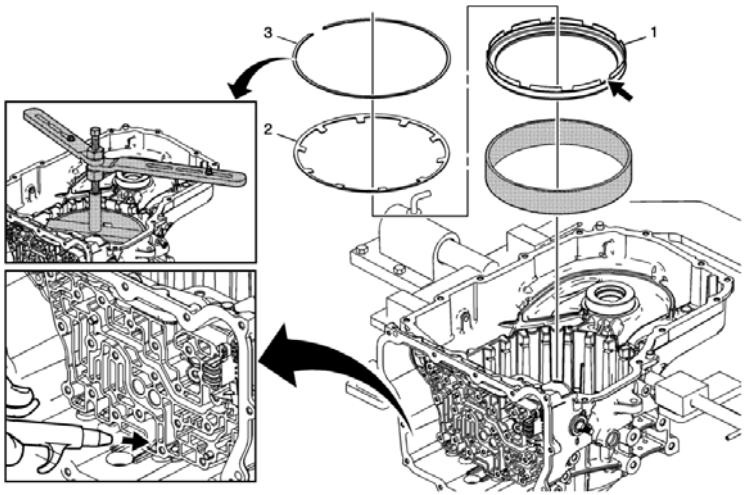


2-6 Clutch Piston Installation

Callout	Component Name
	2–6 Clutch Piston Assembly **Note:** • Position the 2–6 piston air bleed and large slot toward the top of the case. • *DT-47796* seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of the *DT-47796* seal protector to ease installation of the piston.
1	**Special Tool** *DT-47796* Seal Protector For equivalent regional tools, refer to Special Tools.
2	2–6 Clutch Spring 2–6 Clutch Spring Retainer **Caution:** Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. **Note:** • Place the retainer on the 2-6 clutch spring and align the retainer opening with the largest gap in the case splines toward the bottom of the case. The retainer opening should be supported by a spline tooth of the case. • Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation.
3	**Special Tools** • *DT-47797* Spring Installer • *DT-48056* Spring Compressor Bridge For equivalent regional tools, refer to Special Tools.

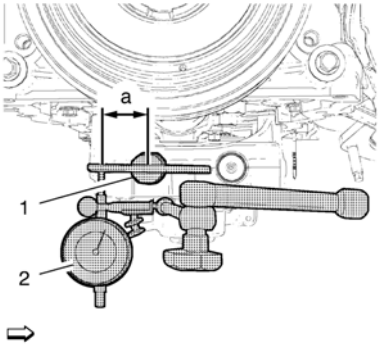
Special Tools

EN-50431 BSM - Backlash Measure Adapter

For equivalent regional tools, refer to Special Tools.

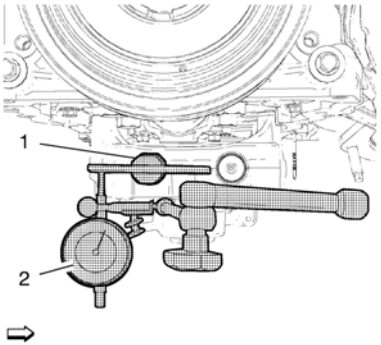
Warning: Refer to Safety Glasses and Compressed Air Warning.

1. Remove the coating remains on the balance shaft module gear by using compressed air.
2. Check the balancer for damages.



Note: The *EN-50431* adapter must be horizontal to the balancer.

3. Install the *EN-50431* adapter (1) to the balancer.
4. Install the dial gauge (2), in the distance “a” of **38.217 mm (1.505 in)** to the center of the balance shaft axle.

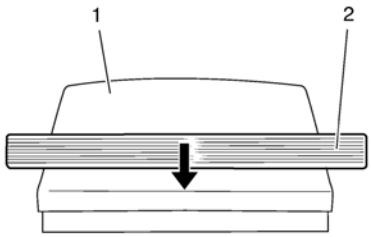


5. Using the dial gauge (2), move the balance shaft module gear by using fingers and measure the backlash.
6. Compare the measurement results with the engine mechanical specifications. Refer to Engine Mechanical Specifications.
7. If the balance shaft module is out of specification, try the procedure (1~6) again.
8. If the balance shaft module gear backlash is out of the specifications, replace the balance shaft module by a NEW balance shaft module.

