

*GTBMS005A Battery management system*

**Assemble**

**Usage**

**explanation**

**HERBIN GUANTUO POWER EQUIPMENT CO.,LTD**

# Catalogue

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# 1. Summarize

GTBMS005A-MC11 a battery management system consists of a colorful led screen with touch panel, a GTBMS005A-MC11 host controller, GTBMS005A-VT voltage、temperature sampling modules and current sampling module , detecting all cells' voltage of the battery pack , total current of the pack and the surrounding temperature . Detailed performances as follow:

A. The host master consists of a colorful screen and managing calculator , the first page displays total voltage and current of the pack 、 storage electrical quantity (SOC) 、 the highest cell and its number、 the lowest cell and its number and maximal temperature , you can examine all the sampled data that includes each cell's voltage 、 temperature 、 capacity and so on through the screen; you can set the system running parameters through the screen , the running parameters includes the choice whose number of batteries that sampling modules manage、 cell's voltage upper/lower limit alarm 、 temperature upper limit alarm 、 current upper limit alarm 、 voltage difference upper limit alarm、 SOC initialization 、 rated capacity、 storage electrical quantity calibration coefficient、 system clock and so on .

B. System voltage and the temperature collect board adopt modularization structure; every module manages 10 battery and 1 road temperature. The battery collecting board but adapting to an electric motor car distributes broader characteristic, follow the battery box to disperse installation, between require mains lead and a little data communication to link up only.

C. The amount of voltage and temperat

D. The host provides CAN Bus which ure sampling boards management battery can be set from 1~ N ( $N \leq 10$ ) flexible, connecting method adopts N +1; Temperature can be set to have or have no depends on need.

E. Current sampling board provides a loop current sampling data, Hall sensor is used as current sensor.

- F. is compatible with *ISO 11898 standard* completely.
- G. The host provides USB interface that can be connected with computer, and provides data saving function, the saving time is 30s; it can save all data within 7 days and receive all data through the BMS application software.
- H. The host provides alarming interface, voltage upper/lower limit, temperature upper limit alarm, over current alarm, etc.

**Major technical target:**

Power supply.....	user provides DC12V
Range of voltage measuring .....	0~+5 V
Voltage measuring accuracy .....	$\pm(0.3\% \text{ FS} + 0.2\% \text{ RD})$
Voltage display resolution .....	1mV
Hall sensor	
Current measuring range .....	0~300 A
Current measuring accuracy .....	$\pm 0.5\%$
Current display differentiate rate .....	0.1A
Temperature measuring range .....	-10°C ~ 85°C
Temperature measuring accuracy .....	$\pm 1 \text{ }^\circ\text{C}$
Minimum sampling period (voltage) .....	0.5 s
Ampere-hour accumulative total minimum period .....	0.1s
Ampere-hour display accuracy.....	0.1Ah

Ampere-hour measuring upper limit: ..... > 1000 Ah

Alarm contact parameter

The largest on-off voltage .....30Vdc

the largest on-off current ..... 1A

**Note:** The above correspondence interface of touch-screen display and host, and connecting method can be set depends on the customer's need according to ordering contract.

## 2.Connection

- 1.The system connection principle diagram is on attached diagram.
- 2.The main controller connection diagram is on attached diagram.



- (1) DC+12V INPUT.(Direct current low voltage power is connected outside)
- (2) Charger.
- (3) CAN Bus interface.
- (4) Interface of data sampling modules and alarm output.



- (5) USB interface ----- to connect computer.
- (6) RS422 ----- Colorful screen correspondence.
- (7) DC+24VOUTPUT ----- Colorful screen power interface

Detailed interface definition is on attached diagram.

