Powerware®

9170+ UPS

3–18 kVA,
50 and 60 Hz

USER'S GUIDE

www.powerware.com

POWERWARE®

Requesting a Declaration of Conformity

Units that are labeled with a CE mark comply with the following harmonized standards and EU directives:

- Harmonized Standards: EN 50091-1-1 and EN 50091-2; IEC 950 Third Edition
- EU Directives: 73/23/EEC, Council Directive on equipment designed for use within certain voltage limits
  93/68/EEC, Amending Directive 73/23/EEC
  89/336/EEC, Council Directive relating to electromagnetic compatibility
  92/31/EEC, Amending Directive 89/336/EEC relating to EMC

The EC Declaration of Conformity is available upon request for products with a CE mark. For copies of the EC Declaration of Conformity, contact:

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Class A EMC Statements

FCC Part 15

NOTE This equipment has been tested and found to comply with the limits for a Class A 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 commercial 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

ICES-003

This Class A Interference Causing Equipment meets all requirements of the Canadian Interference Causing Equipment Regulations ICES-003.

Cet appareil numérique de la classe A respecte toutes les exigences du Reglement sur le matériel brouilleur du Canada.

EN 50091-2

Some configurations are classified under EN 50091-2 as "Class-A UPS for Unrestricted Sales Distribution." For these configurations, the following applies:

WARNING This is a Class A-UPS Product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take additional measures.

VCCI Notice

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Table of Contents

Chapter 1 Introduction

The Powerware 9170+ uninterruptible power system (UPS) is a modular UPS that contains battery modules and power control modules (referred to as power modules). These modules plug into a rack cabinet structure containing additional control, communication, and display functions that enable integrated control of all power modules. The UPS is housed in a single cabinet, with extra battery capacity housed in auxiliary battery cabinets.

The pluggable power modules can be removed and replaced (hot-swapped) without powering the UPS down if the UPS has sufficient redundant capacity. Battery modules may also be hot-swapped for maintenance. Power control circuitry in the cabinet senses problems in power modules, and automatically transfers control and load to the remaining power modules.

All power modules share the load requirements equally. For example, three power modules are capable of supplying a total of 9 kVA. If a load requires only 4.5 kVA, each power module supplies 1.5 kVA to the output. If one power module is removed or for some reason fails, each of the two remaining power modules would supply half of the load, or 2.25 kVA. In other words, redundancy exists when the load can be supplied by less than all of the installed power modules.

The UPS can be configured with up to seven power and/or optional battery charger modules; its output is limited such that an excess number of power modules allow the failure of one or more modules without causing the UPS to lose any functionality.

To permit UPS removal from the power path, while maintaining power to the loads, an external bypass switch is required. This switch is optional but recommended for system serviceability.

Safety Warnings

Read the following precautions before you install the UPS.

IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS

This manual contains important instructions that you should follow during installation and maintenance of the UPS and batteries. Please read all instructions before operating the equipment and save this manual for future reference.

CAUTION

- Split-phase power modules (model ASY-0673) have brown labels on the front and produce two output voltages: 100/100 for 200, 110/110 for 220, 120/120 for 240, 120/120 for 208, or 127/127 for 220 Vac. Universal power modules (model ASY-0674) have black labels on the front and produce a single output voltage: 200, 208, 220, 230, or 240 Vac. DO NOT mix the two types of power modules in the same Powerware 9170+ cabinet.
- Do NOT install more than seven power and/or optional battery charger modules in the system.
- Battery modules to be used in the Powerware 9170+ system are model ASY-0529. Each battery module weighs 30 lb (14 kg). Use care in lifting and moving battery modules.
- All input and output wiring must be copper and adequate to carrying currents as listed in Table 16 and Table 17 on pages 97 and 99.
- Torque all bolts holding input and output power conductors to values specified in Table 2 on page 22.
- The user is required to provide power input and output disconnect devices for the UPS. These must be within sight of the UPS and easily accessible. For a plug-receptacle unit, the plug serves as the power input disconnect device, which must also be readily accessible.

Physical Features

The Powerware 9170+ UPS is available in four cabinet sizes. Figure 1 through Figure 6 show the 3-slot and 9-slot configurations and identify basic Powerware 9170+ system features. Six-slot and 12-slot cabinets are also available; external battery cabinets are available in 6-, 9-, and 12-slot sizes.

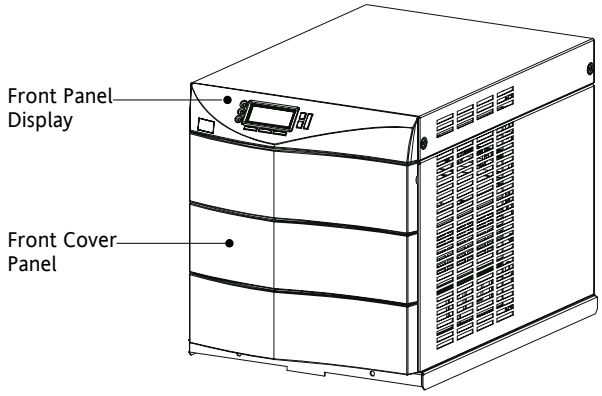


Figure 1. Three-Slot Cabinet (Front View)

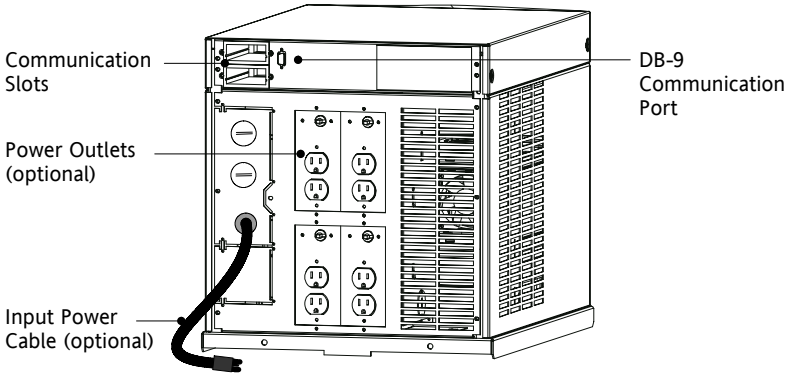


Figure 2. Three-Slot Cabinet (Rear View)

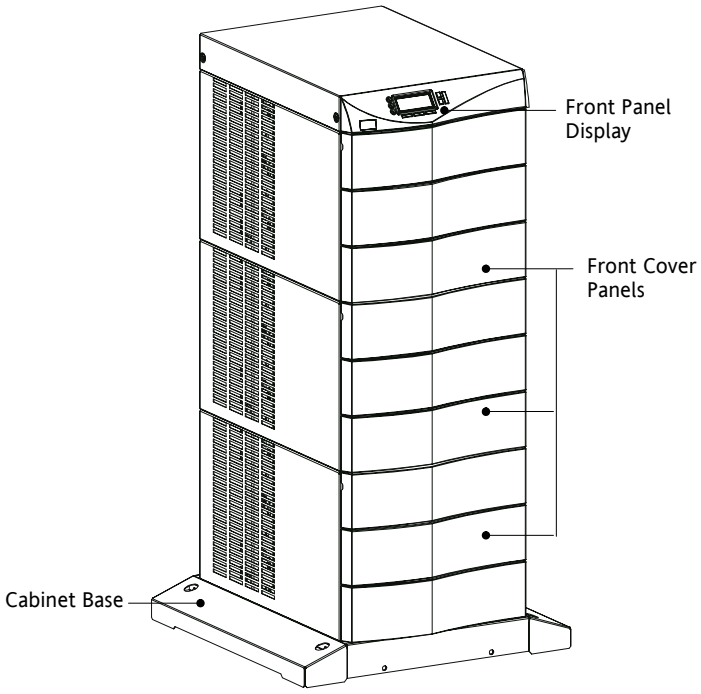


Figure 3. Nine-Slot Cabinet (Front View)

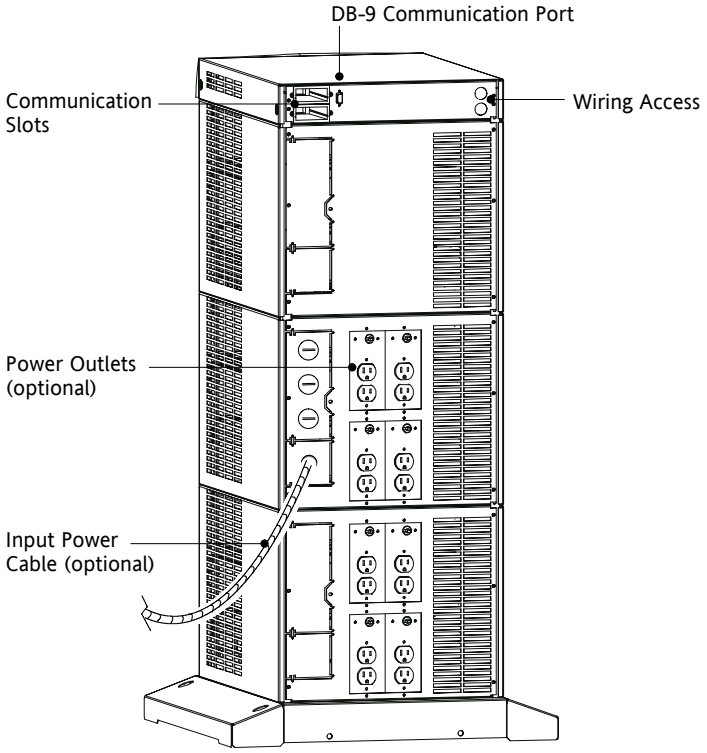


Figure 4. Nine-Slot Cabinet (Rear View)

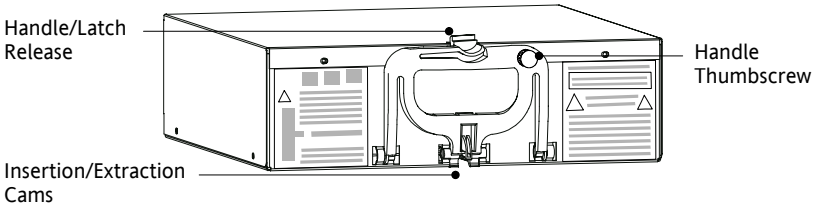


Figure 5. Power Module (ASY-0673 and ASY-0674)

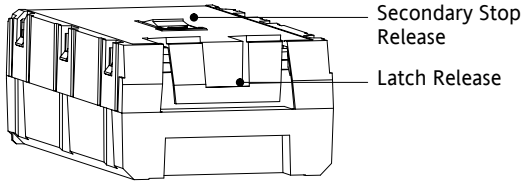


Figure 6. Battery Module (ASY-0529)

Chapter 2 | Installation Setup

This chapter explains how to setup and install the Powerware 9170+ cabinets:

- Setup, including clearances and location requirements
- Caster cart installation
- Stabilizer bracket installation (for 12-slot cabinets with non-isolated output)
- Rack-mount installation (for three- and six-slot cabinets)
- Floor anchor kit installation
- Moving the cabinets

Equipment Clearances

All cabinet sizes require the following clearances to allow for servicing and adequate ventilation:

- From the side panels: 6″ (15.2 cm)
- Top and back: 12″ (30.5 cm)
- Front: 36″ (91.5 cm)

If flexible conduit connects the UPS to the service input and load distribution panels, you may be able to gain access for servicing by moving the UPS. If this is the case, you must still leave 12″ (30.5 cm) clearance at the back and 6″ (15.2 cm) at the sides of the UPS for ventilation.

NOTE *Do not block the ventilation holes on each side and the back of the unit.*

Nine- and 12-slot external battery cabinets may be installed with bases tight against the UPS cabinet base and against each other. Six-slot cabinets require 6″ of separation.

Location Requirements

Install the Powerware 9170+ UPS as close as possible to the equipment or the load distribution panel it will protect. If this distance is more than 25 ft (7.6m), transient noise can reappear in the electrical distribution system.

If a separate external battery cabinet is installed, the battery cabinets must be adjacent to the Powerware 9170+ UPS. If the batteries will be further from the unit than the standard cables allow, contact your service representative or your local distributor for assistance.

UPS Setup

The Powerware 9170+ UPS is shipped in a carton on a shipping pallet. Power and battery modules are shipped in separate boxes on another pallet. Three-slot cabinets and modules are shipped on one pallet. Refer to the unpacking instruction sheet (LTS-1724) packed inside the UPS shipping carton.

NOTE *Verify that all Powerware 9170+ UPS power modules are the proper type for the UPS cabinet: Split-phase power modules have brown labels; universal (single-phase) power modules have black labels. Do not mix brown and black modules in the same UPS cabinet.*

Three- and Six-Slot Cabinets

NOTE *Do not attempt to lift the cabinet by the module shelves or other convenient edges or panels.*

1. If an optional caster cart is included for cabinet mobility, see "Caster Cart Installation" on page 10 for information about mounting the cabinet on the cart and stabilizing it using the cart foot pads.
2. After placing the cabinet in its intended operating location, cut the lifting straps or slip them off the cabinet base tabs.

3. If you are installing an external battery cabinet, continue to "Battery Cabinet Installation" on page 57.

   If you do not have an external battery cabinet, continue to "UPS Startup" on page 63 for plug-receptacle units. For hardwired units, continue to "UPS with Bypass Electrical Installation" on page 19 or "UPS Electrical Installation" on page 37.

Nine- and Twelve-Slot Cabinets

NOTE *The 12-slot Powerware 9170+ UPS cabinet with non-isolated output is shipped with two stabilizer brackets. These brackets must be attached to the wall or the floor behind the UPS cabinet (see page 11).*

CAUTION

Do NOT lower the casters or attempt to move the cabinet with the power or battery modules installed.

1. Lower the four cabinet casters (one at each corner of the cabinet base) by using a 1/2″ hex-style socket wrench to turn each bolt clockwise.
2. With all casters fully extended, carefully roll the cabinet down the ramp and to its intended operating location.
3. To stabilize the cabinet in its operating location, turn the four caster bolts counter-clockwise until the cabinet rests on the floor. Place a plastic cap into each bolt access hole.

NOTE *If the floor is uneven and the cabinet is tilted or unstable, you may need to place a thin steel plate under a corner.* **Do not use the caster bolts to level the cabinet.**

4. If you are installing an external battery cabinet, continue to "Battery Cabinet Installation" on page 57.

   If you do not have an external battery cabinet, continue to "UPS Startup" on page 63 for plug-receptacle units. For hardwired units, continue to "UPS with Bypass Electrical Installation" on page 19 or "UPS Electrical Installation" on page 37.

Caster Cart Installation

An optional caster cart (ASY-0527) is available for 3- and 6-slot cabinets for increased mobility of the UPS (see Figure 7).

NOTE *The UPS cabinet is heavy. This procedure requires two people to lift and position the cabinet onto the caster cart. Lift the cabinet using four lifting straps shipped with the cabinet; do not attempt to lift the cabinet by the module shelves or other convenient edges or panels.*

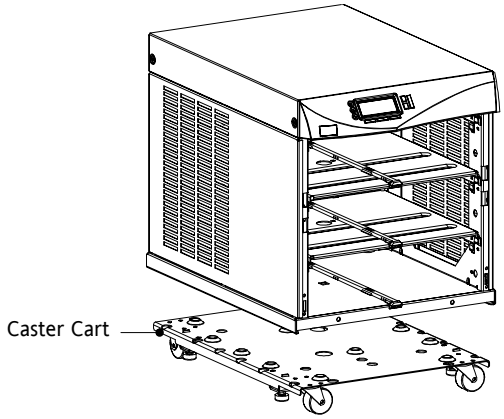


Figure 7. Three-Slot Cabinet Being Lowered onto Caster Cart

1. Place the caster cart (shipped separately from the UPS cabinet) under the cabinet before installing power and battery modules and before making connections to the intended power source.

   The cart requires no bolts or other hardware to fasten it to the UPS cabinet. It is shaped to fit securely under the cabinet, ensuring proper alignment after placing the cabinet on the cart.

2. Four foot pads under the cart keep the cart from rolling when it is in its intended location. Turn each threaded foot to lower it to the floor. When the foot is tight against the floor, turn the lock nut on the threaded foot up tight against the bottom of the cart to keep the foot from rotating.

3. If leveling of the UPS is required, use the foot pads to raise a side or corner before locking them with their lock nuts.

Stabilizer Bracket Installation (Twelve-Slot Cabinet Only)

The 12-slot Powerware 9170+ UPS cabinet with non-isolated output is shipped with two stabilizer brackets. These brackets must be attached to the wall or the floor behind the UPS cabinet. Under all module-loading conditions, they act as a protective stop to prevent the cabinet from falling forward if it is unintentionally pushed away from the wall.

Each bracket has holes that enable it to be attached by screws to either the wall or the floor (or both) behind the intended cabinet installation (see Figure 8). The stabilizer brackets are not attached to the cabinet base itself.

Use the following steps to install the stabilizer brackets:

1. Select the location for the brackets, approximately 12–16″ (30–41 cm) apart, at the floor/wall intersection behind the intended cabinet location.
2. Using the proper type of **customer-supplied screws** for the intended mounting surface, attach each bracket as shown in Figure 8. All screws must be driven into structural material such as wall studs.
3. Roll the UPS cabinet to its intended location. Position the rear section of the cabinet base under the open ends of the stabilizer brackets as far as the cabinet will go.
4. Turn all four caster bolts counter-clockwise until the cabinet rests on the floor. Place a plastic cap into each bolt access hole.

NOTE *If the floor is uneven and the cabinet is tilted or unstable, you may need to place a thin steel plate under a corner.* **Do not use the caster bolts to level the cabinet.**

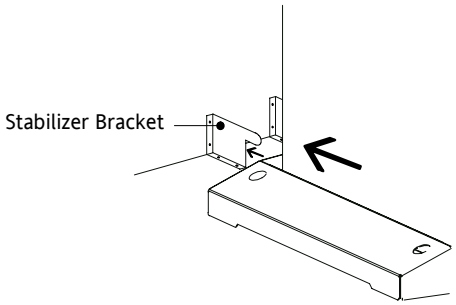


Figure 8. Stabilizer Bracket Installation

Rack-Mount Installation (Three- and Six-Slot Cabinet)

NOTE *For nine- and 12-slot cabinets, follow the installation instructions with the nine- and 12-slot rack-mount kit.*

The 3- and 6-slot UPS cabinets may be installed in an EIA-standard 19″ (48.3-cm) equipment rack. An optional rack-mounting kit (ASY-0547), containing brackets and required hardware, is available for such an installation. For each 3-slot section, use the following mounting procedure to convert the UPS cabinet and install it in the equipment rack:

NOTE *The UPS cabinet is heavy (see page 102). This procedure requires two people to lift and position the cabinet into the equipment rack. Install the cabinet in the rack before installing power and battery modules and before making connections to the intended power source.*

1. Remove the four screws (two on either side) securing the top cover of the UPS cabinet. Carefully lift the cover straight up and off to avoid stressing the front panel display. Set the cover aside.
2. Remove the two cabinet side panels (4 panels in 6-slot cabinets) by lifting the top edge. No other hardware must be detached. Store or discard the side panels.

3. Carefully replace the UPS cabinet top cover and secure with the four screws removed in Step 1. Position the cover lip to fit behind the front panel display.

4. Install three metal clip-nuts onto each side flange (6 clip-nuts on 6-slot cabinets) along the front of the UPS cabinet (see Figure 9).

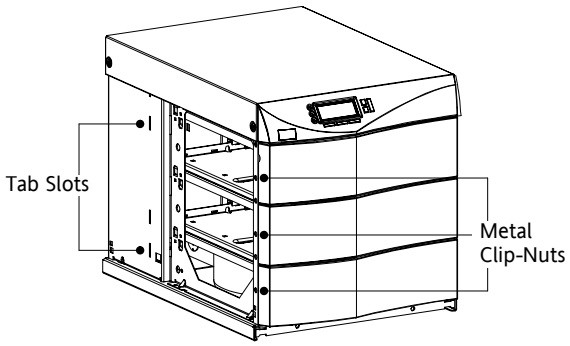


Figure 9. Metal Clip-Nut and Tab Slot Locations

5. Install a rack-mount ear (2 for 6-slot cabinets) on each side of the UPS cabinet (see Figure 10).

Insert the two offset tabs on the rear edge of the ear into the matching tab slots on the cabinet side frame (see Figure 9). Pivot the ear forward until it is flush against the UPS cabinet side frame. Using three 1/4-20 × 1/2″ Phillips-head bolts, screw the bolts into the metal clip-nuts installed in Step 4.

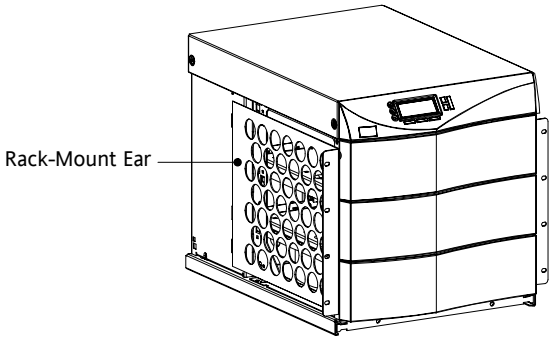


Figure 10. Rack-Mount Ear Installed

6. Select the position for the UPS in the equipment rack.

7. Install one equipment rail on each side of the rack using four 10-32 × 1/2″ flat-head screws per rail. Select the proper holes in the rail that position the UPS at the desired location in the rack (see Figure 11).

