Service Bulletin

File in Section: -
Bulletin No.: 17-NA-366
Date: April, 2018

INFORMATION

Subject: **2018 Chevrolet Low Cab Forward 6500XD New Model Features**

Attention: **There is a requirement to retain all Warranty Parts from this vehicle. The Warranty Parts Center will be requesting all Warranty Parts submitted on paid Warranty Transactions to be returned. Dealer Management should ensure their parts retention, tagging, storage and return procedures are compliant and that all Parts Managers, Parts Personnel, Service Managers and Service Technicians are aware of this requirement for this vehicle.**

Brand:	Model:	Model Year:		VIN:		Engine:	Transmission:
		From:	To:	From:	To:		
Chevrolet	Low Cab Forward 6500XD	2018	2018	All	All	5.2L, 4 CYL, 4HK1 Turbocharged Diesel Engine — RPO I1B	Allison Transmission, Automatic 6-Speed 2550RDS, Conv Clutch, with Park Pawl (with PTO Provisions) — RPO MPQ

Involved Country	United States

Overview

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2018 Chevrolet Low Cab Forward 6500XD

Bulletin Purpose

This is a special bulletin to introduce the 2018 Chevrolet Low Cab Forward (LCF) 6500XD Truck. The purpose of this bulletin is to help the Service Department Personnel become familiar with some of the vehicle's new features and to describe some of the action they will need to take to service it.

Introduction

Chevrolet is expanding its range of LCF trucks with a new dock-height Class 6 model – the 6500XD. The 6500XD, like its Class 3, 4 and 5 stablemates is a highly flexible platform designed for driver comfort, superior visibility, maneuverability, serviceability and ease of upfit. For commercial customers with specific configuration needs, General Motors has a dedicated Upfitter Integration Group to serve as a liaison between Special Vehicle Manufacturers, customers, and GM's engineering, marketing, and service teams. A website with detailed body builder manuals, technical bulletins, and best practices is also available to assist upfitting. Visit: https://www.gmupfitter.com/

Cab Over Design

The Cab Over design provides optimal visibility for the driver, which is especially useful in tight urban areas. The cabin's design is also helpful for crews that make multiple pick-ups and deliveries throughout the day due to its ease of entry and exit. Easy access to the engine compartment makes routine maintenance a breeze.

Highlights

The 6500XD adds significant extra capability as follows:

- 5.2L four-cylinder turbodiesel that delivers 215 hp (160 kW) with 520 lb-ft (705 Nm) of torque which is a 68 lb-ft (92 Nm) increase over the 2016 5500XD 5.2L. The torque increase was provided by an improved engine control calibration, without any hardware changes.
- 50 degree wheel cut. This is the turning degree of the front wheels. 0 degrees would be straight ahead. It provides for a much more nimble truck, with tight turning diameters.
- Allison 2550RDS (Rugged Duty Series™) 6-speed automatic transmission with Park Pawl (with PTO provisions).
- Chassis is prewired for a trailer harness and brakes to reduce the time and cost of upfitting.
- Compatibility for a variety of body types, including dry freight boxes, refrigerated boxes, stake/flat beds and service bodies.
- Easy access to the engine compartment with a 45-degree tilting cab.
- Easy driver entry and exit.

- Eight wheelbases are available for bodies from 14 ft. (4 m) up to 30 ft. (9 m) long.
- Extra strong straight-rail frame.
- Front Dana axle rating of 12,000 lbs. (5,443 kg), rear Dana axle rating of 19,000 lbs. (8,618 kg). Maximum GVWR is 25,950 lbs. (11,771 kg).
- Front grill opens to access certain components.
- Front Highway / Rear Traction 22.5-inch wheels/ tires.
- Standard air brakes.
- Standard exhaust brake.
- Wide integrated step.
- Wider cab.

Interior Workspace

The interior design maximizes the use of space to benefit drivers with a fold-down tray that doubles as a laptop/work area and has convenient storage areas in the dash, doors, seatback pockets, overhead shelf, and rear organizer tray. There is room behind the driver seat that folds down for a fire extinguisher or tool box.

Standard Equipment

The following is standard equipment on the 6500XD:

- AM/FM radio with CD, USB and Bluetooth®.
- Air brakes.
- Air conditioning.
- Driver Suspension Seat with arm rest.
- Cloth seat insert for all 3 seats.
- Center seat with seat back tray.
- Floor mats, 4 cup holders (2 in dash, 2 in floor console).

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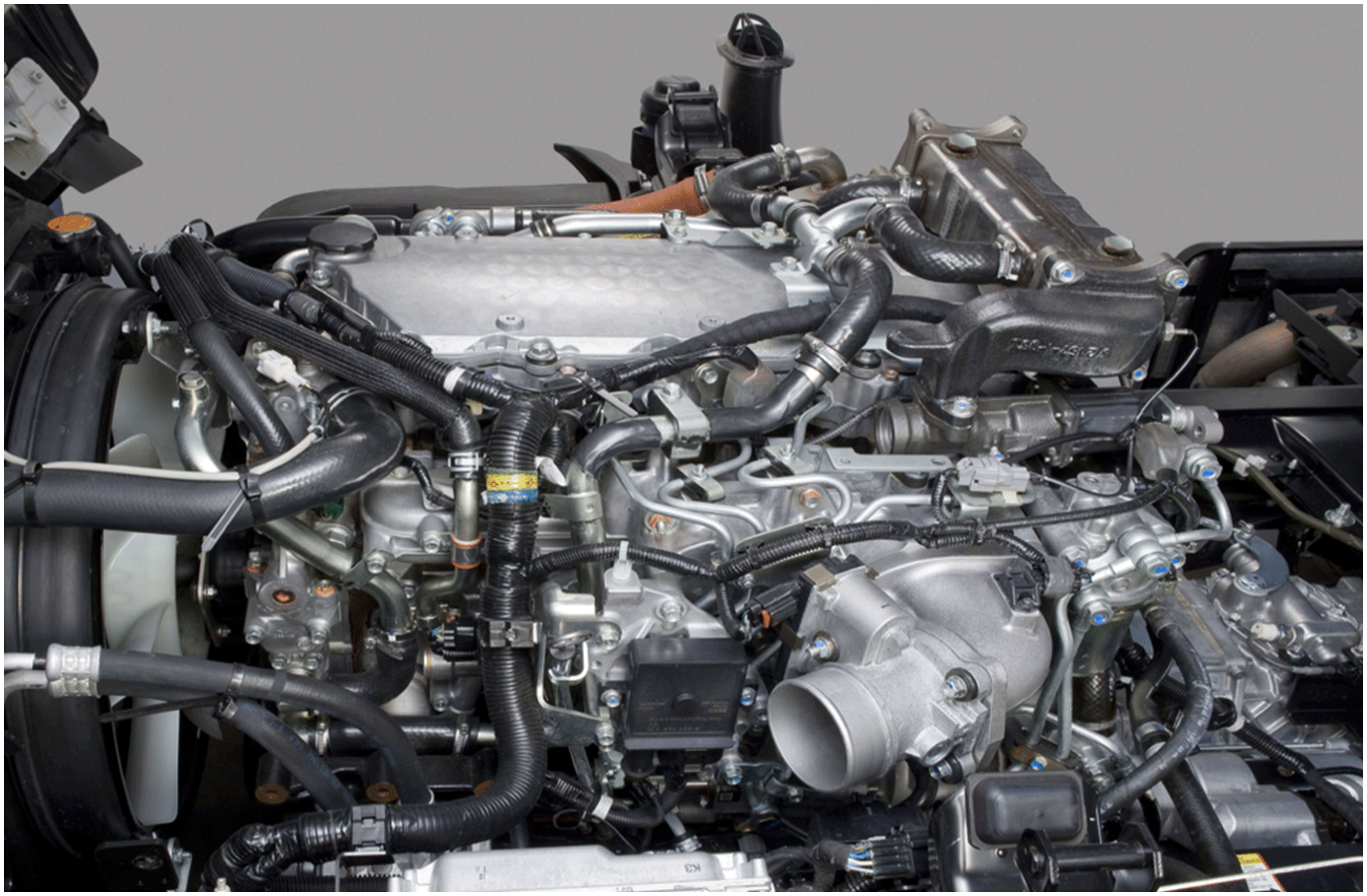
- Keyless Odometer Check switch. Press the Odometer Check switch to display the odometer and trip meter mileage after the key is turned OFF. The fuel gauge will also operate when this switch is pressed. The DIC and some lights will also illuminate on the instrument panel.
- Oil Level Check switch.
- Power windows and door locks.
- Roof Console.
- Standard 50 gallon (189 L) or 100 gallon (378 L) fuel tank depending on wheelbase.
- Tilt and telescoping steering wheel.
- White paint, color keyed radiator grill and side fender.

Engine — 5.2L I4 4HK1-TC Diesel

5.2L I4 Diesel Engine 4HK1-TC — RPO I1B



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Shown is a typical view of the engine.

This engine has the following features for increased performance and emissions reduction.

