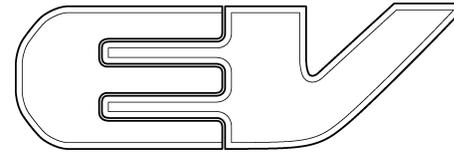


 **TOYOTA**  
**RAV4 EV**



**Electric**  
**2012 Model**  
**2<sup>nd</sup> Generation**  
*Emergency Response Guide*



## Foreword

In 1997, Toyota released the 1<sup>st</sup> generation Toyota RAV4 EV electric vehicle in North America. To educate and assist emergency responders in the safe handling of RAV4 EV technology, Toyota published the 1998 RAV4 EV Emergency Response Guide.

With the release of the 2<sup>nd</sup> generation Toyota RAV4 EV in July 2012, a new 2012 Toyota RAV4 EV Emergency Response Guide was published for emergency responders. While many features from the 1<sup>st</sup> generation model are similar, emergency responders should recognize and understand the new, updated features of the 2<sup>nd</sup> generation RAV4 EV covered in this guide.

High voltage electricity powers the electric motor, DC/DC converter, battery coolant heater, air conditioning (A/C) compressor, cabin coolant heater and inverter. All other automotive electrical devices such as the head lights, radio, and gauges are powered from a separate 12 Volt auxiliary battery. Numerous safeguards have been designed into the RAV4 EV to help ensure the high voltage, approximately 230 to 386 Volt, Lithium-ion (Li-ion) Electric Vehicle (EV) battery assembly is kept safe and secure in an accident.

The RAV4 EV utilizes the following electrical systems:

- Maximum 450 Volts AC
- Nominal 230 to 386 Volts DC
- Nominal 120/240 Volts AC
- Nominal 12 Volts DC

2<sup>nd</sup> generation RAV4 EV features:

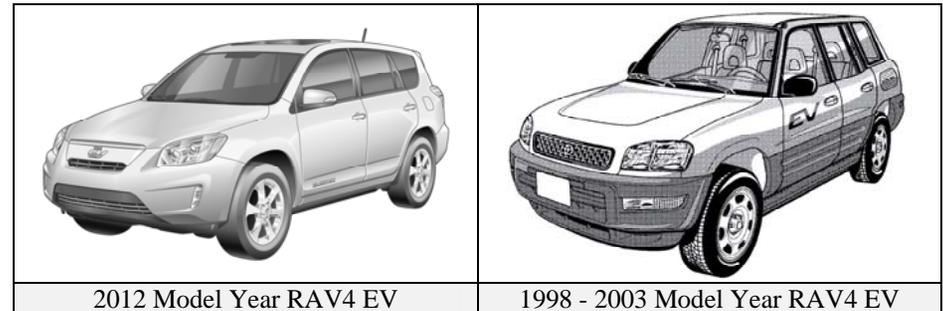
- Complete model change with a new exterior and interior design.
- A high voltage Electric Vehicle (EV) battery assembly rated at 230 to 386 Volts.
- A high voltage motor driven Air Conditioning (A/C) compressor rated at 230 to 386 Volts.
- A high voltage battery coolant heater and cabin coolant heater rated at 230 to 386 Volts.

- An electric vehicle charge cable rated at 120/240 Volts.
- An onboard battery charger with AC 120/240 Volt input and DC 230 to 386 Volt output.
- A DC/DC Converter with a 230 to 386 Volt input and a 12 Volt output.
- A body electrical system rated at 12 Volts with a negative chassis ground.
- Supplemental Restraint System (SRS) – dual stage frontal airbags, front seat side airbags, side curtain airbags and front seat belt pretensioners.

High voltage electrical safety remains an important factor in the emergency handling of the RAV4 EV Electric Vehicle. It is important to recognize and understand the disabling procedures and warnings throughout the guide.

Additional topics in the guide include:

- RAV4 EV identification.
- Major Electric Vehicle component locations and descriptions.
- Extrication, fire, recovery, and additional emergency response information.
- Roadside assistance information.



This guide is intended to assist emergency responders in the safe handling of a RAV4 EV vehicle during an incident.

NOTE:

Emergency Response Guides for Toyota electric, hybrid and alternative fuel vehicles may be viewed at <http://techinfo.toyota.com>.

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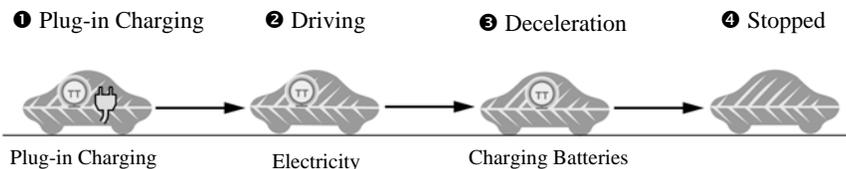
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## About the RAV4 EV

The RAV4 EV continues into its 2<sup>nd</sup> generation as an electric vehicle. Electric Vehicle means that the vehicle contains only an electric motor and does not have a gasoline engine for power. Electricity stored in a high voltage Electric Vehicle (EV) battery assembly for the electric motor.

The following illustration demonstrates how the RAV4 EV operates in various driving modes.

- 1 Utilizing the charge cable assembly connected to a 120/240 Volt outlet, the vehicle's EV battery assembly can be fully charged within 40 hours (when charging at 120 Volt / 15 Amp) or 6 hours (when charging at 240 Volt / 40 Amp) from a fully discharged state.
- 2 During driving, when the Li-ion battery is sufficiently charged, the vehicle will drive using electric only power for approximately 152 miles (245 km).
- 3 During deceleration, such as when braking, the vehicle regenerates kinetic energy from the front wheels to produce electricity that recharges the EV battery assembly.
- 4 While the vehicle is stopped, the electric motor is off, however the vehicle remains on and operational.



## RAV4 EV Identification

In appearance, the 2012 model year RAV4 EV is nearly identical to the conventional, non-electric Toyota RAV4. The RAV4 EV is a 5-door SUV. Exterior, interior, and motor compartment illustrations are provided to assist in identification.

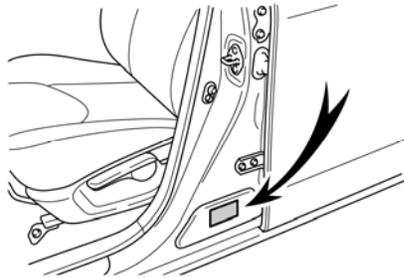
The alphanumeric 17 character Vehicle Identification Number (VIN) is provided in the front windshield cowl and on the driver side B pillar.

Example VIN: 2T3YL4DV0C2020211

A RAV4 EV is identified by the first 8 alphanumeric characters **2T3YL4DV**.



Driver Side Windshield



Driver Side B Pillar

### Exterior

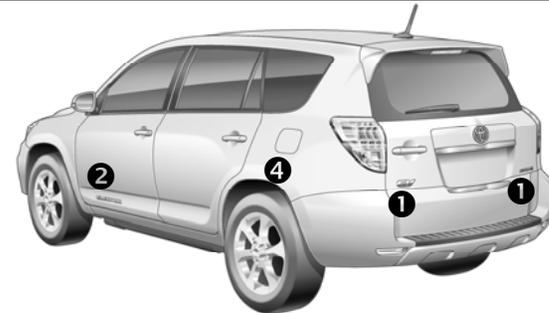
- 1 **RAV4** and **EV** logos on the back door.
- 2 **ELECTRIC** logo on the driver and front passenger door.
- 3 **EV** logo on the front upper grille.
- 4 Charge inlet door located on the driver side rear quarter panel.



Exterior Driver Side View



Exterior Front and Rear View



Exterior Rear and Driver Side View

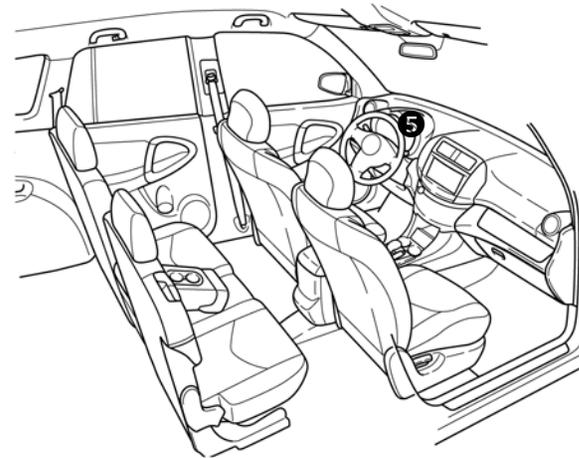
## RAV4 EV Identification (Continued)

### Interior

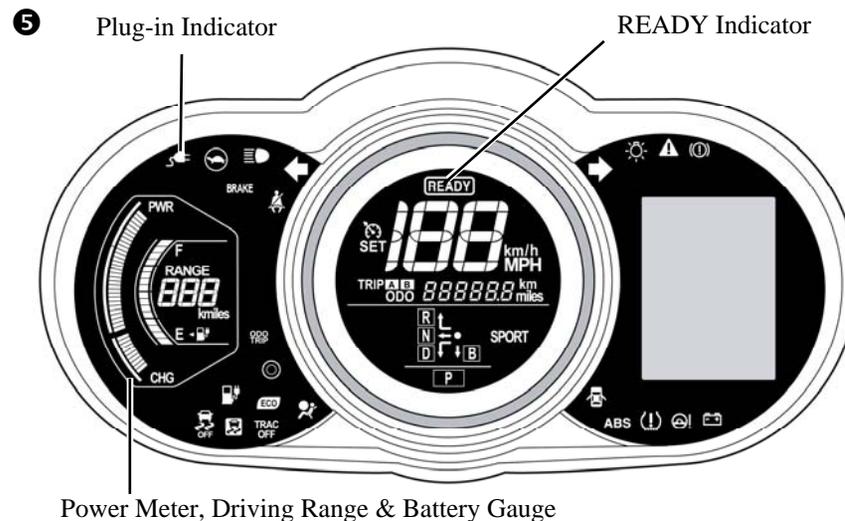
- ⑤ The instrument cluster (power meter, driving range & battery gauge, **READY** indicator, plug-in indicator and warning lights) located in the dash behind the steering wheel, is different than the one on the conventional, non-electric RAV4.

#### NOTE:

If the vehicle is shut off, the instrument cluster gauges will be “blacked out”, not illuminated.



Interior View

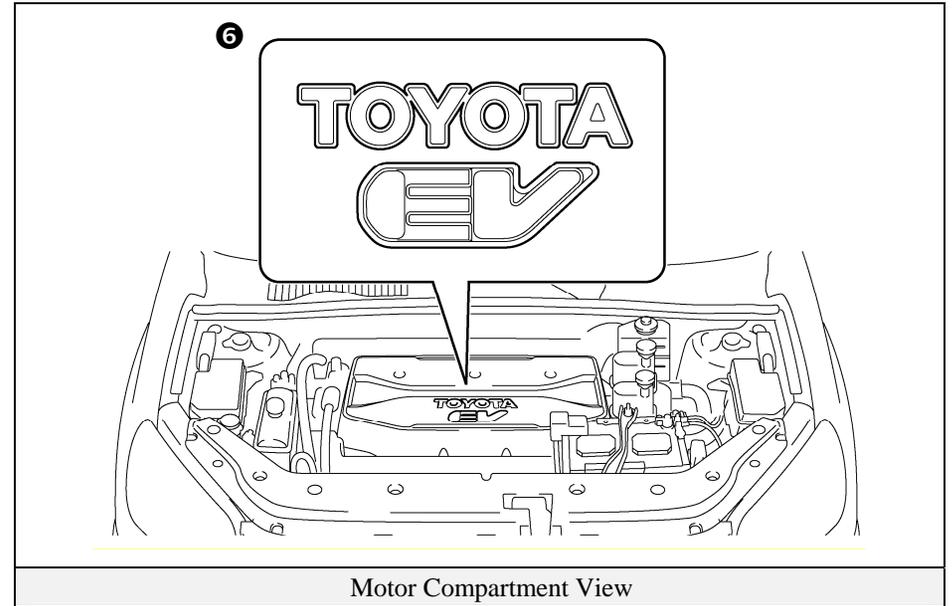


Instrument Cluster View

## RAV4 EV Identification (Continued)

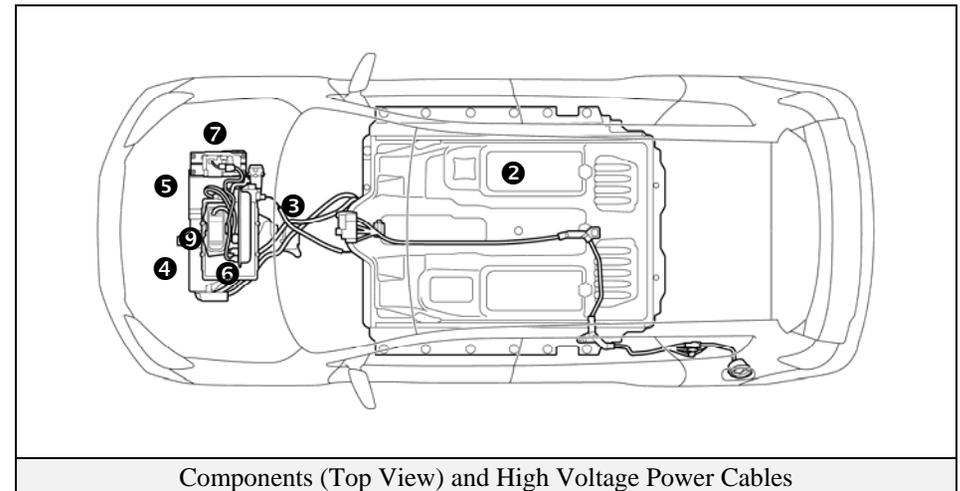
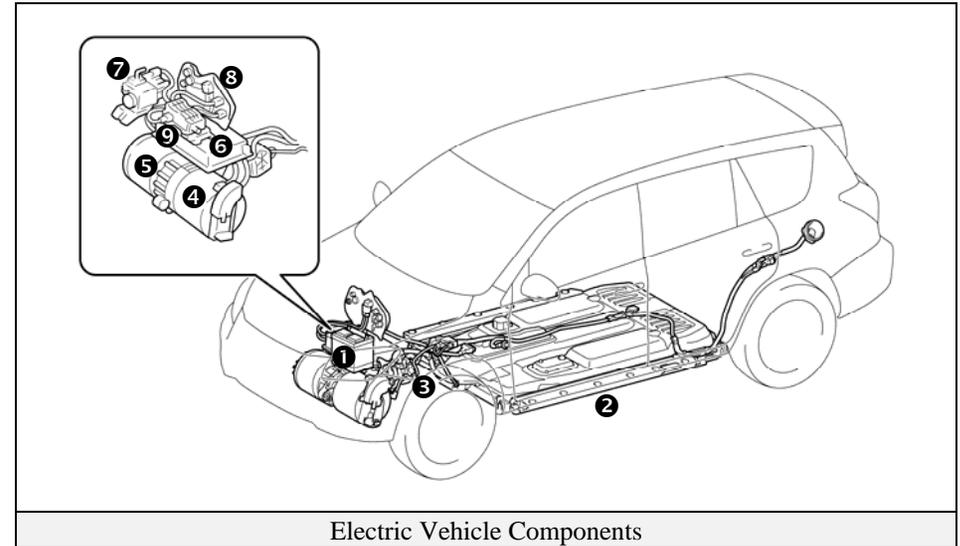
### Motor Compartment

- ⑥ Logo on the plastic cover.



