TOYOTA

HIGHLANDER

HYBRID SYNERGY DRIVE

2006 Model

Emergency Response Guide

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06Highlander Hybrid ERG REV – (08/17/05)

Foreword

In June 2005, Toyota released the Toyota Highlander gasoline-electric hybrid vehicle in North America. Except where noted in this guide, basic vehicle systems and features for the Highlander hybrid are the same as those on the conventional, non-hybrid Highlander. To educate and assist emergency responders in the safe handling of the Highlander hybrid technology, Toyota published this Highlander hybrid Emergency Response Guide.

High voltage electricity powers the electric motors, generator, inverter/converter, and power steering. All other automotive electrical devices such as the headlights, radio, and gauges are powered from a separate 12-Volt battery. Numerous safeguards have been designed into the Highlander hybrid to help ensure the high voltage, approximately 288-Volt, Nickel Metal Hydride (NiMH) Hybrid Vehicle (HV) battery pack is kept safe and secure in an accident.

The Highlander hybrid utilizes the following electrical systems:

- Maximum 650-Volts AC
- Nominal 288-Volts DC
- Nominal 42-Volts DC
- Nominal 12-Volts DC

Highlander hybrid features:

- Adoption of *Hybrid Synergy Drive* as the name for the Toyota Gasoline - Electric Hybrid System.
- *Hybrid Synergy Drive* includes a boost converter in the inverter assembly that boosts to 650-Volts the available voltage to the electric motors.
- The high voltage hybrid vehicle battery pack rated at 288-Volts.
- A high voltage motor driven air conditioning compressor rated at 288-Volts.
- A high voltage Electric Power Steering (EPS) assist motor rated at 42-Volts.
- Body electrical system rated at 12-Volts negative chassis ground.
- Both two-wheel-drive (2WD) and four-wheel-drive intelligent (4WD-i) configurations are available.
- 4WD-i models include an additional 650-Volt electric motor to drive the rear wheels.
- Supplemental Restraint System (SRS) - dual stage frontal airbags, front seat mounted side airbags, side curtain airbags, and front seat belt pretensioners.

High voltage electrical safety is an important factor in the emergency handling of the Highlander *Hybrid Synergy Drive* system. It is important to recognize and understand the disabling procedures and warnings throughout the guide.

Additional topics contained in the guide include:

- Toyota Highlander hybrid identification.
- Major *Hybrid Synergy Drive* component locations and descriptions.
- Extrication, fire, recovery, and additional emergency response information.
- Roadside assistance information.

2006 Model Year Highlander Hybrid

By following the information in this guide, emergency responders should be able to safely perform a rescue involving the Toyota Highlander hybrid vehicle.

NOTE:
Emergency Response Guides for select Toyota alternative fuel vehicles may be viewed at http://techinfo.toyota.com.

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About the Highlander Hybrid

The Highlander hybrid is the first gasoline-electric hybrid Sports Utility Vehicle (SUV) for Toyota. The gasoline-electric hybrid system has been named *Hybrid Synergy Drive*. *Hybrid Synergy Drive* means that the vehicle contains a gasoline engine and an electric motor for power. Two energy sources are stored on board the vehicle:

1. Gasoline stored in the fuel tank for the gasoline engine.
2. Electricity stored in a high voltage Hybrid Vehicle (HV) battery pack for the electric motor.

The result of combining these two power sources is improved fuel economy and reduced emissions. The gasoline engine also powers an electric generator to recharge the battery pack; unlike a pure all electric vehicle, the Highlander hybrid never needs to be recharged from an external electric power source.

Depending on the driving conditions one or both sources are used to power the vehicle. The following illustration demonstrates how the Highlander hybrid operates in various driving modes.

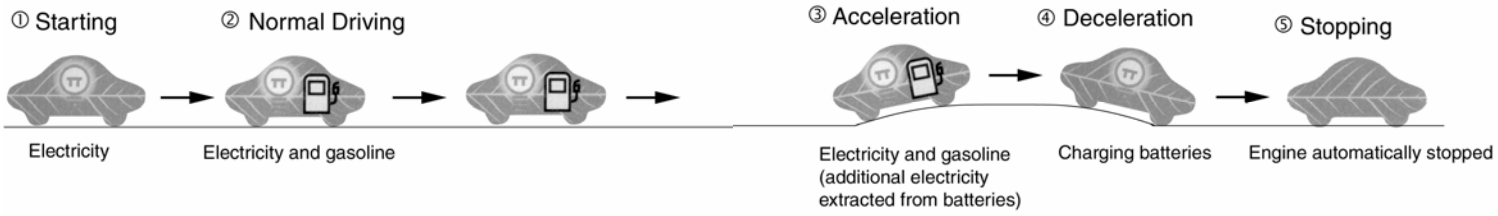
❶ On light acceleration at low speeds, the vehicle is powered by the electric motor. The gasoline engine is shut off.

❷ During normal driving, the vehicle is powered mainly by the gasoline engine. The gasoline engine is also used to recharge the battery pack.

❸ During full acceleration, such as climbing a hill, both the gasoline engine and the electric motor power the vehicle.

❹ During deceleration, such as braking, the vehicle regenerates the kinetic energy from the front wheels to produce electricity that recharges the battery pack.

❺ While the vehicle is stopped, the gasoline engine and electric motor are off, however the vehicle remains on and operational.



Highlander Hybrid Identification

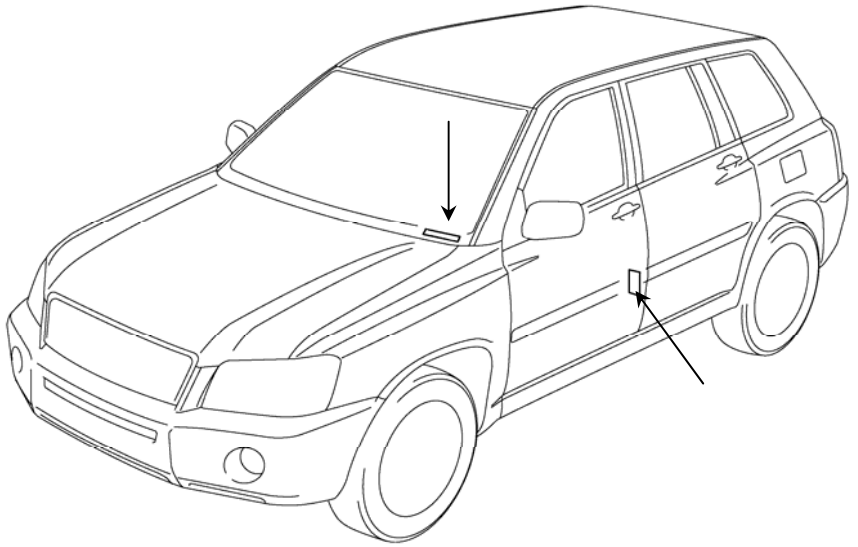
In appearance, the 2006 Highlander hybrid is nearly identical to the conventional, non-hybrid Toyota Highlander. The Highlander hybrid is a 5-door SUV. Exterior, interior, and engine compartment illustrations are provided to assist in identification.

The alphanumeric 17 character Vehicle Identification Number (VIN) is provided in the front windshield cowl and driver door post.

Example VIN: JTEGW21A840020208 (2WD)
JTEHW21A850011201 (4WD-i)

A Highlander hybrid is identified by the first 6 alphanumeric characters as follows.

2WD: **JTEGW2 / JTEDW2**
4WD-i: **JTEHW2 / JTEEW2**



VIN Plate Locations

Highlander Hybrid Identification (Continued)

Exterior

❶ TOYOTA *HIGHLANDER* HYBRID SYNERGY DRIVE logos the on rear hatchback door.

