



Powerware

**Powerware® 9315 UPS
Parallel Capacity/Redundant System
Installation and Operation Manual**

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.



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

The Powerware 9315 Parallel Capacity/Redundant System online power protection can be utilized 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 9315 Parallel Capacity/Redundant 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 Parallel Capacity/Redundant System supplies clean, consistent power that your sensitive electronic equipment requires for reliable operation. And during brownouts, blackouts, and other power interruptions, optional battery racks provide emergency power to safeguard your operation.

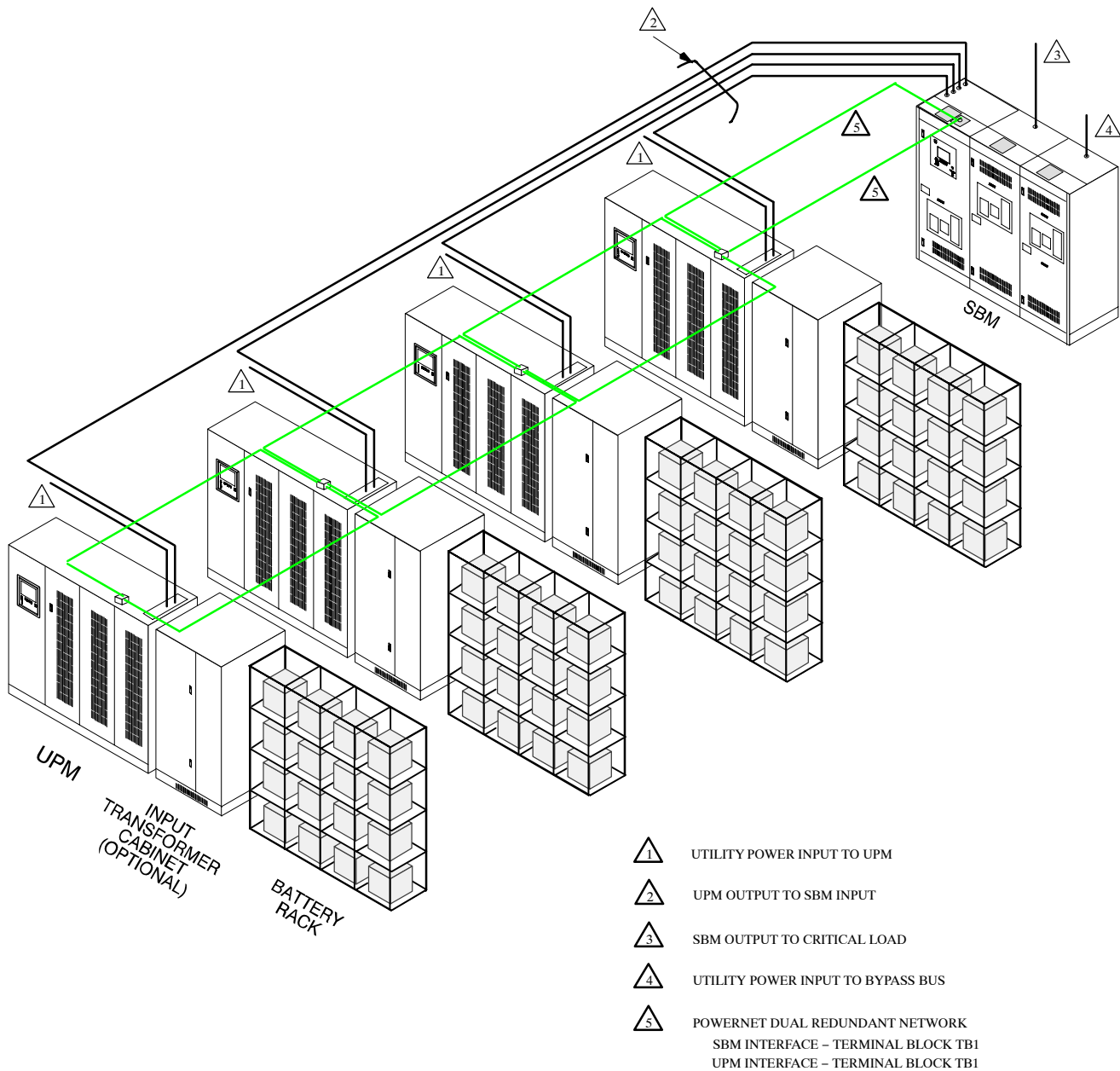
The Parallel Capacity/Redundant system, using the System Bypass Module (SBM), allows two to eight UPMs to operate in parallel to provide more capacity than a single UPM and as backup for each other. The Parallel Capacity/Redundant system can supply up to 2000 Amps, depending on the SBM used. In addition, 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. The Parallel Capacity/Redundant system refers to the SBM in conjunction with the UPMs. The Parallel Capacity/Redundant system consists of one System Bypass Module with optional System Maintenance Bypass (SMB), two or more UPMs, and battery racks or cabinets. Each UPM may have its own battery rack, or may share the same battery rack with the other UPMs.

Your UPMs functions automatically and requires 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 and Emergency Load Off procedure described in the Powerware® 9315 UPS Operation manual provided with the UPM.

This manual describes how to install and operate your Powerware[®] 9315 Parallel Capacity/Redundant system. The installation section contains instructions for installing the System Bypass Module (SBM). The operation section contains instructions for operating the SBM and UPMs while paralleling for capacity/redundancy. The information you use depends on the system you purchased.

NOTE: The installation procedures of this manual only refer to the SBM and its connection to the UPS modules for parallel capacity/redundancy operation. The operation section of this manual refers to the operation for the SBM and the UPMs when paralleling for capacity/redundancy. For full installation and operation of the UPMs, refer to the Powerware® 9315 UPS Installation and Powerware® 9315 UPS Operation manuals provided with the UPMs.

Each component of your Parallel Capacity/Redundant system is housed in a free-standing cabinet. The cabinets line up and match in style and color, and have safety shields behind the doors for hazardous voltage protection. Figure 1 shows a typical Parallel Capacity/Redundant System.



NOTE: Accommodates one to eight UPMs. Four UPM system shown.

Figure 1. Typical Parallel Capacity/Redundant System

Basic System Configurations

These basic Parallel Capacity/Redundant system configurations are possible:

- System Bypass Module (SBM) with optional System Maintenance Bypass (SMB), two or more UPS modules, and one battery rack for each module
- System Bypass Module (SBM) with optional System Maintenance Bypass (SMB), two or more UPS modules, and one common battery rack
- System Bypass Module (SBM) with optional System Maintenance Bypass (SMB), two or more UPS modules, one battery rack for each module, and an input transformer
- System Bypass Module (SBM) with optional System Maintenance Bypass (SMB), two or more UPS modules, one common battery rack, and an input transformer

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

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 Parallel Capacity/Redundant 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 Parallel Capacity/Redundant system. It discusses equipment environmental requirements, inspecting, and unpacking cabinets.
- Chapter 2 – Installing the Parallel Capacity/Redundant System – describes how to install the SBM cabinet and provides references for installing UPMS and optional equipment.
- Chapter 3 – Installing a Remote EPO Control – contains information for installing the optional Remote Emergency Power Off (EPO) control.
- Chapter 4 – Installing a Remote Monitor Panel – contains information for installing the optional Remote Monitor Panel (RMP).
- Chapter 5 – Installing a Relay Interface Module – contains information for installing the optional Relay Interface Panel (RIM).
- Chapter 6 – Installing a Supervisory Contact Module – contains information for installing the optional Supervisory Contact Module (SCM).

Section II

- Chapter 7 – Understanding Parallel Capacity/Redundant Operation – provides information on understanding parallel operation.
- Chapter 8 – Operational Controls and Features – describes the standard and optional operational features and controls of the parallel capacity/redundant system.
- Chapter 9 – 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 10 – Operating Instructions for the Parallel Capacity/Redundant System – contains startup and shutdown procedures for the Parallel Capacity/Redundant system.
- Chapter 11 – Using Features and Options – contains descriptions and instructions for the Parallel Capacity/Redundant system features and options.
- Chapter 12 – Responding to System Events – lists all the alarm, messages and notices that occur during operation of the Parallel Capacity/Redundant system.
- Chapter 13 – Serial Communications – describes the serial communications features of the Parallel Capacity/Redundant system.
- Chapter 14 – Remote Notification – contains instructions for using the remote notification feature of the Parallel Capacity/Redundant system.
- Chapter 15 – Maintaining the Parallel Capacity/Redundant System – contains maintenance instructions for the Parallel Capacity/Redundant system.
- Chapter 16 – Product Specifications – provides detailed specifications for the Parallel Capacity/Redundant 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.

Read through each procedure before you begin. Perform only those procedures that apply to the Parallel Capacity/Redundant 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 SBM refers only to the System Bypass Module cabinet and its internal elements. The term Parallel Capacity/Redundant system refers to the entire power protection system—the SBM, UPS modules, battery racks and options or accessories installed.

Safety Considerations

The UPS cabinet and parallel cabinet enclosures are designed for industrial or computer room applications, and contain safety shields behind the doors. However, the parallel redundant 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 parallel redundant 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 and the Powerware 9315 Operation manual provided with the UPS system.
- Keep the cabinet doors closed to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the unit.
- The parallel redundant 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 service or maintenance on the parallel redundant system.

If service or routine maintenance is required:

- Ensure all power is disconnected before performing installation or service.
- Ensure the area around the parallel redundant system 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.
- Refer to the more detailed safety precautions described in the Powerware 9315 Operation manual provided with the UPS system.

For More Information

This manual describes how to install and operate your Parallel Capacity/Redundant system. For more information about the installation and operation of the UPS modules, refer to the following:

164201037	Powerware [®] 9315 (200 kVA–300 kVA) UPS Installation
164201118	Powerware [®] 9315 (400 kVA–500 kVA) UPS Installation Provides installation instructions for the UPS cabinet, and optional components and accessories. Site preparation, planning for installation, and wiring and safety information are supplied. Detailed illustrations of cabinets and optional accessories, including dimensional and connection point drawings are provided.
164201036	Powerware [®] 9315 (200 kVA–300 kVA) UPS Operation
164201119	Powerware [®] 9315 (400 kVA–500 kVA) UPS Operation Describes the UPS cabinet Control Panel and Monitor Panel, and explains the functions of the UPS; discusses the standard features of the UPS and optional accessories; provides procedures for starting and stopping the UPS, and information about maintenance and responding to system events. Also described are the RS–485 and RS–232 serial communications capabilities of the UPS system; discusses the two communications ports on the Customer Interface Panel inside the UPS and how to connect optional remote accessories to your UPS system; 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 have a question about any of the information in this manual, or if you have a question this manual does not answer, please call Powerware Corporation Field Service:

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

Section I

Installation

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1.1 Installing the UPS

The System Bypass Module (SBM) and UPMs of the Parallel Capacity/Redundant system are shipped on separate pallets. Use a forklift or pallet jack to move the packaged cabinets to the installation site, or as close as possible to the site, before unloading it from the pallet.

This is the basic sequence of the installation steps:

1. Create an installation plan for the Parallel Capacity/Redundant system (Chapter 1).
2. Prepare your site for the Parallel Capacity/Redundant system (Chapter 1).
3. Inspect, unpack, and unload the SBM (Chapter 1).
4. Inspect, unpack, and unload the UPMs (refer to the applicable Powerware® 9315 Installation manual provided with the UPM).
5. Wire the system (refer to Chapter 2 and the applicable Powerware® 9315 Installation manual provided with the UPM).
6. Install features, accessories, and/or options, as applicable (Chapter 3).
7. Complete the Installation Checklist (Chapter 2).
8. 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 Parallel Capacity/Redundant system. 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 Parallel Capacity/Redundant 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. It is important to note that UPM installation procedures are contained in the applicable Powerware® 9315 Installation manual provided with the UPMs. First understand how to install the UPMs before installing the SBM. The information in Chapter 2 of this manual is a guide to installation of the SBM to the UPMs.

1.1.2 **Preparing Your Site**

For your Parallel Capacity/Redundant system to operate at peak efficiency, your installation site should meet the environmental parameters outlined in the operator's manual for the SBM and UPMs. 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 Drawings 164201150-5, 164201150-9, and Table H of Appendix A.

The basic environmental requirements for operation of the Parallel Capacity/Redundant system are:

Ambient Temperature Range:	0–40°C (32–104°F)
Recommended Operating Range:	20–25°C (68–77°F)
Maximum Relative Humidity:	95% noncondensing

The UPM cabinets uses forced air cooling to regulate internal component temperature. The SBM, battery and optional component cabinets use convection 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 Parallel Capacity/Redundant system will be adversely affected if the installation does not meet the following guidelines:

1. The system must be installed on a sealed concrete pad or a sealed concrete floor.
2. The system must be installed in a temperature-controlled indoor area free of conductive contaminants.

1.1.4 **Preparing for Wiring the Parallel Capacity/Redundant System**

For external wiring requirements, including the minimum AWG size of external wiring, see Tables A and B in Appendix A and the applicable Powerware® 9315 Installation manual provided with the UPS. 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 and/or larger size wire may be necessary. Control wiring for PowerNet, EPO and optional accessories (such as building alarms, monitoring interface and Maintenance Bypass control) should be connected at the customer interface panel at the top of the SBM.

1.1.5 Inspecting and Unpacking Each Cabinet

NOTE: Refer to the applicable Powerware® 9315 Installation manual provided with the UPMs for UPM unpacking instructions.

The first task in preparing for installation is inspecting and unpacking the SBM. The SBM is shipped bolted to a cushioned wooden pallet and protected with outer protective packaging material as shown in Figure 1–1 and a plastic inner covering.

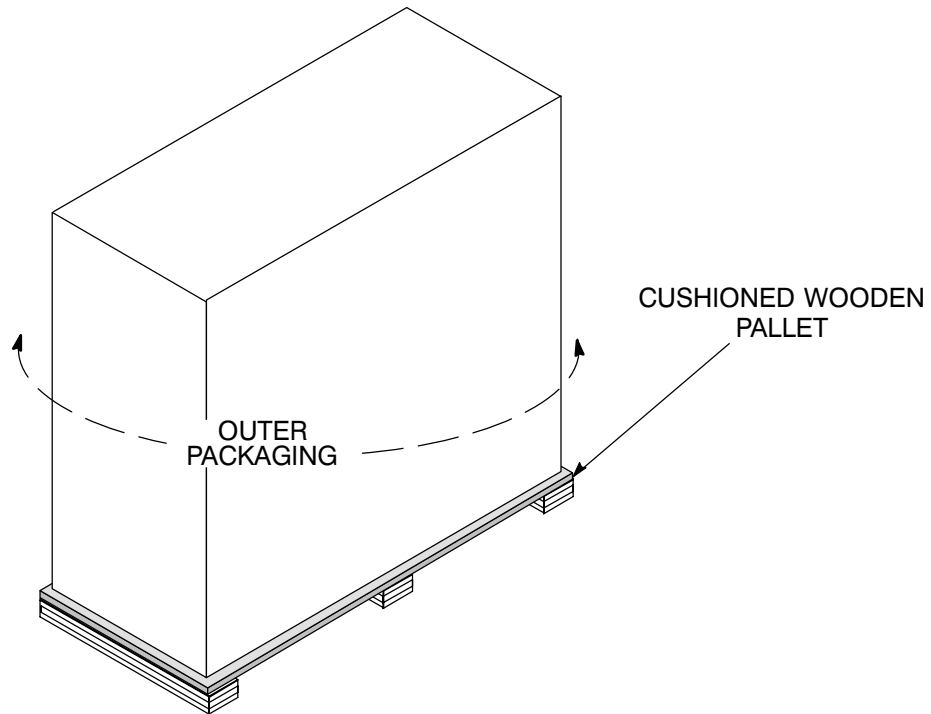


Figure 1–1. Cabinet as Shipped, with Outer Packaging and Pallet

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 foam cushions 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. Cut the steel bands 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 Powerware Corporation Customer Service Department immediately to determine the extent of the damage and its impact upon further installation.

NOTE: While awaiting installation, protect the unpacked SBM and UPS cabinets from moisture, dust, and other harmful contaminants.

Installing the Parallel Capacity/Redundant System



2.1 Preliminary Installation Information

Refer to the following while installing the Parallel Capacity/Redundant system:

WARNING



Installation should be performed by qualified personnel.

- 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 System Bypass Module (SBM), System Maintenance Bypass (SMB), UPMs or other cabinets 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 16 gauge steel (0.06 in. thick).
- The Remote Emergency Power Off (EPO) and the EMERGENCY UPM OFF pushbuttons open all breakers in the SBM, shut down the UPMs, and isolate power from your critical load. Local electrical codes may also require tripping protective devices upstream from the UPMs.
- The SBM cabinet 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 UPMs. Refer to Table H in Appendix A for equipment weight and point loading.
- Details about control wiring are provided in each procedure for connecting options and features. Drawings 164201150–13 and 164201150–14 in Appendix A identify the control wiring terminations.

2.2 *Installing the SBM Cabinet*

The SBM is bolted to a cushioned wooden pallet consisting of a wood platform secured to foam cushions. The foam cushions act as shock absorbers for the cabinet during shipment and movement to the installed location.

WARNING



The SBM cabinet is extremely heavy. If unloading instructions are not followed exactly, the cabinet may tip and cause serious injury.

1. Move SBM to final installed location using forklift jacks between foam cushions on the bottom of the unit.
2. Remove side panels from SBM cabinet, to gain access to hardware securing cabinet to cushioned pallet.
3. Remove hardware securing cabinet to cushioned pallet.

CAUTION



Lift only at lifting eyes or cabinet damage may occur.

4. Attach suitable hoist to SBM lifting eyes, and lift the SBM cabinet until the cabinet bottom clears the cushioned pallet by approximately 3 mm (1/8 in.).
5. Once SBM cabinet is clear of the cushioned pallet, pull the pallet from under the UPS cabinet. Discard or recycle them in a responsible manner.
6. Carefully lower the SBM cabinet until the cabinet base contacts the floor.
7. Remove lifting eyes from SBM cabinet.

2.3 *Installing the SMB Cabinet*

NOTE: When the SBM and SMB are installed at the same time, the SMB is shipped installed and wired to the SBM. The following instructions are provided for SMB installation, if the SMB is installed after the initial installation of the SBM.

The SMB is bolted to a cushioned wooden pallet consisting of a wood platform secured to foam cushions. The foam cushions act as shock absorbers for the cabinet during shipment and movement to the installed location.

WARNING



The SBM cabinet is extremely heavy. If unloading instructions are not followed exactly, the cabinet may tip and cause serious injury.

1. Remove side panels from SMB cabinet, if provided.
2. Remove right side panel from SBM cabinet.
3. Move SMB to final installed location on the right side of the SBM cabinet using forklift jacks between foam cushions on the bottom of the unit.
4. Remove hardware securing cabinet to cushioned pallet.

CAUTION



Lift only at lifting eyes or cabinet damage may occur.

5. Attach suitable hoist to SMB lifting eyes, and lift the SMB cabinet until the cabinet bottom clears the cushioned pallet by approximately 3 mm (1/8 in.).
6. Once SMB cabinet is clear of the cushioned pallet, pull the pallet from under the UPS cabinet. Discard or recycle them in a responsible manner.
7. Carefully lower the SMB cabinet until the cabinet base contacts the floor.
8. Remove lifting eyes from SMB cabinet.
9. Bolt the SMB cabinet to the SBM cabinet.
10. Install Bus plates where applicable.

2.4 Installing the UPM Cabinets

To install the UPMs, refer to the Powerware® 9315 UPS Installation manual provided with the UPMs.

2.5 Installing SBM Wiring

NOTE: Refer to the applicable Powerware® 9315 Installation manual provided with the UPMs for UPM wiring and termination requirements and wiring access information.

1. Install power wiring between the UPMs, SBM, SMB (if provided), and critical load. Each UPM is individually wired to the SBM UPM input bus. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.
2. Install control wiring between UPMs and the SBM, and between the SBM and SMB. PowerNet network is wired serially (daisy chained) between UPMs and SBM. Wire dual redundant PowerNet in separate conduits for maximum failure protection. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.
3. If a common UPM battery is being used, a separate DC source disconnect device must be provided for each UPM. Wire shunt/UV DC disconnect trip and battery breaker open signals from each UPM to the respective DC source disconnect.
4. After wiring the Parallel Capacity/Redundant system to the facility power and critical load(s), be sure to ground the system according to local and/or national electrical wiring codes, using your own cabling and conduit.
5. Install batteries in accordance with all applicable codes and regulations, including the National Electrical Code (NEC), Article 480.

2.6 Installing SMB Wiring

1. Install power wiring between the SBM, SMB, and critical load. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.
2. Install control wiring between the SBM and SMB. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.

2.7 Prepare for Installing Optional Accessories

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

2.7.1 To Prepare the SBM for Wiring to an RMP, RIM, SCM, or Remote EPO:

1. Be sure the Parallel Capacity/Redundant 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 SBM cabinet to gain access to the Customer Interface Panel (refer to Appendix A for location of the access plate).
3. Refer to Chapters 3, 4, 5, or 6 as applicable for installation instructions.

2.8 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.

2.9 Completing the Installation Checklist

The final step in installing your Parallel Capacity/Redundant 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 Parallel Capacity/Redundant 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 Parallel Capacity/Redundant system for the first time.

2.10 Installation Checklist

- All packing materials and restraints have been removed from each cabinet.
- Each cabinet in the Parallel Capacity/Redundant 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 SBM, UPMs and auxiliary cabinets.
- All power cables are properly terminated.
- A ground conductor is properly installed.
- If neutral connection is used, no other N–G bonds exist downstream from the UPMs.
- 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 UPMs to battery breaker(s).
- Air conditioning equipment is installed and operating correctly.
- The area around the installed Parallel Capacity/Redundant system is clean and dust-free. (It is recommended that the Parallel Capacity/Redundant system be installed on a sealed concrete pad or a sealed concrete floor.)
- Adequate work space exists around the SBM, UPMs and other cabinets.
- Adequate lighting is provided around the Parallel Capacity/Redundant system.
- A 120VAC service outlet is located within 25 feet of the Parallel Capacity/Redundant system.
- 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 SBM 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 SBM 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)
- Startup and operational checks performed by authorized service personnel.

Installing a Remote EPO Control

3

The Remote EPO control arrives as shown in Figure 3–1. See Drawing 164201150–16 in Appendix A for wiring information, enclosure dimensions, side views, and knockout patterns.

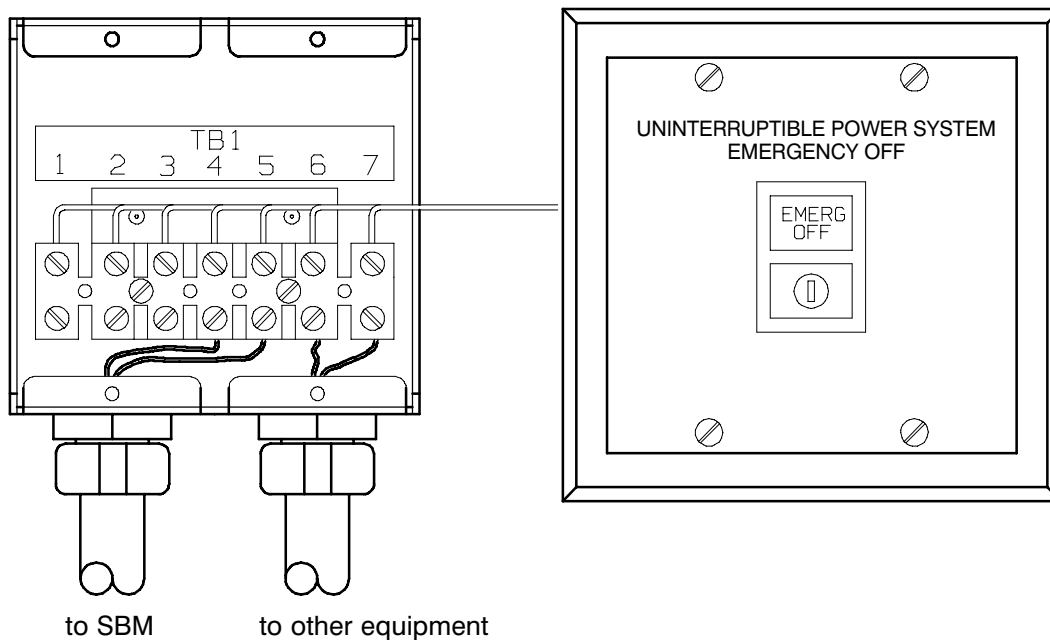


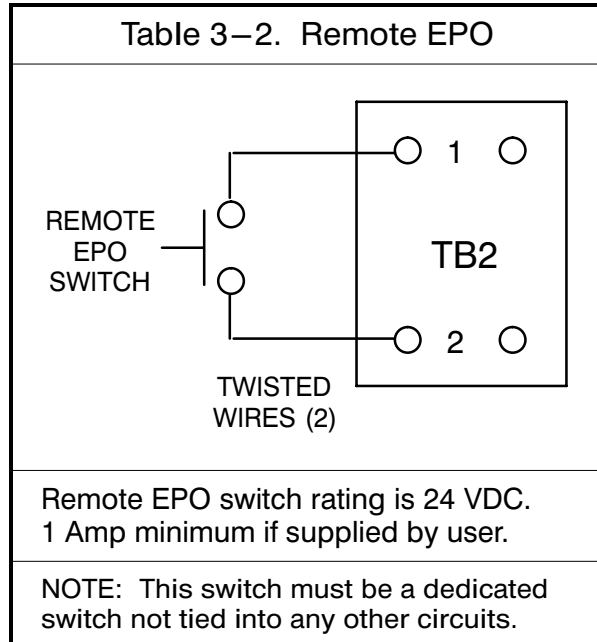
Figure 3–1. Remote EPO Control

NOTE: Before installing an Remote EPO, be sure you have prepared the SBM 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 exit doors.
2. Install wiring from the Remote EPO station using ½-in. conduit through the cable entry panels on the top of the SBM.
3. Connect the Remote EPO wiring as shown in Tables 3–1 and 3–2:

From Remote EPO Station(s)	To Customer Interface Panel in SBM	Remarks
TB1–4	TB2–1	Twisted wires (2) 14–18 gauge
TB1–5	TB2–2	



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 3–2. Remote EPO switch wiring must be in accordance with UL Class I requirements.
6. Secure the SBM by reversing all steps taken to prepare it for Remote EPO installation.