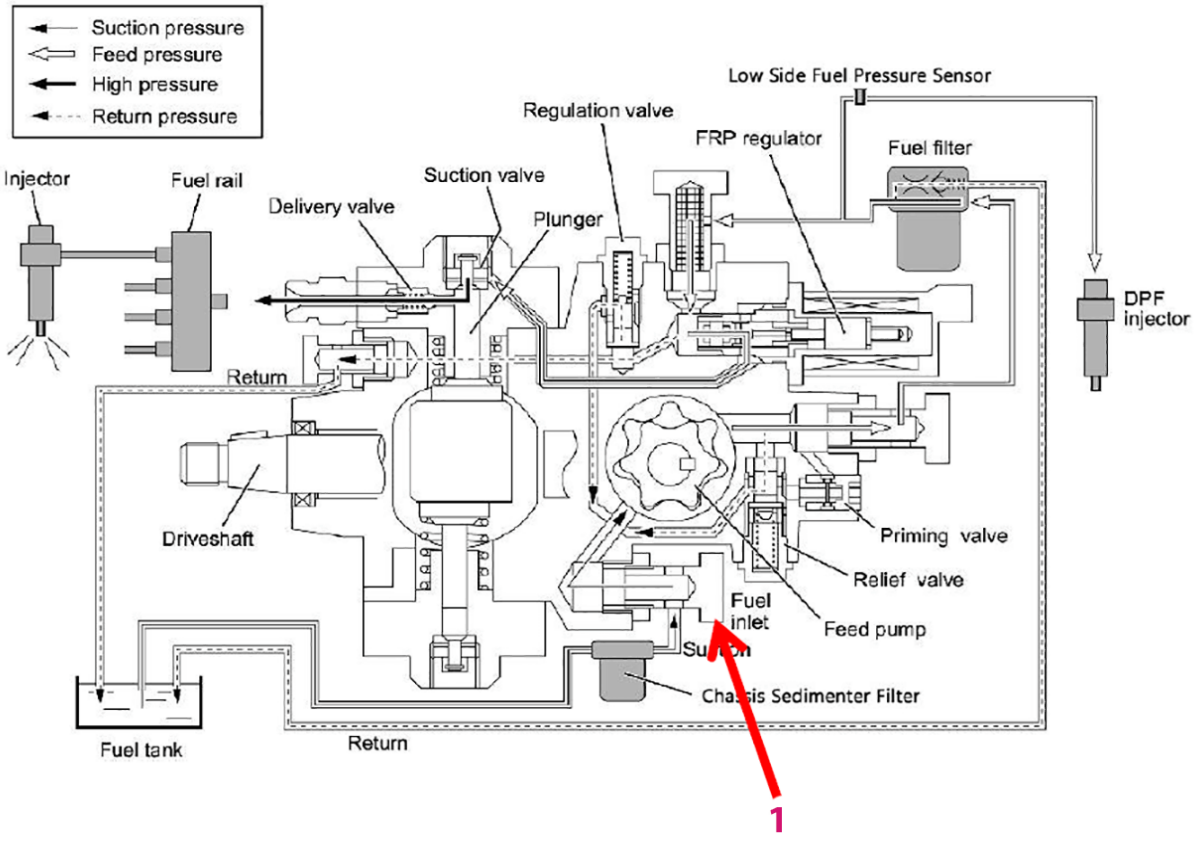
- **B20 Biodiesel Capable:** Biodiesel can be blended and used in many different concentrations. It is acceptable to use diesel fuel containing up to 20% biodiesel (B20). B20 is a blend between 6% to 20% biodiesel blended with petroleum diesel. B20 is popular in the United States because it represents a good balance of cost, emissions, cold-weather performance, materials compatibility, and ability to act as a solvent.

  A listing of certified marketers can be found at **www.bq-9000.org**
- **Bore x Stroke:** 4.53 in (115 mm) x 4.92 in (125 mm)
- **Camshaft:** The overhead camshaft is directly above the cylinder which minimizes valve train losses by eliminating the push rods and other components. The camshaft followers are roller type for reduced friction losses. Valve timing events have been modified via revised camshaft lobe profiles for improved engine performance. The two intake and two exhaust valves are forged from heat resistant steel. The valve tappets are roller type for reduced friction and better performance.
- **Crankshaft:** The crankshaft is made from forged steel. It has 5 main bearings and is fully counterweighted. The crankshaft is retained by 27 bolts connecting the lower ladder structure crankcase to the engine block.
- **Cylinder Block:** The cylinder block is made of cast iron and is a parent bore design with five bearings. The cylinder walls are induction hardened for enhanced durability and long life. The bearing cap has a ladder frame structure integrating with the crankcase to increase block rigidity for greater strength against mechanical loads and stresses. The cylinder block water passages are designed to improve coolant circulation and eliminate hot spots. The block has been strengthened and stiffened in several key areas to reduce stress and increase engine life.
- **Cylinder Head:** The cylinder head features 4 valves per cylinder and a direct injection fuel system. The cylinder head is made from a high strength cast iron material and is held in place by 20 high strength head bolts. The cylinder head casting is entirely new, with new water passages to improve coolant circulation and eliminate hot

spots. Additional stiffening ribs have been added to the casting to increase head stiffness in order to improve head gasket retention and improve engine reliability. The intake and exhaust port geometry is entirely new and designed to improve air flow and combustion efficiency. The cylinder head bolt engagement length has been increased to improve clamping force and engine stiffness, which increases reliability while reducing transmitted combustion noise.

- **Displacement:** 5.2L (317ci)
- **EGR System:** In order to reduce emissions of harmful Oxides of Nitrogen (NOx), engine utilizes cooled EGR. The EGR system features several improvements. New EGR coolers provide increased cooling capacity for improved emissions performance. The secondary EGR cooler is mounted across the top of the valve cover and now features two ports that allow air to be bled from the system and coolant to be added to the cooling system. This change will significantly improve serviceability and reduce the time required to bleed the cooling system. Additionally, the EGR valve motor has been upgraded to brushless motor design, which will increase service life of the motor and valve. Refer to the Section titled: EGR in this Bulletin.
- **Exhaust Brake:** The exhaust brake is a means of slowing a diesel engine by closing off the exhaust path from the engine, causing the exhaust gases to be compressed in the exhaust manifold, and in the cylinder. Since the exhaust is being compressed, and there is no fuel being applied, the engine works backwards, slowing down the vehicle. The amount of negative torque generated is usually directly proportional to the back pressure of the engine.

- **Fuel Injection Order:** 1-3-4-2



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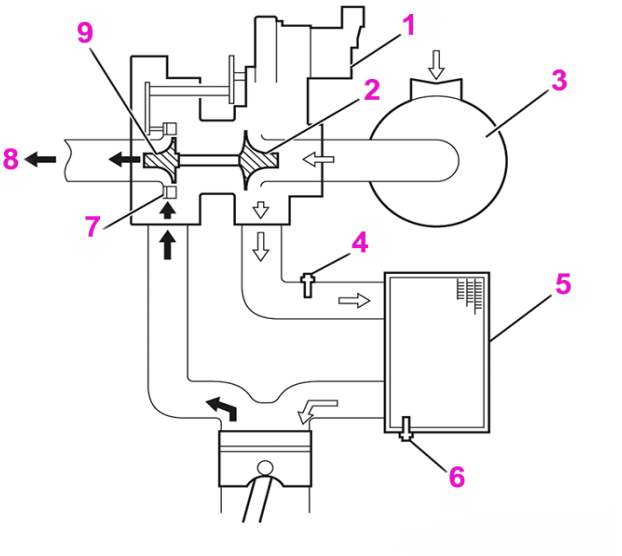
- **Fuel System Diagram:** Supply Pump Bolt with Filter Restriction (1).
- **Fuel Injection System:** The fuel injection system is a Denso® common rail type fuel system. Pressure is supplied by a high pressure pump to the common rail. Fuel is then distributed to the injectors which are controlled by the ECM. The injectors deliver the correct amount of fuel regardless of speed and altitude. The injection pressure has been increased from 23,200 psi (160 MPa) to 29,000 psi (200 MPa) to reduce emissions and improve fuel consumption. Combustion noise has also been significantly reduced.
- **Horsepower:** 215 hp (160 kW). **Torque:** 520 lb-ft (705 Nm).
- **Lubrication:** The lubrication system features a gear-driven pump which provides direct lubrication of the main, connecting rod and cam shaft bearings. The piston crowns are also oil cooled. The oil pump capacity has been increased to provide increased oiling for reduced wear and improved reliability. The 4HK1-TC engine also features a plate type oil cooler in the water jacket to help control oil temperature. The Closed Crankcase Ventilation (CCV) System has been redesigned to dramatically reduce oil carryover. This will improve emissions performance and engine reliability, and reduce oil in the intake system. The oil cooler capacity has been increased to improve cooling performance. A full flow oil filter is standard. The engine uses only low ash oil as specified in the Owner Manual for vehicles equipped with a Diesel Particulate Filter (DPF) emission system. Oil change intervals are 10,000 miles. Oil Capacity is 2.91 gallons (11.0 L).
- **Main Engine Fuel Filter:** Five micron main engine fuel filter.
- **Piston:** The high strength aluminum alloy pistons are cam ground. This process allows them to assume a round shape when warm so they will precisely match the shape of the cylinder. This means that the piston ring assembly seals better, and results in longer engine life. The top ring carrier is cast into the top ring groove, and four sides of the top ring are nitrided and the outside is coated with hard metal to ensure sufficient strength and wear resistance between the ring and groove. The piston skirt has graphite coating.
- **Preheating System:** Diesel engines are compression ignited, making them difficult to start when they are cold. Preheating means warming the compressed air inside the combustion chambers using glow plugs to facilitate engine starting. Start the engine after the Wait-to-Start light has turned OFF.

