



Nissan LEAF

First Responder's Guide



Zero Emission

Foreword

This manual describes first response operations and related warnings and cautions for this vehicle.

This vehicle is an electrically driven car equipped with a high voltage battery pack. Improper rescue techniques may result in death or serious personal injury.

Please read this manual in advance in order to understand the features of this vehicle and to help you deal with incidents involving this vehicle. Follow the procedures in order to help assure a successful first response operation.

IMPORTANT INFORMATION ABOUT THIS MANUAL

You may see various symbols in this manual. They have the following meanings:

DANGER

This symbol is used to inform you of an operation which will result in death or serious personal injury if instructions are not followed.

Example: Touching high voltage components without using the appropriate protective equipment will result in electrocution.

WARNING

This symbol is used to inform you of an operation which may cause death or serious personal injury if instructions are not followed.

CAUTION

This symbol is used to inform you of an operation which may cause personal injury or component damage if instructions are not followed.

Please note that there may be differences between this manual and the vehicle specification due to specification changes.

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1. About the Nissan LEAF™

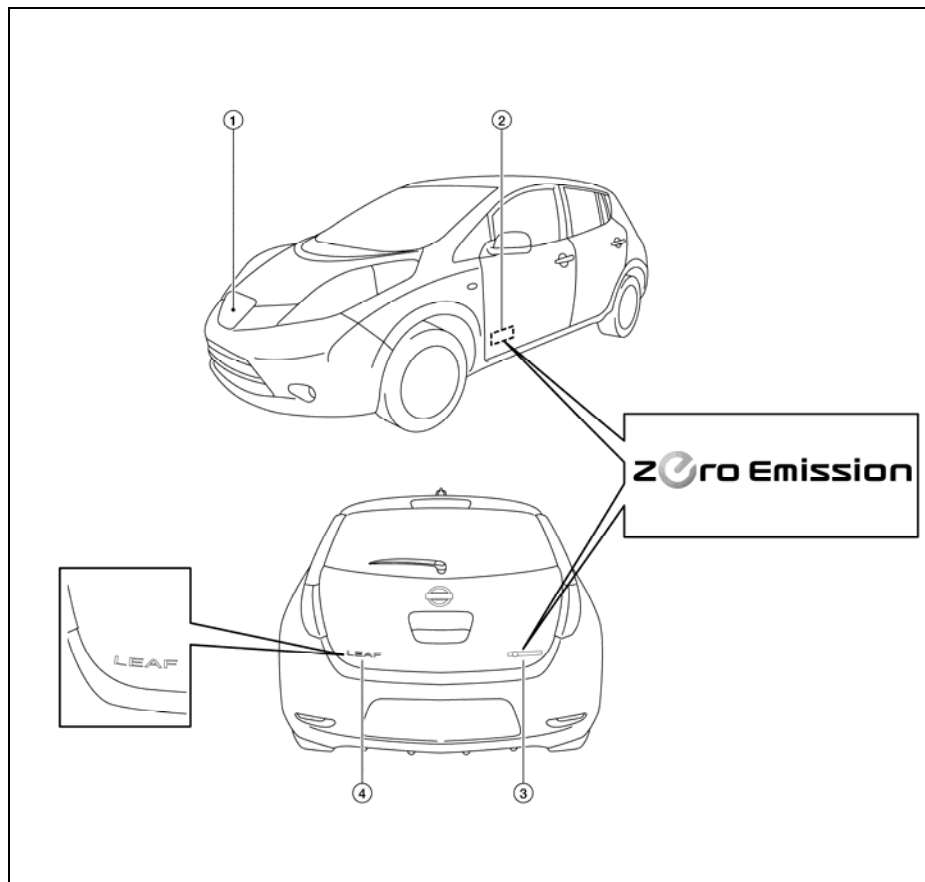
This vehicle uses two types of batteries. One is a 12V battery that is the same as the battery in vehicles powered by internal combustion engines, and the other is the Lithium-ion (Li-ion) battery (high voltage) for the traction motor which propels the vehicle. The Li-ion battery is encased in steel and mounted underneath the vehicle.

The vehicle must be plugged-in in order for the Li-ion battery to be recharged. Additionally, the vehicle system can recharge the Li-ion battery by converting driving force into electricity while the vehicle is decelerating or being driven downhill. This is called regenerative charging. This vehicle is considered to be an environmentally friendly vehicle because it does not emit exhaust gases.

1-1 LEAF Identification

1-1.1 Exterior

The specific exterior identification features are indicated as follows:



1. Charge port lid

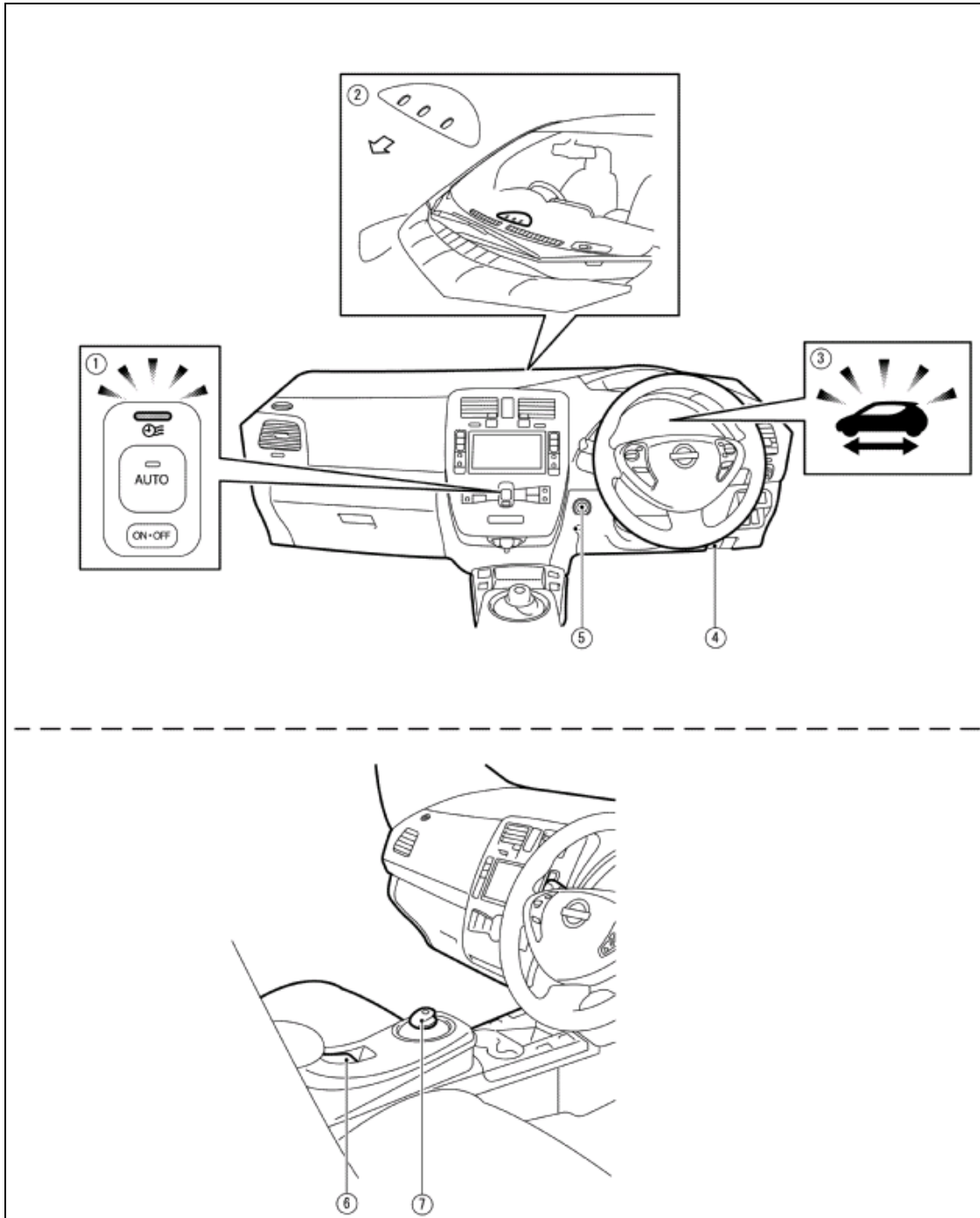
2. Zero Emission badge


3. Zero Emission badge

4. LEAF badge

1-1.2 Interior Component Location

Interior components referenced in this manual are as follows:



