



**Powerware**

**Powerware® 9355 Tie Cabinet  
Installation Guide**

For use with Powerware 9355 20/30 kVA UPSs

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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 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.

## 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 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:

Eaton Power Quality Oy  
Koskelontie 13  
FIN-02920 Espoo  
Finland  
Phone: +358-9-452 661  
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## 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.



**ON** - Indicates that the switch is in the ON position.



**OFF** - Indicates that the switch is in the OFF position.



**PHASE** - The word "phase."

# Table of Contents

<b>1</b>	<b>Introduction</b> .....	<b>1</b>
<b>2</b>	<b>Safety Warnings</b> .....	<b>3</b>
<b>3</b>	<b>Tie Cabinet Installation</b> .....	<b>7</b>
<b>4</b>	<b>Installing Options</b> .....	<b>19</b>
	Powerware Hot Sync CAN Bridge Card .....	19
<b>5</b>	<b>Service and Support</b> .....	<b>27</b>



## Chapter 1

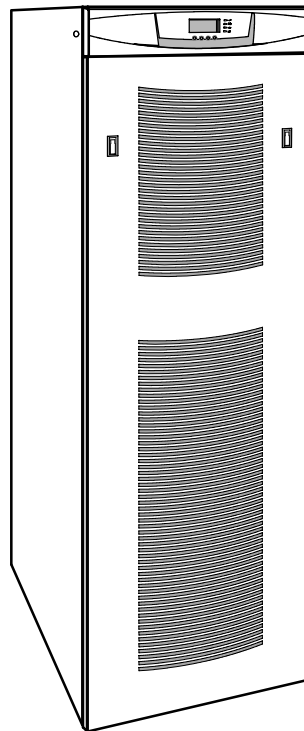
## Introduction

A Tie Cabinet can be installed as a wall-mounted bypass or to provide support for a parallel system for redundancy or extra capacity.

A wall-mounted bypass switch is used to bypass the UPS during maintenance or servicing, providing wrap-around bypass for UPS service without shutting down the load.

A parallel (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® Controller Area Network (CAN) Bridge Card provides connectivity for system metering and operational mode control. The parallel system consists of two to four UPSs, each with a parallel CAN Bridge Card and a parallel cabinet.

Figure 1 shows the Powerware 9355 UPS.



**Figure 1. The Powerware 9355 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.

#### 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 125 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 comporte des instructions importantes que vous êtes invité à suivre lors de toute procédure d'installation et de maintenance des batteries et de l'onduleur. Veuillez consulter entièrement ces instructions avant de faire fonctionner l'équipement et conserver ce manuel afin de pouvoir vous y reporter ultérieurement.



#### 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.



#### AVERTISSEMENT!

- Cette onduleur possède sa propre source d'alimentation (batteries). Il est possible que la sortie de l'onduleur soit sous tension même lorsque l'onduleur n'est pas connectée à une alimentation CA.
- 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).
- Afin de réduire les risques d'incendie, n'effectuez le raccordement qu'avec un circuit muni d'une protection de surintensité du circuit de dérivation maximum de 125 ampères conformément au Code Électrique National (National Electrical Code) des États-Unis ANSI/NFPA 70.
- La protection de surintensité de sortie ainsi que le sectionneur doivent être fournis par des tiers.



#### ATTENTION!

- Les batteries peuvent présenter un risque de choc électrique ou de brûlure provenant d'un courant de court-circuit haute intensité. Observez les précautions appropriées. L'entretien doit être réalisé par du personnel qualifié connaissant bien les batteries et les précautions nécessaires. N'autorisez aucun personnel non qualifié à manipuler les batteries.
- 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 importantes que debe seguir durante la instalación y el mantenimiento del SIE y de las baterías. Por favor, lea todas las instrucciones antes de poner en funcionamiento el equipo y guarde este manual para referencia en el futuro.

#### 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.

#### ADVERTENCIA



- Este SIE contiene su propia fuente de energía (baterías). La salida del SIE puede transportar voltaje activo aun cuando el SIE no esté conectado con una fuente de CA.
- 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).
- Para reducir el riesgo de incendio, realice la conexión únicamente hacia un circuito que cuente con un máximo de 125 amperios de protección contra sobrecorriente de circuito derivado, de acuerdo con el Código Eléctrico Nacional, ANSI/NFPA 70.
- La protección contra sobrecorriente de salida y el conmutador de desconexión debe suministrarse por parte de terceros.

#### PRECAUCIÓN



- Las baterías pueden constituir un riesgo de descarga eléctrica o quemaduras por corriente alta de corto circuito. Adopte las precauciones debidas. Personal calificado de servicio que conozca de baterías y esté al tanto de las precauciones requeridas debe darle servicio al equipo. Mantenga al personal no autorizado alejado de las baterías.
- 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.



## Chapter 3

# Tie Cabinet Installation

The Powerware 9355 has the following power connections:

- 3-phase (L1, L2, and L3), neutral, and ground connection for rectifier/bypass input
- 3-phase (L1, L2, and L3), neutral, and ground connection for load output

The nominal input/output voltages are:

- 120/208 or 127/220 Vac

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

Figure 9 and Figure 11 beginning on page 15 show the oneline diagrams.

### 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 Tie Cabinet:

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 to the ones in Table 1 on page 11.



**NOTE** To accommodate the feature of easy system expandability, it is recommended that initial installation of the Powerware 9355 UPS contain wiring to support the maximum capacity of the UPS cabinet.

3. Switch off utility power to the distribution point where the 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 Tie Cabinet front cover (see Figure 2).