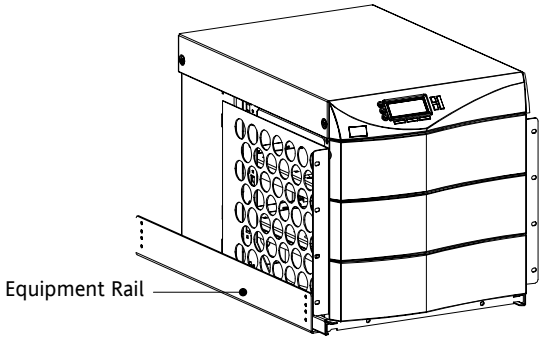


Figure 11. Rails Holding UPS

8. With one person lifting each side of the UPS cabinet, position the cabinet onto the two equipment rails.

   Carefully slide the UPS into the equipment rack until the rack-mount ears of the cabinet are flush with the front vertical rails of the rack. Verify that the holes in the ears align with the holes in the rack.

9. Secure the UPS in the rack using eight 10-32 × 1/2″ torx screws (16 for 6-slot cabinets) or other appropriate customer-specified screws.

Floor Anchor Kit Installation

An optional floor anchor kit (ASY-0548) is available for all sizes of the Powerware 9170+ UPS. The kit helps to stabilize the UPS or battery cabinet in the event of accidental bumps or small floor movements. Any testing to specific seismic requirements is the responsibility of the customer.

The floor anchor brackets, shipped separately from the UPS and battery cabinet, should be attached inside the lower front and rear edges of the cabinet before installing power and battery modules and before making connections to the intended power source.

Use mounting hardware supplied with the floor anchor kit to attach the brackets to the UPS or external battery cabinet (see Figure 12). The customer is responsible for specifying and supplying floor mounting bolts.

Mounting Centers for 5/16″ (8-mm) Floor Bolts	
Dimension (see Figure 12)	Measurement
A	14.5″ (36.8 cm)
B (3- and 6-slot cabinets)	30.25″ (76.8 cm)
B (9- and 12-slot cabinets)	34.25″ (87 cm)

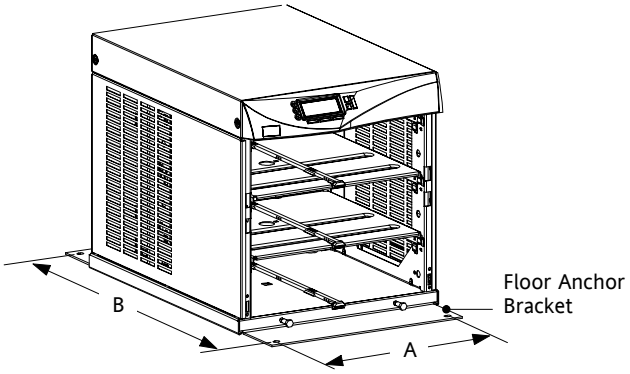


Figure 12. Floor Anchor Brackets Bolted to UPS Cabinet

Moving the Cabinets

CAUTION

Do NOT attempt to raise the cabinet with the power or battery modules installed.

The Powerware 9170+ UPS and the battery cabinet are very heavy with power and battery modules installed. Before moving the cabinets, remove the power and battery modules. Move the modules separately from the cabinets.

The 3- and 6-slot cabinets may be ordered with a caster cart to enable moving the cabinet. “Caster Cart Installation” on page 10 describes how to set the four foot pads on this cart to keep the cabinet from rolling when properly positioned.

The 9- and 12-slot cabinets have casters built into the cabinet base. Use the following procedure to raise the cabinet before rolling it on its casters.

1. Ensure that the cabinet contains no power or battery modules.
2. **For 12-slot cabinets with non-isolated output only.** Slide the cabinet base out from under the stabilizer brackets in the rear section of the cabinet base.

   Remove the stabilizer brackets from the floor/wall. Follow the instructions in “Stabilizer Bracket Installation” on page 11 to reinstall the stabilizer brackets in the new location.
3. Locate the four plastic caps covering the caster bolts. They are at the corners of the cabinet base.
4. Pry the caps out of the bolt access holes.
5. Use a 1/2″ hex-style socket wrench to turn each of the four bolts clockwise. Doing so lowers the casters to allow the cabinet to roll on the casters.

6. After rolling the cabinet to its intended position, turn all four caster bolts counter-clockwise until the cabinet rests on the floor. Place a plastic cap into each bolt access hole.

NOTE *If the floor is uneven and the cabinet is tilted or unstable, you may need to place a thin steel plate under a corner.* **Do not use the caster bolts to level the cabinet.**

7. After properly positioning and leveling the cabinet, insert power and battery modules into the cabinet as described in "UPS Startup" on page 63.

Chapter 3 | UPS with Bypass Electrical Installation

NOTE *If you have a plug-receptacle unit, continue to "Battery Cabinet Installation" on page 57 for installing optional battery cabinets or to "UPS Startup" on page 63.*

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the electrical installation. Risk of electrical shock.

The Powerware 9170+ UPS input power may be hardwired through conduit to either a main power source circuit breaker or to an optional external bypass switch. For hardwired installations, it is recommended that you install a Powerware bypass switch to enable power transfer during maintenance or UPS downtime. If a bypass switch is used, both UPS input and UPS output must be hardwired–**through separate conduits**–to the bypass switch, as shown in Figure 13.

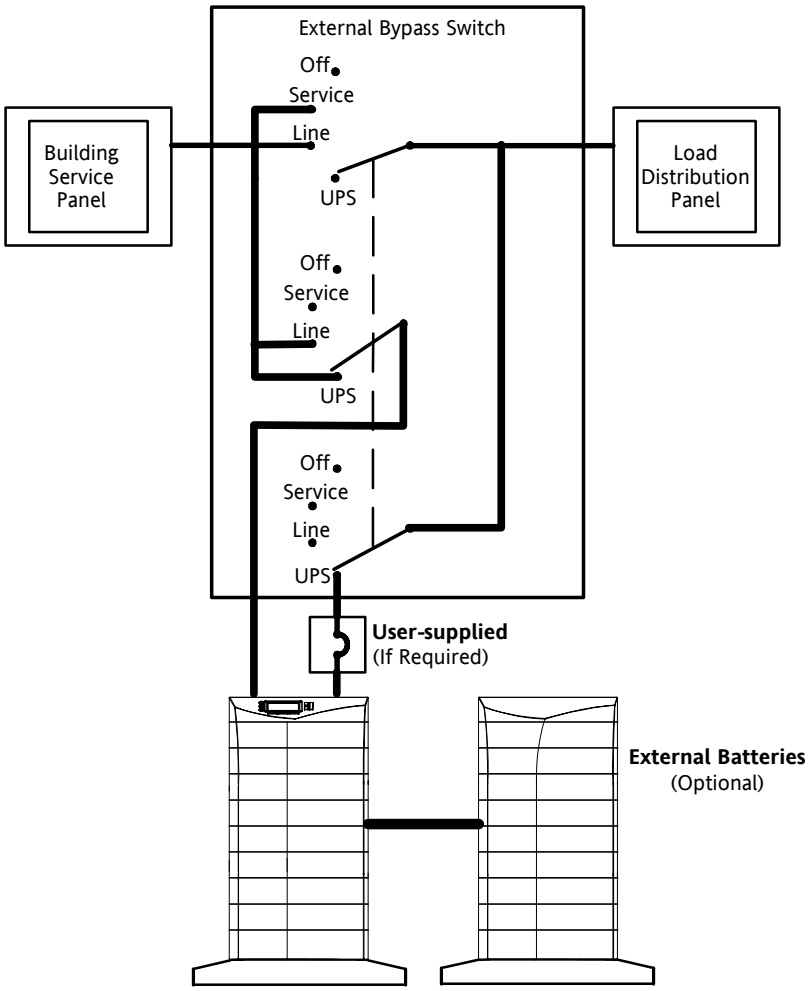


Figure 13. Typical Installation with a Bypass Switch

Input Current Ratings

Table 1 contains the required circuit breaker ratings for hardwired installations. Circuit breaker ratings for units having an input line cord are determined by the current capacity of the line cord.

Table 1. Required Input Circuit Breaker Sizes (200–240 Vac, 50/60 Hz)

UPS Capacity	Input Circuit Breaker Rating
3 kVA	25A
6 kVA	40A
9 kVA	60A
12 kVA	80A
15 kVA	100A
18 kVA	125A

NOTE *If you are installing an optional battery charger module, refer to that user's guide (164201399) for the proper input circuit breaker sizes and ratings.*

NOTE *To accommodate the feature of easy system expandability, it is recommended that initial installation of the Powerware 9170+ UPS contain wiring to support the maximum capacity of the UPS cabinet: 3 kVA for 3-slot cabinets; 9 kVA for 6-slot cabinets; 18 kVA for 9- and 12-slot cabinets.*

See Table 2 for recommended conductor sizes to wire the input circuit breakers.

Table 2. Recommended Wire Sizes

Input Circuit Breaker Size	75°C Copper Wire Size	Conductor Screw Torque
25A	10 AWG (5.3 mm^2)	35 in lb (4.0 Nm)
40A	8 AWG (8.4 mm^2)	40 in lb (4.5 Nm)
60A	4 AWG (21.2 mm^2)	45 in lb (5.1 Nm)
80A	3 AWG (26.7 mm^2)	50 in lb (6.6 Nm)
100A	2 AWG (33.6 mm^2)	50 in lb (6.6 Nm)
125A	1 AWG (42.1 mm^2)	50 in lb (6.6 Nm)

FOR U.S. INSTALLATIONS, READ THIS IMPORTANT NOTE!

This table lists the AWG and mm^2 wire size for each circuit breaker size shown on the wiring diagrams. The minimum recommended circuit breaker sizes for each model and voltage application are listed on the wiring diagrams.

Conductor sizes shall be no smaller than the 75°C wire size based on the ampacities given in Table 310–16 of the National Electrical Code, ANSI/NFPA 70-1999, and article 220. All circuit conductors, including the neutral conductor, must be the same size (ampacity) wire. Code may require a larger AWG size than shown in this table because of temperature, number of conductors in the conduit, or long service runs. **Follow local code requirements.**

Bypass Switches

Bypass switches are available in two types: Make-Before-Break (MBB) and Break-Before-Make (BBM).

An MBB switch makes a new connection before it breaks the original connection. For example, if you turn an MBB switch from UPS to LINE, the bypass switch connects the load to AC input power before disconnecting the load from UPS output power. (As noted in Figure 38 on page 55, MBB switches may not be used in certain system configurations.)

A BBM switch breaks the original connection before it makes a new one. If you turn a BBM switch from UPS to LINE, the switch disconnects the load from UPS output power before connecting the load to AC input power.

The bypass switch has four positions as described in Table 3.

NOTE *In the UPS or LINE position, AC input power is still connected to the input terminals inside the UPS.*

Table 3. Bypass Switch Positions

Switch Position	Description
LINE	Connects the load directly to AC input power and disconnects UPS output. AC input power is still connected to the UPS input.
OFF	Disconnects the load from the UPS output power and AC input power, as well as AC input power to the UPS input.
UPS	Connects the UPS output to the load.
SERVICE	Like the LINE position, SERVICE connects the load directly to AC input power and disconnects UPS output. **However, because SERVICE also disconnects AC input from the UPS, this is the appropriate position for UPS maintenance or repair.**

To disconnect AC input power during maintenance or service, turn the bypass switch to the SERVICE position. For MBB switches, you must press the red button beside the switch before you can change the switch position.

Table 4 shows the bypass switch models available for the Powerware 9170+ UPS.

Table 4. Bypass Switch Specifications

Bypass Switch Models		Rating, Continuous	See Figure 14					Weight
BBM	MBB		Height (A)	Width (B)	Depth (C)	Mounting Centers (D)	(E)	
BPE12BBM1A	BPE12MBB1A	40A/300 Vac (CSA) 50A/300 Vac (UL,TÜV)	21.0″ (53.4 cm)	14.0″ (35.6 cm)	6.8″ (17.2 cm)	11.0″ (28.0 cm)	20.0″ (50.8 cm)	27 lb (12.3 kg)
BPE14BBM1A	BPE14MBB1A	80A/300 Vac	21.0″ (53.4 cm)	14.0″ (35.6 cm)	6.8″ (17.2 cm)	11.0″ (28.0 cm)	20.0″ (50.8 cm)	31 lb (14.1 kg)
BPE20BBM1A	BPE20MBB1A	125A/300 Vac	21.0″ (53.4 cm)	14.0″ (35.6 cm)	6.8″ (17.2 cm)	11.0″ (28.0 cm)	20.0″ (50.8 cm)	35 lb (15.9 kg)

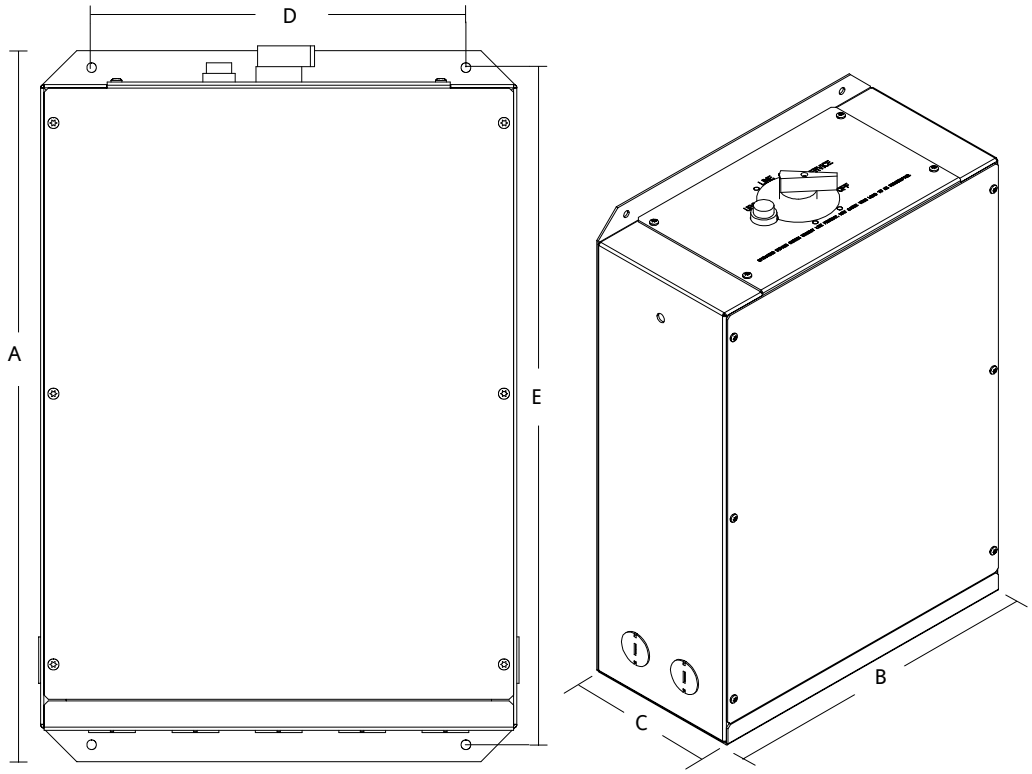


Figure 14. Bypass Switch Mounting Dimensions

UPS Installation with an External Bypass Switch

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the electrical installation. Risk of electrical shock.

CAUTION

To prevent electrical shock or damage to the equipment, verify that the Powerware 9170+ UPS is OFF before you remove the entrance panel. The circuit breaker or disconnect switch must also be off at the AC input service panel. Also, turn OFF the AC disconnect and bypass switches before you connect any wires to the bypass switch terminal strip.

1. Mount the bypass switch within sight of the UPS. If you do not have a Powerware bypass switch or the fuse box or panel is out of sight, you must install a separate disconnect switch next to the UPS.

   The bypass switch should be mounted securely to a sturdy surface. You may need to turn the cabinet 90 degrees (on its side) to enable operator access to the switch handle.

2. Remove the six screws in the bypass switch front panel and remove the panel. Remove any packing material inside the bypass switch.

   Remove knockouts in the bottom of the bypass switch for AC Line Input, AC to UPS Input, AC from UPS Output, and AC to the UPS load.

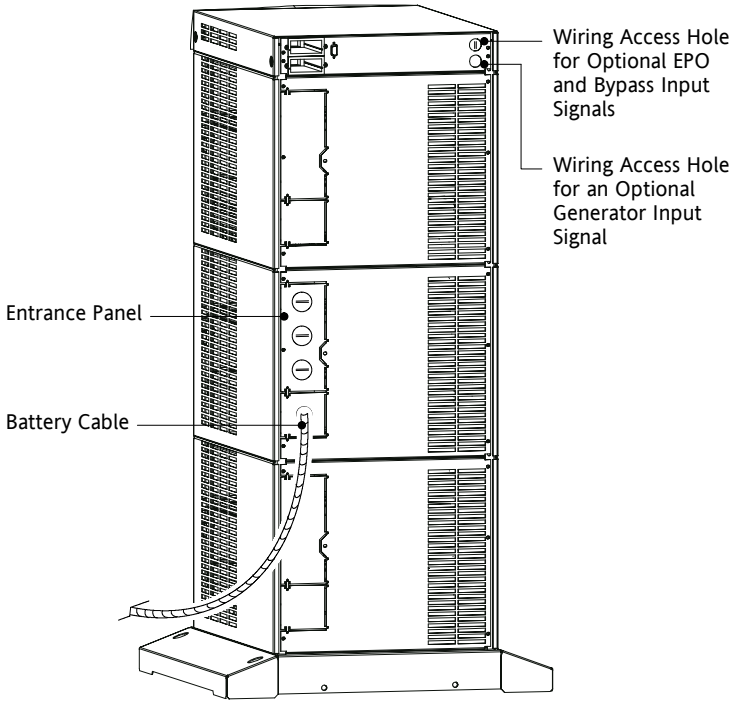


Figure 15. UPS Power Entrance Panel (Nine-Slot Cabinet Shown)

3. Unscrew and remove the rear panel(s) of the UPS (top panel on 3- or 6-slot; top 2 panels on 9- and 12-slot). See Figure 15.

The entrance panel contains knockout openings for entrance and exit conduits and for conduit to an optional external battery cabinet. The entrance panel is located on the top 3-slot section for 3- and 6-slot cabinets; on the second section for 9- and 12-slot cabinets as shown in Figure 15.

Wiring for optional emergency power-off (EPO) and bypass input signals passes through the opening at the top back of the cabinet. Wiring for an optional generator input signal must pass through a separate opening. Installing this wiring is described in Steps 12 and 13 on page 31.

4. Remove the knockouts in the entrance panel for AC input and AC output wiring.

5. Install the conduit adapters. AC input and AC output conductors must be run through separate conduits. UPS output circuits must be installed in dedicated conduit systems and not shared with other electrical circuits.

6. Find the terminal strip inside the bypass switch cabinet. Using the label on the back of the bypass switch access panel and the proper installation wiring diagram, make the terminal strip connections and tighten all connections as specified in Table 2 on page 22. Use copper wire that is the appropriate size for the current draw. Figure 16 shows a sample label.

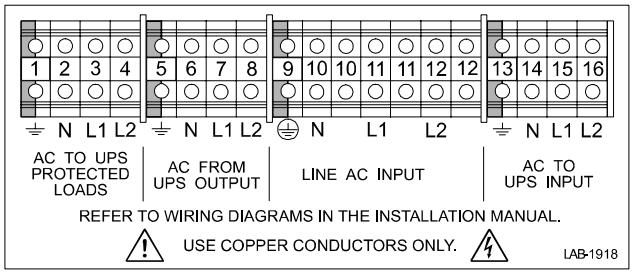


Figure 16. Bypass Switch Wiring Label

7. After installing bypass switch wiring, torque the screws holding all input and output power conductors to the values specified in Table 2 on page 22.

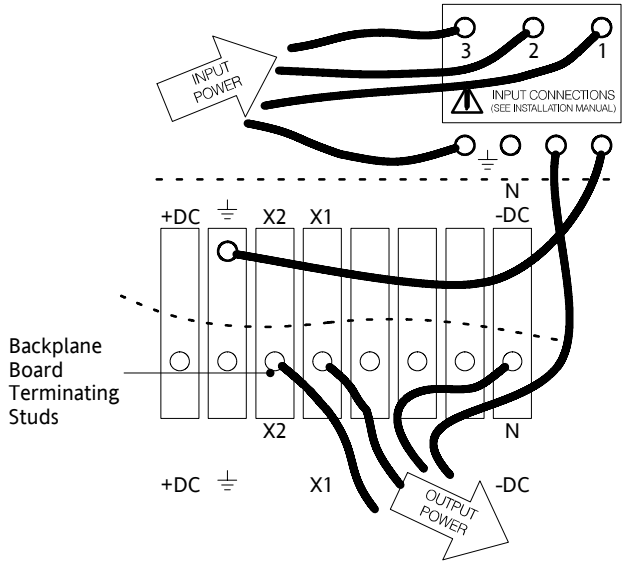


Figure 17. UPS Input and Output Terminals

8. Wire the UPS for the proper input voltage as shown in Figure 18.

Split-phase power modules (model ASY-0673, with brown labels on the front) is capable of supplying two output voltages: 100/100 for 200, 110/110 for 220, 120/120 for 240, 120/120 for 208, or 127/127 for 220 Vac, as selected through the front panel display. These modules produce two output voltages, typically required in North America, South America, and Japan.

