

EMS-01D

user manual

Version	Descriptive	Data
V1.0	First Edition	2023-09-26
V1.1	1. Add Ethernet port wiring to the system wiring diagram. 2. Add network firewall whitelist	2023-10-11

CATALOGS

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1 About this manual

1.1 Introduction

The purpose of this manual is to provide readers with detailed product information and maintenance instructions for industrial and commercial energy storage communication box controllers.

1.2 For Readers

This document is intended for users who perform routine operations on the energy management controller of the energy storage communication box. You can use this document to perform operations during use and commissioning. Readers should have some electrical knowledge and be familiar with the characteristics of energy storage systems. This manual does not cover the electrical connection of inverters, batteries, and related safety precautions, please refer to the corresponding user information.

1.3 Manual Usage

This manual contains important information about the operation of energy storage systems. Before operating and maintaining the energy storage system, read this manual carefully and follow the operation methods described in this manual. Otherwise, equipment damage, personal injury, and property loss may occur. Please keep this manual properly to ensure that the operator can read it at any time. The content of the manual will be updated and corrected continuously, but it is inevitable that there will be a slight discrepancy or error with the real thing. Please refer to the actual product purchased.

1.4 Symbol Use

Before reading the manual, keep in mind several types of security alert messages. As explained, familiarity with these types of messages and the importance of various signal words.

Warnings relating to safety information, including the following:

- Warning signs (symbols)
- Risk level
- Detailed information on the nature and source of the risk
- Detailed information on possible consequences if the warning is ignored
- Measures to avoid danger, injury or property damage
- Warning Description Danger levels are classified according to the following levels



Hazardous!

Indicates a highly hazardous situation which, if not avoided, will result in death or serious injury



Warning!

Indicates a hazard with a medium level of risk that could result in death or serious injury if not avoided



Notice!

Indicates a hazard with a low level of risk that, if not avoided, could result in moderate or minor injury

Please pay attention to the hazard warning marks on the body, which include:

Identifier	Identifier explain
	This symbol indicates that the body contains high pressure, and touching it may result in the risk of electric shock.
	This symbol indicates that the temperature here is higher than the acceptable range of human body. Do not touch it arbitrarily to avoid personal injury.
	This symbol indicates that the PE end is securely grounded to ensure the safety of the operator.

2 Safety notice

This chapter describes the safety precautions to be taken during operation of the energy storage communication box controller. Energy storage communication box controllers are designed and tested according to international safety requirements. However, as a power electronic product, it is necessary to strictly follow the relevant safety precautions during installation, operation and maintenance.

Operation requirements:

- Operators should be familiar with this manual
- The operator should be fully familiar with the relevant standards of the country/region where the project is located
- Operators should be familiar with the working principle of the energy storage system
- Before starting the system, carefully check the electrical status of the system and the three-phase mains and secondary mains. Make sure the system is in a safe and uncorrupted state, if not, do not boot the system

Improper use or mishandling may harm:

- Life and personal safety of the operator or third parties

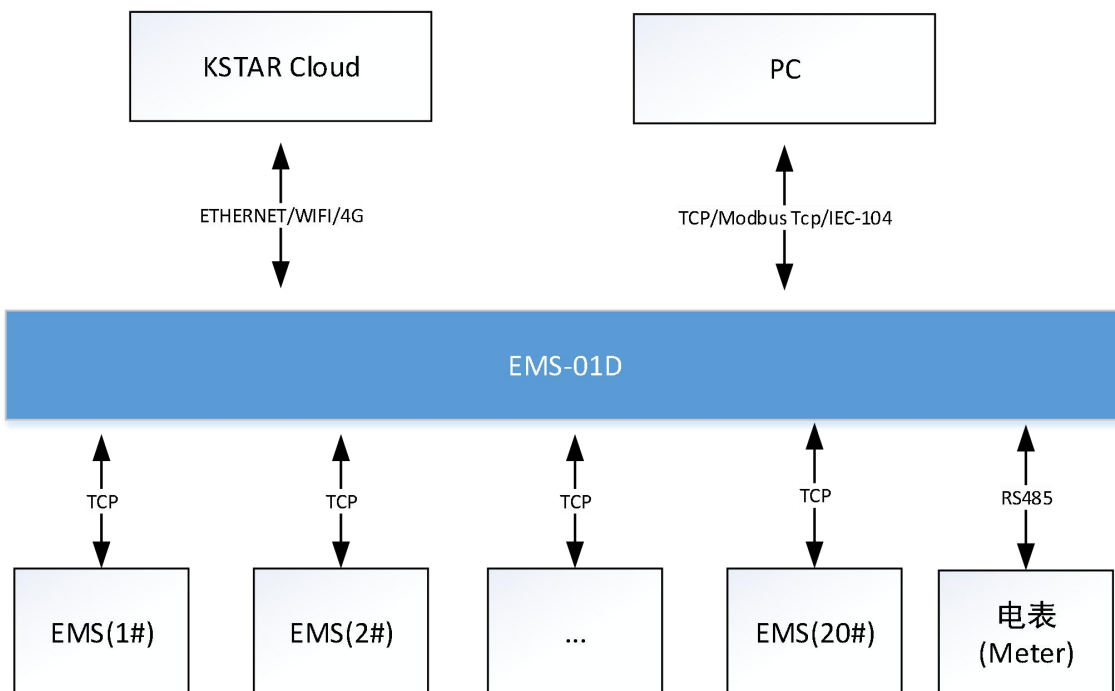
- Energy storage communication box controller and other property belonging to the operator or third parties

3 Product description

3.1 Outlook



3.2 System framework



3.3 Function Description

Note: EMS is independent of each other, when one of the batteries or other factors can not be charged and discharged, it does not affect the work of other energy storage system units; Priority PV charging and discharging during charging and discharging.

Anti-reflux function: When the battery is full and have PV, the energy storage system feeds the maximum power to the grid.

Demand control function: The maximum power of the load and energy storage system. When the power of the meter at the total incoming line is higher than the demand control threshold, it indicates that the power taken from the grid is too large. The energy storage system reduces the charging power until the power is lower than the threshold.

Meter power at the total incoming line: refers to the meter active power installed between the grid and (load, energy storage system). When the energy storage system is not charged or discharged, it is equal to the load power. Direction: From the power grid to the load direction.

Photovoltaic: Always maximize output, supply power to the load or battery, and limit photovoltaic output when the battery is full (feed photovoltaic electricity to the grid in self-generated self-use mode).

Energy storage communication box: When there is an energy storage communication box in the energy storage system, data uploaded to the cloud platform, IEC-104, ModbusTcp data are transmitted through the energy storage communication box, no longer through the EMS to the external transmission.

3.3.1 Manual control

In this mode, the switch and running power are manually controlled, which is convenient for field workers to debug, test and other work.

When the switch machine is controlled, the energy storage communication box sends on-off instructions to all EMS, and the EMS sends on-off instructions to KAC.

When the operating power is controlled, the energy storage communication box evenly distributes power to each EMS, and the EMS sends power to the KAC.

3.3.2 Spontaneous self-use

In automatic self-use mode, the power supply priority is as follows: PV > Energy storage > Mains, PV energy provides the load first, then charges the battery, and finally feeds the grid; When the PV energy is less than the load, the battery power compensation is preferred, and the mains power is finally used. In automatic self-use mode, the mains does not charge batteries (except after

the mains charging setting is enabled).

In spontaneous self-use mode, the following functions can be superimposed:

1. Mains charging

When mains charging is enabled: When the set time is reached, the mains is used to charge the battery.

2. Grid-connected power control

When Export Power Control is enabled: When the PV power is greater than the load and charge power, the excess power is fed back to the grid, at most the grid-connected power setting value. When the set value is 0, no excess PV power is allowed to feed back to the grid.

3. Demand control

When Demand Control is enabled: During mains charging, when the charging + load power is greater than the set value of demand, the charging power is automatically limited to ensure that the charging + load power does not exceed the set value of demand.

