: Make sure all exhaust retaining nuts and bolts are loose before conducting this procedure.

Note: The L98 exhaust is pictured but flange bolts are in the same location on LY7.



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

1. Initially tighten the catalytic converter to exhaust manifold retaining nuts (1) to **20 N•m (15 lb ft)**.
2. Tighten the catalytic converter to exhaust manifold retaining nuts (1) to **45 N•m (33 lb ft)**.
3. Tighten the exhaust crossover pipe to catalytic converter retaining nuts (2) to **40 N•m (30 lb ft)**.
4. Tighten the muffler to exhaust crossover pipe retaining bolts (3) to **45 N•m (33 lb ft)**.

Exhaust System Alignment (LWR)

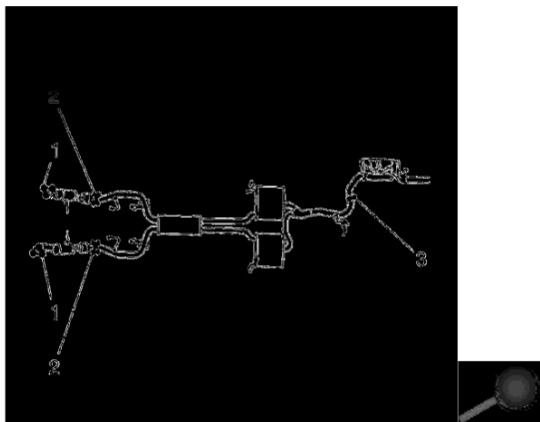
Warning: Refer to [Exhaust Service Warning](#).

Warning: Refer to [Safety Glasses Warning](#).

Caution: [Exhaust System Inspection Caution](#)

Note: This procedure is only to be performed if the exhaust is incorrectly aligned or is not clear of all other components or chassis.

Note: Make sure all exhaust retaining nuts and bolts are loose before conducting this procedure.



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

1. Initially tighten the catalytic converter to exhaust manifold retaining nuts (1) to **20 N·m (15 lb ft)**.
2. Tighten the catalytic converter to exhaust manifold retaining nuts (1) to **45 N·m (33 lb ft)**.
3. Tighten the exhaust crossover pipe to catalytic converter retaining nuts (2) to **21 N·m (15 lb ft)**.

Note: The exhaust clamp is a single used exhaust clamp, replace with a NEW exhaust clamp.

4. Tighten the muffler to exhaust crossover pipe clamp (3) to **35 N·m (26 lb ft)**.

cardiagn.com

Exhaust System Alignment (LFW)

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

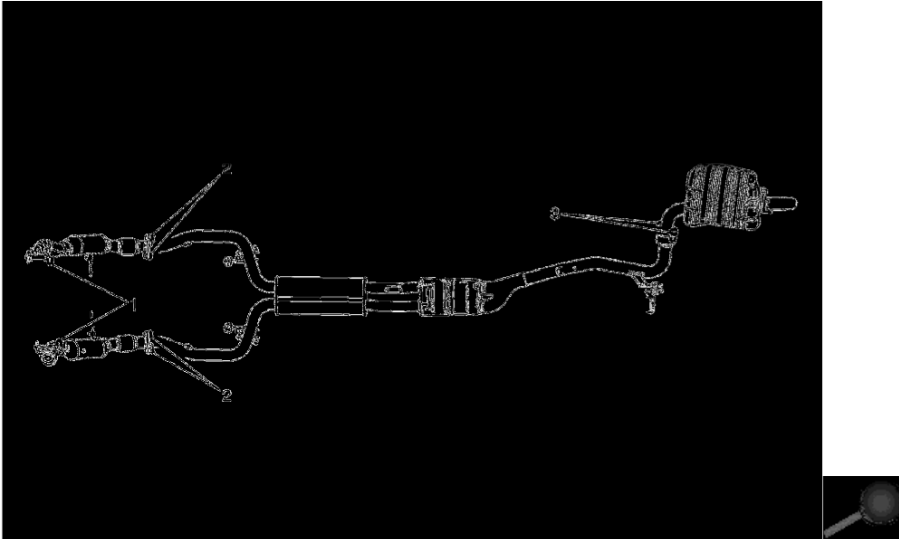
Warning: Refer to [Safety Glasses Warning](#).

Caution: Refer to [Exhaust System Inspection Caution](#).

Note: This procedure is only to be performed if the exhaust is incorrectly aligned or is not clear of all other components or chassis.

Note: Check for any physical damage to the exhaust system components that may be contributing to the misalignment.

Note: Make sure all exhaust retaining fasteners and fasteners are loose before conducting this procedure.



cardiagn.com

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

1. Tighten the catalytic converter to cylinder head retaining fasteners (1) to **50 N·m (37 lb ft)**.
2. Tighten the exhaust crossover pipe to catalytic converter retaining fasteners (2) to **40 N·m (30 lb ft)**.
3. Tighten the muffler to exhaust crossover pipe retaining fasteners (3) to **45 N·m (33 lb ft)**.

Exhaust System Alignment (LSA,LS3)

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

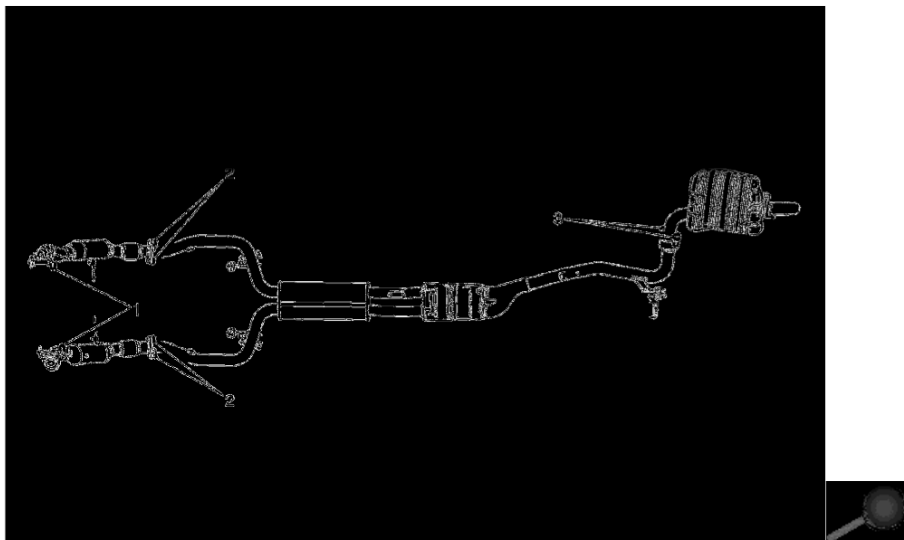
Warning: Refer to [Safety Glasses Warning](#).

Caution: Refer to [Exhaust System Inspection Caution](#).

Note: This procedure is only to be performed if the exhaust is incorrectly aligned or is not clear of all other components or chassis.

Note: Check for any physical damage to the exhaust system components that may be contributing to the misalignment.

Note: Make sure all exhaust retaining fasteners and fasteners are loose before conducting this procedure.



cardiagn.com

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

1. Tighten the catalytic converter to exhaust manifold retaining fasteners (1) to **45 N•m (33 lb ft)**.
2. Tighten the exhaust crossover pipe to catalytic converter retaining fasteners (2) to **40 N•m (30 lb ft)**.
3. Tighten the muffler to exhaust crossover pipe retaining fasteners (3) to **45 N•m (33 lb ft)**.

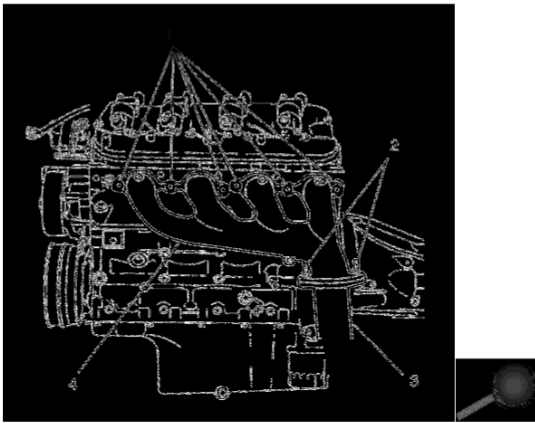
Exhaust Manifold Replacement - Left Side (V8)

Removal Procedure

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

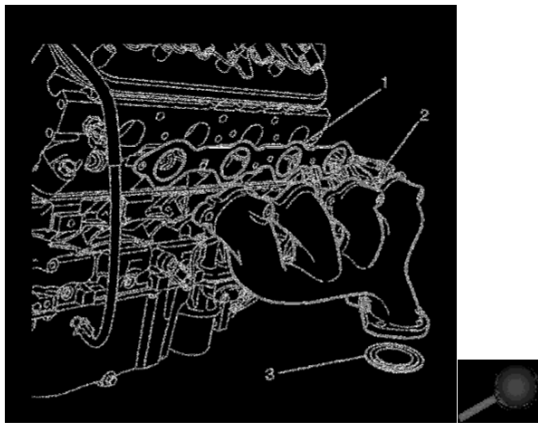
Warning: Refer to [Protective Goggles and Glove Warning](#).

1. Ignition OFF.
- Warning:** Refer to [Battery Disconnect Warning](#).
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the engine cover. Refer to [Engine Cover Replacement](#).
4. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
5. Remove the left side spark plug leads. Refer to [Spark Plug Replacement](#).
6. Remove the left side spark plugs from the cylinder head. Refer to [Exhaust Manifold Heat Shield Replacement - Right Side](#).
7. Remove the left side exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Left Side](#).
8. Remove the engine coolant temperature sensor. Refer to [Engine Coolant Temperature Sensor Replacement](#).



Note: The left catalytic converter to exhaust manifold retaining nuts (2) are single use parts. They must be discarded after removal.

9. Remove the left catalytic converter to exhaust manifold retaining nuts (2).
Discard the nuts.
10. Disconnect the left catalytic converter (3) from the exhaust manifold (4).
11. Loosen the exhaust manifold to cylinder head retaining bolts (1) working from the outside to the centre.
- Note:** Bolts with micro-encapsulated thread sealant must be discarded after removal.
12. Remove the exhaust manifold to cylinder head retaining bolts (1).
Discard the bolts.



Note: Make sure that the surrounding wiring harness and electrical connectors are not damaged when removing the exhaust manifold (2).

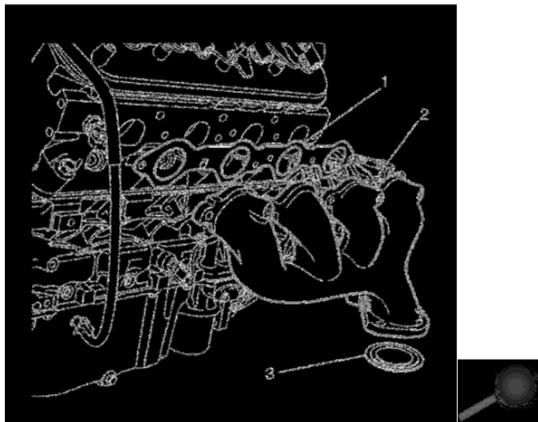
Note: The exhaust manifold gasket (1) and sealing ring (3) are single use parts. They must be discarded after removal.

13. Remove the exhaust manifold (2).

Discard the exhaust manifold gasket (1) and sealing ring (3).

Installation Procedure

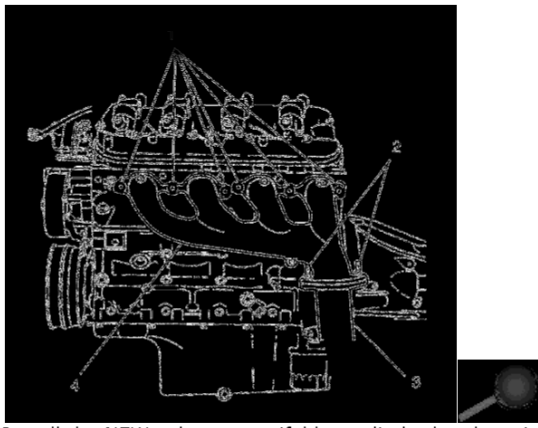
1. Clean and inspect the exhaust manifold. Refer to [Exhaust Manifold Cleaning and Inspection](#).



2. Install a NEW exhaust manifold gasket (1) and NEW sealing ring (3) to the exhaust manifold (2).

Caution: Refer to [Exhaust System Inspection Caution](#).

3. Install the exhaust manifold assembly to the engine.



4. Install the NEW exhaust manifold to cylinder head retaining bolts (1).

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

5. Tighten the exhaust manifold to cylinder head retaining bolts (1) working from the centre to the outside to **20 N•m (15 lb ft)**.

Note: Make sure the sealing ring is seated correctly.

6. Lift the left catalytic converter (3) up and forward to connect to the exhaust manifold (4).
7. Clean the threads of the exhaust manifold to catalytic converter retaining studs with a suitable cleaning solvent.
8. Install the NEW left catalytic converter to exhaust manifold retaining nuts (2) and tighten to **45 N•m (33 lb ft)**.
9. Install the engine coolant temperature sensor. Refer to Engine Coolant Temperature Sensor Replacement.
10. Remove the install the left side exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Left Side](#).
11. Install the left side spark plugs to the cylinder head. Refer to [Spark Plug Replacement](#).
12. Install the left side spark plug leads. Refer to [Spark Plug Wire Inspection](#).
13. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
14. Install the engine cover. Refer to [Engine Cover Replacement](#).
15. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

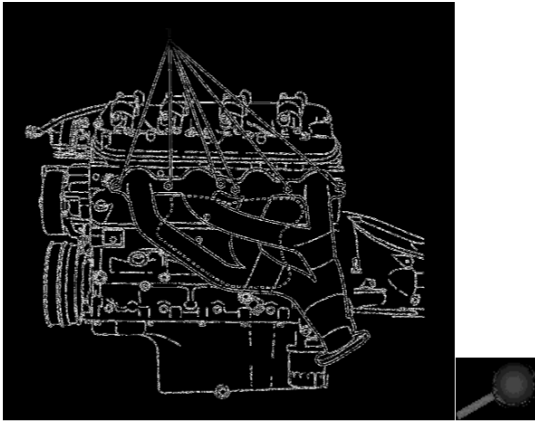
Exhaust Manifold Replacement - Left Side (HSV)

Removal Procedure

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

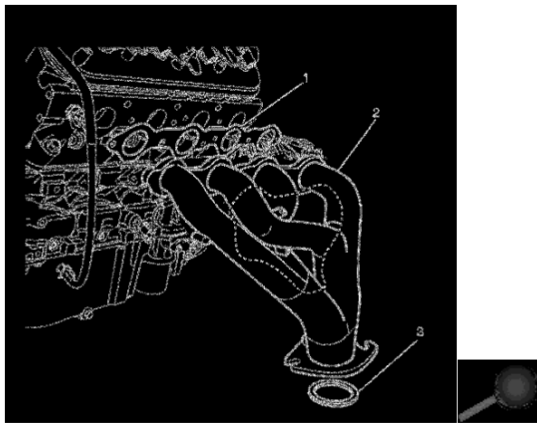
Warning: Refer to [Protective Goggles and Glove Warning](#).

1. Disconnect the battery ground cable from the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the engine dress cover. Refer to [Engine Cover Replacement](#).
3. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
4. Remove the left side spark plug leads. Refer to [Spark Plug Wire Replacement](#).
5. Remove the left side spark plugs from the cylinder head. Refer to [Spark Plug Replacement](#).
6. Remove the left side catalytic converter. Refer to [Catalytic Converter Replacement - Left Side](#).
7. Remove the engine coolant temperature sensor. Refer to [Engine Coolant Temperature Sensor Replacement](#).



8. Loosen the exhaust manifold to cylinder head retaining bolts (1) working from the outside to the centre.
- Note:** Bolts with micro-encapsulated thread sealant must be discarded after removal.
9. Remove the exhaust manifold to cylinder head retaining bolts (1).
Discard the bolts.

cardiagn.com



Note: Make sure that the surrounding wiring harness and electrical connectors are not damaged when removing the exhaust manifold (2).

Note: The exhaust manifold gasket (1) and sealing ring (3) are single use parts. They must be discarded after removal.

Note: The left hand exhaust manifold can only be removed from underneath the vehicle.

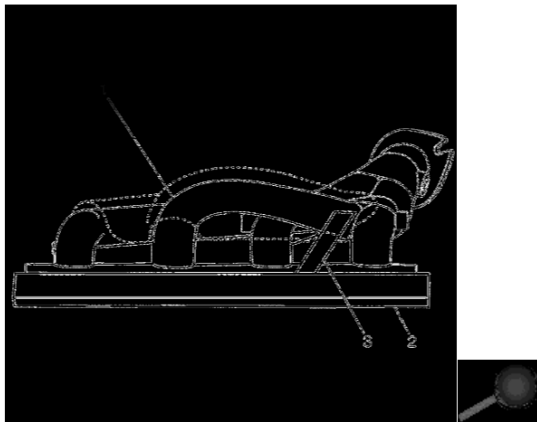
10. Remove the exhaust manifold (2).

Discard the exhaust manifold gasket (1) and sealing ring (3).

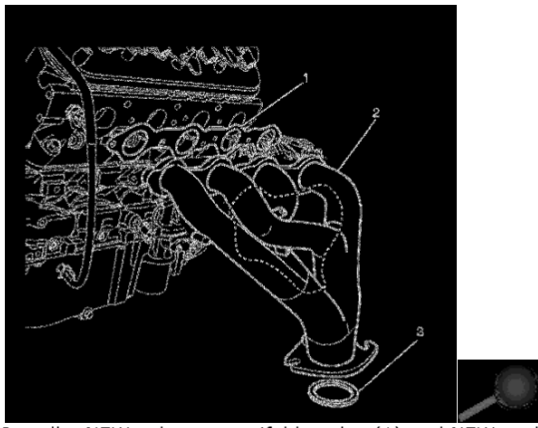
Installation Procedure

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

1. Before installation inspect for the following:
 - Damage to the gasket sealing surfaces
 - Distortion of exhaust manifold mating surface
 - Damage to the exhaust mounting holes



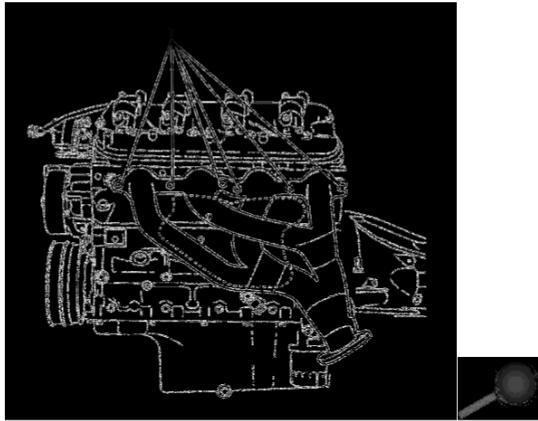
2. Check for distortion on the mating surface of the exhaust manifold (1) by using a straight edge (2) and a feeler gauge (3).
3. Clean the exhaust manifold and catalytic converter flange mating surfaces.



4. Install a NEW exhaust manifold gasket (1) and NEW sealing ring (3) to the exhaust manifold (2).

Caution: Refer to [Exhaust System Inspection Caution](#).

5. Install the exhaust manifold assembly (2) to the engine.



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

Note: Do not fully tighten the exhaust manifold to cylinder head retaining bolts (1) at this stage.

6. Install the NEW exhaust manifold to cylinder head retaining bolts (1).
Do not fully tighten at this stage.
7. Clean the threads of the exhaust manifold to catalytic converter retaining studs with a suitable cleaning solvent.

Note: Make sure the sealing ring is seated correctly.

8. Install the left side catalytic converter. Refer to [Catalytic Converter Replacement - Left Side](#).
9. Tighten the exhaust manifold to cylinder head retaining bolts (1) working from the centre to the outside.
Tighten
Tighten the bolts to **20N·m (15 lb ft)**.
10. Install the engine coolant temperature sensor. Refer to [Engine Coolant Temperature Sensor Replacement](#).
11. Install the left side spark plugs to the cylinder head. Refer to [Spark Plug Replacement](#).
12. Install the left side spark plug leads. Refer to [Spark Plug Wire Replacement](#).

13. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
14. Perform diagnostic system check using diagnostic scan tool, clear all relative DTC's and inspect the system for correct operation.
15. Install the engine dress cover. Refer to [Engine Cover Replacement](#).
16. Connect the battery ground cable to the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).

Exhaust Manifold Replacement - Left Side (LWR)

Removal Procedure

Warning: Refer to [Safety Glasses Warning](#).

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

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

1. Ignition OFF.

Warning: Refer to [Battery Disconnect Warning](#).

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

3. Remove the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).

4. Remove the left pre-catalytic converter heated oxygen sensor (HO2S). Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).

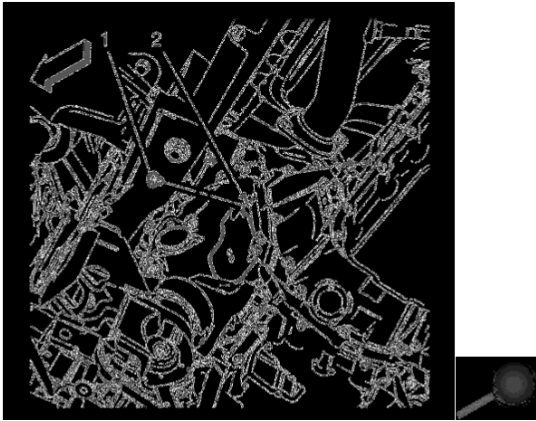
5. Remove the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Left Side](#).

6. Remove the oil level indicator tube. Refer to [Oil Level Indicator and Tube Removal](#).

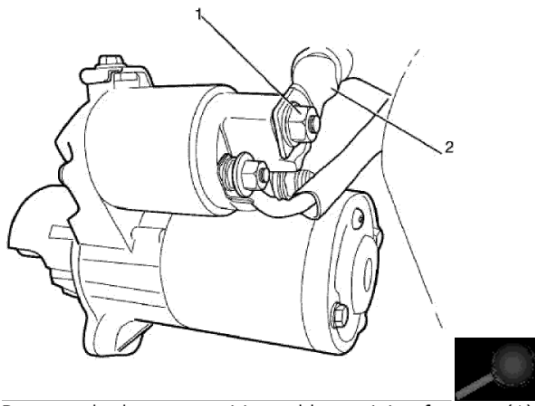
7. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

8. Remove the left catalytic converter. Refer to [Catalytic Converter Replacement - Left Side](#).

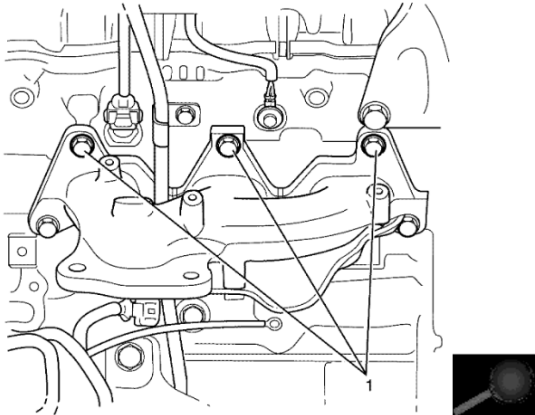
9. Remove the oil pan shield. Refer to [Oil Pan Shield Replacement](#).



10. Remove the starter heat shield fastener (1) and remove the starter heat shield (2).

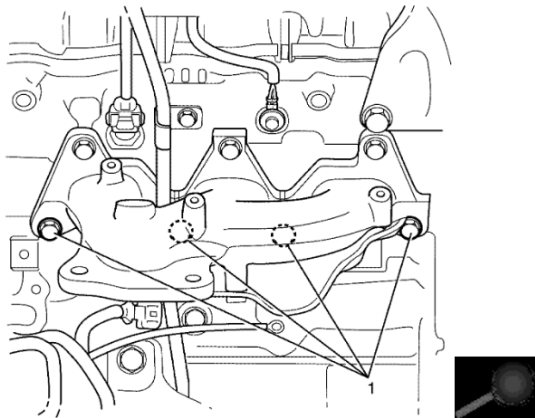


11. Remove the battery positive cable retaining fastener (1) from the starter motor solenoid.
12. Remove the battery positive cable (2) from the starter motor.



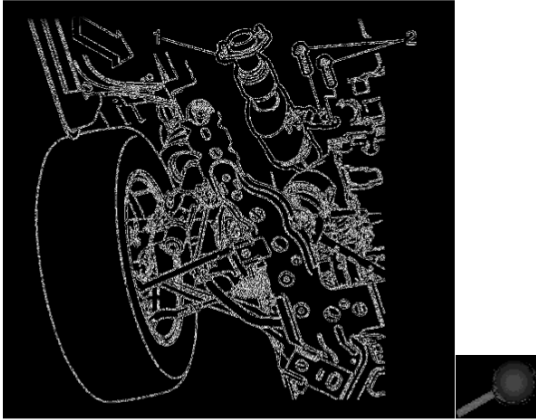
Note: Fasteners with micro-encapsulated thread sealant must be discarded after removal.

13. Loosen the exhaust manifold to cylinder head retaining fasteners (1) starting from the outside and working towards the center.
Discard the fasteners.



Note: Fasteners with micro-encapsulated thread sealant must be discarded after removal.

14. Remove the exhaust manifold to cylinder head retaining fasteners (1) starting from the outside and working towards the center.
15. Discard the fasteners (1).



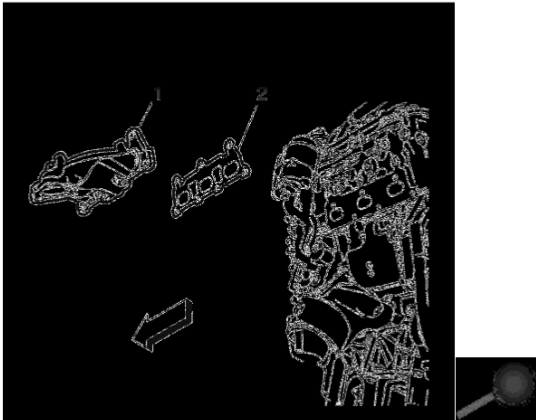
Note: Make sure that the surrounding wiring harness and electrical connectors are not damaged when removing the exhaust manifold (1).

Note: The exhaust manifold gasket (2) is a single used part. The gasket must be discarded after removal.

16. Remove the exhaust manifold (1) and discard the exhaust gasket (2).

Installation Procedure

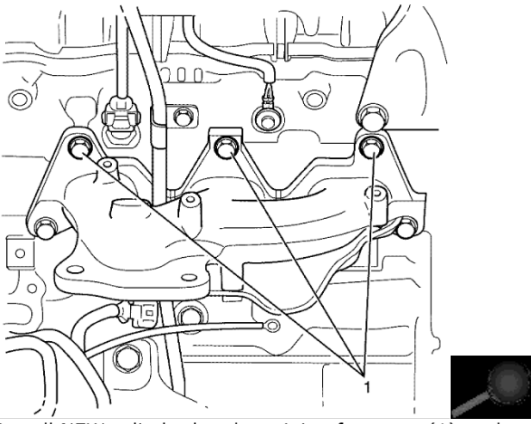
1. Inspect the exhaust manifold before installation. Refer to [Exhaust Manifold Cleaning and Inspection - Left Side](#).



2. Install a NEW exhaust manifold gasket (2) to the exhaust manifold (1).

Note: Make sure that the surrounding wiring harness and electrical connectors are not damaged when installing the exhaust manifold (1).

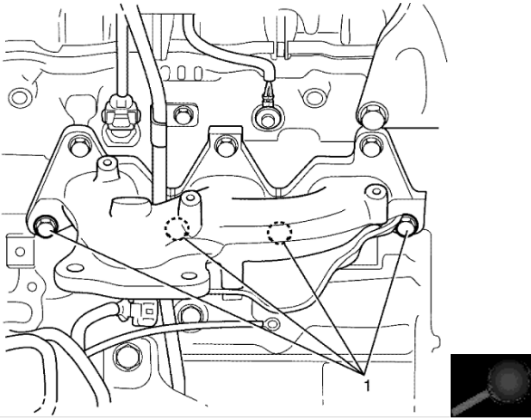
3. Install the exhaust manifold assembly (1) to the engine.



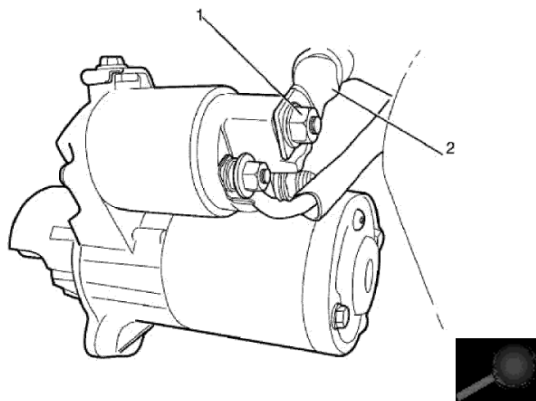
4. Install NEW cylinder head retaining fasteners (1) to the exhaust manifold.

