Monitoring 12 single battery or battery group's voltage,current,temperature, etc.

BMS 100
Battery Management System

KING PIGEON

BMS100
User Manual

Ver 1.1

Date Issued: 2020-07-06

King Pigeon Hi-Tech. Co., Ltd.

www.IOT-Solution.com

Table of Contents

This user manual has been designed as a guide to the installation and operation of BMS 100 battery management system Statements contained in the manual are general guidelines only and in no way are designed to supersede the instructions contained with other products.

We recommend the advice of a registered electrician before any Installation work.

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【UPGRADE HISTORY】

DATE	FIRMWARE VERSION	HARDWARE VERSION	DESCRIPTION
2019-12-24	***V1.0***		
2020-07-06	***V1.1***		

1.1 Brief introduction

1.2 Application

UPS monitoring;
Computer room battery management and monitoring;
Electric vehicle battery management monitoring;
Telecommunication BTS monitoring;
Solar battery monitoring;
Other battery or battery group monitoring.

1.3 Safety Instructions

Safety Instructions
Please do not use this product in places where the use of mobile phones is prohibited!

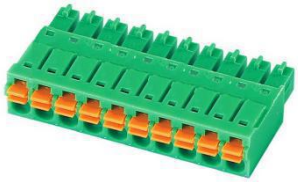
Wireless Interference
This product uses GSM / GPRS / 3G / 4G wireless network, please pay attention to wireless interference!

Before installing and using this device, please confirm whether the following materials are included in the product box:

1.4 Standard Packing List

- 1x BMS100

- 2x 3.5mm female jack.



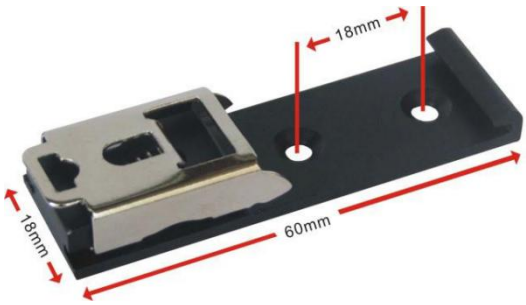
- 1x USB to RS485 cable

- 1x Adaptor（12VDC/2A）

Note: If the above items are missing or damaged, please contact King Pigeon sales.

Optional accessories (purchase separately)

- DIN35mm rail mounting bracket



2. Main Features

- Acquisition 2/4 channels of analog input 4 ～ 20mA, 0 ～ 5V, optional;
- Adopt 12-bit AD acquisition processing, high accuracy measurement;
- Standard Modbus-RTU protocol;
- RS-485 (RS-422 optional) communication interface with ESD protection circuit;
- Wide working voltage DC9 ～ 60V, with anti-reverse protection function ;
- Using industrial-grade chip, built-in watchdog, and has perfect anti-lightning and anti-interference measures to ensure reliability;
- Configurable maximum and minimum value of analog input, intelligent conversion of actual value, convenient for various analog measurement requirements;
- Can measure 12 single battery voltages,several battery group and 1 total voltage;
- It has 3 precision gears for different voltage ranges to improve the voltage measurement accuracy;
- With LED light to indicate working status, easy to install and debug on site;
- Wall mounting or 35mm standard DIN rail mounting, multiple wiring methods, convenient for field installation and wiring.

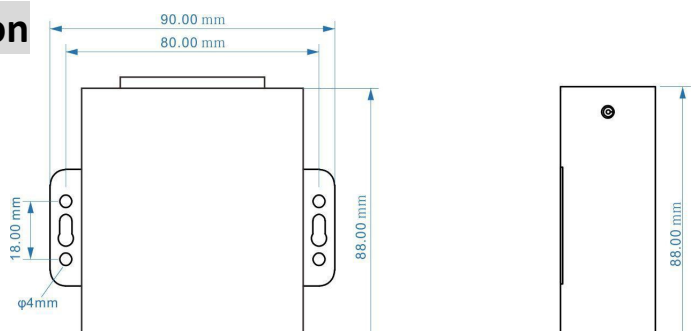
3.Technical Specifications

Item	Parameter	Description
Power	Power supply voltage	9 ~ 60V DC
	Power Consumption	≤0.3W
	Power Protection	Anti-reverse connection, ESD air: 15KV, surge: 4KV
RS485 Serial Port	Protocol	Modbus RTU
	Baud rate	1200bps-115200bps