4. Optical storage AC coupling

This item needs to be enabled when the energy storage system and the photovoltaic inverter form an AC coupled optical storage system. Otherwise, the photovoltaic inverter may not be able to charge the energy storage battery.

3.3.3 Time-sharing control

In the time-sharing control mode, the power supply priority is as follows: PV > Energy storage > Mains; In the discharge, PV energy provides the load first, then charges the battery, and finally feeds the power grid; When charging, PV energy gives priority to the battery, and then the battery is charged with mains electricity.

In time-sharing control mode, the following functions can be superimposed

1. Grid-connected power control

When Export Power Control is enabled: during discharge, when the PV power is greater than the load power, the excess electricity is fed back to the grid, at most the grid-connected power setting value. When the set value is 0, no excess PV power is allowed to feed back to the grid.

Export Power Control when discharging, discharge according to the set power;

2. Demand control

When Demand Control is enabled: During charging, when the charging + load power is greater than the demand value, the charging power is automatically limited to ensure that the charging + load power is not greater than the demand value.

Demand Control (Demand Control) disable: when charging, charge according to the set power;

Note: Settings are required from Monday 1 to Monday 7.

3.3.4 Peak cutting and valley filling

In peak cutting and valley filling mode, charging or discharging from the mains according to the power of the grid, PV energy provides the load first, and then charges the battery.

1. Valley charging

When the load power is less than the valley power, use the mains power to charge the battery. The power taken from the grid is greater than or equal to the valley value power.

2. Peak discharge

When the load power is greater than the peak power, the energy storage system feeds and discharges to the grid, making the power taken from the grid less than or equal to the peak power.

3.3.5 Battery Backup

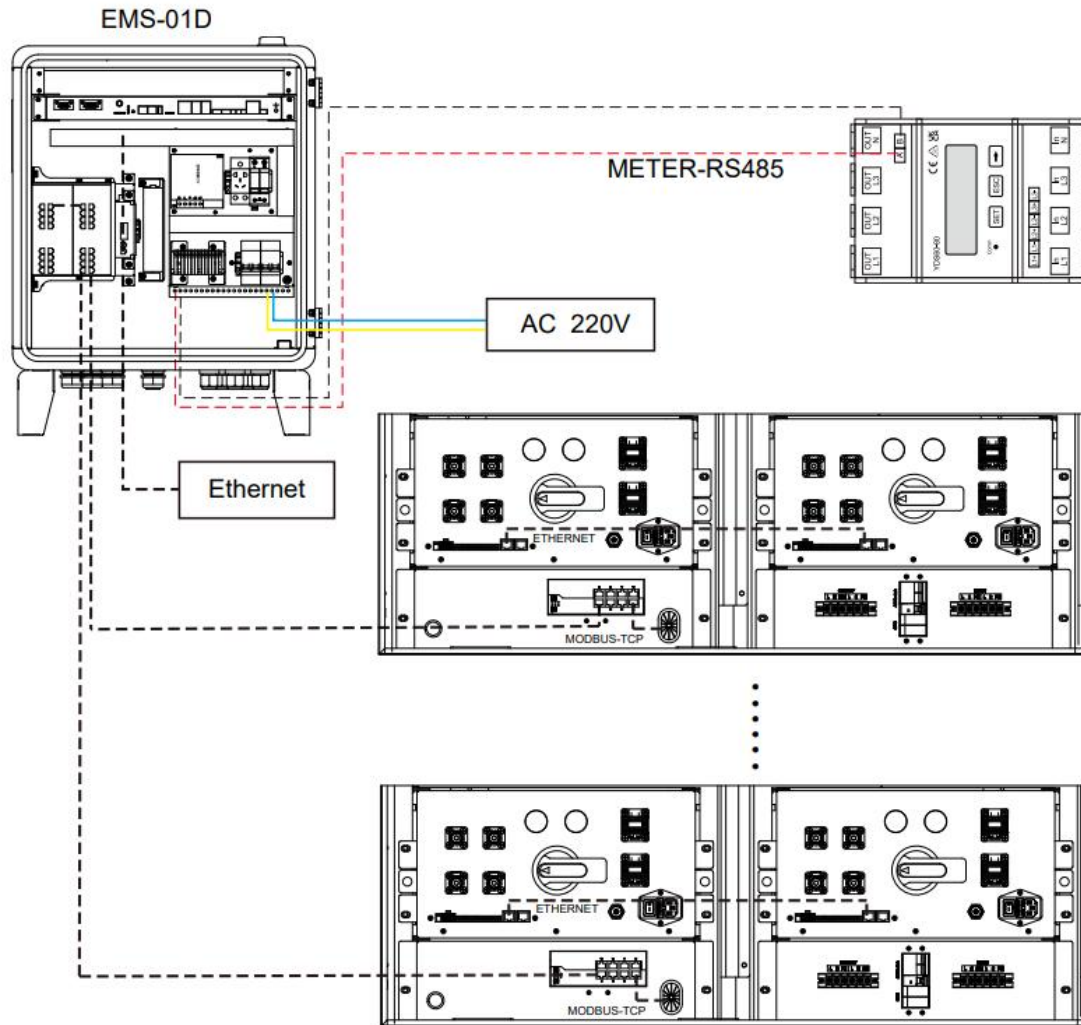
In battery backup mode, When the real-time battery charge (SOC) is lower than the backup SOC: If the sum of the charging power and load power is not greater than the required power, charge the battery from the mains until the real-time SOC is greater than or equal to the backup SOC.

When the real-time battery charge (SOC) is greater than or equal to the backup SOC: When the load power is greater than the required power, the battery feeds power to the grid, so that the power taken from the grid is less than or equal to the required power. When the real-time battery charge (SOC) is greater than or equal to the backup SOC, the battery does not discharge.

3.4 External communication interface

- 1) TCP-based IEC-104 communication (192.168.137.100:2404), ModbusTcp communication (192.168.137.100:2000);
- 2) RS485 communication interface with anti-current meter (RS485_1), RS485 communication interface with photovoltaic inverter (RS485_1)
- 3) Embedded web page (192.168.0.100), login name: admin, login password: 123456, level 2 password: 123456;
- 4) Reserve five RS485 communication ports;

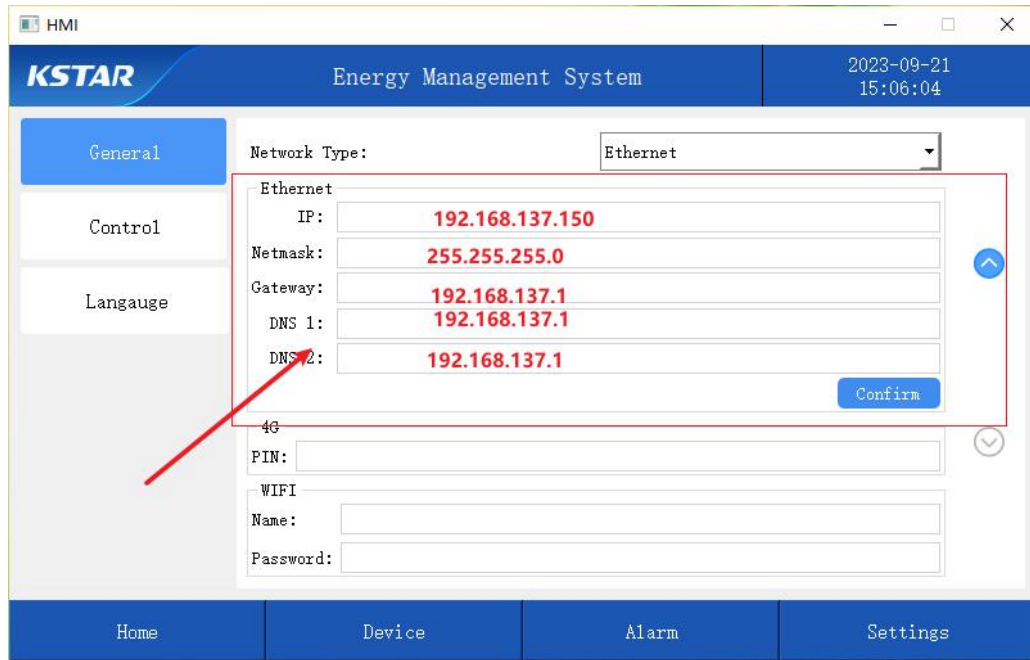
3.5 System wiring



3.6 System setting

1. **Change the EMS IP address on the BC100DE** : The EMS factory default IP address (192.168.137.150) is changed to a different IP address for each EMS and then connected to the switch in the energy storage communication box (example:192.168.137.150, 192.168.137.151, 192.168.137.152, 192.168.137.153, 192.168.137.154, etc., a maximum of 20);

