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Bulletin No.: PI1330

Date: October, 2014

Service Bulletin

PRELIMINARY INFORMATION

Subject: New Model Features and Information

Models: 2015 Chevrolet Impala
Equipped with 3.6L V-6 Bi-Fuel Gasoline and Compressed Natural Gas (CNG) Engine —
RPO LFR

Attention: This vehicle operates using gasoline or compressed natural gas (CNG). When servicing this vehicle, please consult all applicable local, state/provincial and federal regulations relative to technician licensing, tool and workplace requirements.

Introduction to the Bi-Fuel Impala



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The purpose of this bulletin is to help the Service and Sales Personnel become familiar with the new 2015 Chevrolet Impala equipped with the 3.6L bi-fuel gasoline and CNG engine, and describe the action the Service Department personnel will need to take to ensure that they are able to fully service this vehicle. GM is the only company to offer a manufacturer produced fullsize bi-fuel sedan in North America.

The information contained within this bulletin will familiarize dealership service personnel with the vehicle's engine, bi-fuel systems operation, identification of the CNG components, their location and operation.

The 2015 Impala uses GM Service Part Numbers and all service parts including the gaseous fuel components are available through the GM Customer Care and Aftersales (CCA) Parts Distribution System.

Technical assistance will be provided by TAC.

Powertrain diagnostics and diagnostic trouble codes (DTCs) are the same as gasoline only engines.

The vehicle comes with a Chevrolet Impala Bi-Fuel (Gasoline/CNG) Supplement to the Owner Manual.

Available Service Training

The majority of the systems found on the 2015 Impala Bi-Fuel are taught in GM's core curriculum from a conceptual theory and operation perspective.

To access all of the available training courses visit the following website:

- In the United States go to > www.centerlearning.com
- In Canada go to > www.gmprocanada.com

Training Course Name and System RPO - Course Number and Description

Course Name or Description	Course Number and Description
Engine Performance	#16044.21D1 Engine Performance Session 1** #16044.21D2 Engine Performance Session 2** #16044.21D3 Engine Performance Session 3**
Engine Performance	#16044.21W1 Engine Performance 1 #16044.21W2 Engine Performance 2 #16044.21W3 Engine Performance 3 #16044.21W4 Engine Performance 4
Electrical/Electronics	#18043.01W-R4 Electrical/Electronics Stage 1 #18043.02W-R4 Electrical/Electronics Stage 2 #18043.03W-R3 Electrical/Electronics Stage 3
Compressed Natural Gas (CNG)	#16240.62W Compressed Natural Gas (CNG) Fuel System #16240.60W CNG Fuel Systems** #16240.61T1 Type 4 CNG Tanks and Inspection TechAssist**

** Not available in Canada.

Dexos 1™ Engine Oil



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Use and ask for engine oils with the dexos 1™ certification mark (shown above). Oils meeting the requirements of the vehicle will have the dexos 1™ certification mark on the container. This certification mark indicates that the oil has been approved to the dexos 1™ specification.

Refer to this General Motors website for dexos 1™ information about the different licensed brands that are currently available: <http://www.gmdexos.com>

Viscosity Grade

Use SAE 5W-30 viscosity grade engine oil for the 3.6L V-6 engine. In an area of extreme cold, where the temperature falls below -20°F (-29°C), an SAE 0W-30 oil may be used.

Engine Oil Life System

The Impala features GM's engine oil life system, which better protects engines by recommending oil changes based on a computer software algorithm using actual engine operating conditions and can save the vehicle owner money by avoiding unnecessary oil changes.

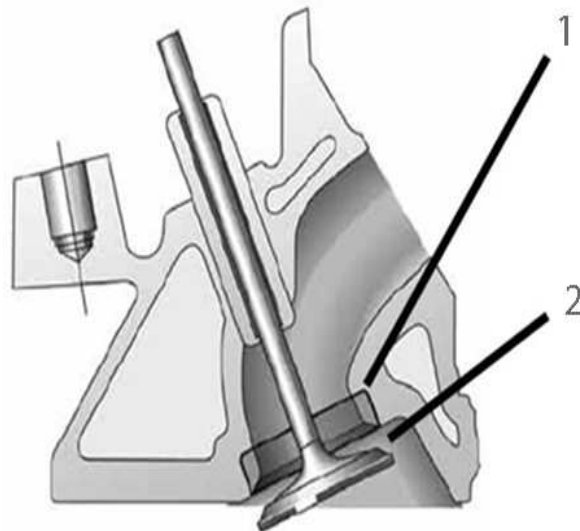
Bi-Fuel Engine Technology



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The 3.6L V-6 engine utilizes an engine control module (ECM) with both gasoline and CNG calibrations, designed to ensure all engine operating parameters are within acceptable performance operating limits. The engine has the following features:

- The engine is designed to meet strict Environmental Protection Agency (EPA) and California Air Resources Board (CARB) certification.
- A gasoline fuel injection system.
- A CNG fuel injection system.
- The hardened bi-fuel engine provides the same durability as a gasoline only engine.
- Fuel system corrosion resistance.
- Fuel system integrity and crash worthiness.
- Hardened engine components for CNG fuel usage as follows:



- Hardened intake and exhaust valve seats (1).
- Hardened exhaust valves (2).

