The Ever-Evolving Energy Storage

By: Mike Erstad K9BBN

Lead Acid Batteries have been around for 166 years. Invented in 1859, the *charge cycles* are around **200 to 1000 times** before they're useless… The Lithium Iron Phosphate battery was invented at the University of Texas in 1996 with *charge* cycles around **2000 to 6000 times**…. And research continues with newer Sodium-ion batteries…

The battery pictured above was built by the Vilas County Amateur Radio Club at the meeting on Jan. 8th, 2025 It consists of 4 Lithium Iron Phosphate Prismatic cells "LiFePo4" (3.2 vdc each) connected in series to produce a 12-volt battery. On the front is the BMS or Battery Monitor/Management System. This BMS is a *Smart* BMS due to the optional Bluetooth device for connectivity through a phone app. The cells are held together with Polystyrene plastic and

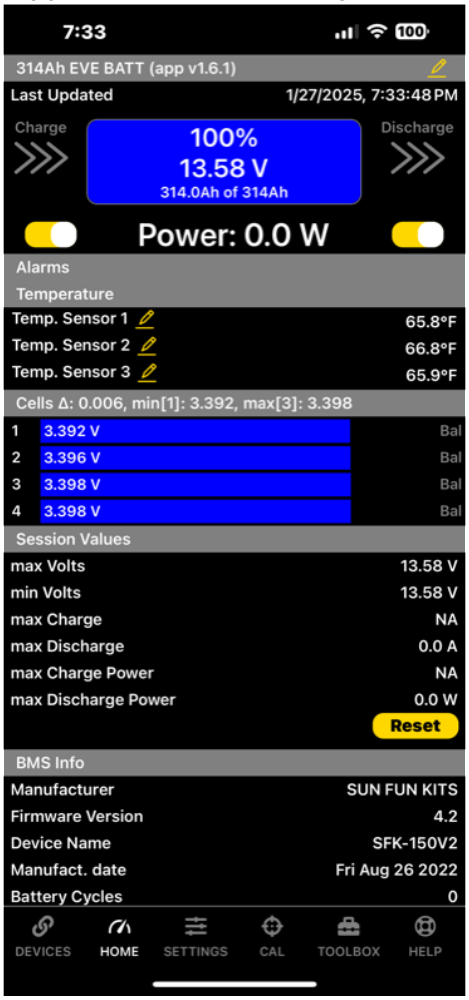
compressed using threaded metal rods (covered in yellow heat shrink). As LiFePo4 cells are charged they expand and contract during discharge. Some say compression will extend the life of the cells, but considering that LiFePo4 cells last so long, by the time you hit that high recharge cycle there will be newer and better cell technology out…

So, what's a BMS for…The definition is below, but simply put it maintains the cell voltages by keeping them top balanced or close the exact same voltage and protects them from over and under charge which would damage the cells.

Definition

Battery management system (BMS) is technology dedicated to the oversight of a battery pack, which is an assembly of battery cells, electrically organized in a row x column matrix configuration to enable delivery of targeted range of voltage and current for a duration of time against expected load scenarios.

The phone app is to monitor battery levels and set parameters.

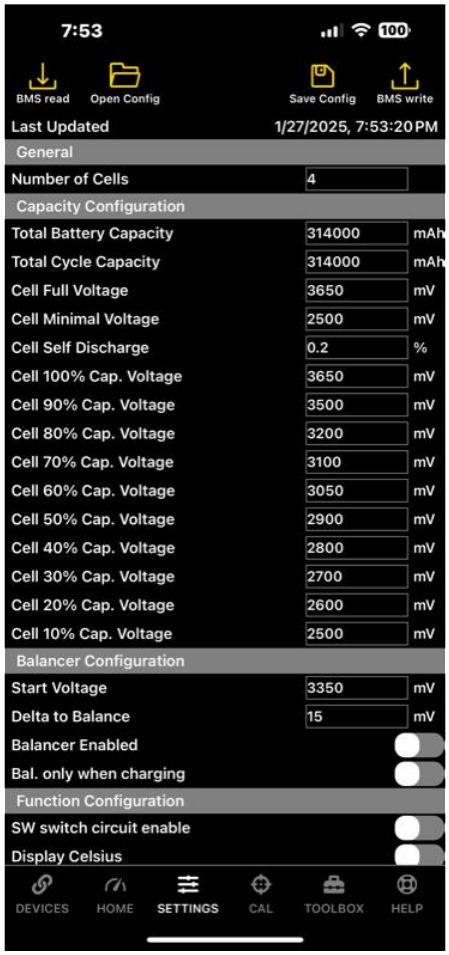


Starting at the top of the image above:

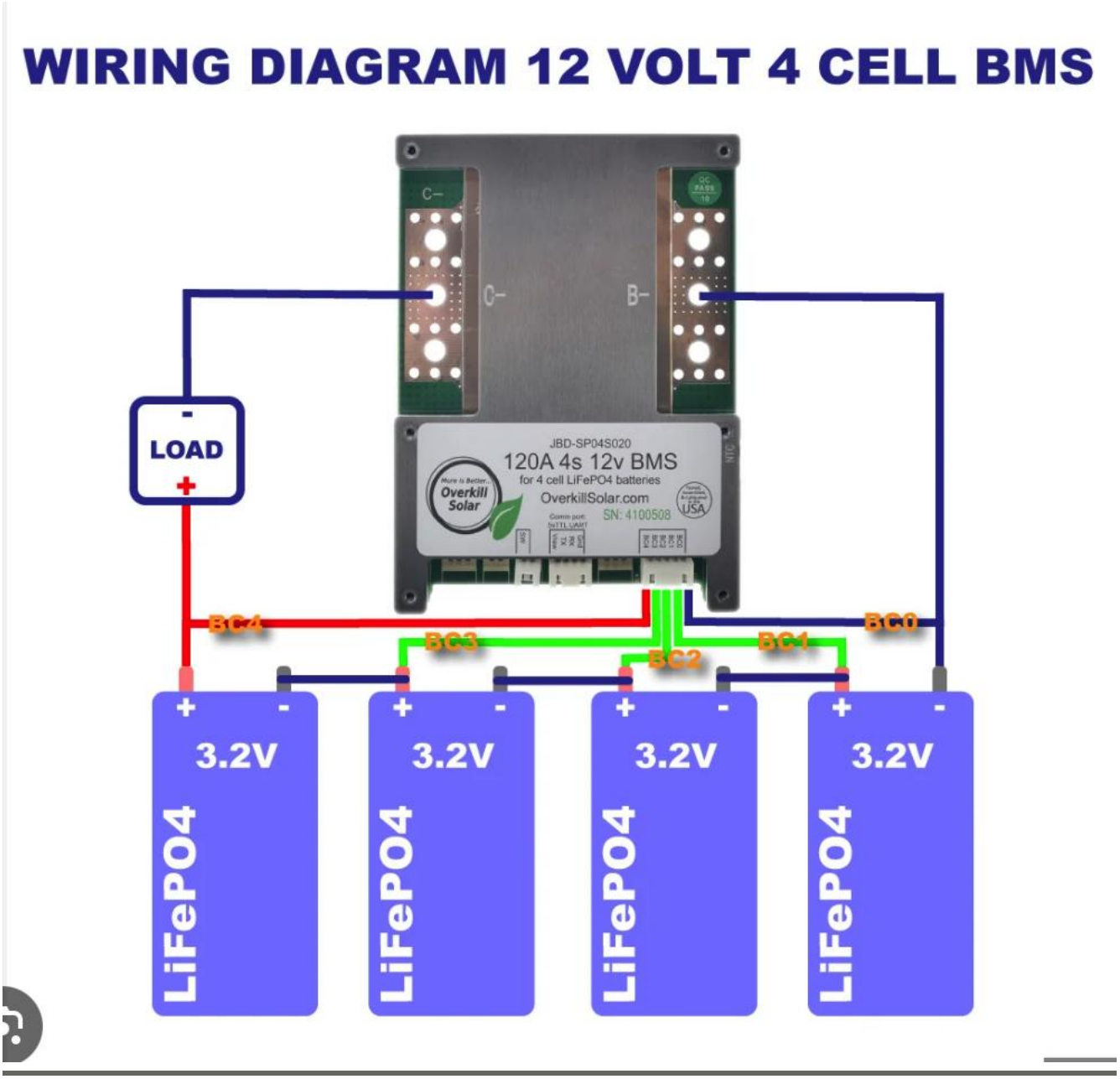
- You can Name the Battery
- Allow it to Charge/Not Charge, Discharge/Not Discharge
- Monitor 3 temperatures, one on the BMS's circuit board and two for monitoring the individual cell high and low temperatures

Page 2 is for Configurating Capacity's….

- Battery Capacity. (314 Amp Hours for these cells)
- Cycle Capacity (314 Amp Hours if you want to fully use the total capacity of your battery (this can be less if you want to extend your battery life)
- Full Cell Voltage… (3.65vdc is the standard for a charge voltage)
- Cell Minium Voltage… (2.50vdc is the standard for a discharge voltage)
- And others…..