Installing a Remote Monitor Panel (Optional)

4

4.1 Installation Procedures

As an option, you can install Remote Monitor Panels (RMPs) to monitor the operation of the Parallel Capacity/Redundant system from virtually any location within your facility, up to 500 feet from the System Bypass Module (SBM). 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 4–1 for the number of accessories permitted. Figure 4–1 shows an RMP. Drawing 164201150–17 in Appendix A shows the enclosure dimensions and knockout patterns.

Number and Type of Accessories Permitted		
Remote Monitor Panel	Relay Interface Module	Supervisory Contact Module
2	—	—
—	2	—
—	—	2
1	1	—
1	—	1
—	1	1

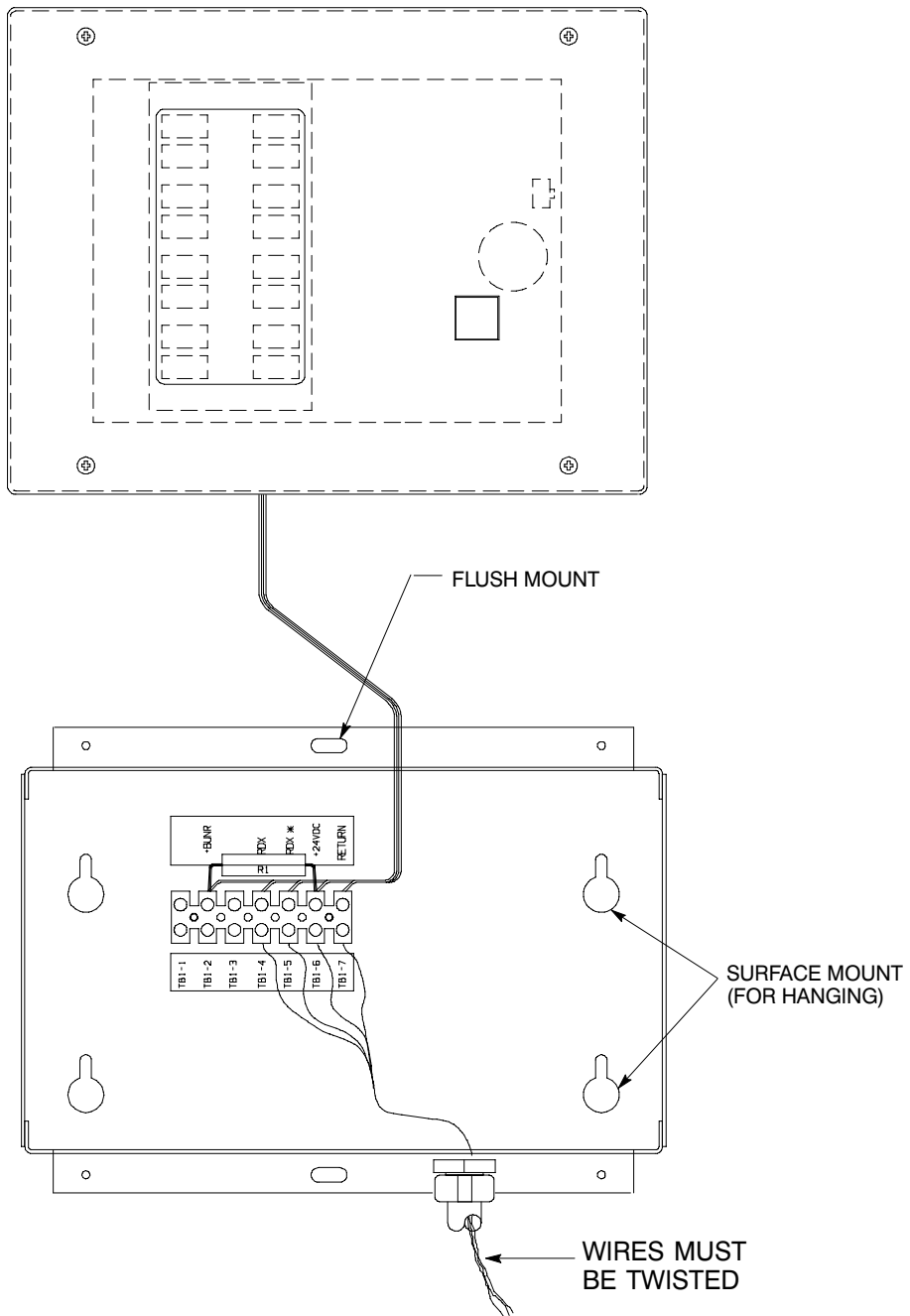


Figure 4–1. Remote Monitor Panel (RMP)

NOTE: Before installing an RMP, be sure you have prepared the SBM according to the instructions in Chapter 2.

4.2 To install an RMP:

1. Securely mount the RMP(s).
2. Install wiring from the RMP using $\frac{1}{2}$ -in. conduit through the cable entry panels in the top of the SBM control section (refer to the enclosed switchboard vendor drawings for the location of the conduit landing plate).
3. In the spare parts kit, locate the RMP adapter cable assembly (Figure 4–2). 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 SBM (refer to Drawing 164201150–13 in Appendix A). Use two screws from the spare parts kit to secure the terminal block bracket to the Customer Interface Panel.

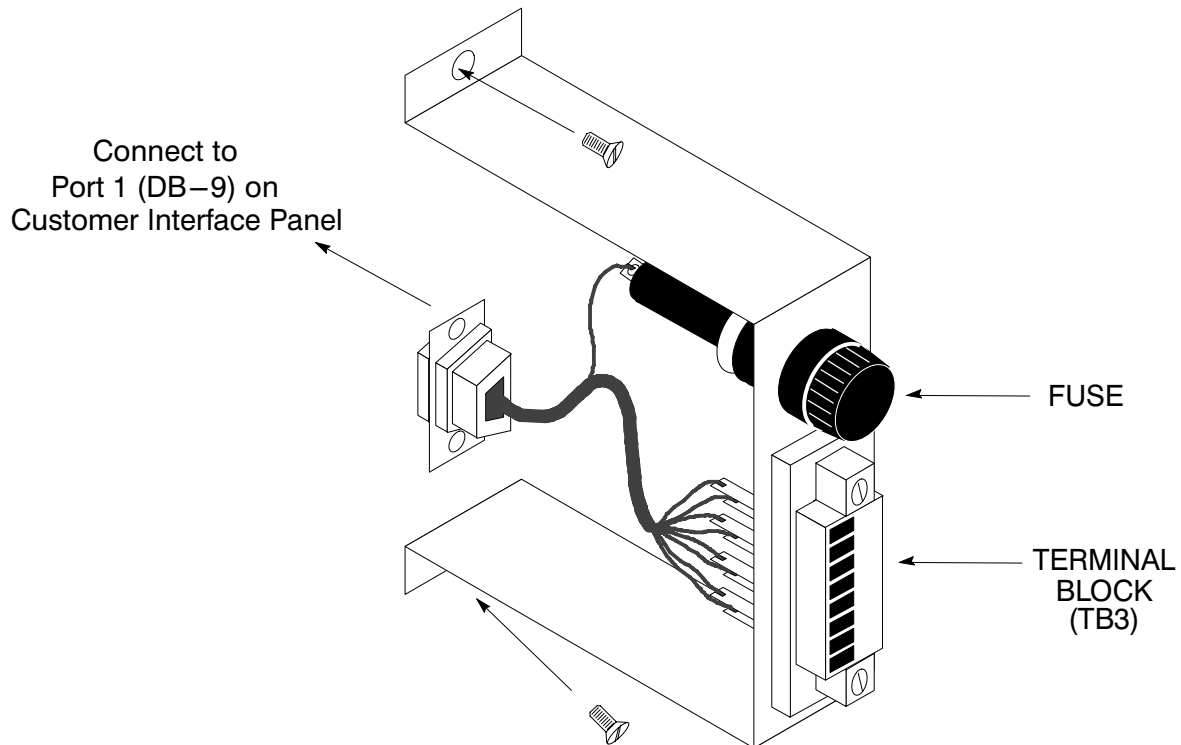


Figure 4–2. Terminal Block Bracket

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

Table 4–2. RMP Wire Terminations		
From RMP A	To SBM	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 SBM	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 Parallel Capacity/Redundant system is supplying the load via the inverters or bypass. If the indicators on the RMP show the appropriate status, then it is operating correctly.

If the communications link between the SBM 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 will 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 5 or 6, respectively; otherwise, secure the SBM by reversing the steps contained in procedure “To Prepare the SBM for Wiring to an RMP, RIM, SCM, or Remote EPO” of Chapter 2.

5.2 To install a RIM:

1. Securely mount the RIM.
2. Install wiring from the RIM using 1/2-in. conduit through the cable entry panels in the top of the SBM control section (refer to the enclosed switchboard vendor drawings for the location of the conduit landing plate).
3. If not already installed, locate the RMP adapter cable assembly (Figure 5–2) 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 SBM (refer to Drawing 164201150–13 in Appendix A). Use two screws from the spare parts kit to secure the terminal block bracket to the Customer Interface Panel.

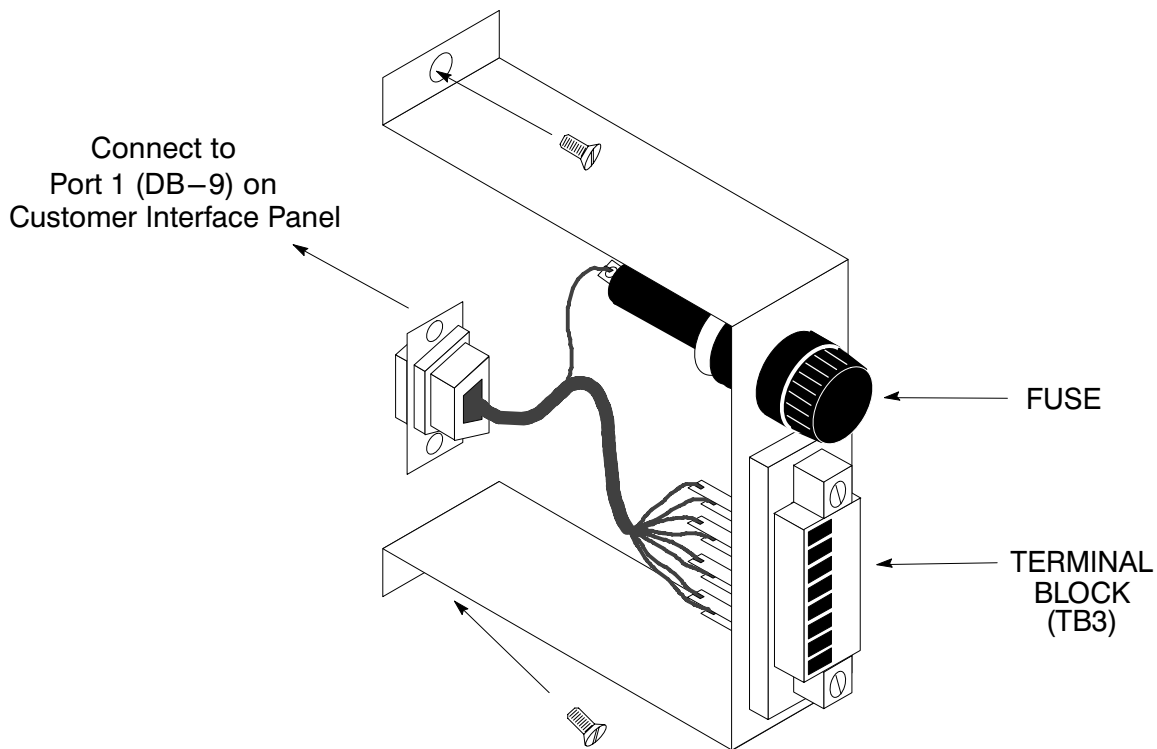


Figure 5–2. Terminal Block Bracket

4. Connect RIM wiring to the terminal block using the terminations shown in Table 5–1.

Table 5–1. RIM Wire Terminations		
From RIM A	To SBM	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 SBM	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 4 or 6, respectively; otherwise, secure the SSBM by reversing the steps contained in procedure “To Prepare the SBM for Wiring to an RMP, RIM, SCM, or Remote EPO” of Chapter 2.

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Installing a Supervisory Contact Module

6

6.1 Installation Procedures

The optional Supervisory Contact Module (SCM) as shown in Figure 6–1 provides contacts for monitoring Parallel Capacity/Redundant system status. A maximum of two monitoring accessories (RMPs, RIMs, or SCMs) can be installed. Refer to Chapter 4, Table 4–1 for the number of accessories permitted. See Drawing 164201150–19 in Appendix A for enclosure dimensions, side views, and knockout patterns.

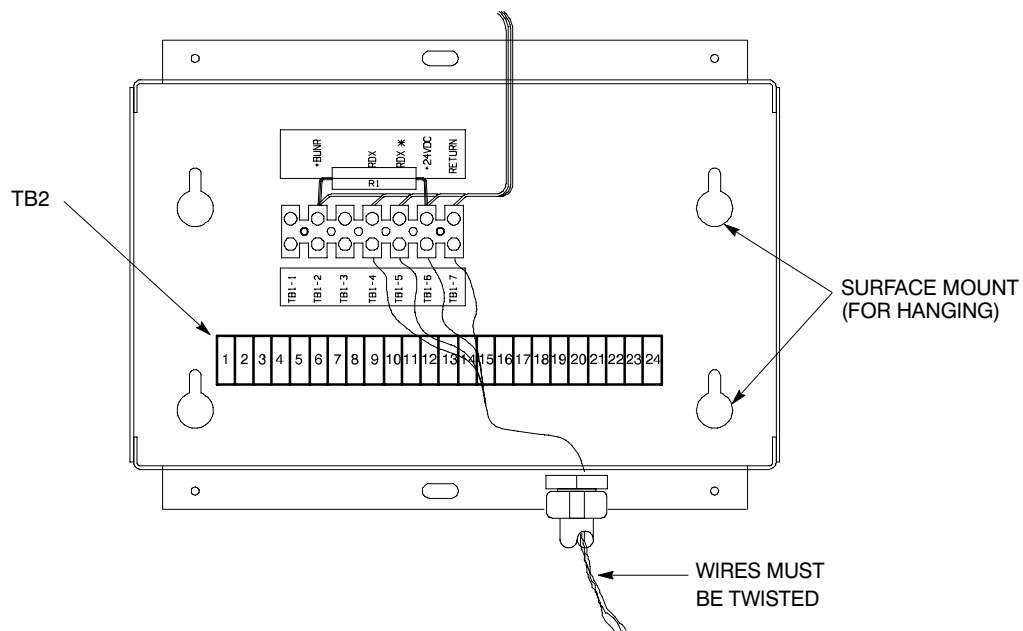


Figure 6–1. Supervisory Contact Module

NOTE: Before installing an SCM, be sure you have prepared the SBM according to the instructions in Chapter 2.

6.2 To install a Supervisory Contact Module:

1. Securely mount the SCM.
2. Install wiring from the SCM using $\frac{1}{2}$ -in. conduit through the cable entry panels in the top of the SBM control section (refer to the enclosed switchboard vendor drawings for the location of the conduit landing plate).
3. If not already installed, locate the RMP adapter cable assembly (see Figure 6–2) 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 SBM (refer to Drawing 164201150–13 in Appendix A). Use two screws from the spare parts kit to secure the terminal block bracket to the Customer Interface Panel.

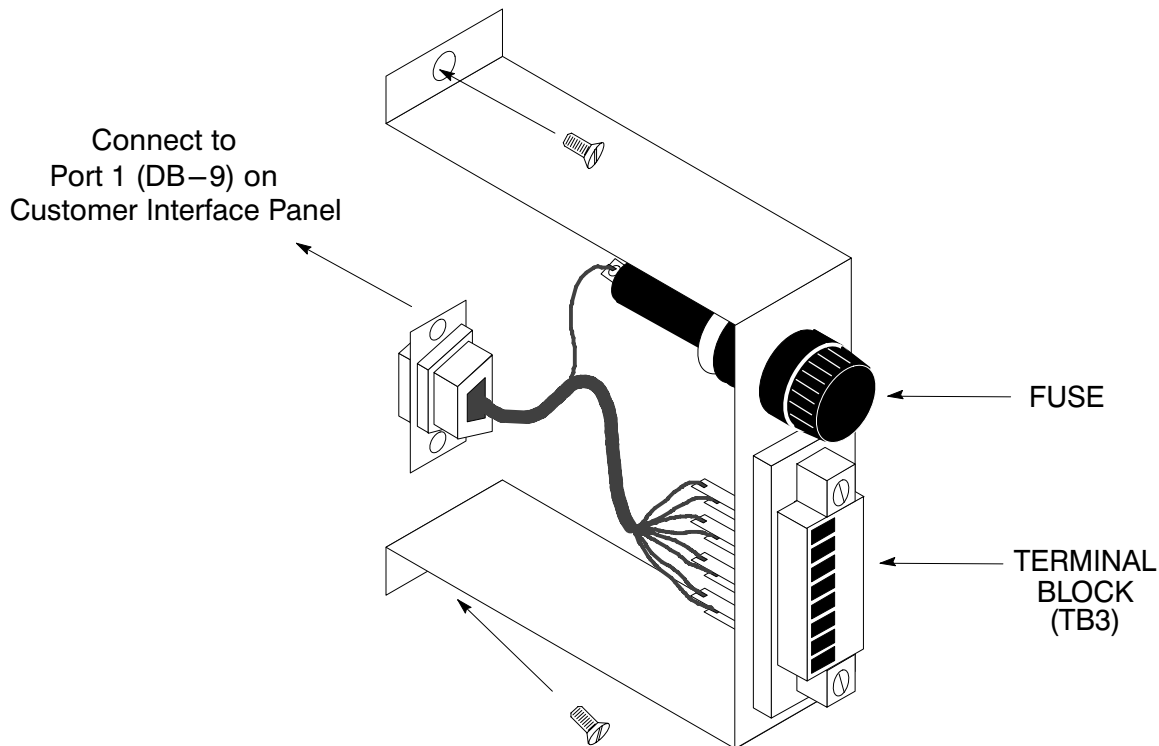
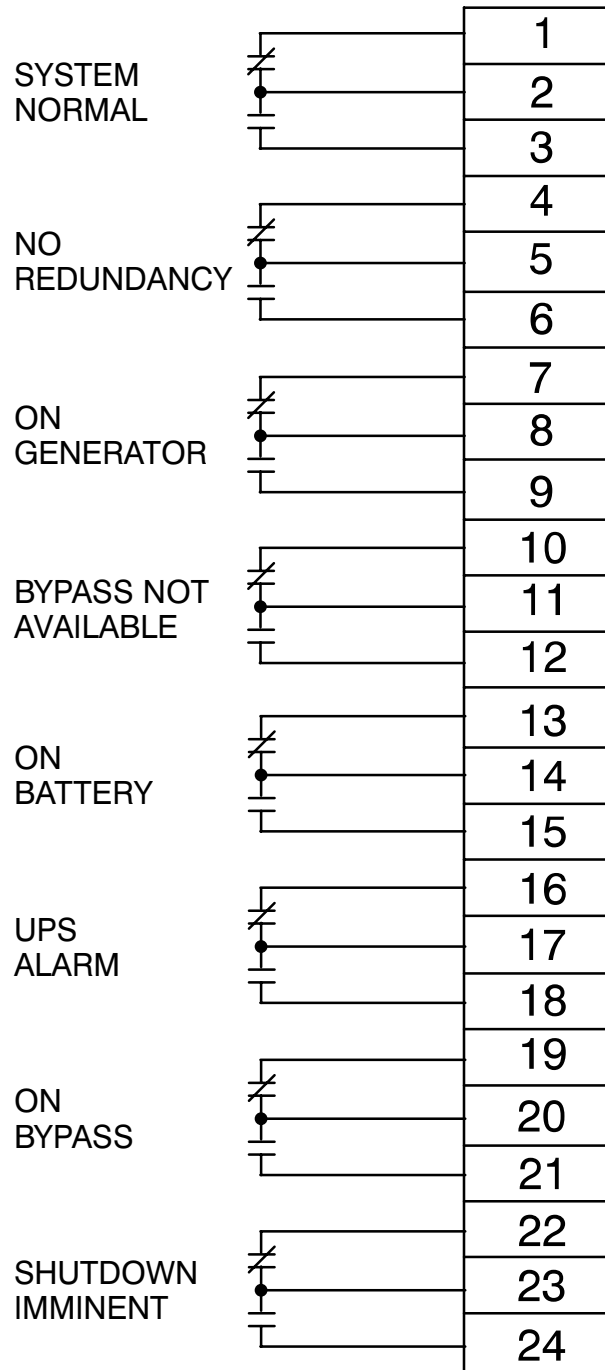


Figure 6–2. Terminal Block Bracket

4. Connect the SCM wiring to the terminal block using the terminations shown in Table 6–1.

Table 6–1. Supervisory Contact Module Wire Terminations		
From SCM A	To SBM	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 SBM	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 Figures 6–1 and 6–3.
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 4 or 5, respectively; otherwise, secure the SSBM by reversing the steps contained in procedure “To Prepare the SBM for Wiring to an RMP, RIM, SCM, or Remote EPO” of Chapter 2.



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 6–3. Supervisory Contact Module TB2

Section II

Operation

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Understanding Parallel Capacity/Redundant System Operation



The System Bypass Module (SBM) supports the normal operation of the Powerware® 9315 Parallel Capacity/Redundant system by offering parallel capacity/redundant capability. The Parallel Capacity/Redundant system continues to maintain power to the critical loads during commercial electrical power brownout, blackout, overvoltage, undervoltage, and out-of-tolerance frequency conditions. Refer to Figure 164201150–4 in Appendix A of this manual for the detailed relationship of the SBM and the UPMs.

If utility power is interrupted or falls outside the parameters specified in the Powerware® 9315 Operation manual, the Parallel Capacity/Redundant system uses a backup battery supply to sustain 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 alternate power system (such as a generator) or shut down the critical load in an orderly manner. Refer to the Powerware® 9315 Operation manual provided with the UPMs for operation of the UPMs.

7.1 *Looking Inside the Parallel Capacity/Redundant System*

The output of the system is normally supplied by several Uninterruptible Power Modules (UPMs). Multiple UPMs are connected with their outputs in parallel to provide a load level greater than the rating of one UPM and for redundancy. The paralleled UPMs supply the output load with protected power as long as the load does not exceed the combined rating of the paralleled UPMs.

The power system is denoted redundant as long as one of the UPMs can be disconnected from the output bus and the remaining UPMs can continue to supply power to the load without exceeding their ratings.

The SBM contains switchgear and components that allow the UPMs to be paralleled and the source of system output power to be transferred between Bypass and the paralleled UPMs.

When the load is being supplied by the UPMs, the system output bus is continuously monitored by the SBM for an over- or under- voltage condition. If an out of limits condition is detected, the SBM will transfer the load to bypass using a high speed emergency bypass. The transfer occurs in less than 4 milliseconds.

The emergency bypass consist of a static switch, a wraparound bypass breaker (CBP) and a backfeed protection breaker (FPS). The backfeed protection breaker is located in series with the static switch. If an SCR shorts, the breaker will open so that the UPMs will not backfeed the bypass source, dropping the load when a utility outage occurs.

During maintenance, the output of the system can be supplied power through the bypass breakers in the SBM or the optional System Maintenance Bypass (SMB). The bypass input and breaker must be rated for the total system load since it must supply all of the system load when on bypass. Manual transfers between the bypass source and the paralleled UPMs are verified make before break.

For manual transfers to bypass, the static switch is not used. During the transfer, CBP is closed and verified and then CBS is opened. For transfers of the load from bypass to the UPMs, CBS is closed and verified and then CBP is opened. The static switch is armed and ready during both types of transfers.

Communications is required between the SBM and UPMs in the system for full system operation. System level communications and control are accomplished using a dual redundant network known as PowerNet. PowerNet consist of two independent networks that are connected to each component network node in the parallel system.

Data is always transmitted on both networks simultaneously. Each network node monitors both PowerNets. Failure of one of the two will only result in an alarm condition. In addition, the applications at each node are designed such that messages can be lost on the network without affecting the operation of the system.

7.2 Normal, Battery, and Bypass Modes with Parallel Operation:

With the Parallel Capacity/Redundant system, the system continues to function automatically to supply AC electrical power to the critical load. There are three standard operation modes and one optional mode in this system:

- In Normal mode, the Parallel Capacity/Redundant system functions normally, supplying clean, filtered power from the UPMs to the load.
- In Bypass mode, the SBM bypass input supplies the load and isolates the UPMs.
- In Battery mode, the battery cabinet supplies DC power, which maintains UPM operation.
- In Maintenance Bypass mode (optional), the SMB bypass supplies the load and isolates the SBM and UPMs for maintenance purposes.

The following descriptions provide the Parallel Capacity/Redundant system operating mode differences.

7.2.1 Normal Mode

In Normal mode, utility AC power is supplied to the UPMs. Power from the output of the UPMs is then supplied to the SBM for parallel operation. The SBM then supplies the critical load with clean, filtered AC power. The message “System Normal” appears in the status area of the Control Panel LCD screen.

Figure 7–1 shows the path of electrical power through the Parallel Capacity/Redundant system when operating in Normal mode.

