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FIRSTLINE P_E

480V 60Hz

80 to 125kVA

USER MANUAL

003-2587, Rev A

Staco Energy is highly specialized in the development and production of uninterruptible power systems (UPS). The UPS's of this series are high quality products, carefully designed and manufactured to ensure optimum performance.

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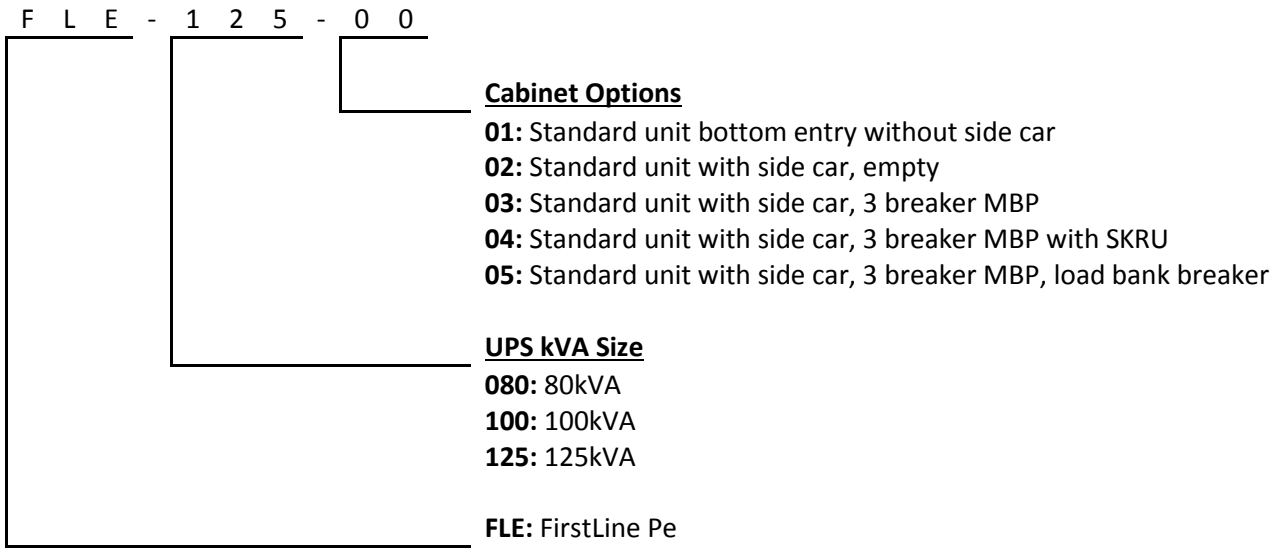
Applicability
Standard Models



Safety Warnings

IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS

This manual contains important instructions for Models 80 -125kVA FIRSTLINE PE series UPS that should be followed during installation and maintenance of the UPS. Please read all instructions before operating the UPS and save this manual for future reference.

READ AND FOLLOW ALL SAFETY INSTRUCTIONS

a. Do not use outdoors.
b. Do not route wiring across or near hot surfaces.
c. Do not install near gas or electric heaters.
d. Use caution when servicing batteries. Battery acid can cause burns to skin and eyes. If acid is spilled on skin or in eyes, flush acid with fresh water and contact a physician immediately.
e. Unit should be installed where it will not readily be subjected to tampering by unauthorized personnel.
f. The use of accessory equipment not recommended by the manufacturer may cause an unsafe condition.
g. Do not use this UPS for other than intended use.

Emergency Interventions

The following information is of a general nature.

First aid interventions

Company regulations and traditional procedures should be followed for any first aid intervention that may be required.

Firefighting measures

1. Do not use water to put out a fire, but only fire extinguishers that are suitable for use with electrical and electronic equipment.
2. If exposed to heat or fire, some products may release toxic fumes into the atmosphere. Always use a respirator when extinguishing a fire.

Symbols used in the Manual

In this manual, some operations are shown by graphic symbols to alert the reader to the dangerous nature of the operations:

	**Danger / Risk of Electric Shock** *This symbol indicates possibility of serious injury or substantial damage to the unit, unless adequate precautions are taken.*
	**Warning** *This symbol indicates important information which must be understood and any stated precautions taken*
	**Note**

DANGER

This UPS contains LETHAL VOLTAGES. All repairs and service should be performed by AUTHORIZED SERVICE PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS inside the UPS.

WARNING

To reduce the risk of fire or electric shock, install this UPS in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Do not operate near water or excessive humidity.

WARNING

Input and output over-current protection and disconnect switches must be provided by others.

High ground leakage current may be present. Do not operate the unit without a proper protective ground.

WARNING

Batteries can present a risk of electrical shock or burn from high short circuit current. Observe proper precautions. Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.

There is a risk of explosion if batteries are replaced by an incorrect type. Replace with same type and rating only.
Proper disposal of batteries is required. Refer to your local codes for disposal requirements.

Never dispose of batteries in a fire

WARNING

The output of UPS cannot connect with unbalance load and half-wave rectification load!

Protective Equipment

No maintenance operations shall be carried out on the unit without wearing the Personal Protective Equipment (PPE) described below. Personnel involved in the installation or maintenance of the unit must be properly clothed.

The following signs show the protective equipment that should be worn. The various items of PPE must be selected and sized according to the nature of the hazard (particularly electrical) posed by the unit.

	**Accident prevention footwear**		**Protective eyewear**
	**Protective clothing**		**Helmet**
	**Work gloves**		

GENERAL PRECAUTIONS

This manual contains detailed instructions for the use, installation and start-up of the UPS. Read the manual carefully before installation. For information on using the UPS, the manual should be kept close at hand and consulted before carrying out any operation on the UPS.

This UPS has been designed and manufactured in accordance with the standards for the product, for normal use and for all uses that may reasonably be expected. It may under no circumstances be used for any purposes other than those envisaged, or in any other ways than those described in this manual. Any interventions should be carried out in accordance with the criteria and the time-frames described in this manual.

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1. Layout

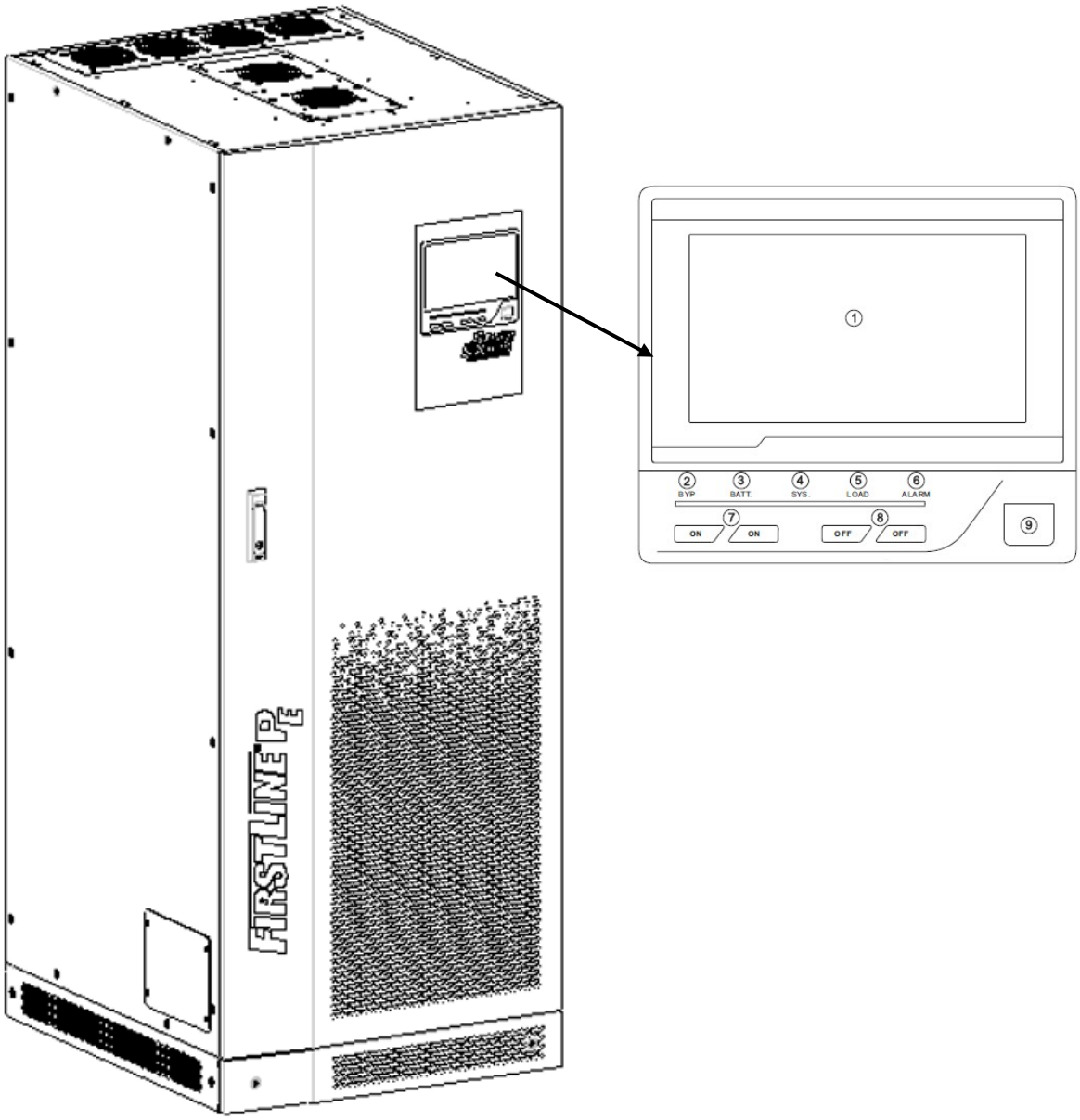


Figure 1 – 80-125kVA Cabinet Front View

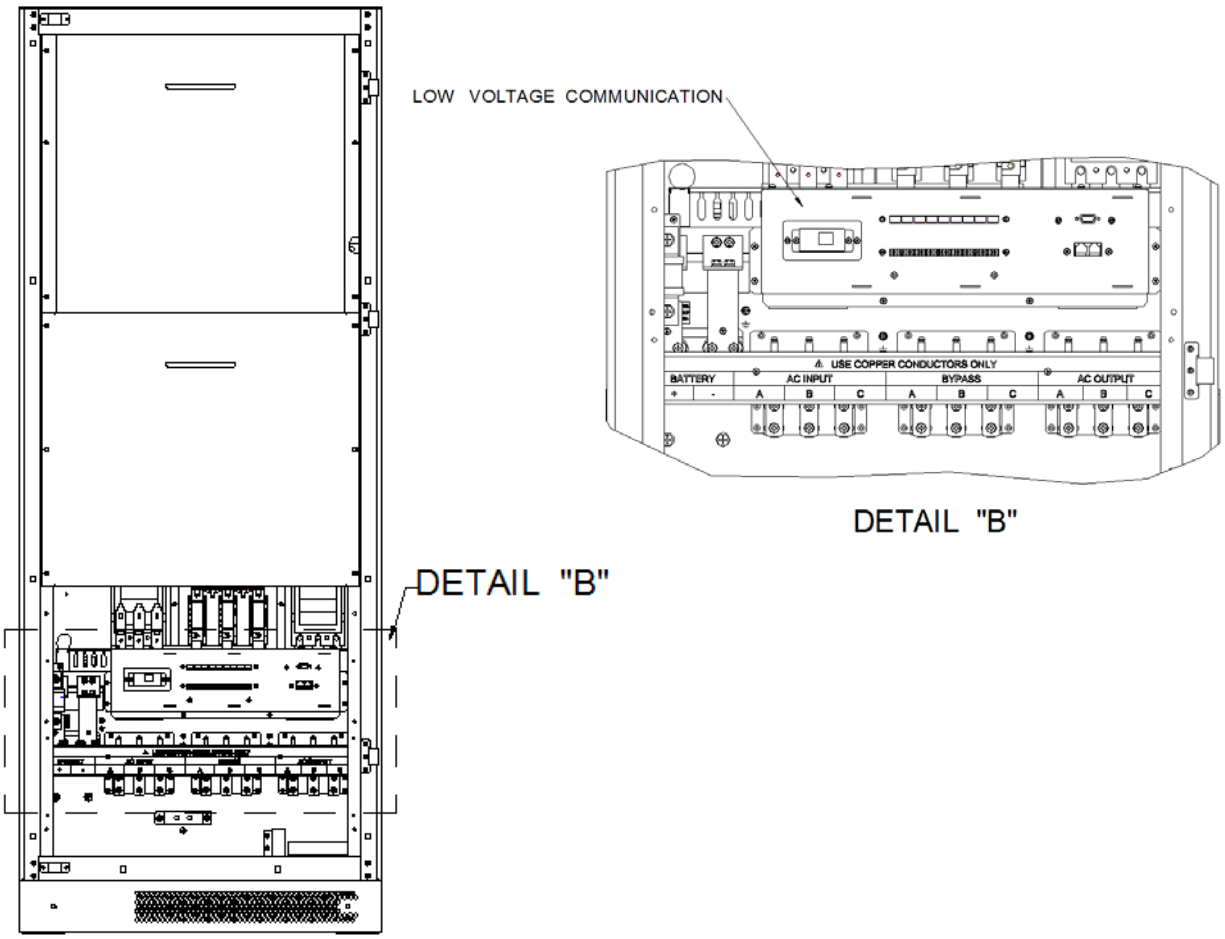


Figure 2–80-125kVA Front Cabinet view with inner protective panel removed.

2. Installation

- Check the Safety Instructions.
- Any incorrect connection or handling may cause damage to the UPS and/or the loads connected to it. Read these instructions carefully and follow the steps indicated.
- This UPS must be installed by qualified electrician.
- It is advisable to provide a maintenance bypass switch or an electrical panel with individual protection for input, output, and static bypass, as well as a manual bypass. This allows isolation of unit during preventive maintenance or repair.

Upon request, a maintenance bypass switch can be sized to your specific requirements.

2.1 Important Safety Instructions

WARNING

As this is a unit with class I protection against electric shocks, it is essential to install an earth conductor. Connect the ground conductor to the Protective Ground terminal, before connecting the power supply to the UPS input.

Before installing any cables, power or control, verify that no power is available to the UPS.

The UPS has multiple electrical inputs and produces electrical output. Verify all terminals are at zero-voltage state before any work on the UPS is performed.

Warning labels should be placed on all primary power switches installed remotely from unit to alert the electrical maintenance personnel of the presence of a UPS in the circuit. The label should bear the following or an equivalent text:

Before working on this circuit.
- Isolate Uninterruptible Power System (UPS).
- Check for Hazardous Voltage.
Risk of Voltage Backfeed

WARNING

Once the mains power supply is connected to the input of the UPS, there may be voltage at the output terminals.

