FUV

EMERGENCY RESPONSE GUIDE

ARCIMOTO

Prepared for Fire Service, Law Enforcement, Emergency Medical, and Professional Towing Personnel

In the event of an emergency response situation involving an FUV, immediately contact Arcimoto 24/7 Product Support at (541) 780-0032.

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Overview

This Emergency Response Guide (ERG) is provided by Arcimoto to assist emergency response professionals in safely responding to incidents involving the FUV electric vehicle.

About This Guide

The information in this guide is separated into two sections:

- **On-Site Emergency Response Procedures**
- **Post-Crash Safety Procedures**

The FUV is an all-electric vehicle with a high voltage (HV) electrical system.

The FUV uses high voltage electric motors, energized by two high voltage battery modules. There is no internal combustion engine or fuel tank.

While the FUV's high voltage system, under most crash situations, is likely to be protected and maintain electrical isolation from the rest of the vehicle, a rare but possible severe crash may compromise some of the safety features of the high voltage system. Due care needs to be taken when working around the electrified propulsion systems, components, or charging systems, regardless of their condition.

Safety features on the FUV help to provide safe access to the vehicle under various conditions. However, when approaching a high-voltage vehicle in a fire, rescue or recovery situation, always follow one industry standard rule:

In a crash recovery situation, always assume that the high-voltage system is powered up!

DANGER

NEVER cut high voltage components or cabling. Cutting could result in serious injury or death.

DANGER

High voltage cables and components may remain energized for up to 2 minutes after disabling.

On-Site Emergency Response Procedures

Overview

Some precautions to be taken in any high voltage situation include:

- Remove all jewelry (watches, necklaces and earrings). Metal objects are conductors of electricity.
- Wear the necessary PPEs (high-voltage rubber gloves, face shield, insulated boots, protective raincoat or apron).
- Bring the following equipment:

  Class ABC powder-type fire extinguisher

  A non-conductive object – about 5 feet (1.5 m) long – used to safely push someone away from the vehicle if they accidentally come in contact with high voltage.

Danger Assessment at Scene of the Incident

In order to assess potential hazards at the scene of the incident, follow these inspection procedures before approaching a damaged FUV:

Check for Signs of Fire	Inspect the FUV for signs of fire including flames, smoke, arcing, or hot spots. Use a thermal camera or IR temperature probe to identify hot spots. Check for evidence of past fire events that had occurred around the battery system. These signs include smoke residue or heat damage around the battery system (for example melted plastic or rubber trim). Also a burnt odor emanating from the battery system may indicate internal fire damage to the battery system. If signs of fire or fire damage are noted, then the local fire department should be notified immediately and the area around the vehicle should be cleared.
Check for Signs of an Unstable HV Battery System	Gurgling, bubbling, crackling, hissing or popping noises emanating from the FUV's Battery Bay can be indicative of cells venting from an overheated condition, or arcing within the high voltage system. If these types of sounds are heard, then the local fire department should be notified immediately and the area around the vehicle should be cleared.

Check for External Battery Leaks	Note that the smell of "bubblegum" is an indication of leaking electrolyte from the Battery Modules. If electrolyte leakage is detected, treat the FUV as a chemical hazard. If it is determined that the battery system is the source of a leaked liquid, or if the source is not determinable, contact Arcimoto at **(541) 780-0032** for Safety Data Sheets for the battery electrolyte. Safety data sheets should be referenced for proper PPE and disposal instructions.
Check for Damage to the HV System	Examine the Battery Bay for ruptures, cracks, punctures, dents, or broken pieces separated from the battery system. Look for evidence of arcing, such as carbon traces. These indicate that isolation of the high voltage system has been lost at some point. Also, look for damage to orange (HV) cables, including pinched or lacerated cables. If loss of mechanical integrity is identified, further vehicle and battery diagnostic steps may be required. Contact Arcimoto at **(541) 780-0032** for assistance.

***NOTE**: A second inspection process is recommended once the vehicle has been delivered to a repair shop or storage facility where time and resources are more readily available.*

If Fire is Present or Suspected

Use copious amounts of water to extinguish and cool down any battery fire. It can take approximately 3,000 gallons of water, applied directly to the battery, to fully extinguish and cool down a battery fire. Always establish or request an additional water supply.

Battery fires can take up to 24 hours to extinguish. Consider allowing the battery to burn while protecting exposures.