Universal power modules (model ASY-0674, with black labels on the front) is capable of supplying a single-phase output voltage: 200, 208, 220, 230, or 240 Vac, as selected through the front panel display. These modules produce a single output voltage, typically required in Europe, the Middle East, Asia, and Africa.

CAUTION

Confirm that the UPS is wired for the proper input voltage as shown in Figure 18, and that the proper power modules (either split-phase or universal) are installed to produce the desired output voltage. Do not mix the two types of power modules in the same UPS cabinet.

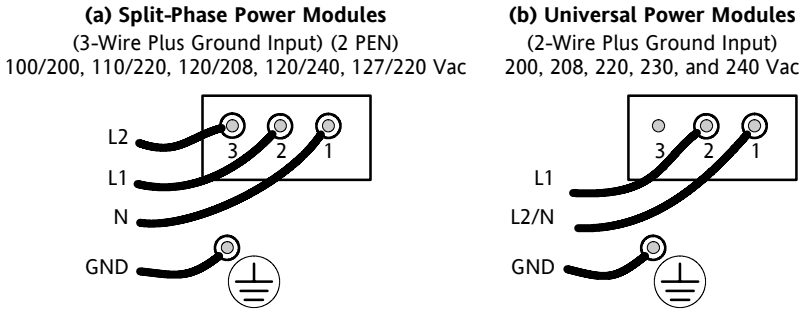


Figure 18. UPS Input Wiring

9. **For isolated output only.** See Chapter 5, "Isolated Output Wiring Diagrams" on page 51 to complete the wiring for isolated output.

10. See the wiring diagrams beginning on page 32 which show output configurations for various voltages and isolation options. Make UPS output connections on the backplane board terminating studs. Compression lugs (supplied in the accessory kit) may be installed on the proper terminating studs. Wires may also be terminated with ring terminals, which are attached to the output terminating studs.

    Figure 19 and Figure 20 describe output wiring configurations for various output voltages. You must also set the operating menu parameter 4-2-4 for the required output voltage as shown in the wiring configuration drawings.

NOTE *For Powerware 9170+ UPS models with low-voltage hardwire output, it is recommended to divide the total load as equally as possible between X1 and X2, as shown in Figure 19.*

NOTE *Failure to balance the loads may cause an overload alarm even if the full capacity of the UPS has not been reached.*

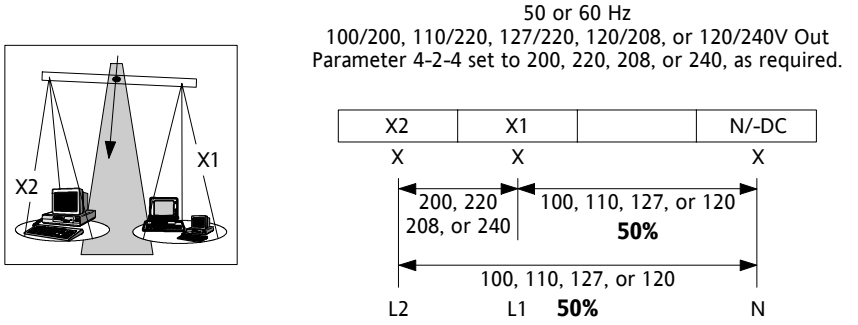


Figure 19. Split-Phase Power Modules with Non-Isolated Output

NOTE *The factory-default wiring for all high-voltage receptacles in a chassis without a power cord is 3-wire plus ground input. If you have a Universal Power Module (ASY-0674), all receptacles MUST be re-wired for a 2-wire plus ground input configuration as shown in Figure 20.*

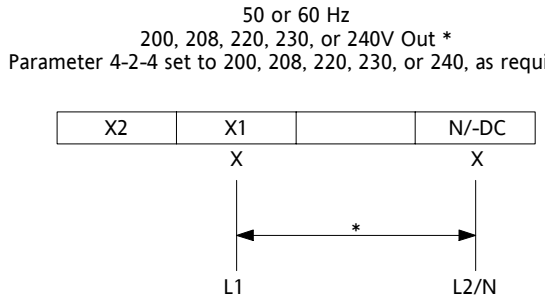


Figure 20. Universal Power Modules with Non-Isolated Output

11. If the bypass switch is an MBB style, notice the cable routed out of the left side of the bypass switch cabinet. The red and black pair of wires (normally open) in this cable must be connected to terminals 3 and 4 in Steps 12 and 13. (Do not connect the white and black pair of wires in this cable.)

12. If any external hardwired control signals are required (EPO or Generator On), unscrew and remove the top rear panel of the cabinet and locate the terminal block (see Figure 21).

CAUTION

EPO and external bypass circuits are not isolated from line voltage, and wiring must be installed according to local codes using conduit or suitable primary supply cables.

The Generator On signal is isolated from line voltage and can be treated as NEC Class 2 wiring.

Use 14–20 AWG, 600V wire (UL) or 14–26 AWG, 300V wire (CSA) for all input control signals.

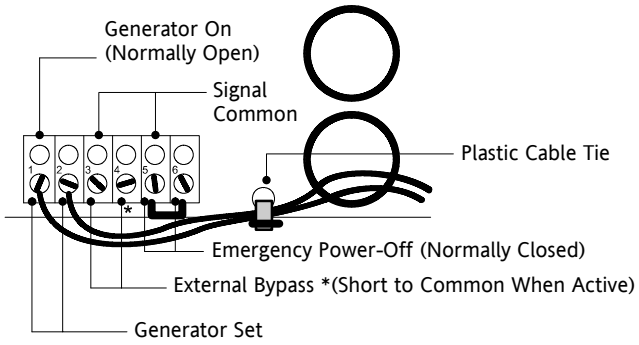


Figure 21. Input Control Signal Wiring

13. Place the signal wires through the proper conduit or grommet above the terminal block and attach to appropriate terminals. Secure each connection by torquing terminal screws to a maximum 3.5 in lb (0.4 Nm). Provide strain relief for cables by installing plastic cable ties.

NOTE *Do not strain relieve EPO or external bypass wiring with the same cable tie used for Generator On wires.*

14. Remove the jumper between terminals 5 and 6 only if you are wiring from an EPO switch. (See “Changing Parameter Settings” on page 81 for information about accessing menu 4, submenu 3, item 2 to view or change the EPO switch type.)

15. When all connections have been made and checked, reinstall the bypass switch front panel and UPS cabinet rear panels using the original screws.

System Wiring Diagrams

Select wiring diagrams from Table 5 based upon the installation voltage.

Table 5. UPS with Bypass Wiring Diagrams for Non-Isolated Output

UPS Input Voltage	UPS Output Voltage	Output Wires	Wiring Diagrams		
			Input	Output	System
100/200 110/220 120/208 120/240 127/220	100/200 110/220 120/208 120/240 127/220	L1, L2, N*	Figure 18a on page 29	Figure 19 on page 30	Figure 22 on page 34
200 208 220 230 240	200 208 220 230 240	L1 – L2	Figure 18b on page 29	Figure 20 on page 30	Figure 23 on page 34
220 230 240	220 230 240	L1 – N	Figure 18b on page 29	Figure 20 on page 30	Figure 24 on page 35

*Split-phase power modules required.

The following notes are referenced in the non-isolated system wiring diagrams (Figure 22 through Figure 24).

NOTE 1 *The customer must provide input overcurrent protection as stated in NEC Section 240-21 or local codes. Size the protection device according to local code requirements (see Table 1 on page 21).*

NOTE 2 *The UPS bypass switch must be installed within sight of the UPS. To properly install, complete the voltage and phase check procedure in "Startup for Hardwired Units" on page 68. The wires coming from the side of the switch must be connected as described in Step 11 on page 30.*

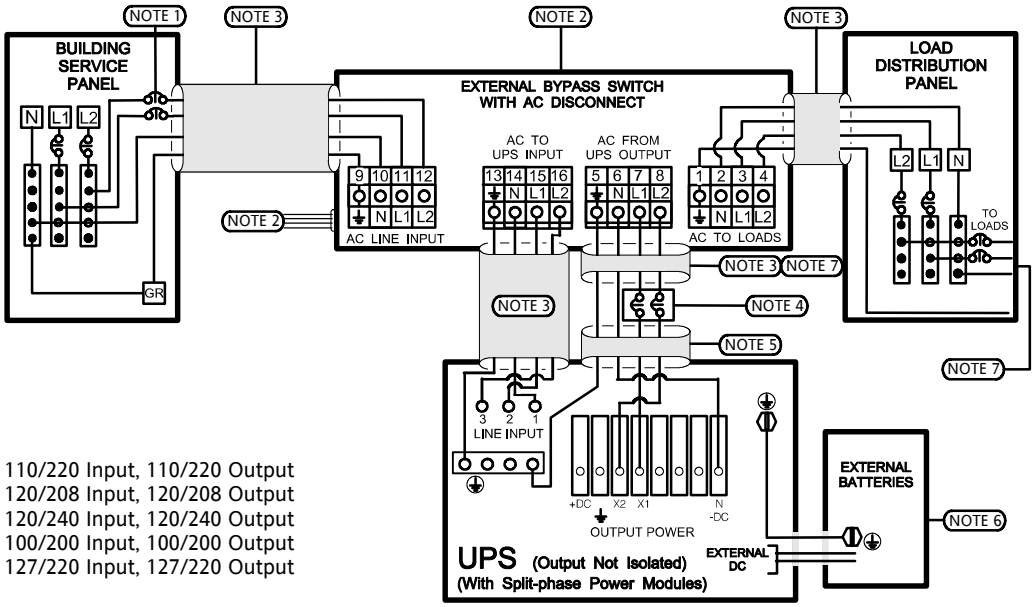
NOTE 3 *All AC circuit conductors, including the neutral conductor, must be the same size (ampacity), have the same rating (75°C) copper wire, and be sized according to the input circuit breaker. The UPS input and output conductors must be run through separate conduits.*

NOTE 4 *The customer must provide output overcurrent protection. See NEC Section 240-21 or local requirements. See Table 16 and Table 17 on pages 97 and 99 for maximum output overcurrent protection device ratings.*

NOTE 5 *See "Equipment Clearances" on page 7 for installation and service clearances before installing the UPS. Use flexible conduit on the UPS or the external battery cabinet if either must be moved.*

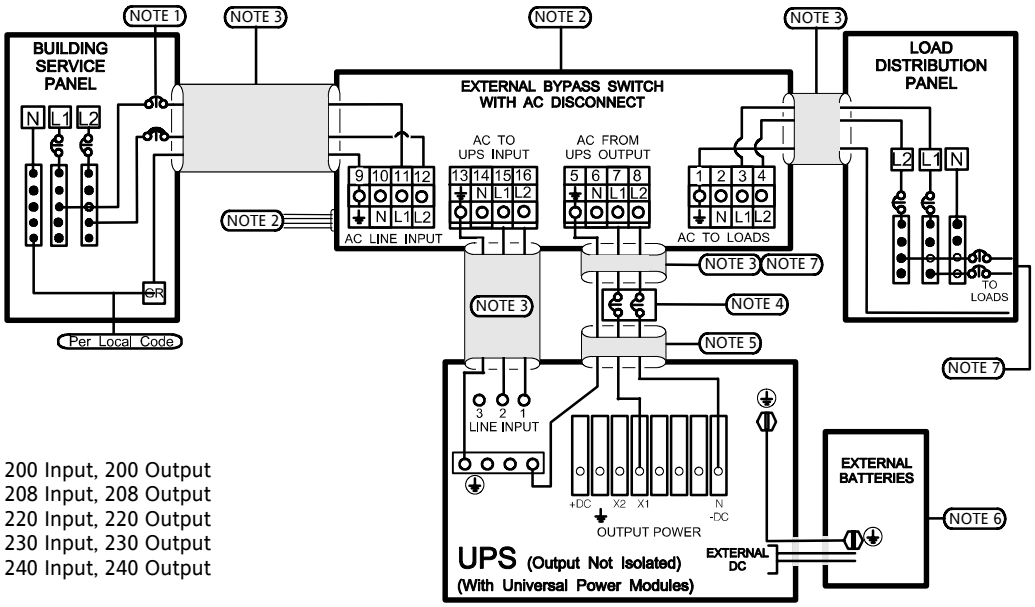
NOTE 6 *External UPS battery cabinets are optional. See "Battery Cabinet Installation" on page 57 for installation instructions.*

NOTE 7 *UPS output circuits shall be installed in dedicated conduit systems and not shared with other electrical circuits.*



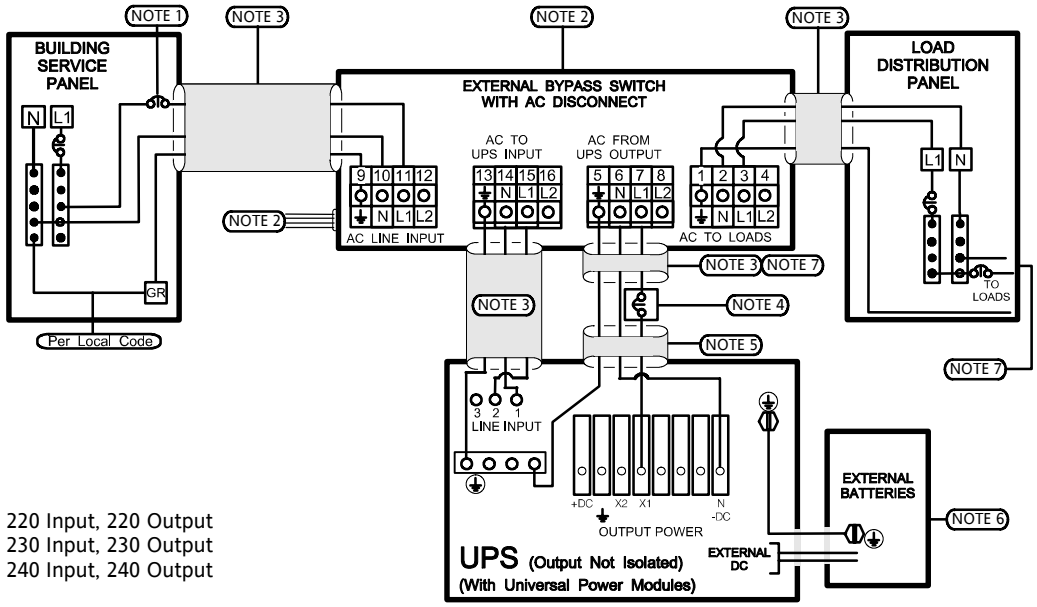
- 110/220 Input, 110/220 Output
- 120/208 Input, 120/208 Output
- 120/240 Input, 120/240 Output
- 100/200 Input, 100/200 Output
- 127/220 Input, 127/220 Output

Figure 22. External Bypass Switch (L1, L2, N), Non-Isolated Output, Split-Phase Power Modules



- 200 Input, 200 Output
- 208 Input, 208 Output
- 220 Input, 220 Output
- 230 Input, 230 Output
- 240 Input, 240 Output

Figure 23. External Bypass Switch (L1, L2), Non-Isolated Output, Universal Power Modules



- 220 Input, 220 Output
- 230 Input, 230 Output
- 240 Input, 240 Output

Figure 24. External Bypass Switch (L1, N), Non-Isolated Output, Universal Power Modules

NOTE *If you have a plug-receptacle unit, continue to "Battery Cabinet Installation" on page 57 for installing optional battery cabinets or to "UPS Startup" on page 63.*

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the electrical installation. Risk of electrical shock.

If a bypass switch is not used, the UPS input may be hardwired through conduit to a main power source circuit breaker, and the UPS output may either be hardwired to a circuit breaker in a distribution panel (as shown in Figure 25) or supplied to loads through receptacles on the back of the UPS. Without a bypass switch, power to the load cannot be maintained if the UPS is taken completely offline.

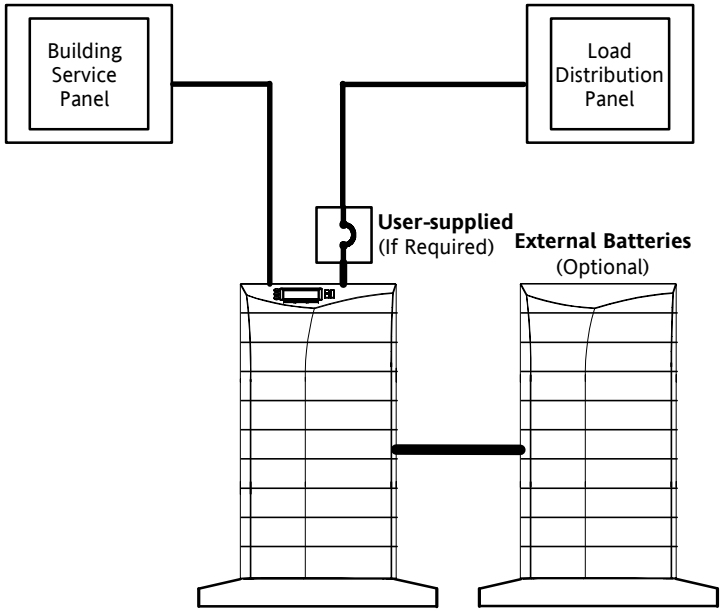


Figure 25. Typical Installation without a Bypass Switch

Input Current Ratings

Table 6 contains the required circuit breaker ratings for hardwired installations. Circuit breaker ratings for units having an input line cord are determined by the current capacity of the line cord.

Table 6. Required Input Circuit Breaker Sizes (200–240 Vac, 50/60 Hz)

UPS Capacity	Input Circuit Breaker Rating
3 kVA	25A
6 kVA	40A
9 kVA	60A
12 kVA	80A
15 kVA	100A
18 kVA	125A

NOTE *If you are installing an optional battery charger module, refer to that user's guide (164201399) for the proper input circuit breaker sizes and ratings.*

NOTE *To accommodate the feature of easy system expandability, it is recommended that initial installation of the Powerware 9170+ UPS contain wiring to support the maximum capacity of the UPS cabinet: 3 kVA for 3-slot cabinets; 9 kVA for 6-slot cabinets; 18 kVA for 9- and 12-slot cabinets.*

See Table 7 for recommended conductor sizes to wire the input circuit breakers.

Table 7. Recommended Wire Sizes

Input Circuit Breaker Size	75°C Copper Wire Size	Conductor Screw Torque
25A	10 AWG (5.3 mm^2)	35 in lb (4.0 Nm)
40A	8 AWG (8.4 mm^2)	40 in lb (4.5 Nm)
60A	4 AWG (21.2 mm^2)	45 in lb (5.1 Nm)
80A	3 AWG (26.7 mm^2)	50 in lb (6.6 Nm)
100A	2 AWG (33.6 mm^2)	50 in lb (6.6 Nm)
125A	1 AWG (42.1 mm^2)	50 in lb (6.6 Nm)

FOR U.S. INSTALLATIONS, READ THIS IMPORTANT NOTE!

This table lists the AWG and mm^2 wire size for each circuit breaker size shown on the wiring diagrams. The minimum recommended circuit breaker sizes for each model and voltage application are listed on the wiring diagrams.

Conductor sizes shall be no smaller than the 75°C wire size based on the ampacities given in Table 310–16 of the National Electrical Code, ANSI/NFPA 70-1999, and article 220. All circuit conductors, including the neutral conductor, must be the same size (ampacity) wire. Code may require a larger AWG size than shown in this table because of temperature, number of conductors in the conduit, or long service runs. **Follow local code requirements.**

UPS Electrical Installation

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the electrical installation. Risk of electrical shock.

CAUTION

To prevent electrical shock or damage to the equipment, verify that the Powerware 9170+ UPS is OFF before you remove the entrance panel. The circuit breaker or disconnect switch must also be off at the AC input service panel.

1. Unscrew and remove the rear panel(s) of the UPS (top panel on 3- or 6-slot; top 2 panels on 9- and 12-slot). See Figure 26.

   The entrance panel contains knockout openings for entrance and exit conduits and for conduit to an optional external battery cabinet. The entrance panel is located on the top 3-slot section for 3- and 6-slot cabinets; on the second section for 9- and 12-slot cabinets as shown in Figure 26.

   Wiring for optional emergency power-off (EPO) passes through the opening at the top back of the cabinet. Wiring for an optional generator input signal must pass through a separate opening. Installing this wiring is described in Steps 9 and 10 on page 45.

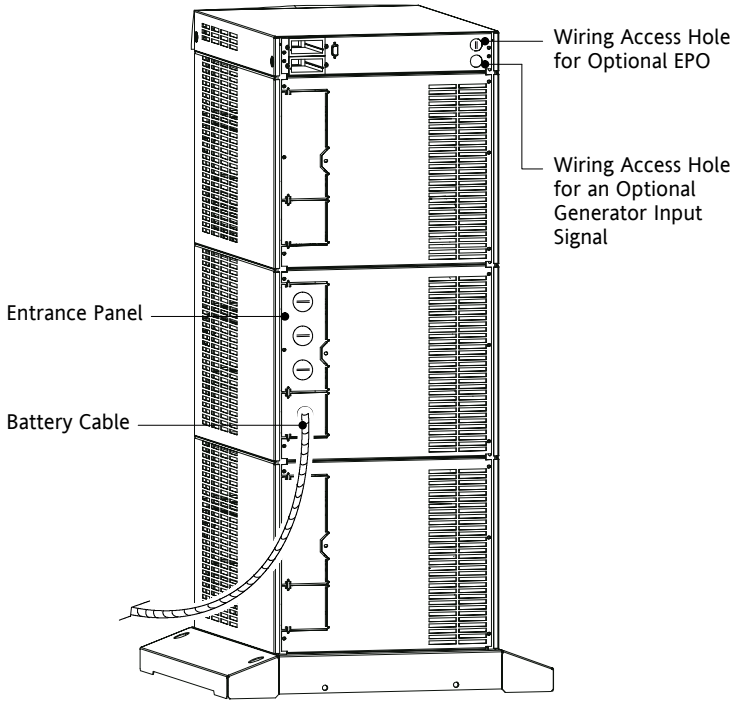


Figure 26. UPS Power Entrance Panel (Nine-Slot Cabinet Shown)

2. Remove the knockouts in the entrance panel for AC input and AC output wiring.

3. Install the conduit adapters. AC input and AC output conductors must be run through separate conduits. UPS output circuits must be installed in dedicated conduit systems and not shared with other electrical circuits.

