Bulletin No.: 17-NA-138

Date: Apr-2017

Service Bulletin

INFORMATION

Subject: **2017 Cadillac CT6 Plug In — New Model Features**

Brand:	Model:	Model Year:		VIN:		Engine:	Transmission:
		From:	To:	From:	To:		
Cadillac	CT6 Plug In (RPO HP9)	2017	2017	All	All	Gasoline, 4 CYL, L4, 2.0L, SIDI, DOHC, VVT, DCVCP, T — RPO LTG	4EL70, Automatic, Rear Wheel Drive, Electric Variable Transmission — RPO MRD

Region — Countries	United States and Canada

Overview

Bulletin Purpose

This is a special bulletin to introduce the 2017 Cadillac CT6 Plug In. 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 this vehicle.

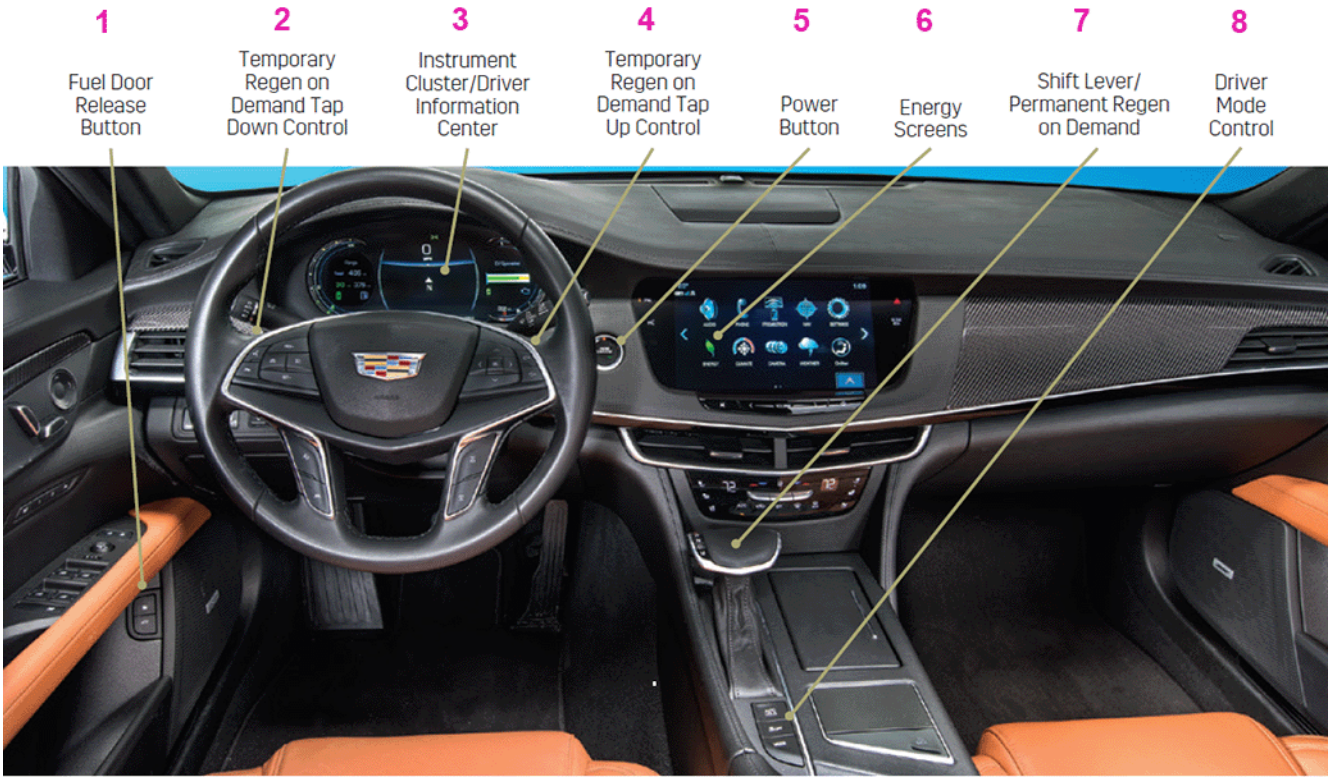
PHEV Specific Highlights

Some of the highlights are:

- Revolutionary 4 Cyl, 2.0L — RPO LTG, turbocharged Plug In (Plug in charging capabilitiy) Hybrid with an all new hybrid electric variable transmission (EVT).
- All new powerful hybrid powertrain capable of 31 miles (50 km) of electric range and 0-60 mph (0-97 km/h) in 5.2 sec.
- The Regen-on-Demand™ energy reclaiming system enables driver control of energy regeneration via convenient paddles on the back of the steering wheel.
- New braking system with improved capability and blended Regen-on-Demand™.
- New Li-Ion HV hybrid battery.
- Distributed HV Power Electronics components.
- Electric HVAC compressor and cabin heater.
- New electro-hydraulic braking system.
- New steel fuel tank system and refueling management system.
- New Hold Mode for saving EV driving for later use.
- New Hybrid IP and gauges and Cue displays/screens.

Instrument Panel

Instrument Panel Features and Controls



The following are some of the IP features and additional controls:

1. Fuel Door Release Button
2. Temporary Regen on Demand™ Tap Down Control
3. Instrument Cluster/Driver Information Center
4. Temporary Regen on Demand™ Tap Up Control
5. Power Button
6. Energy Screens
7. Shift Lever/Permanent Regen on Demand™
8. Driver Mode Control

Vehicle Ready Light

The vehicle ready light illuminates green whenever the vehicle is ready to be driven.

High Voltage Battery Charging

High Voltage Battery Charging

Notice: When using the Portable Charge Cord that is provided with the vehicle, it requires a standard household electrical plug that is a "dedicated circuit" with minimum 15 amp power supply.

Keep the vehicle plugged in, even when fully charged, to keep the battery temperature ready for the next drive. The battery pack requires approximately 13–17 kWh to fully recharge depending on temperature and battery condition. Although the battery pack is 18.4 kWh in full capacity, only approximately 75% of the battery is usable by the customer by design.

Important Information About Portable Electric Vehicle Charging

- Charging an electric vehicle can stress a building's electrical system more than a typical household appliance.
- Before plugging into any electrical outlet, have a qualified electrician inspect and verify the electrical system for heavy-duty service with a "dedicated circuit" with minimum 15 amp power supply.
- Electrical outlets may wear out with normal usage or may be damaged over time, making them unsuitable for electric vehicle charging.
- Check the electrical outlet/plug while charging and discontinue use if the electrical outlet/plug is hot, then have the electrical outlet serviced by a qualified electrician.
- When outdoors, plug into an electrical outlet that is weatherproof.
- Mount the charging cord to reduce strain on the electrical outlet/plug.

Danger: Improper use of portable electric vehicle charge cords may cause a fire, electrical shock, or burns, and may result in damage to property, serious injury, or death.

- Do not use extension cords, multi-outlet power strips, splitters, grounding adaptors, surge protectors, or similar devices.
- Do not use an electrical outlet that is worn or damaged, or will not hold the plug firmly in place.
- Do not use an electrical outlet that is not properly grounded.
- Do not use an electrical outlet that is on a circuit with other electrical loads.