After all fire and smoke has visibly subsided, a thermal imaging camera should be used to actively measure the temperature of the high voltage battery and monitor the trend of heating or cooling. There must not be fire, smoke, or heating present in the high voltage battery for at least one hour before the vehicle can be released to second responders (such as law enforcement, vehicle transporters, etc.).

The battery modules must be completely cooled before releasing the vehicle to second responders or otherwise leaving the incident.

Advise second responders that there is a risk of battery re-ignition.

Due to potential re-ignition, an FUV that has been involved in a submersion, fire, or a collision that has compromised the high voltage battery should be stored in an open area at least 50 ft (15 m) from any exposure.

Turning the FUV Off

If the lights, display and/or control panel on the FUV are illuminated, then the FUV is powered on. Even if these tell-tale signs are not present, assume that the vehicle is powered on.

In an emergency situation, the FUV should first be powered Off. There are several ways to do this.

Note that these methods do not disable the HV electrical system. Refer to Disabling the HV Power System section on page 9 for instructions on disabling the HV electrical system.

1) Remove the Key from the Ignition

Turn the Key switch to the OFF position and remove the Key.

2) Start/Stop Button (Left Grip)

Press and hold the Start/Stop button on the left grip control for 3 seconds to turn the FUV off.

3) Emergency Off Switch (Right Grip)

The red Emergency Off switch on the right grip provides a method of shutting off the motors.

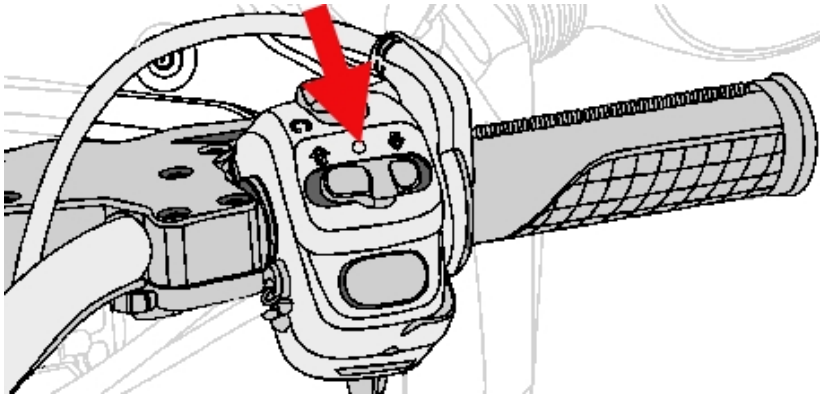
Note that when this switch is in the Off position, the motors are off, but all electronic functions are available (see page 5). Switch the Emergency Off switch to the OFF position.

Securing the FUV

Switch the Direction Setting to Neutral

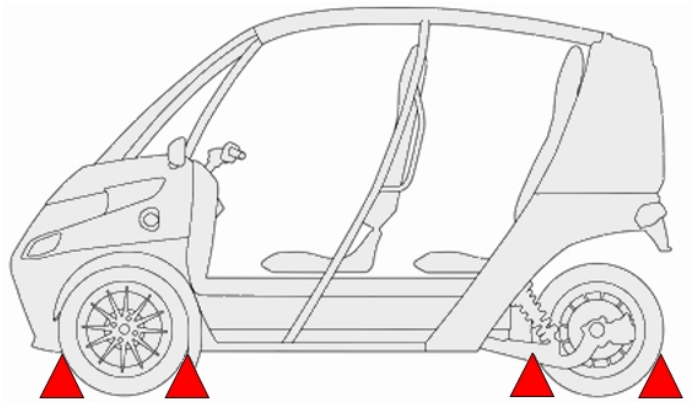
The FUV moves silently, so never assume it is powered off. Twisting the throttle even slightly can cause the FUV to accelerate quickly if the Direction Switch is set to either Forward or Reverse.

On the right grip control, place the Direction Setting switch into the **Neutral** (center) position - , indicated by a dot **(•)**.



Chock all Wheels

Never assume that the FUV will not move. Always chock all three of the wheels, both front and back.



Disabling the HV Power System

***NOTE**: In the event of a collision or severe jarring of the FUV, an inertia switch opens and automatically disables the high-voltage (HV) System. Additionally, the Battery Management System (BMS) and Vehicle Control Unit (VCU) will disable the high voltage system if it detects a potentially dangerous condition.*

However, when approaching a damaged FUV, always assume that the HV System is active.

1) Turn the FUV Off:

Switch the FUV Key Switch to the OFF position and remove the Key. This will disconnect the HV system, as long as the shutdown circuits are not damaged.

