

The power behind competitiveness

# Delta UPS - Ultron Family

HPH Series, Three Phase  
20/ 30/ 40/ 60 kVA 208V

User Manual

## SAVE THIS MANUAL

This manual contains important instructions and warnings that you should follow during the installation, operation, storage and maintenance of this product. Failure to heed these instructions and warnings will void the warranty.

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# Chapter 1 : Important Safety Instructions

## 1.1 Placement Warnings

- Install the UPS in a well-ventilated indoor area, away from excess moisture, heat, dust, flammable gas or explosives.
- Leave adequate space around all sides of the UPS for proper ventilation. Please refer to **5.2 Installation Environment**.

## 1.2 Connection Warnings

- The UPS must be well grounded due to a possible risk of current leakage.
- It is necessary to install protective devices and 4-pole contactors when the UPS is connected to the mains and bypass source. For relevant information, please refer to **5.5.1 Precautions Prior to Wiring**.
- The protective devices connecting to the UPS must be installed near the UPS and must be easily accessible for operation.

## 1.3 Usage Warnings

- This is a class-A product. In a domestic environment, this product may cause radio interference, in which case, the user is required to take adequate measures.
- The UPS is specifically designed for information technology equipment and used to power computers, servers, and associated peripheral devices. If you want to connect any capacitive loads or non-linear loads (that have serious surge current) to the UPS, it needs to be de-rated according to on-site applications. For such special applications, please contact Delta service personnel for the accurate UPS sizing. The UPS is not suitable for connecting with any asymmetrical loads. For the load suitability, please contact Delta customer service before purchasing.
- Use of this equipment in life support applications where failure of this equipment can reasonably be expected to cause the failure of the life support equipment or to significantly affect its safety or effectiveness is not recommended. Do not use this equipment in the presence of a flammable anesthetic mixture with air, oxygen or nitrous oxide.
- The parallel UPSs can connect with common batteries. Before paralleling batteries, please make sure the battery voltage difference between each UPS is lower than 5Vdc.
- It is not recommended to connect the UPS to any regenerative loads. For the load suitability, please contact Delta customer service before purchasing.

- The external vents and openings in the UPS are provided for ventilation. To ensure reliable operation of the UPS and to protect the UPS from overheating, these vents and openings must not be blocked or covered. Do not insert any object into the vents and openings that may hinder ventilation.
- In a low temperature environment (below 32°F (0°C)), you must allow the UPS to adjust to room temperature for at least one hour before using to avoid moisture condensing inside the UPS.
- Do not put beverage containers on the UPS, battery cabinet or any other accessory associated with the UPS.
- The risk of dangerous high voltage is possible when the batteries are still connected to the UPS even though the UPS is disconnected from the mains. Do not forget to disconnect battery cables to completely cut off the battery source.
- Do not open or remove the cover of the UPS to avoid high voltage electric shock. All maintenance services must be performed by qualified service personnel.
- Do not open or mutilate the battery or batteries. The released electrolyte is harmful to the skin and eyes and may be toxic.
- Do not dispose of the battery or batteries in a fire. The batteries may explode.
- The batteries contain chemical substances that may jeopardize or pollute our environment. Please contact the supplier shown on the batteries to properly dispose of the batteries.
- A battery can present a risk of electric shock and high short-circuit current. The following precautions should be observed before replacement of batteries:
  1. Remove watches, rings, or other metal objects.
  2. Use tools with insulated handles.
  3. Wear insulating gloves and boots.
  4. Do not lay tools or metal parts on the top of batteries.
  5. Disconnect the charging source prior to connecting or disconnecting the batteries' terminals.
- Contact qualified service personnel if either of the following events occur:
  1. Liquid is poured or splashed on the UPS.
  2. The UPS does not run normally after this User Manual is carefully observed.

**NOTE:**



If you use the UPS in an area that generates or incurs dust, you should install dust filters in the UPS to ensure normal product life and function.

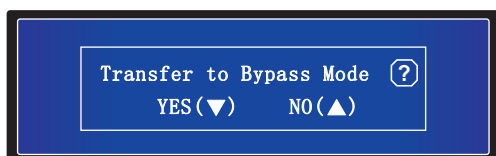
## 1.4 Storage Warnings

- **Prior to Installation**











If the UPS needs to be stored prior to installation, it should be placed in a dry area. The allowable storage temperature is between 5°F (-15°C) and 104°F (40°C).




- **After Usage**

Press the **OFF** key (  ) once and the LCD will appear with the following screen. If you want to turn off the UPS, please press the **DOWN** key (  ). Make sure the UPS is in bypass mode, disconnect the UPS from the utility power and the battery power, remove all equipment from the UPS and store the UPS in a dry and well-ventilated area at a temperature between 5°F (-15°C) and 104°F (40°C). Idle batteries must be fully recharged approximately every three months if the UPS needs to be stored for an extended period of time. The charging time must not be less than 24 hours each time.



## 1.5 Glossary of Symbols

| No. | Symbol   | Description   |
|-----|--|---|
| 1   |  <b>NORMAL</b>  | Online mode LED indicator: green                          |
| 2   |  <b>BATTERY</b> | Battery mode LED indicator: yellow                        |
| 3   |  <b>BYPASS</b>  | Bypass mode LED indicator: yellow                         |
| 4   |  <b>FAULT</b>   | Fault LED indicator: red                                  |
| 5   |  <b>ON</b>      | ON key  |
| 6   |  <b>OFF</b>     | OFF key   |
| 7   |  <b>ESC</b>     | Goes back to previous screen or cancels current selection |
| 8   |  <b>▼</b>       | Moves down/ Decreases number                              |
| 9   |  <b>▲</b>       | Moves up/ Increases number                                |
| 10  |  <b>↵</b>       | Confirms selection  |

| No. | Symbol  | Description  |
|-----|---|--|
| 11  |  | EPO key  |
| 12  | R   | R phase of AC Input/ Bypass Input/ UPS Output  |
| 13  | S   | S phase of AC Input/ Bypass Input/ UPS Output  |
| 14  | T   | T phase of AC Input/ Bypass Input/ UPS Output  |
| 15  | N   | AC Input neutral line/ Bypass Input neutral line/ UPS Output neutral line / Battery neutral line |
| 16  |  | For UPS grounding  |
| 17  |  | For critical load grounding/ For external battery cabinet grounding                              |
| 18  | +   | Positive battery terminal  |
| 19  | —   | Negative battery terminal  |

## 1.6 Standard Compliance

This product meets the following safety standards and electromagnetic compatibility (EMC) inspection standards:

- UL 1778
- CSA C22.2 No. 107.3-14
- FCC Part 15 Class A (EMC)
- IEC 61000-4-2 (ESD) Level 4
- IEC 61000-4-3 (Radiated Field) Level 3
- IEC 61000-4-4 (EFT) Level 4
- IEC 61000-4-5 (Surge) Level 4

## Chapter 2 : Introduction

### 2.1 Product Introduction

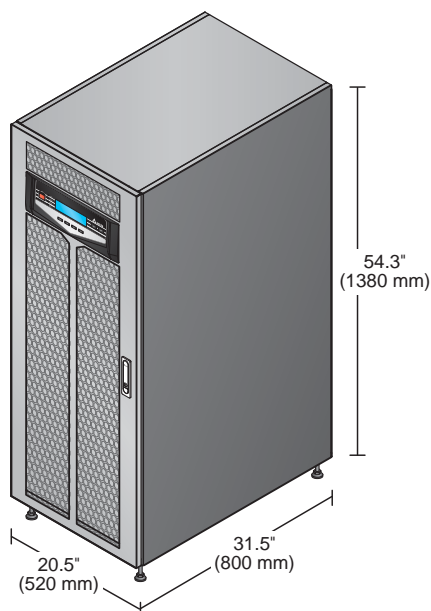
The HPH 20-60kVA 208V Series UPS (hereinafter referred to as UPS) is a three-phase four-wire online uninterruptible power supply, which provides reliable and stable sine-wave power to your electronic devices. The UPS applies the latest design of DSP digital control technology and highest quality assembly, with an output power factor up to unity. The efficiency of the UPS reaches up to 94% in online mode and up to 98% in ECO mode.

With its outstanding features, the UPS not only provides safe, reliable and uninterrupted power to your sensitive electronic equipment at all times, but also produces greater electric power efficiency at less cost. The HPH 20-60kVA 208V Series UPS provides four different rated power levels, 20kVA, 30kVA, 40 kVA and 60kVA, for your selection.

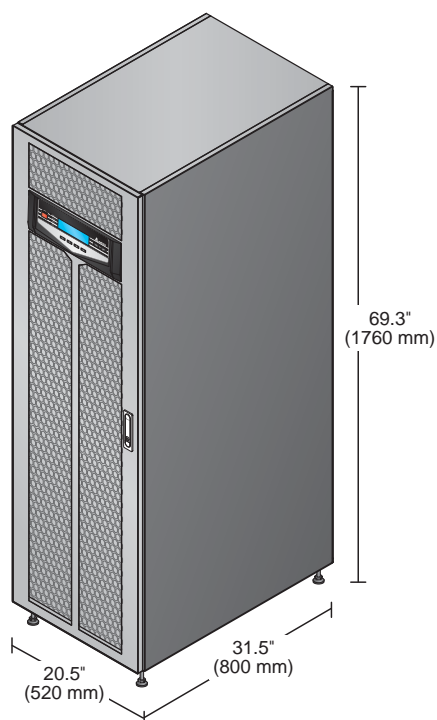


## Chapter 3 : Appearance and Mechanism

### 3.1 Appearance and Dimensions

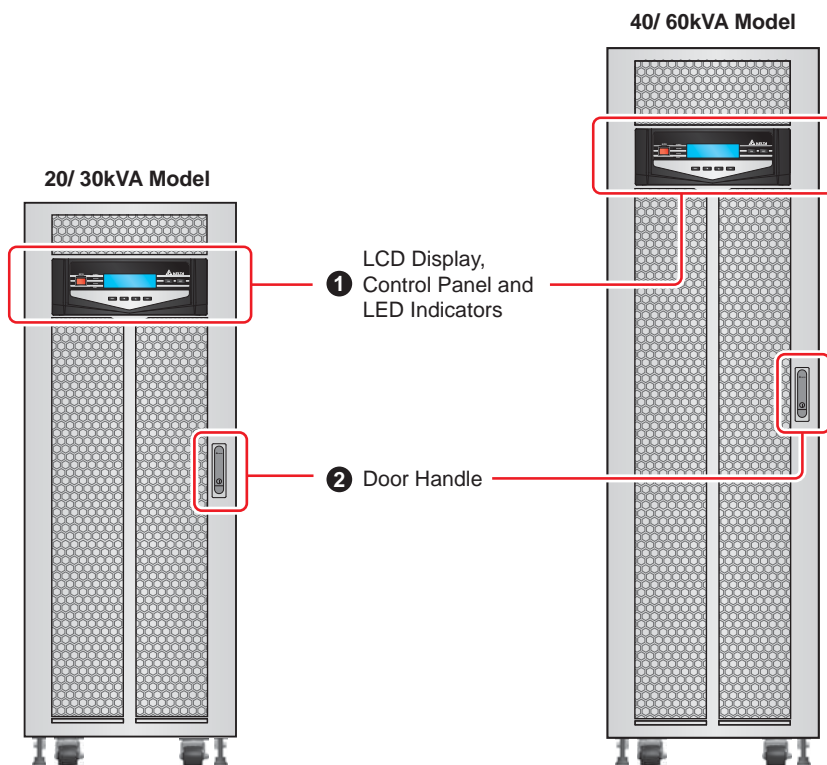


*(Figure 3-1: 20/ 30kVA UPS  
Appearance and Dimensions)*



*(Figure 3-2: 40/ 60kVA UPS  
Appearance and Dimensions)*

## 3.2 Front View

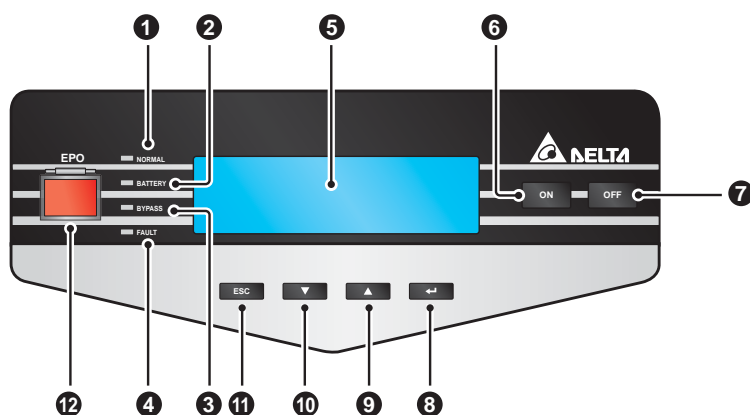


(Figure 3-3: Front View)

| No. | Item  | Description   |
|-----|---|---|
| 1   | LCD Display, Control Panel and LED Indicators | <ol style="list-style-type: none"> <li>1. LCD displays the status of the UPS.</li> <li>2. Control panel includes ESC, move-up, move-down, confirmation, ON, OFF and EPO buttons.</li> <li>3. LED indicators include NORMAL, BATTERY, BYPASS and FAULT. Please refer to <b>3.3 Control Panel</b>.</li> </ol> |
| 2   | Door Handle                                   | <p>Please refer to <b>Figure 3-4</b> for how to open the UPS's front door.</p> <p>(Push)</p>  |






(Figure 3-4: Open the Front Door)

### 3.3 Control Panel



(Figure 3-5: Control Panel)

| No. | Item        | Description   |
|-----|-------------|---|
| ①   | NORMAL      | The UPS is operating in online mode and the utility AC power is normal.   |
| ②   | BATTERY     | The UPS is operating in battery mode and the batteries are discharging.   |
| ③   | BYPASS      | The UPS is operating in bypass mode.  |
| ④   | FAULT       | The UPS has abnormalities.  |
| ⑤   | LCD Display | Displays the UPS operating status and relevant monitoring data.   |
| ⑥   | ON          | <b>ON</b> key: Press the key for 3~4 seconds and release it after hearing a beep to start up the UPS.                                     |
| ⑦   | OFF         | <b>OFF</b> key: Press the key once and the LCD shows the following screen. To shut down the inverter, press the <b>DOWN</b> key (  ).<br> |
| ⑧   |             | Confirms selection.   |
| ⑨   |             | Moves up/ Increases number.   |
| ⑩   |             | Moves down/ Decreases number.   |

| No. | Item  | Description   |
|-----|---|---|
| 11  | ESC   | Goes back to previous screen or cancels current selection.  |
| 12  |  | <p>When an emergency event occurs, press the <b>EPO</b> key () for more than one second to shut down the rectifier, inverter and output of the UPS immediately.</p> <p>To reset, disconnect the <b>EPO</b> key () , press the unit's <b>OFF</b> key () for 3 seconds, and then press the unit's <b>ON</b> key () for 3 seconds to enter into online mode.</p> |