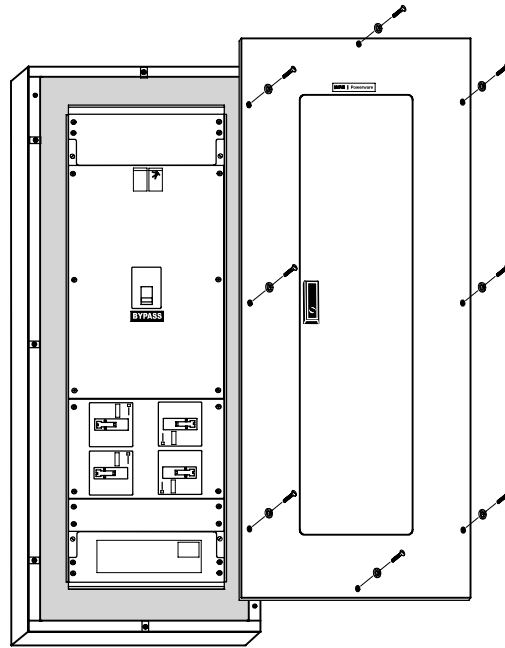


Figure 2. Tie Cabinet Front Cover

6. Remove the internal covers to gain access to the breakers (see Figure 3).

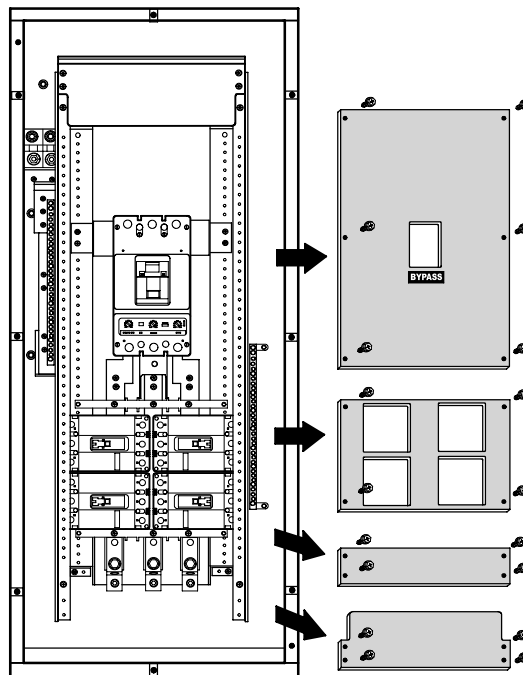
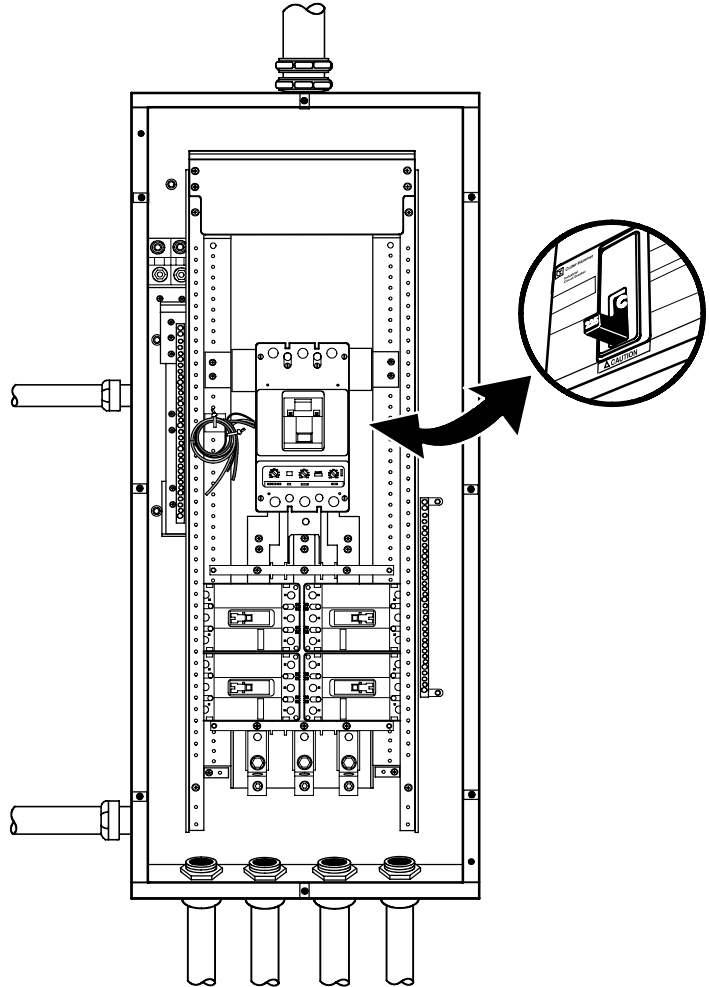


Figure 3. Internal Covers

7. Punch holes for the conduit (AC input, UPS output, load connection, and maintenance bypass contact wires) using a Greenlee® punch or similar device.
8. Verify that the Tie Cabinet bypass breaker is in the OFF position (see Figure 4).



**Figure 4. Tie Cabinet Bypass Breaker**

9. Mount the Tie Cabinet to the wall and install the conduit.

10. From each UPS, remove the UPS front door.
11. Verify that the UPS input circuit breaker is in the OFF position.
12. Verify that each UPS battery circuit breaker is in the OFF position (see Figure 5).
13. If you ordered the UPS with the optional output circuit breaker, verify that the output circuit breaker is in the OFF position.
14. Remove the UPS wiring access cover and retain.

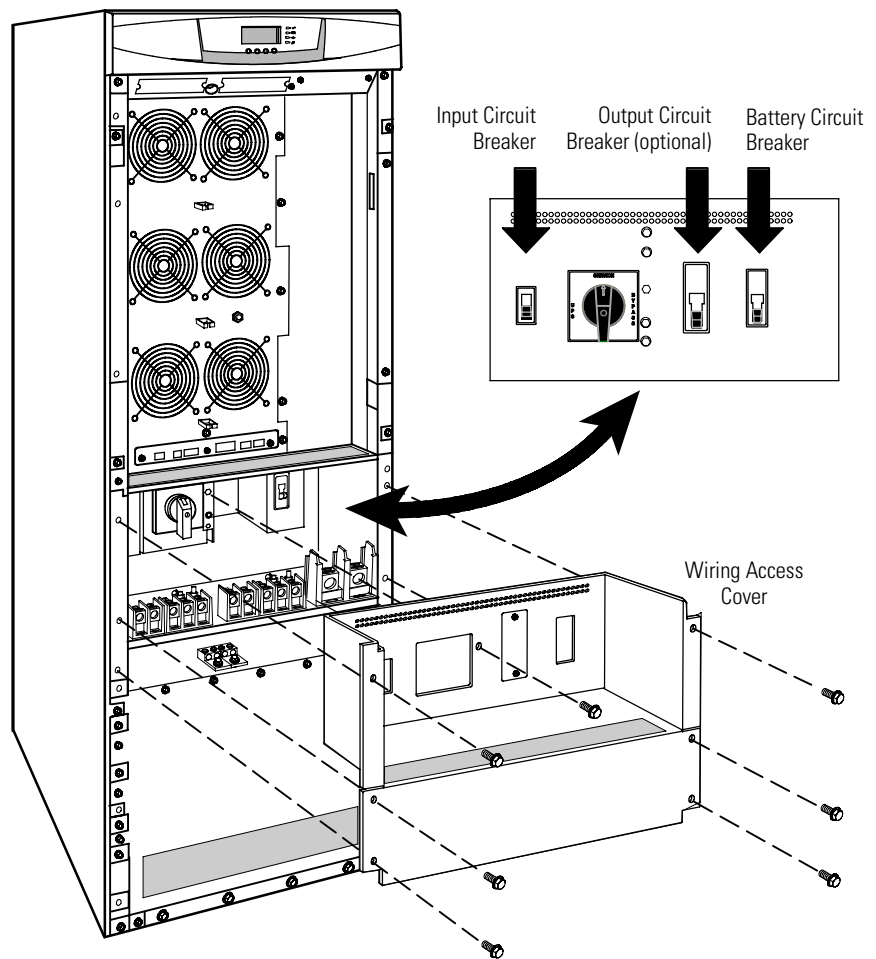


Figure 5. UPS Front View

15. Remove the UPS conduit landing box from the rear panel and retain.
16. Punch two holes in the conduit landing box for the input and output conduit using a Greenlee punch or similar device.
17. Route the wiring from the back of the UPS, through the wiring tray, to the front of the UPS.