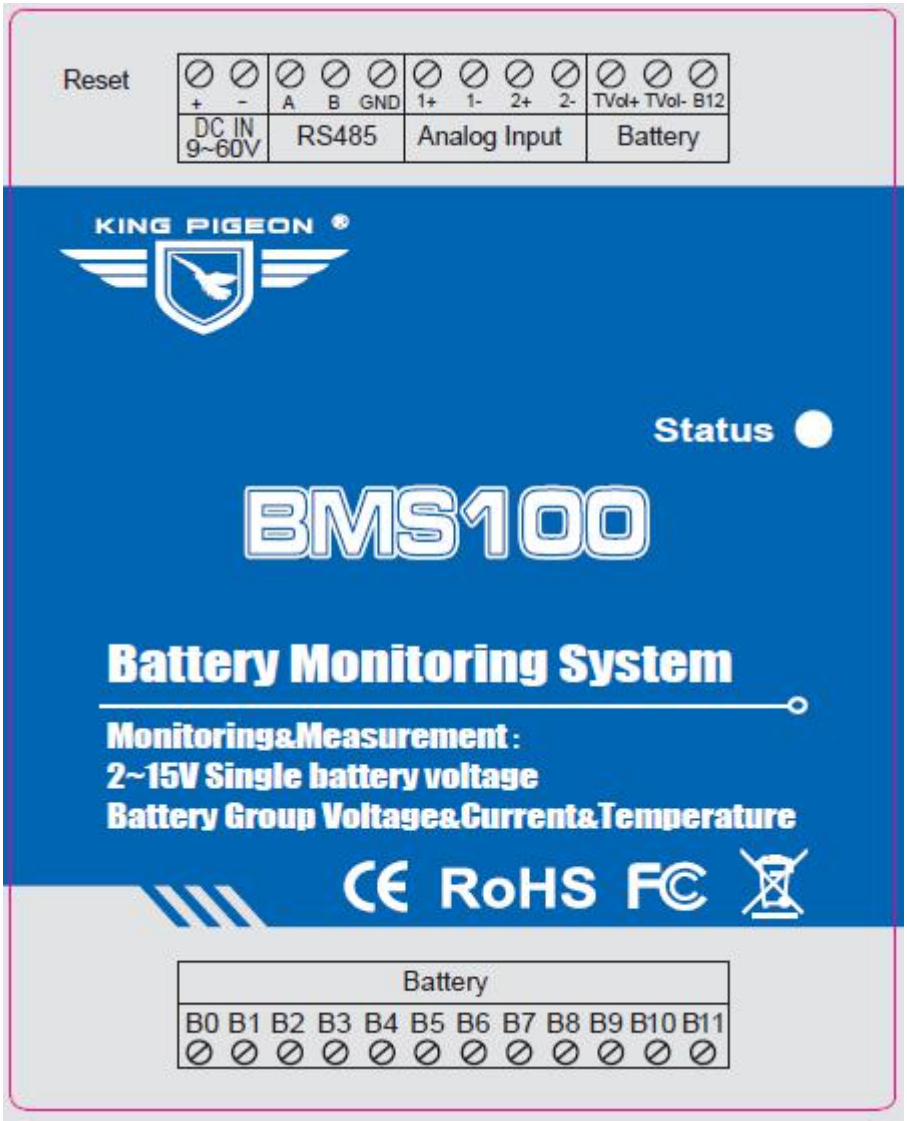
	Data Bit	8
	Parity	None, Even, Odd
	Stop Bit	1,2
	Protocol	Modbus RTU （slave）
Analog Input	Qty	2Channel
	Input way	Differential input
	Input type	4~20mA or 0~5V default 0-5V ,can connect current and temperature sensor to measure current and temperature.
	Resolution	12Bit
	Accuracy	I ±0.1% FSR @ 25 ℃
		I ±0.3% FSR @ -10 and 60 ℃
		I ±0.5% FSR @ -40 and 75 ℃
	Sampling frequency	200ms
	Input resistance	>1M ohms
Total voltage input	Qty	1Channel
	Input way	Differential input
	Measure range	0~300V DC
	Resolution	12Bit
	Accuracy	±0.2%FSR@25℃
	Sampling frequency	2ms
Single Battery	Input way	Differential input
	Measure range	0~15V DC
	Resolution	12Bit
	Accuracy	±0.2%FSR@25℃
	Sampling frequency	2ms

4. Hardware Description

4.1 Dimension



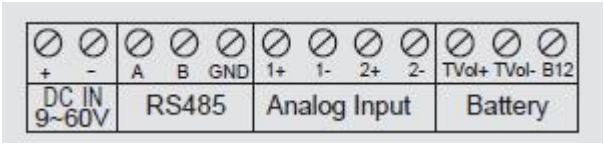
4.2 LED Indicator Light

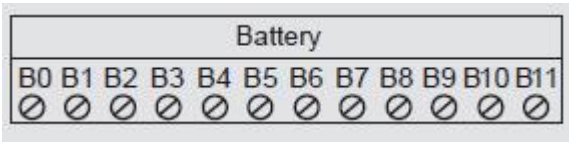


LED Indicator Light			
Name	**Color**	**Status**	**Description**
Status	Red	Steady on	The device is in normal working status
		Blink	Data communication with Modbus master via RS485
		Off	Power outage or device issue
Reset			In the power on state, press and hold for 3 seconds, the device can be restored to the

			factory settings

4.3 Interface definition





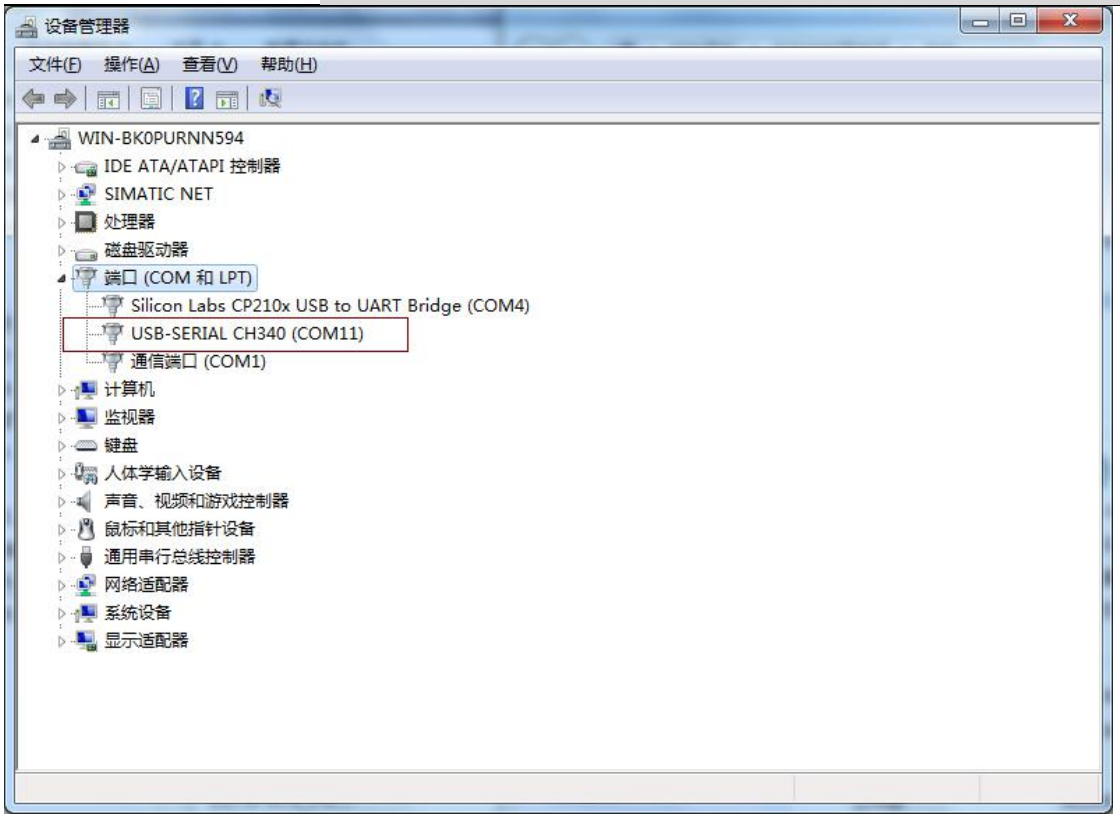
Upper terminal block			Bottom terminal block		
Type	Mark	Description	Type	Mark	Description
DC IN 9~60V	+	Power supply+	BatteryPower supply+	B0	Public negative
	-	Power supply-		B1	1st channel battery +
RS485	A+	485 data+		chan	2nd channel battery +
	B-	485data-		B3	3rd channel battery +
	GND	485Ground		B4	4th channel battery +
Analog Input	AIN1+	Analog input 1+		B5	5th channel battery +
	AIN1-	Analog input 1-		B6	6th channel battery +
	AIN2+	Analog input 2+		B7	7th channel battery +
	AIN2-	Analog input 2-		B8	8th channel battery +
Battery	TVol+	Total battery voltage+		B9	9th channel battery +
	TVol-	Total battery voltage-		B10	10th channel battery +
	B12	12th channel battery +		B11	11st channel battery +