2) Disable the HV System:

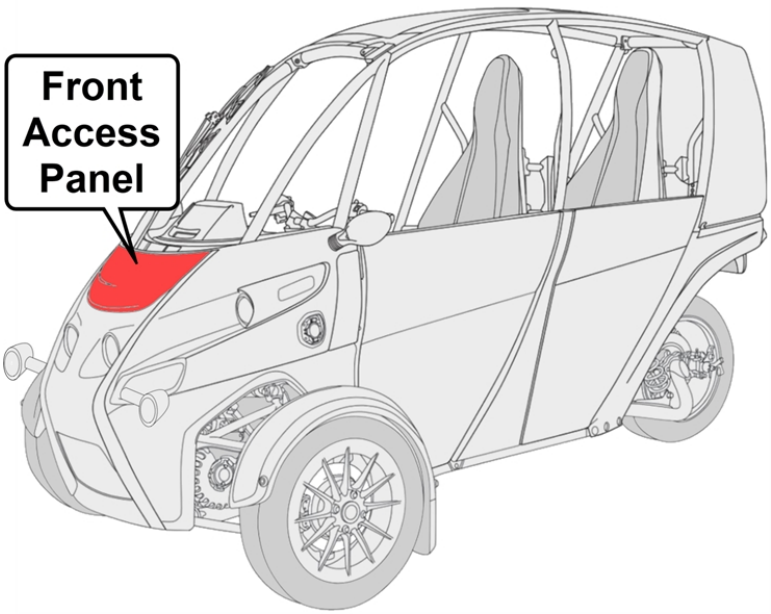
There are three methods of manually disabling the HV system in the FUV:

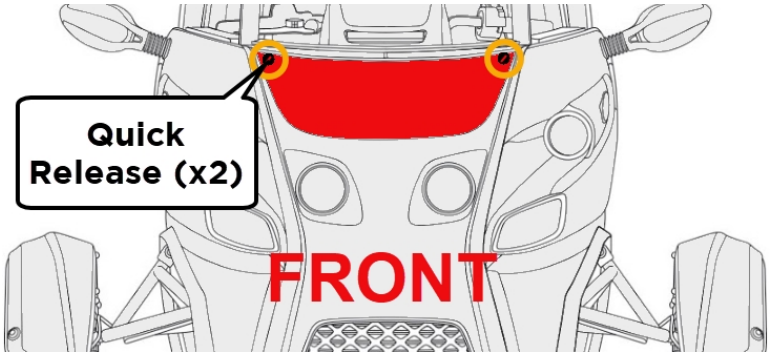
METHOD 1: Cut the Emergency Cut Loop

The FUV features an **Emergency Cut Loop**, located directly behind the Front Access Panel.

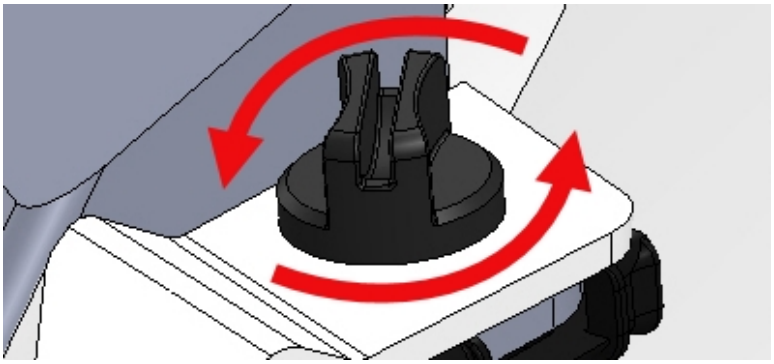
***NOTE**: Cutting the Emergency Cut Loop disables the HV system, but not the 12V system.*

a) Remove the Front Access Panel





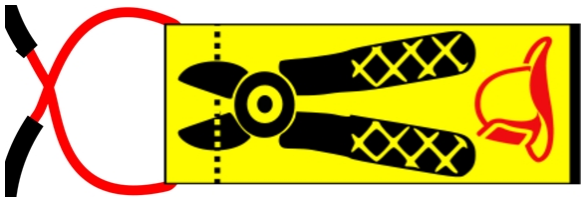
Twist both Quick Release thumbscrews counter-clockwise to release the panel.