❷ Gasoline fuel filler door located on the driver side rear quarter panel.

Exterior Driver Side View

Exterior Front View

Exterior Rear View

Exterior Rear and Driver Side View

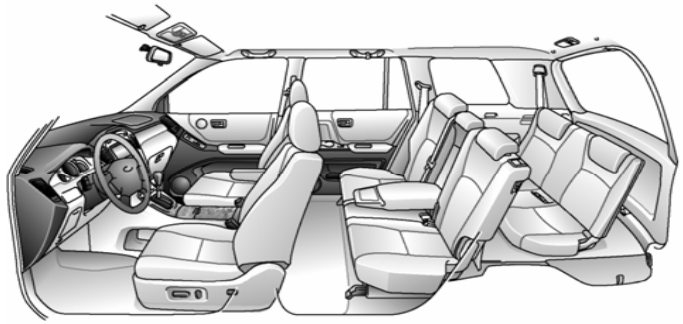
Highlander Hybrid Identification (Continued)

Interior

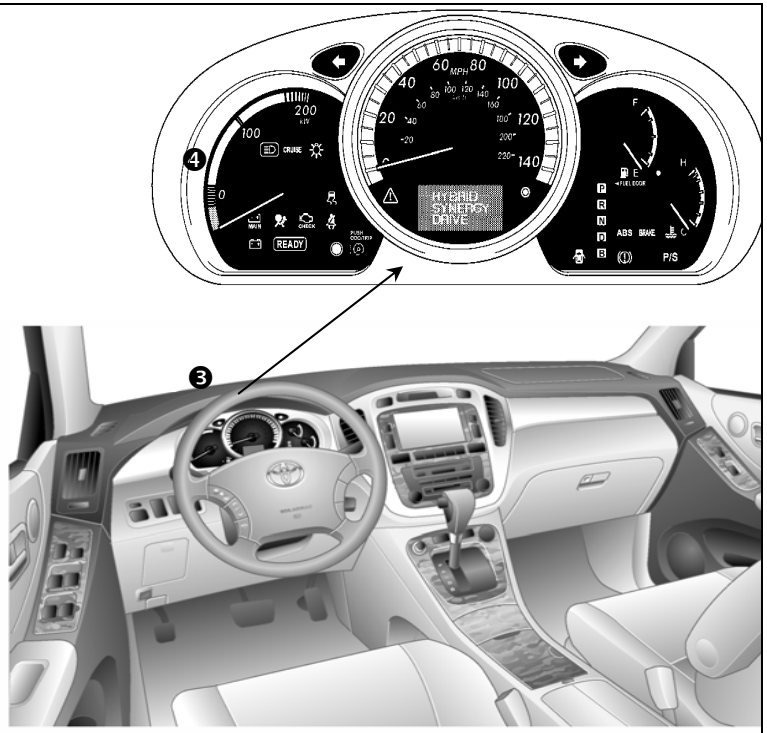
❸ Instrument cluster (speedometer, fuel gauge, warning lights) located in the dash behind the steering wheel, is different than the one on the conventional, non-hybrid Highlander.

❹ In place of a tachometer, a power meter showing kW output is used.

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



Interior View



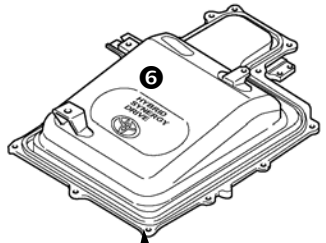
Instrument Cluster View

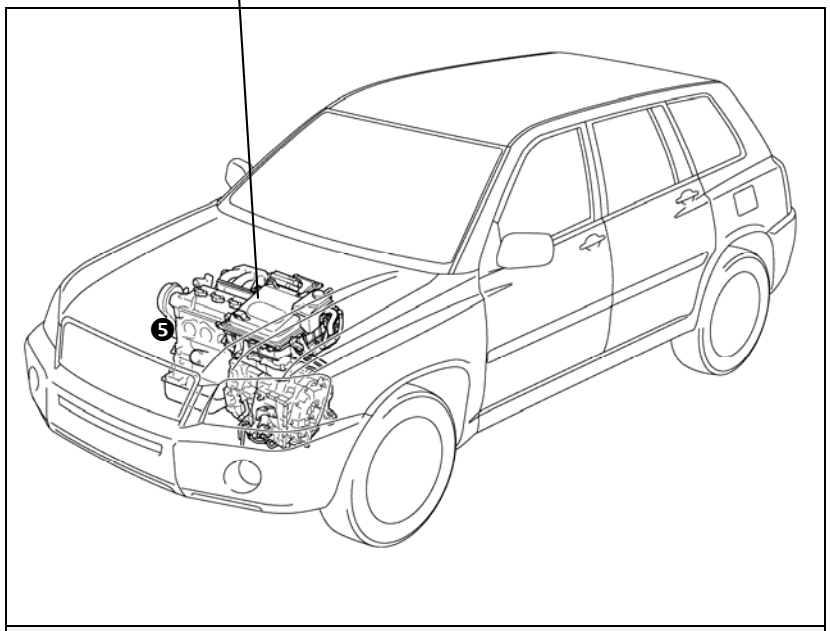
Highlander Hybrid Identification (Continued)

Engine Compartment

❺ 3.3-liter aluminum alloy gasoline engine.
❻ High voltage inverter/converter assembly with logos on the cover.

Logos on Cover

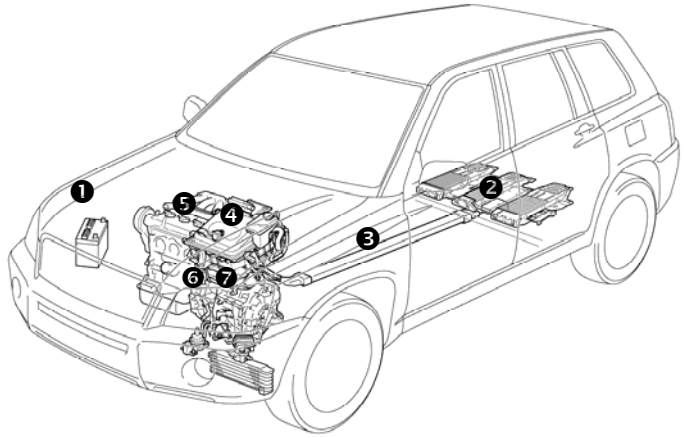




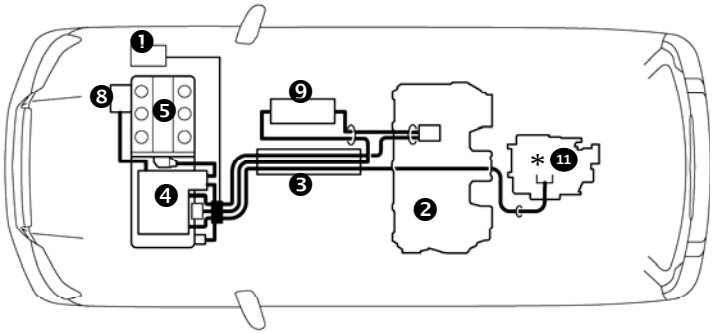
Engine Compartment View

Hybrid Synergy Drive Component Locations & Descriptions

Component	Location	Description
12-Volt ❶ Auxiliary Battery	Engine Compartment	Lead-acid battery powers all low voltage electrical equipment.
Hybrid ❷ Vehicle (HV) Battery Pack	Cabin Area, Mounted to Cross Member located Under Second Row Seat	288-Volt Nickel Metal Hydride (NiMH) battery pack consisting of 30 low voltage (9.6-volt) modules connected in series.
Power ❸ Cables	Under Carriage and Engine Compartment	Orange colored power cables carry high voltage Direct Current (DC) between the HV battery pack, inverter/converter, and A/C compressor. Also carries 3-phase Alternating Current (AC) between inverter/converter, motor, and generator.
Inverter/ Converter ❹	Engine Compartment	Boosts and inverts the high voltage electricity from the HV battery pack to 3-phase AC electricity that drives the electric motor. The inverter/converter also converts AC electricity from the electric generator and motor (regenerative braking) to DC that recharges the HV battery pack.
Gasoline ❺ Engine	Engine Compartment	Provides two functions: 1) powers vehicle; 2) powers generator to recharge the HV battery pack. The engine is started and stopped under control of the vehicle computer.
Front Electric Motor ❻	Engine Compartment	3-phase high voltage AC permanent magnet electric motor contained in the front transaxle. Used to power the front wheels.
Electric ❼ Generator	Engine Compartment	3-phase high voltage AC generator contained in the front transaxle. Used to recharge the HV battery pack.
A/C ❽ Compressor	Engine Compartment	3-phase high voltage AC electrically driven motor compressor.



