



# PHEV Conversion Kit User Manual

for 2004-2009 Prius



## Warning:

- ◆ You are strongly recommended to have a specialist to undertake this installation!
- ◆ High Voltage (HV) Direct Current (DC) Warning: Traction battery Packs, motors, chargers, and other HV sources could cause serious injury or death if proper precautions are not taken while working on or around such high voltage direct current sources.
- ◆ Please note that anyone attempting to install this conversion kit and modify their vehicle is doing so at their own discretion and risk.
- ◆ Warranty: In performing some of these modifications it is possible though unlikely, to void your warranty with the vehicles manufacturer. Please check with your original vehicle manufacturer / dealer for confirmation.
- ◆ This is a patent pending technology.

## Attention

1. Please read instructions before installation.
2. Never connect wires improperly.
3. New batteries should be re-charged to full and balanced before use.
4. Please check the batteries' voltage and balance regularly for the first few times you drive the vehicle.
5. To extend battery life, equipment must be recharged, using the 110VAC household electricity powered charger provided, to full each time and the cells need to be fully balanced after charging.
6. The circuit breaker in the enclosure box is set to be switched off automatically if the current exceeds a pre-set limit (100A). In the event this breaker switches off you will then need to manually switch it back on before use.
7. Please switch the equipment off immediately if a defect is found while driving.
8. Please do not disassemble the components if the equipment is working normally.

## Product Overview

The Plug-in Hybrid Electric Vehicle Conversion Kit (PHEV) is a rechargeable battery set that is supplementary to a Hybrid vehicle battery. It supplies electricity stored in the supplementary battery, which is charged from an AC wall socket, which provides for 20 to 40 mile of electrically assisted driving per charge, sufficient for most normal daily commutes. It is safe, reliable, saves and is user and environmentally friendly.

## What is Included in this Product

- ◆ 16 / 32 cells for 2KWH / 4KWH, Lithium-Ion batteries
- ◆ Battery balancers—one for every 8 cells, monitoring and balancing battery voltages to avoid over or under charges to individual cells. This can extend battery life by a factor of 3.
- ◆ 48V / 15A high power charger
- ◆ 3000W DC / DC Converter and Controller
- ◆ Fire extinguisher for protecting when the temperature is over 105°C—First of all, please open the cover and take out the blue insulative inserter to let it work.
- ◆ Automatic DC circuit breaker—to disconnect high voltage equipment operation in the event of a high current fault.
- ◆ Easily installed enclosure, simple to use system.

## How the System Works

**110VAC household electricity → Enginer PHEV conversion kit → Hybrid vehicle OEM Stock battery → Hybrid electric motor**

Batteries	Type	Capacity	Average Gas Mileage	EV/Mixed Range	Charge time
16 Cells	Lithium-Ion	40 AH	85mpg	10 (20)	3 hours
32 Cells		80 AH	85mpg	20 (40)	5 hours

- Use 110V AC source only.

Balancers: Each balancer controls 8 cells. After setup, press Start / Stop to initiate the balancer to start balancing. Balancer screen will show in order the following data: Total voltage of the 8 cells, Voltages of each individual cell, Standard deviation of voltage; A red dot flashes during balancing and disappears when voltage difference is less than

0.01V.

The balancer will alert if any cell voltage drops below 2.8V or is charged above 3.75V.

## Warranty

Two-year limited parts warranty applies. If equipment defect occurs in normal use conditions, **Enginer** shall repair the equipment or change defective components in this conversion kit only.

Use this information at your own risk: Other than as specified above there is no additional warranty expressed nor implied and Enginer shall not be liable for any of your past, present, nor future actions. Even if you perform these modifications to the letter you could still damage any number of components in your vehicle causing it to no longer function. Even if it appears to function properly your actions may cause it to self destruct with collateral damage to surrounding properties other than your vehicle. By utilizing these ideas and instructions in an attempting to enhance national security, reduce gas consumption, vehicle "emissions", your carbon footprint, or smog, you do so at your own risk & peril.

## Contacts

### US Distributor:

**AutomationTech Inc.**

**Web:** [www.automationtechinc.com](http://www.automationtechinc.com)

**Toll Free:** 877 886-8897

**Address:** 1562 Hamlet Drive, Troy, MI 48084, USA

### Made By: Enginer GreenTech Co. Ltd.

**Web:** [www.enginer.us](http://www.enginer.us)

**Address:** 1010 / 1701 Beijing Xi Road, Shanghai 200040, China

## Preparing and Assembling the PHEV Conversion Kit

**Please carefully read and understand these instructions before opening the product box.**

### Installation and Use

1. Prepare at least a 7x7 feet flat area on the ground near the end of your hybrid vehicle, and cover the floor with 5x5 feet soft and flat cloth or cardboard.
2. The equipment is heavy and should be removed and handled by two adults.
3. Knock open the wooden box, if there is one, and then open the cardboard box in-side.
4. Take out accessory bags and check against the following list to count whether components are complete.
  - One 48cm lid supporting pole
  - One plastic holding bracket.
  - Six red and black jumper wires with ring terminal.
  - Two long wires for connecting the batteries in parallel.
  - ECU signal wires (green, brown and white)
  - One switch panel with on/off switch, red and green LED lights
  - 2 sets of equipment mounting brackets and screws
  - Four screws for mounting the box cover
  - One double-sized spanner
  - A set of two fire extinguisher holders and mounting screws.
  - One thread for converter and charger.
  - One 0.2m corrugated pipe.
  - 1:1 drawing for making mounting holes on car.
5. Place the above accessories in a place not impeding your later installation. Take out the foam plastic cover from the cardboard box and pull out the stainless steel box, this requires two people with both hands, carefully and steadily move out the entire stainless steel box and place it gently on the floor. Do not tilt or turn over the equipment.
6. The equipment weights about 65 lbs without batteries or 115 lbs (2KWH) to 165 lbs (4KWH) with batteries. **Enginer** strongly suggests you use professional lifting equipment, or operators that are strong enough to lift this much weight. Slowly handle the equipment to avoid physical injury or equipment damage.
7. Take the supporting pole from accessories and hold it with your right hand. Open the enclosure box cover and stick the pole in the hole at right hand side close to your body and prop up the cover on the other end. Take out a small white plastic bracket holder from accessories and push it hard into a small hole on the right side of the steel box to rest the pole after use.
8. After popping up the cover firmly and checking that it is being safe with no risk of dropping down, take out all insulating foam gently and check inside component against the following list:
  - Stainless steel box and cover (833 x 505.5 x 157 mm)
  - Batteries: 4 sets of 4 cells (2KWH), or 8 sets of 4 cells (4KWH) depending on what you ordered. Please make sure batteries match your order.
  - Two battery mounting frames to fix the two rows of batteries.
  - Balancers fixed on the rear (the side close to your body) battery frame: two balancers for 2KWH kit or 4 for 4KWH kit, black, each linking 8 cells with wires.
  - One converter mounted back left, connecting batteries with one red and one black power inlet wires with a pair of Anderson plug. It also contains one red and one black power outlet, and a 6 pin cable.
  - One charger mounted on right back connecting black power inlet cable, with left hand side one red and one black cable with an Anderson plug (shared with converter).
  - One ventilation fan on left lower corner.

