

EAT•N

Powerware

**Powerware® 9155 Parallel UPS
8–15 kVA
User's Guide**

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 Règlement sur le matériel brouilleur du Canada.

IEC 62040-2

Some configurations are classified under IEC 62040-2 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

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

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Requesting a Declaration of Conformity

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

- Harmonized Standards: IEC 62040-1-1 and IEC 62040-2; IEC 60950 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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FIN-02920 Espoo
Finland
Phone: +358-9-452 661
Fax: +358-9-452 665 68

Special Symbols

The following are examples of symbols used on the UPS or accessories to alert you to important information:



RISK OF ELECTRIC SHOCK - Indicates that a risk of electric shock is present and the associated warning should be observed.



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



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, lead-acid batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

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Chapter 1 Introduction

A parallel system with up to three uninterruptible power supplies (UPSs) can be installed to provide a parallel capacity and/or redundant system. This load sharing system provides more capacity than a single UPS and can provide backup, depending on the load and configuration. In addition, when one UPS is taken out of service for maintenance or is not operating properly, a redundant UPS continues to supply uninterrupted power to the critical load. A parallel Powerware® Hot Sync® Contoller Area Network (CAN) Bridge Card provides connectivity for system metering and operational mode control. The parallel system consists of two or three UPSs, each with a CAN Bridge Card and a parallel tie cabinet.

Figure 1 shows the Powerware 9155 UPS and an optional Extended Battery Module (EBM).

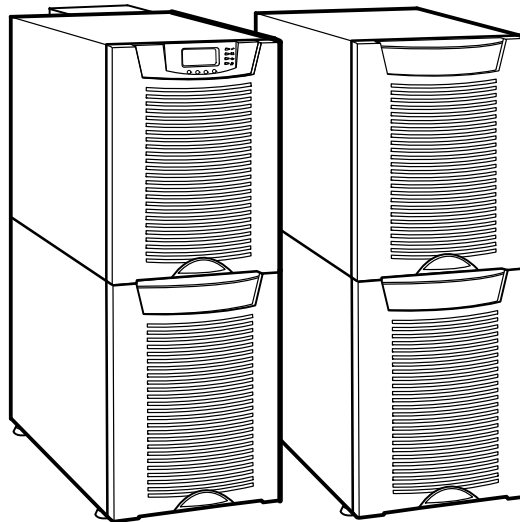


Figure 1. The Powerware 9155 UPS and EBM (2-High Cabinets Shown)

Chapter 2 Safety Warnings

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.

DANGER



This UPS contains **LETHAL VOLTAGES**. All repairs and service should be performed by **AUTHORIZED SERVICE PERSONNEL ONLY**. There are **NO USER SERVICEABLE PARTS** inside the UPS.

WARNING



- This UPS contains its own energy source (batteries). The UPS output may carry live voltage even when the UPS is not connected to an AC supply.
 - 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% maximum).
 - To reduce the risk of fire, connect only to a circuit provided with 100 amperes maximum branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.
 - Output overcurrent protection and disconnect switch must be provided by others.
-

CAUTION



- Batteries can present a risk of electrical shock or burn from high short circuit current. Observe proper precautions. Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.
 - Proper disposal of batteries is required. Refer to your local codes for disposal requirements.
 - Never dispose of batteries in a fire. Batteries may explode when exposed to flame.
-

Consignes de Sécurité

CONSIGNES DE SÉCURITÉ IMPORTANTES CONSERVER CES INSTRUCTIONS CE MANUEL CONTIENT DES CONSIGNES DE SÉCURITÉ IMPORTANTES

DANGER!



Cet onduleur contient des TENSIONS MORTELLES. Toute opération d'entretien et de réparation doit être EXCLUSIVEMENT CONFIEE A UN PERSONNEL QUALIFIE AGRÉÉ. AUCUNE PIÈCE RÉPARABLE PAR L'UTILISATEUR ne se trouve dans l'onduleur.

WARNING



- Cet onduleur renferme sa propre source d'énergie (batteries). Les prises de sortie peuvent être sous tension même lorsque l'onduleur n'est pas branché sur le secteur.
- Pour réduire les risques d'incendie et de décharge électrique, installer l'onduleur uniquement à l'intérieur, dans un lieu dépourvu de matériaux conducteurs, où la température et l'humidité ambiantes sont contrôlées. La température ambiante ne doit pas dépasser 40 °C. Ne pas utiliser à proximité d'eau ou dans une atmosphère excessivement humide (95 % maximum).
- La protection contre une surintensité pour le(s) circuit(s) de sortie de courant alternatif doit être fournie par un autre fournisseur.
- Les interrupteurs de déconnexion convenables pour le(s) circuit(s) de sortie de courant alternatif doivent être fournis par un autre fournisseur.

ATTENTION!



- Les batteries peuvent présenter un risque de décharge électrique ou de brûlure par des courts-circuits de haute intensité. Prendre les précautions nécessaires.
- Une mise au rebut réglementaire des batteries est obligatoire. Consulter les règlements en vigueur dans votre localité.
- Ne jamais jeter les batteries au feu. L'exposition aux flammes risque de les faire exploser.

Advertencias de Seguridad

INSTRUCCIONES DE SEGURIDAD IMPORTANTES GUARDE ESTAS INSTRUCCIONES ESTE MANUAL CONTIENE INSTRUCCIONES DE SEGURIDAD IMPORTANTES

PELIGRO



Este SIE contiene VOLTAJES MORTALES. Todas las reparaciones y el servicio técnico deben ser efectuados SOLAMENTE POR PERSONAL DE SERVICIO TÉCNICO AUTORIZADO. No hay NINGUNA PARTE QUE EL USUARIO PUEDA REPARAR dentro del SIE.

WARNING



- Este SIE contiene su propia fuente de energía (las baterías). Los receptáculos de salida pueden transmitir corriente eléctrica aun cuando el SIE no esté conectado a un suministro de corriente alterna (c.a.).
- Para reducir el riesgo de incendio o de choque eléctrico, instale este SIE en un lugar cubierto, con temperatura y humedad controladas, libre de contaminantes conductores. La temperatura ambiente no debe exceder los 40°C. No trabaje cerca del agua o con humedad excesiva (95% máximo).
- La protección contra exceso de corriente para el/los circuito(s) de CA de salida será suministrada por terceros.
- Los interruptores de desconexión debidamente clasificados para el/los circuito(s) de CA de salida serán suministrados por terceros.

PRECAUCIÓN



- Las baterías pueden presentar un riesgo de descargas eléctricas o de quemaduras debido a la alta corriente de cortocircuito. Preste atención a las instrucciones correspondientes.
- Es necesario desechar las baterías de un modo adecuado. Consulte las normas locales para conocer los requisitos pertinentes.
- Nunca deseche las baterías en el fuego. Las baterías pueden explotar si se las expone a la llama.

SAFETY WARNINGS

Chapter 3 UPS Setup

This chapter describes:

- Equipment inspection
- Floor loading and clearances
- Unloading the cabinet(s)

The instructions are intended for the chief operator/system supervisor, electrical consultants, and installation electricians. Local regulations and electrical code must be followed during the UPS installation.

Inspecting the Equipment

If any equipment has been damaged during shipment, keep the shipping and packing materials for the carrier or place of purchase and file a claim for shipping damage. If you discover damage after acceptance, file a claim for concealed damage.

To file a claim for shipping damage or concealed damage: 1) File with the carrier within 15 days of receipt of the equipment; 2) Send a copy of the damage claim within 15 days to your service representative.



NOTE *Check the battery recharge date on the packaging label. If the date has expired and the batteries were never recharged, do not use the UPS. Contact your service representative.*

Floor Loading

When planning the installation, consider the UPS weight for floor loading. The strength of the installation surface must be adequate for point and distributed loadings. The approximate weights are shown in the following table.

Standard Model Floor Loadings (2-High/3-High Cabinets)			
Powerware 9155	Maximum Weight (lb)	Point Loading (lb/in²)	Distributed Loading (lb/ft²)
2-High UPS	352	88	166
3-High UPS	590	148	278
3-High UPS with Isolation Transformer	558	140	263
2-High EBM	480	120	226
3-High EBM	710	178	335

Clearances

The following clearances are recommended for the Powerware 9155 UPS:

From Front of Cabinet	36" (91.4 cm) working space
From Back of Cabinet	6" (15.2 cm)

Unloading the Cabinet(s)

The following tools are required for unloading the cabinet(s):

- 15 mm wrench or socket
- 7 mm nutdriver or socket



CAUTION

The UPS and Extended Battery Module (EBM) are heavy (see page 8). Unloading the cabinets requires at least two people to safely remove the cabinets from the pallet.

To remove the UPS or EBM from the shipping pallet:

1. Remove the two M10 bolts securing the stabilizing bracket to the pallet (see Figure 2).

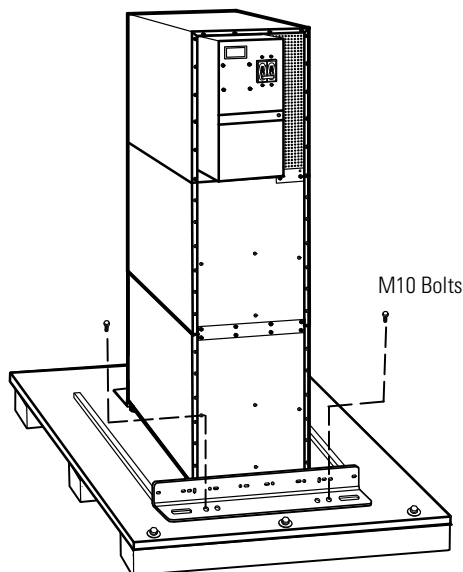


Figure 2. Removing the Stabilizing Bracket Bolts

2. Remove the four M4 screws securing the stabilizing bracket to the cabinet rear panel and remove the bracket (see Figure 3). Retain the hardware for later use.