5. Configuration

5.1 Device connection preparation

Download the BMS100 configuration software and USB to 485 driver from www.iot-solution.com website, then unzip and install;

After the installation is complete, replug the USB-485 device. Right-click [My Computer], and click [Properties]> [Device Manager]> [Port]. If the connection is normal and the driver installation is normal. Show as below picture COM11



Run the BMS100 configuration software on the computer, select the correct COM port, that is, the port number displayed in [Device Manager], and click [Open], as shown below:

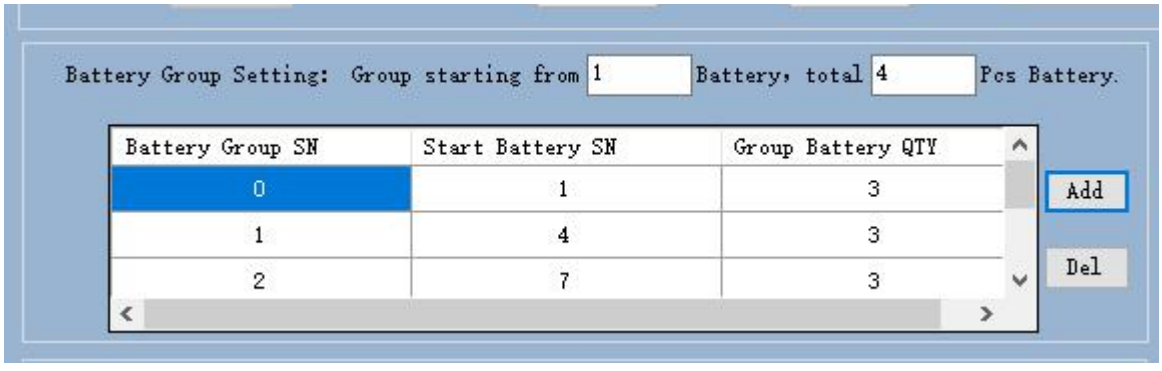
Select [Broadcast], the device and the configuration software will start pairing, and the LED on the device

will start flashing. After successful pairing, it will prompt the broadcast success.

5.2 Serial Port Setting

Serial Port Setting		
Item	**Description**	Default
Serial Port Number	Select the port number of which the device is connected.	COM1
Refresh	When the port number does not show the correct port, you can click to refresh.	
Baud Rate	1200,2400,4800,9600,19200,38400,57600,115200 optional.	9600
Data bit	8	8
Parity	None,even,odd	none
Stop bit	1,2	1
I / O module model	Configuration software automatically recognizes the device model	BMS100
Address	Device's modbus address	01
Settings	To change the baud rate, data bit, parity bit, stop bit of the device, the address needs to click the [save] button to write the changed data to the device. After the device is powered off and restarted, it will start with the changed configuration.	

5.3 Battery Group Settings

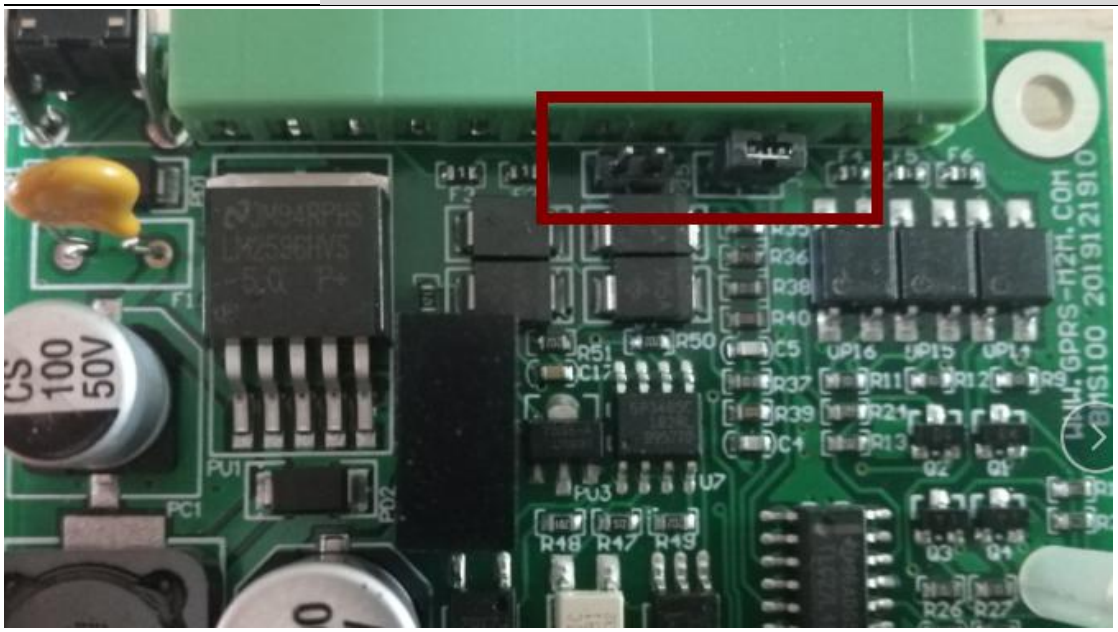


Group the batteries according to how they are connected.

