

User Manual of

Smart LED Balance Module for 3.2V LFP Cell with 250mA Balance Current for LFP-G20



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Introduction 3.2V LED Balancing Module

Each 3.2V LFP cell has a small difference in internal resistivity (so called impedance) due to fabrication tolerance. Especially for cell's capacity >20Ah and in application require very high discharge current (>2C) which will cause unbalanced voltage in each cell during charging. When building a multi-cells battery pack (in series or in parallel), unbalanced voltage will reduce battery pack's energy power and life cycle significantly.

The balance module will keep each LFP cell's voltage at 3.60+/-0.2 V peak during charging by draining excessive voltage with a 250mA discharge current. It will wait for other cells within the pack to reach same voltage level to ensure all cells within the pack are balanced.

Adding the balance module to each LFP cell before making a battery pack will maintain battery power, increase cycle life and save money. Using this balance module means you don't need a pcm (protection board with balance function) but can use a pcb (no balance function) instead.

Connection Diagram

Bat + to Battery's Positive
Bat- to battery's Negative



From this page, the led balancer is assembled together with excluded 4 pcs of LiFePO4 Prismatic Module: 3.2V 20 Ah, 10C Rate , excluded 1 of plastic enclosure, excluded 2 pcs of 3 tabs (90 degree) Faston 0.25 brass for final product below . You may learn the LED balancer's characteristic from document below



Excluded LiFePO4 Prismatic Battery: 12.8V 20Ah (256Wh, 10C rate) with LED Balancing Module

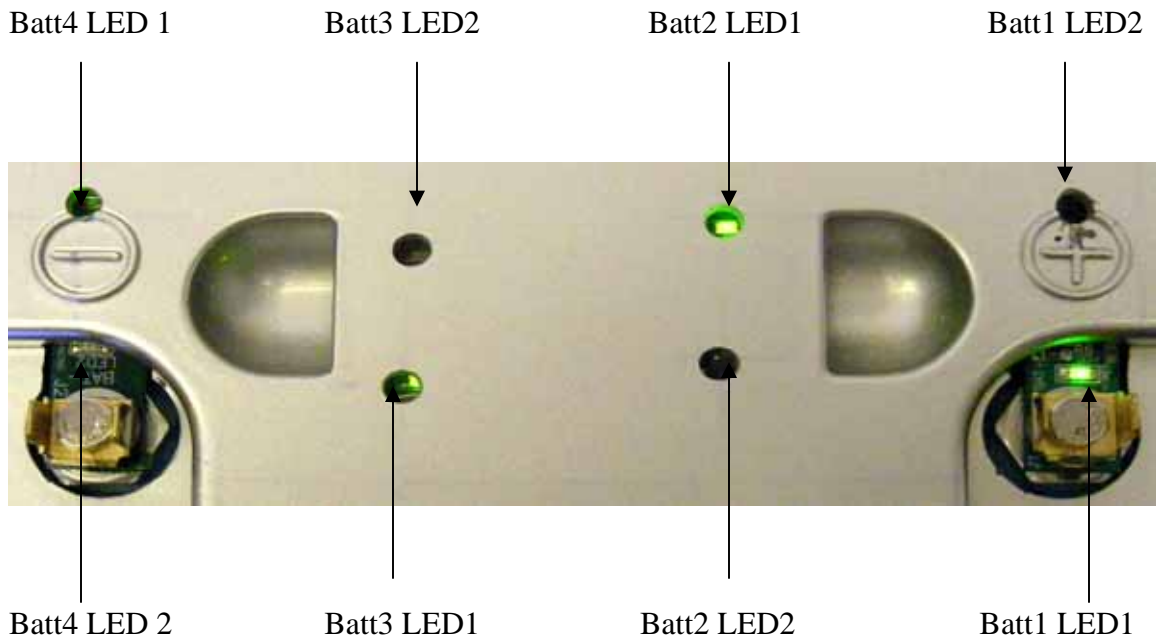
Safety & Warning for LiFePO4 Prismatic Battery: 12.8V 20Ah (256Wh, 10C rate) with LED Balancing Module