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

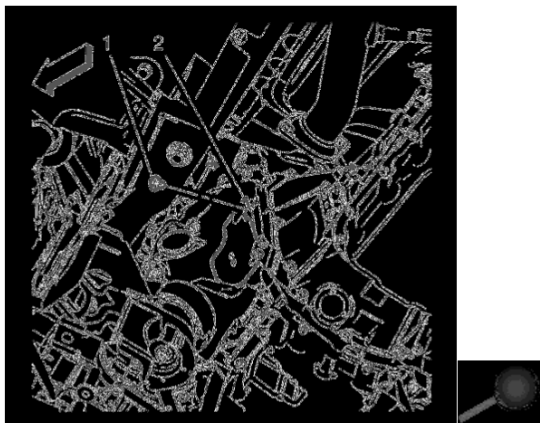
5. Working from the center to the outside, tighten the exhaust manifold fasteners (1) to **20 N·m (15 lb ft)**.
6. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



7. Install NEW cylinder head retaining fasteners (1) to the exhaust manifold.
8. Working from the center towards the outside, tighten the exhaust manifold fasteners (1) to **20 N·m (15 lb ft)**.



9. Install the battery positive cable (2) to the starter motor.
10. Install the battery positive cable retaining fastener (1) to the starter motor solenoid and tighten to **10 N•m (7 lb ft)**.



11. Install the starter heat shield (2) and tighten the fastener (1).
12. Install the left catalytic converter. Refer to [Catalytic Converter Replacement - Left Side](#).
13. Install the oil pan shield. Refer to [Oil Pan Shield Replacement](#).
14. Lower the vehicle.
15. Install the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Left Side](#).
16. Install the left pre-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).
17. Install the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).
18. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

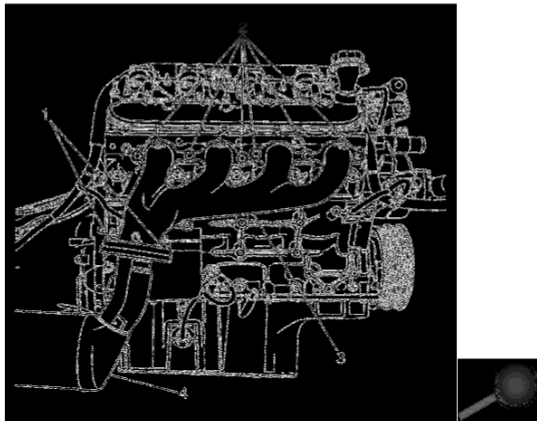
Exhaust Manifold Replacement - Right Side (V8)

Removal Procedure

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

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

1. Ignition OFF.
- Warning:** Refer to [Battery Disconnect Warning](#).
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the engine cover. Refer to [Engine Cover Replacement](#).
4. Remove the oil level indicator tube. Refer to [Oil Level Indicator Tube Replacement](#).
5. Remove the right side spark plug leads. Refer to [Spark Plug Wire Replacement](#).
6. Remove the right side spark plugs from the cylinder head. Refer to [Spark Plug Replacement](#).
7. Remove the right side exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Right Side](#).



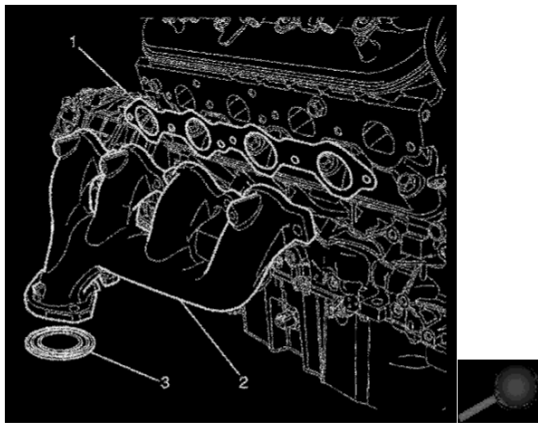
Note: The right catalytic converter to exhaust manifold retaining nuts (1) are single use parts. They must be discarded after removal.

8. Remove the right catalytic converter to exhaust manifold retaining nuts (1). Discard the nuts.
9. Disconnect the right catalytic converter (4) from the exhaust manifold (3).
10. Loosen the exhaust manifold to cylinder head retaining bolts (2) working from the outside to the centre.

Note: Bolts with micro-encapsulated thread sealant must be discarded after removal.

11. Remove the exhaust manifold to cylinder head retaining bolts (2). Discard the bolts.

cardiagn.com



Note: Make sure that the surrounding wiring harness and electrical connectors are not damaged when removing the exhaust manifold (2).

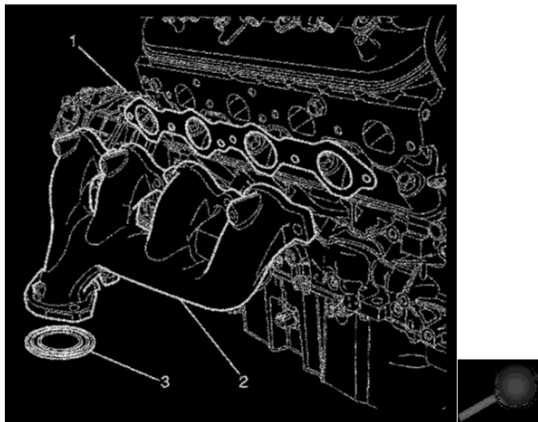
Note: The exhaust manifold gasket (1) and sealing ring (3) are single use parts. They must be discarded after removal.

12. Remove the exhaust manifold (2).

Discard the exhaust manifold gasket (1) and sealing ring (3).

Installation Procedure

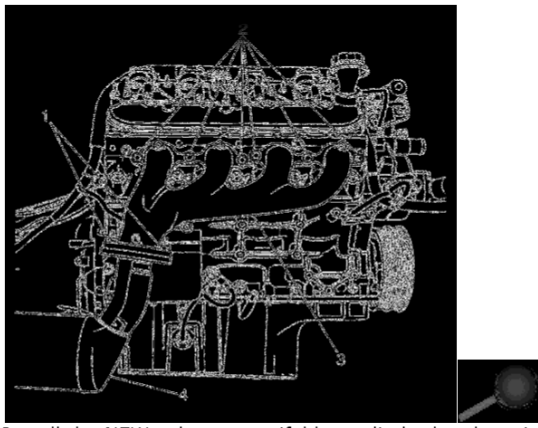
1. Clean and inspect the exhaust manifold. Refer to [Exhaust Manifold Cleaning and Inspection](#).



2. Install NEW exhaust manifold gasket (1) and NEW sealing ring (3) to the exhaust manifold (2).

Caution: Refer to [Exhaust System Inspection Caution](#).

3. Install the exhaust manifold assembly to engine.



4. Install the NEW exhaust manifold to cylinder head retaining bolts (1).

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

5. Tighten the exhaust manifold to cylinder head retaining bolts (2) working from the centre to the outside to **20 N•m (15 lb ft)**.

Note: Make sure the sealing ring is seated correctly.

6. Lift the right catalytic converter (4) up and forward to connect to the exhaust manifold (3).
7. Clean the threads of the exhaust manifold to catalytic converter retaining studs with a suitable cleaning solvent.
8. Install the NEW right catalytic converter to exhaust manifold retaining nuts (1) and tighten to **45 N•m (33 lb ft)**.
9. Install the right side exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Right Side](#).
10. Install the right side spark plugs to the cylinder head. Refer to [Spark Plug Replacement](#).
11. Install the right side spark plug leads. Refer to [Spark Plug Wire Inspection](#).
12. Install the oil level indicator tube. Refer to [Oil Level Indicator Tube Replacement](#).
13. Install the engine cover. Refer to [Engine Cover Replacement](#).
14. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

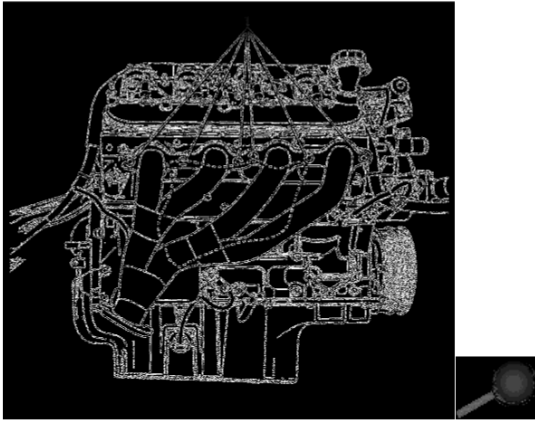
Exhaust Manifold Replacement - Right Side (HSV)

Removal Procedure

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

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

1. Disconnect the battery ground cable from the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the engine dress cover. Refer to [Engine Cover Replacement](#).
3. Remove the oil level indicator tube. Refer to [Oil Level Indicator and Tube Removal](#).
4. Remove the right side spark plug wires. Refer to [Spark Plug Wire Replacement](#).
5. Remove the right side spark plugs from the cylinder head. Refer to [Spark Plug Replacement](#).
6. Remove the right side catalytic converter. Refer to [Catalytic Converter Replacement - Right Side](#).

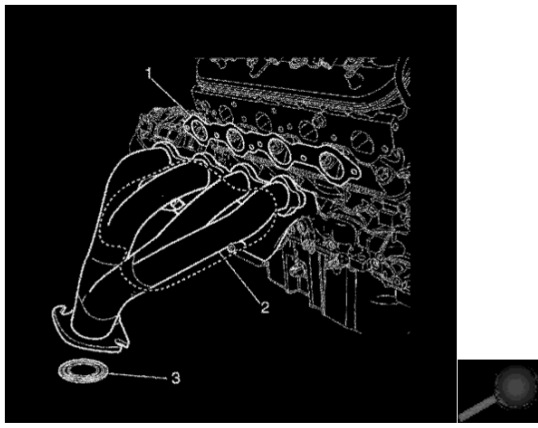


7. Loosen the exhaust manifold to cylinder head retaining bolts (1) working from the outside to the centre.

Note: Bolts with micro-encapsulated thread sealant must be discarded after removal.

8. Remove the exhaust manifold to cylinder head retaining bolts (1).
Discard the bolts.

cardiagn.com



Note: Make sure that the surrounding wiring harness and electrical connectors are not damaged when removing the exhaust manifold (2).

Note: The exhaust manifold gasket (1) and sealing ring (3) are single use parts. They must be discarded after removal.

Note: The right hand exhaust manifold can only be removed upwards out of the engine bay.

9. Remove the exhaust manifold (2).

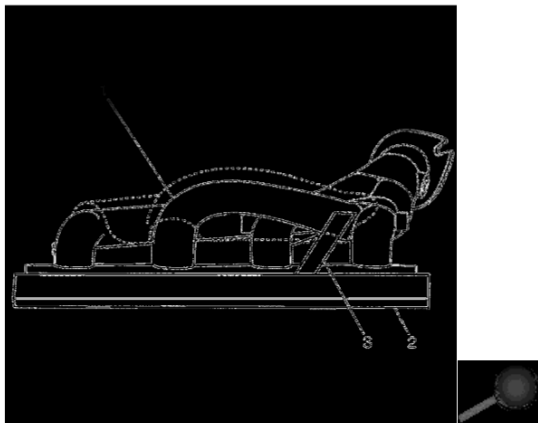
Discard the exhaust manifold gasket (1) and sealing ring (3).

Installation Procedure

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

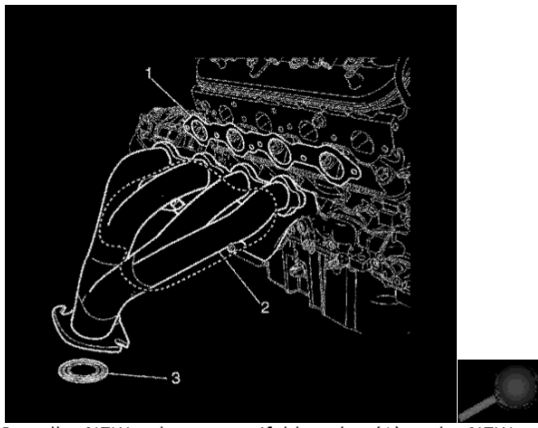
1. Before installation inspect for the following:

- Damage to the gasket sealing surfaces.
- Distortion of exhaust manifold mating surface.
- Damage to the exhaust mounting holes.



2. Check for distortion on the mating surface of the exhaust manifold (1) by using a straight edge (2) and a feeler gauge (3).

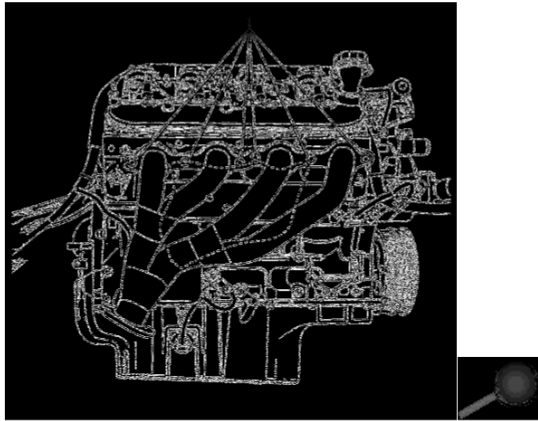
3. Clean the exhaust manifold and catalytic converter flange mating surfaces.



4. Install a NEW exhaust manifold gasket (1) and a NEW sealing ring (3) onto the exhaust manifold (2).

Caution: Refer to [Exhaust System Inspection Caution](#).

5. Install the exhaust manifold assembly to engine.



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

Note: Do not fully tighten the exhaust manifold to cylinder head retaining bolts (1) at this stage.

6. Install the NEW exhaust manifold to cylinder head retaining bolts (1).
Do not fully tighten at this stage.
7. Clean the threads of the exhaust manifold to catalytic converter retaining studs with a suitable cleaning solvent.
8. Tighten the exhaust manifold to cylinder head retaining bolts (1) working from the centre to the outside.

Tighten

Tighten the bolts to 20 N•m (15 lb ft).

Note: Make sure the sealing ring is seated correctly.

9. Install the right side catalytic converter. Refer to [Catalytic Converter Replacement - Right Side](#)
10. Install the right side spark plugs to the cylinder head. Refer to [Spark Plug Replacement](#).
11. Install the right side spark plug wires. Refer to [Spark Plug Wire Replacement](#).
12. Install the oil level indicator tube. Refer to [Oil Level Indicator and Tube Installation](#).

13. Install the engine dress cover. Refer to [Engine Cover Replacement](#).
14. Connect the battery ground cable to the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).

Exhaust Manifold Replacement - Right Side (LWR)

Removal Procedure

Warning: Refer to [Safety Glasses Warning](#).

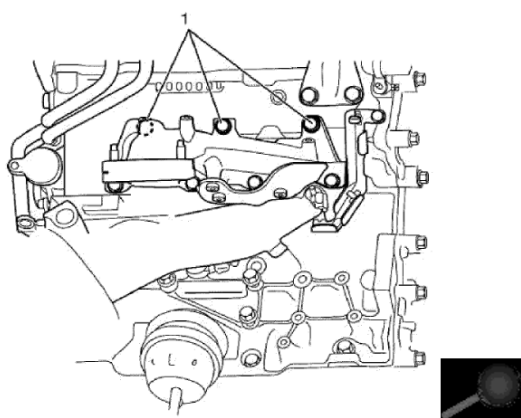
Warning: Refer to [Exhaust Service Warning](#).

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

1. Ignition OFF.

Warning: Refer to [Battery Disconnect Warning](#).

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).
4. Remove the right pre-catalytic convertor heated oxygen sensor (HO2S). Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 1](#).
5. Remove the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Right Side](#).
6. Remove the right catalytic converter. Refer to [Catalytic Converter Replacement - Right Side](#).

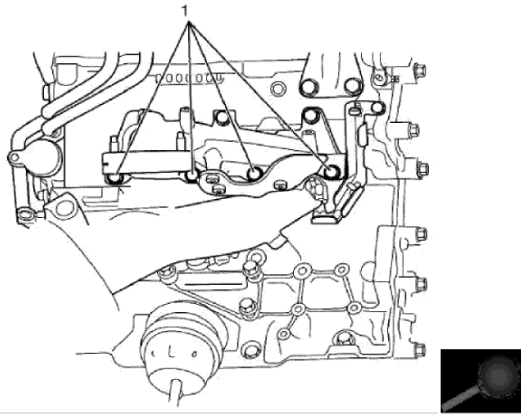


Note: Fasteners with micro-encapsulated thread sealant must be discarded after removal.

7. Starting from the outside and working towards the center, remove the exhaust manifold to cylinder head retaining fasteners (1).
Discard the fasteners.

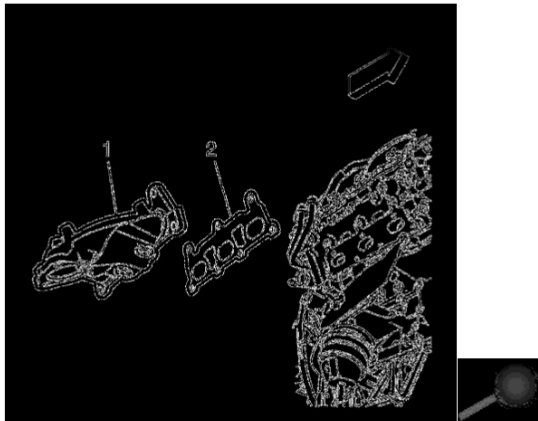
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

8. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



Note: Fasteners with micro-encapsulated thread sealant must be discarded after removal.

9. Remove the exhaust manifold to cylinder head retaining fasteners (1).
Discard the fasteners.



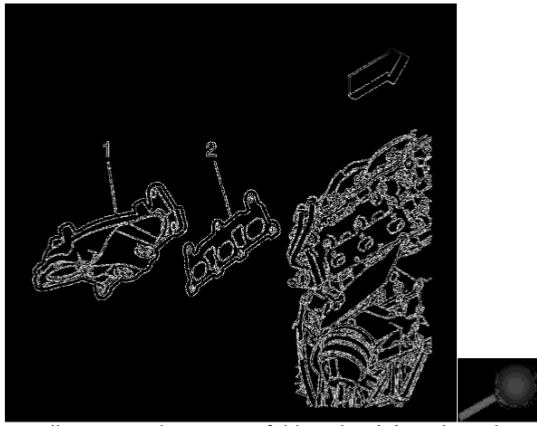
Note: Make sure that the surrounding wiring harness and electrical connectors are not damaged when removing the exhaust manifold (1).

Note: The exhaust manifold gasket (2) is a single use part. The gasket must be discarded after removal.

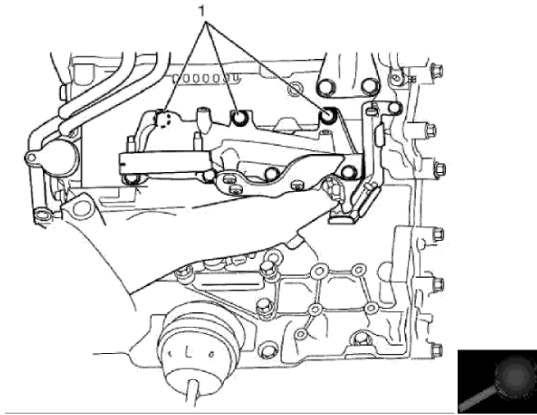
10. Remove the exhaust manifold (1) from the engine assembly.

Installation Procedure

1. Inspect the exhaust manifold before installation. Refer to [Exhaust Manifold Cleaning and Inspection - Right Side](#).



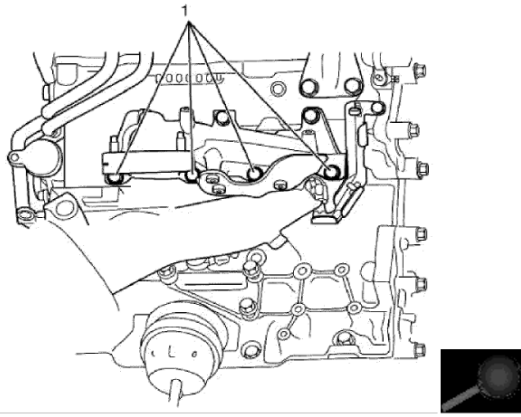
2. Install a NEW exhaust manifold gasket (2) to the exhaust manifold (1).
3. Install the exhaust manifold assembly (1) to the engine.



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

Note: Install NEW exhaust manifold to cylinder head fasteners (1).

4. Working from the center towards the outside, tighten the fasteners (1) to **20 N•m (15 lb ft)**.
5. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



Note: Install NEW exhaust manifold to cylinder head fasteners (1).

6. Working from the center to the outside, tighten the exhaust manifold fasteners (1) to **20 N•m (15 lb ft)**.
7. Lower the vehicle.
8. Install the right catalytic converter. Refer to [Catalytic Converter Replacement - Right Side](#).
9. Install the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Right Side](#).
10. Install the right pre-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 1](#).
11. Install the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).
12. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

Exhaust Crossover Pipe Replacement

Removal Procedure

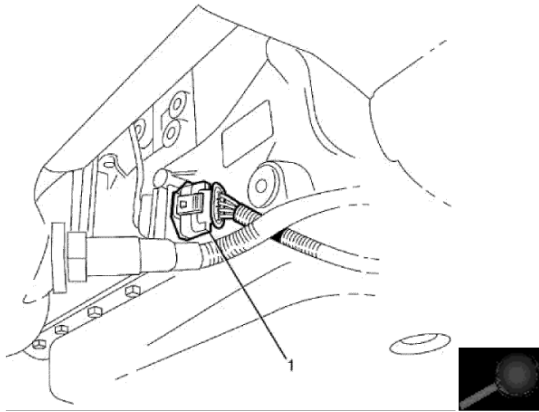
1. Disconnect the battery ground cable from the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

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

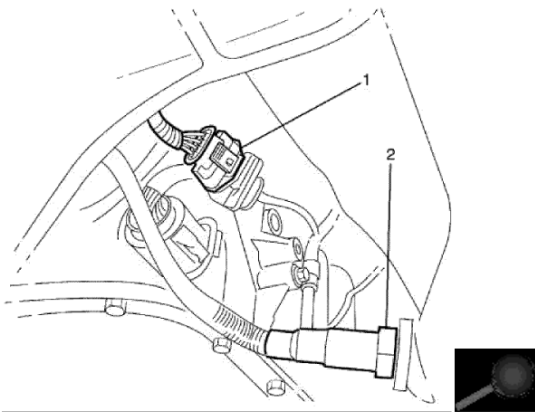
Warning: Refer to [Protective Goggles and Glove Warning](#).

2. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Support the exhaust system using a suitable jack.
4. Remove the rear exhaust muffler assemblies. Refer to [Exhaust Muffler Replacement - Left Side](#) and [Exhaust Muffler Replacement - Right Side](#).

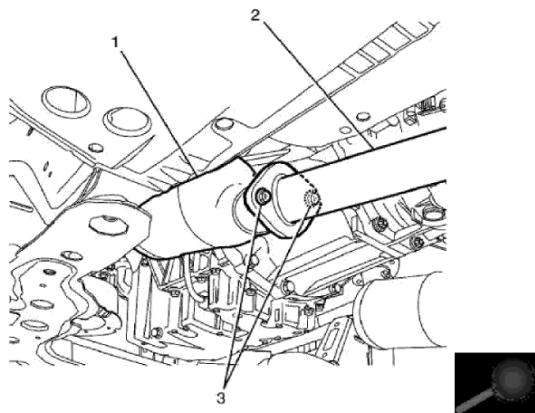


Caution: Refer to [Heated Oxygen and Oxygen Sensor Caution](#).

5. Disconnect the left post-catalytic converter heated oxygen sensor (HO2S) electrical connector (1).

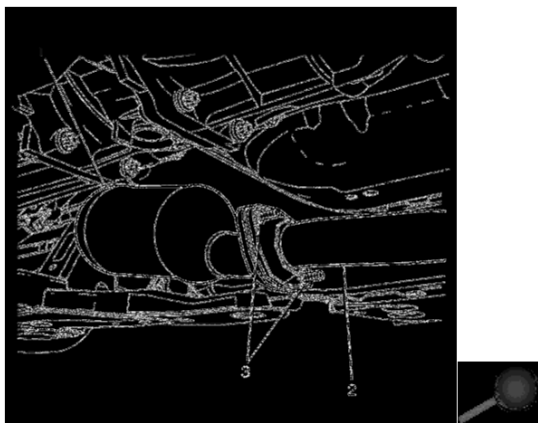


6. Disconnect the right post-catalytic converter HO2S electrical connector (1).



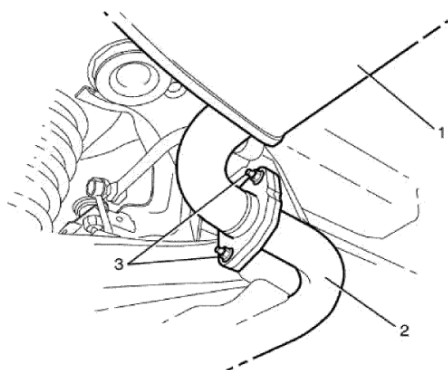
Note: The intermediate exhaust assembly to left catalytic converter retaining nuts (3) are single use parts. They must be discarded after removal.

7. Remove the intermediate exhaust assembly to left catalytic converter retaining nuts (3). Discard the nuts.
8. Disconnect the intermediate exhaust assembly (2) from the left catalytic converter (1).

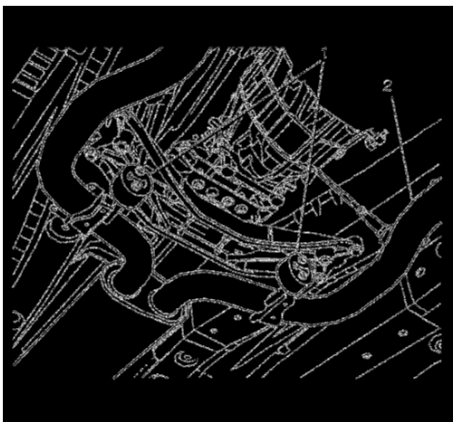


Note: The intermediate exhaust assembly to right catalytic converter retaining nuts (3) are single use parts. They must be discarded after removal.

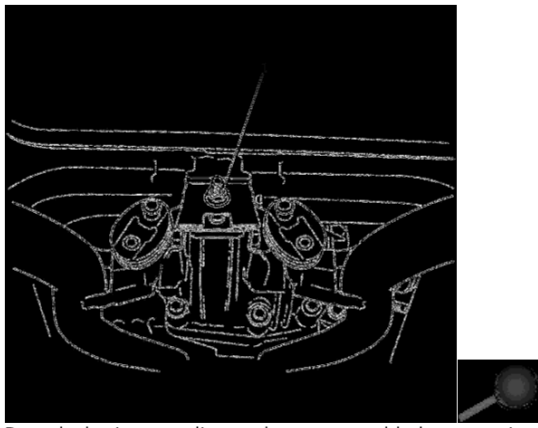
9. Remove the intermediate exhaust assembly to right catalytic converter retaining nuts (3). Discard the nuts.
10. Disconnect the intermediate exhaust assembly (2) from the right catalytic converter (1).



11. Remove the intermediate exhaust assembly to rear muffler retaining bolts (3).



12. Detach the intermediate exhaust assembly (2) by removing the front insulator hangers (1) if fitted.



13. Detach the intermediate exhaust assembly by removing the centre insulator hanger bracket to differential retaining bolt (1).
14. Carefully lower the intermediate exhaust assembly from the vehicle.
15. Remove the left post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#) for 3.6L engine or [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#) for 6.0L engine.
16. Remove the right post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#) for 3.6L engine or [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#) for 6.0L engine.

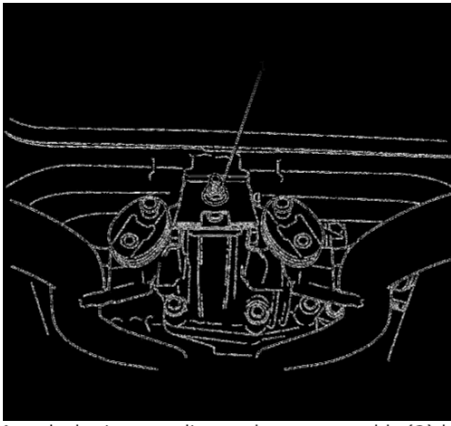
Installation Procedure

1. Clean all threads and flange faces of the intermediate exhaust system.
2. Always check the condition of the catalytic converter to intermediate pipe flange gaskets and replace as necessary.
3. Install the left post-catalytic converter HO2S to the intermediate exhaust system. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#) for 3.6L engine or [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#) for 6.0L engine.
4. Install the right post-catalytic converter HO2S to the intermediate exhaust system. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#) for 3.6L engine or [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#) for 6.0L engine.

