



Hybrid Vehicle Safing Procedure for NiMh Battery

Quick Training Guide QT013A

Before servicing the high voltage system of hybrid vehicles, a safing procedure must be performed.
This Quick Reference Guide describes the safing procedures for most Toyota hybrid models.
Prepared only for technicians that are Toyota Hybrid System certified



Click the ENTER button to view the Quick Training Guide.

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Hybrid Vehicle Precautions

Safing Procedure for All Hybrid Vehicle Models

Vehicle-specific Safing Procedures

CAUTION

Hybrid system circuits can **operate with up to 650 volts**. These **high voltages** are dangerous and **can cause severe personal injuries, burns, electrical shock and even death** if proper safety precautions are not followed. **Always** refer to the Repair Manual for vehicle-specific details.

Notice: This guide does not certify you to work on hybrid vehicle high-voltage systems. You **must** complete Course 071 – Toyota Hybrid Systems (for service technicians), or Course 602 – Advanced Hybrid Systems (for collision repair technicians) to safely begin working on Toyota hybrid systems.

Until you complete Course 071 or Course 602:

- Never touch, disassemble, remove or replace the high-voltage parts, cables and their connectors. **(High-voltage parts and cables are colored orange or have high-voltage warning labels.)**
- Do not try to access the service plug.

Failure to comply with these warnings can cause severe burns or electric shock that may result in **serious injury or death**.

Check DTCs before beginning hybrid vehicle service.

Insulation malfunctions can cause **high voltage to be present in unexpected locations**. **Always check DTCs and repair any isolation faults before proceeding with vehicle service.**

DTC	INF Code	Indicates
P0AA6*	526, 611, 612, 613, 614	HV Battery Voltage System Isolation Fault
P0A1D	721, 722, 723, 787, 818	Monitor CPU Malfunction (ECU internal error)
P0AA7	727	Malfunction in insulation monitoring circuit in HV Battery Smart Unit
P0A1F	129	Malfunction in HV battery voltage circuit in the HV Battery Smart Unit

*In 2001-2003 Prius, P3009 was used in place of P0AA6.

 Click the tabs at the top to view each section

CAUTION

The electrolyte in nickel metal hydride (NiMH) batteries in hybrid vehicles is a **strong alkali solution** that includes potassium hydroxide, which is **damaging to human tissues**. To avoid injury from coming in contact with the electrolyte, wear proper personal protective equipment (PPE). Refer to the RM, FRM, ERG or other source for chemical hazard PPE.

Use the proper personal protective equipment (PPE).

The following personal protective equipment (PPE) is mandatory for working on the high-voltage system in Toyota hybrid vehicles:

- **Safety glasses** (ANSI certified) with side shields
- Class 0 electrical **insulating gloves** meeting ASTM standard specifications (up to 1000 volts)

Gloves that have been in-service for six months must either:

- Be sent out for electrical testing or
- Disposed of and replaced with new gloves



Refer to the RM for care and handling of gloves and in-use check procedures.

Take responsibility for managing safety.

The **Certified Hybrid Technician** is responsible for managing safety while inspecting or repairing any **high-voltage** components.

- Confirm that the **work area is dry** and the areas around the hybrid components (HV battery, inverter) are dry
- Create and **maintain a safe zone** around the hybrid vehicle as appropriate.
- Use the “CAUTION: HIGH VOLTAGE. DO NOT TOUCH” sign to notify other technicians that the **high-voltage** system is being inspected and/or repaired. This sign can be found in most hybrid Repair Manuals under General > Introduction > Repair Instruction > Precaution. **Click here for a copy.**

**CAUTION:
HIGH VOLTAGE
DO NOT TOUCH.**

Person in charge: _____

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The following procedure applies to all Toyota hybrid vehicles except Prius PHV. It does NOT apply to RAV4 EV or Scion iQ EV.

Before servicing the HV system:

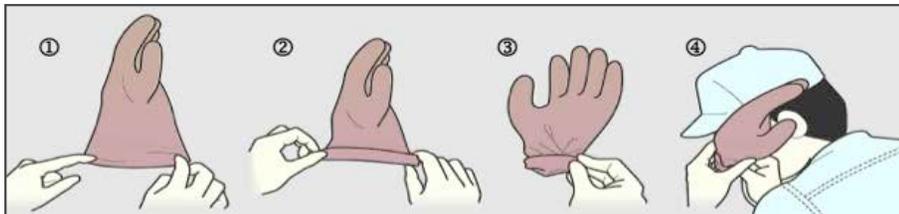
1. Turn the power switch OFF, and remove the key from the interior detection area for the entry and start system.

- When the vehicle is in READY mode, the engine may not be running – but it can start at any time, without warning
- Secure the smart key at least 10 feet away from the vehicle to provide additional safety

2. Disconnect the cable from the auxiliary battery negative terminal.

3. Check the insulated gloves.

- Before use, check the insulated gloves for cracks, tears and other types of damage by performing the following procedure:



- ① Place the glove on its side
- ② Roll the opening up 2 or 3 times, trapping as much air as possible within the glove
- ③ Fold the opening in half to close it
- ④ Confirm that there are no air leaks by listening for escaping air or holding the gloves against your cheek to feel for escaping air

4. Wearing insulated gloves, remove the service plug grip.

- Keep the removed service plug in your pocket (or other secure location) to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage components



Refer to the Repair Manual for the vehicle you're servicing for the specific location of and procedure for removing the Service Plug.