NOTE Be sure to retain the stabilizing bracket and hardware for later re-assembly onto the cabinet.

3. Remove the front cover from the bottom cabinet to access the front shipping bracket.

Press and release the handle latch at the bottom of the cover and then lift the cover up and off the cabinet.

4. Remove the three M10 bolts securing the rear shipping pad to the pallet and remove the shipping pad (see Figure 3).



NOTE Hold the back of the cabinet so that the bolts can be removed easily without the cabinet rolling backward.

5. Remove the two M10 bolts securing the front shipping bracket and remove the bracket.

If needed, adjust the leveling feet to release the bracket.

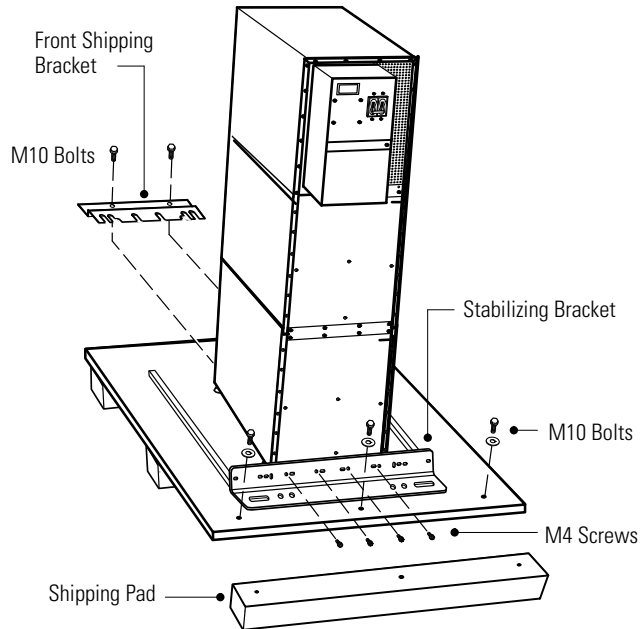


Figure 3. Removing the Brackets and Shipping Pad

6. Reinstall the front cover removed in Step 3.

Hang the top edge of the cover on the cabinet first, then lower the bottom edge and snap into place.



NOTE Be sure to support the front and back of the cabinet when rolling it off the pallet to prevent tipping.

7. Slowly roll the cabinet toward the rear of the pallet. Once the pallet tilts, continue rolling the cabinet down the pallet until the cabinet touches the floor (see Figure 4).

If needed, adjust the leveling feet so that the cabinet will roll.

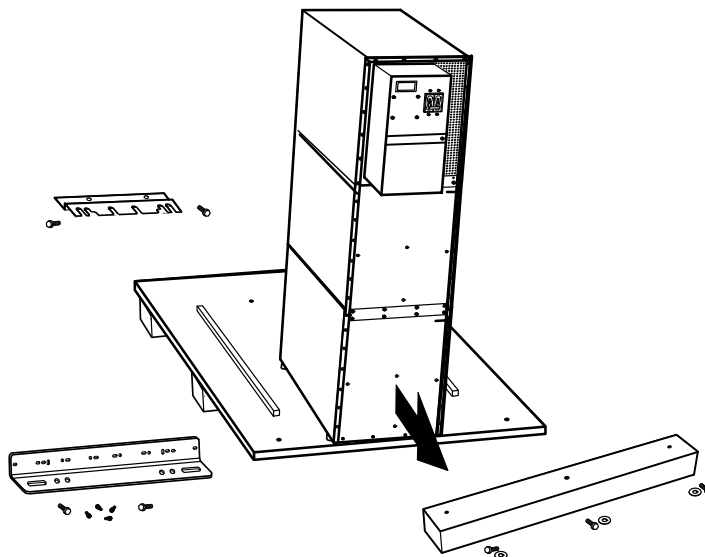


Figure 4. Unloading the Cabinet

8. With the cabinet supported, slowly pull the pallet away from the cabinet (see Figure 5).

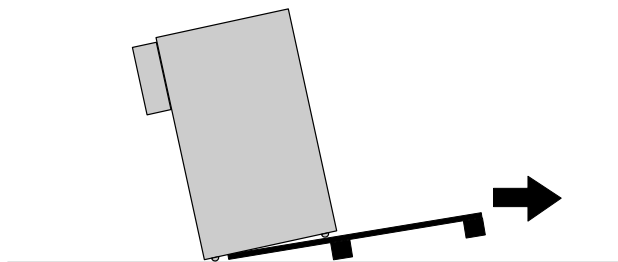


Figure 5. Removing the Pallet

9. Roll the cabinet to the desired location.

Chapter 4 Parallel Installation

The Powerware 9155 has the following power connections:

- 2-phase (L1 and L2), neutral, and ground connection for rectifier/bypass input
- 2-phase (L1 and L2), neutral, and ground connection for load output

The nominal input/output voltages are:

- 100/200, 110/220, or 120/240 Vac with 180° phase displacement
- 120/208 or 127/220 Vac with 120° phase displacement

Output overcurrent protection and disconnect switch must be provided by others.

Figure 14 on page 22 shows a oneline diagram of the parallel UPS system.



WARNING

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

To hardwire the parallel system:

1. Verify that the electrical connections to the installation site have been properly installed.
2. A wall-mounted, user-supplied, readily-accessible disconnection device must be incorporated in the input wiring.

Compare the circuit breaker ratings and wire sizes to the ones in the following wiring table:

Table 1. Circuit Breaker Ratings

UPS Capacity	Input Circuit Breaker Rating	Minimum Wire Size*
8 kVA	60A	4 AWG (21.2 mm ²)
10 kVA	80A	3 AWG (26.7 mm ²)
12 kVA	100A	2 AWG (33.6 mm ²)
15 kVA	100A	2 AWG (33.6 mm ²)

*Use only 75°C-rated copper wire. Minimum wire size is based on 120/208 full load ratings applied to NEC Code Table 310-16. 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 requirements.



NOTE To accommodate the feature of easy system expandability, it is recommended that initial installation of the Powerware 9155 UPS contain wiring to support the maximum capacity of the UPS cabinet.

3. Switch off utility power to the distribution point where the parallel tie cabinet and UPSs will be connected. Be absolutely sure there is no power.
4. Determine your equipment's grounding requirements according to your local electrical code.

- 5. Remove the parallel tie cabinet front cover (see Figure 6).

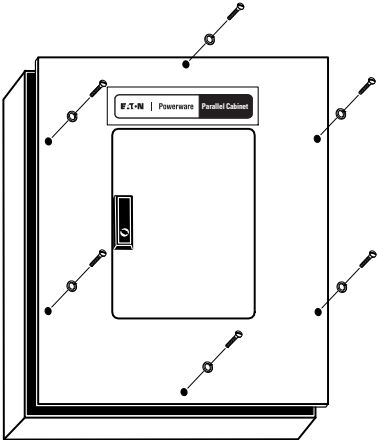


Figure 6. Parallel Tie Cabinet Front Cover

- 6. Remove the internal cover to gain access to the breakers (see Figure 7).

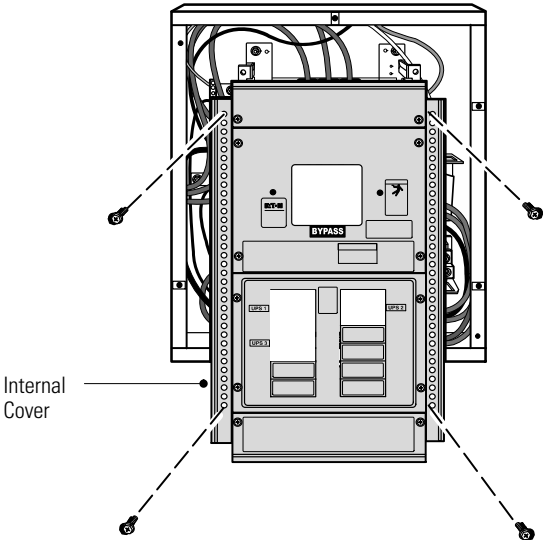


Figure 7. Internal Cover

7. Punch holes for the conduit (AC input, each UPS output, and load connection) using a Greenlee® punch or similar device.
8. Verify that the parallel bypass breaker is in the OFF position (see Figure 8).
9. Mount the parallel tie cabinet to the wall and install the conduit.

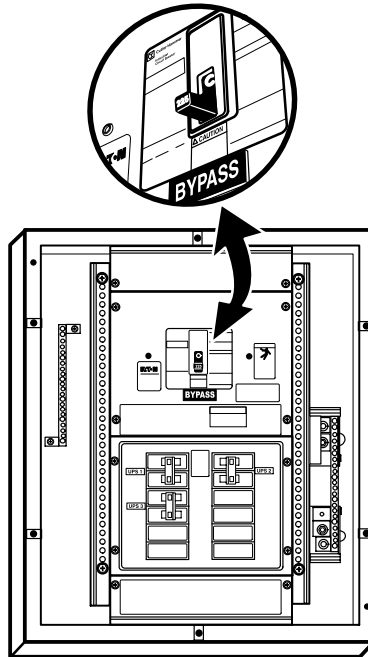


Figure 8. Parallel Bypass Breaker

10. Verify that each UPS battery circuit breaker is in the OFF position (see Figure 9).

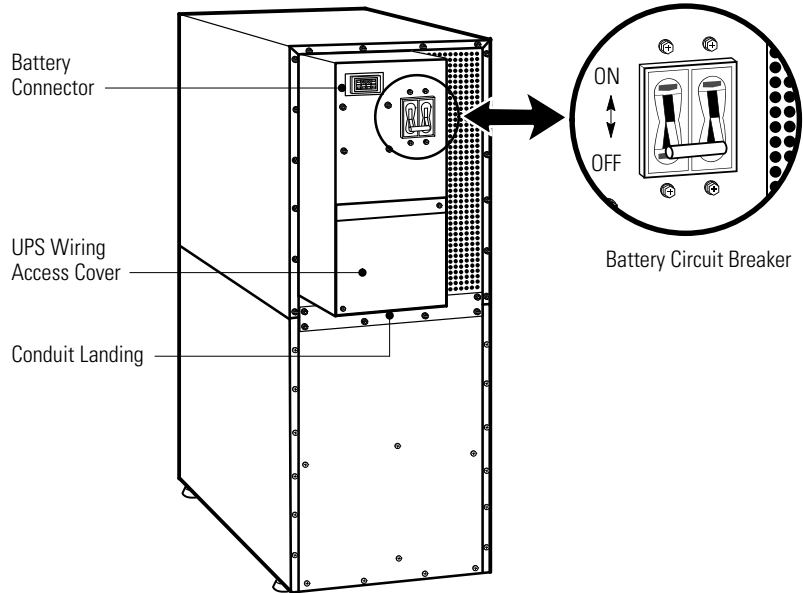


Figure 9. UPS Rear View (2-High Shown)

11. From each UPS, remove the UPS wiring access cover and retain (see Figure 9).
12. Hardwire the UPS input terminations (TB1-1 through TB1-5) for each UPS.