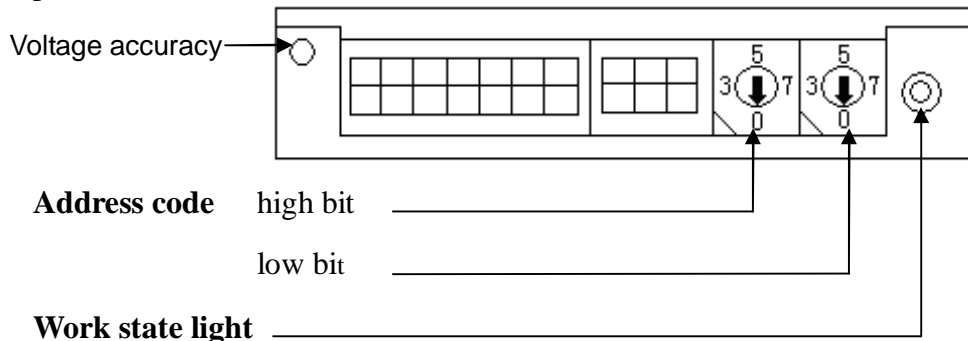
### 3. The set of V-T sampling board:

The address of the sampling board begins from No.0 and ends at No.n, address number which is between No.0 and No.n can not be lack, otherwise, the rest that is after the lack number will be seen as the invalid board.

**For example:**

address number of Sampling board	battery number
0	1 ~ 10
1	11 ~ 20
2	21 ~ 30
3	31 ~ 40
n	n x 101 ~ n x 1010

Note: No.1 battery is voltage high level of battery pack. (The total voltage positive port)



Address value= high address x 10 + low address x 1;

**For example:** No.24 address (No.25 module)

Circumrotate address code high bit to 2; circumrotate address code low bit to 4

Address value= address high bit ×10+address low bit ×1=2×10+4×1=24

**work state light:** after the power being on (6p linker ) , the work state light works , if it corresponds with host controller , the light will glitter.

**I Connection of temperature**

See the attached.

**I battery voltage accuracy adjustment**

Adjust rheostat W1 of V-T sampling board to calibrate the voltage true value according with the sampling value. (static state)

**4.Set of current sampling board**

**I Address set**

The address of voltage sampling board is from 0 to n , so the address of current sampling board is n+2;

For example: the address of voltage sampling board is from 0 to 12, the address of current sample is 12+2=14.

Detailed addressing method see V-T sampling module set\*address set.

**I Adjustment of current accuracy**

Adjust rheostat W1 of current sampling board to calibrate current true value according

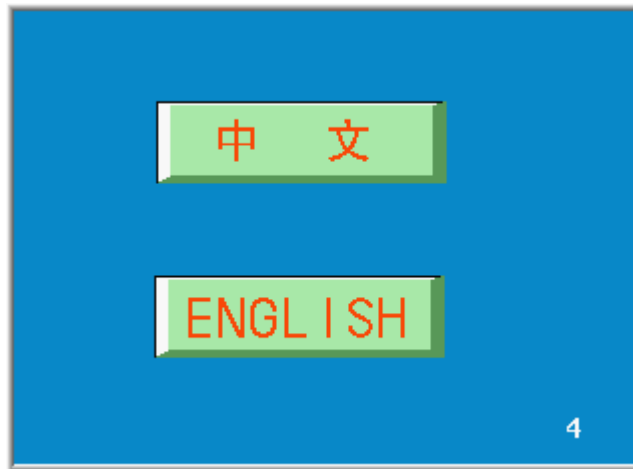
with the sampling value (static state) .

### **I Connection of current sensor**

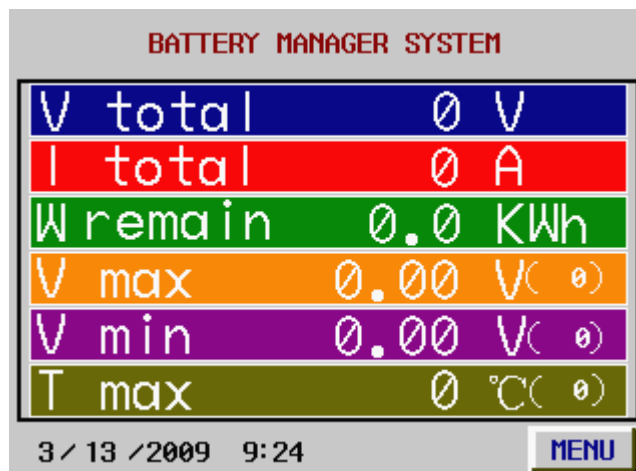
See attached diagram, please.

