

Enersine Pro
Wall Mount Active Harmonic Filter
User's Manual

No. 192321852066004



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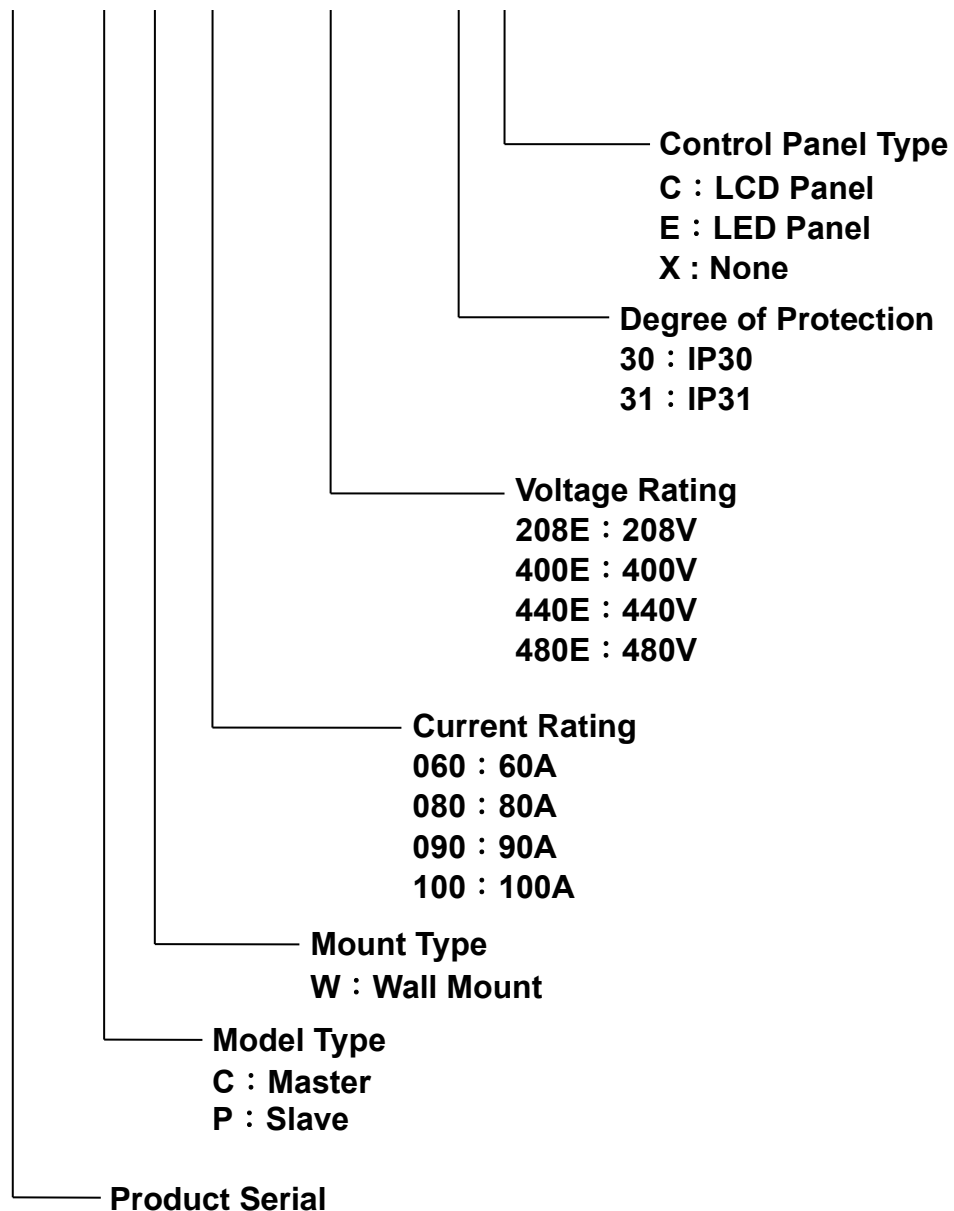
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Model Number Description

This manual describes the following equipment:

ESP - C W 080 - 400E - 30 X



Preface

We thank you for the trust in selecting our **Enersine Pro** Active Harmonic Filter.

Our equipment complies with EN 50178 standard in accordance to Low Voltage Directive 73/23/EC and is authorize to use the CE marking.



The purpose of this manual is to introduce the operating principles of the **Enersine Pro** Active Harmonic Filter and to provide instructions for its safe operation. The manual also provides troubleshooting assistance should an abnormal message or behavior occur.

Should an abnormal message not covered in this manual appear, please contact your local authorized service agent for troubleshooting and repair.

All of the installation, operation, and maintenance of this device must be performed by authorized and qualified technicians who are familiar with this manual.

Safety Instructions

While the **Enersine Pro (Enersine)** Active Harmonic Filter is undergoing installation, operation, maintenance, or calibration, you are reminded of the following safety instructions:

- (1) The **Enersine** is connected to hazardous high voltage. Death can result if the device is not installed properly.
- (2) The installation, calibration, and maintenance of the **Enersine** must be done by qualified technicians according to local and international installation standards.
- (3) A proper grounding of the **Enersine** must be double verified before the filter is powered on. Improper grounding can cause the device to work abnormally and also presents a potential electric shock hazard.
- (4) Before any maintenance work is performed make sure that the power switch is off for at least three minutes to allow the internal capacitors to totally discharge.
- (5) When routine maintenance is performed be sure to avoid potential electric shock hazards from the interior of the filter or energy storage components such as capacitors. Also, we recommend that you wear safety glasses.
- (6) Improper installation of the filter could increase harmonic currents and voltages, which can damage power systems or the load connected.
- (7) Improper operation can damage the internal components of the filter.
- (8) Improper procedure in breaking the circuit can damage the filter or introduce safety hazards.

The operation and maintenance of the filter must be performed by qualified technicians who are familiar with this user's manual.

When replacing any components be sure to proceed as indicated in this manual to avoid safety hazards.

1. Function and Operating Principles

1-1. Functional Features

The **Enersine** is a solid-state power converter which offers the following features under normal conditions:

- Eliminates harmonic currents generated by non-linear loads.
- Compensates reactive power for lagging or leading loads.

The **Enersine** is a harmonic current generator that creates opposite, phase-shifted harmonic currents of the same amplitude.

The benefits of the improved harmonic currents are:

- (1) No risk of harmonic resonance
- (2) Reduced voltage waveform distortion
- (3) Reduced voltage drops on transformers and cables
- (4) Reduced overheating of transformers and cables
- (5) Improved power factor

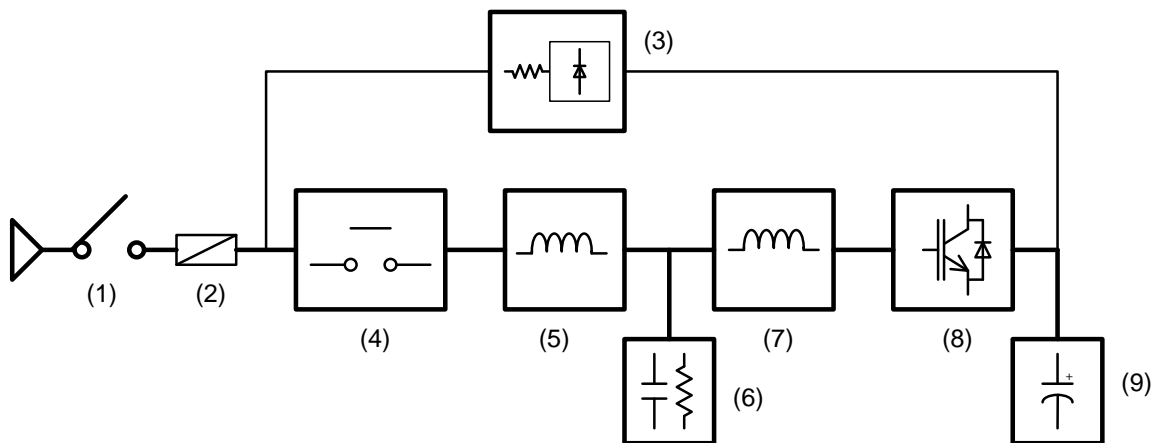
The **Enersine** is not recommended for use with loads that have a high current rise rate. Such a load, for example that of a rectifier with an extra-low inductance rating employing phase control, may cause the **Enersine** to shut down. If the **Enersine** is applied to such a load, we recommend installing a 3-5% reactor at the input side of the load to reduce the rise rate of the load input current.

In certain applications where there are devices having similar characteristics, such as a load which generates high-frequency current, power factor correction capacitors, certain types of passive harmonic filters, etc., those devices may also affect the normal operation of the **Enersine** or cause it to shut down.

1-2. Major Components

Enersine provides 3 phase harmonic and reactive current compensations, and the main components of the filter are as following,

- 1 set of Electromagnetic Contactor and Soft-starting circuit. It helps to limit the amplitude of the inrush current when DC capacitor set is charging
- 1 set of Link Inductor. It is a power transmission interface between the IGBT power converter and the power system.
- 1 set of Ripple Current Filter module. Its main function is to absorb the high frequency ripple current and compensate specific amount of reactive power.
- 1 set of High Frequency Inductor-Capacitor module. It acts as the power transmission interface component between power converter and power system.
- 1 set of IGBT Power Converter module. This is to transform the harmonics energy from the connected power system and re-generate an equal but opposite phase shifted harmonic current back to the power system. This re-generated energy will cancel the harmonics produced by the power system.
- 1 set of DC Capacitor module which store energy taken from the power system before the IGBT Converter can use it to re-generate the opposite phase shifted compensating harmonic current.



- | | |
|-------------------------------|----------------------------------|
| (1) Power Switch | (6) Ripple Current Filter Module |
| (2) Main Fuse | (7) High Frequency Inductor |
| (3) Soft-start Circuit | (8) IGBT Power Converter Module |
| (4) Electromagnetic Contactor | (9) DC Capacitor Module |
| (5) Link Inductor | |

Figure 1-1 *Enersine Pro* Major Components Block Diagram

1-3. General Characteristics and Specifications

1-3-1. General Characteristics

Storage Temperature	-20°C ~ 70°C
Operating Temperature	-10°C ~ 40°C without derating ^{#1}
Relative Humidity	< 95%
Operating Altitude	<1000 m without derating ^{#2}
Reference Harmonic Standard	EN 61000-3-4 , IEEE 519-1992
Reference Design Standard	EN60146
Safety Standard	EN50178
Electromagnetic Compatibility	EN61000-6-4, EN55011, CISPR11, IEC61000-3-11, IEC61000-3-12, EN61000-6-2, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-34

#1 Above 40°C (104°F), the maximum output current must be derated by 3.5% every additional 1°C (1.8°F) up to 50°C (122°F) maximum limit

#2 Over 1000m (3300ft) above sea level, the maximum output current must be derated by 1% every additional 100m (330ft).

1-3-2. Electrical Specification

Rated Current	60A	80A	90A	100A
Input Voltage	208 / 400 / 440V +15%, -20% 480 V +10%, -20%			
Phase/Wires	3 phase 4 wires/3wires ^{#1}			
Frequency	50/60 Hz ±3 Hz (Auto Sensing)			
Maximum Compensation Current/Phase	60 Arms	80 Arms	90 Arms	100 Arms
Maximum Compensation Current of Neutral Line ^{#2}	180 Arms	240 Arms	270 Arms	300 Arms
Inrush Current	Less than rated current			
Current Limitation	Yes, at full correction			
Contacts	EPO			
Communication Interface	USB			
Control Panel	7"LCD Panel/LED Panel			
Configuration	Configurable by using our computer service software via USB, or by using the LCD control panel.			

Harmonic Compensation Mode		Global Mode Selective Mode			
Selective Mode Compensated Harmonic Orders		From 2 nd to 51 st order			
Power Factor Correction		Compensates both lagging and leading reactive power. Power factor can be configured from 0.6 lagging to 0.6 leading.			
CT Ratio		Can be set. Primary Current: 100-10,000 A Secondary Current: 1A/5A			
CT Location		Source Side: Closed Loop Control Load Side: Open Loop Control			
Response Time		Global Mode < 1 ms Selective Mode < 10 ms			
Parallel ^{#3}		One Master unit can parallel with 3 Slave units. Up to 5 Master units in parallel.			
Maximum Heat Loss	208V	Master: 750W Slave: 700W	Master: 970W Slave: 920W	Master: 1170W Slave: 1120W	Master: 1290W Slave: 1340W
	400~480V	Master: 1300W Slave: 1250W	Master: 1700W Slave: 1650W	Master: 1900W Slave: 1850W	Master: 2090W Slave: 2140W
Color		RAL9011 (PANTONE Process Black C)			
Protection Index		IP30/31			
Dimensions (WxDxH)		Master: 500 x 301 x 775 mm Slave: 500 x 286 x 775 mm			
Weight		Master : 51 kg Slave: 46 kg	Master: 58 kg Slave: 53 kg	Master: 58 kg Slave: 53 kg	Master: 60 kg Slave: 55 kg

#1 Voltage level 440V and 480V only can be applied in 3P3W system.

#2 Available for 3P4W application.

#3 Different current rating units can operate in parallel.

1-3-3. LED Control Panel Specification

Keys	ON/OFF and RESET keys
Indicators	4 status LED indicators: POWER ON, FILTERING, FULL CORRECTING, and ERROR 8 alarm LED indicators for Error Messages
Contacts	3 Output Dry Contacts 1 Input Contact
Communication Interface	Optional : RS-485/Ethernet
Configuration	Configurable by service software
Monitoring Software	ESP-Link (optional)
Communication Protocol	J-Bus/MOD Bus Protocol

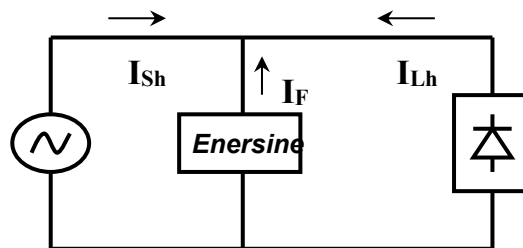
1-3-4. 7" LCD Touch Screen Control Panel Specification

Display interface	LCD Control Panel offers the following functions: <ul style="list-style-type: none"> ● Meter: parameter, waveform, and spectrum ● Event log: Up to 500 records (FIFO) ● Configuration: Compensation Setting, Compensation Logic Control, and System Setting. ● Multi-language
Indicators	2 status LED indicators: POWER ON and ERROR
Contacts	3 Output Dry Contacts 1 Input Contact
Communication Interface	RS-485, Ethernet
Configuration	Configurable by service software or the LCD Control Panel
Monitoring Software	ESP-Link (optional)
Communication Protocol	J-Bus/MOD Bus Protocol

1-4. Compensation Ability

As long as the **Enersine** is powered on and running it provides harmonic current compensation and power factor correction. Therefore the current on the source side is less than that on the load side. In addition, the improvement of the voltage waveform distortion and the voltage regulation may increase harmonic currents on the load side. Therefore, any compensation capability analysis must be done when the **Enersine** is running.

$$\text{Harmonic Attenuation Ratio (HAR)} = \frac{\text{Harmonic Current on Load side (I}_{Lh})}{\text{Harmonic Current on Source side (I}_{Sh})}$$



The harmonic current on the load side is measured when the **Enersine** is running.

1-5. Capacity Selection

The **Enersine** compensates harmonic currents comprehensively, which requires neither measuring the impedance of the power system nor analyzing the load's harmonic spectrum or its individual amplitude. To select the appropriate model, measure the estimated load harmonic current amplitude to be compensated, and then select the **Enersine** model which has an output compensated current rating at least 1.25 times that. For example, if the load harmonic current is 45 A choose the 60 A **Enersine**.

Even if the selected filter offers insufficient compensated harmonic current, the **Enersine** will not be at risk of overloading. It has current-limiting capability up to its full rated compensating capability. Therefore it will not shut down or malfunction as most passive filters do. Adding Slave units or a Master unit in parallel can increase its compensating capacity.

2. Function Description

The **Enersine** is composed of one Master unit and several Slave units. Master unit can be working alone; Slave unit must be working with Master unit. One Master unit can work with three Slave units at maximum. The maximum output current of the **Enersine** depends on the number of Master and Slave units.

2-1. Master Unit

The Master analyzes the load current by DSP, and compensates the harmonic and reactive current as required by the load. The control panel of the Master can be either an LED control panel or an LCD control panel for operation. Figure2-1 is the external interface diagram of the Master, and the function of the Master is introduced as follows.

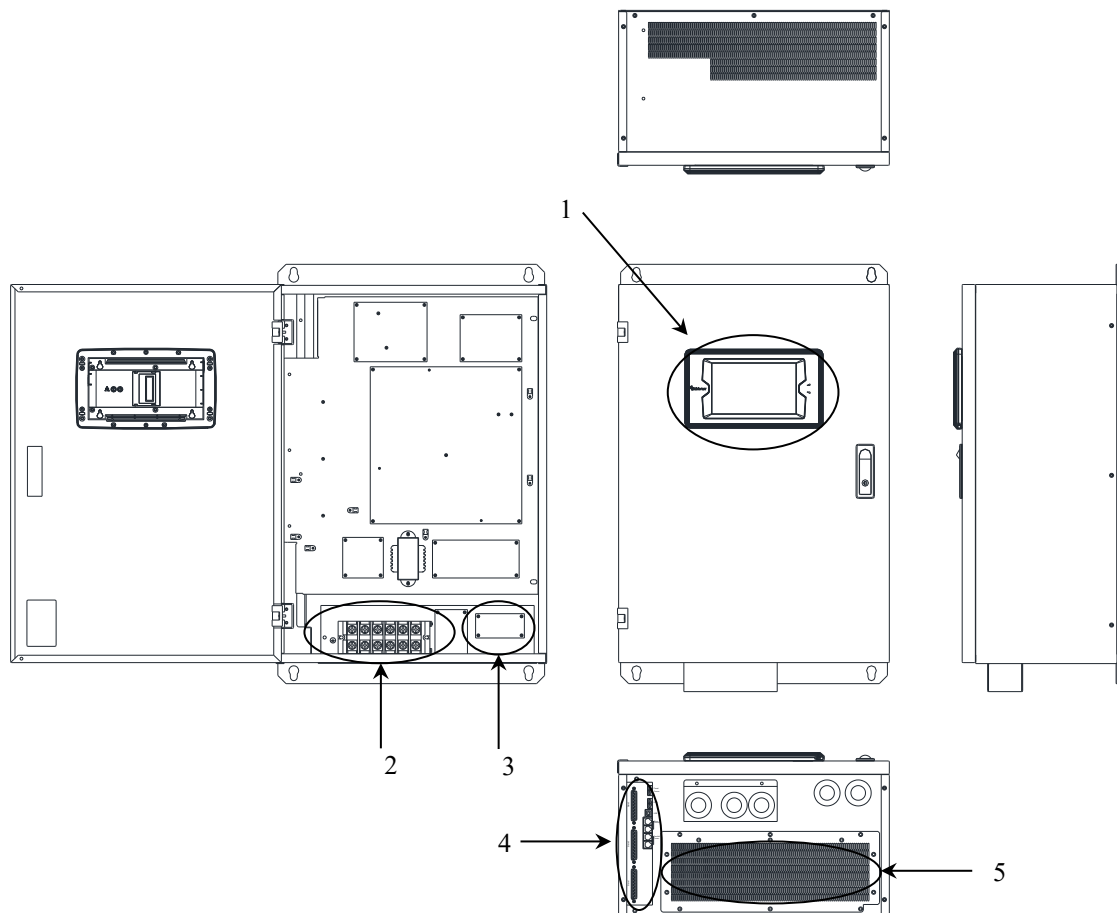


Figure 2-1 Master External Interfaces

- | | |
|------------------------|----------------------------|
| 1. Control Panel | 4. Communication Interface |
| 2. Power Source Input | 5. Cooling Fan |
| 3. CT Connection Input | |

2-1-1. Control Panel

There are two types of control panels available: LED and LCD.

2-1-1-1. LED Control Panel

The LED Control Panel displays the filter status with LED indicators, which may provide the end user sufficient information for control and operation. This section introduces the key features of LED Control Panel.

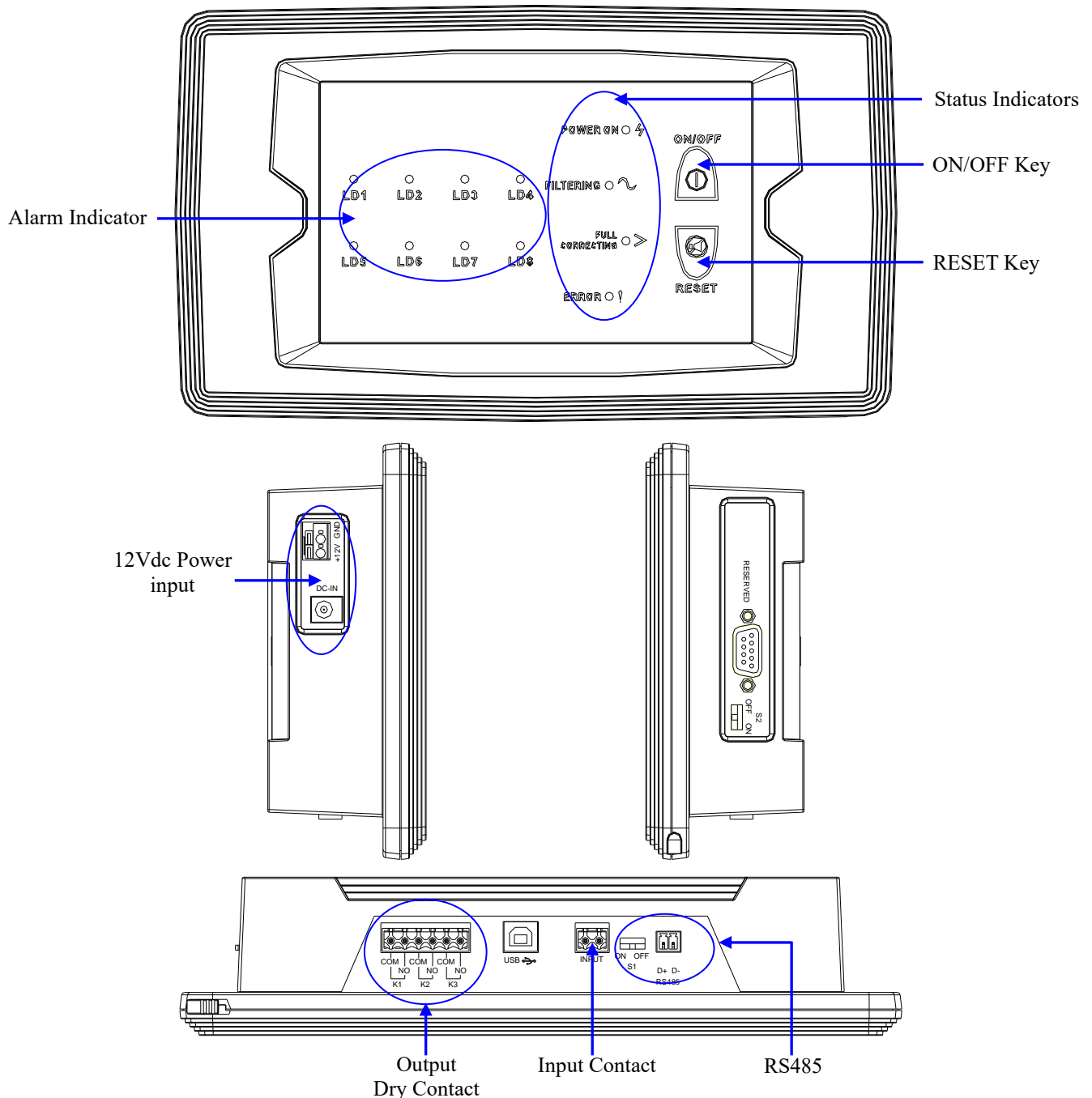


Figure 2-2 LED Control Panel External Features

— Status Indicators

LED Control Panel provides four indicators to indicate the operation status of the filter.