For example:
Fill in the box: The battery group starts from battery 1, and a total of 2 batteries form a group.
Click [Add] to add the 0th battery group to the table;
Indicates that the first and second batteries are set as a group,group serial number is 0.
Similarly, the battery group number 1 in the table indicates that the third, fourth, and fifth batteries are set as a group;
The battery pack number 2 indicates that the sixth, seventh, eight, nine, ten, and eleven batteries are set as a group.
Select the corresponding battery group number and click [Del] to delete the battery.
For battery grouping and wiring after grouping, see the application of battery voltage measurement.
Note: The minimum battery group is 2 batteries, so 12 batteries can be divided into 6 groups at most.

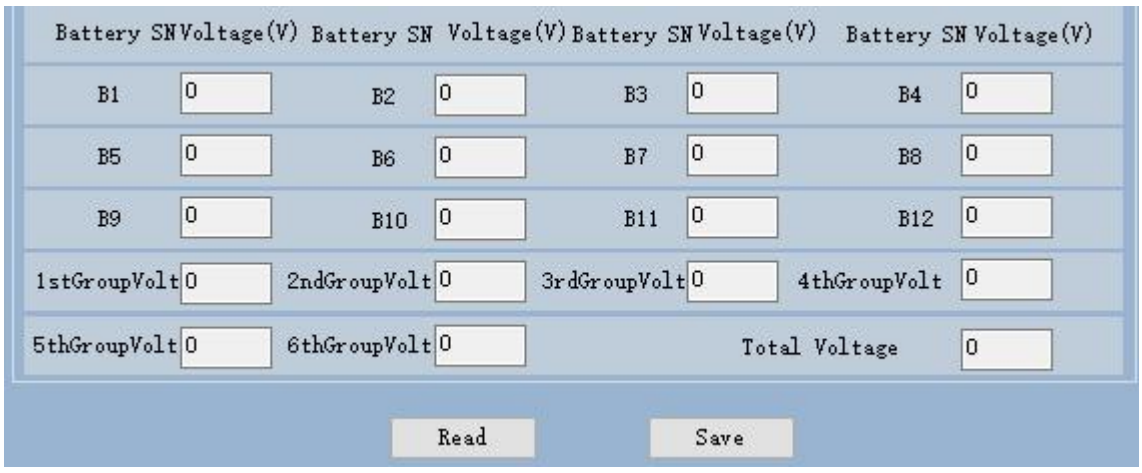
5.4 Analog Input

AI Channel Settings		
Item	**Description**	**Default**
AI Channel	AI1 and AI2	**AI1 4-20mA**
Input Type	0~5V or 4~20mA ,default is 0-5V,If need 4-20mA,please tell us before order.	AI2 0-5V
Maximum	Sensor's max measure value	
Minim	Sensor's min measure value	
Current Value	Read the current actual value , such as specific values such as pressure xxxPa or temperature xxx℃.	
Remark:	The hardware also needs to be adjusted when the input type 0~5V and 4~20Ma are changed.	



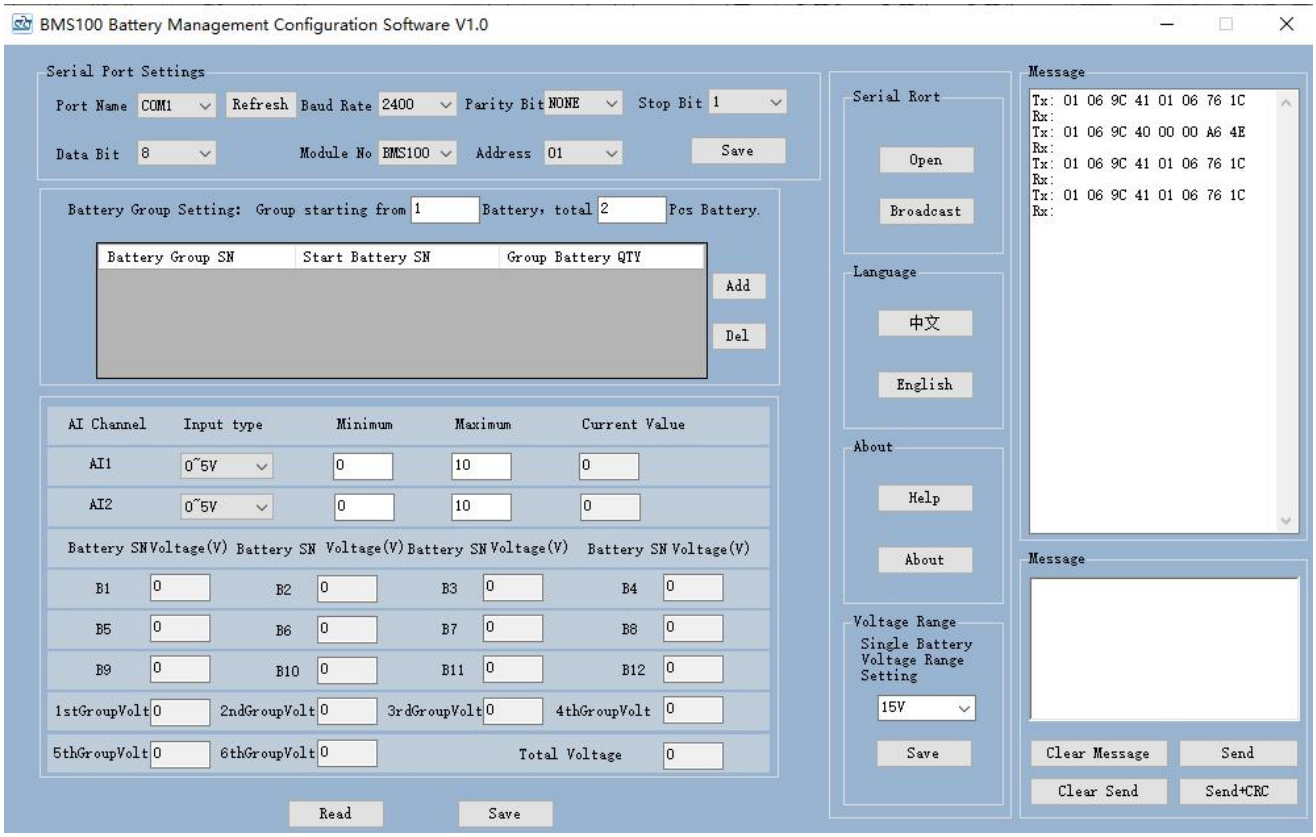
As shown in the picture, J6 is a jumper switch for AIN2 channel type, and J5 is a jumper switch for AIN1 channel type.
The type is 0~5V when the jumper is not inserted, and the type is 4~20mA when the jumper is inserted.
AIN1 defaults to 4~20mA type;
AIN2 defaults to 0-5V type;

5.5 Battery Voltage Measurement



B1 ~ B12: display the current voltage value of each battery;
Group 1 ~ 6 voltage: display the voltage value of each group of batteries; (if no battery pack is added, the default display is 0)
Total battery voltage: display the total voltage value measured real time .