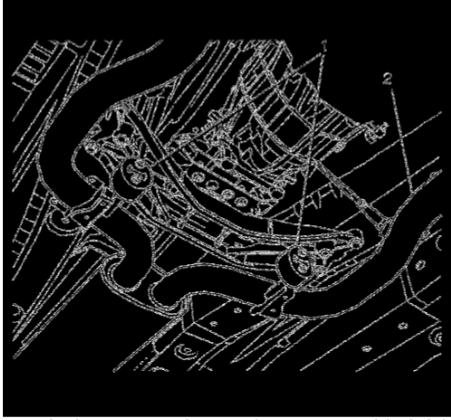
Warning: Refer to [Exhaust Service Warning](#).

Caution: Refer to [Exhaust System Inspection Caution](#).

5. Position the intermediate exhaust assembly to the vehicle using a suitable jack.



6. Attach the intermediate exhaust assembly (2) by installing the centre insulator hanger bracket to differential retaining bolt (1).



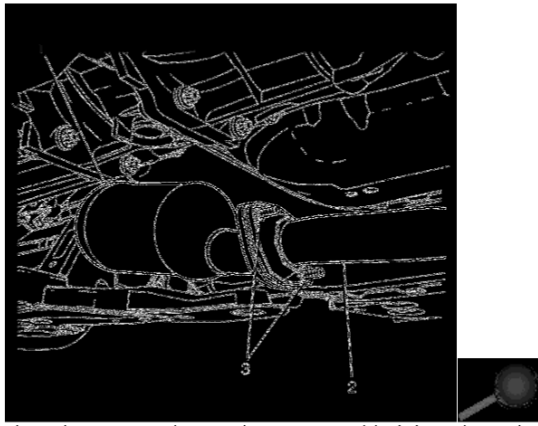
7. Attach the intermediate exhaust assembly (2) by installing the front insulator hangers (1) if fitted.

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

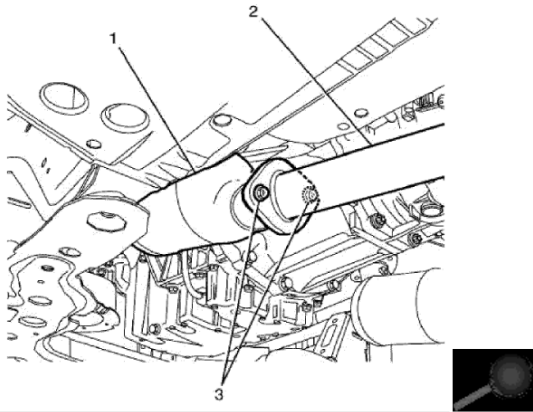
8. Tighten the intermediate exhaust assembly to rear muffler retaining bolts.

Tighten

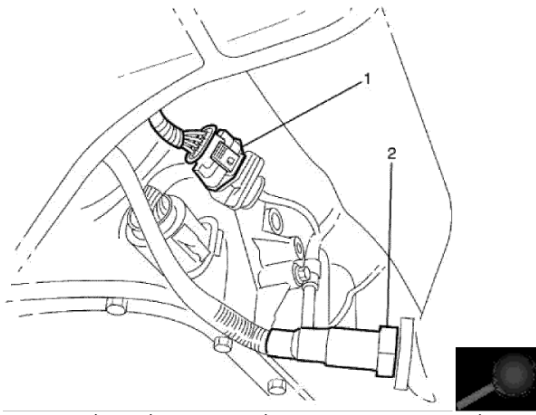
Tighten the bolts to 45 N·m (33 lb ft).



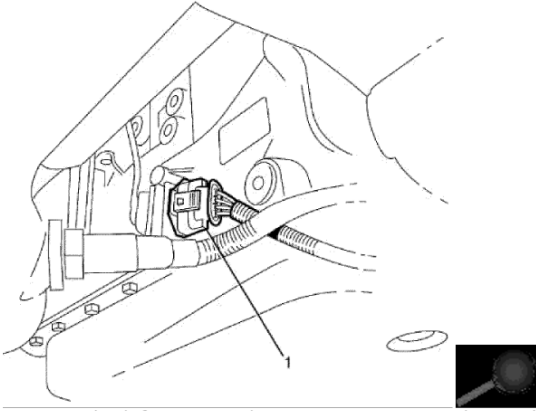
9. Align the intermediate exhaust assembly (2) to the right catalytic converter (1).
10. Tighten the intermediate exhaust assembly to right catalytic converter retaining nuts (3).
Tighten
Tighten the nuts to 40N•m (30 lb ft).



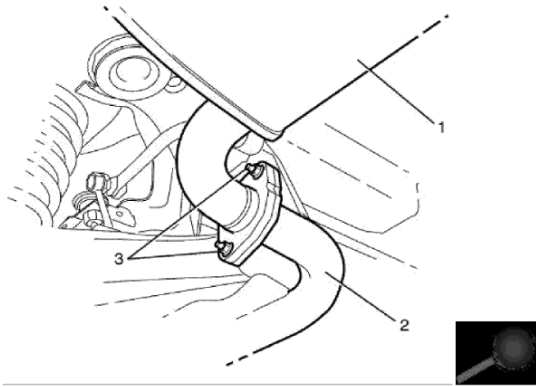
11. Align the intermediate exhaust assembly (2) to the left catalytic converter (1).
12. Tighten the intermediate exhaust assembly to left catalytic converter retaining nuts (3).
Tighten
Tighten the nuts to 40N•m (30 lb ft).



13. Connect the right post-catalytic converter HO2S electrical connector (1).



14. Connect the left post-catalytic converter HO2S electrical connector (1).



15. Connect the left rear muffler (1) to the intermediate exhaust assembly (2).

16. Install the left rear muffler to intermediate exhaust assembly retaining bolts (3).

Tighten

Tighten the bolts to 45 N·m (33 lb ft).

17. Make sure that the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining nuts and re-align. Refer to [Exhaust System Alignment](#).
18. Lower the vehicle to the ground.
19. Connect the battery ground cable to the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).
20. If re-programming is required. Refer to [Control Module References](#).
21. Perform diagnostic system check using diagnostic scan tool, clear all relative DTCs and inspect the system for correct operation.

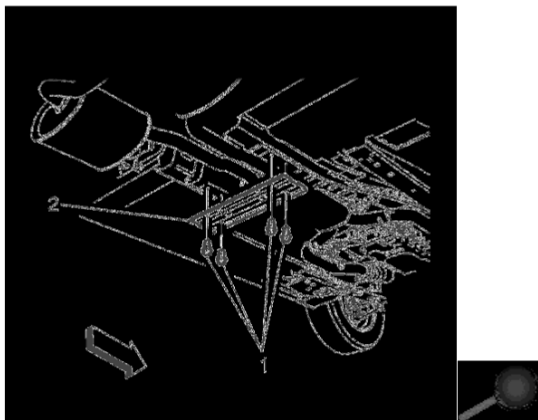
Exhaust System Replacement (LWR)

Removal Procedure

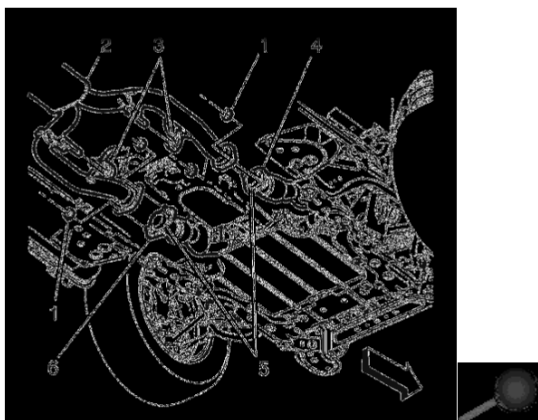
Warning: Refer to [Exhaust Service Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Support the exhaust system securely with a suitable jack.
3. Remove the right hand post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#).
4. Remove the left hand post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#).

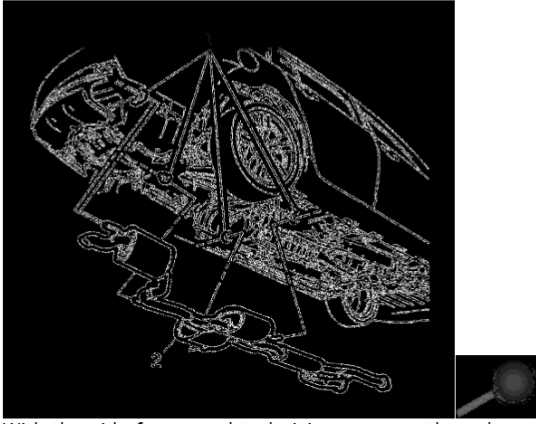


5. Remove the underbody brace retaining fasteners (1).
6. Remove the underbody brace (2).



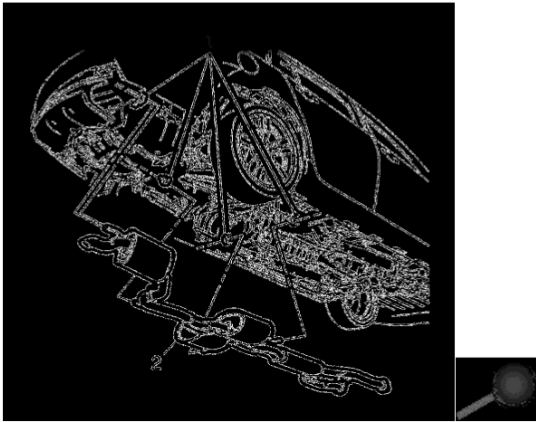
7. Remove the exhaust muffler (2) to catalytic converter fasteners (1).
8. Detach the exhaust muffler (2) from the exhaust isolators (3) and the catalytic converters (4,6).

9. Support the exhaust muffler with a suitable jack or mechanics wire.

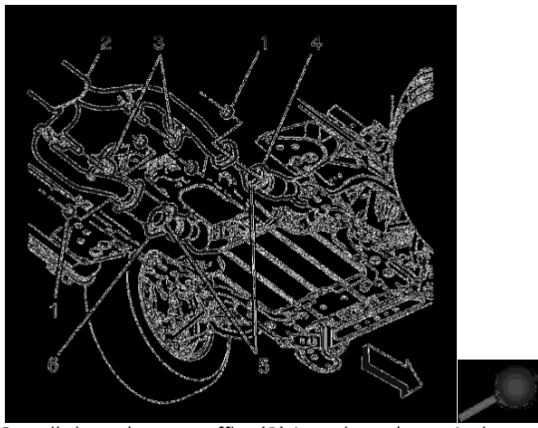


10. With the aid of a second technician, remove the exhaust muffler (2) from the exhaust isolators (1) and lower to the floor.
11. Inspect the catalytic converter seals (5) and replace as necessary.
12. Clean and lubricate the exhaust isolator rods for ease of installation.

Installation Procedure



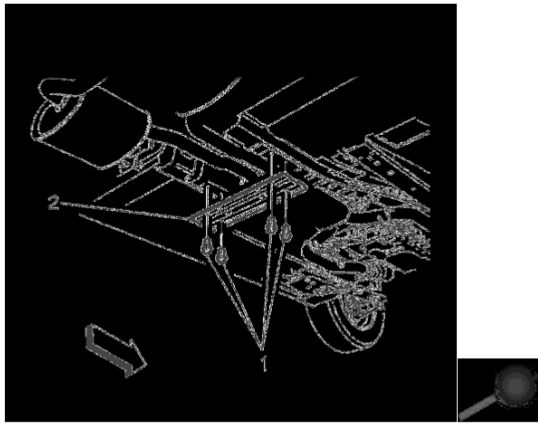
1. With the help of a second technician, install the exhaust muffler (2) into the exhaust isolators (1).
2. Support the front exhaust muffler with a suitable jack or mechanics wire.



3. Install the exhaust muffler (2) into the exhaust isolators (3) and into the left and right catalytic converters (4,6).

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

4. Tighten the exhaust muffler to catalytic converter fasteners (1) to **21 N·m (15 lb ft)**.



5. Install the underbody brace (2) and tighten the fasteners (1) to **58 N·m (43 lb ft)**.
6. Install the right post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#).
7. Install the left post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#).
8. Lower the vehicle.
9. Start the engine and check for exhaust leaks.

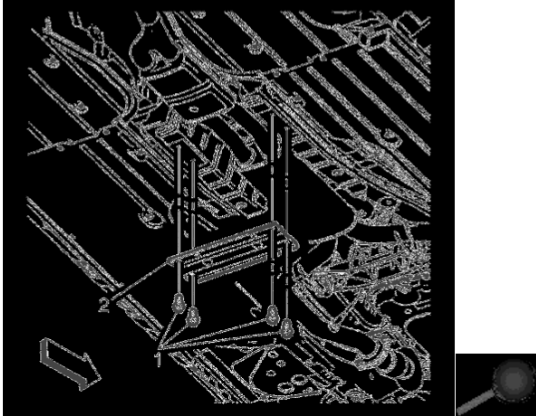
Exhaust System Replacement (LFX)

Removal Procedure

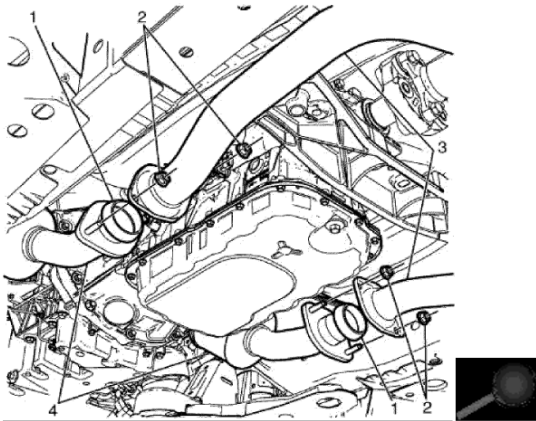
Warning: Refer to [Exhaust Service Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the right post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#).
3. Remove the left post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#).
4. Support the exhaust system securely with a suitable jack.



5. Remove the underbody brace mounting fasteners (1).
6. Remove the underbody brace (2).

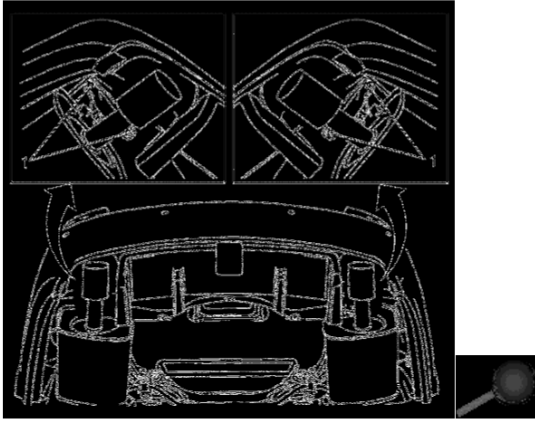


7. Remove the catalytic converter fasteners (2) and detach the exhaust muffler (3) from the catalytic converters.

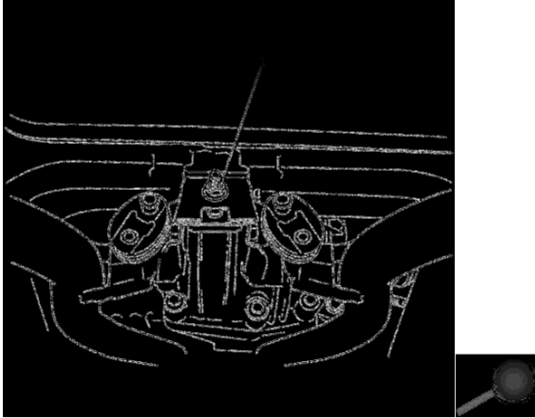
Note: The catalytic converter fasteners (2) and the catalytic converter sealing rings (1) are single use parts. They must be discarded after removal.

© 2014 General Motors. All rights reserved.

8. Discard the catalytic converter fasteners (2) and the exhaust seals (1).



9. Remove the rear exhaust isolator bracket fasteners (1).

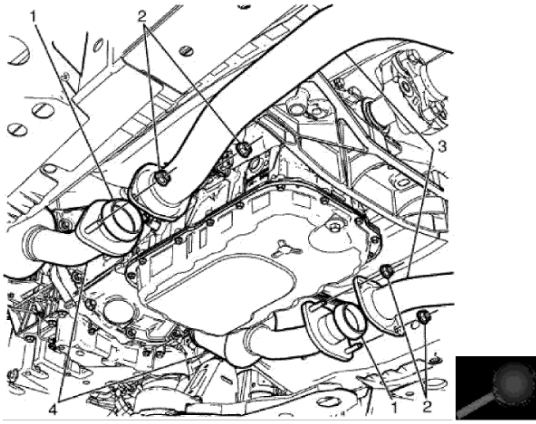


10. Remove the center exhaust isolator hanger bracket fastener (1).
11. With the aid of an assistant or using a suitable jack; detach the exhaust system from the center exhaust isolator stud (1) and carefully lower the exhaust system from the vehicle.
12. Lower the vehicle.

Installation Procedure

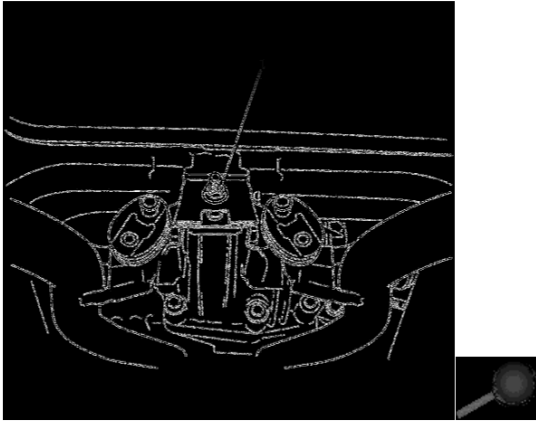
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



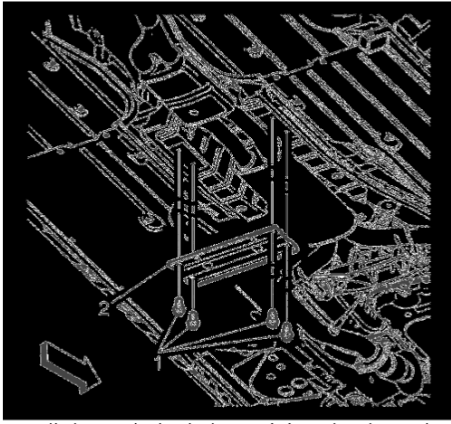
Note: The catalytic converter to exhaust muffler retaining fasteners (2) are single use parts. They must be replaced with NEW fasteners.

2. Install NEW exhaust flange sealing rings (1) to both the left hand and right hand catalytic convertor exhaust flanges.
3. With the aid of an assistant, install the exhaust muffler (3) to the catalytic converters.
4. Install the NEW catalytic converter fasteners (2). Do not fully tighten at this stage.

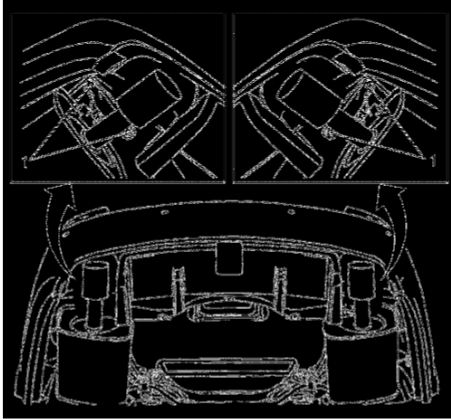


Caution: Refer to [Fastener Caution](#).

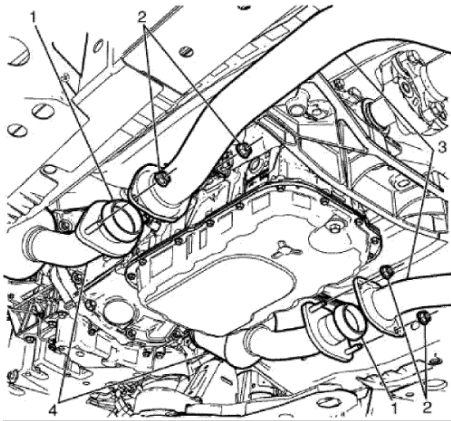
5. Install the center insulator hanger bracket to the differential housing and tighten the fastener (1) to **45 N•m (33 lb ft)**.



6. Install the underbody brace (2) and tighten the fasteners (1) to **58 N·m (43 lb ft)**.



7. Install the rear exhaust isolator hanger brackets. Tighten the fasteners (1) to **22 N·m (16 lb ft)**.



8. Tighten the catalytic converter fasteners (2) to **40 N·m (30 lb ft)**.

9. Remove the jack supporting the exhaust system.
10. Install the right post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#).
11. Install the left post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#).
12. Lower the vehicle.

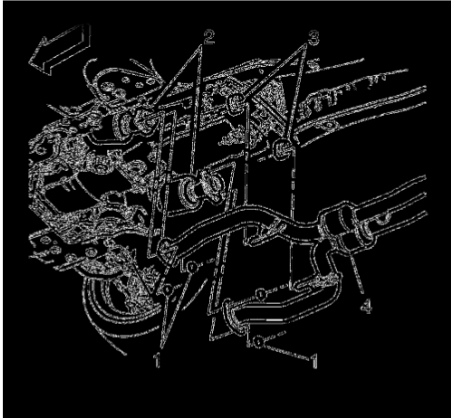
Exhaust System Replacement (LSA, LS3)

Removal Procedure

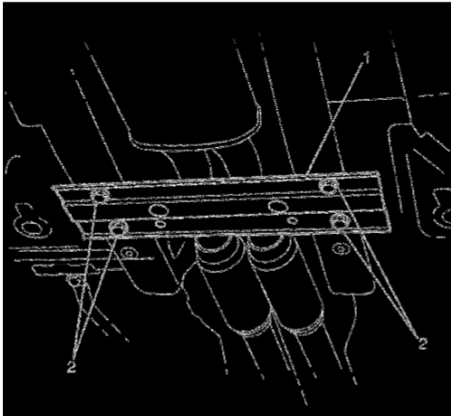
Warning: Refer to [Exhaust Service Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the left post-catalytic converter HO2S . Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#).
3. Remove the right post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#).

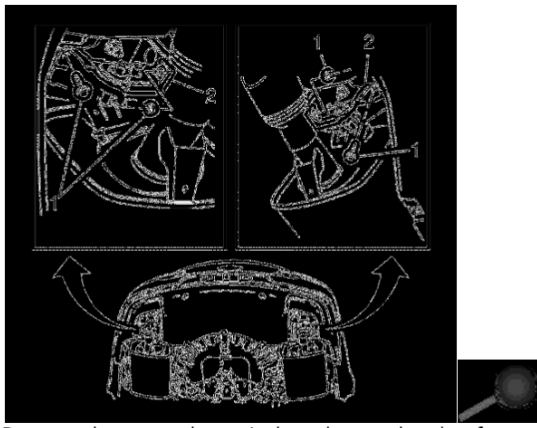


4. Remove the catalytic converter fasteners (1) and remove the exhaust muffler (4) from the exhaust isolators (3).
5. Support the exhaust system with a suitable jack or mechanics wire.
6. Discard the catalytic converter exhaust seals (2) and fasteners (1).

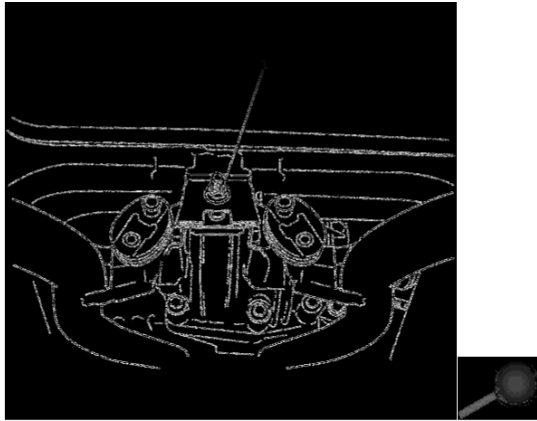


7. Remove the underbody brace fasteners (2).
8. Remove the underbody brace (1).

© 2014 General Motors. All rights reserved.



9. Remove the rear exhaust isolator hanger bracket fasteners (1) above the left and right rear mufflers.

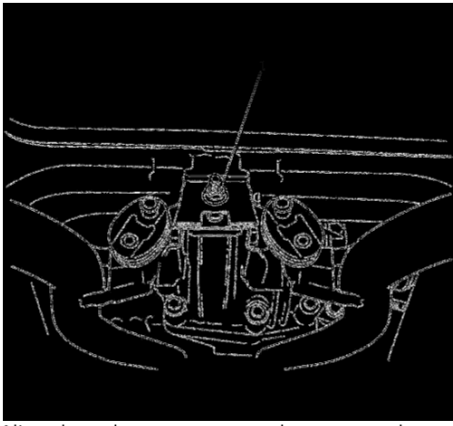


10. Remove the center exhaust isolator hanger bracket to differential retaining fastener (1).
11. Detach the exhaust system assembly from the center exhaust isolator hanger bracket to differential retaining stud (1).
12. With the aid of an assistant or using a suitable jack; carefully lower the exhaust system from the vehicle.

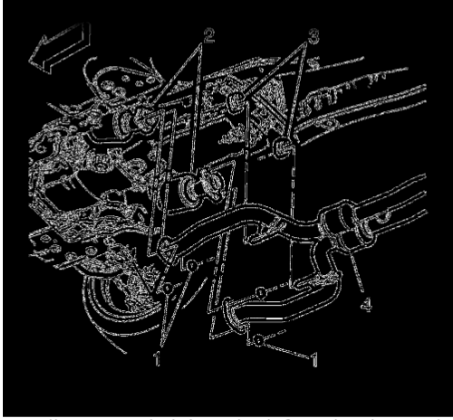
Installation Procedure

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

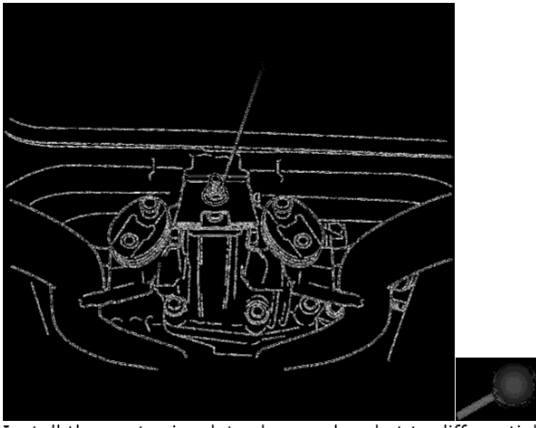
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Install the left post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#).
3. Install the right post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#).
4. With the aid of an assistant, or using a suitable jack; position the exhaust muffler assembly to the vehicle.



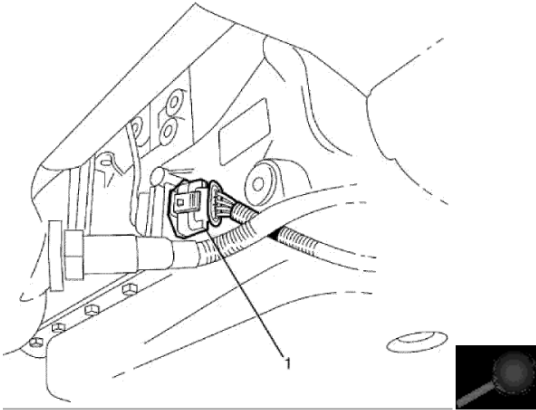
5. Align the exhaust system to the center exhaust isolator hanger bracket to differential retaining stud (1).



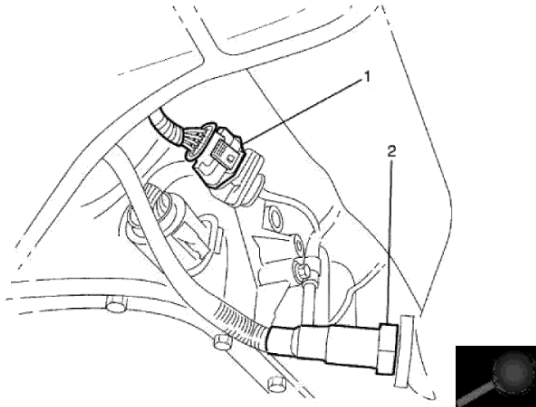
6. Install NEW seals (2) to the left and right catalytic converter flanges.
7. Install the exhaust muffler (4) into the exhaust isolators (3) and align the muffler to the left and right catalytic converters.
- Caution:** Refer to [Fastener Caution](#).
8. Tighten the NEW fasteners (1) to **40 N·m (30 lb ft)**.
9. Remove the jack supporting the exhaust system.