## Electric Vehicle Component Locations & Descriptions

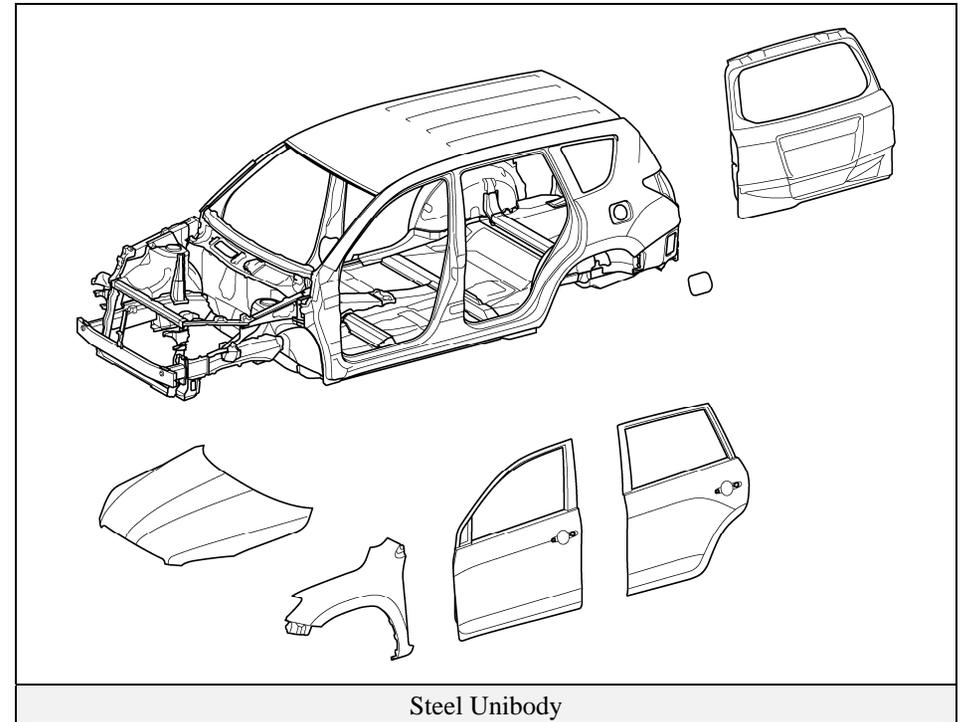
Component	Location	Description
12 Volt Auxiliary Battery ❶	Motor Compartment	A lead-acid battery that supplies power to the low voltage devices.
Electric Vehicle (EV) Battery Assembly ❷	Under the Floor	230 to 386 Volt Lithium-ion (Li-ion) battery assembly consisting of 3.6 Volt cells connected in a series-parallel circuit.
Power Cables ❸	Undercarriage, Motor Compartment and Driver Side behind Rear Quarter Panel	Orange colored power cables carry high voltage Alternating Current (AC) between the charge port and on-board charger, and high voltage Direct Current (DC) between the EV battery assembly, DC/DC converter, inverter, A/C compressor, battery coolant heater and cabin coolant heater.
Drive Unit ❹ ❺	Motor Compartment	The drive unit integrates the inverter, electric motor, differential and p-lock actuator.
Inverter ❹	Drive Unit	Inverts the high voltage electricity from the EV battery to 3-phase AC electricity that drive the electric motor. Also converts the high voltage AC power generated by the electric motor during regeneration to high voltage DC power to charge the EV battery assembly.
Electric Motor ❺	Drive Unit	3-phase high voltage AC inductive electric motor contained in the drive unit. It is used to power the front wheels.
On-Board Charger ❻	Motor Compartment	Boosts the AC power supplied from an external power source and converts it to DC to charge the EV battery assembly.
A/C Compressor (with Inverter) ❼	Motor Compartment	3-phase high voltage AC electrically driven motor compressor.
DC/DC Converter for 12 Volt Auxiliary Battery ❸	Motor Compartment	Converts 230 to 386 Volts from the EV battery assembly to 12 Volts for low voltage vehicle power.
Cabin Coolant Heater ❾	Motor Compartment	Heats the coolant used for the cabin heater.



## Electric Vehicle Component Locations & Descriptions (Continued)

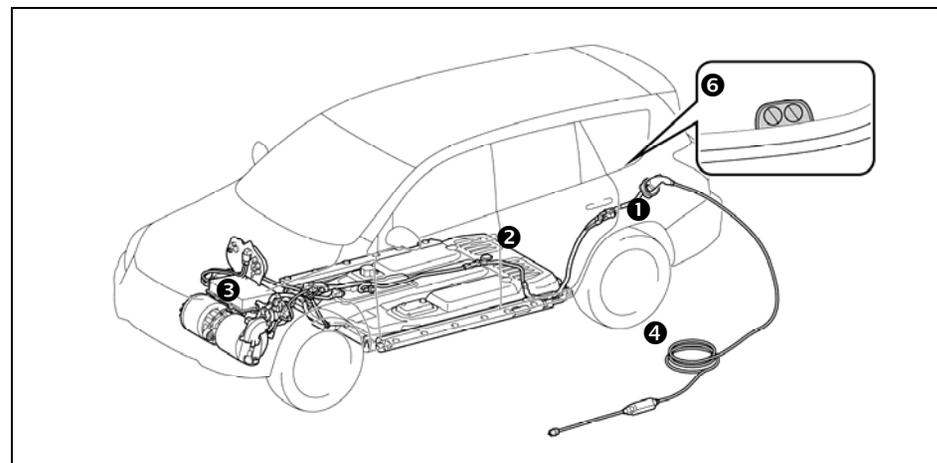
### Key Specifications:

Electric Motor:	154 hp (115 kW), AC Inductive Motor
Transaxle:	Automatic Only
EV Battery Assembly:	230 to 386 Volt Sealed Li-ion Battery
Curb Weight:	4,032 lbs/1,829 kg
Frame Material:	Steel Unibody
Body Material:	Steel Panels
Seating Capacity:	5 passengers

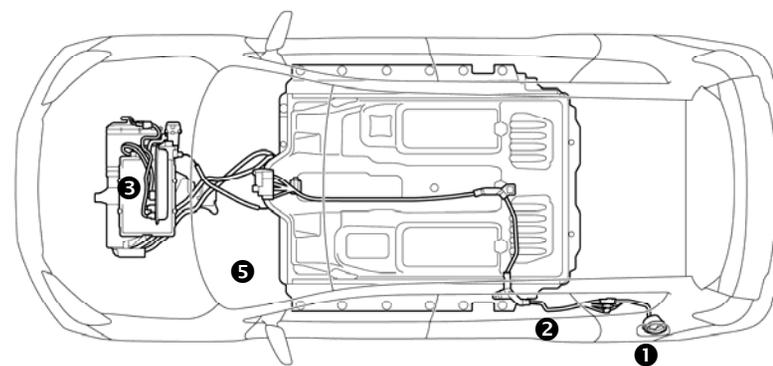


## Plug-in Charging System Component Locations & Descriptions

Component	Location	Description
Charge Inlet ❶	Driver Side Rear Quarter Panel	Connects to the charge cable assembly charge connector. Supplies the electrical power from an external power source to the vehicle.
Power Cable for Charging ❷	Driver Side behind Rear Quarter Panel and Undercarriage	Connects the charge inlet and on-board charger.
On-board Charger ❸	Motor Compartment	Boosts the AC power supplied from an external power source and converts it to DC to charge the EV battery assembly.
Charge Cable Assembly ❹	Driver Side Rear Quarter Panel	Connects to the charge inlet and supplies power from an external power source to the vehicle.
Plug-in Indicator ❺	Instrument Cluster in Dash behind Steering Wheel	Illuminates in green to indicate that the power cable is correctly plugged in. Illuminates in yellow to indicate a malfunction.
Charge Indicator ❻	Driver Side Rear Quarter Window	Displays the charging status by illuminating, flashing or turning off.



Plug-in Charging System Components



Plug-in Charging System Components (Top View) and Charge Inlet Power Cables

## Smart Key System

The RAV4 EV smart key system consists of a smart key transceiver that communicates bi-directionally, enabling the vehicle to recognize the smart key in proximity to the vehicle. Once recognized, the smart key will allow the user to lock and unlock the doors without pushing smart key buttons, and start the vehicle without inserting it into an ignition switch.

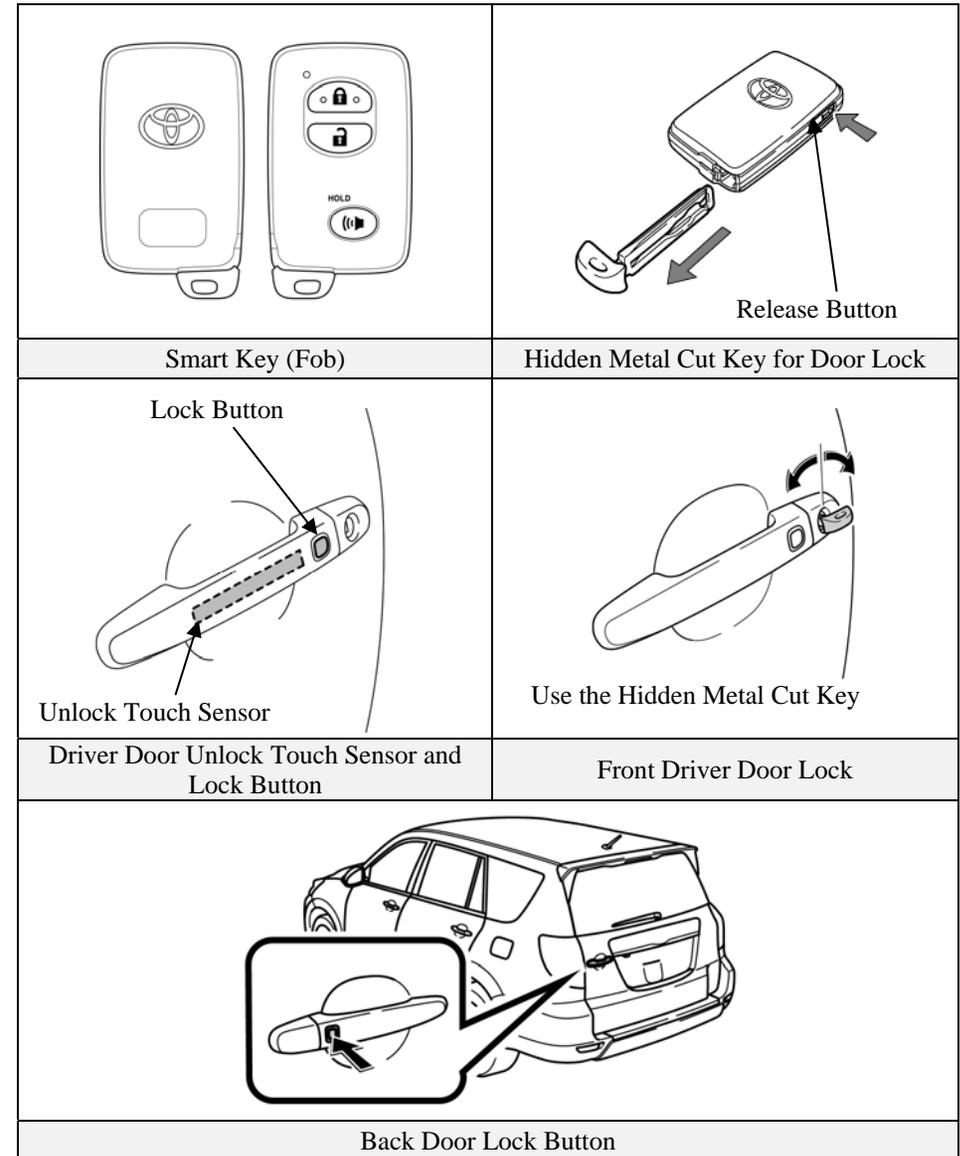
Smart key features:

- Passive (remote) function to lock/unlock the doors and start the vehicle.
- Wireless transmitter buttons to lock/unlock all 5 doors.
- Hidden metal cut key to lock/unlock the doors.

### Door (Lock/Unlock)

There are several methods available to lock/unlock the doors.

- Pushing the smart key lock button will lock all the doors including the back door. Pushing the smart key unlock button once unlocks the driver door, twice unlocks all doors.
- Touching the unlock touch sensor on the backside of the driver door exterior handle, with the smart key in close proximity to the vehicle, unlocks the driver door. Touching the unlock touch sensor on the backside of the front passenger door exterior handle, with the smart key in close proximity to the vehicle, unlocks all the doors. Pushing the lock button on either front door will lock all the doors, or pushing the back door lock button will lock all doors.
- Inserting the hidden metal cut key in the driver door lock and turning it clockwise once unlocks the driver door, twice unlocks all doors. To lock all doors turn the key counterclockwise once. Only the driver door contains an exterior door lock for the metal cut key.



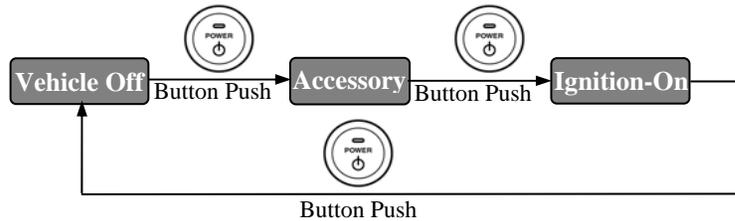
## Smart Key System (Continued)

### Vehicle Starting/Stopping

The smart key has replaced the conventional metal cut key, and the power button with an integrated status indicator light has replaced the ignition switch. The smart key only needs to be in proximity to the vehicle to allow the system to function.

- With the brake pedal released, the first push of the power button operates the accessory mode, the second push operates the ignition-on mode, and the third push turns the ignition off again.

Ignition Mode Sequence (brake pedal released):



- Starting the vehicle takes priority over all other ignition modes and is accomplished by depressing the brake pedal and pushing the power button once. To verify the vehicle has started, check that the power button status indicator light is off and the **READY** indicator is illuminated in the instrument cluster.
- If the internal smart key battery is dead, use the following method to start the vehicle.
  - Touch the Toyota emblem side of the smart key to the power button.
  - Within the 10 seconds after the buzzer sounds, push the power button with the brake pedal depressed (the **READY** indicator will illuminate).
- Once the vehicle has started and is on and operational (**READY-ON**), the vehicle is shut off by bringing the vehicle to a complete stop and then depressing the power button once.
- To shut off the vehicle before coming to a stop in an emergency, push and hold down the power button for more than 2 seconds or push the power button 3 times or more in a row. This procedure may be useful at an accident scene in which the **READY** indicator is on, Park (P) cannot be selected, and the drive wheels remain in motion.

