Bulletin No.: 19-NA-180
Date: September, 2019

Service Bulletin

INFORMATION

Subject: **Duramax® Diesel 3.0L New Engine Features**

Brand:	Model:	Model Year:		VIN:		Engine:	Transmission:
		From:	To:	From:	To:		
Chevrolet GMC	Silverado 1500 Sierra 1500	2020		—		Duramax® Diesel, 3.0L, Inline 6-Cylinder, CRI, DOHC, Turbocharged, VGT, Aluminum, CSS50V — RPO LM2	10L80, 10-Speed Automatic, ATSS, CPA, GEN 2 — RPO MQB

Involved Countries	United States, Canada, Mexico, South America and Middle East

Overview

Bulletin Purpose

The purpose of this bulletin is to introduce the Duramax® diesel 3.0L turbocharged engine. This bulletin will help the Service Department Personnel become familiar with the engine, components, fuel system, engine oil requirements, exhaust aftertreatment system and transmission.

Duramax® Diesel 3.0L L6 Turbocharged Engine — RPO LM2

Overview

The Duramax® Diesel 3.0L will be paired with GM's 10-speed automatic transmission — RPO MQB and will produce approximately 282 horsepower (210.28 kW) and 450 lb ft (610.11 Nm) of torque.

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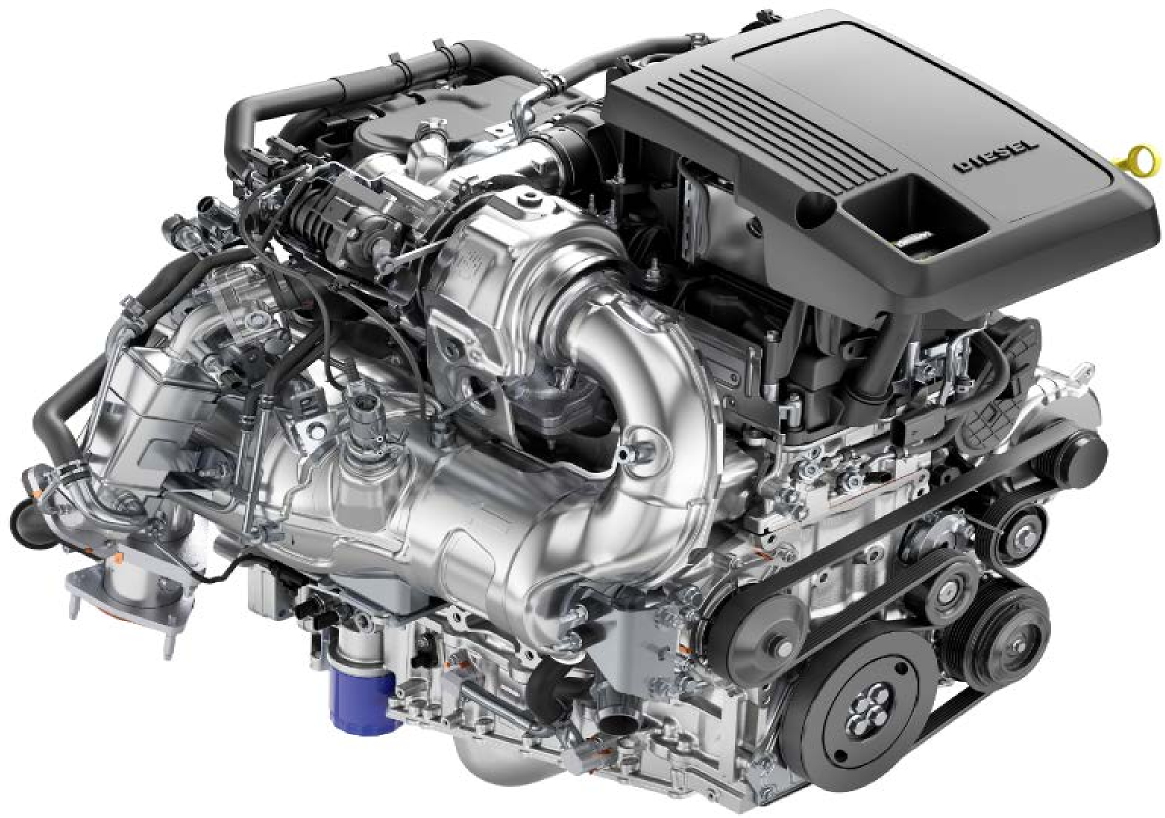
Left Front



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Right Front

Engine Specifications

- **Bore:** 3.307-inches (84.0 mm)
- **Compression:** 261 PSI (1800 kPa)
- **Compression Ratio:** 15:1
- **Displacement:** 3.0L
- **Firing Order:** 1–5–3–6–2–4
- **Glow Plug Voltage:** 5.4 V
- **Stroke:** 3.543-inches (90.0 mm)

Engine Component Description

- **Camshaft:** Two camshafts are used, one for all intake valves, the other for all exhaust valves. The camshafts are driven by two camshaft sprockets which in turn are driven by the secondary timing chain.
- **Compressor Air Intake Turbocharger:** The turbocharger is a variable nozzle design with an electric vane actuator attached to the exhaust manifold. The turbocharger supplies compressed air from the turbine/impeller to the engine to increase power. It also results in higher fuel efficiency and lower CO2 emissions.
- **Crankshaft:** The crankshaft is forged steel with 4 counterweights. It is supported by 7 main journals with main bearings which have oil clearance for lubricating. The thrust bearing is located at the 6th main journal. A crankshaft pulley is used to control torsional vibration. The sprocket for the primary drive chain is machined directly on the crankshaft. An oil pump sprocket is integrated on to the crankshaft along with a timing reluctor ring.
- **Cylinder Head:** The cylinder head is dual over-head camshaft (DOHC) with 4 valves per cylinder. The cylinder head is made of cast aluminum.
- **Engine Block:** The engine block is cast aluminum with 6 pressed in iron sleeves. The block has 7 crankshaft main bearings with one thrust bearing set.
- **Exhaust Manifold:** The exhaust manifold is located on the cylinder head. It is designed to endure high pressure and high temperature. The turbocharger is mounted on the exhaust manifold.
- **High Pressure Diesel Fuel Injection System:** The high pressure fuel pump supplies pressurized fuel through the high pressure fuel lines to the fuel rail and then through the fuel injector lines to the fuel injectors. Excess fuel returns to the fuel tank through the fuel return pipes.
- **Hydraulic Valve Lash Adjuster:** The valve train uses a valve rocker arm acted on by a hydraulic valve lash adjuster which reduces friction and noise.