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Fuel System Overview

The LFR engine is capable of running on gasoline or CNG. There are two separate fuel systems controlled by one ECM. A fuel mode selector switch mounted on the instrument panel allows the operator to select which fuel to operate if the fuel mode switching requirements are met. The engine will start and operate in either gasoline or CNG modes depending on the fuel selector switch position and ambient temperature. If the ambient temperature is colder than -4°F (-20°C) the vehicle will start in gasoline mode and switch to CNG once the engine coolant temperature reaches 122°F (50°C) if the mode switch was in CNG mode when started. The gasoline fuel system is a conventional returnless port fuel injection system. The CNG system has separate fuel supply lines, fuel rail and fuel injectors. If a fuel delivery concern exists in either of the fuel systems the ECM will switch to the system without a malfunction.

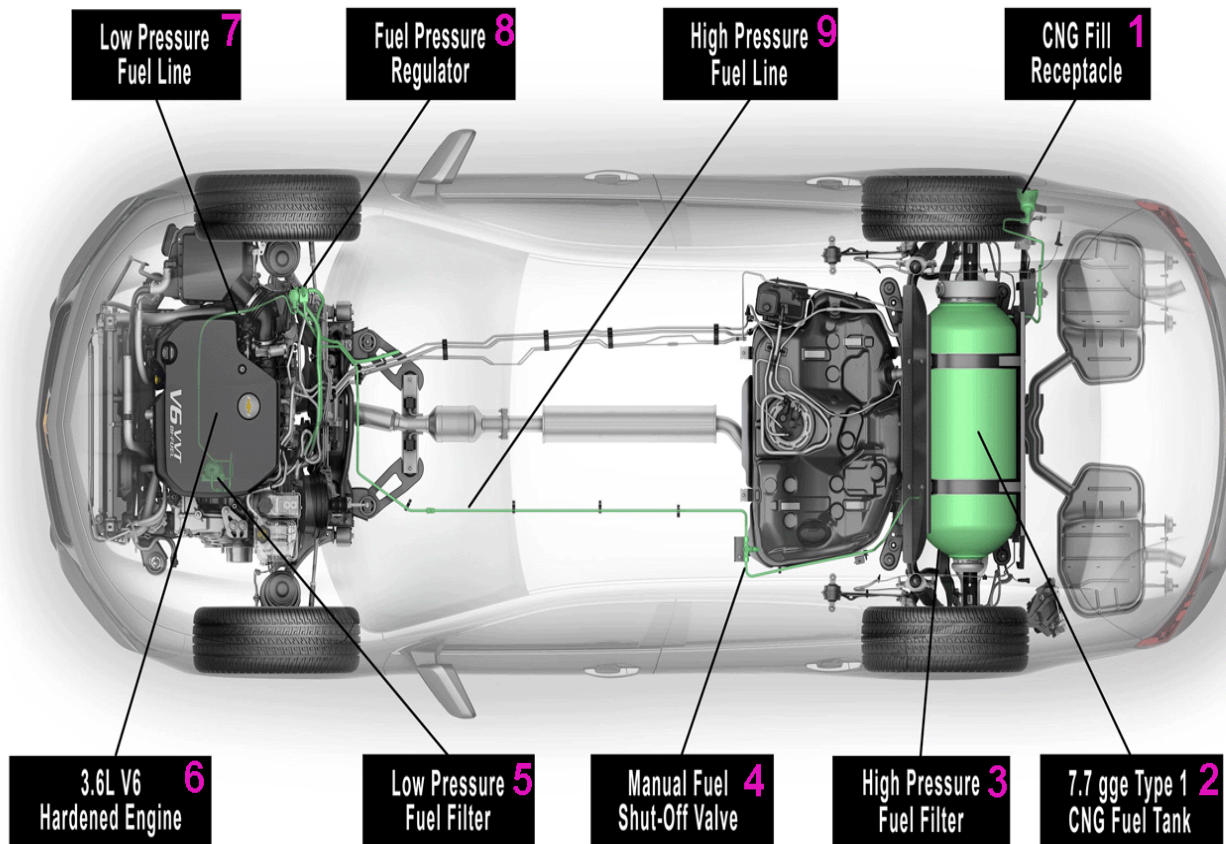
CNG Mode

A CNG fuel tank mounted in the rear compartment of the vehicle can be filled with up to 3,600 psi (24,821 kPa) of compressed natural gas. A CNG fuel high pressure cut-off solenoid valve controls high pressure fuel flow from the fuel tank to the high pressure fuel lines. High pressure fuel flows through the lines and high pressure fuel filter to the CNG fuel pressure regulator assembly. At the CNG fuel pressure regulator assembly the low pressure side of the system is regulated to 68-130 psi (468-896 kPa). A low pressure fuel cut-off solenoid valve controls fuel flow and pressure from the regulator assembly through low pressure lines to a low pressure oil separator/filter then to the CNG fuel rail. The fuel injection timing, and injection duration are controlled by the ECM.

