

IS001 Battery Energy Storage System

Setup and Usage Guide

Version 2.1



Catalog

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1. Introduction Battery Energy Storage System (IS001)

IS001 is a Battery Energy Storage System suitable for small and medium-sized industrial or commercial businesses. It supports higher voltage by series by connecting 4 to 15 batteries in series as a module. And parallel the modules up to higher energy battery storage system.

It included levels of the management system to monitor and collect voltage, current, and temperature of each cell and module in real time.

Equipment includes:

- Server rack batteries modules HVB50096
- High voltage control box (HVCB-02A) or
- High voltage control box (HVCB-03A) and BAU

And accessories

- Positive and Negative color coded power cables
- Inter-battery communication cables

To achieve remote battery health monitoring and diagnostic check, it is recommended to connect to a router for internet access.

Here are the introductions of every part:

1.1 Server Rack Battery module (HVB50096):

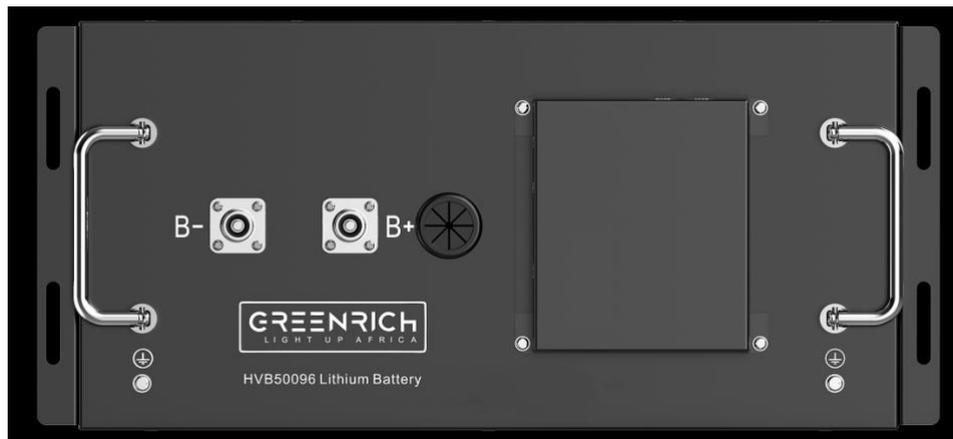


Fig1. HVB50096 images

The Server rack battery HVB50096, rated voltage 51.2V, rated capacity 96.6Ah. Basic parameters are shown in Table 1.

Table1. Parameters of HVB

| Battery Pack | |
|-------------------------|-------------------------------|
| Item | Parameters |
| Cell Type | LiFePO4 |
| Nominal Voltage | 51.2V |
| Nominal Capacity | 96600mAh/4946Wh |
| Working Voltage Range | 46.4V~56.8V |
| Working Temperature | Charging: 0~55℃ |
| | Discharging: -20~60℃ |
| Temperature Sensor Type | B Value 3435 (10K@25℃), 4ways |
| Dimension | 438mm*536mm*221mm |
| Weight | About 50kg |
| Communication Type | CAN bus |

Table 2. Description of the battery module panel functions:

| No. | Item | Description |
|-----|-------------------|---|
| 1 | Cable Outlet | Voltage and Temperature sensors collecting cable outlet |
| 2 | Positive terminal | Positive battery connection |
| 3 | Negative terminal | Negative battery connection |
| 4 | Ground | Ground cable connection |
| 5 | CAN-2 | Communication port of the BSU |
| 6 | CAN-1 | Communication port of the BSU |



Fig2. Server rack battery HVB50096 images

1.2 High voltage control box (HVCB):

High voltage control box is the terminal of voltage and data collects from a series of Battery modules.

There are 2 types of High Voltage Control Boxes, HVCB-02A and HVCB-03A. The system of single series (at most 15 battery units) works with HVCB-02A. The system parallels battery units that work with HVCB-03A and BAU.

a) HVCB-02A

The HVCB-02A capable to manage one series of battery units which equipped with control devices, fuses and relay safety of the battery. It has functions of fault alarm and protection, safety protection lamp, emergency stop and step-by-step disconnect of the system during maintenance. The technical parameters are shown in Table 2:

Besides, there is a WIFI module included in HVCB-02A and can be remotely monitored and controlled separately.

Table3. Parameters of HVCB-02A

| HVCB-02A | |
|-----------------------------|---|
| Operating voltage range | 150V~900Vdc |
| Rated Current | 100A(125A at max) |
| Operating temperature range | -40°C~85°C |
| Communication port | 2 ways of CAN@ 3 ways RJ45 physical interface |
| Analog Signal port | 5 ways of dry contact@ 2ways in 3 ways out |
| Dimension | 478mm*434mm*133mm (W*L*H) |
| Weight | 3500m |
| Installation mode | Screw fixation |
| Protection | Short protection |
| | Over current protection |
| | Over Voltage protection |
| | Under Voltage Protection |
| | Temperature Protection |
| | Breaker Monitor |
| | Remote Control |

The image of the HVCB-02A is as follows:

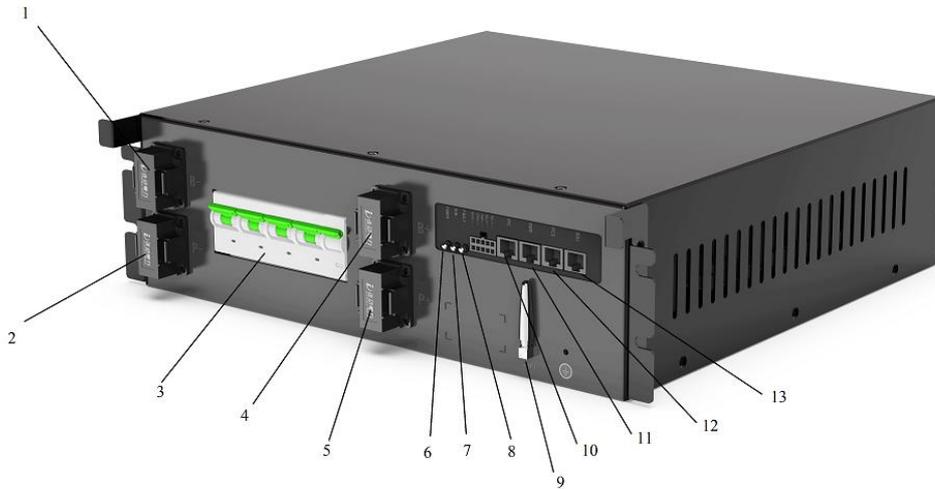


Fig3. HVCB-02A images

1. Battery system negative input B-;
2. Battery system negative output P-;
3. Circuit breaker;
4. Battery system positive input B+;
5. Battery system positive output P+;
6. Battery system energy input indicator;
7. Battery system running indicator;
8. Battery system fault indicator light;
9. WIFI Antenna;
10. IPC;
11. EMS;
12. PCS;
13. BSU.

The electrical drawing of HVCB-02A is as follows:

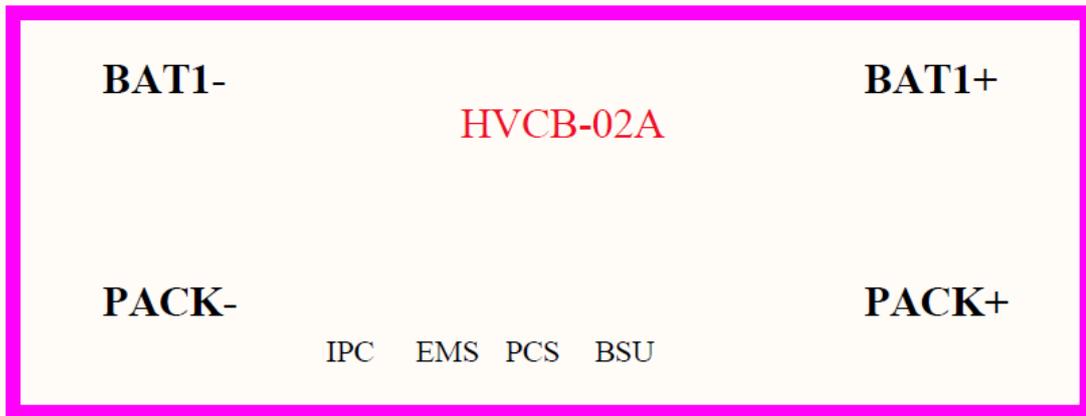
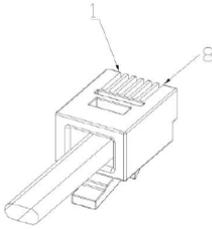


