

REC 600

Rectifier Controller
User Manual

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1 Introduction

1.1 Contents

This manual provides comprehensive product information and installation instructions for users of JEBEL ESS RTF series rectifier controllers manufactured by JEBEL ESS (hereinafter referred to as JEBEL ESS).

Prior to using the product, please carefully review this manual and ensure it is readily accessible to installation, operation, and maintenance personnel.

JEBEL ESS will not notify users of any updates or revisions made to this manual. The content of the manual will be continuously updated and amended; therefore, slight discrepancies or errors with the actual product may occur. For the latest version of this manual, please refer to the actual product, contact your local distributor, or visit our website at www.jebel.ae.

1.2 Applicable Personnel

The applicable personnel must meet the following requirements:

- RTF installation should be carried out by professional electrical personnel certified by relevant departments.
- Operators should have a thorough understanding of the composition and working principle of the entire RTF system.
- It is essential for operators to carefully read this manual.
- The operator should familiarize themselves with the relevant standards of the country/region where the project is located.

In case any issues arise during the installation process, installers can contact JEBEL ESS.

1.3 Signs

To ensure the safety of personal and property during installation or efficient use of this product, relevant information is provided in the manual along with appropriate symbols for emphasis. The following list outlines potential symbols used in this manual; please review them carefully to optimize your usage.

 **Danger**	This sign indicates a high potential hazard if not performed correctly as required, which could result in death or serious injury.
 **Attention**	This sign indicates a situation in which failure to comply with the required performance standards may result in equipment malfunction and property damage under specific conditions.
	Caution! Electric Shock Hazard The device contains AC and DC power terminals. Disconnect each power supply separately and wait for at least five minutes to ensure complete discharge of the rectifier controller.
	Caution! Fire Hazard The installation of this product is only suitable for concrete or other non-combustible materials. It is imperative to keep a safe distance from any flammable and explosive substances.
	PE Terminal The PE Terminal is used for protection and requires a secure grounding connection to ensure the safety of personnel.
	Electric Shock Hazard If there is a risk of electric shock from the capacitor, disconnect all power supplies and wait 5 minutes before removing the cover.

2 Safety

2.1 Notice for use

The RTF installation and service personnel must undergo training to ensure their familiarity with the general safety regulations that need to be followed while working on electrical equipment. Additionally, they should also have knowledge of local regulations and safety requirements.

- Prior to usage, it is essential to thoroughly read this manual. Failure to adhere to the instructions provided in this manual may result in damage to the equipment, for which the Company reserves the right not to provide quality assurance.
- Only qualified electrical engineers are permitted to operate the RTF device.
- During operation, refrain from touching any other electrical components except for accessing operational information through the display screen.
- In case of an emergency, press the red button on the door for immediate power cutoff of all functions related to RTF operations.
- All electrical procedures must comply with local standards.

2.2 Installation

The proper installation of the RTF entails adhering to all instructions outlined in the user manual pertaining to equipment transportation, installation, electrical connection, and operation. JEBEL ESS shall not be held liable for any damages resulting from improper utilization of the equipment.

The RTF possesses an IP20 protection progress and is specifically designed for indoor installations. When installing a rectifier controller, it is imperative to carefully consider the information provided within the user manual, particularly Chapter 5 titled "Product Installation."

Additionally, ensuring appropriate usage of the equipment necessitates attentiveness towards the following aspects:

- Adherence to safety instructions stated herein and below.
- Compliance with guidelines specified in the RTF user manual.
- Consideration of technical data associated with the equipment.

2.3 Important Precautions

Note 1: Static electricity can potentially cause damage to the RTF

Internal components of the RTF may suffer irreparable damage due to static discharge! It is imperative to adhere to anti-static protection specifications when operating the RTF.

Note 2: Usage restrictions

The RTF should not be directly connected to life support systems or medical devices.

Note 3: Tool precautions

Prior to starting the RTF, thoroughly inspect all installation tools and remove any unnecessary items from inside the RTF.

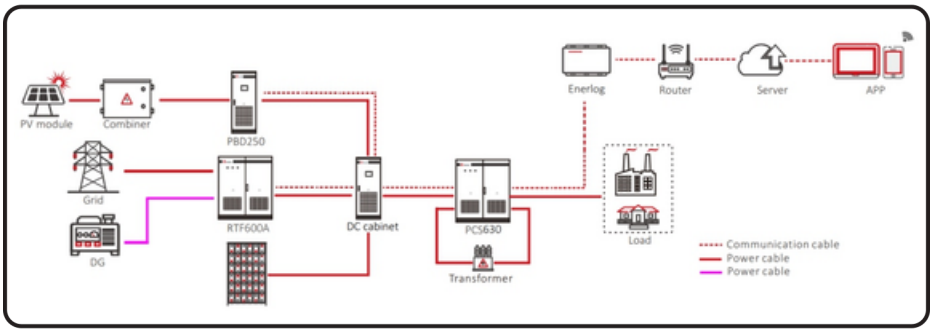
Note 4: Maintenance precautions

Ensure that the RTF is safely powered off during maintenance and that all live components of the machine have been discharged before proceeding with any operations.

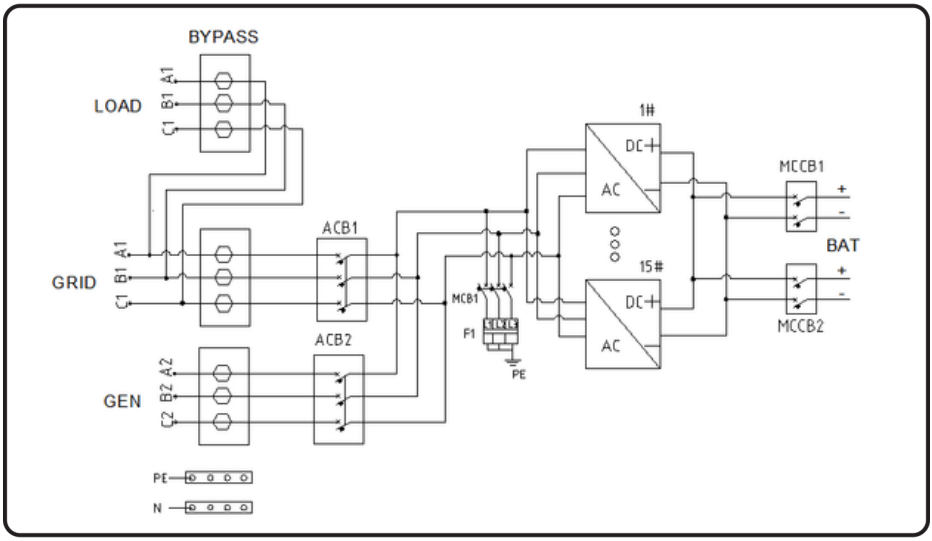
3 Product Description

3.1 RTF Overview

The RTF device developed by JEBEL ESS converts AC electric energy from the grid or diesel generator into DC electric energy, which is then stored in a battery through rectification technology. It primarily operates in conjunction with a PCS system to establish a DC coupling system. This configuration ensures that the PCS remains off-grid and disconnected from the load when necessary, thereby significantly enhancing operational stability. Such a system proves particularly crucial under heavy load conditions or when the local power grid or diesel generator infrastructure has limited carrying capacity. The REC 600 adds the ATS function on the basis of the RTF600, and it is a device that can be connected to the grid and diesel generators at the same time.



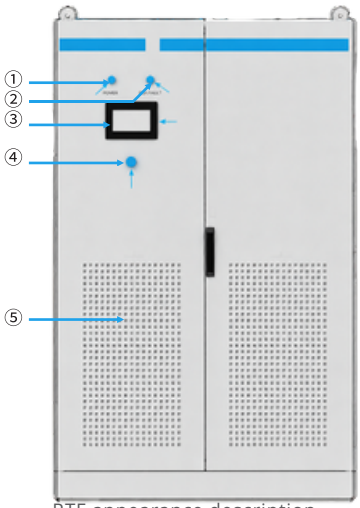
3.2 RTF Electrical principle



3.3 Layout of main parts

3.3.1 External parts

The primary external components of the RTF consist of an LED indicator, an LCD touch screen, and an emergency stop button.



RTF appearance description

S/N	Parts name	Part name
1	Power Indicator(POWER)	When the RTF system supplies power normally, the indicator is running and steady yellow
2	FAULT Indicator	When the RTF is faulty or not turned on, the indicator runs in bright red
3	Touch Screen LCD	Display RTF running information, execute control commands and parameter settings
4	Emergency Stop	EMERGENCY for RTF emergency shutdown, Cut off the external connection
5	Dust Proof Net	Prevent dust from entering the RTF

●Indicator

The RTF device incorporates intelligent design. Positioned at the top of the device, there are two LED lights that serve as indicators for the machine's primary operational status. The current working status of the RTF can be easily monitored through this two LED indicators.



LED	Implication
POWER	When the RTF system is normally powered on, the indicator is steady on
FUN/FAULT	It is always bright when working normally. When a fault occurs, the indicator blinks red

● Emergency stop button

Attention!

The emergency stop button is exclusively intended for use in critical situations, such as severe system malfunctions, fires, leaks, and significant operational errors that require immediate shutdown.



Emergency stop button

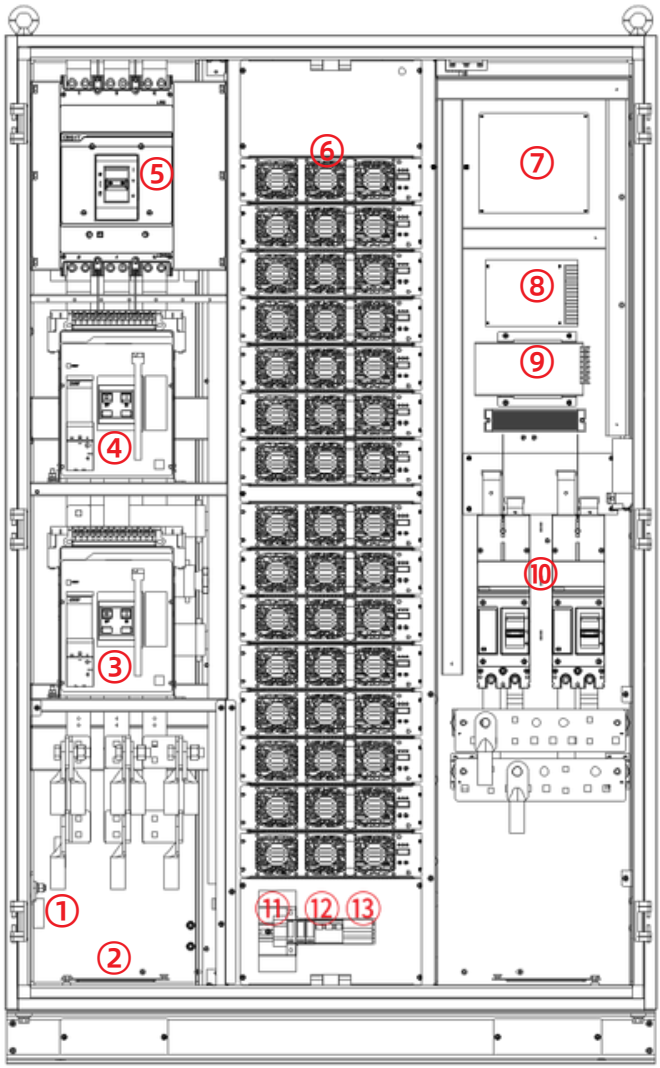
The Emergency stop button immediately disengages the RTF from all external connections, thereby placing the RTF in a secure state. By pressing the Emergency stop button, the device will be securely locked in the "Off" position. Only after rectifying all faults and subsequently turning clockwise to release the emergency stop button, followed by closing the AC/DC circuit breaker, can normal machine operation be resumed.

