RECTIFIER

SYSTEM MONITOR

USER MANUAL

M30

Statement

Overview

User manual include :

Product introduction, user interface definition, common function introduction, LCD interface use, initial monitoring parameters introduction.

The pictures in this article just only for Reference.

This document is intended for the following engineers:

- Sales Engineer

- Technical support engineer maintenance engineer

- Test Engineer

1   Product Introduce

1.1   Product Description

The ITM-AT is a compact site monitoring module that captures module voltage, current, and alarm information, and adjusts module current limit, overvoltage point, and control module power on/off.

ITM-AT provides RS485 communication interface (1 way north, 2 way south), rectifier module communication interface (support RS485 and CAN), sensor interface (ambient temperature and humidity, battery temperature), 6 input dry contact interface (can Associated access control, flooding, smoke, lightning protection, oil machine, temperature control failure, battery out of position and standby DI), 1 channel three-phase AC detection port, 6 output dry contact interface, 9 channel current detection, 2 channel battery melting Wire and 1 total load fuse detection, 5 levels power-down management, 9-channel user power record, battery management, system energy saving, etc., to meet the user's demand for power monitoring functions. The ITM-AT supports the sound and light alarm, the access of the smart device, the dry contact upload, the RS485 upload, and the TCP/IP upload mode. The environment information and alarm information will be reported.
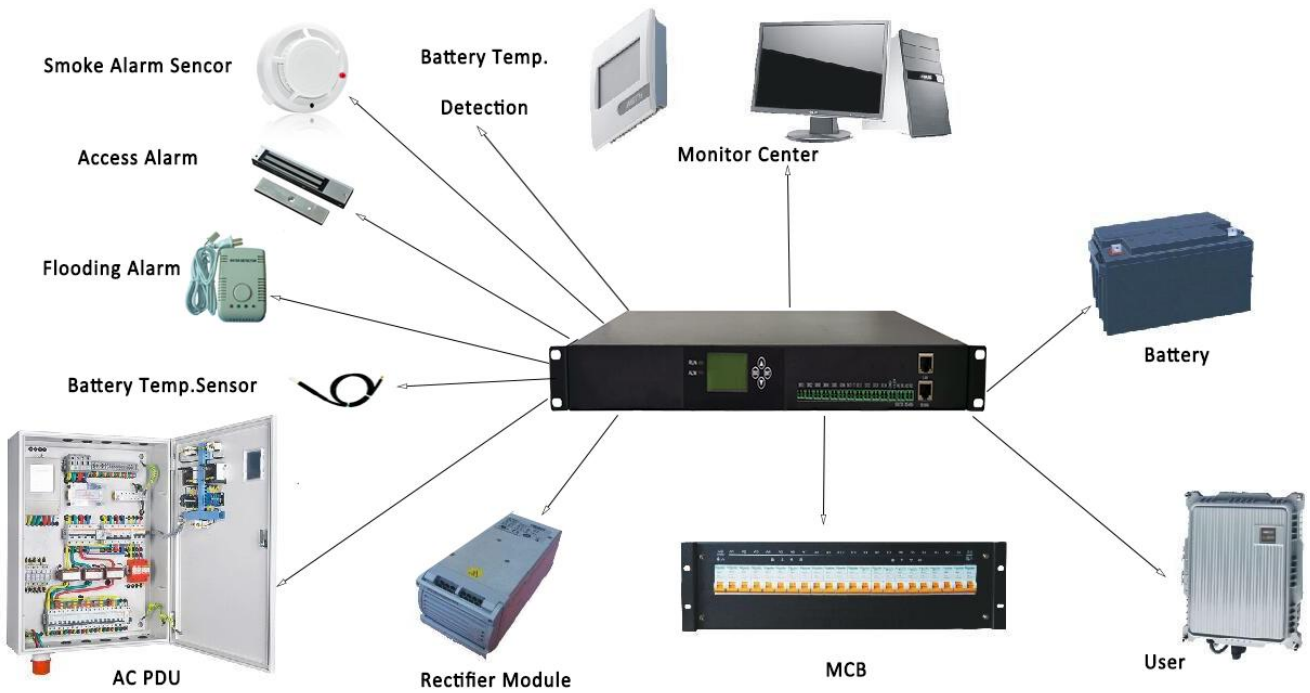
1.2 Product Feature

● **Support real-time detection of the operating status of the power system**

- AC input Detection （Single Phase Input /Three Phase Input can be choose ）

- DC Output Detection

- Rectifier module Detection

- Battery Group Detection

- Ambient temperature, battery temperature, ambient humidity, Access Control, smoke, Flood detection

- Dry contact input signal detection.

- AC lightning protection and DC lightning protection detection.

- Battery in-position detection.

- Battery Fuse and Load Fuse Detection.

- Support alarm real-time detection and reporting

- Support 6-channel alarm dry contact output, output logic normally open / normally closed optional, can be associated with different alarm information.

- Alarm Level can be Configure （Closed/inform/Common/Serious/Urgent）

- Audible and visual alarm

- 1000 units historical alarm records

● **Support Remote Management**

- RS485 interface, TCP/IP interface, YDN23 (YD/T 1363)

● **Support flexible rectifier module management**

- connection to rectifier modules via RS485 or CAN

- Controls the output voltage of the rectifier module

- Controls the rectifier module Output Max current.

- Controls the rectifier module On/off

● **Support Saving energy management**

- Rectifier module intelligent sleep management.

- Rectifier module system current limit management.

● **Support for complete battery management**

- Battery charging management (manual / automatic, equalizing / floating charge).

- Battery charging temp. Compensation.

- Battery High and Low Temp.Alarm.

- Battery charging current limit management.

- Battery low voltage protection (manual / automatic, voltage / duration).

- Battery low voltage power-off protection (manual / automatic, voltage / duration).

- Battery Position Detection.

- Battery test (timing/manual).

- Battery High- Temp. Protection (No Action/Down Voltage/Batter Disconnect)

● **Support Disconnection Management**

 - 5 level independent power management

- Can be Setting to five Disconnection / secondary disconnection mode, contactor type normally open / normally

Closed

- Three type power-down management modes (manual / voltage / duration)

- Disconnection voltage adjustable

- Disconnection Time can be adjustable

● **Support users, battery discharge measurement**

- Electricity, electricity consumption ratio information

- Store the total amount of power used by the user at regular intervals every day

- Battery storage time can be   Setting

- Three power record queries (by day/month/year)

- - Support for querying the power within the specified date.

2 Operation Display and interface

ITM-AT consists of three parts: monitoring board ITM-AT-MAX, LCD display, and Ethernet board ITM-AT-NET.

2.1 LCD Display and Button Instruction

The viewing and Setting of parameters can be achieved through LCD panel operation:
4 Buttons ,instruction as Figure 2-1 .

（1） RUNNING Indicate LED Light
（2） ALARM Indicate LED Light
（3） LCD Display
（4）"Cancel" Button
（5）"Up" Button
（6）"Enter" Button
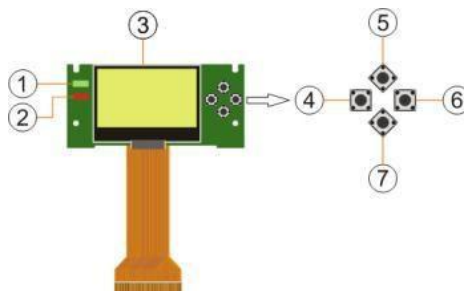
（7）"Down" Button

Figure 2-1 ITM-AT Indicated LED Light

Item	Color	Status	Description
Running Indicated LED Light	Green	Always off	Monitor Fault or Without DC Input
		Slow Flash（0.5Hz）	Monitor Normal
		Fast Flash（4Hz）	Monitor normal work and communicate with the host computer
ALARM Indicate LED Light	Red	Always off	No Alarm
		Slow flash（0.5Hz）	Level II Alarm or Important Alarm
		Always On	Urgent Alarm

Figure 2-2 ITM-AT Button Instruction

| No.	Item	Description
5	Up	"Up" or "Down" Can be checking and modify Parameter
7	Down	
4	Cancel	"Cancel" back to the upper Menu or cancel the current configure
6	Enter	"Enter" Can enter the main menu or enter the next sub-menu, and can be Save Parameter value
Description: *Press and hold the "Up" or "Down" button to trigger a quick Setting up operation, quickly page up or quickly change Setting up parameters.* *There is no button operation within 1 minute, the LCD returns to the main interface, and the backlight turns off.* *The sound alarm is blocked when there is a button operation, and no button operation is restored within 1 minute.*		

2.2 Interface Definition

Figure2-2 ITM-AT-MAX   Inner board connector Definition
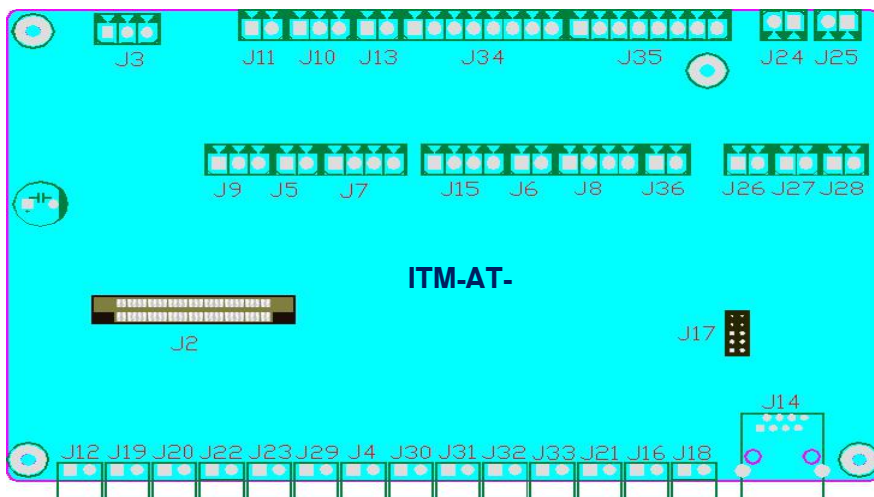
|		
J3 Main Board Power(-48V) 3P	J11 Mid-Point Voltage Detection Port 2Pin	J10 Fuse signal input Port
J13 Battery Current Detection	J34 Load current Detection 8Pin	J35 Load current Detection 8Pin
J24 System Power disconnection （BLVD）	J25 System power disconnection （LLVD1）	J9 Working Temperature Humidity
J5 Working Temp. Detection	J7 AC Power Voltage Detection	J15 Rectifier module 485
J6 Rectifier module Can	J8 DIN5、DIN6	J36 +12V Dc power Output
J26 System Power disconnection	J27 System Power Disconnection	J28 System Power Disconnection
J2 LCD Display	J17 LAN Port	J12 DO1
J19 DO2	J20 DO3	J22 DO4
J23 DO5	J29 DO6	J4 Battery Tem. Detection
J30 DI1	J31 DI2	J32 DI3
J33 DI4	J21 +12V DC Power Output	J16 South 485-1
J18 South 485-2	J14 North 485-RJ45	