Gasoline Mode

A fuel tank stores the fuel supply. The fuel pump module, located in the fuel tank, supplies fuel through the fuel feed pipe to the fuel rail. Fuel enters the intake ports through precision multi-hole fuel injectors. The in-tank fuel pump is controlled with a chassis control module. The ECM enables the chassis control module and sends the desired fuel rail pressure to the chassis control module via GMLAN. The chassis control module sends a pulse width modulated (PWM) voltage to the in-tank fuel pump allowing the fuel pressure to be varied as commanded by the ECM. The fuel rail pressure, fuel injection timing, and injection duration are controlled by the ECM.

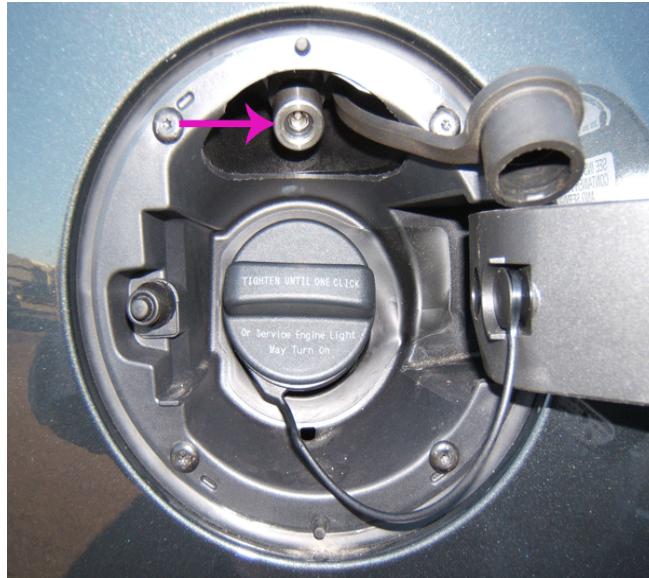
CNG System Components — Description, Operation and Location — Component Numbers 1-9



CNG Fill Receptacle — Component Number 1

Notice: Before refueling, the O-ring must be inspected and replaced if missing or damaged. Replacement O-rings are available through the GM parts network.

The CNG fill receptacle (1) is an NGV1 profile and mates to any NGV1 fill dispenser valve. The fill dispenser seals to the receptacle with an O-ring.



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The CNG fill receptacle is mounted in the top of the vehicle fuel fill pocket behind the fuel access door and has a cover that must be in place when not refueling.

The fuel fill line is a combination of flex hose and tubing. All connections are sealed by O-rings. The fill line runs from the receptacle to the check valve. The check valve is intended to minimize the amount of fuel leakage in the event the receptacle develops a leak. A fuel fill filter is part of the fill receptacle and is not serviceable separately.

CNG Fuel Tank — Component Number 2

Notice: The CNG tank assembly DOES NOT have any serviceable components. If the CNG fuel tank high pressure manual shut-off valve, CNG fuel high pressure cut-off solenoid valve, CNG fuel tank temperature sensor and/or the pressure relief device (PRD) need service the CNG tank MUST be replaced.



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The CNG fuel tank (2) is mounted in the rear storage area. The CNG fuel tank is constructed of steel and conforms to NGV2-1 (Type 1) specifications. A manufacturer's label showing important information is affixed to the CNG tank. A CNG fuel high pressure cut-off solenoid valve is threaded into the CNG tank manual shut-off valve in the end of the CNG fuel tank and is used to prevent fuel flow during non-operational running conditions. A metal shield is used to protect the fuel tank from contact with items that may be in the storage compartment.

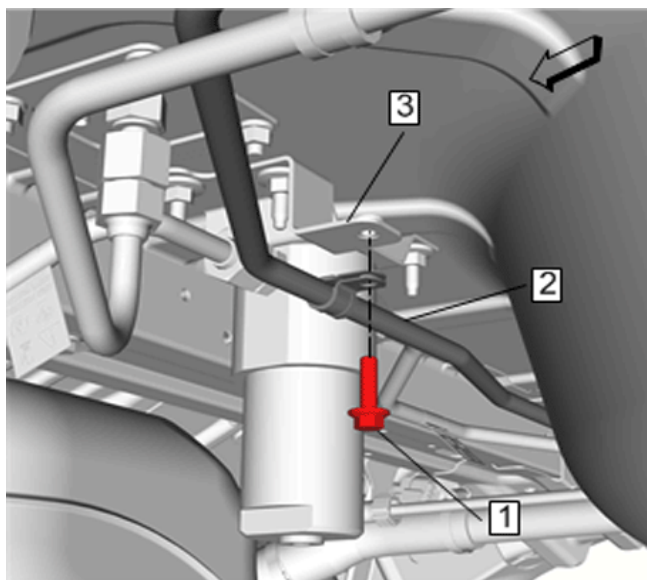
Application	Total Capacities	
	Canada 200 Bar @ 15°C	U.S. 3,600 psi @ 70°F
CNG Fuel Tank Capacity ¹	7.0 GGE	7.8 GGE
¹ GGE (Gasoline Gallon Equivalent)		

