



L5 Plug-In Conversion Module (PCM)

Owner's Manual

Model: L5 PCM



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Important Safeguards

The following safety precautions must be observed when using rechargeable batteries.

READ ALL INSTRUCTIONS IN THIS OWNER'S MANUAL
BEFORE USING YOUR HYMOTION L5 PCM.



LITHIUM ION BATTERY MUST BE
RECYCLED OR DISPOSED OF PROPERLY



WARNING

Read all warnings carefully to reduce the risk of fire, electric shock, or injury.



WARNING

Recycling the L5 PCM

When the L5 PCM requires disposal please contact an authorized Green CHIP dealer. The L5 PCM must only be removed and disposed of through a Green CHIP dealer who will forward the L5 PCM to a professional battery recycler for proper recycling and disposal. Removal of the L5 PCM or failure to dispose of the L5 PCM correctly could result in serious injury or death.



WARNING

Precautions for using the L5 PCM

The L5 PCM contains a high voltage electrical system that is dangerous and could result in serious injury or death including severe burns or electric shock. To avoid personal injury follow all the caution labels attached to the L5 PCM and do not open the top cover. The L5 PCM should only be serviced by a Green CHIP dealer.



If a vehicle accident occurs

When involved in a vehicle accident, pull your vehicle off the road and shut off the L5 PCM. If your vehicle has major damage, you may get an electric shock. To prevent this never touch the cables connecting the L5 PCM to your vehicle or any orange, high-voltage cable at any time. If there are exposed wires do not touch them. If fluid leaks from the L5 PCM do not touch it. If fluid gets into your eyes, wash eyes immediately with a large amount of water and seek medical attention. If a vehicle fire occurs, extinguish it using a fire extinguisher that has been approved for use on electrical fires. If your vehicle needs to be towed, follow the towing procedures specified by the vehicle manufacturer.



High Voltage Cables

The L5 PCM is equipped with high voltage cables connecting it to your vehicle. Never touch the cables that connect the L5 PCM to your vehicle or any orange, high-voltage cable at any time.



Removal of the L5 PCM

Never remove or disassemble the L5 PCM yourself. This could result in serious injury or death. If you wish to remove the L5 PCM you must contact an authorized Green CHIP dealer.



Power Switch

Do not shut off the L5 PCM while driving, except in an emergency. Shutting off the L5 PCM while driving can clear your vehicle's settings, such as cruise control, and could result in serious injury or death.



Liquids

Take care to avoid spilling liquids in the trunk of your vehicle. Do not wash the L5 PCM with water or any liquids. In the event liquid gets into the L5 PCM unit it can cause a fire or malfunction resulting in serious injury or death. It may also cause body corrosion of the L5 PCM.



Charge Port

If the ground terminal on the bumper charge port has any evidence of corrosion or appears damaged in any way, contact an authorized Green CHIP dealer. Do not charge the L5 PCM until the situation is resolved. Charging the L5 PCM when there is evidence of corrosion or damage could result in serious injury or death.



Extension Cord

The L5 PCM must be charged using an Underwriters Laboratories (UL) listed 12/3 American Wire Gauge (AWG) or 14/3 AWG contractor-grade extension cord approved for outdoor use. If the cord becomes warm during charging, use a heavier gauge cord. Do not use a cord that shows any evidence of damage. Failure to use a properly rated cord or use of a damaged cord could result in serious injury or death.



Ground Fault Circuit Interrupter (GFCI)

The L5 PCM must be charged from an electrical outlet or an extension cord equipped with GFCI. Failure to do so could result in serious injury or death.



Spare Tire Removal

Installation of the L5 PCM in a Toyota Prius requires the permanent removal of the spare tire. Do not store the spare tire in the vehicle. It could become a projectile and result in serious injury or death.



Objects in the Spare Tire Well

Do not place objects in the spare tire well between the vehicle and the L5 PCM. These objects could become unsafe projectiles in a collision and result in serious injury or death. In addition, these objects could obstruct the cooling air intake of the L5 PCM and result in improper cooling and impaired performance.



Vehicle Load

The installed L5 PCM adds 200 pounds to the weight of your vehicle as noted on the label attached to the driver side door jamb. See [Figure 1](#) for the location of the vehicle load label. Factor in the weight of the L5 PCM when loading your vehicle. Do not exceed the total load capacity of your vehicle. Doing so could unbalance your vehicle and damage the tires or deteriorate your steering capability. Refer to the *Prius Owner's Manual* regarding the total load capacity of your vehicle.

