

# KIA EMERGENCY RESPONSE GUIDE

soul ev



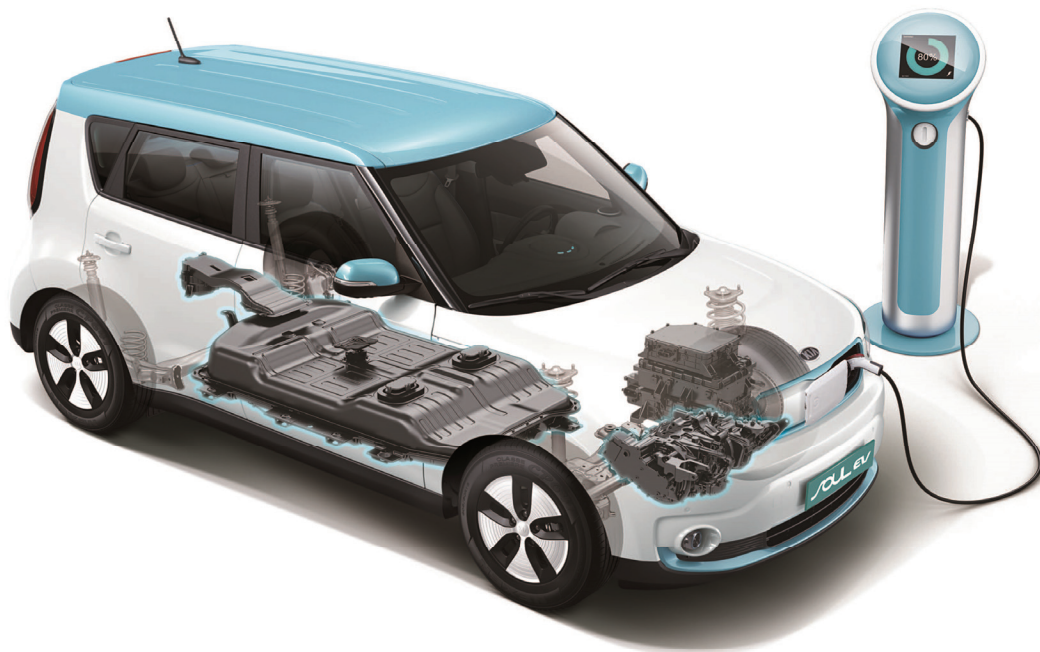
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## DOCUMENT PURPOSE

The purpose of this document is to familiarize first responders and the towing/roadside assistance industry with the proper methods to handle the Soul Electric Vehicle in an emergency situation. This guide gives a basic overview of key vehicle systems and instructions for dealing with the different types of emergencies encountered by first responders. The emergency response procedures for this vehicle will be somewhat similar to a conventional Soul, with additional information provided on dealing with the high voltage electrical system.

## VEHICLE DESCRIPTION

As with other electric vehicles, the Kia Soul EV uses a high voltage battery and an electric motor to propel the vehicle without any gasoline fuel while the conventional vehicle uses the standard combustion engine. The Kia Soul is an eco friendly vehicle which does not produce any exhaust emissions.



## GENERAL VEHICLE DESCRIPTION

The Kia Soul Electric Vehicle is built on the conventional Soul chassis and therefore the vehicle looks very similar to its conventional counterpart with a few notable exceptions. The safest method is to assume that any Soul you respond to is an Electric Vehicle until proven otherwise. Using the information provided in this section, responders will be able to differentiate between the two.

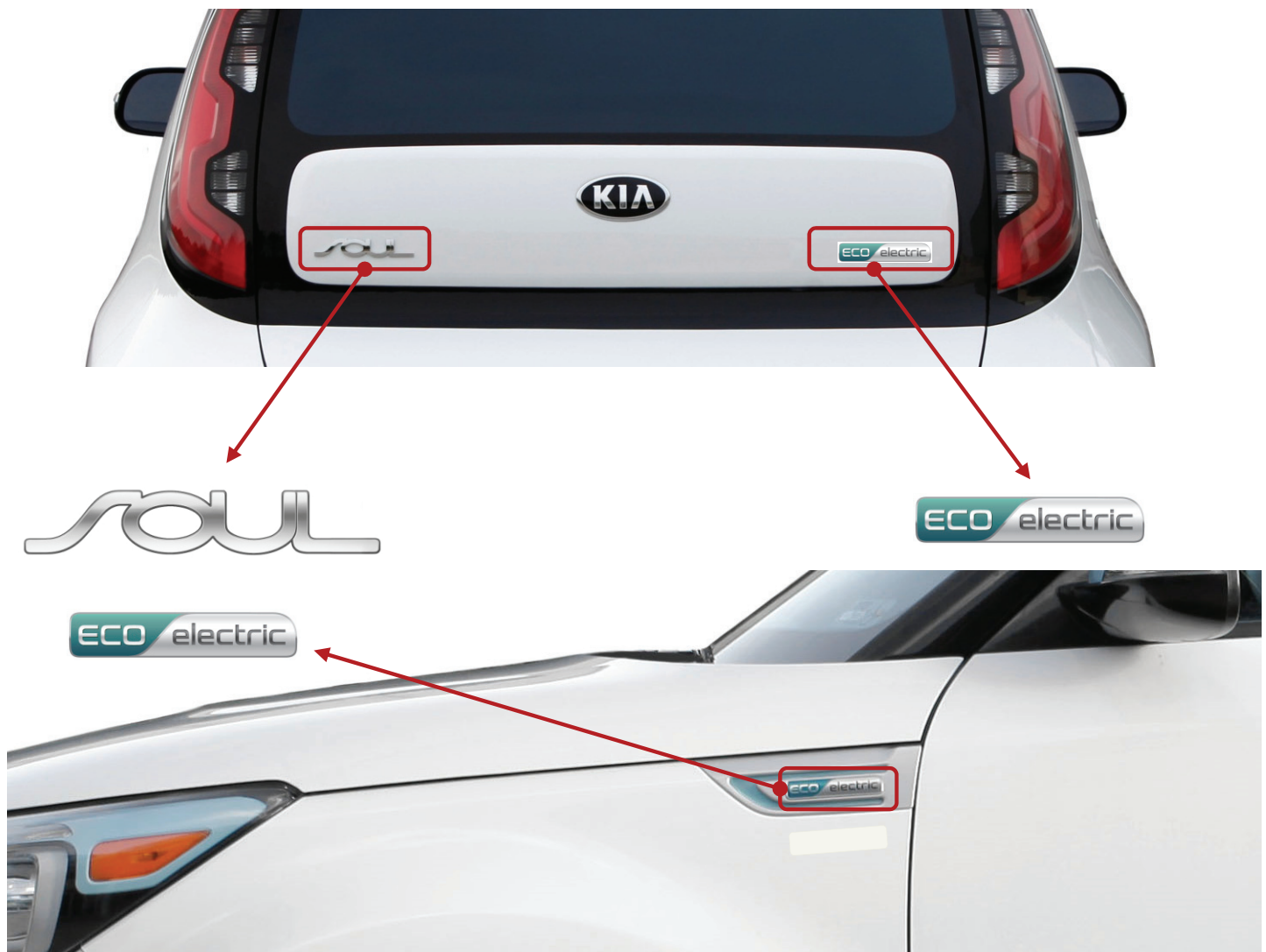
## IDENTIFYING A KIA SOUL ELECTRIC VEHICLE

### Eco Electric badge on Trunk and side of Vehicle

The Kia Soul Electric Vehicle can be easily identified by the Eco Electric badge located on the trunk lid and both sides of the vehicle, beside the passenger-side brake light.

### **DANGER** Electrocutation Risk

Badging can become hidden after a crash due to damage to the vehicle. Always be sure to utilize additional methods of identification before determining there is no badge present.