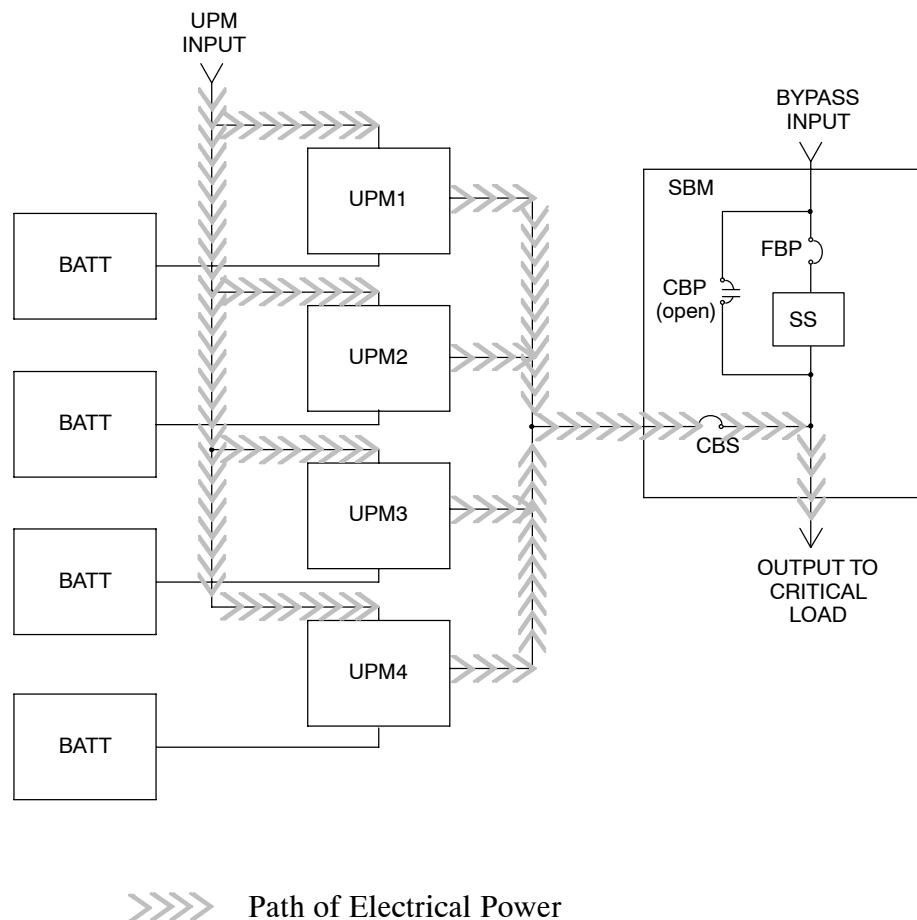


Figure 7–1. Path of Current Through the Parallel Capacity/Redundant System in Normal Mode.

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

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

7.2.2 Bypass Mode

The SBM automatically switches to Bypass mode if it detects a UPM overload, UPMs unavailable, load fault, or internal failure. The bypass source supplies the commercial AC power to the load directly.

CAUTION



The critical load is not protected while the SBM is in Bypass mode.

Figure 7–2 shows the path of electrical power through the Parallel Capacity/Redundant system when operating in Bypass mode.

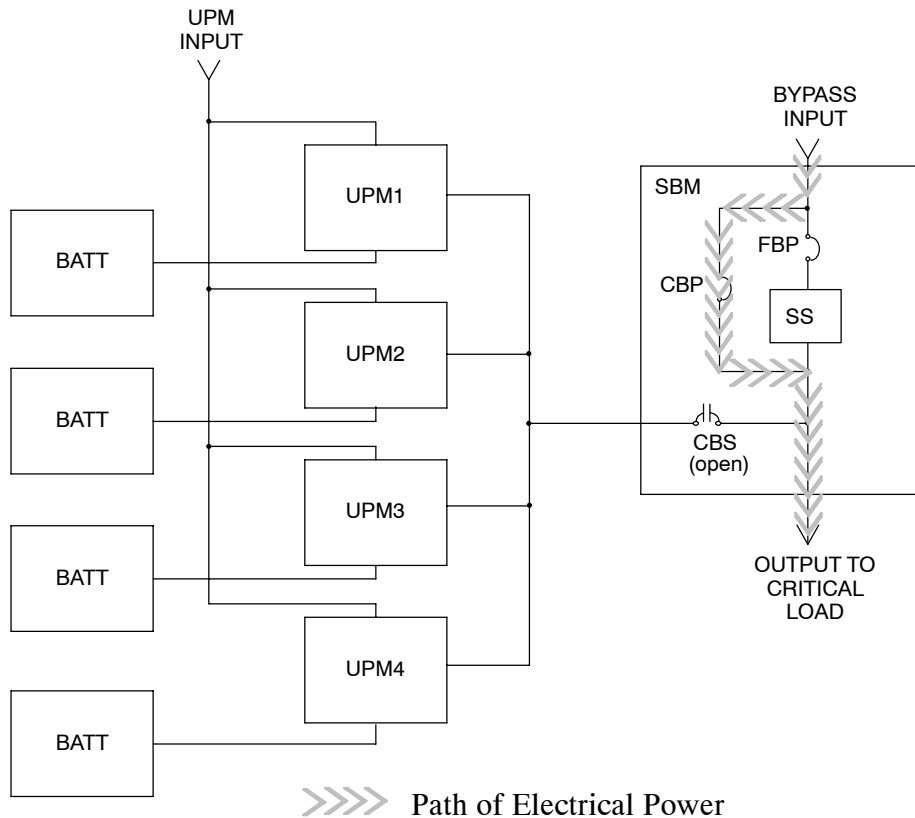


Figure 7–2. Path of Current Through the Parallel Capacity/Redundant System in Bypass Mode.

You can transfer the SBM from Normal mode to Bypass mode manually. However, the SBM switches automatically to Bypass mode whenever the UPMs can no longer supply the critical load. If the SBM transfers to Bypass mode from Normal mode due to an output voltage deviation, the SBM automatically attempts to transfer back to Normal mode (up to three times within a 10-minute period). The fourth transfer or an overload condition will lock the critical load on the bypass source and requires operator intervention to transfer.

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

7.2.3 Battery Mode

The UPMs transfer 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 batteries provide emergency DC power that the inverters convert to AC power. When the UPMs switch 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 7–3 shows the path of electrical power through the Parallel Capacity/Redundant system when operating in Battery mode.

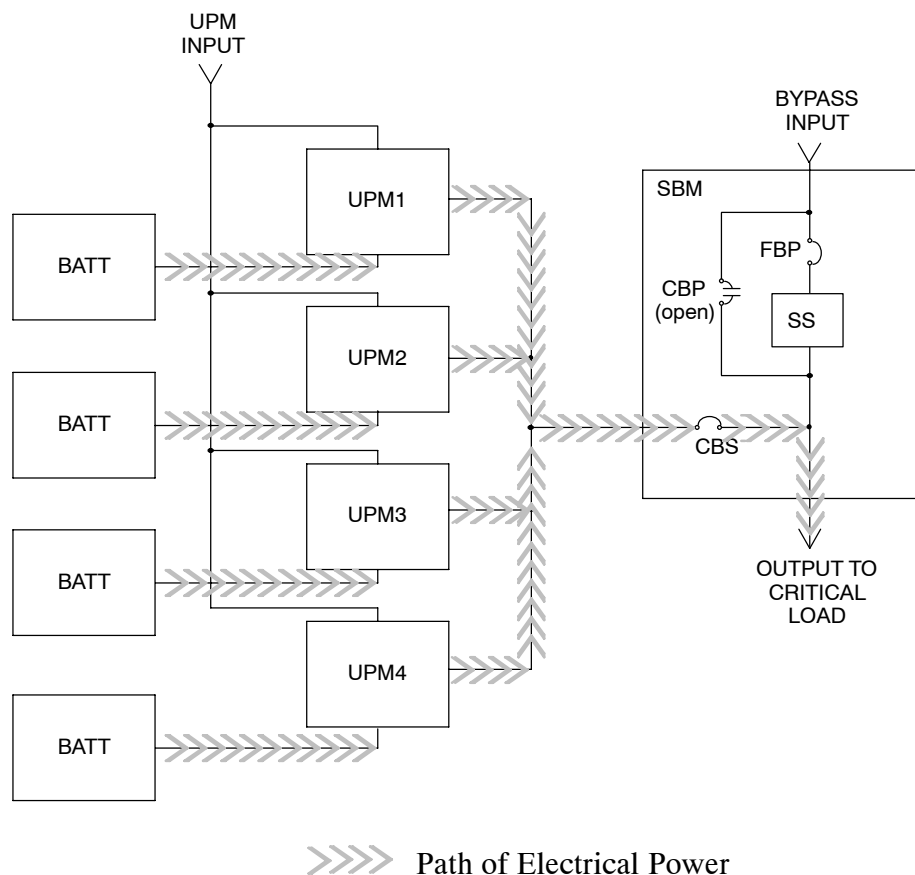


Figure 7–3. Path of Current Through the Parallel Capacity/Redundant System in Battery Mode

When the discharging battery voltage reaches the lower limit of UPM operational capability, the critical load is transferred by the SBM 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 UPMs automatically return to Normal mode and alarm indications clear. However, the process of returning to Normal mode is not instantaneous. The UPMs gradually draw increasing power from the incoming utility until Normal mode is achieved.

7.3 *Optional Modes of Parallel Operation: Maintenance Bypass and Redundant CBP*

There are two optional modes of operation in this Parallel Capacity/Redundant system:

- In Maintenance Bypass mode (optional), the SMB bypass supplies the load and isolates the SSBM and UPMs for maintenance purposes.
- In Redundant CBP mode (optional), if the CBP breaker fails to close during a manual or automatic operation, the SSBM automatically closes the MBP breaker to maintain power to the critical load.

7.3.1 Maintenance Bypass Mode (Optional)

The Parallel Capacity/Redundant system can be manually transferred to maintenance bypass if the System Maintenance Bypass (SMB) has been provided. Maintenance bypass is used when the system is not operating or is in need of service. The maintenance bypass source supplies the commercial AC power to the load directly.

CAUTION



The critical load is not protected while the Parallel/ Capacity system is in Maintenance Bypass mode.

Figure 7–4 shows the path of electrical power through the Parallel Capacity/ Redundant system when operating in Maintenance Bypass mode.

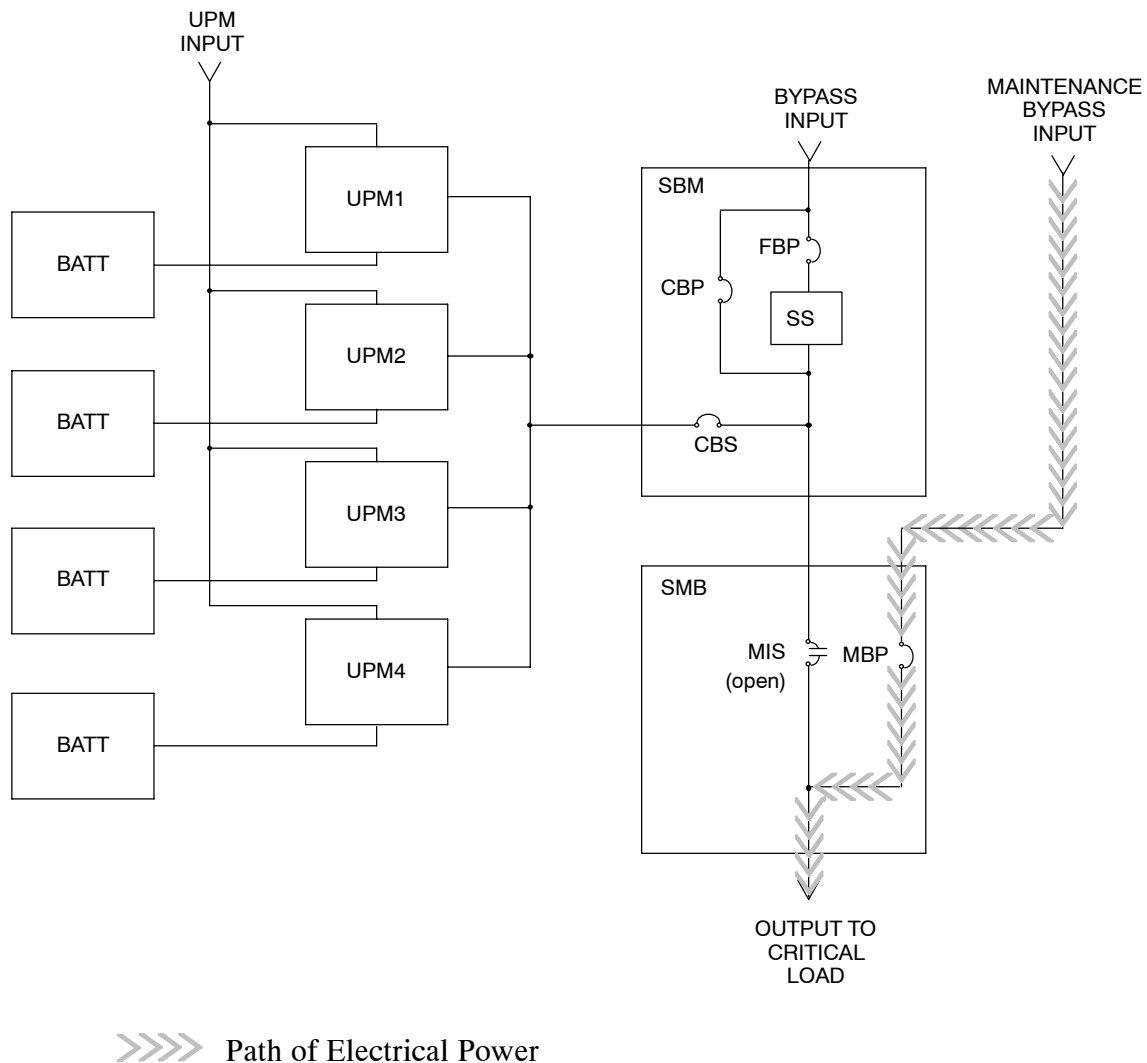


Figure 7–4. Path of Current Through the Parallel Capacity/Redundant System in Maintenance Bypass Mode.

7.3.2 Redundant CBP Mode (Optional)

The Parallel Capacity/Redundant system can be protected against failure of the CBP breaker to close if an electrically interlocked System Maintenance Bypass (SMB) with Redundant CBP controls has been provided. The Redundant CBP controls protect the critical load against power losses caused by CBP close failures during manual or automatic operations.

Redundant CBP operations can be recognized by an alarm condition at the SBM and the following breaker conditions:

CBP	OPEN
CBS	OPEN
FBP	OPEN
MIS	CLOSED
MBP	CLOSED

CAUTION



The critical load is not protected while the Parallel/ Capacity system is in Maintenance Bypass or Bypass mode.

Once Redundant CBP operation has occurred, the SBM must be isolated to allow CBP breaker maintenance without impact on the system's critical load. To achieve SBM isolation, the Redundant CBP controls have been interlocked with the System Maintenance Bypass controls. To exit from Redundant CBP operation, the SMB control switch must be turned to the TO MAINT position. This action opens the UPS system MIS breaker and places the the UPS system fully into Maintenance Bypass mode.

After the CBP breaker has been repaired, the UPS system can be transferred from Maintenance Bypass mode to Bypass mode as described above.

Figure 7–5 shows the path of electrical power through the Parallel Capacity/Redundant system when operating in Maintenance Bypass mode.

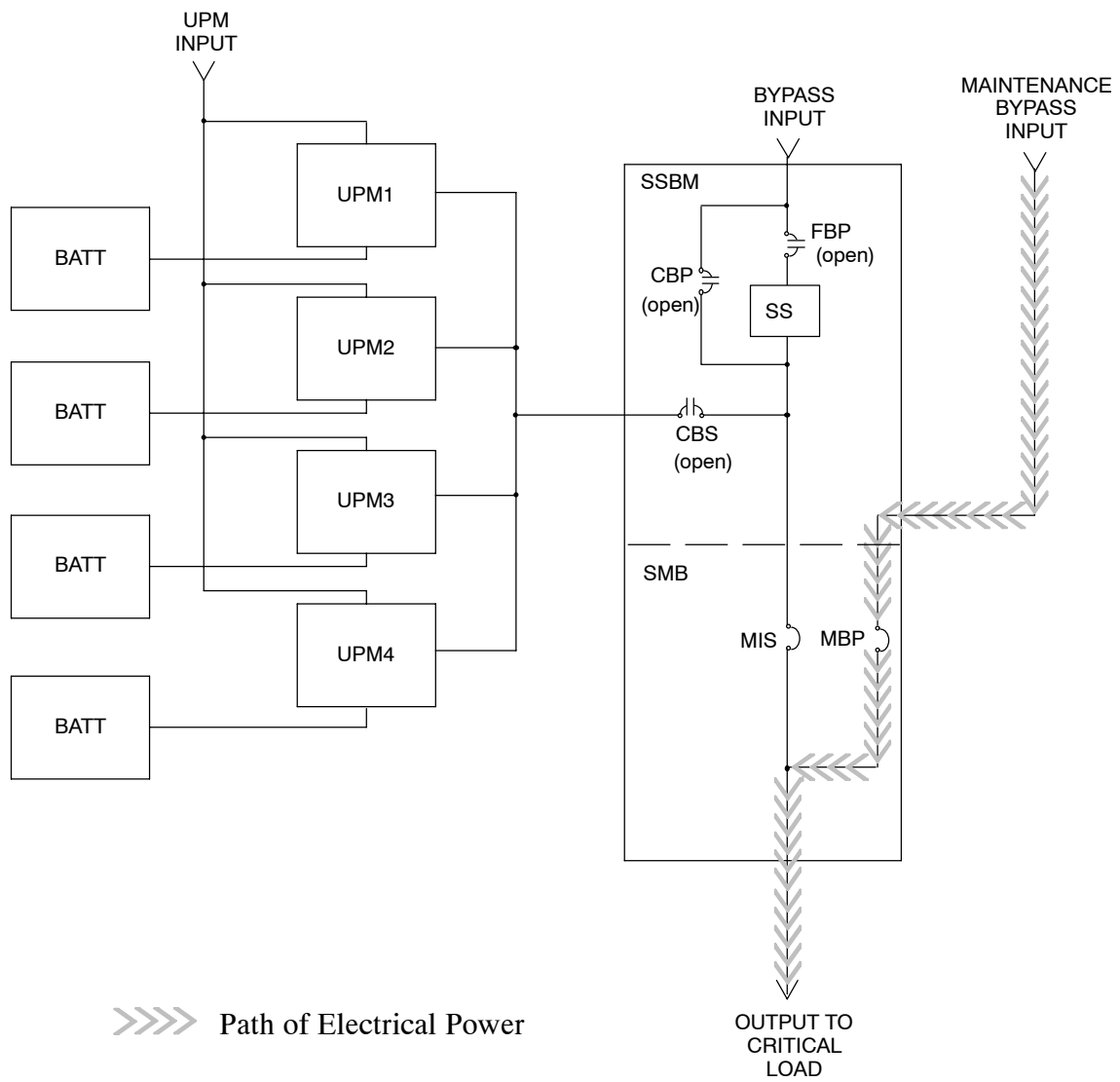


Figure 7–5. Path of Current Through the Parallel Capacity/Redundant System in Redundant CBP Mode.

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Operational Controls and Features



8.1 General

The Parallel Capacity/Redundant 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.

Figures 8–1 and 8–2 identify and show the location of the controls and indicators on the System Bypass Module (SBM). The descriptions provide a brief overview of the SBM controls, and standard and optional features.

NOTE: Read the Operation section and have thorough knowledge of parallel redundant operation before attempting to operate. For a more detailed description of UPS operation, refer to Powerware® 9315 Operation manual supplied with the UPS system.

8.2 SBM Standard Features

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

8.2.1 Control Panel

The Control Panel on the front of the SBM contains an LCD screen to display the current status of the Parallel Capacity/Redundant 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 SBM and alert you to system events. The SYSTEM MODE switch, also located on this panel, is used to start and stop the system and transfer the load between normal UPM 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 EMERGENCY UPM OFF is located above the SYSTEM MODE switch. The Control Panel is described in Chapter 9, “Using the Control Panel”.

8.2.2 SBM Circuit Breakers

The SBM contains three circuit breakers: the UPM Output Breaker (CBS), the System Bypass Breaker (CBP), and the Backfeed Protection Breaker (FBP). CBS connects the output of the UPMs to the critical load. CBP is used as the bypass supply in the event the output of the UPMs are not available and to supply the critical load during maintenance. FBP is used to prevent power from being feed back to the UPMs in the event the static switch fails. These breakers are electrically controlled by the SBM and are automatic in operation.

8.2.3 EMERGENCY UPM OFF

An EMERGENCY UPM OFF pushbutton is provided for situations where you must instantaneously control the UPM and SBM output. The pushbutton is located on the front of the SBM 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 10, “Operating Instructions for the Parallel Capacity/Redundant System.”

8.2.4 Customer Interface Panel

PowerNet

Two redundant control networks connect UPM to UPM and UPM to the SBM. Each network requires only one shielded twisted pair of wires. Refer to Appendix A, drawing 164201150–13 for further information.

Computer Interface

Two serial communications ports are standard on all units, and are electrically isolated from the SBM. You can use these ports to link the SBM to the features described in Chapter 13, “Serial Communications” and Chapter 14, “Remote Notification.”

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 SBM alarm. This feature is described further in Chapter 11, “Using Features and Options.”

Building Alarm Monitoring

You can connect your facility’s alarm system contacts to six (6) inputs in the SBM. The SBM uses these inputs to monitor your building alarms in addition to the SBM status. This feature is described further in Chapter 11, “Using Features and Options.”

8.2.5 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 adjacent to the Customer Interface Panel.

8.2.6 Installation Features

Power wiring can be routed through the top or bottom 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 or bottom of each cabinet.

8.3 Options and Accessories

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

8.3.1 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 SSBM 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 11, “Using Features and Options.”

8.3.2 Relay Interface Module

An optional Relay Interface Module (RIM) uses relay contact closures to indicate the operating status and alarm condition of the SSBM. The module uses a serial interface line and may support up to eight critical loads. This option is described further in Chapter 11, “Using Features and Options.”

8.3.3 Modem

An optional modem is available for use with the Remote Notification feature described in Chapter 14, “Remote Notification”. Refer to the manual supplied with the modem for modem operating instructions.

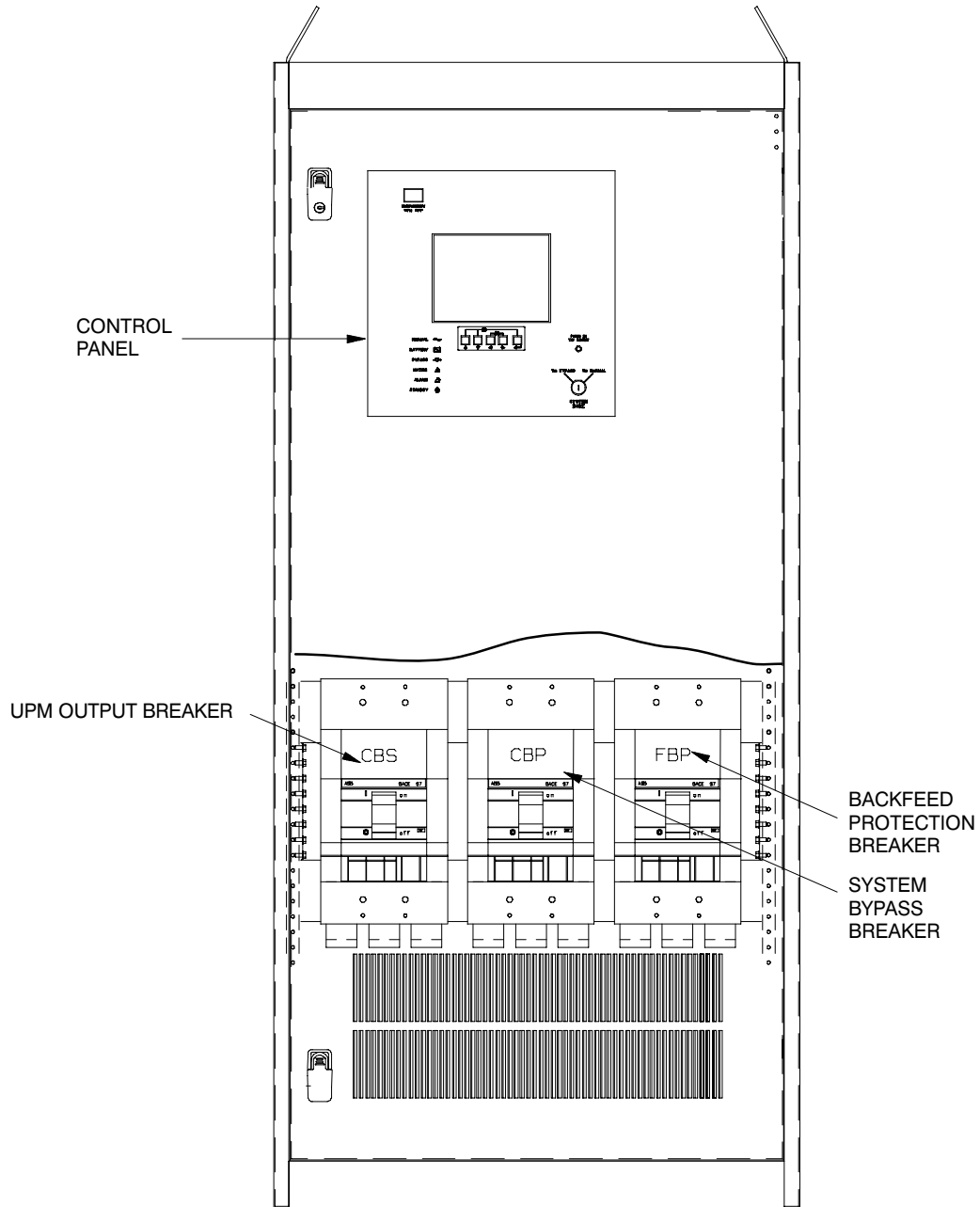


Figure 8-1. 1200A SBM Controls and Indicators

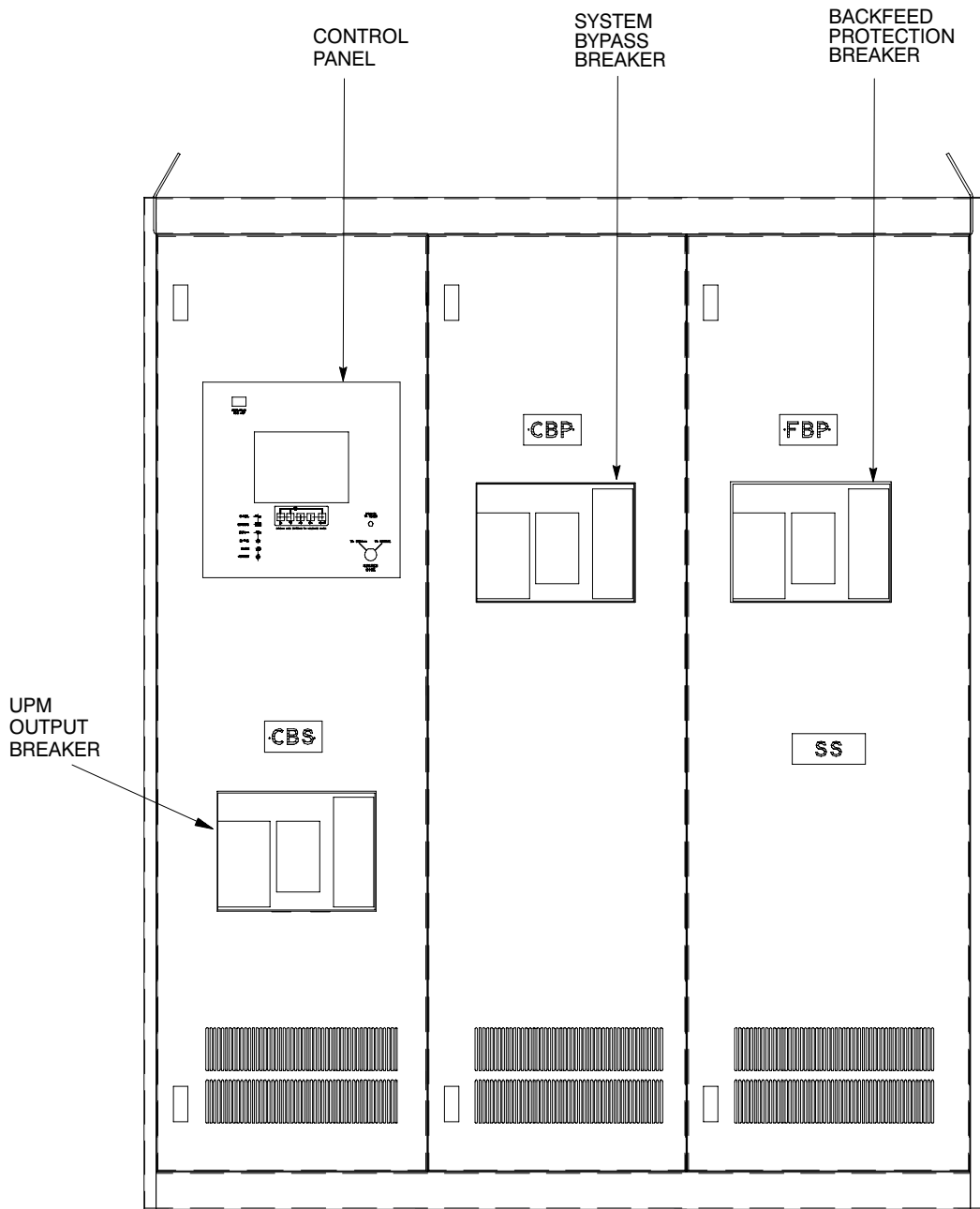


Figure 8–2. 2000A SBM Controls and Indicators

8.4 Safety Considerations

The Parallel Capacity/Redundant system enclosures are designed for industrial or computer room applications, and contain safety shields. However, the system is very 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 Parallel Capacity/Redundant system.

