

Human Machine Interface

ELPQC-HMI-7

User Manual

Version V2.1

Contents

1. Main Interface	1
2. Module & Para Setting.....	2
2.1 Module Setting	2
2.2 Module Para Setting	4
2.3 Start-up Mode Setting	5
2.4 Module Address Setting	6
2.5 Harmonic Compensation Function.....	6
2.6 Harmonic Number Selection.....	7
2.7 Reactive Compensation Function.....	7
2.8 Imbalanced Compensation Function.....	8
2.9 Native Mode Setting	9
2.10 External CT Position Selection	9
2.11 Internal CT Position Selection.....	10
2.12 CT Ratio Setting.....	11
2.13 Compensation Capacity Setting	12
2.14 Phase Sequence Self-adaption Setting	14
2.15 Time Setting	14
2.16 Priority Mode Selection	15
2.17 Transformer capacity and load rate	16
2.18 Target Voltage Value	16
2.19 Timing Power On/Off	16
2.20 Save Para Button	17
3. Capacitance Parameter Setting.....	18
4. Curve Information	24
5. Fault Log	27
6. Version Information.....	28
7. Description of Typical Application Parameter Setting.....	29
7.1 Mode Selection and CT Setting	29
7.2 Module Compensation Capacity Setting.....	29

1. Main Interface

This manual mainly introduces the functional components of the user interface and the user operation information. The user can make the related operation through touching the display panel.

The boot main interface is shown in Figure 1-1.

- **Main Interface:** It mainly displays real-time data such as voltage and current of system side, load side and module.
- **Module & Para Setting:** The interface can set and view all modules and capacitor parameters.
- **Curve Information:** The interface can view the real-time curves of power factor, active and reactive current.
- **Fault Log:** The interface can view the fault information generated during the operation of the device.
- **Power On/Off:** The user can power on or power off.
- **Status Indication:** It displays module status, including standby, running and fault status.



Figure 1-1 Boot Main Interface

2. Module & Para Setting

Click the "Module & Para Setting" button, The parameter setting interface is shown in Figure 2-1.

- Module Setting: Set the number of modules, the number of capacitor control modules, and the communication address.
- Developer Options: It is used by our company's debugging personnel.
- X: Real-time Data: View the real-time data of the corresponding module.
- X: Para Setting: Set the parameters of the corresponding module.



Figure 2-1 Module & Para Setting

2.1 Module Setting

Click the "Module Setting" button, set the number of modules in the "Module Number" Input box, as shown in Figure 2-2.

Module 1 Date 2020-06-18 11:23:42

Module Setting:

Module Number

6

	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Module Address	1	2	3	4	5	6
Capacitance Control Panel	0	0	0	0	0	0

Description:

The current module address is the same as the 485 communication address of the current module. 1~255 can be set. When the current module is attached with capacitive control board :0 - no capacitive control board,1- with capacitive control board.

Return



Main Interface



Module & Para Setting



Curve Information



Fault Log



Version Information

Figure 2-2 Module Setting

The user can set the most twelve modules. The module addresses from 1 began to increase in turn. After setting, return to the module & para setting interface, as shown in Figure 2-3. Real-time data and parameter setting selection of multiple modules will be displayed on the interface.

Module 1 Date 2020-06-18 11:24:46

Module Selection

01

Real-time Data

Para Setting

02

Real-time Data

Para Setting

03

Real-time Data

Para Setting

04

Real-time Data

Para Setting

05

Real-time Data

Para Setting

06

Real-time Data

Para Setting

Module Setting

Developer Options



Main Interface



Module & Para Setting



Curve Information



Fault Log



Version Information

Figure 2-3 Module & Para Setting

2.2 Module Para Setting

Click the "Para Setting" option of the corresponding module, and the password input interface as shown in Figure 2-4 will pop up.



Figure 2-4 Password Input Interface

After entering the password "1000", click "OK" button to enter the module & para setting interface as shown in Figure 2-5. (No operation is performed within 3 minutes after the password is entered, re-enter the password)

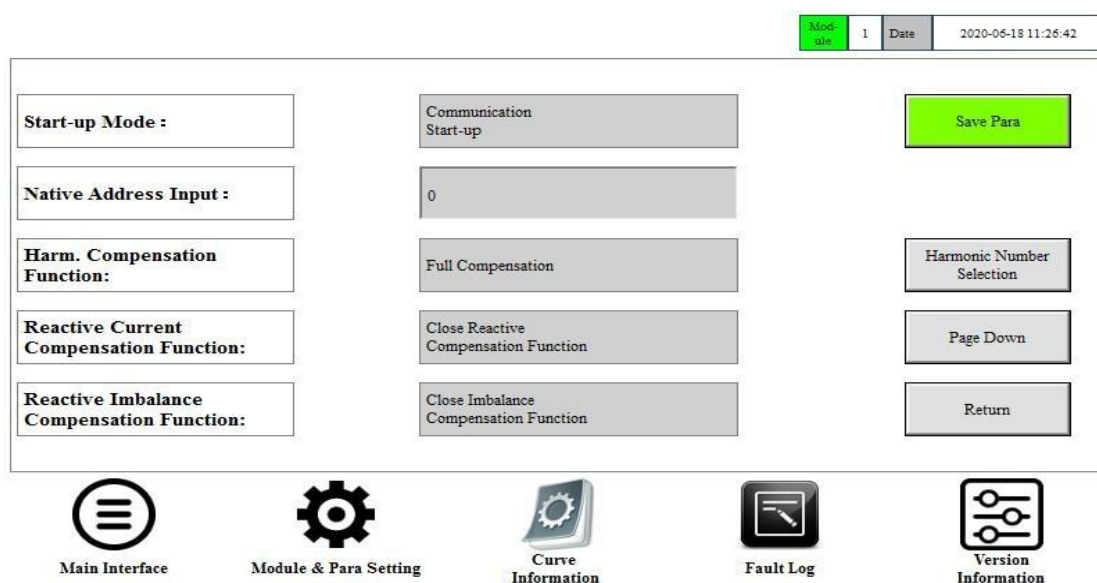


Figure 2-5 Para Setting Interface

2.3 Start-up Mode Setting

Click on "Start-up Mode" option box, the Figure 2-6 will pop up.

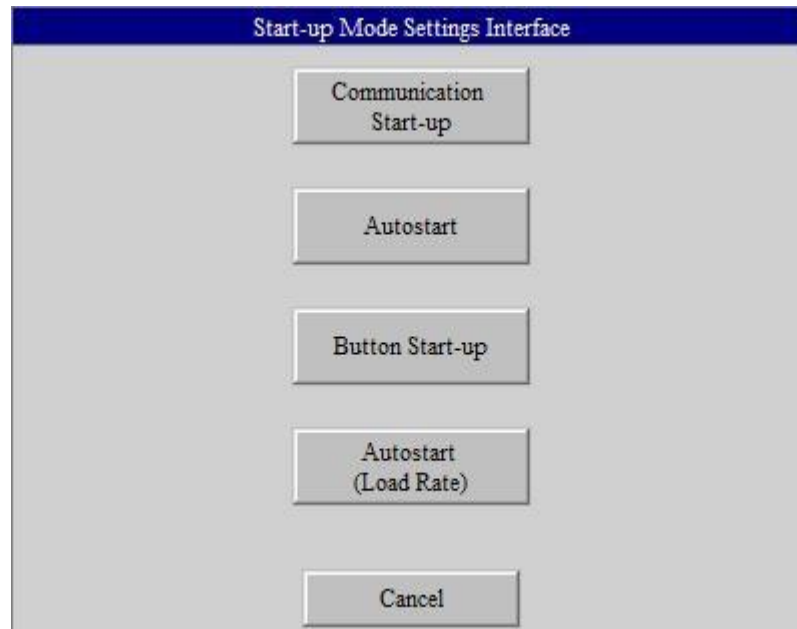


Figure 2-6 Start-up Mode Settings

The module has four modes: communication start-up, autostart, button start-up and autostart (load rate).

Start-up Mode	Instructions
Communication Start-up	In this mode, the device can not be started automatically when it is powered on. It can be turned on or off through the cabinet button or the LCD screen (the function is exactly the same as that of the button start-up).
Autostart	In this mode, After the device is powered on, if there is no fault, the device will start automatically, It can be turned off through the cabinet button or the LCD screen.
Button Start-up	In this mode, the device can not be started automatically when it is powered on. It can be turned on or off through the cabinet button or the LCD screen.

Auto start (Load Rate)	In this mode, the capacity and load rate of the transformer shall be set in the special parameter setting. When the transformer load rate reaches the set value, the module will start automatically. When the transformer load rate is less than the set value, the module stops running.
------------------------------	--

2.4 Module Address Setting

The factory address of all modules defaults to 1. When the number of modules connected to the LCD screen is greater than 1, the address of each module needs to be reset. The starting address of the module is 1 and increases in turn. (Note: the module address of the cabinet has been completed during debugging in the factory)

The module interface are one-to-one correspondence with the module address. For example, the interface of module 1 corresponds to the module data of address 1, the interface of module 2 corresponds to the module data of address 2, and so on.

2.5 Harmonic Compensation Function

Click on "Harm. Compensation Function" option box, the Figure 2-7 will pop up.

