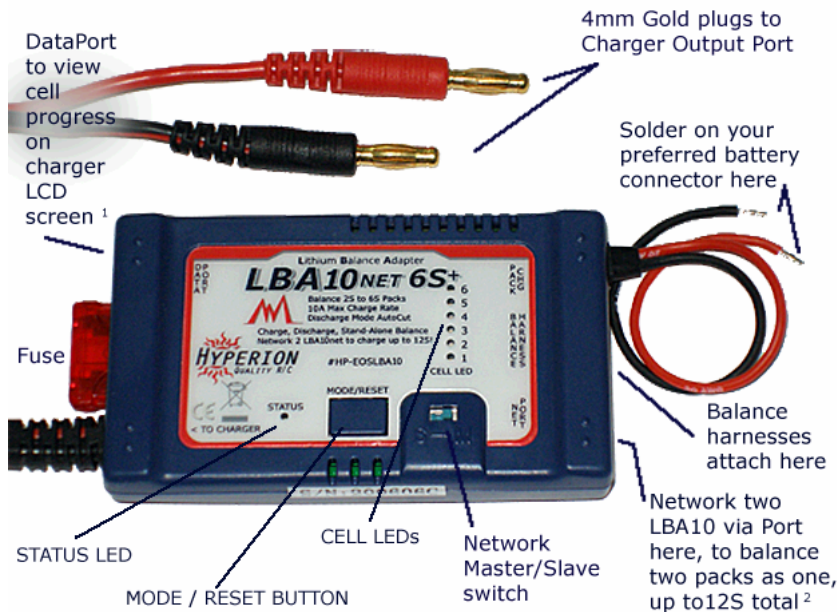


# HYPERION EOS LBA10 NET, 6S+Lithium Balance Adapter

2006-07-29



## 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

Photo Notes: 1: Option Cable #HP-EOSLBA10-DPC required and charger must have DataPort option  
2: Option Set #HP-EOSLBA10-MSC required for Networking LBA10

The Hyperion Lithium Balance Adapter (LBA) is an extremely versatile device. It can balance any lithium 2S~6S battery pack which has a "balance connector" correctly attached to the pack, 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 is called "Disconnection" mode, because the path to charger/discharger is disconnected*

To use the LBA, a Balance-Connector must be wired to your battery pack. The LBA 10 comes with 2S and 3S harnesses which fit Hyperion, Polyquest, Poly-Q, E-Tec and some other brand lithium packs. 4S to 6S harnesses are available separately. Hyperion also offers JST EH and JST XH type harnesses, which fit many other lithium pack brands. Ask your dealer for recent compatibility chart. If your pack does not have such a connector, and you are confident in your ability to install one, you may purchase the connector Part #HP-EOSLBA-MC-P4 (2S~4S packs), #HP-EOSLBA-MC-P5 (5S packs), or #HP-EOSLBA-MC-P6 (6S packs), and attach it according to the diagrams at the end of this manual.

Prepare your LBA by soldering a mating Main Connector for your battery pack to the red/black PACK CHG (LBA OUTPUT) wires

Let's attach your lithium pack to the LBA in **Disconnection Mode** to see how the LED indicators work...

- Be sure the NETWORK switch is set to MASTER
  - Select the appropriate harness for 2S~6S. Connect harness to LBA at port marked 'Balance Harness'
  - Connect your Lithium pack to the LBA Multi-Connector
  - The STATUS LED will blink at one-second intervals
  - WITHIN 12 SECONDS, Connect your Lithium pack Main Connector to the connector you installed on the LBA OUTPUT wires
  - 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*

**If your pack is already very closely balanced**, the LBA 10 will automatically shut down and turn off all LED. There is no work for the LBA to do! After shutdown the LBA puts an extremely small drain on the battery. However, you should always disconnect the battery from LBA as soon as possible after balancing is complete, especially for the smallest packs.