4. Torque the screws holding all input and output power conductors to the values specified in Table 7 on page 39.

5. Figure 27 shows input and output wiring terminals inside the Powerware 9170+ UPS cabinet.

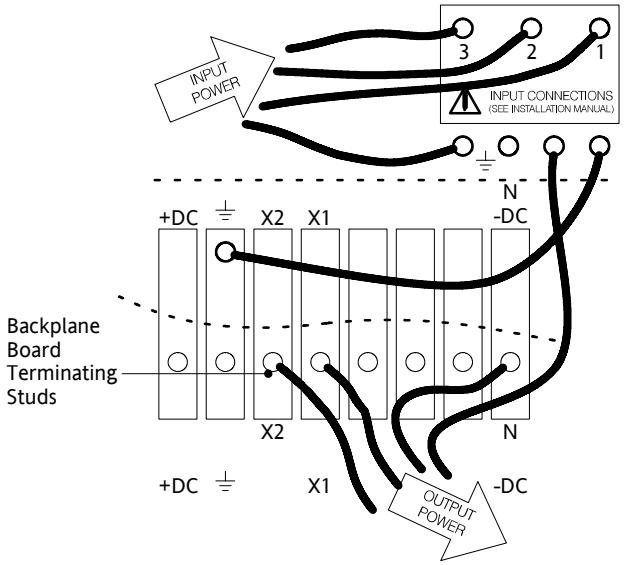


Figure 27. UPS Input and Output Terminals

6. Wire the UPS for the proper input voltage as shown in Figure 28.

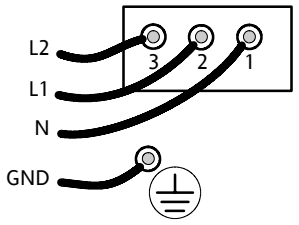
Split-phase power modules (model ASY-0673, with brown labels on the front) is capable of supplying two output voltages: 100/100 for 200, 110/110 for 220, 120/120 for 240, 120/120 for 208, or 127/127 for 220 Vac, as selected through the front panel display. These modules produce two output voltages, typically required in North America, South America, and Japan.

Universal power modules (model ASY-0674, with black labels on the front) is capable of supplying a single-phase output voltage: 200, 208, 220, 230, or 240 Vac, as selected through the front panel display. These modules produce a single output voltage, typically required in Europe, the Middle East, Asia, and Africa.

CAUTION

Confirm that the UPS is wired for the proper input voltage as shown in Figure 28, and that the proper power modules (either split-phase or universal) are installed to produce the desired output voltage. Do not mix the two types of power modules in the same UPS cabinet.

(a) Split-Phase Power Modules
(3-Wire Plus Ground Input) (2 PEN)
100/200, 110/220, 120/208, 120/240, 127/220 Vac



(b) Universal Power Modules
(2-Wire Plus Ground Input)
200, 208, 220, 230, and 240 Vac

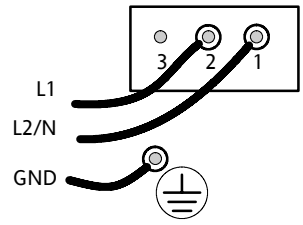


Figure 28. UPS Input Wiring

7. **For isolated output only.** See Chapter 5, "Isolated Output Wiring Diagrams" on page 51 to complete the wiring for isolated output.

8. See the wiring diagrams beginning on page 46 which show output configurations. Make UPS output connections on the backplane board terminating studs. Compression lugs (supplied in the accessory kit) may be installed on the proper terminating studs. Wires may also be terminated with ring terminals, which are attached to the output terminating studs.

   Figure 29 and Figure 30 describe output wiring configurations for various output voltages. You must also set the operating menu parameter 4-2-4 for the required output voltage as shown in the wiring configuration drawings.

NOTE *For Powerware 9170+ UPS models with low-voltage hardwire output, it is recommended to divide the total load as equally as possible between X1 and X2, as shown in Figure 29.*

NOTE *Failure to balance the loads may cause an overload alarm even if the full capacity of the UPS has not been reached.*

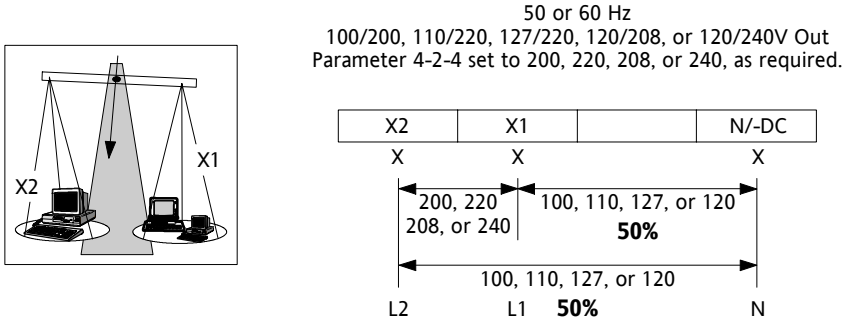


Figure 29. Split-Phase Power Modules with Non-Isolated Output

NOTE *The factory-default wiring for all high-voltage receptacles in a chassis without a power cord is 3-wire plus ground input. If you have a Universal Power Module (ASY-0674), all receptacles MUST be re-wired for a 2-wire plus ground input configuration as shown in Figure 30.*

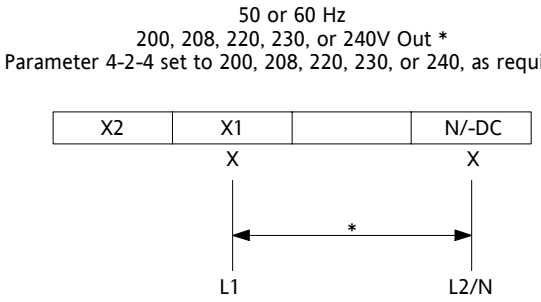


Figure 30. Universal Power Modules with Non-Isolated Output

9. If any external hardwired control signals are required (EPO or Generator On), unscrew and remove the top rear panel of the cabinet and locate the terminal block (see Figure 31).

CAUTION

EPO circuits are not isolated from line voltage, and wiring must be installed according to local codes using conduit or suitable primary supply cables.

The Generator On signal is isolated from line voltage and can be treated as NEC Class 2 wiring.

Use 14–20 AWG, 600V wire (UL) or 14–26 AWG, 300V wire (CSA) for all input control signals.

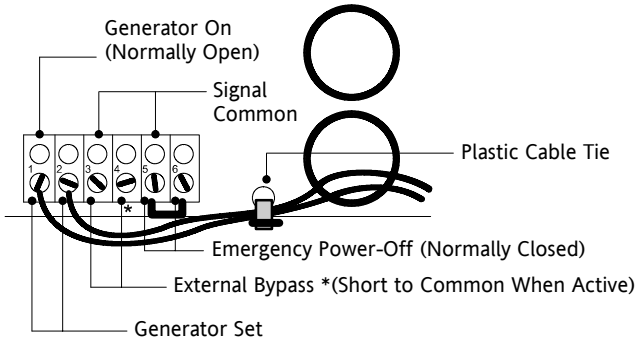


Figure 31. Input Control Signal Wiring

10. Place the signal wires through the proper conduit or grommet above the terminal block and attach to appropriate terminals. Secure each connection by torquing terminal screws to a maximum 3.5 in lb (0.4 Nm). Provide strain relief for cables by installing plastic cable ties.

NOTE *Do not strain relieve EPO wiring with the same cable tie used for Generator On wires.*

11. Remove the jumper between terminals 5 and 6 only if you are wiring from an EPO switch. (See "Changing Parameter Settings" on page 81 for information about accessing menu 4, submenu 3, item 2 to view or change the EPO switch type.)

12. When all connections have been made and checked, reinstall the UPS cabinet rear panels using the original screws.

System Wiring Diagrams

Select wiring diagrams from Table 8 based upon the installation voltage.

Table 8. Wiring Diagrams for Non-Isolated Output

UPS Input Voltage	UPS Output Voltage	Output Wires	Wiring Diagrams		
			Input	Output	System
100/200 110/220 120/208 120/240 127/220	100/200 110/220 120/208 120/240 127/220	L1, L2, N*	Figure 28a on page 43	Figure 29 on page 44	Figure 32 on page 48
200 208 220 230 240	200 208 220 230 240	L1 – L2	Figure 28b on page 43	Figure 30 on page 44	Figure 33 on page 48
220 230 240	220 230 240	L1 – N	Figure 28b on page 43	Figure 30 on page 44	Figure 34 on page 49

*Split-phase power modules required.

The following notes are referenced in the non-isolated system wiring diagrams (Figure 32 through Figure 34).

NOTE 1 *The customer must provide input overcurrent protection as stated in NEC Section 240-21 or local codes. Size the protection device according to local code requirements (see Table 6 on page 38).*

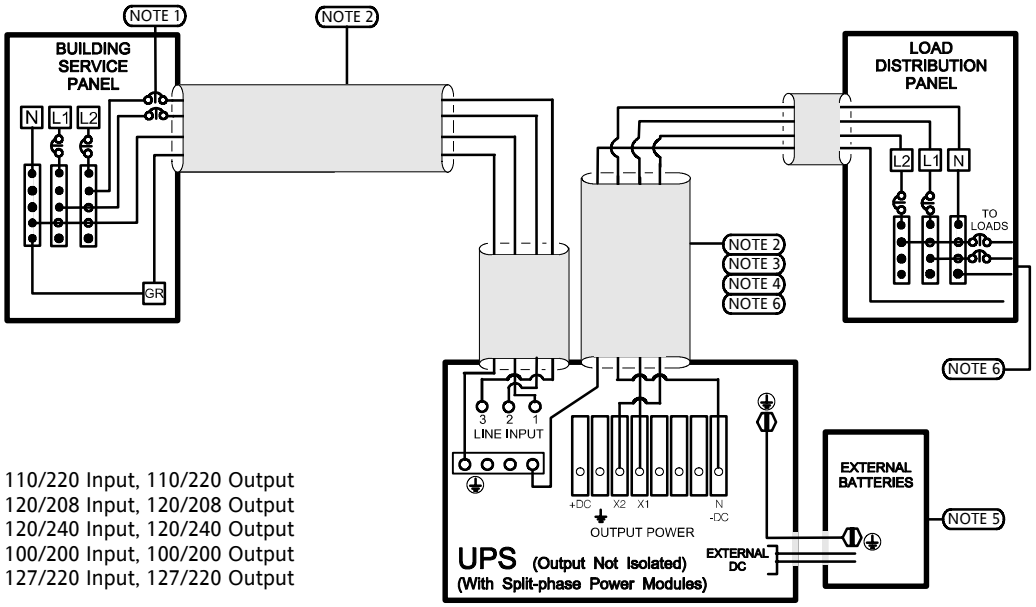
NOTE 2 *All AC circuit conductors, including the neutral conductor, must be the same size (ampacity), have the same rating (75°C) copper wire, and be sized according to the input circuit breaker. The UPS input and output conductors must be run through separate conduits.*

NOTE 3 *The customer must provide output overcurrent protection. See NEC Section 240-21 or local requirements. See Table 16 and Table 17 on pages 97 and 99 for maximum output overcurrent protection device ratings.*

NOTE 4 *See "Equipment Clearances" on page 7 for installation and service clearances before installing the UPS. Use flexible conduit on the UPS or the external battery cabinet if either must be moved.*

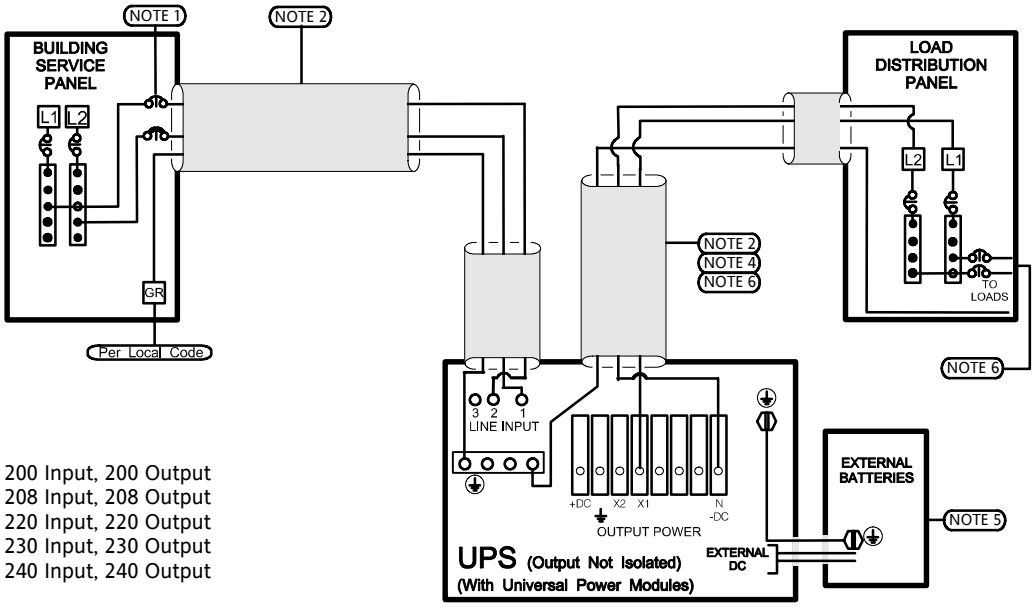
NOTE 5 *External UPS battery cabinets are optional. See "Battery Cabinet Installation" on page 57 for installation instructions.*

NOTE 6 *UPS output circuits shall be installed in dedicated conduit systems and not shared with other electrical circuits.*



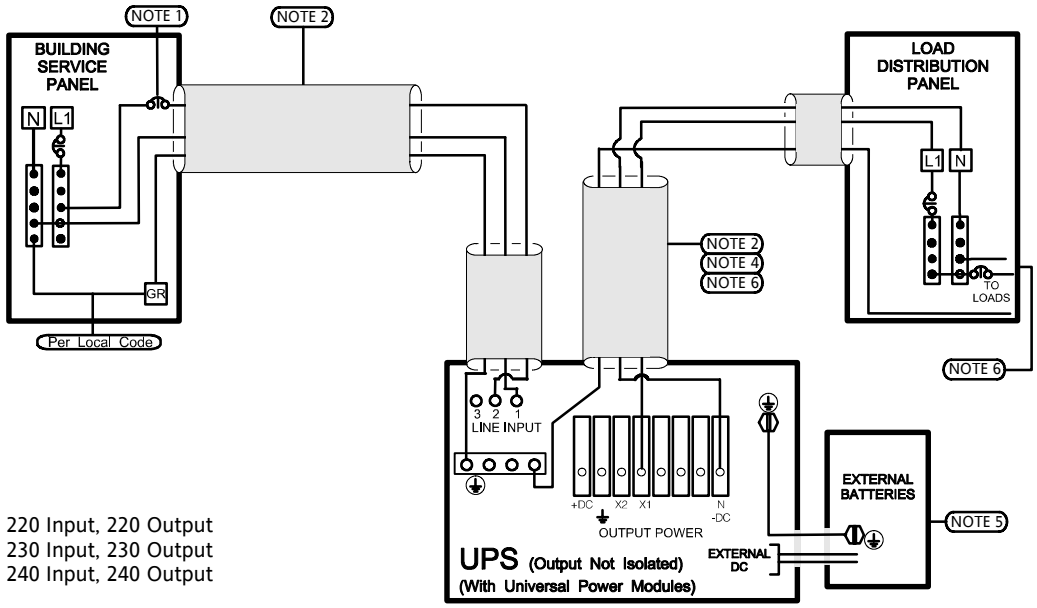
- 110/220 Input, 110/220 Output
- 120/208 Input, 120/208 Output
- 120/240 Input, 120/240 Output
- 100/200 Input, 100/200 Output
- 127/220 Input, 127/220 Output

Figure 32. No External Bypass (L1, L2, N), Non-Isolated Output, and Split-Phase Power Modules



- 200 Input, 200 Output
- 208 Input, 208 Output
- 220 Input, 220 Output
- 230 Input, 230 Output
- 240 Input, 240 Output

Figure 33. No External Bypass (L1, L2), Non-Isolated Output, and Universal Power Modules



- 220 Input, 220 Output
- 230 Input, 230 Output
- 240 Input, 240 Output

Figure 34. No External Bypass (L1, N), Non-Isolated Output, and Universal Power Modules

Chapter 5 | Isolated Output Wiring Diagrams

The wiring diagrams in this section are unique and specific to installations in which the output of the Powerware 9170+ UPS is galvanically isolated from the input.

Figure 35 and Figure 36 describe output wiring configurations for various output voltages. Use Table 9 to identify the wiring diagrams and connect the output AC wiring to the proper Powerware 9170+ system power terminals. You must also set the operating menu parameter 4-2-4 for the required output voltage as shown in the wiring configuration drawings.

NOTE *Do NOT install more than seven power and/or optional battery charger modules in the system.*

NOTE *In isolated-output installations, connect the UPS green and yellow neutral-to-ground wire (N-G bond) to UPS output terminal as illustrated in Figure 37 on page 53.*

Table 9. Wiring Diagrams for Isolated Output (Split-Phase Power Modules Required)

UPS Input Voltage	UPS Output Voltage	Output Wires	External Bypass	Wiring Diagrams		
				Input	Output	System
100/200 110/220 115/230 120/240 120/208*	100/200 110/220 115/230 120/240 120/240	L1, L2, N	Yes	Figure 18a on page 29	Figure 35 on page 52	Figure 38 on page 55
			No	Figure 18a on page 29	Figure 35 on page 52	Figure 39 on page 55
120/208* 127/220*	120/208 127/220	L1, L2, N	Yes	Figure 18a on page 29	Figure 36 on page 52	Figure 40 on page 56
			No	Figure 18a on page 29	Figure 36 on page 52	Figure 41 on page 56

*External bypass switch, if installed, must be Break-Before-Make.

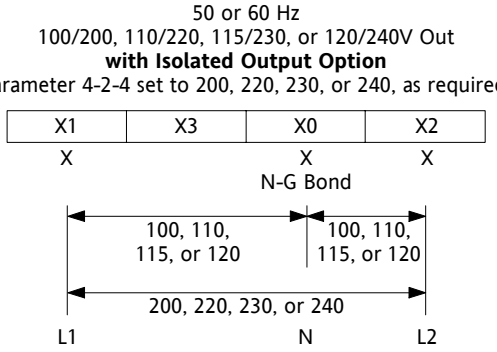


Figure 35. Isolated Outputs – Single-Phase Voltages

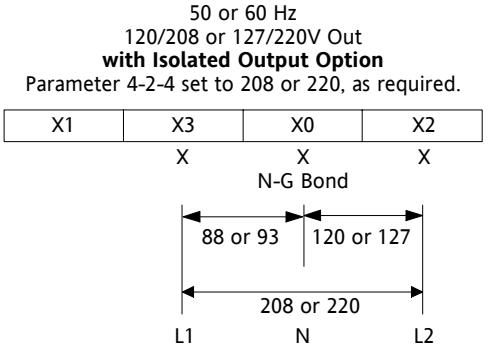


Figure 36. Isolated Outputs – Derived 3-Phase Voltages

Neutral-to-Ground Bonding for Isolated Output

As required under safety regulations issued by various regulatory agencies, the UPS cabinet must have a ground-bond connection for the neutral terminal of an isolated-output system. In such a system, the customer must make the neutral-to-ground (also referred to as N-G or neutral-to-earth) connection after selecting the desired output configuration.

In isolated-output systems, **connect the neutral-to-ground (neutral-to-earth) wire to the proper terminal before making any other connections to the UPS**. A green and yellow neutral-to-ground bonding wire is supplied, with one end connected to the ground (earth) UPS terminal as shown in Figure 37. The other end of the wire (as shown by * in Figure 37) must be attached to the proper output neutral terminal, as specified in Figure 35 and Figure 36.

Ground terminations, inside the UPS rear panel, are located directly below the line input terminals. Figure 17 on page 28 shows input and output wiring terminals inside the Powerware 9170+ UPS cabinet.

If there is any question as to the need for this bond wire, contact your local regulatory agency or your service representative.

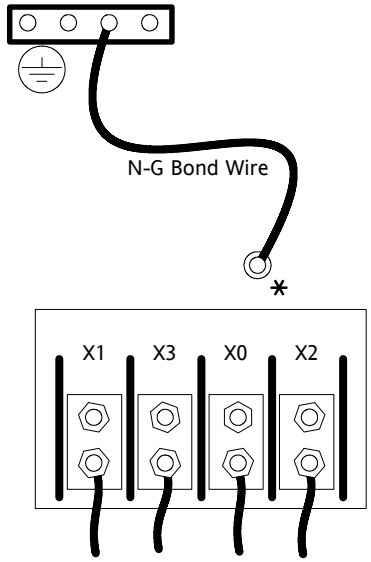


Figure 37. N-G Bond Wire

System Wiring Diagrams

The following notes are referenced in the isolated system wiring diagrams (Figure 38 through Figure 41). To determine which diagram is correct for your site, see Table 9 on page 51.

