



# R90E Online UPS

20kVA Model

User & Installation Manual

## Table of Contents

<b>Introduction.....</b>	<b>7</b>
<b>ProductDescription.....</b>	<b>7</b>
Main Features.....	7
<b>System Configuration.....</b>	<b>8</b>
Unpacking the UPS.....	8
InstallationNotes.....	11
External Protective Devices.....	11
Power Cables.....	12
Power Cables Connection.....	12
Battery Connection.....	14
UPS Multi-Module Installation.....	16
<b>Operation.....</b>	<b>19</b>
OperationModes.....	19
Turn On / Off the UPS.....	20
Communication Port Definitions (RS232, RS485).....	26
TheDisplay.....	27
DisplayMessages.....	40
Options.....	42
<b>Troubleshooting.....</b>	<b>43</b>
<b>Batteries.....</b>	<b>44</b>
Replacing The Battery.....	44
<b>Specifications.....</b>	<b>45</b>
<b>Battery Runtimes Using EBP32.....</b>	<b>46</b>
<b>Shipping List.....</b>	<b>46</b>
<b>Obtaining Service.....</b>	<b>47</b>
<b>Xtreme Power Conversion Limited Warranty.....</b>	<b>48</b>

Thank you for selecting this uninterruptible power supply (UPS). It provides you with protection for connected equipment. **Please read this manual** before installing the R90E-20KVA model as it provides important information that should be followed during installation and maintenance of the UPS and batteries, allowing you to correctly set up your system for the maximum safety and performance. Included is information on customer support and service, if it is required. If you experience a problem with the UPS, please refer to the Troubleshooting section in this manual to correct the problem. If the problem is not corrected, please collect information so that the Technical Support personnel can more effectively assist you.

## Important Safety Instructions: (Save These Instructions)

**CAUTION! (UPS having Internal Batteries):** Risk of electrical shock – Hazardous live parts inside this unit are energized from the battery supply even when the input AC power is disconnected.

**CAUTION! (No User serviceable Parts):** Risk of electrical shock, do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

**CAUTION! (Non-isolated Battery supply):** Risk of electric shock, battery circuit is not isolated from AC input, hazardous voltage may exist between battery terminals and ground. Test before touching.

**WARNING! (Fuses):** To reduce the risk of fire, replace only with the same type and size of fuse.

**WARNING!** Unit intended for installation in a controlled environment.

**CAUTION!** Do not dispose of batteries in a fire, the battery may explode.

**CAUTION!** Do not open or mutilate the battery, released electrolyte is harmful to the skin and eyes.

**CAUTION!** A battery can present a risk of electric shock and high short circuit current. The following precaution should be observed when working on batteries:

- Remove watches, rings or other metal objects.
- Use tools with insulated handles.

To reduce the risk of electric shock, disconnect the UPS from the main supply before installing a computer interface signal cable. Reconnect the power cord only after signaling interconnections have been made.

Servicing of batteries should be performed or supervised by personnel with knowledge of batteries and the required precautions. Keep unauthorized personnel away from batteries.

These UPS units are extremely heavy. Caution should be taken in moving and positioning equipment.

The instructions contained within this safety manual are deemed important and should be closely followed at all times during installation and follow-up maintenance of the UPS and batteries.

**CAUTION**

The unit has a dangerous amount of voltage. If the UPS indicator is on, the unit's outlets may have a dangerous amount of voltage even when not plugged into the wall outlet because the battery may continue to supply power.

Care should be taken to undertake installation indoors, free from electrically-conductive particles which are under temperature and humidity control, in order to reduce the risk of electric shock.

It is best to disconnect the device using the power supply cord. Ensure that the equipment is placed in a position near the outlet where easily accessible.

Except for replacing the batteries, all servicing on this equipment must be carried out by qualified service personnel.

Before conducting any maintenance, repair, or shipment, first ensure that everything is turned off completely and disconnected.

For additional safety instructions, please use the Safety Manual as a reference.

**Special Symbols**

The following symbols used on the UPS warn you of precautions:



RISK OF ELECTRIC SHOCK - Please observe the warning that a risk of electric shock is present



CAUTION: REFER TO OPERATOR'S MANUAL - Refer to the operator's manual for additional information, such as important operating and maintenance instructions.



SAFE GROUNDING TERMINAL - Indicates primary safe ground



Please do not discard of the UPS or the UPS batteries as the UPS may have valve-regulated lead-acid batteries. Please recycle batteries appropriately.

## Introduction

The information provided in this manual covers three-phase 20kVA uninterruptible power systems, its basic functions, operating procedures, options available and emergency situations. It also includes information on how to ship, store, handle, and install the equipment. Only detailed requirements of the UPS units are described herein, and installation must be carried out in accordance with this manual. Electrical installation must also carefully follow local legislation and regulations. Only qualified personnel should conduct these installations as failure to acknowledge electrical hazards could prove to be fatal.

## Product Description

Many different kinds of sensitive electrical equipment can be protected by an Uninterruptible Power Supply (UPS) including computers, workstations, process control systems, telecommunications systems, sales terminals, other critical instrumentation, etc. The purpose of the UPS is to protect these systems from poor quality utility power, complete loss of power, or other associated problems.

Electrical interference exists in many forms, causing problems in AC power, from lightning, power company accidents and radio transmission motors, air conditioners, and vending machines. Protection of sensitive electrical equipment is vital to protect against power outages, low or high voltage conditions, slow voltage fluctuations, frequency variations, differential and common-mode noise, transients, etc.

To prevent power line problems from reaching critical systems causing damage to software, hardware, and equipment malfunctions, the UPS maintains constant voltage, isolating critical load output and cleaning the utility AC power.

## Main Features

This is a three phase input / three phase output high-frequency online UPS. The UPS protects against power failures, power sag, power surge, under-voltage, over-voltage, line noise, frequency variations, switching transients, and harmonic distortion which can all cause critical problems to supported sensitive electronic equipment in the market today.

## Functions and Features

- 3 phase input/output high-density UPS
- Digital Control
  - The UPS is controlled by Digital Signal Processor (DSP) which increases reliability, performance, self-protection, self-diagnostics, etc.
- Modular Design
- Battery Configuration
  - The battery voltage can be configured based on needs
- Charging Configuration
  - The charging current can be customized to meet site requirements
- Intelligent Charging Method
  - 1st stage = high current constant current charging to restore batteries to 90% capacity
  - 2nd stage = constant current charging to assure batteries remain fully charged
  - 3rd stage = float charge

The 3-stage charging method extends the life of the batteries and guarantees rapid recharging
- LCD Display
  - Both LED and LCD displays allow for ease of use and availability of critical UPS status and operational parameters, including: input/output voltage, frequency and load %, battery %, ambient tem-

- perature, etc.
- EPO Function

## System Configuration

The UPS device and the internal batteries make up the system. Depending on the site and load requirements of the installation, certain additional options are available for the solution.

Planning a UPS system, the following should be taken into consideration:

- The total demand of the protected system shall dictate the output power rating (VA). Allow a margin for future expansion or calculation inaccuracies from measured power requirements.
- Backup time required will indicate the battery size needed. If the load is less than the UPS nominal power rating, then actual backup time is longer.
- The following options are available:
  - o Connectivity Options –SNMP/WEB card
  - o Extended Battery Packs - minimum 1 required

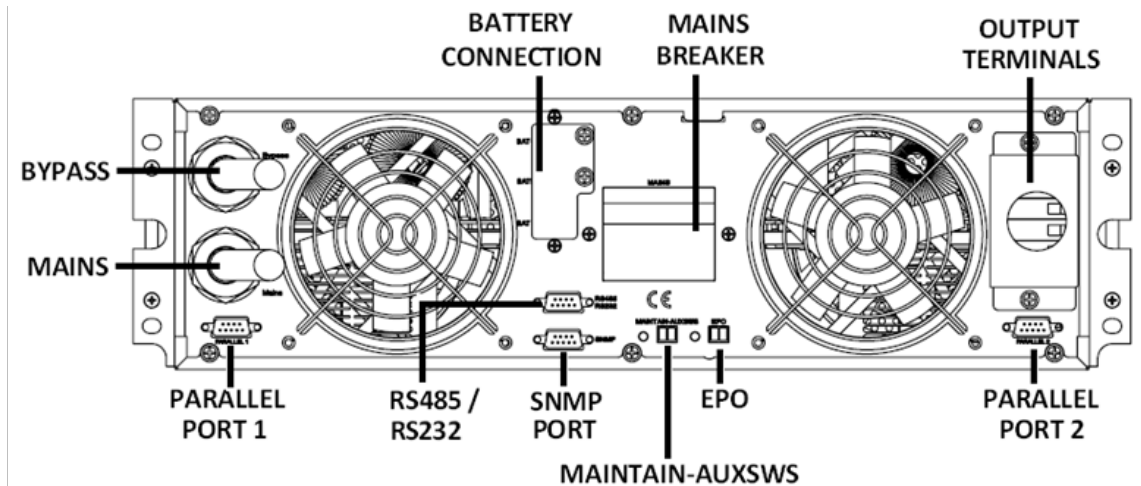
See the Specification section of this manual for additional model information.

## Unpacking the UPS

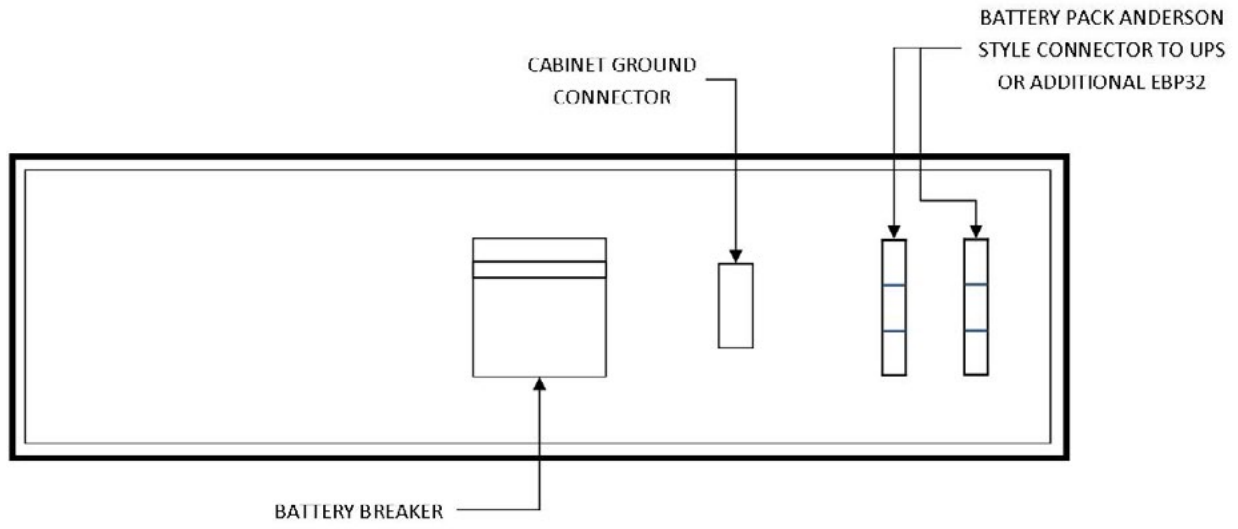
1. Do not lean the UPS against anything when moving it out of the packaging.
2. Check the physical appearance of the UPS to see if it was damaged during transportation. Do not switch on the UPS if damage is found. Please contact your dealer or distributor immediately for assistance.
3. Check the accessories according to the packing list to assure that you have all required pieces.



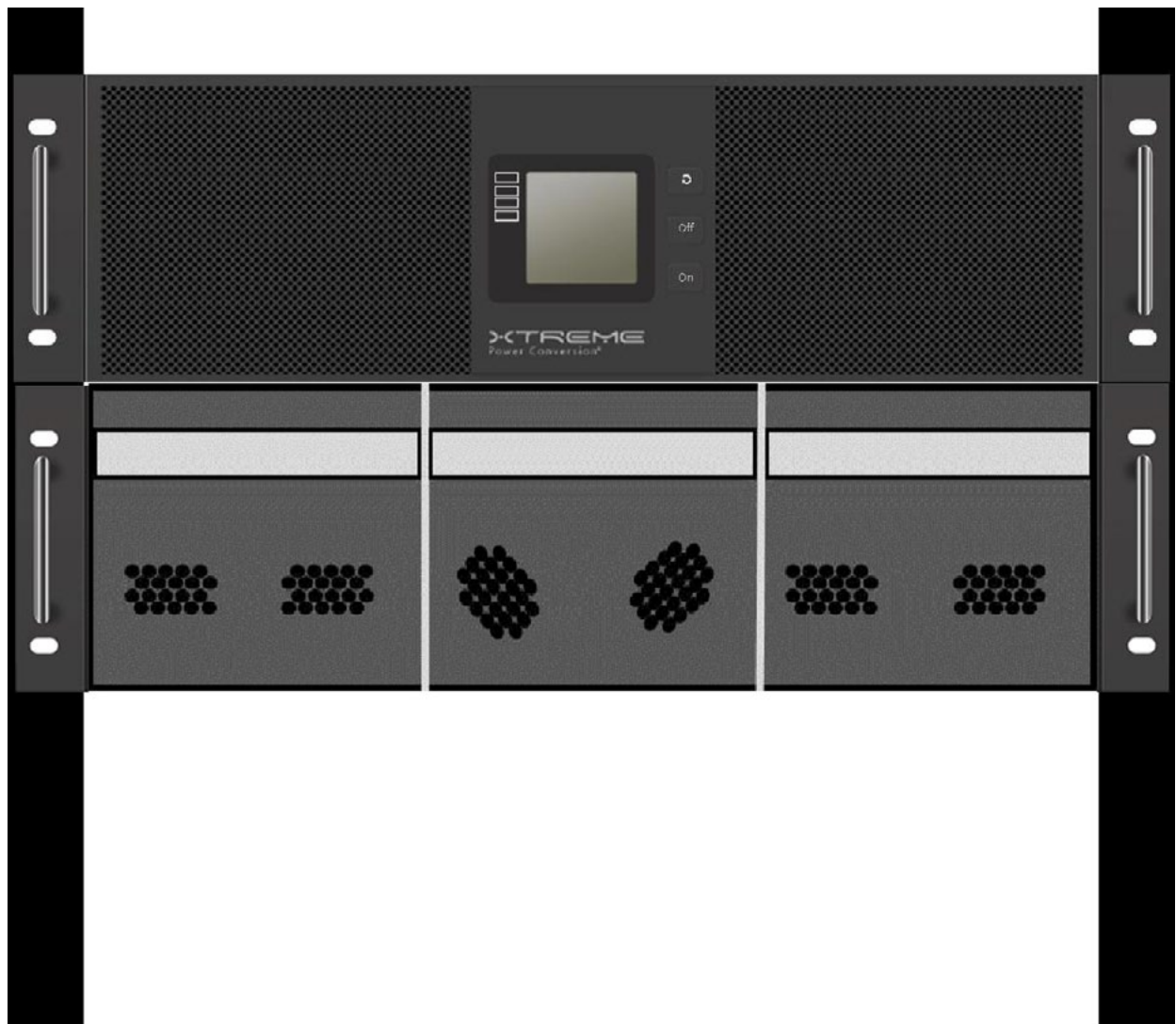
R90E-20K front view



R90E-20KVA rear view diagram



EBP32 rear panel



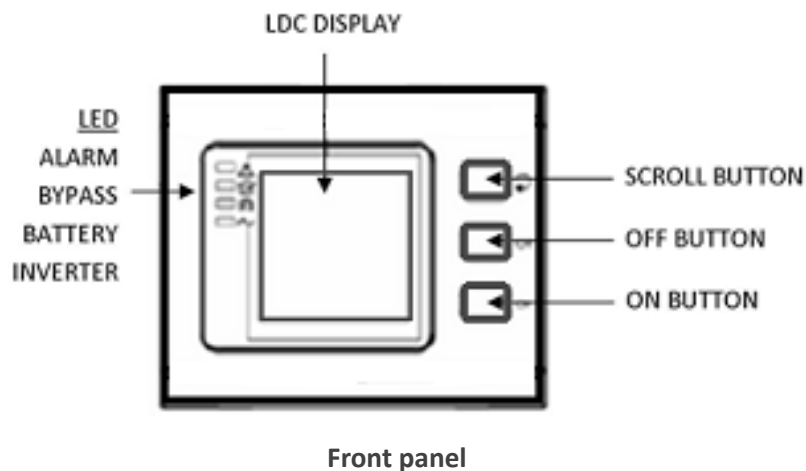
R90E-20K UPS + R90-EBP32 mounted in a rack





Shelf shipped with UPS & EBP32 for mounting in a rack

**Note:** this shelf must be used in order to support the weight of the equipment. Do not install UPS or EBP32 into a rack without using this shelf



Front panel

### Installation Notes

- Place the UPS in a clean, stable environment, avoiding vibration, dust, humidity, flammable gas and liquid, corrosive objects, etc. Check the operating temperature of the room where the UPS is being installed to assure it is within range of UPS specification.
- Batteries should be installed in an environment where the temperature is within the required specifications of the product. Temperature is a major factor in determining battery life and capacity. Normal battery installation requires the temperature be maintained from 15°C to 25°C. Keep batteries away from heat sources and main air ventilation areas.



