



Service Bulletin

PRELIMINARY INFORMATION

Subject: 2016 -2017 Silverado and Sierra BAS3 New Model Features

Models: 2016-2017 Chevrolet Silverado
2016-2107 GMC Sierra

This PI was superseded to update information under the engine section. Please discard PIT5517.

The following diagnosis might be helpful if the vehicle exhibits the symptom(s) described in this PI.

Condition/Concern

The purpose of this bulletin is to introduce new features of the 2016 and 2017 Silverado and Sierra eAssist vehicles and describe the actions that your Service Department will need to take to ensure that you are able to fully service this exciting new model.

Vehicle Handling Safety

General Precautions

The 2016 and 2017 Silverado and Sierra eAssist system uses an 86-volt battery pack, located under the center console and a belt-driven starter-generator, mounted to the front of the engine in place of the alternator.

Danger: Ensure all High Voltage safety procedures are followed. Failure to follow the procedure exactly as written may result in serious injury or death.

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure will perform the following tasks:

- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
- Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors
 - Visually and functionally inspect the gloves before use.
 - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

Failure to follow the procedures exactly as written may result in serious injury or death.

All high voltage circuits are identified with orange wiring conduit. Care should be taken when working near this high voltage wiring and associated components. Refer to High Voltage Disconnect in SI for high voltage disabling procedures.

First Responder Information

First responder information for all GM Hybrid products can be found on the Internet by following the Emergency Personnel Information link from <http://gmstc.com>. This central location will be maintained and provide the most current critical information for the first responder public. First responder information is available in English language only at this time.

Recommendation/Instructions

Pre-Delivery Inspection and Preparation

Performing a quality pre-delivery inspection (PDI) is one of the most important functions the retailer can do for the customer. Most customers consider the condition of their new vehicle during delivery as a direct reflection of the retailer and your service department. A quality PDI is essential to improving a customer's perception of your facility and increasing his/her satisfaction with their new vehicle. The 2016 and 2017 Silverado and Sierra eAssist forms are available via Global Connect. These forms contain the same generic PDI steps as before, but also include a section for Special Inspection Items. This section is updated frequently and contains special items to look for during the PDI process.

Customer Education and Unique Operating Characteristics

Customer Education

It is imperative that the customer be well informed about the unique features and operational characteristics of their 2016 and 2017 Silverado and Sierra eAssist. For the sales team to be fully prepared, they should thoroughly review this New Model Features and Service Guide and use the Getting to Know Your Vehicle (GTK) guide (U.S. Only) as an outline when presenting the Silverado and Sierra eAssist to the prospect customer. Additionally, service and parts leadership, service writers and technicians should familiarize themselves with these materials to avoid attempting repair of normal operating characteristics. The transmission shifting characteristics are different from a non-eAssist truck and may seem objectionable. Normal operating characteristics should be verified before attempting a repair.

System Overview Electric Assist, Coast-Down, Regenerative Braking and Auto Stop/Start

The added electric power provided by the eAssist system allows for higher gearing to improve steady state efficiency without impacting acceleration performance or drivability. The system's capability of providing up to 15 kW of electric power assist at cruising speeds allows the driver to accelerate lightly, ascend mild grades without the transmission downshifting and helps performance during wide open throttle maneuvers. Significant internal transmission changes to clutch controls and hardware provide reduced spin losses while improving shift quality.

When the driver releases the accelerator pedal, air flow into the engine is reduced. The ECM monitors the corresponding changes in the throttle position, MAP, and MAF. The ECM shuts OFF fuel completely if the deceleration is very rapid, or for long periods, such as closed-throttle coast-down. The fuel shuts OFF in order to prevent damage to the catalytic converter and saves fuel by not running the engine. This mode is activated quickly and for a longer duration in the eAssist vehicle.

While in deceleration fuel cut-off mode, the torque converter stays locked allowing the electric motor to be coupled to the wheels (through engine and trans) to recharge the high voltage batteries via regenerative braking. The electric motor can also quickly react to help smooth driveline disturbances (downshifts), or provide assist for a smooth take off when the accelerator is depressed. If the vehicle is brought to a complete stop the electric motor spins the engine bringing it to a smooth stop and is properly positioned for a fast restart.