Hybrid Synergy Drive Components

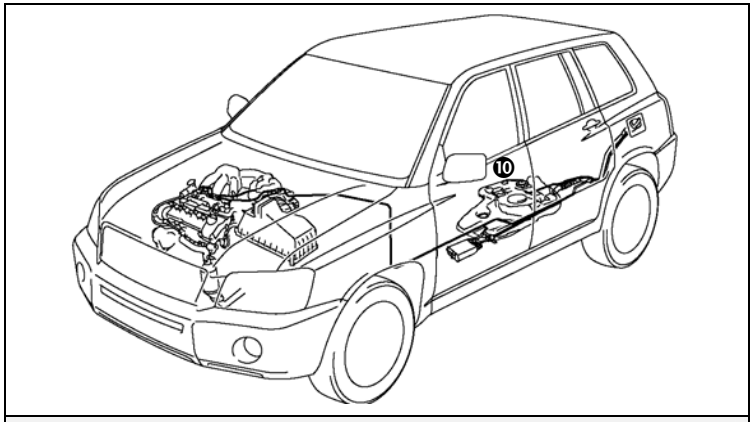


*4WD-i models only

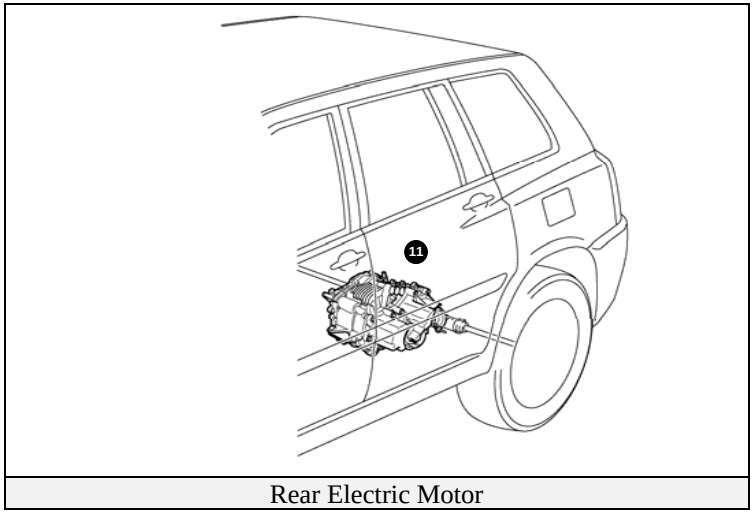
Components (Top View) and High Voltage Power Cables

Hybrid Synergy Drive Component Locations & Descriptions (Continued)

Component	Location	Description
EPS DC-DC Converter ❾	Under Center Console	Converts 288-Volts from the HV battery pack to 42-Volt. Yellow-colored power cables conduct the 42-Volt power underneath the vehicle floor pan to the power steering rack via the EPS ECU, located in the engine compartment.
Fuel Tank ❿ and Fuel Lines	Undercarriage, Driver Side	Fuel tank provides gasoline via a single fuel line to the engine. The fuel line is routed along driver side under the floor pan.
Rear Electric Motor ⓫ (4WD-i Model Only)	Rear Sub-Frame	3-phase high voltage AC permanent magnet electric motor contained in the rear transaxle used to power the rear wheels.



Fuel Tank and Fuel Line Components

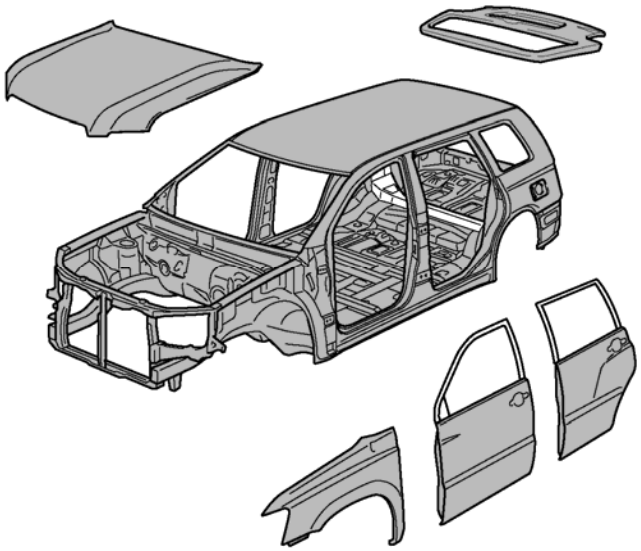


Rear Electric Motor

Hybrid Synergy Drive Component Locations & Descriptions (Continued)

Key Specifications:

Gasoline Engine:	208 hp, 3.3 liter Aluminum Alloy Engine
Electric Motors	
Front:	165 hp, Permanent Magnet Motor
Rear (4WD-i Only):	67 hp, Permanent Magnet Motor
Transmission:	Automatic Only
HV Battery:	288-Volt Sealed NiMH
Curb Weight	
2WD:	4,068 lbs / 1,845 kgs
4WD-i:	4,244 lbs / 1,925 kgs
Fuel Tank:	17.2 gals / 65.0 liters
Fuel Economy	
2WD:	33 / 28 (City/Hwy) miles/gal
4WD-i:	31 / 27 (City/Hwy) miles/gal
	7.5 / 8.1 (City/Hwy) liters/100km
Frame Material:	Steel unibody
Body Material:	Steel panels
Seating Capacity:	7 Passenger



Steel Unibody

Hybrid Synergy Drive Operation

Once the **READY** indicator is illuminated in the instrument cluster, the vehicle may be driven. However, the gasoline engine does not idle like a typical automobile and will start and stop automatically. 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 gasoline engine may be off and the engine compartment is silent.

Instrument cluster **READY** Indicator

Vehicle Operation

- With the Highlander hybrid, the gasoline engine may stop and start at any time while the **READY** indicator is on.

- Never assume that the vehicle is shut off just because the engine is off. Always look for the **READY** indicator status. The vehicle is shut off when the **READY** indicator is off.

- The vehicle may be powered by:
    1. The electric motor only.
    2. The gasoline engine only.
    3. A combination of both the electric motor and the gasoline engine.

- The vehicle computer determines the mode in which the vehicle operates to improve fuel economy and reduce emissions. The driver cannot manually select the mode.

Hybrid Vehicle (HV) Battery Pack and Auxiliary Battery

The Highlander hybrid contains a next generation high voltage, Hybrid Vehicle (HV) battery pack and a low voltage auxiliary battery. The HV battery pack contains non-spillable, sealed Nickel Metal Hydride (NiMH) battery modules and the auxiliary battery is a typical automotive lead-acid type.

HV Battery Pack

- The HV battery pack is enclosed in a metal case and is rigidly mounted to the cabin area floor pan cross member under the second row rear seat. The metal case is isolated from high voltage and concealed by a cover in the cabin area.