Fig4. HVCB-02A-Electrical drawing

As HVCB-02A need to communicate with the PCS, so here are the order definition of PCS port:

Table4. Definition of PCS port

| Item | PIN | Cable color | Net definition | Remarks |
|---|-----|----------------|----------------|----------------------|
| RJ45 Type B connection  | 1 | Orange & White | A1 | 485 Communication |
| | 2 | Orange | B1 | |
| | 3 | Green & White | / | |
| | 4 | Blue | CAN_H | CAN Communication |
| | 5 | Blue & White | CAN_L | |
| | 6 | Green | / | |
| | 7 | Brown & White | / | |
| | 8 | Brown | / | |

b) HVCB-03A with BAU

It is for systems with a structure of more than one series of battery units to achieve higher energy storage. Each series of the batteries is connected to its HVCB-03A, and then connects and communicates with BAU as a whole communication unit.

Similar to HVCB-02A, HVCB-03A equipped with control devices, fuses and relays. It has the functions of fault alarm, fault protection and safety protection lamp to ensure the safety of the battery. At the same time, it has the function of emergency stop and step by step disconnect the system during maintenance. The technical

parameters are shown in Table 3.

BAU is the central information hub of the battery control system, it obtains information from all HVCB-03A including voltage, current, temperature, insulation impedance, SOC, relay status and fault status information through the internal CAN bus. BAU has option to communicate with EMS (energy management system) and PCS through Ethernet, to deploy request based on EMS control strategy, and realize energy scheduling, system thermal management and fault handling.

The HVCB-03A needs to bundle BAU or there will be no function and the device will not even start up.

Here are the parameters of HVCB-03A and BAU:

Table5. Parameters of HVCB-03A

| HVCB-03A | |
|-----------------------------|---|
| Operating voltage range | 150V~900Vdc |
| Rated Current | 100A(125A at max) |
| Operating temperature range | -40°C~85°C |
| Communication port | 2 ways of CAN@ 3 ways RJ45 physical interface |
| Analog Signal port | 5 ways of dry contact@ 2ways in 3 ways out |
| Dimension | 478mm*434mm*133mm (W*L*H) |
| Weight | 3500m |
| Installation mode | Screw fixation |
| Protection | Short protection |
| | Over current protection |
| | Over Voltage protection |
| | Under Voltage Protection |
| | Temperature Protection |
| | Breaker Monitor |
| | Remote Control |

Table6. Parameters of BAU

| BAU | |
|--------------------------------|-------------------------------------|
| Operating voltage | 24Vdc |
| Operating temperature | -30°C~75°C |
| Working humidity | 5%~95% |
| 485 Communication | 5 ways @ Modbus |
| Ethernet Communication | 3 ways @ TCP/IP |
| CAN Communication | 2 ways @ CAN 2.0B |
| Dry Contact | 9 ways @ 5ways output, 4 ways input |
| Temperature Detection Range | -40°C~120°C |
| Temperature detection accuracy | ≤±1°C |
| Operating Power Consumption | <3.8W |
| Sleep Power Consumption | <0.03mW |
| SD Card Storage | 64G TF Card |
| PCS Communication | 485 or CAN |
| EMS Communication | TCP/IP |
| Dimension | 348mm*150mm*48mm (W*L*H) |

The image of the HVCB-03A is as follows:

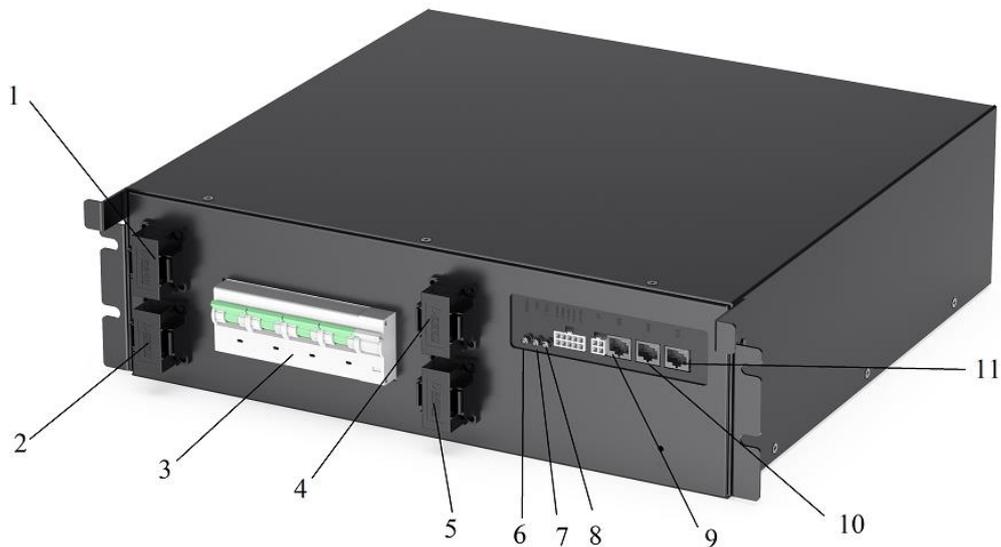


Fig 5. HVCB-03A images

1. Battery system negative input B-;
2. Battery system negative output P-;
3. Circuit breaker;
4. Battery system positive input B+;

5. Battery system positive output P+;
6. Battery system energy input indicator;
7. Battery system running indicator;
8. Battery system fault indicator light;
9. BMU, Cluster Parallel or communicate with BAU;
10. BMU, Cluster Parallel or communicate with BAU;
11. BSU, Communicate with Slave Unit.

The electrical drawing of HVCB-03A is as follows:



Fig 6. HVCB-03A images-Electrical drawing



Fig 7. BAU images

1. TOBAT Communication Port;
2. Communication Port;
3. DEBUG Communication Port;
4. PCS Communication Port;
5. Power indicator light;
6. Run indicator light;
7. Fault indicator light;
8. Dry Contact Port;
9. ON/OFF Power;

The electrical drawing of BAU is as follows:

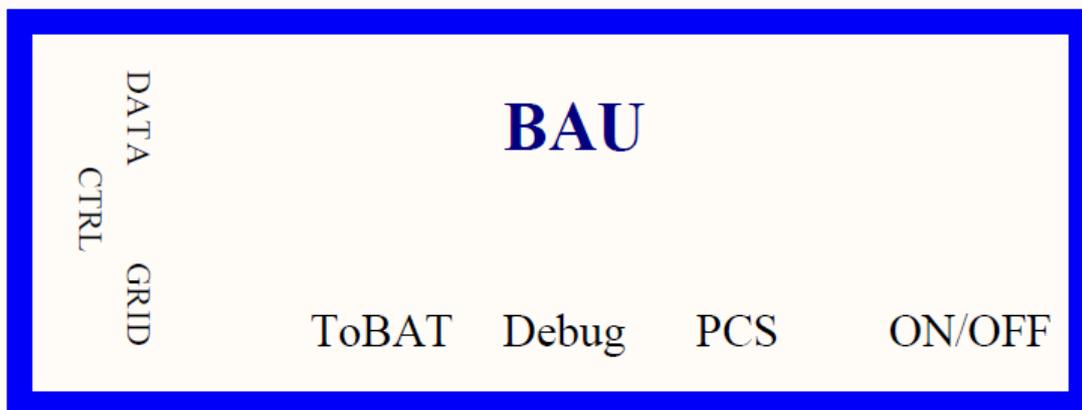
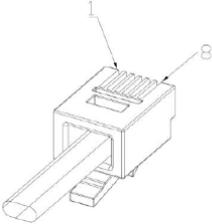


Fig 8. BAU images-Electrical drawing

As BAU need to communicate with the PCS, so here are the order definition of PCS port:

Table7. Definition of PCS Port

| Item | PIN | Cable color | Net definition | Remarks |
|---|-----|----------------|----------------|----------------------|
| RJ45 Type B connection  | 1 | Orange & White | A1 | 485 Communication |
| | 2 | Orange | B1 | |
| | 3 | Green & White | / | |
| | 4 | Blue | CAN_H | CAN Communication |
| | 5 | Blue & White | CAN_L | |
| | 6 | Green | / | |
| | 7 | Brown & White | / | |
| | 8 | Brown | / | |

1.3 BR3000 – Remote energy management system

The EMS is energy management on top of battery modules and/or PCS (Power control system). It used to remotely collect information of the all batteries and PCS, configure and deploy energy management strategy and logic.