While not unique to the eAssist vehicle, expanded operational range is possible because the electric motor can react quickly to smooth driveline disturbances that would otherwise be objectionable.

Vehicles with eAssist have an automatic (auto) engine Stop/start feature. After the powertrain has started and reached operating temperature the auto stop feature may allow the engine to turn off when brakes are applied and the vehicle has come to a complete stop. When the brake is released or the accelerator pedal applied, the engine will start. The engine will continue to run until the next auto stop or until the ignition switch is turned OFF.

AUTO STOP on the tachometer signifies that the engine is in auto stop mode. When the vehicle is turned off, the tachometer will move to OFF.

Conditions Required for "Auto-Stop", Reasons for No "Auto-Stop" or Early "Auto-Start"

There are several conditions which may prevent an auto stop or cause an auto start.

The Engine Will Remain Running When:

- The engine, transmission, or hybrid battery is not warmed up.
- The outside temperature is less than -20°C (4°F).
- The air conditioning or defrost system requires the A/C compressor to maintain vehicle comfort.
- The shift lever is in any position other than DRIVE.
- The hybrid battery pack charge is low.
- The 12-volt vehicle battery charge is low, or accessory loads are high.
- The hood is not fully closed.

The Engine Will Restart When:

- The brake pedal is released.
- The accelerator pedal is applied.

- Shifting out of D (Drive) to any other gear.
- If the eco air conditioning button is selected, the duration of the auto stop will mainly depend on the outside temperature along with some other factors. This economy mode improves fuel economy by limiting the effects of the air conditioning. The warmer it is outside, the shorter the time before the engine is restarted to provide cabin cooling.
- The climate control system is turned from off to normal air conditioning or defrost.
- The engine is required to run for either heater or climate control performance.
- The hybrid battery pack charge is low and requires recharging.
- Auto stop time is greater than two minutes.

How to Maximize Fuel Economy

2016 and 2017 Silverado and Sierra eAssist is rated at 18mpg/city and 24 mpg/highway U.S. (8.3 L/100 km city and 5.4 L/100 km highway in Canada). However, fuel economy can vary greatly depending upon how the vehicle is driven. The measurement of fuel economy during vehicle break-in will typically generate lower numbers. Measured fuel economy will tend to stabilize after the first 1000 miles (1600 km). After this initial period, there are several techniques that can help maximize fuel economy.

Use ECO Gauge

Located in the instrument cluster, ECO gauge provides instant, continuous feedback on how well the driver is maximizing fuel efficiency. To maximize efficiency attempt to keep the pointer in the solid green zone in the middle of the gauge. The gauge moves to the left when braking and to the right when accelerating. When either is done aggressively, it is less efficient and the gauge will move farther away from the center.

Information Displays

Power Flows

To view the Power Flow screens in the infotainment display, press the “Leaf” button on the Home screen. Then press the FLOW button at the bottom of the touch screen. These screens indicate the current operating condition and the energy flow between the engine, generator, and high voltage battery. See the Silverado/Sierra eAssist Supplement for screen definitions.

Energy Information

To view the Consumption History screen on the infotainment display, press the “Leaf” button on the Home screen. Then touch INFO at the bottom of the touch screen. The consumption history graph shows the average fuel economy over the last 50 km or 50 mi. See the Silverado/Sierra eAssist Supplement for additional information.

Vehicle Acceleration

A significant amount of fuel is used in vehicle acceleration. To improve economy, accelerate smoothly and gradually with the lowest reasonable throttle level. As you approach your desired speed, reduce throttle until the pointer lands in the middle of the gauge. Attempt to keep the ball in the solid green zone in the middle of the gauge whenever driving at a constant speed. Allowing a drop in speed when climbing a grade will save fuel over increasing the throttle to maintain a given speed.