5.6 Read&Save



Read: After clicking, you can read

1.Battery group information;

2. Input type of AI channel, maximum value, minimum value, current value.

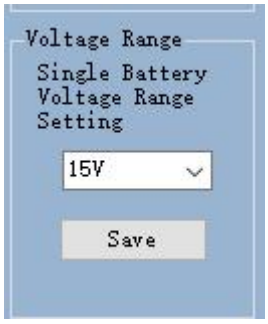
3. The current value of each battery and battery pack and total voltage.

Save: Click to save

1.Battery group information;

2. Input type of AI channel, maximum value, minimum value.

5.7 Select Voltage Measurement range



Select the battery range according to the voltage of a single battery. Selecting the correct range can improve the measurement accuracy;

Single battery is 0 ~ 3V,select 3V range.

Single battery is 3 ~ 6V,6V range is selected.

Single battery is 6 ~ 15V,15V range is selected.

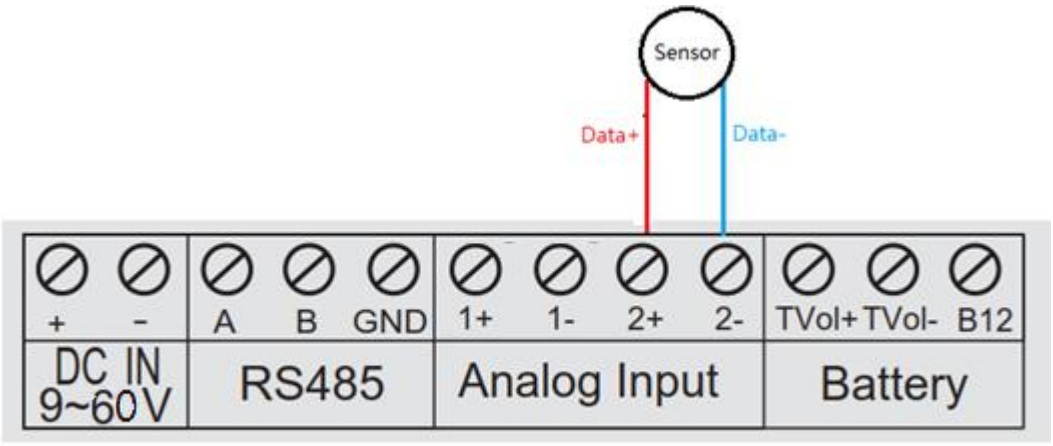
6. Common Applications

6.1 Application of Analog Input

Current&temperature measurement.

0~5V sensor wiring

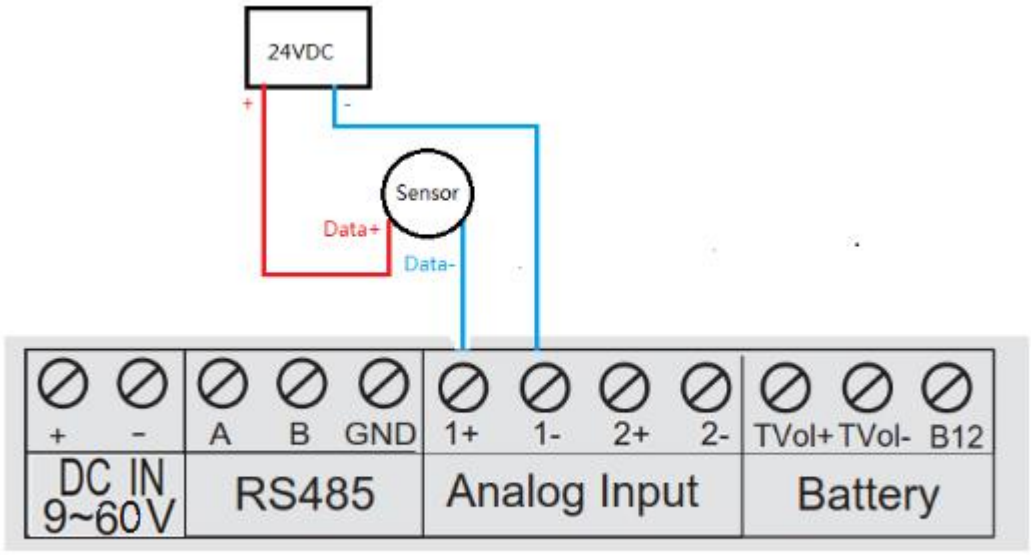
Pls see below picture



0~5V类型传感器接线

6.1.2 4~20mA Sensor Wiring

When using 4 ~ 20mA type sensor, the sensor needs to be powered by 24V power supply (can be powered by the tested battery pack). The wiring is as shown in the picture.