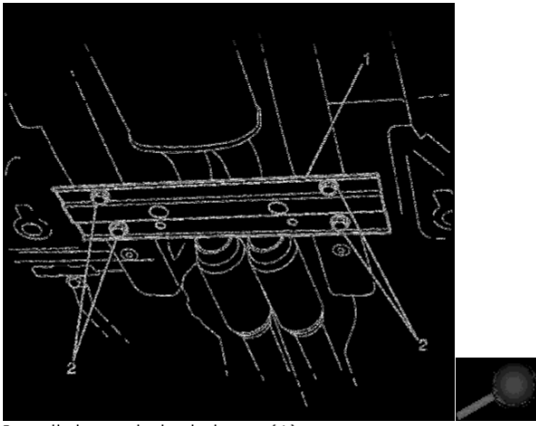
10. Install the center insulator hanger bracket to differential retaining nut (1) and tighten to **45 N·m (33 lb ft)**.



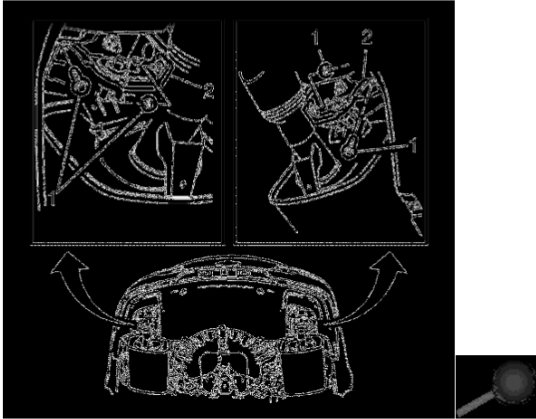
11. Connect the left post-catalytic converter HO2S electrical connector (1).



12. Connect the right post-catalytic converter HO2S electrical connector (1).



13. Install the underbody brace (1).
14. Install the underbody brace mounting fasteners (2) and tighten to **58 N•m (43 lb ft)**.



15. Install the rear exhaust isolator hanger brackets (2) and tighten the fasteners (1) to **22 N•m (16 lb ft)**.
16. Make sure that the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining nuts and re-align. Refer to [Exhaust System Alignment](#).
17. Lower the vehicle.
18. Start the vehicle and check for exhaust leaks.

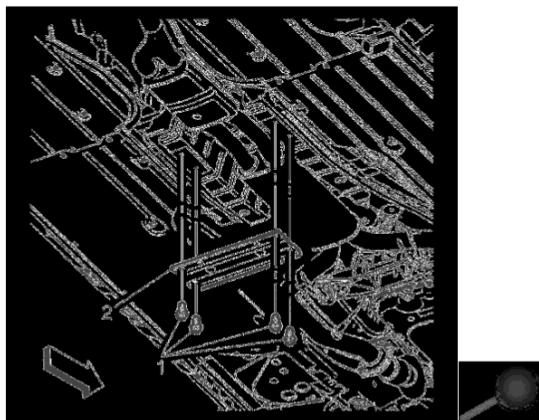
Exhaust System Replacement (LFW)

Removal Procedure

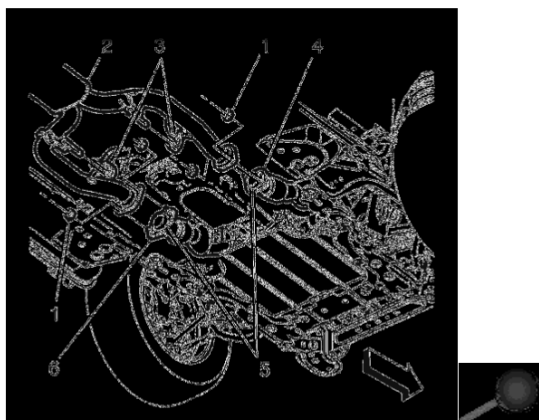
Warning: Refer to [Exhaust Service Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the right post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#).
3. Remove the left post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#).



4. Remove the underbody brace mounting fasteners (1).
5. Remove the underbody brace (2).

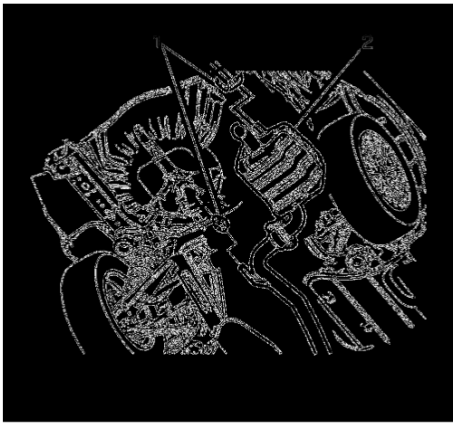


6. Remove the catalytic converter fasteners (1) and detach the exhaust muffler (2) from the catalytic converters (4,6).
7. Remove the exhaust muffler (2) from the exhaust isolators (3).
8. Support the exhaust muffler (2) with a suitable jack or mechanics wire.

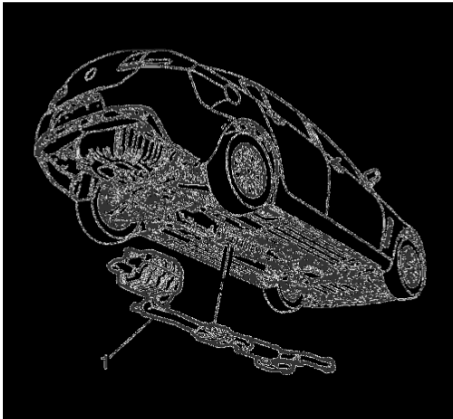
© 2014 General Motors. All rights reserved.

Note: The catalytic converter fasteners (1) and the catalytic converter sealing rings (5) are single use parts. They must be discarded after removal.

9. Discard the catalytic converter fasteners (1) and the exhaust seals (5).



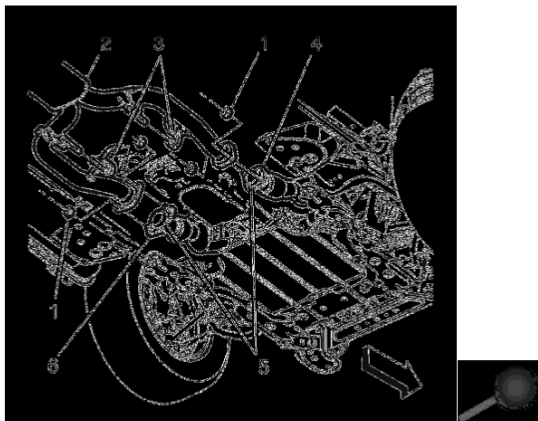
10. Remove the right rear exhaust muffler (2) from the exhaust isolators (1).



11. With the aid of a second technician, lower the exhaust system (1) to the floor.
12. Lower the vehicle.
13. Clean and lubricate the exhaust isolator rods for ease of installation.

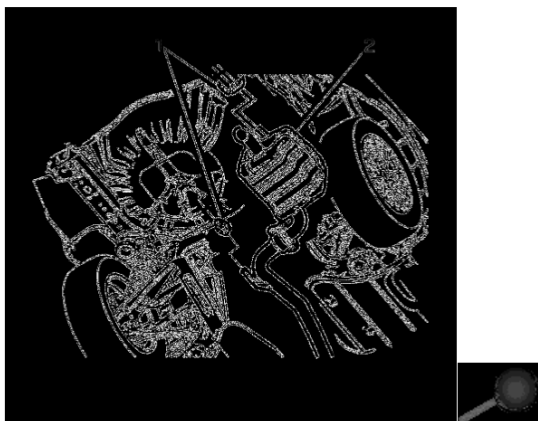
Installation Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

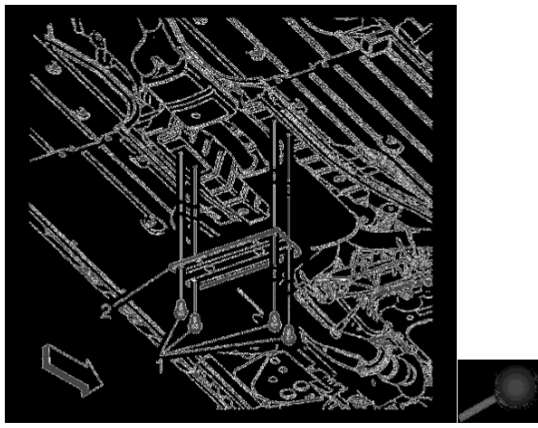


Note: The catalytic converter to exhaust muffler retaining fasteners (1) and seals (5), are single use parts. They must be replaced with NEW fasteners and seals.

2. Install NEW exhaust flange sealing rings (5) to both the left and right catalytic converter exhaust flanges.
3. With the aid of an assistant, install the exhaust muffler (2) to the catalytic converters.
4. Install the NEW catalytic converter fasteners (1). Do not fully tighten at this stage.

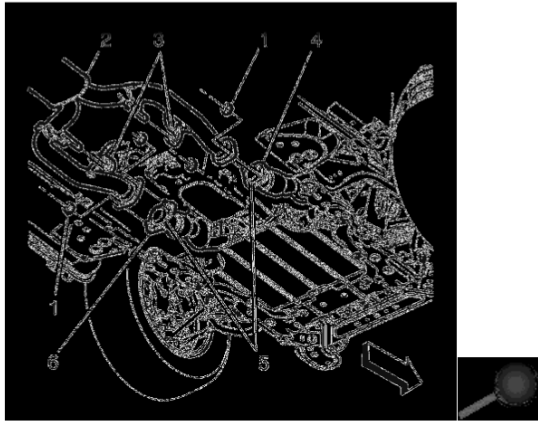


5. Install the exhaust muffler (2) into the exhaust isolators (1).



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

6. Install the underbody brace (2) and tighten the fasteners (1) to **58 N·m (43 lb ft)**.



7. Tighten the catalytic converter fasteners (1) to **40 N·m (30 lb ft)**.
8. Install the right post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 2](#).
9. Install the left post-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 2](#).
10. Lower the vehicle.

Catalytic Converter Replacement - Left Side (LSA,LS3)

Removal Procedure

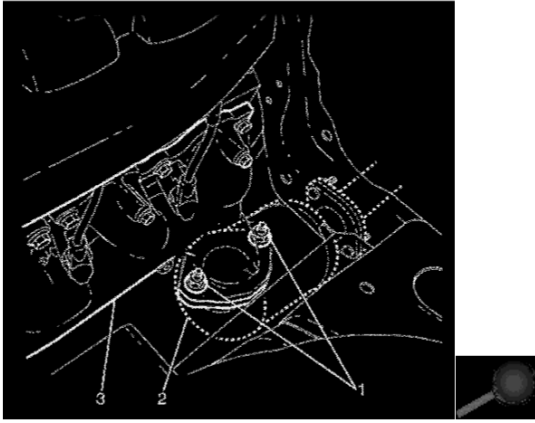
Warning: Refer to [Exhaust Service Warning](#).

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

1. Ignition OFF.

Warning: Refer to [Battery Disconnect Warning](#).

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

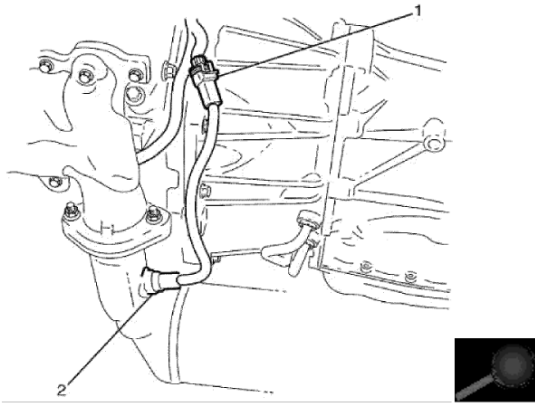


Note: The left catalytic converter to exhaust manifold retaining nuts (1) are single use parts. They must be discarded after removal.

3. Remove the left catalytic converter to exhaust manifold retaining nuts (1). Discard the nuts.
4. Disconnect the left catalytic converter (2) from the exhaust manifold (3).

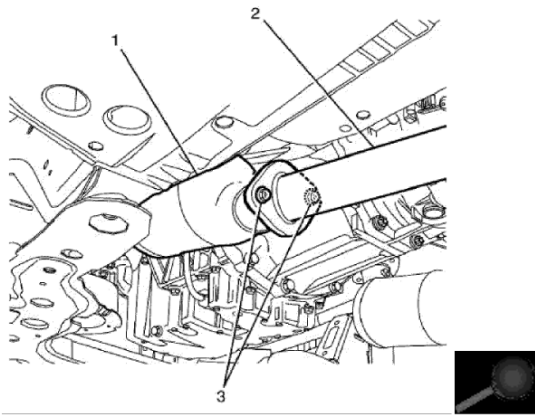
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

5. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



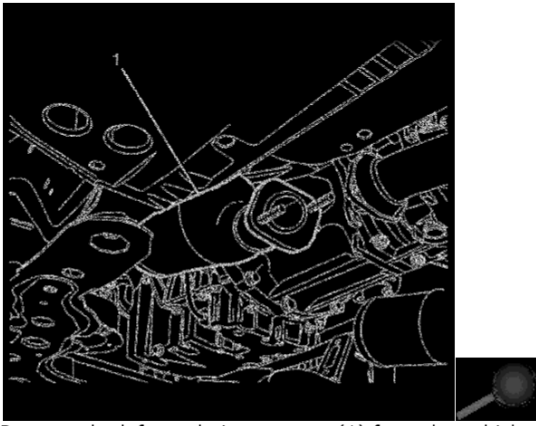
Caution: Refer to [Fuel and Evaporative Emission Hose/Pipe Connection Cleaning Caution](#)

6. Disconnect the left pre-catalytic converter heated oxygen sensor (HO2S) electrical connector (1).



Note: The exhaust crossover pipe assembly to left catalytic converter retaining nuts (3) are single use parts. They must be discarded after removal.

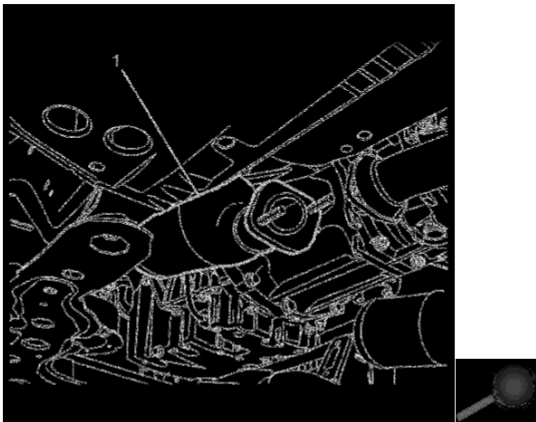
7. Remove the exhaust crossover pipe assembly to left catalytic converter retaining nuts (3). Discard the nuts.
8. Disconnect the exhaust crossover pipe assembly (2) from the left catalytic converter (1).



9. Remove the left catalytic converter (1) from the vehicle.
10. Remove the left pre-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).

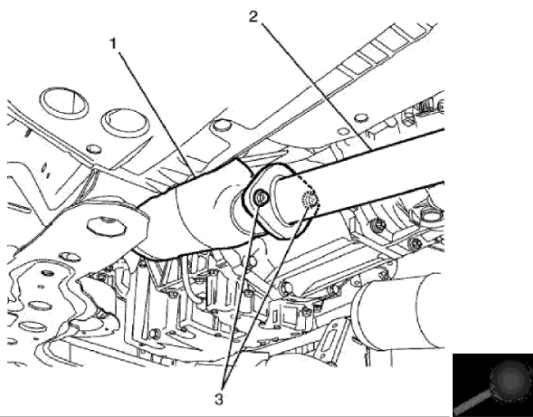
Installation Procedure

1. Install the left pre-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).



Note: Make sure that a NEW sealing ring is fitted prior to installation. Failure to comply may cause the exhaust system to perform poorly.

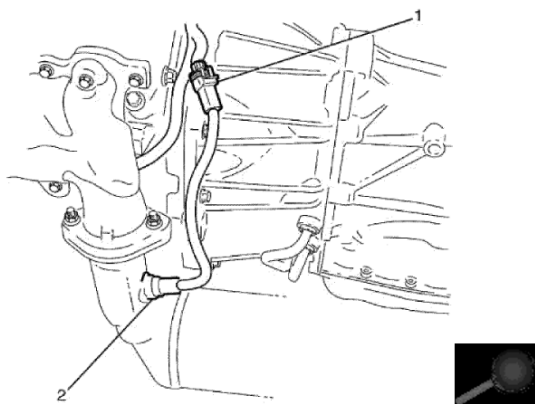
2. Install the left catalytic converter (1) to the vehicle.



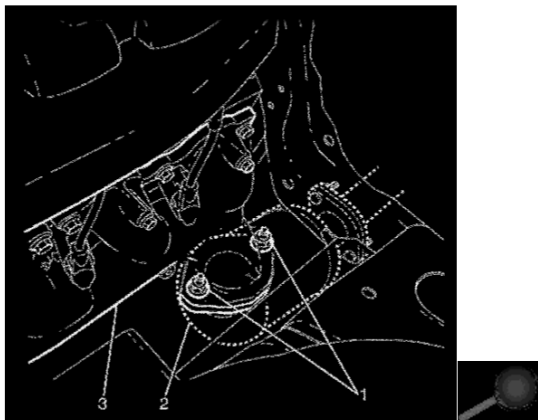
3. Align the exhaust crossover pipe assembly (2) to the left catalytic converter (1).

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

4. Install the exhaust crossover pipe assembly to left catalytic converter retaining nuts (3) and tighten to **40N·m (30 lb ft)**.



5. Connect the left pre-catalytic converter HO2S electrical connector (1).



Note: Push up and forward on the left catalytic converter (2) to connect to the exhaust manifold (3).

6. Connect the left catalytic converter (2) to the exhaust manifold (3).

Note: Do not fully tighten the left catalytic converter to exhaust manifold retaining nuts (3) at this stage.

7. Install the left catalytic converter to exhaust manifold retaining nuts (1).
Do not fully tighten at this stage.
8. Lower the vehicle.
9. Tighten the left catalytic converter to exhaust manifold retaining nuts (1) to **45 N·m (33 lb ft)**.
10. Make sure that the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining nuts and re-align. Refer to [Exhaust System Alignment](#).
11. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

Catalytic Converter Replacement - Left Side (LFX,LFW)

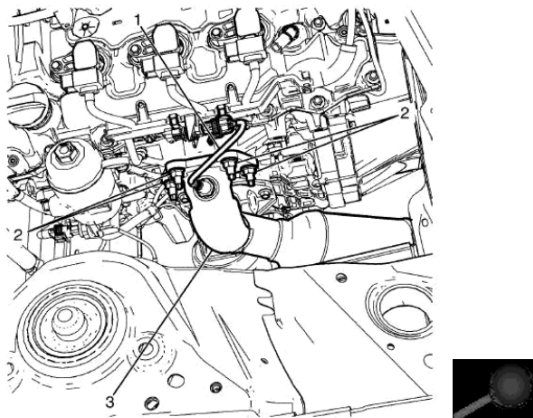
Removal Procedure

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

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

Caution: Refer to [Heated Oxygen and Oxygen Sensor Caution](#).

1. Disconnect the battery ground cable from the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the engine dress cover. Refer to [Intake Manifold Sight Shield Replacement](#).



Note: The left catalytic converter to cylinder head retaining nuts (2) are single use parts. They must be discarded after removal.

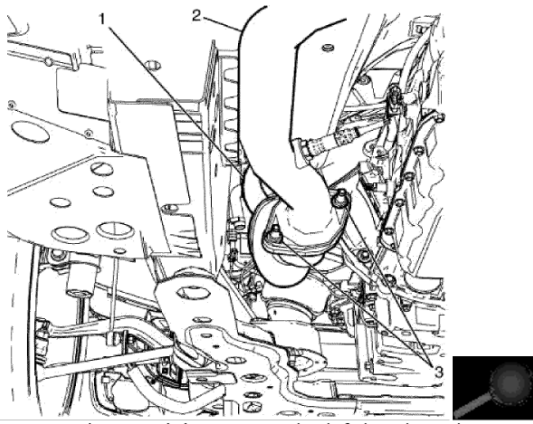
3. Remove the left pre-catalytic converter heated oxygen sensor (HO2S) (1). Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).

Remove and discard the nuts (2) retaining the left hand catalytic converter to the cylinder head.

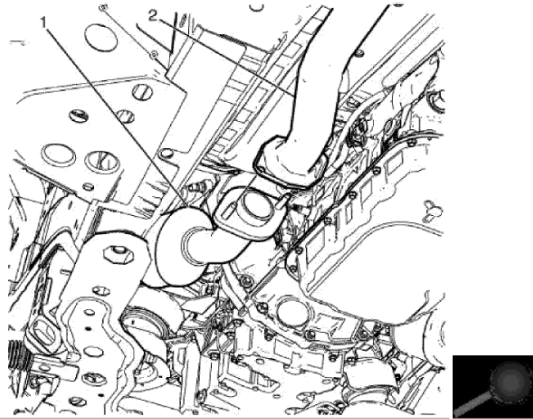
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

4. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

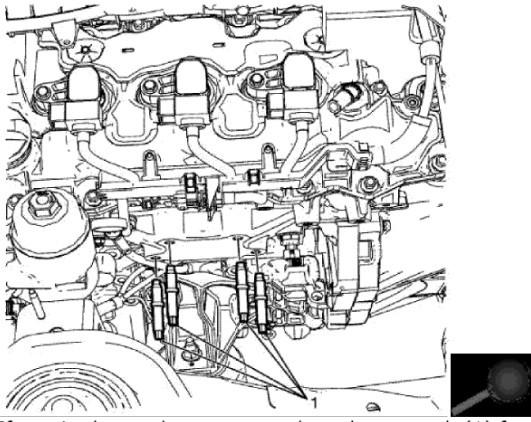
cardiagn.com



5. Remove the nuts (3) retaining the left hand catalytic converter (1) to the crossover pipe assembly (2).

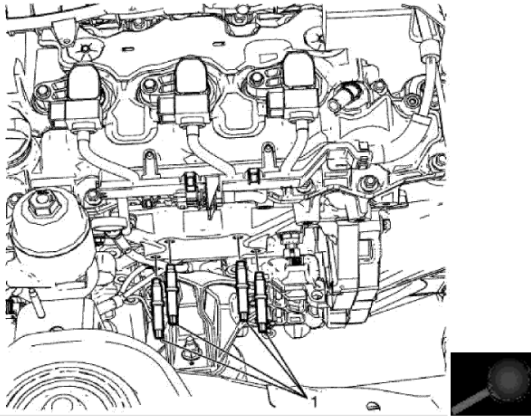


6. With the aid of an assistant, disconnect the left hand catalytic converter (1) from the crossover pipe assembly (2) and carefully maneuver the left hand catalytic converter (1) from the vehicle.
7. Remove and discard the sealing ring from the exhaust flange at the crossover pipe assembly end of the catalytic converter assembly.
8. Remove and discard the gasket from the cylinder head end of the catalytic converter assembly.
9. Lower the vehicle.



10. If required to replace, remove the exhaust studs (1) from the cylinder head.

Installation Procedure



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

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

1. Install NEW studs (1) to the cylinder head.

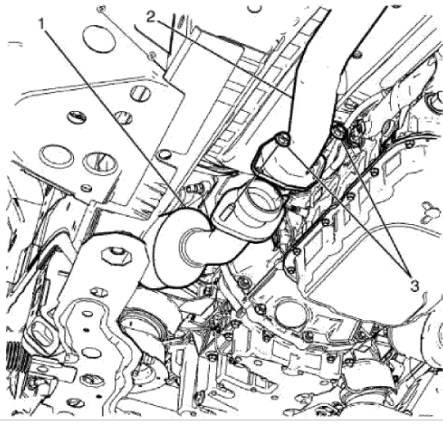
Tighten

Tighten the studs to 14 N·m (124 lb in).

2. Ensure that the gasket mating surfaces on the cylinder head and catalytic converter are flat and free from defects or old gasket material.
3. Install a new exhaust gasket to the studs (1) on the cylinder head.

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

4. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

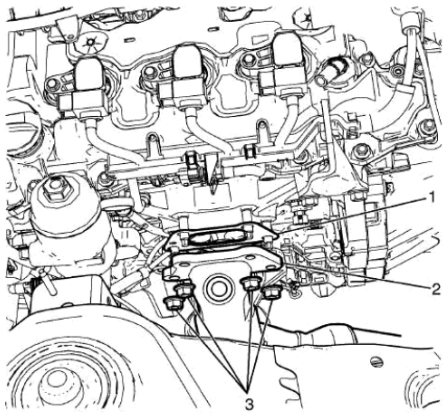


Note: Ensure that a NEW sealing ring is fitted prior to installation. Failure to comply may cause the exhaust system to perform poorly.

5. Install a new sealing ring (4) to the exhaust flange on the catalytic convertor.
6. With the aid of an assistant, lift the left catalytic converter assembly (1) up and forward to engage both the exhaust studs on the cylinder head and the mating join on the crossover pipe (2).

Note: Do not fully tighten the left catalytic converter to cross-over pipe retaining nuts (3) at this stage.

7. Loosely install the retaining nuts (3).
Do not fully tighten at this stage.
8. Lower the vehicle.



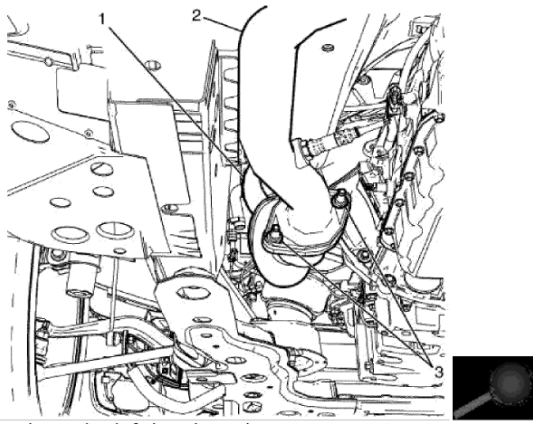
9. Install a NEW gasket (1) to the exhaust studs.
10. Install the left hand catalytic convertor (2) to the exhaust studs.
11. Install NEW retaining nuts (3) to the exhaust studs.

Tighten

Tighten the nuts to 50N•m (37 lb ft).

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

12. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



13. Tighten the left hand catalytic converter to crossover pipe retaining nuts (3).
Tighten
Tighten the nuts to 45N•m (33 lb ft).
14. Ensure that the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining nuts and re-align. Refer to [Exhaust System Alignment](#).
15. Lower the vehicle.
16. Install the left pre-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).
17. Install the engine dress cover. Refer to [Intake Manifold Sight Shield Replacement](#).
18. Connect the battery ground cable to the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).
19. If re-programming is required. Refer to [Control Module References](#).
20. Perform diagnostic system check using diagnostic scan tool, clear all relative DTCs and inspect the system for correct operation.

Catalytic Converter Replacement - Left Side (LWR)

Removal Procedure

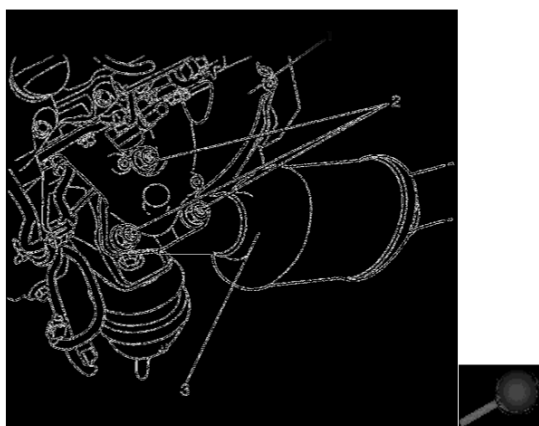
Warning: Refer to [Exhaust Service Warning](#).

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

1. Ignition OFF.

Warning: Refer to [Battery Disconnect Warning](#).

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).
4. Remove the left pre-catalytic converter heated oxygen sensor (HO2S). Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).
5. Remove the left exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Left Side](#).
6. Remove the oil level indicator tube. Refer to [Oil Level Indicator and Tube Removal](#).



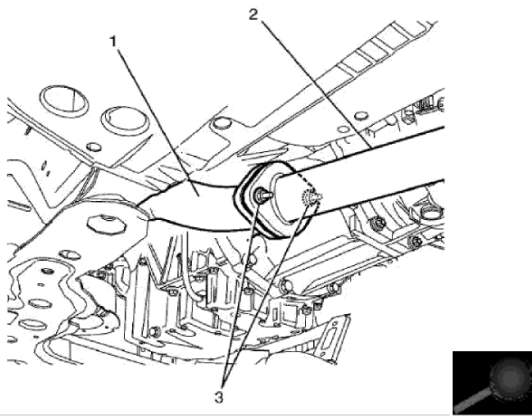
Note: The left catalytic converter to exhaust manifold retaining fasteners (1) are single use parts. They must be discarded after removal.