### 3.Operating

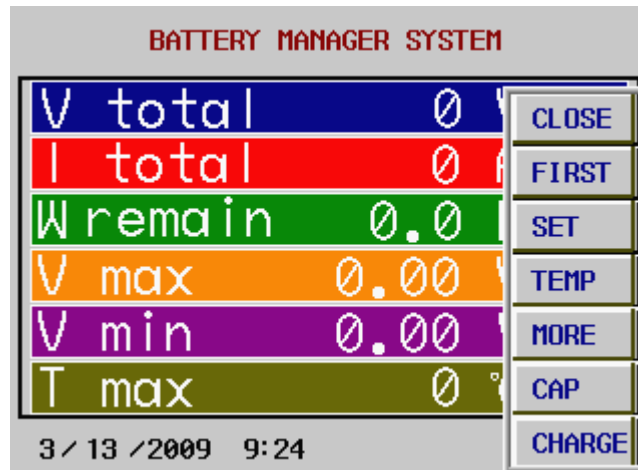
GTBMS 005A-MC11 battery management colorful screen first page interface as follow:



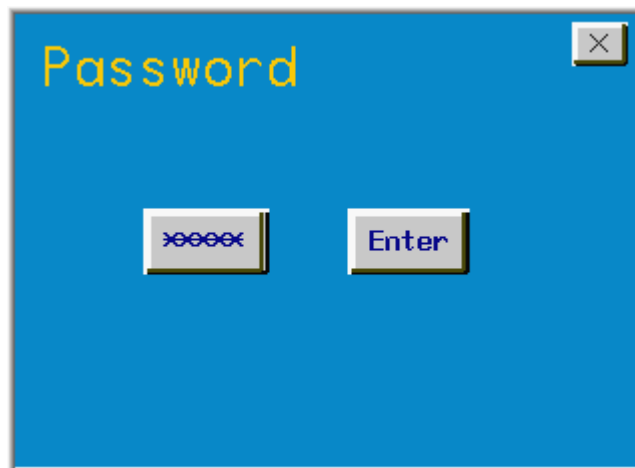
Choose “中文” you can see Chinese interface, choose “ENGLISH” you can see English interface. The system will get into Chinese interface automatically if there is no key pressed within 10 seconds electrifying. English homepage as follow:



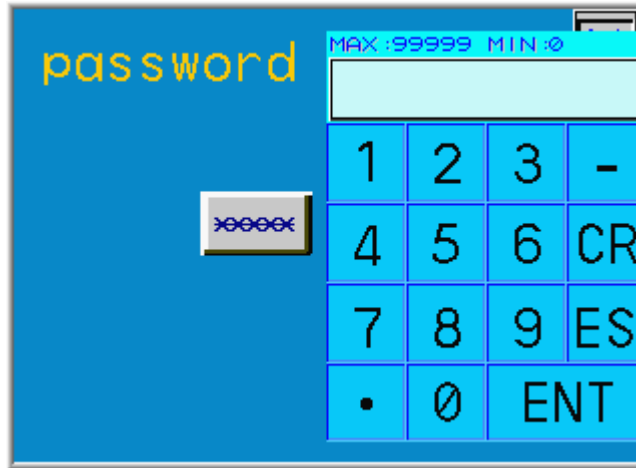
All functions of battery management system include battery parameter setting, system parameter setting and clock parameter setting, etc. All settings can be achieved by operating menu. Choose “MENU”, the interface as follow:



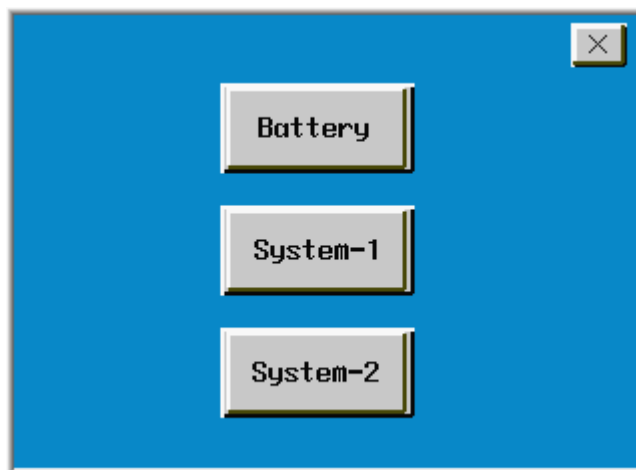
- 2 **Close:** choose “close” key, come back to homepage.
- 2 **First:** choose “first” key, come back to initial language choose interface.
- 2 **Set :**choose “set” key to get into password inputting state, the parameter can be set only when the password is correct, interface as follow:



- 2 Choose “xxxxx” key ,digital dialog box will bomb out from original interface, interface as follow:



Press the number key ,you can input the password, the password consists of five numbers, press the “ENT” key after inputting the password, digital dialog box will bomb back, then press “enter” key , if the password is wrong it will bomb out dialog box to notice you ;if the password is right ,you will see the interface as follow:

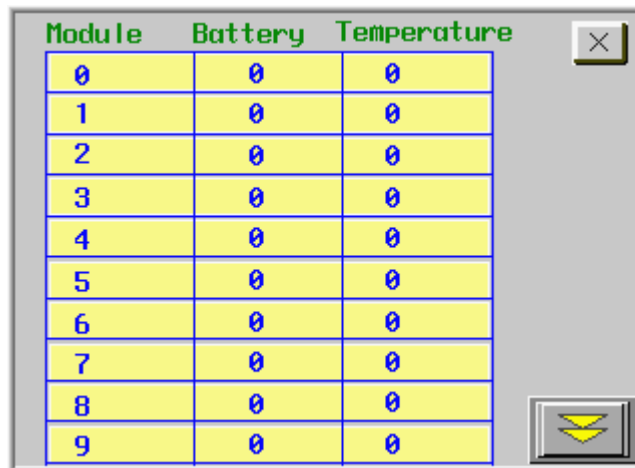


“battery” 、 “system-1” and “system-2” should be set before you use it first time , then the system will memory automatically. If any of them changed, you should set it again.

The system parameter including: the choice whose number of batteries that sampling modules manage、 cell's voltage upper/lower limit alarm 、 temperature upper limit alarm 、 current upper limit alarm 、 voltage difference upper limit alarm、 SOC initialization 、 rated capacity、 storage electrical quantity calibration coefficient、 system clock and so on .

The battery parameter including: the choice whose number of batteries that sampling modules manage and the choice there is temperature or not. Choose

“battery”, the interface as follow:




Module	Battery	Temperature
0	0	0
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0

The numbers in” Module” are the relevant address of sampling module.

The numbers in ”Battery” are the number of sampling modules management batteries that are relevant to this line address(0-10 batteries) and could be modified. The important is the address number of “battery” next to the last available sampling modules must be set as “0”. For example, there are 7 voltage sampling modules in system, the address is “0-6”, so the “battery” of address=7 must be set as “0”.