If service or routine maintenance is required:

- Ensure all power is disconnected before performing installation or service.
- Ensure the area around the Parallel Capacity/Redundant system 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 15.

8.5 Symbols, Controls, and Indicators

These symbols may appear on your Parallel Capacity/Redundant system or on labels inside the SBM. 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.

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Using the SBM Control Panel



9.1 Description

This chapter describes the System Bypass Module (SBM) Control Panel, including controls and indicators, and how to monitor Parallel for Capacity/Redundant operation. The Control Panel is a black square area on the front of the SBM (see Figure 9–1).

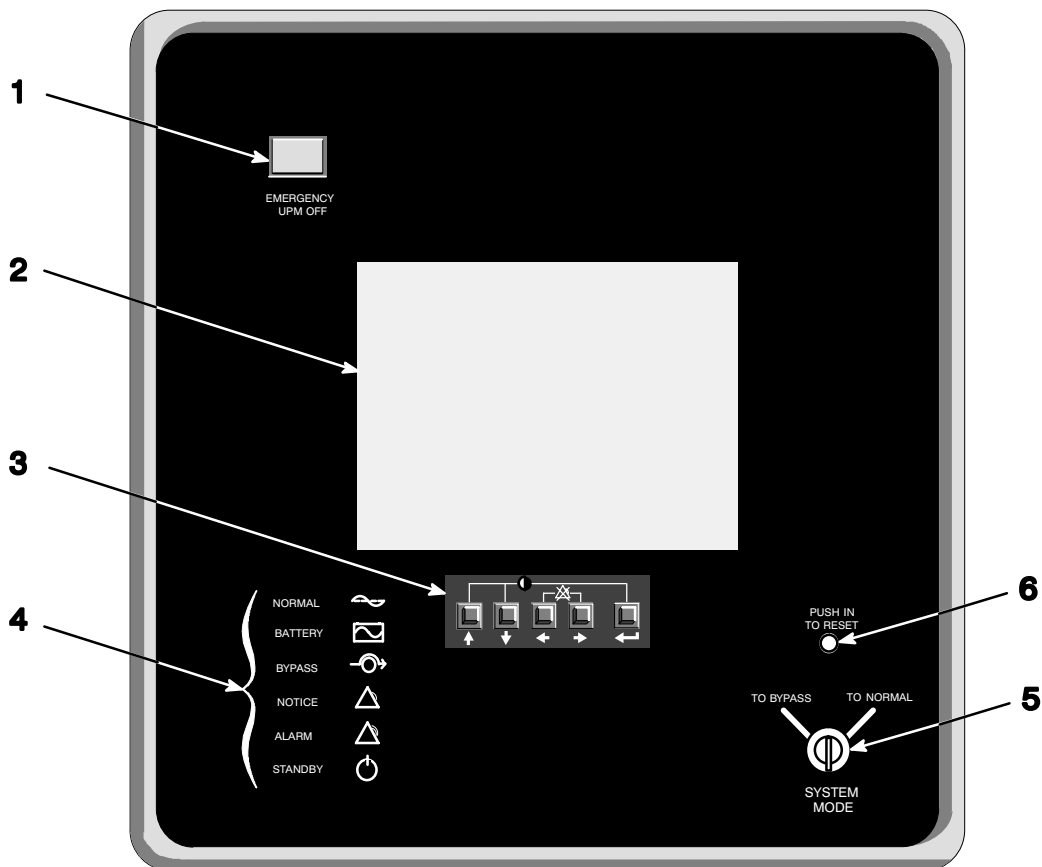


Figure 9–1. Parallel/Capacity Control Panel

The Control Panel contains:

- (1) a red EMERGENCY UPM OFF pushbutton,
- (2) a flat liquid crystal display (LCD) screen,
- (3) a horizontal row of pushbuttons,
- (4) a vertical column of backlit status indicators,
- (5) a SYSTEM MODE key switch,
- (6) and a PUSH IN TO RESET pushbutton.

The following sections describe the Monitor Panel in detail.

9.2 Using the LCD Screen

The LCD screen at the top of the Control Panel provides an operator interface with the Parallel Capacity/Redundant system. Figure 9–2 identifies the display fields discussed in the following sections.

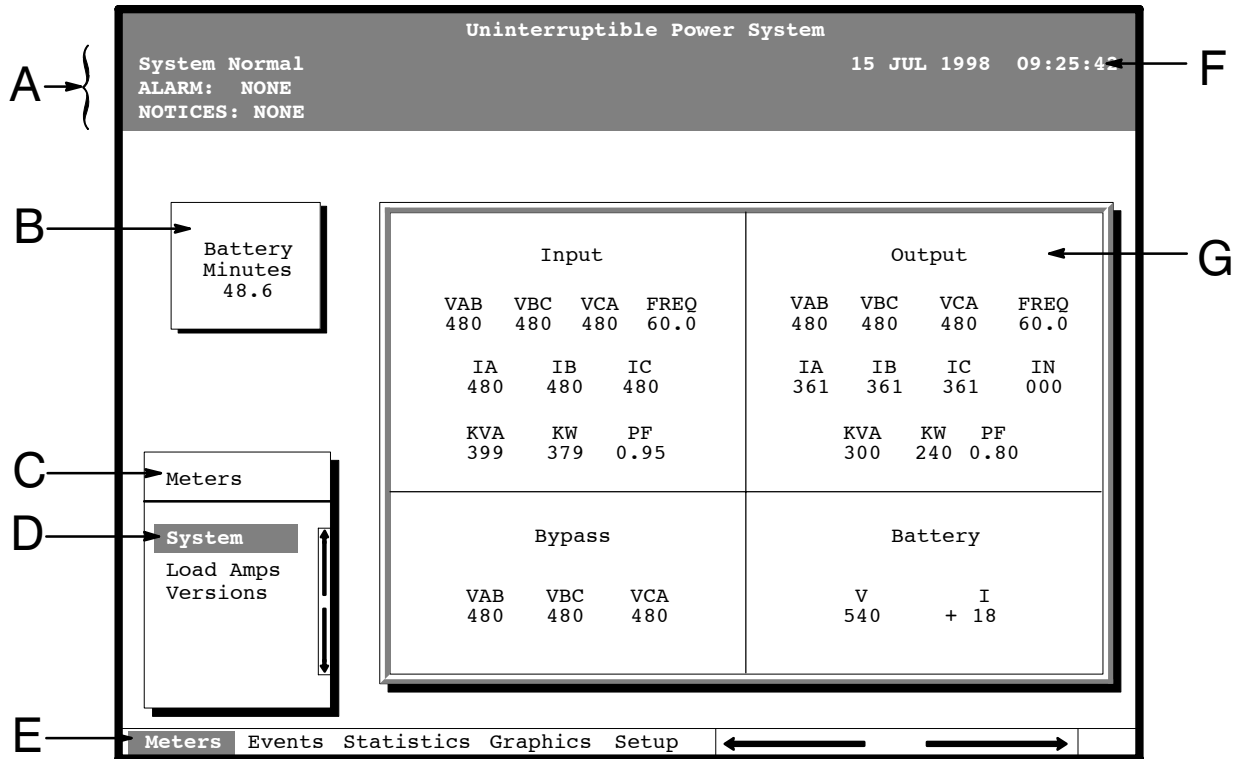


Figure 9–2. Parts of the LCD Screen (Typical for Powerware 9315 300 480/480V Unit)

- 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 11, “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 \uparrow and \downarrow 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 \uparrow and \downarrow 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 \leftarrow and \rightarrow 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.

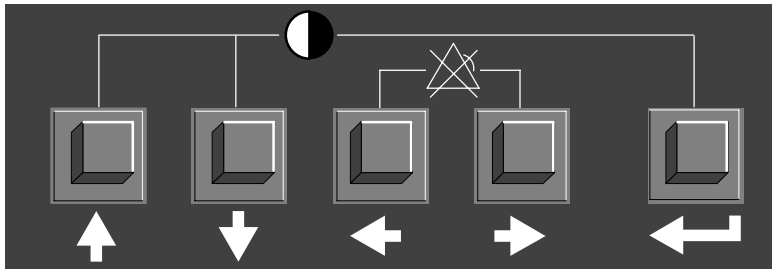
- G The information area contains data about UPS status and operations. Select a menu option to display statistics or graphics.








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).




9.3 Using the Pushbuttons

The pushbuttons below the LCD screen are labeled with arrows indicating their functions:



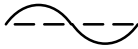
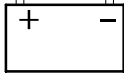







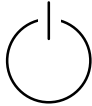
- Press the  and  pushbuttons to move through the options in a menu, or to scroll through the list of alarms and notices in the event log.
- Press the  and  pushbuttons to move through the menu titles on the menu bar. Press them simultaneously to silence the horn, or to test the lamps behind the status indicators.
- Press the  pushbutton to toggle the use of the  and  pushbuttons between the menu box and the information area.

9.4 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.

9.5 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 11.

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.

9.6 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.

Figure 9–3 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.

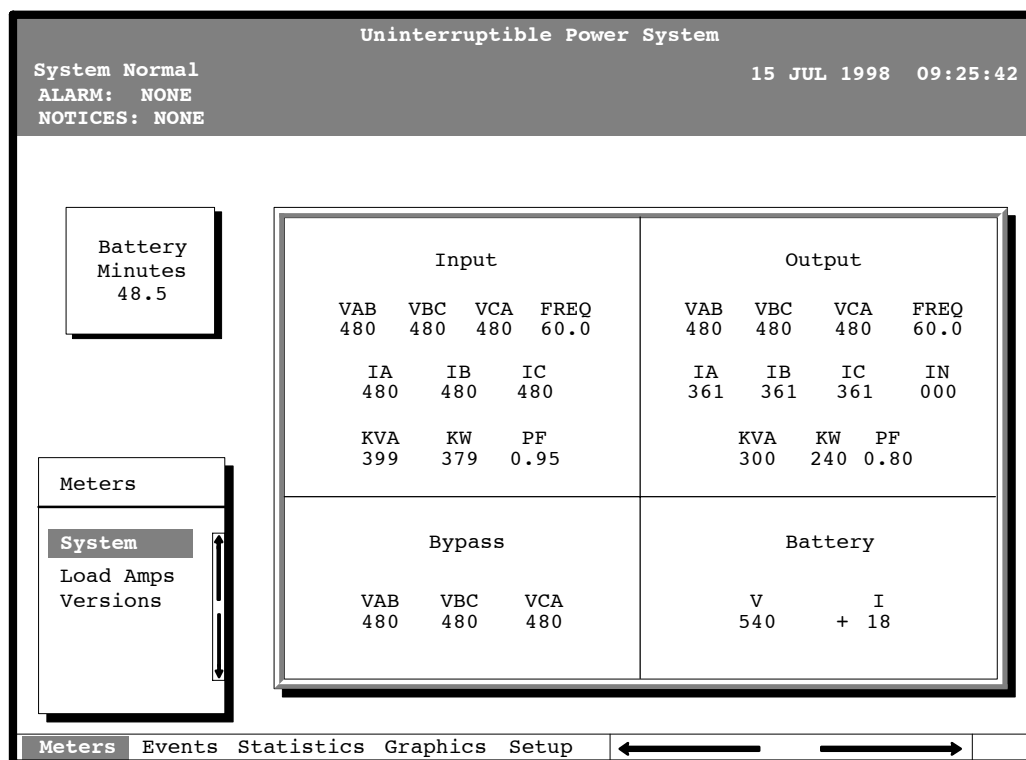


Figure 9–3. System Meters Screen (Typical for Powerware 9315 300 480/480V Unit)

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).

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 9–4 shows the Load Amps Meters screen.

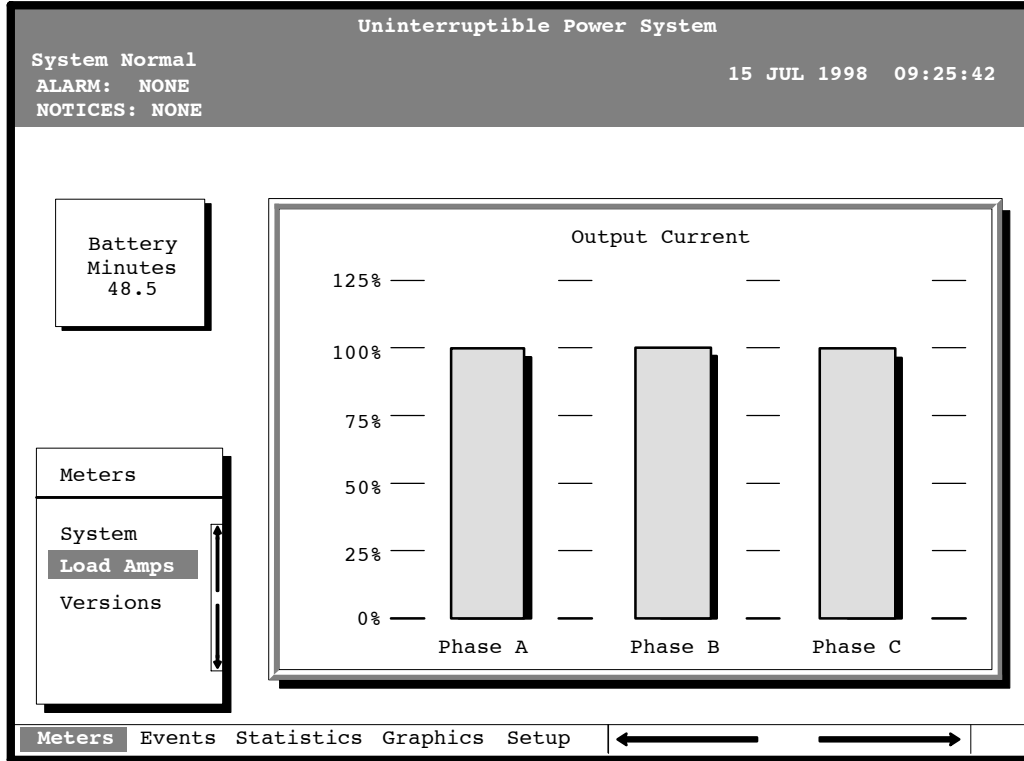


Figure 9–4. Load Amps Meters Screen

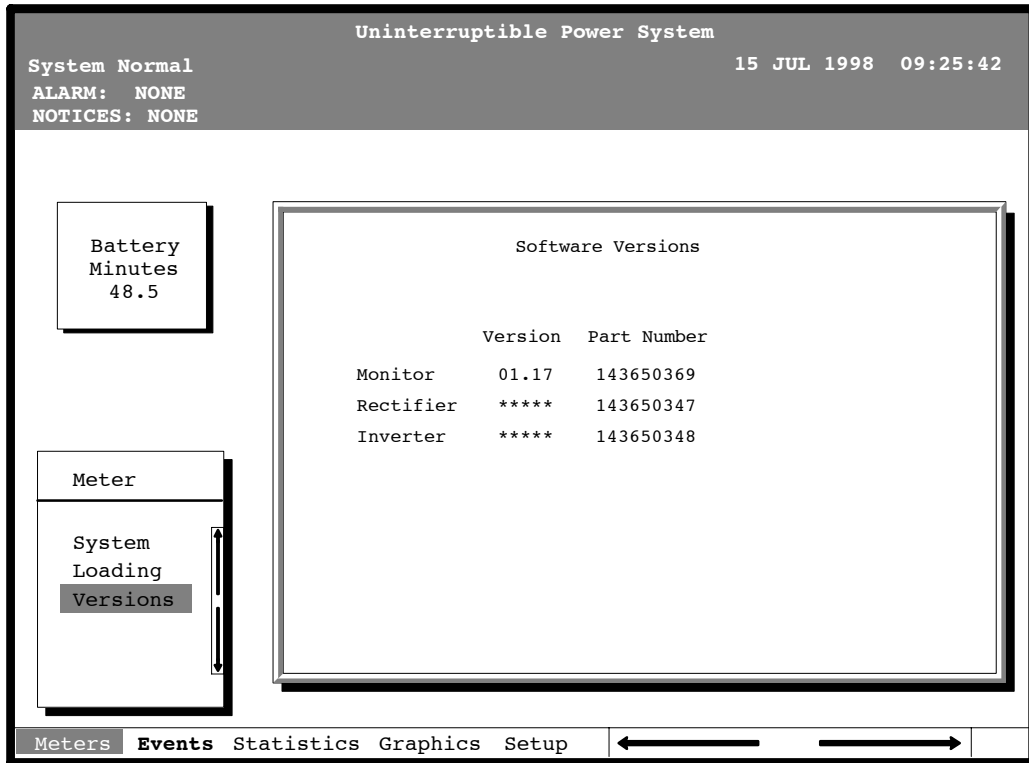


Figure 9–5. Versions Meters Screen

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 9–6 shows the Event History Log screen.

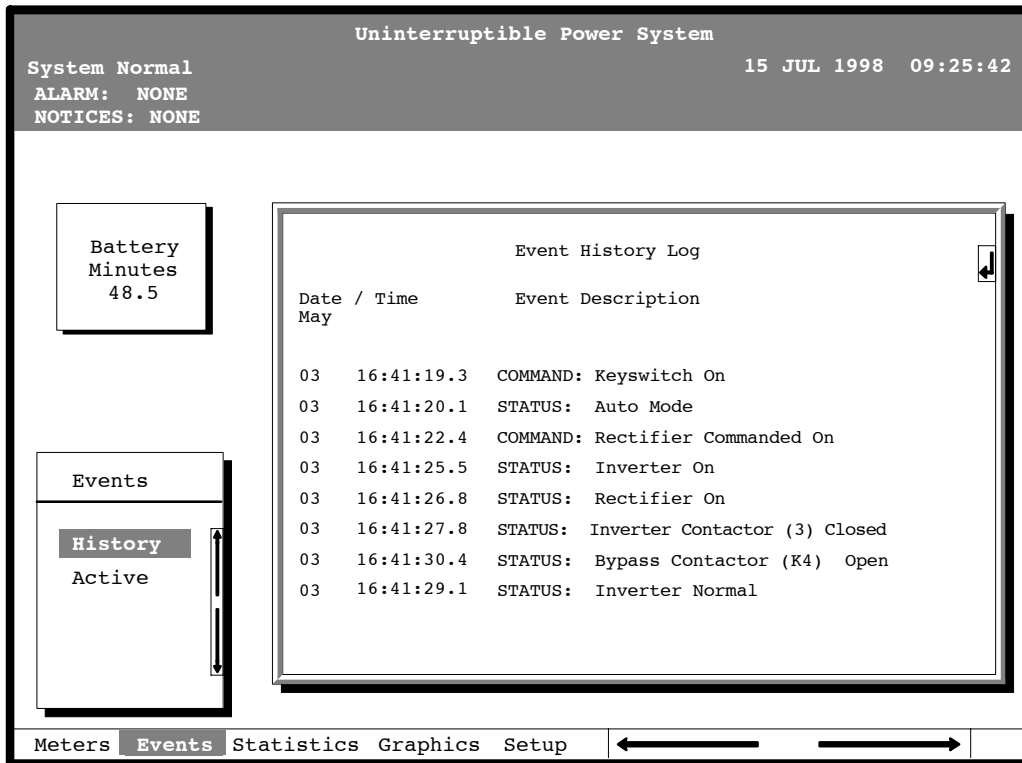


Figure 9–6. Event History Log Screen

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.

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 9–7 shows the Active System Events screen.

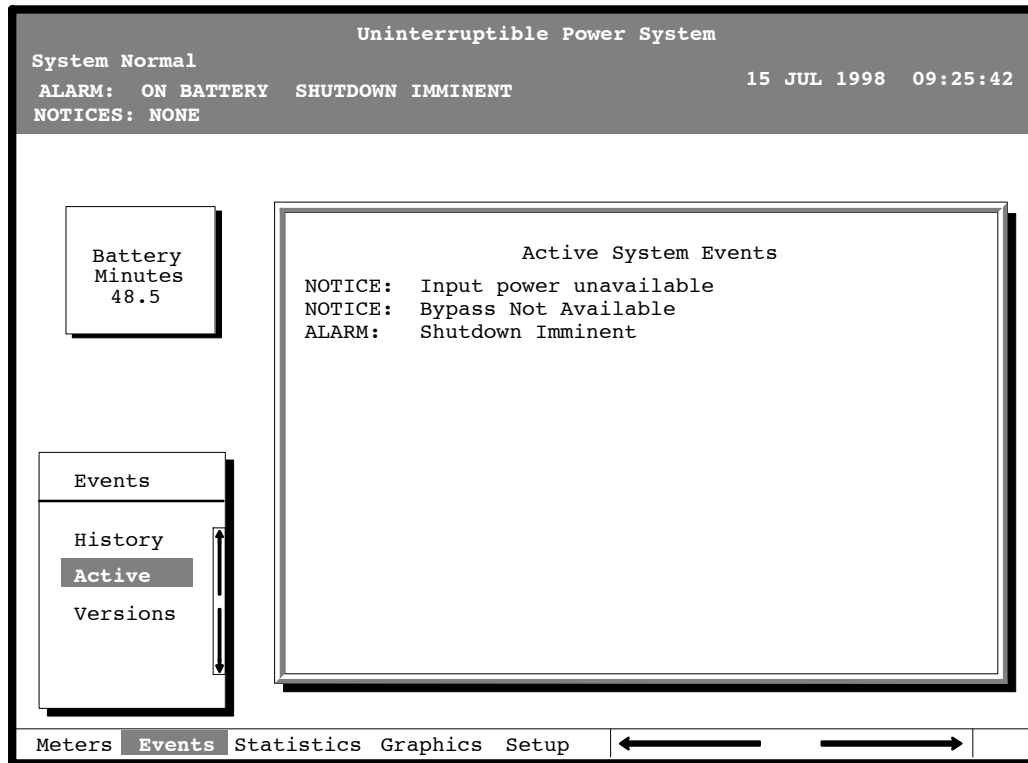


Figure 9–7. Active System Events Screen

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

Figure 9–8 shows the Unit Statistics screen.

