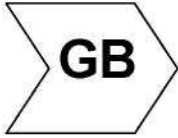


POWERVARIO



User Manual

1000-3000VA (single phase In/Output)

Intelligent True On-Line Uninterruptible Power Supply (UPS)
For Corporate & IT User Installation Guide



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TO PROTECT YOUR MISSION CRITICAL APPLICATIONS

USER MANUAL POWERVARIO

Intelligent True On-Line Uninterruptible Power Supply (UPS)
For Corporate & IT User Installation Guide

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POWER RANGE: 1000-3000VA

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1 Standard Unit Installation Guide

1.1 Important – Please read carefully prior to installation

1. Though this UPS is designed for easy Plug-and-Play installation, it is advisable to engage qualified Electrical Engineer or trained technical personnel to commission or repair the UPS.
2. This UPS is equipped with an EMI filter. To prevent potential leakage current hazard, ensure that the AC main supply is securely grounded.
3. To prevent any overheating of the UPS, keep all ventilation openings free from obstruction, and do not place anything on top of the UPS. Keep the UPS rear panel 30 cm away from the wall or other obstructions.
4. This UPS is designed to be installed and commissioned in a sheltered, controlled environment as follows:
 - Operating temperature 0-40°C and 30-90% non-condensing humidity
 - Always avoid contact with direct sunlight
5. The UPS internal battery should be recharged every 2-3 months if not in use to prevent battery self-discharge. The battery can be recharged when the UPS is connected to the utility supply.
6. Always switch off the UPS and disconnect the batteries when relocating the UPS.
7. Please ensure that the input voltage of the UPS matches the utility supply voltage. Use a certified input power cable with the correct plugs and sockets for the appropriate voltage system.
8. CAUTION -The Warranty of the UPS will be rendered void and the manufacturer reserves the right to refuse replacement/compensation under the following conditions:
 - Accidental damage to the UPS
 - Installing the UPS in inflammable or hazardous environment.
 - Improper installation or maintenance by unauthorised personnel

1.2 Storage Instruction

For extended storage in moderate climate, the batteries should be charged for 12 hours every 3 months interval by connecting the UPS to the utility supply and switch on input breaker located at UPS rear panel. Repeat this procedure every 2 months if the storage ambient temperature is above 30°C.

2 Product Introduction

2.1 General Characteristics

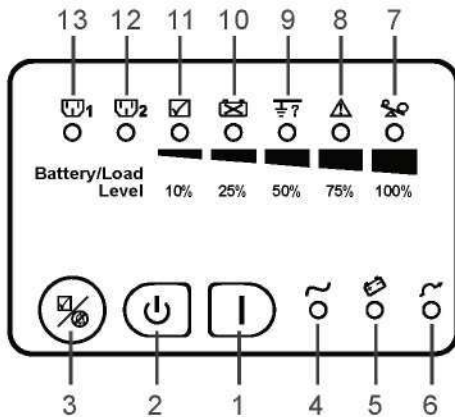
1. True online technology continuously supplies your critical device with a stable, regulated, transient-free pure sine wave AC Power.
2. High-efficiency PWM sine-wave topology yields an excellent overall performance. The high crest factor of the inverter handles all high in-rush current loads without the need to upgrade the power rating.
3. User-friendly Plug-and-Play design allows hassle-free installation. All units up to 3Kva are supplied with input cables and output sockets as standard.
4. Built-in Maintenance-free sealed-type battery minimises the need for frequent after-sales service.
5. To protect the unit from overloading, the UPS will automatically switch to bypass mode in 30 seconds if loading is at 105%~ 120% of rated capacity. It will automatically switch back to inverter mode once overload condition ceases.
6. Should the output becomes short-circuited, the UPS puts the system on stand-by mode, provide visual & audible alarm, and cuts the output supply automatically till the short circuit situation is resolved manually.

2.2 Special Features

1. High Frequency Transformer-less technology with rack/tower convertible enclosure enables the UPS for integration even in the most difficult of environment with space constraints.
2. This UPS is equipped with fully digitalized control logic for greater functionality and enhanced high level of power protection. Digital signal processing (DSP) also provides the UPS with powerful communication capability, which enhances the flexibility for easy remote control and monitoring
3. Wide input voltage tolerance from 120V~288V (220V version) allows under-voltage or over-voltage correction without unnecessary battery drain and helps extend the battery life span.
4. DC-start function ensures the start-up of UPS even during power outages.
5. Revolutionary battery management circuit analyzes battery discharging status to adjust battery cut-off point and extend the batteries' life span.
6. Active Power Factor Correction (PFC) control function constantly maintains the UPS Input Power Factor (PF) at > 0.99 for superb energy efficiency.
7. Selectable Bypass input voltage tolerance (Sensitivity low/high) to prevent under or over voltage being supply to the loads at Bypass mode. The selectable Voltage ranges are (i) Sensitivity Low : 184~260V & (ii) Sensitivity High : 194~260V.
8. Vast Selectable Output Voltages (200/208/220/230/240) to meet various voltage systems.
9. The UPS is designed to comply with various stringent international standards for Electromagnetic Interference & protection (EMC).

3 UPS Functional Descriptions

3.1 UPS Front Panel Display Descriptions

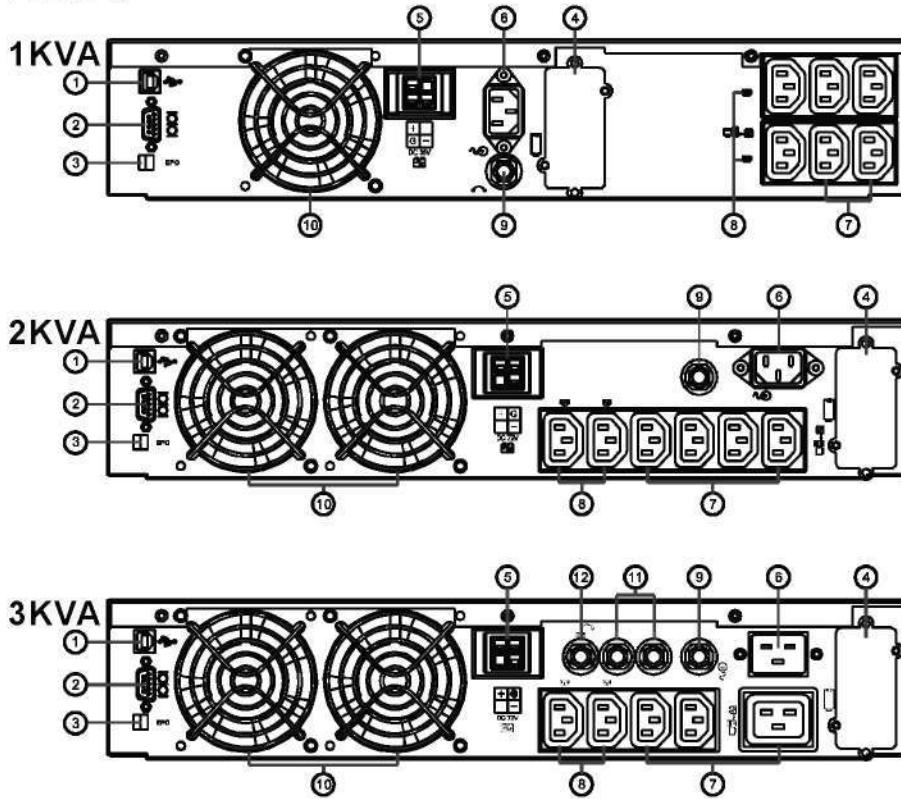


Control Keypads	Symbols	Functional Descriptions
1. ON		UPS Power-On Switch
2. OFF		UPS Power-Off Switch
3. Self-Test(Alarm Silence)		a. Command the UPS to perform self-testing b. Alarm Silence - To mute the alarm buzzer (Do not press & hold for > 1 sec)

LED Indicators	Symbols	Functional Descriptions
4. Normal Mode LED		LED illuminated indicates utility voltage within tolerance (120Vac~280Vac)
5. Battery Mode LED		LED illuminated indicates utility outage or out of tolerance, loads supply by battery power
6. Bypass Mode LED		LED illuminated indicates bypass supply is normal
7. Overload LED		Red LED illuminated indicates UPS is overloaded
8. Fault LED		Red LED illuminated indicates fault or abnormal conditions
9. Site wiring fault LED		Red LED illuminated indicates Live & Neutral lines are connected wrongly or High Neutral-Ground voltage
10. Battery Bad/Weak LED		Red LED illuminated indicates low battery power or faulty battery bank
11. Self Test LED		Green LED illuminated indicates successful self-test and no abnormal conditions or faults were found
12. Outlet2 LED		Green LED illuminated indicates UPS Outlets 2 are enabled and ready to supply loads
13. Outlet1 LED		Green LED illuminated indicates UPS Outlets 1 are enabled and ready to supply loads
7 ~ 11 LEDs (% Indicating Bars)		a. During Normal Mode : Press and hold for 1 sec, the 7~11 LEDs will function as Load Rate indicators showing 100%, 75%, 50%, 25% or 10% of UPS capacity used. These LEDs will stop illuminating after 10 sec. b. During Battery Mode : Press and hold for 1 sec > the 7~11 LEDs will function as Battery Power indicators showing 100%, 75%, 50%, 25% or 10% Battery Power remaining. These LEDs will stop illuminating after 10 sec.

3.2 Real Panel Descriptions

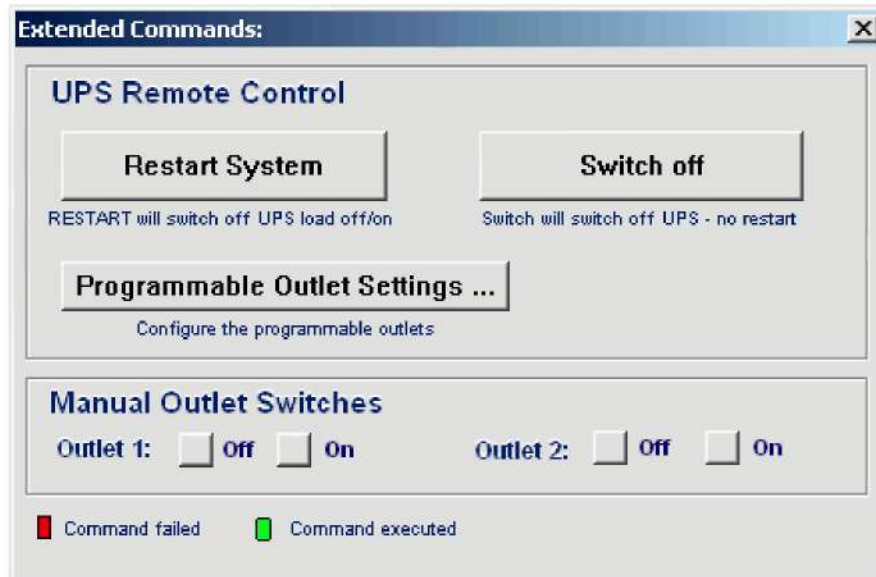
230V



1. USB Port
2. RS232 Port
3. Emergency Power Off (EPO) Dry Contact Signal inputs
4. Communication Card Options Slot
5. External Battery Connector
6. AC power connection socket
7. AC Outlets
8. Two programmable outlets
9. Utility Input fuse holder
10. Cooling Fans
11. Output fuse holders
12. Output fuse holders for two programmable outlets

3.3 Operating Modes & Voltage System Configurations

Through the software that is delivered with the unit you can regulate the output voltage and the power socket



3.3.1 System Configuration Settings

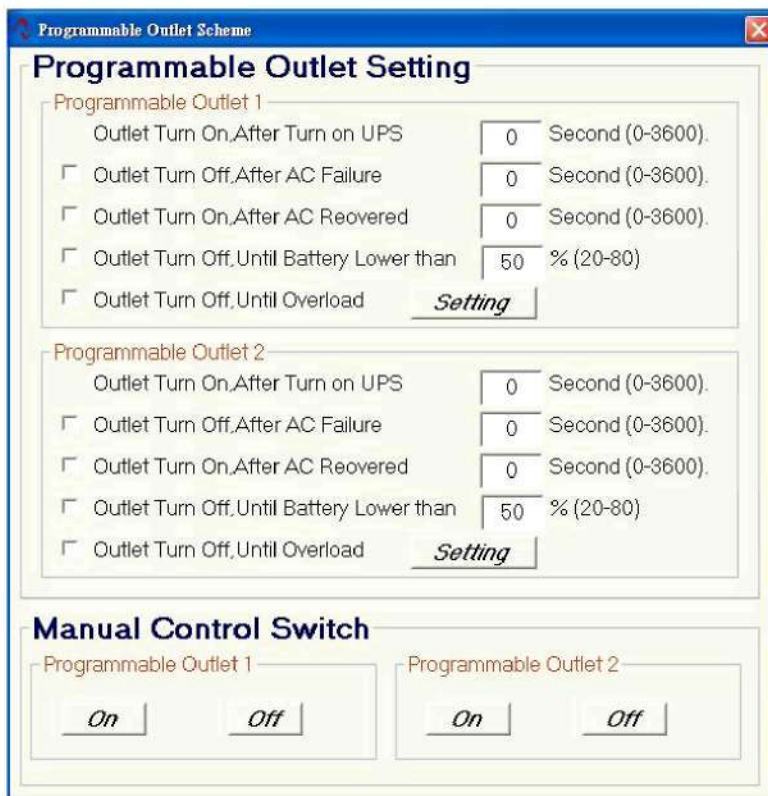
1. System: Select Input Voltage 220V
2. Vo: Select UPS Output Voltage
200V/208V/220V/230V/240V/250V
3. UPS Modes : Select Normal/CF50*/CF60* Mode
4. Fine turning of: Output Voltage Regulation from 0 \pm 3%
5. Bypass Sensitivity: Select Sensitivity Low/Sensitivity High**
6. Synchronizing: Select 3Hz/1Hz Inverter Freq synchronizing range
7. KVA: Key in 1 or 2 or 3 for the UPS KVA rating
8. Com Port: Select Com Port to PC
9. Click on "Write" to confirm the configuration settings. The UPS will sound 2 "beeps" to acknowledge setting is successful.