Warning: When using electric products, basic precautions should always be followed, including the following:

- Read all the safety warnings and instructions before using this product. Failure to follow the warnings and the instructions may result in electric shock, fire, and/or serious injury.
- Never leave children unattended near the vehicle while the vehicle is charging and never allow children to play with the charge cord.
- If the plug provided does not fit the electrical outlet, do not modify the plug. Arrange for a qualified electrician to inspect the electrical outlet.
- Do not put fingers into the electric vehicle connector.

Warning: To reduce the risk of fire, installations shall comply with the requirements of National Electric Code, ANSI/NFPA 70 (USA), Canadian Electrical Code CSA 22.1 and IEC 60364 – Electrical installations in buildings, depending on the region in which the unit is being installed. The installer shall comply with any additional local requirements mandated by the country and/or municipality.

- Do not use this product if the flexible power cord or the electric vehicle cable is frayed, has broken insulation, or shows any other signs of damage.
- For Canada only: Not for use in commercial garages.
- Do not use this product if the enclosure or the vehicle plug is broken, cracked, open, or shows any other indication of damage.
- The plug must be plugged into an appropriate electrical outlet that is properly installed in accordance with all local codes and ordinances. Do not modify th plug provided with the product. If the plug does not fit the electrical outlet, have a proper electrical outlet installed by a qualified electrician. If the ground i missing, the charge cord indicators will indicate an electrical system fault and the vehicle may not charge.

Minimum Requirements for Circuits Used for Charging

It is ***SUGGESTED*** to use a dedicated circuit so the maximum charge of 12A can be used with a minimum 15A power supply and no other electrical loads on the circuit other than the charge cord. Refer to the preceding ***Danger*** and **Warning** statements.

The following are the minimum requirements for electrical circuits used to charge this vehicle:

- 120 volts/15 amps
- 240 volts/20 amps

Charging Times

Charging times will vary with ambient temperature due to battery conditioning.

- Charge Station — 240 V, 16 A: Approximately 4.5 hours.
- Portable Charge Cord — 120 V, 8 A: Approximately 20 hours. This is the “default” setting.
- Portable Charge Cord — 120 V, 12 A: Approximately 12.5 hours.

Portable Charge Cord Storage

The portable charge cord used to charge the vehicle high voltage battery is stored in the rear cargo area. After charging the vehicle always return the portable charge cord to its protective storage area.

Charge Port

The charge port door is located on the driver side of the vehicle. Open the door to access the charge port connector.

Charging Modes

The vehicle can be programmed for 3 charging modes. They are: Immediately, Delay Charge Based on Departure Time, and Delay (Electric Rate and Departure Time).

1. Touch the Green Leaf Energy icon on the infotainment screen and then touch the Charging icon to view the current Charge Limit and Charge Mode status.
2. Touch the Charge Limit text or Charge Mode text to change the setting.

Location-Based Charging

Charging settings can be saved for your home location. The vehicle will automatically use these settings when parked at its Home Location.

1. On the infotainment system, select > Settings > Vehicle > Energy > Location-Based Charging.
2. Select On.
3. Select Update Home Location and select the desired settings for the Home Location.

Charging Status Indicator

The Charging Status Indicator (CSI) is located on the instrument panel near the windshield. When the vehicle is plugged in, the CSI indicates the following:

- **Short Flashing Green** The vehicle is plugged in but the battery is not yet fully charged. The flash rate increases from one to four flashes as the battery charges.
- **Long Flashing Green** The vehicle is plugged in but battery is not yet fully charged. Battery charging is in Delay Mode.

- **Solid Green** The vehicle is plugged in. The battery is fully charged.

Notice: If using AC charging, this vehicle will respond to remote requests through OnStar® to limit or completely block electrical power grid usage for brief time periods. A utility interruption during charging may increase the high voltage battery charge times. A message will display on the instrument cluster indicating that a utility interruption has occurred.

- **Solid Yellow** The vehicle is plugged in. It is normal for the CSI to turn yellow for a few seconds after plugging in a compatible charge cord . The solid yellow may be extended depending on the vehicle and if there is a total utility interruption via OnStar®. This may also indicate that the charging system has detected a fault and will not charge the battery. Refer to > Charge Cord > Charge Cord Status Indicators in the Owner Manual.
- **No Light** The vehicle is not plugged in or there is an issue with the Portable Charge Cord or the electrical outlet.

Sounds From the Vehicle When Charging

Notice: When the charge cord is plugged into the vehicle, the vehicle cannot be driven.

The charging system may run fans and pumps that result in sounds from the vehicle when it is turned **OFF**. Additional unexpected clicking sounds may be caused by the electrical devices used while charging.

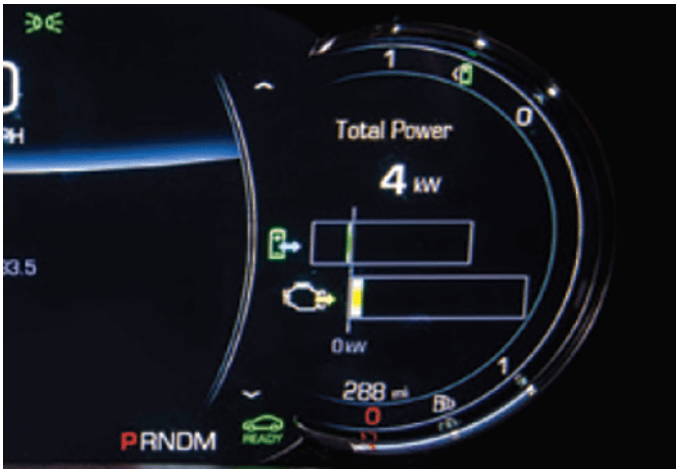
Instrument Panel Cluster

The CT6 Plug In provides the power and torque response needed based on accelerator pedal input, by efficiently combining the propulsion power of the high voltage battery and the high-output 2.0L turbocharged engine, and sending it to the drive wheels through the electric variable transmission.

Maximum EV Operation — EV Operation Gauge

The system works automatically in real time to provide the most efficient use of both propulsion power sources. When fully charged, the high voltage battery is the dominant propulsion power source and the engine will turn **ON** occasionally to provide supplemental power. The EV Operation Gauge indicates when the engine will turn **ON**. The vehicle will operate in EV mode under light or moderate driving conditions for approximately 31 miles (50 km) and up to speeds of 78 mph (126 km/h). Under aggressive acceleration, the engine will turn **ON** to assist the high voltage battery. The engine will turn **OFF** and EV operation will resume once the vehicle is driven under light or moderate driving conditions again.

Hybrid/EV Operation — Total Power Gauge



When the high voltage battery is depleted, the engine is the dominant propulsion power source and the high voltage battery will provide only supplemental propulsion power. The Total Power Gauge shows the current source of power. The high voltage battery will store enough energy to provide some Hybrid/EV driving or supplemental power. Full EV driving can only resume if the vehicle is plugged in to charge.