#### WARNING!

Typical battery performance data is quoted for an operating temperature between 20°C and 25°C. Operating above this range will reduce the battery life while operation below this range will reduce the battery capacity.

- If the equipment is not to be installed immediately, it must be stored in a room so as to protect it against excessive heat and humidity sources.

**CAUTION!**

An unused battery must be recharged every 6 months. Temporarily connecting the UPS to a suitable AC source and activating the UPS for the time required to recharge the batteries is required.

- To monitor the UPS with the software, simply connect the RS232 cable to the UPS and to a computer.

### ***External Protective Devices***

For safety reasons, it is necessary to install an external circuit breaker at the input AC utility and to the battery.

#### **External Battery**

The UPS and its associated batteries are protected against the effect of over-current through a DC compatible thermo-magnetic circuit breaker located close to the battery.

#### **UPS Output**

Any external distribution board used for load distribution shall be fitted with protective devices so as to avoid the risk of UPS overload.

#### **Over-Current Protection**

A protection device shall be installed at the distribution panel of the incoming utility power, and should identify the power cables current capacity as well as the overload capacity of the system.

**CAUTION!**

Select a thermo magnetic circuit-breaker with an IEC 60947-2 trip curve C (normal) for 125% of the current as listed below. **40A Input Circuit Breaker required**

### ***Power Cables***

The cable design shall comply with the voltages and currents provided in this section, and in accordance with local electrical codes.

**WARNING!**

UPON STARTING, PLEASE ENSURE THAT YOU ARE AWARE OF THE LOCATION AND OPERATION OF THE EXTERNAL ISOLATORS WHICH ARE CONNECTED TO THE UPS INPUT/BYPASS SUPPLY OF THE UTILITY DISTRIBUTION PANEL. CHECK TO SEE IF THESE SUPPLIES ARE ELECTRICALLY ISOLATED, AND POST ANY NECESSARY WARNING SIGNS TO PREVENT ANY INADVERTENT OPERATION

#### **Cable Sizes**

UPS MODEL	CABLE SIZES (THHW wiring at 75°C)			
	AC INPUT	AC OUTPUT	DC INPUT	GROUNDING
R90E-20K	8 awg	8 awg	6 awg	8 awg



**CAUTION!**

Protective earth ground cable: connect each cabinet to an earth ground, following the shortest route possible.



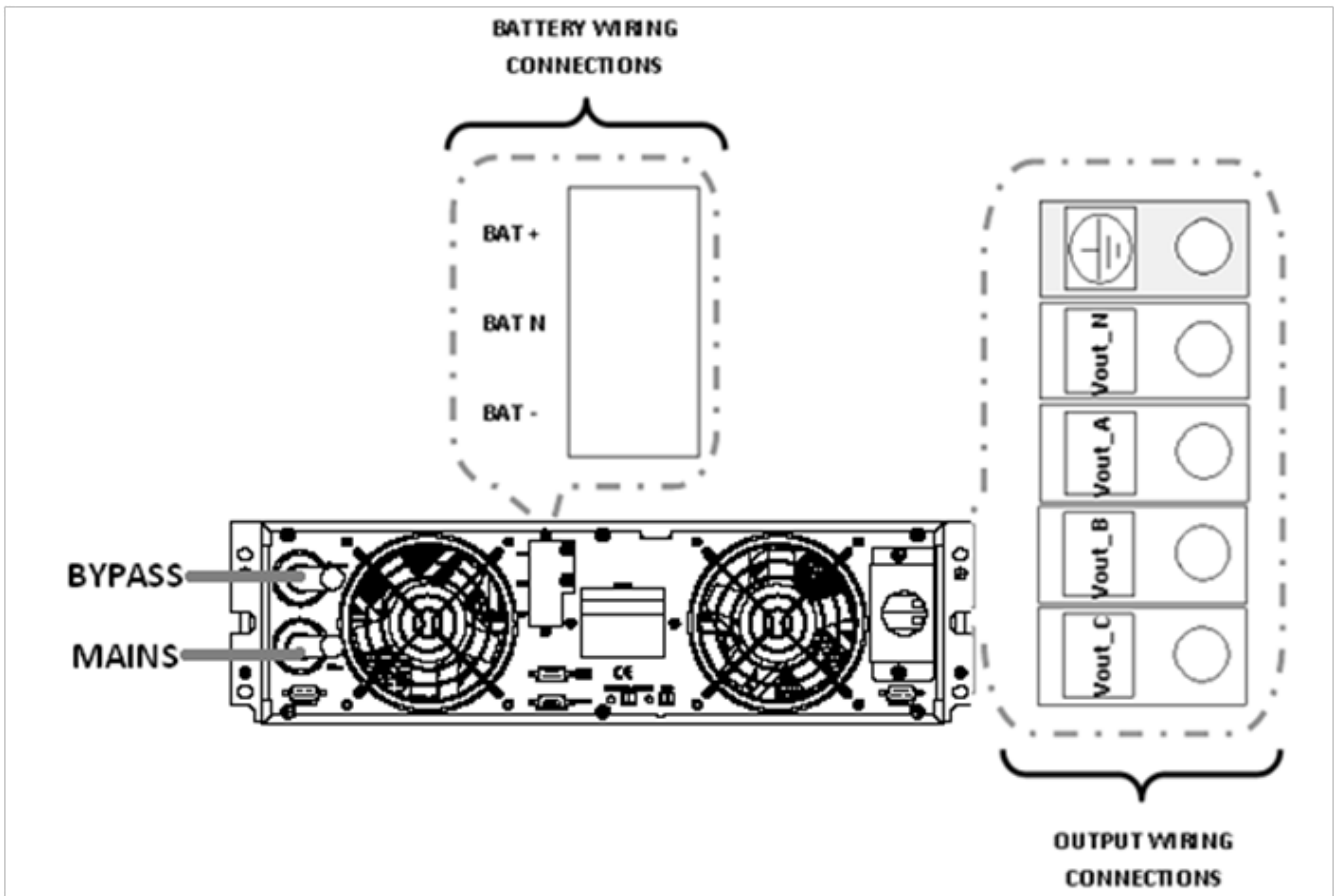
**WARNING!**

FAILURE TO FOLLOW ADEQUATE GROUNDING PROCEDURES MAY RESULT IN ELECTROMAGNETIC INTERFERENCE OR IN HAZARDS INVOLVING ELECTRICAL SHOCK AND FIRE.

**Power Cables Connection**

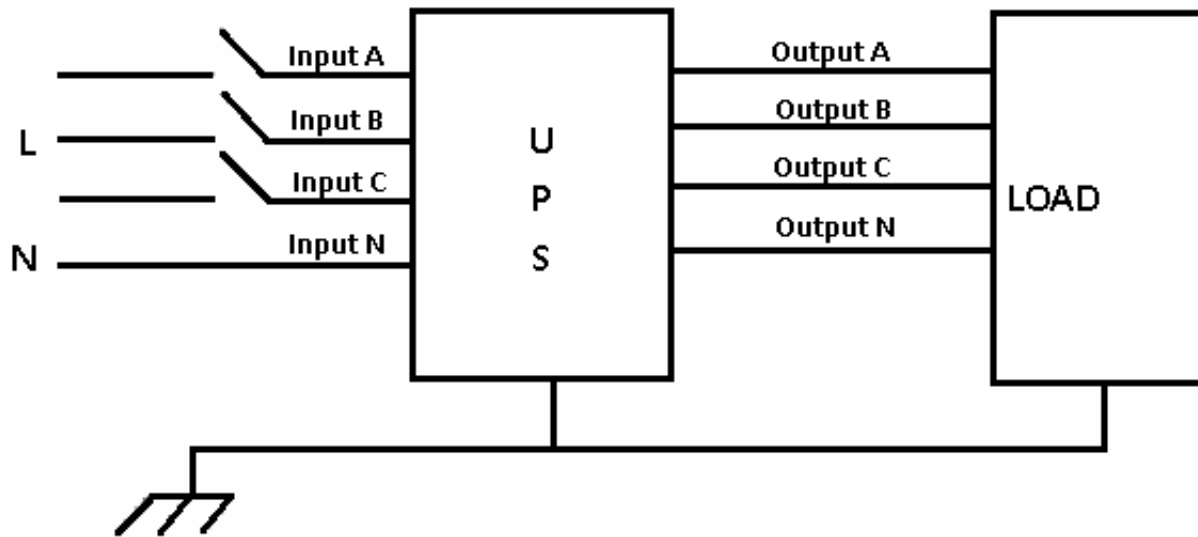
After the equipment has been properly positioned and secured, connect the power cables as described below.

Verify the UPS is totally isolated from its external power source and all circuit breakers to the UPS are open. Check to see that everything is electrically isolated, and post any necessary warning signs to prevent inadvertent operation of the breakers.



Power cable connection diagram

Select the appropriate power cable size, paying attention to the diameter of the connection terminal of the cable, which should be greater than or equal to the connection posts.



Wiring diagram

**WARNING!**

IF THE LOAD EQUIPMENT IS NOT READY TO ACCEPT POWER WHEN THE UPS INSTALLATION IS OCCURRING, ENSURE THAT THE UPS OUTPUT CABLES ARE SAFELY ISOLATED AT THE CABLE ENDS.

**CAUTION!**

The earth ground and neutral bonding arrangement must be in accordance with local and/or national electrical code practices.

### ***Battery Connection***

The UPS has a positive and negative double battery framework using a total of 32 batteries in series. A neutral cable is retrieved from the joint between the cathode of the 16th and the anode of the 17th of the batteries. The neutral cable, the battery positive cable, and the battery negative cable are then connected with the UPS. The batteries between the anode and neutral connection are called positive batteries, and the batteries between the neutral and cathode are called the negative batteries. The connection is shown in the diagram below.



**± 192VDC battery connection diagram internal EBP32**

**Note:** The BAT + of the UPS Connection Terminals is connected to the anode of the Positive Battery. The BAT – of the UPS Connection Terminals is connected to the cathode of the Positive Battery and the anode of the Negative Battery. The BAT – is connected to the cathode of the Negative Battery.

Factory default settings for the battery quantity is 32 pieces and for a battery capacity of 7AH (charger current = 1A programmable to 6A)

**Note:** Optional 3rd party battery configurations of ±192VDC/±204VDC/±216VDC/±240VDC can be used and are available.



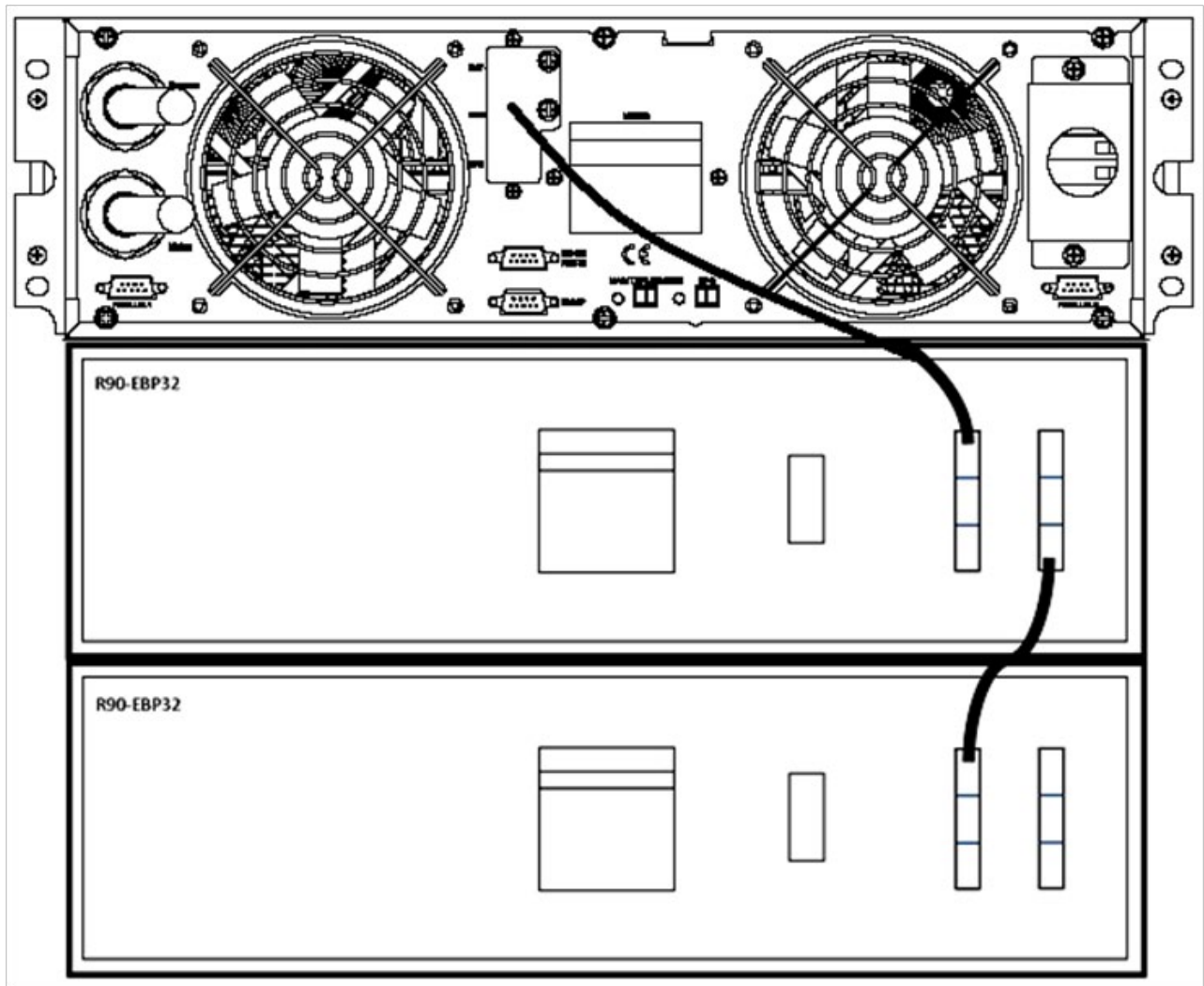
**CAUTION!**

Ensure correct polarity of the battery string series connection (i.e. inter-tier and inter block connections are from (+) to (-) terminals. DO NOT mix batteries with different capacity or different brands, or new or old batteries.