## VIN Number

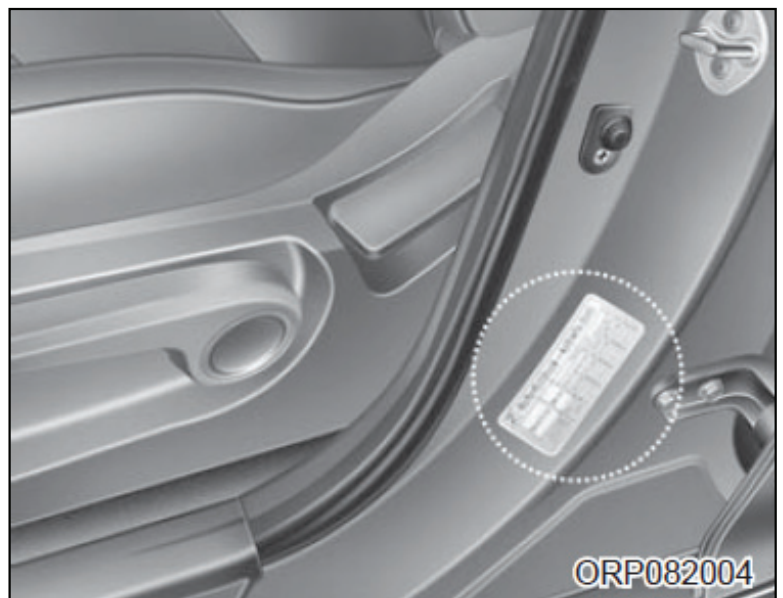
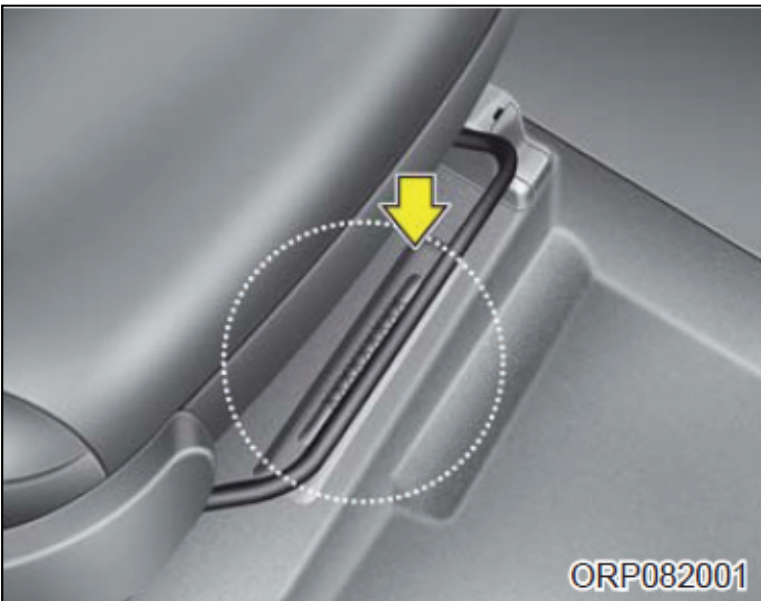
The VIN (Vehicle Identification Number) identifies the Electric Vehicle with a “E” displayed in the 6th position, as shown in the below drawing.

The VIN can be found:

- 1) Underneath the front passenger seat,
- 2) On the vehicle certification label attached to the driver’s side center pillar.
- 3) In a window on the drivers side windshield lower corner.

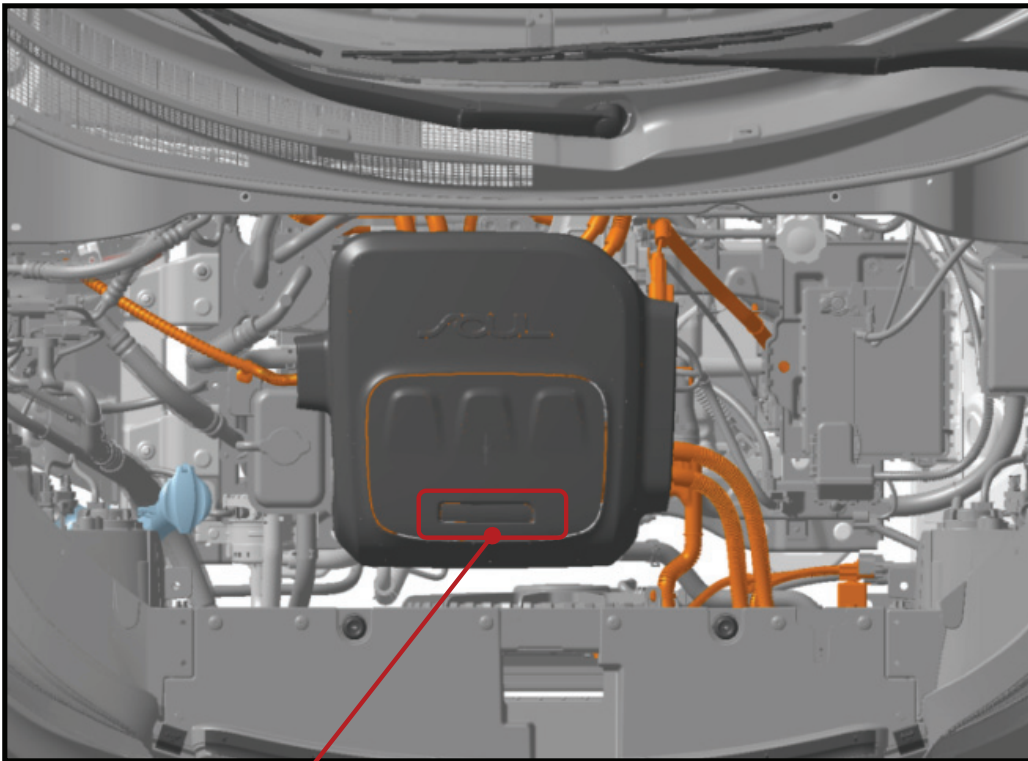
XXXXX **E**XXXXXXXXXX

6th position



## ELECTRIC MOTOR ROOM

A "Eco Electric" badge is also displayed under the hood on the high voltage junction box cover. Also, the High Voltage cabling is orange per SAE standard. Cables run from the bottom of the vehicle where they connect the High Voltage Battery to the Electric Power Control Unit, Motor, Inverter, and other High Voltage components at the front of the vehicle. The presence of orange cables under the hood identifies the vehicle as an Electric Vehicle.

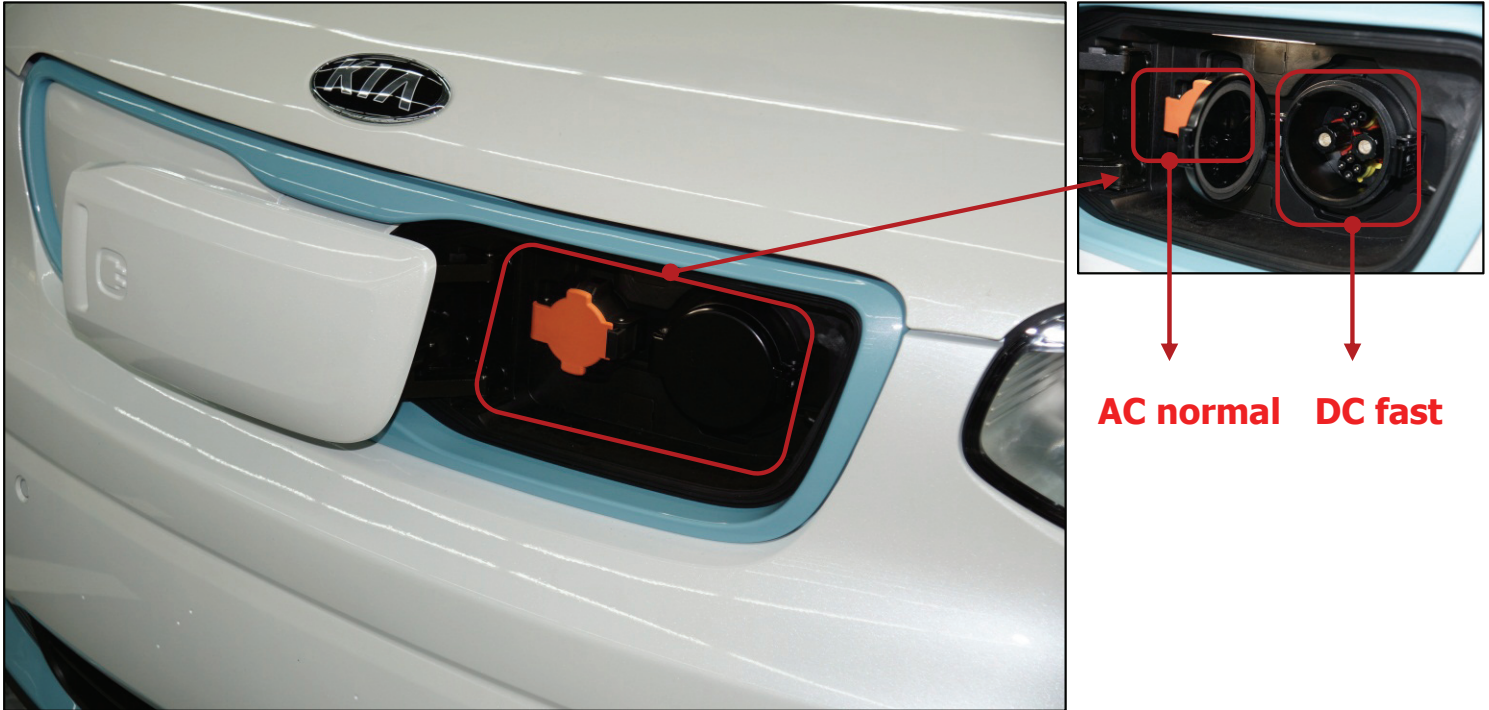


ECO electric



## CHARGING PORT

The Charging Port is located on the front radiator grill with a sliding door and it has two ports, one for AC normal charging and one for DC (CHAdEMO) fast charging.



