

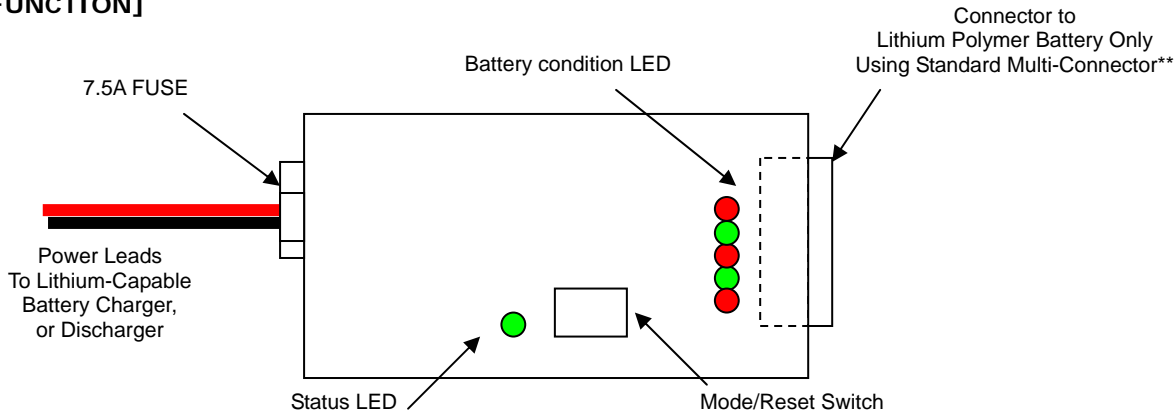
HYPERION EOS LBA6 - Lithium Balance Adapter

2005-08-15

Warnings:

- Lithium polymer batteries can be a fire hazard if charged or discharged improperly. Always use your lithium-polymer battery charger and batteries as directed by the makers.
- Never Charge/Discharge Lithium Batteries unattended
- Charge in an area free of flammable materials, on non-flammable brick, concrete, etc
- Keep Lithium batteries, Charger, and Balancer AWAY FROM CHILDREN and PETS!
- Never attempt to charge an impact-damaged (crashed) battery pack
- Packs which are chronically far out of balance may be damaged and should be discarded

[FUNCTION]



The Hyperion Lithium Balance Adapter (LBA) is an extremely versatile device. It can balance any lithium 2S~5S battery pack which has a balance "multi-connector" and nominal voltage of 3.7V per cell, three ways:

- Stand-Alone* discharge method (without using a charger or discharge device)
- Loaded discharge method (using any load device for discharge load)
- Balance while Charging (using a LiPo compatible charger)

*Standalone mode is called "Disconnection" mode, because the path to charger/discharger is disconnected

To use the LBA, you'll select the appropriate harness for 2S, 3S, 4S, or 5S packs from the included set, to match your battery's cell count. **Note: A standard Multi-Connector must be wired to your battery pack. All PolyQuest, most Align brand, recent E-Tec packs 700mAh and above, and many other brands have these connectors. Check the documentation of the maker to be sure that the wiring is standard, according to the diagrams in the appendix of this manual. If your pack does not have such a connector, and you are confident in your ability to install the connector, you may purchase the connector Part # HP-EOSLBA-MC-P4 (2S~4S packs) or # HP-EOSLBA-MC-P5 (5S packs) to do so.

Let's start by connecting your lithium pack to the LBA in **Disconnection Mode** (Standalone), to see how the LED indicators work...