**WARNING!**

ENSURE CORRECT POLARITY OF STRING END CONNECTIONS TO THE BATTERY CIRCUIT BREAKER, AND FROM THE BATTERY CIRCUIT BREAKER TO THE UPS TERMINALS (I.E. (+) TO (+) / (-) TO (-)). DISCONNECT ONE OR MORE BATTERY CELL LINKS IN EACH TIER. DO NOT RECONNECT THESE LINKS AND DO NOT CLOSE THE BATTERY CIRCUIT BREAKER UNLESS ALL CONNECTIONS ARE PROPERLY CHECKED AND APPROVED.



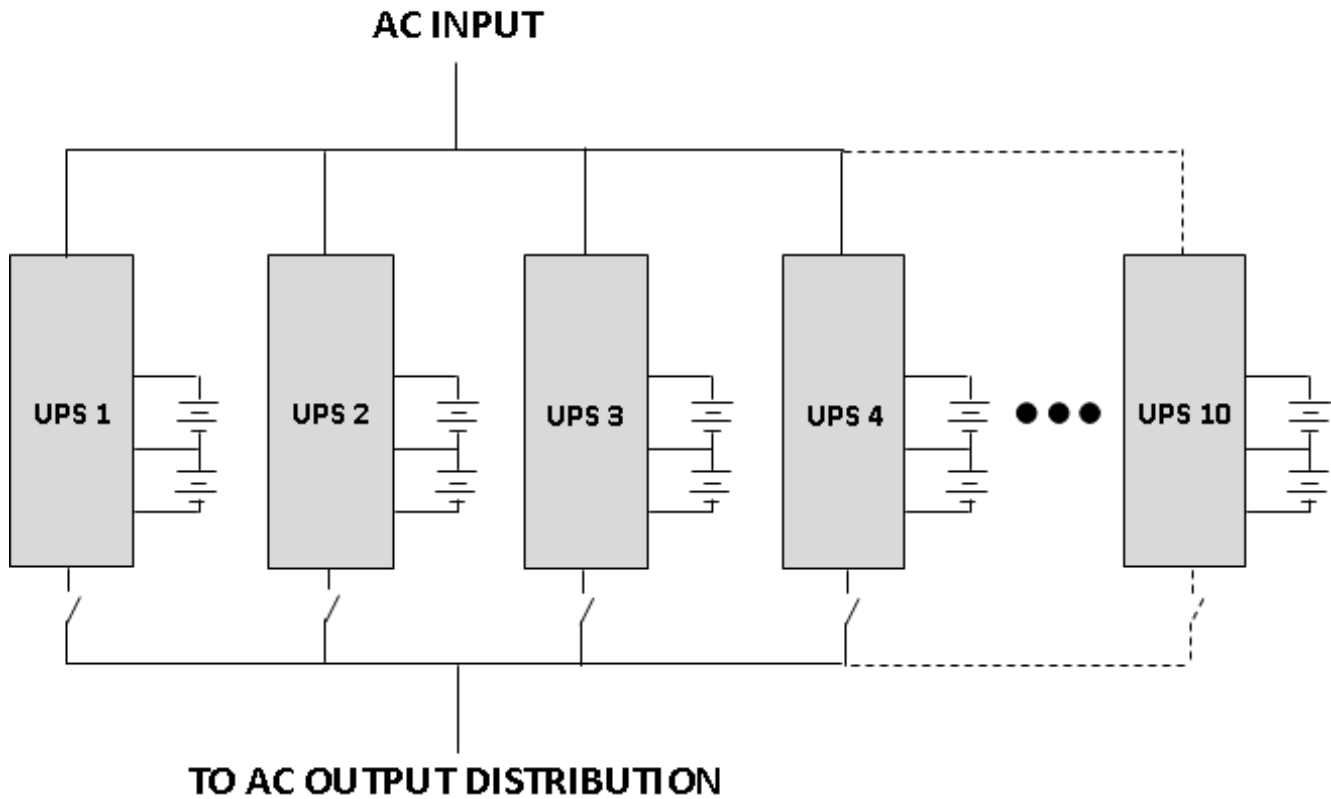
R90E-20K to EBP32 battery connection

### UPS Multi-Module Installation

The basic installation procedure for a parallel system consisting of two or more R90E-20KVA modules is that same as that of a single module. The following provides installation procedures related to a parallel system.

#### Cabinet Installation

Connect all R90E-20KVA UPS required in the parallel system as shown in the diagram below.



**Note:** If installing 5-6 units in parallel, remove the jumper cap J30 on the control inspection board (MHTBJHR-1CU04 in all UPS to be connected in parallel. If installing 7-10 units in parallel, remove the jumper cap J30/J31 on the control inspection board (MHTBJHR1CU04 in all UPS to be connected in parallel. Make sure that each UPS input breaker is in the “OFF” position and there is no output from any UPS connected. The battery strings can be connected separately or in parallel.

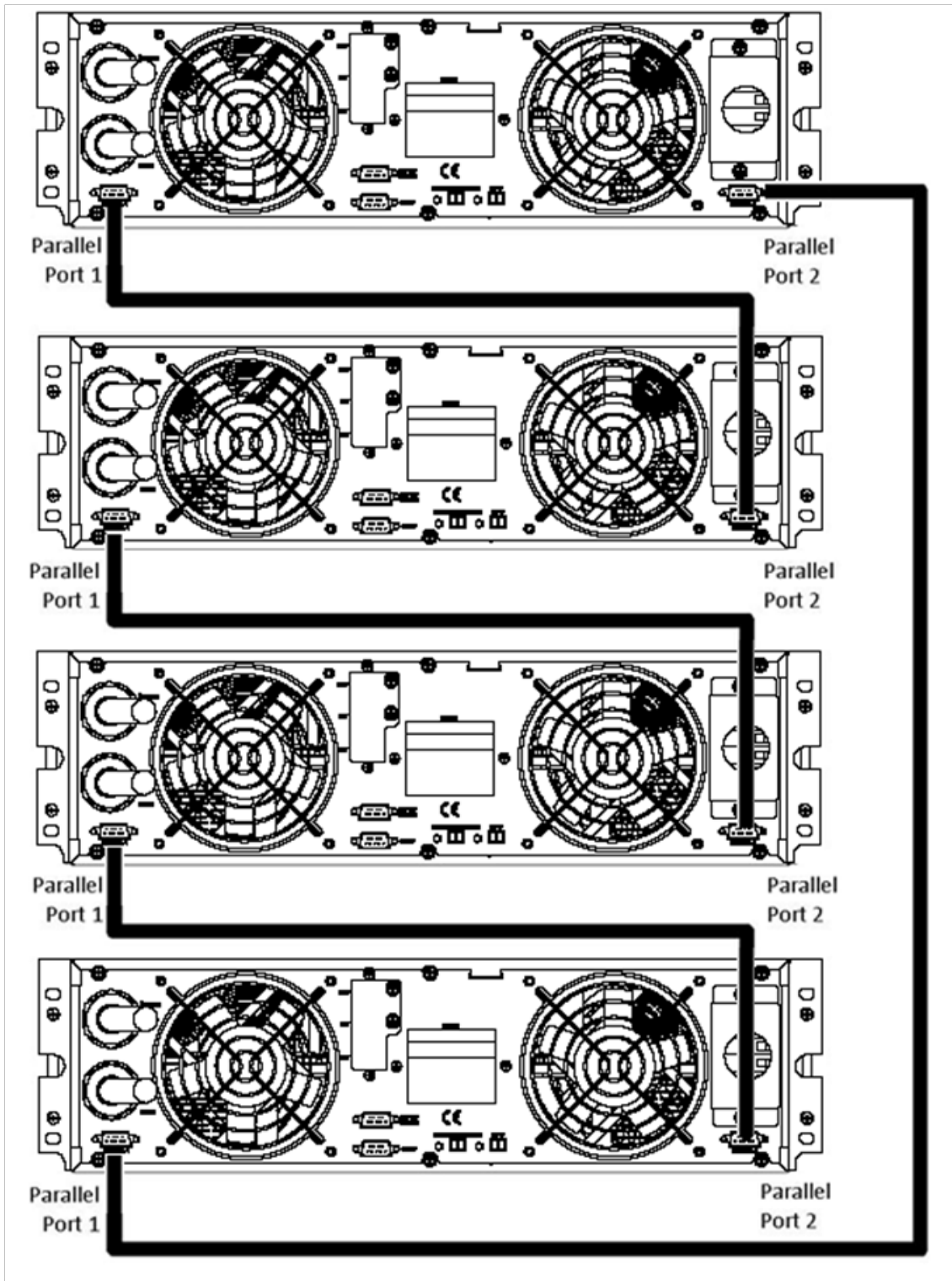


**WARNING!**

MAKE SURE THE N, A(L1), B(L2), AND C(L3) WIRING IS CORRECT, AND THAT GROUND IS CONNECTED.

**Parallel Cable Installation**

The shielded and double insulated control cables must be interconnected in a ring-configuration between UPS modules as shown in the diagram below. The parallel control board is mounted in each UPS module. The ring-configuration ensures high-reliability of the control function.



Parallel connection of UPS



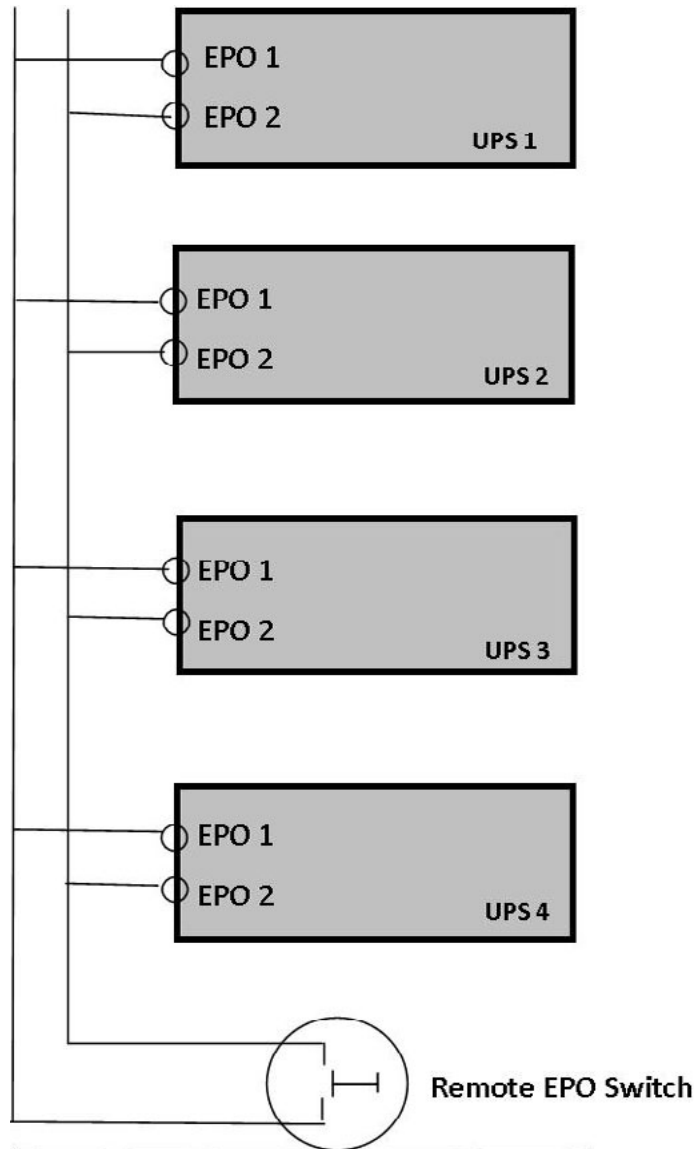
**Remote Emergency Power Off (EPO) for Parallel Systems**

EPO for parallel systems must be connected in parallel and installed as shown below. Once the EPO function of one of the UPS in the parallel system is activated, the UPS will send out a remote command and shut down the other UPS's in the parallel system.



**CAUTION!**

The remote emergency kill switch must be voltage-free and "normally open".



EPO connections for parallel systems

### Requirements for a Parallel System

A group of parallel UPS modules behave as one large UPS system with the advantage of presenting higher reliability. In order to assure that all modules are equally utilized and comply with relevant wiring regulations, please follow the requirements below.

1. All UPS modules must be of the same rating and be connected to the same bypass source.
2. The Bypass and Utility input sources must be referenced to the same neutral potential.
3. The outputs of all the UPS modules must be connected to a common output bus.
4. The length and specification of power cables including the bypass input cables and the UPS output cabinets should be the same size. This facilitates load sharing when operating in bypass mode.
5. Up to 10 UPS modules may be paralleled with common battery if desired

**Note:** If installing 5-6 units in parallel, remove the jumper cap J30 on the control inspection board (MHTBJHR-1CU04 in all UPS to be connected in parallel. If installing 7-10 units in parallel, remove the jumper cap J30/J31 on the control inspection board (MHTBJHR1CU04 in all UPS to be connected in parallel.

## Operation

### *Operation Modes*

The UPS is a double-conversion online UPS that may operate in the following alternative modes.

#### **Normal Mode**

The rectifier / charger derives power from the AC input utility and supplies DC power to the inverter while floating and boost charging the battery simultaneously. The inverter then converts the DC power to AC power and supplies the load.

#### **Battery Mode (stored energy mode)**

If the AC input utility power fails, the inverter, which is operating from power supplied by the battery, supplies the critical AC loads with power from the batteries. There is no power interruption to the critical load. The UPS will automatically return to Normal Mode when AC input utility recovers.

#### **Bypass Mode**

If the inverter is not functioning correctly, or if an overload occurs, the static transfer switch will be activated to transfer the load from the inverter supply to bypass supply without interruption to the critical load. In the event that the inverter output is not synchronized with the bypass AC source, the static switch will perform a transfer of the load from the inverter to the bypass with power interruption to the critical AC loads. This is to avoid paralleling of unsynchronized AC sources. This interruption is programmable but typically set to be less than one electrical cycle (less than 15ms at 50Hz or less than 13.3ms at 60Hz).

#### **ECO Mode**

When the UPS is in AC Model and the requirement to the load is not critical, the UPS can be set to ECO Mode in order to increase the efficiency of the power supplied. In ECO Mode, the UPS works in line-interactive mode, so the UPS will transfer to bypass utility. When the AC is out of the set window, the UPS will transfer from bypass to inverter and supply power from the batteries, with the LCD displaying all related information.

**Note:** ECO mode is not available in parallel system configurations.

#### **Parallel Redundancy Mode (system expansion)**

To achieve higher capacity and / or increase reliability, the output of up to ten (10) UPS modules can be programmed to operate in parallel, with the built-in parallel controller in each UPS ensuring automatic load sharing.