- **Intake Manifold:** Intake air flow from the throttle body passes through the intake manifold to the cylinder combustion chambers. The intake manifold is made of a composite material.
- **Lower Crankcase Extension:** The lower crankcase extension bolts to the engine block and contains the oil pump. The oil pump is fastened directly to the lower crankcase extension. The oil pump is a variable vane pump driven by a wet timing belt, which is driven by the oil pump sprocket.
- **Lower Oil Pan:** The lower oil pan is made of dual-layer stamped aluminum and is attached at the lower crankcase extension.
- **Positive Crankcase Ventilation System:** The positive crankcase ventilation (PCV) valve carries blow-by gas to the turbocharger inlet of the intake system. The amount of blow-by gas varies according to engine conditions, driving conditions and the pressure of the turbocharger. The PCV valve is designed to control the amount of blow-by gas.
- **Valves:** There are 2 intake and 2 exhaust valves per cylinder.

Cooling System

Overview

The Duramax® 3.0L utilizes GM's advanced cooling system strategy known as Active Thermal Management (ATM). ATM distributes coolant through the engine in a targeted manner, sending heat where it's needed to warm up the engine, thereby reducing friction. It promotes quicker heating of the passenger compartment as needed and engine cooling when needed during high power operation. The system uses a conventional engine-driven coolant pump. The ECM controls the complete ATM system using feedback from various sensors.

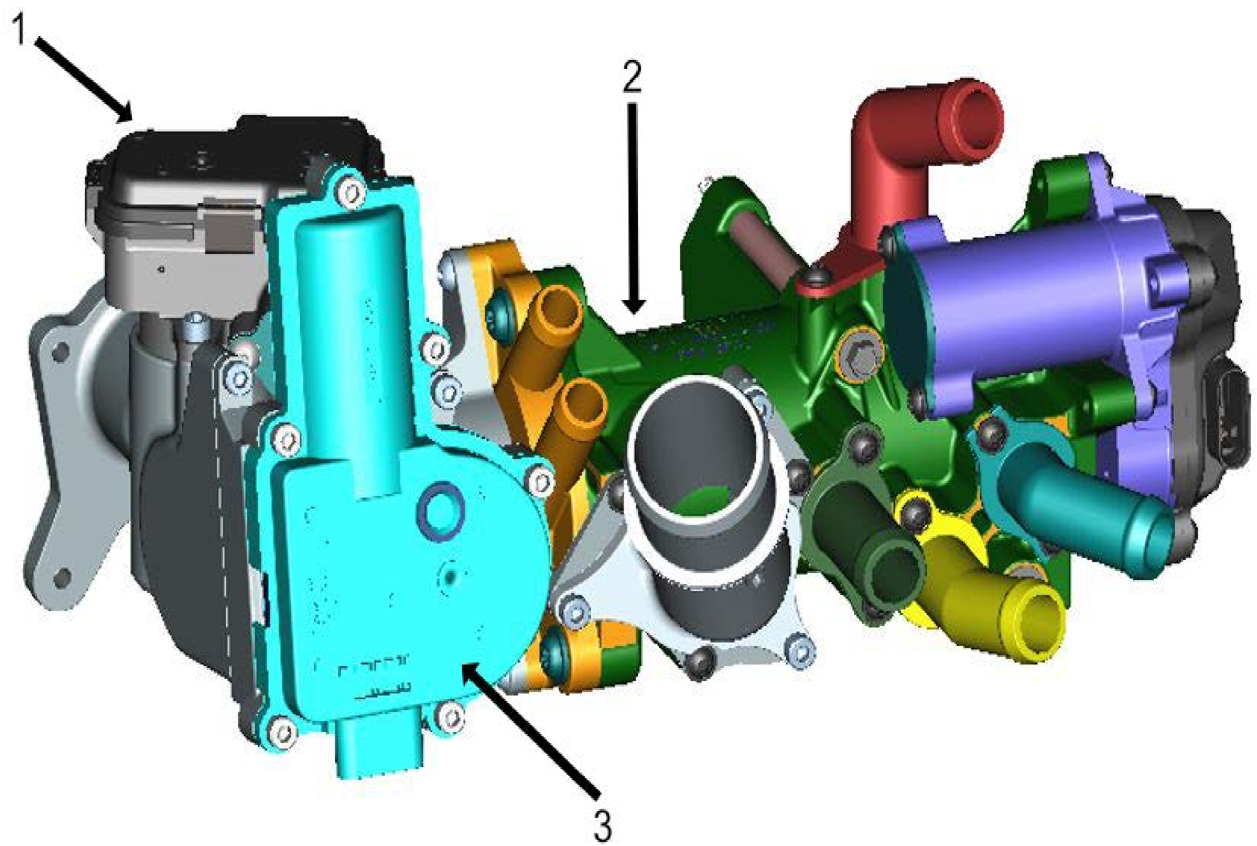
The engine has numerous engine coolant temperature (ECT) sensors placed at specific locations throughout the cooling system as follows:

– Engine Block Coolant Temperature Sensor
– Engine Cylinder Head Coolant Temperature Sensor
– Engine Inlet Coolant Temperature Sensor
– Engine Outlet Coolant Temperature Sensor
– Radiator Outlet Coolant Temperature Sensor
– Heater Core Inlet Coolant Temperature Sensor
– Heater Core Outlet Coolant Temperature Sensor

Additional sensors used by the ECM to control the ATM system are:

– Engine Oil Temperature Sensor 1 and Sensor 2
– Transmission Oil Temperature Sensor
– Control Valve Sensors

Engine Coolant Flow Control Valve



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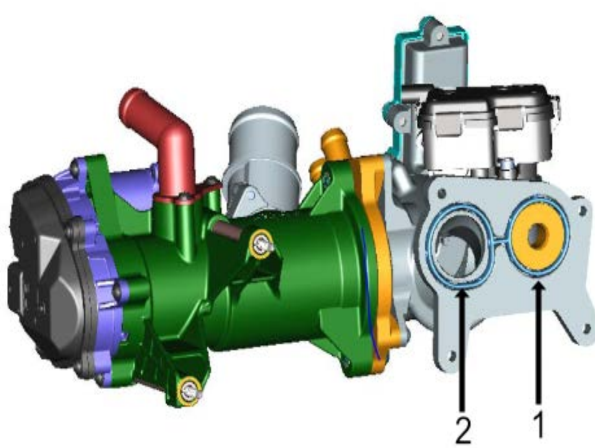
The Engine Coolant Flow Control Valve assembly is attached to the engine under the intake manifold. The engine coolant flow control valve is comprised of two actuators, the Block Rotary Valve (BRV) (1) and the Main Rotary Valve (MRV) (2). The engine coolant flow control valve consists of two chambers. The first chamber controls the coolant flow rate across the radiator and bypass. The second chamber controls the flow to the transmission and engine oil cooler, providing heated coolant from the EGR/Turbocharger return circuit or cold coolant directly from the pump outlet, as required based on feedback from the various coolant temperature sensors. The engine coolant flow control valve also has an integrated Flow Control Valve (FCV) (3) that limits engine coolant flow from the mechanical water pump when full output is not needed. The Exhaust Gas Recirculation (EGR) feed port is always open.