**AC normal DC fast**

## How to open the charging port



The charging port is opened by pushing a button beside the steering wheel.



If the charging port can not be opened because of a discharged supplementary battery or disconnected electric cables, open hood and pull the Charging Door Release Emergency Handle.

## Electric Vehicle Cluster Instrument Panel

The Electric Vehicle Instrument Cluster Panel displays the electric vehicle specific features that identify the Soul as an electric vehicle. Also, an **"ECO electric"** symbol is located at the bottom of the left side of the Instrument Cluster Panel.



: The "Ready" Light indicates the vehicle is ready for driving



: The charging indicator displays the vehicle is in charging mode.



: The Power Down warning lamp shows that battery has very little power to drive.



## Charge Status Indicator

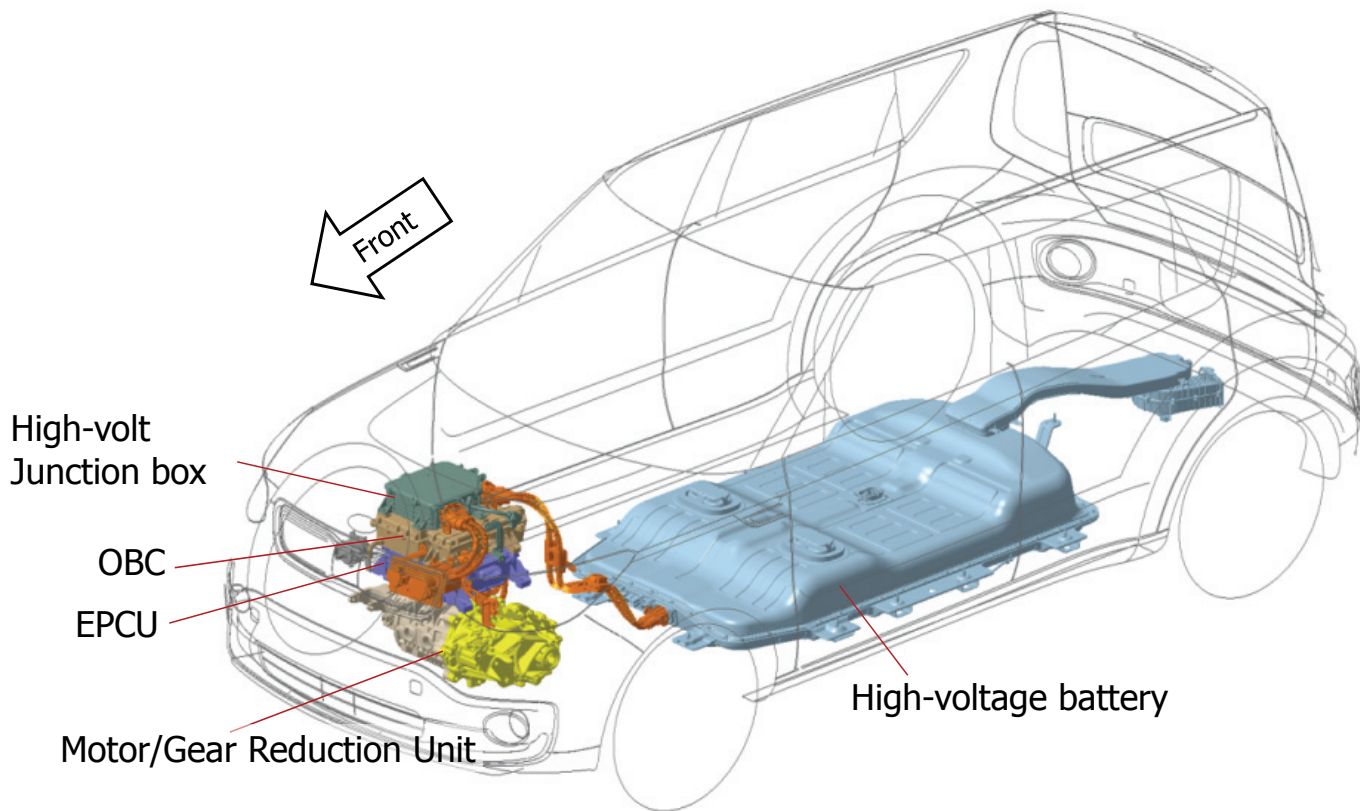
The battery charge status indicator, visible from outside, at the center of the crash-pad, is illuminated when the vehicle is charged with an AC charger. 1st light blinking indicates battery charge is below 33%. 1st light on and 2nd light blinking indicates battery charge is 34~66%. 1st and 2nd lights on and 3rd light blinking indicates a battery charge of 67~99%. All 3 lights on indicate charging complete.



## POWER ELECTRONICS SPECIFICATION

Item			PSEV
Motor	Type		Permanent magnet synchronous motor
	Max. Output (kW)		81.4
	Max Torque (Nm)		285
Gear Reduction Unit	Maximum permissible torque (Nm)		300
	Gear Ratio		8.206
EPCU	Inverter	Input Voltage(V)	240 ~ 413
	LDC	Max. Output (kW)	1.7
OBC (On Board Charger)	Max. Output (kW)		6.6
	Output density (kVA/ℓ)		0.52
Battery	Type		Lithium-ion polymer
	Rated Voltage (V)		360
	Capacity (Ah) / Energy (kwh)		75 / 27
	Number for Packs (Cell / Module)		192CELL / 8MODULE
	Power (kW)		90
	Pack Energy density		97.6 Wh/kg
	Weight (kg) / Volume(ℓ)		277 / 241