Coasting and Braking

During many coast conditions, eAssist vehicle achieves its highest fuel economy as engine fuel flow can be shut off and regenerative braking charges the batteries. In contrast, braking converts the energy of the moving vehicle into heat - which cannot be recovered. To maximize economy, rather than “driving” with the throttle applied up to traffic, a light or stop sign, the operator should begin coasting sooner allowing regenerative braking to slow the vehicle more gradually. In short, begin coasting sooner, and brake less.

About the Vehicle

The purpose of this section is to familiarize you with the technical aspects of Silverado and Sierra eAssist vehicle and introduce the major eAssist-specific components. The following information will only define the differences between the base 2016 and 2017 Silverado and Sierra and the 2016 and 2017 Silverado and Sierra eAssist vehicle.

The primary components in the eAssist include:

- The hybrid/EV battery pack, also referred to as the generator control and battery module assembly, stores 86 V DC in two lithium-ion battery sections. It is located in the rear compartment of the vehicle, under the center console, and serves as a modular assembly to contain many of the eAssist control modules and system components.
- The generator control module, also referred to as the starter generator control module, is located in the engine compartment
- The starter generator, also referred to as the drive motor, is located in the engine compartment. The drive motor is mounted to the front of the engine in place of the alternator.

The drive motor is connected to the crankshaft pulley using a specially designed serpentine belt and drive belt tensioner.

- Direct Current and 3-Phase Alternating Current High Voltage Circuits:

- Direct Current (DC) - The generator control module is connected to the positive and negative terminals of the high voltage, (DC) generator battery assembly. Both of the negative and positive high voltage DC battery poles are isolated from the vehicle chassis. The positive high voltage DC cable is switched ON or OFF by a high voltage, high current contactor relay contained within the generator control and battery module assembly

All high voltage DC negative and positive DC cables are orange in color to alert the technician to the potential presence of high voltage.

- Three Phase Alternating Current (AC) - Three individual cables connect each phase of the drive motor to the generator control module. Each individually shielded cable is orange in color to alert the technician to the potential presence of high voltage. These three cables are routed from engine compartment to the rear of the vehicle in a single conduit.

Engine

The engine included in the 2016 and 2017 Silverado and Sierra eAssist is a 5.3L 8 cylinder (RPO L8B) rated at 355 hp at 5600 rpm. This engine features Variable Valve Timing. This engine is equipped with an accessory drive system similar to the existing Belt-Alternator Starter (BAS) system. Specifically, a 10-rib high strength belt and a unique dual tensioner allow the generator to drive the crankshaft in "Auto-Start" and assist modes, and allow the engine crankshaft to drive the generator in normal electrical generation and regenerative braking.

Auxiliary Coolant Pumps

Two auxiliary coolant pumps are included in the design of the eAssist. One is used to circulate coolant through the electric motor and Starter/Generator Control Module whenever assembly temperature exceeds 70°C (158°F).

The other is used to provide circulation of coolant through the heater core and will only be run while in "Auto-Stop" depending upon the outside air temperature.

Eight Speed Transmission

The transmission is a modified 8L90 (RPO M5X) transmission that includes a High Pressure Accumulator to maintain transmission line pressure, and therefore clutch activation when the vehicle is in 'Auto-Stop' mode. This transmission has other eAssist-specific content including a modified spacer plate and valve body.

The eAssist system employs an eight-speed transmission with sophisticated algorithms that continuously store information about your driving style, such as acceleration and braking.

As the vehicle is driven in a variety of city and highway driving conditions, eAssist will use its on-board processing power to quickly "learn" your driving habits to deliver a more seamless driving experience. During this time (for about the first 1000 miles), some transmission shifts may be more noticeable. The changing outside (Winter/summer) temperature could cause the transmission to go back into learn mode. So some harsh/soft shifts could be experienced as the weather changes.

When ordering service parts care is required to reference the correct transmission RPO.

Note: During regenerative braking, transmission downshifts may be more noticeable when coasting or braking.

