

EVSR SAFETY AND FIRST RESPONDER INFORMATION GUIDE



EVSR High Voltage Safety and First Responder Information Guide is available at:
<http://evsr.net/> and may also be requested by calling 570-682-9666



EVSR is a program of Entropy LLC



EVSR SAFETY QUICK REFERENCE GUIDE

This Guide and the complete EVSR High Voltage Safety and First Responder Information Guide are available at: <http://evsr.net/> and may also be requested by calling 570-682-9666

- EVSR is a race car which carries no liquid fuel and has higher battery current and voltage than a conventional gasoline-only powered car.
- EVSR can be treated much in the same way as any other race car by corner workers. Just as you would not touch a hot engine or exhaust- do not touch any of the large orange wires or components they attach to on the EVSR. Avoid contact with the orange box in the rear of the car as this contains all the high voltage switching mechanisms.
- The high voltage battery packs sit to the left and right of the driver at the outside center of the car and should never require the attention of a worker. In the event of a severe crash in which the containment structure may be compromised, avoid contact with the cells within.
- EVSR does carry a small amount of conventional coolant for the computers which never reaches boiling temperatures as well as cold distilled water for the motor cooling. The rear mounted differential contains gear oil, and the brake system uses conventional brake fluid.
- EVSR is equipped with a Low Voltage Master Kill Switch which under normal circumstances will kill both the LV (12v) systems and will turn off the High Voltage (HV) systems through a relay that will be disconnected. LV power is indicated by the green lights on either side of the main hoop. **TURN THIS MASTER KILL SWITCH OFF BEFORE ASSISTING DRIVER, MOVING CAR, ETC.**
- If you cannot reach the Master Kill Switch, turning off the red capped power switch on the instrument panel will also shut down the power in the EVSR.
- There is also a HV master kill switch just below the LV Master Kill Switch that is used as a service disconnect for the main battery pack. In the event of a crash or serious incident this switch should also be turned off by turning counter-clockwise or by pulling the driver pull in the cockpit to the right of the dashboard.
- In the event of a serious collision that impacts and shorts the high voltage system (HV), there is a master fuse which will quickly blow and shut the high voltage power off. The LV (12v) power is also fused.
- In the event of a fire, there is no increased hazard as compared to a gas powered car and the priority is to turn off the master switch and extract the driver. Standard extinguishers are safe to use on the car as well as water. These may be introduced directly onto the batteries by placing the water or extinguisher into the NACA ducts on the top of the bodywork on both sides of the driver's compartment.
- EVSR may be towed by the roll bar. Additionally, EVSR has tow/tie-down hooks on the front suspension, just inboard of the wheels on the lower control arm, and at the center in the rear of the chassis.
- Please refer to the EVSR First Responder Safety Manual for a complete comprehensive guide to safety with the EVSR. We advise all track workers to become familiar with this information as Electric Race Cars are here to stay.

EVSR SAFETY AND FIRST RESPONDER INFORMATION GUIDE:

This guide is designed to assist emergency responders and corner workers to effectively handle the fully electric EVSR in emergency situations. The information in this guide will allow you to respond to an EVSR in a safe manner. While the EVSR has a much lower risk of fire than a race vehicle equipped with an Internal Combustion Engine (ICE), there are some different risks associated with the use of high voltage, the Lithium Ferrous Phosphate Battery Pack (LiFePO₄), and the lack of noise from an EVSR. This guide will familiarize responders with these specific risks and required cautions. This guide only contains information specific to the EVSR Electric Vehicle Sport Racer, and should only be used for that vehicle. This guide may only be copied in its entirety with express written consent of Entropy LLC.

Covers:

- *Safety Overview*
- *Low Voltage Battery and High Voltage Battery Pack*
- *High-Voltage Electrical Disconnect Features*
- *Other High-Voltage Electrical Components*
- *Fire Fighting Measures*
- *First Aid Measures*
- *Accidental Release Measures*
- *Links to Specific Training Resources*

Safety Overview:

The chassis, body, and mechanical systems of the EVSR are all conventional in nature, and do not need any special attention not required of ICE powered cars. There is no flammable fuel contained in the EVSR as it is a pure electric race vehicle, not a hybrid. The only fluids present are the brake fluid, differential gear oil, ethylene glycol coolant in a small quantity for computer cooling, and distilled water/windshield washer solution for motor cooling.