- The HV battery pack consists of 30 low voltage (9.6-Volt) NiMH battery modules connected in series to produce approximately 288-Volts. Each NiMH battery module is non-spillable and sealed in a metal case.

- The electrolyte used in the NiMH battery module is an alkaline of potassium and sodium hydroxide. The electrolyte is absorbed into the battery cell plates and will form a gel that will not normally leak, even in a collision.

- In the unlikely event the battery pack is overcharged, the modules vent gases directly outside the vehicle through a vent hose.

HV Battery Pack	
Battery pack voltage	288-Volts
Number of NiMH battery modules in the pack	30
NiMH battery module voltage	9.6-Volts
NiMH battery pack dimensions	25 x 43 x 7 in (63 x 108 x 18 cm)
NiMH battery Pack weight	152.1 lbs (69 kg)

Components Powered by the HV Battery Pack

- Front Electric Motor
- Inverter/Converter
- Electric Generator
- Electric Power Steering
- Rear Electric Motor (with 4WD-i)
- A/C Compressor
- Power Cables

HV Battery Pack Recycling

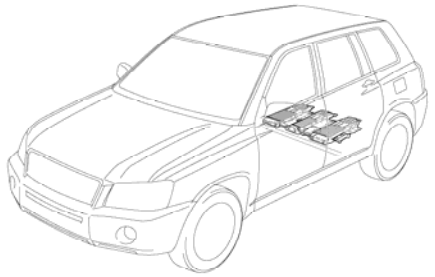
- The HV battery pack is recyclable. Contact the nearest Toyota dealer or:

  United States: (800) 331-4331 Canada: (888) TOYOTA-8 or 896-6828

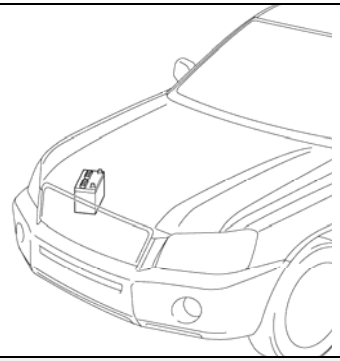
Auxiliary Battery

- The Highlander hybrid also contains a lead-acid 12-Volt battery. The 12-Volt auxiliary battery powers the vehicle electrical system similar to a conventional vehicle. As with other conventional vehicles, the auxiliary battery is grounded (negative pole) to the metal chassis of the vehicle.

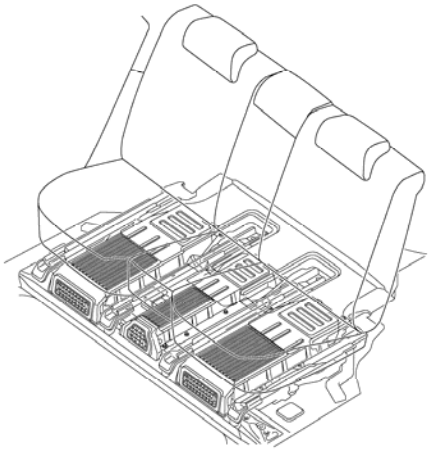
- The auxiliary battery is located in engine compartment area.



288-Volt HV Battery Pack



12-Volt Auxiliary Battery in Engine Compartment.



HV Battery Pack Mounted in Cabin Area

High Voltage Safety

The HV battery pack powers the high voltage electrical system with DC electricity. Positive and negative high voltage power cables are routed from the battery pack, under the vehicle floor pan, to the inverter/converter. The inverter/converter contains a circuit that boosts the HV battery voltage from 288 to 650-Volts DC. The inverter creates 3-phase AC to power the motors. A set of 3 power cables is routed from the inverter to each high voltage motor (electric motor, electric generator, A/C compressor, and optional 4WD-i rear motor). Occupants in the vehicle and emergency responders are separated from high voltage electricity by the following system:

<u>High Voltage Safety System</u>

- A high voltage fuse ❶ provides short circuit protection in the HV battery pack.

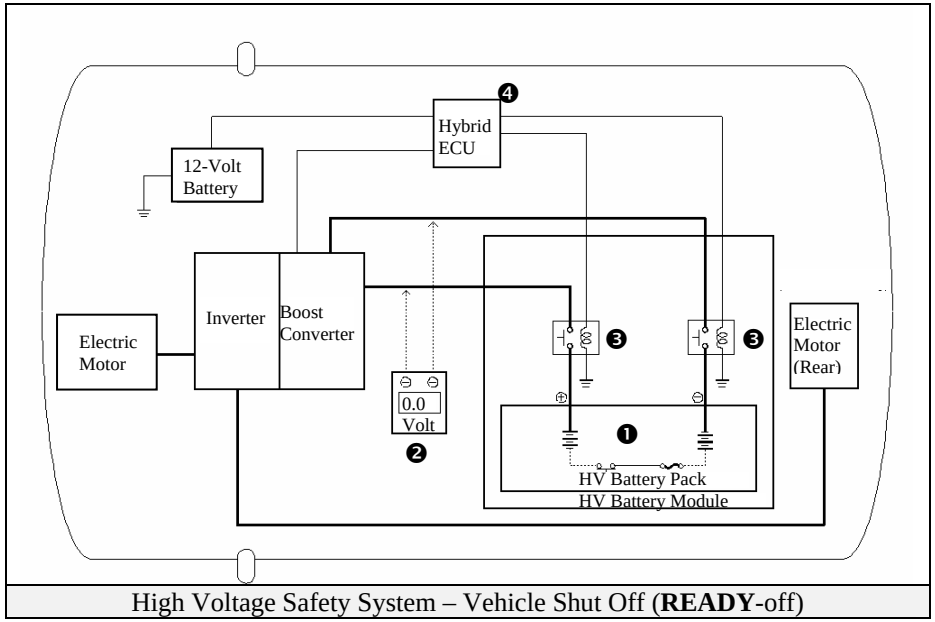
- Positive and negative high voltage power cables ❷ connected to the HV battery pack are controlled by 12-Volt normally open relays ❸. When the vehicle is shut off, the relays stop electricity flow from the HV battery pack.

> ⚠ **WARNING:**
> *High voltage electricity can cause death or serious injury from severe burns or electric shock. To avoid death or serious injury wait 5 minutes after disabling the vehicle to discharge high voltage electricity, and do not touch, cut, or open any orange high voltage power cable or high voltage component.*

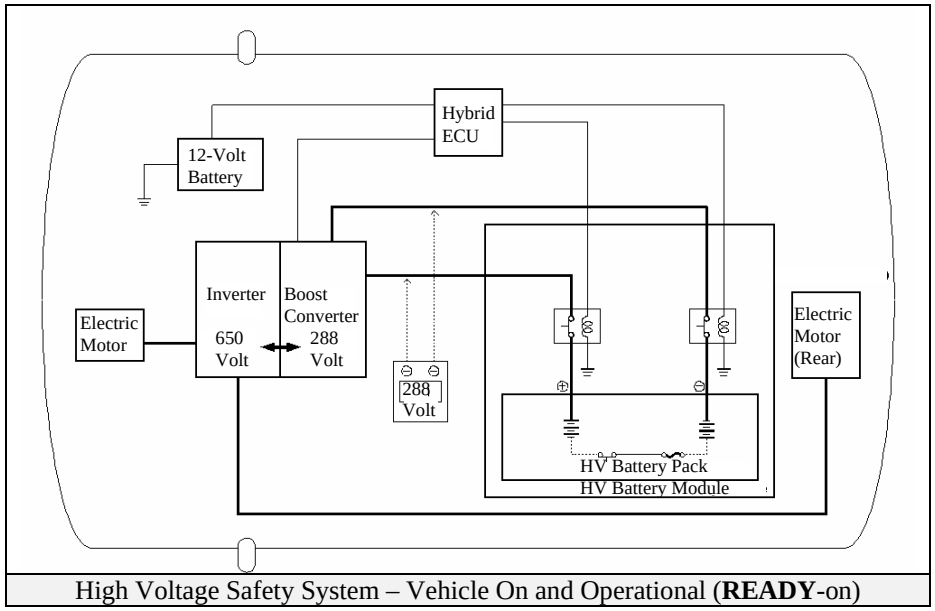
- Both positive and negative power cables ❷ are isolated from the metal chassis, so there is no possibility of shock by touching the metal chassis.