1. Air conditioning remote timer indicator
2. Charging indicator lights
3. READY  indicator
4. Hood release handle
5. Power switch
6. Electric parking brake switch (with built-in indicator)
7. Selector lever

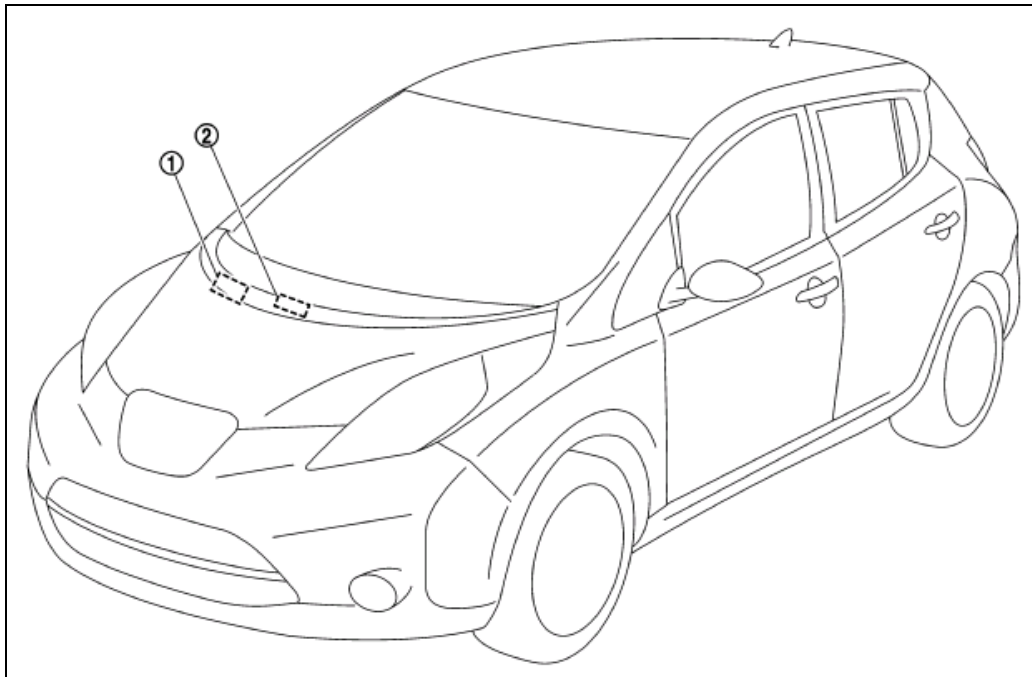
1-2 Vehicle Identification Number (VIN) Layout

The vehicle identification number can be located as follows:

Example VIN : JN1FAAZE0U0000001

The LEAF is identified by the 7th alphanumeric character: **Z**

Z = Electric vehicle

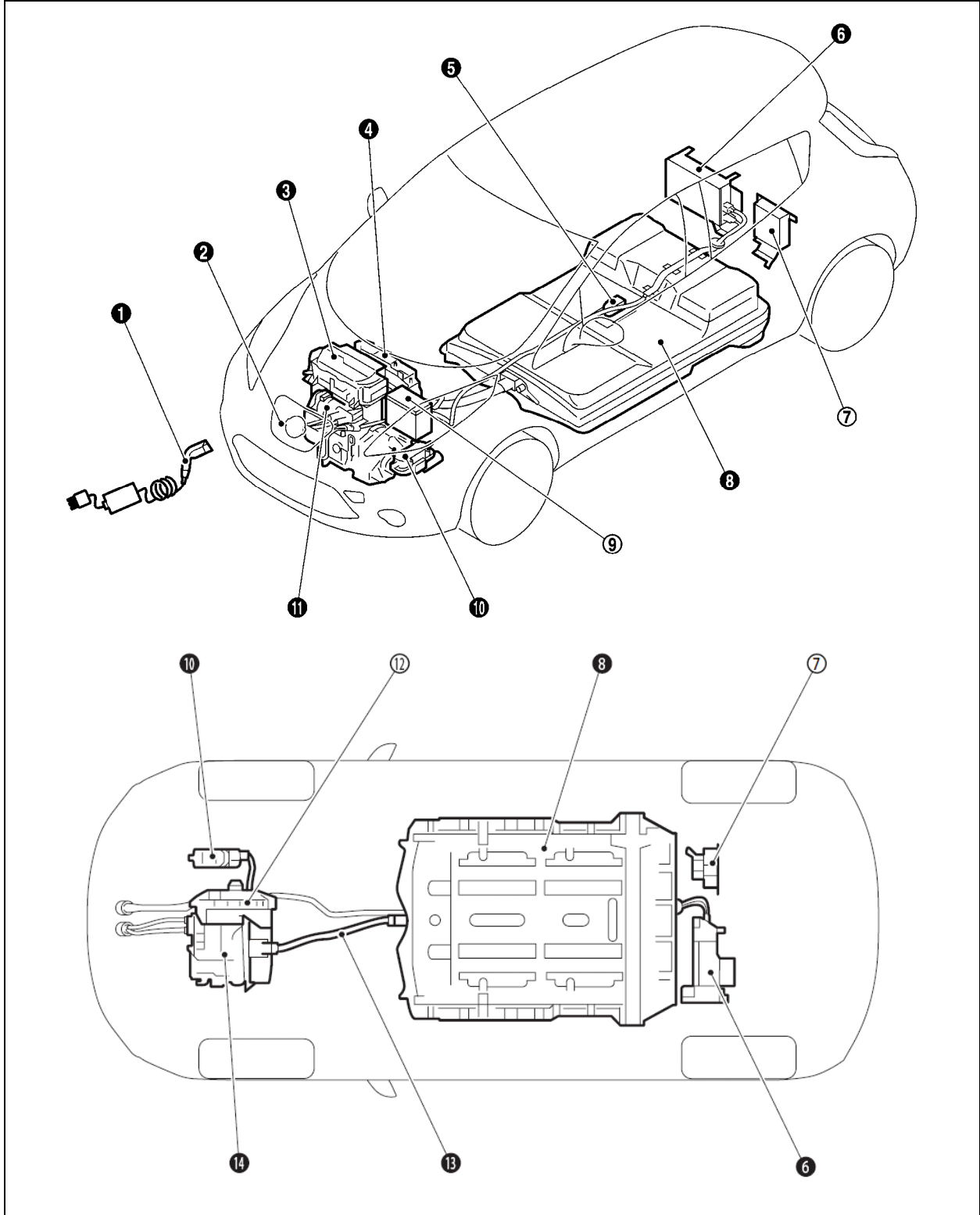


1. Vehicle identification plate

2. Vehicle identification number
(Chassis number)

2. Basic High Voltage System and 12V System Information

2-1 High Voltage-Related and 12V-Related Component Locations and Descriptions



	Component	Location	Description
①	Charge connector	Charge port	Used for Li-ion battery charge.
②	Charge port	Under hood	Connecting port for EVSE (Electric Vehicle Supply Equipment). Two ports are available: Normal charge and quick charge (if so equipped).
③	Inverter	Under hood	Converts the DC power stored in the Li-ion battery to three-phase AC power and controls motor torque (revolution) by regulating the motor current.
④	DC/DC Converter – High voltage junction box	Under hood	This component includes a DC/DC converter and high voltage junction box (J/B). The junction box provides electric power from the Li-ion battery to all high voltage parts of the vehicle. The DC/DC converter reduces the voltage of the Li-ion battery to provide power to the 12V battery in order to operate the vehicle's electric components (headlights, audio system, etc.).
⑤	Service plug	Rear seat floor	Used to disable the high voltage system.
⑥	On Board Charger	Cargo room area (This unit is installed behind a trim panel to prevent access)	Converts single-phase AC power from a home power outlet to DC power and increases the voltage in order to charge the Li-ion battery.
⑦	Brake power supply backup unit	Cargo room area (This unit is installed behind a trim panel to prevent access)	Power supply backup unit for the brake system. It supplies power to the brake system if a malfunction occurs in the 12V battery.
⑧	Li-ion (Lithium ion) battery	Undercarriage	Stores and outputs DC power (Maximum voltage 400V) needed to propel the vehicle.
⑨	12V Battery	Under hood	A lead-acid battery that supplies power to the low voltage devices.