2.2.1 ITM-AT-MAX Interface Statement

2.2.1.1   Power port (-48V) definition (J3)）
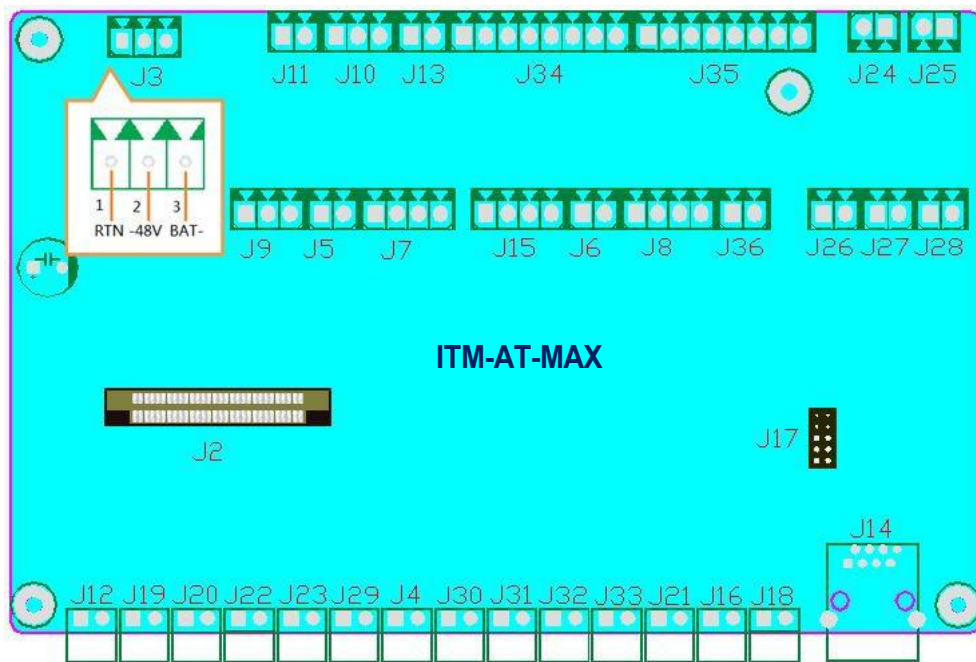
Item	Pin. No.	Pin Defined
J3	1	RTN，48Vdc Input +
	2	-48V，48Vdc Input -
	3	BAT-，48Vdc Input -(Battery-)

2.2.1.2   Mid-Point Voltage Detection Port (J11)
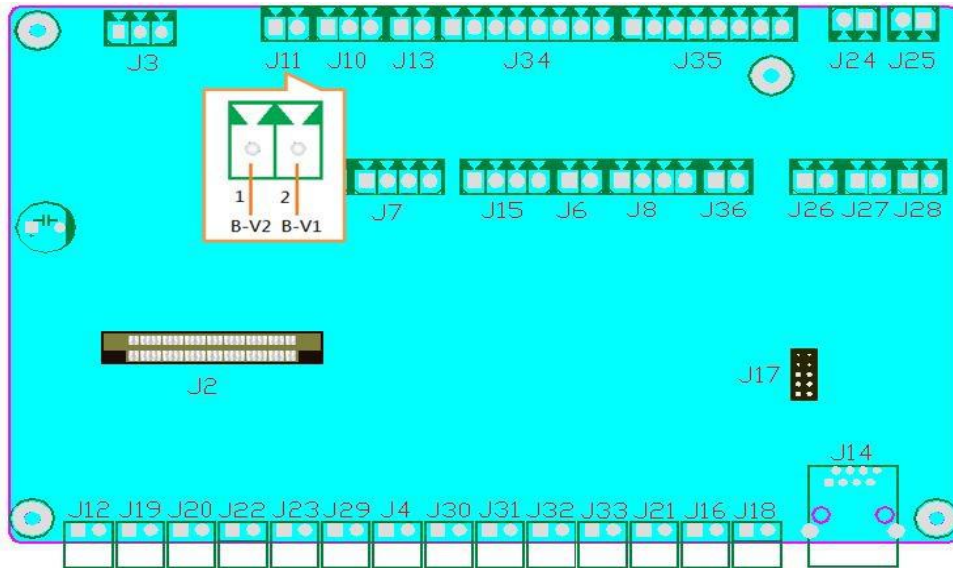
Item	Pin. No.	Pin Defined
J11	1	B-V2，Battery Group 2 MVP Input
	2	B-V1，Battery Group 2 MVP Input

2.2.1.3 Fuse signal input Port (J10)
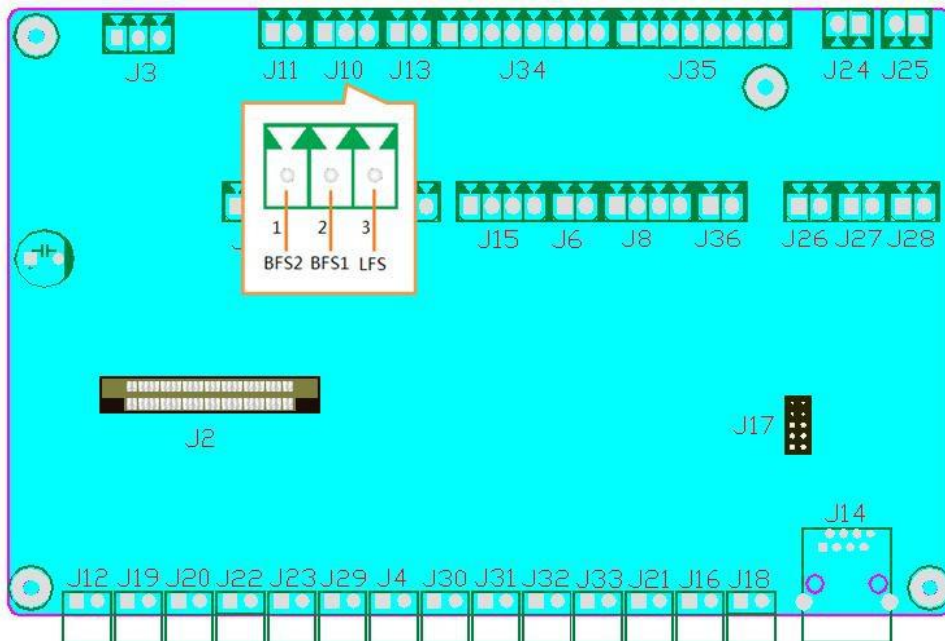
Item	Pin. No.	Pin Defined
J10	1	BFS2，Battery fuse 2 signal input
	2	BFS1，battery fuse 1 signal input
	3	LFS， load fuse signal input

2.2.1.4   Battery Current Detection (J13)
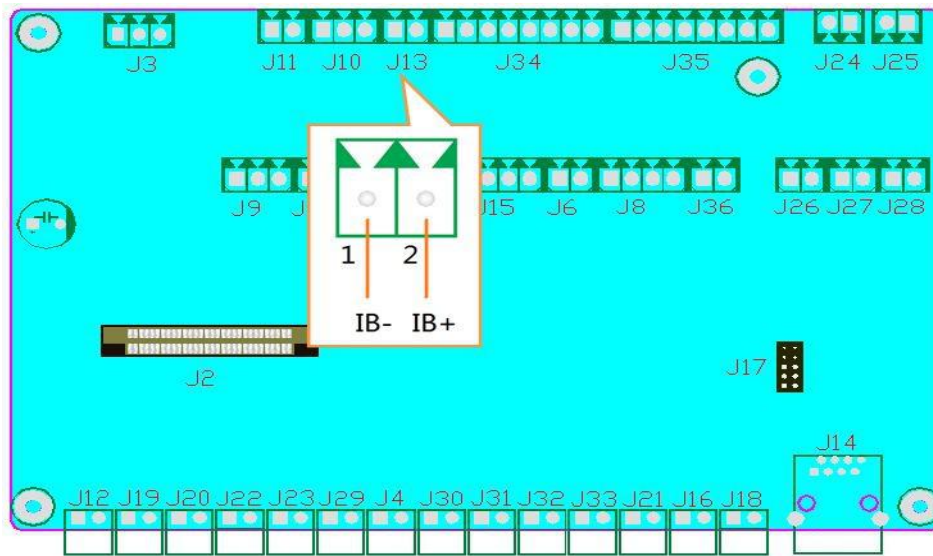
Item	Pin. No.	Pin Defined
J13	1	IB-， Battery current Signal input -
	2	IB+， Battery current Signal input +

2.2.1.5   Load Current Detection (J34)
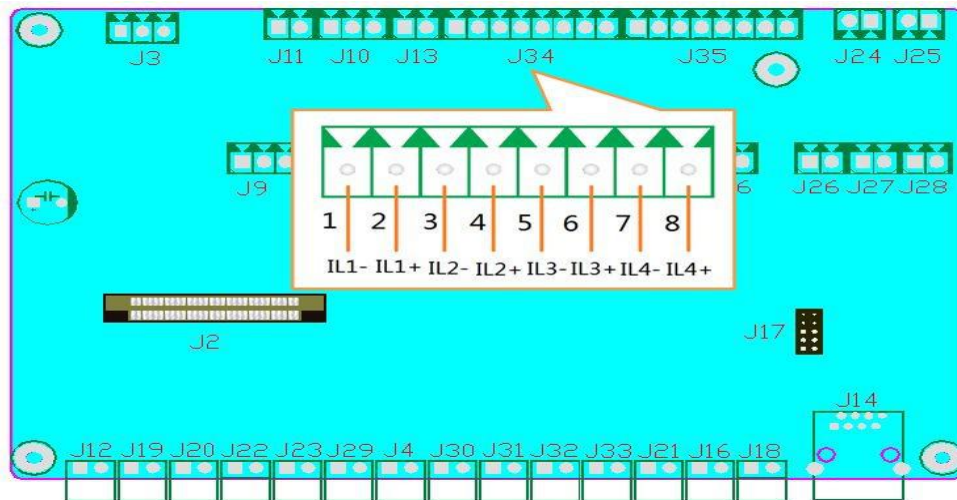
Item	Pin. No.	Pin Defined
J34	1	IL1-,user 1 Primary Load Current signal Input -
	2	IL1+,user 1 Primary Load Current signal Input+
	3	IL2-,user 1 Secondary Load Current signal Input-
	4	IL2+,user 1 Secondary Load Current signal Input+
	5	IL3- ,user 2 Primary Load Current signal Input -
	6	IL3+,user 2 Primary Load Current signal Input+
	7	IL4-,user 2 Secondary Load Current signal Input-
	8	IL4+,user 2 Secondary Load Current signal Input+

