

## APHEV-BMS-01-16-01

### 1 Introduction

The BMS module of 16 series adopts high precision analog front-end chip and high performance 32 bits MCU, superior performance to extend battery life, and ensure the batteries for safety.

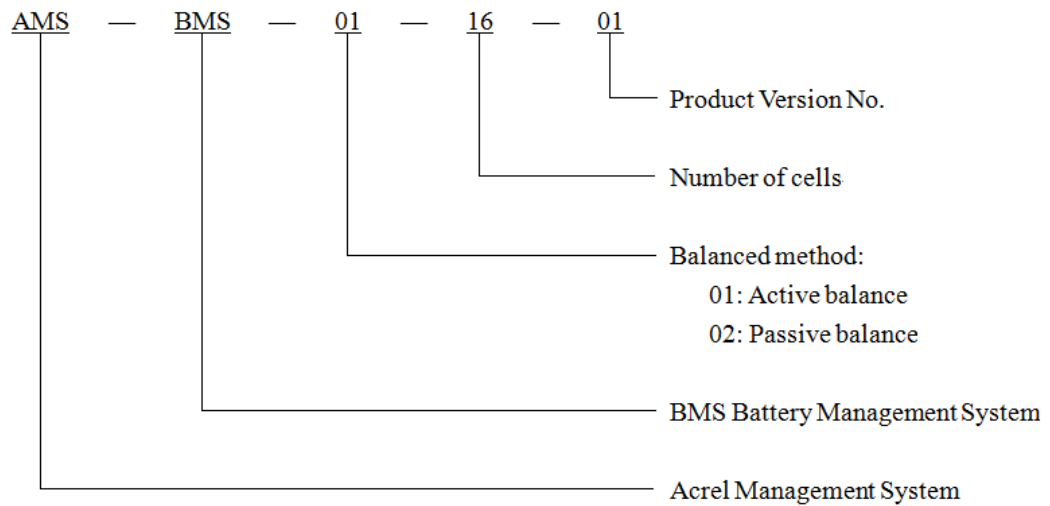


### 2 Composition of System

Main features: high precision signal acquisition module, high precision SOC estimation module, active energy transfer balance mode, the cell information storage module, the cell protection module (overcharge protection, over discharge protection, high and low temperature of cell protection), optional LCD display module.

### 3 Package Information

The package is labeled with five descriptors



### 4 Features

- 4.1 Active balancing energy transfer type, high current is 1.5 A.
- 4.2 Optional battery balance modes: Automatic balance or Force balance.
- 4.3 Module reserved RS485 bus interface can be scaled to 32 cell, 48 cell and more than thousands of cells.
- 4.4 Include a 4G SD card, can store 10 years for battery information.

## 5 Electrical Parameters

Item	Parameter
Size	210*120*37.5mm
Application	16 cells LiFePO <sub>4</sub> batteries or 16 cells Lithium polymer batteries
Working Range	36 – 60V
Sleep mode power current	< 3mA
Normal Operating current	< 20mA
Monomer battery voltage measurement error	< 0.002 V
Monomer battery balanced current(Active balancing energy transfer mode)	≥1.2A Nominal 1.5 A
Temperature measurement error	±2°C
Monomer battery over voltage protection	3.55V
Monomer battery low voltage protection	2.75V
Batteries over temperature protection	65°C±2°C
Batteries low temperature protection	≤3°C
Batteries low-voltage protection	36±2 V
Low voltage protection after the recovery voltage	42±2V
SOC measurement error	≤5%
Battery information storage	> 10years