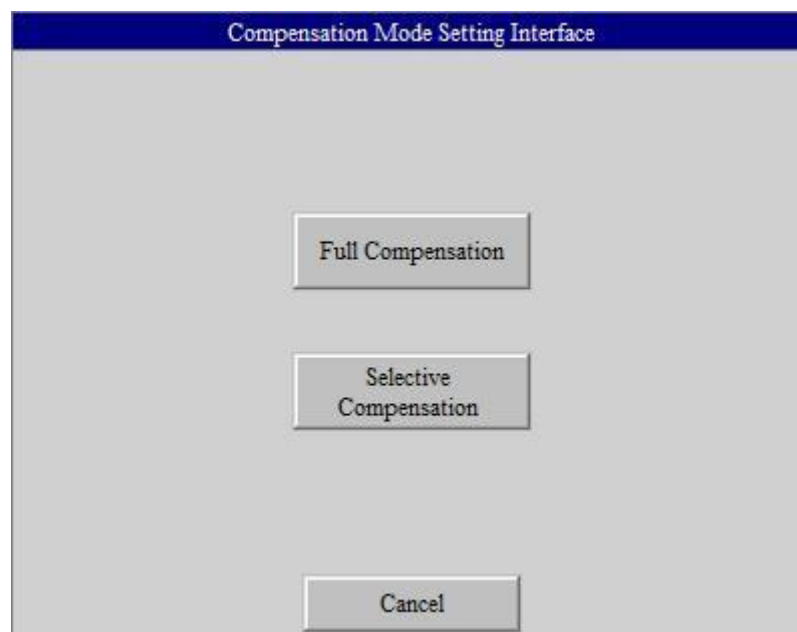


Figure 2-7 Harmonic Compensation Function

The harmonic compensation mode includes selective compensation mode and full compensation mode.

Selective Compensation	The harmonic compensation is based on the specified harmonic compensation number set by "Harmonic Number Selection".
Full Compensation	The module compensates all odd harmonic currents within 50 times.

2.6 Harmonic Number Selection

When the harmonic compensation mode is selective compensation, it is necessary to set "Harmonic Number Selection". Click on "Harmonic Number Selection" button, the Figure 2-8 will pop up. The user can choose the harmonic compensation times according to the need.

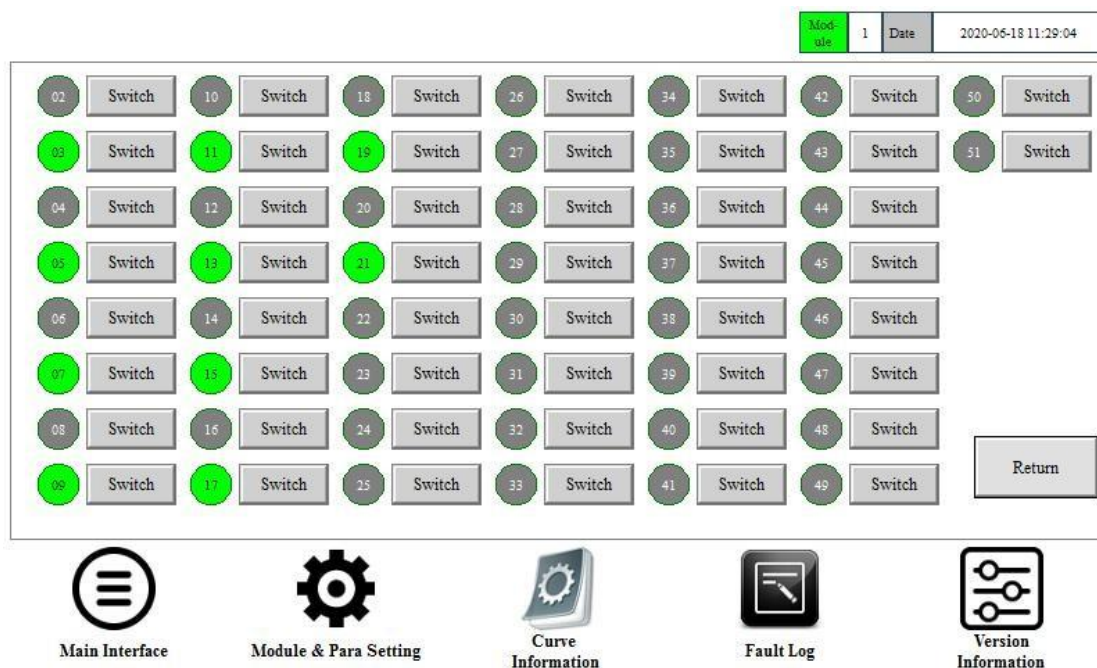


Figure 2-8 Harmonic Number Selection

2.7 Reactive Compensation Function

Click on "Reactive Current Compensation Function" option box, the Figure 2-9 will pop up. Set the opening and closing of reactive compensation function.

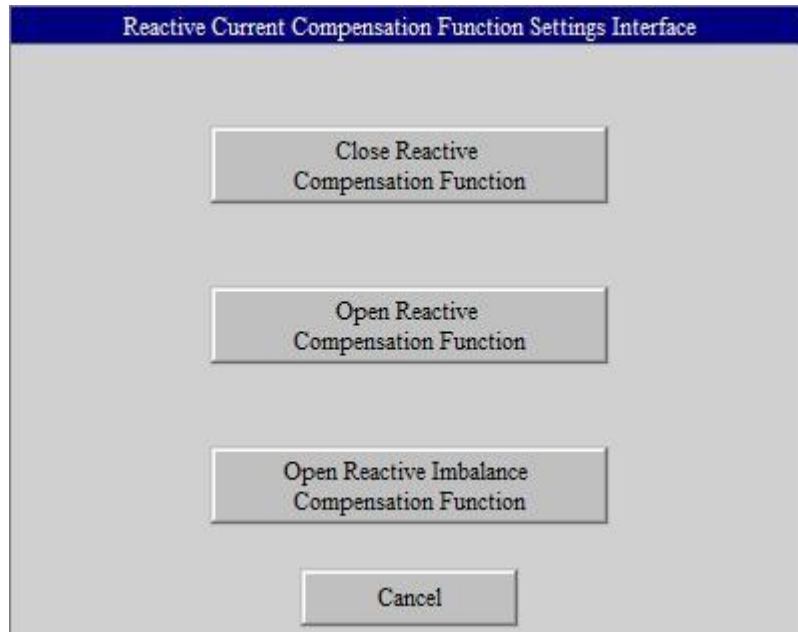


Figure 2-9 Reactive Compensation Function

2.8 Imbalanced Compensation Function

Click on "Imbalance Compensation Function" option box, the Figure 2-10 will pop up.
Set the opening and closing of imbalanced compensation function.

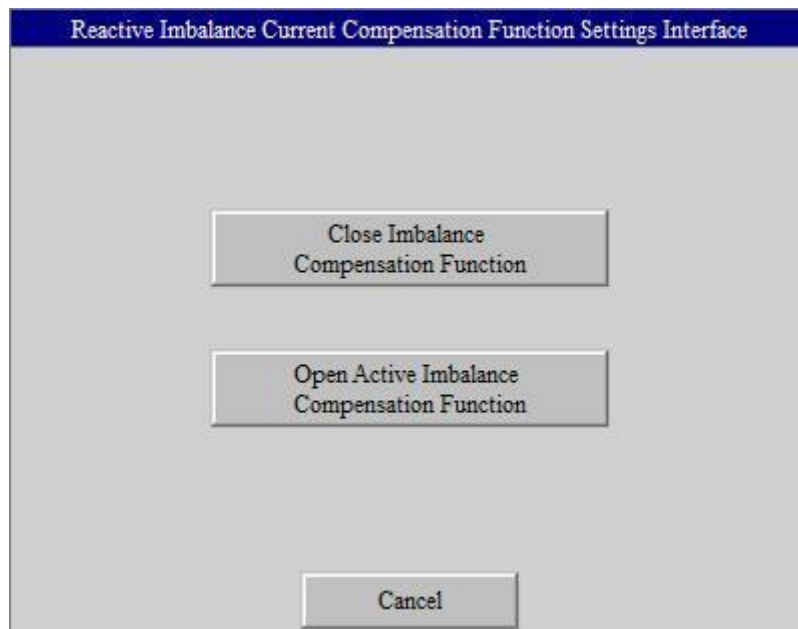


Figure 2-10 Imbalanced Compensation Function

2.9 Native Mode Setting

Click on "Native Mode" option box, the Figure 2-11 will pop up. The working mode of the module is selected according to its usage.