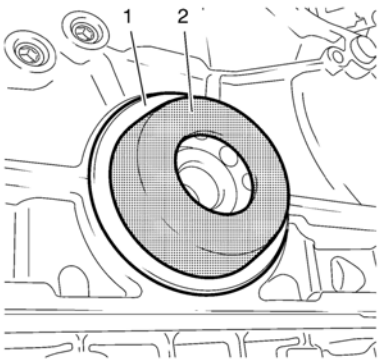
Special Tools

- *EN-658-1* Installer
- *EN-235-D* Installer Kit

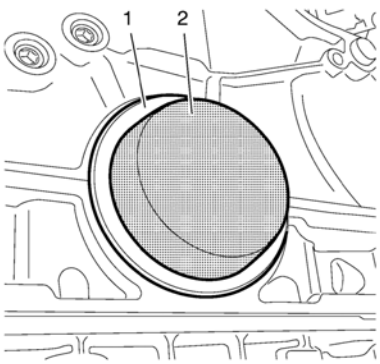
For equivalent regional tools, refer to Special Tools.



1. Slide the crankshaft rear oil seal (2) across the *EN-235-6* installer (1) contained in *EN-235-D* kit.



2. Install the crankshaft rear oil seal (1) with *EN-235-6* installer (2) to the crankshaft.



3. Use *EN-658-1* installer (2) to strike the crankshaft rear oil seal (1)

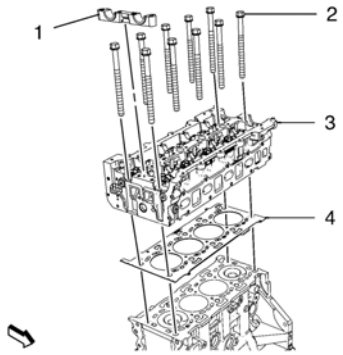
Special Tools

- *EN-470-B* Anglemeter
- *EN-50437* Height Gauge - Piston TDC
- *GE-571-B* Dial Gauge

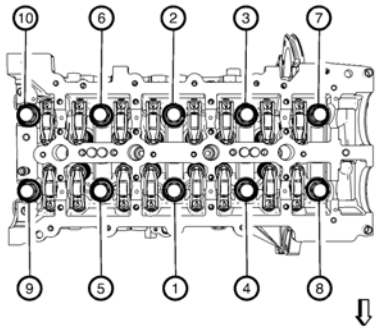
For equivalent regional tools, refer to Special Tools.

Removal Procedure

1. Remove the intake manifold bracket. Refer to Intake Manifold Bracket Replacement
2. Remove the exhaust gas recirculation manifold cooling return hose from the thermostat bypass pipe. Refer to Exhaust Gas Recirculation Manifold Cooling Return Hose Replacement
3. Remove the oil level indicator tube. Refer to Oil Level Indicator Tube Replacement
4. Remove the turbocharger. Refer to Turbocharger Replacement
5. Remove the charge air cooler outlet hose from the throttle body module. Refer to Charge Air Cooler Outlet Hose Replacement
6. Remove the engine water outlet adapter. Refer to Engine Water Outlet Adapter Replacement
7. Remove the intake camshaft. Refer to Intake Camshaft Replacement.



8. Remove the camshaft seat guide (1).

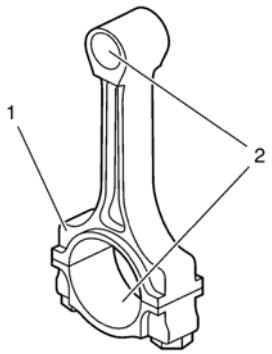


9. Loosen the 10 cylinder head retaining bolts in sequence as shown.

Visual Inspection and Cleaning Procedure

Connecting Rod

Warning: Refer to Safety Glasses and Compressed Air Warning.

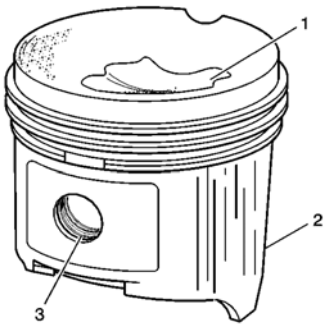


1. Clean the connecting rods (1) in solvent and dry with compressed air.
2. Inspect the connecting rods for the following:

- Signs of being twisted, bent, nicked, or cracked
- Scratches or abrasion on the rod bearing seating surface

- If the beam of the rod is scratched or has other damage replace the connecting rod.
- If there is still excessive clearance, replace the connecting rod.