Engine Coolant Flow Control Valve Reverse View



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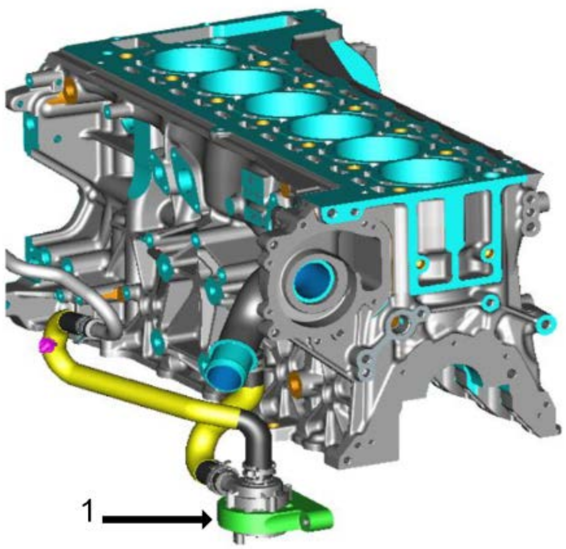
1. Block Port
2. Head Port

Auxiliary Electric Engine Coolant Pump



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When the Stop/Start System has shut down the engine, and the ambient temperature is colder than 59°F (15°C), the ECM will activate the Stop/Start relay for the auxiliary electric engine coolant pump motor (1) to turn it ON. This will continually circulate engine coolant through the heater core while the engine is OFF. This is to ensure the passenger compartment temperature is maintained while the engine is OFF. Once the Stop/Start System has restarted the engine, the ECM will deactivate the relay to turn OFF the auxiliary electric coolant pump motor, allowing the engine driven coolant pump to circulate the engine coolant.

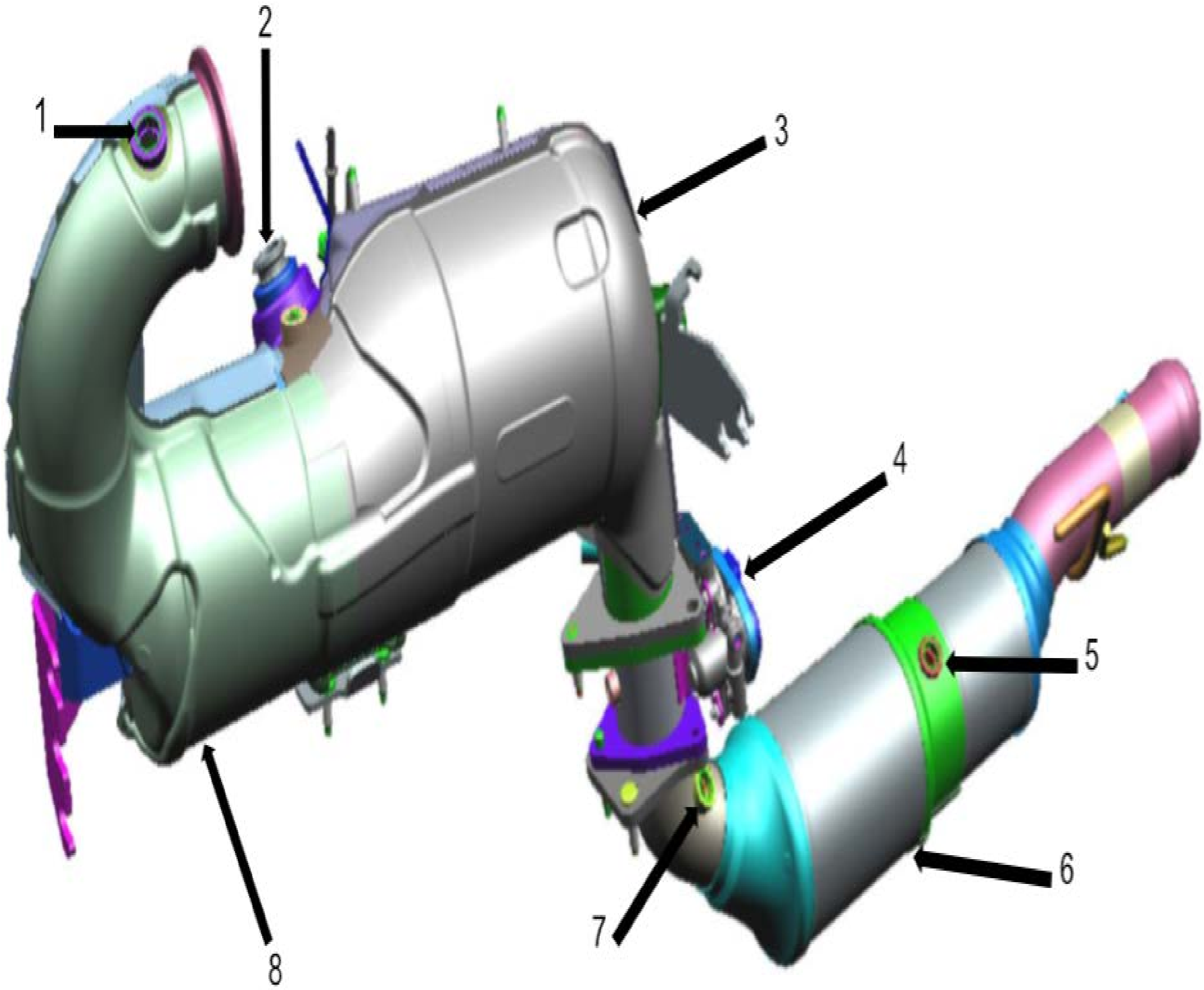
Exhaust Aftertreatment System

Overview

The exhaust aftertreatment system is designed to reduce the levels of hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NOx), and particulate matter (PM) pollutants remaining in the engines's exhaust gases before they exit via the vehicle's exhaust tailpipe.

Typically NOx and PM are controlled by separate aftertreatment components. NOx is controlled by a Selective Catalytic Reduction (SCR) converter combined with precise injections of Diesel Exhaust Fluid (DEF), while PM is controlled by a diesel particulate filter (DPF). Combining aftertreatment system components can reduce packaging volume and manufacturing cost. One way of doing this is to coat the SCR catalyst on the DPF to form an SCR coated DPF also known as a Selective Catalytic Reduction on Filter (SCRoF).

Component Location and Description



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Tip: A exhaust mounting boss is an internally threaded protruding feature on a work piece or component, typically used to mount various exhaust sensors. In the diagrams the boss is used to identify certain component mounting locations.

1. Nitrogen Oxides (NOx) Sensor - Position 1 (Boss).
2. Emission Reduction Fluid/Diesel Exhaust Fluid (DEF) Injector Mounting Flange.

