User Manual
Uninterruptible Power Supply
On-line VH Series UPS
700 – 1000 – 1500 – 2000 – 3000 UL / 120V

GE Consumer & Industrial SA
General Electric Company
CH – 6595 Riazzino (Locarno)
Switzerland
T +41 (0)91 / 850 51 51
F +41 (0)91 / 850 52 52
www.gecriticalpower.com

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ISO 9001
User manual

Uninterruptible Power Supply

On-Line VH Series UPS

700 – 1000 – 1500 – 2000 – 3000 UL / 120V

Please read these instructions carefully before installation and start-up of the VH Series UPS. Keep this manual in a safe place for future reference.

Model: VH Series UL
Issued by: Product Document Department – Riazzino - CH
Approved by R&D Department – Riazzino - CH
Date of issue: 01.05.2015
File name: GE_UPS_OPM_VHU_0K7_3K0_XUS_V011
Revision: 1.1
Identification No. SAP – 1023054 / Local - 411254

Up-dating

<table>
<thead>
<tr>
<th>Revision</th>
<th>Concerns</th>
<th>Date</th>
</tr>
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<tr>
<td>1.0</td>
<td>Initial release</td>
<td>16.10.2012</td>
</tr>
<tr>
<td>1.1</td>
<td>Re-branding, section 4.5, ECN 2191</td>
<td>01.05.2015</td>
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1 IMPORTANT SAFETY INSTRUCTIONS

1.1 SAVE THESE INSTRUCTIONS

This manual contains important instructions that should be followed during installation and maintenance of the UPS. It also gives all necessary information about the correct use of the UPS. Before attempting to install and start up the UPS, carefully read this manual. Keep this manual next to the unit for future references.

Full understanding of and compliance with the safety instructions and warnings contained in this manual are the ONLY CONDITIONS to avoid any dangerous situation during installation, operation and maintenance work, and to preserve the maximum reliability of the UPS system.

GE refuses any responsibility in case of non-observance, unauthorized alterations or improper use of the delivered UPS.

The instructions in this manual are for UPS models VH700 UL, VH1000 UL, VH1500 UL, VH2000 UL and VH3000 UL. Check your model number by looking at the rear panel of your UPS. Any difference in instructions is clearly indicated in the text, for instance 'VH1000 UL'.

The UPS is not suitable for computer room application as per the standard NFPA75.

While every care has been taken to ensure the completeness and accuracy of this manual, GE accepts no responsibility or liability for any loss or damage resulting from the use of the information contained in this document.

This document shall not be copied nor reproduced without the permission of GE.

Due to technical improvements, some of the information contained in this manual may be changed without notice.

1.2 SAFETY WARNINGS AND SYMBOLS

The text of this manual contains warnings to avoid risk to persons, to avoid damages to the UPS system and the supplied critical loads. Do not proceed beyond these warnings if you do not fully understand or are not able to meet the mentioned conditions. The non-observance of the warnings reminding hazardous situations could result in human injury and equipment damage.

Please pay attention to the meaning of the following warnings and symbols.

Safety warnings

**WARNING!** Refers to procedures or operations which, when not correctly performed, could cause personal injury or serious damage to the system.

**CAUTION** The product may be in danger: when procedures or operations are not correctly performed, damage to the product may be the result.

**NOTE** Warns the user about important operations or procedures described in this manual.

Safety Symbols

- **DANGER OF ELECTRICALLY LIVE PARTS**
  Related to all situations with potentially hazardous voltage.

- **SAFETY WARNING**
  This symbol is used for Warnings, Cautions and Notes.
### 1.3 SAFETY RULES

**CAUTION! RISK OF ELECTRIC SHOCK**

The UPS has an internal battery supply with a nominal voltage of 36/72Vdc (see chapter 8). The appliance outlets may be electrically live, even when the UPS is disconnected from the mains. The UPS contains potentially hazardous voltages. Do not open the unit, there are no user serviceable parts inside.

**CAUTION**

There may be damage to the equipment if procedures and practices are not strictly observed and followed.

**NOTE**

Do not attempt to service the UPS unless you have had proper training. Refer all maintenance and servicing to properly qualified, skilled and competent service personnel.

Qualified, skilled personnel are persons who (because of their training, experience, and position as well as their knowledge of appropriate standards, regulations, health and safety requirements and working conditions) are authorised to be responsible for the safety of the equipment, at all times whilst carrying out their normal duties and are therefore aware of, and can report, possible hazards (observe IEC 60364 and national wiring regulations and accident prevention rules).

### 1.4 TRANSPORT / STORAGE

**WARNING!**

Please consider the weight of the UPS. Lift the box with the help of a second person; never try to lift it by yourself!

- No liability can be accepted for any transport damage when the equipment is shipped in non-original packaging.
- Store the UPS in a dry location with the batteries in a fully charged state. Storage temperature must be within -4 and 122°F (-20 and +50 °C). If the unit is stored for a period exceeding 3 months, optimal battery lifetime is obtained if the storage temperature does not exceed 86°F (30°C).
- If the unit is stored for an extended period of time, the batteries must be recharged periodically. Connect the unit to a wall outlet and recharge the batteries for 24 hours:
  - if the storage temperature is within -4 and 86°F (-20 and +30°C): every 12 months,
  - if the storage temperature is within -4 and 122°F (-20 and +50°C): every 3 months.

**CAUTION**

In case of storage, pay attention to:

### 1.5 FCC COMPLIANCE STATEMENT

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Modifications not expressly approved by the manufacturer could void the user’s authority to operate the equipment under FCC rules.
2 INTRODUCTION

2.1 INTRODUCTION

The **GE (General Electric) VH Series UPS**, a truly on-line uninterruptible power supply, protects your equipment from all forms of power interference, including complete power failures.

2.2 INTENDED USE

- Uninterruptible Power Supplies (UPS) are designed to protect sensitive electronic equipment such as computers and telecommunications equipment.

**CAUTION**

DO NOT plug household appliances such as electric heaters, toasters or vacuum cleaners into the UPS. The UPS output is intended to be used only for electronic loads such as computers and telecommunications equipment.

