POWERWARE®

9315

Uninterruptible Power Supply

500 kVA – 750 kVA

Installation and Operation Manual

164201244 Rev. D

IMPORTANT SAFETY INSTRUCTIONS
Instructions Importantes Concernant La Sécurité

SAVE THESE INSTRUCTIONS
Conserver Ces Instructions

This manual contains important instructions for your Uninterruptible Power Supply (UPS) system. You should follow these instructions during the installation and maintenance of the UPS, options, accessories, and batteries.

Cette notice contient des instructions importantes concernant la sécurité.

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 their own expense.

WARNING:
This is a product for restricted sales distribution to informed partners. Installation restrictions or additional measures may be needed to prevent disturbances.

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Introduction

Congratulations on your purchase of a Powerware 9315 (500 kVA – 750 kVA) Uninterruptable Power Supply! The Powerware online power protection system is used to prevent loss of valuable electronic information, minimize equipment downtime, and/or minimize the adverse effect on equipment production due to unexpected power problems.

The Powerware UPS System continually monitors incoming electrical power and removes the surges, spikes, sags, and other irregularities that are inherent in commercial utility power. Working with your building's electrical system, the UPS System supplies clean, consistent power that your sensitive electronic equipment requires for reliable operation. And during brownouts, blackouts, and other power interruptions, optional battery strings provide emergency power to safeguard your operation.

The UPS system is housed in a free-standing cabinet, divided into three sections to facilitate shipping. The cabinet sections line up and match in style and color, and have safety shields behind the doors for hazardous voltage protection. The following illustration depicts a typical Powerware 9315 (500 kVA – 750 kVA) UPS System.

MODULE
BYPASS
CABINET

OUTPUT
INVERTER
CABINET

INPUT
RECTIFIER
CABINET
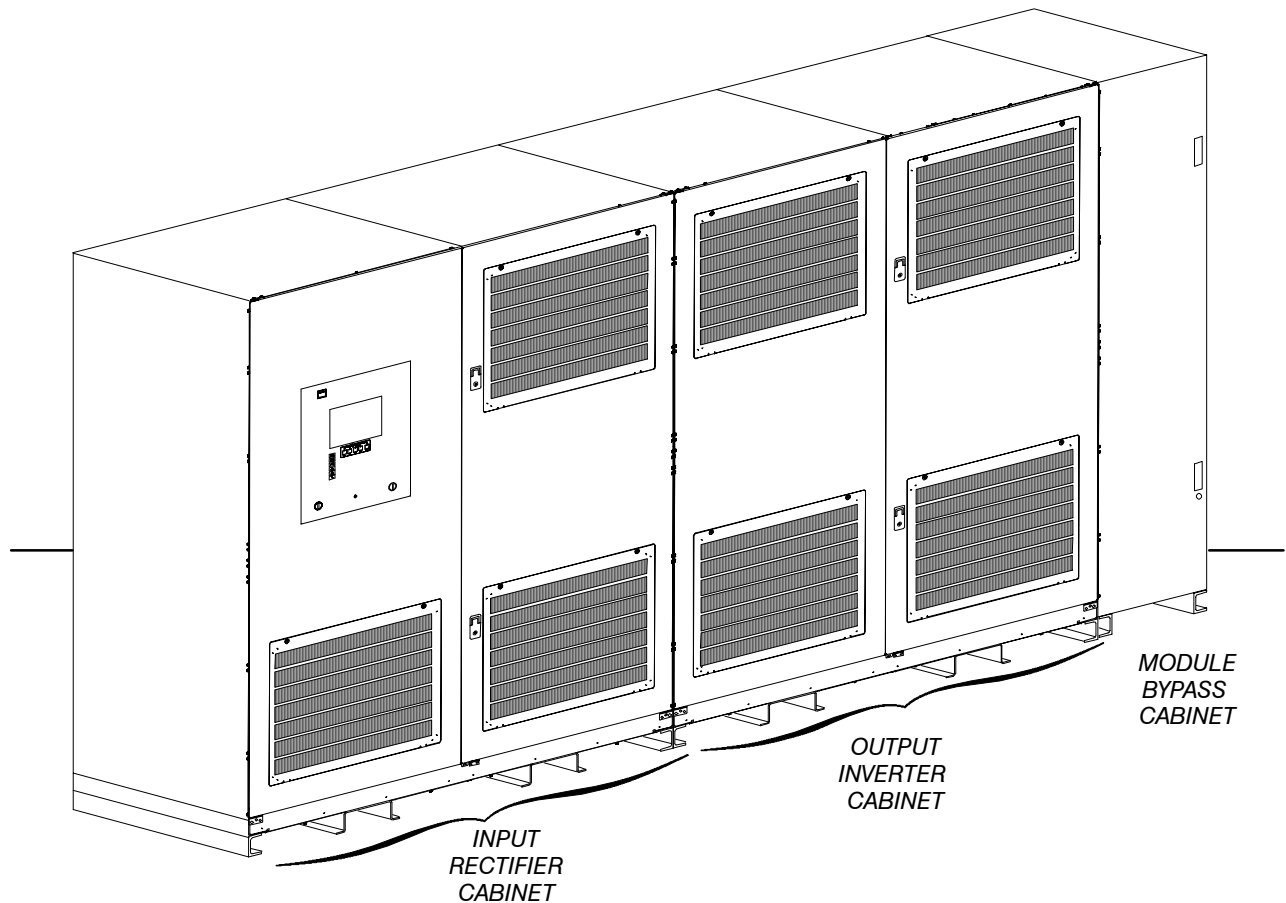
Typical Powerware 9315 (500 kVA – 750 kVA) UPS System

Basic System Configurations

These basic UPS system configurations are possible:

- Single Module UPS and one battery string

- Multi-Module (Parallel for Capacity/Redundancy) UPS System consisting of two or more UPS modules, with one battery string for each module and a Hot−Sync Capacity module

- Multi-Module (Parallel for Capacity/Redundancy) UPS System consisting of two or more UPS modules, with one common battery string and a Hot−Sync Capacity module

The optional Hot−Sync Capacity system (Parallel for Capacity/Redundancy), using a *System Bypass Module (SBM),* allows two or more UPMs to operate in parallel to provide more capacity than a single UPM and as backup for each other. The Parallel Capacity/Redundant system can supply up to 4000 Amps, depending on the SBM used. In addition, when one UPM is taken out of service for maintenance or is not operating properly, the redundant UPM continues to supply uninterrupted power to the critical load.

You can enhance any of these system configurations by adding optional accessories, such as a *Remote Monitor Panel (RMP), Relay Interface Module (RIM), Supervisory Contact Module (SCM), or Remote Emergency Power Off (EPO)* control.

Using This Manual

Your UPMs function automatically and require very little attention during normal operation. However, you should read and understand the procedures described in this manual to ensure trouble-free operation. In particular, you should be thoroughly familiar with the Emergency UPM Off procedure described in Chapter 7 of this manual.

The information in this manual is divided into the sections and chapters listed. The system you are installing dictates which parts of this manual you should read. Everyone should read the Introduction, Chapters 1 and 2 and Chapters 7 through 12.

Introduction

The Introduction provides a brief description of the UPS system, a description of the content of each chapter, safety, text conventions used in the manual and reference information.

Section I

- **Chapter 1 −− Getting Started −−** tells you how to prepare your site for the installation of your UPS system. It discusses equipment environmental requirements, inspecting, and unpacking cabinets.

- **Chapter 2 −− Installing the UPS System −−** describes how to install the UPS cabinets and optional equipment.

- **Chapter 3 −− Installing Batteries −−** provides battery safety and installation information.

- **Chapter 4 −− Installing a Remote Battery Disconnect −−** describes how to install the UPS battery disconnect.

- **Chapter 5 -- Installing a Remote EPO Control --** contains information for installing the optional *Remote Emergency Power Off (EPO)* control.

- **Chapter 6 -- Installing a Remote Monitor Panel --** contains information for installing the optional *Remote Monitor Panel (RMP)*.

- **Chapter 7 -- Installing a Relay Interface Module --** contains information for installing the optional *Relay Interface Panel (RIM)*.

- **Chapter 8 -- Installing a Supervisory Contact Module --** contains information for installing the optional *Supervisory Contact Module (SCM)*.

Section II

- **Chapter 9 -- Understanding UPS Operation --** provides information on understanding parallel operation.

- **Chapter 10 -- Operational Controls and Features --** describes the standard and optional operational features and controls of the UPS system.

- **Chapter 11 -- Using the Control Panel --** describes the controls and indicators found on the Control Panel and shows the various information screens displayed on the LCD screen.

- **Chapter 12 -- UPS Operating Instructions --** contains startup and shutdown procedures for the UPS system.

- **Chapter 13 -- Using Features and Options --** contains descriptions and instructions for the UPS system features and options.

- **Chapter 14 -- Responding to System Events --** lists all the alarm, messages and notices that occur during operation of the UPS system.

- **Chapter 15 -- Serial Communications --** describes the serial communications features of the UPS system.

- **Chapter 16 -- Remote Notification --** contains instructions for using the remote notification feature of the UPS system.

- **Chapter 17 -- Maintaining the UPS System --** contains maintenance instructions for the UPS system.

- **Chapter 18 -- Product Specifications --** provides detailed specifications for the UPS system.

- **Appendix A --Customer Information --** contains important information on wiring requirements and recommendations, and important diagrams of the cabinet's mechanical details and electrical access.

- **Warranty --** provides the Powerware warranty for this product.

Read through each procedure before you begin. Perform only those procedures that apply to the UPS system you are installing or operating.

Conventions Used in This Manual

The text in this manual uses these conventions:

* **Bold type** highlights important concepts in discussions, key terms in procedures, and menu options.

* *Italic type* highlights notes and new terms where they are defined.

* Rectangular boxes containing bold type are warnings or cautions that pertain to the Parallel Capacity system or its electrical connections.

In this manual, the term *UPS* refers only to the UPS cabinet and its internal elements. The term *UPS system* refers to the entire power protection system—the UPS modules, battery strings and options or accessories installed.

Safety Considerations

The UPS cabinet is designed for industrial or computer room applications, and contain safety shields behind the doors. However, the UPS system is a sophisticated power system and should be handled with appropriate care, following these guidelines:

* **Keep surroundings clean and free from excess moisture.**

* **Do not operate the UPS system close to gas or electric heat sources.**

* **The system is not intended for outdoor use.**

* **The operating environment should be maintained within the parameters stated in this manual.**

* **Keep the cabinet doors closed and locked to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the unit.**

* **The UPS system contains its own power source. Lethal voltages are present even when the UPS is disconnected from utility power.**

> **WARNING:**
> **Only AUTHORIZED SERVICE PERSONNEL should perform maintenance on or service the UPS system.**

If service or routine maintenance is required:

* **Ensure all power is disconnected before performing installation or service.**

* **Ensure the area around the UPS system is clean and uncluttered.**

* **Battery maintenance or battery replacement should be performed only by authorized service personnel.**

* **Observe all DANGER, CAUTION, and WARNING notices affixed to the inside and outside of the equipment.**

For More Information

This manual describes how to install and operate your UPS system. For more information about the installation and operation of the Powerware Hot Sync – Capacity system, refer to the following:

164201150   *Powerware® Parallel Capacity/Redundant System Installation and Operation*

Provides installation instructions for the System Bypass Module (SBM) cabinet, and optional components and accessories. Site preparation, planning for installation, and wiring and safety information are supplied. Detailed illustrations of cabinet and optional accessories, including dimensional and connection point drawings are provided.

Describes the SBM Control Panel and explains the functions of the SBM; discusses the standard features of the SBM and optional accessories; provides procedures for starting and stopping the parallel for capacity redundancy system, and information about maintenance and responding to system events.

Also described are the RS−485 and RS−232 serial communications capabilities of the SBM; discusses the two communications ports on the Customer Interface Panel inside the SBM and how to connect optional remote accessories to your SBM; provides information about enabling, disabling, and customizing building alarms.

Contact your local Powerware Field Service office for information on how to obtain copies of this manual.

Getting Help

If you need to schedule initial startup, need regional locations and telephone numbers, have a question about any of the information in this manual, or have a question this manual does not answer, please call Powerware Corporation at:

United States	**1-800-843-9433**
Canada	**1-800-461-9166**
Outside the U.S.	**Call your local representative**

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Section I

Installation

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Getting Started

1.1   Installing the UPS

The cabinet sections of the *UPS* are shipped on separate pallets. Use a forklift or pallet jack, rated to handle the weight of the cabinets (refer to Drawing 164201244−3 in Appendix A for cabinet weights), to move the packaged cabinet sections to the installation site, or as close as possible to the site, before unloading from the pallet.

This is the basic sequence of the installation steps:

1. Create an installation plan for the UPS system (Chapter 1).

2. Prepare your site for the UPS system (Chapter 1).

3. Inspect, unpack, and unload the UPS cabinet sections (Chapter 1).

4. Wire the system (Chapter 2).

5. Install features, accessories, and/or options, as applicable (Chapter 3).

6. Complete the Installation Checklist (Chapter 2).

7. Have authorized service personnel perform preliminary operational checks and startup.

NOTE: *Startup and operational checks should be performed only by authorized service personnel. This service is usually offered as part of the sales contract for your UPS.   Contact service in advance (usually a two week notice is required) to reserve a preferred startup date.*

1.1.1   Creating an Installation Plan

Before beginning to install the UPS system, read and understand how this manual applies to the system being installed. Use the procedures and illustrations in the following chapters to create a logical plan for installing the system.

1.1.2   Preparing Your Site

For your UPS system to operate at peak efficiency, your installation site should meet the environmental parameters outlined in this manual. If you intend to operate the system at an altitude higher than 1500 meters (5000 feet), contact your local sales or service office for important information about high altitude operation. The operating environment must meet the size and weight requirements shown in Drawing 164201244−8, and Table P of Appendix A.

The basic environmental requirements for operation of the UPS system are:

Ambient Temperature Range: 0−40˚C (32−104˚F)

Recommended Operating Range: 20−25˚C (68−77˚F)

Maximum Relative Humidity: 95%

The UPS cabinets use forced air cooling to regulate internal component temperature. Air inlets are in the front of the cabinet, and outlets are in the top. You must allow clearance in front of and above each cabinet for proper air circulation.

1.1.3   Environment Considerations

The life of the UPS system is adversely affected if the installation does not meet the following guidelines:

1. The system must be installed on a level, sealed concrete pad or on a sealed concrete floor.

2. The system must be installed in a temperature-controlled indoor area free of conductive contaminants.

Failure to follow guidelines may invalidate UPS warranty.

1.1.4   Preparing for Wiring the UPS System

For external wiring requirements, including the minimum AWG size of external wiring, refer to Table A or B in Appendix A. The power wiring connections for this equipment are rated at 90˚C. If wire is run in an ambient temperature greater than 30˚C, higher temperature wire and/or larger size wire may be necessary. Control wiring for EPO and optional accessories (such as building alarms, and monitoring interface) should be connected at the customer interface panels and terminal blocks located inside the UPS.

1.1.5   Inspecting and Unpacking Each Cabinet

The first task in preparing for installation is inspecting and unpacking the UPS sections. The UPS sections are shipped bolted to wooden pallets and protected with outer protective packaging material, as shown in Figure 1−1, and a plastic inner covering.

WOODEN PALLET
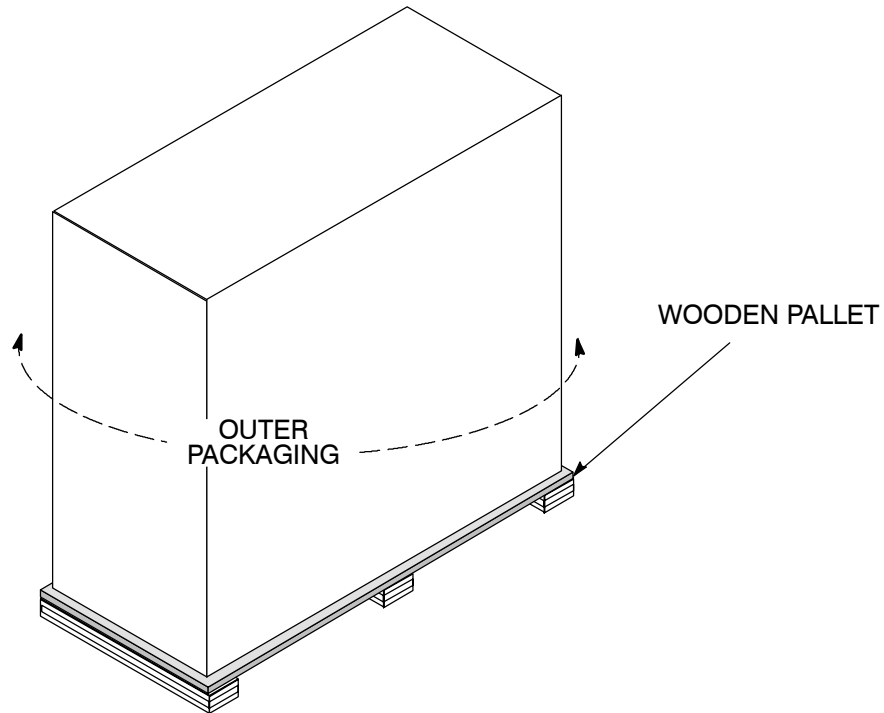
OUTER PACKAGING

Figure 1−1.   Cabinets as Shipped, with Outer Packaging and Pallet

1. Carefully inspect the outer packaging for evidence of damage during transit.

> **CAUTION:**
> **Do not install a damaged cabinet. Report any damage to the carrier and contact your local sales or service office immediately.**

2. Use a forklift or other material handling equipment to move the cabinet to a convenient unpacking area. Insert the forklift jacks between the pallet supports on the bottom of the unit.

> **CAUTION:**
> **Do not tilt cabinets more than 10 degrees from vertical.**

3. Set each pallet on a firm, level surface, allowing a minimum clearance of 4.6m (15 ft) on each side for removing the cabinets from the pallets.

4. If outer packaging is secured with steel bands, cut and remove the bands from around each cabinet.

5. Remove the protective cardboard covering from the cabinets, cutting where indicated, using a knife blade no longer than 25 mm (1 in.).

6. Remove the plastic bag and foam packing material, and discard or recycle them in a responsible manner.

7. After removing the protective covering, inspect the contents for any evidence of physical damage, and compare each item with the Bill of Lading. If damage has occurred or shortages are evident, contact the Powerware, Inc. Customer Service Department immediately to determine the extent of the damage and its impact upon further installation.

NOTE: While awaiting installation, protect the unpacked UPS cabinets from moisture, dust, and other harmful contaminants. Failure to store and protect the UPS properly may invalidate the warranty.

Installing the UPS System

2.1   Preliminary Installation Information

> **WARNING:**
> **Installation should be performed only by qualified personnel.**

Refer to the following while installing the UPS system:

- Refer to Appendix A of this manual for installation drawings and additional installation notes.

- Dimensions in this manual are in millimeters and (inches).

- Do not tilt the UPS cabinet sections more than $\pm 10^\circ$ during installation.

- The conduit landing plates are to be removed to add conduit landing holes as required. Plate material is 14 gauge steel (0.075 in. thick).

- The **EMERGENCY UPM OFF** (EPO) and the Remote Emergency Power Off (REPO) pushbuttons normally open all breakers in the UPS, shutdown the UPS, and isolate power from the critical load. However, the EPO and REPO may be configured to transfer the UPS to bypass and shutdown the UPS. Local electrical codes may also require tripping protective devices upstream from the UPS.

- The UPS cabinet sections must be installed on a level, sealed concrete pad or floor.

- If perforated floor tiles are required for ventilation, place them in front of the UPS. Refer to Table P in Appendix A for equipment weight and point loading.

- Details about control wiring are provided in each procedure for connecting options and features. Drawing 164201244−2 and Tables K through O in Appendix A identify the control wiring terminations.

2.2　Single Module Installation

To install a single module UPS system, perform the procedures in the following paragraphs. If a multi-module system is being installed, proceed to paragraph 2.3.

2.2.1　Installing the UPS Cabinet Sections

Each UPS cabinet section is bolted to a wooden pallet. To remove the pallets, perform the following procedure:

> **WARNING:**
> **The UPS cabinet sections are extremely heavy. Refer to Drawing 164201244–3 in Appendix A for weight of sections. If unloading instructions are not closely followed, the cabinet may tip and cause serious injury.**

1. Move UPS cabinet sections to the final installed location using a forklift.

2. Remove hardware securing each cabinet section to respective pallet.

> **CAUTION:**
> **Lift only with forklift or cabinet damage may occur.**

3. Using forklift, raise the UPS cabinet section until the cabinet bottom clears the pallet by approximately 3 mm (1/8 in.).

4. Once UPS cabinet section is clear of the pallet, pull the pallet from under the UPS cabinet. Discard or recycle them in a responsible manner.

5. Carefully lower the UPS cabinet section until the cabinet base contacts the floor.

6. Repeat steps 3 through 5 for remaining cabinet sections

2.2.2　Installing UPS Internal Power and Control Wiring

NOTE: The cables used in steps 2 through 4 are coiled inside the Input/Rectifier cabinet and are attached at the factory to the output of the rectifier. The cables used in steps 7 and 8 are coiled inside the Module Bypass Cabinet (MBC) and are attached at the factory to the input of the MBC.

1. Remove the plastic shield covering the inverter input section of the Output/Inverter cabinet.

2. Route DC Link cables from the rectifier output (Input/Rectifier cabinet) through cutout in cabinet sides to the inverter input (Output/Inverter cabinet).

3. Connect positive DC Link power wiring to the inverter input. Connect two cables to each inverter. Refer to Appendix A of this manual for terminal locations and tightening torque.

4. Connect negative DC Link power wiring to the inverter input. Connect two cables to each inverter. Refer to Appendix A of this manual for terminal locations and tightening torque.

5. Reinstall inverter input section plastic shield.

6. Remove the plastic shield covering the inverter output section of the Output/Inverter cabinet.

7. Route the MBC input cables from the MBC through cutout in cabinet sides to the inverter output (Output/Inverter cabinet).

8. Connect phase A, B, and C and Neutral power wiring from MBC to the respective inverter output. Refer to Appendix A of this manual for terminal locations and tightening torques.

9. Route ground braid from top of Output/Inverter cabinet to Input/Rectifier cabinet through cabinet cutouts. Braid is secured at the factory to the Output/Inverter cabinet mounting stud.

10. Connect ground braid to Input/Rectifier cabinet mounting stud and secure.

11. Route ground braid from top of MBC to Output/Inverter cabinet through cabinet cutouts. Braid is secured at the factory to the MBC mounting stud.

12. Connect ground braid to Output/Inverter cabinet mounting stud and secure.

13. Reinstall inverter output section plastic shield.

14. Connect the Output/Inverter 15-pin control wiring harness connector to the Input/Rectifier 15-pin control wiring harness connector. Refer to Appendix A of this manual for connector locations.

15. Connect the MBC 15-pin control wiring harness connector to the Output/Inverter 15-pin control wiring harness connector. Refer to Appendix A of this manual for connector locations.

16. Connect 3-pin control wiring harness connector P6 from the MBC to connector J6 on Inverter number 2 control board. Refer to Appendix A of this manual for connector locations.

2.2.3   Installing UPS External Power and Control Wiring

1. Remove the sheetmetal shield covering the input terminal area in the Input/Rectifier cabinet to gain access to the Battery I/O Customer Interface and CB2TB. Refer to Appendix A for location of the shield.

NOTE: Remove Input/Rectifier cabinet conduit landing plate to punch conduit holes.

2. Connect phase A, B, and C power wiring from source to respective rectifier inputs in the Input/Rectifier cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.

3. Connect positive and negative DC power wiring from batteries to the respective DC inputs in the Input/Rectifier cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.

NOTE: Remove entire MBC top panel to punch conduit holes.

4. Connect phase A, B, and C power wiring from bypass source to respective bypass inputs in the MBC cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.

5. Connect phase A, B, and C and Neutral power wiring from MBC output to critical load. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information

6. Connect control wiring (battery breaker open and close signals and shunt DC disconnect) between external battery disconnect and the UPS. Refer to Appendix A of this manual for wiring requirements and wiring access information.

7. After wiring the UPS system to the facility power and critical load, be sure to ground the system according to local and/or national electrical wiring codes.

8. Install batteries in accordance with all applicable codes and regulations, including the National Electrical Code (NEC), Article 480.

2.2.4   Installing Input/Rectifier Customer Connections

If you are installing connections to the Battery I/O terminal connections and terminal board CB2TB you must install conduit between each device and the UPS cabinet for wiring these options. Refer to Appendix A for the location of the interface points within the UPS cabinet.

To prepare the UPS for wiring to Customer Connections:

1. Be sure the UPS system is turned off and all power sources are removed. (See the operation section of this manual for shutdown instructions.)

2. Remove the sheetmetal shield covering the input terminal area in the Input/Rectifier cabinet to gain access to the Battery I/O Customer Interface and CB2TB. Refer to Appendix A for location of the shield.

3. Refer to Appendix A of this manual for terminal assignments, and wiring and termination requirements.

2.2.5   Installing Output/Inverter Customer Connections

If you are installing connections to a Remote *Emergency Power Off (EPO)* device, Building Alarm or Relay contacts, conduit must be installed between each device and the UPS cabinet. Refer to Appendix A for the locations of the interface points within the UPS cabinet.

To prepare the UPS for wiring to Customer Connections:

1. Be sure the UPS system is turned off and all power sources are removed. (See the operation section of this manual for shutdown instructions.)

2. Refer to Appendix A of this manual for terminal assignments, and wiring and terminal requirements.

2.2.6 Prepare for Installing Optional Accessories

If you are installing optional accessories, such as a *Remote Monitor Panel (RMP), a Relay Interface Module (RIM), or a Supervisory Contact Module (SCM),* you must install conduit between each device and the UPS cabinet for wiring these options. Refer to Appendix A for the location of the Customer Interface Panel within the UPS cabinet.

To prepare the UPS for wiring to an RMP, RIM, or SCM:

1. Be sure the UPS system is turned off and all power sources are removed. (See the operation section of this manual for shutdown instructions.)

2. Remove the access plate on top of the UPS Input/Rectifier cabinet to gain access to the Customer Interface Panel (refer to Appendix A for location of the access plate).

3. Refer to chapters 6, 7, or 8 as applicable for installation instructions.

2.3 Multi-Module Installation

To install a multi-module UPS system using a System Bypass Module, perform the procedures in the following paragraphs.

2.3.1 Installing the UPS Cabinet Sections

Refer to paragraph 2.2.1 for procedure.

2.3.2 Installing UPS Internal Power and Control Wiring

NOTE: The cables used in steps 2 through 4 are coiled inside the Input/Rectifier cabinet and are attached at the factory to the output of the rectifier.

1. Remove the plastic shield covering the inverter input section of the Output/Inverter cabinet.

2. Route DC Link cables from the rectifier output (Input/Rectifier cabinet) through cutout in cabinet sides to the inverter input (Output/Inverter cabinet).

3. Connect positive DC Link power wiring to the inverter input. Connect two cables to each inverter. Refer to Appendix A of this manual for terminal locations and tightening torque.

4. Connect negative DC Link power wiring to the inverter input. Connect two cables to each inverter. Refer to Appendix A of this manual for terminal locations and tightening torque.

5. Reinstall inverter input section plastic shield.

6. Route ground braid from top of Output/Inverter cabinet to Input/Rectifier cabinet through cabinet cutouts. Braid is secured at the factory to the Output/Inverter cabinet mounting stud.

7. Connect ground braid to Input/Rectifier cabinet mounting stud and secure.

8. Connect the Output/Inverter 15-pin control wiring harness connector to the Input/Rectifier 15-pin control wiring harness connector. Refer to Appendix A of this manual for connector locations.

9. Remove the plastic shield covering the inverter output section of the Output/Inverter cabinet.

10. Refer to the applicable SBM Installation and Operation manual referenced in the *Introduction* of this manual for SBM input wiring procedures.

11. Reinstall inverter output section plastic shield.

2.3.3   Installing UPS External Power and Control Wiring

1. Remove the sheetmetal shield covering the input terminal area in the Input/Rectifier cabinet to gain access to the Battery I/O Customer Interface and CB2TB. Refer to Appendix A for location of the shield.

NOTE: Remove Input/Rectifier cabinet conduit landing plate to punch conduit holes.

2. Connect phase A, B, and C power wiring from source to respective rectifier inputs in the Input/Rectifier cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.

3. Connect positive and negative DC power wiring from batteries to the respective DC inputs in the Input/Rectifier cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.

4. Connect control wiring (battery breaker open and close signals and shunt DC disconnect) between external battery disconnect and the UPS. Refer to Appendix A of this manual for wiring requirements and wiring access information.

5. Refer to the applicable SBM Installation and Operation manual referenced in the *Introduction* of this manual for SBM output wiring procedures.

6. After wiring the UPS system to the facility power and critical load, be sure to ground the system according to local and/or national electrical wiring codes.

7. Install batteries in accordance with all applicable codes and regulations, including the National Electrical Code (NEC), Article 480.

2.3.4   Installing Input/Rectifier Customer Connections

Refer to paragraph 2.2.4 for procedure.

2.3.5   Installing Output/Inverter Customer Connections

Refer to paragraph 2.2.5 for procedure.

2.3.6   Prepare for Installing Optional Accessories

Refer to paragraph 2.2.6 for procedure.

2.4   Initial Startup

Startup and operational checks should be performed only by authorized service personnel. Contact service in advance (usually a two week notice is required) to reserve a preferred startup date.

2.5   Completing the Installation Checklist

The final step in installing your UPS system is completing the following Installation Checklist. This checklist ensures that you have completely installed all hardware, cables, and other equipment. Completing all items listed on the checklist will ensure a smooth installation. You should make a copy of the Installation Checklist before filling it out, and retain the original.

After your installation is complete, a service representative will be able to verify the operation of your UPS system and commission it to support your critical load. The service representative cannot perform any installation tasks other than verifying software and operating setup parameters. Service personnel may request a copy of the completed Installation Checklist to be sure you have completed all applicable equipment installation.

NOTE: *The Installation Checklist MUST be completed prior to starting the* UPS *system for the first time.*

2.5.1 Installation Checklist

❏All packing materials and restraints have been removed from each cabinet.

❏Each cabinet in the UPS system is placed in its installed location.

❏A ground bond is installed between any cabinets that are bolted together.

❏All switchboards, conduits, and cables are properly routed to the UPS and auxiliary cabinets.

❏All power cables are properly sized and terminated.

❏A ground conductor is properly installed.

❏If bypass input neutral connection is used, no other N−G bonds exist downstream from the UPS.

❏Battery cables and harness are terminated on E4 and E5.

❏Internal battery cabinet connections have been completed (bus bars, plugs, etc.).

❏Shunt trip signal wiring is connected from UPS to battery breaker(s).

❏Air conditioning equipment is installed and operating correctly.

❏The area around the installed UPS system is clean and dust-free. (It is recommended that the UPS be installed on a level, sealed concrete pad or a sealed concrete floor.)

❏Adequate workspace exists around the UPS and other cabinets.

❏Adequate lighting is provided around all UPS equipment.

❏A 120V service outlet is located within 25 feet of the UPS equipment.

❏Each Remote Monitor Panel (RMP) is mounted in its installed location. (OPTIONAL)

❏The control wiring for each RMP is terminated inside the UPS cabinet. (OPTIONAL)

❏The Remote Emergency Power Off (EPO) device is mounted in its installed location and its wiring terminated inside the UPS cabinet. (OPTIONAL)

❏Summary alarms and/or building alarms are wired appropriately. (OPTIONAL)

❏A Relay Interface Module (RIM) is mounted in its installed location and its wiring is terminated inside the UPS cabinet. (OPTIONAL)

❏A remote battery disconnect control is mounted in its installed location and its wiring is terminated inside the UPS and battery cabinet. (OPTIONAL)

❏Debris shields covering ventilation grills removed from all cabinets.

❏Startup and operational checks performed by authorized service personnel.

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Installing Batteries 3

3.1   *Important Safety Instructions*

This chapter describes installing the UPS batteries.

The installation of batteries should be performed or supervised by personnel knowledgeable of batteries and their associated precautions. Keep unauthorized personnel away from batteries.

Observe these precautions when working on or around batteries:

- Remove watches, rings, or other metal objects.

- Use tools with insulated handles.

- Wear rubber gloves and boots.

- Do not lay tools or metal parts on top of batteries.

- Disconnect the charging source prior to connecting or disconnecting terminals.

- Determine if the battery is inadvertently grounded. If it is, remove the source of the ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock is reduced if such grounds are removed during installation and maintenance.

- When replacing batteries, use the same number and type.

- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.

WARNING:
Do not dispose of battery or batteries in a fire. The battery may explode.

Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes, and may be toxic.

A battery can cause electrical shock, burn from high short-circuit current, or fire. Take proper precautions when working with batteries.

> **ATTENTION:**
> **Une batterie peut prêsenter un risque de choc êlectrique, de brulure, ou d'incendie. Suivre les précautions qui s'imposent.**

- Pour le remplacement, utiliser le même nombre et modéle des batteries.

- L'élimination des batteries est règlementée. Consulter les codes locaux à cet effet.

3.2   *Installing Batteries*

NOTE: 1. *There is no DC disconnect device within the UPS.*
         2. *The DC input to the UPS is protected by internal fuses F30 and F31.*

Install batteries in accordance with the battery and battery rack manufacturers instructions.

Installing a Remote Battery Disconnect

4

4.1 Installation Procedures

The remote battery disconnect is crated separately for shipping. The enclosure is designed to be free-standing, You can install a remote battery disconnect anywhere between the remote DC supply and the UPS, according to national and local codes. Figure 4–1 shows a typical remote battery disconnect enclosure.

The remote battery disconnect is set in accordance with the operation procedures contained in Chapter 12 – *UPS Operating Instructions* of this manual. When service personnel are performing maintenance on the UPS or battery string, the disconnect should be set to the OFF position.

Operating Handle **ON** Position

Operating Handle **OFF** Position
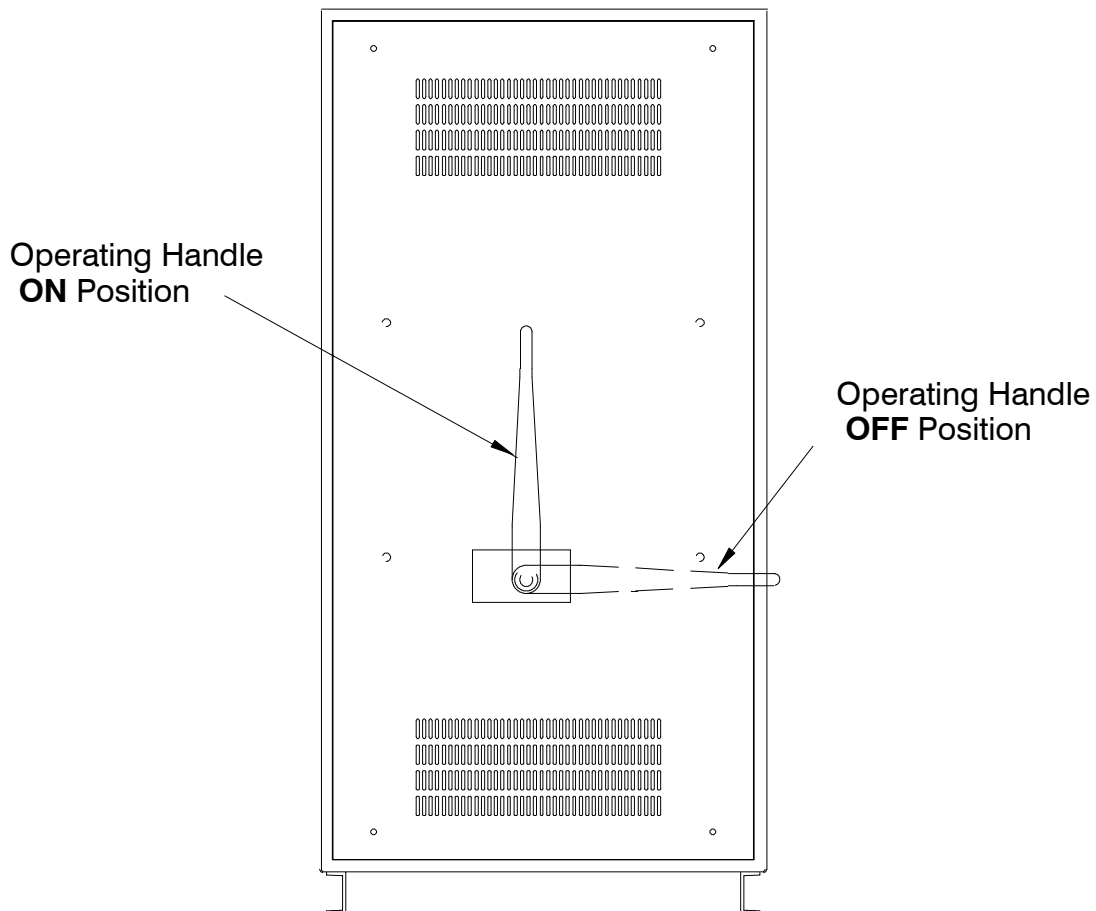
Figure 4–1. Remote Battery Disconnect Enclosure

Installation Notes:

You should read and understand these general notes before beginning installation:

- There is no DC disconnect device within the UPS.

- The DC input to the UPS is only protected by internal fuses F30 and F31.

- The UPS DC disconnect trip signal from CB2TB, terminals 9 and 10 (shunt trip) must be connected to the DC source disconnect device.

- Refer to Appendix A, drawing 164201244−13, for battery disconnect dimensions.

- Refer to Appendix A, Table A of drawing 164201244−1, for specific ratings and wiring requirements.

- The material and labor for external wiring requirements is to be supplied by others.

- The knockout pattern for the disconnect is determined by others at the time of installation.

- Power cables and control wiring must be installed in separate conduit.

- The ground conductor is to be sized per NEC Article 250 and local electrical code requirements.

- The maximum current listed is at the minimum DC operating voltage.

- Nominal voltages listed in this chapter are for a lead-acid battery plant rated per NEC at 2.00 VDC per cell.

- Battery strings must be installed in accordance with all applicable codes and regulations, including the National Electrical Code (NEC), Article 480.

- The UPS to battery cable should be sized for a total maximum voltage drop of 1% nominal DC link voltage at maximum current.

- Table 4−1 in this chapter details the power cable terminations.

- The remote battery disconnect weighs approximately 60.3 kg (133 lb). It has an ampere interrupting capacity (AIC) of 100,000 at 500 VDC.

Table 4-1. Remote Battery Disconnect Power Terminations

Terminal	Terminal Function	Size of Termination	Tightening Torque N-M (lb-ft)	Bolt Size (In.)
E4 (+)	UPS Battery Input (+)	See Appendix A, Table D		
E5(−)	UPS Battery Input (−)	See Appendix A, Table D		
Breaker (+)	Battery Disconnect (+)	8 − 1 Bolt Mounting Bus Bar	76 (56)	1/2
Breaker (−)	Battery Disconnect (−)	8 − 1 Bolt Mounting Bus Bar	76 (56)	1/2
Breaker (jumper)	Battery Disconnect (jumper)	8 − 1 Bolt Mounting Bus Bar	76 (56)	1/2

Table 4-2. Remote Battery Disconnect Circuit Breaker Ratings

UPS Model	Circuit Breaker Rating	DC Voltage
9315−750/500	1600	384
9315−750/625	2000	384
9315−750/750	2000	384

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Installing a Remote EPO Control

5.1   Installation Procedures
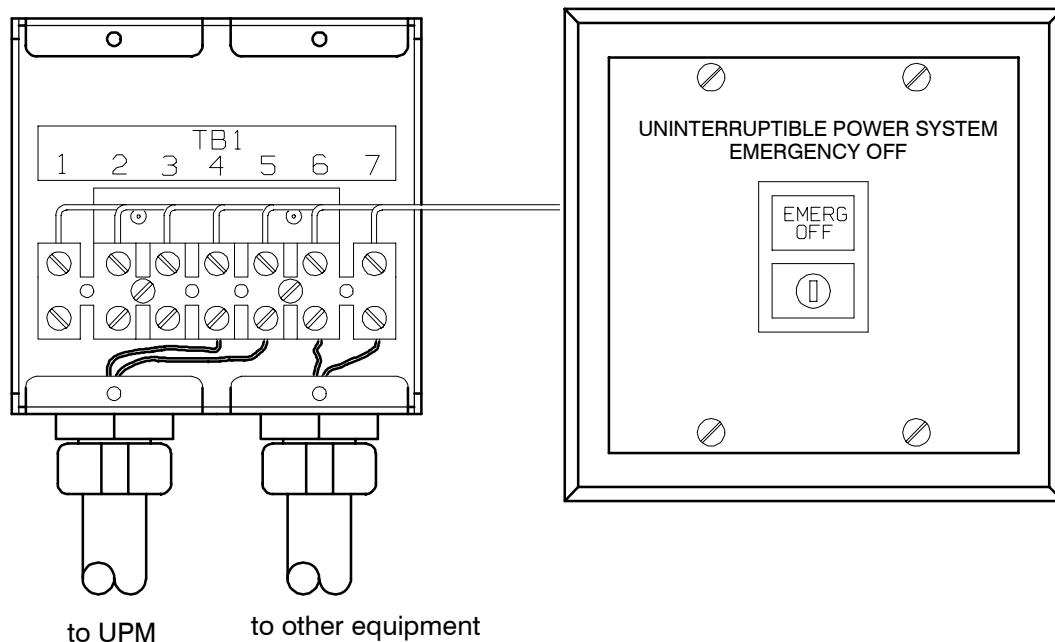
Figure 5‒1.   Remote EPO Control

5.2   To install a Remote EPO:

NOTE: *Before installing a Remote EPO, be sure you have prepared the UPM according to the instructions in Chapter 2.*

To install a Remote EPO control:

1. Securely mount the Remote EPO station. Recommended locations include operator's consoles or near exit doors. Refer to Appendix A, Drawing 164201244‒9, for enclosure dimensions and wiring knockouts.

2. Install wiring from the Remote EPO station using ½-in. conduit through the cable entry panel on the top of the UPS Output/Inverter cabinet. Refer to Appendix A, Drawing 164201244‒7, for conduit landing area and terminal board location, and Drawing 164201244‒2 for terminal wiring assignments.

3. Connect the Remote EPO wiring as shown in Tables 5–1 and 5–2:

Table 5–1. Remote EPO Wire Terminations

From Remote EPO Station(s)	To Customer Interface Terminal Board CUSTTB in UPS Output/Inverter Cabinet	Remarks
TB1–4	CUSTTB–9	Twisted wires (2) 14–18 gauge
TB1–5	CUSTTB–10	

Table 5–2. Remote EPO

Remote EPO switch rating is 24 VDC. 1 Amp minimum if supplied by user.