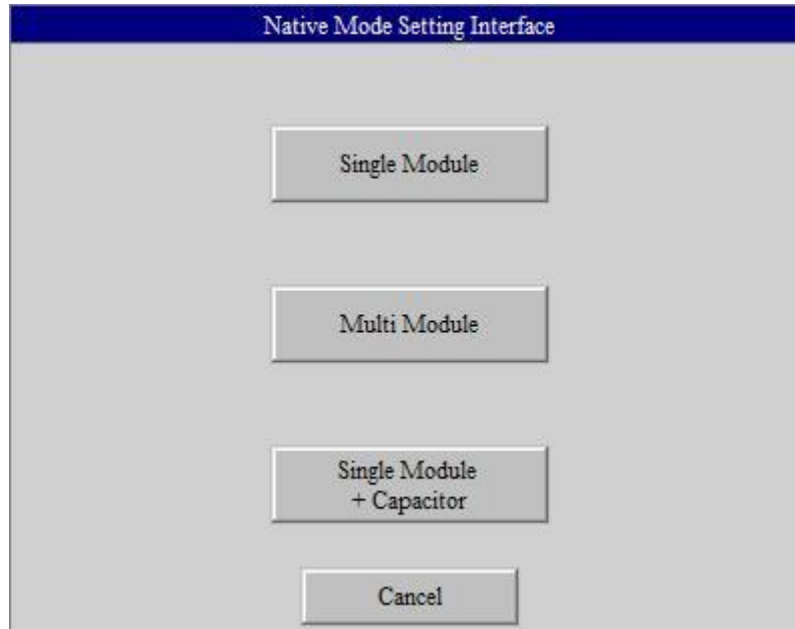


Figure 2-11 Native Mode Setting

Single Module	The system is configured with a module (without the capacitor).
Multiple Module	The system is configured with multiple modules or multiple modules plus capacitors.
Single Module + Capacitor	The system is configured with a single module and a capacitor that controls the switching of the capacitor.

2.10 External CT Position Selection

Click on "External CT Position Selection" option box, the Figure 2-12 will pop up.

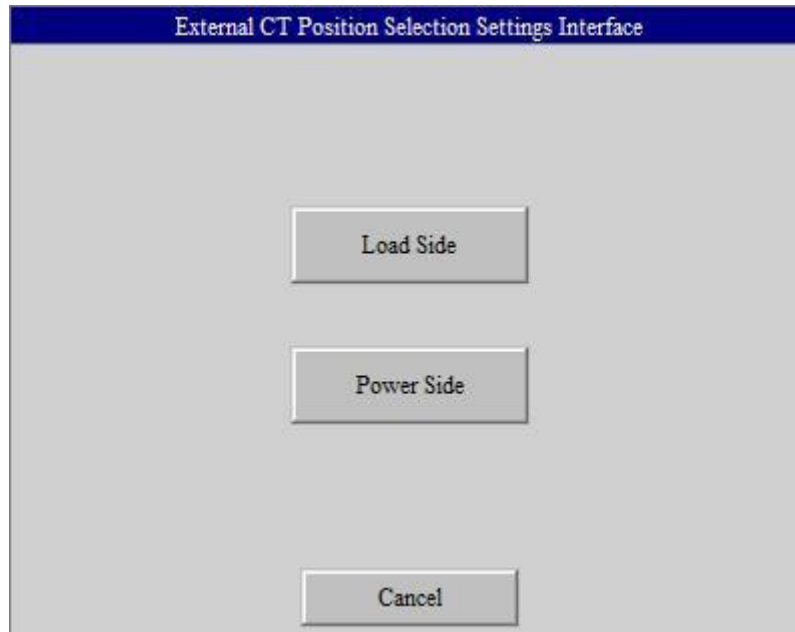


Figure 2-12 External CT Position Selection

The external CT position has two options: load side and power side, which are selected according to the actual installation position of the external CT.

Load Side	The external CT is installed between the module bus access point and the load
Power Side	The external CT is installed between the module bus access point and the transformer.

2.11 Internal CT Position Selection

Click on "Internal CT Position Selection" option box, the Figure 2-13 will pop up.

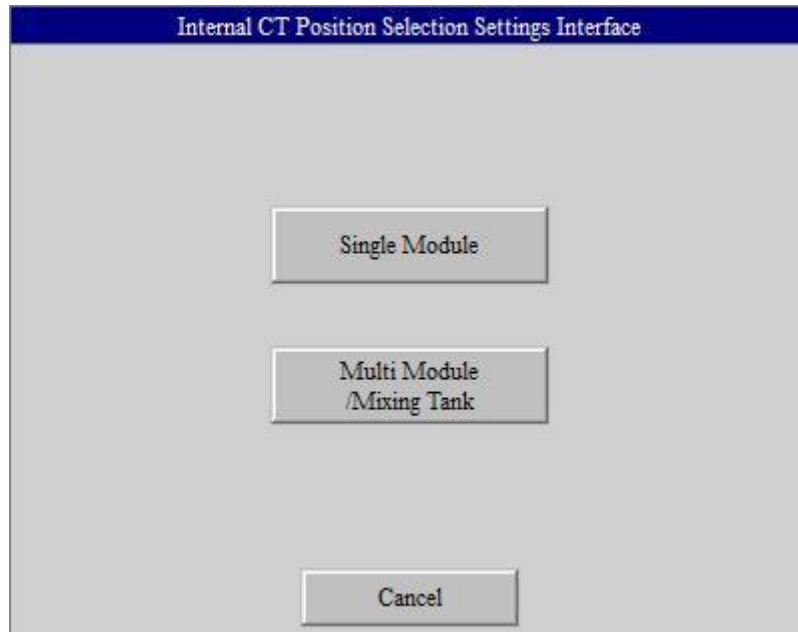
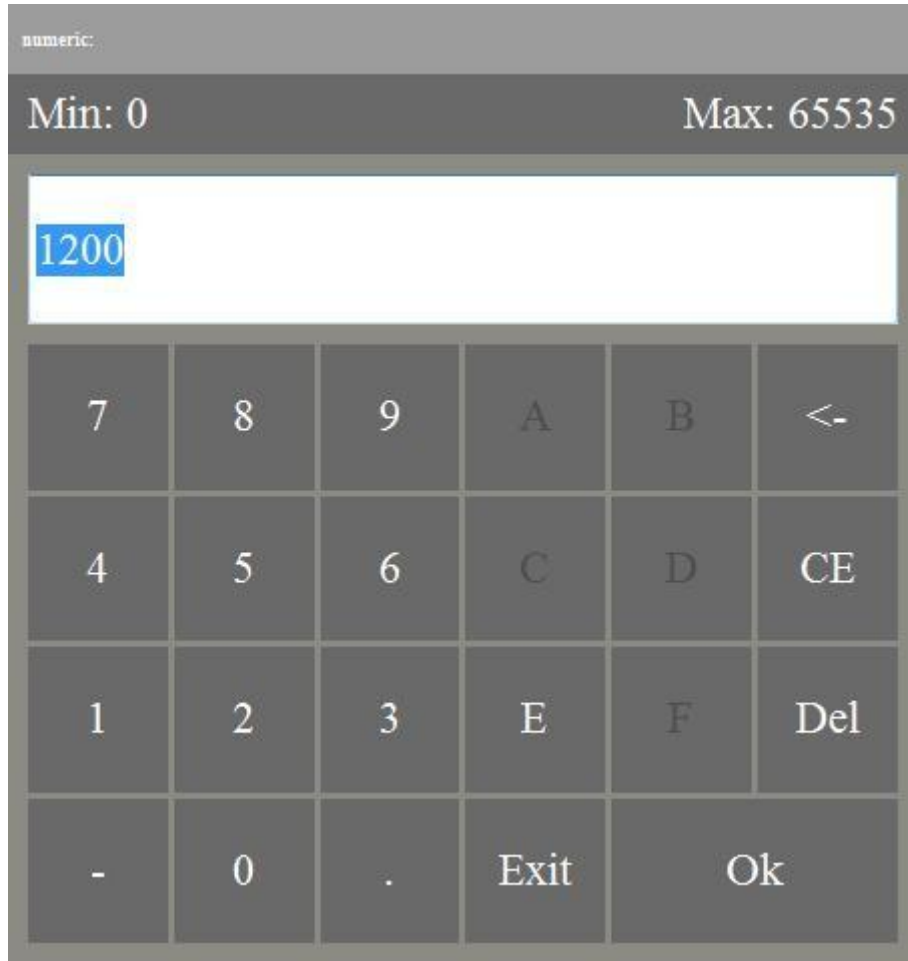


Figure 2-13 Internal CT Position Selection

Single Module	The system is configured with a module (without the capacitor).
Multiple Module /Mixing Tank	The system is configured with multiple modules or module plus capacitor.

2.12 CT Ratio Setting

Click on "External/Internal CT Ratio Setting" option box, the Figure 2-14 will pop up. CT variable ratio parameters range from 50:5 to 20000:5. When setting CT variable ratio parameters, if it is necessary to set 1200:5, directly enter "1200" and confirm.



numeric:

Min: 0 Max: 65535

1200

7	8	9	A	B	<-
4	5	6	C	D	CE
1	2	3	E	F	Del
-	0	.	Exit	Ok	

Figure 2-14 CT Ratio Setting

The variable ratio of external CT and internal CT shall be set according to the transformer ratio, the number of modules and the rated capacity of modules. Modules with different capacities in parallel shall be set according to the rated capacity of the module.

For example, if the external CT variable ratio is 2000:5, the internal CT variable ratio is 800:5, and the number of parallel modules with the same capacity is 4, then the external CT variable ratio parameter of each module is 500:5, and the internal CT variable ratio parameter is 200:5.