- The technical data as well as information concerning connecting requirements can be found on the rating label and in this document and shall be strictly observed.

2.3 WARRANTY

GE, operating through its authorised agents, warrants that the standard products will be free of defects in materials and workmanship for a period as per contract specifications, starting from the date of the invoice.

**NOTE**

This warranty does not cover failures of the product which result from incorrect installation, misuse, alterations by persons other than authorized agents, or abnormal operating conditions.

2.4 DIAGRAM

![Diagram](image_url)

*Fig. 2.4: Diagram*
3 INSTALLATION

3.1 PACKAGE CONTENTS

The UPS shipping box contains:

- VH Series UPS
- 4 plastic support parts
- Mounting set
- 1 plastic front panel
- 2 plastic plugs
- 2 mounting brackets and screws
- 1 input power cord (700-2000VA)
- 1 USB cable
- 1 CD ROM with UPS monitoring software (see chapter 5) and its manual
- This manual
- REPO Connector (see 3.6.3 / 4.4.1)

Inspect the UPS for damage after unpacking. If any damage is present please immediately notify the carrier and place of purchase.

**WARNING!** In case of recognizable damage:
- DO NOT connect any voltage to the unit
- DO NOT put the unit into operation

Condensation may occur if the UPS system is moved directly from a cold to a warm environment. The UPS system must be absolutely dry before being installed. Please allow an acclimatization time of at least two hours prior to installation.

Save the original packing material. No liability can be accepted for any transport damage when the equipment is shipped in non-original packaging.

3.2 INSTALLATION RULES

**NOTE**
Before making any connection and switching on the VH Series UPS, please check the following conditions:

- Your mains supply is 120 Volts and 50/60 Hz.
- The total power demand of the connected equipment does not exceed the rated output power of the VH Series UPS (refer to chapter 8 for the ratings).
- The UPS is intended to be used in normal domestic and office situations.
- The UPS must be powered from a single phase grounded socket-outlet. Do not use extension cords.
- The ambient temperature should not exceed 104°F (40°C). Optimal battery lifetime is obtained if the ambient temperature does not exceed 86°F (30°C).
- It is important that ventilation air can move freely around and through the unit. Do not block the air vents.
- Do not plug appliances such as electric heaters, toasters and vacuum cleaners into the UPS. The UPS output can be used only for electronic loads such as computers and telecommunications equipment.
- Be careful when connecting laser printers: be sure that the demanded power does not exceed the capacity of the UPS.
- The sum of the leakage currents of the UPS and the connected loads should not exceed 3.5mA.
- Connect only to short circuit and over-current protection branch circuit rated in accordance with the National Electric Code, ANSI/NFPA 70, see following table:

<table>
<thead>
<tr>
<th>UPS model</th>
<th>Branch protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH700 UL</td>
<td>15A or 20A</td>
</tr>
<tr>
<td>VH1000 UL</td>
<td>15A or 20A</td>
</tr>
<tr>
<td>VH1500 UL</td>
<td>20A</td>
</tr>
<tr>
<td>VH2000 UL</td>
<td>20A</td>
</tr>
<tr>
<td>VH3000 UL</td>
<td>30A</td>
</tr>
</tbody>
</table>

**CAUTION**
To reduce risk of fire, connect the UPS only to a circuit provided with fuse values according to the above
## 3.3 INSTALLATION PREPARATIONS

The UPS can be used in a stand-alone tower format using the two supporting stands (section 3.3.1), or can be mounted in a 19 inch rack using the two mounting brackets (section 3.3.2). All required items are included in the delivery.

### NOTE
Please consider the weight of the UPS. Lift the unit with the help of a second person.

#### 3.3.1 Vertical installation – preparations

1. Place the UPS horizontally on a table or desk.

2. Assemble the four parts of the plastic supports (and metal rails in case of VH Series 1500-3000 VA) at the bottom side of the UPS cabinet, using the 4 screws provided.

* The following two steps (3 and 4) must be performed by qualified, skilled and service personnel only.

3. * Connect the DC connector of the internal batteries.

   Battery block is 36V/72V and 7Ah/9Ah, as follows:
   - 700VA - 3 x 7Ah, 36 V
   - 1kVA - 3 x 9Ah, 36 V
   - 1.5kVA - 6 x 7Ah, 72 V
   - 2kVA - 6 x 9Ah, 72 V
   - 3kVA - 6 x 9Ah, 72 V

4. * Assemble the front panel: insert the two metal clamps at the rear of the panel into the holes at the upper side of the UPS, then click the front panel into position. Fix the front panel with the screw provided.

5. Place the UPS upright, and insert the two black plastic plugs to cover the holes in the top panel of the UPS cabinet.

The VH Series UPS is now ready for further connections: proceed with section 3.4.
### 3.3.2 Rackmount installation - preparations

**NOTE**
Please consider the weight of the UPS prior to installation to ensure the rack is capable of supporting the weight. We recommend that the UPS is placed in the lower half of the rack. Fit the unit into the rack cabinet with the help of a second person.

1. Place the UPS horizontally on a table or desk.

2. Install the two mounting brackets that came with the unit using the screws provided.

   *The following two steps (3 and 4) must be performed by qualified, skilled and service personnel only.*

3. * Connect the DC connector of the internal batteries.

4. * Assemble the front panel: insert the two metal clamps at the rear of the panel into the holes at the right side of the UPS, then click the front panel into position. Fix the front panel with the screw provided.

5. Install the UPS into a 19’ rack. The UPS cabinet must be supported by mounting rails, do not mount it by using the mounting brackets only. Fix the mounting brackets on the 19 inch enclosure with screws.

The VH Series UPS is now ready for further connections. proceed with section 3.4.

Fig. 3.3.2: Installation preparations - Rackmount
3.4 REAR PANEL

Figure 3.4.a shows a VH3000 UL. The differences with the rear panel - configuration of other models is clearly indicated in the text below.