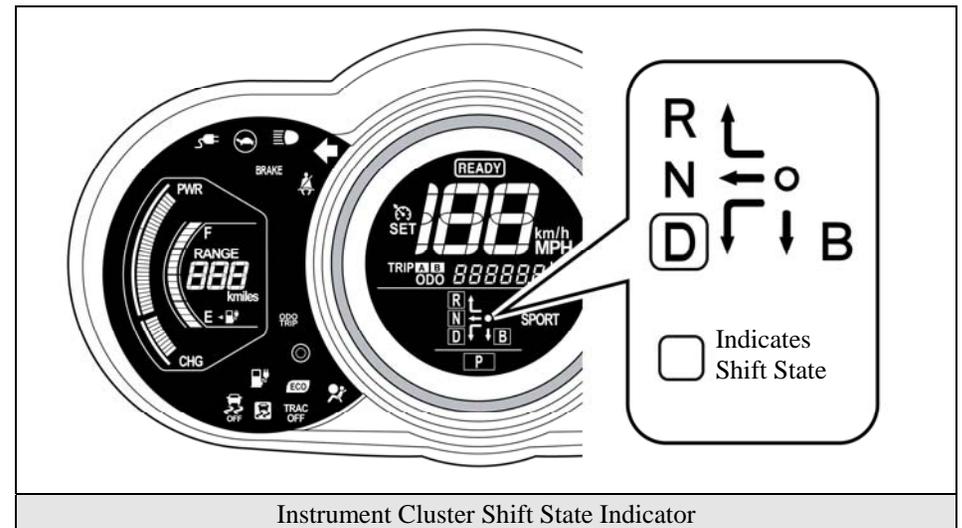
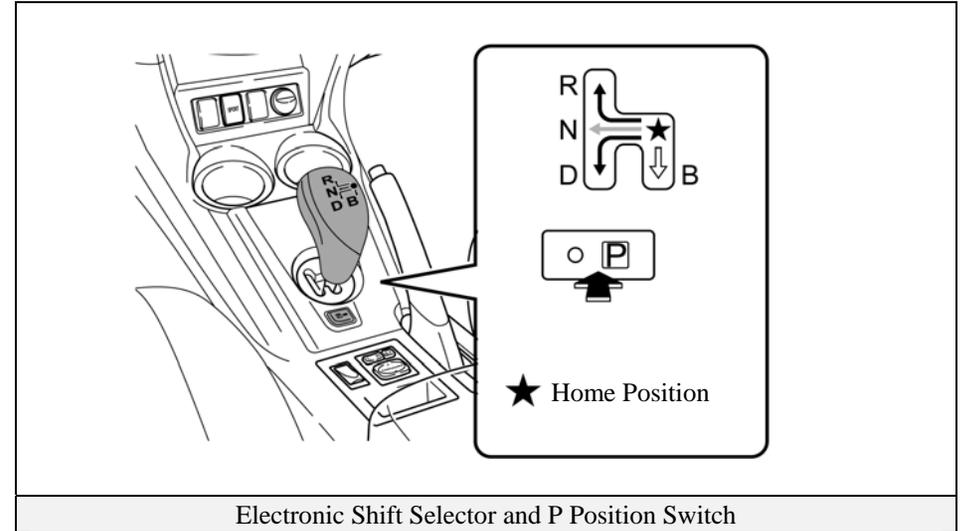
Ignition Mode	Power Button Indicator Light
Off	Off
Accessory	Amber
Ignition-On	Amber
Brake Pedal Depressed	Green
Vehicle Started (READY-ON)	Off
Malfunction	Blinking Amber

<p>Power Button with Integrated Status Indicator Light</p>	<p>Ignition Modes (Brake Pedal Released)</p>
<p>Starting Sequence (Brake Pedal Depressed)</p>	<p>Smart Key Recognition (When Smart Key Battery is Dead)</p>

## Electronic Shift Selector

The RAV4 EV electronic shift selector is a momentary select shift-by-wire system that can be used to select the reverse (R), neutral (N), drive (D) or brake (B) states.

- These states may only be selected while the vehicle is on and operational (**READY-ON**), except for neutral (N), which may also be selected while in the ignition-on mode. After reverse (R), neutral (N), drive (D), or brake (B) is selected, the transaxle remains in that state, identified on the instrument cluster, but the shift selector returns to the home position. To select neutral (N), it is necessary to hold the shift selector in the N position for approximately 0.5 seconds.
- Unlike a conventional vehicle, the electronic shift selector does not contain a park (P) position. Instead, a separate P position switch located behind the shift selector selects park (P).
- When the vehicle is stopped, regardless of shift state, pressing the P position switch or pressing the power button to shut off the vehicle engages the p-lock actuator to lock the transaxle into park (P).
- Being electronic, the shift selector and park (P) systems depend on the low voltage 12 Volt auxiliary battery for power. If the 12 Volt auxiliary battery is discharged or disconnected, the vehicle cannot be started and cannot be shifted into or out of park (P). The vehicle can be shifted into or out of park (P) by reconnecting the auxiliary battery, jump starting the vehicle (refer to page 36), or performing the manual override (refer to page 34).



## Electric Vehicle Operation

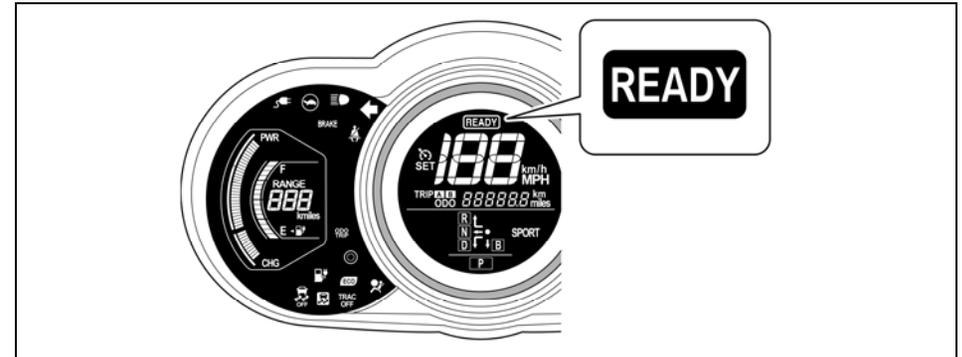
Once the **READY** indicator is illuminated in the instrument cluster, the vehicle may be driven. However, as there is no gasoline engine, no sound will be produced from the vehicle. It is important to recognize and understand the **READY** indicator provided in the instrument cluster. When lit, it informs the driver that the vehicle is on and operational even though the motor compartment is silent.

### Vehicle Operation

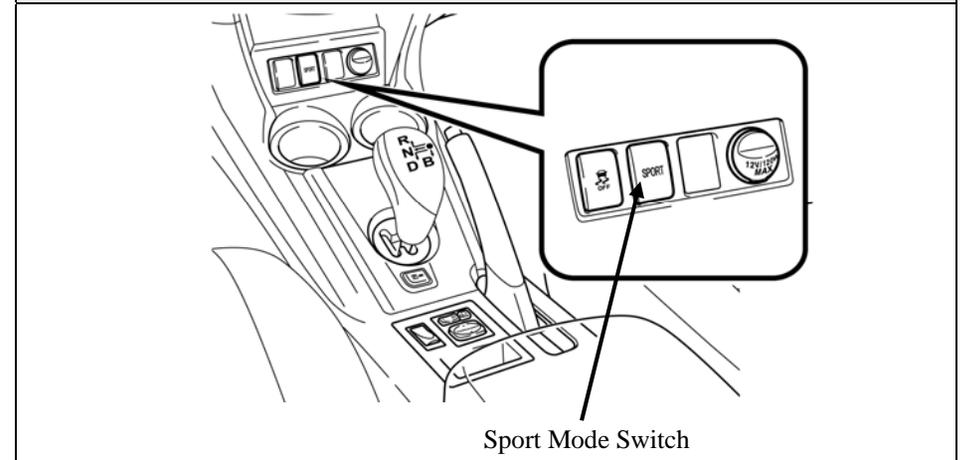
- With the RAV4 EV, the system is operational while the **READY** indicator is on.
- Never assume that the vehicle is shut off just because the motor compartment is silent. Always look for the **READY** indicator status. The vehicle is shut off when the **READY** indicator is off.
- The vehicle computer determines the mode in which the vehicle operates. The RAV4 EV features normal mode and sport mode.
  1. Normal Mode: Creates a balance between maximum vehicle performance and driving range.
  2. Sport Mode: When activated, Sport mode optimizes acceleration feel by increasing the power output more quickly at the beginning of accelerator pedal operation.

### Vehicle Proximity Notification System

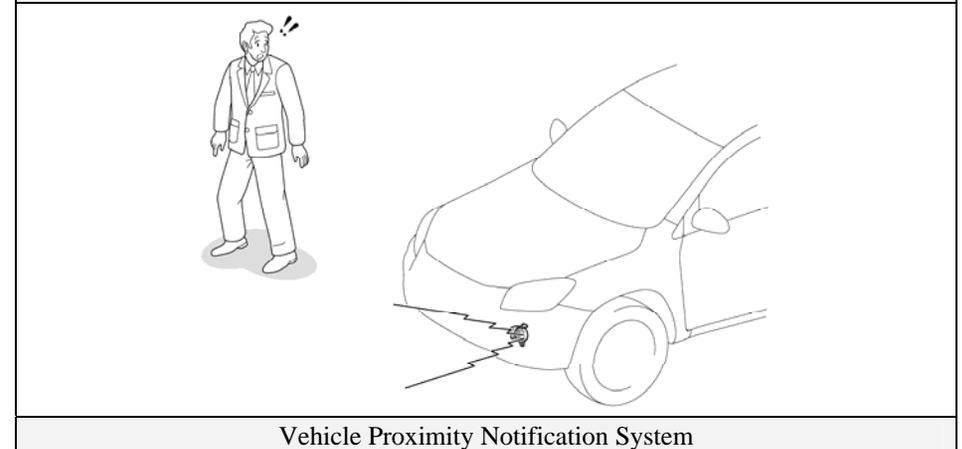
A new feature on the 2012 RAV4 EV is the vehicle proximity notification system that emits a sound when the vehicle is driven at speeds less than 16 mph (25 km/h). The sound is intended to notify pedestrians that the vehicle is approaching.



Instrument Cluster **READY** Indicator



Sport Mode Switch



Vehicle Proximity Notification System

## Electric Vehicle (EV) Battery Assembly

The RAV4 EV features a high voltage Electric Vehicle (EV) battery assembly that contains sealed Lithium-ion (Li-ion) battery cells.

### EV Battery Assembly

- The EV battery assembly is enclosed in a metal case and is rigidly mounted under the floor. The metal case is isolated from high voltage.
- The EV battery assembly consists of low voltage (3.6 Volt) Li-ion battery cells connected in a series-parallel circuit to produce approximately 230 to 386 Volts. Each cell is non-spillable and contained in a sealed metal case.
- The electrolyte used in the Li-ion battery cells is a flammable organic electrolyte. The electrolyte is absorbed into the battery cell separator and will not normally leak, even in a collision.

EV Battery Assembly	
Battery assembly voltage	230 to 386 V
Number of Li-ion battery cells in the battery	-
Li-ion battery cell voltage	3.6 V
Li-ion battery cell dimensions Diameter x Height	0.71 x 2.56 in. (18 x 65 mm)
Li-ion cell weight	Approximately 0.1 lbs (46.5 g)
Li-ion battery assembly dimensions	74 x 57 x 11 in. (1876 x 1454 x 270 mm)
Li-ion battery assembly weight	845 lbs (383.5 kg)

### Components Powered by the EV Battery Assembly

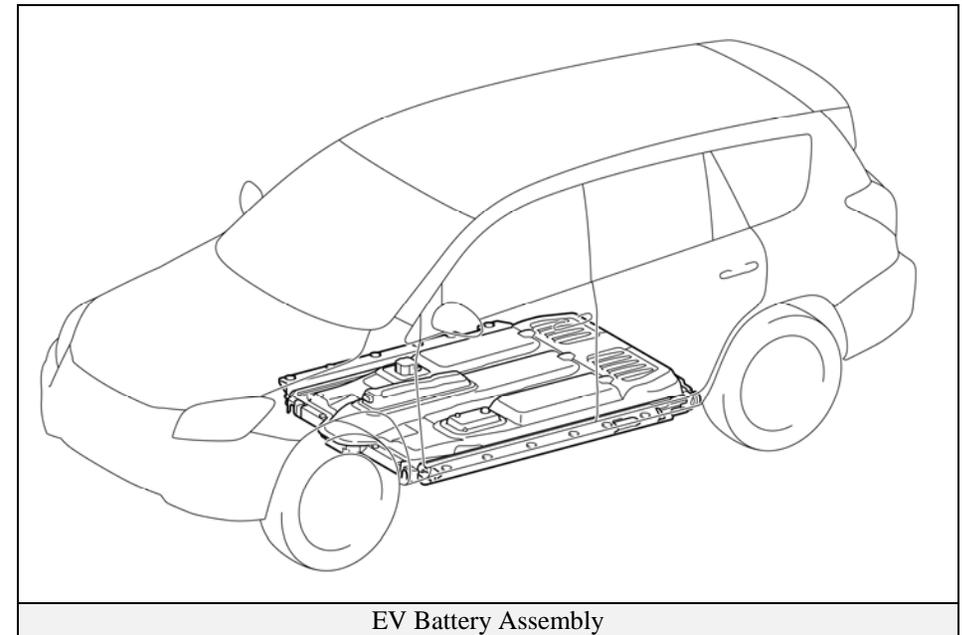
- Inverter
- Power Cables
- DC/DC Converter for 12 V Auxiliary Battery
- A/C Compressor
- Cabin Coolant Heater
- Battery Coolant Heater

### EV Battery Assembly Recovery

- If recovery of the EV battery assembly is necessary, please contact:

United States: (800) 331-4331

Canada: (888) TOYOTA 8 [(888) 869-6828]



## Plug-in Charging System

The plug-in charging system uses an on-board charger to convert AC power supplied via the charge cable assembly to DC power that can be used to charge the EV battery assembly. The charging system uses refined charging control to ensure battery durability and prevent fires due to overcharging.

The external power supplied by the charge cable assembly is converted by the onboard charger assembly to the approximately 230 to 386 Volts DC used to charge the EV battery assembly.