### 18. Hardwire the UPS input terminations.

See Table 1 for specifications and Figure 6 for a detailed view of the UPS terminal block.



**NOTE** Input neutral must be wired for proper operation or the UPS will not start.

**NOTE** The Powerware 9355 UPS is shipped as a single-feed UPS and can be converted to a dual-feed UPS in the field.

**NOTE** DO NOT overtighten the screws; be sure to use the specified tightening torque values shown in Table 1.

**Table 1. Terminal Block Wiring**

20 kVA Input Voltage	Wire Function	Input Circuit Breaker Size	L1, L2, L3, N Wire Size <sup>1</sup>	Ground Wire Size <sup>1</sup>	Tightening Torque	Conduit Size <sup>2,3</sup> (Number of Conduits)
208	Input	100A	1 AWG	6 AWG	120 lb in (13.5 Nm)	2.00" Conduit (1)
220		100A	1 AWG	6 AWG		
480 (with transformer)		45A	8 AWG	10 AWG		1.00" Conduit (1)
600 (with transformer)		35A	8 AWG	10 AWG		
208	Output		1 AWG	6 AWG	120 lb in (13.5 Nm)	2.00" Conduit (1)
220			1 AWG	6 AWG		
480 (with transformer)			1 AWG	6 AWG		
30 kVA Input Voltage	Wire Function	Input Circuit Breaker Size	L1, L2, L3, N Wire Size <sup>1</sup>	Ground Wire Size <sup>1</sup>	Tightening Torque	Conduit Size <sup>2,3</sup> (Number of Conduits)
208	Input	125A	1/0 AWG	6 AWG	120 lb in (13.5 Nm)	2.00" Conduit (1)
220		125A	1/0 AWG	6 AWG		2.00" Conduit (1)
480 (with transformer)		60A	6 AWG	10 AWG		1.00" Conduit (1)
600 (with transformer)		50A	8 AWG	10 AWG		1.00" Conduit (1)
208	Output		1/0 AWG	6 AWG	120 lb in (13.5 Nm)	2.00" Conduit (1)
220			1/0 AWG	6 AWG		
480 (with transformer)			1/0 AWG	6 AWG		

<sup>1</sup> Use only 90°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.

<sup>2</sup> Per NEC article 300-20(a), all three-phase conductors must be run in the same conduit. Neutral and ground must be run in the same conduit as the phase conductors.

<sup>3</sup> Conduit is sized to accommodate one neutral conductor the same size as the phase conductor and one ground conductor. If two neutral conductors or an oversized neutral conductor are to be installed, check the size of the conduit needed to accommodate the extra wire or size and use that conduit size in place of the conduit size listed. Conduit sizes were chosen from NEC Table C1, type letters RHH, RHW, RHW-2, TW, THW, THHW, THW-2.