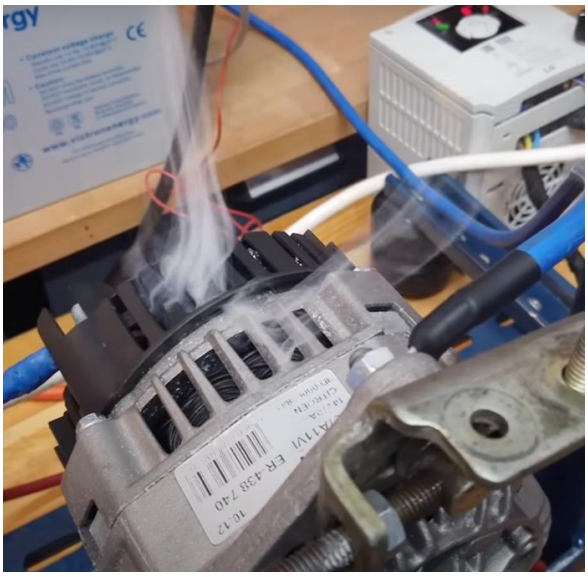
Your basic wiring diagram for 4 Cells and a BMS:



Careful – Car Alternators Charging Lithium Batteries 😳

Due to LiFePO4's lower resistance than a lead acid battery, the LiFePO4 draws high current even at low engine idle speeds and can exceed the maximum rated amperage of the Alternator causing it to overheat.

Also, when a LiFePO4 battery gets fully charged, it turns off and disconnects which can **damage** the Alternators internal circuitry.



If you use a "***regulated***", ***current limiting*** or ***DC to DC converter***, you should have no issues.

(A DC-DC converter in a LiFePO4 battery system functions by taking the raw DC voltage from the battery source (which can fluctuate depending on usage) and converting it to a stable, regulated voltage suitable for powering connected devices)

The company, **Balmar** makes an alternator $$$ that *regulates* the current by using temperature sensors within the housing.

Link/URL to Battery Finder: (daily updated spreadsheet of the current costs, volts, capacity, price and link on Amazon) - - see a "snapshot" and URL below…

LiFePO4 Battery Finder

This site is a work in p
Prices may not includ

Voltage:
- [x] 12 Volts
- [ ] 24 Volts
- [ ] 36 Volts
- [ ] 48 Volts
- [ ] 72 Volts

Capacity:
- [ ] 10-99 Ah
- [x] 100-199 Ah
- [ ] 200-299 Ah
- [ ] 300-399 Ah
- [ ] 400-499 Ah

Brand	Voltage	Capacity	Price	Amazon Link
YoungTree	12.0V	100Ah	$124.99	YoungTree 12V 100AH LiFePO4 Lithium Battery with Low Temperature Protection, Deep Cycle Group 24 LiF
SUDOO	12.0V	100Ah	$125.99	12.8V 100Ah LiFePO4 Battery, 100A BMS Rechargeable Lithium Battery with Up to 4000-15000 Cycles, 1.2
POTEK	12.0V	100Ah	$128.88	POTEK 12V 100Ah Bluetooth LiFePO4 Lithium Battery,Built-in Smart BMS,Deep Cycle Battery Perfect for
Qingzhuan	12.0V	100Ah	$128.86	12V 100Ah Mini LiFePO4 Battery, 1.28kWh Rechargeable Lithium Iron Phosphate Battery for Camping, RV
jsdsolar	12.0V	100Ah	$129.00	jsdsolar Premium 12V 100Ah Lithium LiFePO4 Battery 10-Year Lifespan, 8000-15000 Deep Cycles, Fast Ch
YoungTree	12.0V	100Ah	$129.99	YoungTree 12V 100Ah LiFePO4 Battery, Low Temperature Rechargeable Deep Cycle Lithium Battery with 10
JITA	12.0V	100Ah	$129.99	JITA 12V 100Ah Lithium Battery,20000 Deep Cycle Battery,12.8V 100Ah lifepo4 battery 1280Wh Energy Bu

https://batteryfinder.net/index.php?12v=1&ah1=1

Link/URL to Battery's and Accessories:

https://jag35.com

https://www.18650batterystore.com (best pricing)

https://www.sunfunkits.com

https://www.siekonenergy.com

If you have any questions, feel free to contact me and I'll see if I can find the answers…

Mike/K9BBN