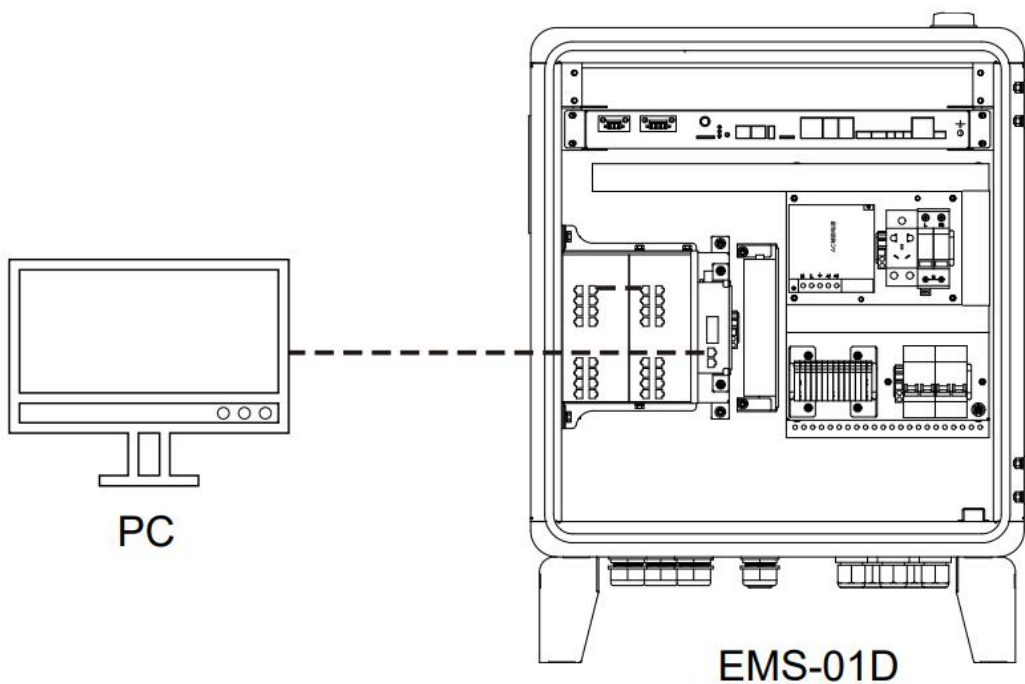
The IP address setting path of the EMS is “Settings” -> “universal”



Note: The subnet mask (default 255.255.255.0), gateway (default 192.168.137.1), DNS_1 (default 192.168.137.1), DNS_2 (default 192.168.137.1) do not need to be changed, use the default Settings.

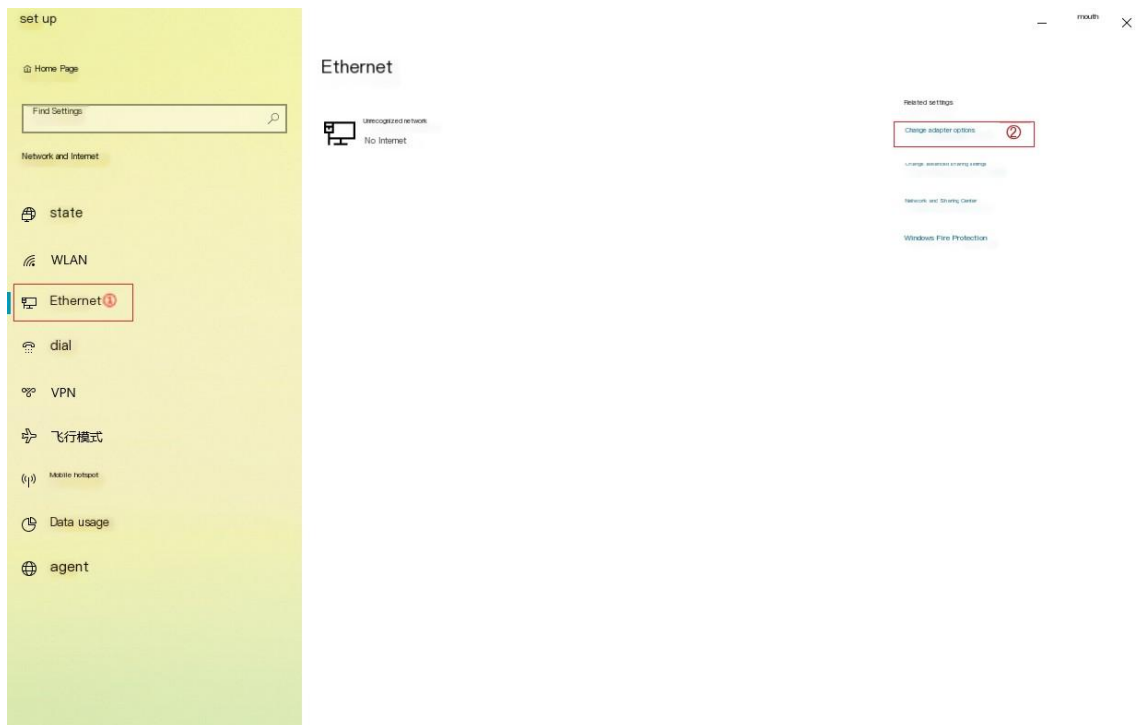
2. Log in to the system :

- a) Connect the PC directly to the EMS01D through a network cable.