2.2.1.6 Load current 5-6 Current Detection（J35）
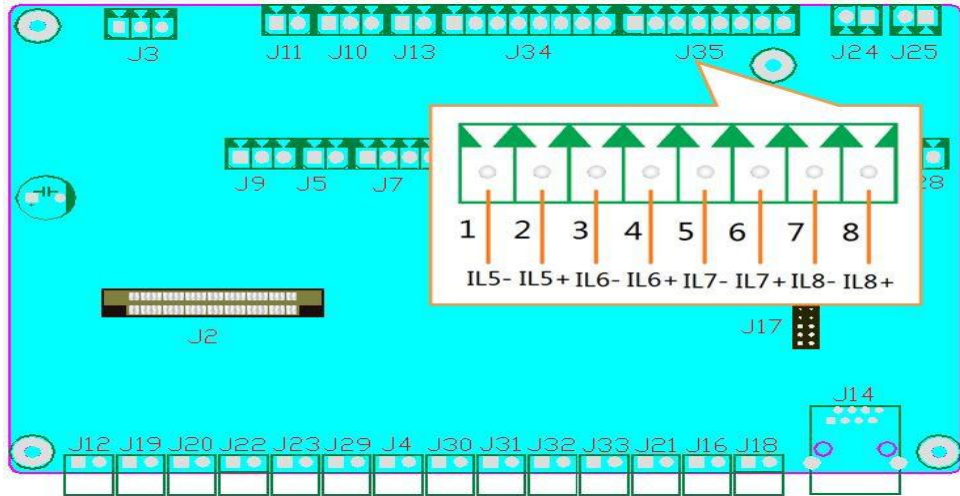
Item	Pin. No.	Pin Defined
J35	1	IL5-,user 3 Primary Load Current signal Input -
	2	IL5+,user 3 Primary Load Current signal Input+
	3	IL6-,user 3 Secondary Load Current signal Input-
	4	IL6+,user 3 Secondary Load Current signal Input+
	5	IL7-,user 3 Primary Load Current signal Input -
	6	IL7+,user 4 Primary Load Current signal Input+
	7	IL8-,user 4 Secondary Load Current signal Input-
	8	IL8+,user 4 Secondary Load Current signal Input+

2.2.1.7   AC Power Voltage Detection（J7)
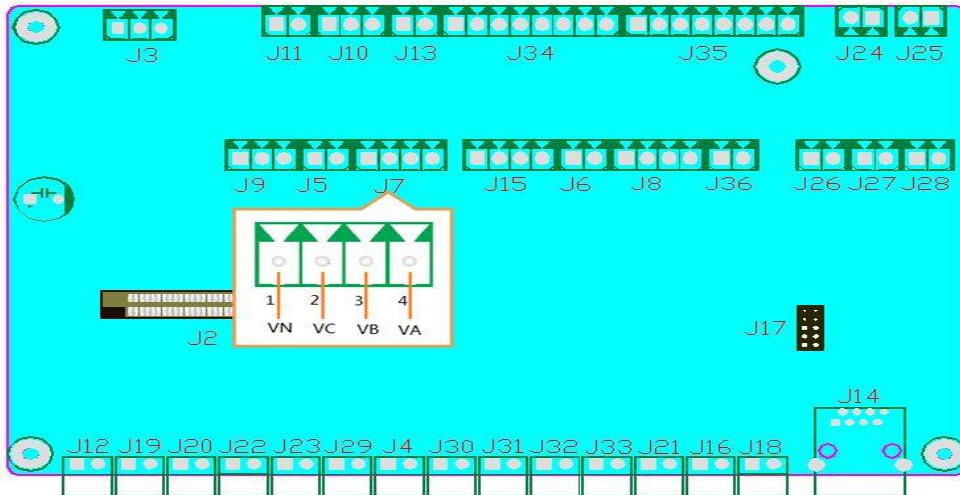
Item	Pin. No.	Pin Defined
J7	1	VN，Input Signal Neuter Line
	2	VC，C Phase Voltage Signal input
	3	VB，B Voltage Signal input
	4	VA，A Voltage Signal input

2.2.1.8   Working Temp. Detection (J5)
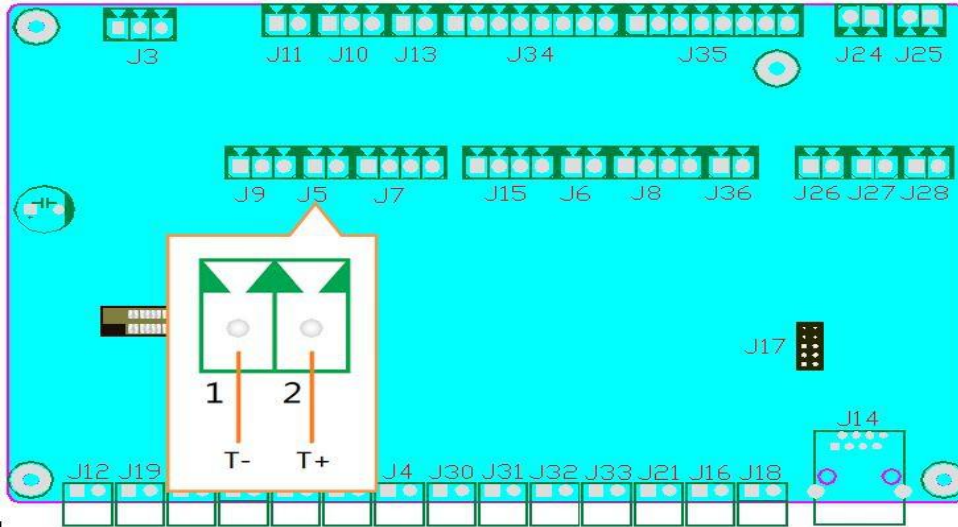
Item	Pin. No.	Pin Defined
J5	1	T-，NTC-Port
	2	T+，NTC+Port

2.2.1.9   Working Temperature Humidity Detection（J9）
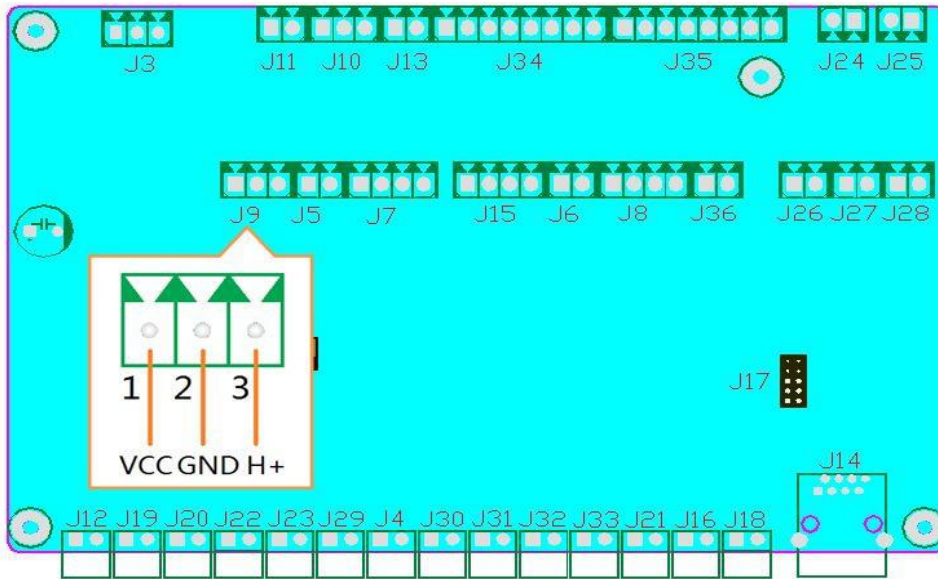
Item	Pin. No.	Pin Defined
J9	1	VCC,Sensor Power +
	2	GND,Sensor Power-
	3	H+，Sensor input +

2.2.1.10 BLVD(J24) &LLVD1(J25) System power disconnection LVD（J24）
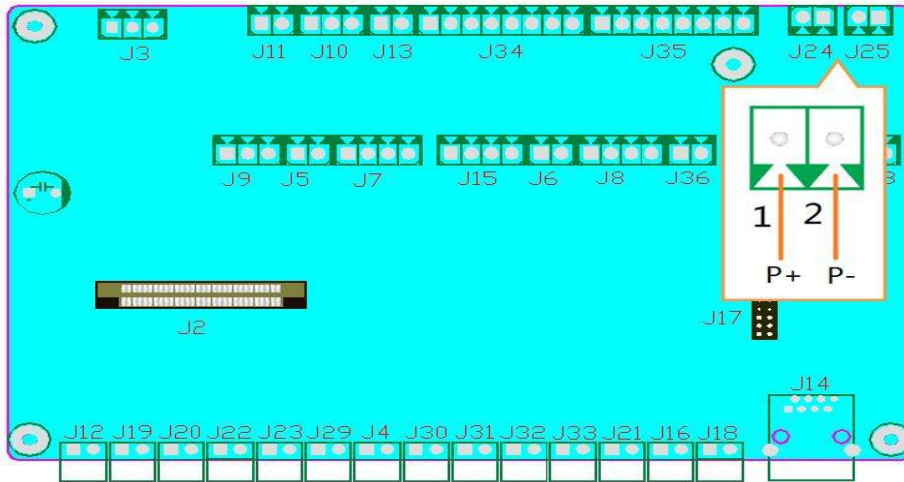
Item	Pin. No.	Pin Defined
J24、J25	1	P+,Disconnection signal output port +
	2	P-,Disconnection signal output port -

2.2.1.11 LLVD2（J26）、LLVD3（J27）、LLVD4（J28） control connector
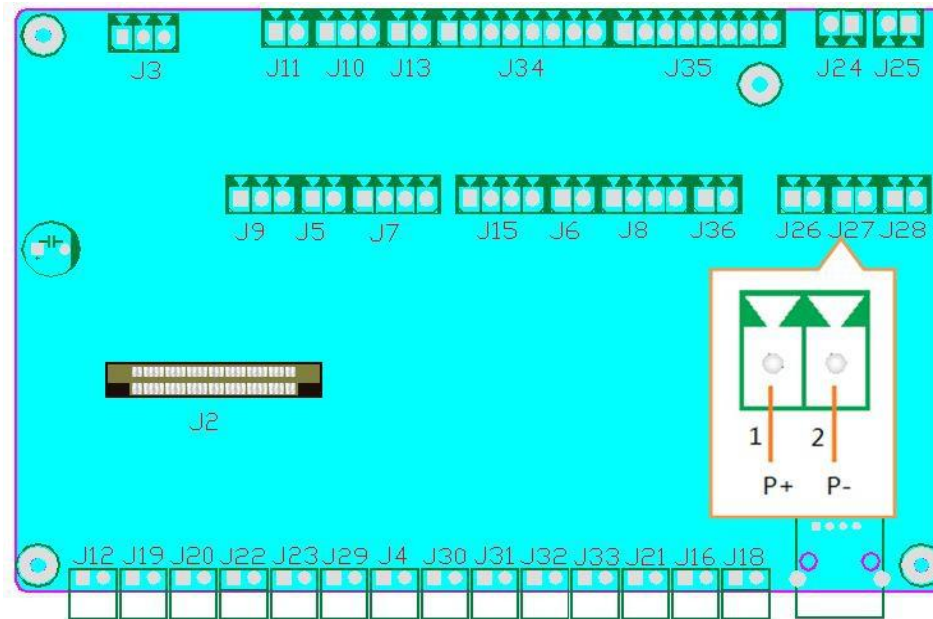
Item	Pin. No.	Pin Defined
J26~J28	1	P+,Disconnection signal output port +
	2	P-,Disconnection signal output port -