### Safety Concerns

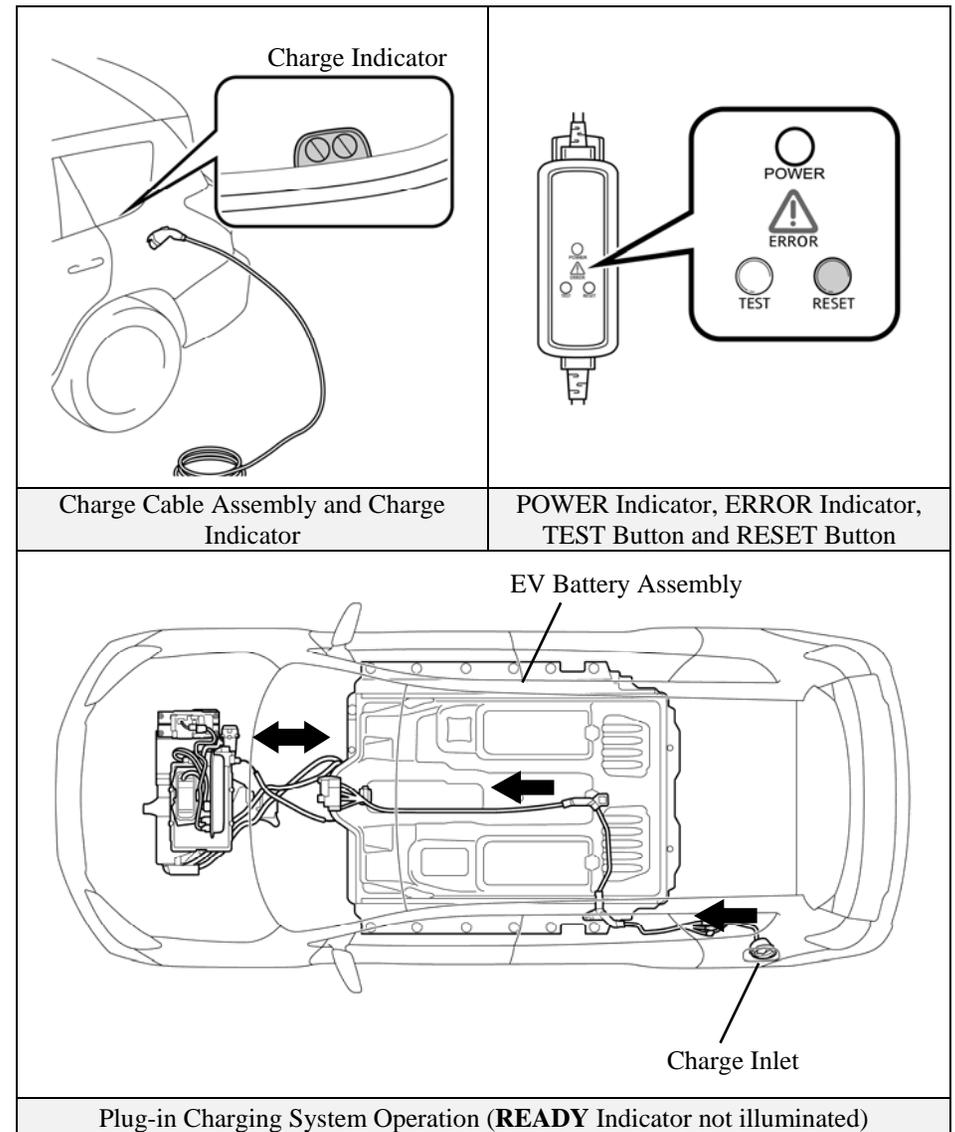
Since the operation of the plug-in charging system allows high voltage electrical flow when the vehicle is shut off, it is important to recognize how the system is activated, deactivated, and disabled.

### System Activation:

The following steps provide a simplified explanation on how to charge the vehicle.

1. Confirm that the vehicle is off and in park (P).
2. Connect the charge cable assembly to a suitable 120/240 Volt external power outlet.
3. Confirm the presence of power and test the CCID (Charging Circuit Interrupter Device).
4. Connect the charge cable assembly to the vehicle charge inlet connector.
5. Confirm that the vehicle's charge indicator illuminates.

When charging, the high voltage cables are energized. External power flows from the charge inlet, its voltage is then boosted and it is provided to the EV battery assembly, cabin coolant heater, battery coolant heater and A/C compressor. Charging normally completes within 40 hours (when charging at 120 Volt / 15 Amp) or 6 hours (when charging at 240 Volt / 40 Amp) from a fully discharged state and will stop automatically.



## Plug-in Charging System (Continued)

### System Deactivation:

The following steps explain how to stop charging.

1. Disconnect the charge cable assembly connector from the vehicle. To disconnect it, push the lock release button on the top of the connector and pull it away from the vehicle.
2. Close the charge inlet cap and charge inlet door.
3. Disconnect the plug of the charge cable assembly from the electrical outlet.

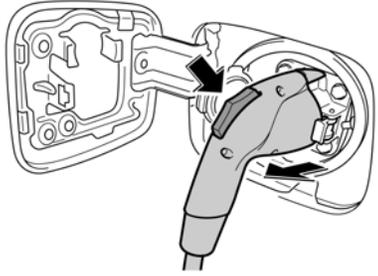
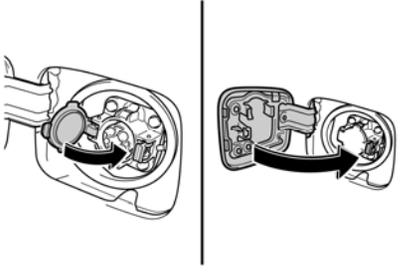
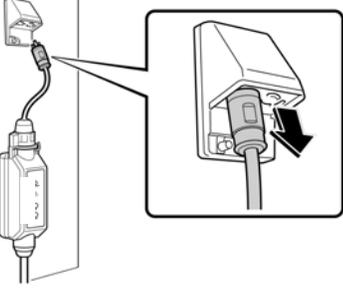
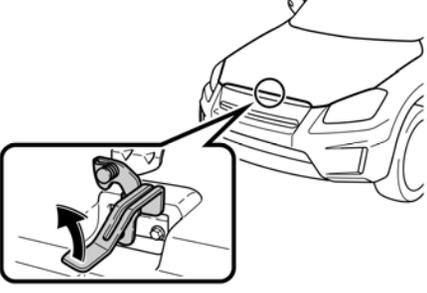
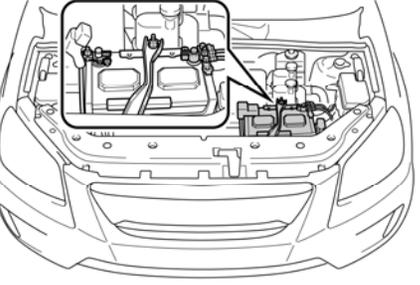
When the charging system is deactivated, high voltage cables are de-energized and the high voltage electrical flow stops in the charge cable assembly and vehicle.

### **⚠️ WARNING:**

*The high voltage system, including the charging system, may remain powered for up to 10 minutes after the vehicle is shut off, disabled, or charging stops. To prevent serious injury or death from severe burns or electric shock, avoid touching, cutting, or breaching any orange high voltage power cables or high voltage components.*

### System Disabling:

To disable the charging system, disconnect the 12 Volt auxiliary battery after performing the above deactivation procedure.

	
<p>Disconnect Charge Cable Connector</p>	<p>Close Charge Inlet Cap and Charge Inlet Door</p>
	
<p>Disconnect Plug</p>	<p>Remote Hood Release</p>
	
<p>Hood Latch Release</p>	<p>12 V Auxiliary Battery Mounted in Motor Compartment</p>

## Remote Climate Control System

The remote climate control system is provided to enhance occupant comfort by heating or cooling the vehicle interior while the vehicle is shut off and the remaining charge level of the EV battery assembly is greater than 50%.

The remote climate control system is similar to a remote engine start system used in a conventional gasoline vehicle to precondition the vehicle interior while the vehicle is parked. To heat or cool the vehicle interior, the RAV4 EV utilizes power from the EV battery assembly to operate the high voltage A/C compressor and/or the cabin coolant heater. The system can be set to turn on according to a navigation schedule or can be turned on remotely using a smart phone.

### Safety Concerns

Since the operation of the remote climate control system allows high voltage electrical flow, it is important to recognize how the system is activated, deactivated, and disabled.

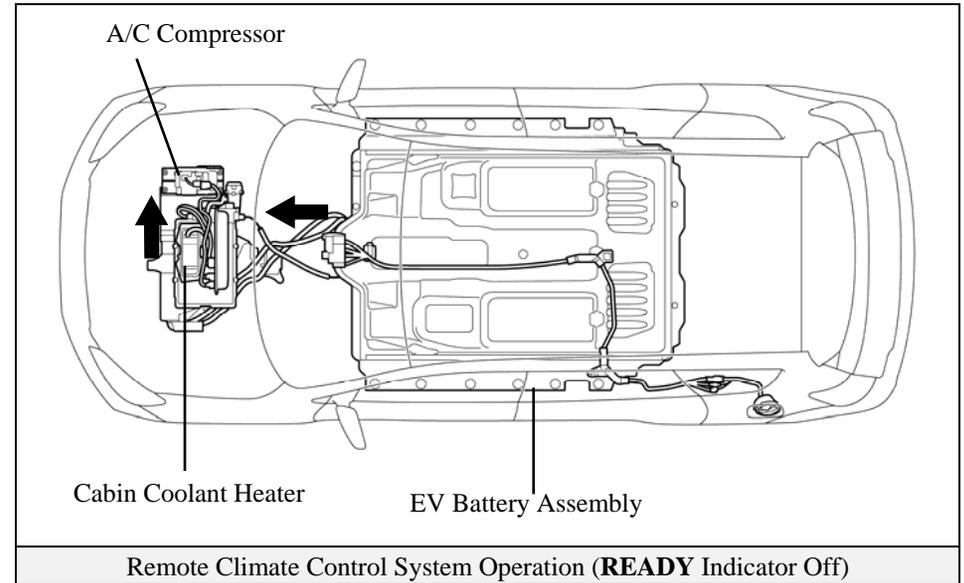
### System Activation:

When the remote climate control system is activated, the high voltage cables are energized. High voltage flows from the EV battery assembly to the A/C compressor and/or the cabin coolant heater. The system can operate when all of the following operating conditions are met:

- The remaining charge level of the battery is greater than 50%.
- All doors and hood are closed.
- The vehicle Power switch is off.
- The brake pedal is not being depressed.
- The shift position is park (P).
- There is no malfunction in high voltage system.

The following points can be used to confirm that the remote climate control system is operating:

- Air is flowing from the interior vehicle vents, and blower fan noise, cooling fan noise or compressor noise is heard.
- The instrument cluster lights are on, the **READY** indicator is off, and all of the conditions in the preceding list are met.



## Remote Climate Control System (Continued)

### System Deactivation:

When the system is deactivated, the air conditioning system stops. The system is deactivated when any one of the following conditions occurs:

- When the system has operated for more than about 15 minutes.
- The ignition mode changed to Accessory, Ignition-On or READY-ON.
- When a door is opened, the hood is opened, or the brake pedal is depressed.
- A stop request is received from a smart phone.
- A shift position other than park (P) is selected.
- When the operating conditions are not met.
- A malfunction is detected in the high voltage system.

### **WARNING:**

*The high voltage system, including the charging system, may remain powered for up to 10 minutes after the vehicle is shut off, disabled, charging stops, or the remote climate control system stops. To prevent serious injury or death from severe burns or electric shock, avoid touching, cutting, or breaching any orange high voltage power cable or high voltage component.*

### System Disabling:

To disable the remote climate control system, first shut off the vehicle by pushing the power button if necessary and ensuring that the **READY** indicator and instrument cluster lights are off. Second, disconnect the 12 Volt auxiliary battery.

# Low Voltage Battery

## Auxiliary Battery

- The RAV4 EV contains a sealed lead-acid 12 Volt battery. This 12 Volt auxiliary battery powers the vehicle electrical system similar to a conventional vehicle. As with other conventional vehicles, the negative terminal of the auxiliary battery is grounded to the metal chassis of the vehicle.
- The auxiliary battery is located in the motor compartment.

**NOTE:**

An under hood label shows the location of the EV battery assembly (traction battery) and 12 Volt auxiliary battery.

Pull Hood Release	Hood Latch Release			
12 V Auxiliary Battery Mounted in Motor Compartment (Driver Side)				
<table border="1"> <tr> <td data-bbox="1150 1094 1255 1273"> </td> <td data-bbox="1255 1094 1411 1273"> <p><b>BATTERY LOCATION</b></p> <p>This vehicle has two types of battery:</p> <p>① Lithium Ion Battery (Traction Battery)</p> <p>② Lead Acid Battery (Auxiliary Battery for accessories, lights, etc.)</p> </td> <td data-bbox="1411 1094 1591 1273"> <p><b>EMPLACEMENT DES BATTERIES</b></p> <p>Ce véhicule est équipé deux types de batteries:</p> <p>① Batterie au lithium (batterie de traction)</p> <p>② Batterie à acide et plomb (Batterie auxiliaire pour les feux, les accessoires, etc.)</p> </td> </tr> </table>			<p><b>BATTERY LOCATION</b></p> <p>This vehicle has two types of battery:</p> <p>① Lithium Ion Battery (Traction Battery)</p> <p>② Lead Acid Battery (Auxiliary Battery for accessories, lights, etc.)</p>	<p><b>EMPLACEMENT DES BATTERIES</b></p> <p>Ce véhicule est équipé deux types de batteries:</p> <p>① Batterie au lithium (batterie de traction)</p> <p>② Batterie à acide et plomb (Batterie auxiliaire pour les feux, les accessoires, etc.)</p>
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Battery Location Label				

## High Voltage Safety

The EV battery assembly powers the high voltage electrical system with DC electricity. Positive and negative orange colored high voltage power cables are routed from the EV battery assembly, under the vehicle floor pan, to the drive unit (inverter and motor) and DC/DC converter. The inverter contains a circuit that boosts and inverts the 230 to 386 Volts DC from the EV battery assembly to 450 Volts AC to power the motor. Power cables are routed from the DC/DC converter (HV junction block) to each high voltage component (A/C compressor, battery coolant heater and cabin coolant heater). The following systems are intended to help keep occupants in the vehicle and emergency responders safe from high voltage electricity:

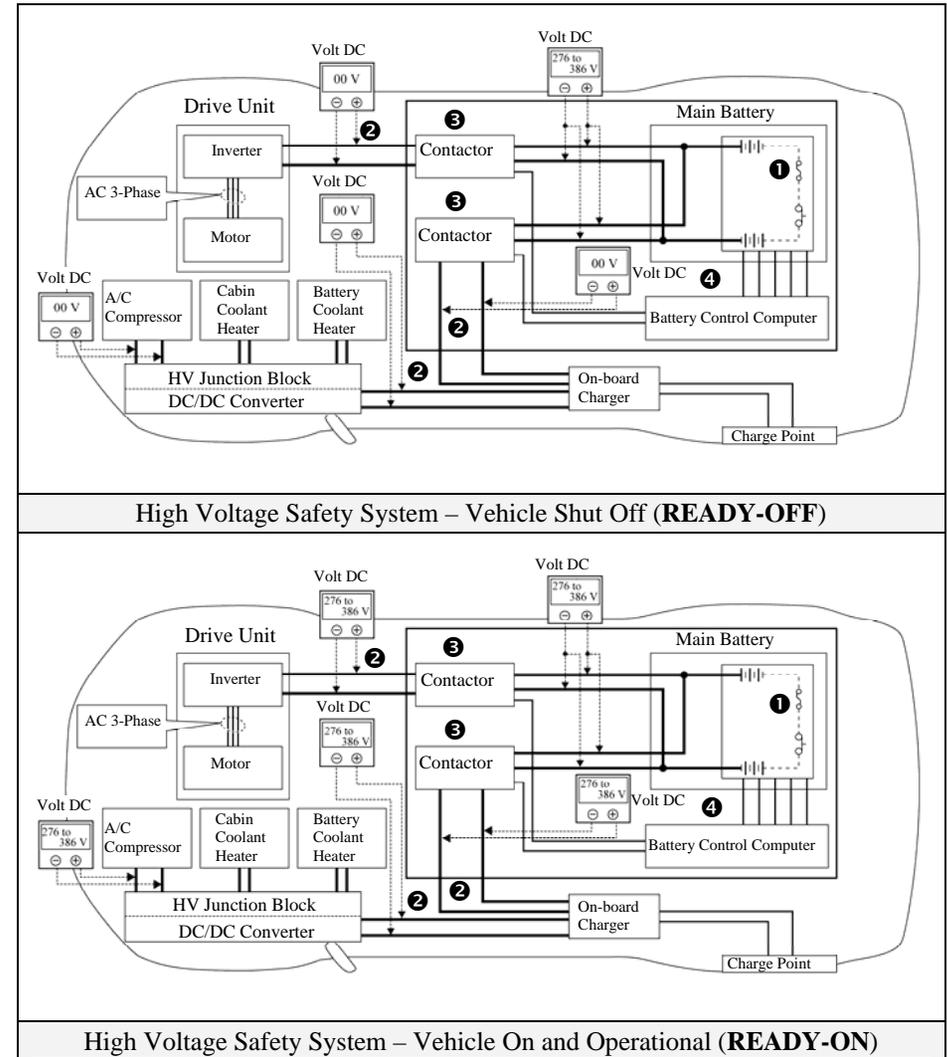
### High Voltage Safety System

- High voltage fuses ❶ provide short circuit protection in the EV battery assembly.
- Positive and negative high voltage power cables ❷ connected to the EV battery assembly are controlled by a 12 Volt contactor ❸. When the vehicle is shut off and not charging, the contactor stop electricity flow from the EV battery assembly.