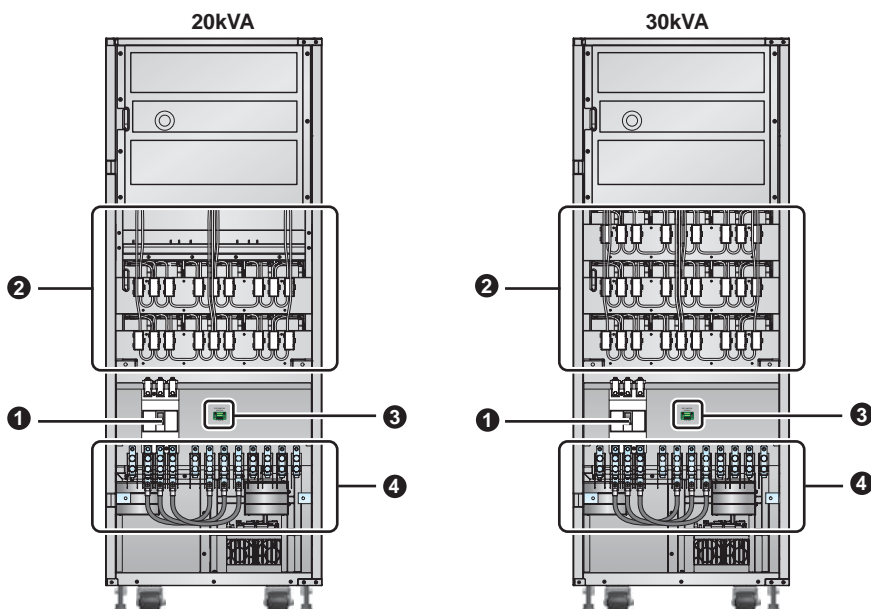
### 3.4 Front View with Door Open and Internal Panel Removal

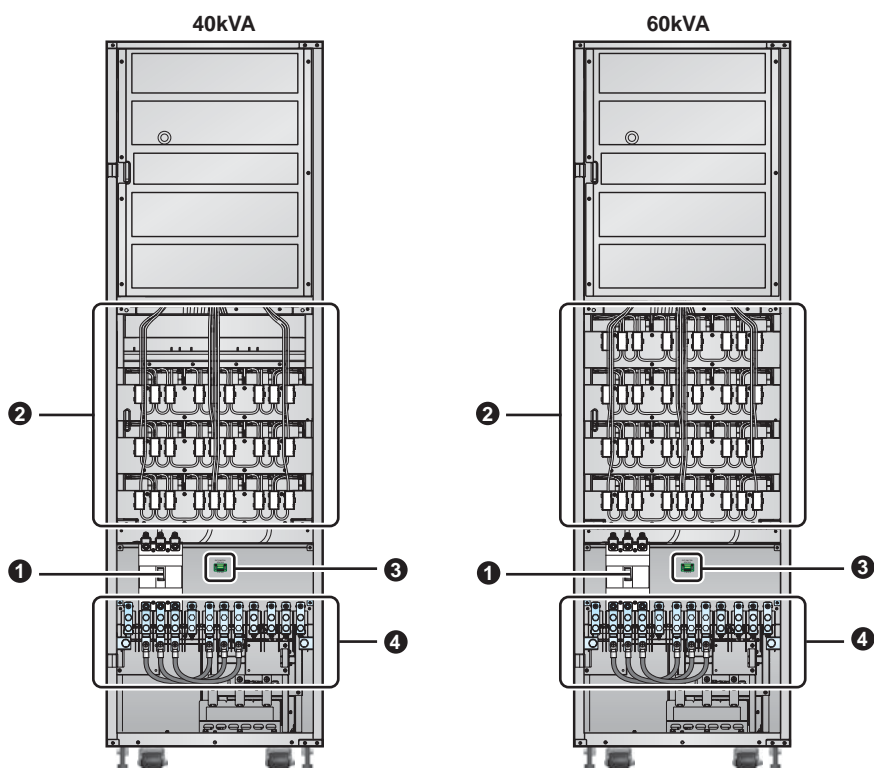
- Models with Internal Batteries: GES203HH77A035/ GES303HH77A035/ GES403HH77A035/ GES603HH77A035



#### NOTE:

After you open the front door and remove the corresponding internal panels, you will see the view shown in **Figure 3-6**.





(Figure 3-6: Front View with Door Open and Internal Panel Removal (Models with Internal Batteries) )

### ① Input Breaker

Controls the UPS system's main input switch and is used for safety protection.

### ② Internal Battery Cabinet

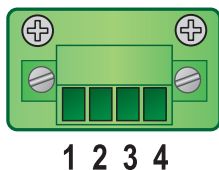
The four UPS models have different contents inside the internal battery cabinet. Please refer to the table below for more information.

1. The internal battery cabinet includes:

| No. | Item               | Q'ty  |       |       |       |
|-----|--------------------|-------|-------|-------|-------|
|     |                    | 20kVA | 30kVA | 40kVA | 60kVA |
| 1   | Internal Batteries | 48    | 72    | 72    | 96    |
| 2   | Battery Tray       | 12    | 18    | 18    | 24    |

2. The internal batteries, battery trays and battery cables shown in the table above and **Figure 3-6** have already been configured at factory. Only qualified service personnel can perform battery installation, wiring and connection.

### ③ External Switch Status Dry Contacts



(Figure 3-7: External Switch Status Dry Contacts)

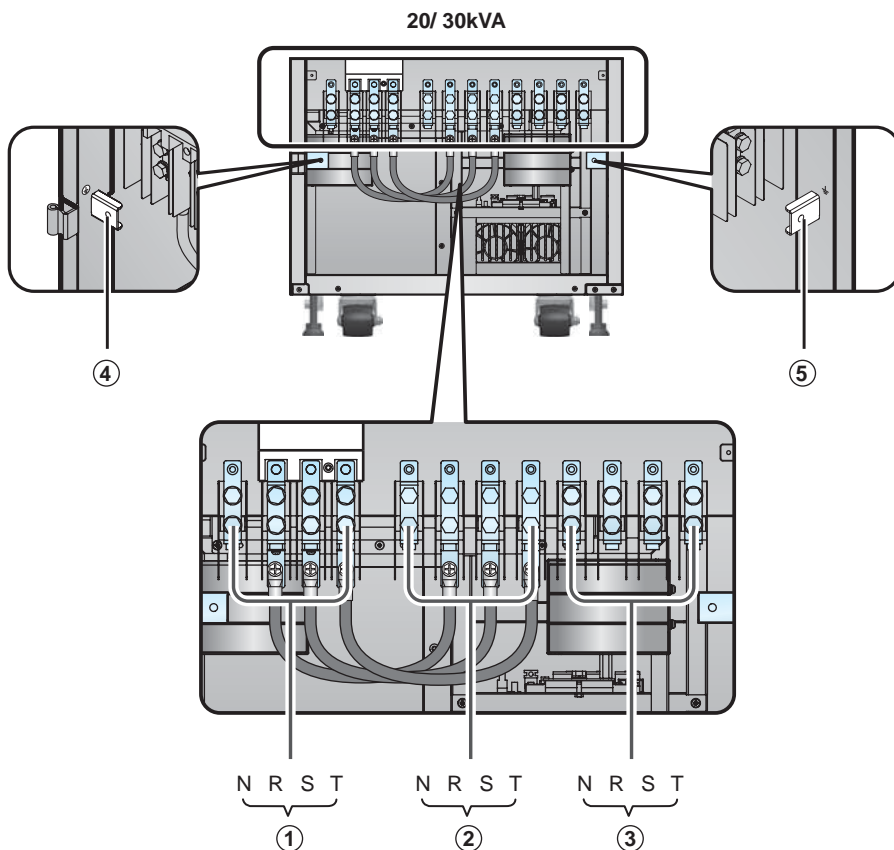
1. Dry contacts 1 & 2: Connect to the user-supplied Manual Bypass Breaker.
2. Dry contacts 3 & 4: Connect to the user-supplied Output Breaker.



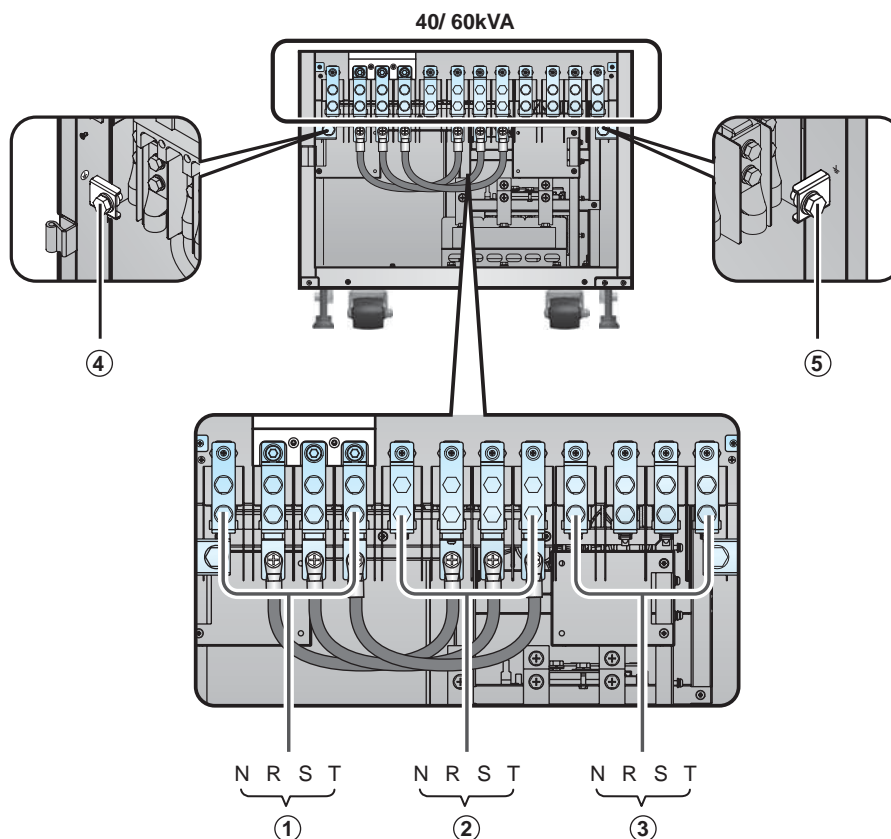
#### NOTE:

The Manual Bypass Breaker and Output Breaker should be supplied by the user and connected to the above mentioned External Switch Status Dry Contacts. The purpose is to detect the Manual Bypass Breaker and Output Breaker's ON/ OFF status.

### ④ Wring Terminal Block



(Figure 3-8: Wring Terminal Block\_20/ 30kVA)



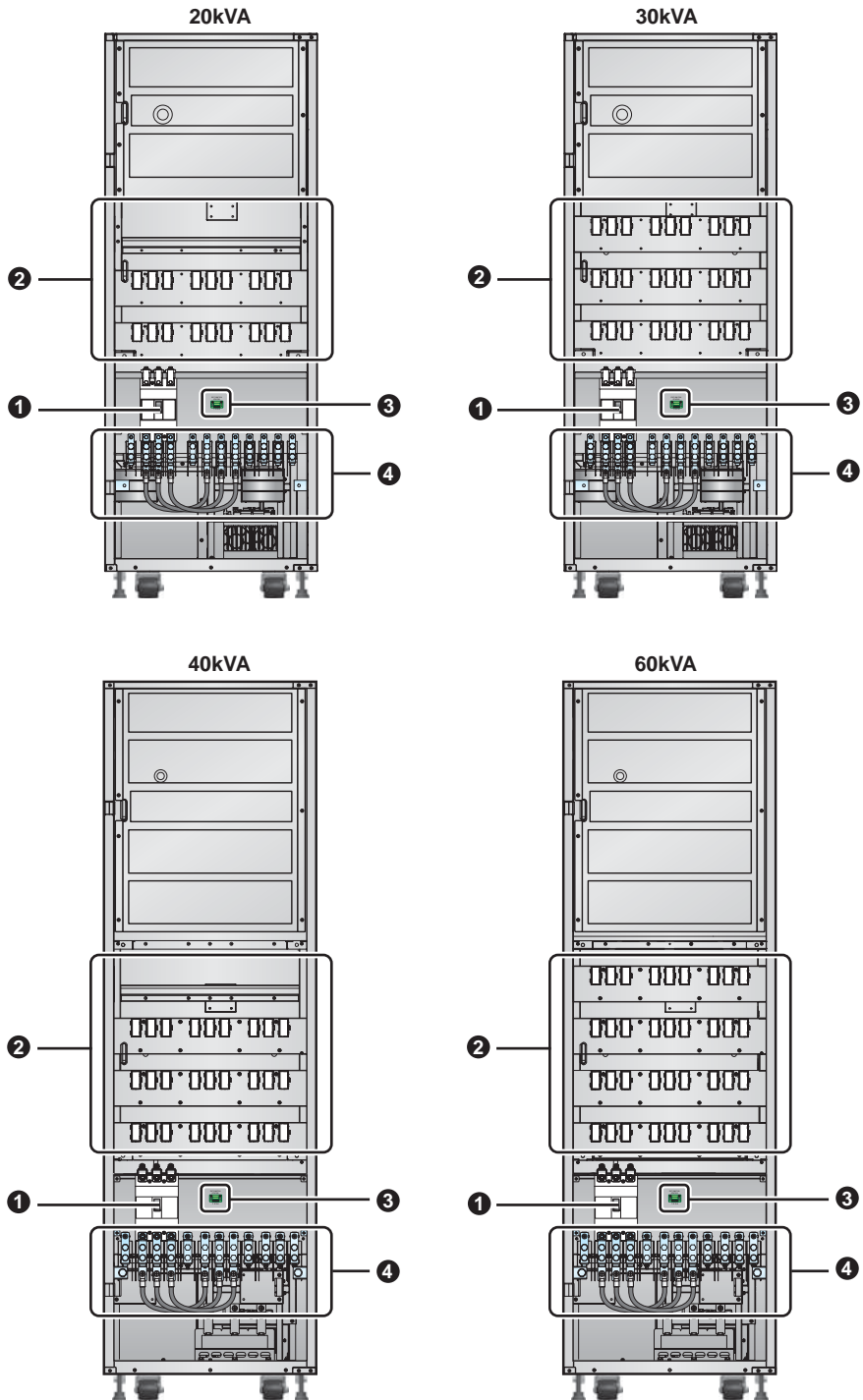
(Figure 3-9: Wring Terminal Block\_40/ 60kVA)

| No. | Item                                     | Description                        |
|-----|--|------------------------------------|
| ①   | AC Input Terminal Block (N/ R/ S/ T)     | Connects to the main AC source.    |
| ②   | Bypass Input Terminal Block (N/ R/ S/ T) | Connects to the bypass source.     |
| ③   | UPS Output Terminal Block (N/ R/ S/ T)   | Connects to the critical loads.    |
| ④   | ⊕  | For the UPS grounding.             |
| ⑤   | ⊕  | For the critical loads' grounding. |

- **Models without Internal Batteries:** GES203HH77B035/ GES303HH77B035/ GES403HH77B035/ GES603HH77B035

**NOTE:**

After you open the front door and remove the corresponding internal panels, you will see the view shown in **Figure 3-10**.