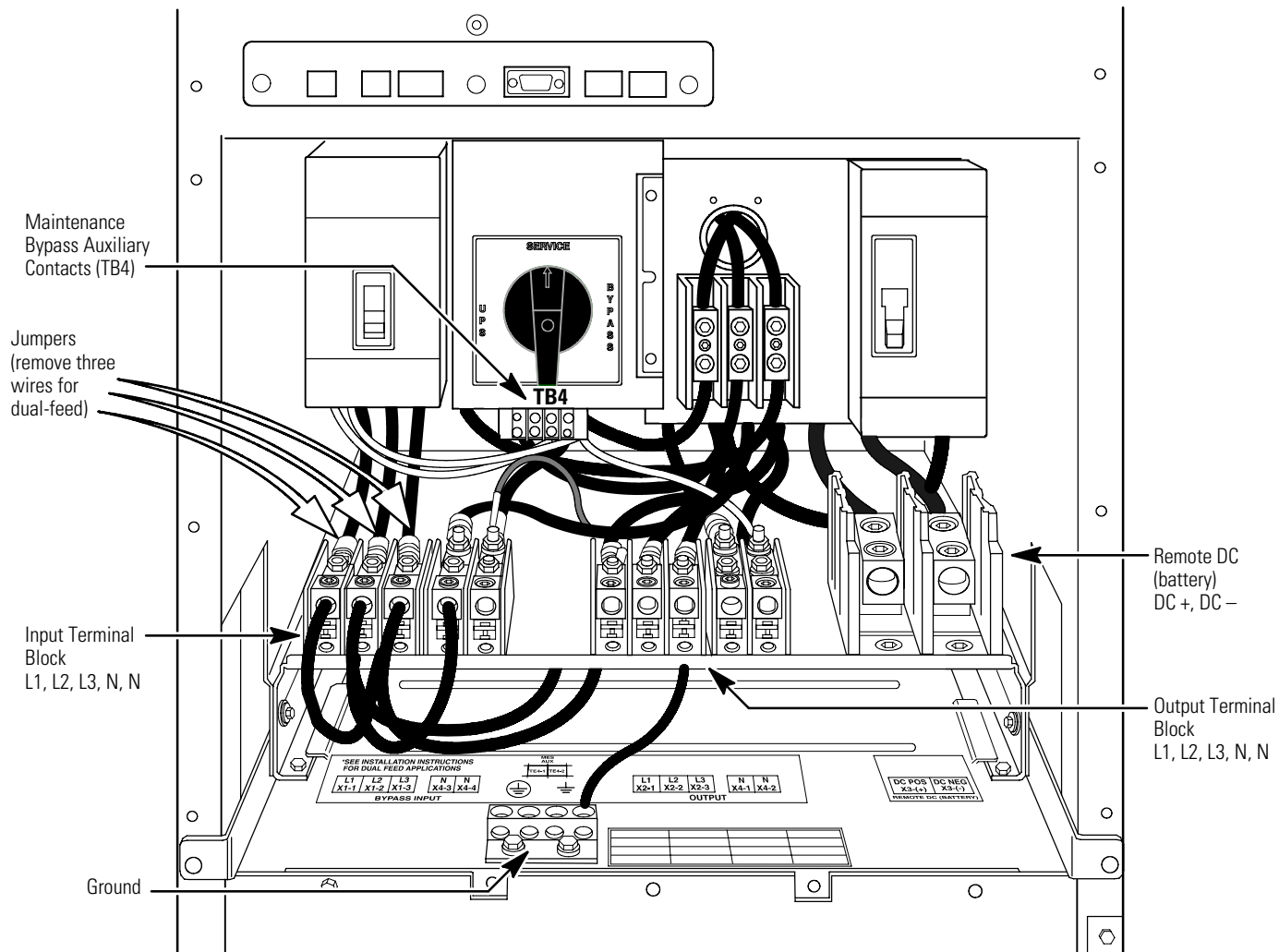


Figure 6. UPS Terminal Block



**NOTE** The two input neutral terminals are jumpered together; use either one of these terminals to make the input neutral connection.

**NOTE** The two output neutral terminals are jumpered together; use either one of these terminals to make the output neutral connection.

19. Hardwire the output terminations from the UPS to the Tie Cabinet (see Figure 7).
20. Repeat Steps 11 through 19 for each UPS.