Even with the service plug removed, the HV battery still has **high-voltage components inside**. Note that using non-insulated tools can cause a short circuit between high-voltage components resulting in an **electrical arc and burns**. Always follow the safety precautions described in the Repair Manual when working around the HV battery.

5. Wait for 10 minutes or more to discharge the high-voltage capacitor inside the inverter assembly.

- The capacitor stores and releases high-voltage electricity supplied by the HV battery and the motor generators
- The capacitor must be allowed to fully discharge before servicing the HV system

6. Check the voltage at the designated inspection points in the inverter (0V check).

- Before using the voltmeter to measure voltage at the inverter terminals, test the voltmeter by measuring the voltage of the auxiliary battery
- Be sure the meter is set to measure the appropriate voltage range as specified in the Repair Manual



Refer to the Repair Manual for the specific test points for voltage measurements for the vehicle you're servicing.

7. Insulate the disconnected high-voltage connectors with insulated vinyl tape.

For Additional Safety Information

Additional safety information for first responders and for dismantlers is available free at <http://www.techinfo.toyota.com>. Go to the bottom of the page and click on the "**Emergency Response and Hybrid Information**" link. There you will find:

- Emergency Response Guides
- Hybrid Emergency Responder Training
- Hybrid Dismantling Manuals

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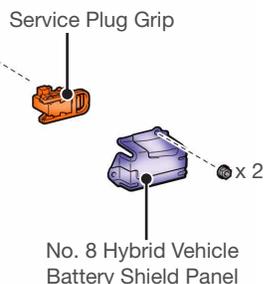
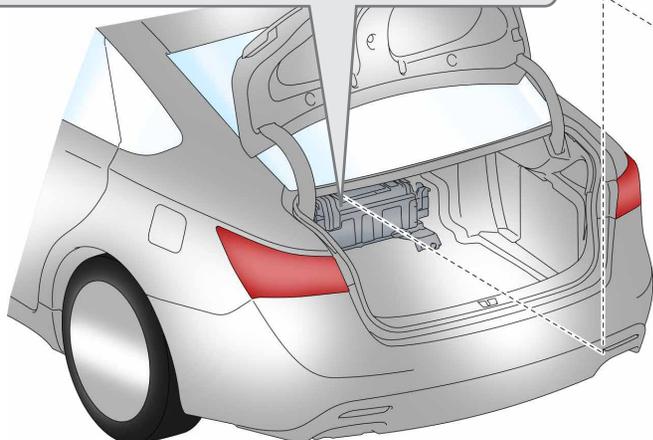
Hybrid Vehicle Precautions			Safing Procedure for All Hybrid Vehicle Models			Vehicle-specific Safing Procedures		
Avalon 2013+ Camry 2012+	Camry 2007-2011	Highlander 2006-2010	Highlander 2011+	Prius 2001-2003	Prius 2004-2009	Prius 2010+	Prius V 2012+	Prius C 2012+

 Click the tabs at the top to view each section

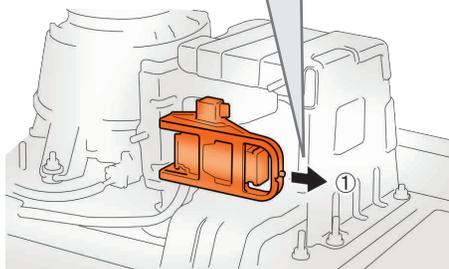
Avalon, 2013+ and Camry, 2012+

Step 4:

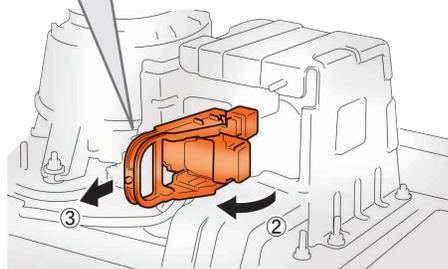
Remove the luggage trim service hole cover, luggage compartment floor mat, luggage compartment front trim cover, and No. 8 hybrid vehicle battery shield panel.



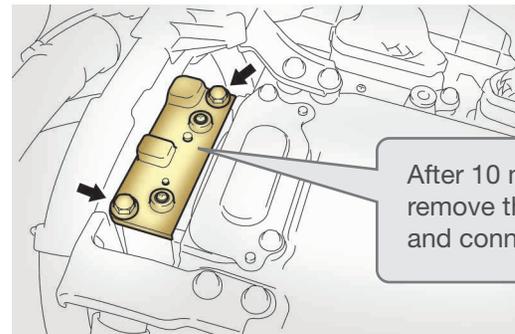
Wearing insulated gloves, slide the lever to the right.



Pull the lever toward you and remove the plug.



Step 6:



After 10 minutes, remove the 2 bolts and connector cover.*

Using a measuring range of 750 V DC or more, measure the voltage between the terminals.*
Std. Voltage: 0V



*Wear insulated gloves.