See Table 2 for specifications and Figure 10 for a detailed view of the UPS terminal block.



NOTE Input neutral must be wired for proper operation. Failure to connect an input neutral will void the warranty.

Table 2. UPS Terminal Block Wiring

Wire Function	Terminal Position	Upstream Circuit Breaker	Minimum Wire Size*	Tightening Torque	Conduit Connection (Entry Size)
Input	Ground	TB1-1	8 AWG		
	L1	TB1-3	100A	25 lb in (2.83 Nm)	2" access hole for 1-1/2" conduit
	Neutral	TB1-4	3 AWG		
	L2	TB1-5	100A	3 AWG	
Output	L1	TB1-6	3 AWG	25 lb in (2.83 Nm)	2" access hole for 1-1/2" conduit
	Neutral	TB1-7	3 AWG		
	L2	TB1-8	3 AWG		
	Ground	TB1-9	8 AWG		

*Use only 75°C-rated copper wire. Minimum wire size is based on 120/208 full load ratings applied to NEC Code Table 310-16.

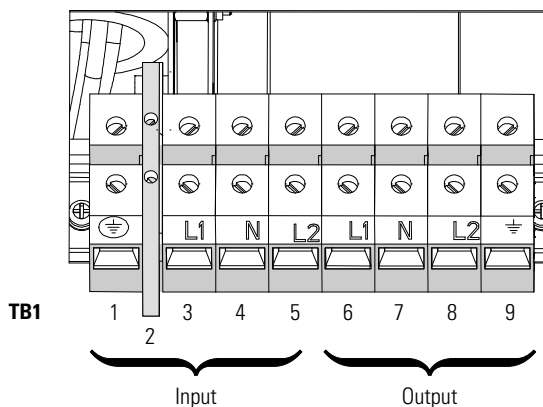


Figure 10. UPS Terminal Block

13. Hardwire the output terminations (TB1-6 through TB1-9) from each UPS to the parallel tie cabinet (see Figure 11).

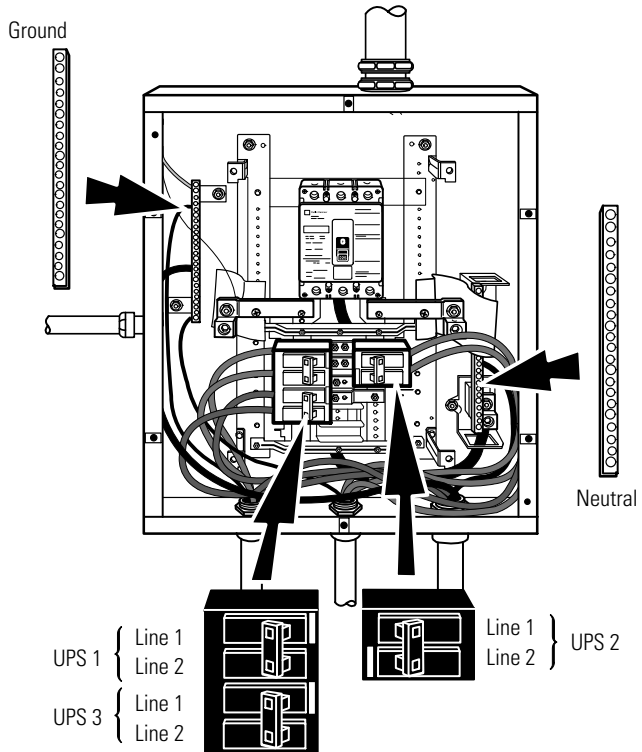


Figure 11. UPS Output to Parallel Tie Cabinet Wiring

14. Replace each UPS wiring access cover.

15. Hardwire the load to the parallel tie cabinet (see Figure 12).

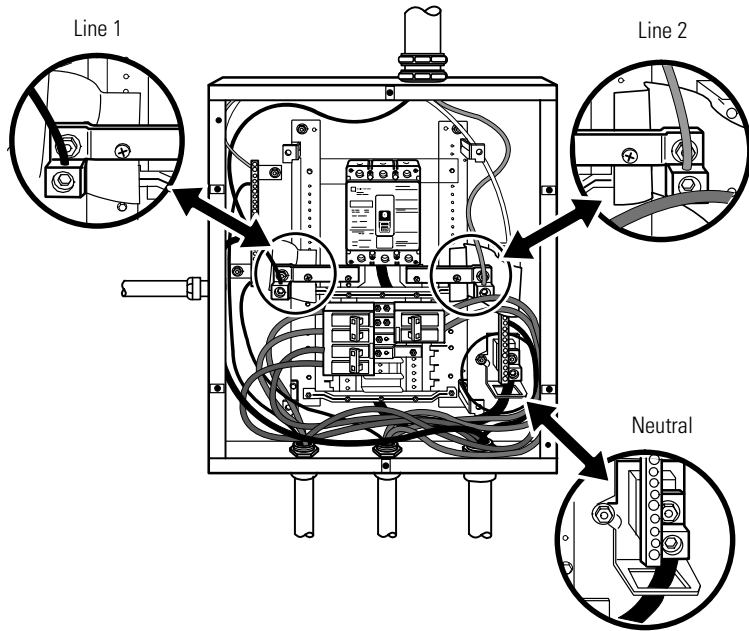


Figure 12. Load Connections

16. Wire the AC input to the bypass breaker (see Figure 13).

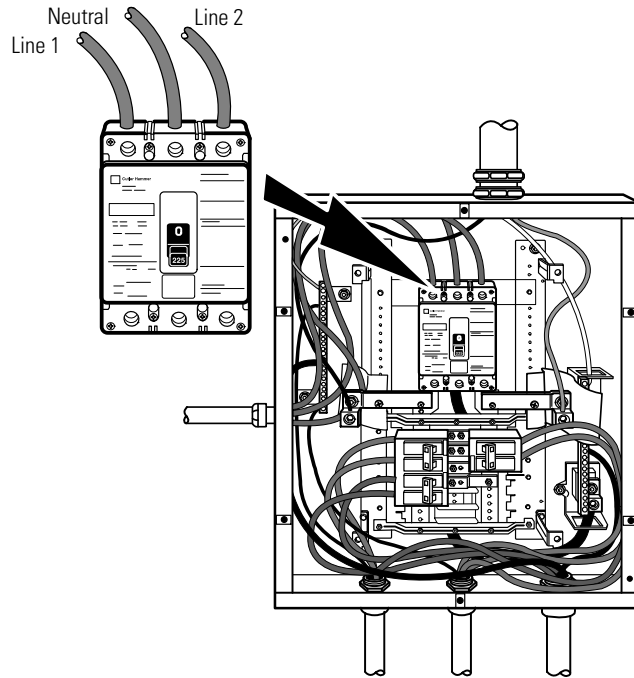


Figure 13. Parallel AC Input Wiring

17. Verify the phase rotation for each UPS and the bypass input.
18. Reinstall the internal cover removed in Step 6.
19. Reinstall the parallel tie cabinet front cover removed in Step 5.
20. Continue to “Installing Options” on page 23.

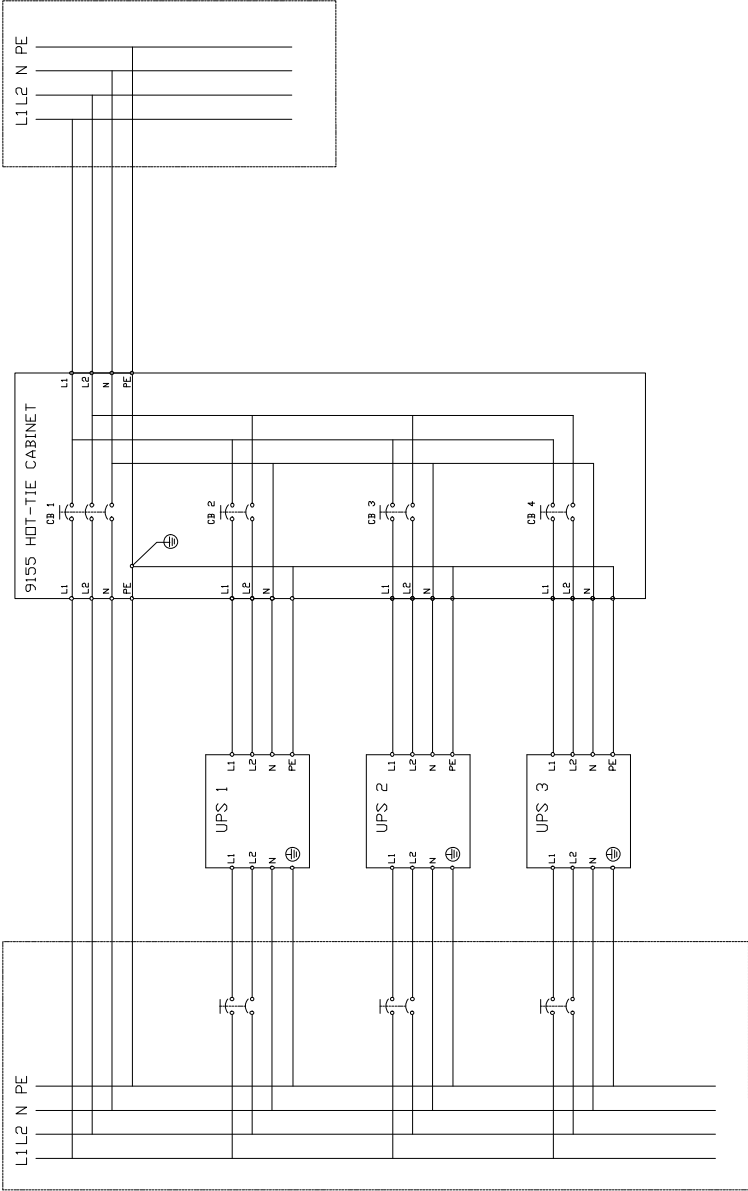


Figure 14. Parallel Wiring Diagram

Chapter 5 Installing Options

This section describes the Powerware Hot Sync CAN Bridge Card.