2.2.1.12   Rectifier module Rs485 （J15）
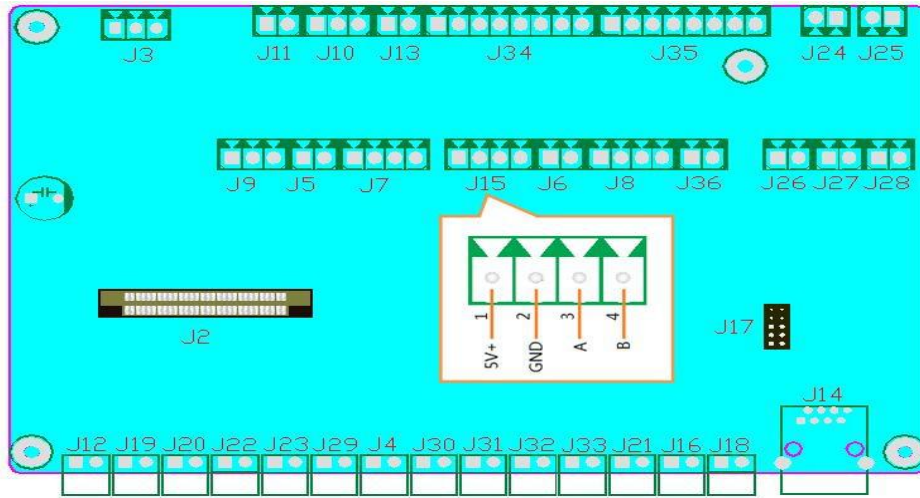
Item	Pin. No.	Pin Defined
J15	1	5V+， 5V output
	2	GND
	3	485-A
	4	485-B

2.2.1.13   Rectifier module Can Communication (J6)
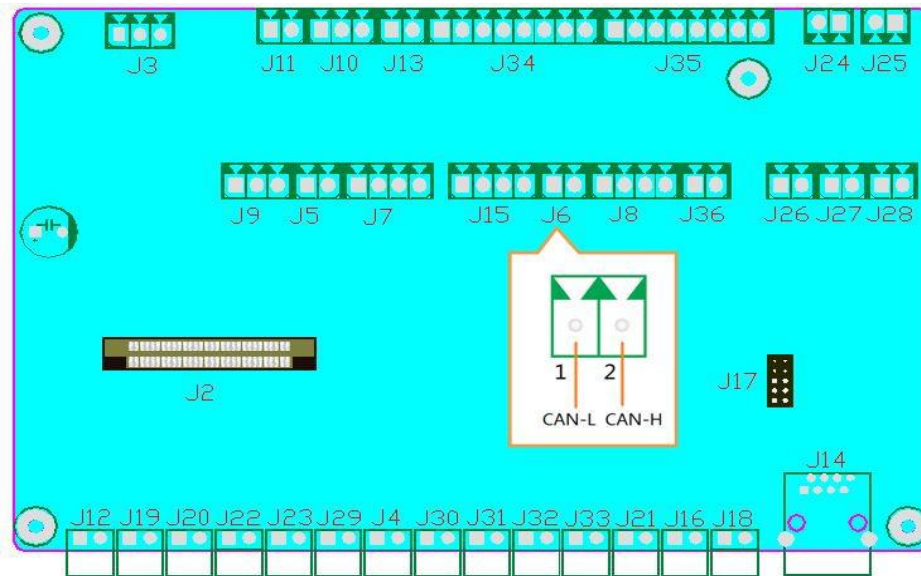
Item	Pin. No.	Pin Defined
J6	1	CAN-L， CAN -
	2	CAN-H， CAN +

2.2.1.14   DI5、DI6 Dry contact Input Connector （J8）
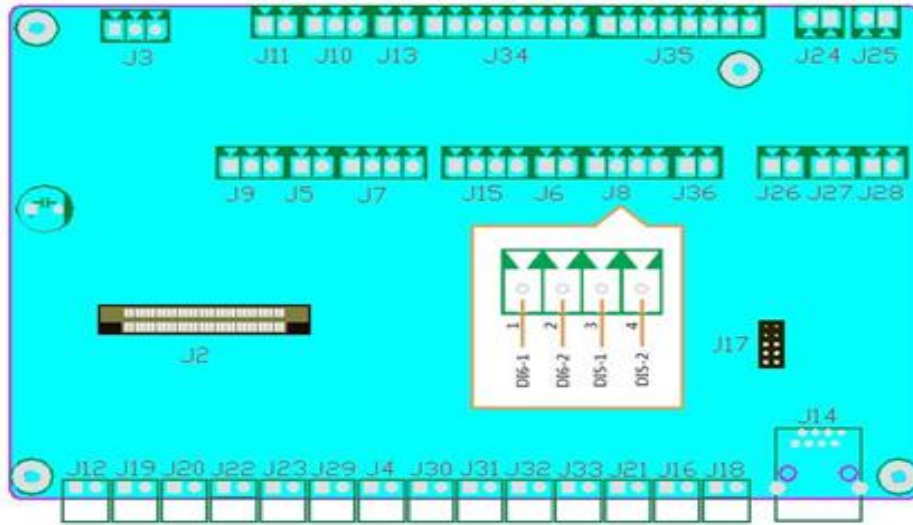
Item	Pin. No.	Pin Defined
J8	1	DI6-1，DI6 signal input 1
	2	DI6-2，DI6 signal input 2
	3	DI5-1，DI5 signal input 1
	4	DI5-2，DI5 signal input 2

2.2.1.16 North 485-RJ45 (J14)）
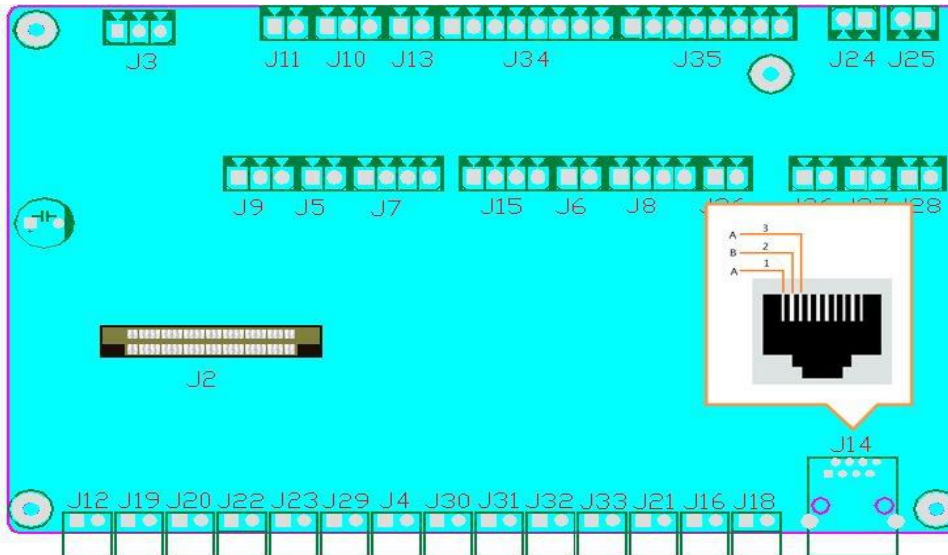
Item	Pin. No.	Pin Defined
J14	1，3	A， 485-A
	2	B， 485-B
	6	PE

2.2.1.17 Dry Contact Output Port（J12、J19、J20、J22、J23、J29）
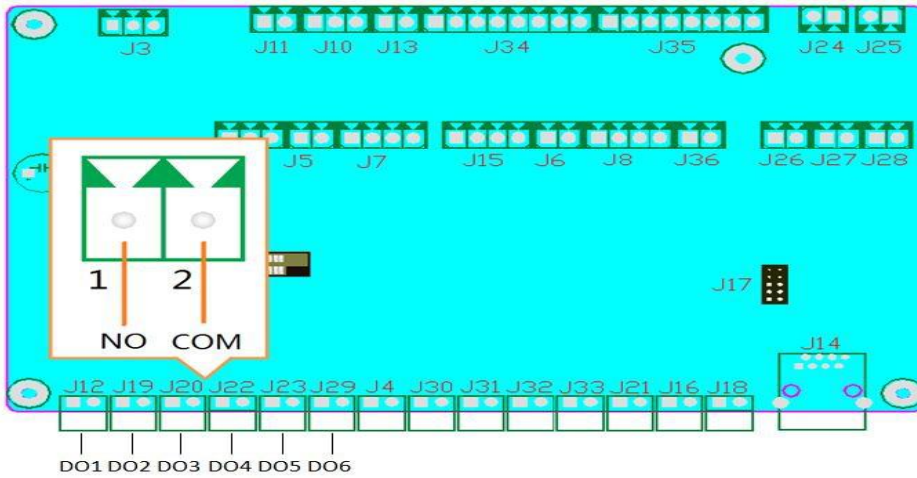
Item	Pin. No.	Pin Defined
J12、J19、J20、J22、J23、J29	1	NO1,NO2,NO3,NO4,NO5,NO6
	2	COM1,COM2,COM3,COM4,COM5,COM6

2.2.1.18 Battery Temp.Port（J4）,DI1~DI4 Dry Contact Input（J30~J33）, 12V output（J21）
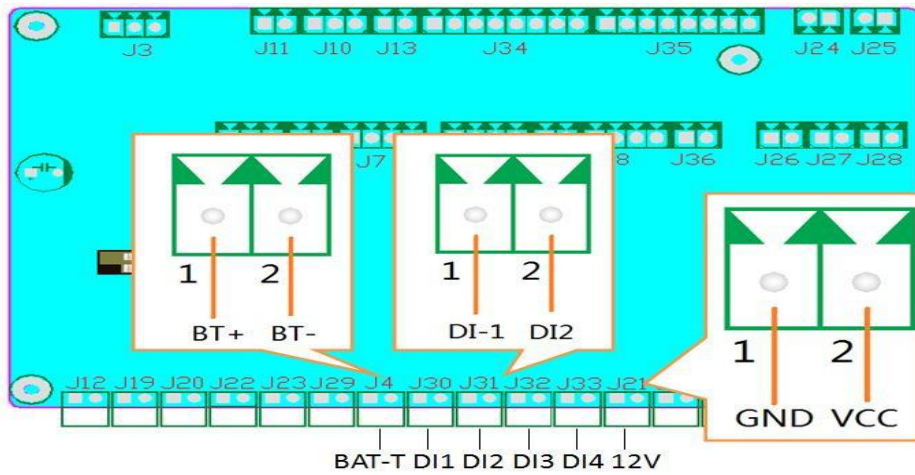
Item	Pin. No.	Pin Defined
J4	1	BT+,NTC +
	2	BT-,NTC -
J30~J33	1	DI-1,DI1,DI2,DI3，DI4 Dry contact signal Input 1
	2	DI-2,DI1,DI2,DI3，DI4 Dry contact signal Input 12
J21	1	GND,12V Power Output -
	2	VCC,12V Power Output +