NOTE: This switch must be a dedicated switch not tied into any other circuits.
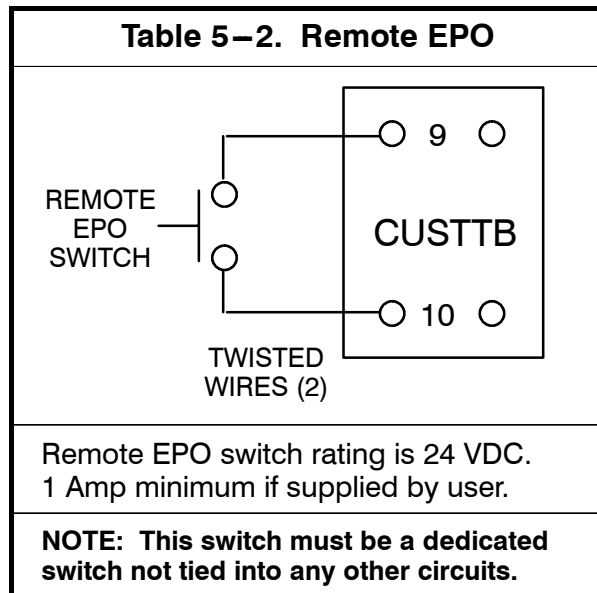
4. If you are installing multiple Remote EPO stations, wire additional stations in parallel with the first Remote EPO.

5. If required, install ½-in. conduit and wiring from the Remote EPO station to trip circuitry of upstream protective devices. A normally open contact is provided, as shown in Table 5–2. Remote EPO switch wiring must be in accordance with UL Class II requirements.

6. Secure the UPS by reversing all steps taken to prepare it for Remote EPO installation.

Installing a Remote Monitor Panel

6

6.1 Installation Procedures

As an option, you can install Remote Monitor Panels (RMPs) to monitor the operation of the UPS system from virtually any location within your facility, up to 500 feet from the UPS. You can flush-mount or surface-mount an RMP on a desktop or on a wall, wherever you have a serial interface line. A maximum of two monitoring accessories (RMPs, RIMs, or SCMs) can be installed. See Table 6−1 for the number of accessories permitted. Figure 6−1 shows an RMP. Drawing 164201244−10 in Appendix A shows the enclosure dimensions and knockout patterns.

Table 6−1. Optional Monitoring Accessories		
Number and Type of Accessories Permitted		
Remote Monitor Panel	Relay Interface Module	Supervisory Contact Module
2	—	—
—	2	—
—	—	2
1	1	—
1	—	1
—	1	1

Figure 6 – 1. Remote Monitor Panel (RMP)

6.2   To install an RMP:

NOTE: Before installing an RMP, be sure you have prepared the UPS according to the instructions in paragraph 2.2.6.

1. Securely mount the RMP(s).

2. Install wiring from the RMP using ½-in. conduit through the cable entry knockout in the top of the UPS Input/Rectifier cabinet (refer to Appendix A, Drawing 164201244−7, for the location of the conduit landing area).

3. In the spare parts kit, locate the RMP adapter cable assembly (see Figure 6−2). Mate the DB−9 connector on the back of the terminal block to the DB−9 connector (Port 1) on the Customer Interface Panel of the UPS (refer to Drawing 164201244−2 in Appendix A). Use two screws from the spare parts kit to secure the terminal block bracket to the Customer Interface Panel.

Connect to
Port 1 (DB−9) on
Customer Interface Panel

FUSE
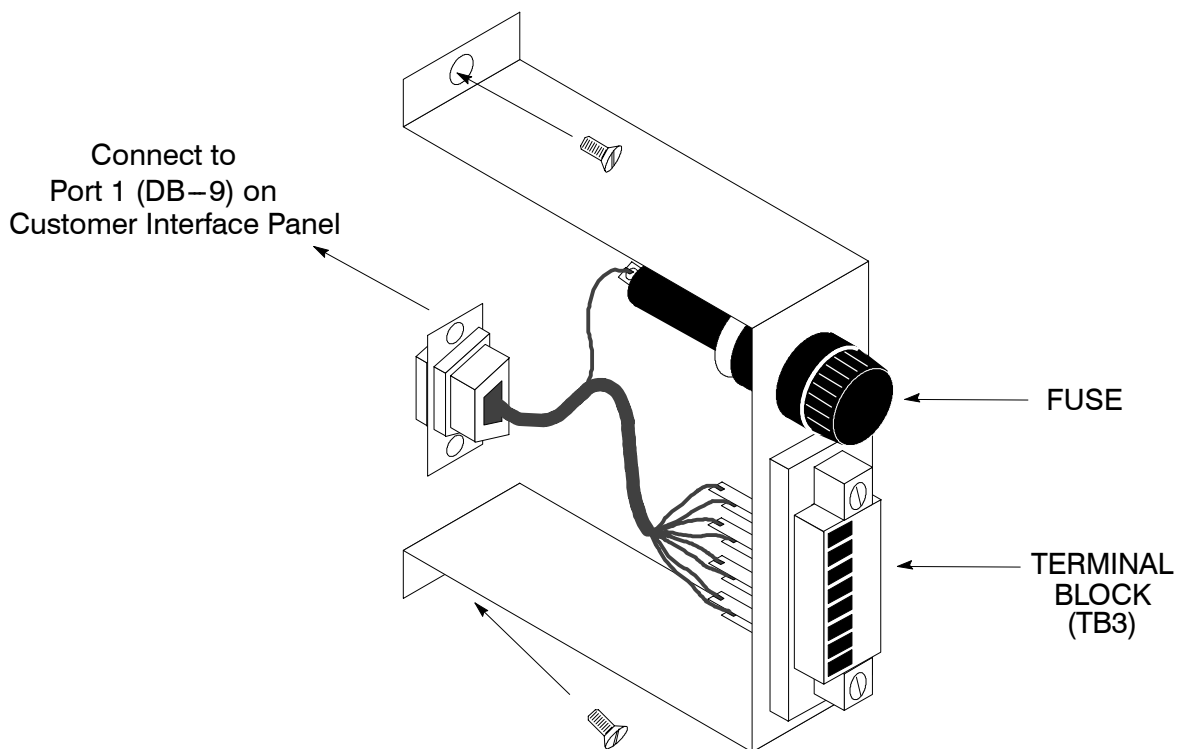
TERMINAL
BLOCK
(TB3)

Figure 6−2.   Terminal Block Bracket

4. Connect RMP wiring to the terminal block using terminations shown in Table 6–2.

Table 6–2. RMP Wire Terminations		
From RMP A	*To UPS*	*Remarks*
TB1–4	TB3–1	TWISTED WIRES (4) 1–2 TURNS PER 3 INCHES
TB1–5	TB3–2	
TB1–6	TB3–3	
TB1–7	TB3–4	
From RMP B (if used)	*To UPS*	*Remarks*
TB1–4	TB3–5	TWISTED WIRES (4) 1–2 TURNS PER 3 INCHES
TB1–5	TB3–6	
TB1–6	TB3–7	
TB1–7	TB3–8	

5. To check the operation of the RMP, ensure that the UPS system is supplying the load via the inverter or bypass. If the indicators on the RMP show the appropriate status, then it is operating correctly.

If the communications link between the UPS and the RMP is not present, the RMP will self-test (all indicators flash and the horn beeps at one-second intervals). If this occurs, check all harness connectors and the fuse for proper seating. If all connections are secure but the RMP continues to self-test, replace the fuse with the spare included in the hardware kit. If this does not correct the problem, contact your local field service office for verification that the RMP is working correctly.

6. To test the indicator lamps, press the horn silence button and hold it for 3 seconds. All lamps should light, and the horn sound continuously until you release the button.

7. Repeat steps 1, 2, and 4 through 6 for each RMP you are installing.

8. If you are installing an RIM or SCM in addition to an RMP, proceed to Chapter 7 or 8, respectively; otherwise, secure the UPS cabinet by reversing the steps contained in paragraph 2.2.6.

Installing a Relay Interface Module

7.1   Installation Procedures

The optional Relay Interface Module (RIM) uses relay contact closures to indicate the operating status and alarm condition of the UPS system. The module uses an RS422 serial interface line and may support up to eight critical loads. A maximum of two monitoring accessories (RMPs, RIMs, or SCMs) can be installed. Refer to Table 6−1 for the number of accessories permitted. Figure 7−1 shows the RIM with its four 15-pin connectors labeled J1 through J4. Refer to Drawing 164201244−11 in Appendix A for enclosure dimensions and wiring knockouts.
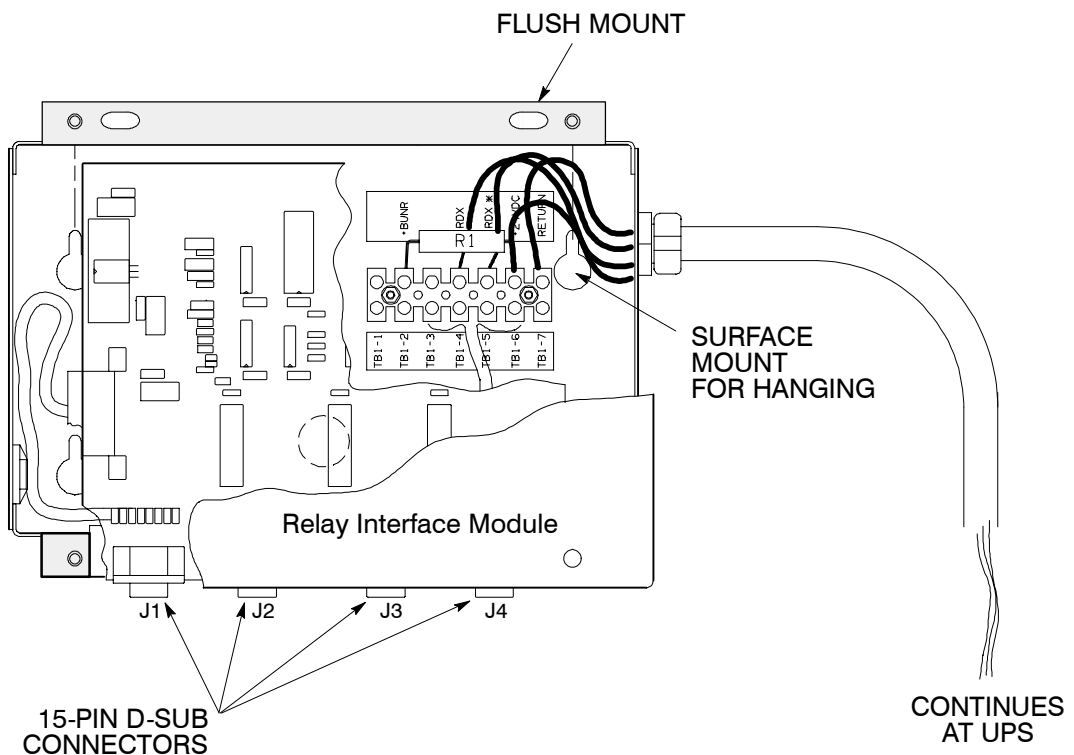
Figure 7−1.   Relay Interface Module

7.2   To install a RIM:

NOTE: Before installing a RIM, be sure you have prepared the UPS according to the instructions in paragraph 2.2.6.

1. Securely mount the RIM.

2. Install wiring from the RIM using ½-in. conduit through the cable entry knockout in the top of the UPS Input/Rectifier cabinet (refer to Appendix A, Drawing 164201244−7, for the location of the conduit landing area).

3. If not already installed, locate the RMP adapter cable assembly (see Figure 7−2) in the spare parts kit. Mate the DB−9 connector on the back of the terminal block to the DB−9 connector (Port 1) on the Customer Interface Panel of the UPS (refer to Drawing 164201244−2 in Appendix A). Use two screws from the spare parts kit to secure the terminal block bracket to the Customer Interface Panel.

Connect to
Port 1 (DB−9) on
Customer Interface Panel

FUSE
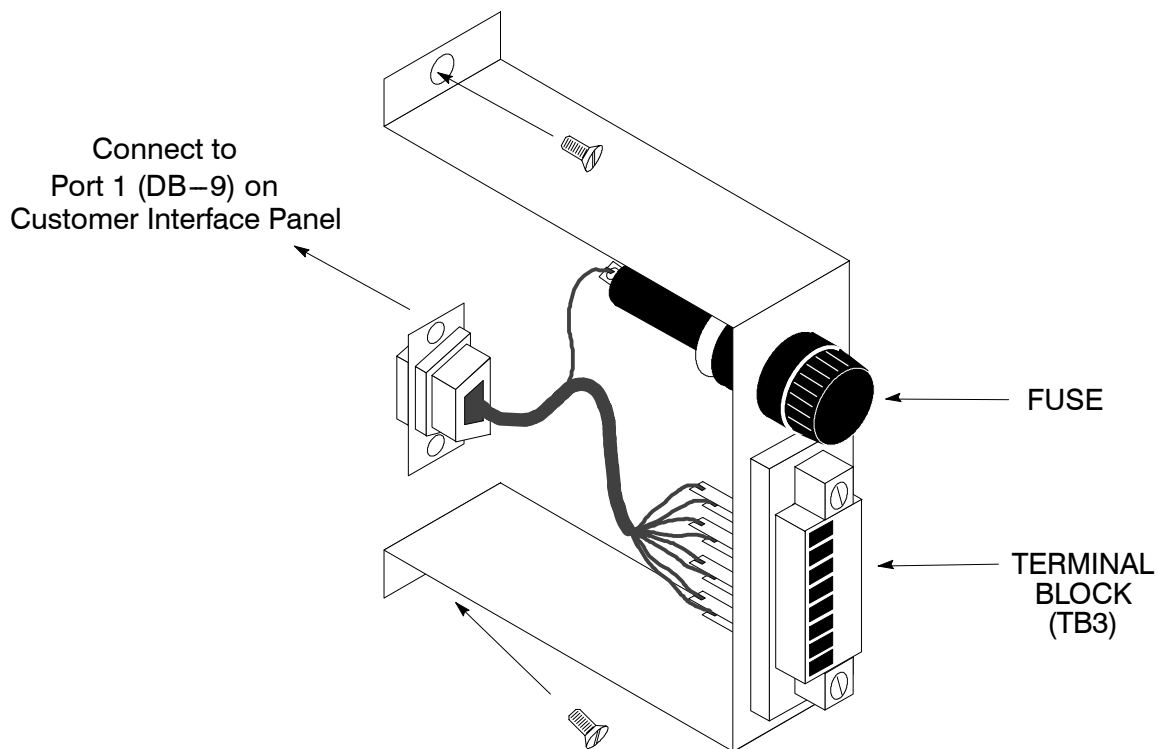
TERMINAL
BLOCK
(TB3)

Figure 7−2.   Terminal Block Bracket

4. Connect RIM wiring to the terminal block using the terminations shown in Table 7−1.

Table 7−1. RIM Wire Terminations		
From RIM A	*To UPS*	*Remarks*
TB1−4	TB3−1	TWISTED WIRES (4) 1−2 TURNS PER 3 INCHES
TB1−5	TB3−2	
TB1−6	TB3−3	
TB1−7	TB3−4	
From RIM B (if used)	*To UPS*	*Remarks*
TB1−4	TB3−5	TWISTED WIRES (4) 1−2 TURNS PER 3 INCHES
TB1−5	TB3−6	
TB1−6	TB3−7	
TB1−7	TB3−8	

5. Contact your local field service office for verification and testing of the RIM and its connections prior to making connections to J1−J4.

You can order interface cables separately for connecting to the 15-Pin D-Sub Connectors.

6. Repeat steps 1 through 5 for each RIM you are installing.

7. If you are installing an RMP or SCM in addition to an RIM, proceed to Chapter 6 or 8, respectively; otherwise, secure the UPS cabinet by reversing the steps contained in paragraph 2.2.6.

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Installing a Supervisory Contact Module

8
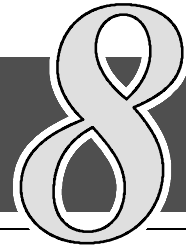
8.1   Installation Procedures

The optional Supervisory Contact Module (SCM) shown in Figure 8−1 provides contacts for monitoring UPS system status. A maximum of two monitoring accessories (RMPs, RIMs, or SCMs) can be installed. Refer to Table 6−1 for the number of accessories permitted. Refer to Appendix A, Drawing 164201244−12, for enclosure dimensions, side views, and knockout patterns.
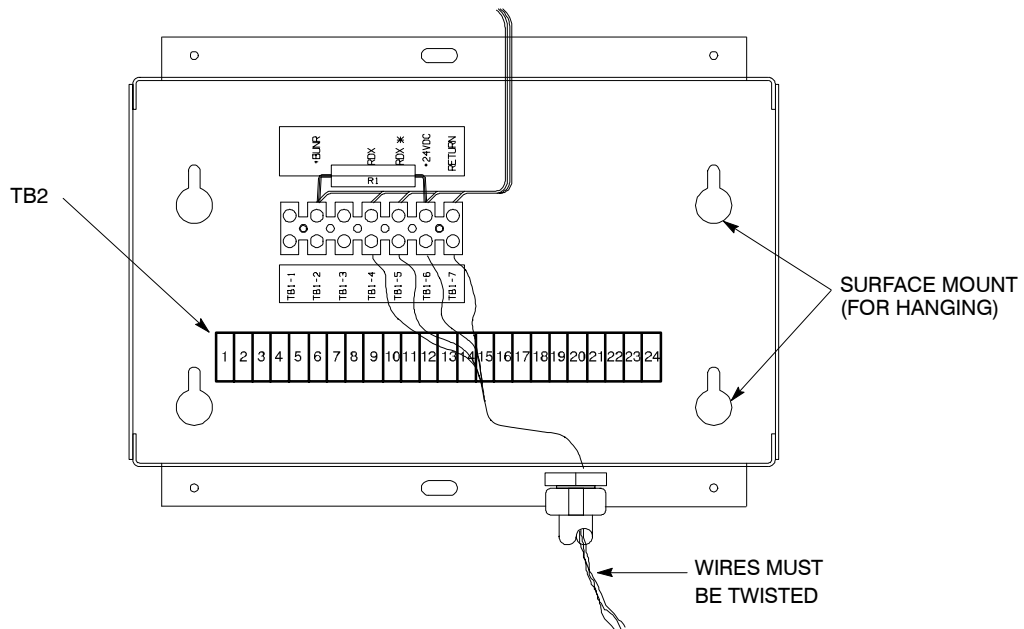
Figure 8 − 1.   Supervisory Contact Module

8.2 To install a Supervisory Contact Module:

NOTE: *Before installing an SCM, be sure you have prepared the UPS according to the instructions in paragraph 2.2.6.*

1. Securely mount the SCM.

2. Install wiring from the SCM using ½-in. conduit through the cable entry knockout in the top of the UPS cabinet (refer to Appendix A, Drawing 164201244−7, for the location of the conduit landing area).

3. If not already installed, locate the RMP adapter cable assembly (see Figure 8−2) in the spare parts kit. Mate the DB−9 connector on the back of the terminal block to the DB−9 connector (Port 1) on the Customer Interface Panel of the UPS (refer to Drawing 164201244−2 in Appendix A). Use two screws from the spare parts kit to secure the terminal block bracket to the Customer Interface Panel.

Connect to
Port 1 (DB−9) on
Customer Interface Panel

FUSE
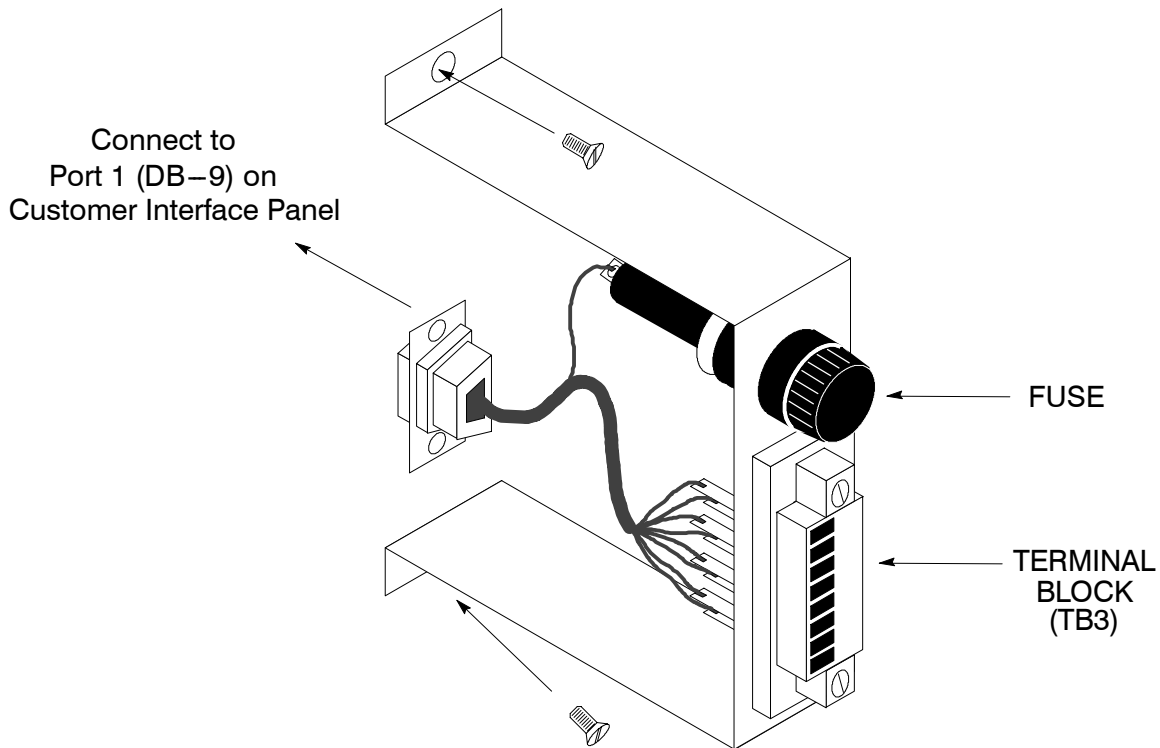
TERMINAL
BLOCK
(TB3)

Figure 8−2.   Terminal Block Bracket

4. Connect the SCM wiring to the terminal block using the terminations shown in Table 8−1.

Table 8−1. Supervisory Contact Module Wire Terminations		
From SCM A	*To UPS*	*Remarks*
TB1−4	TB3−1	TWISTED WIRES (4) 1−2 TURNS PER 3 INCHES
TB1−5	TB3−2	
TB1−6	TB3−3	
TB1−7	TB3−4	
From SCM B (if used)	*To UPS*	*Remarks*
TB1−4	TB3−5	TWISTED WIRES (4) 1−2 TURNS PER 3 INCHES
TB1−5	TB3−6	
TB1−6	TB3−7	
TB1−7	TB3−8	

5. Contact your local field service office for verification and testing of the SCM and its connections prior to making connections to terminal strip TB2 shown in Figure 8−3.

6. Repeat steps 1 through 5 for each SCM you are installing.

7. If you are installing an RMP or RIM in addition to an SCM, proceed to Chapter 6 or 7, respectively; otherwise, secure the UPS cabinet by reversing the steps contained in paragraph 2.2.6.

SYSTEM NORMAL — 1, 2, 3

NO REDUNDANCY — 4, 5, 6

ON GENERATOR — 7, 8, 9

BYPASS NOT AVAILABLE — 10, 11, 12

ON BATTERY — 13, 14, 15

UPS ALARM — 16, 17, 18

ON BYPASS — 19, 20, 21

SHUTDOWN IMMINENT — 22, 23, 24
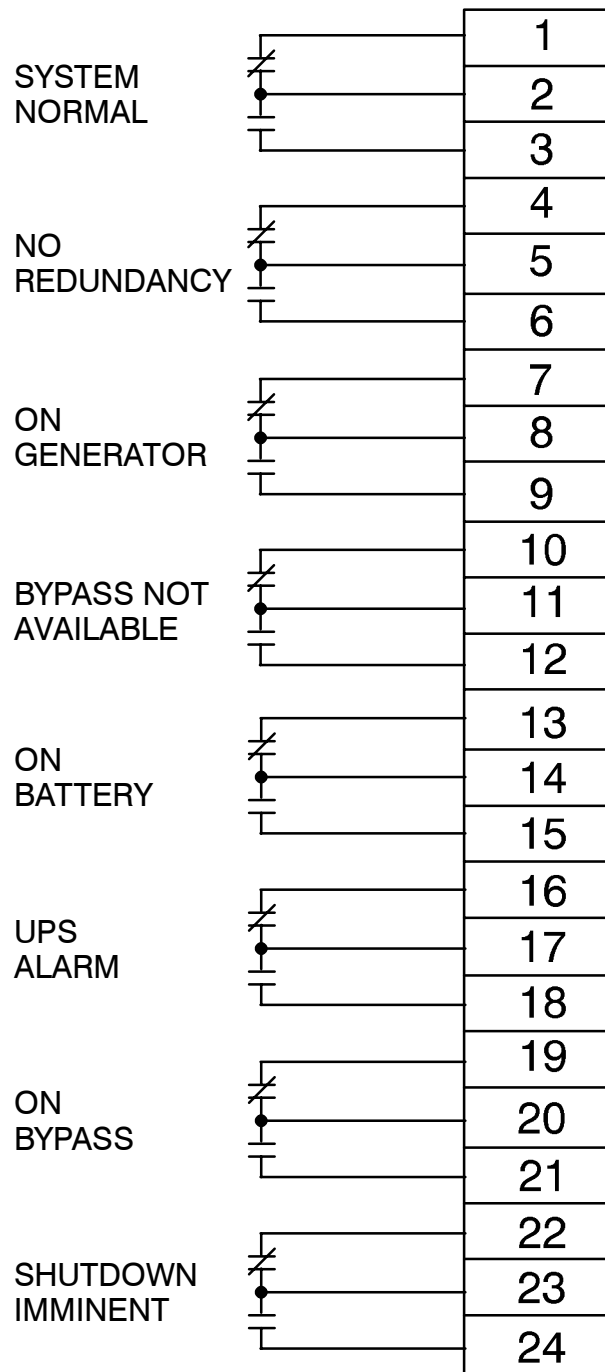
Note: Supervisory contacts are rated at 2.0 amps at 28 Vdc or 120 Vac and 0.15 amp at 115 Vdc.

Supervisory contacts require external power supply. Internal 24 Vdc is not capable of supplying contact current.

Figure 8–3.   Supervisory Contact Module TB2

Section II

Operation

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Understanding UPS Operation

9.1   *Looking Inside a Parallel Capacity/Redundant System*

The Powerware 9315 is a continuous duty, solid-state UPS that supports the following equipment: process control, data processing, telecommunications/PBX, research, and medical. The Powerware 9315 maintains power to the critical loads during commercial electrical power brownout, blackout, overvoltage, undervoltage, and out-of-tolerance frequency conditions.

In this manual, the power required by your equipment is called the *critical load*. The UPS supplies the critical load with conditioned power that is synchronized with your utility power. Figure 9−1 shows the main elements of the UPS.
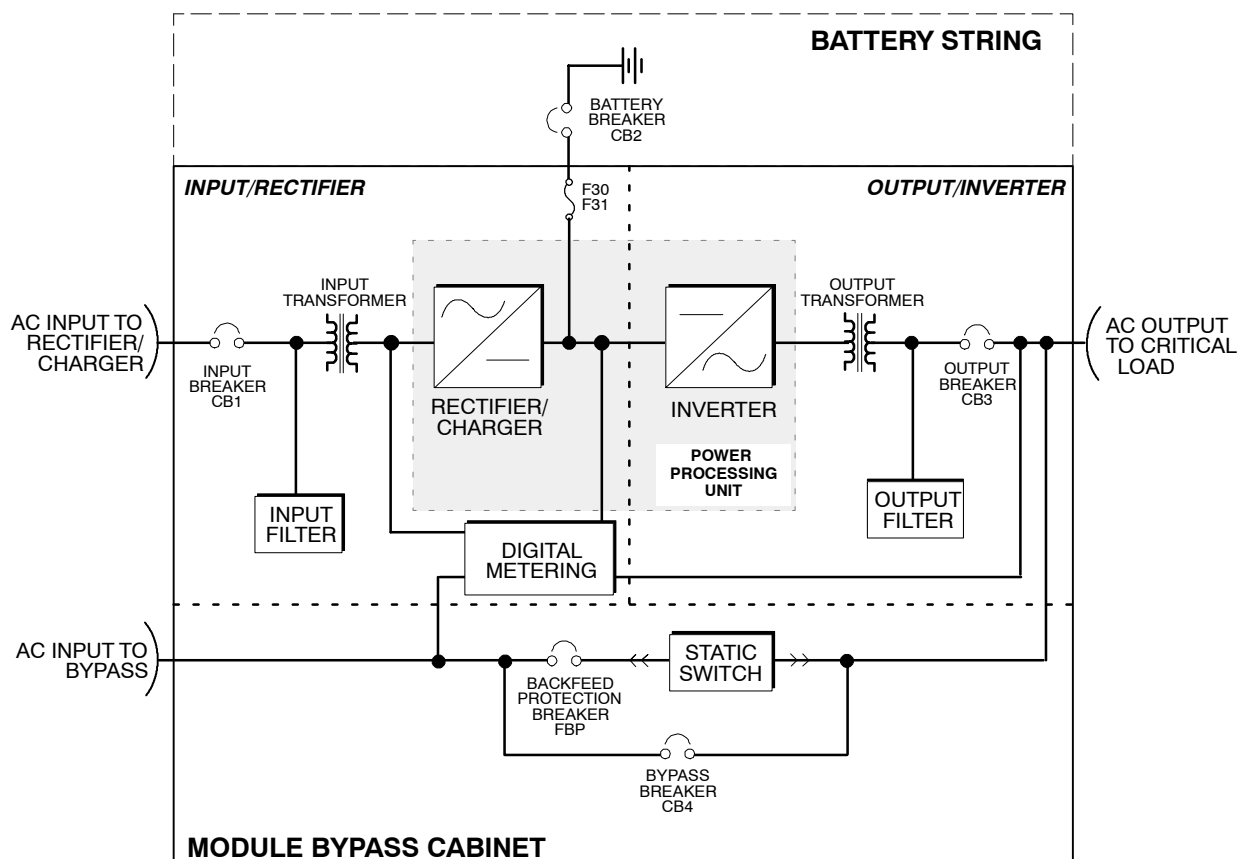
Figure 9−1.   Main Elements of the UPS System

The emergency bypass consist of a static switch, a wraparound bypass breaker (CB4) and a backfeed protection breaker (FBP). The backfeed protection breaker is located in series with the static switch. If an SCR shorts, the breaker opens so that the UPS cannot backfeed the bypass source.

For manual transfers to bypass, the static switch is not used. During the transfer, CB4 is closed and verified and then inverter output breaker CB3 is opened. For transfers of the load from bypass to the UPS, CB3 is closed and verified and then CB4 is opened. The static switch is armed and ready during both types of transfers.

If utility power is interrupted or falls outside the parameters specified in Chapter 18, "Product Specifications," the UPS uses a *backup battery supply* to maintain power to the critical load for a specified period of time or until the utility power returns. For extended power outages, the backup battery supply allows you to either transfer to an alternative power system (such as a generator) or shut down your critical load in an orderly manner.

9.2   Normal, Battery, and Bypass Modes

The UPS system functions automatically to supply AC electrical power to the critical load. There are three standard operation modes:

- In Normal mode, the critical load is supplied by the inverter, which derives its power from rectified utility AC power. In this mode, the rectifier also provides charging current for the battery.

- In Battery mode, the battery cabinet provides DC power, which maintains inverter operation. The battery supports the critical load.

- In Bypass mode, the critical load is directly supported by utility power.

The UPS continually monitors itself and the incoming utility power, and automatically switches between these modes as required, with no operator intervention. The sophisticated detection and switching logic inside the UPS ensures that operating mode changes are automatic and transparent to the critical load. The UPS switches operating modes in response to these *system events*:

- A *command* is an intervention that is externally initiated by an operator or by some site action. A command causes the UPS to switch operating modes; it usually does not require any further action by you.

- A *notice* is a minor system event that may or may not require your attention.

- An *alarm* is a system event that requires immediate operator intervention.

System events, alarm horns, and indicator lights are described in Chapter 14, "Responding to System Events."

The following descriptions provide the differences in UPS operating modes.

9.3   Normal Mode

In Normal mode, utility AC power is supplied to the rectifier. The rectifier supplies DC power to the inverter, which then supplies the critical load with AC power. The rectifier also provides charging power to the battery. The battery charge condition is monitored by the UPS and reported by a status indicator on the Control Panel. The message "System Normal" appears in the status area of the Control Panel LCD screen.

Figure 9−2 shows the path of electrical power through the UPS system when the UPS is operating in Normal mode.
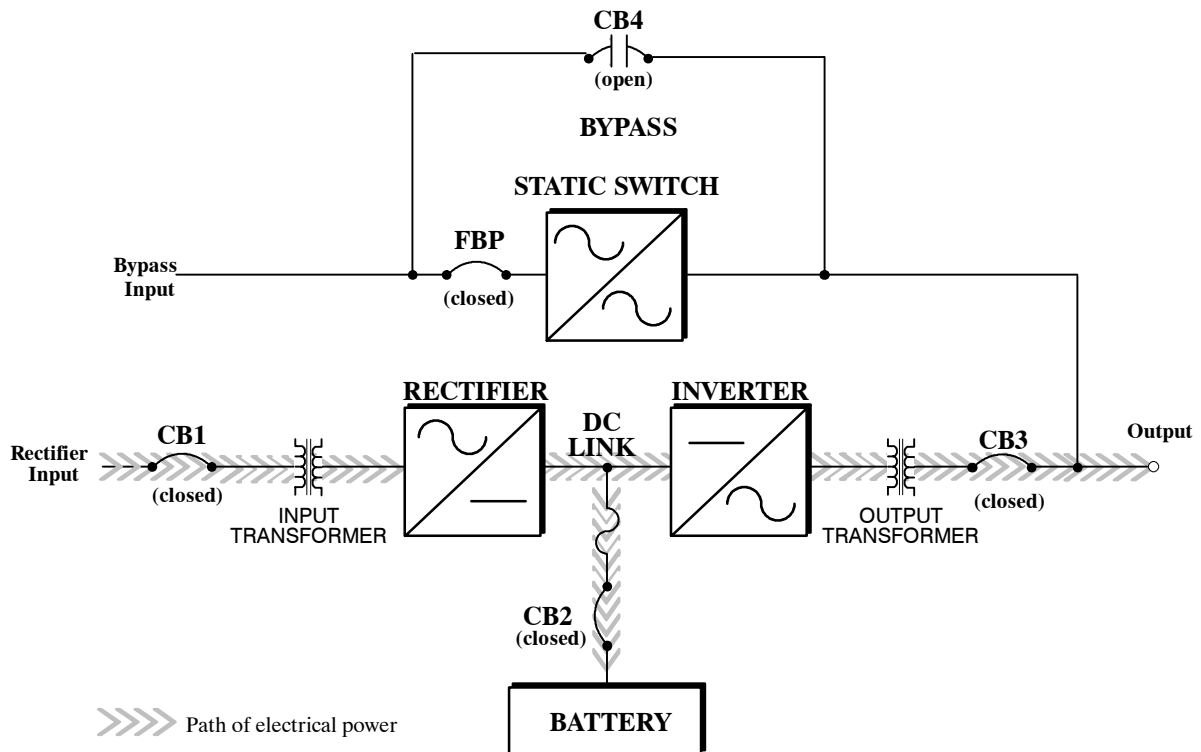
Figure 9−2.   Path of Current Through the UPS in Normal Mode

If the utility AC power is interrupted or is out of specification, the UPS automatically switches to Battery mode to support the critical load with no interruption. When utility power returns, the UPS returns to Normal mode.

If the UPS becomes overloaded or unavailable, the UPS switches to Bypass mode. The UPS automatically returns to Normal mode when the error condition is cleared and system operation is restored within specified limits.

If the UPS suffers an internal failure, it switches automatically to Bypass mode and remains in that mode until the failure is corrected and the UPS is back in service.

9.4 Bypass Mode

The UPS automatically switches to Bypass mode if it detects an overload, load fault, or internal failure. The bypass source supplies the commercial AC power to the load directly.

Figure 9−3 shows the path of electrical power through the UPS system when operating in Bypass mode.

> **CAUTION:**
> **The critical load is not protected while the UPS is in Bypass mode.**
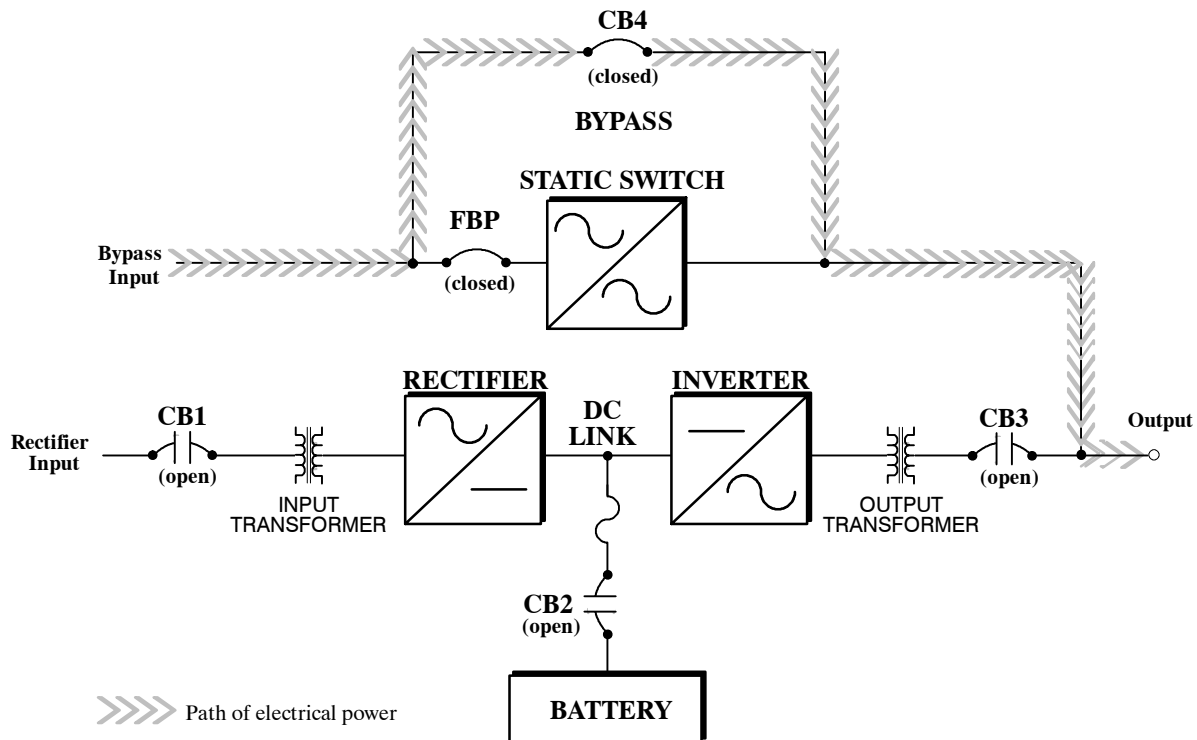
Figure 9−3.   Path of Current Through the UPS in Bypass Mode

The UPS can be transferred from Normal mode to Bypass mode manually. However, the UPS switches automatically to Bypass mode whenever the inverter can no longer supply the critical load. Initially, the static switch fires and conducts power from breaker FBP to the load. When breaker CB4 closes, the static switch stops conducting and breaker FBP opens. If the UPS transfers to Bypass mode from Normal mode due to any reason other than operator intervention, the UPS automatically attempts to transfer back to Normal mode (up to three times within a 10-minute period). The fourth transfer locks the critical load to the bypass source and requires operator intervention to transfer.

Bypass mode is a normal operating mode, and not an alarm condition. However, if the UPS is unable to return to Normal mode following an automatic transfer to Bypass mode, an alarm condition is recorded.

9.5   Battery Mode

The UPS transfers to Battery mode automatically if a utility power outage occurs, or if the utility power does not conform to specified parameters. In Battery mode, the battery provides emergency DC power that the inverter converts to AC power. When the UPS switches to Battery mode, the alarm indications depend on the cause and condition of the battery charge. The length of time the system can operate in Battery mode depends on loading and the battery supply capacity.

Figure 9−4 shows the path of electrical power through the UPS system when operating in Battery mode.
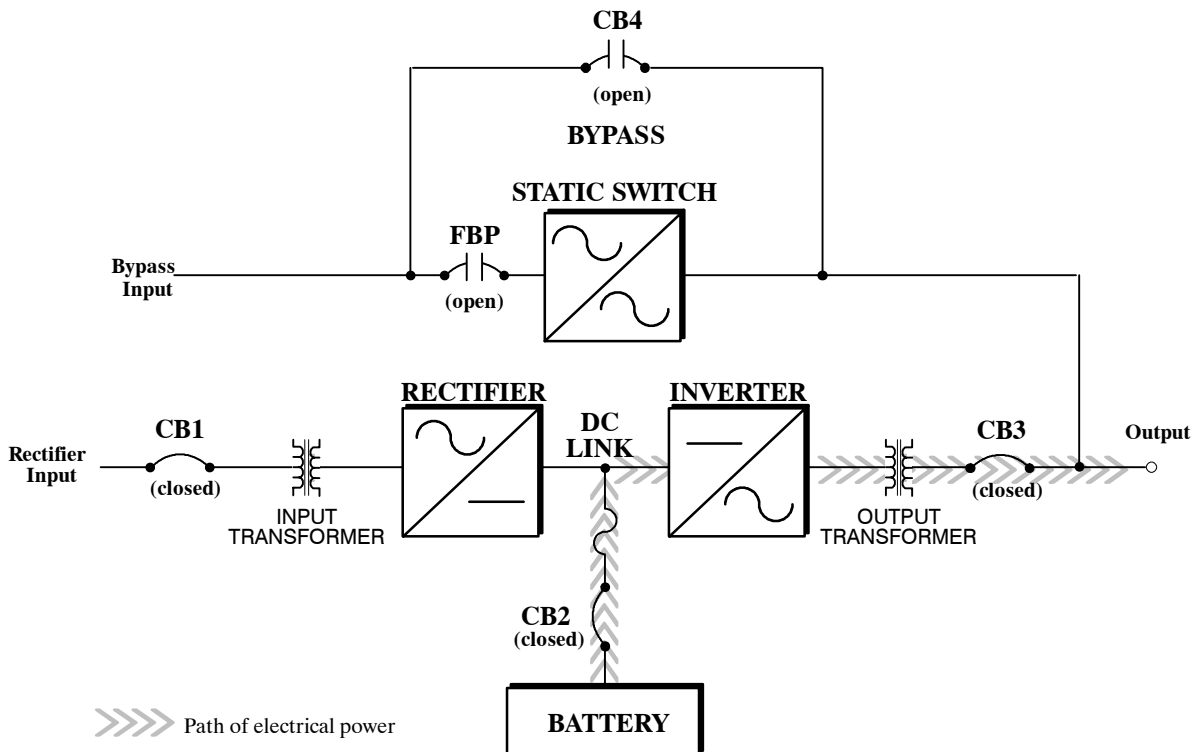
Figure 9−4.   Path of Current Through the UPS in Battery Mode

When the discharging battery voltage reaches the lower limit of UPS operation capability, the critical load transfers to Bypass mode if it is available. If Bypass input is not available, a "Shutdown Imminent" warning occurs. The warning time before critical load loss occurs is approximately 2 minutes, depending on battery capacity and the amount of loading.