The EVSR is very quiet in operation, and may not be heard by track workers if it is approaching. Use caution when entering a hot track when EVSRs are present.

Other distinguishing safety features of the EVSR include the use of Aircraft type Lithium Ferrous Phosphate (LiFePO₄) High Voltage Batteries, which have a very small fire hazard when punctured, as opposed to the more commonly used Lithium-Ion type. The battery MSDS is on evsr.net. Also, the EVSR Power System nominal voltage is under 200v, not the 400v commonly in use on most road going Hybrid and Electric Vehicles.



The EVSR Power System is a “Floating” System which means the High Voltage (HV) circuit grounds are separate from the Low Voltage (LV) circuit grounds. The Computerized Controller System (CCS) measures the HV system’s “Isolation” from HV Circuits to Chassis Ground. Faults will be displayed in the Driver Instrument System (DIS) / Cluster. An electric shock may occur if the HV circuit ground is shared with the LV circuit ground.

Do not touch or open the Pelican Case that contains HV connections, or the charge leads that are mounted on top of the case, located under the tail section.



WARNING: DO NOT cut into the vehicle until the LV (12v) and HV electrical systems have been deactivated. Cutting into the vehicle prior to disconnecting and isolating the 12v and HV electrical energy sources may cause electric shock resulting in serious injury.

There is a “Master Kill Switch” that is located on right side of the vehicle’s roll bar structure, accompanied by a pair of green LED power indicator lights. Pushing this switch in will shut off the LV (12v) power, which in turn prevents the HV system from being powered under normal operating conditions. There are a pair of green LED power indicators on each side of the upper roll structure.

Always push this switch off and be sure that the green light has gone out before attempting to enter or move the vehicle.



Low Voltage Battery:

EVSR carries a small LV (12v) battery to power accessories and processors. This battery location varies depending on the car. It may be an Absorbent Glass-Mat (AGM) battery or a small 12v lithium battery. Depressing the LV Master Kill Switch, detailed above, or turning off the red capped switch on the dashboard are both equal options for disabling the electronics throughout the entire car.

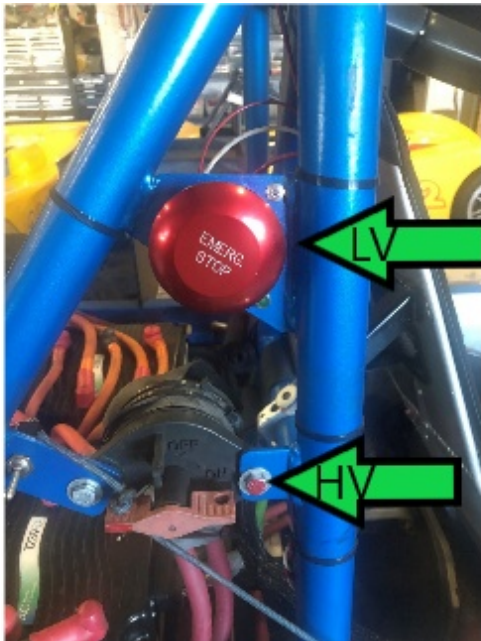
High Voltage Battery Packs:

There are **two** High Voltage Lithium Ferrous Phosphate (LiFePO₄) Battery packs located on each side of the EVSR, connected in series. These batteries are made up of individual sealed cells connected by metal buss bars. Orange colored heavy gauge wires carry the high voltage current throughout the EVSR. The **HV Battery Disconnect Switch** is located on the right side of the car, next to the LV(12v) Emergency Shut-Off. This will interrupt the circuit for the HV system, preventing any current flow through the pack.