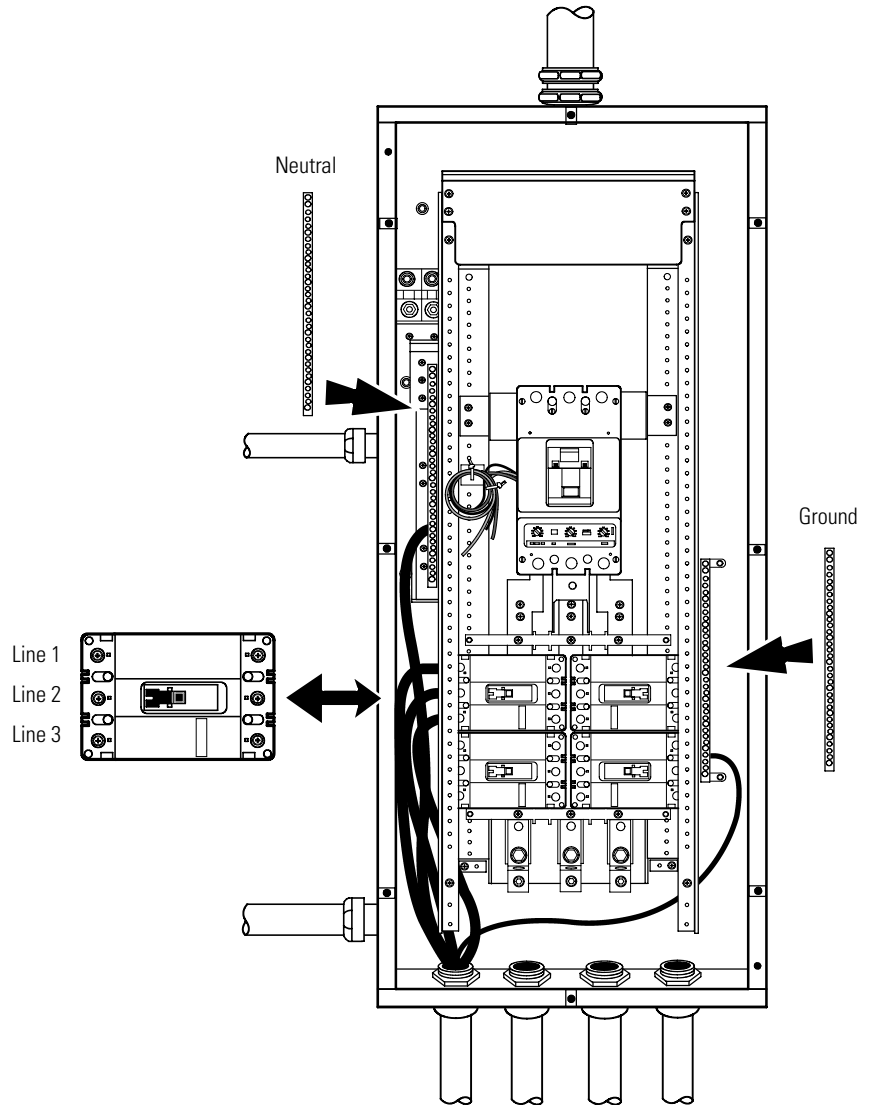


Figure 7. UPS Output to Tie Cabinet Wiring

21. Hardwire the load to the Tie Cabinet (see Figure 8).

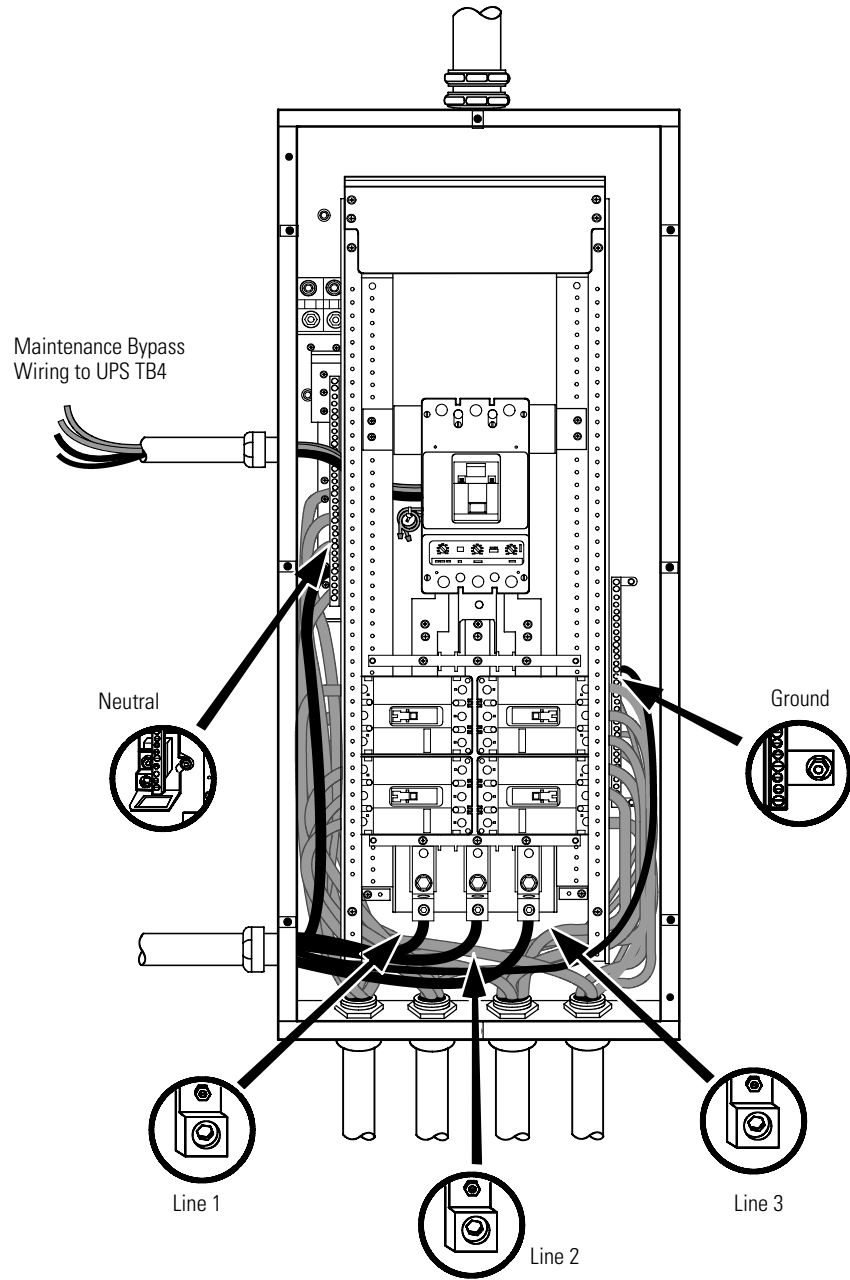


Figure 8. Load Connections

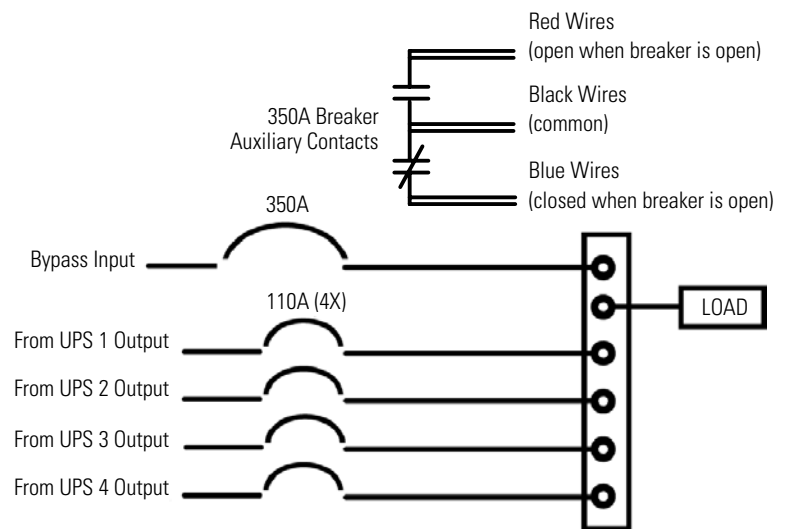
- 22.** Wire the maintenance bypass auxiliary contacts and terminate to the maintenance bypass wires in the Tie Cabinet (see Figure 6 on page 12).

Connect the black and the red wire to TB4 on the UPS (see Figure 9). Cap the blue wire.



**NOTE** The maintenance bypass contacts are normally-open. To ensure proper bypass operation, **DO NOT** use the blue wire (it is normally-closed).

**NOTE** There are two sets of maintenance bypass wires; you can terminate to either set. If you are installing four UPSs, it is recommended to terminate two UPSs to one set of wires and two UPSs to the other set of wires.



**Figure 9. Parallel Wiring Diagram**

- 23.** Reinstall the UPS wiring access cover.
- 24.** Reinstall the UPS conduit landing box in the reversed position.

25. Wire the AC input to the bypass breaker (see Figure 10).

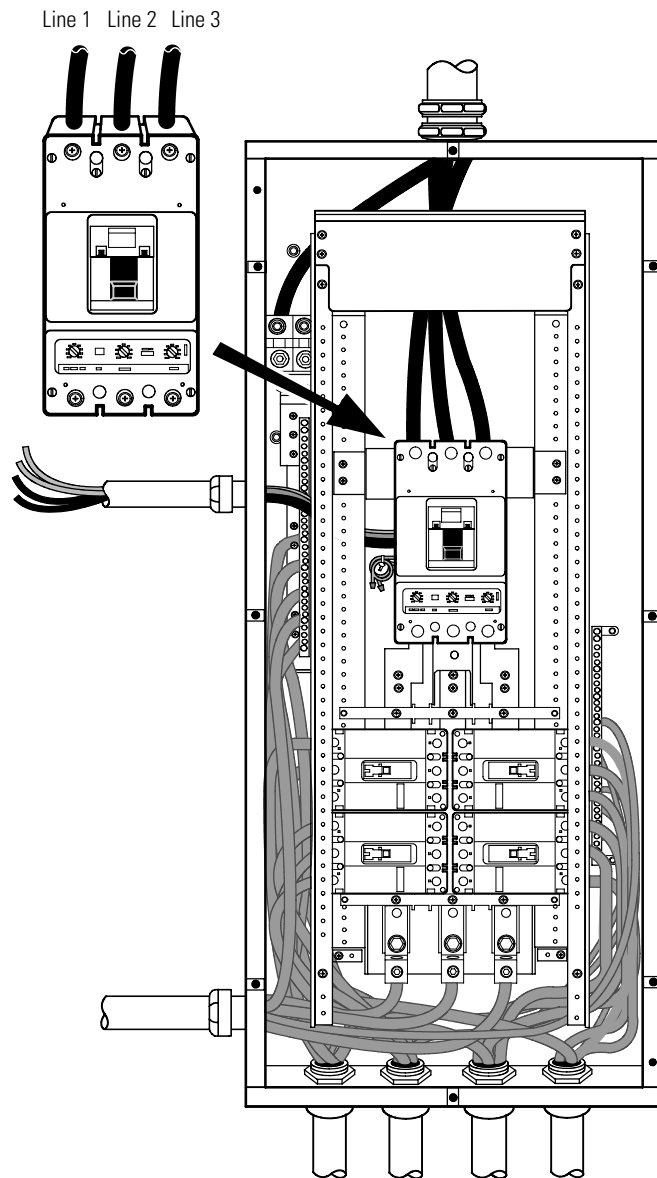


Figure 10. Bypass AC Input Wiring

26. Verify the phase rotation for each UPS and the bypass input.
27. Reinstall the internal cover removed in Step 6.
28. Reinstall the Tie Cabinet front covers removed in Step 5.
29. Continue to "Installing Options" on page 19.