Note: *CF50/CF60 = Frequency Converter mode 50 to 60Hz or vice versa

**Sensitivity Low : 184~260V, High: 194~260V

3.3.2 Programmable outlet setting

The UPS is equipped with 2 programmable outlets for use to supply to less critical loads. These outlets can be disabled to shed the less critical loads during back-up modes or overload conditions to maintain quality power supply to the more critical loads connected to the UPS. Click on the “Programmable outlet setting” bar to enter to the setting screen as shown below.



1. Outlet Turn On After Turn on UPS – select the time to automatically enable this outlet within the specified time when the UPS is power on. If “0” sec is selected, the outlet will be enabled once the UPS is power on.
2. Outlet Turn Off After AC Failure – select this option to automatically disable the outlet within the specified time after utility outage to shed the less critical loads to provide longer battery back-up time for the other more critical loads connected to the UPS.
3. Outlet Turn On After AC Recovered – select this option to automatically enable the outlet within the specified time after the utility is restored.
4. Outlet Turn Off When Battery Lower than - select this option to automatically disable the outlet at the specified remaining battery power capacity(%) during battery mode to shed the less critical loads to prolong battery back-up time for the other more critical loads connected to the UPS.
5. Outlet Turn Off When Overload – select this option to automatically disable the outlet during overload condition (bypass mode) to possibly allow the more critical loads:
 - a) To be continually supplied via Bypass without shut down
 - b) To be transferred back to Inverter mode if the overload condition is removed by shedding the less critical loads.
6. Click on “setting” to confirm the configurations. The UPS will sound 2 “beeps” to acknowledge setting is successful.
7. Manual Control Switch – Click “On” or “Off” to manually enabled or disabled the programmable outlets, overriding all previous settings.

4 Installation and Operation

Read the Safety Instruction guide (page 2 to 3) before installing the UPS

4.1 Unpacking

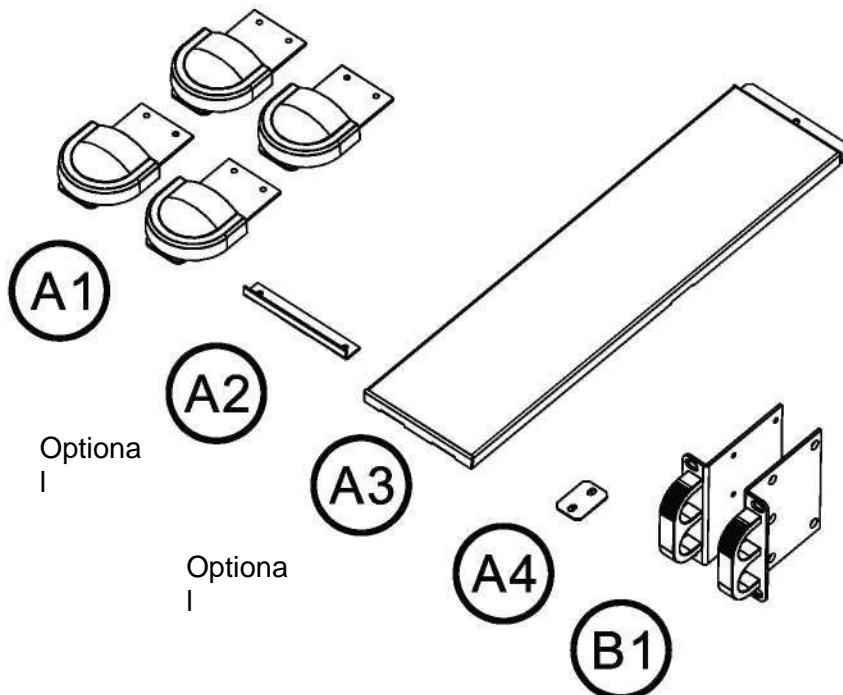
Inspect the UPS upon receipt. The manufacturer designed robust packaging for your product. However, accidents and damage may occur during shipment. Notify the forwarder and dealer if there is damage.

The packaging is recyclable; save it for reuse or dispose of it properly.

Remove the UPS from the carton box.

Check the package contents. Standard content shall includes:

- 1 set of User's Manual
- 2 pcs of IEC output cables (for UPS with IEC sockets only)
- 1 pc of AC Input Power Cord
- 1 set of UPS communication software with RS232 cable
- 1 set of Tower/Rack Accessories Kit as below:

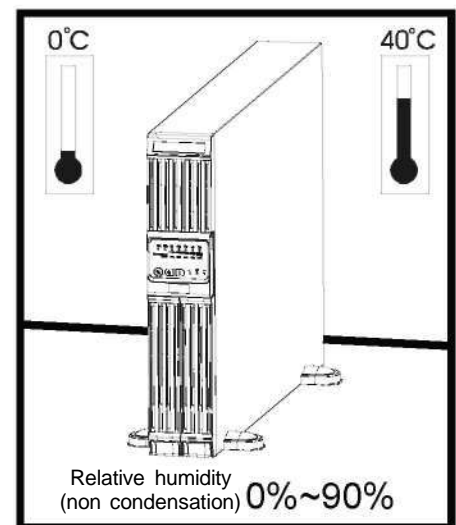
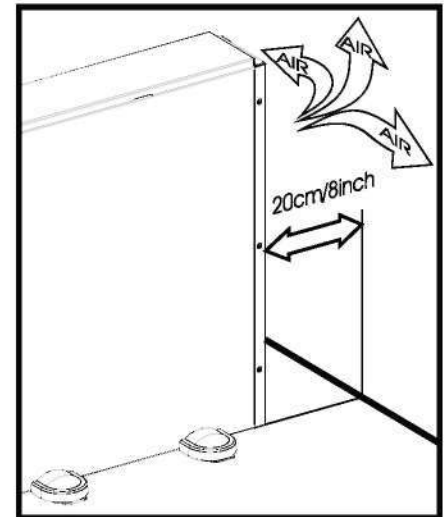


4.2 Selecting Installation Position

The UPS is heavy. Select a location sturdy enough to handle the UPS weight.

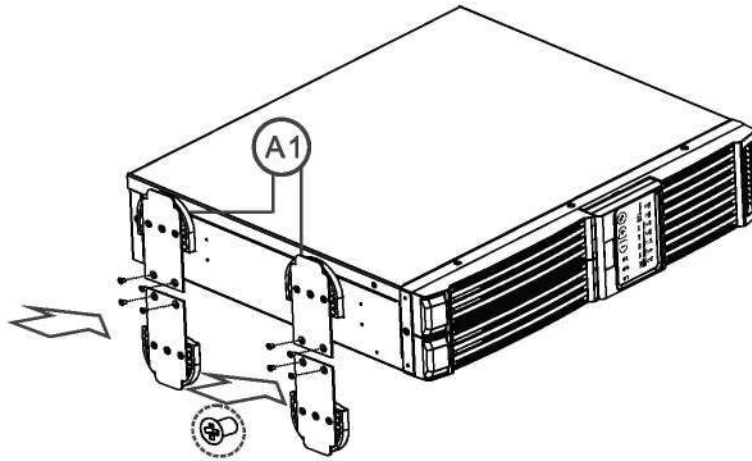
To ensure proper operation and long operating life, always position the UPS according to the following requirement:

1. Keep minimum 20cm (8 inches) distance clearance from the rear panel of the UPS to avoid any obstructions.
2. Do not block the air-flow to the ventilation louvers of the unit.
3. Please ensure the installation site is free from excessive dust and the ambient temperature and humidity should be within the specified limits.
4. Do not place the UPS in a dusty or corrosive environment or near any flammable objects.
5. This UPS is not designed for outdoor use.

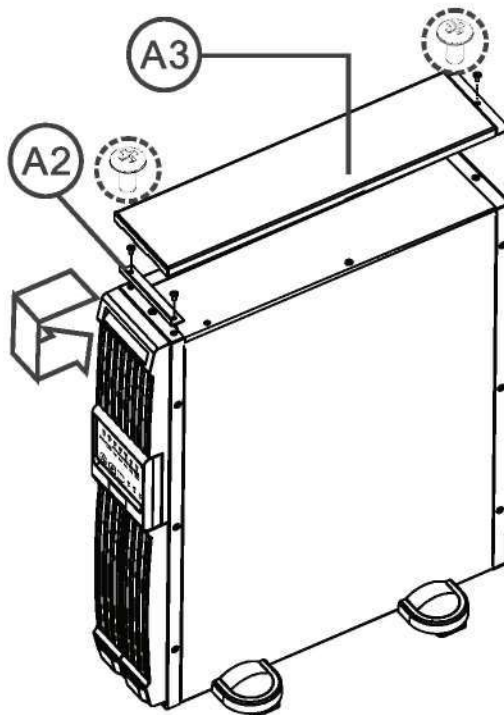


4.3 Tower Configuration Setup

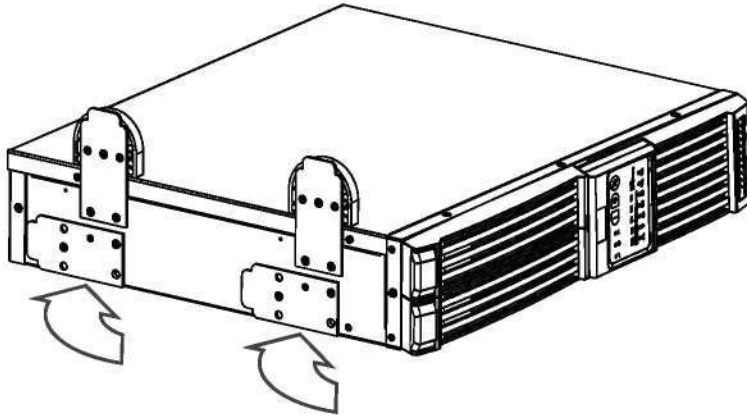
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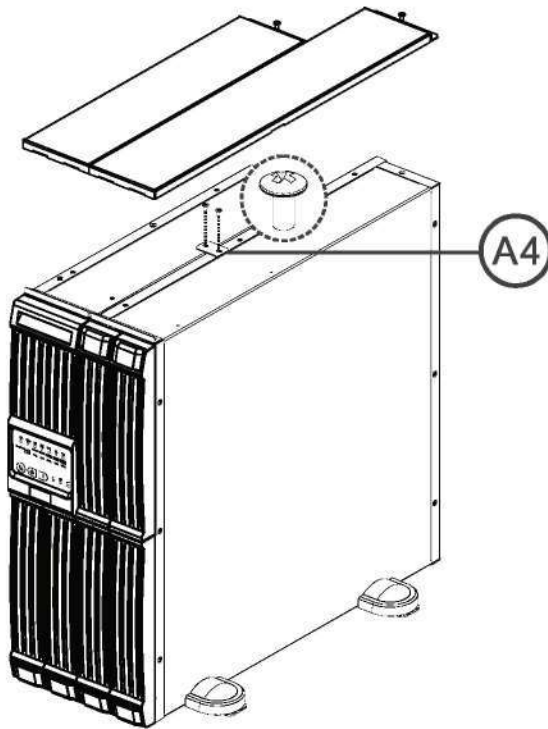
Step 2