1  Input socket – max. rating 20A
   AC mains supply to the UPS
   700-1000VA: IEC-C14
   1500-2000VA: IEC-C20

1a Input plug – max. rating 30A
   AC mains supply to the UPS
   Type: NEMA L5-30P

2  Input thermal circuit breaker
   Protects the UPS from damage caused by high input currents

2a Output thermal circuit breaker

3  Appliance outlets - max. rating 20A
   To connect the loads to the UPS.
   Type: NEMA 5-20R
   700 VA: 4 outlets
   1000-3000 VA: 6 outlets

3a Appliance outlet :
   2000 VA:
   Type: NEMA L5-20R / max. rating 20A
   3000 VA:
   Type: NEMA L5-30R / max. rating 30A

4  DC connector (not on VH700 UL)
   To connect a battery extension pack for extended battery runtime

5  Fan(s)
   Electronically controlled cooling fan(s).
   Make sure ventilation air can move freely around and through the UPS.

6  USB port
   See 5.1 for more information

7  RJ11 port
   See 5.2 for more information

8  REPO (Remote Emergency Power OFF)
Please refer to the previous page for more information.

**Fig. 3.4.b: Rear panels VH2000 UL, VH1500 UL, VH1000 UL and VH700 UL – Rack mount orientation**
3.5 INSTALLATION OF A BATTERY EXTENSION PACK

With a battery extension pack you can increase the battery runtime of the UPS. If you do not install a battery extension pack please skip this section and proceed with 3.6.

NOTE
The battery extension packs are suitable if connectable to circuits directly connected to mains and compliant with the following:
Nominal Voltage (Vdc): 36 (700 - 1000 VA) / 72 (1500 – 3000 VA)
Nominal Capacity (Ah): 14
Recharge Current (A): 1.5

The following actions must be performed by qualified and skilled personnel only.

1. Before installation, check whether the nominal voltage of the battery pack is suitable for the UPS: the voltage mentioned on the label on the battery drawer of the UPS and the one on the rear panel of the battery extension pack (36 Vdc or 72 Vdc) should match.
2. Make sure that the battery breaker on the rear side of the battery pack is in the “OFF” position.
3. UPS and battery pack can be mounted together in one set of mounting supports (for rack mount see 3.3.2).
4. At the rear side the UPS and battery pack can be coupled using the coupling bracket that came with the battery pack.
5. Connect the DC connector of the battery pack to the DC socket of the UPS (fig. 5a and 5b). You will hear a click when the cable is properly connected. Block the DC connector: install the small locking plate that came with the battery pack, and fasten it with the screw provided.
6. Connect the DC connectors at the front side of the battery pack similar to UPS (See 3.3.1 step 3).
7. Assemble the front panel: insert the two metal clamps at the rear of the panel into the holes at the upper side of the UPS, then click the front panel into position. Fix the front panel with the screw provided.
8. Turn the battery breaker at the rear side of the battery pack into position "ON" to complete installation.

Fig. 3.5: Installing battery extension pack(s) to the UPS
3.6 CONNECTIONS

3.6.1 Connecting interface devices

If you do not want to use the communication capabilities of the UPS, please skip this section and proceed with 3.6.2. The UPS is equipped with two interface ports: a USB port and an RJ11 port, allowing advanced communication between the UPS and a computer (network). Refer to chapter 5 for more detailed information.

3.6.2 Connecting power and load

**NOTE**

The UPS output sockets can be live as soon as the UPS is connected to the main power supply, even if the UPS has not been switched on via the front panel. The socket outlet shall be installed near the equipment and shall be easily accessible.

1. Switch off your computer, and unplug it from the socket-outlet.

**NOTE**

Grid supply is 120 Volt, 50/60 Hz, fused (see section 3.2).

2. Disconnect the power cord from the computer (see note below) and connect this cord to the male input socket (1, fig. 3.4.b) at the rear of the UPS.

   **VH3000 UL only:** connect the cable to the wall socket (1a, fig. 3.4.a).

3. Add up the power consumption [in VA] of the appliances that will be protected by the UPS ('the load') and make sure that the resulting value does not exceed the VA output rating of the UPS. This way you ensure that the UPS is able to supply the required output and prevent that an overload situation will happen.

4. Using the output cords (see note below) connect the load to the appliance outlets (3 & 3a, fig. 3.4.a/b) of the unit. Spread the loads over the appliance outlets as equally as possible. If you use a distribution box to connect more than one appliance per outlet, please note that the maximum AC-current ratings of each appliance outlets is 20A, and 30A for the VH3000 UL (3 & 3a, fig. 3.4.a/b).

5. Connect the mains cord of the UPS to a working, grounded AC wall socket outlet. The green LED ‘operation’ will blink now: mains power is available and the batteries are charging. If the LED does not blink but illuminates continuously instead, press keypad ‘0’ for one second.

For best results, allow the UPS to recharge the batteries during a period of approx. 2 hours. It is acceptable to use the UPS without first charging the battery, but the runtime may be reduced.

**NOTE:**

To connect UPS and loads use cables meeting the below requirements:

Detachable UL Listed, SJT Type flexible cord with grounding type plug, maximum 14.76 ft. (4.5m) long. Cord type and ratings as per the table below:

<table>
<thead>
<tr>
<th>UPS Model</th>
<th>AC Power Cord Rating (Minimum)</th>
<th>Plug Type</th>
<th>Connector Type</th>
<th>UPS Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH700 UL</td>
<td>125V / 10A</td>
<td>NEMA LI5-15P or NEMA LI5-20P</td>
<td>IEC C13</td>
<td>NEMA 5-20R</td>
</tr>
<tr>
<td>VH1000 UL</td>
<td>125V / 15A</td>
<td>NEMA LI5-15P or NEMA LI5-20P</td>
<td>IEC C19</td>
<td>NEMA 5-20R</td>
</tr>
<tr>
<td>VH1500 UL</td>
<td>125V / 20A</td>
<td>NEMA LI5-20P</td>
<td>IEC C19</td>
<td>NEMA 5-20R and NEMA L5-20R</td>
</tr>
<tr>
<td>VH2000 UL</td>
<td>125V / 20A</td>
<td>NEMA LI5-30P</td>
<td>-</td>
<td>NEMA 5-20R and NEMA L5-30R</td>
</tr>
<tr>
<td>VH3000 UL</td>
<td>125V / 30A</td>
<td>NEMA L5-30P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.6.3 Connecting REPO (Remote Emergency Power Off) switch

REPO can be used to remotely shut down the UPS using the connector provided on the rear panel of the UPS (Fig. 3.4.a/b). Figure 3.6.3 shows all suitable connections on the REPO Connector.