Piston



1. Clean the piston skirts and the pins with a cleaning solvent. DO NOT wire brush any part of the piston.
2. Clean the piston ring grooves with a groove cleaner. Make sure that the oil ring holes and slots are clean.
3. Inspect the pistons for the following conditions:

- Cracked ring lands, skirts, or pin bosses.
- Ring grooves for nicks, burrs that may cause binding.
- Eroded areas at the top of the piston (1).
- Scuffed or damaged skirts (2).
- Worn piston pin bores (3).

- If there is any excessive wear, replace the piston.

Piston and Connecting Rod Measurement Procedure

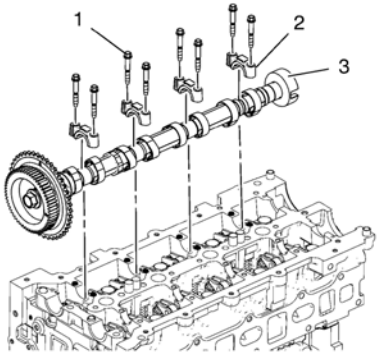
Piston Pin to Connecting Rod Bore and Piston Bore Clearance

1. Measure clearance between piston pin and connecting rod bore. Use the following procedure:
2. Measure the piston pin outside diameter.
3. Measure the connecting rod bore diameter.
4. Substract the piston ring diameter from the connecting rod diameter.

Refer to Engine Mechanical Specifications.

Removal Procedure

1. Remove the timing chain. Refer to Camshaft Timing Chain Replacement.

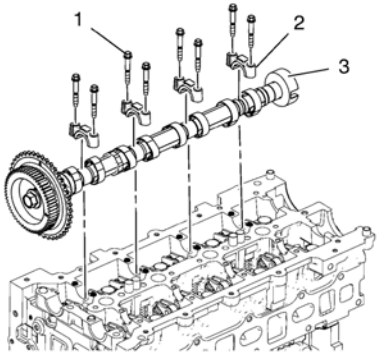


Note: Take extreme care to prevent any scratches or damage to the camshafts.

Note: Remove camshaft seat guide cap from 4. cylinder at least. Set the camshaft seat guide caps aside in order as removed.

2. Remove the 8 camshaft seat guide cap retaining bolts (1).
3. Remove the 4 camshaft seat guide caps (2).
4. Remove the intake camshaft (3).

Installation Procedure



Note:

- Ensure that the crankshaft is fixed 90° beyond TDC with *EN-50433* fixing tool
- Take extreme care to prevent any scratches or damage to the camshaft. Install the camshaft guides in order as removed.
- Clean the contact surfaces from camshaft , camshaft sprocket and camshaft sprocket bolt. Coat camshaft bearing surfaces with engine oil.

1. Install the intake camshaft (3).

Note: Tighten the camshaft seat guide cap from cylinder 4 at first.

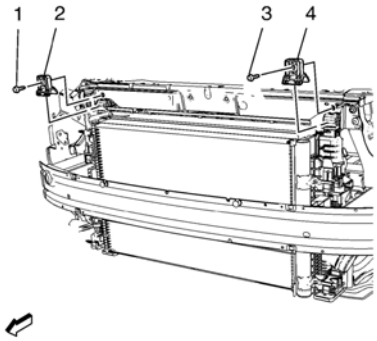
2. Install 4 camshaft seat guide caps (2).

Caution: Refer to Fastener Caution.

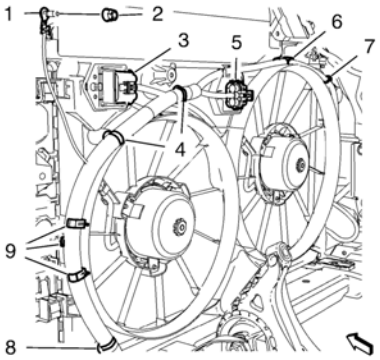
3. Install 8 camshaft seat guide cap retaining bolts (1). Tighten the 8 camshaft seat guide cap retaining bolts (1) to **10 Y (89 lb in)**.
4. Install the timing chain. Refer to Camshaft Timing Chain Replacement.