● Touch screen LCD

Display RTF real-time operating data, fault information records, etc. See Chapter 7 for details.

3.3.2 Internal parts

The internal components of the RTF include: DC circuit breaker, AC circuit breaker, power supply micro-break, AC lightning protection switch, PCB board, etc.



REC 600 Front Structure

S/N	Parts name	Instructions
1	N terminal	Connect to the grid's N line, but not as the convergence point of the N line
2	PE terminal	Ground line connection point
3	Grid breaker(AC input)	Control the connection and disconnection between the Grid and RTF
4	Gen breaker(AC input)	Control the connection and disconnection between the Gen and RTF
5	Bypass breaker	Use it in case of system failure:When repairing the system, close this switch and use the grid directly to supply power to the load
6		
7	40K AC/DC module	40 kW AC/DC conversion unit,composed of 15 units
8	Control board	RTF control board
9	BUCK power board	Provide Mingwei with a DC200V
10	Mingwei Power supply	Provide system with a DC24V
11	DC breaker	Control the connection and disconnection between the battery and RTF
12	Communication connection	External communication line connector terminal
13	terminal Circuit Breaker	power supply and RTF Lightning protection
	Auxiliary power supply micro	Control the connection and disconnection between the auxiliary

3.4 Running Mode and Status

3.4.1 on-grid mode

The RTF is activated based on the charging demand sent by the PCS system. When the grid (diesel generator) operates normally, the RTF will transition into a standby state and switch to normal operation upon receiving a charging instruction from the PCS.

3.4.2 Fault status

When the RTF fails, it will enter a fault state to ensure system safety. The RTF will continuously monitor for fault elimination and maintain the fault state if the fault persists. Once the fault is rectified, the system will automatically restart.



When the ambient temperature is excessively high, it is expected that the output power of the RTF will typically decrease. However, if this issue occurs frequently, it is advisable to inspect the cooling surface of the RTF or relocate it to an area with improved ventilation conditions. In case there is accumulation of dirt on the RTF fan, kindly clean off any dust present. If there are internal malfunctions within the RTF, please seek assistance from professional services.

3.5 Dimensions

Type	REC 600
Dimension(W*H*D mm)	1204.4*1957.2*798.4mm
Weight(kg)	623kg

3.6 Packaging information

S/N	Name	Unit	Number	Instructions
1	RTF complete machine	pcs	1	Cabinet key included
2	User manual	pcs	1	/
3	Certificate	pcs	1	/
4	Factory test report	pcs	1	/

4 Product Transportation and Storage

4.1 Product transportation

The transportation method specified in the user manual must be strictly followed when transporting the RTF. Please take into consideration the weight of the RTF and its off-centered center of gravity, as indicated on the packaging box.



Danger!

The transportation of RTF requires qualified lifting equipment and personnel due to its significant weight. It is essential to transport the RTF perpendicular to the horizontal plane, aligning with the center of gravity mark. During transportation, the inclination of the RTF should not exceed 10 degrees from its upright position. Transporting the equipment upside down or in a horizontal position is strictly prohibited. Incorrect hoisting and transportation procedures may result in severe risks to life safety, property loss, and damage to the RTF.

4.2 Product inspection and storage

The user should carefully inspect the RTF sent by the transportation company before signing, ensuring that both the received items and those listed in the delivery notice match. In case of any defects or damages, immediate notification to the transportation company is required, requesting an evaluation of the equipment. If necessary, assistance can be sought from JEBEL ESS.



Attention!

The equipment should be stored exclusively in a package to ensure the prevention of internal dust and moisture. If the storage duration is prolonged, it is essential to store the RTF in a dry environment for waterproofing purposes.

5 Product Installation

5.1 Installation Requirements

In order to ensure the normal operation of the machine, the installation environment and requirements are as follows:

- The RTF protection level is IP20, making it an electronic device that should not be placed in a humid location. It needs to be installed indoors away from direct sunlight and rain exposure.
- The installation site must meet the size requirements of RTF.
- Adequate ventilation around the machine is necessary, along with a clean installation environment.
- As the equipment generates some noise during operation, it should be installed at a considerable distance from residential areas whenever possible.
- It is crucial to ensure that the installation floor remains stable and capable of meeting RTF's load-bearing requirements.
- The chosen position for installation should facilitate easy maintenance procedures.
- Maintain an ambient temperature between -25℃ and 55℃.
- Sufficient space must also be reserved to guarantee proper ventilation and heat dissipation.

For optimal results, it is recommended to install RTF in a power distribution room where strict design standards for flooring, space allocation, cable trenches, air ducts, ventilation equipment, and protective measures are met.

● Foundation Requirements

The installation of RTF should be carried out on a level surface using flame-retardant materials or channel steel support structures. The ground must remain stable and free from any sagging or tilting. Moreover, the foundation needs to be robust, secure, and dependable in order to bear the weight of RTF equipment.

● Space Requirements

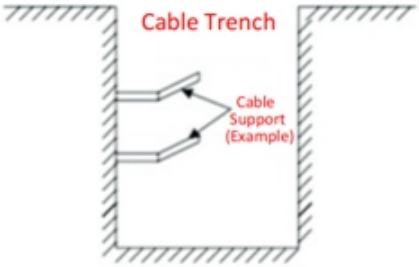
During installation, it is essential to maintain an appropriate distance from walls or other equipment in accordance with the requirements for narrow maintenance passageways, escape routes, and ventilation.



The front of the RTF installation position should provide a clearance of more than 1.5m, while the back and top should have clearances exceeding 1.5m and 0.2m respectively, in order to facilitate installation, efficient heat dissipation, and convenient maintenance.

- Cable trenches design

The cables of the RTF should be routed from the bottom to the line. It is recommended to route cables between the RTF and external cables through the cable trench for convenient installation and maintenance.



The design and construction of cable communication systems are typically carried out by the construction party in accordance with relevant standards, taking into consideration the weight and size of the equipment. It is essential to ensure proper electrical connections between cable trenches as well as between cable trenches and ground electrodes.

● Wiring specification

The cables utilized in the system can generally be categorized into power cables and communication cables. When installing communication cables, it is essential to maintain a safe distance from power cables and ensure they intersect at a right angle. Additionally, it is advisable to minimize cable length and keep them sufficiently distant from power cables. It is recommended that the insulation impedance between BT+ and BT- at the battery end with respect to ground should exceed 1M ohms.

To mitigate electromagnetic interference caused by output voltage transients, power cables and communication cables should be segregated within separate cable trenches, avoiding long-distance parallel routing. The minimum separation distance between power and communication cables must be greater than 0.2m. In cases of cross-distribution of wires, a perpendicular crossing angle of 90 degrees should be maintained while considering an appropriate reduction in distance.

● Ventilation specification

The operation of RTF generates a significant amount of heat, which can adversely affect the electrical performance and even cause damage to the equipment when exposed to high ambient temperatures. Therefore, it is crucial for the control room design to thoroughly consider heat dissipation in order to ensure the normal and efficient operation of the equipment. The RTF design features forward wind intake and outflow.

● Ventilation environment

The installation environment must satisfy the ventilation requirements of the RTF, ensuring that it is not placed in an area with inadequate ventilation and low air circulation. Sufficient air supply should be provided to the air inlet.

● Ventilation device

In order to ensure the safe, reliable, and efficient operation of the equipment, it is essential to maintain an ambient temperature within the range of -25 °C to 55 °C. Therefore, it is necessary to equip appropriate ventilation devices for effective dissipation of heat generated by the equipment. It is recommended that the minimum ventilation volume in the RTF installation space should be at least 3665m3/h.

1. The distribution room must be equipped with adequate ventilation facilities to ensure proper discharge of waste heat energy from the RTF equipment and meet the maximum allowable ambient temperature requirements. This can be achieved by installing exhaust devices such as fans and ventilation pipes.

2. To maintain pressure balance, an external exhaust fan should be added at the outlet of the air outlet pipe.

3. The orientation of the air outlet should be selected based on local wind direction considerations.

4. Attention should be given to implementing dust-proof measures and rainproof designs for both air inlet and air outlet areas.

5. If a ventilation duct is required, its size should correspond to the air output capacity and must be designed by professionals.

● Other protection

The RTF is suitable for installation in a dry and clean power station environment, with an IP20 protection rating. However, it is important to take precautions to prevent water leakage from causing damage to the RTF. Additionally, considering EMC requirements and noise levels, it is recommended to install the rectifier controller in an industrial environment.

5.2 Tools&spare parts required for whole machine installation

The following tools and parts are required for installation:

- Lifting cranes, forklifts or forklifts (capable of carrying RTF weight).
- Torque wrench.
- Screwdriver.
- Wire stripper.
- Terminal press machine.
- Hot hair dryer.
- Megohm meters and multimeters.

5.3 Mechanical installation

5.3.1 Transportation of whole machine with packaging

● Relevant precautions

The RTF utilizes a comprehensive transportation mode, which can be lifted from the bottom by a forklift or moved using a crane.

Note 1: The RTF is an integral unit and must not be disassembled during transportation or installation. Any modifications not authorized by Time Energy Technology will void the warranty.

Note 2: It is important to avoid tilting, violently shaking, or subjecting the RTF to sudden forces such as dropping or lifting during movement.

Note 3: Carefully review the specified parameters to select an appropriate location for transport and storage.

Users are advised to use a forklift to move the RTF.



Before positioning the RTF cabinet, it is recommended to lay the power cables in advance due to their thickness, as cable routing becomes challenging once the cabinet is installed.

In order to ensure optimal protection of RTF during transportation, it is recommended to utilize appropriate packaging and adhere to the specified markings on the packaging. The graphical representation of these markings is as follows:

Icon	Hint
	Center of gravity mark
	Lifting mark
	Face up. Do not place the energy storage controller horizontally, tilted, or upside down.
	Handle with care to avoid damage to the rectifier controller caused by too intense collision friction in the transportation environment.
	Pay attention to moisture, to protect the rectifier controller from rain or moisture.