⑩	PTC heater	Under hood	This is the electric heat source for the cabin heater. It heats the interior of the vehicle. PTC: Positive Temperature Coefficient
⑪	Electric compressor	Under hood	Air conditioner compressor
⑫	Reduction gear	Under hood	Reduces the motor revolution and increases the torque to rotate the wheels.
⑬	High voltage cables	Undercarriage and Under hood	Orange-colored power cables carry high direct current (DC) voltage between each of the high voltage components.
⑭	Traction motor	Under hood	Converts three-phase AC power to drive power (torque) which propels the vehicle.

*: White numbers on black background show high voltage components.

2-1.1 Li-ion Battery Pack Specifications

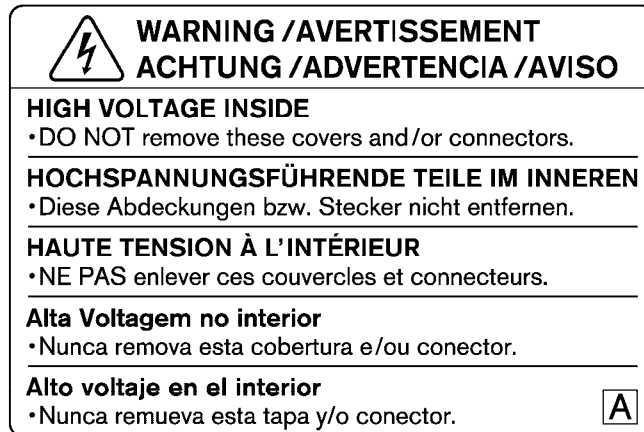
Li-ion battery voltage	403.2V
Number of Li-ion battery modules in the pack	48
Li-ion battery dimensions	61.8 x 46.8 x 10.4 in. (1570.5 x 1188 x 264.9 mm)
Li-ion battery weight	648 lbs (294 kg)

2-2 High Voltage Safety Measures

The following safety measures are set against high voltage system:

Circuit insulation	The high voltage positive (+) and negative (-) circuits are insulated from the metal chassis.
Reducing the risk of electrocution	The high voltage components and harnesses have insulated cases or orange-colored coverings which provide easy identification and insulation. The high voltage case is electrically connected to the vehicle ground. This connection helps protect the vehicle occupants and emergency
Identification	The high voltage components are labeled "WARNING" as shown below. All high voltage harnesses are coated in orange.

2-2.1 Warning Label



2-3 High Voltage Circuit Shut-Off System

The high voltage can be shut off by the following methods:



Service plug	Positioned in the center area of the Li-ion battery, this plug shuts off output high voltage when manually removed.
System main relay	Controlled by the power switch, this relay, which is controlled by the 12V system, shuts off the high voltage from the Li-ion battery.
Emergency shut-off system	In the case of a collision (air bag deployment, etc.) or certain system malfunctions this system shuts off the high voltage from the Li-ion battery.
Charging connector	Some of the high voltage components are activated during charging. Remove the charging connector to deactivate these components.

2-4 Preventing Electrical Shock








1. If it is necessary to touch any of the high voltage harnesses or components, please wear appropriate PPE and shut off the high voltage system by referring to [3-3.3 High Voltage System Shut-Down Procedure](#).
2. To avoid the risk of electrocution, do not touch the inside of the Li-ion battery with bare hands after shutting off the high voltage system. The Li-ion battery maintains charge even though the high voltage system is shut down.
3. Cover damaged high voltage components with insulated tape.

3. Steps of Emergency Response





DANGER

-  Failure to disable the high voltage electrical system before the Emergency Response Procedures are performed will result in serious injury or death from electrical shock. To prevent serious injury or death, DO NOT touch high voltage harnesses or components with bare hands.
-  If it is necessary to touch any of the high voltage harnesses or components please wear appropriate PPE to avoid electrical shock. Shut down the high voltage system by following the steps outlined in [3-3.3 High Voltage System Shut-Down Procedure](#).

WARNING

-  NEVER assume the LEAF is shut OFF simply because it is quiet.
-  If it becomes necessary for the rescuer to leave the vehicle, place a “DANGER” sign (for example, refer to [4. Storing the Vehicle](#)) on the vehicle to alert other people that the vehicle contains a high voltage battery.
-  If the READY  indicator, charging indicator or air conditioning remote timer indicator are ON the high voltage system is active.
-  If possible be sure to check the READY  indicator on the instrument cluster and verify that the READY  indicator is OFF and the high voltage system is stopped.

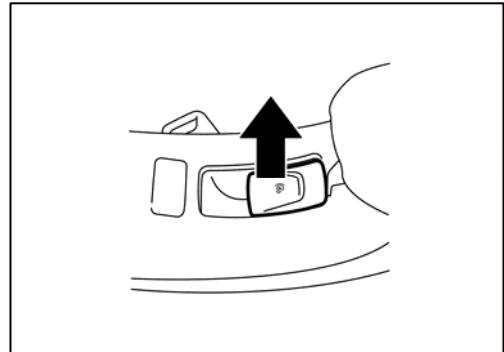
3-1 Preparation Items

Preparation Items	Specification	Purpose
PPE (personal protective equipment): Insulated gloves  Insulated shoes  Safety shield 	Maximum use voltage:AC600 V - -	To protect people from high voltage electrical shock
Wrenches 	Size:10mm	To remove the service plug access cover bolts. To remove the 12V battery terminal bolt.
Heat proof solvent resistant protection gloves Heat proof solvent resistant protection shoes	Heat proof solvent resistant protection tools	To utilize in the event of a Li-ion battery electrolytic solution leak.
Absorbent pad	The same pad used for internal combustion engine fluids can be used.	To absorb any Li-ion battery electrolytic solution leakage.
Extinguisher	Type ABC For electrical fires caused by the electrical harnesses and components, etc. and oil fires.	To extinguish a fire.
Insulated tape	Insulating	To cover the damaged harnesses to protect from and prevent electrical shock. Tape should cover all bare or damaged wire.