Removal Procedure

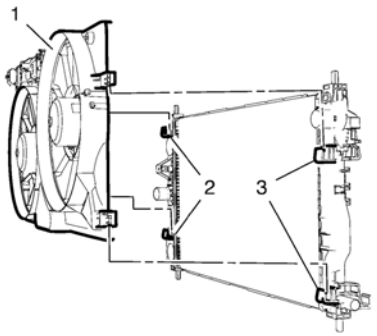
1. Drain the cooling system. Refer to Cooling System Draining and Filling.
2. Remove the charge air cooler. Refer to Charge Air Cooler Replacement.



3. Remove the 2 upper radiator bracket bolts (1, 3).
4. Remove the 2 upper radiator brackets (2, 4).
5. Remove the radiator outlet hose from the radiator. Refer to Radiator Outlet Hose Replacement.



6. Unclip the wiring harness clip (8) from the engine coolant fan shroud.
7. Unclip the wiring harness from the engine coolant fan shroud holders (9) and hang the wiring harness aside.
8. Disconnect the 2 engine coolant fan motor wiring harness plugs (3, 5).
9. Unclip the wiring harness clip (4, 7) from the engine coolant fan shroud.
10. Unclip the wiring harness from the engine coolant fan shroud holders (6).
11. Hang the engine coolant fan shroud wiring harness aside.



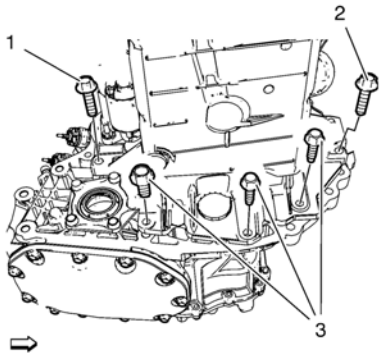
12. Remove the engine coolant fan shroud (1) in top direction from the 4 radiator clips (2, 3).

Removal Procedure

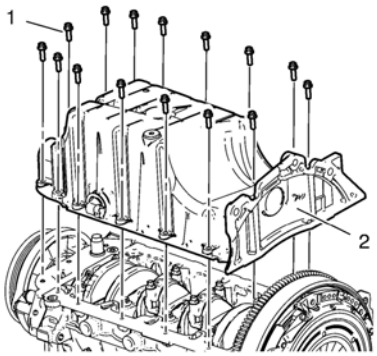
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
2. Place collecting basin underneath.
3. Remove the oil drain bolt.
4. Collect the engine oil.

Caution: Refer to Fastener Caution.

5. Install the NEW seal ring and the oil drain bolt, tighten to **14 Y (124 lb in)**.
6. Lower the vehicle.
7. Remove the oil level indicator tube. Refer to Oil Level Indicator Tube Replacement.
8. Raise the vehicle.
9. Remove the front compartment splash shield. Refer to Front Compartment Splash Shield Replacement.
10. Remove the exhaust front pipe. Refer to Exhaust Front Pipe Replacement.

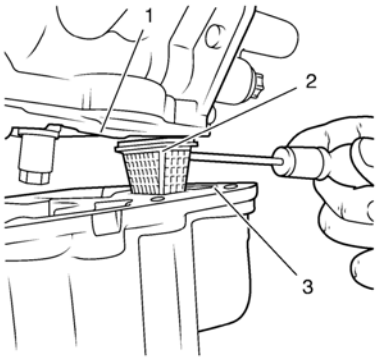


11. Remove the 3 oil pan bolts (3 from the transmission.



Note: Remove the oil pan evenly all the way around with a suitable tool.

12. Remove the 15 oil pan bolts (1) and remove the oil pan (2).



Special Tools

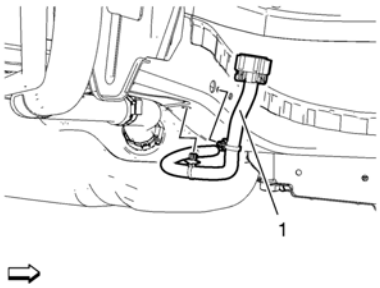
EN-6015 Closure Plugs

For equivalent regional tools, refer to Special Tools.

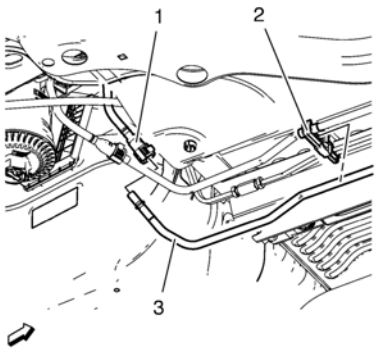
Removal Procedure

Warning: Refer to Gasoline/Gasoline Vapors Warning.