(Figure 3-10: Front View with Door Open and Internal Panel Removal  
(Models without Internal Batteries) )



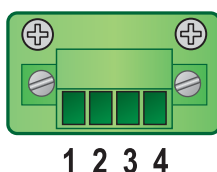
### ① Input Breaker

Controls the UPS system's main input switch and is used for safety protection.

### ② Internal Battery Cabinet

The internal battery cabinet does not include any batteries. Please install our suggested type of batteries. For battery type, please contact your local dealer or service personnel. Please note that you need to additionally purchase a battery kit (not provided) for battery installation. For battery installation and configuration, please refer to **Figure 3-6** and **5.5.3 Single Unit Wiring** . Only service personnel can perform battery installation, wiring and connection.

### ③ External Switch Status Dry Contacts



(Figure 3-11: External Switch Status Dry Contacts)

1. Dry contacts 1 & 2: Connect to the user-supplied Manual Bypass Breaker.
2. Dry contacts 3 & 4: Connect to the user-supplied Output Breaker.



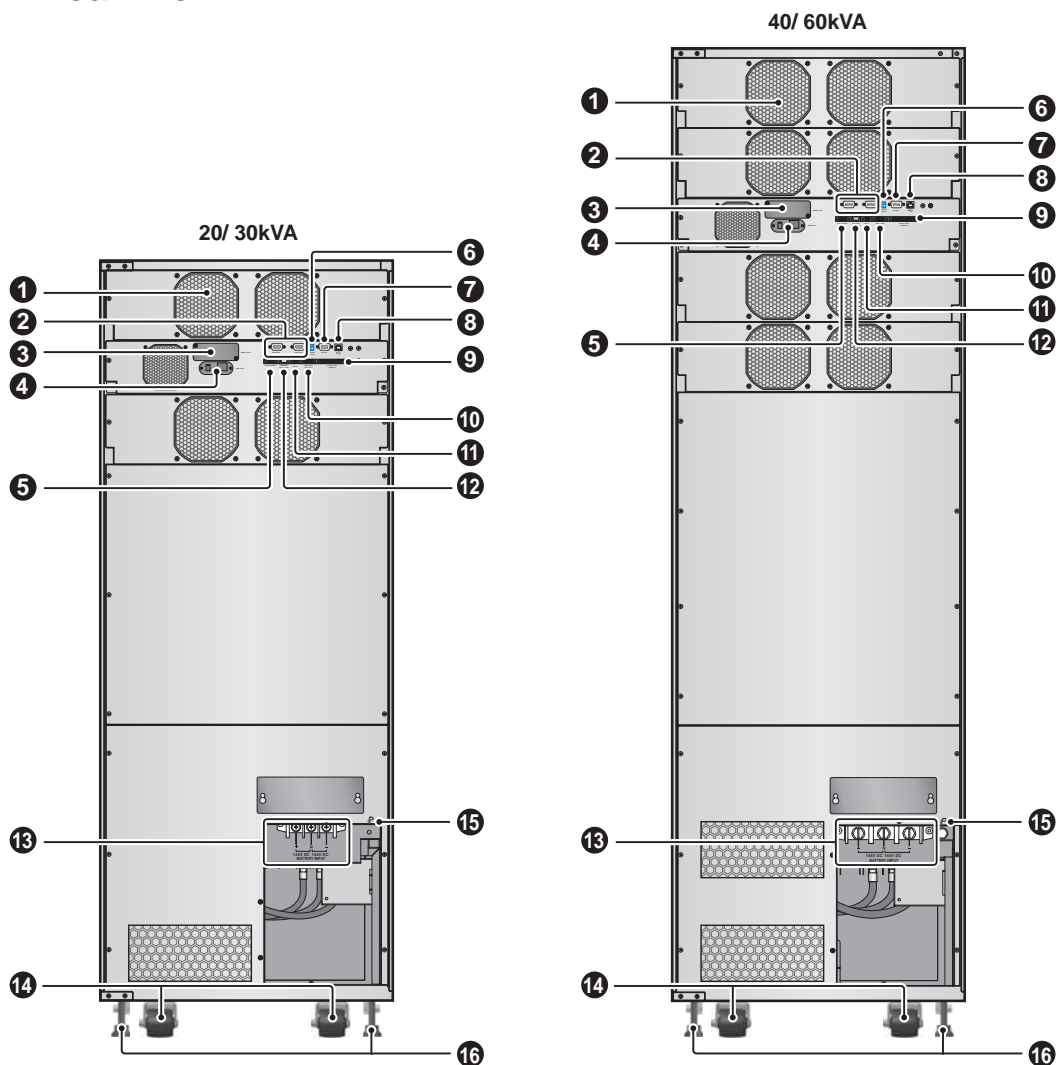
#### NOTE:

The Manual Bypass Breaker and Output Breaker should be supplied by the user and connected to the above mentioned External Switch Status Dry Contacts. The purpose is to detect the Manual Bypass Breaker and Output Breaker's ON/ OFF status.

### ④ Wring Terminal Block



Please refer to **Figure 3-8** and **Figure 3-9**.

### 3.5 Rear View



(Figure 3-12: 20/ 30kVA & 40/ 60kVA Rear View)


| No. | Item           | Description  |
|-----|----------------|--|
| ①   | DC Fans        | Cool and ventilate the UPS.  |
| ②   | Parallel Ports | For UPS parallel usage.  |
| ③   | SMART Slot     | Connects SNMP/ Relay I/O/ MODBUS card.                                     |
| ④   | MINI Slot      | Connects Mini SNMP/ Mini Relay I/O/ Mini USB/ Mini MODBUS/ Mini TVSS card. |

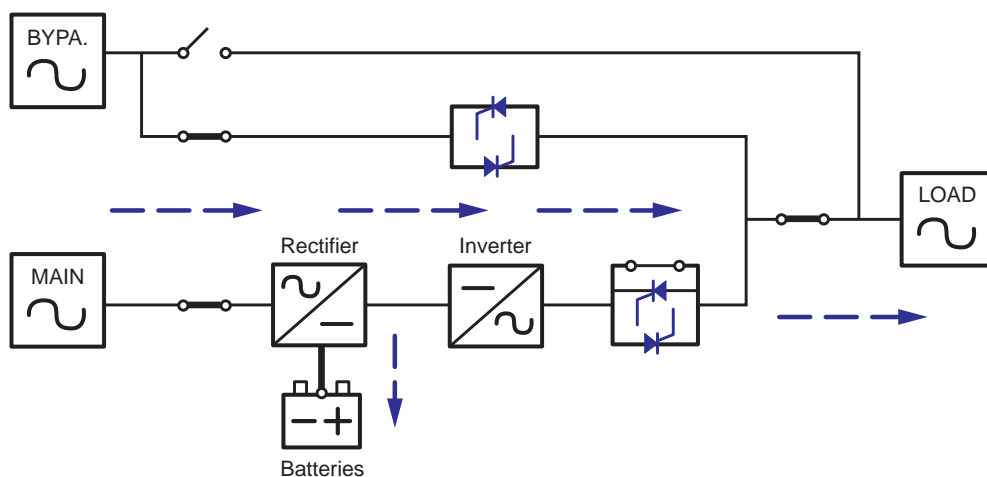
| No. | Item                                   | Description  |
|-----|--|--|
| ⑤   | Battery Dry Contacts                   | Detects at maximum two external battery cabinets' temperature.   |
| ⑥   | Parallel Switch                        | Controls parallel ports' status (ON or OFF).   |
| ⑦   | RS-232 Port                            | <p>Connects to a computer.</p> <p> <b>NOTE:</b> You can use the UPSentry 2012 software (<a href="https://datacenter-softwarecenter.deltaww.com.cn">https://datacenter-softwarecenter.deltaww.com.cn</a>) to monitor and manage the UPS via the RS-232 port.</p> |
| ⑧   | USB Port                               | Connects to a computer.  |
| ⑨   | Output Dry Contacts                    | Receive the UPS system's event information.  |
| ⑩   | Input Dry Contacts                     | Receive external information of devices connected to the input dry contacts.   |
| ⑪   | REPO Port                              | When an emergency event occurs, the UPS immediately disconnects the power supply and shuts down the unit safely.   |
| ⑫   | Charger Detection Port                 | Connects to a charger box and detects the charger status.  |
| ⑬   | Battery Input Terminal Block (+/- / N) | <p> <b>NOTE:</b> Please remove the bottom panel to see the Battery Input Terminal Block.</p> <p>Connects an external battery cabinet. Only batteries with the same type and rating can be paralleled.</p>   |
| ⑭   | Casters                                | <p>The casters are designed for a short distance movement only. Do not use the casters to move the UPS over a long distance. The casters are not designed to provide long-term support for the UPS after installation. Please refer to <b>5.4 UPS Installation</b> for how to firmly fix the UPS on the ground.</p>                              |
| ⑮   | $\perp$                                | For external battery cabinet's grounding.  |
| ⑯   | Levelers                               | The levelers are designed to provide long-term support for the UPS.  |

## Chapter 4 : Operation Modes

This chapter provides a basic description of the UPS system's path of electrical power in its various operating modes.

- **Online Mode**

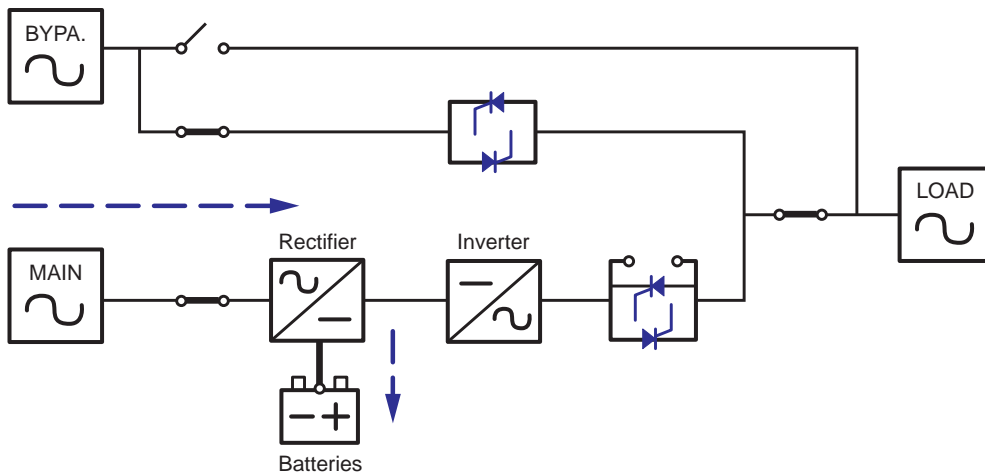
The critical load is supplied by the inverter, which derives its power from the utility AC power, and the UPS charges the batteries as needed and provides power protection to the equipment. During on-line mode, the NORMAL LED indicator (  NORMAL ) illuminates (green).



(Figure 4-1: Path of Electrical Power through the UPS in Online Mode)



### • Standby Mode

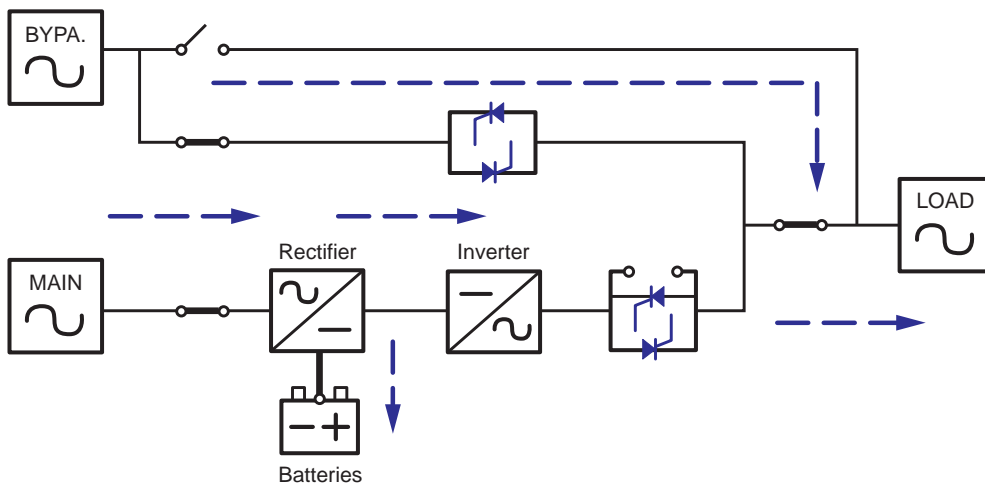
When the input voltage and frequency of the utility AC power are within the normal range, the UPS runs in standby mode and charges the batteries. The bypass and the inverter have no output.



(Figure 4-2: Path of Electrical Power through the UPS in Standby Mode)


### • ECO Mode

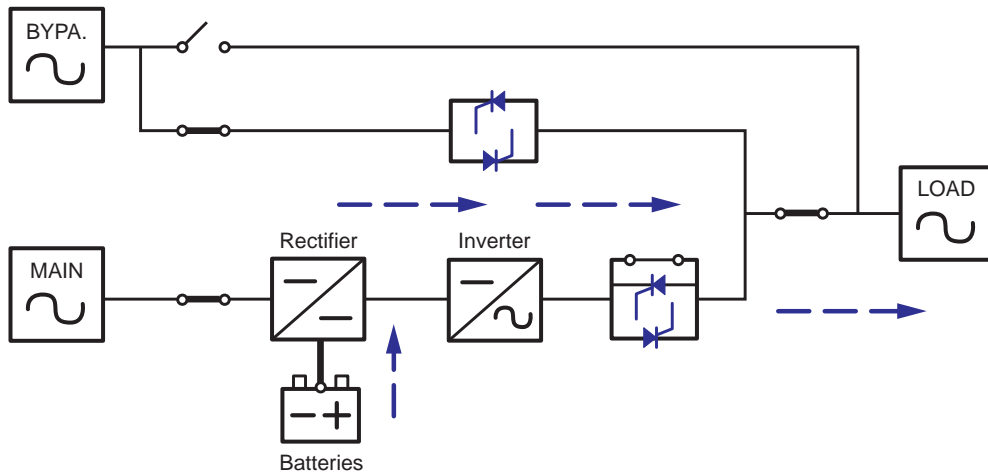
The UPS can be set in ECO mode manually. In ECO mode, when the utility input voltage is within the  $\pm 10\%$  range of rated voltage, the load is supplied by the utility power and the BYPASS LED indicator (  **BYPASS** ) illuminates (yellow); if out of the range, the load is supplied by the inverter and the NORMAL LED indicator (  **NORMAL** ) illuminates (green).



(Figure 4-3: Path of Electrical Power through the UPS in ECO Mode)

- **Battery Mode**

When the UPS is operating during a power outage, the batteries provide DC power, which maintains inverter operation to support the critical load. During battery mode, the BATTERY LED indicator (  BATTERY ) illuminates (yellow).