2.13 Compensation Capacity Setting

Click on "Compensation Capacity" option box, the Figure 2-15 will pop up.

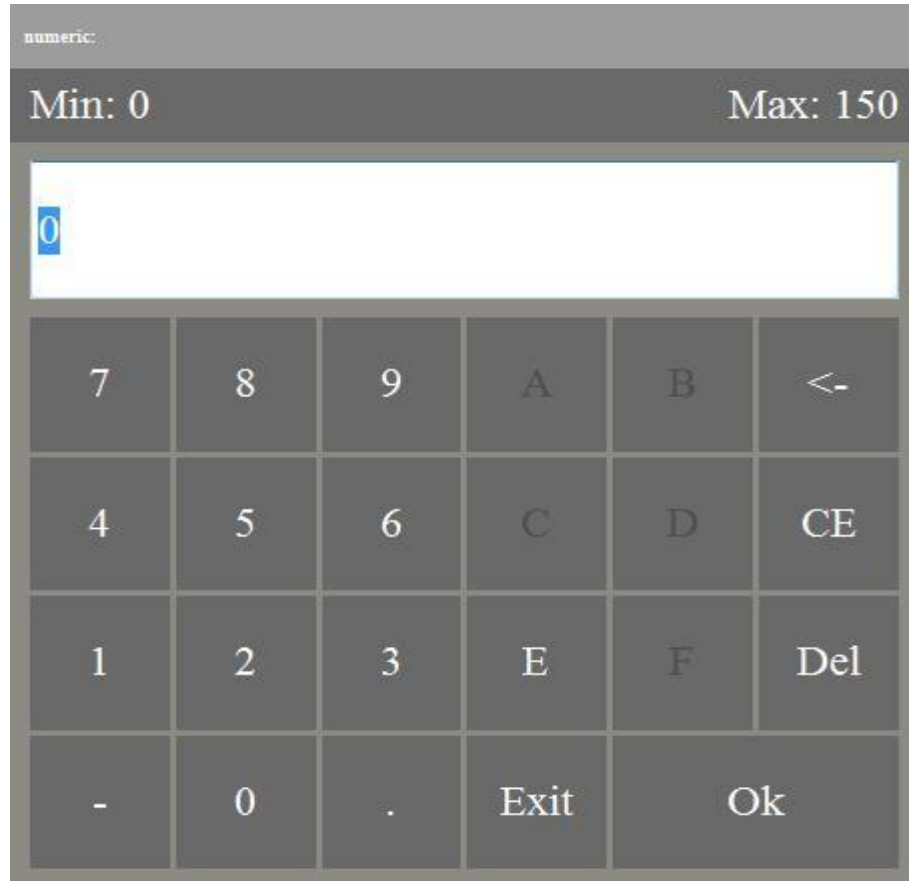


Figure 2-15 Compensation Capacity Setting

Description of compensation capacity parameter setting:

Reactive Compensation Capacity	Harmonic Compensation Capacity	Imbalanced Compensation Capacity	Module rated capacity
X	$Y \times 1.4$	Z	$P = X + Y + Z$
Instructions	1. The compensation capacity of each function should be set according to the actual demand, in units of A (ampere) (1kvar= 1.5A). 2. The reactive compensation capacity (X), harmonic compensation capacity (Y) and imbalanced compensation capacity (Z) of all parallel modules must be consistent. 3. When the harmonic compensation capacity is setted, the coefficient of 1.4 shall be multiplied.		

2.14 Phase Sequence Self-adaption Setting

Click on "Phase Sequence Self-adaption" option box, the Figure 2-16 will pop up. The phase sequence self-adaption function can be turned on and off. The phase sequence self-adaption function is turned off by default. When the phase sequence error occurs and the module cannot be started, the phase sequence problem can be solved by turning on the phase sequence self-adaption function, but the CT sampling of each phase must be consistent with the main feed line.

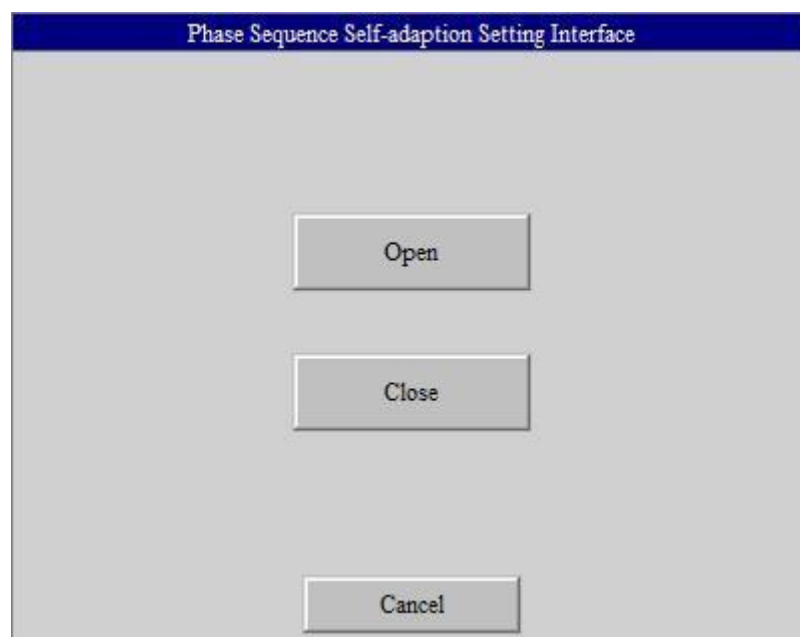
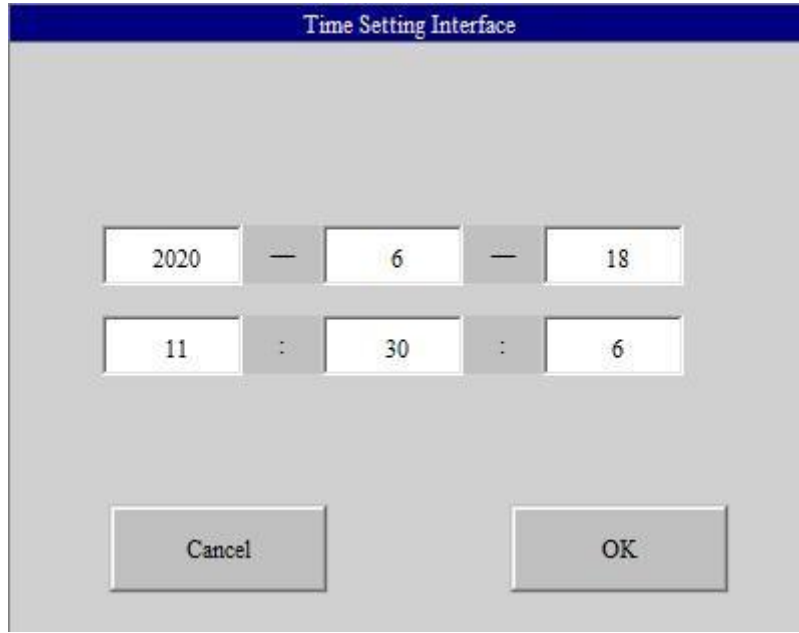


Figure 2-16 Phase Sequence Self- adaption Setting

2.15 Time Setting

Click on "Time Setting" option box, the Figure 2-17 will pop up. This interface is used to set the module system time.

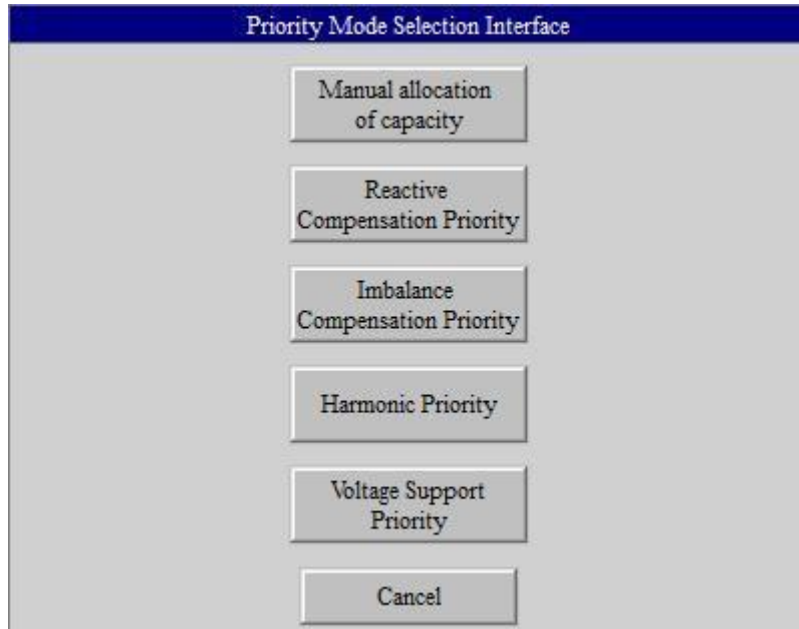


The image shows a 'Time Setting Interface' window. It has a dark blue title bar with the text 'Time Setting Interface'. The main area is light gray. It contains two rows of input fields. The first row has three fields: '2020', '6', and '18', separated by hyphens. The second row has three fields: '11', '30', and '6', separated by colons. Below these fields are two buttons: 'Cancel' on the left and 'OK' on the right.