## Turn On / Off the UPS

### Connecting with Utility

The UPS is a double-conversion online UPS that may operate in the following alternative modes.



#### CAUTION!

MAKE SURE PROPER GROUNDING IS IN PLACE.

- Set the Battery Breaker to the "ON" position according to the user manual.
- Switch "ON" the UPS

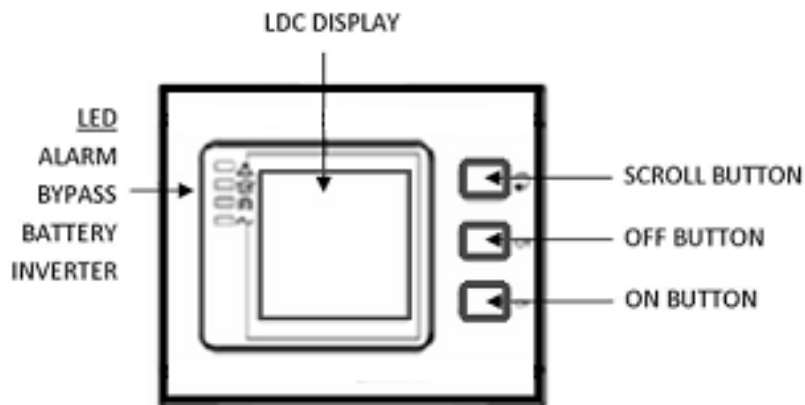


#### CAUTION!

Check to see if the load is safely connected to the output of the UPS. If the load is not ready to receive power from the UPS, make sure that it is safely isolated from the UPS output terminals.

The internal fan of the UPS will start spinning; the UPS will perform self-diagnostics until the unit beeps twice to show the UPS is normal. The UPS then goes to bypass, Utility LED and Bypass LED turn Green, the inverter is now starting. When the inverter is checked "normal", the UPS goes to Normal Mode and the load is supplied power by the inverter.

### Cold Start Procedure



#### CAUTION!

Follow these procedures when there is an input AC Utility Failure but the batteries are normal.

- Turn on the battery switch.
  - The battery will feed the Auxiliary power board.
- Trigger the Cold Start Buttons of the modules respectively using the ON BUTTON shown in the above diagram.
  - When battery is normal, the rectifier starts operation. 30 seconds later the inverter starts and operates, INV and Output light up.



#### CAUTION!

Wait for approximately 30 seconds before pressing the ON BUTTON.

## Inverter Off

When the Utility is normal, press OFF BUTTON for approximately 1 second until you hear a beep. The INVERTER LED will extinguish, the BYPASS LED will be illuminated, then the UPS turns to bypass supply.

## Disconnecting from Utility



### CAUTION!

This procedure should be followed to completely shut down the UPS and the LOAD. After all power switches, isolators, and circuit breakers are opened, there will be no output power from the UPS.

- After the inverter is off, turn the Utility and Battery breakers to "OFF". The LCD display will extinguish completely and the fan stops spinning in 60 seconds. If there are external battery packs connected, turn the Battery breakers on each battery pack to the "OFF" position.

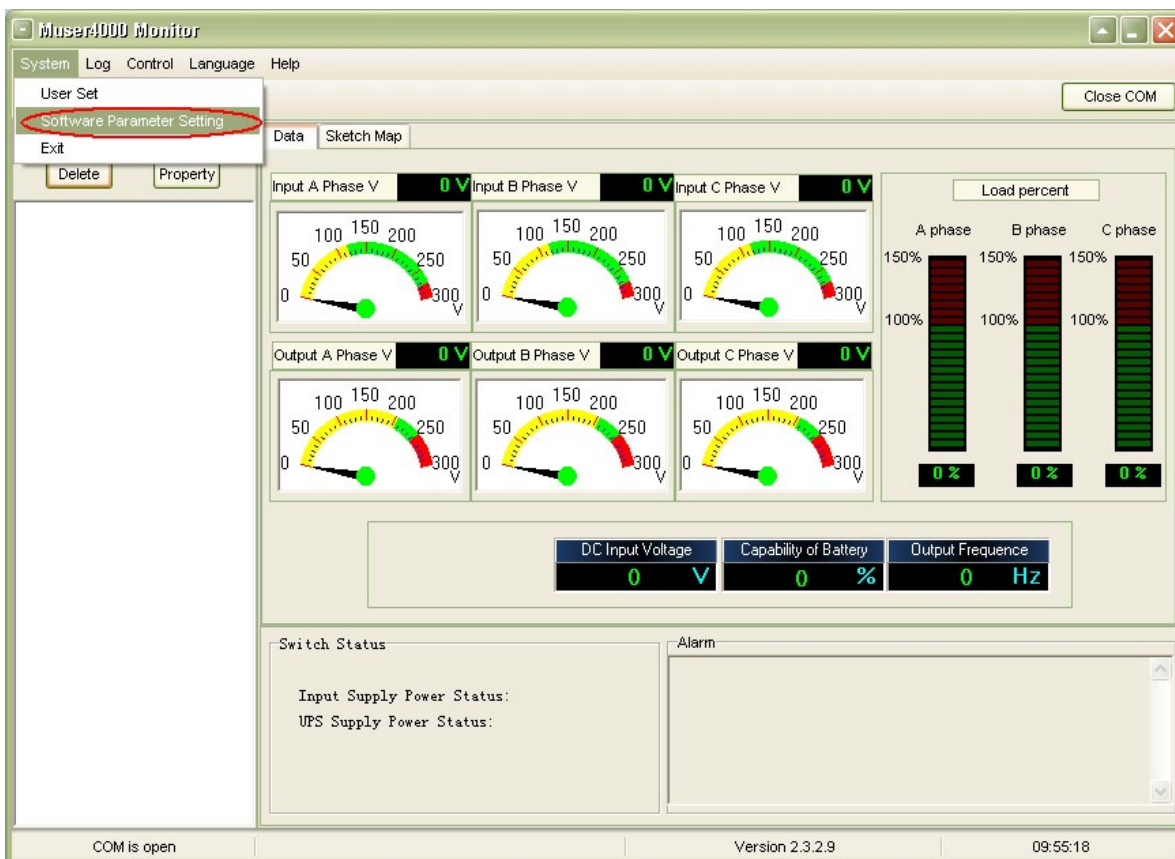


### WARNING!

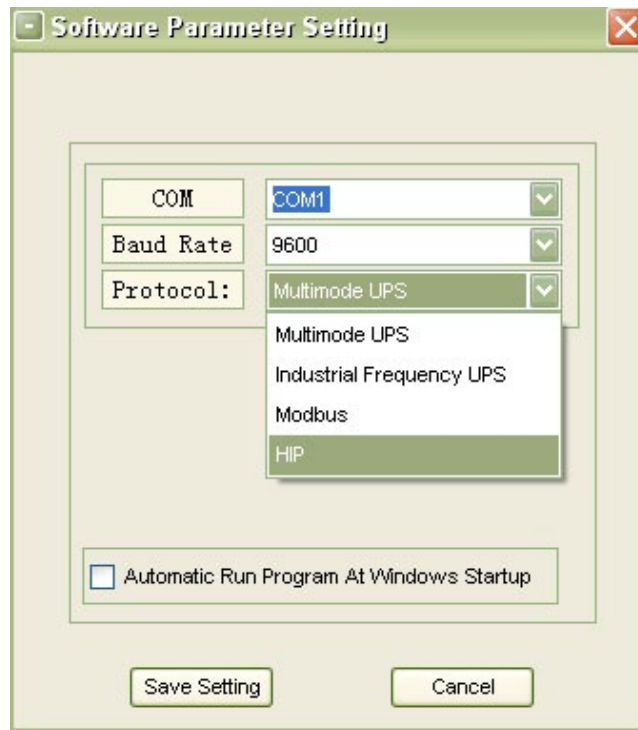
Wait about 5 minutes for the internal DC bus bar capacitors to be completely discharged.

## Computer Access

- Connect one end of the RS232 communications cable to a computer and the other end to the RS232 port on the UPS
- Open the software Muser4000, and choose "system" button

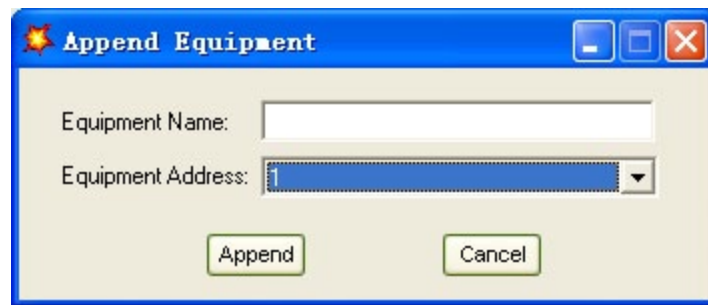


- Choose “**Software Parameter Setting**” and set selections as shown below and then save settings
  - o COM = COM1
  - o Baud Rate = 9600
  - o Protocol = HIP



- On the main page of Muser4000, choose the “**Append**” button, place the UPS name into “**Equipment Name**”, and UPS ID address into “**Equipment address**”. Choose the “**Append**” button, then the connection between UPS and computer is complete.



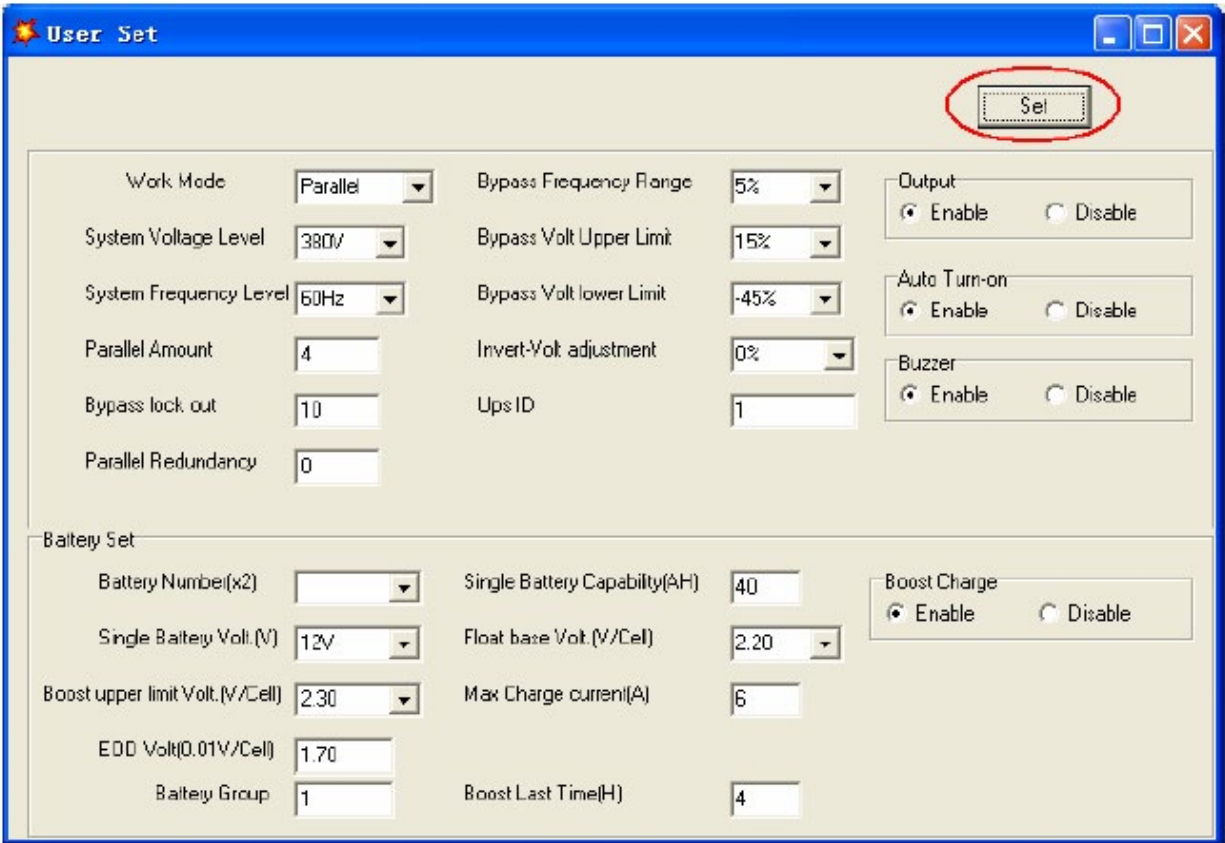


**Parallel Setting**

- Connect the UPS with a computer. Power ON the UPS.
- Open Muser4000 software and choose "System" > "User Set"



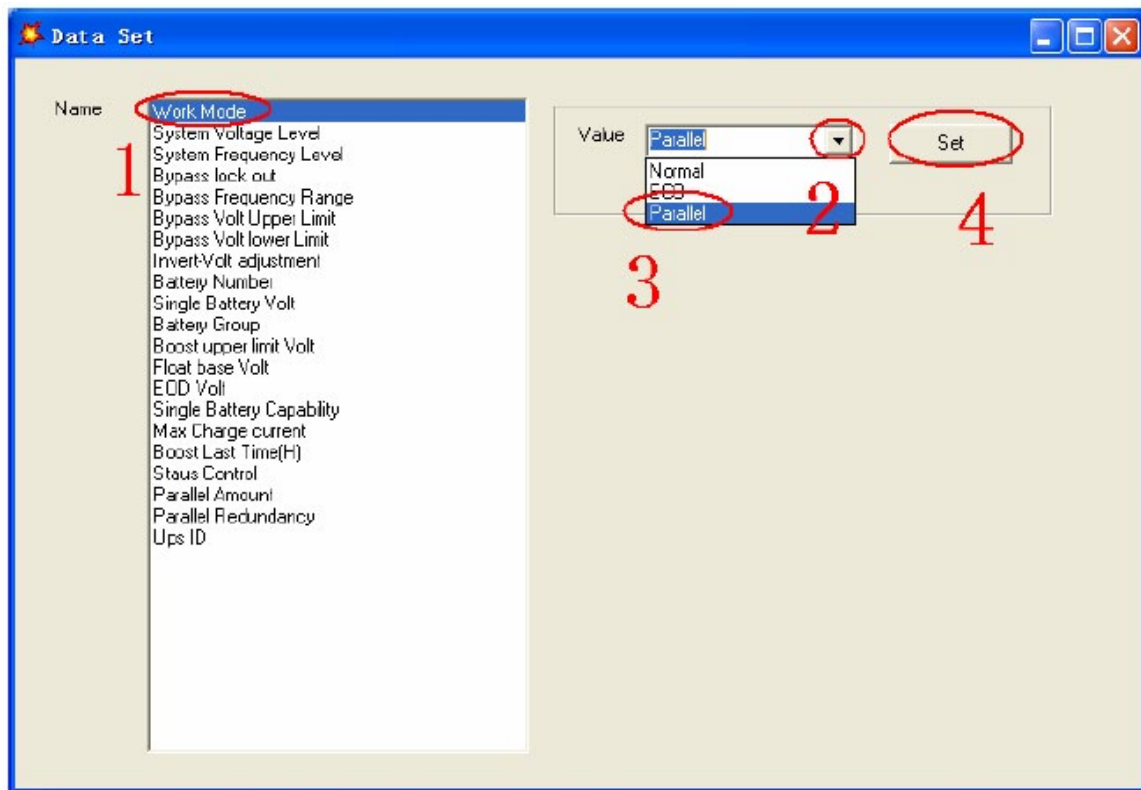
- Select **"Set"** at **"User Set"** window