7. Remove the left catalytic converter to exhaust manifold retaining fasteners (2).
Discard the fasteners.

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

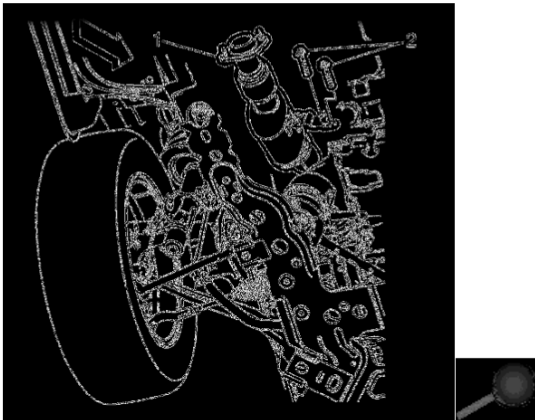
8. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

cardiagn.com



Note: The exhaust crossover pipe assembly to the left catalytic converter retaining fasteners (3) are single use parts. They must be discarded after removal.

9. Remove the exhaust crossover pipe assembly to the left catalytic converter retaining fasteners (3).
Discard the fasteners.
10. Pull down and back on the left catalytic converter (3) to disconnect from the exhaust manifold (1).
11. Disconnect the exhaust crossover pipe assembly (2) from the left catalytic converter pipe (1).

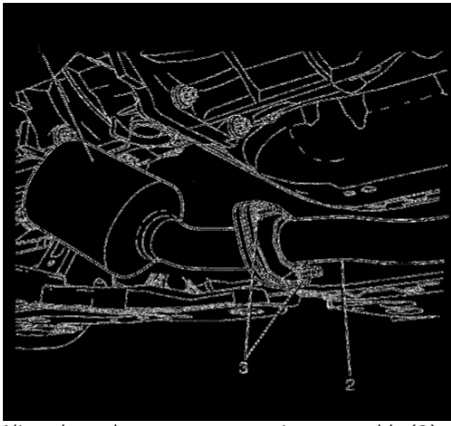


12. Remove the catalytic converter brace fasteners (2) and remove the catalytic converter (1) from the vehicle.
13. If replacing the catalytic converter, transfer the catalytic converter brace to the NEW one.

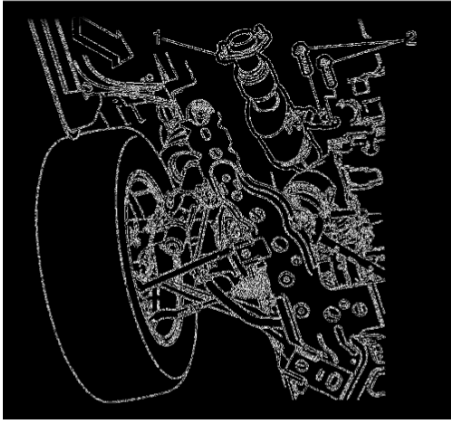
Installation Procedure

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

1. Raise and support the vehicle.



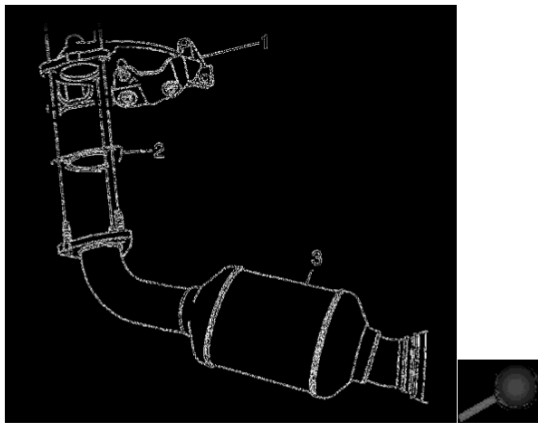
2. Align the exhaust crossover pipe assembly (2) to the left catalytic converter pipe (1).



3. Loosely install the catalytic converter brace to the bell housing and hand tighten the fasteners (2).

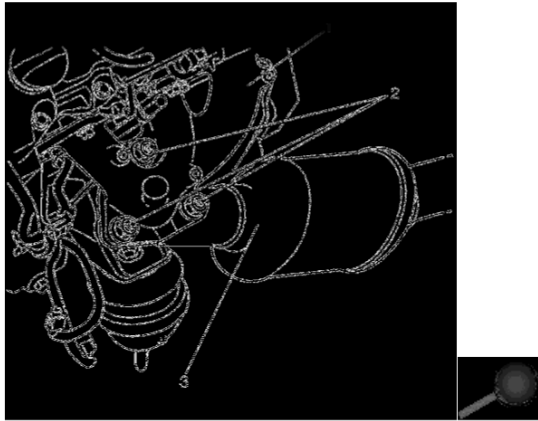
Caution: Refer to [Fastener Caution](#).

4. Install NEW exhaust crossover pipe assembly to left catalytic converter retaining fasteners (3) and tighten to **40N·m (30 lb ft)**.
5. Lower the vehicle.

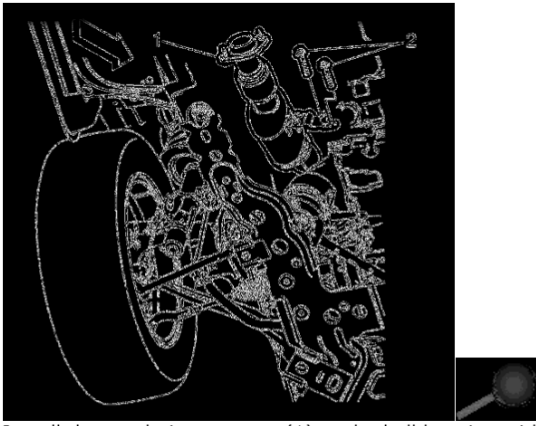


Note: Make sure that a NEW gasket is fitted prior to installation. Failure to comply may cause the exhaust system to perform poorly.

6. Install a NEW gasket (2) to the exhaust manifold (1) and install the catalytic converter (3) into position.



7. Install NEW left catalytic converter to exhaust manifold retaining fasteners (1) and tighten to **45 N•m (33 lb ft)**.
8. Make sure that the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining fasteners and re-align. Refer to [Exhaust System Alignment](#).
9. Raise and support the vehicle.



10. Install the catalytic converter (1) to the bell housing with the fasteners (2) and tighten to **58 N·m (43 lb ft)**.
11. Lower the vehicle.
12. Install the oil level indicator tube. Refer to [Oil Level Indicator and Tube Removal](#).
13. Install the left exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Left Side](#).
14. Install the left pre-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).
15. Install the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).
16. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

Catalytic Converter Replacement - Right Side (LSA,LS3)

Removal Procedure

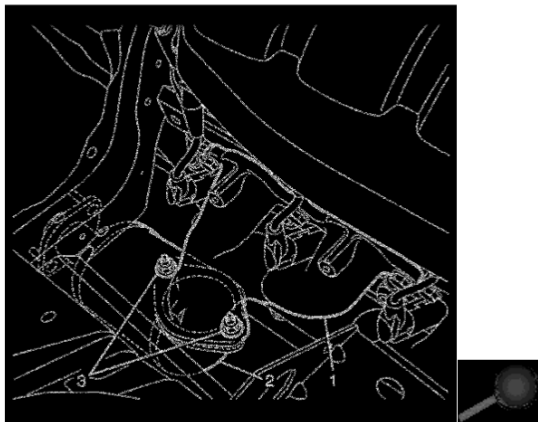
Warning: Refer to [Exhaust Service Warning](#).

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

1. Ignition OFF.

Warning: Refer to [Battery Disconnect Warning](#).

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



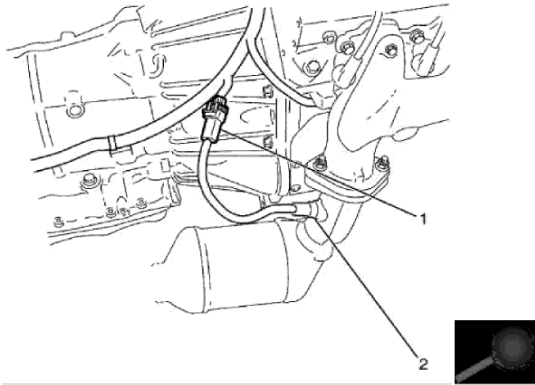
Note: The right catalytic converter to exhaust manifold retaining nuts (1) are single use parts. They must be discarded after removal.

3. Remove the right catalytic converter to exhaust manifold retaining nuts (3). Discard the nuts.
4. Disconnect the right catalytic converter (2) from the exhaust manifold (1).

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

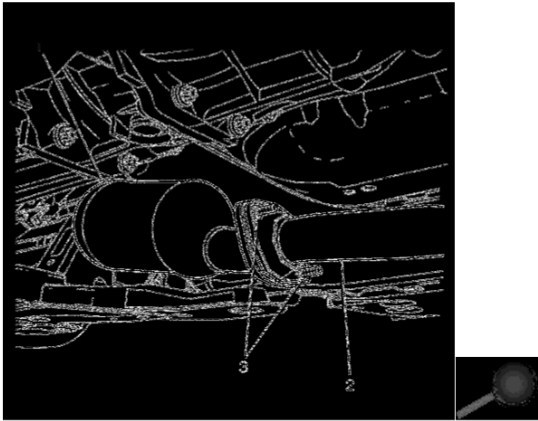
5. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

cardiagn.com



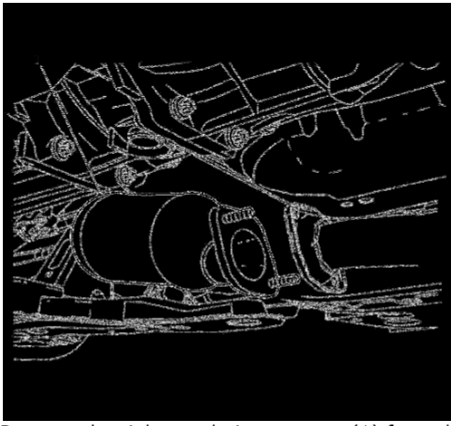
Caution: Refer to [Fuel and Evaporative Emission Hose/Pipe Connection Cleaning Caution](#)

6. Disconnect the right pre-catalytic converter heated oxygen sensor (HO2S) electrical connector (1).



Note: The exhaust crossover pipe assembly to right catalytic converter retaining nuts (3) are single use parts. They must be discarded after removal.

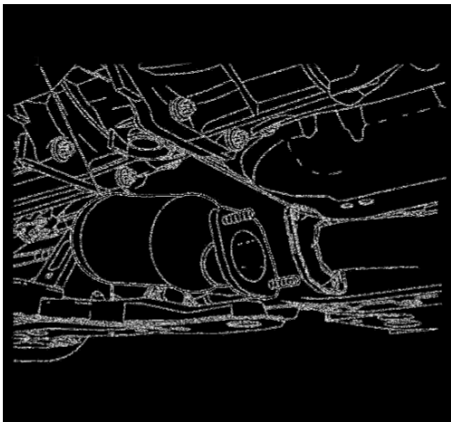
7. Remove the exhaust crossover pipe assembly to right catalytic converter retaining nuts (3). Discard the nuts.
8. Disconnect the exhaust crossover pipe assembly (2) from the right catalytic converter (1).



9. Remove the right catalytic converter (1) from the vehicle.
10. Remove the right pre-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 1](#).

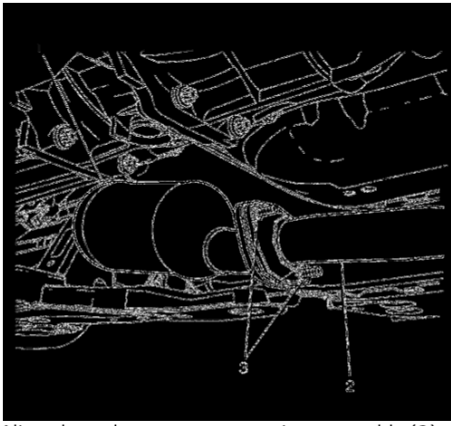
Installation Procedure

1. Install the right pre-catalytic converter heated oxygen sensor (HO2S) to the right catalytic converter. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 1](#).



Note: Make sure that a NEW sealing ring is fitted prior to installation. Failure to comply may cause the exhaust system to perform poorly.

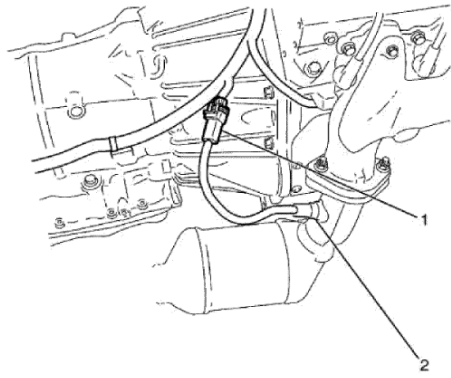
2. Install the right catalytic converter (1) to the vehicle.



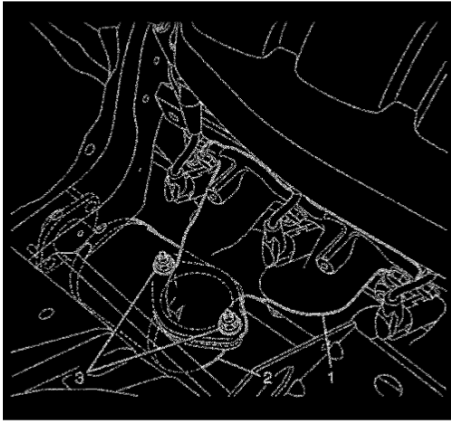
3. Align the exhaust crossover pipe assembly (2) to the right catalytic converter (1).

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

4. Install the exhaust crossover pipe assembly to right catalytic converter retaining nuts (3) and tighten to **40N•m (30 lb ft)**.



5. Connect the right pre-catalytic converter HO2S electrical connector (1).



Note: Push up and forward on the right catalytic converter (2) to connect to the exhaust manifold (3).

6. Connect the right catalytic converter (2) to the exhaust manifold (1).

Note: Do not fully tighten the right catalytic converter to exhaust manifold retaining nuts (3) at this stage.

7. Install the right catalytic converter to exhaust manifold retaining nuts (3).
Do not fully tighten at this stage.
8. Lower the vehicle.
9. Tighten the right catalytic converter to exhaust manifold retaining nuts (1) to **45 N•m (33 lb ft)**.
10. Make sure the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining nuts and re-align. Refer to [Exhaust System Alignment](#).
11. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

Catalytic Converter Replacement - Right Side (LFX,LFW)

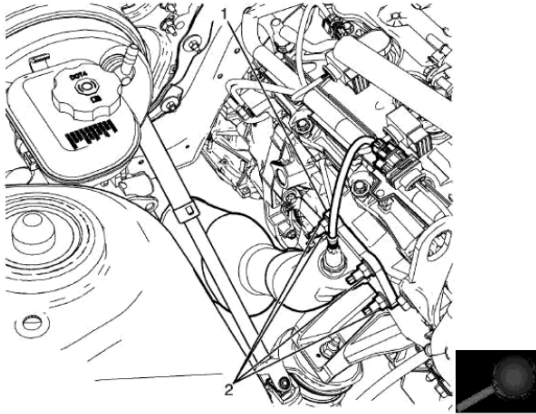
Removal Procedure

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

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

Caution: Refer to [Heated Oxygen and Oxygen Sensor Caution](#).

1. Disconnect the battery ground cable from the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the engine dress cover. Refer to [Intake Manifold Sight Shield Replacement](#).

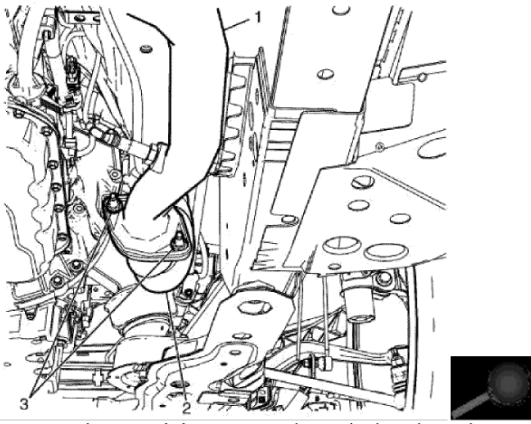


Note: The right catalytic converter to cylinder head retaining nuts (2) are single use parts. They must be discarded after removal.

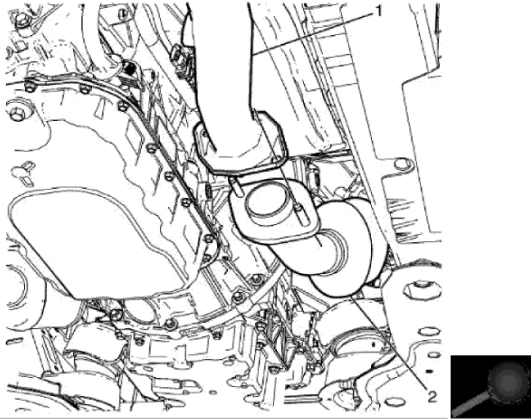
3. Remove the right pre-catalytic converter heated oxygen sensor (HO2S) (1). Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).
Remove and discard the nuts (2) retaining the right hand catalytic converter (1) to the cylinder head.

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

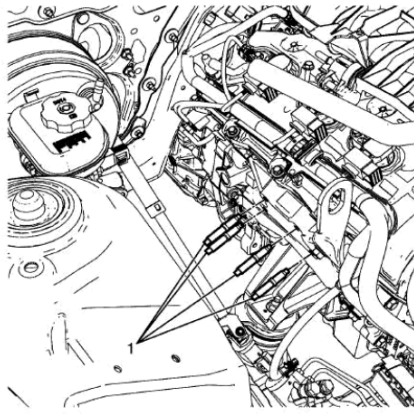
4. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



5. Remove the nuts (3) retaining the right hand catalytic converter (2) to the crossover pipe assembly (1).

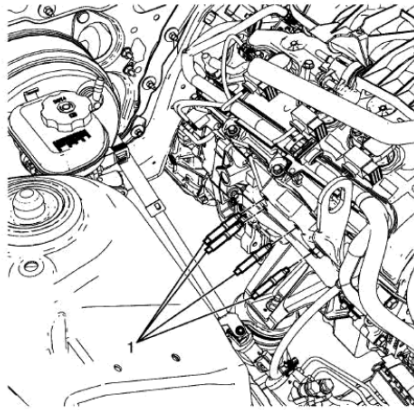


6. With the aid of an assistant, disconnect the right hand catalytic converter (2) from the crossover pipe assembly (1) and carefully maneuver the right hand catalytic converter (2) from the vehicle.
7. Remove and discard the old sealing ring from the exhaust flange at the crossover pipe assembly end of the catalytic convertor assembly.
8. Remove and discard the old gasket from the cylinder head end of the catalytic convertor assembly.
9. Lower the vehicle.



10. If required to replace, remove the exhaust studs (1) from the cylinder head.

Installation Procedure



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

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

1. Install NEW studs (1) to the cylinder head.

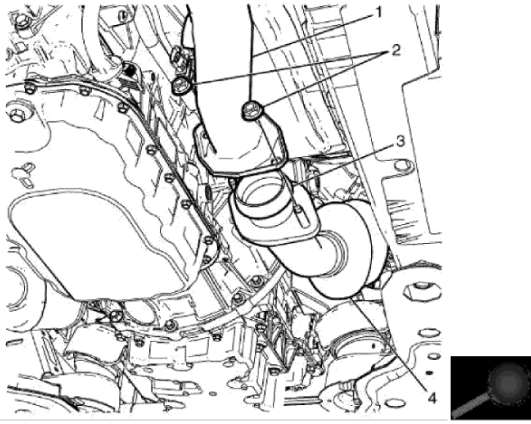
Tighten

Tighten the studs to 14 N·m (124 lb in).

2. Ensure that the gasket mating surfaces on the cylinder head and catalytic converter are flat and free from defects or old gasket material.
3. Install a new exhaust gasket to the studs (1) on the cylinder head.

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

4. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

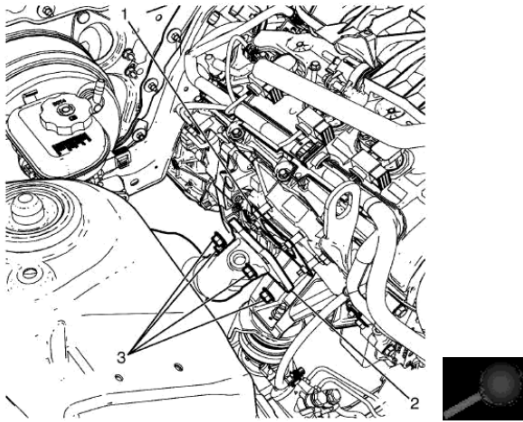


Note: Make sure that a NEW sealing ring is fitted prior to installation. Failure to comply may cause the exhaust system to perform poorly.

5. Install a new sealing ring (3) to the exhaust flange on the catalytic convertor.
6. With the aid of an assistant, lift the right hand catalytic converter assembly (4) up and forward to engage both the exhaust studs on the cylinder head and the mating join on the crossover pipe (1).

Note: Do not fully tighten the right catalytic converter to exhaust manifold retaining nuts (2) at this stage.

7. Loosely install the retaining nuts (2).
Do not fully tighten at this stage.
8. Lower the vehicle.



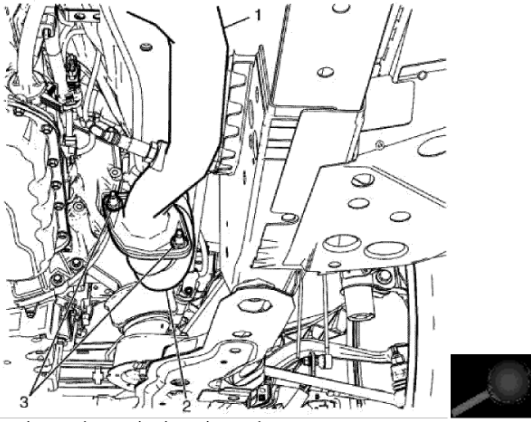
9. Install a NEW gasket (1) to the exhaust studs.
10. Install the right hand catalytic convertor (2) to the exhaust studs.
11. Install NEW retaining nuts (3) to the exhaust studs.

Tighten

Tighten the nuts to 50N•m (37 lb ft).

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

12. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



13. Tighten the right hand catalytic converter to crossover pipe retaining nuts (3).
Tighten
Tighten the nuts to 45N•m (33 lb ft).
14. Ensure that the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining nuts and re-align. Refer to [Exhaust System Alignment](#).
15. Lower the vehicle.
16. Install the right pre-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).
17. Install the engine dress cover. Refer to [Intake Manifold Sight Shield Replacement](#).
18. Connect the battery ground cable to the battery. Refer to [Battery Negative Cable Disconnection and Connection](#).
19. If re-programming is required. Refer to [Control Module References](#).
20. Perform diagnostic system check using diagnostic scan tool, clear all relative DTCs and inspect the system for correct operation.

Catalytic Converter Replacement - Right Side (LWR)

Removal Procedure

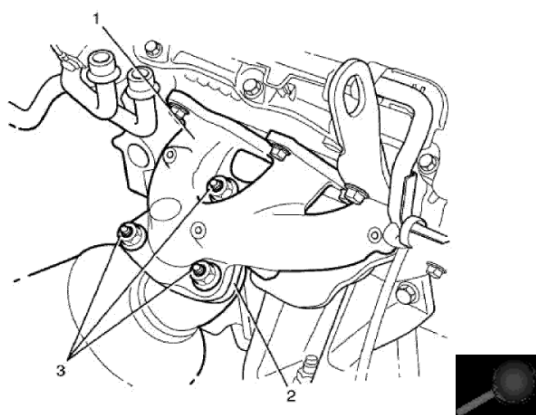
Warning: Refer to [Exhaust Service Warning](#).

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

1. Ignition OFF.

Warning: Refer to [Battery Disconnect Warning](#).

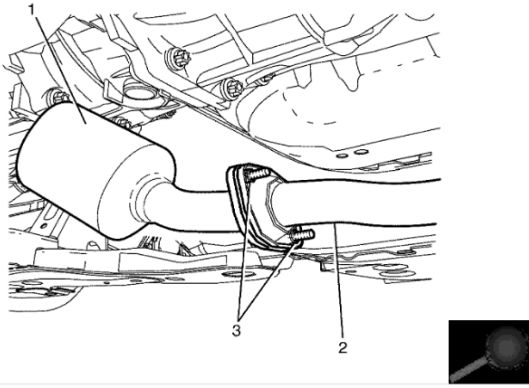
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).
4. Remove the right pre-catalytic converter heated oxygen sensor (HO2S) sensor. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 1](#).
5. Remove the right exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Right Side](#).



Note: The right catalytic converter to exhaust manifold retaining fasteners (1) are single use parts. They must be discarded after removal.

6. Remove the right catalytic converter to exhaust manifold retaining fasteners (3).
7. Discard the fasteners (3).
8. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

cardiagn.com

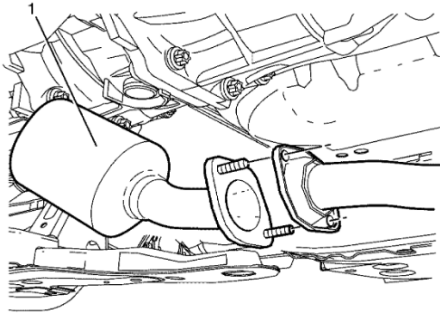


Note: The exhaust crossover pipe assembly to right catalytic converter retaining fasteners (3) are single use parts. They must be discarded after removal.

9. Remove the exhaust crossover pipe assembly to right catalytic converter retaining fasteners (3).
10. Discard the fasteners (3).



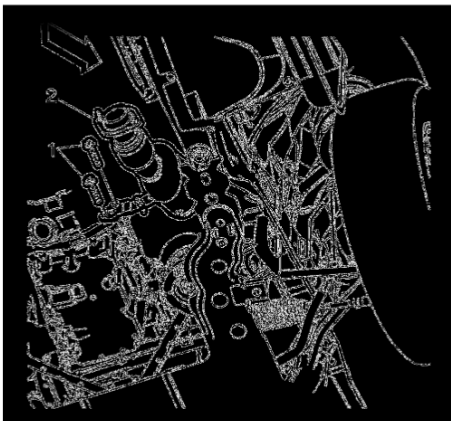
11. Remove the catalytic converter brace fasteners (1) and remove the catalytic converter (2).
12. Pull down and back on the right catalytic converter (1) to disconnect from the exhaust manifold.
13. Disconnect the exhaust crossover pipe assembly from the right catalytic converter (1).



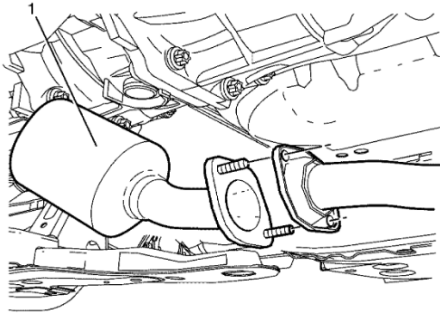
14. Remove the right catalytic converter (1) from the vehicle.
15. Lower the vehicle.
16. If replacing the catalytic converter, transfer the brace to the NEW one.

Installation Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

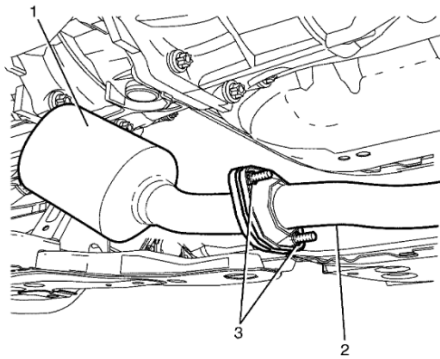


2. Loosely install the catalytic converter (2) to the bell housing and hand tighten the fasteners (1).



Note: Make sure that a **NEW** sealing ring is fitted prior to installation. Failure to comply may cause the exhaust system to perform poorly.

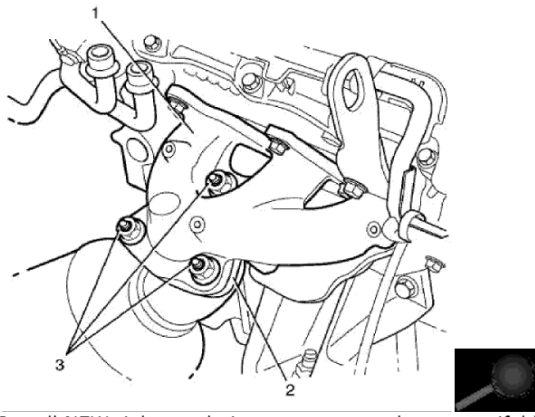
3. Install the right catalytic converter (1) to the vehicle.