- One circuit breaker mounted on top of charger.

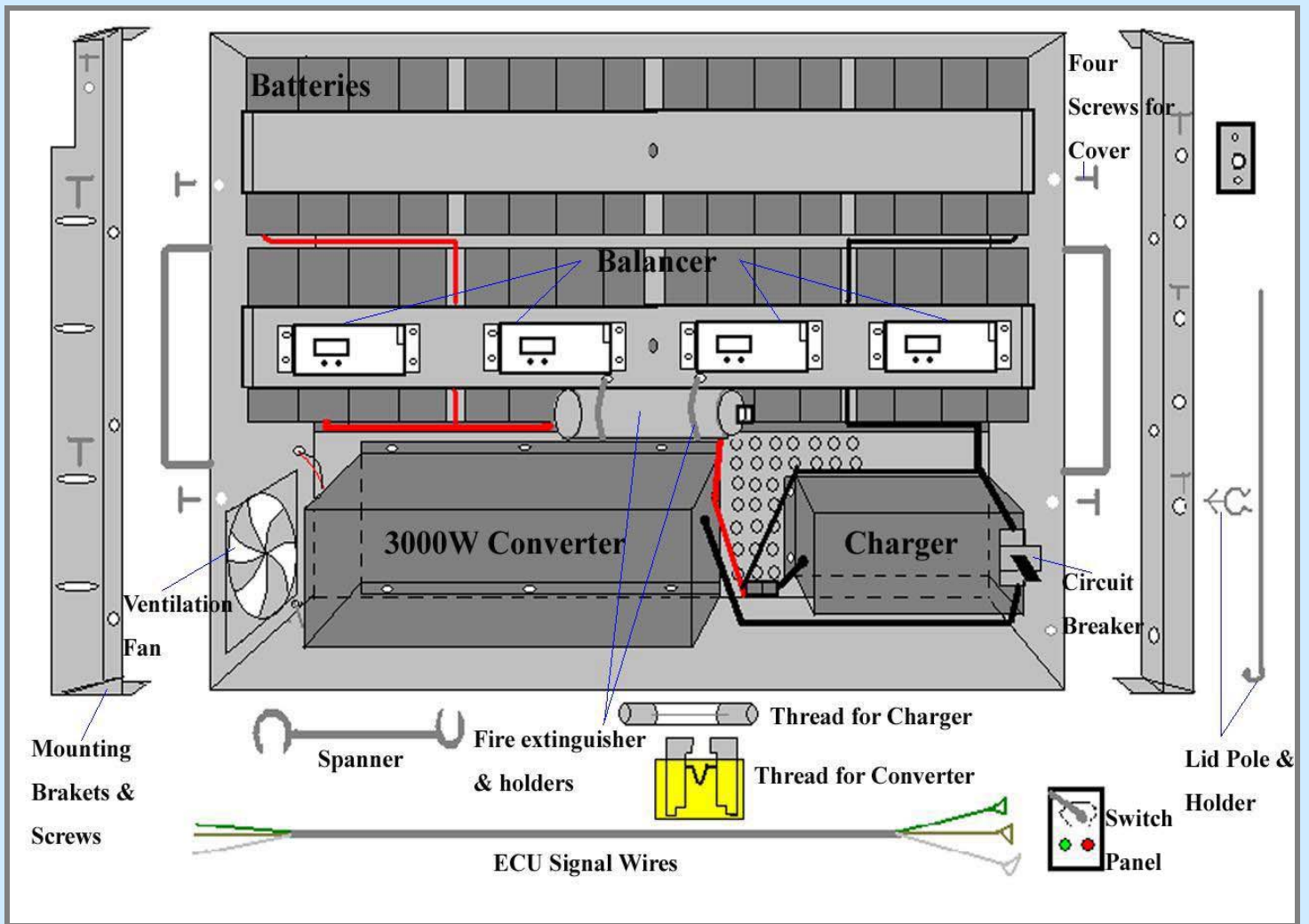


Figure 1: Component Layout

9. Wiring Check: ① Make sure circuit breaker is in the OFF position, Anderson plug from charger / converter is disconnected, balancers' interfaces are pulled off; ② Charger and converter connections are connected firmly; ③ Connection between black wires from converter and circuit breaker is connected firmly; ④ Connection between circuit breaker and another black wire is connected firmly. ⑤ Positive and negative of each group of batteries are connected firmly (16 cells in series, two 16 cell packs in parallel shown in FIG1), terminal plastic covers are in position.