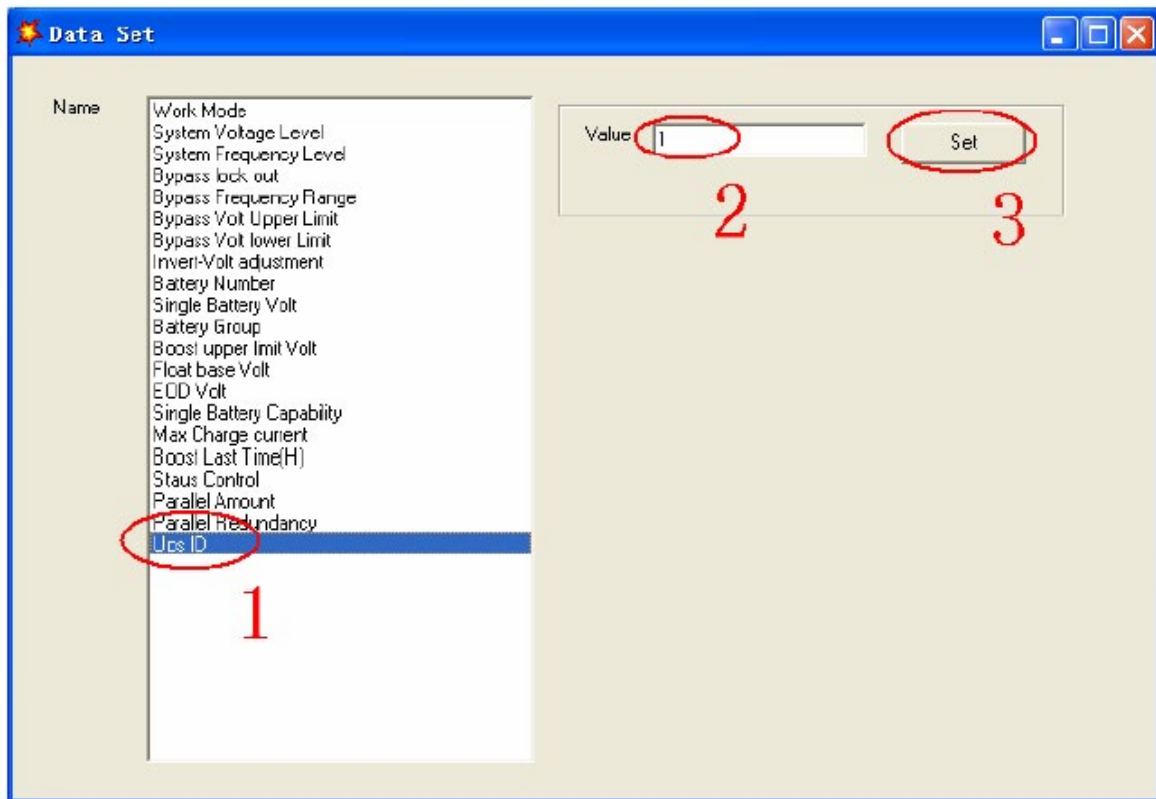
### CAUTION!

When powered by inverter, it is necessary to turn off the inverter before setting the voltage and frequency level in PC

- At the window of **"Data Set"**, select **"Work Mode"** with **"Parallel"** for the Value, then select **"Set"** as shown in the figure below. If the UPS "beeps" it means the setting is correct.



- At the window of "Data Set", select "UPS ID", enter the Value for the parallel UPS ID at the right side, then select "Set" as shown in the figure below. If the UPS "beeps" it means the setting is correct.







**CAUTION!**

After changing the parallel system ID, the connection between Muser4000 and equipment might be interrupted. If this occurs, re-connect in accordance with the instructions described earlier in this manual.



**CAUTION!**

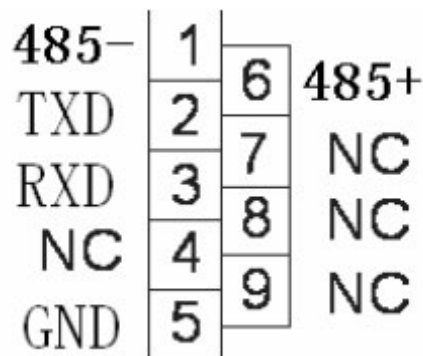
Parallel cable cannot be connected when setting the parallel parameters

- After setting the UPS's that need to be paralleled, power OFF all the UPS's. Connect all the UPS's according to "parallel cable installation", and then power ON the UPS's.

**Note:** If installing 5-6 units in parallel, remove the jumper cap J30 on the control inspection board (MHTBJHR-1CU04 in all UPS to be connected in parallel. If installing 7-10 units in parallel, remove the jumper cap J30/J31 on the control inspection board (MHTBJHR1CU04 in all UPS to be connected in parallel.

**Communication Port Definitions (RS232, RS485)**

Definition of the Port



Connection between PC RS232 port and UPS RS232 port

PC RS232 port	UPS RS232 port	Description
Pin 2	Pin 2	UPS send, PC receive
Pin 3	Pin 3	PC send, UPS receive
Pin 5	Pin 5	Ground

Connection between the computer RS485 port and UPS RS485 port

PC (DB9 male)	UPS (DB9 female)	Description
Pin 1	Pin 1	485 "-"
Pin 6	Pin 6	485 "+"

Available function of RS232

- Monitor UPS power status
- Monitor UPS alarm information
- Monitor UPS running parameters
- Timing Off / On setting

RS-232 communication data format

Baud rate = 9600bps

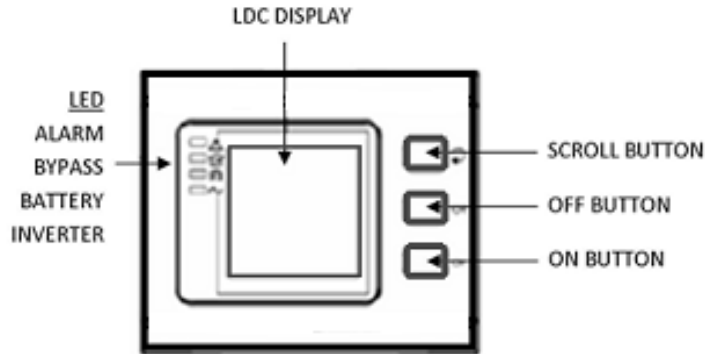
Byte length = 8bit

End bit = 2bit

Parity check = none

## The Display

### System LCD Display



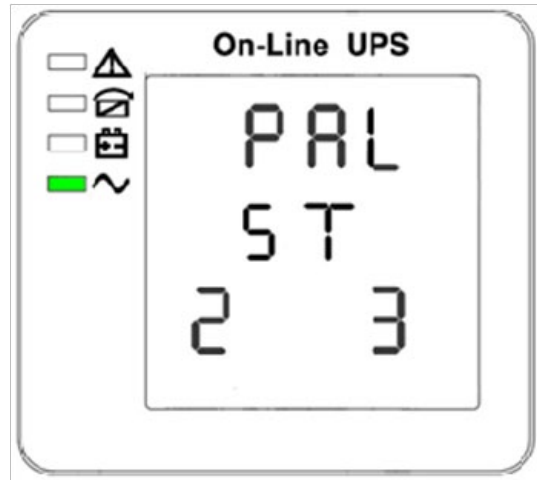
### CAUTION!

The display provides more functions than those described in this manual.

There are 15 interfaces available in the LCD display as shown below.

ITEM	INTERFACE DESCRIPTION	CONTENT DISPLAYED
01	CODE	Operational status and mode
02	Input A (Input L1)	Voltage & Frequency
03	Input B (Input L2)	Voltage & Frequency
04	Input C (Input L3)	Voltage & Frequency
05	Bat. +	Voltage & Current
06	Bat. -	Voltage & Current
07	Backup time	Capacity & Time
08	Output A (Output L1)	Voltage, Frequency & Load
09	Output B (Output L2)	Voltage, Frequency & Load
10	Output C (Output L3)	Voltage, Frequency & Load
11	Load A	Load
12	Load B	Load
13	Load C	Load
14	Total Load	Load
15	Temperature	Battery temperature (need to connect batter sensor, internal temperature and ambient temperature)
16	Software version & model	Version of rectifier software, version of inverter software, model
	CODE	Operational status and mode
	CODE	Alarm Code (Warning Message)

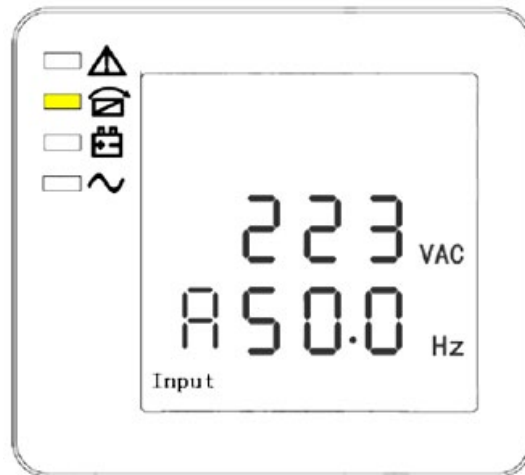
1. When the UPS is connecting with Utility or Battery at Cold Start Mode, the LCD displays shows as below.



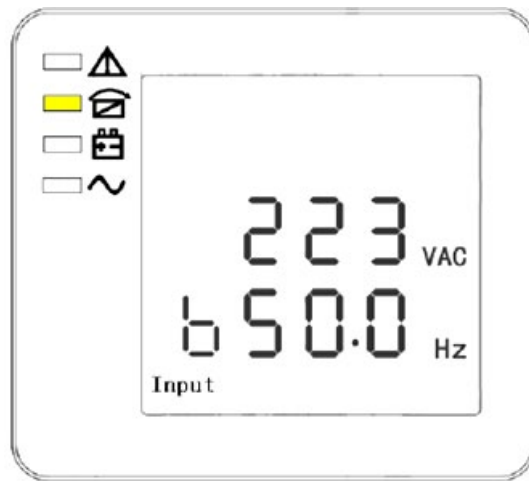
**Operational Status and mode**

If UPS is in single mode, display shows "NOA" or ECO"  
If UPS is in parallel mode, display shows "PAL"

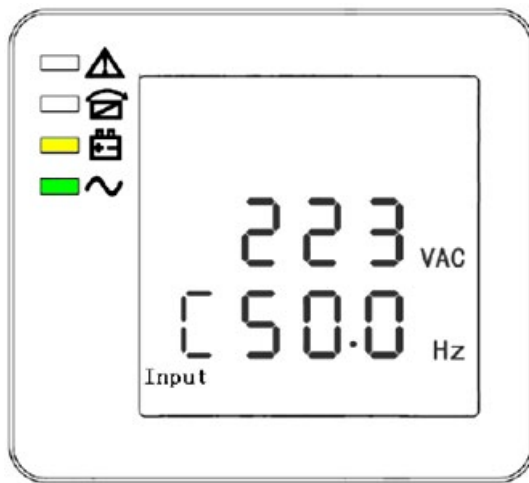
2. Press SCROLL BUTTON, the UPS goes to the next screen as shown below.



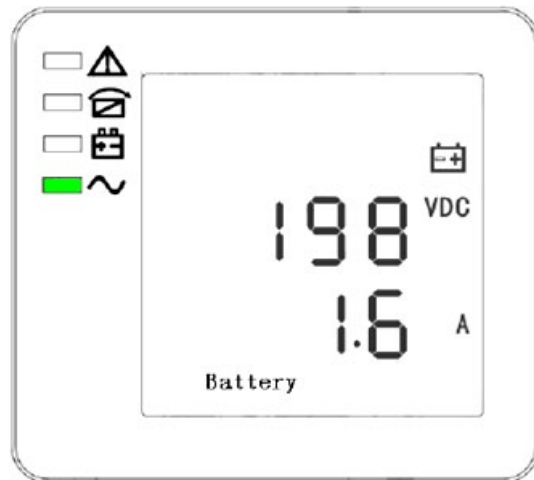
**PHASE A (L1) INPUT VOLTAGE / FREQUENCY**



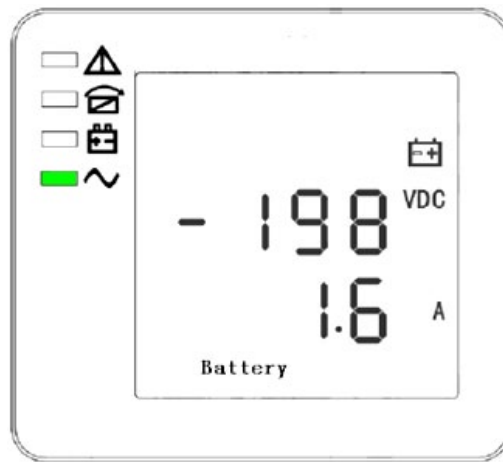
PHASE B (L2) INPUT VOLTAGE / FREQUENCY



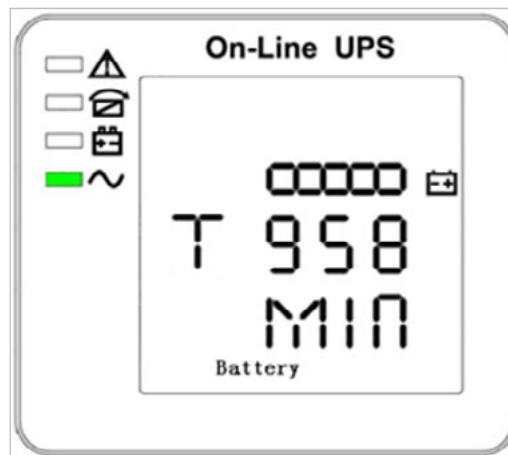
PHASE C (L3) INPUT VOLTAGE / FREQUENCY



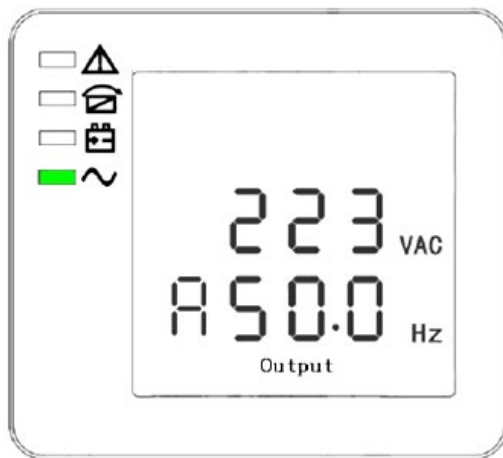
BAT + (POSITIVE)



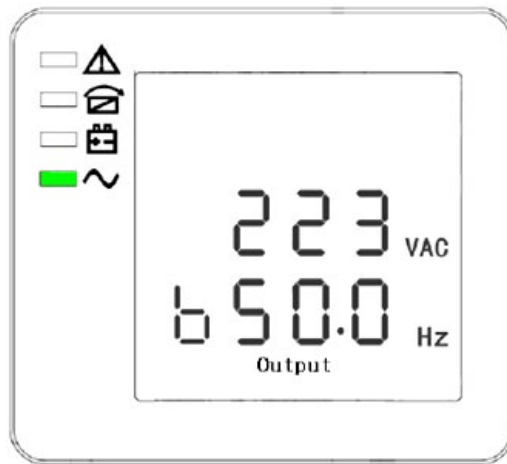
BAT - (NEGATIVE)