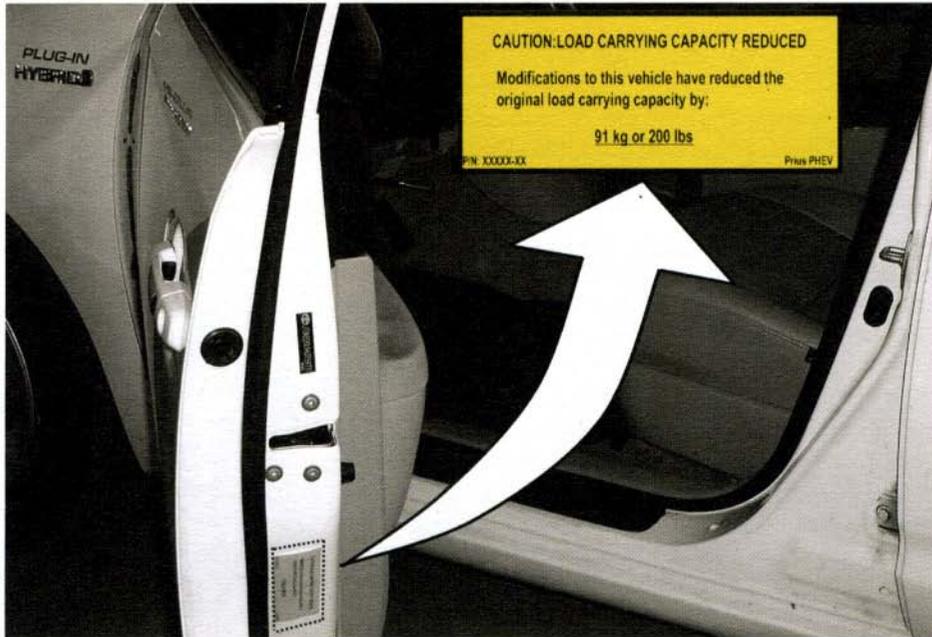


Figure 1

Vehicle load label

Introducing the Hymotion™ L5 Plug-In Conversion Module (PCM)

The L5 PCM is a supplemental lithium ion battery installed in the spare tire well of your Toyota Prius as shown in [Figure 2](#). The L5 PCM provides approximately 5 kilowatt hours (kWh) of onboard electrical storage capacity. This additional electrical energy enables the Prius to use pure electric drive more often and for longer distances, resulting in fuel efficiency gains and CO₂ emissions reduction over the standard Prius.

The L5 PCM must be recharged from an electrical outlet or extension cord equipped with GFCI. The L5 PCM does not receive any regenerative charge during driving. When the L5 PCM is charged, the Prius is capable of achieving fuel economy in excess of 100 miles per gallon (mpg) and reducing CO₂ emissions by up to 2/3rds over the standard Prius.

The L5 PCM can provide electrical assistance for approximately 30 to 40 miles of driving on a single charge before becoming depleted. Once the L5 PCM's charge has been depleted, the vehicle's operation and fuel economy reverts to that of a regular Prius until the L5 PCM is recharged by plugging in.



Figure 2 L5 PCM location in your vehicle



Installation of the L5 PCM in a Toyota Prius requires the permanent removal of the spare tire. Do not store the spare tire in the vehicle. It could become a projectile and result in serious injury or death.



Electrically assisted driving, range, and fuel economy can vary greatly depending on driving style, road conditions, outside temperature, and other factors. Refer to [Chapter 6, Tips to Improve your Fuel Economy](#) for more information.