Monitoring	3.2 inch touch screen LCD
Communication	CAN 2.0
Extension	RS485 extension other modules
Force Balance Mode  Balancing switch to position “1”.	Balance when High - Low difference is above 10mV. Stop balancing when the delta is 10mV
Automatic Balance Mode  (Default) switch position “0”	<p>(i) Balancing is always on: Monomer battery differences over 60 mV starts automatic balancing to 60mV.</p> <p>(ii) Balance every 15 days, Balance when High - Low difference over 60mV. Stop balancing when the delta is 10mV or Day 15+1</p>
BMS Module circuit protection	<p>Balancing modes will be turned off when the module temperature reaches 65°C,</p> <p>Balancing will restart when the temperature is below 45°C</p>

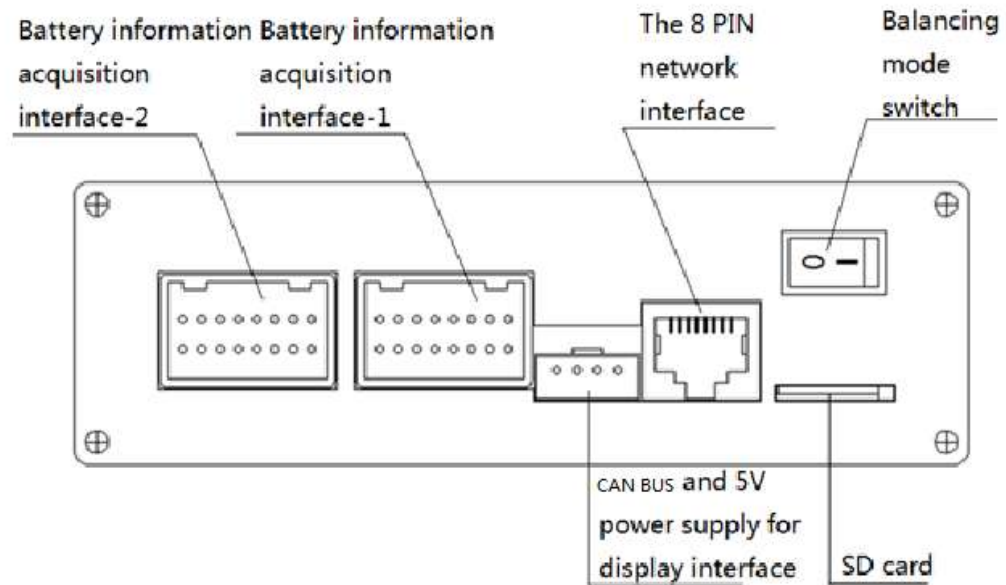
#### LED Indicators

Single cell drops below 2.75V	Red LED flashes and suspends discharging
Single cell exceeds 3.55V	Red LED flashes and suspends charging
Battery Temperature > 70°C	Red LED flashes and suspends discharging and charging

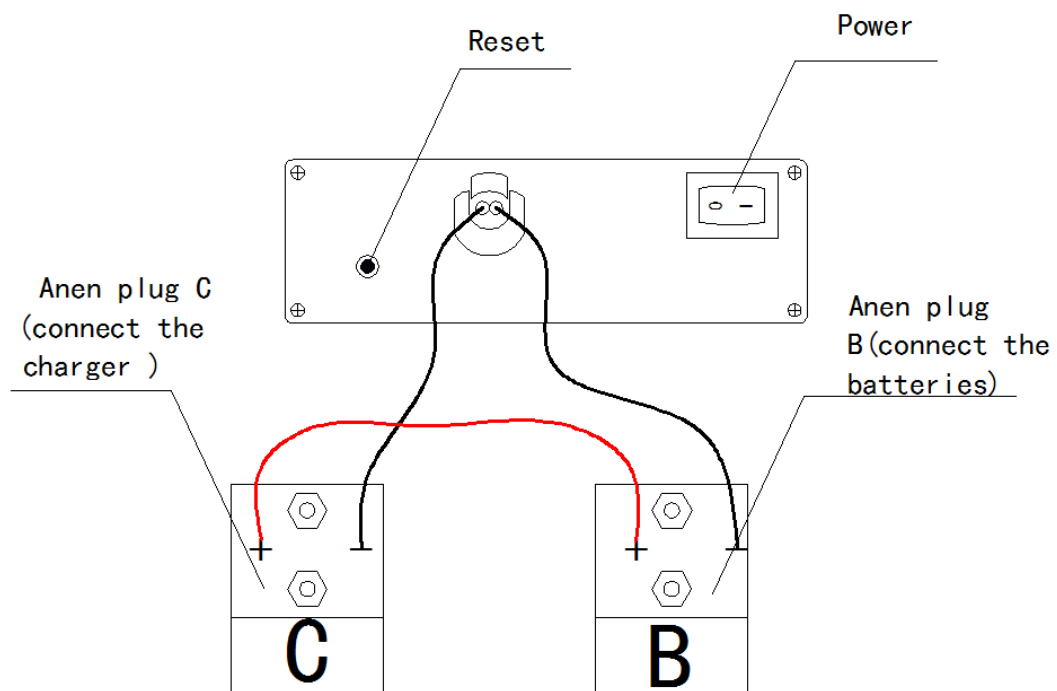
## 6 Schematic Diagram and Definition of BMS Module Interface