Step 3

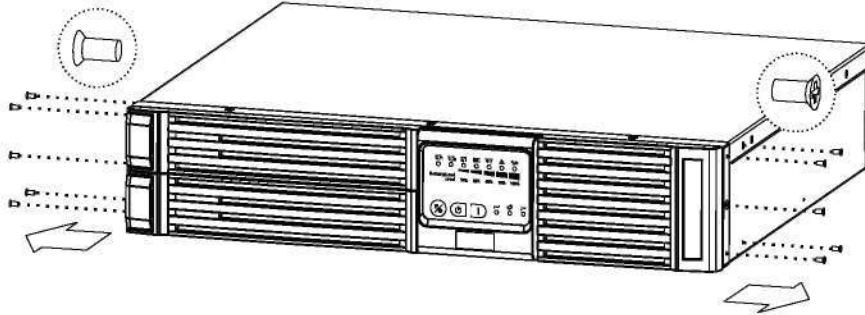


Step 4

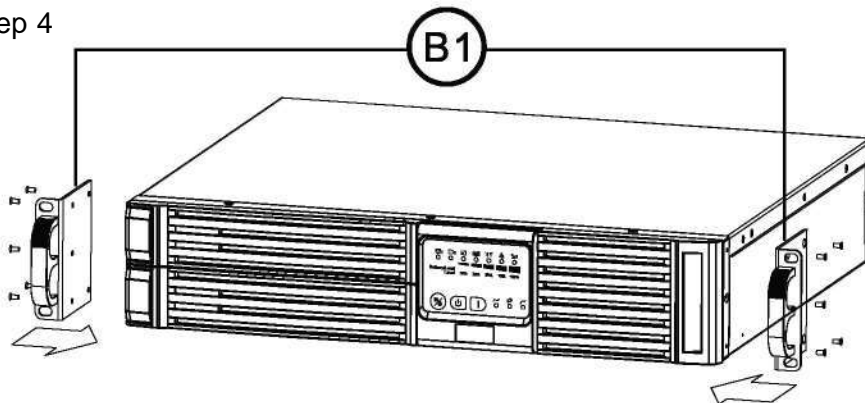


4.4 Rack-Mount Configuration Setup

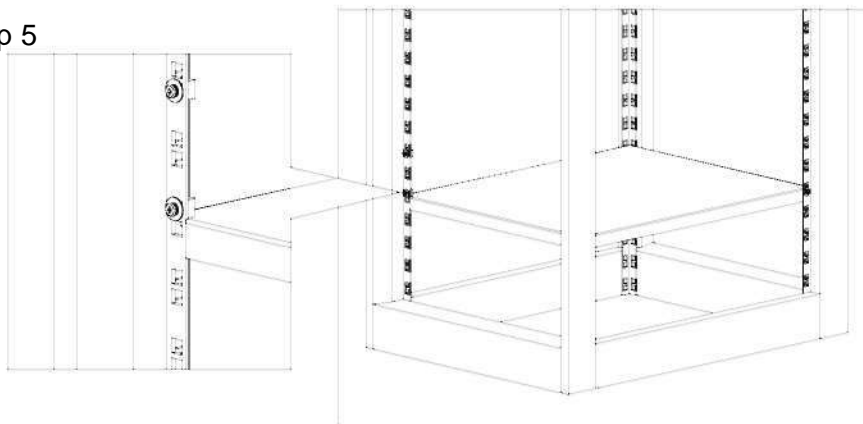
Step 3



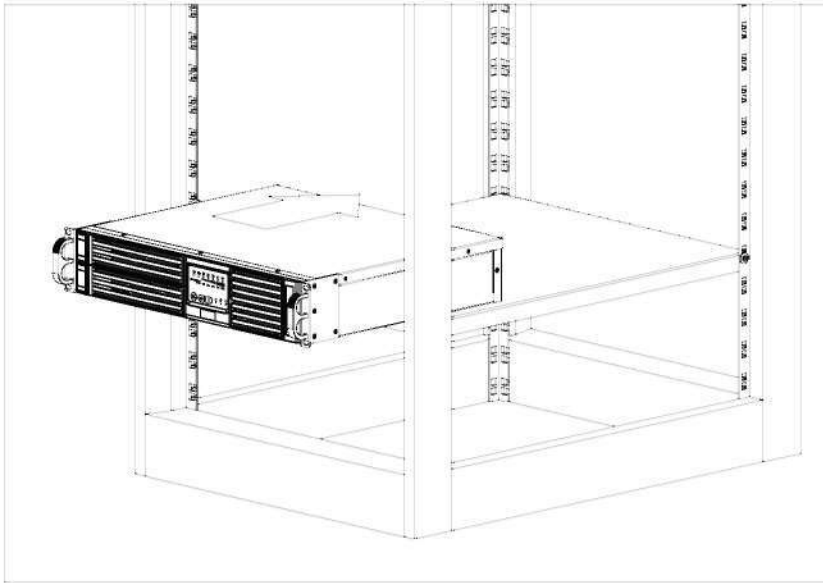
Step 4



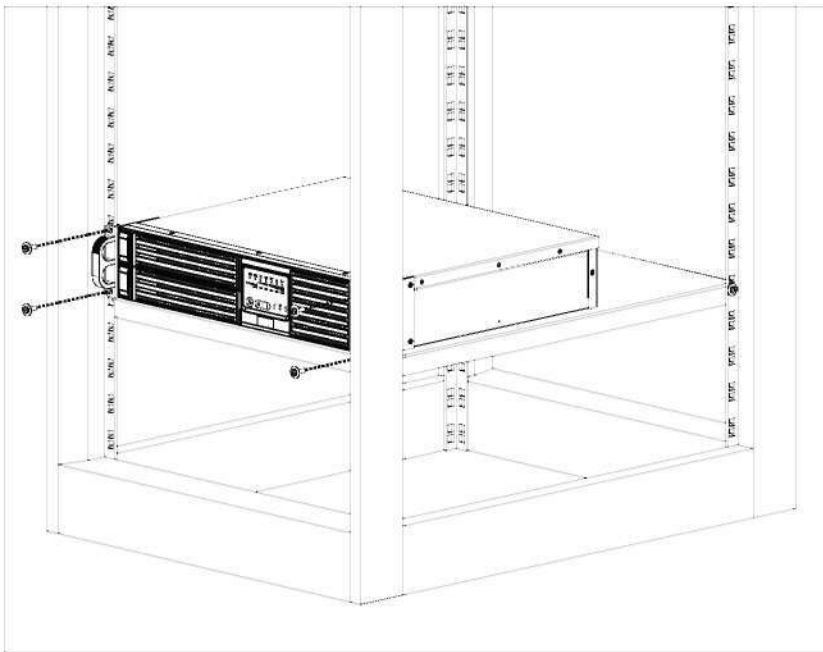
Step 5



Step 6











Step 7



4.5 Operation

4.5.1 Start Up in Normal AC Mode






1. Before commencing the installation, please ensure the grounding is connected properly.
2. Ensure the voltage of Utility matches with the input voltage window of the UPS.
3. Connect UPS main power cord into Utility AC power source receptacle.
4. Switch on the AC power source, all the LEDs on the front panel display will flash once after 3 seconds, except   which will remain illuminated (Green). At the same time, the fan at the rear of the UPS will start operating.
5. Press the  Switch for approximately 3 seconds to start the UPS, the buzzer will beep and the LED display of " " and " " will light up after 30 seconds. The start-up procedure is completed and the UPS outlets are ready to supply to load.
6. It is advisable to perform a battery mode test before connecting the loads to the UPS to ensure the batteries are working properly.

Switch Off the AC power source when the UPS had been switched on. The  LED on the front panel display will light off while the  LED will be illuminated and the buzzer alarm will beep intermediately, indicating the UPS is in Battery Mode.

Connect a non critical load to the UPS outlets to confirm if the Battery is supplying power. Repeat the test by switching on & off the AC power source to ensure the UPS is functioning properly

4.5.2 Start-up in Battery Mode (Cold Start)

This UPS is able to be Switch On for operation without the presence of an AC power source.






Press and hold the  Switch until the buzzer beep, within the next 10 sec press and hold the  Switch for 2nd time. The UPS shall perform its start-up procedure. The LED display of " " and " " will light up after 30 seconds, the buzzer will beep intermediately to indicate successful power on.

Note: Ensure the UPS Battery is pre-charge for minimum 4 hours by simply connecting the AC power cord to the Utility receptacle.


If the Battery Voltage is below the preset value (1Kva = 33.5V; 2Kva/3Kva = 67V) the UPS will not be able to start up in Battery Mode.

4.5.3 Shutdown





Shutdown in AC Mode:-

Press the  Switch for approximate 5 seconds until the buzzer beeps, the UPS will stop power supply to the outlets. "", "" LEDs shall remains illuminated and the ventilating fans shall continue to operate. Switch Off the AC power source, after 10 sec the "", "" LEDs will light off and the ventilating fans stop operating. The UPS is now completely shutdown.

Shutdown in DC Mode:-

Press the  Switch for approximate 5 seconds until the buzzer beeps. The UPS will stop power supply to the outlets, "U1", "U2" LEDs light off and the ventilating fans shall stop to operate after 10 sec. The UPS is now completely shutdown.

4.5.4 Self Testing during AC mode

After the UPS has been successfully start-up in AC mode, press the  Switch for approximately 5 seconds until the buzzer beeps. The  LED will blink to indicate self test in progress. The  LED will stop blinking and remains illuminated when the self test is completed without finding any faults or abnormal conditions. The  LED will automatically lights off 30 sec after the successful self test.

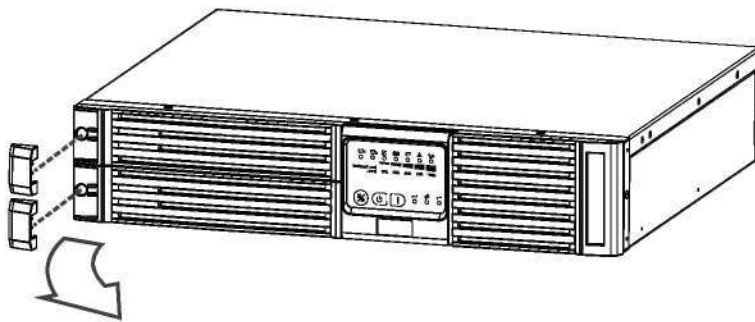
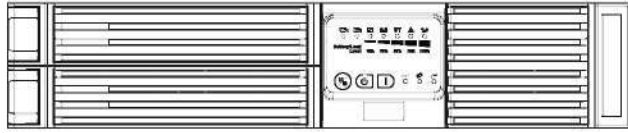
4.5.5 Status & Alarm Buzzer

The following table helps to define some of the common UPS statuses with respect to their buzzer beep descriptions.

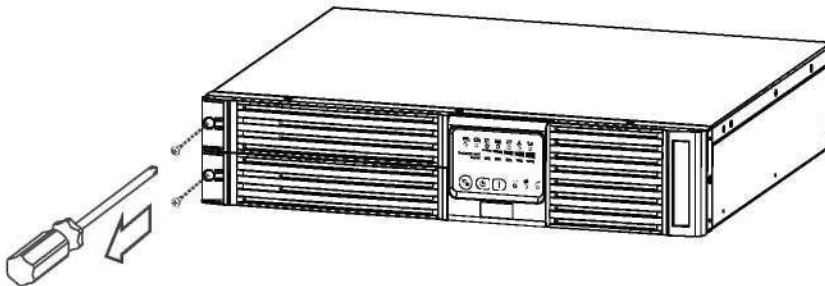
Status Definitions	Buzzer Beep Descriptions
UPS faulty, Inverter shutdown. All functions inhabited.	Long Continuous Beep
UPS faulty, loads continue to be supplied via Inverter or Bypass.	Single successive beep with ~ 2 sec interval
battery mode	Single short successive beep with ~1 sec interval
battery low	Very quick and short successive beep
confirm/RS232 port receiving	2 quick & short beeps
service mode ok	1 quick & short beep
UPS initial starts up with self test	2 successive quick & short beeps, repeating per ~2 sec interval.