1. **Don't remove plastic cover on the top. (Some parts removed such as 3 Tabs Faston terminal, plastic cover on the top from this document is for demonstration purpose only)**
2. **Don't drain battery exceed 40A Maximum Continuous discharge rate. (200A Maximum Impulse rate < 10 sec is acceptable)**
3. **Must keep an eye while charging battery pack. Please use 12.8V LiFePO4 (14.6V cut-off) smart charger to charge battery pack. The maximum charging current must not exceed 60A**
4. **Must DIY connector with correct wire gauge size, otherwise, the wire may burn out.**
5. **This balancing board won't perform over-discharge protection function. Also, battery pack doesn't have a PCM installed, please don't over**

discharge battery. If over discharge to 10V (2.5V/cell), please recharge the pack right away. Otherwise the battery is over discharge and cannot recover!

6. The LifePO4 Smart charger must have cut-off voltage = $3.60 \pm 0.035V$, otherwise, this balancing board won't perform balancing charge function.
7. All parameter measured such as Voltage, Amperage may be varied based on battery's condition, testing environment.

Balancer's LED assignment



How to Discharge Battery

1. Check LED status on balancing board before connect load to battery. The Ready to discharge LED indicator must be below.

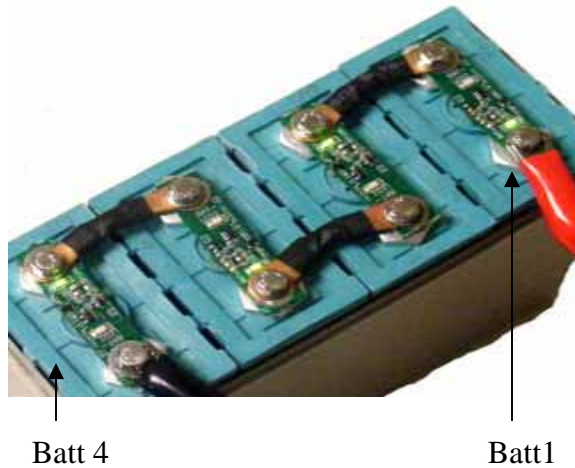
Batt1: LED1 = Green, LED2 = "Off"

Batt2: LED1 = Green, LED2 = "Off"

Batt3: LED1 = Green, LED2 = "Off"

Batt4: LED1 = Green, LED2 = "Off"

Please don't discharge battery while LED 2 from either of battery still turns "RED".
(The LED 2 from each of battery will be disappeared within 10~30 minutes after fully charged)



2. Connect Load to battery's discharge terminal. Plastic cover on the top and T terminal have been removed. Don't short circuit while discharging. You may follow discharge connection diagram. **(Plastic cover and 3 Tabs Faston terminal removed from this document is for demonstration purpose only. Don't remove plastic cover on the top and 3 Tabs Faston terminal while you are using this battery)**

Battery T terminal --> Optional for DIY connector --> Load



How to connect with excluded standard Anderson plug & excluded DC Programmable Electronic load: 0-240A / 0-150V / 3600W --- M9717 (**Excluded additional DIY connector**)



Set CC (Constant Current) load = 20.0A from excluded DC Programmable Electronic load: 0-240A / 0-150V / 3600W --- M9717 (Battery is being discharged by 20.0A continuous current rate)

3. Since battery pack don't have a PCM installed, please don't over discharge battery below 10.0V. If over discharge to 10V (2.5V/cell), please recharge the pack right away. Otherwise the battery is over discharge and cannot recover!