### Interface

#### 6.1 Front panel interface

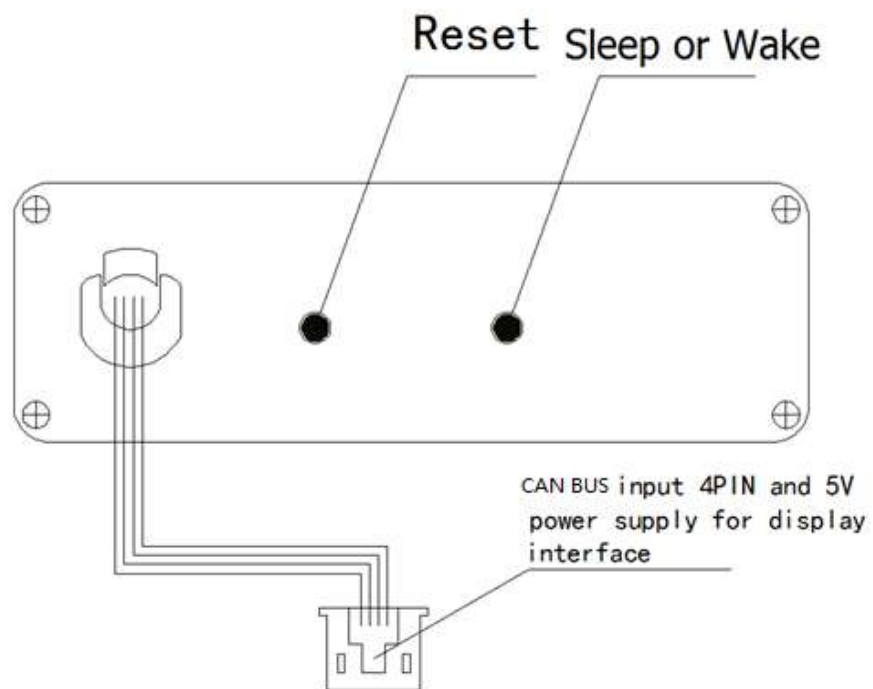


#### 6.2 Anderson connection Interface.



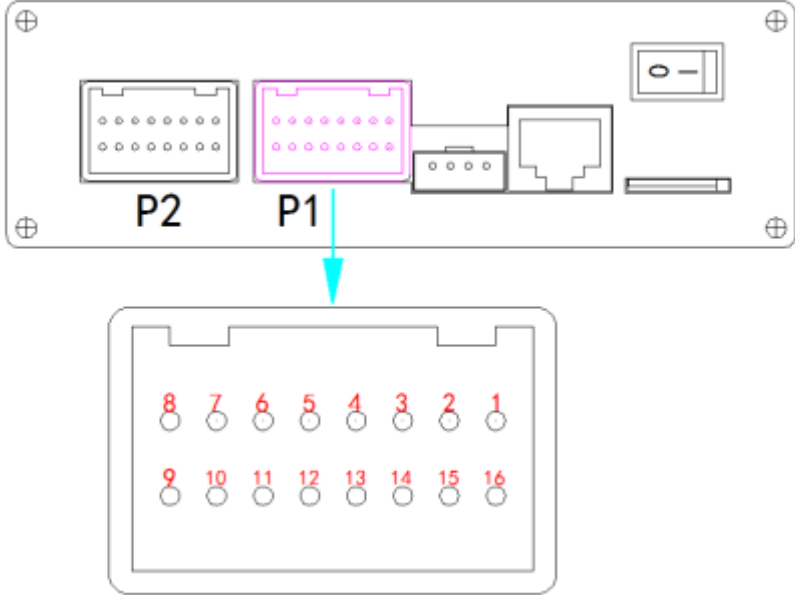
Reset	Restart measuring functions