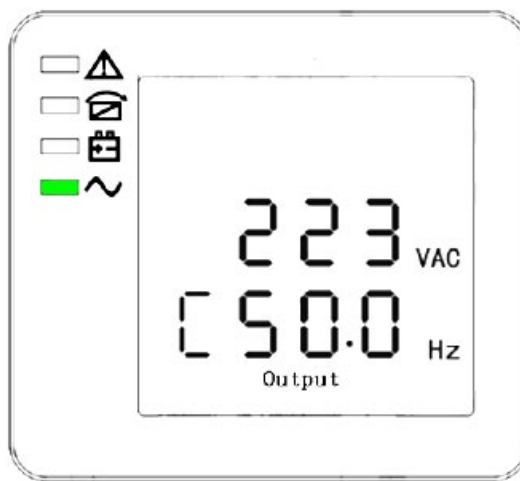
BACKUP TIME



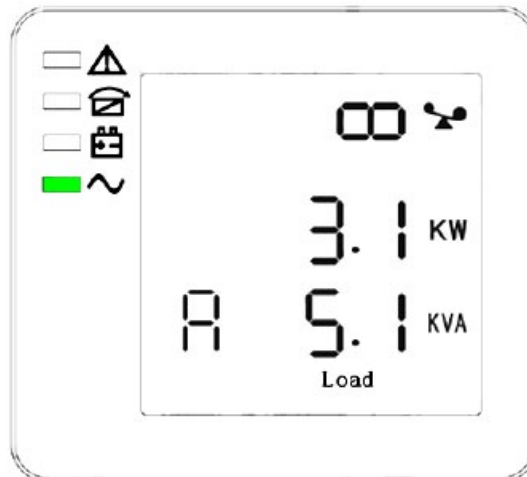
PHASE A (L1) OUTPUT VOLTAGE / FREQUENCY



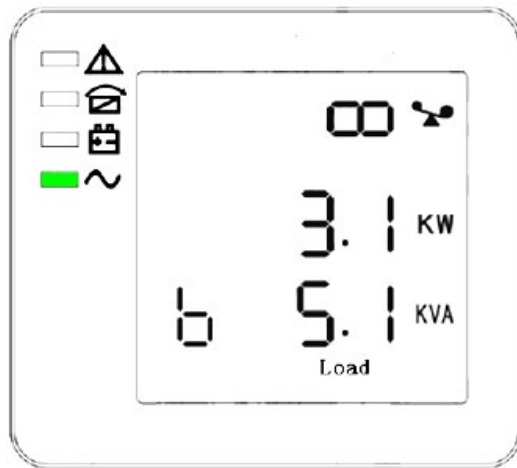
PHASE B (L2) OUTPUT VOLTAGE / FREQUENCY



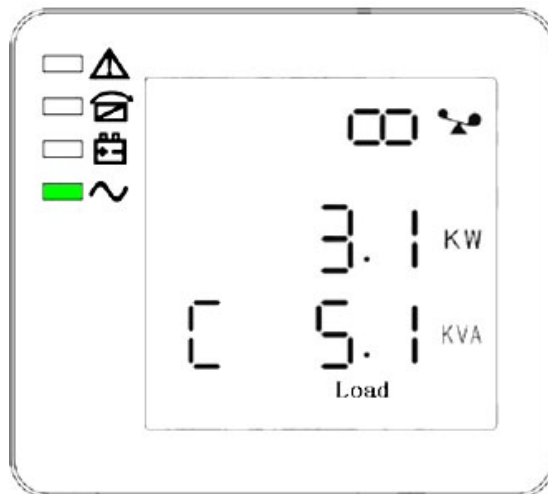
PHASE C (L3) OUTPUT VOLTAGE / FREQUENCY



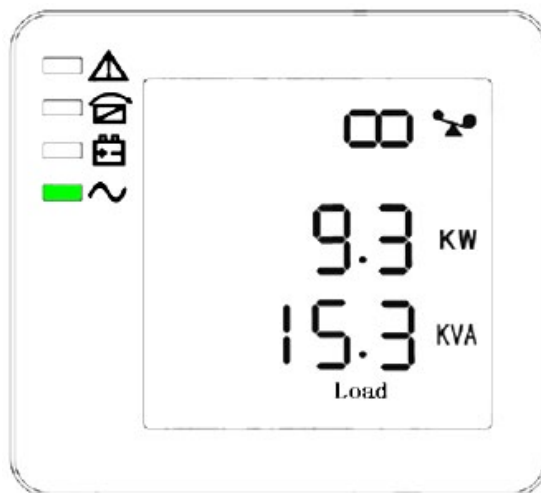
PHASE A (L1) LOAD CAPACITY



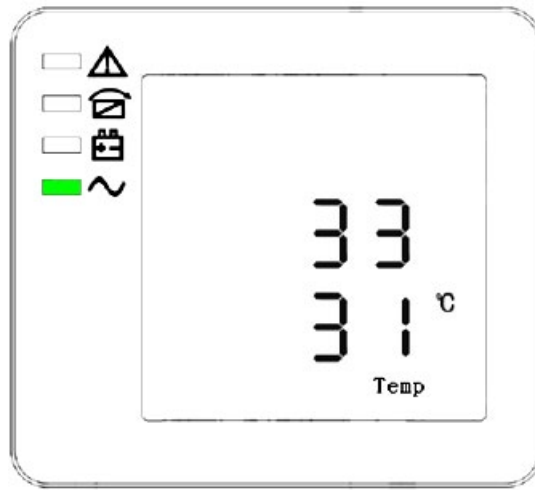
PHASE B (L2) LOAD CAPACITY



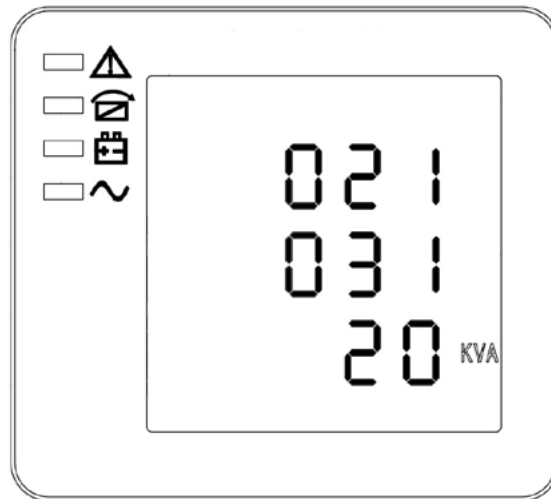
PHASE C (L3) LOAD CAPACITY



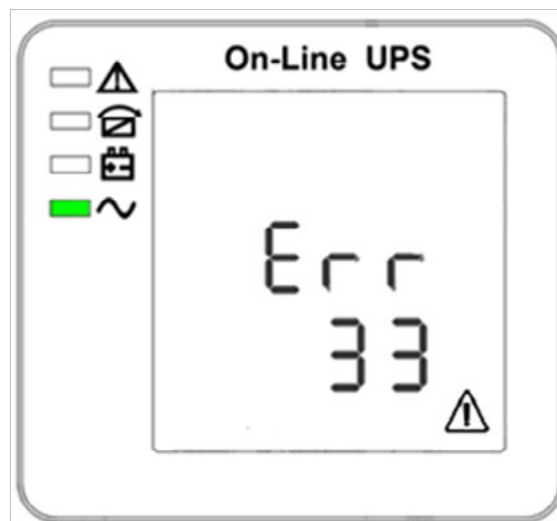
TOTAL LOAD CAPACITY



INTERNAL TEMPERATURE AND AMBIENT TEMPERATURE



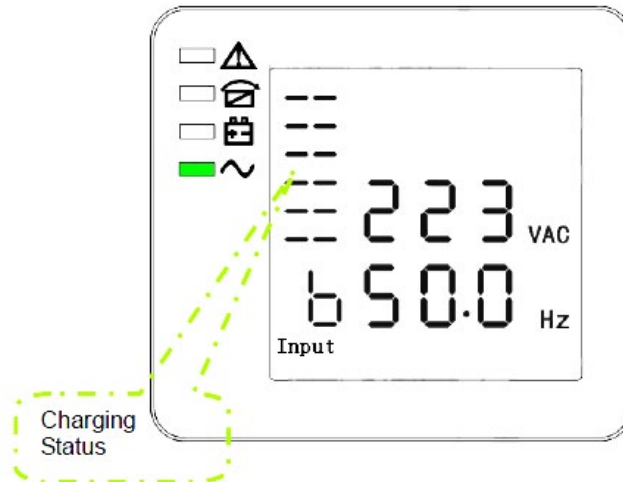
SOFTWARE VERSION & MODEL



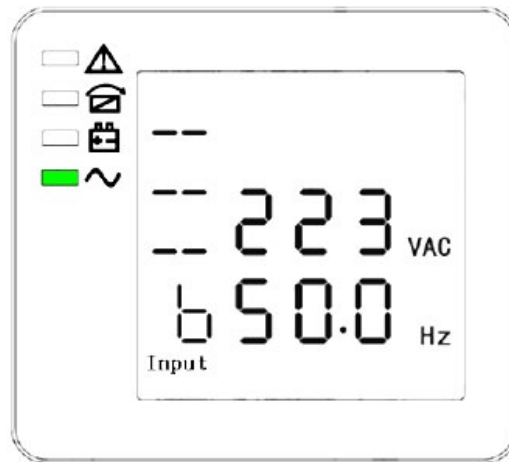
ALARM CODE



The charging status can also be shown on the display as shown below while the charger is operating.



**BOOST**



**FLOATING**

3. Pressing SCROLL BUTTON, steps through all messages from the first to the last, and then returns back to the first message display.
4. All alarm codes are present when abnormal behaviors occur.

### ***Parameters Setting***

The setting function is controlled by 3 buttons (Enter, Off, On)

Enter - goes into the setting page and value adjustment  
Off and On - is for choosing different pages

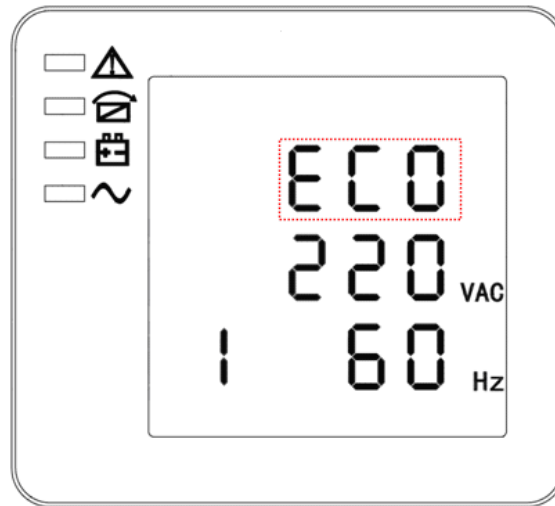
**Enter** setting mode after the UPS is on by pressing Enter and Off for 2 seconds

**Exit** setting mode by waiting 30 seconds after last button has been pressed. Settings will not be saved when exiting setting mode in this option.

**Save** Settings by adjusting parameters on each setting screen as needed. Once the last parameter screen

has been reached (parallel redundancy quantity setting) press On to exit and save all settings.

### Mode setting

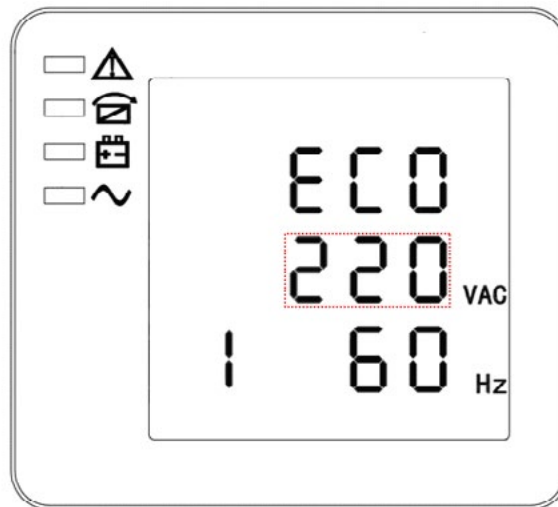


#### MODE SETTING

(Note: the information in the red box will be flashing)

After entering the setting menu, mode setting is defaulted, and the model setting line flashes as in above image. Use the Enter button to choose different modes. There are 3 different modes for setting: ECO, PAL, and NOR. Press Off or On to exit the mode setting (save the mode setting), and then goes to output voltage setting or parallel redundancy quantity setting.

### Output voltage setting

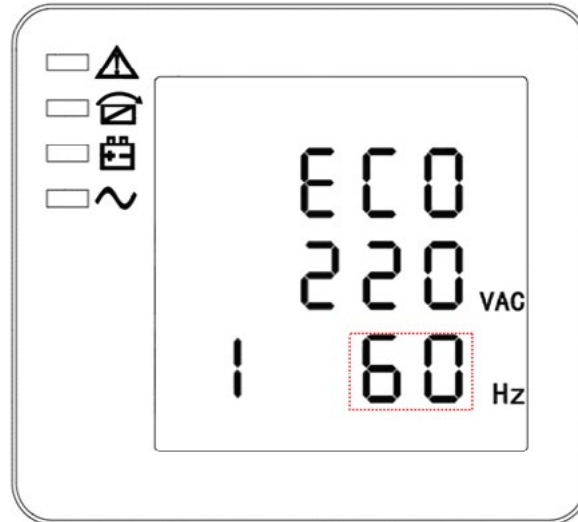


#### OUTPUT VOLTAGE SETTING

(Note: the information in the red box will be flashing)

When in mode setting press On or when in frequency setting press Off to go to the output voltage setting mode. The output voltage line flashes as in the above image. Use the Enter button to choose different output voltage. There are 3 different voltages - 220, 230, 240V. Press Off or On to exit the output voltage setting (save the output voltage setting), and then goes to mode setting or frequency setting.

### Frequency setting

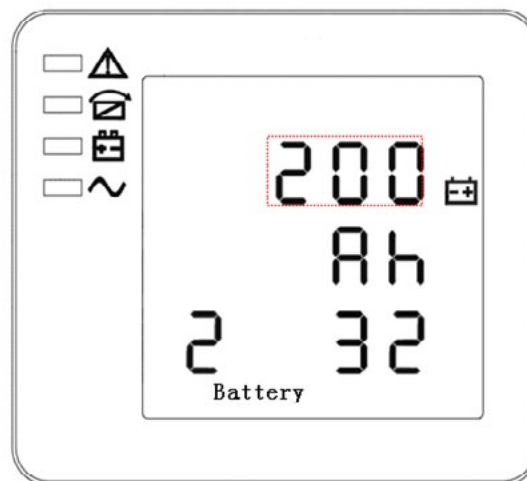


#### FREQUENCY SETTING

(Note: the information in the red box will be flashing)

When in output voltage setting press On or when in battery capacity setting press Off to go to the frequency setting mode. The frequency line flashes as in the above image. Use the Enter button to choose different frequency. There are 2 different frequencies - 50 or 60 Hz. Press Off or On to exit the frequency setting (save the frequency setting), and then goes to output voltage setting or battery capacity setting.