If incoming power returns to within specified parameters, the UPS automatically returns to Normal mode and alarm indications clear. However, the process of returning to Normal mode is not instantaneous. The rectifier gradually draws increasing power from the incoming utility until Normal mode is achieved.

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Operational Controls and Features

10.1 General

The UPS system should function automatically and require very little attention during normal operation. The controls and indicators identified in this section are used during startup, to monitor normal operation and during abnormal events.

Figure 10−1 identifies and shows the location of the controls and indicators on the UPS. The descriptions provide a brief overview of the UPS controls, and standard and optional features.

NOTE: Read the Operation section of this manual and have thorough knowledge of UPS operation before attempting to operate any of the UPS controls or optional components.

10.2 UPS Standard Features

The UPS has many standard features that provide cost-effective and consistently reliable power protection:

10.2.1 Control Panel

The *Control Panel* on the front of the UPS contains an LCD screen to display the current status of the UPS system. You can view a statistical history and log of system events and display a real-time graphic representation of power flowing through the system components. Backlit status indicators show the operating mode of the UPS and alert you to system events. The **BATTERY** switch controls the application of battery power to the UPS. The **MODE** switch, also located on this panel, is used to start and stop the system and transfer the load between normal UPS operation and bypass operation. The **EMERGENCY UPM OFF** pushbutton is located at the top of the control panel, and the **PUSH IN TO RESET** button for the **EMERGENCY UPM OFF** is located between the **BATTERY** and **MODE** switches. The Control Panel is described in Chapter 11, "Using the Control Panel".

CONTROL
PANEL

INPUT
BREAKER
CB1
(OPTIONAL)

OUTPUT
BREAKER
CB3
(OPTIONAL)

BYPASS
BREAKER
CB4

BACKFEED
PROTECTION
BREAKER

CB1

CB3

CB4

FBP

INPUT/RECTIFIER

OUTPUT/INVERTER

MBC
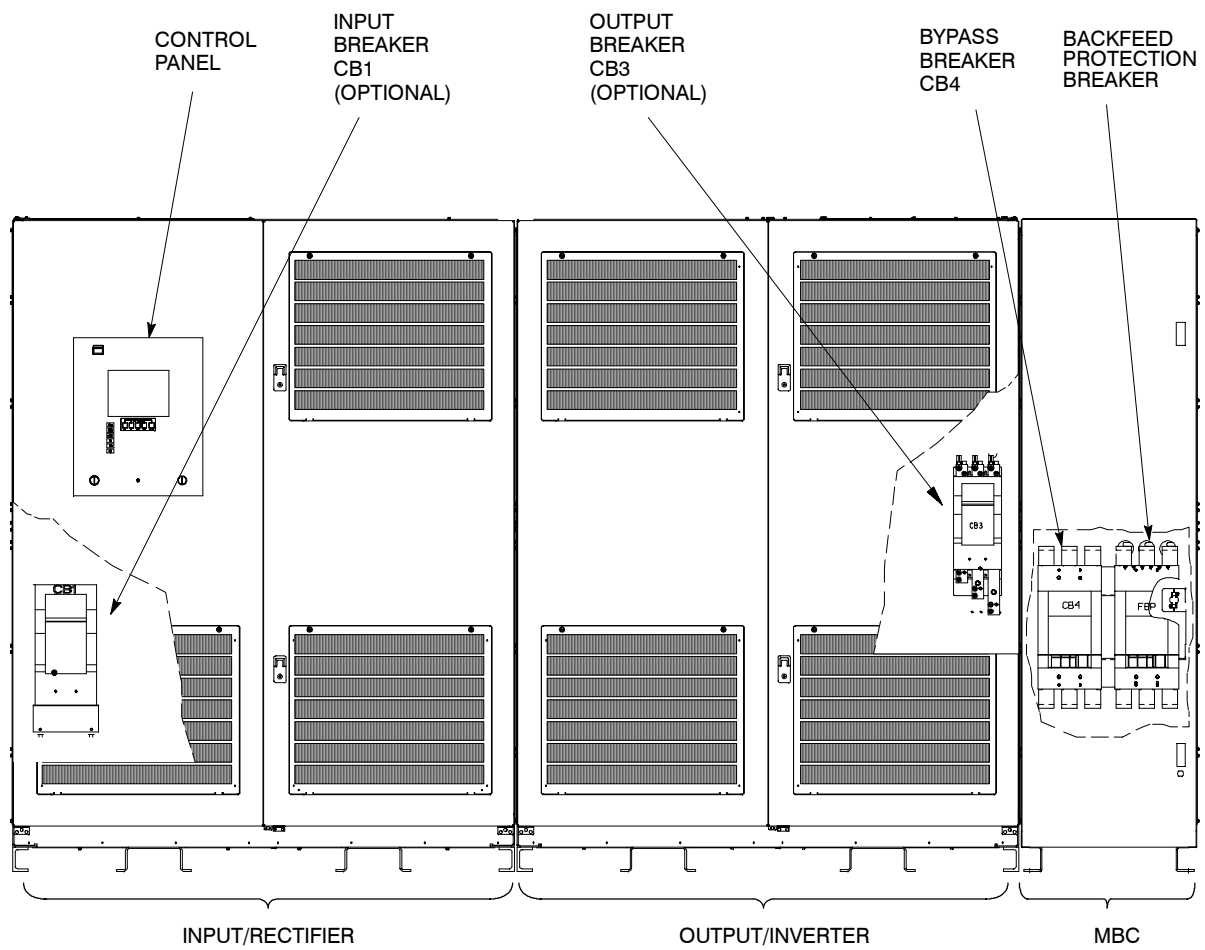
Figure 10 – 1.   UPS Controls and Indicators

10.2.2 UPS Circuit Breakers

The UPS can contain as many as four circuit breakers, the UPM Input Breaker (CB1), the UPS Output Breaker (CB3), the System Bypass Breaker (CB4), and the Backfeed Protection Breaker (FBP).

CB1 controls the input to the UPS rectifier, while CB3 controls the output of the UPS inverter. CB1 is optional and may be either motor operated or manual controlled.

CB4 and the FBP are used in single module applications and are contained in the Module Bypass section of the UPS. CB4 is used as the bypass supply in the event the output of the UPS is not available and to supply the critical load during maintenance. The FBP is used to prevent power feedback to the UPS input supply when the UPS is operating in the battery mode. These breakers are electrically controlled by the UPS and are automatic in operation.

Multi-module systems replace the Module Bypass section of the UPS with a System Bypass Module (SBM). Refer to the applicable SBM Installation and Operation manual referenced in the *Introduction* of this manual for SBM circuit Breakers.

In addition, a remote mounted external battery disconnect is used to connect the battery string to the UPS. This disconnect is manually operated.

10.2.3 EMERGENCY UPM OFF

An **EMERGENCY UPM OFF** pushbutton is provided for situations where you must instantaneously control the UPS output. The pushbutton is located on the front of the UPS for quick access and is covered with a clear plastic shield to prevent inadvertent operation. The shield must be raised before pressing the pushbutton. The **EMERGENCY UPM OFF** pushbutton is described in detail in Chapter 12, "UPS Operating Instructions."

10.2.4 Customer Interface

Computer Interface
Two serial communications ports are standard on all units, and are electrically isolated from the UPS. You can use these ports to link the UPS to the features described in Chapter 15, *"Serial Communications"* and Chapter 16, "Remote Notification."

Building Alarm Monitoring
You can connect your facility's alarm system contacts to four inputs in the UPS. The UPS uses these inputs to monitor your building alarms in addition to the UPS status. This feature is described further in Chapter 13, "Using Features and Options."

Summary Alarm Contacts
Alarm contacts are provided for connection to equipment at your facility, such as a light, an audible alarm, or a computer terminal. The equipment you connect to these contacts alerts you to an UPS alarm. This feature is described further in Chapter 13, "Using Features and Options."

10.2.5 Automatic Battery Charge Current Limit

A preset limit restricts battery charging current to protect batteries from damage due to high current charging. Charging at high currents can overheat and damage batteries.

10.2.6 Customer Convenience Outlet

An uninterruptible 120VAC, 0.2 amp, fuse-protected convenience outlet is provided to supply power to the optional modem. It is located on the Customer Interface Panel.

10.2.7 Installation Features

Power wiring can be routed through the top of each cabinet. External sensing and monitoring control wire must be installed in accordance with Class 2 wiring methods. Class 2 wiring can be routed through the top of each cabinet.

10.3 Options and Accessories

Contact your sales representative for information about any of these available options:

10.3.1 5% Input Filter

Your unit may be equipped with an *input filter*. An *input filter* yields power factor correction that allows you to save on your initial installation and operating costs. The filter also reduces input harmonic current distortion and minimizes upstream interference that can damage sensitive hardware components.

10.3.2 Battery

You can enhance the protection provided by your UPS with one or more backup battery supplies equipped with sealed lead-acid, maintenance-free batteries.

10.3.3 External Fused Battery Disconnect

An optional DC disconnect, enclosed in a freestanding cabinet, provides an automatic or manual means of disconnecting batteries that are located remotely from the UPS. This option is described further in Chapter 13, "Using Features and Options."

10.3.4 Upgrade Capability

The UPS is available in various output power ratings in both 50 and 60 Hz models. If your power requirements increase, you can upgrade your UPS system to provide more output power with a minimum impact on your facility.

10.3.5 Remote Monitor Panel

An optional *Remote Monitor Panel (RMP)* contains backlit status indicators and a local horn, allowing you to monitor the operational status and alarm condition of the UPS from virtually any location within your facility. You can install multiple RMPs at remote locations to increase your monitoring capabilities. This option is described further in Chapter 13, "Using Features and Options."

10.3.6 Relay Interface Module

An optional *Relay Interface Module (RIM)* uses relay contact closures to indicate the operating status and alarm condition of the UPS. The module uses a serial interface line and may support up to eight critical loads. This option is described further in Chapter 13, "Using Features and Options."

10.3.7 Modem

An optional modem is available for use with the Remote Notification feature described in Chapter 16, "Remote Notification". Refer to the manual supplied with the modem for modem operating instructions.

10.4 Safety Considerations

The UPS enclosure is designed for industrial or computer room applications, and contain safety shields. However, the system is sophisticated and should be handled with appropriate care, following these guidelines:

- **Keep surroundings clean and free from excess moisture.**

- **Do not operate the system close to gas or electric heat sources.**

- **The system is not intended for outdoor use.**

- **The system operating environment should be maintained within the parameters stated in this manual.**

- **Keep the system doors closed to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the unit.**

- **The system contains its own power source. Lethal voltages are present even when the system is disconnected from utility power.**

> **WARNING:**
> **Only AUTHORIZED SERVICE PERSONNEL should perform service or maintenance on the UPS.**

If service or routine maintenance is required:

- **Ensure all power is disconnected before performing installation or service.**

- **Ensure the area around the UPS is clean and uncluttered.**

- **Battery cabinet maintenance or battery replacement should be performed only by authorized service personnel.**

- **Observe all DANGER, CAUTION, and WARNING notices affixed to the inside and outside of the equipment.**

- **Always conform to the more detailed safety precautions described in "Important Safety Instructions" section of Chapter 17.**

10.5 Symbols, Controls, and Indicators

These symbols may appear on your UPS system or on labels inside the UPS. They are accepted by most international safety agents. Everyone in your organization who works with your system should understand the meaning of these symbols:

ON
The principal power switch is in the "On" position.

OFF
The principal power switch is in the "Off" position.

PHASE
The word "phase."

CAUTION: REFER TO MANUAL
Stop and refer to the Operator's Manual for more information.

RISK OF ELECTRIC SHOCK
There is a risk of electric shock present, and you should observe associated warnings. The UPS contains high voltages.

Using the Control Panel

11.1 Description

This chapter describes the UPS Control Panel, including controls and indicators, and how to monitor UPS operation. The Control Panel is a black square area on the front of the SBM (see Figure 11−1).
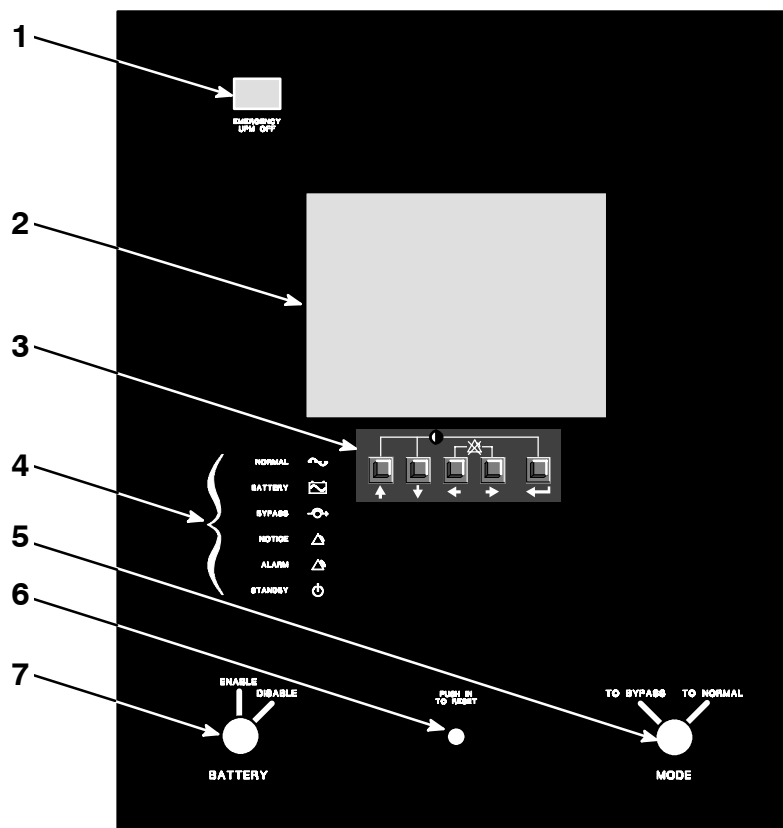
Figure 11−1.   UPS Control Panel

The Control Panel contains the red **EMERGENCY UPM OFF** pushbutton switch (**1**), flat Liquid Crystal Display (LCD) screen (**2**), horizontal row of pushbutton switches (**3**), a vertical column of backlit status indicators (**4**), the **MODE** key switch (**5**), the **PUSH IN TO RESET** pushbutton switch (**6**), and the **BATTERY** switch (**7**). The following sections describe using the UPS Control Panel to monitor the UPS. Refer to Chapter 12 − *UPS Operating Instructions* for use of the operational controls.

11.2 Using the LCD Screen

The LCD screen at the top of the Control Panel provides an operator interface with the UPS system. Figure 11−2 identifies the display fields discussed in the following sections.
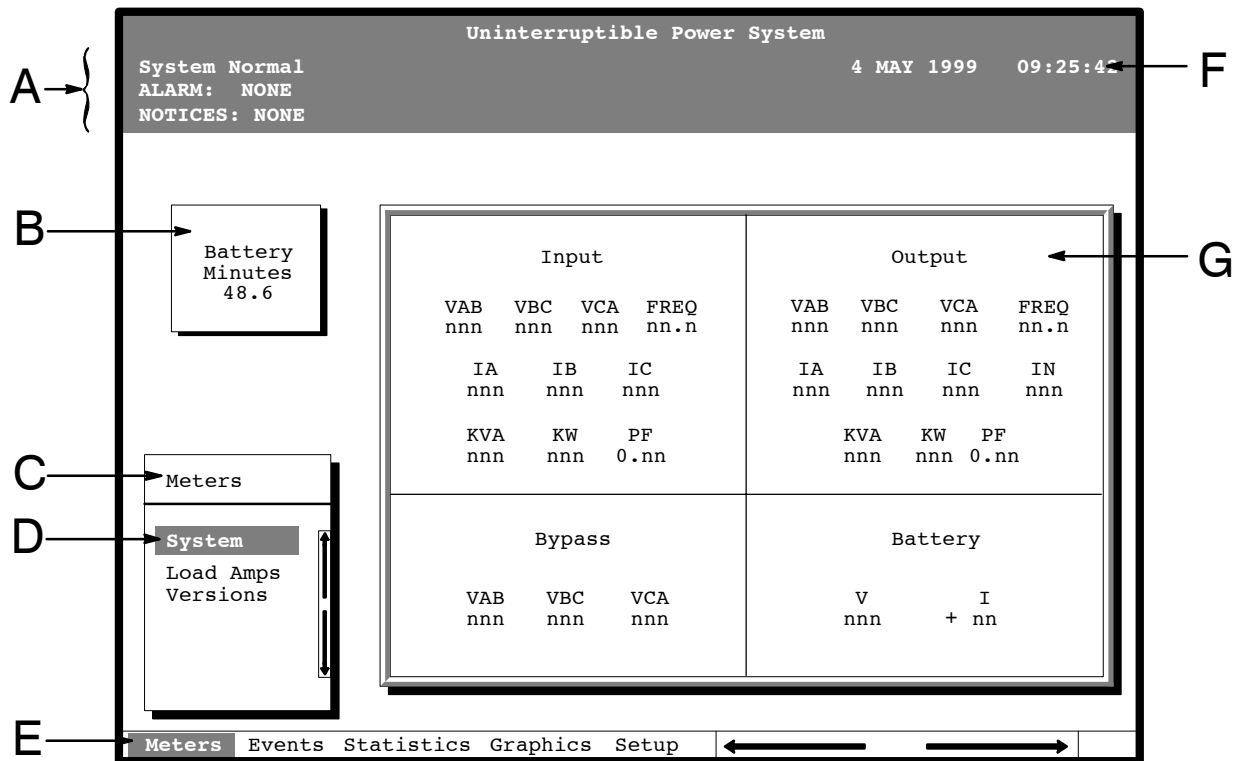
Figure 11−2.   Parts of the LCD Screen

A The *UPS status area* contains three lines that display the current state of the UPS. The first line shows the present operational mode of the UPS. The second line shows the highest level of the current active alarms, and the third line shows any notices the UPS has posted. (For more information about alarms and notices, refer to Chapter 14, "Responding to System Events.")

B The *battery charge box* shows the minutes of battery capacity available.

C The *menu box* shows the currently selected menu and lists the options available on that menu. The title at the top of the menu box is also shown below on the menu bar (**E**). Press the ⇧ and ⇩ pushbuttons to scroll up and down through the options in the menu box.

D The currently selected *option* is highlighted in the menu box. Press the ⇧ and ⇩ pushbuttons to move the highlight up or down. The data in the information area (**G**) changes accordingly.

E The *menu bar* lists the titles of the menus. The title of the menu currently displayed in the menu box is highlighted. When you press the ⇦ and ⇨ pushbuttons to move the highlight left or right, the data in the menu box and the information area change accordingly.

F The *time stamp* shows the current date and time. This date and time are recorded in the Event Log when a notice or alarm is activated.

G The *information area* contains data about UPS status and operations. Select a menu option to display statistics or graphics.

You can use the LCD screen and the pushbuttons beneath it to:

- Monitor UPS operation

- Look at a log of UPS events (alarms, notices, and commands).

11.3 Using the Pushbuttons

The *pushbuttons* below the LCD screen are labeled with arrows indicating their functions:
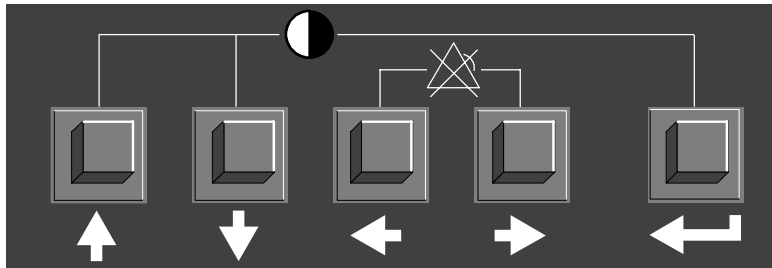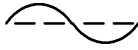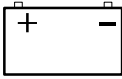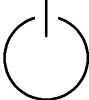
- Press the ⇧ and ⇩ pushbuttons to move through the options in a menu, or to scroll through the list of alarms and notices in the event log.

- Press the ⇦ and ⇨ pushbuttons to move through the menu titles on the menu bar. Press them simultaneously to silence the horn, or to test the lamps behind the status indicators.

- Press the ⏎ pushbutton to toggle the use of the ⇧ and ⇩ pushbuttons between the menu box and the information area.

11.4 Adjusting the Contrast

- Use the pushbuttons to adjust the contrast on the LCD screen. Hold down the ⏎ pushbutton, then press the ⇧ pushbutton to increase the contrast or the ⇩ pushbutton to decrease the contrast.

11.5 Reading the Status Indicators

The six symbols on the left side of the monitor panel are *status indicators*. They are backlit by colored light emitting diode (LED) lamps, and they work in conjunction with the alarm horn to let you know the operating status of the UPS.

NORMAL

This green symbol is lit when the UPS is operating in Normal mode. The power processing unit (PPU) is supplying power to the critical load.

Battery

This yellow symbol is lit when the UPS is operating in Battery mode. Because Battery mode is a normal condition of the UPS, the Normal indicator also remains lit.

Bypass

This yellow symbol is lit when the UPS is operating in Bypass mode. The critical load is supported by the bypass source. The Normal indicator is not lit when the system is in Bypass mode.

Notice

This yellow symbol is lit when the system needs attention. The LCD screen shows all active notices. Some notices may be accompanied by an audible horn. To silence the horn, press the ⇦ and the ⇨ pushbuttons simultaneously. The Notice indicator may be lit along with other indicators.

Alarm

This red symbol is lit when a situation requires immediate attention. The LCD screen shows the highest priority active alarms. All alarms are accompanied by an audible horn. To silence the horn, press the ⇦ and the ⇨ pushbuttons simultaneously. The Alarm indicator may be lit along with other indicators.

Standby

This yellow symbol is lit when electricity is present in the PPU of the UPS and the Normal indicator is not lit. During normal startup, this indicator illuminates until the the UPS transfers to Normal mode, at which point the Normal indicator is lit. During normal shutdown, the Standby indicator is lit until all energy in the UPS is dissipated and shutdown is complete.

For more information about audible horns, refer to the "System Event Horns" section of Chapter 14.

To test the LED lamps behind the status indicators, press the ⇦ and ⇨ pushbuttons simultaneously for 3 seconds. All the indicators should light while you hold down these pushbuttons. If any indicator does not light, its LED may need to be replaced. Contact Customer Service if you have a problem with the indicator lamps.

11.6 Using the Menu Options

The UPS *menus* allow you to display data in the information area to help you monitor and control UPS operation. The following menus and options are available:

- **Meters**   Displays performance meters for the system or critical load.

- **Events**   Displays the list of Active System Events and a historical log of system events.

- **Statistics**   Displays statistical information about UPS operations for the battery, load, or line.

- **Graphics**   Displays a real-time graphic representation of the flow of current through the internal UPS components.

- **Setup**   Allows you to configure the UPS communications port and set the date and time for the time stamp.

11.6.1 System Meters Screen

Figure 11–3 shows the LCD screen as it appears when you first start the UPS. The Meters menu is displayed in the menu box, with the System option highlighted. In the information area, the system meters show their current readings.

```
                      Uninterruptible Power System
System Normal
ALARM:  NONE                                  4 MAY 1999   09:25:42
NOTICES: NONE


      ┌──────────┐    ┌─────────────────────────────────────────────┐
      │ Battery  │    │        Input                    Output        │
      │ Minutes  │    │                                               │
      │  48.5    │    │  VAB   VBC   VCA   FREQ     VAB   VBC   VCA   FREQ  │
      └──────────┘    │  nnn   nnn   nnn   nn.n     nnn   nnn   nnn   nn.n  │
                      │                                               │
                      │   IA    IB    IC            IA    IB    IC    IN   │
                      │  nnn   nnn   nnn           nnn   nnn   nnn   nnn  │
      ┌──────────┐    │                                               │
      │ Meters   │    │  KVA    KW    PF           KVA    KW   PF     │
      │          │    │  nnn   nnn   0.nn          nnn   nnn  0.nn    │
      │ System   │    ├───────────────────────────────────────────── │
      │ Load Amps│    │        Bypass                   Battery       │
      │ Versions │    │                                               │
      │          │    │  VAB   VBC   VCA              V         I     │
      └──────────┘    │  nnn   nnn   nnn            nnn       + nn    │
                      └─────────────────────────────────────────────┘
  Meters  Events  Statistics  Graphics  Setup
```

Figure 11–3.   System Meters Screen

The Input area shows the phase-to-phase voltage, frequency, and phase current of the incoming utility, followed by the KVA, KW, and power factor measurements. The output area shows the same information for the power being output by the UPS.

The Bypass area shows the phase-to-phase voltage of the bypass source. The Battery area displays the DC voltage (V) and the DC current (I).

11.6.2 Load Amp Meters Screen

Select **Load Amps** from the Meters menu to see a real-time bar graph of the output current of the UPS. The graph shows the current for each phase.

Figure 11−4 shows the Load Amps Meters screen.
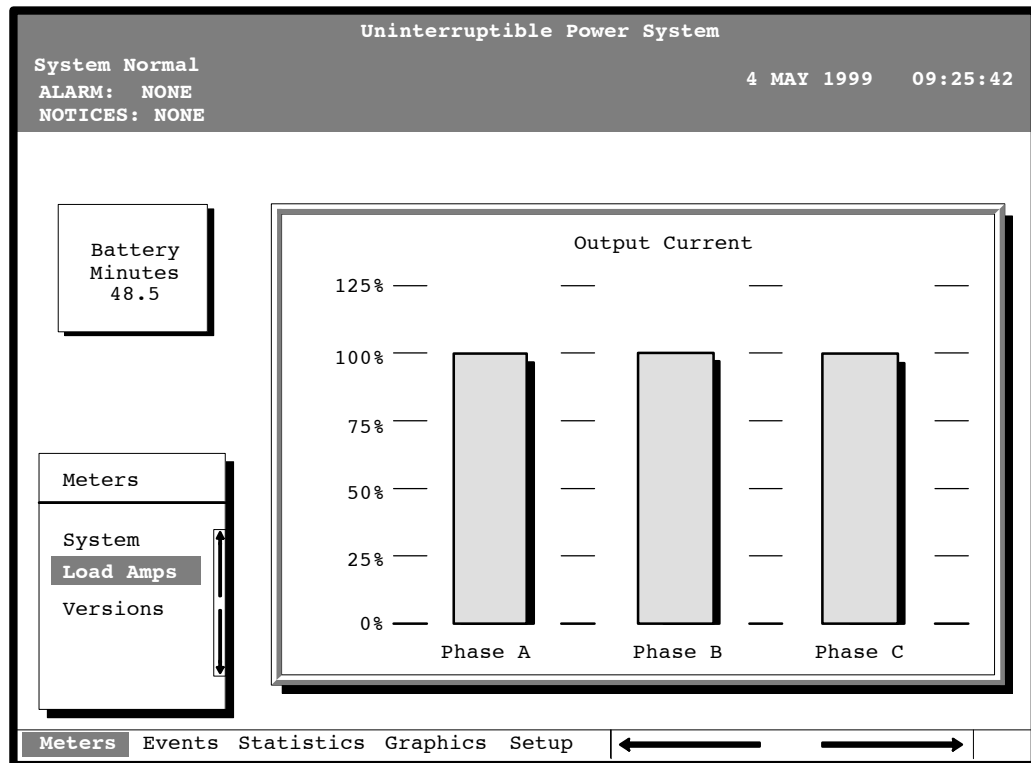
Figure 11−4.   Load Amps Meters Screen

11.6.3 Software Versions Screen

Select **Versions** from the Meters menu to see the software versions installed on the UPS.

Figure 11−5 shows the Versions screen.

```
                          Uninterruptible Power System
System Normal                                        4 MAY 1999    09:25:42
 ALARM:   NONE
 NOTICES: NONE


    ┌────────────┐      ┌─────────────────────────────────────────────┐
    │            │      │                                             │
    │  Battery   │      │               Software Versions             │
    │  Minutes   │      │                                             │
    │   48.5     │      │                                             │
    │            │      │              Version   Part Number          │
    └────────────┘      │                                             │
                        │     Monitor    01.17   143650369            │
                        │                                             │
                        │     Rectifier  *****   143650347            │
    ┌────────────┐      │                                             │
    │  Meters    │      │     Inverter   *****   143650348            │
    │            │      │                                             │
    │  System    │      │                                             │
    │  Load Amps │      │                                             │
    │  Versions  │      │                                             │
    │            │      │                                             │
    └────────────┘      └─────────────────────────────────────────────┘

  Meters  Events  Statistics  Graphics  Setup   ←───────  ───────→
```
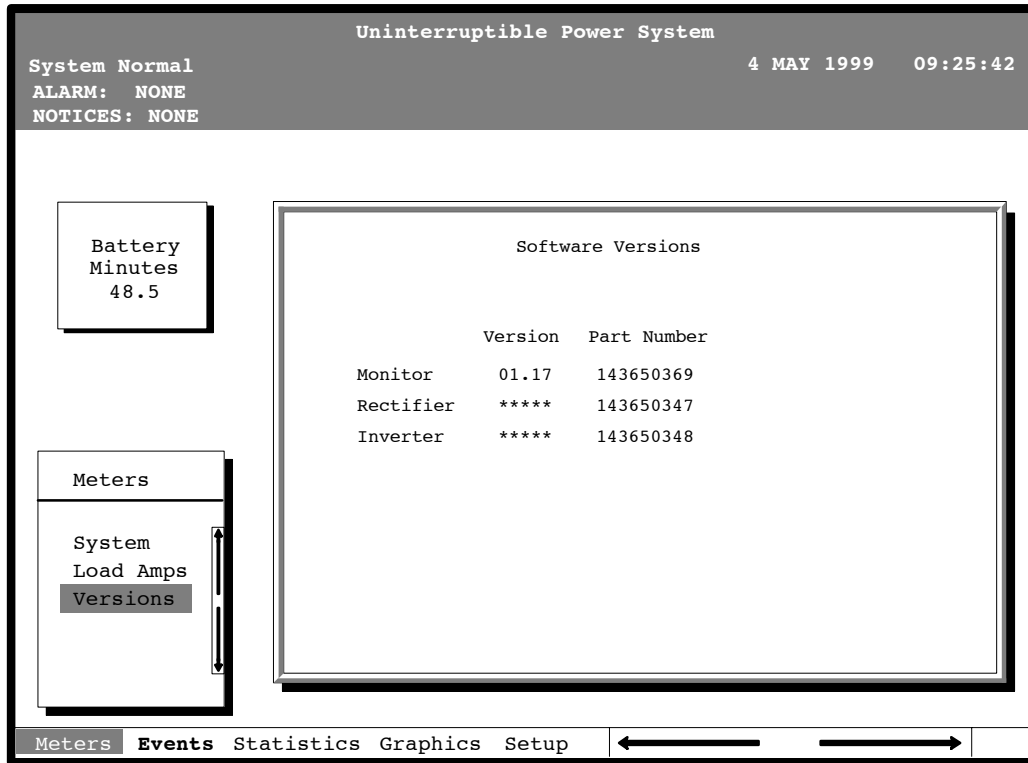
Figure 11−5.   Versions Screen

11.6.4 System History Screen

Select **History** from the Events menu to display the Event History Log. The Event History Log lists up to 400 system events in chronological order, with the most recent event listed last. The end of the log (the most recent events) appears when you display the screen, and you must scroll upward to view older event listings.

Figure 11−6 shows the Event History Log screen.

```
                        Uninterruptible Power System
 System Normal                                     4 MAY 1999    09:25:42
  ALARM:  NONE
  NOTICES: NONE



    ┌──────────┐      ┌───────────────────────────────────────────────┐
    │ Battery  │      │                 Event History Log          ↵   │
    │ Minutes  │      │                                                │
    │   48.5   │      │  Date / Time        Event Description          │
    └──────────┘      │  May                                           │
                      │                                                │
                      │  03   16:41:19.3   COMMAND: Keyswitch On        │
                      │  03   16:41:20.1   STATUS:  Auto Mode           │
                      │  03   16:41:22.4   COMMAND: Rectifier Commanded On│
    ┌──────────┐      │  03   16:41:25.5   STATUS:  Inverter On         │
    │ Events   │      │  03   16:41:26.8   STATUS:  Rectifier On        │
    │          │      │  03   16:41:27.8   STATUS:  Output Breaker (CB3) Closed│
    │ History  │      │  03   16:41:30.4   STATUS:  Bypass Breaker (CB4) Open│
    │ Active   │      │  03   16:41:29.1   STATUS:  Inverter Normal     │
    └──────────┘      └───────────────────────────────────────────────┘

  Meters  Events  Statistics  Graphics  Setup    ◄────────  ────────►
```

Figure 11−6.   Event History Log Screen

A small return arrow (⇐↵) appears in the upper right corner of the information area of the Event History Log screen. This arrow is a reminder that you can press the ⇐↵ pushbutton on the Monitor Panel to toggle the scroll bar between the menu box and the information area. When the scroll bar is in the information area, the return arrow is in the menu box. When the scroll bar is in the menu box, the return arrow is in the information area.

When the scroll bar is in the information area, you can press the ⇧ and ⇩ pushbuttons to scroll through the Event History log.

11.6.5 Active System Events Screen

Select **Active** from the Events menu to display a listing of all system events that are currently active. The most recent system event is listed first. As events clear, they are removed from the Active System Events listing.

Figure 11−7 shows the Active System Events screen.
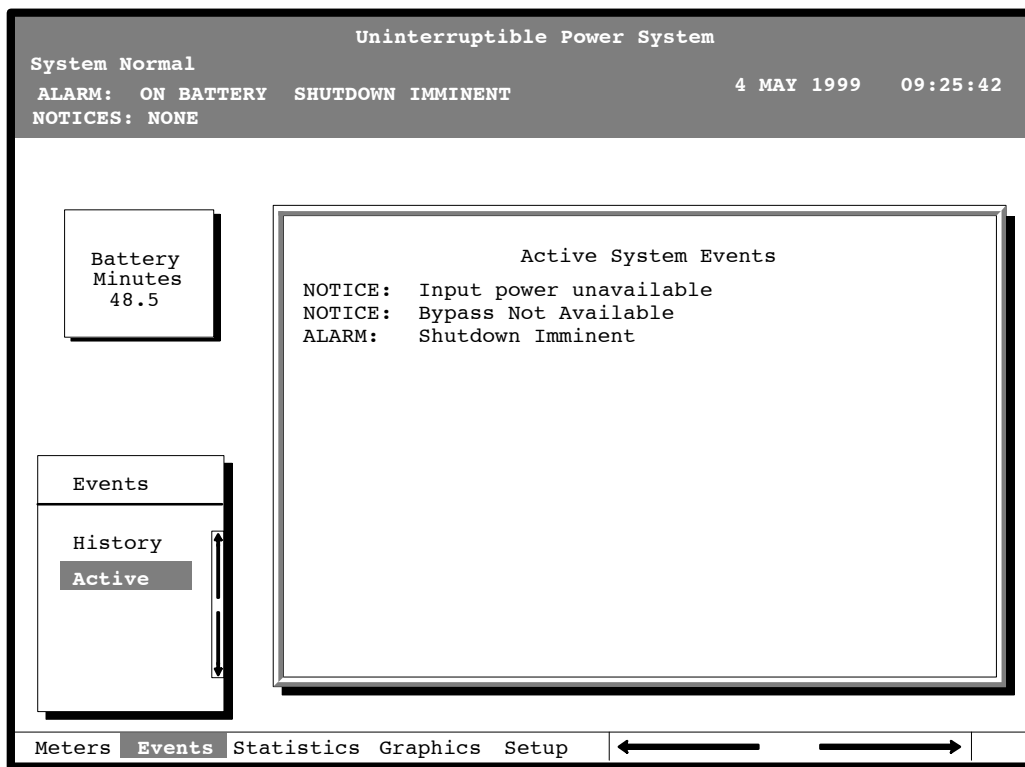
Figure 11−7.   Active System Events Screen

11.6.6 Unit Statistics Screen

Select **Unit** from the Statistics menu to display a listing of statistics about UPS operation.

Figure 11−8 shows the Unit Statistics screen.

```
                    Uninterruptible Power System
 UPS System Normal
 ALARM:   NONE                                    4 MAY 1999    09:25:42
 NOTICES: NONE



   ┌──────────┐           ┌────────────────────────────────────────────┐
   │ Battery  │               Start Date:      04 MAY 1999
   │ Minutes  │
   │   48.5   │           Number of Incidents: Month Total Time On:  DAYS HR MN
   └──────────┘
                          On Battery < 1 Min.    0     0  UPS       0035 20 59
                          On Battery 1-4 Min.    1     0  Bypass    0000 00 30
                          On Battery > 4 Min.    0     0  Battery   0000 00 02
                          Full Batt. Discharge   0     0  Generator 0000 00 00
   ┌──────────┐           Building Alarm 1       2    11  Logic     0035 21 30
   │Statistics│           Building Alarm 2       2     9
   │          │           Building Alarm 3       3     8
   │ ┌──────┐ │           Building Alarm 4       2     5  Availability
   │ │ Unit │ │           Building Alarm 5       3     8  UPS             0.99
   │ └──────┘ │           Building Alarm 6       3     9  Bypass          0.81
   │          │
   └──────────┘           └────────────────────────────────────────────┘

   Meters   Events  Statistics  Graphics  Setup    ←─────     ─────→
```

Figure 11−8.   Unit Statistics Screen

The left column shows the number of UPS incidents for the current month and since the start date shown at the top of the screen. The top right column shows the time that the UPS was on bypass, battery, or generator, and the amount of time the UPS logic has been functioning since the start date. The lower right column shows the percent of availability of the UPS and the bypass source.

11.6.7 Mimic Screen

Select **Mimic** from the Graphics menu to display a real-time graphical representation of the flow of current through the UPS.

Figure 11−9 shows the Mimic screen.
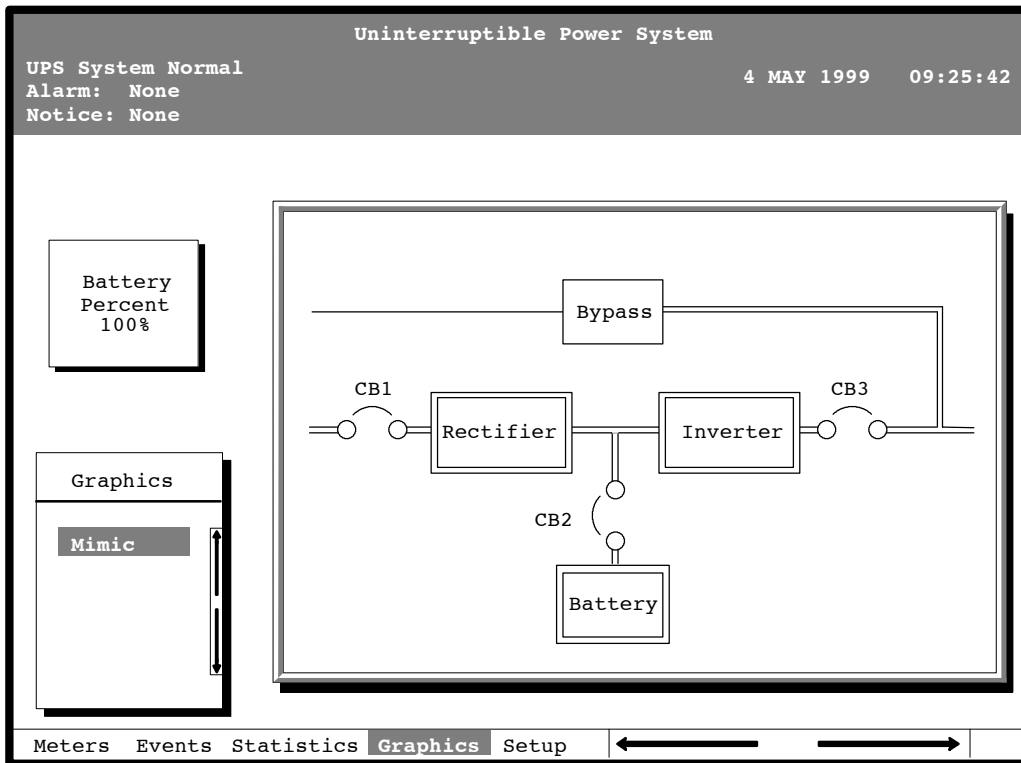
Figure 11−9.   Mimic Screen

The Mimic screen shows the internal components of the UPS cabinet. The flow of current through the components is highlighted.

11.6.8 Time Setup Screen

Select **Time** from the Setup menu to display the Time Setup screen. The Time Setup screen allows you to set the internal time stamp of the UPS. The time stamp is used for logging events in the Event History Log. Figure 11−10 shows the Time Setup screen.

```
                    Uninterruptible Power System

UPS System Normal                              4 MAY 1999   09:25:42
ALARM:   NONE
NOTICES: NONE



    ┌──────────┐        ┌──────────────────────────────────────┐
    │          │        │                                    ┌──┐│
    │ Battery  │        │                                    │← ││
    │ Minutes  │        │             Set Time & Date        └──┘│
    │  48.5    │        │                                        │
    └──────────┘        │      DAY DT MON YR HR:MN SAVE          │
                        │      MON 07 APR 99 15:06  YES          │
                        │                                        │
                        │                                        │
    ┌──────────┐        │                                        │
    │ Setup    │        │                                        │
    │          │        │                                        │
    │ Port 1   │        │                                        │
    │ Port 2   │        │                                        │
    │ Time     │        │                                        │
    │ Language │        └──────────────────────────────────────┘
    └──────────┘

  Meters  Events  Statistics  Graphics  Setup   ←───────  ──────→
```
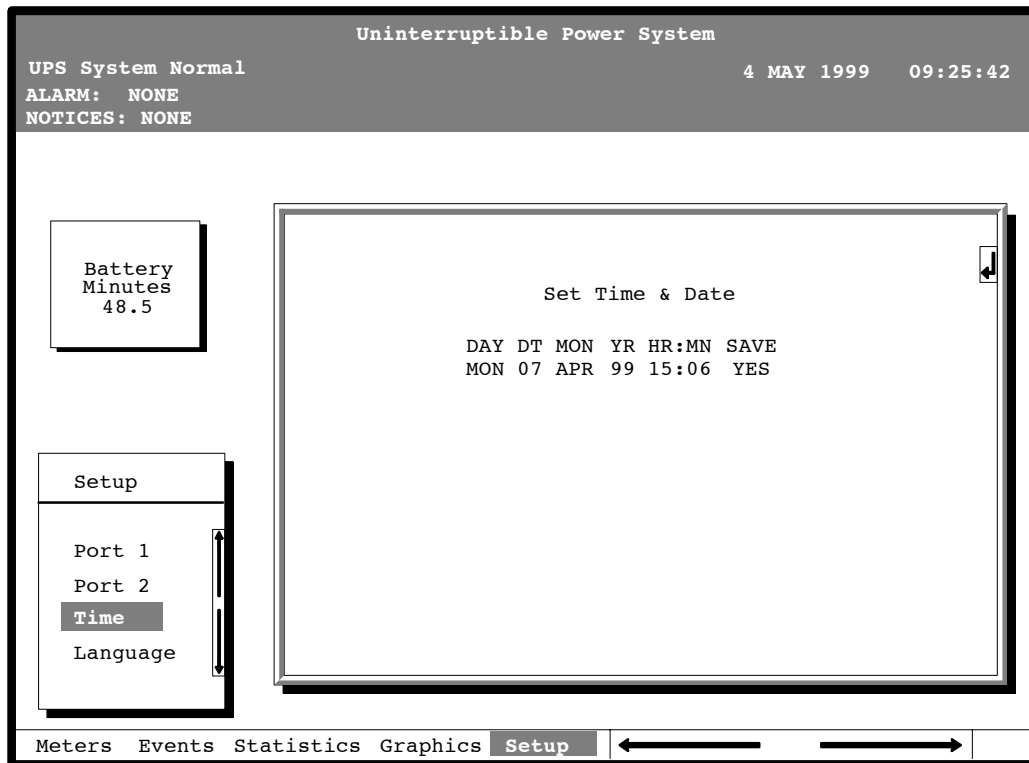
Figure 11−10.   Time Setup Screen

The small return arrow (⇐) appears in the upper right corner of the Time Setup screen. This arrow is a reminder that you can press the ⇐ pushbutton on the Monitor Panel to toggle the pushbuttons between the menu box and the information area. When the scroll bar is in the information area, the return arrow is in the menu box. When the scroll bar is in the menu box, the return arrow is in the information area.