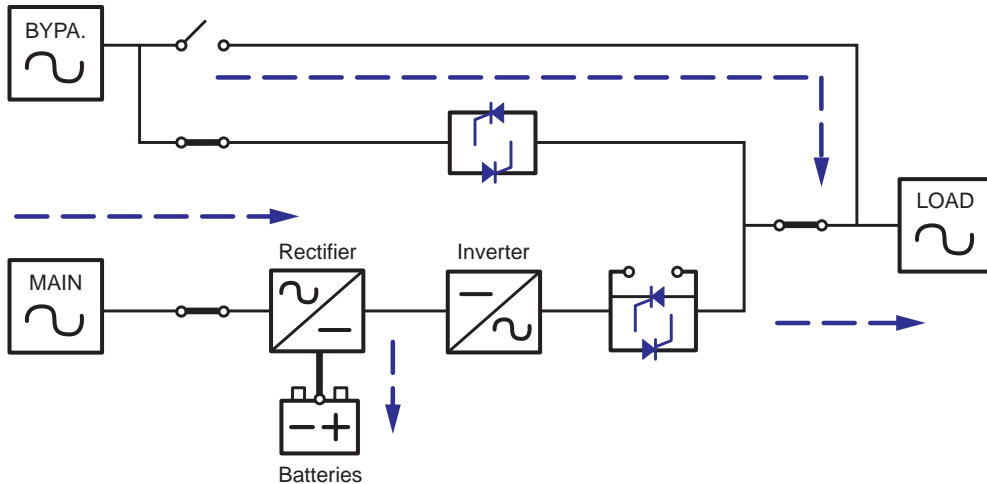
(Figure 4-4: Path of Electrical Power through the UPS in Battery Mode)

Table 4-1: The battery status is as follows

| Battery Capacity | Buzzer  | LCD Display                     |
|------------------|---|---------------------------------|
| <b>Full/ Mid</b> | The alarm beeps once every 10 seconds.<br>(ON for 0.1 second and OFF for 9.9 seconds) | BATTERY CAPACITY<br>00V/ 000%   |
| <b>Low</b>       | The alarm beeps once every 0.5 second.<br>(ON for 0.1 second and OFF for 0.4 second)  | BATTERY CAPACITY<br>00V/ 000%   |
| <b>Depleted</b>  | Long beep   | SHUT DOWN DUE TO<br>LOW BATTERY |

### • Bypass Mode

The critical load is directly supplied by the utility power and the batteries are charged. During bypass mode, the BYPASS LED indicator (  BYPASS ) illuminates (yellow).



(Figure 4-5: Path of Electrical Power through the UPS in Bypass Mode)

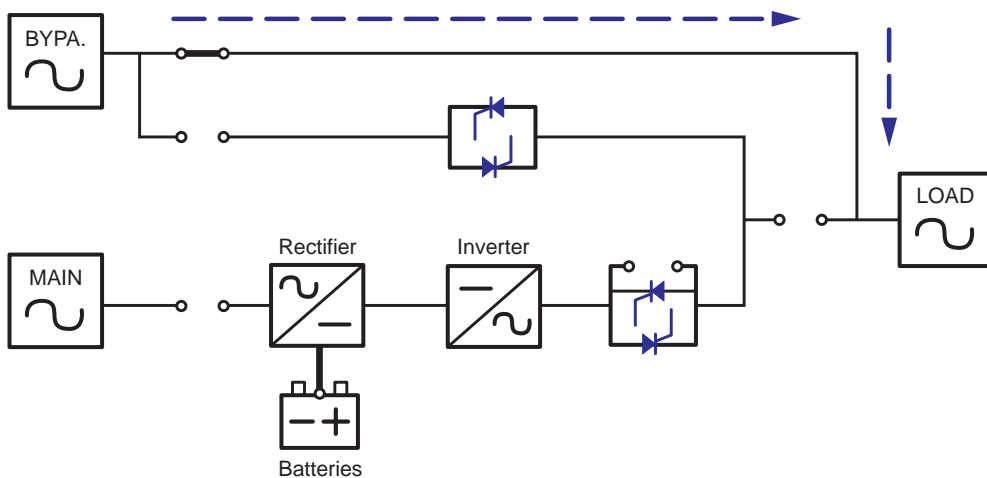
### • Manual Bypass Mode

If UPS system maintenance or repair is required, the UPS system may be bypassed without interrupting the supply of power to the attached load.




#### **WARNING:**

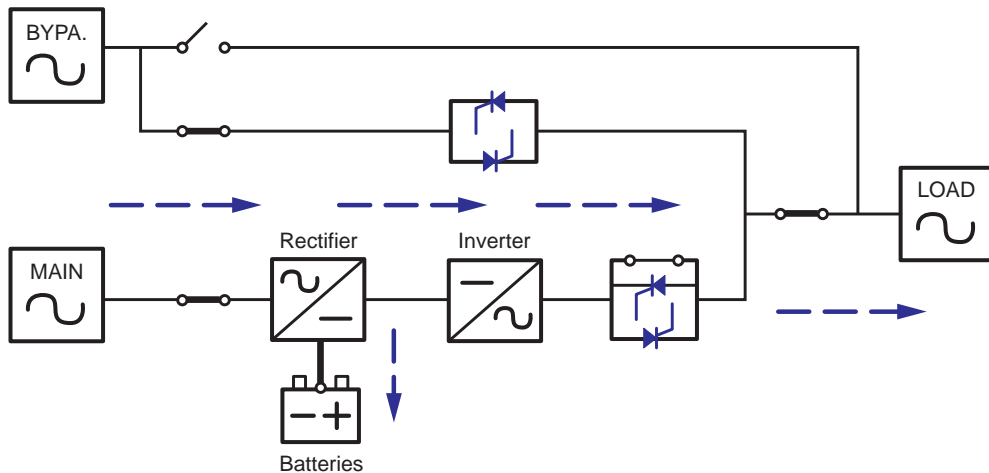
The UPS system must be de-energized completely before performing maintenance or repair by shutting it down completely after switching to manual bypass mode.



(Figure 4-6: Path of Electrical Power through the UPS in Manual Bypass Mode)

- **Converter Mode**

When the UPS is manually set in converter mode, the output frequency can be set as 50Hz or 60Hz. After the output frequency is set up, the system will automatically disable the bypass function. Once the inverter shuts down, there is no bypass output. During converter mode, the NORMAL LED indicator (  **NORMAL** ) illuminates (green).



(Figure 4-7: Path of Electrical Power through the UPS in Converter Mode)



## Chapter 5 : Installation and Wiring

### 5.1 Precautions Prior to Installation and Wiring

Please read this user manual thoroughly before installation and wiring. Only authorized Delta engineers or qualified service personnel can perform installation and wiring. If you want to execute any action mentioned above by yourself, the action must be under the supervision of authorized Delta engineers or qualified service personnel. If you use a forklift or other equipment to move the UPS, please make sure its load bearing is sufficient. For the weight of the UPS, please refer to **Appendix 1: Technical Specifications**.

### 5.2 Installation Environment

- Install the UPS indoors. Do not place it outdoors.
- Make sure that transportation routes (e.g. corridors, doors, gates, elevators, floors, etc.) and installation area can accommodate and bear the weight of the UPS, any associated battery cabinets and all handling equipment. For the weight of the UPS, please refer to **Appendix 1: Technical Specifications**.
- The installation place must be kept clean and tidy at all times.
- Ensure that the installation area is big enough for maintenance and ventilation. Since the fans of the UPS ventilate from the front to the rear, it is recommended that you place the external battery cabinet next to the UPS and:
  1. Keep a distance of 39.4" (100 cm) from the front of the UPS and the external battery cabinet for maintenance and ventilation.
  2. Keep a distance of 19.7" (50 cm) from the rear of the UPS and the external battery cabinet for maintenance and ventilation.
- Keep the installation area's temperature around 32 ~ 86°F (0 ~ 30°C) and humidity below 95% (non-condensing). The optimum operating temperature for the batteries is 77°F (25°C). Please consider the derating values when operating the UPS over 3280 ft (1000 meters). The highest operating altitude is 6561 ft (2000 meters) above sea level.

**WARNING:**

Do not use air conditioners or similar equipment to blow into the rear side of the UPS and hinder ventilation.

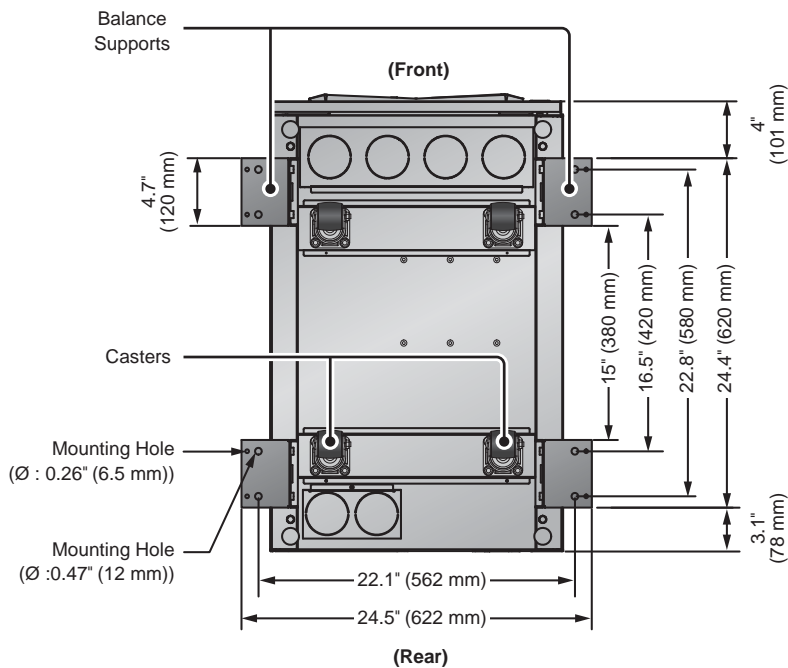
## 5.3 UPS Transportation & Handling

There are four casters at the bottom of the UPS. Please pay attention to the movement of the casters to avoid accidents when you move the UPS from its pallet. The casters are designed to move on level ground. Do not move the UPS on an uneven surface. This might cause damage to the casters or tip the UPS which could damage the unit. If you need to move the UPS over a long distance, please use appropriate equipment like a forklift. Do not use the UPS casters to move the unit over a long distance.

## 5.4 UPS Installation

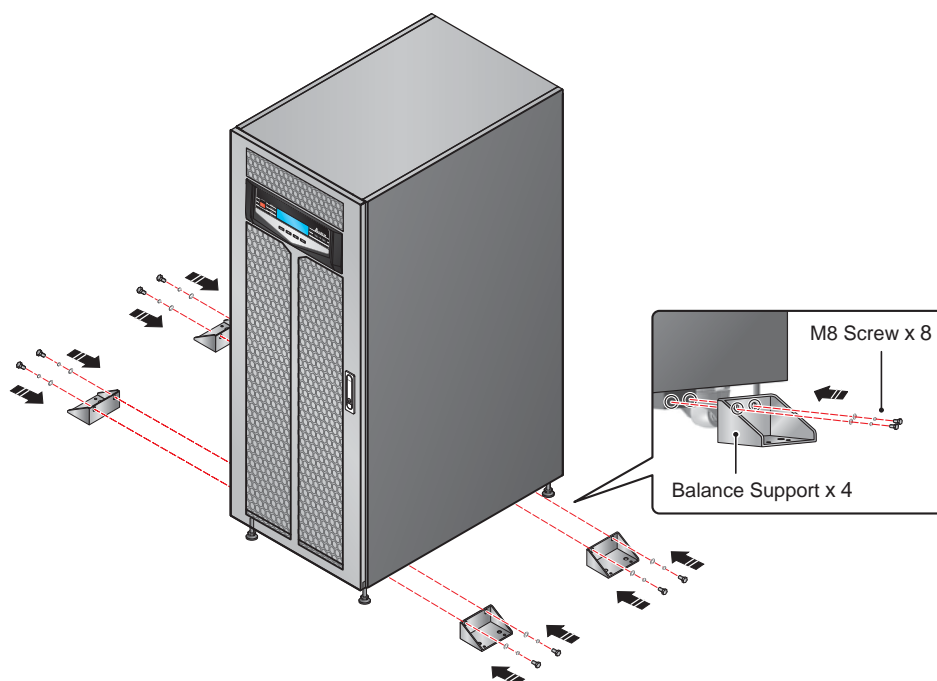
To avoid tipping the UPS, please reinstall the balance supports that were removed from the UPS during the unpacking process. Please follow the following steps.

- 1 After you decide the installation area, follow the mounting hole diagram below to drill holes.



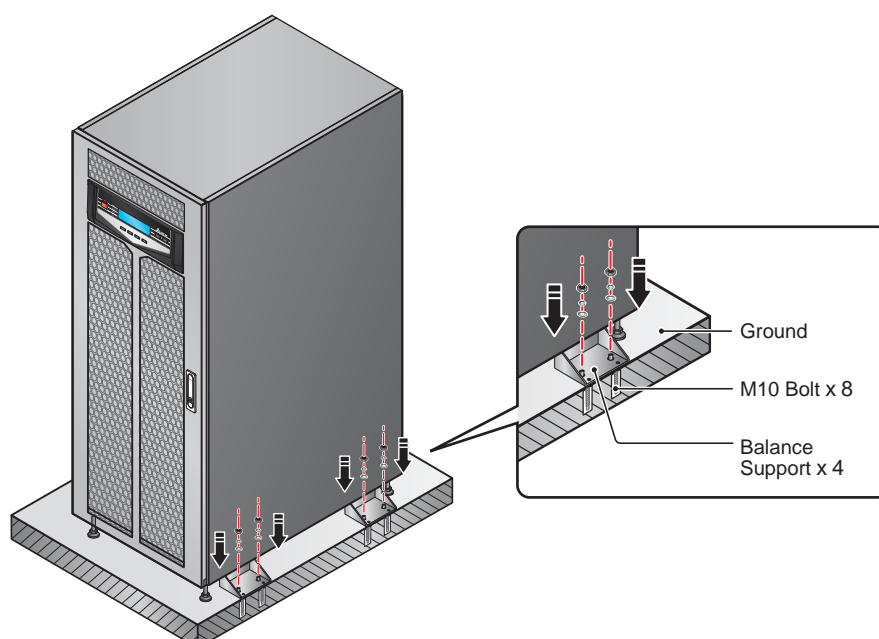
(Figure 5-1: Mounting Hole Diagram)

- 2 Place the UPS over the drilled holes, use the levelers to stabilize the UPS on the ground and use the M8 screws (that were removed from the UPS during the unpacking process) to reinstall the balance supports on the UPS. Please refer to the figure below.



(Figure 5-2: Balance Support Installation)

- 3 Use eight user-supplied M10 bolts to fix the four balance supports on the ground to avoid UPS movement.