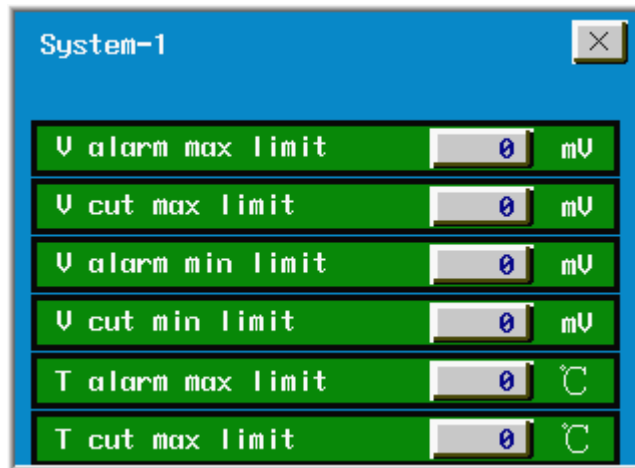
The numbers in “Temperature” are the sampling modules that are relevant to this line address whether sample temperature (0 not sample, 1 sample).

When the number of batteries、 temperature or no temperature and choosing the number in frame are set ,there is a digital dialog box popup ,input relevant value, press “ENT” key ,if the number you input excesses the range, the number will not be

affirmed, press “×”key to back to parameter setting interface, press “  ”

key to turn pages.

2 Choose “sys-1” key ,the interface as follow:



**Voltage alarm upper limit:**

When the largest cell voltage is larger than this value, the system will provide scroll word and a group of relay contacts (passive) to alarm while buzzer 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. When it's alarming, if the largest cell voltage drop and it's 5mV lower than the value, the alarm will stop. The data is the base of charger adjusting.

**Voltage cut upper limit:**

When the largest cell voltage is larger than this value, the system will provide scroll word to alarm while buzzer alarm. The alarm won't stop until the power is cut-off. The data is the base of charger controlling output.

**Voltage alarm lower limit:**

When lowest cell voltage is lower than the value, the system will provide scroll word to alarm while buzzer alarm. When it's alarming, if the lowest cell voltage rise and is 5mv larger than the value, the alarm will stop. The value is the base of motor controller reducing output power. When it's charging (with our charger), it won't alarm.

**Voltage cut lower limit:**

When the lowest cell voltage is lower than the value, the system will provide scroll word and a group relay contracts to alarm and buzzer at the same time. Normally, relay common contacts are switched on with N.C. contacts and cut off

with N.O. contacts, When it's alarming, common contracts are switched on with N.O. contacts and cut off with N.C. contacts. The alarm won't stop until the power is cut-off. When it's charging (with our charger), it won't alarm.

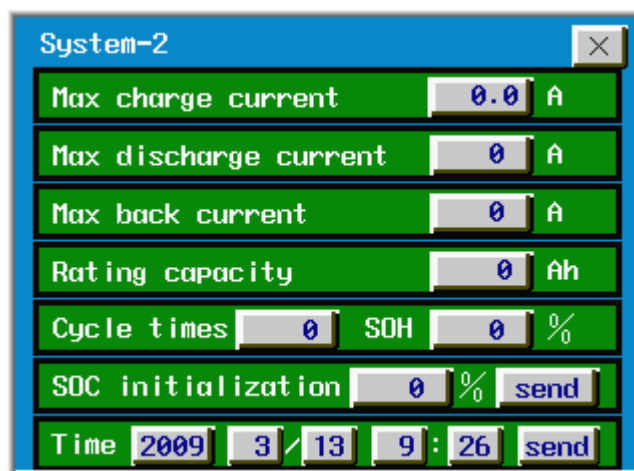
**Delta voltage alarm:**

The value is the difference between the largest cell voltage and lowest cell voltage. When the difference settles for this value, the system will provide scroll word to alarm. When it's alarming, if the difference is lower than the value, the alarm will stop.

**Temperature upper limit:**

When the highest environment temperature is higher than the value, the system will provide scroll word and a group relay contracts to alarm. When it's alarming, if the highest temperature drop and is 4°C lower than the value , the alarm stop. It use the same group contracts with "Voltage cut upper limit".

2 Choose "sys-2" key ,the interface as follow:



**Charging current upper limit:**

When total current is higher than this value, the system will provide scroll word to alarm while buzzer alarm. The value is the limit of charging output current.