Units with optional manual bypass, the output terminals may have output voltage from the manual bypass.

Precautions must be taken working around the batteries. Batteries are not isolated from the AC input, and dangerous voltage between the battery terminals and the ground may be present.

Battery Safety Instructions

WARNING

The handling and connection of the batteries shall be done and supervised by personnel with battery knowledge.

The battery supply can involve the risk of electric shock and can produce high short circuit current. Observe the following preventive measures before working with Battery Terminals:

- Disconnect the corresponding protection elements.
- When connecting a battery cabinet to the UPS, verify correct polarity.
- Wear rubber gloves and shoes.
- Use tools with insulated handles.
- Removes watches, rings or other metal objects.
- Do not place metal tools or objects on the batteries.
- Never short the battery terminals as it will result in a high safety risk and potential damage to the battery and the UPS.
- Avoid mechanical impacts.
- Do not open or mutilate the battery. Released electrolyte is harmful to the skin and eyes.
- Do not dispose of batteries in a fire. The batteries may explode.
- In case of contact of the acid with parts of the body, wash immediately with plenty water and seek medical help.
- Batteries involve a serious risk for health and for the environment. Their disposal should be done according to the existing laws.

2.2 Equipment Handling

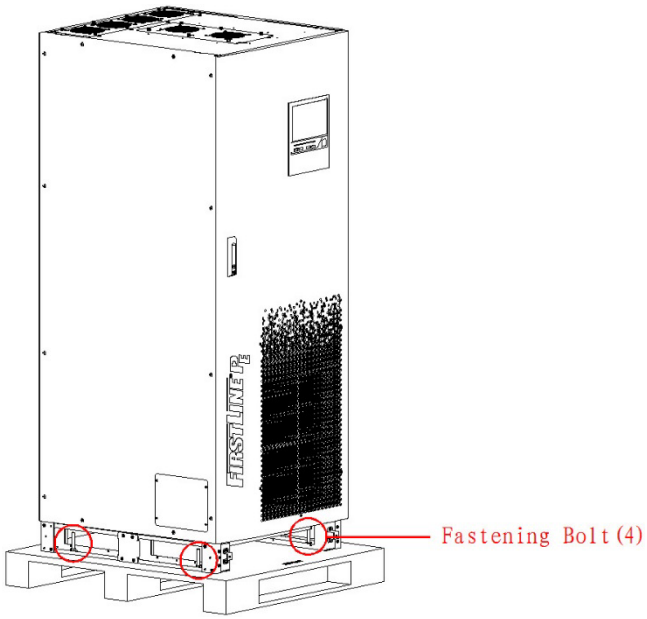
2.2.1 Unpacking and Content Checking

Upon receiving the UPS, make sure that it has not suffered any damage in transport. If any shipping damage is noticed, make all pertinent claims to the carrier. Also check that the data in the nameplate, which is attached inside the front door, corresponds to those specified in the purchase order; it will be necessary to unpack it. To unpack, cut the bands on the cardboard container and remove it by lifting above or remove it with the necessary tools if made of wood; remove the corner pieces and the plastic sleeve. The UPS should be unpacked on the pallet.

When the unit has been accepted, it is best to repack the UPS until it is put into service in order to protect it from any possible mechanical damage, dust, dirt, etc....

2.2.1.1 Uncrating the UPS

Remove bolts connecting UPS to pallet



2.2.2 Storage

Storage of the UPS should be in a dry, ventilated place and protected against rain, water or chemical agents. It is advisable to maintain the UPS in the original package which has been designed to assure the maximum protection during transport and storage.

2.2.3 Transport

. It is important to observe the rough weights indicated in the technical specs both with respect to the site itself and the means to be used to put it there (floor, hoist, lift, stairs, etc.…).

2.2.4 Location

Clearance above the UPS must be 40 inches minimum. Failure to adhere these minimum clearances will result in overheating.

Adequate space must be provided in front for service and maintenance (See **Figure 4**). In parallel systems or systems with external battery or other cabinets there is no requirement to separate the cabinets other than maintaining the ability to service the UPS and assuring the paralleling cables can connect to each unit. Using flexible conduit for power wiring may provide some benefit.

Access to side will be required only for maintenance/repair of the UPS.

If mounting the UPS to floor, see **Figure 3** for mounting hole locations. The mounting bolts should not extend more than 2 inches above grade.

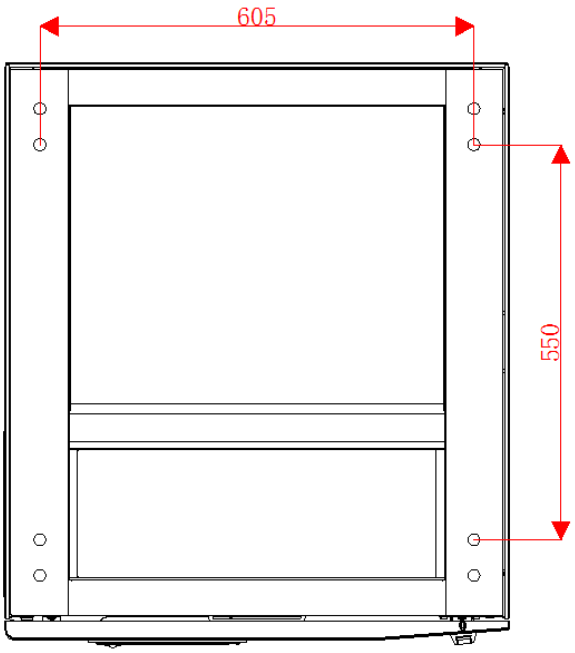


Figure 3 – Bottom mounting holes

2.2.5 Installation Clearance

- Maintain a clearance of at least 1000mm from the front panel to the wall or adjacent equipment, and at last 1000mm from the top to ceiling, which is to ensure good ventilation, as shown in **Figure 4**.
- Keep the air inlets at the front panel and top of the UPS unobstructed to facilitate ventilation and heat dissipation. Otherwise, the UPS internal temperature will rise, which may shorten the UPS service time.

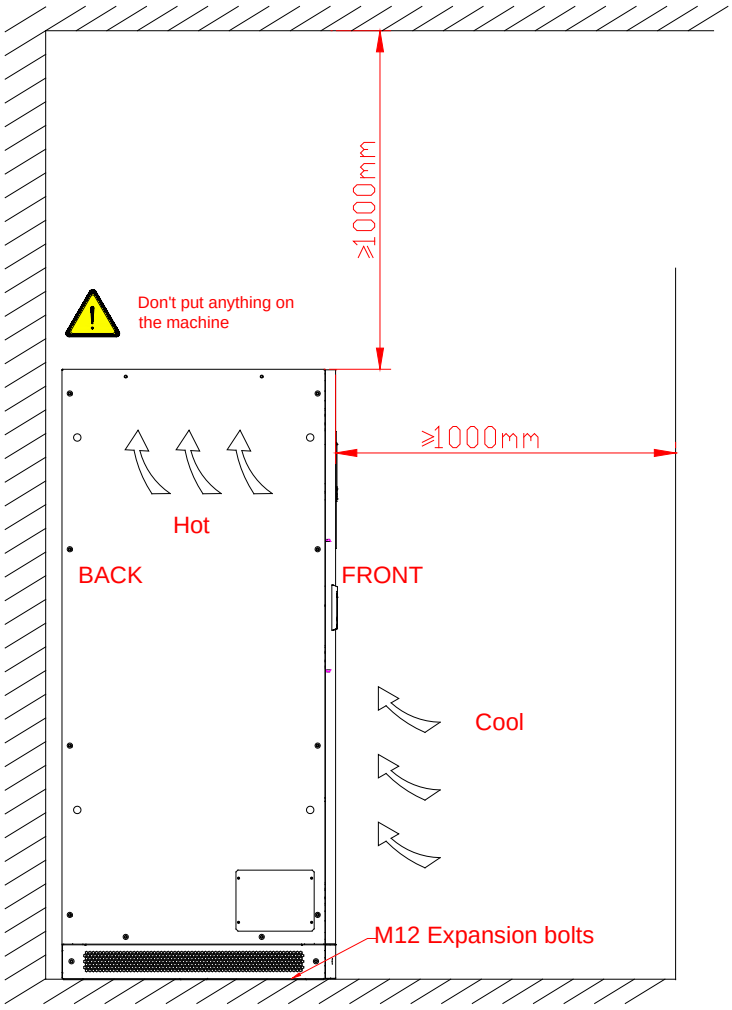


Figure 4– Installation Clearance

2.3 Power Connections

2.3.1 Preparing UPS

All of the UPS models have terminals for power connection and connectors for communications located inside the UPS front door. Follow the steps described below for access to all connections:

- Open front door
- Remove the screws securing the terminal cover inside of the cabinet and set it aside. The input, output and external battery terminals are now exposed.
- Once the connection of the UPS is finished, replace the cover and close the door.

Wire size should be in accordance with NEC and local code using the currents shown in **6.2 Rated Currents and Recommend Field Wiring Information**

In parallel systems, the length and cable cross section from the distribution panel to each UPS and from each UPS to the load panel must be the same. This is required to maintain load balance between parallel units.

Circuit protection in power distribution panels should be size to be compatible, as minimum, with the currents stated in **6.2 Rated Currents and Recommend Field Wiring Information**

If input, output or bypass peripherals were added to the UPS, like transformers or autotransformers, follow the installation instructions in the manuals for those units.

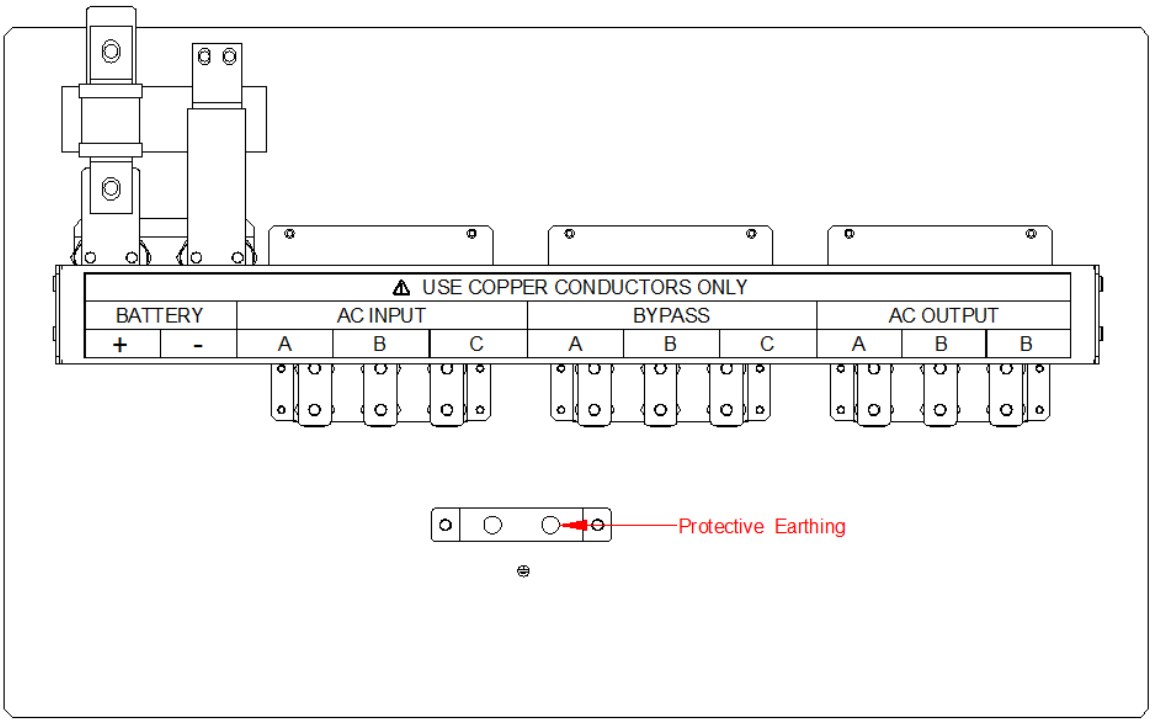


Figure 5– Customer connection

2.3.2 Connection to Mains Input

Connection to the ground:
This unit is class I protection against electric shocks, a ground conductor must be installed. Connect the ground conductor to the Protective Earth terminal before connecting the power to the UPS input. See **6.2 Rated Currents and Recommend Field Wiring Information** for current ratings.

Connection to the Input:
Connect the power supply cables A-B-C to the AC Input terminals, see **Figure 5**, following the order of phases indicated on the label of the unit and in this manual. See **6.2 Rated Currents and Recommend Field Wiring Information** for current ratings.

If the order of the phases is not followed, the unit will not operate. When there are discrepancies between the labeling and the instructions of this manual, the label on the UPS will always prevail.

2.3.3 Connection to the Bypass Input:

Single Input
For UPS that have a single input from utility, connect the power supply cables A-B-C from the AC Input terminals to Bypass terminals, see **Figure 5**, following the order of phases indicated on the label of the unit and in this manual. See **6.2 Rated Currents and Recommend Field Wiring Information** for current ratings

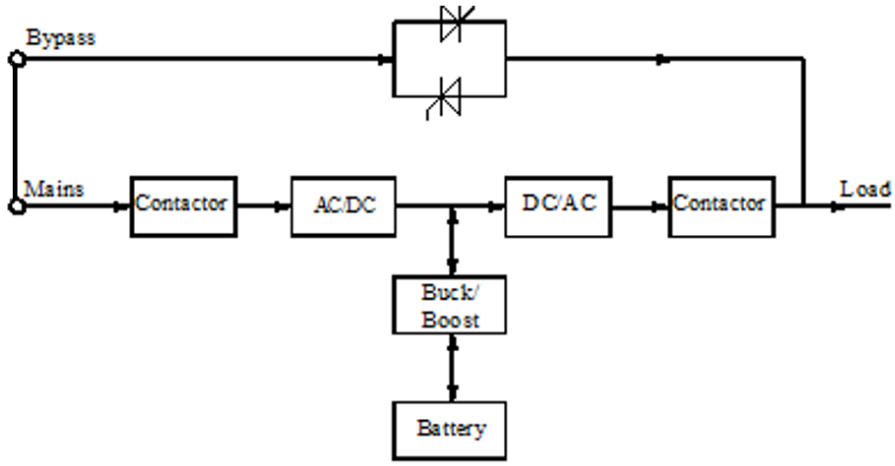


Figure 6– Single Input 1-line

Independent Bypass Input
For UPS configurations where the bypass input is separate from the rectifier input.