4.5.6 Battery Replacement

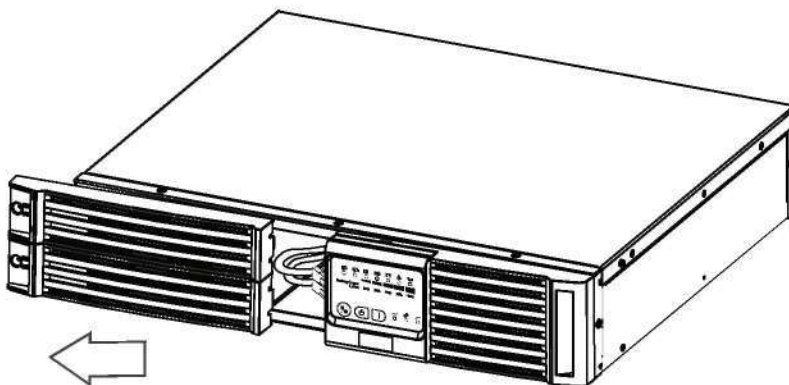
Step 1



Step 2

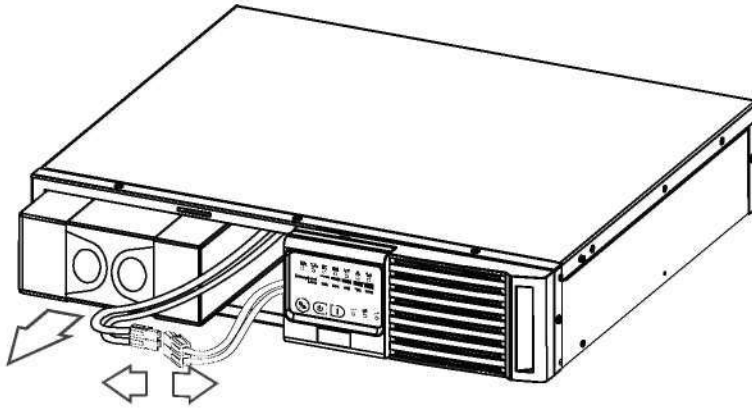


Step 3

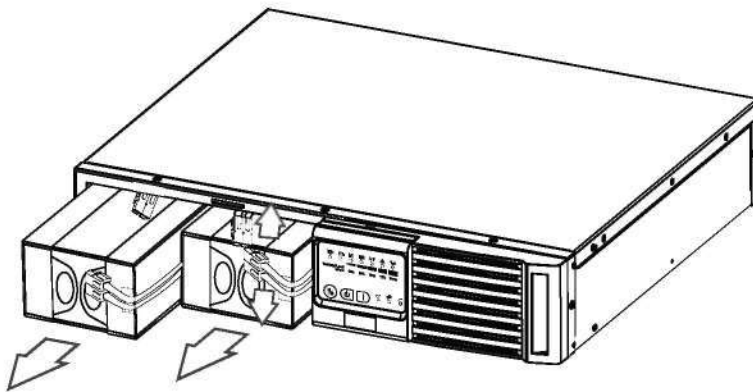


Step 4

1KVA



2K/3KVA



5 UPS Working Principle

5.1 UPS System Block Diagram

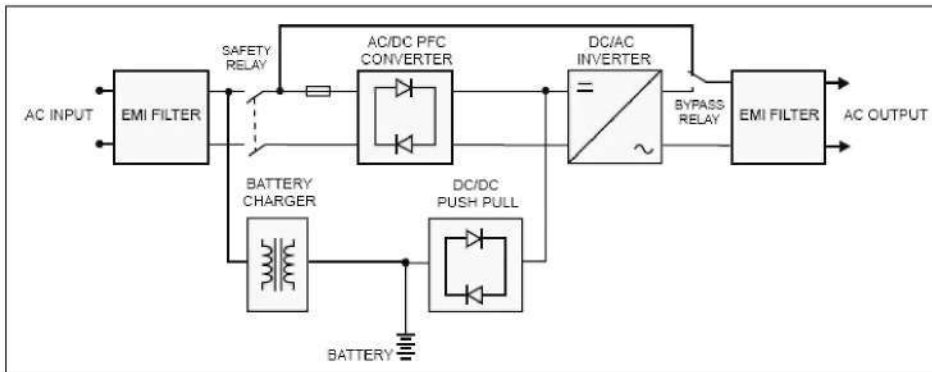


Figure 5.1 above illustrates the True On-Line Double Conversion architecture of the UPS system. The major modules consist of:

- 1) An AC to DC power converter (Rectifier) with PFC control circuit
- 2) A DC to AC power high frequency inverter
- 3) An Intelligent Battery Charger
- 4) A bank of stationary maintenance-free batteries
- 5) A DC to DC push/pull converter control circuit
- 6) A Static Bypass Loop
- 7) Input & Output EMI Filter

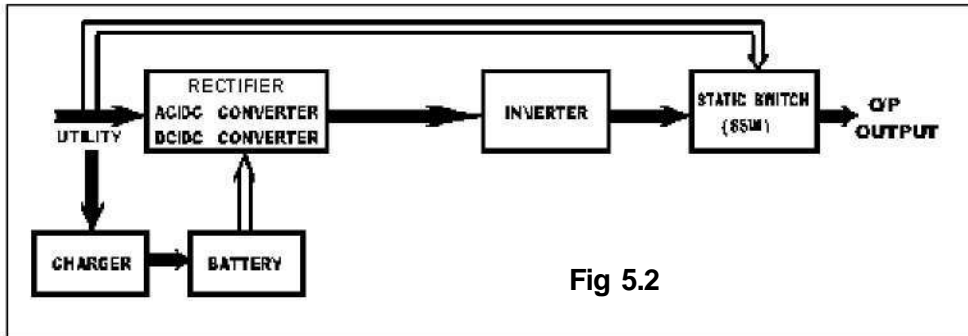
The table below provide a summery guide to the UPS operating modes against the Utility AC Power Source conditions

Utility Conditions	UPS Operating Modes	LEDs Display indications
Utility Normal	Rectifier convert AC to DC, battery charging, Inverter convert DC to AC and supply to loads with clean & stable power.	~ , U1, U2 LEDs remain illuminated
Utility Abnormal (under or over voltage) / Absent	Rectifier and charger stop operating Battery discharge via DC~DC push/pull circuit and supply to Inverter. Loads continue to receive supply from Inverter. Alarm buzzer beeps, UPS now on battery mode.	~ LED off, LED illuminated
Utility Abnormal/Absent, Battery low voltage	Rectifier and charger stop operating Battery discharge via DC~DC push/pull circuit and supply to Inverter. Alarm buzzer beeps with quick & short succession, indicating battery power low and Inverter may stop supply soon.	~ LED off, (Battery Low) LED illuminated.

Paragraph 5.2 ~ 5.7 below provide detailed descriptions of the UPS operating principle

5.2 When Utility is Normal

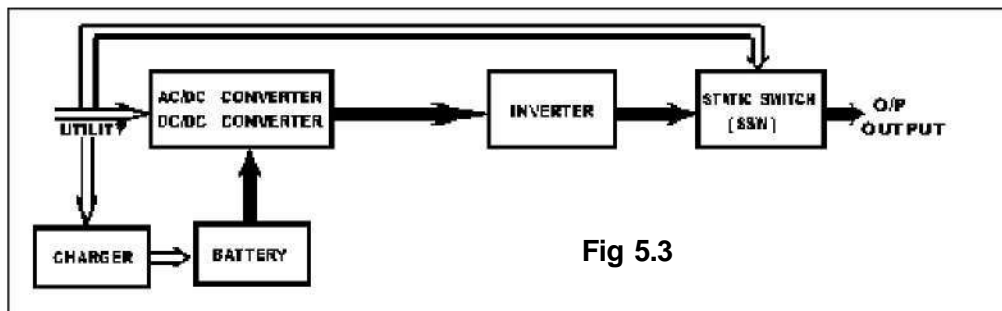
The working principle of the UPS under Utility normal condition is illustrated as follows:



When Utility is normal, the AC source is rectified to DC, partially fed into the charger to charge battery and partially fed into inverter. The inverter reverts the DC to a cleaned and pure AC to supply energy to the load connected. The \sim , U_1 , U_2 LEDs illuminated.

5.3 When Utility is Abnormal/Absent

The working principle of the UPS under Utility abnormal condition is illustrated as follows:



1. When Utility is abnormal, the UPS will direct the battery energy automatically to the Inverter without delay, and turn off the charger and AC/DC converter. The inverter reverts DC to AC to supply energy to the output load connected without interruption. The U_1 LED will be illuminated.
2. When Utility is back to Normal, the UPS will turn on the AC/DC converter, turn off DC/DC converter and switch the charger to charging mode. It has the same working principle as figure 5.1.
3. During a utility outage, the UPS will work as illustrated in figure 5.2. When Battery is low, buzzer will beep continuously till battery is completely cut off. The battery low protection of the UPS will cut off battery supply after a preset threshold to avoid the battery from over-drain. The U_1 & U_2 (Battery Low) LEDs will light up till the UPS is completely cut off. The UPS will re-start automatically when Utility is available.

5.4 Overload Condition

The working principle of the UPS when overloading is illustrated as follows:

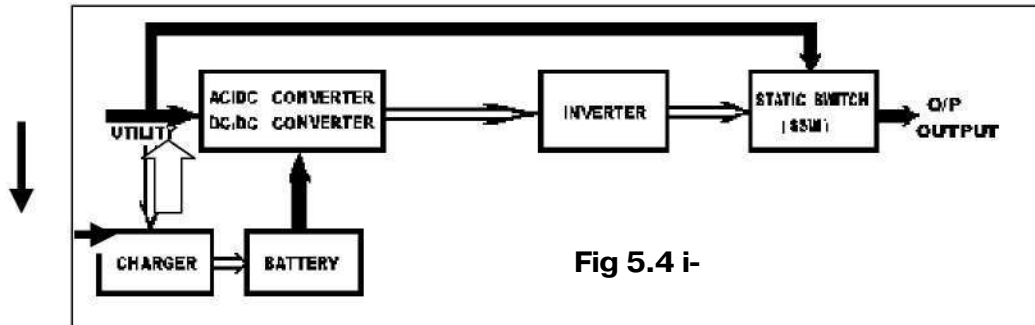
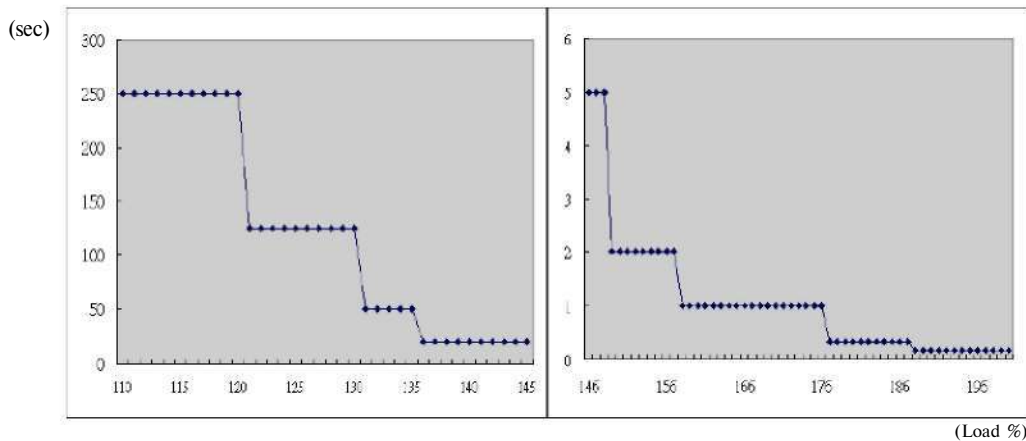


Fig 5.4 i-

1. Generally modern day electronics & IT equipment generate an inrush current when switching on. The amount of inrush current varies from equipment to equipment, some can be as high as 6 times its rated capacity while others produce negligible inrush. To prevent severe damage to its Inverter cause by the inrush produce by the loads, the UPS is equipped with electronics overload protection feature as standard. If the UPS loading is >105~120% of its capacity, it will switch to bypass mode in 30 seconds to protect the Inverter. If overload condition is eliminated by reducing the load to <105%, the UPS will switch back to Inverter mode automatically. If the UPS is over 150% loading, it inverter will shutdown immediately.
2. The UPS Bypass loop is also equipped with overload protection. Its overload capacity is illustrated by the graph & table below.



Load (%)	uo~iza	121-III	131-135	136-145	146-143	149-157	158-176	177-1S7	1S8<
Delay Time (Set)	250	125	50	30	s	↓	>	0.32	0.16

5.5 Inverter Failure

Output Load short circuit when supply via inverter

If output load is short circuited while supply via Inverter, the UPS will shutdown Inverter automatically and stop supply to the loads. The Fault LED lights up and the buzzer will beep continuously. The UPS will not switch on automatically after short circuit condition is eliminated. The UPS has to be re-start manually (refer to 4.5.1 'Start Up in Normal AC Mode').

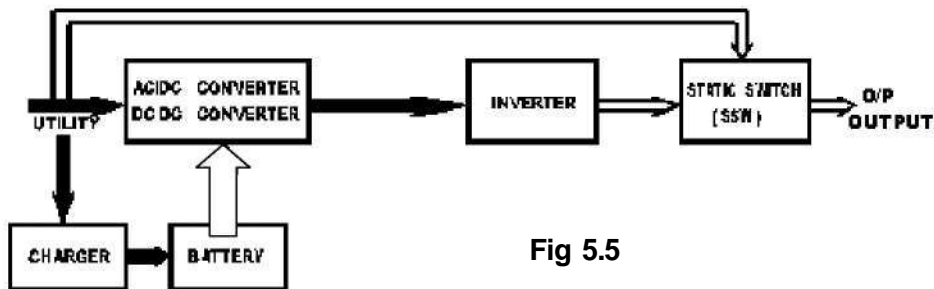


Fig 5.5

Output Short circuit when supply via bypass loop

If output load is short circuited under bypass mode, the input AC fuse/breaker will be activated (open circuited) to prevent the output load from damage. You shall replace a new fuse with same rating after the short circuit condition is eliminated.

5.6 Inverter/Internal Over temperature

If the UPS experiences internal over-temperature when Utility is normal, it will switch to bypass loop. The UPS will switch back to inverter mode when the over-temperature situation is eliminated. If over temperature occurs when Utility is abnormal, the buzzer will beep continuously and the Fault LED \triangle will light up. The UPS will cut off supply to the loads.

5.7 Inverter Over-current and Inverter Output Voltage Out of tolerance




If the UPS inverter delivers over-current and out-of-tolerance voltage to its outlets, the UPS is out of order. The UPS will switch to bypass loop when Utility is normal. The Utility \sim LED, Bypass \sim LED and Fault \triangle LED will light up.

If these two fault conditions occur when Utility is abnormal, the UPS will cut off the supply to its outlets and the Fault \triangle LED will light up.

6 Maintenance Guide

6.1 Trouble Shooting

When the UPS becomes faulty or malfunctions during operation, you may check the fault lists below for respective solutions. Should the problem persists, please contact your local dealer for assistance.