#### ⚠️WARNING:

The high voltage system, including the charging system, may remain powered for up to 10 minutes after the vehicle is shut off, disabled, or charging stops. To prevent serious injury or death from severe burns or electric shock, avoid touching, cutting, or breaching any orange high voltage power cables or high voltage components.

- Both positive and negative power cables ❷ are insulated from the metal body. High voltage electricity flows through these cables and not through the metal vehicle body. The metal vehicle body is safe to touch because it is insulated from the high voltage components.
- The battery control computer ❹ continuously monitors for high voltage leakage to the metal chassis while the vehicle is running. If a malfunction is detected, the battery control computer ❹ will illuminate the master warning light ⚠️ in the instrument cluster and indicate “Check EV System” on the multi-information display.



## Plug-in Charging Safety

The EV battery assembly can be charged using power from an external power source. AC power is supplied to the charge inlet by the charge cable assembly and sent to the on-board charger. The charger boosts AC input voltage and converts to DC output voltage (230 to 386 Volts DC) for the EV battery assembly. The EV battery assembly communicates with the charger to regulate charging profile. To provide information about charging, the battery control computer illuminates the charge indicator located in the driver side rear quarter window during charging. When charging completes, EV battery contactors is opened to stop charging system high voltage power flow.

The following systems are intended to help keep vehicle occupants and emergency responders safe from high voltage electricity:

### Plug-in Charging System Safety System

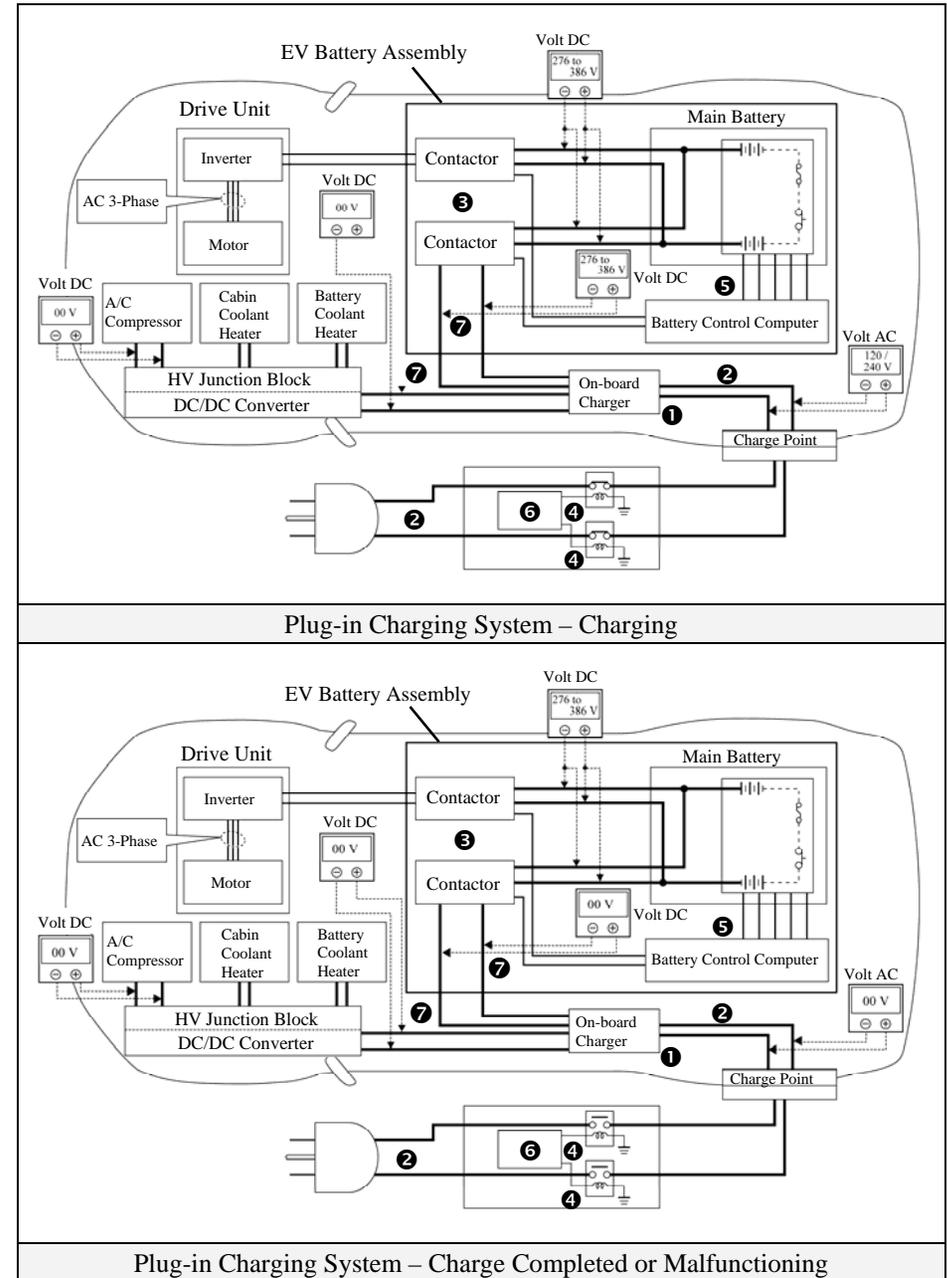
- The battery control computer monitors the charging system based on information from various sensors. If the battery control computer detects a malfunction, charging is stopped, contactor is opened, and the charge indicator flashes quickly to indicate the presence of the malfunction.

#### **WARNING:**

*The high voltage system, including the charging system, may remain powered for up to 10 minutes after the vehicle is shut off, disabled, or charging stops. To prevent serious injury or death from severe burns or electric shock, avoid touching, cutting, or breaching any orange high voltage power cables or high voltage components.*

## Plug-in Charging Safety (Continued)

- The AC cables ② are connected to the on-board charger. The high voltage DC power cables from the on-board charger ① are connected to the EV battery assembly and are controlled by a 12 Volt contactor ③ and AC leakage cut relays ④. When charging is not being performed, the contactor ③ stops electrical flow from the EV battery assembly to the charger assembly, and the AC leakage cut relays in the CCID (Charging Circuit Interrupter Device) ④ stop the supply of external power to the vehicle.
- Both the high voltage power cables ⑦ and the AC cables ② are insulated from the metal body. High voltage electricity flows through these cables and not through the metal vehicle body. The metal vehicle body is safe to touch because it is insulated from the high voltage components.
- The battery control computer ⑤ and the ground fault monitor ⑥ continuously monitor for high voltage leakage to the metal chassis while the vehicle is charging. If a malfunction is detected, the CCID will illuminate its error light ⚠.
- The CCID contains a POWER indicator, an ERROR indicator ⚠, a TEST button, and a RESET button. When the charge cable assembly is connected to a 120/240 Volt external power source, the POWER indicator illuminates. The TEST and RESET buttons function like a conventional residential GFCI (Ground Fault Circuit Interrupter). Pushing the TEST button opens the CCID relays, and pushing the RESET button resets the circuit.



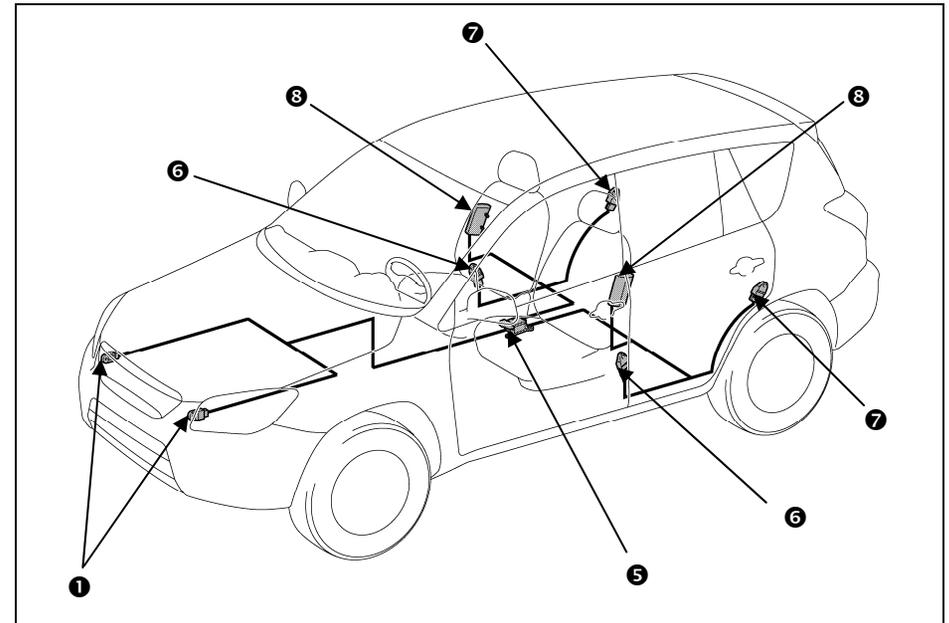
## SRS Airbags & Seat Belt Pretensioners

### Standard Equipment

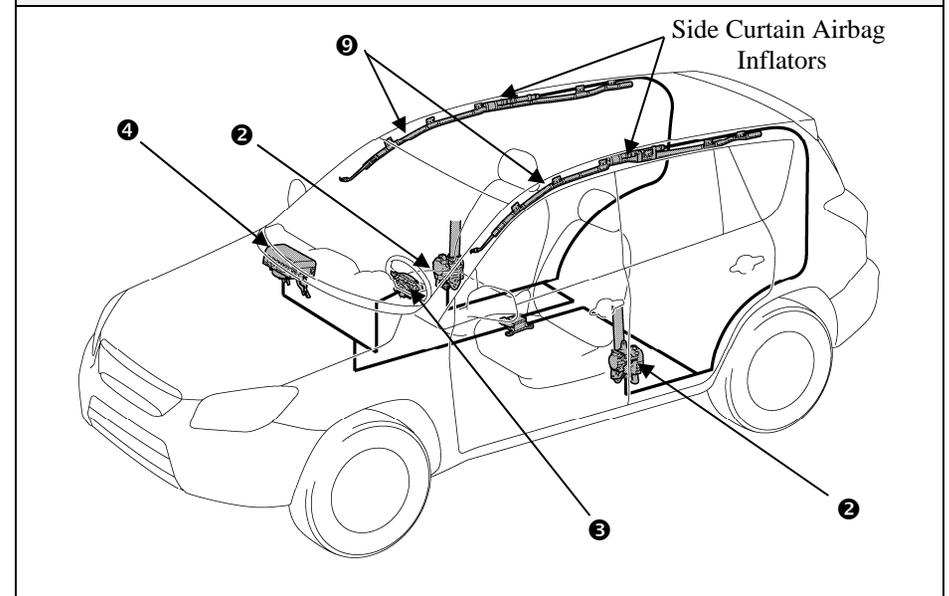
- Electronic frontal impact sensors (2) are mounted in the motor compartment ① as illustrated.
- Front seat belt pretensioners are mounted near the base of the B-pillars. ②
- A frontal dual stage driver airbag ③ is mounted in the steering wheel hub.
- A frontal dual stage passenger airbag ④ is integrated into the dashboard and deploys through the top of the dashboard.
- The SRS computer ⑤, which contains an impact sensor and a rollover sensor, is mounted on the floor pan underneath the center console.
- Front electronic side impact sensors (2) are mounted near the base of the B-pillars. ⑥
- Rear electronic side impact sensors (2) are mounted near the base of the C-pillars. ⑦
- Front seat side airbags ⑧ are mounted in the front seatbacks.
- Side curtain airbags ⑨ are mounted along the outer edge inside the roof rails.

### WARNING:

*The SRS may remain powered for up to 90 seconds after the vehicle is shut off or disabled. To prevent serious injury or death from unintentional SRS deployment, avoid breaching the SRS components.*



Electronic Impact Sensors and Side Airbags



Standard Frontal Airbags, Seat Belt Pretensioners, Side Curtain Airbags

## SRS Airbags & Seat Belt Pretensioners (Continued)

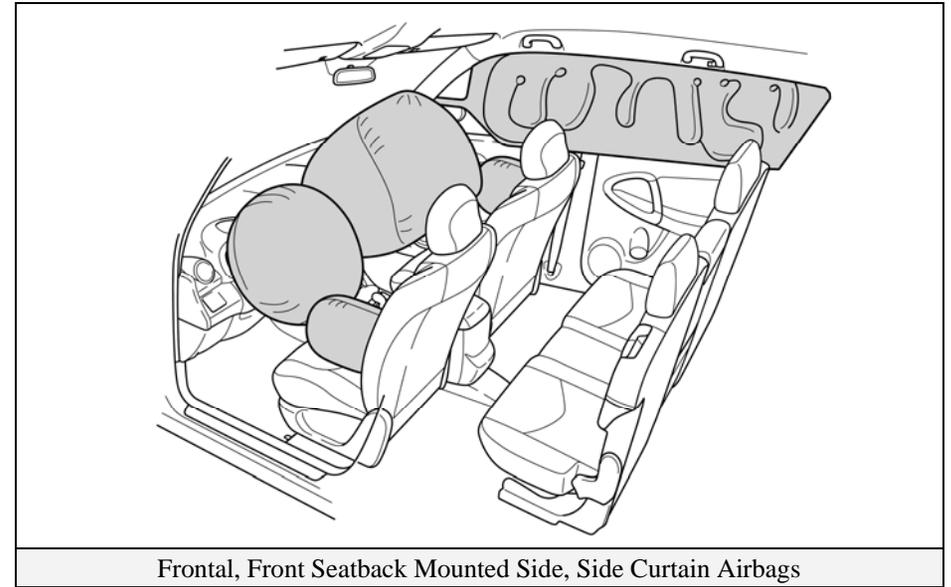
### Standard Equipment (Continued)

**NOTE:**

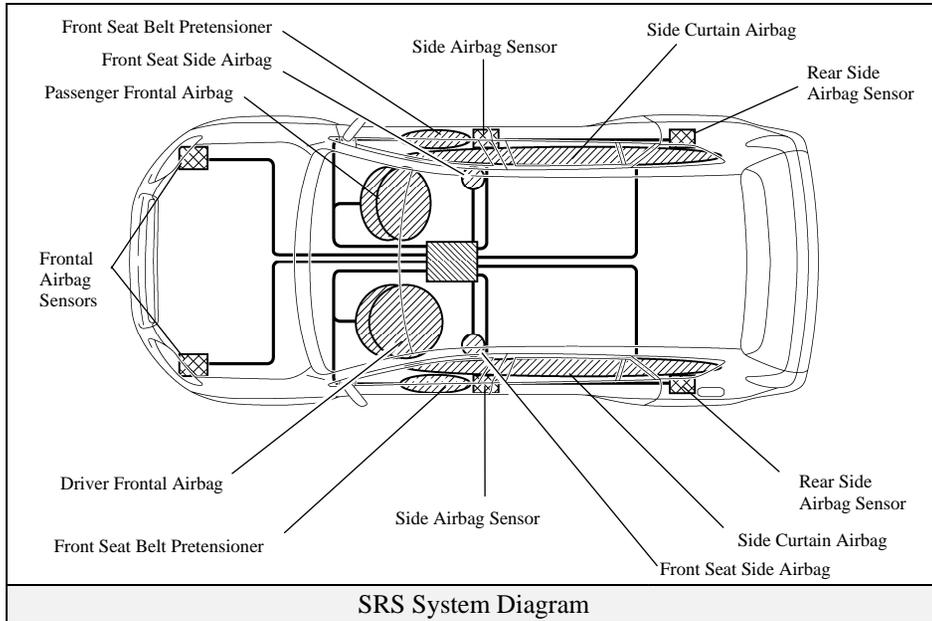
The front seatback mounted side airbags and the side curtain airbags may deploy independently of each other.