2.2.1.19　South RS485 Output Port（J16、J8）
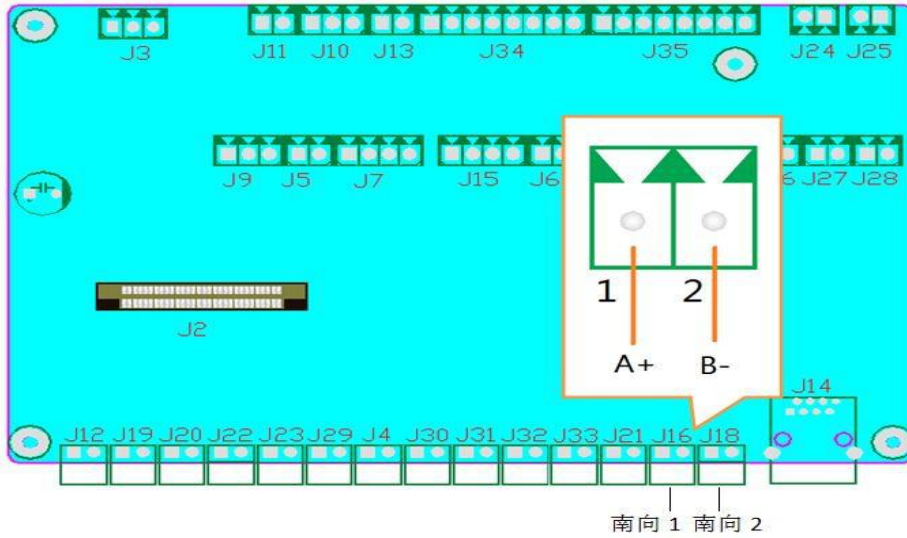
Item	Pin. No.	Pin Defined
J16、J18	1	A+，RS485 +
	2	B-，RS485 -

2.2.1. 20　12V DC Power Output Connector
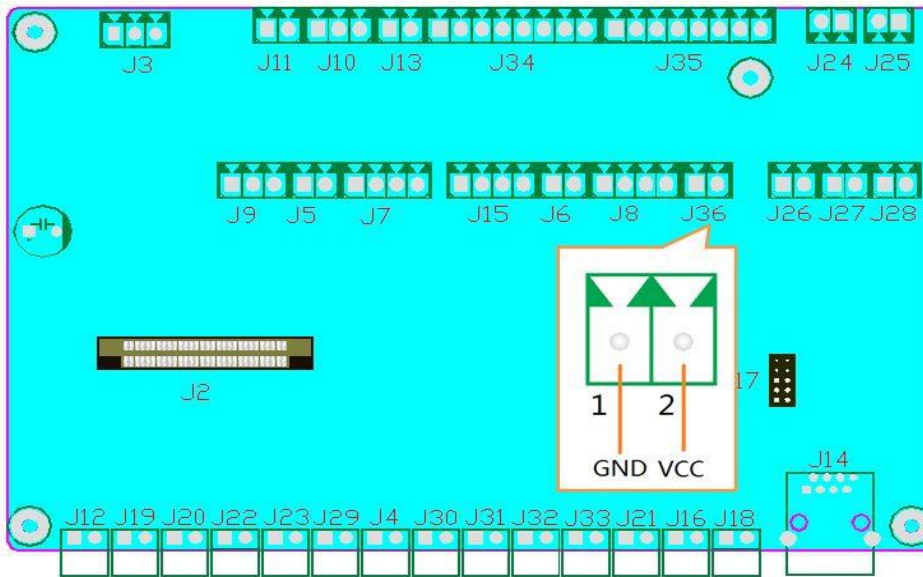
Item	Pin .No	Pin Defined
J36	1	GND，12V DC Power Output -
	2	VDD，12V DC Power Output +

3   LCD Operation Menu

- **Button Definition ,Figure 3-1:**
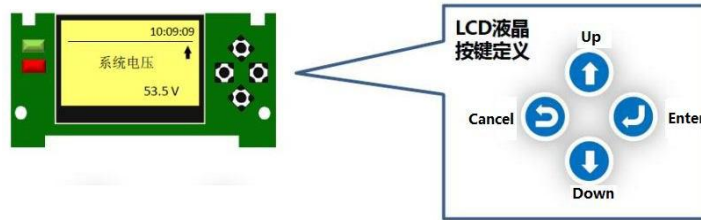
- **Operation Definition**

- When the black body white character is selected, press the "Enter" key to enter the selected state.
- When Setting parameters, you must change the parameter value by pressing the "Up" or "Down" key.
- In the parameter Setting, press "Enter" to save, press "Cancel" to cancel the Setting, not save.
- Press and hold the "Up" or "Down" button for 1.5 seconds to enter the quick Setting state, which can be used to quickly turn pages or quickly change parameter values.

- **Pass words**

- When "Parameter Setting" is turned on, the password needs to be verified. The low privilege password is "1111" and the high privilege password is "3333".

- Some important parameters can only be viewed when low permissions are not Setting

- Enter the authorization status after the password is entered correctly, and enter the "Parameter Setting" again without verifying the password.

- When the backlight is off after one minute of no button operation, the authorization status is removed when the backlight is turned off, and the password is verified again.
- Low privilege password can be changed in "Parameter Setting" -> "System Settings" to change the password. High privilege password cannot be modified

- **Language**

  The language selection page is displayed when the computer is turned on. After no operation for 20 seconds, the original selection is entered into the system page by default.

  You can enter the LCD interface language in "Parameter Setting" -> "System Settings", you can choose Chinese / English

Level I Menu	Level II Menu	Syst. Configure	Para.
Action. Alarm	System. Setting	AC Input Setting	Chinese
Run Info	Alarm Setting	User load Configure	English
Para. Settingting	Battery Setting	Current Shunt Configure	
Run. Ctrl	Rectifier module Setting	Load shunt Configure	
Alm. Log	LVD Setting	Ele-Save Time	
Distribution information	Energy saving Setting	Language Setting	
Bat. Log	Input Setting	Buzzer Setting	
	Output Setting	Address Setting	
	Calibration Setting	Password	
		Data Setting	

4   Feature Description

4.1   Rectifier Management

4.1.1   Rectifier module Status Log.

4.1.2   Rectifier module Control

4.1.3   Rectifier Module Parameter Setting & function Setting.

4.1.1   Rectifier module Status Log.

LCD Display Path：Main Menu -> Running Information ->Rectifier Status Log As figure 4-1

Figure 4-1-1 Rectifier module Status Log.

	Parameter	Descriptions
Total Rectifier module	Number of in-position modules	The total number of modules currently in position
	Number of working Rectifier	The total number of modules currently working
	Total Rated rated current	The sum of the current ratings of the current in-position modules
	Working rectifier rate current	The sum of the rated currents of the current working modules
	Total rectifier Output Voltage	Read the maximum output voltage of each module
	Total Rectifier Output Current	Take the sum of the output current of each module
	Total Rectifier average temperature	Average air inlet temperature of each module
	Power On Status	Indicates that the current status of the module power

		on/off
Single Rectifier module	Fault Status	Indicates whether the module currently has a fault alarm or not
	Protect Status	Indicates whether the module is currently in protection status
	Communicate Status	Indicates whether the current monitoring and module communication is normal or not
	Limited Current Status	Indicates that the current state of the module is current limit/ Current unlimited
	Shunt Status	Indicates whether the module has a Not Share current alarm.
	Output Voltage	Indicates module output voltage value
	Output Current	Indicates Rectifier module output Current Value
	Input Voltage	Indicates Rectifier module input Voltage
	Input Current	Indicates rectifier module input Current
	Rectifier Limited Current Point	Indicates the current rectifier module current limit
	Rectifier Software Version	Indicates the current Rectifier t module Software Version 380AC&220/380V
	Air inlet temperature	Indicates rectifier module Air inlet temperature
	Efficiency type	Indicated rectifier Efficiency Value
	Module rated current	Indicate rectifier module Rated Current

4.1.2 Rectifier module Control

LCD Display Path：Main Menu ->Run Contr.->Rectifier Contr.

● Rectifier module Power On/ Off Control

In the case of manual control mode, the user can turn on/off a rectifier module or turn all modules on/off according to actual needs.

● Rectifier output Voltage & Current Control .

This function can only be used in the module control manual mode. In the automatic mode, the voltage output value is automatically calculated according to the power system status.
The control output voltage can directly configure the desired output voltage value, the parameter range is 42V-58V; the control output current is realized by configuring the current limit point, the parameter range is 0.5A-module rated current.

● Control module in-position detected again

When the module needs to re-detect the number of bits in place, it can be re Setting.

● Rectifier module Re Setting Control

When Rectifier module have been Lock for the Over Voltage , can be restart Automatic

● Module manual control mode

In the manual control mode, the system does not perform energy saving actions and automatically calculates the module output voltage based on the battery status. At this point, the user can control the module on and off at any time, output voltage and current control.

Description: Automatically switch to automatic control mode 5 minutes after no control operation in manual control mode. 。

4.1.3   Rectifier module Parameter Configure & function Setting

LCD Display Path：Main Menu->Parameter Configure ->Rectifier Setting

● Rectifier module Limited Current point

Can be Setting rectifier module output Limited Current point 。

Figure 4-1-2 Rectifier module Limited Current point

Configure Parameter	Description	Default	Setting Value
Rectifier limited Current point	Can be Configure Rectifier Max Output Current	55	1-60

When the module output voltage is too high, the module enters the protection status, and the monitoring module will be protection alarm.

Figure4-1-3 rectifier module over-Voltage Protection Parameter

Configure Parameter	Descriptions	Default	Setting Value
Over Voltage Protection Point	Module output overvoltage protection point	59.5V	58.5V-60.5V

● **Walk-in Function** （**(requires module protocol support**）

After this function is enabled, the module linearly releases the output current from 0 to the Setting current limit within the Setting time to avoid the impact on the module output.

Figure 4-1-4 rectifier module Walk-in Parameter

Configure Parameter	Description	Default	Optional range
Walk-in Enable	Walk-in Function Enable	Closed	On/off
Walk-in Time	Walk-in Power on time	8s	8s-200s

● **Rectifier module Start according to sequence (requires module protocol support**）

The module turns on the modules one by one according to the Setting sequence start interval to

avoid the impact on the module input.

Figure 4-1-5 Rectifier module sequence start Parameter

Configure Parameter	Descriptions	Default	Optional range
Sequential starting interval	The sequence start interval of the module, 0s is the shutdown function	0s	0s-20s

● Max QTY of Support rectifier Module

You can Setting the maximum number of modules in the system. The monitoring only communicates with modules whose address is not greater than the maximum number of modules in the system. Once Modules larger than the maximum number of modules in the system cannot be identified.