Basically, we can get all the cell voltage, temperature, current and fault status information from the EMS as well as PCS. Connect the EMS to the internet, we can get all the information remotely.

We offered BR3000 EMS and Router, specifications as shown in the attachment. Please contact us if you want to use your own brand.

2. Hardware Wiring and Configuration

2.1 Hardware Wiring and configuration for HVCB-02A

How to connect Cables to the Battery Terminal

1. Identify the positive B+ and negative B- terminals on your battery using the Power cable (color in orange). Terminals are labeled.
2. Verify you have all hardware to attach the cable properly. Check to ensure the bolt insert for the terminal fully seats and can be tightened to the proper torque.
3. Connect the cables to your battery terminals by removing the terminal bolts, inserting them through the eyelet of the proper cable, and reseating the bolt into the terminal block to the correct torque.
4. DO NOT finger-tighten the terminal bolts. They require a specific torque (60 in-lb/7nm) to ensure they do not loosen during operation. Failure to properly tighten the terminal bolts can result in serious damage and will void your warranty.

Connect Your Batteries in SERIES – batteries are needed to connect in SERIES to achieve higher voltage.

Power cable connection

1. Connect the positive terminal B+ to the negative terminal B- of the next battery.
2. Connect one end of the battery B+ terminal to HVCB B+ terminal. Connect the other end of the battery B- terminal to HVCB B- terminal as below pic.

Data (communication) cable connection

1. Connect HVCB BSU to the CAN-1 port of the nearest battery.
2. Follow the connection sequence of power cable.

Connect the CAN-2 port to the CAN-1 port of next battery. The last blank CAN port should insert a CAN plug to match communications.

All battery information will be uploaded to HVCB through the BSU communication port.

3. Connect the EMS port to router to access the internet to achieve remote data management.

Application program is needed to install to configure the HVCB internet access.

Grounding

Connect the grounding screw with ground cables provided and then connect to the grounding conductor.

Warning – DO NOT ground rack/cabinet or door to negative or positive terminal in the battery

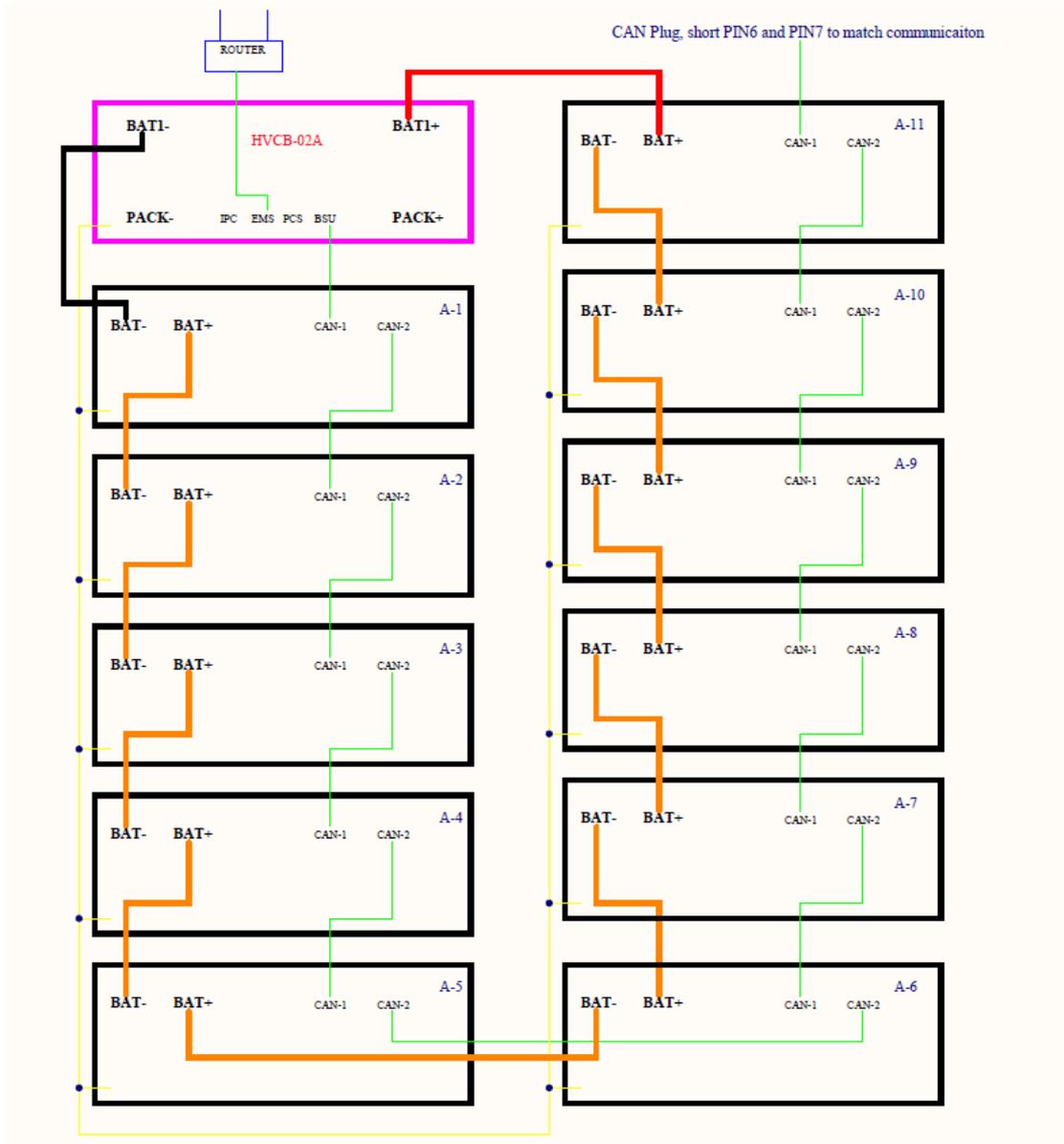


Fig 9. Hardware wiring for HVCB-02A

PC Software installation and configuration:

A PC is needed to run a Windows application program. It is used as a diagnostic and configuration tool (for remote access) for HVCB-02A.

Connect PC to the router LAN port.

Confirm the network setting in PC

1) Network settings on PC(Automatically)

HVCB-02A and PC automatically get the IP address from the router (DHCP).
Windows default network settings are shown as below.

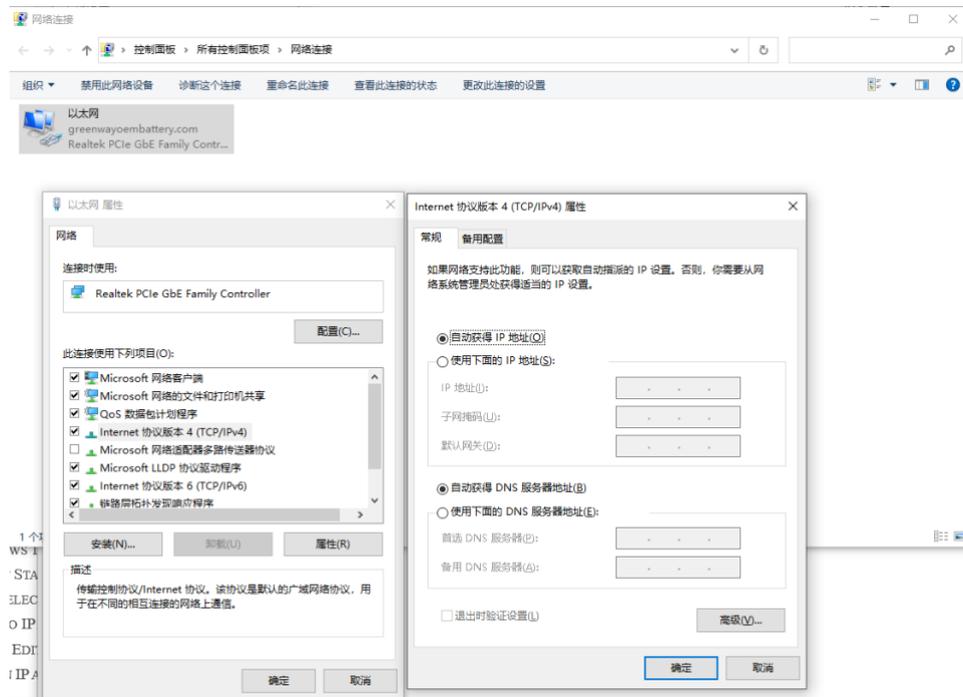


Fig10. Network Setting: automatically get IP address

2) Application HV_Master configures on Windows OS

Note: Application is supported on Windows OS only

a. Start HV_Master application in PC

Open the folder and double click this icon: HV_Master.exe to start the application.