Table 2-1 Status Indicators on the LED Control Panel

Indicator	Color	Description
POWER ON	Red	Indicates that the control logic circuits of the Master are energized.
FILTERING	Green	Indicates that the filter is providing compensating current to the load. This indicator light will switch off when the filter is shut down by the user or by system malfunction. If the LED is blinking , it means the filter is in standby mode.
FULL CORRECTING	Yellow	Indicates that the capacity of the filter is insufficient for the load. At this time the filter should be in current-limit state and continue to compensate the current up to its rated value.
ERROR	Red	Indicates that there are some external abnormal conditions or internal abnormal breakdown. The filter should stop providing compensating current.

— Alarm Indicators

LED Control Panel provides eight indicators to indicate the operation status of the filter.

Table 2-2 Alarm Indicators on the LED Control Panel

Indicator	Color	Description
LD1	Red	1. The phase polarity of the External CTs is reversed. 2. The phase rotation or polarity of the Parallel CTs is reversed.
LD2	Red	Filter OFF: 1. The system voltage is over-voltage, under-voltage, or has high distortion. 2. The system frequency is out of range. 3. The phase rotation of system voltage is not clockwise. 4. The filter may resonate with the load. Filter ON: 1. The LED is blinking , The system voltage is over-voltage, under-voltage, or has high distortion. 2. The LED is blinking , The system frequency is out of range. 3. The LED is blinking , The phase rotation of system voltage is

Indicator	Color	Description
		not clockwise. 4. If the LED is blinking , The filter may resonate with the load.
LD3	Red	<ol style="list-style-type: none"> 1. Incompatible Firmware ° 2. Master FRAM is not working properly. 3. Slave FRAM is not working properly. 4. LED Control Panel FRAM is not working properly. 5. The CT signal connection inside the Master is incorrect. 6. Communication of the Master is not working properly. 7. Parallel communication is not working properly or the parallel communication settings are not correct. 8. If the LED is blinking, Master parallel communication alarms. 9. If the LED blinking, Master FRAM alarms. 10. If the LED is blinking, communication is not working properly.
LD4	Red	1. The DC Bus voltage is abnormal.
LD5	Red	<ol style="list-style-type: none"> 1. Senses temperature abnormal. 2. overheated ° 3. A cooling fan is out of order. °
LD6	Red	<ol style="list-style-type: none"> 1. The peak current of the IGBT power converter is too high. 2. Output current of the IGBT power converter is too high.
LD7	Red	<ol style="list-style-type: none"> 1. The IGBT or IGBT driver circuit is faulty. 2. Too much high frequency ripple current generated from the IGBT power converter.
LD8	Red	<ol style="list-style-type: none"> 1. The electromagnetic contactor is tripped or malfunctioning. 2. The fuse is blown. 3. The Master connection is abnormal. 4. The Slave operation mode is incorrect.

#1 LED constantly lighting: there's fault internally, unable to turn on.

#2 LED flashing: there's alarm internally, able to turn on.

— Output Dry Contact

There are three output dry contact connectors for remote monitoring. These output dry contacts are programmable. The user can change the definition for each contact using Monitoring Software **ESP-Link** or consult your local authorized service agent. The default definitions of the output dry contacts are shown in Table 2-3.

Electrical specification: 250 VAC/ 2 A, 30 VDC/ 2 A

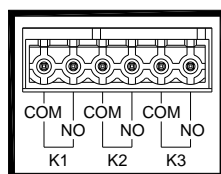


Table 2-3 The Default Definition of the Output Dry Contacts

	Function	Description
K1	POWER ON	The control logic circuits of the filter are energized.
K2	FILTERING	The filter is providing compensating current.
K3	ERROR	There are some external abnormal conditions or internal breakdown. The filter should stop providing compensating current.

— Input Contact

The input contact is connected to an external switch, which can be used to turn the filter on and off. There are two operation modes that can be selected: Mode 0 and Mode 1. The default mode is Mode 0. The user can change to Mode 1 via Monitoring Software **ESP-Link** or consult your local authorized service agent.

Operation Mode 0:

Refer to figure 2-3 to connect an external tack switch for use in turning the filter on and off. If you press the switch for two seconds the filter will change from on to off and vice versa as indicated in figure 2-4.

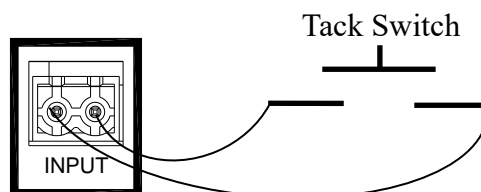


Figure 2-3 Input Contact Connections for Mode 0

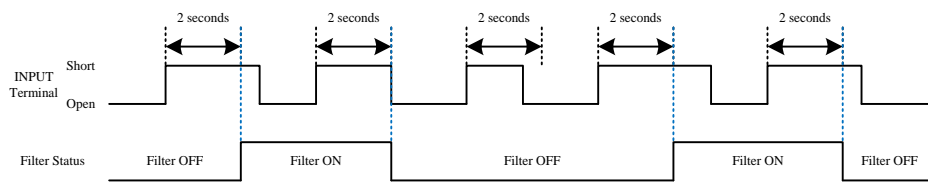


Figure 2-4 Operation in Mode 0

Operation Mode 1 :

Refer to Figure 2-5 to connect an external, two-position switch for use in turning the filter on and off. Two seconds after the switch position is changed to either the “on” or “off” position the filter will correspondingly be started up or shut down, as indicated in Figure 2-6.

When in Mode 1 please close the external switch first, and then press the ON/OFF key on the Control Panel to put the filter in standby mode (Green Indicator blinking). Then you may control the filter from the external switch.

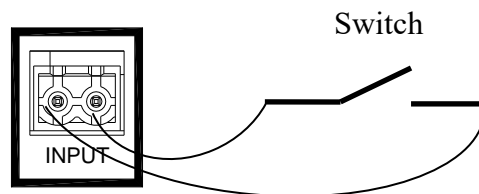


Figure 2-5 Input Contact Connections for Mode 1

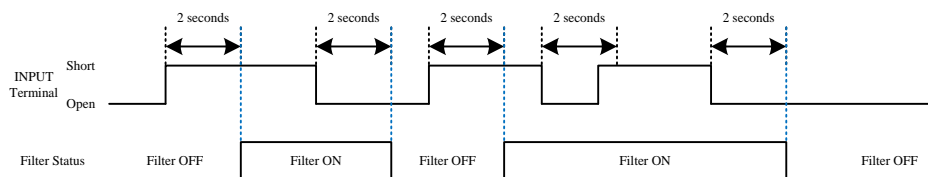
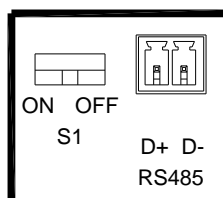


Figure 2-6 Operation in Mode 1

— RS485

This terminal is for the communication between control panel and machine internal controller.



Figures 2-7 show the outer dimensions of the LED Control Panel.

Unit: $\frac{\text{mm}}{[\text{inch}]}$ 

Figure 2-7 LED Control Panel Dimensions Diagram

2-1-1-2. LCD Touch Screen Control Panel

This section introduces the key features of LCD Touch Screen Control Panel.
Please refer to chapter 3 for the detail function operation of LCD touch screen.

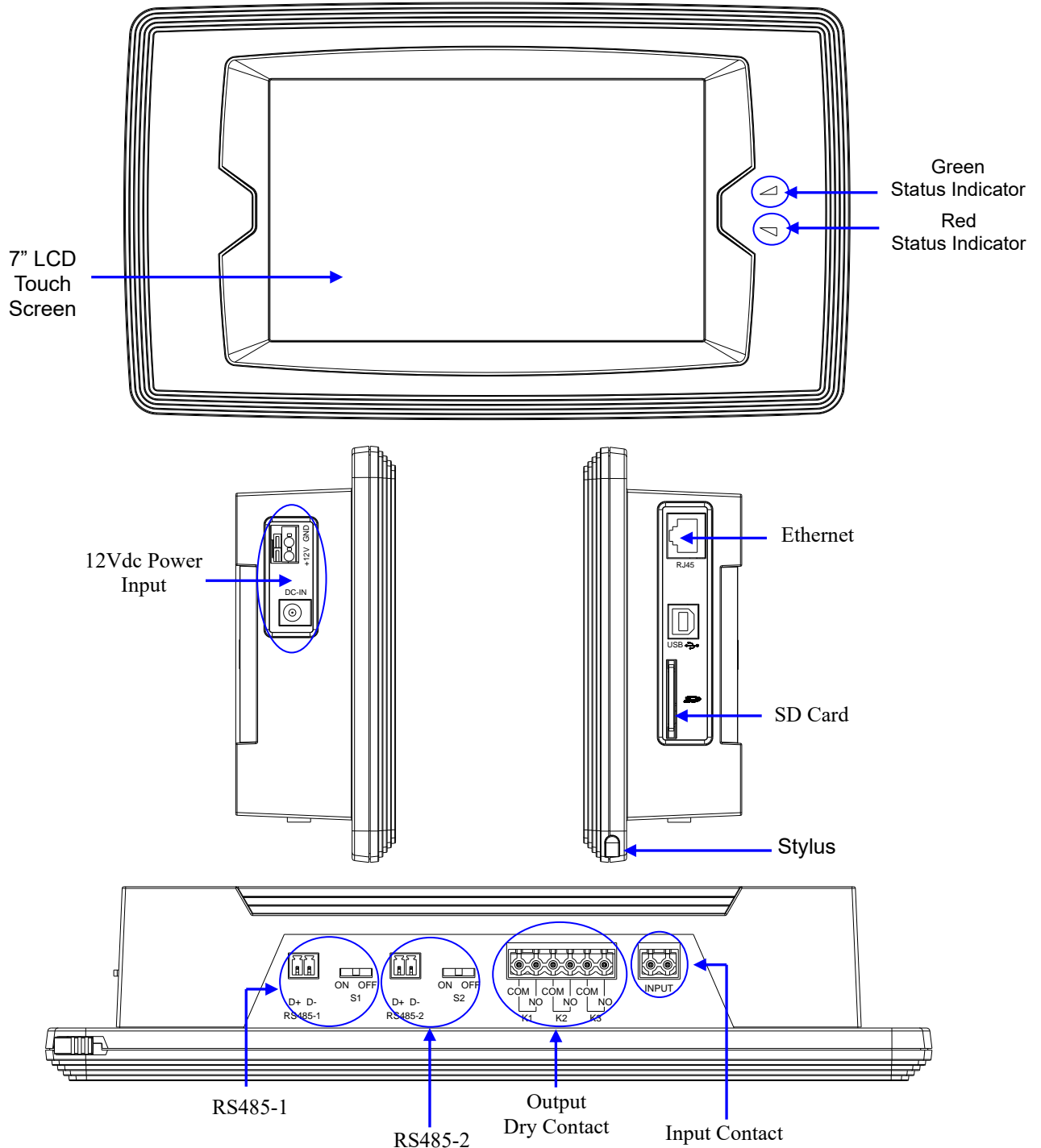


Figure 2-8 LCD Touch Screen Control Panel External Features

— Status Indicators

LCD Touch Screen Control Panel provides two indicators to indicate the operation status of the filter.

Table 2-4 Description of Status Indicators of LCD Touch Screen Control Panel

Indicator	Display	Description
Green	off	The filter is stop working.
	on	The filter is providing compensating current.
	blinking	The filter is under standby mode.
Red	off	The filter is normal
	on	There are some external abnormal conditions or internal breakdown. The filter should stop providing compensating current.

— Output Dry Contact

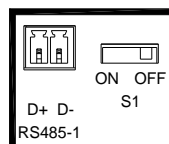
There are three output dry contacts on LCD control panel, and the function and default setting is the same as LED control panel which is specified in section 2-1-1-1. The only difference between LCD and LED control panel is that users can change output dry contact setting through LCD control panel.

— Input Contact

There is one input contact on LCD control panel, and the function is the same as LED control panel which is specified in section 2-1-1-1. The only difference between LCD and LED control panel is that users can change input contact setting through LCD control panel.

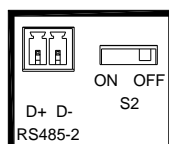
— RS485-1 Communication Port

This terminal is for the communication between control panel and machine internal controller.

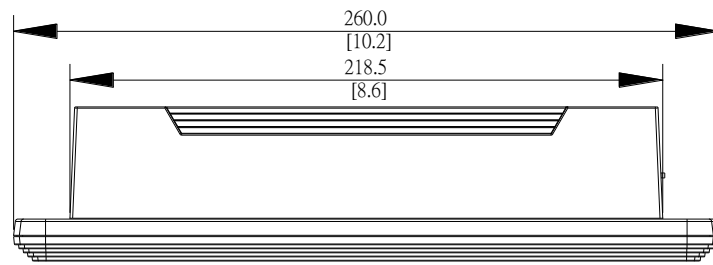


— RS485-2 Communication Port

This is Modbus communication port for remote monitoring. The baud rate can be programmable from 2400 to 57600 via the LCD Touch Screen. Below picture shows the pin assignments and S2 is the switch for terminal resistor.

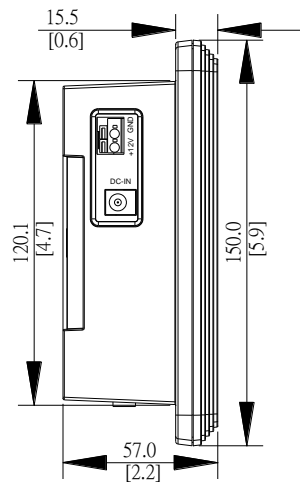


Figures 2-9 show the outer dimensions of the LCD Touch Screen Control Panel.

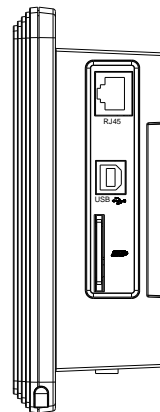


Unit: $\frac{\text{mm}}{\text{[inch]}}$

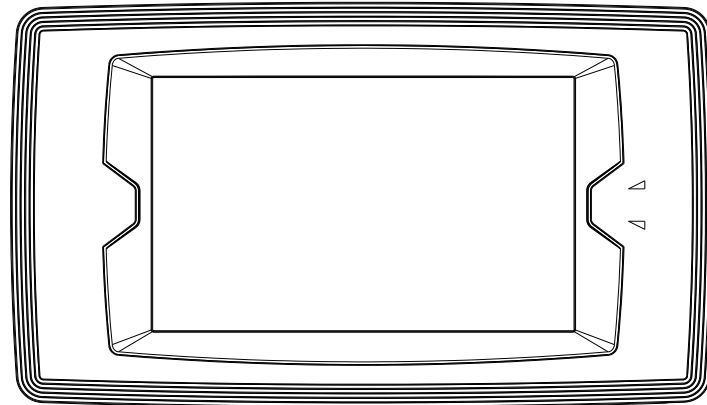
Top View



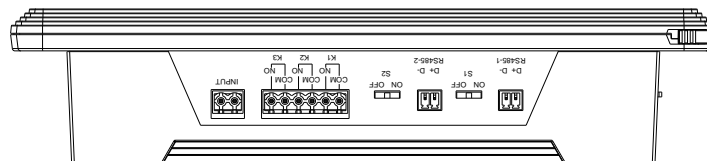
Left View



Right View



Front View



Bottom View

Figure 2-9 LCD Touch Screen Control Panel Dimensions Diagram

2-1-2. Power Source Input

Figure 2-10 shows the position of input power connecting terminal block, and please refer to section 4-3 for installation guide.

N: Neutral
L1: Phase 1
L2: Phase 2
L3: Phase 3
G: Ground

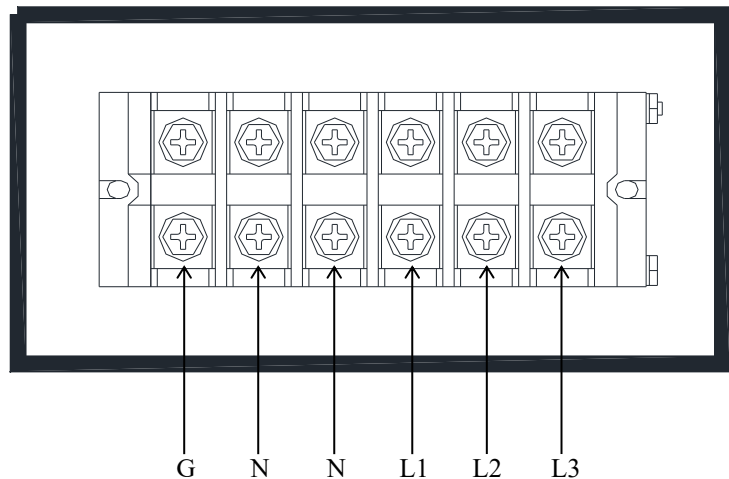


Figure 2-10 Power Source Input of the Master

2-1-3. CT Connection Input

The CT connection terminal is shown in Figure 2-11. Please refer to chapter 4 for detail description, From SW1 to SW3 are short switches for the Parallel CT ; From SW4 to SW6 are the short switches for the External CT. To prevent CT from open circuit and damaging while a technician is replacing or maintaining machine, the short switches must be set to ON.

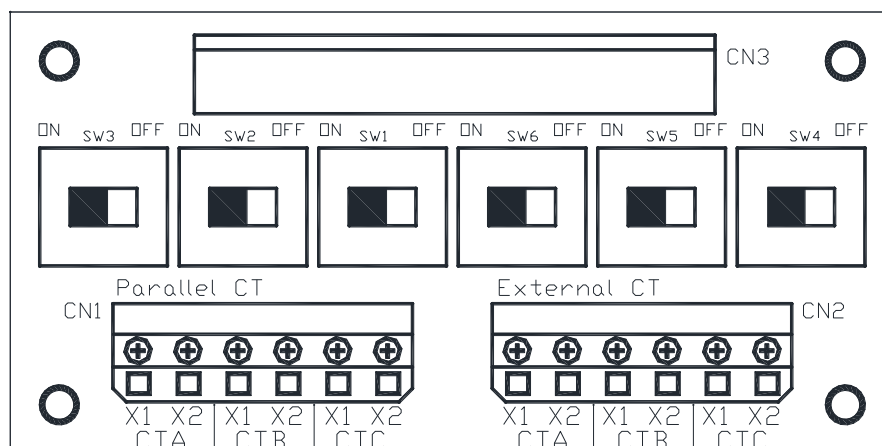


Figure 2-11 CT Connection Terminal

2-1-4. Communication Interface

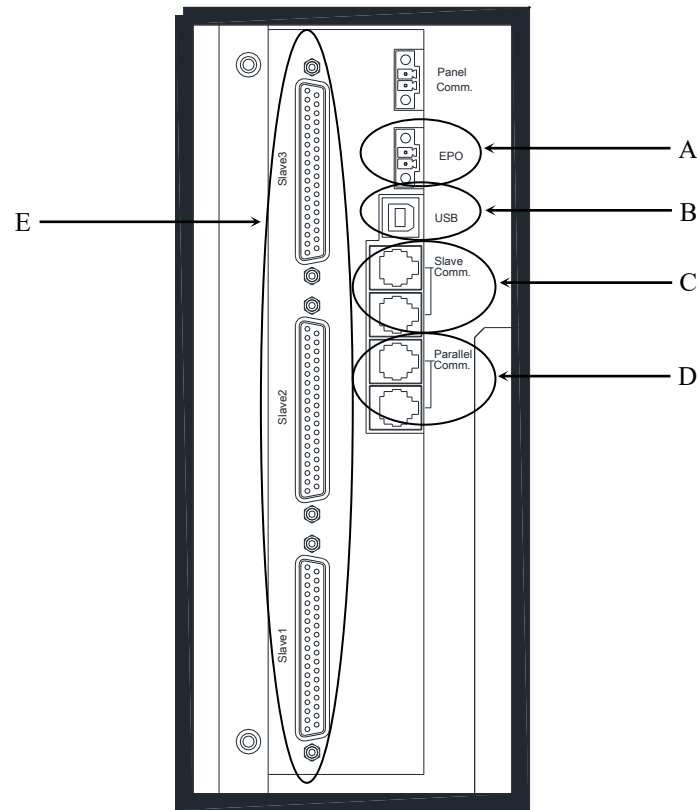


Figure 2-12 Communication Interface

- | | |
|----------------------------------|---------------------------------|
| A. EPO | D. Parallel Communication Ports |
| B. USB Service Port | E. Control Signal Connectors |
| C. Communication Ports for Slave | |

A. EPO

The **Enersine** comes with an EPO contact, which allows you to turn off **Enersine** in an emergency. If the LED/LCD control panel is out of order, you can still shut down **Enersine** using the EPO switch. The EPO can set as NO (Normal Open) or NC (Normal Close) through LCD control panel. When the EPO is set as NO, short circuit the Pin1 and the Pin2 to shut down the **Enersine** ; when the EPO switch is set as NC, open circuit the Pin1 and the Pin2 to shut down the **Enersine**.

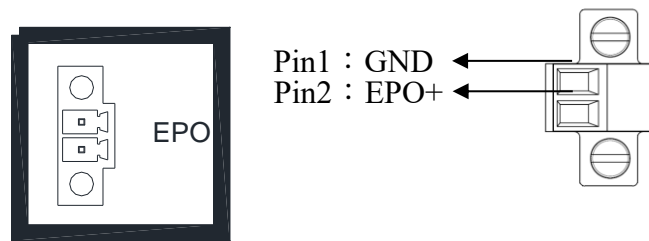


Figure 2-13 EPO Switch

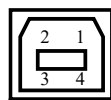
B. USB Service Port

This USB port is for service only.

Complies with USB V1.0, 1.5Mbps

Complies with USB HID (Human Interface Device) V1.0

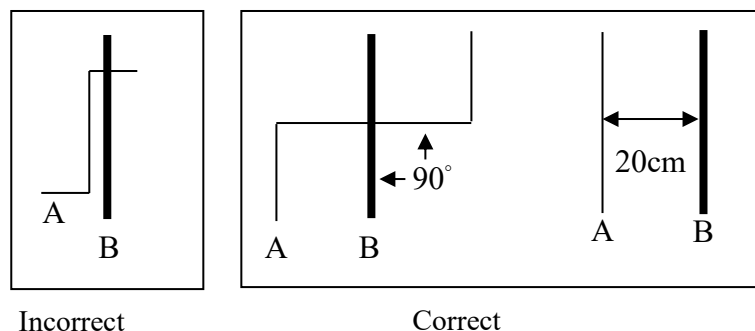
Pin Assignment:



- 1 → VCC (+5V)
- 2 → D-
- 3 → D+
- 4 → Ground

C. Communication Ports for Slave

The communication port is to connect to the Slave units. To avoid noise interference, do not intermix these cables with power cables. If intermixing cannot be avoided, align them at 90 degrees or separate them by at least 20cm as indicated in Figure 2-14. The maximum total length of the parallel communication cables must be less than 20 meters, and they must be connected in a ring topology, and refer to section 4-3 for installation guide.