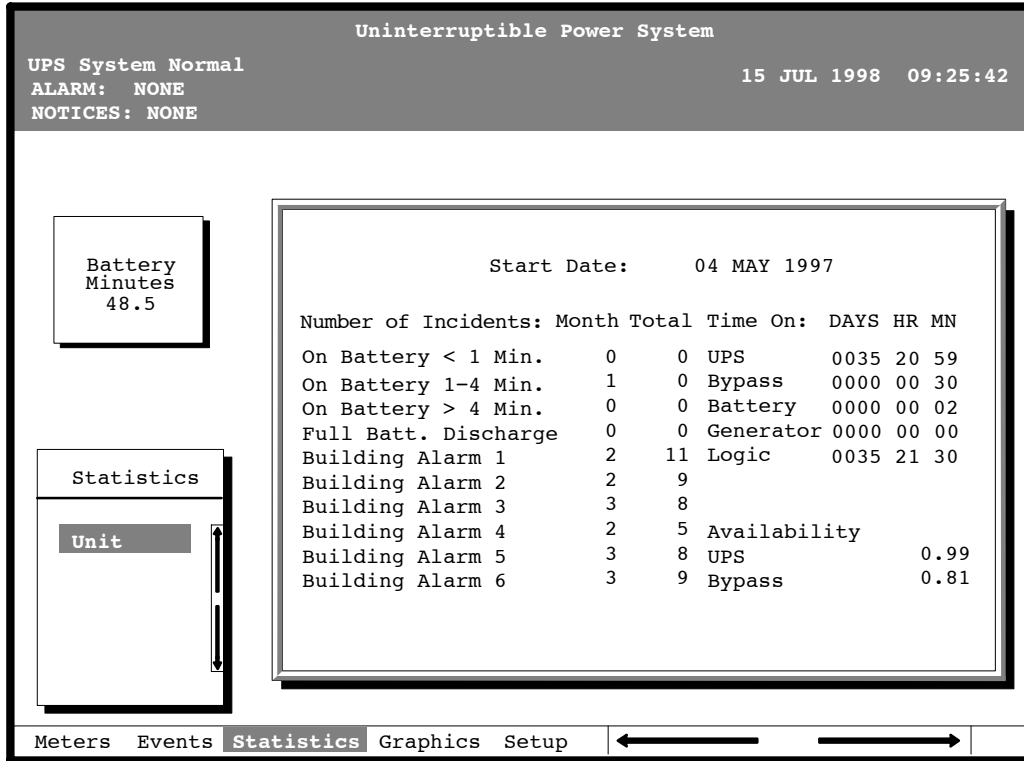


Figure 9–8. Unit Statistics Screen

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.

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

Figure 9–9 shows the Mimic screen.

NOTE: Number of UPMs showing on MIMIC screen is dependent on number of units installed at site.

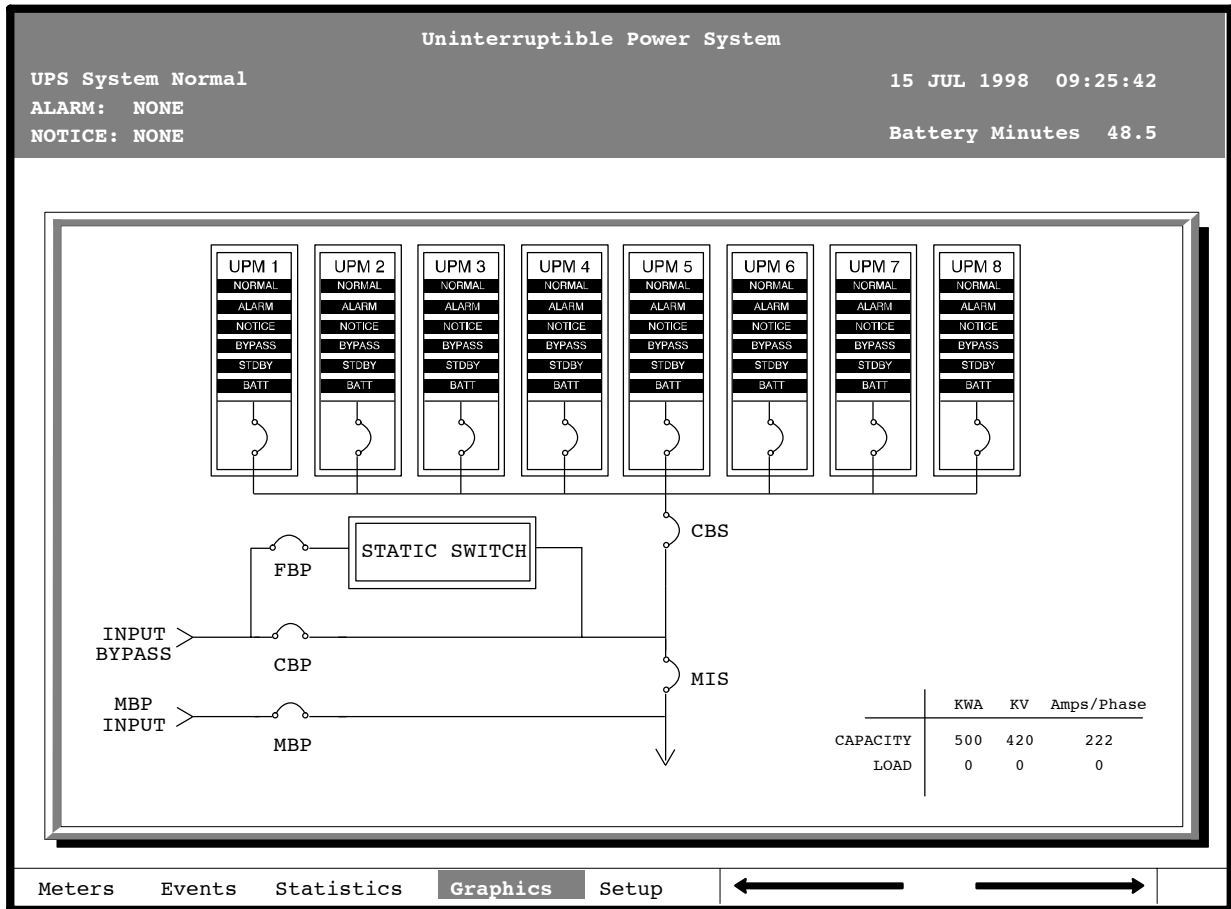


Figure 9–9. Mimic Screen

The Mimic screen shows the internal components of the UPS cabinet. The flow of current through the components is highlighted. NOTE: The number of UPMs displayed on the Mimic screen is dependent on the actual number of units installed at location. Also all alarms are shown for information purposes only. Only actual alarms would be shown in the installed instance.

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 9–10 shows the Time Setup screen.

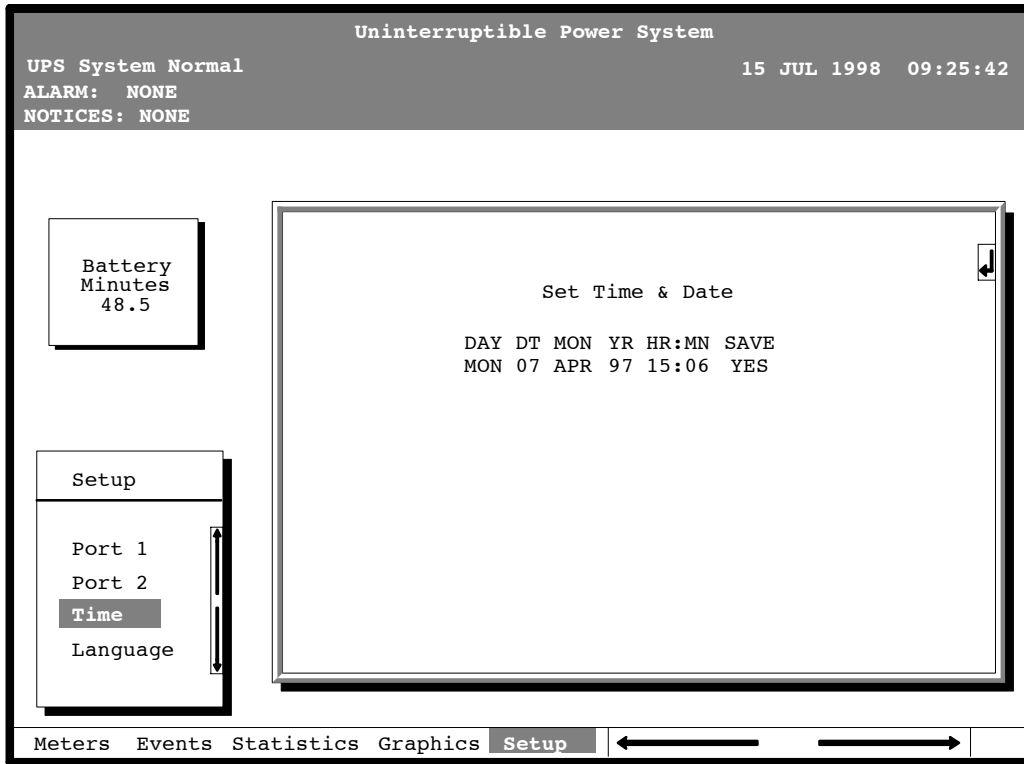


Figure 9–10. Time Setup Screen

The small return arrow (\leftarrow) appears in the upper right corner of the Time Setup screen. This arrow is a reminder that you can press the \leftarrow 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 \leftarrow and \rightarrow pushbuttons to highlight the setting you want to change. To increase the setting (make it a higher value), press the \uparrow pushbutton. To decrease the setting (make it a lower value), press the \downarrow pushbutton. If you want to save the settings upon exit from this screen, be sure the SAVE field is set to YES.

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 9–11 shows the Setup Serial Port 1 screen.

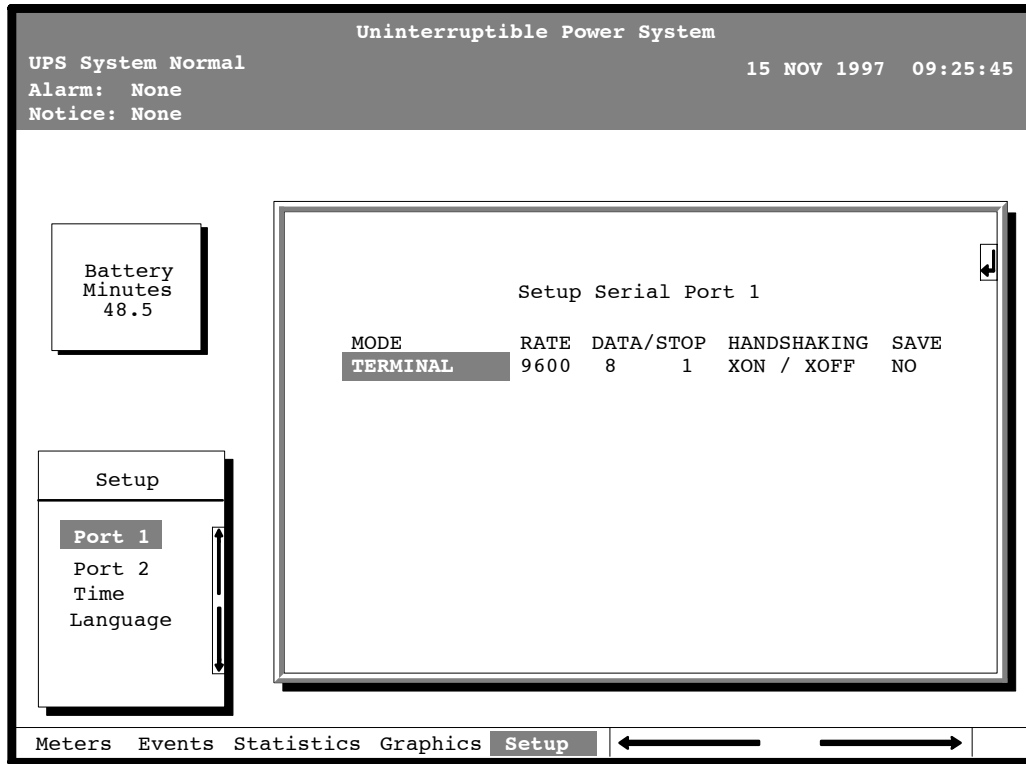


Figure 9–11. Port Setup Screen

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 13, “Serial Communications.”

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Operating Instructions for the Parallel Capacity/Redundant System



10.1 General Information – Before You Start

The following procedures provide instructions for operating the Parallel Capacity/Redundant System.

- NOTE: 1. Before starting the Parallel Capacity/Redundant system 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 Parallel Capacity/Redundant system operates properly.
2. Refer to Chapter 9 of this manual for description of SBM controls and monitor panel functions.
 3. Refer to the applicable Powerware® 9315 UPS Operation manual provided with the UPMs, for UPM operating instructions.

10.2 Operation of SBM with Powerware 9315–200 thru 9315–500 UPMs

10.2.1 Initial Setup

1. Ensure the System Bypass Module (SBM) circuit breakers are set as follows:
 - UPM Output Breaker (CBS) – Open
 - System Bypass Breaker (CBP) – Open
 - Backfeed Protection Breaker (FBP) – Open
 - Maintenance Isolation Breaker (MIS) – Open
 - Maintenance Bypass Breaker (MBP) – Open

NOTE: When power is applied in the following step, circuit breakers CBS, CBP, and FBP will charge, if not already charged.

2. Close upstream UPM and SBM Bypass input feeder circuit breakers.
3. Observe SBM monitor screen becoming active and Alarm and Notice messages scrolling.

10.2.2 Manual Start

1. Perform the Initial Setup procedures.
2. On SBM, turn the SYSTEM MODE key switch to BYPASS momentarily.
If a bypass source is available when you turn the SYSTEM MODE key switch to BYPASS, the critical load is immediately supplied by the bypass source in Bypass mode until the the UPMs are available and the SBM has been manually transferred to Normal mode. The status indicators on the SBM monitor screen indicate when the Parallel Capacity/Redundant system is in Bypass mode and Normal mode.
3. Observe that CBP and FBP have closed.
4. On first UPM, close CB1.
5. Observe UPM monitor screen becoming active as an indication of logic power.
6. Verify UPM is shown on the SBM mimic screen.
7. On first UPM, set BATTERY switch to NORMAL.
8. On first UPM, set MODE switch to NORMAL.
9. On first UPM, turn the START switch to the right for 2 seconds and then release.
10. When UPM Battery Disconnected alarm and notification is received, close first UPM battery disconnect breaker.
11. On first UPM, turn the START switch to the right momentarily.
The rectifier turns on, then the inverter turns on. When the inverter reaches full voltage, K3 closes. Logic power is supplied and the UPM is ready to supply power to the critical load. It takes less than 1 minute for the UPM to achieve Normal mode.
12. Start remaining UPMs by repeating steps 3 through 10.
13. On SBM monitor screen, check for On Bypass, UPMs Ready message.
14. If message appears, turn the SBM SYSTEM MODE key switch to NORMAL momentarily.
15. Observe that breaker CBS closes and breaker CBP opens. System is now in Normal mode, with the critical load being supplied power from the UPMs.

10.2.3 Auto Start

NOTE: Automode must be enabled to use this procedure.

1. Perform the Initial Setup procedures.
2. On SBM, turn the SYSTEM MODE key switch to BYPASS momentarily.
3. Observe that CBP and FBP have closed.
4. On all UPMs, close CB1
5. On all UPMs, set BATTERY switch to NORMAL.
6. On all UPMs, set MODE switch to NORMAL.
7. On SBM, turn the SYSTEM MODE key switch to NORMAL momentarily.

The UPM rectifiers turn on.

If a bypass source is available, the critical load is immediately supplied by the bypass source in Bypass mode until the the UPMs are available. The status indicators on the SBM monitor screen indicate when the Parallel Capacity/Redundant system is in Bypass mode and Normal mode.

8. Observe that CBS is open and CBP is closed.
9. When UPM Battery Disconnected alarm and notification message is received, close UPM battery disconnect breakers.

The UPM inverters turns on. When each inverter reaches full voltage, K3 closes. Logic power is supplied and the UPM is ready to supply power to the critical load. It takes less than 1 minute for the UPM to achieve Normal mode.

10. Once the Parallel Capacity/Redundant system is redundant, the critical load is automatically transferred from bypass to the UPMs and system is operating in normal mode.

NOTE: If transfer is not completed within one minute, the SYSTEM MODE key switch must be turned momentarily to NORMAL again to achieve normal operation.

10.2.4 *Single UPM Shutdown*

NOTE: If system is not redundant, UPM can not be shutdown using this procedure.

1. On UPM, turn the MODE switch to BYPASS.
2. On SBM monitor screen, verify UPS OFF message appears.
3. Set UPM battery disconnect breaker to open.
4. When UPM Battery Disconnected alarm and notification message is received, open CB1 on UPM. The UPM powers down.

WARNING



Power is present at UPM CB1 input, until upstream UPM input feeder circuit breaker is opened. Fans and load side of K3 will still have voltage present.

10.2.5 *SBM Shutdown to Bypass*

1. On SBM, turn the SYSTEM MODE key switch to BYPASS momentarily.
2. Observe CBS opens and CBP closes.
3. On SBM monitor screen, verify On Bypass message appears. System is now on bypass.
4. Set UPM battery disconnect breakers to open.
5. When UPM Battery Disconnected alarm and notification message is received, open CB1 on all UPMs, except the last UPM. The last UPM must be shutdown using the UPM LOAD OFF pushbutton. Refer to “Using the UPM LOAD OFF Pushbutton” in this chapter.
6. To shutdown last UPM, press last UPM LOAD OFF pushbutton.

WARNING



Power is present at UPM CB1 input, until upstream UPM input feeder circuit breaker is opened. Fans and load side of K3 will still have voltage present.

10.2.6 Restarting a Single UPM

1. On UPM, close CB1.
2. Observe UPM monitor screen becoming active as an indication of logic power.
3. Verify UPM is shown on the SBM mimic screen.
4. On UPM, set BATTERY switch to NORMAL.
5. On UPM, set MODE switch to NORMAL.
6. On UPM, turn the START switch to the right for 2 seconds and then release.
7. When UPM Battery Disconnected alarm and notification is received, close UPM battery disconnect breaker.
8. UPM, will automatically return to on line condition.
The rectifier turns on, then the inverter turns on. When the inverter reaches full voltage, K3 closes. Logic power is supplied and the UPM is ready to supply power to the critical load. It takes less than 1 minute for the UPM to achieve Normal mode.
9. On SBM mimic screen, check for presence of UPM.

10.2.7 Using the UPM LOAD OFF Pushbutton

NOTE: The UPM LOAD OFF pushbutton will only interrupt the ability for that module to deliver power to the critical bus. The redundant modules will continue to support the critical load. To remove all power from the critical load, use the SBM EMERGENCY UPM OFF pushbutton.

Load Off is initiated by the covered, red UPM LOAD OFF pushbutton on the Monitor Panel. This pushbutton is protected by a clear plastic shield to prevent accidental activation. In an emergency, you can press this pushbutton to instantaneously open the input breaker and interrupt UPM output. The UPM remains locked off until you reset the LOAD OFF pushbutton.

WARNING



All power to the critical load is lost when you press this pushbutton. Use this feature only in an emergency or when you want to immediately de-energize the critical load.

To restart the UPS after pressing the LOAD OFF pushbutton, follow the procedure “Resetting the UPM after Load Off” of this chapter before starting the UPS.

NOTE: The UPM Remote Emergency Load Off option functions the same way as the LOAD OFF pushbutton on the Monitor Panel.

10.2.8 To Use the LOAD OFF Pushbutton

1. Raise the clear plastic shield covering the red LOAD OFF pushbutton on the UPM Monitor Panel.
2. Press the LOAD OFF pushbutton.

The breaker and contactors open (you can hear them opening). The CB1 switch trips, and the Load Off PUSH TO RESET pushbutton on the UPM Control Panel pops out. The UPM shuts down.

10.2.9 Resetting the UPM after LOAD OFF

CAUTION



Do not attempt to restart the UPM after Load Off until the cause of the emergency has been identified and cleared.

The Load Off PUSH TO RESET pushbutton is a small white button on the UPM Control Panel. The PUSH TO RESET pushbutton pops out and the CB1 switch trips when the LOAD OFF pushbutton on the Monitor Panel is activated.

To reset the UPM:

1. Press the Load Off PUSH TO RESET pushbutton until it clicks in and remains recessed.
2. Move the CB1 switch from the center (tripped) position to OFF. The switch should be difficult to move from the TRIPPED position.
3. The UPM is now reset. To restart the UPM, follow the procedure in Chapter 4, “Starting and Stopping the UPS.”

10.2.10 Using the SBM EMERGENCY UPM OFF Pushbutton

An SBM Emergency UPM Off is initiated by the covered, red EMERGENCY UPM OFF pushbutton on the SBM 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 UPM and SBM output. The SBM EMERGENCY UPM OFF pushbutton functions differently, depending on the Emergency Power Off (EPO) option specified when ordered. The options available are as follows:

- The critical load is transferred to bypass and UPMs powered down. UPM CB1 breakers remain closed.
- Power to the critical load is de-energized and UPMs powered down. UPM CB1 breakers remain closed.
- The critical load is transferred to bypass and UPMs powered down. UPM CB1 breakers trip and the UPM is cut off from utility power. This function requires additional EPO kit available from Powerware.
- Power to the critical load is de-energized and UPMs powered down. UPM CB1 breakers trip and the UPM is cut off from utility power. This function requires additional EPO kit available from Powerware.

The SBM (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 Parallel Capacity/Redundant 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 SBM Control Panel.

10.2.11 To Use the SBM EMERGENCY UPM OFF Pushbutton

1. Raise the clear plastic shield covering the red SBM EMERGENCY UPM OFF pushbutton on the SBM Control Panel.
2. Press the EMERGENCY UPM OFF pushbutton.

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

10.2.12 Resetting the Parallel Capacity/Redundant System after an EMERGENCY UPM OFF

CAUTION



Do not attempt to restart the UPM after Load 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 SBM Control Panel. The PUSH TO RESET pushbutton pops out when the Emergency UPM Off pushbutton on the SBM Control Panel is activated.

To reset the Parallel Capacity/Redundant system:

1. Press the Emergency UPM Off PUSH IN TO RESET pushbutton until it clicks in and remains recessed.
2. On the UPMs, move the CB1 switches from the center (tripped) position to OFF. The switches should be difficult to move from the TRIPPED position.
3. The Parallel Capacity/Redundant system is now reset. To restart the Parallel Capacity/Redundant system, follow the procedure at the beginning of this Chapter.

10.3 Operation of SBM with Powerware 9315–625 thru 9315–750 UPMs

10.3.1 Initial Setup

1. Ensure the System Bypass Module (SBM) circuit breakers are manually charged and set as follows:

System Output Breaker (CBS)	OPEN
System Bypass Breaker (CBP)	OPEN
Backfeed Protection Breaker (FBP)	OPEN
Maintenance Isolation Breaker (MIS)	CLOSED (optional)
Maintenance Bypass Breaker (MBP)	OPEN (optional)

2. Ensure the UPS circuit breakers for all UPMs are set as follows:

UPS Input Breaker (CB1)	Open
UPS Battery Breaker (CB2) (MBB)	Open
UPS Output Breaker (CB3)	Open

3. Ensure the Emergency UPM OFF PUSH TO RESET pushbuttons on the SBM and all UPMs are pressed in.

NOTE: When power is applied in the following step, circuit breakers CBS, CBP, and FBP will charge, if not already charged.

4. Close upstream UPM and SBM input feeder circuit breakers.
5. Observe SBM monitor screen becoming active and Alarm and Notice messages scrolling.
6. Observe all UPM monitor screens become active as an indication of logic power.
7. Verify all UPMs are shown on the SBM mimic screen.

10.3.2 Manual Start

1. Perform the Initial Setup procedures.
2. On SBM, turn the SYSTEM MODE key switch to BYPASS momentarily.
If a bypass source is available when you turn the SYSTEM MODE key switch to BYPASS, the critical load is immediately supplied by the bypass source in Bypass mode until the UPMs are available and the SBM has been manually transferred to Normal mode. The status indicators on the SBM monitor screen indicate when the Parallel Capacity/Redundant system is in Bypass mode and Normal mode.
3. Observe that CBP and FBP have closed.
4. On first UPM, set BATTERY switch to ENABLE.
5. On first UPM, turn the MODE key switch to NORMAL for three seconds.
6. Confirm the UPS breaker CB1 has closed by verifying breaker position on LCD mimic screen.
The rectifier and input/rectifier cooling fans blowers should be running.
7. Confirm UPS Battery Breaker CB2 (MBB) has closed by viewing breaker position on LCD Mimic screen.

NOTE: If CB2 is a manual battery breaker, manually close CB2 after UPM Battery Disconnected alarm and notification is received.

The inverter and output/inverter cooling blowers turn on. When the inverter reaches full voltage, UPS breaker CB3 closes. It takes less than 1 minute for the UPS to achieve Normal mode. If UPS is not in Autorestart, turn the MODE key switch to NORMAL for three seconds to transfer to Normal mode.
8. UPS is now operating in Normal mode.
9. Start remaining UPMs by repeating steps 4 through 8.
10. On SBM monitor screen, check for On Bypass, UPMs Ready message.
11. If message appears, turn the SBM SYSTEM MODE key switch to NORMAL momentarily.
12. Observe that breaker CBS closes, breaker CBP opens, and the SSW is turned off.

10.3.3 Auto Start

NOTE: Autorestart must be enabled to use this procedure.

1. Perform the Initial Setup procedures.
2. On SBM, turn the SYSTEM MODE key switch to BYPASS momentarily.
3. Observe that CBP and FBP have closed.
4. On all UPMs, set BATTERY switch to ENABLE.
5. On SBM, turn the SYSTEM MODE key switch to NORMAL momentarily.
The UPS CB1 breakers close.

The rectifiers and input/rectifier cooling blowers turn on.

All CB2 (MBB) UPS battery breakers close.

NOTE: If CB2 is a manual battery breaker, manually close CB2 after UPM Battery Disconnected alarm and notification is received.

All inverter and output/inverter cooling blowers turn on. When the inverters reach full voltage, the UPS CB3 breakers close. It takes less than one minute for the UPMs to achieve Normal mode.

The UPMs are now ready to supply power to the critical load.

6. Once the Parallel Capacity/Redundant system is redundant, the critical load is automatically transferred from bypass to the UPMs via the CBS breaker and system is operating in Normal mode.

NOTE: If transfer is not completed within one minute, the SYSTEM MODE key switch must be turned momentarily to NORMAL again to achieve normal operation.

10.3.4 Single UPM Shutdown

NOTE: If system is not redundant, UPM cannot be shut down using this procedure.

1. On UPM, turn the MODE key switch to BYPASS for three seconds.
2. Verify that UPS breakers CB1 and CB3 and battery breaker CB2 (MBB) are open and the UPM powers down.
3. On SBM monitor screen, verify UPS OFF, message appears.

WARNING



Power is present at UPM CB1 input until upstream UPM input feeder circuit breaker is opened. The load side of CB3 still has voltage present.