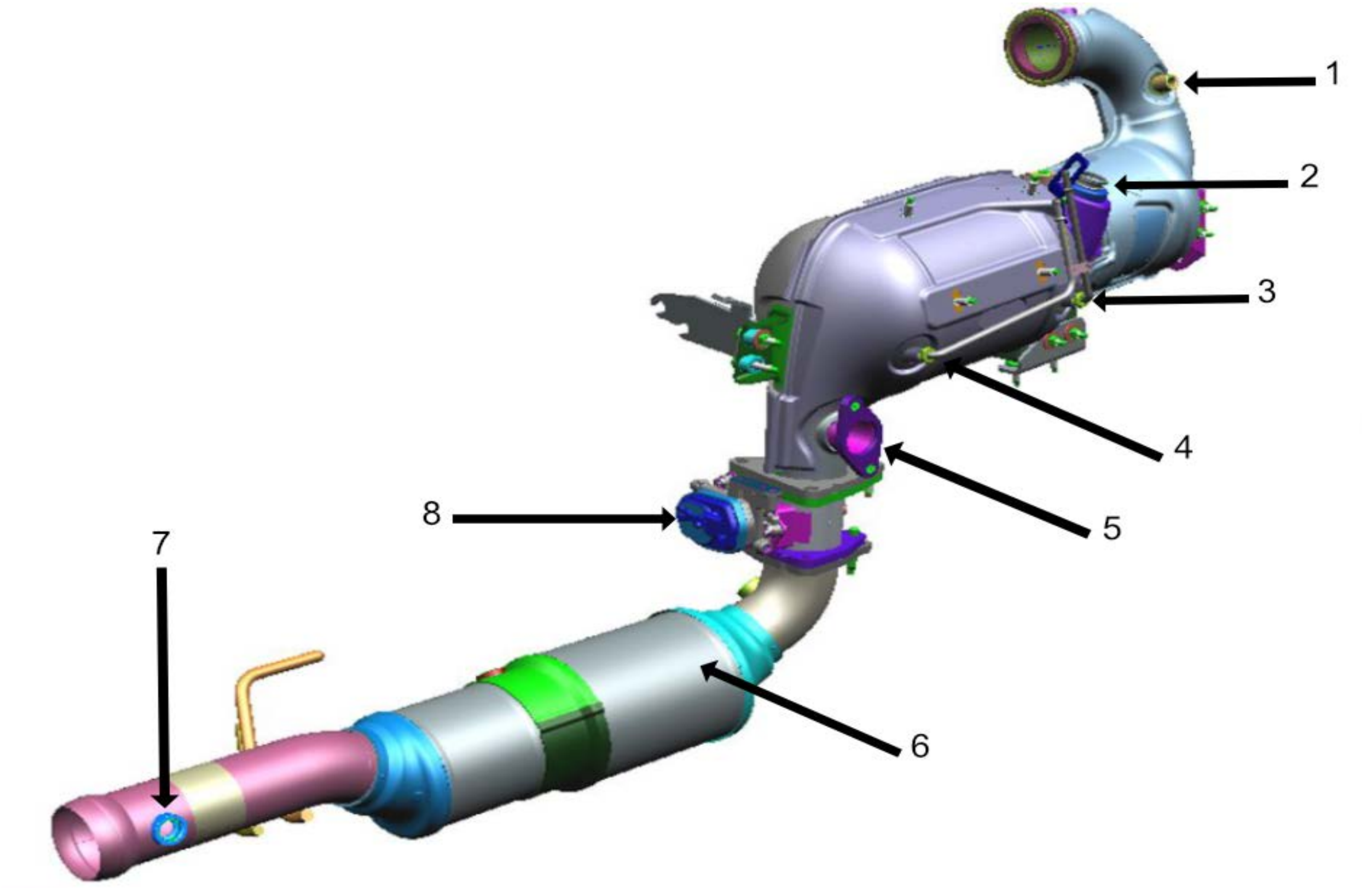
Note: This catalyst is located in the close coupled position.

3. Nitrogen Oxides Catalytic Converter (LM2 With Filter) ***assembly***. The arrow points to the Diesel Particulate Filter (DPF) section of the ***assembly*** (rear gray section), that contains the SCR on Filter (SCRoF).
4. Exhaust Back Pressure Valve. The valve disc is internal to the assembly and the valve actuator is mounted on the exterior cover.
5. Nitrogen Oxides (NOx) Sensor - Position 3 (Boss).

Note: This catalyst is located in the underfloor position.

6. Nitrogen Oxides Catalytic Converter (LM2 Without Filter) ***assembly***. The front section of the assembly is an SCR. The rear section of the assembly is an Ammonia Oxidation Catalyst.
7. Nitrogen Oxides (NOx) Sensor - Position 2 (Boss).
8. Diesel Oxidation Catalyst (DOC), part of the Nitrogen Oxides Catalytic Converter (LM2 With Filter) ***assembly***. The arrow points to the Diesel Oxidation Catalyst section of the ***assembly*** (front green section).

Component Location and Description (Reverse View)



1. Exhaust Temperature Sensor - Position 1 (Boss).
2. Emission Reduction Fluid/Diesel Exhaust Fluid (DEF) Injector Mounting Flange.
3. Exhaust Pressure Differential Sensor Pipe.
4. Exhaust Pressure Differential Sensor Pipe.
5. Exhaust Gas Recirculation (EGR) Flange.

Note: This catalyst is located in the underfloor position.

6. Nitrogen Oxides Catalytic Converter (LM2 Without Filter) ***assembly***. The front section of the assembly is an SCR. The rear section of the assembly is an Ammonia Oxidation Catalyst. The arrow points to the SCR section of the ***assembly***.
7. Particulate Matter (PM) (Boss).
8. Exhaust Back Pressure Valve. The valve disc is internal to the assembly and the valve actuator is mounted on the exterior cover.

Diesel Oxidation Catalyst (DOC) Operation

The DOC is the front section of the Nitrogen Oxides Catalytic Converter (LM2 With Filter) assembly. The close coupled DOC removes exhaust HC and CO through an oxidation process. The DOC functions much like the catalytic converter used with gasoline fueled engines. As with all catalytic converters, the DOC must be hot in order to effectively convert the exhaust HC and CO into CO_2 and H_2O. On cold starts, the exhaust gases are not hot enough to create temperatures within the DOC that are hot enough to support full HC and CO conversion. Proper DOC function requires the use of ultra-low sulfur diesel (ULSD) fuel containing less than 15 parts-per-million (ppm) sulfur. Levels above 15 ppm will reduce catalyst efficiency and eventually result in poor driveability and one or more DTCs may be set.