Notice: United States and Canada Federal Government Regulations (FMVSS 303, FMVSS 304, CMVSS 301.2, ANSI/CSA NGV2) require that the CNG fuel tank and its brackets be inspected every three years or 36,000 mi (60,000 km), whichever occurs first. Inspection results should be recorded in > Service and Maintenance > Maintenance Records > CNG Fuel Tank Inspection Record section of the Chevrolet Impala Bi-Fuel (Gasoline/CNG) Supplement. The service life of the type 1 CNG fuel tank used in this vehicle is 15 years from the date of manufacture. All CNG fuel tanks regardless of inspection results must be removed from service after this 15 year period.

CNG High Pressure Fuel Filter — Component Number 3

The CNG high pressure fuel filter (3) is a coalescing media filter located on the underside of the vehicle below the CNG fuel tank area. This filter must have the water drained and the filter element must also be replaced at the specified service intervals as follows:

- Drain the high pressure CNG filter every 15,000 mi (25,000 km). See your dealer or other qualified repair facility for required service and maintenance. Your dealer has the necessary training and parts to repair the vehicle.
- Replace the high pressure CNG filter every 62,000 mi (100,000 km) or 36 months, whichever occurs first.



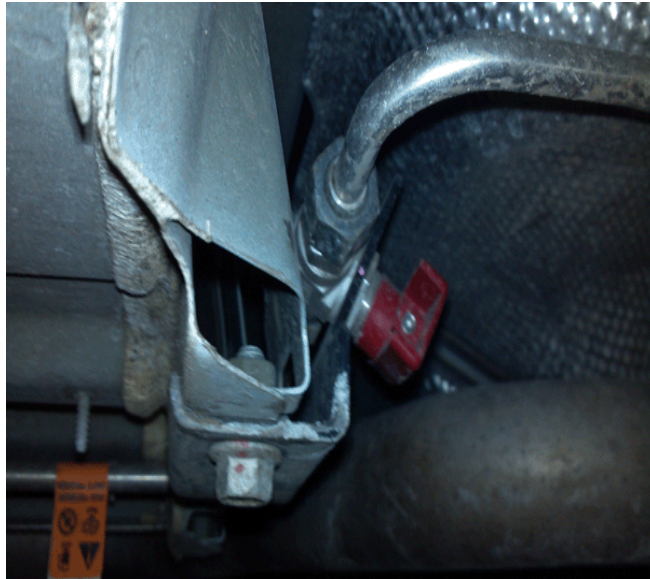
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CNG tank pressure relief valve pipe fastener (1).

CNG tank pressure relief valve pipe (2).

CNG fuel filter bracket (3).

CNG 1/4 Turn Manual Fuel Shut-Off Valve — Component Number 4



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The CNG 1/4 turn manual fuel shut-off valve (4) is on the driver side of the vehicle in front of the rear tire. The CNG 1/4 turn manual fuel shut-off valve **HANDLE is RED**. To turn **OFF** the valve, turn the lever one-quarter turn clockwise. Turn it counterclockwise to turn the valve back **ON**. Turn **OFF** the valve if a fuel leak is suspected or if the vehicle is involved in an accident. This valve when turned **OFF**, will stop CNG flow to the engine.



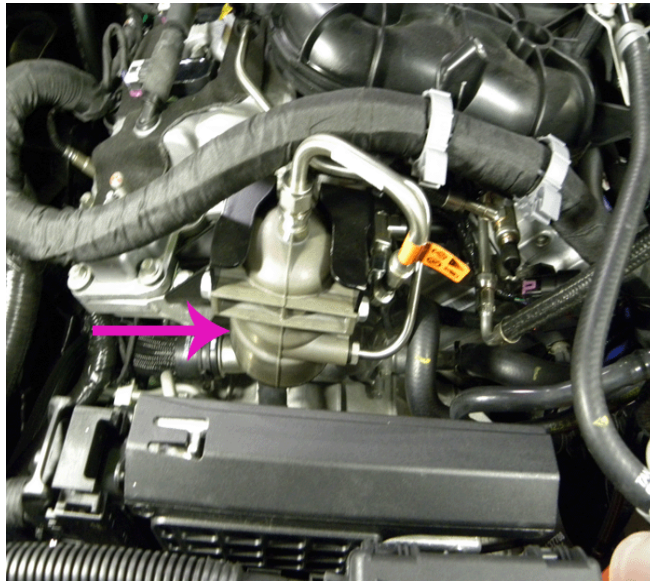
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A label is on the outside of the vehicle near the CNG 1/4 turn manual fuel shut-off valve. Do not remove this label.