Key Features

Operating the Prius with the L5 PCM engaged

- Electrically assisted driving range of 30 to 40 miles on a single charge
- Up to 100 mpg or greater city/highway combined fuel economy within the 30 to 40 mile electrically assisted driving range
- Prius resumes standard operation and fuel economy when the L5 PCM is fully depleted or turned off
- Maintains the Prius' Super Ultra Low Emissions Vehicle (SULEV) emissions rating
- Up to 2/3rds reduction in CO₂ emissions
- Prius' Energy Monitor Display indicates the L5 PCM State of Charge (SOC)

Safety

- Safety interlock prevents driving the Prius while charging
- The converted Prius meets the United States federal vehicle crash test safety standards
- Integrated crash sensor electrically isolates the L5 PCM in a collision



Product Specifications

Energy	Approximately 5kWh
Charging temperature range	-20 deg F to 140 deg F
Operating temperature range	-20 deg F to 140 deg F
Charging voltage	120V
Maximum charging current	10A
Charging time	5.5 hrs @ 75 deg F
Required electrical outlet	15A electrical outlet equipped with GFCI
Weight	187 pounds



Do not exceed the total load capacity of your vehicle. Doing so could unbalance your vehicle damaging the tires, deteriorating the steering capability, or cause an accident. Refer to the *Prius Owner's Manual* regarding the total load capacity of your vehicle.

Operating Instructions

The L5 PCM is designed to work seamlessly with your Prius' existing drive, control, and display systems. Operate and maintain your modified Prius as you would a standard Prius. Refer to the *Prius Owner's Manual* for vehicle operation and maintenance instructions. Driving with the L5 PCM installed does not require any special driving techniques. The vehicle should be driven in the same manner as a standard Prius.

Turning the L5 PCM On and Off

1. Set the dashboard switch to the up position for On or the down position for Off. See [Figure 3](#) for the location and details of the L5 PCM switch.
2. When the L5 PCM switch is in the On position and the vehicle is in READY mode, the L5 PCM automatically comes online if it has sufficient electrical charge.
3. When the L5 PCM switch is left in the On position, the L5 PCM automatically shuts off when the vehicle is turned off.
4. When the L5 PCM is turned off or if it fully discharges while driving, the L5 automatically disengages and standard Prius operation resumes.

LED Status Light

- Steady = L5 PCM is charged
 - Blinking = Possible L5 PCM problem
- See [Chapter 4, Troubleshooting the L5 PCM](#) for more information.

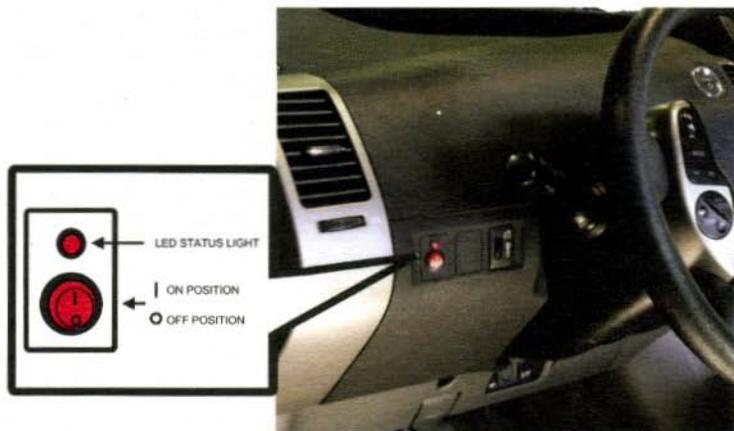


Figure 3 L5 PCM switch

Monitoring the L5 PCM Operation

1. The Prius Energy Monitor displays the L5 PCM's State of Charge (SOC) when the L5 PCM is in operation. The SOC indicates the L5 PCM's available electrical energy as shown in Figure 4. Green is high charge, blue is between high and low charge, and purple is low charge.
The L5 PCM communicates status information to the Prius. When a new piece of information is sent by the L5 PCM, the Energy Monitor display may flicker or return to the Energy Monitor home screen if a different screen is being displayed. This is normal.
2. The Energy Monitor SOC indicator reflects the SOC of the Prius NiMH battery when the L5 PCM has fully discharged or has been turned off.