The unpacked RTFs can be relocated using forklifts, crane forks, or cranes. When moving them, it is crucial to consider the package's weight to ensure that the forklift, crane fork, or crane has sufficient carrying capacity. The center of gravity of the RTF is symmetrically distributed in front and back, left and right, as well as lower position; therefore, support or lifting points should be reasonably arranged during transportation.

Forklift transport is the recommended method for transportation. During this process, the box's center of gravity should fall between the two forks of the forklift truck. Additionally, it is important to note that larger-sized RTFs may obstruct the driver's view and require assistance from auxiliary personnel.

5.3.2 Transportation of RTF without packaging

Remove the RTF package

Follow the steps below to unpack the device shipping package.

Step 1: Remove the wooden sides and top plate of the packing case.

Step 2: Remove peripheral packaging materials from the machine;

Step 3: Remove the fastening screws between the machine and the pallet.

1) Remove the front and rear cover plates of the base.

Moving installation of bare machine

The unpacked RTFS can be relocated using forklifts, cranes, rails, or hoists. In case the disassembly package is situated a considerable distance away from the final installation site, it is advisable to initially transport the bottom wooden pallet.

If the bottom wooden pallet of the RTF has already been removed, when employing a forklift to move the RTF, it becomes necessary to first detach the front and rear cover plates of its base and ensure that the center of gravity falls between both forklifts before proceeding with lifting operations. This procedure is illustrated in the following diagram:



Danger!

The movement of the RTF with a forklift should be executed at a slow and gentle pace to minimize excessive vibration or potential collisions with surrounding objects, thereby ensuring personal safety and preventing any damage to the RTF.

If you opt for the lifting mode for transportation, it is crucial to meticulously consider the lifting position and ensure a precise lifting angle of 70°. Additionally, utmost attention should be given to the center of gravity of the RTF.

Please note:

- The center of gravity position of the RTF must always be diligently monitored.
- It is imperative to implement necessary auxiliary measures to guarantee the safety of transport personnel.
- It is imperative to implement necessary auxiliary measures to ensure that equipment reaches its final installation site in impeccable condition.

5.4 Electrical Installation

5.4.1 Input and output requirements

Danger!

- The operation of RTFS is restricted to electricians with professional skills due to the potential risk of high-voltage electric shock.
- All procedures related to the device must be carried out in a no-voltage condition.
- Incorrect connection of input and output terminals may result in damage to the RTF.

Failure to follow this warning may result in serious injury, property damage, or death.

● Battery components

The operating voltage of the battery is 200V-1000V. The minimum battery voltage is not less than 200V, and the maximum voltage is not more than 1000V.

● Three-phase grid

RTF will constantly check whether the grid meets the grid connection conditions, so pay attention to the installation site of the grid voltage level to meet the needs of RTF, and should get the permission of the local power department before installing RTF.

Type	REC 600
Grid voltage Limit	360V-440V
Grid frequency limits	45Hz-65Hz

● Cable requirements

1. Please choose the appropriate voltage-resistant cable based on the voltage level.

2. Due to variations in voltage levels, it is necessary to calculate the corresponding cable diameter based on the actual range of voltages. The table below provides cable diameters calculated for both maximum current at the DC end and 400V level at the AC end.

CABLES	Wire diameter requirements (mm^2)	Mounting aperture
Battery	$95mm^2$*4	Φ10
Grid	$120mm^2$*3	Φ10
GEN	$120mm^2$*3	Φ10
Ground wire	No less than $16mm^2$, please use the special ground yellow green wire	Φ8
Communication Wire	$0.75mm^2$, please use a dedicated shielded communication cable	/

5.4.2 DC Side Cables



Danger!

The output positive and negative terminals of the battery assembly cannot be reversed. The polarity should be measured with a multimeter and then connected to the positive and negative input terminals of the RTF.

The methods for connecting DC cables are as follows:

Step 1: Disconnect the power distribution circuit breaker on the upper DC side and ensure that no power is connected to the DC side.

Step 2: Use a multimeter to measure the open circuit voltage of the battery assembly to ensure that it is within the allowable range.

Step 3: Use a multimeter to confirm the positive and negative electrodes.

Step 4: Peel the insulation off the end of the cable.

Step 5: Crimp the wiring brass nose.

1. Place the stripped copper core part into the crimping hole of the copper nose.
2. Use a terminal press to press the copper nose tightly. The number of crimps should be at least two.

Step 6: Install the heat shrink tubing.

1. Select a heat shrink tube that is in line with the size of the cable, and choose a length of about 5cm.
2. Put the heat shrink sleeve on the copper nose of the cable, so as to completely cover the pressure hole of the copper nose of the cable.
3. Use a hot hair dryer to tighten the heat shrink tubing.

Step 7: Connect the "DC1/2 output +" end of the RTF to the positive end of the battery assembly with a cable.

1. Select bolts that fit the wiring brass nose.
2. Securely connect the copper noses at both ends of the cable to the "DC1/2 output +" end of the RTF and the positive terminal of the battery assembly.
3. Tighten the bolts using a screwdriver or wrench.

Step 8: Connect the "DC1/2 output -" end of the RTF to the negative terminal of the battery assembly using the same cable as in Step 7.

Step 9: Verify that the cable is securely connected.

5.4.3 Connecting AC side cables



Danger!

When connecting the AC power grid, disconnect the circuit breaker of the AC distribution cabinet to ensure that the AC line connected to the terminal is not live.

The rated output voltage on the AC side of the RTF is 400V. The AC side of the rectifier controller is connected as follows:

Step 1: Disconnect the circuit breaker on the power grid side, disconnect the circuit breaker on the AC side of the RTF, and use a multimeter to check that the wiring terminal is powered off.

Step 2: Determine the phase sequence of the AC connection cable.

Step 3: Strip the insulation off the end of the cable.

Step 4: Crimp the wiring nose.

1. Place the exposed copper core of the stripped wire end into the crimping hole of the copper nose.

2. Use a terminal press to press the copper nose of the wire. The number of crimps should be at least two.

Step 5: Install the heat shrink tubing.

1. Select the heat shrink sleeve that is more in line with the size of the cable, and choose a length of about 5cm.

2. Put the heat shrink sleeve on the copper nose of the cable, so as to completely cover the pressure hole of the copper nose of the cable.

3. Use a hot hair dryer to tighten the heat shrink tubing.

Step 6: Connect the "L1" cable to the "L1" or phase A (U) of the AC PDC. Select bolts that fit the wiring brass nose.

Step 7: Connect the "L2" of the AC output to the "L2" of the AC distribution cabinet according to the method of step 6, that is, phase B (V); The "L3" connected to the AC output is connected to the "L3" of the AC distribution cabinet, that is, phase C (W).

5.4.4 Connect the ground cable

For safety, all RTFS need to be grounded through the PE conductor. The PE copper bar in the RTF cabinet has been reliably connected to the RTF housing in the cabinet, and the PE ground copper bar needs to be reliably connected to the equipotential connection device in the installation site or the electrical control room when making the PE connection. The grounding resistance of a ground cable must be no higher than 0.4Ohm.

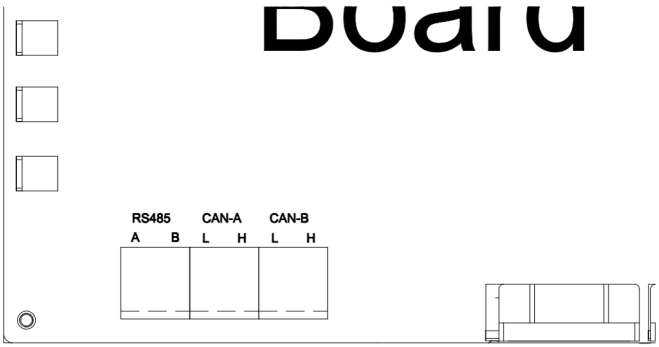
The inlet and outlet of the cable should be placed at the bottom of the RTF. After all the cable connections are completed, the inlet and outlet of the cable should be sealed with fireproof mud to prevent dust and small animals from entering the RTF.



Connect a few cables on the PE copper bar, that is the RTF internal individual devices need to be grounded, please do not change without your own, so as not to cause the risk of electric shock!

5.5 Communication wiring

RTF adopts CAN and 485 communication modes. The external communication cable has been drawn out using the terminal block. The terminal blocks are as follows:



485-A/B: Connect to the JEBEL ESS monitoring system and connect to Enerlog. CAN1-H/L: Connect to other devices in the system for communication. CAN2-H/L: Communication between the mainboard and each module.

1. RS485 monitoring communication

In the system, RTF and other energy storage devices communicate through RS485, and finally connect to Enerlog and upload to the server through the network, which can remotely monitor the running status of single/multiple devices in real time. Both ends of the RS485 communication cable use wiring terminals, both ends of the wiring terminals parallel wiring to make RS485 communication cable, its length should not exceed 1000 meters, in order to ensure the transmission quality, please use a dedicated shielded communication line.

The 485 interface of RTF is located on the internal communication terminal block of the machine, please distinguish "A" and "B".

If Enerlog is not used for monitoring, the user's own monitoring equipment needs to be compatible with JEBEL ESS 485 communication protocol.



2. CAN Communication

● RTF and devices such as PCS in the system communicate through CAN.

● Terminals are used at both ends of the CAN1 communication cable, and parallel terminals are connected to make CAN communication cables. It is recommended to use special shielded communication cables.

● The CAN-A interface of the RTF is located in the internal communication terminal block of the machine. Please distinguish "L" and "H".

6 Power On the Machine for the First Time

6.1 Check before running

Before the RTF is put into operation, its installation shall be checked by at least two staff members to ensure the correctness of the installation according to the items listed in the following table.

