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GM's First Responder Guides are available at www.gmstc.com
The intent of this guide is to provide information to help you respond to emergency situations involving Chevrolet Spark Electric Vehicle (EV) in the safest manner possible. This guide contains a general description of how the Chevrolet Spark EV systems operate, identifies the location of the unique badging, and includes illustrations of the unique components. The guide also describes methods of disabling the high voltage system and identifies cut zone information.

The Chevrolet Spark EV is a fully electric, front-wheel drive, four-passenger vehicle. The Spark EV uses electrical energy that is stored in a high voltage battery to drive a single electric motor. Once the battery capacity is reduced, the vehicle must be recharged by an external energy source.
The Spark EV badging is one method of identifying the vehicle. The badging will include the acronym “EV” which denotes Electric Vehicle. The vehicle's logo is located on the right side of the deck lid as well as low on the rear bumper. You may also identify the vehicle by the charge port on the left fender.
A unique Liquid Crystal Display (LCD) instrument panel cluster assists in identifying the Chevrolet Spark EV.
System Components

The Spark EV propulsion system is composed of the following components and systems:

- High voltage battery
- Absorbent Glass Mat (AGM) low voltage battery (12V)
- Power inverter module
- Accessory power module
- High voltage battery charger
- High voltage battery DC charger
- 1ET35 Transmission
High and Low Voltage Batteries

Drive Motor Battery
The high voltage battery, also known as the drive motor battery, is a system of many components that operate together to provide the energy required for vehicle propulsion. The energy storage cells are comprised of a lithium-phosphate compound and has a nominal voltage level of 360 volts. High voltage contactors, internal to the battery pack, turn on and off to control the output of stored electrical energy.

Low Voltage Battery (12 Volt)
The Chevrolet Spark EV’s low voltage system (12V) utilizes an Absorbent Glass Mat (AGM) lead acid battery. The battery is located under the hood towards the left side. The low voltage energy is utilized by vehicle modules to control the high voltage battery contactors. Severing the low voltage cables should cause the high voltage contactors to open. The low voltage (12V) cable cut location is found in the engine compartment rearward of the right strut tower.
Drive Motor / Generator Power Inverter Module

The power inverter module is located under the hood on the right side and is mounted on top of the transmission. The module changes the high voltage Direct Current (DC) into 3 phase alternating current. This 3-phase electrical energy provides vehicle propulsion to the motor within the transmission.

Accessory DC Power Control Module

The accessory DC power module is mounted underneath the power inverter module. The module replaces the typical generator common to conventional vehicles. Its function is to convert high voltage DC electrical energy into low voltage DC electrical energy to provide the energy needed for the vehicle systems.
The Chevrolet Spark EV features an onboard high voltage charger that recharges the high voltage battery. The charger is located under the hood on the left side above the transmission. The charger converts household Alternating Current (AC) into Direct Current (DC) voltage to charge the onboard battery. A unique cord connects the vehicle to an electrical receptacle. The vehicle charge port provides the interface between the cord, plug, and the charger.

In the event that a Spark EV is involved in an incident while the battery is charging, remove the charge cord from the car using the charger cord handle at the charge port in the left front fender. If that cannot be accomplished, terminate the electrical power at the source.
The Chevrolet Spark EV features an optional DC fast charge capability. Utilizing a commercial off board charger, the Spark EV can achieve an 80% charge in less than 30 minutes. The drive motor battery DC charger is located under the hood on the right side above the drive motor / generator power inverter module. The DC charger utilizes a set of contactors to connect the off-board fast charge station directly to the drive motor battery. A unique cord connects the vehicle to a DC fast charge station through the charge port.

In the event that a Spark EV is involved in an incident while the battery is charging in this manner, terminate the electrical power to the charge station.

Vehicles that are not equipped with this option will still feature the DC charger assembly as it is a electrical junction for high voltage components.
The variable-speed, electronically controlled, front wheel drive transmission is fully automatic. It consists primarily of 2 axles, 85 Kilowatt (kw) drive motor / generator, 1 planetary gear set, 1 differential gear set, and a high voltage auxiliary fluid pump.

The transmission’s electric motor / generator:
- propels the vehicle
- generates / recaptures energy
The Spark EV is an all Electric Vehicle (EV). Stored electrical energy is used to power a single 85Kw motor. The vehicle operates until the battery has reached a low state of charge. Once the stored electrical energy is depleted, the vehicle must be charged using an external power source.
There are two separate electrical systems in the vehicle: low voltage and high voltage. The low voltage system is similar to a conventional systems. The high voltage electrical system distributes 360 volts DC between the high voltage components and 3-phase AC to the transmission.

The high voltage cables are orange in color to easily identify the potential existence of high voltage. High voltage cables that are routed through non-orange conduit are identified with high voltage warning labels.
The two voltage levels in the Spark EV are:

- **Low voltage** – from 0 to 30 volts DC or 0 to 15 volts AC
- **High voltage** – any voltage greater than 60 volts DC or 30 volts AC

Color coding identifies the different levels. Orange identifies high voltage cables.
DC Voltage Classifications

Chevrolet Spark EV’s use high voltage, specifically 360 volts DC. Therefore, one MUST approach an emergency situation with caution. Keep in mind that the vehicle should isolate and contain the high voltage within the drive motor battery. However, a disable procedure must be performed before proceeding with any repair facility service work.
A series of high voltage labels enable quick identification of potential electrical hazards. The labels are attached onto each high voltage component.