Power Gauge

The Power Gauge shows the vehicle's current total power consumption from both the engine and high voltage battery. The Power Gauge also indicates when energy is being recaptured during regenerative braking and coasting.

- The yellow area indicates high power usage.
- The white area indicates power is being provided by the engine and/or high voltage battery.
- The green area indicates power is being regenerated.

High Voltage Battery Gauge

The Battery Gauge shows the high voltage battery state of charge. When the gauge reads empty, the vehicle should be plugged in to charge the high voltage battery and to allow maximum EV operation again.

Instrument Panel Cluster — Configurations

The instrument cluster can be configured in a Balanced or Enhanced display layout. Use the controls on the right side of the steering wheel to move between the display zones and to scroll through the different displays in each layout.

Balanced Configuration

Enhanced Configuration with Night Vision

Head Up Display

Head Up Display

The Head Up Display (HUD) provides information at a glance. The full-color Head Up Display projects driving and entertainment updates onto the windshield so you can stay informed without taking your eyes off the road. It is reconfigurable, so it can be customized to display the information that is most relevant to the driver.

Information Displays

Several information displays are available on the infotainment system that provide an overview of hybrid operation. Touch the **Green Leaf Energy** icon on the infotainment Home screen and then touch the Flow, Charging, or Info icon.

Power Flow — Engine and Battery Power

The Power Flow screen indicates the current system operating conditions, showing the power flow between the high voltage battery and engine through the transmission. The active components are highlighted.

Charging

The Charging screens show the Charge Limit and Charge Mode status. The Charge Limit sets the vehicle's charge limit to the capability of the charging location. The Charge Limit settings are Maximum (12 amps) and Reduced (8 amps). The 3 programmable charge modes are: Immediately, Delay Charge Based on Departure Time, and Delay (Electric Rate and Departure Time).

Energy Usage

The Energy Usage screen shows all energy use (electric and gasoline) since the last time the high voltage battery was fully charged.

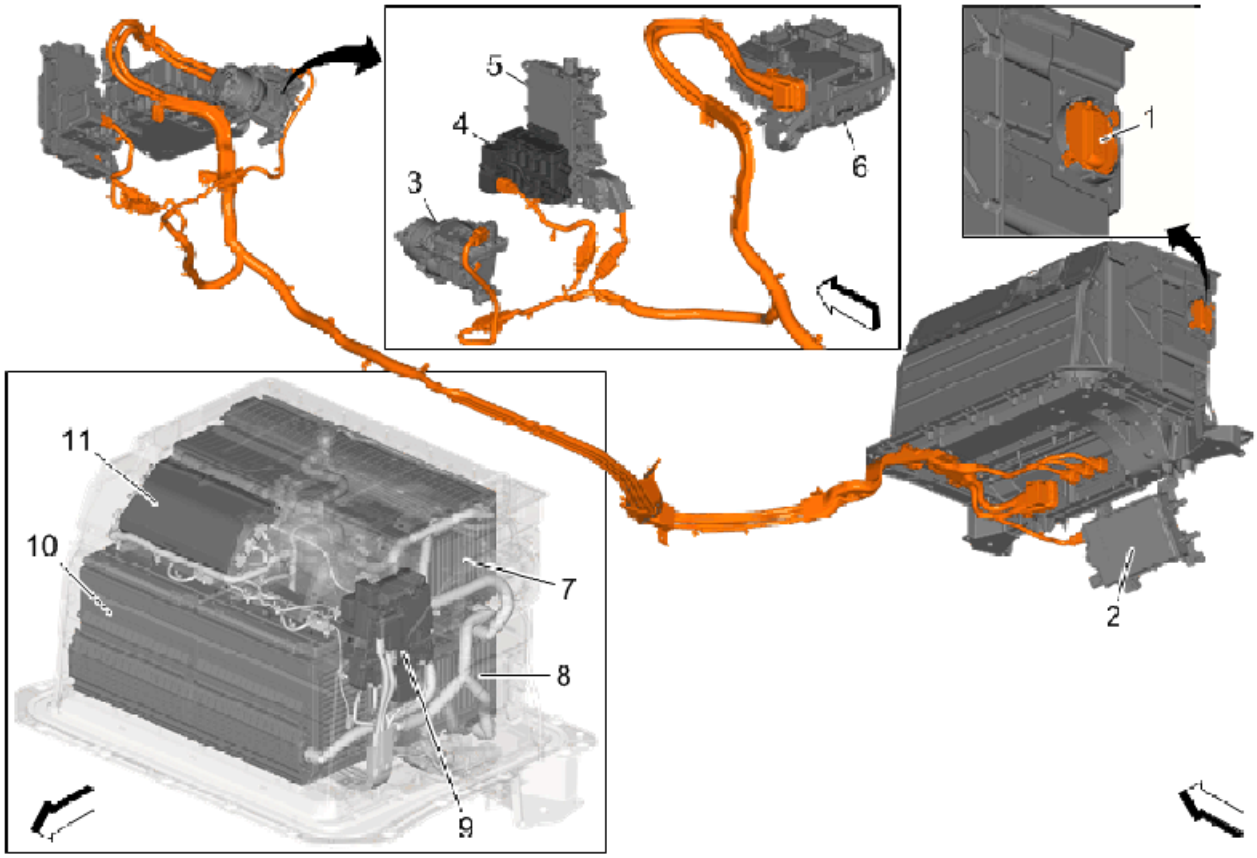
Energy Details

The Energy Details screen displays how the energy was used since the last time the high voltage battery was fully charged.

Consumption History

The Consumption History screen features a graph of the average fuel economy over the last 50 miles ***or*** over the last 50 km (This distance value is not a conversion). Touch Reset to clear the data.

Drive Motor Battery System Description



1. S15 Manual Service Disconnect
2. T18 Battery Charger
3. K10 Coolant Heater Control Module
4. K1 14V Power Module
5. T6 Power Inverter Module
6. G1 A/C Compressor
7. C4B Hybrid/EV Battery Section 2
8. C4C Hybrid/EV Battery Section 3
9. A28 Hybrid/EV Battery Contactor Assembly
10. C4A Hybrid/EV Battery Section 1
11. K16 Battery Energy Control Module

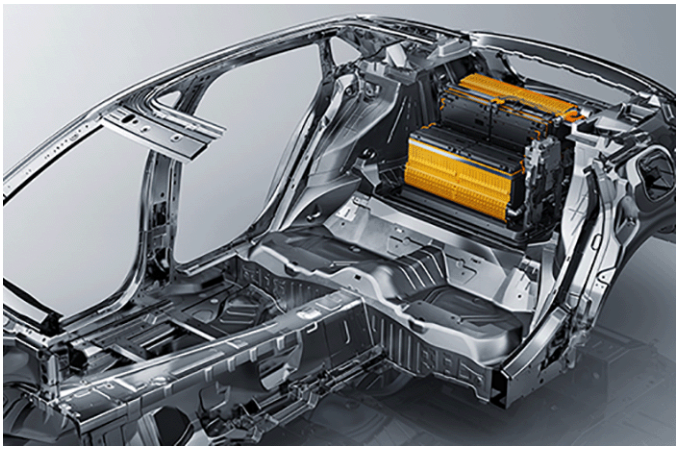
Overview

The high voltage hybrid/EV battery contains 192 individual lithium-ion cells. Two cells are welded together in parallel and called a cell group. There are a total of 96 cell groups in the hybrid/EV battery assembly. These cell groups are electrically connected in series. Each individual cell group is rated at 3.7 V, for a nominal system voltage of 355 V direct current. The battery cell groups are joined to form 3 distinct sections. The first 32 battery cell groups make up C4A hybrid/EV battery section 1. This section is the forward-most section and contains battery cell groups 65 through 96. The next 32 battery cell groups make up C4B hybrid/EV battery section 2. This section is located on top of section 3 and contains battery cell groups 33 through 64. Located beneath battery section 2 is C4C hybrid/EV battery section 3 and it contains the remaining 32 battery cell groups 1 through 32. The battery sections also contain two temperature sensors, with one sensor located at each end of the section for a Hybrid/EV battery pack total of six temperature sensors.