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### 3.2 inch LCD display module key

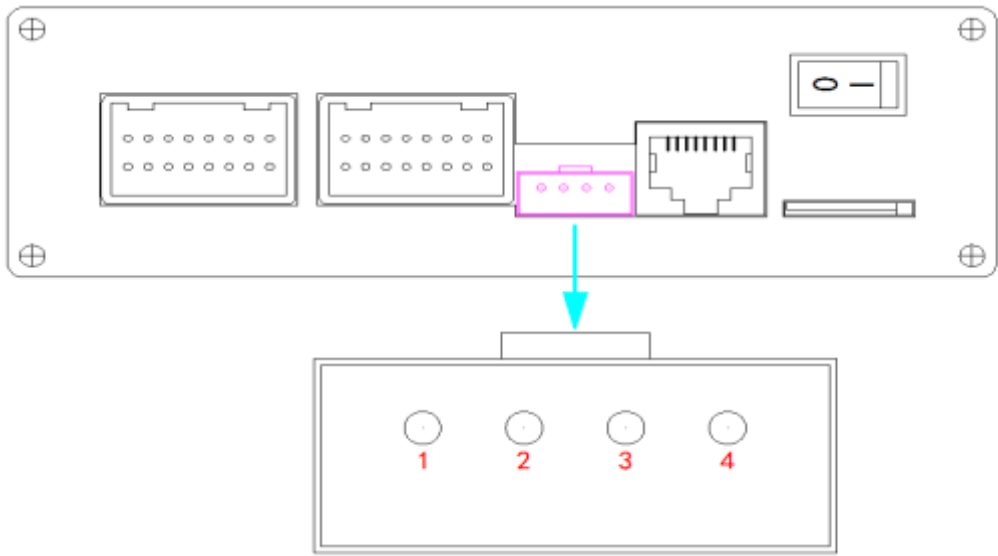


Reset	Re-start the display, re-calibrate touch screen
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6.3 Interface Socket Definitions