The labels are color coded to indicate the potential high voltage state.

There is also a pictorial label that illustrates the removal of the high voltage Manual Service Disconnect (MSD).
The emergency / service personnel warning label is affixed to the right side of the power inverter module and provides specific disable procedures for emergency personnel.

The high voltage danger labels are red and indicate that high voltage is present at all times. These labels are located only on the high voltage battery.

The high voltage warning labels are orange and indicate a potential shock hazard if high voltage is not properly disabled. The labels are located on all high voltage components with the exception of the high voltage battery which utilizes the danger label.
The First Responder cable cut tag is wrapped around the low voltage power wires for the air bag module and the EV control module. It is located in the front right wheel house behind the right strut tower. Always cut the low voltage cables to ensure the high voltage contactors are open before performing any extrication work.
First responder cut tags help First Responders safely disable the vehicle in an emergency situation. The cable cut tag is yellow and wraps around the low voltage positive cable to indicate where emergency personnel must cut the cable.

**Important:** Cut through the cables on each side of the tag to remove a section of the cable to ensure they cannot reconnect inadvertently.
To disable the vehicle:

1. Turn OFF the ignition switch by pressing the button on the center console controls.

2. Cut the wire harness cable located in the front right wheel house, behind the strut tower at the yellow tape.

**Note:** After disabling 12 volt power, wait 1 minute to allow any un-deployed air bag reserve energy to dissipate.

**Important:** Cut through the harness on each side of the tag to remove a section of the cable. This ensures that they cannot reconnect inadvertently.
Disabling the High Voltage Battery

The Manual Service Disconnect (MSD) may also be removed to further ensure the high voltage system is disabled within the battery. The MSD physically interrupts the high voltage cables internal to the battery. A label illustrating the removal of the MSD is located underneath the rear seat cushion.

**Note:** There is high voltage in the battery even after the MSD is removed.
Cable - DO NOT CUT ZONES

The high voltage cables in the Chevrolet Spark EV are highly protected and should not interfere with any extraction procedures. However, always perform the disabling procedure prior to work to eliminate electrical current flow through the 12 volt system and disables the high voltage electrical system, external to the 360V battery. No further action is required.

DANGER: Do NOT cut the orange high voltage 360V cables. Cutting these cables can result in serious injury or death. No matter which disable method you perform, always assume the high voltage cables and components contain high voltage.
Do NOT cut the:

- Center tunnel area or the area under the rear seats - the 360V battery is installed in this area.
- Roof rails near the lift gate hinge - side curtain air bag inflators and lift gate hold open struts are located in this area.
- Front and rear seat backs on the outboard side - contains side air bags.
- The B pillar near the rocker - contains the seat belt pretensioner and the side impact sensor.
- The front door area near the upper hinge - additional side impact sensors are located there.

**WARNING:** Do NOT cut into the vehicle until the 12V electrical system has been disabled. Cutting into the vehicle prior to disconnecting and isolating the 12V electrical energy sources may cause air bag deployment resulting in serious injury.
The vehicle has been designed to protect the occupant(s) during a collision. The vehicle design begins with a strong, body-frame-integral structure. High-strength steel makes up more than 62 percent of the Spark EV’s underbody and 42 percent of its upper body. Adequate cutting tools will be required to penetrate the structure.

The Spark EV is equipped with 10 standard air bags, including both driver and passenger front knee air bags to reduce the risk of injuries to lower extremities in frontal crashes. Dual-stage frontal air bags, seat-mounted side air bags, and side curtain air bags that extend over the front and rear seating rows are also standard.

Additionally, crumple zones protect the occupant with front, side, and rear rails that are designed to crush in the event of a collision.
Whenever the air bags deploy, the contactors within the high voltage battery are commanded open. This interrupts the 360 volt electrical system and discontinues current flow through the high voltage cables.

Because the vehicle is equipped with dual-stage front air bags, the appearance of deployed air bags does not ensure that all stages of air bag deployment has occurred.

Therefore, disabling 12 volt power is essential for personal safety even if the air bags in the vehicle appear to have been deployed. After disabling 12 volt power, wait 1 minute to allow any un-deployed air bag reserve energy to dissipate.
Approaching a vehicle that is charging

To stop charging a vehicle, first attempt to unplug the charge cord at the vehicle. If access is unavailable, turn off the power to the charge station or cord set.

Fire

A battery on fire will not explode. If battery cells reach high enough temperature, they vent and release electrolyte. Battery electrolyte is flammable. Use copious amounts of water to cool the battery and extinguish the fire. Do not use an ABC dry chemical extinguisher because it will not extinguish a battery fire.

Water

The high voltage battery is sealed and isolated from the vehicle chassis. If the vehicle is immersed in water, you will not be electrocuted by touching the vehicle.

Locate and review the Lithium-Ion Battery Chemistry Material Safety Data Sheet for more information.
General Motors is committed to making your job as safe as possible.

We are confident the information contained in this guide will prove useful as you prepare to assist those involved in an emergency event.