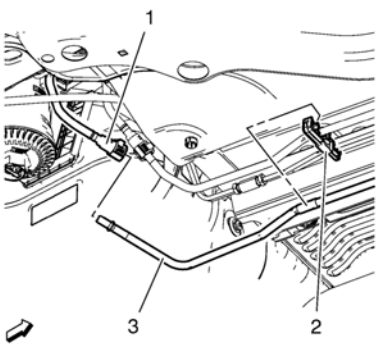
1. Disconnect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection.
2. Fuel tank draining. Refer to Fuel Tank Draining.
3. Remove the rear wheelhouse panel liner. Refer to Rear Wheelhouse Liner Replacement.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.



5. Disconnect the fuel tank fuel pump module wiring harness (1) and unclip from the body.

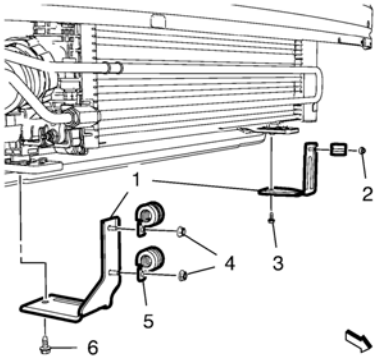


6. Disconnect the fuel return pipe (3) from the fuel return pipe connector (1). Refer to Plastic Collar Quick Connect Fitting Service.
7. Close all connections with *EN-6015* plugs .



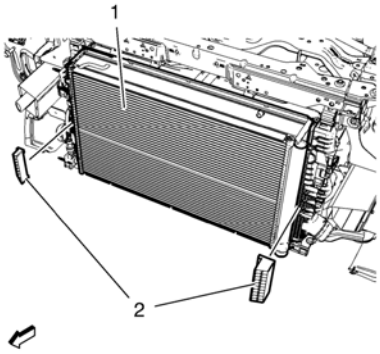
8. Disconnect the fuel feed pipe (3) from the fuel feed pipe connector (1). Refer to Plastic Collar Quick Connect Fitting Service.
9. Close all connections with *EN-6015* plugs .

3. Install the charge air cooler inlet hose (1) to the charge air cooler (2).
4. Install the radiator upper brackets. Refer to Radiator Upper Bracket Replacement.

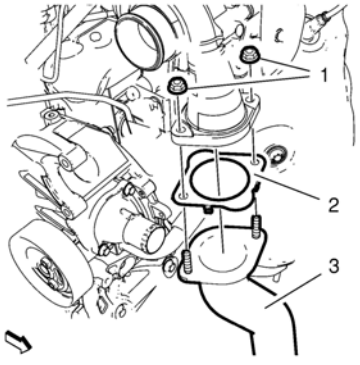


Caution: Refer to Fastener Caution.

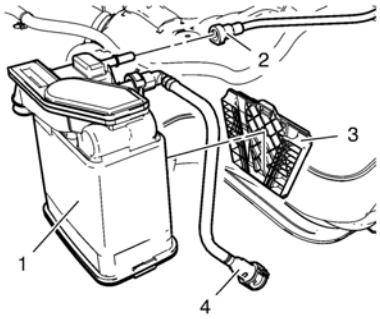
5. Install the 2 power steering fluid cooling pipe loop brackets (1).
6. Install the 2 power steering fluid cooling pipe loop bracket bolts (3, 6) and tighten to **9 Y (80 lb in)**.
7. Install the 3 power steering fluid cooling pipe loop bracket hose clamp nuts (2, 4) and tighten to **9 Y (80 lb in)**.
8. Install the radiator air seal.



9. Clip in the 2 radiator protector fenders (2) to the radiator (1).
10. Connect the air conditioning refrigerant pressure sensor wiring harness plug to the air conditioning condenser.
11. Install the intake air duct. Refer to Intake Air Duct Replacement.