## POWER ELECTRONICS (PE)

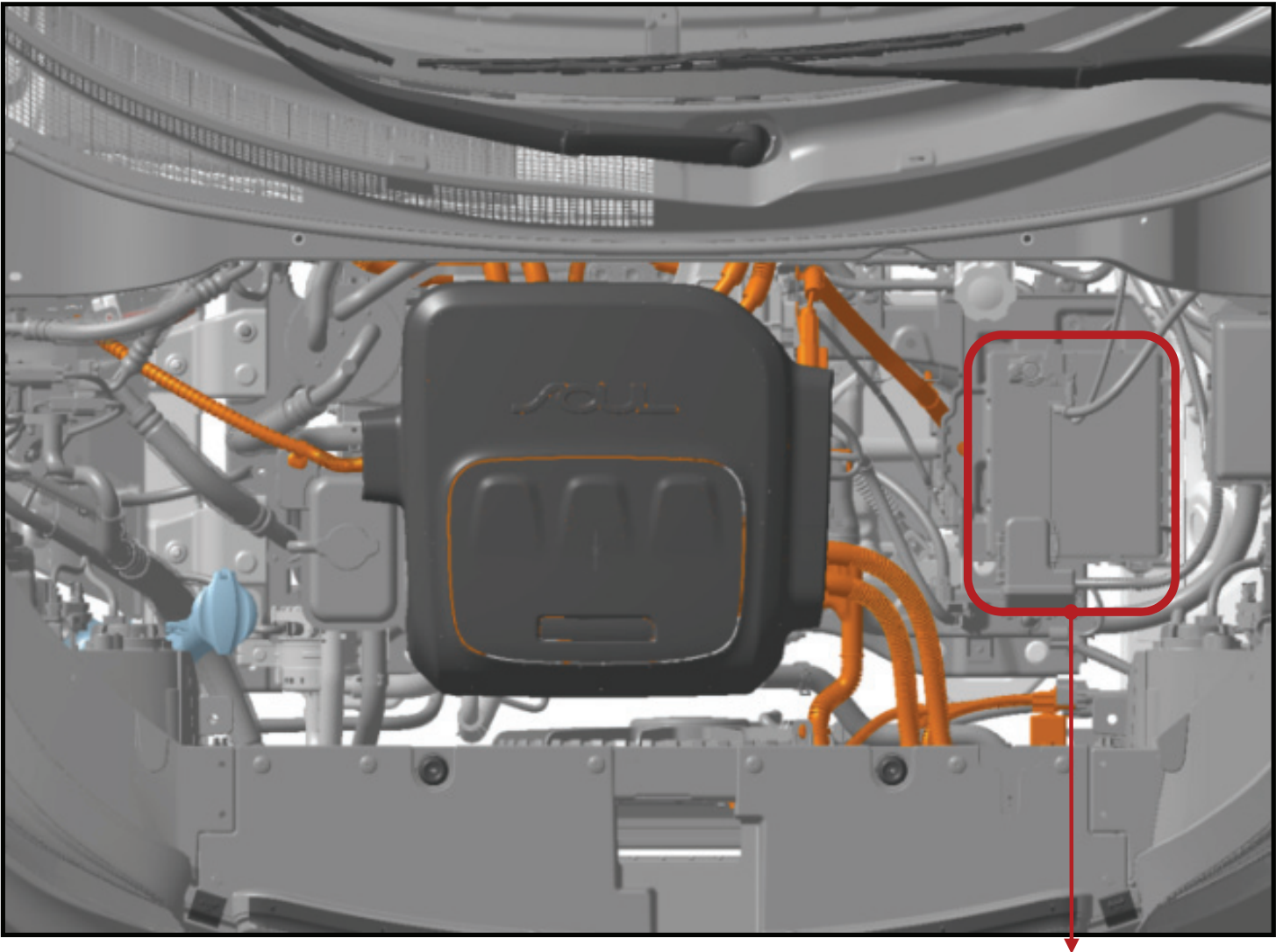


<b>High-voltage Junction box</b>	It supplies electricity from battery to the inverter, LDC, air conditioner compressor, PTC heater, etc...
<b>OBC</b>	On-Board Charger: Battery charging equipment (AC→DC)
<b>EPCU</b>	Electric Power Control Unit (Inverter + LDC)
<b>LDC</b>	Low Power DC-DC Converter: Charge 12V supplementary battery
<b>Inverter</b>	DC→AC (from battery to motor) AC→DC (charge using regenerative braking )
<b>Motor</b>	When current flows through the coil. It generates a rotating magnetic field and generates motor torque and output
<b>Gear Reduction Unit</b>	Increases Motor Torque and increased Torque is transferred to the wheels.
<b>High voltage battery</b>	Supplies and stores electric energy to traction motor.

## VEHICLE COMPONENTS

### 12V auxiliary battery

The 12V auxiliary battery is located on the drivers side of the electric motor compartment, and powers all of the vehicle's standard electronics like radio, air conditioner, etc. Also, it powers the EPCU (Electric Power Control Unit) which controls high voltage current to main electronic systems like the motor and high voltage junction box.



12V Auxiliary Battery

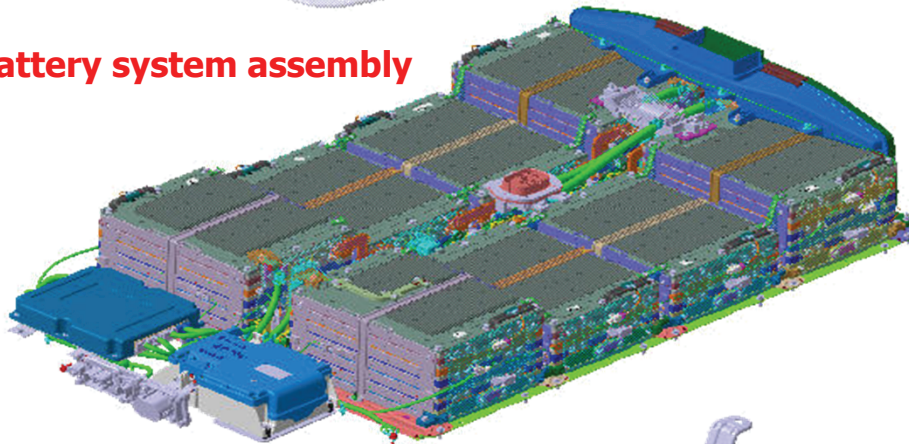
## High voltage battery system

The High voltage battery system supplies and stores electric energy to traction motor. It is a Lithium ion polymer battery with the following specifications, 360V / 75Ah / 27 kWh. It is located under the floor of the Soul electric vehicle, and is closed in an upper and lower case as shown below.

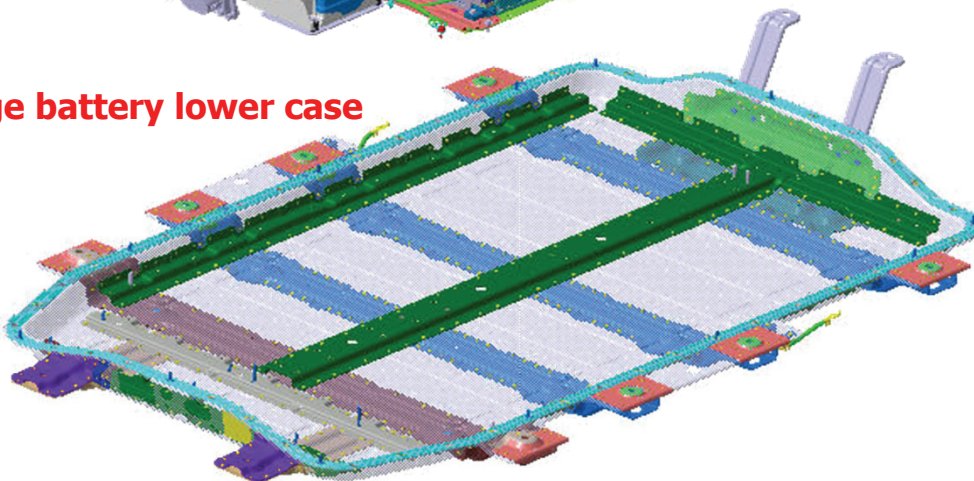
### High voltage battery upper case



### High voltage battery system assembly



### High voltage battery lower case



## High Voltage Orange Cabling

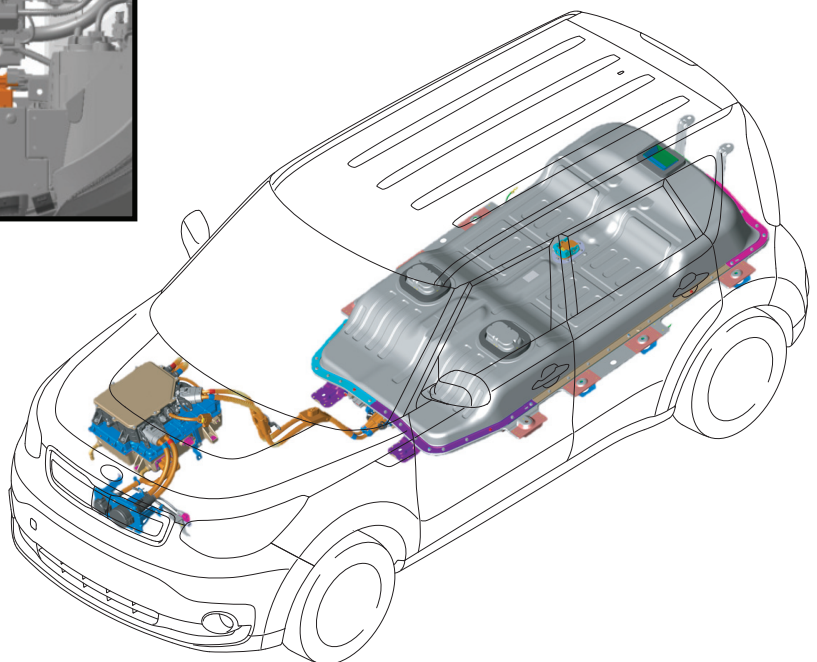
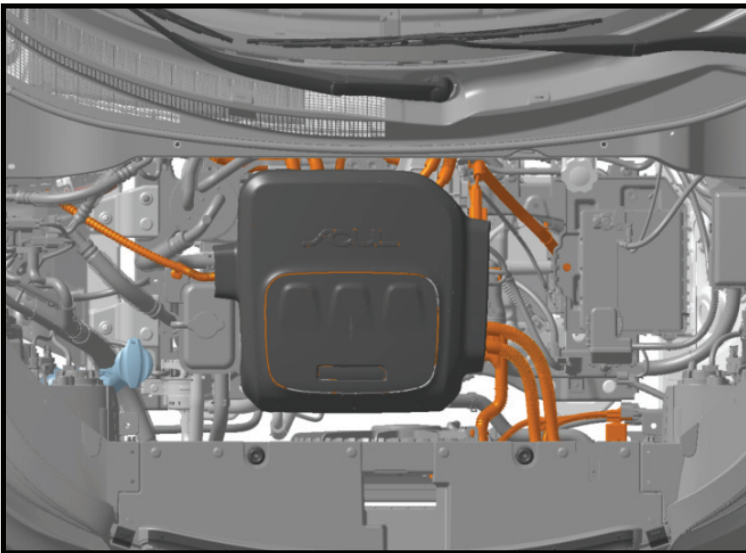
The High Voltage cabling is orange per SAE standard. Cables run under the floor of the vehicle and connect the High Voltage Battery to the EPCU, Motor, LDC, Inverter and other High Voltage components at the front of the vehicle.

The presence of orange cables under the hood, on the under-floor battery compartment, or orange shielding under the car, identifies the vehicle as a electric vehicle.