4. Please keep charging battery pack at least 3 months a time if battery is not used.

How to charge Battery

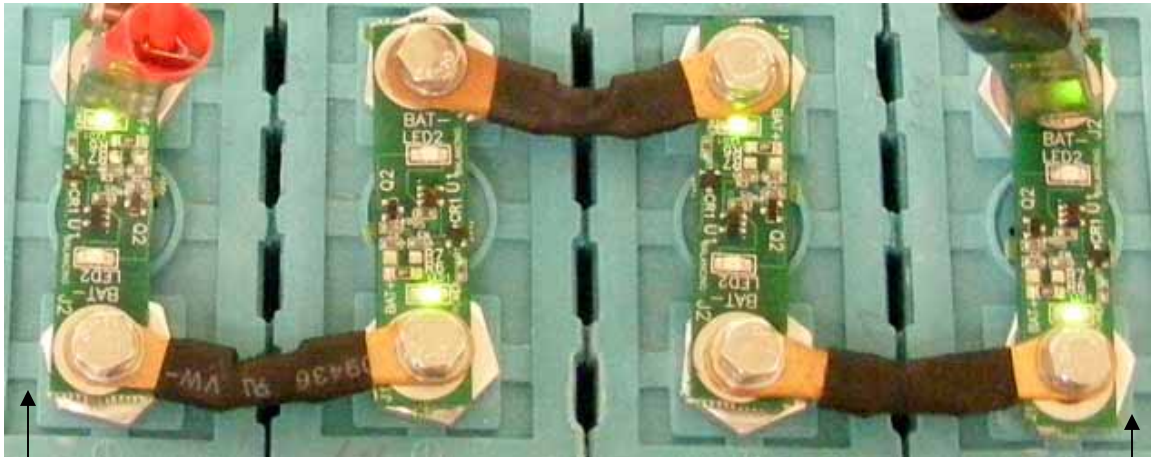
1. Check LED status on balancing board before connect battery to charger. The Ready to charge LED indicator must be below.

Batt1: LED1 = Green, LED2 = "Off"

Batt2: LED1 = Green, LED2 = "Off"

Batt3: LED1 = Green, LED2 = "Off"

Batt4: LED1 = Green, LED2 = "Off"



Batt1

Batt4

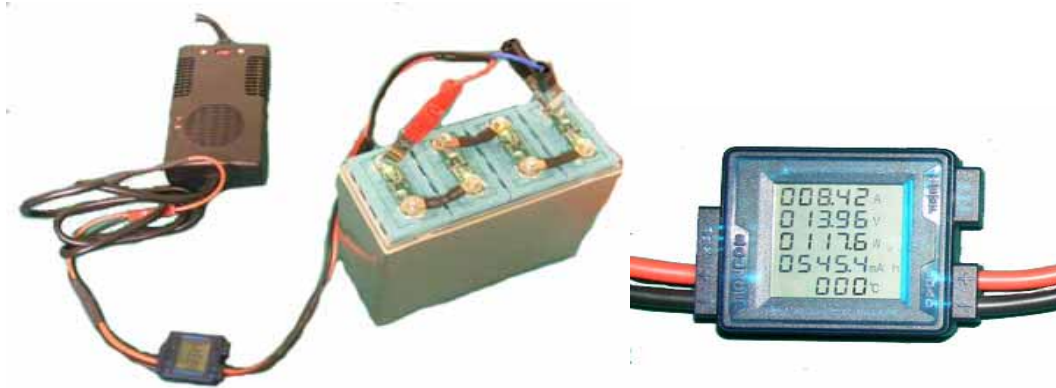
2. You may use Smart Charger (10 A, Watt-Meter Built In, Large Alligator Clip plug) for 12.8V LiFePO4 Battery Pack Worldwide use (Part# CH-LF12810WU) to charge / Monitor watt up parameter



3. Connect 10.0A Smart charger with built in Watt meter to battery. Must follow diagram below. LED will turn red indicate charging (Charger's alligator clips is not necessary to

use). Measure all parameter (Voltage (V) , Current (A), Power (W), Electronic Charge (mAh)) on watt meter except temperature (°C)