CNG Low Pressure Fuel Oil Separator/Filter Assembly — Component Number 5

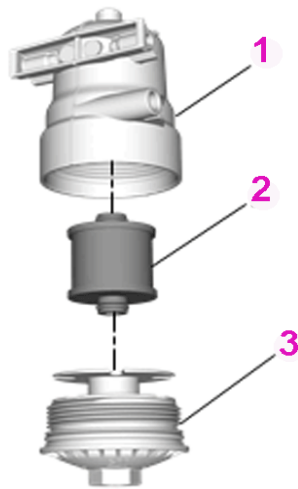
The CNG fuel oil separator/filter assembly (5) is located on the left side of the engine near the forward valve cover. The main purpose of this filter is to separate oil contamination from the CNG. This filter requires periodic service intervals as follows:

Replace the low pressure CNG fuel filter oil separator filter element every 36,000 mi (60,000 km) or 36 months, whichever occurs first.



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Underhood view of the low pressure CNG fuel oil separator/filter assembly.



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- CNG low pressure fuel oil separator filter housing (1).
- CNG low pressure fuel oil separator filter element (2).
- CNG low pressure fuel oil separator filter housing cover (3).

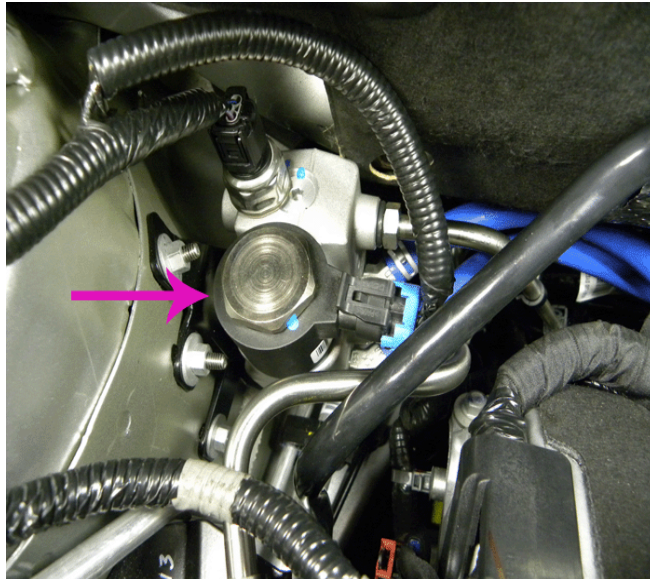
3.6L V-6 Hardened Engine — Component Number 6

The 3.6L V-6 hardened bi-fuel engine (6) provides the same durability as a gasoline only engine. The Chevrolet Impala bi-fuel addresses the range anxiety issue associated with vehicles that run only on CNG. It features a factory-engineered and fully warranted powertrain that switches seamlessly from CNG to gasoline. Total range is expected to be up to 500 miles (800 km).

CNG Low Pressure Fuel Line — Component Number 7

High pressure fuel is delivered to the CNG fuel pressure regulator (8) through the high pressure fuel line (9). The regulator assembly reduces the high fuel tank pressure to a lower pressure of 68-130 psi (468-896 kPa) and supplies it to the low pressure fuel line (7) in order to allow the amount of fuel injected to be precisely managed.

CNG Fuel Pressure Regulator — Component Number 8



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High pressure fuel is delivered to the CNG fuel pressure regulator (8) assembly through the high pressure fuel line (9). The CNG fuel pressure regulator reduces the high CNG fuel tank pressure to a lower pressure of 68-130 psi (468-896 kPa) and supplies it to the low pressure fuel line (7) in order to allow the amount of fuel injected to be precisely managed.

