

HMU15N-EMS HYBRID ENERGY CONTROL SYSTEM USER MANUAL





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Date	Version	Note
2023-05-06	1.0	Original release.
SI		

Table 1 – Software Version

Symbol	Instruction
ANOTE	Highlights an essential element of a procedure to ensure correctness.
	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
WARNING	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

Table 2 – Symbol Instruction



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1 OVERVIEW

<u>HMU15N-EMS Hybrid Energy Control System</u> is used for hybrid energy system consists of solar energy, wind energy, energy storage battery, hydrogen fuel cell, mains supply and diesel genset. It can read and display the data and status of various energy, control the power distribution, customize the control policy and support multiple control modes. The communication protocol is customized and the touch screen display LCD is configurable by PC, the operation policy or control logic can be written by using the built-in PLC. It is suitable for hybrid energy systems with flexible configuration and easy operation.

2 PERFORMANCE AND CHARACTERISTICS

Its main characteristics are as follows:

- 15-inch capacitive touch LCD with 1024*768 resolution, optional Chinese and English operation interface;
- With 4-way RS485 communication port, 1-way CAN port, 1-way Ethernet port;
- The logic programming is available by the built-in PLC, operation mode and scheduling method can be changed;
- Customized communication protocols for PV inverter, energy storage converter and BMS;
- Customized communication protocols when connecting to power expansion module, genset controller and low voltage distribution controller;
- The previous data monitoring can be realized via Ethernet port;
- Real-time display parameters and alarm information;
- Real-time clock display, operation history and alarm records functions, which can be exported;
- With USB device port and host port;
- With multi-level brightness, it can be adjusted automatically for different environments;
- With distance sensor, the screen lights up automatically when someone is in front of the display screen;
- The controller is fixed with metal clips;
- Modular design, pluggable wiring terminals, built-in mounting, compact structure with easy installation.

3 SPECIFICATION

Table 3 – Performance Parameter

Item	Content								
Working Voltage	DC8.0V~DC35.0V continuous power supply.								
Overall Consumption	Up to 15W								
DC405	4-way RS485 ports adopt MODBUS-RTU communication protocol,								
R5485	isolated, half-duplex, baud rate can be set								
Ethernet	Self-adaption 10/100/1000Mbps								
CAN	Isolated, the maximum communication length is 250m, using								
CAN	Belden 9841 cable or equivalent								
	Frequency Range: 5Hz~8Hz: ±7.5mm								
Vibration	Frequency Range: 8Hz~500Hz: a ±2g								
	IEC 60068-2-6								
	50g, 11ms, pulse waveform, half-sine, complete shock test from								
Shock	three directions, and 18 times shock for each test								
	IEC 60068-2-27								
Bump Test	20g, 16ms, half-sine								
Production Compliance	According to EN 61010-1 installation category (over voltage								
Froduction compliance	category) III, 300V, pollution class 2, altitude 3000m								
Overall Dimensions	377mm x 316mm x 76mm								
Panel Cutout	359.5mm x 298.2mm								
Working Temperature	(-25~+70)°C								
Working Humidity	(20~95)%RH								
Storage Temperature	(-30~+80)°C								
Protection Level	Front Panel: IP65								
Weight	3.75kg								

4 DISPLAY AND OPERATION

4.1 FRONT PANEL



Fig.1 – Front Panel Drawing

	Table 4 – Indicator Description
Indicator	Description
Alarm	Using PLC programming to control alarm indicator flash or light off.
Power	Always illuminated after power on and operation for touch screen. Extinguished when touch screen is power off.

4.2 QUICKSTART

This section will introduce how to use the touch scrren from PC configuration.

4.2.1 SOFTWARE DOWNLOAD

Please download and install the configuration software of HMU15N-EMS touch screen by SmartGen official website:

http://smartgen.com.cn/product/451

Note: The IP addresses of PC network card and the slave computer must be on the same network segment, for example, 192.168.0.10, subnet mask: 255.255.255.0, gateway: 192.168.0.1.

4.2.2 CONNECTION SETTING

Using network cable to connect touch screen (slave computer) with PC (host computer), click "Setting" of PC, set the IP as "192.168.0.111", and the port number as "8080".



Fig.2 – Connection Setting

Click "Read" of PC, it will display "Read Configuration Completely", which means that the communication between PC and slave computer is successful.

🚟 HMU15N-EMS V1.0.(
⊕ ⊕ Read Write	L New	Open 0	D Save	Save as		. } uit	
Home							About
Port Settings					Module	Туре	HMU15N-EMS
Device Settings					Softwa	e Ver.	V1. 0. 0. 1
Computation					Hardwa	e Ver.	V1. 4
Module					PD		Z230420-HHU15N-ENS
Database							
Custon Settings							
						Info	×
System Settings	<						
About							Read configuration completed!
							OK

Fig.3 – Successful Communication

4.2.3 PORT SETTING

You can modify the port parameters of slave computer in this section. Modify the port parameters via PC and write the configuration into slave computer, it will take effect as the following figure:



Table 4 – Port Setting (PC)

Note: The modifications will take effect immediately on setting interface of slave computer, as the following figure:

Setting			
Configuration	RS485-1		
Port	Status: Enable	EDIT	
	Baud: 9600 bps	EDIT	
Debug	Parity: None	EDIT	
History	Stop Bits: 1	EDIT	
System	RS485-2		
	Status: Enable	EDIT	
	Baud: 9600 bps	EDIT	
	Parity: None	EDIT	
	Stop Bits: 1	EDIT	
	RS485-3		
	Status: Enable	EDIT	
	Baud: 9600 bps	EDIT	
	Parity: None	EDIT	
	Stop Bits: 1	EDIT	
	RS485-4		
2023/04/20 08:37:35		A • • 🜣	

Table 5 – Port Setting (Touch Screen)

4.2.3.1 RS485 PORT SETTING (4 RS485 ports in total)

Enable Status: the port communication is able to be opened and closed.

Baud Rate: 1200bps,2400bps,4800bps,9600bps,19200bps,38400bps,57600bps,115200bps are optional, the default is 9600bps.

Data Bit: 8-bit.

Parity Bit: None, odd parity and even parity, default is None.

Stop Bit: 1-bit, 2-bit are optional, default is 1-bit.

Each port can set its baud rate, stop bit and parity bit separately.

4.2.3.2 ETHERNET PORT SETTING

Eable Status: the port communication is able to be opened and closed.

The default IP address is 92.168.0.111, subnet mask is 255.255.255.0, gateway is 192.168.0.1. They can be modified through PC and take effect after restart.

4.2.3.3 CAN PORT SETTING

Enable Status: the port communication is able to be opened and closed.

Baud Rate: 5kbps,10kbps,20 kbps,50 kbps,100 kbps,125kbps,250kbps,500 kbps,800 kbps,1000 kbps are optional, the default is 125kbps.

4.2.4 EXTERNAL DEVICE MANAGEMENT

Each device here corresponds to a real device, which may be photovoltaic inverter, energy storage converter, genset controller, etc. By setting its port, communication address and message, the system can obtain the real-time data automatically, such as working status, alarm information of the device. At the same time, according to the self-defined PLC logic, the slave computer is able to control the working status of each device, for instance, the power distribution and the start/stop of energy device, closing/opening of circuit breaker, so as to realize the management of whole system.

This section will describe how to configure each external device by wizard mode. $(\mathbf{\hat{T}})$ € Ľ В D Save as **{ộ}** Set Device Settings Hone GEN ON O ON Computation PV ₩TS GEN Name Name Name RS485-1 Port RS485-1 RS485-2 Port Port - 1 + (1-254) 2 🕂 (1-254) 1 🕂 (1-254) Address Address -Address -Custom Settings About ON ON on C Mains LOAD Name Name PCS Name RS485-3 RS485-4 Port Port Port Network - 1 + (1-254) - 1 + (1-254) Address Address Address - 1 🕂 (1-254) IP 192 . 168 . 0 . 200 Port number 📒 502 🕂 (1-65535)

Table 6 – Device Management

4.2.4.1 ADD DEVICE

Click **+** Add to add a new device, which may be photovoltaic inverter, energy storage converter, genset controller, etc. Please name each device properly.

Enable Status: the communication of device is able to be opened and closed.

Device Name: You may customize the display name to distinguish different devices.

Communication Port: Select the communication ports, and the options are: RS485-1,RS485-2,RS485-3,RS485-4, Ethernet port and CAN port.

Module Address: 1-254 is available.

IP: the IP address of the Ethernet port needs to be set and should be on the same network segment as the slave computer.

Port No.: the Ethernet device needs to be set its port number, the default value is 502.

Note: the baud rate, data bit, parity bit, stop bit of all devices with same RS485 port should be the same, while the module address cannot be the same.

4.2.4.2 MESSAGE SETTING

Click *Message* to display all the Modbus message of the device. When the touch screen is running, it will automaticlly loop to obtain the real-time data of external device based on the message setting.



Click + Add to add Modbus message for external device, include the function code, communication type (only for Modbus-RTU protocol), register start address, register number and timeout interval.

When adding messages, minimum Modbus message (with minimum number of row) is recommended, a row of message had better cover all the data to be obtained. In this way, the loop interval is reduced and the real-time data is enhanced.

Note: If the device is on RS485 port, the timeout interval is 500ms, if the device is on Ethernet port, the timeout interval is 200ms.





Fig.8– Message Setting

The following is the loop sequence diagram for all devices on the same port:



Fig.9– Loop Sequence Diagram

Note: The loop duration depends on the total number of messages access to the device.

4.2.4.3 BOUNDING COMPUTATION

to display all the computation bound to the device. The computation are Click divided into three types: floating-point, string (value), string (bit). The floating-point type is used to display parameters of device (e.g. voltage, power, etc.), the string (value) type is used to display the running status of device (e.g. start countdown, etc.), the string (bit) type is used to display the alarm information and control information (e.g. low battery voltage, start/stop, etc.). Please see more details about the computation in next section.

	+ Add X Unbind All											
	Computation	Type	Value	String	Method	Func. code	Address	Start	Digit	Rate	Edit	Unb
1	[1]—PV State	String(400	Display	NONE					1	Edit	Unb
	[2]-PV Alarms	String(0	Display	BOOLEANS_BITS_AB	03	0	0	0	1	Edit	Unb
	[3]-PV Warnings	String(0	Display	BOOLEANS_BITS_AB	03	0	0	0	1	Edit	Unb
	[4]-PV Running	Float	0		UINT_BITS_AB	03	0	0	0	1	Edit	Unb
	[5]-PV Common Alarm	Float	0		UINT_BITS_AB	03	0	0	0	1	Edit	Unb
	[6]-PV Common Warning	Float	0		UINT_BITS_AB	03	0	0	0	1	Edit	Unł
	[8]-PV Direction	Float	0		UINT_BITS_AB	03	0	0	0	1	Edit	Unł
	[9]-PV Stopped	Float	0		UINT_BITS_AB	03	0	0	0	1	Edit	Unł
	[10]—PV Generation Today	Float	0		UINT32_ABCD	03	0			1	Edit	Unł
	[11]-PV Total Power Generation	Float	0		UINT32_ABCD	03	0			1	Edit	Unb
	[12]-PV Active Power	Float	0		INT16_AB	03	0			1	Edit	Unb
	[13]-PV Reactive Power	Float	0		INT16_AB	03	0			1	Edit	Unb
	[14]-PV Power Factor	Float	0		INT16_AB	03	0			1	Edit	Unb
	[15]-PV DC1 Voltage	Float	0		INT16_AB	03	0			1	Edit	Unb
	[16]-PV DC1 Current	Float	0		INT16_AB	03	0			1	Edit	Unb
	[17]-PV DC1 Power	Float	0		INT16_AB	03	0			1	Edit	Մոե
	[18]—PV DC2 Voltage	Float	0		INT16_AB	03	0			1	Edit	Unb
	[19]-PV DC2 Current	Float	0		INT16_AB	03	0			1	Edit	Unb
	[20]-PV DC2 Power	Float	0		INT16_AB	03	0			1	Edit	Unb
	[21]-PV AC-L1 Voltage	Float	0		INT16 AB	03	0			1	Edit	Unb

Fig.10 – Device Computation

🕂 🖌 🕂 Click to add a computation to be bound with the device, after the computation is

selected, it will be modified rapidly.

	Modify	×
Computation	12 PV Active Power	
Туре	Float 🗸 🖌 🗸 String	
Method	INT16_AB 🗸	
Default Value	0	
Address	- 0 +	
Function	03 ~	
Magnificati	1	
Start	• 0 +	
Digit	— 0 +	
	✔ Ok 🕞 Cancel	

Fig.11 – Bound Computation

Click it is select the computation needs to be bound with, only the computation that not bound to any device can be selected.