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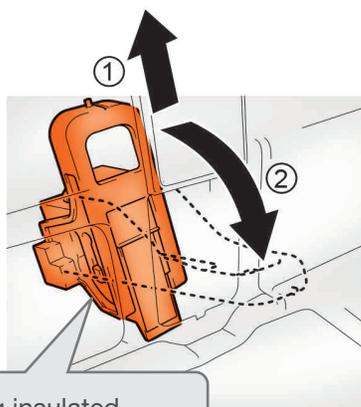
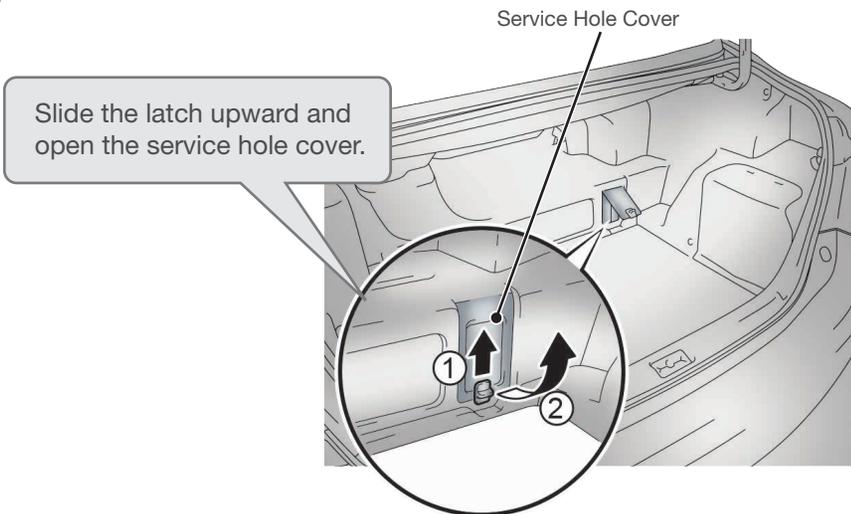
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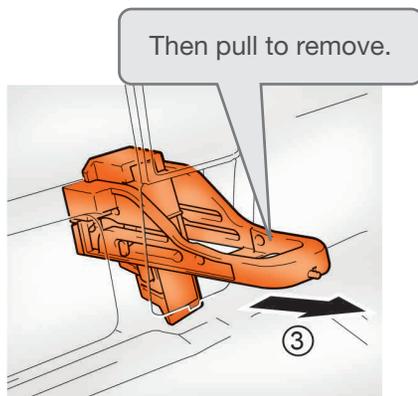
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Camry, 2007-2011

Step 4:

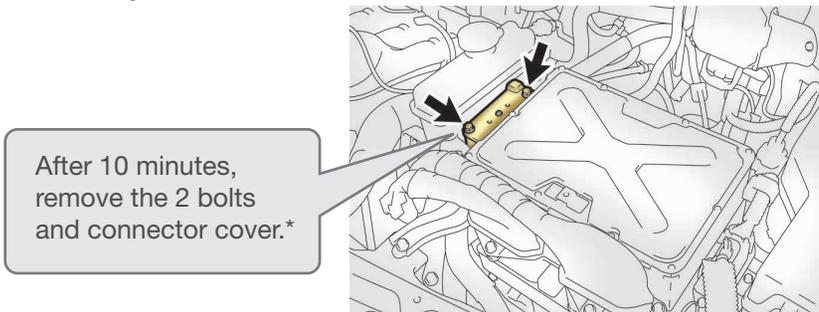


Wearing insulated gloves, slide the lever upward and pull down.



Then pull to remove.

Step 6:



Using a measuring range of 750 V DC or more, measure the voltage between the terminals.*
Std. Voltage: 0V



*Wear insulated gloves.

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Highlander, 2006-2010

Step 4:

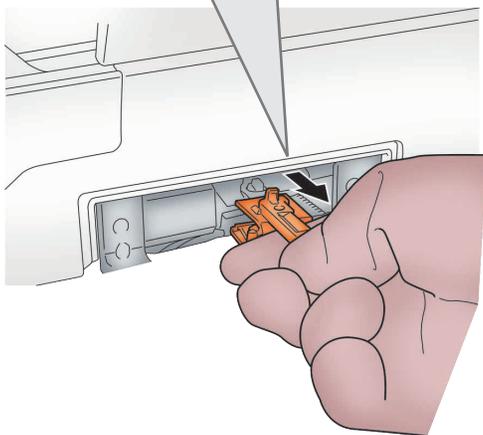
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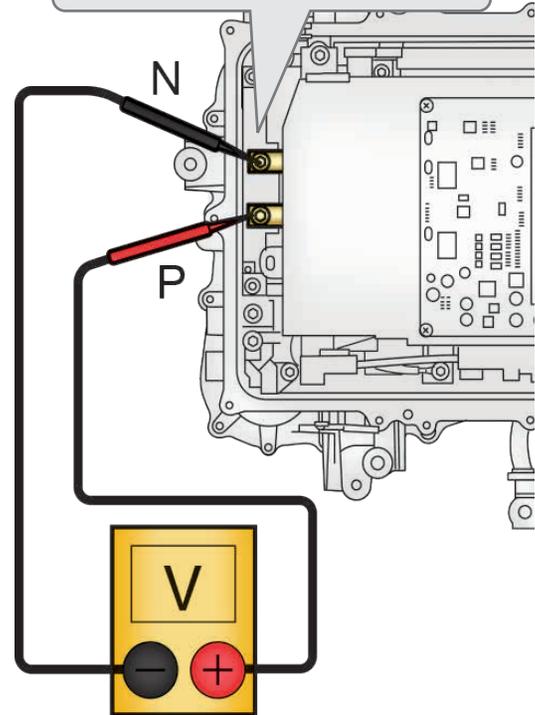
Remove the 2 clips and rear door scuff plate LH.
Remove the 2 clips and reclining hinge cover.