When the scroll bar appears in the information area, you can use the pushbuttons to change the time stamp settings. To change a setting in the time stamp, press the ⇦ and ⇨ pushbuttons to highlight the setting you want to change. To increase the setting (make it a higher value), press the ⇧ pushbutton. To decrease the setting (make it a lower value), press the ⇩ pushbutton. If you want to save the settings upon exit from this screen, be sure the SAVE field is set to YES.

11.6.9 Port Setup Screen

Select **Port 1** or **Port 2** from the Setup menu to display one of the Port Setup screens. The Port Setup screens allow you to specify settings for the two serial communication ports on the UPS. Figure 11–11 shows the Setup Serial Port 1 screen.

```
                    Uninterruptible Power System
UPS System Normal
Alarm:  None                                 4 MAY 1999    09:25:42
Notice: None


   ┌──────────┐                     ┌──────────────────────────────┐
   │ Battery  │                     │                          ⟵┘   │
   │ Minutes  │                     │        Setup Serial Port 1    │
   │   48.5   │                     │                               │
   └──────────┘                     │  MODE      RATE DATA/STOP  HANDSHAKING  SAVE  │
                                     │  TERMINAL  9600   8     1  XON / XOFF   NO    │
                                     │                               │
                                     │                               │
   ┌──────────┐                     │                               │
   │  Setup   │                     │                               │
   │          │                     │                               │
   │  Port 1  │                     │                               │
   │  Port 2  │                     │                               │
   │  Time    │                     │                               │
   │  Language│                     │                               │
   └──────────┘                     └──────────────────────────────┘

   Meters  Events  Statistics  Graphics  Setup   ⟵━━━━━━━━  ━━━━━━━━▶
```
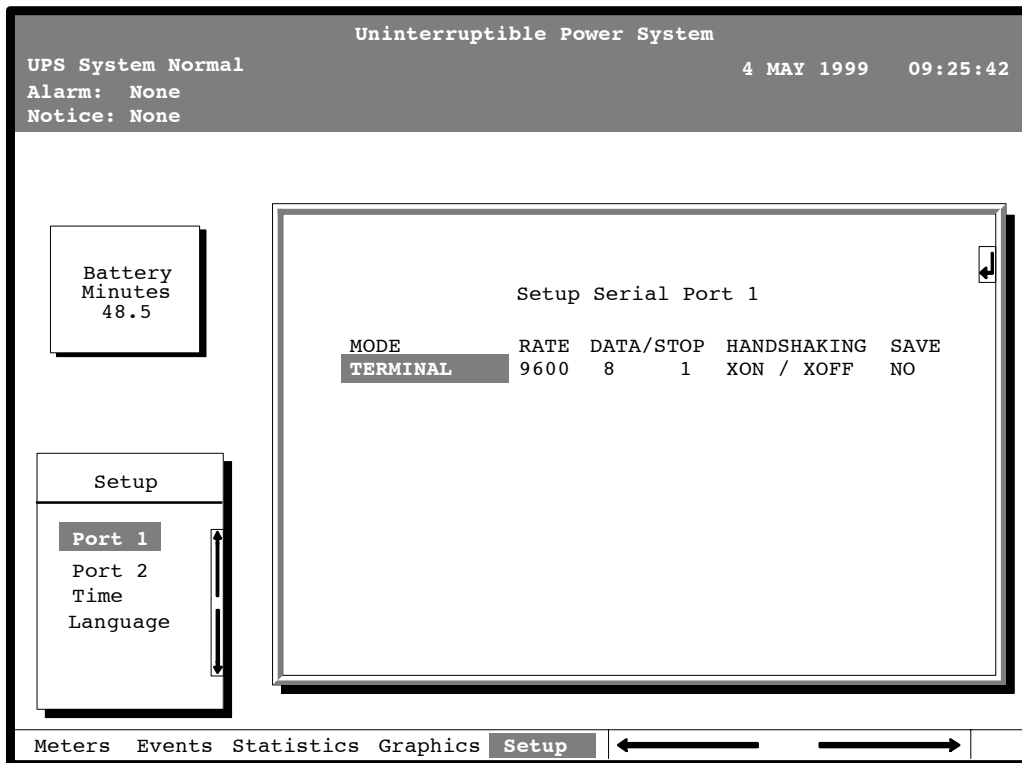
Figure 11–11.   Port Setup Screen

The small return arrow (⟵┘) appears in the upper right corner of the Port Setup screen. This arrow is a reminder that you can press the ⟵┘ pushbutton on the Monitor Panel to toggle the pushbuttons between the menu box and the information area. When the scroll bar is in the information area, the return arrow is in the menu box. When the scroll bar is in the menu box, the return arrow is in the information area.

When the scroll bar appears in the information area, you can use the pushbuttons to change the port configuration. To change a setting, press the ⇦ and ⇨ pushbuttons to move the highlight to the setting you want to change. To scroll through the available options for that setting, press the ⇧ or ⇩ pushbutton. To save the settings upon exit from this screen, be sure the SAVE field is set to YES.

The setup screens for Port 1 and Port 2 are identical. For detailed information about configuring the serial ports, refer to Chapter 15, *"Serial Communications."*

UPS Operating Instructions

12.1 Operation

The following procedures provide instructions for operating the UPS system. Refer to Chapters 10 and 11 of this manual for a description of the UPS controls and monitor panel functions.

NOTE: 1. *Before starting the UPS ensure all installation tasks are complete and a preliminary startup has been performed by authorized service personnel. The preliminary startup verifies all electrical interconnections to ensure the installation was successful and the UPS operates properly.*
2. *The following procedures are applicable for systems with the optional internally installed rectifier input breaker CB1 and inverter output breaker CB3.*
3. *For operation of the System Bypass Module (SBM) in a Multi-module system, refer to the applicable SBM Installation and Operation manual referenced in the "Introduction" of this manual.*

12.2 Starting the UPS

To start the UPS system, perform the following procedure:

NOTE: This procedure assumes Automode is enabled.

1. Ensure the UPS circuit breakers are set as follows:

UPS Input Breaker (CB1)	**OPEN**
UPS Battery Breaker or Battery Disconnect (CB2)	**OPEN**
UPS Output Breaker (CB3)	**OPEN**
UPS Bypass Breaker (CB4)	**OPEN**
Backfeed Protection Breaker (FBP)	**OPEN**

NOTE: When feeder power is applied in steps 3 and 5, UPS circuit breakers CB1, CB2, CB3, CB4 and FBP will charge, if not already charged.

2. Ensure the Emergency UPM Off **PUSH TO RESET** pushbutton is pressed in.

3. Close the UPS input feeder circuit breaker.

4. Observe UPS monitor screen becoming active as an indication of logic power.

5. Close UPS Bypass input feeder circuit breaker. Breakers CB4 and FBP will close as soon as charged.

   The critical load is immediately supplied by the bypass source, in Bypass mode, until the inverter turns on and the UPS transfers to Normal mode. The status indicator on the UPS Control Panel indicates the UPS is in Bypass mode.

6. On the UPS, set **BATTERY** switch to **ENABLE**.

7. If system is equipped with motor operated breaker CB1, proceed to step 8; otherwise, proceed to step 11.

8. On the UPS, turn the **MODE** key switch to **NORMAL** for one second.

NOTE: If system is equipped with Inrush Protection Option, the inrush contactor will close before CB1 closes.

9. Confirm UPS breaker CB1 has closed, by viewing breaker position on LCD Mimic screen.

   The rectifier and the input/rectifier cooling blowers turn on.

10. Proceed to step 13.

11. Close UPS breaker CB1.

   The input/rectifier cooling blowers turn on.

12. On the UPS, turn the **MODE** key switch to **NORMAL** for one second.

   The rectifier turns on.

13. If system is equipped with motor operated breaker CB2, proceed to step 14; otherwise, proceed to step 16.

14. Confirm UPS Battery Breaker CB2 has closed by viewing breaker position on LCD Mimic screen.

   The inverter and output/inverter cooling blowers turn on. When the inverter reaches full voltage, UPS breaker CB3 closes and breaker CB4 opens supplying power to the critical load. It takes less than 1 minute for the UPS to achieve Normal mode. If UPS is not in Automode, turn the **MODE** key switch to **NORMAL** for one second to transfer UPS to Normal mode.

15. Proceed to step 18.

16. When UPS Battery Disconnected alarm and notification is received, close UPS Battery Disconnect CB2.

17. On the UPS, turn the **MODE** key switch to **NORMAL** for one second.

   The inverter and output/inverter cooling blowers turn on. When the inverter reaches full voltage, UPS breaker CB3 closes and breaker CB4 opens supplying power to the critical load. It takes less than 1 minute for the UPS to achieve Normal mode. If UPS is not in Automode, turn the **MODE** key switch to **NORMAL** for one second to transfer UPS to Normal mode.

18. UPS is now operating in Normal mode.

12.3 Starting the UPS in Bypass Mode

If the Inverter output of the UPS is not available and the critical load needs to be energized, perform the following procedure:

1. Ensure the UPS circuit breakers are set as follows:

UPS Input Breaker (CB1)	**OPEN**
UPS Battery Breaker or Battery Disconnect (CB2)	**OPEN**
UPS Output Breaker (CB3)	**OPEN**
UPS Bypass Breaker (CB4)	**OPEN**
Backfeed Protection Breaker (FBP)	**OPEN**

2. Close UPS Bypass input feeder circuit breaker. Breakers CB4 and FBP will close as soon as charged. If breakers do not close, turn the **MODE** key switch to **BYPASS** for one second.

   The critical load is immediately supplied by the bypass source, in Bypass mode, until the inverter turns on and the UPS transfers to Normal mode. The status indicator on the UPS Control Panel indicates the UPS is in Bypass mode.

3. UPS is now operating in Bypass mode. No backup is available.

12.4 Transfer to Bypass Mode

*NOTE: In the following step, holding the **MODE** switch in the **BYPASS** position for three seconds will transfer the load to Bypass and shutdown the UPS.*

1. On UPS, turn the **MODE** key switch to **BYPASS** for one second.

2. Confirm UPS breaker CB4 closes and UPS breaker CB3 opens.

   The UPS switches to Bypass mode. If the bypass source is not available, the power processor remains on and an alarm sounds.

3. On UPS monitor screen, verify "On Bypass" message appears and the **BYPASS** mode indicator illuminates on the Control Panel. System is now on bypass and UPS power processor remains on.

> **WARNING:**
> **Power is present inside Input/Rectifier and Output/Inverter cabinet sections.**

12.5 Transfer to Normal Mode

1. On UPS, turn the **MODE** key switch to **NORMAL** for one second.

2. Confirm UPS breaker CB3 closes and UPS breaker CB4 opens.

   The UPS switches to Normal mode. If the power processor unit is not available, the system remains on bypass and an alarm sounds.

3. On UPS monitor screen, verify "Normal" message appears and the **NORMAL** mode indicator illuminates on the Control Panel. System is now in normal mode.

12.6 Transfer to Bypass with UPS Shutdown

1. On UPS, turn the **MODE** key switch to **BYPASS** for one second.

2. Confirm UPS breaker CB4 closes and UPS breaker CB3 opens.

    The UPS switches to Bypass mode. If the bypass source is not available, the power processor unit remains on and an alarm sounds.

3. On UPS monitor screen, verify "On Bypass" message appears and the Bypass mode indicator illuminates on the Control Panel. System is now on bypass.

4. On UPS, turn the **MODE** key switch to **BYPASS** for one second.

5. Observe UPS breaker CB1 and Battery Disconnect CB2 open.

    The bypass source supplies the critical load, the power processor unit de-energizes and cooling blowers shutdown.

> **WARNING:**
> **Power is present at UPS CB1, until the upstream UPS input feeder circuit breaker is opened.**

12.7 UPS and Critical Load Shutdown

To perform maintenance or service on the critical load, shut down power to the load by performing the following procedure:

1. Transfer critical load to bypass by performing procedure in paragraph 12.4.

2. Turn off all equipment that is being powered by the UPS.

3. Press the **EMERGENCY UPM OFF** pushbutton on the Control Panel.

> **WARNING:**
> **Power is present at the UPS CB1 input, until the upstream UPS input feeder circuit breaker is opened.**

4. Open the UPS input feeder circuit breaker.

12.8 Using the UPS EMERGENCY UPM OFF Pushbutton

An UPS Emergency UPM Off is initiated by the covered, red **EMERGENCY UPM OFF** pushbutton on the UPS Control Panel. This pushbutton is protected by a clear plastic shield to prevent accidental activation. In an emergency, you can press this pushbutton to instantaneously control the UPS output. The UPS **EMERGENCY UPM OFF** pushbutton functions differently, depending on the Emergency Power Off (EPO) option specified when ordered. The options available are as follows:

- Power to the critical load is de-energized and the UPS powered down. UPS breakers CB1, CB3, and FBP, and Battery Disconnect CB2 trip and the UPS is cut off from utility power.

- The critical load is transferred to bypass and the UPS powered down. UPS breakers CB1 and CB3, and Battery Disconnect CB2 trip and the UPS is cut off from utility power.

The UPS (including Bypass) remains locked off until you reset the **EMERGENCY UPM OFF** pushbutton.

To restart the UPS after pressing the **EMERGENCY UPM OFF** pushbutton, follow the procedure, "Resetting the UPS System after Emergency UPM Off", of this chapter, before starting the system.

NOTE: The Remote Emergency Power Off option functions the same way as the EMERGENCY UPM OFF pushbutton on the UPS Control Panel.

12.8.1 To Use the UPS EMERGENCY UPM OFF Pushbutton

1. Raise the clear plastic shield covering the red UPS **EMERGENCY UPM OFF** pushbutton on the UPS Control Panel.

2. Press the **EMERGENCY UPM OFF** pushbutton.

   The breakers open (you can hear them opening) and the Emergency UPM Off **PUSH IN TO RESET** pushbutton on the UPS Control Panel pops out.

12.8.2 Resetting the UPS System after an EMERGENCY UPM OFF

> **CAUTION:**
> **Do not attempt to restart the system after Emergency UPM Off until the cause of the emergency has been identified and cleared.**

The Emergency UPM Off **PUSH IN TO RESET** pushbutton is a small white button on the UPS Control Panel. The **PUSH TO RESET** pushbutton pops out when the Emergency UPM Off pushbutton on the UPS Control Panel is activated.

To reset the UPS system:

1. Press the Emergency UPM Off **PUSH IN TO RESET** pushbutton until it clicks in and remains recessed.

2. Breakers CB4 and FBP charge and close.

3. Reset tripped circuit breakers on UPS systems with manual CB1 and CB2 breakers.

4. The UPS system is now reset. To restart the UPS system, follow the procedure at the beginning of this chapter.

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Using Features and Options

13

13.1 General

The many standard features of your UPS system provide consistent, economical, and dependable power protection. In addition, you can add available options to enhance the performance of your system. This chapter provides descriptions of some of the features and options introduced earlier in this manual. Refer to drawings 164201244−1, 164201244−2, and 164201244−7 in Appendix A for location of the customer interface panel and terminals and for terminal wiring information.

13.2 Building Alarm Monitoring

This standard feature lets you connect the UPS to your building alarms, such as smoke detectors or overtemperature alarms. The customer interface terminals for external connections are located inside the UPS.

Regardless of how you assign the building alarms, they display as Building Alarm 1, Building Alarm 2, Building Alarm 3, etc., on the LCD screen of the Monitor Panel. You should use twisted pair wires for each alarm input and common.

13.3 General Purpose Relay Contacts

Two general purpose relay contacts are provided as a standard feature on the UPS. The alarm contacts (one notice and one alarm) are located inside the UPS on the customer interface terminal board.

You can specify that each contact be either normally closed (NC) or normally open (NO). If the state of the contact changes from the state you specify as normal, an signal is issued. You can connect these contacts to equipment at your facility (such as a light or an alarm bell) to let you know when an alarm is active on the UPS. This feature is useful if the UPS is located in a remote area where the UPS alarm horn may not be heard immediately.

> **CAUTION:**
> **Contacts should not be operated in excess of 30 VAC or 42.4V peak AC or DC @ 1A maximum.**

13.4 Remote Monitor Panel

As an option, you can install Remote Monitor Panels (RMPs) to monitor the operation of the UPS system from virtually any location within your facility, up to 500 feet from the UPS. Each RMP contains backlit status indicators and a local horn. You can flush-mount or surface-mount an RMP on a desktop, wall, or wherever you have a serial interface line. A maximum of two monitoring accessories (RMPs, Relay Interface Modules (RIMs), or Supervisory Contact Modules (SCMs)) can be installed. See Table 13–1 for the number of accessories permitted. Figure 13–1 shows an RMP.
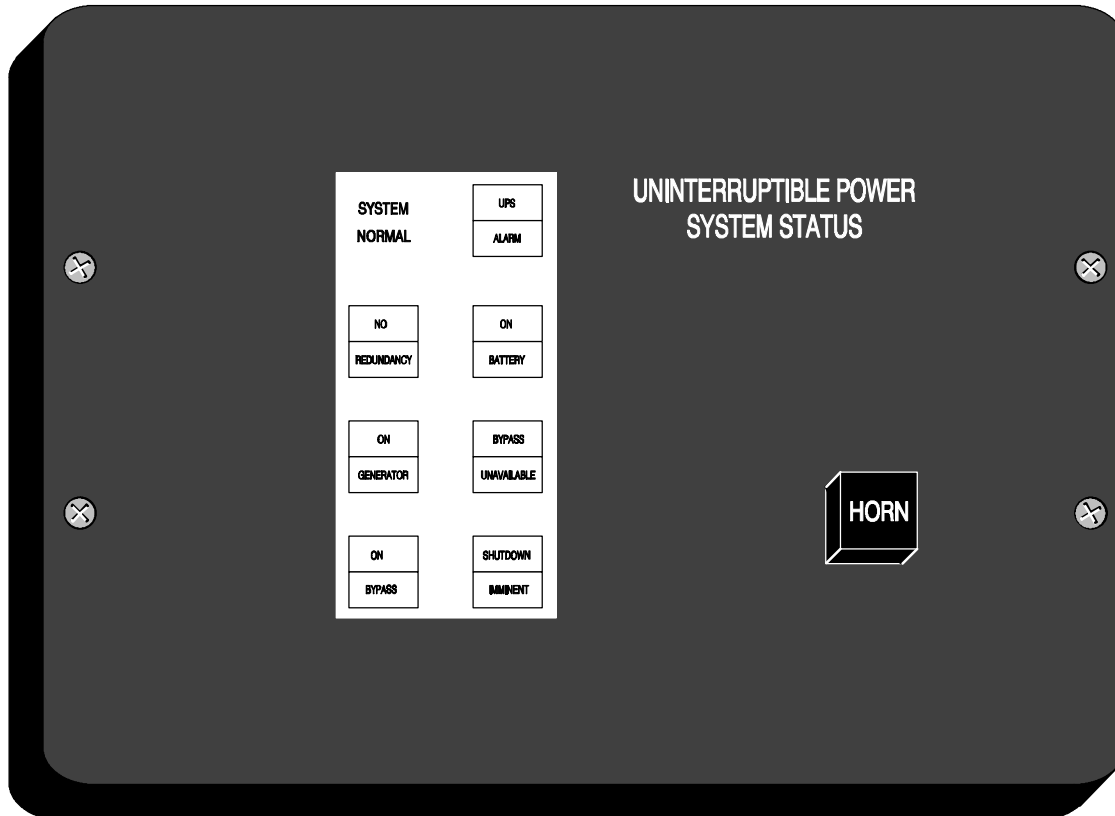
Figure 13–1. Remote Monitor Panel

Table 13–1. Optional Monitoring Accessories		
Number and Type of Accessories Permitted		
Remote Monitor Panel	Relay Interface Module	Supervisory Contact Module
2	—	—
—	2	—
—	—	2
1	1	—
1	—	1
—	1	1

The RMP contains a local horn and the following backlit status indicators:

SYSTEM NORMAL
The UPS is energized (either with utility power or battery backup) and is supplying conditioned power to the critical load.

NO REDUNDANCY
This indicator applies only to parallel systems when one cabinet is not functioning. This feature is not available on this system.

ON GENERATOR
This alarm means that the UPS input and bypass are being supplied by the power from the generator, instead of from the utility power.

ON BYPASS
The bypass source is supplying the critical load. Usually this means that the UPS is not energized. The load is not protected in Bypass mode, and a horn sounds after 30 seconds.

UPS ALARM
The UPS system is issuing an alarm. Conditions that affect the current UPS mode are indicated by the alarm lamps and horn on the UPS.

ON BATTERY
The UPS battery backup is supplying the critical load. The utility power is either interrupted or out of specification. The SYSTEM NORMAL indicator is also lit.

BYPASS UNAVAILABLE
The UPS system is in Normal mode, but a bypass source is not within specification. A horn sounds after 30 seconds.

SHUTDOWN IMMINENT
The UPS is preparing to shut down because the UPS is in Battery mode and the DC voltage is approaching its low limit.
This light is accompanied by an audible alarm horn.

SYSTEM NORMAL		UPS
		ALARM
NO		ON
REDUNDANCY		BATTERY
ON		BYPASS
GENERATOR		UNAVAILABLE
ON		SHUTDOWN
BYPASS		IMMINENT
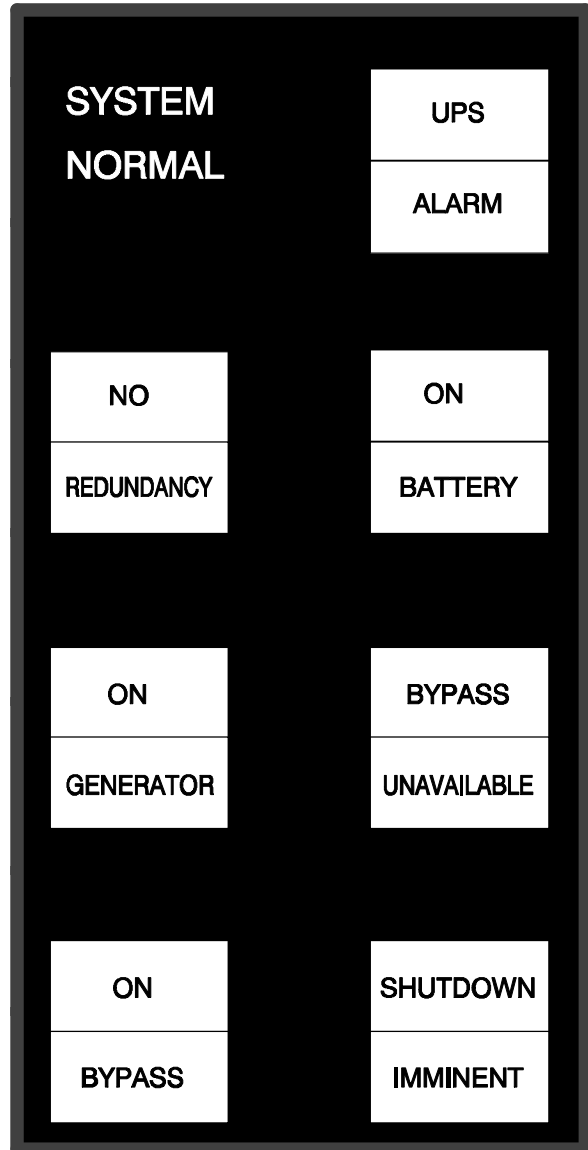
13.5 Relay Interface Module

An optional Relay Interface Module (RIM) uses relay contact closures to indicate the operating status and alarm condition of the Parallel Capacity/Redundant system . A maximum of two monitoring accessories (RMPs, RIMs, or SCMs) can be installed. See Table 13−1 for the number of accessories permitted. Figure 13−2 shows the RIM with its four 15-pin connectors labeled J1 through J4.
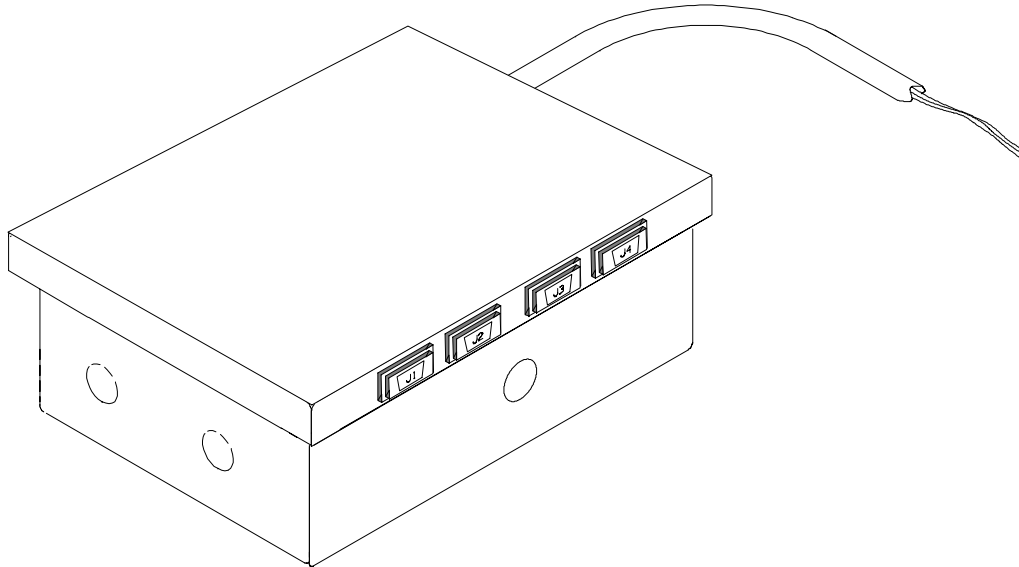
Figure 13−2.   Relay Interface Module

The RIM can provide these signals:

- **UPS AVAILABLE**   (pins 1 and 12) Contacts are closed when the UPS is offline.

- **UPS OFF LINE**   (pins 3 and 13) Contacts are closed when the UPS is operating in Normal mode.

- **UTILITY FAILURE**   (pins 6 and 15) Contacts are closed when Utility Failure is detected.

- **BATTERY WEAK**   (pins 5 and 14) Contacts are closed when approximately 2 minutes of battery time is remaining, before the critical load is lost.

13.6 Supervisory Contact Module

An optional Supervisory Contact Module (SCM) establishes an interface between the Parallel Capacity/Redundant system manufacturer's equipment and the customer's monitor. This interface allows the customer to monitor operational status of the Parallel Capacity/Redundant system equipment. A maximum of two monitoring accessories (RMPs, RIMs, or SCMs) can be installed. See Table 13−1 for the number of accessories permitted. Figure 13−3 shows the SCM, input connections on TB1, and output connections on TB2.
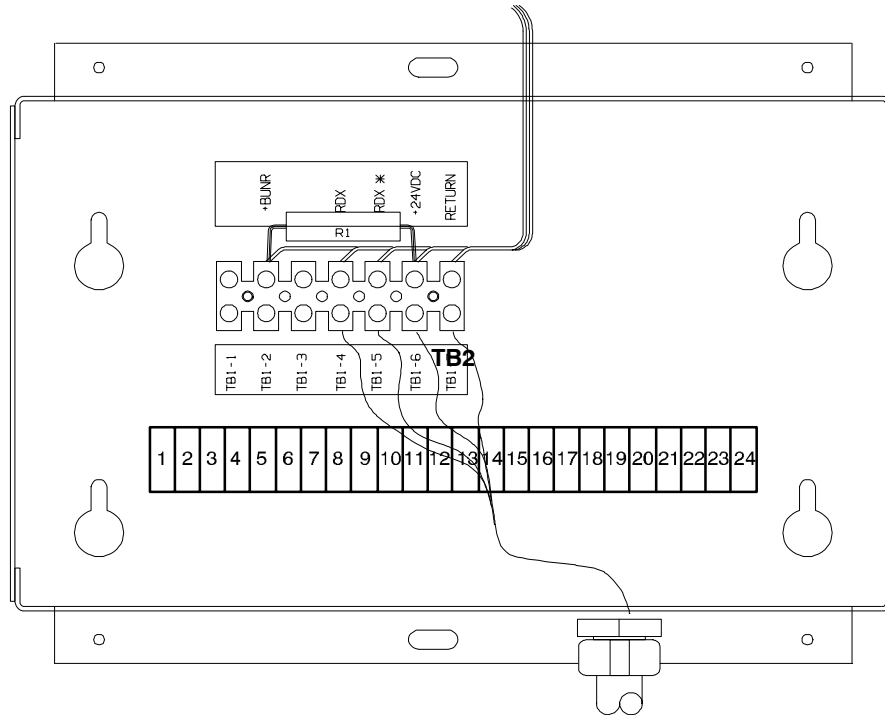
Figure 13−3.   Supervisory Contact Module

The SCM provides signals for the following indications:

- **SYSTEM NORMAL**   TB2−1 through TB2−3

- **NO REDUNDANCY**   TB2−4 through TB2−6

- **ON GENERATOR**   TB2−7 through TB2−9

- **BYPASS NOT AVAILABLE** TB2−10 through TB2−12

- **ON BATTERY**   TB2−13 through TB2−15

- **UPS ALARM**   TB2−16 through TB2−18

- **ON BYPASS**   TB2−19 through TB2−21

- **SHUTDOWN IMMINENT**   TB2−22 through TB2−24

13.7 Battery Racks

You can enhance the protection time provided by your UPS system by adding one or more battery racks. The battery racks should be equipped with sealed lead-acid, maintenance-free batteries. An external battery disconnect switch must be used. Refer to Chapter 3 in this manual for UPS battery requirements and installation instructions.

13.8 External Battery Disconnect

An optional external DC disconnect provides an automatic or manual means of disconnecting a battery string from the UPS. The disconnect is enclosed in a floor mounted freestanding box. You can install it anywhere between the remote DC supply and the UPS, according to national and local codes.

The breaker switch on the remote battery disconnect is set in accordance with the operation procedures contained in Chapter 12 – *UPS Operating Instructions* of this manual. When service personnel are performing maintenance on the UPS or battery cabinet, the switch should be set to the OFF position.   Refer to Chapter 4 in this manual for battery disconnect requirements and installation instructions.

Responding to System Events

14.1 General

When the UPS system is running in Normal mode, it continually monitors itself and the incoming utility power. In Battery or Bypass modes, the UPS may issue alarms to let you know exactly what event caused the change from Normal mode. System events on the UPS can be indicated by horns, lights, messages, or all three.

Select **Active** from the Events menu on the LCD screen to look at the Active System Events screen. This screen shows any currently active alarms, notices, or commands.

14.2 System Event Horns

The system event horn beeps according to the type of event it is signifying:

- When the UPS detects an alarm that requires your attention, the horn beeps at ½-second intervals.

- When a notice occurs, the horn beeps at 2-second intervals.

14.3 System Event Lights

The status indicators on the UPS Control Panel work in conjunction with the event horn to let you know when the UPS system is operating in any mode other than Normal. Only the Normal indicator is visible during normal UPS system operation. The others light to indicate alarms or events. When an alarm occurs, you should first check these indicators to see what type of event has taken place. (For descriptions of the status indicators, refer to the "Reading the Status Indicators" section of Chapter 11.)

14.4 System Event Messages

When a system event occurs, a message is added to the Event History Log. A message may also appear on the Monitor Panel of the UPM. The Event History Log contains all system event messages, whether or not they were displayed on the Monitor Panel. The following list contains the programmable events displayed on the Active screen of the Monitor panel.

INVERTER ALARMS

Inverter Failure

Inverter AC Over Voltage

Inverter AC Under Voltage

Inverter Over Frequency

Inverter Under Frequency

Inverter DC Over Voltage

Bypass Phase Rotation

Inverter Phase Rotation

Service Required

UPS Tripped

Shutdown Imminent

UPS Off

Battery Contactor (K2) Failed

Bypass Contactor (K4) Failed

Inverter Contactor (K3) Failed

Bypass Control Failed

Check Unit Setup

Bypass Contactor (K4) Fail

Battery Ground Fault

100% Overload Shutdown

125% Overload Shutdown

Over Temperature Shutdown

Network Sync Failure

Inverter Calibration Required

Inverter Setup Required

RECTIFIER ALARMS

Rectifier Failure

Rectifier DC Over Voltage

Rectifier DC Under Voltage

Input Phase Rotation

Over Temperature

Over Temperature Warning

Temperature Sensor Failure

Rectifier Calibration Required

Rectifier Setup Required

MONITOR ALARMS

Overload Warning

Load Over 100%

Load Over 125%

Battery Test Failed

Battery Test Failed

EEPROM Write Failed

Logic Power Supply Failure

Fan Failure

UPS Failure

Other UPS is On Bypass

Other UPS Status is Unknown

Emergency Bypass Failure

Redundant Module Failure

Check KW Sensing

Check Parallel Setup

Parallel System Overload

On Battery more than 30 Seconds

Check UPM Breaker (CBS) AUX

Check Bypass Breaker (CBP) AUX

Monitor Calibration Required

Monitor Setup Required

PNODE ALARMS

PowerNode Board Failure

Bypass Brkr (CBP) Will NOT Open

Bypass Brkr (CBP) Will NOT Close

UPM Breaker (CBS) Will NOT Open

UPM Breaker (CBS) Will NOT Close

Bkfeed Brkr (FBP) Will NOT Open

Bkfeed Brkr (FBP) Will NOT Close

UPM Phase Rotation

Bypass Phase Rotation

PowerNet Channel A RX Down

PowerNet Channel B RX Down

PowerNet Channel A TX Down

PowerNet Channel B TX Down

STSW NOT Available

STSW SCR SHORTED

Load Over 100%

Load Over 125%

STSW Disconnected

K1 Relay Failure

PowerNode Calibration Required

PowerNode Setup Required

UPM ALARMS

UPM 1 Not Reporting

UPM 2 Not Reporting

UPM 3 Not Reporting

UPM 4 Not Reporting

UPM 5 Not Reporting

UPM 6 Not Reporting

UPM 7 Not Reporting

UPM 8 Not Reporting

UPM 1 Alarm

UPM 2 Alarm

UPM 3 Alarm

UPM 4 Alarm

UPM 5 Alarm

UPM 6 Alarm

UPM 7 Alarm

UPM 8 Alarm

UPM 1 Phone Home

UPM 2 Phone Home

UPM 3 Phone Home

UPM 4 Phone Home

UPM 5 Phone Home

UPM 6 Phone Home

UPM 7 Phone Home

UPM 8 Phone Home

INVERTER NOTICES

Input Breaker (CB1) Open

Bypass Mode

Bypass AC Over Voltage

Bypass AC Under Voltage

Bypass Over Frequency

Bypass Under Frequency

Bypass is Not Available

Battery Discharged

Battery DC Under Voltage

Battery Disconnected

Battery Not Charged

Phase A Current Limit

Phase B Current Limit

Phase C Current Limit

Battery Voltage Low

Inv. Logic Power Failure

RECTIFIER NOTICES

Input AC Over Voltage

Input AC Under Voltage

Input Over Frequency

Input Under Frequency

Power Supply Over Voltage

Power Supply Under Voltage

Input Transient

DC Voltage Low

DC Voltage High

Equalizing Battery

Testing Battery

Battery Test Failed

Input/Battery Current Limit

Reduced Input Current Limit

Rct. Logic Power Failure

MONITOR NOTICES

Output AC Over Voltage

Output AC Under Voltage

Output Over Frequency

Output Under Frequency

Three Wire AC Over Voltage

Three Wire AC Under Voltage

Three Wire Under Freq.

PowerNode Network Down

Power Off Switch

Rectifier Network Down

Inverter Network Down

Monitor Network Down

Battery Time Low

Batt Test Requires Calibration

Battery Time Low

Monitor Logic Power Failure

Building Alarm 1 Active

Building Alarm 2 Active

Building Alarm 3 Active

Building Alarm 4 Active

Building Alarm 5 Active

Building Alarm 6 Active

Testing Battery

Battery Test Aborted (load)

Battery Test Aborted (utility)

Battery Passed Test

##Printing Sampled Data

Other UPS Bypass Not Available

Loss of Redundancy

PNODE NOTICES

UPM AC Over Voltage

UPM AC Under Voltage

UPM Over Frequency

UPM Under Frequency

Bypass AC Over Voltage

Bypass AC Under Voltage

Bypass Over Frequency

Bypass Under Frequency

Bypass is Not Available

Not Enough UPMs

System NOT Redundant

PowerNode Calibration Fail

PowerNode Calibration Pass

No Bypass Sync

Check EPO Reset

Pn. Logic Power Failure

Serial Communications

15.1 Description

This chapter describes the serial communications feature of the Powerware®
9315−750 UPS. Two serial communications ports on the UPS allow you to
connect equipment to view system event information.

The following sections describe the serial communications feature, and provide
information about connecting hardware, setting up the ports, changing settings,
and changing modes.

15.2 Locating the Communications Panel

The Customer Interface Panel inside the UPS contains two serial communications
ports, one DB−9 and one DB−25. The ports provide a computer interface to a
Remote Monitor Panel (RMP), Relay Interface Module (RIM), Supervisory Contact
Module (SCM), or remote terminal and/or printer. The Customer Interface Panel
also contains a 120 VAC, 0.2A convenience outlet for powering a modem used for
remote notification. Refer to Appendix A for location of the Customer Interface
Panel inside the UPS.

15.3 Connecting Equipment to a Serial Port

The UPS is designed to accept a wide variety of Data Communication Equipment
(DCE) such as terminals, printers, and computers to each port. Set up the remote
equipment using the appropriate parameters for the mode you select. The
following section provides more information about configuration.

The cables you use for connection depend on the equipment you are connecting
to the UPS. Cables should be no longer than 16m (50 ft). The connectors for
Port 1 and Port 2 on the Communications Panel in the UPS are female, so the
cables into the UPS should be male. Figure 15−1 shows the pin assignments for
Port 1, and Table 15−1 describes them. Figure 15−2 shows the pin assignments
for Port 2, and Table 15−2 describes them.

PORT 1 (DB‑9)
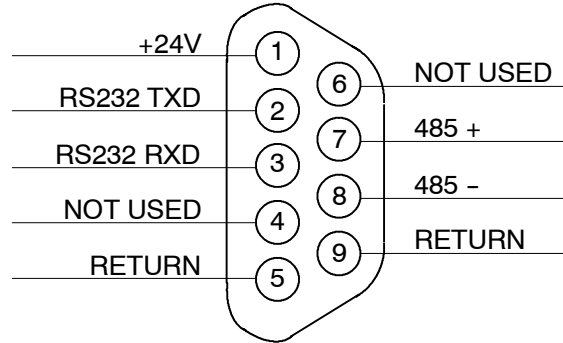
Figure 15–1. Port 1 Pin Assignments

Table 15–1. Pin Assignments for Port 1 (DB–9)			
Pin #	Symbol	Description	Comments
1	+24V	+ 24 volts DC	
2	TXD	Transmit Data	Input to UPS
3	RXD	Receive Data	Output from UPS
5	RTN	Return	
7	485+	RS485 + Data	
8	485–	RS485 – Data	
9	RTN	Return	

PORT 2 (DB-25)

```
            GND  ( 1 )
                        ( 14 )  NOT USED
      RS232 TXD  ( 2 )
                        ( 15 )  NOT USED
      RS232 RXD  ( 3 )
                        ( 16 )  NOT USED
      RS232 RTS  ( 4 )
                        ( 17 )  NOT USED
      RS232 CTS  ( 5 )
                        ( 18 )  NOT USED
      RS232 DSR  ( 6 )
                        ( 19 )  NOT USED
            RTN  ( 7 )
                        ( 20 )  RS232 DTR
           +12V  ( 8 )
                        ( 21 )  NOT USED
       NOT USED  ( 9 )
                        ( 22 )  -12V
       NOT USED  ( 10 )
                        ( 23 )  NOT USED
       NOT USED  ( 11 )
                        ( 24 )  NOT USED
       NOT USED  ( 12 )
                        ( 25 )  NOT USED
       NOT USED  ( 13 )
```
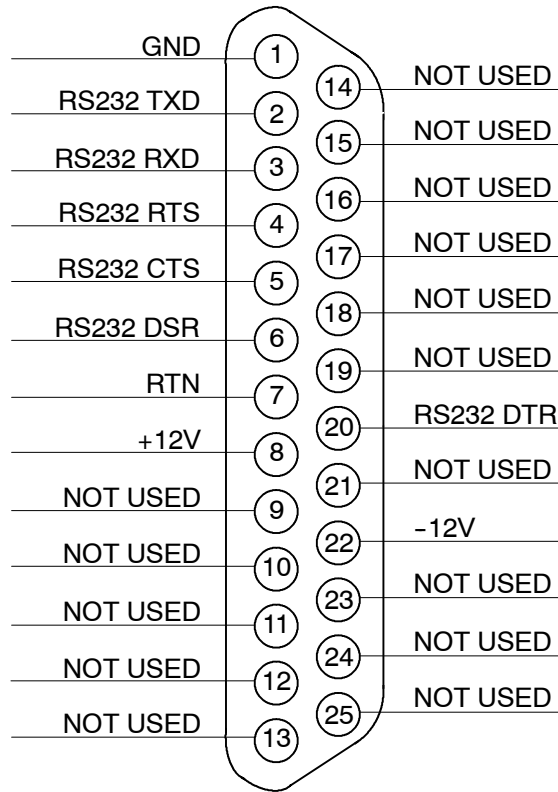
Figure 15–2.   Port 2 Pin Assignments

Table 15–2. Pin Assignments for Port 2 (DB–25)			
Pin #	**Symbol**	**Description**	**Comments**
1	GND	Chassis Ground	
2	TXD	Transmit Data	Input to UPS
3	RXD	Receive Data	Output from UPS
4	RTS	Request to Send	Input to UPS
5	CTS	Clear to Send	Output from UPS
6	DSR	Data Set Ready	Output from UPS
7	RTN	Return	
8	+12V	+12 volts	Output from UPS − always true
20	DTR	Data Terminal Ready	Input to UPS − typically not used by UPS
22	−12V	− 12 volts	Output from UPS − always true
NOTE: Pins 5 and 6 are tied together internally.			

15.4 Configuring the Serial Ports

You must configure the port for communications using the LCD screen and pushbuttons on the UPS Monitor Panel.