- A ground fault monitor ❹ continuously monitors for high voltage leakage to the metal chassis while the vehicle is running. If a malfunction is detected, the vehicle computer ❹ will illuminate the master warning light ⚠ in the instrument cluster and indicate "CHECK HYBRID SYSTEM" on the Multi-information Display.

- The HV battery pack relays will automatically open to stop electricity flow in a collision sufficient to activate the SRS.



High Voltage Safety System – Vehicle Shut Off (**READY**-off)

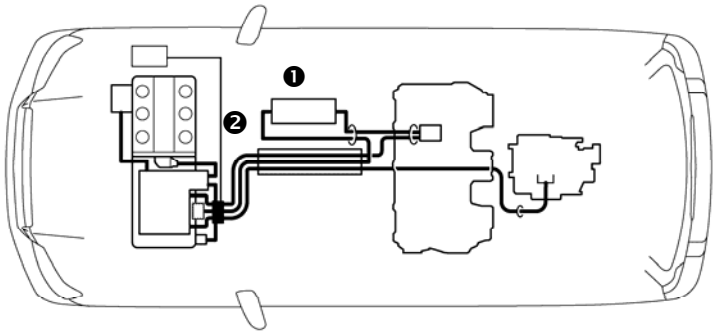


High Voltage Safety System – Vehicle On and Operational (**READY**-on)

High Voltage Safety (Continued)

The HV battery pack also powers a 288-Volt DC to 42-Volt DC converter for the assist motor in the electric power steering (EPS). This DC-DC converter is located under the center console ❶. Both positive and negative 42-Volt cables ❷ are contained within plastic yellow sheathing and are isolated from the metal vehicle chassis.

NOTE:
42-Volt DC has a higher arc potential than 12-Volt DC.



HV Battery and DC-DC Converter Cable Routing
Note: Positive and negative power cables shown bundled as a single line

SRS Airbags & Seat Belt Pretensioners

Standard Equipment

- Electronic frontal impact sensors (2) are mounted in the engine compartment ❶.
- Front seat belt pretensioners are mounted near the base of the B-pillar ❷.
- Frontal dual stage airbag for the driver ❸ is mounted in the steering wheel hub.
- Frontal dual stage airbag for the front passenger ❹ is integrated into the dashboard and deploys through the top of the dashboard.
- SRS computer ❺ is mounted on the floor pan underneath the center console. It also contains an impact sensor.

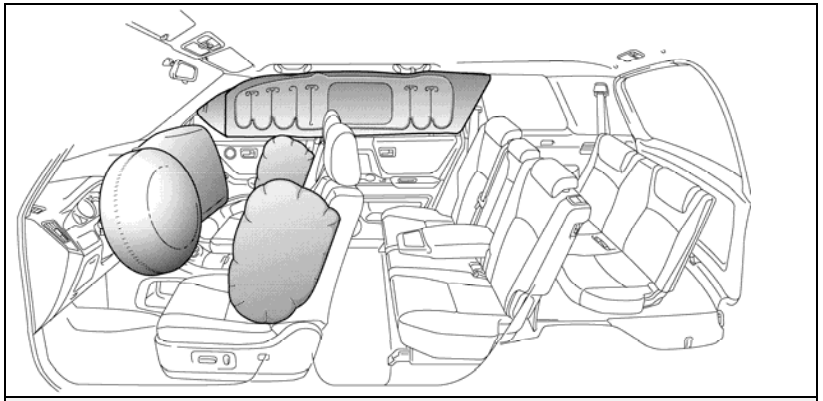
Optional Side Airbag Package

- Front electronic side impact sensors (2) are mounted near the base of the B-pillars ❻.
- Rear electronic side impact sensors (2) are mounted near the base of the C-pillars ❼.
- Front seat side airbags ❽ are mounted in the front seats.
- Side curtain airbags ❾ are mounted along the outer edge inside the roof rails.

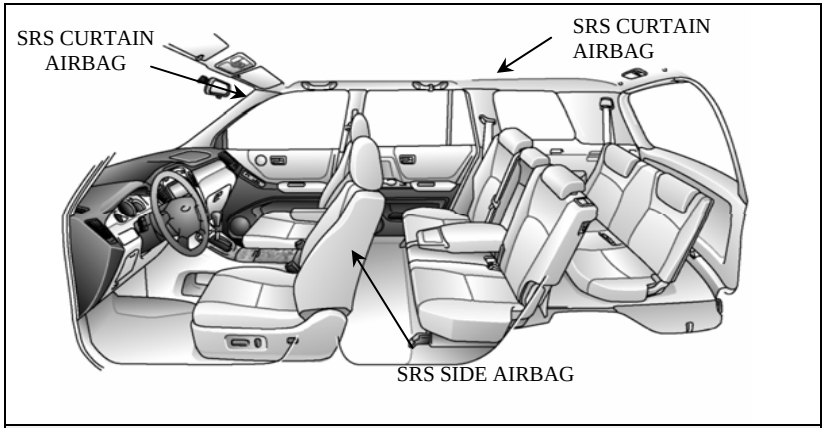
NOTE:
The front seat side airbags and the side curtain airbags may deploy independently of each other.

The front passenger occupant classification system may prohibit the deployment of the frontal passenger airbag, front passenger side airbag, and front passenger seat belt pretensioner.

⚠ **WARNING:**
The SRS airbags can cause death or serious injury by sudden deployment. To avoid death or serious injury wait 90 seconds after disabling the vehicle to allow the SRS backup power to discharge.

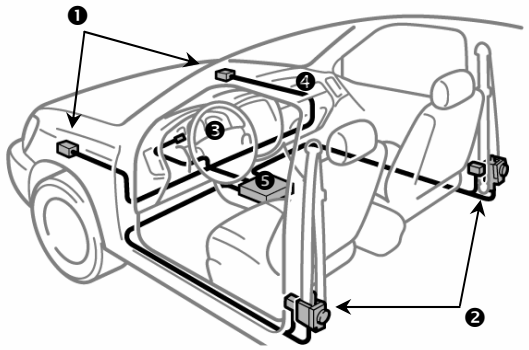
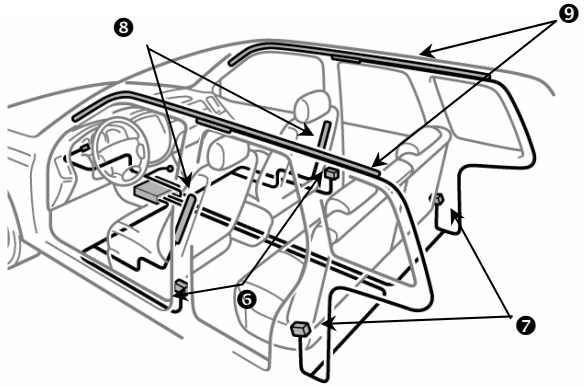
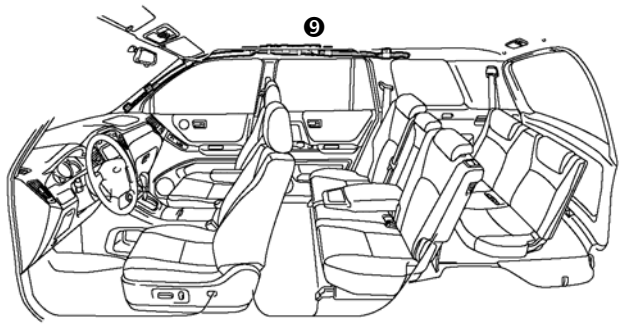