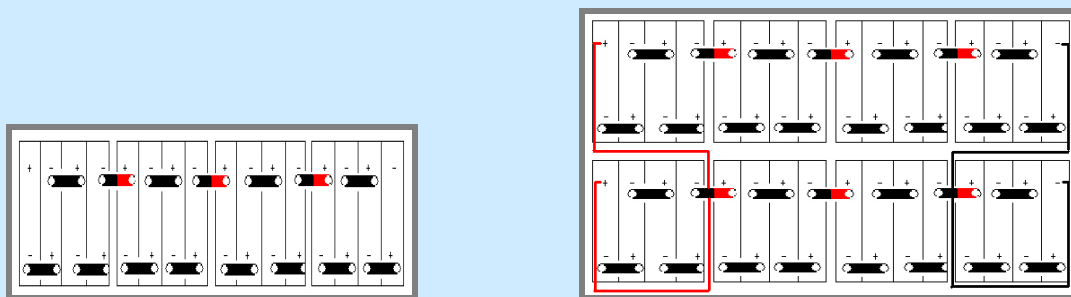
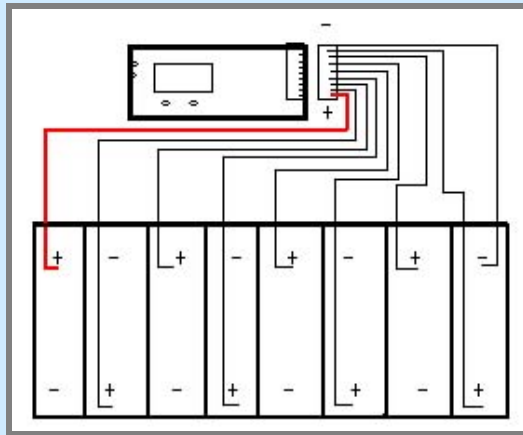


Figure 2: Connection of one row batteries (2KWH)

Connection of two rows of batteries (4KWH)

- ⑥ Connection between balancers and batteries are normal and firm:



**Figure 3: Balancer Connection**

10. Wiring: ① Pull off the protection cap of the battery terminals (positive and negative) between two battery packs, use red / black short jumper cable to put them in series as shown in Figure 2. If it is a 4KWH model, connect two strings of the 2KWH battery packs in parallel (positive to positive, negative to negative terminals); ② Connect the DC/DC converter (11) to the end terminals of the battery pack, red to positive and black for negative. ③ Connect the white connectors to the balancers. ④ Connect the grey Anderson connector to the charger.
11. Remove the lid supporting bar, close the cover and tighten two screws on both side of the cover.
12. The conversion kit assemble is completed and ready to be installed into the vehicle.
13. Bumper outlet for charger connection. Black wire: Live line (L); White wire: Null Line (N); Green wire: Ground Line(E).



14. PHEV switch panel operation:
  - ON: Turn on PHEV DC/DC Converter (LED Green---On; Red—Battery Low)
  - OFF: Turn off PHEV DC/DC Converter (LED Green-- Off)

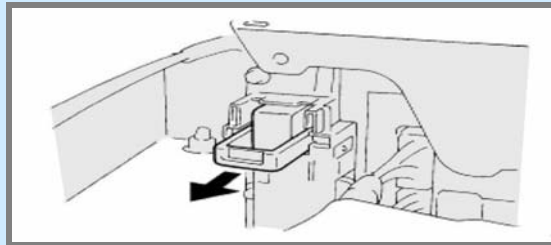
## Connecting Enginer PHEV Conversion Kit to a Toyota Prius

Installation Time: 2-3 hours by professionals, 6 hours or longer by first timers.

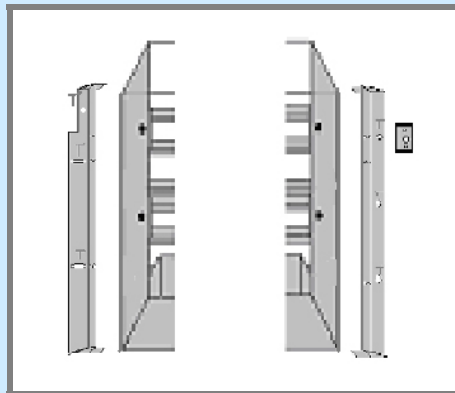
Before installation, please be advised to login to Toyota Technical Website [techinfo.toyota.com](http://techinfo.toyota.com) for Reference Instructions. (\$15 for two day usage as of June 2009)

### Installation Procedure

1. Stop your Prius engine completely by removing the car key.
2. Remove truck interior cover on the back of the back seat to gain access to OEM stock battery orange service plug and unplug it.