Figure 2-17 Time Setting

2.16 Priority Mode Selection

Click on "Priority Mode Selection" option box, the Figure 2-18 will pop up.



The image shows a 'Priority Mode Selection Interface' window. It has a dark blue title bar with the text 'Priority Mode Selection Interface'. The main area is light gray. It contains a vertical stack of six buttons: 'Manual allocation of capacity', 'Reactive Compensation Priority', 'Imbalance Compensation Priority', 'Harmonic Priority', 'Voltage Support Priority', and 'Cancel' at the bottom.

Figure 2-18 Priority Mode Selection

By default, the module is manual allocation of capacity mode. In the mode of manual allocation of capacity mode, the module compensates according to the capacity

settings of each function compensation.

In the other three priority modes, the compensation capacity of all functions of the module should be set to the rated capacity. The module will compensate the specified items in priority. If there is any remaining capacity of the device after the compensation, it will be equally distributed to other items for compensation.

2.17 Transformer capacity and load rate

When the starting mode of the module is "Autostart (Load Rate)", "Transformer Capacity" and "Load Rate" shall be set. The transformer capacity shall be set according to the actual transformer capacity on site, and the load rate shall be set according to the actual demand. When the transformer load rate reaches the set value, the module starts to run. When the transformer load rate is lower than the set value, the module stops running.

2.18 Target Voltage Value

When priority mode is "Voltage Support Priority" mode, it is necessary to set target voltage value.

Target voltage ranges from 176V to 264V. When the system voltage exceeds the voltage regulating upper limit U_{max} ($U_{max} = \text{target voltage value} * 107\%$) of the device, the device can output inductive current to reduce the voltage. When the system voltage is lower than the voltage regulating lower limit U_{min} ($U_{min} = \text{target voltage value} * 90\%$) of the device, the device can output capacitive current, thus increasing the voltage.

2.19 Timing Power On/Off

Click on "Timing Power On/Off" option box, the Figure 2-19 will pop up. This interface is used to set the timing on/off function of the module.



The image shows a software window titled "Timing Settings Interface". It contains two rows of settings. The first row is for "Timing Power On" with two input boxes, both containing the number "0", separated by a colon. The second row is for "Timing Power Off" with two input boxes, both containing the number "0", separated by a colon. At the bottom left is a "Cancel" button, and at the bottom right is a green "Open Timing" button.

Figure 2-19 Timing Power On/Off

2.20 Save Para Button

When the module parameter setting is completed, click on "Save Para" button, then the module will have a restart process, which can be judged by the operation of the fan.

3. Capacitance Parameter Setting

Module built-in capacitance control board: can output 16 channels thyristor control signal.

When the module controls the capacitor, it is necessary to set the capacitance. Enter the module & para setting interface, click on "Module Setting" button, and change the parameter of "Capacitance Control Board" of the module that controls the switching of capacitor to 1, as shown in Figure 3-1.

Module 1 Date 2020-06-18 11:33:06

Module Setting:

Module Number 6

	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Module Address	1	2	3	4	5	6
Capacitance Control Panel	1	0	0	0	0	0

Description:
 The current module address is the same as the 485 communication address of the current module. 1~255 can be set.
 When the current module is attached with capacitive control board :0 - no capacitive control board,1- with capacitive control board.

Return



Main Interface



Module & Para Setting



Curve Information



Fault Log



Version Information

Figure 3-1 Capacitance Control Board Setting

Go back to the module & para setting interface, click the "Real-time Data" of module 1, and enter the interface as shown in Figure 3-2. You can see an additional column on the main interface showing the working status of capacitor, with a total of 16 capacitor switching signals. When the capacitor is put into the circuit, the corresponding indicator light will turn green. After the capacitor is removed, the indicator light will return to gray.

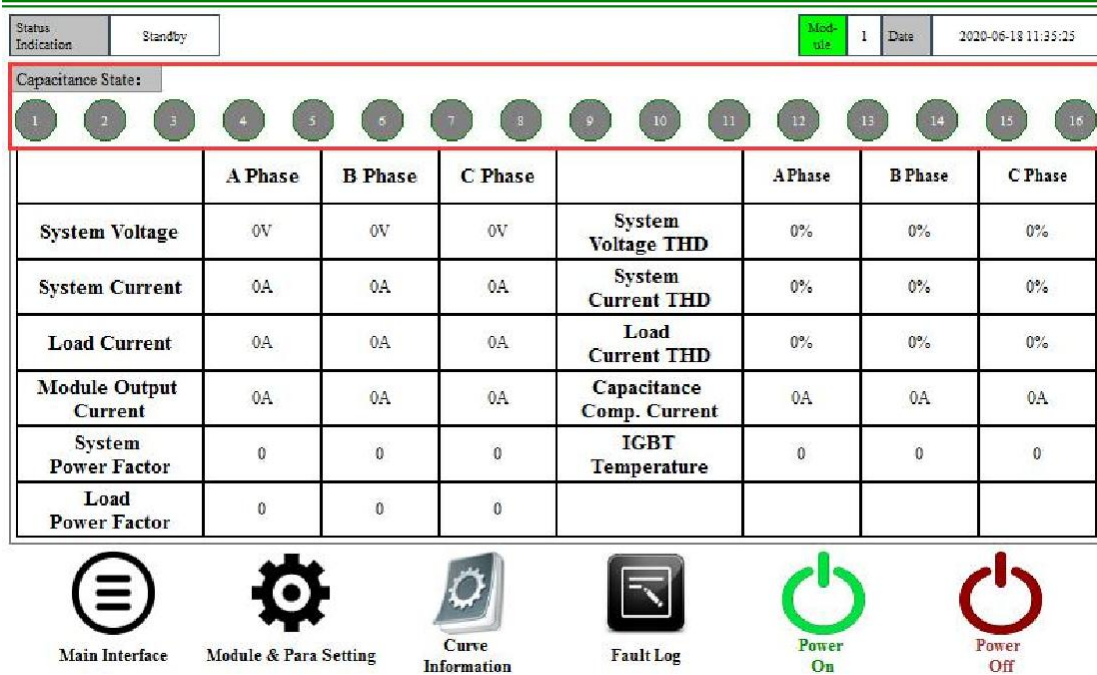


Figure 3-2 Main Interface

Enter the module & para setting interface again, and you will see an additional "Capacitor Settings" option in the interface. as shown in Figure 3-3.

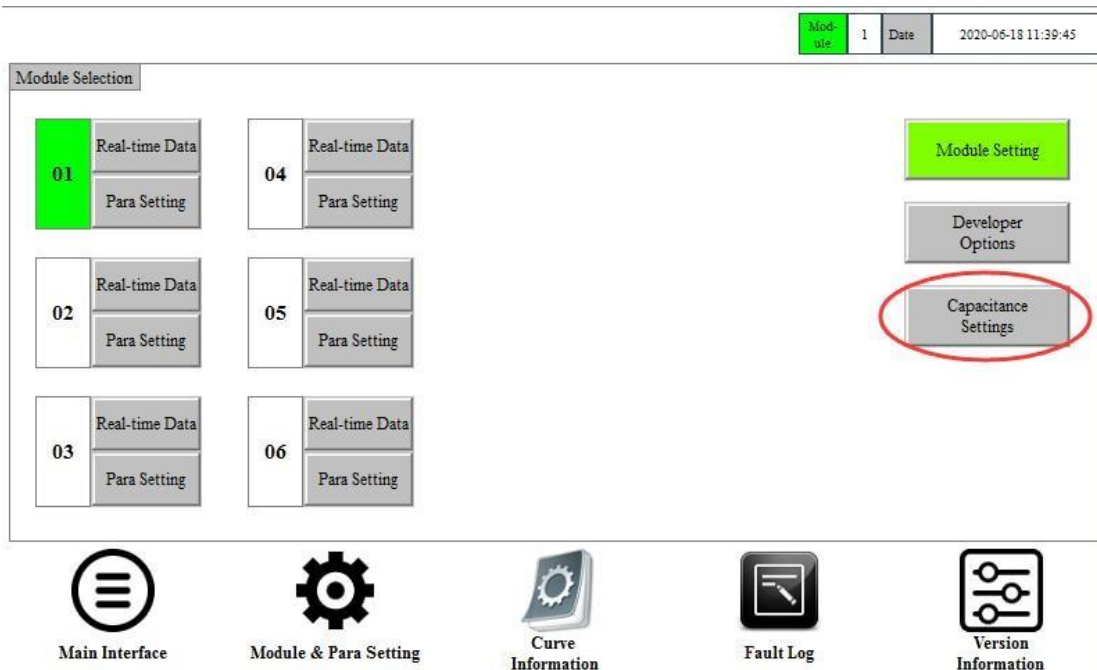


Figure 3-3 Module & Para Setting

Enter the interface of capacitance setting, as shown in Figure 3-4. This interface can perform switching capacitance test and select switching mode of capacitance.

- Test Mode: It is used by our company's debugging personnel.
- Manual Mode: Manual control of capacitance switching, not affected by load changes.
- Automatic Control Mode: According to the load reactive power detected by the module, an independent switching strategy is adopted for capacitor switching.