3-2 Vehicle Immobilization and Stabilization

3-2.1 Setting the Electric Parking Brake

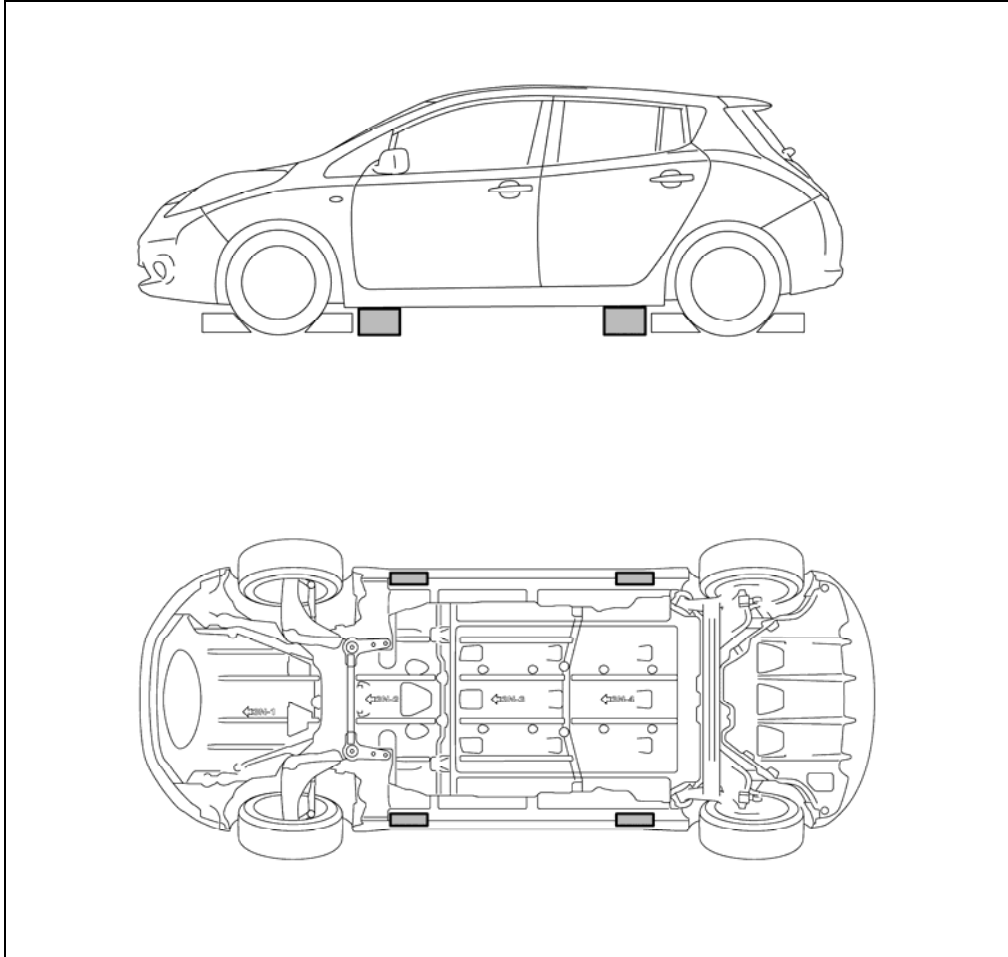
1. Firmly apply the brake pedal.
2. Pull up on the electric parking brake switch.



If possible, immobilize the vehicle with the electrically operated parking brake before turning the 12V system OFF and stabilize it with a wheel chock(s). Stabilize the vehicle with wooden blocks, by removing air from the tires, or utilize the Lift Airbag Equipment for rescue.

CAUTION

- Do not stabilize the vehicle with wooden blocks under the Li-ion battery.
- Do not put the Lift Airbag Equipment for rescue and wheel chock(s) under the high voltage components and harnesses to avoid electrical shock.



3-3 How to Handle a Damaged Vehicle at an Accident Scene

3-3.1 Water Submersion

⚠ WARNING

- **⚠** The power switch of the submerged vehicle must be turned OFF first, if possible. Then the vehicle must be completely out of the water to avoid electrical shock.
- **⚠** Wear appropriate PPE and remove/drain water before removing the service plug when working on a vehicle after a fire or submersion to avoid electrical shock.
- **⚠** If the vehicle is in the water, to avoid electrical shock do not touch the high voltage components, harnesses or service plug.

3-3.2 Vehicle Fire

WARNING

In the case of extinguishing a fire with water, large amounts of water from a fire hydrant (if possible) must be used. **DO NOT** extinguish fire with a small amount of water. Small amounts of water will make toxic gas produced by a chemical reaction between the Li-ion battery electrolyte and water.

CAUTION

In the event of a small fire, a Type ABC fire extinguisher may be used for an electrical fire caused by wiring harnesses, electrical components, etc. or oil fire.



In case of vehicle fire, contact fire department immediately and extinguish the fire if possible. 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.

3-3.3 High Voltage System Shut-Down Procedure




Shut down the high voltage system according to vehicle damage level. Any of the following procedures can shut down the high voltage system. The first response operation should be done after shutting down the high voltage system.

If the vehicle is heavily damaged, for example the Li-ion battery is deformed, broken or cracked, appropriate PPE must be used and the Li-ion battery and high voltage components must not be touched.

DANGER

-  Failure to properly shut down the high voltage system before the Emergency Response Procedures are performed may result in serious injury or death from electrical shock. To prevent from serious injury or death, **DO NOT** touch high voltage harnesses or components with bare hands.
-  When contact with high voltage components or high voltage harnesses is unavoidable, or when there is risk of such contact, be sure to wear appropriate PPE.

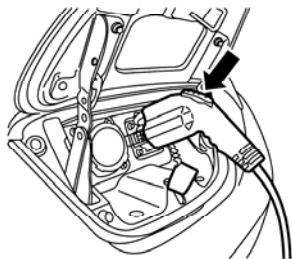
⚠ WARNING

- **⚠** If the charge connector is connected to the vehicle, remove it. Refer to [Removing the Charge Connector](#).
- **⚠** The vehicle contains parts that contain powerful magnets. If a person who is wearing a pacemaker or other medical device is close to these parts, the medical device may be affected by the magnets. Such persons must not perform work on the vehicle.
- Be sure to check the READY  indicator in the instrument cluster, and verify that the READY  indicator is off and the high voltage system is stopped.
- There is a possibility of remaining high voltage in the air conditioning system by the remote air conditioning system. If the READY  indicator is turned OFF and the air conditioning remote timer indicator is turned ON the high voltage system is active. Please ensure that the air conditioning remote timer indicator is turned OFF and the air conditioning system is inactive.
- After high voltage system shut-down, please wait for ten (10) minutes for complete discharge of the high voltage condenser. While waiting, do not operate any vehicle functions.
- The high voltage full discharge takes ten (10) minutes, but after five (5) minutes the voltage has dropped below 60V.
- Remove the 12V battery negative (-) terminal and wait for three (3) minutes to discharge the air bag condenser. Even though the 12V battery negative (-) is disconnected, the Supplemental Restraint System (SRS) air bag maintains voltage for three (3) minutes. There is a possibility of sudden SRS air bag inflation due to harness short circuit or damage and it may cause