4. Align the exhaust crossover pipe assembly (2) to the right catalytic converter (1).

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

5. Install NEW exhaust crossover pipe assembly to right catalytic converter retaining fasteners (3) and tighten to **40 N·m (30 lb ft)**.
6. Lower the vehicle.



7. Install NEW right catalytic converter to exhaust manifold retaining fasteners (1) and tighten to **45N•m (33 lb ft)**.
8. Make sure that the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining fasteners and re-align. Refer to [Exhaust System Alignment](#).



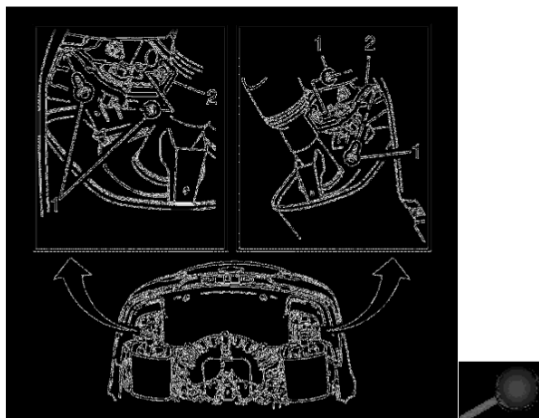
9. Tighten the catalytic brace fasteners (1) to **58N•m (43 lb ft)**.
10. Install the right exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement - Right Side](#).
11. Install the right pre-catalytic converter HO2S sensor. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 1](#).
12. Install the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).
13. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

Exhaust System Insulator, Hanger, Bracket Replacement

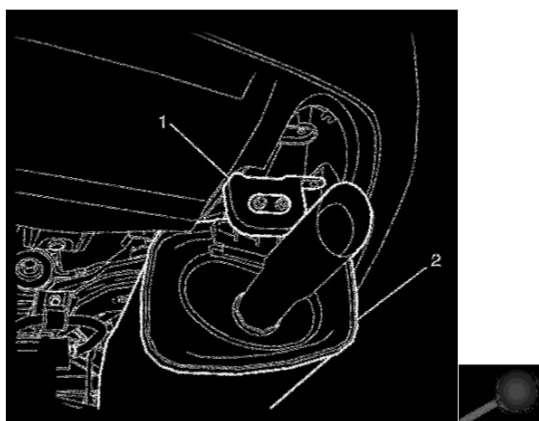
Removal Procedure

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

Warning: Refer to [Safety Glasses Warning](#).

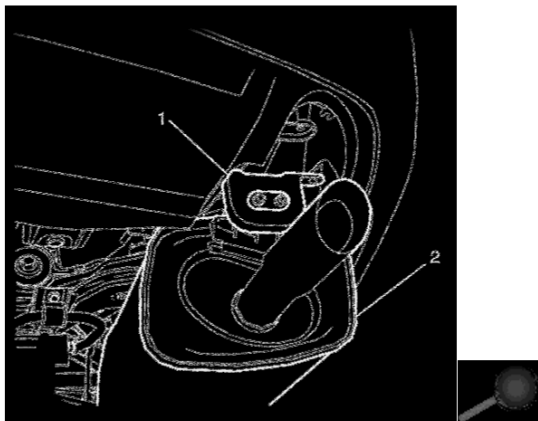


1. Remove the fasteners (1) to the rear muffler hanger bracket (2).

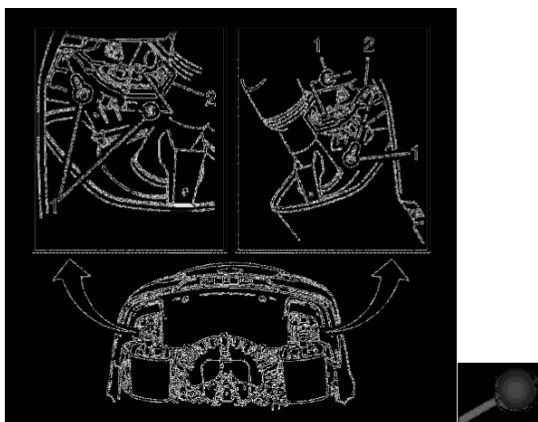


2. Remove the rear muffler hanger bracket (1) from the rear muffler (2).

Installation Procedure



1. Install the rear muffler hanger bracket (1) to the rear muffler (2).



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

2. Install the fasteners (1) to the rear muffler hanger bracket (2) and tighten to **22 N•m (16 lb ft)**.

Exhaust Hanger Mounting Bracket Replacement

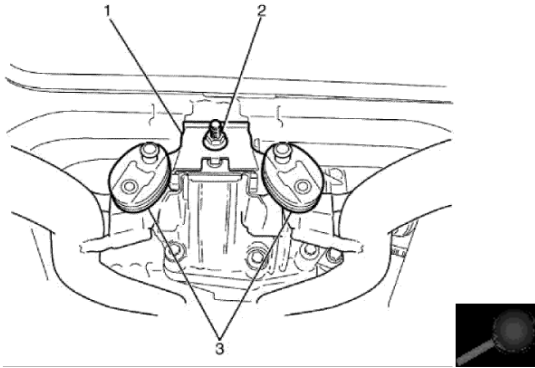
Removal Procedure

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

Warning: Refer to [Safety Glasses Warning](#).

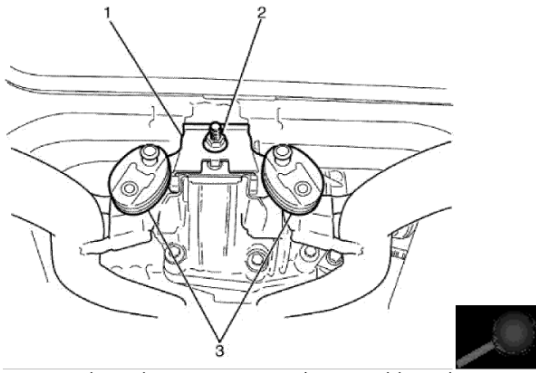
Warning: Refer to [Exhaust Service Warning](#).

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



2. Support the exhaust system with a suitable jack.
3. Remove the rubber insulators (3) by sliding them rearwards over the barbed ends of the exhaust hanger mounting bracket.
4. Remove the exhaust hanger mounting bracket retaining nut (2) and exhaust hanger mounting bracket (1) from the vehicle.

Installation Procedure



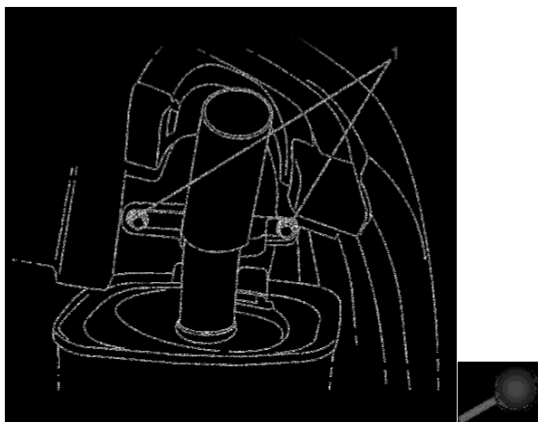
1. Support the exhaust system with a suitable jack.
- Caution:** Refer to [Fastener Caution](#).
2. Install the exhaust hanger mounting bracket (1) to the vehicle.
3. Install the exhaust hanger mounting bracket retaining nut (2) and tighten to **45 N·m (33 lb ft)**
4. Install the rubber insulators (3) by sliding them forwards over the barbed ends of the exhaust hanger mounting bracket.
5. Lower the vehicle.

Exhaust Rear Muffler Rear Hanger Replacement

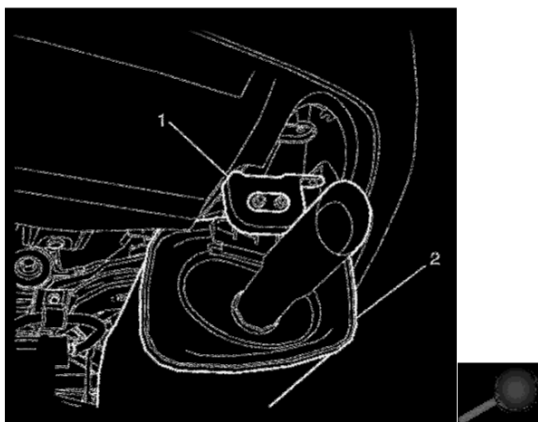
Removal Procedure

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

Warning: Refer to [Safety Glasses Warning](#).

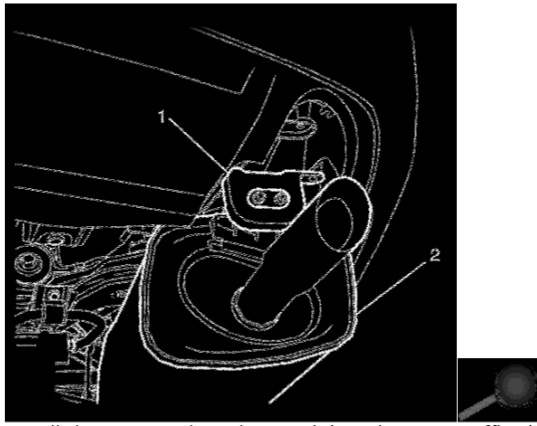


1. Remove the rear Insulator hanger to body retaining bolts (1).

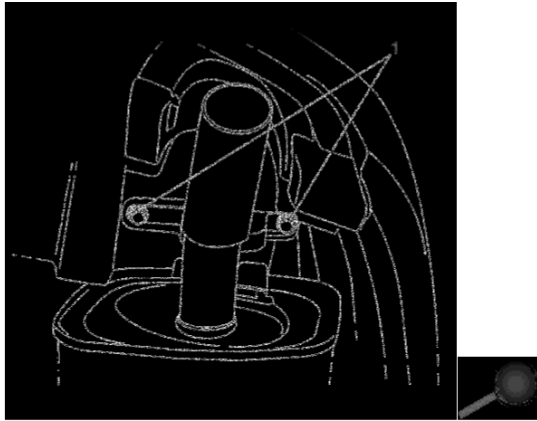


2. Remove the rear insulator hanger (1) from the rear muffler (2).

Installation Procedure



1. Install the rear insulator hanger (1) to the rear muffler (2).



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

2. Install the rear insulator hanger to body retaining bolts (1).

Tighten

Tighten the bolts to 26 N•m (19 lb ft).

Exhaust Muffler Replacement - Left Side (LFX)

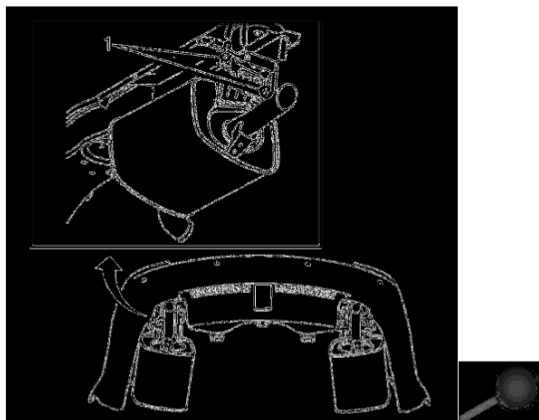
Removal Procedure

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

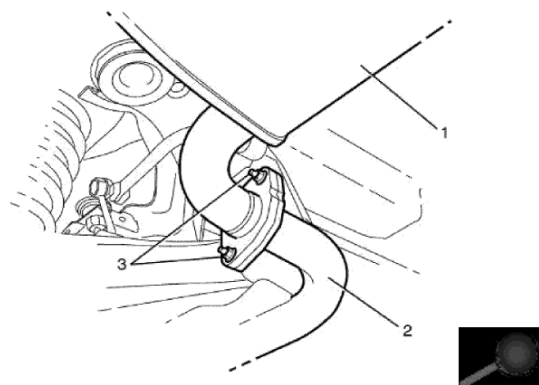
Warning: Refer to [Safety Glasses Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Support the exhaust system using a suitable jack.

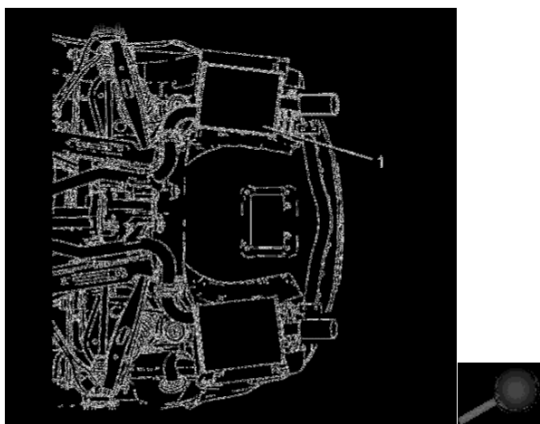


3. Remove the rear insulator hanger to body retaining fasteners (1).



Note: The left rear muffler to intermediate exhaust assembly retaining nuts (3) are single use parts. They must be discarded after removal.

4. Remove the left rear muffler to intermediate exhaust assembly retaining bolts (3).
5. Disconnect the left rear muffler (1) from the intermediate exhaust assembly (2).

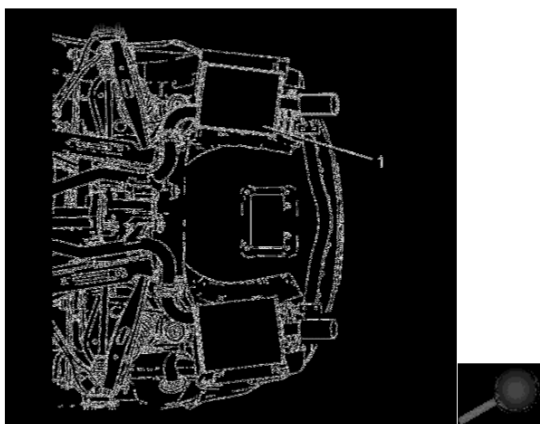


6. Remove the left rear muffler (1) from the vehicle.

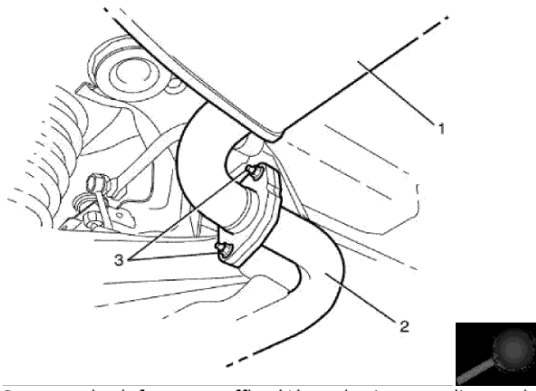
Installation Procedure

Note: The originally equipped exhaust extension pipe can be cut and reused when replacing a rear muffler. Only reuse if the extension pipe is in an acceptable condition.

1. Clean the threads of the rear exhaust assembly with a suitable cleaning solvent.



2. Install the left rear muffler (1) to the vehicle.



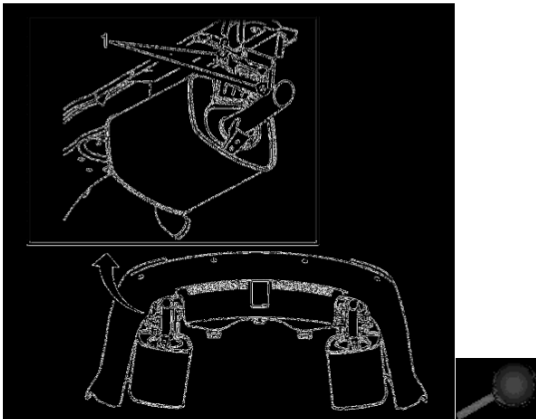
3. Connect the left rear muffler (1) to the intermediate exhaust assembly (2).

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

4. Install the left rear muffler to intermediate exhaust assembly retaining bolts (3).

Tighten

Tighten the bolts to 45 N·m (33 lb ft).



5. Install the rear insulator hanger to body retaining fasteners (1).

Tighten

Tighten the bolts to 26 N·m (19 lb ft).

6. Make sure that the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining nuts and re-align. Refer to [Exhaust System Alignment](#).
7. Lower the vehicle to the ground.

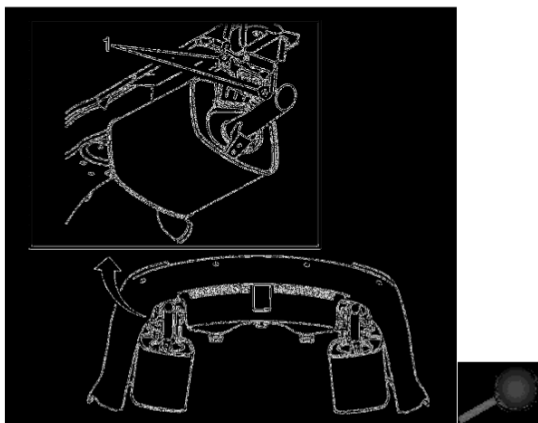
Exhaust Muffler Replacement - Left Side (LSA,LS3)

Removal Procedure

Warning: Refer to [Safety Glasses Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

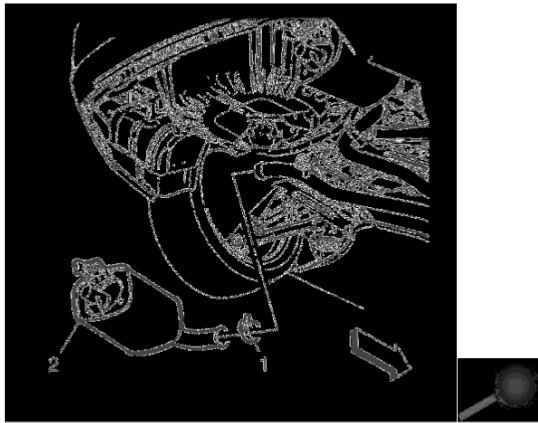


2. Remove the rear exhaust isolator hanger bracket fasteners (1).

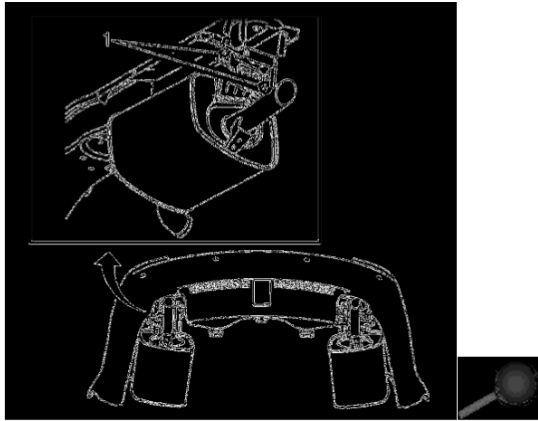


3. Loosen the left rear exhaust muffler clamp fastener (1) and remove the left rear exhaust muffler (2).

Installation Procedure



1. Install the left rear muffler (2) to the exhaust muffler with a NEW exhaust clamp.



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

2. Install the rear exhaust isolator hanger bracket fasteners (1) and tighten to **22 N·m (16 lb ft)**.



3. Tighten the left rear exhaust muffler clamp fastener (1) to **50 N·m (37 lb ft)**.

4. Lower the vehicle to the ground.
5. Start the vehicle and check for exhaust leaks.

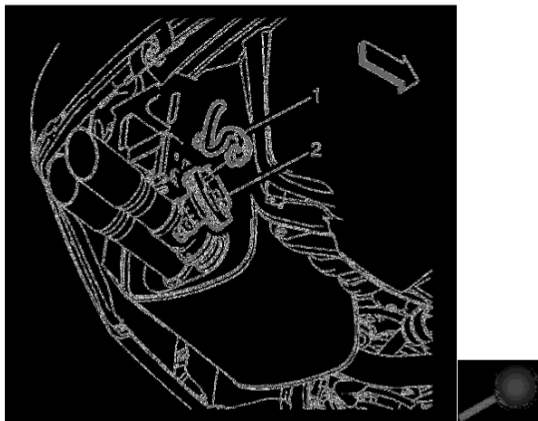
Exhaust Muffler Replacement - Left Side (HSV)

Removal Procedure

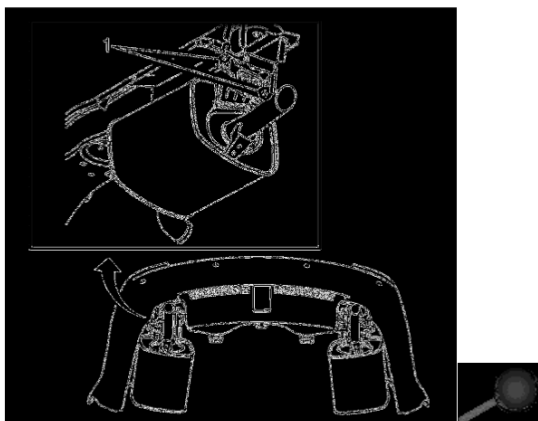
Warning: Refer to [Safety Glasses Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



2. Disconnect the vacuum connector (1) from the exhaust flow control valve (2).



3. Remove the rear exhaust isolator hanger bracket fasteners (1).

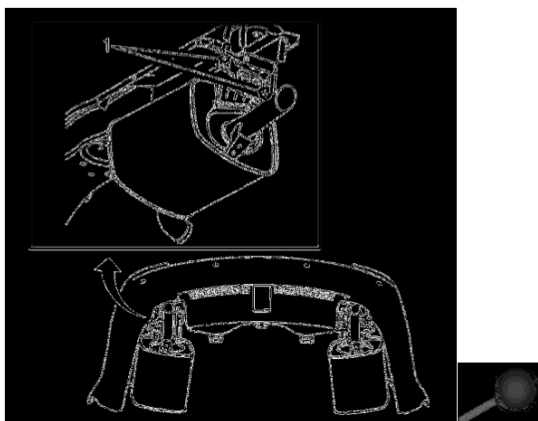


4. Loosen the left rear exhaust muffler clamp fastener (1) and remove the left rear exhaust muffler (2).

Installation Procedure

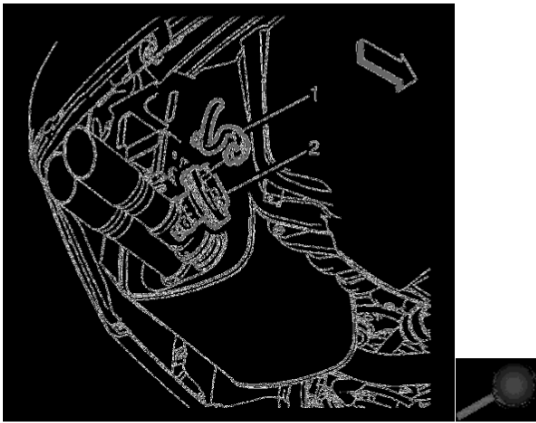


1. Install the left rear muffler (2) to the exhaust muffler with a NEW exhaust clamp.

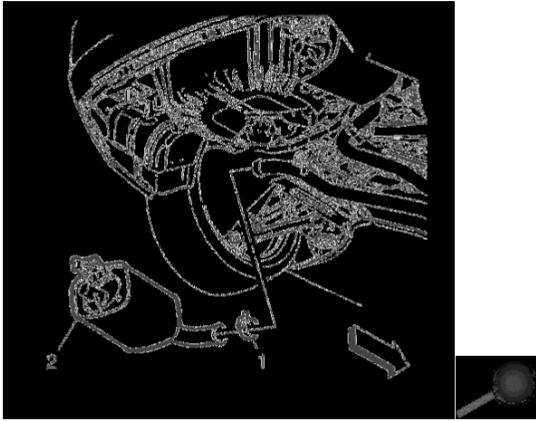


Caution: Refer to [Fastener Caution](#).

2. Install the rear exhaust isolator hanger bracket fasteners (1) and tighten to **22 N•m (16 lb ft)**.



3. Connect the vacuum connector (1) to the exhaust flow control valve (2).



4. Tighten the left rear exhaust muffler clamp fastener (1) to **50 N•m (37 lb ft)**.
5. Lower the vehicle to the ground.
6. Start the vehicle and check for exhaust leaks.

Exhaust Muffler Replacement - Right Side (LFX)

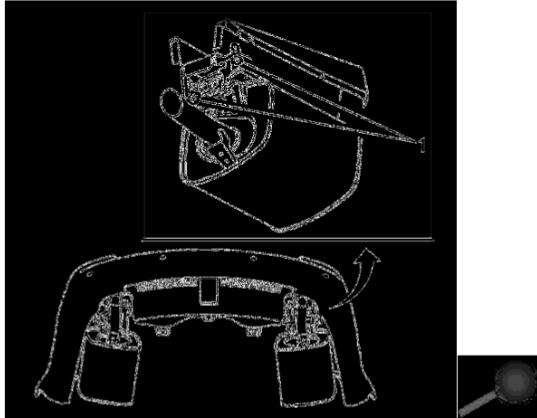
Removal Procedure

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

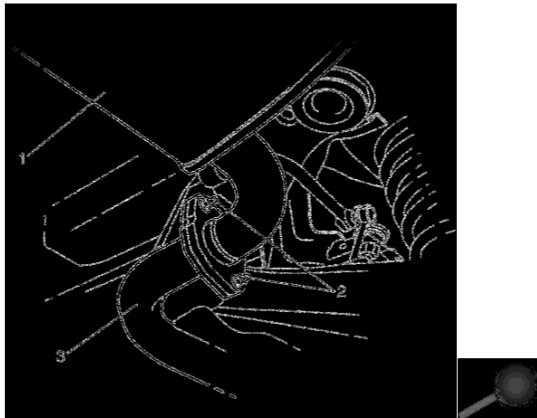
Warning: Refer to [Safety Glasses Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Support the exhaust system using a suitable jack.

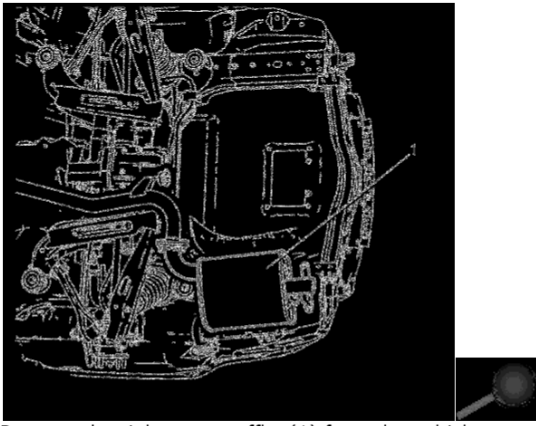


3. Remove the rear insulator hanger to body retaining fasteners (1).



Note: The right rear muffler to intermediate exhaust assembly retaining nuts (2) are single use parts. They must be discarded after removal.

4. Remove the right rear muffler to intermediate exhaust assembly retaining bolts (2).
5. Disconnect the right rear muffler (1) from the intermediate exhaust assembly (3).

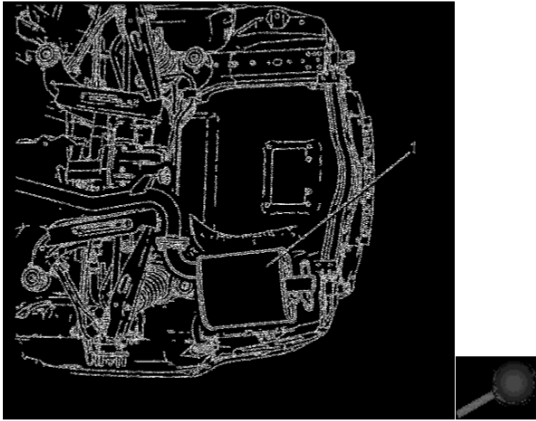


6. Remove the right rear muffler (1) from the vehicle.

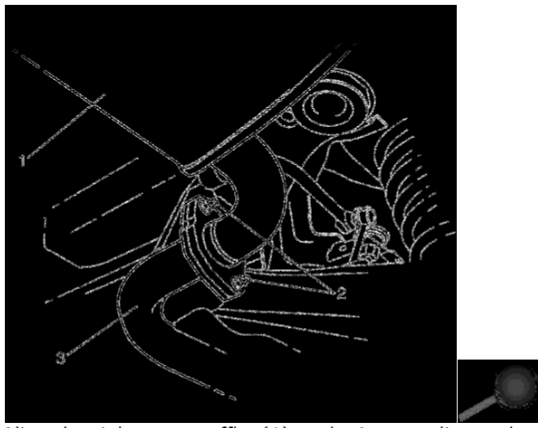
Installation Procedure

Note: The originally equipped exhaust extension pipe can be cut and reused when replacing a rear muffler. Only reuse if the extension pipe is in an acceptable condition.