### **DANGER**

- Do not cut or disconnect orange cabling and connectors. It may cause serious injury or death due to electrical shock.
- Exposed cables or wires may be visible inside or outside the vehicle. Never touch the wires, cables, connectors, or any electric components before disabling the system, to prevent injury or death due to electrical shock.



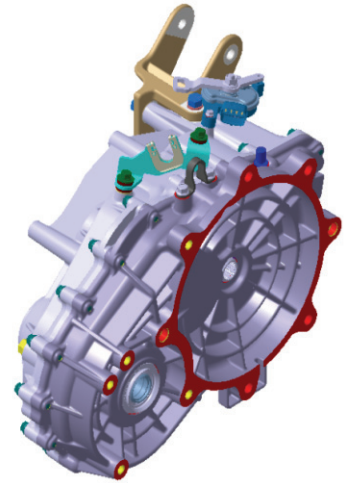
## Motor

The motor of the electric vehicle converts electrical energy into propelling energy with a Max. power of 81.4 kW and Max. torque of 285 Nm.



## Gear Reduction Unit

The Gear Reduction Unit increases Motor Torque and transfers increased Torque to the wheels with Max. torque of 300Nm.



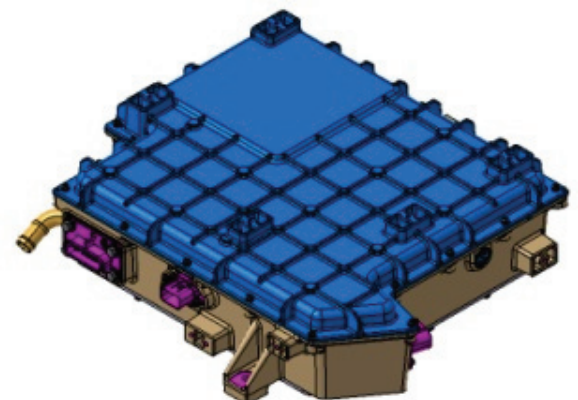
## Electric Power Control Unit (EPCU)

The EPCU includes an Inverter and LDC (Low Power DC-DC Converter) in one housing. The inverter converts DC to AC to supply electricity to the motor. It also converts AC to DC to charge the high voltage battery. The LDC converts high voltage electricity to 12 volts to charge the 12V auxiliary battery.



## OBC (On-Board Charger)

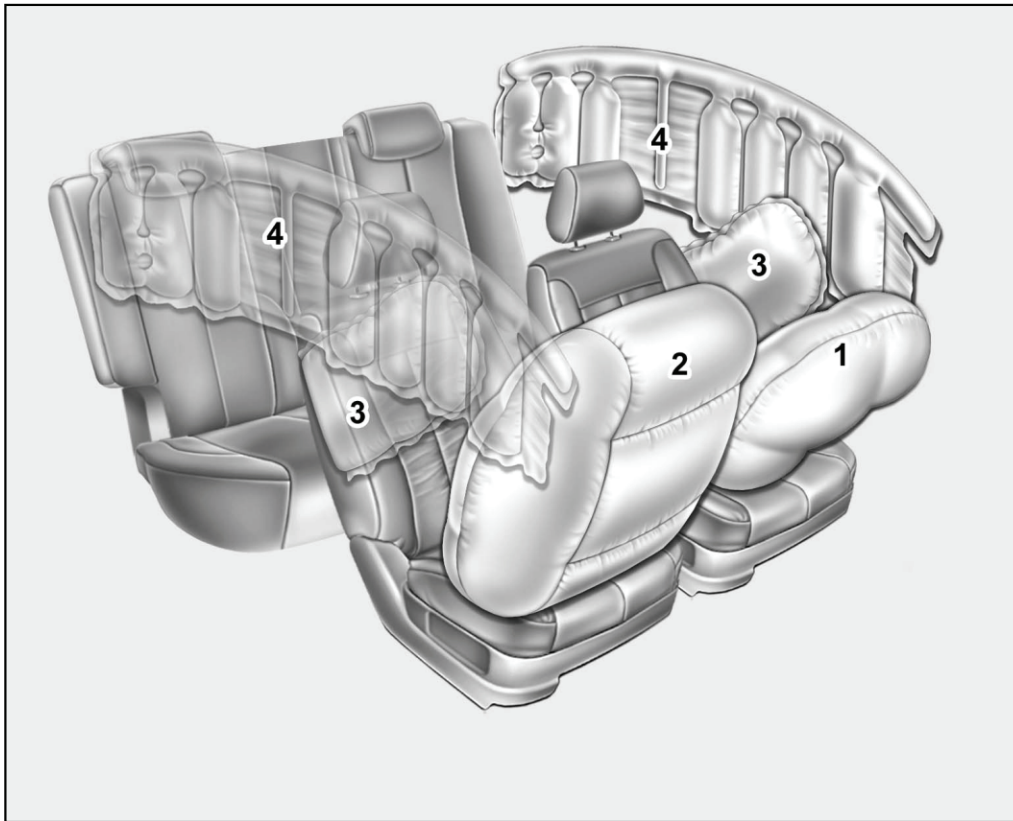
The OBC is the battery charging equipment that converts external AC to DC to charge the high voltage battery.



## AIRBAG SYSTEM (SRS: SUPPLEMENTAL RESTRAINT SYSTEM)

### Airbag

Six airbags are installed in the Soul Electric Vehicle as shown below. Before starting any emergency procedure, make sure the vehicle ignition is turned off, disconnect the negative cable from the 12V auxiliary battery to prevent accidental deployment of undeployed airbags.



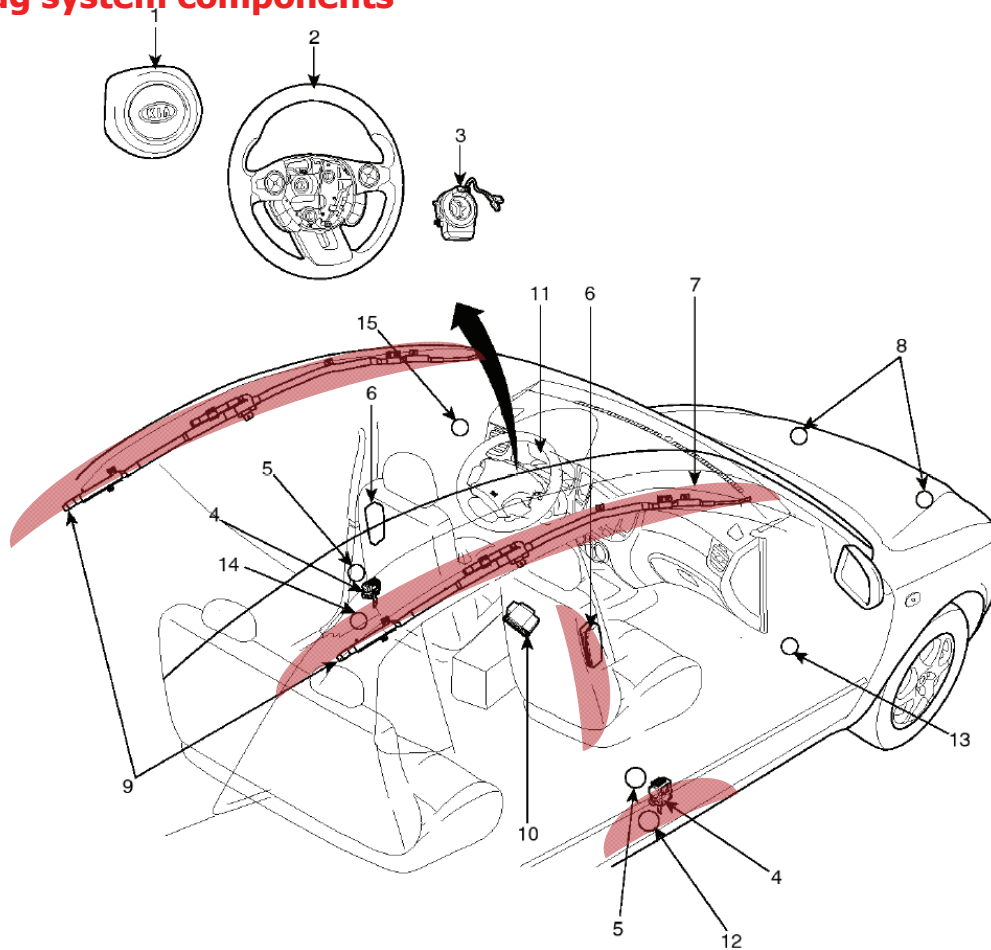
- (1) Driver's front airbag
- (2) Passenger's front airbag
- (3) Side airbag
- (4) Curtain airbag

✱ The actual air bags and seats in the vehicle may differ from the illustration.

### Seat Belt Pretensioner

The Soul electric vehicle is equipped with driver's and front passenger's seat belts with pretensioners. When the seat belt pretensioners are activated in a collision, a loud noise may be heard and fine dust, which may appear to be smoke, may be visible in the passenger compartment. These are normal operating conditions and are not hazardous. The seat belt pretensioner assembly mechanisms may become hot during activation, and may need several minutes to cool after they have been activated.