- **Turbocharger Overview:**



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Turbocharger System Diagram

1) VNT Actuator and Sensor
2) Compressor Wheel
3) Air Cleaner
4) Turbocharger Outlet Air Temperature Sensor
5) Charge Air Cooler (CAC)
6) CAC Temperature Sensor 2
7) Nozzles
8) Exhaust Gas
9) Turbine Wheel

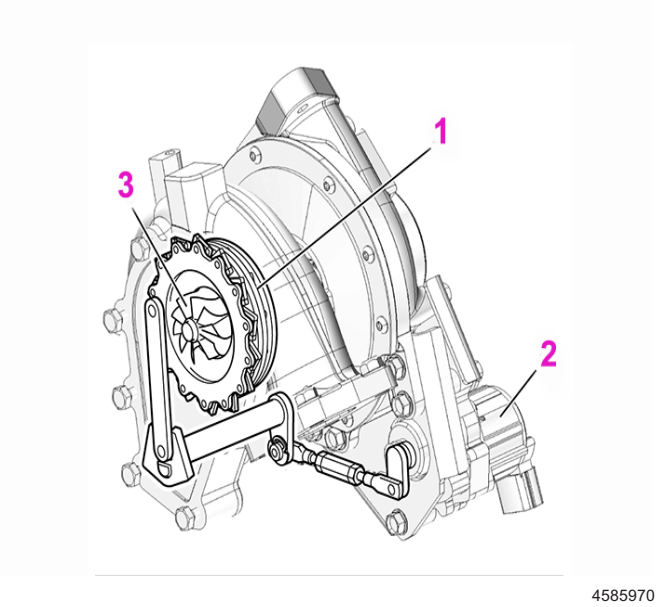
– **Turbocharger:** The 5.2L uses a Variable Vane Turbocharger with a Charge Air Cooler which provides excellent boost response over the entire RPM range of the engine. The turbocharger is used to increase the amount of air that enters the engine cylinders. This allows a proportional increase of fuel to be injected into the cylinders, resulting in increased power output, more complete combustion, and decreasing the temperature of the cylinder heads, pistons, valves, and exhaust gas. This cooling effect extends engine life. The compressor wheel is attached directly to the turbine shaft so the compressor wheel rotates at the same speed as the turbine wheel. The turbocharger compressor wheel has been upgraded to a new, higher efficiency wheel which improves fuel consumption and also reduces emissions. The turbocharger housing structure has been strengthened mechanically to improve reliability.

– **Charge Air Cooler:** The charge air cooler (CAC) is an air-to-air heat exchange device used on this engine to improve its volumetric efficiency by increasing intake air-charge density through isochoric cooling.

– **CAC Temperature Sensor 2:** The CAC Temperature Sensor 2 is installed downstream of the CAC. The CAC Temperature Sensors is a variable resistor. The CAC Temperature Sensor 2 measures the temperature of the air in the outlet of the CAC. When the CAC Temperature Sensor is cold, the sensor resistance increases. When the CAC Temperature Sensor is hot, the sensor resistance decreases. With high sensor resistance, the ECM detects a high voltage on the signal circuit. With lower sensor resistance, the ECM detects a lower voltage on the signal circuit.

– **Turbocharger Outlet Air Temperature Sensor:** The Turbocharger Outlet Air Temperature Sensor is installed in the turbocharger outlet pipe. The Turbocharger Outlet Air Temperature Sensor is a variable resistor that measures the temperature of the turbocharger outlet air. When the turbocharger outlet air temperature sensor is cold, the sensor resistance increases. When the turbocharger outlet air temperature is hot, the sensor resistance decreases. With high sensor resistance, the ECM detects a high voltage on the signal circuit. With lower sensor resistance, the ECM detects a lower voltage on the signal circuit.

– **Variable Nozzle Turbocharger Control Module:** The position of the turbocharger variable nozzle is controlled by the Variable Nozzle Turbocharger (VNT) control module, based on the command from the ECM. Because the VNT control module continuously controls the boost, there is no need for a wastegate in the system. When the engine is in a low load condition, the turbocharger nozzles are moved to the open direction and boost pressure becomes less. When the engine is in a high load condition, the VNT control module commands the control solenoid to close the turbocharger nozzles, and the boost pressure increases. The ECM will vary the target boost pressure depending upon the requirements of engine power output.



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– **Variable Nozzle Turbocharger Actuator and Sensor:** ***The VNT System is controlled overall by the ECM.*** The position of the Turbocharger Variable Nozzle is controlled by the Variable Nozzle Turbocharger (VNT) control module based on command from the ECM and is actuated electrically by a servo motor that is attached to the turbocharger assembly via the control linkage.

1) Nozzle

2) VNT Actuator and Sensor

3) Turbine Wheel

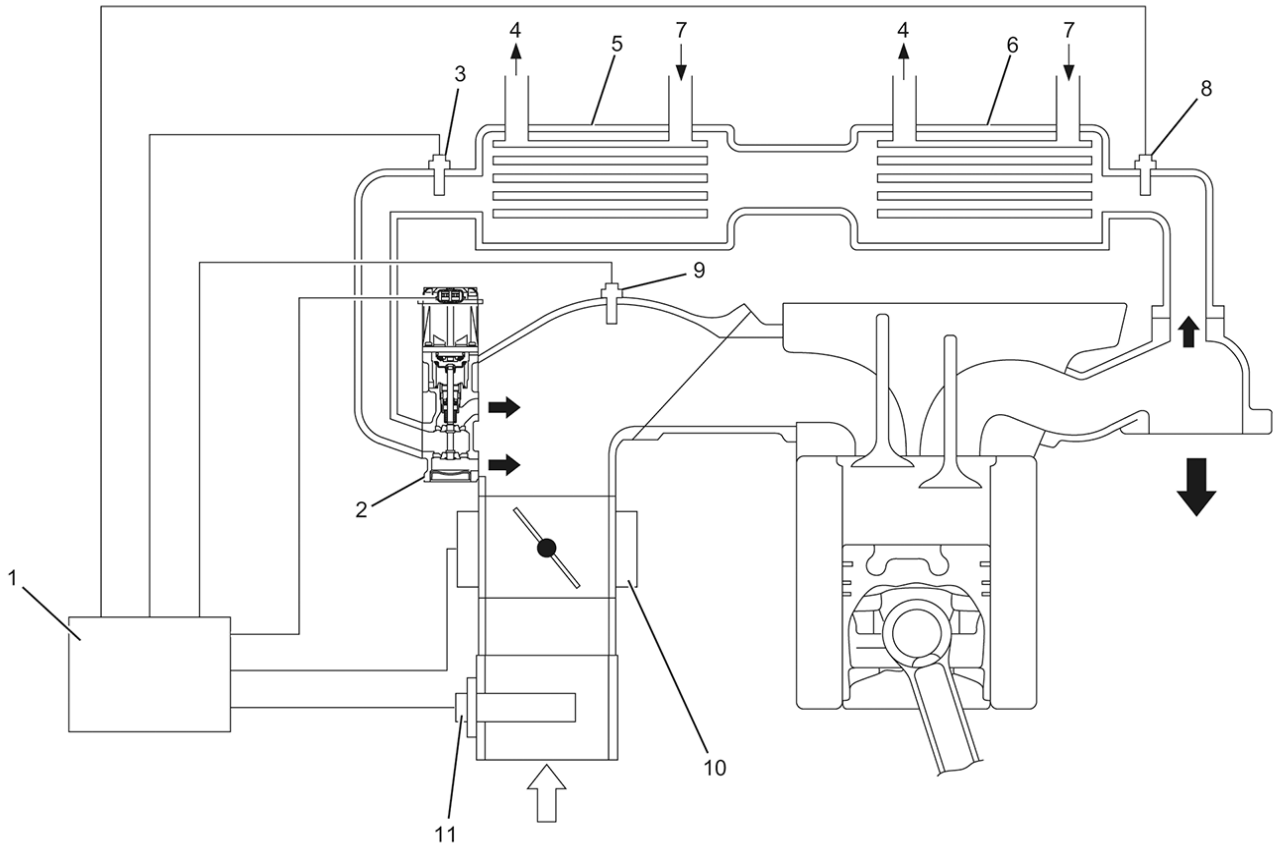
Engine Coolant — 5.2L I4 4HK1-TC Diesel

Use a 50/50 mixture of clean, drinkable water and GM extended life coolant, GM Part Number 12378560.

EGR

Overview

The EGR system recirculates a portion of the exhaust gas back into the intake manifold and by mixing this inert gas with the intake air, the combustion temperature is lowered and the generation of NOx is reduced. The EGR uses an electronic control system to ensure both drivability and low emissions. The microprocessor in the EGR valve operates the motor based on the target opening angle information sent from the ECM via CAN and controls the lift amount of the EGR valve. In addition, it feeds back a signal of the actual valve lift amount to the ECM in order for it to accurately control the EGR opening angle. EGR control starts when the conditions for engine speed, engine coolant temperature, intake air temperature, and barometric pressure are met. When the conditions are met the EGR valve opening is calculated according to the engine speed and the target fuel injection quantity. Based on the calculated EGR valve opening, the drive duty cycle of the motor is controlled and the valve is driven accordingly. The intake air flow (IAF) valve is used to throttle the intake air flow in order to ensure the requested amount of EGR gas flow is able to enter the intake manifold.