ID	Name	Type	Value	String	Method	Func. code	Address	Start	Digit	Rate	Binding device
1	PV State	String(400	Display	NONE					1	PV
2	PV Alarms	String(0	Display	BOOLEANS_BITS_AB	03	0	0	0	1	PV
3	PV Warnings	String(0	Display	BOOLEANS_BITS_AB	03	0	0	0	1	PV
4	PV Running	Float	0		UINT_BITS_AB	03	0	0	0	1	PV
5	PV Common Alarm	Float	0		UINT_BITS_AB	03	0	0	0	1	PV
6	PV Common Warning	Float	0		UINT_BITS_AB	03	0	0	0	1	PV
8	PV Direction	Float	0		UINT_BITS_AB	03	0	0	0	1	PV
9	PV Stopped	Float	0		UINT_BITS_AB	03	0	0	0	1	PV
10	PV Generation Today	Float	0		UINT32_ABCD	03	0			1	PV
11	PV Total Power Genera	Float	0		UINT32_ABCD	03	0			1	PV
12	PV Active Power	Float	0		INT16_AB	03	0			1	PV
13	PV Reactive Power	Float	0		INT16_AB	03	0			1	PV
14	PV Power Factor	Float	0		INT16_AB	03	0			1	PV
15	PV DC1 Voltage	Float	0		INT16_AB	03	0			1	PV
16	PV DC1 Current	Float	0		INT16_AB	03	0			1	PV
17	PV DC1 Power	Float	0		INT16_AB	03	0			1	PV
18	PV DC2 Voltage	Float	0		INT16_AB	03	0			1	PV
19	PV DC2 Current	Float	0		INT16_AB	03	0			1	PV
20	PV DC2 Power	Float	0		INT16_AB	03	0			1	PV
21	PV AC-L1 Voltage	Float	0		INT16_AB	03	0			1	PV
00	DT 40 10 T 1.	Floot	0		THEFIG AD	0.0	0			1	DU

Fig.12 – Computation Selection

After binding, the value of the computation can be obtained through the real-time data calculation of the device according to the set calculation method, or through the mutual calculation among the computation, settings and internal variables according to the internal PLC logic.

The relationship among external device, real-time data and computaion is shown as follows:



Fig.13 – Software Frame

4.2.5 COMPUTATION MANAGEMENT

As a bridge between external device and touch screen, computation is the data mapping of external physical device, the data source of the touch screen, and the data center of the whole energy management system.

According to the binding relationship between computation and the device, the related configuration of computation, the computation can be calculated and assigned by the real-time data of the device or by the internal PLC logic calculation. The computation may not involved in any calculations.

Computation is devided into floating-point type, string (value), string (bit). Each type has its own using method. The computation value can be used for touch screen display, or participate in the PLC logic calculation, or provide data source for database.

HMU15N-EMS V1.0.0.1 - [C:\Config_en.	jsonc]												~ - 0
⊕ ⊕ <u> </u> 🗅	凸		\$ \$	€										
Read Vrite New														
Hone						Computa	tion							
Port Settings	+ Add	🗙 Delete All												
Tore Settings			1											
Device Settings	ID													
Computation	▶ 1	PV State	String(Value)	400	Display	NONE					1	PV	Edi t	Delete
·	2	PV Alarms	String(Bit)	0	Display	BOOLEANS_BITS_AB	03	0	0	0	1	PV	Edit	Delete
Nodule	3	PV Warnings	String(Bit)	0	Display	BOOLEANS_BITS_AB	03	0	0	0	1	PV	Edit	Delete
atabase	4	PV Running	Float	0		UINT_BITS_AB	03	0	0	0	1	PV	Edit	Delete
	5	PV Conmon Alarm	Float	0		UINT_BITS_AB	03	0	0	0	1	PV	Edit	Delete
olor	6	PV Common Warning	Float	0		UINT_BITS_AB	03	0	0	0	1	PV	Edit	Delete
Voton Sattings	8	PV Direction	Float	0		UINT_BITS_AB	03	0	0	0	1	PV	Edit	Delete
usion bertings	9	PV Stopped	Float	0		UINT_BITS_AB	03	0	0	0	1	PV	Edit	Delete
rc	10	PV Generation Today	Float	0		UINT32_ABCD	03	0			1	PV	Edit	Delete
	11	PV Total Power Generation	Float	0		UINT32_ABCD	03	0			1	PV	Edit	Delete
ystem bettings	12	PV Active Power	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
bout	13	PV Reactive Power	Float	0		INT16_AB	03	0			1	PV	Edi t	Delete
	14	PV Power Factor	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	15	PV DC1 Voltage	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	16	PV DC1 Current	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	17	PV DC1 Power	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	18	PV DC2 Voltage	Float	0		INT16_AB	03	0			1	ΡV	Edit	Delete
	19	PV DC2 Current	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	20	PV DC2 Power	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	21	PV AC-L1 Voltage	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	22	PV AC-L2 Voltage	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	23	PV AC-L3 Voltage	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	24	PV AC-L1 Current	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	25	PV AC-L2 Current	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	26	PV AC-L3 Current	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	27	PV AC Frequency	Float	0		INT16_AB	03	0			1	PV	Edit	Delete
	28	PCS State	String(Value)	3	Display	NONE					1	PCS	Edit	Delete

Fig.14 – Computation Management

4.2.5.1 ADD COMPUTATION

Click Add to add computation, the system will assign a unique serial number automatically. Click "Edit" to modify the computation name (Both Chinese and English), type, default value, calculation method, address (decimalism), etc. Click "Delete" to delete the computation, but the serial number of the computation can be used again.

The name of the computation must be unique. In addition, the type and calculation method of the computation should be correctly configured. Otherwise, the correct value cannot be calculated.

For more details of the configuration about the type and calculation method, see the following section.



Fig.15 – Add Computation

4.2.5.2 COMPUTATION TYPES

4. 2. 5. 2. 1 FLOAT-POINT TYPE

Its value is a floating-point number, which can be directly displayed on touch screen for displaying various numerical parameters of the device.

If the absolute value of the computation is greater than or equal to 10000, the decimal digit is not displayed; if it is less than 10000, no decimal digit is displayed when the computation multiplier is 1, while 1 decimal digit is displayed when the computation multiplier is 10, 2 decimal digits are displayed when the computation multiplier is 100. And so on, the different number of decimal digits are displayed according to the computation multiplier.

4. 2. 5. 2. 2 STRING (VALUE) TYPE

Its value is an integer, which is used to display the running status of the device. Suppose the string list of computation is configured as the following figure below, and its value is 85, the touch screen displays "Power Limit Disabled".



Fig.16 – String (Value) Type

4. 2. 5. 2. 3 STRING (BIT) TYPE

Its value is Boolean array used to display the alarm information of the device. Suppose that the string list of computation is configured as the following figure, and its value is Boolean array [FALSE, TRUE, TRUE, TRUE], the touch screen displays "Loss of Phase of Mains, Low Water Level of Oil Engine, Low OP of Oil Engine".

In the popup window of the home page, all alarms could be displayed and one piece of alarm information will displayed for each line.

		Modify String	
F	Batch .	Add 🗙 Delete All	
	Value	String	Delete
I	1	low battery voltage	Delete
	2	mains phase loss	Delete
	3	low water level	Delete
	4	low oil pressure	Delete
*			
		✔ OK 🕞 Cancel	

Fig.17 – String (Bit) Type

4.2.5.3 ASSIGNMENT OF COMPUTATION

According to the different binding relationships of computation, its calculation and assignment operation of the value are different.

4. 2. 5. 3. 1 ASSIGNMENT OF UNBOUND DEVICE

Unbound floating-point, string (bit) computations are assigned by coverting computations, settings, internal variables and constants(quantity) according to PLC logic.

The computation of floating-point type only needs to set name, type and default value, other configurations are invalid.

The computation of string (value) type only needs to set name, type, string list, default value, other configurations are invalid.

Conversion operation supported by PLC include: +,-,*, /,%, absolute value, max., min., mean value, assignment, as the following figure:



Fig.18 – PLC Conversion Operation

For instance, suppose that there are three computations named "Photovoltaic Power Generation Today", "Wind Power Generation Today" and "Unit Power Generation Today". Then define the computation named "Total Power Generation Today", whose value is the sum of the above three computations, as shown in the figure below:

				Default value								Delete
▶	1	PV generation today	Float	0	INT16_AB	03	100		1	PV	Edit	Delete
	2	WTS generation today	Float	0	INT16_AB	03	100		1	WTS	Edi t	Delete
	3	Genset generation today	Float	0	INT16_AB	03	200		1	GENSET	Edit	Delete
	4	Generation today	Float	0	NONE				1		Edit	Delete

Fig.19 – Computation Example

The value of "Total Power Generation Today" is assigned by the computation of user-defined PLC logic, as shown in the figure below:



Fig.20 – Example of Computation Coversion

4. 2. 5. 3. 2 ASSIGNMENT OF BOUND DEVICE

The computation bound to the device requires correct configuration of its calculation method. The system calculates and assigns the values according to the real-time data of the device, or assigns values via PLC logic.

The calculation method is valid only for the computation bound to the device, while it is invaild for the computation that is not bound to the device.

If the calculation method configured for the computation bound to the device doesn't match with the type or function code, the default value remains unchanged.

Table 5 – Calculation Method

The calculation method is shown as the following table:

Method	Description	Example
NONE	PLC logic operation assignment or	Computation 2= Computation 1+ Internal
	as a constant	Variable 1
UINT_COIL	Coil Register Status	ON: 1, OFF : 0
BOOLS_BITS_AB	Get a Boolean array of multiple bits	Hexadecimal: 0xFEFC
		Binary System: MSB 1111 1110 1111 1100
		LSB Intercept 4 bits from the first bit=>
		[false, true, true]
UINT_BITS_AB	Get an unsigned 16-bit integer of	Hexadecimal: 0xFEFC
	multiple bits	Binary System: MSB 1111 1110 1111 1100
		LSB Intercept 3 bits from the first bit
		0x110 => 6
INT8_A_AB	Get a signed 8-bit integer of	"FEFC" ==> -2
	pre-byte	
INT8_B_AB	Get a signed 8-bit integer of	"FE <mark>FC</mark> " ==> -4
	post-byte	

Method	Description	Example
UINT8_A_AB	Get an unsigned 8-bit integer of	" FE FC" ==> 254
	Cot on unsigned 8 bit integer of	
UINTO_D_AD	post-byte	
INT16_AB	Get a signed 16-bit integer of AB	"FEFC" ==> -260
	sequence	
INT16_BA	Get a signed 16-bit integer of BA	"FEFC" ==> -770
	sequence	
UINT16_AB	Get an unsigned 16-bit integer of	"FEFC" ==> 65276
	AB sequence	
UINT16_BA	Get an unsigned 16-bit integer of	"FEFC" ==> 64766
	ВА	
INT32_ABCD	Get a signed 32-bit integer of ABCD	"FEDCBAFF" => -19088641
	sequence	
INT32_DCBA	Get a signed 32-bit integer of DCBA	"FEDCBAFF" => -4530946
	sequence	
INT32_BADC	Get a signed 32-bit integer of BADC	"FEDCBAFF" => -587268166
	sequence	
INT32_CDAB	Get a signed 32-bit integer of CDAB	"FEDCBAFF" => -1157628196
	sequence	
UINT32_ABCD	Get an unsigned 32-bit integer of	"FEDCBAFF" => 4275878655
	ABCD sequence	
UINT32_DCBA,	Get an unsigned 32-bit integer of	"FEDCBAFF" => 4290436350
	DCBA sequence	
UINT32_BADC	Get an unsigned 32-bit integer of	"FEDCBAFF" => 3707699130
	BADC sequence	
UINT32_CDAB	Get an unsigned 32-bit integer of	"FEDCBAFF" => 313733910
	CDAB sequence	
FLOAT32_ABCD	Get 32-bit floating-point number of	"FEDCBAFF" => -1.4670055E38
	ABCD sequence	
FLOAT32_DCBA	Get 32-bit floating-point number of	"0080C842" => 100.25
	DCBA sequence	
FLOAT32_BADC	Get 32-bit floating-point number of	"FEDCBAFF" => -5.7420655E17
	BADC sequence	
FLOAT32_CDAB	Get 32-bit floating-point number of	"FEDCBAFF" => -0.001953091
	CDAB sequence	

The details are as follows:

1) NONE

Suitable for computions of floating-point type and string (value) type.