Selective Catalyst Reduction (SCR) — SCR on Filter (SCRoF)

The close coupled DOC along with the SCR on Filter (SCRoF) are integrated into one assembly. The combined SCR and DPF make up the second section of the Nitrogen Oxides Catalytic Converter (LM2 With Filter) assembly. In the DPF, particulate matter consisting of extremely small particles of carbon remaining after combustion are removed from the exhaust gas by the large surface area of the DPF. DEF is injected into the exhaust gases prior to entering the SCRoF stage. Within the SCRoF, NOx is converted to nitrogen (N_2), carbon dioxide (CO_2) , and water vapor (H_20) through a catalytic reduction fueled by the injected DEF.

Emission Reduction Fluid — Diesel Exhaust Fluid (DEF)

Note: Depending on the Service Information or Parts Information that is being referenced, Emission Reduction Fluid is also identified as Diesel Exhaust Fluid (DEF) and/or Reductant.

Diesel Exhaust Fluid (DEF) is a mixture of a carefully blended aqueous urea solution of 32.5% high purity urea (Pharmaceutical Grade Urea) and 67.5% deionized water. The ECM energizes the DEF injector to dispense a precise amount of reductant upstream of the SCRoF in response to changes in exhaust NOx levels. Within the SCRoF, exhaust heat converts the urea into ammonia (NH3) that reacts with NOx to form nitrogen, CO2, and water vapor. Optimum NOx reduction occurs at SCRoF temperatures of more than 480°F (250°C). At lower temperatures, NH3 and NOx may react to form Ammonium Nitrate (NH4NO3) which can lead to temporary deactivation of the SCRoF catalyst. To prevent this, the ECM will suspend DEF injection when the exhaust temperature is less than a calibrated minimum.

A 32.5% solution of urea with 67.5% deionized water will begin to crystallize and freeze at 12°F (−11°C). At this ratio, both the urea and water will freeze at the same rate, ensuring that as it thaws, the fluid does not become diluted, or over concentrated. The freezing and thawing of DEF will not cause degradation of the product. DEF should be stored in a cool, dry, well-ventilated area, out of direct sunlight.

Exhaust Gas Temperature (EGT) Sensor

The engine uses exhaust gas temperature (EGT) management to maintain the SCRoF catalyst within the optimum NOx conversion temperature range of 390–750°F (200–400°C). The ECM monitors the EGT sensors located upstream and downstream of the SCRoF in order to determine if the SCRoF catalyst is within the temperature range where maximum NOx conversion occurs.

Exhaust Pressure Differential Sensor

Pressure connections, provided by pipes/hoses at the DPF inlet and outlet allow the sensor to measure the pressure drop across the DPF. This pressure drop increases as trapped soot (Particulate Matter) collects in the cells of the DPF during vehicle operation. The rate at which soot collects varies with the power demands placed on the engine. If left unchecked, the increasing back pressure will eventually result in a driveability problem. There are two sensing elements in the sensor; one for the upstream side of the DPF, and the other for the downstream side. Pressure from each side of the DPF is applied to the bottom side of a silicon diaphragm in each sensing element while atmospheric pressure is applied to the top side of each diaphragm. Relative pressure differences in each sensing element is converted to a voltage (V1 & V2). The difference in these voltages is monitored by the ECM. As the DPF becomes restricted, the pressure on the upstream side increases because of back pressure due to the restriction of the exhaust gas flow exiting the DPF.

Nitrogen Oxides (NOx) Sensor

The ECM uses three smart NOx sensors to control exhaust NOx levels. The first NOx sensor is located in the inlet pipe of the close coupled catalyst, near the turbocharger outlet and monitors the engine out NOx. The second NOx sensor is located in the exhaust pipe downstream of the SCRoF and monitors NOx levels exiting the close coupled SCRoF. The third NOx sensor is located on the Nitrogen Oxides Catalytic Converter (LM2 Without Filter) assembly and monitors NOx levels exiting the aftertreatment system.

The smart NOx sensors consist of two components, the NOx module and the NOx sensor element that are serviced as a unit. The NOx sensors incorporate an electric heater that is controlled by the NOx module to quickly bring the sensors to operating temperature. As moisture remaining in the exhaust pipe could interfere with sensor operation, there is a delay turning ON the heaters until the exhaust temperature exceeds a calibrated value. This allows any moisture remaining in the exhaust pipe to boil off before it can effect NOx sensor operation.