Mechanical installation item inspection

● RTF no deformation, damage condition

● The bottom of the RTF is fixed and the support is stable and reliable

● The RTF is surrounded by plenty of space

● The temperature, humidity and ventilation conditions of the environment in which the RTF is located meet the requirements

● Cooling air flow smoothly

● Cabinet seal protection is complete and reliable

Electrical installation inspection

● RTF grounding complete and firm

● The grid voltage matches the RTF rated output voltage

● The power grid connection phase sequence is correct, and the tightening torque meets the requirements

● The DC input is correctly connected to the positive and negative terminals, and the tightening torque meets the requirements

● Connect the communication cables correctly, and keep a certain distance from other cables

● Cable numbers are marked correctly and clearly

● The insulation protective cover is complete and reliable, and the hazard warning label is clear and firm

Other checks

● Tighten all useless conductive parts with insulating cable ties

● There are no remaining tools, parts, conductive dust from drilling, or other foreign objects inside the cabinet

● There is no condensation of moisture or freezing inside the cabinet

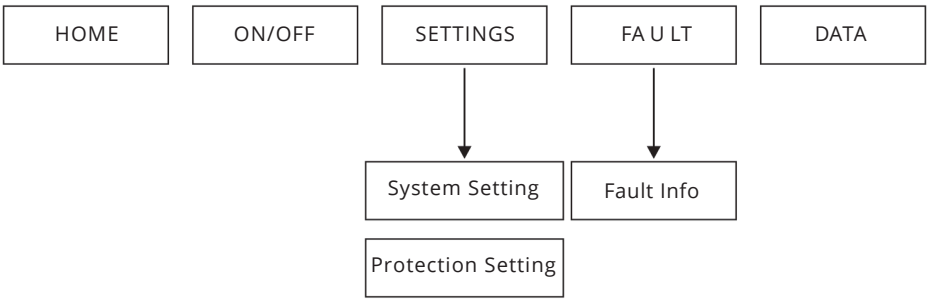
6.2 Powering On the Cabinet

When powering on the machine for the first time, close the AC switch and auxiliary power switch to light up the machine screen. Then close the DC switch.

7 Human-Machine Interface

7.1 Introduction to Touch Screen

Users can view RTF running information and set RTF running parameters on the LCD touch screen. In order to facilitate operation, the following provides the logical structure distribution diagram of the LCD menu.



RTF LCD menu logical structure distribution

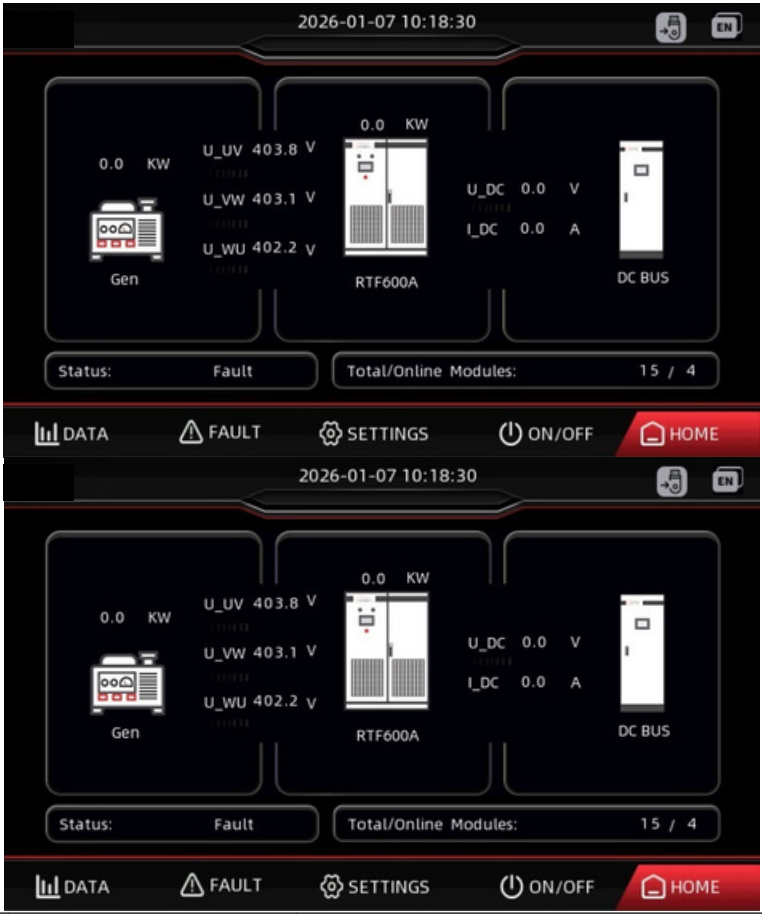
After the LCD is powered on, the startup screen is displayed, and the home page is displayed in about 5 seconds. At this time, you can start to operate related keys to query information and set parameters.

There are five common function keys at the bottom of each page: "Home page", "Power ON/OFF page", "Setting page", "Fault page "and "Data page". Through these five commonly used keys, users can operate easily and quickly. Select the corresponding interface,the icon will enter the black background state.

7.2 Touch Screen Operations

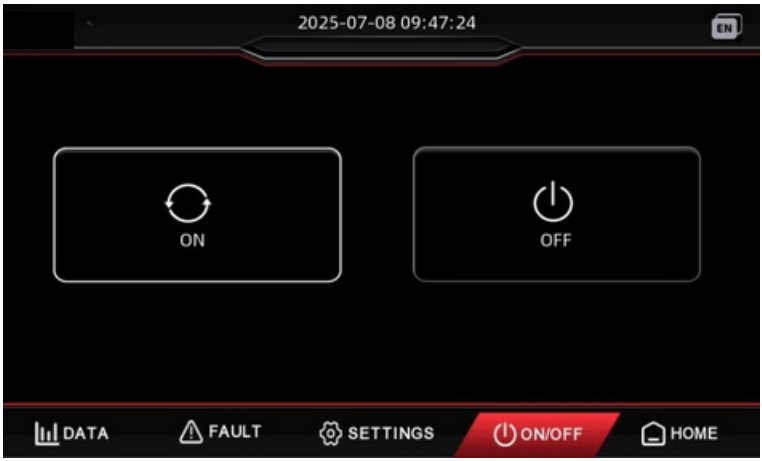
7.2.1 Home page

Click the "Home page"button under any other interface to enter the page. The main information in this page is: Sampling of AC voltage of the grid/generator,DC voltage, DC current, AC power, DC power, Status, Total/Online modules and so on.



No.	Main page displays contents	Instructions
1	U_UV	Sampling of AC voltage of the grid/generator
2	U_VW	
3	U_WU	
4	U_DC	DC Voltage
5	I_DC	DC Current
6	Grid/GEN Power	AC Power
7	REC 600 Power	DC Power
8	Status	Standby, Working, EPO, Fault, Button off
9	Charge Module Total/Online	The total number of charging modules and number of normal communication

7.2.2 Power on/off page



7.2.3 Setting page

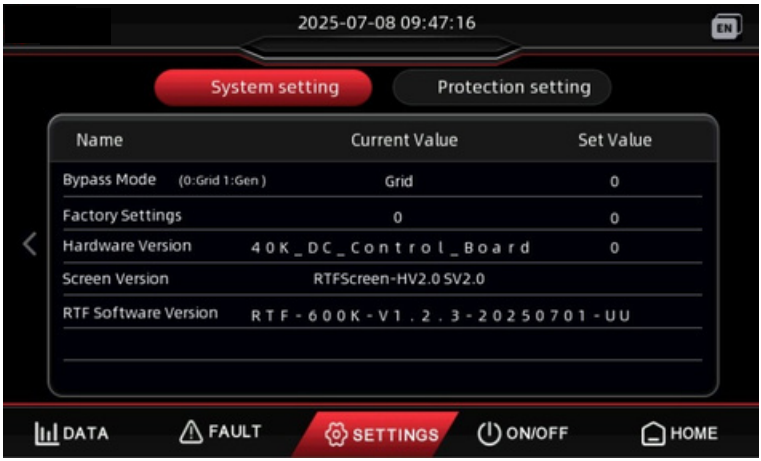
1.System setting

Click the "System Setting "button in any other interface, a password box will pop up. If you enter the password correctly, you can enter the setting page. The default password is 1234.



No.	Settings page displays contents	Instructions
1	RTF Serial Number	Identification SN of the machine. Generally, the factory setting is good. Do not modify it casually.

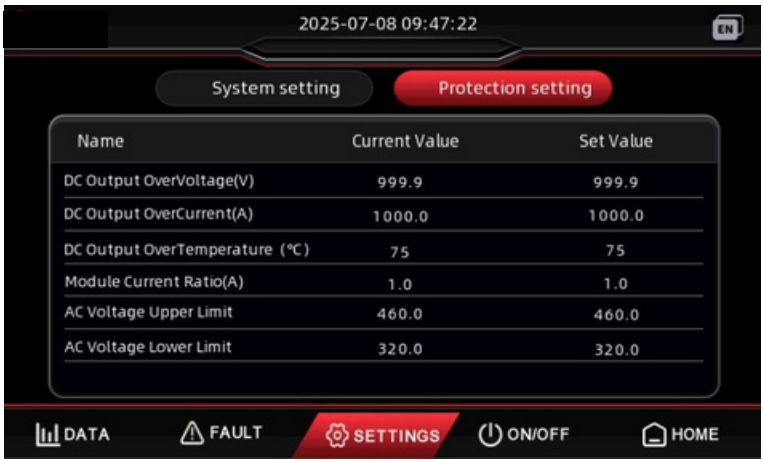
No.	Settings page displays contents	Instructions
2	RTF Model	Model Settings. Set 1, indicating that the model is RTF300; Set 2, stands for RTF600; Set 3, stands for REC 600; Set 4, stands for RTF1200A.
3	RTF 485 ID	The communication address of machine 485, which is used to identify EnerLog. For systems with multiple RTFS, this address cannot be set to repeat.
4	RTF CAN ID	The address to communicate with the PCS, set from 1. If the system has only one RTF, set 1. If there are two, set 1 on the first and 2 on the second; And so on.
5	Baud Rate Set	The CAN1 baud rate setting for communication with PCS only supports 125k, 250k, and 500k.
6	System Number	Set the number of RTF units in the system, Set according to the actual number of RTF units in the system.
7	Time Set	The time setting is based on the local time.



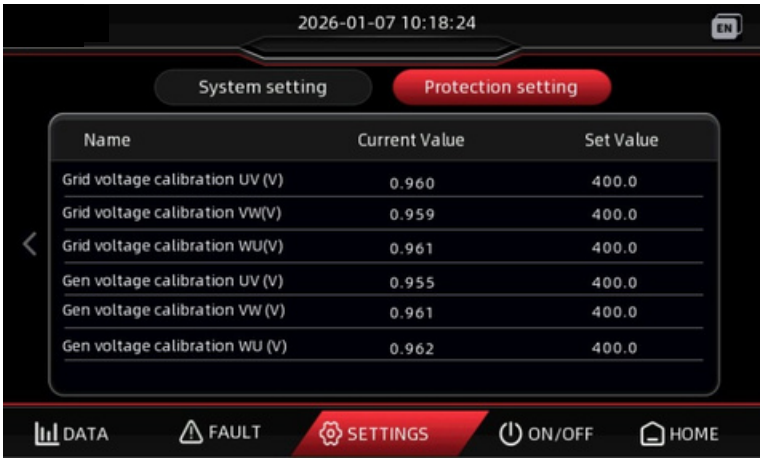
No.	Settings page displays contents	Instructions
1	Bypass Model	GEN: The customer connects the generator line to the grid side switch and the grid line to the generator side switch. If there is power on the generator side, the grid mode is in operation. If there is power on the grid side, the generator mode is in operation. If there is power on both sides, close the generator side switch and operate in grid mode. (Modify when the bypass maintenance switch is used) Grid: The customer normally connects the grid and the generator; if there is power on the grid side, the grid mode is in operation. If there is power on the generator side, the generator mode is in operation. If there is power on both sides, close the grid side switch and operate in grid mode.