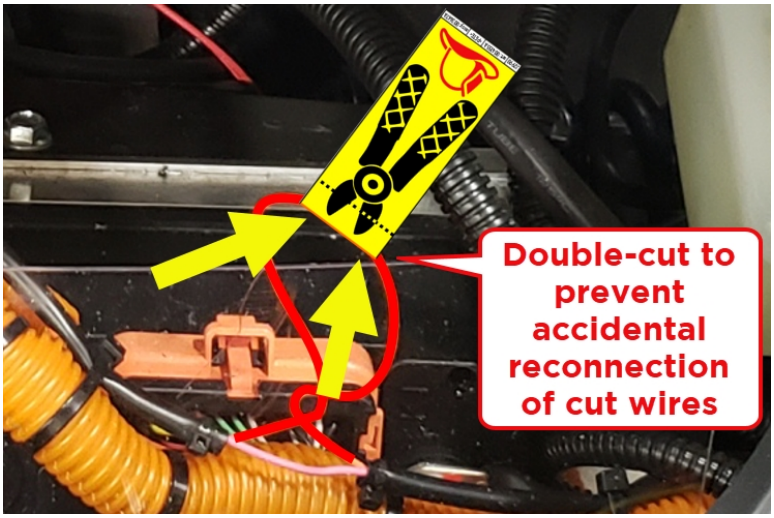
Once released, remove the **Front Access Panel**..

b) Cut the Emergency Cut Loop

The **Emergency Cut Loop** is labeled with a yellow tag that is highly visible once the Front Access Panel has been removed. It consists of a red 12V wire that can be safely cut with standard diagonal-cut wire cutters:



Note that the Emergency Cut Loop tag extends through a slot in the clear plastic safety screen. The safety screen provides protection from electrical components and cables in the bulkhead.



NOTE: *Do not reach behind the safety screen. and avoid touching or using metallic tools on or around electrical components and cables.*

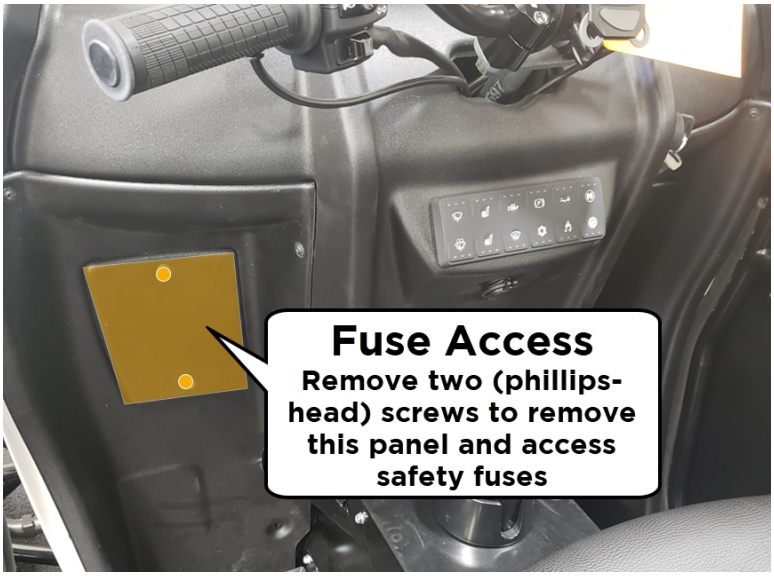
Double cut the red wire loop to remove an entire section of wire. This method reduces the risk of the cut wires accidentally reconnecting.

METHOD 2: Pull the Safety Fuses

Four **40A safety fuses** are located behind an access panel on the lower left side of the dashboard. Removal of these fuses disables the high-voltage system, and the 12V system.

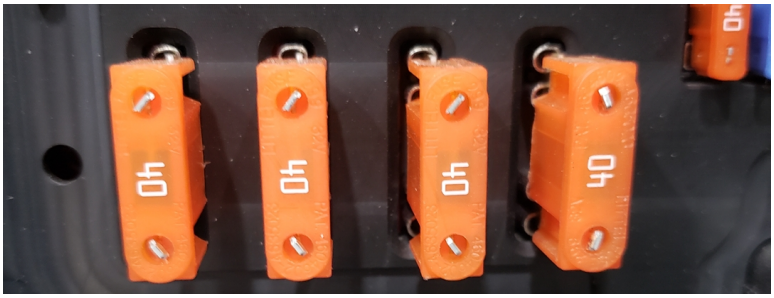
a) Remove the Fuse Access Panel

Remove the two phillips-head screws that secure the fuse access panel:



b) Remove the 40A Safety Fuses

Pull out the four 40A orange Safety Fuses:



These fuses can be safely removed without using any special tools.