Incorrect

Correct

A → parallel communication or control signal cable

B → power cable

Figure 2-14 Recommended Layout of Communication Cable

D. Parallel Communication Ports

The Parallel Communication ports are for running multiple Masters in parallel, Wiring caution is the same as previous section, and refer to section 4-3 for installation guide. When the connections of the parallel communication cables are complete, the number of parallel units and the unique “Parallel Number” of each filter must be set with using our service software. If there’s wrong setting, the filter will alarm and cannot be started up. Consult your local authorized service agent for help with the parallel settings.

E. Control Signal Connectors

There are three control signal ports (Slave1-Slave3), which means you can connect up to three Slave units. Be sure to connect the Slave units in sequence from Slave1 to Slave3, and refer to section 4-3 for installation guide.

2-1-5. Cooling Fan

The purpose of the cooling fan is to expel the heat generated from Master unit. To prevent Master from overheating make sure there are no obstacles blocking the ventilation openings.

2-2. Slave Unit

Slave unit can be operated only when connecting to Mater unit. This section introduces the key features of Slave.

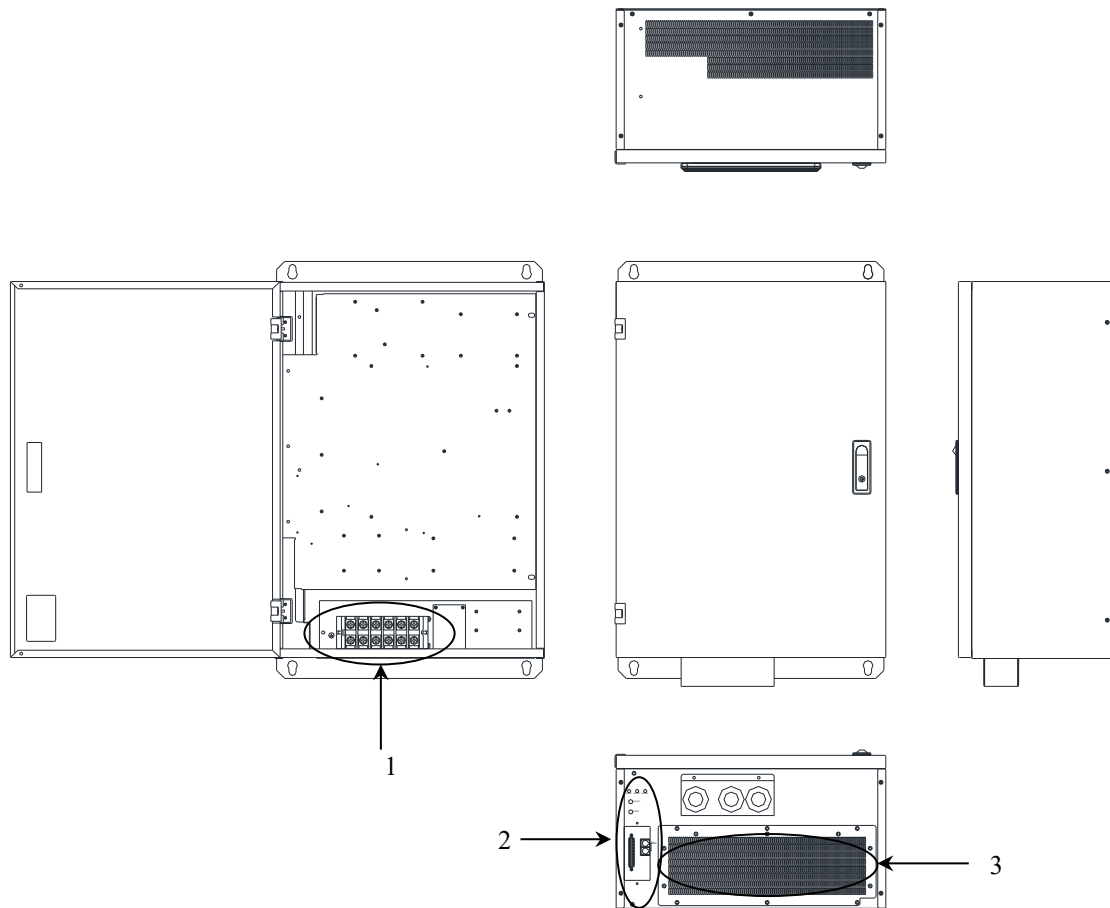


Figure 2-15 Slave External Interfaces

- | | |
|----------------------------------|----------------|
| 1. Power Source Input | 3. Cooling Fan |
| 2. Control and Display Interface | |

2-2-1. Power Source Input

The function is specified in section 2-1-2, and please refer to section 4-3 for installation guide.

2-2-2. Control and Display interface

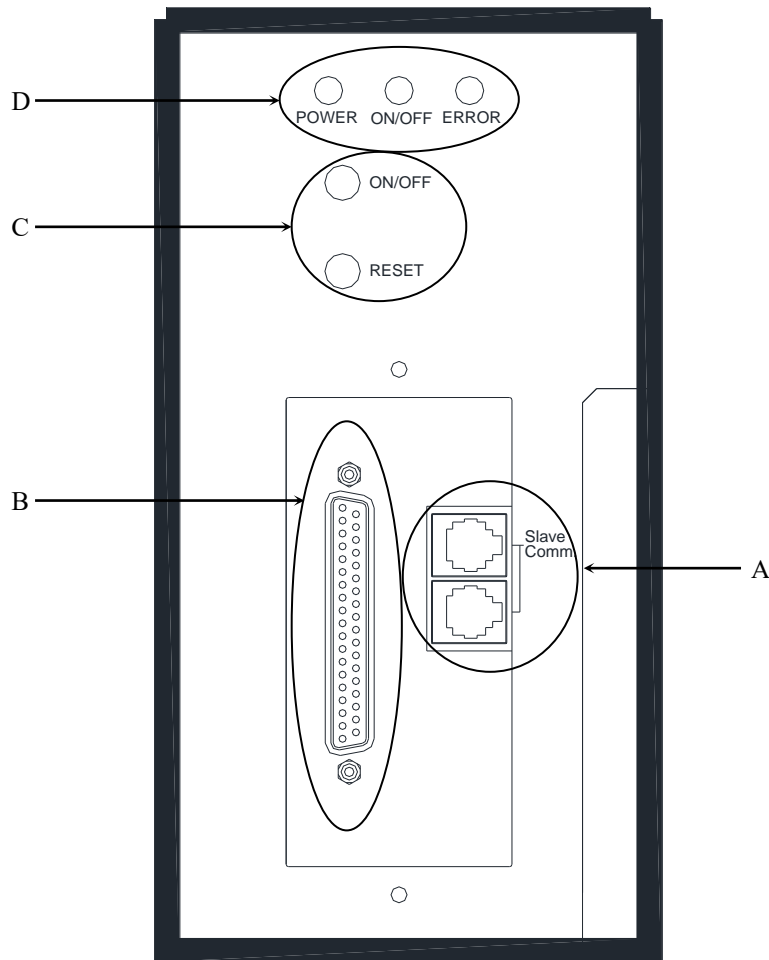


Figure 2-16 Control and Display Interface

- | | |
|----------------------------------|--------------------------|
| A. Communication Ports for Slave | C. ON/OFF and RESET Keys |
| B. Control Signal Connectors | D. Stats Indicators |

A. Communication Ports for Slave

The communication ports are to connect to Master or Slave, and the function is specified in section 2-1-4, and please refer to section 4-3 for installation guide.

B. Control Signal Connectors

The terminal is to connect to Master, and the function is specified in section 2-1-4, and please refer to section 4-3 for installation guide.

C. ON/OFF and RESET Keys

The keys on the interface are described in Table 2-5.

Table 2-5 Description of the Keys on the Interface

Button	Description
ON/OFF	Press this key for two seconds to turn on or off the Slave.
RESET	Press this key to reset alarm when the Slave occurs alarm.

D. Stats Indicators

The stats indicators on the interface are described in Table 2-6.

Table 2-6 Status Indicators on the Interface

indicator	Color	Description
POWER	Yellow	Indicates that the control logic circuits of the Slave are energized.
ON/OFF	Green	Indicates that the filter is providing compensating current to the load. This indicator light will switch off when the filter is shut down. When it flashes slowly(0.5s), the Slave is ready and wait for the command of the Master; when it flashes fast(0.125s), the Slave is ready to turn on.
ERROR	Red	Indicates that there are some external abnormal conditions or internal abnormal breakdown. The filter should stop providing compensating current. When it flashes slowly(0.5s), the micro switch of the Slave is closed or EPO is activated, and the Slave is shut down.

#1 When the three indicators are flashing, the operation mode is error.

2-2-3. Cooling Fan

The purpose of the cooling fan is to expel the heat generated from Slave unit. To prevent Slave from overheating make sure there are no obstacles blocking the ventilation openings.

3. LCD Touch Screen Operation

Figure 3-1 is a block diagram of the functions provided by the LCD Touch Screen. The detail descriptions of each function please refer to below section.

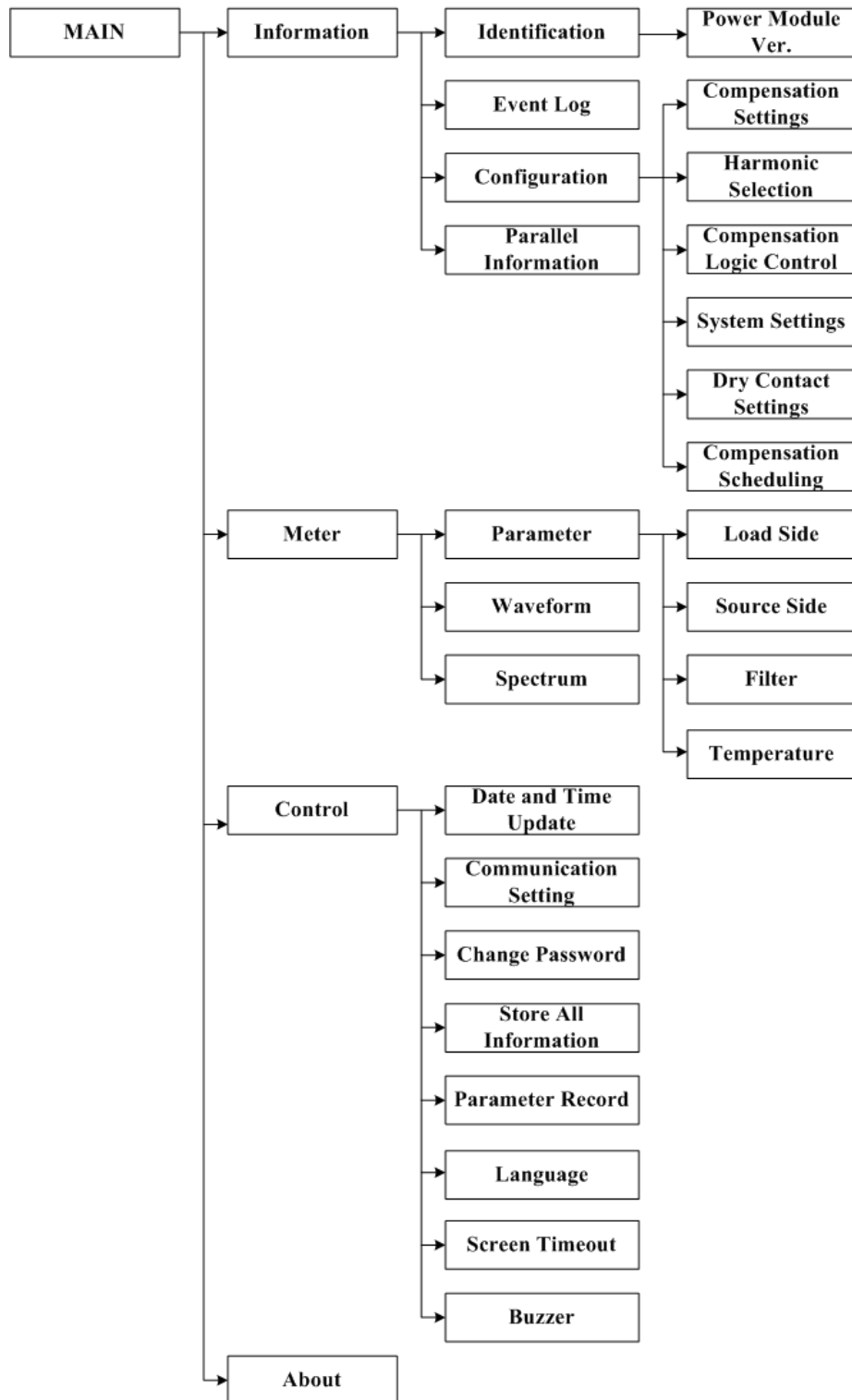
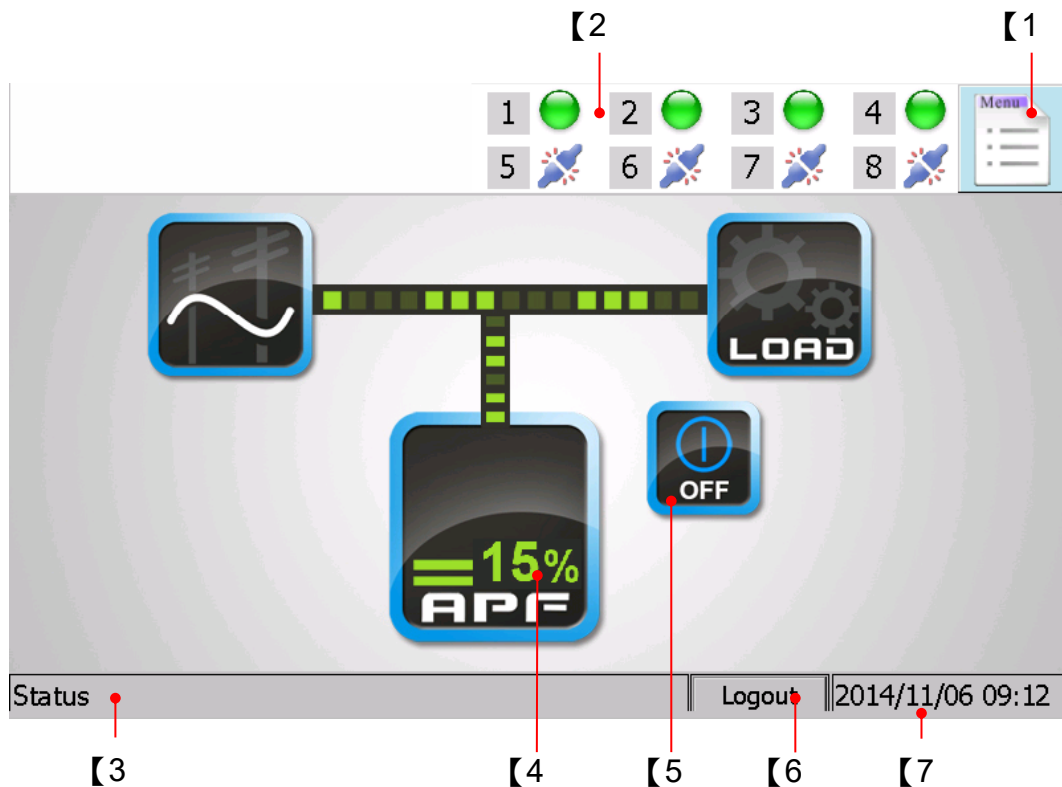


Figure 3-1 LCD Touch Screen Functions, Block Diagram


3-1. Main Screen





【1】 Function Menu


【2】 The status of each filter. The LCD Touch Screen Control Panel can monitor and control up to 8 CMs.


1/2/3/4/5/6/7/8 : Number of the filter unit.

 : The filter is connected.

 : The filter is disconnected.

 : The filter is running and providing compensating current.

 : The filter is full correcting.

 : There are some external abnormal conditions or internal breakdown.

【3】 Status Box : Display the newest status of the filter.

【4】 Load Rate

【5】 Control Button



: To turn the filter on.



: To turn the filter off.



: To silence the alarm.



: To clear the fault status.

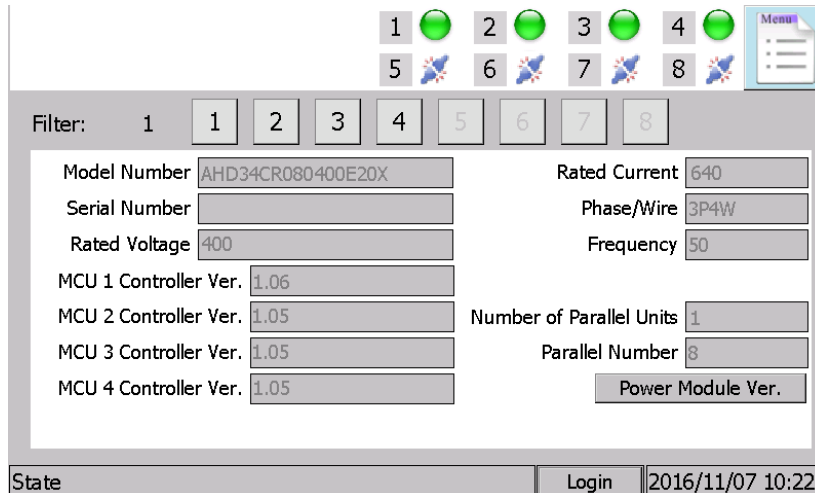
【6】 Login/Logout Button:

【7】 Current Date and Time

3-2. Information

3-2-1. Identification

- 1) Press “Menu”→“Information”→“Identification” to enter Identification screen.
- 2) Choose the filter number by press icon 1 ~ 8 and then you will see the desired filter information.

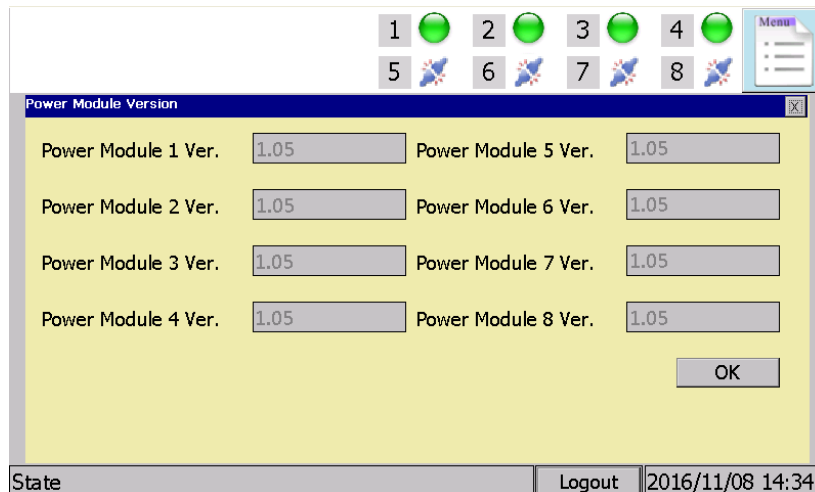


The screenshot shows the 'Identification' screen. At the top, there are eight filter selection icons (1-8) with green circles. Below them is a 'Filter:' section with buttons for filters 1 through 8. The main area displays various system parameters in a two-column layout:

Model Number	AHD34CR080400E20X	Rated Current	640
Serial Number		Phase/Wire	3P4W
Rated Voltage	400	Frequency	50
MCU 1 Controller Ver.	1.06	Number of Parallel Units	1
MCU 2 Controller Ver.	1.05	Parallel Number	8
MCU 3 Controller Ver.	1.05	Power Module Ver.	
MCU 4 Controller Ver.	1.05		

At the bottom, there is a 'State' field, a 'Login' button, and a timestamp: 2016/11/07 10:22.

- 3) Click the Power Module Ver. in the **Identification** page and see the firmware version of each Power Module.



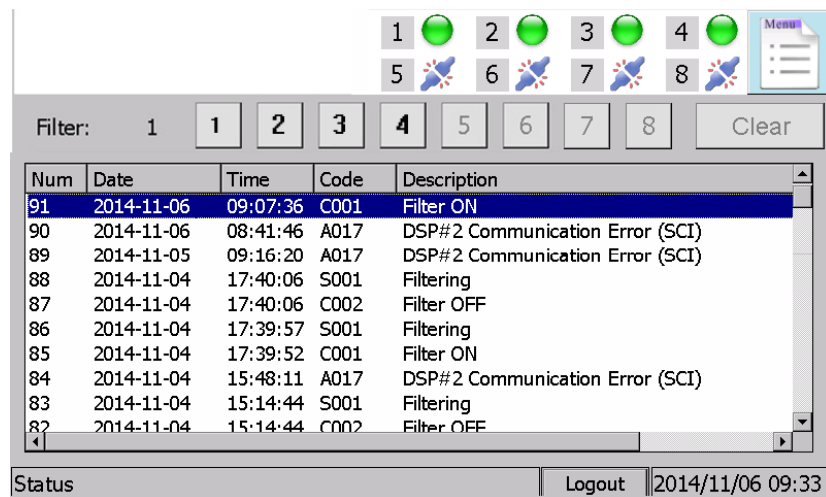
The screenshot shows the 'Power Module Version' screen. It displays the firmware version for each of the eight power modules in a two-column layout:

Power Module 1 Ver.	1.05	Power Module 5 Ver.	1.05
Power Module 2 Ver.	1.05	Power Module 6 Ver.	1.05
Power Module 3 Ver.	1.05	Power Module 7 Ver.	1.05
Power Module 4 Ver.	1.05	Power Module 8 Ver.	1.05

An 'OK' button is located at the bottom right. At the bottom of the screen, there is a 'State' field, a 'Logout' button, and a timestamp: 2016/11/08 14:34.

3-2-2. Event Log

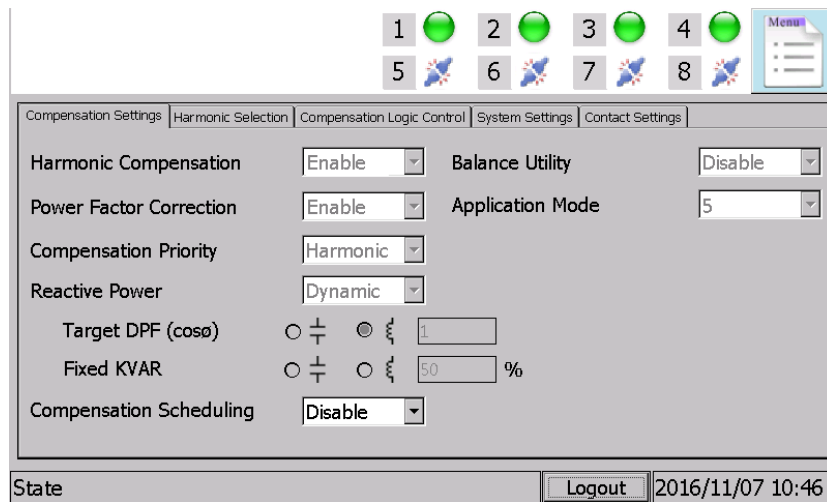
- 1) Press “Menu”→ “Information” → “Event Log” to enter Event Log screen.
Choose the filter number by press icon 1 ~ 8 and then you will see the desired filter event log recorders. Each filter can record up to 500 events log records. Old data is deleted to make room for new in FIFO (first in, first out) orde.



3-2-3. Configuration

- 1) Press “Menu”→ “Information” → “Configuration” to enter Configuration screen.
- 2) Configuration screen offers five informations.
If you need to change any setting expect Contact Settings, you must consult your local authorized service agent.