10.3.5 *SBM Shutdown to Bypass*

1. On SBM, turn the SYSTEM MODE key switch to BYPASS momentarily.
2. Observe CBS opens, CBP closes.
3. On SBM monitor screen, verify On Bypass message appears. System is now on bypass.
4. On all but the last UPM, turn the MODE key switch to BYPASS for three seconds.
5. Verify that UPS breakers CB1 and CB3 and battery breaker CB2 (MBB) are open and the UPM powers down.
6. To shut down last UPM, press last UPM LOAD OFF pushbutton.
7. Verify that UPS breakers CB1 and CB3 and battery breaker CB2 (MBB) are open and the UPM powers down.

WARNING



Power is present at UPM CB1 input until upstream UPM input feeder circuit breaker is opened. The load side of CB3 still has voltage present.

10.3.6 *Restarting a Single UPM*

1. Close upstream UPM input feeder breaker.
2. Observe UPM monitor screen becoming active as an indication of logic power.
3. Verify UPM is shown on the SBM mimic screen.
4. On UPM, set BATTERY switch to ENABLE.
5. On UPM, turn MODE key switch to NORMAL for three seconds
6. Confirm the UPS breaker CB1 has closed by viewing breaker position on LCD Mimic screen.
The rectifier and input/rectifier cooling blowers turn on.
7. Confirm UPS Battery Breaker CB2 (MBB) has closed by viewing breaker position on LCD Mimic screen.

NOTE: If CB2 is a manual battery breaker, manually close CB2 after UPM Battery Disconnected alarm and notification is received.

The inverter and output/inverter cooling blowers turn on. When the inverter reaches full voltage, UPS breaker CB3 closes. It takes less than 1 minute for the UPS to achieve Normal mode. If UPS is not in Autorestart, turn the MODE key switch to NORMAL for three seconds to transfer to Normal mode.

8. The UPM is now operating in Normal mode.
9. On SBM mimic screen, check for presence of UPM.

10.3.7 Using the UPM EMERGENCY UPM OFF Pushbutton

NOTE: The UPM EMERGENCY UPM OFF pushbutton will only interrupt the ability for that module to deliver power to the critical bus. The redundant modules continue to support the critical load.

Emergency UPM shutdown is initiated by the covered, red UPM EMERGENCY UPM OFF pushbutton on the UPM Monitor Panel. This pushbutton is protected by a clear plastic shield to prevent accidental activation. In an emergency, you can press this pushbutton to instantaneously open all UPM breakers and interrupt UPM output. The UPM 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 UPM after Shutdown” of this chapter before starting the UPS.

NOTE: The UPM REMOTE EMERGENCY LOAD OFF (REPO) functions in the same way as the UPM EMERGENCY UPM OFF pushbutton on the UPM Monitor panel.

10.3.8 To Use the UPM EMERGENCY UPM OFF Pushbutton

1. Raise the clear plastic shield covering the red EMERGENCY UPM OFF pushbutton on the UPM Monitor Panel.
2. Press the EMERGENCY UPM OFF pushbutton.
UPS breakers CB1 and CB3 and Battery breaker CB2 (MBB) open. The EMERGENCY UPM OFF PUSH TO RESET pushbutton on the UPM Control Panel pops out. The UPM shuts down.

10.3.9 Resetting the UPM after an EMERGENCY UPM Shutdown

CAUTION



Do not attempt to restart the UPM after Load Off until the cause of the emergency has been identified and cleared.

The EMERGENCY UPM OFF PUSH TO RESET pushbutton is a small white button on the UPM Control Panel. The PUSH TO RESET pushbutton pops out when the EMERGENCY UPM OFF pushbutton on the Monitor Panel is activated.

To reset the UPM:

1. Press the EMERGENCY UPM OFF PUSH TO RESET pushbutton until it clicks in and remains recessed.
2. The UPM is now reset. To restart the UPM, follow the procedure in this chapter, “Restarting a Single UPM.”

10.3.10 Using the SBM EMERGENCY UPM OFF Pushbutton

An SBM Emergency UPM Off is initiated by the covered, red EMERGENCY UPM OFF pushbutton on the SBM Control/Monitor 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 UPM and SBM output. The SBM EMERGENCY UPM OFF pushbutton functions differently, depending on the Emergency Power Off (EPO) option specified when ordered. The options available are as follows:

- The critical load is transferred to bypass and UPMs powered down. UPM breakers CB1, CB2 (MBB) and CB3 open.
- Power to the critical load is de-energized and UPMs powered down. UPM breakers remain CB1, CB2 (MBB) and CB3 open.
- The critical load is transferred to bypass and UPMs powered down. UPM CB1 breakers trip and the UPM is cut off from utility power. This function requires additional EPO kit available from Powerware.
- Power to the critical load is de-energized and UPMs powered down. UPM CB1 breakers trip and the UPM is cut off from utility power. This function requires additional EPO kit available from Powerware.

The SBM (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 Parallel Capacity/Redundant System after Emergency UPM Off”, of this chapter, before starting the system.

NOTE: The Remote SBM Emergency Power Off (REPO) option functions differently than the SBM EMERGENCY UPM OFF pushbutton on the SBM control panel. If activated, the REPO option will deenergize the critical load, power down the UPMs and open UPM breakers CB1, CB2 (MBB), and CB3. The Remote SBM Emergency Power Off (REPO) option is not configurable to transfer the critical load to bypass power, if activated.

10.3.11 To Use the SBM EMERGENCY UPM OFF Pushbutton

1. Raise the clear plastic shield covering the red SBM EMERGENCY UPM OFF pushbutton on the SBM Control Panel.
2. Press the EMERGENCY UPM OFF pushbutton.
Breakers open and close (you can hear them opening and closing) and the Emergency UPM Off PUSH IN TO RESET pushbutton on the SBM Control Panel pops out.

10.3.12 Resetting the Parallel Capacity/Redundant System after EMERGENCY UPM OFF

CAUTION



Do not attempt to restart the UPM after Load 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 SBM Control/Monitor Panel. The PUSH TO RESET pushbutton pops out when the Emergency UPM Off pushbutton on the SBM Control/Monitor Panel is activated.

To reset the Parallel Capacity/Redundant system:

1. Press the Emergency UPM Off PUSH IN TO RESET pushbutton until it clicks in and remains recessed.
2. The Parallel Capacity/Redundant system is now reset. To restart the Parallel Capacity/Redundant system, follow the procedure at the beginning of this chapter.

10.4 Transfer to Maintenance Bypass

NOTE: Refer to Appendix A for location of Maintenance Bypass key switch.

1. Ensure power is supplied to the MBP breaker input before attempting transfer to maintenance bypass.
2. On 1200A SBM, ensure SBM is on bypass. On 2000A SBM ensure that SBM CBS breaker is open or system is not on inverter.
3. On SBM, turn the Maintenance Bypass key switch to the left (To Maintenance) momentarily.
4. Observe MBP closes and MIS opens. System is now on maintenance bypass.
5. To shutdown SBM and UPMs, follow procedure under SBM Shutdown to Bypass.

WARNING



Power is present at SBM, CBP, and FBP inputs until upstream SBM bypass input feeder circuit breaker is opened.

6. On SBM, open CBP and FBP breakers.

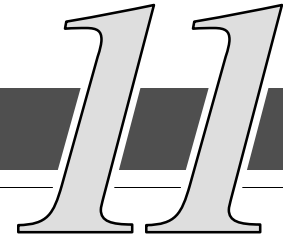
10.5 Transfer from Maintenance Bypass

NOTE: Refer to Appendix A for location of Maintenance Bypass key switch.

1. If system was shutdown, follow Manual Start or Auto Start procedure to start system.
2. Ensure SBM is on bypass.
3. On SBM, turn the Maintenance Bypass key switch to the right (From Maintenance) momentarily.
4. Observe MIS closes and MBP opens. System is now in normal mode.

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Using Features and Options



11.1 General

The many standard features of your Parallel Capacity/Redundant 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 drawing 164201150–13 in Appendix A for location of the customer interface panel and for terminal wiring information.

NOTE: Refer to the applicable Powerware® 9315 Operation manual provided with the UPS for UPS features and options

11.2 Building Alarm Monitoring

This standard feature lets you connect the System Bypass Module (SBM) to your building alarms, such as smoke detectors or overtemperature alarms. The terminals for external connections are located inside the SBM on the customer interface panel.

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.

If the SBM is equipped for a Powerware Sync Control, or Hot-Tie Control, not all Building Alarms will be available for customer use. See Appendix A, Drawing 164201150–13 for affected areas.

11.3 General Purpose Relay Contacts

Two general purpose relay contacts are provided as a standard feature on the SBM. The alarm contacts (one notice and one alarm) are located inside the SBM on the customer interface panel. Refer to drawing 164201150–13 in Appendix A for location of the customer interface panel and for terminal wiring information.

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, a 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 SBM. This feature is useful if the SBM is located in a remote area where the SBM alarm horn may not be heard immediately.

NOTE: In choosing contacts, note that Relay 1 is normally deenergized and is only energized for an alarm condition. Relay 2 is normally energized and is only deenergized for an alarm condition.

CAUTION



Contacts should not be opened in excess of 30VAC or 42.4V peak AC or DC @1A maximum.

11.4 Remote Monitor Panel (Optional)

As an option, you can install Remote Monitor Panels (RMPs) to monitor the operation of the Parallel Capacity/Redundant system from virtually any location within your facility, up to 500 feet from the SBM. 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 11–1 for the number of accessories permitted. Figure 11–1 shows an RMP.

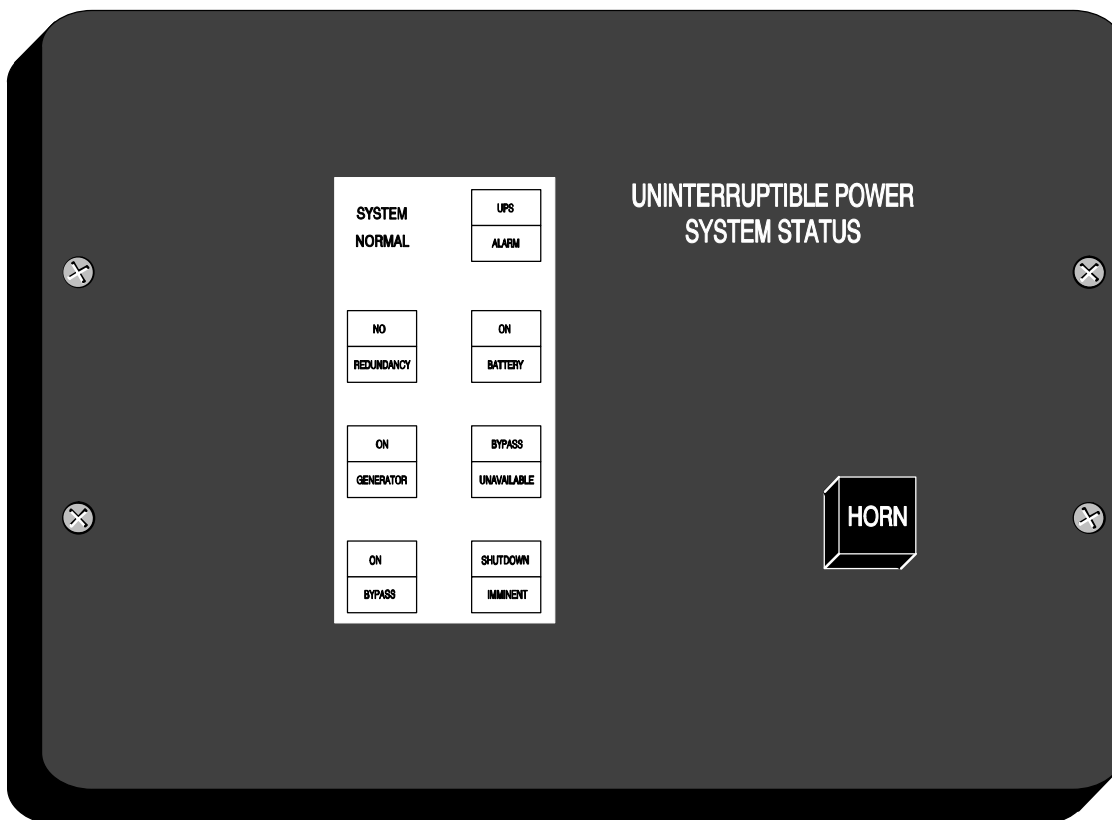


Figure 11–1. Remote Monitor Panel

Table 11–1. 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

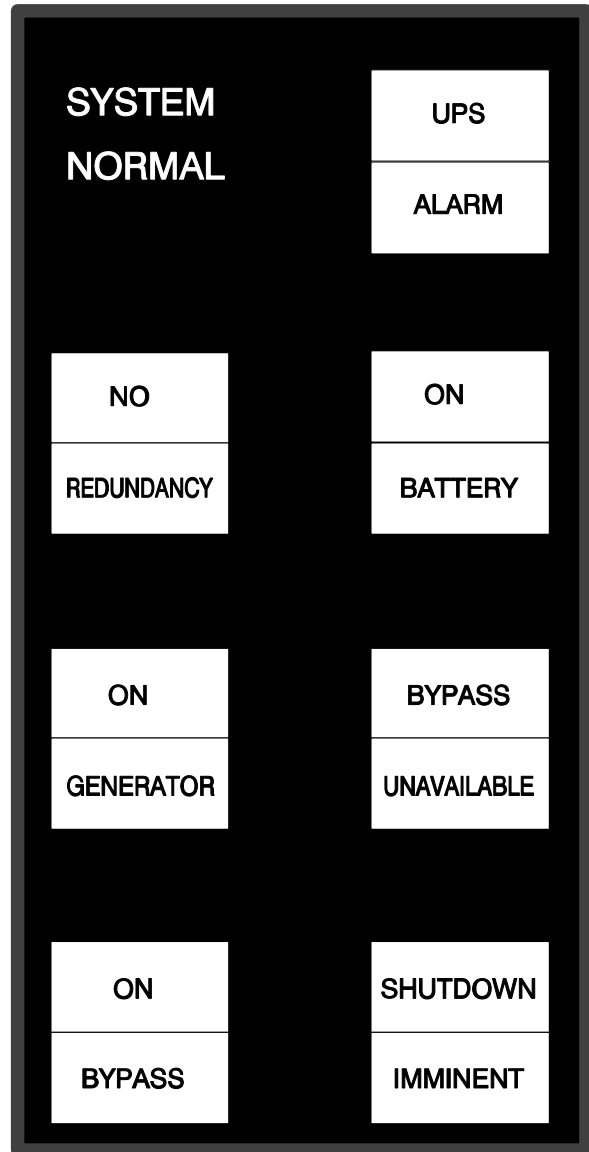
The UPS battery backup is supplying the critical load. The utility power is either interrupted or out of specification. The SYSTEM NORMAL indicator is also lit.

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.



11.5 Relay Interface Module (Optional)

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 11–1 for the number of accessories permitted. Figure 11–2 shows the RIM with its four 15-pin connectors labeled J1 through J4.

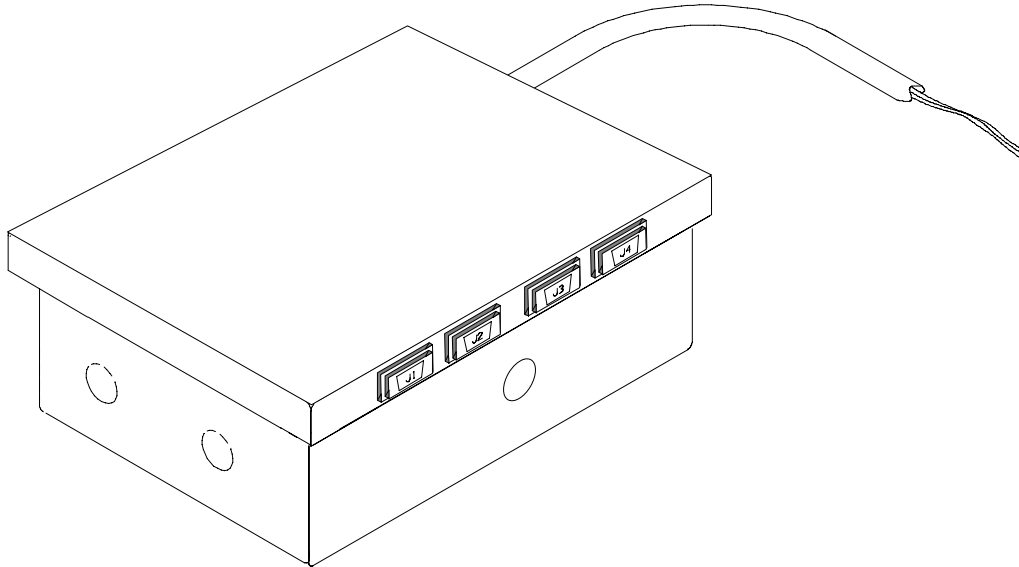


Figure 11–2. Relay Interface Module

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.

11.6 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 11–1 for the number of accessories permitted. Figure 11–3 shows the SCM, input connections on TB1, and output connections on TB2.

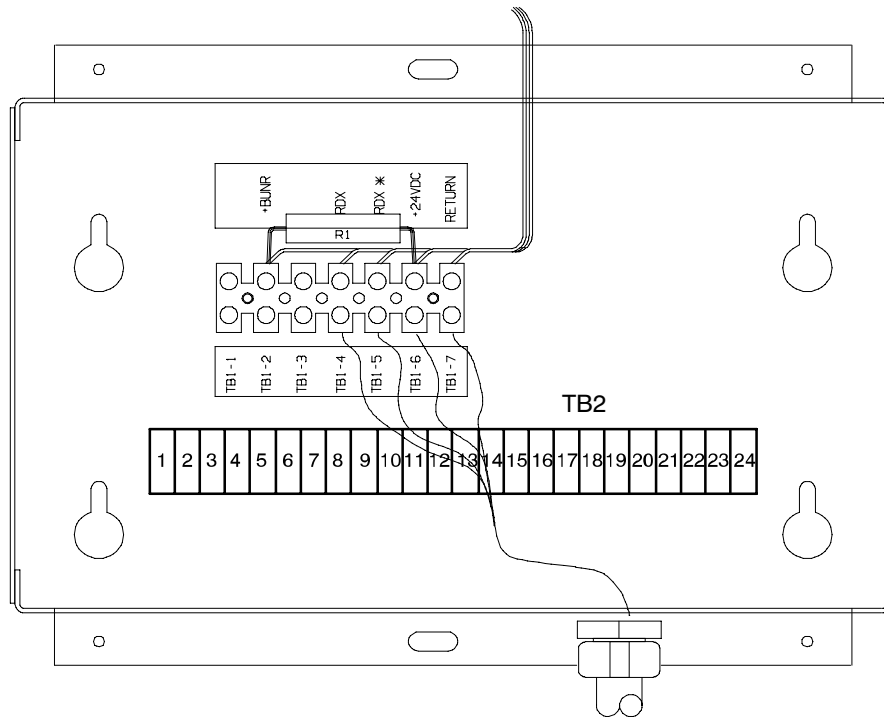


Figure 11–3. Supervisory Contact Module

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

Refer to the applicable Powerware 9315 Installation manual chapter, Installing a Supervisory Contact Module, for TB2 contact configurations.

11.7 Common Battery Racks

A Common battery rack can be used to supply the DC input to the Parallel Capacity/Redundant system UPS modules. This common rack would be used in place of the individual racks for each module. You can enhance the protection time provided by your Parallel Capacity/Redundant 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 the applicable Powerware® 9315 Installation manual provided with the UPS for battery requirements and installation instructions.

11.8 External Battery Disconnect for Common Battery Racks

An optional external DC circuit breaker provides a manual means of disconnecting a battery rack from the UPS modules in the Parallel Capacity/Redundant system. The circuit breaker is enclosed in a wall-mounted box. You can install it anywhere between the remote DC supply and the UPS, according to national and local codes.

The breaker switch should be set to ON for normal UPS operation when DC power is available at the UPS. When service personnel are performing maintenance on the UPS or battery cabinet, the switch should be set to OFF.

Note 1: There is no DC disconnect device within the UPMs.

Note 2: The DC input to the UPM is protected by internal fuses F21 and F22.

Note 3: The UPM DC disconnect trip signal from TB4, points 1 and 2 (shunt trip) or TB4, points 1 and 3 (UV trip) must be connected to the DC source disconnect device(s). Each UPM must have a separate disconnect device.

Responding to System Events

12

12.1 General

When the Parallel Capacity/Redundant system is running in Normal mode, it continually monitors itself and the incoming utility power. In Battery or Bypass modes, the Switchboard System Bypass Module (SSBM) may issue alarms to let you know exactly what event caused the change from Normal mode. System events on the SSBM 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.

NOTE: Refer to the applicable Powerware® 9315 UPS Operation manual provided with the UPMS, for UPM system events.

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

12.3 System Event Lights

The status indicators on the SSBM Control Panel work in conjunction with the event horn to let you know when the Parallel Capacity/Redundant system is operating in any mode other than Normal. Only the Normal indicator is visible during normal Parallel Capacity/Redundant 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 9.)

12.4 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 SSBM or 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

13.1 Description

This chapter describes the serial communications feature of the Powerware[®] 9315 System Bypass Module (SBM). Two serial communications ports on the SBM 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.

13.2 Locating the Communications Panel

The Customer Interface Panel inside the SBM 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 Communications Panel also contains terminals (TB1 thru TB7) for connecting your equipment to the SBM. Refer to drawing 164201150-13 in Appendix A for location of the Customer Interface Panel inside the SBM.

13.3 Connecting Equipment to a Serial Port

The SBM 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 SBM. Cables should be no longer than 16m (50 ft). The connectors for Port 1 and Port 2 on the Communications Panel in the SBM are female, so the cables into the SBM should be male. Figure 13-1 shows the pin assignments for Port 1, and Table 13-1 describes them. Figure 13-2 shows the pin assignments for Port 2, and Table 13-2 describes them.

PORT 1 (DB-9)

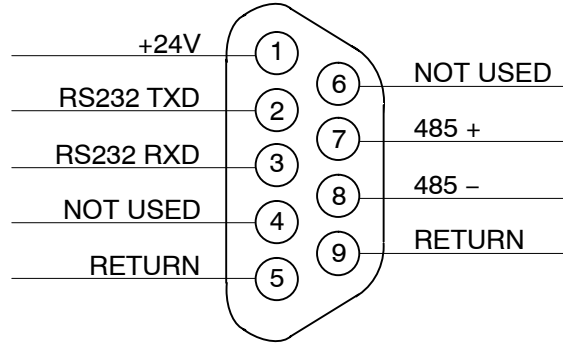


Figure 13–1. Port 1 Pin Assignments

Table 13–1. 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)

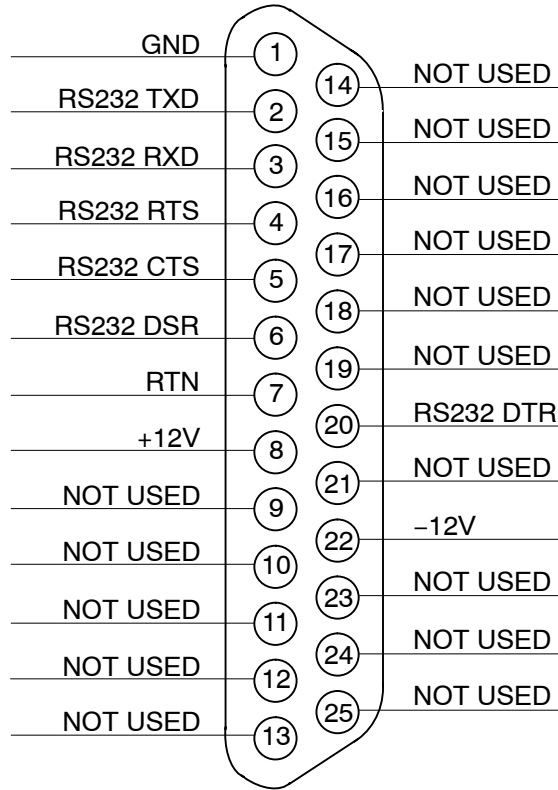


Figure 13–2. Port 2 Pin Assignments

Table 13–2. 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.			

13.4 Configuring the Serial Ports

You must configure the port for communications using the LCD screen and pushbuttons on the SBM 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 13–3 shows the Setup Serial Port 1 screen.

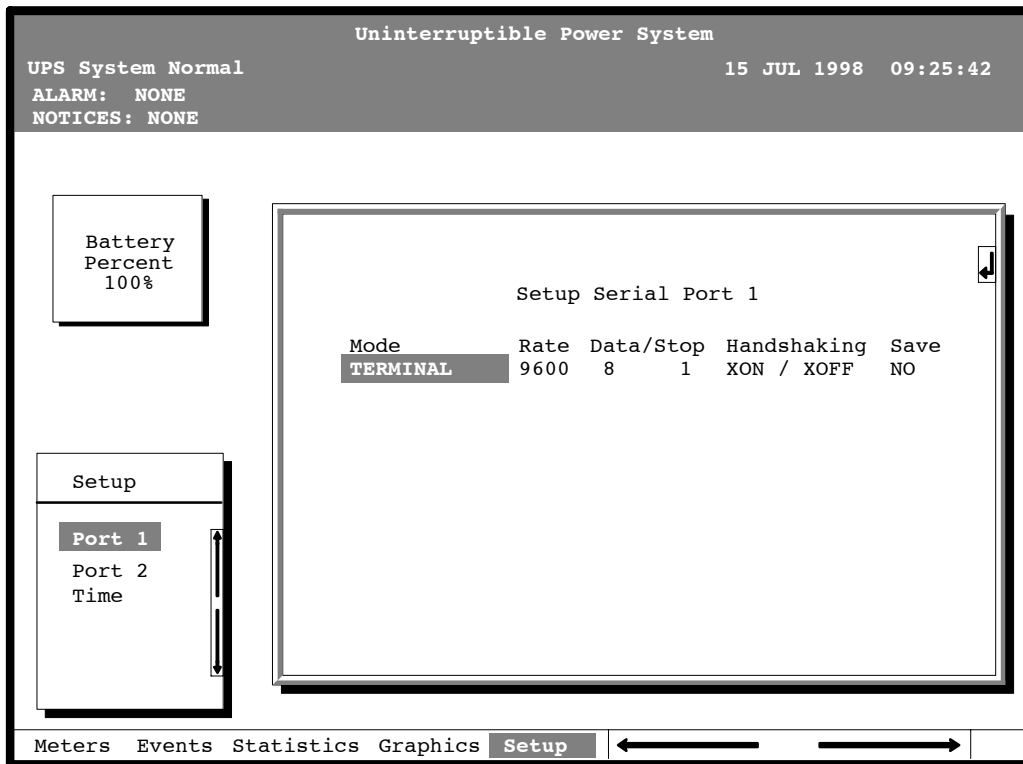


Figure 13–3. Setup Serial Port 1 Screen

A small return arrow (\leftarrow) appears in the upper right corner of the Setup Port screen. This arrow is a reminder that you can press the \leftarrow 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 \leftarrow pushbutton to toggle to the information area. The first setting (Mode) is highlighted. Press the \leftarrow or \rightarrow pushbutton to move the highlight to the setting you want to change. To scroll through the available options for that setting, press the \uparrow or \downarrow pushbutton.