If floating-point computation is selected, only need to configure the name, type, calculation method and default value, other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value and string list, other configurations are invalid.

If string (bit) computation is selected, the calculation method does not match with type.

Only when the calculation method of the computation bound to device is set to NONE, the value can be assigned by PLC logic operation; Other methods can only calculate and assign values according to the real-time data of the device, the value is invalid in PLC logic operation.

The PLC logic operation and assignment bound to the device are the same as the compution not bound to the device.

The difference between them is the computation not bound to the device can be assigned by PLC logic operation without any calculation method, while the computation bound to the device must be configured with NONE calculation method before it can be assigned by PLC logic operation.

2)UINT-COIL

Suitable for computions of floating-point type and string (value) type, applicable for 01 function code, the data range is 0 or 1.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, other configurations are invalid.

Coil register status is ON, the compution value is 1, if the status is OFF, the computation value is 0.

3)BOOLS_BITS_AB

Suitable for string (bit) computation, appliable for function code 03.

If string (bit) computation is selected, only need to configure the name, type, string list, calculation method, address, function code, start bit, digit, other configurations are invalid. The data range of start bit is 0~15, the bits number should be the same as the string list.

Suppose that the computation is configured as the figure below, and the register value of address 1 is 0x0044 (MSB 0000 0000 0010 1100 LSB), 4 bits are intercepted from index 0, and the computation value is Boolean data [FALSE, FALSE, TRUE, TRUE].

		Modify $ imes$
1	Name	Genset Alarms
	Type	String(Bit) V String
	Method	BOOLEANS_BITS_AB
	Default Value	0
	Address	- 0 +
	Function Code	03 🗸
	Magnificati	1
	Start	- 0 +
	Digit	- 4 +
		✔ Ok 🕞 Cancel

Fig.21 – BOOLS_BITS_AB Calculation Method

4)UNIT_BITS_AB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is $0 \sim 65535$.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, start bit, digit, other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, start bit, digit, other configurations are invalid.

The data range of start bit is $0\sim15$, and the data range of digit is $0\sim16$, the sum of start bit and digit number should less than 16, which means the cross-register interception is not supported.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0x0044 (MSB 0000 0000 0010 1100 LSB), 4 bits are intercepted from index 0, and the intercepted hexadecimal number is 0x1100, which is converted into unsigned 16-bit integer decimal number is 12, after multiplying by 1, the computation value is 12.

	Modify		×
Name	Custom Name		
Туре	Float	 Image: Comparison of the second second	String
Method	UINT_BITS_AB		~
Default Value	0		
Address	- 0	+	
Function Code	03	~	
Magnificati	1		
Start	- 0	+	
Digit	- 4	+	
	🗸 Ok 🕞 C	Cancel	

Fig.22 – UINT_BITS_AB Calculation Method

5) INT8_A_AB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 128~127.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0x34CC, make the first byte 0x34 convert into the signed 8-bit integer decimal number is 52, after multiplying by 1, the computation value is 52.

	Modify $ imes$
Name	Custom Name
Туре	Float 🗸 🖌 Float
Method	INT8_A_AB 🗸
Default Value	0
Address	- 1 +
Function Code	03 🗸
Magnificati	1
Start	— 0 +
Digit	- 4 +
	✔ 0k 🕞 Cancel

Fig.23 – INT8_A_AB Calculation Method

6) INT8_B_AB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 128~127.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0x34CC, make the second byte 0xCC convert into the signed 8-bit integer decimal number is -52, after multiplying by 1, the computation value is -52.

	Modify		
Name	Custom Name		
Type	Float	~	🖉 Strin
Method	INT8_B_AB		``
Default Value	0		
Address	- 1	+	
Function Code	03	~	
Magnificati	1		
Start	- 0	+	
Digit	- 4	+	
	🗸 Ok 🕞	Cancel	

Fig.24 – INT8_B_AB Calculation Method

7)UINT8_A_AB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is $0\sim255$.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0x34CC, make the first byte 0x34 convert into the unsigned 8-bit integer decimal number is 52, after multiplying by 1, the computation value is 52.

	Modify	
Name	Custom Name	
Туре	Float 🗸	String
Method	UINT8_A_AB	~
Default Value	0	
Address	- 1 -	2
Function Code	03 ~	<u>·</u>
Magnificati	1	
Start	- 0 4	-
Digit	- 4 -	•
	🗸 Ok 🕞 Cance	1

Fig.25 – UINT8_A_AB Calculation Method

8)UINT8_B_AB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 0~255.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0x34CC, make the second byte 0xCC convert into the unsigned 8-bit integer decimal number is 204, after multiplying by 1, the computation value is 204.

	Modify	×
Name	Custom Name	
Туре	Float 🗸	String
Method	UINT8_B_AB	~
Default Value	0	
Address	— 1 +	
Function Code	03 ~	
Magnificati	1	
Start	— 0 +	
Digit	- 4 +	
	✔ Ok 🕞 Cancel	

Fig.26- UINT8_B_AB Calculation Method

9)INT16_AB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is -32768~32767.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEFC, according to the sequence, make (0xFEFC) convert into the signed 16-bit integer decimal number is -260, after multiplying by 1, the computation value is -260.

	Modify $ imes$
Name	Custom Name
Туре	Float 🗸 🖌 🗸 String
Method	INT16_AB 🗸
Default Value	0
Address	- 1 +
Function Code	03 🗸
Magnificati	1
Start	- 0 +
Digit	- 4 +
	✔ 0k 🕞 Cancel

Fig.27- INT16_AB Calculation Method

10) INT16_BA

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is -32768~32767.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEFC, according to the sequence, make (0xFCFE) convert into the signed 16-bit integer decimal number is -770, after multiplying by 1, the computation value is -770.

	Modify $ imes$
Name	Custom Name
Type	Float 🗸 🖌 🗸 String
Method	INT16_BA 🗸
Default Value	0
Address	- 1 +
Function Code	03 🗸
Magnificati	1
Start	• 0 +
Digit	— 4 +
	🗸 Ok 🕞 Cancel

Fig.28- INT16_BA Calculation Method

11)UINT16_AB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 0~65535.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEFC, according to the sequence, make (0xFEFC) convert into the unsigned 16-bit integer decimal number is 65276, after multiplying by 1, the computation value is 65276.

	Modify	×
Name	Custom Name	
Туре	Float 🗸	String
Method	UINT16_AB	~
Default Value	0	
Address	- 1 +	
Function Code	03 ~	
Magnificati	1	
Start	• 0 +	
Digit	- 4 +	
	🗸 Ok 🌔 Cancel	

Fig.29- UINT16_AB Calculation Method

12)UINT16_BA

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 0~65535.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEFC, according to the sequence, make (0xFCFE) convert into the unsigned 16-bit integer decimal number is 64766, after multiplying by 1, the computation value is 64766.

Name Type Method Default Value Address Function Code	Custom Name Float UINT16_BA 0 1 +
Type [] Method [] Default Value [Address Function Code []	Float
Method Default Value Address Function Code	UINT16_BA \
Default Value Address Function Code	
Address Function Code	- 1 +
Function Code	
	03 🗸
Magnificati	1
Start	• 0 +
Digit	- 4 +

Fig.30– UINT16_BA Calculation Method

13)INT32_ABCD

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is -2147483648~2147483647.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0Xbaff, according to the sequence of ABCD, make (0xFEDCBAFF) convert into the signed 32-bit integer decimal number is -19088641, after multiplying by 1, the computation value is -19088641.

Custom Name	
Float 🗸	String
INT32_ABCD	~
0	
- 1 +	
03 ~	
1	
— 0 +	
- 4 +	
🗸 Ok 🚺 🕞 Cancel	
	Custom Name Float INT32_ABCD 0 1 0 1 0 + 0 + 0 + 0 + Cancel

Fig.31 – INT32_ABCD Calculation Method

14)INT32_DCBA

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is -2147483648~2147483647.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of DCBA, make (0xFFBADCFE) convert into the signed 32-bit integer decimal number is -4530946, after multiplying by 1, the computation value is -4530946.

	Modify $ imes$
Name	Custom Name
Туре	Float 🗸 🖌 🗸
Method	INT32_DCBA 🗸
Default Value	0
Address	- 1 +
Function Code	03 🗸
Magnificati	1
Start	• 0 +
Digit	- 4 +
	✔ 0k 🕞 Cancel

Fig.32- INT32_DCBA Calculation Method

15)INT32_BADC

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is -2147483648~2147483647.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of BADC, make (0xDCFEFFBA) convert into the signed 32-bit integer decimal number is -587268166, after multiplying by 1, the computation value is -587268166.

	Modify X
Name	Custom Name
Туре	Float 🗸 🖌 🗸 String
Method	INT32_BADC 🗸
Default Value	0
Address	- 1 +
Function Code	03 ~
Magnificati	1
Start	— 0 +
Digit	— 4 +
	✔ 0k 🕞 Cancel

Fig.33– INT32_BADC Calculation Method

16)INT32_CDAB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is -2147483648~2147483647.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of CDAB, make (0xBAFFFEDC) convert into the signed 32-bit integer decimal number is -1157628196, after multiplying by 1, the computation value is -1157628196.

	Modify	×	
Name	Custom Name		
Type	Float 🗸	String	
Method	INT32_CDAB	~	
Default Value	0]	
Address	- 1 +		
Function Code	03 🗸]	
Magnificati	1]	
Start	- 0 +]	
Digit	- 4 +]	
	🗸 Ok 🕞 Cancel		
		_	

Fig.34– INT32_CDAB Calculation Method

17)UINT32_ABCD

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 0~4294967295.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of ABCD, make (0xFEDCBAFF) convert into the signed 32-bit integer decimal number is 4275878655, after multiplying by 1, the computation value is 4275878655.

	Modify	×
Name	Custom Name	
Type	Float 🗸 🕻	🖋 String
Method	UINT32_ABCD	~
Default Value	0	
Address	- 1 +	
Function Code	03 ~	
Magnificati	1	
Start	— 0 +	
Digit	- 4 +	
	✔ Ok 🕞 Cancel	

Fig.35– INT32_ABCD Calculation Method

18)UINT32_DCBA

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 0~4294967295.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of DCBA, make (0xFFBADCFE) convert into the unsigned 32-bit integer decimal number is 4290436350, after multiplying by 1, the computation value is 4290436350.

	Modify >	
Name	Custom Name	J
Туре	Float 🗸 🖌 🗸	
Method	UINT32_DCBA 🗸	J
Default Value	0	
Address	- 1 +	
Function Code	03 🗸	
Magnificati	1	
Start	— 0 +	
Digit	- 4 +	
	✔ 0k 🕩 Cancel	

Fig.36- INT32_DCBA Calculation Method

19)UINT32_BADC

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 0~4294967295.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of BADC, make (0xDCFEFFBA) convert into the unsigned 32-bit integer decimal number is 3707699130, after multiplying by 1, the computation value is 3707699130.

	Modify	×	
Name	Custom Name		
Type	Float 🗸	String	
Method	UINT32_BADC	~	
Default Value	0		
Address	- 1 +		
Function Code	03 ~		
Magnificati	1		
Start	- 0 +	•	
Digit	- 4 +		
	🗸 Ok 🕞 Cancel		

Fig.37- INT32_BADC Calculation Method

20) UINT32_CDAB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 0~4294967295.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of CDAB, make (0xBAFFFEDC) convert into the unsigned 32-bit integer decimal number is 3137339100, after multiplying by 1, the computation value is 3137339100.

	Modify	
Name	Custom Name	
Туре	Float 🗸	🖉 String
Method	UINT32_CDAB	~
Default Value	0	
Address	— 1 +	
Function Code	03 ~	
Magnificati	1	
Start	— 0 +	
Digit	- 4 +	
	🗸 Ok 🕞 Cancel	

Fig.38 – INT32_CDAB Calculation Method

21) FLOAT32_ABCD

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 1.4E-45F~3.4028235E38.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of ABCD, make (0xFEDCBAFF) convert into the 32-bit integer decimal number is -1.4670055E38, after multiplying by 1, the computation value is -1.4670055E38.

	Modify $ imes$
Name	Custom Name
Type	Float 🗸 🖌 Float
Method	FLOAT32_ABCD V
Default Value	0
Address	- 1 +
Function Code	03 🗸
Magnificati	1
Start	— 0 +
Digit	– 4 +
	🗸 Ok 🕞 Cancel

Fig.39- FLOAT32_ABCD Calculation Method

22) FLOAT32_DCBA

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 1.4E-45F~3.4028235E38.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0x0080, and the register value of address 2 is 0xC842, according to the sequence of DCBA, make (0x42C88000) convert into the 32-bit integer decimal number is 100.25, after multiplying by 1, the computation value is 100.25.