3-2-3-1. Compensation Settings







Compensation Setting Details:

Harmonic Compensation	Shows whether Harmonic Compensation is enabled or disabled.
Power Factor Correction	Shows whether Power Factor Correction is enabled or disabled.
Compensation Priority	Shows which setting has priority, Harmonic Compensation or Power Factor Correction.
Reactive Power	Shows whether the reactive power compensation mode is Target DPF or Fixed KVAR when Power Factor Correction is enabled.
Target DPF (cosΦ)	Shows the Target DPF setting.
Fixed KVAR	Shows the Fixed KVAR setting.
Compensation Scheduling	Shows whether Compensation Scheduling is enabled or disabled. Please refer to Chapter 3-2-3-6.
Balance Utility	When 3-Phase current of the load is unbalanced and Balance Utility is enabled the filter will compensate the system current to balance.
Application Mode	The filter computes several control parameters for different load types to obtain the best performance. 0 For single-phase rectifier 1 For 3P3W, 6-pulse rectifier 2 For 3P3W, 6-pulse and single-phase rectifiers 3 For 3P3W, 6-pulse rectifier with even-order harmonic 4 For single-phase rectifier with even-order harmonic 5 For all load types (default) 6 User define

3-2-3-2. Harmonic Selection

1 
2 
3 
4 
Menu 

5 
6 
7 
8 

Compensation Settings				Harmonic Selection				Compensation Logic Control				System Settings				Dry Contact Settings			
Order	Select	Active	Redution	Order	Select	Active	Redution	Order	Select	Active	Redution	Order	Select	Active	Redution	Order	Select	Active	Redution
2nd	<input type="checkbox"/>	<input type="checkbox"/>	100 %	3rd	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	4th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	5th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	6th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
4th	<input type="checkbox"/>	<input type="checkbox"/>	100 %	5th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	6th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	7th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	8th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
6th	<input type="checkbox"/>	<input type="checkbox"/>	100 %	6th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	7th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	8th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	9th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
8th	<input type="checkbox"/>	<input type="checkbox"/>	100 %	7th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	8th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	9th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	10th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
10th	<input type="checkbox"/>	<input type="checkbox"/>	100 %	8th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	9th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	10th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	11th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
12nd	<input type="checkbox"/>	<input type="checkbox"/>	100 %	9th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	10th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	11th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	12th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
14th	<input type="checkbox"/>	<input type="checkbox"/>	100 %	10th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	11th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	12th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	13th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
16th	<input type="checkbox"/>	<input type="checkbox"/>	100 %	11th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	12th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	13th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	14th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
				12th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	13th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	14th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	15th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
				13th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	14th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	15th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	16th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
				14th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	15th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	16th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	17th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %
				15th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	16th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	17th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %				
				16th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %	17th	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100 %								

1 2 3

Status
Logout
2014/11/06 10:55

Order : Harmonic order

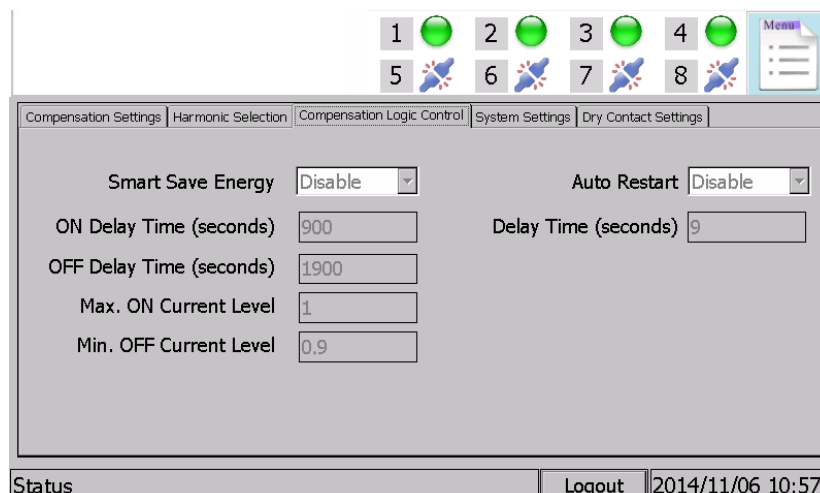
Select : The selected harmonic order

Active : The active harmonic order

Reduction : The reduction ratio for the specific order

1 2 3 : Show next page information

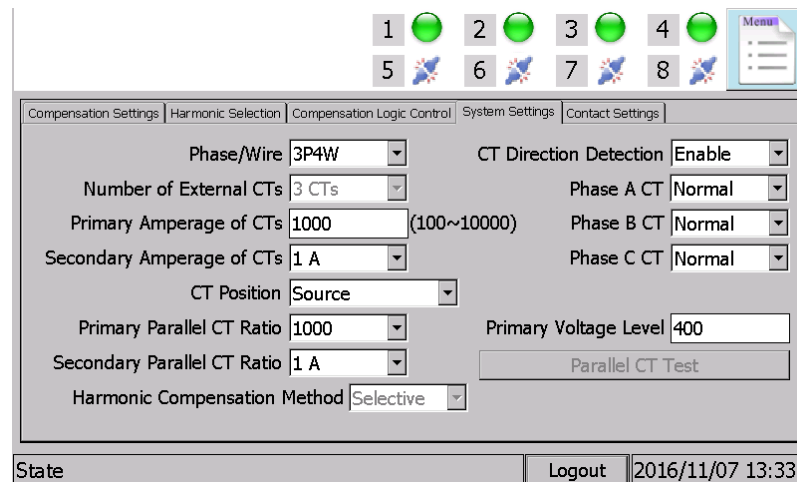
3-2-3-3. Compensation Logic Control



Compensation Logic Control details:

Smart Save Energy	Smart Save Energy	When this function is enabled the filter will start up and shut down automatically according to the load current level. When the load current is less than Min. OFF Current Level for OFF Delay Time the filter will shut down automatically until the load current is greater than Max. ON Current Level for ON Delay Time .
	ON Delay Time	Shows The delay time for automatic start-up
	OFF Delay Time	Shows The delay time for automatic shutdown
	Max. ON Current Level	Shows The current level for automatic start-up
	Min. OFF Current Level	Shows The current level for automatic shutdown
Auto Restart	Auto Restart	When this function is enabled the filter is allowed to automatically restart when some abnormal conditions return to normal. Such abnormal conditions include system voltage abnormal, frequency error, etc.
	Delay Time	Shows The delay time for automatic restart

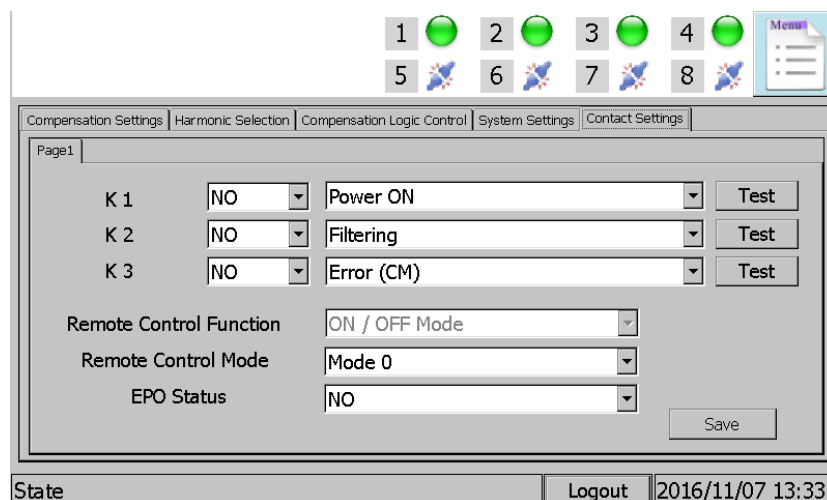
3-2-3-4. System Settings



System Settings Details:

Phase/Wire	Shows 3P3W or 3P4W according to the power system that the filter is connected to. If the system is 3P3W then the neutral line does not need to be connected.
Number of External CTs	Shows 2 or 3 as the number of external CTs that are installed on the Source/Load side. If the system is 3P4W then 3 CTs are needed.
Primary Amperage of CTs	Shows the primary current rating of the External CTs.
Secondary Amperage of CTs	Shows the Secondary current rating of the External CTs.
CT Position	Shows the location where External CTs are installed.
Primary Parallel CT Ratio	Shows the primary current rating of the Parallel CTs.
Secondary Parallel CT Ratio	Shows the Secondary current rating of the Parallel CTs.
Harmonic Compensation Method	Shows the compensation method. (Selective or Global)
CT Direction Detection	When this function is enabled the filter will diagnose the polarity of External CTs. When the polarity is incorrect the filter will alarm and cannot be started up.
Phase A CT	When the polarity of an External CT is incorrect, reversing the CT's polarity here eliminates the need to reconnect the CT wires.
Phase B CT	
Phase C CT	
Primary Voltage Level	The filter allows you to apply different voltage levels from an external transformer installed at the input side of the filter. When an external transformer is used the voltage level should be set to the primary voltage of the transformer.
Parallel CT Test	Click the parallel CT test icon to test the parallel CT; if any setting change is needed, please contact your local authorized service agent.

3-2-3-5. Contact Settings



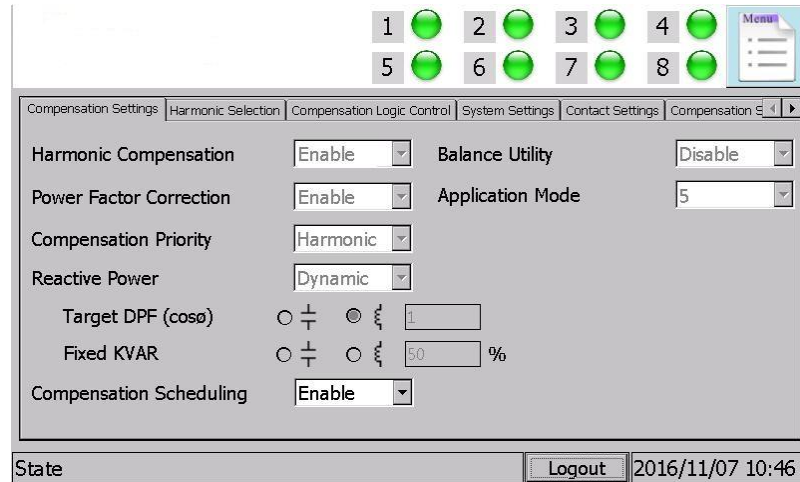
K1 / K2 / K3	This is the status of each dry contact; the definition of each dry contact is shown in table 3-1. There are total 23 events and status to be chosen. Dry contacts can be chosen as either NO(Normal Open) or NC(Normal Close). The default definitions of dry contacts are shown in table 2-4.
Remote Control Function	Display the status of external input dry contact, ON/OFF Mode or Time Compensation Mode.
Remote Control Mode	Display the mode of external input dry contact. Please refer to Chapter 2-2-4-1.
EPO Status	Display the status (NO/NC) of external power emergency off (EPO).

Table 3-1 Event List

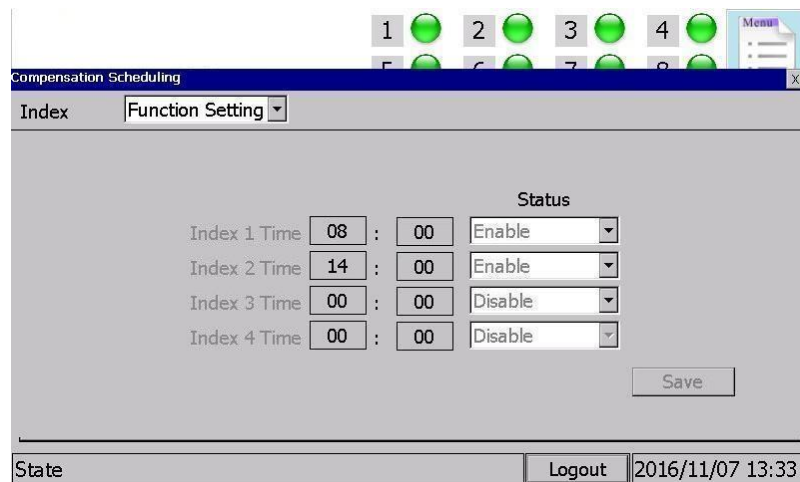
Item	Event	Item	Event
1	Power ON	2	Filtering
3	Full Correcting	4	Error(CM)
5	CT Installation Error	6	System Voltage Abnormal
7	Control Board Abnormal (CM)	8	Control Board Abnormal (PM)
9	Memory Error (LED Panel)	10	Communication Error (CM)
11	DC Bus Abnormal	12	DC Bus Over Voltage
13	DC Bus Under Voltage	14	Over Temperature
15	Fan Fault	16	Over Current
17	Inverter Error	18	High Frequency Resonance
19	MC Tripped	20	Main Fuse Blown
21	Control Cable Error	22	Micro Switch unclosed
23	Operation Mode Setting Error	24	Error(PM)

3-2-3-6. Compensation Scheduling

- 1) When the Compensation Scheduling is Enable in Compensation Settings page, there will appear Compensation Settings menu.

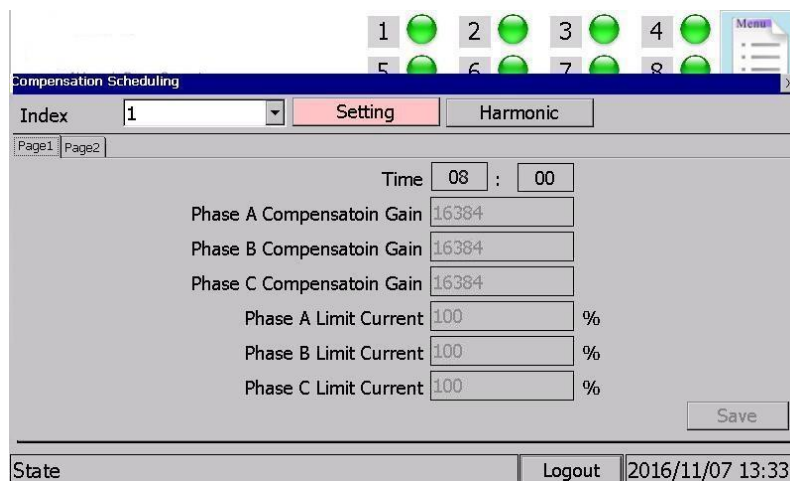


- 2) Click Compensation Settings menu and go into Compensation Settings page. Click Function Settings and then can see Index time and the status(Enable/Disable).

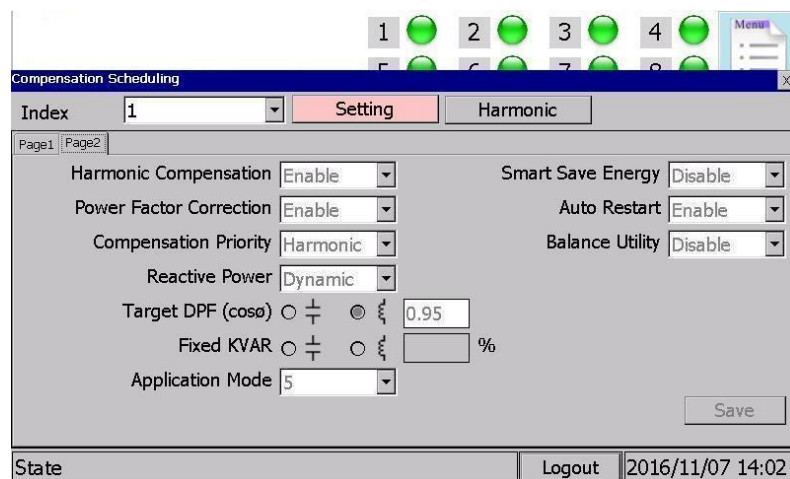


Index	Time	Status
Index 1 Time	08 : 00	Enable
Index 2 Time	14 : 00	Enable
Index 3 Time	00 : 00	Disable
Index 4 Time	00 : 00	Disable

- 3) Select Index 1~4 and click Setting icon, and then can see compensation settings of each Index.

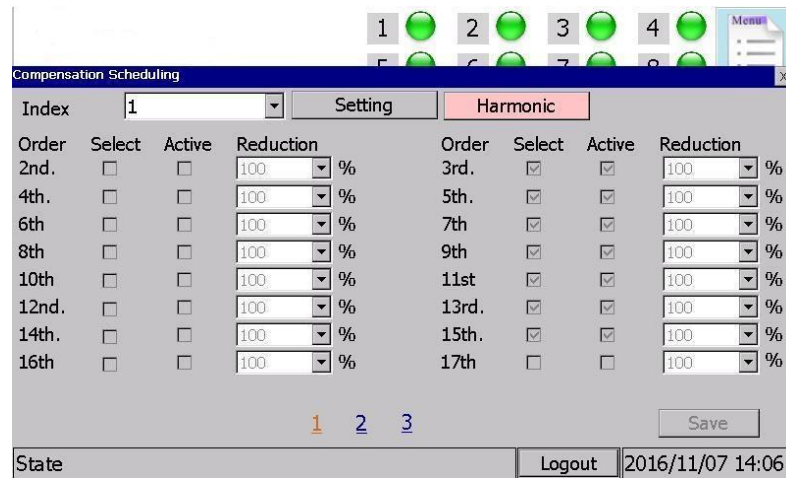


The screenshot shows the 'Compensation Scheduling' window with the 'Setting' tab selected for Index 1. The interface includes a top navigation bar with buttons 1 through 8 and a 'Menu' button. Below the index selection, there are tabs for 'Page1' and 'Page2'. The main settings area includes a 'Time' field set to '08 : 00', and three 'Phase A Compensation Gain', 'Phase B Compensation Gain', and 'Phase C Compensation Gain' fields, all set to '16384'. Below these are 'Phase A Limit Current', 'Phase B Limit Current', and 'Phase C Limit Current' fields, all set to '100 %'. A 'Save' button is located at the bottom right of the settings area. At the bottom of the window, there is a 'State' field, a 'Logout' button, and a timestamp '2016/11/07 13:33'.



The screenshot shows the 'Compensation Scheduling' window with the 'Setting' tab selected for Index 1. The interface includes a top navigation bar with buttons 1 through 8 and a 'Menu' button. Below the index selection, there are tabs for 'Page1' and 'Page2'. The main settings area includes a 'Harmonic Compensation' dropdown set to 'Enable', a 'Power Factor Correction' dropdown set to 'Enable', a 'Compensation Priority' dropdown set to 'Harmonic', a 'Reactive Power' dropdown set to 'Dynamic', a 'Target DPF (cosφ)' field set to '0.95', a 'Fixed KVAR' field set to '0 %', and an 'Application Mode' dropdown set to '5'. On the right side, there are three more dropdowns: 'Smart Save Energy' set to 'Disable', 'Auto Restart' set to 'Enable', and 'Balance Utility' set to 'Disable'. A 'Save' button is located at the bottom right of the settings area. At the bottom of the window, there is a 'State' field, a 'Logout' button, and a timestamp '2016/11/07 14:02'.

- 4) Click Harmonic icon, and then can see harmonic order settings of each Index.

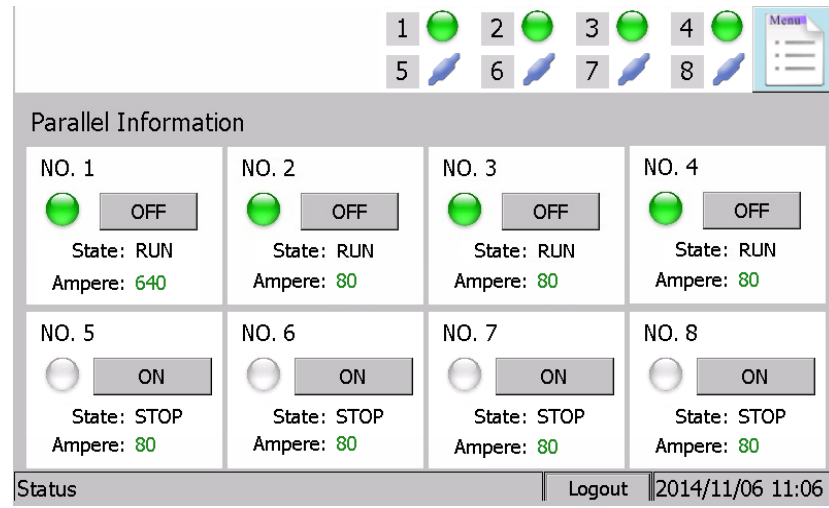


Order	Select	Active	Reduction	%
2nd.	<input type="checkbox"/>	<input type="checkbox"/>	100	%
4th.	<input type="checkbox"/>	<input type="checkbox"/>	100	%
6th.	<input type="checkbox"/>	<input type="checkbox"/>	100	%
8th.	<input type="checkbox"/>	<input type="checkbox"/>	100	%
10th.	<input type="checkbox"/>	<input type="checkbox"/>	100	%
12nd.	<input type="checkbox"/>	<input type="checkbox"/>	100	%
14th.	<input type="checkbox"/>	<input type="checkbox"/>	100	%
16th.	<input type="checkbox"/>	<input type="checkbox"/>	100	%

Order : Harmonic order
Selection : Selected harmonic order
Active : Harmonic order that is being compensated
Reduction : Harmonic reduction ratio
1 2 3 : Select to page1,2,3

3-2-4. Parallel Information

- 1) Press “Menu” → “Information” → “Parallel Information” to enter Parallel Information screen.



NO. 1	NO. 2	NO. 3	NO. 4
State: RUN Ampere: 640	State: RUN Ampere: 80	State: RUN Ampere: 80	State: RUN Ampere: 80
NO. 5	NO. 6	NO. 7	NO. 8
State: STOP Ampere: 80	State: STOP Ampere: 80	State: STOP Ampere: 80	State: STOP Ampere: 80

Status Logout 2014/11/06 11:06

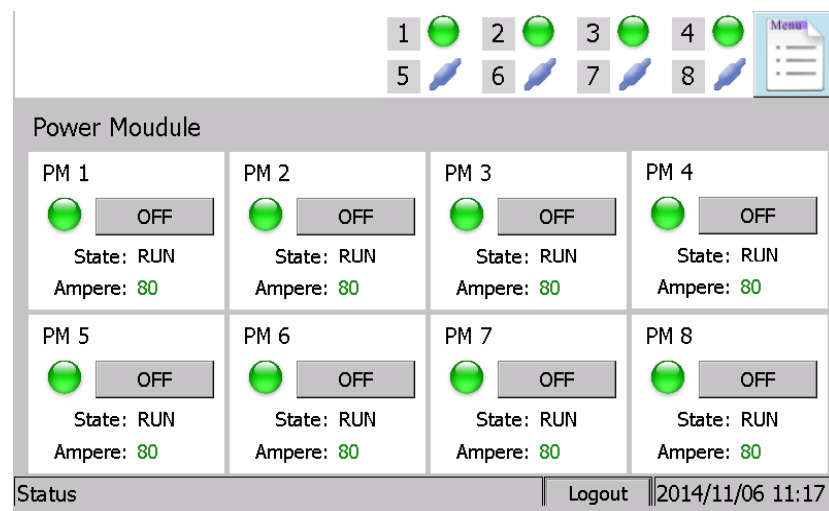
No. # : The number of the parallel filter

ON/OFF button : To turn-on/turn-off the filter

State : The state of the filter

Ampere : The current rating of the filter

- 2) Press “NO.1” to enter Power Module screen.



PM 1	PM 2	PM 3	PM 4
State: RUN Ampere: 80	State: RUN Ampere: 80	State: RUN Ampere: 80	State: RUN Ampere: 80
PM 5	PM 6	PM 7	PM 8
State: RUN Ampere: 80	State: RUN Ampere: 80	State: RUN Ampere: 80	State: RUN Ampere: 80

Status Logout 2014/11/06 11:17

PM. (Power Module) : The number of the Power Module

ON/OFF : To turn-on/turn-off the Power Module

State : The state of the Power Module

Ampere (Current Rated) : The current rating of the Power Module

3-3. Meter

3-3-1. Parameter

- 1) Press “Menu”→ “Meter” → “Parameter” to enter Parameter screen.
- 2) On Load Side and Source Side pages show the following parameters.