NOTE 1 *The customer must provide input overcurrent protection as stated in NEC Section 240-21 or local codes. Size the protection device according to local code requirements (see Table 1 on page 21).*

NOTE 2 *The UPS bypass switch must be installed within sight of the UPS. To properly install, complete the voltage and phase check procedure in "Startup for Hardwired Units" on page 68. The wires coming from the side of the switch must be connected as described in Step 11 on page 30.*

NOTE 3 *The customer must provide and install this ground (earth) connection per NEC Sections 250-20, 250-30, 250-62, and 250-64, or local code requirements.*

NOTE 4 *All AC circuit conductors, including the neutral conductor, must be the same size (ampacity), have the same rating (75°C) copper wire, and be sized according to the input circuit breaker. The UPS input and output conductors must be run through separate conduits.*

NOTE 5 *The customer must provide output overcurrent protection. See NEC Section 240-21 or local requirements. See Table 16 and Table 17 on pages 97 and 99 for maximum output overcurrent protection device ratings.*

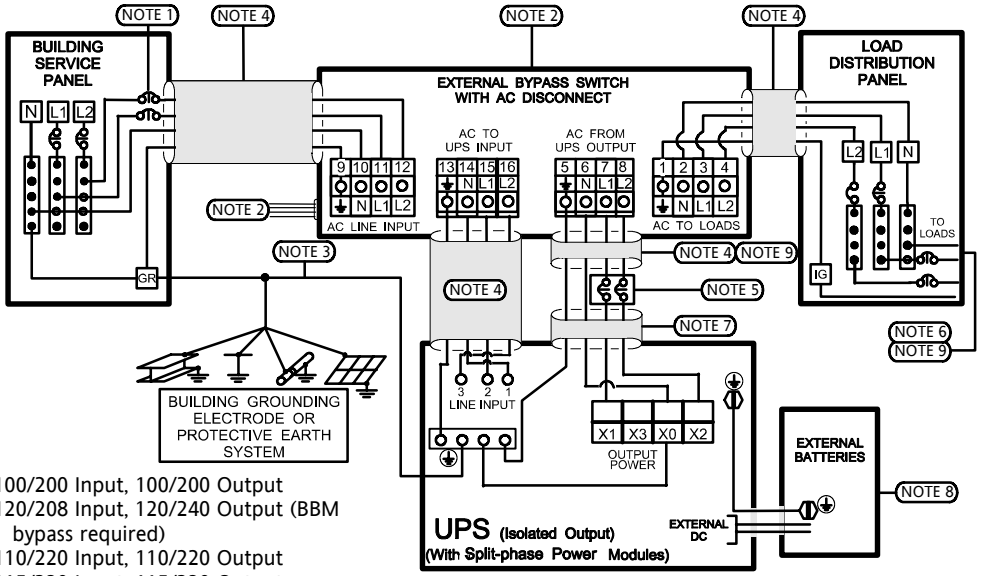
NOTE 6 *For maximum protection against electrical noise, use isolated ground receptacles. See NEC Section 250-146(d).*

NOTE 7 *See "Equipment Clearances" on page 7 for installation and service clearances before installing the UPS. Use flexible conduit on the UPS or the external battery cabinet if either must be moved.*

NOTE 8 *External UPS battery cabinets are optional. See "Battery Cabinet Installation" on page 57 for installation instructions.*

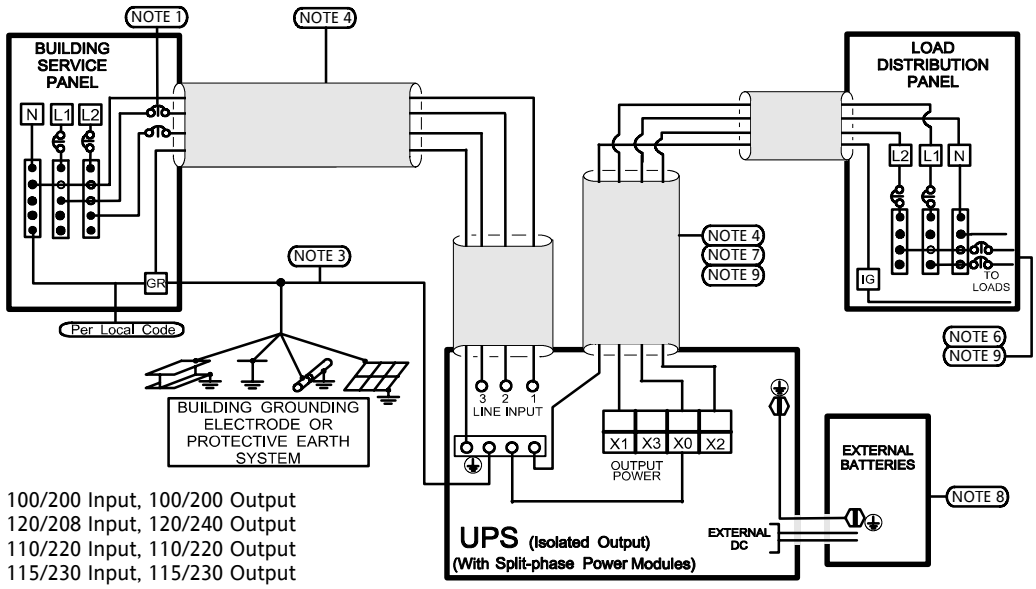
NOTE 9 *UPS output circuits shall be installed in dedicated conduit systems and not shared with other electrical circuits.*

NOTE 10 *Do not connect output wiring to X1 when connecting L1 to X3. X1 produces only 88V at 208V nominal output, and 93V at 220V.*



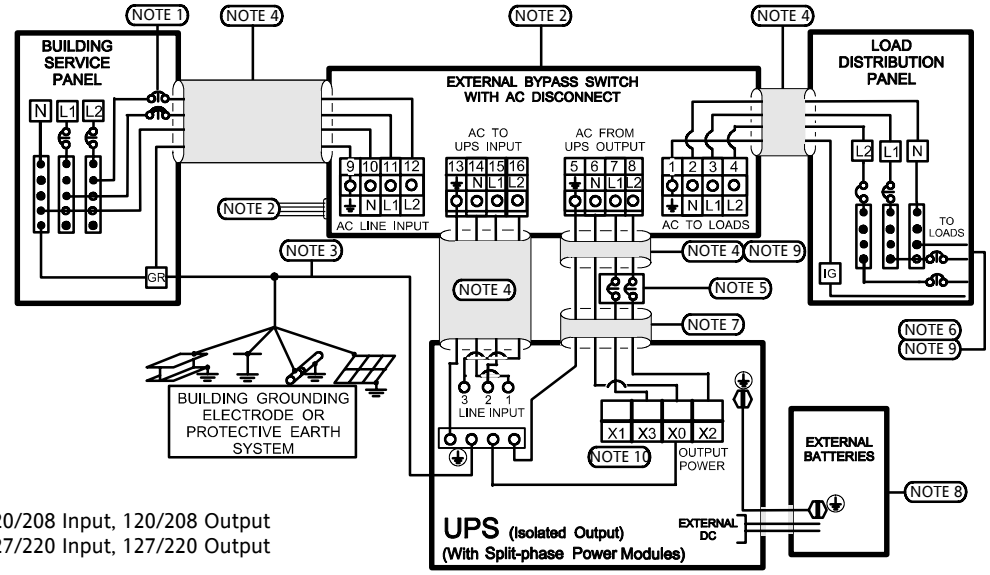
- 100/200 Input, 100/200 Output
- 120/208 Input, 120/240 Output (BBM bypass required)
- 110/220 Input, 110/220 Output
- 115/230 Input, 115/230 Output
- 120/240 Input, 120/240 Output

Figure 38. External Bypass Switch (L1, L2, N), Isolated Output for Single-Phase Voltages



- 100/200 Input, 100/200 Output
- 120/208 Input, 120/240 Output
- 110/220 Input, 110/220 Output
- 115/230 Input, 115/230 Output
- 120/240 Input, 120/240 Output

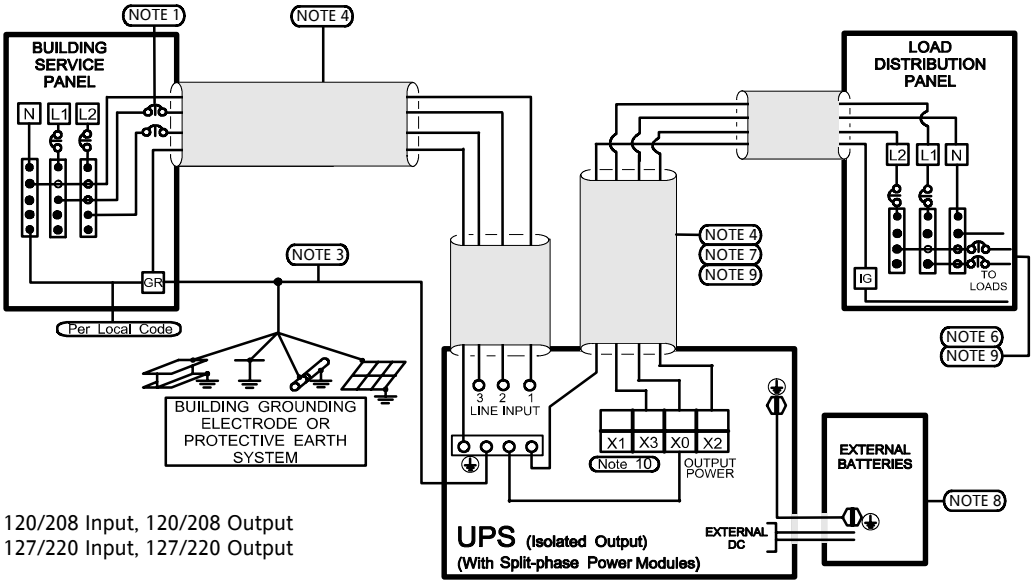
Figure 39. No External Bypass (L1, L2, N), Isolated Output for Single-Phase Voltages



- 120/208 Input, 120/208 Output
- 127/220 Input, 127/220 Output

(Voltages require the bypass switch to be BBM; contact your service representative for details.)

Figure 40. External Bypass Switch (L1, L2, N), Isolated Output for Derived 3-Phase Voltages



- 120/208 Input, 120/208 Output
- 127/220 Input, 127/220 Output

Figure 41. No External Bypass (L1, L2, N), Isolated Output for Derived 3-Phase Voltages

Chapter 6 | Battery Cabinet Installation

If you are not installing battery modules into a separate external battery cabinet, continue to “UPS Startup” on page 63.

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the battery cabinet installation. Risk of electrical shock.

CAUTION

- Before connecting an external battery cabinet to the UPS cabinet or to another external battery cabinet, verify that all AC input power is removed from the UPS. Open the input service circuit breaker or turn the external bypass switch to the SERVICE position.
- Disconnect all battery strings in the UPS cabinet and/or battery cabinet to ensure DC voltage is removed from the internal DC buses. You can remove all battery modules or unplug each pair of battery modules from the cabinet backplane.

1. Open the carton containing the external battery cabinet cable assembly.
2. Locate the 3-slot section in the UPS cabinet that contains the power entrance panel. Unscrew and remove the rear panel of this section (see Figure 42).

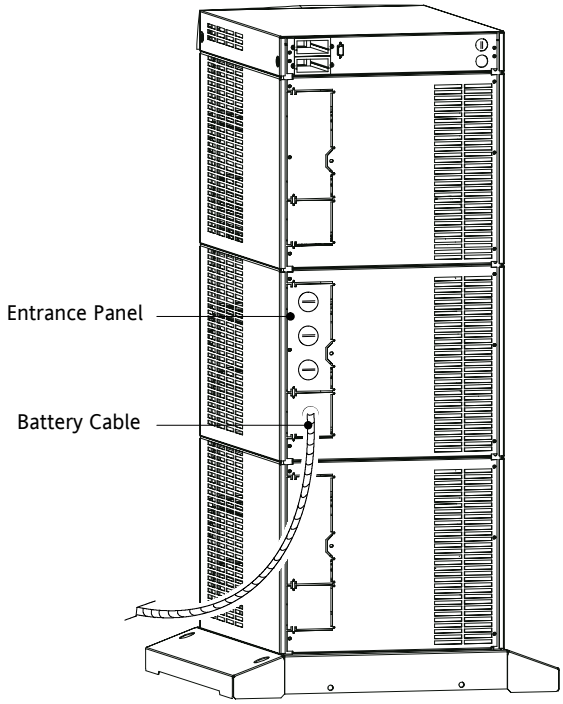


Figure 42. UPS Power Entrance Panel

3. Use a pair of pliers to bend the narrow links (1 and 2 in Figure 43) between the outer edge of the lower breakaway panel and the rear panel.

4. Use the pliers to bend the entire breakaway panel (at 3 and 4 in Figure 43) until it breaks away.

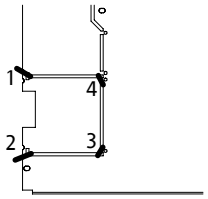


Figure 43. Breakaway Panel Links

5. Verify all hazardous voltages have been removed from the backplane by testing with a voltmeter or other test device.

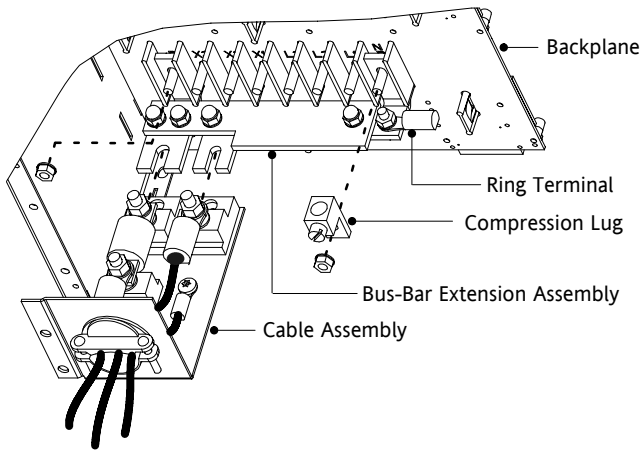


Figure 44. Bus-Bar Extension Installation

6. Remove the nuts holding the +DC and the –DC bus bars to the backplane as shown in Figure 44. Remove the ring terminal and the compression lug from the –DC bolt.

7. Position the bus-bar extension assembly onto the +DC and –DC bolts as shown in Figure 44. Replace the compression lug onto the –DC bolt of the bus-bar extension assembly. Secure the assembly by replacing the two nuts removed in Step 6.

8. Use the bolt and nut supplied with the cable assembly to attach the ring terminal to the empty hole in the –DC bus bar.

9. Torque all three bolts to 75–85 in lb (8.5–9.6 Nm).

10. Loosen the three large nuts on the end of the cable assembly (see Figure 44).

11. Slip the terminals of the cable assembly onto the tabs of the bus-bar extension, putting the tabs between the stud block and the fuse end and between the other stud block and the cable terminal.

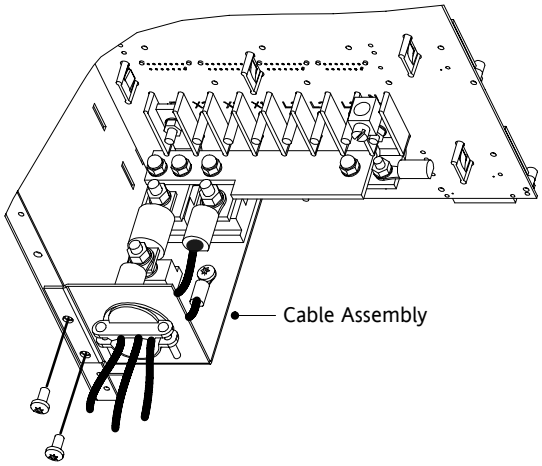


Figure 45. Battery Cable Assembly Installation

12. Align the screw holes of the cable assembly's entry plate with holes on the cabinet side panel as shown in Figure 45. Secure the entry plate with screws supplied with the cable assembly.

13. If the battery cable will be installed in customer-supplied flexible or other conduit (as required by local wiring codes), loosen the two screws holding the strain-relief clamp shown in Figure 45. Remove the clamp by loosening the star nut on the inside of the entry plate, leaving the nut in place. Replace the clamp with a panel-to-conduit feedthrough and secure it with the star nut.

14. Secure the cable assembly terminals by tightening the nuts onto the backplane bus bars. Also tighten the third nut, holding the other fuse end. Torque all three nuts to 75–85 in lb (8.5–9.6 Nm).

15. Reinstall the UPS cabinet rear panel using the original screws.

16. If the battery cable will be installed in flexible or other conduit, pull the conductors through the conduit. Attach the conduit to both the UPS power entrance panel and the battery cabinet entrance panel as shown in Figure 46.

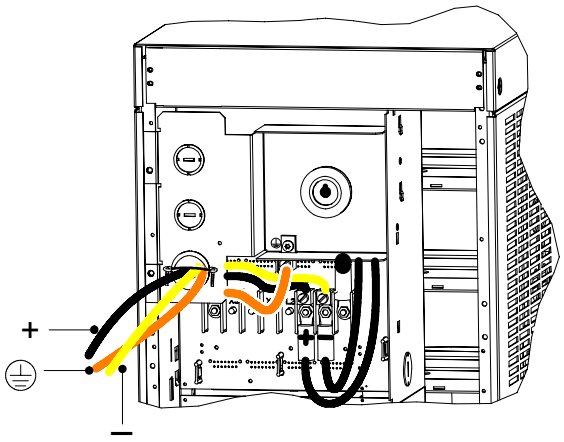


Figure 46. Battery Cable Installed in Battery Cabinet

17. Secure the **+**, the **—**, and the ⏚ conductors to the proper compression lugs on the battery cabinet backplane as shown in Figure 46. Torque all three compression lugs to 75–85 in lb (8.5–9.6 Nm).

18. If an additional battery cabinet will be connected to the first, in a daisy-chain configuration, use another external battery cabinet cable assembly for the connections between the battery cabinets (see Figure 47).

19. Locate the daisy-chained cable on the rear of the first battery cabinet in the section below the location of the first cable assembly. Follow this procedure for connecting any additional daisy-chained battery cabinets.

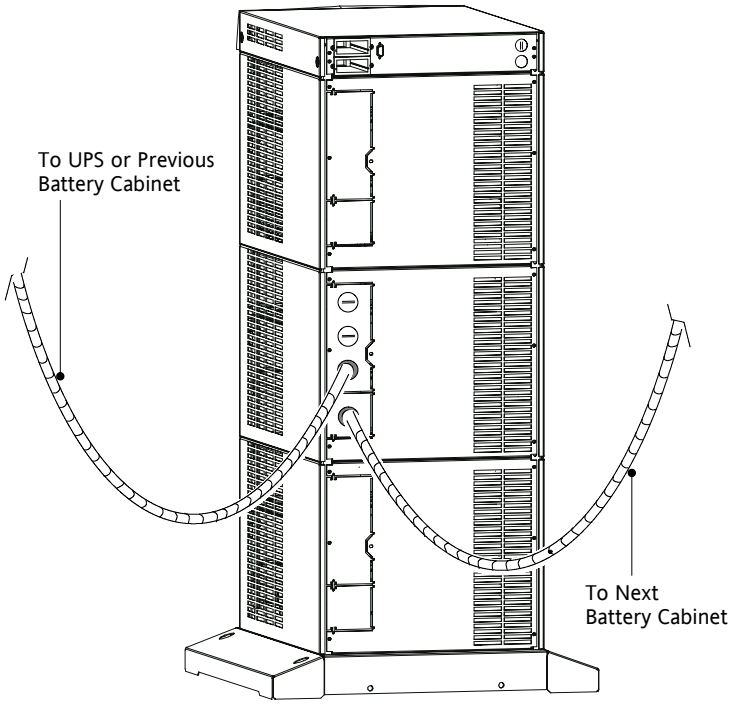


Figure 47. Connecting Additional Battery Cabinets

20. Reinstall the remaining rear panels using the original screws.

21. Continue to “UPS Startup” on page 63.

Chapter 7 | UPS Startup

This section provides step-by-step instructions for starting your Powerware 9170+ system. Follow these procedures closely to avoid potential damage to your equipment or the UPS and to protect yourself and others from hazardous operating conditions.

CAUTION

- This UPS contains its own energy source (batteries). The output receptacles may carry hazardous voltage even when the UPS is not connected to an AC supply. When AC input voltage is present, the Powerware 9170+ system can provide output voltage even though its batteries are disconnected. To confirm that there is no UPS output voltage, always disconnect all of the AC input sources and unplug all strings of internal battery modules; if the UPS has one or more separate battery cabinets, open (push in) the DC disconnect switch button on each battery cabinet or unplug all battery strings in each battery cabinet.
- To reduce the risk of fire or electric shock, install this UPS in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% max).
- For optimum battery life, ambient temperature should not exceed 25°C (77°F). Battery life is substantially reduced if ambient temperature is higher.