Located within the high voltage Hybrid/EV battery pack, the K16 battery energy control module monitors the temperature, current and voltage of the 96 battery cell groups. The voltage sense lines are attached to each individual cell group, and these sense lines terminate at a connector located on the top surface of the battery section. A voltage sense harness joins this connector to the K16 battery energy control module.

The K16 battery energy control module will determine when a fault condition is present. Diagnostics and system status are communicated from the K16 battery energy control module to the K114B hybrid powertrain control module 2 through serial data. The K114B hybrid powertrain control module 2 is the host controller for K16 battery energy control module diagnostic trouble code information.

Hybrid/EV Battery Location



The high voltage hybrid/EV battery is installed from beneath the vehicle, into the rear storage compartment. The K16 battery energy control module, a current sensor, and the high voltage contactors are located within the hybrid battery assembly. The K114B hybrid powertrain control module 2 is mounted to the exterio of the hybrid/EV battery assembly, accessible within the rear storage compartment.

High Voltage Control

The hybrid/EV battery contains 4 high voltage contactors and 1 solid state relay (transistor). The high voltage contactors and transistor allow the high voltage DC batteries to be connected to the vehicle or contain the high voltage DC within the hybrid/EV battery assembly. The 4 high voltage contactors consist of a main positive high voltage contactor, main negative high voltage contactor, charge positive high voltage contactor and a precharge negative high voltage contactor. The transistor controls the battery heater high voltage negative circuit. The high voltage contactors and transistor are located within the A28 hybrid/EV battery contactor assembly. In order to prevent large in-rush current to capacitors located in the vehicles high voltage components, the contactors close in a specific precharge sequence controlled by the K114B hybrid/EV powertrain control module 2.

Thermal Management

The hybrid/EV battery is cooled and heated with pre-mixed DEX-COOL®, which is a 50/50 mixture of DEX-COOL® and de-ionized water. A refrigerant/coolant heat exchanger (chiller) and the G1 A/C compressor cools down the high voltage hybrid/EV battery. A high voltage heater inside the hybrid/EV battery can also heat the coolant entering the hybrid/EV battery when needed.

Hybrid/EV Cooling System Description and Operation

Hybrid/EV Cooling System Description and Operation

This vehicle is equipped with three fully independent cooling systems.

- **The hybrid/EV electronics cooling system is dedicated to cooling the power electronics components.** The hybrid/EV electronics cooling system is dedicated to cooling the power electronics components. The primary purpose of the hybrid/EV electronics cooling loop is to cool the T6 power inverter module, T18 battery charger, and the K1 14V power module. The hybrid/EV electronics cooling system uses the auxiliary radiator, engine control module inputs, radiator fan(s) and 12 V G35 hybrid/EV electronics coolant pump to circulate coolant through the system. The K114B hybrid/EV powertrain control module 2 activates the coolant pump and monitors the B202 hybrid/EV electronics coolant temperature sensor in the auxiliary radiator. The coolant pump will activate when the vehicle is on and during charging. The hybrid/EV electronics cooling system circulates a pre-mixed DEX-COOL® which is a 50/50 mixture of DEX-COOL® and de-ionized water. De-ionized water is required for high voltage isolation and to prevent corrosion from effecting heat sink performance. Always use pre-mixed coolant and never use tap water in the hybrid/EV electronics coolant system.
- **Hybrid/EV Battery Pack Cooling System Description and Operation** The hybrid/EV battery pack cooling system is dedicated to cooling and heating the high voltage hybrid/EV battery pack. The energy storage system cooling system uses the 12 V G37 hybrid/EV battery pack coolant pump, a refrigerant/coolant heat exchanger (chiller) and the high voltage G1 A/C compressor to cool down the A4 hybrid/EV battery pack. There is also a high voltage E54 hybrid/EV battery pack coolant heater inside the hybrid/EV battery to heat the coolant entering the hybrid/EV battery when needed. The K114B hybrid/EV powertrain control module 2 monitors the B204A hybrid/EV battery pack coolant temperature sensor 1, hybrid/EV battery cell temperature sensors, refrigerant temperature, refrigerant pressure, and the B258 Hybrid/EV Battery Coolant Level Switch. The K114B hybrid/EV powertrain control module 2 determines how much hybrid/EV battery cooling or heating is required and turns on the G37 hybrid/EV battery pack coolant pump. Depending on what is required, it will operate the radiator fan(s) and request the A/C Compressor Module to turn on the high voltage A/C compressor, or turn on the high voltage E54 hybrid/EV battery pack coolant heater. The hybrid/EV battery pack cooling system could be activated when the vehicle is operating, during charging, or when the vehicle is OFF and maintaining the hybrid/EV battery pack temperature. to Automatic HVAC Description and Operation. The B258 hybrid/EV battery pack coolant level switch is attached to the coolant reservoir. The level sensor is a 2 state magnet/reed switch which changes state when the level in the reservoir gets low. The K114B hybrid/EV powertrain control module 2 uses the B258 hybrid/EV battery pack coolant level switch to determine if disabling the hybrid/EV battery pack charging operation is necessary due to a loss of coolant. The hybrid/EV battery pack cooling system circulates a pre-mixed DEX-COOL® which is a 50/50 mixture of DEX-COOL® and de-ionized water. De-ionized water is required for high voltage isolation and to prevent corrosion from effecting heat sink performance. Always use pre-mixed coolant and

never use tap water in the battery coolant system.