- Select the appropriate harness for 2S~5S from the set included with LBA. Connect harness to LBA
- Connect your Lithium pack to the LBA Multi-Connector, and watch the "Status LED"
- Status LED will be ON continuously ● in Disconnection Mode ... OR will show an ERROR:
 - Flashes Twice: Battery Voltage higher than expected
 - Flashes Three Times: Battery Voltage lower than expected
 - Flashes Four Times: Other Connection or Wiring Error

If you have these errors, check to see that you have the proper harness installed

Now disconnect the Lithium Battery, and re-connect, this time watching the five "Battery Condition" LEDs

- When first connected, the LEDs corresponding to your battery pack cell count will flash. For example LEDs 1, 2, 3 for a 3S pack will flash. ● (LED color has no meaning - colors for easy viewing only)
 - Single Flash: Cell imbalance is 0.020V or less (well-balanced pack)
 - Double Flash: Cell imbalance is between 0.020V and 0.195V (moderately out of balance)
 - Triple Flash: Cell imbalance is 0.200V or more (badly balanced pack*)

**A pack which triple flashes should only be balanced in Disconnection mode (no charging) initially. After Disconnection Mode balancing is completed, we suggest a Charge Balance at 1/10C (ex: 0.1A for 1000mAh pack)*

Note: When a lithium pack is first connected to the LBA, you start in "Disconnection" mode. When the LBA is not connected to a charger, the two 4mm gold banana connectors on the LBA are not insulated. In disconnection mode, these may freely touch each other without harm. However, if they touch while in "Connection" mode, the LBA fuse will blow. To avoid this, simply **do not touch the MODE button if the LBA is not connected to a charger**. Alternatively, you may choose to make a cover for one of the male 4mm connectors, using a female connector covered in heat shrink tubing.

After five Flash Cycles, the Battery Condition LEDs will stop signaling imbalance status for the pack, and one or more of the Battery Condition LEDs will start blinking rapidly. **This indicates that the cell has higher voltage than the pack as a whole, and so the LBA is discharging that cell.**

If you leave the Lithium pack attached to the LBA now, it will continue discharging the high-voltage cells until the pack is balanced to within 5mV (very closely balanced). The LBA, does however, contain Auto-Cut circuitry, to avoid over-discharging a badly out-of-balance pack, or one which starts nearly discharged already. When any one cell reaches 2.75V, the LBA microprocessor powers OFF, and discharging is stopped. At this point the draw on the Lithium pack is extremely small (120uA), so you could leave the pack connected for several days without damage. HOWEVER, lithium packs should always be disconnected from the LBA as soon as possible after completion.

When balancing is complete, the Battery Condition LEDs will give a Single Flash, five times, then all LEDs will go dark and the LBA will power OFF.

Using the LBA in "Connection Mode" with LiPo-Compatible Charger

First, set your **charger** cell count and charge rate appropriately for your Lithium Polymer battery pack. For example, if you have a 11.1V 1200mAh pack, set the charger for 3S (11.1V) and 1.2A (1200mA). The LBA can be used at charge rates up to 6.0 amps (i.e. 6000mAh pack at 1C... or 8000mAh pack at 0.75C, etc)

Now, connect the LBA to the Charger, via the two male 4mm gold banana plugs.

At this point, the procedure is the same as before: We start in "Disconnection Mode" by connecting the lithium pack to the LBA's 3S multi-connector harness (if 3S pack!).

Confirm that the pack is not badly out of balance, by watching the number of flashes given by the Battery Condition LEDs. (Remember, if 3 flashes you should balance in Disconnection Mode first, then Charge Mode at 1/10C)

If all is OK, push the MODE/RESET Switch on the LBA to enter Connection Mode. After a brief pause, the "Status LED" should start single flashes to indicate that connection mode is active.

Now push the "START" button on your charger. There's nothing else to do, until your charger indicates the charge has completed. Disconnect your balanced lithium pack at that time.

Using the LBA in "Connection Mode" with Discharge Load

If you want to speed the discharge balance process (compared to Disconnection Mode), you can attach an appropriate load to the LBA Power Leads 4mm Banana Connectors. While this could be as simple as a 12V light bulb, you do need to be sure that the current drawn is appropriate for your pack, and does not exceed the LBA's 6A limit. Any charger which has Discharge capability can be used, even if it does not have an Auto-Cut function, because the LBA will properly limit discharging of the pack.