Wearing insulated gloves, pull the lever (do not slide) and remove the service plug grip.



After 10 minutes, remove the inverter cover.*
Using a measuring range of 750 V DC or more, measure the voltage between the terminals.*
Std. Voltage: 0V



*Wear insulated gloves.

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Avalon 2013+
Camry 2012+

Camry
2007-2011

Highlander
2006-2010

Highlander
2011+

Prius
2001-2003

Prius
2004-2009

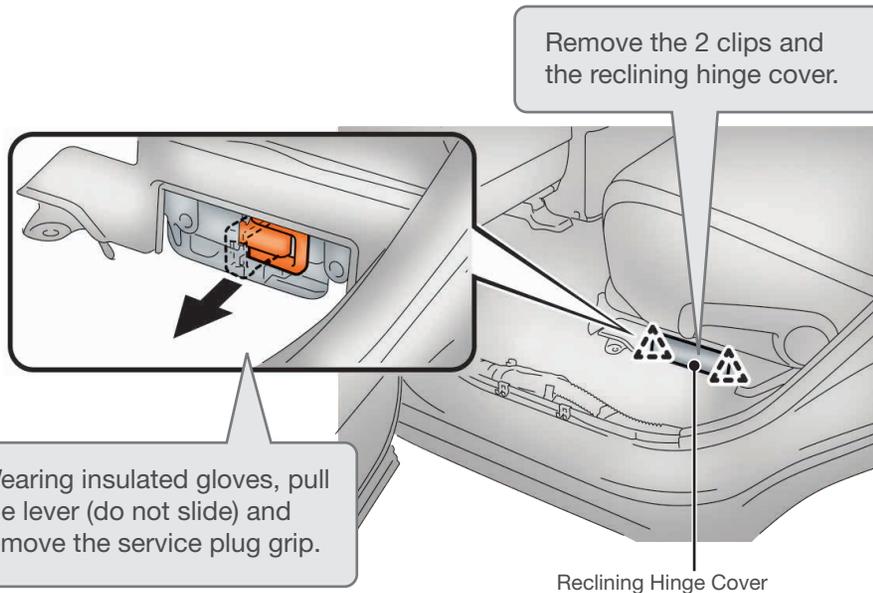
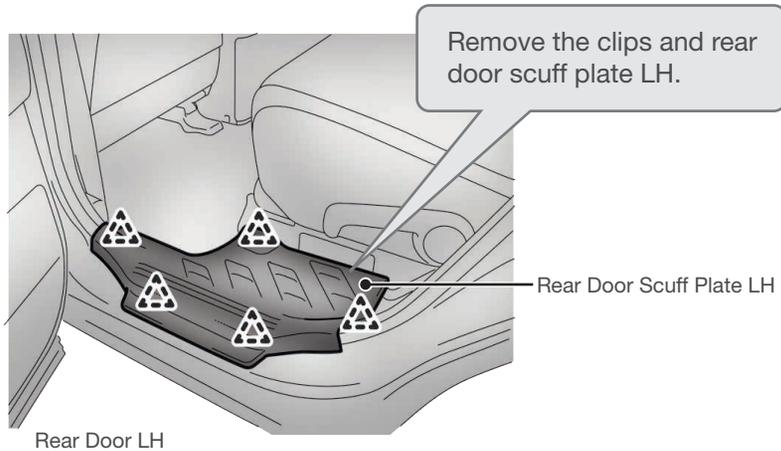
Prius
2010+

Prius V
2012+

Prius C
2012+

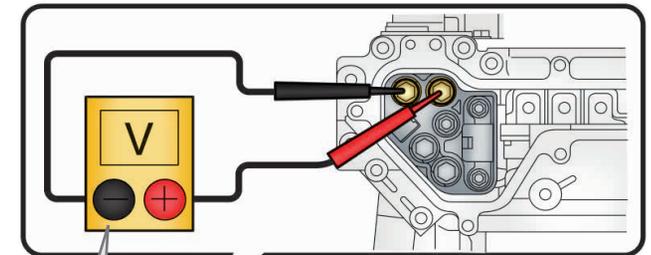
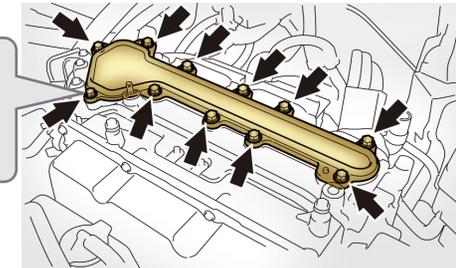
Highlander, 2011+

Step 4:



Step 6:

After 10 minutes, remove the 11 bolts and the inverter terminal cover.*



Using a measuring range of 750 V DC or more, measure the voltage between the terminals.*

Std. Voltage: 0V

*Wear insulated gloves.