- **Passenger Compartment Heater System Description and Operation** The passenger compartment heater system is dedicated to cooling the engine and providing heat to the passenger compartment. The passenger compartment heater system uses the engine radiator, the 12 V G36 auxiliary heater coolant pump, Q66 passenger compartment heater coolant control valve, high voltage K10 coolant heater control module and a heater core to provide warm cabin air. The Q66 passenger compartment heater coolant control valve has two positions. When commanded in bypass mode, as when the engine is OFF, the Q66 passenger compartment heater coolant control valve separates the engine and the high voltage coolant heater coolant loops to prevent heat generated by the high voltage K10 coolant heater control module from dissipating into the engine coolant loop. After the engine starts up and has attained sufficient warmth, the Q66 passenger compartment heater coolant control valve is commanded to normal mode and the two coolant loops are linked. Linking allows excess engine heat to assist the high voltage K10 coolant heater control module in heating the passenger compartment. The Q66 passenger compartment heater control valve contains an internal position sensor that the K114B hybrid powertrain control module 2 monitors. When the engine coolant temperature heats up, a valve position learn procedure takes place. The K33 HVAC control module turns on the G36 auxiliary heater coolant pump and monitors the temperature sensors in the passenger compartment and coolant loop to determine if high voltage K10 coolant heater control module operation is needed. Passenger compartment heat is provided by air flowing through the heater core. When operating the vehicle in cold temperatures, the engine may run for short periods to assist in maximizing heat efficiency to the passenger compartment depending on the outside temperature and the amount of passenger compartment heat requested by the vehicle operator. The engine/passenger compartment heater cooling system circulates a 50/50 mixture of DEX-COOL® and clean, drinkable water.

Automatic HVAC Description and Operation

Heating and A/C Operation

The purpose of the heating and A/C system is to provide heated and cooled air to the interior of the vehicle. The A/C system will also remove humidity from the interior and reduce windshield fogging.

HVAC Controls

The HVAC controls contains all switches, buttons, and dials which are required to control the functions of the HVAC system and serve as interface between the operator and the HVAC control module. The selected values are passed to the HVAC control module via LIN-Bus.

HVAC Control Module

The HVAC control module is a GMLAN device that interfaces between the operator and the HVAC system to maintain and control desired air temperature and air distribution settings. The battery positive voltage circuit provides power that the HVAC control module uses for keep alive memory. If the battery positive voltage circuit loses power, all HVAC DTCs and settings will be erased from keep alive memory. The body control module (BCM), which is the vehicle mode master, provides a device ON-Signal. The HVAC control module provides blower, air delivery mode and air temperature settings.

Actuators (Front)

Doors in the HVAC case assembly are used to control air flow. The HVAC control module operates the doors through the use of actuators, with one actuator being used for each door. The system has the following air control doors and associated actuators: left and right mode, left and right temperature, rear console air flow control, rear console temperature, and recirculation. Each actuator used in the system is a 5-wire stepper motor. The HVAC control module supplies a 12 V reference voltage to the stepper motor and energizes the 4 stepper motor coils with individual control circuits. The control circuits are operated to move the door to the required position. The null point of the stepper motor will be calibrated, if the stepper motor is new. When the stepper motor is calibrated, the HVAC control module can drive the applicable coil to reach exactly the desired position of the flap.

Air Speed and Blower Motor (Front)

The blower speed control is part of the HVAC control. The selected value is sent to the HVAC control module via LIN-Bus. The blower motor speed control from the HVAC control module, battery positive and ground circuits enable the blower motor to operate. The HVAC control module provides a low side pulse width modulation (PWM) signal to the blower motor via the blower motor speed control circuit. As the requested blower speed increases, the HVAC control module increases the amount of time that the speed signal is modulated to ground.

Duct Temperature Sensors

The air temperature sensors are 2-wire negative temperature coefficient thermistors. The sensors operate within a temperature range of −40 to +185°F (−40 to +85°C). The sensors are installed in the air distribution ducts and measure the temperature of the air that streams from the ducts. The HVAC control module uses these values to calculate actuator position.

Evaporator Temperature Sensor

The evaporator temperature sensor is a 2-wire negative temperature coefficient thermistor. The sensor operates within a temperature range of −40 to +185°F (−40 to +85°C). The sensor is installed at the evaporator and measures its temperature. If the temperature drops under 38°F (3°C), the compressor will be switched OFF in order to prevent evaporator freezing.

A/C Refrigerant High Pressure Sensor

The A/C refrigerant pressure sensor is a 3-wire piezoelectric pressure transducer. A 5 V reference voltage, low reference, and signal circuits enable the sensor to operate. The A/C pressure signal can be between 0.2–4.8 V. When the A/C refrigerant pressure is low, the signal value is near 0 V. When the A/C refrigerant pressure is high, the signal value is near 5 V. The engine control module (ECM) converts the voltage signal to a pressure value. When pressure is too high or

too low, the ECM will not allow the A/C compressor clutch to engage.

A/C Refrigerant Low Pressure Sensor (with HP9)

The A/C refrigerant pressure sensor is a 3-wire piezoelectric pressure transducer. A 5 V reference voltage, low reference, and signal circuits enable the sensor to operate. The A/C pressure signal can be between 0.2–4.8 V. When the A/C refrigerant pressure is low, the signal value is near 0 V. When the A/C refrigerant pressure is high, the signal value is near 5 V. The Hybrid/EV Powertrain Control Module 2 monitors the low side refrigerant pressure through the A/C pressure sensor.

A/C Compressor (with HP9)

The AC compressor function is to provide refrigerant flow in the AC refrigerant loop to help cool down the cabin, help dehumidify the air in a defrost mode and help maintain the battery temperature. Rather than a more-typical pulley, the A/C compressor uses a 3-phase alternating current, high voltage electric motor to operate. It has an on-board inverter that takes high voltage direct current from the vehicle's high voltage battery and inverts it to alternating current for the motor.

HVAC Coolant Pump (with HP9)

The HVAC control module will control the cabin coolant heater pump based on a valid flow rate. If the HVAC Heating system requests a coolant flow rate, the HVAC coolant pump will be commanded ON and to the desired speed.

Engine

2.0L L4 Turbocharged Engine

Performance from GM's Ecotec family of engines continues to advance with the 2.0L Turbo and is based on a generation of large displacement four cylinder engines which are designed for greater efficiency. The turbocharger generates up to 20 pounds (138 kPa) of boost and its twin-scroll design helps optimize the usable power from the engine, virtually eliminating turbo lag and helping deliver a broad power band. It also gives the engine the rapid throttle responsiveness associated with a higher displacement naturally aspirated high performance engine. Electronically controlled supporting components, including the wastegate and bypass, help optimize performance and efficiency.

Shown is a typical view of the 2.0L L4 turbocharged engine — RPO LTG.

Engine Component Description and Operation

- **Cam Driven High Pressure Fuel Pump:** A high-pressure, cam driven pump provides the fuel pressure required by the direct injection system. The engine mounted fuel pump is augmented by a conventional electrically operated supply pump in the fuel tank. The fuel delivery system features a high-pressure stainless steel feed line and a pressure regulated fuel rail without a conventional fuel return line from the engine to the tank. Fuel pressure varies from about 750 psi (5,171 kPa) at idle to 2,250 psi (15,513 kPa) at wide-open throttle.
- **Cylinder Head and Valves:** The engine has an A356T6 aluminum cylinder head that is cast using a Rotocast process for high strength, reduced machining and improved port flow and is designed specifically for direct injection (DI). The head is also designed specifically for direct injection. The hea has unique injector mounting locations below the ports. The head uses stainless steel intake valves that are nitrided for improved durability and undercut to improve flow and reduce weight. The exhaust valves have sodium-filled stems that promote valve cooling. At normal engine operating temperatures, the sodium inside the valve stem fuses and becomes liquid. The liquid sodium improves conductivity, promoting heat transfer away from the valve face and valve guide to the cooler end of the stem, where it more readily dissipates. This helps maintain a lower, more uniform valve temperature, reducing

wear on the valve guide for better alignment and a consistent seal between the valve seat and valve face over the life of the engine. The exhaust manifold is mounted to the cylinder head and made of cast stainless steel. It is extremely durable and delivers exceptional airflow qualities.