Situation	Check Items	Solution
<p>UPS Fault LED</p> <p>Read the error code (see next page for error readings) displayed by the combinations of the LEDs and verify the fault as follow:</p>	<p>1. Er05, Er25, </p> <p>2. Overload </p> <p>3. Er11 (UPS Over Temperature)</p> <p>4. Site wiring/Ground fault </p> <p>5. Er14 (Fans out of order)</p> <p>6. Other error codes</p>	<p>1. Check battery connection if is properly done. Measure Battery voltage to ensure batteries are charged or healthy. Recharge batteries for 8 hours if necessary. Simulate Utility outage to verify if UPS is able to provide DC back-up. Otherwise consult your local dealer right away.</p> <p>2. Disconnect some non critical loads form the UPS output until overload ceases. Check if there is any short circuit between cables due to broken cable insulator. Replace the cables in necessary.</p> <p>3. Remove any objects obstructing the ventilation louvers. Verify if the cooling fans are working properly. Contacts your local dealer to replace the fans if necessary.</p> <p>4. Verify if the "L" & "N" phase of the Utility AC source has been wrongly wired or if the Ground-Neutral Voltage exceeded the limits</p> <p>5. Verify if the ventilating fans are functioning properly. Do not attempt to replace the fans by yourself. Contact your local dealer for replacement.</p> <p>6. Consult your local dealer for assistance.</p>
<p>UPS fails to provide battery backup or its back up time is shorter than its intended performance.</p>		<p>If the backup time remains non-satisfactory after 8 hours of charging, please contact your local dealer for battery replacement.</p>
<p>UPS is normal but no Output to load</p>	<p>Check if all power codes are properly connected.</p>	<p>If problem persist, consult your local dealer for technical assistance.</p>

Situation	Check Items	Solution
The UPS switches to battery mode then back to Utility mode, when connected device is turned on. Or, the UPS switches back and forth between battery and Utility.	if any power strip is connected to the UPS. Verify if there is any damage to the utility Wall Receptacle or if the cable cord plug is faulty.	<ol style="list-style-type: none"> Do not use power strip. Replace the wall receptacle/cable cord plug.
Strange noise and smell		Immediately shut down the whole System. Disconnect the power from the UPS and call for service.
UPS is unable to provide backup power source		Check that the battery connectors are fully engaged. Allow the battery to recharge if the batter is weak. If problem persist after recharging, replace the battery. If problem persist, consult your local dealer for technical assistance.

Note When the Fault LED Δ is illuminated, press and hold the D key to check the error code. The error code is represented by the five 10% - 100% bar LEDs. Each bar LED represents a number as shown in the figure below.

For example, the fig. below showed the 100% bar LED, 75% bar LED & illuminated when the D key is pressed. The error code shall be $1 + 2 + 8 = 11$, or Er11, which indicate that the UPS is over-temperature.



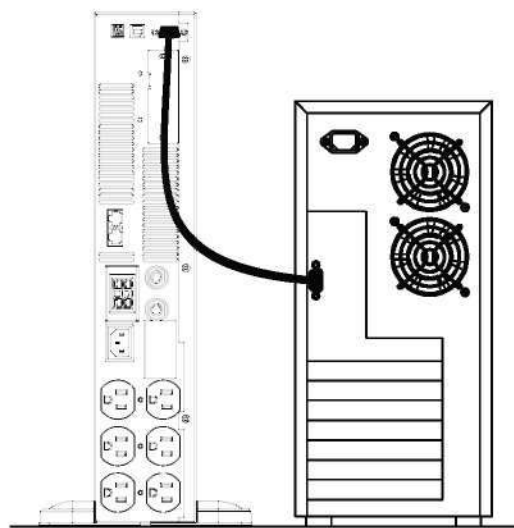
6.2 Error Codes and Their Descriptions

Code	Descriptions
Er05	Battery weak or faulty
Er06	Output short-circuited
Er07	EPO mode
Er11	UPS over-temperature
Er12	Inverter overload
Er14	Fans out of order
Er18	EEPROM's data error
Er24	Utility Low <85/170V & Battery Disconnect
Er28	Bypass overload
Er31	EEPROM's data not conform to the Jumper Setting

7 Bundle Software Installation Guide

7.1 Hardware Installation

1. Connect the male connector of RS232/USB* cable to the UPS communication port.
2. Connect the female connector of the RS232/USB* cable to a dedicated RS232 port of the Computer.
3. For optional interface cards, please refer to Chapter 9 for more details.



**Note: Only RS232 cable is provided with the UPS. USB cable is optional*

7.2 WAVEMON Shutdown and Management Software

7.2.1 Why is UPS Management important?

By combining a UPS with network management products, such as an SNMP protocol, System-administrators are guaranteed their data and their system will constantly be protected from corruption or data loss even in the event of an extended power failure or when batteries reach a critical low state. In the event of a power disturbance system administrators can also monitor their network from a central location, allowing an early detection of problems. In fact utility power is unreliable at times, ensuring that all network systems have constant power can be a difficult task. The situation becomes even more complex if systems are managed across a Local Area Network (LAN) or Wide Area Network (WAN) around the world.

When a power failure occurs action can be taken to protect the system and its valuable data. If no action is initiated by the operator, this event can seriously damage the system. The UPS software will react automatically in such a case and shutdown the operating system. NEWAVE has found it important to have a complete solution for its UPS and is able to offer a wide range of monitoring/remote controls for assuring the maximum protection degree to the NEWAVE customers.

7.2.2 Wavemon Shutdown and Monitoring Software

Wavemon is an external monitoring and shutdown software which was designed to operate with all NEWAVE UPS products, both with the DRY PORT (Relays) X1-X21 and SMART PORT (RS232) JD1. The software packet consists of a CD ROM for most diffused operating systems (Windows, Unix, OS/2, DEC VMS, Novell, Apple), a standard connection and a user manual.

The 25 pin port with voltage-free contacts may also be used for automatic shutdown in connection with **wavemon**. It is necessary to provide a special cable to connect the 25 pin port of the UPS and the serial port of the server.

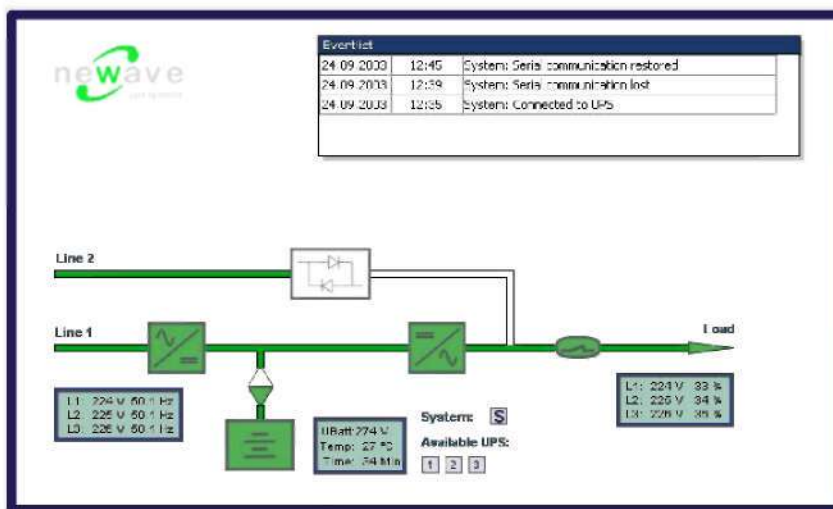


Figure 7.5. Monitoring image.

The main characteristics of **wavemon** software are:

- Automatic unattended master/slave shutdown in heterogeneous networks
- On-screen autonomy time / battery time countdown
- On-screen server log off and shutdown procedure
- Extensive logging of all UPS activity and power quality data, with timestamp
- Scheduled UPS economy mode, service mode, other systems status
- Graphical user interface for Windows compatible platforms

- Automatic unattended local shutdown
- Special software modules to close and save open MS-Office documents.
- Compatible for all optional modules like UPSDIALER, SNMP adapters, Temperature sensors, etc. The UPS-Management Software is a client-/server-

application for networks and local workstations. Basically **Wavemon** consists of two parts: the server-module of the UPS-Management Software is **UPSMAN**, which communicates via RS-232 cable with the UPS. Working as a background process the UPSMAN collects messages, received from the UPS. The UPSMAN interprets received messages and makes them available to the client-module **UPSMON** and to any SNMP-based management station.

When UPSMAN detects voltage variations or a power failure it can execute various so called system „event routines“, which for example may shutdown the server or send warning to connected users. These system event routines which are a part of the UPS-Management Software can be adjusted to your demands.

The UPS management software includes with every serial number the licence for using the UPS service on one server with one UPS and an unlimited numbers of connected WINDOWS workstations. When operating with two or more servers a licence for every additional server is required. It doesn't matter if the UPS service runs at that location or if the server is halted by a UPS service via remote command. The same regulations are applicable to the use of remote send/receive modules RCCMD and multiserver shutdown under NT, UNIX and other operating systems. The service programs are generally delivered as a single-licence. To use a single CD ROM to shutdown multiple servers you have to purchase additional CD license keys.

Parallel/redundant UPS systems are also manageable by the software.

The main principle is: let introduce a shutdown of a Server only when strictly necessary. A correct Parallel Handling has therefore to manage a parallel system as a whole and always considering redundancy. Following statements apply:

- Every alarm on any unit is immediately notified, but ...
- ... a reaction to a severe fault is introduced only when the minimum number of UPS –Modules necessary to supply the load exhibits an alarming situation.
- The real Battery autonomy time of the (whole) parallel system is computed continuously.
- Maintenance on a redundant unit may be executed without annoyance to the management system (supervisor).

In order to be managed, a NEWAVE UPS can be integrated into a network in two ways:

1. By means of the server which is being powered by the UPS and is integrated in the network. In most of the cases the server is used as sub-agent and you only need the Wavemon software without any SNMP Adapter. You need a standard serial connection between the RS232 SMART port of the UPS and the RS232 port of the computer/server.

2. In some situations it is preferable to interface the network via an SNMP adapter. By this way up to 50 computers can be shut down in a RCCMD environment. RCCMD (Remote Console Command) is an additional software module, which can be triggered by the SNMP device to executes a command (typically a shutdown command) on a remote system.

7.3 SNMP CARD/ADAPTER For Network Management /Remote Monitoring

The **Simple Network Management Protocol (SNMP)** is a worldwide-standardized communication-protocol. It is used to monitor any device in the network via simple control language. The UPS-Management Software also provides its data in this SNMP format with its internal software agent. The operating system you are using must support the SNMP protocol. We offer our software with SNMP functionality for Novell, OS/2, all Windows running on INTEL and ALPHA, DEC VMS, Apple.

Two types of SNMP interfaces with identical functionality are available: an external SNMP-Adapter (Box) and an internal SNMP-Card. Both can manage a parallel system (N modules) and return either global values - which are consistent for the whole parallel system - or specific values from the single modules.

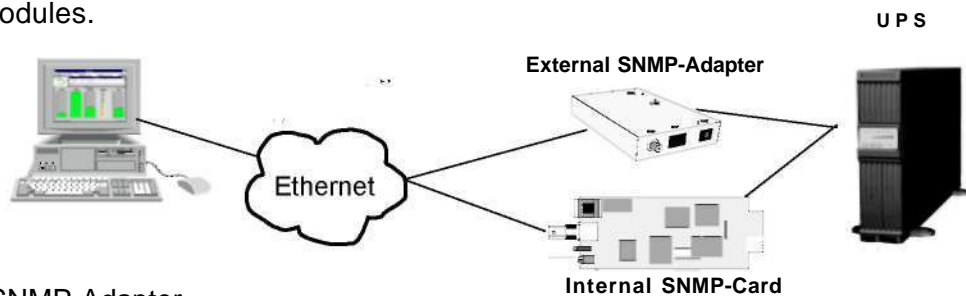


Figure 7.6 SNMP Adapter

The adapter may be configured via Telnet, HTTP (Web-Browser) or serial connection (Terminal). For normal operation at least one network connection (Ethernet) is required.

The SNMP adapter can be used, utilising the RCCMD send function, for an automatic network wide shut down or just for informing connected users. The shut down procedure can be initiated on a low residual battery autonomy time (downtime) or by a countdown timer which is started at the beginning of the alarm. A shut down is therefore possible without extra input from the operator, and is fully software controlled.

The small (125x70 mm) External SNMP adapter comes with following interfaces:



1. RJ-45 connector for 10/100 Base-T (autoswitchable)
2. Serial Port for configuration (COM2) or optional ModBus interface.
3. Error/Link LED for UPS status
4. Aux Port
5. DIP Switch
6. Serial Port to the UPS (COM1)
7. DC Supply (9 VDC or 9-36 VDC supply, depending on model);

Figure 7.7 External SNMP Adapter



The Internal SNMP-Card can be inserted into an appropriate extension slot of the UPS **PowerVario**. This adapter communicates via the serial port of the UPS and makes a direct multiple server shut down possible without additional SNMP management software.

Figure 7.8 Internal SNMP Adapter

For detailed information please see Software Manual provided with the WAVEMON CD ROM.