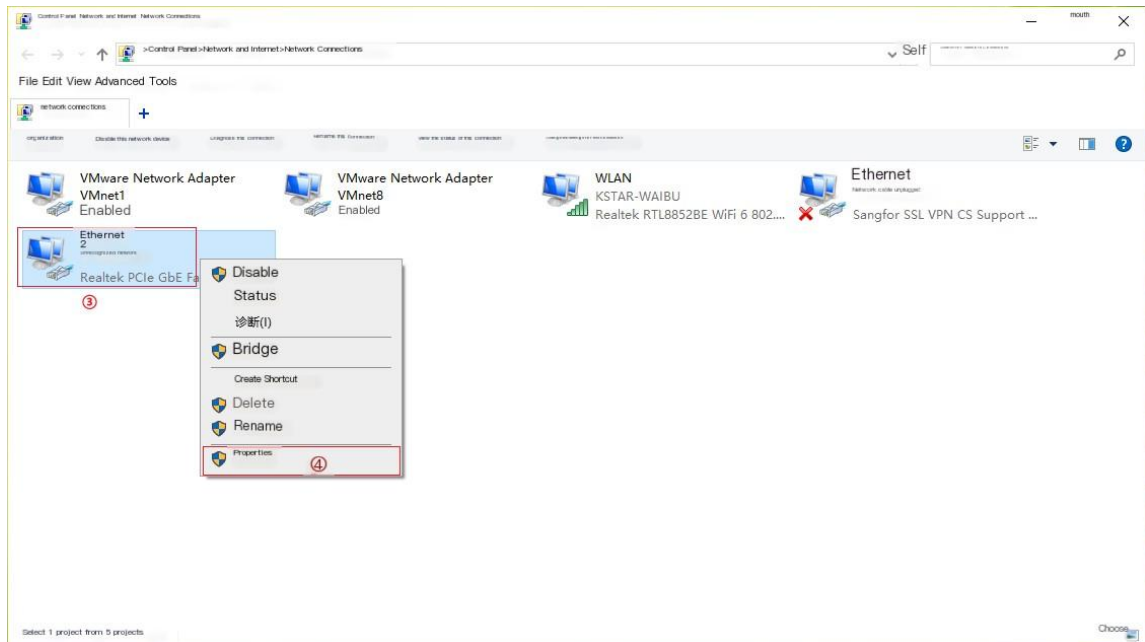


b) Set the IP address of the computer to 192.168.2.201

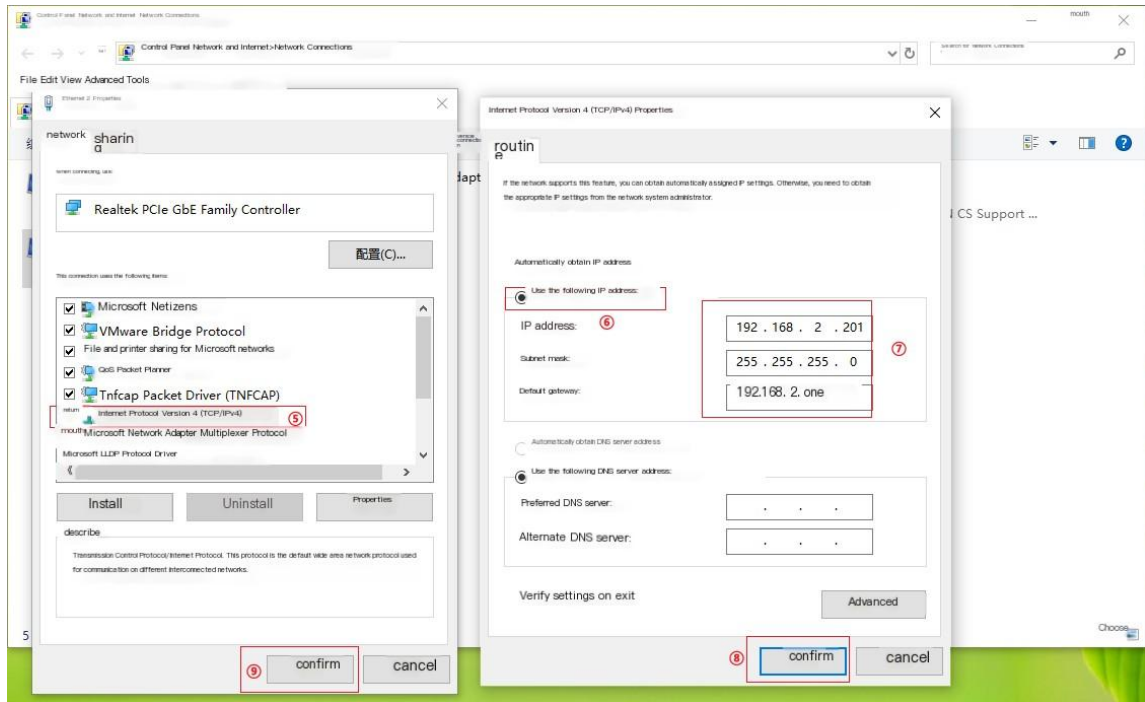
1. Open the computer Settings, click "Ethernet" -> "Changing Adapter Options";



2. Select a network port, for example "Ethernet 2", tap "Ethernet 2"->"properties"



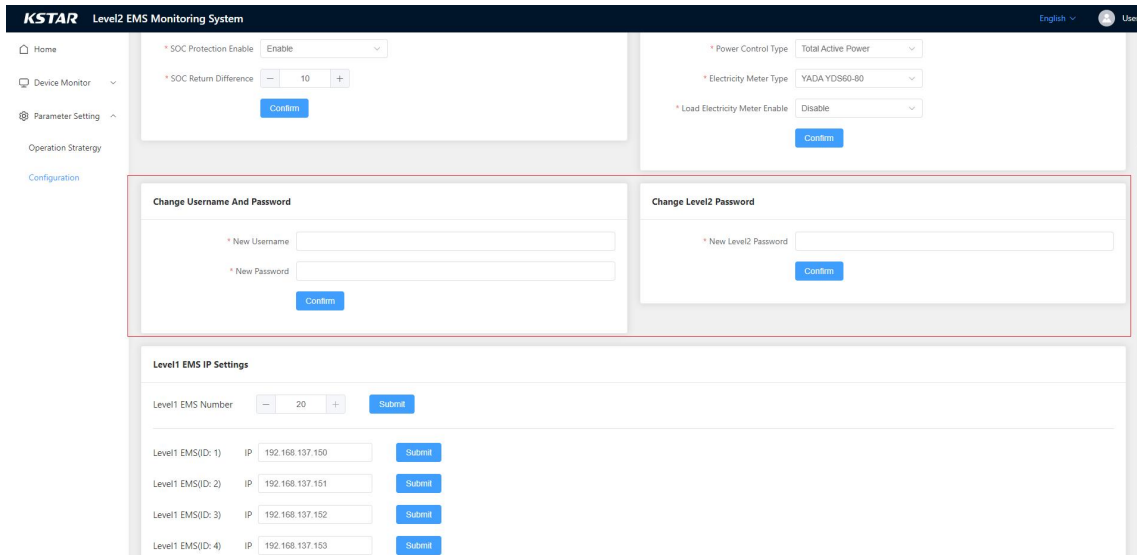
3. tap "Internet protocol version 4 (TCP/IPv4)" -> Use the following IP address -> Enter the IP information in the figure -> confirm -> confirm " .



c) Access with your computer browser : 192.168.2.100 , User name : admin , Password: 123456.

d) Password change;

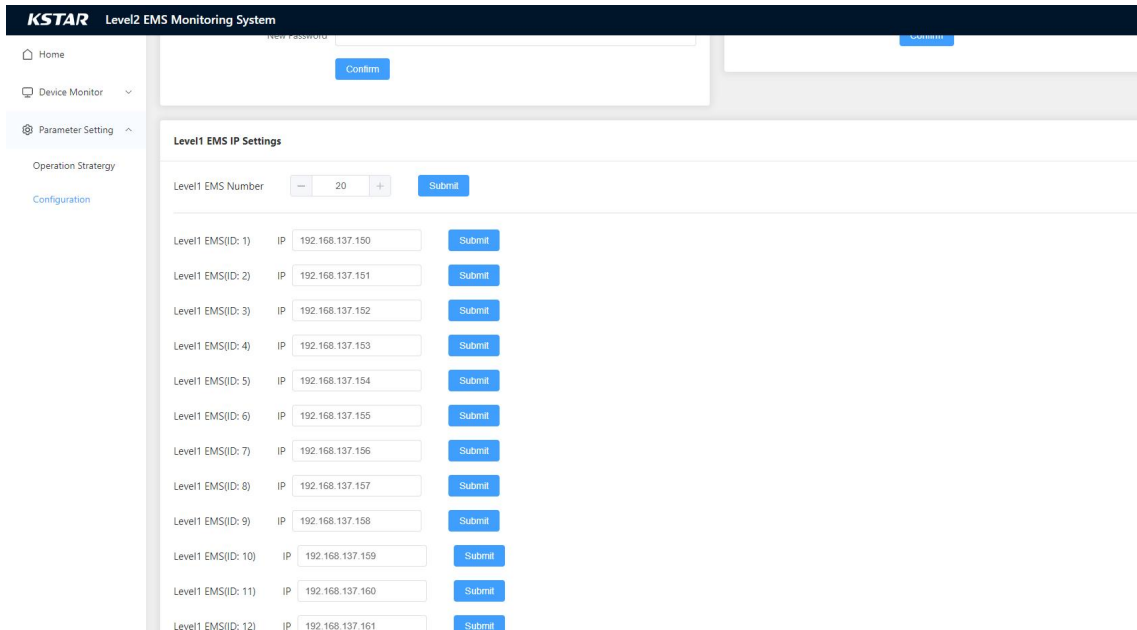
In "Parameter Setting" -> "Configuration"->"Change Username And Password"example change the user name and password;



e) Configure the capacity:

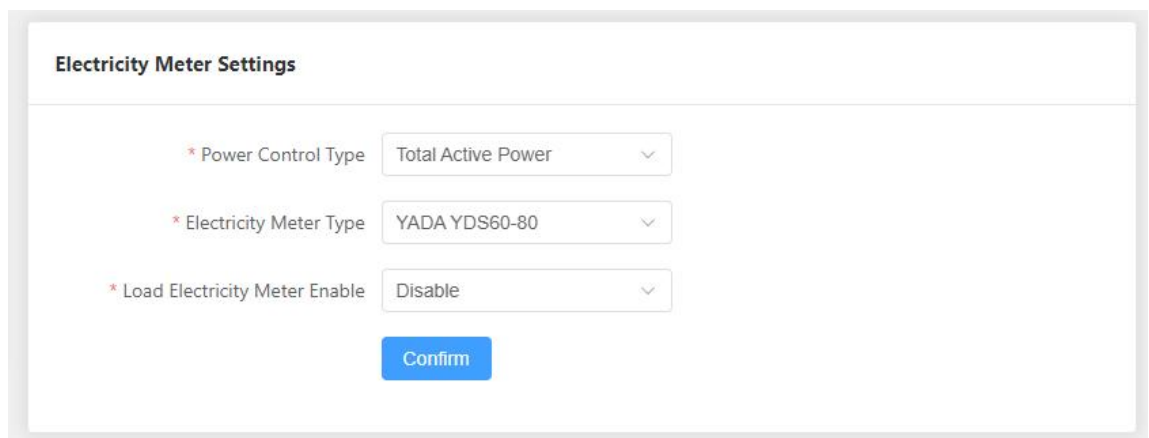
In "Parameter Setting" -> "Configuration"->"EMS IP Settings" Add EMS number and IP address

of the EMS.



f) Electric meter Settings:

1. The meter is connected to the terminal of RS4851 in the wiring terminal of the energy storage communication box cabinet (refer to 3.3 System Wiring), baud rate :19200, address :1, no check, 1 stop bit. Baud rate, address setting mode, see 《YDS60-80 Smart Power Sensor.pdf》 -3.2-3.3
2. Set the meter model according to the actual meter model in Parameter Settings - Configuration Information - Meter Settings. By default, the system only enables the meter at the total inlet line, and does not enable reading the PV inverter meter. If you need to read the data of the PV inverter meter, enable this function and connect it to the terminal of the RS4852 (refer to 3.3 System Cable Connection), baud rate :19200, address :1, no check, and 1 stop bit. For details about how to set the baud rate and address, see YDS60-80 Smart Power Sensor.pdf -3.2-3.3



g) network settings

In "Parameter Setting" -> "Configuration"-> "IP Information" Modify the IP information of the

energy storage communication box for external communication (web page, IEC-104, ModbusTcp).

In "Parameter Setting" -> "Configuration"-> "Networking Settings" Modify the server type and Internet access mode of the energy storage communication box. Select "Server 1" for Chinese users and "Server 2" for users from other countries.;

There are "Ethernet", "4G", "WIFI" and "DHCP" four networking modes:

"Ethernet": The user provides an IP address for Internet access, modifies the IP address information, and inserts a network cable.

"4G" : The user provides a sim card and inserts it into the right side of the box. After selecting the "4G" mode, the system automatically connects to the network. If the cloud platform does not receive data within 5 minutes, the system automatically connects to the network by entering the "PIN code";

"WIFI" : Select "WIFI" mode, enter the name, password system automatically connect to the network;

"DHCP": Select DHCP mode and connect the network cable that supports DHCP. The system automatically obtains an IP address and accesses the Internet. You need to view the obtained IP address on the back gateway of the router before logging in to the system.

Note: The default IP address is IP (192.168.2.100), subnet mask (255.255.255.0), gateway (192.168.137.1), DNS_1 (192.168.137.1), DNS_2 (192.168.137.1).Default server (Server 1), default networking mode (Ethernet)

firewall whitelisting :

51.141.112.234:3300

51.141.112.234:3400

193.112.41.194:21

111.230.141.84:3300

111.230.141.84:3400

The screenshot shows a web interface for configuring network settings. At the top, it displays 'SN Number: 110990382202D1026000Q' and 'Version: 1.0.0.1'. The interface is divided into two main sections: 'IP Information' and 'Networking Settings'.
The 'IP Information' section contains five input fields: IP (192.168.137.100), Subnet Mask (255.255.255.0), Gateway (192.168.137.1), DNS 1 (192.168.137.1), and DNS 2 (192.168.137.1). A blue 'Confirm' button is located at the bottom of this section.
The 'Networking Settings' section contains three dropdown menus: 'Server Type' (set to 'kems.ksdatacloud.com'), 'Networking Mode' (set to 'Ethernet'), and 'PIN Code'. Below these are three text input fields for 'Wi-Fi Name' and 'Wi-Fi Password'. A blue 'Confirm' button is located at the bottom of this section.

h) Run mode settings

In "Parameter Setting" -> "Operation Strategy" Set the running mode of the energy storage system.(For details about the running mode, see 3.4 Function Description.);

7, Other settings

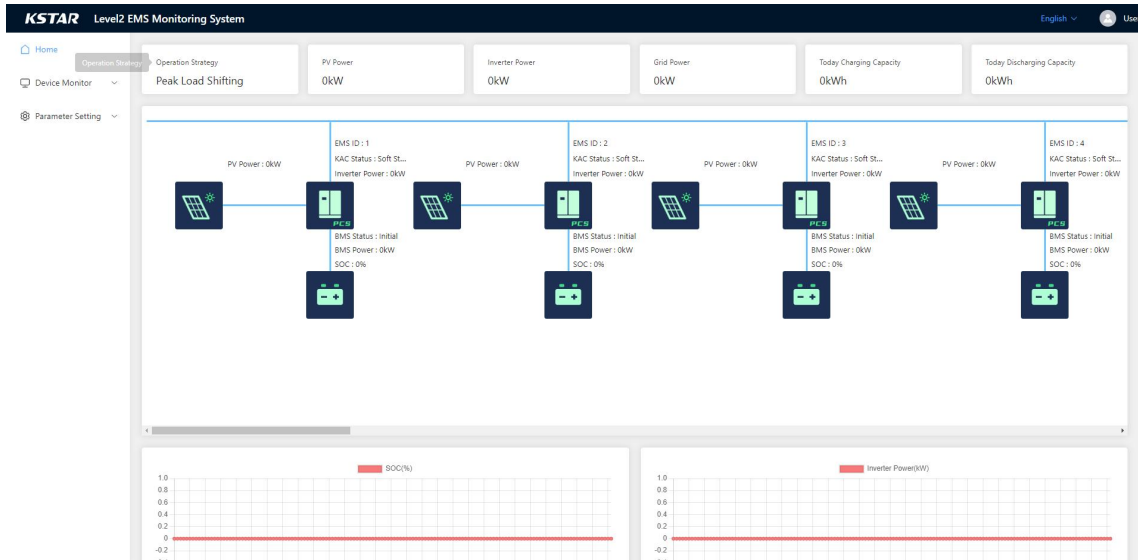
Time: Enter the time according to the local time.

Power grid standard: Select a power grid standard based on the local power grid type.