1. Remove the cable link from the male connector that came with the unit
2. Connect a switch to the male connector, the switch should be of Normally Closed type for normal operation.
3. Place the male connector to the connector on the rear panel of the UPS (Fig. 3.4.a/b.)
4. When the switch is opened, the UPS will shut down. More information is given in section 4.4.14

<table>
<thead>
<tr>
<th>WARNING!</th>
<th>The REPO Contact is a Safety Extra Low Voltage Circuit. Connect it only to a SELV Circuit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE</td>
<td>Use standard Low Voltage Cable in accordance with National and local regulations.</td>
</tr>
</tbody>
</table>

![Fig. 3.6.3: REPO connections](image)

| NOTE | To maintain the security of the SELV circuit be sure to use the following (only for qualified, skilled and service personnel):
| Wire type: UL Style 1015, 86°F (10°C), 600 VAC |
| Minimum wire: AWG 26 |
| Maximum wire: AWG 16 |
| Torque: 3.0 lb-inch |
4 OPERATION

4.1 OPERATING PANEL

Fig. 4.1: Operating panel

<table>
<thead>
<tr>
<th>switch / LED</th>
<th>main function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - ‘on’ switch</td>
<td>switches on the UPS, starts quick battery test (see 4.6)</td>
</tr>
<tr>
<td>2 - ‘off’ switch</td>
<td>switches off the UPS</td>
</tr>
<tr>
<td>3 - LED ‘operation’</td>
<td>on when the UPS is operating blinks if the UPS is in standby mode</td>
</tr>
<tr>
<td>4 - LED ‘on bypass’</td>
<td>on when the UPS operates in bypass mode: the incoming mains power is channeled directly to the load</td>
</tr>
<tr>
<td>5 - LED ‘on battery’</td>
<td>on in case of battery operation: the mains power fails, and the internal batteries supply the required power until either they are depleted or mains power returns.</td>
</tr>
<tr>
<td>6 - LED ‘alarm’</td>
<td>blinks in case of an alarm</td>
</tr>
<tr>
<td>7 - LED bar ‘runtime capacity’</td>
<td>the remaining available battery runtime for the actual load, in % of the maximum runtime with the actual load</td>
</tr>
<tr>
<td>8 - LED bar ‘load’</td>
<td>indicates to what extent the output capacity of the UPS is used by the actual load. If e.g. the 25% and 50% LED are on, the load exceeds 50% of the maximum load. If all 4 LEDs are on the unit operates in overload. As this is an abnormal situation the alarm LED will blink as well.</td>
</tr>
</tbody>
</table>

More info in section 4.3.2 and 4.4.8.
4.2 START-UP

4.2.1 Start-up, mains available

Via front panel:
press keypad 'I' (1, fig. 4.1) briefly; LED ‘operation’ (already slowly blinking) will at first blink faster and after a few seconds it will illuminate continuously, indicating that the unit has started up.

Via UPS monitoring software:
startup after delay, see 4.4.12 for more information. The equipment connected to the UPS can now be switched on.

The UPS will not start-up if “Phase Neutral reversal” indication is present (see section 4.4.13).

4.2.2 Start-up, mains not available

If the mains input is absent (power cord not connected, or mains failure):
Press keypad ‘I’ until the buzzer sounds. The LEDs ‘operation’ and ‘on battery’ will illuminate. The UPS operates on battery: it discharges the batteries. See 4.4.5 for further details about this operating mode.

4.3 USE: NORMAL OPERATION

4.3.1 Normal operation conditions

- the mains supply is present,
- the UPS is on,
- the load does not exceed the capacity of the UPS and
- the operating temperature is below alarm level

4.3.2 No-load shutdown

If this function is activated, the UPS will switch off during a mains failure when the load is less than 5% of the maximum load. In this way unnecessary discharging of the batteries is avoided. The unit will automatically turn on again when mains power is restored. The default setting of the no-load shutdown function is: disabled. The setting can be changed using the UPS monitoring software. For more information please refer to the manual that came with the software.

If the no-load shutdown function is activated and the load is smaller than the 5% threshold, the ‘25%’ load LED will blink to warn you that the unit will switch off during a mains failure.

4.3.3 Output frequency

At power up default enabled “Auto” frequency detection updates output frequency setting by comparing it with input frequency. Only stable 50 or 60 Hz frequencies are valid, otherwise previous setting is kept (60 Hz at first start up). Setting output frequency to 50 or 60 Hz with the UPS monitoring software disables the “Auto” frequency detection.

**NOTE**
The unit can be used as a frequency converter: the input frequency range is 45-66Hz, the output frequency is selectable 50/60Hz. If the unit is used as a frequency converter, the bypass function is no longer available. As a result an audible alarm will be generated continuously (see 4.4.7). To avoid this, we advise to disable the bypass.

**WARNING!**
Changing of the output frequency can cause severe damage of equipment connected to the appliance outputs of the UPS: Be sure that the new frequency is suitable for the connected equipment! Please refer to section 4.5 to set/check your output frequency.

4.3.4 Switching off

Via operating panel:
Press keypad ‘0’ (2, fig. 4.1) for 1 second. If the UPS is switched off the output will always be absent for a few seconds to ensure that the connected equipment is able to reboot.

Using UPS monitoring software:
Shutdown after delay.