	Modify	×
Name	Custom Name	
Type	Float 🗸 🖌 Strin	e
Method	FLOAT32_DCBA	~
Default Value	0	
Address	- 1 +	
Function Code	03 🗸	
Magnificati	1	
Start	• 0 +	
Digit	- 4 +	
	🗸 Ok 🕞 Cancel	

Fig.40- FLOAT32_DCBA Calculation Method

23) FLOAT32_BADC

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 1.4E-45F~3.4028235E38.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of BADC, make (0xDCFEFFBA) convert into the 32-bit integer decimal number is -5.7420655E17, after multiplying by 1, the computation value is -5.7420655E17.

	Modify	×
Name	Custom Name	
Туре	Float 🗸	String
Method	FLOAT32_BADC	~
Default Value	0	
Address	- 1 +	
Function Code	03 🗸	
Magnificati	1	
Start	— 0 +	
Digit	- 4 +	
	🗸 Ok 🕞 Cancel	

Fig.41 – FLOAT32_BADC Calculation Method

24) FLOAT32_CDAB

Suitable for floating-point, string (value) computation, appliable for function code 03 and the data range is 1.4E-45F~3.4028235E38.

If floating-point computation is selected, only need to configure the name, type, calculation method, default value, address, function code, multiple, and other configurations are invalid.

If string (value) computation is selected, only need to configure the name, type, calculation method, default value, string list, address, function code, multiple, other configurations are invalid.

Suppose that the computation is configured as the figure below, the register value of address 1 is 0xFEDC, and the register value of address 2 is 0xBAFF, according to the sequence of CDAB, make (0xBAFFFEDC) convert into the 32-bit integer decimal number is -0.001953091, after multiplying by 1, the computation value is -0.001953091.

	Modify	×
Name	Custom Name	
Туре	Float 🗸 🖌 🗸	ring
Method	FLOAT32_CDAB	~
Default Value	0	
Address	— 1 +	
Function Code	03 🗸	
Magnificati	1	
Start	• 0 +	
Digit	- 4 +	
	🗸 Ok 🕞 Cancel	

Fig.42- FLOAT32_CDAB Calculation Method
4.2.6 HOMEPAGE SETTING OF TOUCH SCREEN

This section will describe the homepage configuration of touch screen by PC test software, and introduce how to display the various parameters, status and alarm information.

The homepage of touch screen is divided into three parts, which are upper left, lower left and right. Up to 10 energy devices can be configured in upper left part. (Each device is called an energy flow, similar to the followings), four optional data are configured in lower left part, and three diagrams are configured in right part. The configuration of PC is shown as the following figure:



Fig.43 – Homepage Configuration (PC)

Note: the PC data is only used for placeholder display, and the actual data is subject to the display of touch screen.

The display of touch screen is shown as follows:



Fig.44 – Homepage Display of Touch Screen

4.2.6.1 HOMEPAGE CONFIGURATION

To add a PV energy flow to the energy flow display area, drag the PV icon in the option area (or other energy flows) to the specified position of the display area. From 1 to 10, the sequence number of the energy flow is where it is located (the sequence number of the first line is 1-5, and the second line is 6-10). The number of energy flow is 2 as shown in the following figure.

Drag the style icon from the digram options part to the display part to add a diagram of the selected style to the corresponding area.



Double-click the icon of the selected data to display any computaion.

Fig.45 – Hompage Configuration Area (PC)

Write the configuration into the touch screen, and the energy flow, optional data, diagram are displayed in the setting area, as shown in the figure below:



Fig.46 – Homepage Display Area (Touch Screen)

4.2.6.2 ENERGY FLOW CONFIGURATION

Click of PC, or double-click the icon of energy flow to configure the energy flow. Please pay attention to the red marked number in the figure below should correspond to the slave computer:

	Edi		
Icon	3		
Module Status	1 PV State		
Status Color	142PV state c	olor	
Icon Status	142 PV icon st	ate	
Direction	88PV Directi	on	
Binding module	pv5		~
-Key data 1			
Computation	16PV Generat	ion Today	
Name	Generation Tod	ay	
Unit	k\h 🗸	Display symbols	ON
-Key data 2 —			
Computation	12 PV Active	Power	
Name	Active Power		
Unit	k₩ ✓	Display symbols	ON
	🗸 ок	🕞 Cancel	

Fig.47 – Energy Flow Configuration

Click to pop up computation selection as the following figure, select the computation and

click

Select to bind the computation.

						Select Computatio	n						
	ID	Name	Туре	Value	String	Method	Func. code	Address	Start	Digit	Rate	Binding device	Í
⊳	1	PV State	String(400	Display	NONE					1	₽V	
	2	PV Alarms	String(0	Display	BOOLEANS_BITS_AB	03	0	0	0	1	PV	
	3	PV Warnings	String(0	Display	BOOLEANS_BITS_AB	03	0	0	0	1	PV	
	4	PV Running	Float	0		UINT_BITS_AB	03	0	0	0	1	PV	
	5	PV Common Alarm	Float	0		UINT_BITS_AB	03	0	0	0	1	PV	
	6	PV Common Warning	Float	0		UINT_BITS_AB	03	0	0	0	1	PV	
	8	PV Direction	Float	0		UINT_BITS_AB	03	0	0	0	1	PV	
	9	PV Stopped	Float	0		UINT_BITS_AB	03	0	0	0	1	₽V	
	10	PV Generation Today	Float	0		UINT32_ABCD	03	0			1	PV	
	11	PV Total Power Genera	Float	0		UINT32_ABCD	03	0			1	PV	
	12	PV Active Power	Float	0		INT16_AB	03	0			1	PV	
	13	PV Reactive Power	Float	0		INT16_AB	03	0			1	PV	
	14	PV Power Factor	Float	0		INT16_AB	03	0			1	PV	
	15	PV DC1 Voltage	Float	0		INT16_AB	03	0			1	PV	
	16	PV DC1 Current	Float	0		INT16_AB	03	0			1	PV	
	17	PV DC1 Power	Float	0		INT16_AB	03	0			1	PV	
	18	PV DC2 Voltage	Float	0		INT16_AB	03	0			1	PV	
	19	PV DC2 Current	Float	0		INT16_AB	03	0			1	PV	
	20	PV DC2 Power	Float	0		INT16_AB	03	0			1	PV	
	21	PV AC-L1 Voltage	Float	0		INT16_AB	03	0			1	PV	
	22	PV #C-L2 Voltage	Float	0		TNT16 4B	03	0			1	PV	•

Fig.48 – Computation Selection

1) Energy Flow Status String

It applies to string (value) computation. The strings corresponding to the bound compution are displayed here. Suppose the bound computation is configured as the follwing figure, the slave computer displays "Status 4" by default. If the compution value is 100, "Status 1" is displayed. If the computation value is not within the preset range, "—" is displayed.

	Mo					Modify String	
Name	PV Stat	e		ŀ	Batch Add	🗙 Delete All	
Туре	String(Value) 🗸 🗸	🖉 String		Value	String	Delete
Method	NONE		~	⊳	100	Statel	Delete
Dofault Valu	400				200	State2	Delete
Deraurt Vart	18 400				300	State3	Delete
Address	-	0 +			400	State4	Delete
Function Cod	le 01	~			500	State5	Delete
					600	Stateô	Delete
Magnificati	1						
Start	-	0 +					
Digit	-	0 +					
_	✔ Ok	Cancel		-			
Voltage	Float	0	_	1			
Voltage	Float	0					
Current	Float	0					
urrent	Float	0					
Current	Float	0				V OK 🕞 Cancel	
	Floot	0					

Fig.49 – Status Computation Example

The bound computation can be changed by PLC logic to realize the display of the running status and alarm information of the device during operation. The example of PLC logic is as follows:

\Box 🔞 🕽 When PV Common Alarm = 1, top	home block show PV Alarms	
PV Common Alarm	Action	×
	Action type UI Bind	
	Home 1	
	Computation 2 PV Alarms	
	OK Cancel	

Fig.50 – Example 1 of Status Change Bound Computation

8	‡	When PV Common Wa	rmings = 1, top b	nome block show	PV Warnings	
	ŧ	PV Common Warning	HomeBlock 1	Action		×
Ř	•	J	—()	Action type	UI Bind	<u> </u>
		-1		Home	1	
				Computation	3 PV Warnings	
					OK Cancel	

Fig.51 – Example 2 of Status Change Bound Computation

🗆 😢 🕻	When PV Common Warn Status	ings is not 1 a	and PV Common A	larms is not 1, top home block show	v Running
👝 🕇	PV Common	HomeBlock 1	Action		×
□ ₩ +	╶┯╶┛╫	—()	Action type	UI Bind	<u> </u>
	-1	_	Home	1	
	PV Alarms		Computation	2 PV Alarms	
	-1				
				OK Cancel	

Fig.52 – Example 3 of Status Change Bound Computation

Uses	h	·
поше	۳	-

is the serial number correspingding to the energy flow.

2)Background Color of Energy Flow Status

It applies to floating-point computation, the background color of text can be changed according to the bound computation. Suppose that the color matching settings of PC are as follows:

+ Add X Delete All			
Stopped 🗙	Alarm 🗙	Tarnings 🗙	Running 🗙
ID 1	ID 2	ID 3	ID 4
Name Stopped	Name Alarm	Name Warnings	Name Running
Color	Color	Color	Color
Transparency <u>255</u>	Transparency 255 +	Transparency 255 +	Transparency - 255 +

Fig.53 – Color Matching Set

The bound computation is configured as the following figure, the default value is 1, and the color of corresponding ID is the "Stop" color.

	Modify	
Name	PV state color	
Туре	Float	✓ 🖉 String
Method	NONE	~
Default Value	0	
Address	- 0	+
Function Code	01	~
Magnificati	1	
Start	- 0	+
Digit	- 0	+

Fig.54 – Example of Status Background Color Computation

The computation is assigned by PLC logic operation, such as the figure of PLC logic below:





When PV is in normal running, the computation value is 4, and the text background color is "Normal Running " color, when PV is stop, the computation value is 1, the text background color is " Stop" color, it displays black if the computation value is not configured with the corresponding color.



Fig.56 – Energy Flow Icons

4) The Status of Energy Flow Icon

It applies to floating-point computation, icons can be changed flashing or static according to the computation value.

Suppose that the computation is configured as the following figure:

	Мо	dify			×
Name	PV icon	state]
Type	Float		~	🖉 String	
Method	NONE			~]
Default Value	0				
Address	-	0	+		
Function Code	01		\sim		
Magnificati	1				
Start	-	0	+		
Digit	-	0	+		
	🗸 Ok	(→ c)	ancel		

Fig.57 – Example of Icon Status Computation

This computation is assigned by PLC logic, such as the PLC logic of the following figure:



Fig.58 – Example of Icon Status Change

When there is no alarm of PV, the computation value is 0, the PV icon will be static, when the PV icon alarms, the computation value is not 0, the PV icon starts to flash.

5) Click Event of Energy Flow Icon

Click the icon to jump to the details of the corresponding module according to the "Bound Module". If "Bound Module" is not configured, the click will not take effect.

6) Energy Flow Data 1

∟Key data 1	
Computation	0
Name	Today power
Unit	k₩h ✓ Display symbols Off

Fig.59 – Energy Flow Data 1

Click 💼 to select the bound computation, which applies to the floating-point computation,

the value is displyed on slave computer. The name and unit displayed on the slave computer can be customized. If "Data Display Sign" is switched on, both positive and negative signs of the computation value will be displayed. If "Data Display Sign" is switched off, the negative sign will be displayed if the computation value is negative.

7) Energy Flow Data 2

The configuraton method is the same to "Energy Flow Data 1".

8)Energy Flow Direction

It applies to the bound floating-point computation, according to its value, the energy flow arrow can point to the busbar or icon.

When the value of bound computation is 0, it will point to the busbar, while the value is not 0, it will point to icon. It depends, the bound computation can be calculated and assigned according to the real-time data of the device, or by PLC logic operation.

9) Optinal Data

Click i of the self-selected data area of PC, or double-click the icon of the self-selected area to configure the data in detail.

	Energy saving information	×	
Icon	P		
Name	Eq. planted		
Computation	19 Equivalent planted	•••	
Unit	tree	 	
	✔ OK 🕞 Cancel		
	Fig.60 – Optional Data		

to select the bound computation, it applies to the floating-point computation, the Click value is displayed on slave computer. The displayed name and unit of the slave computer can be to select the icon displayed on slave computer, and supported icons are customized.Click shown as below:



Fig.61 – Optional Data Icon

10)Optional Chart

The data source of the chart is the database. Each chart needs to be bound to a database, and the data is displayed in the form of a chart. See the following detais about the database in next section.