Connection to the ground:
This unit is class I protection against electric shocks, a ground conductor must be installed. Connect the conductor from to the ground terminal before connecting the power to the UPS input. See **6.2 Rated Currents and Recommend Field Wiring Information** for current ratings.

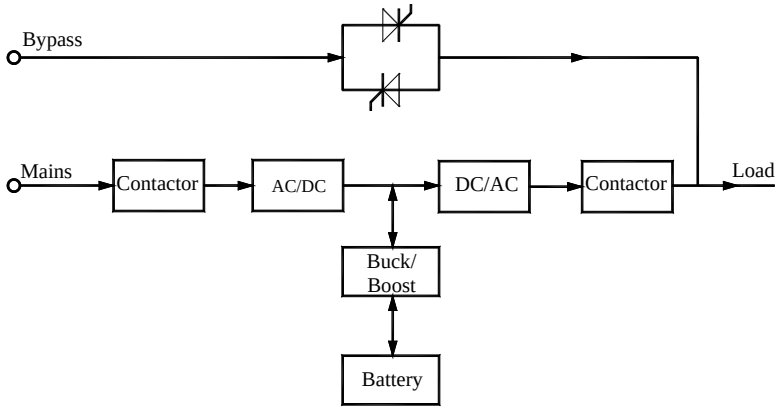


Figure 7– Dual Input 1-line

Connection to the Bypass:
Some UPS configurations may have jumper wires between AC Input and Bypass terminals. For Independent bypass configuration, these jumpers must be removed.

Connect the bypass power supply cables A-B-C to the Bypass terminals, see **Figure 5**, following the order of phases indicated on the label of the unit and in this manual.

If the order of the phases is not followed, the unit will not operate. When there are discrepancies between the labeling and the instructions of this manual, the label on the UPS will always prevail.

2.3.4 Connection to the Output

Connection to the ground:
This unit is class I protection against electric shocks, a ground conductor must be installed. Connect the ground conductor to the Protective Earth terminal before connecting the power to the UPS input. See **6.2 Rated Currents and Recommend Field Wiring Information** for current ratings.

Single Module
Connect the loads cables A-B-C to the AC Output terminals, see **Figure 5**, following the order of phases indicated on the label of the unit and in this manual.

If the order of the phases is not followed, the unit will not operate. When there are discrepancies between the labeling and the instructions of this manual, the label on the UPS will always prevail. A user accessible disconnect device sized appropriately to **6.2 Rated Currents and Recommend Field Wiring Information** shall be installed between the output of UPS and critical load.

Paralleled Modules

From each module in system, connect the loads cables A-B-C to the AC Output terminals, see **Figure 5,** following the order of phases indicated on the label of the unit and in this manual.

If the order of the phases is not followed, the unit will not operate. When there are discrepancies between the labeling and the instructions of this manual, the label on the UPS will always prevail.

With respect to the protection that must be placed on the output of the UPS, it is recommended that the output power should be distributed in at least four lines. Each will have a user accessible magnetic thermal protection switch of a value of one quarter of the nominal power. This type of power distribution will mean that in the event of a fault, the fault will be isolated. The rest of the connected loads will have their continuity assured due to the triggering of the protection, only the line affected by the fault will remain. See

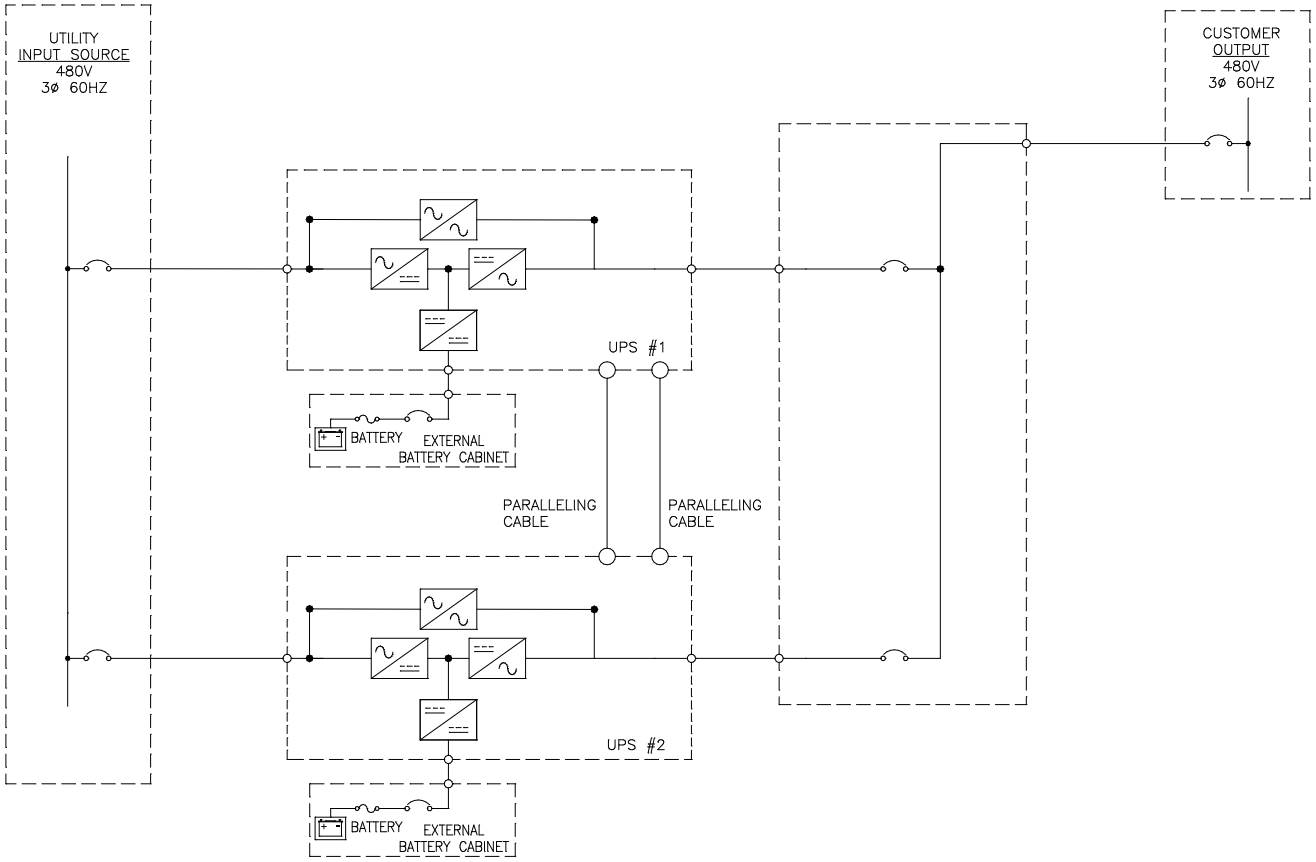


Figure 8–Typical Single line diagram of parallel system connection

2.3.5 External Battery Connection

Danger

Connection to the ground:
This unit is class I protection against electric shocks, a ground conductor must be installed. Connect the ground conductor to the Protective Earth terminal before connecting the power to the UPS input.

Danger

IMPORTANT FOR SAFETY: Do not close the battery disconnect until instructed to do so in the startup procedure. Failure to comply may cause irreversible damage to the UPS or personal harm because the operator is exposed to ELECTRICAL DISCHARGE DANGERS when connecting the UPS battery.

A user accessible disconnect device sized appropriately to **6.2 Rated Currents and Recommend Field Wiring Information** shall be installed between the DC input of UPS and battery strings. UPS connection with an external battery will be made by connecting properly sized cables to battery input terminals matching polarity at the external battery terminals.

Insure that the external battery complies with the battery requirements for this UPS system. See the external battery documentation for connection details.

If more than one external battery cabinet is to be connected, the connection will always be in parallel among them and the UPS's cable from the negative of the UPS to the negative of the first battery pack and from this one to the negative of the second battery pack, and so on. Proceed in the same way for positive cables and earth.

When connecting external battery cabinets to multiple UPS in a parallel configuration, each UPS must have its own separate battery cabinet(s). A single battery cabinet cannot be shared between multiple UPS.

Danger

If it is required to disconnect the battery cabinet after starting up the UPS, the UPS has to be completely shut down (see shut down section). Turn off the battery disconnect. Wait at least 5 min. until the filter capacitors have been discharged.

2.3.6 Connection Main Protective Earth

Make sure that all loads connected to the UPS are only connected to the ground bonding terminal. Grounding of the load(s) and/or the battery case(s) or cabinet(s) to this single point will help prevent ground loops which will affect the quality of the power supplied. All of the terminals identified as ground, are joined together, to the main grounding terminal and to the frame of the unit.

2.4 Control Connections

2.4.1 RS232 Communication

The RS232 communication port locates in the front of the device. It allows the remote monitoring for input voltage, frequency, output voltage, frequency, load, etc. of the UPS, and it also can achieve remote power on/ off operation.

RS232 pins:
Pin 6: RXD
Pin 7: GND
Pin 9: TXD

2.4.2 RS485 Communication

The RS485 communication port locates in the front of the device. It allows the remote monitoring for input voltage, frequency, output voltage, frequency, load, etc. of the UPS, and it also can achieve remote power on/ off operation.

RS485 pins:
Pin 5: A
Pin 8: B

2.4.3 Dry Contact Communication

The dry contact communication board is as shown in **Figure 9**.

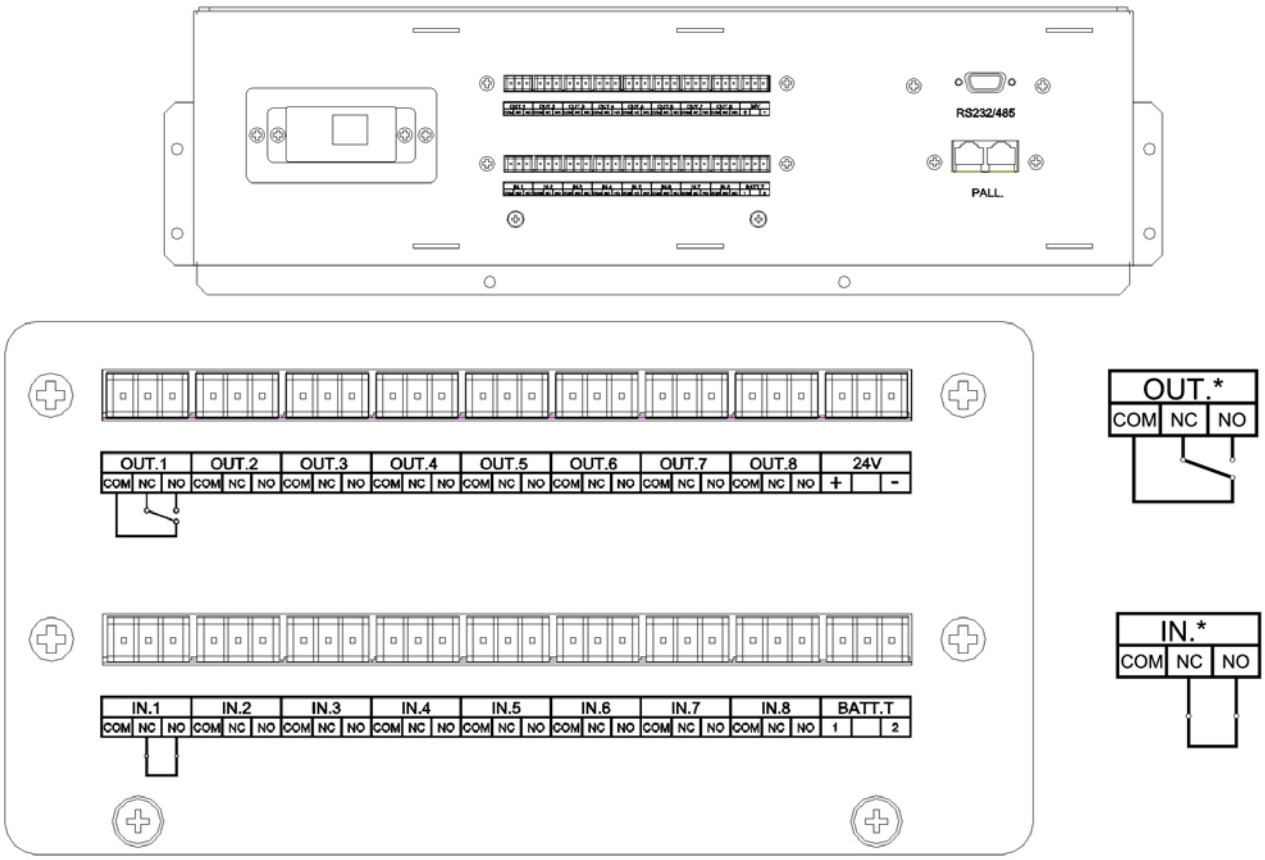


Figure 9- Dry contact communication board

The input and output dry contacts each have 8 channels. Each channel is programmable. See Section **4.6.4 Dry contact setting** for instructions for programming

Contact	Function
Battery Abnormal	Active for 90 min -Charger turns off; Active for 24 hrs – UVR contact is opened
Alternate Input Power Level	When active, UPS will set input current limit to reduced setting (See 4.6.1 System Management)
Remote EPO	When active, UPS Output and battery functions will turn off
On Generator	When active, UPS will set input current limit to reduced setting (See 4.6.1 System Management)
Remote Online	When activated, the UPS will transfer from bypass to inverter. Inverter must be ready and able to accept load. If inverter is not able to accept load, this command is ignored
Remote bypass	When activated, the UPS will transfer from inverter to bypass. Bypass must be ready and able to accept load. If bypass is not able to accept load, this command is ignored.
Battery breaker open	When activated the battery breaker open message will display on LCD
Output breaker open	When activated the output breaker open message will display on LCD
Inverter inhibit	When activated: If unit is on inverter, the unit will transfer to bypass. If bypass is not in sync with inverter, the unit will do an interrupted transfer. If bypass is not available, unit turns off output. If unit is on bypass, the unit will ignore any attempt to transfer to bypass
Charging inhibit	When activated the UPS will disable the charger
External Alarm	When activated the UPS will display External Alarm on LCD