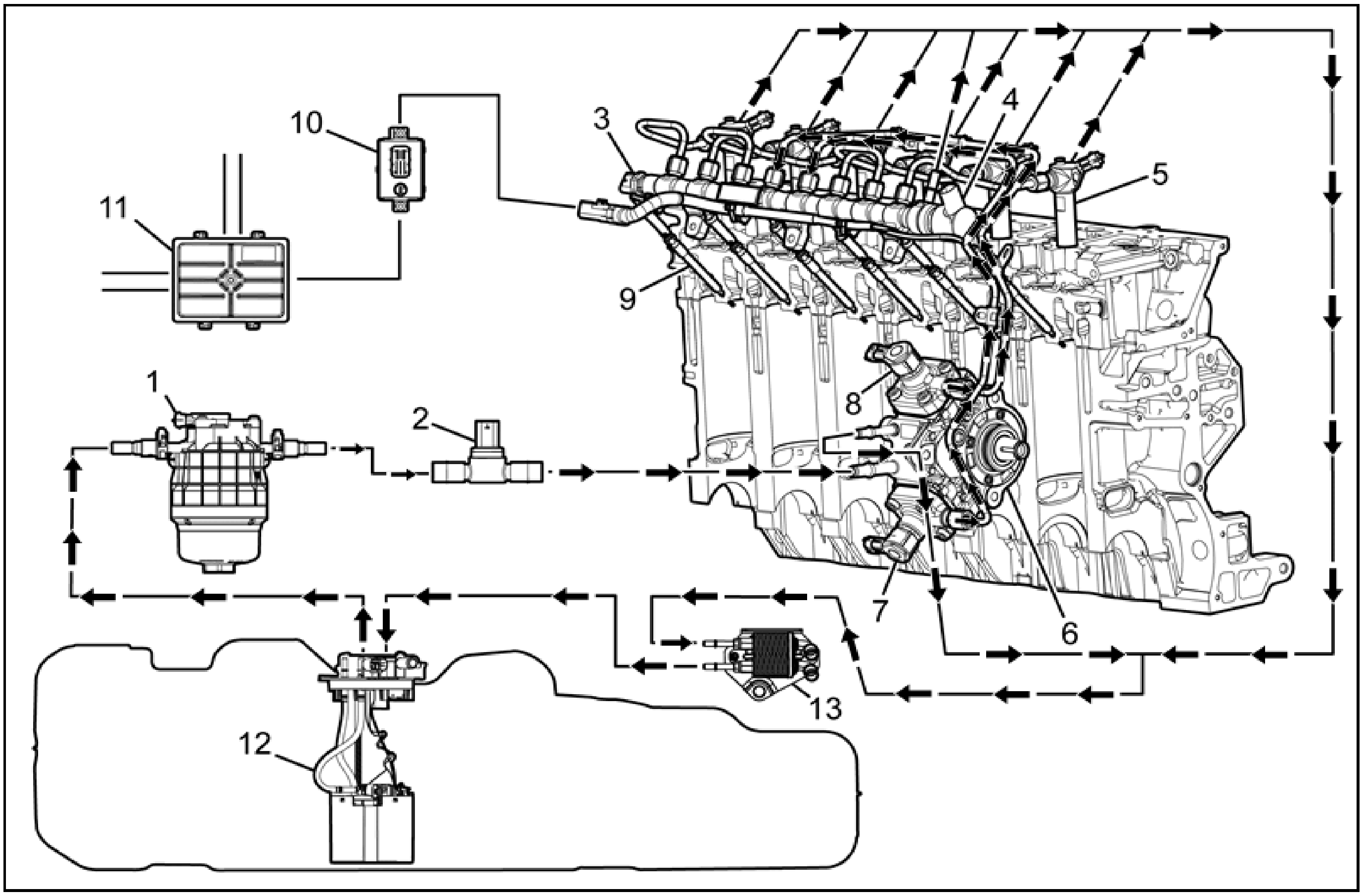
Particulate Matter (PM) Sensor

The PM sensor monitors the amount of particulates (soot) in the exhaust gas exiting the tailpipe. The PM sensor is similar to a heated oxygen sensor with a ceramic element but also includes an individually calibrated control unit. The PM sensor sensing element includes two comb-shaped inter-digital electrodes, a heater and a positive temperature coefficient (PTC) resistor used for temperature measurement.

The operation of the PM sensor is based on the electrical conductivity characteristic of the soot. As the exhaust gas flows over the sensing element, soot is absorbed in the combs between the electrodes, eventually creating a conductive path. When the path is formed, it generates a current based on the voltage being applied to the element. The measurement process continues until a preset current value is reached. To avoid misleading readings, the sensor operates on a “regenerative” principle, where the soot is cleaned off by heating up the element to burn off the carbon, before the measurement phase begins. The amount of regenerations is based on vehicle strategy. When the calibrated amount of regenerations are reached, the cumulative current readings are used to determine the amount of soot concentration in the exhaust gas, indicating the collection efficiency of the DPF.

Fuel System

Fuel System Component List



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1. Fuel Filter Assembly
2. B47 Fuel Pressure Sensor
3. B47B Fuel Rail Pressure Sensor
4. Q18B Fuel Pressure Regulator 2
5. Q17 Fuel Injector
6. G18 High Pressure Fuel Pump
7. Q18A Fuel Pressure Regulator 1
8. Q18C Fuel Pressure Regulator 3
9. E12 Glow Plug
10. K34 Glow Plug Control Module
11. K20 Engine Control Module
12. A7 Fuel Pump and Level Sensor Assembly
13. Fuel Cooler

Fuel Tank

The primary fuel tank stores the fuel supply and contains a 3–phase electric fuel pump that is controlled by the fuel pump driver control module and ECM. Fuel is pumped from the primary fuel tank through the fuel feed line to the fuel filter assembly. The fuel filter assembly consists of a fuel filter/water separator, fuel heater, fuel temperature sensor, and a water in fuel sensor. Fuel flows out of the fuel filter assembly through the rear fuel feed pipe and past the fuel pressure sensor to the high pressure fuel pump. High pressure fuel is supplied through the high pressure fuel line to the fuel rail and then through the fuel injector lines to the fuel injectors. High pressure fuel is controlled by the ECM, fuel pressure regulators 1, 2, and 3. Excess fuel returns to the fuel tank through the fuel return pipes.

Fuel Cooler

The fuel cooler is located under the vehicle. The returning fuel goes through the fuel cooler prior to reaching the vehicle’s fuel tank. Coolant from the engines cooling system flows through the fuel cooler in order to cool the fuel and maintain a constant fuel temperature.

Fuel Feed and Return Pipes

The fuel feed pipe carries fuel from the fuel tank to the fuel filter/heater, the exhaust aftertreatment fuel injector, and fuel injection pump. The fuel return pipe carries fuel from the fuel rail assemblies back to the fuel tank.

Fuel Injectors

A fuel injector is a solenoid device, controlled by the ECM, that meters pressurized fuel to a single engine cylinder. Fuel from the fuel injector tip is sprayed directly into the combustion chamber on the compression stroke of the engine. The fuel injectors are located above each cylinder and deliver fuel directly into the cylinder. Each injector has a high pressure fuel pipe from the fuel rail and a return line.

Fuel Injection Timing

The ECM has the ability to learn injector timing performance. When the engine is at operating temperature, throttle closed and in deceleration fuel cut-off mode, the ECM will pulse each injector individually and measure the changes in rotational speed of the crankshaft using the input from the crankshaft position sensor. The ECM will run this diagnostic at one fuel rail pressure operating point for each injector. The ECM stores the injector timing value.

Fuel Pressure Regulator 1 & 3

The ECM controls the fuel rail pressure using three pulse width modulated fuel rail pressure regulators. Fuel pressure regulator 1 & 3 are located in the fuel injection pump and meters the amount of fuel that enters the high pressure side of the pump. From the high pressure pump, the fuel moves to the fuel rail through high pressure steel lines. The fuel rail distributes high pressure fuel to all 6 fuel injectors.

Fuel Pressure Regulator 2

The ECM controls the fuel rail pressure using 3 pulse width modulated fuel rail pressure regulators. Fuel pressure regulator 2 is located on the rear of the fuel rail and meters the amount of fuel being returned to the fuel tank. The ECM varies the PWM voltage to fuel pressure regulator 2 to relieve excessive fuel pressure allowing fuel to return to the fuel tank. When the ignition is OFF, fuel pressure regulator 2 opens to bleed off the pressure on the high pressure side of the fuel system.

Fuel Pressure Sensor

The fuel pressure sensor is located in the fuel feed pipe. The fuel pressure sensor monitors the fuel pressure in the fuel line. The fuel pump driver control module monitors the voltage signal from the fuel pressure sensor and sends serial data to the ECM to provide low side fuel pressure control.

Fuel Rail Pressure Sensor

The fuel rail pressure sensor is a dual analog sensor that provides two fuel rail pressure signals to the engine control module (ECM) and is located in the end of the fuel rail assembly.

Fuel Tank Fuel Pump Module

The fuel tank fuel pump module is located inside of the fuel tank. The fuel tank fuel pump module contains the following major components: the fuel level sensor, fuel pump and reservoir assembly and fuel strainer.

High Pressure Fuel Pump

The high pressure fuel pump is a mechanical pump and is attached to the lower driver side of the engine block. The high pressure fuel pumps provides high pressure fuel to the fuel rail at a specified pressure regulated by the fuel pressure regulators.