Power and Battery Module Installation

Use the following procedure to install the power and battery modules into the Powerware 9170+ cabinet:

1. Remove the front cover panel(s) of the cabinet.

   The panels have spring latches on the left and right sides that hold them in place.

NOTE *Place battery modules below all power modules in the UPS cabinet. Two battery modules (side-by-side) are required to complete each battery string.*

2. Insert the battery modules into the cabinet.

   Push each module firmly until the front latch snaps to secure the battery module (see Figure 48). Repeat for each additional battery module.

NOTE *All power modules in the Powerware 9170+ UPS cabinet must be of the same type: Split-phase power modules have brown labels; universal (single-phase) power modules have black labels. Do not mix brown and black modules in the same UPS cabinet.*

NOTE *Do NOT install more than seven power and/or optional battery charger modules in the system.*

3. Insert the power modules into the upper slots of the cabinet. To insert a power module:

   Lower the front down slightly and lift the rear edge over the safety stop on the center support rail. Keep the module handle extended until the module is fully inserted (see Figure 48).

   Raise the power module handle to secure the module into the cabinet. Be sure the handle latch snaps into place. Tighten the thumbscrew on the handle.

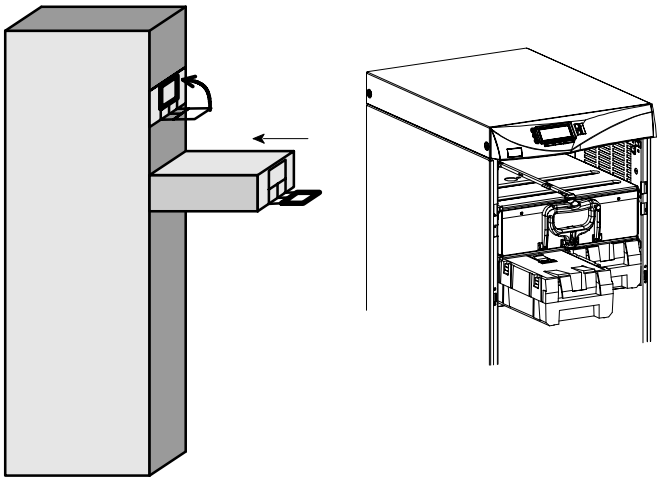


Figure 48. Inserting the Modules

4. If you installed an optional battery cabinet, repeat Steps 1 and 2 to install the battery modules.

5. Reinstall the front cover panel(s).

6. Continue to the following section, “Startup for Plug-Receptacle Units” if your cabinet has a power cord already attached. If you hardwired the UPS, skip to “Startup for Hardwired Units” on page 68.

Startup for Plug-Receptacle Units

To start a plug-receptacle unit, use the following steps:

1. Plug the power cable of the unit into an approved, functional power outlet.

2. If external battery cabinets are installed, check the cable connections between the UPS and external battery cabinets.

   Close the DC disconnect switch button on the back of each external battery cabinet. Insert the switch key supplied with the cabinet into the button and turn clockwise 1/2-turn. Pull the button out to close the switch. Turn the key back counter-clockwise, and remove the key.

3. Ensure that all power modules are properly installed and latched into the UPS cabinet.

4. If you are installing power management software, connect your computer to the UPS communication port using the supplied communication cable.

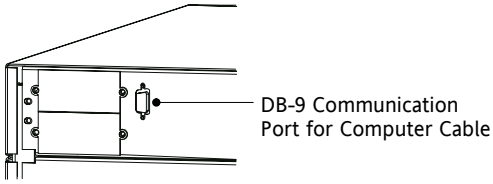


Figure 49. Communication Port

5. The UPS front panel display automatically turns on whenever input power is present and at least one power module is installed. Set up the initial operating parameters through the front panel display (see **"**Initial Startup Parameters" on page 72).

NOTE *The unit has no physical On/Off switch. The UPS On/Off function must be accessed through the front panel display.*

NOTE *If the UPS has been manually set to operate in Bypass or Battery mode, change the System Control Mode Preference (menu 4-1) selection to Auto to return to normal Auto mode operation.*

6. If applicable, test proper operation of optional external control signals and computer communication before connecting the load. (See "DB-9 Communication Port" on page 90 for details.)

7. Plug the equipment to be protected into the UPS output receptacles. Turn on the equipment that is connected to the UPS.

DO NOT protect laser printers with the UPS because of the exceptionally high power requirements of the heating elements.

NOTE *The total volt-ampere load must not exceed the volt-ampere rating of the entire cabinet. Failure to balance the loads may cause an overload alarm even if the full capacity of the UPS has not been reached.*

For Powerware 9170+ UPS models with low-voltage output receptacles, it is recommended to divide loads between upper and lower receptacles as equally as possible. (In some configurations, each set of receptacles is limited to one half of the total UPS capacity.) Whether the cabinet has one panel containing eight receptacles, two panels containing 16 receptacles, or three panels containing 24 receptacles, you should try to supply half of the UPS output through the upper half of the receptacles (X1) and the other half through the lower half of the receptacles (X2), as shown in Figure 50.

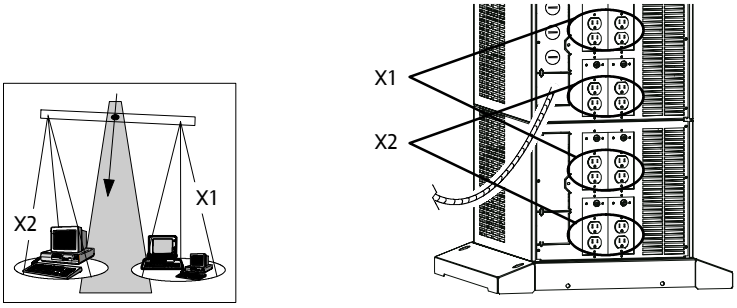


Figure 50. Balancing Receptacle Loads

NOTE *The factory-default wiring for all high-voltage receptacles in a chassis without a power cord is 3-wire plus ground input. If you have a Universal Power Module (ASY-0674), all receptacles MUST be re-wired for a 2-wire plus ground input configuration as shown in Figure 20 on page 30.*

Startup for Hardwired Units

To start a hardwired unit, use the following steps:

1. Confirm that an electrician has completed and tested the connection to the proper power source.
2. If external battery cabinets are installed, check the cable connections between the UPS and external battery cabinets.
3. Ensure that all power modules are properly installed and latched into the UPS cabinet.
4. If you are installing power management software, connect your computer to the UPS communication port using the supplied communication cable.

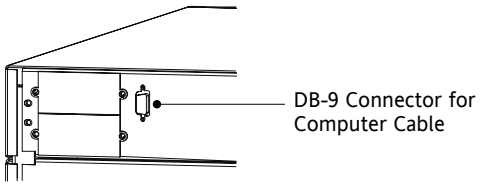


Figure 51. Communication Port

5. If your unit is wired to an external bypass switch, you must perform a voltage and phase check (Steps 6 through 16). Otherwise, skip to Step 17.

CAUTION

Before operating the bypass switch, use the following procedure to check the wiring for correct installation. To prevent damage to the load, turn off the main circuit breaker in the load service panel or verify that the load cannot receive power from the UPS.

6. At the bypass switch, press the red button and turn the switch to UPS.
7. Remove the six screws in the bypass switch front panel and remove the panel to gain access to the terminal block for voltage measurements.

8. If external battery cabinets are installed, close the DC disconnect switch button on the back of each external battery cabinet. Insert the switch key supplied with the cabinet into the button and turn clockwise 1/2-turn. Pull the button out to close the switch. Turn the key back counter-clockwise, and remove the key.

9. The UPS front panel display automatically turns on whenever input power is present and at least one power module is installed. Set up the initial operating parameters through the front panel display (see **"**Initial Startup Parameters" on page 72).

NOTE *The unit has no physical On/Off switch. The UPS On/Off function must be accessed through the front panel display.*

NOTE *If the UPS has been manually set to operate in Bypass or Battery mode, change the System Control Mode Preference (menu 4-1) selection to Auto to return to normal Auto mode operation.*

10. Use an AC voltmeter to measure voltages on the terminal block inside the bypass switch cabinet. See Figure 16 on page 27, which shows the terminal numbering for input and output UPS connections.

    Record your measurements in the following chart. The voltages in the first column should be nearly equal to the voltages in the second column. If the values differ by more than a few volts, check the terminal block connections and correct any wiring problems.

AC Line Input	Measurement	AC from UPS Output	Measurement
L1 to L2 (11 to 12*)		7 to 8*	
N to L1 (10 to 11*)		6 to 7*	
N to L2 (10 to 12*)		6 to 8*	

*For some installations, there is no connection at terminals 6, 8, 10, or 12.

11. If the bypass switch is a Break-Before-Make type, skip this step and proceed to Step 12.

If the bypass switch is a Make-Before-Break type, verify that the AC voltages from the UPS and the AC line input are in phase. Measure the voltage between the following points on the terminal block. These measurements must be no more than 20 Vac; if they are, call your service representative.

Terminal 7 to 11
Terminal 8 to 12

12. Measure the AC voltage between the following points on the terminal block. This reading must be no more than 1 Vac; if it is, call your service representative.

Terminal 6 to 10

13. Switch the bypass switch to LINE. Measure the voltage to the protected equipment (at the load distribution panel) and verify that it is correct.

14. Switch the bypass switch to UPS and verify the voltage to the protected equipment is still correct.

15. Reinstall the bypass switch front panel and UPS front cover panels using the original screws.

16. If the UPS will not be operated immediately, switch the bypass switch to SERVICE and push in the DC disconnect switch button on the back panel of the external battery cabinet closest to the UPS. Otherwise, skip to Step 19 to continue the UPS startup.

17. When starting the UPS, apply input power to the UPS by closing the service circuit breaker.

If external battery cabinets are installed, close the DC disconnect switch button on the back of each external battery cabinet. Insert the switch key supplied with the cabinet into the button and turn clockwise 1/2-turn. Pull the button out to close the switch. Turn the key back counter-clockwise, and remove the key.

18. The UPS front panel display automatically turns on whenever input power is present and at least one power module is installed. Set up the initial operating parameters through the front panel display (see **"**Initial Startup Parameters" on page 72).

NOTE *The unit has no physical On/Off switch. The UPS On/Off function must be accessed through the front panel display.*

NOTE *If the UPS has been manually set to operate in Bypass or Battery mode, change the System Control Mode Preference (menu 4-1) selection to Auto to return to normal Auto mode operation.*

19. If applicable, test proper operation of optional external control signals and computer communication before connecting the load. (See "DB-9 Communication Port" on page 90 for details.)

20. If there are receptacles on the UPS rear panel, plug the equipment to be protected into the UPS output receptacles.

DO NOT protect laser printers with the UPS because of the exceptionally high power requirements of the heating elements.

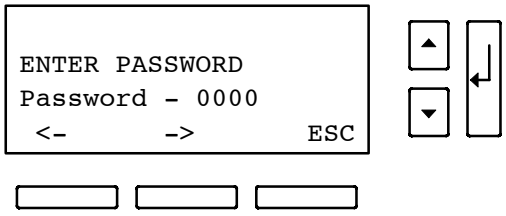
21. Turn on the equipment that is connected to the UPS.

22. If there is an external bypass switch, turn it to UPS. Otherwise, close the load distribution circuit breaker(s).

Initial Startup Parameters

The first time the UPS is turned on, you must set or verify certain operating parameters before placing the UPS into operation. Use the following procedure to set these initial configuration parameters.

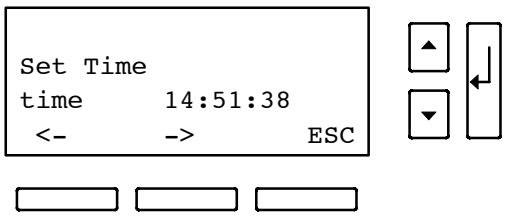
1. Enter the correct user security password: 0377. Move left and right by pressing the buttons below the <- and -> on the display. To change the value of the selected digit, press the ▲ and ▼ buttons. When the password shows 0377, press the ↲ button.



2. Select the desired language for the display. Use the ▲ and ▼ buttons to scroll between English, French, German, and Spanish. Enter your selection by pressing the ↲ button.

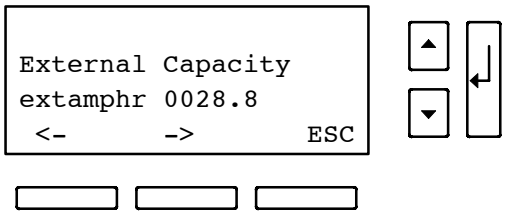
3. Set the clock for the local time and date. If the time or the date is correct as displayed, press the ↲ button to advance to the next configuration setting. Time must be entered in 24-hour format.

   Press the <- and -> buttons to move left and right. Press the ▲ and ▼ buttons to increase or decrease the value of each selected digit. When the displayed value is correct, press the ↲ button.



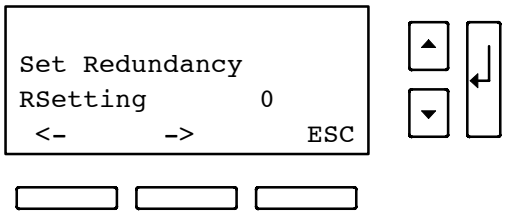
4. The output voltage is the most important operating parameter you must set as part of the initial configuration screens. Select the desired UPS output voltage using the ▲ and ▼ buttons. Possible selections are 200, 208, 220, 230, and 240 Vac. (Low voltages are derived from these voltages, as listed in Table 5 on page 32 and Table 9 on page 51.) Press the ↵ button when the desired output value is displayed.

5. If the system includes any external battery cabinets, record the ampere-hour capacity of batteries installed in these cabinets. If using a standard cabinet, count the number of battery strings (two battery modules, side-by-side equals one string). Each battery string contains 7.2 ampere-hours. Enter the total value in the next startup screen.

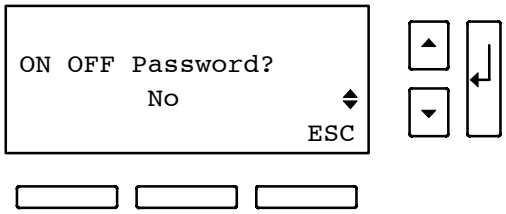


6. The system signals an alarm when the required output cannot be maintained with the loss of redundant power modules. The alarm is essentially disabled with a redundancy level set at 0.

If you want the system to notify you when the number of redundant power modules is less than a specified level, enter a redundancy level. Each increment above 0 indicates the number of modules that can be removed from operation before the alarm occurs. This setting only affects the alarm; the system continues to operate as an N+X system even if this parameter is left at the default value of 0.



7. To password-protect the UPS On/Off function, press the ▲ or ▼ button to make your selection; then press the ↵ button. If a password is required, the UPS On and Off functions are accessible only after first entering the correct password value (0377).



8. The UPS is now ready to operate, and displays the normal On/Off function screen.

Press the ON button on this screen to start the UPS.

These configuration parameters are accessible during normal UPS operation by pressing the Config button through the front panel display.

Chapter 8 Operation

The Powerware 9170+ UPS operates in several different modes. Normally it operates under internal control, called Auto mode, to automatically protect loads connected to it. It also functions under operator control to enable manual override should servicing or testing be required.

Figure 52 is an illustration of the operating modes. In Auto mode, the UPS automatically switches between modes depending on line and load conditions.

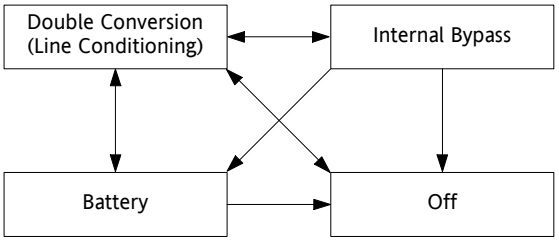


Figure 52. UPS Operating Modes Under Auto Mode Control

Double Conversion mode produces output power from the internal DC bus. The AC input power is rectified and boosted to supply this DC bus. The UPS switches automatically to and from Battery mode with no interruption (0 ms transfer time) as AC input power drops and returns. Batteries are charged in this mode.

Battery mode produces power from the batteries to supply the internal DC bus.

Internal Bypass (Bypass) mode shunts power flow around the DC/AC internal circuitry to keep the output powered with no line conditioning. Electromagnetic interference (EMI) and surge circuitry still protect the loads from voltage spikes and noise.

The High Efficiency (H.E.) mode is a user-programmable automatic mode of operation. This mode allows power to flow through the internal UPS bypass path for as long as AC input stays within the user-defined set points. If the input voltage or frequency deviates beyond these set points, the Powerware 9170+ system transfers to the Double Conversion mode of operation. Complete loss of input voltage causes the UPS to transfer to Battery mode. While in H.E. mode, the Powerware 9170+ system provides passive EMI filtering in the power path.

Off mode turns off the output and most internal circuitry. Within this mode, another mode (Sleep) turns off all internal circuitry when AC line is not present and battery voltage drops to a low threshold. If AC input voltage is not present in Off mode, the user can direct the UPS to enter Sleep mode by selecting the Battery Protect (BP) feature (see "Removing Input Power" on page 77). When AC input voltage returns in the Off mode (caused by a low battery alarm condition), the UPS automatically recovers and, if the Auto Restart parameter is enabled, switches to Double Conversion. Auto Restart is enabled as a factory-default.

After a discharge and subsequent low-battery shutdown, the UPS will automatically recover from Sleep mode if the Auto Restart parameter is enabled.

Figure 53 shows the basic functional elements of the UPS.

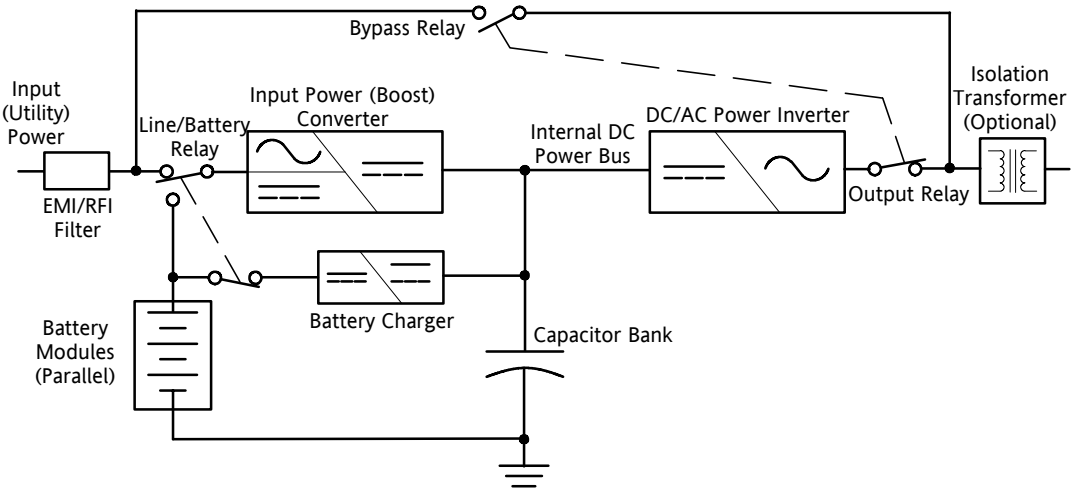


Figure 53. Powerware 9170+ UPS Functional Block Diagram

Turning the UPS On

The unit has no physical On/Off switch. The UPS On/Off function must be accessed through the front panel display.

If the UPS has been turned off, press the ON button through the front panel display to turn the UPS on again.

If the UPS has been manually set to operate in Bypass or Battery mode, change the System Control Mode Preference (menu 4 1) selection to Auto to return to normal Auto mode operation.

NOTE *The UPS will not start operating if AC input voltage or frequency is beyond acceptable limits or if the system mode selection is set to Battery. The UPS can not go directly from Off to Battery.*

Removing Input Power

Always put the Powerware 9170+ UPS into the Off mode before removing input power. Powerware 9170+ system batteries will discharge if the input line voltage is disconnected or turned off without first turning off the Powerware 9170+ UPS.

If the input power source will be disconnected or turned off for more than a day or two, you should put the UPS into Sleep mode. Do this by turning the UPS off, removing AC input power, and then pressing the On button and selecting Battery Protect (BP). Sleep mode allows the UPS to remain unpowered for up to six months without having to remove or recharge batteries.

Failure to properly power down the Powerware 9170+ UPS could permanently damage any installed batteries. Also, if batteries become severely discharged, the UPS might not start immediately when input power is restored.

Front Panel Display

The front panel has an alphanumeric display, three LED indicators, and six pushbuttons as described in Figure 54 and in Table 10.

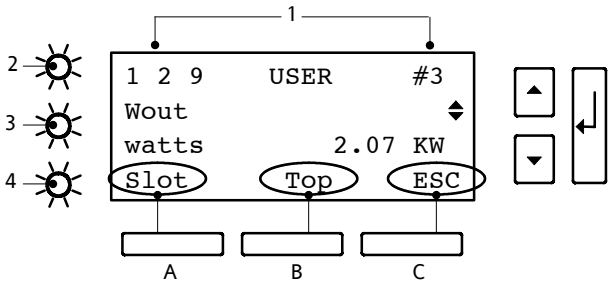


Figure 54. UPS Front Panel

Table 10. Front Panel Details

Item	Description
1	Alphanumeric display of unit function and operating parameters. Also displays alarm/data logs.
2	Alarm LED (red). Illuminates to signal that the unit has detected an alarm condition.
3	Battery LED (yellow). Illuminates to signal that the unit is operating on battery power and producing output voltage.
4	Line LED (green). Illuminates to signal that the unit is operating on AC utility power and producing output voltage.
A and B	Multi-function buttons, as labeled by the bottom line of the alphanumeric display.
C	Menu/Escape button, for moving into and out of display menus. Also, for avoiding a change to a parameter value.
▲ and ▼	Menu scroll up and down buttons. Also, for increasing/decreasing parameter value digits.
↵	Enter button, to activate/accept displayed parameter or operating mode.