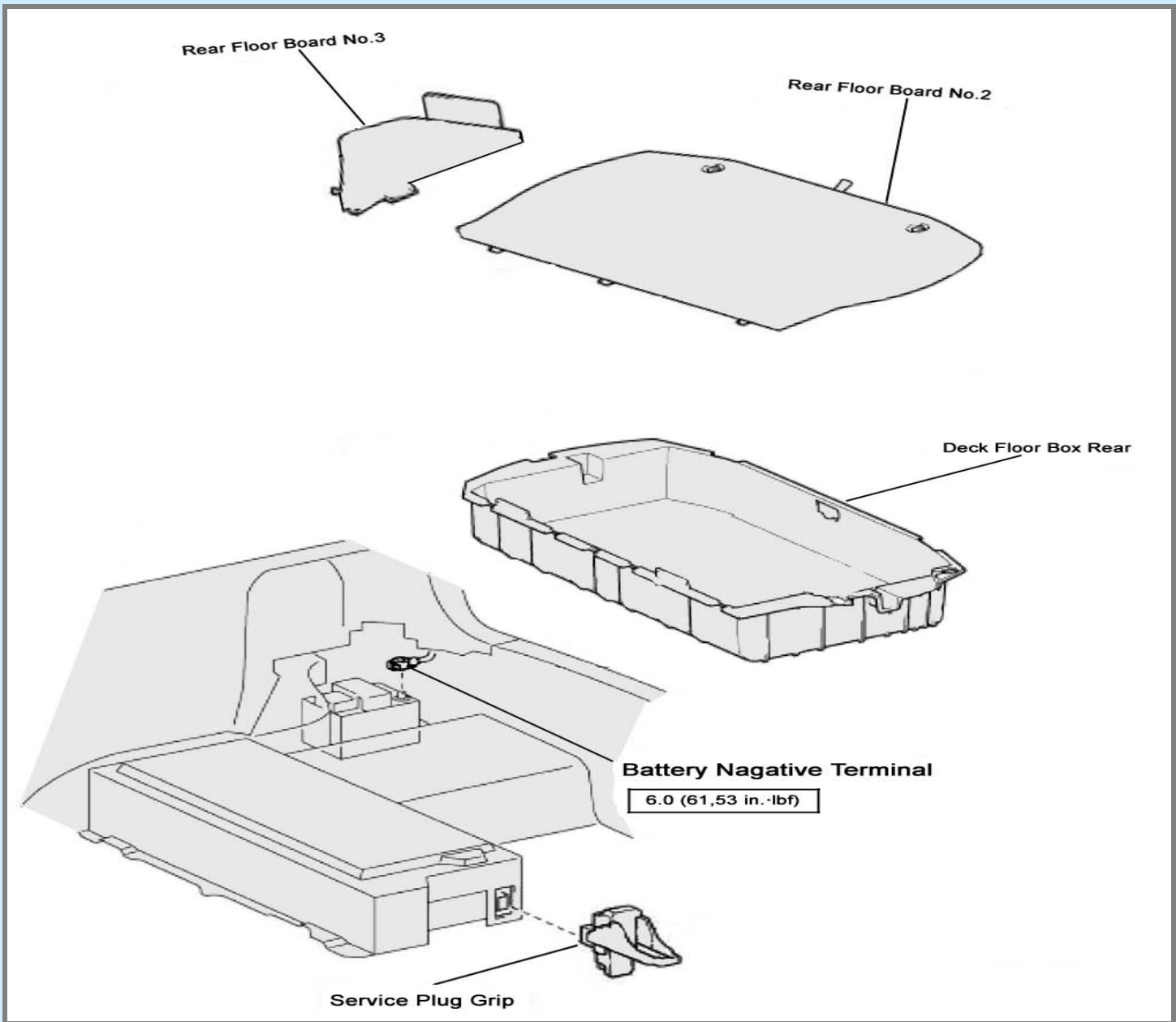
3. Remove auxiliary battery negative terminal.
4. Mount your **Enginer** PHEV Conversion Kit to the truck.
  - A. Mark four mounting holes according to size and dimension of the Kit's mounting brackets.
  - B. Drill and tap #10 screw on the truck floor plate
  - C. Tighten six mounting screws with washer and spring ring.