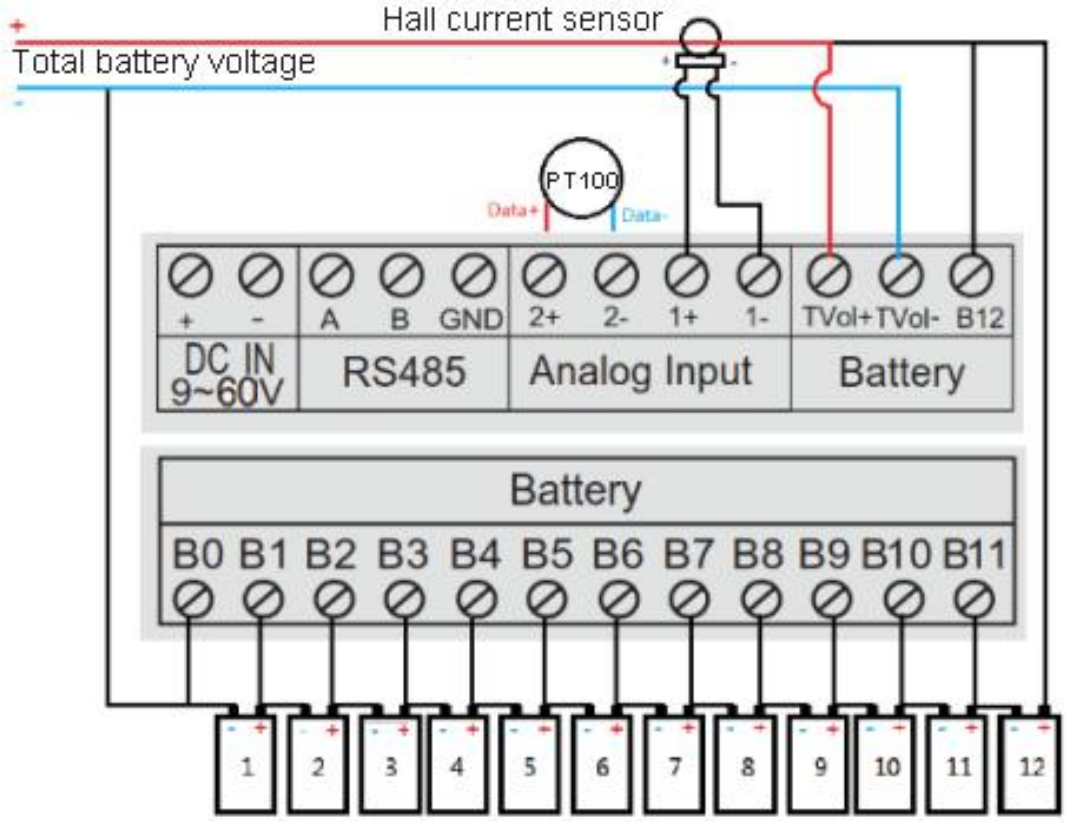


4~20mA类型传感器接线

6.2 Application of Battery Voltage Measurement

6.2.1Application of batteries in series

When all batteries in series connection,each battery's negative electrode connect to the next battery's positive electrode. As show in the picture：



The electric potential difference between B1 and B0 is first battery's voltage,so B1 point is first battery's

voltage.

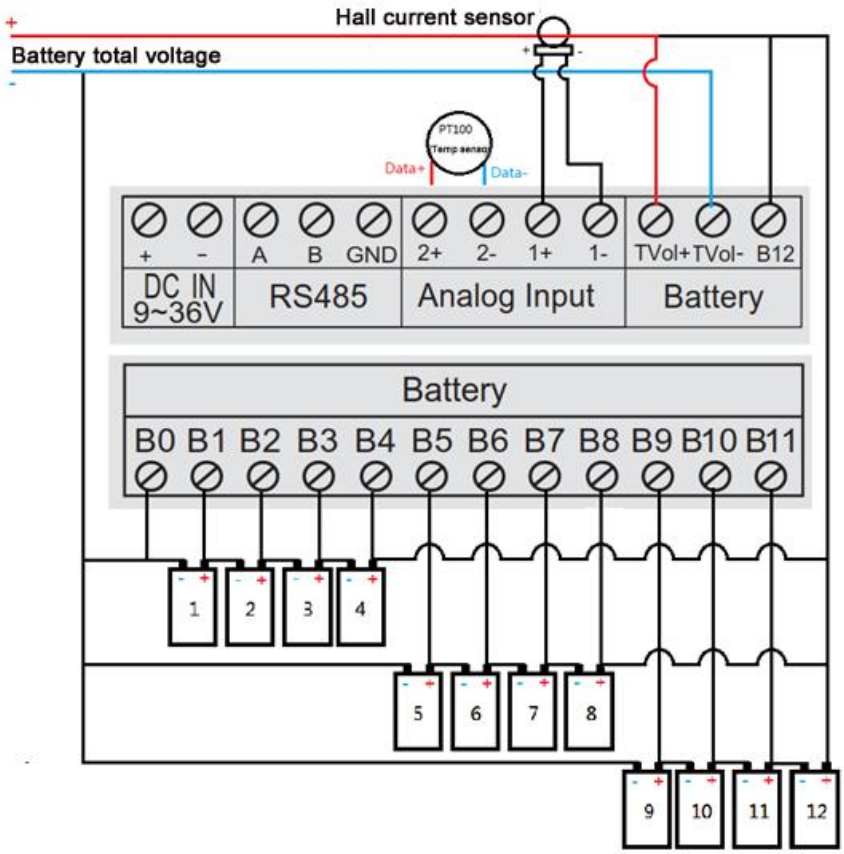
Similarly, the potential difference between points B2 and B1 is the voltage of the second battery, so point B2 is the voltage of the second battery; point B3 is the voltage of the third battery; and so on, each battery has a corresponding point to monitor.

TVol +,TVol- can be used to monitor the total voltage of all batteries. Analog Input 1 can be used to monitor the battery current.Analog Input 2 can be used to monitor the current battery temperature.

Note: PT100 sensors have 0 ~ 5V type and 4 ~ 20mA type. For wiring, please refer to the application of analog input.

6.3 Application of Battery Grouping

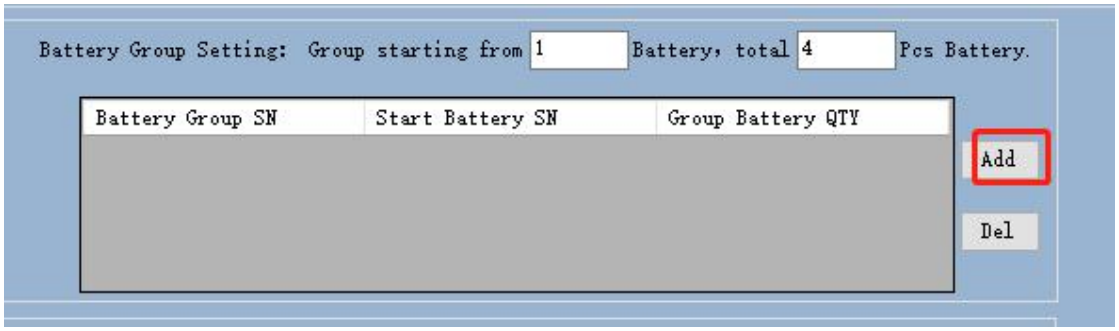
When batteries are connected in parallel, battery grouping is required. The batteries connected in series are a group, and the negative electrode of the first battery of each group needs to be connected to B0.As shown below.