- **Direct Injection:** Direct injection (DI) moves the point where fuel feeds into an engine closer to the point where it ignites, enabling greater combustion efficiency. It fosters a more complete burn of the fuel in the air-fuel mixture, and operates at a lower temperature than conventional port injection. This allows the mixture to be leaner (less fuel and more air), so less fuel is required to produce the equivalent horsepower of a conventional, port-injection fuel system. DI also delivers reduced emissions, particularly cold start emissions, by about 25 percent. The fuel system operates at pressures as high as 2,250 psi (15,513 kPa) compared to about 60 psi (414 kPa) in conventional port-injected engines.
- **Cylinder Block:** The Ecotec 2.0L turbo sand-cast cylinder block is a superior refinement of previous Ecotec engine block castings. It is dimensionally similar with previous Ecotec turbo block variants, while providing improved structural support, as well as enabling greater control of noise, vibration and harshness. The main bearing bulkheads, which support the crank bearings, as well as the cylinder bore walls have been significantly strengthened to support increased engine loads. Refinements to the oil distribution system enable improved oil flow throughout the engine and an expansion of the coolant jacket, along with the use of cast-in-place bore liners, allows more precise bore roundness and improves the block's ability to dissipate heat.
- **Rotating Assembly:** The crankshaft is made of drop forged steel with induction heat-treated fillets and cross-drilled chamfered oil passages for racing grade lubrication characteristics. Forged powdered metal connecting rods incorporate a larger, forged I-beam cross section for added strength in this turbocharged application. The pistons are lightweight cast aluminum, which reduces reciprocating mass inside the engine and enhances efficiency. The tops of the pistons have a dish shape that deflects injected fuel. Each piston has its own directed jet that sprays oil toward its skirt, coating its underside and the cylinder wall with an additional layer of lubricant. The extra lubrication cools the pistons, reduces both friction and operational noise and bolsters the engine's durability.
- **Two-Stage Variable Displacement Oil Pump:** The variable-flow oiling system helps maximize fuel efficiency. Rather than the linear operation of a conventional fixed-flow pump, it is accomplished with a crankshaft-driven oil pump that matches the oil supply to the engine load. The engine's variable-flow pump changes its capacity based on the engine's demand for oil. This prevents using energy to pump oil that is not required for proper engine operation. An engine oil cooler helps maintain optimum oil temperatures. It has a heat exchanger incorporated into the oil filter housing. Coolant to the heat exchanger is provided by the engine's coolant circuit. The design optimizes oil cooling with a minimal pressure loss. During cold starting, the systen also enables faster heating of the engine oil for an earlier reduction of internal engine friction.
- **Twin Scroll Turbocharger and Air-to-Air Intercooler:** An advanced, electronically controlled turbocharger with a unique twin scroll design is used to increase power in the 2.0L. Each of two scrolls on the turbine is fed by a separate exhaust passage, one from cylinders one and four, the other from cylinders two and three which virtually eliminates turbo lag at low engine speeds, giving the engine immediate throttle response associated with a naturally aspirated high performance engine. The turbocharger generates maximum boost of about 20 psi (138 kPa). Because DI cools the intake process compared to port injection, it allows the 2.0L turbo to safely operate at higher boost and a relatively higher compression ratio (9.5:1) than a conventional turbo engine, increasing both output and efficiency. An intake charge cooler enhances the power-increasing benefits of the turbocharging system. The air-to-air intercooler draws fresh air through a heat exchanger, much like a radiator, to reduce the temperature of compressed air that's forced through the intake system by the turbocharger. Inlet temperature is reduced as much as 180°F (100°C). Cooler air is denser, which means more oxygen is packed in the cylinders for optimal combustion and, consequently, greater power.
- **Vacuum Pump:** A cam driven vacuum pump ensures the availability of vacuum under all conditions, especially under boost, when the engine produces the opposite of vacuum. The pump is mounted at the rear of the cylinder head and is driven by the exhaust camshaft via a flexible coupling.

Engine Specifications

- **Displacement:** 2.0L (122 cubic inches)
- **Bore x Stroke :** 3.38 inches (86 mm) x 3.38 inches (86 mm)
- **Compression Ratio:** 9.5:1
- **Horsepower:** 265 hp (198 kW) @ 5,500 RPM
- **Maximum Engine Speed:** 7,000 RPM
- **Torque:** 295 lb-ft (400 Nm) @ 1,700–5,500 RPM
- **Valves:** 2 intake and 2 exhaust valves per cylinder
- **Valve Lifters:** Hydraulic roller finger follower
- **Recommended Fuel:** Premium unleaded.

Engine Oil — dexos®

Ask for and use engine oils that meet the dexos® specification. Engine oils that have been approved by GM as meeting the dexos® specification are marked with either of the dexos1® approved logos that are shown. For additional information, visit this General Motors website: **http://www.gmdexos.com**

Viscosity Grade

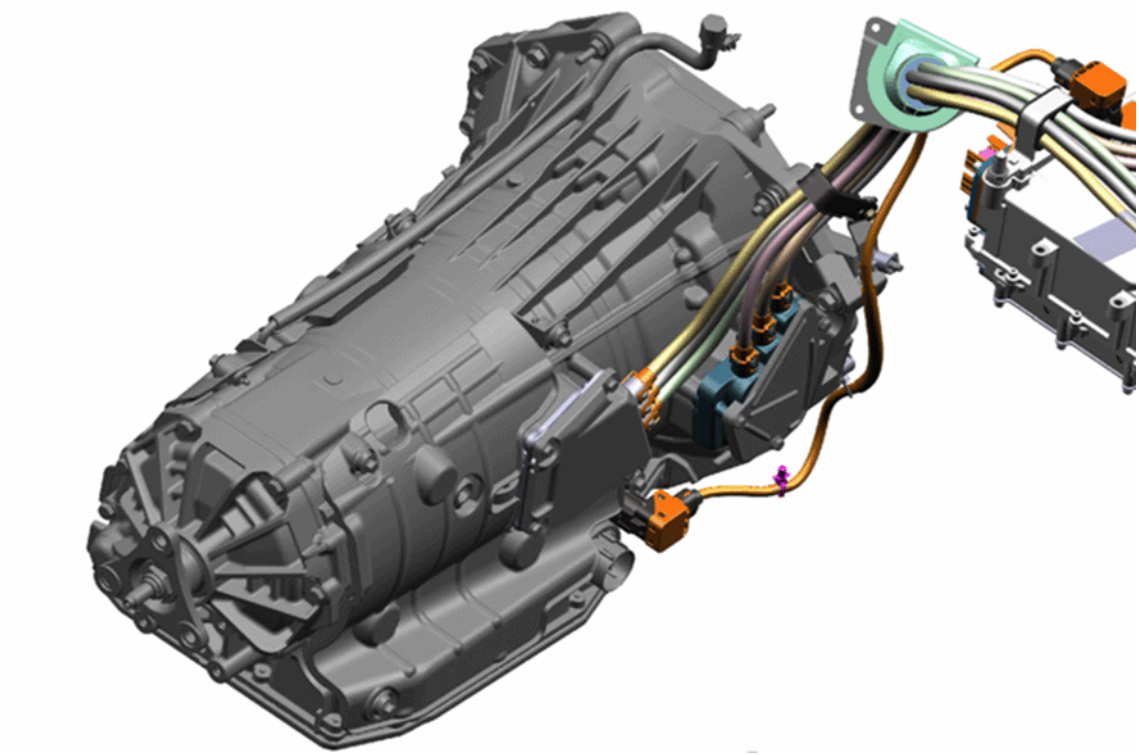
Use ACDelco dexos1® SAE 5W-30 viscosity grade engine oil. In an area of extreme cold, where the temperature falls below −20°F (−29°C) use SAE 0W-30 engine oil. An oil of this viscosity grade will provide easier cold starting for the engine at extremely low temperatures.