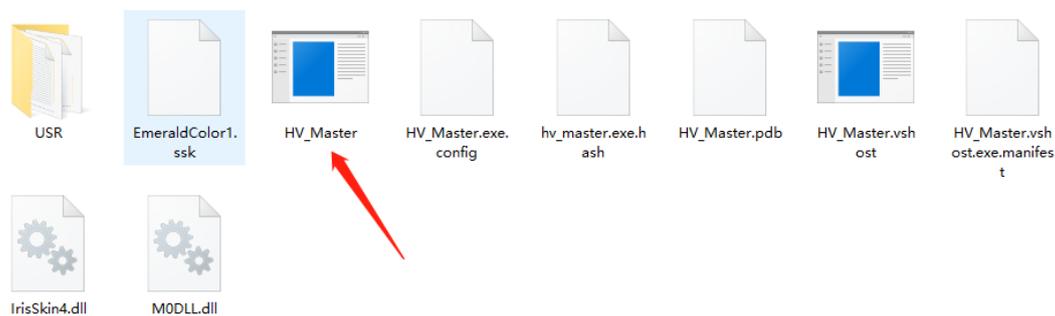


Fig11. Open HV_Master application

b. Login to Admin mode

In “Key Info” tab -> “Admin Mode” box, enter “jsyh1234” in “Admin password” and then click “Login”

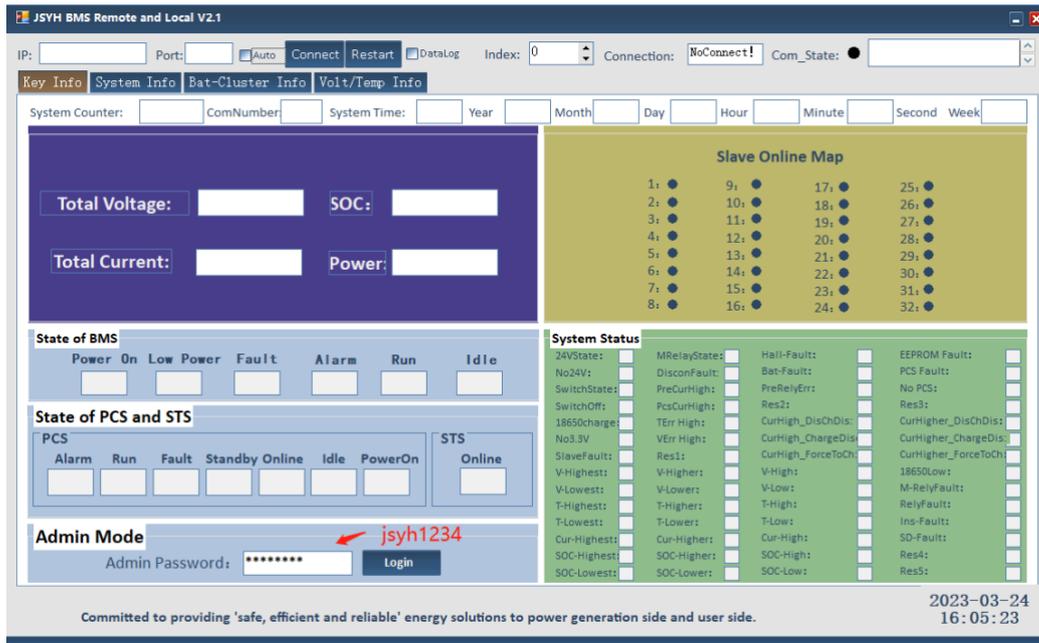


Fig12. Admin password: jsyh1234

c. Detect local and setting

i) Go to “Upgrade/Remote” tab;

ii) Click “Search”, output Message will show the detected IP address of the PC, then click “LAN”, and then click “Connect”, the “Com_State” light will turn green after the battery system get connected with the application program;

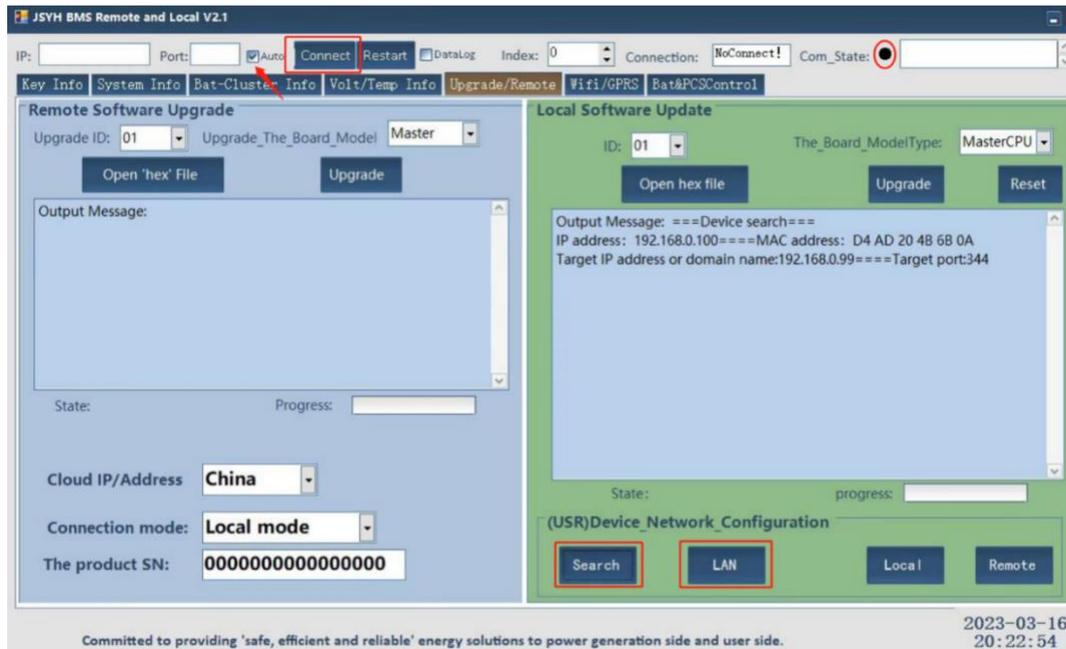


Fig13. Search-LAN-Connect-Com_State light turns green

iii) Go to “Bat&PCS Control” tab, enter“ 30000” in command run time, then

click “Write” to let the battery system go into test mode;