(Figure 5-3: Fix the Balance Supports on the Ground)

## 5.5 Wiring

### 5.5.1 Precautions Prior to Wiring

- The wiring must be performed by qualified professional personnel.
- Before wiring or making any electrical connection, make sure the power supplied to the input and output of the UPS is completely cut off and the internal and external batteries are completely disconnected.
- When connecting the UPS to the utility AC power and bypass source, protective devices and 4-pole contactors must be installed. The protective devices and 4-pole contactors must use approved components that meet safety certifications. Please refer to the table below for suggested protective devices. For the installation of the protective devices and 4-pole contactors, please see **Figure 5-9, 5-10, 5-12 and 5-13**.

| UPS   | Suggested Protective Device  |
|-------|------------------------------|
| 20kVA | D-Curve 75A circuit breaker  |
| 30kVA | D-Curve 125A circuit breaker |
| 40kVA | D-Curve 150A circuit breaker |
| 60kVA | D-Curve 225A circuit breaker |

- When connecting the critical loads to the UPS, a listed certified breaker must be installed between them. Refer to the table below.

| UPS   | Suggested 3-Pole Circuit Breaker |
|-------|----------------------------------|
| 20kVA | C-Curve 75A circuit breaker      |
| 30kVA | C-Curve 125A circuit breaker     |
| 40kVA | C-Curve 150A circuit breaker     |
| 60kVA | C-Curve 225A circuit breaker     |

- Check that the size, diameter, phase, and polarity of each cable connecting to the UPS is correct. For the specifications of input/ output/ battery cables and circuit breakers, please refer to **Table 5-1**.

**Table 5-1: Specifications of Input/ Output/ Battery Cables and Circuit Breakers**

| Capacity (kVA)       | 20kVA                                | 30kVA                            | 40K kVA                          | 60K kVA                             |
|----------------------|--------------------------------------|----------------------------------|----------------------------------|-------------------------------------|
| AC Input Cable*      | 2 AWG<br>(25mm <sup>2</sup> )        | 1/0 AWG<br>(50 mm <sup>2</sup> ) | 3/0 AWG<br>(70 mm <sup>2</sup> ) | 250 kcmil<br>(120 mm <sup>2</sup> ) |
| Bypass Input Cable*  | 2 AWG<br>(25mm <sup>2</sup> )        | 1/0 AWG<br>(50 mm <sup>2</sup> ) | 3/0 AWG<br>(70 mm <sup>2</sup> ) | 250 kcmil<br>(120 mm <sup>2</sup> ) |
| Output Cable*        | 2 AWG<br>(25mm <sup>2</sup> )        | 1/0 AWG<br>(50 mm <sup>2</sup> ) | 3/0 AWG<br>(70 mm <sup>2</sup> ) | 250 kcmil<br>(120 mm <sup>2</sup> ) |
| Battery Input Cable* | 1 AWG<br>(35 mm <sup>2</sup> )       | 1/0 AWG<br>(50 mm <sup>2</sup> ) | 3/0 AWG<br>(70 mm <sup>2</sup> ) | 300 kcmil<br>(150 mm <sup>2</sup> ) |
| Tightening Torque    | M8= 130 ± 4.4 lb-in (150 ± 5 Kgf-cm) |                                  |                                  |                                     |
| Input Breaker        | 75A<br>(3-pole × 1)                  | 125A<br>(3-pole × 1)             | 150A<br>(3-pole × 1)             | 225A<br>(3-pole × 1 )               |

\* Use only cooper wire rated 194°F (90°C) or higher.

**NOTE:**

1. In accordance with National Electrical Codes (NEC), please install a suitable conduit and bushing.
  2. Please refer to national and local electrical codes for acceptable non-fuse breakers and cable size.
  3. Cables with PVC material and with temperature resistance up to 221°F (105°C) are suggested.
  4. Make sure that the input/ output/ battery cables are locked tightly.
- When connecting with the external battery cabinet, please confirm the polarity. Do not reverse the polarity.
  - The grounding cable of the external battery cabinet must be connected to the (⏏) terminal of the battery terminal block.
  - Installer should consider the maximum current and wiring gauge that may be required for future expansion of parallel configurations.
  - The UPS default setting is single input. If there is an intention to change the UPS into dual input or hot standby redundancy configuration, please contact qualified service personnel. Check whether the electric potential of the neutral line (N) of the bypass source is the same as that of the neutral line (N) of the main AC source. If they do not share a common neutral line system, add an isolation transformer to the bypass source.

- The input of the UPS must be a Y connection, and the neutral line (N) must be connected to avoid UPS failure. Do not connect the UPS's neutral line (N) with the ground terminal ( $\oplus$ ).
- If there is a floating voltage between the input power's neutral (N) and the ground ( $\oplus$ ) and you require that the VNG of the UPS should be zero, it is suggested an isolation transformer be installed in front of the UPS input side and the UPS neutral (N) be connected with the ground ( $\oplus$ ).
- The utility AC power must be three phases (R/ S/ T) and meet specifications on the UPS rating label. When connecting the utility input power to the UPS, make sure it is in positive phase sequence.
- Connect the external battery cabinet's grounding terminal to the grounding terminal ( $\oplus$ ) of the UPS's battery terminal block. Do not connect the grounding terminal of the external battery cabinet to any other grounding system.
- The ground terminal ( $\oplus$ ) of the UPS must be grounded. Please use ring-type terminal for wiring.



**WARNING:**

1. Incorrect wiring will lead to severe electric shock and damage to the UPS.
2. For single input, the UPS will not work normally if the main input power's neutral (N) is not firmly connected or is not connected to the AC Input Block's neutral (N) terminal.

For dual input, the UPS will not work normally if the main input power's neutral (N) is not firmly connected or is not connected to the AC Input Block's neutral (N) terminal, and the bypass power's neutral (N) is not firmly connected or is not connected to the Bypass Input Block's neutral (N) terminal.

## 5.5.2 Single Input/ Dual Input Modification

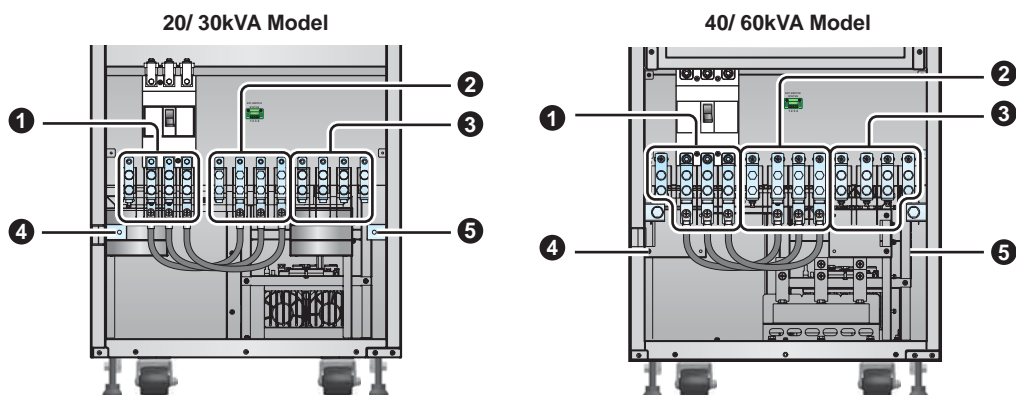


**WARNING:**

1. Only authorized Delta engineers or service personnel can modify single input/ dual input setup.
2. For dual input, the main AC source's Neutral (N) must be connected with the bypass source's Neutral (N).

The UPS default setting is single input. If you want to modify it into dual input, please follow the following steps.

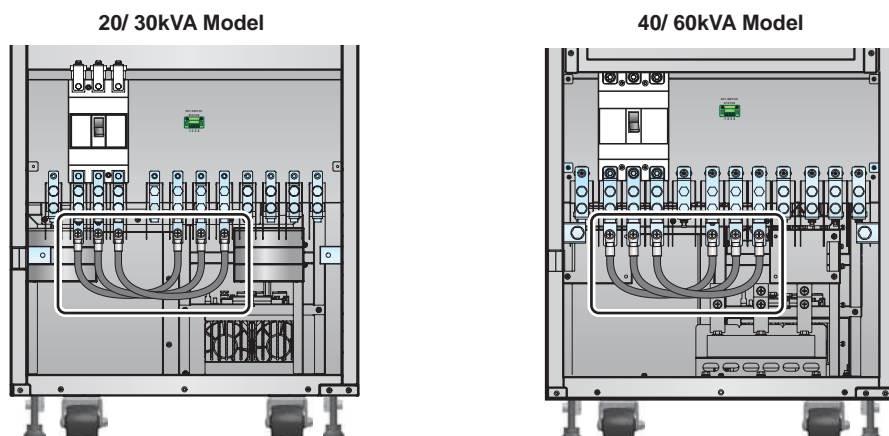
- 1 Open the front door and remove the corresponding internal panels. After that, you will see the wiring terminal block.



(Figure 5-4: Wiring Terminal Block)

| No. | Item                                     | Description                        |
|-----|--|------------------------------------|
| ①   | AC Input Terminal Block (N/ R/ S/ T)     | Connects to the main AC source.    |
| ②   | Bypass Input Terminal Block (N/ R/ S/ T) | Connects to the bypass source.     |
| ③   | UPS Output Terminal Block (N/ R/ S/ T)   | Connects to the critical loads.    |
| ④   | ⏏  | For the UPS grounding.             |
| ⑤   | ⏏  | For the critical loads' grounding. |

- ② Remove the three cables shown in **Figure 5-5** to modify the UPS from single input into dual input.



(Figure 5-5: Three Cables Location)



**NOTE:** If you want to modify the UPS from dual input into single input, please reinstall the three cables shown in **Figure 5-5**.

### 5.5.3 Single Unit Wiring

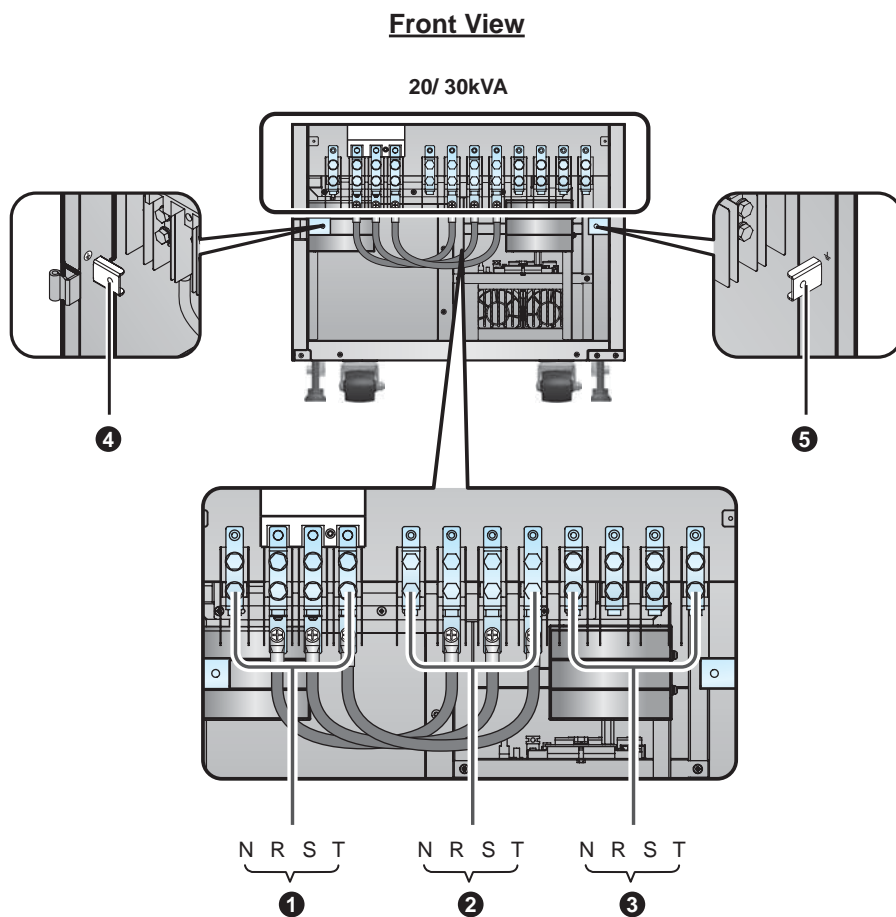


**NOTE:** Prior to wiring, please read **5.5.1 Precautions Prior to Wiring** first.

- **Single Input (Single Unit)**

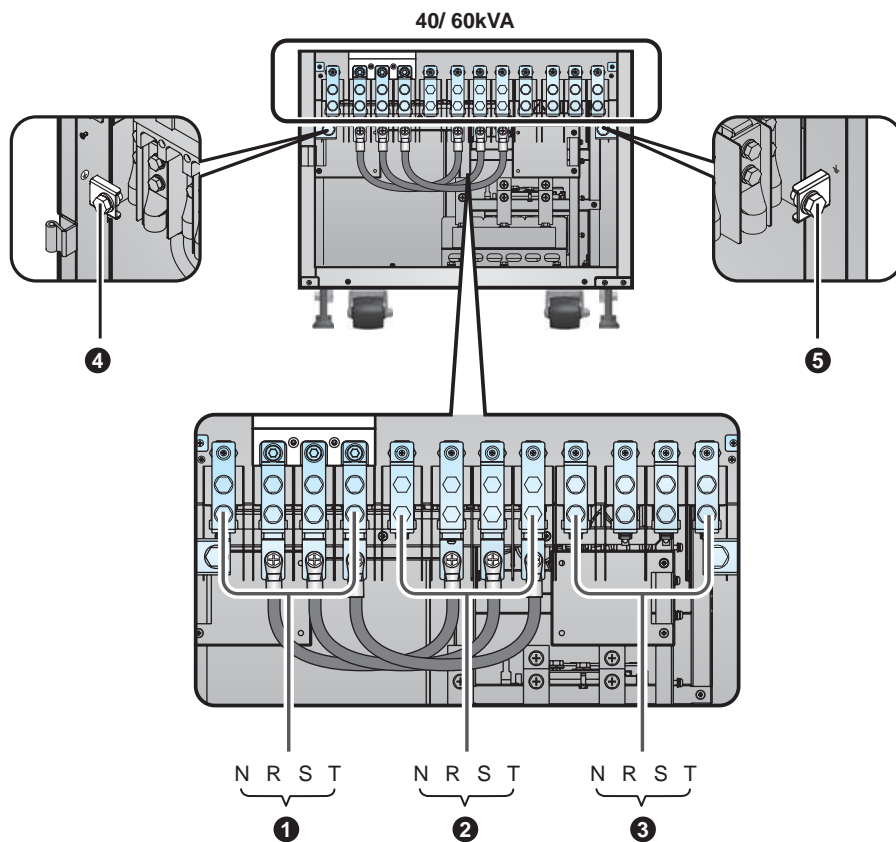
When there is only one AC power source, single unit wiring procedures are as follows.

- 1 Open the UPS's front door, remove the front and rear panels, and you will see the wiring terminal block shown in **Figure 5-6 ~ Figure 5-8**.