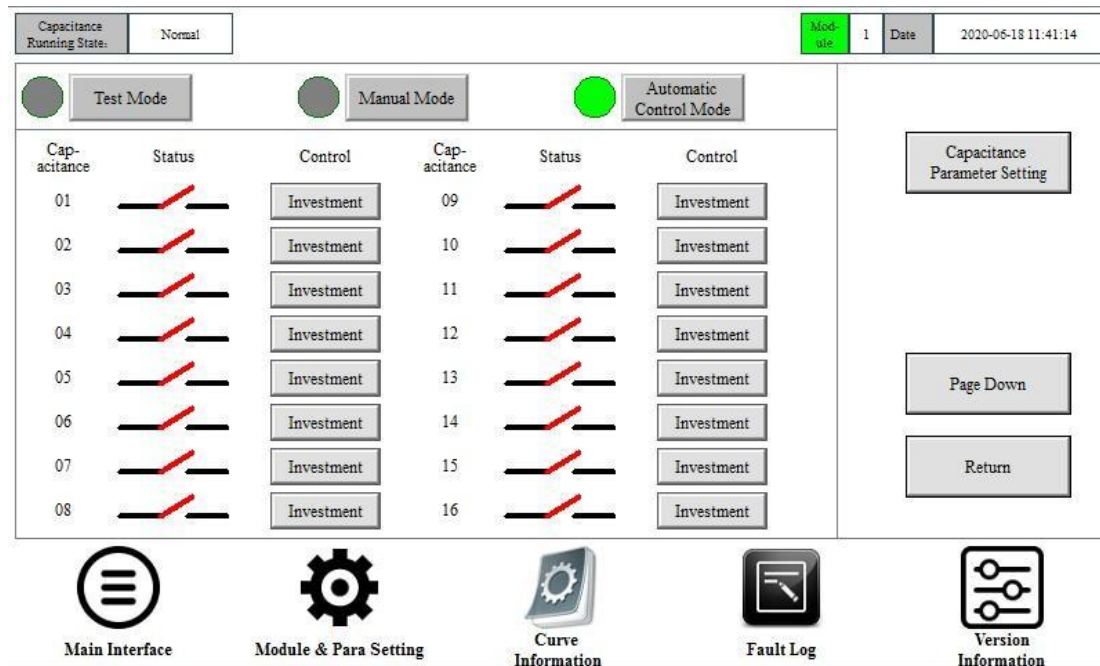


Figure 3-4 Capacitance Setting

Click "Page Down" to enter the interface as shown in Figure 3-5. The interface is used to monitor the total number of capacitor switches corresponding to the module. Click "Empty The Statistical Records" to clear all the switching times of 16-way capacitors.

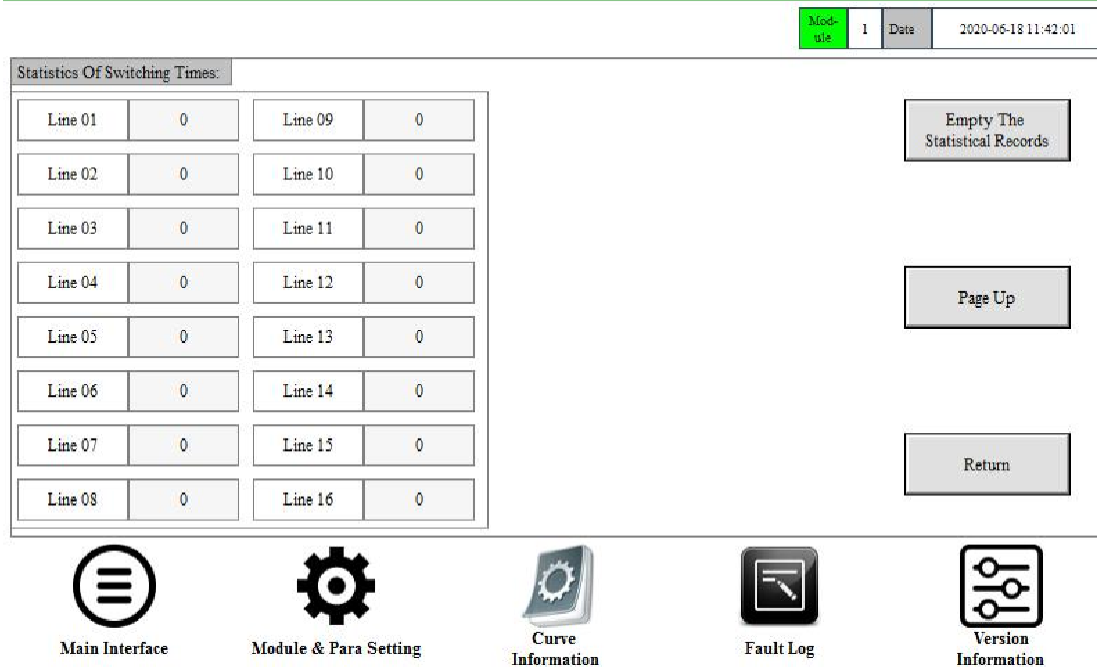


Figure 3-5 Capacitance Switching Times

When clicking "Capacitor Parameter Setting" on the interface of capacitor setting, enter the interface shown in Figure 3-6. Click the gray area where parameters need to be set to set the parameters.

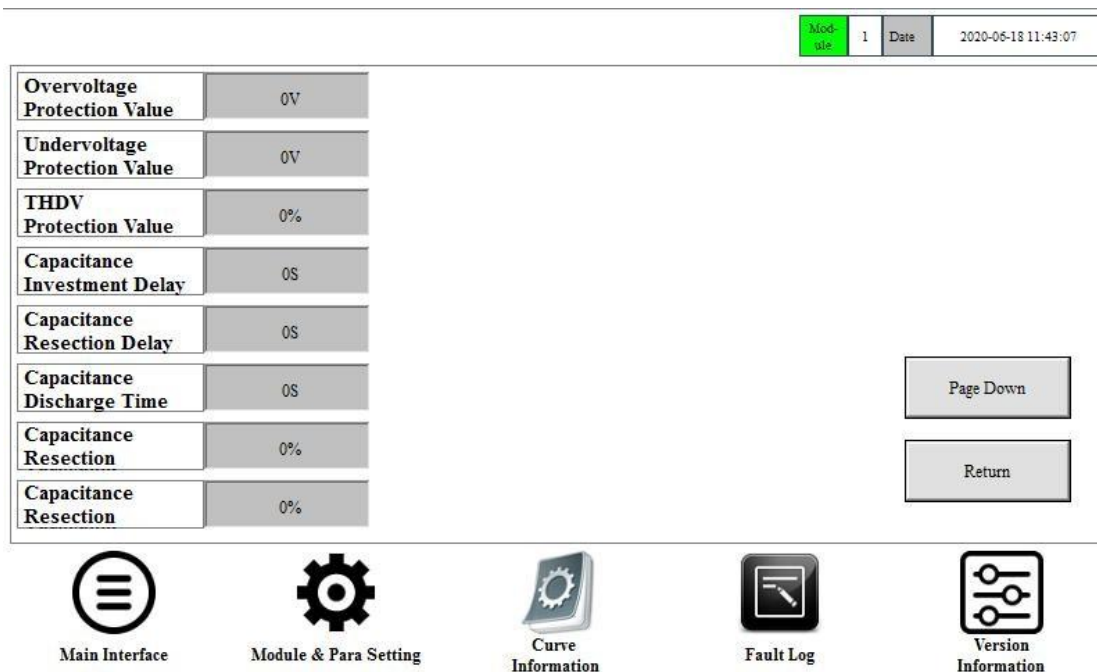


Figure 3-6 Capacitor Parameter Setting

Click "Page Down" to enter the interface as shown in Figure 3-7. This interface is

used to set the number of groups and capacity of capacitance. When setting the capacity, the complementary capacity is set as the single-phase capacity, and the co-complementary capacity is set as the total capacity of the capacitor.

Module 1 Date 2020-06-18 11:44:08

Partial Complement Group Number	0	Co-complement 1 Capacity	0.0KVar	Page Up Page Down Return
Partial Complement 1 Capacity	0.0KVar	Co-complement 2 Capacity	0.0KVar	
Partial Complement 2 Capacity	0.0KVar	Co-complement 3 Capacity	0.0KVar	
Partial Complement 3 Capacity	0.0KVar	Co-complement 4 Capacity	0.0KVar	
Partial Complement 4 Capacity	0.0KVar	Co-complement 5 Capacity	0.0KVar	
Partial Complement 5 Capacity	0.0KVar	Co-complement 6 Capacity	0.0KVar	
Partial Complement 6 Capacity	0.0KVar	Co-complement 7 Capacity	0.0KVar	
Co-complement Group Number	0	Co-complement 8 Capacity	0.0KVar	


Main Interface


Module & Para Setting


Curve Information


Fault Log


Version Information

Figure 3-7 Capacitor Parameter Setting

When the module controls the capacitor, the option "Capacitance Para Recovery Factory" will appear in the module parameter interface, as shown in Figure 3-8.