For other options, such as additional X-Slot™ cards, Powerware LanSafe™ Power Management Software, remote emergency power-off (REPO), relay output contacts, or programmable signal inputs, refer to the *Powerware 9155 UPS (8–15 kVA) User's Guide*.

Figure 15 shows the location of the communication options and control terminals on the UPS.

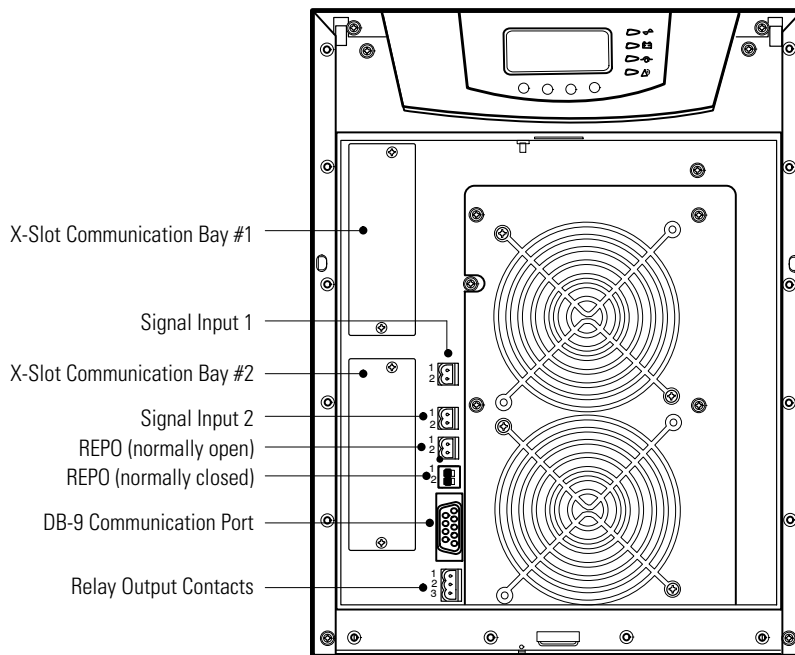


Figure 15. Communication Options and Control Terminals

Powerware Hot Sync CAN Bridge Card

The Powerware Hot Sync CAN Bridge Card, shown in Figure 16, can be installed to provide connectivity for operational mode control and metering of a parallel system at any UPS in the system.

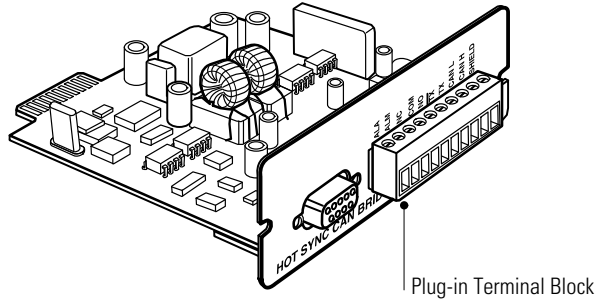


Figure 16. Powerware Hot Sync CAN Bridge Card

To install the Powerware Hot Sync CAN Bridge Card:

1. Remove the front covers of all cabinets, starting with the top cabinet.

Press and release the handle latch at the bottom of each cover and then lift the cover up and off the cabinet (see Figure 17).

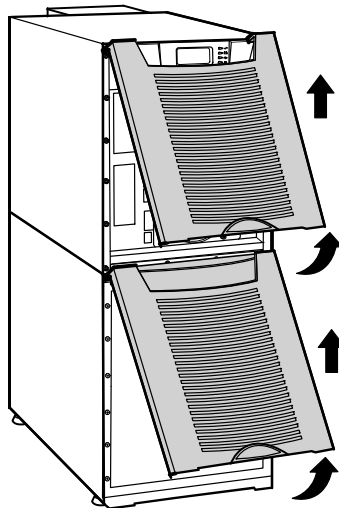
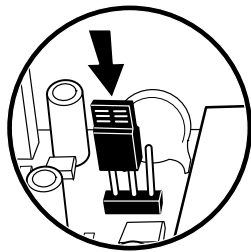


Figure 17. Removing the Front Covers

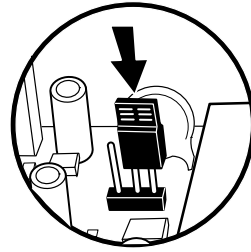
2. If you ordered a factory-configured parallel UPS, remove the Powerware Hot Sync CAN Bridge Card from the X-Slot on the front of the UPS. Retain the screws.

Otherwise, remove the X-Slot communication bay cover and retain the screws.

3. Set the jumper pins on the Powerware Hot Sync CAN Bridge Card according to the parallel configuration (see Figure 18):
 - If only two UPSs are paralleled, then set both cards to Pins 1 and 2.
 - For three paralleled UPSs, set the cards of the first and last UPS to Pins 1 and 2; set the card for the middle UPS to Pins 2 and 3.



Jumper J7 - Pins 1 and 2



Jumper J7 - Pins 2 and 3

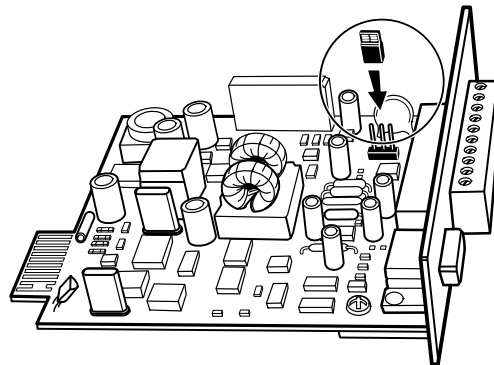


Figure 18. Setting the CAN Bridge Card Jumper J7 (Side View)



NOTE *If you are installing another X-Slot card, be sure to install the Powerware Hot Sync CAN Bridge Card in X-Slot 2.*

4. Loosely install the Powerware Hot Sync CAN Bridge Card into an open X-Slot on the front of the UPS. You may want to remove the terminal block from the CAN Bridge Card for better wiring access.
5. Strip shielded, four-wire, twisted-pair wire for CAN Bridge Card wiring. Recommended wire size is 18 AWG maximum.
6. Install the CAN Bridge Card wiring between each UPS (see Figure 19). Be sure to check correct polarity for Pins 8 and 9:
 - Connect SHIELD Pin 10 on all cards together.
 - Connect CAN H Pin 9 and CAN L Pin 8 (twisted pair) on all cards together.
 - Connect COM Pin 4 and NC Pin 3 (twisted pair) on all cards together.
7. Install the pull-chain wiring between the CAN Bridge Card and Signal Input 2 on each UPS and daisy chain the wiring to each UPS. Be sure to check correct polarity (see Figure 19):
 - Connect COM Pin 4 to Signal Input 2 Pin 1 on each UPS.
 - Connect NC Pin 3 to Signal Input 2 Pin 2 on each UPS.

CAUTION



If polarity or wiring is not correct, the parallel system does not operate normally. For example, when shutting down one UPS, the remaining UPS transfers the load to bypass instead of supporting the load. Verify all CAN Bridge Card wiring is correct for proper operation.