METHOD 3: Flip the 12V Circuit Breaker to OFF Position

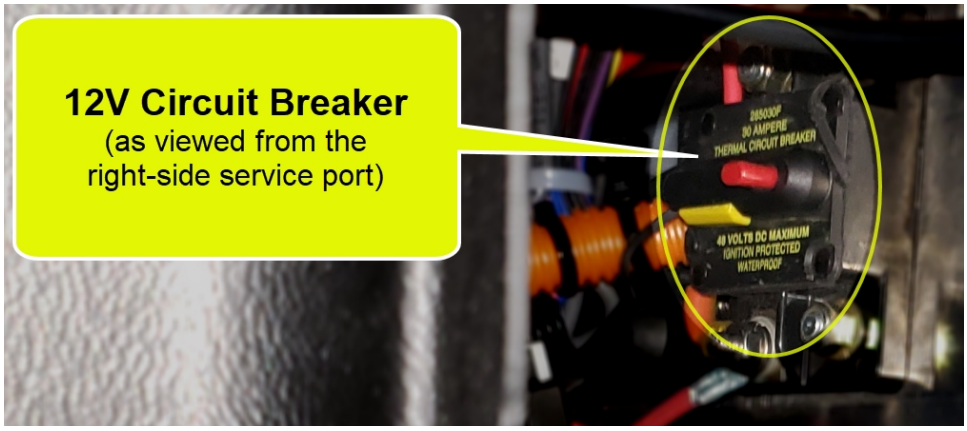
1) Remove Both Service Port Panels

There are two service port panels located inside the FUV, on either side of the Control Panel. Each panel is secured with two Philips-head screws:

With these panels removed, you have access to the left and right side service ports.

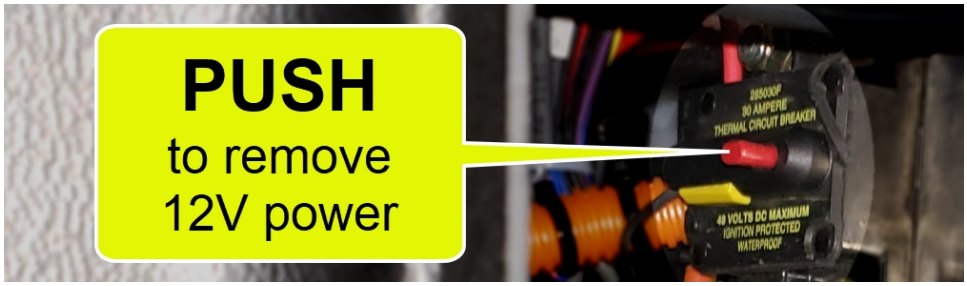
2) Access the 12V Circuit Breaker

Look into the **right-side service port** to locate the 12V Circuit Breaker. It is a black box with a red button and a yellow lever, right behind the steering column:



3) Push the Red Button on the 12V Circuit Breaker

Push the red button on the 12V Circuit Breaker to remove 12V power:

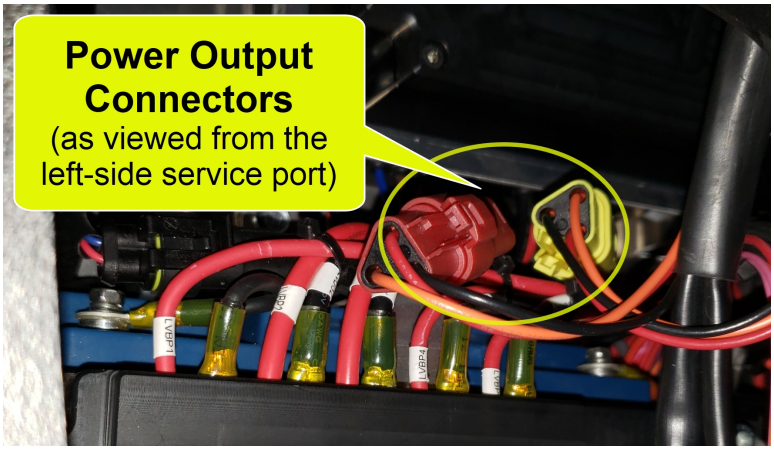


Note that when the red button is pressed, the yellow RESET lever flips down to the OFF position:

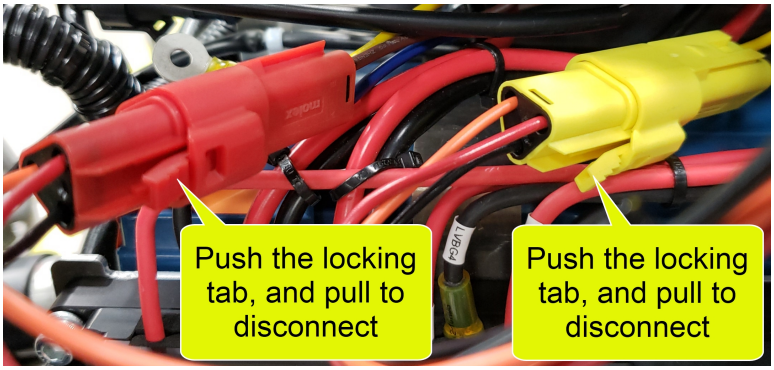
4) Unplug the Power Output Connectors

Look into the **left-sideservice port** to locate the RED and YELLOW Power Output Connectors.

These 3-wire connectors are side by side, to the left of the steering column:



Press the locking tab down, and gently pull to unplug each connector.



DANGER

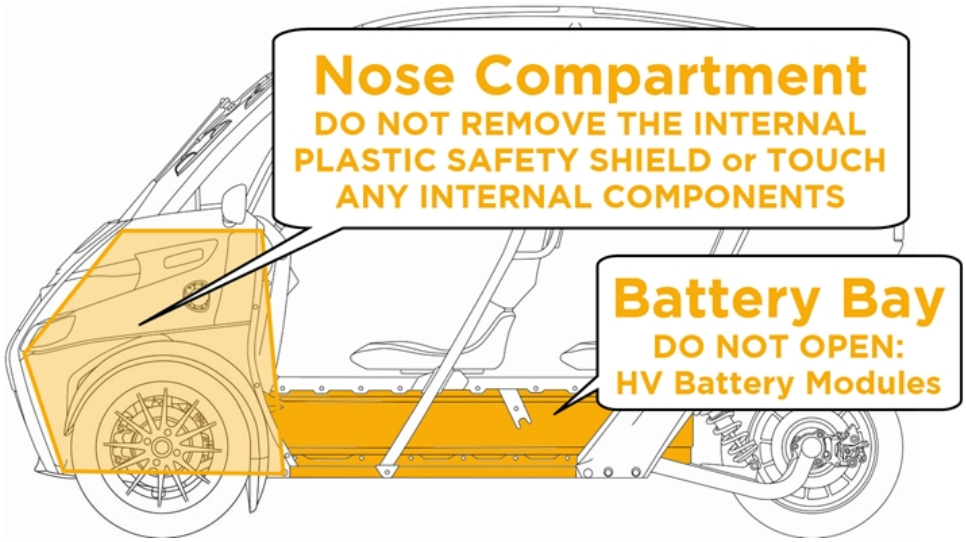
After deactivation, the high voltage circuit requires 2 minutes to de-energize.

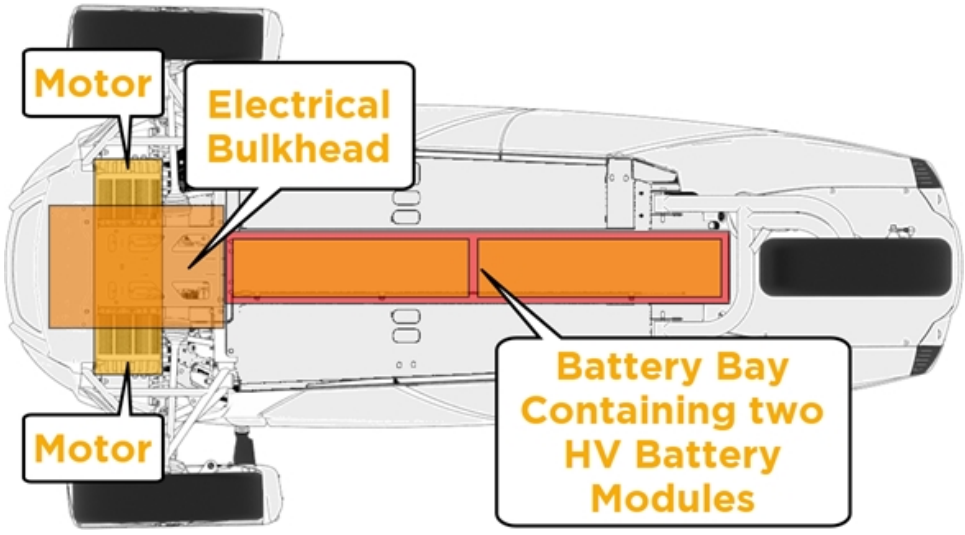
Cutting, crushing, or touching high voltage components can result in serious injury or death.