3.7 Data display

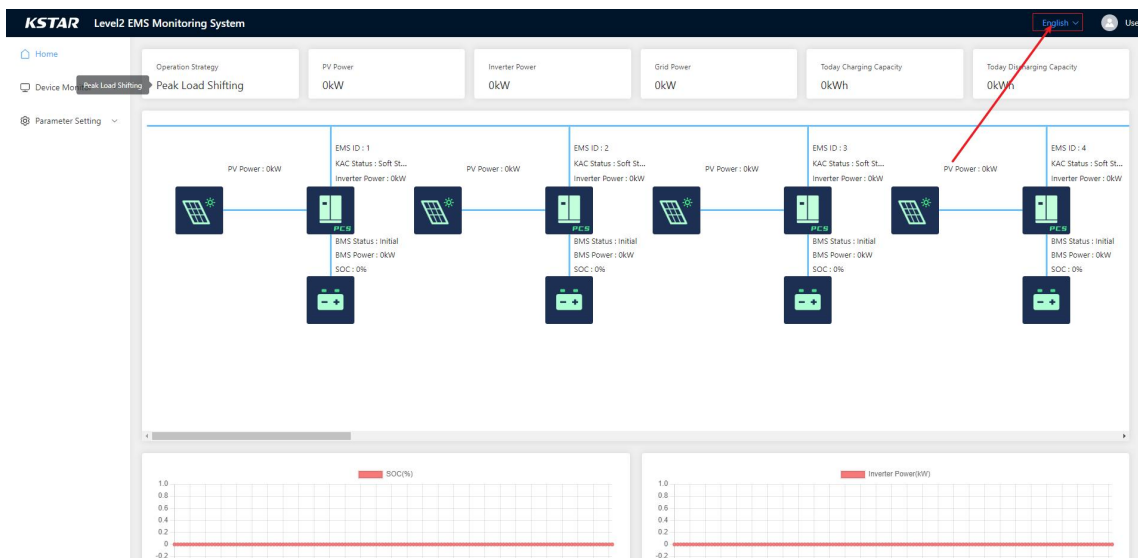
3.7.1 Home page

The home page of the controller screen of the energy storage communication box visually displays PV, INV, power grid, charge and discharge amount and other data, as shown in the following figure :



3.7.2 Language settings

You can select the Settings in the top right corner, available options are: English, Chinese, as shown below :

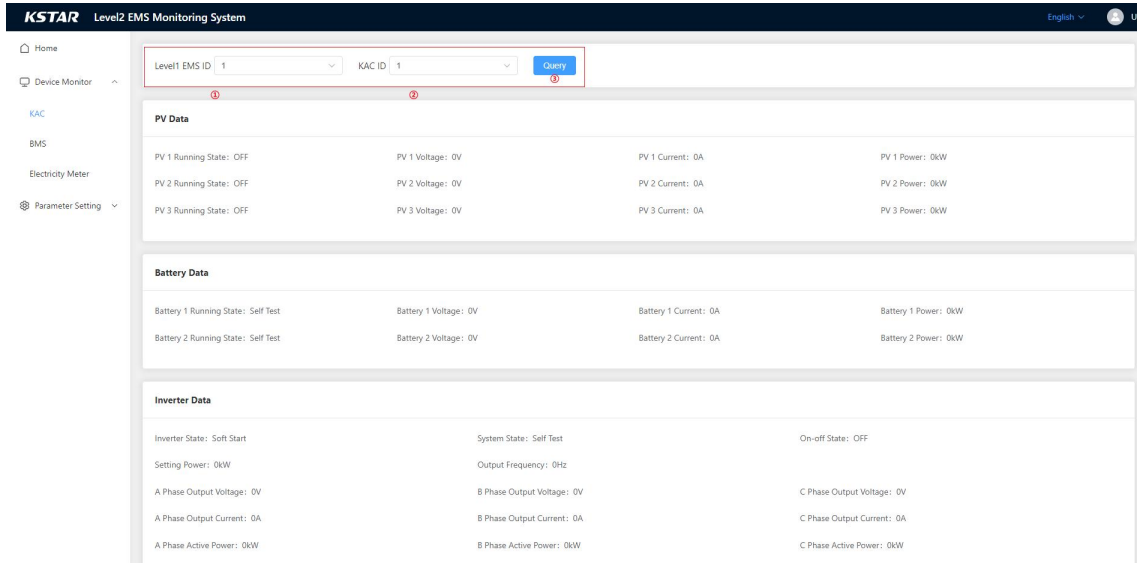


3.7.3 System Real-Time Information

3.7.3.1 KAC Running information

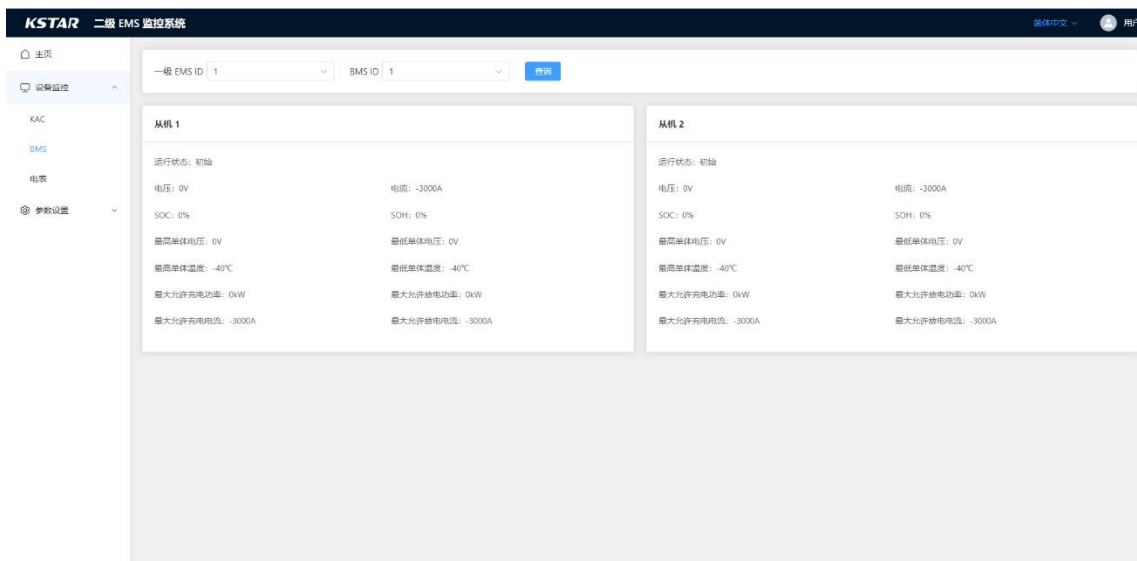
click "KAC", to select the real-time data of KAC under each EMS, as shown in the figure

below:



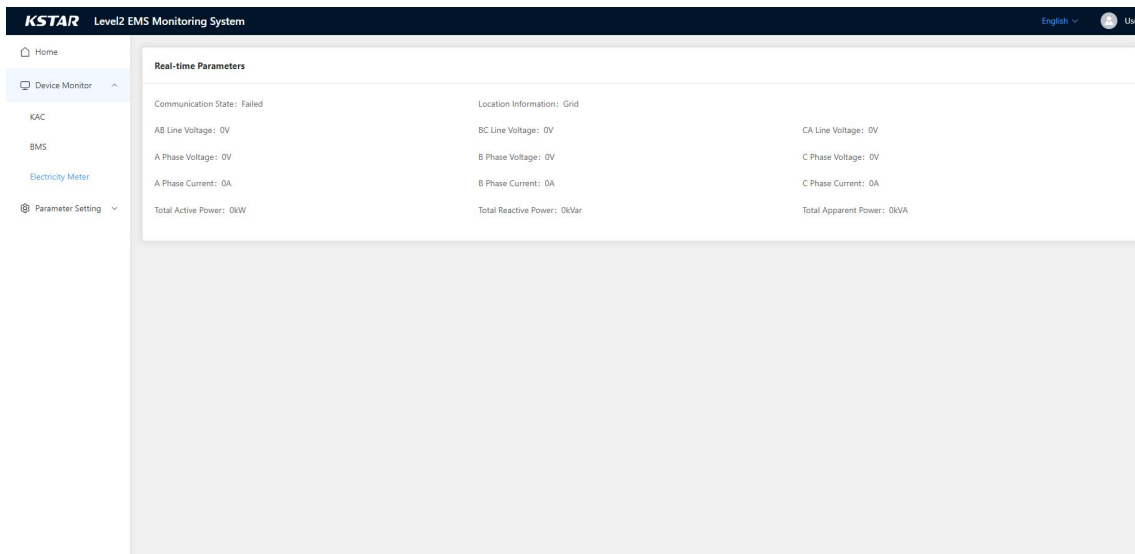
3.7.3.2 BAT Running information

Click "BMS" to select the real-time data of BMS under each EMS, as shown in the figure below:



3.7.3.3 Meter Information

Click "electricity meter", you can view the real-time data of the electricity meter, as shown below:



3.7.4 System Settings

3.7.4.1 Basic Settings

click“Configuration”, to view the basic information and Settings of the system ,

IP information: Internal IP information of the energy storage communication box connected to the EMS network (no need to change);

Networking Settings: Type of EMS system uploaded to domestic server or foreign server; Access the Internet with Ethernet, 4G, wifi or DHCP. PIN is the card password (in the card information of the network card) when using 4G Internet access; wifi name and wifi password are the information when using wifi to access the Internet (default: Ethernet);

SOC protection Enable: SOC upper and lower limits are controlled on the battery Settings page , Stop charging when real-time SOC > =SOC upper limit, Stop charging when real-time SOC <=SOC lower limit (do not need to change)

SOC return difference: Anti-reflux and load power > PV power case, The battery is in discharge state. When the battery is placed under SOC, the system will not discharge any more. In this case, the PV charges the battery, When SOC>= (SOC lower limit +SOC back difference), the system starts anti-counter-current discharge, reducing the number of charge and discharge (do not need to change);

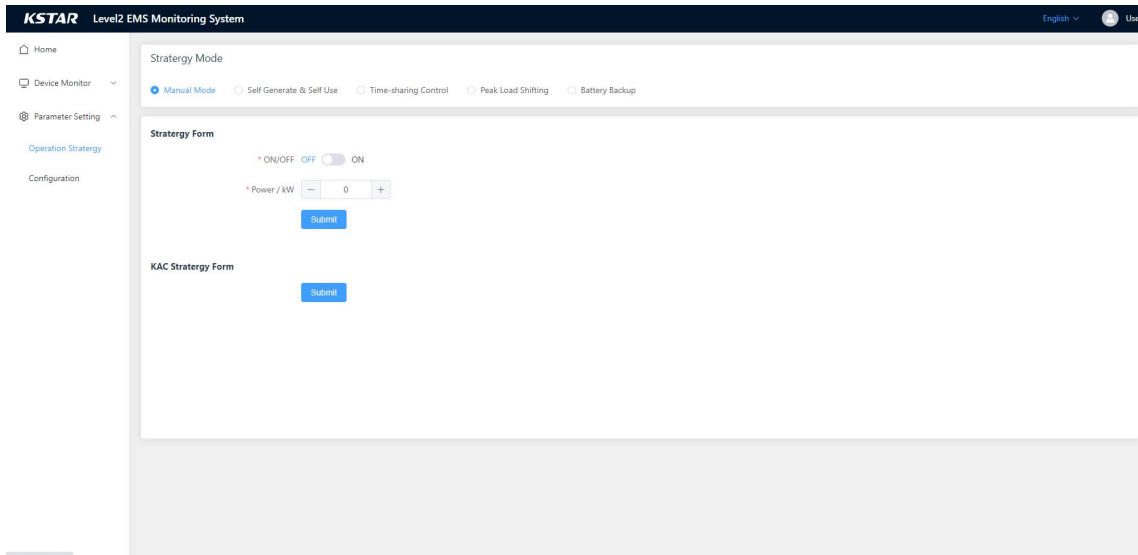
Power control take the meter value: can choose total active power or single-phase minimum *3 user logic control (default: total active power);

Meter type: Select YDS60-80, RID240 or RIF550 (default: YDS60-80);

Photovoltaic meter: You can select whether to read the photovoltaic meter. If you select the required communication cable, connect it to the second RS485 in the wiring terminal (Default: disabled)..

3.7.4.2 Controlling Information

Operation mode Settings: manual mode, self-use, time-sharing control, peak cutting and valley filling, battery backup. According to the use requirements, you can set it on this page, as shown in the following figure :



4 Trial Run

Check before running:

- All cables are intact, properly insulated, and properly sized
- All cables are connected correctly and securely
- The power cable connection polarity is correct, and the ground cable is properly grounded

Trial running step:

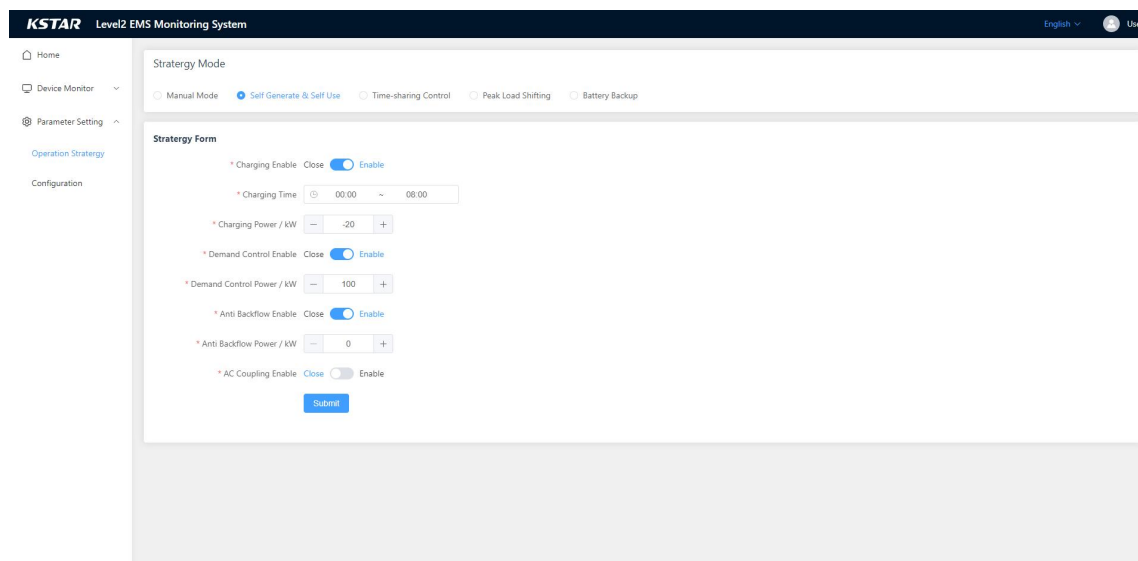
- check before running
- Energy storage communication box The energy management controller is powered on
- Ensure that the device is securely connected to the EMS controller
- In "Configuration" configure the number of EMS devices on the page
- Check whether the data of each device is displayed on the web page and whether the data is within a reasonable range.
- Manually start the KAC, charge and discharge it, and check whether it works properly

5 Apply case configuration

The operating modes of the system include: self-use, time-sharing power, peak cutting and valley filling, and battery backup

5.1 Self-use

1. Enter the control interface, select Running mode setting, and select Spontaneous self-use;
2. Enable the charging time, and enter the charging period and power: 00:00-07:00, -50;
3. Enable anti-counter-current and enter the anti-counter-current value of 10.
4. Enable demand control and enter the demand control value 50;
5. In this case, the system will run in automatic mode.