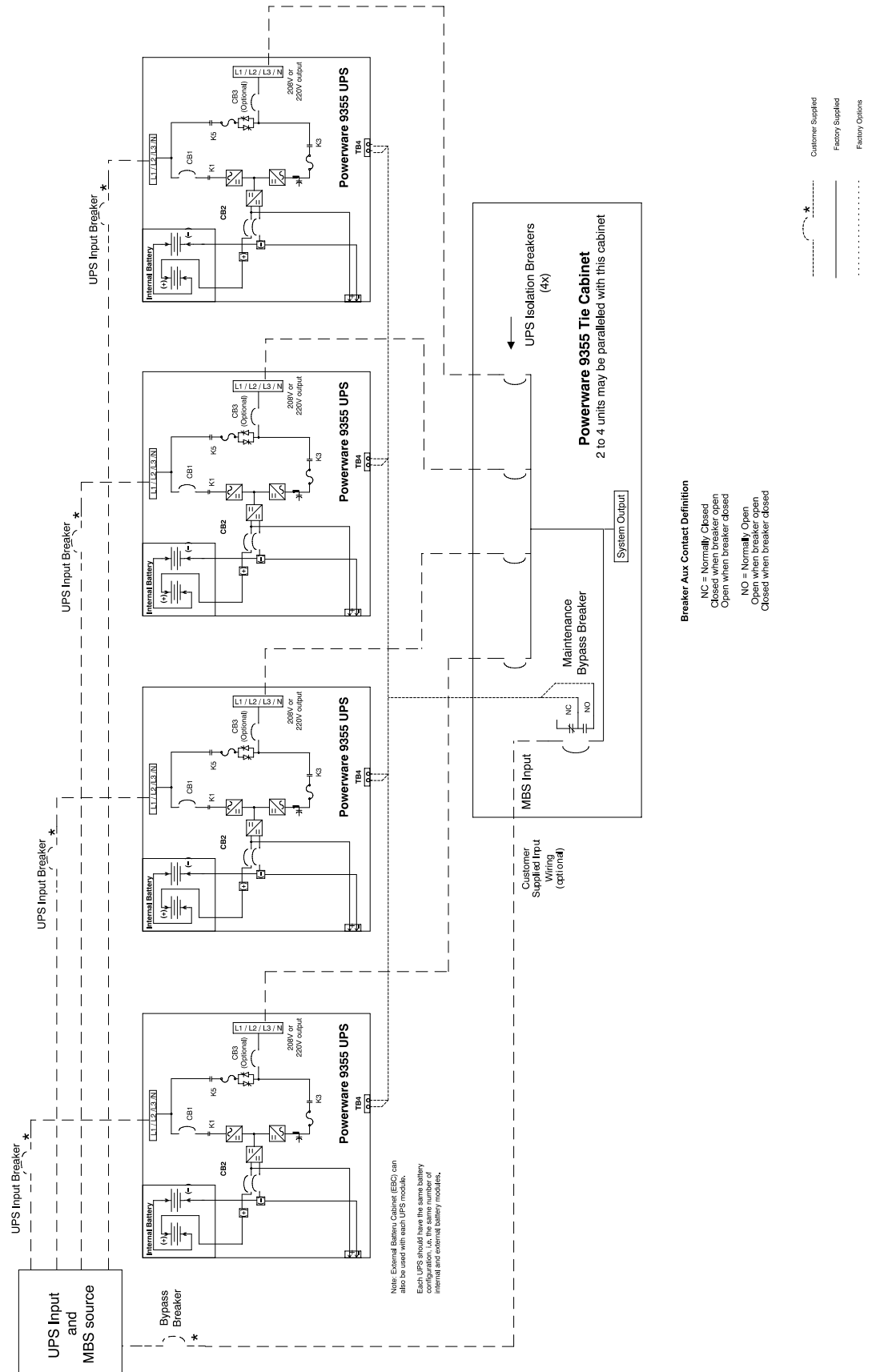


Figure 11. Parallel UPS System with Tie Cabinet Diagram (Single-Feed, 208V or 220V Input : 208V or 220V Output)