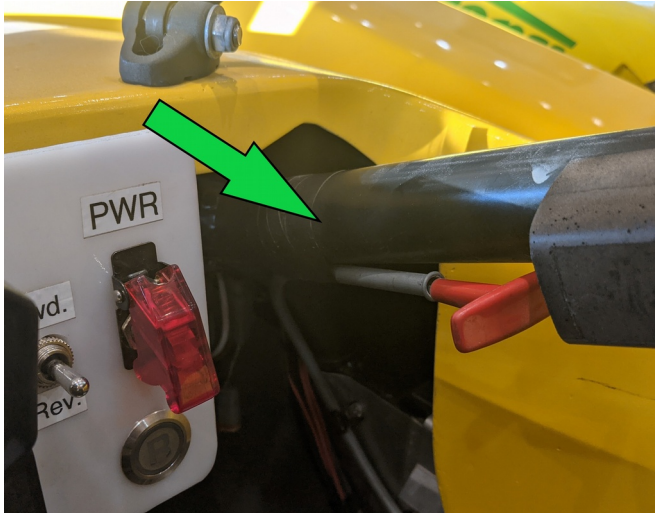
There is a main HV system fuse that is located inside the orange contactor box under the bodywork at the rear of the car. This fuse will blow and disconnect the HV Battery Pack from the EVSR if any short circuit occurs in the High Voltage EVSR System.



Whenever workers respond to an incident involving an EVSR, the first course of action is to de-power the vehicle by pushing in the LV Master Kill Switch located on the right side, on the main roll bar and labeled “Emergency Stop”, followed by turning off the HV disconnect located directly below the LV kill switch, labeled “Battery Switch.”



This switch may also be turned off by pulling the loop or T handle to Drivers Right of the instrument panel.



Other High-Voltage Electrical Components:

There are many orange colored heavy gauge wires that carry high voltage current throughout the EVSR System. Most of these are not live unless the car is switched on and the throttle is being applied. There are exceptions to this, so **always** treat the HV System as if it were live!

Fire Fighting Measures:

For vehicle fires, and in particular fires involving electric drive vehicles, a key question for emergency responders is: “what is different with electric drive vehicles and what tactical adjustments are required?” The Fire Protection Research Foundation states the following:

The use of water or other standard agents does not present an electrical hazard to firefighting personnel.

Extinguishing Media:

- Copious amounts of cold water or water-based foam may be used to cool burning cells or batteries. Do not use warm or hot water. This may be introduced into the NACA ducts on top of the body on both sides of the driver's compartment, directly onto the batteries.



- A carbon dioxide (CO2) extinguisher is also effective.

- For fires involving exposed, raw lithium metal (characterized by deep red flames), use only metal (Class D) fire extinguishers. Due to the chemistry of the batteries EVSR uses, this scenario is highly unlikely.

Special Fire Fighting Procedures:

- Use a positive pressure self-contained breathing apparatus (SCBA) if cells or batteries are involved in a fire.
- Full fire fighting protective clothing is necessary.
- During water application, caution is advised as burning pieces of flammable particles may be ejected from the fire.

Unusual Fire and Explosion Hazard:

- Cells or batteries that are damaged, opened or exposed to excessive heat/fire may flame or leak potentially hazardous organic vapors.

First Aid Measures:

Inhalation:

- Avoid inhaling any vented gases. Remove to fresh air immediately.
- If breathing is difficult, seek emergency medical attention.

Ingestion:

- Consult a physician or local poison control center immediately
- Exposure to materials from a ruptured or otherwise damaged cell or battery may cause skin irritation.
- Flush immediately with water and wash affected area with soap and water.

Eye Contact:

- Exposure to materials from a ruptured or otherwise damaged cell or battery may cause eye irritation.

Flush immediately with copious amounts of water for at least 15 minutes; consult a physician immediately.

Accidental Release Measures:

- In the event a cell or battery is crushed; releasing its contents, rubber gloves must be used to handle all battery components.
- Avoid inhalation of any vapors that may be emitted.
- **Damaged batteries that are not hot or burning should be placed in a sealed plastic bag or container.**

Links to Specific Training Resources:

The MSDS for CALB Batteries can be read [HERE](#)

EV Safety and Training: Other helpful links for first responders and information about EV safety and training:

[Emergency Responder Training for Advanced Electric Drive Vehicles PART ONE](#)

[Emergency Responder Training for Advanced Electric Drive Vehicles PART TWO](#)

[Emergency Responder Training for Advanced Electric Drive Vehicles PART THREE](#)

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