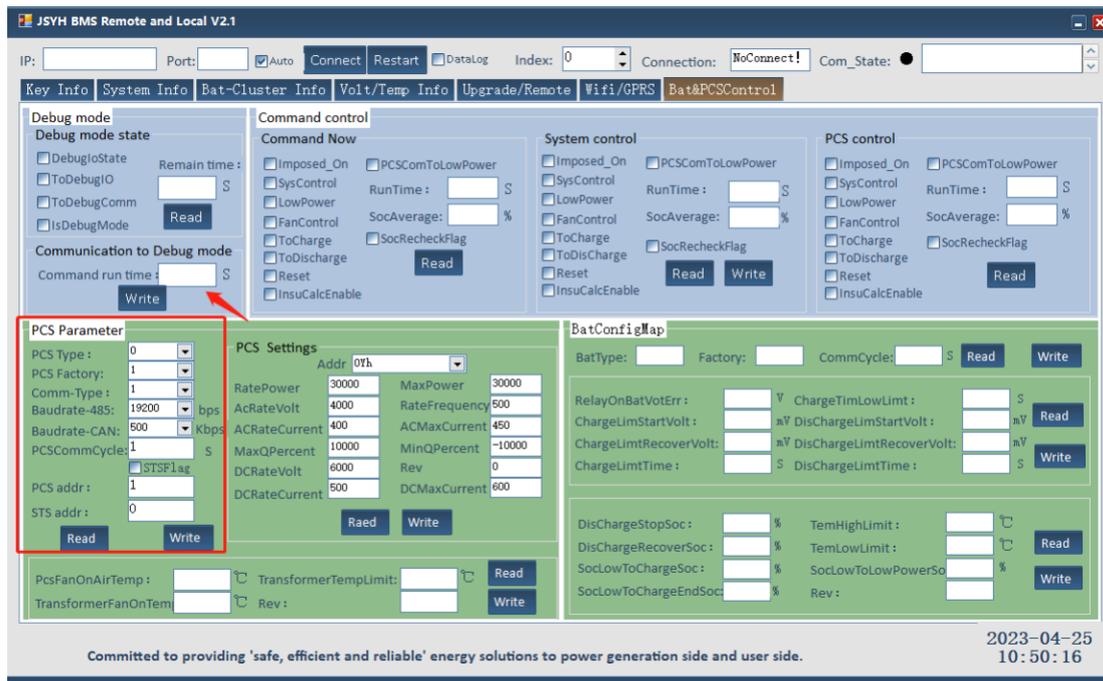


Fig14. Enter 30000 in Command run time in case the HVCB-02A goes into sleep mode

IV) Setting “PCS parameter” to match the different brands of PCS, shown in

Fig14. Here are the settings of different brands of PCS:

| PCS Brand | PCS type | PCS Factory | Comm -Type | Baudrate -485 | Baudrate -CAN | PCS Comm Cycle | PCS addr | STS adr |
|-----------------|----------|-------------|------------|---------------|---------------|----------------|----------|---------|
| Deye/PYLON | 0 | 1 | 1 | 19200 | 500 | 1 | 1 | 0 |
| Goodwe /Sunways | 0 | 6 | 1 | 19200 | 250 | 1 | 1 | 0 |
| ATESS | 0 | 8 | 1 | 19200 | 250 | 1 | 1 | 0 |
| MEGAREVO/ Solis | 0 | 5 | 1 | 9600 | 500 | 1 | 1 | 1 |
| Growatt | 0 | 9 | 1 | 19200 | 500 | 1 | 1 | 0 |

d) Trail Run:

After all the parameters are set, start the PCS to Trail run and see if there are any alarm in red.

If there is an alarm, please check the connections and settings, if there are still

problems, please feel free to contact us.

e) go to remote mode:

After the PCS run well, go to “Upgrade/Remote” tab, click “Search” and “Remote”, then the battery system can be monitored remotely online.

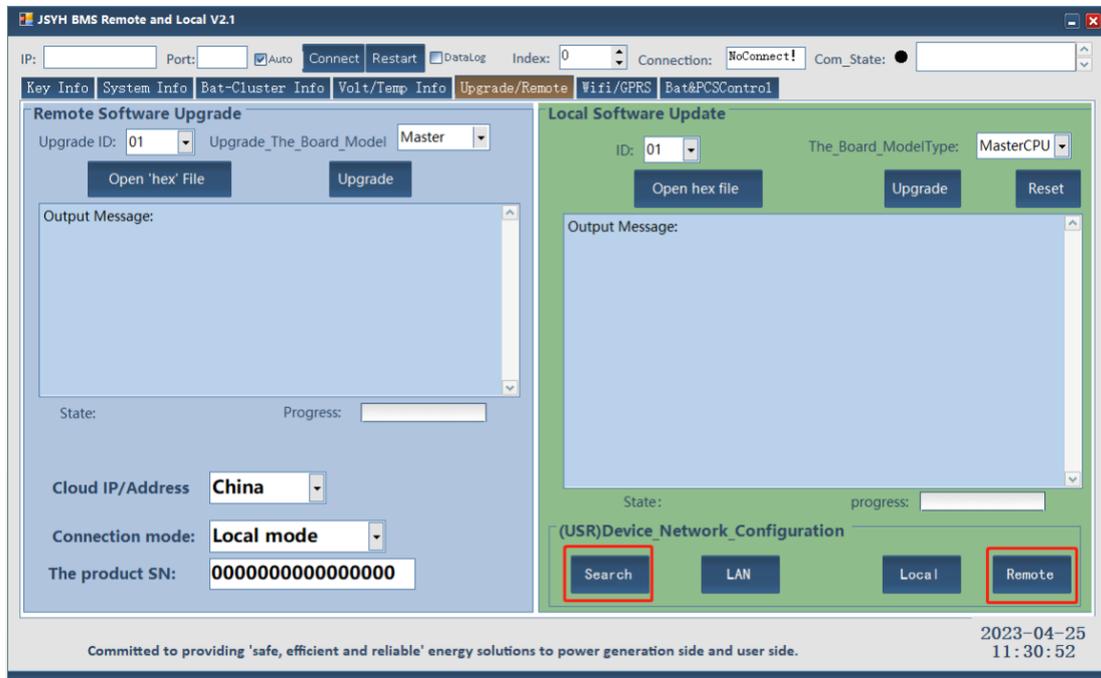


Fig15. Search-Remote, then the battery system can be monitored remotely

2.2 Hardware Wiring and configuration for HVCB-03A and BAU

Each HVCB-03A connected to one series of HVB50096 batteries. Batteries are connected in series to achieve the expected voltage.

And connect all HVCB-03A in parallel to obtain the accumulated capacity.

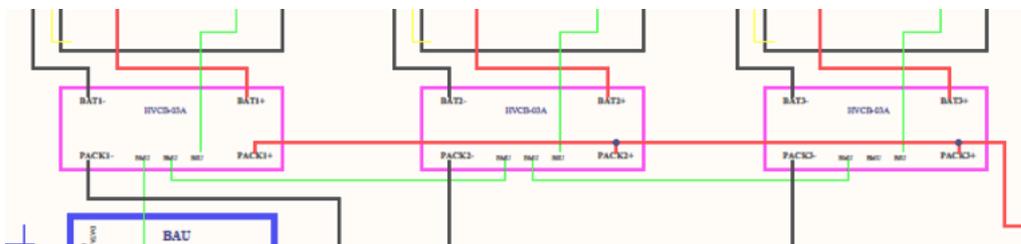


Fig16. All HVCB-03A in parallel

How to connect Cables to the Battery Terminal

1. Identify the positive B+ and negative B- terminals on your battery using the Power cable (color in orange). Terminals are labeled.
2. Verify you have all hardware to attach the cable properly. Check to ensure the bolt insert for the terminal fully seats and can be tightened to the proper torque.
3. Connect the cables to your battery terminals by removing the terminal bolts, inserting them through the eyelet of the proper cable, and reseating the bolt into the terminal block to the correct torque.
4. DO NOT finger-tighten the terminal bolts. They require a specific torque (60 in-lb/7nm) to ensure they do not loosen during operation. Failure to properly tighten the terminal bolts can result in serious damage and will void your warranty.

Power cable connection

1. Connect the positive terminal B+ to the negative terminal B- of the next battery, one after the other within the same series of battery.
2. Within the series of battery, connect one end of battery B+ terminal to HVCB B+ terminal. And connect the other end of the battery B- terminal to HVCB B- terminal.
3. Connect in parallel the PACK+ and PACK- of all HVCB-03A and to the PCS

Data (communication) cable connection

1. Connect HVCB BSU port to the CAN port of the first series connected battery.
2. Follow the connection sequence of power cable. Connect CAN port of battery to CAN port of next battery within the series. the last blank CAN port in the series should insert a CAN plug to match communications.

All battery information will be uploaded to HVCB through the BSU communication port.

3. Connect BMU to BMU port in series between HVCB-03A

All information will be collected to BAU.

4. Connect BMU of one end of HVBC-03A to BAU “To BAT” port.
5. Connect the CTRL port to router to access the internet to achieve remote data management.