NOTE *Signal Input 2 can still be used for building alarms; it is automatically rerouted to the CAN Bridge Card.*

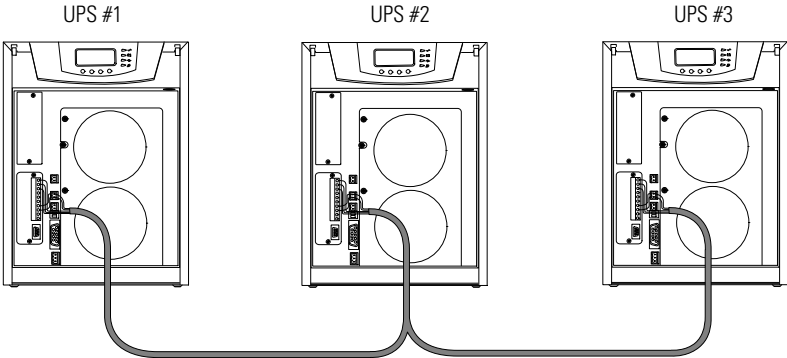
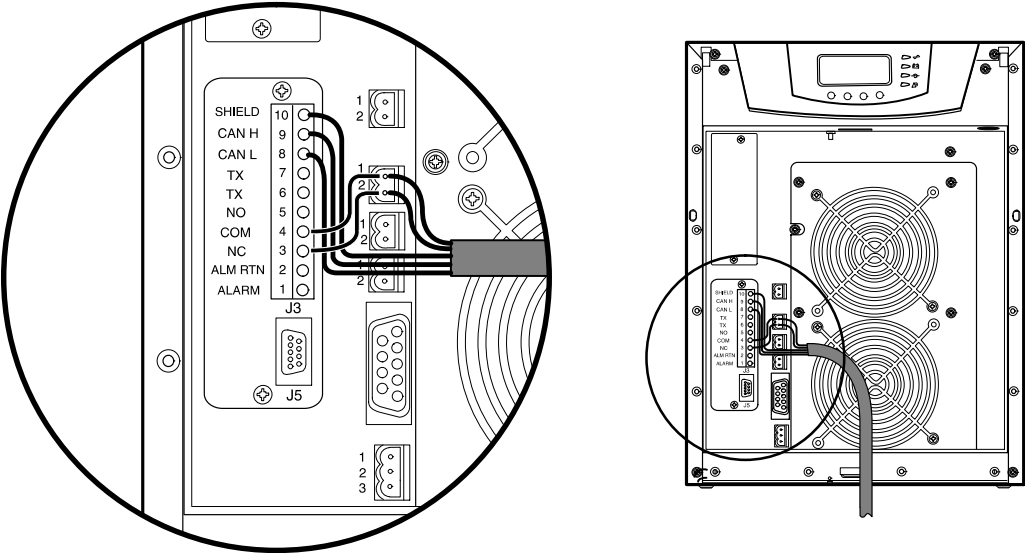


Figure 19. CAN Bridge Card Wiring

8. Secure the Powerware Hot Sync CAN Bridge Card with the screws removed in Step 2.
9. On the bottom cover (and also the middle cover if 3-high), remove a knockout tab in the top edge of the cover for each cable:

With wire cutters, cut either side of the tab and twist down to remove the tab (see Figure 20).

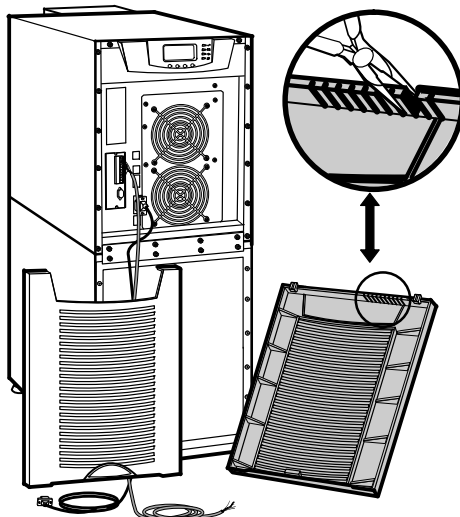


Figure 20. Removing Knockout Tabs

10. Route the cable(s) to the approximate location of the cover access holes.

11. Reinstall the front covers, starting with the bottom cabinet (see Figure 21).

Hang the top edge of the cover on the cabinet first, then lower the bottom edge and snap into place. Be sure the cables fit in the access holes in the covers.

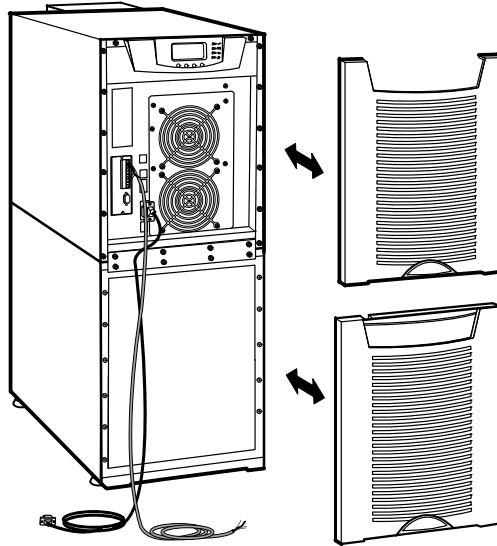


Figure 21. Reinstalling the Front Covers

12. Continue to “Stabilizing the Cabinet” on page 31 to complete the parallel UPS installation.

Chapter 6 Stabilizing the Cabinet



NOTE For seismic installations, you **MUST** order and install a Powerware 9155 UPS seismic kit; do not use the following instructions.

NOTE For non-seismic installations, you **MUST** install the stabilizing bracket on all 3-high cabinets. The stabilizing bracket is optional for 2-high cabinets.

To stabilize the cabinet(s):

1. Lower the leveling feet to prevent the cabinet from rolling.

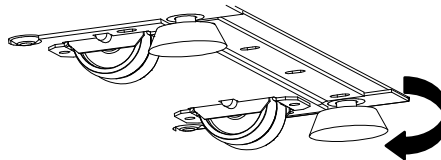


Figure 22. Lowering the Leveling Feet

2. Attach the stabilizing bracket to the bottom of the cabinet rear panel using the retained hardware from the shipping pallet according to the cabinet configuration:
 - For one cabinet, see Figure 23.
 - For two cabinets, see Figure 24.
 - For three cabinets, see Figure 25.



NOTE No more than three cabinets can be attached together. For four cabinets, use two of the two-cabinet installations. For five cabinets, use one three-cabinet and one two-cabinet installation.

3. Use the holes and slots in the bottom of the bracket to attach the cabinet to the flooring if desired.

4. Continue to one of the following sections:
- “Extended Battery Module Installation” on page 35 to install optional EBMs.
 - “Operation” on page 39 to start up the parallel UPS system.

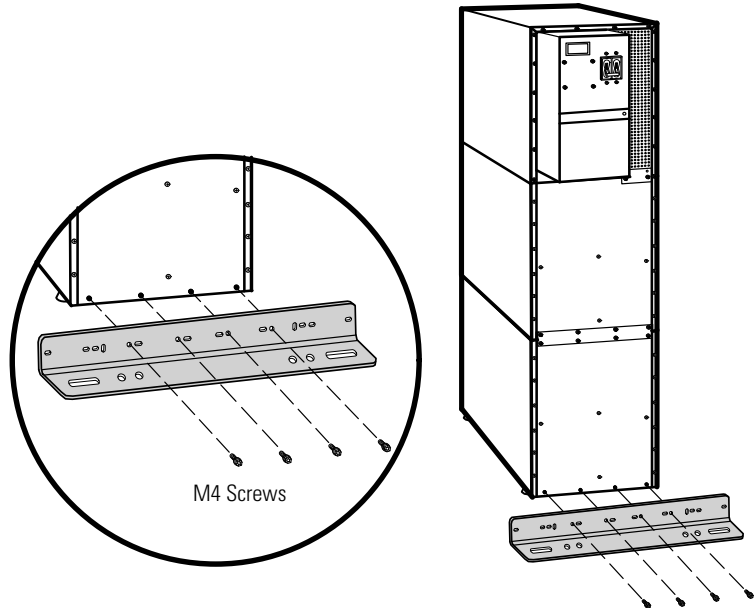


Figure 23. Stabilizing Bracket with One Cabinet

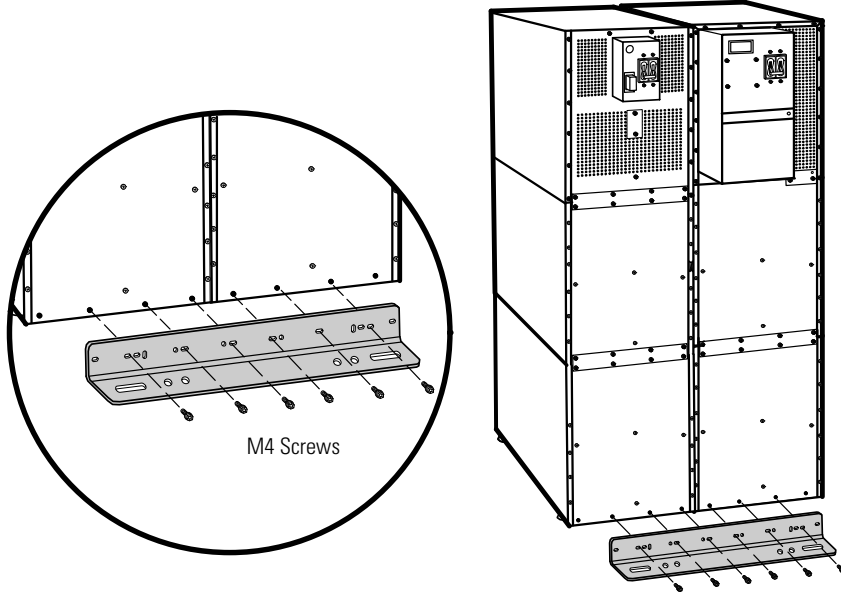


Figure 24. Stabilizing Bracket with Two Cabinets

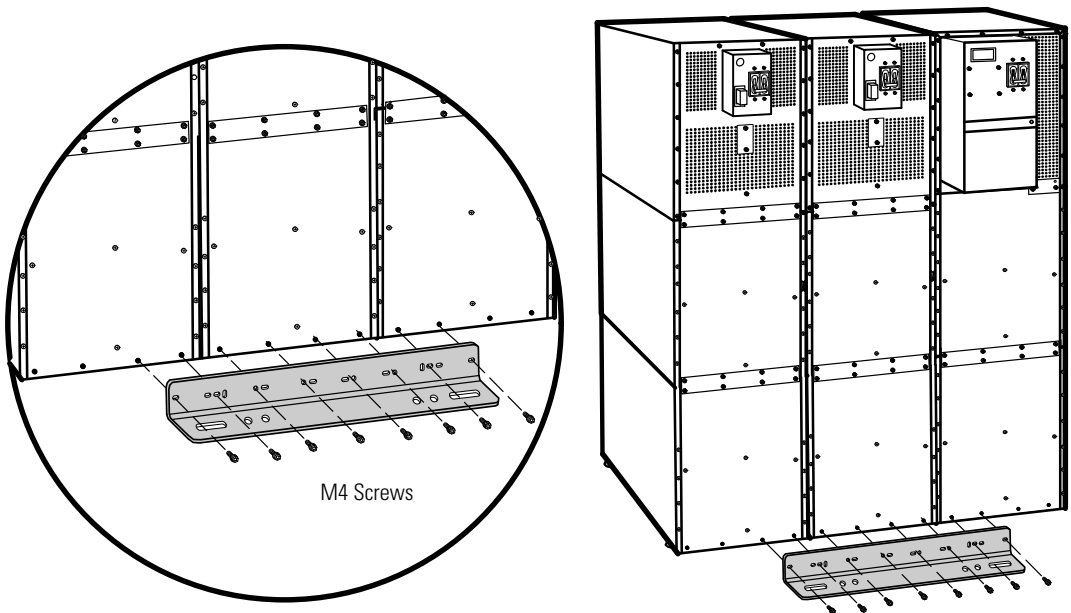


Figure 25. Stabilizing Bracket with Three Cabinets

STABILIZING THE CABINET

Chapter 7 Extended Battery Module Installation



NOTE A maximum of 22 battery strings can be installed in one configuration, including UPS batteries (4 EBM-64 models or 3 EBM-96 models). UPS-32 models contain 2 strings; UPS-64 models contain 4 strings; EBM-64 models contain 4 strings; and EBM-96 models contain 6 strings.