Select **Port 1** or **Port 2** from the Setup menu to display one of the Setup Port screens. The screens for Port 1 and Port 2 are identical, and allow you to specify settings for the two serial communication ports. Figure 15−3 shows the Setup Serial Port 1 screen.

```
                    Uninterruptible Power System
UPS System Normal                              15 JUL 1998   09:25:42
 ALARM:   NONE
 NOTICES: NONE


   ┌──────────┐        ┌─────────────────────────────────────────┐
   │ Battery  │        │                                        ⏎ │
   │ Percent  │        │                                          │
   │   100%   │        │           Setup Serial Port 1            │
   └──────────┘        │                                          │
                       │   Mode        Rate  Data/Stop  Handshaking  Save │
                       │   TERMINAL    9600   8     1   XON / XOFF   NO   │
                       │                                          │
   ┌──────────┐        │                                          │
   │  Setup   │        │                                          │
   │          │        │                                          │
   │  Port 1  │        │                                          │
   │  Port 2  │        │                                          │
   │  Time    │        │                                          │
   │          │        │                                          │
   └──────────┘        └─────────────────────────────────────────┘

  Meters  Events  Statistics  Graphics  Setup    ⟵━━━━━    ━━━━━⟶
```
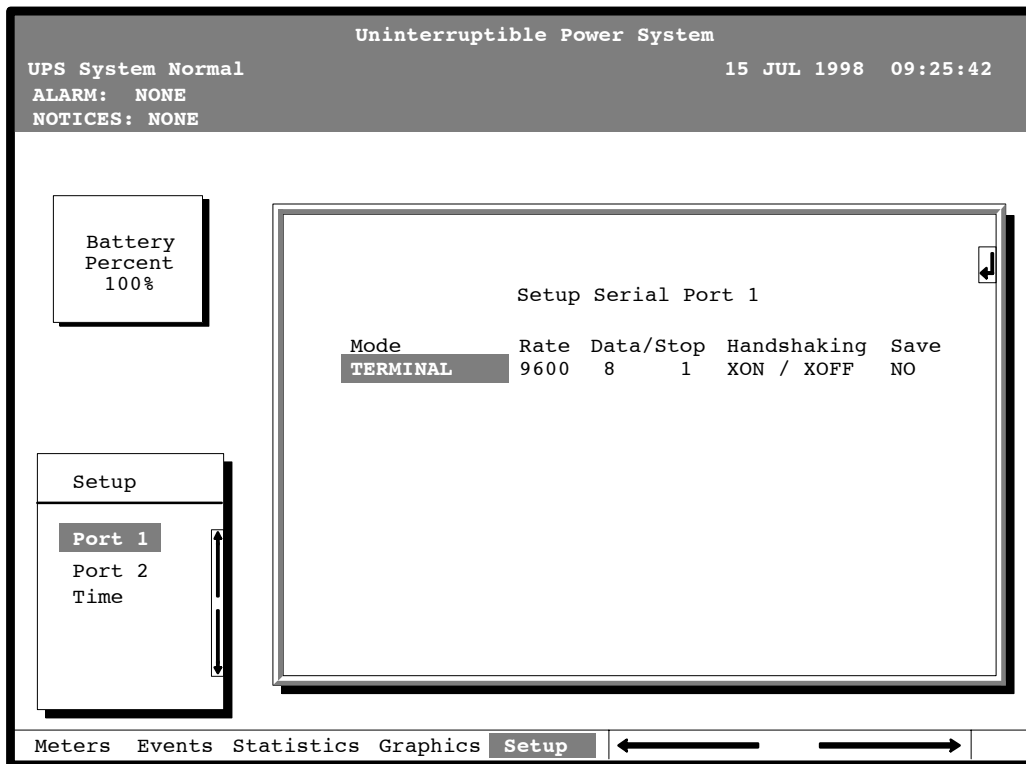
Figure 15−3.   Setup Serial Port 1 Screen

A small return arrow (⟸) appears in the upper right corner of the Setup Port screen. This arrow is a reminder that you can press the ⟸ pushbutton on the Monitor Panel to toggle the pushbuttons between the menu box and the information area.

If the scroll bar is in the menu box, press the ⟸ pushbutton to toggle to the information area. The first setting (Mode) is highlighted. Press the ⇦ or ⇨ pushbutton to move the highlight to the setting you want to change. To scroll through the available options for that setting, press the ⇧ or ⇩ pushbutton.

To save the settings upon exit from this screen, be sure the Save field is set to YES.

Table 15-3 shows which options are available for each port. The sections that follow describe the configuration settings you can change.

Table 15-3. Options Available for Each Communication Port		
Port 1	**Port 2**	**Options**
X	X	Terminal Mode
	X	Calibration Mode
X	X	System Configuration
	X	Computer Mode
X		Remote Monitor Mode
X	X	Baud rate of 300, 1200, 2400, 4800, 9600, or 19200
X	X	Data size/stop bits of 8/1 or 8/2
	X	Data size/stop bits of 7/1 or 7/2
X	X	Disabled handshaking
X	X	XON/XOFF handshaking

15.4.1 Modes

The operational mode of the port. Each communications port operates in one of the following modes:

Terminal mode   System events are logged immediately as they occur.

Calibration   Used only by service personnel.

System Config.   Allows you to set building alarms, battery tests, etc.
(Check with your Sales or Service Representative for availability.)

Computer   Provides a proprietary Binary Computer Mode (BCM) Interface for Powerware facility monitoring or network communication via ConnectUPS.

Remote Monitor   Sends all system event information to an RMP, RIM, or SCM. Available for Port 1 only.

Port 1 and Port 2 cannot be in the same mode simultaneously; they must always be operating in different modes. The modes are described later in this chapter.

15.4.2 Rate

The baud rate of the equipment connected to this port. The baud rate determines the speed of data transferred between the UPS and the connected equipment. For Remote Monitor mode, the baud rate must be set to 300. All other modes should operate at the highest baud rate available with the connected equipment. 300 baud is not recommended for any mode except Remote Monitor.

You can select a baud rate of 300, 1200, 2400, 4800, 9600, or 19,200.

15.4.3 Data/Stop

The data size and stop bits of the equipment connected to this port. These settings determine the number of bits transmitted per ASCII character. The data size and stop bits you specify depend on the configuration of your equipment.

For Port 1, the data size must be set to 8, with 1 or 2 stop bits. Settings of 7 data bits/1 stop bit and 7 data bits/2 stop bits are available for Port 2.

NOTE: When connecting a computer running a terminal emulation program, you should set your equipment to NO PARITY.

15.4.4 Handshaking

This setting controls handshaking. You can select XON/XOFF or Disabled for this setting.

● **Disabled (No Handshaking)**

If handshaking is disabled, the UPS transmits and receives data via the serial port, ignoring all inputs from handshaking lines.

● **XON/XOFF**

If handshaking is enabled, the UPS uses special characters (XON and XOFF) to handshake with the host terminal. The XON character is defined to be ASCII value 11 hex, and the XOFF character is defined to be ASCII value 13 hex. Upon reception of an XOFF command, the UPS halts transmission until an XON command is received. In the same way, if the terminal receives an XOFF command, the UPS expects the terminal to halt transmission until the UPS sends an XON command.

15.4.5 Save

Set to YES to save any changes to configuration settings upon exit from the Setup screen. Set to NO if you do not want to save any changes.

15.4.6 Default Settings

The following are the default configuration settings for the serial communications ports:

Port 1	Remote Monitor	300 baud	8/1	Handshaking Disabled
Port 2	Terminal	9600 baud	8/1	Handshaking Disabled

Each communications port on the UPS operates in one of five modes which you select when configuring the port using the Setup Port screen.

15.5 Terminal Mode

In this mode, system events are continually logged through the serial port to the device connected to the port. Port 2 operates by default in Terminal mode.

The printed log entries contain a time and date stamp and the alarm text message. Terminal mode uses this format for printing alarm entries:

MMM DD   HH:MM:SS.hh KYWD MESSAGE   ✳✳✳✳   <CR> <LF>

Symbol	*Description*
MMM	Month (3 letters)
DD	Day (2 digits)
HH	Hour (2 digits)
MM	Minute (2 digits)
SS	Second (2 digits)
hh	Hundredths of Second (2 digits)
KYWD	Keyword (ALARM, NOTICE, COMMAND, or STATUS)
✳✳✳✳	System Diagnostic Information
<CR>	Carriage Return Character (ASCII 13)
<LF>	Line Feed (ASCII 10)

An alarm message is prefixed by the word "CLEAR" whenever an alarm is entered into the Event History Log with a cleared status.

15.5.1 Printing Selected Information

If a port is operating in Terminal mode and is connected to a computer, you can use key combinations at any time to print only selected information:

Ctrl+P   Prints the entire log with a header

Ctrl+M   Prints the current system meters with a header

Ctrl+A   Prints all system information

Ctrl+B   Prints Battery Test Log

To use a key combination, hold down the Control key and press the letter key.

15.5.2 Entire Log (Ctrl + P)

This key sequence prints the entire Event History Log of the UPS at the time the data is requested. The printout begins with the oldest alarm entry in the queue and ends with the most recent. Any alarms that occur while the Event History Log is printing are included in chronological order.

The Event History Log lists up to 400 system events in chronological order with the most recent event listed last. Figure 15−4 shows a sample Event History Log printout.

```
                  Uninterruptible Power System

UPS System Normal                    03 NOV 1997   14:23:45
Alarm:  None
Notice:  None

                     Event History Log

                     Event Description

MAY  12 16:41:19.3 COMMAND: Keyswitch On      0421
     12 16:41:29.1 STATUS:  Auto Mode         1000
     12 16:41:42.4 COMMAND: Rectifier Commanded On   2030
     12 16:42:05.5 STATUS:  Inverter On               2202
     12 16:42:46.8 STATUS:  Rectifier On
     12 16:43:15.8 STATUS:  Inverter Contactor (3) Closed
     12 16:43:42.4 STATUS:  Bypass Contactor (K4) Open
     12 16:44:29.1 STATUS:  Inverter Normal  4001        32


JUN  04 12:16:35.9 NOTICE:  Room High Temperature
```

Figure 15−4.   Event History Log

15.5.3 Meters Printout (Ctrl + M)

This key sequence prints the current readings of the UPS system meters. The Input area shows the phase-to-phase voltage, frequency, and phase current of the incoming utility, followed by the kVA, kW, and power factor measurements. The output area shows the same information for the power being output by the UPS. The Bypass area shows the phase-to-phase voltage of the bypass source. The Battery area displays the DC voltage (V) and the DC current (I). Figure 15−5 shows a sample Meters printout.

```
                  Uninterruptible Power System

UPS System Normal                   03 NOV 1997   14:22:45
Alarm:  None
Notice:  None

            Input                       Output

       VAB  VBC  VCA FREQ        VAB  VBC   VCA   FREQ
       480  480  480 60.0        480  480   480   60.0

        IA   IB   IC              IA   IB   IC    IN
       640  640  640             480  480  480     0

       KVA   KW   PF              KVA  KW    PF
       530  505  0.95             400  320  0.80


            Bypass                      Battery

       VAB  VBC  VCA               V    +    I
       480  480  480              540        0
```

Figure 15−5.   System Meters Screen

15.5.4 System Information Printout (Ctrl + A)

This key sequence prints a listing of all available serial data. This printout contains the information shown on the Event History Log and Meters screens of the UPS (both Figures 15−4 and 15−5).

15.6 System Configuration

The System Configuration mode allows you to modify special functions in your UPS. These functions include programming of building alarms, customizing building alarm messages, adjusting the nominal output voltage, and scheduling battery tests. The menus provided and their function are described in this section.

15.6.1 System Configuration Mode Main Menu

When the System Configuration mode is selected with a terminal attached, you will be prompted to enter the password for this mode:

Please Enter Password:

The default password is POWER1. You may modify this password using the change password function in the following menu. When the valid password is entered, the main menu will be displayed:

Program Mode Main Menu

a. Program Building Alarms

b. Program Unit Name

c. Adjust Output Voltage

d. Change Password

e. Battery Test Setup

f. Modify Low Battery Time

g. Exit Program Mode

Enter Selection:

15.6.2 Program Building Alarms

This menu provides access to all the functions available in the system configuration mode. If 1 is entered at the prompt, you can program the building alarm functions:

Program Building Alarms

a. Enable/Disable Default Functions

b. Customize Alarm Messages

c. Return to Main Menu

Enter Selection:

15.6.3 Enable/Disable Default Functions

From this menu you may either enable the building alarms for general functions or special functions such as On Generator, Go To Bypass, and Go To UPS. You may also customize the alarm messages from this menu. When 1 is selected from this menu, the following menu is displayed:

> Enable/Disable Default Functions
>
> a. Enable/Disable Go To Bypass
>
> b. Enable/Disable Go To UPS
>
> c. Enable/Disable On Generator
>
> d. Enable/Disable Building Alarm
>
> e. Return to Program Building Alarms Menu
>
> Enter Selection:

If you select entry 1–3 from this menu, the following menu will be displayed:

> Enable/Disable (*Function*)
>
> Enabled Building Alarm Number(s) 1 4
>
> Enter E# to Enable Building Alarm Number #
>
> Enter D# to Disable Building Alarm Number #
>
> Enter <CR> for No Change
>
> Enter Selection:

Where (*Function*) indicates the function the building alarm is being programmed for. The line following the Enabled Building Alarm Number(s) label indicates which building alarms are currently enabled for the function. (In this example, Building Alarms 1 and 4 are enabled.) A building alarm can only be programmed for one special function at a time from these menus. Enabling a building alarm for a special function automatically enables the alarm. If you disable a special function, the building alarm is also disabled.

If you select entry 4 from this menu, the following menu will be displayed:

> Enable/Disable Building Alarm
>
> Enabled Building Alarm Number(s) 1 4
>
> Enter E# to Enable Building Alarm Number #
>
> Enter D# to Disable Building Alarm Number #
>
> Enter <CR> for No Change
>
> Enter Selection:

The line following the Enabled Building Alarm Number(s) label indicates which building alarms are currently enabled. (In this example, Building Alarms 1 and 4 are enabled.)

15.6.4 Customize Alarm Messages

If Customize Alarm Messages is selected from the Program Building Alarm menu, you can select a custom message for a building alarm or disable a previously enabled building alarm custom message. When this entry is selected, the following menu is displayed:

Customize Alarm Messages

Enabled on Building Alarm Number(s) 2 3

Enter Building Alarm Number:

This example indicates that there are custom messages enabled for Building Alarms 2 and 3. When a building alarm number is entered, the message being used by the software is displayed (either a custom message or the default message indicated by the list of enabled custom messages). If 1 was entered at the prompt, the following will be displayed:

Building Alarm Active Message: Building Alarm 1 (default message)

Enter New Message or <CR> for No Change:

At this level you can enter a custom message, 30 characters maximum, to display when Building Alarm 1 is activated. If a custom message is entered to activate the building alarm, a custom message should also be entered to deactivate. After the message or a carriage return is entered, the following is displayed:

Building Alarm Clear Message: Clear Building Alarm 1 (default message)

Enter New Message or <CR> for No Change:

At this prompt, the user should enter the custom message for the building alarm deactivation state. When a message or a carriage return is entered, the following will be displayed:

Enter E to Enable Custom Message

Enter D to Disable Custom Message

Enter <CR> for No Change

Enter Selection:

If an E is entered at the prompt, the custom messages will be used for the building alarm. If a D is entered, the default messages will be used for the building alarm.

15.6.5 Program Unit Name

If Program Unit Name is selected from the main menu, the following is displayed:

    Program Unit Name

    Unit Name:

    Enter New Name or <CR> No Change:

NOTE: Unit Name is 45 characters maximum

The current unit name is displayed. This name will be displayed on the second line of the display and in the headers of prints from Terminal mode. If a change is desired, the new unit name should be entered at the prompt. The unit name is 45 characters maximum and includes spaces and any punctuation. If the user wants to center the text portion of the name, the appropriate number of leading spaces should be included when entered.

15.6.6 Change Password

If Change Password is selected from the main menu, the following menu is displayed:

    Change Password

    Enter New Password:

    Verify New Password:

NOTE: Password must be six characters in length.

    <CR> to return with no change.

The password will be changed if the user enters and verifies the password. The entry must be six characters.

15.6.7 Battery Test Setup

If Battery Test Setup is selected from the main menu (option 5), the following menu is displayed:

NOTE: *If a message stating "Battery Test Requires Calibration" appears, please notify your service representative for proper calibration.*

> Battery Test Setup
>
> a. Setup One-time Delayed Battery Test
>
> b. Setup Monthly Battery Test
>
> c. Setup Quarterly Battery Test
>
> d. Cancel Pending Battery Test
>
> e. Display Next Scheduled Battery Test
>
> f. Return to Main Menu
>
> Enter Selection:

This menu allows you to schedule, review schedule, or cancel pending battery tests. The following menu is displayed when 1–3 is selected:

> Enter Starting Month (1–12):
>
> Enter Day of Week, Sunday = 1, (1–7):
>
> Enter Week of Month (1–5):
>
> Enter Hour of Test (0–23):
>
> Enter Minute of Test (0–59):

NOTE: *Follow each entry with <CR>.*

> <CR> with no entry will return to Battery Test Setup Menu.

Enter the information at the prompt with a carriage return to schedule the battery test.

If entry 4 is selected from the Battery Test Setup menu, you will be prompted to enter "Y" to cancel all pending tests. This selection will only cancel pending tests and will not stop a test currently in progress.

If entry 5 is selected from the Battery Test Setup menu, and if a Battery Test is scheduled, the following menu is displayed:

> Next Battery Test Scheduled
>
> WK DAY MON HR:MN
>
> 4 FRI MAR 15:34

NOTE: *Enter <CR> to return to Battery Test Setup Menu.*

If 5 is selected and there are no tests scheduled, the following will be displayed:

> No Battery Test Scheduled
>
> Enter <CR> to return to Battery Test Setup Menu

NOTE: *The unit will only perform one battery test in any 24 hour period.*

15.6.8 Modify Low Battery Time

This menu allows you to modify the low battery time warning. When selected, the following menu will be displayed:

Modify Low Battery Time

Low Battery Time (Minutes): 004

Enter New Low Battery Time:

NOTE: *Low Battery Time should be no greater than 999. Enter <CR> to return with no change.*

Enter the new time desired to change the warning level.

15.7 Calibration Mode

Calibration mode is used by factory and field service personnel to calibrate system meters. Factory test engineers calibrate the UPS meters prior to shipping so the UPS arrives at your site correctly calibrated. After use, field service personnel may need to use Calibration mode to recalibrate one or more meter settings.

NOTE: *Calibration mode is for use by service personnel ONLY. To prevent inadvertent modification, this mode can be accessed only by trained personnel.*

15.8 Computer Mode

This mode provides a computer interface which gives your system compatibility with system monitoring and network products. For a list of products available, contact your sales representative.

15.9 Remote Monitor Mode

This mode provides the interface for the RMP, RIM, or SCM described earlier.

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Remote Notification

16.1 Description

Remote Notification provides the user with the option of receiving alarms and notices at a remote location. Remote Notification operates through a standard computer modem. Using the Terminal mode, the user calls the UPS to perform basic monitoring. In the event of a UPS alarm or notice, the user is notified at the remote location. The UPS calls, through the modem, to the user's computer or pager and leaves a message.

Remote Notification is an extension of the Terminal mode with the additional support algorithms necessary to control an external modem (refer to Chapter 7, "Serial Communications"). Connection to the UPS is made when a user calls the UPS on the phone. The user has exactly the same capabilities as if using a terminal connected directly to the UPS RS–232 port. Remote Notification differs from the basic Terminal mode with the addition of Call Answer, Call Out, and Housekeeping functions. The Call Answer function allows the user to call into the UPS from a remote location and enter Terminal mode. The Call Out function allows the UPS to be configured to call either a remote computer or numeric paging service over the phone line. Call Out allows the UPS to call a remote computer and leave a one-line descriptive message of the alarm or notice condition. Numeric paging support allows the UPS to call a paging service and send numeric messages. The Housekeeping function maintains the link between the UPS and modem.

16.2 Remote Notification Features

Remote Notification provides the UPS with the capability to utilize a standard off-the-shelf PC modem as a telephone interface. The features provided by this option are as follows:

- Call out to a remote terminal or pager based on programmable events and alarms.

- Two separate, programmable notification groups (phone numbers).

- Programmable number of redial attempts.

- Programmable time delay between call out attempts.

- Automatic answering (user configurable) for access to the Terminal mode of the UPS.

- Remote and local ability to clear Call Out alarms and events.

- Error detection and correction for misconfigured and disconnected modems.

- Uses standard modems and null modem cables available at your local computer supply center.

NOTE: Programmable functions are by Powerware authorized personnel only,

16.3 Description of Operation

The Remote Notification option performs three basic functions: Call Answer into Terminal mode, Call Out to a remote terminal, and Housekeeping. Remote Notification also allows access to any functions available in the Terminal mode from a remote computer or terminal.

16.3.1 Call Answer

When the modem receives a call, the UPS is alerted to wait for a connect signal from the modem. When the modem answers and finishes handshaking, the UPS acknowledges the modem connect signal and allows the caller into the Terminal mode (refer to Chapter 7, "Serial Communications"). In this mode, the user can request four items and perform one command:

NOTE: The brackets ([ ]) in the following steps indicate standard keyboard characters.

- Display all screens (^B, ^M, ^P). Press and hold [CTRL], then press [A].

- Display battery test results by pressing and holding [CTRL], then pressing [B].

- Display meters screen by pressing and holding [CTRL], then pressing [M].

- Display event history by pressing and holding [CTRL], then pressing [P].

- Reset Call Out Alarms by pressing and holding [CTRL], then pressing [R].

The Reset Call Out Alarms command causes the UPS to cease Call Out attempts on a currently active alarm and resets that alarm call. Refer to the "Call Out" section of this chapter for more information when calling a pager or if a failed connection to a PC terminal.

16.3.2 Call Out

The Call Out function contains programmable alarms (setup by service personnel) and status events (refer to Chapter 12, "Responding to System Events"). The notification groups tell the UPS to notify a remote computer or pager for each selected event. Refer to the "Configuring the Modem" section of this chapter for information on the modem configuration. Refer to the "User-Selected Events" section of this chapter to note which events are designated as group one or two. These events are selected when the UPS is purchased. The Call Out function activates as follows:

- A UPS alarm or notice occurs that is programmed to cause a Call Out.

- The UPS takes the modem off the hook and sends a command to the modem to call the notification groups (phone numbers) required. The phone are stored in the modem only. The command sent to the modem for group one is "ATDS0" and "ATDS1" for group two. This allows the user to program the desired phone numbers into the modem.

- The UPS logs a successful notify to the event log when the remote computer or modem answers and leaves an event message with the following format.

nnn<space>mmm<LF><CR> where:

nnn   =   UPS_Remote_Notification−Default (40 characters maximum)
<space> =   ASCII space character (0x20)
mmm   =   Event message for notice or alarm (40 characters maximum)
<LF>   =   ASCII line feed character (0x0A)
<CR>   =   ASCII carriage return character (0x0D)

If calling a pager service and the service answers, the modem can delay momentarily and before dialing the pager number. Refer to "Configuring the Modem to Call a Numeric Pager" section of this chapter for more information.

NOTE: *Because the pager service is not a modem, the UPS does not know if its message got through; therefore, the UPS continues to call the pager service for a programmed number of times or until a call-in reset is performed or the key on the front panel is reset. An unsuccessful notify event is logged into the UPS event log for each attempted call out.*

If the phone number that the UPS is calling does not answer, the UPS delays for a time period (programmable from 1 to 60 minutes) and then reattempts the call. If answered, the UPS ceases further attempts to call. Each unsuccessful attempt to call causes an unsuccessful notify event to be logged into the UPS event log.

If both call groups are active, the UPS alternates between calling the groups. The Call Out process can be terminated at any time by calling into the UPS and sending the reset command (press and hold [CTRL] and press [R]) or by turning the key switch on the front of the UPS.

16.3.3 Housekeeping

When the modem is idle, the UPS "pings" (tests for connection) the modem by sending an "AT" to the modem at five-minute intervals. If the modem does not respond correctly, by sending either "OK" or "0" to the UPS, the UPS attempts to re-initialize the modem. After a successful re-initialization, the UPS returns to the Housekeeping function. If the re-initialization is unsuccessful, two more attempts to re-initialize the modem are made before the UPS disables all Call Out attempts. Re-initialization is then attempted every ten minutes or until the communications mode is changed by the UPS front panel controls (or the modem is successfully re-initialized). For each unsuccessful attempt, the UPS logs a modem failure event into the event log. When the modem link is confirmed, the UPS communications resume normal operation and Call Out is enabled.

16.4 Hardware Requirements

The following hardware components are required to connect the Remote Notification function.

- Modem: Basic external PC modem supporting the following AT commands.

T	– Tone dialing.
&F	– Load factory defaults.
E0	– Do not echo characters in command state.
N0	– Handshake only at speed specified by S37.
Q0	– Return result codes in both originate and answer mode.
V0	– Display result codes as numbers.
X0	– Provide basic result codes: CONNECT, NO CARRIER, and RING.
&D0	– Ignore status of DTR signal.
&K0	– Disable local flow control.
&Q5	– Communicate in error control mode.
S0=1	– Auto Answering.
S37=6	– 2400 Baud.
V0	– Store setup in profile O.
Y0	– Recall profile O on power up.

NOTE: *Consult the modem manufacturer's manual to confirm that the above commands are supported by your modem.*

- Standard serial cable with a male DB25 connector on both ends.

- DB25 null modem adapter.

All the above items can be acquired at your local computer products supply store.

An alternative to purchasing a cable is to build your own serial cable using the following pin out description:

Male DB25	Male DB25
pin 7	pin 7
pin 2	pin 2
pin 3	pin 2

16.5 Configuring the Modem

The modem must be programmed with the Call Out telephone numbers in order to operate the Remote Notification option.

To configure the modem, connect the serial port of a standard PC computer to the modem through the serial cable. Run a terminal emulation program on the computer. Test the connection to the modem by typing [A], [T] and [ENTER]. The modem should respond with either "OK" or "0" (zero). If the modem does not respond, consult the modem manufacturer's manual to confirm your setup. If the modem still does not respond, then seek technical assistance from your modem manufacturer.

After connection, perform "Basic Modem Configuration" and the remaining sections of this chapter.

16.5.1 Basic Modem Configuration

The basic modem should be a plug and play type. All setup is done by the UPS. Only the initial phone number needs to be entered by the user.

16.5.2 Configuring the Modem to Call a Remote Computer

To configure the modem to call a remote computer, perform the following procedure:

NOTE: The brackets ([ ]) in the following steps indicate characters that require keying in prior to pressing [ENTER].

1. Connect the modem to the PC through the serial port as described in the modem manufacturer's manual .

2. Key in [A], [T], then press [ENTER].

3. Confirm that the modem responds with "OK" or "0" (zero).

NOTE: In steps 4 and 5, the "xxxxxxx" is the phone number of a remote computer. The phone number should include all local line and long distance access numbers needed to dial out. This number is limited to 32 characters. For example, use "9" if needed for an outside line, "1" for long distance + (Area Code) + Number or whatever access codes are needed to dial the call directly. Add a "," in the number anywhere that a delay is needed. This will cause a one-second delay. More than one delay may be added to the number; for example, enter "AT&Z0=T,9,,1 (Area Code) (Phone Number)".

4. To program a group one number, key in [A], [T], [&], [Z], [0] (zero), [=], [T], [,], [xxxxxxx], then press [ENTER].

5. To program a group two number, key in [A], [T], [&], [Z], [1], [=], [T], [,], [xxxxxxx], then press [ENTER].

6. Confirm that the modem responds with "OK" or "0" (zero).

7. Key in [A], [T], [&], [W], [0] (zero), then press [ENTER].

9. Confirm that the modem responds with "OK" or "0" (zero).

8. Key in [A], [T], [&], [Y], [0] (zero), then press [ENTER].

9. Confirm that the modem responds with "OK" or "0" (zero).

10. Connect a telephone line to the modem and test the modem by keying in [A], [T], [D], [S], = [0] (zero), then pressing [ENTER].

11. The modem dials the telephone number stored in step 4. (The number is displayed on the terminal screen as it is dialed.) Repeat steps 4 through 9 as necessary to modify the telephone number.

12. Confirm that the modem responds with "1" (one) or "Connect" when the connection is made.

NOTE: To set up a group one or group two pager number, refer to "Configuring the Modem to Call a Numeric Pager" section of this chapter.

16.5.3 Configuring the Modem to Call a Numeric Pager

To configure the modem to call a numeric pager system, perform the following procedure.

NOTE: The brackets ([ ]) in the following steps indicate characters that require keying in prior to pressing [ENTER].

1. Connect the modem to the PC through the serial port as described in the modem manufacturer's manual .

2. Key in [A], [T], then press [ENTER].

3. Confirm that the modem responds with "OK" or "0" (zero).

NOTE: In steps 4 and 5 the "xxxxxxx" is the pager system number and "yyyyyyy" is the numeric message (usually a phone number). The three "[,]" provide a delay while the pager system computer answers. The "xxxxxxx" entry should include all local line and long distance access numbers needed to dial out, as well as the pause necessary between dialing the pager service and sending the pager the numeric message. This number is limited to 32 characters. For example, use "9" if needed for an outside line, "1" for long distance + (Area Code) + Number or whatever access codes are needed to dial the call directly. Add a "," in the number anywhere that a delay is needed. This causes a one-second delay. More than one delay may be added to the number; for example, enter "AT&Z0=T,9,,1 (Area Code) (Phone Number) (Pauses) (Numeric Message)". For areas with pulse dialing, the "T" should be inserted before the numeric message to switch to tone dialing. The numeric message can only be delivered using tone dialing. Keying in the "#" (pound) character at the end of the numeric message is very important. It prevents the pager service from picking up on the modem hang-up commands and sending additional characters.

4. To program a group one number, key in [A], [T], [&], [Z], [0] (zero), [=], [T], [,], [xxxxxxx], [,], [,], [,], [yyyyyyy], [#], then press [ENTER].

5. To program a group two number, key in [A], [T], [&], [Z], [1], [=], [T], [,], [xxxxxxx], [,], [,], [,], [yyyyyyy], [#], then press [ENTER].

6. Confirm that the modem responds with "OK" or "0" (zero).

7. Key in [A], [T], [&], [W], [0] (zero), then press [ENTER].

6. Confirm that the modem responds with "OK" or "0" (zero).

7. Key in [A], [T], [&], [W], [0] (zero), then press [ENTER].

8. Confirm that the modem responds with "OK" or "0" (zero).

9. Connect a telephone line to the modem and test the modem by keying in [A], [T], [D], [S], [0] (zero), then pressing [ENTER].

10. The modem dials the telephone number stored in step 4 or step 5. (The number is displayed on the terminal screen as it is dialed.) Confirm that the pager receives the message. Repeat steps 4 (or 5) through 9 as required to modify the telephone number and message.

NOTE: *To set up a group one or group two number to call a computer, refer to "Configuring the Modem to Call a Remote Computer" section of this chapter.*

To configure the modem to answer incoming calls, perform the following procedure.

16.5.4 Final Modem Configuration

The final step in configuring the PC modem for use with the UPS is to turn off the echo feature of the modem. Perform the following procedure.

16.6 UPS Setup Configuration

Connect the modem to the UPS by connecting one end of the serial cable to the UPS Port 2 DB−25F connector and the other to the modem (refer to Chapter 13, "Serial Communications"). If using a standard serial cable, a null modem adapter is required for the connection to the modem.

The Powerware 9315 UPS can only use serial Port 2, DB−25F, for the Remote Notification option. This connection is located on the Customer interface Panel at the top right of the UPS cabinet.

The remote modem operates at only 2400 baud.

Following the instructions in Chapter 9, "Using the Control Panel" and Chapter 13, "Serial Communications", use the LCD screen and pushbuttons on the Monitor Panel to access the setup screen and configure Port 2 as follows.

NOTE: The modem should be connected to the UPS as described in the modem manufacturer's manual before configuring the UPS communications port.

<MODE>	Remote Notify
<RATE>	The baud rate at which the modem will communicate to other modems, 2400 baud.
<DATA/STOP>	8 1 Standard 8 data bits, 1 stop bit, no parity.
<HANDSHAKING>	Disabled
<SAVE>	Yes. To save new configuration.

The handshaking feature listed is for UPS-to-terminal handshaking, not UPS-to-modem handshaking. Setting the handshaking to "modem" has no effect. If the remote terminal has buffering problems because of excessive data transfer rate from the UPS, XON/XOFF handshaking can be selected to resolve this issue. The user must make sure that the modem (not the remote terminal) at the remote terminal end of the connection is configured for either hardware handshaking or none at all. This is required so that the modem does not attempt to trap the XON/XOFF characters and prevent them from being transmitted to the UPS.

16.6.1 User Selected Events

Insert a check at each alarm or notice in the appropriate Group 1 or Group 2 block to indicate the configuration of your UPS.

INVERTER MESSAGES – ALARMS	Group 1	Group 2	INVERTER MESSAGES – NOTICES	Group 1	Group 2
Inverter AC Over Voltage			Inv. Logic Power Failed		
Inverter AC Under Voltage			Bypass AC Over Voltage		
Inverter Calibration Required			Bypass AC Under Voltage		
Inverter Contactor (K3) Failed			Bypass is Not Available		
Inverter DC Over Voltage			Bypass Mode		
Inverter Failure			Bypass Over Frequency		
Inverter Over Frequency			Bypass Under Frequency		
Inverter Phase Rotation			Input Breaker (CB1) Open		
Inverter Setup Required			Battery Contactor (K2) Open		
Inverter Under Frequency			Battery DC Under Voltage		
100% Overload Shutdown			Battery Discharged		
125% Overload Shutdown			Battery Not Charged		
Over Temperature Shutdown			Battery Voltage Low		
Shutdown Imminent			Phase A Current Limit		
Load Off			Phase B Current Limit		
Bypass Contactor (K4) Failed			Phase C Current Limit		
Battery Contactor (K2) Failed			Phase C Current Limit		
Bypass Control Failed					
Bypass Phase Rotation					
Go To Bypass Active					
Battery Ground Fault					

RECTIFIER MESSAGES – ALARMS	Group 1	Group 2	RECTIFIER MESSAGES – NOTICES	Group 1	Group 2
Input Phase Rotation			Battery Test Failed		
Over Temperature			DC Voltage High		
Over Temperature Warning			DC Voltage Low		
Rectifier Calibration Required			Equalizing Battery		
Rectifier DC Over Voltage			Input AC Over Voltage		
Rectifier DC Under Voltage			Input AC Under Voltage		
Rectifier Failure			Input Over Frequency		
Rectifier Setup Required			Input Transient		
Temperature Sensor Failure			Input Under Frequency		
			Input/Battery Current Limit		
			Logic Power Failed		
			Power Supply Over Voltage		
			Power Supply Under Voltage		
			Rectifier 1.12		
			Reduced Input Current Limit		
			Testing Battery		

MONITOR MESSAGES – ALARMS	Group 1	Group 2	MONITOR MESSAGES – NOTICES	Group 1	Group 2
Battery Test Failed			Battery Passed Test		
Battery Test Failed			Battery Test Aborted (load)		
Fan Failure			Battery Test Aborted (utility)		
Load Over 100%			Battery Test Requires Calibration		
Load Over 125%			Battery Time Low		
Monitor Calibration Required			Building Alarm 1 Active		
Monitor Setup Required			Building Alarm 2 Active		
Overload Warning			Building Alarm 3 Active		
Power Supply Failure			Building Alarm 4 Active		
			Building Alarm 5 Active		
			Building Alarm 6 Active		
			Inverter Network Down		
			Monitor Logic Pwr Fail		
			Monitor Network Down		
			No Active Events		
			Output AC Over Voltage		
			Output AC Under Voltage		
			Output Over Frequency		
			Output Under Frequency		
			Power Off Switch		
			Rectifier Network Down		
			Testing Battery		
			Three Wire AC Over Voltage		
			Three Wire AC Under Voltage		
			Three Wire Over Freq.		
			Three Wire Under Freq.		

Maintaining the UPS System 17

17.1 General

The components inside the UPS cabinet are secured to a sturdy metal frame that is supported by the UPS magnetics. This design allows authorized service personnel to remove repairable components with very little disassembly. All repairable parts and assemblies are located in the front of the UPS, allowing all routine maintenance and servicing to be performed with front panel access.

You must schedule periodic performance checks of your UPS system to keep it running properly. Regular routine checks of operation and system parameters will enable your system to function efficiently for many trouble-free years.

17.2 Important Safety Instructions

Remember that your UPS system is designed to supply power *EVEN WHEN DISCONNECTED FROM THE UTILITY POWER*. The UPS module interiors are unsafe until the DC power source is disconnected and the electrolytic capacitors are discharged. After disconnecting the utility power and the DC power, authorized service personnel should wait at least 5 minutes for capacitor bleedoff before attempting internal access to the UPS module.

> **WARNING:**
> **Servicing and maintenance should be performed by qualified service personnel only.**

> **WARNING:**
> **LETHAL VOLTAGE PRESENT. This unit should not be operated with the cabinet doors open or protective panels removed. Do not make any assumptions about the electrical state of any cabinet in the UPS system.**

Since each battery string is an energy source in itself, opening the Battery Circuit Breaker does not de-energize the voltage within the battery string. **DO NOT ATTEMPT TO ACCESS ANY INTERNAL AREA OF THE BATTERY STRING YOURSELF. VOLTAGES ARE ALWAYS PRESENT IN THE BATTERY STRING.** If you suspect that a battery string needs service, you should contact your local field service office.

If the string requires service, refer to the battery manufacturer's operating manual for instructions on battery maintenance, or contact your local field service office.

Observe these precautions when working on or around batteries:

- Remove watches, rings, or other metal objects.

- Use tools with insulated handles.

- Wear rubber gloves and boots.

- Do not lay tools or metal parts on top of batteries or battery cabinets.

- Disconnect the charging source prior to connecting or disconnecting terminals.

- Determine if the battery is inadvertently grounded. If it is, remove the source of the ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.

- When replacing batteries, use the same number of sealed, lead-acid batteries.

- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.

> **WARNING:**
> **HAZARDOUS WASTE. Do not incinerate or dispose of batteries indiscriminately. Observe local and national codes.**

> **WARNING:**
> **Do not dispose of battery or batteries in a fire. The battery may explode.**
>
> **Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes, and may be toxic.**
>
> **A battery can cause electrical shock, burn from high short-circuit current, or fire. Observe proper precautions.**

> **ATTENTION:**
> **Une batterie peut prêsenter un risque de choc êlectrique, de brulure, ou d'incendie. Suivre les précautions qui s'imposent.**

- Pour le remplacement, utiliser le même nombre et modéle des batteries.

- L'élimination des batteries est règlementée. Consulter les codes locaux à cet effet.

17.3 Performing Preventive Maintenance

The UPS system requires very little preventive maintenance. However, the system should be inspected periodically to verify that the units are operating normally and that the batteries are in good condition.

Perform the following checks DAILY:

1. Check the area surrounding the UPS system. Ensure the area is not cluttered, allowing free access to the unit.

2. Ensure the air intakes (vents on the front doors) and exhaust opening (on top of the UPS cabinet sections) are not blocked.

3. Ensure there is at least six inches of clearance behind the unit for proper air circulation.

4. Ensure the operating environment is within the parameters specified in Chapter 18, "Product Specifications."

5. Ensure the UPS is in Normal mode (Normal status indicator is illuminated). If an alarm lamp is illuminated or the Normal status indicators are not illuminated, contact Customer Support.

Perform the following checks MONTHLY:

1. Ensure all status indicator lamps are operative. (Press the ⇧ and ⇩ pushbuttons simultaneously to test the lamps.)

2. Monitor system parameters as described in Chapter 11, "Using the Control Panel."

3. The UPS cooling air intake filters (located behind grills on the front doors) are washable. Check the air filters and wash or replace them as necessary. The filter size is 20 in. x 25 in. x 1 in. To remove filters:

   a. Loosen captive screws at top of filter grill.

   b. Rotate grill out and down from door.

   c. Remove and replace filter.

   d. Close filter grill and secure with captive screws.

4. Record the results of your checks and any corrective actions in a suitable log.

ANNUAL maintenance:

Annual preventive maintenance should be performed only by authorized service personnel familiar with maintenance and servicing of the UPS system. Contact your nearest field service office for more information about service offerings.

BATTERY maintenance:

Contact your nearest field service office for battery maintenance. Battery replacement and maintenance should be performed only by authorized service personnel.

17.4 *Maintenance Training*

A basic training course, available from Powerware Inc., gives you a competent working knowledge of the UPS system operation and teaches you how to perform first level corrective maintenance. For more information about training and other services, contact the Powerware Corporation Training Coordinator in Raleigh, North Carolina, or call Powerware corporation field service at **1‒800‒843‒9433**.

Product Specifications

18.1 Model Numbers

The UPS systems are housed in freestanding, double-front cabinets with safety shields behind the doors. The UPS systems are available in 50/60 Hz with various output power ratings. Smaller models within a system may be upgraded in the field to larger models:

System	Models	Notes
Powerware 9315–625	562, 500, 450, 400 kw	50/60 Hz
Powerware 9315–750	675, 600, 562, 500 kw	60 Hz only

The following sections detail the input, output, environmental, and battery specifications for the UPS.