Module 1 Date 2020-06-18 11:46:29

Start-up Mode :	Communication Start-up	Save Para Capacitance Para Recovery Factory Harmonic Number Selection Page Down Return
Native Address Input :	0	
Harm. Compensation Function:	Full Compensation	
Reactive Current Compensation Function:	Close Reactive Compensation Function	
Reactive Imbalance Compensation Function:	Close Imbalance Compensation Function	


Main Interface


Module & Para Setting


Curve Information


Fault Log


Version Information

Figure 3-8 Capacitance Para Recovery Factory

Click "Capacitance Para Recovery Factory", and the interface as shown in Figure 3-9 will pop up. After entering, restore factory settings for capacitor parameters. (After the capacitor parameter setting is completed, if the capacitor cannot be switched normally, you can try to restore the capacitor control parameter to factory setting and then reset the capacitor parameter)

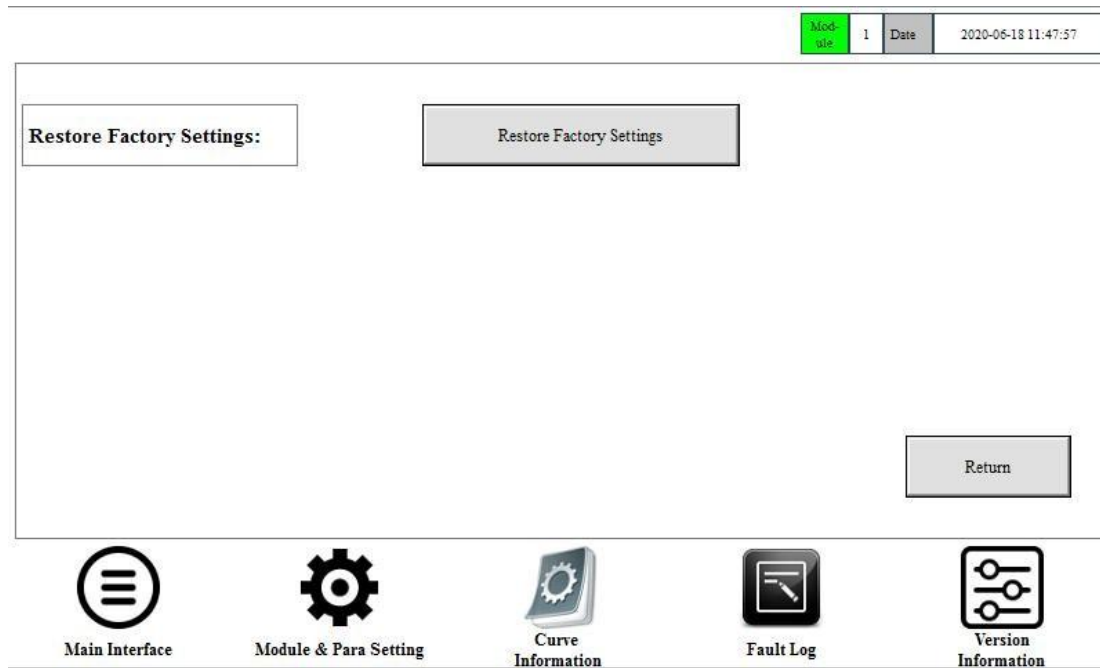


Figure 3-9 Capacitance Para Recovery Factory

4. Curve Information

Click "Curve Information" to enter the interface as shown in Figure 4-1. The interface mainly contains real-time curve information: "System Power Factor", "Load Power Factor", "System Active Current" and "System Reactive Current". You can view the maximum, minimum, and average of phases A, B, and C.

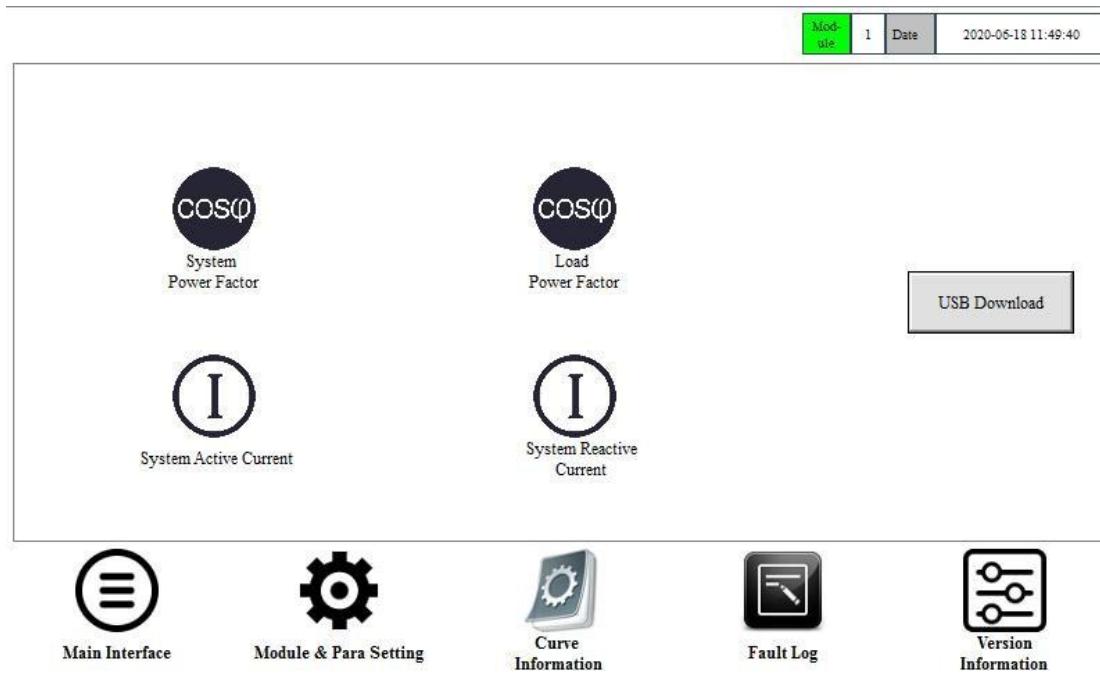


Figure 4-1 Curve Information

Click "USB Download" and the interface as shown in Figure 4-2 will pop up about 5 seconds later. At this time, the inserted USB disk will automatically generate a table file with the suffix CSV. The maximum, minimum and average value of the system power factor A, B and C phases; The maximum, minimum and average value of the load power factor A, B and C phases; The maximum, minimum and average value of the system active current A, B and C phases; The maximum, minimum and average value of the system reactive current A, B and C phases and the number of switches per circuit of the 16-way capacitance are downloaded in the file.

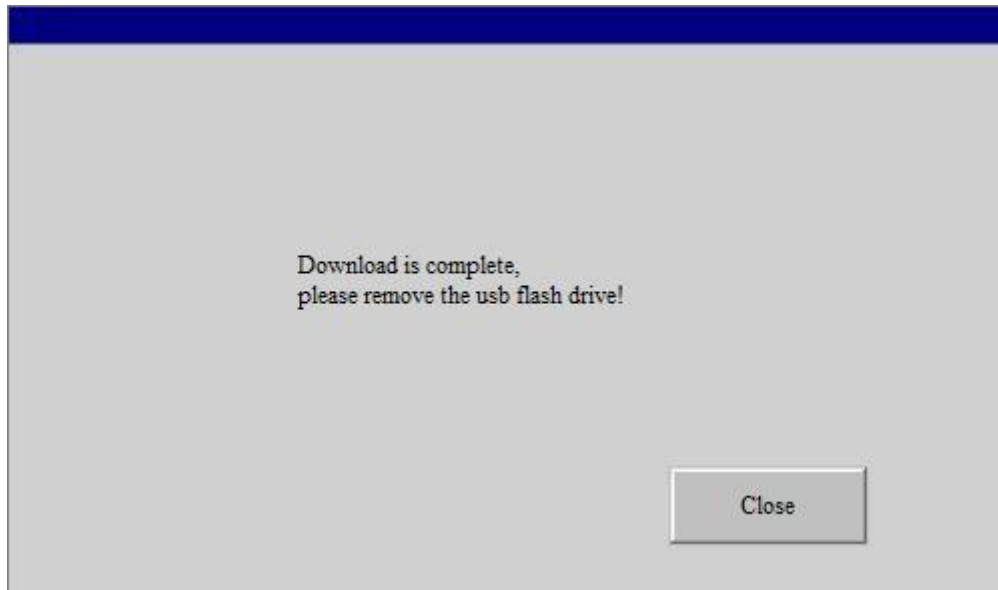


Figure 4-2 USB Download

Taking the load power factor as an example, click phase A, phase B and phase C in Figure 4-3 to enter into Figure 4-4 respectively, corresponding to the data of the specific maximum, minimum and average value in a time.