Turbocharger

Overview

A turbocharger increases engine power by pumping compressed air into the combustion chambers, allowing a greater quantity of fuel to combust at the optimal air/fuel ratio. The Variable Geometry Turbine (VGT) body assembly contains a contact-less inductive VGT position sensing element that is managed by a customized integrated circuit. The VGT position sensor is mounted within the VGT body assembly and is not serviceable. The ECM supplies the VGT body with a 5 V reference circuit, a low reference circuit, an H-bridge motor directional control circuit, and an asynchronous signal/serial data circuit. The asynchronous signal means communication is only going from the VGT body to the ECM. The VGT body cannot receive data from the ECM over the signal/serial data circuit. The VGT position sensor provides a signal voltage that changes relative to VGT vanes angle. The customized integrated circuit translates the voltage based position information into serial data using Single Edge Nibble Transmission (SENT) protocol. The VGT position sensor information is transmitted between the VGT body and the ECM on the signal/serial data circuit. The ECM decodes the serial data signal and is used as voltages for VGT position sensor.

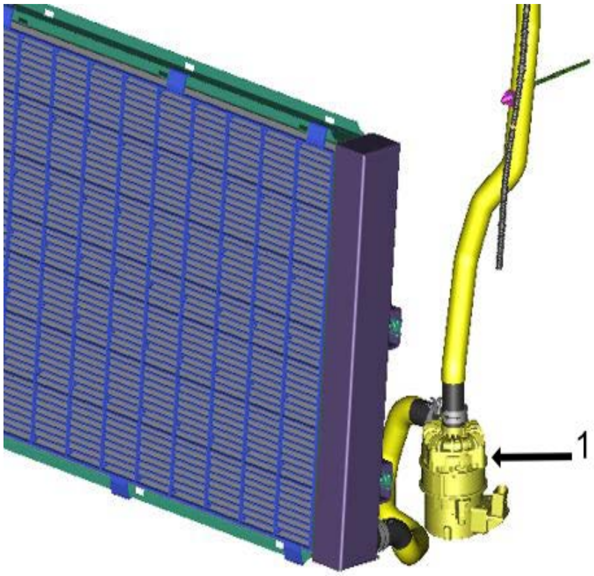
The turbocharger vanes are normally closed at idle, greater than 70%, when the engine is not under load. As the vehicle accelerates and the torque request stabilizes, the ECM will open the turbocharger vanes to regulate boost pressure.

The ECM will close the turbocharger vanes to create back pressure to drive exhaust gas through the EGR valve as required. At extreme cold ambient temperatures, the ECM may maintain a more closed vane position, at low load conditions, in order to accelerate engine coolant heating.

Charge Air Cooler and Intercooler

The turbocharger is supported by an air-to-water charge air cooler (CAC) system, which uses fresh air drawn through a heat exchanger to reduce the temperature of the warmer compressed air forced through the intake system. Inlet air temperature can be reduced by up to 180°F (100°C), which enhances performance. This is due to the higher density of oxygen in the cooled air, which promotes optimal combustion. The intake manifold housing has an integrated intercooler. The intercooler uses conventional coolant in a system that is separate from the engine cooling system. The intercooler system includes an air cooler/heat exchanger built into the intake, a charge air cooler radiator assembled in the front fascia, and an electric coolant pump. Coolant is pumped through the intercooler, enters through the inlet port, is directed into and through the charge air cooler/ heat exchanger, and exits through the outlet port and pumped back to the charge air cooler radiator.

Charge Air Cooler Coolant Pump



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The CAC coolant pump (1) is a solid state device. Ignition voltage is supplied from a fuse and ground is provided at the chassis. When the engine starts, the ECM sends a request via serial data circuit to the CAC coolant pump commanding it to operate at the desired speed. The charge air cooler coolant pump provides operational and diagnostic feedback to the ECM on the serial data circuit. If a condition exists with the physical pump, or microprocessor logic, the device will report fault specific information via the serial data circuit to the ECM. The ECM will then set the corresponding DTC. If the device fails to communicate or a condition exists with external circuits, the devices corresponding U-code will set.

Active Engine Mount

Overview

The MY2020 Silverado 1500 and MY2020 Sierra 1500 trucks equipped with the Duramax® 3.0L will use an active engine mount system to cradle the engine. The active engine mounts are used to enable an optimal balance between vehicle Noise Vibration and Harshness (NVH) performance and vehicle dynamics. This includes during key cycles and Stop/Start events. The variable viscosity technology is essentially an adaptive shock absorber that actively controls engine vibration, reducing a significant amount of vibration from the engine and contributing to lower NVH levels. There is a single solenoid on each active engine mount that is energized during an ignition event and switched ON for idle and driving events. The engine mount solenoid valves are supplied with battery voltage through a single fuse and are controlled by the ECM. The engine mount solenoid valves are identified in the Master Electrical Component List as follows:

- Q80L Engine Mount Solenoid Valve - Left
- Q80R Engine Mount Solenoid Valve - Right

Oil — dexosD™ DIESEL

Specification

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Engine oils approved by GM as meeting the dexosD™ diesel specification are marked with the ***dexosD™ DIESEL*** logo.

Use engine oils that meet the dexosD™ diesel specification, such as ***ACDelco™ Light Duty Diesel*** engine oil. The oil can be purchased directly from ACDelco™.

Visit the dexos™ website at https://www.gmdexos.com/index.html

Viscosity Grade

Use SAE 0W20 ***dexosD™ DIESEL*** engine oil in the 2020 Duramax® 3.0L — RPO LM2 engine. Do not add anything to the oil.

Stop/Start System

Overview

Warning: The automatic engine Stop/Start System causes the engine to shut OFF while the vehicle is still ON. Do not exit the vehicle before shifting to P (Park). The vehicle may restart and move unexpectedly. Always shift to P, and then turn the ignition OFF before exiting the vehicle.

The Stop/Start system will shut OFF the engine to help conserve fuel. It has components designed for the increased number of engine starts that will occur.

Auto Engine Stop/Start

When the brakes are applied and the vehicle is at a complete stop, the engine may turn OFF. When stopped, the tachometer indicator will point to: AUTO STOP. When the brake pedal is released or the accelerator pedal is pressed, the engine will restart. To maintain vehicle performance and/or passenger comfort, other conditions may cause the engine to automatically restart before the brake pedal is released.