Using the Front Panel Display

The front panel display shows several important things (see Figure 55). The numbers in the upper left corner (for example, 1 2 9) are the display location within the operating menu structure. The word in the top center (for example, USER) is the security level, which allows various operating parameters to be changed.

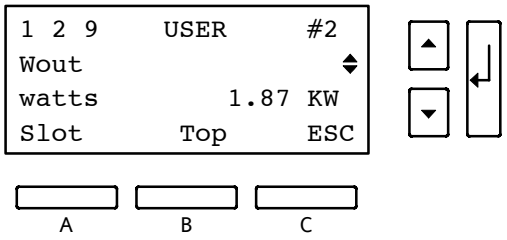


Figure 55. Typical Front Panel Display

The number in the upper right corner (for example, #2) identifies the cabinet slot (numbered from the top down) for a specific power module's parameters. #0 is defined as System, enabling you to observe overall system operation.

One or two triangles at the right of the display tells you which arrow buttons are active for moving to various parameters within a menu level. See Figure 60 on page 85 for the complete system menu.

The words or symbols in the bottom line of the display define the function of the three buttons below the display. In Figure 55, Slot (button A) enables you to observe the operation of a specific power module (the module in slot #2, in this case) or the overall system (selected as slot #0). Top (button B) takes you to the top item in the current menu level (in this case, 1 2 1). And ESC (button C) enables you to move out of the current menu level (in this case, to menu 1 2).

During normal operation, the display appears as shown in Figure 56. Md: indicates the current UPS operating mode and St: indicates the operational state. The number of power modules (M) and number of battery module strings (B) that are currently online, and the total number of module slots in the cabinet—for example, M4-B7-12—is shown in the upper right corner of the display. (The count of battery strings does not include additional battery strings contained in connected external battery cabinets.)

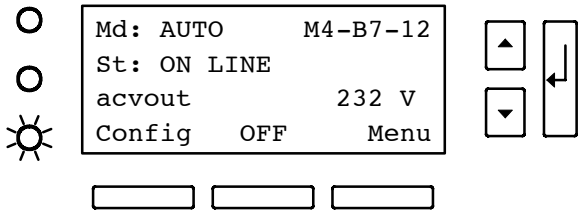


Figure 56. Front Panel Display (Normal Operation)

Operating parameters shown on the third line of the display vary depending on the operating mode. You can use the ▼ and ▲ buttons to scroll through the available parameters. After five seconds of inactivity, the system automatically saves the parameter that was selected as the default display parameter. The parameters that are available for display are:

- Phase 1 Input Voltage
- Phase 2 Input Voltage
- Phase 1 Output Voltage
- Phase 2 Output Voltage
- Total System Percent Load
- Phase 1 Percent Load
- Phase 2 Percent Load
- Battery Voltage
- Estimated Battery Run Time

Parameters

The parameters describe the Powerware 9170+ system operation. Some useful parameters are input and output voltage, input and output current, and battery voltage. The UPS measures or records many other parameters. Some are operator-adjustable, such as the local date and time and various operating limits. All parameters are password-protected. Although every operating condition and parameter is accessible through the front panel display, you may change a value **only** if you have entered the correct password to allow you to change it.

NOTE *After 10 minutes of inactivity, the UPS automatically deletes any active password level and returns to the normal running display.*

Changing Parameter Settings

The method of changing any operating parameter follows the same procedure as setting initial parameters, as described in "Initial Startup Parameters" on page 72.

Use the Menu map (Figure 60 on page 85) to find the parameter you need to change, and move through the menu structure until the parameter name appears on the display.

Press the ↵ button to access the parameter value. The Enter Password screen automatically appears if permission is required for a particular parameter. Enter the appropriate password, if applicable, and then change the parameter value.

When you have changed the value, press the ↵ button again to save the change. To avoid making a change, press ESC instead of the ↵ button.

Reading the Powerware 9170+ System Logs

The Powerware 9170+ system makes an entry in its logs each time it sounds an alarm or runs on battery power. This information can help in diagnosing power problems. You can display the UPS Inverter and Alarm logs on the unit's front panel display; these logs are in menu 2.

Inverter Log

The inverter (Battery mode) log is in menu 2, submenu 1. Move through the menu structure by pressing the Menu button and pressing the ▼ button to move down to menu 2. Press ↵ to move to submenu 1 and press ↵ again to view the most recent entry in the inverter log.

The log stores up to 10 entries, in chronological order. You can use the ▼ and ▲ buttons to scroll up and down through the log entries. Each entry shows the date and time the unit switched to battery operation (in 24-hour format), and the duration of battery operation (in hours and minutes).

A typical entry might look like this:

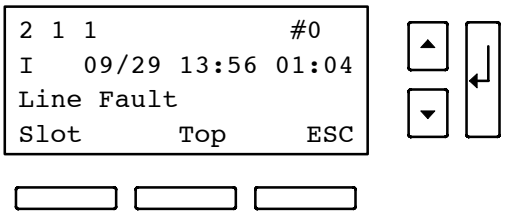


Figure 57. Inverter Log Entry

In Figure 57, the most recent inverter log (2 1 1) is being displayed. If the unit is still running on inverter (battery power), an asterisk (*) is displayed beside the date. “09/29” is the date of the Battery mode operation: September 29. “13:56” means that Battery mode operation started at 1:56 p.m. And “01:04” means the batteries supplied power for 1 hour and 4 minutes.

Table 11 contains a description of all inverter messages.

Table 11. Inverter Log Messages

Message	Explanation
Line Fault	UPS switched to battery because the input voltage was too high or too low.
Battery Test	Battery test initiated inverter operation.
Manual	Operator initiated inverter operation.

Alarm Log

The alarm log is in menu 2, submenu 2. Move through the menu structure by pressing the Menu button and pressing the ▼ button to move down to menu 2. Press ↵, and press the ▼ button to move down to submenu 2. The display shows the most recent entry in the alarm log.

The log stores up to 10 entries, in chronological order. You can use the ▲ and ▼ buttons to scroll up and down through the log entries. Each entry shows the alarm code, the alarm date and time (in 24-hour format), and the duration (in hours and minutes.)

A typical entry might look like this:

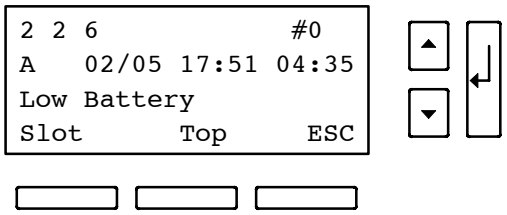


Figure 58. Alarm Log Entry

In Figure 58, the sixth most-recent alarm (2 2 6) is being displayed. “A” means the Powerware 9170+ system sounded alarm A (Low Battery). If the alarm is still active, an asterisk (*) is displayed beside the letter alarm code. “02/05” is the date the alarm occurred: February 5. “17:51” means the alarm sounded at 5:51 p.m. And “04:35” means the alarm was active for 4 hours and 35 minutes.

Some alarms indicate the specific power or battery module slot number. “Slot: XX” appears in the upper right hand corner of the display, as shown in Figure 59, indicating the slot number where the fault occurred.

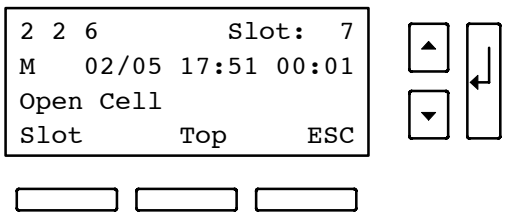


Figure 59. Alarm Entry for Specific Slot Number

Table 12 contains a description of all alarm log messages.

Table 12. Alarm Log Messages

Message	Explanation
Open Cell	Battery failure caused by open cell.
Weak Battery	Battery failure caused by load test.
Phase Error	Internal error – contact your service representative.
Module Failure	Internal error – contact your service representative.
Excessive Transfers	Internal error – contact your service representative.
Precharge Failure	Internal error – contact your service representative.
Insufficient Batteries	Too few battery modules; decrease load or add battery modules.
Insufficient Modules	Too few power modules; decrease load or add power modules.
Incompatible Module	A power module with incompatible firmware has been installed in the system; contact your service representative.

Battery Test

NOTE *The batteries must be fully charged and the UPS must not have been on battery within 24 hours of the battery test.*

The Powerware 9170+ has a battery test that runs automatically every 30 days by default and can also be performed manually.

The battery test parameters, including the test interval and time of day, can be set up in menu 3, submenu 1. To initiate a manual test, select menu 3 1 1. When the test is complete, the UPS automatically provides the results on the screen.

Menu Map

Figure 60 is an illustration of how to access all Powerware 9170+ system parameters. The menu structure has 6 primary-level menus, named System Status Menu (1) through Service Menu (6). Under each primary menu are secondary items, each numbered by its location under the primary menu. Use the various buttons as shown in the map to navigate to the desired parameter.

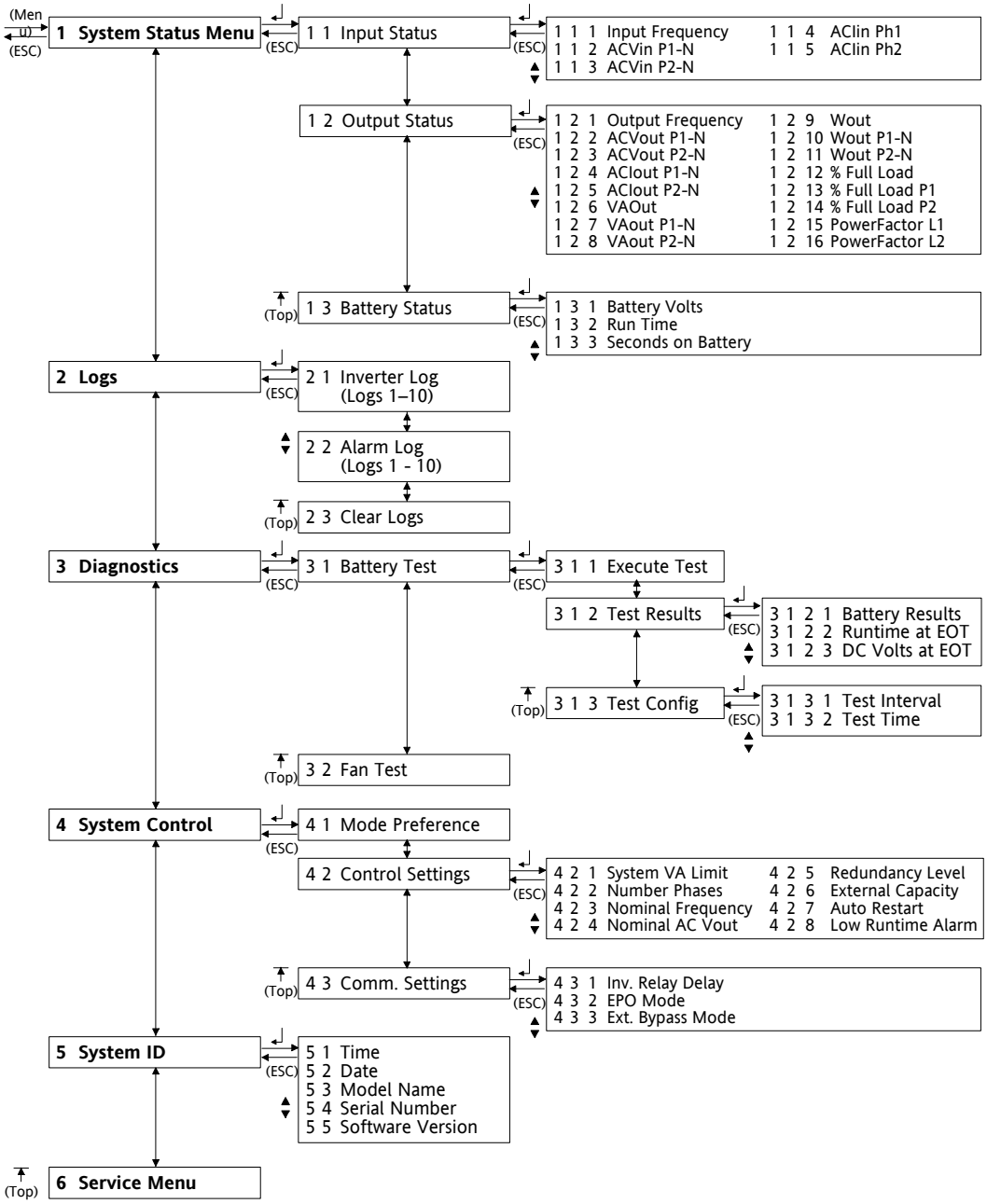


Figure 60. Powerware 9170+ System Menu Map

Chapter 9 Communication

Powerware offers several methods of communicating with your Powerware 9170+ system in addition to the front panel display:

- LanSafe Power Management Software
- Optional Interface Kits
- Communication Slots
- Dedicated Input Signals
- DB-9 Communication Port

LanSafe Power Management Software

Each Powerware 9170+ UPS ships with LanSafe Power Management Software and an interface cable. To begin installing LanSafe software, see the instructions accompanying the Powerware Software Suite CD.

LanSafe software uses an RS-232 serial link to communicate with the UPS, and it provides you with up-to-date graphics of UPS power and system data and power flow. It also gives you a complete record of critical power events, and it notifies you of important UPS or power information. If there is a power outage and the Powerware 9170+ system battery power becomes low, LanSafe software can automatically shut down your computer system to protect your data before the UPS shutdown occurs.

Optional Interface Kits

For computer systems that already have UPS monitoring software, Powerware offers interface cable kits for connecting the Powerware 9170+ system to your computer system. The kit includes the cable, adapters, and instructions.

Communication Slots

The Powerware 9170+ UPS has two communication slots that allow quick installation of the optional BestDock™ cards. These interface cards extend the capabilities of the Powerware 9170+ system to provide compatibility with network and remote monitoring/management systems.

ConnectUPS™ Web/SNMP Card (BD Model)

The ConnectUPS-BD card provides the Powerware 9170+ system with its own ethernet network connection, allowing it to be remotely monitored and controlled via industry-standard internet browsers. The HTML interface enables UPS monitoring and management from anywhere on the internet or within your intranet. In addition, third-party Simple Network Management Protocol (SNMP) software packages may also be used to communicate remotely with the Powerware 9170+ system.

The ConnectUPS-BD card also allows UPS-dependent computer systems to automatically shut down during extended power outages using the NetWatch client software provided on the Powerware Software Suite CD or Web site.

Relay Interface Card (BestDock Model)

The BestDock Relay Interface Card provides true relay contact output to peripheral devices. Outputs are user-selectable as normally open or normally closed. Refer the instructions included with the relay card for more detail.

Dedicated Input Signals

Emergency Power-Off: Connection to a facility Emergency Shutdown switch provides a method for emergency Powerware 9170+ system shutdown. Opening this connection creates an immediate shutdown of the Powerware 9170+ UPS output.

Bypass: The signal from an external bypass switch, to isolate the Powerware 9170+ system for maintenance purposes, tells the UPS to go into Internal Bypass mode.

On-Generator: An external signal that the input power is being supplied by a generator. Closure of this contact causes the UPS to change the following parameters to preset values that are designed to optimize performance during periods of generator instability:

- Phase Lock Window and Frequency Slew Rate. These parameters increase the rate at which the UPS tracks the input line, which causes fewer recognized line faults during generator instability.
- Frequency Glitch Count. This parameter increases the number of bad frequency cycles before the unit transfers to battery power. This allows the UPS to operate smoothly during generator instability without transferring to battery.
- Maximum Delta and Line Delta. These parameters widen the acceptable input voltage range, allowing the UPS to ignore any transient voltage regulation problems a generator may experience during unstable periods.

These parameters are also available to trained service personnel through the Service Menu.

See Figure 15 on page 26 and Figure 21 on page 31 to make the connection for all dedicated input signals.

DB-9 Communication Port

Table 13 explains the functions of the pins on the Powerware 9170+ DB-9 communication port. This port is on the Powerware 9170+ UPS rear panel, as shown in Figure 49 on page 66.

Table 13. DB-9 Port Signals

Pin	Function	Description
1	Low Battery Alarm	Pin 1 shifts from RS-232 Low (positive voltage) to RS-232 High (negative voltage) and remains high whenever the UPS enters a Low Battery alarm state.
2	RS-232 Transmit Data	Sends outgoing RS-232 communication data at 9600 baud, 8 bits, no parity, 1 stop bit.
3	RS-232 Receive Data/ RS-232 Shutdown	**RS-232 Receive Data Function.** Receives incoming RS-232 communication data at 9600 baud, 8 bits, no parity, 1 stop bit. **RS-232 Shutdown Function.** If Pin 3 receives an RS-232 Low signal (+Vdc) for at least 5 seconds, but not more than 7 seconds, during an AC Failure condition, the UPS output shuts off following a delay of 120 seconds (±5 seconds). • The UPS output shuts off even if the normal AC input power is restored during the 120 second delay. • The UPS output automatically restarts after the UPS determines the normal AC input power is stable. • The shutdown and restart timing represented by the functionality of Pin 3 is independent from the shutdown and restart timing specified from the host software.
4	Reserved	Loopback to Pin 6.
5	Common	Signal Ground
6	Reserved	Loopback to Pin 4
7	No Connection	Open pin
8	AC Fail Signal (On-Battery)	Pin 8 shifts from RS-232 Low (positive voltage) to RS-232 High (negative voltage) and remains high for 15 seconds (±1 second) after the UPS detects an AC Failure condition, assuming the condition still exists after the 15 seconds. When the AC Failure condition no longer exists, the signal returns to the RS-232 Low state (positive voltage).
9	No Connection/ DC Supply Voltage	The UPS is factory-set with Pin 9 disconnected, but can be enabled through a technician-replaceable jumper inside the UPS. The jumper setting MUST be changed by a qualified service technician. When enabled, Pin 9 provides supply voltage for use with external connectivity devices requiring DC power directly from the UPS DB-9 port (nominal 12 Vdc/5W; 8V minimum, 24V maximum). Use only Powerware brand connectivity devices.

Chapter 10 | Maintenance

Routine Maintenance

NOTE *Technicians must observe important safety precautions while performing these checks.*

NOTE *Powerware recommends that you schedule preventive maintenance checks at least every six months.*

The Powerware 9170+ system is designed to provide years of trouble-free operation. Its internal control system checks the batteries and inverter periodically to ensure reliable operation. In fact, you'll probably find that your Powerware 9170+ system requires less maintenance than any of your other computer peripherals.

Nevertheless, the Powerware 9170+ UPS and optional external battery cabinets do require some attention to assure continued reliable service. The service technician should follow Powerware's recommended maintenance schedule, which includes the following items:

- Check operating environment for clean, cool, dry conditions.
- Inspect and clean the unit.
- Check operation of fans (power modules).
- Check and tighten all connections.
- View and record the alarm and inverter logs.
- Check the batteries.
- Check the displayed UPS readings against actual measurements and recalibrate if necessary.
- Perform a system test.
- Check and record the values of the parameters in the System Status Menu (menu 1) online and on battery.
- Check the MOV surge suppression pack.

For more information on preventive maintenance checks, contact your service representative.

Storage Temperature

Store the Powerware 9170+ battery modules (in the UPS or external battery cabinet) at –20 to +40°C (–4 to +104°F). Batteries will have a longer shelf life if they are kept below +25°C (+77°F). The Powerware 9170+ UPS or battery cabinet without batteries may be stored at –40 to +60°C (–40 to +140°F).

External Bypass Switch (Make-Before-Break Only) Operation

You must press the red button beside the switch before turning the Powerware MBB bypass switch. This button serves two purposes. It sends an electrical signal to the UPS to switch to the internal Bypass mode (if it is not already operating in that mode). The button also operates a mechanical interlock, to prevent the switch from being turned without first signaling the UPS.

NOTE *When the red button is released, the UPS remains in its internal Bypass mode and must be manually returned to the Auto mode by selecting that mode on the front panel display.*

Battery Replacement

The Powerware 9170+ hot-swappable feature allows you to replace the battery modules easily without disconnecting the load or damaging the batteries.

NOTE *The Powerware 9170+ UPS will operate with uncharged (or no) batteries, but will have limited (or no) battery backup capability. Backup protection requires at least three battery strings for every four power modules. The UPS may indicate an alarm with no batteries present.*

Use the following procedure to replace battery modules in pairs.

1. Remove the front cover panel(s) from the battery modules you need to replace.

   The panels have spring latches on the left and right sides that hold them in place.

2. Grasp the battery module handle and press down on the latch release.

3. Pull the module out approximately 7″ (17 cm) to the secondary stop on top of the module.

4. Press down on the secondary stop release, pull the module out further, and support the module weight with your second hand as you remove the module from the cabinet. Remove the battery module beside the first in a similar manner. Label the original modules with masking tape or some other identifier.

5. After removing a pair (one string) of battery modules, install a replacement pair. Replacements may be installed in empty cabinet slots before removing original battery modules.