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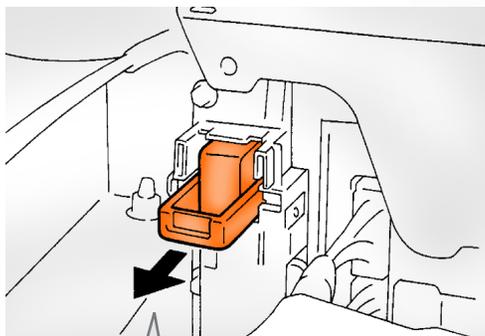
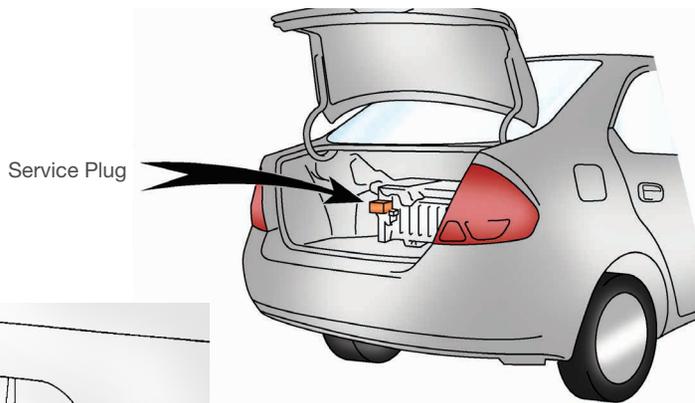
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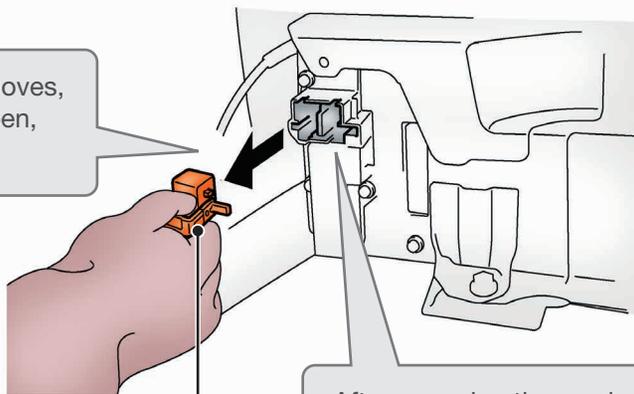
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Prius, 2001-2003

Step 4:

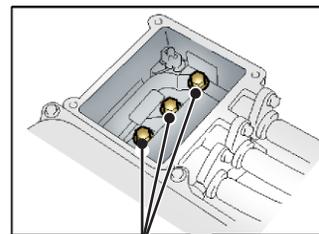


Wearing insulated gloves, rotate the handle open, then pull to remove.



After removing the service plug, cover the plug connector using rubber or vinyl tape.

Step 6:



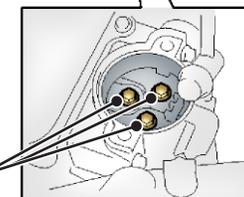
Terminals U, V, W

Using a voltmeter, measure the voltage between terminals of 3 phases (U-V, V-W, U-W) and each terminal and body ground to verify them to be approx. 0V.*

- After 5 minutes:
- Use a torx socket wrench (T30) to remove the 4 screws and inverter terminal cover.*
 - Using a torx socket wrench (T40), remove the 2 screws, circuit breaker sensor and connector cover.*

Hint Slide the connector cover to disconnect the circuit breaker sensor connector.

Terminals U, V, W



*Wear insulated gloves.

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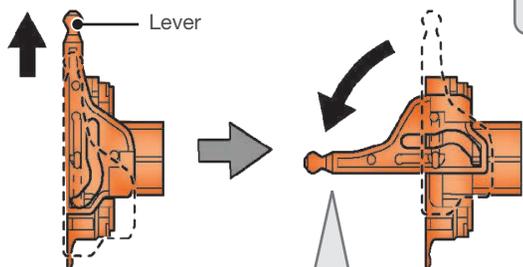
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Prius, 2004-2009

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Step 4:



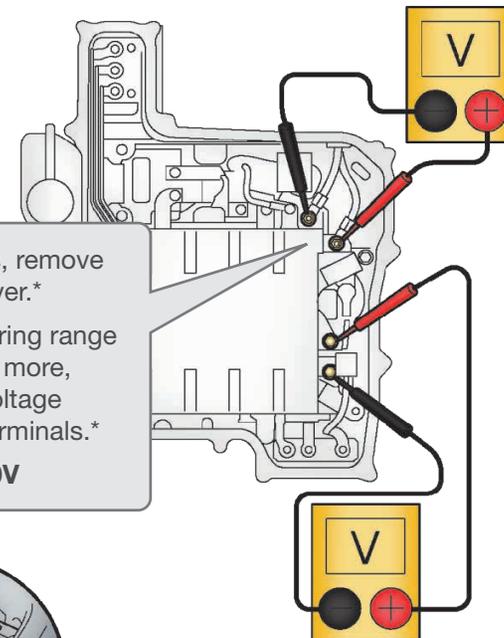
Wearing insulated gloves, slide the lever up, then pull it down to the left.

Remove the rear floor board No. 2, the rear deck floor box, and the rear floor board No. 3.