Engine Oil Life System

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

Transmission — 4EL70 Automatic Rear Wheel Drive Electric Variable — RPO MRD

4EL70



The 4EL70 is a fully automatic, rear wheel drive, electric variable transmission (EVT). It includes an input shaft, three stationary and two rotating friction clutch assemblies, a hydraulic pressurization and control system, an electric fluid pump, three planetary gear sets, and two electric drive motors.

The torque dampener is external to the transmission, bolted to the engine crankshaft, and splined to the transmission input shaft. The torque dampener acts as a spring coupling to smoothly transmit shaft power from the engine to the input planetary gear set in the transmission and as a direct mechanical coupling from the transmission to the engine.

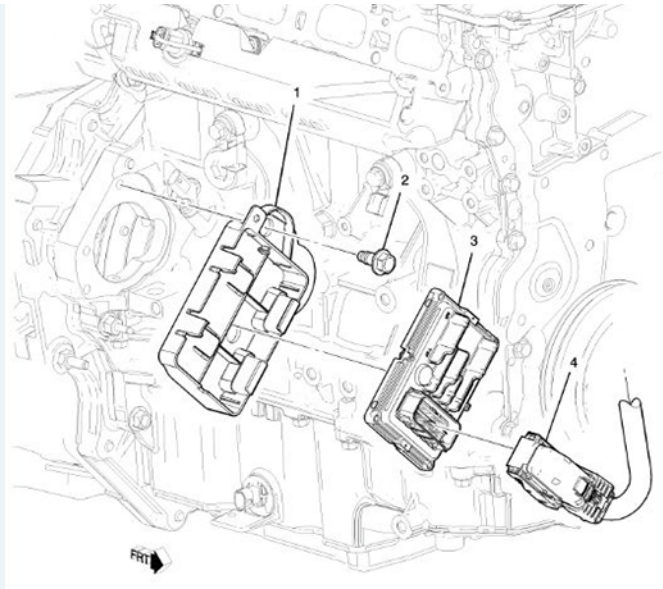
The hydraulic system includes a high pressure electric fluid pump driven by an electric motor supplied with high-voltage current from the power inverter module, shift solenoid valves, a variable line pressure control solenoid valve, and control wiring harness. The electric pump maintains working pressure and control of the clutches when the engine is on and when the engine is off.

The three planetary gear sets, electric motor-generators, and other clutches together provide all-electric propulsion, electric variable hybrid transmission ratios, and fixed mechanical transmission ratios.

Torque Dampener

The torque dampener is external to the transmission, bolted to the engine crankshaft and splined to the transmission input shaft. It acts as a spring coupling and transmits crankshaft power from the engine to the input planetary gear set. It also acts as a direct mechanical coupling from the transmission to the engine.

Transmission Control Module



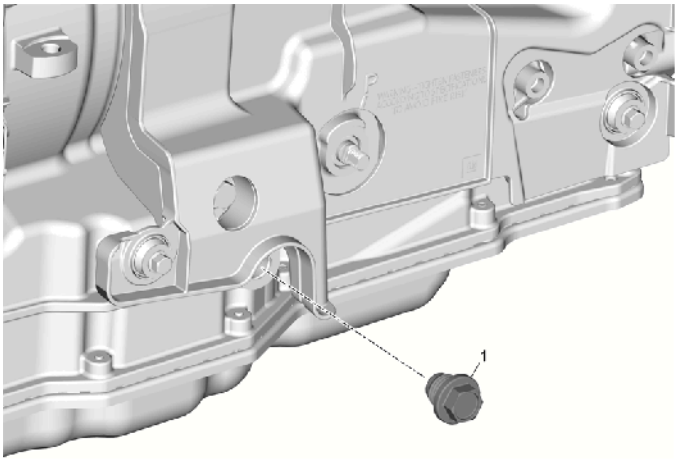
The Transmission Control Module (TCM) is a standalone controller mounted to the vehicle. The TCM has one 66 way connector to interface with vehicle electrical system, transmission assembly and other vehicle control modules. The TCM sends and receives various input and output signals from a number of switches and sensors internal and external to the transmission. In addition, the TCM is part of a network of other control modules on the vehicle. The network of control modules will share information with each other, over a common serial data communications line. Based upon the calibrations and input information the TCM receives, it will always have final authority of when to allow an upshift or downshift whether in manual mode operation or in drive position for automatic shifting.

1. TCM bracket
2. Bolt
3. TCM
4. TCM engine wiring harness connector

Transmission Fluid

Use DEXRON® HP transmission fluid.

Transmission Fluid Level



1 Transmission Fluid Filler Plug

This procedure checks both the transmission fluid level, as well as the condition of the fluid itself. Since the transmission on this vehicle is not equipped with a fi tube and dipstick, the transmission fluid filler plug in the case is used to set the fluid level. Always install a ***NEW*** transmission fluid filler plug after checking the fluid level. When inspecting the transmission fluid level, refer to this procedure: Transmission Fluid Level and Condition Check in SI.

Regen On Demand™

Operation

Notice: The brake pedal must be used at low speeds. Regen on Demand™ will not stop the vehicle.

Regenerative braking takes some of the energy from the slowing vehicle and turns it back into electrical energy, which is then stored in the high voltage battery. Regenerative braking occurs while the vehicle is coasting and during most braking events. Regen on Demand™ allows you to increase the amount of deceleration provided by regenerative braking by using the tap shift controls on the back of the steering wheel. It can be used during sporty driving and when descending hills to slow the vehicle. It also enables one-footed driving using the accelerator pedal and the selected deceleration level.

Temporary Regen On Demand™

With the shift lever in Drive (D), tap either control on the back of the steering wheel to activate Temporary Regen on Demand™. Press and hold the right control for 2 seconds to deactivate Temporary Regen on Demand™. Temporary Regen on Demand™ is automatically deactivated after the accelerator pedal is applied for 15 seconds.