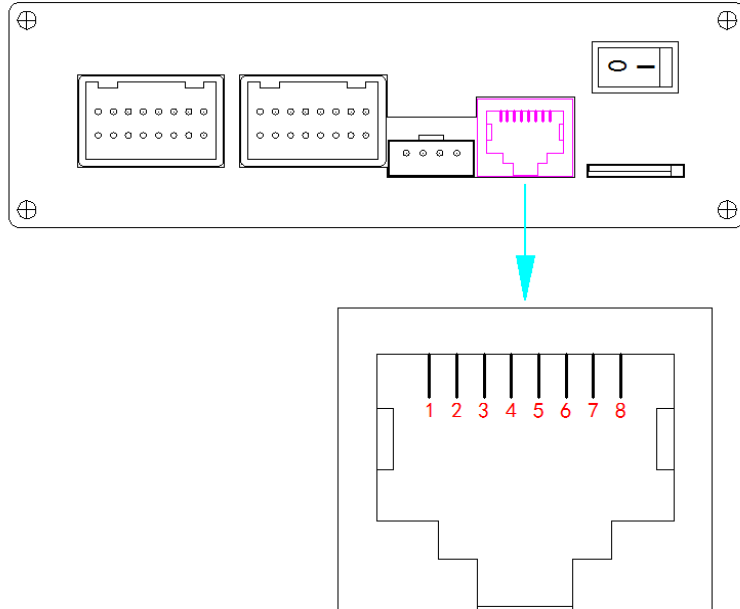
Interface diagram			
<div></div>			
BMS16 front panel (look from the outlet end)			
Note : P1 and P2 are configured as described in the table below			
Pin Number	Function	Pin Number	Function
1	BAT-1—	11	18B20 1VDD
2	BAT-2—	12	DQ
3	BAT-3—	13	GND
4	BAT-4—	14	18B20 2VDD
5	BAT-5—	15	DQ
6	BAT-6—	15	DQ
7	BAT-7—	16	GND
8	BAT-8—		—: Cell negative pole

<b>9</b>	BAT-8+	NOTE	+: Cell positive pole
<b>10</b>	NONE		

BMS Display Monitor - The definition of CAN BUS and 5V power supply	
	
Pin Number	Function
<b>1</b>	5V
<b>2</b>	CANH
<b>3</b>	CANL
<b>4</b>	GND



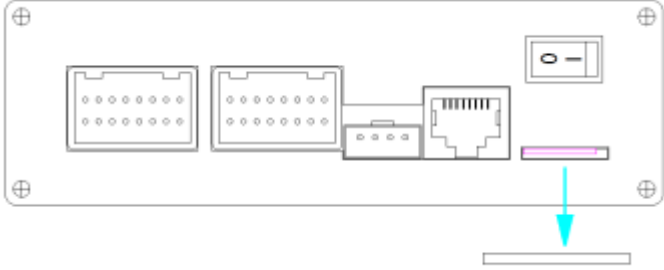
## BMS Control Interface



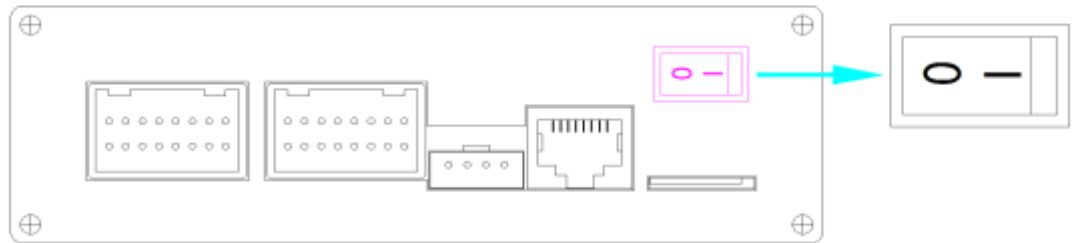
BMS16 front panel (view from the outlet)

Pin Number	Function
1	Over discharge protection(relay disconnected normally, contact closure condition: 0.5A/24V)
2	Detect input current (input: 0-5V, range: 0-150A)
3	Over discharge protection (relay disconnected normally, contact closure condition: 0.5A/24V)
4	GND
5	GND
6	GND
7	Detect output current (input: 0-5V, range: 0-30A)

8	Detect input voltage (input: 0-5V, range: 0-400V)
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SD Card Data recording	
	
Type	Capacity
Micro SD	SDC4/4G

**Balancing mode switch diagram**



Type	Function
Balancing mode switch.  Default, factory setting “0”	Automatic balancing mode features:  (i) Balancing is always on: If the monomer battery difference is over 60 mV automatic balancing begins. Balancing stops when the Monomer battery difference is 60 mV  (ii) A balancing function is run every 15 days using the BMS internal clock. The balancing target is a Monomer battery differences of 10mV.
Balancing switch to position “1”.	Force balance mode features:  If the monomer battery difference is over 60 mV balancing begins. The balancing target is a Monomer battery difference of 10mV.