## Airbag system components



- |                                 |  |
|---------------------------------|--|
| 1. Driver Airbag (DAB)          | 8. Front Impact Sensor (FIS)                             |
| 2. Steering Wheel               | 9. Curtain Airbag (CAB)                                  |
| 3. Clock Spring                 | 10. Supplemental Restraint System Control Module (SRSCM) |
| 4. Seat Belt Pretensioner (BPT) | 11. Airbag Warning Lamp                                  |
| 5. Side Impact Sensor (SIS)     | 12, 14. Emergency Fastening Device (EFD)                 |
| 6. Side Airbag (SAB)            | 13, 15. Pressure Side Impact Sensor (PSIS)               |
| 7. Passenger Airbag (PAB)       |  |

### **WARNING**



### **Explosion**

To avoid injuries caused by accidental deployment of undeployed airbags:

- Do not cut the red colored part on the above layout.
- Make sure the vehicle ignition switch is turned off, disconnect the negative cable from the 12V auxiliary battery, and recommended wait at least 3 minutes or longer to allow the system to deactivate.

## INITIAL RESPONSE: IDENTIFY, IMMOBILIZE AND DISABLE

The following procedures should be used whenever you are dealing with a Soul Electric Vehicle at an emergency scene. All other operations should be consistent with your department's standard operating procedures or guides. Electric vehicles damaged by a crash may have compromised high voltage safety systems and present a potential high voltage electrical shock hazard. Exercise caution and wear appropriate personal protective equipment (PPE) safety gear, including high voltage safety gloves and boots. Remove all metallic jewelry, including watches and rings.


### Identify

When dealing with an Soul at an incident scene, emergency responders should always assume that it is an electric vehicle until it can be proven otherwise, using the identification clues outlined in this ERG. External badging will usually be the first clue but it can often be hidden by damage caused in a crash. Always be sure to visualize multiple sides of the vehicles as well as using clues found under the hood and in the interior of the vehicle.



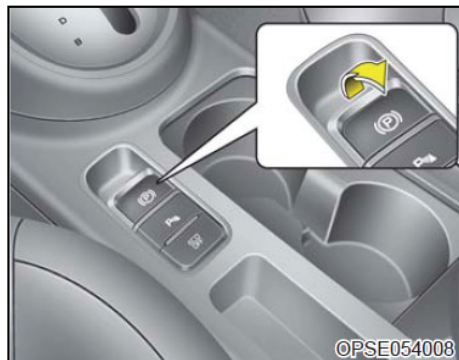
## Immobilize

The next step is to immobilize the vehicle to prevent any accidental movement that can endanger response personnel and civilians alike. Although Soul Electric Vehicle has a function of virtual sound of engine, it may be damaged by a crash. Therefore, there will be instances where the vehicle appears to be off due to no engine sound.

When  "READY" lamp is illuminated on the Cluster Instrument Panel, the vehicle can move almost silently using the electric motor. Responders should approach the vehicle from the sides and stay away from the front or rear as they are potential paths of travel. To immobilize the vehicle, follow these procedures:



Chock the wheels



Set the parking brake.




Position the shift lever in park (P)

## Disable

The final step in the initial response process, conducted after the vehicle is secured to prevent movement, is to disable the vehicle, its SRS components and the high voltage electrical system. To prevent current flow through the system, use one of the following procedures to disable the vehicle.

### I . Disabling the System – Smart Key System and “POWER” START/STOP Button

1. Check the status of the READY light on the instrument panel. If the  READY light is illuminated, the vehicle is on.

(Refer to page 6)

- a) If the READY light is NOT illuminated, the vehicle is off. Do not push the “POWER” START/STOP button because the vehicle may start.



**“POWER” START/STOP Button**

- b) To turn off the system, put the shift lever in the P (Park) position and press the POWER button beside a shift lever.

### Without depressing the brake pedal

Pressing POWER button	POWER button LED color	Vehicle condition
	Off	Off
One time	Amber	Electrical accessories are operational.
Two times	Reddish orange	The warning lights can be checked before the vehicle is started.
Three times	Off	Off

### Depressing the brake pedal while a shift lever is in the P (Park) position

Pressing POWER button	POWER button LED color	Vehicle condition
	Off	Off
One time	Off	Ready to drive

2. If necessary, lower the windows, unlock the doors and open the trunk as required, before disconnecting the 12V battery. Once the 12V battery is disconnected, power controls will not operate.

3. Before disconnecting the 12V battery, move the smart Key at least 2 meters away from the vehicle to prevent accidental restart.

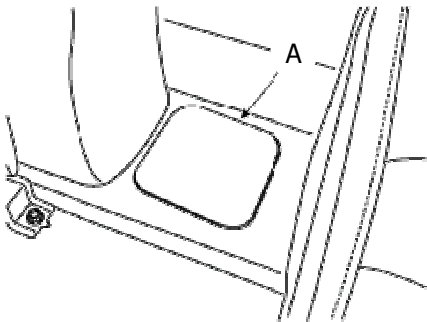


Smart key

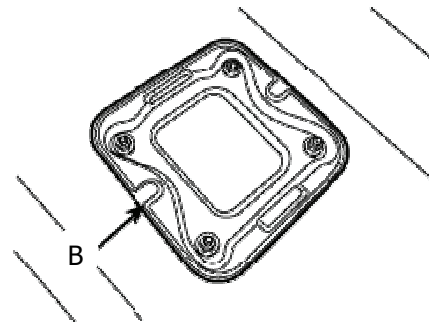
4. Disconnect the negative (-) 12V battery cable, located in the electric motor compartment, to further prevent the risk of accidental restart.

5. Use the following procedure to remove the safety plug and disable the high voltage battery:

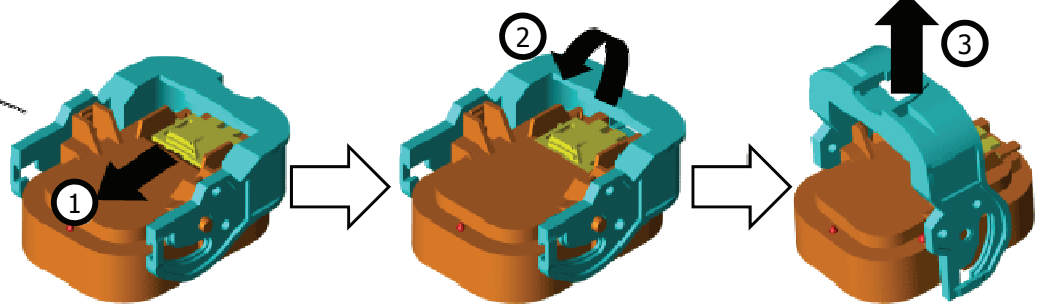
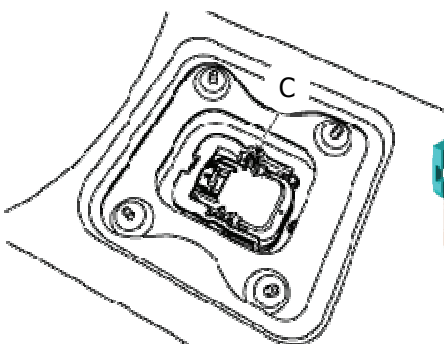
a) Remove cover (A) under the center of the rear floor carpet.



b) After removing mounting nuts (10mm), remove the safety plug access cover (B).



c) Remove the safety plug (C) using the following procedure.