Figure 4-1-6 rectifier module Limited Parameter

Configure Parameter	Descriptions	Default	Optional range
Support Max rectifier Module	Setting the maximum number of modules in the system	8	1-24

4.2 Energy Saving Management

4.2.1 Rectifier module intelligent energy saving

The rectifier module has a low working efficiency when the load is small. In order to achieve the best efficiency point of the system and improve the overall operating efficiency, the system intelligent energy-saving function can be turned on. Intelligent energy saving is a working mode that improves the load efficiency by controlling the number of working modules. When the total load of the power system is small, the part of the rectifier module is turned off, so that other rectifier modules in the power system work at a higher load, thereby improving the working efficiency of the system and achieving the purpose of energy saving; at the same time, reducing the working time of the rectifier module and extending the rectification The life of the module.

The ITM-AT calculates the number of turns on the rectifier module based on the load rate of the power system. When the load is reduced, the rectifier module is turned off one by one; when the load is large, the ITM-AT appropriately turns on the number of rectifier modules according to the current load size. In order to make the working time of the rectifier module in the system consistent, the ITM-AT periodically switches the module to be turned off, so that different modules take turns to enter the working state. When modules of different efficiency work in the same power system, the high efficiency module has the priority to work.

When the system is in the energy-saving status, once one of the following conditions has

happened, the system saves energy model will interrupt and open all modules until the alarm is restored, and the system restarts the energy-saving mode.

1: Battery current limit, discharge, test, Battery not in place.

2. Battery high temperature, protection, fuse break, Batteryloss, imbalance, over-voltage, under capacity, over-current, battery maintenance time.

3: lightning arrester fault, DC overvoltage, and under-voltage.

4: AC power failure, phase loss, over-voltage, under-voltage.

5: Rectifier module communication interruption, fault, protection, current limit.

Rectifier module energy-saving related parameters

LCD Display Path：

Main Menu->Parameter Setting ->Energy Saving

System Energy Saving Parameter Setting As figure 4-2-1

Figure **4-2-1** Rectifier module energy-saving parameters

Parameter	Description	Default	Optional Range
Energy Enable	Open：When the power system meets the energy-saving conditions, the ITM-AT will order the rectifier module into a power-saving status Closed ：Closed system Energy Saving function	Open	Open/Closed
Minimum working module	The minimum number of rectifier modules to work after energy saving is enabled。	1	1-24
Energy saving cycle (days)	The rectifier module saves energy for one cycle. After the energy saving reaches the Setting time, wake up the closed module and close another working rectifier module.	7	1-365
Module best efficiency point (%)	The ratio of the load current to the rated current when the rectifier module converts the optimum efficiency. The efficiency of the rectifier module at this efficiency point is the highest. When the energy saving is on, when the module efficiency of the system is lower than this value, the system will shut down a rectifier module.	80%	50%-100%

	For example: the rectifier module has a rated current of 50A and a single module at 40A. The overall performance is best, and the optimum efficiency point is 40A/50A*100% = 80%.		24
Module redundancy point(%)	The ratio of the redundant current of the rectifier module to the rated current of the rectifier module.When the energy saving is turned on, when the redundancy value of the system is lower than the value, the system will Turn on a closed rectifier module.Example: The rectifier module has a rated current of 50A, and the user wants the power supply.10A/50A*100% = 20% 。		

4.3　Battery Management

4.3.1　Battery Charge

● 　　　　Float charge

In order to compensate for the self-discharge loss after the battery is saturated, it is necessary to perform battery floating charging so that the battery is always in a full state, and the floating charge can also be used to restore the battery capacity after a large discharge of the battery.

● 　　　　Equal charge

After the AC power failure is restored, in order to quickly restore the battery capacity, it needs to be equalized Charge. Or after a long period of battery floating charge, the battery self-discharge loss is large and the activity is reduced. To activate the battery activity and restore the battery capacity, it is necessary to perform equalization. The charge voltage of the charge is higher than the float voltage.

● 　　　　Charging current limit

During the charging process of the battery, in order to avoid overcharging the battery and bulging the battery, current limiting control is required to maintain constant current charging during battery charging.Battery charging parameters

Float charge Parameter Setting LCD Path：Main Menu->Parameter Setting ->Battery Setting

Figure 4-3-1Battery Charge Parameter

Configure Parameter	Statement	Default	Optional Range
Float Chg Voltage	Rectifier output Voltage under Float Charge	54.0V	42-58
Equ- Chg Voltage	Rectifier output Voltage under Battery Equ- charge	56.0V	42-58
Float to Equ- Chg Current coefficient	When Charge Current >Battery Capacity *Float to Equ- charge Coeff., then it will switch to Equ- charge	0.05C	0.01-0.25

Float to Equ -chg time	When the charging current is more than the default value, and that confirm time of Switch to Equ- Chg confirmation time.	1Min	1-60
Equ- to Float chg Current Coeff.	When the charging current is less than the battery capacity*Equ- Chg to Float Chg Current Coefficient, then it will switch to Float Chg,	0.04C	0.01-0.25
Equ- Float Chg Time	When the charging current is less than the default value, and that confirm time of Switch to Float-Chg .	1Min	1-60
Each Group Battery Rated Capacity	Battery Group Rate Capacity	150AH	5-1000
Battery Group QTY	Rectifier System Default Battery Group	2	0-50
Charge Limited Current Point	Charge Current More than battery Capacity *Charge limited Point , system will down Output voltage	0.1C	0.05-0.5
Charge Over-Current Point	Charge Current more than battery Capacity *Charge Over-Current Point ,rectifier will report Over-Current Alarm	0.25C	0.05-0.5
Equ- Chg Protection Time	Equ- Chg Max time, once over this time, it will switch to Float Chg	16H	5-48
Automatic- Equ- charge Enable	Refer to the charging current, Automatically switch the enable switch of the floating charge	Close	Open/Close
Timing Equ- Chg Enable	Switch of Timing Equ- Chg Enable	Close	Open /Close
Timing Equ- Chg interval	once without Equ- Chg during the interval, after that time, it will be automatic Equ- charge	30 days	1-365 days
Timing Equ- Chg time	The Hours of T iming Equ- Chg	3H	1-24
Pre- Equ-chg enable	Pre-Equ-Chg Switch	Close	Open /Close

- Float -Chg & Equ- Chg Control

Figure 4-3-2 Equ- charge Control method

Control method	Equ- Chg Mode	Description
Automatic	Automatic Equ- Chg	Automatically Switch to the equalizing status according to the charging current of the battery
	Timing Equ- Chg	According to the Setting timing of the charging interval, it will automatically switch to the Equ-Chg status
	Pre-Equal chg	Before the battery periodic discharge test, enter the Equ-Chg status, according to the battery capacity, and charge the battery for discharge test after a certain period of time.

	Manual Equ- Chg	The user manually switches the "Equ & Float Chg Control" to the "Equ-Chg" status. When the Equ-Chg condition is not met, the system automatically switches to "floating Chg" status
Manual Equ- Chg	Manual Equ- Chg	The user manually switches the " Equ &float Chg Control" to the "flat Chg status". If you need to switch to the "floating charge" status, you need to manually operate.
	Boost Equ- Chg	The user manually turns on the fast Equ-Chg mode and switches to the "equal charge" status. When the Equ-Chg time reaches the "fast charge time", the system automatically switches to the "floating charge" status.

Equ & Float Charge Control LCD Path ： Main Menu->Running Control->Equ & Floa Chg Control

Once without any operation in manual mode, it will Automatically Switch to automatic mode after 2 hours, and Equ-Chg Model will be Stop when appearing below condition in automatic mode:

1. Battery high temperature, protection, fuse break, loss, imbalance, over voltage, under capacity, over-current, battery maintenance time.
2. Lightning protection fault, DC over and under voltage.
3. AC power loss, phase loss, over voltage, under voltage.
4. Rectifier module communication interruption, fault, protection, current limit.
5. The equalization duration exceeds the equalization protection time.

4.3.2 Battery Testing

In order to detect if the battery is damaged, the battery will be tested for discharge. Determine whether the battery can be used normally by calculating the length of discharge time.

Figure 4-3-3Battery Testing Parameter

Configure Parameter	Description	Defaul	Optional Range
Manual battery Testing	Manually turn on the timing test	Closed	Open/Closed
Timing testing enable	Timing battery test enable switch	Closed	Open/Closed
Timing test interval	Timing battery test cycle	30 days	1-365
Battery Testing Stop Voltage	When the battery voltage drops to the Stop voltage, the battery test ends.	48V	44-53V
Battery Testing Stop Time	When the battery test time reaches the Stop time, the battery test ends.	240Min	1-1440Mins

Users can check battery test records through LCD or background,

LCD Checking path:

Main Menu->Battery Record->Battery test record

4.3.3   Battery temperature compensation

In order to reduce the influence of ambient temperature to the battery, Ensure battery activity and extend battery life, ITM-AT is based on the optimal operating temperature of the battery, based on the current battery temperature and the user- Setting temperature compensation coefficient and temperature compensation center point. Adjust the system output voltage to maintain a stable charging current. When the temperature raises, ITM-AT reduces the system output voltage. When the temperature decreases, ITM-AT increases the system output voltage. but this function is not active when the battery temperature sensor is not connected or fails.

Rectifier Output Voltage =Float Chg Voltage - （Battery Actual Temp.*- Temp. Comp. Center Point ）×Temperature compensation coefficient

Temperature compensation correction value $\Delta V = V - V_0 \pm 2V$ 。Over this Value ， please based on this $V_0 \pm 2V$.

Figure 4-3-4 Battery Temp .Compensation Parameter

Configure Parameter	Description	Default Value	Optional Range
Temperature compensation coefficient	For every 1 ℃ change in temperature, compensate for the magnitude of the battery charging voltage that needs to be adjusted (mV/℃).	80mV/℃	0-500
Temperature compensation center point	The center point of the temperature compensation, when the battery ambient temperature as that value, the temperature compensation correction value is 0.	25℃	5-45

Battery Temperature compensation Parameter LCD   Setting Path ：Main Menu ->Parameter Setting->Battery   Setting

4.3.4   Battery High Temperature. Protection

As the battery temperature increases or decreases, the ITM-AT will active reported Alarm.

When the battery temperature is lower than the default low-temperature alarm point, the ITM-AT will active a low-temperature alarm.

when the battery temperature Over that Default high-temperature alarm point, The ITM-AT will active a high-temperature alarm

To Avoid prevent an accident occurs during the charging process, we add the high-temperature protection function

Figure 4-3-5 Battery High Protection Parameter

Configure Parameter	Description	Default Value	Optional Range
Battery High -temp. Alarm Point	When the battery Temperature over that Setting value, a "battery high-temperature alarm" will be active.	45℃	25-80
Battery Low Temp Alarm Point	When the battery Temperature less than that Setting value, a "battery Low-temperature alarm" will be active.	0℃	-20-80
Battery High-Temp.Protection Points	When the battery temperature Over the Setting value, the battery high-temperature protection will be active	50℃	25-80
Battery High - temp. Protection Action	Battery High Temp. Protection that will action	No action	No action / down voltage / battery power off
Battery high temperature protection voltage	When the battery high temperature protection action is configured as "down voltage", adjust the module output voltage according to this parameter.	50.5℃	42-53

Battery High Temp. Protection Parameter Setting LCD Path：Main Menu->Parameter Setting-> Battery Setting

4.3.5 Battery Low Voltage Disconnection Protection (BLVD)

Disconnection Function ：It refers to a management mode in which the system maximizes the working time of important loads when the power supply is insufficient. An abnormality in the AC input or a failure of the rectifier module in the power system may result in insufficient system output power, and the battery pack supplies power to the load. To ensure the working time of important loads, the system supports LLVD

power-off function to prevent battery over-discharge and damage the battery. The system supports BLVD function. ITM-AT controls one way BLVD and four way according to current battery voltage

LLVD - AC Input or Rectifier module Recovery Normal, ，After the voltage rises to the LLVD power-on voltage，ITM-AT Control BLVD and LLVD Connection.