## 7 Module Wiring Instruction

### 7.1 Voltage detection wire harness connection

Please insert battery information acquisition wiring harness L, R into BMS information acquisition interface 1(L), 2(R).



### 7.2 8PIN network wiring and display connection

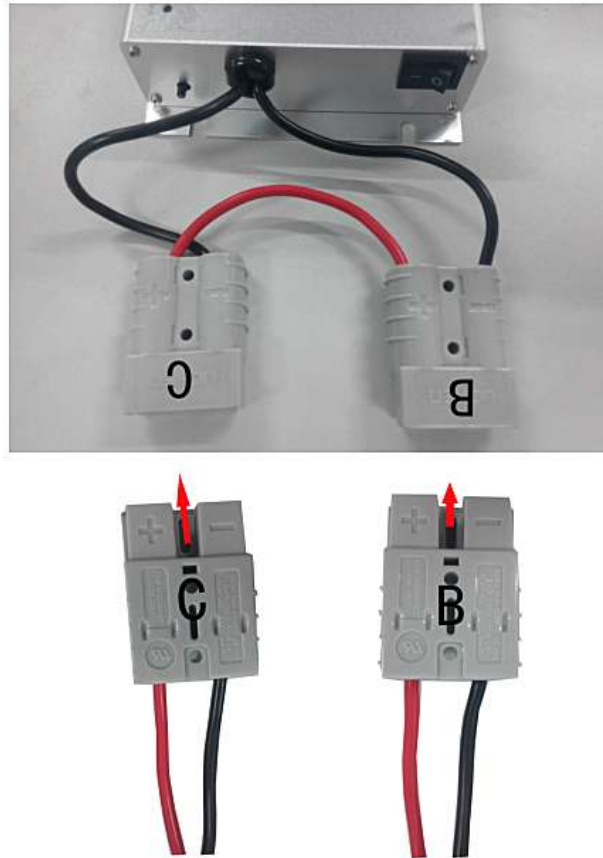
Please insert the converter 8PIN RJ45 connector into the BMS 8PIN network interface;  
insert the display 4PIN connector into BMS 485AB and 5V power supply for display interface.



### 7.3 Battery pack and charger wiring harness connection

Connect the Anderson plug with label C of the BMS to the Charger with the matching C label

Connect the Anderson plug with label B of the BMS to the Battery pack with the matching B label



## 8 SD card data storage

### 8.1 Stored data sample:

N	SOC	Vo	Ic	Io	Ii	C1	C2	C3	C4	C5
0h1m0s	88	242 726	15250	18377	78245	3357	3361	3361	3373	3369
0h1m30s	88	241 758	14825	18635	78893	3375	3378	3378	3390	3385

C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
3364	3363	3373	3366	3361	3361	3364	3364	3361	3381	3367
3379	3378	3391	3382	3376	3378	3381	3379	3376	3400	3385

Max	Min	Ave	TM1	TM2	TM3	TM4	B1	B2	B3	B4
3381	3357	3365	18	18	18	18	1			
3400	3375	3381	18	18	18	18	1	14	10	11

## 8.2 Annotation

SOC: State of Charge.

Vo: Voltage of the Converter output

Ic: Charging current.

Io: Current output of the Converter

Ii: Discharging current.

C1,C2,C3,C4,C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15,C16: 1-16 cell voltage

Max: Maximum cell voltage of the 16 cells.

Min: Minimum cell voltage of the 16 cells.

Ave: Average voltage of the 16 cells.

TM1, TM2, TM3, TM4: Internal temperature of the battery.

B1, B2, B3, B4: Request to balance these cell numbers of the battery.