Fig.62 – Optional Chart

The displayed chart name on slave computer can be customized. Click to select chart style, the supported styles include line chart, histogram, up/down histogram, ring chart (displyed as percentage), pie chart (displayed as specific value), as shown below:



4.2.7 MODULE CONFIGURATION

Each module corresponds to a detail page of slave computer, which can customize the name, data display, table header data, digrams. Please pay attention to the red marked number should be matched with the slave computer.

The PC configuration is shown as the following figure:



Fig.64 – Module Configuration (PC)

🖽 PV · State4 121,828,565,271,948,755,462,148,860 500,000 400,000 0 0 DC1 (A) 300,000 200.000 100,000 0 0 DC1 (kW) Power Factor 18:21 18:2 WTS (Generation kWh Generation 1448 kWh Active Power kW Reactive kvar Power Factor 0 AC-L2 AC-L3 AC-L2 2023/02/13 18:26:24 •

The slave computer is displayed as below:

Fig.65 – Module Display (Touch Screen)

4.2.7.1 TITLE BAR SETTINGS

It includes module icon, module name, module status. Among which the module status can be bound to the computation and display the device running status by the computation value.

Click to select the module icon, the supported icons are as the following figure:



Fig.66 – Module Icons

Click Estatus to select any computation, which is suitable for string (value) computation and displayed on the title bar of the details, as is shown below:

	Status Set	×
Name	running state	
Computatio	1 PV State	•••
	✔ OK 💽 Cancel	

Fig.67 – Title Bart Setting

4.2.7.2 DATA DISPLAY

🔳 Data

```
Click
```

to display all the data, as the following figure:

			Data S	lettings		×
	🕂 Add	🗙 Delete All				
		Name	Unit	Computation	Edit	Delete
Þ	1	Generation Today	k₩h	[10] - PV Generation Today	Edit	Delete
	2	Generation Total	k₩h	[11] - PV Total Power Generation	Edit	Delete
	3	Active Power	kW	[12] - PV Active Power	Edit	Delete
	4	Reactive Power	kvar	[13] - PV Reactive Power	Edit	Delete
	5	Power Factor		[14] - PV Power Factor	Edit	Delete
	6	DC1	V	[15] - PV DC1 Voltage	Edit	Delete
	7	DC1	A	[16] - PV DC1 Current	Edit	Delete
	8	DC1	k₩	[17] - PV DC1 Power	Edit	Delete
	9	AC	Hz	[27] - PV AC Frequency	Edit	Delete
	10	DC2	V	[18] - PV DC2 Voltage	Edit	Delete
	11	DC2	A	[19] - PV DC2 Current	Edit	Delete
	12	DC2	k₩	[20] - PV DC2 Power	Edit	Delete
	13	AC-L1	V	[21] — PV AC—L1 Voltage	Edit	Delete
	14	AC-L2	V	[22] - PV AC-L2 Voltage	Edit	Delete
	15	AC-L3	¥	[23] — PV AC—L3 Voltage	Edit	Delete
	16	AC-L1	A	[24] - PV AC-L1 Current	Edit	Delete
	17	AC-L2	A	[25] - PV AC-L2 Current	Edit	Delete
	18	AC-L3	A	[26] - PV AC-L3 Current	Edit	Delete
			✓ 0K	C Cancel		

Fig.68 – Computation Selection

Click Add to add a data option, of which the display name and unit can be customized and bound to a computation to display the computation value or the corresponding string. If the bound computation is string (value) or string (bit), the click the detailed information displayed by slave computer. Click Rdit to modify the existing data, as is shown below:

🖽 PV-State4									
				50	0.000		18	,189,023 2,288 73	
0				Modify			× 75 ^{162 149800}		
DC1 (V)	,	Name	Genera	tion Today			c=20324342222	8 <mark>23170</mark> 29	
		Unit	k₩h			~	2481448		
		Compu	tatio 10 PV	Generation Tod	ay		TT AR (PA1890 19	5994992 157	
0		/			_			40 <mark>,32</mark> 1 15,978	
DC1 (KW)		~	OK 🕞 Car	ncel		18:23 18:25 1	8:2718:29	
						PV (kWh)	■ WTS (kWh) ■ PCS	(kWh)	
Generation 0	kWh	Generation	1602 kWh	Active Power	0	kW	Reactive	0	kvar
Power Factor 0		DC1	0 V	DC1	0	A	DC1	0	kW
AC 0	Hz	DC2	0 V	DC2	0	A	DC2	0	kW
AC-L1 0	v	AC-L2	0 V	AC-L3	0	v	AC-L1	0	А
AC-L2 0	A	AC-L3	0 A						
2022/02/12 18:20:00									
2023/02/13 18:29:09					~				

Fig.69 - Module Data

4.2.7.3 TABLE HEADER MANAGEMENT

Click Click to set four table headers. The data source is the data item added to the detail page, and the max. value and min. value of the dial plate need to be set , as shown in the

detail page, and the max. value and min. value of the dial plate need to be set , as shown in the following figure:



Fig.70 – Table Header Management

4.2.7.4 CHART SETTINGS

Click

to set a chart and selecct the style, the data source is bound to a data base

that in form of chart display. The specific configuration is the same as the chart selected on the homepage. The details can refer to the following section.

4.2.8 DATABASE SETTINGS

The database is used to display the line charts, bar charts, ring charts or pie charts. Each chart has only one database bound to it, and the chart is updated in real-time as the database changes.

Databases are divied into minute database, hour database, day database, month database, year database. Each database can be set as single point data or cumulative data.

4.2.8.1 SINGLE POINT DATA

Single point data is time record data.

Table (

Table 6 – Types of Single Point Database	
Description	Ī

Types	Description						
Minute	Data is read and stored at 0s/min. The database points to the next data address.						
	Circularly cover the data and save the latest 60 items.						
Hour	Data is read and stored at each hour. The database points to the next data address.						
	Circular over the data and save the latest 24 items.						
Day	Data is read and stored at every 0' o clock. The database points to the next data address.						
	Circular over the data and save the latest 30 items.						
Month	Data is read and stored at the beginning of each month. The database points to the next						
	data address.						
	Circular over the data and save the latest 12 items.						
Year	Data is read and stored at the beginning of each year. The database points to the next						
	data address.						
	Circular over the data and save the latest 50 items.						

It is assumed that a computation of PV active power is added to the minute database as the data source, which is calcuted and assigned through the real-time data of the device. The system reads the value of the PV active power every minute and stores the data. The database points to the next data, and so on, and saves the latest 60 items.

Other types of database are similar.

4.2.8.2 ACCUMULATED DATA

Types	Description
Minute	Data is stored at 0s/min. The database points to the next data address and clears the
	accumulated data.
	Circularly cover the data and save the latest 60 items.
Hour	Data is stored at a clock by each hour. The database points to the next data address and
	clears the accumulated data.
	Circular over the data and save the latest 24 items.
Day	Data is read and stored at every 0' o clock. The database points to the next data address
	and clears the accumulated data.
	Circular over the data and save the latest 30 items.
Month	Data is read and stored at the beginning of each month. The database points to the next
	data address and clears the accumulated data.
	Circular over the data and save the latest 12 items.
Year	Data is read and stored at the beginning of each year. The database points to the next
	data address and clears the accumulated data.
	Circular over the data and save the latest 50 items.

Table 7 – Types of Accumulated Data

It is assumed that a computation of PV generation is added to the minute database as the data source, which is calcuted and assigned by PLC logic. The PV active power is calculated and assigned by real-time data of device. As shown in the following figure:

🗆 🐼 🚦 Edit PV Generation = PV Active Power / 3600

4.2.8.3 DATA SOURCE

Click Edit Data to add up to 5 computations as the data source, the string (bit) value computation is not supported, as shown in the following figure:

	Data				×
🕂 Add 🗙 Delete All					
Computation	Name	Unit	Edit	Delete	
[11]-PV Total Power Generation	PV	k₩	Edit	Delete	
[64]-WTS generation total	WTS	k₩	Edit	Delete	
[87]-Mains generation total	Mains	k₩	Edit	Delete	
[109]-GEN generation total	GENSET	k₩	Edit	Delete	
✓ ok	Cancel				

Fig.71 – Data Source

Each database corresponds to a chart, and each computation corresponds to a curve or category in chart. Click Ldit to customize each curve or the name and unit of the category as the figure note, as shown in the following figure:



Fig.72 – Chart Option Settings

4.2.8.4 CHART TYPES

Line chart, a computation corresponds to a curve, the slave computer displys as the following figure:





Histogram, the slave computer displys as the following figure:





Compared with the histogram, only the first two items of data in the database, the slave computer displys as the following figure:



Fig.75 – Histogram Comparison

Pie Chart: take the most approximate value of each data in the database, the slave computer displys as the following figure:



Fig.76 – Pie Chart

Ring Chart: take the most approximate value of each data in the database, the slave computer displays as the following figure:





4.2.9 SETTING MANAGEMENT

Settings are the supplement to the computation, the values can be saved after a power failure, which can be used to save the coefficient, threshold, status, etc. It can be divided into key type, value type, and both of them are floating-point value and can take part in the PLC logic operation. In addition to the floating-point value, the key type also has the corresponding string.

The functional-related settings can be put in the same group when adding. Click "Edit" to modify the name, type, default value, authority, unit of the setings, and click "Delete" to delete the computation.

The setting value can be manually modified in setting page of slave computer, or assigned by PLC logic operation, or modified by PC. The figure of PC setting screen is shown as follows:

HMU15N-EMS V1.0.0.1 - [C:∖C	onfig_en.jsonc]		~ - c
The set of	Open Save Save as Set	⊂ C→ _{Quit}	
Home		Custom Settings	
Port Settings	Add 🗙 Delete All		
Device Settings		PCS	×
Computation	Name PCS		+ Add
Module	> Rated active power	500 kW	🗹 Edit 🗙 Delete
Database	> Rated reactive power	500 kvar	🕼 Edit 🗙 Delete
Color	> PCS cut-off discharge SOC	30 %	🖉 Edit 🗙 Delete
Custom Settings	> PCS cut-off charge SOC	100 %	🗹 Edit 🗙 Delete
PLC		PV	*
System Settings	Name PV		+ Add
About	> PV rated active power	500 kW	🗹 Edit 🗙 Delete
	> PV rated reactive power	500 kvar	🖉 Edit 🔀 Delete

Fig.78 – Setting Management (PC)

The figure of slave computer screen is shown as follows:

Setting			
	PCS		
Port	Rated active power: 500.0 kW		
	Rated reactive power: 500.0 kvar		
Debug	PCS cut-off discharge SOC: 30.0 %		
History	PCS cut-off charge SOC: 100.0 %		
System	PV		
	PV rated active power: 500.0 kW		
	PV rated reactive power: 500.0 kvar	EDIT	
2023/02/13 18:18:12		*	
2023/02/13 18:18:12		¢	

Fig.79 – Setting Management (Touch Screen)

4.2.9.1 FLOATING-POINT TYPE SETTING

The value of setting is floating-point, and can be set as default value, custom unit. Suppose the setting is configured as the following figure:

	Modify	
Name	Max SOC	
Туре	Float	~
Limit	No password required	~
Default	100	
Unit	%	~
[✔ OK 🕞 Cancel	

Fig.80 – Example of Floating-point Setting 1

This setting can be used as threshold value, when the storage energy SOC is less than or equal to 30%, the discharge will be stopped, as shown in the figure below:

_ 🔞 🕻	PCS SOC	0x05	Condition		×
	<pre>J <-PCS cut-off discharge SOC</pre>	MO	Condition Type	Computation V	
			Polarity	Normally open 🗸	
			Computation	36 PCS SOC	
			Test	<= ✓	
			Value 1	Custom : ~ PCS cut-off discharge SOC	~
				OK Cancel	

Fig.81 – Example of Setting Usage 1

Suppose the setting is configured as the following figure:

	Modify	×
Name	Equivalent economic fact	ors
Туре	Float	~
Limit	No password required	~
Default	0.7	
Unit	\$/k\h	~
	✔ OK 🕞 Cancel	

Fig.82– Example of Floating-point Setting 2

This setting can be used as a coefficient to calculate the equivalent economic income of PV power generation today, as shown in the following figure:

Variable	×
	Z=f(x, y)
z	Computa v 139 Equivalent savings
x	Computa V 10 PV Generation Today ····
Operator	* ~
У	Custom : -> Equivalent economic factors ->
	OK Cancel

Fig.83– Example of Setting Usage 2

4.2.9.2 KEY TYPE SETTING

The value of the setting is the index value of the option, from 0 to display the corresponding string. In key option settings, the selected option is the default value.