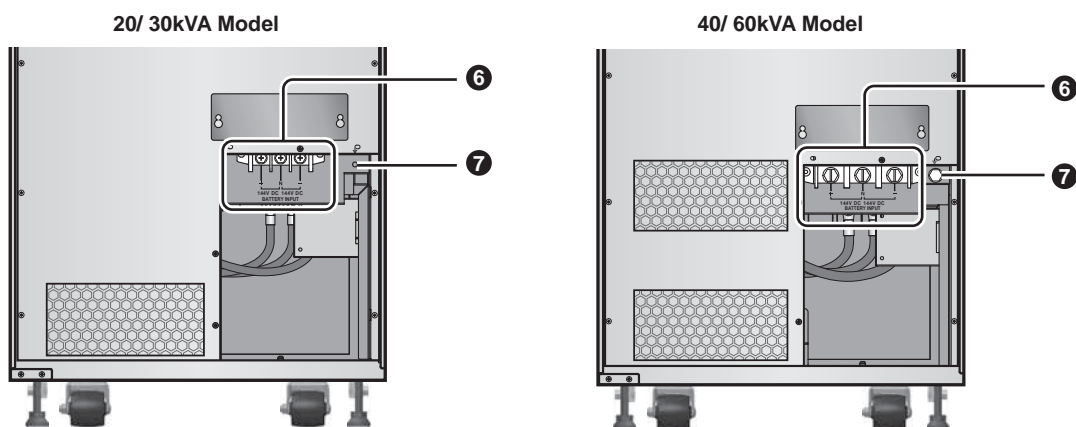
(Figure 5-6: Front View\_Wring Terminal Block\_20/ 30kVA)









(Figure 5-7: Front View\_Wiring Terminal Block\_40/ 60kVA)

### Rear View

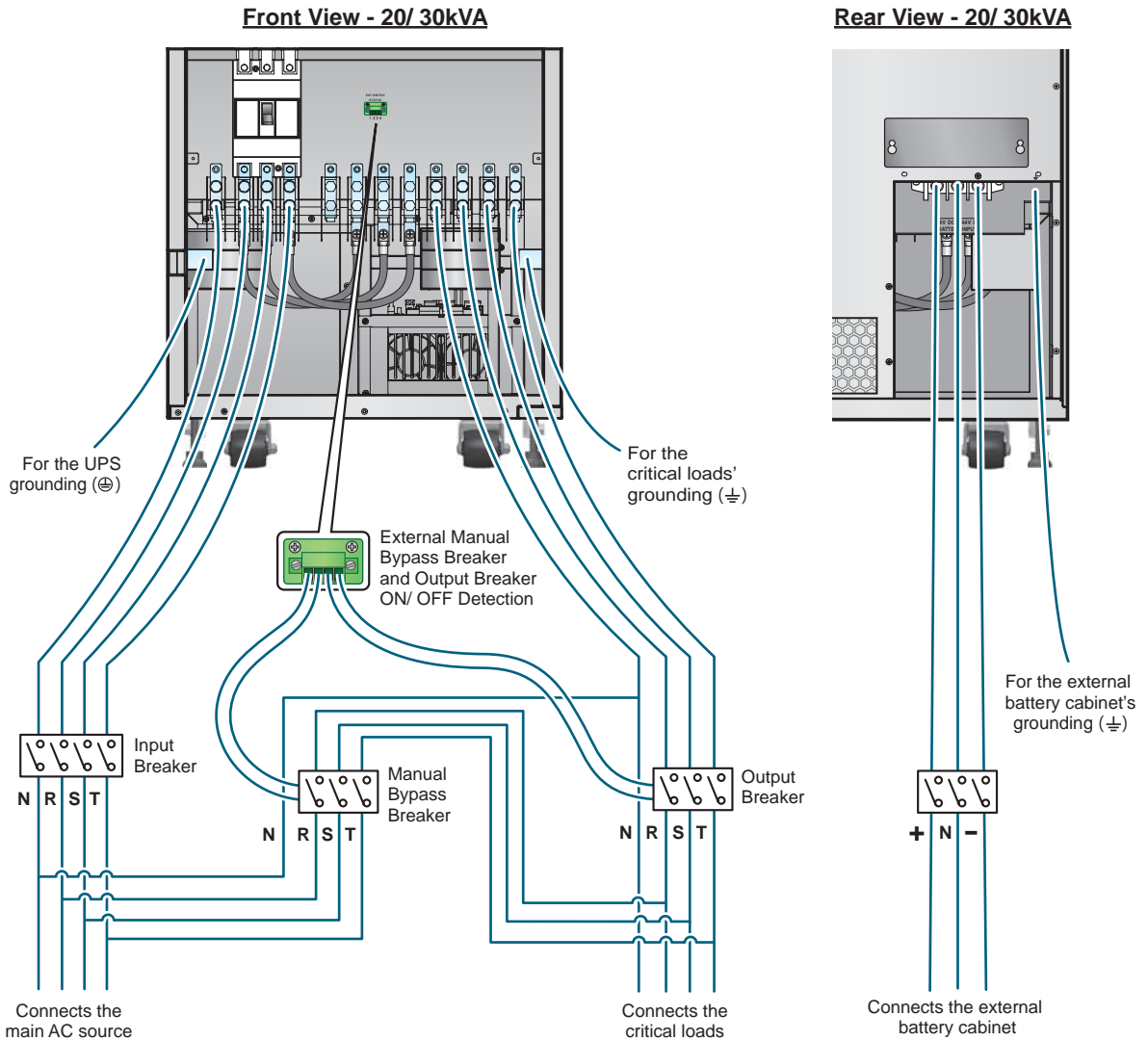


(Figure 5-8: Rear View\_Wiring Terminal Block - 20/ 30/ 40/ 60kVA)

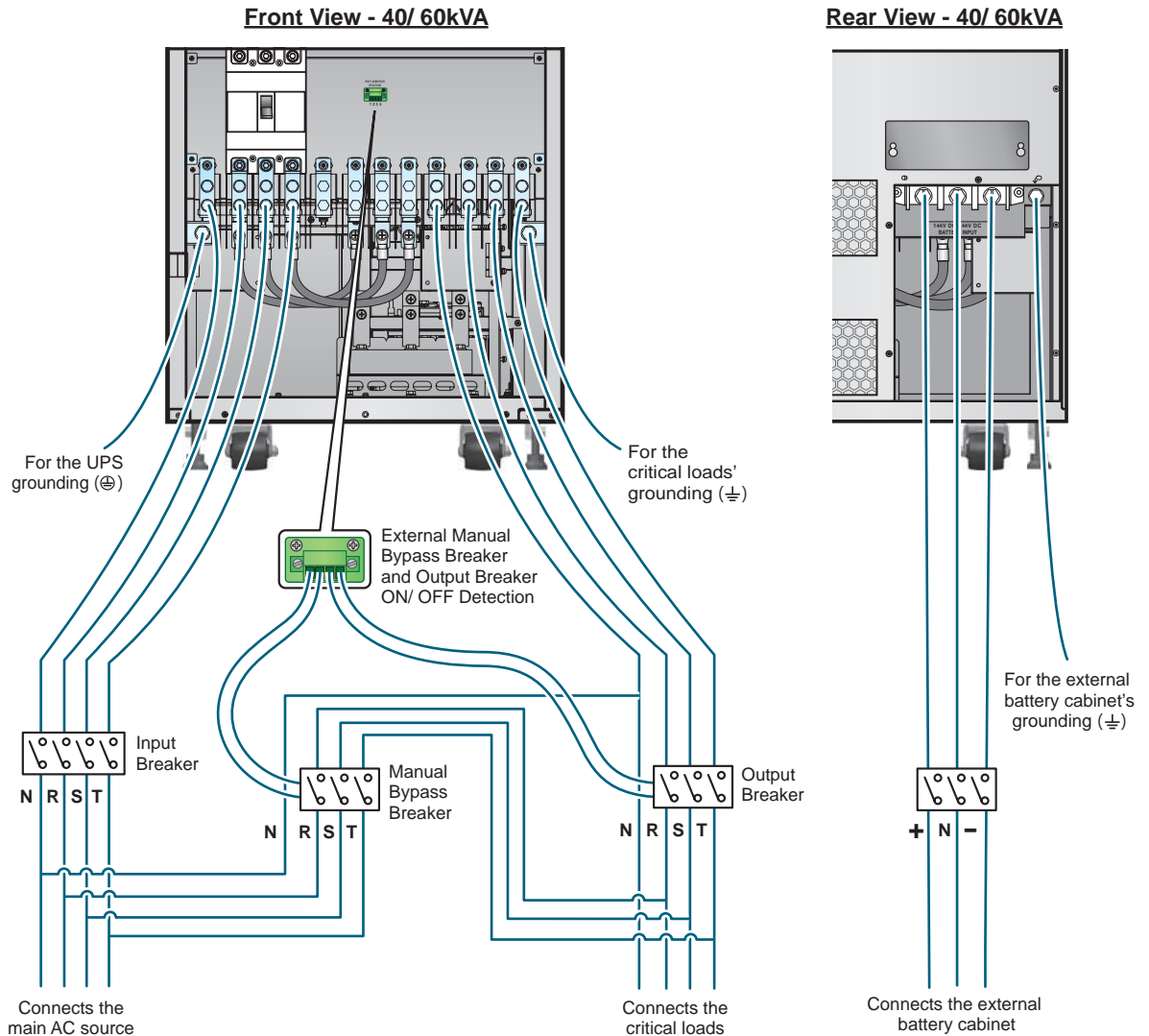
- 2 Ensure that you understand the functions of the wiring terminal block shown in **Figure 5-6 ~ Figure 5-8**.

| No. | Item   | Description   |
|-----|--|---|
| 1   | AC Input Terminal Block<br>(N/ R/ S/ T)  | Connects to the main AC source.   |
| 2   | Bypass Input Terminal Block<br>(N/ R/ S/ T)  | Connects to the bypass source.  |
| 3   | UPS Output Terminal Block<br>(N/ R/ S/ T)  | Connects to the critical loads.   |
| 4   |   | For the UPS grounding.  |
| 5   |   | For the critical loads' grounding.  |
| 6   | Battery Input Terminal Block<br>(+ / - / N)  |  <b>NOTE:</b> Please remove the bottom panel to see the Battery Input Terminal Block.<br>Connects an external battery cabinet. Only batteries with the same type and rating can be paralleled. |
| 7   |  | For the external battery cabinet's grounding.   |

- 3 Confirm the UPS rating voltage is 120/ 208Vac or 127/220Vac, and the battery rating voltage is  $\pm 144$ Vdc.
- 4 Confirm the input breaker is in the **OFF** position. For the position of the breaker, refer to **Figure 3-6**.
- 5 Select the proper input, output and battery cables according to the UPS capacity (please refer to **Table 5-1**).
- 6 Connect the main AC source/ output/ external battery cabinet cables to the relevant wiring terminal blocks and do not forget to ground the UPS (please refer to **Figure 5-9** and **Figure 5-10**).



(Figure 5-9: Single Unit Single Input Wiring Diagram\_20/ 30kVA)




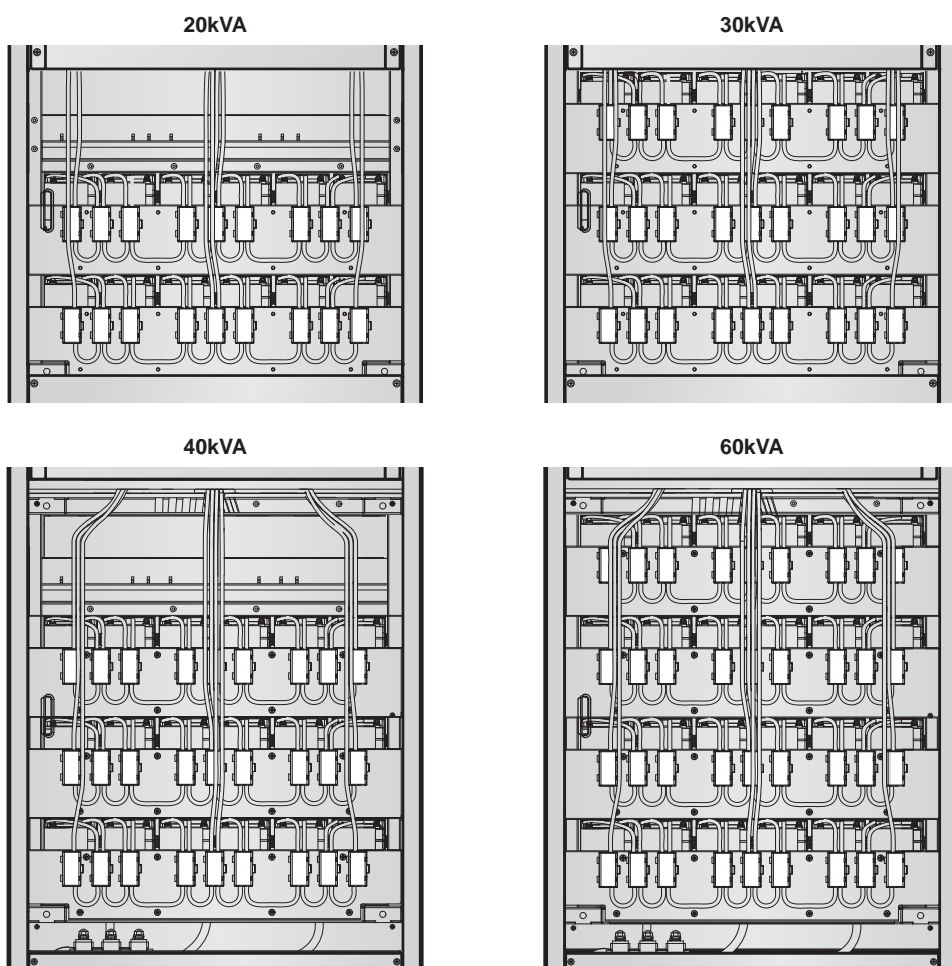
(Figure 5-10: Single Unit Single Input Wiring Diagram\_40/ 60kVA)

- 7 Only qualified service personnel can perform internal battery installation and wiring. For UPS with part No. GES203HH77B035 or GES303HH77B035 or GES403HH77B035 or GES603HH77B035, open the UPS's front door, follow the table below to install correct strings of batteries (not provided; for battery type, please contact service personnel) and the battery kit (not provided). Do not connect the batteries in reverse. For internal battery installation and wiring, please refer to **Figure 5-11**. For battery kit installation, please contact service personnel.