Smart Charger --> Source terminal --> Load terminal --> Battery pack

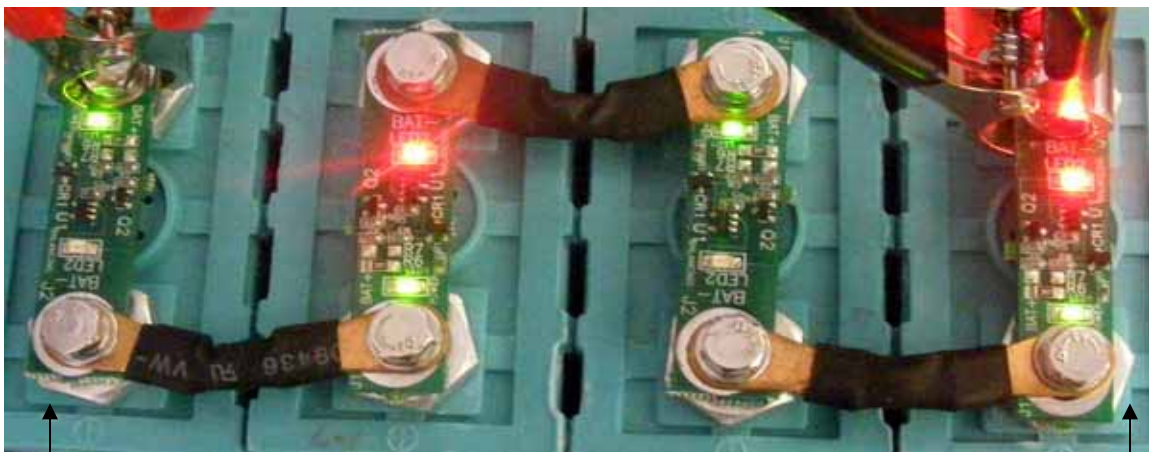


How to connect battery pack to excluded CH-LF12810WU charger. The battery pack is being charged by 8.42A charging current at 13.96V

4. The balancing board performs balancing function for batt 2 & batt 4 once the battery pack is almost fully charge (Battery pack voltage = 14.26V, Charging current = 4.21A).
“The perform balancing function” LED indicator must be below.

Sequence 1 : batt 2 & batt 4 start “perform balancing function”

- Batt1: LED1 = Green, LED2 = “Off”
- Batt2: LED1 = Green, LED2 = “Red”
- Batt3: LED1 = Green, LED2 = “Off”
- Batt4: LED4 = Green, LED2 = “Red”



Batt1

Batt4

The balancing board performs balancing function for batt 2 & batt 4



The balancing board start perform balancing function for batt2 & batt 4 at Battery pack voltage = 14.26V, Charging current = 4.21A

5. The balancing board will perform balancing function for batt1 & batt 3 while batt2 & batt4 is still being performed balancing. (Battery pack voltage = 14.37V, Charging current = 2.84A). “ The perform balancing function” LED indicator must be below.