*If electric isolation is required, unplug the power cord from the wall outlet.*
### 4.4 USE: STATUS AND ALARM INDICATIONS

- **status indications** the operating mode
- **! low priority alarms** abnormal operating situations
- **!! high priority alarms** situations in which the actual output voltage of the UPS is no longer guaranteed; immediate action should be taken

<table>
<thead>
<tr>
<th>Situation</th>
<th>Indicators on front panel (fig. 4.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Standby [4.4.1]</td>
<td>- - -</td>
</tr>
<tr>
<td>o Startup pending [4.4.12]</td>
<td>- - -</td>
</tr>
<tr>
<td>o Normal operation [4.4.2]</td>
<td>----- 0 - 4 0 - 3</td>
</tr>
<tr>
<td>o eBoost operation [4.4.3]</td>
<td>----- 0 - 4 0 - 3</td>
</tr>
<tr>
<td>!! On bypass [4.4.4]</td>
<td>----- ----- ----- 0 - 4 0 - 4 ----- hi</td>
</tr>
<tr>
<td>o On battery [4.4.5]</td>
<td>----- ----- 0 - 4 0 - 4 ----- lo</td>
</tr>
<tr>
<td>!! Battery low [4.4.6]</td>
<td>----- ----- 25% 0 - 4 ----- lo</td>
</tr>
<tr>
<td>! Bypass out of limits [4.4.7]</td>
<td>----- ----- ----- 0 - 4 0 - 4 ----- lo</td>
</tr>
<tr>
<td>!! Overload [4.4.8]</td>
<td>----- ----- ----- 0 - 4 4 ----- hi</td>
</tr>
<tr>
<td>! Battery bad [4.4.9]</td>
<td>----- ----- ----- 0 - 4 0 - 4 ----- lo</td>
</tr>
<tr>
<td>!/!! General alarm [4.4.10]</td>
<td>----- ----- ----- 0 - 4 0 - 4 ----- lo / hi</td>
</tr>
<tr>
<td>o Shutdown pending [4.4.11]</td>
<td>----- 0 - 4 0 - 4 ----- lo</td>
</tr>
<tr>
<td>o No-load shutdown enabled, load &lt; 5% [4.3.2]</td>
<td>----- 25% -----</td>
</tr>
<tr>
<td>!! Input Phase-Neutral reversed [4.4.13]</td>
<td>----- ----- ----- ----- hi</td>
</tr>
<tr>
<td>!! REPO (Remote Emergency Power Off) [4.4.14]</td>
<td>----- ----- ----- ----- 0 - 4 0 - 4 ----- hi</td>
</tr>
</tbody>
</table>

Operating modes and corresponding indications, see 4.3.2 and 4.4.1 – 4.4.14.

- - - - = intermittent  
----- = continuous  
0 - 4 = number of LEDs that can be on, depending on runtime capacity / load  
25% = LED 25% is blinking  
hi = 1 / 2 secs  
lo = 1 / 5 secs  
mute buzzer: press push button ‘I’ briefly
4.4.1 Standby
The UPS output is off, but the batteries are charging, see 3.6.2 step 5.

4.4.2 Normal operation
See 4.3.1.

4.4.3 eBoost operation
As long as the mains is suitable for the load, the UPS is able to operate in a "green", high efficiency operating mode: the UPS supplies the load from bypass, while keeping ready for operation in double conversion. You can adjust the setting of the eBoost function using the Configuration tool provided on CD.

The output voltage range is -10% ~ +5% of nominal, while the frequency range is +/-5% of nominal (the latter can be configured to +/-1%). Both voltage and frequency have to be OK for 5 seconds before eBoost operation is accepted. To protect the load from repetitive oscillations of an unstable grid, eBoost operation will be inhibited for 10 minutes if mains is disturbed more than twice in 30 seconds.

4.4.4 On bypass
The UPS is equipped with an automatic bypass switch. This switch automatically transfers the load to the mains if the UPS is unable to deliver the demanded output power due to overload or overtemperature.

If all 4 load LEDs illuminate, bypass operation is caused by an overload. If only green load LEDs illuminate (the red load LED is off), bypass operation is caused by over temperature. Take appropriate measures: reduce load and/or temperature.

The UPS will switch back to normal operation when the overload has been removed or the temperature has dropped below alarm level.

If a power failure occurs during bypass operation, the UPS will switch to battery operation and eventually, when the batteries are depleted, output power is lost.

The bypass function can be disabled - see 4.4.7 and 4.5 for further details.

**Fail safe bypass operation:** if the UPS becomes defective, the load may be switched to bypass (provided that the bypass function was not disabled). As the status of the UPS is unknown in this situation the indications on the operating panel may differ.

4.4.5 On battery
The UPS uses the energy stored in the batteries: see section 8 ‘Batteries - runtime’.

The runtime capacity LED bar will show the remaining runtime. The UPS will shutdown:
- if the batteries have been discharged (automatic restart), or
- if keypad ‘O’ is pressed (restart via front panel required) or
- if a ‘UPS shutdown’ command is given by the computer (automatic restart)

Automatic restart depends on the setting of the ‘auto restart’ function:
- if set ‘on’ the UPS will automatically restart when the mains returns
- if set ‘off’ a manual restart is required, as in 4.2.1.

As default the ‘auto restart’ function is ‘enabled’. The setting can be changed using the UPS monitoring software. For more information please refer to the manual that came with the software.

4.4.6 Battery low (end of runtime)
If during ‘on battery’ operation the 25% LED starts blinking, the batteries are nearly discharged: the remaining runtime is less than 2 minutes (default setting, adjustable via the UPS monitoring software). Controlled shutdown of any computer equipment is absolutely necessary at this point. If the UPS operates at 100% load, the shutdown procedure should be completed within 2 minutes after the ‘battery low’ alarm started. If only part of the output capacity of the UPS is used this period can be longer, with aged batteries this period can be shorter.

When the batteries are fully discharged, the UPS is no longer able to power the connected equipment.