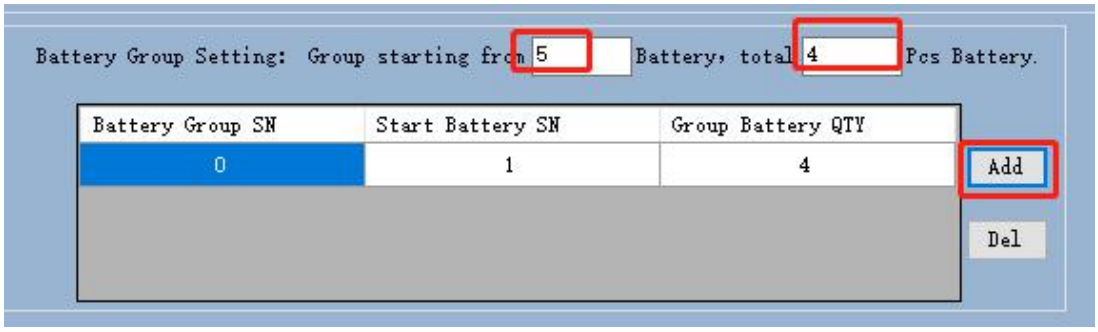
In the picture, there are 12 batteries in total, 4 batteries in one group, and 3 batteries groups in total. BMS100 can measure the voltage of 12 single battery, also the total voltage. And It also can monitor the voltage of each battery group.

The configuration software add the battery pack as below:

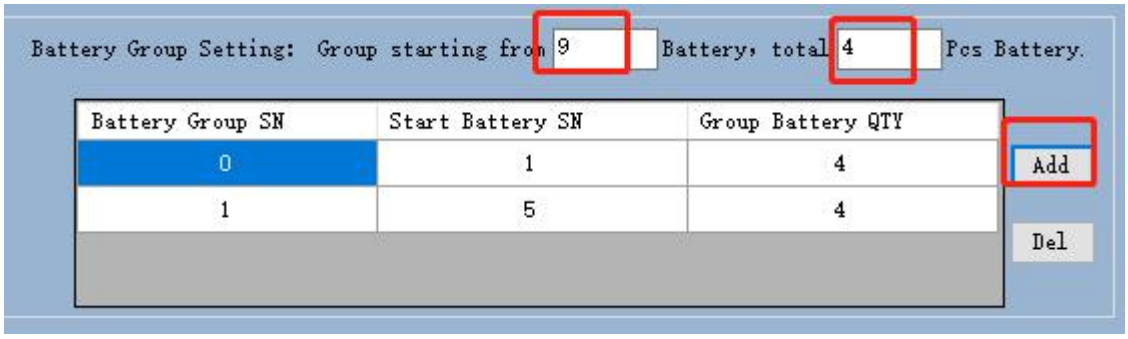
Add first battery group of battery 1-4.(fill in 1 and 4,then click “Add”)



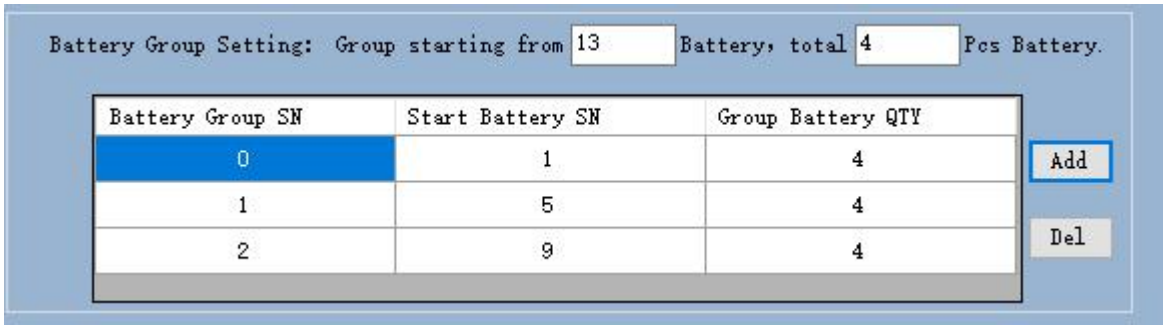
After add first 4 batteries in first group,show below:(second batteries group with battery 5-8 ,and total 4PCS,click" Add")



It will show the second group(battery 5-8,and third group start from 9,then click "Add" to add 3rd group)



Then 3rd battery group with battery 9-12 show below:



Then click read.

After adding batteries groups, the battery bank voltage can be monitored.