Load Side	Source Side	Filter	Temp.
Freq	60.05	Hz	THD
Vab	397	V	1.5
Vbc	397	V	1.5
Vca	397	V	1.5
Ia	169	A	35.9
Ib	169	A	36.2
Ic	169	A	36
In	0	A	

- 3) On Filter page show the following parameters.

Load Side	Source Side	Filter	Temp.
Freq	60.05	Hz	THD
Vab	397	V	1.5
Vbc	397	V	1.5
Vca	397	V	1.5
Ia	70	A	
Ib	70	A	
Ic	70	A	
In	0	A	

- 4) On Temperature page show the following parameters.

Temperature	
Control Module 1 Temp.	40 ℃
Power Module Temp. and DC Bus Voltage	
Control Module 2 Temp.	40 ℃
Power Module Temp. and DC Bus Voltage	
Control Module 3 Temp.	40 ℃
Power Module Temp. and DC Bus Voltage	
Control Module 4 Temp.	40 ℃
Power Module Temp. and DC Bus Voltage	
OK	

Temperature and DC Bus

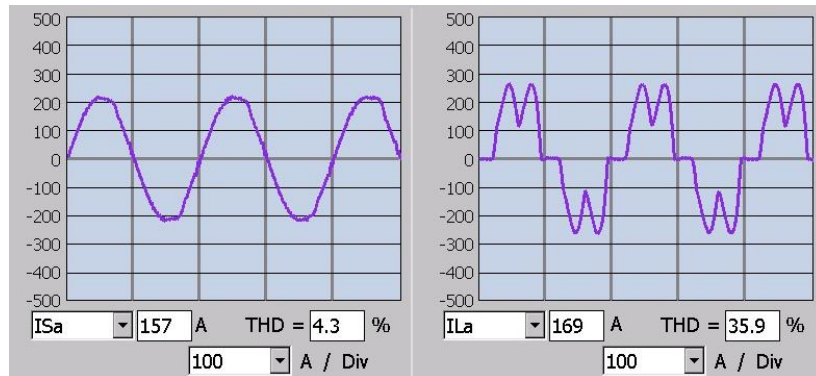
CM 1 : Power Module 1 2 3 4 5 6 7 8

IGBT A Temp.	37 °C	Choke B Temp.	42 °C
IGBT B Temp.	38 °C	Choke C Temp.	43 °C
IGBT C Temp.	39 °C	Positive DC Bus Voltage	400.00 V
Equalizer Temp.	40 °C	Negative DC Bus Voltage	400.00 V
Choke A Temp.	41 °C	Fan Speed	0 RPM

OK

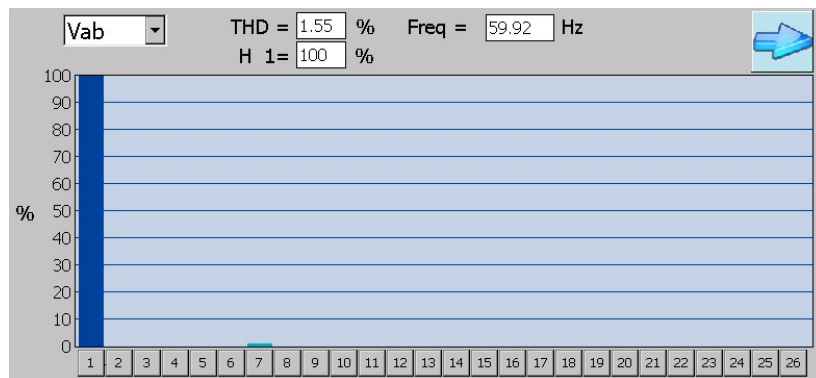
3-3-2. Waveform

- 1) Press “Menu”→ “Meter” → “Waveform” to enter Waveform screen.



3-3-3. Spectrum

- 1) Press “Menu”→ “Meter”→ “Spectrum” to enter Spectrum screen.



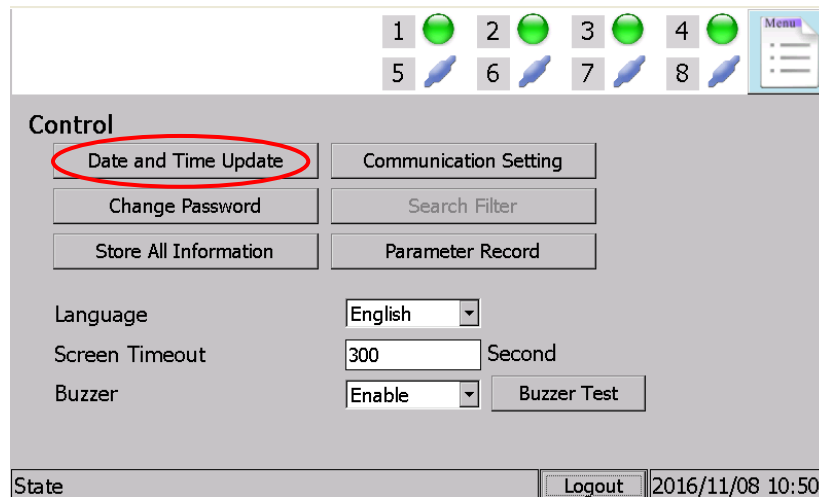
: Show next page information

3-4. Control

Press “Menu”→ “Control” to enter Control screen.

3-4-1. Date and Time Update

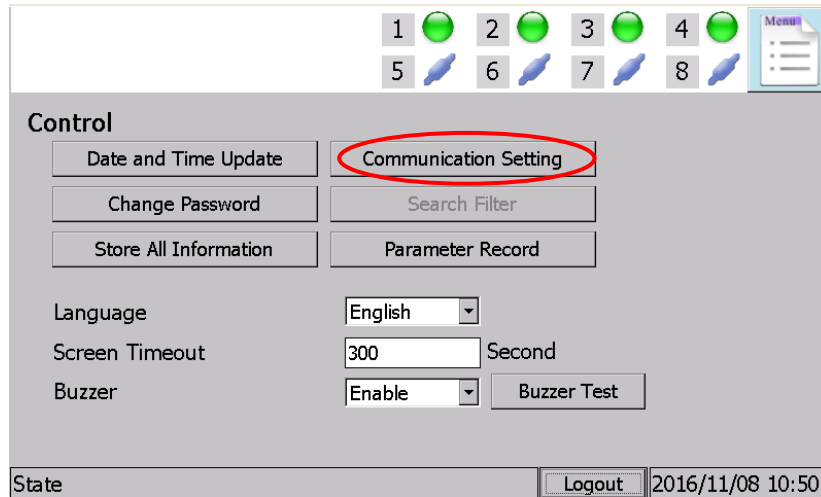
Press “Date and Time Update” to set the system date and time °




Note: The current date and time will be lost and reset to the initial conditions (2000-00-00 00:00:00) when the filter is disconnected from the power utility for 168 hours (7 days). This change will not affect the stored parameters in the control panel.

3-4-2. Communication Setting

Press “Communication Setting” to enter Communication screen.



The screenshot shows the main control panel with a grid of buttons at the top (1-8) and a 'Menu' button. The 'Control' section contains buttons for 'Date and Time Update', 'Communication Setting' (highlighted with a red circle), 'Change Password', 'Search Filter', 'Store All Information', and 'Parameter Record'. Below these are settings for 'Language' (English), 'Screen Timeout' (300 Second), and 'Buzzer' (Enable) with a 'Buzzer Test' button. At the bottom, there is a 'State' field, a 'Logout' button, and a timestamp '2016/11/08 10:50'.

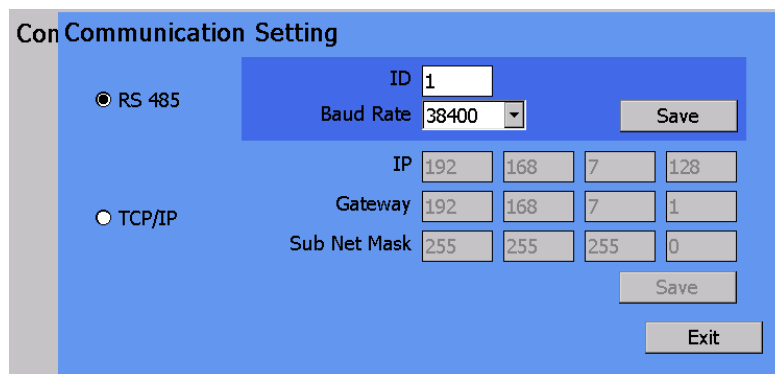
There are two kind of communication ports can be chosen.
If RS-485 is choosen, please set ID and Baud Rate.

ID : 1~255

Baud Rate : 2,400~57,600 bps

If TCP/IP is used, please set IP, Gateway and Subnet Mask.

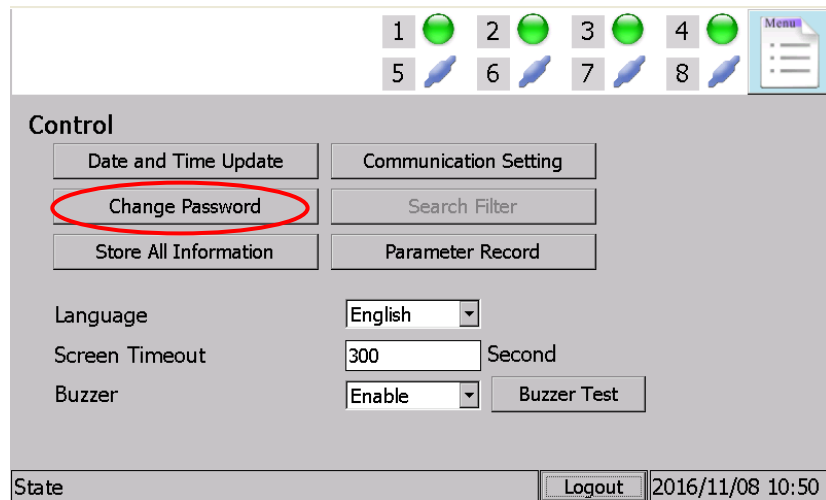
Note: After the TCP/IP communication setting is completed, the panel must be restart and then the setting will be written in.



The screenshot shows the 'Communication Setting' screen. It has two radio buttons: 'RS 485' (selected) and 'TCP/IP'. For 'RS 485', there are fields for 'ID' (1) and 'Baud Rate' (38400) with a 'Save' button. For 'TCP/IP', there are fields for 'IP' (192.168.7.128), 'Gateway' (192.168.7.1), and 'Sub Net Mask' (255.255.255.0) with 'Save' and 'Exit' buttons.

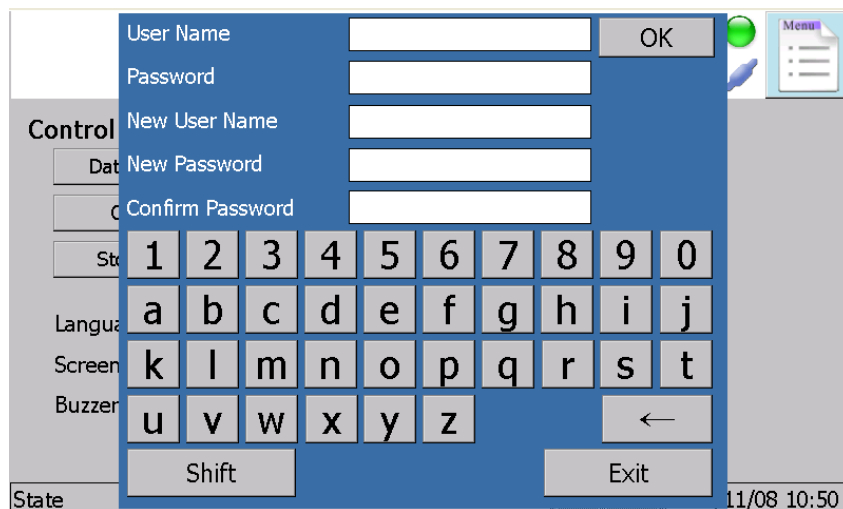
3-4-3. Change Password

Press “Change Password” to enter Change Password screen.



The screenshot shows the 'Control' screen of the device. At the top, there are eight status indicators (1-8) with green and blue lights. Below them are buttons for 'Date and Time Update', 'Communication Setting', 'Change Password' (highlighted with a red circle), 'Search Filter', 'Store All Information', and 'Parameter Record'. There are also settings for 'Language' (English), 'Screen Timeout' (300 Second), and 'Buzzer' (Enable) with a 'Buzzer Test' button. At the bottom, there is a 'Logout' button and a timestamp '2016/11/08 10:50'.

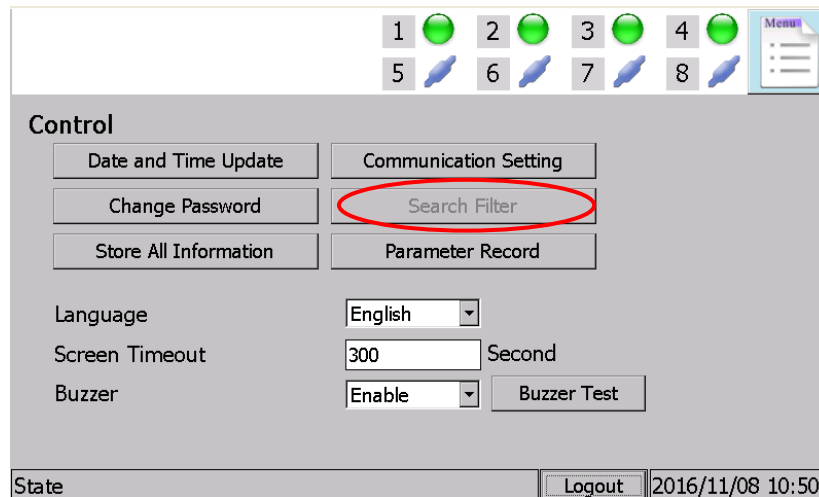
Please fill in the blanks below and then press “OK” for changes your username and password immediately.



The screenshot shows a dialog box for changing the password. It has five input fields: 'User Name', 'Password', 'New User Name', 'New Password', and 'Confirm Password'. To the right of the 'User Name' field is an 'OK' button. Below the input fields is a numeric keypad (0-9) and an 'Exit' button. The dialog box is overlaid on the 'Control' screen, which is partially visible in the background.

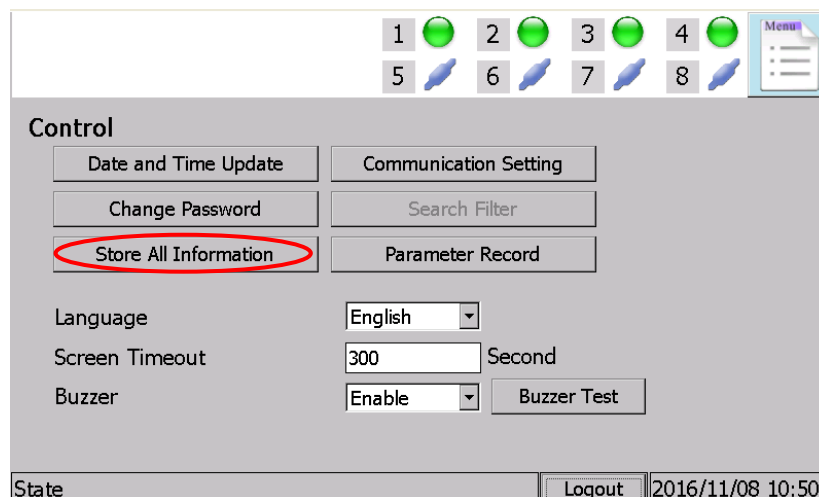
3-4-4. Search Filter

Press “Search Filter” to find out and connect the filter units. If you want to add or remove the filter, please consult your local authorized service agent for help.

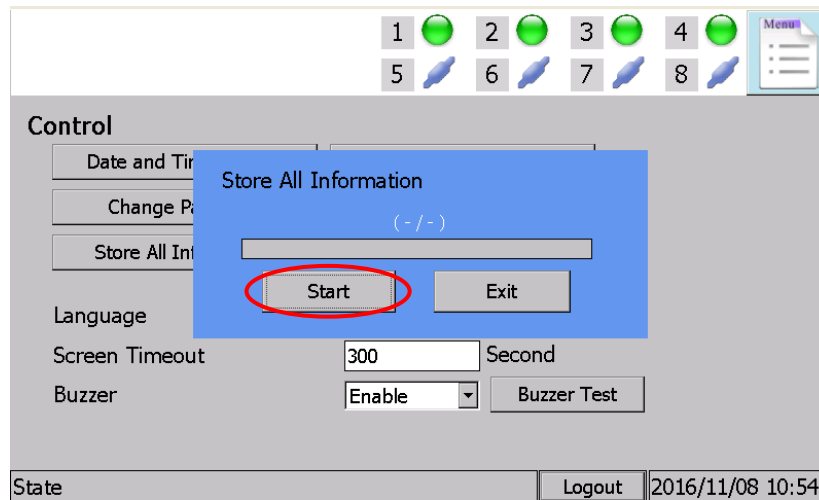


3-4-5. Store All Information

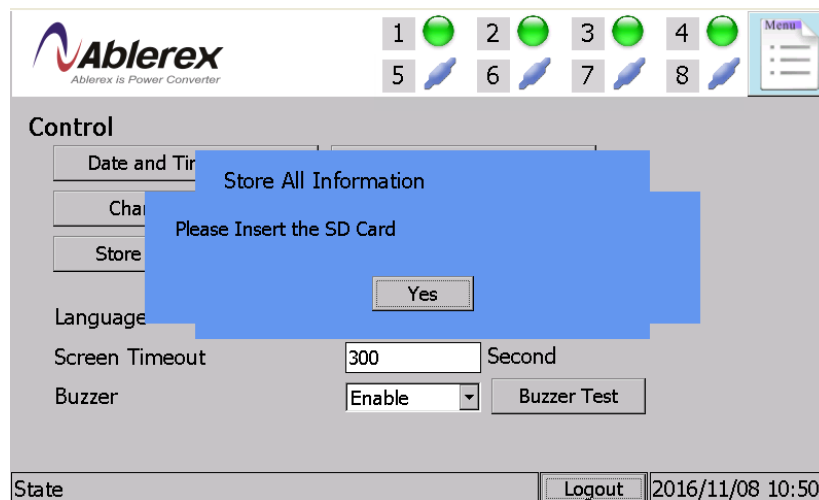
- 1) Store currently information to the SD card, including all settings, power parameter, waveform, and spectrum.



- 2) Click Start icon to start storing. After the storing is complete, you can read the information by inserting the SD card to a computer.

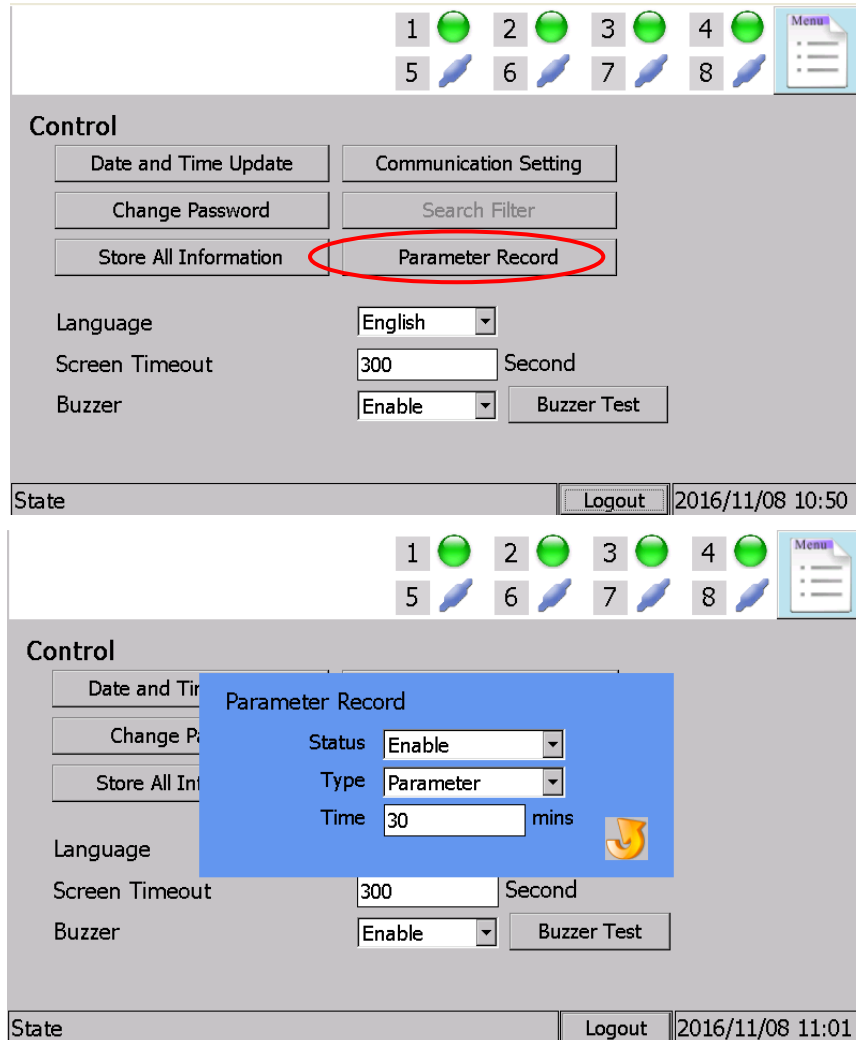


- 3) When the SD card is abnormal or no SD card is inside, below message will appear.



3-4-6. Parameter Record

- 1) It's able to setup the schedule to store the power parameter and waveform of the filter to the SD card.



The first screenshot shows the 'Control' panel with the 'Parameter Record' button circled in red. The second screenshot shows the 'Parameter Record' dialog box with the following settings:

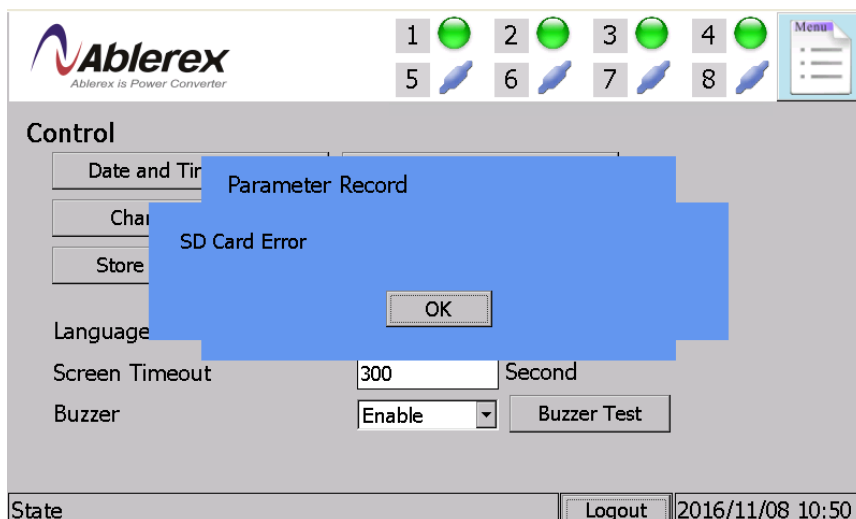
- Status: Enable
- Type: Parameter
- Time: 30 mins

The background settings in the second screenshot are:

- Language: English
- Screen Timeout: 300 Second
- Buzzer: Enable

The status bar at the bottom shows 'Logout' and the time '2016/11/08 11:01'.

- 2) When the SD card is abnormal or no SD card is inside, below message will appear.