Procedure is the same as with Connection Mode Charging. Make the appropriate settings on your discharger, and select the appropriate LBA Harness to match your pack.

Connect the Discharger (or light bulb, or other load you have chosen), via the LBA's two male 4mm gold banana plugs.

We start in "Disconnection Mode" by connecting the lithium pack to the LBA's multi-connector harness.

Push the MODE/RESET Switch on the LBA to enter Connection Mode. After a brief pause, the "Status LED" should start single flashes to indicate that connection mode is active.

Now push the "START" button on your discharger. When the LBA completes balancing, or shuts down because one cell is getting too low, the circuit will be disconnected. Many Dischargers (such as the EOS series) will sound an alarm when the circuit is opened.

If using a Light Bulb, the bulb will light when you push the MODE/RESET Switch to enter connection mode, and bulb will go off when the LBA completes balancing and shuts down.

[SPECIFICATIONS]

Parameter	Mode	SPEC...	Unit
Operating Voltage	Output Battery Voltage	6.0 ~ 30	V
	Charger Input Voltage	55	Vmax
Battery Type	Lithium Polymer Battery Only		
Operated Mode	Connection Mode		
	Disconnection Mode		
Balance Battery Cells	Lithium Polymer Battery	2 ~ 5	Cells
Max Current		6	Amps max
Voltage Resolution	Connection, Disconnection Mode	±5 *	mV
Display Type	Condition LED	Green, Red	
	Status LED	Green	
Case Type	Plastic CASE		
Input Type	Wire Cable	PO.18X50X200	
Output Type	Wire to board Connector	SMAW250-08	Pin
FUNCTION	Over Charge Protection Voltage	4.30±0.010 *	V/Cell
	Over Discharge Protection Voltage	3.00±0.010 *	V/Cell
	Short Protection Voltage	2.00±0.010 *	V/Cell
	Power Down Voltage	2.75±0.010 *	V/Cell

* Digital calibrated value

[MODE DETAILS]

MODE/RESET Switch function

- Mode – Once the button is pressed, the connection mode is activated.
 Pressed once more, the disconnection mode is activated.
- Error status – Once the button is pressed, error is cleared, and the LBA resets.
- Power Down status – Once the button is pressed, power down is cleared, and the LBA resets.

Connection Mode Charging (FET Network ON):

- ① Over 3.0V
 - a. Voltage balancing is continued.
- ② 2.75V ~ 3.0V Range
 - a. Cell balance is not activated.
 - b. When the voltages drop, it moves to the disconnection mode, and it starts the cell balance. In the disconnection mode, if the cell balance is fit, completion is indicated, and it moves to the power down.
- ③ Any Cell Below 2.75V
 - a. POWER DOWN after moving to the disconnection mode.

2. Disconnection Mode / Discharging (Stand Alone - FET Network OFF).

- ① Below 2.75V
 - a. If any one cell drops below 2.75V, LBA powers down.
- ② Over 2.75V
 - a. Balancing continues based on the lowest cell's voltage. If balance is achieved before any cell reaches 2.75V, LBA indicates "finished" and powers down.

3. POWER DOWN Mode

- A. LBA Microprocessor powers down to prevent the battery from being over discharged.
- B. Press MODE/RESET to reset the LBA.

