Cell Balancing a Buddipole 4S2P Battery Pack

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http://www.charlespreston.net/batteryop/Cell-Balance-BP-4S2P.pdf

If you are using a Cellpro Multi4 or 10s battery charger to charge your battery pack, and you have it set to balance while charging, you don't need to separately balance the cell voltages.

However if you almost always charge your battery pack from a solar panel or another source of current, the individual cells (in this case each pair of cells in parallel) will charge to slightly different voltages. One pair may charge to a voltage higher than the recommended maximum. In the case of a deep discharge, the lowest voltage cell may fall below the recommended discharge voltage before the whole battery pack voltage is so low it won't run a radio. If this low cell voltage isn't extreme, it doesn't immediately cause the cell to fail, but will likely reduce the lifespan of an expensive and very good battery pack.

 According to an FMA Direct report, Managing A123 Cells with FMA Cell Balancing Technologies, an individual A123 cell is not damaged if discharged to 2.5 VDC (10 VDC for a 4S2P if cells are equal) , but is damaged if discharged to 0.0 VDC. And any individual cell reaching more than 3.7 VDC while charging will be damaged.

Balancing the cell voltages will reduce these problems.

The Astro 106-123 Blinky is a cell balancer for battery packs using A123 cells like those found in Buddipole packs. It measures the cell voltages and reduces the voltage in the cells that have a voltage higher than the lowest. If you balance the cells after charging, they can start discharging from an equal voltage.

http://www.astroflight.com/index.phmain_page=product_info&cPath=34&products_id=21

How to connect a Blinky to a Buddipole 4S2P battery pack

After looking at catalog pages for the sockets needed, the easiest way I could think of to buy small quantities was to order them as prepared cables which I could modify.

The 7 pin socket for the Blinky is one of the connectors on a 6S JST XH Extension Align Style
http://www.rcaccessory.com/6salignextensionjstxh.aspx

The 5 pin socket for the Buddipole balancing connector is on one end of a Cellpro-JST-PA-4s extension cable. This is a 3 inch extension for the charging/balance connector on a Buddipole 4S2P battery pack.

http://www.usastore.revolectrix.com/Products_2/Cellpro-Multi4_3/Cellpro-JST-PA-4s-Charger-3-Extension-Cable

I rearranged the wires coming from the 7 pin Blinky socket by removing the crimped pins and re-inserting them in the desired color order. The wires were shortened to about 2 inches and soldered in place of those on the very small circuit board holding the 5 pin charging/cell balance socket.