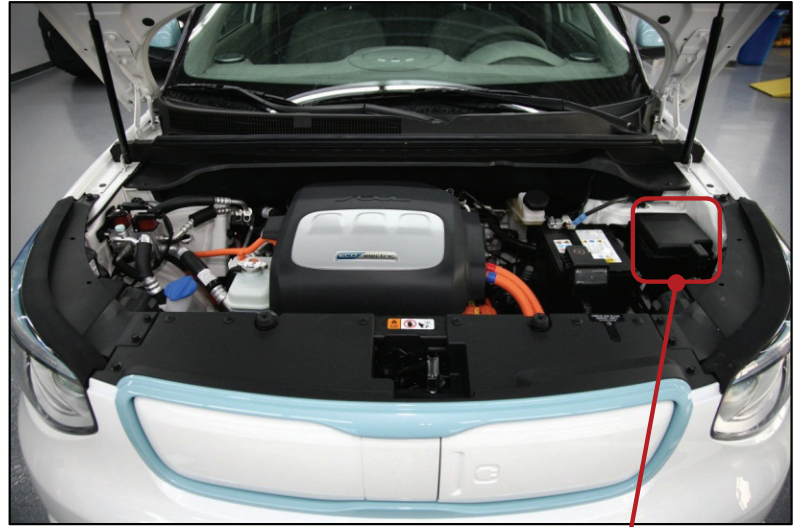
(1) Unlock

(2) Release

(3) Remove

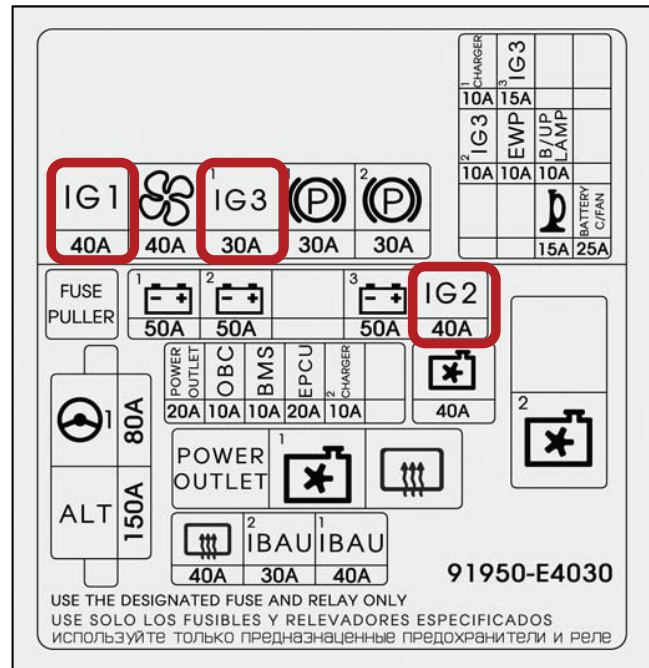
## II. Disabling the System – IG Relay Removal (Alternate Method)

1. Open the hood.
2. Remove the electric motor compartment fuse box cover.
3. If necessary, lower the windows, unlock the doors and open the trunk as required, before disconnecting the 12V battery. Once the 12V battery is disconnected, power controls will not operate.



**Electric motor compartment fuse box**

4. In the event the vehicle can not be disabled using the "Power" START/STOP Button, pull the IG1, IG2, IG3 Relay from the under hood electric motor room fuse box. If the IG Relay cannot be located, pull out all the fuses and relays in the fuse box.

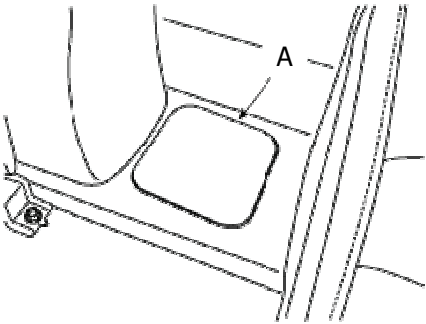


5. Disconnect the negative (-) 12V battery cable, located in the electric motor room, to further prevent the risk of accidental restart.

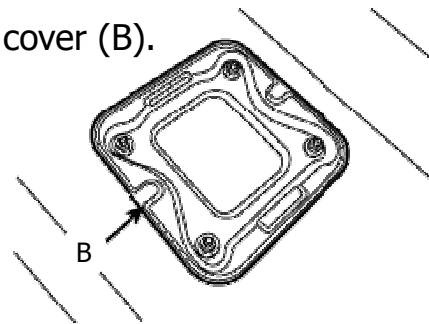
Before disconnecting the 12V battery (if needed) lower the windows, unlock the doors and open the trunk as required. Once the 12V battery is disconnected, power controls will not operate.

5. Use the following procedure to remove the safety plug and disable the high voltage battery:

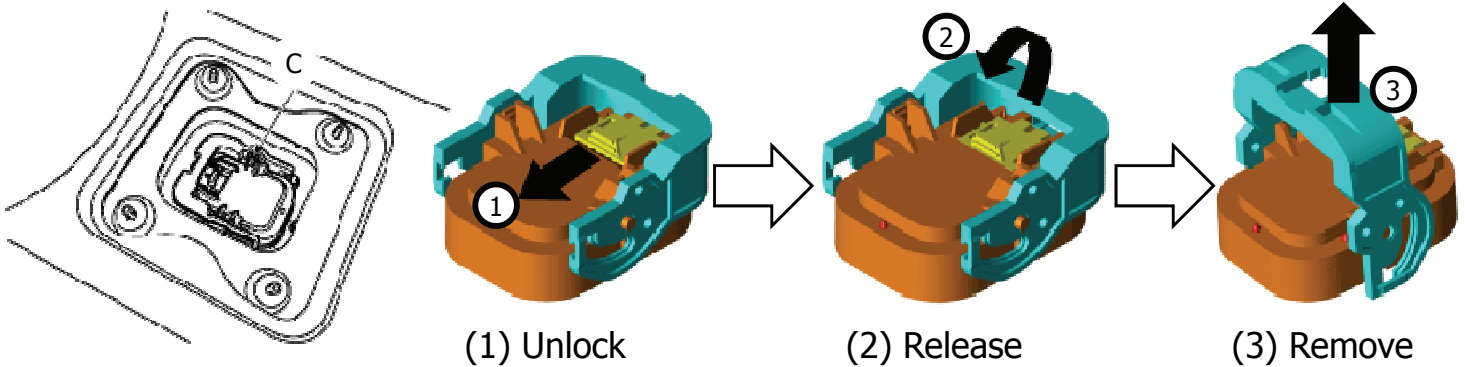
a) Remove cover (A) under the center of the rear floor carpet.



b) After removing mounting nuts (10mm), remove the safety plug access cover (B).



c) Remove the safety plug (C) with the following procedure.



If both methods of disabling system are unsuccessful, the vehicle is not secured from accidental deployment of undeployed airbags and electric shock of high-voltage components.

## ⚠ WARNING



## Electrocution Risk

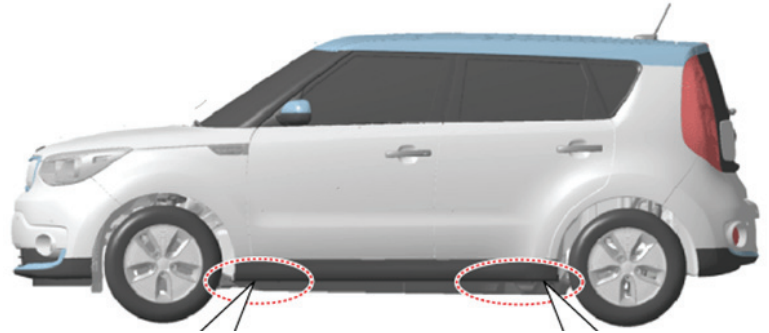
- Before engaging in emergency response procedures, ensure the vehicle is disabled and wait for more than 5 minutes to allow the capacitor in the high voltage system to discharge to avoid electrocution.
- Exposed cables or wires may be visible inside or outside the vehicle. Never touch the wires or cables before disabling the system, to prevent injury or death due to electrical shock.

## EXTRACTION OPERATIONS

The extraction operations of Soul electric vehicle are similar to the conventional gasoline fueled Soul. However, the first responder should pay special attention when they extract occupants in the vehicle. Before extraction operations, the first responders should carry out "Initial Response: Identify, Immobilize and Disable" in section of page 15 to 20.

### Vehicle Stabilization

Use standard stabilization (cribbing) points, as shown beside. Always be sure to connect to a structural member of the vehicle and avoid placing cribbing under high voltage cables, fuel lines and other areas not normally considered acceptable.






### Extraction tools and procedure

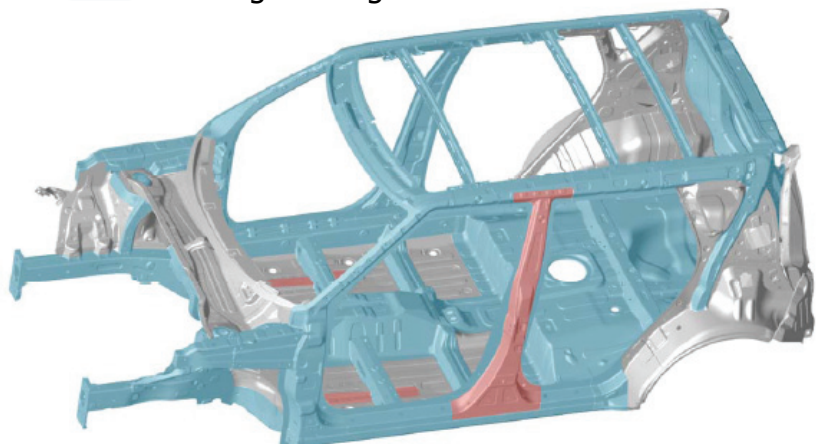
When responding to an incident involving a Soul electric vehicle, we recommend that the first responders follow their organization's standard operating procedures for assessing and dealing with vehicle emergencies.