1. Clean the threads of the rear exhaust assembly with a suitable cleaning solvent.



2. Install the right rear muffler (1) to the vehicle.



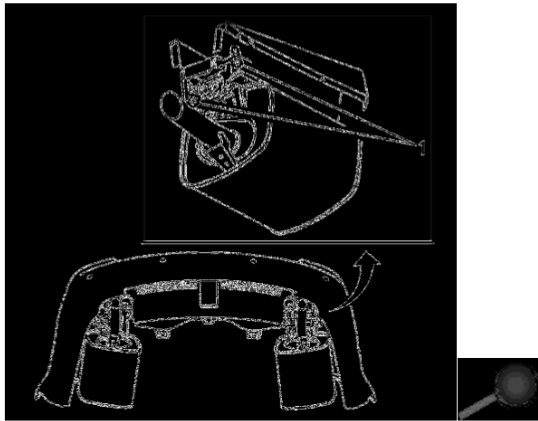
3. Align the right rear muffler (1) to the intermediate exhaust assembly (3).

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

4. Install the right rear muffler to intermediate exhaust assembly retaining bolts (2).

Tighten

Tighten the bolts to 45 N•m (33 lb ft).



5. Install the rear insulator hanger to body retaining fasteners (1).

Tighten

Tighten the bolts to 26 N•m (19 lb ft).

6. Make sure that the exhaust system is clear of all other components and chassis. If the exhaust system is not clear of all the other components loosen all retaining nuts and re-align. Refer to [Exhaust System Alignment](#).
7. Lower the vehicle.

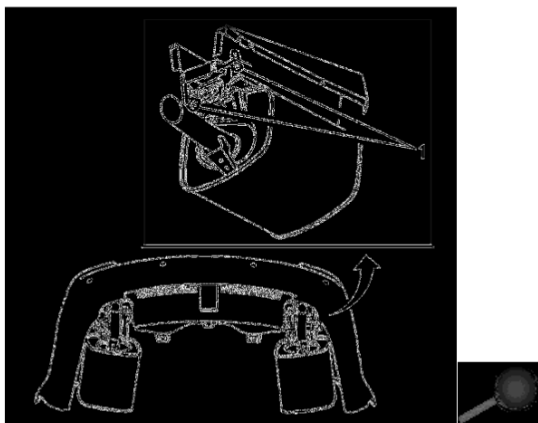
Exhaust Muffler Replacement - Right Side (LSA,LS3)

Removal Procedure

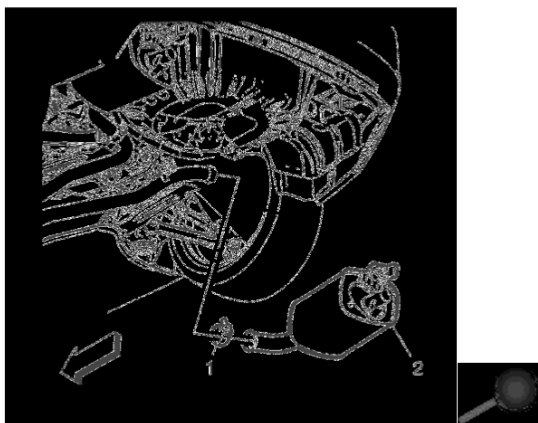
Warning: Refer to [Safety Glasses Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

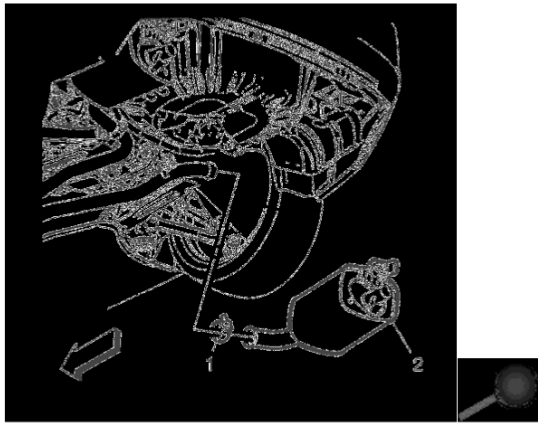


2. Remove the right rear exhaust isolator hanger bracket fasteners (1).

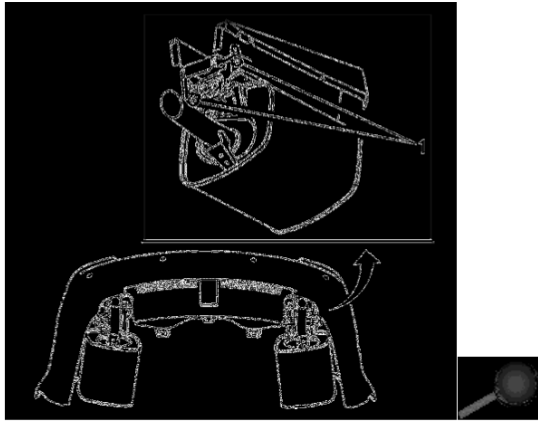


3. Loosen the right rear muffler clamp fastener (1) and remove the right rear muffler (2).

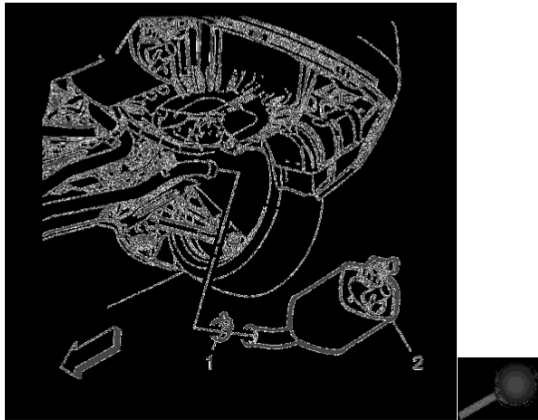
Installation Procedure



1. Install the right rear muffler (2) to the exhaust muffler with a NEW exhaust muffler clamp.



2. Install the right rear exhaust isolator hanger bracket mounting fasteners (1) and tighten to **22 N·m (16 lb ft)**.



3. Tighten the right rear muffler exhaust clamp fastener (1) to **50 N·m (37 lb ft)**.
4. Lower the vehicle.

5. Start the vehicle and check for exhaust leaks.

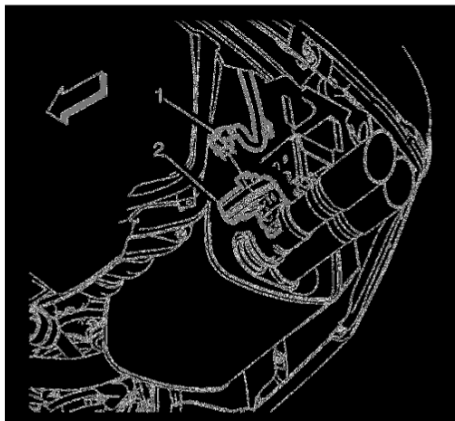
Exhaust Muffler Replacement - Right Side (HSV)

Removal Procedure

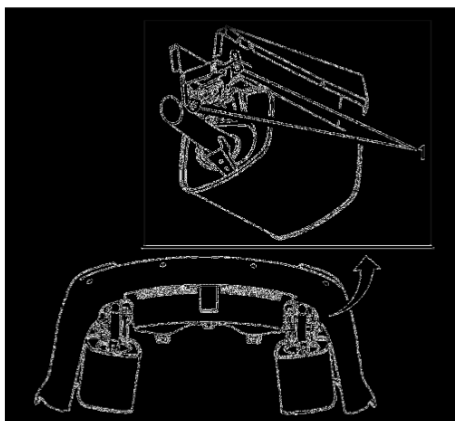
Warning: Refer to [Safety Glasses Warning](#).

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

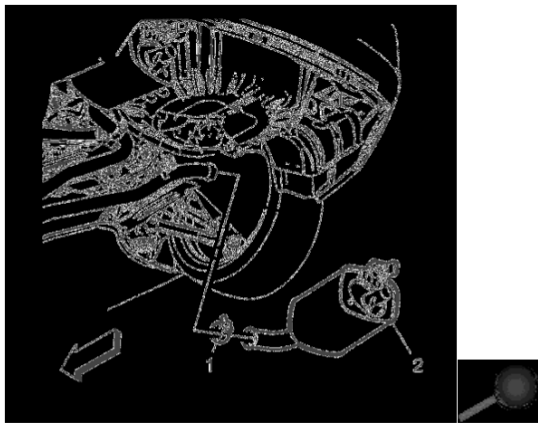
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



2. Disconnect the vacuum connector (1) from the exhaust flow control valve (2).

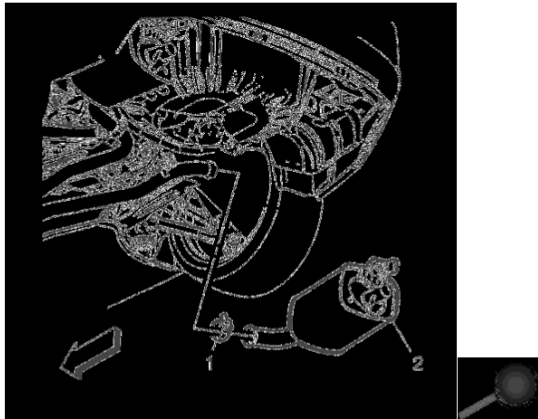


3. Remove the right rear exhaust isolator hanger bracket fasteners (1).

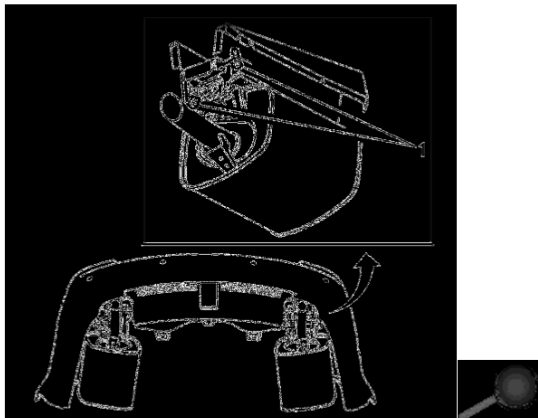


4. Loosen the right rear muffler clamp fastener (1) and remove the right rear muffler (2).

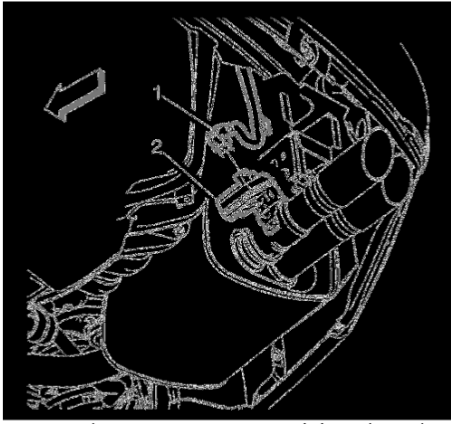
Installation Procedure



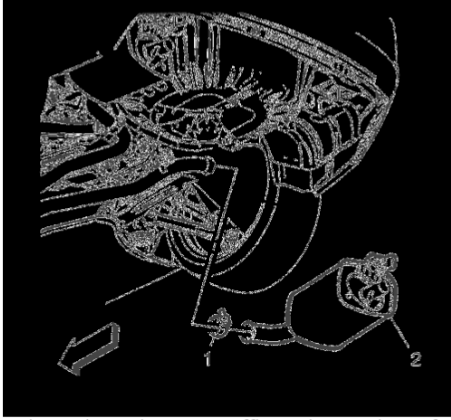
1. Install the right rear muffler (2) to the exhaust muffler with a NEW exhaust muffler clamp.



2. Install the right rear exhaust isolator hanger bracket mounting fasteners (1) and tighten to **22 N·m (16 lb ft)**.



3. Connect the vacuum connector (1) to the exhaust flow control valve (2).

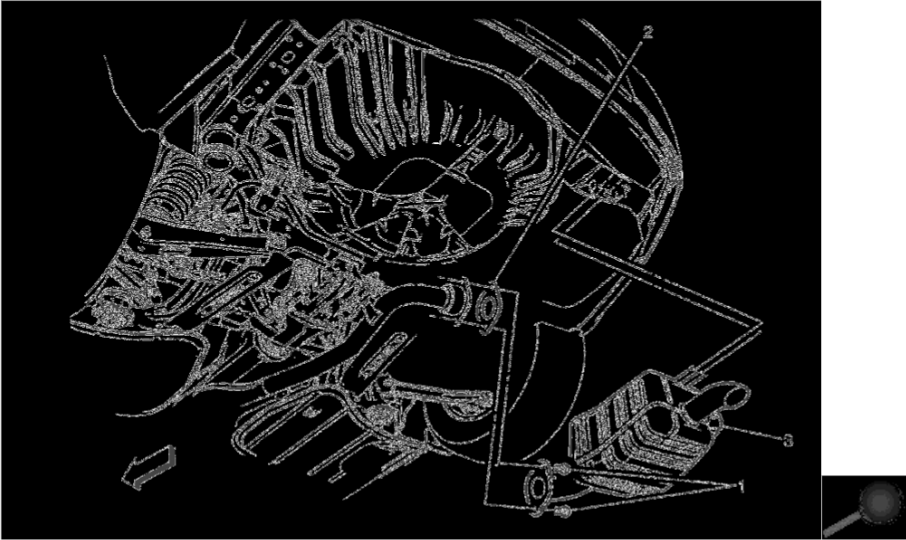


4. Tighten the right rear muffler exhaust clamp fastener (1) to **50 N•m (37 lb ft)**.

5. Lower the vehicle.

6. Start the vehicle and check for exhaust leaks.

Exhaust Muffler Replacement - Right Side (LFW)

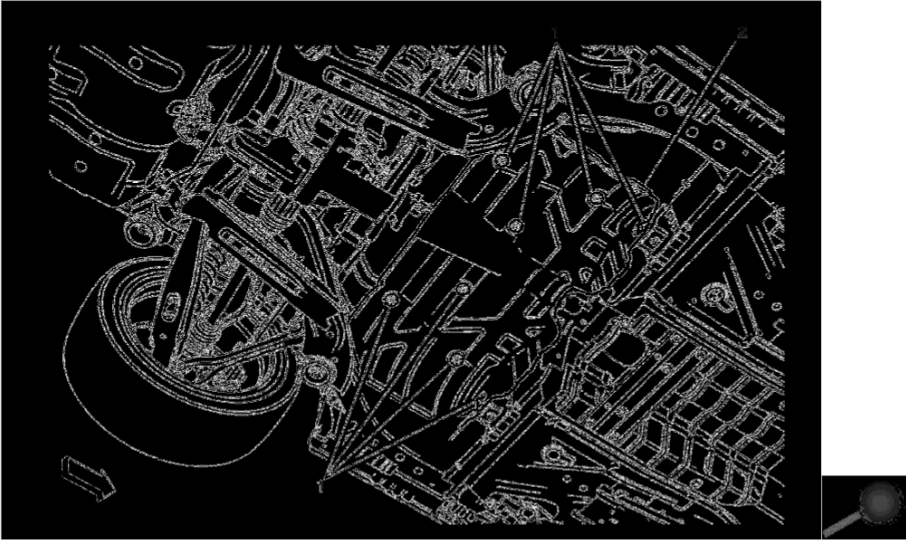


Exhaust Muffler Replacement - Right Side

Callout	Component Name
Warning: Refer to Moving Parts and Hot Surfaces Warning. Warning: Refer to Safety Glasses Warning. Preliminary Procedure Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.	
1	Exhaust Muffler Fasteners (Qty: 2) Caution: Refer to Fastener Caution . Tighten 45 N·m (33 lb ft)
2	Exhaust Gasket Note: Replace with a NEW exhaust gasket.
3	Exhaust Muffler - Right Rear

cardiagn.com

Exhaust Heat Shield Replacement (LWR)

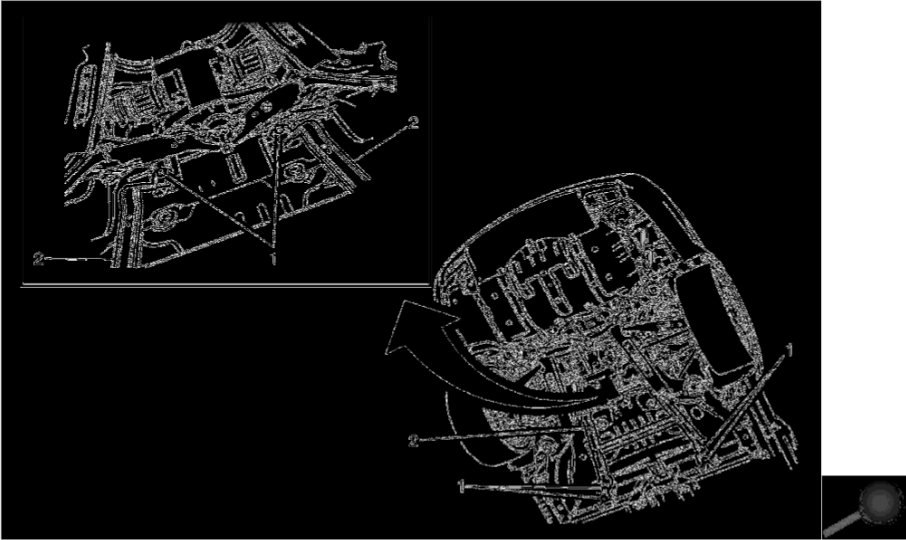


Exhaust Heat Shield Replacement

Callout	Component Name
Preliminary Procedure 1. Lift and support the vehicle. Refer to Lifting and Jacking the Vehicle. 2. Remove the exhaust system. Refer to Exhaust System Replacement. 3. Remove the propeller shaft. Refer to Propeller Shaft Replacement.	
1	Exhaust Heat Shield Fasteners (Qty: 8) Caution: Refer to Fastener Caution .
2	Exhaust Heat Shield

cardiagn.com

Exhaust Heat Shield Bracket Replacement (LWR)



Exhaust Heat Shield Bracket Replacement

Callout	Component Name
Preliminary Procedure Remove the exhaust heat shield. Refer to Exhaust Heat Shield Replacement .	
1	Exhaust Heat Shield Bracket Fasteners (Qty: 6) Caution: Refer to Fastener Caution . Tighten 30 N•m (22 lb ft)
2	Exhaust Heat Shield Bracket

cardiagn.com

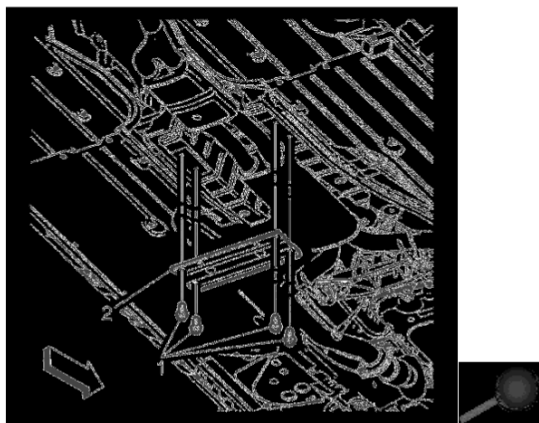
Exhaust Muffler Intermediate Heat Shield Replacement

Removal Procedure

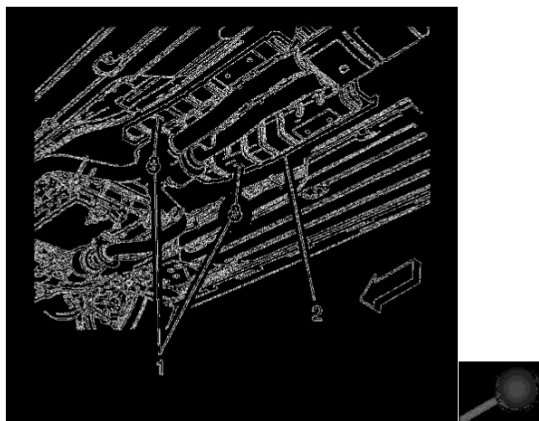
Warning: Refer to [Exhaust Service Warning](#).

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



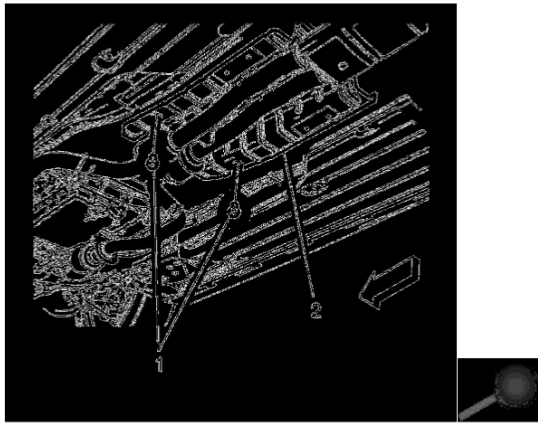
2. Remove the underbody brace mounting fasteners (1).
3. Remove the underbody brace (2).



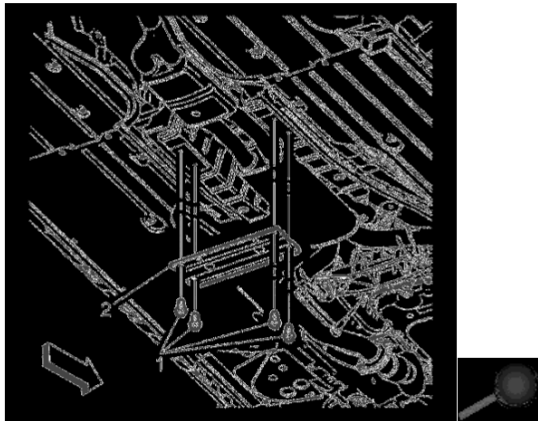
4. Remove the exhaust heat shield fasteners (1) and remove the exhaust heat shield (2).

Installation Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



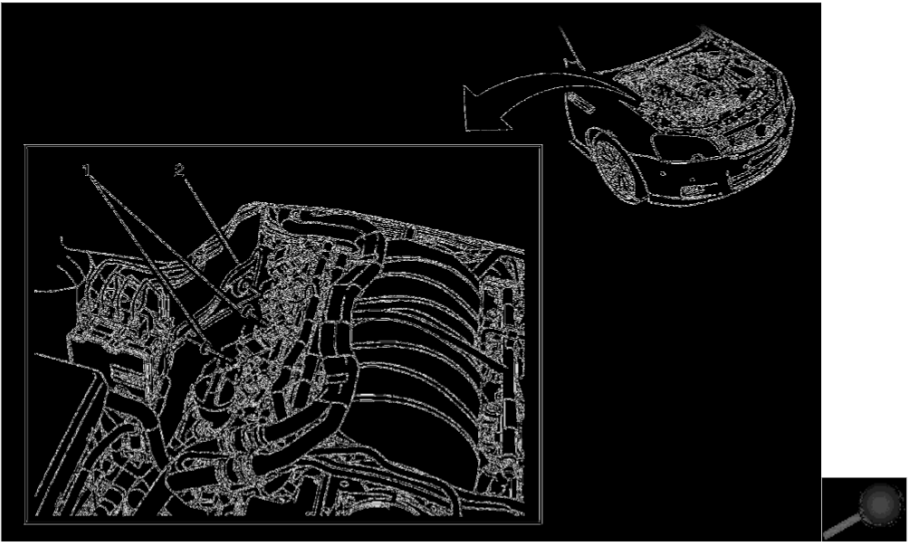
2. Install the exhaust heat shield (2) into position.
3. Install the exhaust heat shield fasteners (1) and tighten to **4 N·m (35 lb in)**.



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

4. Install the underbody brace (2) and tighten the fasteners (1) to **58 N·m (43 lb ft)**.
5. Lower the vehicle.

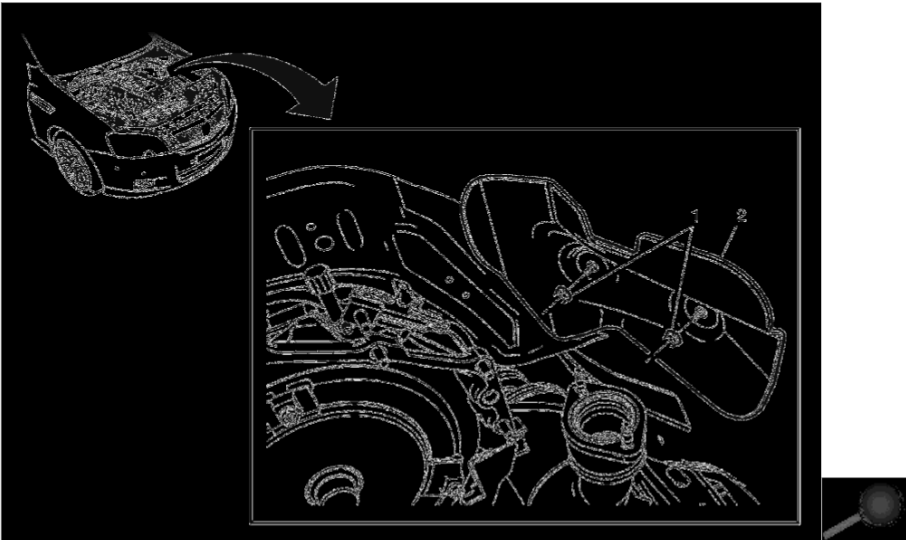
Exhaust Heat Shield Replacement - Dash Panel (LHD)



Exhaust Heat Shield Replacement - Dash Panel

Callout	Component Name
Warning: Refer to Moving Parts and Hot Surfaces Warning. Warning: Refer to Safety Glasses Warning. Preliminary Procedure Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement or the engine cover. Refer to Engine Cover Replacement.	
1	Heat Shield Fasteners (Qty: 2) Caution: Refer to Fastener Caution . Tighten 4.5 N·m (40 lb in)
2	Heat Shield

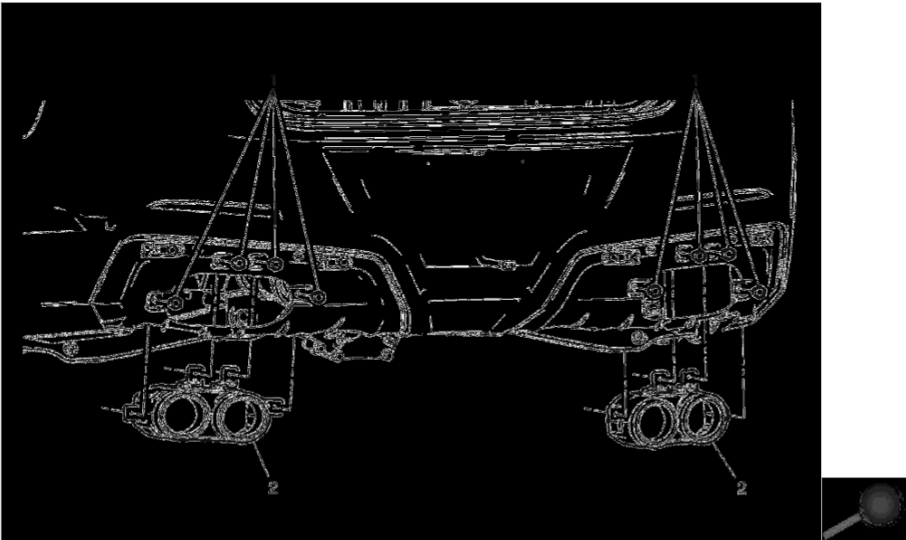
Exhaust Heat Shield Replacement - Dash Panel (RHD)



Exhaust Heat Shield Replacement - Dash Panel

Callout	Component Name
Warning: Refer to Moving Parts and Hot Surfaces Warning. Warning: Refer to Safety Glasses Warning. Preliminary Procedure Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement or the engine cover. Refer to Engine Cover Replacement.	
1	Heat Shield Fasteners (Qty: 2) Caution: Refer to Fastener Caution . Tighten 4.5 N·m (40 lb in)
2	Heat Shield

Exhaust Heat Shield Replacement - Rear Fascia



Exhaust Heat Shield Replacement - Rear Fascia

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Remove the exhaust system. Refer to Exhaust System Replacement . 3. Remove the rear bumper fascia insert. Refer to Rear Bumper Fascia Insert Replacement .	
1	Exhaust Heat Shield Rear Fascia Fasteners (Qty: 4) Caution: Refer to Fastener Caution . Tighten 4 N·m (35 lb in)
2	Exhaust Heat Shield Rear Fascia

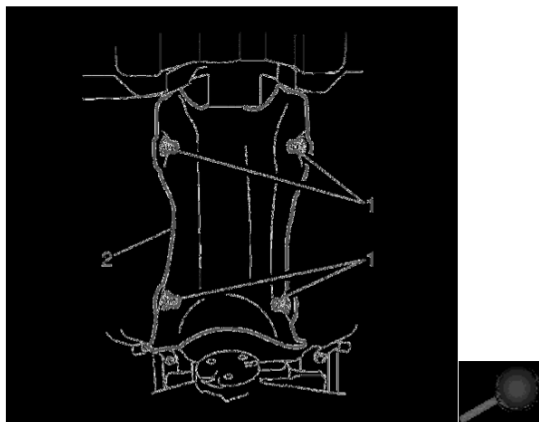
Fuel Tank Heat Shield Replacement

Removal Procedure

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

Warning: Refer to [Safety Glasses Warning](#).

