Operation Manual of
BMS for Any Type of Li-Ion Battery Pack 1-20 Cells in Series with
LCD Screen & Software

Part# BMS-20S

AA Portable Power Corp (http://www.batteryspace.com)
Address: 860 S, 19th St, Unit A, Richmond, CA, 94804
Tel: 510-525-2328
Fax: 510-439-2808
Email: Sales@batteryspace.com
Prepared & Approved by Louis (01/05/09)
A. System brief

BMS-20S battery management is made up of a management host with two voltage/current/temperature module (VCT Module), can measuring all voltage of single batteries, total current of pile, environment temperature. Detailed performance as follows:

1. Management host consists of black and white LCD and management calculator, first page displays of battery group total voltage and total current, max voltage and battery number, min voltage and battery number; second page displays capacity (adds while is charging, subtract while is discharging, save while power cut, clear), consume Wall-hour, max temperature of all measuring points and min temperature; press key display every battery voltage;

2. Sampling module adopts master-slave mode. Master sampling module manages ten batteries, one current and one temperature, slave sampling module manages ten batteries and one temperature.

3. Master sampling module provides one sampling current, current sensor is current hall sensor.

4. The number of batteries that is managed by sampling module can be set from 1~N (N<<10) through management host, connection mode adopts N+1.

5. Management host has two alarm interfaces, switch of voltage upper limit, aural and visual alarm, high temperature switch, aural and visual alarm, switch of high temperature, aural and visual alarm, switch of over current, aural and visual alarm. Max voltage alarm and high temperature alarm share the same group interface, voltage lower limit alarm and over current alarm share the same group interface.

6. Host has two keys: “first” and “set”. Select “first”, screen displays first page information, press “set” key you can search all information except that of the first page; under the first page state, keep pressing “first” key for five seconds to get into parameter set menu; under the first page state, keep pressing “set” key for five seconds to get into running parameter set menu. Get into the second page, keep pressing “first” key for five seconds to clear capacity value, keep pressing “set” key for five seconds to clear watt value; When the system gets into alarm state, it will provide flashing light, buzzer and a group of relay contacts to alarm. System running parameters include: the number of batteries that each sampling module manages, voltage upper/lower limit, voltage cut lower limit, temperature cut upper limit, etc.

Main technique parameter:
- Voltage measuring range .................. 0~+5V
- Voltage measuring accuracy .............. \( \pm (0.3\% \text{RD}+0.2\% \text{FS}) \)
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage display accuracy</td>
<td>1mV</td>
</tr>
<tr>
<td>Temperature measuring range</td>
<td>-10°C ~ +85°C</td>
</tr>
<tr>
<td>Temperature measuring accuracy</td>
<td>±1°C</td>
</tr>
<tr>
<td>Minimum sample cycle (voltage)</td>
<td>0.5s</td>
</tr>
<tr>
<td>Minimum accumulated capacity cycle</td>
<td>0.5 s</td>
</tr>
<tr>
<td>Capacity display accuracy</td>
<td>1Ah</td>
</tr>
<tr>
<td>Capacity measuring upper limit</td>
<td>≤999Ah</td>
</tr>
</tbody>
</table>

**Alarm contacts index**

- Maximum switch voltage: 30Vdc
- Maximum switch current: 1A

**LCD**

- Black and white screen, white backlighting
- Display region: 47mm x 26mm
**B、System connection**
1. The system connection is on the attached.
2. **Main control board connection**
   See attached page.
3. **VCT sampling module set**
   · Address set

   When the battery number is no more than ten, only one VCT module is enough, and this module is master module, master module can manage less than ten batteries, and provide a loop of temperature and current.

   When the number of batteries is more than ten, the system will need two VCT modules, one is master module (not need to be set) and another is set as slave module. Master module can manage less than ten batteries, and provide a loop of temperature and current. Slave module can manage no more than ten batteries, and provide a loop of temperature.

   There cannot be two slave sampling modules in the system at the same time.

   Master module is connected from high position of battery group, detailed connection method and slave set method see attach page.

**Temperature sensor connection**
See attach page.

**Adjust voltage accuracy of battery and adjust current accuracy of battery**
Adjust rheostat W1 of V-T sampling board to calibrate the voltage true value according with the sampling value. (static state)

**Current sensor connection**
See attach page.
C. System operation

Main controller has two press keys, FIRST key and SET key; a ALARM indicator light.

Man controller orthoptic diagram as follows:

1. Display region
2. First page key
3. Function key
4. Alarm light

**First page key**: display first page information, includes: total voltage、total current、single battery max voltage and its number、single battery min voltage and its number.