Disconnection Management Two Model：

1. **Automatic mode:** In the automatic mode, the user can select the following two methods according to the needs: ：

Model I：Disconnection according to the Time .

When the module is powered off and the battery is discharged, the user's 1~4 load is powered down according to the battery discharge time (time can be Setting). When the battery voltage in the circuit is lower than 38~44V (adjustable) Battery pack output to protect the battery pack (second power off), when the DC voltage is restored, it should be automatically reconnected, and then the voltage is 46~52V adjustable.

Model II ：Disconnection According to the Voltage .

When the battery is discharged, the user's 1~4 load is powered down according to the battery voltage (voltage can be Setting), that is, when the battery voltage is lower than the user Setting value, the user performs a power-off protection when the battery voltage is lower than When the battery power-off protection point is Setting, the battery contactor is disconnected, and the battery pack is protected (the second power-off). When the DC voltage is restored, it should be automatically re-applied, and the access voltage is adjustable from 46~52V.

2. Manual Mode:The user is forced to power on and off according to the needs.

 Description: If the system under the Connection of manual mode, once the AC power-off time too long, the battery may be damaged due to excessive discharge. When using the manual mode, pay attention to the remaining battery capacity.

When the system is powered off, Rectifier fault, the power supply is insufficient. At this time, the system will use the battery to supply power to the load. Because the battery capacity is constant, after the battery works for a certain period of time, the voltage will be reduced, which is insufficient to support all the load work. When LLVD is powered off, disconnect the high-power load and continue to support the important load. When the battery voltage is lower than a certain value, in order to ensure that the battery is not damaged by the transient discharge, the system will power off the BLVD, disconnect the important load, and let the battery be in no consumption. Status, waiting for AC voltage recovery.

Figure3-1 Power-down logic diagram
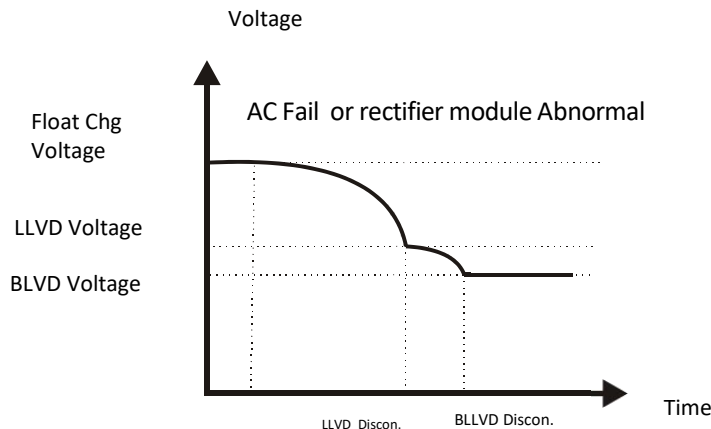
Description：The power-off function just only active when the mains is AC Fail or the module is abnormal and the battery is discharged.

Figure 4-3-6 Battery Low Voltage Disconnection Control

Model	Description	Default Value	Optional Range
Disconnection Model	According to the number of contactors, it can be configured as a secondary power-off or five-Level power-off mode.	Fifth level Disconnection	Second Level Disconnection / Fifth Level Disconnection
BLVD Contractor type	The indication is a NO or NC contactor	NO	NO/NC
LLVD1 Contactor type	The indication is a NO or NC contactor	NC	NO/NC
LLVD2 Contactor type	The indication is a NO or NC contactor	NC	NO/NC
LLVD3 Contactor type	The indication is a NO or NC contactor	NC	NO/NC
LLVD4 Contactor type	The indication is a NO or NC contactor	NC	NO/NC
Manual Model	Under Manual Model，can control disconnection & Connection on LCD display	Manual	Automatic/Manual
Automatic mode	Configure as Voltage model or Time model	Voltage	Voltage / Time

Figure 4-3-7 Battery Low Voltage disconnection Protection Parameter

Configuration	Description	Default Value	Optional
BLVD Disconnection Voltage	When the system voltage is lower than this Default value, the BLVD branch will be Disconnection.	43.2V	42-57
BLVD Connection Voltage	When the system voltage is more than than this Default value, the BLVD branch will be Disconnection.	51.5V	42-57
LLVD1 Disconnection Voltage	When the system voltage is lower than this Default value，LLVD1 branch will be Disconnection	44V	43-57
LLVD1 Disconnection Voltage	When the system voltage is more than than this Default ，LLVD1 branch will be Connection	51.5V	43-57
LLVD2 Disconnection Voltage	When the system voltage is less than than this Default value, the LLVD2 branch will be Disconnection.	44V	43-57
LLVD2 Disconnection Voltage	When the system voltage is more than than this Default ，LLVD2 branch will be Connection	51.5V	43-57
LLVD3 Disconnection Voltage	When the system voltage is less than than this Default value, the LLVD3 branch will be Disconnection.	44V	43-57
LLVD3 Disconnection Voltage	When the system voltage is more than than this Default ，LLVD3 branch will be Connection	51.5V	43-57
LLVD4 Disconnection Voltage	When the system voltage is less than than this Default value, the LLVD4 branch will be Disconnection.	44V	43-57
LLVD4 Disconnection Voltage	When the system voltage is more than than this Default ，LLVD4 branch will be Connection	51.5V	43-57

Modify Disconnection Parameter LCD Path：

Main Menu->Parameter configuration->LVD Setting

4.3.6   Battery in-position detection

The ITM-AT determines whether the battery is in position (stolen or damaged by the battery) by detecting the battery center point voltage or the "battery not in Position" dry contact access alarm. When the battery is stolen, the ITM-AT reports a "battery loss" alarm that is easy for the user to process in a timely manner. ITM-AT supports up to 2 Group Batterydetections of the in-position (upgrade Max 4 group ） , the actual number varies depending on the type of power system.

4.3.7   Battery Imbalance Detection

The ITM-AT determines whether there is a battery imbalance alarm by detecting the battery center point voltage. When the difference between the battery midpoint voltage and the system voltage/2 is greater than 1V, a battery imbalance alarm will be report.

Figure 4-3－1Midpoint voltage detection hardware connection diagram
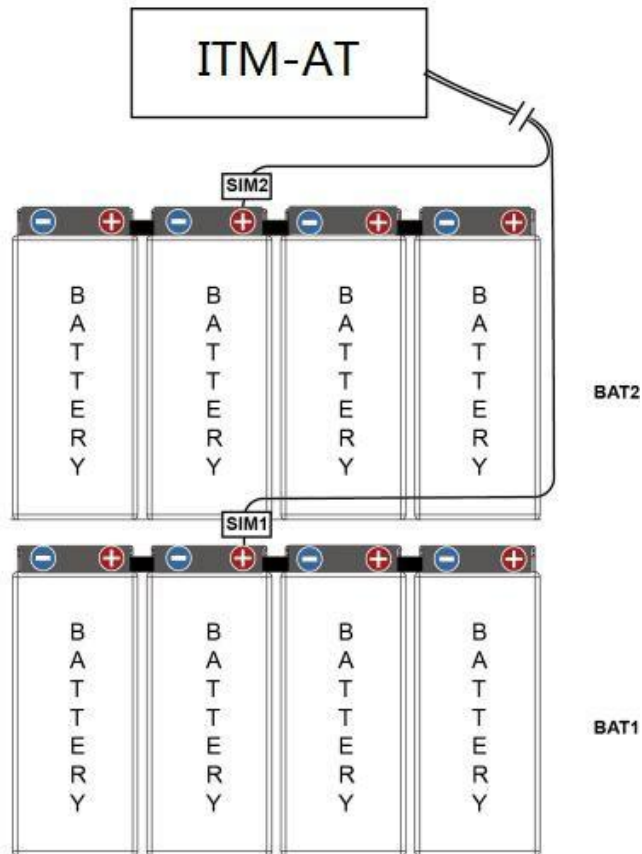
4.3.8   Battery Record

ITM-AT will display the current status and save the status of the battery real-time. The battery status includes: floating charge / constant voltage charge / constant current charge/discharge/ test / pre-charge / Power on detection / no-position, (the Power On test does not Will be saved in the record), other states will exist in the record and show the happen time and end time of the historical state.

The ITM-AT will save the battery test record locally, including start cause, start time, duration, start voltage, end voltage, and discharge amount.

Checking Battery Records LCD Path ：Main Menu->Battery Records

4.4 Generator /Oil Machine Start Management

4.4.1 Management Logic

4.4.2

To save fuel when the oil machine is started, it can reduce the battery charging current or forbid the battery charging. The start condition of the oil machine working when the DI input alarm associated with the "oil start"。

4.4.3 Related Parameter

Parameter	Description	Default Value	Optional Range
Oil Machine Start Action	System action when the oil machine starts	No action	No Action/ limited Voltage / Limited Current / battery Disconnection
Oil Machine Start Limited Voltage Point	Voltage limiting point during Voltage Limiting action	44V	42V-58V
Oil Machine Start Limited Current	Current limit point during current limiting action	0.01C	0C-1C

4.5 Other Management Function

4.5.1 Power Management

The ITM-AT manages 4 users power usage information and battery discharge capacity. ITM-AT stores the accumulated power information of each user periodically every month. It can record the power data in the past 90 days. If the power is over 90 days, the system will automatically replace the oldest record in the next recording. The user can manually modify the power timing record date via the LCD.

Figure 4-5-1 Electric meter information query parameter

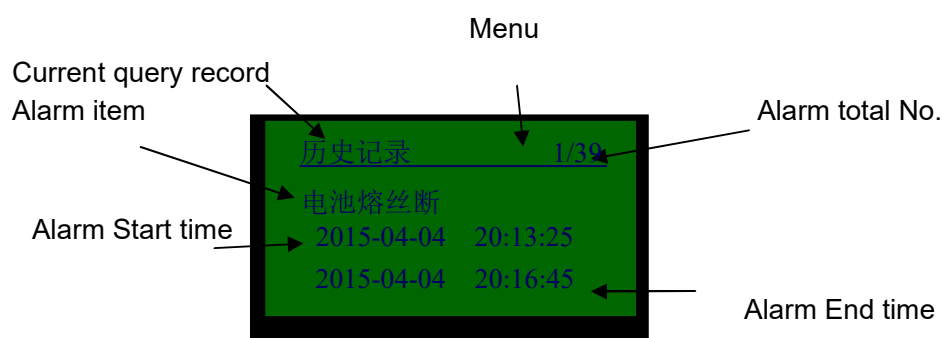| Parameter	Description
Real-time battery information	The system displays when each user (total user, user 1 once loaded, user 1 twice) Load, user 2 primary load, user 2 secondary load, user 3 primary load, User 3 secondary load, user 4 primary load, user 4 secondary load) power information, including current, power, and power consumption ratio。
Load power query	Record the electricity information of each user in the past 90 days. Users can query by day, by specified date, by month, by year.
Battery discharge query	Record the discharge information of the battery in the past 90 days, the user can query by the specified date and month by day.