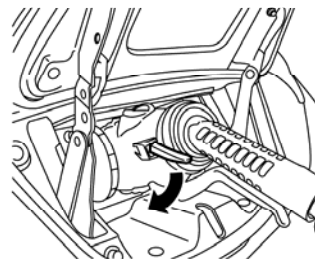
Removing the Charge Connector

1. Press the lock release button/lever on the charge connector.
2. Pull the charge connector to remove it.


Trickle Charge Connector



Quick Charge Connector



Indications the High Voltage System is ON

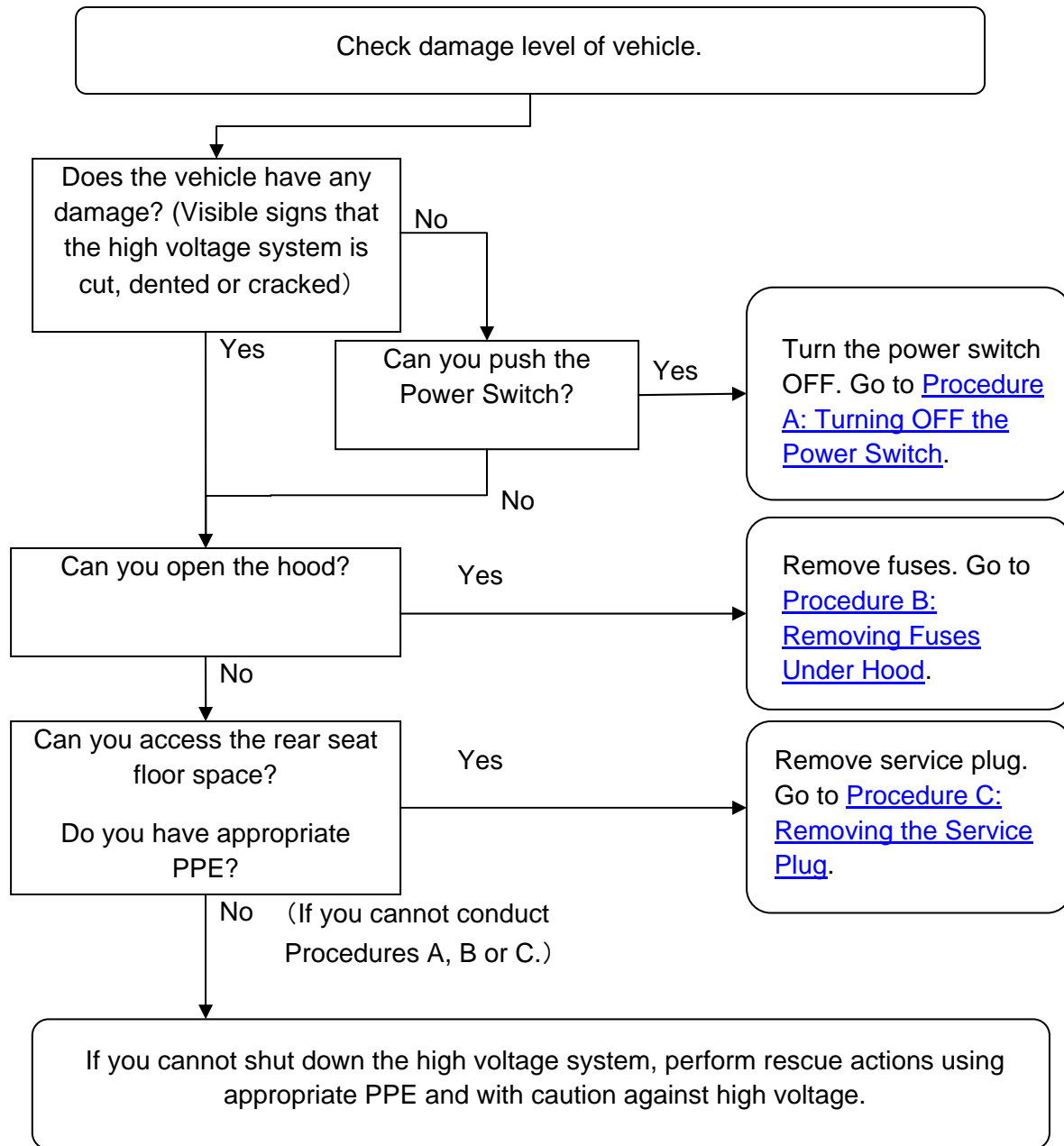
1. If the READY  indicator is ON, the high voltage system is active.
2. If the charge indicator is ON, the high voltage system is active.
3. If the air conditioning remote timer indicator (located on the HVAC controller) is ON, the high voltage system is active.
4. If the remote controlled air conditioning system is active, push the power switch to the ON position. This will turn OFF the remote controlled air conditioning system.

NOTE:



Remote controlled air conditioning system is a feature that allows the vehicle owner to activate the air conditioning system via telematics communication (cell phone, personal computer, etc.). When this system is active, the air conditioning remote timer indicator (located on the HVAC controller) is illuminated.

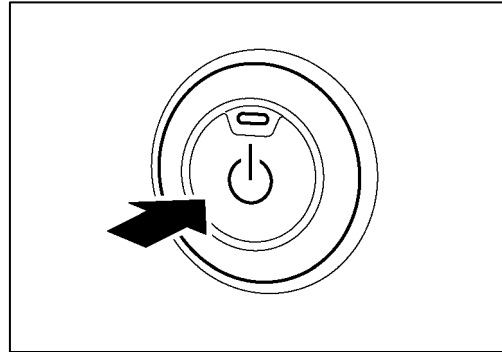
Before disconnecting the 12V battery terminal, if necessary, set the parking brake, lower the windows, unlock the doors, and open the rear hatch as required. Once 12V battery is disconnected, power controls will not operate.

Refer to the following chart to determine which shut-down procedure should be used according to the vehicle damage.

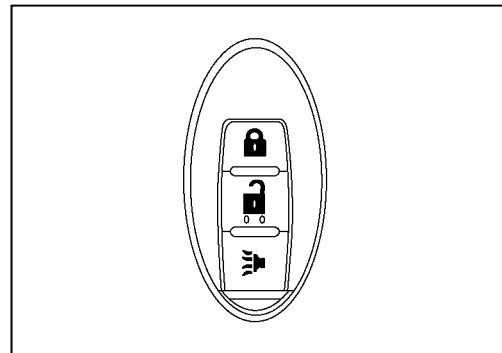


Procedure A: Turning OFF the Power Switch

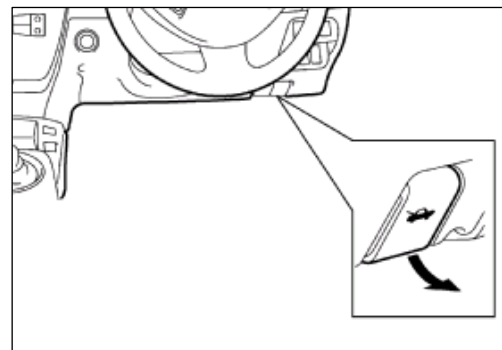
1. Check the READY  indicator status. If it is ON, the high voltage system is active.
2. Press the power switch once to turn OFF the high voltage system. Then verify whether the READY  indicator is OFF.



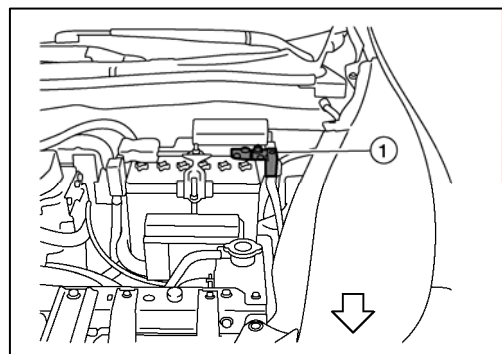
3. If possible, keep the Nissan Intelligent Key™ at least 5 meters (16 feet) away from the vehicle.



4. Open the hood.



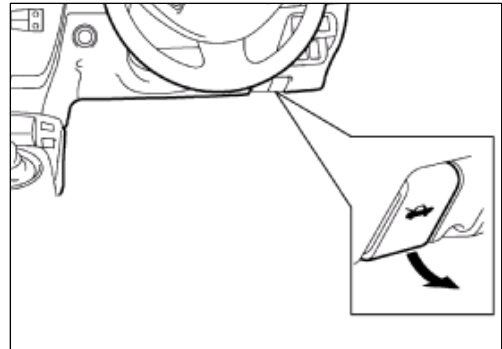
5. Disconnect the negative (-) 12V battery cable (1). Insulate the negative (-) battery cable terminal with insulated tape.



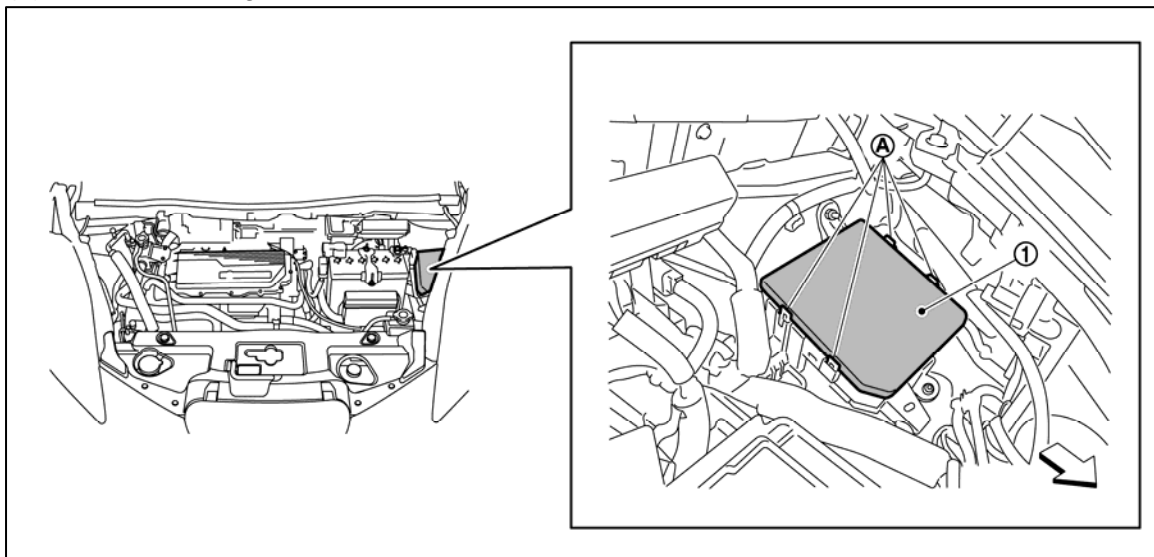
6. Wait ten (10) minutes for complete discharge of the high voltage condenser after the power switch has been turned OFF and the battery cable has been disconnected.
7. Perform the first response action.