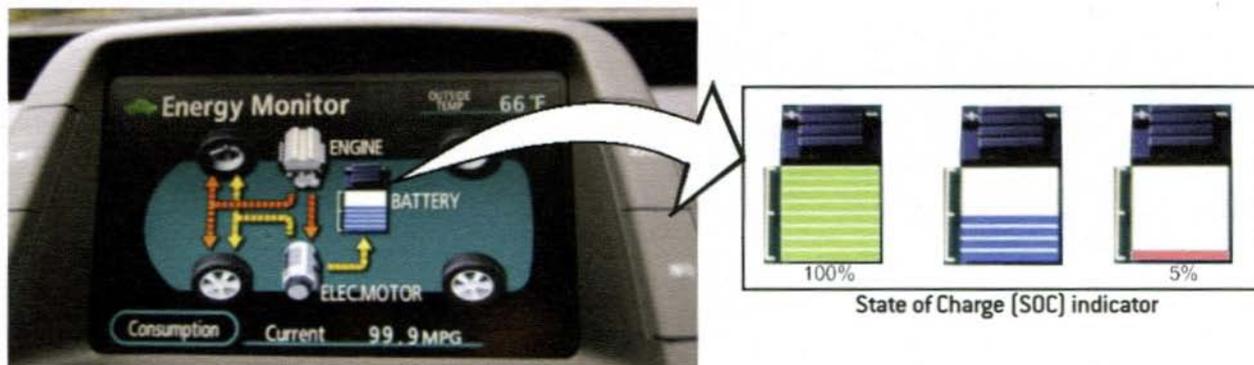


Figure 4 Energy Monitor Display



Do not shut off the L5 PCM while driving, except in an emergency. Shutting off the L5 PCM while driving can clear the vehicle settings, such as cruise control, and could result in serious injury or death.



Due to the interactions between the L5 PCM and the vehicle's display, the center panel can return to the Energy Monitor home screen during L5 PCM information updates. This could interrupt the user while browsing through other functions. For example, if the user is adjusting the temperature using the touch panel display and the L5 PCM begins communicating with the vehicle, the display screen could return to the Energy Monitor screen and disrupt the user's temperature adjustment.



The L5 PCM utilizes the Prius' Electric Vehicle (EV) mode by requesting EV operation from the Prius' hybrid system controller. If EV mode is unavailable due to road or driving conditions, the Energy Monitor Display could flash a message, beep or both. Messages and beeping are a normal part of EV mode operation.

Charging Requirements

The L5 PCM must be charged from a GFCI equipped electrical outlet using a UL listed 12/3 AWG or 14/3 AWG contractor-grade extension cord approved for outdoor use. See [Figure 5](#) for the charge port location.

Observe the following extension cord requirements:

- 3-prong grounded cord
 - Constructed with 12/3 AWG wire no longer than 50 feet
- OR*
- Constructed with 14/3 AWG wire no longer than 25 feet
 - Must be equipped with GFCI if the electrical outlet is not



Figure 5 L5 PCM charge port location



Do NOT use an extension cord constructed of less than 14 gauge wire or a cord longer than 50 feet to charge your L5 PCM.

Charging the L5 PCM

To charge the L5 PCM:

1. Verify the vehicle is turned off.
 2. Plug an appropriate extension cord into the vehicle's charge port located on the rear bumper as shown in Figure 5 and into an electrical outlet.
 3. Watch for the tail lights to illuminate for four to five seconds. This indicates a proper connection. During the charge cycle the tail lights remain dimly lit and go entirely dim when the L5 PCM is fully charged as shown in Figure 6.
- The L5 PCM can be charged at any time regardless of its State of Charge (SOC).
 - It takes approximately 5.5 hours to charge a fully depleted L5 PCM.
 - The L5 PCM is only charged from an electrical outlet. It will not receive any regenerative charge during the drive cycle.

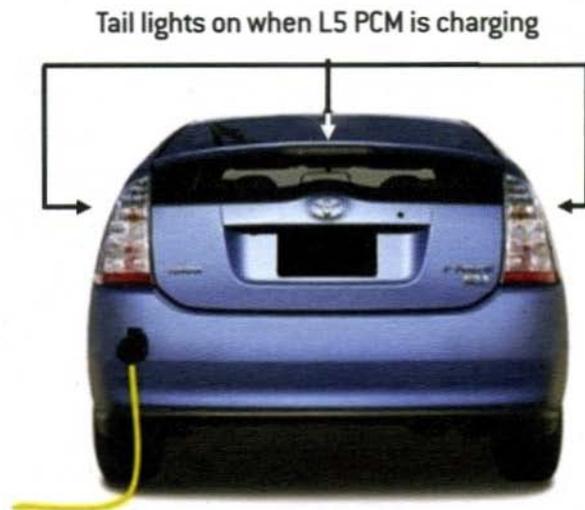


Figure 6 Charging indicators



To prevent the user from driving off while the vehicle is charging, the L5 PCM activates an interlock feature that disables the vehicle's POWER button. Disconnect the extension cord if the vehicle must be moved during the charge cycle.