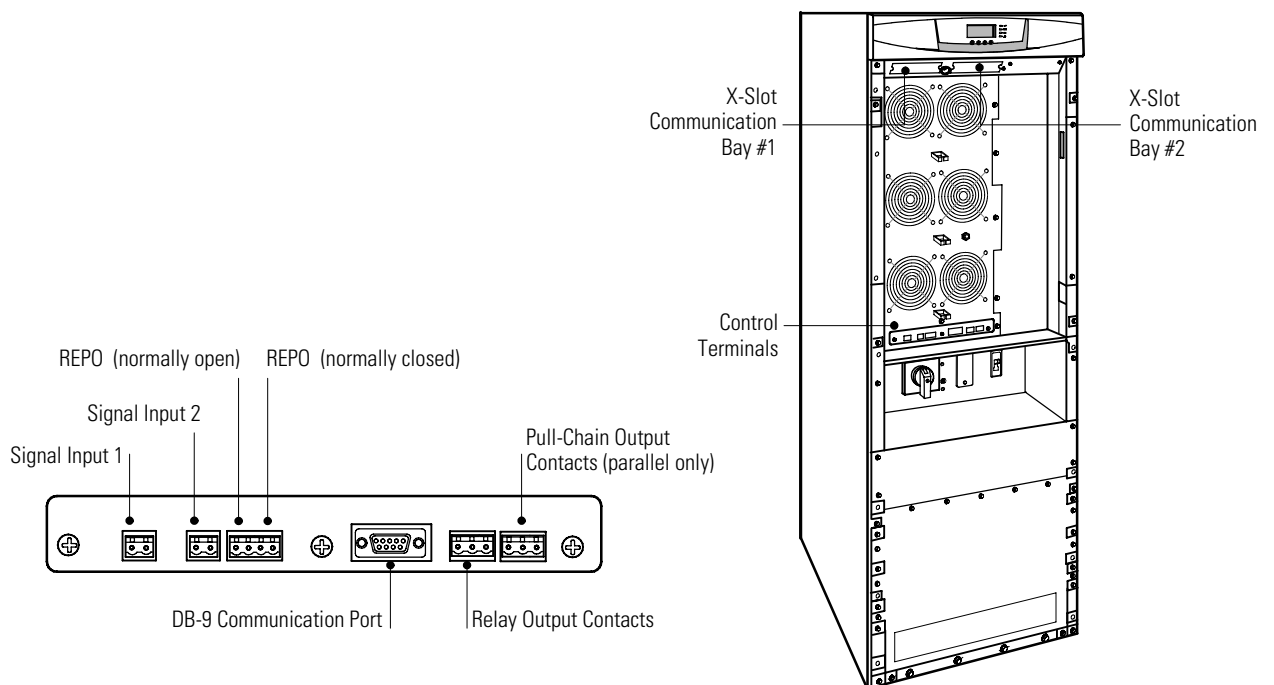
## Chapter 4

## 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 9355 UPS (20/30 kVA) Installation and Operation Manual*.

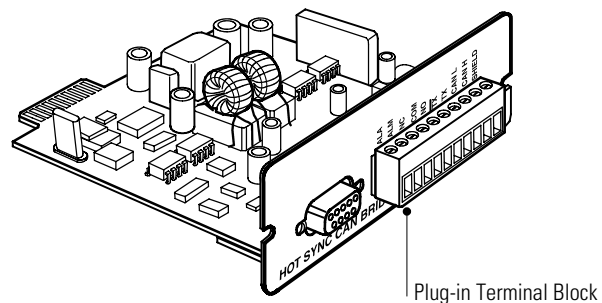
Figure 12 shows the location of the communication options and control terminals on the UPS.



**Figure 12. Communication Options and Control Terminals**

### Powerware Hot Sync CAN Bridge Card

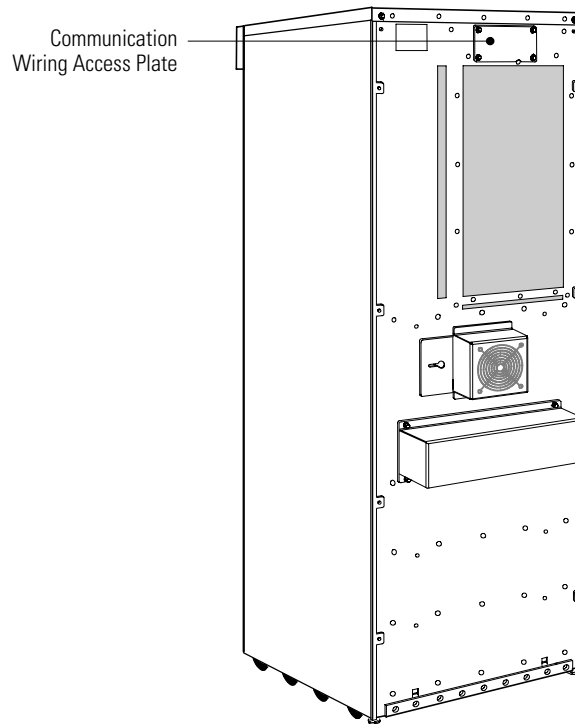
The Powerware Hot Sync CAN Bridge Card, shown in Figure 13, can be installed to provide connectivity for operational mode control and metering of a parallel system at any UPS in the system.



**Figure 13. Powerware Hot Sync CAN Bridge Card**

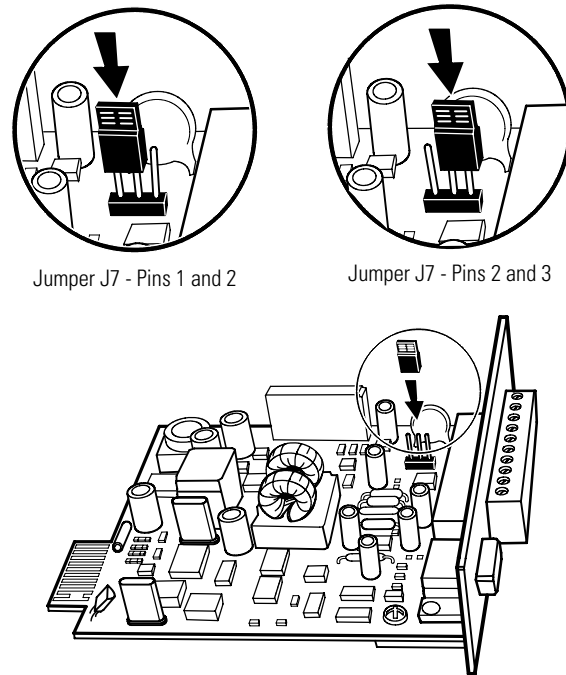
To install the Powerware Hot Sync CAN Bridge Card:

1. Remove the UPS front door.
2. Remove the communication wiring access plate from the UPS rear panel and punch a hole in it using a Greenlee punch or similar device (see Figure 14).
3. Install conduit for the communication wiring.



**Figure 14. Communication Wiring Access**

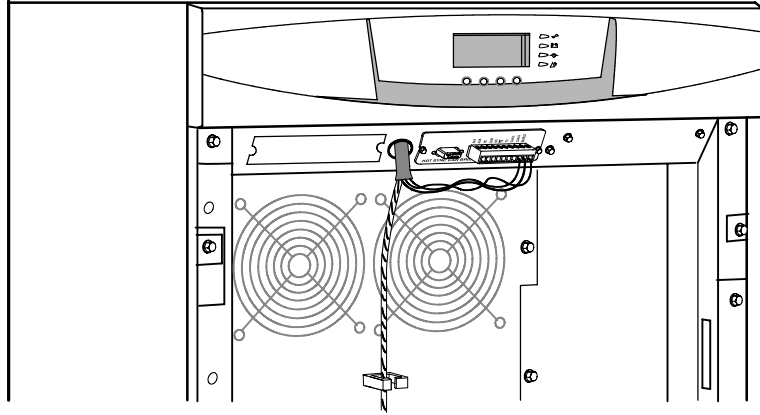
4. Set the jumper pins on the Powerware Hot Sync CAN Bridge Card according to the parallel configuration (see Figure 15):
  - If only two UPSs are paralleled, then set both cards to Pins 1 and 2.
  - For three or four paralleled UPSs, set the cards of the first and last UPSs to Pins 1 and 2; set the cards for the middle UPSs to Pins 2 and 3.



**Figure 15. Setting the CAN Bridge Card Jumper J7 (Side View)**

5. Install the CAN Bridge Card into X-Slot 2 (see Figure 12 and Figure 17).
6. Strip shielded, four-wire, twisted-pair wire (maximum 18 AWG recommended) for CAN Bridge Card wiring and pull-chain wiring.
7. Repeat Steps 1 through 6 for each UPS.

8. Route the wiring through the conduit from the communication wiring access plate to the opening between the two X-Slot communication bays on each UPS (see Figure 16).