The screenshot displays the 'Strategy Mode' configuration interface in the KSTAR Level2 EMS Monitoring System. The interface is titled 'Strategy Mode' and features a navigation menu on the left with options: Home, Device Monitor, Parameter Setting, Operation Strategy, and Configuration. The main content area shows the 'Strategy Form' with the following settings:

- Manual Mode:
- Self Generate & Self Use:
- Time-sharing Control:
- Peak Load Shifting:
- Battery Backup:

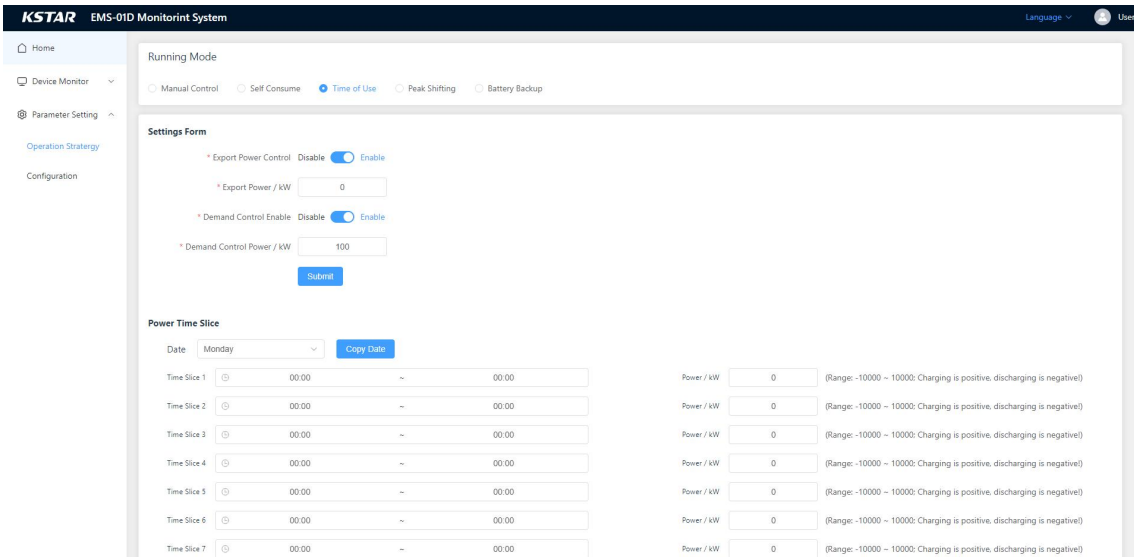
The 'Strategy Form' includes the following parameters and controls:

- Charging Enable: Enable
- Charging Time: 00:00 ~ 08:00
- Charging Power / kW: -20
- Demand Control Enable: Enable
- Demand Control Power / kW: 100
- Anti Backflow Enable: Enable
- Anti Backflow Power / kW: 0
- AC Coupling Enable: Enable

A 'Submit' button is located at the bottom of the form.

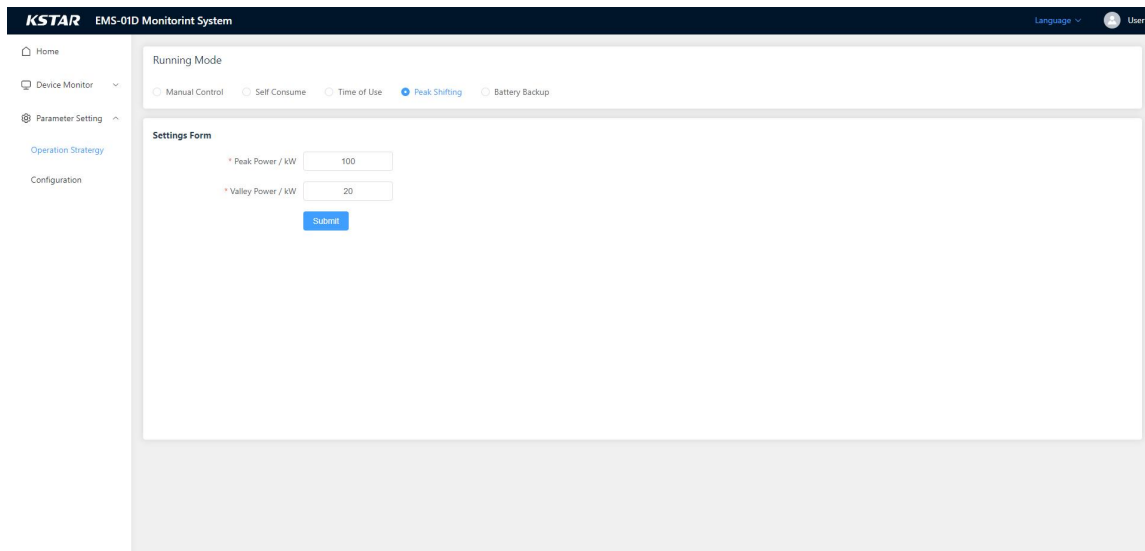
5.2 Time-sharing power

1. Enter the control screen, select running mode Settings, and select time-sharing power.
2. Enable anti-counter-current and enter the anti-counter-current value of 10.
3. Enable demand control and enter the demand control value 50;
4. Click "Time-sharing Power" in the left navigation bar, and enter the charging and discharging time period and power respectively on weekdays and weekends:
00:00-07:00, -50,
10:00-14:00, 50,
17:00-19:30, -50,
20:00-23:59, 50,
5. At this time, the system will run in time-sharing power mode.



5.3 Cut peaks and fill valleys

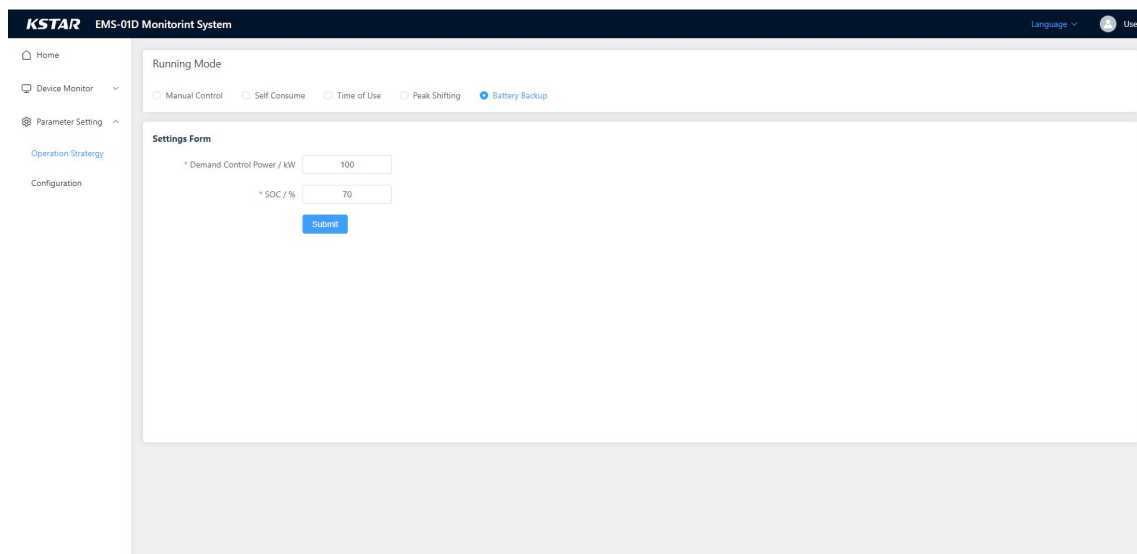
1. Enter the control interface, select operation mode setting, and select peak trimming and valley filling;
2. Valley power, and input value 10;
3. Peak power, and input value 50;
4. At this time, the system will run in peak cutting and valley filling mode.



5.4 Battery Backup

1. On the control screen, select Running Mode and battery backup.
2. Demand control value 50;
3. Enter the SOC value 70.

4. In this case, the system works in battery backup mode.



6 Routine Maintenance

General safety rules:

- Only qualified and authorized personnel are allowed to maintain the energy storage communication box controller.
- Do not leave metal parts such as screws and washers in the controller of the energy storage communication box during maintenance. Otherwise, the device may be damaged.

Maintenance list:

- Check whether strong electromagnetic interference devices are placed around the controller of the energy storage communication box.
- Check whether a heat source is placed around the controller of the energy storage communication box.
- Check whether there are corrosive substances around the controller of the energy storage communication box.
- Check whether the power supply voltage is normal.
- Check whether the terminal is secure.
- Check whether the case, circuit board and components are clean;
- Check whether the screws on the control terminal are loose. If yes, tighten it using a screwdriver.
- Check whether the copper bar or screws are oxidized and discolored.
- Check the terminal connections and cable distribution.
- Check the device communication.
- Check the parameter Settings of the energy storage communication box controller.
- Check the software version of the energy storage communication box controller.