4.4.7 Bypass out of limits
The mains voltage or mains frequency are outside bypass input tolerance but inside UPS input tolerance (see section 8). Bypass operation is inhibited: if for whatever reason the UPS is not able to deliver the required output, output power is lost. If the input frequency is often out of tolerance – during which bypass operation is inhibited and an alarm is generated – it may be useful to disable the bypass function after which the unit operates as a UPS without automatic bypass switch. See 4.5.
4.4.8 Overload
The demanded power exceeds the normal capacity of the UPS. The alarm occurs when the load is > 100%. If the load exceeds 150% the UPS will immediately switch to bypass, assuming that the conditions for a transfer to bypass are fulfilled. If an overload condition between 110-150% persists, the UPS will also switch to bypass operation. During an overload the UPS may automatically switch off within a few minutes (load dependent) and output power is lost:
- if a transfer to bypass is inhibited (see 4.4.7), or
- if the bypass function has been disabled (see 4.5), or
- if the UPS operates on battery (see 4.4.5).
To avoid these problems, be absolutely certain that the power demands of the protected equipment are within the limits of the UPS.

4.4.9 Battery bad
Either the batteries are almost chemically worn out or the battery wiring, including the battery fuse, is faulty. If the batteries are aged, they must be replaced as soon as possible to ensure full protection for your equipment. Perhaps the 'battery bad' alarm occurs after a test which you started immediately after installation or after a power failure. In this case the alarm may be incorrect as the batteries have been (partly) discharged during transport or storage / during the power failure. Allow the UPS to recharge the batteries. See also 4.6.

4.4.10 General alarm
‘General alarm’ comprises a group of alarms; the buzzer behaviour indicates which alarm is active:

<table>
<thead>
<tr>
<th>1 / 2 secs:</th>
<th>1 / 5 secs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>General fault</td>
<td></td>
</tr>
<tr>
<td>Overload (see 4.4.8)</td>
<td></td>
</tr>
<tr>
<td>Overtemperature</td>
<td></td>
</tr>
<tr>
<td>Output out of tolerance</td>
<td></td>
</tr>
<tr>
<td>Charger failure</td>
<td></td>
</tr>
<tr>
<td>Bypass out of limits (see 4.4.7)</td>
<td></td>
</tr>
<tr>
<td>Battery bad (see 4.4.9)</td>
<td></td>
</tr>
</tbody>
</table>

4.4.11 Shutdown pending
The UPS monitoring software allows you to switch the UPS into standby mode after a programmable delay time. During countdown the ‘operation’ LED will blink 2x per second and the buzzer will beep every 5 seconds.

4.4.12 Startup pending
The UPS monitoring software allows you to start up UPS after a programmable delay time. During this delay time the ‘operation’ LED will blink 2x per second.

4.4.13 P-N (Phase-Neutral) reversal
If the P-N reversal indication is enabled, the UPS will indicate whether the voltage between Neutral and Earth (Ground) at the UPS input exceeds a certain voltage (i.e. Phase and Neutral at the UPS input are reversed in an earthed/grounded Neutral system). In this potentially unsafe situation both LEDs ‘operation’ and ‘alarm’ will blink fast and the buzzer will sound. Reversing the mains plug will prevent this unsafe situation and will cancel the alarm. In case of non-earthed/grounded Neutral system this indication should be disabled.
The P-N reversal indication is by default enabled. Changing of the setting is described in section 4.5.

4.4.14 REPO (Remote Emergency Power Off)
REPO can be used to remotely shut down the UPS using the REPO connector provided at the rear side of the UPS (8, fig. 3.4.a/b). See section 3.6.3 for installation instructions.
The REPO functionality is by default disabled and can be enabled by using the Configuration tool.

If a normally closed switch, connected to the REPO connector, is opened, the UPS will shut down. All LEDs on the front panel will be on and the buzzer will beep 1x / 2 seconds.

After a REPO shutdown, restart the UPS as follows:
1. Close the switch connected to the REPO connector.
2. Press the “ON” switch briefly (1, fig. 4.1).
### 4.5 USE: SETUP MODE

The setup mode can only be entered if the UPS is in ‘standby’ -mode: connected to a live wall outlet and switched off (LED ‘operation’ blinks).

1. Press keypad ‘O’ and keep it pressed while pressing ‘I’ simultaneously. Release both buttons. The setup sequence starts with the setup of the output voltage, indicated by a blinking LED ‘operation’.
2. Scroll through the four functions with keypad ‘I’, one of the LEDs ‘operation’, ‘on bypass’, ‘on battery’ or ‘alarm’ will blink, indicating which function has been selected (see fig. 4.5).
3. Toggle the setting of the selected function by pressing switch ‘O’. The LEDs on the LEDbar ‘runtime capacity’ shows the setting.
4. Store the new settings and leave the setup mode: press keypad ‘0’ and keep it pressed while pressing ‘I’ simultaneously. Release both buttons.

![Setup menu](image)

*DEFAULT SETTING

- **Output frequency**
  - auto*
  - 50 Hz
  - 60 Hz

- **Bypass**
  - enabled*
  - disabled

- **Phase – Neutral reversal**
  - enabled*
  - disabled

- **Output voltage**
  - 120 Vac*
  - 127 Vac
  - 100 Vac
  - 110 Vac
  - 115 Vac

*Fig. 4.5: Setup menu*
4.6  BATTERY MANAGEMENT

Maximum battery life and reliability are obtained by the following features:

- **Quick battery test**
  The quick battery test checks whether the batteries and their wiring are healthy. If a quick battery test shows that the batteries are close to being worn out, a ‘battery bad’ alarm will be generated (see 4.4.9). Batteries have to be replaced as soon as possible.

  **Automatic battery test**
  The VH Series UPS conducts periodic automatic battery tests:
  - 5 hours after manual switch-on
  - 5 hours after return of mains following any power failure, and
  - 30 days from the last battery test

- **Manual battery test**
  A quick battery test can be initiated manually
  - either via the front panel, by pressing pushbutton ‘I’ for 5 seconds during normal operation,
  - or via UPS monitoring software. For details please refer to the manual of your software.

**NOTE**
If the test is started manually immediately after installation or after a power failure, the UPS may generate a false ‘battery bad’ alarm as the batteries have been (partly) discharged during transport/storage or during the power failure.

- **Deep battery test**
  A deep battery test, to be initiated through the UPS monitoring software, checks the actual battery capacity in order to ensure accurate runtime prediction. During a deep battery test the batteries will be discharged.