The electrical outlet, used for charging the L5 PCM, must be rated for 15A and must be equipped with GFCI. Do not use an extension cord that shows any evidence of damage. If the cord becomes warm during charging use a heavier gauge cord. Periodically check the cord for cuts, abrasions, or loose connections.



Do NOT leave the cord in standing water or drive over it. Failure to use a properly rated cord or use of a damaged cord could result in serious injury or death.

L5 PCM Removal

At the end of its service life the L5 PCM can be removed from your vehicle by an authorized Green CHIP dealer. For L5 PCM removal or recycling, bring your vehicle to an authorized Green CHIP dealer. Unauthorized removal of the L5 PCM from the vehicle will void the L5 PCM warranty.



Consult an authorized Green CHIP dealer for proper disposal of the L5 PCM. Failure to dispose of the L5 PCM correctly could result in serious injury or death.

Troubleshooting the L5 PCM

The L5 PCM system provides you with troubleshooting and resolution procedures. These procedures are designed to resolve minor problems without taking your vehicle into your Green CHIP dealer. During troubleshooting you may use some of the procedures below.

Resetting communications between the L5 PCM and Prius

Some temporary and minor problems could be resolved by resetting and saving the Prius' communication and diagnostic codes. This is done by turning the vehicle off and on five times, pausing a minimum of thirty seconds between cycles.

Resetting the L5 PCM circuit breaker

A circuit breaker is used to protect the L5 PCM and its electronics. The circuit breaker is located on the front side of the L5 PCM, and can be reset by depressing the white/red cylinder.

The location and details of the circuit breaker's operation are shown in [Figure 7](#).



Figure 7 L5 PCM circuit breaker

If you encounter a problem with your L5 PCM, you may be able to resolve it using the procedures below. If the problem persists or recurs, contact your Green CHIP dealer for initial product support. Should you need to bring your car to a Green CHIP dealer for further diagnosis, drive your car with the L5 PCM switch placed in the Off position.



Do not ignore the Prius' dashboard indicator warning lights or the L5 PCM LED indicator light. You should not drive with the L5 PCM engaged if a problem persists. Contact your Green CHIP dealer if a problem recurs or persists.

PROBLEM	POSSIBLE REASON	POSSIBLE SOLUTION
Vehicle will not start.	<ol style="list-style-type: none">1. L5 PCM is plugged in and charging. This engages the safety interlock.2. Prius 12V battery has low voltage.	<ol style="list-style-type: none">1. Unplug the charging cord.2. Recharge the Prius 12V battery.
L5 PCM is not charging.	<ol style="list-style-type: none">1. Improper charging connection.2. L5 PCM circuit breaker is tripped.3. Problem with the electrical outlet.4. GFCI is tripped.	<ol style="list-style-type: none">1. Ensure a proper connection has been made. Watch for the flash of tail lights to indicate a proper connection.2. Reset the L5 PCM circuit breaker.3. Check outlet for proper operation.4. Reset the GFCI.

PROBLEM	POSSIBLE REASON	POSSIBLE SOLUTION
Prius warning lights on the dashboard are lit.	<ol style="list-style-type: none"> 1. Communications error between L5 PCM and the Prius. 2. Prius 12V battery has low voltage. 	<ol style="list-style-type: none"> 1. Reset communications between L5 PCM and Prius. 2. Recharge the Prius 12V battery. Contact your Green CHIP dealer if the problem recurs or persists.
Prius check engine light is on.	Possible issue with gasoline engine or hybrid system.	Contact your Green CHIP dealer.
L5 PCM LED status indicator light is blinking.	Possible issue with L5 PCM.	Verify that the LED status indicator light continues to blink after two consecutive drives separated by at least five minutes. If this is the case, contact your Green CHIP dealer.

Product Support and Service

In regular operation the L5 PCM does not require periodic service, inspection or maintenance. However, should product support or service become necessary contact your Green CHIP dealer. For Green CHIP contact information, go to www.hymotion.com or call (508) 497-7398.



NOTE

Your Prius should be serviced and maintained according to the guidelines recommended in the *Prius Owner's Manual*. The L5 PCM does not need to be disconnected or isolated from the vehicle for Prius service to occur.