RCCMD - Remote Console Command module for a multi-server shutdown. This stand-alone software module is designed to receive and execute a command issued by a remote device. Thanks to RCCMD it is possible to execute a shutdown in an heterogeneous multiplatform network. The new release RCCMD2 is an application available for all Operating Systems, analogous to Wavemon. Our SNMP Interfaces are compatible to RCCMD

8 Communication Port Explanation

The UPS is equip with EPO dry contacts input, true RS232 & USB Communication port as standard to provide communication with bundled UPS monitoring software for remote monitoring of UPS status via PC.

There are 2 other optional interface cards available to meet various communication needs, i.e. dry contact relay card and SNMP/WEB card

The bundled software of the UPS is compatible with many operating systems such as Windows 98, & 2000, ME, NT and XP. For other applications such as Novell, NetWare, Unix, Linux, please contact your local dealer for suitable software.

All the communication ports (including optional cards) can be active & use simultaneously to monitor the UPS status. However only 1 communication interface at any one time with the highest priority has the ability to command & control the UPS. The priority of these communication interfaces are as follow:

Highest Priority (in descending order),

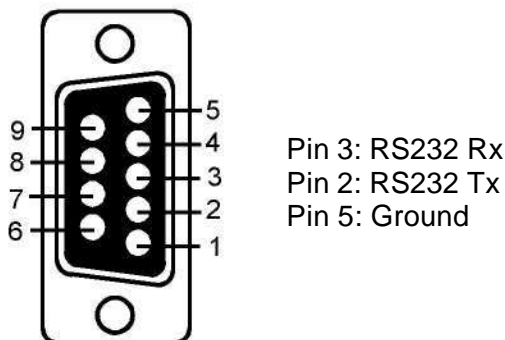
- 1) EPO input port
- 2) Optional Interface card
- 3) USB
- 4) RS232

8.1 True RS232 Port Descriptions

The RS232 interface shall be set as follows:

Baud Rate	2400 bps
Data Length	8 bits
Stop Bit	1 bit
Parity	None

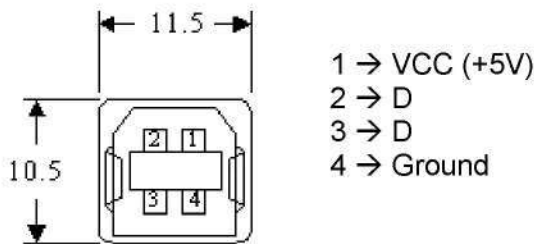
The Pin Assignments of the true RS232 port are illustrated as follows:



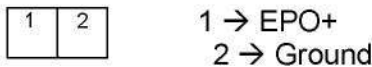
8.1.1 USB Port Descriptions

The USB communication protocol definition as below:

1. Comply with USB version 1.0, 1.5Mbps
2. Comply with USB HID Version 1.0.
3. The Pin Assignments of the USB port:



8.2 The Pin assignments of the EPO Input port are:



To enable the EPO function, please short Pin 1 & 2.

9 Optional Communication Cards

The UPS rear panel is equipped with a ready “plug-and-play” optional communication card slot to accommodate either a AS400 Dry Contact card or SNMP/Web card. These optional communication cards respective functions are described in 9.1 & 7.3

9.1 AS400 (Dry Contact) card



The signal descriptions of the 10 assigned pins of the Dry contact card are indicated below. Take note that all pins except Pin-9 & Pin-10 which are isolated, are shorted or open circuited (selectable using Jumper cable) to the common Pin-8

The pin assignments of the 10-Pin Terminals:

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

Pin 1: UPS on Bypass mode.

Pin 2: AC abnormal

Pin 3: AC normal

Pin 4: Inverter On

Pin 5: Battery Low

Pin 6: Battery weak or faulty

Pin 7: UPS fault Alarm

Pin 8: Common

*Pin 9: Shutdown UPS positive (+) signal

*Pin 10: Shutdown UPS negative (-) signal

* To Shutdown the UPS, supply a DC voltage of between 5.5V~25V to Pin-9 (use as “+” terminal) and Pin-10 (use as “-“ terminal).

9.2 SNMP Cards

Both SNMP cards produce by UIS Abler and Megatec are suitable to use with this UPS. Please refer to the soft copy user manual which come with each respective cards for installation guide.

SNMP card By UIS Abler



SNMP card By Megatec



10 Battery Bank Installation

10.1 Chapter 1: Important Safety Instructions

SAVE THESE INSTRUCTIONS

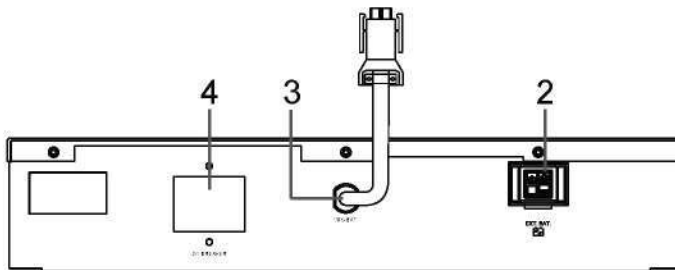
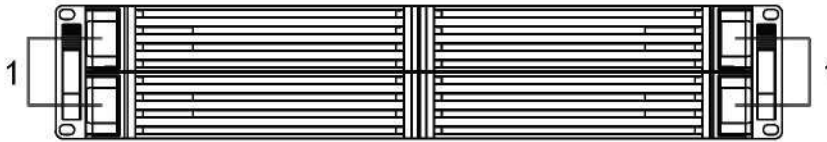
This manual contains important instructions that should be followed during installation and maintenance of the battery bank and batteries.

An Important Notice

- The battery bank which is supplied with a factory input plug can be safely connected to the wall receptacle by the user.
- This battery bank is connected to an UPS. There will be voltage at the output terminals if the UPS is turned on even if the input AC Mains is not available.
- Make sure that the AC Utility outlet is correctly grounded.
- Do not try to repair the unit yourself, contact your local supplier or your warranty will be void.
- Use a certified input power cable with the correct plugs and sockets for the appropriate voltage system.
- To eliminate any overheating of the battery bank, keep all ventilation openings free from obstruction and do not place any foreign objects on top of the battery bank. Keep the battery bank 20 cm away from the wall.
- Make sure the battery bank is installed within the proper environment as specified. (0-40°C and 30-90% non-condensing humidity)
- Do not install the battery bank under direct sunlight. Your warranty will be void if the batteries fail due to overheating.
- This battery bank is designed for indoor use only.
- This battery bank is not designed for use in dusty, corrosive and salty environment .
- The warranty for this battery bank will be void if water or other liquid is spilt or poured directly onto the battery bank. Similarly we do not warrant any damage to the battery bank if foreign objects are deliberately or accidentally inserted into the battery bank enclosure.
- The battery will discharge naturally if the system is unused for a period of time.
- It should be recharged every 2-3 months if unused. If this is not done, then the warranty will be null and void. During normal operation, the batteries will be automatically remained in charged condition.
- Servicing of Batteries Should be Performed or Supervised by Trained Personnel with Knowledge of Batteries and the Required Precautions
- When Replacing Batteries, Replace With the Same Quantity, Type & Capacity.
- CAUTION – Do Not Dispose of Battery or Batteries in an open fire. The Battery May Explode.
- CAUTION – Do not open or mutilate the batteries. The electrolyte from the batteries is toxic and harmful to the skin and eyes.
- CAUTION – Risk of Electric Shock – Battery Circuit is not isolated from AC, hazardous Voltage may exist between battery terminals and ground. Test before touching with bare hands.
- CAUTION – A Battery can present a Risk of Electrical Shock and High Short Circuit Current. The Following Precaution Should be Observed When Working on Batteries:
 - A) Remove watches, rings, or other metal objects.
 - B) Use tools with insulated handles.
 - C) Wear rubber gloves and boots.
 - D) Do not lay tools or metal parts on top of batteries.
 - E) Disconnect charging source prior to connecting or disconnecting battery terminals

10.2 Chapter 2: Introduction to the Front and Rear Panel

10.2.1 Front and Rear Panel Descriptions



1. Screw Cover	To replace batteries, please remove the screw covers and the screws inside the covers.
2. EXT.BAT. +/-	To the DC terminal of the 2 nd (or next) battery bank connected.
3. UPS BAT. +/-	To the UPS DC terminal or the next battery bank.
4. DC Breaker	1. Battery Over-current Protection Breaker 2. To easy swappable battery, please put the position of the breaker in "O" position. In case there is 2 nd (or next) battery bank connected with the battery bank, the DC voltage from the UPS Bat.+/- will flow through without any interruption to the 2 nd Battery Bank.

10.3 Chapter 3: Installation and Operation

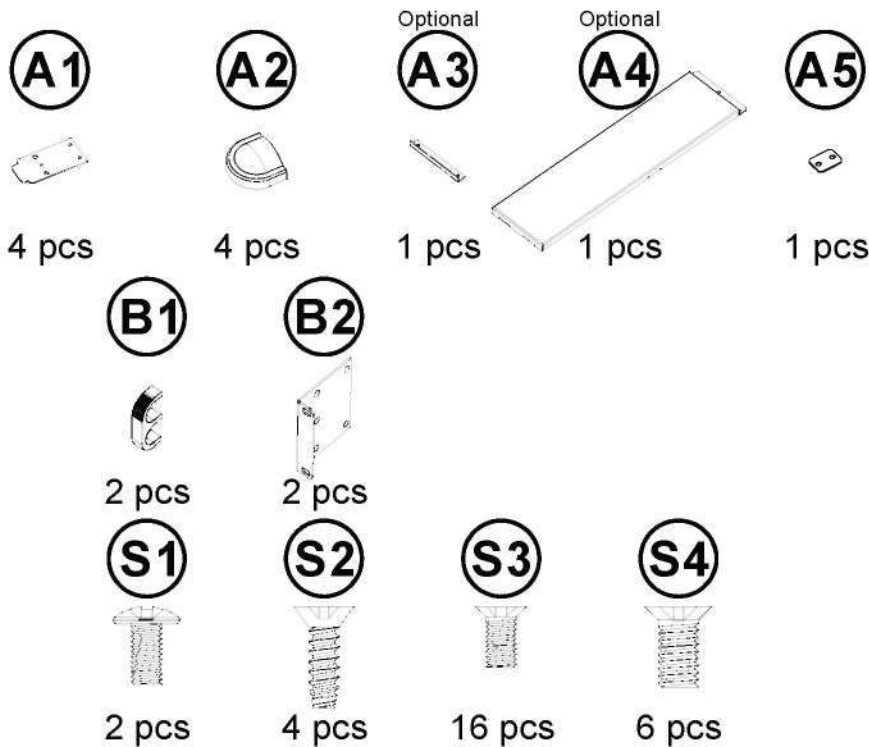
Note: The packing condition and the external outlook of the unit should be inspected carefully before installation. Retain the packing material for future use.

10.3.1 Unpacking

1. Take the battery bank out of the PE foam.
2. Remove the packing materials.

Note: The battery bank module is approx. 12.5~50 kgs, be cautious when unpacking and lifting the unit to avoid injury

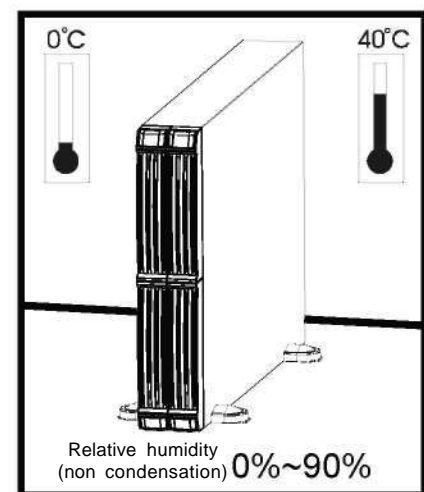
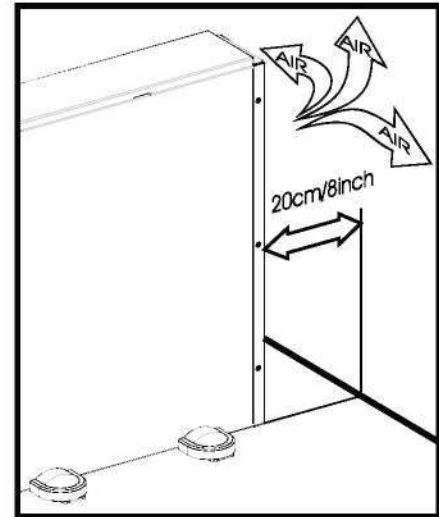
3. Standard Package includes User's Manual
4. Accessories for Tower and Rack Mount



10.3.2 Selecting Installation Position

It is necessary to select a proper environment to install the unit, in order to minimize the possibility of damage to the battery bank and extend the life of the batteries. Please follow the instructions below:

1. Keep at least 20cm(8 inches) clearance from the rear panel of the battery bank from the wall or other obstructions.
2. Do not block the air-flow to the ventilation openings of the unit.
3. Please ensure the installation site environmental conditions are in accordance with the battery bank working specifications to avoid overheat and excessive moisture.
4. Do not place the battery bank in a dusty or corrosive environment or near any flammable objects.
5. This battery bank is not designed for outdoor use.