NOTE For non-seismic installations, you **MUST** install the stabilizing bracket on all 3-high cabinets. The stabilizing bracket is optional for 2-high cabinets.

NOTE In a parallel system, each UPS should have the same number of Extended Battery Modules (EBMs) to ensure equivalent runtimes.

To install the optional EBM:

1. Position the EBM adjacent to the next cabinet.
2. Verify that all battery circuit breakers are in the OFF position (see Figure 26).
3. Remove the two ground straps from the EBM rear panel.
4. Install one ground strap between the UPS and EBM rear panels as shown in Figure 26.
5. If additional EBMs are installed, attach another ground strap between the first and second EBM as shown in Figure 26. Repeat for each additional EBM.
6. Plug the EBM cable into the UPS battery connector.
7. If additional EBMs are installed, plug the EBM cable of the second cabinet into the battery connector on the first EBM. Repeat for each additional EBM.

EXTENDED BATTERY MODULE INSTALLATION

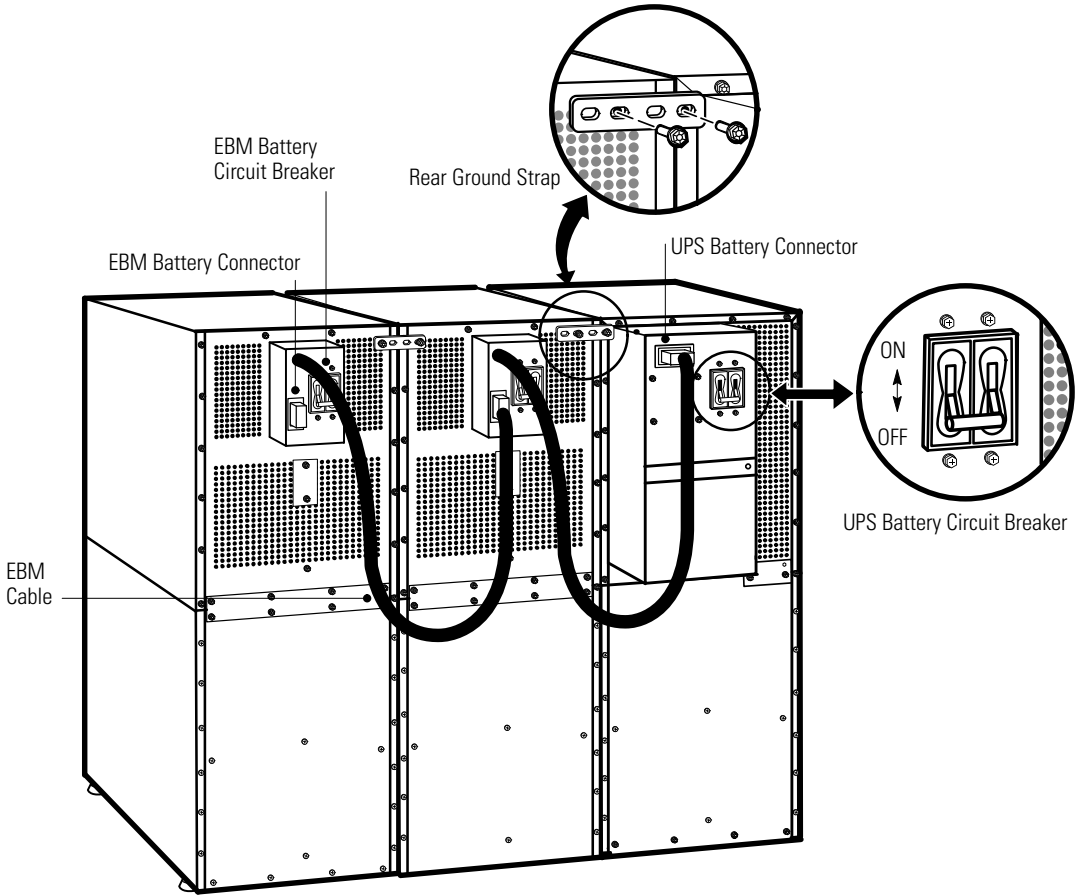


Figure 26. Typical EBM Installation (2-High Cabinets Shown)

8. Remove the top front covers of all cabinets.

Press and release the handle latch at the bottom of the cover and then lift the cover up and off the cabinet.

9. Install the remaining ground straps between each cabinet (see Figure 27).

10. Reinstall the top front covers removed in Step 8.

Hang the top edge of the cover on the cabinet first, then lower the bottom edge and snap into place.

11. Continue to "Operation" on page 39 to start up the UPS.



NOTE After UPS startup, ensure maximum battery runtime by configuring the UPS for the correct number of EBMs (see page 49).

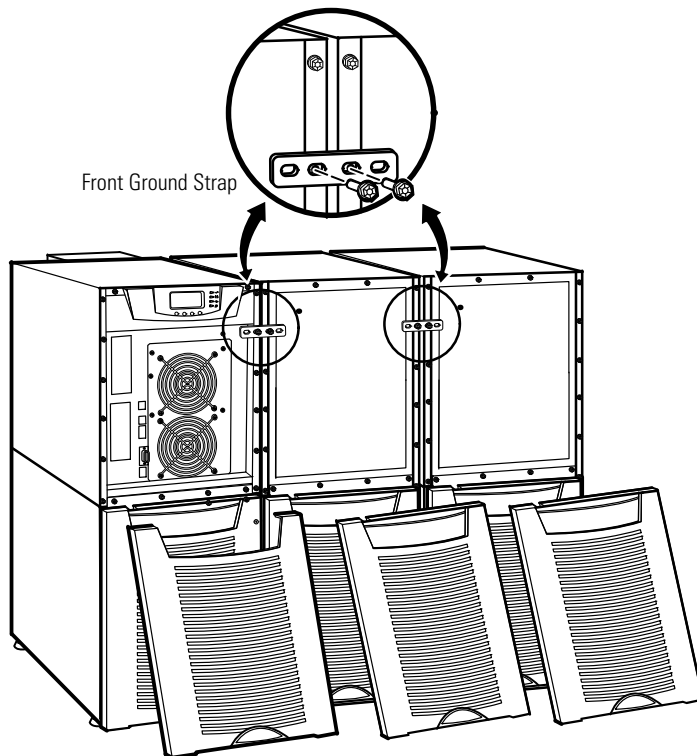


Figure 27. Front Ground Strap Installation (2-High Cabinets Shown)

EXTENDED BATTERY MODULE INSTALLATION

Chapter 8 Operation

This chapter contains information on how to use the Powerware 9155, including front panel operation, UPS startup and shutdown, and configuring the UPS for Extended Battery Modules (EBMs).

Control Panel Functions

The UPS has a four-button graphical LCD with backlight. It provides useful information about the UPS itself, load status, events, measurements, and settings (see Figure 28).

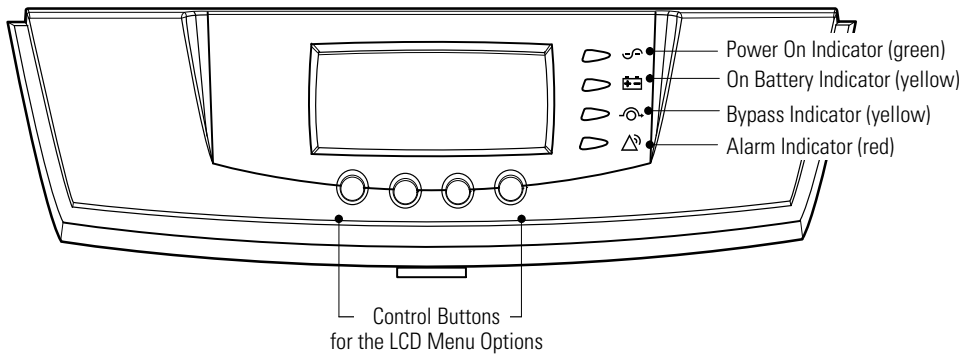






Figure 28. Powerware 9155 Control Panel

The following table shows the indicator status and description.

Indicator	Status	Description
	On	The UPS is operating normally.
Green	Flashing	<ul style="list-style-type: none"> The UPS is starting up or is shut down and waiting for power to return. A new information message is active. Bypass is not available.
	Off	The UPS is turned off and will not turn on automatically.
	On	The UPS is in Battery mode.
Yellow		
	On	The UPS is in Bypass mode.
Yellow		
	On	The UPS has an active alarm.
Red	Flashing	There is a new UPS alarm condition. See "Troubleshooting" on page 55 for additional information.