Table 1– Input Dry Contact Parameters

Contact	Function
Online operation	Active when the UPS is in Inverter mode
Bypass operation	Activate when the ON Bypass warning in UPS is active
Redundant Bypass operation	Activate when the ON Bypass warning in UPS is active (duplicate contact for SKRU applications)
Battery operation	Active when the On Battery alarm in UPS is active
Battery low voltage	Active when The Low Battery Alarm in UPS is active
Battery Shutdown	Active after battery End of Discharge has been reached
Overload	Active when any Overload Alarm in UPS is active
General Alarm	Active when any alarm is active in UPS is active
Warning	Active when any warning in UPS is active
UVR	This contact will be active anytime it is OK to have the Battery breaker closed. It will deactivate when the battery breaker must be open. (24Vdc)
Bypass abnormal	Active when the load cannot transfer from Inverter to Bypass
Input abnormal	Active when Input abnormal alarm in UPS is active

Table 2– Output Dry Contact Parameters

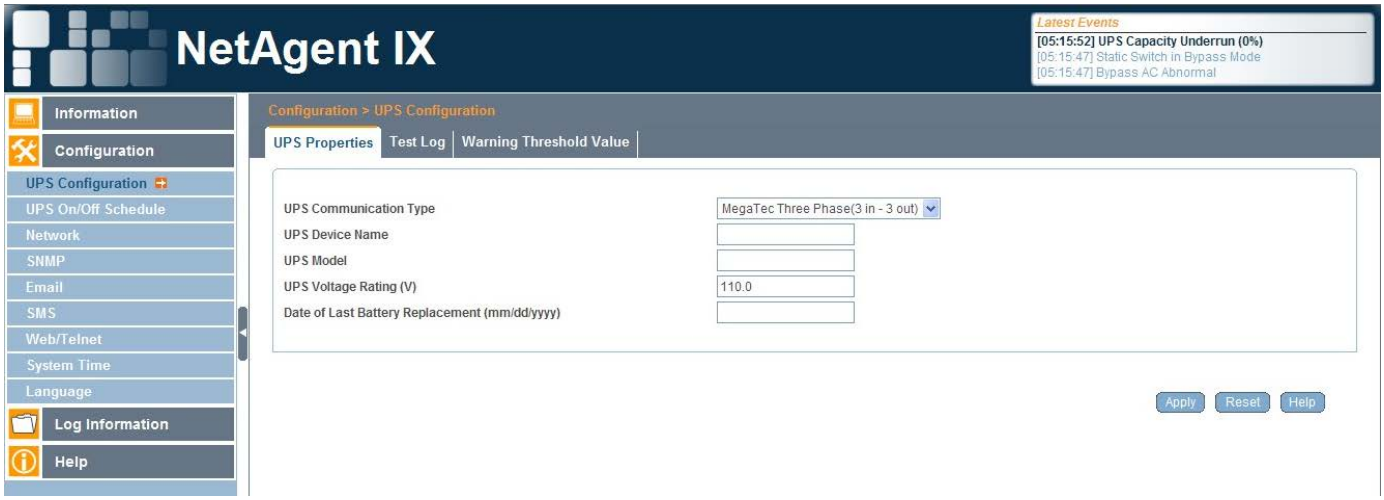
2.4.4 SNMP Card (Optional)

The following settings need to be made for the SNMP card to communicate properly.

Communication Protocol Type: SNMP (see **Section 4.6.5 Communication**)

SNMP Card Setting:

UPS Communication Type Megatec Three Phase



3. Operation

It is critical that the following procedure be followed in the sequence given.

3.1 Start up

3.1.1 Before Start Up

Verify that all the connections have been made correctly and are properly tighten, following the labeling of the phase rotation sequence.

Check that the UPS switches and any external battery cabinet or cabinets are in off position.

Be sure that all the loads are turned off.

3.1.2 Start-Up Procedure Single Module

It is very important to follow the established order during the following instructions. **DO NOT** close any battery disconnects until instructed to do so.

1. Close the mains circuit breaker to provide power to the input of the UPS. If UPS is wired for dual input, apply power to both Rectifier and Bypass inputs. The LCD will turn on.
2. The load will be support by Static Bypass power.
3. Once the LCD screen has completed initializing, Press the ON combination buttons for more than 1 second.
    a. The Rectifier will automatically start-up.
    b. The DC bus will charge up
    c. The Inverter will automatically start
    d. After the inverter is initialized and synchronized with the Static Bypass, the load will automatically transfer to Inverter.
    e. Close all battery disconnect devices once the “Do not Close Battery Breaker” message discontinues.
4. The system is now started up completely, and the UPS is protecting the critical load.

3.1.3 Start-Up Procedure Paralleled System

It is very important to follow the established order during the following instructions. **DO NOT** close any battery disconnects until instructed to do so.

Note: Ensure enough systems are online to support the load before applying load.

1. Apply Utility to all UPS modules. The modules will start in *Static Bypass* mode.
2. Turn Each Module “ON”.
3. Note: the UPS’s will go into a standby mode (Inverter on, but not connected to load) until there is enough Inverters ready to carry the load.
4. Once all Modules are turned ON and the system in running on Inverter, close Battery Switch located in Battery cabinets.
5. Close Load breaker to apply load.

System is now fully operational

3.2 Shutdown

3.2.1 Complete Shutdown of UPS

1. Shutdown the loads.
2. Open any distribution breakers.
3. Press the OFF combination buttons
4. Open the circuit breaker on any external battery cabinet(s).
5. To completely isolate UPS, remove power to the UPS input and the bypass. The system is now completely deactivated.
6. Wait minimum 5 minutes to allow capacitor discharge.
7. UPS is now safely de-energized.

3.2.2 Complete Shutdown of Parallel System

1. Open Load breaker.
2. Turn each UPS module OFF
3. Remove Utility Power
4. Open Battery breakers
5. Wait minimum 5 minutes to allow capacitor discharge.
6. UPS are now safely de-energized.

Danger

After shutdown of the UPS, wait at least 5 minutes before performing any maintenance or service work to allow the electrolytic capacitors to be discharged.

3.2.3 Emergency Power Off (EPO)

Emergency Power Off (EPO) will completely shut down unit or system of units:

When activated, the output voltage to the load is turned off.

3.2.3.1 Remote Emergency Power Off (REPO)

Remote shutdown function (REPO) is activated through the Input Dry Contacts, see Section **2.4.3 Dry Contact Communication**.

In a parallel system, it is only necessary to connect a Remote EPO to one UPS. The communication BUS will shut down all units when any single unit REPO is activated.

To restart the unit/system after REPO shutdown, the UPS will need to be turned off and then re-started

3.2.3.2 End of Discharge

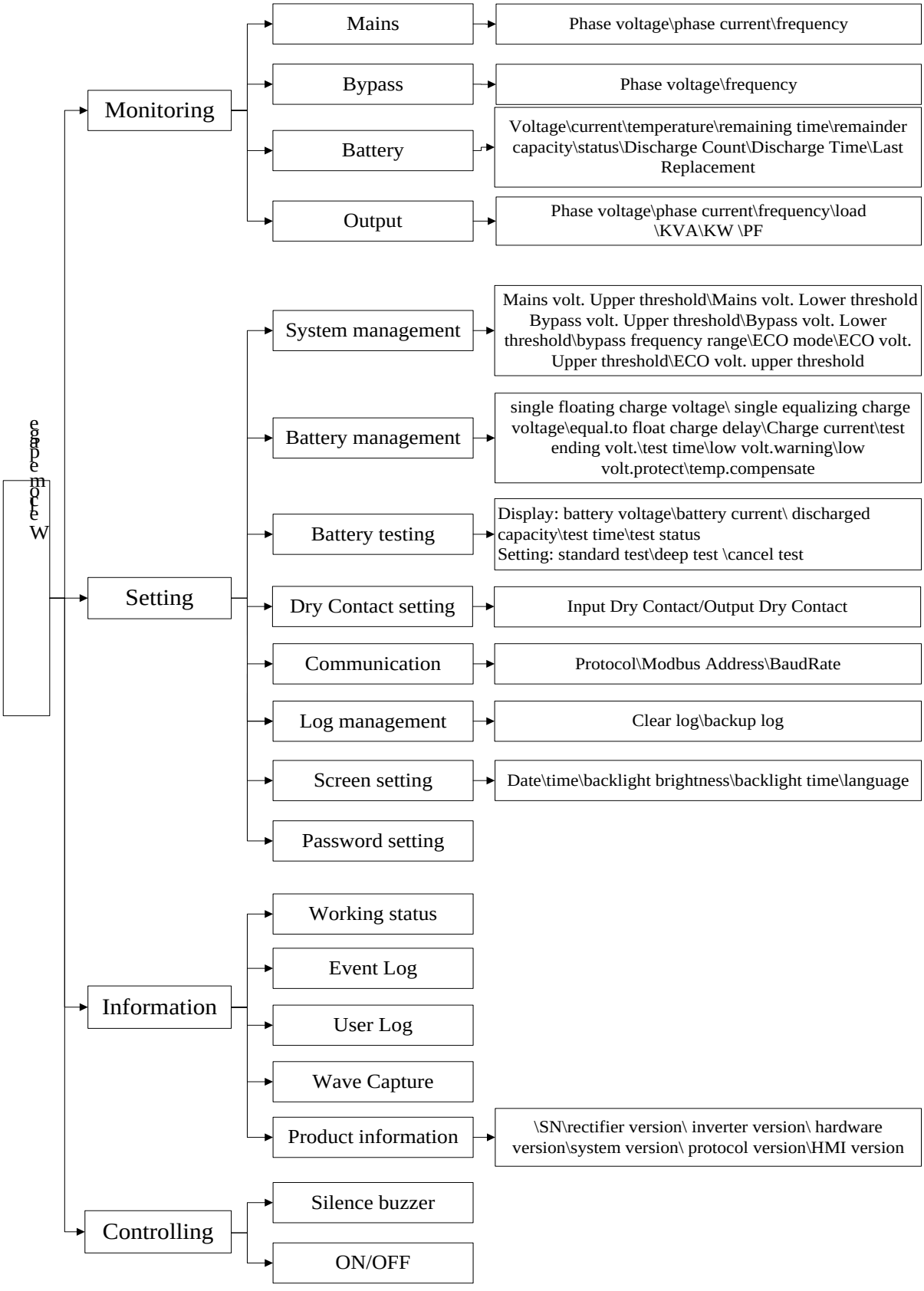
When the unit is in Battery Mode, it will constantly monitor the battery voltage level. When the batteries have discharge below the Low Battery level, an alarm will activate. When the batteries have discharge below the End of Discharge (EOD) level, the unit will turn off the inverter, but the controls will remain on. Once the input power is re-qualified, the unit will automatically restart and transfer to inverter.

If the input power is off for an extended period of time after EOD, it is recommended to open the battery breakers to avoid excess discharge of the batteries.

4. Control Panel and Display

Figure 10-Typical Main screen

4.1 Menu Structure



4.2 Main Page

Figure 11- Main page

: Bypass input information

: Mains input information


: Battery information

: Output information


: System Information


: System parameter settings


: Alarm details


: Buzzer control


: Power On/Off

4.3 Main screen

The Status and energy flow on the main page shows the status of the system.

Figure 12- Rectifier startup

Figure 13–Rectifier on and Battery connected

Figure 14– Normal Mode

Figure 15–Battery Mode

Figure 16–Unit starting on Bypass

Figure 17–Bypass Mode

Figure 18 – Maintenance Bypass

Figure 19- Fault

When a fault is active, the Alarm icon flashes. Click the Alarm icon to enter current fault page, as shown in **Figure 20**.

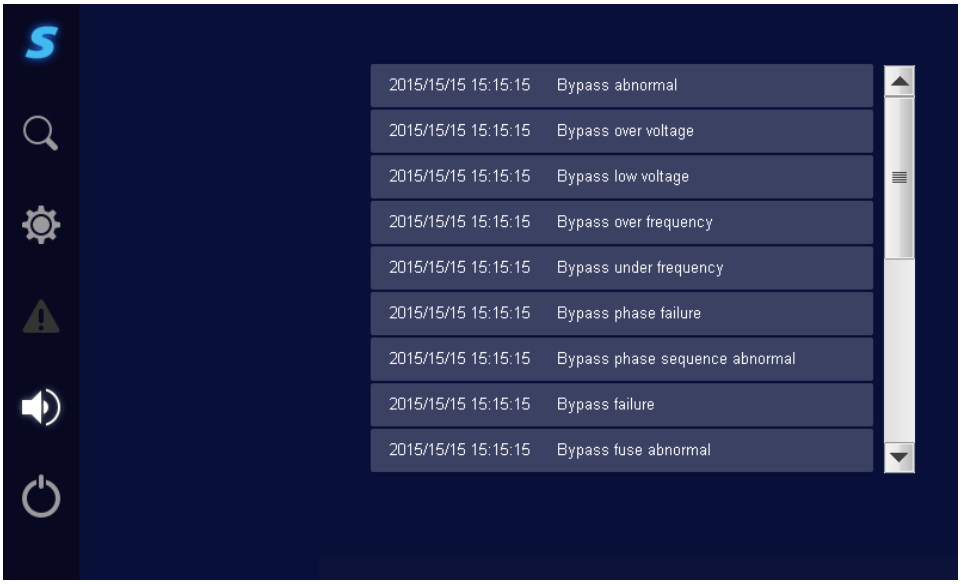


Figure 20– Fault Log

4.4 Control Function

4.4.1 ON/OFF

After pressing the Power On/Off button, a confirmation page will appear, See **Figure 21** & **Figure 22.** Pressing OK will turn the UPS On/OFF. Pressing Cancel will keep the UPS in current state.