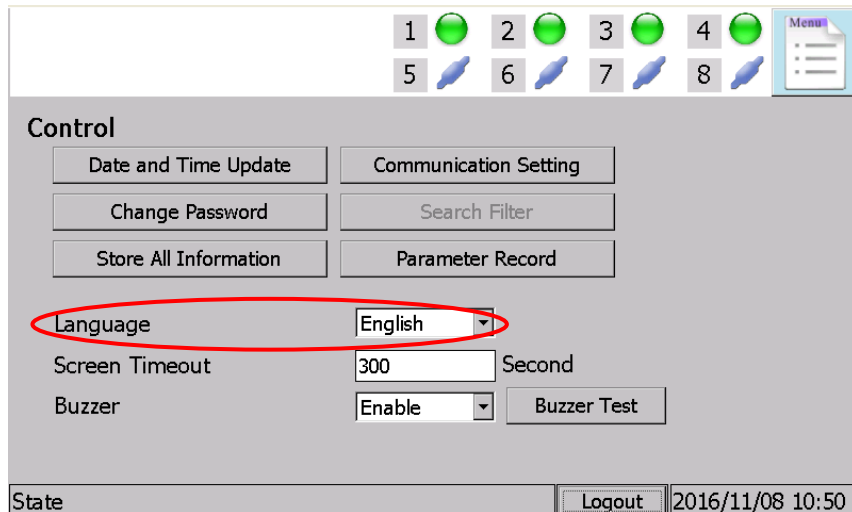


The screenshot shows the 'Control' panel with an 'SD Card Error' message box overlaid. The message box contains the text 'SD Card Error' and an 'OK' button. The background settings are the same as in the previous screenshots.

The status bar at the bottom shows 'Logout' and the time '2016/11/08 10:50'.

3-4-7. Language

Select the language that you would like to use.



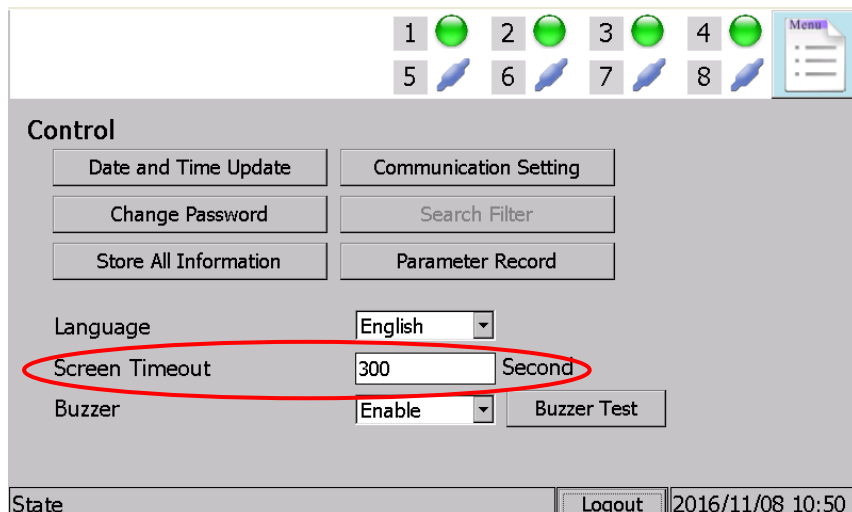
The screenshot shows the 'Control' panel with various settings. The 'Language' dropdown menu is highlighted with a red circle and is currently set to 'English'. Other settings include 'Date and Time Update', 'Communication Setting', 'Change Password', 'Search Filter', 'Store All Information', 'Parameter Record', 'Screen Timeout' (300 Second), and 'Buzzer' (Enable). The 'Logout' button and the date/time '2016/11/08 10:50' are visible at the bottom right.

3-4-8. Screen Timeout

After a period of inactivity, the screen turns off to conserve power. You can set the idle time before the screen turns off.

The time setting range from 60 to 3600 seconds.

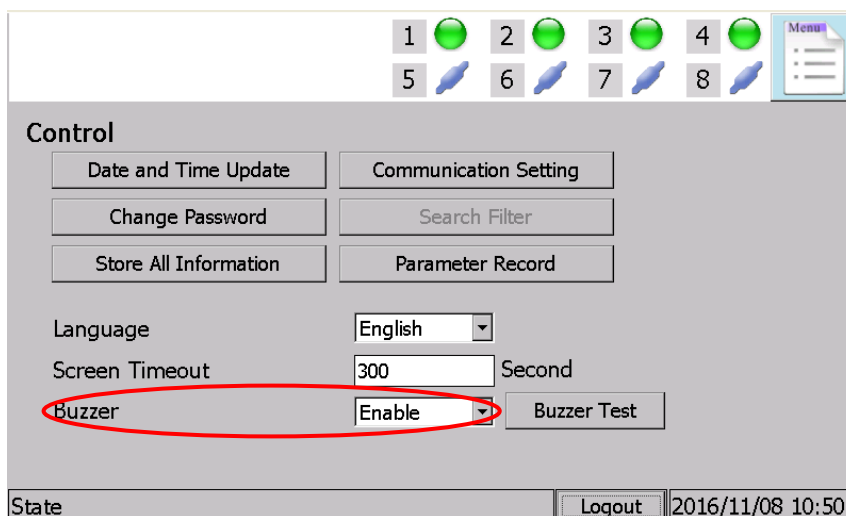
This function will be disabled while set to “0”.



The screenshot shows the 'Control' panel with various settings. The 'Screen Timeout' dropdown menu is highlighted with a red circle and is currently set to '300 Second'. Other settings include 'Language' (English), 'Date and Time Update', 'Communication Setting', 'Change Password', 'Search Filter', 'Store All Information', 'Parameter Record', and 'Buzzer' (Enable). The 'Logout' button and the date/time '2016/11/08 10:50' are visible at the bottom right.

3-4-9. Buzzer

To enable or disable the buzzer.



The screenshot displays the 'Control' interface of the Ablerex system. At the top, there are eight status indicators numbered 1 through 8, each with a green circle and a blue arrow. Below these is a 'Menu' button. The main area is titled 'Control' and contains several buttons: 'Date and Time Update', 'Communication Setting', 'Change Password', 'Search Filter', 'Store All Information', and 'Parameter Record'. Below these buttons, there are three settings: 'Language' set to 'English', 'Screen Timeout' set to '300' seconds, and 'Buzzer' set to 'Enable'. The 'Buzzer' setting is circled in red. To the right of the 'Buzzer' dropdown is a 'Buzzer Test' button. At the bottom, there is a 'State' label, a 'Logout' button, and a timestamp '2016/11/08 10:50'.

Control
Date and Time Update
Communication Setting
Change Password
Search Filter
Store All Information
Parameter Record
Language: English
Screen Timeout: 300 Second
Buzzer: Enable
Buzzer Test
State
Logout
2016/11/08 10:50

4. Installation and Wiring

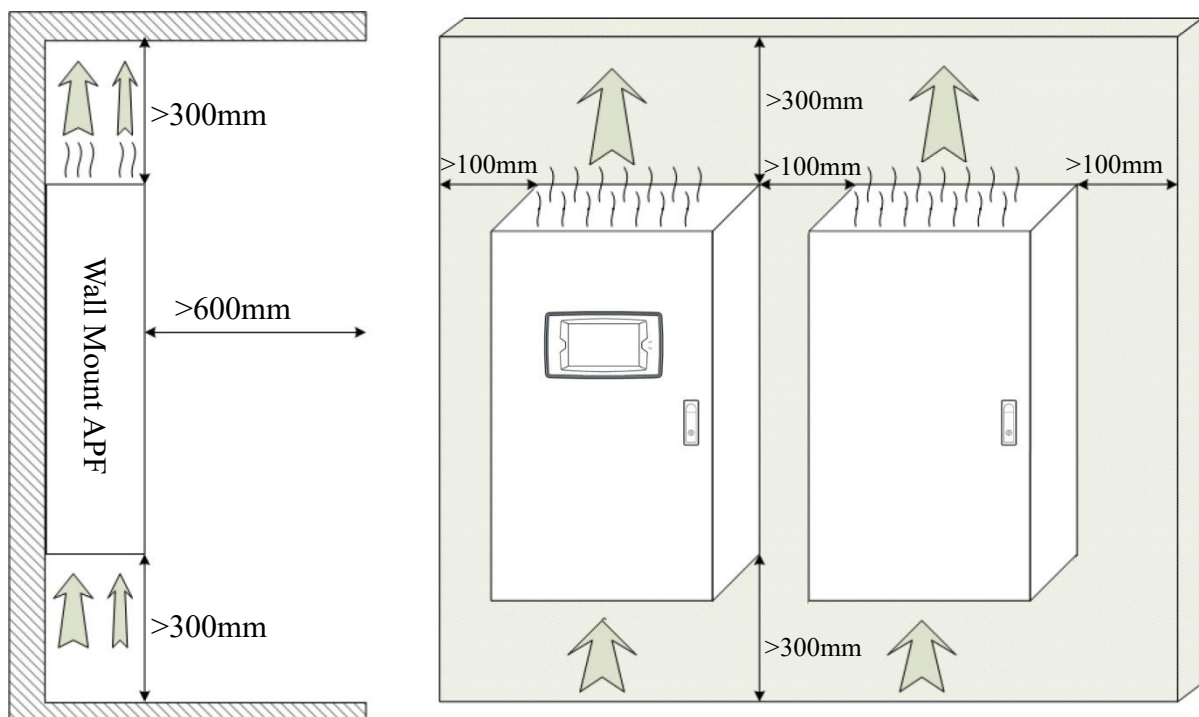
4-1. Installation Environment

1. Because the **Enersine** is an electronic control device, its installation environment can affect its operational reliability and lifetime. The filter is equipped with cooling fans to reduce the heat generated during operation. Therefore, do not block the ventilation openings during installation.
2. Do not install the filter in an environment which is overly dusty, hot, humid, corrosive, or vibrating. It is strongly recommended that you install the filter in a clean and dust-free room with controlled temperature at 15-25 °C. °

4-2. General Requirement for Ventilation and Maintenance

During installation ensure that the following conditions are met.

1. Keep at least 300 mm of air-flow space around both the top and bottom of the filter, and do not block the air flow around the filter.
2. Keep at least 600 mm of free space in front of the filter for future maintenance purposes.
3. The space between two filters must be at least 100 mm.



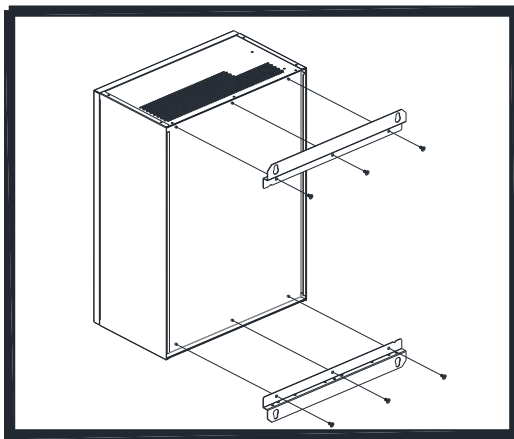
4-3. Installation

4-3-1. For One Master

Step1 : Install the holder for wall mount.

Installation list : 【 1 】 holder for wall mount × 2

【 2 】 M5 Nut × 6



Step2 : Power cables and protection cap installation, Please refer to section 4-4-2 to choose the suitable power cable size, If the system is 3P3W then the neutral cable does not need to be connected.

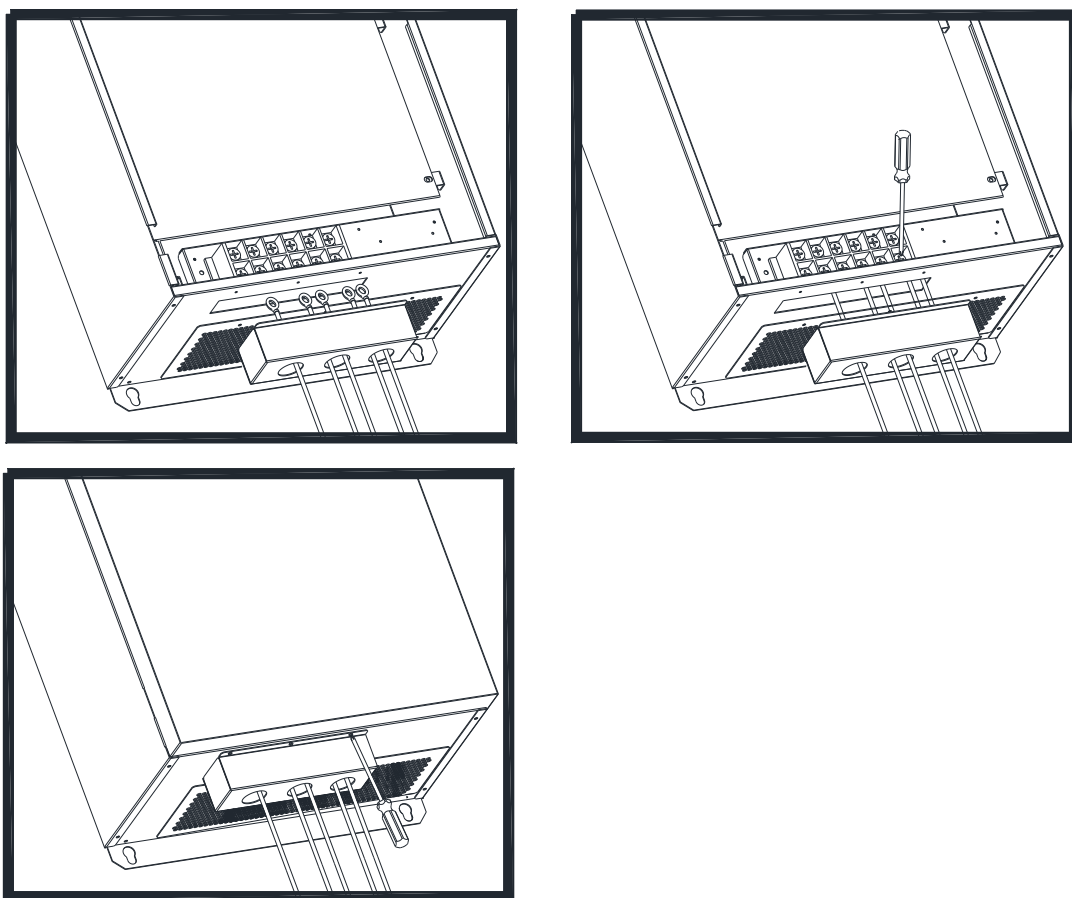
Installation list : 【 1 】 Protection cap × 1

【 2 】 M4 8mm truss screws × 3

【 3 】 Power cables × 3

【 4 】 Neutral cable × 1

【 5 】 Ground cable × 1



Step3 : External CTs installation. Refer to section 4-4-1 for specified guideline.

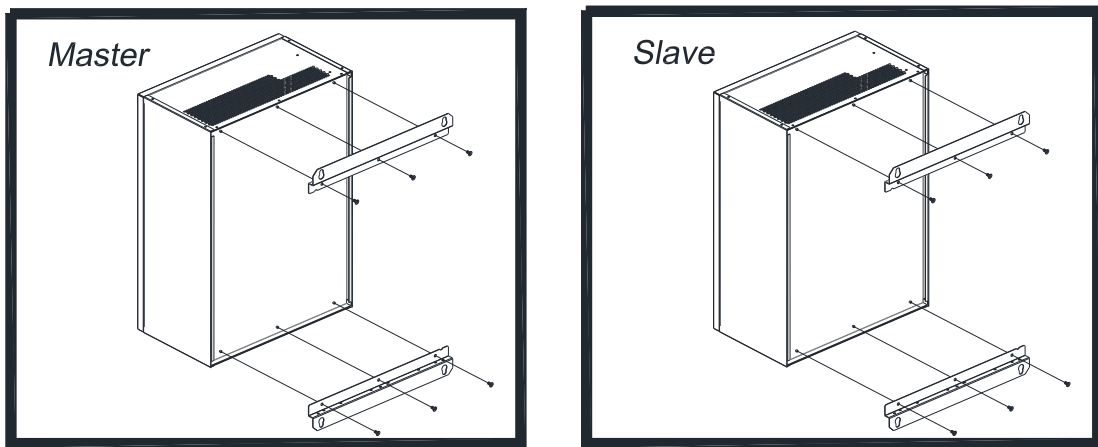
4-3-2. For One Master and N Units Slave

This chapter is to specify the installation process of a Master connecting to N units Slave. Master can connect with three Slave at maximum.

Step1 : Install the holder for wall mount.

Installation list : 【 1 】 holder for wall mount $\times 2+2N$

【 2 】 M5 Nut $\times 6+6N$



Step2 : Power cables and protection cap installation, and please refer to section 4-

4-2 to choose the suitable power cable size, If the system is 3P3W then the neutral cable does not need to be connected.

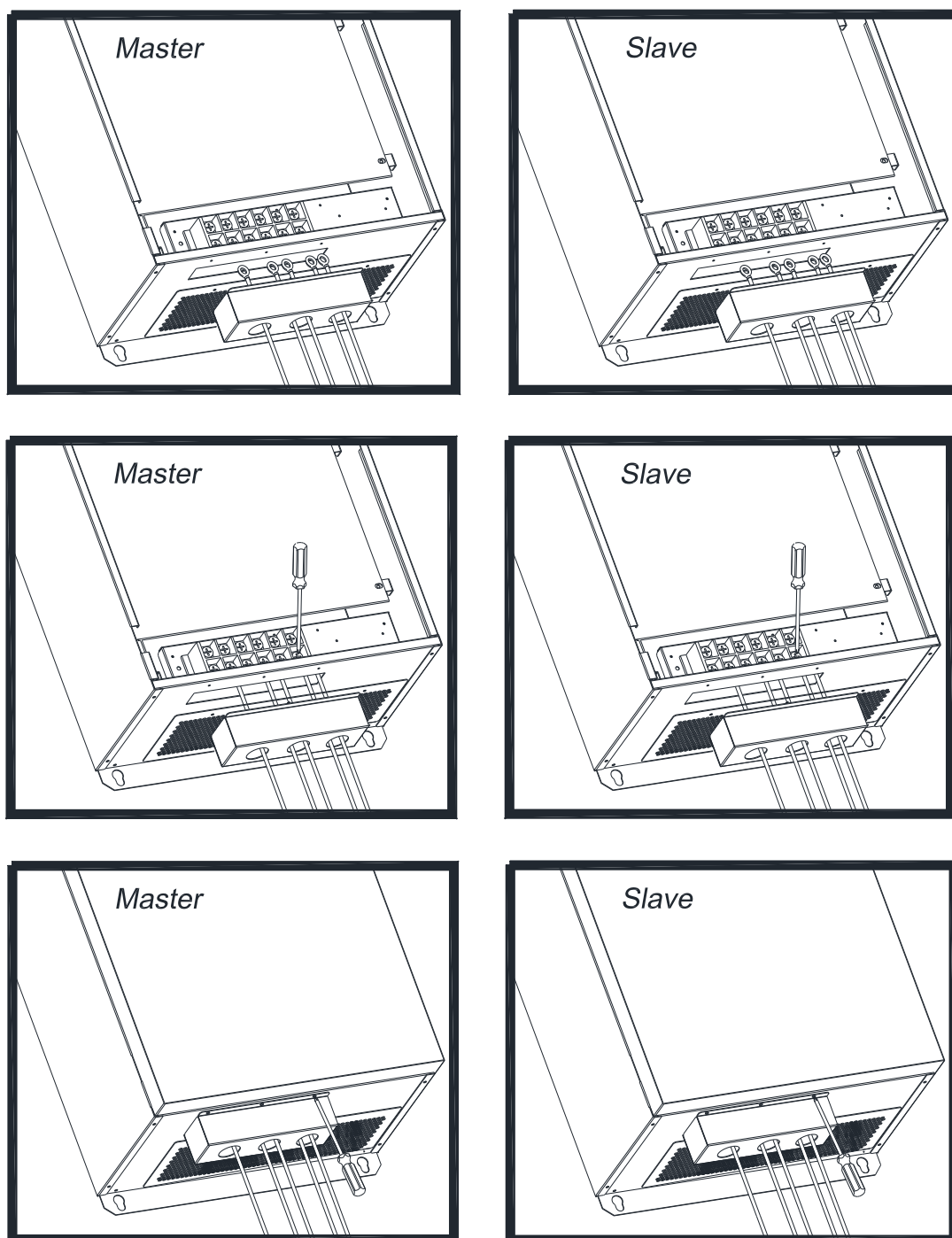
Installation list : 【 1 】 protection cap $\times 1+N$

【 2 】 M4 8mm truss screws $\times 3+3N$

【 3 】 Power cables $\times 3+3N$

【 4 】 Neutral cable $\times 1+N$

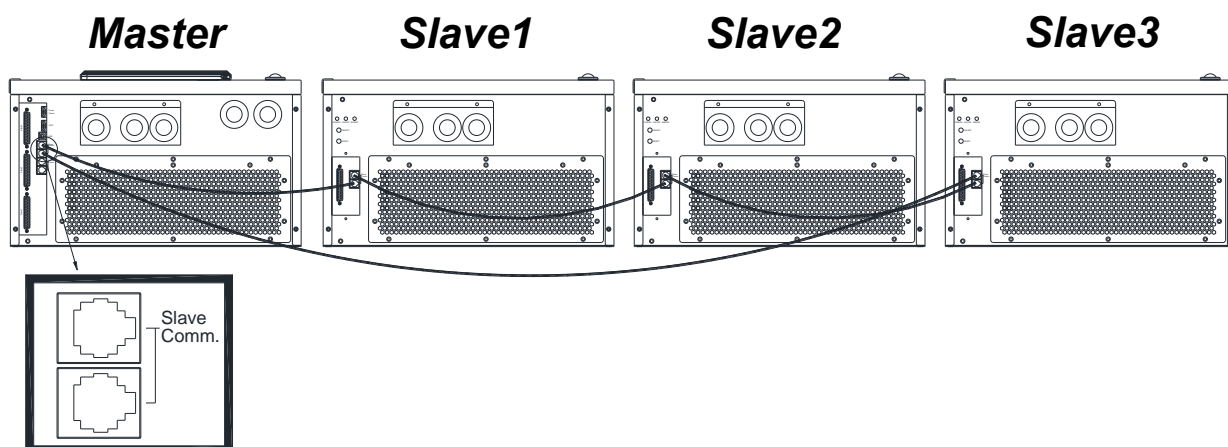
【 5 】 Ground cable $\times 1+N$



Step3 : Slave communication wiring installation.

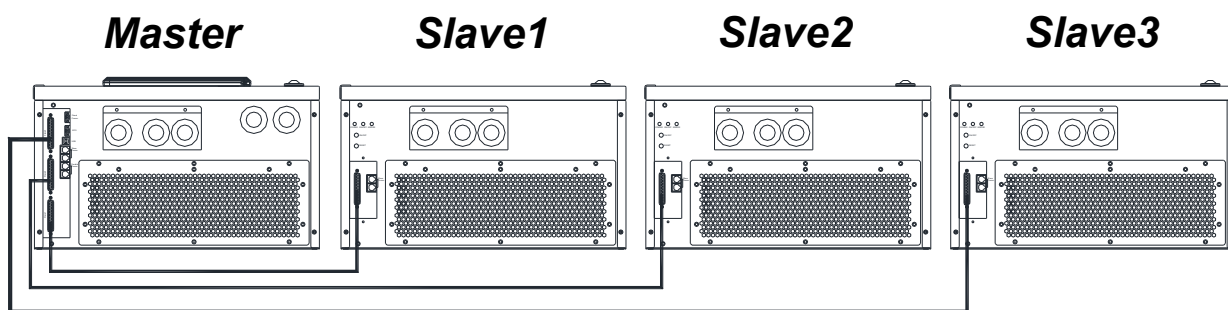
Installation list : 【 1 】 RJ11 communication cable 480cm × 1

【 2 】 RJ11 communication cable 130cm × N



Step4 : Control wiring installation.