18.2 UPS System Input

Operating Input Voltage (Nominal +10/–15%)	600 VAC for operation from 510 VAC to 660 VAC (60 Hz only) 480 VAC for operation from 408 VAC to 528 VAC (60 Hz only) 400 VAC for operation from 340 VAC to 440 VAC (50/60 Hz only)
Operating Input Frequency Range	±3 Hz of nominal (50 Hz or 60 Hz)
Operating Input Current	*Battery Charge:* 125% of full load for overload + battery charge Actual load + 25% of full load for battery charge with 0.8 pF output units 115% of full load for overload + battery charge Actual load + 15% of full load for battery charge with 0.9 pF output units *Reduced for Generator:* Adjustable, set to 102%
Input Current Harmonic Content	5% THD at full load (with input filter option installed)
Power Walk-In	Adjustable 3–60 second rectifier ramp-up to full utility load
Power Factor	Minimum 0.85
Line Surges	6 kV OC, 3 kA SC per ANSI 62.41 and IEC 801–4

18.3 UPS System Output

Rectifier/Charger Capacity	125% or 115% depending on modle
DC Filtering	Ripple voltage less than 0.5% peak to peak
UPS Output Capacity	100% rated current at 0.8 power factor or 100% rated current at 0.9 power factor
Output Voltage Regulation	1% (10% to 100% load)
Output Voltage Adjustment (Nominal +/--5%)	600 VAC nominal, adjustable from 570 VAC to 630 VAC (60 Hz only) 480 VAC nominal, adjustable from 456 VAC to 504 VAC (60 Hz only) 400 VAC nominal, adjustable from 380 VAC to 420 VAC (50/60 Hz)
Output Voltage Harmonic Content	3% max THD, 2% max single (linear load)
Output Voltage Balance	3% for 100% maximum load imbalance (linear load)
Output Voltage Phase Displacement	3° for 100% maximum load imbalance (linear load)
Output Transients	±5% for 100% load step or removal
Frequency Regulation	±0.01 Hz free running
Synchronous to Bypass	Bypass within voltage limits of +5%, −8% of output setting; bypass within ±0.5 Hz
Frequency Slew Rate	1 Hz per second maximum (adjustable)
Overload Capability	125% for 10 minutes 150% for 10 seconds
Maximum Output Capability	300% peak for 10 cycles without bypass

18.4 Environmental Specifications

Operating Temperature	0 to 40˚C without derating. The recommended operating temperature is 25˚C.
Operating Altitude	Maximum 1500m (5000 ft) at 40˚C without derating
Storage Temperature	−20 to +70˚C (prolonged storage above 40˚C will cause rapid battery self-discharge)
Relative Humidity (operating and storage)	95% maximum noncondensing
Acoustical Noise	75 dBA at a 1m distance
EMI Suppression	Meets FCC Regulation 47, Part 15, for class A devices
Electrostatic Discharge (ESD) Immunity	Meets IEC 801−2 specifications. Withstands up to 25 kV pulse without damage and with no disturbance or adverse effect to the critical load.
System Efficiency at Full Unity Power Factor Load and Nominal Input Voltage	*400V Models:* 94% *480V Models:* 94% *600V Models:* 94%

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Appendix A − Customer Information

The information in this appendix will help you plan for and install your UPS system. This appendix contains the following drawings:

- 164201244−1   Power Wiring Installation Notes

- 164201244−2   Customer Interface Wiring Installation Notes

- 164201244−3   Physical Features and Requirements

- 164201244−4   Typical UPS System

- 164201244−5   UPS System Oneline Configurations

- 164201244−6   Oneline Drawing of UPS System

- 164201244−7   Location of UPS Terminals

- 164201244−8   UPS Cabinet Dimensions

- 164201244−9   Remote Emergency Power Off

- 164201244−10   Remote Monitor Panel

- 164201244−11   Relay Interface Module

- 164201244−12   Supervisory Contact Module

- 164201244−13   Battery Disconnect Switch

Table A. INPUT/OUTPUT Ratings & External Wiring Requirements for
Powerware 9315−625/400, 9315−625/450, 9315−625/500, and 9315−625/562

Ratings		Units	Rating 50/60 Hz			
Basic unit ratings: 9315-625/400 and 9315-625/500 at 0.8 lagging PF load		KVA KW	500 400	500 450	625 500	625 562
9315-625/450 and 9315-625/562 at 0.9 lagging PF load		INPUT/OUTPUT VOLTAGE	400	400	400	400
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3∅, 1 Neutral, 1 gnd* ⒶA *Minimum conductor size (number per ∅)* *(Maximum amps includes full load current plus battery recharge current)	Amps*	880	910	1100	1138
		AWG or kcmil(ea)	350 (4)	400 (4)	600 (4)	700 (4)
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3∅, (1) Neutral, (1) gnd* ⒷB *Minimum conductor size (number per ∅)*	Amps	722	722	902	902
		AWG or kcmil(ea)	300 (4)	300 (4)	500 (4)	500 (4)
DC INPUT	**DC Input from Battery to UPS** *(1) positive, (1) negative* ⒸC *Minimum conductor size (number per ∅)*	VDC	384	384	384	384
		Amps @ (2.0V/cell)	1096	1234	1371	1542
		AWG or kcmil(ea)	400 (4)	500 (5)	400 (5)	700 (5)
AC OUTPUT	**AC Output to Optional System Bypass Module(SBM)** *Full Load Current 3∅, (1) Neutral, (1) gnd* ⒺE *Minimum conductor size (number per ∅)*	Amps	722	722	902	902
		AWG or kcmil(ea)	300 (4)	300 (4)	500 (4)	500 (4)
AC OUTPUT	**AC Output to Critical Load** *Full Load Current 3∅, (1) Neutral, (1) gnd* ⒹD *Minimum conductor size (number per ∅)*	Amps	722	722	902	902
		AWG or kcmil(ea)	300 (4)	300 (4)	500 (4)	500 (4)

Read and understand the following notes while planning your installation:

1. Refer to national and local electrical codes for acceptable external wiring practices.

2. Material and labor for external wiring requirements are to be provided by designated personnel.

3. For external wiring, use 90°C copper wire. See the appropriate column in Table A, B, or C. Wire sizes are based on using a continuous duty rated breaker.

4. Wire ampacities are chosen from Table 310−16 of the NEC. Wire is 90°C specification.

5. The neutral conductor is considered to be a current-carrying conductor per note 10 of the Notes to Ampacity Table 310 of the NEC. If a neutral is used, the wire is derated by 80% per Note 8(a) of the Notes to Ampacity Table 310 assuming 4−6 conductors in a raceway. If there is no neutral, it is assumed that there is only 3 current carrying conductors in a raceway (one per phase).

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, Ⓓ, and Ⓔ map to drawing #164201244−4

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**	
DRAWING NO:	164201244−1	SHEET: 1 of 10
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Table B. INPUT/OUTPUT Ratings & External Wiring Requirements for **Powerware 9315−750/500 and 9315−750/562**						
Ratings		*Units*	*Rating 60 Hz*			
Basic unit ratings: 9315-750/500 at 0.8 lagging PF load		KVA KW	625 500	625 500	625 562	625 562
9315-750/562 at 0.9 lagging PF load		INPUT/OUTPUT VOLTAGE	480	600	480	600
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3∅, 1 Neutral, 1 gnd*	Amps*	951	761	984	787
	Minimum conductor size (number per ∅) Ⓐ	AWG or kcmil(ea)	400 (4)	350 (4)	500 (4)	350 (4)
	*(Maximum amps includes full load current plus battery recharge current)					
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3∅, (1) Neutral, (1) gnd*	Amps	752	601	752	601
	Minimum conductor size (number per ∅) Ⓑ	AWG or kcmil(ea)	500 (3)	350 (3)	500 (3)	350 (3)
DC INPUT	**DC Input from Battery to UPS** *(1) positive, (1) negative*	VDC	384	384	384	384
		Amps @ (2.0V/cell)	1370	1370	1542	1542
	Minimum conductor size (number per ∅) Ⓒ	AWG or kcmil(ea)	500 (6)	500 (6)	600 (6)	600 (6)
AC OUT-PUT	**AC Output to Optional System Bypass Module(SBM)** *Full Load Current 3∅, (1) Neutral, (1) gnd*	Amps	752	601	752	601
	Minimum conductor size (number per ∅) Ⓔ	AWG or kcmil(ea)	500 (3)	350 (3)	500 (3)	350 (3)
AC OUT-PUT	**AC Output to Critical Load** *Full Load Current 3∅, (1) Neutral, (1) gnd*	Amps	752	601	752	601
	Minimum conductor size (number per ∅) Ⓓ	AWG or kcmil(ea)	500 (3)	350 (3)	500 (3)	350 (3)

6. A bypass neutral feeder must be supplied when the output neutral is used. If no bypass neutral feeder is supplied, the output neutral of the UPS is to be connected to chassis ground.

7. Refer to Section I of this manual for installation Instructions.

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, Ⓓ, and Ⓔ map to drawing #164201244−4

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**	
DRAWING NO: 164201244−1		SHEET: 2 of 10
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Table C. INPUT/OUTPUT Ratings & External Wiring Requirements for **Powerware 9315−750/600 and 9315−750/675**						
Ratings		*Units*	*Rating 60 Hz*			
Basic unit ratings: 9315-750/600 at 0.8 lagging PF load		KVA KW	750 600	750 600	750 675	750 675
9315-750/675 at 0.9 lagging PF load		INPUT/OUTPUT VOLTAGE	480	600	480	600
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3∅, 1 Neutral, 1 gnd* Ⓐ	Amps*	1141	913	1181	945
	Minimum conductor size (number per ∅)	AWG or kcmil(ea)	700 (4)	500 (4)	700 (4)	500 (4)
	*(Maximum amps includes full load current plus battery recharge current)					
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3∅, (1) Neutral, (1) gnd* Ⓑ	Amps	902	722	902	722
	Minimum conductor size (number per ∅)	AWG or kcmil(ea)	400 (4)	500 (3)	400 (4)	500 (3)
DC INPUT	**DC Input from Battery to UPS** *(1) positive, (1) negative* Ⓒ	VDC	384	384	384	384
		Amps @ (2.0V/cell)	1645	1645	1850	1850
	Minimum conductor size (number per ∅)	AWG or kcmil(ea)	600 (6)	600 (6)	750 (6)	750 (6)
AC OUT- PUT	**AC Output to Optional System Bypass Module(SBM)** *Full Load Current 3∅, (1) Neutral, (1) gnd* Ⓔ	Amps	902	722	902	722
	Minimum conductor size (number per ∅)	AWG or kcmil(ea)	400 (4)	500 (3)	400 (4)	500 (3)
AC OUT- PUT	**AC Output to Critical Load** *Full Load Current 3∅, (1) Neutral, (1) gnd* Ⓓ *Minimum conductor size (number per ∅)*	Amps	902	722	902	722
		AWG or kcmil(ea)	400 (4)	500 (3)	400 (4)	500 (3)

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, Ⓓ, and Ⓔ
map to drawing #164201244−4

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**	
DRAWING NO:	164201244−1	SHEET: 3 of 10
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8. Terminals E1 through E12 are 2-hole bus bar mountings for standard NEMA 2-hole barrel lugs. Refer to Table D for power cable terminations, Table E for conduit requirements, and Table F for recommended installation parts and tools not supplied by Powerware. Drawing 164201244−7 shows the location of the power cable terminals inside the UPS.

Table D. UPS Cabinet Power Cable Terminations					
Terminal Function	*Terminal*	*Function*	*Bus Landings*	*Tightening Torque N-M (lb-ft)*	*Bolt Size (In.)*
AC Input to UPS Rectifier (CB1 Input)	E1	Phase A	4 − 2 bolt mounting	76 (56)	1/2
	E2	Phase B	4 − 2 bolt mounting	76 (56)	1/2
	E3	Phase C	4 − 2 bolt mounting	76 (56)	1/2
AC Input to Module Bypass (UPS Bypass)	E6	Phase A	4 − 2 bolt mounting	76 (56)	1/2
	E7	Phase B	4 − 2 bolt mounting	76 (56)	1/2
	E8	Phase C	4 − 2 bolt mounting	76 (56)	1/2
AC Output from Inverter to Module Bypass or SBM	E9	Phase A	4 − 2 bolt mounting	76 (56)	1/2
	E10	Phase B	4 − 2 bolt mounting	76 (56)	1/2
	E11	Phase C	4 − 2 bolt mounting	76 (56)	1/2
	E12	Neutral	4 − 2 bolt mounting	76 (56)	1/2
AC Input to Module Bypass from Inverter	E9	Phase A	4 − 1 bolt mounting	76 (56)	1/2
	E10	Phase B	4 − 1 bolt mounting	76 (56)	1/2
	E11	Phase C	4 − 1 bolt mounting	76 (56)	1/2
	E12	Neutral	4 − 1 bolt mounting	76 (56)	1/2
AC Output to Critical Load from Module Bypass	E9	Phase A	12 − 2 bolt mounting	76 (56)	1/2
	E10	Phase B	4 − 2 bolt mounting	76 (56)	1/2
	E11	Phase C	4 − 2 bolt mounting	76 (56)	1/2
DC Input from Battery to UPS	E4	Battery (+)	6 − 2 bolt mounting	76 (56)	1/2
	E5	Battery (−)	6 − 2 bolt mounting	76 (56)	1/2
DC Link Output from Rectifier to Inverter	(+)	DC Link (+)	6 − 1 bolt mounting	76 (56)	1/2
	(−)	DC Link (−)	6 − 1 bolt mounting	76 (56)	1/2
DC Link Input to Inverter from Rectifier	Inverter (+)	DC Link (+)	6 − 1 bolt mounting	76 (56)	1/2
	Inverter (−)	DC Link (−)	6 − 1 bolt mounting	76 (56)	1/2
Neutral, Output	E12	Neutral	12 − 2 bolt mounting	76 (56)	1/2
Customer Ground	Ground	Ground	8 − 2 bolt mounting	76 (56)	1/2

NOTE: Customer ground, size 2/0, can be run in any conduit listed in Table E.

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9. Per NEC article 300-20(a), all three phase conductors must be run in the same conduit. If a neutral and/or ground is used, it must be run in the same conduit as the phase conductors.

10. Conduit is sized to accommodate one neutral conductor the same size as the phase conductor (if applicable) and one 2/0 ground conductor.

11. Conduit sizes were chosen from NEC Table C1, type letters RHH, RHW, RHW-2, TW, THW, THHW, THW-2.

Table E. Power Cable Conduit Requirements					
Powerware System	*Voltage*	*Terminal*	*Number of Wires in Conduit*	*Minimum Conduit Trade Size*	*Number of Conduits*
9315-750/600 9315-750/675	600	AC Input to UPS (A, B, C, Gnd)	5	3.5 in.	3
		AC Input to Module Bypass (A, B, C, Gnd)	4	3 in.	3
		Output (A, B, C, Neut, Gnd)	4	3 in.	3
	384	Battery (+), (−), Gnd	4	4 in	3
9315-750/600 9315-750/675	480	AC Input to UPS (A, B, C, Gnd)	5	4 in.	3
		AC Input to Module Bypass (A, B, C, Gnd)	6	3.5 in.	3
		Output (A, B, C, Neut, Gnd)	6	3.5 in.	3
	384	Battery (+), (−), Gnd	4	4 in	3
9315-750/500 9315-750/562	600	AC Input to UPS (A, B, C, Gnd)	5	3 in.	3
		AC Input to Module Bypass (A, B, C, Gnd)	5	3 in.	3
		Output (A, B, C, Neut, Gnd)	5	3 in.	3
	384	Battery (+), (−), Gnd	4	3.5 in	3

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**	
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Table E. Power Cable Conduit Requirements (Cont'd)

Powerware System	Voltage	Terminal	Number of Wires in Conduit	Minimum Conduit Trade Size	Number of Conduits
9315-750/500 9315-750/562	480	AC Input to UPS (A, B, C, Gnd)	5	3.5 in.	3
		AC Input to Module Bypass (A, B, C, Gnd)	4	3 in.	3
		Output (A, B, C, Neut, Gnd)	4	3 in.	3
	384	Battery (+), (−), Gnd	4	3.5 in	3
9315-625/500 9315-625/562	400	AC Input to UPS (A, B, C, Gnd)	4	3.5 in.	4
		AC Input to Module Bypass (A, B, C, Gnd)	5	3.5 in.	3
		Output (A, B, C, Neut, Gnd)	5	3.5 in.	3
	384	Battery (+), (−), Gnd	5	4 in	2
9315-625/400 9315-625/450	400	AC Input to UPS (A, B, C, Gnd)	5	3 in.	3
		AC Input to Module Bypass (A, B, C, Gnd)	5	3 in.	3
		Output (A, B, C, Neut, Gnd)	5	3 in.	3
	384	Battery (+), (−), Gnd	5	3.5 in	2

Table F. Recommended Installation Parts and Tool (Not Supplied by Powerware)

Part	Size	Quantity	Manufacturer	Part Number	Notes
Long Barrel 2 Hole Lug	500 MCM	As required	Thomas & Betts	54876BE	Color Code: Brown Die Code: 87
Bolt, Grade 5	1/2 x 2 inch	1	N/A	N/A	Quantity per lug hole
Flat Washer	1/2 inch	1	N/A	N/A	
Lock Washer	1/2 inch	1	N/A	N/A	
Nut	1/2 inch	1	N/A	N/A	
Manual Hydraulic Crimp Tool	14 Ton	1	Thomas & Betts	TBM14M	
Die Set	N/A	1	Thomas & Betts	15506	

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**	
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12. Standard breakers used in the UPS are rated for 65 KAIC, with optional breakers rated for 100 KAIC. To prevent cable whipping, secure cables as shown in figure below. Wrap line cables together with nominal 3/8 inch (9.5mm) nylon rope or rope having a minimum tensile strength of 2000 pounds (8896 N). Wrap line cables at 6 inches (152 mm) and 12 inches (305 mm) from the line terminals with five wraps. Wrap each additional 6 inch (152.4 mm) interval with five wraps or 1 inch (25.4 mm) intervals with one wrap.

SECUREMENT OF CABLE

NYLON ROPE –
3/8 inch (9.5 mm)
diameter. Minimum
of five wraps.

6 inches (152 mm)
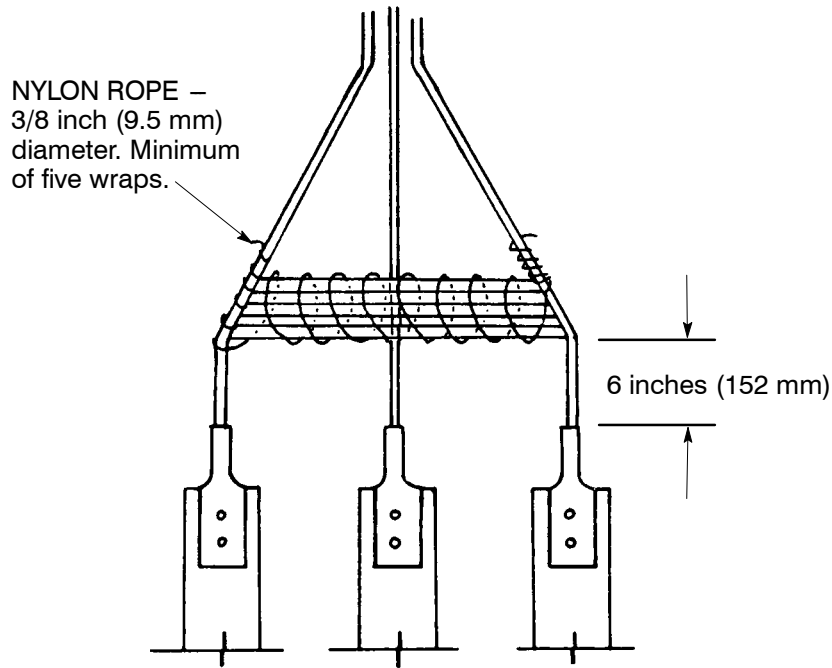
DESCRIPTION:	POWER WIRING INSTALLATION NOTES	
DRAWING NO: 164201244–1		SHEET: 7 of 10
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13. External overcurrent protection is not provided by this product, but is required by codes. Refer to Tables A through G for wiring requirements. If an output lockable disconnect is required, it is to be supplied by designated personnel.

14. Table G lists the maximum rating for continuous duty rated input circuit breakers.

Table G. Maximum Input Circuit Breaker Ratings			
Powerware System	*Input Voltage Rating*		
	400V	480V	600V
9315-625/400 9315-625/450	1000A	N/A	N/A
9315-625/500 9315-625/562	1200A	N/A	N/A
9315-750/500 9315-750/562	N/A	1000A	800A
9315-750/600 9315-750/675	N/A	1200A	1000A

CAUTION: To reduce the risk of fire, connect only to a circuit provided with maximum input circuit breaker current ratings from Table G in accordance with the National Electrical code, ANSI/NFPA 70.

15. Source protection for the AC input should be treated as if you were supplying a 750 kVA three phase transformer, to allow for inrush current.

16. The input breaker (CB1) has a trip rating of 1200 amps AT and a standard Amp Interrupting Capability (AIC) of 65,000 in symmetrical RMS amps. An optional 100,000 AIC breaker is available.

17. The input and bypass three phase feeds should be symmetrical about ground, due to the existence of voltage surge protection devices.

18. The line-to-line unbalanced output capability of the UPS is limited only by the full load per phase current values for AC output to critical load shown in Tables A and B. The recommended line-to-line load unbalance is 50% or less.

19. Output overcurrent protection and output disconnect switch are to be provided by the user. Table H lists the maximum rating for continuous duty rated output circuit breakers satisfying the criteria for both.

Table H. Maximum Output Circuit Breaker Ratings			
Powerware System	*Output Voltage Rating*		
	400V	480V	600V
9315-625/400 9315-625/450	800A	N/A	N/A
9315-625/500 9315-625/562	1000A	N/A	N/A
9315-750/500 9315-750/562	N/A	800A	700A
9315-750/600 9315-750/675	N/A	1000A	800A

DESCRIPTION:	**INSTALLATION NOTES**	
DRAWING NO: 164201244−1		SHEET: 8 of 10
REVISION: C	DATE: 021500	

20. DC input overcurrent protection and disconnect switch are to be provided by the user. Table I lists the maximum rating for continuous duty rated circuit breakers satisfying the criteria for both.

Table I. Maximum DC Input Circuit Breaker Ratings			
Powerware System	Output Voltage Rating		
	400V	480V	600V
9315-625/400 9315-625/450	1600A	N/A	N/A
9315-625/500 9315-625/562	1600A	N/A	N/A
9315-750/500 9315-750/562	N/A	1600A	1600A
9315-750/600 9315-750/675	N/A	2000A	2000A

21. Table J lists the battery shunt trip trip wiring requirements.

Table J. Battery Shunt Trip Wiring Requirements	
	ST
CB2TB Points	9, 10
Output Max Pulse	220 VA instantaneous
Wiring	#18 AWG

22. There is no DC disconnect device within the UPS.

23. The DC input to the UPS is protected by internal fuses F30 and F31.

24. Recommended wire size is 14 AWG.

25. Battery voltage is computed at 2 volts per cell as defined by Article 480 of the NEC. Rated battery current is computed at 2 volts per cell.

26. The battery wiring used between the battery and the UPS should not allow a voltage drop of more than 1% of nominal DC voltage at rated battery current.

27. A battery disconnect switch is recommended, and may be required by NEC or local codes when batteries are remotely located. The battery disconnect switch may be supplied as an accessory, and should be installed between battery and UPS.

28. If the conductors used for DC input from the battery string to the UPS are those provided by the UPS manufacturer, and the UPS and battery string are manufactured by the same supplier, then it is acceptable if they do not meet the noted minimum conductor sizes.

DESCRIPTION:	INSTALLATION NOTES	
DRAWING NO: 164201244−1		SHEET: 9 of 10
REVISION: C	DATE: 021500	

29. The UPS DC disconnect trip signal from CB2TB, points 9 and 10 (shunt trip) must be connected to the DC source disconnect device.

BATTERY
DISCONNECT

CB2TB

Not Used	1
CB2 CLS−120 VAC	2
CB2 AUX #1	3
CB2 AUX #1	4
Not Used	5
Not Used	6
CNT−120 VAC	7
CNT−NEUT	8
S.T. RTN−24 VDC	9
S.T. RTN−24 VDC	10

ST
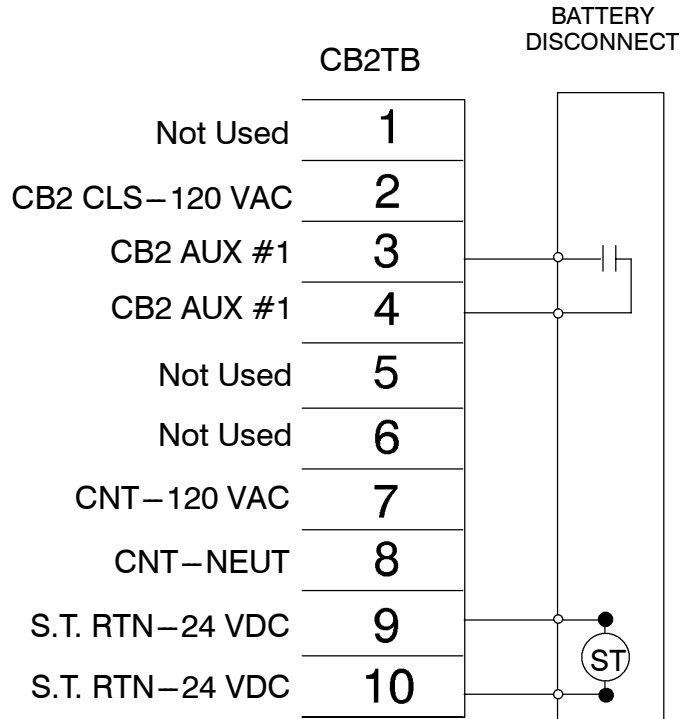
DESCRIPTION:	INSTALLATION NOTES	
DRAWING NO:	164201244−1	SHEET: 10 of 10
REVISION: C	DATE: 021500	

1. Use Class 1 wiring methods (as defined by the NEC) for control wiring. Install the control wiring in separate conduit from the power wiring. The wire should be rated at 24 volts, 1 amp minimum.

2. Refer to Tables K through O and to Chapter 2 and Chapters 5 through 8 of this manual for customer interface wiring.

Table K. Input/Rectifier Section Customer Interface Inputs and Outputs		
CUSTJ4 Terminal	Name	Description
1	OPEN FILTER	Dry contact used to deactivate input filter.
2	OPEN FILTER RETURN	
3	NO SYNC	Dry contact used to deactivate UPS synchronization to bypass.
4	NO SYNC RETURN	
5	ON GENERATOR	Dry contact used to indicate UPS is being supplied power by the generator.
6	ON GENERATOR RETURN	
7	BATTERY DISCONNECT OPEN	Dry contact used to indicate UPS Battery Disconnect is open.
8	BATTERY DISCONNECT OPEN RETURN	
9	NOT USED	
10	NOT USED	
CB2TB Terminal		
1	NOT USED	
2	CB2 CLOSE − 120 VAC	Close Circuit Breaker CB2 signal.
3	CB2−AUX #1	Circuit Breaker CB2 Auxiliary Contact.
4	CB2−AUX #1	
5	NOT USED	
6	NOT USED	
7	CONTROL − 120 VAC	Breaker charge power.
8	CONTROL − NEUTRAL	
9	SHUNT TRIP 24 VDC	Open Circuit Breaker CB2 signal.
10	SHUNT TRIP 24 VDC	

DESCRIPTION:	CUSTOMER INTERFACE WIRING INSTALLATION NOTES	
DRAWING NO:	164201244−2	SHEET: 1 of 8
REVISION: A	DATE: 051599	

INPUT/RECTIFIER SECTION–PCM 1
CUSTOMER INTERFACE

BATTERY TERMINAL BOARD

CB2TB

1

CB2 – CLOSE
CB2 – AUX #1
CB2 – AUX #1
CONTROL – 120 ⎤ BREAKER CHARGE
CONTROL – NEUTRAL ⎦ POWER
SHUNT TRIP
SHUNT TRIP

10

BATJ1   BATJ2

J1   J2
1   10
2
3
4
5
6
7
8
9
10   1

J4
10   BATTERY DISCONNECT OPEN – RETURN
       BATTERY DISCONNECT OPEN
       ON GENERATOR RETURN
       ON GENERATOR
J3   NO SYNC RETURN
       NO SYNC
       OPEN FILTER – RETURN
1   OPEN FILTER

BATJ4

BATTERY I/O BOARD
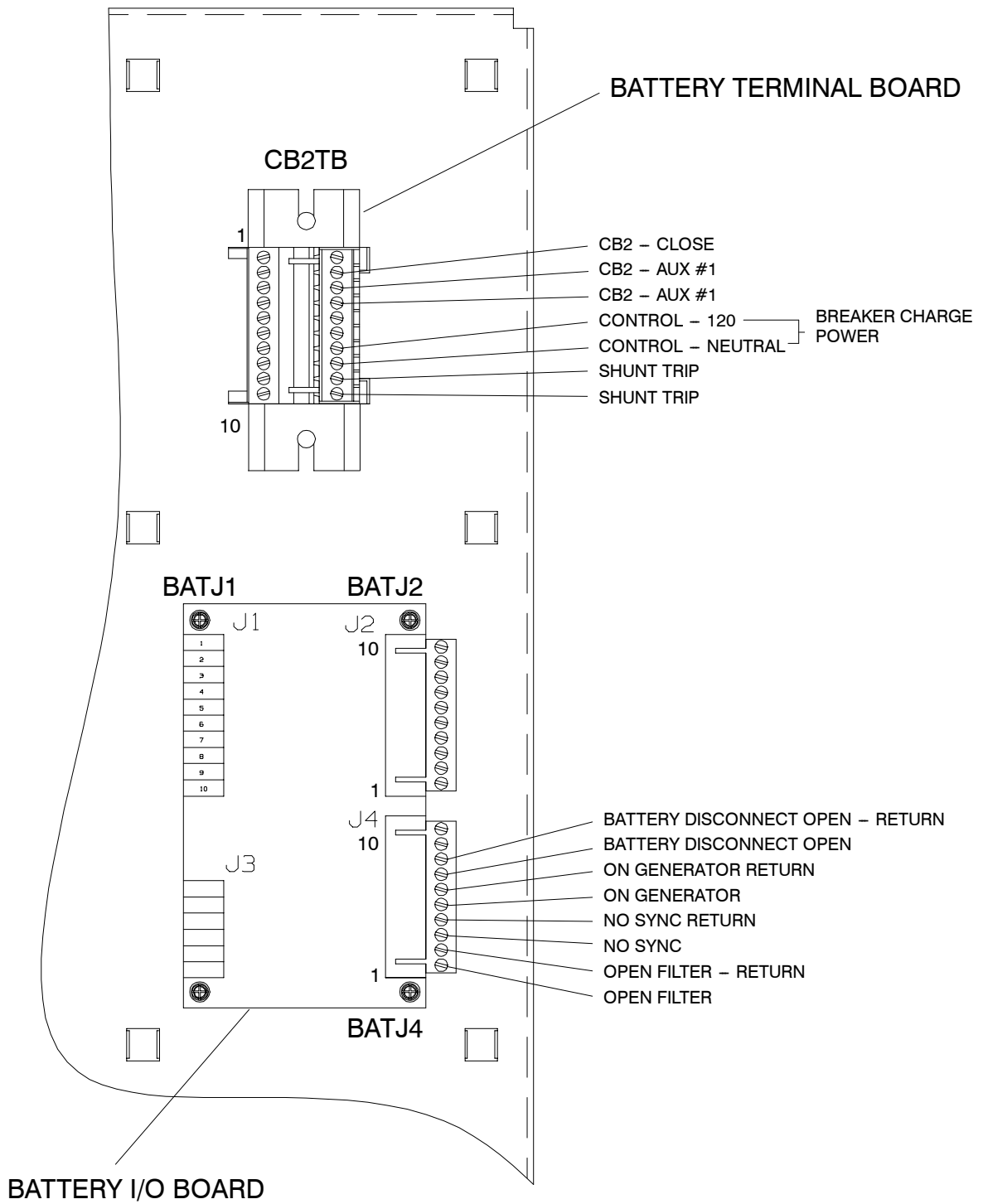
DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**	
DRAWING NO:	164201244–2	SHEET: 2 of 8
REVISION: A	DATE: 051599	

INPUT/RECTIFIER SECTION−PCM 1
CUSTOMER INTERFACE PANEL

RS485   RS232

INSTALL ADAPTOR AS SHOWN
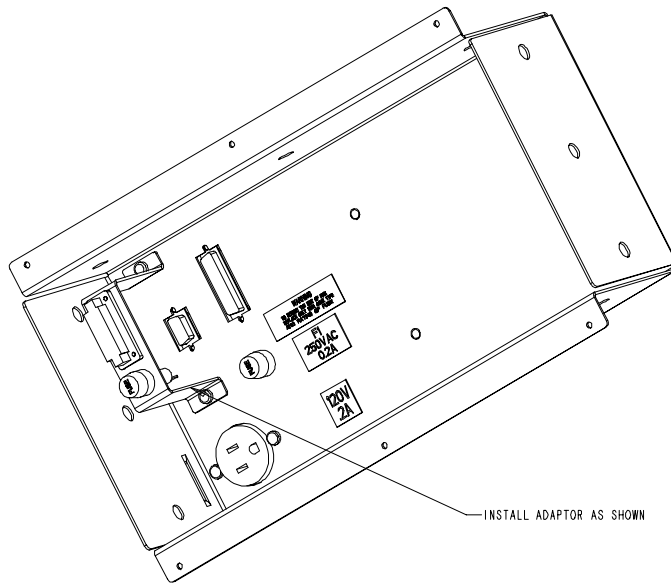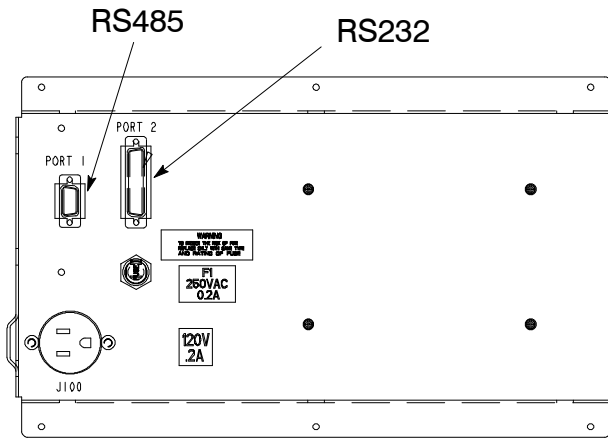
DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**	
DRAWING NO:	164201244−2	SHEET: 3 of 8
REVISION: A	DATE: 051599	

Table L. Output/Inverter Section Customer Interface Inputs and Outputs		
CUSTJ4 Terminal	Name	Description
1	BLDG ALARM 1	Programmable UPS alarm. Activated by a remote dry contact closure.
2	BLDG ALARM 1 RTN	
3	BLDG ALARM 2	Programmable UPS alarm. Activated by a remote dry contact closure.
4	BLDG ALARM 2 RTN	
5	BLDG ALARM 3	Programmable UPS alarm. Activated by a remote dry contact closure.
6	BLDG ALARM 3 RTN	
7	BLDG ALARM 4	Programmable UPS alarm. Activated by a remote dry contact closure.
8	BLDG ALARM 4 RTN	
9	NOT USED	
10	NOT USED	
CUSTJ2 Terminal		
1	RELAY 1 NC	General purpose NO and NC relay contacts.
2	RELAY RTN	
3	RELAY 1 NO	
4	NOT USED	
5	NOT USED	
6	RELAY 2 NC	General purpose NO and NC relay contacts.
7	RELAY RTN	
8	RELAY 2 NO	
9	NOT USED	
10	NOT USED	
CUSTTB Terminal		
1	CB3−AUX #2	Circuit Breaker CB3 Auxiliary Contact.
2	CB3−AUX #2	
3	NOT USED	
4	REMOTE TO BYPASS	Dry contact used to activate remote transfer to bypass.
5	REMOTE TO BYPASS	
6	REMOTE TO UPS	Dry contact used to activate remote transfer to UPS.
7	REMOTE TO UPS	
8	NOT USED	
9	REMOTE EPO	Dry contact used to activate remote EPO of UPS.
10	REMOTE EPO RTN	

DESCRIPTION:	CUSTOMER INTERFACE WIRING INSTALLATION NOTES	
DRAWING NO: 164201244−2		SHEET: 4 of 8
REVISION: A	DATE: 051599	

OUTPUT/INVERTER SECTION−PCM 2
CUSTOMER INTERFACE

INVERTER I/O BOARD
(USED ONLY IN MULTI-MODULE
APPLICATIONS USING AN SBM)

CUSTJ4

BUILDING ALARM #1
BUILDING ALARM #1−RETURN
BUILDING ALARM #2
BUILDING ALARM #2−RETURN
BUILDING ALARM #3
BUILDING ALARM #3−RETURN
BUILDING ALARM #4
BUILDING ALARM #4−RETURN

1

10 J4

J3

RELAY #1 NC
RELAY #1 RETURN
RELAY #1 NO
RELAY #2 NC
RELAY #2 RETURN
RELAY #2 NO

1

10 J2

J1

CUSTJ2

CUST TB

REMOTE EMERGENCY POWER OFF (REPO)
REMOTE EMERGENCY POWER OFF (REPO) COMMON

10

REMOTE TO UPS
REMOTE TO UPS
REMOTE TO BYPASS
REMOTE TO BYPASS

CB3−AUX #2
CB3−AUX #2

1

NOTE: *All building alarm inputs or remote features require an isolated normally open contact or switch (rated at 24 VDC, 20 mA minimum) connected between the alarm input and common terminal as shown. All control wiring and relay and switch contacts are customer provided.*
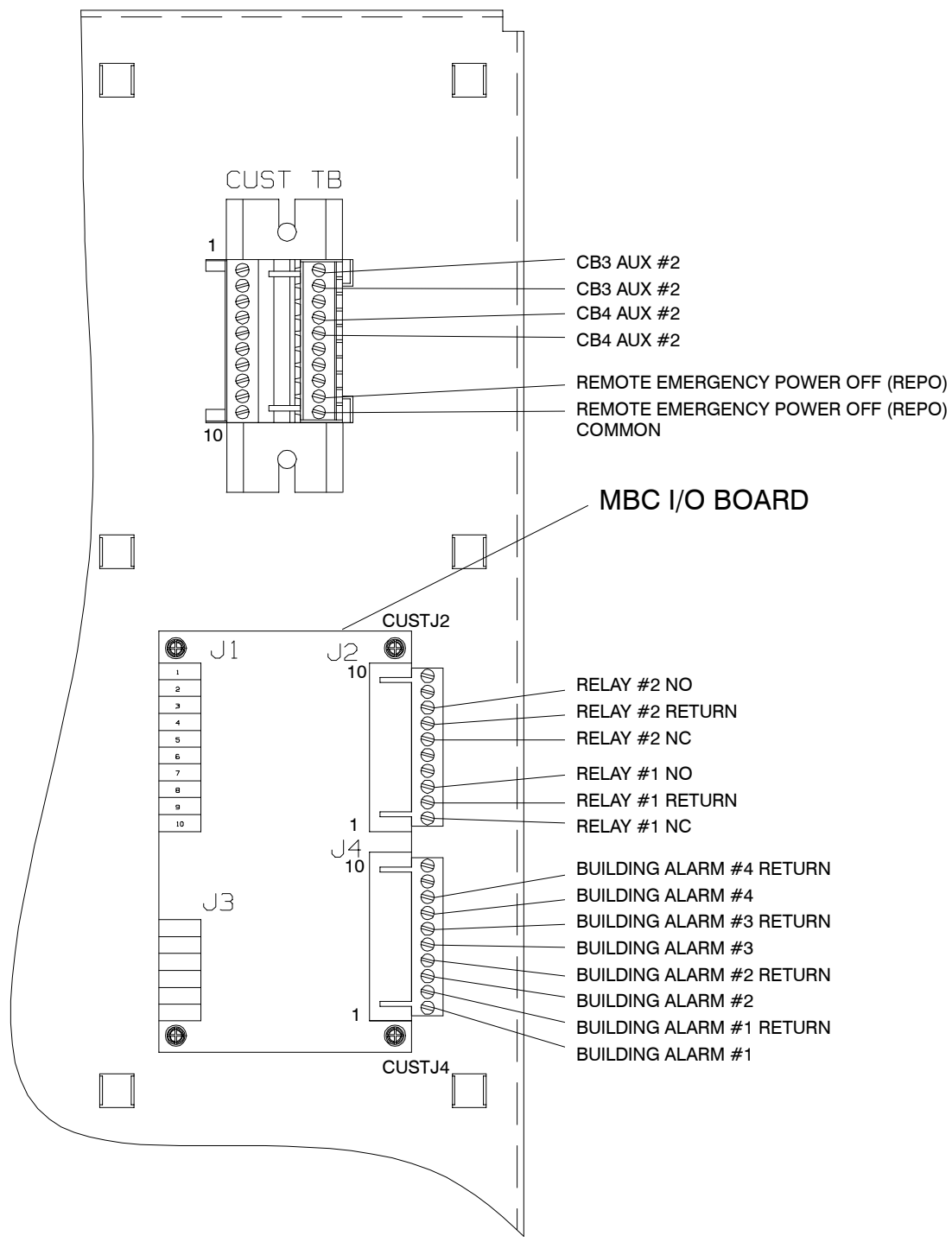
NOTE: *Regardless of assignment, alarms display as Building Alarm 1, Building Alarm 2, etc., on Monitor Panel. Use twisted pair wires for each alarm input and common.*

DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**	
DRAWING NO: 164201244−2		SHEET: 5 of 8
REVISION: A	DATE: 051599	

	Table M. MBC Section Customer Interface Inputs and Outputs	
CUSTJ4 Terminal	Name	Description
1	BLDG ALARM 1	Programmable UPS alarm. Activated by a remote dry contact closure.
2	BLDG ALARM 1 RTN	
3	BLDG ALARM 2	Programmable UPS alarm. Activated by a remote dry contact closure.
4	BLDG ALARM 2 RTN	
5	BLDG ALARM 3	Programmable UPS alarm. Activated by a remote dry contact closure.
6	BLDG ALARM 3 RTN	
7	BLDG ALARM 4	Programmable UPS alarm. Activated by a remote dry contact closure.
8	BLDG ALARM 4 RTN	
9	NOT USED	
10	NOT USED	
CUSTJ2 Terminal		
1	RELAY 1 NC	General purpose NO and NC relay contacts.
2	RELAY RTN	
3	RELAY 1 NO	
4	NOT USED	
5	NOT USED	
6	RELAY 2 NC	General purpose NO and NC relay contacts.
7	RELAY RTN	
8	RELAY 2 NO	
9	NOT USED	
10	NOT USED	
CUSTTB Terminal		
1	CB3−AUX #2	Circuit Breaker CB3 Auxiliary Contact.
2	CB3−AUX #2	
3	NOT USED	
4	CB4−AUX #2	Circuit Breaker CB4 Auxiliary Contact.
5	CB4−AUX #2	
6	NOT USED	
7	NOT USED	
8	NOT USED	
9	REMOTE EPO	Dry contact used to activate remote EPO of UPS.
10	REMOTE EPO RTN	

DESCRIPTION:	CUSTOMER INTERFACE WIRING INSTALLATION NOTES	
DRAWING NO: 164201244−2		SHEET: 6 of 8
REVISION: A	DATE: 051599	

MBC CUSTOMER INTERFACE
(SINGLE MODULE SYSTEM ONLY)

CUST TB

1

CB3 AUX #2
CB3 AUX #2
CB4 AUX #2
CB4 AUX #2

REMOTE EMERGENCY POWER OFF (REPO)
REMOTE EMERGENCY POWER OFF (REPO)
COMMON

10

MBC I/O BOARD

CUSTJ2

J1   J2
10

RELAY #2 NO
RELAY #2 RETURN
RELAY #2 NC

RELAY #1 NO
RELAY #1 RETURN
RELAY #1 NC

J4
10

BUILDING ALARM #4 RETURN
BUILDING ALARM #4
BUILDING ALARM #3 RETURN
BUILDING ALARM #3
BUILDING ALARM #2 RETURN
BUILDING ALARM #2
BUILDING ALARM #1 RETURN
BUILDING ALARM #1

J3

1

CUSTJ4

DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**		
DRAWING NO:	164201244–2	SHEET:	7 of 8
REVISION: A	DATE: 051599		

Table N. Summary Alarm Relay Contacts

	8	
RELAY 2 ●	7	
	6	
	3	
RELAY 1 ●	2	
	1	

CONTACT RATING:		
Maximum Switched Voltage	32 VAC	42 VDC
Maximum Carrying Current	1A	
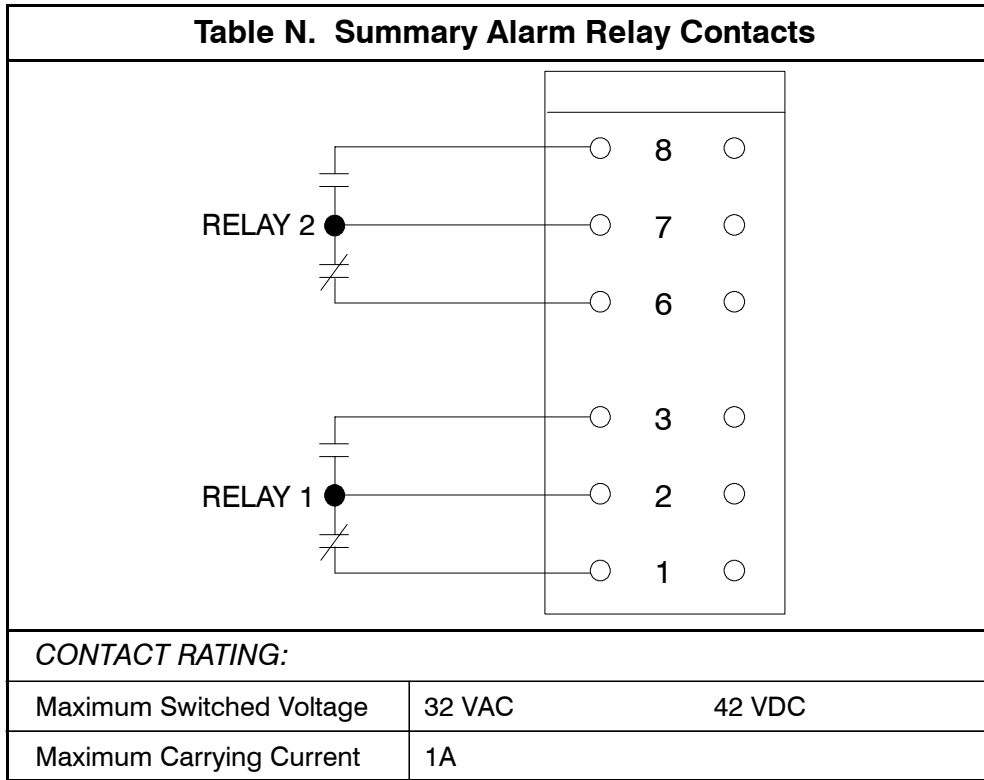
3. The Remote EPO feature opens all breakers and contactors in the UPS cabinet and isolates power from your critical load. Local electrical codes may also require tripping upstream protective devices to the UPS.