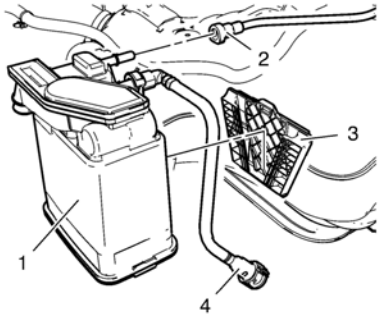


12. Install a NEW gasket (2).
13. Install the charge air cooler inlet hose (3) to the turbocharger.
14. Install the 2 charge air cooler inlet hose nuts (1) and tighten to **22 Y (16 lb ft)**.
15. Connect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection.
16. Install the battery cover. Refer to Battery Cover Replacement.



12. Disconnect the fuel tank vent pipe (2).
13. Close the fuel tank vent pipe (2) with the *CH-807* plug .
14. Disconnect the evaporative emission canister purge pipe (4).
15. Close the evaporative emission canister purge pipe (4) with the *CH-807* plug .
16. Remove the evaporative emission canister (1) from the evaporative emission canister bracket (3).

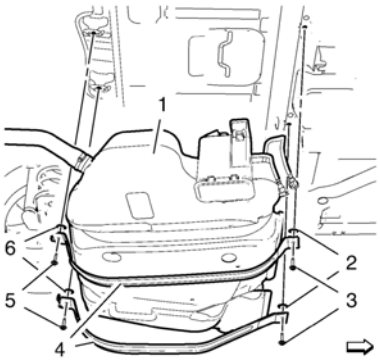
Installation Procedure



1. Install the evaporative emission canister (1) to the evaporative emission canister bracket (3).
2. Remove the *CH-807* plug from the evaporative emission canister purge pipe (4).
3. Connect the evaporative emission canister purge pipe (4).
4. Remove the *CH-807* plug from the fuel tank vent pipe (2).
5. Connect the fuel tank vent pipe (2).

Note: A second technician is required.

6. Raise the fuel tank to the original position.



7. Pre-install the 4 fuel tank strap bolts (3, 5) with the 4 fuel tank strap bolt retainers (2, 6) to the fuel tank straps (4).
8. Mount the 2 fuel tank straps (4).

Caution: Refer to Fastener Caution.

9. Install the 4 fuel tank strap bolts (3, 5) and tighten to **20 Y (15 lb ft)**.
10. Remove the adjustable jack from the fuel tank.
11. Clip the fuel feed pipe and the fuel vent pipe into the rear bracket clip at the underbody.

Fuel System Overview

The fuel system is a returnless on-demand design. The fuel pressure regulator is a part of the fuel pump module, eliminating the need for a return pipe from the engine. A returnless fuel system reduces the internal temperature of the fuel tank by not returning hot fuel from the engine to the fuel tank. Reducing the internal temperature of the fuel tank results in lower evaporative emissions.

An electric turbine-style fuel pump is attached to the fuel pump module inside the fuel tank. The fuel pump supplies high pressure fuel through the fuel feed pipe to the fuel injection system. The fuel pump provides fuel at a higher rate of flow than is needed by the fuel injection system. The fuel pump module contains a reverse flow check valve. The check valve and the fuel pressure regulator maintain fuel pressure in the fuel feed pipe and the fuel rail in order to prevent long cranking times.

Fuel Tank

The fuel tank stores the fuel supply. The fuel tank is located in the rear of the vehicle. The fuel tank is held in place by 2 metal straps that are attached to the underbody. The fuel tank is molded from high-density polyethylene.

Fuel Filler Cap

Note: If a fuel tank filler cap requires replacement, use only a fuel tank filler cap with the same features. Failure to use the correct fuel tank filler cap can result in a serious malfunction of the fuel and Evaporative Emission (EVAP) system.

The fuel fill pipe has a tethered fuel filler cap. A torque-limiting device prevents the cap from being overtightened. To install the cap, turn the cap clockwise until the cap clicks audibly. This indicates that the cap is correctly torqued and fully seated. A fuel filler cap that is not fully seated may cause a malfunction in the emission system.

Fuel Pump Module

The fuel pump module consists of the following major components:

- The fuel level sensor
- The fuel pump
- The fuel strainer
- The fuel pressure regulator
- The fuel filter

Fuel Level Sensor

The fuel level sensor consists of a float, a wire float arm, and a ceramic resistor card. The position of the float arm indicates the fuel level. The fuel level sensor contains a variable resistor which changes resistance in correspondence with the position of the float arm. The ECM sends the fuel level information via the serial data circuit to the instrument panel cluster. This information is used for the instrument panel cluster fuel gauge and the low fuel warning indicator, if applicable. The ECM also monitors the fuel level input for various diagnostics.