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

Table 13–3 shows which options are available for each port. The sections that follow describe the configuration settings you can change.

Table 13–3. 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 19,200
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

13.4.1 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.

13.4.2 Rate

The baud rate of the equipment connected to this port. The baud rate determines the speed of data transferred between the SBM 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.

13.4.3 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.

13.4.4 Handshaking

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

- **Disabled (No Handshaking)**

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

- **XON/XOFF**

If handshaking is enabled, the SBM 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 SBM halts transmission until an XON command is received. In the same way, if the terminal receives an XOFF command, the SBM expects the terminal to halt transmission until the SBM sends an XON command.

13.4.5 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.

13.4.6 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 SBM operates in one of five modes which you select when configuring the port using the Setup Port screen.

13.5 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
MM	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.

13.5.1 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.

13.5.2 Entire Log (Ctrl + P)

This key sequence prints the entire Event History Log of the SBM 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 13–4 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 13–4. Event History Log

13.5.3 Meters Printout (Ctrl + M)

This key sequence prints the current readings of the SBM 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 SBM. 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 13–5 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 13–5. System Meters Screen

13.5.4 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 SBM (both Figures 13–4 and 13–5).

13.6 System Configuration

The System Configuration mode allows you to modify special functions in your SBM. 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.

13.6.1 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

1. Program Building Alarms
2. Program Unit Name
3. Adjust Output Voltage
4. Change Password
5. Battery Test Setup
6. Modify Low Battery Time
7. Exit Program Mode

Enter Selection:

13.6.2 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

1. Enable/Disable Default Functions
2. Customize Alarm Messages
3. Return to Main Menu

Enter Selection:

13.6.3 *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

1. Enable/Disable Go To Bypass
2. Enable/Disable Go To UPS
3. Enable/Disable On Generator
4. Enable/Disable Building Alarm
5. 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.)

13.6.4 *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.

13.6.5 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.

13.6.6 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.

13.6.7 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

1. Setup One-time Delayed Battery Test
2. Setup Monthly Battery Test
3. Setup Quarterly Battery Test
4. Cancel Pending Battery Test
5. Display Next Scheduled Battery Test
6. 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.

13.6.8 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.

13.7 Calibration Mode

Calibration mode is used by factory and field service personnel to calibrate system meters. Factory test engineers calibrate the SBM meters prior to shipping so the SBM 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.

13.8 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.

13.9 Remote Monitor Mode

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

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14.1 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 Switchboard System Bypass Module (SBM) to perform basic monitoring. In the event of a SBM alarm or notice, the user is notified at the remote location. The SBM 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 13, "Serial Communications"). Connection to the SBM is made when a user calls the SBM on the phone. The user has exactly the same capabilities as if using a terminal connected directly to the SBM 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 SBM from a remote location and enter Terminal mode. The Call Out function allows the SBM to be configured to call either a remote computer or numeric paging service over the phone line. Call Out allows the SBM to call a remote computer and leave a one-line descriptive message of the alarm or notice condition. Numeric paging support allows the SBM to call a paging service and send numeric messages. The Housekeeping function maintains the link between the SBM and modem.

14.2 Remote Notification Features

Remote Notification provides the SBM 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 SBM.
- 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 to be set by Powerware Corporation authorized personnel only.

14.3 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.

14.3.1 *Call Answer*

When the modem receives a call, the SBM is alerted to wait for a connect signal from the modem. When the modem answers and finishes handshaking, the SBM acknowledges the modem connect signal and allows the caller into the Terminal mode (refer to Chapter 13, “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 SBM 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.

14.3.2 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 SBM 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 SBM is purchased. The Call Out function activates as follows:

- A SBM alarm or notice occurs that is programmed to cause a Call Out.
- The SBM takes the modem off the hook and sends a command to the modem to call the notification groups (phone numbers) required. The phone numbers 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 SBM 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 SBM does not know if its message got through; therefore, the SBM 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 SBM event log for each attempted call out.

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

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

14.3.3 Housekeeping

When the modem is idle, the SBM “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 SBM, the SBM attempts to re-initialize the modem. After a successful re-initialization, the SBM returns to the Housekeeping function. If the re-initialization is unsuccessful, two more attempts to re-initialize the modem are made before the SBM disables all Call Out attempts. Re-initialization is then attempted every ten minutes or until the communications mode is changed by the SBM front panel controls (or the modem is successfully re-initialized). For each unsuccessful attempt, the SBM logs a modem failure event into the event log. When the modem link is confirmed, the SBM communications resume normal operation and Call Out is enabled.

14.4 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

14.5 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.

14.5.1 *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.

14.5.2 *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 "xxxxxx" 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.

14.5.3 *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 "xxxxxx" is the pager system number and "yyyyyy" is the numeric message (usually a phone number). The three "[,]" provide a delay while the pager system computer answers. The "xxxxxx" 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], [,], [xxxxxx], [,], [,], [,], [yyyyyy], [#], then press [ENTER].
5. To program a group two number, key in [A], [T], [&], [Z], [1], [=], [T], [,], [xxxxxx], [,], [,], [,], [yyyyyy], [#], 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.

14.5.4 Final Modem Configuration

The final step in configuring the PC modem for use with the SBM is to turn off the echo feature of the modem. 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 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).
4. Key in [A], [T], [E], [0] (zero), then press [ENTER].
5. Confirm that the modem responds with "OK" or "0" (zero).
6. Key in [A], [T], then press [ENTER].
8. Confirm that the modem responds with "OK" or "0" (zero) and that the "AT" is not echoed back to the terminal.
9. Key in [A], [T], [&], [W], [0] (zero), then press [ENTER].
10. Confirm that the modem responds with "OK" or "0" (zero).

14.6 SBM Setup Configuration

Connect the modem to the SBM 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 SBM 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 SBM 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 SBM as described in the modem manufacturer’s manual before configuring the SBM 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 SBM-to-terminal handshaking, not SBM-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 SBM, 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 SBM.

14.6.1 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 SBM.

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 Parallel Capacity/Redundant System

15

15.1 General

You must schedule periodic performance checks of your Parallel Capacity/Redundant 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.

NOTE: Refer to the applicable Powerware® 9315 Operation manual provided with the UPS for UPS maintenance.

15.2 Important Safety Instructions

Remember that your Parallel Capacity/Redundant 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. The SSBM is unsafe until the UPS modules have been powered down and bypass power has been removed. After disconnecting the utility power and the DC power, authorized service personnel should wait at least 5 minutes before attempting internal access to the UPS module.

WARNING



Servicing and maintenance should be performed by service qualified personnel only.

WARNING

LETHAL VOLTAGE PRESENT



This unit should not be operated with the cabinet doors open or protective covers removed. Do not make any assumptions about the electrical state of any cabinet in the UPS system.

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

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

Observe these precautions when working on or around battery racks:

- 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 code.

WARNING

Do not dispose of batteries in a fire. They 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 safety precautions.

ATTENTION:

Une batterie peut présenter un risque de choc électrique, de brûlure, ou d'incendie. Suivre les précautions qui s'imposent.

- Pour le remplacement, utiliser le même nombre et modèle des batteries.
- L'élimination des batteries est réglementée. Consulter les codes locaux à cet effet.

15.3 Performing Preventive Maintenance

The Parallel Capacity/Redundant 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:



CAUTION



In addition to the maintenance instructions outlined below, the enclosed switchboard manuals must be thoroughly reviewed for vendor specific maintenance requirements.

- Check the area surrounding the Parallel Capacity/Redundant system. Ensure the area is not cluttered, allowing free access to the unit.
- Ensure the air intakes (vents on the front doors) and exhaust opening (on top of the UPS cabinet and SSBM) are not blocked.
- Ensure there is at least six inches of clearance behind the unit for proper air circulation.
- Ensure the operating environment is within the parameters specified in Chapter 16, “Product Specifications.”
- Ensure the SBM and UPS modules are in Normal mode (Normal status indicator is lit). If alarm lamps are lit or the Normal status indicators are not lit, contact Powerware Customer Support.

Perform the following checks MONTHLY:

- Ensure all status indicator lamps are operative. (Press the  and  pushbuttons simultaneously to test the lamps.)
- Monitor system parameters as described in Chapter 9, “Using the Control Panel.”
- Check the air filters in UPS modules (located behind the front doors) and replace them as necessary. The filter size is 16 in. x 20 in. x 1 in.
- 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 Parallel Capacity/Redundant system. Contact your nearest Powerware field service office for more information about service offerings.

BATTERY maintenance:

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

15.4 Maintenance Training

A basic training course, available from Powerware Corporation, gives you a competent working knowledge of the Parallel Capacity/Redundant 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

16

16.1 Model Numbers

The System Bypass Module (SBM) is housed in a freestanding, single or triple bay cabinet . The SBM is available in both 50 Hz and 60 Hz, with various current ratings:

System	Model
Powerware□ 9315 1200 SBM	600
Powerware□ 9315 1200 SBM	800
Powerware□ 9315 1200 SBM	1000
Powerware□ 9315 1200 SBM	1200
Powerware□ 9315 2000 SBM	1200
Powerware□ 9315 2000 SBM	1600
Powerware□ 9315 2000 SBM	2000

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

16.2 SBM Input

Input Voltage (UPM Dependent)	480 VAC nominal (60 Hz only) 400 VAC nominal (50/60 Hz only) 600 VAC nominal (60 Hz only)
Input Frequency Range	± 3 Hz of nominal (50 Hz or 60 Hz)
Input Current	Model 600: 600 Amps Model 800: 800 Amps Model 1000: 1000 Amps Model 1200: 1200 Amps Model 1600: 1600 Amps Model 2000: 2000 Amps

16.3 SBM Output

Output Voltage (UPM Dependent)	480 VAC nominal (60 Hz only) 600 VAC nominal (60 Hz only) 400 VAC nominal (50/60 Hz)
Output Frequency Range	± 3 Hz of nominal (50 Hz or 60 Hz)
Output Current	Model 600: 600 Amps Model 800: 800 Amps Model 1000: 1000 Amps Model 1200: 1200 Amps Model 1600: 1600 Amps Model 2000: 2000 Amps
Overload Capability	Alarm only. Trip Delay customer adjustable in accordance with breaker manufacturer specifications.

16.4 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	N/A
EMI Suppression	Meets FCC Regulation 47, Part 15, Subpart J, for class A devices
Electrostatic Discharge (ESD) Immunity	Meets IEC 801–2 specifications. Withstands up to 25 kV without damage and with no disturbance or adverse effect to the critical load.

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:

- 164201150–1 Installation Notes
- 164201150–2 Typical 1200A SBM Parallel Capacity/Redundant Systems
- 164201150–3 Typical 2000A SBM Parallel Capacity/Redundant Systems
- 164201150–4 Oneline Drawings Of Parallel Capacity/Redundant System
- 164201150–5 1200A System Bypass Module (SBM)
- 164201150–6 Location of 1200A SBM Terminals
- 164201150–7 1200A System Maintenance Bypass (SMB)
- 164201150–8 Location of 1200A SMB Terminals
- 164201150–9 2000A System Bypass Module
- 164201150–10 Location of 2000A SBM Terminals
- 164201150–11 2000A System Maintenance Bypass (SMB)
- 164201150–12 Location of 2000A SMB Terminals
- 164201150–13 SBM Customer Interface Panel
- 164201150–14 UPM PowerNet Interface Panel
Powerware 9315–200 to –500 UPMs
- 164201150–15 UPM CAN Interface: Powerware 9315 625/750 UPMs
- 164201150–16 Remote Emergency Power Off
- 164201150–17 Remote Monitor Panel
- 164201150–18 Relay Interface Module
- 164201150–19 Supervisory Contact Module

Table A. INPUT/OUTPUT Ratings & External Wiring Requirements for Powerware 9315 1200A System Bypass Module (SBM)

Ratings		Units	Rating			
		SBM Model	600	800	1000	1200
		Maximum Amps	600	800	1000	1200
AC INPUT	AC Input from UPS to SBM CBS Breaker Minimum conductor size, 3Ø, 1 gnd (number per Ø) A	AWG or kcmil(ea)	Refer to applicable Powerware 9315 UPS installation manual for minimum conductor sizes.			
AC INPUT	AC Input to SBM Bypass Full Load Current minimum conductor size, 3Ø, (1) Neutral, (1) gnd (number per Ø) B	AWG or kcmil(ea)	500 (2)	400 (3)	350 (4)	500 (4)
AC INPUT	AC Input to optional SMB Bypass Full Load Current minimum conductor size, 3Ø, (1) Neutral, (1) gnd (number per Ø) C	AWG or kcmil(ea)	500 (2)	400 (3)	350 (4)	500 (4)
AC INPUT	AC Input from SBM to optional SMB Full Load Current minimum conductor size, 3Ø, (1) Neutral, (1) gnd (number per Ø) D	AWG or kcmil(ea) (105°C HiFlex, Powerware provided)	4/0 (3)	4/0 (3)	4/0 (3)	4/0 (3)
AC OUTPUT	AC Output from SBM or optional SMB to Critical Load Full Load Current minimum conductor size, 3Ø, (1) Neutral, (1) gnd (number per Ø) E	AWG or kcmil(ea)	500 (2)	400 (3)	350 (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 for Powerware 9315 (200 kVA–300 kVA) UPMs and 90°C copper for Powerware 9315 (300 kVA–500 kVA) UPMs. See the appropriate column in Tables A and B.
4. Refer to the appropriate UPS installation manual for UPS module and optional equipment installation notes.
5. A bypass neutral feeder must be installed when the output neutral is used. If no bypass neutral is installed, the output neutral is to be bonded to the chassis in the SBM through the minimum size copper conductor listed in Table I on Sheet 3 of Drawing 164201150–4. In either case, fully rated neutral conductors are to be run from the output of each UPM to the neutral buss bar inside the SBM.
6. External overcurrent protection is not provided by this product, but is required by codes. Refer to Tables A and B for wiring requirements. If an output lockable disconnect is required, it is to be supplied by designated personnel.

NOTE: Callout letters **A**, **B**, **C**, **D**, and **E** map to drawing #164201150–4

DESCRIPTION:	INSTALLATION NOTES	
DRAWING NO:	164201150–1	SHEET: 1 of 6

Table B. INPUT/OUTPUT Ratings & External Wiring Requirements for Powerware 9315 2000A System Bypass Module (SBM)

Ratings		Units	Rating		
		SBM Model	1200	1600	2000
		Maximum Amps	1200	1600	2000
AC INPUT	AC Input from UPS to SBM CBS Breaker Minimum conductor size, 3Ø, 1 gnd (number per Ø) A	AWG or kcmil(ea)	Refer to applicable Powerware 9315 UPS installation manual for minimum conductor sizes.		
AC INPUT	AC Input to SBM Bypass Full Load Current minimum conductor size, 3Ø, (1) Neutral, (1) gnd (number per Ø) B	AWG or kcmil(ea)	500 (4)	400 (6)	500 (6)
AC INPUT (Note 2)	AC Input to optional SMB Bypass Full Load Current minimum conductor size, 3Ø, (1) Neutral, (1) gnd (number per Ø) C	AWG or kcmil(ea)	500 (4)	400 (6)	500 (6)
AC INPUT	AC Input from SBM to optional SMB Full Load Current minimum conductor size, 3Ø, (1) Neutral, (1) gnd (number per Ø) D	AWG or kcmil(ea)	Bus Plate (Supplied by Powerware)	Bus Plate (Supplied by Powerware)	Bus Plate (Supplied by Powerware)
AC OUTPUT	AC Output from SBM or optional SMB to Critical Load Full Load Current minimum conductor size, 3 Ø, (1) Neutral, (1) gnd (number per Ø) E	AWG or kcmil(ea)	500 (4)	400 (6)	500 (6)

7. Non-linear loads can create neutral currents that are greater than 100%. This product can accommodate double-sized neutral terminations if needed.
8. Terminals E1 through E10 are 2-hole bus bar mountings for standard NEMA 2-hole barrel lugs. The Frame Ground is a single hole bus bar mounting for standard NEMA 1-hole barrel lugs. Refer to Table C and Table D for power cable terminations. Drawings 164201150–6 and 164201150–10 show the location of the power cable terminals inside the SBM.
9. The system supports either a single common battery shared by all UPS modules or a separate battery for each UPS module. The system supports either valve regulated lead acid batteries or flooded (wet cell) batteries.
10. The rectifier inputs and bypass input three phase feeds should be symmetrical about ground, due to the existence of voltage surge protection devices.
11. 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. The recommended line-to-line load unbalance is 50% or less.

NOTE 1: Callout letters **A**, **B**, **C**, **D**, and **E** map to drawing #164201150–4

NOTE 2: Normal common feed bypass input connections to the SMB are made using the provided bus plates between the SBM and SMB. To use a separate feed for the SMB bypass input, remove factory installed bus plates and use wire size indicated in this table.

DESCRIPTION:	INSTALLATION NOTES	
DRAWING NO:	164201150–1	SHEET: 2 of 6

**Table C. Power Cable Terminations and Conduit Requirements
Powerware 9315 1200A System Bypass Module**

Terminal Function	Terminal	Function	Bus Landings	Tightening Torque N-M (lb-ft)	Bolt/Int. Hex Size (In.)
AC Input from UPS Output to SBM	E8	Phase A	8 – 2 bolt mounting	76 (56)	1/2
	E9	Phase B	8 – 2 bolt mounting	76 (56)	1/2
	E10	Phase C	8 – 2 bolt mounting	76 (56)	1/2
AC Input to SBM Bypass	E1	Phase A	8 – 2 bolt mounting	76 (56)	1/2
	E2	Phase B	8 – 2 bolt mounting	76 (56)	1/2
	E3	Phase C	8 – 2 bolt mounting	76 (56)	1/2
AC Input from SBM to optional SMB	E8	Phase A	4 – 4/0-500 kcmil Pressure Termination	42.4(32.2)	3/8
	E9	Phase B	4 – 4/0-500 kcmil Pressure Termination	42.4(32.2)	3/8
	E10	Phase C	4 – 4/0-500 kcmil Pressure Termination	42.4(32.2)	3/8
AC Input to optional SMB Bypass	E1	Phase A	4 – 4/0-500 kcmil Pressure Termination	42.4(32.2)	3/8
	E2	Phase B	4 – 4/0-500 kcmil Pressure Termination	42.4(32.2)	3/8
	E3	Phase C	4 – 4/0-500 kcmil Pressure Termination	42.4(32.2)	3/8
AC Output from SBM or optional SMB to Critical Load	E5	Phase A	8 – 2 bolt mounting	76 (56)	1/2
	E6	Phase B	8 – 2 bolt mounting	76 (56)	1/2
	E7	Phase C	8 – 2 bolt mounting	76 (56)	1/2
SBM Neutral	E4	Neutral	26 – 2 bolt mounting	76 (56)	1/2
SBM Customer Ground	Frame Ground	Ground	26 – 1 bolt mounting	76 (56)	1/2
SMB Neutral	E4	Neutral	8 – 2 bolt mounting	76 (56)	1/2
SMB Customer Ground	Frame Ground	Ground	14 – 1 bolt mounting	76 (56)	1/2

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

DESCRIPTION:

INSTALLATION NOTES

DRAWING NO: 164201150-1

SHEET: 3 of 6

**Table D. Power Cable Terminations and Conduit Requirements
Powerware 9315 2000A System Bypass Module**

Terminal Function	Terminal	Function	Bus Landings	Tightening Torque N-M (lb-in)	Bolt Size (In.)
AC Input from UPS Output to SBM	E8	Phase A	20 – 2-bolt mounting	76 (56)	1/2
	E9	Phase B	20 – 2-bolt mounting	76 (56)	1/2
	E10	Phase C	20 – 2-bolt mounting	76 (56)	1/2
AC Input to SBM Bypass	E1	Phase A	6 – 2-bolt mounting	76 (56)	1/2
	E2	Phase B	6 – 2-bolt mounting	76 (56)	1/2
	E3	Phase C	6 – 2-bolt mounting	76 (56)	1/2
AC Input to optional SMB Bypass (Separate Feed)	E1	Phase A	10 – 2-bolt mounting	76 (56)	1/2
	E2	Phase B	10 – 2-bolt mounting	76 (56)	1/2
	E3	Phase C	10 – 2-bolt mounting	76 (56)	1/2
AC Output from SBM to Critical Load	E5	Phase A	6 – 2-bolt mounting	76 (56)	1/2
	E6	Phase B	6 – 2-bolt mounting	76 (56)	1/2
	E7	Phase C	6 – 2-bolt mounting	76 (56)	1/2
AC Output from optional SMB to Critical Load	E5	Phase A	20 – 2-bolt mounting	76 (56)	1/2
	E6	Phase B	20 – 2-bolt mounting	76 (56)	1/2
	E7	Phase C	20 – 2-bolt mounting	76 (56)	1/2
SBM Neutral	E4	Neutral	50 – 2-bolt mounting	76 (56)	1/2
SBM Customer Ground	Frame Ground	Ground	50 – 1-bolt mounting	76 (56)	1/2
SMB Neutral	E4	Neutral	16 – 2-bolt mounting	76 (56)	1/2
SMB Customer Ground	Frame Ground	Ground	14 – 1-bolt mounting	76 (56)	1/2

DESCRIPTION:		INSTALLATION NOTES	
DRAWING NO:	164201150-1	SHEET:	4 of 6

12. Bypass input overcurrent protection and Bypass input disconnect switch are to be provided by the user. Table E lists the maximum rating for output circuit breakers satisfying the criteria for both. Rating is based on 125% of output current for an 80% breaker.

Table E. Maximum Bypass Input Circuit Breaker Ratings						
Powerware 9315 System Bypass module	SBM Model					
	600	800	1000	1200	1600	2000
1200A SBM	750	1000	1250	1500	N/A	N/A
2000A SBM	N/A	N/A	N/A	1500	2000	2500

13. Local code may require UPS module output overcurrent protection. Refer to the applicable UPS manual for UPS module output overcurrent protection breaker size.
14. The breakers CBS, CBP and FBP have a AT trip ratings and a maximum Amp Interrupting Capability (KAIC) as shown in Table F.

Table F. SBM Breaker Trip Ratings and Amp Interrupting Capability							
Powerware 9315 System Bypass module	SBM Model						All Models
	600	800	1000	1200	1600	2000	
	Trip Rating						KAIC
1200A SBM	600	800	1000	1200	N/A	N/A	35
2000A SBM	N/A	N/A	N/A	1200	1600	2000	65

15. Output overcurrent protection and output disconnect switch are to be provided by the user. Table G lists the maximum rating for output circuit breakers satisfying the criteria for both. Rating is based on 125% of output current for an 80% breaker.

Table G. Maximum Output Circuit Breaker Ratings						
Powerware 9315 System Bypass module	SBM Model					
	600	800	1000	1200	1600	2000
1200A SBM	750	1000	1250	1500	N/A	N/A
2000A SBM	N/A	N/A	N/A	1500	2000	2500

16. In the Parallel Capacity/Redundant System, each UPS module, System Bypass Module (SBM) and optional equipment are crated separately for shipping.
17. Do not tilt cabinets more than $\pm 10^\circ$ during handling.
18. Dimensions are in millimeters (inches).