The RAV4 EV is equipped with a standard front passenger occupant classification system that may prohibit the deployment of the front passenger frontal airbag and seat belt pretensioner. If the front passenger occupant classification system prohibits deployment during an SRS event, the front passenger SRS will not re-arm nor deploy.

Electronic side impact sensors are installed near the base of the B-pillar and C-pillar to aid in side collision detection accuracy.



Frontal, Front Seatback Mounted Side, Side Curtain Airbags



SRS System Diagram

## Emergency Response

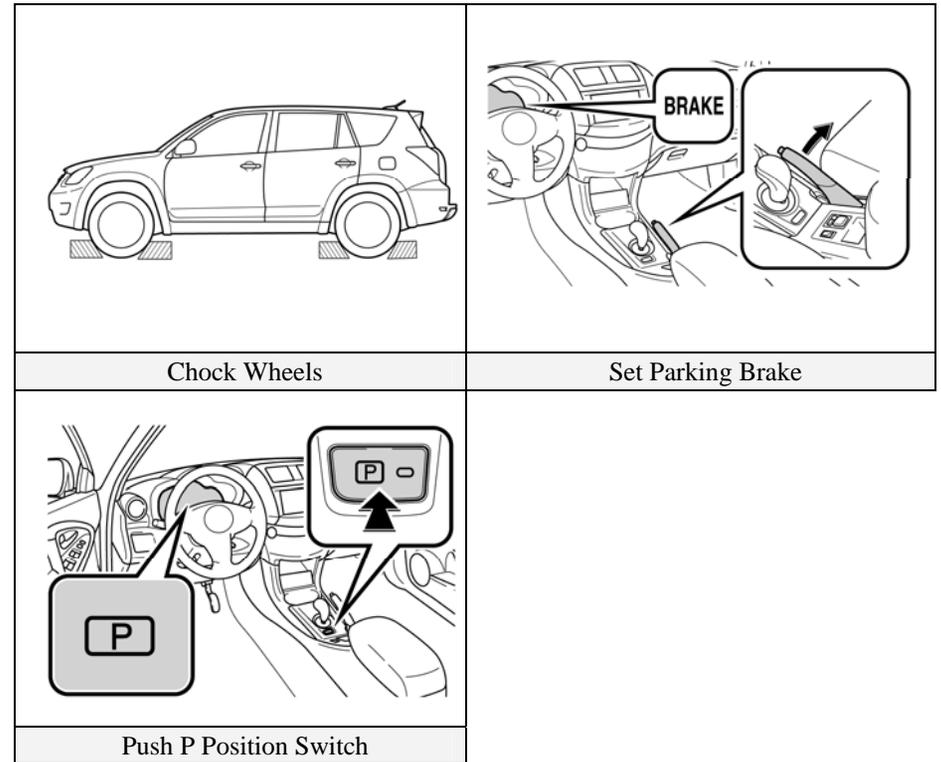
On arrival, emergency responders should follow their standard operating procedures for vehicle incidents. Emergencies involving the RAV4 EV may be handled like other automobiles except as noted in these guidelines for Extrication, Fire, Overhaul, Recovery, Spills, First Aid and Submersion.

### ⚠ WARNING:

- *Never assume the RAV4 EV is shut off simply because it is silent.*
- *Always observe the instrument cluster for the **READY** indicator status to verify whether the vehicle is on or shut off. The vehicle and remote climate control system are shut off when the **READY** indicator is off and the instrument cluster lights are out.*
- *Failure to shut off and disable the vehicle before emergency response procedures are performed may result in serious injury or death from unintentional deployment of the SRS or severe burns and electric shock from the high voltage electrical system.*

### Extrication

- Immobilize Vehicle  
Chock the wheels and set the parking brake.  
Push the P position switch to engage park (P).



## Emergency Response (Continued)

### Extrication (Continued)

- Disable Vehicle

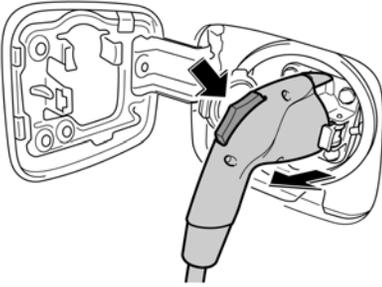
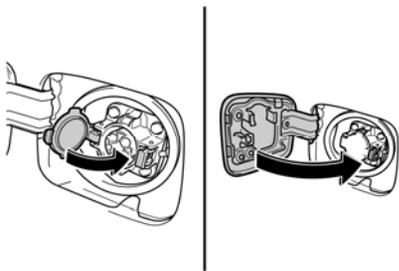
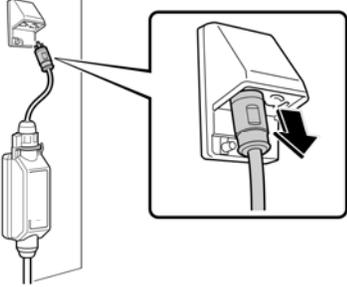
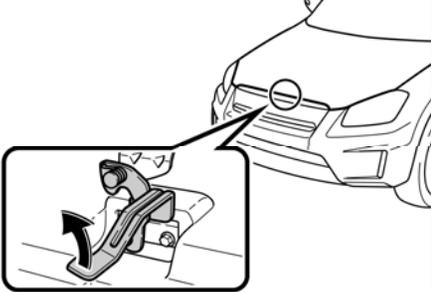
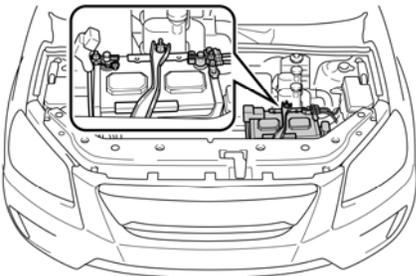
**Perform these steps first if the charge cable assembly is connected to the vehicle.**

1. Disconnect the charge cable assembly connector from the vehicle. To disconnect it, push the lock release button on the top of the connector and pull it away from the vehicle.
2. Close the charge inlet cap and charge inlet door.
3. Disconnect the plug of the charge cable assembly from the electrical outlet.

Performing either of the following two procedures will shut the vehicle off and disable the EV battery assembly, SRS and remote climate control system.

#### Procedure #1

1. Confirm the status of the **READY** indicator in the instrument cluster.
2. If the **READY** indicator is illuminated, the vehicle is on and operational. Shut off the vehicle by pushing the power button once.
3. The vehicle is already shut off if the instrument cluster lights and the **READY** indicator are not illuminated. Do **not** push the power button because the vehicle may start.
4. If the smart key is easily accessible, keep it at least 16 feet (5 meters) away from the vehicle.
5. If the smart key cannot be found, disconnect the 12 Volt auxiliary battery in the motor compartment to prevent accidental restarting of the vehicle.

	
<p>Disconnect Charge Cable Connector</p>	<p>Close Charge Inlet Cap and Charge Inlet Door</p>
	
<p>Disconnect Plug</p>	<p>Shut Off Vehicle (<b>READY-OFF</b>)</p>
	
<p>Hood Latch Release</p>	<p>12 V Auxiliary Battery Mounted in Motor Compartment</p>

## Emergency Response (Continued)

### Extrication (Continued)

#### Procedure #2 (Alternate if power button is inaccessible)

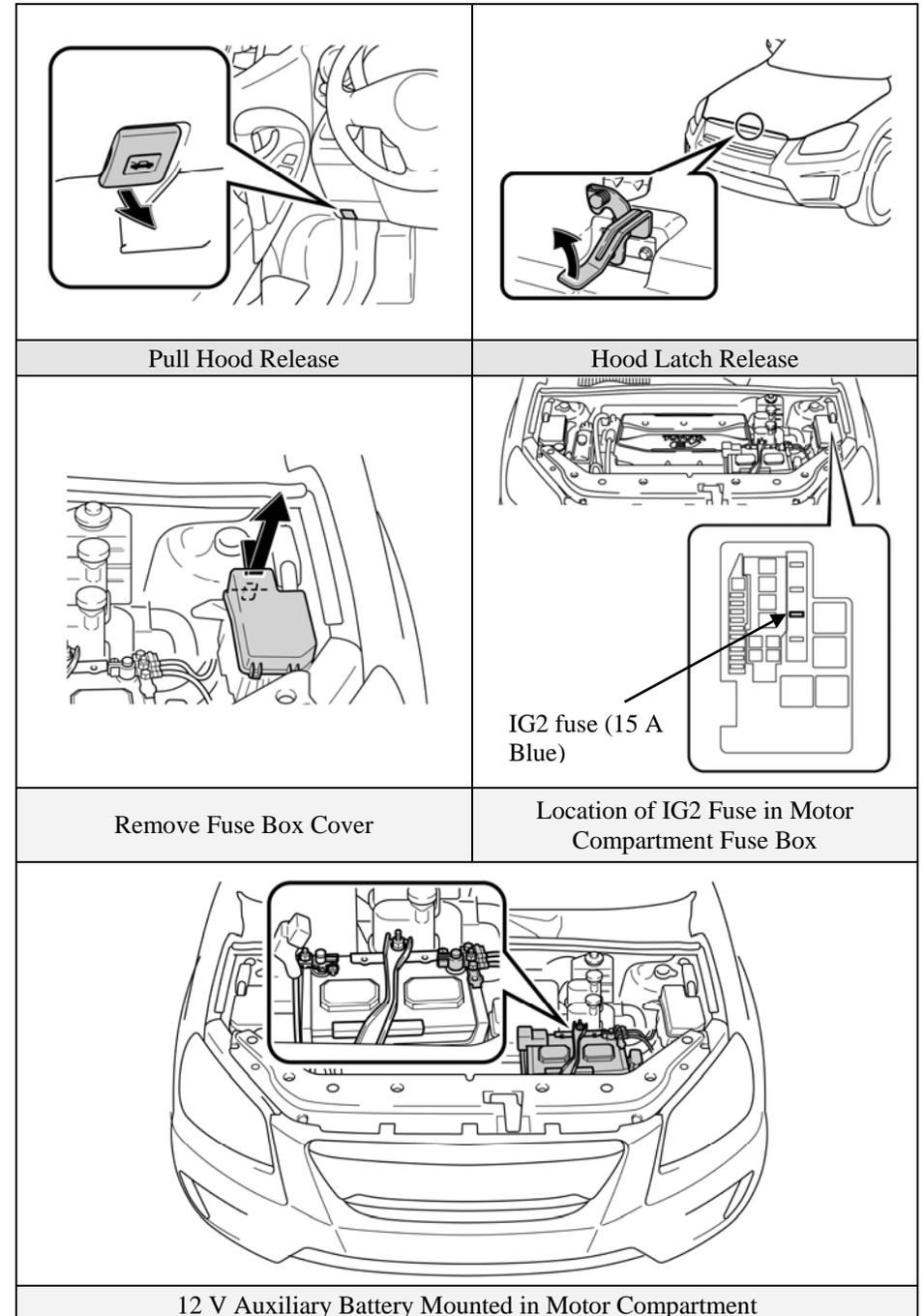
1. Open the hood.
2. Remove the fuse box cover.
3. Remove the **IG2** fuse (15 A blue colored) in the motor compartment fuse box (refer to illustration). If the correct fuse cannot be recognized, pull all fuses in the fuse box.
4. Disconnect the 12 Volt auxiliary battery located in the motor compartment.

#### NOTE:

Before disconnecting the 12 Volt auxiliary battery, if necessary, lower the windows and unlock the doors as required. Once the 12 Volt auxiliary battery is disconnected, power controls will not operate.

#### WARNING:

- *The high voltage system, including the charging system, may remain powered for up to 10 minutes after the vehicle is shut off, disabled, or charging stops. To prevent serious injury or death from severe burns or electric shock, avoid touching, cutting, or breaching any orange high voltage power cable or high voltage component.*
- *The SRS may remain powered for up to 90 seconds after the vehicle is shut off or disabled. To prevent serious injury or death from unintentional SRS deployment, avoid breaching the SRS components.*
- *If none of the disabling procedures can be performed, proceed with caution as there is no assurance that the high voltage electrical system or SRS are disabled.*



## Emergency Response (Continued)

### Extrication (Continued)

- Stabilize Vehicle

Crib at (4) points directly under the front and rear pillars.

Do not place cribbing under the high voltage power cables or EV battery assembly.

NOTE:

The RAV4 EV is equipped with a tire pressure warning system that by design prevents pulling the metal valve stem with integral transmitter from the wheel. Snapping the valve stem with pliers or removing the valve cap and valve core will release the air in the tire.

- Access Patients

Glass Removal

Use normal glass removal procedures as required.

SRS Awareness

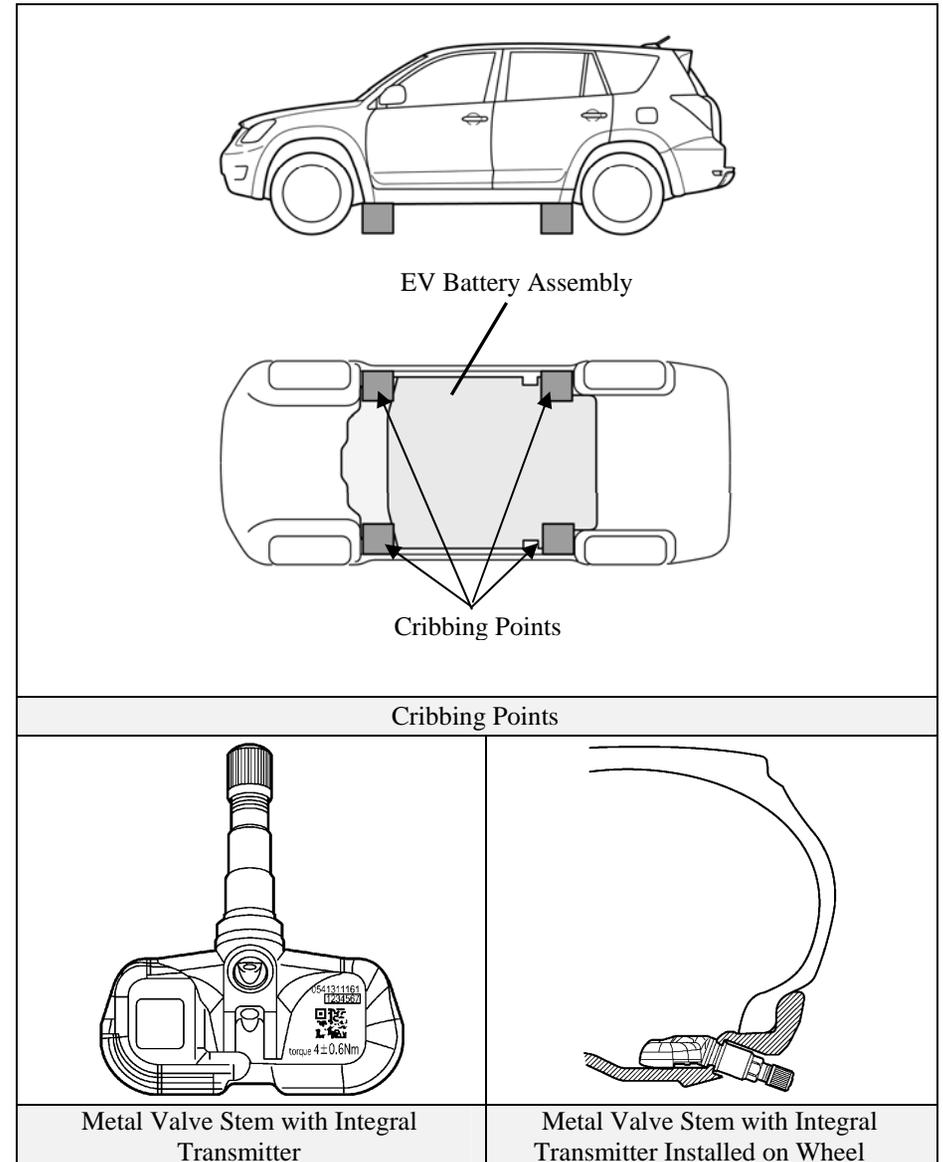
Responders need to be cautious when working in close proximity to undeployed airbags and seat belt pretensioners. Frontal dual stage airbags automatically ignite both stages within a fraction of a second.