6. When all desired battery modules have been replaced, reinstall the front cover panel(s).

7. If the batteries are not properly installed, the Open Cell alarm activates. Check the batteries in the slot indicated on the alarm screen.

Power Module Replacement

The Powerware 9170+ hot-swap feature allows you to replace a power module easily without disconnecting the load or damaging the UPS.

NOTE *The UPS may switch to internal bypass if the remaining power modules are insufficient to supply the required power. If empty slots exist, install replacement modules before removing original ones.*

Use care in removing and installing power modules. To remove a power module:

1. Remove the front cover panel.

   The panels have spring latches on the left and right sides that hold them in place.

2. Loosen the thumbscrew on the module handle. Press down on the latch release at the center of the module handle and pull the handle down.

   As the module handle fully extends, the module disconnects. Slide the module slowly out of the cabinet.

3. Use two hands to support the module. When fully extended, lower the front down slightly and lift the rear edge over the safety stop on the center support rail.

4. Treat the original and replacement modules with care to avoid damaging connectors or internal circuitry. Label the original module with masking tape or some other identifier. Record the serial number of the replacement module for your warranty.

5. Insert the replacement module by sliding it carefully into the cabinet. Lower the front down slightly and lift the rear edge over the safety stop on the center support rail. Keep the module handle extended until the module is fully inserted.

6. Raise the power module handle to secure the module into the cabinet. Be sure the handle latch snaps into place. Tighten the thumbscrew on the handle.

7. Reinstall the front cover panel.

Chapter 11 | Specifications

This section provides the following specifications for the Powerware 9170+ models:

- Electrical input and output
- Isolation
- Model specifications
- Environmental and safety
- Battery
- Weights and dimensions

Table 14. Electrical Input and Output

Nominal Input Voltage	200–240 Vac or 100/200, 110/220, 120/208, 120/240, 127/220 Vac
Input Voltage Range	176–276 Vac*
Nominal Output Voltage	200–240 Vac or 100/200, 110/220, 120/208, 120/240, 127/220 Vac
Nominal Frequency	Online: 50/60 Hz auto-sensing; output frequency tracks input frequency to selectable limit (±0.1 to ±5.0 Hz; ±3.0 Hz default); switches to battery operation outside this tolerance On battery: 50 Hz or 60 Hz ±0.1 Hz.
Regulation	±3% load regulation (under any line, load, or battery condition)
Voltage Waveform	Sine wave; <3% THD at rated linear loads, computer-grade power
Overload Capability	150% for 10 seconds; 300% for 12 cycles
DC Input Protection	DC fuse and battery charger overvoltage limit network
Output Protection	Microprocessor-sensed overvoltage and overcurrent, with fuse backup
Efficiency in Double-Conversion mode	>88%
Efficiency in Double-Conversion mode (with Isolated Output)	>84%
Efficiency in Bypass mode (with Isolated Output)	>96%

*176–250 Vac for universal power modules producing 200 and 208 Vac nominal output voltage. 152–239 Vac for 120/208 and 127/220.

Table 15. Isolation

Models 0650C and 0660C Output Neutral-to-Ground Bonding	±3% load regulation (under any line, load, or battery condition) Neutral is carried through from input to output; a separate neutral-to-ground bond is not required
Model 0650I, 0660I, and 0660J Isolation, Including Output Neutral-to-Ground Bonding	True, separately-derived power source as defined by National Electrical Code Article 250-5d, with output neutral bonded to ground. No direct connection between input and output; neutral-to-ground bond is required; other local codes may take precedence.

Table 16. Split-Phase Model Specifications (ASY-0673)

3 kVA, 2500 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	16A	15A	25A	285W (0.98 kBTU/hr)
220	15A	14A		
208	14A	14.5A		
220	13A	14A		
230	14.5A	13A		
240	14A	12.5A		
6 kVA, 5000 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	32A	30A	40A	570W (1.95 kBTU/hr)
220	30A	28A		
208	28A	29A		
220	26A	28A		
230	29A	26A		
240	28A	25A		
9 kVA, 7500 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	48A	45A	60A	860W (2.93 kBTU/hr)
220	45A	42A		
208	42A	43.5A		
220	39A	42A		
230	43.5A	39A		
240	42A	37.5A		

*In High-Efficiency and Bypass modes the input current equals the output current plus 2A for each power module in the system.
For redundant power module operation (N+X), increase the input current rating by 2A for each additional redundant power module.

Table 16. Split-Phase Model Specifications (ASY-0673) Continued

12 kVA, 10000 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	64A	60A	80A	1145W (3.90 kBTU/hr)
220	60A	56A		
208	56A	58A		
220	52A	56A		
230	58A	52A		
240	56A	50A		
15 kVA, 12500 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	80A	75A	100A	1430W (4.88 kBTU/hr)
220	75A	70A		
208	70A	72.5A		
220	65A	70A		
230	72.5A	65A		
240	70A	62.5A		
18 kVA, 15000 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	96A	90A	125A	1720W (5.85 kBTU/hr)
220	90A	84A		
208	84A	77A		
220	78A	84A		
230	87A	78A		
240	84A	75A		

*In High-Efficiency and Bypass modes the input current equals the output current plus 2A for each power module in the system.
For redundant power module operation (N+X), increase the input current rating by 2A for each additional redundant power module.

Table 17. Universal Model Specifications (ASY-0674)

3 kVA, 2100 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	14A	15A	25A	285W (0.98 kBTU/hr)
208	13.5A	14.5A		
220	13A	14A		
230	12.5A	13A		
240	12A	12.5A		
6 kVA, 4200 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	28A	30A	40A	570W (1.95 kBTU/hr)
208	27A	29A		
220	26A	28A		
230	25A	26A		
240	24A	25A		
9 kVA, 6300 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	42A	45A	60A	860W (2.93 kBTU/hr)
208	40.5A	43.5A		
220	39A	42A		
230	37.5A	39A		
240	36A	37.5A		

*In High-Efficiency and Bypass modes the input current equals the output current plus 2A for each power module in the system.

For redundant power module operation (N+X), increase the input current rating by 2A for each additional redundant power module.

Table 17. Universal Model Specifications (ASY-0674) Continued

12 kVA, 8400 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	56A	60A	80A	1145W (3.90 kBTU/hr)
208	54A	58A		
220	52A	56A		
230	50A	52A		
240	48A	50A		
15 kVA, 10500 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	70A	75A	100A	1430W (4.88 kBTU/hr)
208	67.5A	72.5A		
220	65A	70A		
230	62.5A	65A		
240	60A	62.5A		
18 kVA, 12600 Watts				
Voltage	Input Current*	Output Current	Input Service*	Heat Dissipation Normal Mode
200	84A	90A	125A	1720W (5.85 kBTU/hr)
208	81A	87A		
220	78A	84A		
230	75A	78A		
240	72A	75A		

*In High-Efficiency and Bypass modes the input current equals the output current plus 2A for each power module in the system.

For redundant power module operation (N+X), increase the input current rating by 2A for each additional redundant power module.

Table 18. Environmental and Safety

Operating Temperature	0°C to 40°C (32°F to 104°F) Optimal battery performance: 25°C (77°F)
Storage Temperature	UPS with battery modules: –20°C to +40°C (–4°F to 104°F) UPS without batteries: –40°C to +60°C (–40°F to 140°F)
Relative Humidity	5–95% noncondensing
Operating Altitude	Up to 3,050 meters above sea level (10,000 ft) The maximum operating ambient temperature decreases 1°C per 300m above 1525m (2°F per 1000 ft above 5000 ft)
Non-Operating Altitude	Up to 12,200 meters above sea level (40,000 ft)
Ventilation	The air around the UPS must be clean and free of dust, corrosive chemicals, and other contaminants. The Powerware 9170+ UPS uses internal fans to circulate the air for cooling. The air must be free to circulate around the UPS and battery cabinet(s). Do not operate the UPS in a sealed room or container.
Audible Noise	Less than 53 dBA
Surge Suppression	ANSI C62.41 Category B (formerly IEEE 587); IEC 61000-4-5
Safety Conformance	CAN/CSA C22.2, No. 107.1; UL 1778; EN 50091-1-1 and IEC 60950
Agency Markings	UL, cUL, TÜV, CE, C-Tick, BCIQ
EMC (Class A)	EN 50091-2, FCC Part 15, ICES-003, VCCI

Table 19. Battery

Configuration	(2) 60V, 7.2 Ah batteries per string
Voltage	120 Vdc
Type	Sealed, maintenance-free, valve-regulated, lead-acid
Charging	Recharge time: 4 hr after full-load resistive discharge; 8 hr after half-load resistive discharge, using standard internal battery charger. Optional battery chargers at higher current ratings will be available for future product release.

Table 20. Weights and Dimensions

Cabinet Size	Height	Width	Depth	Weight*
3-slot	17.75″ (45 cm)	17.0″ (43 cm)	25.5″ (65 cm)	66 lb (30 kg)
3-slot (with caster cart)	19.5″ (49.5 cm)	17.0″ (43 cm)	25.5″ (65 cm)	78 lb (35 kg)
6-slot	31.5″ (80 cm)	17.0″ (43 cm)	25.5″ (65 cm)	103 lb (47 kg)
6-slot (with caster cart)	33.25″ (84.5 cm)	17.0″ (43 cm)	25.5″ (65 cm)	115 lb (52 kg)
9-slot	47.0″ (119.5 cm)	24.0″ (61 cm)	28.5″ (72.5 cm)	158 lb (72 kg)
12-slot	60.75″ (154.5 cm)	24.0″ (61 cm)	28.5″ (72.5 cm)	196 lb (89 kg)

* Add the following weights for isolation transformers:
  3-slot cabinet: 65 lb (30 kg)
  6-slot cabinet: 140 lb (64 kg)
  12-slot cabinet: 275 lb (125 kg)
Optional floor anchor kit weighs 9 lb (4 kg)
Each battery module weighs 30 lb (14 kg)
Each power module weighs 17 lb (8 kg)

Chapter 12 | Troubleshooting

The following questions provide a few quick-to-find answers to commonly asked questions.

Table 21. Frequently Asked Questions

Question: "How do I... "	Answer
Turn the UPS on?	Verify that all power modules are securely plugged into the cabinet, and each module handle is latched. If external battery cabinets are installed, confirm that the DC disconnect switch button on the back of the cabinet is closed (pulled out). To close the DC disconnect switch button, insert the switch key supplied with the cabinet into the button and turn clockwise 1/2-turn. Pull the button out to close the switch. Turn the key back counter-clockwise, and remove the key. If an external bypass switch is installed, turn the switch to the LINE or UPS position. Refer to the front panel display and press the button labeled ON. (If On/Off control is password-protected, enter the user password: 0377.) Confirm the selection by pressing the button labeled Yes. After a few seconds, the green LED illuminates to signal the UPS is operating and producing power.
Turn the UPS off?	Refer to the front panel display and press the button labeled OFF. Confirm the selection by pressing the button labeled Yes. (If On/Off control is password-protected, enter the user password: 0377.) In the event of a front panel display failure, you can turn the unit on or off using a computer connected to the communication port. In an emergency or when the above two methods fail to turn the unit off, remove the front cover panels, and unlatch and pull the handles of all power modules out at least one inch (2.5 cm) to turn off the power control circuitry. If your UPS has external battery cabinets, push in the DC disconnect switch button on the back of the battery cabinet nearest to the UPS cabinet.
Turn off the alarm beeps?	Press the lower left button on the front panel display. Note the alarm message and see "Alarms" on page 105 to correct the problem. After the problem has been resolved, press the lower center button to clear the alarm.
View the alarm log?	Go to menu 2-2. Press the ↵ button to view the most recent alarm. Press the ▼ button to scroll down through the log to view older alarms.
Install the LanSafe III software?	See the instructions accompanying the LanSafe III software CD-ROM.
Check the input or output voltage?	Go to menus 1-1-2 and 1-1-3 for the input voltage; go to menus 1-2-2 and 1-2-3 for the output voltage.

Question: "How do I... "	Answer
Check the battery voltage?	Go to menu 1-3-1. To view other system status parameters, see the Menu map on page 85.
Check the condition of the batteries?	The results of the most recent battery test are stored at menu 3-1-2-1. To run a test of battery condition, go to menu 3-1-1 and press the ↵ button. When the test is complete, the results are again stored in the Battery Results parameter.
Change the battery low-voltage alarm threshold? (or any other alarm or operating limit?)	This is one of the parameters that require a trained person, knowing the correct password, to perform. Without the proper password, you are only able to view operating limits, not change them. Only authorized personnel should change these limits. For information about making this or other password-protected adjustments, contact your service representative.
Apply power to the load if the unit won't operate?	Turn the optional external bypass switch to either the SERVICE or the LINE position. In these two positions, utility power flows directly to the load. In the SERVICE position, the UPS does not receive utility power and may be worked on for maintenance purposes.
Turn the external bypass switch?	If the bypass switch is a Make-Before-Break type, you must press the red button beside the switch before turning the switch.
Set the UPS to turn on in High Efficiency mode?	Go to menu 4-1. Select the system mode desired at power-on by pressing the ▲ or ▼ button. When the display shows Auto High Efficiency, press the ↵ button.
Set the UPS to operate in High Efficiency mode on weekends?	The Powerware 9170+ system will not change operating modes as a timed event. But, if you wish to conserve energy, before leaving for the weekend, go to menu 4-1. Select High Efficiency and press the ↵ button. After the weekend, return to the Automatic mode by going to menu 4-1 again, and selecting Auto followed by pressing the ↵ button.
Change the level of system redundancy?	To view or change the redundancy level, go to menu 4-2-5.
Change the batteries?	Each side-by-side pair of battery modules forms one series string on the battery bus. See "Battery Replacement" on page 93 for the battery replacement procedure.
Add/delete one or more strings of batteries?	Physically install or remove battery modules as described on page 64. Record capacity of external battery strings (in all external battery cabinets) by going to menu 4-2-6.
Add/delete one or more power modules?	Physically install or remove power modules as described on page 64. The system operating software senses the number and location of all power modules in the cabinet. If you want to change the number of redundant power modules, go to menu 4-2-5 and change the level of system redundancy.

Alarms

Figure 61 shows a typical alarm display. Alarms are annunciated by a constant Alarm LED and a constant beep. During alarm display, button (A) silences the audible alarm, button (B) clears the alarm display, and button (C) performs the normal Escape function to exit from the alarm display. The ↲ button enables you to scroll through all alarms.

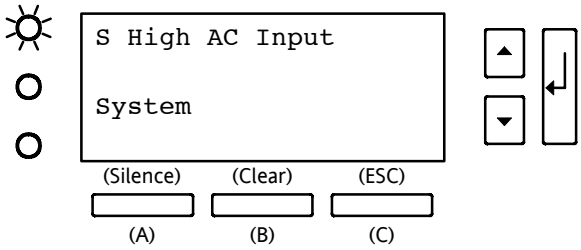


Figure 61. Typical System Active Alarm Display

Figure 62 shows a detailed alarm entry. Some alarms provide additional information on the second line of the display to help identify the cause of the alarm. The third line may also display a specific slot number where the fault occurred. If the alarm is not specific to a slot number, “System” appears on the display.

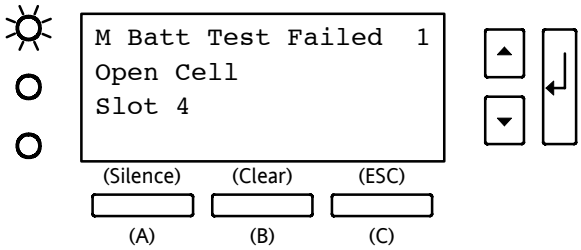


Figure 62. Detailed Alarm Entry

When the Powerware 9170+ UPS detects an alarm condition, the UPS displays the alarm with the following indications:

- the red LED next to the front panel display illuminates
- sounds an audible alarm
- displays an alarm message

When this happens, follow these steps:

1. Observe the display to see which alarm is active.

NOTE *To find out if more than one alarm is active, press ↵. This switches the display between alarm messages. To silence the audible alarm, press button (A) below the display.*

2. Find the alarm message in Table 22 or Table 23 and follow the instructions to resolve the problem. To clear an alarm after resolving the problem, press button (B) below the display. If the problem is still present, the alarm will sound again after a short delay.

Table 22 contains descriptions of critical alarm messages. Critical alarms require immediate operator attention and corrective action.

Table 22. Critical Alarm Messages

Alarm Message	What It Means	What to Do
A Low Battery	The UPS has shut down after running on battery and discharging the batteries.	Wait for AC input power to be restored. When AC input power returns, the UPS begins recharging batteries and applies power to the load.
C High Battery	The battery voltage is too high because of a charger problem, battery problem, or incorrect parameter setting.	Contact your service representative.
E Low AC Output	The UPS has shut down because the AC output voltage is too low to provide power to the load.	Contact your service representative.
F High AC Output	The UPS has shut down because the AC output voltage is too high.	Contact your service representative.
S High AC Input	The AC input voltage is too high; any further increase to the voltage may damage the UPS.	This alarm automatically clears when input voltage returns to normal limits. The UPS will continue to support the load until the batteries are depleted.
G Output Overload	The load is requiring more power than the UPS power modules are capable of supplying, and the UPS has switched to Bypass mode.	Switch off your equipment one piece at a time until the alarm stops.

Alarm Message	What It Means	What to Do
I Overload Shutdown	The UPS has shut down due to excessive load.	Remove excess load(s) from the UPS output and restart the UPS by pressing the ON button through the front panel display.
H High Heatsink Temperature	The inverter temperature is too high. If the temperature reaches a preset limit, the unit will shut down.	If the UPS has not shut down, bypass the UPS or shut down your equipment, and turn the UPS off. Contact your service representative.
P EPO	The Emergency Power-Off function has been activated.	Deactivate the external EPO switch and restart the UPS by pressing the ON button through the front panel display.
T Call Service	The UPS has detected a problem that requires service.	Contact your service representative.
T Call Service Phase Error	The UPS has detected the input phase rotation to be incompatible with its output wiring and will not start up.	Correct the input wiring problem and restart the UPS.
T Call Service Module Failure	A power module has detected an internal fault and has shut down.	Look for the slot number (third line on display) of the power module and replace the defective module.
T Call Service Excessive Transfers	The UPS has detected an excessively high number of automatic transfers from High Efficiency mode, and has switched to Double Conversion (Auto) mode.	Contact your service representative.
T Call Service Precharge Failure	A power module has detected an initialization sequence problem and will not start up.	Look for the slot number (third line on display) of the affected module. Contact your service representative.
T Call Service Incompatible Module	A power module with incompatible firmware has been installed in the system.	Look for the slot number (third line on display) of the affected module. Contact your service representative.
5 Fan Failure	The UPS has detected a module fan problem that requires service.	Contact your service representative.

Table 23 contains descriptions of non-critical alarm messages. Non-critical alarms are not as urgent as critical alarms, but should be attended to as soon as convenient to avoid the problem becoming critical.

Table 23. Non-Critical Alarm Messages

Alarm Message	What It Means	What to Do
B Near Low Battery	The battery voltage has reached the Near Low Battery set point.	If the voltage increases, the alarm clears automatically. If it drops further, it will cause a Low Battery alarm.
D Low Runtime	Batteries in the unit are nearly discharged.	Perform an orderly shutdown of all equipment and wait for AC input power to return. When AC input power returns, the UPS begins recharging batteries and automatically restarts.
O Check Memory	The configuration as stored in the system memory may have been corrupted.	Look for the slot number (third line on display) of the failed module. Contact your service representative.
M Check Battery	The batteries have failed an automatic system test.	Contact your service representative.
M Check Battery Open Cell	A battery (pair of modules) has failed an open cell test.	Look for the slot number (third line on display) of the failed modules. Verify that both battery modules are properly installed. If properly installed, replace both battery modules.
M Check Battery Weak Battery	The system batteries have degraded to the point where system runtime is less than the designed rating.	Replace all battery modules.
U Low Redundancy	The number of active power modules is too low to provide the programmed redundancy level to protect the current load.	The unit is able to protect the equipment, but will not be fault tolerant. To regain the desired redundancy, either add power modules or reduce the load.
U Low Redundancy Insufficient Batteries	The UPS load exceeds 2800 watts per battery string. The system will protect the load during short power outages, but battery degradation or damage may result.	Reduce the load or install additional battery modules (two modules per string).
U Low Redundancy Insufficient Modules	The number of active power modules is too few to provide the programmed redundancy level while protecting the load. The UPS will protect the load, but will not be fault tolerant.	Reduce the load or install additional power modules.

Service and Support

If you have any questions or problems with the UPS, call your **Local Distributor** or the **Help Desk** at one of the following telephone numbers and ask for a UPS technical representative.

In the United States:	**1-800-356-5737** or **1-608-565-2100**
Europe, Middle East, Africa:	**+44-17 53 608 700**
Asia:	**+852-2830-3030**
Australia:	**+61-3-9706-5022**

Please have the following information ready when you call the Help Desk:

- Model number
- Serial number
- Version number (if available)
- Date of failure or problem
- Symptoms of failure or problem
- Customer return address and contact information

If repair is required, you will be given a Returned Material Authorization (RMA) Number. This number must appear on the outside of the package and on the Bill Of Lading (if applicable). Use the original packaging or request packaging from the Help Desk or distributor. Units damaged in shipment as a result of improper packaging are not covered under warranty. A replacement or repair unit will be shipped, freight prepaid for all warrantied units.

NOTE *For critical applications, immediate replacement may be available. Call the* **Help Desk** *for the dealer or distributor nearest you.*