BalancePro HD 6s Charger

Model LIPOCH6S10-A123 for charging LiPo, Li-Ion and A123 battery packs with node connectors.

Charging to 10A with cell balancing and overcharge protection.

BalancePro HD

Features

- Charges Lithium Polymer, Lithium Ion, Lithium Manganese and A123® chemistries. Adapters are available from FMA Direct.
- Charges packs having one to six cells and any capacity from 500mAh to 50Ah.
- Each cell is charged independently, providing exceptional charging safety and elevating RC packs to the safety level of cell phones.
- Latest technology provides the ultimate in safety. Even charges packs having hidden physical damage without danger of fire. A pack will not charge if individual cell voltages don't equal total pack voltage.
- Cell balancing to 10mV and automatic overcharge protection assure longest pack life. Automatic temperature monitoring prevents pack overcharging at low ambient temperatures and charger damage at high ambient temperatures.
- Low Voltage Restore feature automatically attempts to repair overdischarged packs. Cells discharged as low as 0.5V may be repaired to as much as 98% of capacity.
- Cold Weather Charge stops charging at 4.15V/cell when temperature is below 55ºF to prevent cell damage.
- Operates from any 12 to 15VDC, 25A (minimum) power source, such as a power supply or 12V lead acid battery. Inputs and outputs are protected against reverse polarity.
- Viewer software (a free download) displays real-time data and graphs.

Precautions

- Follow all instructions in this manual to assure safe operation.
- Always watch LiPo packs while they are charging. Never leave LiPo packs unsupervised during charging.
- The charger itself may reach 140ºF when charging at high currents. This temperature may feel uncomfortable to your fingers, but it is normal. The charger protects itself from damage due to overheating.
- See additional warning sheets provided with this charger and FMA LiPo packs.
- Follow all guidelines for charging, discharging, handling and storing LiPo cells.

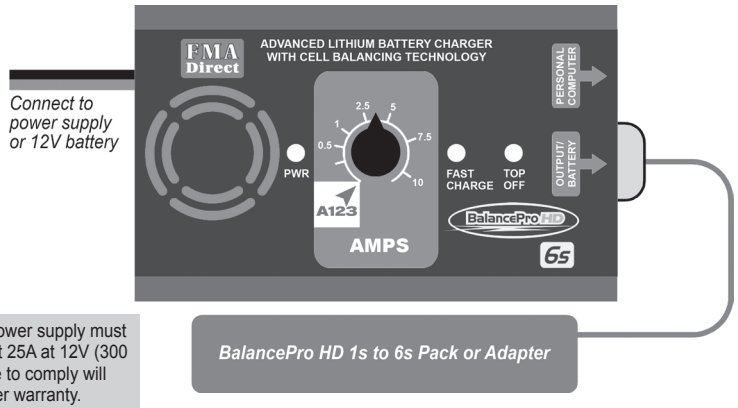
FMA, Inc. ● 5716A Industry Lane ● Frederick, MD 21704
Sales: (800) 343-2934 ● Technical: (301) 668-4280 ● www.fmadirect.com

FMA Direct

Connecting the pack

Connecting a pack with a BalancePro connector

Connect your BalancePro HD Pack's connector to the Charger's output connector.

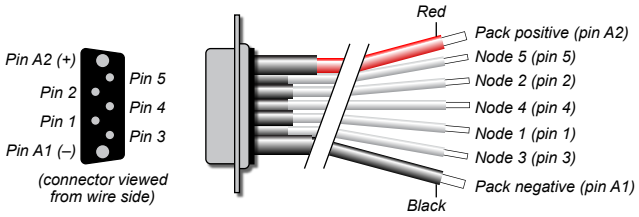


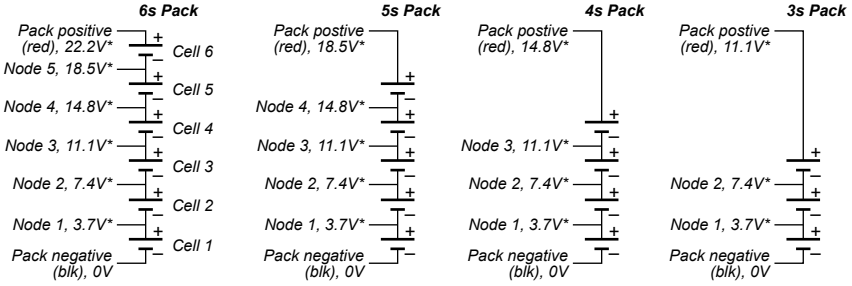
WARNING: Power supply must provide at least 25A at 12V (300 Watts). Failure to comply will void the charger warranty.

Connecting a pack without a BalancePro connector

FMA Direct offers plug-and-play adapters for charging packs equipped with node connectors made by other vendors. Check the BalancePro section at www.fmadirect.com for the latest adapters.