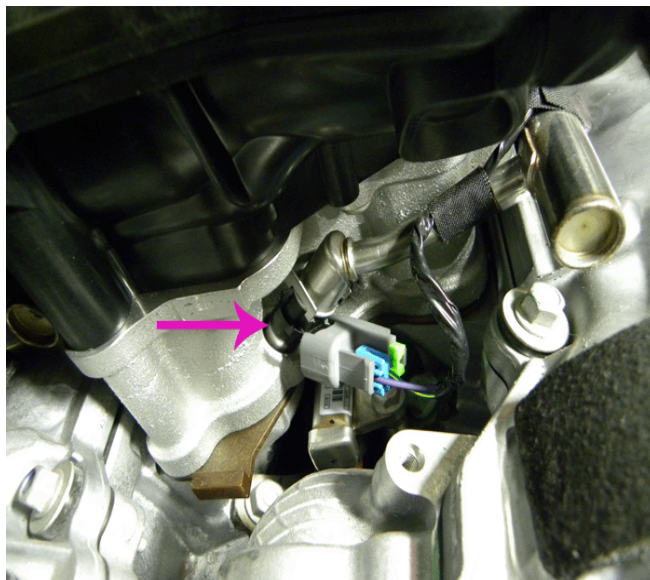
The CNG fuel pressure regulator (8) assembly is mounted near the right strut tower on the front of the dash and also contains the CNG fuel tank pressure sensor. The ECM controls the pulse width modulated voltage to the CNG fuel pressure regulator to control fuel rail pressure. A safety valve in the regulator assembly will reduce pressure to 290 psi (2,000 kPa) maximum in the event that the low pressure fuel system is opened to the atmosphere.

CNG High Pressure Fuel Line — Component Number 9

The CNG fuel tank (2) mounted in the rear compartment of the vehicle can be filled with up to 3,600 psi (24,821 kPa) of CNG. A CNG fuel high pressure cut-off solenoid valve controls high pressure fuel flow from the fuel tank to the high pressure fuel line (9). High pressure fuel flows through the lines and high pressure fuel filter to the fuel pressure regulator assembly (8). At the fuel pressure regulator assembly the low pressure side of the system is regulated to 68-130 psi (468-896 kPa). A low pressure fuel cut-off solenoid valve controls fuel flow and pressure from the regulator assembly through low pressure lines to a low pressure CNG fuel oil separator/filter assembly (5) and then to the CNG fuel rail and CNG injectors.

Additional CNG System Components — Description, Operation and Location

CNG Fuel Injectors

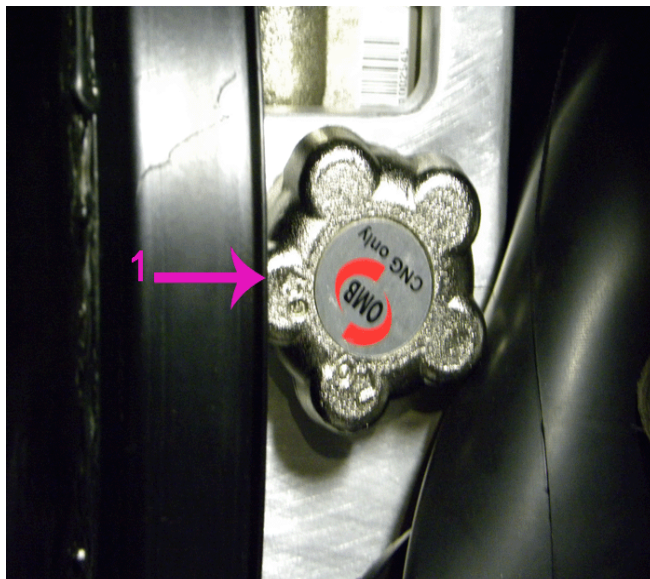


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The CNG fuel injector assembly is a solenoid device controlled by the ECM that are specifically designed to meter gaseous fuel into a single engine cylinder. Fuel from the injector tip is injected into the specific intake port, causing the fuel to become further atomized before entering the combustion chamber. This fine atomization improves fuel economy and reduces emissions.

CNG Fuel Tank High Pressure Manual Shut-Off Valve

Notice: The CNG tank assembly **DOES NOT** have any serviceable components. If the CNG fuel tank high pressure manual shut-off valve needs service, the CNG tank **MUST** be replaced.



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The CNG fuel tank manual shut-off valve (1) is located at the end of the CNG fuel tank, underneath the protective cover, near the CNG high pressure cut-off solenoid valve. The CNG fuel tank manual shut-off valve is on the passenger side end of the CNG fuel tank. The CNG fuel tank manual shut-off valve (1) is used to close **OFF** the CNG fuel tank pressure from the rest of the CNG system.

CNG Fuel Tank Pressure Sensor



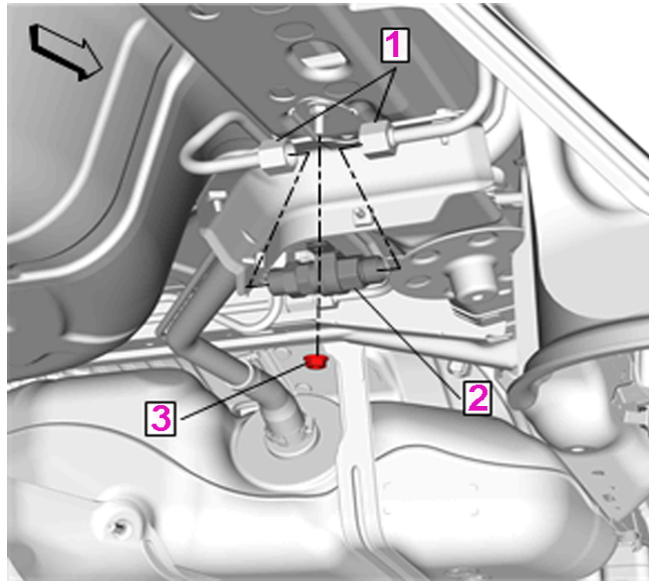
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The CNG fuel tank pressure sensor (1) is a 3 wire pressure transducer that provides a CNG fuel tank pressure signal to the ECM. The CNG fuel tank pressure sensor (1) is located on top of the CNG fuel pressure regulator assembly. The ECM uses the signal along with the CNG fuel tank temperature sensor to accurately determine the CNG fuel tank fuel level.