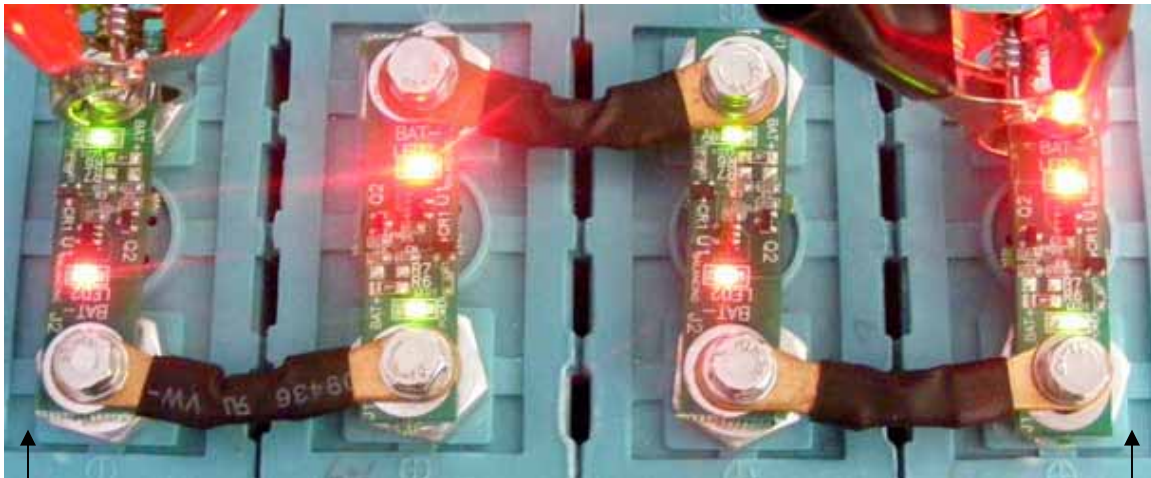
Sequence 2: batt 1 & batt 3 start “perform balancing function” while batt2 & batt4 is still being performed balancing

Batt1: LED1 = Green, LED2 = “Red”

Batt2: LED1 = Green, LED2 = “Red”

Batt3: LED1 = Green, LED2 = “Red”

Batt4: LED4 = Green, LED2 = “Red”



Batt1

Batt4

The balancing board performs balancing function for batt 1 & batt 3 while batt2 / batt4 is still being performed balancing. (ALL LED 2 turn Red)



Batt 1 & Batt 3 start “perform balancing function” while batt2 & batt4 is still being performed balancing at Battery pack voltage = 14.37V, Charging current = 2.84A

Note:

- The sequence of “Perform balancing function LED” may be appeared differently from our testing based on the battery’s condition after being discharged.

6. Charger LED will turn green after the battery is fully charged (Battery pack voltage = 14.55V, Charging current = 0.52A).





Battery pack fully charge voltage = 14.55V, Charging current = 0.52A

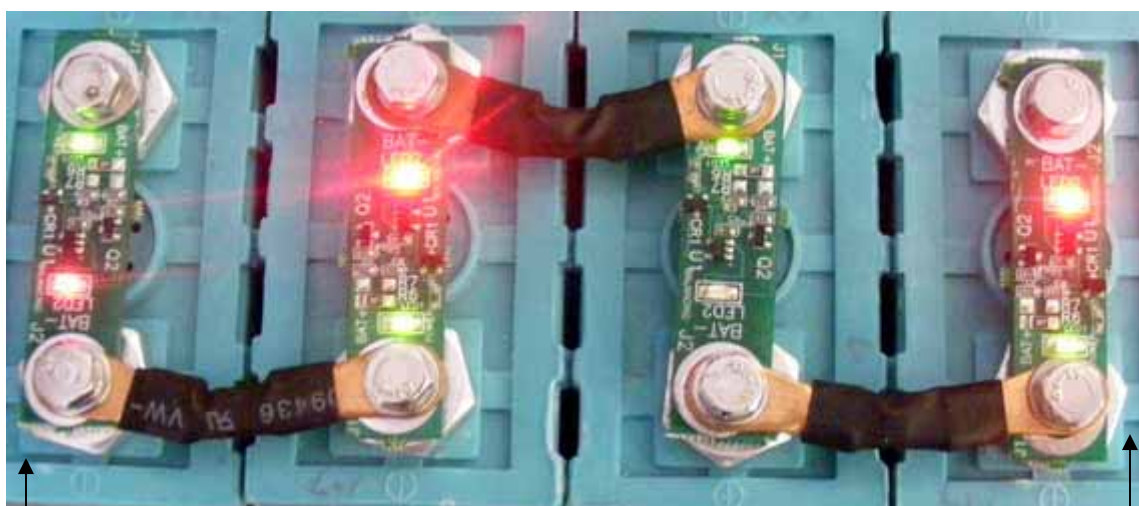
7. Disconnect CH-LF12810WU charger from AC outlet
8. Wait LED 2 from each of battery disappear within 10~30 minutes after fully charged.
“The finish balancing “ LED will be as below.