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1. ECM
2. EGR Valve
3. EGR Gas Temperature Sensor 2
4. Engine Coolant Outlet
5. Secondary EGR Cooler
6. Primary EGR Cooler
7. Engine Coolant Inlet
8. EGR Gas Temperature Sensor 1
9. Intake Air Temperature (IAT) Sensor 2
10. Intake Air Flow (IAF) Valve
11. Mass Air Flow (MAF) Sensor

Engine Oil — 5.2L I4 4HK1-TC Diesel

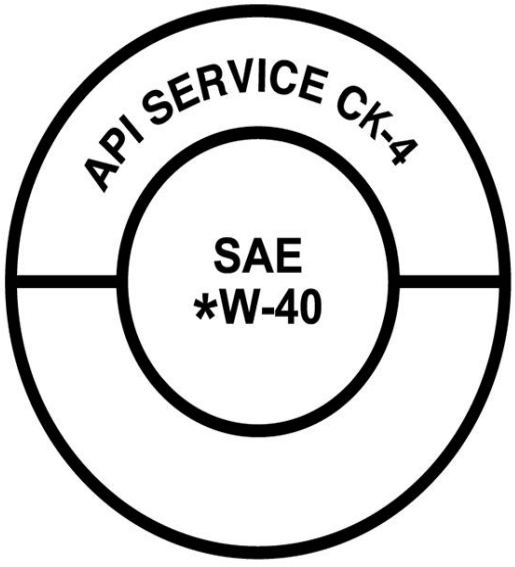
Engine Oil

Engine oil is an important factor determining engine performance and longevity. Be sure to use only the specified oil and oil filters. The engine oil level must be checked and the oil should be changed regularly according to the Maintenance Schedule. When particulate matter (PM) has accumulated to a preset level in the diesel particulate filter (DPF), the filter is automatically regenerated through combustion. To make this regeneration possible, a small amount of fuel is injected into the engine combustion chamber after firing. This causes fuel to gradually become mixed with the engine oil, and the ***engine oil level may rise beyond the original level.*** This does not indicate a malfunction of the engine.

Low Ash Engine Oil

GM recommends using low ash oil engine oil, which supports the DPF. Using an engine oil that is not low ash will increase the particulate matter (PM) produced by engine combustion. Consequently, the maintenance interval of the DPF filter will be reduced.

Oil Identification Logo and Viscosity Grade



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A logo (symbol) is used on most oil containers to help select the proper engine oil to use. The top portion of the logo shows the oil quality by API designations such as CK4 or others. The center portion of the logo shows the SAE viscosity grade, such as SAE *W-40 (* indicates viscosity on the low temperature side). Look for this logo on the oil container, and ONLY use oil displaying the logo. Engine oils with the letters CK-4 and viscosity grade SAE *W-40 are required for the 5.2L 4HK1 engine. The CK-4 designation can appear either alone or in combination with other American Petroleum Institute (API) designations, such as API CK-4/SL.

Checking the Engine Oil Level Using Switch

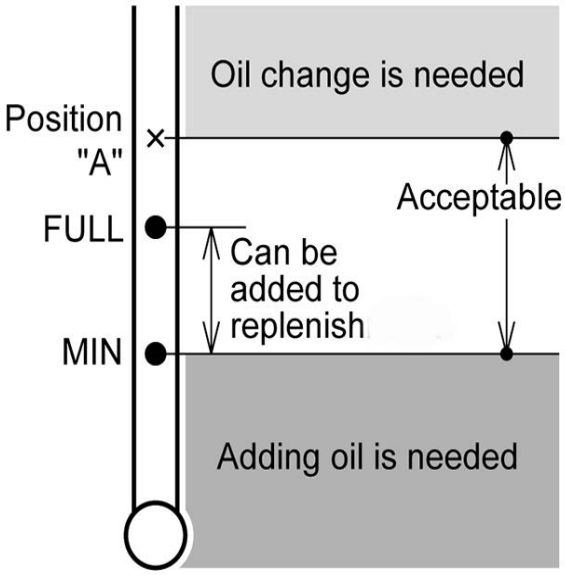
Notice: **When checking the engine oil level ensure the vehicle is on level ground and the engine is cool.** .

When the engine oil level check switch is pushed with the engine control switch in LOCK, the green engine oil level indicator light will turn ON if the engine oil level is OK.

Access Engine Oil Dipstick

The engine oil dipstick is located on the left side of the engine after tilting the cab. Refer to > Owner Manual > Cab Tilting.

Checking the Engine Oil Level Using the Dipstick



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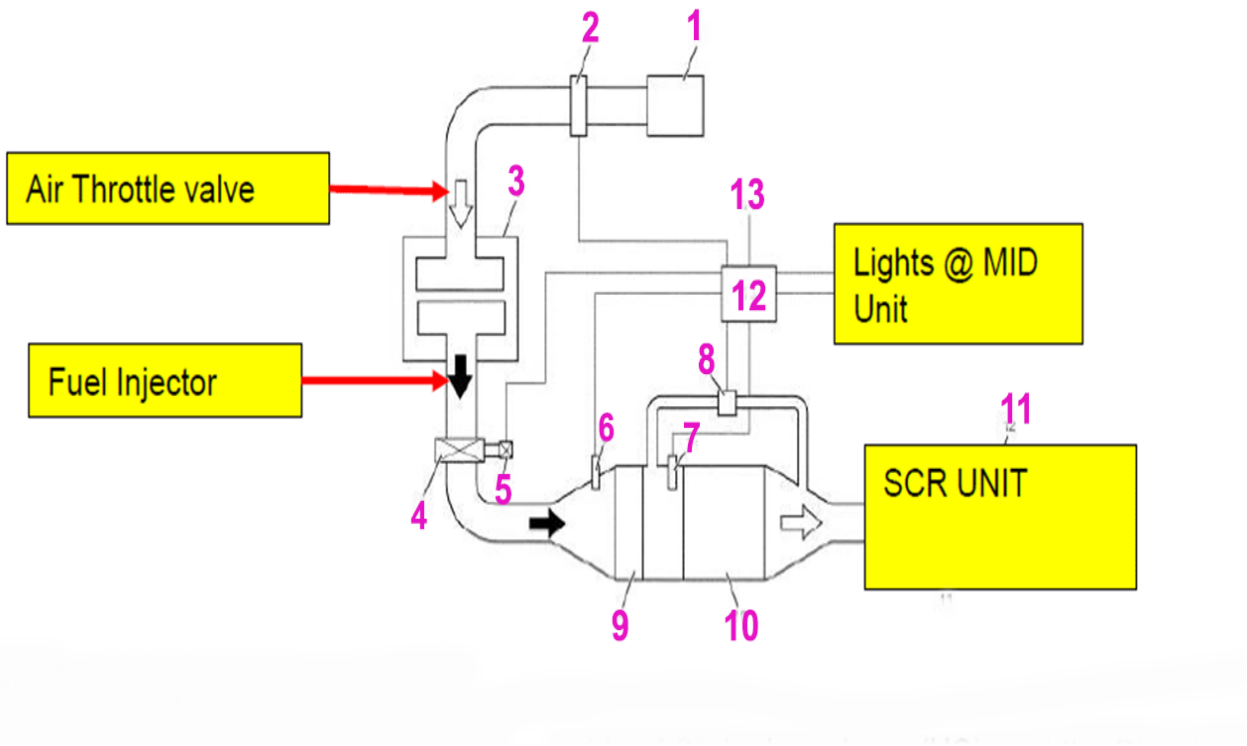
1. Remove the oil dipstick and wipe off any oil on the oil dipstick.
2. Reinsert the oil dipstick fully and then gently remove it. The oil is at an acceptable level if the oil level is between the Position “A" and MIN marks.
3. If the oil level is too low, add oil to the "FULL" mark.
4. If the oil level is beyond the Position “A" mark, the oil needs to be changed.
5. Reinstall the oil dipstick.

Diesel Particulate Filter — Diesel Oxidizing Catalyst

Diesel Particulate Filter (DPF) — Diesel Oxidizing Catalyst (DOC) — System Overview



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DPF System Diagram

1) Air Cleaner
2) MAF Sensor
3) Engine Assembly
4) Exhaust Brake Valve
5) Exhaust Brake Valve Solenoid
6) EGT Sensor 1
7) EGT Sensor 2
8) Exhaust Differential Pressure Sensor
9) Diesel Oxidizing Catalyst (DOC)
10) Diesel Particulate Filter (DPF)
11) Selective Catalytic Reduction (SCR) Assembly
12) ECM
13) Various Sensor Inputs to ECM

Diesel Oxidizing Catalyst

The DOC is designed to oxidize carbon monoxide (CO), hydrocarbons (HC), and the Particulate Matter (PM) to meet current EPA emissions standards. Diesel exhaust contains sufficient amounts of oxygen, between 3 and 17%, depending on the engine load, necessary for the oxidation reaction to occur, which results in CO2 and H2O. A minimum exhaust temperature of 392°F (200°C) is necessary for the catalyst oxidation to take place. The catalyst activity efficiency increases with temperature.

Diesel Particulate Filter

The DPF system uses a DPF Fuel Injector during a DPF regeneration event. The DPF is designed to capture the Particulate Matter (PM) or soot, and to reduce exhaust emissions. Conversion of PM is an important function of the modern diesel oxidation catalyst. Conversion of PM may reach and exceed 80% at higher temperatures, but at lower temperatures, approximately 572°F (300°C), the total PM conversion is usually between 30 and 50%.

Exhaust Brake Valve

The Exhaust Brake Valve is used to help increase exhaust temperatures for Regeneration, for the Quick Warming-up System (QWS) and brake assistance on some models. The ECM controls the exhaust brake valve solenoid based on the DPF Regeneration status or exhaust brake command signal. The ECM energizes the exhaust brake solenoid which then applies vacuum

to the diaphragm chamber to operate the exhaust brake valve. The exhaust brake valve is installed in front of the DPF housing.

⇒ If the Exhaust Brake Valve is not working properly, binding or misadjusted, exhaust temperatures may not be sufficient for Stationary Regeneration to occur or an over-temperature condition may occur.

Exhaust Differential Pressure Sensor

The Exhaust Differential Pressure Sensor is mounted on the chassis frame near the DPF assembly. The Exhaust Differential Pressure Sensor is a transducer that varies voltage according to changes in the exhaust gas pressure between the front and rear of the DPF filter. The Exhaust Differential Pressure Sensor provides a signal to the ECM on the signal circuit, which is relative to the pressure changes in front and in rear of the DPF filter. A low signal voltage indicates a small PM accumulation. A high signal voltage indicates a large PM accumulation.