A123Systems Hymotion™ Product Support

Call: (508) 497-7398

Email: hymotionsupport@a123systems.com

Hours: Monday through Friday, 10 am to 6 pm Eastern Time

Tips to Improve your Fuel Economy

Gentle Acceleration

- Gently accelerating allows the gasoline engine to remain disengaged in many circumstances.
- Use the "pulse & glide" technique of acceleration to help disengage the engine. To "pulse & glide" ease off the accelerator to disengage the engine, then gently accelerate to increase vehicle speed using electric power.
- Observe the posted speed limit.

Using the Prius Display

- When the L5 is charged, the Prius display indicates the state of charge of the L5, as well as how the L5 and gasoline engine are being used for driving.
- The display indicates when the gasoline engine is engaged. Use this feedback and apply the "pulse & glide" technique to disengage the engine, if possible, to help minimize use of the gasoline engine.

Climate Control

- The gasoline engine is the only source of heat for your vehicle. Use the heater as little as possible to minimize the use of the gasoline engine.
- Using the cooling system on the highway, rather than opening the windows, increases aerodynamic efficiency.
- The defroster control on the steering wheel always engages the gasoline engine. Use the control on the console display to avoid using the gasoline engine.

Miscellaneous

- Plug in the L5 PCM as often as possible to maximize the electrical energy that is available to drive your Prius.
- Keep your tires inflated to the proper Pounds per Square Inch (PSI).

Limited Warranty

1. A123Systems Hymotion™ L5 Plug-in Conversion Module Limited Parts and Labor Product Warranty

A123Systems, Inc. ("A123") warrants that if the L5 Plug-in Conversion Module ("Product") installed in your vehicle proves to be defective in material or workmanship within three (3) years from the date of installation ("Warranty Period") by A123 or an A123 Certified Hymotion Installation Partner ("Green CHIP Dealer") we (or Green CHIP Dealer) will, at our option, either replace the defective Product or component thereof, or provide without charge the labor and parts necessary to remedy any such defect.

A123Systems' only responsibility under this warranty is to replace or repair the Product and under no circumstances shall A123's or its Green CHIP Dealer's cumulative liability under this warranty exceed the price paid by you for the Product, except as outlined in Paragraph 2 below (Interaction with Prius Factory Limited Parts and Labor Warranty).

PLEASE REGISTER YOUR PRODUCT THROUGH YOUR GREEN CHIP DEALER AT THE TIME OF INSTALLATION. TO OBTAIN WARRANTY SERVICE YOU MUST PRESENT YOUR VEHICLE AND PROOF OF PURCHASE TO A GREEN CHIP DEALER AT THE TIME OF SERVICE DURING THE WARRANTY PERIOD.

Conditions, Limitation and Exclusions

If you make a warranty claim to A123Systems, A123 (or its authorized representative) reserves the right to inspect your Product before repairing or replacing your Product directly or through a Green CHIP Dealer. If upon inspection of your Product no defect in material or workmanship is found, then you may be assessed a labor charge for the diagnostic work. A123 or the Green CHIP Dealer in its sole discretion will determine whether your Product has a defect in material or workmanship.

This warranty does not cover any Product that is installed, removed, serviced or modified by anyone other than A123 or a Green CHIP Dealer. This warranty is void if (a) the Product's date code or serial number is defaced, missing or altered; (b) the Product has been damaged by or the claim results from accident, misuse, improper charging, neglect, or improper service, (c) the Product has been modified or used in a manner contrary to its intended purpose or as provided in the user manual, or (d) the Product has been opened by any unauthorized person including the purchaser. This warranty does not cover damages that result from abuse, accidents, or fire, flood or other acts of God. Removal, installation transportation, labor, inconvenience, damage or other components, personal damage or injury and/or any injury or liability to other persons or property are specifically excluded from this limited warranty.

2. Interaction With Prius Factory Limited Parts and Labor Warranty

A123 warrants that if, as a direct or indirect result of the Product, Toyota Motor Sales, USA., Inc ("Toyota") voids a warranty claim on your Prius under their express warranty ("Toyota Express Warranty") which, but for the demonstrable installation of Product by A123 or a Green CHIP Dealer and the interaction of the Product with your Prius, would not have resulted in the warranty claim, A123 at its sole option shall either (a) reimburse you for the actual cost of the parts and labor for the repair which would have otherwise been covered by the Toyota Express Warranty or (2) reimburse our Green CHIP Dealer (provided such Green CHIP Dealer is also an authorized Toyota dealer) for the actual cost of the parts and labor for the repair which would have otherwise been covered by the Toyota Express Warranty, provided however, that prior to initiating the repair services you receive pre-authorization from A123 for any repair. A123 shall not be responsible for any parts and labor costs which (a) did not receive the required pre-authorization or (b) arise from a Toyota Express Warranty that is voided for reasons other than those set forth above.