**Discharging current upper limit:**

When total current is higher than this value, the system will provide scroll word and a group of relay contacts (passive) to alarm while buzzer alarm. When it's alarming, if total current drops and is lower than the value, the alarm stops. Relay contracts state is the same as "Voltage alarm upper limit".

**Rating capacitance:** rated capacitance of cell, SOC value is 100%.

**Capacitance calibrate:**

It's only relevant to charging capacity, and being that case, pay attention to Hall sensor set orientation, please. For example: storage capacity modify=95%, when charge capacity calculate value is 200Ah; charge capacity after being modified=200Ah x 95% = 190Ah. The parameter must be lower than 100% to compensate the capacity wastage when being discharging.

**SOC initialization:**

Rest electrical quantity initialization . Every time it gets into “system-2” , this value is 0% . The first time you use this system , you need to set the pack's rest electrical quantity , the value should be set as 0% ~ 105% , you should choose “send” key after your set , or the value you set will be invalid .

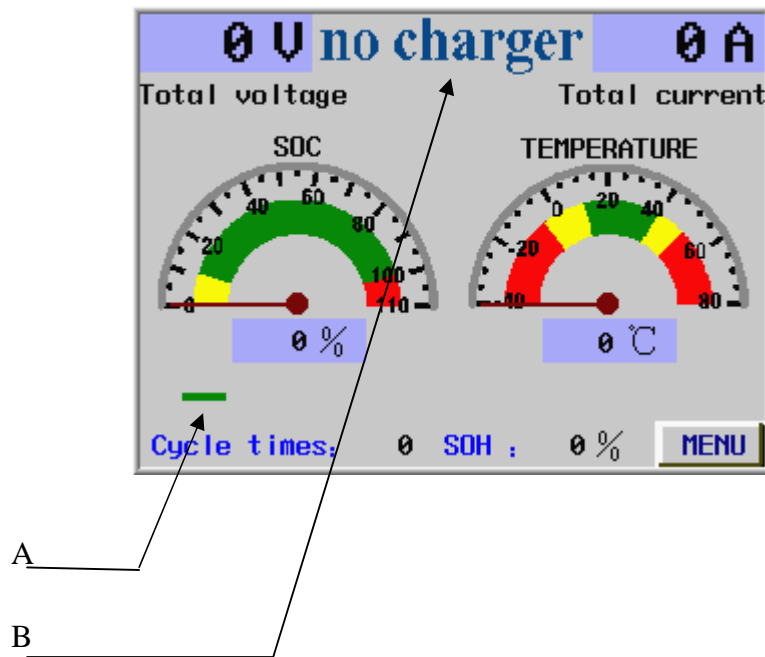
**Time:** System memory the data associated time. The system will memory it after once set.

**Nods invalid alarm:**

When the system controller can't communicate with sampling modules, the system will provide scroll word and a group of relay contacts (passive) to alarm while buzzer alarm. It use the same group contracts with “voltage cut lower limit”. It is the base of motor controller reduces output power.

Press “×” to save and exit to parameter set interface.

2 **Charge:** choose “charge”, the interface as follow:



A: SOC state indicator: when it's charging, the indicator scrolls to display.

When it's not charging, the number in indicator is the current SOC value.

B: Charger state:

no charger: the charger is not connected

ready: the charger gets ready, can charge

charging: the charger is charging

stop: the charger has stopped charging

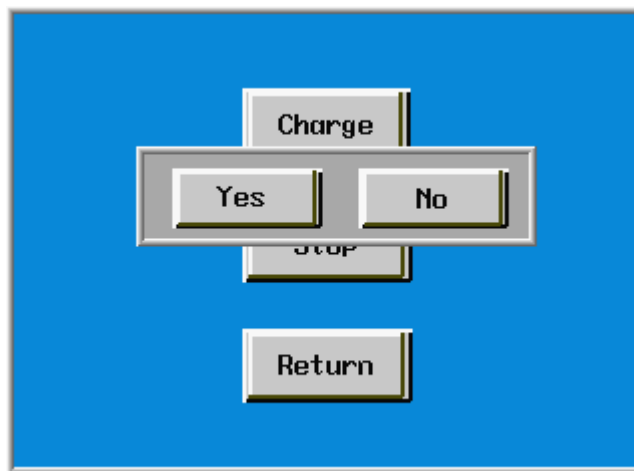
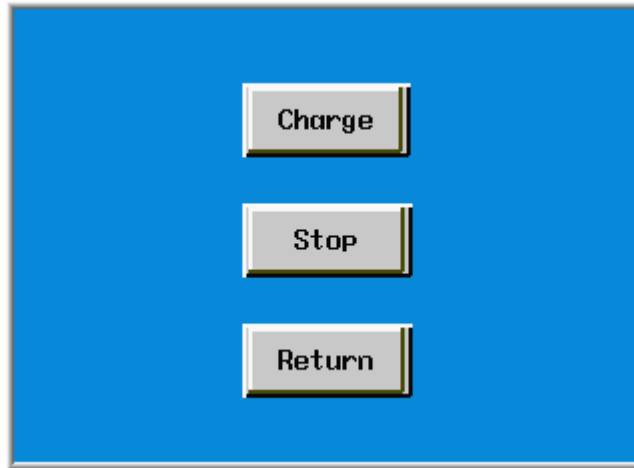
cycle times : charging cycle times

SOH: battery group health index

SOC: residual electrical quantity

Temperature: battery group highest circumstance temperature.

Choose "MENU", the interface as follow:



Charge: when the charger's state is "ready", choose this key to charge

Stop: choose this key to stop all output

Return: choose this key to back to homepage

There are 3 phases during charging course:

a. Precharging:

During the precharge course, BMS controls charger charging at 0.05C (rating capacity), after a minute, if the cell lowest voltage is higher than "voltage cut lower limit", the charger will convert to constant current charging phase; if the cell lowest voltage is lower than "voltage cur lower limit", the charger will charge at this current, if the cell lowest voltage is higher than "voltage cut lower limit", the charger will convert to constant current charging phase, or the charging will be stopped.

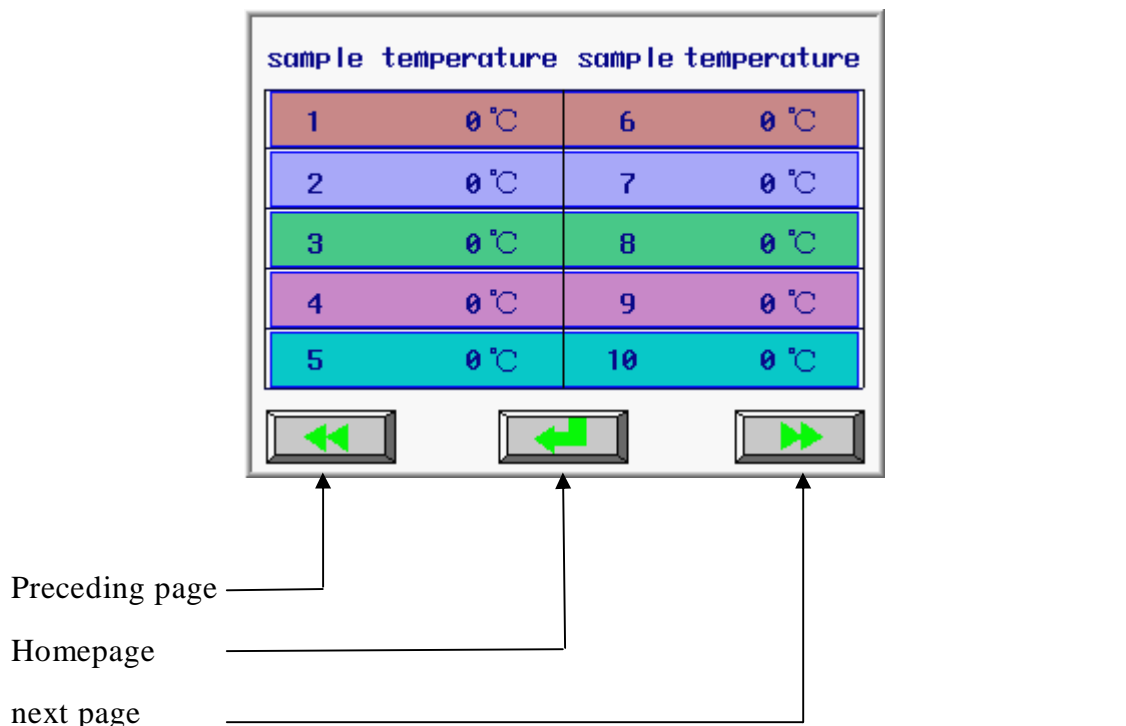
b. Constant charging:

During this course, BMS controls charger charging at “largest charging current”, if “largest charging current” is higher than the charger’s largest output current, the charger will charging at largest output current. When is charging, if the cell largest voltage is higher than “voltage alarm upper limit”, the charger will convert to trickle charging phase.

c. Trickle charging:

During this course, BMS controls charger inducing output current until the cell largest voltage is 5mV lower than “voltage alarm upper limit”, the charger will charge at the current that has been adjusted. The course will cycle until the output current reduces to 0.025C, the charger will stop charging. The charging finishes.

2 **Temperature:** Choose the “TEMP” key , the interface as follow :



Monitoring point temperature default is 0°C , if there are 5 monitoring points , it will display 5 temperature value .

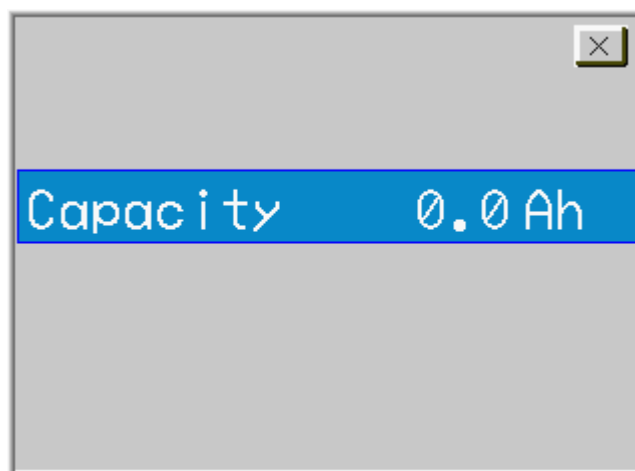
2 Detail: choose “detail” key, the interface as follow:

NO.	VOLTAGE	NO.	VOLTAGE
1	0.000 V	6	0.000 V
2	0.000 V	7	0.000 V
3	0.000 V	8	0.000 V
4	0.000 V	9	0.000 V
5	0.000 V	10	0.000 V

Navigation buttons: Left, Home, Right

You can examine any battery voltage; key function is the same as the key function in temperature page. When the number of batteries that are set by sampling modules is less than 10, the sampling point with batteries will display battery voltage; the sampling point without batteries will display 0.000V.

2 Capacity: choose “capacity” key, the interface as follow:



4. English define explain

**V total**

**Voltage total**

**I total**

**Current total**

**V max**

**Voltage maximum**

**V min**

**Voltage minimum**

**W remain**

**Watt remain**

**T max**

**Temperature maximum**

**HRBIN GUANTUO POWER EQUIPMENT CO.LTD**

**TEL : 0451-57831599**

**FAX : 0451-57831600**

**ADDRESS : The 3<sup>rd</sup> floor of the building of NO.5 NO.15**

**XINGNAN road NANGANG District HRERBIN City**

**Zip code : 150086**