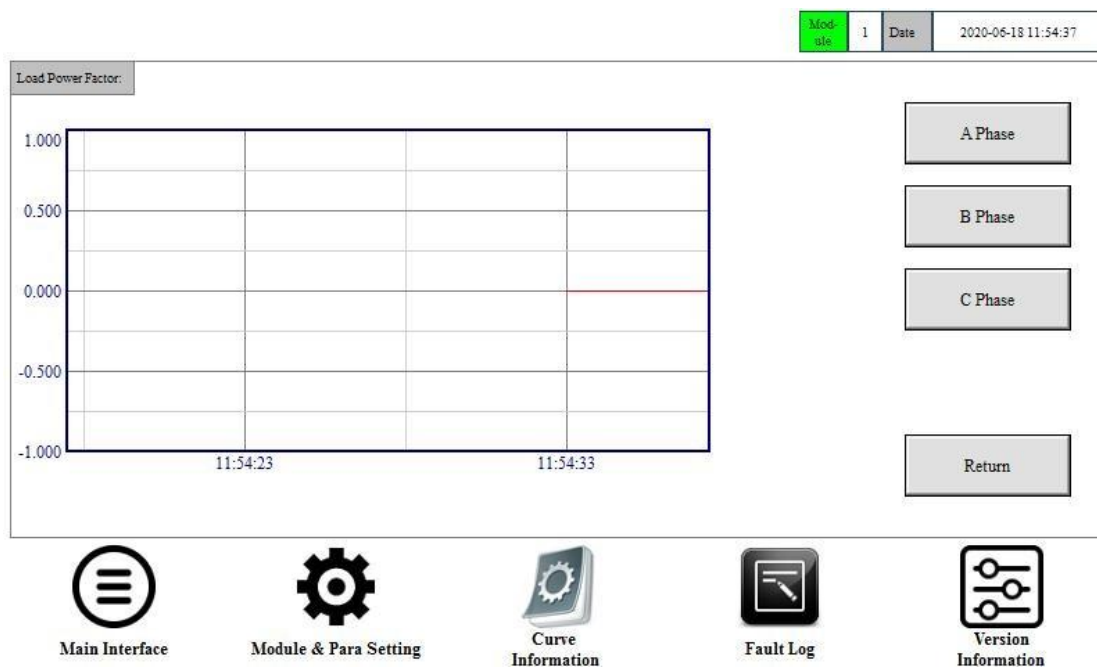


Figure 4-3 Load Power Factor

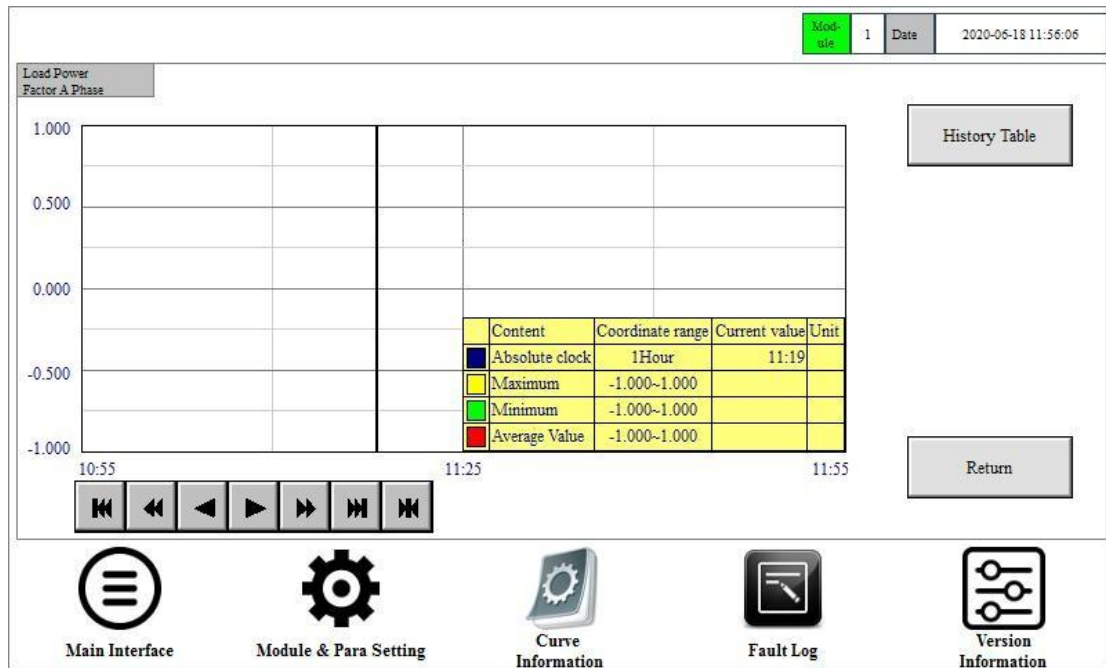


Figure 4-4 Load Power Factor A Phase

Click "History Table" and enter Figure 4-5 to view the data of corresponding time node. Click "◀" and "▶" on the top horizontal slider to view the parameters, and "▲" and "▼" on the vertical slider to view more data records.

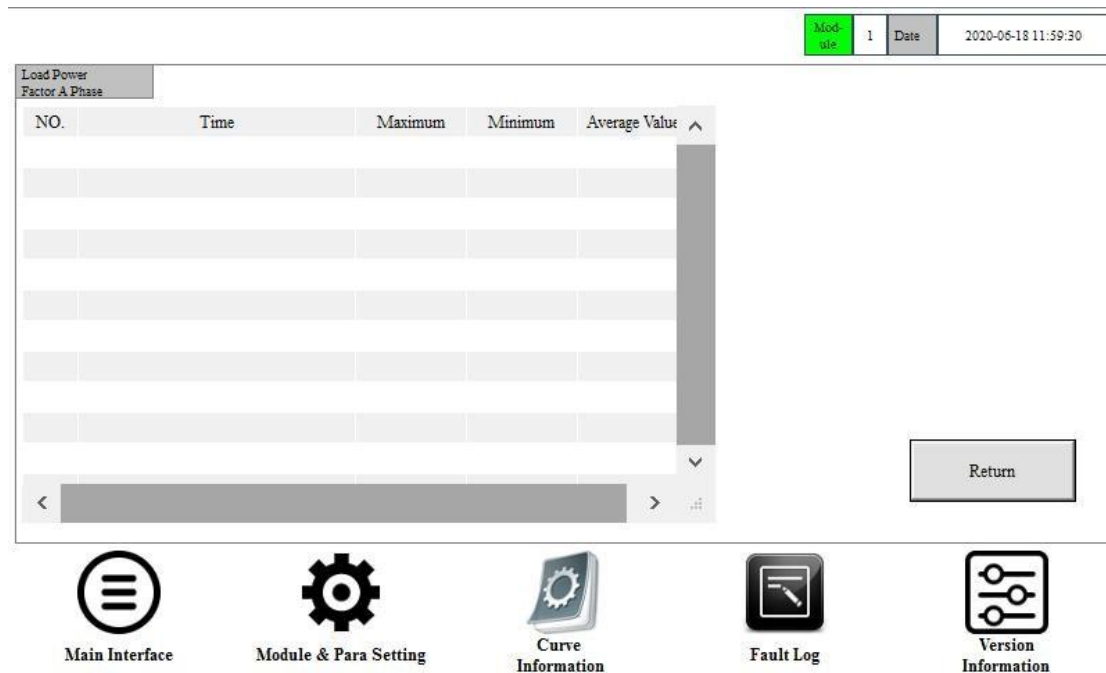


Figure 4-5 History Table

5. Fault Log

Enter the fault logging interface as shown in Figure 5-1. This fault logging interface can view the faults occurred during operation. It includes the detailed time of faults, fault code, fault name and key system parameters. Click on the horizontal slider "◀" and "▶" to view the corresponding parameter information, and the vertical slider "▲" and "▼" to view more fault records.



Figure 5-1 Fault Log

6. Version Information

Click "Version Information" to enter the interface as shown in Figure 6-1. This interface can view the module version number, the hardware version number and the version number of the touch screen itself.



Figure 6-1 Version information

7. Description of Typical Application Parameter Setting

7.1 Mode Selection and CT Setting

(1) Parameter setting for single module application

Application scenarios	System Mode	External CT Position Selection	Internal CT Position Selection	External CT Variable Ratio	Internal CT Variable Ratio
CT to load side	Single Module	Load Side	Single Module	the actual CT ratio	the actual CT ratio
CT to power side	Single Module	Power Side			

(2) Related parameter setting for parallel application of multiple modules

Application scenarios	System Mode	External CT Position Selection	Internal CT Position Selection	External CT Variable Ratio	Internal CT Variable Ratio
CT to load side	Multiple Module	Load Side	Multiple Module	the actual CT ratio /the module number	the actual CT ratio /the module number
CT to power side	Multiple Module	Power Side			

7.2 Module Compensation Capacity Setting

For example, when a 75A APF module is used alone to compensate reactive power 25A and harmonic 50A, the reactive power compensation capacity =25A, the harmonic compensation capacity =70A (50A*1.4), and the unbalanced compensation capacity =0A.

Reactive Compensation Capacity	Harmonic Compensation Capacity	Imbalanced Compensation Capacity	Module rated capacity
X	$Y \times 1.4$	Z	$P = X + Y + Z$
Instructions	1. The compensation capacity of each function should be set according to the actual demand, in units of A (ampere) (1kvar= 1.5A). 2. The reactive compensation capacity (X), harmonic compensation capacity (Y) and imbalanced compensation capacity (Z) of all parallel modules must be consistent. 3. When the harmonic compensation capacity is setted, the coefficient of 1.4 shall be multiplied.		