Door Removal/Displacement

Doors can be removed by conventional rescue tools such as hand, electric, and hydraulic tools. In certain situations, it may be easier to pry back the vehicle body to expose and unbolt the hinges.

NOTE:

To prevent accidental airbag deployment when performing front door removal/displacement, ensure the vehicle is shut off and the 12 Volt auxiliary battery is disconnected.



## Emergency Response (Continued)

### Extrication (Continued)

#### Roof Removal

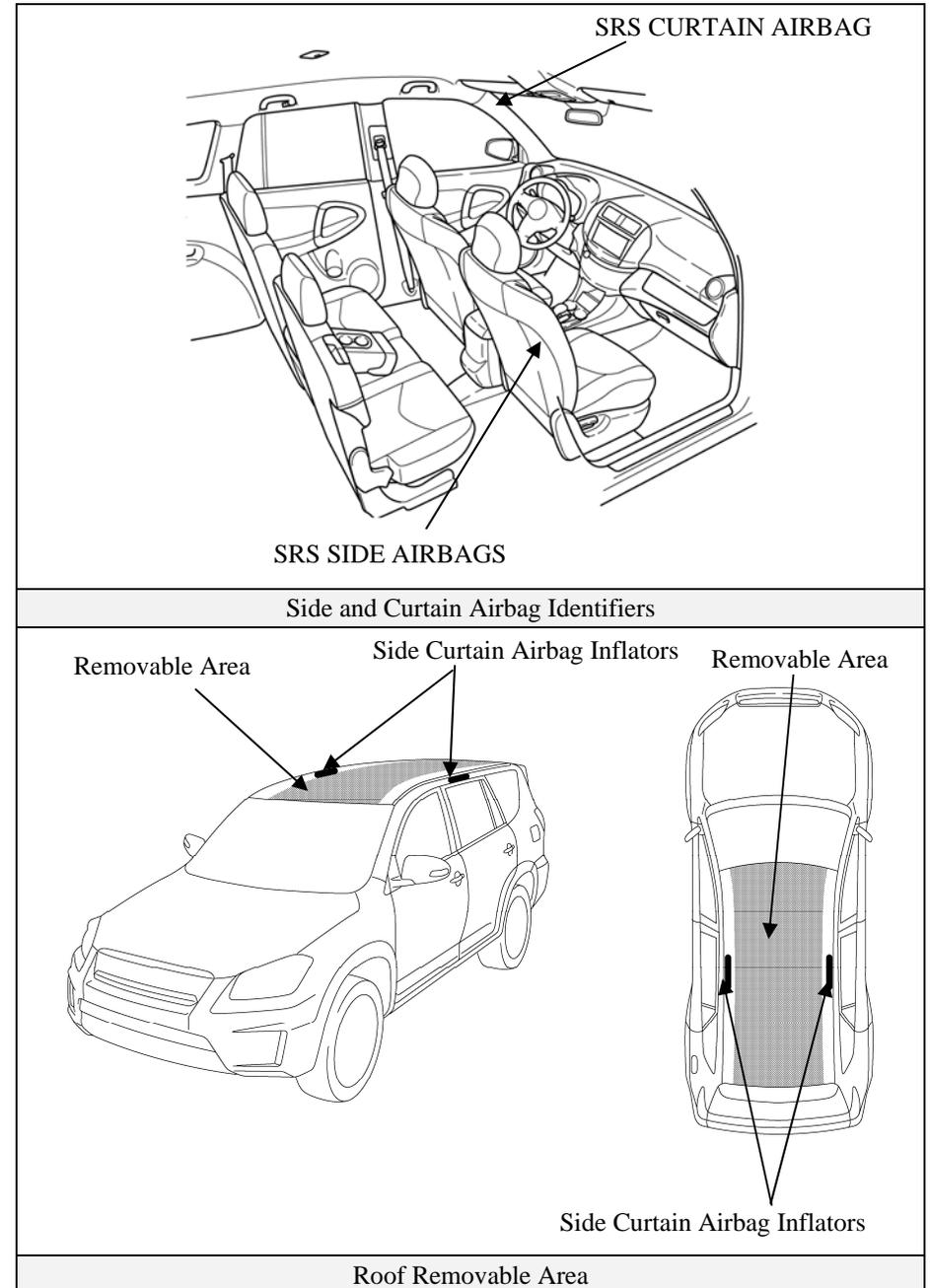
The RAV4 EV is equipped with side curtain airbags. When undeployed, total roof removal is not recommended. Patient access through the roof can be performed by cutting the roof center section inboard of the roof rails as illustrated. This would avoid breaching the side curtain airbags, inflators, and wiring harness.

#### NOTE:

The side curtain airbags may be identified as illustrated on this page (additional component details on page 21).

#### Dash Displacement

The RAV4 EV is equipped with side curtain airbags. When undeployed, total roof removal is not recommended to avoid breaching the side curtain airbags, inflators, and wiring harness. As an alternative, dash displacement may be performed by using a Modified Dash Roll.



## Emergency Response (Continued)

### Extrication (Continued)

#### NOTE:

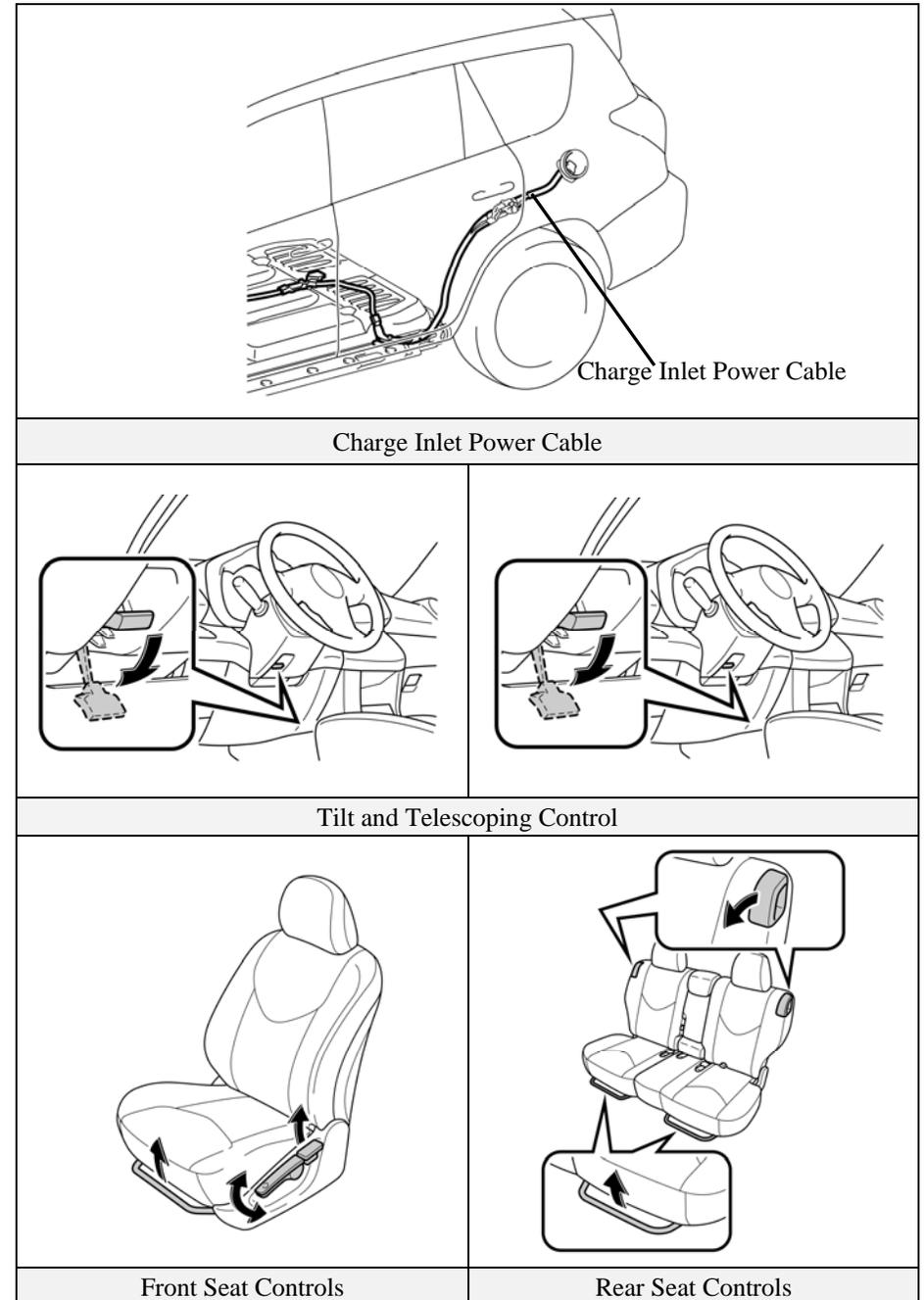
The RAV4 EV has an orange charge inlet power cable that is energized during charging. The charge inlet power cable is routed behind the rear quarter panel and along the middle of the EV battery assembly.

#### Rescue Lift Air Bags

Responders should not place cribbing or rescue lift air bags under the high voltage power cables or the EV battery assembly.

#### Repositioning Steering Wheel, Front and Rear Seats

Tilt and telescopic steering wheel and seat controls are shown in the illustrations.

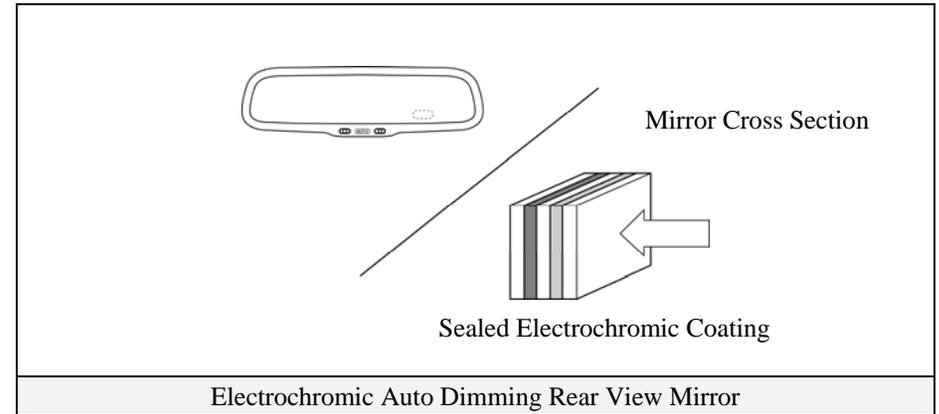


## Emergency Response (Continued)

### Extrication (Continued)

**NOTE:**

The RAV4 EV has an electrochromic auto dimming rear view mirror. The mirror contains a minimal amount of transparent gel sealed between two glass plates that will not normally leak.



## Emergency Response (Continued)

### Fire

Approach and extinguish a fire using proper vehicle fire fighting practices as recommended by NFPA, IFSTA, or the National Fire Academy (USA).

- **Extinguishing Agent**  
Water has been proven to be a suitable extinguishing agent.
- **Initial Fire Attack**  
Perform a fast, aggressive fire attack.  
Divert the runoff from entering watershed areas.  
Attack teams may not be able to identify a RAV4 EV until the fire has been knocked down and overhaul operations have commenced.
- **Fire When Vehicle Charging**  
When extinguishing a fire when charging, the vehicle and charge cable assembly may come in contact with water. As soon as possible, shut off the power to the electrical outlet before disconnecting the charge cable assembly. Perform the charge cable assembly disconnection procedure contained in the Extrication section on page 24.
- **Fire in the EV Battery Assembly**  
Should a fire occur in the Li-ion EV battery assembly, attack crews should utilize a water stream or fog pattern to extinguish any fire within the vehicle *except* for the EV battery assembly.

### **WARNING:**

- *The Li-ion battery electrolyte is a flammable organic electrolyte that is damaging to human tissues. To avoid injury by coming in contact with the electrolyte, wear proper personal protective equipment.*
- *Burning batteries may irritate the eyes, nose, and throat. To prevent injury, wear personal protective equipment suitable for organic solvents including SCBA.*
- *The battery cells are contained within a metal case and accessibility is limited.*
- *To avoid serious injury or death from severe burns or electric shock, **never** breach or remove the high voltage battery assembly cover under any circumstance including fire.*
- *To prevent serious injury or death, shut off the utility circuit supplying power to the charge cable assembly before disconnecting it if the CCID or charge cable assembly are submerged in water.*

When allowed to burn themselves out, the RAV4 EV Li-ion battery cells burn rapidly and are reduced to a combination of ashes and metal components.

#### *Offensive Fire Attack*

Normally, flooding a Li-ion EV battery assembly with copious amounts of water at a safe distance will effectively control the EV battery assembly fire by cooling the adjacent Li-ion battery cells to a point below their ignition temperature. The remaining cells on fire, if not extinguished by the water, will burn themselves out.

However, flooding the RAV4 EV EV battery assembly is *not* recommended due to the battery case design and location preventing the responder from properly applying water through the available vent openings safely. Therefore, it is recommended that the incident commander allow the RAV4 EV EV battery assembly to burn itself out.

## Emergency Response (Continued)

### Fire (Continued)

#### *Defensive Fire Attack*

If the decision has been made to fight the fire using a defensive attack, the fire attack crew should pull back a safe distance and allow the Li-ion battery cells to burn themselves out. During this defensive operation, fire crews may utilize a water stream or fog pattern to protect against the risk of exposure or to control the path of smoke.

### Overhaul

During overhaul, immobilize and disable the vehicle if not already done. Refer to illustrations on page 23, 24 and 25. The EV battery assembly cover should *never* be breached or removed under any circumstances including fire. Doing so may result in severe electrical burns, shock, or electrocution.

- Immobilize Vehicle

Chock the wheels and set the parking brake.  
Push the P position switch to engage park (P).