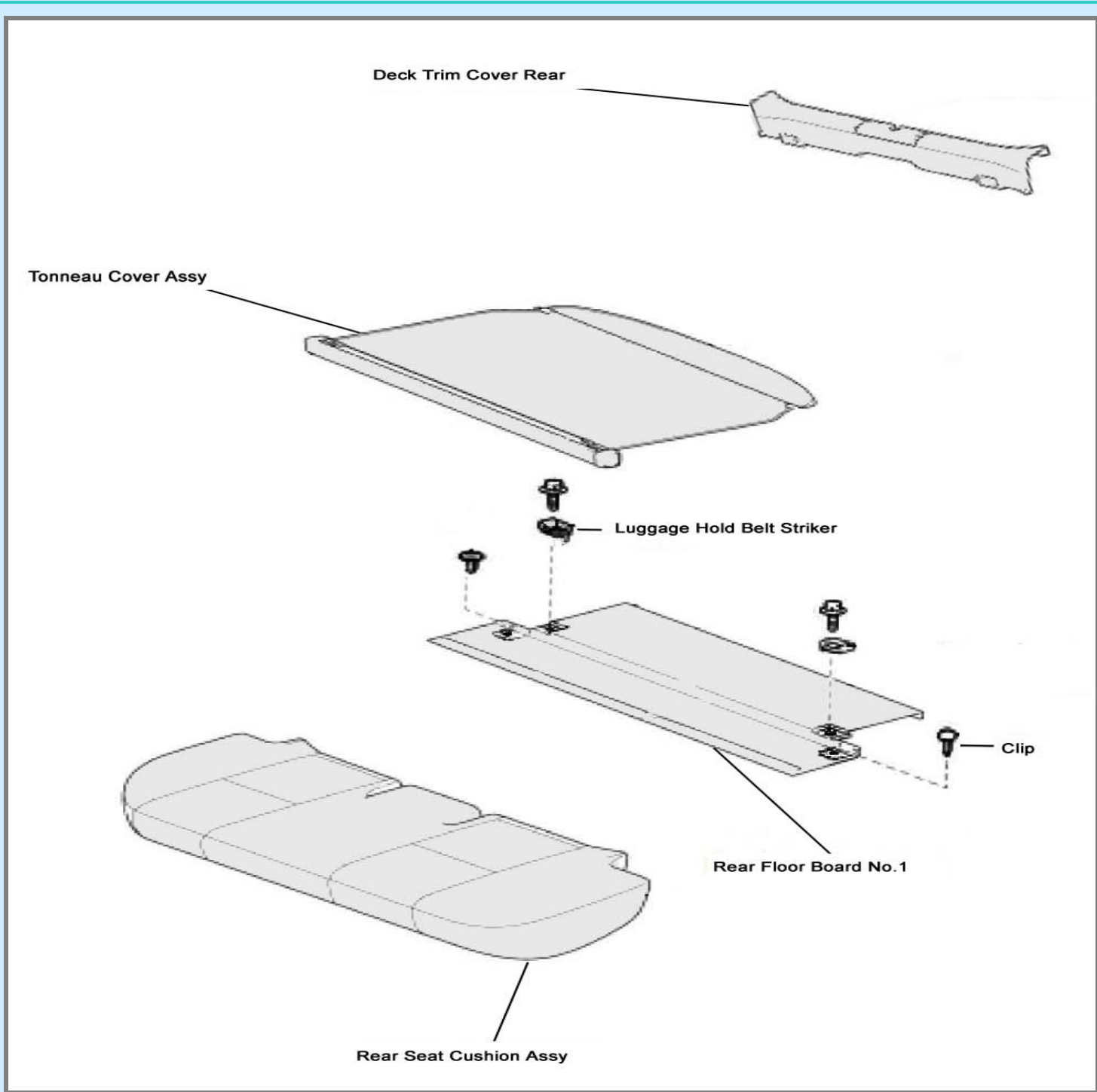


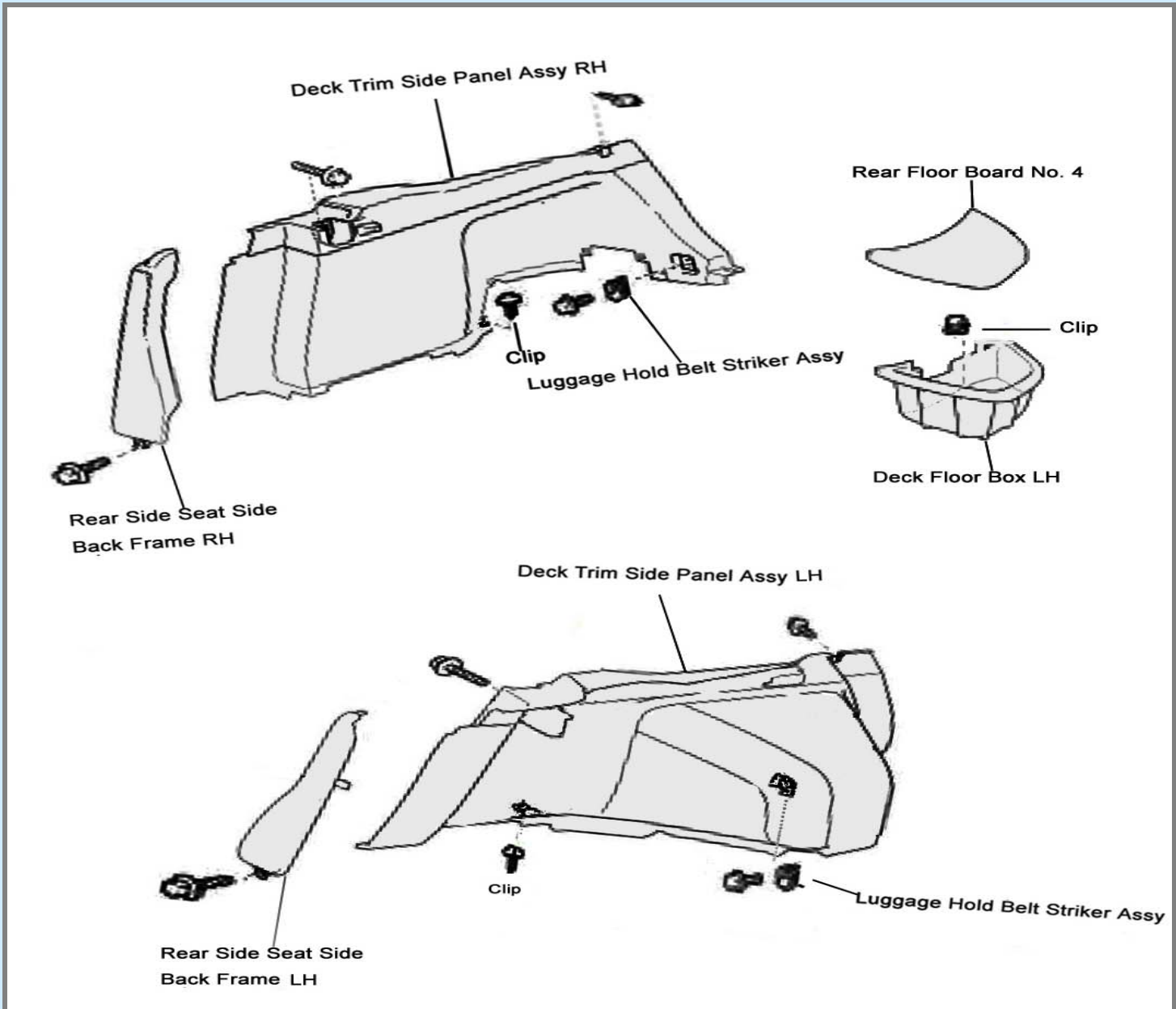
5. Remove back seat and gain access to the OEM stock battery output terminals.