**Set key**: display all information except first page information, includes capacity, consumed watt-hour, max temperature and its number, min temperature and its number, voltage of each battery.

**Alarm light**: flashes while alarms.

You must setup system running parameter once before using. System will memory it automatically, without the need of set when you use it next time. But if you change the main controller, you need to set the parameter again.

System will display first page information after being switched with the power, press “set” key get into the next page, the information includes capacity, consumed watt-hour, max temperature and its number, min temperature and its number, voltage of each battery, press “FIRST” key back to first page.

1. **system running parameter set**
Under the first page state, keep pressing “SET” key for five seconds to get into system running parameter set menu. Enter the password before getting into this menu, customer's password is marked at the main controller back. System parameter include: the number of batteries that each sampling module manages, voltage upper limit, voltage lower limit, voltage cut lower limit, temperature cut upper limit, current cut upper, etc.

System parameter should be set once after being installed and will save parameter automatically, and will monitor and alarm according to parameter that is set.

System running parameters diagram as follows:

```
SYSTEM SET
MODULE  BATTERY
# 1      0
# 2      0
```

**MODULE**: VCT Module sampling module address; #1 master module, #2 is slave module.

**BATTERY**: the number of battery. If the number of batteries is less than ten, #2 must set as “0”.

Black frame is current editing content, “SET” key add 1, “FIRST” key is “ok”; Press “FIRST” key, black frame will automatically move below. After setting #2 value, press “FIRST” key to confirm. Press “FIRST” key and “SET” key simultaneity to get into next menu. Diagram as follows:

```
VOLTAGE
upper V alarm
4.20V
```

**upper V alarm**: When any battery voltage is larger than the value, system lightens the LCD and provides a group of relay contacts to alarm. Normally, relay common contracts are
switched on with N.C. contacts and cut off with N.O. contacts. When it’s alarming, common contacts are switched on with N.O. contacts and cut off with N.C. contacts. If the largest cell voltage drop and is 15mv lower than the value, the alarm will stop.

Press “SET” to add 1, press “FIRST” to subtract 1; if press “FIRST” and “SET” key at the same time to get into the next menu. Diagram as follows:

```
  lower V warn
    3.20V
```

**lower V warn** : If any cell voltage is lower than the value, system will lighten the LCD and buzzer to alarm. If the largest cell voltage drops and is 15mv lower than the value, the alarm will stop.

**lower V alarm** : If any cell voltage is lower than the value, system will lighten the LCD, buzzer and provide a group of relay contacts to alarm. Normally, relay common contacts are switched on with N.C. contacts and cut off with N.O. contacts. When it’s alarming, common contacts are switched on with N.O. contacts and cut off with N.C. contacts. The alarm won’t stop unless shut off the power.

Press “SET” key to 1, press “FIRST” key to subtract 1; Simultaneity press “FIRST” key and “SET” key get into next menu. Diagram as follows:

```
  upper I alarm
    200A
```

**upper I alarm** : When total current is larger than the value, system will lighten the
LCD, buzzer and provide a group of contacts to alarm. The alarm and “lower V alarm” share with the same group of relay contacts.

**upper T alarm**: When the nods temperature is higher than the value, system will lighten the LCD, buzzer and provide a group of contacts to alarm. When the highest temperature drops and is 5°C lower than the value, the alarm will stop. The alarm and “lower V alarm” share with the same group of relay contacts.

Press “SET” key to add 1, press “FIRST” key to subtract 1; simultaneity press “FIRST” key and “SET” key back to home page.
D. Define

\[
\begin{align*}
V_{\text{total}} & \quad \text{Voltage total} \\
I_{\text{total}} & \quad \text{Current total} \\
E_{\text{remain}} & \quad \text{Electricity remain} \\
V_{\text{max}} & \quad \text{Voltage maximum} \\
V_{\text{min}} & \quad \text{Voltage minimum} \\
W_{\text{out}} & \quad \text{Watt out} \\
T_{\text{max}} & \quad \text{Temperature maximum} \\
T_{\text{min}} & \quad \text{Temperature minimum}
\end{align*}
\]
Text:

current sensor particular type is in contract explain (VCT Module = Voltage / Current / Temperature Module)
P2: 6P EL linker
P4: 4P EL linker
P5: 2P EL linker
P6, P7:10P linker(5557-10Y)
P8, P9:14P linker(5557-14Y)
T SENSOR: temperature sensor DS18B20.