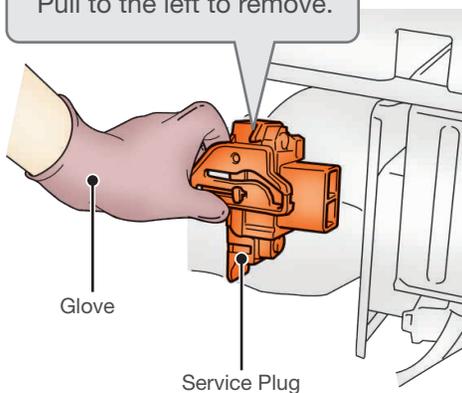


Step 6:

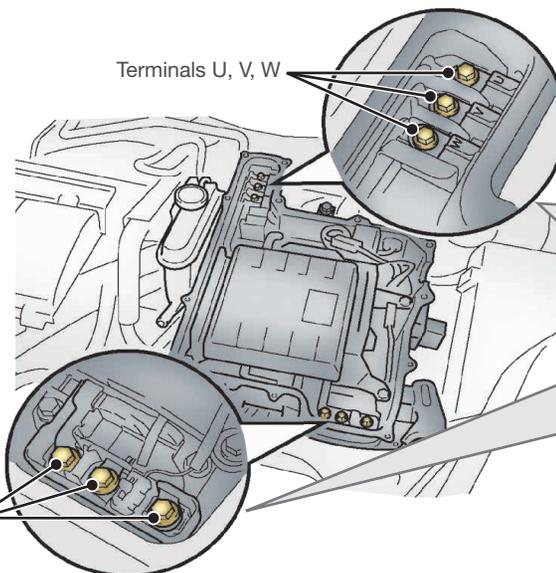
After 5 minutes, remove the inverter cover.*
Using a measuring range of 400 V DC or more, measure the voltage between the terminals.*
Std. Voltage: 0V



Pull to the left to remove.



Terminals U, V, W



Using the voltmeter, measure the voltage at the terminals of both three phase connectors. Measure both connectors between U - V, V - W, and U - W.*
Std. Voltage: 0V

*Wear insulated gloves.

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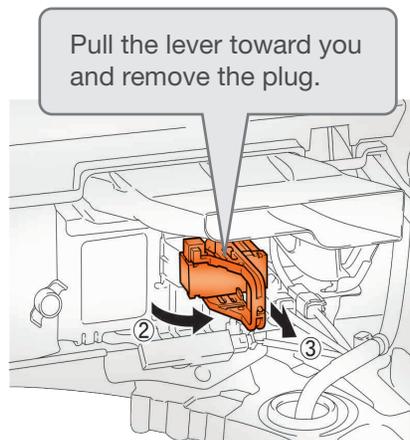
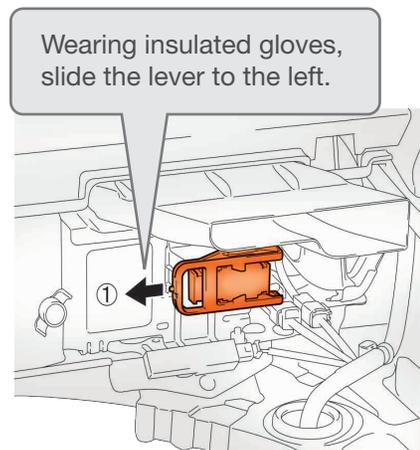
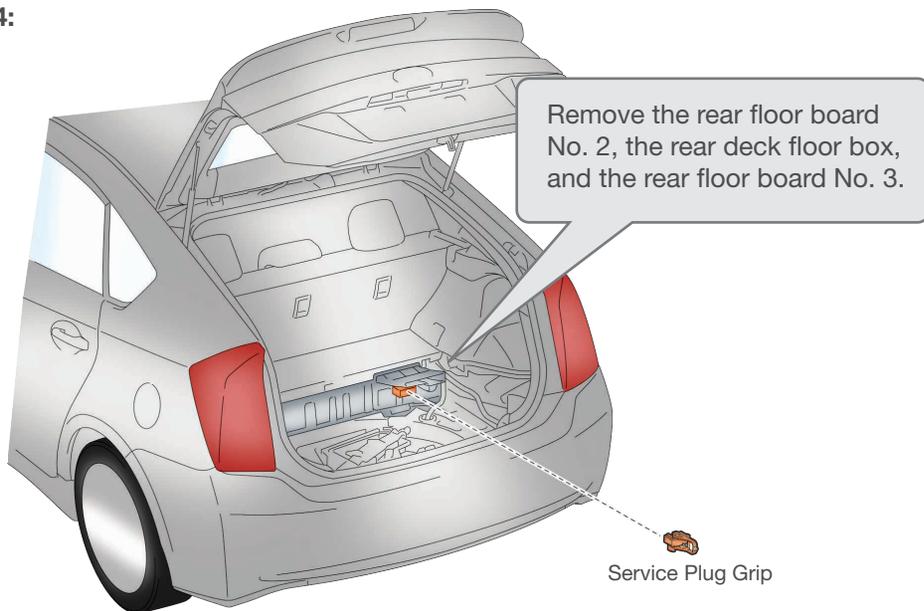
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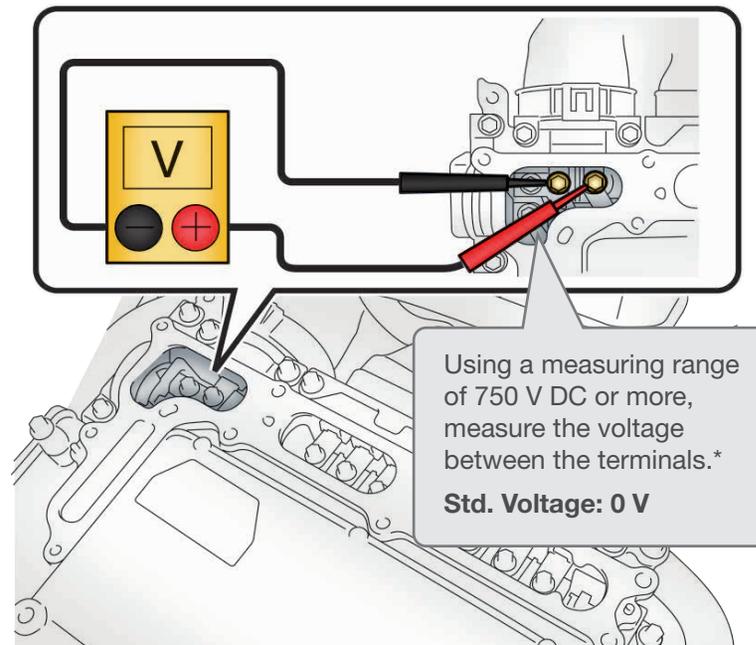
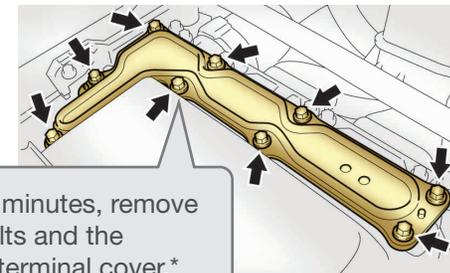
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Prius, 2010+