Installation list : 【 1 】 37Pin control cable 150cm × N



Step5 : Parallel CTs installation. Refer to section 4-4-1 for specified guideline.

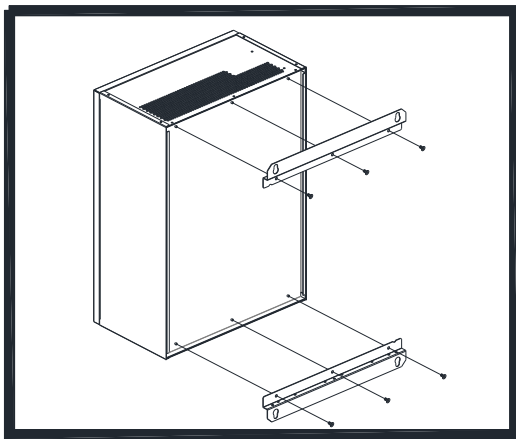
4-3-3. For N Units Master

This chapter is to specify the installation process of paralleling N units Master, and Master can be paralleled up to 5 units, the detail of the parallelable unit quantity of Master and Slave is described in chapter 1-3-2.

Step1 : Install the holder for wall mount.

Installation list : 【 1 】 holder for wall mount \times 2N

【 2 】 M5 Nut \times 6N



Step2 : Power cables and protection cap installation, and please refer to section 4-4-2 to choose the suitable power cable size, If the system is 3P3W then the neutral cable does not need to be connected.

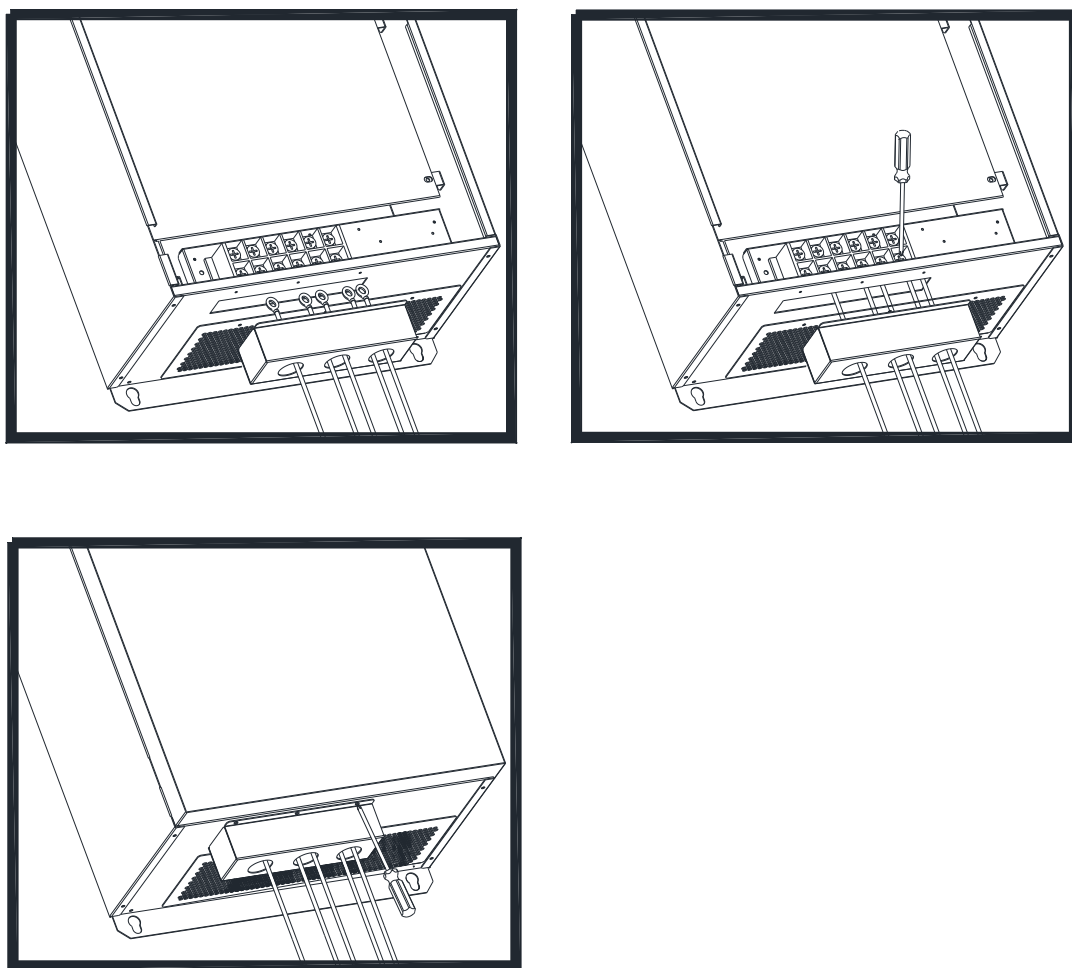
Installation list : 【 1 】 protection cap \times N

【 2 】 M4 8mm truss screws \times 3N

【 3 】 Power cables \times 3N

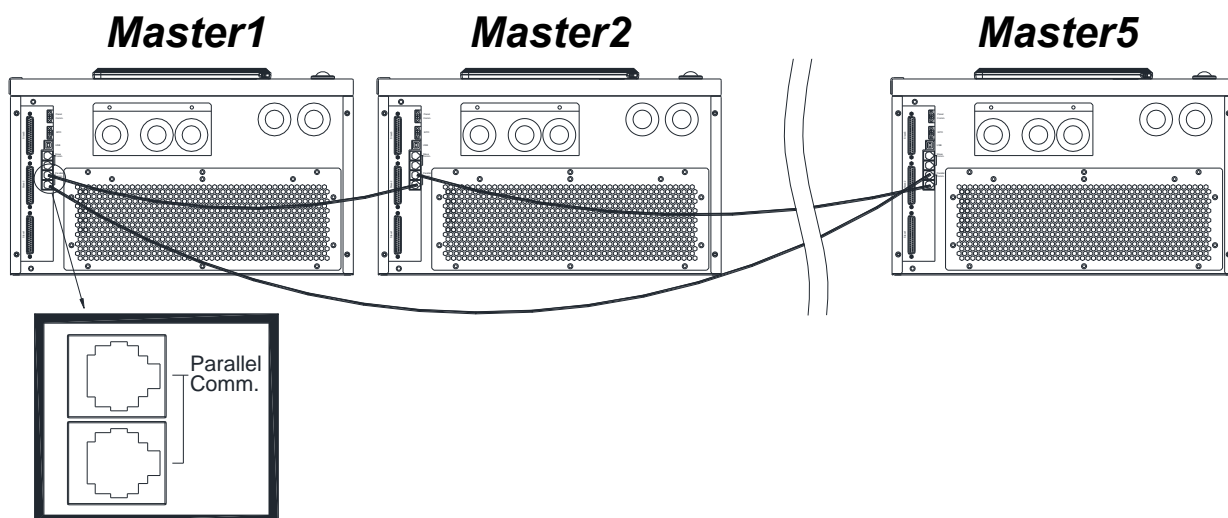
【 4 】 Neutral cable \times N

【 5 】 Ground cable \times N



Step3 : Parallel communication wiring installation.

Installation list : 【 1 】 RJ11 communication cable 480cm × N



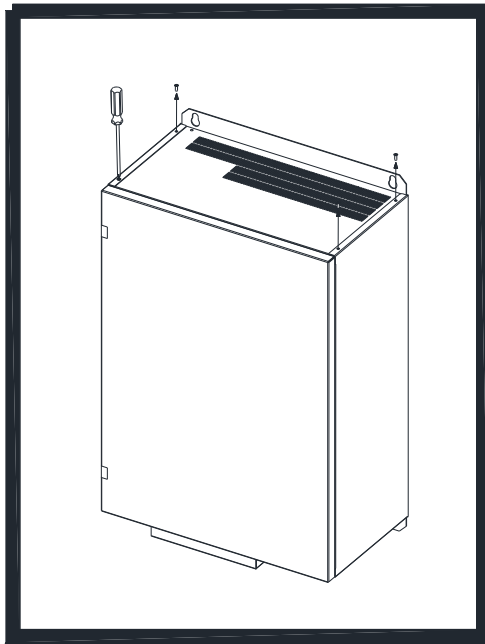
Step4 : Set the number of parallel units and the unique “Parallel Number” of each Master using our service software.

Step5 : External CTs and parallel CTs installation. Refer to section 4-4-1 for specified guideline.

4-3-4. IP31 Cover Plate

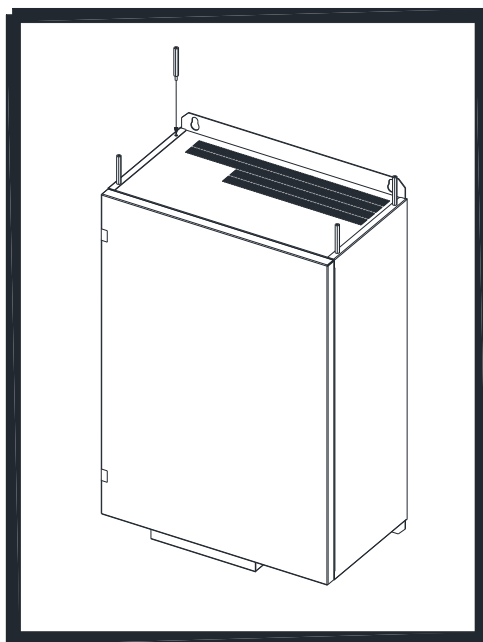
If IP31 is required, please install cover plate above the machine. The installation steps are specified as below.

Step1: remove the four screws above the machine.



Step2: install the IP31 cover plate fixing columns.

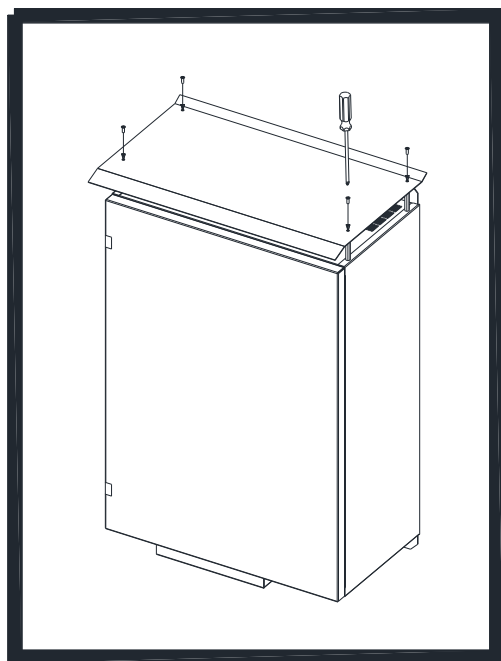
Installation list: **【 1 】 cover plate fixing column x 4**



Step3: install the IP31 cover plate, and use screws to fix it.

Installation list: 【1】 IP31 cover plate x 1

Installation list: 【2】 M4 6mm flat screw x 4



4-4. Wiring and Cables

4-4-1. CT Wiring

The **Enersine** can be used with 3-phase/3-wire or 3-phase/4-wire systems. A set of external CTs is needed for detect the load current. 3 Parallel CTs are required to install for measure the total output current of the filters when several filters operate in parallel.

Table 4-1 Recommended CT Cable Size

	Recommended Minimum Cable Size	Terminal Block Specification	Recommended Maximum Length
CT Cable	0.5mm ²	Hard-wire · 4mm ²	30m

Table 4-2 Recommended CT Specification

	External CT	Parallel CT
Accuracy	Class 1.0 or better	
CT Ratio	Primary 100~10,000A Secondary 1A /5A	1000/1A, 2000/1A, 3000/1A, 4000/1A

To avoid the possibility of interference with the CT output signal, do not place power cables and the CT twisted-pair signal cable in the same tray or conduit. If both power and signal cables need to be in the same tray or conduit, ensure that proper partitions are in place to provide isolation between them.

4-4-1-1. External CT Installation

The external CTs can be installed on the source side or on the load side as indicated in Figures 4-1 to 4-4. When used in a 3-phase/3-wire system, the connections can be made as in Figure 4-1 to 4-4. When used in a 3-phase/4-wire system, external CTs can be connected as in Figure 4-3 and Figure 4-4.

We recommend installing the external CTs on the source side, and we recommend using three CTs for the best performance. If the external CTs must be installed on the load side please contact your local authorized service agent.

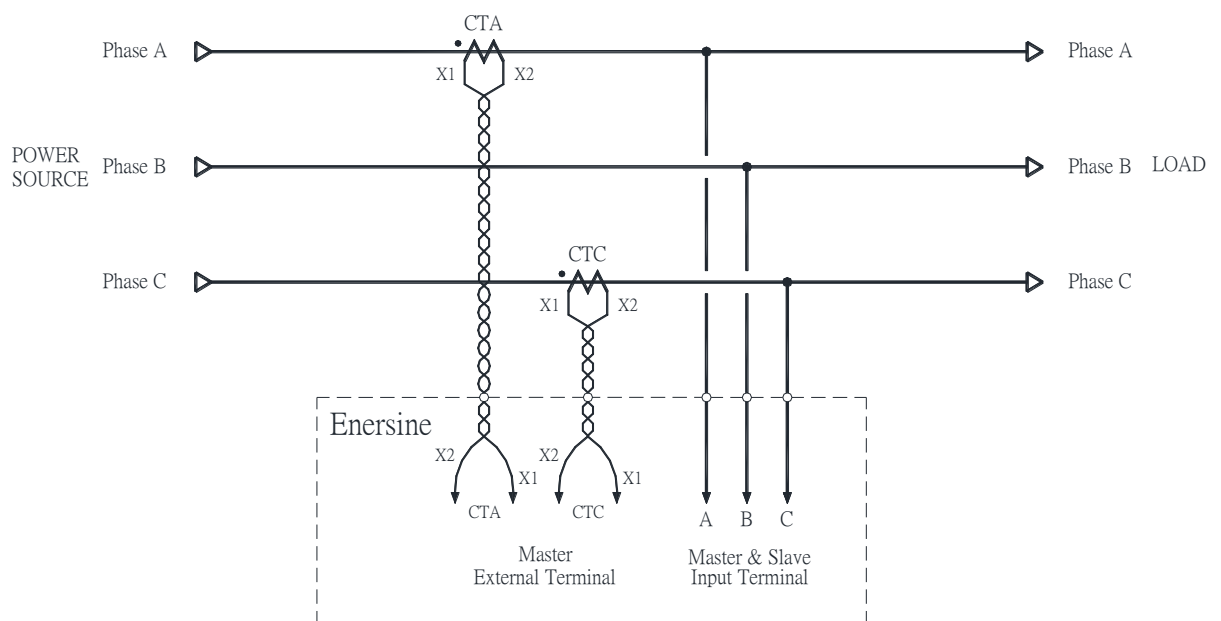


Figure 4-1 Two External CTs Installed at Source Side

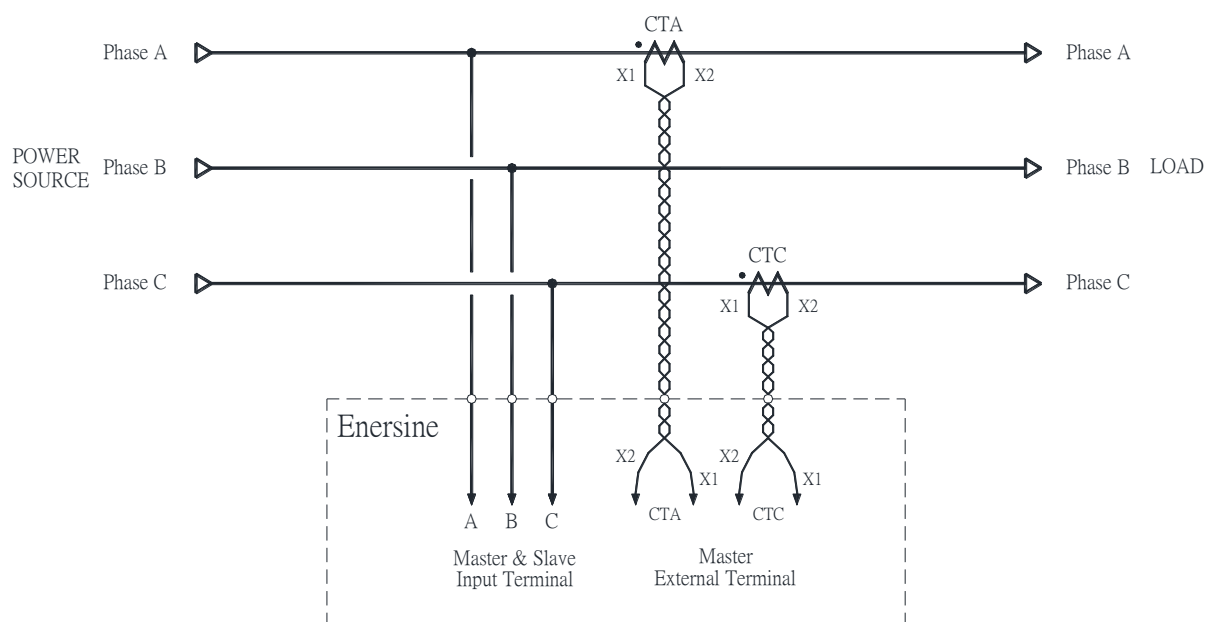


Figure 4-2 Two External CTs Installed at Load Side

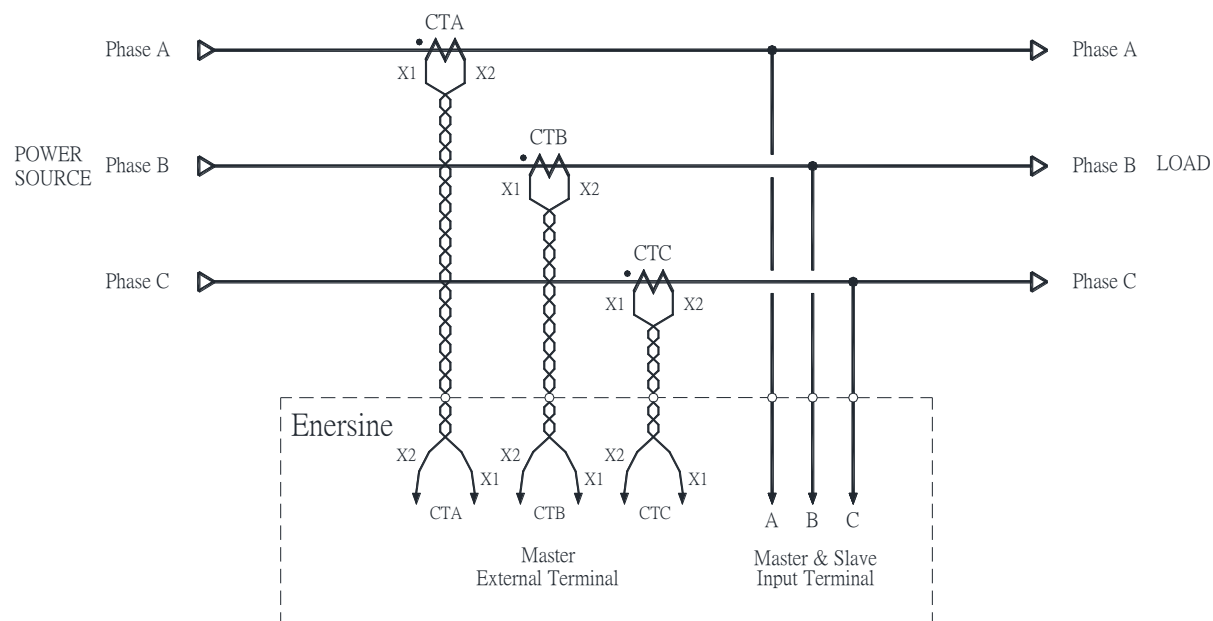


Figure 4-3 Three External CTs Installed at Source Side

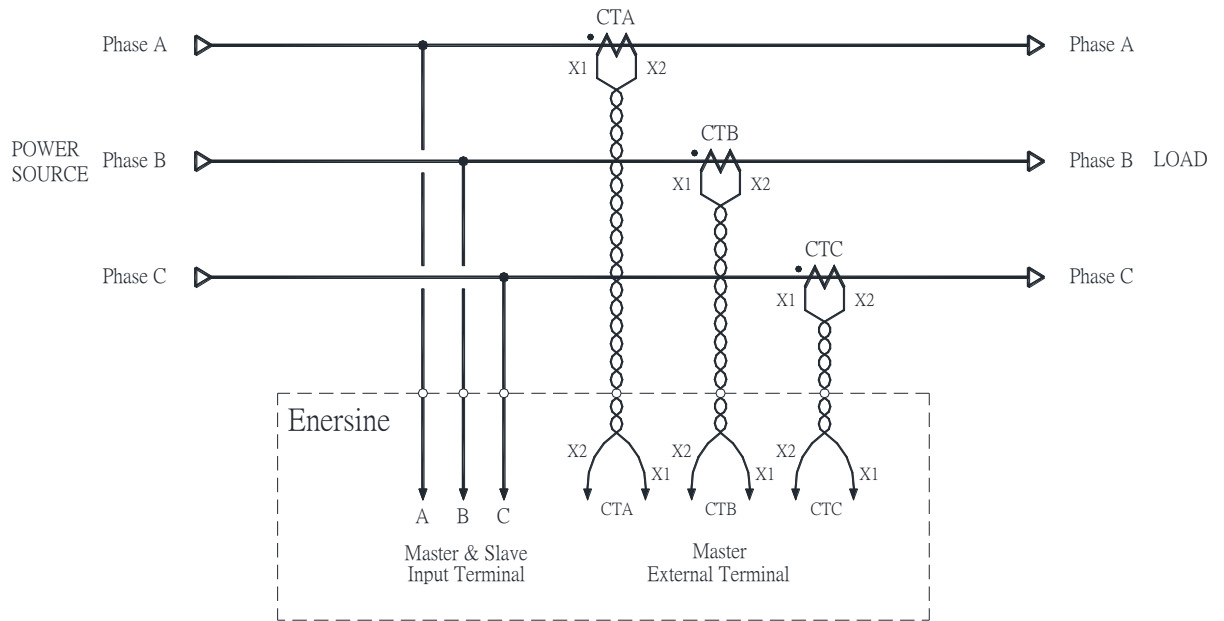


Figure 4-4 Three External CTs Installed at Load Side

When **Enersine** are installed in parallel, the RJ11 cables must be connected according to section 2-1-4. In addition, the wiring of the external CTs is different from the standalone unit. Each CT's output signals must be connected to the External terminal block of the **Enersine** in series as shown in Figure 4-5.