Frontal, Optional Front Seat Side, and Optional Side Curtain Airbags



Optional Front Seat Side and Side Curtain Airbag Identifiers

SRS Airbags & Seat Belt Pretensioners (Continued)

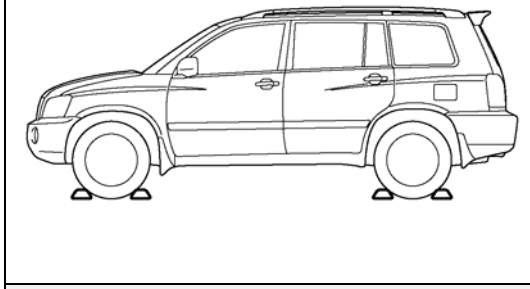
		
Standard Frontal Airbags and Seat Belt Pretensioners	Optional Front Seat Side and Side Curtain Airbags	Optional Side Curtain Airbag Inflator in Roof Rail

Emergency Response

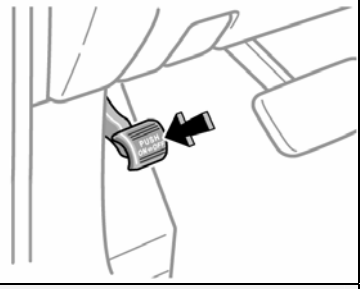
On arrival, emergency responders should follow their standard operating procedures for vehicle incidents. Emergencies involving the Highlander hybrid may be handled like other automobiles except as noted in these guidelines for Extrication, Fire, Overhaul, Recovery, Spills, First Aid, and Submersion.

⚠ WARNING:

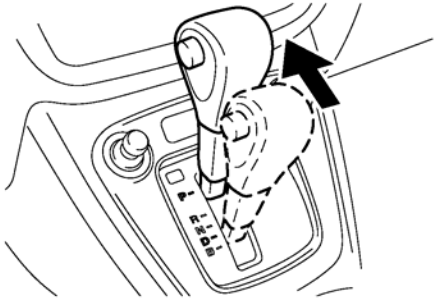
- ***Never*** *assume the Highlander hybrid is shut off simply because it is silent.*
- *Always observe the instrument cluster for the* ***READY*** *indicator status to verify whether the vehicle is on or shut off. The vehicle is shut off when the READY indicator is off.*
- *Failure to shut off the vehicle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



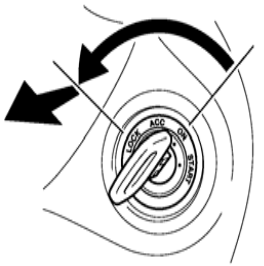
Chock Wheels



Set Parking Brake



Shift Lever in Park



Turn Ignition Key Off

Extrication

- Immobilize Vehicle

  Chock wheels and set the parking brake.
  Move the shift lever to the **P** (Park) position.

- Disable Vehicle

  Performing either of the following two procedures will shut the vehicle off and disable the HV battery pack, SRS, and gasoline fuel pump.

  Procedure #1

  1. Turn the ignition key off.
  2. Remove the key and place on dash. If the key cannot be removed, disconnect the 12-Volt auxiliary battery in the engine compartment.

  NOTE:
  Before disconnecting the 12-Volt auxiliary battery, reposition power seats, lower windows, open door locks and fuel door as required. Once the 12-Volt auxiliary battery is disconnected power controls will not operate.

Emergency Response (Continued)

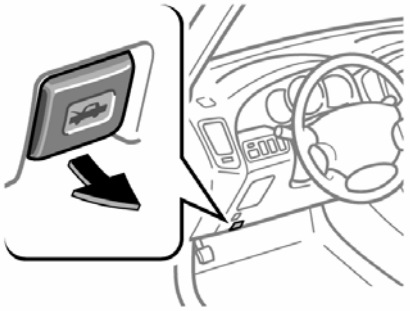
Extrication (Continued)

Procedure #2 (Alternate if ignition key is inaccessible).

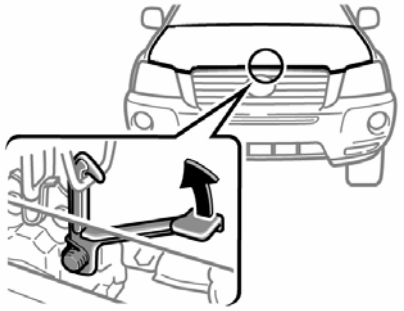
1. Disconnect the 12-Volt auxiliary battery in the engine compartment.
2. Remove the fuse box cover.
3. Remove the IGCT No. 4 fuse (10A Red colored) in the engine compartment junction block as illustrated. When in doubt, pull all four fuses in the fuse block.

⚠ WARNING:

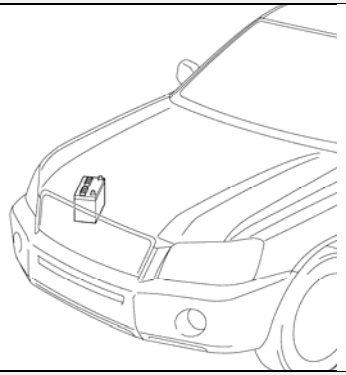
- *High voltage electricity can cause death or serious injury from severe burns or electric shock. To avoid death or serious injury wait 5 minutes after disabling the vehicle to discharge high voltage electricity, and do not touch, cut, or open any orange high voltage power cable or high voltage component.*
- *The SRS airbags can cause death or serious injury by sudden deployment. To avoid death or serious injury wait 90 seconds after disabling the vehicle to allow the SRS backup power to discharge.*
- *If neither of the disabling procedures can be performed, proceed with caution as there is no assurance that the high voltage electrical system, SRS, or fuel pump are disabled.*



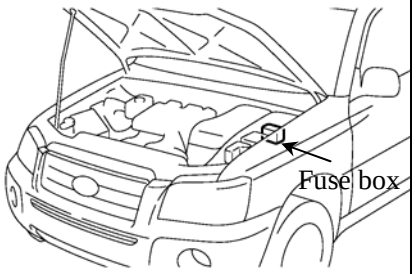
Remote Hood Release



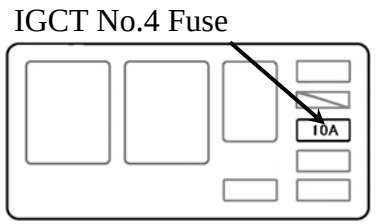
Hood Latch Release



12-Volt Auxiliary Battery



Remove Junction Block Cover



IGCT No. 4 Fuse Location

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, exhaust system, or fuel system.

- Access Patients
  Glass Removal
  Use normal glass removal procedures as required.

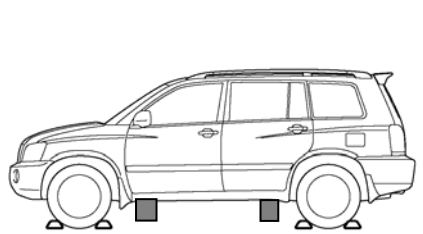
  SRS Awareness
  Responders need to be cautious when working in close proximity to undeployed airbags and seat belt pretensioners. Deployed front dual stage airbags automatically ignite both stages within a fraction of a second.