Note:

- The sequence of “Finish balancing LED” may be disappeared differently from our testing based on how fast each single cell finish balanced.

Sequence 1 : Batt 3 “finish balancing LED”;

- Batt1: LED1 = Green, LED2 = “Red”
- Batt2: LED1 = Green, LED2 = “Red”
- Batt3: LED1 = Green, LED2 = “Off”
- Batt4: LED4 = Green, LED2 = “Red”

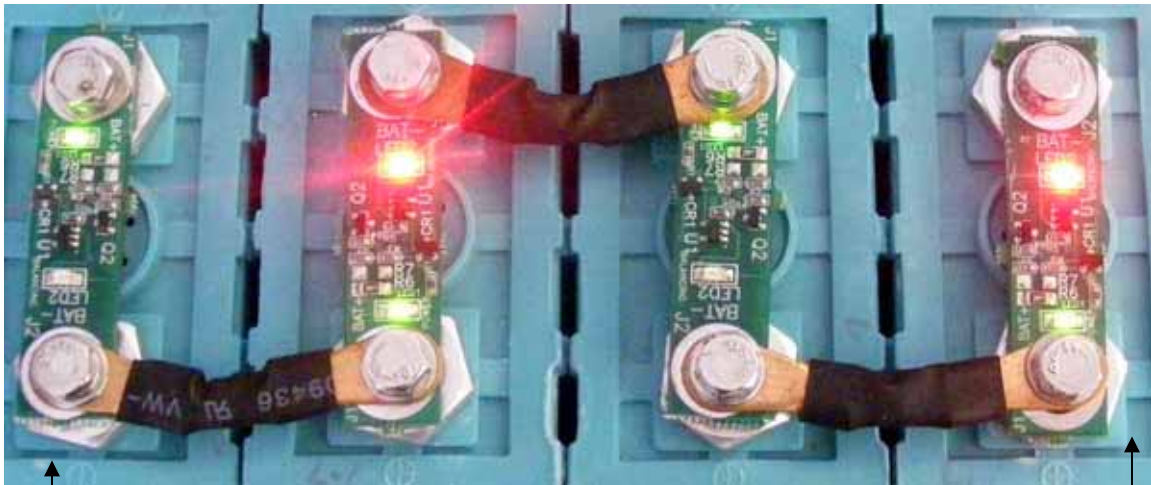


Batt1

Batt4

Sequence 2: Batt 1 “finish balancing LED”;

Batt1: LED1 = Green, LED2 = “Off”
Batt2: LED1 = Green, LED2 = “Red”
Batt3: LED1 = Green, LED2 = “Off”
Batt4: LED4 = Green, LED2 = “Red”