Brakes

The Silverado and Sierra eAssist vehicle comes standard with ABS, Traction Control and ESC as the base brake system. All of the brake hardware for the eAssist vehicle is shared with the 2016 and 2017 Silverado and Sierra vehicle without the eAssist.

The brake system includes a brake booster vacuum sensor and electric vacuum pump. The EBCM will monitor the vacuum sensor and turn on the vacuum pump if the vacuum level is below a threshold. This is common during periods of low engine supplied vacuum (i.e. during Auto Stops).

The brake system also contains the feature of Hill Start Assist (HSA). HSA reduces vehicle roll when stopped on a hill. HSA will activate for a brief period of time (up to ~1.5 seconds) when the driver releases the brake pedal and has not yet applied the accelerator pedal. This reduces backward roll if the vehicle is in "drive" is on a nose-up hill and reduces forward roll if the vehicle is in "reverse" on a nose downhill.

Auto Stop and Auto Start control is performed by the Starter Generator Control Module. A brake pedal position sensor is wired directly to the Starter Generator Control Module. An Auto Stop will be commanded when the vehicle is stationary and the brake pedal is applied beyond a certain point. The engine will perform an autostart as the brake pedal is released.

Instrument Panel Cluster

Silverado and Sierra eAssist includes an ECO gauge on the instrument panel that continuously responds to driving behavior, enabling you to drive with maximum efficiency.

Vehicles equipped with DVD navigation can see the powerflow diagram displayed on the center console by pressing INFO button on the centerstack.

HVAC Controls

The eAssist HVAC control panel is similar to the HVAC control panel in the Silverado and Sierra. The unique feature with the Silverado and Sierra eAssist HVAC control panel is the addition of an "ECO A/C" mode. The A/C button LED will be Green in ECO mode. The LED will be yellow for "Comfort A/C" mode.

In the "ECO A/C" mode, green LED the operator is allowing the "Auto stop/Start" function when the vehicle is at rest in drive. By selecting "Comfort A/C" mode, yellow LED, the operator requests reduced "Auto stop/start" mode.

The operator-requested A/C mode may be overridden by the HVAC system depending upon air delivery selection.

During Defrost air delivery mode, A/C compressor will remain on, disabling "Auto stop/start" regardless of the operator-selected A/C mode. Additionally, the A/C

compressor will operate if the air delivery is selected anywhere from floor to the first detent back from defrost. This compressor operation is commanded in order to dehumidify the incoming air to avoid window fogging even when the A/C LED is not illuminated.

To maximize fuel economy, use the "AUTO" selection for Fan Speed and Air Delivery.

A/C Operation

Use the "AUTO" feature on both the fan setting and the mode setting. Also select a temperature setting that is higher in warm weather and lower in cooler weather.

If the "AUTO" feature is not utilized, minimizing the application of the A/C compressor will also improve economy. The A/C button LED will be Green in "ECO A/C" mode. The LED will be yellow for "Comfort A/C" mode.

To improve passenger comfort during "Auto Stop/Start" turn on air recirculation on the HVAC control panel. This will not only improve the comfort in the vehicle, but will tend to allow "Auto Stop/start" to last longer as the evaporator temperature will rise at a slower rate. Using recirculation will improve economy over use of the "Comfort A/C" mode, yellow LED with similar comfort.

Air delivery mode is also important when trying to minimize A/C compressor operation. Setting the air delivery to the windshield (Defrost) mode will force the A/C compressor ON, and disable "Auto stop/start" regardless of the operator-selected A/C mode. If possible, it is suggested to dial the air delivery one detent counter-clockwise, or 'one click back', from defrost to at least allow "Auto-Stop."

Extended Storage

If the eAssist vehicle is to be stored for a period greater than 30 days, the 12-volt battery negative cable should be disconnected to protect both batteries from discharge.

Jump Starting

If the vehicle fails to crank, it may be jump started by using the eAssist battery to charge the 12-volt battery. See the Silverado/Sierra eAssist Supplement for additional information on how to perform a jump start using the eAssist battery.