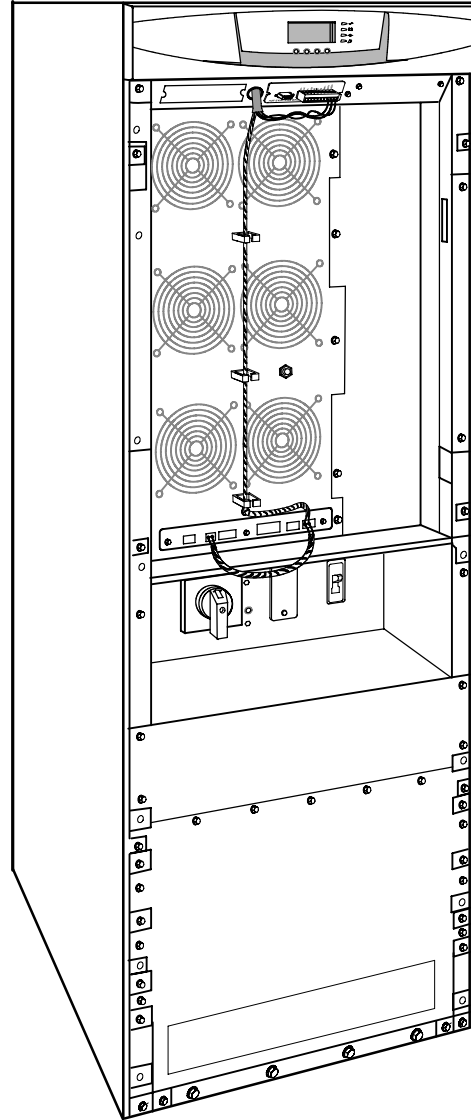
**Figure 16. Routing the Cables**

9. Install the CAN Bridge Card wiring between each UPS (see Figure 18 on page 25).

Use three wires of the four-wire twisted-pair wire. (Reserve two wires for pull-chain wiring in Step 11.) 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.

10. Route the pull-chain wiring through the middle of the fan section and secure in the cable clips for each UPS (see Figure 17).



**Figure 17. Installing Communication Cables**

**11.** Wire the pull-chain wiring to Signal Input 2 on each UPS and daisy chain the wiring to each UPS as shown in Figure 18. Be sure to check correct polarity:

- Connect Pull-Chain Output Contact Pin 1 to Signal Input 2 Pin 1 on each UPS.
- Connect Pull-Chain Output Contact Pin 2 to Signal Input 2 Pin 2 on each UPS.

**CAUTION**



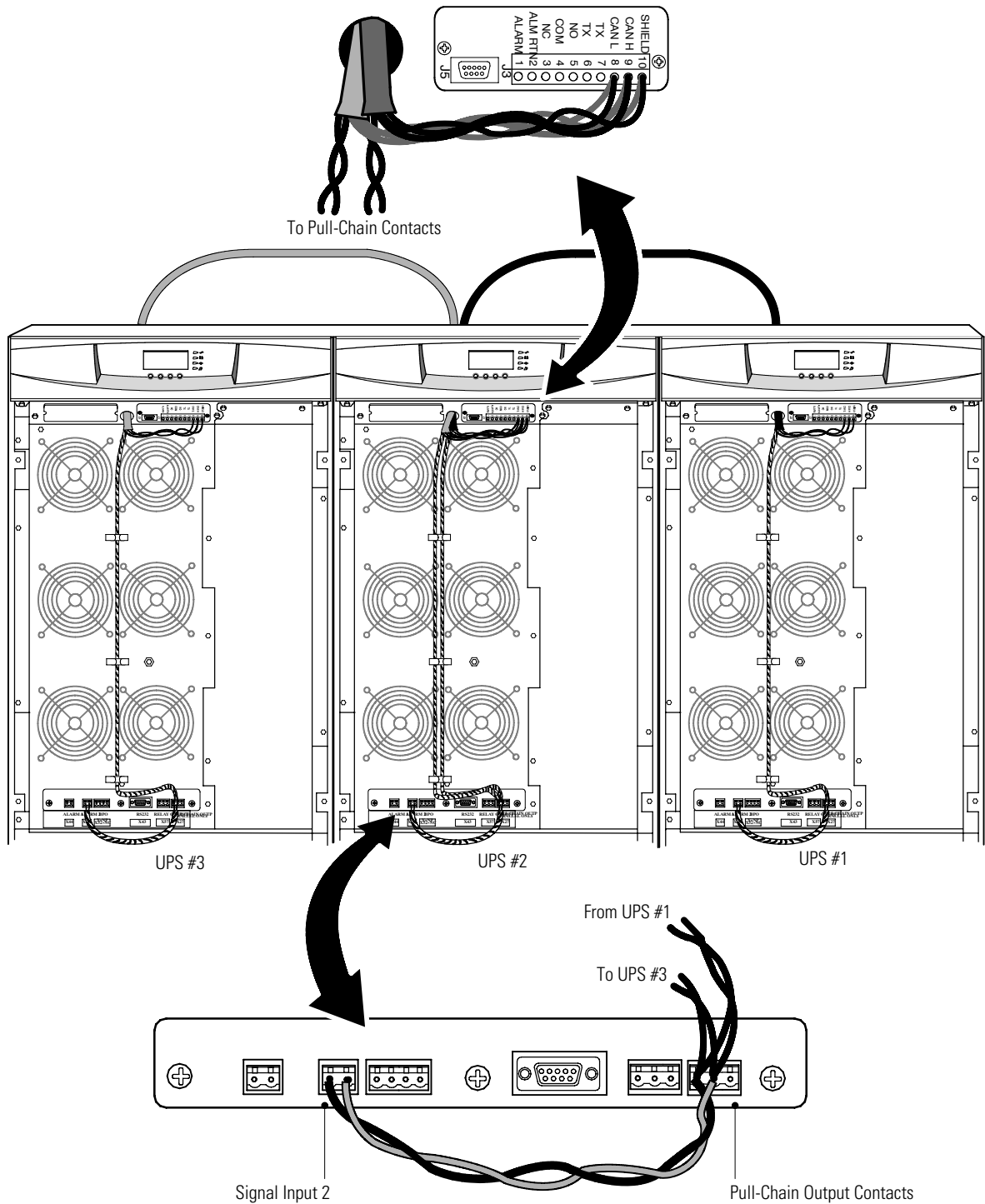
If polarity or wiring is not correct, the parallel system does not operate normally. For example, when shutting down one UPS, the remaining UPS transfers the load to bypass instead of supporting the load. Verify all CAN Bridge Card wiring is correct for proper operation.



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

**12.** Reinstall the communication wiring access plate on each UPS.

**13.** Replace the UPS front door on each UPS.



**Figure 18. CAN Bridge Card and Pull-Chain Wiring**





## Chapter 5

## 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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