Exhaust Gas Temperature Sensors

The Exhaust Gas Temperature (EGT) Sensor 1 and EGT Sensor 2 are installed in the DPF housing. Both EGT Sensors are a variable resistor. The EGT Sensor 1 measures the temperature of the exhaust gas in front of the DOC and EGT Sensor 2 measures the temperature of the exhaust gas in front of the DPF. When the exhaust temperature sensor is cold, the sensor resistance is high. When the exhaust temperature increases, the sensor resistance decreases. With high sensor resistance, the ECM detects a high voltage on the signal circuit. With low sensor resistance, the ECM detects a lower voltage on the signal circuit.

Intake Air Flow Valve

The position of the Intake Air Flow Valve (IAFV) is controlled by the ECM based on engine operating conditions. The ECM has the ability to accelerate engine warm-up by closing the IAFV and the exhaust brake valve during cold engine temperatures. During EGR operation, the ECM controls the IAFV to allow the proper amount of EGR flow into the intake air stream. During stationary Regeneration, the ECM controls the IAFV & Exhaust Brake Valve to maintain Regeneration temperatures in the proper range.

Particulate Matter Sensor

The Particulate Matter (PM) Sensor is installed in the tailpipe downstream of the SCR. In order to detect DPF damage, the PM Sensor is used to measure the PM amount from exhaust gas that has passed through the DPF. The ECM and the PM Sensor communicate control and diagnostic information via the CAN communication bus. The PM Sensor integrates the value sensor, temperature sensor, heater and controller. The built-in controller continuously supplies voltage to all sensors and the heater, and monitors current changes. Also, it performs trouble diagnosis for all parts. If there is good conductivity between the PM Sensor and the soot deposits, resistance of the sensor decreases and the current into the controller increases. The value of the current detected by the PM Sensor is sent to the ECM, and the ECM determines from the value of the current if Regeneration is necessary. The ECM Regenerates the PM Sensor if the value of the current exceeds a specified value and then burns off soot adhering to the sensor. PM leakage amount is estimated by the ECM according to the regeneration interval.

Regeneration

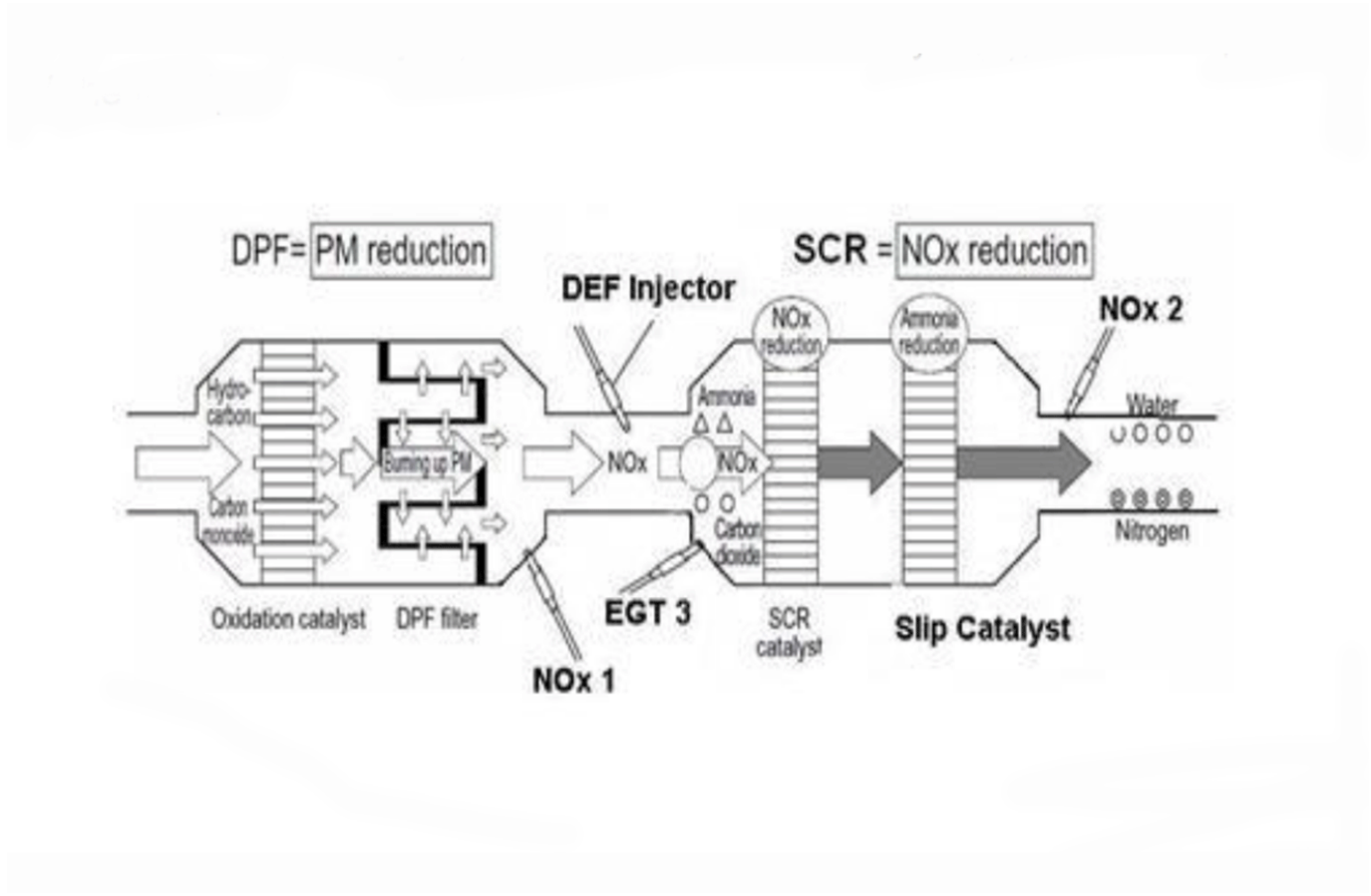
The accumulated PM on the DPF must be burned off periodically in a process called Regeneration. Without this process the DPF can become restricted, causing lack of power, a no start condition and/or possible damage to the DPF filter. The ECM monitors the Exhaust Differential Pressure Sensor to determine when Regeneration is needed. During Regeneration, the ECM injects diesel fuel into the exhaust system using the DPF Fuel Injector. This added fuel raises the exhaust temperature (at EGT Sensor 2) above the minimum 1100°F (594°C) to begin and sustain the regeneration process. If the exhaust temperature is too low, or becomes too low, additional fuel is added and the exhaust brake valve is activated to increase the exhaust temperatures to the necessary threshold. Regeneration can take place in Automatic mode, Selectable Mode, or Emergency Mode.

Selective Catalytic Reduction

SCR Overview

The SCR system eliminates NOx contained in the exhaust gas by converting it into harmless nitrogen by means of reductive reaction. DEF is used to induce the reductive reaction, and the reaction is facilitated through the SCR catalyst. The DEF control module controls the pressurized DEF injection amount, using information from the ECM, NOx Sensors, etc., and injects the DEF using the injector installed on the exhaust pipe. The injected DEF is hydrolyzed by the heat from the exhaust gas which generates ammonia, and the generated ammonia induces a reductive reaction with NOx, which decomposes the NOx into water and nitrogen and reduces emissions.

SCR Operation



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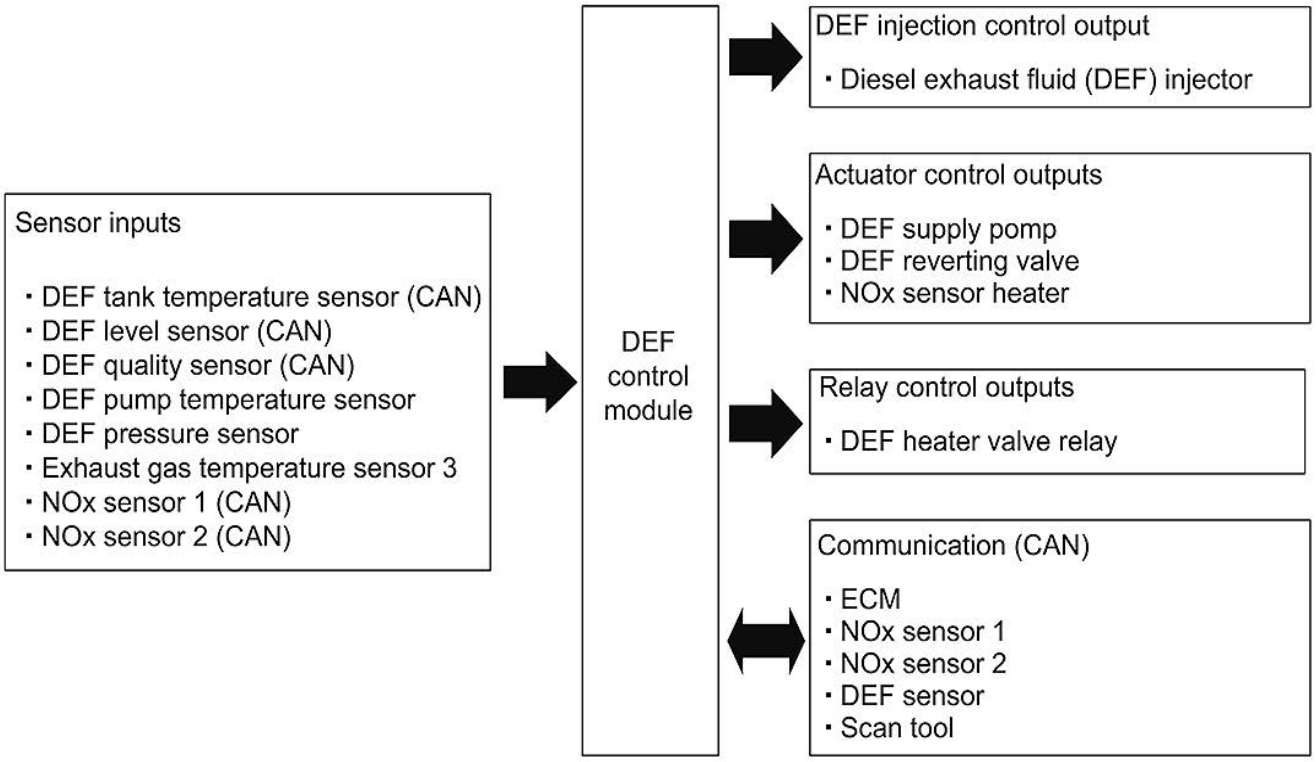
The SCR System is added onto the Exhaust System after the DOC/DPF. The SCR consists of the following 2 catalysts:

1. Catalyst 1 which stores the DEF fluid and the amount that is stored is dependent upon catalyst temperature.
2. Catalyst 2 which is called a Slip Catalyst, is positioned after the main SCR catalyst and is used to prevent ammonia release at the tailpipe.