### Battery capacity setting

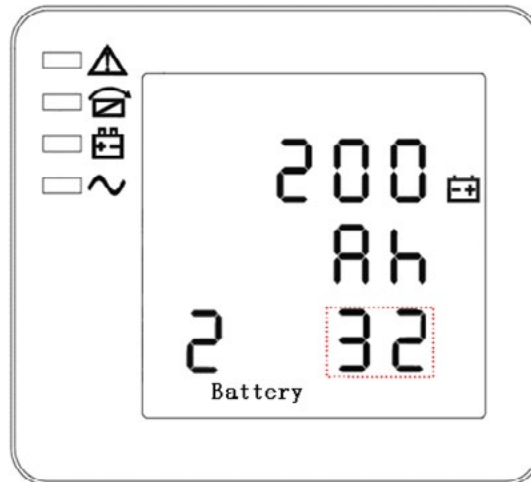


#### BATTERY CAPACITY SETTING

(Note: the information in the red box will be flashing)

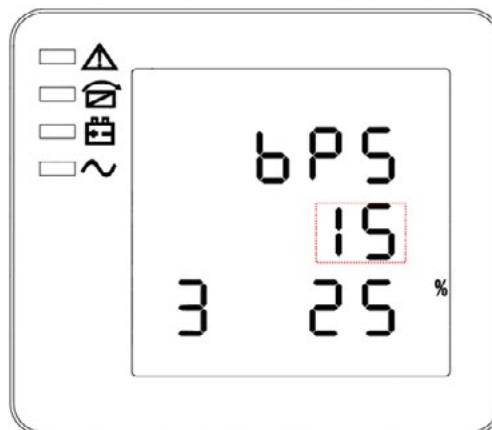
When in frequency setting press On or when in battery quantity setting press Off to go to the battery capacity setting mode. The battery capacity line flashes as in the above image. Use the Enter button to choose different battery capacity. Battery capacity range is 1 – 200 Ah. (Note: long-press of Enter can adjust battery capacity quickly). Press Off or On to exit the battery capacity setting (save the battery capacity setting), and then goes to frequency setting or battery quantity setting.

**Note: Battery capacity setting adjusts the maximum charging current for the system up to 6A. For example, 2 strings of 7AH batteries will have a charging current of – 14AH x .15 = 2.1A.**

**Battery quantity setting****BATTERY QUANTITY SETTING**

(Note: the information in the red box will be flashing)

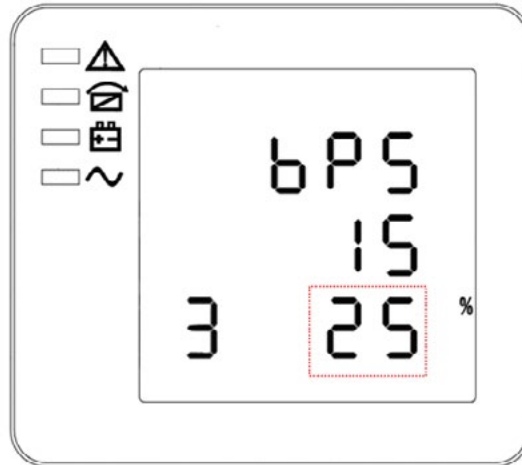
When in battery capacity setting press On or when in bypass voltage upper limit setting press Off to go to the battery quantity setting mode. The battery quantity line flashes as in the above image. Use the Enter button to choose different battery quantity. Battery quantity range is 32, 34, 36, 38, 40. Press Off or On to exit the battery quantity setting (save the battery quantity setting), and then goes to battery capacity setting or bypass voltage upper limit setting.

**Bypass voltage upper limit setting****BYPASS VOLTAGE UPPER LIMIT SETTING**

(Note: the information in the red box will be flashing)

When in battery quantity setting press On or when in bypass voltage lower limit setting press Off to go to the bypass voltage upper limit setting mode. The bypass voltage upper limit line flashes as in the above image. Use the Enter button to choose different bypass voltage upper limit. Bypass voltage upper limit range is 5%, 10%, 15%, 25% (25% is only available for 220V output). Press Off or On to exit the bypass voltage upper limit setting (save the bypass voltage upper limit setting), and then goes to battery quantity setting or bypass voltage lower limit setting.

**Bypass voltage lower limit setting**

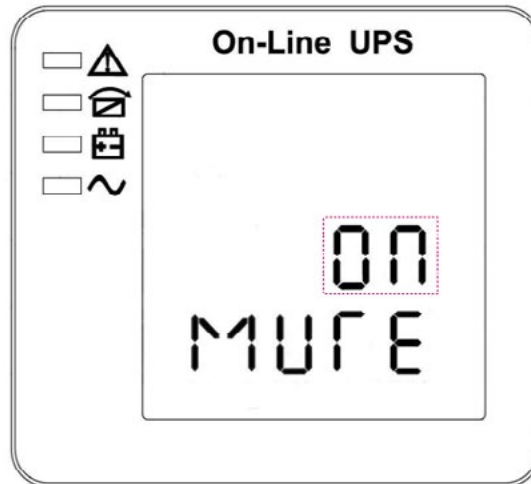


**BYPASS VOLTAGE LOWER LIMIT SETTING**

(Note: the information in the red box will be flashing)

When in bypass voltage upper limit setting press On or when in Buzzer Mute setting press Off to go to the bypass voltage lower limit setting mode. The bypass voltage lower limit line flashes as in the above image. Use the Enter button to choose different bypass voltage lower limit. Bypass voltage lower limit range is 20%, 30%, 45%. Press Off or On to exit the bypass voltage lower limit setting (save the bypass voltage lower limit setting), and then goes to bypass voltage upper limit setting or Buzzer Mute setting.

**Buzzer Mute Setting**

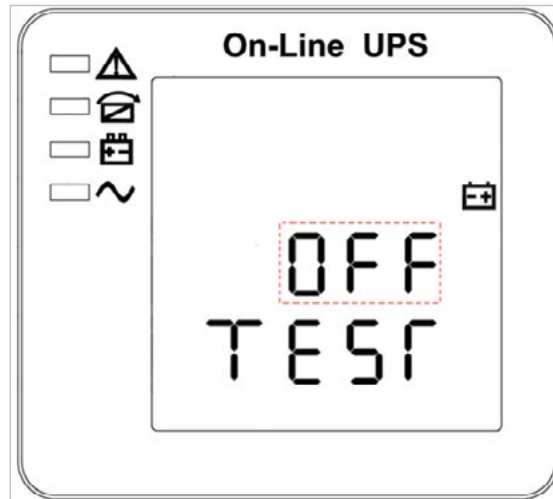


**BUZZER MUTE SETTING**

(Note: the information in the red box will be flashing)

Press key ON under bypass volt-lo setting or press key OFF into buzzer setting under Periodical battery self-test setting. The scintillation of setting state shows as in above picture (Note: ON shows MUTE, OFF shows NO MUTE). ① press button Enter for Mute Cycle Settings, mute choice has On and Off. ② press button ON or OFF exits mute Setting (save mute setting state) and change to bypass volt-lo setting or periodical battery self-test Settings.

### Periodical battery self-test Setting

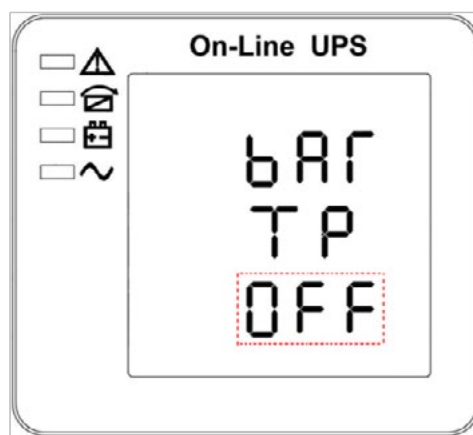


#### PERIODICAL BATTERY SELF-TEST SETTING

(Note: the information in the red box will be flashing)

Press On under the buzzer setting or press Off under battery temperature compensation sensor switch setting, it goes to Periodical battery self-test setting. In the meantime the setting state flashes as above picture shows (Note: ON 1- the battery self-test function is enabled, UPS will do self-test 10 seconds every 30 days; ON 2- the battery self-test function is enabled, UPS will do self-test 10 minutes every 30 days; ON 3- the battery self-test function is enabled, UPS will do self-test till battery voltage reaches EOD point every 30 days; OFF- battery self-test function is disabled.). Press ENTER to set Periodically Self-test setting. The options are OFF, ON 1, ON 2 and ON 3. Press On or Off to exit Periodically Self-test setting (any modified setting will be saved in the meantime), and switch to buzzer setting or battery temperature compensation sensor switch setting.

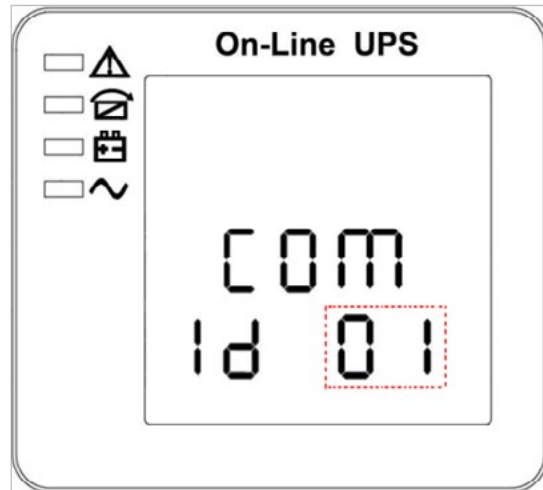
### Battery temperature compensation sensor switch setting



#### Battery temperature compensation sensor switch setting

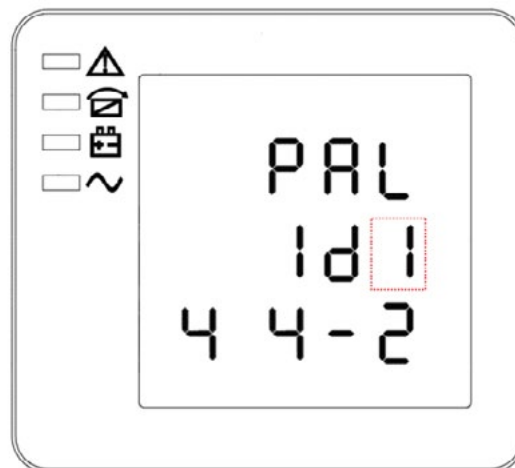
(Note: the information in the red box will be flashing)

Press On under the periodical battery self-test setting or press Off under device address setting, goes to the battery temperature compensation switch setting. The setting state flashes as above picture shows (Note: OFF means turn off the sensor switch, ON means turn on the sensor switch, send query command to sensor with address 11,12 every second. Press Enter is to set the battery sensor, with options OFF & ON. Press On or Off to exit the battery sensor setting (save the battery sensor setting) and transfer to battery periodical battery self-test setting or device address setting.

**Device address setting****Device address setting**

(Note: the information in the red box will be flashing)

Press On under the battery temperature compensation sensor switch setting or press Off under parallel ID setting, goes to the device address setting. The setting state flashes as above picture shows (Note: device address is 1~15, it is the MODBUS device address at RS232 & RS485 communication ports. Press Enter is to set the address, with options 1~15. When battery temperature sensor is open, can choose 1~10 & 13~15; If it's parallel mode and device address  $\leq$  parallel quantity, device address = parallel ID. Press On or Off to exit the device address setting (save the device address setting) and transfer to battery temperature compensation sensor setting or parallel ID setting. (Note: Under single UPS mode, until this device address setting save and exit, single UPS setting is done.

**Parallel ID setting****PARALLEL ID SETTING**

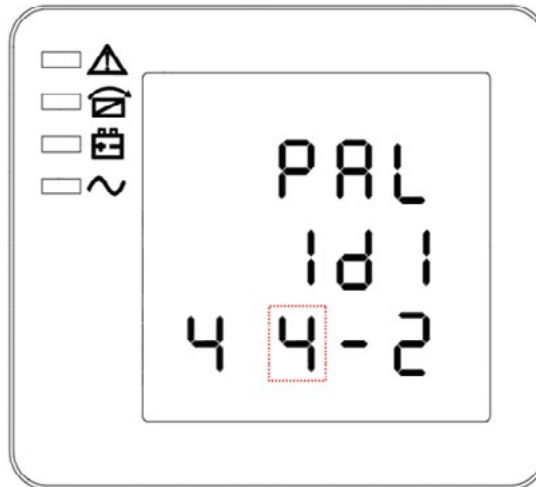
(Note: the information in the red box will be flashing)

When in device address setting press On or when in parallel quantity setting press Off to go to the parallel ID setting mode. The parallel ID line flashes as in the above image. Use the Enter button to choose different parallel ID. Parallel ID range is 1 - 4. Press Off or On to exit the parallel ID setting (save the parallel ID setting), and then goes to device address setting or parallel quantity setting.

**CAUTION!**

Parallel cable cannot be connected when setting the parallel parameters

**Note:** If installing 5-6 units in parallel, remove the jumper cap J30 on the control inspection board (MHTBJHR-1CU04 in all UPS to be connected in parallel). If installing 7-10 units in parallel, remove the jumper cap J30/J31 on the control inspection board (MHTBJHR1CU04 in all UPS to be connected in parallel).

**Parallel quantity setting****PARALLEL QUANTITY SETTING**

(**Note:** the information in the red box will be flashing)

When in parallel ID setting press On or when in parallel redundancy quantity setting press Off to go to the parallel quantity setting mode. The parallel quantity line flashes as in the above image. Use the Enter button to choose different parallel quantity. Parallel quantity range is 2 - 4. Press Off or On to exit the parallel quantity setting (save the parallel quantity setting), and then goes to parallel ID setting or parallel redundancy quantity setting.

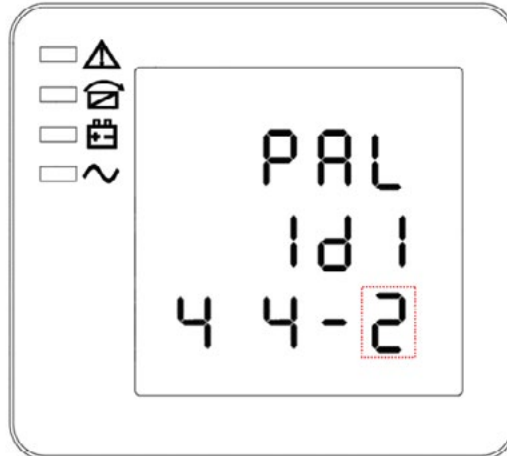
**CAUTION!**

Parallel cable cannot be connected when setting the parallel parameters

**Note:** If installing 5-6 units in parallel, remove the jumper cap J30 on the control inspection board (MHTBJHR-1CU04 in all UPS to be connected in parallel). If installing 7-10 units in parallel, remove the jumper cap J30/J31 on the control inspection board (MHTBJHR1CU04 in all UPS to be connected in parallel).



### Parallel redundancy quantity setting



#### PARALLEL REDUNDANCY QUANTITY SETTING

(**Note:** the information in the red box will be flashing)

When in parallel quantity setting, press On to go to the parallel redundancy quantity setting mode. The parallel redundancy quantity line flashes as in the above image. Use the Enter button to choose different parallel redundancy quantity. Parallel redundancy quantity range is 0 - 3. Press Off or On to exit the parallel redundancy quantity setting (save the parallel redundancy quantity setting), and then goes to parallel redundancy setting or to exit the mode setting. The UPS LCD panel setting is now completed.