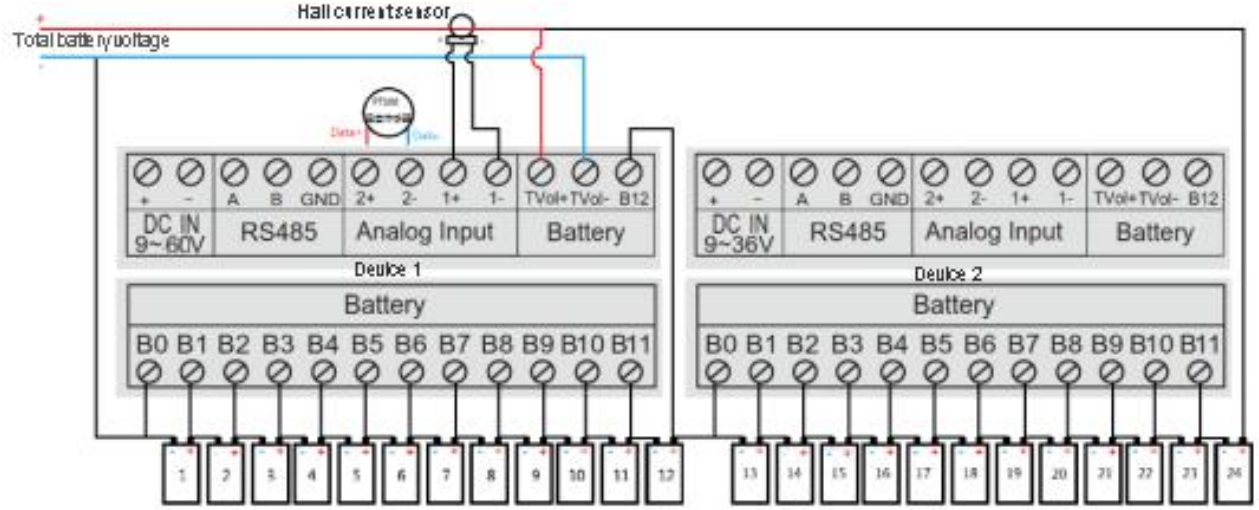
TVol +, TVol- can be used to monitor the total voltage of all batteries.Analog Input 1 can be used to monitor the battery current.Analog Input 2 can be used to monitor the battery temperature.

If you need to monitor the current of each group of batteries, you can use King Pigeon S275 or other device to expand the Analog Input interface. S275 can upload all data of the device to the cloud platform through the RS485 port.

Note: PT100 sensors have 0 ~ 5V type and 4 ~ 20mA type. For wiring, please refer to the application of analog input.

6.4 Application of battery cascade

When the quantity of batteries is more than 12, can use multiple BMS100 to measure the battery voltage and total voltage, as shown in the picture:



A large number of battery packs can be cascaded through multiple BMS100.
TVol +, TVol- can be used to monitor the total voltage of all batteries. Analog Input 1 can be used to monitor the battery current; Analog Input 2 can be used to monitor the current battery temperature.
If you need to monitor the current of each group of batteries, you can use King Pigeon S275 or other device to expand the Analog Input interface. S275 can upload all data of the device to the cloud platform through the RS485 port.
Note: PT100 sensors have 0 ~ 5V type and 4 ~ 20mA type. For wiring, please refer to the application of analog input.

7.Modbus Slave Application

This device has its own register address input register. The function code is 04. The device address can be set (default is 1). For the register address, please refer to the appendix.
The message format sent by the server master is as follows:

Send Content	Byte	Example	Description
Device Address	1	01H	Device 01H, range: 1-247, subject to the set address
Register start address	2	00 00H	Register start address
Read the qty of registers	2	00 15H	Read a total of 21 16-bit register addresses
16 CRC	2	F1 C3H	CRC0 CRC1 Low byte first

The format of the message returned by the device is as follows:

Send Content	Byte	Example	Description
Device Address	1	01H	Device 01H, consistent with the

			data delivered
Function Code	1	04H	Read input register
Return Byte	1	26H	Data length returned
Return Data	26	00 00 00 E7 00 00 00 DD 00 00 00 DD 00 00 00 DC 00 00 00 DE 00 00 00 DF 00 00 00 00 04 C6 01 9A 00 00 00 01 00 01 00 01 00 01	Return Data
16 CRC	2	A9 3CH	CRC0 CRC1 Low byte first

Example: Polling the 12 single-cell battery voltage, battery pack voltage and total voltage of this device at the same time

Server sends: 01 04 00 00 00 13 F1 C3

among them:

01 ：Device address

04 ：Read input register value

00 00 ：Register start address, please refer to the appendix for detailed address

00 13 ：Consecutive reading of 19 input register values

F1 C3 ：CRC

Device return：01 04 26 00 00 00 E7 00 00 00 DD 00 00 00 DD 00 00 00 DC 00 00 00 DE 00 00 00 DF 00 00 00 00 04 C6 01 9A 00 00 00 01 00 01 00 01 00 01

01 ：Device address

04 ：Read input register value

26 ：Returns the number of data bytes

00 00 00 E7 00 00 00 DD 00 00 00 DD 00 00 00 DC 00 00 00 DE 00 00 00 DF 00 00 00 00 04 C6 01 9A 00 00 00 01 00 01 00 01 00 01：returned data

A9 3C ：CRC

8. Warranty

1）This module is warranted to be free of defects in material and workmanship for one year.

2）This warranty does not extend to any defect, malfunction or failure caused by abuse or misuse by the Operating Instructions. In no event shall the manufacturer be liable for any module altered by purchasers

The End!

Any questions please help to contact us feel free.

Http://www.iot-solution.com

Appendix Local Register Address

Device's Modbus address can be changed by configuration software (default is 1)
All register types are input registers, using 04 function code

Address	Name	Data Type	Description
0	B1	16-bit signed integer AB order	1st battery voltage, the actual value = the measured value / 100
1	B2		2nd battery voltage, the actual value = the measured value / 100
2	B3		3rd battery voltage, the actual value = the measured value / 100
3	B4		4th battery voltage, the actual value = the measured value / 100
4	B5		5th battery voltage, the actual value = the measured value / 100
5	B6		6th battery voltage, the actual value = the measured value / 100
6	B7		7th battery voltage, the actual value = the measured value / 100
7	B8		8th battery voltage, the actual value = the measured value / 100
8	B9		9th battery voltage, the actual value = the measured value / 100
9	B10		10th battery voltage, the actual value = the measured value / 100
10	B11		11st battery voltage, the actual value = the measured value / 100
11	B12		12th battery voltage, the actual value = the measured value / 100
12	1st battery group voltage		Battery voltage of the first group, actual value = this value / 100
13	2nd battery group voltage		Battery voltage of the second group, actual value = this value / 100
14	3rd battery group voltage		Battery voltage of the third group, actual value = this value / 100
15	4th battery group voltage		Battery voltage of the fourth group, actual value = this value / 100
16	5th battery group voltage		Battery voltage of the fifth group, actual value = this value / 100

17	6th battery group voltage		Battery voltage of the sixth group, actual value = this value / 100
18	Total voltage		Total battery voltage, actual value = this value / 100
19	AIN1 value	16-bit signed integer, AB order	Actual value = this value / 10
20	AIN2 value		Actual value = this value / 10