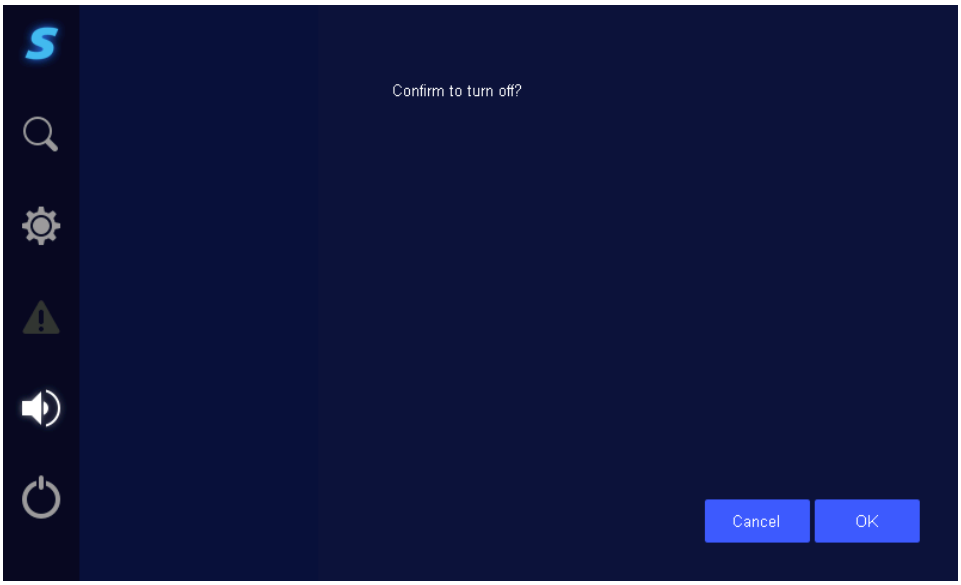


Figure 21- Confirm to turn off

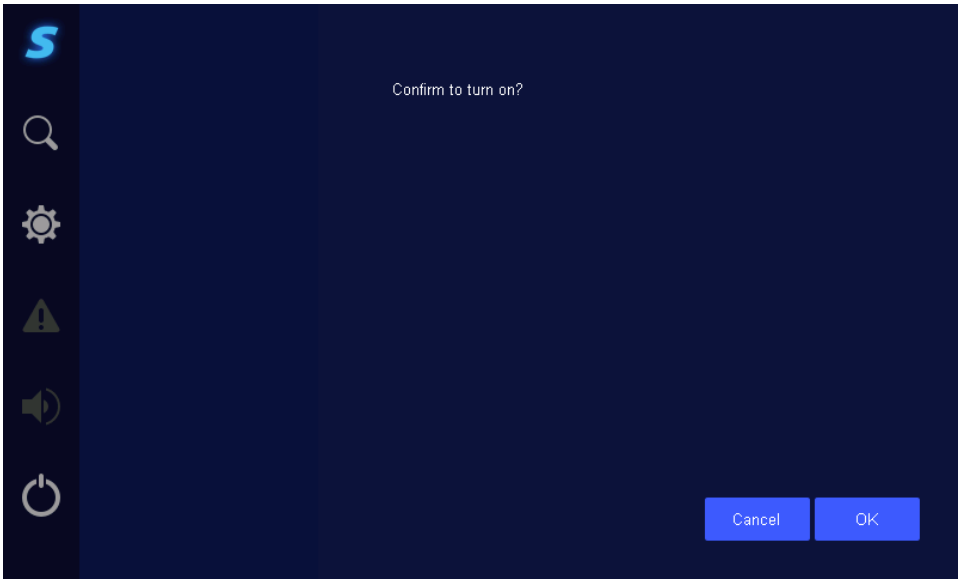


Figure 22- Confirm to turn on

4.4.2 Silence buzzer

When audible alarm is active, the Buzzer icon will turn white. To silence audible alarm, press the Buzzer icon.

4.5 Monitoring Function

4.5.1 Bypass information

On main page, click Bypass icon, the page displays the line voltage, frequency and status of bypass input, as shown in **Figure 23**.

Figure 23- Bypass information

4.5.2 AC input information

On main page, click AC Input icon, the page displays the line voltage, line current, frequency and status of mains as shown in **Figure 24**.

Figure 24- Mains information

4.5.3 Battery information

On main page, click Battery icon, it will show the battery information, as shown in **Figure 25**, **Figure 26** and **Figure 27**.

Figure 25- Battery information 1

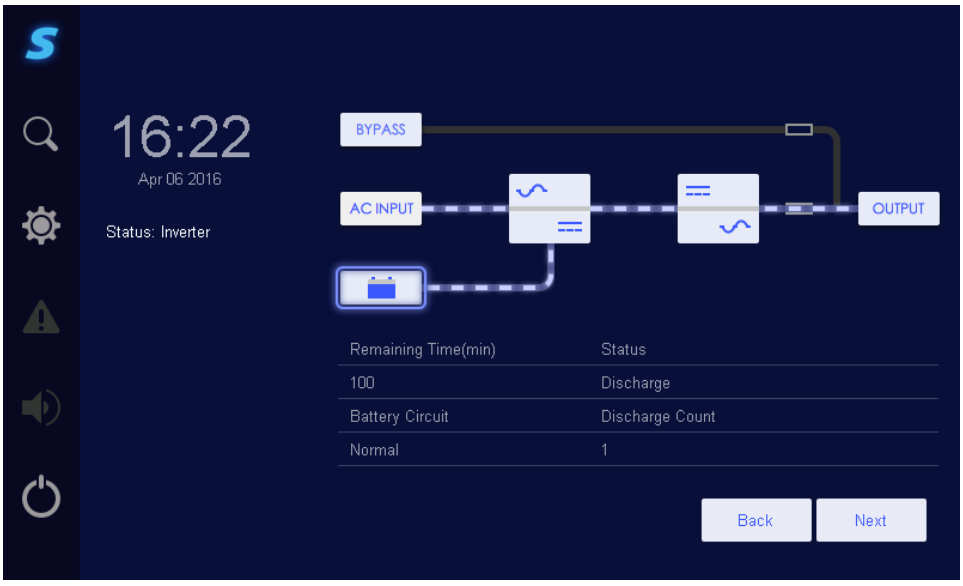


Figure 26- Battery information 2

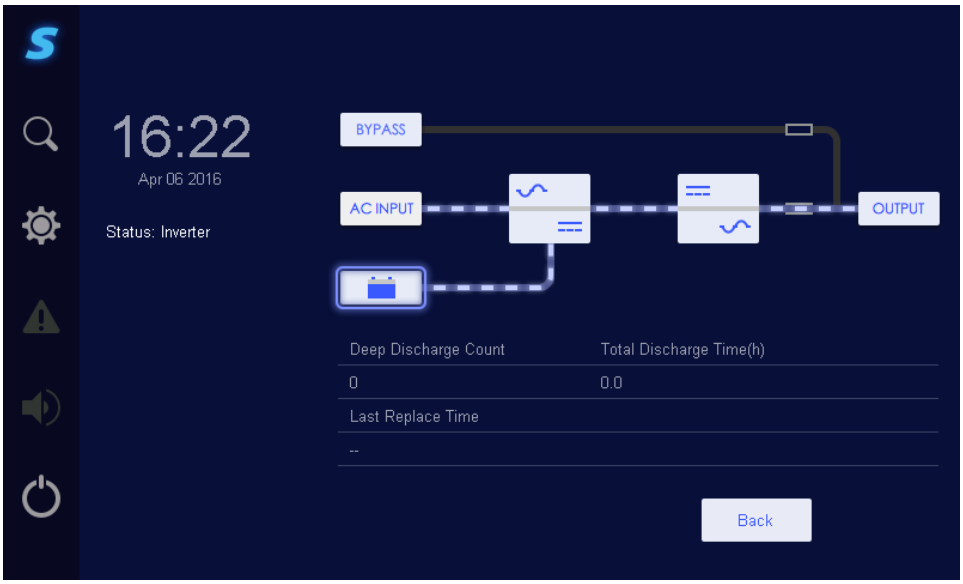


Figure 27- Battery information 3

If the battery is not connected, battery status, battery temperature, remaining capacity, remaining time will show as “--”.
System will display the charging current/discharging current according to battery status automatically.

4.5.4 Output information

On main page, click Output icon, it will show the output information, including phase voltage, phase current, frequency, apparent power, active power and load percentage, as shown in **Figure 28** and **Figure 29**.

Figure 28- System output information 1

Figure 29- System output information 2

4.6 Parameter Setting

Click Setting icon, it will enter Login interface, as shown in **Figure 30**.

Figure 30- Login interface

After entering password it will turn to parameter setting page, as shown in **Figure 31**.
Default passwords:
Read only: 123456
Maintenance: 121212

Figure 31- Parameter setting interface

4.6.1 System Management

On **Parameter Setting** page, click "**System Manage**" to enter system manage interface as shown in **Figure 32**. Press specific parameter button to change its parameters.

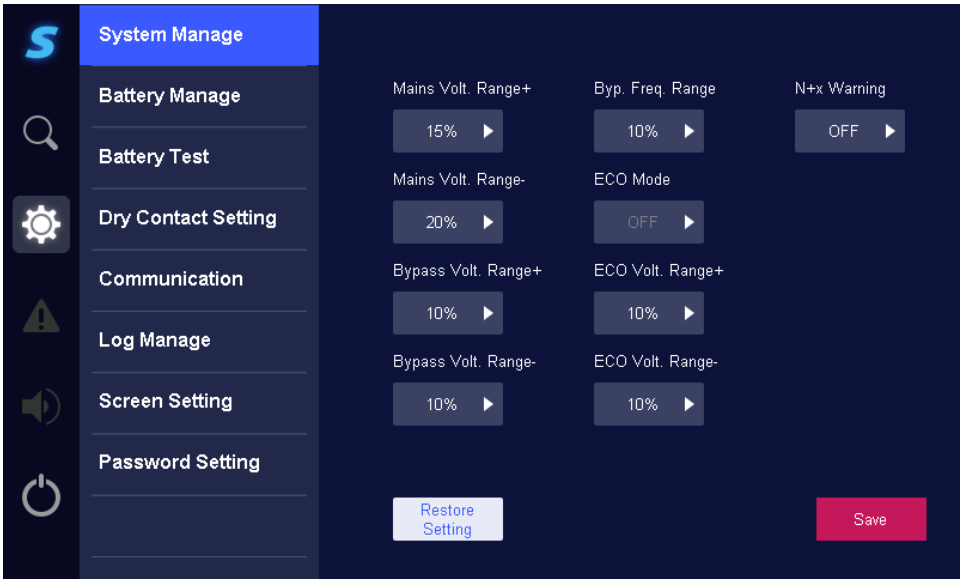


Figure 32- System management page

Parameter	Range	Default
Mains Volt. Range+	+10%,+15%, +20%;	15%
Mains Volt. Range-	-10%,-15%, -20%, -25%, -30%, -35%, -40%	20%
Bypass Volt. Range+	+10%,+15%, +20%	10%
Bypass Volt. Range-	-5%,-10%,-15%, -20%, -40%	10%
Byp Freq Range	±5%, ±10%	10%
ECO mode	On, Off	Off
ECO Volt. Range+	+5%, +10%	10%
ECO Volt. Range+	-5%, -10%	10%
N+x Warning	Only for display	Off

Table 3– System Manage Parameters

After changing the parameter, it is necessary to click Save button to save the setting. If the setting is successful, there will be a Check icon at the right side of the parameter, as shown in **Figure 33**, if the setting is unsuccessful, there will be a Cancel icon at the right side of the parameter, as shown in **Figure 34**.

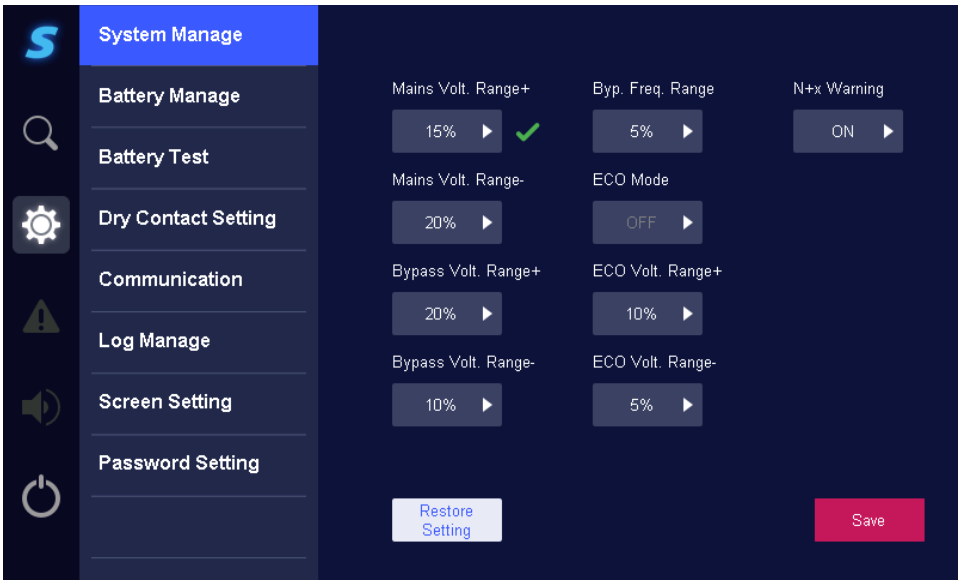


Figure 33- Successful setting

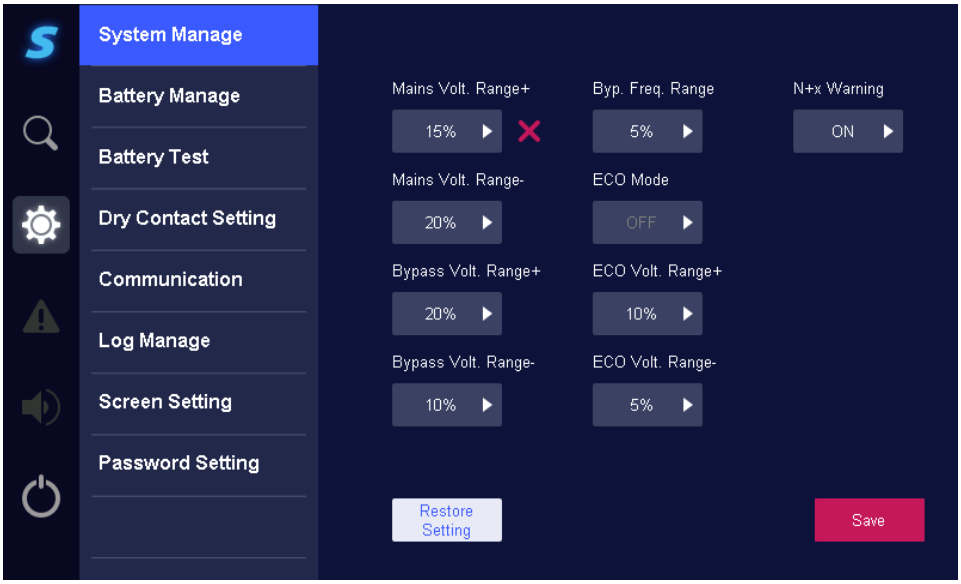


Figure 34- Unsuccessful setting

4.6.2 Battery management

On Parameters Setting page, click “Battery Manage”, it will enter battery manage page, as shown in **Figure 35**.

Figure 35- Battery management

Parameter	Range	Step	Default
Equalizing charge voltage(V)	12.500-14.500	0.001V	14
Floating charge voltage(V)	12.500-14.000	0.001V	13.625
Equal to float charge Delay(min)	0-10	1min	1
Charge current range(A)	10-60;	0.1A	40
Charge current (On Generator) (A)	10-60;	0.1A	30
Battery test ending voltage(V)	10.000-15.000	0.001V	10.5
Battery test time(min)	1-600	1min	60
Low voltage warning(V)	10.500-12.000	0.001V	11.2
Low voltage protection(V)	9.000-11.000	0.001V	10.5
Temperature compensate(mv/℃)	0-5	1 mv/℃	3

Table 4– Battery Management Parameters

Click number input box, it will display the input range of setting value at the top of the input keyboard. When the setting exceeds the range the setting will be invalid. After setting, click Save button to save the setting.