No.	Settings page displays contents	Instructions
2	Factory Settings	Initialization parameter settings: Set 1. All parameters revert to default values. Be cautious when modifying (The setting requires entering a password: 1234).
3	Hardware Version	0:40K control board 1:60K control board 2:600A control board
4	Screen Version	Screen Version
5	RTF Software Version	RTF Software Version

2.Protection setting

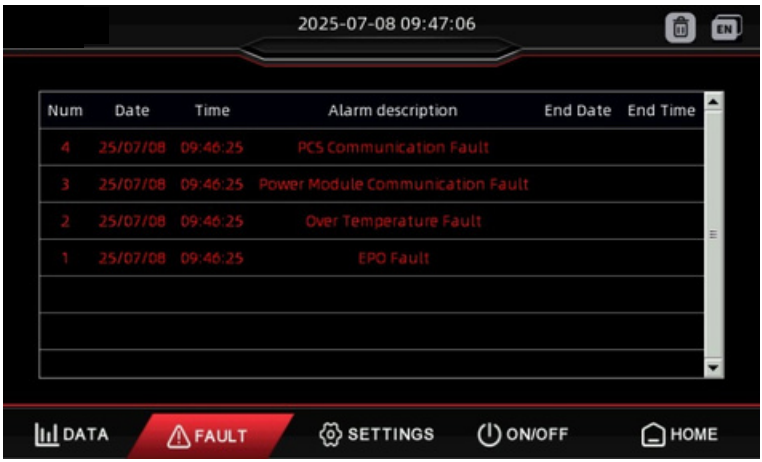


No.	Settings page displays contents	Instructions
1	DC Output OverVoltage	DC overvoltage protection point. The maximum value is 1000v. it is generally set to the total voltage corresponding to the battery overvoltage protection
2	DC Output OverCurrent	DC output overcurrent protection point. The maximum value is 1000A for the REC 600
3	DC Output OverTemperature	The default is 70 ℃ and the maximum temperature is set to 70 ℃
4	Module Current Ratio	Module current output soft start parameters
5	AC Voltage Upper Limit	Upper limit protection parameters for AC Voltage
6	AC Voltage Lower Limit	Lower limit protection parameters for AC Voltage



No.	Settings page displays contents	Instructions
1	Grid voltage calibration UV(V)	In "Set Value", input the actual value of the grid voltage
2	Grid voltage calibration VW(V)	
3	Grid voltage calibration WU(V)	
4	GEN voltage calibration UV(V)	In "Set Value", input the actual value of the generator voltage
5	GEN voltage calibration VW(V)	
6	GEN voltage calibration WU(V)	

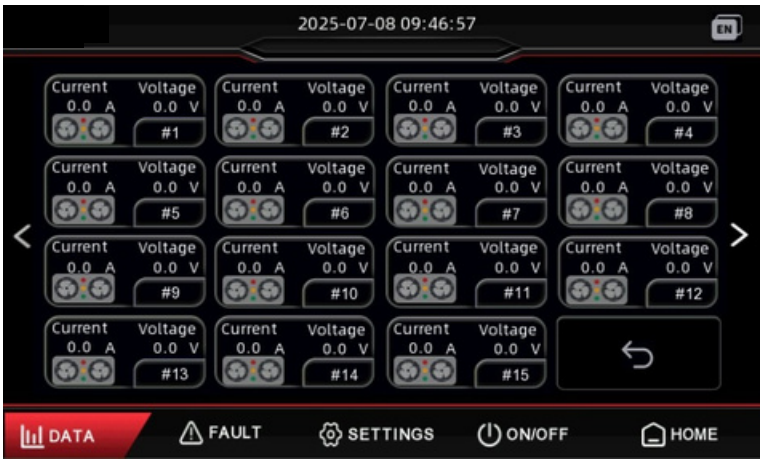
7.2.4 Fault page



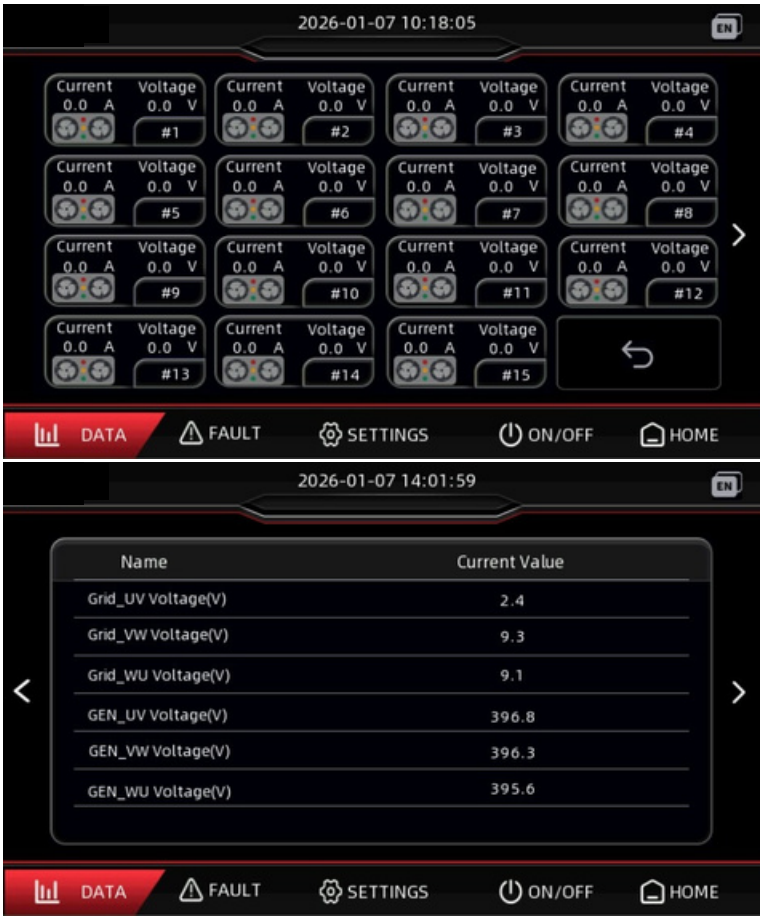
No.	Fault name	Instructions
1	Over Temperature Fault	If the environmental temperature remains higher than the screen-set protection temperature for more than 5 seconds continuously, report an over-temperature fault.
2	Grid Relay Check Fault	The control of the relay and the status of the self-check do not match. Cannot be automatically restored. Manually restart.
3	Gen Relay Check Fault	The control of the relay and the status of the self-check do not match. Cannot be automatically restored. Manually restart.
4	DC Output OverVoltage Fault	The actual voltage was 1.01 times higher than the screen's set protection value. After 5 seconds, an overvoltage fault was reported. After the voltage returns to normal for 60 consecutive seconds, and when the number of overvoltage faults during this power-on process of the system is less than or equal to 5 times, the system can be restored.
5	DC Output OverCurrent Fault	When the actual current of all DC switches being closed exceeds 1.01 times the protection value set on the screen and lasts for 500 ms, an overcurrent fault is reported. When the actual current of DC switch A or B being closed exceeds 5.05 times the protection value set on the screen and lasts for 500 ms, an overcurrent fault is reported. When all DC switches are open and the actual current is greater than 0 A, an overcurrent fault is reported. After the current returns to normal for 60 consecutive seconds, and when the number of overvoltage faults during this power-on process of the system is less than or equal to 5 times, the system can be restored.
6	Fire_Fault	If the fire alarm recheck signal remains abnormal for 200 milliseconds continuously, report a fire alarm fault. Cannot be automatically restored.
7	Power Module Communication Fault	No communication data from the module was received within 1.8 seconds. Communication is normal and can be restored.
8	PCS Communication Fault	No PCS communication command received for 15 consecutive seconds. Communication is normal and can be restored.
9	EPO Fault	The RTF emergency stop button has been pressed.Cannot be automatically restored. Manually restart.
10	Grid_UV OverVoltage Warning Grid_VW OverVoltage Warning Grid_WU OverVoltage Warning	If the grid voltage remains above the upper limit protection parameter for 1 second, an overvoltage fault of the AC voltage will be reported. If The grid voltage remains below the upper limit protection parameter of the AC voltage for 5 seconds, the AC voltage overvoltage alarm willbe cleared.
11	GEN_UV OverVoltage Warning GEN_VW OverVoltage Warning GEN_WU OverVoltage Warning	If the DG voltage remains above the upper limit protection parameter for 1 second, an overvoltage fault of the AC voltage will be reported. If The DG voltage remains below the upper limit protection parameter of the AC voltage for 5 seconds, the AC voltage overvoltage alarm willbe cleared

No.	Fault name	Instructions
12	Grid_UV UnderVoltage Warning Grid_VW UnderVoltage Warning Grid_WU UnderVoltage Warning	If the grid voltage remains below the upper limit protection parameter for 1 second, an undervoltage fault of the AC voltage will be reported. If The grid voltage remainsabove the upper limit protection parameter of the AC voltage for 5 seconds, the AC voltage undervoltage alarm willbe cleared.
13	GEN_UV UnderVoltage Warning GEN_VW UnderVoltage Warning GEN_WU UnderVoltage Warning	If the DG voltage remains below the upper limit protection parameter for 1 second, an undervoltage fault of the AC voltage will be reported. If The DG voltage remainsabove the upper limit protection parameter of the AC voltage for 5
14	AC Fault	seconds, the AC voltage undervoltage alarm willbe cleared. The RTF cannot operate when the status of the AC switch is not that of the grid or the generator.