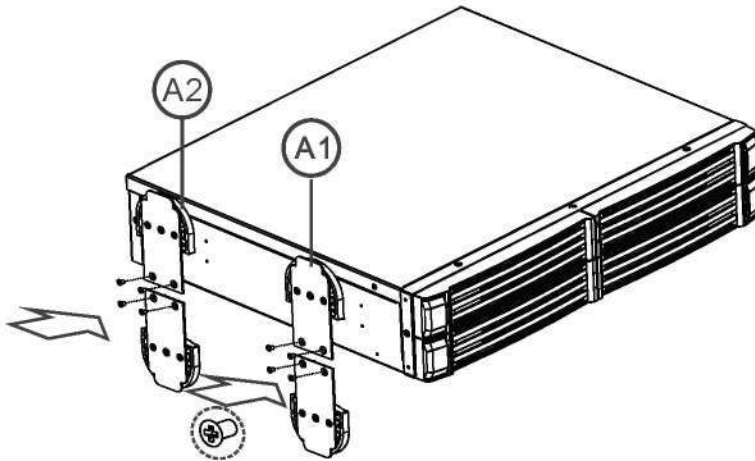


10.3.3 Installation Instructions

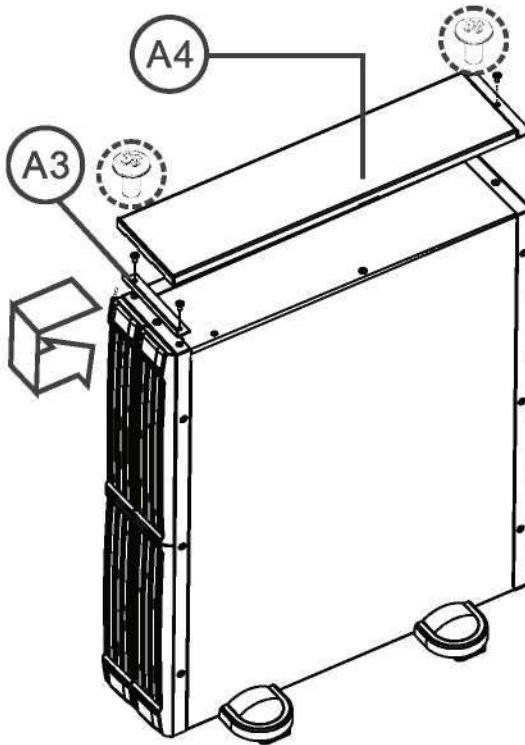
Tower installation

Stand alone unit

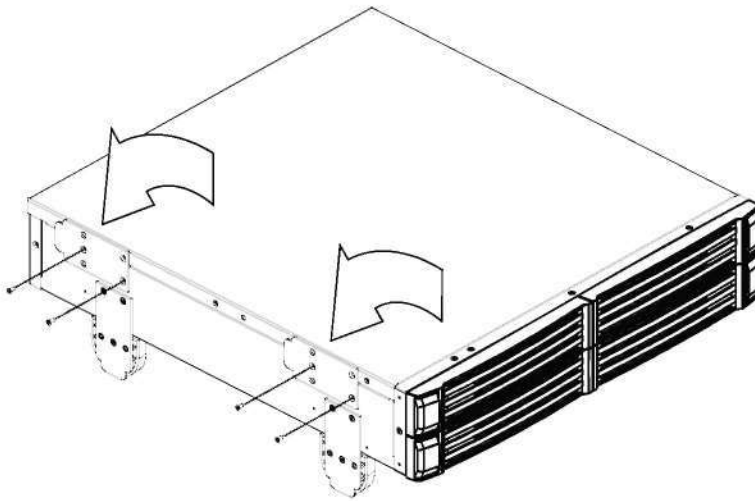
Step 1



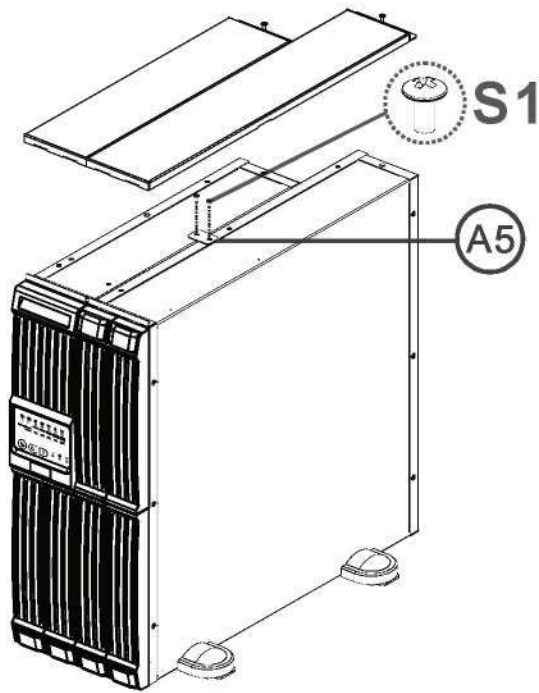
Step 2



Use with UPS
Step 1

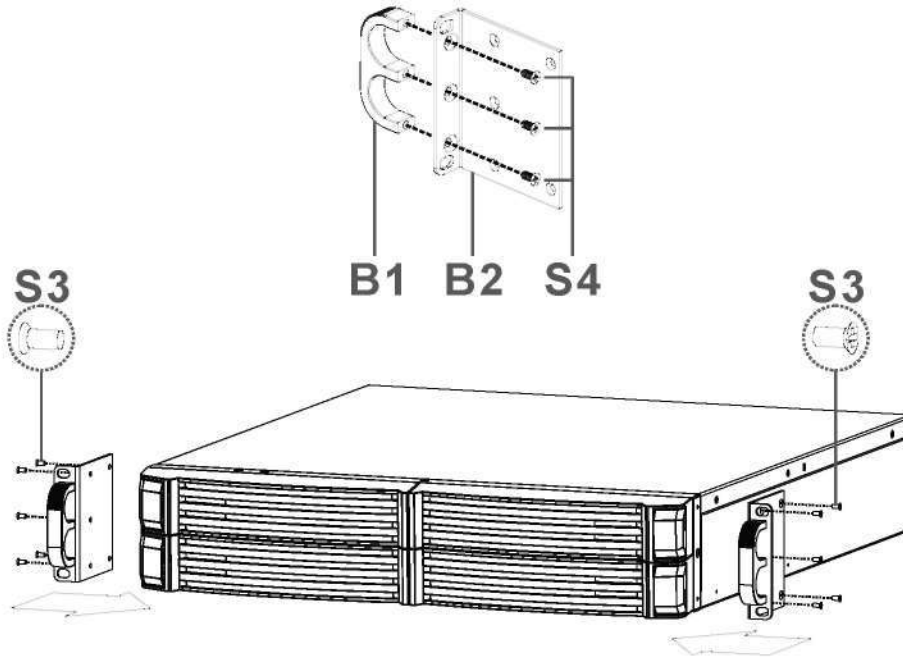


Step 2

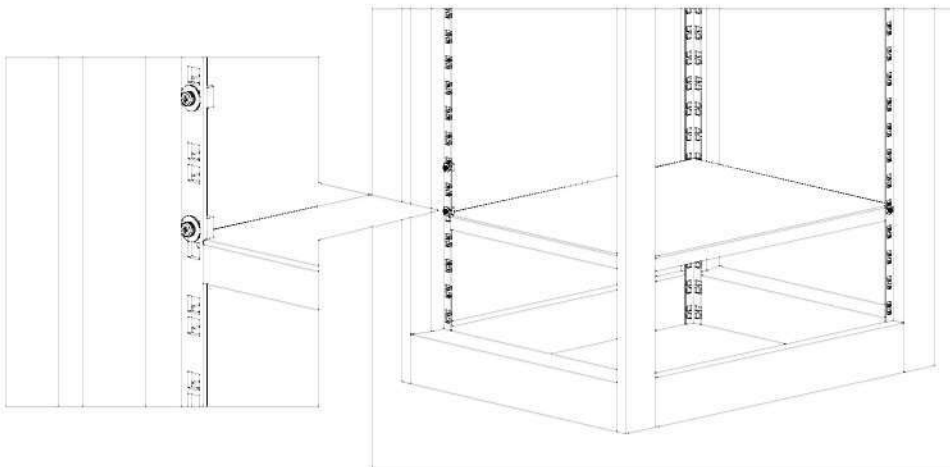


10.3.4 Rack Mount installation

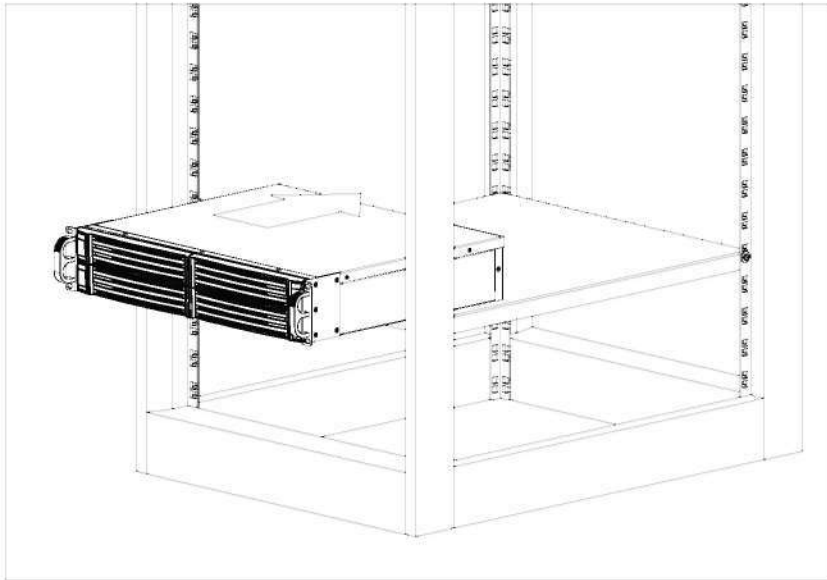
Step 1



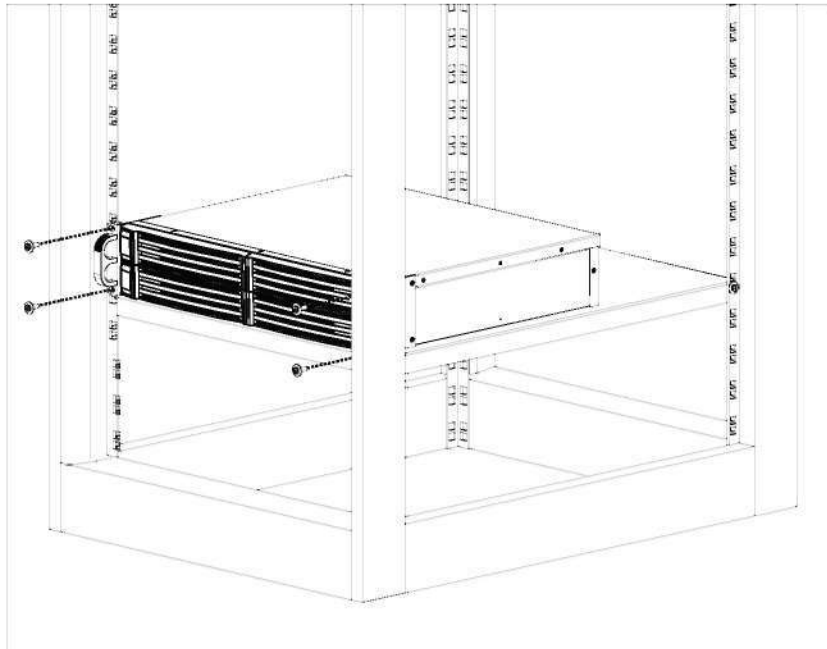
Step 2



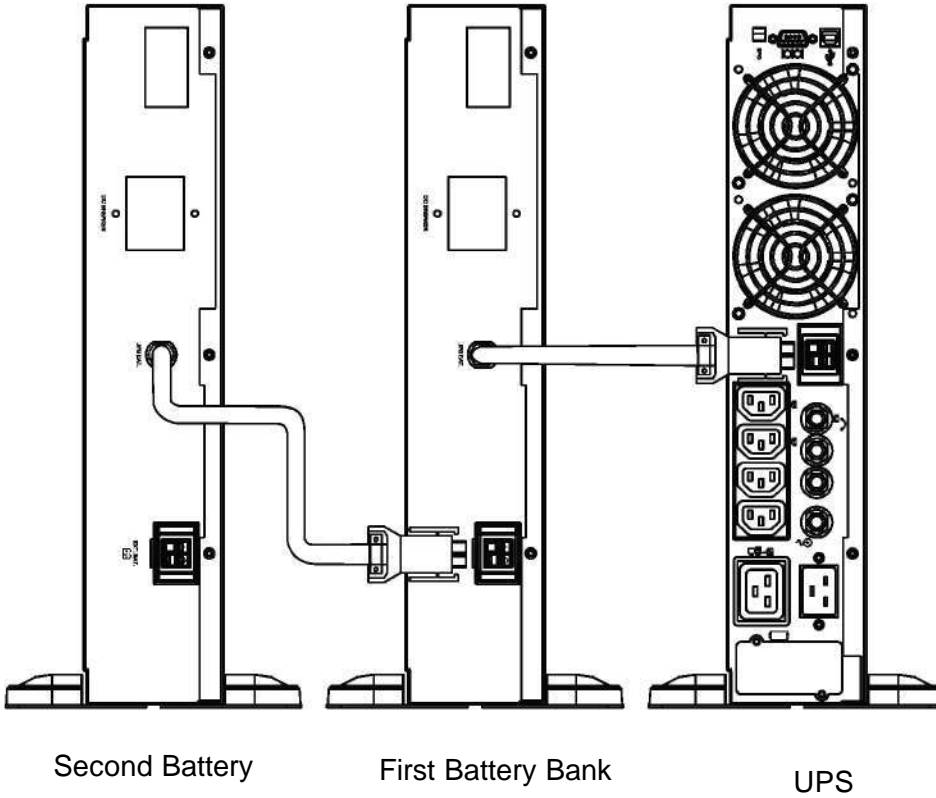
Step 3



Step 4



Connect DC Cable

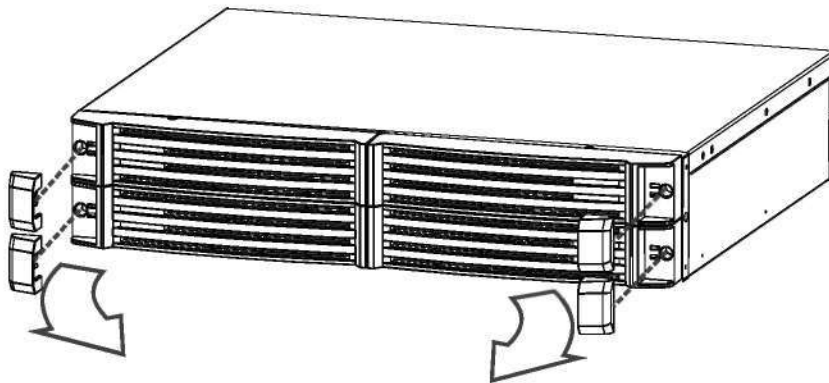
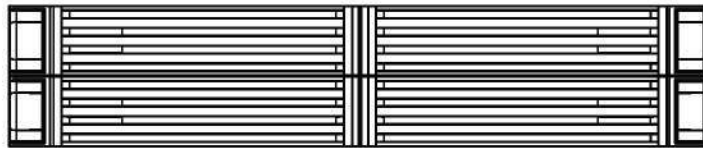


10.3.5 Storage Instruction

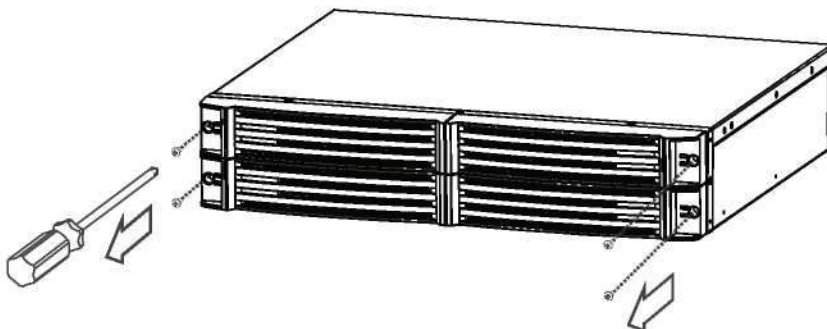
For extended storage through moderate climate (-15 to +30 °C / +5 to +86 °F), the batteries should be charged for 12 hours every 6 months by plugging the UPS power cord into the wall receptacle. Repeat this every 3 months under high temperature (+30 to +45 °C / +86 to +113 °F) environment.

10.3.6 Replacing the Battery

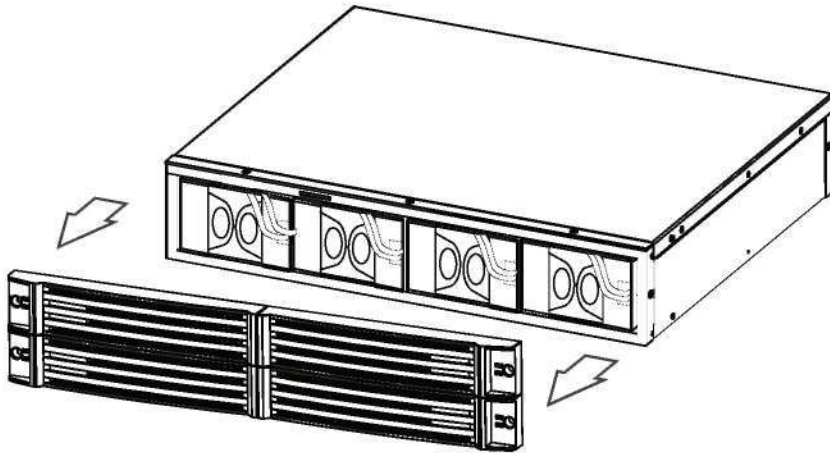
Step 1



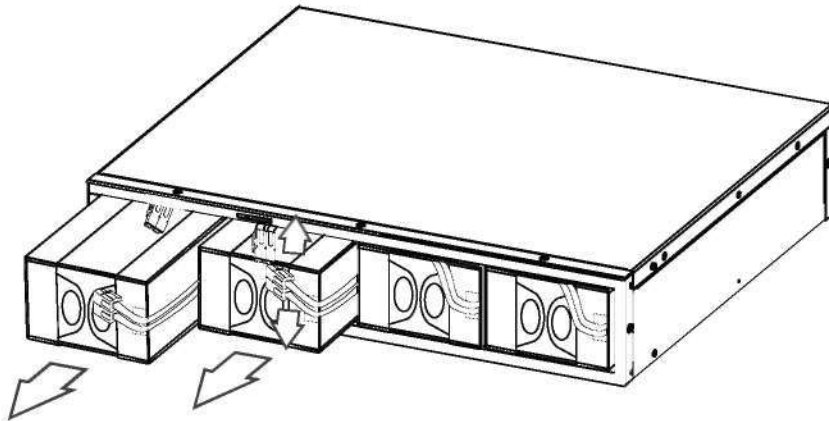
Step 2



Step 3



Step 4



10.3.7 Specifications

UPS	1KVA	2KVA/3KVA
Battery Bank SN	BBC12A000	BBC12B000
Nominal System Voltage	36VDC	72VDC
DC Sockets Diagram	<p>+(Red)</p> <p>G(Green)-(Black)</p>	<p>+(Red) G(Green)</p> <p>-(Black)</p>
DC Plug Diagram	<p>-(Black) +(Red) G(Green)</p>	<p>G(Green) -(Black) +(Red)</p>

10.3.8 Recycling the Used battery



Contact your local recycling or hazardous waste center for information on proper disposal of the used battery.

11 Technical Specifications

TECHNICAL SPECIFICATIONS POWERVARIO

Intelligent True On-Line Uninterruptible Power Supply (UPS)
For Corporate & IT User Installation Guide



POWER RANGE: 1000-3000VA



ups systems



TO PROTECT YOUR MISSION CRITICAL APPLICATIONS

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1 Specifications

1.1 VA Rating

Model	PVO1000	PVO2000	PVO3000
Apparent Output Power	1000VA	2000VA	3000VA
Active Output Power	700Watts	1400Watts	2100Watts
Power Factor	0.7		
Topology	Double conversion On-Line		
Type	Rack/Tower		
Agency Approvals	CE		

1.2 Input

Model	PVO1000	PVO2000	PVO3000	
Voltage Window	230V	120/140/160 - 288Vac		
Voltage Range	Base on load percentage (0~33/33~66/66~100%)			
	Low Line Transfer	230V	120/140/160Vac	
	Low Line Comeback	230V	170Vac	
	High Line Transfer	230V	288Vac	
	High Line Comeback	230V	278Vac	
Frequency	50/60 Hz auto-select, \pm 5Hz			
Phase	Single phase with ground			
PF	0.99 at full rated linear load			
Typical Transfer Time	0 ms.			
AC Leakage current	230V	3.5mA		
Surge Protection	230V	300 joules		

1.3 Output

Model	PVO1000	PVO2000	PVO3000	
Output (INV. mode)	Voltage	230V, adjustable to 200/208/220/230/240		
	Voltage Regulation	$\leq \pm$ 1% until low battery warning		
	Frequency(Synchronized Range)	3Hz or 1Hz (setting by software)		
	Frequency(Battery Mode)	\pm 0.1% (0.05~0.06Hz) unless synchronized to line		
	Current Crest Factor	3:1		
	Harmonic Distortion	3% THD(Linear Load) 7% THD(Non-Linear Load)		
	Transient Response(ms)	60ms/5%		
	Waveform	Pure Sine wave		
Efficiency	To AC Mode (Full load)	85%	85%	88%
	To Battery Mode (Full load)	83%	83%	85%