**NOTE**
When executing a deep battery test the available runtime in case of mains failure may be shorter than normal. Don’t execute this test if reduced battery runtime is not acceptable.

- **Temperature compensated battery charging**
  This feature adjusts the battery charge voltage according to the ambient temperature. As a result poor charging of the batteries under low temperature conditions and overcharging of the batteries under high temperature conditions are avoided.

- **Load dependent battery-end-voltage**
  The allowable final battery voltage depends on the discharge current: the higher the current, the lower the ‘end-of-discharge’ battery voltage. In this way maximum battery capacity is obtained without over-discharging. Over-discharging would result in shortened service life and failure to recover normal capacity.

- **Automatic boost charge**
  This feature reduces the battery recharge time considerably: totally depleted batteries will be recharged to 90% in approx. 3.0 hours, provided that discharging took place at 100% load.
5  COMMUNICATION

CAUTION! RISK OF ELECTRIC SHOCK
The UPS has an internal battery supply with a nominal voltage of 36/72Vdc. The appliance outlets may be electrically live, even when the UPS is disconnected from the mains. The UPS contains potentially hazardous voltages. Do not open the unit, there are no user serviceable parts inside.

WARNING!
Connect only Safety Extra Low Voltage (SELV) Circuits to any of these communication I/O ports.

5.1 USB PORT

The USB port is a plug-in interface port which enables advanced communication between the UPS and the computer (UPS software required). The interface port is operative as soon as the mains power cord is plugged into a live wall outlet, even if the UPS is switched off. For more information please refer to the user manual that comes with the interface software. We strongly recommend to use only original GE software products in combination with the interface port.

NOTE
The change of some settings can cause the unit to switch from bypass to standby and output power is lost.

5.2 RJ11 PORT

The RJ11 port is a plug-in contact interface port.

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mains failure</td>
</tr>
<tr>
<td>2</td>
<td>General alarm *)</td>
</tr>
<tr>
<td>3</td>
<td>Battery low</td>
</tr>
<tr>
<td>4</td>
<td>On bypass</td>
</tr>
<tr>
<td>5</td>
<td>Remote UPS shutdown / RxD</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
</tr>
</tbody>
</table>

*) Active if the output voltage of the UPS is no longer guaranteed due to other circumstances than already indicated by pin 1-3-4. The alarms are listed in section 4.4.10

5.3 USB / RS232 / RELAY INTERFACE CARD (OPTION)

The card is equipped with
- USB port as described in 5.1
- RS232 port
- potential free change-over relay contacts for the following alarms: mains failure/general alarm/battery low/bypass active

For more information please refer to the user manual that comes with the interface card.

5.4 SNMP / WEB INTERFACE CARD (OPTION)

The SNMP card makes the UPS ‘SNMP manageable’: it allows the data interface to be connected directly to an Ethernet network. For more information please refer to the user manual that comes with the interface card.
6 MAINTENANCE

6.1 SAFETY

**DANGER**
When the UPS operates, all parts of the electronics are directly connected to the utility and high voltages are present on all internal parts, including the battery. Even after disconnection from the utility, all parts inside the UPS, including the battery, conduct dangerous voltages (except the RJ11 and USB output). For your safety, only authorized service personnel may remove the cabinet cover. Refer to section 1.3 for further details.

6.2 GENERAL

The GE VH Series UPS is virtually maintenance free: take care of proper environmental conditions and keep air inlets/outlets free of dust. Please read 3.2.

**NOTE**
Leave maintenance and service work to qualified and skilled personnel only. Refer to section 1.3 for further details.

6.3 RECYCLING THE UPS AT THE END OF SERVICE LIFE

**NOTE**
This product has been designed to respect the environment, using materials and components respecting eco-design rules. It does not contain CFCs (Carbon Fluorine Chloride) or HCFCs (Halogen Carbon Fluorine Chloride).

The batteries contain lead, which is a harmful substance for the environment. Proper disposal or recycling of the batteries is required. Refer to your local codes for disposal requirements. Don’t throw batteries away, treat them as harmful waste.

GE, in compliance with environment protection recommends that the UPS equipment, at the end of its service life, must be recycled conforming to the local applicable regulations.

6.4 BATTERIES

The service life of the battery is from 3 to 6 years, depending on the operating temperature and on the number of discharge cycles.

As a healthy battery is critical to the performance of the UPS, an automatic quick battery test is performed regularly to ensure failsafe operation (see section 4.6). When the condition of the battery is critical, a ‘battery bad’ alarm will be activated (see 4.4.9). Batteries are to be replaced as soon as possible.

**NOTE**
Under certain circumstances a manual battery test can result in a false alarm: please see 4.6 ‘quick battery test’.
# TROUBLESHOOTING

Whenever a malfunction occurs, first check external factors (e.g. connections, temperature, humidity or load) to determine whether the problem is caused by the unit itself or by its environment. Subsequently check the thermal circuit breaker: it may be tripped. If so: reset it (see fig. 3.4.a/b) and be sure that the UPS is not overloaded.