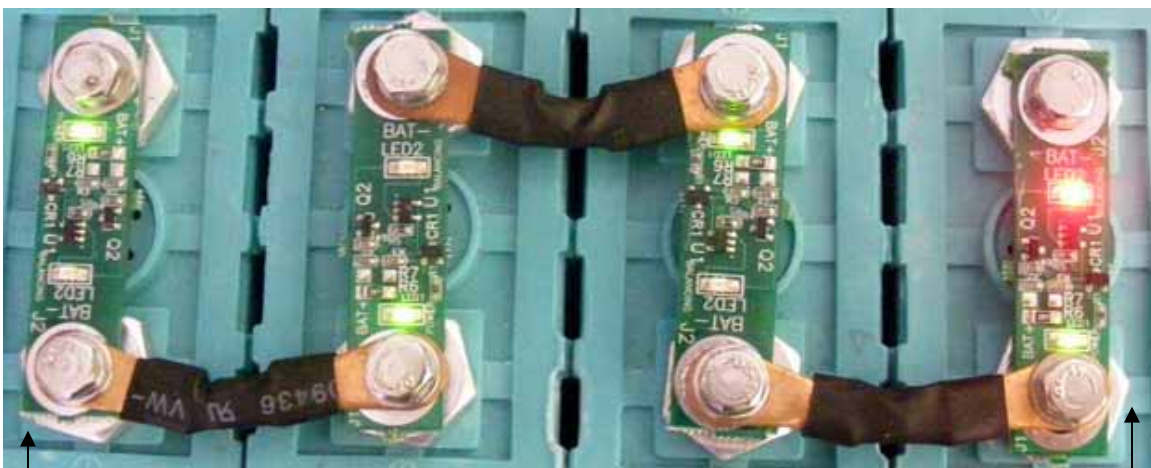


Batt1

Batt4

Sequence 3: Batt 2 “finish balancing LED”;

Batt1: LED1 = Green, LED2 = “Off”
Batt2: LED1 = Green, LED2 = “Off”
Batt3: LED1 = Green, LED2 = “Off”
Batt4: LED4 = Green, LED2 = “Red”



Batt1

Batt4

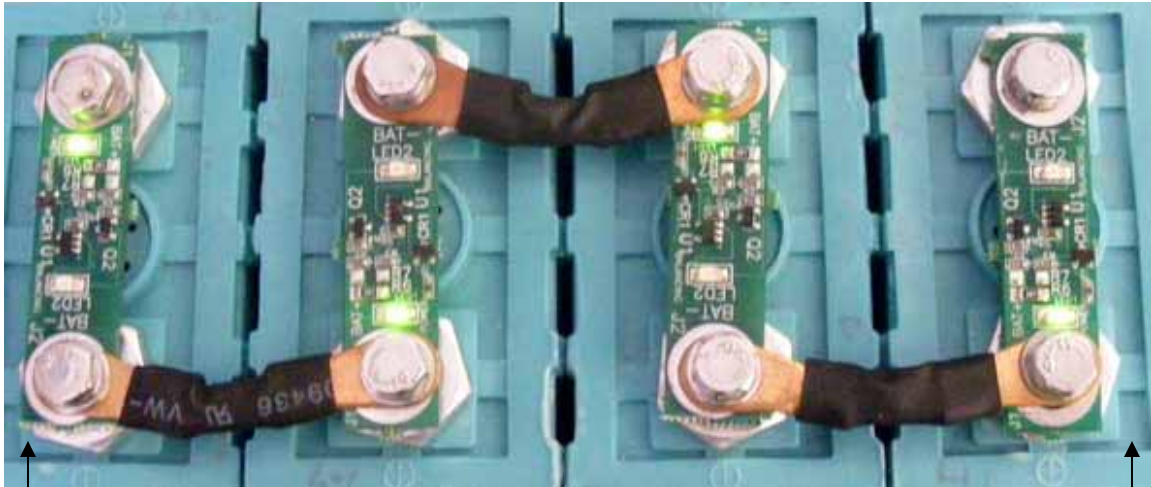
Sequence 4: Batt 4 “finish balancing LED”;

Batt1: LED1 = Green, LED2 = “Off”

Batt2: LED1 = Green, LED2 = “Off”

Batt3: LED1 = Green, LED2 = “Off”

Batt4: LED1 = Green, LED2 = “Off”



Batt1

Batt4

Tip: After all LED2 turn off (Finish balancing process), You may measure battery pack / single fully charged voltage by using excluded multi meter to ensure each single cells have a fully charged equilibrium voltage..



According to our testing, Battery pack fully charge voltage = 13.65V, Batt1 fully charged voltage = 3.41V, Batt2 fully charged voltage = 3.41V, Batt3 fully charged voltage = 3.41V, Batt4 fully charged voltage = 3.42V