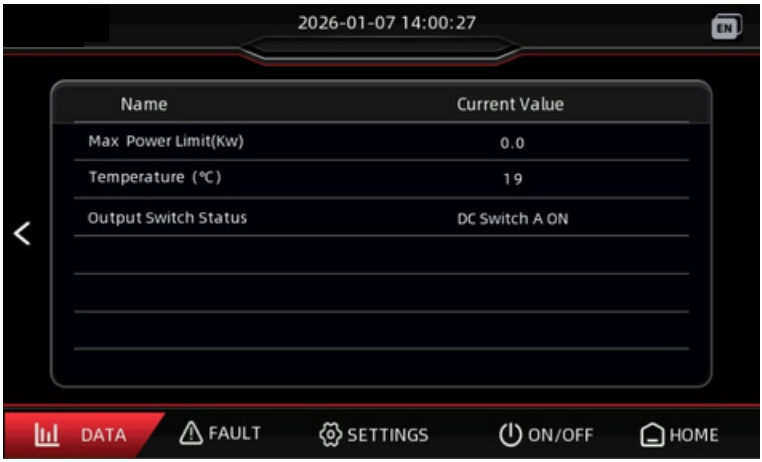
7.2.5 Data page



Module output voltage and current display:

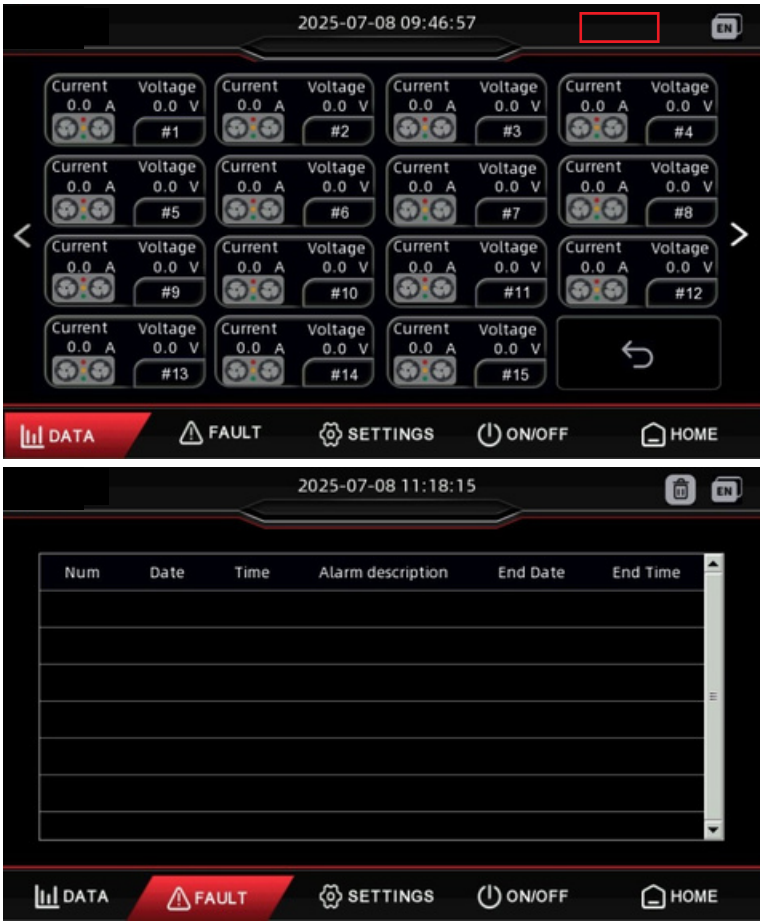


No.	Name	Description
	Grid_UV Voltage(V)	Grid sampling voltage
2	Grid_VW Voltage(V)	
3	Grid_WU Voltage(V)	
4	GEN_UV Voltage(V)	GEN sampling voltage
5	GEN_VW Voltage(V)	
6	GEN_WU Voltage(V)	



No.	Name	Description
1	Max Power Limit	Machine max DC power value.
2	Temperature	Temperature in side the machine.
3	Output Status Switch	The status of the current switch: ON, OFF, DC Switch A ON, DC Switch B ON.

7.2.6 Module fault Information page



No.	Fault name	Fault description
1	Module X AC Input OverVoltage	模块x交流输入过压
2	Module X AC Input UnderVoltage	模块x交流输入欠压
3	Module X AC OverVoltage Shutdown	模块x交流过压脱离
4	Module XPFC Bus OverVoltage	模块x PFC 母线过压
5	Module X PFC Bus UnderVoltage	模块x PFC 母线欠压
6	Module X PFC Bus Imbalance	模块x PFC 母线不平衡

No.	Fault name	Fault description
7	Module X DC Output OverVoltage	模块x 直流输入过压
8	Module X DC Output OverVoltage Shutdown	模块x 直流输入过压关机
9	Module x DC Output UnderVoltage	模块x 直流输入欠压
10	Module x Fan Fault	模块x 风扇故障
11	Module x Fan Voltage Drive Circuit Damaged	模块x 风扇电压驱动电路损坏
12	Module x OverTemperature Protection	模块x 环境温度过温保护
13	Module x LowTemperature Protection	模块x 环境温度过低保护
14	Module x PFC OverTemperature Protection	模块x PFC过温保护1
15	Module x OutputRelay Fault	模块x 输出继电器故障
16	Module x DC OverTemperature Protection1	模块x DC过温保护1
17	Module x PFC DCDC Communication Fault	模块x 原副边通信故障
18	Module x PFC Fault	模块x 原边故障
19	Module x DCDC Fault	模块x 副边故障
20	Module x DC Output Voltage Imbalance	模块x DC输出电压不平衡
21	Module x Discovered Same SN Modules	模块x 发现相同序列号的模块
22	Module x Bleeder Not Work	模块x 泄放电路损坏

7.3 Internal module display introduction

The internal RTF consists of a number of independent 40Kw modules. There is an independent display panel on the module, which can be used to view module information and set parameters by operating keys. The specific setting method refer to the module introduction in Chapter 9.



Module has three parameters need to be set correctly, the system can run normally, in the system is abnormal, you can check the priority of these three Settings are correct. The three parameters are set as follows:

Group number (6-) : 01

Address (R-) : Set according to the serial number on the module shelf.

Protocol number (b-) : B-1



Module parameters have been set before the factory, the user can not modify the parameters without permission, to avoid failure or module damage! If the parameters need to be confirmed due to system abnormalities, please modify the parameters under the guidance of JEBEL ESS after-sales personnel!

8 Running

8.1 Run on startup steps

After the installation and system Settings are checked, you can start up and run.

● First run

First run steps are as follows:

1.Turn on the DC output, AC input, and power supply micro-switch of the RTF.

2.Check whether the sampled data on the screen is abnormal and consistent with the actual data;

3.Check whether the DC overvoltage protection and DC overcurrent protection Settings are consistent with the actual battery, if not, please modify;

4.Check the screen history information page and check the general fault table to see if there is a serious fault.

5.Click the power button on the main interface, the machine will enter the standby mode, after receiving the PCS demand, output as required.

6.During operation, observe whether the data displayed on the screen is normal, whether there is fault information reported, whether the machine has abnormal sound and odor; If there is any abnormal situation, please stop the machine immediately for inspection.

Manual shutdown

When the RTF is working, you can click the shutdown button on the LCD to stop the RTF.

The RTF is still charged after manual shutdown.

8.2 General Troubleshooting

If a fault occurs during the operation of the machine, please click on the LCD "History Information" page to view the current fault. The following are common RTF fault analysis and treatment steps:

1.RTF Scram fault: occurs after the Scram is operated.

Solution:

Rotate the Scram button to reset it.

2.RTF overtemperature protection: occurs when the actual temperature reaches the set value.

Solution:

a. Check the temperature display on the screen to confirm the current temperature.

b. Check whether the overtemperature protection is set too low. The maximum temperature is set to 70 ° C.

c. Check whether the air inlet and air outlet are blocked by foreign bodies. After the above inspection and troubleshooting, the problem still persists

If the problem exists, please contact the energy technology personnel for assistance.

3. RTF overtemperature load loss:occurs when the actual temperature reaches the set value

Solution:

a. Check the temperature display on the screen to confirm the current temperature.

b. Check whether the over-temperature load drop setting is too low. The maximum value is 55 degrees.

c. Check whether the air intake and air outlet are blocked by foreign bodies. After the above inspection and troubleshooting, the problem still persists

If the problem exists, please contact the energy technology personnel for assistance.

4. RTF over-voltage protection: occurs when the actual DC voltage is greater than the set value

Solution:

Check whether the set over-voltage protection value is reasonable, calculate the actual value of the battery over-voltage protection according to the on-site battery configuration, and compare the set value. If the setting is unreasonable, modify it. If the problem is not handled, contact an energy technology person for assistance.

5. RTF over-current protection:occurs when the actual DC current is greater than the set value

Solution:

Check whether the over-current protection value is reasonable, and set it according to the actual maximum charging current allowed by the battery. If the setting is not reasonable, modify it. If the problem is not handled, contact an energy technology person for assistance.

6. RTF and PCS communication failure: occurs when the communication between the actual rectifier cabinet and PCS is abnormal.

Solution:

a. Check whether the CAN cable of the RTF is connected to the CAN-B port of the PCS control board

b. Check whether the CAN cable is correctly connected

c. Use the CAN box to check whether there is data sent by PCS on the bus

d. Check whether the CAN wire is the shielded wire used

e. If communication still fails, please contact the Energy technology personnel for assistance.

7. RTF and module communication failure: occurs when the communication between the actual rectifier control board and the internal module is abnormal.

Solution:

a. Check whether the communication cables between the RTF control board and all internal modules are loose.

b. Check whether the CAN cables are correctly connected

c. Use the CAN box to check whether there is communication data between RTF and module on the bus

d. If you still cannot communicate, please contact the energy technology personnel for assistance.

For other faults, please contact the relevant professionals of energy technology of The Times

8.3 Shutdown and power-off Procedure



Warnings !
After the RTF is completely powered off, the RTF is still live, if you need to operate, be sure to completely disconnect all external connections and wait at least 5 minutes before using the instrument to measure safely before proceeding to other operations.

1. Tap the screen Off button.
2. Disconnect DC input switch DC input.
3. Disconnect the AC output switch AC input.



Warnings !
It is normal for the RTF to generate an alarm during the power-off process. You can continue with the power-off procedure.

9 Module Description

9.1 Product Technical Description

9.1.1 Basic Parameter

- The maximum continuous charging power is 40kW.
- The maximum continuous charging current is 133A, adjustable from 0 to 133A.
- Wide charging voltage range: 50 - 1000 Vdc, 300 - 1000 V constant power charging.
- Wide input voltage range: 260-485Vac.
- Wide operating temperature range: -40℃ to 75℃.

9.1.2 Operating Principle

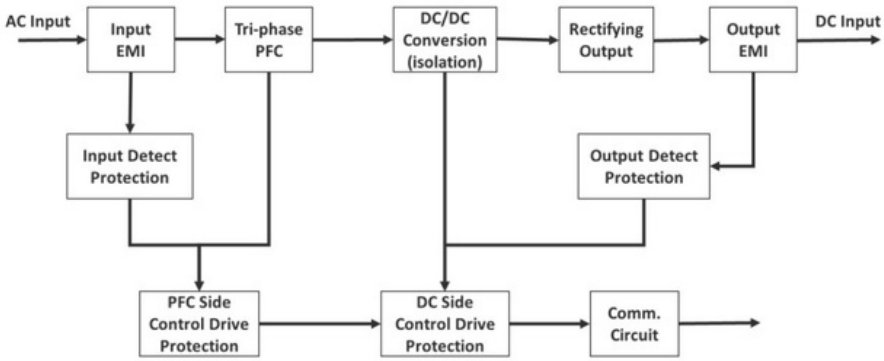


Figure 1 Operating principle

The main circuit of the module includes input EMI filtering, three-phase PFC, DC/DC conversion (LLC), output EMI circuit, etc. The control circuit includes input detection protection, PFC side control drive protection, DC side control drive protection, output detection protection, communication circuit, etc.