The following chart is a simple troubleshooting checklist only. If the suggested solution does not succeed, or if the information is insufficient to solve the problem, please contact your dealer or consult www.gecriticalpower.com.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Circuit Breaker (TCB) tripped</td>
<td>UPS overload</td>
<td>Reduce load, reset TCB (2, fig. 3.4.a/b)</td>
</tr>
<tr>
<td></td>
<td>System failure</td>
<td>Contact your dealer or consult <a href="http://www.gecriticalpower.com">www.gecriticalpower.com</a></td>
</tr>
<tr>
<td>UPS will not switch on (without using ‘battery start’) and the output has been off for a few secs. (see also 4.3.4)</td>
<td>Line cord not connected</td>
<td>Read 3.6.2 Connect line cord</td>
</tr>
<tr>
<td></td>
<td>Dead wall socket outlet, or mains voltage out of limits</td>
<td>Contact qualified electrician</td>
</tr>
<tr>
<td></td>
<td>Tripped Thermal Circuit Breaker</td>
<td>See above</td>
</tr>
<tr>
<td>LEDs ‘operation’ and ‘alarm’ blink, buzzer sounds 1/2 secs. UPS does not start.</td>
<td>P (phase) and N (neutral) are reversed at the UPS input in a system with grounded Neutral</td>
<td>In a system with grounded Neutral: reverse the mains plug. In other systems: disable the indication. See 4.4.13 and 4.5. In case of doubt contact a qualified electrician.</td>
</tr>
<tr>
<td>UPS switched off automatically</td>
<td>UPS overtemperature</td>
<td>Allow UPS to cool down</td>
</tr>
<tr>
<td></td>
<td>Mains failure, battery discharged</td>
<td>Wait until mains returns</td>
</tr>
<tr>
<td></td>
<td>Programmed shutdown in progress</td>
<td>See 4.4.11</td>
</tr>
<tr>
<td></td>
<td>The load is &lt; 5% of the max. load and no mains power is present. (No-load shutdown function is active, see 4.3.2)</td>
<td>Wait until mains returns</td>
</tr>
<tr>
<td>LEDs ‘alarm’ and ‘on battery’ blink, buzzer sounds 1/5 secs</td>
<td>Battery test just after installation or mains failure</td>
<td>Allow the UPS to recharge the batteries</td>
</tr>
<tr>
<td></td>
<td>Battery test shows weak battery</td>
<td>Have the batteries replaced</td>
</tr>
</tbody>
</table>
# 8 SPECIFICATIONS

<table>
<thead>
<tr>
<th>VH Series</th>
<th>700</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
<th>3000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ratings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage Amperes (VA) with computer type load</td>
<td>700</td>
<td>1000</td>
<td>1500</td>
<td>1920</td>
<td>3000</td>
</tr>
<tr>
<td>Watts (W) with resistive load</td>
<td>630</td>
<td>900</td>
<td>1350</td>
<td>1740</td>
<td>2700</td>
</tr>
<tr>
<td>Input thermal circuit breaker (A)</td>
<td>8</td>
<td>12</td>
<td>18</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Internal input fuse 250V, slow (A)</td>
<td>15</td>
<td>15</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

| **Input converter** | | | | | |
| AC input voltage | 60 - 140 V | | | | |
| Input current waveform | sinusoidal, EN 61000-3-2 (IEC 555-2) compliant | | | | |
| Input current (A) at nominal input voltage | 6.5 | 9.1 | 13.9 | 16 | 24 |
| Input power factor | 0.9 | | | | |
| Input frequency range | 45 - 66 Hz | | | | |
| Inrush current | | | | | |
| **Output converter** | | | | | |
| AC output voltage | 100 / 110 / 115 / 120 / 127 V (selectable) | | | | |
| AC output voltage tolerance | ± 2% | | | | |
| Output frequency | auto selectable or 50 / 60 Hz, front selectable | | | | |
| Output frequency range | nominal ± 0.05% unless synchronized to the mains | | | | |
| Output waveform | sine wave | | | | |
| Harmonic distortion | < 1% with linear load | | | | |
| Power factor | | | | | |
| Crest factor (peak to RMS current) | suitable for loads with c.f. up to 3:1 | | | | |
| Capacity appliance outlets | max. 20A per outlet (+ 1 high power outlet max. 20A, on 2000VA model only) | | | | |
| Bypass | | | | | |
| AC input voltage range | selected output voltage -15% to +10% | | | | |
| Frequency tracking rate | 2 Hz/sec. | | | | |
| Frequency tracking range | nominal ± 10% / ± 2% selectable | | | | |
| Phase difference | < 1º typical (max. 7º during tracking frequency range) | | | | |
| Typical transfer time, msec | 1 | | | | |
| **Overload capability** | | | | | |
| Overload behaviour during battery operation | fully protected against overload and short circuits | | | | |
| Overload behavior during bypass operation | 110% 4 minutes | | | | |
| | 150% 2 seconds | | | | |
| Batteries (ratings given for 77ºF) | | | | | |
| Nominal voltage (Vdc) | 36 | 36 | 72 | 72 | 72 |
| Number / Ah batteries | 3/7 | 3/9 | 6/7 | 6/9 | 6/9 |
| Type | sealed lead acid, maintenance free | | | | |
| Service life | up to 6 years (depending on use) | | | | |
| Battery recharge time | up to 6 hours (depending on use) | | | | |
| VA/Watts | 12 | 12 | 11 | 12 | 7 |
| Runtime in minutes at typical load (75%) | | | | | |
| Battery pack | | | | | |
| Nominal voltage (Vdc) | 36 | 36 | 72 | 72 | 72 |
| Weight (lbs/kg) | 60/27 | 101/46 | | | |
| Dimensions (HxWxD) | 3.4x17.2x18.5 inch | 3.4x17.2x21.3 inch | 3.4x17.2x23.0 inch | 3.4x17.2x23.0 inch | 3.4x17.2x23.0 inch |
| **General** | | | | | |
| Weight UPS (lbs/kg) | 35/16 | 37/17 | 64/29 | 71/32 | 77/35 |
| Dimensions UPS (HxWxD) - inch | 87x438x470 | 87x438x540 | 87x438x585 | | |
| Enclosure / protection | steel-plastic / IP20 | | | | |
| Battery pack | | | | | |
| Nominal voltage (Vdc) | 36 | 36 | 72 | 72 | 72 |
| Weight (lbs/kg) | 60/27 | 101/46 | | | |
| Dimensions (HxWxD) | 3.4x17.2x18.5 inch | 3.4x17.2x21.3 inch | 3.4x17.2x23.0 inch | 3.4x17.2x23.0 inch | 3.4x17.2x23.0 inch |
| Environment | | | | | |
| Safety | UL 1778, 5th Edition | | | | |
| Electromagnetic compatibility | EN 62040-2 | | | | |
| Ambient temperature | 32 to 104ºF (0 to +40ºC) | | | | |
| Audible noise at 1 meter | < 45 dB(A), load and temperature dependent | | | | |
| Max. relative humidity | 95% (non-condensing) | | | | |