When the first responders cut the vehicle, they should always pay special attention to airbag system, orange colored high voltage cables and other high voltage components so that the parts are not damaged, causing risks of explosion.

### Location of ultra-high strength steel

In the image, high strength steel is used in the areas coloured in blue and ultra-high strength steel is used in the red coloured areas. Depending on the tools used, ultra high strength steel can be challenging or impossible to cut. If necessary, use a workaround technique.

-  Normal strength steel
-  High strength steel
-  ultra-high strength steel



## VEHICLE FIRE

- A burning or over-heating battery releases toxic vapors. These vapors include H<sub>2</sub>SO<sub>4</sub>, oxides of carbon, nickel, aluminum, lithium, copper and cobalt.
- Responders should wear full PPE (Personal Protective Equipment), including SCBA (Self-Contained Breathing Apparatus), and take appropriate measures to protect civilians downwind from the incident. Smoke from a Soul electric vehicle fire is similar to smoke from a conventional vehicle fire.
- Even after a lithium-ion battery fire appears to have been extinguished, a renewed or delayed fire can occur.
- In the case of extinguishing a fire with water, **a powder extinguisher exclusively for an electric fire or large amounts of water from a fire hydrant** (if possible) must be used.

Do not extinguish fire with a small amount of water, to avoid electrocution.

- If you must walk away from the vehicle, notify an appropriate responder or a rescue person of the fact that the vehicle is an electric car and contains a high voltage system and warn all others.

## DANGER

- Always assume there is power to the system, even if you suspect the sensing system has disabled the high voltage battery.
- Kia motor recommends that fire extinguishing should follow standard fire fighting practices.
- Once disabled, there is no risk of electric shock from touching the car's body or framework; therefore, firefighters should not hesitate to pour large amounts of water on the vehicle.

## SUBMERGED OR PARTIALLY SUBMERGED VEHICLES

In the event the vehicle is submerged or partially submerged, remove the vehicle from the water before attempting to disable the vehicle. Use one of the methods described in sections of page 17 to 20 to disable the vehicle once it has been removed from the water. There is no risk of electric shock from touching the car's body or framework — in or out of the water.

## HIGH VOLTAGE BATTERY DAMAGE AND FLUID LEAKS

If electrolyte solution leakage, or damage such as any problem with the Li-ion battery casing are observed, the first responders should attempt to neutralize the battery by applying a large volume of water to the battery pack while wearing appropriate Personal Protective Equipment (PPE). The neutralization process helps stabilize the thermal condition of the battery pack but does not discharge the battery.

- Cease all smoke, spark, flame around the vehicle.
- Electrolyte solution is a skin irritant.
- Do not touch or step on the spilled electrolyte.
- If electrolyte leak occurs, wear appropriate solvent resistant PPE and use soil, sand, or a dry cloth to clean up the spilled electrolyte. Be sure to adequately ventilate the area.

### **WARNING**



### **Irritation**

- The high voltage battery contains electrolyte solution. To avoid exposure to electrolyte solution and serious personal injury, always wear appropriate solvent resistant PPE (Personal Protective Equipment) and SCBA (Self-Contained Breathing Apparatus).

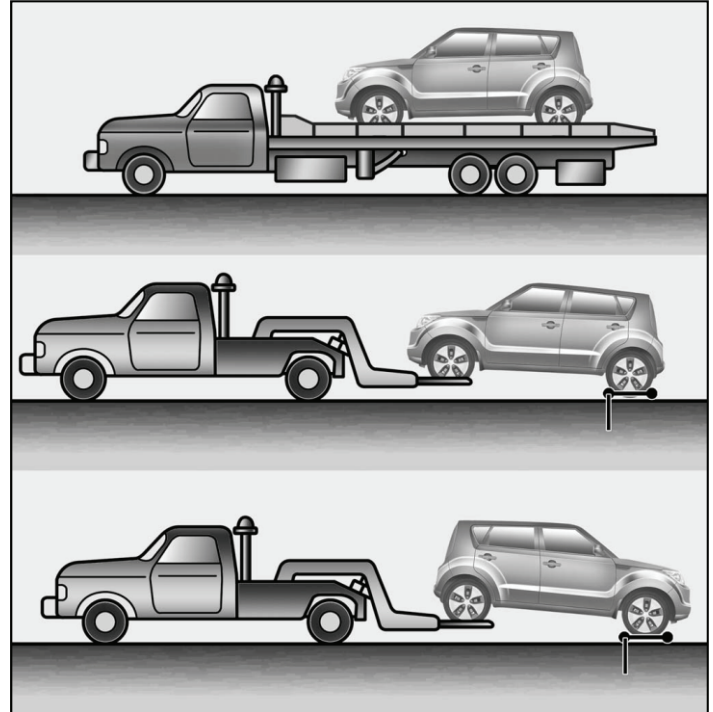
- Electrolyte solution is an eye irritant – If contact with eyes, rinse with plenty of water for 15 minutes.
- Electrolyte solution is a skin irritant. Therefore, if there is contact with skin, wash it with a soap.
- Electrolyte liquid or fumes that have come into contact with water vapors in the air will create an oxidized substance. This substance may irritate skin and eyes. In these cases, rinse with plenty of water and see a doctor immediately.
- Electrolyte fumes (when inhaled) can cause respiratory irritation and acute intoxication. Move to fresh air and wash mouth with water. See a doctor immediately.

## TOWING

In the event of an accident, The high voltage system must be disabled. To disable the vehicle, the service plug must be removed from the high voltage battery according to one of the methods described in sections of page 17 to 20.

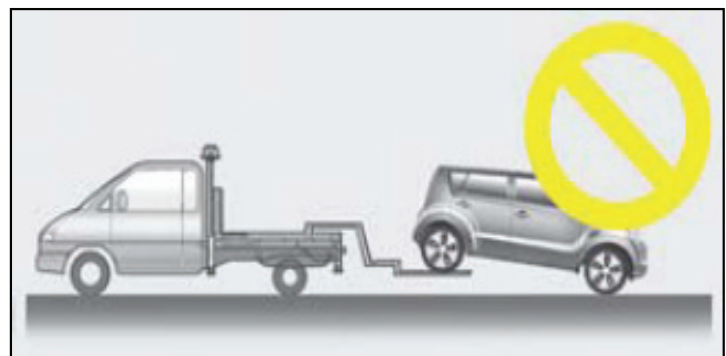
When towing Soul electric vehicle, all wheels should off the ground and not in contact with the road.

If emergency towing is necessary, we recommend having it done by an authorized Kia dealer or a commercial tow-truck service. Proper lifting and towing procedures are necessary to prevent damage to the vehicle. The use of wheel dollies or flatbed is recommended.



### Caution

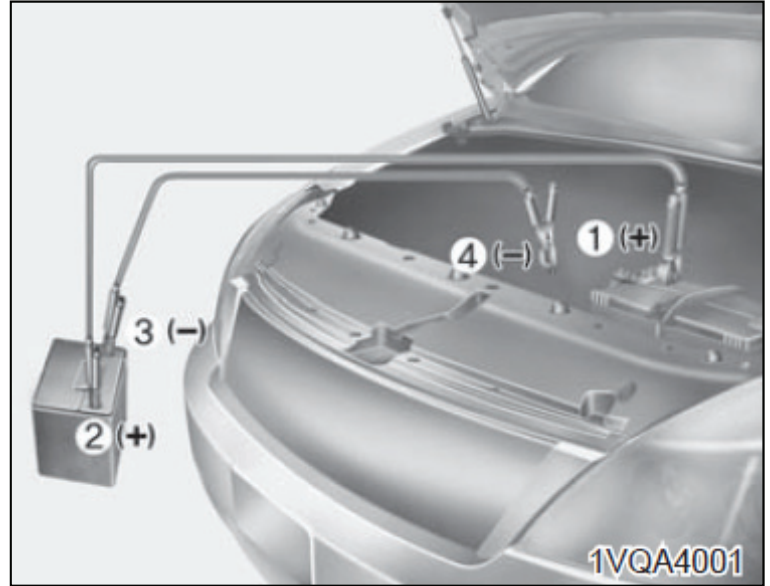
- Do not tow the vehicle backwards with the front wheels on the ground as this may cause damage to the vehicle.
- Do not tow with sling-type equipment. Use wheel lift or flatbed equipment.
- Never tow the vehicle with the front wheels on the ground (forward or backward), as this may cause damage to the motor or fire.



## TO JUMP START THE CAR

Do not attempt to jump start the high voltage battery, it cannot be jump started. In case of full discharge of the high voltage batteries, the vehicle must be towed as mentioned on the previous page.

In case the 12V auxiliary battery is discharged, attach jumper cables or starting device to the 12V battery in the motor room as you would any 12V battery (see image). Refer to page 6-4 of the Kia Owner's Manual for additional information. Connect jumper cables in numerical order and disconnect in reverse order.





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