Application program is needed to install to configure the HVCB internet access.

Grounding

Connect the grounding screw with ground cables provided and then connect to the grounding conductor.

Warning – DO NOT ground rack/cabinet or door to negative or positive terminal in the battery.

The electrical drawing of HVCB-03A system are shown as below example:

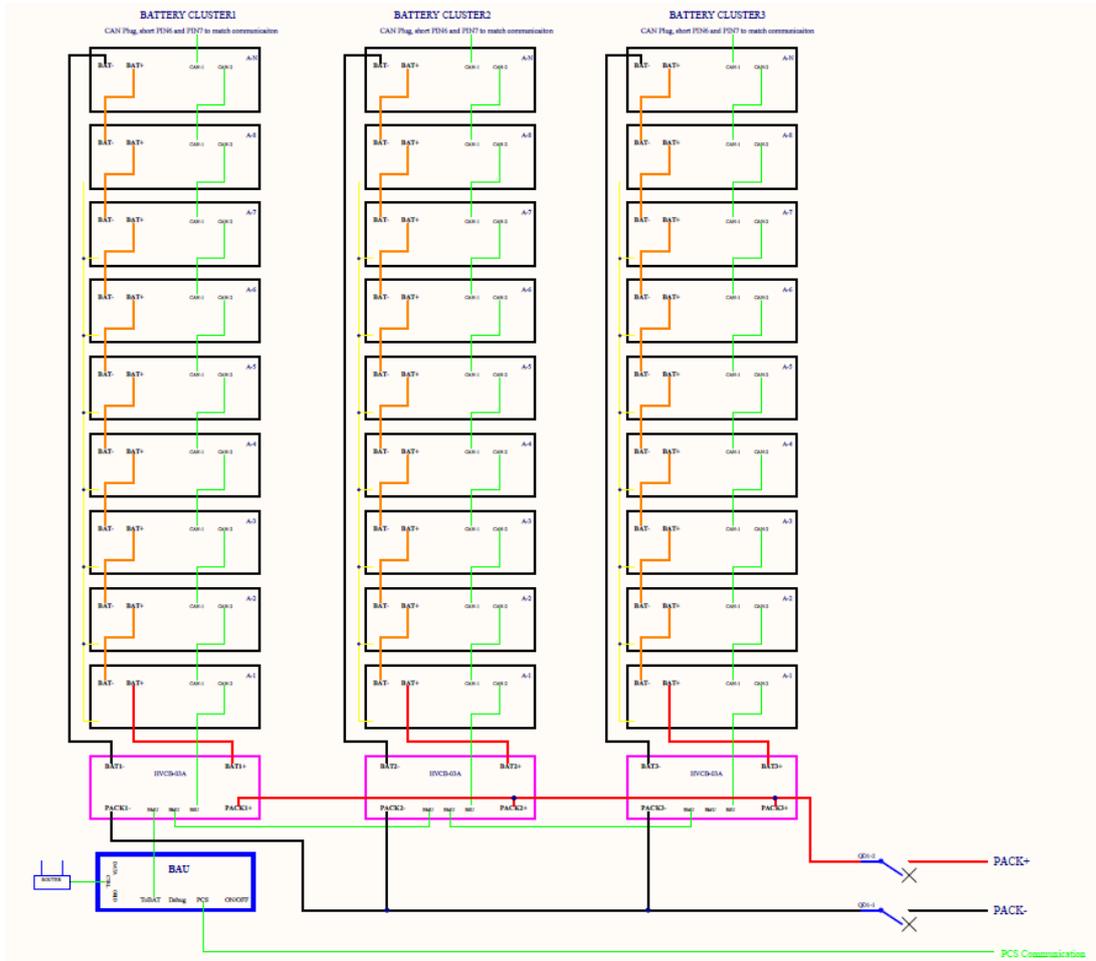


Fig17. Three Cluster Battery Module Connection Example

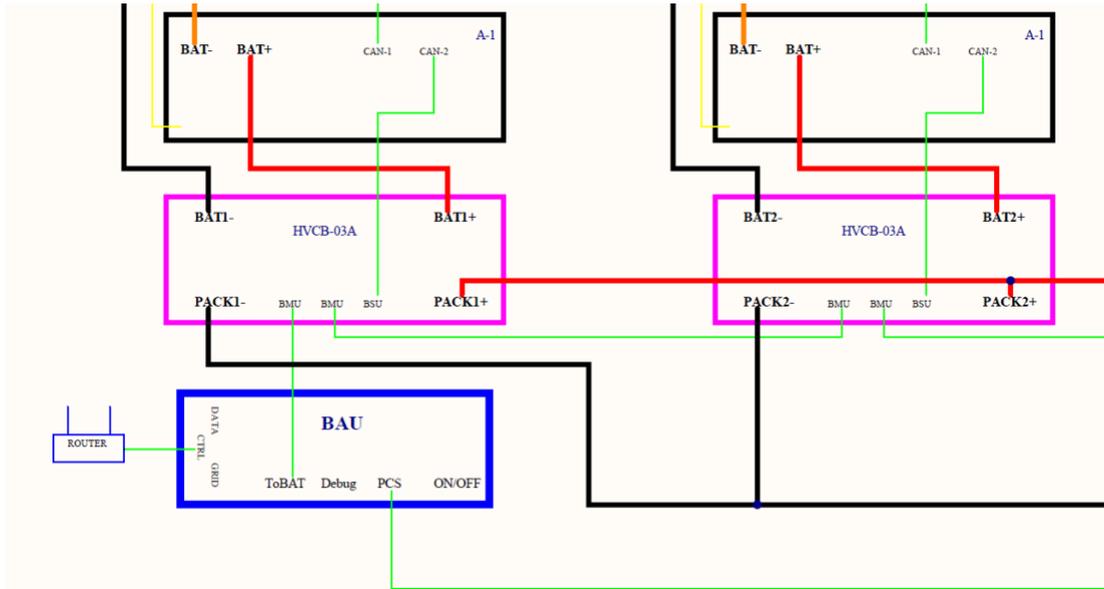


Fig18. Electrical drawing of HVCB-03A system

After all the cable connected well, start the system (start the breaker and then press the ON/OFF button on the BAU) and operate as below:

1) Network settings on PC(Automatically)

HVCB-03A and PC automatically get the IP address from the router (DHCP).

Windows default network settings shown as below.

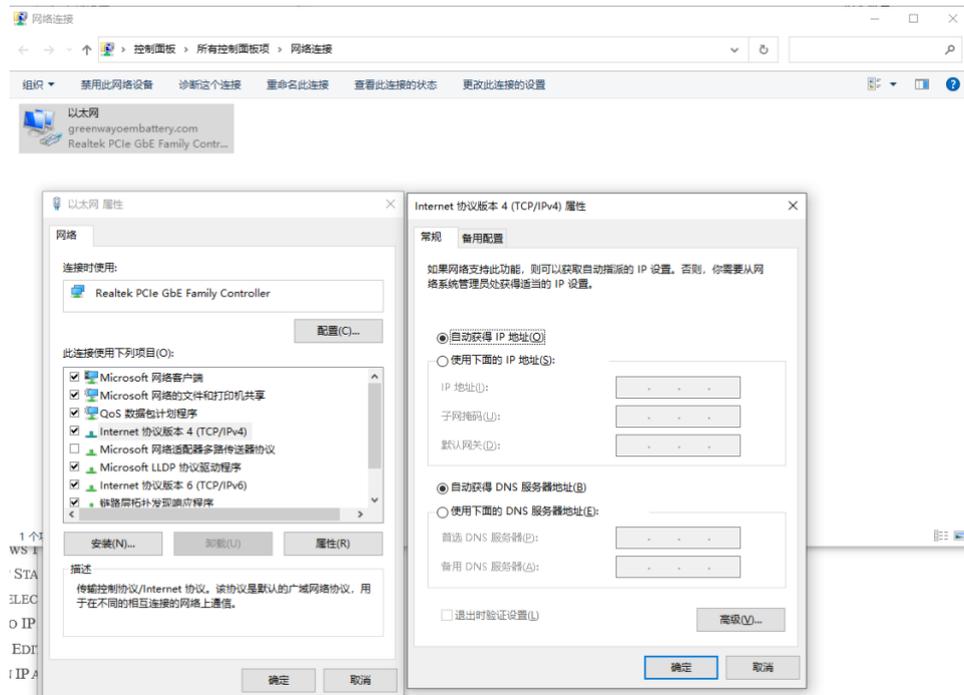


Fig19. Network Setting: automatically get IP address

2) Application HV_System configures on Windows OS

Note: Application is supported on Windows OS only

a. Start HV_System application in PC

Open the folder and double click this icon: HV_System.exe to start the Application program.