When refueling in cold ambient temperatures, the fuel gauge may not display **FULL** even though the temperature-compensated refueling event produces a temperature-compensated **FULL** condition. This is due to commercial refueling station output being regulated by a temperature vs. pressure strategy to prevent the CNG system from becoming over-pressurized if the vehicle is relocated to a location with a warmer ambient temperature after the refueling event.

CNG Tank Filler Check Valve

The CNG fuel filler line is a combination of flex hose and tubing. All connections are sealed by O-rings. The filler line runs from the receptacle to the check valve. The check valve is intended to minimize the amount of fuel leakage in the event the receptacle develops a leak.



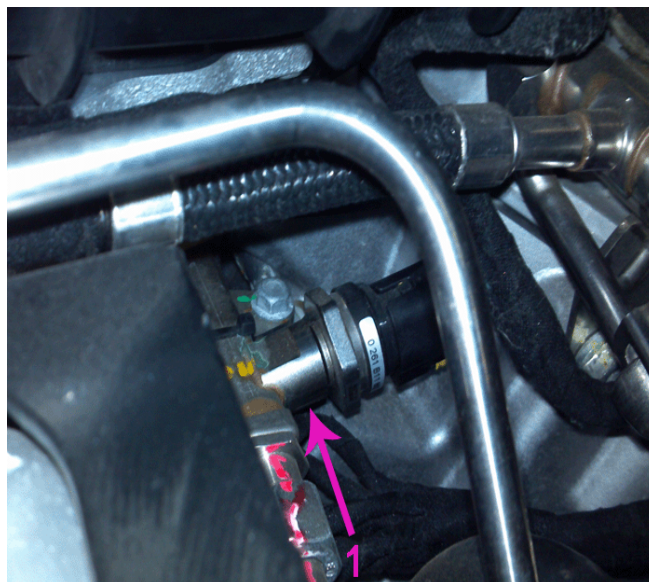
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- CNG fuel filler line nuts (1).
- CNG filler check valve (2).
- CNG filler check valve fastener (3).

CNG Fuel Rail Assembly

The CNG fuel rail assembly is mounted in the engine valley. The fuel rail distributes CNG fuel to each of the 6 CNG fuel injectors.

CNG Fuel Rail Pressure/Temperature Sensor

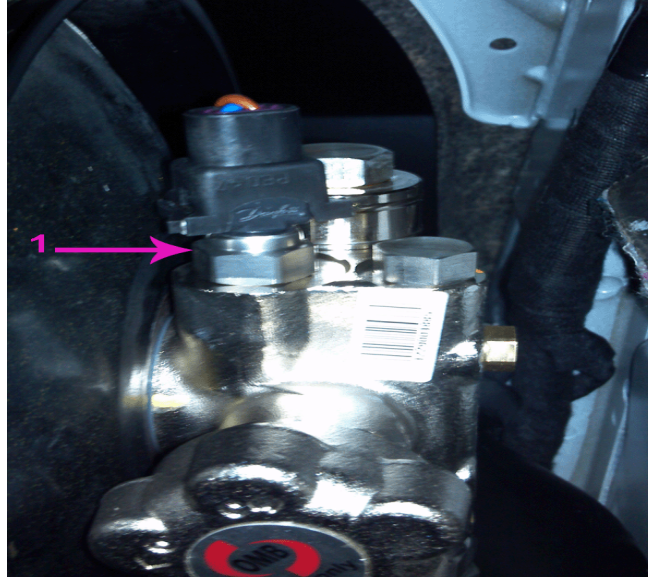


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The CNG fuel rail pressure/temperature sensor (1) is mounted on the end of the CNG fuel rail. An over pressure protection valve is also mounted to the CNG fuel rail to protect the components from over pressure. In the event of an over pressure condition greater than 210 psi (1,450 kPa) the valve will open, releasing the excess pressure. The over pressure protection valve does not require replacement if activated.

CNG Fuel Tank Temperature Sensor

Notice: The CNG tank assembly **DOES NOT** have any serviceable components. If the CNG fuel tank temperature sensor needs service, the CNG tank **MUST** be replaced.