- Disable Vehicle

**Perform these steps first if the charge cable assembly is connected to the vehicle.**

1. Disconnect the charge cable assembly connector from the vehicle. To disconnect it, push the lock release button on the top of the connector and pull it away from the vehicle.
2. Close the recharge inlet cap and charge inlet door.
3. Disconnect the plug of the charge cable assembly from the electrical outlet.

Performing either of the following two procedures will shut the vehicle off and disable the EV battery assembly, SRS and remote climate control system.

#### **Procedure #1**

1. Confirm the status of the **READY** indicator in the instrument cluster.
2. If the **READY** indicator is illuminated, the vehicle is on and operational. Shut off the vehicle by pushing the power button once.

3. The vehicle is already shut off if the instrument cluster lights and the **READY** indicator are not illuminated. Do **not** push the power button because the vehicle may start.
4. If the smart key is easily accessible, keep it at least 16 feet (5 meters) away from the vehicle.
5. If the smart key cannot be found, disconnect the 12 Volt auxiliary battery in the motor compartment to prevent accidental restarting of the vehicle.

#### **Procedure #2 (Alternate if power button is inaccessible)**

1. Open the hood.
2. Remove the fuse box cover.
3. Remove the **IG2** fuse (15 A blue colored) in the motor compartment fuse box as illustrated on page 25. If the correct fuse cannot be recognized, pull all fuses in the fuse box.
4. Disconnect the 12 Volt auxiliary in the motor compartment.

#### NOTE:

Before disconnecting the 12 Volt auxiliary battery, if necessary, lower the windows and unlock the doors as required. Once the 12 Volt auxiliary battery is disconnected, power controls will not operate.

#### **WARNING:**

- *The high voltage system, including the charging system, may remain powered for up to 10 minutes after the vehicle is shut off, disabled, or charging stops. To prevent serious injury or death from severe burns or electric shock, avoid touching, cutting, or breaching any orange high voltage power cable or high voltage component.*
- *The SRS may remain powered for up to 90 seconds after the vehicle is shut off or disabled. To prevent serious injury or death from unintentional SRS deployment, avoid breaching the SRS components.*
- *If none of the disabling procedures can be performed, proceed with caution as there is no assurance that the high voltage electrical system, SRS, recharging or remote climate control system are disabled.*

## Emergency Response (Continued)

### Recovering of Li-ion EV Battery Assembly

For information regarding recovery of the EV battery assembly, contact:

United States: (800) 331-4331

Canada: (888) TOYOTA 8 [(888) 869-6828]

### Spills

The RAV4 EV contains some of the same common automotive fluids used in other non-electric Toyota vehicles, with the exception of the Li-ion electrolyte used in the EV battery assembly. The electrolyte used in the Li-ion battery cells is a flammable organic electrolyte. The electrolyte is absorbed into the battery cell separators, even if the battery cells are crushed or cracked, it is unlikely that liquid electrolyte will leak. Any liquid electrolyte that leaks from a Li-ion battery cell quickly evaporates.

#### **WARNING:**

- *The Li-ion battery contains organic electrolyte. Only a small amount may leak from the batteries which may irritate the eyes, nose, throat, and skin.*
- *Contact with the vapor produced by the electrolyte may irritate the nose and throat.*
- *To avoid injury by coming in contact with the electrolyte or vapor, wear personal protective equipment for organic electrolyte including SCBA or protective mask for organic gases.*

In an emergency, the Li-ion battery part number G9280-0R010 manufacturer's Product Safety Data Sheet (PSDS) is available by contacting:

United States: CHEMTREC at (800) 424-9300

Canada: CANUTEC at \*666 or (613) 996-6666 (collect)

- Handle Li-ion electrolyte spills using the following Personal Protective Equipment (PPE):
  - Splash shield or safety goggles. Fold down helmet shields are not acceptable for electrolyte spills.
  - Rubber gloves or gloves suitable for organic solvents.
  - Apron suitable for organic solvents.

Rubber boots or boots suitable for organic solvents.

Protective mask for organic gases or SCBA

- Absorbent
  - Suitable absorbent for an organic solvent.

### First Aid

Emergency responders may not be familiar with Li-ion electrolyte exposure when rendering aid to a patient. Exposure to the electrolyte is unlikely except in a catastrophic crash or through improper handling. Utilize the following guidelines in the event of exposure.

- Wear Personal Protective Equipment (PPE)
  - Splash shield or safety goggles. Fold down helmet shields are not acceptable for electrolyte spills.
  - Rubber gloves or gloves suitable for organic solvents.
  - Apron suitable for organic solvents.
  - Rubber boots or boots suitable for organic solvents.
  - Protective mask for organic gases or SCBA
- Absorption
  - Perform gross decontamination by removing affected clothing and properly disposing of the garments.
  - Rinse the affected areas with water for 20 minutes.
  - Transport patients to the nearest emergency medical care facility.
- Inhalation in Non-Fire Situations
  - Contact with the vapor produced by the electrolyte may irritate the nose and throat. In severe cases such as confined spaces, move exposed patients to a well ventilated area.
  - Transport patients to the nearest emergency medical care facility.
- Inhalation in Fire Situations
  - Toxic gases are given off as by-products of combustion. All responders in the Hot Zone should wear the proper PPE for fire fighting including SCBA.
  - Move a patient from the hazardous environment to a safe area and administer oxygen.
  - Transport patients to the nearest emergency medical care facility.

## Emergency Response (Continued)

### First Aid (Continued)

- Ingestion
  - Do not induce vomiting, unless instructed by the doctor.
  - If vomiting occurs naturally, avoid aspiration.
  - Transport patients to the nearest emergency medical care facility.

### Submersion

A submerged electric vehicle does not have a high voltage potential on the metal vehicle body, and is safe to touch.

#### Access Patients

Responders can access the patient and perform normal extrication procedures. High voltage orange color coded power cables and high voltage components should never be touched, cut, or breached.

#### Vehicle Recovery

If a electric vehicle is fully or partially submerged in water, emergency responders may not be able to determine if the vehicle has been automatically disabled. The RAV4 EV may be handled by following these recommendations:

#### **Perform these steps first if the charge cable assembly is connected to the vehicle (see illustrations on page 24)**

1. Shut off the utility circuit supplying power to the charge cable assembly.
2. Disconnect the charge cable assembly connector from the vehicle. To disconnect it, push the lock release button on the top of the connector and pull it away from the vehicle.
3. Close the recharge inlet cap and charge inlet door.
4. Disconnect the plug of the charge cable assembly from the external power outlet.

5. Remove the vehicle from the water.
6. Drain the water from the vehicle if possible.
7. Follow the immobilizing and disabling procedure on page 23, 24 and 25.

#### NOTE:

If park (P) system related components are damaged due to submersion, it may not be possible to shift from park (P) to neutral (N). If this is the case, make sure to tow or move the vehicle with the front wheels off the ground.

#### **WARNING:**

*To prevent serious injury or death, shut off the utility circuit supplying power to the charge cable assembly before disconnecting it if the CCID or charge cable assembly are submerged in water.*

## Roadside Assistance

The RAV4 EV utilizes an electronic shift selector and a P position switch for selecting park (P). If the 12 Volt auxiliary battery is discharged or disconnected, the vehicle cannot be started nor can it be shifted out of park (P). If discharged, the 12 Volt auxiliary battery can be jump started to allow shifting out of park (P). Park lock manual override can be performed at the drive unit. Using a 6 mm socket, turn the bolt counterclockwise to disengage the park lock. Most other roadside assistance operations may be handled like conventional Toyota vehicles except as noted in the following pages.

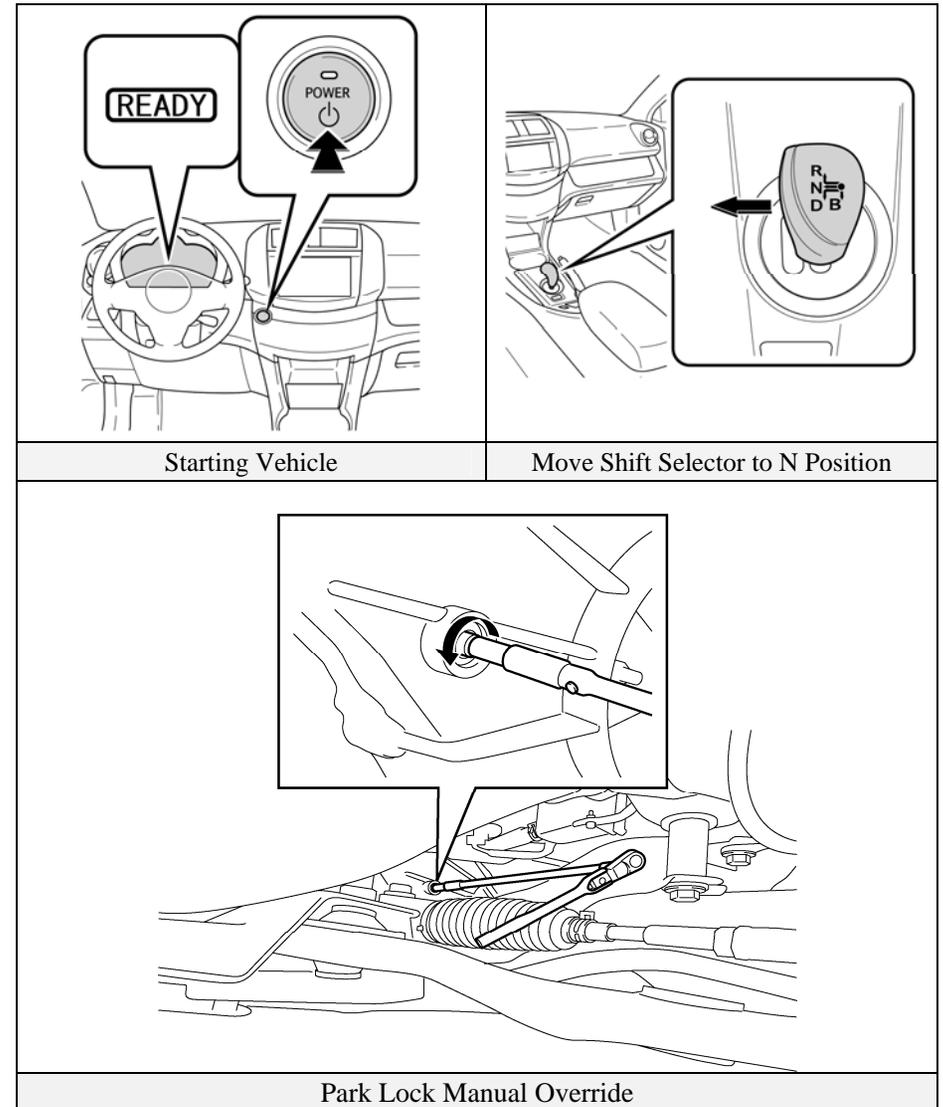
Toyota Roadside Assistance is available during the basic warranty period by contacting:

United States: (800) 255-3987, Canada: (800) 265-3987

### Towing

The RAV4 EV is a front wheel drive vehicle and it **must** be towed with the front wheels off the ground. Failure to do so may cause serious damage to Electric Vehicle components.

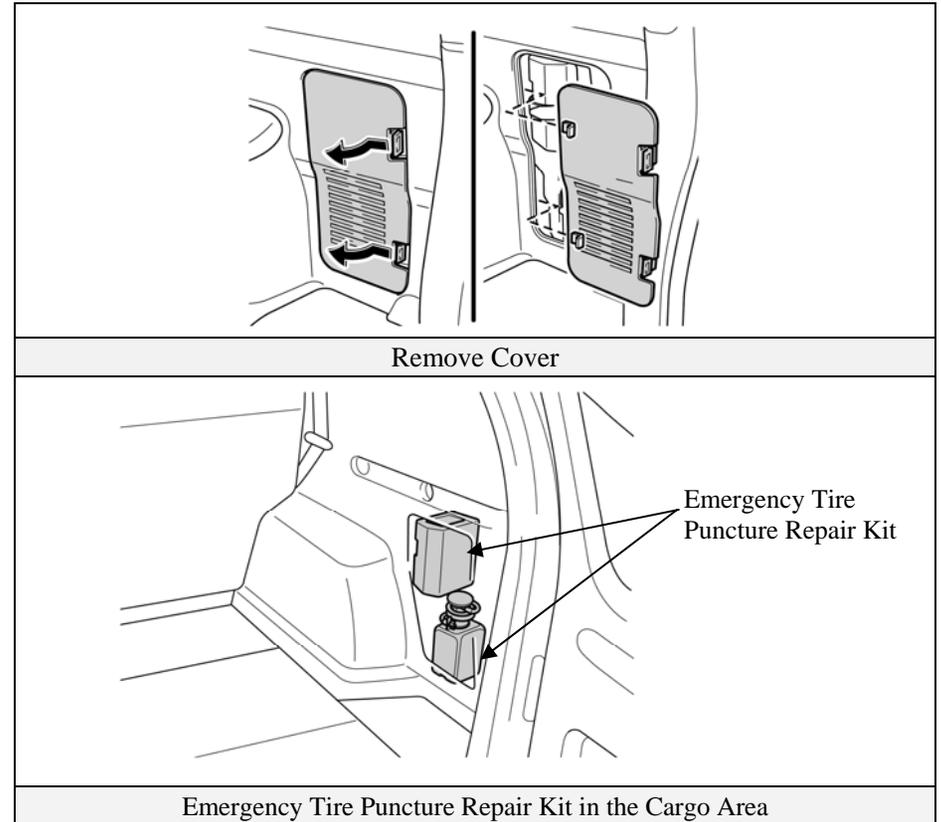
- A flat bed trailer is the preferred method of towing.
- The vehicle may be shifted out of park (P) into neutral (N) when in either ignition-on and **READY-ON** modes. To select neutral (N), it is necessary to hold the shift selector in the N position for approximately 0.5 seconds.
- If the 12 Volt auxiliary battery is discharged, the vehicle will not start and shifting out of park (P) is not possible. The vehicle can be shifted into or out of park (P) by reconnecting the auxiliary battery, jump starting the vehicle (refer to page 36), or performing the manual override.
- If a tow truck is not available, in an emergency the vehicle may be moved for short distances at low speeds (below 18 mph (30 km/h)).



## Roadside Assistance (Continued)

### Emergency Tire Puncture Repair Kit

The RAV4 EV does not contain a spare tire and tools, jack and towing eyelet. Instead, an emergency tire puncture repair kit is provided. It is located as shown in the illustration.



## Roadside Assistance (Continued)

### Jump Starting

The 12 Volt auxiliary battery may be jump started if the vehicle does not start and the instrument cluster gauges are dim or off after depressing the brake pedal and pushing the power button.

The 12 Volt auxiliary battery is located in the motor compartment.

- Open the hood.
- Connect the positive jumper cable to the positive terminal following the numbered sequence.
- Connect the negative jumper cable to the negative terminal following the numbered sequence.
- Place the smart key in proximity to the interior of the vehicle, depress the brake pedal and push the power button.

#### NOTE:

If the vehicle does not recognize the smart key after connecting the booster battery to the vehicle, open and close the driver door when the vehicle is shut off.

If the smart key internal battery is dead, touch the Toyota emblem side of the smart key to the power button during the start sequence. See the instructions and illustrations on page 9 for more details.

- The high voltage EV battery assembly cannot be jump started.

### Immobilizer

The RAV4 EV is equipped with a standard immobilizer system.

- The vehicle can be started only with a registered smart key.