Changing the Language

Press and hold the first button on the left for approximately five seconds to select the language menu. This action is possible from any LCD menu screen.

Display Functions

As the default or after 15 minutes of inactivity, the LCD displays the selectable startup screen. The default is the Eaton Powerware logo and can be changed to the Mimic screen in the User Settings menu.

The backlit LCD automatically dims after a long period of inactivity. Press any button to restore the screen.

Use the two middle buttons (↑ and ↓) to scroll through the menu structure. Press the → button to enter a submenu. Press the ← button to select an option. Press the **ESC** button to cancel or return to the previous menu.

The following table shows the basic menu structure.

Table 3. Menu Map for Display Functions

Main Menu	Submenu	Display Information or Menu Function
UPS Status		System normal / Battery floating UPS in Parallel mode / Parallel Unit Number x / Units on CAN Bus / Units on load
Event Log		Displays up to 100 events and alarms
Measurements	Parallel System	Voltage [by unit] / Voltage [Parallel total] / Output Voltage: L-N / Output Voltage L-L / Output Current / Output Frequency / Output Power
	Output	L-N and L-L / Current / Frequency / Power
	Battery	Voltage / Current / Runtime
	Input	L-N and L-L / Current / Frequency
	Bypass	L-N and L-L / Frequency
Control	Go to Bypass Mode	Transfers the UPS system to internal Bypass mode When this command is active, the option changes to Go to Normal Mode.
	Start Battery Test	Initiates a battery test
	Display Test	Four different selectable tests for the front panel functions: the LEDs cycle through, the alarm beep sounds, the backlight turns off and on, and the pixels scroll through to test the LCD.
Settings	User Settings	See Table 4 for detail.
	Service Settings	This screen is password-protected.
Identification		UPS Type / Part Number / Serial Number / Firmware / Display / CAN Bridge
Turn UPS ON/OFF	ON and OFF Options	UPS Off / System On / System Off

User Settings

The following table displays the options that can be changed by the user.



NOTE Changes to the output voltage or frequency options should be made before turning on the UPS; otherwise, the changes do not take effect.

Table 4. User Settings

Description	Available Settings	Default Setting
Set Date and Time	Set Month Date: mm/dd/yyyy Time: 24:00	01/01/2003 00:00
Display Contrast	Adjust contrast with up/down arrow buttons	Moderate
Change Language	Select Language: <English> Elegir idioma <Español>	English
Relay Config	Relay: [Alarm 1] [X-Slot 1-1/2/3/4] or [X-Slot 2-1/2/3/4] Setup: [empty] [On Battery] [summary alarm] [On Bypass] [UPS ok] [custom]	Alarm 1: empty X-Slots (1 or 2) #1: UPS ok #2: On Bypass #3: Summary Alarm #4: On Battery
Signal Inputs	[empty] [Logic] Signal Input must be wired to the CAN Bridge Card (see Figure 19 on page 27). For more information, refer to "Programmable Signal Inputs" in the <i>Powerware 9155 UPS (8–15 kVA) User's Guide</i> .	<empty>
Serial Port Config	Port: [X-Slot-1] [X-Slot-2/Serv] Speed: [19200] [9600] [2400] [1200]	19200
Parallel Operation Settings	Parallel Unit Number: [Single Unit] [Unit #1] [Unit #2] [Unit #3]	Single Unit
	Start Auto Calibration: [Press ←]	
	Redundant Mode Capacity Mode	Redundant Mode

Table 4. User Settings (continued)

Description	Available Settings	Default Setting
Modem Config	Modem Installation	<Not Installed>
	Set Modem Call Events	Event #0 Call modem: no
	Set Modem Init String	ATZ0
	Set Modem Call Command	None
	Set Modem Communication Password	None
Start Screen	Eaton Powerware logo Mimic screen	Eaton Powerware logo
User Password	Enabled/Disabled If Enabled is selected, the password is USER.	Disabled
Audible Alarms	Normal Sound/Disabled	Normal Sound
Battery Charging	ABM cycling/constant	ABM cycling
Automatic Battery Tests	Enabled/Disabled Enabled automatically runs the battery test once a month.	Enabled
Full Power Battery Test	Enabled/Disabled	Enabled
Number of Battery Strings	0 through 22 (see “Configuring the UPS for EBMs” on page 49)	2 strings for UPS-32 models 4 strings for UPS-64 models
Battery Capacity	1 through 65535 watts per cell	34 W/cell
Battery Low Alarm Level	1.750 through 1.950 volts per cell	1.880 V/cell
Set Nominal Output Voltage	120V/240V 120V/208V 110V/220V 100V/200V 127V/220V	120V/208V
Bypass Voltage High Limit	+1 through +20% (1% increments)	120V +10%
Bypass Voltage Low Limit	-1 through -20% (1% increments)	120V -15%
Nominal Output Frequency	50 Hz or 60 Hz	60 Hz
Synchronization	Enabled/Disabled	Enabled

Table 4. User Settings (continued)

Description	Available Settings	Default Setting
Synchronization Window	±0.5 through ±3.0 Hz (0.1 Hz increments)	±2.0 Hz
Unsynchronized Transfer to Bypass	Allowed/Not Allowed	Not Allowed
Output Frequency Slew Rate	0.1 through 5 hertz per second (0.1 Hz increments)	0.5 Hz/s
Usage of Bypass	Enabled/Disabled	Enabled
Transfer to Bypass When Overload	After a delay/Immediately	After a delay
Automatic Start Delay	-1 through 32767 seconds (-1 means disabled)	0s
Control Commands from X-Slot1	Allowed/Disabled	Allowed
Control Commands from X-Slot2/Serv	Allowed/Disabled	Allowed
X-Slot Signal Input Activation Delay	0 through 65 seconds	5s
Input signal delayed shutdown delay	1 through 65535 seconds	120s
Site Wiring Fault Notice	Enabled/Disabled	Enabled
Reset Custom Event Settings	0 through 32	Total: 0/32
Auto Output Configuration	Enabled/Disabled	Enabled for initial startup Disabled after initial startup

Parallel UPS Startup



WARNING

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

Verify that UPS installation has been carried out correctly and the UPS ground has been connected.




NOTE *In a parallel capacity system (2+0 or 2+1), determine the minimum number of UPSs required for capacity.*

To start up the parallel system:

1. Verify that all UPS breakers on the parallel tie cabinet are in the OFF position.

2. Switch on utility power where the UPSs are connected.

3. Wait for the front panel LCD to illuminate.

The  indicator flashes on each UPS.

4. Remove the breaker tie from all battery circuit breakers.

5. Switch all battery circuit breakers to the ON position.

The  indicator stops flashing on each UPS.

6. Configure the UPS for parallel operation through the front panel:
 - Press any button on the front panel display to activate the menu options.
 - Using the ↑ button, scroll to the Settings menu, and then press the → button twice to select the User Settings menu.
 - Using the ↓ button, scroll to the Parallel Operation Settings option and press the → button.
 - Press the → button to select the Parallel Unit Number option.
 - Use the ↓ button to scroll the Unit number to identify the UPS number of the parallel system (Unit #1, Unit #2, or Unit #3).
 - Press the ←↵ button to save the setting.
 - Use the ↓ button to scroll to the Parallel Operation Mode option and press the → button to enter the menu.
 - Use the ↓ button to scroll the desired option (either Redundant Mode or Capacity Mode).
 - Press the ←↵ button to save the setting.
7. Press the **ESC** button until the Eaton Powerware logo appears.
8. Repeat Steps 6 and 7 for the remaining UPSs in the parallel system.

9. Shut down each UPS:

- Press the ↑ button on the front panel display and then press the → button to select the TURN UPS ON/OFF menu.
- Press the ↓ button to select the UPS Off option; press the ↵ button.
- Confirm the selection. Press and hold the ↵ button for three seconds, until the UPS stops beeping.
- Switch the UPS battery circuit breaker to the OFF position.


The UPS is disconnected from the batteries and is on logic power only.

10. Cycle the utility power to the distribution point where the parallel tie cabinet and UPSs are connected. Wait until the LCD is off before reapplying utility power.

11. Switch the UPS breakers on the parallel tie cabinet to the ON position.


12. Switch all battery circuit breakers to the ON position.

13. Verify that no alarms appear on the UPS front panel display.

If the  indicator is flashing, do not proceed until all alarms are clear. Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.

14. Verify the phase rotation for each UPS.


15. From the UPS Status menu, select the Units on CAN Bus option and verify that all UPSs appear in the list.

If all UPSs appear in the list, press the  button until the Eaton Powerware logo appears.

If any UPS is missing, verify the Powerware Hot Sync CAN Bridge Card connections and recheck the status from the UPS front panel.

16. Press the ↑ button on the front panel display and then press the → button to select the TURN UPS ON/OFF menu.

17. Select the System On option; press the ← button.
18. Confirm the selection. Press and hold the ← button for three seconds, until the UPS stops beeping.

The UPS goes to Bypass mode for five seconds, and then the  indicator illuminates. Each UPS should be in Normal mode.

19. Press the **ESC** button until the Eaton Powerware logo appears.
20. Auto-calibrate the load (with 10% minimum load recommended):
 - Using the ↑ button, scroll to the Settings menu and then press the → button twice to select the User Settings menu.
 - Using the ↓ button, scroll to the Parallel Operation Settings option and press the → button.
 - Using the ↓ button, scroll to the Start Auto Calibration option and press the ← button to select the option. Press and hold the ← button for a second to begin the process.
21. After calibration completes (in less than a minute), verify the load sharing through the front panel:
 - Using the ↓ button, scroll to the Measurements menu and press the → button twice to select the Parallel System menu.
 - Select and view the voltage meter options.
22. Press the **ESC** button until the Eaton Powerware logo appears.

Configuring the UPS for EBMs



NOTE Each UPS in a parallel system must have its own EBM and the same number of EBMs to ensure consistent runtimes.