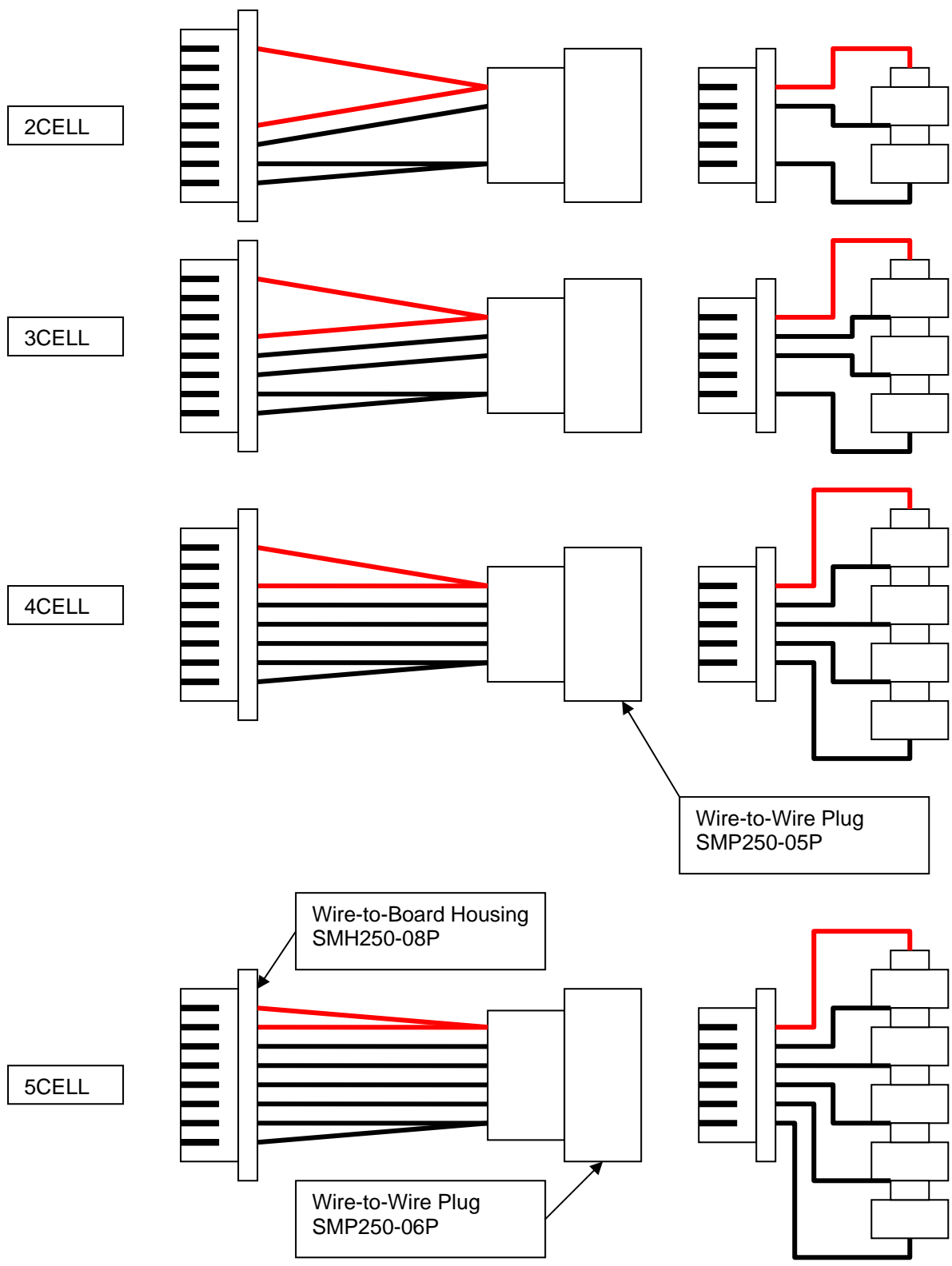
4. ERROR Mode

- A. Error is indicated for 10 seconds then the LBA moves to the power down.
- B. While an error is indicated pressing MODE/RESET will activate Connection Mode.