9.2 Panel Operation Instructions

9.2.1 Digital tube and key group

The LED digital tube can display ten types of module information, namely output voltage, output current, module address, module group number, fault code, module version, grouping mode, operation mode, power on/off status and protocol switching of the module.

The key group consists of two keys: the up key (▲) and the down key (▼). Through the keys, you can view the module information and modify the module parameters. There are two ways to press the keys: short press and long press. Short press means releasing the key within 2.5 seconds after pressing, and long press means releasing the key after pressing for 2.5 seconds or more.

When viewing the module information, short press the keys (▲) and (▼), and the display sequence of the module information is as shown in Figure 9. Pressing the key (▼) will display it in reverse order.

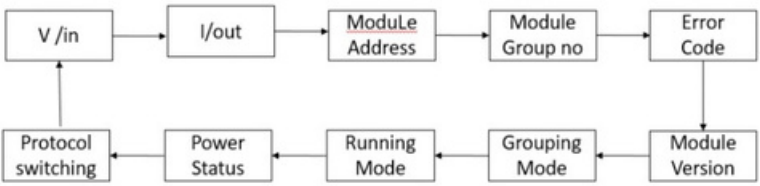


Figure 2 the sequence of digital tube information display

9.2.2 Parameter setting

The module information available for setting parameters includes: module output voltage, output current, module address, module group number, grouping mode, operating mode and on/off status. When setting module parameters, first briefly press the up key (▲) or down key (▼) to adjust to the interface where you want to set the parameters, then long press (▲) or (▼). After releasing, you can see the digital tube interface flashing, indicating that it is in the parameter setting state at this time. At this point, briefly press (▲) or (▼) to change the parameters. When adjusting to the desired parameters, long press (▲) or (▼) to save the modified values.

(1) Output voltage

If there is no fault after startup, the digital tube will jump to the output voltage interface. The factory setting defaults the startup voltage to 50V. The displayed value is between 0 and 999V. When setting the output voltage through the keys, the operation mode must be the debugging mode. The setting value range is 50V-1000V. When the setting value is greater than 999V, set it to 999V.

(2) Output current

The displayed value is between 0 and 133A. When setting the output current through the key, the operation mode must be the debugging mode. When the set value is less than 1A, set it to 133A; when the set value is greater than 133A, set it to 1A.

(3) The digital tube displays information

Items	Display Range	Up-limit	Low-limit	Note
V/out	0~999			Short press (less than 2.5s) the upper button (▲) or lower button (▼) to view module information
I/out	0~133			
Address	20~9E			
Group no.	0~60			
Error code	E01~E23			
Version	xxx			
Grouping mode	1or 0			
Running mode	-A-or-C-			
Power state	OFF or ON			

Table 1

(4) Digital tube setting information

Items	Display Range	Default	Up-limit	Low-limit	Note
V/out	50~999	50	Greater than 999 set to 50	Less than 50 set to 999	In the "-C-" mode, long press the up key (▲) or down key (▼) for more than 2.5 seconds to flash the display module information.
I/out	1~133		Greater than 133 set to 1	Less than 1 set to 133	
Address	01H~1EH				
Group no.	0~60		Greater than 60 set to 0	Less than 0 set to 60	
Grouping mode	1or 0				
Running mode	-A-or-C-				
Power state	OFF or ON				

Table 2

(5)Module address

Theaddress settings for the thirty modules are shown in the table below.

1	01H	2	02H
3	03H	4	04H
5	05H	6	06H
7	07H	8	08H
9	09H	10	0AH
11	0BH	12	0CH
13	0DH	14	0EH
15	0FH	16	10H
17	11H	18	12H
19	13H	20	14H
21	15H	22	16H
23	17H	24	18H
25	19H	26	1AH
27	1BH	28	1CH
29	1DH	30	1EH

(6) When setting the module group no. by pressing the button, the module must be under standby mode and dynamic grouping mode. When the grouping mode is preset grouping, the group number and address of the module correspond to each other as shown in Table 3, and cannot be modified by pressing the key.

Fixed group number	Module address range
1	0x80~0x87
2	0x88~0x8F
3	0x90~0x97
4	0x98~0x9E
5	0x60~0x67
6	0x68~0x6F
7	0x70~0x77
8	0x78~0x7F

Table 3 Module fixed group no. and module address in fixed grouping

(7) The module version displays the current version number.

(8) The grouping mode is divided into fixed grouping and dynamic grouping. When the module is manufactured, the default grouping mode is dynamic grouping mode. The digital tube on this interface displays 1. If it is changed to fixed grouping, the digital tube on this interface displays 0.

(9) Operating mode

The operation mode is divided into normal mode and debug mode. When powered on, it defaults to normal mode, at which time the digital tube displays -A. It can be set to debug mode by pressing the key, at which time the digital tube displays -C.

(10) On/Off status

The power-on and power-off states are divided into ON and standby. If there is no fault when powered ON, the digital tube will display "OFF". After power-on, it will change to "ON". If there is no fault during power-on, the digital tube will jump to the output voltage interface.

(11) Protocol switching

The displayed value is between 0 and 9, and the default is the State Grid protocol. If you need to switch protocols, please contact our staff.

9.3 Module maintenance

9.3.1 Alarm and fault handling suggestions

Indicator Light:

Function	Description
Display function	The module displays the operating status through LED lights: operation (green), alarm (yellow), fault (red). Through digital tube display operation parameters: the output voltage, output current, communication address, fault code.
Input function	The operator sets the working mode, communication address, etc. by pressing the buttons and visually viewing the digital tube display screen.

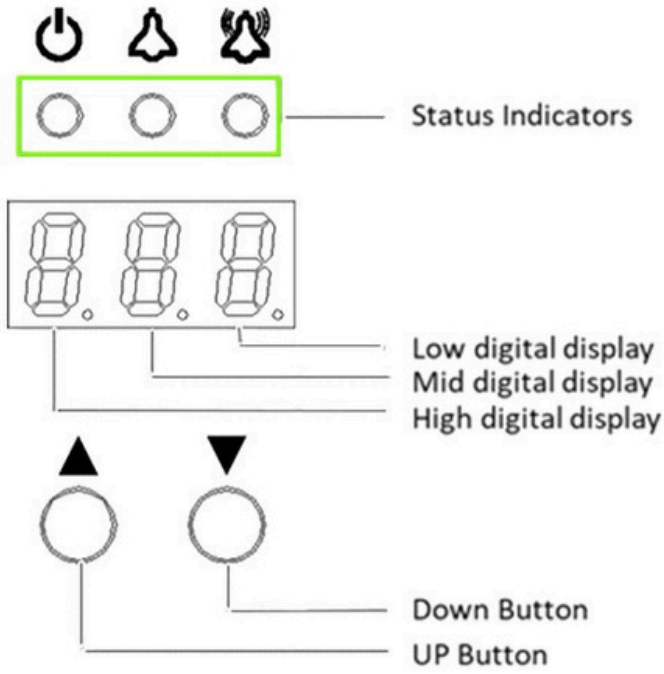


Figure 3 Human-computer interaction interface

It is convenient for users to observe whether there are common faults. Under normal conditions, the green operation indicator light is on, the yellow alarm indicator light and the red fault indicator light are off. The abnormal conditions of the indicator lights are shown in Table 5.

Indicator Light	Status	Notes	Process Scheme
Green operation indicator light	On	Normal condition	/
	Off	No input power supply	1. Check whether the ac input is normal, such as ac input is not normal, screening the whole pile and communicate module the abnormal parts (such as short circuit, etc.), ruled out before testing ac input. 2. Normal such as communication, module internal obstacle may therefore, need to change the module.
Yellow alarm indicator light	On	1. Input faults (AC power failure, overvoltage, undervoltage, phase loss), module PFC protection (busbar overvoltage, undervoltage, uneven voltage), ambient temperature over-temperature. 2. The system grouping mode is inconsistent. 3. The system protocols are inconsistent.	1. Check the wiring for any issues during power-off. If there are no problems, preliminarily determine that the module is damaged and replace it. 2. Set up groups according to system requirements. 3. Contact the after-sales personnel and switch the protocol.
	Off	Normal condition	/
	Twinklethe	The communication between the module and the upper computer was interrupted.	1. Check if the communication lines are correct. 2. Verify if the module protocol is inconsistent with the system.
Red fault indicator light	On	1. Output overvoltage, output short circuit, severe uneven current, fan failure, discharge failure, module internal over-temperature, internal communication interruption between primary and secondary sides of the module, output emergency stop alarm, relay interlock, DC output overcurrent 2. Address duplication.	1. This type of fault is usually caused by the module itself. You can power down the device and then check again. If the problem still persists after powering down, it is recommended to replace the module and contact the after-sales service for factory repair. 2. Set the address according to the system slot address requirements.
	Off	Normal condition	/

In addition, when a module malfunctions, the digital tube will automatically jump to the fault code interface. You can view the alarm code of the digital tube to analyze the fault. If at this time the user uses the key to switch to another interface and does not use the key within five seconds, it will automatically jump back to the fault code interface. If no fault code is displayed, fault location can also be carried out based on the status of the indicator light. The alarm code table is shown in Table 6:

Table 4 shows the code description table

Warning Codes	Warning description	treatment measure
E01	Ac input faults (overvoltage, undervoltage and phase loss)	Turn on the power and observe whether the AC input line is correct.
E02	DC output overvoltage	After the electricity to electricity, check module lamp signal is normal, such as continuous fault lamp signal need to change module.
E03	An irrecoverable malfunctioning machine with no output	After the electricity to electricity, check module lamp signal is normal, such as continuous fault lamp signal need to change module.
E04	Internal Over-Temperature	Power-off recovery. Check if the air duct of the module is unobstructed and whether the dust filter of the system is clogged.
E05	Output short circuit	After power is turned off and then turned back on, check if the module indicator lights are functioning properly. If the fault indicator lights remain on continuously, the module needs to be replaced.
E06	Fan Failure (Comprehensive)	1. Check the fan for any foreign objects. 2. Replace the module
E07	Discharge fault	After power is turned off and then turned back on, check if the module indicator lights are functioning properly. If the fault indicator lights remain on continuously, the module needs to be replaced.
E08	Excessive environmental temperature	Power-off recovery. Check if the air duct of the module is unobstructed.
E09	Internal primary and secondary communication has been interrupted	Replace the module
E10	Address duplication	Change the address on the digital tube
E11	Output emergency stop alarm	After the emergency stop is restored, it will automatically resume

Warning Codes	Warning description	treatment measure
E12	Module EEPROM fault alarm	Power on and check. If it doesn't restore, replace the module
E13	Module uneven flow alarm	Reserved fault
E14	Module PFC protection	Module failure. Replace the module
E15	System protocol inconsistency alert	Return to the factory to replace the agreement
E16	Alarm for inconsistent system configuration mode	Change the configuration Settings on the digital tube
E17	The CAN communication of the module is interrupted	Check module and system side communication cable with and without empty pick up, trying to identify whether the mold piece of protocol, system CCU CAN communication interface is normal
E18	DC overcurrent protection alarm	After power is turned off and then turned back on, check if the module indicator lights are functioning properly. If the fault indicator lights remain on continuously, the module needs to be replaced.
E19	Module address out of range fault	Adjust the module address
E20	Address sorting mode conflict	reserved
E21	Output relay adhesion fault	After power is turned off and then turned back on, check if the module indicator lights are functioning properly. If the fault indicator lights remain on continuously, the module needs to be replaced.
E22	/	reserved
E23	Output undervoltage	After power is turned off and then turned back on, check if the module indicator lights are functioning properly. If the fault indicator lights remain on continuously, the module needs to be replaced.