**If your pack needs balancing, the LBA will go to work**, discharging the cells with highest voltage. Each **CELL LED** will have one of these three states:

ON SOLID: Discharging that cell at max rate  
QUICKLY FLASHING: Discharging that cell at low/medium rate  
OFF: That cell's voltage is low, so no discharging

**\*LED COLOR: Cells 1-3-5 are always RED; 2-4-6 always GREEN. The colors just help you identify which cell is which.**

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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). When balancing is complete, the CELL Condition LEDs will each Flash, then all LEDs will go dark and the LBA will power OFF. At this point the draw on the Lithium pack is very small (490uA), so you could leave the pack connected for extended periods without damage. HOWEVER, lithium packs should always be disconnected from the LBA as soon as possible after completion. Charging should NEVER be left unattended!!

**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 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 covers for one or both of the male 4mm connectors.

**NOTE:** The LBA contains Auto-Cut circuitry to avoid over-discharging a badly out-of-balance pack, or a pack which starts with voltage too low already. If any one cell ever falls below 2.75V, the LBA microprocessor powers OFF, regardless of balance state, and discharging is stopped.

### **Charging with a single LBA 10 in "Connection Mode", using a LiPo-Compatible Charger, for 2S to 6S**

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 10.0 amps (i.e. 10,000mAh pack at 1C...)

#### **CONNECTION SEQUENCE**

- 1) Check to be sure that the LBA Network Switch is in MASTER mode
- 2) Connect the LBA 10 INPUT LEADS to the Charger, via the two male 4mm gold plugs
- 3) Connect the appropriate 2S-6S balance harness to the LBA 10
- 4) Connect the Balance Harness to your Lithium pack
- 5) Quickly (within 12 seconds) connect your pack Main Wires to the Red/Black LBA OUTPUT wires

At this point, the sequence is the same as before: We start in "Disconnection Mode. You should see a solid STATUS LED, and at least one blinking CELL LED. If so, 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. Check to be sure the STATUS LED is blinking in one-second intervals before continuing.

Now push the "START" button on your charger. There's nothing else to do, until your charger indicates the charge has completed. At that time, press the MODE button to enter DISCONNECT MODE, then detach components in this order:

- 1) Disconnect your lithium pack Main Connector from the LBA Output Wires
- 2) Disconnect the Balance Harness from your Lithium pack
- 3) If desired, disconnect LBA 10 from the charger

**NOTE: if you start with a very closely balanced pack, the LBA will power off shortly after it enters disconnect mode. In that case, push the MODE button TWICE to enter connection mode.**

**NOTE:** Chargers which do not have a start button will begin charging when you start Connect Mode by pushing the MODE button (or pushing MODE twice if the LBA has already shut down with well balanced pack)

**NOTE:** If you have connected your LBA 10 to a DataPort equipped charger (such as EOS 5i DP), via the optional DataPort Cable, you need not press the MODE button to disconnect when charge/balancing is finished. The charger automatically tells the LBA to disconnect... The DataPort cable and supporting charger allow you to monitor the voltage of each cell during the charge process, via the charger's LCD screen.

### **Using a single LBA 10 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 INPUT 4mm Gold 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 10A 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 to 3.0V per cell, assuming all cells are above 3.0V to begin. (in case a cell is between 2.75V and 3.0V to start, the LBA will be sure that no cell falls below 2.75V. If any cell is below 2.75V to start, the LBA 10 will only indicate a voltage error, and stop.)

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, and then quickly attaching the Main Pack Wires to the LBA Output Wire set. 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.

## Using Two LBA 10, Networked to Balance two similar packs as a single unit

The LBA 10 Net Balancer can be connected as in the diagram below, in order to balance charge two similar packs such that the voltage of all cells in both packs are balanced within 0.05V of each other, or better. This allows you, after balance charging is complete, to safely connect the two packs in series and fly them as a single unit in your model.