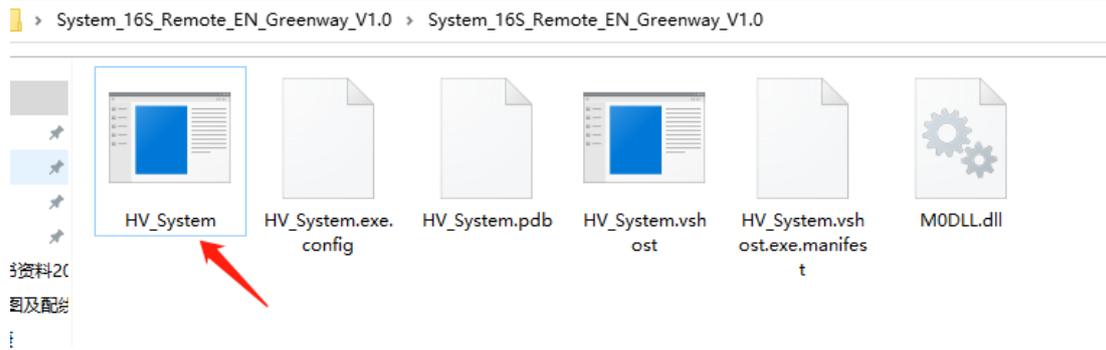


Fig20. Open HV_Master application

b. Login to Admin mode

In “Key Info” tab -> “Admin Mode” box, enter “jsyh5678” in “Admin password” and then click “Login”

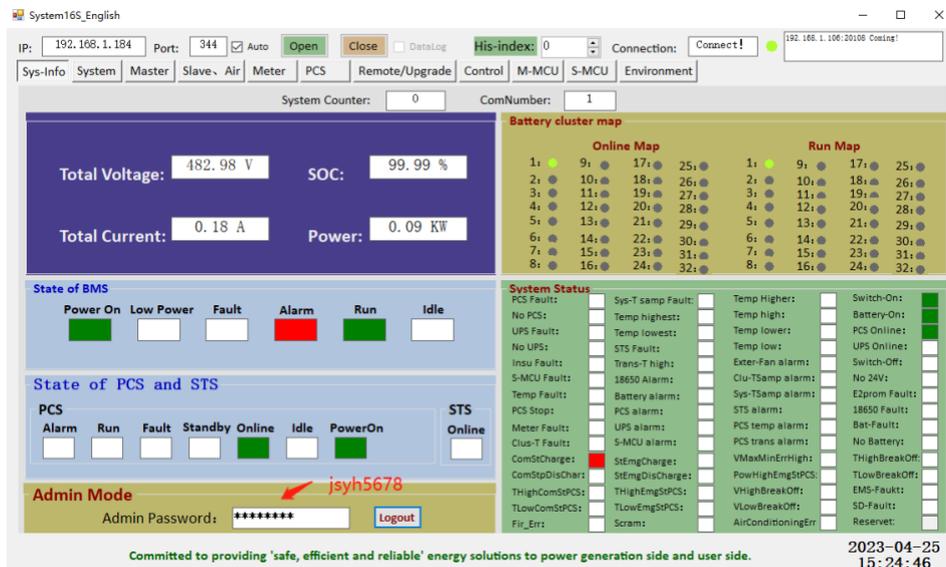


Fig21. Admin Password: jsyh5678

c. Detect local and setting

i) Go to “Upgrade/Remote” tab;

ii) Click “Search”, output Message will show the detected IP address of PC, and then click “LAN”, and then click “Connect”, the “Com_State” light will turn green

after the battery system get connect with the application program;

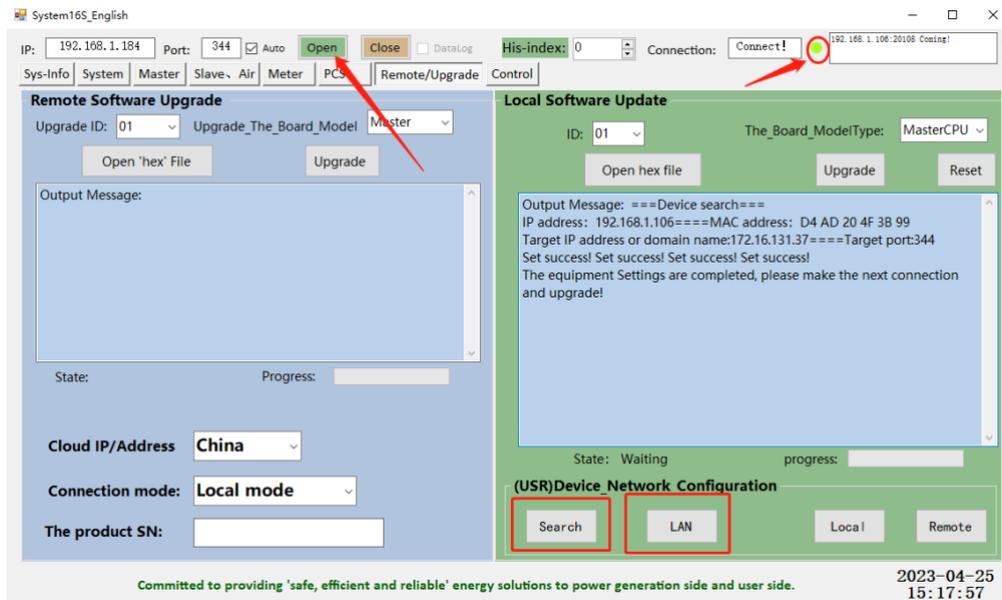


Fig22. Search-LAN-Open, the connection light will turn green if connected

iii) Go to “Environment” tab Setting PCS parameter to match different brand of PCS, shown in Fig. Here are the settings of different brand of PCS:

| PCS Brand | PCS type | PCS Factor | Comm -Type | Baudrate -485 | Baudrate -CAN | PCS Comm Cycle | PCS addr | STS adr |
|----------------|----------|------------|------------|---------------|---------------|----------------|----------|---------|
| Sinexcel 100kw | 0 | 2 | 1CAN | 19200 | 250 | 1 | 1 | 0 |
| Goodwe | 0 | 6 | 1CAN | 9600 | 250 | 1 | 1 | 0 |
| Sinexcel | 0 | 7 | 1CAN | 9600 | 250 | 1 | 1 | 0 |
| Deye/PYLON | 0 | 9 | 1CAN | 19200 | 500 | 1 | 1 | 0 |
| ATESS | 0 | 10 | 1CAN | 19200 | 250 | 1 | 1 | 0 |
| MEGAREVO | 0 | 11 | 1CAN | 9600 | 500 | 1 | 1 | 0 |