Heat shrink tubing or tape should be put over the re-soldered circuit board with its exposed solder connections.
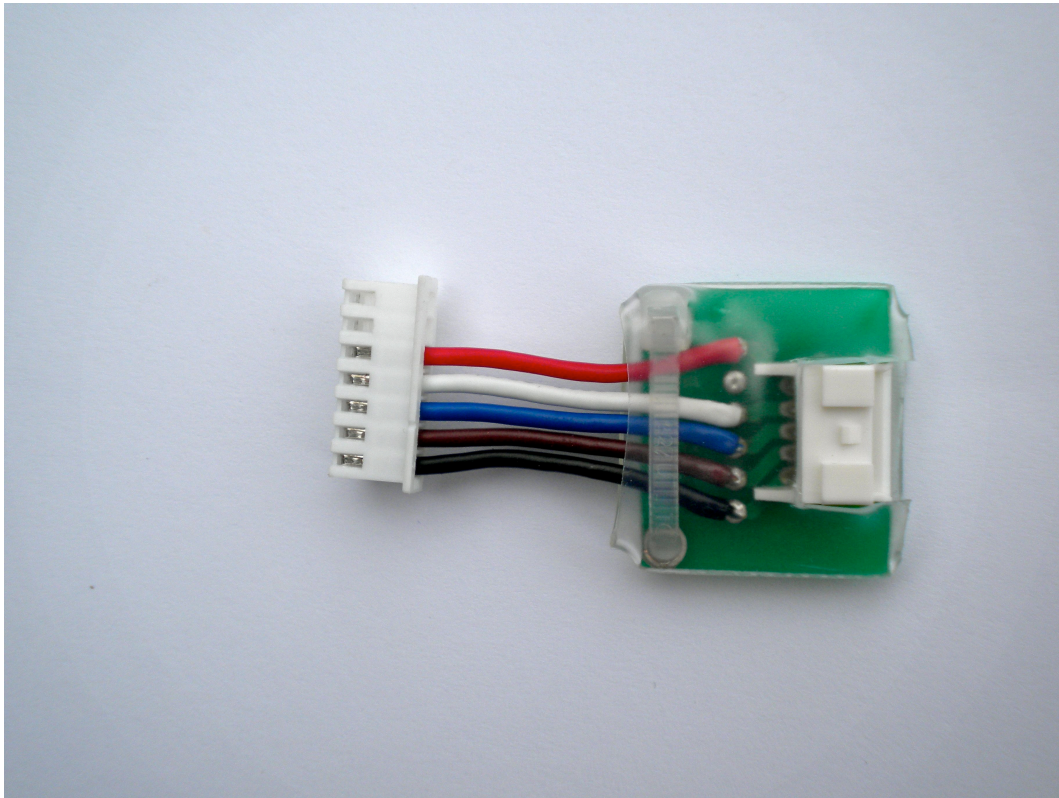
The Blinky is marked with Blk and Red on the corners on the end beside the protruding pins. It should be inserted into the socket so those markings match the color of the wires. As you can see in the photo below, the Blk corner is on the end of the white connector socket where the black wire is. Only 5 pins of the 7 pin socket are used. That's 1 for ground, and 1 at each positive battery terminal of the 4 in series.
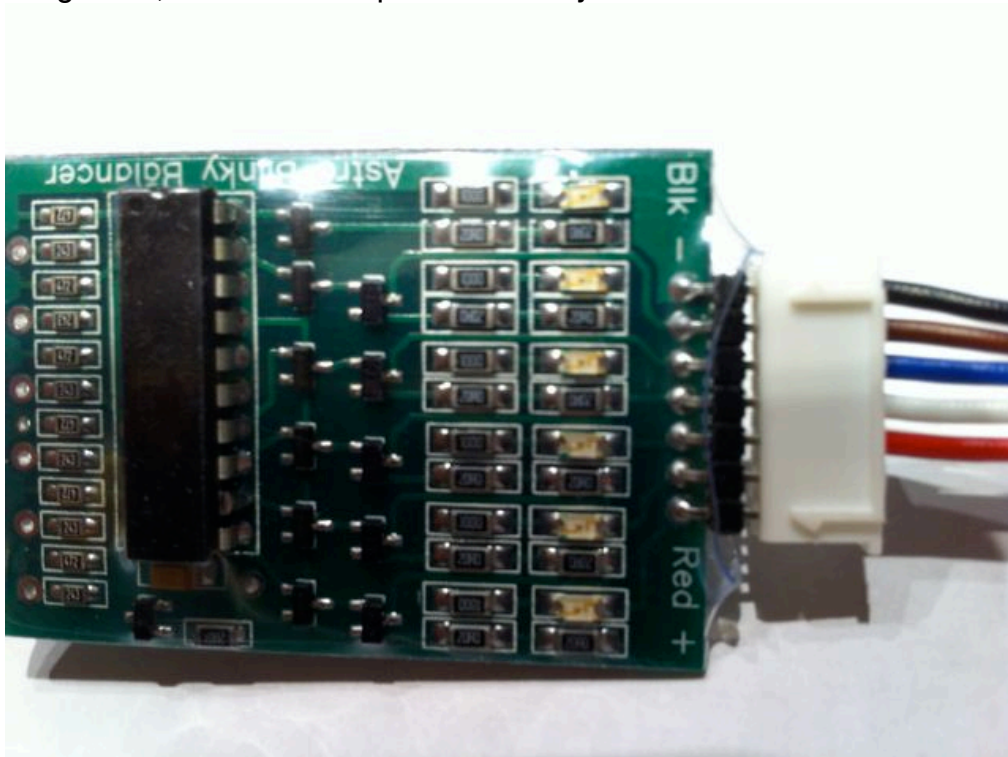
When the Blinky is first connected to the battery pack, the leftmost 4 red LEDs will stay on for 3 seconds. This indicates that each cell is at least 2.8 VDC, which is the minimum voltage to start charging with high current.

While balancing, one or more of the leftmost 4 LEDs will be on as it discharges higher voltage cells toward the voltage of the lowest cells in the battery pack.

If no LEDs light for about 5 seconds, the cells are balanced.

Does it work?
Here are the unbalanced battery voltages from a 4S2P that has been almost completely recharged by a solar panel and a Genasun GV-5-Li-14.2V solar MPPT controller.

Cell   Voltage
G-1   3.528 VDC
1-2   3.523
2-3   3.517
3-4   3.502

The maximum difference in this case is 0.026 VDC.   I doubt that this small imbalance is very harmful. The cells in this pack have been kept balanced almost every time it has been charged. A battery pack that has been deeply discharged and charged without

balancing for a number of cycles will probably develop larger differences in cell voltages.Here are the voltages after 6 minutes of balancing by the Blinky.

Cell   Voltage
G-1   3.517
1-2   3.518
2-3   3.512
3-4   3.501

The maximum difference between the cells has been reduced to 0.017 VDC.

Balancing while charging
According to the Blinky literature, it can be used while charging the battery, but I don't know if the sudden small voltage changes caused by discharging the high cell(s) will have any effect on the Genasun controller and its ability to sense the proper end of charge condition. Experiments are ongoing. If balancing while charging works, this should keep the individual cell voltages from exceeding the recommended maximum.

Because the GV-5-14.2 controller limits its maximum charging voltage to less than the 14.4 V (3.6 V per cell) specified by A123, there may be less risk of cell over charging even without balancing while charging.