Fuel Pump

The fuel pump is mounted in the fuel pump module reservoir. The fuel pump is an electric low-pressure pump. Fuel is pumped to the fuel injection system at specified rates of flow and pressure. The fuel pump delivers a constant flow of fuel to the engine even during low fuel conditions and aggressive vehicle maneuvers. The ECM controls the electric fuel pump operation through a fuel pump relay. The fuel pump flex pipe acts to dampen the fuel pulses and noise generated by the fuel pump.

Fuel Strainer

The fuel strainer is attached to the lower end of the fuel pump module. The fuel strainer is made of woven plastic. The functions of the fuel strainer are to filter contaminants and to wick away fuel. Normally, the fuel strainer does not require maintenance. Fuel stoppage at this point indicates that the fuel tank contains an abnormal amount of sediment or contamination.

Fuel Pressure Regulator

The fuel pressure regulator is contained in the fuel pump module near the fuel pump outlet. The fuel pressure regulator is a diaphragm relief valve. The diaphragm has fuel pressure on one side and regulator spring pressure on the other side. Fuel pressure is controlled by a pressure balance across the regulator. The fuel system pressure is constant.

Fuel Feed Pipes

The fuel feed pipe carries fuel from the fuel tank to the fuel injection system. The fuel pipe consists of 3 sections:

- The rear fuel pump fuel feed hose runs from the top of the fuel tank to the chassis fuel pipe. The rear fuel hose is constructed of nylon.
- The fuel feed intermediate pipe is located under the vehicle and connects the rear fuel pump fuel feed hose to the front fuel pump fuel feed hose. The intermediate fuel pipe is constructed of a combination of nylon and steel pipes.
- The front fuel pump fuel feed hose connects the fuel feed intermediate pipe to the fuel rail. The front fuel hose contains the fuel pulse dampener and is constructed of a combination of nylon and steel pipes.

Nylon Fuel Pipes

Warning: Refer to Fuel and Evaporative Emission Pipe Warning.

Nylon pipes are constructed to withstand maximum fuel system pressure, exposure to fuel additives, and changes in temperature.

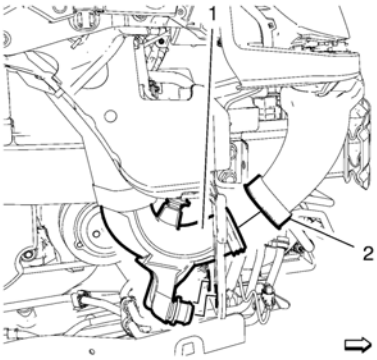
Heat resistant rubber hose or corrugated plastic conduit protect the sections of the pipes that are exposed to chasing, high temperature, or vibration.

Nylon fuel pipes are somewhat flexible and can be shaped around gradual turns under the vehicle. However, if nylon fuel pipes are forced into sharp bends, the pipes may kink and restrict the flow of fuel. Also, once exposed to fuel, nylon pipes may become stiffer and are more likely to kink if bent too far. Exercise special care when working on a vehicle with nylon fuel pipes.

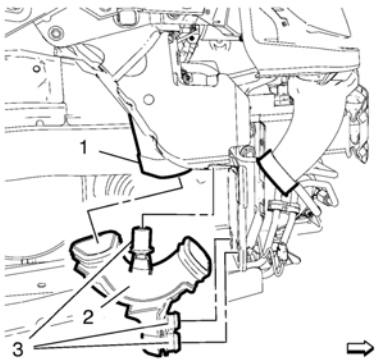
Quick-Connect Fittings

Removal Procedure

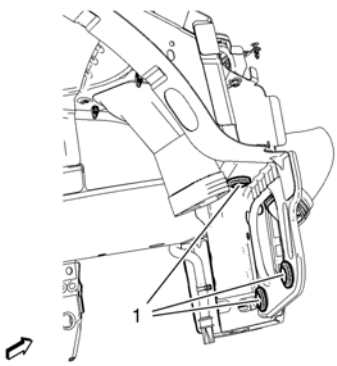
1. Remove the front bumper fascia. Refer to Front Bumper Fascia Removal and Installation.



2. Separate the front intake air duct (2) from the rear intake air duct (1).
3. Push the rear intake air duct carefully out of the 2 lower bracket insulators.