Main Menu ->Distribution information ->Real-time battery information。

Distribution history information query LCD path

Main Menu->Distribution information->Electricity history record.

4.5.2 Checking the history Alarm

The ITM-AT has an automatic save history alarm record function, which records the alarms that occur when the site is unattended. The log information includes the site alarm start time and alarm recovery time, which is convenient for maintenance personnel to perform troubleshooting and maintenance.

Current query record

Menu

Alarm item

Alarm total No.

历史记录   1/39

电池熔丝断

Alarm Start time

2015-04-04   20:13:25

2015-04-04   20:16:45

Alarm End time

History records Query LCD Path:
Main Menu-> History Alarm Records

4.5.3 Audible and visual alarm indication

ITM-AT When an alarm occurs, an audible and visual indication will be reported according to the alarm level:

Alarm Level	Alarm action
Close	No. Action
inform	Can be Checking in the LCD activity alarm, but there is no sound and light indication
secondary	The alarm content is displayed in the LCD activity alarm, and the red light flashes slowly, and the buzzer does not working.
Serious	The alarm content is displayed in the LCD activity alarm, and the red light flashes slowly, and the buzzer sounds slowly.
Urgent	The alarm content is displayed in the LCD activity alarm, and the red light is always on, and the buzzer sounds quickly.

Note: When alarms with different alarm levels appear at the same time, the sound and light indication is subject to the highest level.

4.5.4 Alarm cancellation function

The user can Setting the temporarily unnecessary alarm to be disabled according to his actual needs. When the alarm function is required, the alarm can be Setting to secondary/critical/emergency in the alarm level.

4.5.5 Host Computer parameter Setting and import and export function

The user can use the host computer to communicate with the ITM-AT via RS485 or TCP/IP to obtain relevant information and parameters. At the same time, the relevant parameters can be Setting, and all the current parameters of the ITM-AT can be read out and exported as a notebook file. You can import the log file and write the parameters as a whole to the ITM-AT.

4.5.6 Host Computer online upgrade function

Users can use the host computer to communicate with ITM-AT via RS485 or TCP/IP, update the program on the online upgrade page, and support the rollback function.。

4.5.7 Monitoring Software Re Setting Function

Press the UP button and the DOWN button simultaneously for 5 seconds , monitor will restart operation。

B Alarm Figure

B-1 system alarm Setting

LCD Alarm Item	Alarm Level	Alarm correlation
AC Disconnection	Urgent	DO2
AC input Voltage Abnormal	Urgent	DO2
Rectifier module AC input Voltage	Urgent	DO4
Output Voltage Abnormal	Urgent	DO3
BLVD Disconnection	Urgent	Not correlation
Lightning arrester Fail	Urgent	DO1
Load Fuse Broken	Urgent	Not correlation
Backup DI	Urgent	Not correlation
Generator open	Urgent	Not correlation

Temperature control failure	Urgent	Not correlation
LLVD1 Disconnection	Urgent	Not correlation
LLVD2 Disconnection	Closed	Not correlation
LLVD3 Disconnection	Closed	Not correlation
LLVD4 Disconnection	Closed	Not correlation

B-2 Battery Group Alarm Setting

LCD Alarm item	Alarm Level	Alarm correlation
Battery over Voltage	Closed	Not correlation
Battery under capacity	Closed	Not correlation
Battery Temp.	Closed	DO4
Battery Discharge	Closed	Not correlation
Battery Group 1 Fuse Broken	Serious	DO4
Battery Group 2 Fuse Broken	Serious	DO4
Battery not In Position	Serious	Not correlation
Battery Group 1 Lost	Closed	DO4
Battery Group 2Lost	Closed	DO4
Battery Group 1 unbalanced	Closed	DO4
Battery Group 2 unbalanced	Closed	DO4
Battery maintenance time is Coming	Serious	Not correlation
Battery Charging Over Current	Closed	Not correlation

B-3 Environmental alarm Settings

LCD Alarm Item	Alarm Level	Alarm correlation
Envir. Temp.	Closed	Not correlation
Envir. Humidity	Closed	Not correlation
Flooding	Closed	Not correlation
Access control	Closed	Not correlation
smoke	Closed	Not correlation

B-4 Rectifier Module Alarm Setting

LCD Alarm Item	Alarm Level	Alarm correlation
Rectifier Output Over Voltage	Serious	Not correlation
Rectifier output Under-Voltage	Serious	Not correlation
Rectifier Fault	Serious	DO4
Rectifier Communication interruption	Serious	DO4
Rectifier Limited Current	Serious	DO4
Rectifier Current imbalance	Serious	DO4
Rectifier protection	Serious	DO4

5 C Parameter

C-1 AC & DC Parameter Setting

Parameter Item	Default Vale	Optional Range
AC Over Voltage Alarm Point	275V	AC under Voltage ~ 300
AC Under Voltage Alarm Point	175V	90 - AC Over Voltage
AC disconnection Alarm point	60V	10 - 80
AC Over frequency Alarm point	65Hz	40 - 120
AC under frequency Alarm Point	45Hz	0 - 60
DC Over Voltage Alarm point	58V	53 - 60
DC under Voltage Alarm point	47V	42 - 57
System limited Current Value	110%	1 - 120

C-2 Rectifier AC Parameter Setting

Parameter	Default Value	Optional Range
Rectifier current Limited Point	55A	1— 60
Over Voltage Protection Point	59V	58 —60.5
Rectifier Current imbalance Point	40%	0.1 - 100

C-4 Energy Saving management Parameter Setting

Parameter	Default	Optional Range
Energy saving Enable	close	Open/Close
Min-Rectifier QTY	1	1 - 24
Rectifier Cycle time	7 天	1 —365
Rectifier best efficiency point	80%	50 —100
Rectifier redundancy point	20%	10 —100

C-5 Disconnection Parameter Se

Parameter	Default Value	Optional Range
Disconnection model	Fifth Disconnection	Twice Disconnection/Fifth Disconnection
BLVD Connector Type	NC	NO/NC
LLVD1 Connector Type	NC	NO/NC
LLVD2 Connector Type	NC	NO/NC
LLVD3 Connector Type	NC	NO/NC
LLVD4 Connector Type	NC	NO/NC
BLVD	Automatic	Automatic/Manual
BLVD Disconnection Time	480min	1 - 1500
BLVD Disconnection Voltage	43.2V	42 —BLVD Connection Voltage
BLVD Connection Voltage	50V	BLVD Disconnection Voltage—57
LLVD1	Automatic	Automatic/Manual
LLVD1 Disconnection Time	480min	1 - 1500
LLVD1 Disconnection Voltage	46V	42—LLVD1 Connection Voltage
LLVD1 Connection Voltage	50V	LLVD1 Disconnection Voltage—57
LLVD2	Automatic	Automatic/Manual
LLVD2 Disconnection Time	480min	1 - 1500
LLVD2 Disconnection Voltage	46V	42—LLVD2 Connection Voltage

LLVD2 Connection Voltage	50V	LLVD2 Disconnection Voltage—57
LLVD3	Automatic	Automatic/Manual
LLVD3 Disconnection Time	480min	1 - 1500
LLVD3 Disconnection Voltage	46V	42—LLVD3 Connection Voltage
LLVD3 Connection Voltage	50V	LLVD3 Disconnection Voltage—57
LLVD4	Automatic	Automatic/Manual
LLVD3 Disconnection Time	480min	1 - 1500
LLVD4 Disconnection Voltage	46V	43—LLVD4 Connection Voltage
LLVD4 Connection Voltage	50V	LLVD4 Disconnection Voltage—57

C-6 Battery Management Parameter Setting

Parameter	Default Value	Optional Value
Float Chg Voltage	54V	42 — Equ- Chg Voltage
Equ Chg Voltage	56V	Float Chg Voltage — 58
Float switch to Equ Chg-current Coeff.	0.06 C10	0.01 —0.25
Float Switch to Equ Chg time	1min	1 - 60
Equ- switch to Flat Chg Current Coeff.	0.04 C10	
Equ- switch to Flat Chg Time	1min	1 - 60
Timing Equ- chg enable	Close	Open/Close
Timing Equ- Chg Period	3H	1 - 24
Timing Equ- Chg interval	30 days	1 —365
Pre-Equ- Chg enable	Close	Open /Close
Equ-Chg Protection Time	16H	5 - 48
Battery Group Rated Capacity	150AH	5 - 1000
Battery Group QTY	2 group	0 - 50
Battery Chg Limited Current Point	0.10 C10	0.05 —1
Battery Chg Over Current Point	0.25 C10	0.05 —0.5
Battery. Temp Compensation Coeff.	72mv/℃	0 —500
Battery Temp. Compensation Center point	25℃	5 —45
Battery High Temp. Alarm Value	40℃	25 —50
Battery Low temp. Alarm Value	0℃	-20 —20
Battery High Temp. Protection Point	50℃	25 —80

Battery High- temp.Protection Action	No Action	No Action/Down Voltage /Battery Disconnection
Battery High- Temp.Volta	50.5V	42 - 53

C-7 Environment Parameter Setting

Parameter	Default Value	Optional Range
Environment High Temp. Alarm Value	50℃	Environment Low temp. Alarm Value –80
Envir.Low Temp. Alarm Value	-5℃	-20—Environment High Temp. Alarm Value
Envir . High Humidity Alarm Value	75%	Environment Low Humidity Alarm Value—100
Envir. Low Humidity Alarm Value	20%	0 – Environment High Humidity Alarm Value

C-8 Input logic   Setting

Parameter	Default Value	Optional Range
DIN1	NO	NO/NC
DIN2	NO	NO/NC
DIN3	NO	NO/NC
DIN4	NO	NO/NC
DIN5	NO	NO/NC
DIN6	NO	NO/NC

C-9 Output Dry Contact   Setting

Parameter	Default Value	Optional Range
DO1	NO	NO/NC
DO2	NO	NO/NC
DO3	NO	NO/NC
DO4	NO	NO/NC
DO5	NO	NO/NC
DO6	NO	NO/NC

C-10 Input Dry Contact correlation

Parameter	Default Value	Optional Range
DIN1	No correlation	Optional
DIN2	No correlation	Optional
DIN3	No correlation	Optional
DIN4	No correlation	Optional
DIN5	No correlation	Optional
DIN6	Lightning arrester	Optional

Note：6 Route Dry Contact Input can Correlated with below Alarm ：

1：Lightning Arrester protection fault (AC, DC)   2：Flooding

3：Access control alarm   4: Smoke Alarm

5：Oil machine/Generator   6：Temp. Control

7： backup DI

8：batter not in position