To receive warranty service for your Prius you must present your vehicle to any authorized Toyota dealer in accordance with the terms of the Prius warranty. Should you require pre-authorization approval from A123 for Prius warranty service, please contact A123 Hymotion Customer Service.

A123Systems' only responsibility under this warranty is to reimburse you or our Green CHIP Dealer (provided such Green CHIP Dealer is an authorized Toyota dealer) for the actual cost of the parts and labor for the repair which would have otherwise been covered by the Toyota Express Warranty, provided, however, that under no circumstances shall A123's cumulative liability under this warranty exceed the then-current replacement cost of the vehicle calculated in accordance with the then-current Blue Book value of the vehicle at the time of the repair request.

3. General Provisions

The following provisions apply to the limited warranties set forth in section 1 and 2 above.

This warranty applies only to your Product installed in your original Prius. This warranty cannot be transferred to your Product installed in another vehicle and is void if the Product is removed from your vehicle without authorization from A123. If you are the original purchaser of the Product, you may transfer this warranty to a new owner of the vehicle in which the Product was originally installed, provided the new owner contacts A123 during the Warranty Period in order to register the Product. Under no circumstances shall such transfer extend the duration of the Warranty Period.

Your Product is the first generation of commercially available new technology and may be modified or improved over time in subsequent versions of the Product. A123 reserves the right to make changes to future versions of the Product without assuming any obligation to make such changes on your previously installed or manufactured Product. Your Product has been engineered and tested by A123 during product development to operate effectively and without detrimental effect to your Prius. A123 does not anticipate detrimental interaction with your Prius or other defects in the Product. However, as A123 gains additional field experience with the Product, if A123 determines that there is a systematic defect in the Product, A123 may initiate a voluntary Product recall. In the event of a voluntary Product recall, A123 will reimburse you the price you paid for your Product amortized over the Warranty Period and will ensure that your Prius is returned to its original state at the time of purchase at no additional cost to you. The remedies set forth in this paragraph are your sole and exclusive remedy in the event of a voluntary recall. In the event you choose not to participate in a voluntary recall, to the extent permitted by law, the express warranties set forth in Section 1 and 2 above shall be void.

EXCEPT AS EXPRESSLY SET FORTH ABOVE, NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND A123 EXPRESSLY DISCLAIMS ALL WARRANTIES NOT EXPRESSLY STATED HEREIN.

THE DURATION OF ANY IMPLIED WARRANTY INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED TO THE DURATION OF THE APPLICABLE EXPRESS WARRANTY SET FORTH ABOVE. IN THE EVENT THAT A PRODUCT PROVES TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP WITHIN THE WARRANTY PERIOD, YOUR SOLE AND EXCLUSIVE REMEDY SHALL BE REPAIR OR REPLACEMENT AS PROVIDED HEREIN. IN NO EVENT SHALL A123 SYSTEMS BE LIABLE FOR ANY LOSS OR DAMAGES WHETHER DIRECT, INCIDENTAL, CONSEQUENTIAL OR OTHERWISE RESULTING FROM A BREACH OF ANY EXPRESS OR IMPLIED WARRANTIES OR FROM THE USE OR OPERATION OF THE PRODUCT, EXCEPT AS EXPRESSLY SET FORTH HEREIN.

This warranty gives you specific legal rights and you may also have other rights that vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, or do not allow disclaimers of implied warranties or limitation on the duration of implied warranties, so the above limitations and exclusions may not apply to you.

For warranty claims, contact A123Systems Hymotion™ Product Support:

Call: 1-877-246-7438

Email: hymotionsupport@a123systems.com

Hours: Monday through Friday, 10 am to 6 pm Eastern Time

Warranty claims are processed through A123Systems. For warranty service you must bring your vehicle to an authorized Green CHIP dealer for inspection and repair.