Diesel Exhaust Fluid Control Module



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Caution: Do not block the DEF Module air vent. Keep water away from the air vent. Do not submerge the DEF module in water.

The DEF Module constantly monitors the NOx Sensors, the EGT 3 Sensor, the DEF tank sender and ECM data. Based on these inputs, the DEF Module controls the DEF Fluid Supply Pump and DEF Injector operation. The DEF Module performs diagnostics of the DEF Injector and NOx Sensors. When SCR faults occur, the DEF module may set a code, and turn ON the DEF Warning Lamp, while sending a message to the ECM. SCR codes, both Active and History, are stored in the DEF Module, with the exception of P20C9 Diesel Exhaust Fluid (DEF) Control Module Requested MIL Illumination. This code is stored in the ECM and will cause the MIL to turn ON.

Diesel Exhaust Fluid

Notice: **The contamination of DEF can result in a malfunction of the SCR system. Additionally, it can cause damage to the catalysts and result in a system failure. DEF freezes when exposed to temperatures colder than 12°F (−11°C).**

DEF is colorless, non-hazardous, and non-flammable and is extremely sensitive to chemical impurities. It may smell depending on the conditions, however this is normal. It is imperative that DEF be handled carefully to prevent any sort of contamination. DEF is an aqueous urea solution made with 32.5% urea and 67.5% deionized water. It is used as a consumable in the SCR in order to lower NOx concentration in the diesel exhaust emissions. DEF consumption is approximately 1% to 2% of fuel consumption. That means 1-2 gallons of DEF are used for every 100 gallons of fuel consumed. DEF usage will vary depending on driving style, if towing a trailer, loaded vehicle weight, weather, idle time and PTO usage. DEF has a shelf life of 2 years. However, this can be reduced if the fluid is exposed to direct sunlight or temperatures warmer than 86°F (30°C) for sustained periods of time. Use only API certified DEF (or ISO: AUS 32). All DEF packaging should be labeled with a production date. ***DO NOT*** dispose of DEF and/or the empty container into lakes, marine areas, rivers, etc. DEF must be disposed of in a method conforming to the regulatory requirements in your state.

DEF Availability

DEF is available from your local authorized Chevrolet dealer. The U.S. Department of Energy has created an on-line DEF locator that can be accessed at: http://www.discoverdef.com/

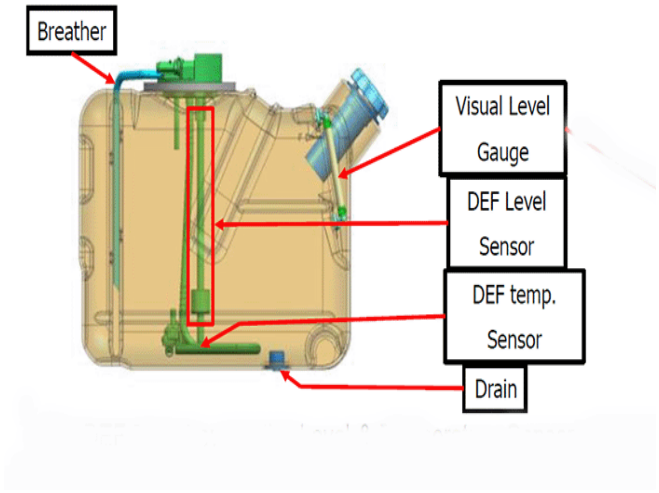
DEF Injector

The DEF Injector is installed in the inlet of the SCR catalyst. The DEF Injector is subject to extremely hot exhaust temperatures. For this reason, engine coolant is continuously flowing through the DEF Injector to keep it cooled and working correctly. In cold weather, the engine coolant is used as a heating system to defrost the DEF fluid.

DEF Supply Pump

The DEF supply pump is installed near the DEF tank on the left side frame rail. After the engine has been started, the diaphragm pump is activated to pressurize the DEF up to 130 psi (900 kPa) in order to meet operating requirements. After that, the DEF control module makes a calculation based on the value from the DEF Pressure Sensor inside of the DEF supply pump, and maintains the DEF pressure at the operating requirement. When the engine is stopped, the DEF control module operates the DEF supply pump ***after*** switching the reverting valve to return the DEF inside the DEF injector, DEF piping and DEF supply pump back into the DEF tank to prevent those components from being damaged in freezing temperatures.

DEF Tank



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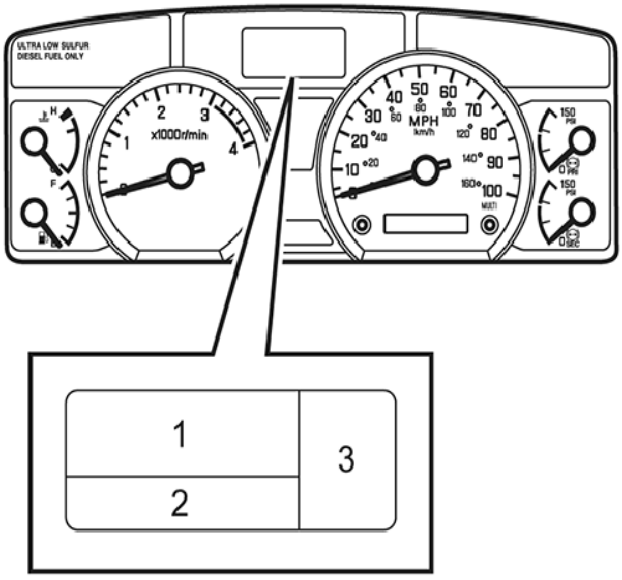
Caution: Take care when filling the DEF tank. Do not over fill the DEF tank. DEF is highly corrosive to electrical connectors, wiring, rubber, metallic parts and painted surfaces. If any of these components come in contact with DEF, wash the area thoroughly with warm water and allow to completely dry before proceeding. Perform a visual inspection for any damage if any parts of the vehicle have been exposed to DEF.

The DEF tank is installed on the frame at the left side of vehicle, and is made of special resin which provides lightweight and robustness. The DEF Tank houses the Level & Temperature Sensor, has a drain plug and a tamper resistant filler insert to prevent filling with fluids other than DEF fluids. The internal pickup includes the Coolant Heating Tube and Gauge Sending Unit. The pickup is serviced as a complete assembly.

DEF Gauge in the DIC



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The DIC display is in the center of the instrument cluster. The displays show the status of many vehicle systems. There are three parts to the DIC display:

1. DIC menu items, warning lights and messages and includes operation related information, diesel particulate filter (DPF) status, maintenance data, and errors.
2. Automatic transmission shift indicator.
3. Diesel Exhaust Fluid gauge.

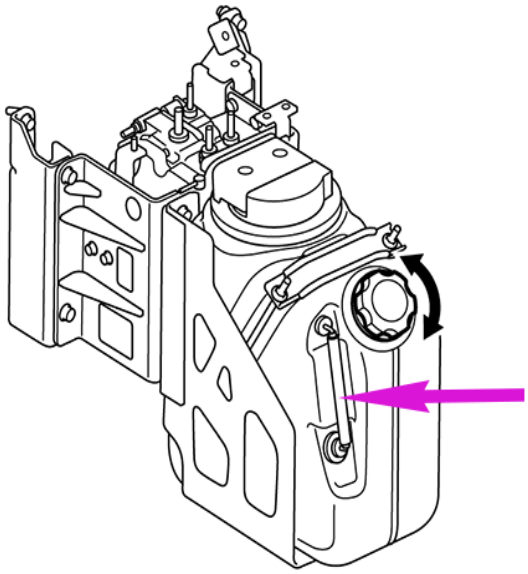
DEF Gauge

4585330

With the engine control switch in the ON position, this gauge indicates the approximate quantity of DEF remaining in the DEF tank. F means the tank is full and E means the tank is almost empty. When only one green bar is showing, the DEF tank is almost empty and should be refilled soon. If the vehicle is driven too long with only one bar, the green will change to amber and additional warnings and indicators will display.

Vehicle speed will be severely limited when the DEF tank is empty. Be sure to add DEF in advance of the empty status.

DEF Tank — Checking the Level



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The sight tube on the DEF tank only shows the top portion of the tank in order to prevent over filling. Even if the fluid is not visible in the sight tube, there may still be fluid in the tank. Checking the DEF level using the MID display on the instrument cluster is the recommended method.

DEF Tank Low Stages

DEF is a required fluid for the operation of this diesel engine just as diesel fuel is required. To avoid running out of DEF the vehicle will turn ON warning and indicator lights and reduce engine power in progressive stages to remind the operator to add DEF.