[BATTERY CONNECTION SYSTEM]

Battery Detection/Balance Harnesses

(These four types below: 2S~5S are included with EOS LBA 6)



OPTIONAL HARNESS SETUP FOR HIGH CURRENT CHARGING

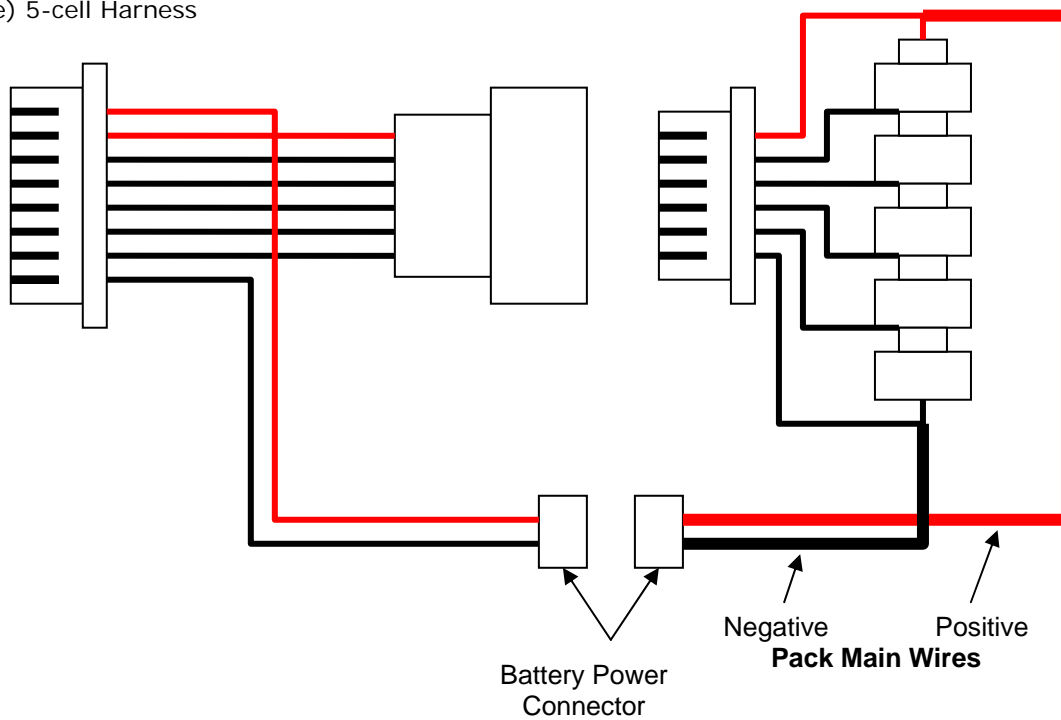
The EOS LBA6 comes with the four harnesses on previous page. These may be used to charge /discharge balance lithium packs at up to the 6A maximum allowed by the LBA. However, if you plan to regularly charge/discharge at rates exceeding 3A, it may be best to use the harness arrangement as pictured below.

Note that instead of doing the charging/discharging via the multi-connector, this arrangement connects the charger directly to the lithium pack via the two MAIN Wires of the lithium pack. This relieves the burden of high charge rates from the relatively small multi-connector pins, and insures reliability for many connect/disconnect cycles.

The diagram shows a 5S setup, but the principle is the same for 2S, 3S, and 4S harnesses.

Battery Detection + EXTERNAL Harness Setup

example) 5-cell Harness



These optional harnesses, to which you need only add your preferred battery main connector, are available for purchase from your Hyperion Dealer.

For additional technical support, contact the Hyperion dealer from whom you purchased the LBA6, please.

***Note on chargers:** The LBA6 has been specifically designed to be compatible with the majority of chargers on the market, and tolerant of high transient voltages. However, a few chargers on the market may output extremely high transient voltages when they encounter an open circuit, which could potentially damage any Balancer or PCM device, regardless of safeguards employed. Therefore, it is "best practice" to use Hyperion EOS 5i or EOS 7i chargers if possible, as they are designed to limit voltage under open-circuit conditions, and are guaranteed safe with any PCM or Balancer device.