Auto Stops ***may not occur*** and/or Auto Starts ***may occur*** because of the following:

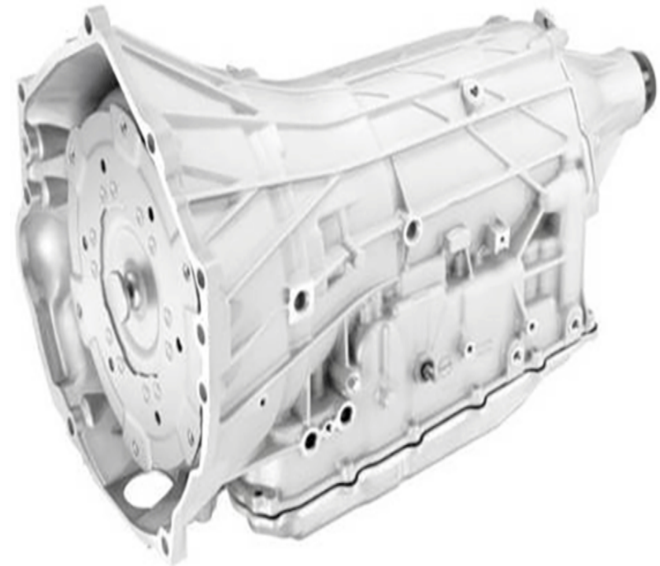
- The climate control settings require the engine to be running to cool or heat the vehicle interior as needed.
- The vehicle battery charge is low.
- The vehicle battery has recently been disconnected.
- A minimum vehicle speed has not been reached since the last Auto Stop.
- The accelerator pedal is pressed.
- The engine or transmission has not met the required operating temperature.
- The ambient temperature is not in the required operating range.
- The transmission is in any gear other than **D**.
- Tow/Haul Mode or other drive modes have been selected.
- The vehicle is on a steep hill or grade.
- The driver door has been opened or the driver seat belt has been unbuckled.
- The hood has been opened.
- Auto Stop has reached the maximum allowed time.

Auto Stop Disable Switch

The automatic Engine Stop/Start feature can be disabled and enabled by pressing the switch with the **A** surrounded by a circular arrow symbol. Auto Stop is enabled each time the vehicle is started. When the **A** surrounded by a circular arrow symbol is illuminated, the system is enabled.

Transmission 10L80 10-Speed — RPO MQB

Operation



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10L80, 10-Speed, Automatic, ATSS, CPA, GEN 2 — RPO MQB

The 10L80 10-speed is a fully automatic, rear-wheel drive, electronic-controlled transmission. The 10-speed ratios are generated using four simple planetary gearsets, two brake clutches, and four rotating clutches. The resultant on-axis transmission architecture utilizes a squashed torque converter, an off-axis pump and 4 close coupled gearsets. The 4 rotating clutches are located forward of the gearsets to minimize the length of oil feeds which provides for enhanced shift response. There are different variants of the transmission, all based on torque capacity. Architecture is common between the variants, and component differences are primarily related to size.

The transmission architecture features a case with integral bell housing for enhanced powertrain stiffness. A unique pump drive design allows for off-axis packaging very low in the transmission. The pump is a variable vane type which effectively allows for 2 pumps in the packaging size of 1 pump. This design and packaging strategy not only enables low parasitic losses and optimum priming capability but also provides for ideal oil routing to the controls system, with the pump located in the valve body itself. The transmission control module (TCM) is externally mounted, enabling packaging and powertrain integration flexibility. The controller makes use of 3 speed sensors which provide for enhanced shift response and accuracy.

The 4 element torque converter contains a pump, a turbine, a pressure plate splined to the turbine, and a stator assembly. The torque converter acts as a fluid coupling to smoothly transmit power from the engine to the transmission. It also hydraulically provides additional torque multiplication when required. The pressure plate, when applied, provides a mechanical direct drive coupling of the engine to the transmission.

The planetary gear sets provide 10 forward gear ratios and 1 reverse. Changing gear ratios is fully automatic and is controlled by the TCM. The TCM receives and monitors various electronic sensor inputs and uses this information to shift the transmission at the optimum time.

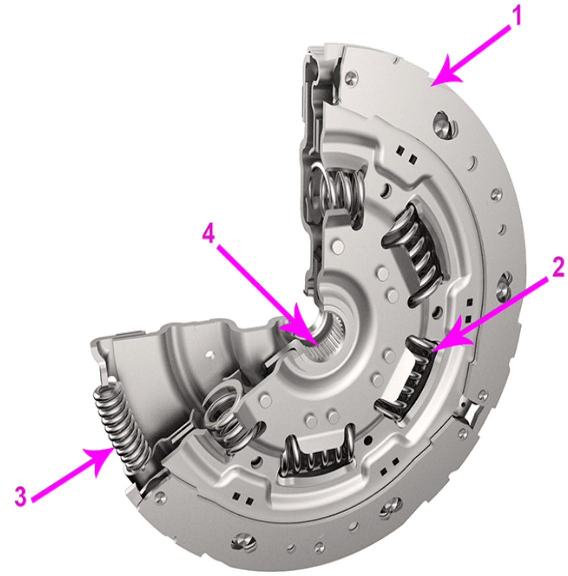
The hydraulic system primarily consists of an off-axis gear-driven variable vane-type pump next to the valve body, and 2 control valve body assemblies. The pump maintains the working pressures needed to stroke the clutch pistons that apply or release the friction components. These friction components, when applied or released, support the automatic shifting qualities of the transmission.

The friction components used in this transmission consist of 6 multiple disc clutches. The multiple disc clutches deliver 11 different gear ratios, 10 forward and 1 reverse, through the gear sets. The gear sets then transfer torque through the output shaft.

Transmission — Torque Converter with Centrifugal Pendulum Absorber

Centrifugal Pendulum Absorber

To control vibration and noise inside of the vehicle, GM engineers **integrated** a device called a centrifugal pendulum absorber (CPA) in the torque converter that is used with the 10 speed 10L80 automatic transmission. The CPA is an absorbing damper with a set of secondary spring masses, that when energized cancels out the engine's torsional vibrations so the driver and passengers can't feel them. In this unique design the spring masses vibrate in the opposite direction of the torsional vibrations of the engine balancing out undesirable torsional vibrations, thereby improving NVH levels.



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1. Pendulum masses.
2. Output isolator spring.
3. Input isolator spring.
4. Output hub.

Special Tools

The following new tools were released for the 2020 Duramax® 3.0L — RPO LM2:

Special Tools — Tool Number and Description

Tool Number	Description
EN-52445	Camshaft Tool
EN-52446	Rear Crankshaft Seal Installer
EN-52448	High Pressure Fuel Pump Tool
EN-52449	Engine Stand Adapter
EN-52451	Fuel Injector Remover
EN-52452	Installer, Front Crankshaft Seal
EN-52474	Engine Lift Bracket Assembly
EN-52579	Crankshaft Rotator Tool
EN-52586	Fixing Pin, Crankshaft Timing
EN-50717-20	Valve Spring Compressor Adapter

Training Courses

Training Courses — Description and Number

Description	Course Name and Number
Engine	16440.24D-V: Engine: New and Updates for RPOs LM2, LTA, LSY, L3B, L8T
Transmission	#17041.79W: 10-Speed Automatic Transmission Overview

Version Information

Version	1
Modified	Released August 24, 2019

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