Procedure B: Removing Fuses Under Hood

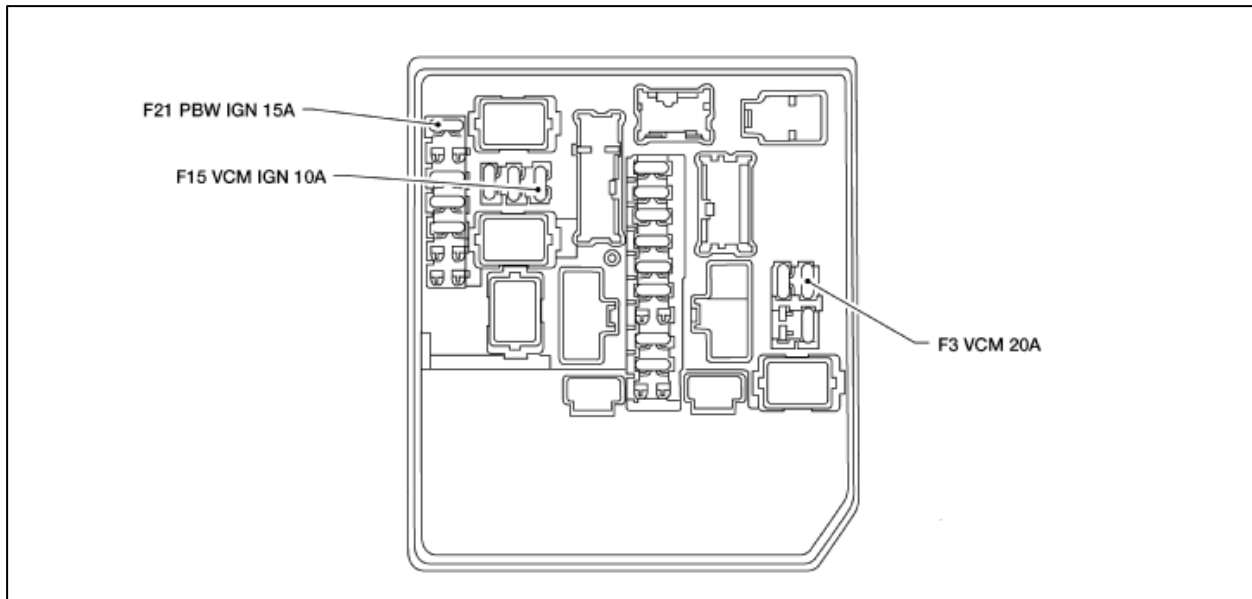
1. Open the hood.



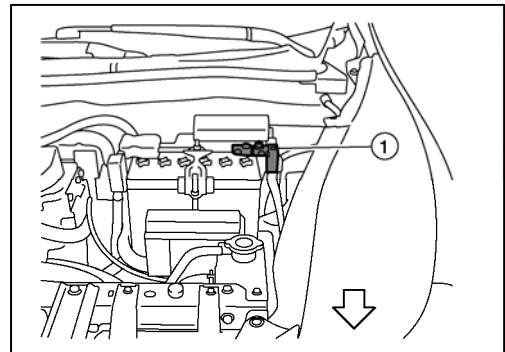
2. Press and expand the pawls (A) on the sides of the fuse box and remove the fuse box (1) from its housing.



3. Remove the following fuses:
 - a. VCM IGN fuse (F15 VCM IGN 10A)
 - b. PBW Fuse (F21 PBW IGN 15A)
 - c. VCM Fuse (F3 VCM 20A)



4. If you cannot identify the above fuses, remove all fuses in the fuse box.
5. Disconnect the negative (-) 12V battery cable (1). Insulate the negative (-) battery cable terminal with insulated tape.




6. Wait ten (10) minutes for complete discharge of the high voltage condenser after the fuses are pulled and battery cable has been disconnected.
7. Perform the first response action.

⚠ WARNING



⚠ To avoid unintended installation and risk of electrical shock, the rescuer should carry the fuses on his/her person and cover the fuse box with insulated tape.

Procedure C: Removing the Service Plug

DANGER

 Do not remove the service plug without wearing appropriate PPE to help protect the responder from any serious injury or death by electrical shock.

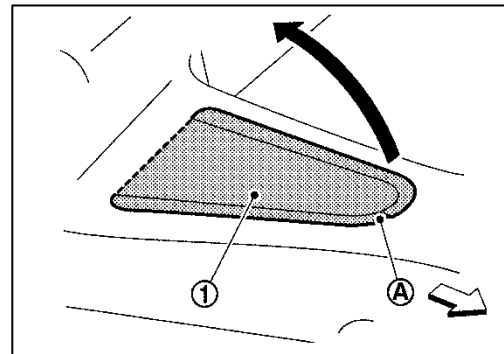
WARNING

-  To avoid unintended installation and risk of electrical shock, the rescuer should carry the service plug on his/her person while work is in progress.
-  Immediately cover the service plug socket with insulated tape. To avoid electric shock, DO NOT touch the terminals inside the socket.

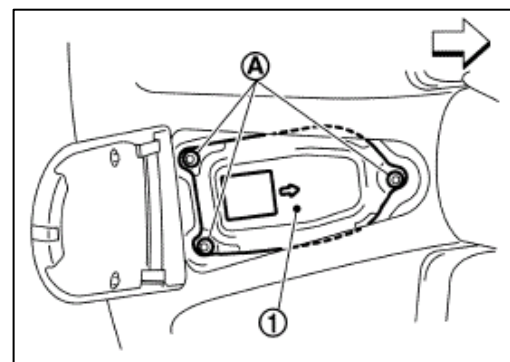
1. Locate the carpet flap (1) behind the center console on the floor raised area. At the notched area (A) pull up on the carpet flap (1).

NOTE:

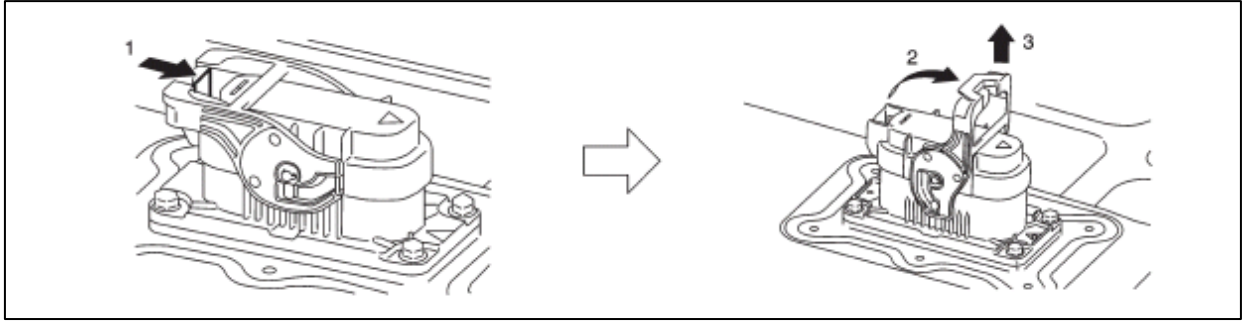
Arrow in illustration depicts vehicle front direction.