Suppose the setting is configured as the following figure:

Modify		Key Options	×
Name Running Mode		+ Add Options 🗙 Delete All	
Type Key	-	• Grid tied	8
Limit No password required	2	O Retention	8
Default Grid tied		O Zero carbon	8
🖉 Edit		O Grid off	8
✔ OK 🕞 Cancel			
		✔ OK 🕞 Cancel	

Fig.84– Key Type Setting

The setting can be used as a condition, and according to the different states of the condition to perform different PLC logic operations, as shown below:



Fig.85 – Usage Example of Key Type Setting

4.2.9.3 PERMISSION MANAGEMENT

There are three modification permissions for setting: "No Password", "Only Confirm", "Password Confirm". If the permission to change the setting value is "No Password", the value can be modified directly. If the permission to change the setting value is "Only Confirm", click "confirm" to modify its value, shown as below:



Fig.86 – Only Confirm

If the modification permission is "Password Confirm", the value can be modified after entering the correct password. The management password is "318" as default, it can be modified via PC and the password input box is as follows:

Please input password			
	CANCEL	ок	
Fig.87 – Password	Confirm		

4.2.10 COLOR SETTING

The color value and name and be preset. The system automatically assigns serial number to each color value, it starts from 1. According to the floating-point computation value, the corresponding color value can be selected.

Add the setting as the following figure, if the computation is 2, the corresponsing color value is "Alarm Color".

🗱 HMU15N-EMS V1.0.0.1 - [C	[C:\Config_en.jsonc]	~ - 🗆 X
€ € Ŀ) 🗁 🐻 💭 @ @ w Onen Sava Sava as Set Ouit	
Ноле	Color	
Port Settings	+ Add X Delete All	
Device Settings	Stopped 🗙 Alarm 🗙 Varnings	×
Computation	ID 1 ID 2 ID 3	
Module	Name Stopped Name Alarm Name ¥arnings	
Database	Color Color Color	
Color		
Custom Settings	Transparency - 255 + Transparency - 255 + Transparency - 255 +	
PLC <		U
System Settings		
About	Name Running	
	Color	
	Transparency 255 +	
	Fig. 99 - Color Monogoment	



4.2.11 PLC INTRODUCTION

As the introduction of the above section, after the communication establishement between PC and external device, the real-time data is obtained continuously, including various parameters, running status, alarm information, etc, which is converted into the computation and displayed on slave computer to realized the remote monitoring of the external device.

Through the PLC logic operation, the computation, internal variables and settings can be converted to each other to control the display of the slave computer, and can be sent to the external device the Modbus request to realize the remote control of external device, which is more flexible and convenient to meet the business requirements.

4.2.11.1 PLC EDITING INTERFACE

PLC editing interface is divided into condition area, action area, setting area and logic editing area, as shown below:



Fig.89 – PLC Editing Interface

4.2.11.2 CONDITIONAL ELEMENTS

Drag the corresponding condition icon to the logic editing area for logical editing. The conditional elements are shown as the following table:

lcon	Condition Name	Description	Example
	Flag	To test whether the flag is valid.	PLC Flag 1 When Flag 1 is true, condtion is valid; otherwise the condition is invalid.
123	Counter	To test wheter the counter value reaches the set value. Click on a of the setting area to set the counter.	Counter# 1 When the value of Counter 1 reaches the set value, condition is valid; otherwise the condition is invalid.
	Timer	To test whether the delay time of timer reaches the set value. Click on (*) of setting area to set the timer. Condition Type Timer test Polarity Rornally open Timer#	When the delay time of Timer 1 reaches the set value, condition is valid, otherwise the condition is invalid.
,,,,,,,	Cycle Timer	To test whether the cycle timer and positive pulse reach the set value.Click on set the value of setting area to set the value	Cycle timer 1 When the delay

Table 8 – Elements of PLC Conditional Area

lcon	Condition Name	Description	Example
		Of cycle timer.	time of Cycle Timer 1 is less than the set value of positive pulse time, condition is valid; otherwise the condtion is invalid.
Xn	Internal Variable	To test whether the internal variable meets the set conditions, and can be compared with the internal variable, settings, computation, constant in pairs.	When internal variable X1 is less than constant 100, condition is valid; otherwise condition is invalid.
J	Computation	To test whether the computation meets the set condtions, floating-point type and string (value) type are supported, and can be compared with the internal variable, settings, computation, constant in pairs.	When the value of computation SOC is less than the constant 100, condition is valid; otherwise the condition is invalid.



lcon	Condition Name	Description	Example
Icon	Condition Name	Description Implicit in Type Computation Polarity Computation Computation Tot constant of the setting is meet the set conditions, and can be compared with the internal variable, settings, computation, constant in pairs. Condition Type Config at the set of the set in the set	Example Soc (x1) When the value of computation SOC is less than the value of internal variable X1, condition is valid; otherwise the condition is invalid. (B) When the value of computation A is less than the value of compution B, condition is valid; otherwise the condition is invalid. PCS SOC When the value of computation SOC is less than charge SOC value, condition is valid; otherwise the condition is invalid. Running mode is equal to the constant value 0, condition is valid; otherwise the condition is invalid. Running mode is equal to the constant value 0, condition is valid; otherwise the condition is invalid. Running Mode (X1) When the value of When the value of valid; otherwise the condition is invalid. Running Mode (X1) When the value of When the value of valid; otherwise the condition is invalid. Running Mode (X1) When the value of (X1)
		Value 1 Constan v 0	Running Mode S (X1) When the value of running mode is less than the value of internal variable X1, condition is valid; otherwise the condition is invalid.
			When the value of running mode is greater than the value of genset status, condition is valid; otherwise the condition is invalid.

lcon	Condition Name	Description	Example
			When the value of setting A is less than the value of setting B, condition is valid; otherwise the condition is invalid.
	Time	To test whether the current time meets the specific time period of setting, including start time,but not the end time. The start time should be earlier than the end time, and both of them should be on the same day.	12:00->18:00 When the time of slave computer is between 12:00 and 18:00, condition is valid; otherwise the condition is invalid.
Weekly Mon.	Week	To test whether the time of the day meets the condition of the specific day. Condition Veckly(s) Sunday, Monday OK Cancel	Sunday, Monday When the day of slave computer is Sunday or Monday, condition is valid; otherwise the condition is invalid.
Day 10th	日期 Date	To test whether the current date meets the conditon of specific date.	When the date of slave computer is the first or second day of each month, condition is valid; otherwise the condition is invalid.
Week 1st	Week No.	To test whether the number of current week of a month meets the set number condition.	When the date of slave computer is the first or second week of each month, condition is valid; otherwise the condition is invalid.

lcon	Condition Name	Description	Example
		Condition X Condition Type Week in the month Polarity Normally open Week (s) Week 1, Week 2 OK Cancel	
Month May	Month	To test whether the current month meets the set month condition.	When the month of slave computer is Jan. or Feb., condition is valid; otherwise the condition is invalid.
Year 2025	Year	To test whether the current year meets the set year condition.	When the year of slave computer is 2023, condition is valid; otherwise the condition is invalid.

4.2.11.3 ELEMENTS OF ACTION AREA

Drag the corresponding action icon to the logic editing area for logical editing. The logic conditon can have multiple logic actions.

lcon	Action Description	Example
	Action: Set flag to 1. Trigger Mode: Triggered when condition is valid.	Act when condition is
	Action type Set flag Flag# 1 ÷ OK Cancel	valid: set flag to 1; act when condition is invalid: flag keeps the original state.
	Action: Set flag to 0. Trigger Mode: Triggered when condition is valid. Action Action type Reset flag Flag# 1 OK Cancel	Act when condition is valid: set flag to 0; act when condition is invalid: flag keeps the original state.

Table 9 – Elements of PLC Action Area

lcon	Action Description	Example
	Action: Toggle flag (if the original flag is 1,it turns	Flag# 1
¢,	to 0; if the original flag is 0, it turns to 1.).	
	Trigger Mode: Triggered when condition changes	Act when condition
	from invalid to valid (edge trigger) .	changes from invalid to valid: toggle
	Action X	flag.
	Action type Toggle flag	
	Flag# 1	
	Action: Drive flag (set flag to 1 when condition is	Flag# 1
	avtive; set flag to 0 when condition is invalid).	
	Trigger Mode: Triggered when condition are valid	Act when conditon is
	and invalid.	valid: set flag to 1; act when
	Action ×	condition is invalid: set flag to 0.
	Action type Drive flag	
	Flag# 1	
	OK Cancel	
123	Action: Add 1 to the counter.	Counter# 1
	Irigger Mode: Iriggered when condition changes	
	from invalid to valid (edge trigger).	Act when condition
	Action	changes from invalid to valid:
	Action type Increment counter	counter increases by 1.
	Counter#	
	OK Cancel	
123	Action: Minus 1 to the counter.	Counter# 1
	Trigger Mode: Triggered when condition changes	()
	from invalid to valid (edge trigger).	Act when condition
	Action X	changes from invalid to valid:
	Action type Decrement counter V 123	counter minus by 1.
	Counter# 1	
	OK	
123	Action: Rest counter (reset the value of the	Counter# 1
Reset	counter to 0).	
	Trigger Mode: Triggered when then condition is	Act when condition is
	valid.	valid: reset the counter, and the value
	Action	of counter is reset to 0.
	Action type Reset counter 123	
	Counter#	
	OK Cancel	

lcon	Action Description	Example
	Action: Drive delay (timer keeps working if condition is valid; timer stops delay when condition is invalid, and resets the timer to 0.) Trigger Mode: Triggered when the conditions are valid and invalid. Action type Timer delay Timer# 1 Cancel	Act when condition is valid: timer continuous keeps working; act when condition is invalid: timer stops delay and resets to 0.
Fun	Action: To trigger cycle timer (the cycle timer continuous keeps working if condition is valid: the cycle timer stops delay when the condition is invalid, and resets to 0). Trigger Mode: Triggered when condition is valid. Action Action type CycleTimer Cycle Timer# 1 Cycle Tim	Act when condition is valid: the cycle timer is cycle working: act when condition is invalid: cycle timer stops deay and resets to 0.
M	Action: Send the Modbus request to external device. Trigger Mode: Triggered when condition changes from invalid to valid(edge trigger). Action type Modbus Fun code 0x05 Device PV Address Constan 1 Data Variabl. X1 Optional Function Code: 0x05、0x06、0x10.	Send the Modbus request to external device when condition changes from invalid to valid.

lcon	Action Description	Example	
	Address and data can be filled in constant, or use		
	the computation, settings , internal variable value		
	(floating-point is strongly coverted to integer).		
×	Action: numerical conversion and conversions	X1	
ЛУ	among computation, internal variable and	()	
	settings in pairs.	Conversions among	
	Trigger Mode: Triggered when condition is valid.	computation, internal variable and settings in pairs when condition is	
	Action X		
	Action type Convert	valid.	
	Z Variable V X1 V		
	x Computa V 12 PV Active Power		
	Operator + V		
	v Computa v 65 WTS Active Power		
	OK Cancel		
	X, Y are parameters, Z is the output value, X, Y, Z		
	are floating-point types.		
	Action: Interface binding, to change the	HomeElock 1	
U	computation bound to the homepage energy flow.	———()	
	Trigger Mode: Triggered when condition is valid.	Change the computation	
	Action X	bound to the energy flow of	
	Action type UI Bind	homepage when the condition is	
	Home 1	valid.	
	Computation 1 PV State		
	OK Cancel		
	The homepage is the sequence number of energy		
	flow, see section 4.2.5.1.2.		

4.2.11.4 ELEMENTS OF SETTING AREA

It can open, save, delete the PLC configuration, add label and variable change, set counter, timer and cycle timer.

lcon	Description	Example
	Open: Click the icon to open the edited PLC file.	
B	Save: Save all the logic editing areas to PLC file.	
	Selected Save Save the selected logic code to PLC file.	
创	Clear: Clear the logic editing area.	
	Save the Single Line: Save the PLC logic of the line to PLC file.	
:	Move: Drag up and down to change the position of the PLC logic in the whole PLC logic.	
8	Delete: Delete the line.	
	Label: Drag the icon to logic editing area for labeling. Save the comments or notes about the PLC logic in this section.	Image: Second second Image: Second second second Image: Second s
Xy	Numerical Conversion: Drag the icon to logic editing area for adding the conversions among computation, internal variable and settings in pairs.	 Edit X1 = GEN AC-L1 Voltage + GEN AC-L2 Voltage Edit X2 = X1 + GEN AC-L3 Voltage Edit GEN Voltage Avg = X2 / 3 Edit GEN Voltage Avg Flage 1 Edit GEN Voltage Avg Flage 1
		x I and X2 are internal variables, Gen Ua, Gen Ub, Gen Uc and average voltage are computations.
123 Set	Counter Setting: Click icon to set the counter, and there are 100 built-in counters.	Counter limit 1 5 🗼 Set the upper limit times of Counter 1 is 5.