9.3.2 Module replacement

If an irrecoverable fault occurs during the use of the module, please replace it directly.

Replacement preparation

● Prepare the tools and materials: anti-static wristband, anti-static gloves, anti-static box or anti-static bag, insulating shoes, electric screwdriver and other auxiliary tools.

● Confirm that the appearance of the new charging module is undamaged.

● Before replacing the module, please record the address of the original module. The replaced module must be consistent with the original one.

Operating steps

Step 1: Connect the grounding wire of the anti-static wristband, and put on the anti-static wristband, anti-static gloves and insulating shoes.

Step 2: Use an electric screwdriver to remove the fixing screws and take out the charging module.

Note:

1.Do not touch the terminal at the tail of the module.

2.Pay attention to the temperature of the module to avoid the risk of burns.

● Use a screwdriver to remove the screws on the hanging ear.

● Pull out the module forcefully.

Step 3: Install the new charging module

● Slowly push the module into the slot.

● Use a screwdriver to install the four screws on the hanging ear.

Step 4: Remove the grounding wire of the anti-static wrist strap, then take off the anti-static wrist strap and the anti-static gloves.

Step 5: After the installation is completed, the charging pile is powered on again. Once it enters the charging stage, the green light on the module indicator light turns constantly on, confirming that the module is working properly.

Step 6: If there are groups, set the addresses of the modules by pressing the keys, as shown in Section 9.3.2.

10 Product Maintenance

10.1 Routine Maintenance

10.1.1 Maintenance and repair



All maintenance and repair operations on the RTF can only be performed when the RTF is safely disconnected from all external connections, when it is confirmed that these power sources will not be connected again and wait at least 5 minutes.

Only professional technicians familiar with the operation of the system should perform such operations.

● Disconnect the circuit breaker

Operate the DC input DC switch to disconnect the RTF from the battery assembly and operate the AC input AC switch to disconnect the RTF from the AC. Make sure the RTF is not accidentally reconnected. Use a multimeter test to make sure the device has been disconnected and that there is no voltage. Even if the RTF has been disconnected from the power grid/main power supply and battery, some components (such as capacitors) in the RTF still have residual voltage, and the discharge is slow. Therefore, after the circuit breaker is disconnected, please wait at least 5 minutes and use a multimeter to measure the safety before continuing the operation.

● Maintenance and Modification

Only personnel authorized by JEBEL ESS can maintain and modify the RTF. To ensure personal safety, please only use the original parts provided by the manufacturer. If you use non-original parts, you will not be able to guarantee compliance with the relevant certification standards in terms of electrical safety, EMC, etc.

● Functional and safety parameters

Do not change the parameters of the RTF without the authorization of the local power supply company and the instructions of JEBEL ESS. Any unauthorized alteration of the functional safety parameters may cause injury or damage to the person or RTF, in which case, JEBEL ESS will not provide warranty service.



Attention !
1.After powering off, wait 5 minutes to confirm that it is safe before performing repair work.
2.Use a multimeter to measure and ensure that it is safe before disassembling.

10.1.2 Replacing the air filter

The top of the RTF should be cleaned regularly and the air intake air filter should be cleaned or replaced. The RTF needs to be powered off during the process of replacing the air filter.

How to replace the air filter:

The dust filter cotton on the door panel can be directly extracted upward for cleaning and replacement.



In order to ensure the normal operation of the RTF, the air filter needs to be cleaned regularly.

10.1.3 Scheduled Maintenance

RTF must carry out regular maintenance work to ensure its normal operation and service life.

Maintenance Items	Cycles
Read the data from the data collector	Monthly
Check the inside of the cabinet for dust, moisture, or condensation	Monthly
Check for loose cable connections and tighten screws if necessary	Monthly
Check warning labels and add or replace them promptly if necessary	Monthly
Manually inspect AC/DC circuit breakers	Monthly
Check the emergency stop button as well as the stop function of the LCD	By the month
Check the machine for abnormal noises during operation	Weekly

Table 7-2 lists the recommended routine maintenance periods and work contents

10.2 Waste Disposal

RTF will not cause pollution to the environment, the component materials and components of the product meet the requirements of environmental protection, JEBEL ESS according to the requirements of environmental protection, users at the end of the use of RTF, should be processed according to the corresponding local laws and regulations.

11 Accessories

11.1 Product Specifications

Model Number	REC 600
AC parameters	
Power rating	600kWp
Input rated voltage	400Vac
Input voltage range	360Vac-440Vac
Input rated current	866A
Enter frequency	45Hz-65Hz
Input power factor	0.98 or higher
Current harmonic THDI	5% or less
Efficiency	95% or higher
DC parameter	
Output voltage range	200Vdc-1000Vdc
Full load output voltage range	600Vdc-1000Vdc
Maximum output current	1000A
Output voltage ripple	1% or less
Steady flow accuracy	1% or less
Pressure stabilization accuracy	0.5% or less
Other parameters	
Cabinet dimensions (width x height x thickness mm)	1204.4*1957.2*798.4mm
Machine weight	623KG
Level of protection	IP20
Noise	≤68dB
Operating ambient temperature	-25℃ ~ +55℃ (45℃ above load reduction use)
Storage temperature	-40 ℃ ~ 85℃
Relative humidity	≤95%, no condensation
Atmospheric pressure altitude	79kPa ~ 106kPa; Highest altitude 4000m, (derating above 2000m)
Cooling mode	Smart air cooling
Communications	
LCD interface	Touch LCD
Communication port	RS485/CAN

11.2 JEBEL ESS Factory Warranty

● Warranty Period

The warranty period of this product is three years, if otherwise stipulated in the contract, the contract shall prevail.

During the warranty period of JEBEL ESS products, customers should take the initiative to show to the service personnel of JEBEL ESS during maintenance

Invoice and date of purchase of the product. At the same time, the nameplate identification on the product should be clearly visible, otherwise you have the right not to repair.

● Warranty Conditions

If the product fails during the warranty period, JEBEL ESSwill repair or replace the product free of charge; The customer shall reserve a certain amount of time for JEBEL ESS to repair the faulty machine.

● Waivers of liability

The Company has the right not to guarantee the quality under the following circumstances: 1.No JEBEL ESS logo products.

2.Products or components have exceeded the JEBEL ESS warranty period.

3.Failure or damage caused by not according to the instructions, not the working environment specified by the product or by wrong installation, storage and use (such as the ambient temperature is too high, too low, too wet or dry, too high altitude, voltage or current instability, etc.).

4.Failure or damage caused by the installation, repair, change or disassembly of the after- sales service personnel of JEBEL ESS, except for those entrusted by JEBEL ESS after-sales service.

5.Failure or damage caused by the use of JEBEL ESS components.

6.Failure or damage caused by accidents or human causes (operation error, scratch, handling, bump, access to inappropriate voltage, etc.), transportation damage.

7.Failure or damage caused by natural disasters and other force majeure (such as earthquake, lightning strike, fire, etc.).

8.Other failure or damage not caused by the quality problems of the machine (including components) itself.

I.3 Non-shutdown System Maintenance Inspection Record Table

have caused downtimethe screen

S/N	Category	**Assignment Items**	Inspection method/	Judging criteria	Problem Maintenance	Check the results		
1		Check the history for faults that have caused downtime.	Visually inspect the screen.	No fault information causing downtime		☐ Normal ☐ Abnormal		
2		Check that the data transmission of the monitoring device is normal	Montor web page/ app	The connection is established properly and the data transfer is normal		☐ Normal ☐ Abnormal		
3		Check whether the fan rotates normally and whether the air output is normal (you can first check whether the temperature collected by the equipment reaches the set conditions for opening the fan)	Visually Inspection Thermal imaging	The fan rotates normally and trhe air ourput is normal		☐ Normal ☐ Abnormal		Once a month
4		Check the devise for odors or unusual sounds	Smell and listen	No noise, no odor		☐ Normal ☐ Abnormal		
5		Check the emergency stop button (check when the systemison standby)	Manual	The switchtrips normally after pressing the emergency stop button		☐ Normal ☐ Abnormal		

Check results

cabinet

tool

I.4 Shutdown System Maintenance Inspection Record Table

S/N	Category	Job item	Inspection method/ tool	Criteria for determination	Check results	Problem description	maintenance Cycle
1	System Cleaning	Whether there are leaks of other foreign objects in the room or container	Visual Inspection	No leaks and foreign objects	☐ Normal ☐ Abnormal		Once a month
2		Whether there are animals such as mice, geckos, spiders in the cabinet	Visual Inspection	No animals or insects	☐ Normal ☐ Abnormal		
3	System Cable Connections	Check for loose power calbe connections or obvious signs of rust or corrosion	Manual/ wrench	No signs of loosening or rust	☐ Normal ☐ Abnormal		
4		Check for loose communication cable connections	Manual/ Screwdriver	No looseness	☐ Normal ☐ Abnormal		
5		Check the grounding connection of the device	Visually inspect/ multimeter	≤4Ω	☐ Normal ☐ Abnormal		
6		Check the external connection cables of the device for breakage	Visual Inspection	No breakage	☐ Normal ☐ Abnormal		
7	Internal cleaning of the system	Check the inside of the cabinet for moisture or condensation	Visual Inspection	No condensation and no moisture	☐ Normal ☐ Abnormal		
8		Check the cabinet for visible dust inside	Visual Inspection	No obvious dust	☐ Normal ☐ Abnormal		
9		Check that the air filter is blocked	Visual Inspection	No clogging	☐ Normal ☐ Abnormal		
10		Inspect the inside of the device for visible signs of damage	Visual Inspection	No breakage	☐ Normal ☐ Abnormal		
11		Check the inside of the cabinet for visible signs of rust	Visual Inspection	No rust marks	☐ Normal ☐ Abnormal		
12		Safety signs	Visual Inspection	Equipment safety sign is not off	☐ Normal ☐ Abnormal		



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