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

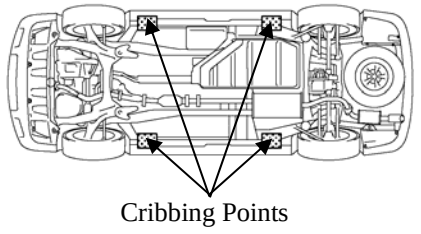
  Roof Removal
  The vehicle may contain optional side curtain airbags. If equipped and undeployed, it is not recommend to remove or to displace the roof. Optional side curtain airbags may be identified as illustrated.

  Dash Displacement
  The vehicle may contain optional side curtain airbags. When equipped, do not remove or displace the roof during a dash displacement to avoid cutting into undeployed airbags or inflators. As an alternative, dash displacement may be performed by using a Modified Dash Roll.

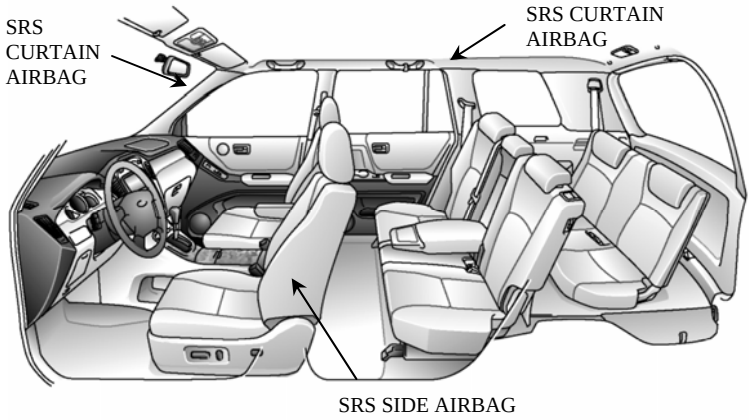
  If not equipped with the optional side curtain airbags, displace the dash by using a conventional dash roll or Modified Dash Roll.



Cribbing Points



Underbody View



Optional Front Seat Side and Side Curtain Airbag Identifiers

Emergency Response (Continued)

Extrication (Continued)

Rescue Lift Air Bags

Responders should not place cribbing or rescue lift airbags under the high voltage power cables, exhaust system, or fuel system.

Repositioning Steering Wheel and Seat

Manual tilt steering wheel and manual or optional power seat controls are shown in the illustrations.

Fire

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

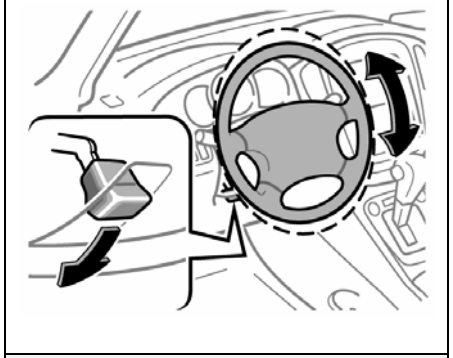
- Extinguishing Agent
  Water has been proven to be a suitable extinguishing agent.

- 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 Highlander hybrid until the fire has been knocked down and overhaul operations have commenced.

- Fire in the HV Battery Pack
  Should a fire occur in the NiMH HV battery pack attack crews should utilize a water stream or fog pattern to extinguish any fire within the occupant cabin *except* for the HV battery pack.

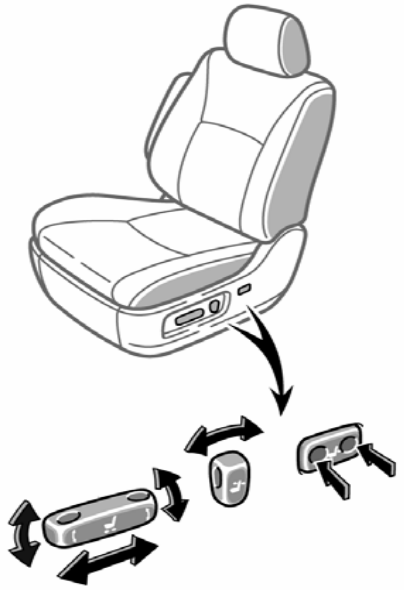
⚠ WARNING:

- *High voltage electricity can cause death or serious injury from severe burns or electric shock.*
- *The battery modules are contained within a metal case and access is limited to duct openings under the second row rear seat.*
- *To avoid death or serious injury from severe burns or electric shock, **never** breach or remove the high voltage battery cover under any circumstance including fire.*



Tilt Steering Control

Manual Front Seat Controls



Optional Power Front Seat Controls

Emergency Response (Continued)

Fire (Continued)

When allowed to burn themselves out, the Highlander hybrid NiMH battery modules burn rapidly and can quickly be reduced to ashes except for the metal.

Offensive Fire Attack
Normally flooding the NiMH HV battery pack with copious amounts of water at a safe distance will effectively control the HV battery pack fire by cooling the adjacent NiMH battery modules to a point below their ignition temperature. The remaining modules on fire, if not extinguished by the water, will burn themselves out.

However, flooding the Highlander hybrid HV battery pack is *not* recommended due to battery design and forward location preventing the responder from properly applying water through the available vent openings safely. It is recommended that the incident commander allow the Highlander hybrid HV battery pack to burn itself out.

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 NiMH battery modules to burn themselves out. During this defensive operation, fire crews may utilize a water stream or fog pattern to protect exposures or to control the path of smoke.

Overhaul
During overhaul, immobilize and disable the vehicle if not already done. See illustrations on page 15.

- Immobilize Vehicle
  Chock wheels and set the parking brake.
  Move the shift lever to the **P** (Park) position.

- Disable Vehicle
  Performing either of the following two procedures will shut the vehicle off and disable the HV battery pack, SRS, and gasoline fuel pump.

Procedure #1
1. Turn the ignition key off.
2. Remove the key and place on dash. If the key cannot be removed, disconnect the 12-Volt auxiliary battery in the engine compartment.

Procedure #2 (Alternate if ignition key is inaccessible).
1. Disconnect the 12-Volt auxiliary battery in the engine compartment.
2. Remove the fuse box cover.
3. Remove the IGCT No. 4 fuse (10A Red colored) in the engine compartment junction block. When in doubt, pull all four fuses in the fuse block.

⚠ WARNING:
- *High voltage electricity can cause death or serious injury from severe burns or electric shock. To avoid death or serious injury wait 5 minutes after disabling the vehicle to discharge high voltage electricity, and do not touch, cut, or open any orange high voltage power cable or high voltage component.*
- *The SRS airbags can cause death or serious injury by sudden deployment. To avoid death or serious injury wait 90 seconds after disabling the vehicle to allow the SRS backup power to discharge.*
- *If neither of the disabling procedures can be performed, proceed with caution as there is no assurance that the high voltage electrical system, SRS, or fuel pump are disabled.*

Recovery/Recycling NiMH HV Battery Pack
Clean up of the HV battery pack can be accomplished by the vehicle recovery crew without further concern of runoff or spill. For information regarding recycling of the HV battery pack, contact the nearest Toyota dealer or:

United States: (800) 331-4331 Canada: (888) TOYOTA-8 or 869-6828

Emergency Response (Continued)

Spills

The Highlander hybrid contains the same common automotive fluids used in other Toyota vehicles, with the exception of NiMH electrolyte used in the HV battery pack. The NiMH battery electrolyte is a caustic alkaline (pH 13.5) that is damaging to human tissues. The electrolyte, however, is absorbed in the cell plates and will not normally spill or leak out even if a battery module is cracked. A catastrophic crash that would breach both the metal battery pack case and the metal battery module would be a rare occurrence.

Similar to using baking soda to neutralize a lead-acid battery electrolyte spill, a dilute boric acid solution or vinegar is used to neutralize a NiMH battery electrolyte spill.