If an adapter isn't available for the pack you want to charge, or if the pack doesn't have a node connector, the FMA SVBP7 BalancePro HD Battery Pigtail cable assembly (shown below) will make the pack compatible with the BalancePro HD Charger. The diagrams below show how the Node Connector attaches to packs of various configurations. Additional assembly information is provided with the Battery Pigtail.





* Nominal voltage with respect to pack negative.

Charger specifications

For battery type	Lithium Polymer, Lithium Ion, Lithium Manganese and A123 packs; charger can be used with 1s to 6s packs having node connectors and connected to charger with an appropriate FMA adapter cable
Pack capacity	500mAh to 50Ah
Input voltage	12 to 15VDC*, reverse polarity protected
Input current	25A minimum*
Power conversion	62.5kHz switcher operating at 90% efficiency
Nominal output voltage	4.20 volts per cell for all except A123 packs 3.60 volts per cell for A123 packs
Output current	Up to 10A
Voltage calibration	Cell voltage measurements are factory calibrated to a standard traceable to NIST; calibration is to ±6mV
Serial data output	19.2kbps, 8 bits, 1 start bit, 1 stop bit, no parity

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FMA limited warranty

FMA, Inc. warrants this product to be free of manufacturing defects for the term of 1 year from the date of purchase. Should any defects covered by this warranty occur, the product shall be repaired or replaced with a unit of equal performance by FMA or an authorized FMA service station.

Limits and exclusions

This warranty may be enforced only by the original purchaser, who uses this product in its original condition as purchased, in strict accordance with the product's instructions. Units returned for warranty service to an FMA service center will be accepted for service when shipped postpaid, with a copy of the original sales receipt or warranty registration form, to the service station designated by FMA.

This warranty does not apply to:

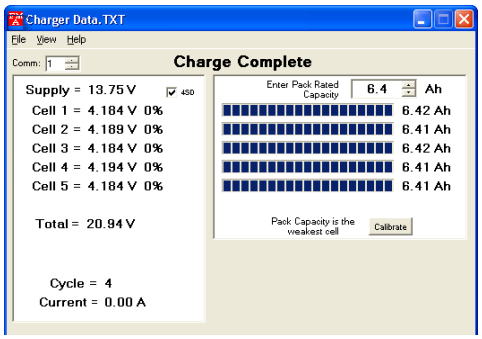
- Consequential or incidental losses resulting from the use of this product.
- Damage resulting from accident, misuse, abuse, neglect, electrical surges, reversed polarity on connectors, lightning or other acts of God.
- Damage from failure to follow instructions supplied with the product.
- Damage occurring during shipment of the product either to the customer or from the customer for service (claims must be presented to the carrier).
- Damage resulting from repair, adjustment, or any alteration of the product by anyone other than an authorized FMA technician.
- Installation or removal charges, or damage caused by improper installation or removal.

Call (301) 668-7614 for more information about service and warranty repairs.

Charger Viewer Software

Use the Charger Viewer Software to monitor pack voltage, cell voltages, charge current and error codes on your PC.

1. Download "Charger 6s Viewer" from **Support** page at www.fmadirect.com. Double-click downloaded file and follow installation instructions.
2. Connect Charger to BalancePro HD 6s Pack and to power supply.
3. Connect Charger to PC using an RS232C cable and FMA P/N FSIM1. If PC doesn't have an RS232C port, use an RS232C-to-USB adapter to connect cable to USB port.
4. Launch Charger Viewer. Change **Comm** setting until data appears in window.



- *To see voltage versus time:* **View > Graphs**. In **Graphs** window, **View > Charge Voltage** or **View > Discharge Voltage**.
- *To add notes:* **View > Battery Notes**.
- *To see charger error codes:* **View > Error Code History**.

Charging the pack

1. Connect the charger to a 12 to 15VDC, 25A power source, such as a power supply or 12V lead acid or gel cell battery. The red Power LED will turn on.

   WARNING: Power supply must provide at least 25A at 12V (300 Watts). Failure to comply will void the charger warranty.

2. Set the Charger's current control:
   - For low discharge or older lithium packs, set charge rate at 1C. Packs will charge in about 1 hour 20 minutes.
   - For recently-manufactured lithium packs, set charge rate up to 3C. Packs in good condition should charge without cell damage. However, use caution and don't leave the charger unattended.

     CAUTION: *NEVER* exceed 3C charge rate for a BalancePro HD pack. Serious damage to the battery pack may occur including venting with flames in some instances!

   - For A123 packs, turn the current control knob fully counterclockwise to the "A123" position. A123 packs charge in about 15 minutes (the preset rate is 4.5C).

     CAUTION: "A123" is a special charging mode, activated by turning the current knob all the way to the left. This mode charges A123 packs to 3.6V/cell. Set the knob before connecting A123 batteries. Do not attempt to charge A123 packs using any other setting of the current knob. Likewise, do not attempt to charge lithium chemistries other than A123 in the A123 mode, as the cells will not reach full charge.