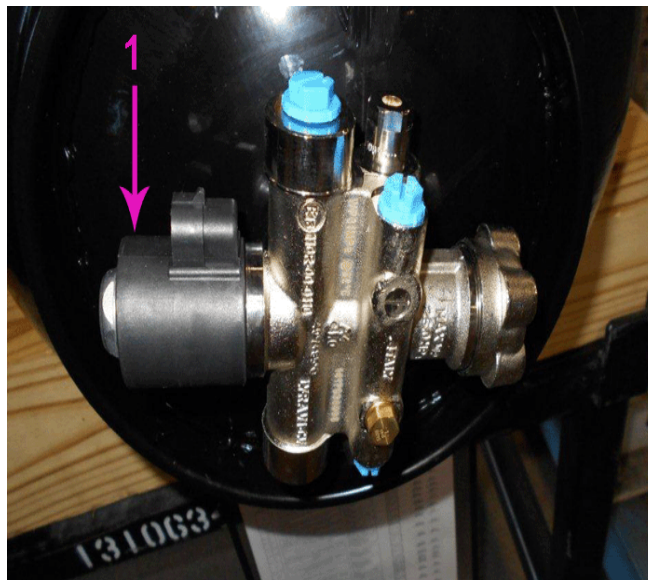


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The CNG fuel tank temperature sensor (1) is located on the CNG fuel tank near the CNG fuel tank high pressure manual shut-off valve. The two wire sensor provides a CNG fuel tank temperature signal to the ECM. The signal is used along with the CNG fuel tank pressure sensor to calculate the CNG fuel level in the CNG tank.

CNG Fuel High Pressure Cut-Off Solenoid Valve

Notice: The CNG tank assembly **DOES NOT** have any serviceable components. If the CNG fuel high pressure cut-off solenoid valve needs service the CNG tank **MUST** be replaced.



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The CNG fuel high pressure cut-off solenoid valve (1) is a normally closed solenoid valve mounted on the CNG fuel tank manual shut-off valve. The CNG fuel high pressure cut-off solenoid valve (1), along with the CNG fuel low pressure cut-off solenoid valve prevents fuel flow when in the closed position. The ECM commands the cut-off solenoid valves **ON** when the engine is operating in CNG Mode. The ECM energizes the cut-off solenoid valves as long as the engine RPM indicates a crank or run condition is present.

CNG Fuel Tank Pressure Relief Device (PRD)

Notice: The CNG tank assembly **DOES NOT** have any serviceable components. If the CNG fuel tank pressure relief device needs service, the CNG tank **MUST** be replaced.

The CNG fuel high pressure cut-off solenoid valve contains an integral pressure and thermally-activated pressure relief device (PRD). The PRD will activate when exposed to temperatures of approximately 220°F (104°C) or when the CNG tank pressure becomes too high for safe operation, approximately 5,400 psi (37,232 kPa). An additional thermally-activated PRD is on the opposite end of the CNG fuel tank.

Driver Information Center (DIC) — Fuel Gauge Operation

Fuel Gauge Operation

The ECM monitors the signal of the CNG fuel tank pressure sensor in order to determine the amount of pressure in the CNG tank. The ECM uses this signal to calculate the percentage of CNG fuel remaining in the CNG tank. The ECM sends the fuel level information to the DIC via serial data. The DIC then displays the approximate remaining fuel level on the fuel gauge.

For CNG, the fuel gauge has been calibrated to display **FULL** at approximately 3,600 psi (24,821 kPa) and **EMPTY** at approximately 400 psi (2,758 kPa). CNG quantity is affected by changes in fuel temperature and fuel pressure.

When the engine is in CNG mode, the CNG fuel level is displayed in the fuel gauge in the DIC.

When the engine is in gasoline mode, the gasoline fuel level is displayed in the fuel gauge in the DIC.

CNG Fuel Level Low — DIC Message



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A message will display when the CNG fuel level is low. When this message displays, the driver will not be able to select the CNG mode.

CNG Fuel Selector Switch



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The CNG fuel selector switch is on the instrument panel to the left side of the steering wheel. When the ignition is in **ON/RUN**, press the CNG fuel selector switch to select between gasoline and CNG. The indicator light in the CNG fuel selector switch will illuminate when the vehicle is running on CNG. If the fuel selector switch is in CNG mode when the vehicle is started, the vehicle will start on CNG if the conditions for CNG operation have been met. If the vehicle is turned **OFF** when in gasoline mode, when started it will remain in gasoline mode until the fuel selector switch is pressed.

If the switch is pressed to change to gasoline from CNG while driving, the engine will change to gasoline operation. If the switch is pressed to change to CNG from gasoline while driving, the engine will change to CNG operation.

When the CNG fuel selector switch is pressed, the indicator light will flash during a fuel transition.

CNG Fuel Tank Shield Label



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There is a label in the rear compartment in front of the CNG tank showing the CNG shields and other important information. **DO NOT** remove this label.