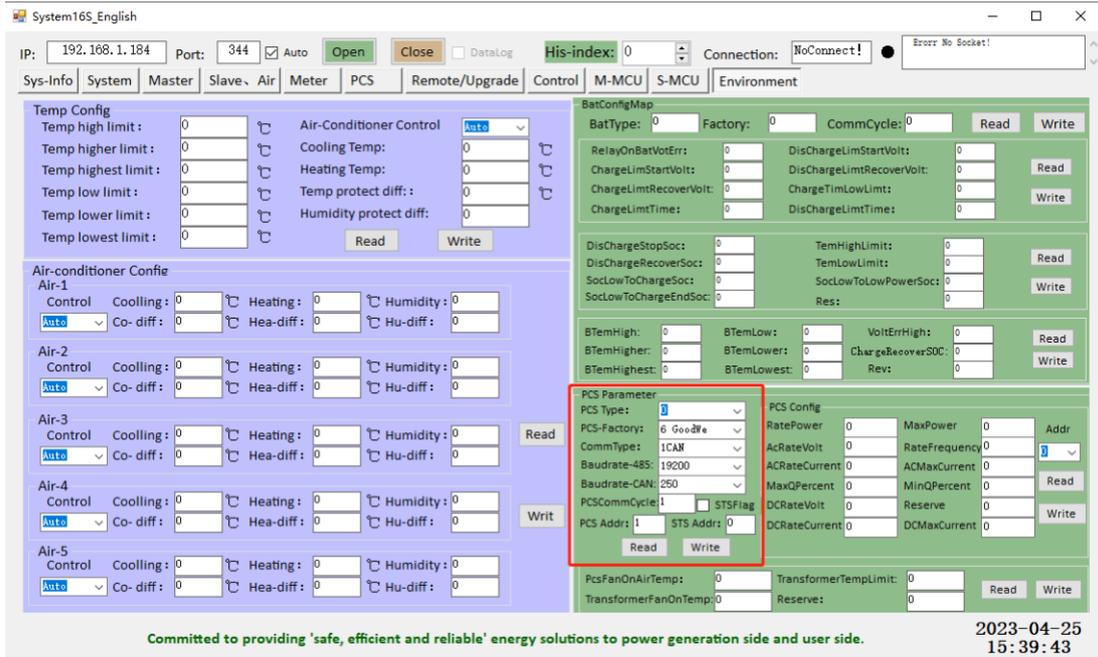


Fig23. PCS Parameter Settings

d. Number of high voltage control box setting

Setting the number of high voltage control box in “PCS” tab -> “Master Map” box, for example, choose “0” if there is only one HVCB-03A, choose “1” if there are two HVCB-03A, and so on, in total, we can set 32 HVCB-03 boxes in the system.

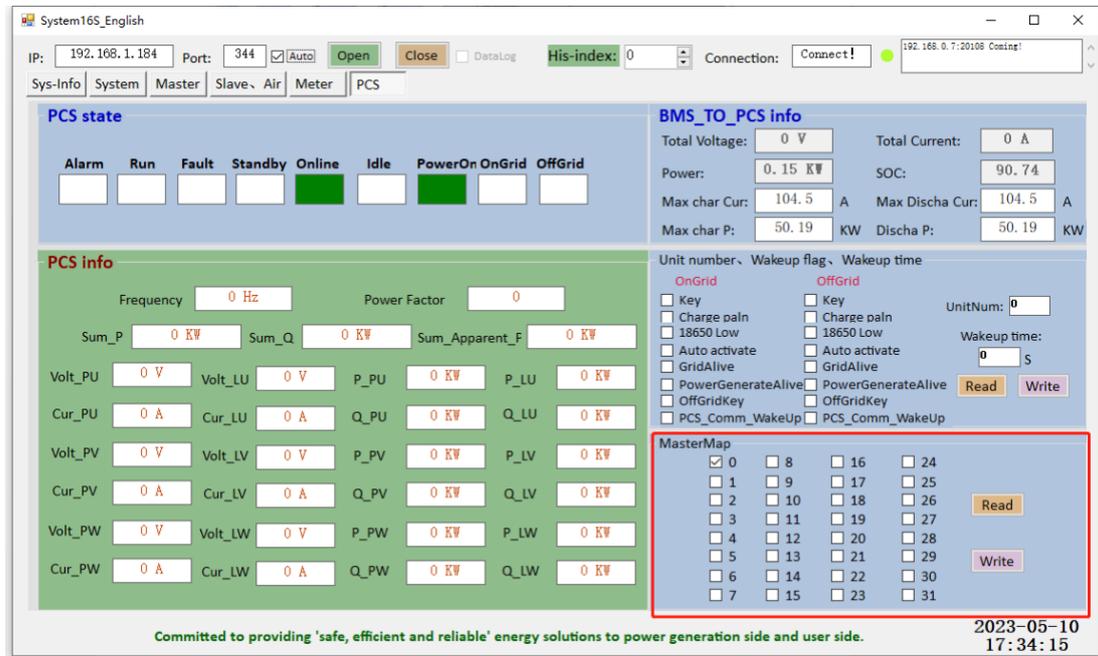


Fig24. Number of HVCB-03A box setting

e) Trail Run:

After all the parameters are set, start the PCS to Trail run and see if there are any alarm.

If there is an alarm, please check the connections and setting, if there are still problems, please feel free to contact us.

And record the SN number of the BAU as below

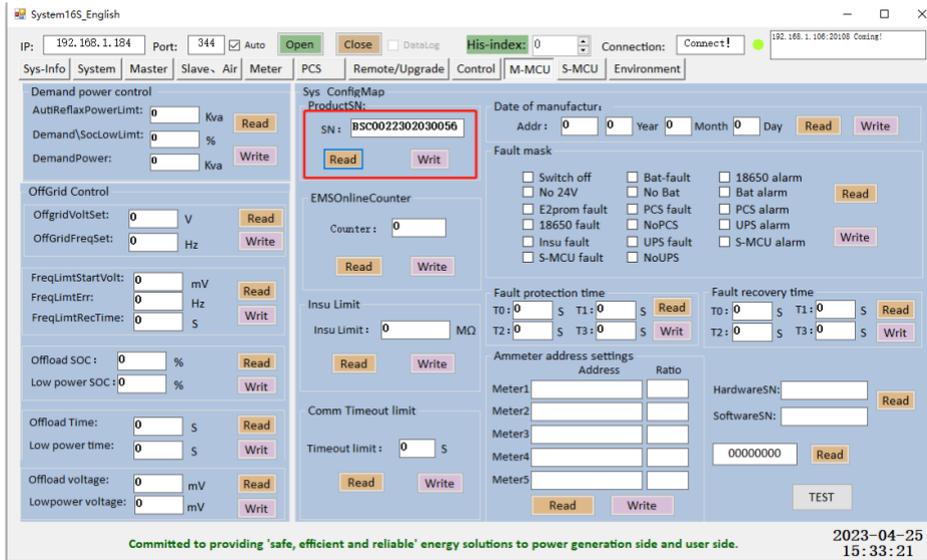


Fig25. PCS Parameter Settings

f) go to remote mode:

After the PCS run well, go to “Upgrade/Remote” tab, click “Search” and “Remote”, then the battery system can be monitored remotely online.

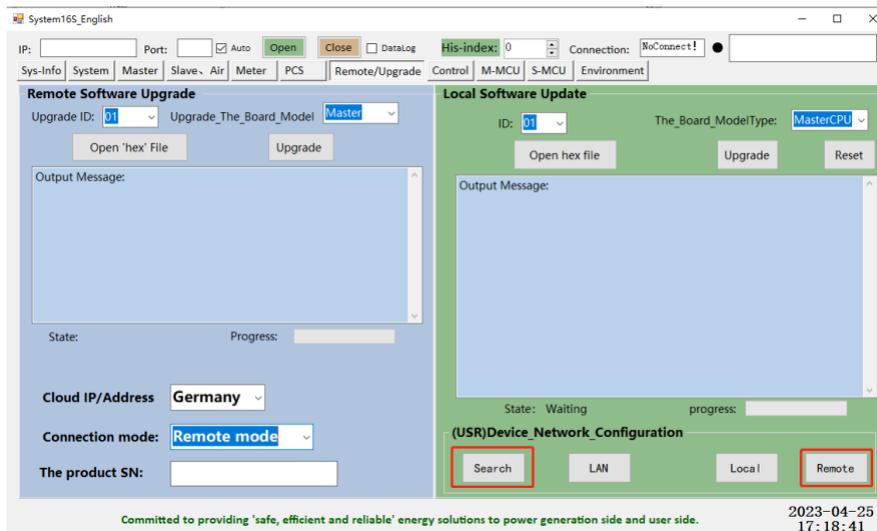


Fig26. Search-Remote

3. APP download and application

3.1 App download and register



Fig27. Batterich App download

Use the QR code to download app and register with your own e-mail

Batterich Battery

Login Register

Please enter the email

Please enter password

— . . .

→

Fig28. Register with E-mail account

3.2 App application

a) Bind your own device, there are three ways to bind, as below

Bonded device



Fig29. Bind your device

b) After the device is binded, the information of the whole system can be checked on your mobile phone.



Fig30. Information Interface