3. Monitor charging with the LEDs:

Charge step	Fast Charge LED (yellow)	Top Off LED (green)
Low Volt Restore (first two minutes)	Flashing slow	Off
Safety Charge	Flashing slow	Any
Fast Charge	On	Off
80% fast charge*	On	Flashing slow
90% top off†	Off	Flashing fast
100% complete	Off	On

*Takes about 1 hour at 1C to reach 90% of capacity.
†Takes an additional 20 minutes at 1C to reach 100% capacity.

4. When charging is complete, disconnect the pack from the charger.

Practical information about the BalancePro HD Charger

- You can top off packs, or remove them when they are partially charged. There is no way to damage a pack when using the BalancePro HD Charger.
- If a pack is at 80% or less of its capacity when connected to an auto-detect speed controller, the controller may lower its cut-off voltage. This could overdischarge the pack during the flight. Auto-detect speed controllers should properly set cut-off voltage if packs are charged to at least 90%.
- To save time, stop charging when the pack reaches about 90% of capacity. That last 10% takes the longest.
- When charging an A123 pack that has been discharged very low, the charger initially may not be able to accurately count cells in the pack. To eliminate the possibility of an inaccurate count, the charger applies current to "wake up" the cells, then recounts. All cells in an A123 pack must measure greater than 0.1V for the charger to detect them.
- Overdischarging an A123 pack below 2.0V/cell will damage the cells (contrary to some reports). The BalancePro HD Charger requires a minimum pack voltage of 1.5V to activate charging. If an A123 pack is below this voltage, do not try to repair the pack by boosting voltage. Even if you manage to repair the pack, it will not have many cycles left and the charger will reject it for multiple reasons (as indicated by displayed safety codes).
- Older packs that have weak cells may cause the charger to enter Safety Charge Mode. In this mode, current is reduced to 0.5A to reduce risk of fire. When the charger is in Safety Charge Mode, the yellow LED will blink for the entire charge.
- The charger has over-temperature protection modes that reduce current when its temperature rises above 130ºF. To help avoid these modes when charging at high voltages and currents, keep the charger out of direct sunlight.

Troubleshooting

If the yellow and green LEDs flash simultaneously, there is an error. The LEDs flash a safety code. Count the number of flashes before the pause, then look up the code in the table below. Correct the error. If errors continue, contact FMA Customer Service.

Tip: The charger stores error information. If you return the charger for service, FMA can diagnose the problem.

Code	Cause	Resolution
1	Low-cell-voltage timeout on startup	Cycle charger power. Try charging again no more than 2 times.
2	Input voltage below 10 volts	Lower charge amps, get a bigger power supply.
3	Input voltage above 16 volts	Power supply voltage is too high. Lower voltage.
4	Input voltage unstable	Power supply is too small. Lower charge amps.
5	Cell voltage above 4.30 volts	Discharge pack.
6	Cell removed too many times	Cycle charger power. If error continues, pack or charger may have a problem.
7	Bad mode number	Factory error. Send charger for repair.
8	Checksum error	Factory error. Send charger for repair.
9	Current greater than 13 amps	If input voltage didn't change, send charger for repair.
10	Shorted drive FET	Factory error. Send charger for repair.
11	Voltage reference is reading low	Factory error. Send charger for repair.
12	Voltage reference is reading high	Factory error. Send charger for repair.
13	Crowbar blown	Factory error. Send charger for repair.
14	Bad EEPROM write	Factory error. Send charger for repair.
15	System soft start	Cycle charger power. Check for bad power connection.
16	Firmware corruption	Factory error. Send charger for repair.
17	Cell voltages don't total correctly	Cycle charger power. Pack may have a bad cell.
18	Cell balancing stopped after 4 hours	Raise charge current. Pack may be too big or bad.
19	Cell top-off stopped after 4 hours	Raise charge current. Pack may be too big or bad.
20	Fast charge stopped after 4 hours	Raise charge current. Pack may be too big or bad.
21	Bad cell count	Cycle charger power. If error continues, pack may be bad.
22	Current below 100mA	If pack is not full, try raising current above 1A.
23	Pack detect ran 8 times without finishing a single charge	Pack may have bad cell. Check individual voltages. If one cells is full and another cell is empty, pack cannot be safely charged
24	Cell dropped below 3 volts during charge	Pack may have bad cell.
28	Pack detect failed	Check individual cell voltages (each cell must be above 0.5V). Ensure all node wires are properly connected to cells, and black (pack –) node wire is properly connected. Ensure battery ground is not connected to power source ground. Charger may be wet. A123 pack drained to 0V may have damaged cell.
29	Battery connector noise	Check or clean the battery connector. If charging through thin node wires, reduce current below 5A.
30	Charger overtemp	Place charger in cooler area. Run external fan on charger.