4.6.3Battery test

On Parameter Setting page, click “Battery Test”, it will enter battery test page, as shown in **Figure 36**.

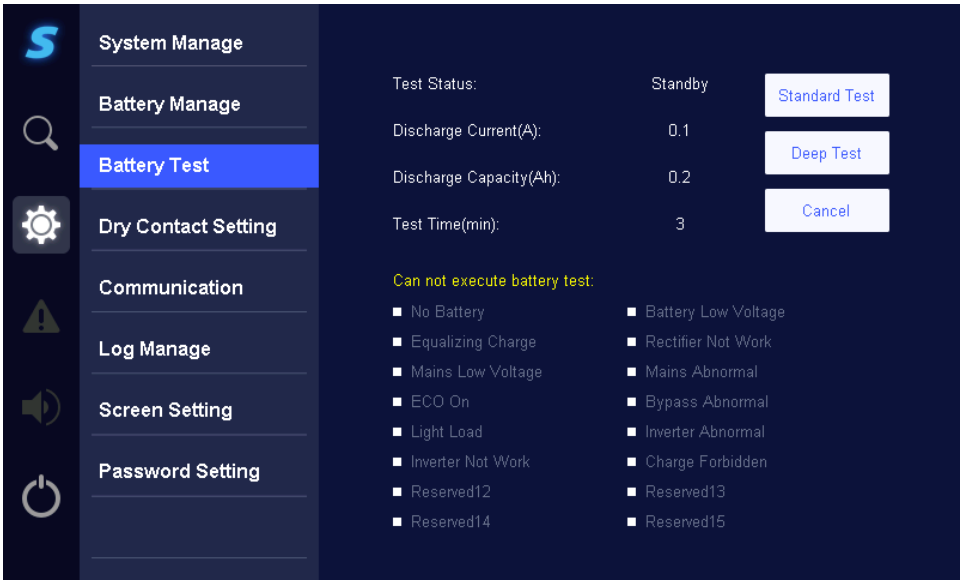


Figure 36- Battery test page

Click “Standard Test” icon, it will popup confirming window, click “OK” button to start standard test, as shown in **Figure 37**.

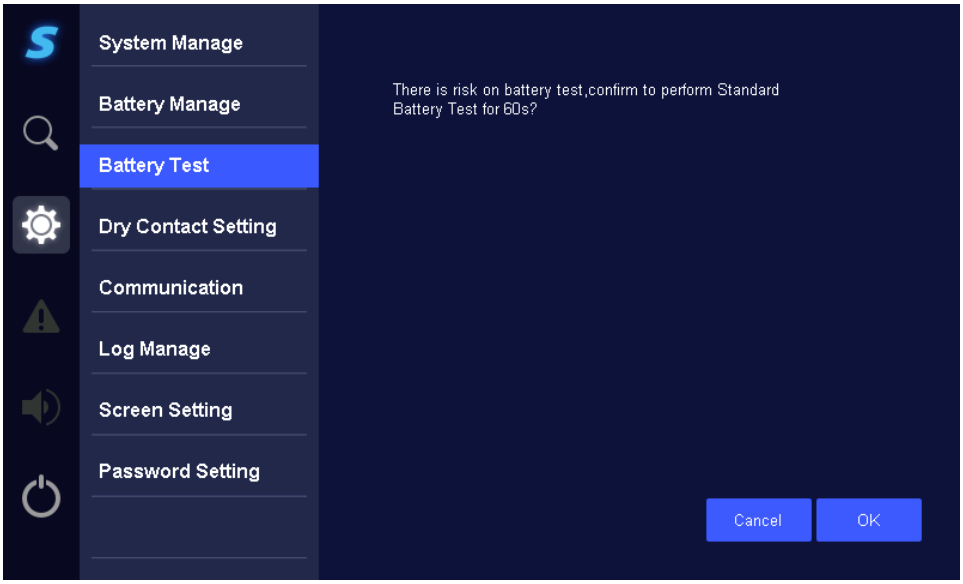


Figure 37 - Standard test

Click “Deep Test” icon, it will popup confirming window, click “OK” button to start deep test, as shown in **Figure 38**.

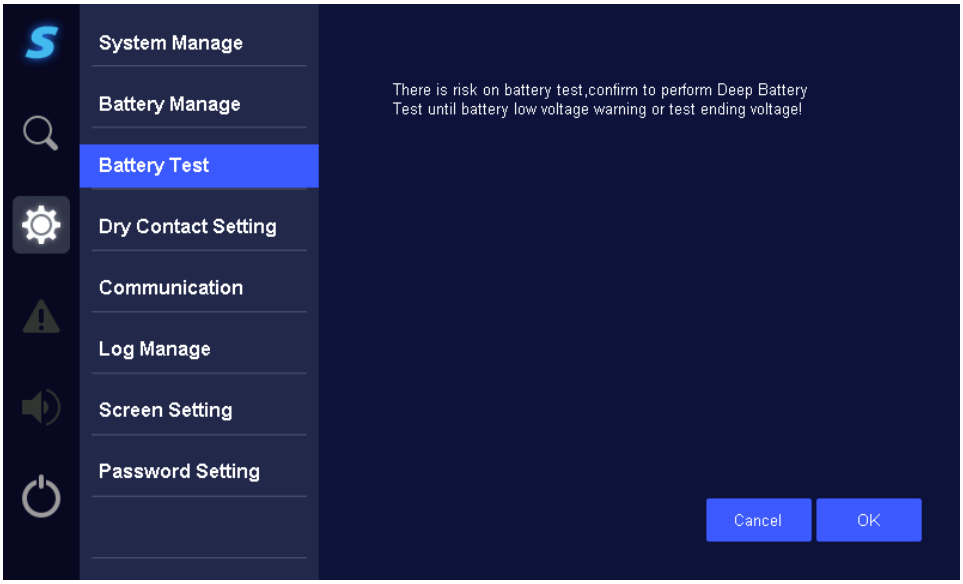


Figure 38- Deep test

During battery testing, if it needs to stop testing, you can enter battery test page, and click “Cancel” button to cancel battery test, as shown in **Figure 39**.

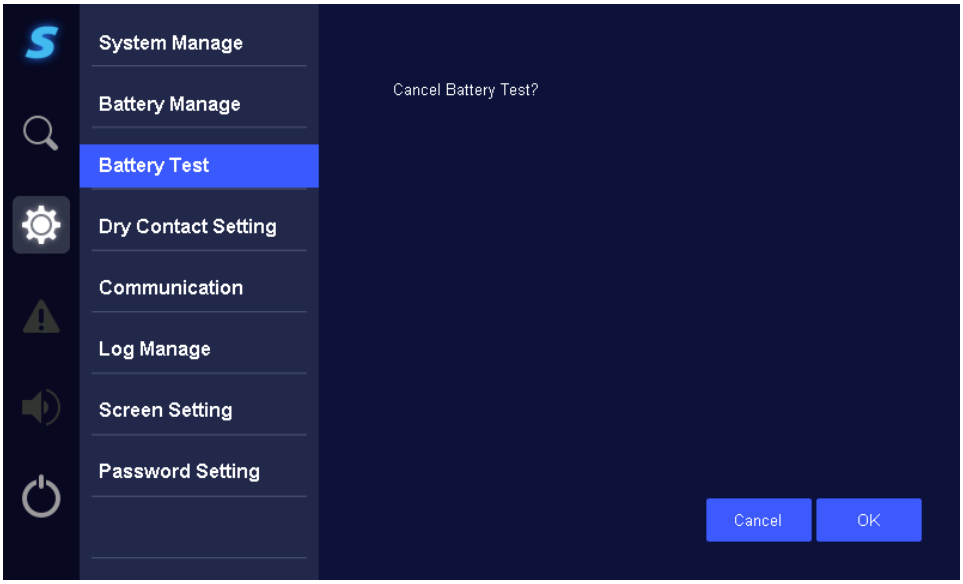


Figure 39- Cancel battery test

After finishing the battery test, the Event Log will record the battery test result.

4.6.4 Dry contact setting

On Parameter Setting page, click “Dry Contact Setting”, it will enter dry contact setting page, as shown in **Figure 40**.

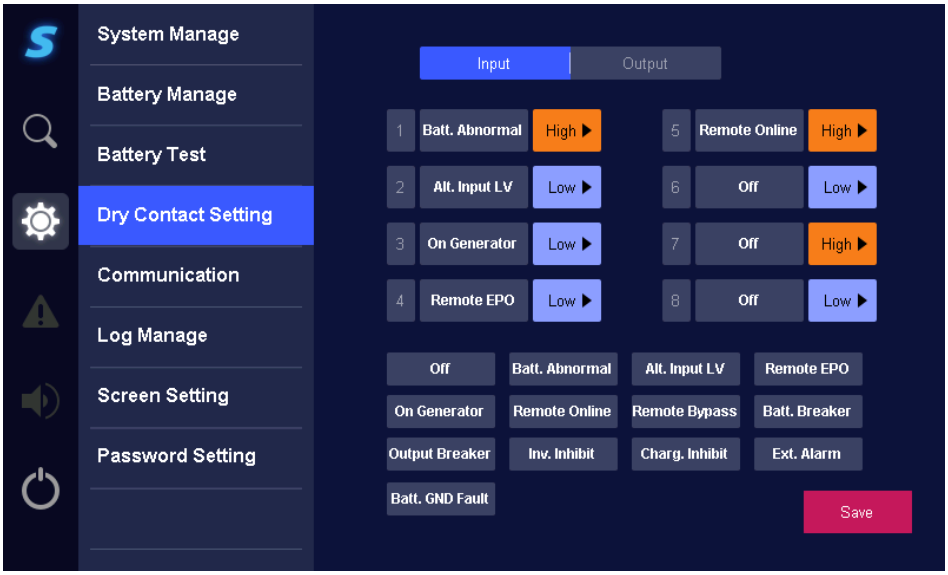


Figure 40- Dry contact setting

After setting, click Save button to save the setting.

4.6.5 Communication

On Parameters Setting page, click “Communication”, it will enter communication setting page, as shown in **Figure 41**.

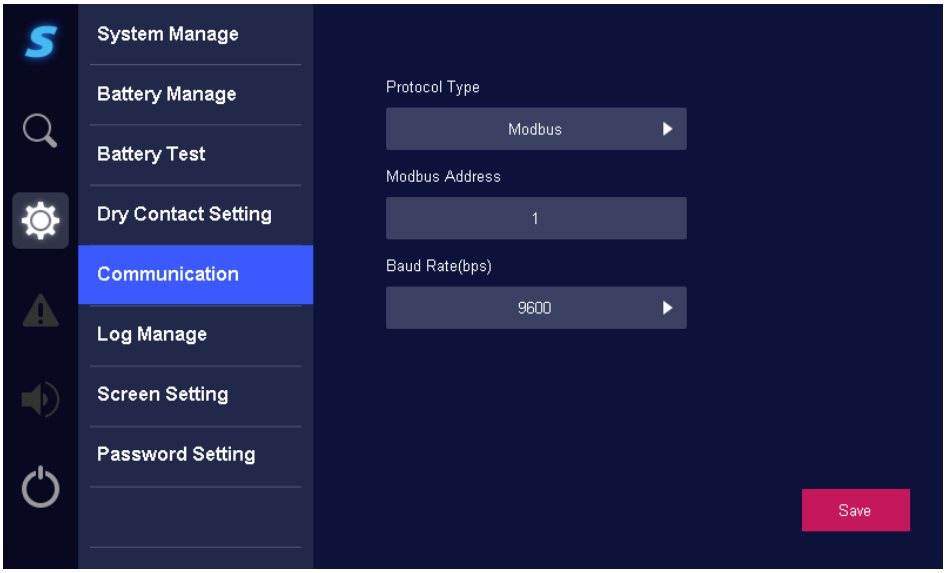


Figure 41- Communication setting page

Description	**Parameter**
Protocol type	Modbus or SNMP
Modbus Address	0-247
Baud Rate	4800, 9600, 19200

Table 5– Communication Settings

Click number input box, it will display the input range of setting value at the top of the input keyboard. When the setting exceeds the range the setting will be invalid. After setting, click Save button to save the setting.

4.6.6 Log Manage

On Parameter Setting page, click “Log Manager”, it will enter log manager page, as shown in **Figure 42**.

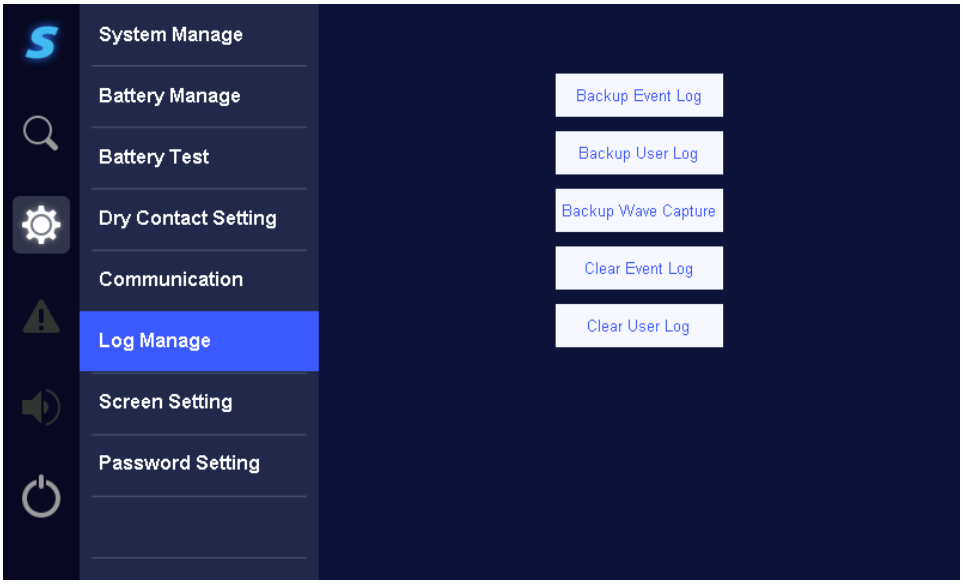


Figure 42- Log manage page

Allows clearing log, exporting log or backup the records. To Backup data, a flash drive must be inserted into the USB port at rear of the LCD.