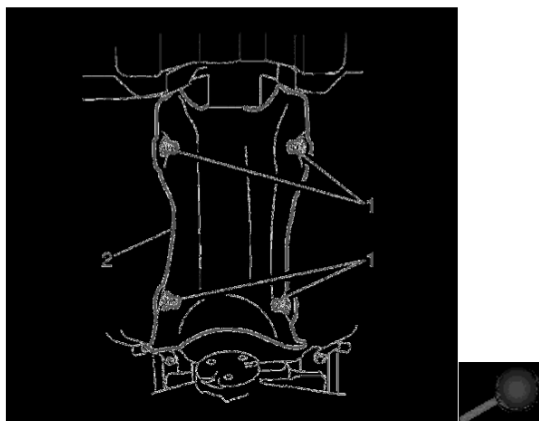
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



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

2. Remove the fuel tank heat shield to fuel tank retaining nuts (1).
3. Remove the fuel tank heat shield (2).

Installation Procedure



1. Position the fuel tank heat shield (2) to the vehicle.

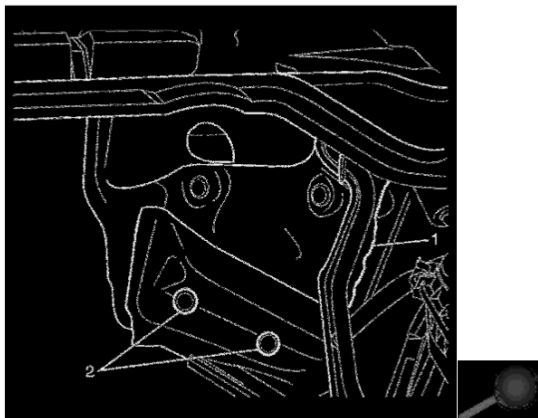
Caution: Refer to [Fastener Caution](#).

© 2014 General Motors. All rights reserved.

2. Install the fuel tank heat shield to fuel tank retaining nuts (1) and tighten to **4 N•m (35 lb in)**.
3. Lower the vehicle to the ground.

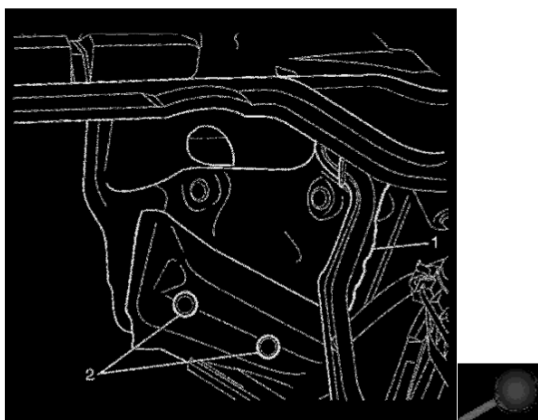
Exhaust Manifold Heat Shield Replacement (RHD)

Removal Procedure



1. Remove the exhaust manifold heat shield to air box retaining clips (2).
2. Remove the exhaust manifold heat shield (1) from the vehicle.

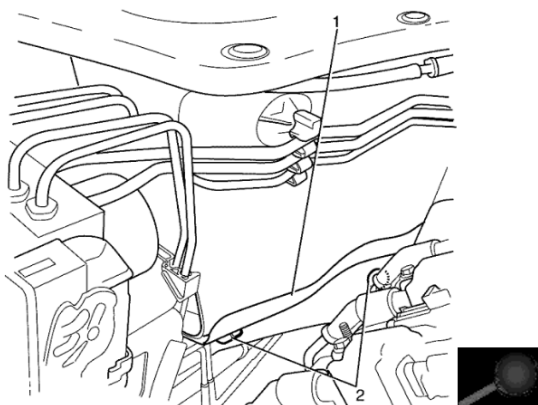
Installation Procedure



1. Install the exhaust manifold heat shield to the vehicle (1)
2. Install the exhaust manifold heat shield to air box retaining clips (2)

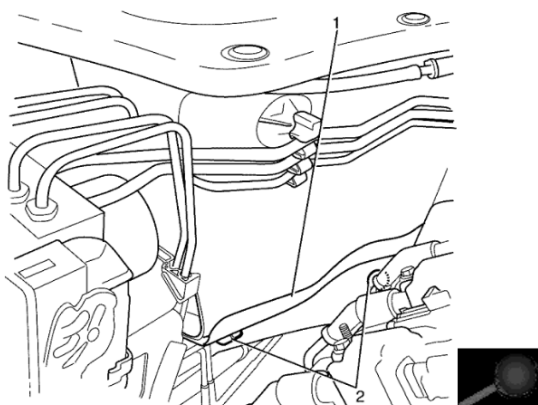
Exhaust Manifold Heat Shield Replacement (LHD)

[Removal Procedure](#)



1. Remove the exhaust manifold heat shield to air box retaining clips (2).
2. Remove the exhaust manifold heat shield (1) from the vehicle.

[Installation Procedure](#)

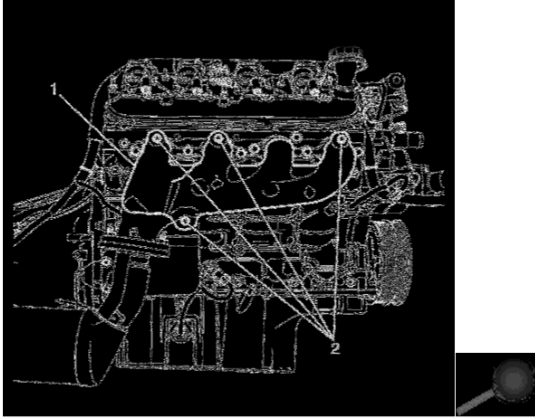


1. Install the exhaust manifold heat shield (1) to the vehicle.
2. Install the exhaust manifold heat shield to air box retaining clips (2).

Exhaust Manifold Heat Shield Replacement - Right Side (V8)

Removal Procedure

1. Remove the engine cover. Refer to [Engine Cover Replacement](#).
2. Remove the oil level indicator tube. Refer to [Oil Level Indicator Tube Replacement](#).

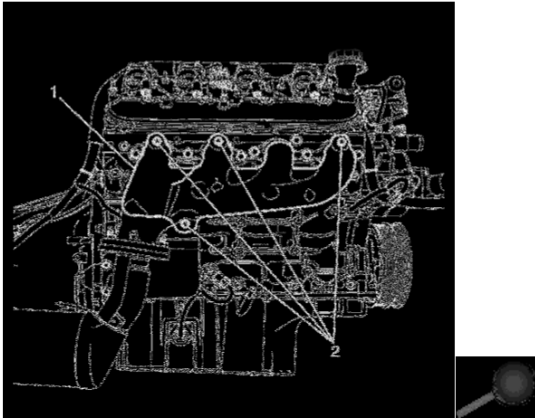


Warning: Refer to [Exhaust Service Warning](#).

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

3. Remove the exhaust manifold heat shield to exhaust manifold retaining bolts (2).
4. Remove the exhaust manifold heat shield (1) from the exhaust manifold.

Installation Procedure



1. Position the exhaust manifold heat shield (1) to the exhaust manifold.

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

2. Install the exhaust manifold heat shield to exhaust manifold retaining bolts (2) and tighten to **10 N·m (89 lb in)**.
3. Install the oil level indicator tube. Refer to [Oil Level Indicator Tube Replacement](#).
4. Install the engine cover. Refer to [Engine Cover Replacement](#).

Exhaust Manifold Heat Shield Replacement - Right Side (LWR)

Removal Procedure

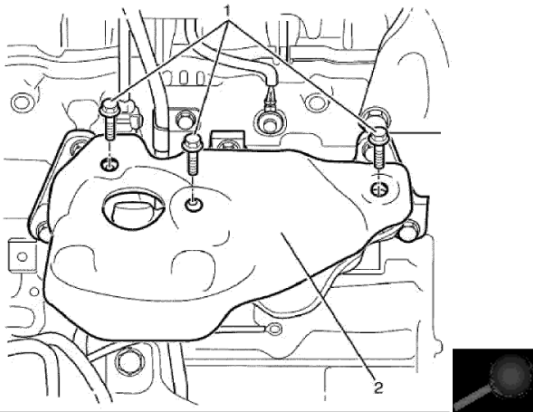
Warning: Refer to [Exhaust Service Warning](#).

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

1. Ignition OFF.

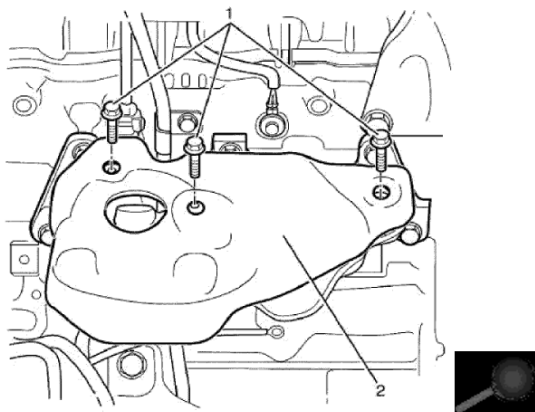
Warning: Refer to [Battery Disconnect Warning](#).

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).
4. Remove the right pre-catalytic converter heated oxygen sensor (HO2S). Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 1](#).



5. Remove the exhaust manifold heat shield to exhaust manifold retaining fasteners (1).
6. Remove the exhaust manifold heat shield (2).

Installation Procedure



1. Install the exhaust manifold heat shield (2).

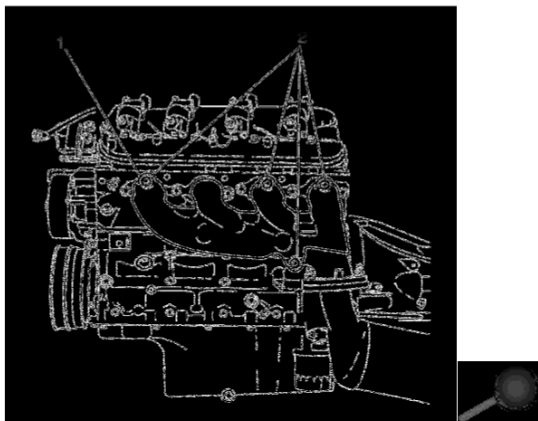
Caution: Refer to [Fastener Caution](#).

2. Install the exhaust manifold heat shield to exhaust manifold retaining fasteners (1) and tighten to **10N•m (89 lb in)**.
3. Install the right pre-catalytic converter HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 1 Sensor 1](#).
4. Install the intake manifold sight shield. Refer to [Intake Manifold Sight Shield Replacement](#).
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

Exhaust Manifold Heat Shield Replacement - Left Side (V8)

Removal Procedure

1. Remove the engine dress cover. Refer to [Engine Cover Replacement](#).

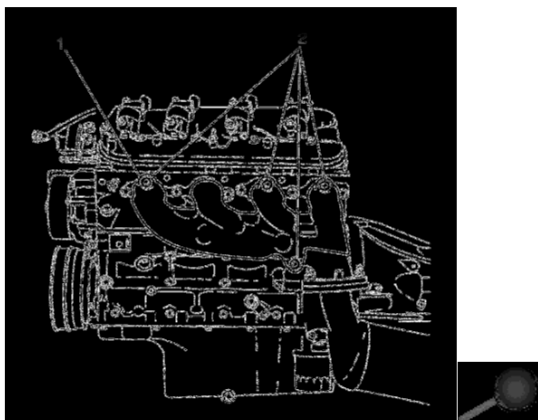


Warning: Refer to [Exhaust Service Warning](#).

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

2. Remove the exhaust manifold heat shield to exhaust manifold retaining bolts (2).
3. Remove the exhaust manifold heat shield (1) from the exhaust manifold.

Installation Procedure



1. Position the exhaust manifold heat shield (1) to the exhaust manifold.
2. Install the exhaust manifold heat shield to exhaust manifold retaining bolts (2) and tighten to **10 N•m (89 lb in)**.

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

3. Install the engine dress cover. Refer to [Engine Cover Replacement](#).

Exhaust Manifold Heat Shield Replacement - Left Side (LWR)

Removal Procedure

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

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

1. Ignition OFF.

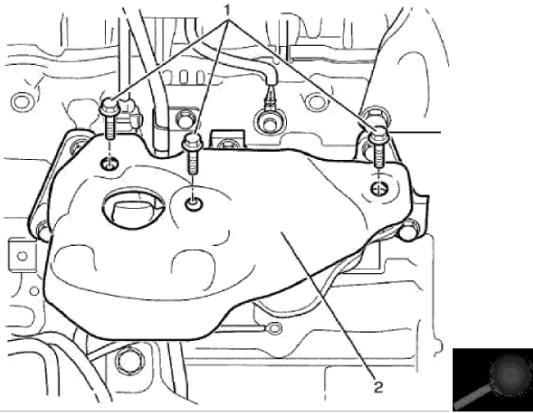
Warning: Refer to [Battery Disconnect Warning](#).

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

3. Remove the engine cover. Refer to [Intake Manifold Sight Shield Replacement](#).

4. Remove the left pre-catalytic converter heated oxygen sensor (HO2S). Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).

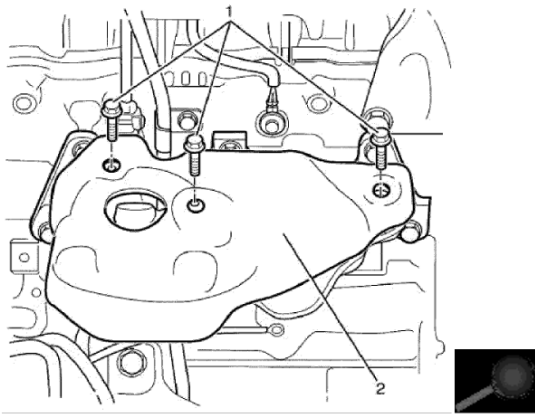
5. For RHD vehicles, remove the dash panel exhaust manifold heat shield. Refer to [Exhaust Heat Shield Replacement - Dash Panel](#).



6. Remove the exhaust manifold heat shield to exhaust manifold retaining fasteners (1).

7. Remove the exhaust manifold heat shield (2).

Installation Procedure

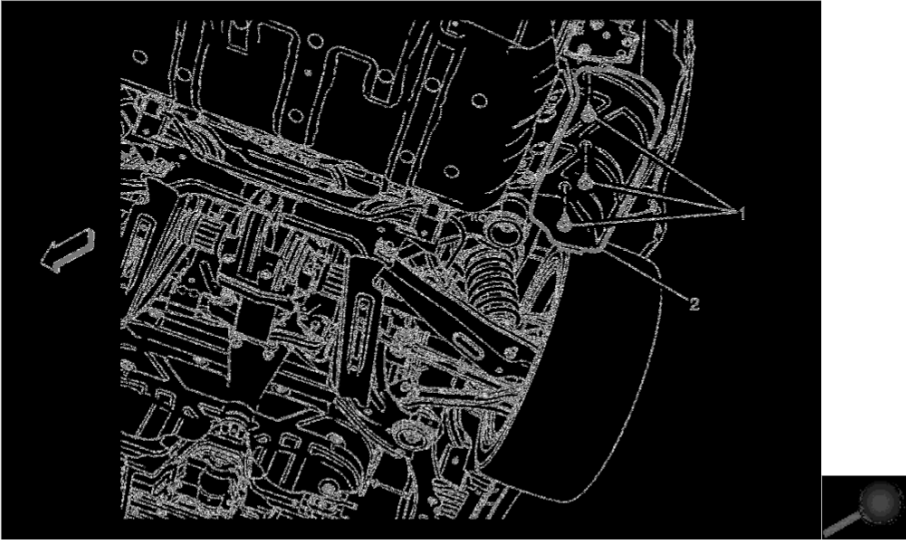


1. Install the exhaust manifold heat shield (2).

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

2. Install the exhaust manifold heat shield to exhaust manifold retaining fasteners (2) and tighten to **10N•m (89 lb in)**.
3. For RHD vehicles, install the dash panel exhaust manifold heat shield. Refer to [Exhaust Heat Shield Replacement - Dash Panel](#).
4. Install the left pre-catalytic convertor HO2S. Refer to [Heated Oxygen Sensor Replacement - Bank 2 Sensor 1](#).
5. Install the engine cover. Refer to [Intake Manifold Sight Shield Replacement](#).
6. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

Exhaust Muffler Heat Shield Replacement (LWR)



Exhaust Muffler Heat Shield Replacement

Callout	Component Name
Preliminary Procedure 1. Lift and support the vehicle. Refer to Lifting and Jacking the Vehicle. 2. Remove the exhaust system. Refer to Exhaust System Replacement.	
1	Exhaust Muffler Heat Shield Fasteners (Qty: 3) Caution: Refer to Fastener Caution. Tighten 4 N·m (35 lb in)
2	Exhaust Muffler Heat Shield

Exhaust Muffler Heat Shield Replacement - Right Side

Removal Procedure

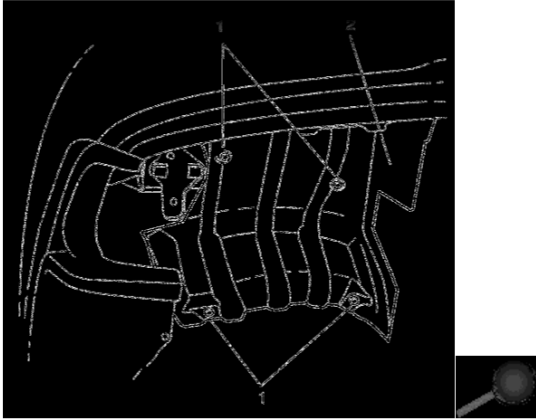
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

Warning: Refer to [Safety Glasses Warning](#).

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

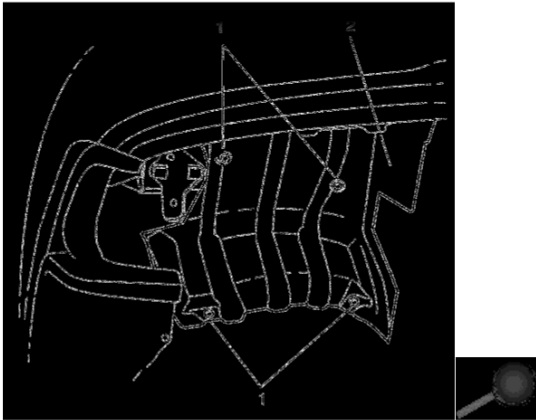
Warning: Refer to [Exhaust Service Warning](#).

2. Remove the right rear muffler assembly. Refer to [Exhaust Muffler Replacement - Right Side](#).



3. Remove the right exhaust muffler heat shield to body retaining bolts (1).
4. Remove the right exhaust muffler heat shield (2).

Installation Procedure



1. Position the right exhaust muffler heat shield (2) to the vehicle.

© 2014 General Motors. All rights reserved.

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

2. Install the right exhaust muffler heat shield to body retaining bolts (1) and tighten to **4 N•m (35 lb in)**.
3. Install the right rear muffler assembly. Refer to [Exhaust Muffler Replacement - Right Side](#).
4. Lower the vehicle to the ground.

Exhaust Muffler Heat Shield Replacement - Left Side

Removal Procedure

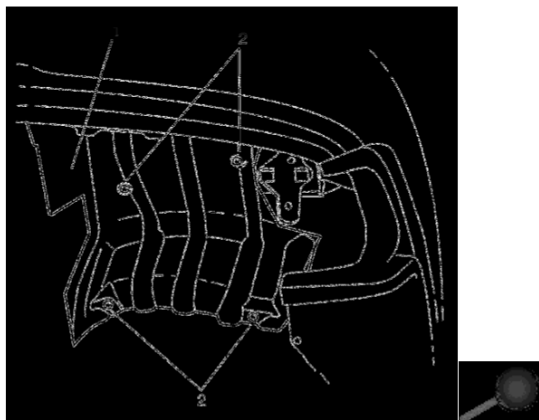
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

Warning: Refer to [Safety Glasses Warning](#).

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

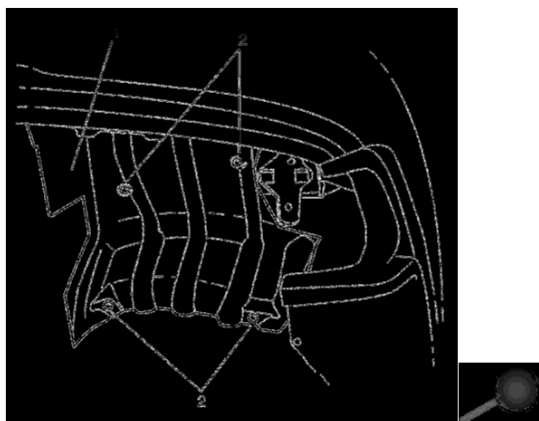
Warning: Refer to [Exhaust Service Warning](#).

2. Remove the left rear muffler assembly. Refer to [Exhaust Muffler Replacement - Left Side](#).



3. Remove the left exhaust muffler heat shield to body retaining bolts (2).
4. Remove the left exhaust muffler heat shield (1).

Installation Procedure



1. Position the left exhaust muffler heat shield (1) to the vehicle.

© 2014 General Motors. All rights reserved.

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

2. Install the left exhaust muffler heat shield to body retaining bolts (2) and tighten to **4 N•m (35 lb in)**.
3. Install the left rear muffler assembly. Refer to [Exhaust Muffler Replacement - Left Side](#).
4. Lower the vehicle to the ground.

Exhaust Heat Shield Replacement - Center

Removal Procedure

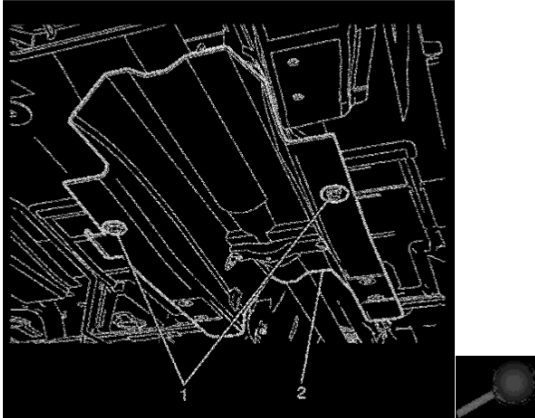
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

Warning: Refer to [Safety Glasses Warning](#).

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

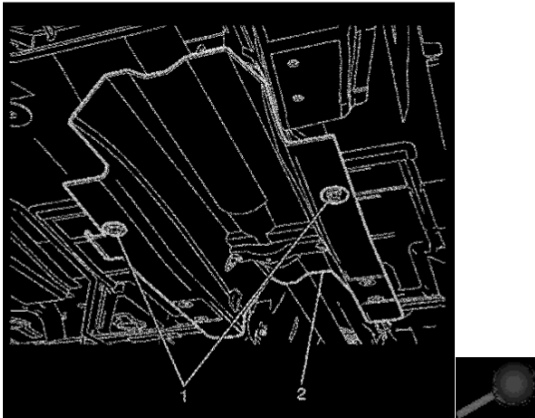
Warning: Refer to [Exhaust Service Warning](#).

2. Remove the intermediate exhaust assembly. Refer to [Exhaust Crossover Pipe Replacement](#).



3. Remove the center exhaust heat shield to body retaining bolts (1).
4. Remove the center exhaust heat shield (2).

Installation Procedure



1. Position the center exhaust heat shield (2) to the vehicle.

© 2014 General Motors. All rights reserved.

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

2. Install the center exhaust heat shield to body retaining bolts (1) and tighten to **4 N·m (35 lb in)**.
3. Install the intermediate exhaust assembly. Refer to [Exhaust Crossover Pipe Replacement](#).
4. Lower the vehicle to the ground.

Fastener Tightening Specifications

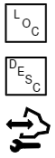
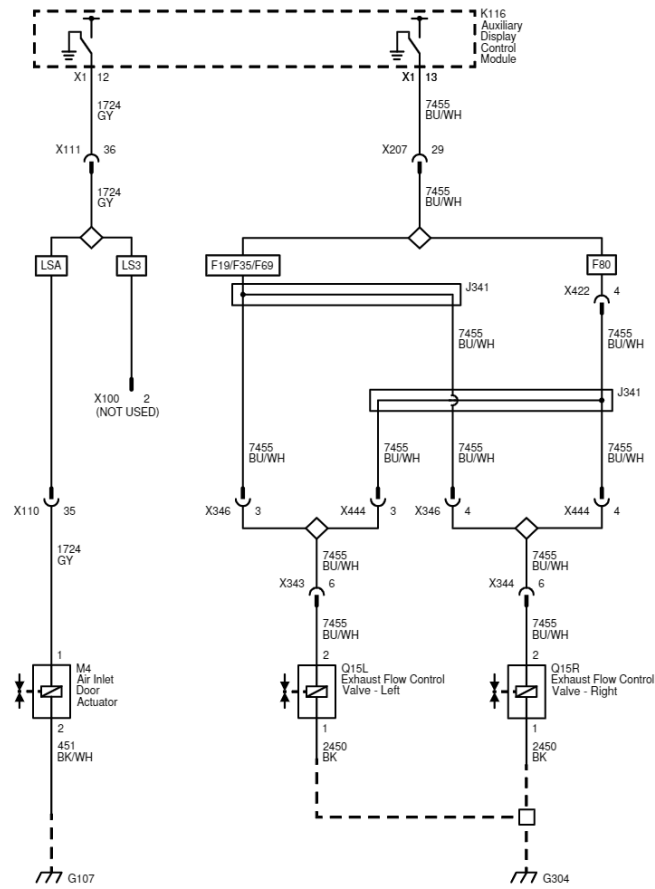
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter to Bell Housing Brace (LWR)	21 N•m	15 lb ft
Catalytic Converter Brace Fasteners (LWR)	58 N•m	43 lb ft
Catalytic Converter to Exhaust Manifold Retaining Nuts (LWR)	45 N•m	33 lb ft
Catalytic Converter to Exhaust Manifold Retaining Nuts (V8)	45 N•m	33 lb ft
Catalytic Converter to Cylinder Head Retaining Studs (LFX)	18 N•m	13 lb ft
Catalytic Converter to Cylinder Head Retaining Nuts (LFX)	50 N•m	37 lb ft
Catalytic Converter to Exhaust Muffler (LSA,LS3)	40 N•m	30 lb ft
Centre Exhaust Heat Shield to Body Retaining Bolts	4 N•m	35 lb in
Exhaust Hanger Mounting Bracket to Differential Retaining Nut	45 N•m	33 lb ft
Exhaust Heat Shield Rear Facia	4 N•m	35 lb in
Exhaust Manifold Heat Shield to Exhaust Manifold Retaining Bolts (V6)	10 N•m	89 lb in
Exhaust Manifold Heat Shield to Exhaust Manifold Retaining Bolts (V8)	10 N•m	89 lb in
Exhaust Manifold to Cylinder Head Retaining Bolts (LWR)	20 N•m	15 lb ft
Exhaust Manifold to Cylinder Head Retaining Bolts (V8)		
First Pass	15 N•m	11 lb ft
Final Pass	20 N•m	15 lb ft
Exhaust Muffler Clamp (Norma)	35 N•m	26 lb ft
Exhaust Muffler Heat Shield to Body Retaining Bolts	4 N•m	35 lb in

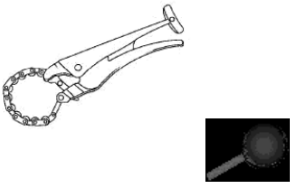
© 2014 General Motors. All rights reserved.

cardiagn.com

Application	Specification	
	Metric	English
Front Exhaust Foil Heat Shield to Body Retaining Bolt	4 N•m	35 lb in
Fuel Tank Heat Shield to Fuel Tank Retaining Nuts	4 N•m	35 lb in
Intermediate Exhaust Assembly to Catalytic Converter Retaining Nuts	40 N•m	30 lb ft
Rear Insulator Hanger Bracket to Body Retaining Bolts	22 N•m	16 lb ft
Rear Muffler to Intermediate Exhaust Assembly Retaining Bolts	45 N•m	33 lb ft



Special Tools

Illustration	Tool Number/Description
	EN 35314-A J 35314-A Exhaust Back Pressure Gauge
	CH-6614 MKM-6614

cardiagn.com