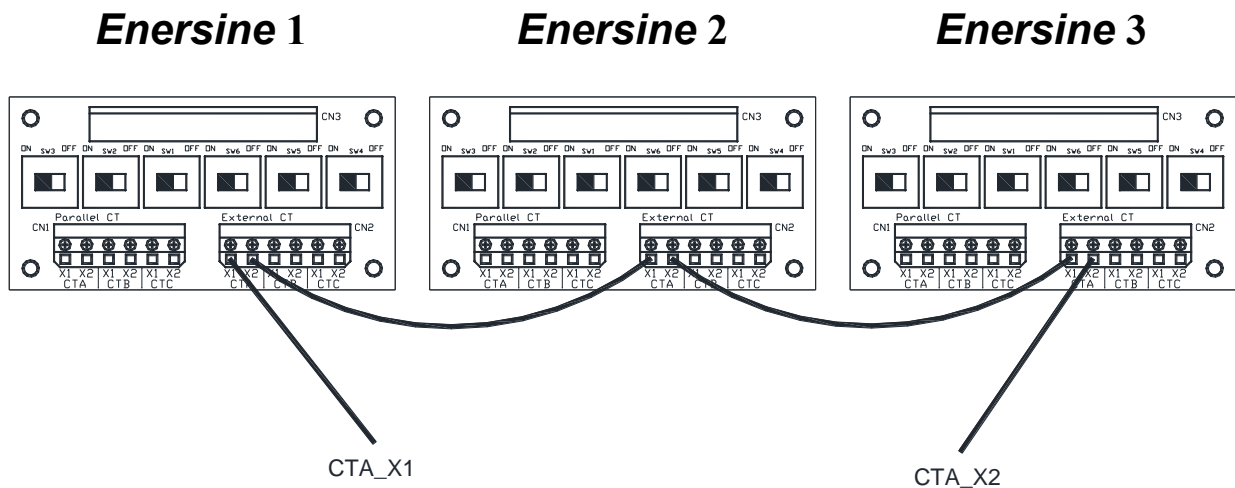
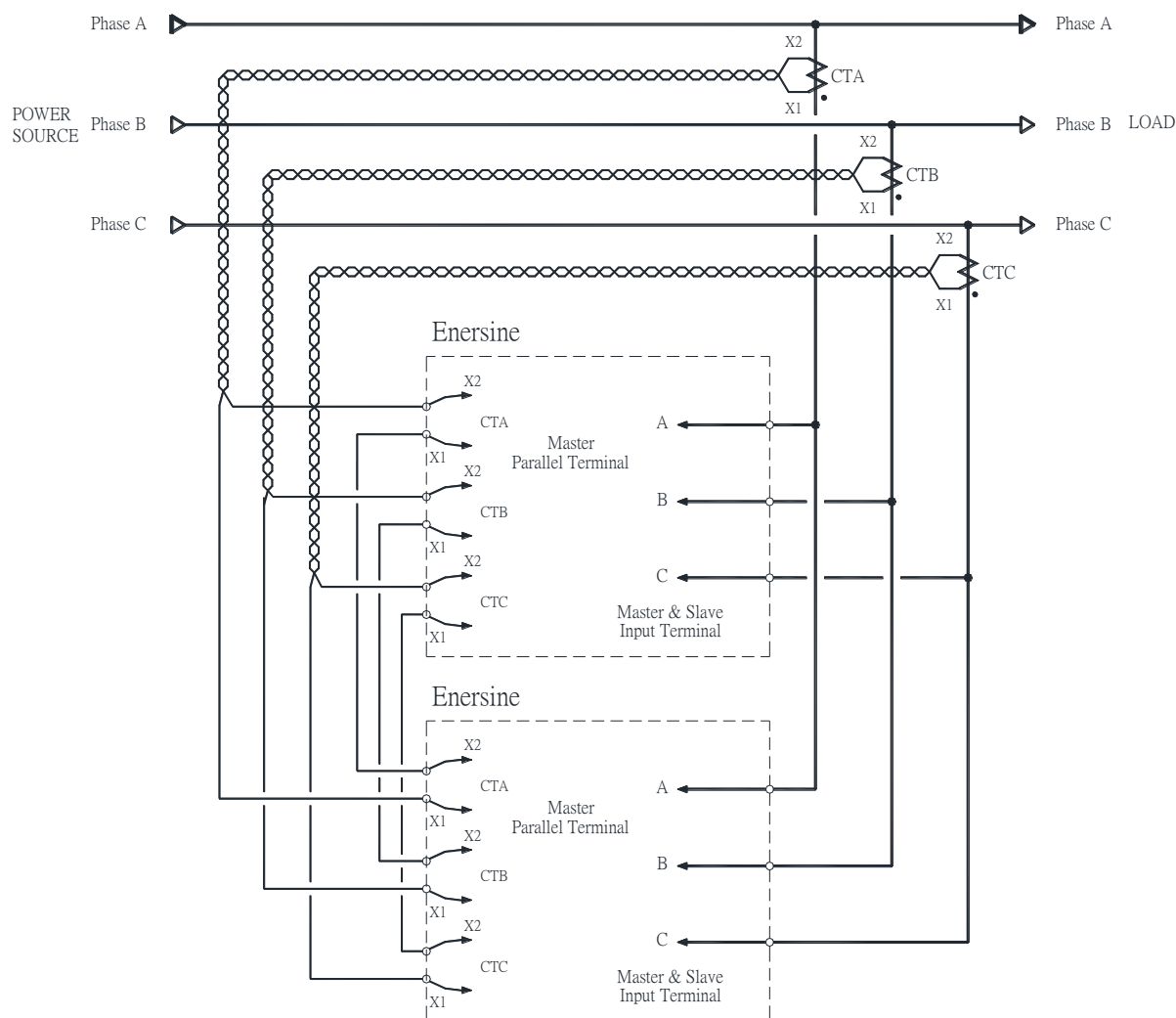


Figure 4-5 External CTs Connection for Parallel

Three parallel CTs must be installed at the total output of the **Enersine** filters when the **Enersine** filters operate in parallel. Refer to Figure 2-10 for parallel CT connections.





(c)

Figure 4-6 Parallel CTs Installation and Connections

4-4-2. Wiring specifications

Figure 4-7 is the outer dimension of power cable terminal for Master and Slave. Please refer table 4-3 for the recommended power cables size. It's recommended that the ground cable size should be bigger than 16mm² or 6AWG, and also must meet the requirement of ground cable size of local law.

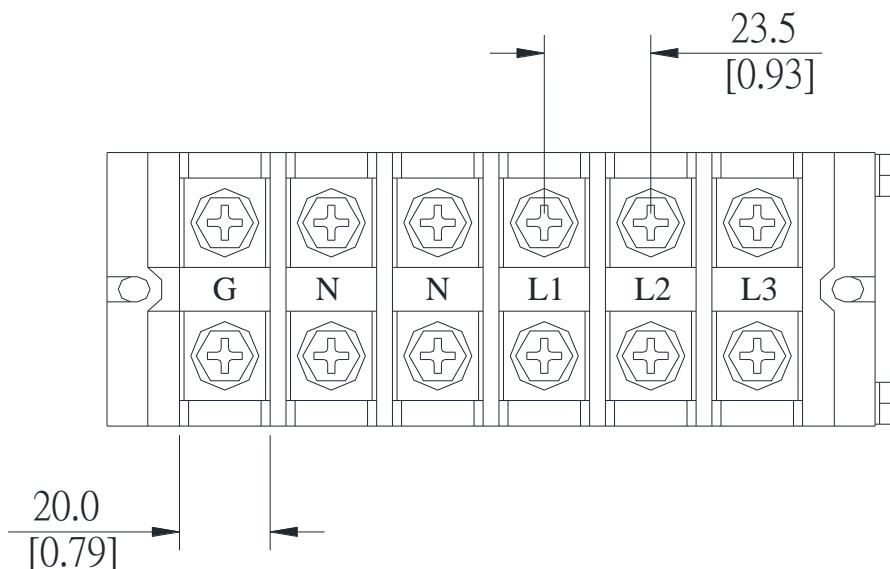


Figure 4-7 Terminal outer dimension

Table 4-3 Recommended Power Cable Size

Current Rating	Power Cables	Recommended Minimum Cable Size		Number of parallel cables	Terminal Block Specification	Recommended Maximum Length
		[mm ²]	AWG			
60A	Phase A, B, C	16	6	1	Fastening with screw, M8	20m
	Neutral	25	4	2	Fastening with screw, M8	20m
80A	Phase A, B, C	25	4	1	Fastening with screw, M8	20m
	Neutral	35	2	2	Fastening with screw, M8	20m
90A	Phase A, B, C	25	3	1	Fastening with screw, M8	20m
	Neutral	50	1	2	Fastening with screw, M8	20m
100A	Phase A, B, C	35	3	1	Fastening with screw, M8	20m
	Neutral	50	1/0	2	Fastening with screw, M8	20m

4-5. External Views and Dimensions

Figures 4-8 to 4-9 show the outer dimensions of both the IP30 Master and Slave.

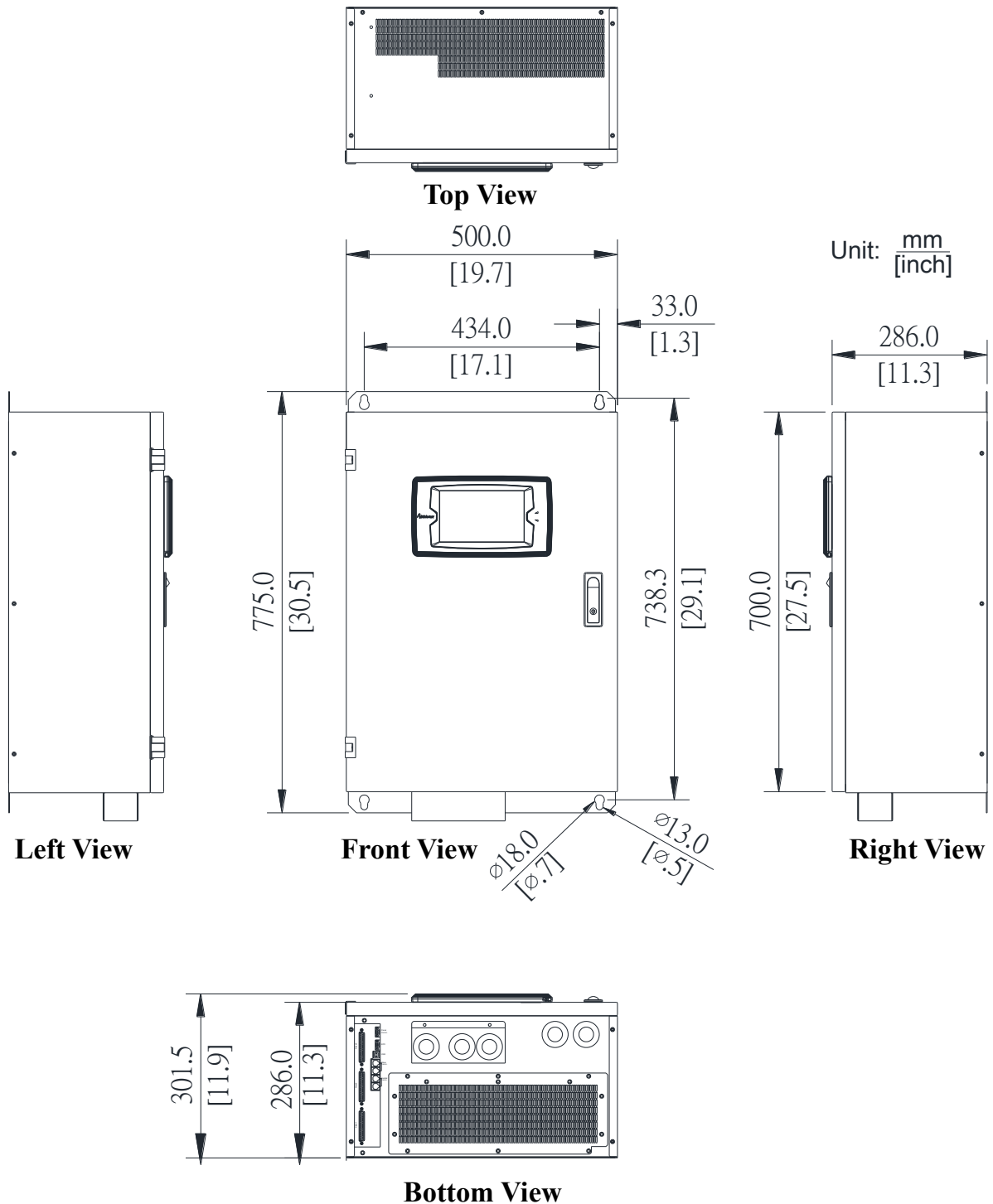


Figure 4-8 Dimensions of the IP30 Master

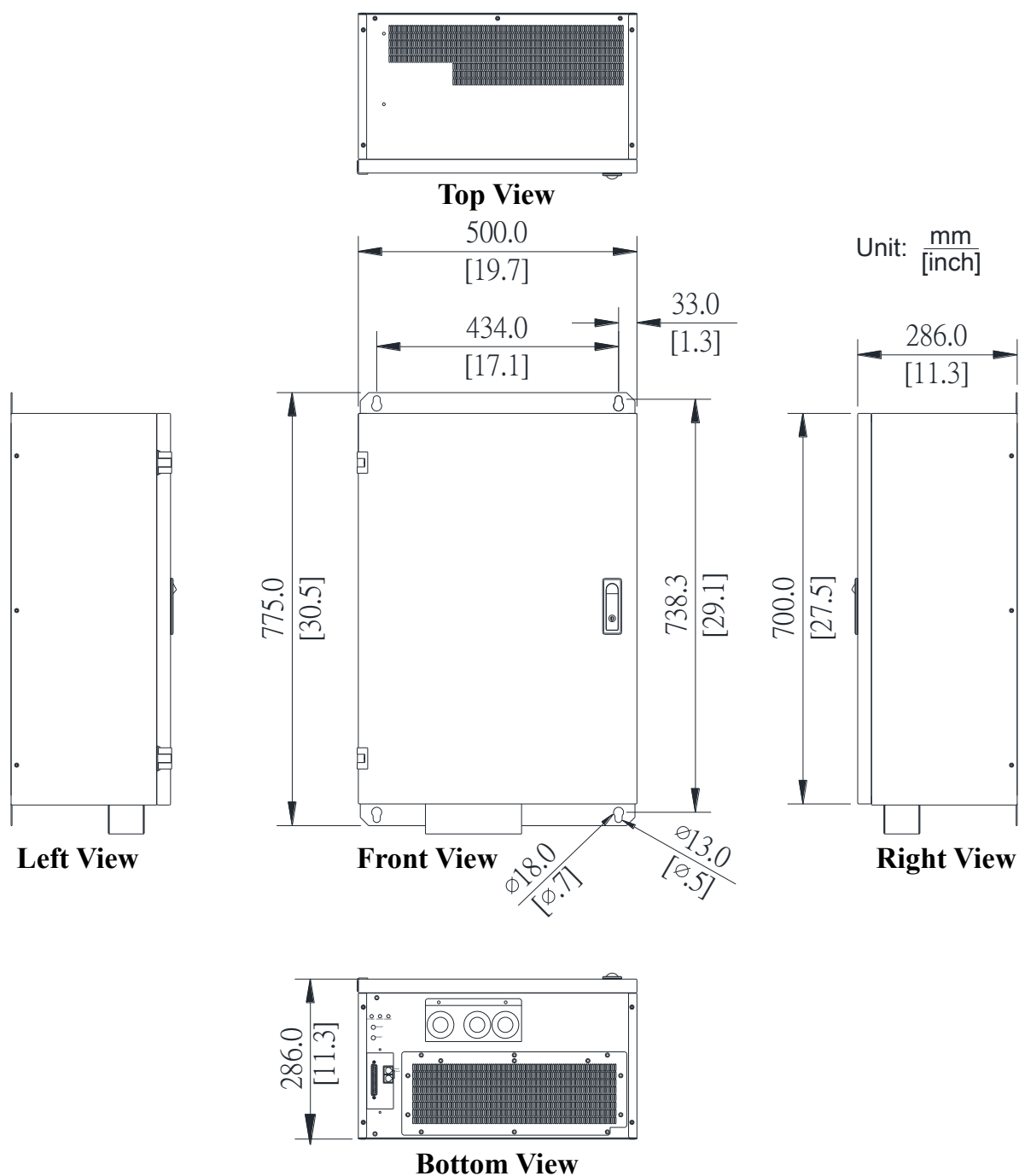


Figure 4-9 Dimensions of the IP30 Slave

Figures 4-10 to 4-11 show the outer dimensions of both the IP31 Master and Slave.

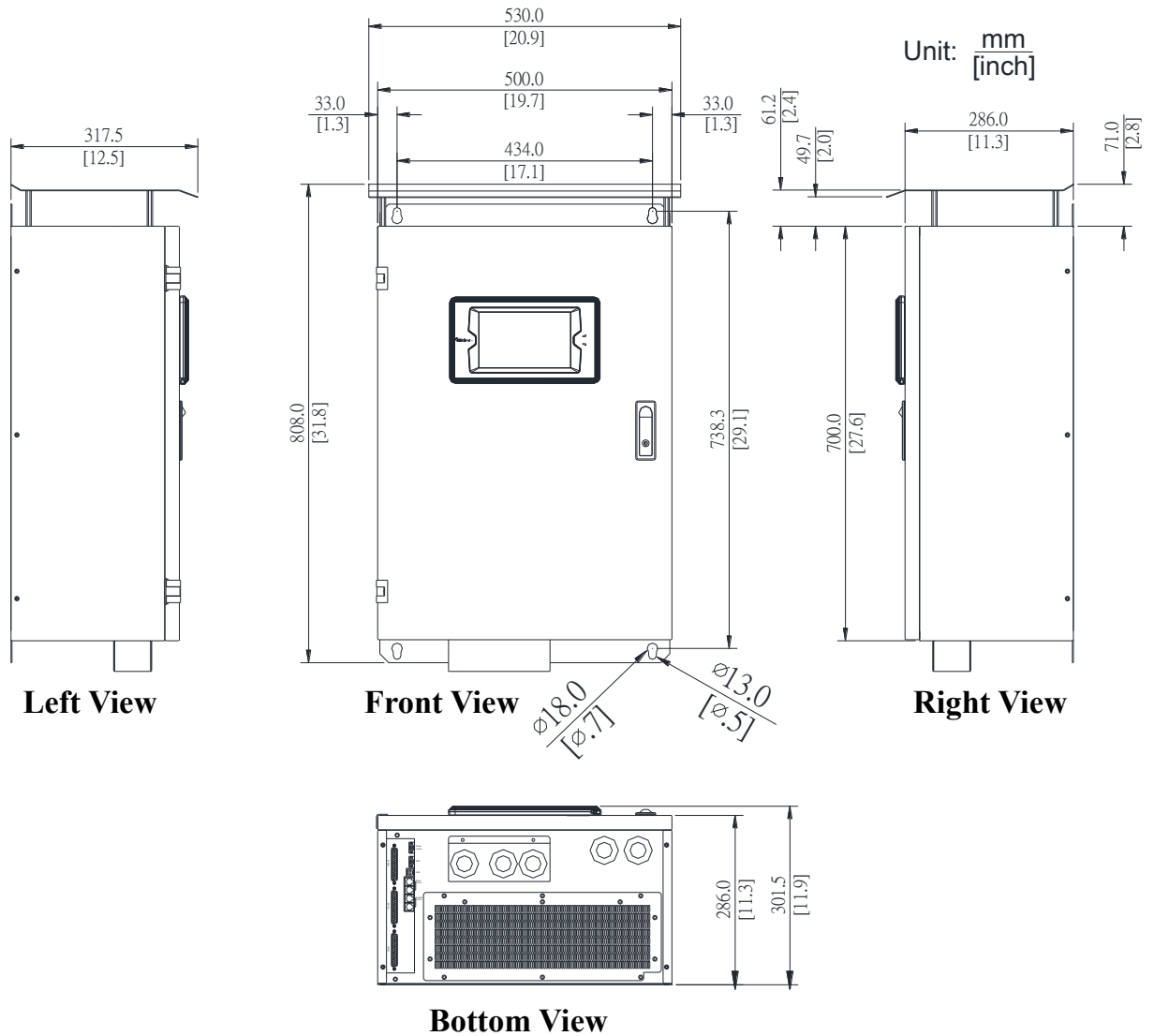


Figure 4-10 Dimensions of the IP31 Master

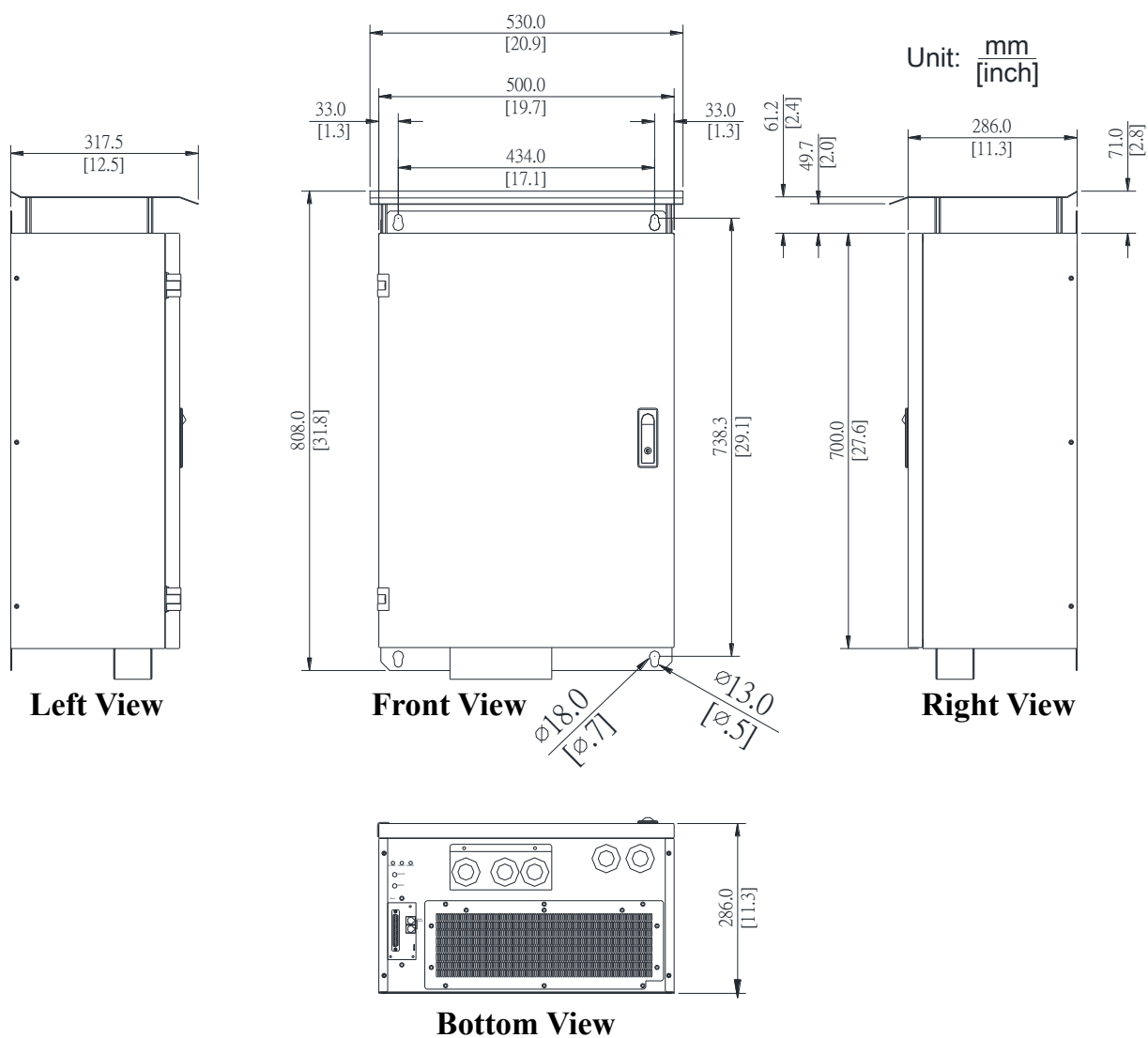


Figure 4-11 Dimensions of the IP31 Slave