High Voltage Components

Several high-voltage cables and components are located in the Nose Compartment of the vehicle.

Two high-voltage Battery Modules and HV cabling are housed within the Battery Bay, which runs along the bottom center line of the vehicle (below the seats).



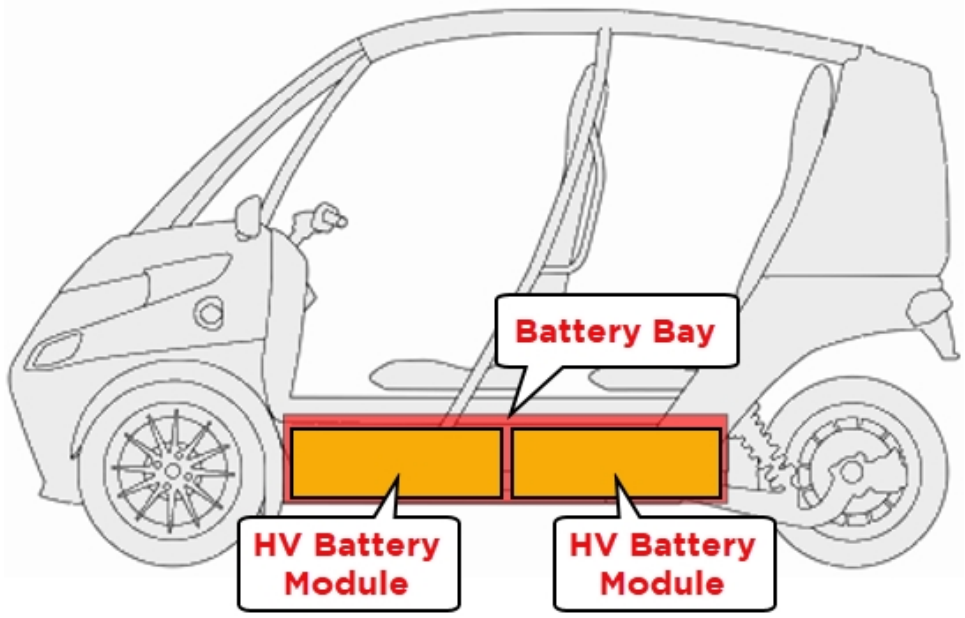


High-voltage cables in the FUV are color-coded orange. All orange cables in the FUV should be considered to be high-voltage cables.

Even after the high-voltage system in the FUV has been manually disabled, all responders should avoid touching or using metallic tools on or around HV components and cables.

HV Battery Modules

The FUV is equipped with two floor-mounted high voltage battery modules, contained within the Battery Bay. The Battery Bay is a sealed enclosure that runs along the bottom center line of the vehicle, below the seats:



Each Battery Module is enclosed in a sealed case and bolted to the floor of the Battery Bay. These Battery Module are designed to be water and impact resistant.

Under normal circumstances, the Battery Modules should present no hazard. However, the contents of the Battery Modules are flammable and can burn if the Battery Module case is broken open, giving off gases that can cause irritation if inhaled.

When approaching an FUV that has been in a crash, inspect the Battery Bay for structural damage including punctures and sheared or deformed metal. If electrolyte leakage is detected, treat the FUV as a chemical hazard.

- Never cut into the Battery Bay.
- Never open the Battery Bay.

Post-Crash Safety Procedures

Overview

An FUV with a damaged high voltage system may pose hazards during transit or during storage. These hazards may include loss of electrical isolation, exposure to potentially toxic materials and/or vapors, and potential vehicle / battery fires.

Because of these potential hazards, the FUV should remain isolated until after it has been inspected by a trained Arcimoto technician. The tow operator should make arrangements to tow the vehicle directly to a suitable off-site location where the vehicle can be isolated.

- Ensure that the damaged FUV is kept in an open area instead of inside a garage or other enclosed building.
- The damaged FUV should be separated from all combustibles and structures by a distance of not less than 50 feet (15.2 meters) from all sides of the vehicle/battery system.
- Rather than attempt to discharge a HV battery, an emergency responder, tow truck operator, or storage facility manager should contact Arcimoto Product Support at **(541) 780-0032**.