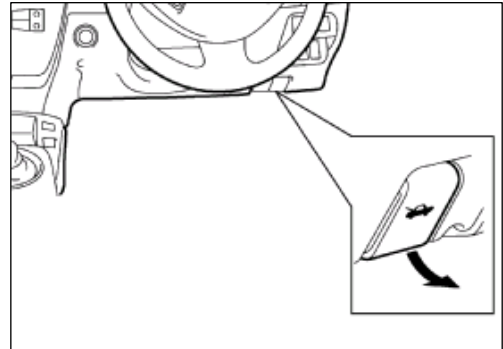
2. Remove the access cover bolts (A) and remove the cover (1).



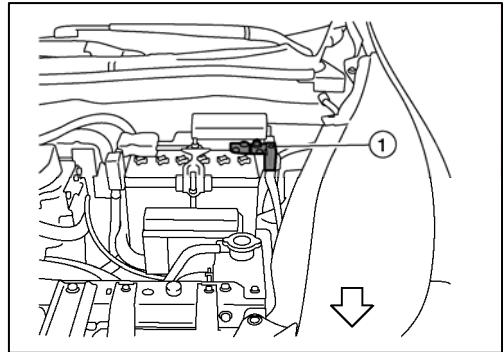
3. Remove the service plug by pressing the locking tab (1) and rotating the handle (2) upward. Using the handle, pull (3) the service plug completely out of its socket.



4. Wait ten (10) minutes for complete discharge of the high voltage condenser after the service plug has been removed.
5. Open the hood.






6. Disconnect the negative (-) 12V battery cable (1). Insulate the negative (-) battery cable terminal with insulated tape.




7. Wait three (3) minutes for complete discharge of the air bag condenser after the battery cable has been disconnected.
8. Perform the first response action.

3-3.4 Cutting the Vehicle Body

DANGER

-  Do not cut into high voltage related areas.
-  Do not cut into the Li-ion battery.
-  When removing parts, **DO NOT** touch the high voltage parts or the insides of the exposed orange-colored high voltage cables.

WARNING

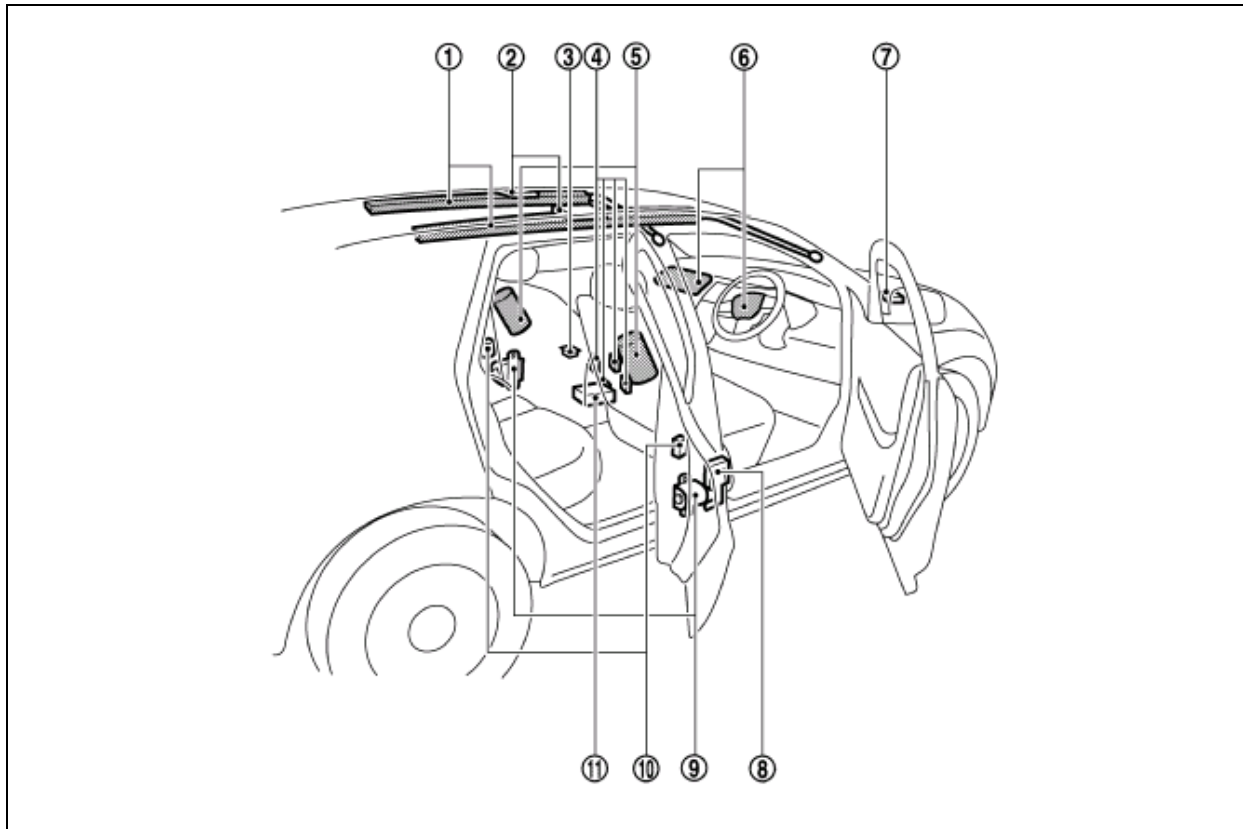
-  Use the appropriate tools (for example, hydraulic cutter that do not set sparks) when cutting the vehicle to protect the first responder.
- Do not cut air bag parts.

If ten (10) minutes have passed since the rescuer shut down the high voltage system (refer to [3-3.3 High Voltage System Shut-Down Procedure](#)), then the rescuer can cut the vehicle except for the Li-ion battery. **DO NOT** cut the Li-ion battery due to possible electrocution risk and electrolyte solution leakage.

SRS Air Bag System Components Location

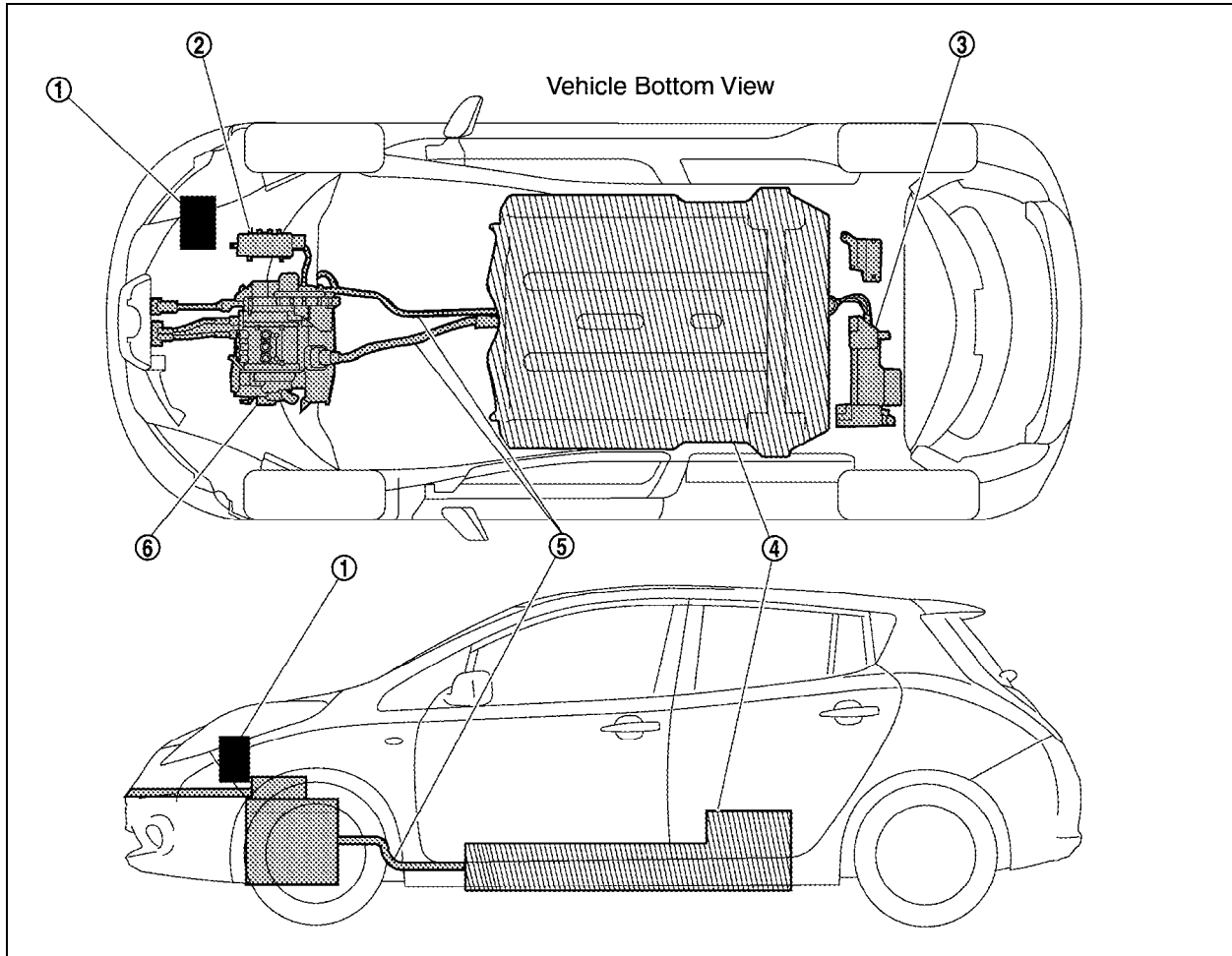
The SRS air bag system must not be cut as there is a risk of short circuit and unintentional deployment of the SRS. However, the vehicle can be cut (except inflators) under the following conditions:

- The front, side and curtain air bags have deployed.
- Three (3) minutes have passed after the 12V battery negative (-) cable has been disconnected.



- | | | |
|--|--|--|
| 1. Roof-mounted curtain side-impact supplemental air bag modules | 2. Roof-mounted curtain side-impact supplemental air bag inflators | 3. Occupant classification system control unit |
| 4. Occupant classification sensors (weight sensors) | 5. Front seat-mounted side-impact supplemental air bag modules | 6. Supplemental front-impact air bag modules |
| 7. Crash zone sensor | 8. Lap outer pretensioner (driver side only) | 9. Seat belt with pretensioner |
| 10. Satellite sensors | 11. Air bag control unit (ACU) | |

Vehicle Cut Sheet



- | | | |
|------------------|------------------------|-------------------------------------|
| ① 12V battery | ② PTC heater | ③ On board charger |
| ④ Li-ion battery | ⑤ High voltage harness | ⑥ Traction motor and reduction gear |

Key

- : High voltage component or line
- : NEVER CUT- Li-ion battery
- : 12V battery

DANGER

 Never cut electrical storages/sources for any reason. Death or serious personal injury will result.

3-3.5 Li-ion Battery Damage and Fluid Leaks

Li-ion Battery Electrolyte Solution Characteristics:

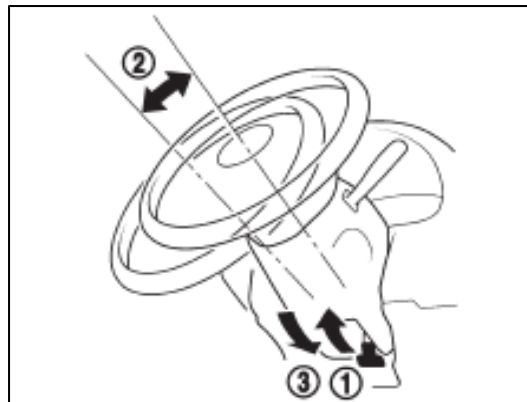
- Clear in color
- Sweet odor
- Similar viscosity to water
- Skin irritant
- Eye irritant – If contact with eyes, rinse with plenty of water and see a doctor immediately.
- Highly flammable
- Electrolyte liquid or fumes that have come into contact with water vapors in the air will create an oxidized substance. This substance may irritate skin and eyes. In these cases, rinse with plenty of water and see a doctor immediately.
- Since the Li-ion battery is made up of many small sealed battery modules, electrolyte solution should not leak in large quantity.

NOTE:

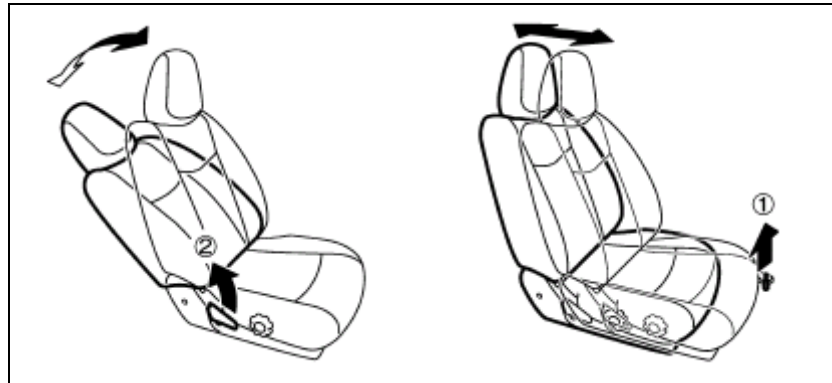
Other fluids in the vehicle (such as washer fluid, brake fluid, coolant, etc.) are the same as those in a conventional internal combustion vehicle.

3-3.6 Accessing the Occupants

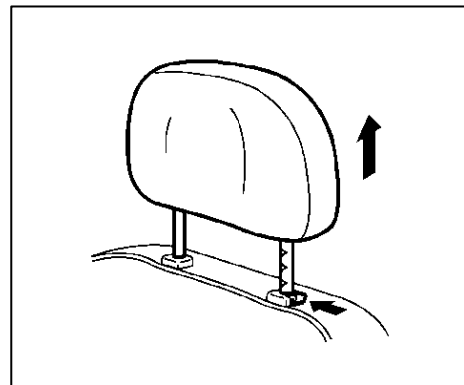
1. Remove windows
 - a. Perform window removal the same as a normal vehicle.
2. Remove doors
 - a. The doors are removable with hand tools or basic rescue tools such as electrical/hydraulic rescue tools. It may be easier to remove the doors by cutting door hinges.
3. Adjust steering wheel and front seat position (if necessary)
 - a. Steering wheel can be adjusted up/down by pushing the lock lever down (1), moving the steering wheel (2) and pulling the lock lever up (3) to lock the steering wheel in place.



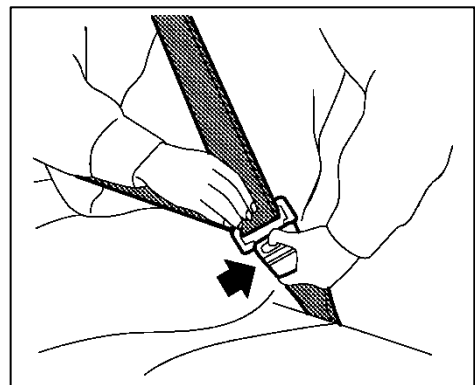
- b. Front seat can be adjusted forward/backward manually by pulling up and holding lever (1) and tilted forward/backward manually by pulling up and holding lever (2).



4. Remove front seat head restraint (if necessary). The front seat head restraint can be removed by pressing the lock knob and pulling it up.



5. Unfasten the seat belt. Seat belt can be unfastened by pressing the release button. If seat belt cannot be unfastened, cut it with a belt cutter.



4. Storing the Vehicle

If LEAF needs to be stored or left unattended, put a sign on the vehicle indicating it is an electric vehicle with high voltage dangers. For example:

<p>Person in charge: _____</p> <p>DO NOT TOUCH! IN PROGRESS. HIGH VOLTAGE REPAIR DANGER:</p>
<p>DANGER: HIGH VOLTAGE REPAIR IN PROGRESS. DO NOT TOUCH!</p> <p>Person in charge: _____</p>
<p>Copy this page and put it after folding on the roof of the vehicle in service.</p>



Zero Emission

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