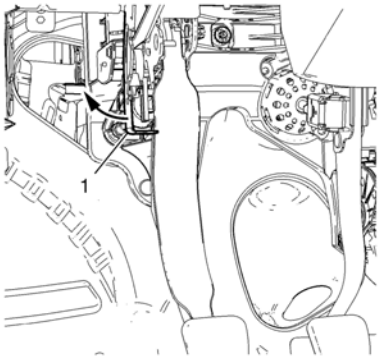


4. Remove the rear intake air duct (2) from the air cleaner adapter (1) and from the brackets.
5. Remove the 3 rear intake air duct bracket insulators (3) from the rear intake air duct (2).

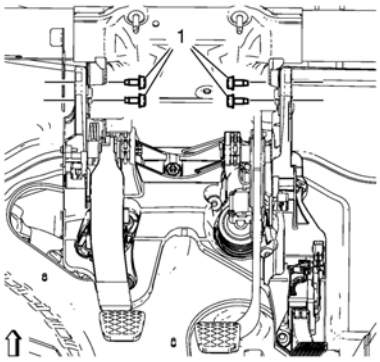


6. Install the 3 bracket insulator (1) to the guidance.

Installation Procedure

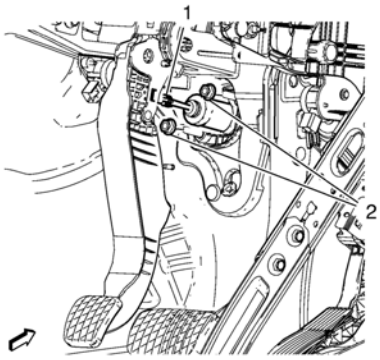


2. Carefully place the fuse box bracket (1) back in position
3. Install wiring harness to brake pedal bracket.
4. Connect electrical connectors.

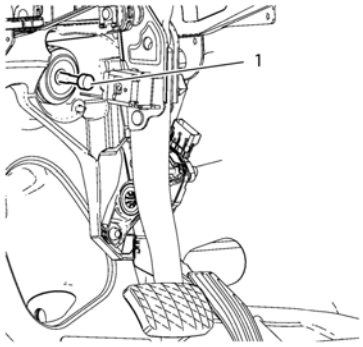


Caution: Refer to Fastener Caution.

5. Install brake pedal bracket bolts and tighten to **20 Y (15 lb ft)**.
6. Connect clutch master cylinder push rod (1) to the clutch pedal, if equipped.



7. Install the clutch master cylinder nuts (2) to the pedal bracket, if equipped and tighten to **18 Y (13 lb ft)**.



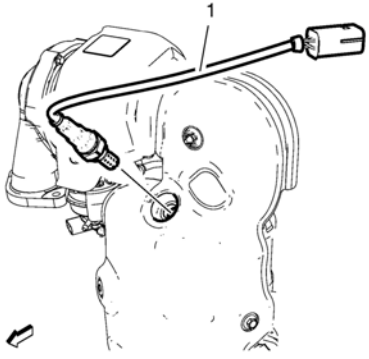
8. Connect the brake pedal pushrod (1) to the brake pedal.
9. Install the steering column. Refer to Steering Column Replacement.
10. Install the intermediate steering shaft. Refer to Intermediate Steering Shaft Replacement.
11. Install the steering column lower trim cover. Refer to Steering Column Lower Trim Cover Replacement.

Special Tools

EN-48259 Remover - Oxygen Sensor

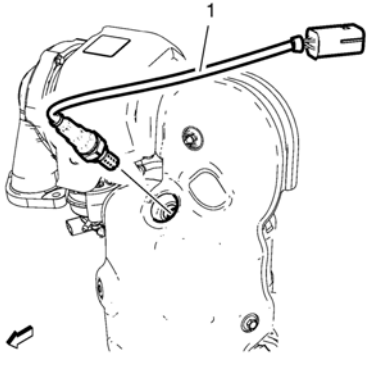
For equivalent regional tools, refer to Special Tools.

Removal Procedure



1. Disconnect the heated oxygen sensor wiring harness plug.
2. Remove the heated oxygen sensor (1), using the *EN-48259* remover .

Installation Procedure



Caution: Refer to Fastener Caution.

1. Install the heated oxygen sensor (1), using the *EN-48259* installer and tighten to **50 Y (37 lb ft)**.
2. Connect the heated oxygen sensor wiring harness plug.