1.4 Battery System

Model	PVO1000	PVO2000	PVO3000
Type	12V/7.2Ah	12V/7.2Ah	12V/9Ah
Numbers of Batteries	3	6	6
Backup Time(Full Load)	>7min.	>7min.	>5min.
Recharging Time	4 Hours to 90%		
Charging Current (Max.)	1.1A	2.16A	2.7A
Charging Voltage	41.0Vdc±0.5V	82.0Vdc±0.5V	82.0Vdc±0.5V
Hot Swappable Battery	Yes		
Internal battery	Yes		
DC leakage current	30uA (±10uA) with no AC applied and the unit in the off position		
Battery type	Sealed, non-spillage, maintenance-free, lead acid		

1.5 Transfer Time

Model	PVO1000	PVO2000	PVO3000
AC to DC	Zero		
Inverter to Bypass	2.5ms(Typical)	Zero	
DC Start	Yes		
Self Diagnostics	Upon Power-on and Software Control		

1.6 Front Panel

Model	PVO1000	PVO2000	PVO3000
LED	Load Level/Battery Level/ Battery Mode/ Normal Mode/Bypass Mode/ Self-Test/ Weak/Bad Battery/Site Wiring Fault/ Fault/ Overload/Programmable Outlet1//Programmable Outlet2		
Key	ON Button/ OFF Button/ (Test/Alarm Reset Button)		

1.7 Protection

Model	PVO1000	PVO2000	PVO3000
Overload	(AC Mode)		
	105 continuous 106 120 for 30 seconds transfer to bypass 121 150 for 10 seconds transfer to bypass 150 for immediately transfer to bypass Buzzer continuously alarms.		
Overload	(Battery Mode)		
	105 continuous 106 120 for 30 seconds shuts down 121 150 for 10 seconds shuts down 150 for immediately shuts down Buzzer continuously alarms.		

	(Bypass Mode)
	105 continuous 106 120 for 250 seconds shuts down 121 130 for 125 seconds shuts down 131 135 for 50 seconds shuts down 136 145 for 20 seconds shuts down 146 148 for 5 seconds shuts down 149 157 for 2 seconds shuts down 158 176 for 1 seconds shuts down 177 187 for 0.32 seconds shuts down 188 for 0.16 seconds shuts down Buzzer continuously alarms.
Short Circuit	Bypass mode : Input Fuse/Input Breaker Normal Mode: Output Breaker/Electronic Circuit Battery Mode: Output Breaker/Electronic Circuit
Battery	ABDM
EPO	UPS shuts down immediately
Over Temperature	Transfer to Bypass Mode
	UPS shuts down immediately
	Transfer to Bypass Mode
	UPS shuts down immediately

1.8 Audible Alarm

Model	PVO1000	PVO2000	PVO3000
Battery Mode	Sounding once every 1.5 seconds		
Low Battery	Sounding once every 0.2 seconds		
Overload	Sounding once every 3 second		
Fault	Continuously Sounding or Sounding once every 3 second		

1.9 Physical

Model	PVO1000	PVO2000	PVO3000
Dimensions(HxWxD in mm)	88(2U)x440(17")x405	88(2U)x440(17")x650	88.8(2U)x440(17")x650
Weights	34.5lb(15.7kg)	64.7lb(29.4kg)	65.3lb(29.7kg)
Input Connection	230V 10A, IEC 320-C14	10A, IEC 320-C14	16A, IEC 320-C20
Output Connection	230V	(6) 10A,IEC 320-C13	(4) 10A,IEC 320-C13 (1) 16A,IEC 320-C19

1.10 Environmental

Model	PVO1000	PVO2000	PVO3000
Operation Temperature	0-40		
Noise Level	50dBA		
Relative Humidity	0 to 90% (Without condensation)		

1.11 Interface

Model	PVO1000	PVO2000	PVO3000
Interface Type	1 *USB port+ 1*RS-232 port		
SNMP(option)	Power management from SNMP manager and Web browser		
Compatible platforms	Windows Unix, OS/2, Novell, Apple		

1.12 Standards and Certification

Model	PVO1000	PVO2000	PVO3000
Safety	IEC/EN 62040-1-1, IEC 60950-1		
Performance	IEC/EN 62040-3		
EMC	EN50091-2/IEC 62040-2 class A IEC 61000-4-2/-3/-4/-6-8/-11, IEC 61000-3-2/-3		
Markings	CE, cUL, FCC additional versions on request		