DEF tank low stages are as follows:

- **Stage 1** When the remaining level of DEF becomes excessively low the DEF gauge will change color from green to amber. In addition, warning and indicator lights will turn ON and engine power will be reduced so the vehicle speed will not exceed 55 mph (89 km/h).
- **Stage 2** If driving is continued without adding DEF, approximately 200 miles (320 km) the DEF gauge, warning and indicator lights will begin blinking. Engine power will be reduced so the vehicle speed will not exceed 35 mph (56 km/h).
- **Stage 3** If driving is continued until the DEF tank is empty, the DEF gauge will change color from amber to red and the warning and indicator lights will begin to blink faster. Engine power will still be reduced so the vehicle speed will not exceed 35 mph (56 km/h). The vehicle speed will be limited to 5 mph (8 km/h) either when the vehicle is stopped after driving further on, approximately 5 miles (8 km) or when the engine is restarted.
- **Stage 4** The DEF gauge is red, the indicator light is blinking and the buzzer is beeping continuously. Vehicle speed is limited to 5 mph (8 km/h).

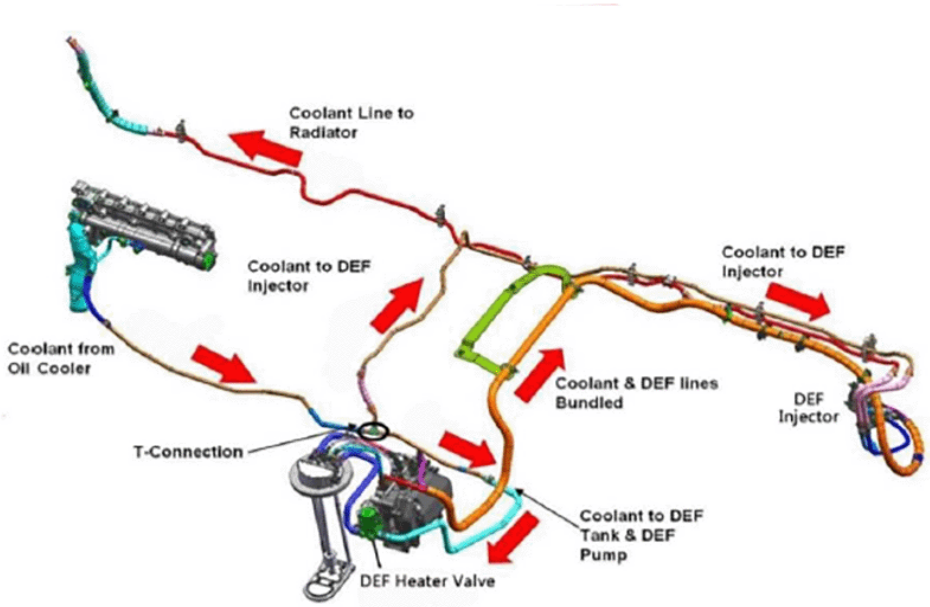
When the DEF Tank is Empty

If the DEF tank is empty and warning and indicator lights are ON, the procedure below ***must*** be followed to cancel the vehicle restriction:

1. Turn the engine control switch to the LOCK or ACC position, and add DEF.
2. After adding DEF, turn the engine control switch to the ON position.
3. Wait until the buzzer stops and warnings and indicators turn OFF.
4. If the buzzer does not stop, return the engine control switch back to the LOCK position and add more DEF (DO NOT overfill), and then start over from Step 2.
5. Restart the engine.

   It may take a while until the warning lights and indicators turn OFF and the buzzer stops after turning the engine control switch to the ON position.

DEF Cooling and Heating System



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DEF Cooling and Heating System Diagram

– **DEF Cooling and Heating System Operation:** When the engine is first started, if temperatures are below 20°F (-7°C), the DEF Control Module opens the DEF Heater Control Valve. This allows engine coolant to circulate through the DEF Tank and DEF Supply Pump Module. When the sensors indicate DEF temperatures are above a specified value, the DEF Heater Control Valve closes, ending the Defrost Cycle. If the signal from the DEF Tank Temperature Sensor or the DEF Supply Pump Temperature Sensor falls below the specified value again, the Defrost Cycle is repeated.

– **Thermal Control:** After a certain period of engine run time, if the AAT/IAT1 Sensor signal is at or colder than the specified value, the DEF Control Module will keep the DEF Heater Control Valve open.

– **Tip:** Whenever the DEF cooling lines are opened for any reason, the DEF Heater Control Valve ***must*** be cycled to purge air from the lines. Use the GDS 2 Output Test: DEF Heater Valve Relay to purge the air.

DEF Auxiliary Heater

The system uses engine coolant heat to meet DEF thaw guidelines. ***Auxiliary heaters are NOT allowed to draw heat from the engine coolant*** because it may increase DEF thaw times beyond acceptable guidelines. If equipped, the auxiliary heater must include a self-contained heat source. DEF freezes when exposed to temperatures colder than 12°F (-11° C). In cold conditions it is normal for DEF to freeze. The tank and delivery lines are heated to thaw frozen DEF. When filling the tank in cold conditions, the vehicle may not recognize the new level until the tank thaws. In certain cold conditions, it is possible to find some frozen DEF in the DEF fill pipe opening. When travelling in extremely cold areas, it is recommended to fill the tank prior to cold temperature exposure.

DEF Indicator Lamp

The DEF indicator lamp is located in the instrument panel cluster. The DEF indicator lamp will illuminate if any of the following conditions occur and vehicle service is required.

- DEF level is too low or empty.
- DEF tank is refilled with any fluid other than DEF, such as water, low-concentrated DEF, engine coolant etc.
- Malfunction of the SCR system.

DEF Tank Temperature Sensor

The DEF Tank Temperature Sensor is a variable thermistor that measures the temperature of the DEF using the changes in the resistance value that correspond to the changes in temperature. The resistance decreases when the DEF temperature is high and increases when the DEF temperature is low. The DEF control module performs the DEF defrosting control and thermal control based on the signal from the DEF Tank Temperature Sensor.

DEF Quality Sensor

The DEF Quality Sensor measures the concentration of the urea in the DEF fluid by applying ultrasonic waves to the fluid and measuring the time between the transmission and reception of the ultrasonic waves. The DEF control module determines whether the urea quality is abnormal, based on the signal from the sensor. There are a number of safeguards put in place to prevent confusion between diesel and DEF filler necks. The standard nozzle diameter for DEF is 0.75 inches (19 mm), compared to 0.87 inches (22 mm) for diesel, preventing the diesel nozzle from ever being inserted into the DEF tank. The filling cap for the DEF tank is ***blue*** and will be clearly marked Diesel Exhaust Fluid with the accompanying ISO standard number.

Exhaust Gas Temperature Sensor 3

The Exhaust Gas Temperature (EGT) Sensor 3 is a variable resistance temperature sensor which is installed on the inlet of the SCR catalyst, and measures the temperature of the exhaust gas before the SCR catalyst and transmits that information to the DEF control module.

NOx Sensors

The NOx Sensors are installed in the front and rear of the SCR catalyst. NOx Sensor 1 is installed in the SCR catalyst upstream, and detects the NOx concentration exiting from the engine. NOx Sensor 2 is installed in the SCR catalyst downstream, and detects the NOx concentration after NOx conversion by the SCR catalyst. The DEF control module monitors the NOx conversion efficiency using these NOx Sensors. The DEF control module calculates the required DEF injection amount based on the signals from these NOx Sensors.

Driver Information Center

The Driver Information Center (DIC) is located in the upper center portion of the Instrument Panel Cluster (IPC).

The DIC can display Driver Controlled Information, Non-Driver Controlled Information, Warning Lamps and Messages. The following are some of the items that are visible on the DIC:

Driver Information Displays

- Current Date
- Current Time
- DEF Tank Level
- Battery Voltage
- Tire Rotation Reminder
- Fuel Filter Service Reminder
- Engine Oil & Filter Service Reminder
- Fuel Economy Instant Average
- Fuel Economy Average for a Trip
- Language Selection
- Illumination Dimmer Setting
- DPF PM Level
- Water In Fuel
- Hour Meter

Warning Lamps

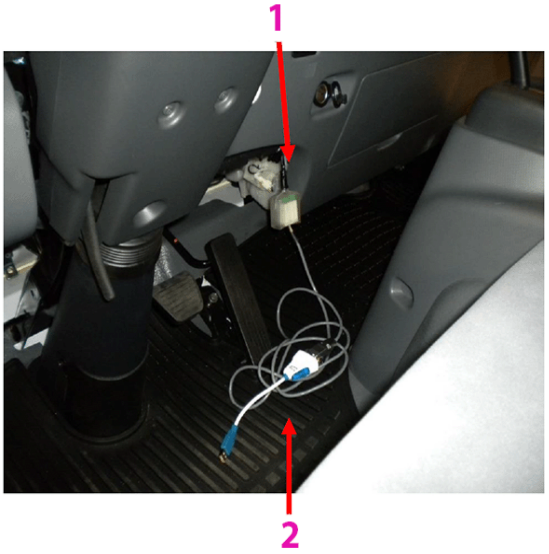
- Maintenance Reminder
- DEF Warning Lamp
- Battery
- Brake
- Brake Booster
- Oil Pressure
- MIL
- DEF Level

Vehicle Messages

- Engine Overheat
- Low Coolant
- Water Separator
- Air Cleaner
- Low Fuel Warning
- Regeneration Warning
- Exhaust System Warning
- Refill DEF Warning
- DIC Errors
- Maintenance Data
- Hour Meter

Mimamori System

Vehicle Pigtail Connector



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The vehicle pigtail connector (1) is used as the communication gateway (similar to the DLC on other GM vehicles) on this vehicle and is accessible after removing the relay fuse cover in the center of the lower dash panel. After removing the panel, the connector (1) is located in the lower right corner of the opening. The connector (1) can be identified by its ***green identifying mark*** under the clear plastic cover.

