Specification of

CMB for 12.8V LiFePO4 Battery Pack (10A limited) with DC charging, Fuel Gauge and full protection

AA Portable Power Corp

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1. Purpose

1.1. The purpose of this specification is to establish the working parameters needed to design a battery pack that is capable of supplying 12.8V nominal voltage up to a max continuous operating current of 10A. The unit is capable of being discharged while under charging. If the load exceeds the charger current while charging, the battery will continue to discharge.

2. Definitions and Abbreviations

2.1. **Cell:** A single cylindrical wound LFP battery

2.2. **Battery:** A battery pack made with multiple cells in various serial and parallel configurations to obtain the required voltage and capacity. For instance, single LFP26650E cells configured in an 4S, 4P configuration yield a battery with 12.8V and 12.0Ah (3.2V * 4cells = 12.8V; 3.0Ah * 4cells = 12.0Ah)

2.3. **CC:** Constant Current

2.4. **CV:** Constant Voltage

3. Description

3.1. The electrical design for the battery pack will include a fuel gauge, protection circuit, on-board charge controller, and an off board power supply. The fuel gauge will be of type voltage-based (or equivalent) design that controls the LED state of charge indicator. The on-board charger will implement the constant current (CC) / constant voltage (CV) algorithms. In addition a solar charger with 15.2V, 450mA shall be able to charge the battery pack based on charging parameters in Section 3. The protection circuitry will monitor the battery pack for over-voltage, under-voltage, over-current, and short circuit conditions.

4. Electrical Specifications

1. Battery Pack Configuration:
    - 4S, 4P LFP26650E, Lithium Iron Phosphate (LFP)
    - Maximum Charge Voltage: 16.4V
    - Charge cut-off voltage: 14.6
    - Average Operating Voltage: 12.8V
    - Minimum Discharge Voltage: 8.0V
    - Discharge Cut-Off Voltage: 9.6V
    - Nominal Capacity: 12.0Ah
2. Fuel Gauge Parameters:
    - Voltage-based or equivalent
    - State of Charge: Push button activation
    - LED Status Indication: 30%, 60%, 100% (Three Green LED's)

- LEDs remain off except when activated by push button with auto 2 second timeout during discharge to save the battery's power.

3. Charger Controller Parameters:
    - Battery Charge Algorithm: CC/CV, CC=3A, $CV_{per\ cell}$= 3.65V, MAX
    - Input Voltage: 16-18 Volts, DC
    - Maximum Input Current, 3.5A.
    - Peak Input current, 5A.
    - Battery Charging Voltage: 16-18 Volts
    - Battery Charging Time: 4 hrs
    - Battery Charge Termination Voltage: 14.6V
    - Battery Charge Termination Current: 80 mA
    - Recommended Charging Temperature Range: 15°C to 35°C
    - Press Fuel Gauge button to check the state of charge.
    - Battery pack is capable of discharge load while being charged. Load must be less than 3.5A otherwise battery pack will continue to discharge.
    - After connecting the DC input, charging will start; the Red Charge LED will turn on. When charging is complete, the Red LED will turn to Green and remain on until unplugged from power supply..
    - Press Fuel Gauge button to check the state of charge during charging mode.

4. Protection Parameters:
    - Over Charge Voltage: 3.90V (per cell)
    - Reset Voltage: 3.80V(per cell)
    - Over Discharge Voltage: 2.3V (per cell)
    - Reset Voltage: 2.70V(per cell)
    - Over Discharge Current: 10.0A
    - A Short Circuit condition is protected by the over discharge current controlle
    - The battery output will be 0V if any fault condition occurs.
    - All faults are reset with charger input.
5. Output Parameters
    - Output Voltage: 9V to 14V
    - Output Current: 10.0A Max.
    - Discharge temperature under 35°C
    - Press Fuel Gauge button to check the state of discharge during discharging mode.
6. Incoming Power Supply (60W) Energy Supplied Power Supply:
    - Input Voltage: 90VAC to 250VAC
    - Output Voltage: 16VDC – 18VDC
    - Supply Current: 3A
    - Most Solar Chargers with similar outputs.
7. PCBoard Configuration and LEDs Description:

- A diode is installed to protect battery's unnecessary discharge through charger circuitry.
- When Charge LED is Red, charging is in progress
- When Charge LED is Green, battery pack is fully charged. Green LED to remain on while power supply is plugged in.

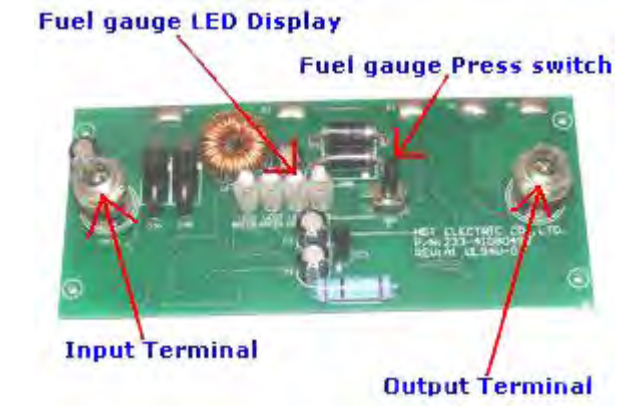
8. Board Dimensions:
    - (LxWxH): 108mm(4.3") x 49mm(1.9") x 20mm (0.8")

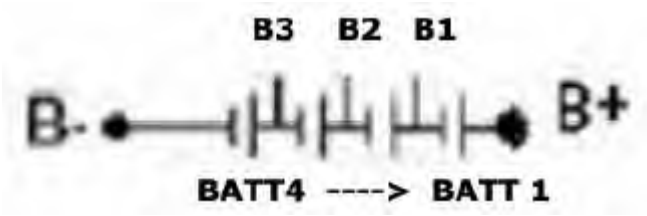
9. Connectors
    - Input Connector: Ø5.5mm O.D./ Ø2.5mm I.D. Barrel Jack (Minimum Rating at 3A, 16 - 18V)
    - Output Connector: Ø5.5mm O.D./ Ø2.5mm I.D. Barrel Jack (Minimum Rating at 10A, 16V)

5. Common Abbreviations

A	Amp(s) or Amperes
°C	Degrees Celcius
CC	Constant Current
CV	Constant Voltage
DC	Direct Current
hrs	hours
I.D.	Inside Diameter
LED	Light Emitting Diode
LFP	Lithium Iron Phosphate
mA	Milliampere
Max	Maximum
Min	Minimum
Mm	millimeters
O.D.	Outside Diameter
PC	Printed Circuit
Rev	Revision
V	Volt(s)
VAC	Voltage Alternating Current
VDC	Voltage Direct Current
W	Watts, or Wattage

Port Explanation





Note:

- **Please check polarity before use !!!**
- **B- connect to “Battery 4 Negative”**
- **B+ connect to “Battery 1 Positive”**
- **Sense wire B1 / B2 / B3 must be connected between “positive” and “negative” of each cell**
- **BatterySpace is not responsible for any damage caused by misunderstanding and misuse !**