To ensure maximum battery runtime, configure the UPS for the correct number of EBMs:

1. Press any button on the front panel display to activate the menu options.
2. Using the ↑ button, scroll to the Settings menu.
3. Press the → button twice to select the User Settings menu.
4. Using the ↓ button, scroll to the Number of Battery Strings option and press the → button.
5. Use the ↑ or ↓ buttons to select the number of strings according to your UPS configuration:

All 2-High UPS and EBM Cabinets*	Number of Strings
UPS + 1 EBM	6
UPS + 2 EBMs	10
UPS + 3 EBMs	14
UPS + 4 EBMs	18
All 3-High UPS and EBM Cabinets*	Number of Strings
UPS + 1 EBM	10
UPS + 2 EBMs	16
UPS + 3 EBMs	22

*UPS-32 models contain 2 strings; EBM-64 models contain 4 strings.
UPS-64 models contain 4 strings; EBM-96 models contain 6 strings.

6. Press the ← button to save the setting.
7. Press the **ESC** button until the Eaton Powerware logo appears.

Parallel System Shutdown

To remove power to the parallel UPS system output:

1. Press any button on the front panel display to activate the menu options.
2. Press the ↑ button on the front panel display and then press the → button to select the TURN UPS ON/OFF menu.
3. Press the ↓ button to select the System Off option; press the ← button.
4. Confirm the selection. Press and hold the ← button for three seconds, until the UPS stops beeping.

The UPS removes power to the parallel UPS system output.

5. Press the **ESC** button until the Eaton Powerware logo appears.
6. If you want to completely remove power from the UPS, continue to the following section, "Individual UPS Shutdown," to shut down each UPS.

Individual UPS Shutdown

To shut down a single UPS in the parallel system:

1. Press any button on the front panel display to activate the menu options.
2. Press the ↑ button on the front panel display and then press the → button to select the TURN UPS ON/OFF menu.
3. Press the ↓ button to select the UPS Off option; press the ← button.
4. Confirm the selection. Press and hold the ← button for three seconds, until the UPS stops beeping.

The input contactor opens.

5. Switch the UPS battery circuit breaker to the OFF position.

The UPS is disconnected from the batteries and is on logic power only.

6. Switch the UPS breaker on the parallel tie cabinet to the OFF position.



NOTE *If there is only one breaker for all UPSs, do not switch off utility power until all UPSs are shut down.*

7. Switch off utility power where the UPS is connected.

If you are shutting down all the UPSs in a parallel system, repeat Steps 2 through 6 for each UPS then remove utility power.

Restarting the Parallel System

To restart the parallel system:

1. Verify that all UPS breakers on the parallel tie cabinet are in the OFF position.

2. Switch on utility power where the UPSs are connected.

3. Wait for the front panel LCD to illuminate.


The  indicator flashes on each UPS.



4. Switch all battery circuit breakers to the ON position.



The  indicator stops flashing on each UPS.


5. Switch the UPS breakers on the parallel tie cabinet to the ON position.


6. Verify that no alarms appear on the UPS front panel display.

If the  indicator is flashing, do not proceed until all alarms are clear. Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.

7. Press the  button once and then press the  button to select the TURN UPS ON/OFF menu.

8. Press the  button to select the System On option; press the  button.

9. Confirm the selection. Press and hold the  button for three seconds, until the UPS stops beeping.



The UPS goes to Bypass mode for five seconds, and then the  indicator illuminates. Each UPS should be in Normal mode.

10. Press the  button until the Eaton Powerware logo appears.

Chapter 9 Parallel Bypass

To switch the parallel UPS to maintenance bypass from Normal mode:

1. From any UPS, set the system to internal Bypass mode:
 - Using the ↑ button on the front panel display, scroll to the Control menu option and press the → button.
 - Press the ←↵ button to select the Go to Bypass Mode option.

The  and  indicators illuminate, indicating the UPS system is operating in Bypass mode.

2. Switch the bypass breaker on the parallel tie cabinet to the ON position.
3. Switch the UPS breakers on the parallel tie cabinet to the OFF position.

To return to Normal mode from maintenance bypass:



1. Verify that all UPS breakers on the parallel tie cabinet are in the OFF position.
2. Switch on utility power where the UPSs are connected.

In a parallel capacity system (2+0 or 2+1), apply utility to the minimum number of UPSs required for capacity.



NOTE Use the same UPS that was used to set internal bypass to return the parallel system to Normal mode.

3. Set the system to internal Bypass mode:
 - Using the ↑ button on the front panel display, scroll to the Control menu option and press the → button.
 - Press the ← button to select the Go to Bypass Mode option.





The  and  indicators illuminate, indicating the UPS system is operating in Bypass mode.
4. Switch all UPS breakers on the parallel tie cabinet to the ON position.
5. Switch the bypass breaker on the parallel tie cabinet to the OFF position.
6. On the same UPS front panel, set the UPS to Normal mode:
 - Press the ← button to select the Go to Normal Mode option.
 - Each UPS should go to Normal mode.


Chapter 10 Troubleshooting

The Powerware 9155 is designed for durable, automatic operation and also alerts you whenever potential operating problems may occur. Usually the alarms shown by the control panel do not mean that the output power is affected. Instead, they are preventive alarms intended to alert the user. Use the following troubleshooting chart to determine the UPS alarm condition.

Typical Alarms and Conditions

The following table describes typical alarms and conditions; check the Event Log through the control panel for a list of active alarms. If an alarm appears with a service code, please contact the Help Desk (see page 58).

Alarm or Condition	Possible Cause	Action
On Battery  LED is on. 1 beep every second.	A utility failure has occurred and the UPS is in Battery mode.	The UPS is powering the equipment with battery power. Prepare your equipment for shutdown.
Battery Low  LED is on. Continuous beep for 10 seconds.	The battery is running low.	Five minutes or less of battery power remains (depending on load configuration and battery charge). Save your work and turn off your equipment. When utility power is restored, the UPS restarts automatically, provides power to the load, and charges the battery.
Battery Breaker  LED is on. 1 beep every second.	The UPS does not recognize the internal batteries.	Verify the battery circuit breaker is in the ON position. If the condition persists, contact your service representative.
Overload  LED is on. 1 beep every second.	Power requirements exceed the UPS capacity (greater than 100% of nominal).	Remove some of the equipment from the UPS. The UPS continues to operate, but may switch to Bypass mode if the load increases. The alarm resets when the condition becomes inactive.

Alarm or Condition	Possible Cause	Action
<p>Overtemperature</p>  <p>LED is on. 1 beep every second.</p>	<p>UPS internal temperature is too high or the fan has failed.</p>	<p>If you have an optional Maintenance Bypass Module or Power Distribution Module, turn the maintenance bypass switch to the SERVICE position. Otherwise, shut down the UPS. Clear vents and remove any heat sources. Allow the UPS to cool. Ensure the airflow around the UPS is not restricted.</p> <p>If the alarm disappears, turn the maintenance bypass switch back to the UPS position (or restart the UPS if you do not have a switch). If the condition persists, contact your service representative.</p>
<p>Battery test failed</p>	<p>The batteries need service.</p>	<p>Contact your service representative.</p>
<p>The UPS does not start.</p>	<p>The main utility breaker is off.</p> <hr/> <p>If an optional isolation transformer is installed, the input circuit breaker is off.</p>	<p>Verify that the main utility breaker is on.</p> <hr/> <p>Verify that the isolation transformer input circuit breaker is on.</p>
<p>Power is not available at the UPS output receptacles.</p>	<p>The UPS is in Standby mode.</p>	<p>Supply power to the connected equipment: Press any button on the front panel display to activate the menu options. Press the ↑ button on the front panel display and then press the → button to select the TURN UPS ON/OFF menu. Press the ↓ button to select the System On option; press the ← button. Press and hold the ← button for three seconds, until the UPS stops beeping.</p>
<p>The UPS does not provide the expected backup time.</p>	<p>The batteries need charging or service.</p> <hr/> <p>Battery circuit breakers are in the OFF position.</p>	<p>Apply utility power for 48 hours to charge the batteries. If the condition persists, contact your service representative.</p> <hr/> <p>Switch all battery circuit breakers to the ON position.</p>

Alarm or Condition	Possible Cause	Action
Check Parallel Board	The UPS is not recognizing another parallel unit.	<p>From the UPS Status menu, select the Units on CAN Bus option and verify that all UPSs appear in the list.</p> <p>If any UPS is missing, verify the Powerware Hot Sync CAN Bridge Card connections and recheck the status from the UPS front panel.</p> <p>If all UPSs appear in the list, check the pull-chain wiring (see page 26).</p> <p>Set the system to internal Bypass mode (see page 53).</p> <p>If the condition persists, contact your service representative.</p>
Abnormal output voltage at startup	The UPS breaker on the parallel tie cabinet was not switched to the ON position properly.	<p>Shut down the UPS where the alarm is indicated.</p> <p>Switch the UPS breaker on the parallel tie cabinet to the ON position.</p> <p>Start up the UPS.</p> <p>Select the System On option through the front panel of the UPS that was turned off.</p>
Selective Trip	The Powerware Hot Sync CAN Bridge Card is not wired correctly.	<p>Verify the CAN wiring (see page 26).</p> <p>Verify the pull-chain wiring (see page 26).</p> <p>If the condition persists, contact your service representative.</p>

Silencing the Alarm

Before silencing an alarm, check the alarm condition and perform the applicable action to resolve the condition.

Press any button on the front panel display to silence the alarm. If the alarm status changes, the alarm beeps again, overriding the previous alarm silencing.

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.

United States: **1-800-843-9433** or **1-919-870-3028**

Canada: **1-800-461-9166 ext 260**

All other countries: **Call your local service representative**

Please have the following information ready when you call for service:

- Model number
- Serial number
- Firmware version number
- Date of failure or problem
- Symptoms of failure or problem
- Customer return address and contact information



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