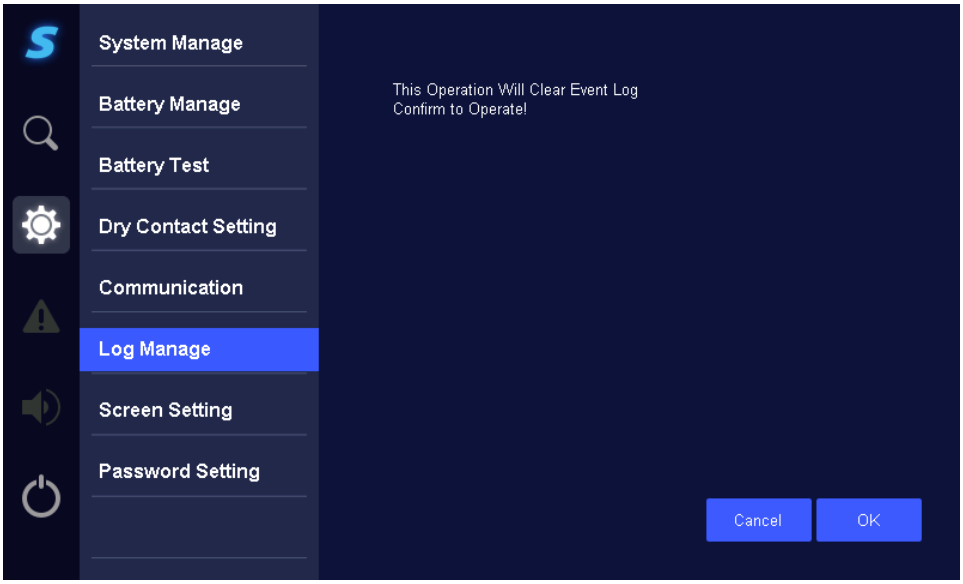


Figure 43- Prompt for clearing log

4.6.7Screen setting

On **Parameter Setting** page, click "**Screen Setting**", it will enter screen setting interface, as shown in **Figure 44**.

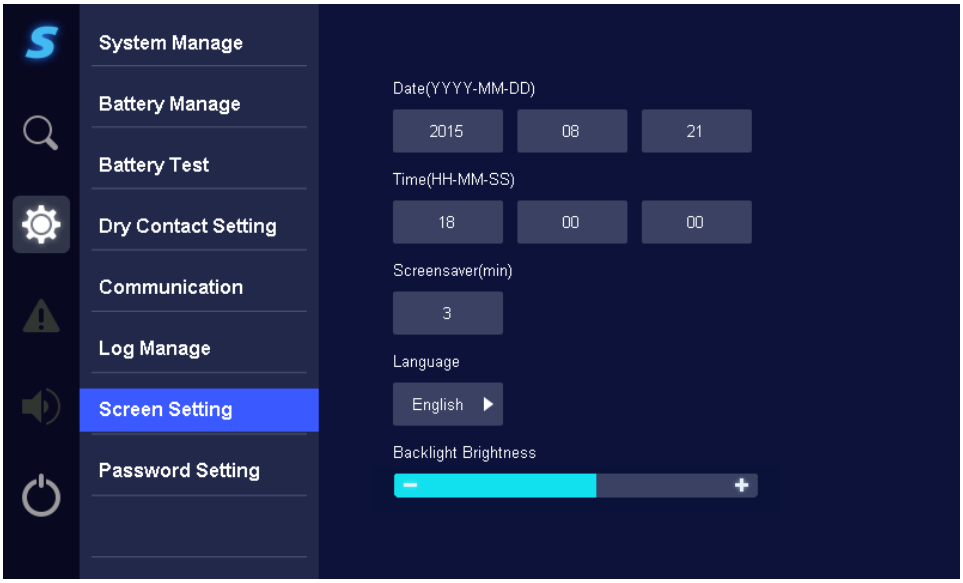


Figure 44- Screen setting page

4.6.8Password setting

On Parameter Setting page, click "Password Setting", it will enter password setting page. The current user's password can be changed only, as shown in **Figure 45**. The password is 1 to 6 positions Arabic numerals. After filling in new password, click "Save" button to save the setting.

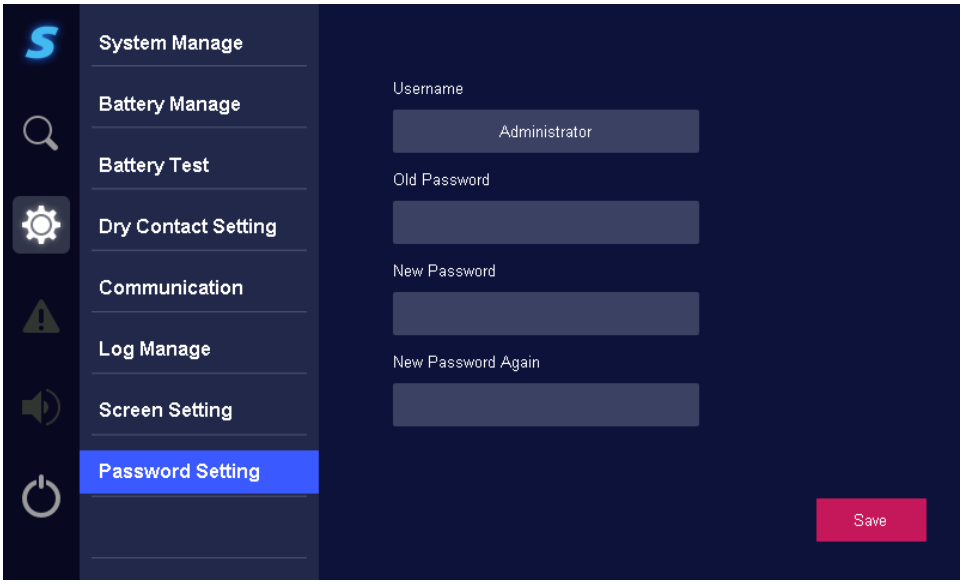


Figure 45- Password setting

4.7 Information Inquiry

Click Search icon to enter information inquiry page, the related information is as shown in **Figure 46**.

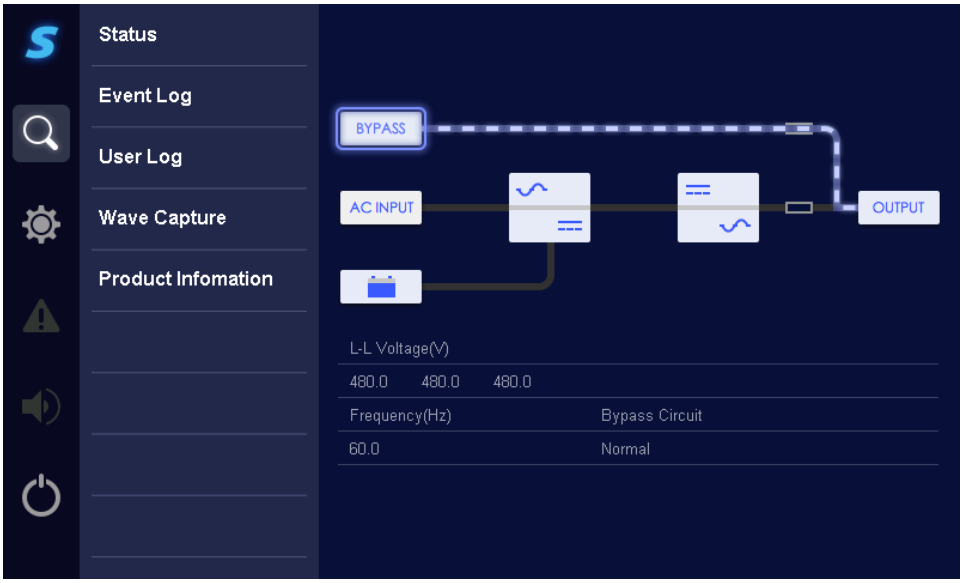


Figure 46- Information inquiry page

4.7.1 Working status

On **Information Inquiry** page, click "**Work Status**", it will enter work status page, as shown in **Figure 47**.

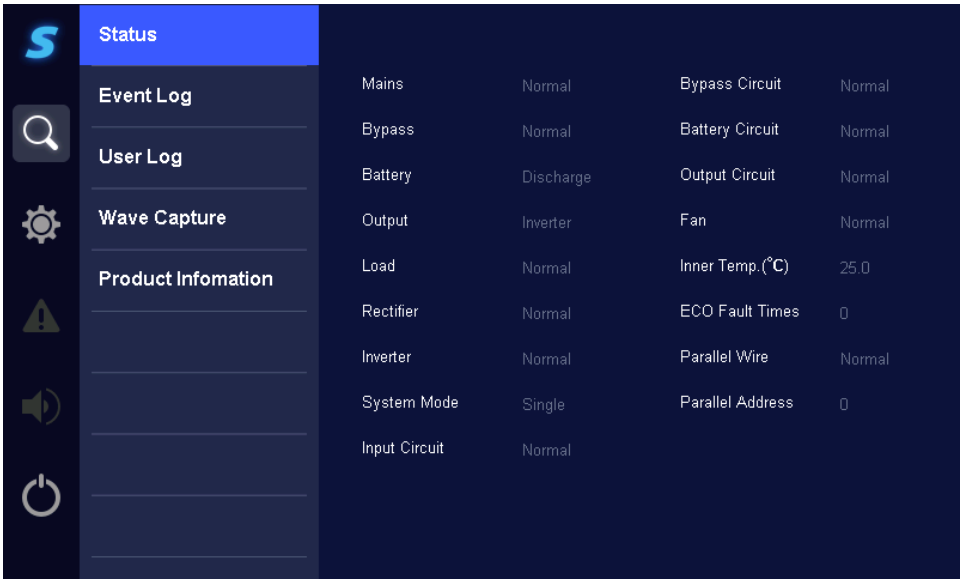


Figure 47- Work status

If the battery is not connected, battery status, battery temperature, remaining capacity, remaining time will show as "--".

When the work mode is single mode, the parallel wire status will show as "--".

4.7.2 Event log

On Information Inquiry page, click “Event Log” icon, it will enter event log page. The page records the historical fault and alarm information of the system, as shown in **Figure 48**.

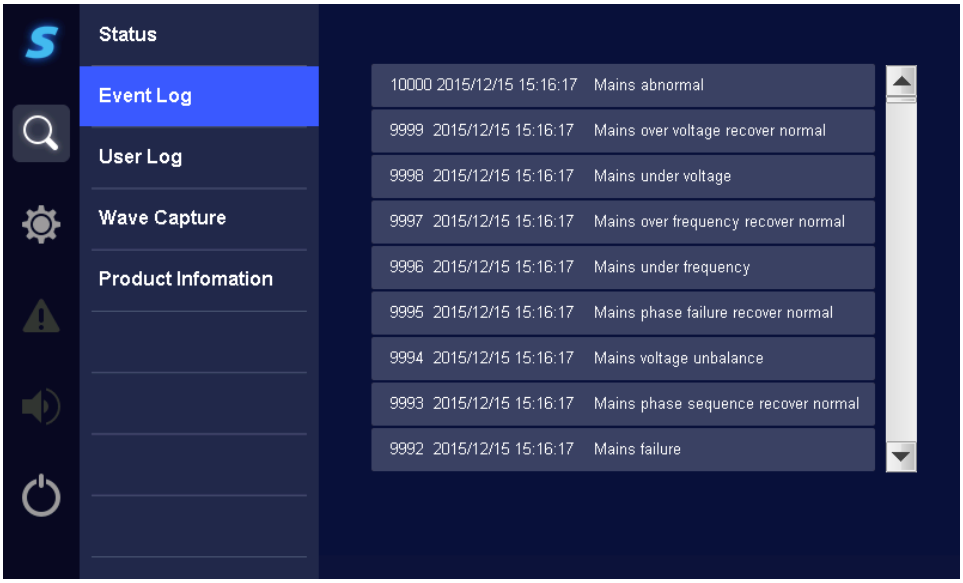


Figure 48- Event log

4.7.3 User log

On Information Inquiry page, click “User Log”, it will enter user log page, as shown in **Figure 49**.

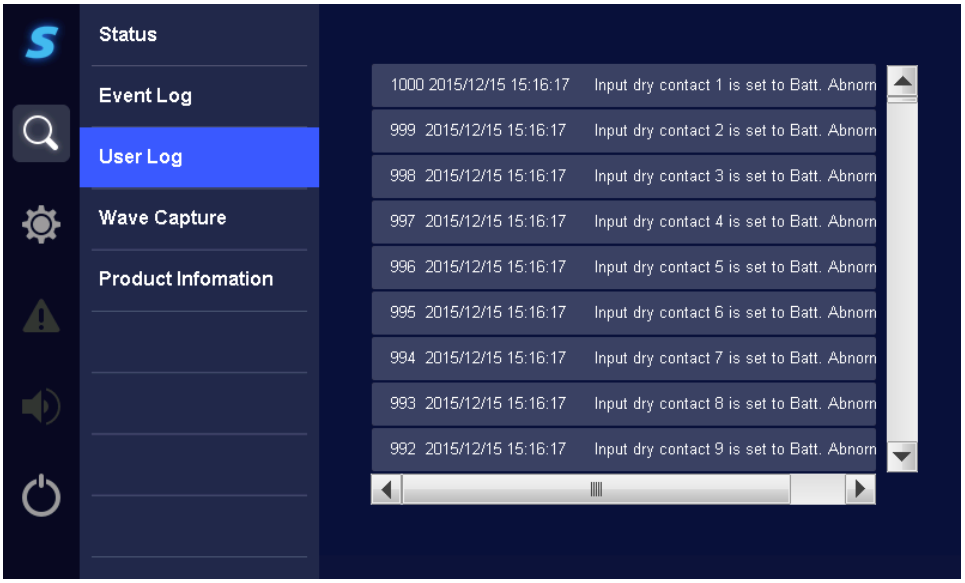


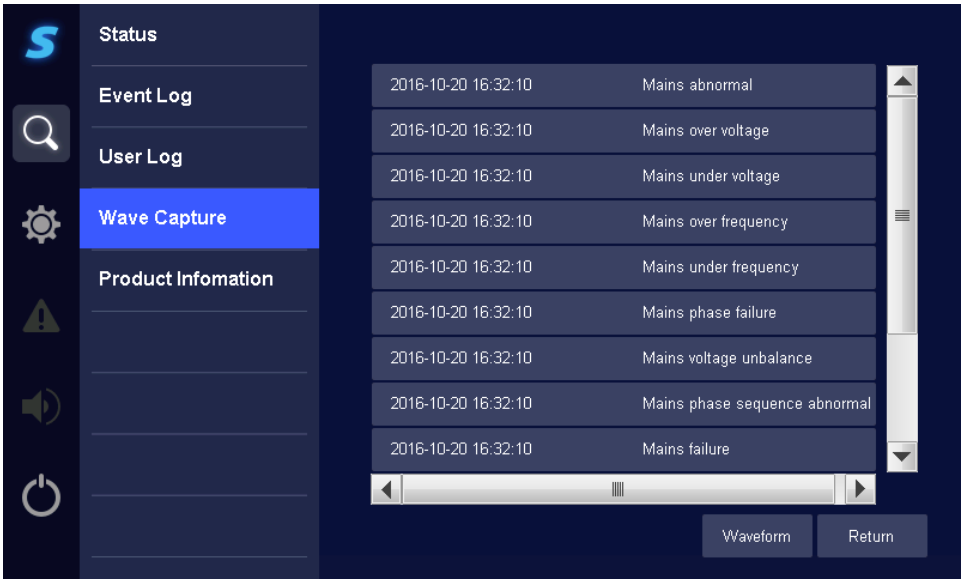
Figure 49- User log

4.7.4 Wave capture

On Information Inquiry page, click “Wave Capture”, it will enter wave capture list page, as shown in **Figure 50**.