EL-52244 Cable

The EL-52244 Cable (2) is an essential tool and must be used to connect to the vehicle pigtail connector (1) in order to download the Vehicle Health Report. Contact TCSC for additional assistance – 800-828-6860

Vehicle Health Report — Download Procedure

The Vehicle Health Report download procedure is similar to previous models. The ignition key must be left **ON** with the engine **OFF** throughout the download procedure. The GDS 2 must be connected to the laptop USB port and the EL-52244 cable must also be connected to the laptop USB port. During the download the two blue lights on the cable will be flashing, indicating the download is in process.

Port Installed Equipment

The following is a list of some of the optional Port Installed Equipment avaialble for the 6500XD:

- Radio delete.
- PTO switches.
- Rear body dome lamp switch.
- Seat covers.
- High visibility (Red) seat belts.
  – Driver only.
  – Driver & RH passenger.
- Fire extinguisher, 2.5 or 5.0 lbs (1.13 or 2.27 kg) and triangle reflector kit.
- Heated outside/convex mirrors.
- Heated/remote outside mirrors with heated convex mirrors.
- Mirror stays for 102" wide body. (Wider mirror brackets to move the mirrors outward so the driver can see around wider bodies).
- Keyless entry system.
- Cold weather package consisting of an engine block heater and heated fuel filter.
- Chrome radiator grill.
- CAN Interface Converter (telematics module). This module allows a 3rd party telematics provider (such as Verizon Telematics, Spieron, Fleetmatics etc.) to hook up their monitoring device without affecting communication between computers on the diesel trucks.
- Locking DEF cap, standard or keyed alike.
- Emergency engine shutdown.
- Engine idle shutdown 3 or 5 min.
- Engine block heater.
- Oil pan heater.
- Speed limiter.
- Back-up alarm.

Suspension

Front

The front axle is a onepiece, steelforged Ibeam section. The outer ends of the axle center are machined to accommodate the steering king pins and the knuckles. King pin inclination is built into the knuckle end. The front axle is a 12,000 lbs (5,450 kg) Dana model E1254W. The relay rod and the tie rod arms attach to the knuckle through tapered holes in the knuckle and keyed castle nuts. The king pin is located in a steelbacked bronze bushing at the lower and upper end of the kingpin. The bushings are greased through fittings in the lower and lower covers. Excess grease is purged through skirttype seals. The springs are tapered leaf type with an eyeandcompression shackle. All springs and shackles are rubber bushed. The spring assembly rests on the axle, and both are attached to the front axle with Ubolts. A rubber bumper is attached to the frame. This bumper hangs suspended above the spring center. The stabilizer assembly consists of a shaft attached to a mount at the front of the springs. Twintube shock absorbers provide damping. These shock absorbers are mounted vertically in front of the front axle. The top and bottom attachments are pin type with rubber insulators. The shock absorber upper mounting is a stamping attached to the frame. The lower attachment is a forging on the underside of the axle spring seat.

Rear

The multileaf springs use a front eye and rear slider. The rear of the spring rides on the slider, so the slider must be lubricated. The slider and side shims are replaceable. All springs are a 2stage design. All spring and shackle eyes are rubber bushed and nonlubricated. Spring eyes are fully reamed in order to accept the rubber bushings. The auxiliary spring is a single leaf parabolic taper form and the frame brackets are shaped cams to produce a variable rate. A polyurethane spring aid and rubber bump stop are attached to the frame above the spring center.

The single speed rear axle consists of the following two main components:

- **Rear axle housing:** The banjo type rear axle housing carries the weight of the vehicle. The rear axle housing provides a machined spindle surface for the rear wheel bearings. The rear wheel hubs rotate on the rear wheel bearings, allowing the rear axle shafts to float within the rear axle housing.
- **Differential carrier assembly:** The differential carrier assembly changes the driving force 90 degrees from the propeller shaft and allows the rear wheels to turn at different speeds. The complete carrier assembly may be removed from the vehicle without removing the axle housing assembly.

Rear Axle Identification

The Rear axle identification tag is located on the top of the rear axle.

Allison Rugged Duty Series™ Fully Automatic Transmission

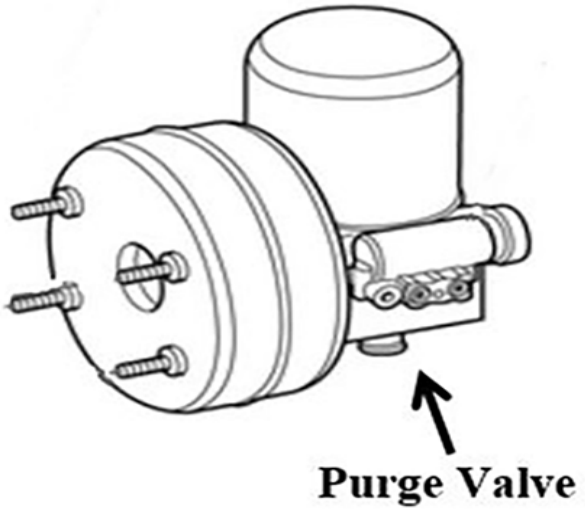
4863704

Notice: **When servicing this transmission it will be necessary to utilize an authorized Allison Distributor.**

The Allison Rugged Duty Series™ fully automatic transmission with its patented Continuous Power Technology™ delivers smoother, seamless, full-power shifts, superior acceleration and startability. Each shift is made automatically when appropriate allowing drivers to precisely manage performance and exercise superior vehicle control. Allison automatics perform better than manual or automated manual transmissions (AMTs) that lose power and torque every time they shift, resulting in inefficient operation and less productivity. Faster acceleration means more work accomplished in less time.

New Information Since Start of Vehicle Production

The following information is provided to help Technicians better understand common vehicle operating conditions, that may be incorrectly perceived by the Customer as a problem.



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- **Purge valve noise creating an intermittent ticking or light knocking noise from the engine area:** When the air tanks are at a full level, air from the compressor will exhaust (exit) from the bottom of the dryer. A ticking/light knocking sound may be heard from the exhausting air. This sound can be confused with an engine noise when standing outside of the vehicle on the driver's side at the back of the cab. This sound from air exiting the dryer is normal and does not require repair.
- **MIL Illuminated:** When the vehicle is started and the air brake pressure is very low or at zero (0) psi, DTC P0027 Exhaust Valve Control Solenoid Performance may set. This is most likely to happen after the air brake system has been serviced or if the vehicle has been stored for a period of time and the air brake pressure has been depleted. If the DTC was set after starting under the previously described conditions and the exhaust brake functions properly, there is no problem. The DTC should be cleared before returning the vehicle back into service.
- **Air brake pressure goes to zero (0) psi after 2–3 days of storage:** Light leakage from the air brake system is normal. Over the course of 2–3 days of not running the engine this light leakage will deplete the pressure in the air system to zero (0) psi. The air brake pressure will increase to a normal operating range soon after the engine is started.
- **Roaring noise in the cab while running:** Because the engine cooling fan is directly underneath the cab, a vehicle operator might interpret "fan noise" to be a problem when it is not. The viscous fan clutch will typically engage both during initial start-up and when there is a lot of heat from the radiator air flow. The sound of the cooling fan engaging is normal and only seems unusually "loud" because the fan is located directly underneath the cab.

- **Water dripping from the dash vent and water on the floor mat:** During periods of high humidity, moisture may drip from the HVAC outlets while operating the air conditioning. To alleviate this, customers should keep the windows rolled up and utilize “outside” air mode when operating the air conditioning.
- **Radio is muted when the gear lever is moved to reverse (R).** The radio automatically mutes when **R** is selected, to allow the driver to concentrate completely on their surroundings while the truck is moving backwards. This is normal operation.

Vehicle Communication Cables

5034892

A new interface cable with double red ends is required for complete communication with all onboard ECUs. This includes the ECM, DCU, Mimamori ECU, EBCM and the FMS if equipped.

5034907

A new interface Y-cable is required for complete communication with all onboard ECUs. This includes the ECM, DCU, Mimamori ECU, EBCM and the FMS if equipped.

Transmission Control Module

Transmission control module (TCM) data can only be retrieved using Allison DOC Software.

Special Tools

Special Tools — Tool Number and Description

Tool Number	Description
Essential Tools	
J-42206	Dual Air Pressure Gauge
J-42206-50	Dual Air Pressure Gauge Fitting Kit
J-45666	Air Line Connector Release Tool
EL-52509	ABS Programming Adapter Cable
Available Tool	
J-35184	Front Hub Seal Installer

Training Courses

The majority of the systems found on this vehicle are taught in GM’s core curriculum from a conceptual theory and operation perspective. The North American technical training core curriculum structure is system based.

To access **all** of the available training courses in the United States, visit the following website:
www.centerlearning.com

Training Course Name or System — Course Number and Description

Course Name or System	Course Number and Description
Product Launch Course	#90317.10 — Medium Duty Truck Overview
Powertrain	#90317.11 — Medium Duty Truck Powertrain
Air Brake Systems	#90318.30W Medium Duty Truck Air Brake Systems — WBT (Available Fall of 2017) #90318.30H Medium Duty Truck Air Brake Systems — Hands-On (Available Fall of 2017)

Version Information

Version	2
Modified	Released November 17, 2017 **Revised April 09, 2018** Add a section titled New Information Since Start of Vehicle Production including three graphics.

Trademark Footnotes

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