Table 5-2: How many strings of batteries should be installed?

| UPS          | 20kVA | 30kVA | 40K kVA | 60K kVA |
|--------------|-------|-------|---------|---------|
| String Q'ty  | 2     | 3     | 3       | 4       |
| Battery Q'ty | 48    | 72    | 72      | 96      |

 **NOTE:** One string includes 24 batteries.

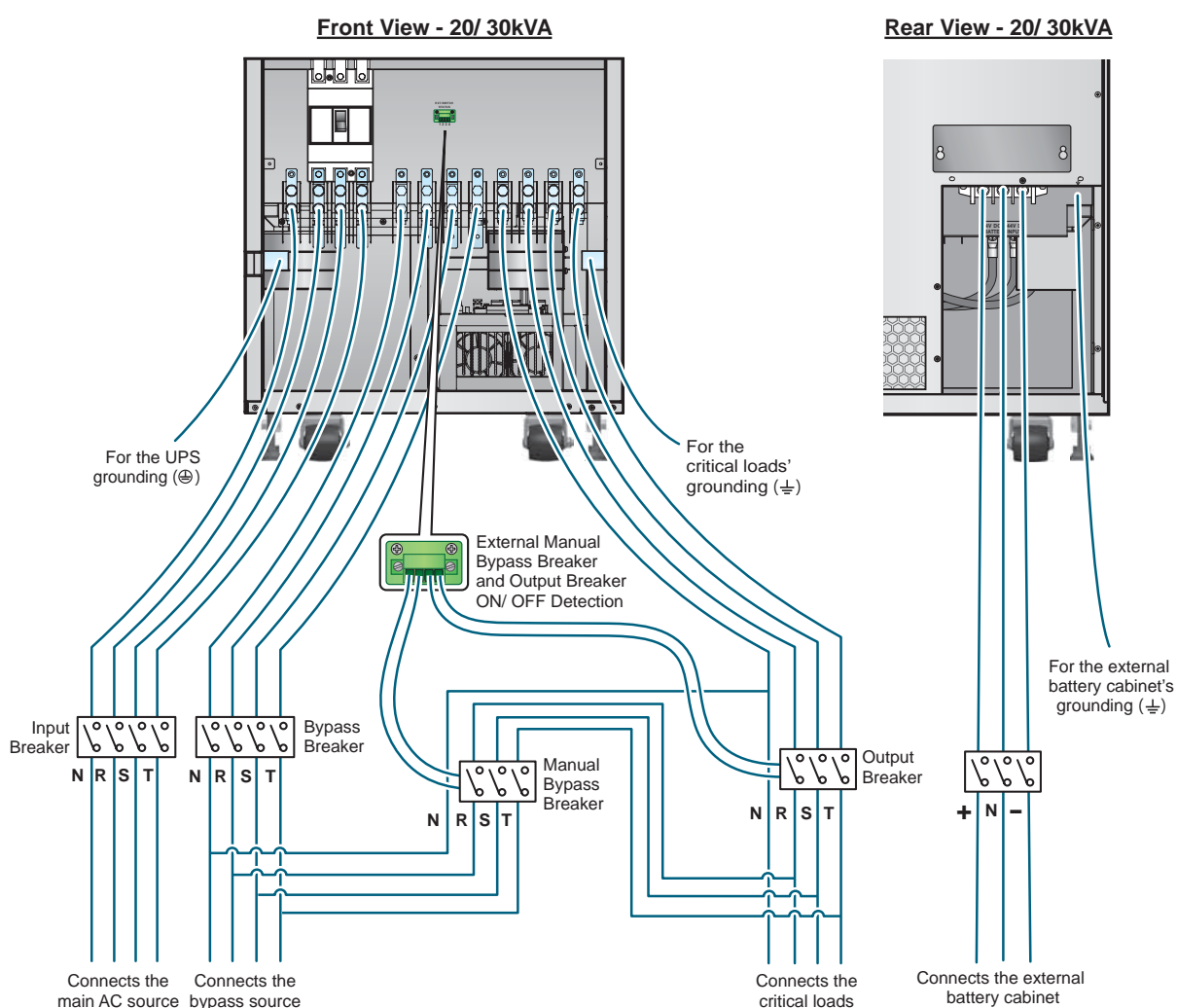
**Front View with Door Open and Internal Panel Removal**

(Figure 5-11: Internal Battery Installation and Wiring)

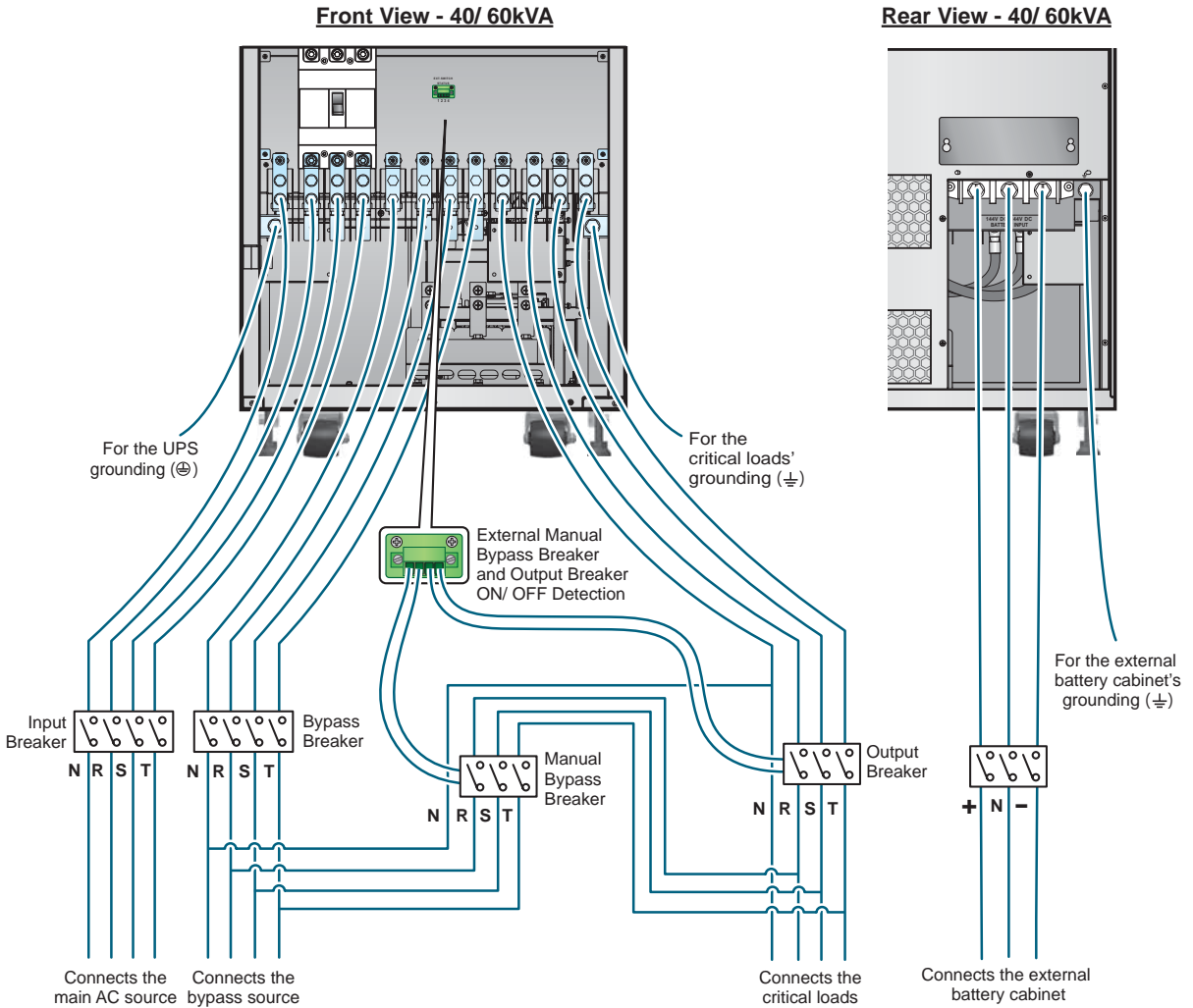
- **Dual Input (Single Unit)**

When there are two AC power sources, single unit wiring procedures are as follows.

- 1 Follow **5.5.2 Single Input/ Dual Input Modification** to modify the UPS into dual input. Please note that only authorized Delta engineers or service personnel can modify single input/ dual input setup.
- 2 Follow steps 1 ~ 5 stated in section **Single Input (Single Unit)**.
- 3 Connect the main AC source/ bypass source/ output/ external battery cabinet cables to the relevant wiring terminal blocks and do not forget to ground the UPS (please refer to **Figure 5-12** and **Figure 5-13**).



(Figure 5-12: Single Unit Dual Input Wiring Diagram\_20/ 30kVA)



(Figure 5-13: Single Unit Dual Input Wiring Diagram\_40/ 60kVA)

4 Follow step 7 stated in section **Single Input (Single Unit)**.

## 5.5.4 Parallel Units Wiring

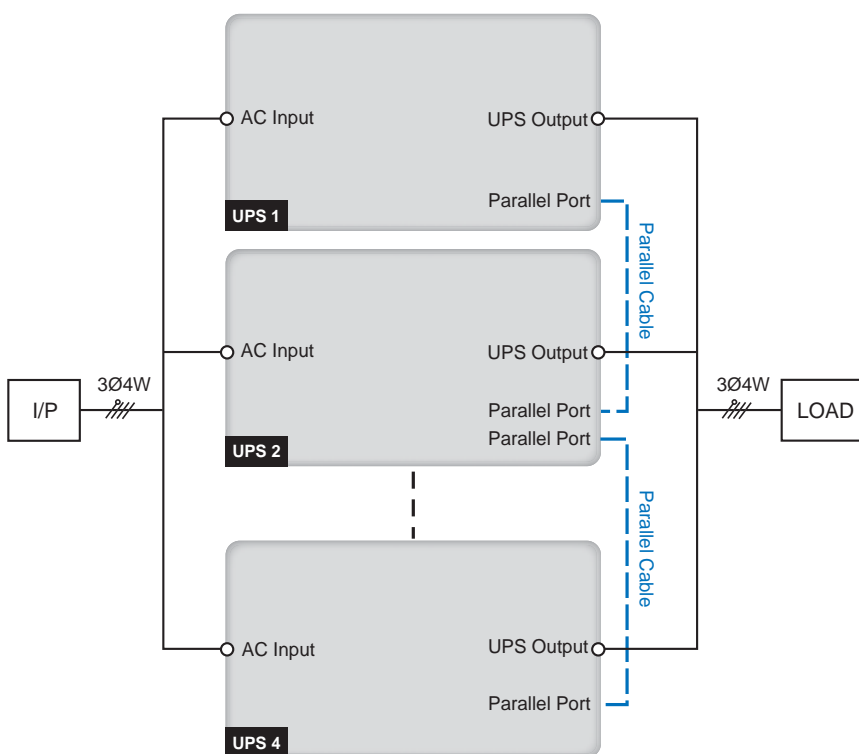


**NOTE:** Prior to wiring, please read **5.5.1 Precautions Prior to Wiring** first.

- **Single Input (Parallel Units)**

When there is only one AC power source, single unit wiring procedures are as follows.

- 1 Please follow steps 1 ~ 5 stated in section **Single Input (Single Unit)**.
- 2 Connect the main AC source/ output/ external battery cabinet cables to the relevant wiring terminal blocks and do not forget to ground the parallel UPSs (please refer to **Figure 5-9 ~ 5-10** and **Figure 5-14**).



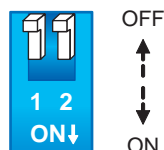
(Figure 5-14: Parallel Units Single Input Wiring Diagram)

- 3 Use the provided parallel cable to connect the parallel ports on the parallel units. Please see **Figure 3-12** for parallel port location.
- 4 Set up each UPS's parallel switch in the **ON** or **OFF** position.



**NOTE:**

When you parallel UPSs, you need to set up each UPS's parallel switch to activate parallel function. The parallel switch includes two DIP switches. To turn on a DIP switch, switch the DIP to the down position; to turn off a DIP switch, switch the DIP to the up position.

**Parallel Switch**

1. When two UPSs are paralleled, turn on each UPS's DIP switches.
2. When three UPSs are paralleled, turn off the middle UPS's DIP switches and turn on the remaining UPSs' DIP switches.
3. When four UPSs are paralleled, turn off the middle two UPSs' DIP switches and turn on the remaining UPSs' DIP switches.

5 Follow step 7 stated in section **Single Input (Single Unit)**.

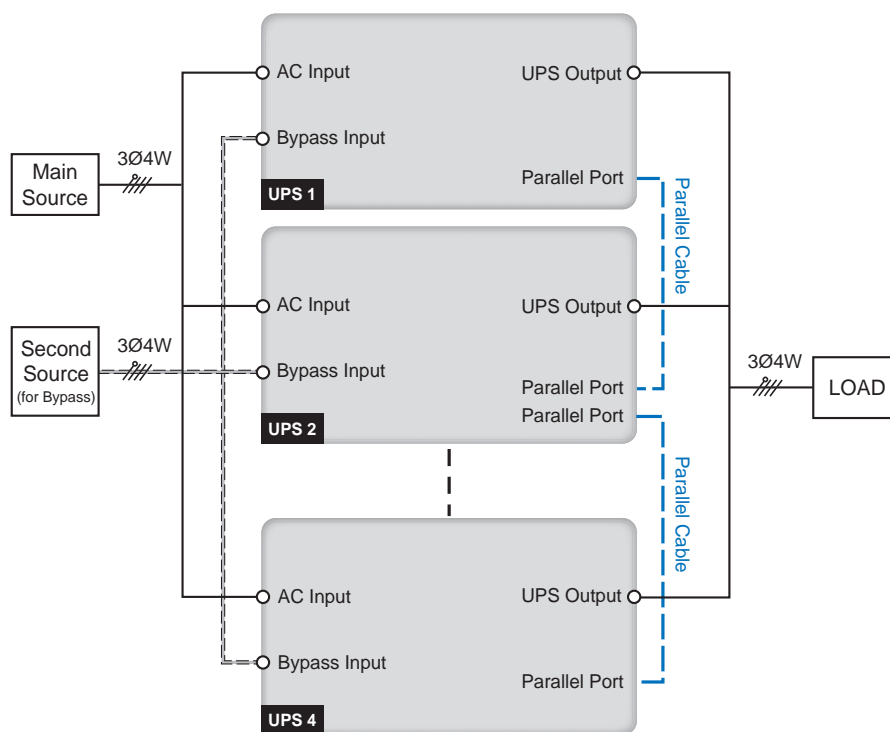
**WARNING:**

1. When UPSs are paralleled, the length of each unit's input cables/ output cables must be equal. This ensures that the parallel UPSs can equally share the equipment loads in bypass mode.
2. Only UPSs with the same capacity, voltage and frequency can be paralleled; otherwise, parallel functions will fail.
3. Before start-up of parallel units, qualified service personnel should set ID (0, 1, 2 or 3) through the LCD. Otherwise, parallel UPSs cannot be started. If the symbol '!' appears after an ID number, it indicates there is a conflict between ID numbers.

- **Dual Input (Parallel Units)**

When there are two AC power sources, parallel units' wiring procedures are as follows.

- 1 Follow **5.5.2 Single Input/ Dual Input Modification** to modify the UPS into dual input. Please note that only authorized Delta engineers or service personnel can modify single input/ dual input setup.
- 2 Please follow steps 1 ~ 5 stated in section **Single Input (Single Unit)**.
- 3 Connect the main AC source/ bypass AC source/ output/ external battery cabinet cables to the relevant wiring terminal blocks and do not forget to ground the parallel UPSs (please refer to **Figure 5-12 ~ 5-13** and **Figure 5-15**).