Table O. Remote EPO

REMOTE EPO SWITCH

CUSTTB

9

10

TWISTED WIRES (2)

Remote EPO switch rating is 24 VDC.
10 Amp minimum if supplied by user.

NOTE: This switch must be a dedicated switch not tied into any other circuits.
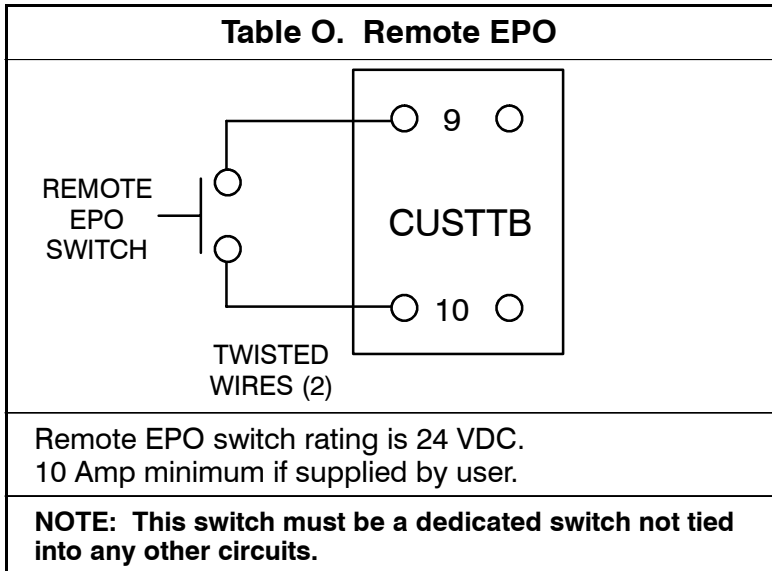
DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**	
DRAWING NO: 164201244−2		SHEET: 8 of 8
REVISION: A	DATE: 051599	

1. The UPS equipment operating environment must meet the size and weight requirements shown in Table P, according to your UPS system configuration:

2. In the UPS system, the Input/Rectifier, Output/Inverter, and Module Bypass or System Bypass Module (SBM) cabinets are crated separately for shipping.

3. Do not tilt cabinets more than $\pm 10°$ during handling.

4. Dimensions are in millimeters (inches).

Table P. Equipment Weight		
Component	Weight Kg (lb)	
	Shipping	Installed
Power Control Module 1 (Input/Rectifier)	2818 (6200)	2682 (5900)
Power Control Module 2 (Output/Inverter)	2909 (6400)	2773 (6100)
Power Control Module 3 (Module Bypass)	272.7 (600)	250 (550)

5. The basic environmental requirements for operation of the UPS system are:

   Ambient Temperature Range: $0-40°C$ ($32-104°F$)

   **Recommended Operating Range:** $20-25°C$ ($68-77°F$)

   Maximum Relative Humidity: 95%

The UPS ventilation requirements are shown in Table Q.

Table Q. Air Conditioning or Ventilation Requirements During Full Load Operation		
Ratings	Input/Output Voltage	Heat Rejection* BTU/hr $\times$ 1000/hr (Kg$-$cal/hr)
Powerware 9315 (500 kVA$-$750 kVA)		
500 KVA	400/400	109 (27.5)
625 KVA	400/400	130.8 (33)
625 KVA	480/480, 600/600	109 (27.5)
750 KVA	480/480, 600/600	130.8 (33)

6. Recommended minimum clearance over the UPS module is 304.8 mm (12 in.). Required for cooling air exhaust: approximately 1420 liter/sec (3000 cfm).

DESCRIPTION:	**PHYSICAL FEATURES AND REQUIREMENTS**	
DRAWING NO:	164201244$-$3	SHEET: 1 of 1
REVISION: A	DATE: 051599	

MODULE
BYPASS
CABINET

OUTPUT
INVERTER
CABINET

INPUT
RECTIFIER
CABINET
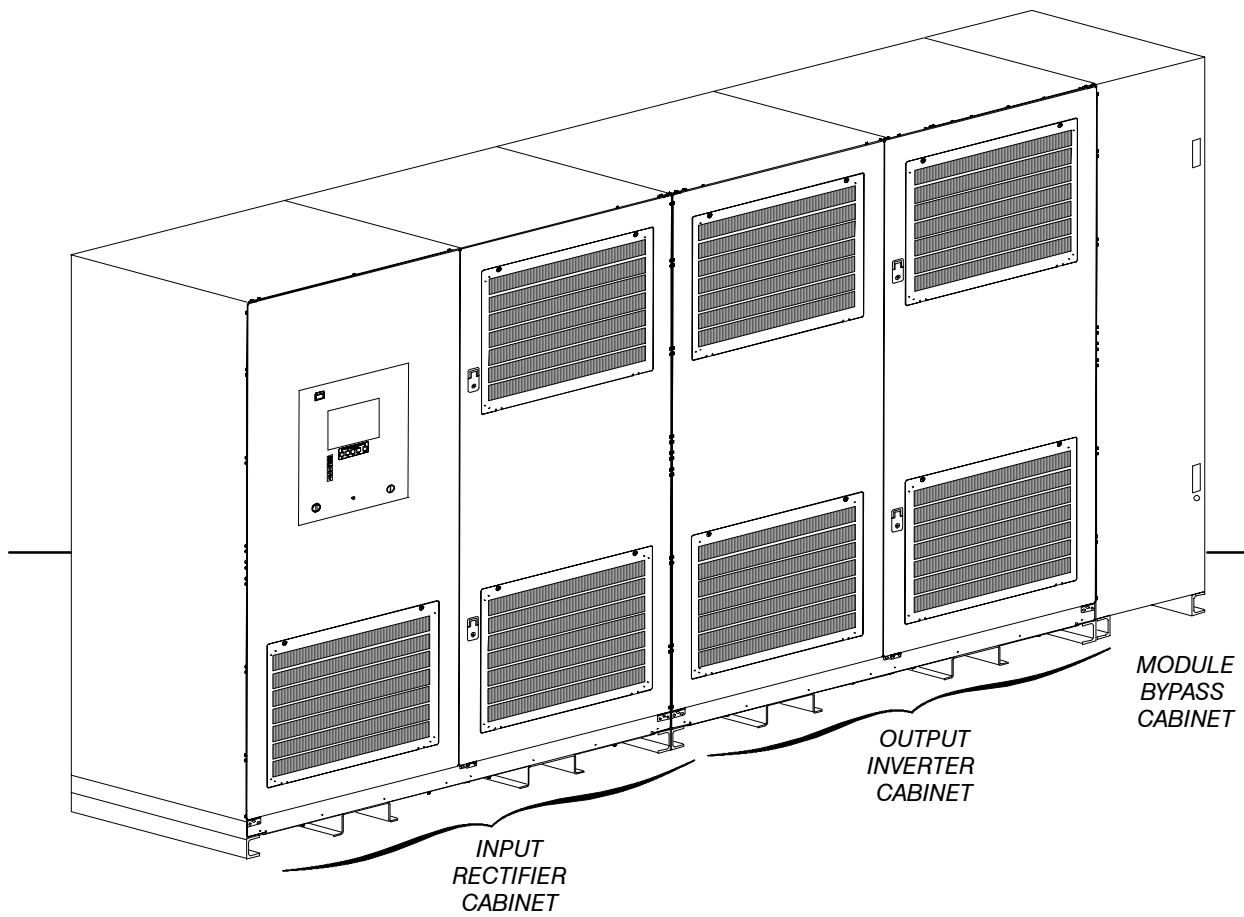
DESCRIPTION:	**TYPICAL UPS SYSTEM**		
DRAWING NO:	164201244−4	SHEET:	1 of 1
REVISION: A		DATE: 051599	

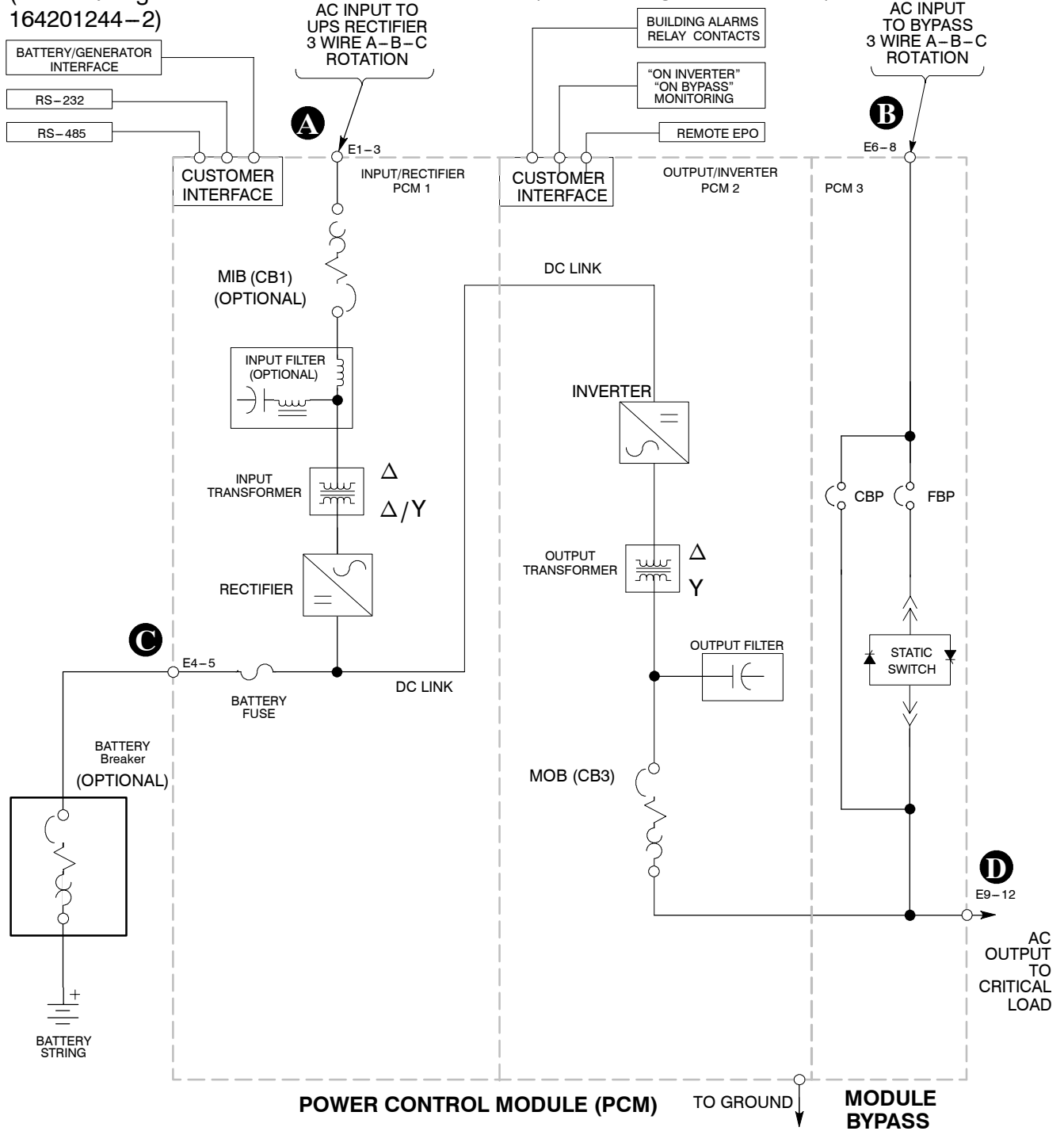| Table R. UPS System Oneline Configurations			
Oneline Drawing 164201244-6	Powerware Model	Vin / Vout	System Type
Sheet 1	9315-625/500	400/400	Single Module - Reverse Transfer
	9315-625/625		
	9315-750/625	480/480	
	9315-750/750		
	9315-750/625	600/600	
	9315-750/750		
Sheet 2	9315-625/500	400/400	Multi-module - Parallel Capacity/Redundant
	9315-625/625		
	9315-750/625	480/480	
	9315-750/750		
	9315-750/625	600/600	
	9315-750/750		

NOTE 1: *A bypass neutral feeder must be supplied when the output neutral is used. If no bypass neutral feeder is supplied, the output neutral of the UPS is to be connected to chassis ground.*

NOTE 2: *Output Voltage must match Bypass Input Voltage.*

DESCRIPTION: UPS SYSTEM ONELINE CONFIGURATIONS		
DRAWING NO: 164201244-5		SHEET: 1 of 1
REVISION: A	DATE: 051599	

(See Drawing 164201244−2)

AC INPUT TO UPS RECTIFIER 3 WIRE A−B−C ROTATION

BATTERY/GENERATOR INTERFACE

RS−232

RS−485

BUILDING ALARMS RELAY CONTACTS

"ON INVERTER" "ON BYPASS" MONITORING

REMOTE EPO

AC INPUT TO BYPASS 3 WIRE A−B−C ROTATION

A

E1−3

INPUT/RECTIFIER PCM 1

CUSTOMER INTERFACE

CUSTOMER INTERFACE

OUTPUT/INVERTER PCM 2

PCM 3

B

E6−8

MIB (CB1) (OPTIONAL)

DC LINK

INPUT FILTER (OPTIONAL)

INVERTER

CBP   FBP

INPUT TRANSFORMER

Δ

Δ/Y

OUTPUT TRANSFORMER

Δ

Y

RECTIFIER

STATIC SWITCH

C

E4−5

DC LINK

OUTPUT FILTER

BATTERY FUSE

DC LINK

BATTERY Breaker (OPTIONAL)

MOB (CB3)

D

E9−12

BATTERY STRING

AC OUTPUT TO CRITICAL LOAD

POWER CONTROL MODULE (PCM)

TO GROUND

MODULE BYPASS
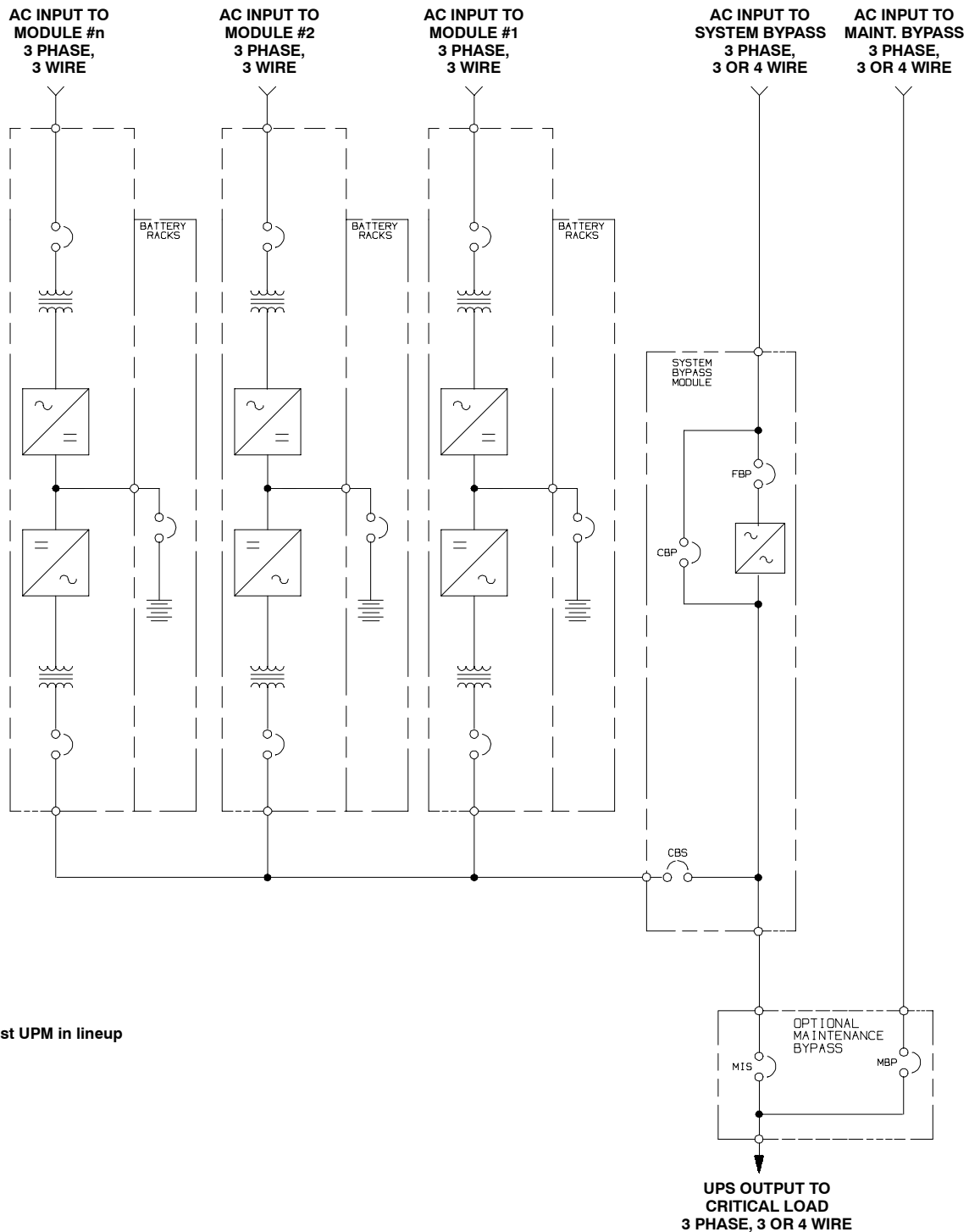
SINGLE MODULE UPS SYSTEM (480/480 AND 600/600 VOLT INPUT/OUTPUT)

NOTE 1: *A bypass neutral feeder must be supplied when the output neutral is used. If no bypass neutral feeder is supplied, the output neutral of the UPS is to be connected to ground.*

DESCRIPTION:	**ONELINE DRAWINGS OF UPS SYSTEM**	
DRAWING NO:	164201244−6	SHEET: 1 of 2
REVISION: A	DATE: 051599	

AC INPUT TO
MODULE #n
3 PHASE,
3 WIRE

AC INPUT TO
MODULE #2
3 PHASE,
3 WIRE

AC INPUT TO
MODULE #1
3 PHASE,
3 WIRE

AC INPUT TO
SYSTEM BYPASS
3 PHASE,
3 OR 4 WIRE

AC INPUT TO
MAINT. BYPASS
3 PHASE,
3 OR 4 WIRE

BATTERY
RACKS

BATTERY
RACKS

BATTERY
RACKS

SYSTEM
BYPASS
MODULE

FBP

CBP

CBS

n = last UPM in lineup

OPTIONAL
MAINTENANCE
BYPASS

MIS

MBP

UPS OUTPUT TO
CRITICAL LOAD
3 PHASE, 3 OR 4 WIRE

MULTI MODULE UPS SYSTEM WITH POWERWARE HOT SYNC−CAPACITY
MODULE (480/480 AND 600/600 VOLT INPUT/OUTPUT)

NOTE 1: *A bypass neutral feeder must be supplied
when the output neutral is used. If no
bypass neutral feeder is supplied, the
output neutral of the UPMs are to be
connected to chassis ground.*

DESCRIPTION:	ONELINE DRAWINGS OF UPS SYSTEM	
DRAWING NO:	164201244−6	SHEET: 2 of 2
REVISION: A	DATE: 051599	

INPUT/RECTIFIER SECTION – PCM 1

CUSTOMER
INTERFACE
BATTERY
I/O BOARD

AC INPUT TO
UPS RECTIFIER
(E1, E2, E3)
(A, B, C)

DC INPUT
FROM BATTERY
TO UPS
(E4, E5)

CUSTOMER
INTERFACE
TERMINAL
BOARD
(CB2TB)

RECTA

RECTB

T4

H2   H3

E4A

H1   H4

DCCTA2   DCCTB2

RECTIFIER DC
LINK OUTPUT
TO INVERTER

CB2TB

BATTERY
I/O

LA1   C3

CB1

CPT2

A60

INPUT
BREAKER CB1

15 PIN INTER-
CABINET
CONNECTION
ON PIGTAIL
HARNESS
TO OUTPUT/
INVERTER
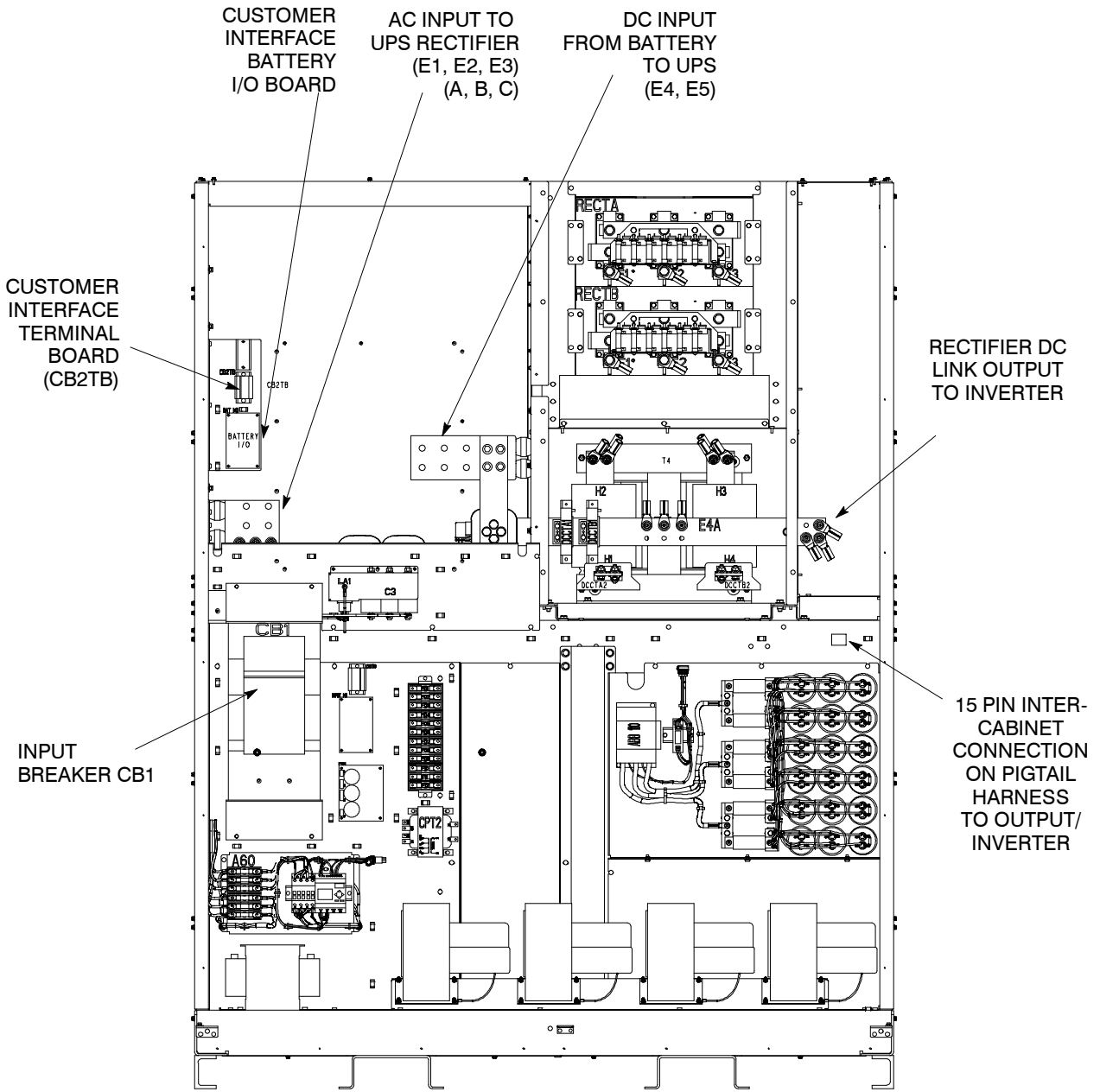
FRONT VIEW

NOTE: METAL SHIELD COVERING
BATTERY CUSTOMER INTERFACE
MUST BE REMOVED TO GAIN ACCESS
TO WIRING TERMINALS

DESCRIPTION:	**LOCATION OF UPS TERMINALS**	
DRAWING NO:	164201244–7	SHEET: 1 of 6
REVISION: A	DATE: 051599	

INPUT/RECTIFIER SECTION−PCM 1

FRONT

CUSTOMER
ACCESS
PANEL

E4
(POS)

E5
(NEG)

} DC Source Input

E1
(∅A)

E2
(∅B)

E3
(∅C)

GND

} AC Source Input

REAR

LEFT SIDE
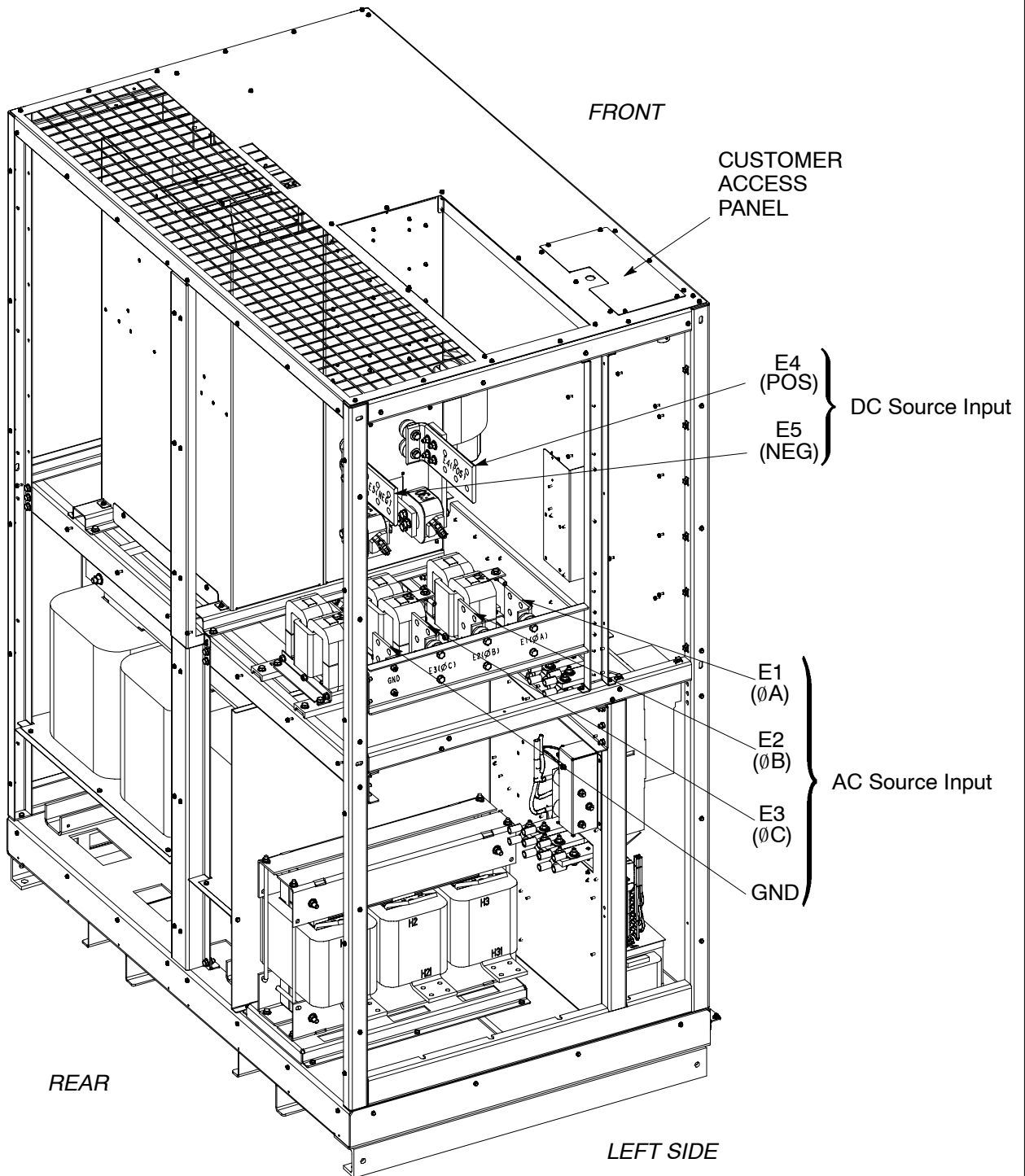
DESCRIPTION:	**LOCATION OF UPS TERMINALS**	
DRAWING NO:	164201244−7	SHEET: 2 of 6
REVISION: A	DATE: 051599	

OUTPUT/INVERTER SECTION – PCM 2

CUSTOMER INTERFACE TERMINAL BOARD (CUSTTB)

POSITIVE DC INPUT FROM RECTIFIER DC LINK (See next view)

CUSTOMER INTERFACE CAN A

CUSTOMER INTERFACE CAN B

CUSTOMER INTERFACE BUILDING ALARM AND RELAY CONTROL 1 AND 2 (USED FOR SBM WIRING ONLY)

15 PIN INTERCABINET CONNECTION ON PIGTAIL HARNESS TO MBC

NEGATIVE DC INPUT FROM RECTIFIER DC LINK (See next view)

GROUND

AC OUTPUT TO MBC OR SBM (E9, E10, E11)

E9 E10 E11 E12

OUTPUT NEUTRAL CONNECTION (E12)

CB3

OUTPUT BREAKER CB3 (OPTIONAL)

15 PIN INTER-CABINET CONNECTION ON PIGTAIL HARNESS TO INPUT/ RECTIFIER CABINET

OUTPUT CAPS

FRONT VIEW

NOTE: CLEAR SHIELD OVER INVERTER INPUTS AND OUTPUTS MUST BE REMOVED TO GAIN ACCESS TO WIRING TERMINALS

DESCRIPTION:	**LOCATION OF UPS TERMINALS**	
DRAWING NO:	164201244–7	SHEET: 3 of 6
REVISION: A	DATE: 051599	
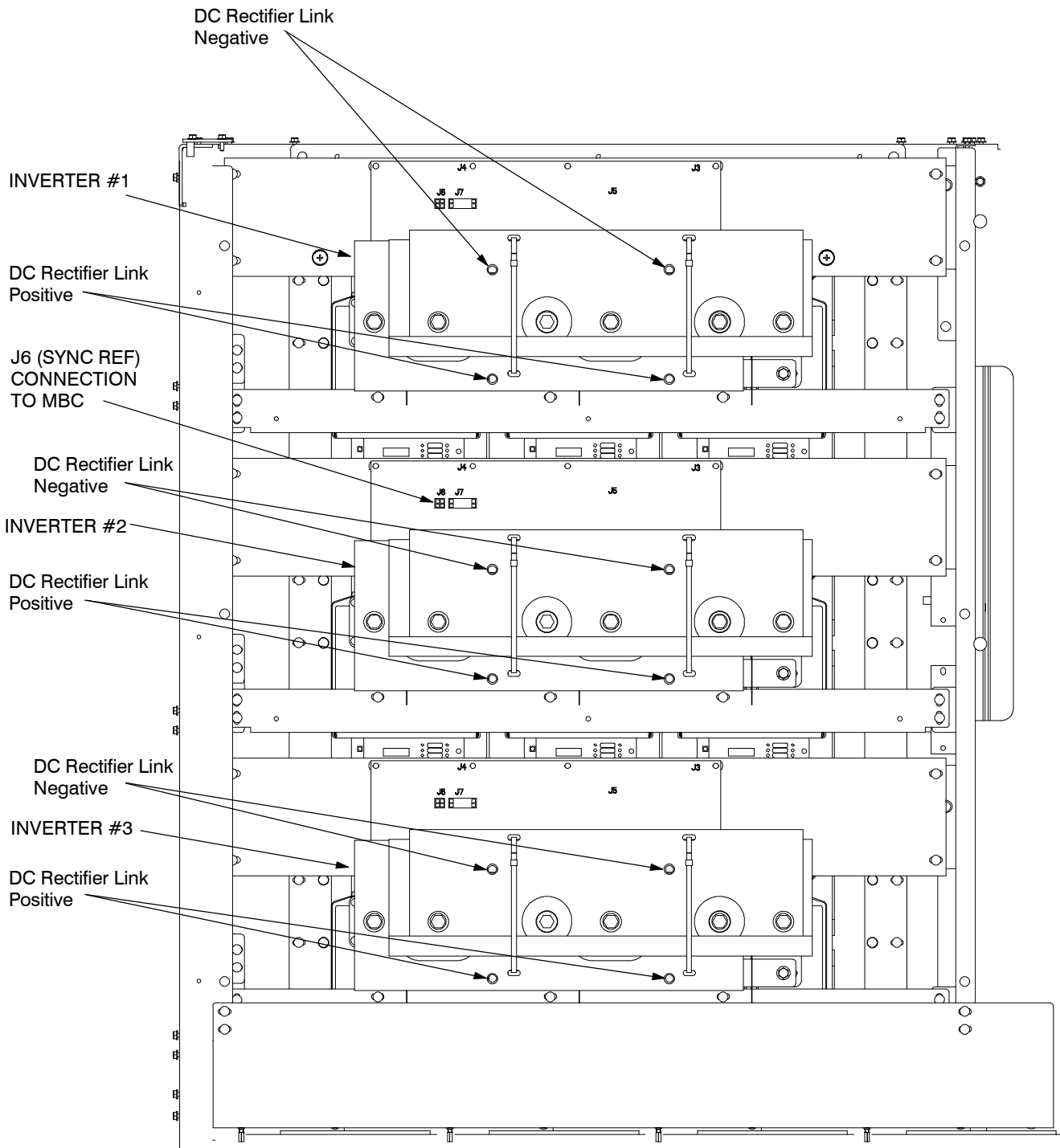
OUTPUT/INVERTER SECTION–PCM 2

DC Rectifier Link
Negative

INVERTER #1

DC Rectifier Link
Positive

J6 (SYNC REF)
CONNECTION
TO MBC

DC Rectifier Link
Negative

INVERTER #2

DC Rectifier Link
Positive

DC Rectifier Link
Negative

INVERTER #3

DC Rectifier Link
Positive

NOTE: CLEAR SHIELD OVER INVERTER
INPUTS AND OUTPUTS MUST BE
REMOVED TO GAIN ACCESS TO
WIRING TERMINALS

DESCRIPTION:	**LOCATION OF UPS TERMINALS**		
DRAWING NO:	164201244–7	SHEET:	4 of 6
REVISION: A		DATE: 051599	

MODULE BYPASS-LEFT AND FRONT

GROUND
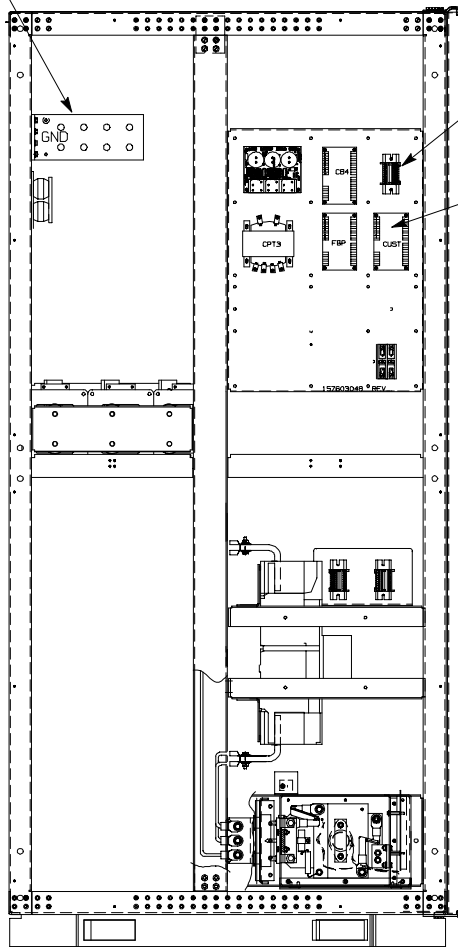
OUTPUT
NEUTRAL
CONNECTION
(E12)

CUSTOMER
TERMINAL
BOARD
(CUSTTB)

CUSTOMER
INTERFACE

AC INPUT
TO BYPASS
(E6, E7, E8)
(A, B, C)

AC INPUT
FROM
INVERTER
(Top two
terminal holes
only)

AC OUTPUT
(E9, E10, E11)
(A, B, C)

BACKFEED
PROTECTION
BREAKER

SYSTEM
BYPASS
BREAKER

STATIC
SWITCH

LEFT SIDE

FRONT

DESCRIPTION:	**LOCATION OF UPS TERMINALS**		
DRAWING NO:	164201244−7	SHEET:	5 of 6
REVISION: A		DATE: 051599	

MODULE BYPASS – TOP AND BUS BARS

AC Input from
Inverter Cabinet

AC Output
to Load

AC Input
to Bypass

E11

E10

E9

E8

E7

E6
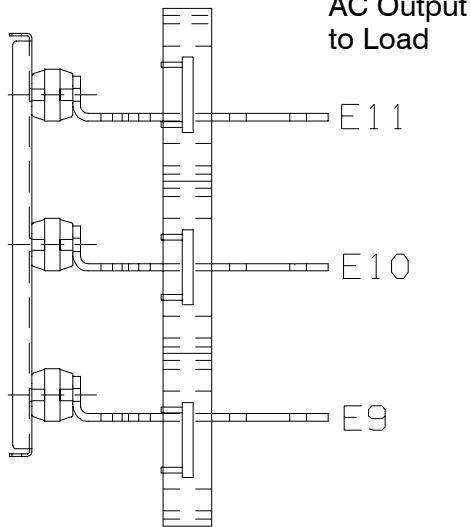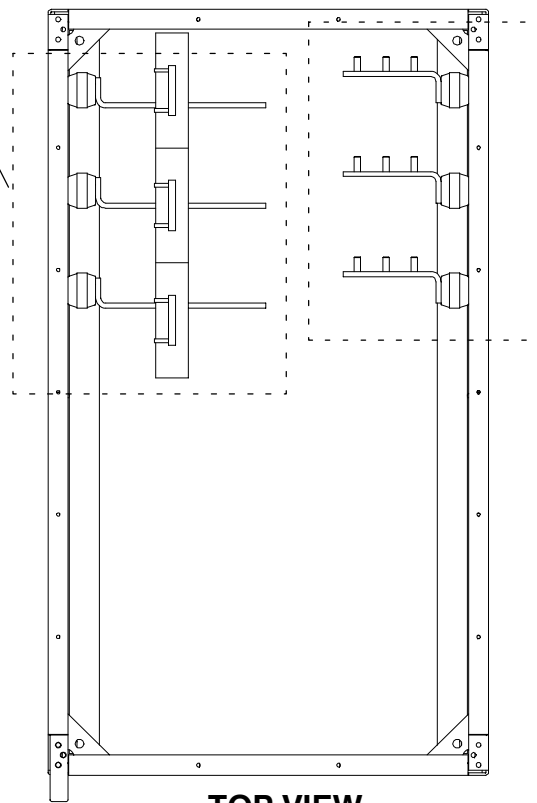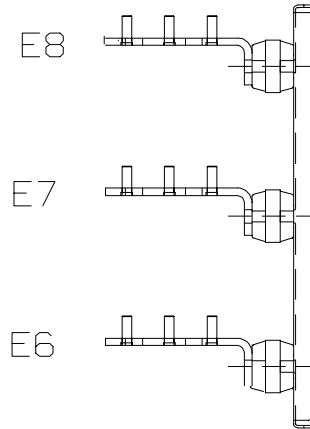
TOP VIEW

DESCRIPTION:	LOCATION OF UPS TERMINALS	
DRAWING NO:	164201244 – 7	SHEET: 6 of 6
REVISION: A	DATE: 051599	
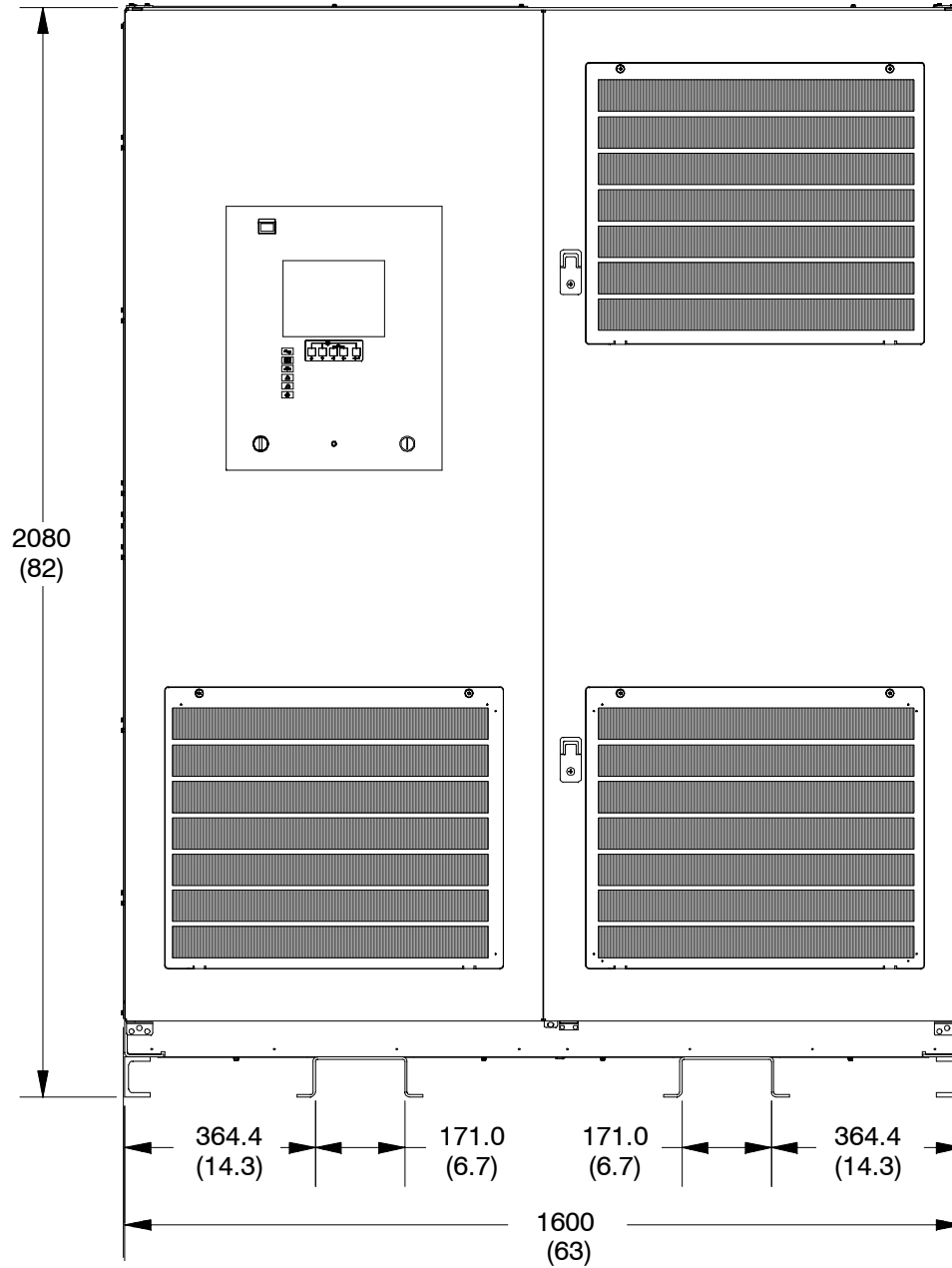
INPUT/RECTIFIER SECTION – PCM 1

2080
(82)

364.4
(14.3)

171.0
(6.7)

171.0
(6.7)

364.4
(14.3)

1600
(63)

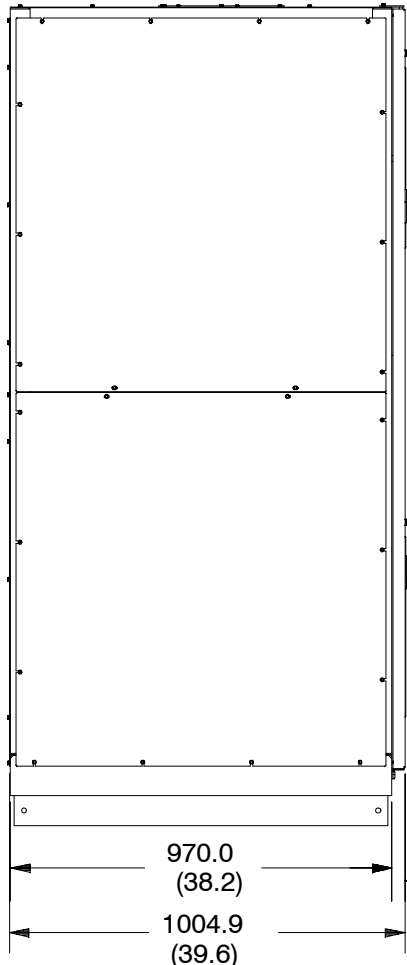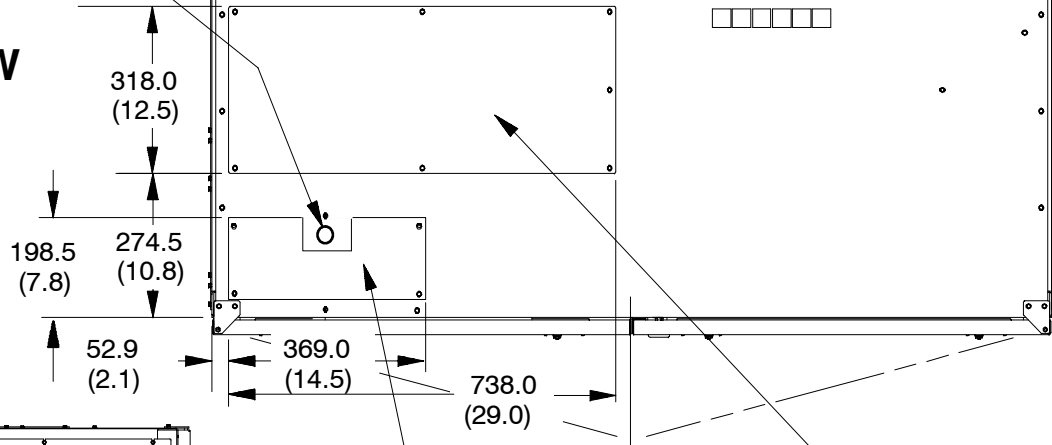| DESCRIPTION:	**UPS CABINET DIMENSIONS**		
DRAWING NO:	164201244–8	SHEET:	1 of 6
REVISION: A		DATE: 051599	

Dimensions are in millimeters and (inches)

INPUT/RECTIFIER SECTION−PCM 1

Remove debris shield
covering exhaust grill before
operating system.
(Shield not shown for clarity).