Step 4:



Step 6:



*Wear insulated gloves.

Hybrid Vehicle Safing Procedure for NiMh Battery

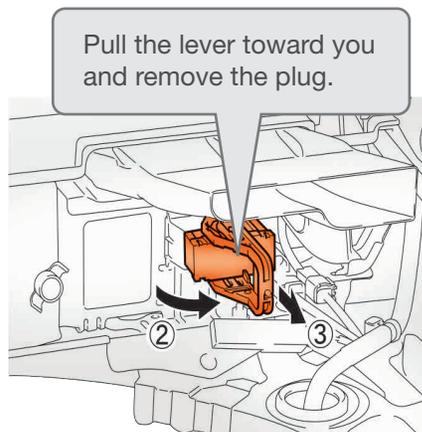
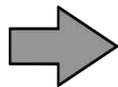
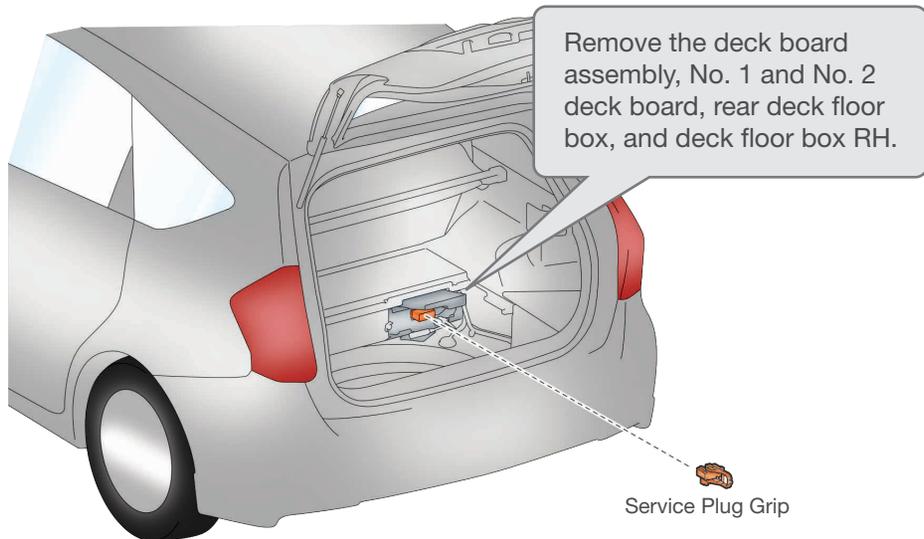
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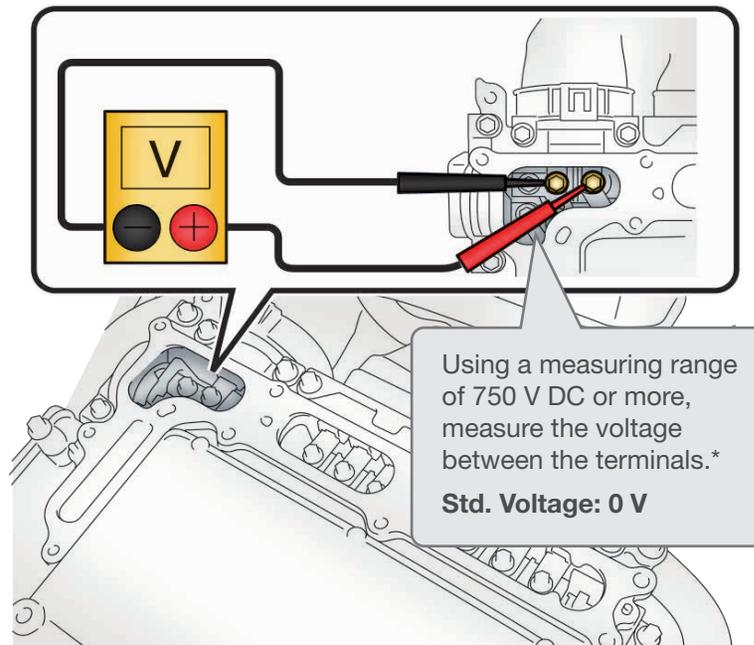
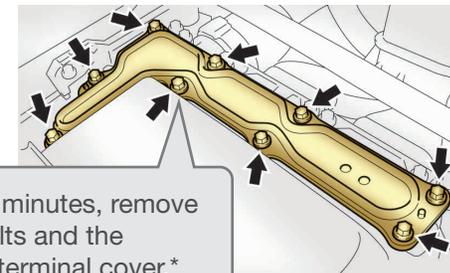
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Prius V, 2012+

Step 4:



Step 6:



*Wear insulated gloves.