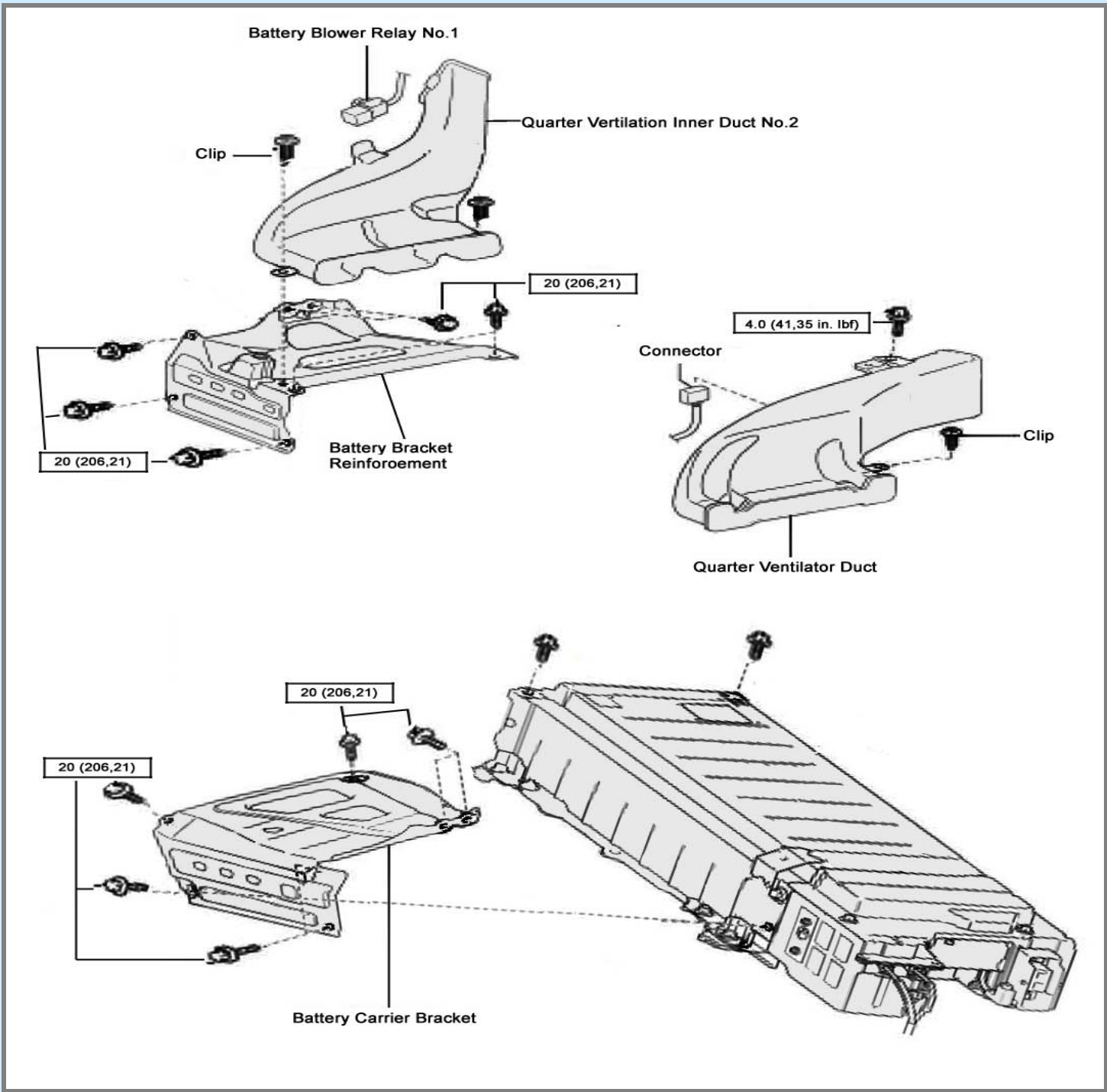
**Reference: 21-54 HYBRID CONTROL SYSTEM-HV BATTERY (for 2004—2009 Prius)**

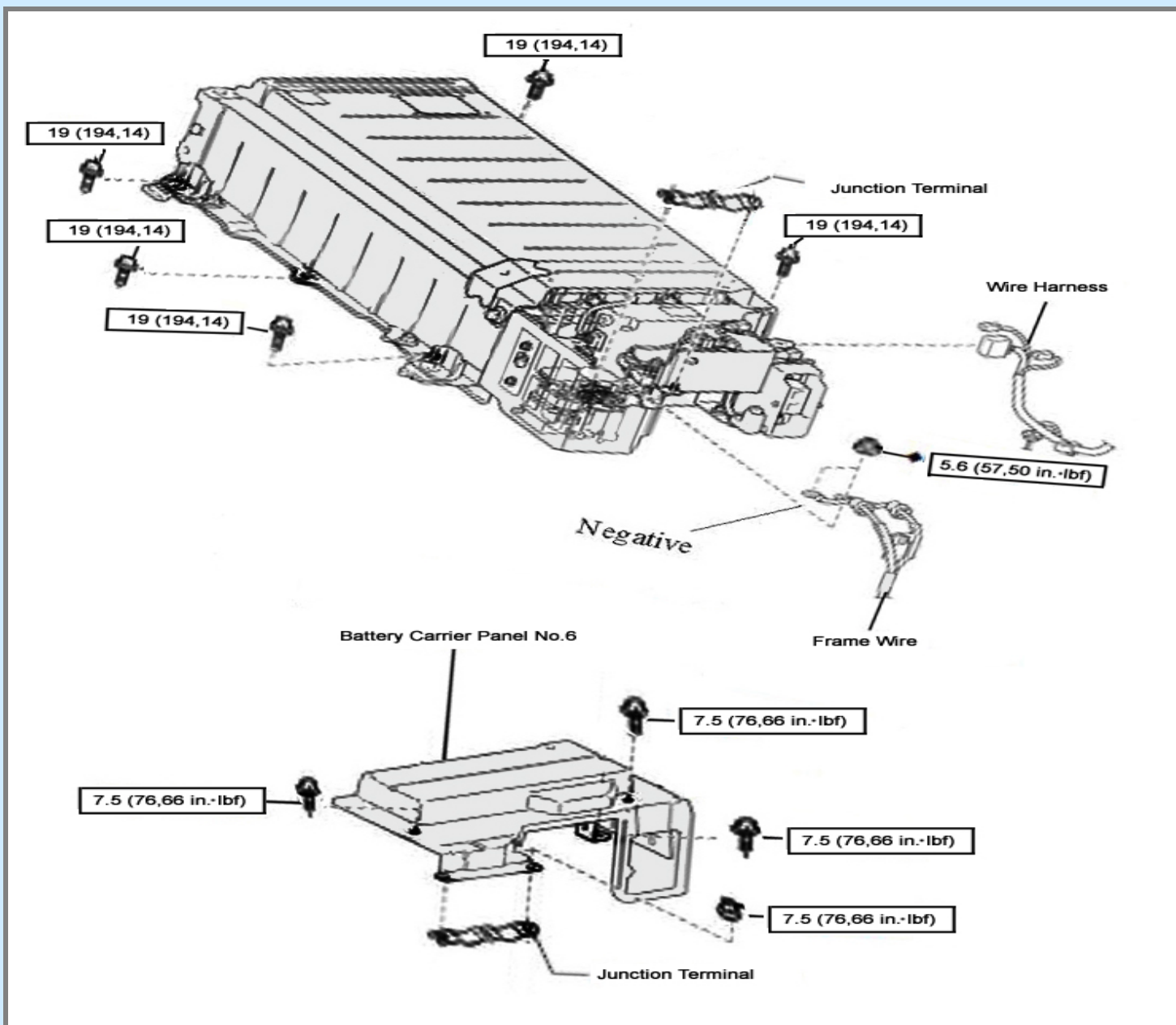












6. Connect the conversion kit's power cable to positive and negative terminals of the stock battery output power cable.

7. Install on/off switch panel.

- A. Take off the blank panel on the left hand side of your meter board
- B. Drill three holes for the switch and the 2 LED lights to fit in (6mm for the switch, 3mm for each LED light)
- C. Loosen the switch bolt, place it on through the panel hole and tighten it on the panel.