Tow Requirements

FUV's may only be transported on a flat bed. Never tow the FUV with any of the wheels touching the ground.

DANGER

When towing an FUV it is important to ensure the electric motors are not rotating during tow.

The FUV's electric motors are mechanically connected to the vehicle wheels. Even when the vehicle is not turned on, if the wheels are moving, then voltage could be generated. The voltage level generated will correspond to the speed of the motor which is connected to the wheels. The generated voltage may exceed the component ratings in the high voltage system, potentially allowing arcing to occur. Furthermore, if high voltage components are damaged, arcing may occur below the system rating.

For this reason, it is required that any damaged FUV is transported on a flat bed to avoid this potential.

If the FUV is required to be recovered where the wheels must turn prior to loading on the tow truck (for example, if the vehicle is 100 yards off the road), the speed of the FUV should be kept to less than 5 mph to prevent excessive voltage generation in the high voltage system.

When loading or recovering an FUV, tow operators should avoid direct contact with the battery or battery assembly. The vehicle should not be lifted or supported by the battery system - refer to .the **Post-Crash Safety Procedures section on the previous page**

Emergency Towing

The FUV can be towed on a flat-bed trailer under the following conditions:

- The FUV is facing forward for towing in a forward direction.
- Place the Direction Switch in Neutral (•). See page 1.
- Maximum speed is 35 mph (56 km/h).
- Maximum distance is 50 mi (80 km).

CAUTION

Incorrectly towing a disabled vehicle may cause damage. The damage would not be covered by the vehicle warranty. Do not lash or hook to suspension components. Use the proper straps around the tires to secure the FUV. Do not drag a locked wheel/tire while loading the FUV. Do not use a sling type lift to tow the FUV. This could damage the vehicle.

WARNING

Because of the single rear wheel on the FUV, it cannot be towed by a conventional tow truck. Never tow the FUV on its wheels behind another vehicle.

CAUTION

Towing the FUV from the rear, with the front wheels on the ground, will damage the drive unit. Do not tow the vehicle from the rear with the front wheels on the ground.

CAUTION

Front or rear wheel lifts must not be used (if the remaining wheels are on the ground). Internal damage to the vehicle will occur if a front or rear wheel lift is used when towing.

CAUTION

Do not use sling type equipment when towing. Damage may occur. When securing the FUV to a flat bed truck, do not attach to front or rear suspension components. Damage to the vehicle may result from improper towing.

Storage Requirements for a Damaged FUV

FUVs that have sustained damage to the high voltage system should not be stored inside a structure until inspected.

Second responders should contact Arcimoto to seek further guidance to ensure the battery system is at a safe energy level. The FUV should remain in isolation until it is determined that the battery system is at a safe energy level where the vehicle is unlikely to pose a greater than normal risk.

Isolation Guidelines

Open Perimeter Isolation

An area where the FUV is separated from all combustibles and structures by a distance of not less than 50 feet (15.2 meters) from all sides of the vehicle (see DOT HS 811 574, 'Interim Guidance for Electric and Hybrid Electric Vehicles Equipped with High Voltage Batteries').

Barrier Isolation

An area where the FUV is separated from all combustibles and structures by a barrier constructed of earth, steel, concrete, or solid masonry designed to contain a fire from a stored FUV from extending to adjacent vehicles.

Barriers should be of sufficient height to direct any flame or heat away from the adjacent vehicles. If the barrier is provided only on 3 of the 4 sides of the FUV, then the open side must maintain the separation distance as referenced above for the open perimeter isolation.

It is not recommended to fully enclose the FUV in a structure due to the risk of a post-incident fire extending to the structure and the possibility of trapped explosive or harmful gasses, therefore a roof is not recommended for the barrier construction.

If the battery system is ruptured, vehicle exposure to elements such as rain should be avoided.

Mark the FUV as an Electric Vehicle

Use a placard or some other identifier to mark the damaged FUV as a high voltage vehicle with suspected damage - both during and after isolation. This is to ensure persons are aware of the presence of a high voltage system and do not access the vehicle without proper training and PPE.

Copies of this ERG are available for reference or downloading at https://www.arcimoto.com.

NOTE: *A summary of this ERG is provided as a* ***Quick Reference Sheet (QRS)****, also available to download from https://www.arcimoto.com.*

www.arcimoto.com

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