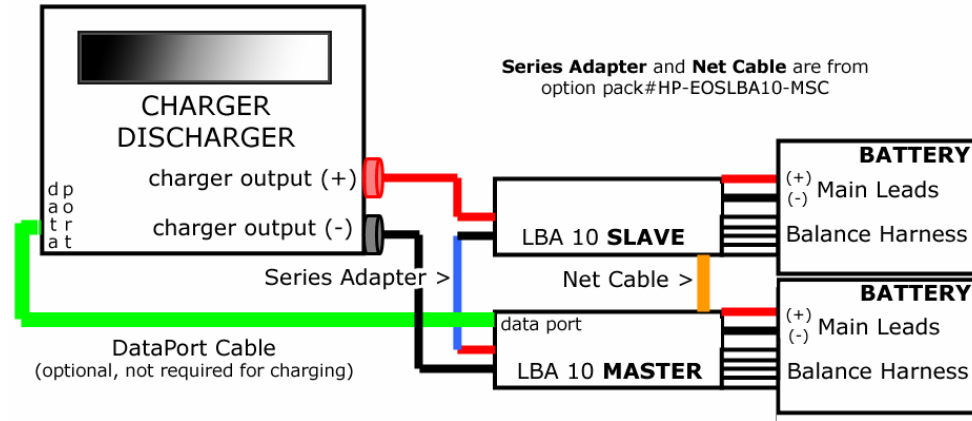
### NETWORK CHARGING NOTES:

\* The two packs must be from the same maker, of same capacity and type (ex: VX3700-3S, VX3700-4S to make 7S)

\* Ideally, the two packs should have similar history. That is, they are both new, or they have both been used in the same model, separately, for about the same number of flight hours before. You simply want to avoid pairing tired or old packs with fresh, new packs.

\* A lithium charger rated to suit the total SERIES (S) cell count of the two packs is required. That is, to charge a 4S and a 4S pack as 8S, you need a charger rated for 8S or higher.

\* As an alternative to a single high-S charger connected as below, you could use two inexpensive 5S chargers each connected separately to LBA10 and pack. After each pack is balance-charged separately, check total voltage of each pack. If within 0.05V/cell, connect and fly! If not, connect the two packs as in the example below, and balance them DICONNECT Mode as a unit. Only the high cells are reduced in voltage, and effect on capacity is negligible...



### Two-Pack System Advantages

\* 5S packs flown in 2.5Kg model can be combined to 10S to fly a new 5Kg model, for example

\* Damage to one pack means replacing only ½ the battery system.

\* Two packs can easily be rearranged to fit in a model, to provide proper CG without adding weight

\* Versatile: change from Series to Parallel connections effortlessly

### CONNECTION SEQUENCE

- Set one LBA10 to **SLAVE** mode on Network Switch, one on **MASTER** mode
- Connect the 4mm Female-Female **Series Adapter** from option pack #HP-EOSLBA10-MSC, as shown above by the blue line between Positive/Negative Input Cables of the two LBA units. Connect the NETWORK CABLE, as shown by the Orange line, between the two LBA10 units.
- Connect the two remaining Red/Black LBA 10 INPUT LEADS to the Charger, via the two male 4mm gold plugs
- Connect the appropriate 2S-6S balance harness to each LBA 10
- Connect the appropriate pack to the balance harness on **SLAVE** LBA first!
- Connect the appropriate pack to the balance harness on **MASTER** LBA
- Quickly (within 12 seconds) connect the Main Leads of each lithium pack to the Red/Black LBA OUTPUT wires
- Press the MODE button to enter CONNECTION mode
- Start your charger

If you have trouble, it is most like that the first Slave LBA has timed out before you got all the connections made. Arranging the various components carefully on the table beforehand is very helpful. After a little practice, it'll be easy...

Disconnect after charging is finished by reversing the sequence above.

### ---- Connecting Packs in Series before Flight, Disconnecting before Charging or 'Disconnect Mode Balancing' ----

NOTE: When wiring two packs in series for flight, we suggest using Gold Bullet Connectors of the appropriate current rating. Hyperion offers 3.5mm short gold connectors for battery <> ESC connections up to 25A continuous (40A peak /10 seconds), 4mm long connectors for 20~60A continuous (80A peak/10 seconds), and 6mm short connectors for 40A~80A continuous, (110A peak /10 seconds). It is always well to keep the wires between Battery and Speed Controller (ESC) as short as possible [they should never be made longer than as supplied by maker - if necessary, add length to wires between **Motor and ESC** instead]. For packs which will always be paired in Series in your model, we recommend that you cut short the RED wire on one pack and the BLACK wire on the OTHER pack - just long enough that the two wires can be joined by a single Male/Female pair of Bullet Connectors. The remaining longer RED wire should have a MALE connector attached\*, and the remaining longer BLACK wire a FEMALE connector. These two will connect to your ESC. In this way, you not only reduce the total length of battery<>ESC circuit, you also make it very clear which two leads get connected for Series (the short ones). **BE SURE YOU NEVER SHORT THE TWO BATTERIES BY CONNECTING THEM DIRECTLY TOGETHER!** (it may sound silly, but can happen if you aren't paying attention!)