Table 10 – Elements of PLC Setting Area

lcon	Description	Example
	Timmer Setting:	Timer limit 1 60.0 文 s
	Click the icon to set the timer, and	设置定时器 1 的延时时间为 10.0s。
	there are 100 built-in timers, the type	Set the delay time of Time 1 as 10.0s.
	can be s or min.	
, nnr	Cycle Timer Setting:	Cycle Positive Pulse Type
	Click the icon to set the cycle timer,	Timer limit 1 0.0 🚖 0.0 🖨 s 🗸
	there are 100 built-in cycle timers, the	Set the cycle time of the timer as 10.0s, and the
	type can be s or min.	positive pulse as 1s.

4.2.11.5 LOGIC INTRODUCTION

4. 2. 11. 5. 1 "OR" LOGIC



4. 2. 11. 5. 3 "NOT" LOGIC



Fig.92 – "Not" Logic

When flag 5 is false, perform this function.

4. 2. 11. 5. 4 COMBINATION LOGIC



Fig.93 – Combination Logic

In the state when flag 3 is true, flag 1 is true or flag 2 is true, perform this function.

4.2.11.6 APPLICATION EXAMPLES

Suppose the service logic is as follows: system is composed of PV1, PCS1, BMS1, Mains 1, Wind 1, Load 1.

Grid-tied Running

In grid-tied operation, PV and wind energy are always at the highest power generation.

Safety Power Running Mode

The goal is to make the energy storage as the backup power supply, which could support a maximum power supply time during the whole micro-grid is in off-grid running mode due to the failure of external power grid.

Table 11 – Safety Power Mode

SOC >= 98%	SOC < 95%
PCS stop charging	PCS start charging

Zero-carbon Economy Running Mode

The goal is to use PV, wind, storage energy as the clear energy to the fullest and to supply power for load at the demand.

If the total output of the three energy sources is less than the load, the differential load will be supplied by external grid. Meanwhile, considering the peak and off-peak hours of the power price, the charge and discharge of energy storage will be economically scheduled to realize the zero-carbon economy running of the system.

	PV + Wind Energy >= Load		PV + Wind Energy < Load		
	SOC >= 95%	SOC < 95%	SOC > 10%	SOC <= 10%	
Valley Power	Excess Power is	Charging	Discharging	No charging and	
2:00-4:00	connected to the	The charging	The discharging	discharging.	
11:00-17:00	grid.	power is the	power is the load		
Flat Power		excess power.	power – PV		
0:00-2:00			power – wind		
4:00-7:00			power		
10:00-11:00					
17:00-18:00					
Peak Power					
7:00-10:00					
18:00-24:00					
Uniform	SOC < 40%, full power 100kW charge;				
Recharge	SOC >= 40%, No recharge.				
16:00-17:00					

Table 12 – Zero-carbon Economy Mode

Off-grid Running

The off-grid mode operation only happened during special circumstances (such as trips of external grid maintenance power failure, overcurrent, short circuit, voltage loss protection)

		-		
PV + Wind Energy >= Load		PV + Wind Energy < Load		
SOC >= 98%	SOC < 98%	SOC > 10%	SOC <= 10%	
To limit the power	Charging	Discharging	Storage energy at rest, and	
generation, first to limit the Full pow		Full power	the whole system is power	
wind energy, then to limit the	generation of	energy of PV	off.	
PV.	PV and wind	and wind		
	energy	energy		

Table 13 – Off-grid Mode












4.2.12 DEBUG MODE

Display the status of flag ,computation, settings, internal variable, counter, timer and cycle timer of PLC in real-time.

4. 2. 12. 1. 1 FLAGS

As shown in the figure below, there are 100 flags, the green boder means the flag is used in PLC, and the green filling means that the flag is used in PLC and the status is true.

Setting										
Configuration		Flag C	computation	Variable	e Confi	guration	Counter	Timer	Cycle	Timer
Port	1	2	3	4	5	6	7	8	9	10
	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	11	12	13	14	15	16	17	18	19	20
	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
History	21	22	23	24	25	26	27	28	29	30
	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
System	31	32	33	34	35	36	37	38	39	40
	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	41	42	43	44	45	46	47	48	49	50
	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	51	52	53	54	55	56	57	58	59	60
	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	61	62	63	64	65	66	67	68	69	70
	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	71	72	73	74	75	76	77	78	79	80
	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	81	82	83	84	85	86	87	88	89	90
	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	91	92	93	94	95	96	97	98	99	100
	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
2023/04/20 08:39:21				† •	• \$					

Fig.97 – Flags

4.2.12.2 COMPUTATION

As shown in the figure below, each item displays computation ID, device name (if bound to device), computation name, current value, and the green border means that the computation is used in PLC.

Setting					
Configuration	Flag	Computation Varia	able Configuration	Counter Timer	Cycle Timer
	Tips: click to see detail				
Port	34: Generator status Standby	37: PV inverter: PV1 in	38: PV inverter: PV2 in	39: PV inverter: PV1 in	40: PV inverter: PV2 in
	41: PV inverter: PV1 in	42: PV inverter: PV2 in	43: PV inverter: PBUS v	44: PV inverter: NBUS v	45: PV inverter: RS-pha
History	46: PV inverter: ST-pha	47: PV inverter: TR-pha.	_ 48: PV inverter: R-phas	49: PV inverter: S-phas	50: PV inverter: T-phase
System	51: PV inverter: RS-pha	52: PV inverter: ST-pha	53: PV inverter: TR-pha 	54: PV inverter: Grid-tie	55: PV inverter: Radiato
	56: PV inverter: Module	57: PV inverter: Runnin. 	- 58: PV inverter: Genera	59: PV inverter: Numbe	60: PV inverter: Power
	61: PV inverter: Daily e	62: PV inverter: Week G	63: PV inverter: Month	65: PV inverter: Operati 	66: PV inverter: Set the
2023/04/20 08:37:32			• • •		

Fig.98 – Computation

Click it to display the computation details, and the floating-point type is shown as the following figure:



Fig.99 – Floating-point Type Computation

The string (value) type is shown as the following figure, including value and its corresponding string, the green is the current value:

Generator status	L
Tips: Green indicate valid	L
	L
1: Preheat	L
2: Fuel Output	L
	L
4: Crank Rest	L
5: Safety Delay	L
6: Start Idle	L
7: Warming Up	L
	L
9: Normal Running	L
10: Cooling	L
11: Stop Idle	L
	L
	L
14: Stop Failure	L
	L
ОК	



The string (bit) type is shown as the following figure, including register address, bits and its corresponding string, the green is the current bit:

	PV inverter: Common Alarm		
Tips: Green indicate valid			
34.0: alarm00			
34.2: alarm02			
34.3: alarm03			
34.6: alarm06			
34.7: alarm07			
34.8: alarm08			
34.9: alarm09			
34.10: alarm10			
34.11: alarm11			
34.12: alarm12			
34.13: alarm13			
34.14: alarm14			
34.15: alarm15			
		ОК	
	Fig.101 – String (bit) Type Computation		

4.2.12.3 SETTINGS

As shown below, each item displays the setting ID, name, current value, and the green border means the setting is used in PLC.

Setting						
Configuration	Flag	Computation	Variable	Counter	Timer	Cycle Timer
Port	4: Minimum load settir 10.0	5: Generator al 50.0	nd load r)			
History						
System						

Fig.102 – Settings

4.2.12.4 INTERNAL VARIABLE

There are 100 internal variables and the default value is 0. The green border means the parameter is used in PLC.

Configuration Flag Computation Variable Configuration Counter Timer Cycle Timer Port 1 0 2 0 3 0 5 0 6 0 7 0 8 9 0 10 0 Debug 1 0 12 0 14 0 15 0 16 17 0 19 0	Setting										
Port 1 0 2 0 3 0 4 0 5 0 7 0 8 9 0 10 Debug 11 0 12 0 14 0 15 0 17 0 18 0 20 0 History 21 0 22 0 24 0 25 0 27 0 29 0 <t< th=""><th>Configuration</th><th></th><th>Flag</th><th>Computation</th><th></th><th>e Confi</th><th>guration</th><th>Counter</th><th>Timer</th><th>Cycle</th><th>e Timer</th></t<>	Configuration		Flag	Computation		e Confi	guration	Counter	Timer	Cycle	e Timer
Debug 11_{0} 12_{0} 13_{0} 14_{0} 15_{0} 16_{0} 17_{0} 18_{0} 19_{0} 20_{0} History 2_{0} 2_{0} 23_{0} 24_{0} 25_{0} 26_{0} 27_{0} 28_{0} 29_{0} 30_{0} 30_{0} 30_{0} 30_{0} 30_{0} 30_{0} 30_{0} 30_{0} 40_{0} 31_{0} 32_{0} 33_{0} 34_{0} 35_{0} 36_{0} 37_{0} 38_{0} 39_{0} 40_{0} 41_{0} 42_{0} 43_{0} 44_{0} 45_{0} 46_{0} 47_{0} 48_{0} 49_{0} 50_{0} 60_{0} 60_{0} 60_{0} 60_{0} 60_{0} 60_{0} 60_{0} 60_{0} 60_{0} 60_{0} 60_{0} 60_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0} 70_{0}	Port										
History 21_{0} 22_{0} 23_{0} 24_{0} 25_{0} 26_{0} 27_{0} 28_{0} 29_{0} 30_{0} System 31_{0} 32_{0} 33_{0} 34_{0} 35_{0} 36_{0} 37_{0} 38_{0} 39_{0} 40_{0} 41_{0} 42_{0} 43_{0} 44_{0} 45_{0} 46_{0} 47_{0} 48_{0} 49_{0} 50_{0} 10 42_{0} 43_{0} 44_{0} 45_{0} 46_{0} 47_{0} 48_{0} 49_{0} 50_{0} 10 42_{0} 53_{0} 54_{0} 55_{0} 56_{0} 57_{0} 58_{0} 59_{0} 60_{0} 10 62_{0} 63_{0} 64_{0} 65_{0} 66_{0} 67_{0} 70_{0} 80_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0} 90_{0}					14 0						
System 31 32 33 34 35 36 37 38 39 40 0 41 0 42 0 43 0 45 0 47 0 48 0 50 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0 6 0	History				24 0				28 0	29 0	30 0
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	System				34 0	35 0	36 0		38 0	39 0	40
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		41	42	43 0	44	45	46	47	48	49	50
61 0 62 0 63 0 64 0 65 0 67 0 68 0 70 0 71 0 72 0 73 0 74 0 75 0 77 0 78 0 79 0 80 0 81 0 82 0 83 84 0 85 0 87 0 88 0 90 0 0 91 0 92 0 93 94 95 96 97 0 90 0 100					54		56		58	59	60
1 0					64		66		68	69	
0 0									78		80
0 0 0 0 0 0 0 0 0 91 92 93 94 95 96 97 98 99 100 0 0 0 0 0 0 0 0 0 0		81	0 82	83	0 84	0 85	86	87	88	0 89	90
		0	92	93	94	95	0	0	98	0	0
	0000/04/00 00:07:05										

Fig.103 – Internal Variable

4.2.12.5 COUNTER

There are 100 counters, each item displays the set value and the current value of the counter. The green border means the counter is used in PLC, the green filling means the counter is used in PLC and the counter value reaches to the set value, shown as the following figure:

🌣 Setting					
Configuration	Flag	Computation Variable	Configuration	Counter Timer	Cycle Timer
Port	1	2	3	4	5
	Target: 5	Target: 0	Target: 100	Target: 0	Target: 0
	Value: 5	Value: 0	Value: 8	Value: 0	Value: 0
	6	7	8	9	10
	Target: 0	Target: 0	Target: 0	Target: 0	Target: 0
	Value: 0	Value: 0	Value: 0	Value: 0	Value: 0
History	11	12	13	14	15
	Tourist 0	Tt 0	Tourst: 0	Toronti 0	Tomat 0
System	Value: 0	Value: 0	Value: 0	Value: 0	Target: 0 Value: 0
	16	17	18	19	20
	Target: 0	Target: 0	Target: 0	Target: 0	Target: 0
	Value: 0	Value: 0	Value: 0	Value: 0	Value: 0
	21	22	23	24	25
	Target: 0	Target: 0	Target: 0	Target: 0	Target: 0
	Value: 0	Value: 0	Value: 0	Value: 0	Value: 0
	26	27	28	29	30
	Target: 0	Target: 0	Target: 0	Target: 0	Target: 0
	Value: 0	Value: 0	Value: 0	Value: 0	Value: 0
	31	32	33	34	35
	Target: 0	Target: 0	Target: 0	Target: 0	Target: 0
	Value: 0	Value: 0	Value: 0	Value: 0	Value: 0
	36	37	38	39	40
	Target: 0	Target: 0	Target: 0	Target: 0	Target: 0
	Value: 0	Value: 0	Value: 0	Value: 0	Value: 0
	41	42	43	44	45
	Target: 0	Target: 0	Target: 0	Target: 0	Target: 0
	Value: 0	Value: 0	Value: 0	Value: 0	Value: 0
2023/04/20 08:37:39			• \$		



4.2.12.6 TIMER

There are 100 timers, each item displays the set value and the current value of the timer. The green border means the timer is used in PLC, the green filling means the timer is used in PLC and the delay time reaches to the set value, shown as the following figure:

Configuration	Flag	Computation Variat	le Configuration	Counter Timer	Cycle Tir
Port	1	2	3	4	5
	Period: 5s	Period: 0s	Period: 100s	Period: 0s	Period:
	Value: 5s	Value: 0s	Value: 10.7s	Value: 0s	Value: 0
Debug	6	7	8	9	10
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0
History System	11 Period: 0s Value: 0s	12 Period: 0s Value: 0s	13 Period: 0s Value: 0s	14 Period: 0s Value: 0s	15 Period: 0 Value: 0
	16	17	18	19	20
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0
	21	22	23	24	25
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0
	26	27	28	29	30
	Period: 0s	Period: 0s	Period: Os	Period: 0s	Period: 0
	Value: 0s	Value: 0s	Value: Os	Value: 0s	Value: 0
	31	32	33	34	35
	Period: 0s	Period: 0s	Period: Os	Period: 0s	Period: 0
	Value: 0s	Value: 0s	Value: Os	Value: 0s	Value: 0
	36	37	38	39	40
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0
	41	42	43	44	45
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0:

Fig.105 – Timer

4.2.12.7 CYCLE TIMER

There are 100 cycle timers, each item displays the set value, curren value, positive pulse set value of the cycle timer. The green border means the cycle timer is used in PLC, and the green filling means the cycle timer is used in PLC and the delay time is less than the positive pulse set value, shown as the following figure:

onfiguration	Flag	Computation Variable	Configuration	Counter Timer	
Port	1	2	3	4	5
	Period: 10s	Period: 1s	Period: 10s	Period: 0s	Period: 0s
	Pulse: 1s	Pulse: 0.5s	Pulse: 5s	Pulse: 0s	Pulse: 0s
	Value: 5s	Value: 0s	Value: 5s	Value: 0s	Value: 0s
History	o Period: 0s Pulse: 0s Value: 0s	Period: 0s Pulse: 0s Value: 0s	o Period: 0s Pulse: 0s Value: 0s	Period: 0s Pulse: 0s Value: 0s	Period: 0s Pulse: 0s Value: 0s
System	11	12	13	14	15
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0s
	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0s
	16	17	18	19	20
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0s
	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0s
	21	22	23	24	25
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0s
	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0s
	26	27	28	29	30
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0s
	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0s
	31	32	33	34	35
	Period: 0s	Period: 0s	Period: 0s	Period: 0s	Period: 0s
	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s	Pulse: 0s
	Value: 0s	Value: 0s	Value: 0s	Value: 0s	Value: 0s
	36	37	38	39	40
	Period: 0e	Period: 0s	Period: 0s	Period: 0s	Period: 0s

Fig.106 – Cycle Timer

4.2.13 EVENT LOG

Event log includes the operation records of manual modification of settings, port setting, system setting and homepage data snapshots automatically recorded in PLC. Up to 10000 piecs of data are supported to be saved in a local database, which can be exported by a USB flash drive. As shown below:

🌣 Setting					
Configuration		Date and Time	Title	Event	Source
	289	2023-02-13 18:19:04	Snapshot		PLC
Port	288	2023-02-13 18:19:03	Snapshot		PLC
Debug	287	2023-02-13 18:19:03	Snapshot		PLC
	286	2023-02-13 18:19:02	Snapshot		PLC
	285	2023-02-13 18:19:02	Snapshot		PLC
System	284	2023-02-13 18:19:01	Snapshot		PLC
	283	2023-02-13 18:19:01	Snapshot		PLC
	282	2023-02-13 18:19:00	Snapshot		PLC
	281	2023-02-13 18:19:00	Snapshot		PLC
	280	2023-02-13 18:18:59	Snapshot		PLC
	279	2023-02-13 18:18:59	Snapshot		PLC
	278	2023-02-13 18:18:58	Snapshot		PLC
	277	2023-02-13 18:18:58	Snapshot		PLC
	276	2023-02-13 18:18:57	Snapshot		PLC
	275	2023-02-13 18:18:57	Snapshot		PLC
	274	2023-02-13 18:18:56	Snapshot		PLC
	273	2023-02-13 18:18:56	Snapshot		PLC
					EFRESH EXPORT
2023/02/13 18:19:07				¢	

Fig.107 – Event Log

Click "Clear" to clear up all the historical data and click "Refresh" to obtain the latest historical data.

After connecting the USB flash drive, click "Export" to export the historical records, the export operation supports the data with a maximum of one month. Note: The partition table of USB flash drive must be in MBR format and file system must be FAT32 format.

Click "View Details" to display the data of snapshot, including the homepage data and settings, shown as the following figure:

		C	omputation	Configuration	
Port	Device	Title	ID	Computation Title	Value
RS485-1	PV	State String	1	PV State	
		State Color	140	PV state color	
t		Icon Status	146	PV icon state	
RS485-1	PV	Generation Today	10	PV Generation Today	(kWh)
RS485-1	PV	Active Power	12	PV Active Power	(kW)
RS485-1	PV	Power Direction	8	PV Direction	
RS485-1	WTS	State String	55	WTS State	
		State Color	141	WTS state color	
		Icon Status	147	WTS icon state	
RS485-1	WTS	Generation Today	63	WTS generation today	
RS485-1	WTS	Active Power	65	WTS Active Power	0(kW)
RS485-1	WTS	Power Direction	61	WTS Direction	
RS485-3	Mains	State String	78	Mains State	Warning1, Warning2, Warning3

Fig.108 – Event Log

4.2.14 SYSTEM SETTING

The system settings include date and time, buzzer switch, distance sensor switch, automatic brightness switch, manual brightness ajustment and software update, shown as the following figure:

🌣 Setting		
Configuration	System Settings	
Port	Date and Time: 2023-02-13 18:43:45	
Debug	Buzzer: Disable Proximity Sensor: Disable	
History	Automatic Light: Disable	
System	Backlight: 40.0 %	
	About	
	Module Type: HMU15N-EMS	
	Software version: 1.0.0.1 SO	
	Hardware version: 1.4	
	PD: Z230425-HMU8N-EMS	
2023/02/13 18:43:45		• ‡

Fig.109 – System Settings

After the buzzer is enabled, the buzzer can be turned on or turned off by the function in PLC.

When distance sensor is enabled, if no one is in front of the screen for 60s within 1.5m, the screen brightness will decrease to the lowest level.

After the automatic brightness is enabled, the system will automatically adjust the screen brightness according to the environment. If manually adjust the brightness, the automatic brightness function will be disabled.

Update the software: save the updated file into U flash drive, click "Update Software" and enter the management password to pop up the menu of U flash drive, as shown below. Select and click update file to update the program. The default mangement password is 318, which could be changed through PC.

🌣 Setting									
Conf	USB				م	Ŧ		:	
	0	Recent		LOST.DIR			6:46 F	PM	
		Internal storage 5.52 GB free		System Volume Information			Ma	y 9	
٦ 		USB 28.75 GB free	Ŵ	SmartGen.apk			May	10	
s									
2023/02/1	3 18:47	7:47	•	• • • • • \$					

Fig.110 – Update Software

5 WIRING CONNECTION



Fig.111 – Back Panel Drawing

Table 14 – Terminal Connection Description				
No.	Function	Cable Size	Description	
1	Terminal Matching Resistance (120Ω)	/		
-2	CAN H	0.5 mm ²	Impedance-1200 shielding wire is recommended	
3	CAN L	0.5 mm ²	and its single end grounded.	
4	PE1	/		
5	Terminal Matching Resistance (120Ω)	/	langeden en 1200, ekielding wire in recommended	
6	RS485A-1(+)	0.5 mm ²	impedance-1200 shielding wire is recommended	
7	RS485B-1(-) 0.5 mr		and its single end grounded.	
8	PE2	/		
9	Terminal Matching Resistance (120Ω)	/	langeden eg 1200, ekielding wire is recommended	
10	RS485A- 2(+)	0.5 mm ²	impedance-1200 shielding wire is recommended	
11	RS485B- 2(-)	0.5 mm ²	and its single end grounded.	
12	PE3	/		
13	Terminal Matching Resistance (120Ω)	/	Impedance 1900, chielding with is recommended	
14	RS485A- 3(+)	0.5 mm ²	impedance-1200 snielding Wire is recommended	
15	RS485B- 3(-) 0.5 mm ²		and its single end grounded.	
16	PE4	/		

No.	Function	Cable Size	Description	
17	Terminal Matching	/		
17	Resistance (120 Ω)	/	Impedance 1200, chielding wire is recommon	
18	RS485-4A(+)	0.5 mm ²	and its single and grounded	
19	RS485-4B(-)	0.5 mm ²	and its single end grounded.	
20	PE5	/		
21	B-	1.0 mm ²	Connect to battery negative.	
22	B+	1.0 mm ²	Connect to battery positive.	
23	PE	/		

Note 1: ETHERNET port can be directly connected to conntroller via network cable, or multiple controllers via a switch. The default IP address of touch screen is 192.168.0.111, and the IP address of controller must be in the same network segment but different from that of big screen.

Note 2: USB-HOST is used for rapid upgrade and data export of the USB flash drive. The partition table of the USB flash drive must be in the MBR format and the file system must be in FAT32 format.

Note 3: USB-DEVICE port is used to connect PC to upgrade the firmware. There are two pinholes on the left side of the big screen, the upper one is RESET key and the lower one is MODE key.

The upgrade steps are as follows:

1. Power on the monitoring screen;

2. Press the MODE key;

3. Press the RESET key;

4. Release the RESET key;

5. Release the MODE key, and then the touch screen enters the burning mode;

6. Connect to PC via USB-DEVICE of the big screen;

7. Decompress the upgrade package, and double-click the file of "mftool2.vbs";

8. If "Vendor-defined device in line with HID standard" appears, it indicates a successful identification.

MfgTool_MultiPanel (Library: 2.7.0)		
Hub 2Port 1	Status Information	
Drive(s):	Successful Operations:	0
	Failed Operations:	0
HID-compliant device	Failure Rate:	0 %
	Start	Exit

Fig.112 – Burn Mode

9. Click "Start" button to start burning the image, click "Stop" to stop burning after successful burning, and click "Exit" to exit the burning software;

10. Disconnect the big screen from the PC, press the RESET button and release it to restart the big screen.

MfgTool_MultiPanel (Library: 2.7.0)) — C	×
Hub 1Port 3	Status Information	
Drive(s): E:	Successful Operations:	1
	Failed Operations:	0
Done	Failure Rate:	0.00 %
	Stop	Exit

Fig.113 – Successful Firmware Upgrade

6 TYPICAL APPLICATION



Fig.114 – Typical Application Diagram

7 OVERALL DIMENSIONS AND PANEL CUTOUT



Fig.115 - Overall Dimensions and Panel Cutout

8 TROUBLE SHOOTING

Check whether the PC network adapter connection speed and duplex mode are 100Mbps full duplex;

Check whether the PC network and HMU15N-EMS are on the same network segment;

Check whether the IP address and port set by PC are the same with HMU15N-EMS;

Check the baud rate, stop bit, parity bit of RS485 port are correct or not;

Check whether the register address, number and timeout period of the device message are correct;

Check Whether the communication address and calculation method of the computation are correct;

Check whether the partition table of the USB flash drive is in MBR format and the file system is in FAT32 format;

Ensure that all cable connectors are firmly connected to HMU15N-EMS;

Please do not press the display screen of HMU15N-EMS with force or hard object.