Figure 50- Wave capture list

Click the Wave Capture Time, it will enter Wave Capture Fault page, as shown in **Figure 51**.



Click on event to show the waveform.

Figure 51- Wave capture detail

4.7.5 Product information

On Information Inquiry page, click “Product Information” Icon, it will enter product information page, the first page shows the product name, model, manufacturer, contact information, etc. as shown in **Figure 52**.

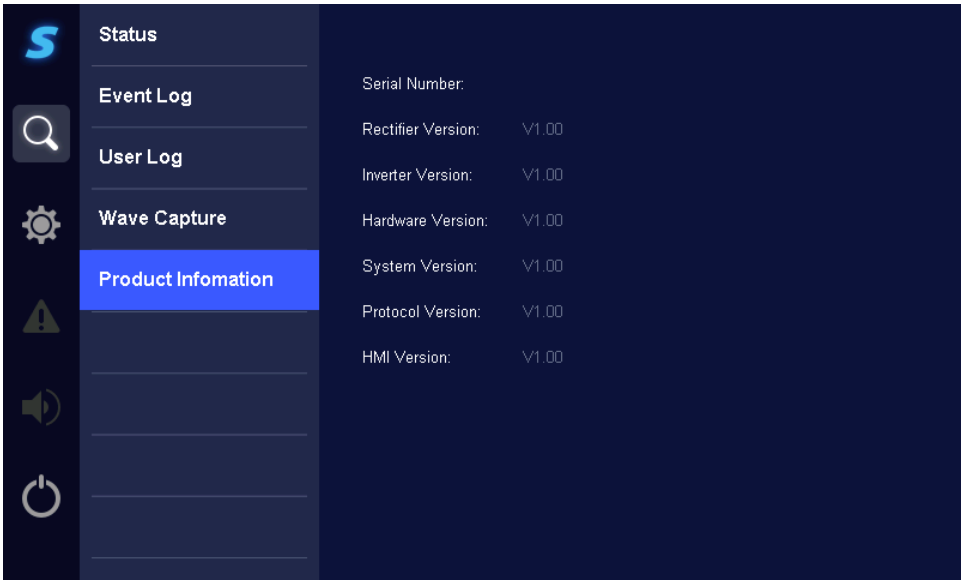


Figure 52- Product information page

5. Maintenance
5.1 Basic Maintenance Guide

The uninterruptible power system is designed and produced to last, even in the most severe service conditions. It is an electronic power unit, which requires periodic maintenance. Moreover, some components have a limited lifespan and as such must be periodically checked and replaced should conditions so dictate: in particular the batteries, the fans and in some cases the electrolytic capacitors. It is therefore recommended to implement a preventive maintenance program with a specialized personnel authorized by the manufacturer.
Our Technical Support Team will be happy to recommend the various personalized options for preventive maintenance.

5.1.1 Periodic maintenance (to be carried out by trained personnel and with doors closed)

The following operations should be carried out periodically (e.g. once a month, or more frequently in particularly difficult environmental conditions):

- Ensure that the air intake slots (located on the front door and at the back of the cabinet) and the output grilles located on the top of the cabinet are clean;
- Perform a battery test.

5.1.2 Maintenance inside the UPS (factory authorized personnel only)

Danger

Maintenance inside the UPS may only be carried out by trained personnel. The UPS is designed to power the load when it is disconnected from the mains power supply.
High voltage is present inside the UPS even when the mains power supply and the battery have been disconnected.
After disconnecting the input utility and the battery source, trained service personnel must wait at least ten minutes for the capacitors to discharge before working on the inside of the UPS.

5.1.3 Ordinary maintenance for batteries (trained personnel only)

The system automatically controls the efficiency of the batteries every 24 hours, and sounds an alarm when the efficiency is lower than that calculated, according to the stored capacity value.
The lifespan of the batteries is linked to the operating temperature and to the number of charge and discharge cycles the battery has experienced.
The capacity is not constant, but increases after some charge and discharge cycles; it then remains constant for several hundreds of cycles before decreasing permanently.
Preventive maintenance of the battery:

- Keep the operating temperature within the range of 20 - 25°C;
- Perform two or three discharge and charge cycles during the first month of use;
- Repeat this operation every six months after the first month of use.

Danger

Maintenance inside the UPS may only be carried out by trained personnel.
Since the batteries are a source of energy, opening the battery circuit breaker/disconnect does not eliminate the voltage inside the battery cabinet. DO NOT TRY TO ACCESS THE INSIDE OF THE BATTERY CABINET. THERE ARE ALWAYS DANGEROUS VOLTAGES FROM THE BATTERIES. If the batteries are thought to be faulty in any way, please contact Staco technical support.

Warning

If the batteries need to be replaced, this must be done by ***factory authorized personnel***. The replaced parts must be sent to a specialized company for disposal by means of recycling. Batteries are classified by law as “toxic waste”.

5.2 Recommended Replacement Intervals

The Staco UPS has a long design life. Due to the characteristics of the part, not the design of the UPS, certain components used in the design have a limited life, even with proper maintenance.

Service and maintenance work must be performed only by factory authorized personnel.

Staco recommends these limited-life components be periodically inspected and replaced before the expected expiration of their life cycle. The recommended replacement schedule is an estimate only. The life of these parts depends on site conditions such as ambient temperature, load profile, cleanliness of environment and other factors. See Section **6.1 Technical Specifications**

Staco Recommends a Factory Authorized Preventative Maintenance review is schedule at least once a year.

Component	Recommend Replace in:
Fans	4-6 years
Batteries	4 years
AC Filter Capacitors	4-6 years
DC Filter Capacitors	4-6 years

Table 6 - Recommended Replacement Intervals

The functional lifetime of VRLA batteries is significantly affected by the temperature at which they are stored and operated. Ideally, VRLA batteries should be used in a 25º C (77º F) environment. For every 8.3º C (15º F) increase in temperature, the life expectancy of a battery will be halved.

Exposure to temperatures in excess of 32º C (90º F) should be limited to no more than 30 days per year. Under no circumstances should the VRLA battery be exposed to temperatures over 40º C (104º F) which can lead to thermal runaway, a condition that damages the battery. Thermal runaway can cause batteries to swell. If the battery cases burst, the hazardous contents may be exposed.

Maintaining proper ambient temperature usually requires installing the product in a temperature controlled space. Equipment rooms without cooling systems do not generally maintain the proper conditions for good battery life.

See Staco’s website for warranty details:
http://www.stacoenergy.com/support/literature-download-center.html

6. Specifications
6.1 Technical Specifications

Input	
Voltage	480V (3W+G)
Range	15% / -20%
Frequency	45-65
Power Factor	>0.99
Reflected Current Distortion (THD)	<3%
Output	
Voltage (V_{LL})	480/ 400/380V (3W+G)
Static Voltage Regulation	±1%
Voltage Transient Response	±5%
Frequency Slew Rate	0.5Hz/1.5Hz/2.5Hz
Free Running Frequency	50/60 +/-0.1
Voltage Distortion (THD)	≤1% (linear load)
Inverter Overload	111-125%: 10 minutes 126-150%: 1 minute
Bypass	
Bypass Overload	126-150%: 30 minutes 151-200%: 1 minutes
Bypass Input Synch Voltage Range	20%/15%/10% -10%/-15%/-20%/-20%
Bypass Input Frequency Tracking Range	50/60±5% (±10% optional)
Battery	
Nominal Battery voltage (Vdc)	480V
Charging current (A)	10 - 60
Environmental	
Altitude	< 2000 meters Derate load capability above 1000 meters 1% per 100 meters
Operating Temperature (°F/°C)	23 -104 / -5 - 40
Storage Temperature[1] (°F/°C)	-13 - 131 / -25 - +55
Cooling	Forced Air (Inlet: front; Outlet: top)
Relative humidity	0~95%, non-condensation
Audible Noise (dbA)	≤69
General	
Dimensions (HxWxD)	27.56 x 31.50 x 70.87 (in) 700×800×1800 (mm)
Weight (lb/kg)	991 / 450
Standards	UL listed to 1778, CUL to CSA C22.2, NEMA PE-1, ASME, ASA-C-39.1-1984, FCC Part 15 Subpart J Class B, NEC, OSHA, IEEE587, ANSI C 62.41-1980, ISO9000, 14000

1. If the transporting and storage temperature exceed the work temperature, it is necessary to place the UPS to normal operation temperature and keep it for at least 4 hours before installing and powering on.

6.2 Rated Currents and Recommend Field Wiring Information

KVA	CURRENT (AMPS)			
	MAX INPUT	BYPASS	OUTPUT	DC @ EOD
80	112	96	96	210
100	145	120	120	262
125	181	150	150	328

KVA	RECOMMENDED BREAKERS[4,5,6]			
	RECTIFIER	OUTPUT	BYPASS	DC
80	150	125	125	300
100	200	175	175	350
125	250	200	200	450

KVA	RECOMMENDED CABLES [1,2,3]			
	RECTIFIER	OUTPUT	BYPASS	DC
80	1/0	1AWG	1AWG	(2) 1/0
100	3/0	2/0	2/0	(2) 2/0
125	(2) 1AWG	3/0	3/0	(2) 4/0

KVA	RECOMMENDED GROUND CABLE[7]			
	RECTIFIER	OUTPUT	BYPASS	DC
80	4AWG	4AWG	4AWG	2AWG
100	4AWG	4AWG	4AWG	1AWG
125	2AWG	4AWG	4AWG	1/0

1. Based on 75°C copper wire.
2. Recommended cable sized based on THW cables at 30°C ambient (NEC Table 310.16). If different cables are used or installed at higher ambient, the cable size need to be reviewed.
3. Any external battery wires use reinforced insulation or double insulated wire.
4. Over Current Protection Device, must be rated for branch circuit protection.
5. Output circuit protection requirement is determined by distribution circuit. Smaller wire may be used for load wiring if rated load current is not needed and the appropriate circuit protection is applied. Output circuit protection must be provided as a part of the installation.
6. Input and output circuit protection must be provided by others as part of the UPS installation.
7. Per NEC article 300-20(2), all three-phase conductors must be run in the same conduit. Ground must be run in the same conduit as the phase conductors.

6.3Recommended Lugs

Cable Size	T&B Lug	Bolt Size	Torque
4AWG	256-30695-264	1/2"	75 ft-lbs
2AWG	54145-TB		
1AWG	54150		
1/0	54155-TB		
2/0	54160		
3/0	54165-TB		
4/0	54170		

6.4BTU/hr

kVA	BTU/hr
80	10,350
100	13,058
125	17,055

Appendix A – Alarms

Description	Condition
Mains abnormal	Mains Abnormal Alarm is active
Bypass abnormal	Bypass Abnormal Alarm is active
Battery abnormal	Battery Abnormal Alarm is active
Rectifier abnormal	Rectifier Abnormal Alarm is active
Internal communication fault	Control board internal communication abnormal
PFC power limited	Mains input current reach the current-limit setting value
PFC flash read error	Internal Flash read error
Battery over temperature alarm	Battery temperature over the setting value
Environment over temperature alarm	Environment temperature over the setting value
Output circuit abnormal	External output breaker disconnected (output dry contact）
Output overload alarm	Output load larger than 100%
Output over voltage alarm	Output overvoltage
Output under voltage alarm	Output undervoltage
Inverter assistant point fault	Output contactor abnormal
Inverter abnormal	Inverter Abnormal Alarm is active
Rectifier locked inverter	Rectifier abnormal prohibit inverter working
Parallel mode with non-redundancy	While system is in redundancy mode, system load above redundancy level
Enter ECO state	Enter ECO mode
Exit ECO state	Exit ECO mode
Fan fault	Fan fault
ECO fault	Bypass abnormal or Bypass overload protection or bypass voltage larger than ECO voltage upper limit setting value or bypass voltage less than ECO voltage lower limit setting value
Inverter bus fault	Inverter detect DC link voltage abnormal
Inverter losing synchronization fault	Inverter synchronization loss
Inverter debug mode on	Inverter debug mode started
Emergency power off	Panel EPO active or input dry contact EPO active
Impact load startup fault	System is in impact load mode inverter slow-start process abnormal
Parallel wire 1 abnormal	Parallel wire 1 abnormal lost connection
Parallel wire 2 abnormal	Parallel wire 2 abnormal lost connection
System power on parameter mismatch	Parallel system machine parameters mismatch or Parallel address is the same parameters system rated power, rated voltage, rated frequency ,working mode, impact load mode setting, frequency conversion mode setting
System overload	Inverter output overload protection
Waiting invert together	Parallel system waiting for bypass switch to invert together
System emergency power off	EPO fault
Parameter mismatch fault	One of parallel parameters is incorrect
Battery abnormal(Remote)	Input dry contact-Battery abnormal action

Description	Condition
Alternate input power level	Input dry contact-Alternate input power level action
Remote EPO	Input dry contact-Remote EPO action
On generator	Input dry contact-On generator action
Remote online	Input dry contact-Remote online action
Remote bypass	Input dry contact-Remote bypass action
Battery breaker off	Input dry contact-Battery breaker off action
Output breaker off	Input dry contact-Output breaker off action
Inverter inhibit	Input dry contact-Inverter inhibit action
Charging inhibit	Input dry contact-Charging inhibit action
External alarm	Input dry contact-External alarm action
Battery ground fault	Input dry contact-Battery ground fault action