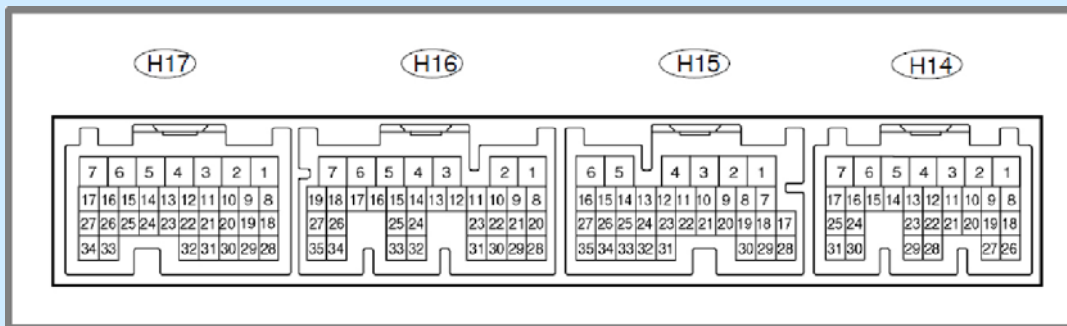
8. Hook up ECU Ignition Ready signal to on/off switch panel.

**Reference: 05-408 DIAGNOSTICS – HYBRID CONTROL SYSTEM (for 2004-2009 Prius)**

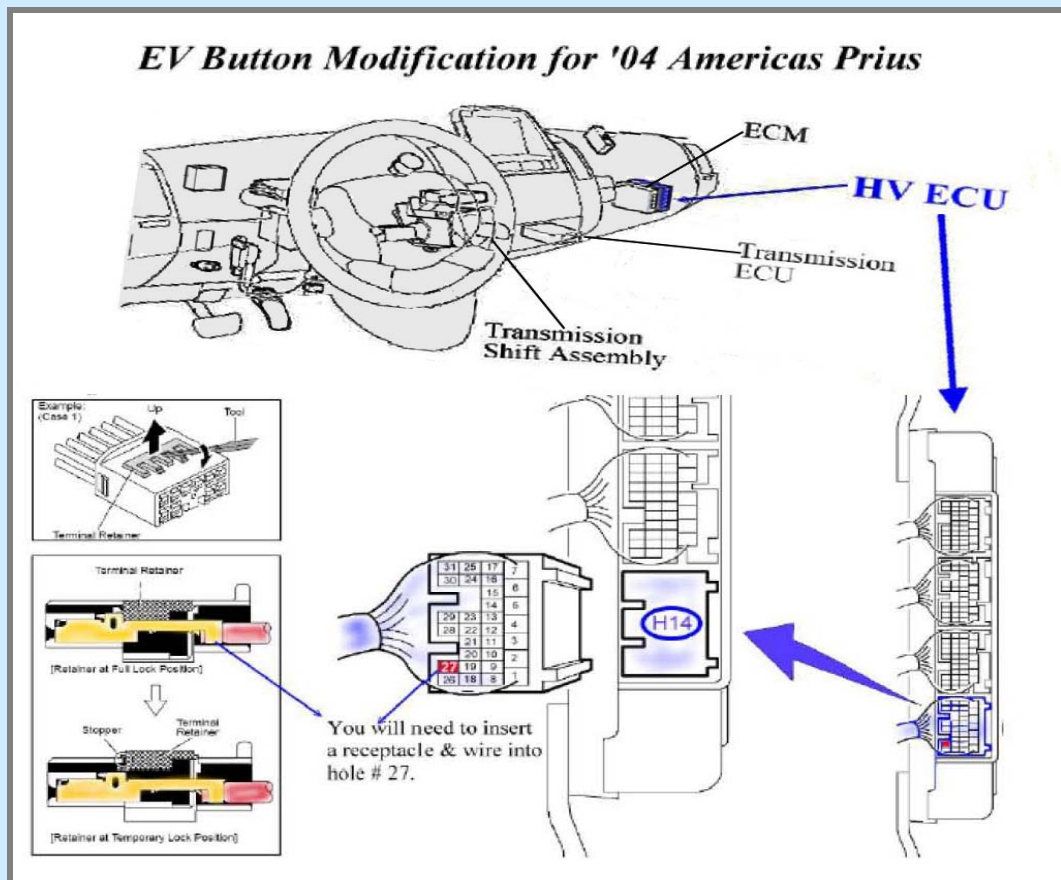
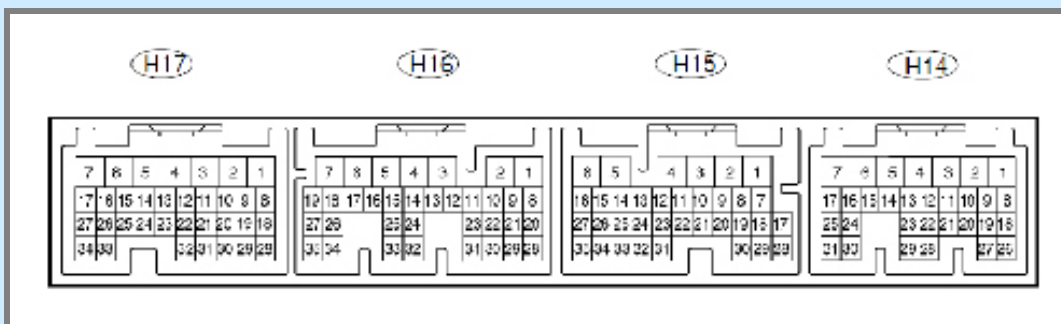
CON2 (H16-2) – Green: Ignition Ready (Connect to the Green wire of PHEV switch panel)