#### CAUTION!

Parallel cable cannot be connected when setting the parallel parameters

**Note:** If installing 5-6 units in parallel, remove the jumper cap J30 on the control inspection board (MHTBJHR-1CU04 in all UPS to be connected in parallel. If installing 7-10 units in parallel, remove the jumper cap J30/J31 on the control inspection board (MHTBJHR1CU04 in all UPS to be connected in parallel.

## Display Messages

This section lists the event and alarm messages that the UPS might display. The messages are listed in alphabetical order.

### Operational Status and Mode(s)

ITEM	CONTENT DISPLAYED
1	Initialized
2	Standby Mode
3	No Output
4	Bypass Mode
5	Utility Mode
6	Battery Mode
7	Battery Self-diagnostics
8	Inverter is starting up
9	ECO Mode (Note: ECO mode is not available in parallel system configurations.)
10	EPO Mode
11	Maintenance Bypass Mode
12	Fault Mode

### Alarm Information

EVENT LOG	UPS ALARM WARNING	BUZZER	LED
1	Rectifier Fault	Continuously	Fault LED on
2	Inverter fault (incl Inverter bridge shorted)	Continuously	Fault LED on
3	Inverter Thyristor short	Continuously	Fault LED on
4	Inverter Thyristor broken	Continuously	Fault LED on
5	Bypass Thyristor short	Continuously	Fault LED on
6	Bypass Thyristor broken	Continuously	Fault LED on
7	Fuse broken	Continuously	Fault LED on
8	Parallel Relay fault	Continuously	Fault LED on
9	Fan fault	Continuously	Fault LED on
10	Fan Power fault	Continuously	Fault LED on
11	Auxiliary Power fault	Continuously	Fault LED on
12	Initialization fault	Continuously	Fault LED on
13	P-Battery Charger fault	Continuously	Fault LED on
14	N-Battery Charger fault	Continuously	Fault LED on
15	DC Bus Over Voltage	Continuously	Fault LED on
16	DC Bus Below Voltage	Continuously	Fault LED on
17	DC Bus Unbalance	Continuously	Fault LED on
18	Soft Start failed	Continuously	Fault LED on
19	Rectifier Over Temperature	Twice per second	Fault LED on

20	Inverter Over Temperature	Twice per second	Fault LED on
21	Input Neutral Line missing	Twice per second	Fault LED on
22	Battery Reverse	Twice per second	Fault LED on
23	Cable Connection error	Twice per second	Fault LED on
24	CAN Communication fault	Twice per second	Fault LED on
25	Parallel Load Sharing fault	Twice per second	Fault LED on
26	Battery Over Voltage	Once per second	Fault LED blinking
27	Mains Site Wiring fault	Once per second	Fault LED blinking
28	Bypass Site Wiring fault	Once per second	Fault LED blinking
29	Output Short-Circuit	Once per second	Fault LED blinking
30	Rectifier Over Current	Once per second	Fault LED blinking
31	Bypass Over Current	Once per second	BPS LED blinking
32	Overload	Once per second	INV or BPS LED blinking
33	No Battery	Once per second	Battery LED blinking
34	Battery Under Voltage	Once per second	Battery LED blinking
35	Battery Low Pre-warning	Once per second	Battery LED blinking
36	Internal Communication Error	Once per 2 seconds	Fault LED blinking
37	DC component over limit	Once per 2 seconds	INV LED blinking
38	Parallel Overload	Once per 2 seconds	INV LED blinking
39	Mains Volt. Abnormal	Once per 2 seconds	Battery LED on
40	Mains Freq. Abnormal	Once per 2 seconds	Battery LED on
41	Bypass Not Available		BPS LED blinking
42	Bypass unable to trace		BPS LED blinking
43	Inverter on invalid		

## Options



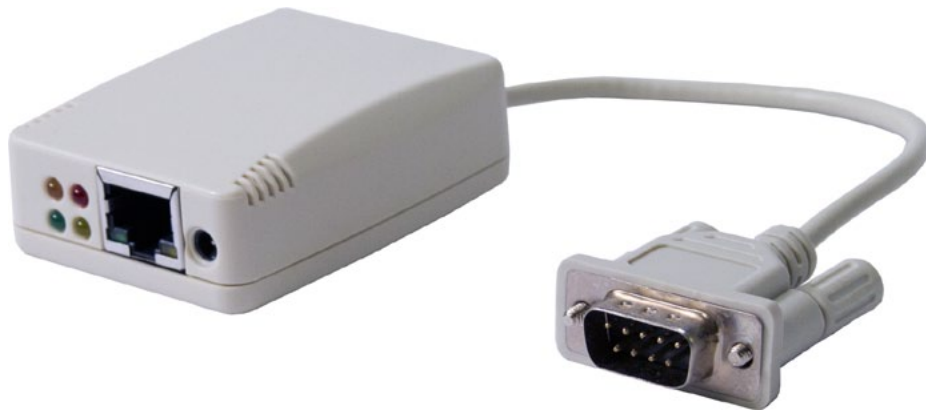
### CAUTION!

For network management configuration and use, refer to the separate user manual - Network Management Card with Environmental Monitor, which is shipped with the SNMP card.

#### SNMP Card: external SNMP optional

- Connect the external SNMP adapter to the SNMP port indicated
- Tighten the screws

The slot called SNMP supports the MEGAtec protocol. We advise NetAgent II-3 port is a tool to remotely monitor and manage any UPS system.



EXTERNAL SNMP CARD

## Troubleshooting

No.	PROBLEM	POSSIBLE REASON	SOLUTION
1	Utility connected but the UPS cannot power ON	Input power supply is not connected.	Measure if the UPS input voltage / frequency are within the required range per specification. Check if all modules input switches are turned on.
		Input voltage low	
		The input switch of the module is not switched on	
2	Utility normal but Utility LED does not light, and the UPS operates at battery mode	The input breaker of the modules are not switched on; input cables are not properly connected	Switch on the input breaker. Make sure the input cable is properly connected.
3	The UPS does not indicate any failure, but the output does not have voltage	Output cable is not properly connected	Make sure the output cable is properly connected
4	Battery LED is flashing but no charge voltage and current	Battery breaker does not switch on, or batteries are damaged, or battery is reverse connected.	Switch on the battery breaker. If batteries are damaged, replace the entire set of batteries. Connect the battery cables correctly.
		Battery number and capacity are not set correctly	Go to the LCD display setting of the battery number and capacity, and set with correct data.
5	Audible beep every 0.5 seconds and LCD displays "Output Overload" code 39	Overload	Remove some of the load
6	The UPS only works on bypass	The UPS is set to ECO Mode or the transfer times to Bypass Mode are limited	Set the UPS working mode to Single Module type (non-parallel) or to reset the times of transfer to bypass or re-start the UPS
7	Cannot Cold Start	Battery breaker is not properly closed or battery capacity is low	Chose the battery breaker; Re-charge the batteries
15	Buzzer sounds continuously, Fault LED is illuminated and the related code of "Rectifier / Inverter Out of Order" or "Output Out of Order" shows in the LCD display	UPS has failed	Contact dealer or distributor for service and repair

## Batteries

The life of batteries used in these UPS products is estimated at 3-6 years depending on level of usage. Once the battery is no longer useful and must be replaced, please contact service personnel for assistance.

### *Replacing The Battery*

#### **(Qualified Service Personnel Only)**

**CAUTION!** Read and follow the IMPORTANT SAFETY INSTRUCTIONS before servicing the battery. Service the battery under the supervision of Qualified Service Personnel knowledgeable of batteries and their precautions.

**CAUTION!** Use only the specified type of battery. See your dealer for replacement batteries.

**CAUTION!** The battery may present risk of electrical shock. Do not dispose of batteries in a fire as it may explode. Follow all local ordinances regarding proper disposal of batteries.

**CAUTION!** Do not open or mutilate the batteries. Released electrolyte is harmful to skin and eyes and may be toxic.

**CAUTION!** The battery can present a high risk of short circuit current and electrical shock. The short circuit current capability of the battery is sufficient to burn wire or tools very rapidly, producing molten metal. Observe these precautions when replacing the battery:

1. Remove all watches, rings or other metal objects.
2. Only use tools with insulated handles.
3. Do not lay tools or metal parts on top of battery or any terminals.
4. Wear protective eye wear (goggles), rubber gloves, and boots.
5. Disconnect the charging source before connecting or disconnecting the battery terminals.
6. Determine if the battery is inadvertently grounded. If inadvertently grounded, remove the source of the ground. Contact with a grounded battery can result in electrical shock! The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance (applicable to a UPS and a remote battery supply not having a grounded circuit).

## Specifications

MODEL NUMBER		R90E-20K
INPUT	Capacity	20kVA/18kW
	Phase	Three-phase, four wires and ground
	Voltage range	210–478VAC*
	Frequency	40–70Hz
	Power factor	≥ 0.99
OUTPUT	Voltage	380/220VAC, 400/230VAC, 415/240VAC (selectable)
	Power factor	0.9 (0.7 leading–0.7 lading load PF accepted)
	Overload protection	< 110% for 60 min; < 125% for 10 min; < 150% for 1 min; > 150% immediate
	Voltage regulation	< 2%
EFFICIENCY	Efficiency	Online mode up to 95.5%; ECO mode 98%
BATTERY	Common battery voltage	± 192VDC, ± 204VDC, ± 216VDC, ± 228VDC, ± 240VDC
	EBP32 battery voltage	± 192VDC, (32) 12V 7.2AH
	Charge current	20A
PHYSICAL	UPS dimensions (W x D x H)	443 x 580 x 131 mm (17.4 x 22.8 x 5.2 in)
	UPS weight	31 kg (68.4 lbs)
	EBP32 dimensions	438 x 698 x 133 mm (17.3 x 27.5 x 5.3)
	EBP32 weight	93 kg (205 lbs)
	Rectifier input connection	15ft, with IEC 309 connector
	Bypass input connection	15ft, with IEC 309 connector
	Output connection	Terminal block
OPTIONAL MAINTENANCE BYPASS	Model number	R90-MB40A
	Breaker size	Make-before-break with UPS interlock; 40A
	Dimensions (W x D x H)	431 x 203 x 89 mm (17.0 x 8.0 x 3.5 in)
	Weight	10 kg (22 lbs)
ENVIRONMENT	Operating temperature	0–40°C (32–104°F)
	Altitude	11,500 ft above sea level
	Humidity	0–95% non-condensing
	Storage temperature	-25–55°C (-13–131°F) non-condensing
APPROVALS		CE, EN/IEC 62040-2, EN/IEC 62040-1-1
WARRANTY		2 years electronics (EMEA)
COMMUNICATIONS INTERFACE		Bypass contact, RS232, RS485, EPO, parallel port, external Web/SNMP (optional)
INCLUDED IN BOX		Shelf kit, local monitoring software
AVAILABLE OPTIONS		Web/SNMP card, maintenance bypass, output distribution

\*Depending on load level

## Battery Runtimes Using EBP32

QTY of R90-EBP32	5kVA/4.5kW	10kVA/9kW	15kVA/13.5kW	20kVA/18kW
(1) R90-EBP32	15	5	2.5	< 2
(2) R90-EBP32	36	15	8	5
(3) R90-EBP32	60	25	15	8
(4) R90-EBP32	87	36	21	15
(5) R90-EBP32	116	47	28	19
(6) R90-EBP32	146	60	36	25
(7) R90-EBP32	178	73	43	30
(8) R90-EBP32	211	87	52	36

*Battery runtimes are shown in minutes and will vary based on battery age and site conditions. \*Two or more EBP32 battery packs are recommended for loads over 15kVA/13.5kW.*

## Shipping List

### R90E-20K UPS

1. Software CD
2. Horizontal brackets (front)
3. Shelf with mounting hardware
4. Manual

### R90-EBP32 (OPTIONAL)

1. Horizontal brackets (front)
2. Shelf with mounting hardware



## Obtaining Service

If the UPS requires Service:

1. Use the TROUBLESHOOTING section in this manual to eliminate obvious causes.
2. Verify there are no circuit breakers tripped.
3. Call your dealer for assistance. If you cannot reach your dealer, or if they cannot resolve the problem, call Xtreme Power Conversion Corp Technical Support at 800.582.4524. Technical support inquiries can also be made at [support@xpcc.com](mailto:support@xpcc.com). Please have the following information available BEFORE calling the Technical Support Department:
  - Your name and address.
  - The serial number of the unit.
  - Where and when the unit was purchased.
  - All of the model information about your UPS.
  - Any information on the failure, including LED's that may or may not be illuminated.
  - A description of the protected equipment, including model numbers if possible.
  - A technician will ask you for the above information and, if possible, help solve your problem over the phone. In the event that the unit requires factory service, the technician will issue you a Return Material Authorization number (RMA).

If you are returning the UPS to Xtreme Power for service, please follow these procedures:

1. Pack the UPS in its original packaging. If the original packaging is no longer available, ask the Technical Support Technician about obtaining a replacement set of packaging material. It is important to pack the UPS properly in order to avoid damage in transit. Never use Styrofoam beads for a packing material.
2. Include a letter with your name, address, daytime phone number, RMA number, a copy of your original sales receipt, and a brief description of the problem.
3. Mark the RMA number on the outside of all packages. Xtreme Power cannot accept any package without the RMA number marked on the outside of the boxes.
4. Return the UPS by insured, prepaid carrier to the address provided by the Technician.
5. Refer to the Warranty statements in this manual for additional details on what is covered.

## Xtreme Power Conversion Limited Warranty

Xtreme Power Conversion (XPC) Corporation warrants Xtreme Power Conversion equipment, when properly applied and operated within specified conditions, against faulty materials or workmanship (excluding batteries) for a period of **two years for R90E-Series products** from the date of purchase. For warranty units, an (RMA) must be requested for all claims. XPC will honor warranties at the sole discretion of XPC Corporation after units have been evaluated.

If equipment provided by XPC Corporation is found to be **Dead-on-Arrival (DOA)**, the customer must request and received a **Return Material Authorization (RMA)** number. DOA equipment is defined as equipment that does not properly function according to user documentation when initially received and connected in conjunction with proper procedures as shown in the user documentation or via support provided by XPC Corporation personnel or authorized agents.

This warranty shall be void if (a) the equipment is repaired or modified by anyone other than XPC Corporation or a XPC Corporation approved third party; (b) the equipment is damaged by the customer, is improperly used or stored, is subjected to an adverse operating environment, or is operated outside the limits of its electrical specifications; or (c) the equipment has been used or stored in a manner contrary to the equipment's operating manual, intended use or other written instructions. Any technical advice furnished by XPC Corporation or a XPC Corporation authorized representative before or after delivery with regard to the use or application of Xtreme Power Conversion equipment is furnished on the basis that it represents XPC Corporations best judgment under the situation and circumstances, but it is used at the recipient's sole risk.

EXCEPT AS STATED ABOVE, XPC Corporation DISCLAIMS ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCEPT AS STATED ABOVE, IN NO EVENT WILL XPC Corporation BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF Xtreme Power Conversion EQUIPMENT, including but not limited to, any costs, lost profits or revenue, loss of equipment, loss of use of equipment, loss of software, loss of data, cost of substitutes, or claims by third parties. Purchaser's sole and exclusive remedy for breach of any warranty, expressed or implied, concerning Xtreme Power Conversion equipment, and the only obligation of XPC Corporation under this warranty, shall be the repair or replacement of defective equipment, components, or parts; or, at XPC Corporations sole discretion, refund of the purchase price or substitution of an equivalent replacement product.