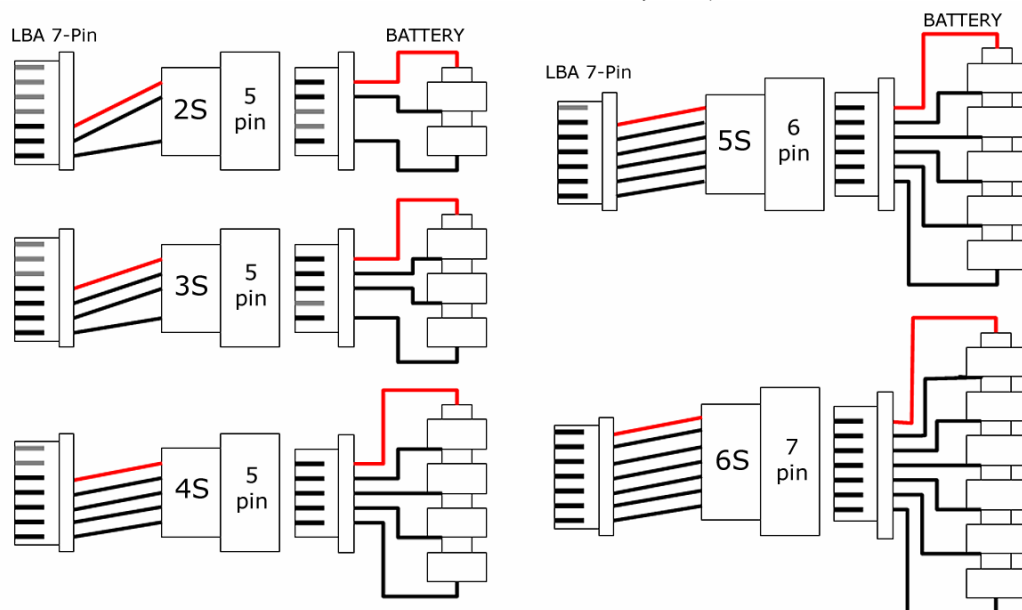
When Charge, Discharge, or Disconnect Balancing each of these packs, the main RED/BLACK wires are all disconnected, then each LBA's Output Wire connected directly to each battery pack's main wires.

\*Male Connector on battery (+) is industry standard. Batteries do not have Ground (Earth), so it doesn't matter if the (+) connector has exposed metal (as long as ONE of the two connectors is shielded, you're ok). Your charger does have ground, however. Therefore you want the FEMALE connector on charger side (+) Output, because it is covered completely with shrink tubing. As such, it cannot short on the grounded (-) metal case of the charger.

## TECHNICAL ADDENDUM

### EOS LBA 10 – HARNESS WIRING FOR HYPERION-COMPATIBLE PACKS

(2S and 3S are included with LBA10, 4S, 5S, 6S available as accessory items)



#### [SPECIFICATIONS]

Parameter	Mode	SPEC...	Unit
Operating Voltage	Output Battery Voltage	6.0 ~ 26.0	V
	Charger Input Voltage (max tolerance)	55	Vmax
Battery Type	Lithium Polymer Battery Only	3.7V nominal Type Only	
Operation Modes	Connection Mode (with charger)		
	Disconnection Mode (stand alone)		
Output Battery Cells	Lithium Polymer Only	2 ~ 6	Cells
Max Charge Current		10	Amps max
Voltage Resolution	Connection, Disconnection Mode	±5 *	mV
Display Type	CELL LEDs (opposing colors for visibility)	Cells 1, 3, 5 always RED Cells 2, 4, 6 always GREEN	
	STATUS LED	Always GREEN	
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

For additional technical support, please contact the Hyperion dealer from whom you purchased the LBA10.

**\*Note on chargers:** The LBA10 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 chargers, as only they are expressly designed to limit voltage under open-circuit conditions, and are guaranteed safe with any PCM or Balancer device.