In an emergency, Toyota Material Safety Data Sheets (MSDS) are available by contacting:

United States: CHEMTREC at (800) 424-9300
Canada: CANUTEC at *666 or (613) 996-6666 (collect)

- Handle NiMH Electrolyte Spills Using The Following Personal Protective Equipment (PPE):
  Splash shield or safety goggles. Fold down helmet shields are not acceptable for acid or electrolyte spills.
  Rubber, latex or Nitrile gloves.
  Apron suitable for alkaline.
  Rubber boots.

- Neutralize NiMH Electrolyte
  Use a boric acid solution or vinegar.
  Boric acid solution - 800 grams boric acid to 20 liters water or 5.5 ounces boric acid to 1 gallon of water.

First Aid

Emergency responders may not be familiar with a NiMH 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.

⚠ WARNING:
The NIMH battery electrolyte is a caustic alkaline (pH 13.5) that is damaging to human tissues. To avoid injury by coming in contact with the electrolyte, wear proper personal protective equipment.

- Wear Personal Protective Equipment (PPE)
  Splash shield or safety goggles. Fold down helmet shields are not acceptable for acid or electrolyte spills.
  Rubber, latex or Nitrile gloves.
  Apron suitable for alkaline.
  Rubber boots.

- Absorption
  Perform gross decontamination by removing affected clothing and properly disposing of the garments.
  Rinse the affected areas with water for 20 minutes.
  Transport to the nearest emergency medical care facility.

- Inhalation in Non-Fire Situations
  No toxic gases are emitted under normal conditions.

- Inhalation in Fire Situations
  Toxic gases are given off as the by-product 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 to the nearest emergency medical care facility.

- Ingestion
  Do not induce vomiting.
  Allow a patient to drink large quantities of water to dilute electrolyte (Never give water to an unconscious person).
  If vomiting occurs spontaneously, keep the patients head lowered and forward to reduce the risk of asphyxiation.
  Transport to the nearest emergency medical care facility.

Emergency Response (Continued)

Submersion

Handle a Highlander hybrid that is fully or partially submerged in water by disabling the HV battery pack, SRS, and gasoline fuel pump.

- Remove vehicle from the water.
- Drain water from the vehicle if possible.
- Follow the immobilizing and disabling procedures on page 15.

Roadside Assistance

Toyota Highlander hybrid roadside assistance 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: (877) 304-6495 Canada: (888) TOYOTA-8 or 869-6828

Shift Lever

Similar to most Toyota vehicles, the Highlander hybrid uses a shift lever as shown in the illustration. However, the Highlander hybrid shift lever includes a motor brake **B** position for high load regenerative braking when decelerating down a steep grade.

Towing

- A 2WD Highlander hybrid must be towed with the front wheels off the ground.
- A 4WD-i Highlander hybrid must be towed with all 4 wheels off the ground.
- Do not tow the vehicle with 4 wheels on the ground. This may cause serious damage to the vehicle.
- The vehicle may be shifted out of **P**ark into **N**eutral by turning the ignition-on, depressing the brake, then moving the shift lever to **N**.
- If the shift lever cannot be moved out of **P** (park), a shift lock release button is provided near the shift lever as shown in the illustration.

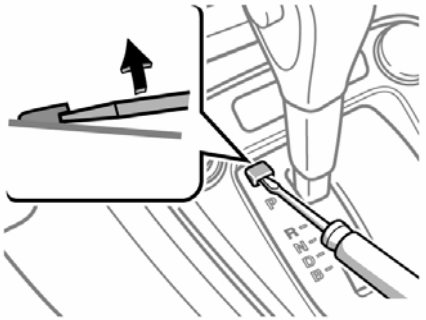
Electric Fuel Door Opener

The Highlander hybrid is equipped with an electric fuel door opener. In the event of 12-Volt power loss, the fuel door can only be opened with the manual release located inside the cargo area.

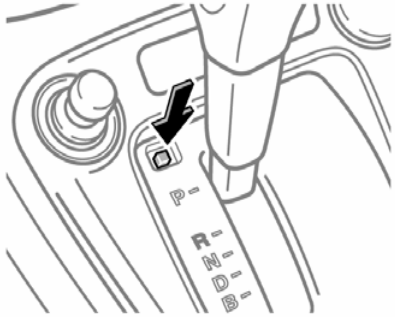
Spare Tire

The jack and tools are provided in the cargo area as illustrated. The spare tire is fixed by the carrier underneath, outside the cargo area.

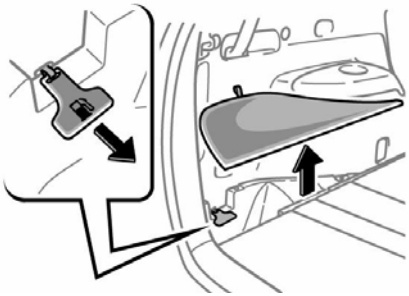
Shift Lever



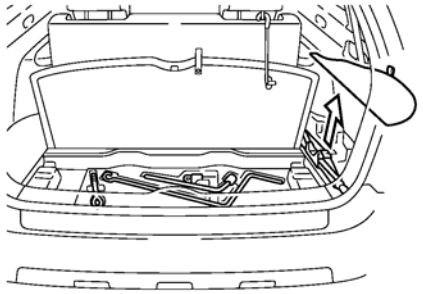
Shift Lock Release Cover



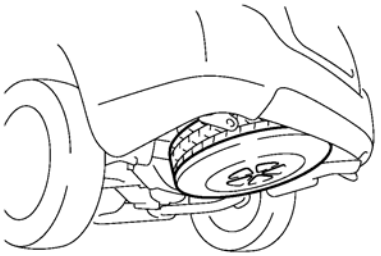
Push in Shift Lock Release



Manual Fuel Door Release



Tools in Cargo Area



Spare Tire Under Cargo Area

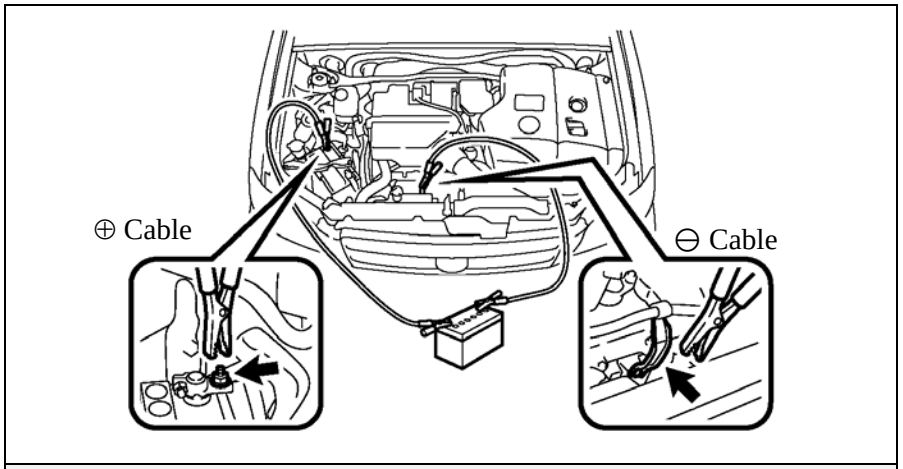
Roadside Assistance (Continued)

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 turning the ignition key to “START.”

The 12-Volt auxiliary battery is located in the engine compartment. The jump starting procedure is the same as for other Toyota vehicles.

- Connect the positive jumper cable to the positive battery post.
- Connect the negative terminal to the ground bracket.
- The high voltage HV battery pack cannot be jump started.



Jumper Cable Connections

Immobilizer & Anti-Theft Alarm

The vehicle has a standard electronic key immobilizer system and an optional anti-theft alarm. The vehicle may only be started with a learned immobilizer coded key.

To disarm the optional Anti-Theft Alarm:

- Unlock the door using an ignition key or wireless remote control.
- Turn the ignition switch on.