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Camry 2012+

Camry
2007-2011

Highlander
2006-2010

Highlander
2011+

Prius
2001-2003

Prius
2004-2009

Prius
2010+

Prius V
2012+

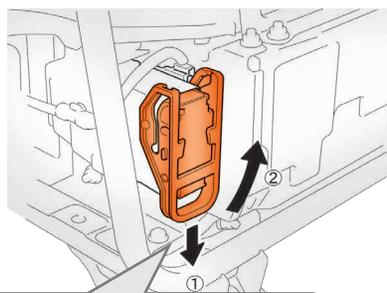
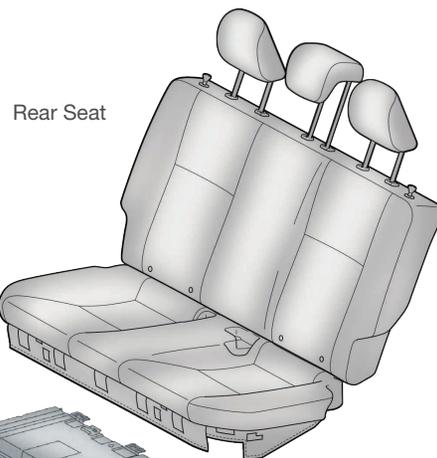
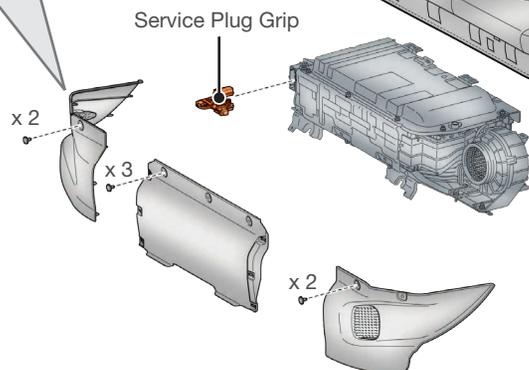
Prius C
2012+

Prius C, 2012+

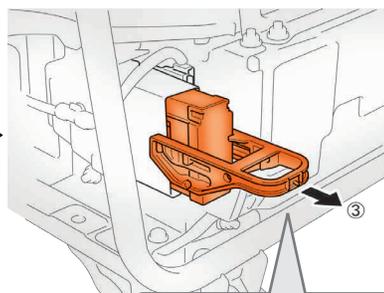
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Remove the front floor cover RH, front floor cover LH, and front center floor cover.

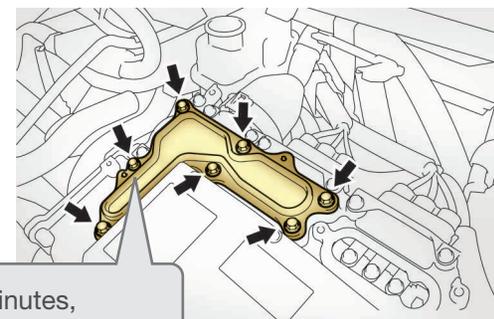


Wearing insulated gloves, slide the lever downward.

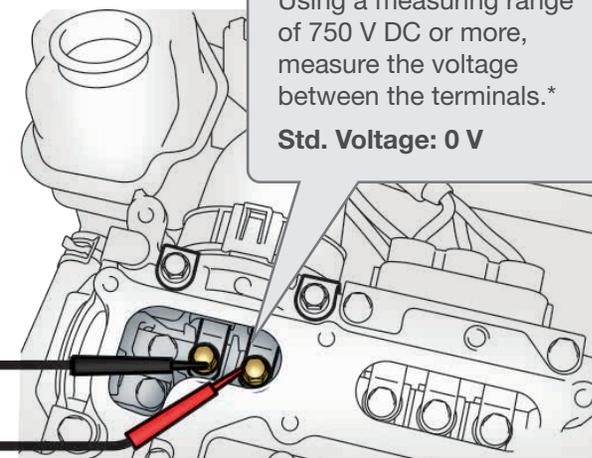


Pull the lever toward you and remove the plug.

Step 6:



After 10 minutes, remove the 7 bolts and the inverter cover.*



Using a measuring range of 750 V DC or more, measure the voltage between the terminals.
Std. Voltage: 0 V

*Wear insulated gloves.

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Caution Sign

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Copy this sign, and after folding it, put it on the roof of the vehicle in service.

	<p>Person in charge: _____</p> <p>CAUTION: HIGH VOLTAGE. DO NOT TOUCH DURING OPERATION.</p>	<p>CAUTION: HIGH VOLTAGE. DO NOT TOUCH DURING OPERATION.</p> <p>Person in charge: _____</p>	
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