Permanent Regen On Demand™

There are 4 coast deceleration levels (M1, M2, M3, M4). M1 provides the most deceleration and M4 the least amount. M4 and Drive (D) generate the same coast deceleration levels.

1. Move the shift lever from Drive (D) to Manual Mode (M).
2. Tap the left control on the back of the steering wheel to select more deceleration. Tap the right control to select less deceleration.
3. Move the shift lever to Drive (D) to exit.

Propulsion Creep Speed

Use Regen on Demand™ to also change the coasting and creep speed of the vehicle when the accelerator pedal or brake pedal is not applied in stop-and-go traffic. Select a deceleration level from M4 (fastest) to M1 (slowest) to adjust the creep speed.

Driver Selectable Modes

Driver Modes

The available driver-selectable operating modes tailor the performance of the vehicle to the driver's preferences. Press the MODE button on the center console to scroll through the three modes displayed on the instrument cluster. After 3 seconds, the highlighted mode will become active.

Tour

Tour is the default mode at the start of each ignition cycle. Tour provides a balance of ride comfort, performance and fuel economy for everyday driving.

Sport

Sport delivers a more engaging driving experience with more aggressive acceleration and steering responses.

Hold

Saves EV operation for later use. The charge of the high voltage battery remains constant.

Refueling

The CT6 Plug In has a unique fuel tank and refueling management system.

Filling the Fuel Tank

To add fuel to the vehicle follow this procedure:

1. With the vehicle OFF, press the Fuel Door button, located on the driver's door. The ***Wait to Refuel*** message will display on the instrument cluster.
2. When the ***Ready to Refuel*** message displays, the fuel door on the passenger's side of the vehicle will unlock. It will not open automatically.
3. Press and release the rear edge of the fuel door; it will pop open slightly. Open the door to refuel the vehicle.

Parking

The low ground clearance of the CT6 Plug In adds to its aerodynamic efficiency. The flexible air deflector under the front bumper may contact a parking block or curb if the vehicle is parked too closely to it. Park carefully and avoid contact to prevent damage.

Tires

The CT6 PLUG-IN is equipped with unique energy-efficient performance tires for the front and rear wheels. The front and rear tires are different sizes and have different tire pressure specifications. The rear tires have a higher load capability and cannot be used on the front wheels.

- **Front Tire Size:** 235/50R18 SL 97V BW AL3
- **Rear Tire Size:** 265/45R18 SL 101V BW AL3

Towing the Vehicle — Recreational Vehicle Towing

Towing the Vehicle

Have the vehicle towed on a flatbed car carrier. A wheel lift tow truck could damage the vehicle.

Recreational Vehicle Towing

Notice: DO NOT Dinghy tow this vehicle. The CT6 was not designed to be towed with all four wheels on the ground.

Recreational vehicle towing means towing the vehicle behind another vehicle such as a motor home. If the vehicle must be towed, a dolly should be used.

To dolly tow a **rear-wheel drive vehicle from the rear** perform the following:

1. Attach the dolly to the tow vehicle following the dolly manufacturer instructions.
2. Put the rear wheels on the dolly.
3. Shift the transmission to **P** (Park).
4. Firmly set the parking brake.
5. Use an adequate clamping device designed for towing to ensure that the front wheels are locked into the straight-ahead position.
6. Secure the vehicle to the dolly following the manufacturer instructions.
7. Release the parking brake only **after** the vehicle being towed is firmly attached to the towing vehicle.
8. Turn OFF the ignition.

In the Event of a Collision

In the event of a collision, CT6 vehicles requiring structural repairs should be sent to a Cadillac Aluminum Repair Network (CARN) facility. These approved facilities have the training, equipment and tools necessary to properly perform structural repairs, restoring the vehicle as close to its pre-collision condition as possible. In Canada, Cadillac dealers that determine a CT6 requires structural repair or quarter panel replacement should refer the vehicle to one of the Cadillac certified aluminum repair facilities in Canada.

Special Tools

Notice: The U.S. Dealer Special Tool Loan Tool Program is administered and managed by Bosch Automotive Service Solutions. Additional information on the Loan Tool Program can be found in Bulletin #16-NA-158: New U.S. Dealer Special Tool Loan Program or by emailing:

gmloanertools@service-solutions.com GM Dealers still have the option to purchase special tools via the online catalog and/or by calling 1-800-GM-TOOLS.

The following new tools were released for the 2017 CT6 Plug In:

Special Tools — Tool Number and Description

Tool Number	Description
EL-50332-335	High Voltage Cable — Battery Pack
EL-50332-340	High Voltage Cable — OBCM
EL-50332-345	High Voltage Cable — ACCM
EL-50332-350	PHEV Depowering Software
EL-51102	High Voltage Battery Lift Bar Tilter
EL-51102-30	High Voltage Battery Lift Bar Eye-Bolt Kit
EL-51102-50	High Voltage Battery Lift Bar Straps
EL-51865	Fixture, Battery Pack Support (Loan Tool Program)
DT-52039	GRE Transmission Tool Kit (Loan Tool Program)

Training Courses

Plug-in Hybrid Electric Vehicle Training Path

Notice: United States — GM STC hybrid and electric vehicle training consists of a set of system based courses as well as system specific courses. The system based courses provide a technician with a general knowledge and understanding of hybrid and electric vehicle propulsion systems, as well as diagnostic and service procedures. These courses culminate in a series of comprehensive hands-on training events in which a technician practices diagnosis and service of various hybrid and electric vehicle systems, high voltage battery systems and electrified transmissions. The vehicle level hands-on course includes multiple disable procedures technicians perform on various systems. A technician who has mastered these skills can now become familiar with a specific system, such as the PHEV, with a series of in-dealer web courses.

Notice: Canada — GM hybrid and electric vehicle training consists of a set of system based courses as well as system specific courses. The system based courses provide a technician with a general knowledge and understanding of hybrid and electric vehicle propulsion systems, as well as diagnostic and service procedures. These courses culminate in a series of comprehensive hands-on training events in which a technician practices diagnosis and service of the Extended Range Electric Vehicle (Volt - EREV) system high voltage battery, power electronics and electrified transmissions. The vehicle level hands-on course includes multiple disable procedures as well as other HV servicing practices. A technician who has mastered these skills can now become familiar with a specific system, such as the PHEV, HEV, eAssist or any of the EV variants, with a series of in-dealer web 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***

In Canada, visit: ***GM GlobalConnect and select Centre of Learning***

Training Course Name or System — Course Number and Description

Course Name or System	Course Number and Description
New Model Feature	Not Available

Engine Gasoline, 4 Cylinder L4, 2.0L, SIDI, DOHC, VVT, DCVCP, TURBOCHARGED — RPO LTG	#16440.17D-V — Engines: New and Updates for RPOs LCV, LTG, LL0 (United States Only) #16043.16H — Gen 2 Overhaul/Repair Certification (Canada Only)
Plug In Hybrid System	#18460.00W — Plug-in Hybrid Electric Vehicle Introduction #18420.02W7 — High Voltage Energy Storage Systems 7
Transmission 4EL70 Transmission — RPO MRD	#18420.04W6 — Advanced Technology Vehicle Transmission 6

Version Information

Version	1
Modified	

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