1/2 KNOCKOUT FOR
CUSTOMER INTERFACE
PANEL CONDUIT

CABINET 1 EXHAUST

TOP VIEW

318.0
(12.5)

198.5
(7.8)

274.5
(10.8)

52.9
(2.1)

369.0
(14.5)

738.0
(29.0)

CUSTOMER INTERFACE
PANEL ACCESS

CONDUIT ENTRY AREA FOR
CONTROL WIRE CONNECTIONS.
AC INPUT AND DC INPUT
(REMOVE PANEL TO DRILL OR
PUNCH CONDUIT HOLES.)

970.0
(38.2)

33.0
(1.3)

1004.9
(39.6)

LEFT VIEW

Dimensions are in millimeters and (inches)

DESCRIPTION:	**UPS CABINET DIMENSIONS**	
DRAWING NO: 164201244−8		SHEET: 2 of 6
REVISION: D	DATE: 030101	

OUTPUT/INVERTER SECTION – PCM 2
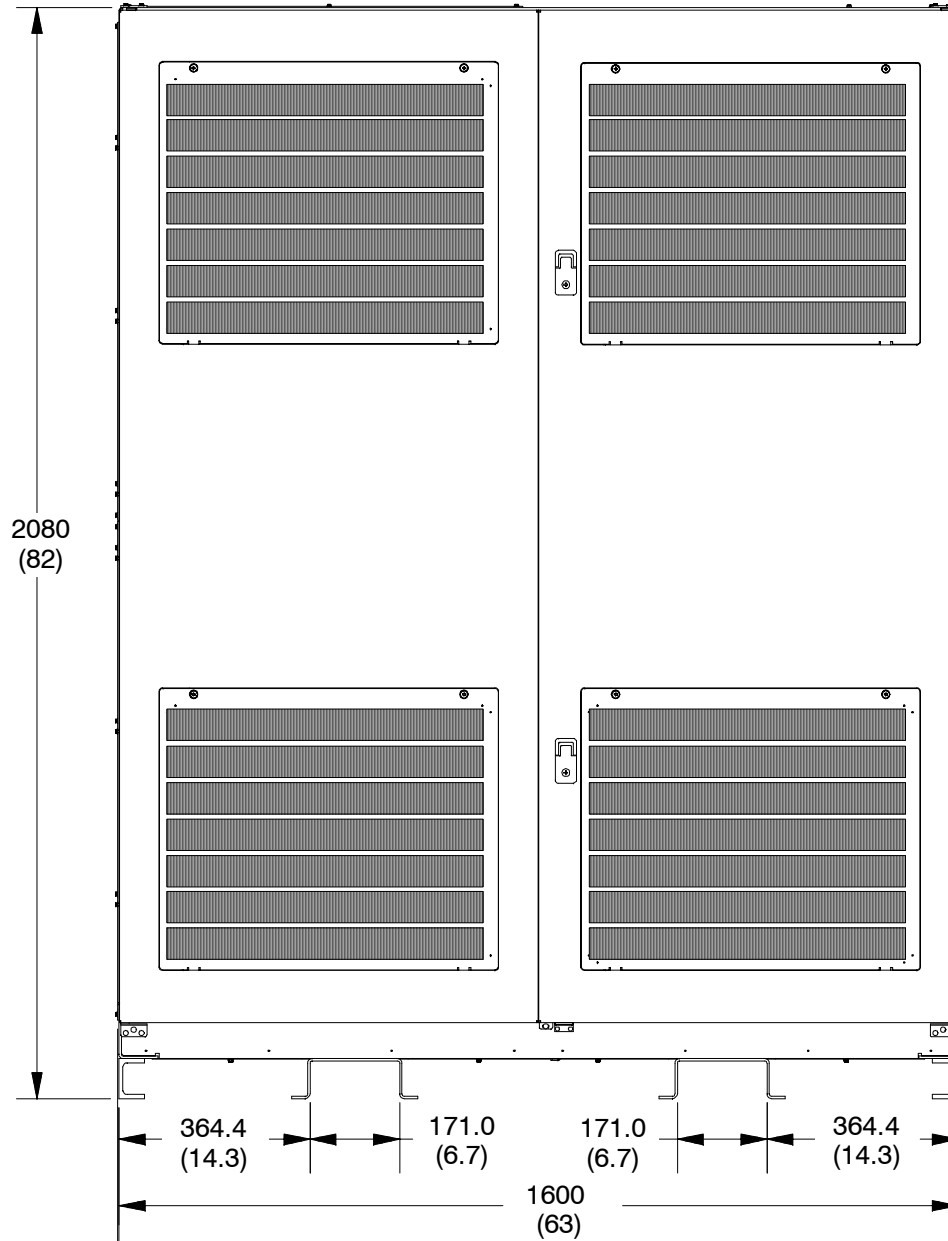
2080
(82)

364.4
(14.3)

171.0
(6.7)

171.0
(6.7)

364.4
(14.3)

1600
(63)

Dimensions are in millimeters and (inches)

DESCRIPTION:	**UPS CABINET DIMENSIONS**		
DRAWING NO:	164201244–8	SHEET:	3 of 6
REVISION: A		DATE: 051599	

OUTPUT/INVERTER SECTION – PCM 2

Remove debris shield covering exhaust grill before operating system. (Shield not shown for clarity).

CABINET #2 EXHAUST

280.0
(11.0)

600.0
(23.6)

35.9
(1.4)

CONDUIT ENTRY AREA FOR CONTROL WIRE CONNECTIONS AND AC OUTPUT TO SBM (HOT SYNC – CAPACITY SYSTEM ONLY) (REMOVE PANEL TO DRILL OR PUNCH CONDUIT HOLES.)

TOP VIEW

970.0
(38.2)

33.0
(1.3)

1004.9
(39.6)
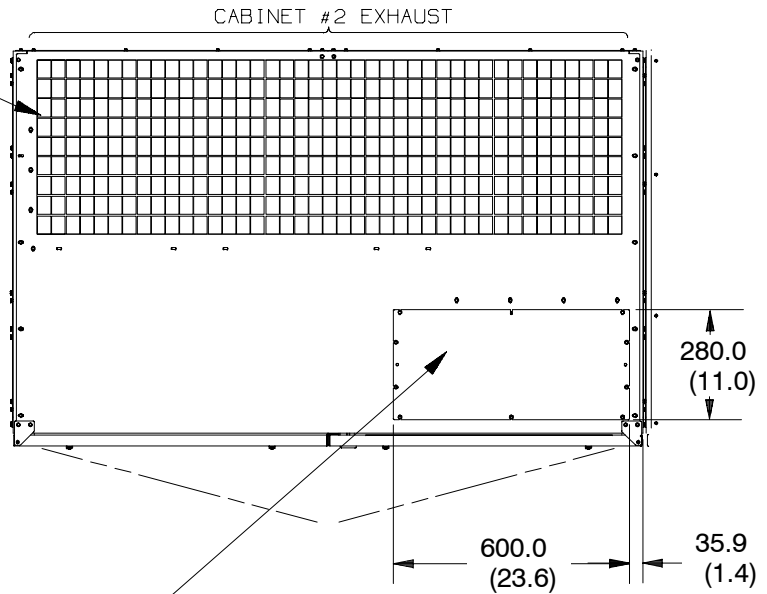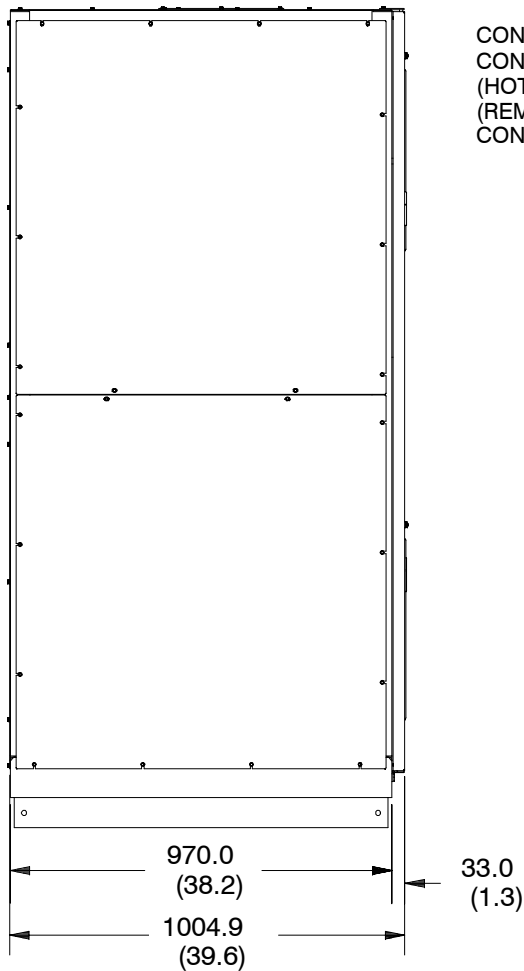
Dimensions are in millimeters and (inches)

LEFT VIEW

DESCRIPTION:	**UPS CABINET DIMENSIONS**		
DRAWING NO:	164201244 – 8	SHEET:	4 of 6
REVISION: D		DATE: 030101	

MODULE BYPASS—PCM 3
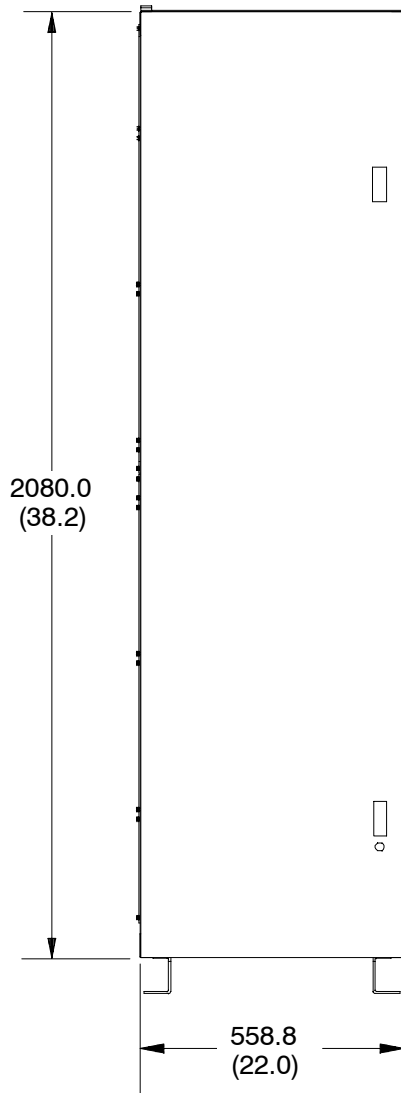
2080.0
(38.2)

558.8
(22.0)

FRONT VIEW

DESCRIPTION:	**UPS CABINET DIMENSIONS**		
DRAWING NO:	164201244−8	SHEET:	5 of 6
REVISION: A		DATE: 051599	

MODULE BYPASS–PCM 3

CONDUIT ENTRY AREA FOR CONTROL
WIRE CONNECTIONS, BYPASS INPUT,
AND AC OUTPUT TO CRITICAL LOAD
(REMOVE PANEL TO DRILL OR PUNCH
CONDUIT HOLES.)
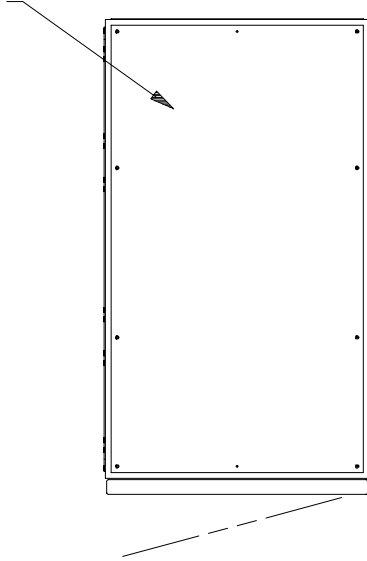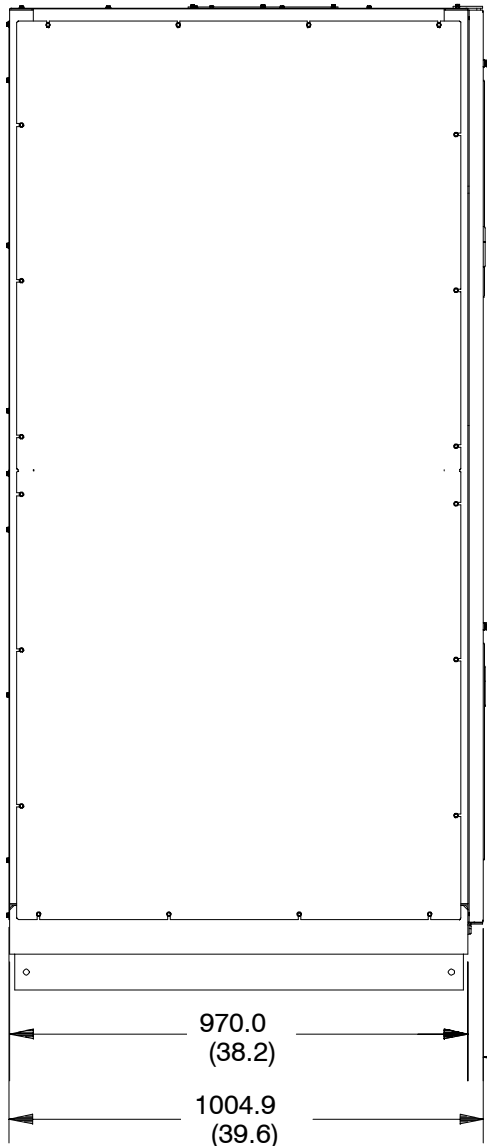
TOP VIEW

970.0
(38.2)

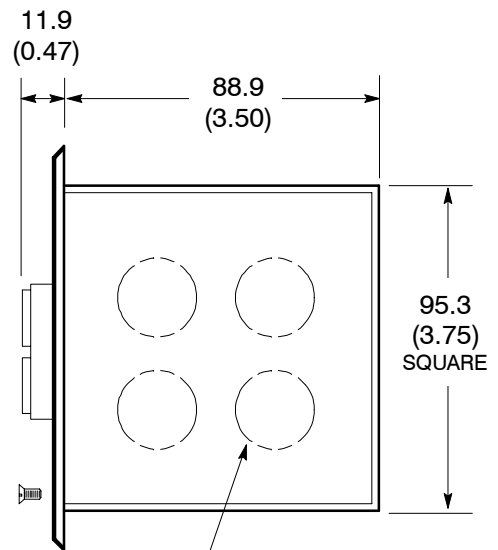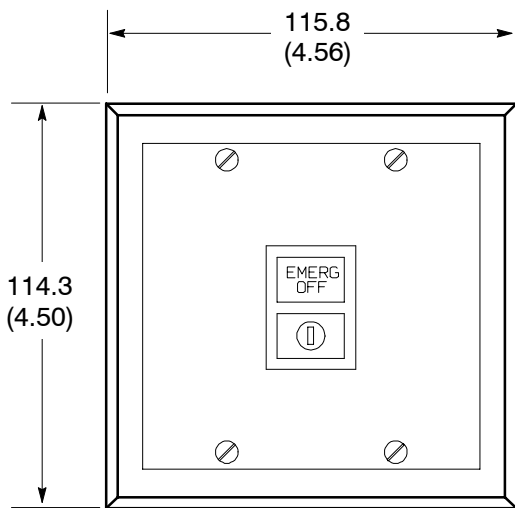33.0
(1.3)

1004.9
(39.6)

LEFT VIEW

Dimensions are in millimeters and (inches)

DESCRIPTION:	**UPS CABINET DIMENSIONS**	
DRAWING NO: 164201244–8		SHEET: 6 of 6
REVISION: A	DATE: 051599	

115.8
(4.56)

11.9
(0.47)

88.9
(3.50)

114.3
(4.50)

95.3
(3.75)
SQUARE

EMERG
OFF

Knockout pattern
typ. 5 sides

TB1
1 2 3 4 5 6 7

UNINTERRUPTIBLE POWER SYSTEM
EMERGENCY OFF

EMERG
OFF

TO UPS

TO OTHER
EQUIPMENT
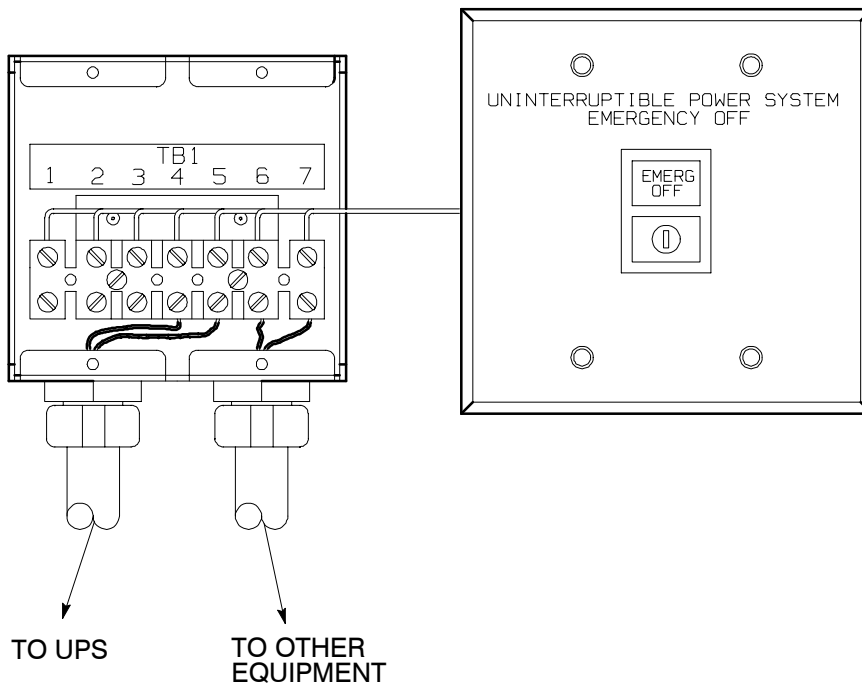
Dimensions are in millimeters and (inches)

DESCRIPTION:	**REMOTE EMERGENCY POWER OFF**		
DRAWING NO:	164201244−9	SHEET:	1 of 1
REVISION: A		DATE: 051599	

100.1
(3.94)

74.7
(2.94)

171.5
(6.75)

25.4
(1.00)

KNOCKOUTS PROVIDED
ON FIVE SURFACES

285.7
(11.25)

215.9
(8.50)

MAX. WIRE SIZE: NO. 14 AWG
MIN. WIRE SIZE: NO. 18 AWG

FLUSH MOUNT

.75

216.58
(8.50)

197.47
(7.75)

41.1
(1.62)

88.9
(3.50)

190.5
(7.50)

+BUNR
RDX
RDX *
+24VDC
RETURN

R1

TB1-1
TB1-2
TB1-3
TB1-4
TB1-5
TB1-6
TB1-7

SURFACE
MOUNT
(FOR HANGING)

CONDUIT AND WIRING SUPPLIED BY
CUSTOMER. MAX. DISTANCE BETWEEN
REMOTE MONITOR AND UPS NOT TO
EXCEED 500 FEET.

WIRES MUST
BE TWISTED
(14−18 gauge)

DESCRIPTION:	**REMOTE MONITOR PANEL**		
DRAWING NO:	164201244−10	SHEET:	1 of 1
REVISION: A		DATE: 051599	

Dimensions are in millimeters and (inches)

215.9
(8.5)

196.8
(7.75)

19.0
(.750)

28.6
(1.12)

FLUSH MOUNT

41.1
(1.62)

190.5
(7.50)

88.9
(3.50)

+BUNR
RDX
RDX *
+24VDC
RETURN

R1

TB1-1 TB1-2 TB1-3 TB1-4 TB1-5 TB1-6 TB1-7

Relay Interface Module

SURFACE
MOUNT
FOR HANGING

EXISTING
INTERNAL
WIRING

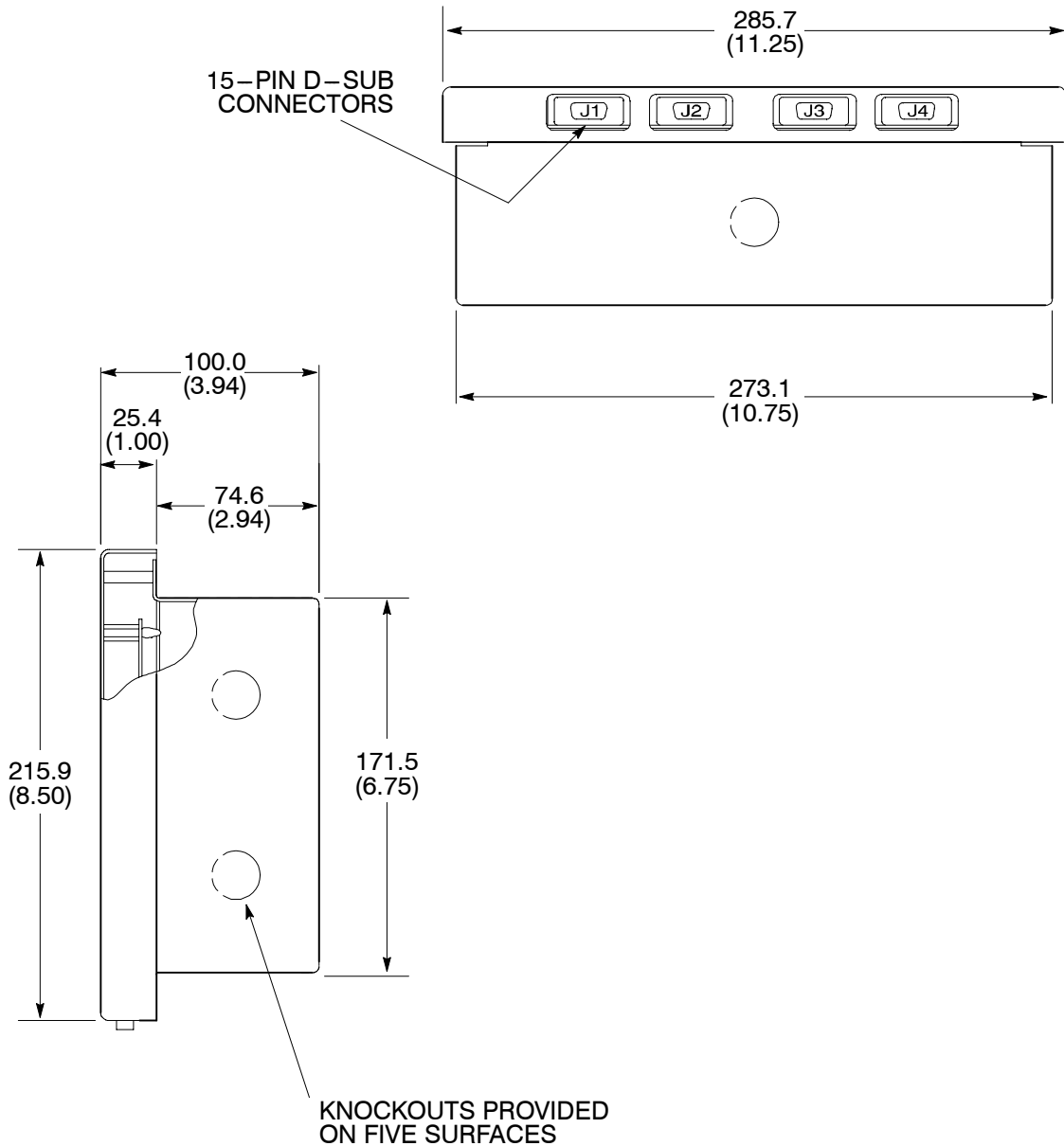CONTINUES AT UPS
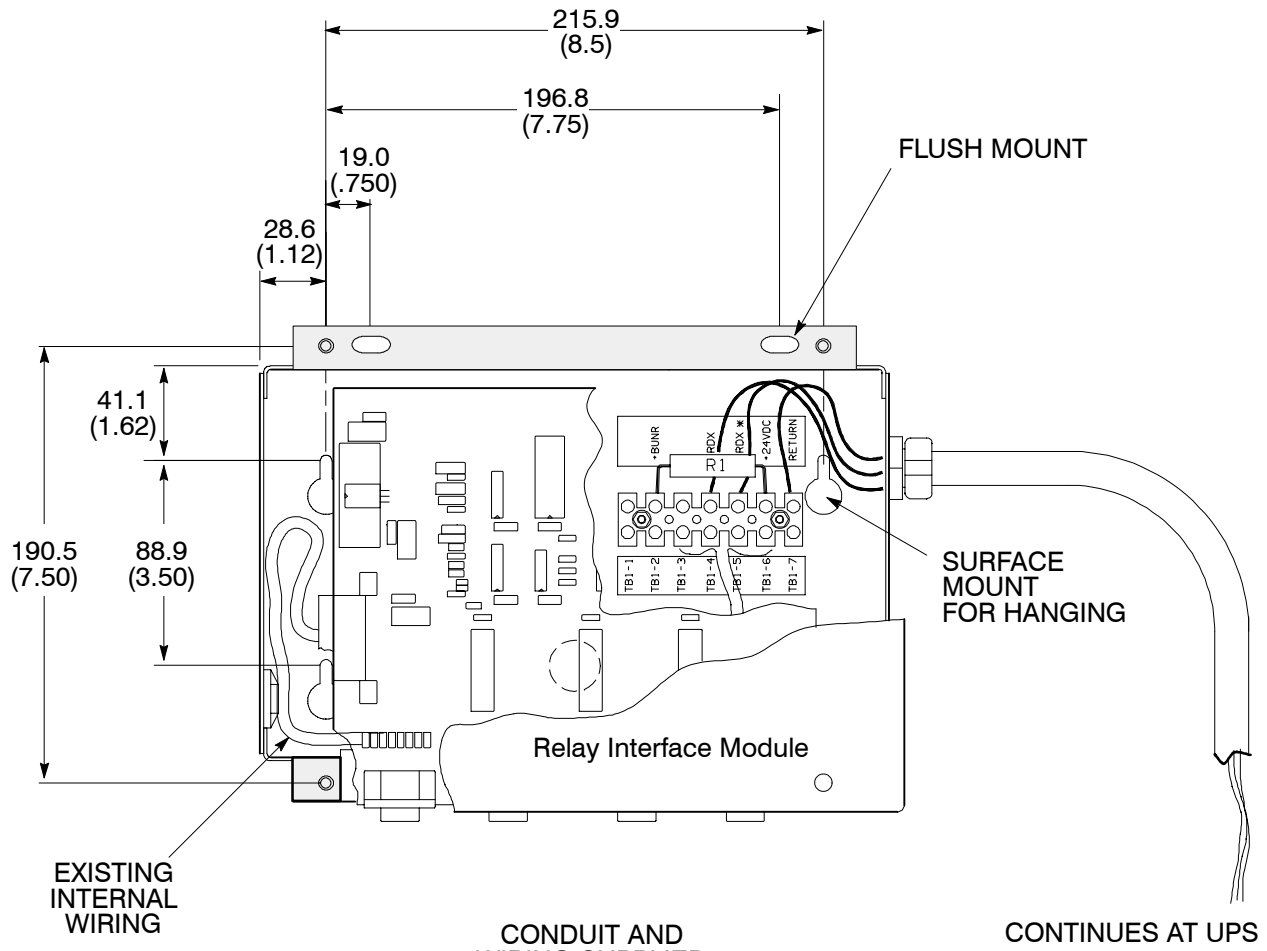
CONDUIT AND
WIRING SUPPLIED
BY CUSTOMER.
Maximum distance between
RIM and UPS not to exceed
500 feet. Wires must be twisted.
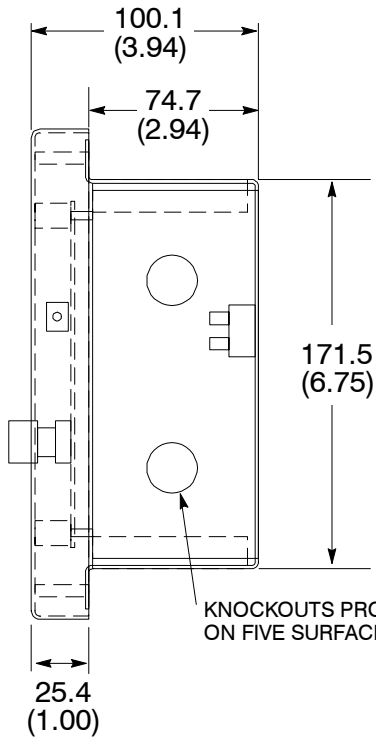MAX WIRE SIZE NO. 14 AWG.
MIN WIRE SIZE NO. 18 AWG.

DESCRIPTION:	**RELAY INTERFACE MODULE**		
DRAWING NO:	164201244-11	SHEET:	1 of 2
REVISION: A		DATE: 051599	

Dimensions are in millimeters and (inches)

285.7
(11.25)

15−PIN D−SUB
CONNECTORS

J1   J2   J3   J4

273.1
(10.75)

100.0
(3.94)

25.4
(1.00)

74.6
(2.94)

215.9
(8.50)

171.5
(6.75)

KNOCKOUTS PROVIDED
ON FIVE SURFACES

DESCRIPTION:	**RELAY INTERFACE MODULE**		
DRAWING NO:	164201244−11	SHEET:	2 of 2
REVISION: A		DATE: 051599	

Dimensions are in millimeters and (inches)

100.1
(3.94)

74.7
(2.94)

285.7
(11.25)

171.5
(6.75)

215.9
(8.50)

KNOCKOUTS PROVIDED
ON FIVE SURFACES

MAX. WIRE SIZE: NO. 14 AWG
MIN. WIRE SIZE: NO. 18 AWG

25.4
(1.00)

FLUSH MOUNT

216.58
(8.50)

197.47
(7.75)

.75

41.1
(1.62)

88.9
(3.50)

+BDNR RBX RBX * +24VDC RETURN

R1

TB1-1 TB1-2 TB1-3 TB1-4 TB1-5 TB1-6 TB1-7

SURFACE
MOUNT
(FOR HANGING)

190.5
(7.50)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
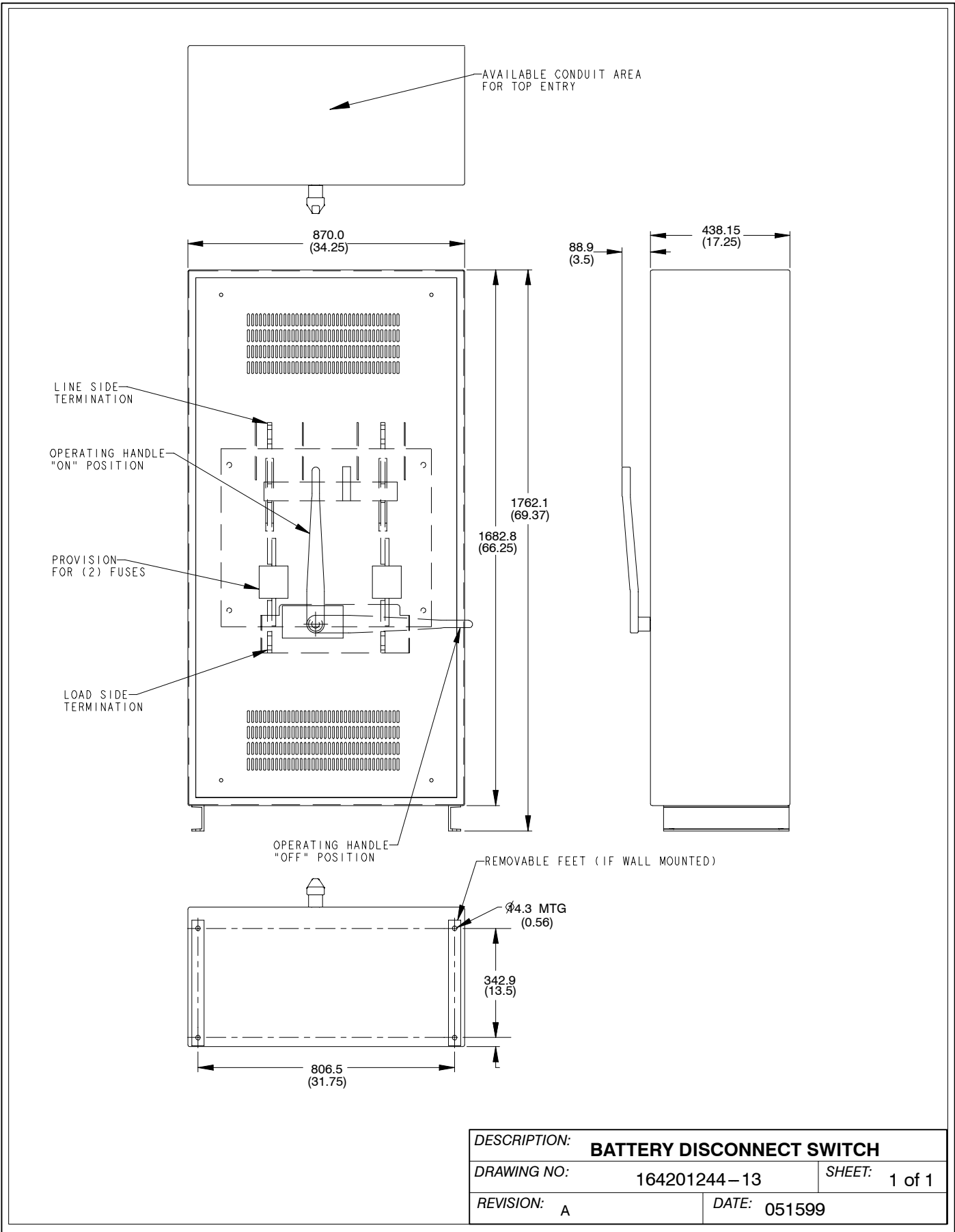
CONDUIT AND WIRING SUPPLIED BY
CUSTOMER. MAX. DISTANCE BETWEEN
REMOTE MONITOR AND UPS NOT TO
EXCEED 500 FEET.

WIRES MUST
BE TWISTED

DESCRIPTION:	SUPERVISORY CONTACT MODULE	
DRAWING NO:	164201244−12	SHEET: 1 of 1
REVISION: A	DATE: 051599	

Dimensions are in millimeters and (inches)

AVAILABLE CONDUIT AREA
FOR TOP ENTRY

870.0
(34.25)

438.15
(17.25)

88.9
(3.5)

LINE SIDE
TERMINATION

OPERATING HANDLE
"ON" POSITION

1762.1
(69.37)

1682.8
(66.25)

PROVISION
FOR (2) FUSES

LOAD SIDE
TERMINATION

OPERATING HANDLE
"OFF" POSITION

REMOVABLE FEET (IF WALL MOUNTED)

⌀14.3 MTG
(0.56)

342.9
(13.5)

806.5
(31.75)

DESCRIPTION:	**BATTERY DISCONNECT SWITCH**	
DRAWING NO:	164201244–13	SHEET: 1 of 1
REVISION: A	DATE: 051599	

LIMITED FACTORY WARRANTY FOR THREE-PHASE POWERWARE PRODUCTS

This Warranty applies only to units installed in the Fifty (50) United States of America. Subject to the conditions herein, Powerware Corporation (Powerware®) warrants solely to the initial end−user the electronics (the "Unit") against defects in material and workmanship for a period of 12 months from the date of equipment start up or 18 months from date of receipt by end user, whichever occurs first.

If, in the opinion of Powerware, the Unit fails to meet published specifications and the defect is within the terms of this warranty, the Unit will be repaired or replaced at the option of Powerware with no charge for replacement parts. Labor required, to make the repairs or replacement installation, and travel costs incurred by Powerware's representatives, is not included under the terms of this Limited Warranty, except for labor required during the first 90 days after the date of delivery, provided that start−up, of the unit on−site, has been performed by Powerware. Equipment sold, but not manufactured, by Powerware, e.g., batteries and only the manufacturer of such equipment shall warrant battery racks. Equipment repaired or replaced pursuant to this warranty will be warranted for the remaining portion of the original warranty subject to all the terms thereof.

This warranty does not apply to any Unit that has been subject to neglect, accident, abuse, misuse, misapplication, incorrect installation, or that has been subject to repair or alteration, not authorized in writing by Powerware' personnel, Purchaser shall be invoiced for, and shall pay for, all services not expressly provided for by the terms hereof, including, without limitation, site calls involving an inspection which determines no corrective maintenance is required. THIS WARRANTY IS THE PURCHASER'S (USER'S) SOLE REMEDY AND IS EXPRESSLY IN LIEU OF, AND THERE ARE NOT OTHER, EXPRESSED OR IMPLIED GUARANTEES OR WARRANTIES (INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE, WHICH ARE EXPRESSLY DISCLAIMED). In no case will Powerware's' liability under this Warranty exceed the replacement value of the Unit warranted.

Powerware's obligation, under said warranty, is expressly conditioned upon receipt by Powerware of all payments due it (including interest charges, if any). During such time as Powerware has not received payment of any amount due to Powerware, in accordance with the Contract terms under which the equipment is sold, Powerware shall have no obligation, under said warranty; also during this time, the period of said warranty shall continue to run and the expiration of said warranty shall not be extended upon payment of the overdue amount. These limitations, to said warranty, apply even in the event that the equipment is sold initially by Powerware for resale to an ultimate end−user.

In no event shall Powerware be liable for any indirect, incidental special or consequential damages of any kind or type whatsoever, or based on any claim or cause of action, however denominated. Powerware shall not be responsible for failure to provide service or parts due to causes beyond Powerware's' reasonable control. This limited warranty applies only to the original end user of the unit.

Cost for replacement equipment, installation, material freight charges travel expenses and labor of Powerware representatives will be borne by the Purchaser (user). Any advice furnished the Purchaser before or after delivery in regard to use or application of Powerware equipment is furnished without charge and on the basis that it represents Powerware's best judgment under the circumstances. The use of any such advice by the Purchaser is solely and entirely at its own risk.

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