(Figure 5-15: Parallel Units Dual Input Wiring Diagram)

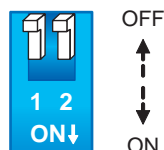
- 4 Use the parallel cable to connect the parallel ports on the parallel units. Please see **Figure 3-12** for parallel port location.
- 5 Set up each UPS's parallel switch in the **ON** or **OFF** position.



**NOTE:**

When you parallel UPSs, you need to set up each UPS's parallel switch to activate parallel function. The parallel switch includes two DIP switches. To turn on a DIP switch, switch the DIP to the down position; to turn off a DIP switch, switch the DIP to the up position.

**Parallel Switch**



1. When two UPSs are paralleled, turn on each UPS's DIP switches.
2. When three UPSs are paralleled, turn off the middle UPS's DIP switches and turn on the remaining UPSs' DIP switches.
3. When four UPSs are paralleled, turn off the middle two UPSs' DIP switches and turn on the remaining UPSs' DIP switches.

6 Please follow step 7 stated in section **Single Input (Single Unit)**.



**WARNING:**

1. When UPSs are paralleled, the length of each unit's input cables/ output cables must be equal. This ensures that the parallel UPSs can equally share the equipment loads in bypass mode.
2. Only UPSs with the same capacity, voltage and frequency can be paralleled; otherwise, parallel functions will fail.
3. Before start-up of parallel units, qualified service personnel should set ID (0, 1, 2 or 3) through the LCD. Otherwise, parallel UPSs cannot be started. If the symbol '!' appears after an ID number, it indicates there is a conflict between ID numbers.

## 5.6 External Battery Cabinet Connection Precautions



**WARNING:**

1. You can connect loads to the UPS only after the batteries are fully charged. This guarantees that the UPS can provide sufficient backup power to the loads connected when a power failure occurs.
2. A battery can present a risk of electric shock and high short-circuit current. Servicing of batteries and battery cabinets must be performed or supervised by qualified service personnel knowledgeable in batteries, battery cabinets and the required precautions. Keep unauthorized personnel away from batteries and battery cabinets.


• **Battery**

1. Charge Voltage
  - 1) Float voltage:  $\pm 163.2$  Vdc (default)
  - 2) Boost voltage:  $\pm 168$  Vdc (default)
2. Charge Current

| UPS     | 20 kVA | 30 kVA | 40K kVA | 60K kVA |
|---------|--------|--------|---------|---------|
| Default | 2A     | 3A     | 3A      | 4A      |
| Minimum | 1A     | 1A     | 1A      | 1A      |
| Maximum | 10A    | 10A    | 20A     | 20A     |

3. Low Battery Shutdown: 120Vdc (default: 120Vdc)

4. Number of Internal Batteries:

|  | 20kVA                                | 30 kVA                               | 40K kVA                              | 60K kVA                              |
|--|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| <b>Internal Battery Q'ty</b>   | 12Vdc × 48 PCS<br>(Total: 2 Strings) | 12Vdc × 72 PCS<br>(Total: 3 Strings) | 12Vdc × 72 PCS<br>(Total: 3 Strings) | 12Vdc × 96 PCS<br>(Total: 4 Strings) |
|  <b>NOTE:</b> One string includes 24 batteries. |                                      |                                      |                                      |                                      |



**NOTE:**

1. You can adjust the charge current from 2A to the maximum. Each adjustment level is 0.5A.
2. If you need to modify the charge current default setting and low battery shutdown default setting, please contact your local dealer or service personnel.
3. Only qualified service personnel can perform wiring and installation for external batteries. For external battery installation and wiring, please contact Delta service personnel. The Q'ty of external batteries in one string could be 22 PCS, 24 PCS or 26 PCS. When 22 PCS external batteries are installed for one string, please note the following:

Vbat > 123V      PF: 0.9    1

Vbat < 120V      PF: 1    0.9

4. For internal battery configuration, one string includes 24 batteries. If you would like to use the internal batteries and the external batteries at the same time, please make sure (1) the Q'ty of external batteries in one string is 24 PCS and (2) the voltage difference between the internal batteries and the external batteries is less than 5Vdc.

- Only use the same type of batteries from the same supplier. Never use old, new and different Ah batteries at the same time.
- The number of batteries must meet UPS requirements.
- Do not connect the batteries in reverse.
- Use a voltage meter to measure whether the total voltage, after the external battery cabinet connection, is around 12.5Vdc × the total number of batteries.
- When connecting the external battery cabinet to the UPS, it is compulsory to install an appropriate non-fuse DC breaker and fast-acting fuses (when short-circuit occurs, the melting current must be 5~6 times of the battery fuse's rating current).

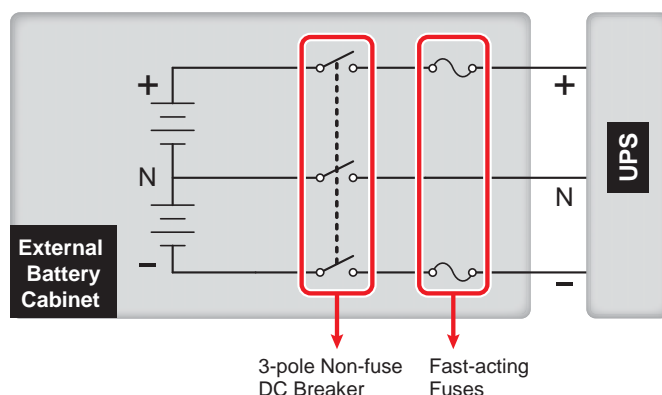


**NOTE:** Recharge time will be extended; take note of charger capacity.

- To extend battery backup time, you can connect several external battery cabinets to the UPS. Please note that the number of the batteries in each paralleled external battery cabinet must be the same.

| UPS                            | 20 kVA                         | 30 kVA                           | 40K kVA                          | 60K kVA                             |
|--------------------------------|--------------------------------|----------------------------------|----------------------------------|-------------------------------------|
| Circuit Breaker Rating Current | 75A                            | 125A                             | 150A                             | 225A                                |
| Battery Cable                  | 1 AWG<br>(35 mm <sup>2</sup> ) | 1/0 AWG<br>(50 mm <sup>2</sup> ) | 4/0 AWG<br>(95 mm <sup>2</sup> ) | 250 Kcmil<br>(120 mm <sup>2</sup> ) |
| Battery Fuse                   | 80A                            | 125A                             | 150A                             | 225A                                |

- The breaker must be a 3-pole non-fuse DC breaker with characteristics of 1-pole 125Vdc, 2-pole 300Vdc and 3-pole 450Vdc. Follow **Figure 5-16** to install a 3-pole non-fuse DC breaker and fast-acting fuses between the UPS and the external battery cabinet.



(Figure 5-16: A 3-pole Non-fuse DC Breaker and Fast-acting Fuses Installation)

- The parallel UPSs can connect with common batteries.
- Battery Alarm**

When the batteries connected to the UPS have the following problems, the UPS system will sound one of the following alarms.

| No. | Battery Status       | Alarm                        |
|-----|----------------------|------------------------------|
| 1   | Battery Test Fail    | Sounds once every 2 seconds  |
| 2   | Battery Low Warning  | Sounds once every 0.5 second |
| 3   | Battery Low Shutdown | Long beep (5 seconds)        |
| 4   | Battery Missing      | Sounds once every 2 seconds  |

## Chapter 6 : Maintenance

- **UPS**

1. UPS Cleaning:

Regularly clean the UPS, especially the vents and openings, to ensure that the air freely flows into the UPS to avoid overheating. If necessary, use an air-gun to clean the vents and openings to prevent any object from blocking or covering these areas.

2. UPS Regular Inspection:

Regularly check the UPS every half year and inspect:

- 1) Whether the UPS, LEDs, and alarm function are operating normally.
- 2) Whether the UPS works in bypass mode (normally, the UPS will work in normal mode). If yes, check if any error, overload, internal fault, etc. occurs.
- 3) Whether battery voltage is normal. If the battery voltage is too high or too low, find the root cause.

- **Battery**

The HPH 20-60kVA 208V Series UPS uses sealed lead-acid batteries. The battery life depends on the temperature, the usage, and the charging/ discharging frequency. High temperature environments and high charging/ discharging frequency will quickly shorten the battery life. Please follow the suggestions below to ensure a normal battery lifetime.

1. Keep operating temperature between 59 ~ 77°F (15 ~ 25°C).
2. When the UPS needs to be stored for an extended period of time, the batteries must be recharged once every three months and the charging time must not be less than 24 hours each time.

- **Fan**

Higher temperatures shorten fan life. When the UPS is running, please check if all fans work normally and make sure if the ventilation air can move freely around and through the UPS. If not, replace the fans.



**NOTE:**

Please ask your local dealer or customer service for more maintenance information. Do not perform maintenance if you are not trained for it.

## Appendix 1 : Technical Specifications

| Model        |                             | HPH-20K-LV-B<br>HPH-20K-LV-BN*1   | HPH-30K-LV-B<br>HPH-30K-LV-BN*1 | HPH-40K-LV-B<br>HPH-40K-LV-BN*1 | HPH-60K-LV-B<br>HPH-60K-LV-BN*1 |
|--------------|-----------------------------|---|---------------------------------|---------------------------------|---------------------------------|
| Power Rating |                             | 20kVA/20kW  | 30kVA/30kW                      | 40kVA/40kW                      | 60kVA/60kW                      |
| Waveform     |                             | Sine Wave   |                                 |                                 |                                 |
| Input        | Nominal Voltage             | 208/120Vac, 220/127Vac  |                                 |                                 |                                 |
|              | Voltage Range               | 125 ~ 253Vac (L-L)/ 72 ~ 146Vac (L-N)*2   |                                 |                                 |                                 |
|              | Frequency                   | 50/60 Hz  |                                 |                                 |                                 |
|              | Frequency Range             | 40 ~ 70 Hz  |                                 |                                 |                                 |
|              | Input Current               | 67.5A   | 100A                            | 135A                            | 200A                            |
|              | Power Factor                | > 0.99 (full load)  |                                 |                                 |                                 |
| Output       | Voltage                     | 208/120Vac, 220/127Vac  |                                 |                                 |                                 |
|              | Power Factor                | Unity   |                                 |                                 |                                 |
|              | Voltage Regulation          | ± 1%  |                                 |                                 |                                 |
|              | Voltage Harmonic Distortion | < 1.5% (linear load)  |                                 |                                 |                                 |
|              | Overload Capability         | ≤ 105%: Continuous; 105 ~ 125%: 10 minutes.;<br>125 ~ 150%: 1 minute.; > 150%: 1 second |                                 |                                 |                                 |
|              | Output Frequency            | 50/60 Hz ± 0.05 Hz  |                                 |                                 |                                 |
| Efficiency   | Online Mode                 | Up to 94%   |                                 |                                 |                                 |
|              | ECO Mode                    | Up to 98%   |                                 |                                 |                                 |
| Battery      | Type                        | SMF/ VRLA   |                                 |                                 |                                 |
|              | Battery Voltage             | ± 144 Vdc (default)   |                                 |                                 |                                 |
|              | Charge Current              | 10A   |                                 | 20A                             |                                 |
|              | Charge Voltage              | Float charge 163 ± 3 Vdc ; Boost charge 168 ± 3 Vdc (default)                           |                                 |                                 |                                 |
|              | Discharge Time*3            | 9.5 minutes<br>(9Ah × 48PCS)  | 9.5 minutes<br>(9Ah × 72PCS)    | 6.5 minutes<br>(9Ah × 72PCS)    | 5.2 minutes<br>(9Ah × 96PCS)    |

| Model                    |                             | HPH-20K-LV-B<br>HPH-20K-LV-BN*1  | HPH-30K-LV-B<br>HPH-30K-LV-BN*1 | HPH-40K-LV-B<br>HPH-40K-LV-BN*1                | HPH-60K-LV-B<br>HPH-60K-LV-BN*1 |
|--------------------------|-----------------------------|--|---------------------------------|--|---------------------------------|
| Audible Noise            |                             | < 65 dBA   |                                 | < 70 dBA                                       |                                 |
| LED & LCD                |                             | LED indicators and Multi-language LCD display  |                                 |  |                                 |
| Communication Interfaces |                             | SMART Slot × 1, MINI Slot × 1, Parallel Port × 2, RS232 Port × 1, REPO Port × 1, Charger Detection Port × 1, Input Dry Contact × 2, Output Dry Contact × 6 |                                 |  |                                 |
| Environ-<br>ment         | Operating Altitude          | 3280 ft (without derating)<br>1000 meters (without derating)   |                                 |  |                                 |
|                          | Operating Temperature       | 32 ~ 104°F (0 ~ 40°C)  |                                 |  |                                 |
|                          | Ambient Storage Temperature | 5 ~ 104°F (-15 ~ 40°C)   |                                 |  |                                 |
|                          | Relative Humidity           | 0 ~ 95% (non-condensing)   |                                 |  |                                 |
| Physical                 | Dimensions (W x D x H)      | 20.5" x 31.5" x 54.3"<br>(520 x 800 x 1380 mm)   |                                 | 20.5" x 31.5" x 69.3"<br>(520 x 800 x 1760 mm) |                                 |
|                          | Weight (with batt.)         | 749.6 lb<br>(340 kg)   | 925.9 lb<br>(420 kg)            | 992.1 lb<br>(450 kg)                           | 1168.4 lb<br>(530 kg)           |
|                          | Weight (without batt.)      | 432.1 lb<br>(196 kg)   | 449.7 lb<br>(204 kg)            | 515.9 lb<br>(234 kg)                           | 533.5 lb<br>(242 kg)            |



**NOTE:**

1. Refer to the rating label for the safety rating.
2. All specifications are subject to change without prior notice.
3. <sup>\*1</sup> : UPS with this model has no batteries inside.
4. <sup>\*2</sup> : When input voltage range is 72 ~ 108Vac (L-N) and 125 ~ 187Vac (L-L), the sustainable loading is from 63% to 100% of UPS capacity.
5. <sup>\*3</sup> : At 70% load with internal batteries.



## Appendix 2 : Warranty

Seller warrants this product, if used in accordance with all applicable instructions, to be free from original defects in material and workmanship within the warranty period. If the product has any failure problem within the warranty period, Seller will repair or replace the product at its sole discretion according to the failure situation.

This warranty does not apply to normal wear or to damage resulting from improper installation, operation, usage, maintenance or irresistible force (i.e. war, fire, natural disaster, etc.), and this warranty also expressly excludes all incidental and consequential damages.

Maintenance service for a fee is provided for any damage out of the warranty period. If any maintenance is required, please directly contact the supplier or Seller.

**WARNING:**

The individual user should take care to determine prior to use whether the environment and the load characteristic are suitable, adequate or safe for the installation and the usage of this product. The User Manual must be carefully followed. Seller makes no representation or warranty as to the suitability or fitness of this product for any specific application.



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