Service Charging of the eAssist High Voltage Battery Pack

The eAssist high voltage battery pack is designed to be charged by the eAssist vehicle system only. The eAssist vehicle system monitors the voltage and temperature of individual battery cells and controls the charging rate to optimize the life of the batteries. There is no provision at this time for "off-board" charging of the eAssist high voltage battery pack and such charging should not be attempted. In the event of a significant high voltage battery discharge, it may be necessary to replace the complete high voltage battery pack.

Technical Assistance

Menu Prompts (U.S. TAC Only)

The Technical Assistance Center has modified the telephone prompts to target 2016 and 2017 Silverado and Sierra eAssist calls to a specialized hybrid group.

Restricted Parts

Many of the eAssist -specific electrical/electronic parts will be restricted initially, not allowing parts departments to order these parts. To obtain a restricted part, the service department will need to contact Technical Assistance who will assist in the diagnosis, document the issue and submit the parts order on behalf of the retailer.

Danger: Ensure all High Voltage safety procedures are followed. Failure to follow the procedure exactly as written may result in serious injury or death.

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure will perform the following tasks:

- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed. Before working on any high voltage system, be sure to wear the following Personal Protection

Equipment:

- Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
- Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.
 - Visually and functionally inspect the gloves before use.
 - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

Failure to follow the procedures exactly as written may result in serious injury or death. For all the parts that are included in the following restricted list, it is important that these parts are not disassembled more than is necessary to remove them from the vehicle or more than the supplied replacement part. Further

disassembly in the field may result in disturbing the assembly, therefore reducing the benefit of parts return.

Parts Return

For parts returned through Warranty Part Center (WPC) reference the latest revision of Corporate Bulletin Number #99-00-89-019: Global Warranty Management (GWM) Warranty Parts Center (WPC) Parts Return Program Information

Danger: Ensure all High Voltage safety procedures are followed. Failure to follow the procedure exactly as written may result in serious injury or death.

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure will perform the following tasks:

- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed. Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:
 - Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
 - Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.
 - Visually and functionally inspect the gloves before use.
 - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

Failure to follow the procedures exactly as written may result in serious injury or death.

Submitting Field Product Reports

As with any new vehicle, or vehicle technology, prompt detailed feedback on owner concerns and/or vehicle conditions in the field is of great value to the manufacturer.

U.S. Dealers: To provide Voice Mail reports on the product the retailer should reference the latest version of Corporate Bulletin Number 02-00-89-002 - Information for Dealers on How to Submit a Field Product Report (FPR).

Canadian Dealers: Submit Product Information Reports (PIRs) using the electronic PIR form located within GM GlobalConnect Service Library. Refer to the latest version of Corporate Bulletin Number 10-00-89-006: Information for Dealers on How to Submit a Product Information Report (PIR). End of Vehicle Life Recycling of eAssist High Voltage Battery Pack

In the event that a vehicle reaches the end of useful life and is due to be dismantled, information on the recycling of the eAssist high voltage battery pack can be found at <http://www.recyclemybattery.com>.

Important: Canadian Dealers: The above website link will direct you to a list of Commercial Battery Recyclers.

GM is not recommending these recyclers nor is it an exhaustive list of available recyclers. Two such battery recyclers listed are Inmetco (www.inmetco.com) and Kinsbursky/Toxco (www.kinsbursky.com).

These U.S.-based companies specialize in the recycling of batteries, including the Lithium Ion (Li-Ion) type used in the 2016 and 2017 Silverado and Sierra eAssist high voltage battery pack.

Additional information can be obtained by contacting these companies directly via their respective websites.

You are responsible for complying with all federal, provincial, and local laws and regulations relating to the shipment of the high voltage battery back.

Please note that provincial and/or local laws can be more stringent than federal regulations, so be sure to check all three.

Please follow this diagnostic or repair process thoroughly and complete each step. If the condition exhibited is resolved without completing every step, the remaining steps do not need to be performed.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



WE SUPPORT VOLUNTARY TECHNICIAN CERTIFICATION