GND1 (H14-1) – White-Black: Ground (Connect to the Brown wire of PHEV switch panel)

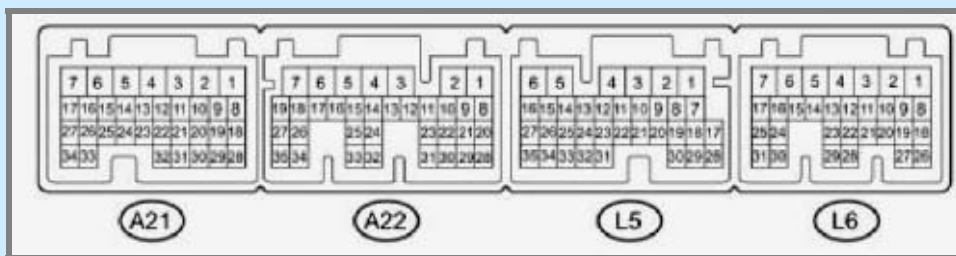
EV (H14-27) – Blank Pin: EV Mode (Connect to the White wire of PHEV switch panel)



Add EV switch wire (Reference: <http://www.calcars.org/prius-evbutton-install.pdf>)



### Power Management Control ECU



9. Hookup 6-Pin on/off switch panel cable to your Enginer battery box.
10. Drill a hole and mount Bumper AC Outlet
11. Re-Install back seat and trunk panels.

Your **Enginer** PHEV Conversion Kit installation is now complete.

Please test the equipment in the following steps:

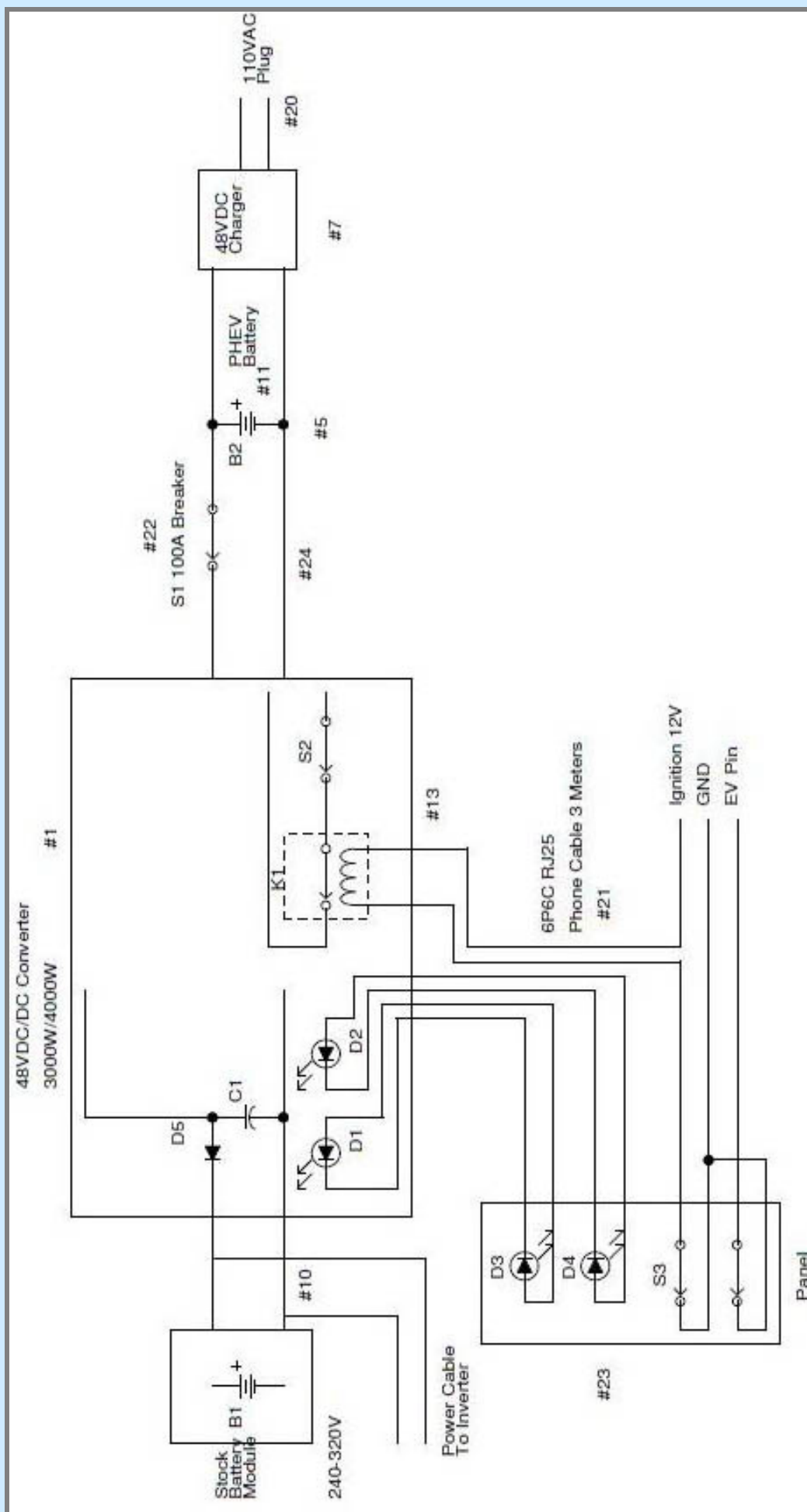
1. Charging batteries
2. Wait overnight for the cell to be balanced
3. Turn on circuit breaker
4. Turn off PHEV switch
5. Turn vehicle ignition key
6. Turn on PHEV switch. Power LED should turn green and Battery Low LED should be off

**Once all the above steps are completed and no defect occurs, you are now safe to drive your **Enginer** Plug-in Hybrid Electric Vehicle!**

**Please dial **Enginer Assistance Hotline** at **877-886-8897** if you encounter difficulty or risk during and after installation.**

**Enginer very much appreciates your effort to save the earth  
and wishes you enjoy your driving with your PHEV.**





**NOTE:**