DESCRIPTION:		INSTALLATION NOTES	
DRAWING NO:	164201150-1	SHEET:	5 of 6

19. If perforated floor tiles are required for ventilation, you should place them in front of the UPS and System Bypass Module (SBM).
20. Ambient air convection cooling is the only cooling requirement for the SBM. Recommended minimum clearance over the SBM is 304.8 mm (12 in.). Do not block ventilation grills.
21. Your System Bypass Module operating environment must meet the size and weight requirements shown in Table H.
22. 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)

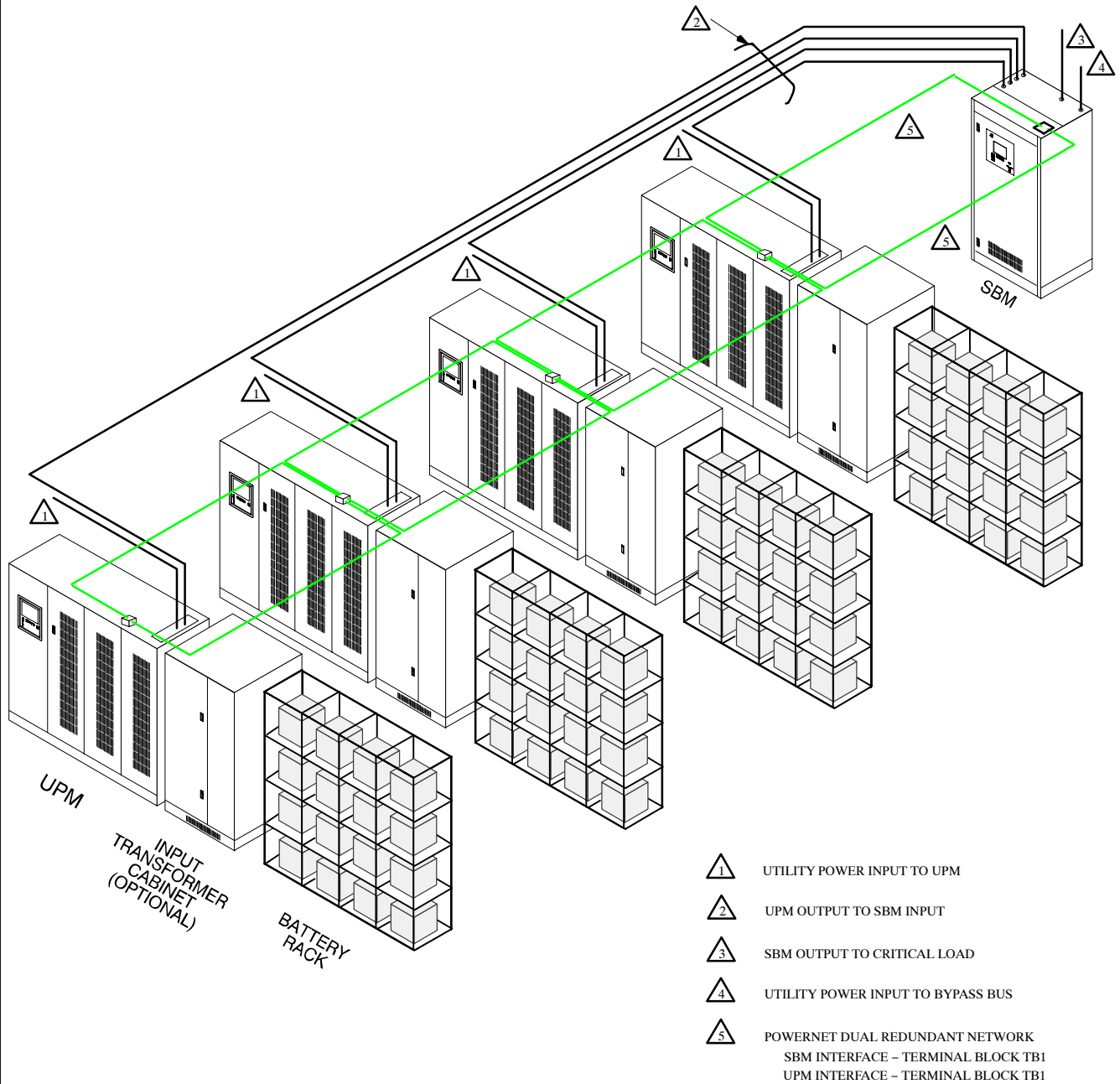
Maximum Relative Humidity: 95% noncondensing

Table H. Equipment Weight and Point Loading		
Component	Weight Kg (lb)	Point Loading Kg (lb)
1200A System Bypass Module	530 (1170)	N/A
2000A System Bypass Module	1227 (2700)	N/A
1200A System Maintenance Bypass	204 (450)	N/A
2000A System Maintenance Bypass	454 (1000)	N/A

23. The 1200A and 2000A System Maintenance Bypass (SMB) cabinets are not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.
24. The 1200A SMB input leads to the SBM are installed at the factory and coiled inside the SMB. Route leads through the left side of the SMB and connect to the SBM output bus.
25. Use supplied bus plate to connect 1200A SMB neutral to SBM neutral.
26. Use supplied bus plates to connect the 2000A SMB inputs, bypass inputs, and neutral to the SBM.

DESCRIPTION:		INSTALLATION NOTES
DRAWING NO:	164201150–1	SHEET: 6 of 6

SEPARATE BATTERY SYSTEM

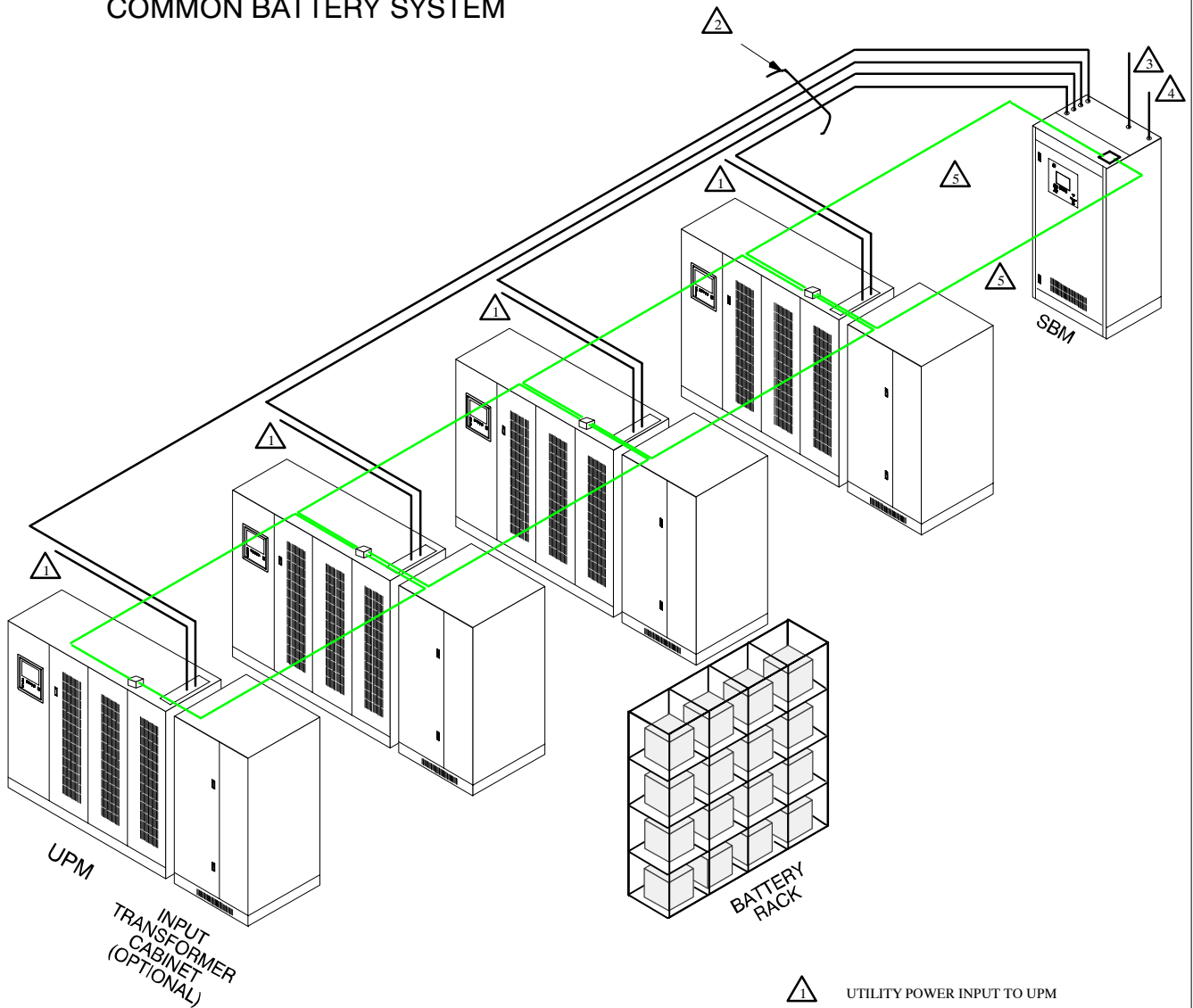


- NOTE:**
1. Accommodates one to eight UPMs. Four UPM system shown.
 2. The input transformer cabinet may be installed on either the left or the right side of the UPM cabinet.
 3. Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer installation information.






- 1 UTILITY POWER INPUT TO UPM
- 2 UPM OUTPUT TO SBM INPUT
- 3 SBM OUTPUT TO CRITICAL LOAD
- 4 UTILITY POWER INPUT TO BYPASS BUS
- 5 POWERNET DUAL REDUNDANT NETWORK
SBM INTERFACE - TERMINAL BLOCK TB1
UPM INTERFACE - TERMINAL BLOCK TB1

DESCRIPTION:	TYPICAL PARALLEL CAPACITY/ REDUNDANT SYSTEM WITH 1200A SBM	
DRAWING NO:	164201150-2	SHEET: 1 of 2

COMMON BATTERY SYSTEM

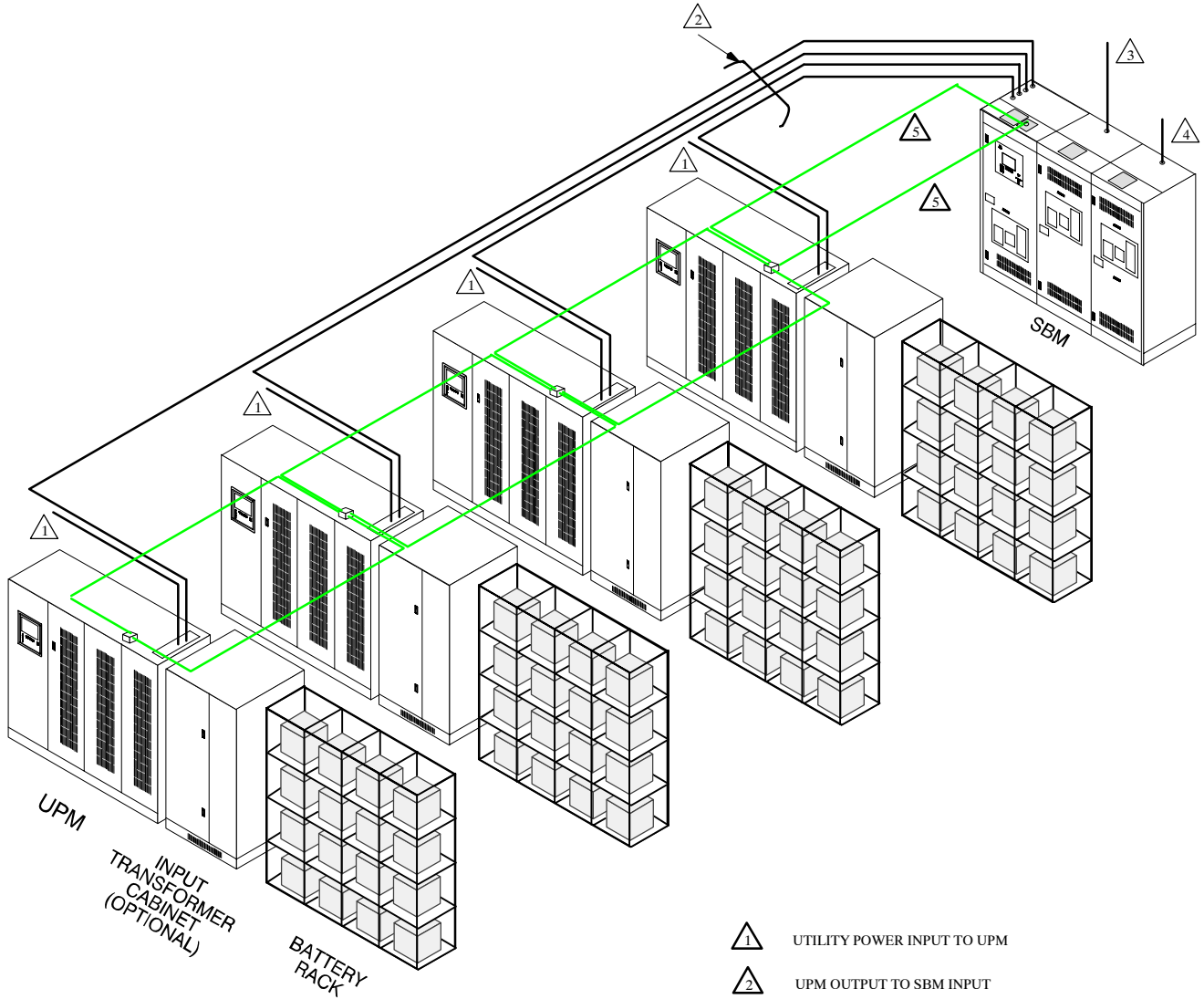


NOTE: 1. Accommodates one to eight UPMs. Four UPM system shown.
 2. The input transformer cabinet may be installed on either the left or the right side of the UPM cabinet.
 3. Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer installation information.

-  UTILITY POWER INPUT TO UPM
-  UPM OUTPUT TO SBM INPUT
-  SBM OUTPUT TO CRITICAL LOAD
-  UTILITY POWER INPUT TO BYPASS BUS
-  POWERNET DUAL REDUNDANT NETWORK
 SBM INTERFACE - TERMINAL BLOCK TB1
 UPM INTERFACE - TERMINAL BLOCK TB1

DESCRIPTION: TYPICAL PARALLEL CAPACITY/ REDUNDANT SYSTEM WITH 1200A SBM	
DRAWING NO:	164201150-2
SHEET:	2 of 2

SEPARATE BATTERY SYSTEM

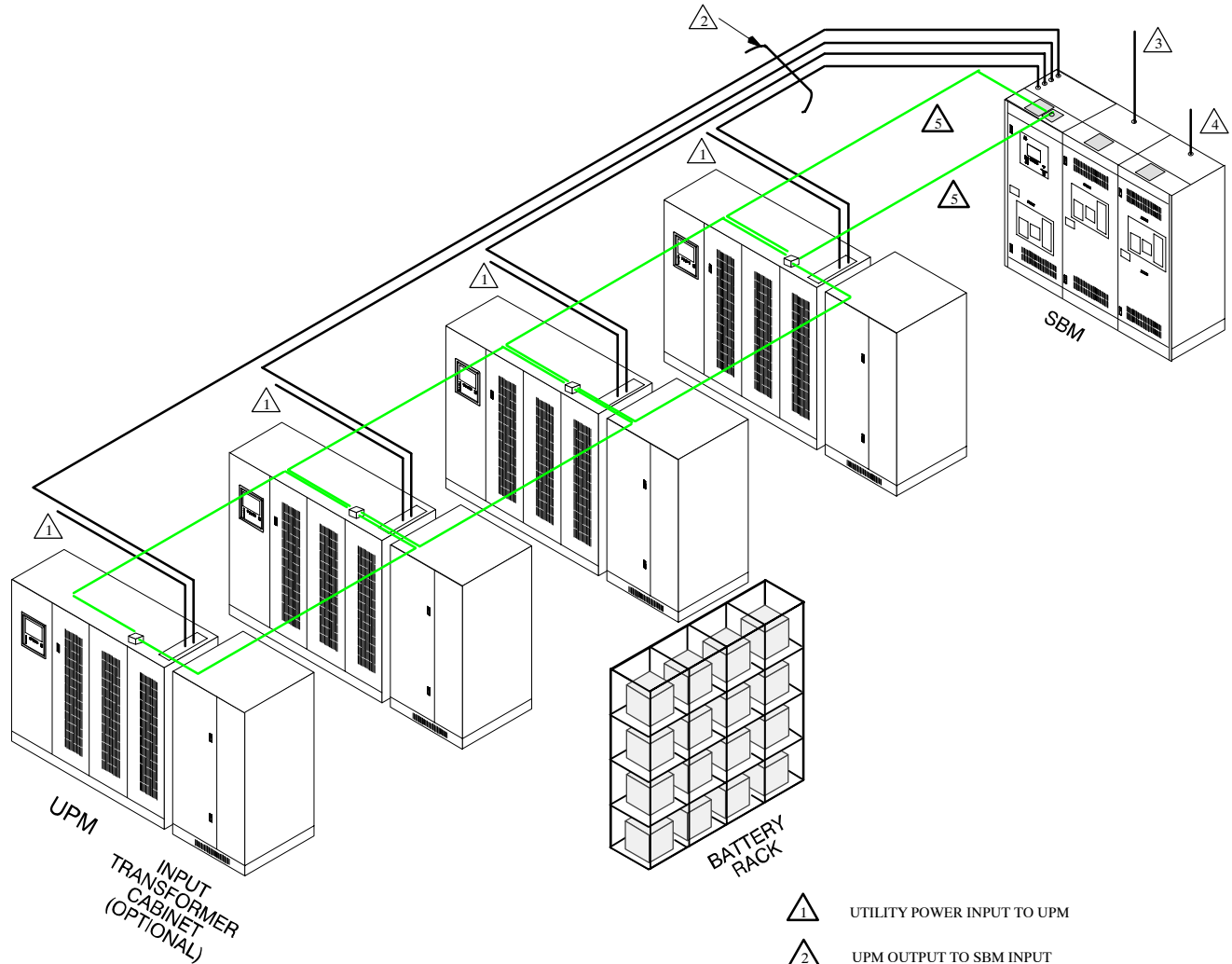







- 1 UTILITY POWER INPUT TO UPM
- 2 UPM OUTPUT TO SBM INPUT
- 3 SBM OUTPUT TO CRITICAL LOAD
- 4 UTILITY POWER INPUT TO BYPASS BUS
- 5 POWERNET DUAL REDUNDANT NETWORK
SBM INTERFACE - TERMINAL BLOCK TBI
UPM INTERFACE - TERMINAL BLOCK TBI

NOTE: 1. Accommodates one to eight UPMs.
Four UPM system shown.
2. The input transformer cabinet may be installed on either the left or the right side of the UPM cabinet.
3. Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer installation information.

DESCRIPTION:	TYPICAL PARALLEL CAPACITY/ REDUNDANT SYSTEM WITH 2000A SBM	
DRAWING NO:	164201150-3	SHEET: 1 of 2

COMMON BATTERY SYSTEM



-  UTILITY POWER INPUT TO UPM
-  UPM OUTPUT TO SBM INPUT
-  SBM OUTPUT TO CRITICAL LOAD
-  UTILITY POWER INPUT TO BYPASS BUS
-  POWERNET DUAL REDUNDANT NETWORK
SBM INTERFACE - TERMINAL BLOCK TB1
UPM INTERFACE - TERMINAL BLOCK TB1

NOTE: 1. Accommodates one to eight UPMs. Four UPM system shown.
 2. The input transformer cabinet may be installed on either the left or the right side of the UPM cabinet.
 3. Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer installation information.

DESCRIPTION:	TYPICAL PARALLEL CAPACITY/ REDUNDANT SYSTEM WITH 2000A SBM	
DRAWING NO:	164201150-3	SHEET: 2 of 2

AC INPUT TO
MODULE #4
3 PHASE,
3 WIRE

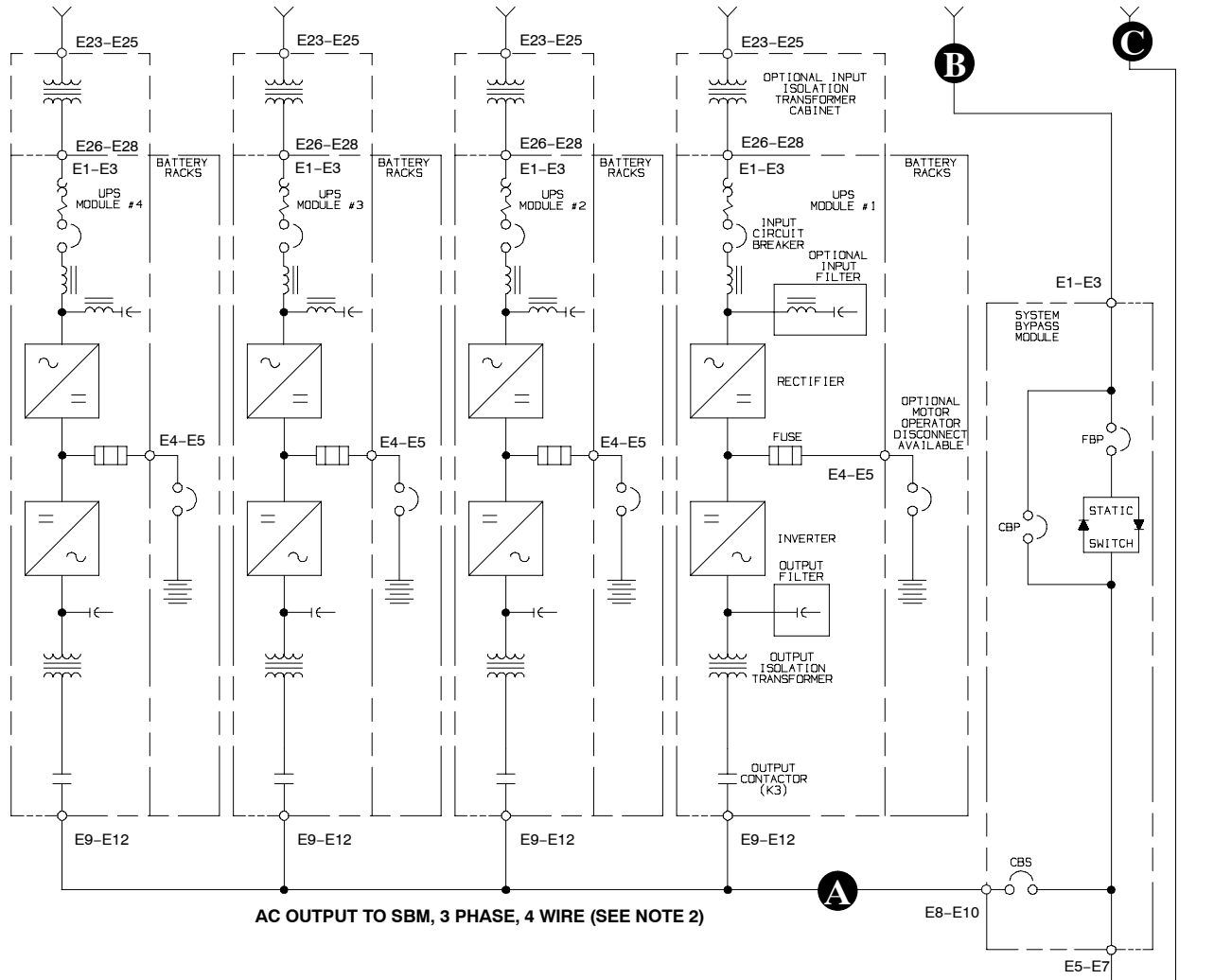
AC INPUT TO
MODULE #3
3 PHASE,
3 WIRE

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



AC OUTPUT TO SBM, 3 PHASE, 4 WIRE (SEE NOTE 2)

**SEPARATE BATTERY PARALLEL
CAPACITY/REDUNDANT
SYSTEM**

See Sheet 3 for notes.

UPS OUTPUT TO
CRITICAL LOAD
3 PHASE, 3 OR 4 WIRE

DESCRIPTION:	ONLINE DRAWINGS OF PARALLEL CAPACITY/REDUNDANT SYSTEM	
DRAWING NO:	164201150-4	SHEET: 1 of 3

AC INPUT TO
MODULE #4
3 PHASE,
3 WIRE

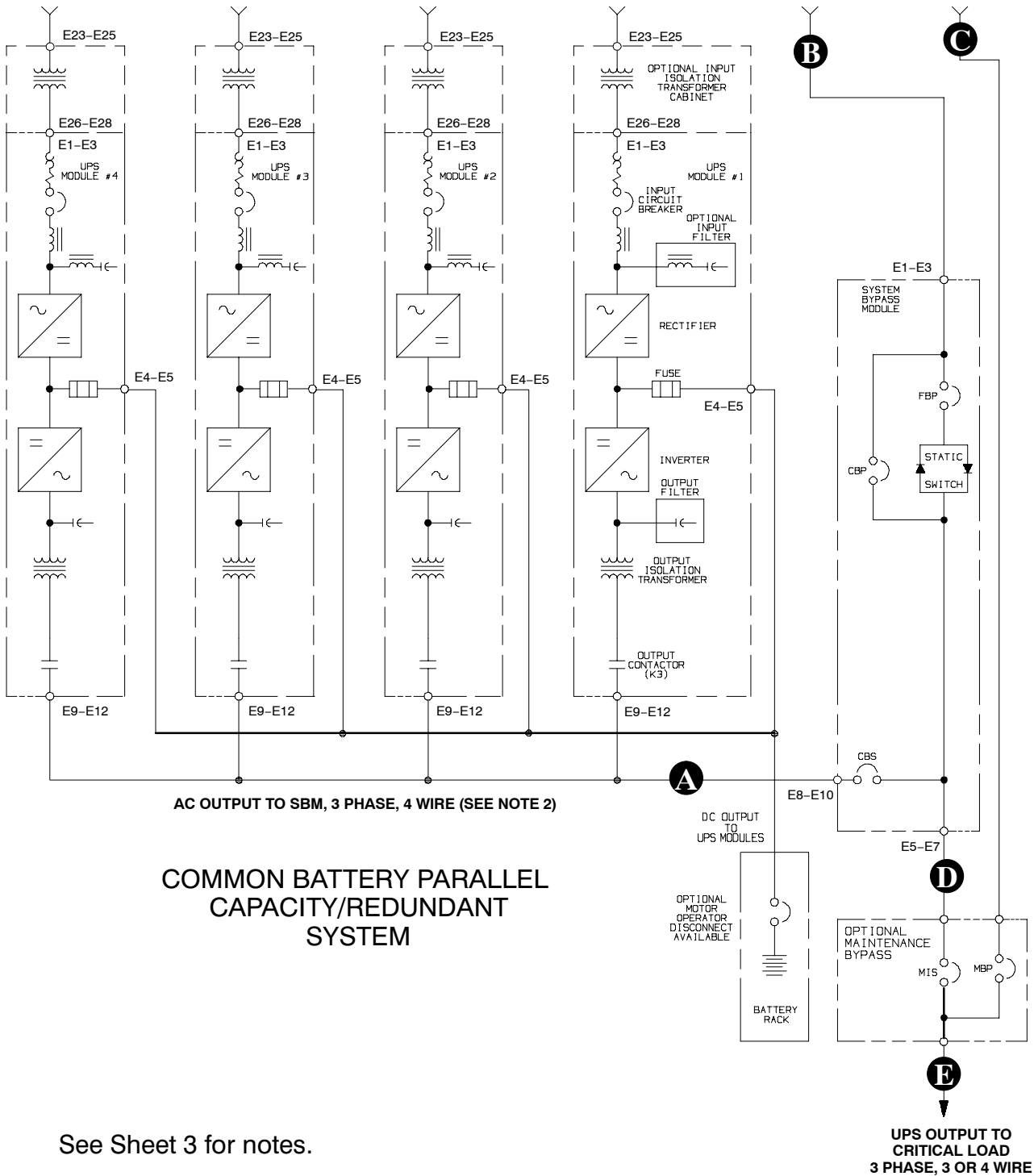
AC INPUT TO
MODULE #3
3 PHASE,
3 WIRE

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



AC OUTPUT TO SBM, 3 PHASE, 4 WIRE (SEE NOTE 2)

**COMMON BATTERY PARALLEL
CAPACITY/REDUNDANT
SYSTEM**

See Sheet 3 for notes.

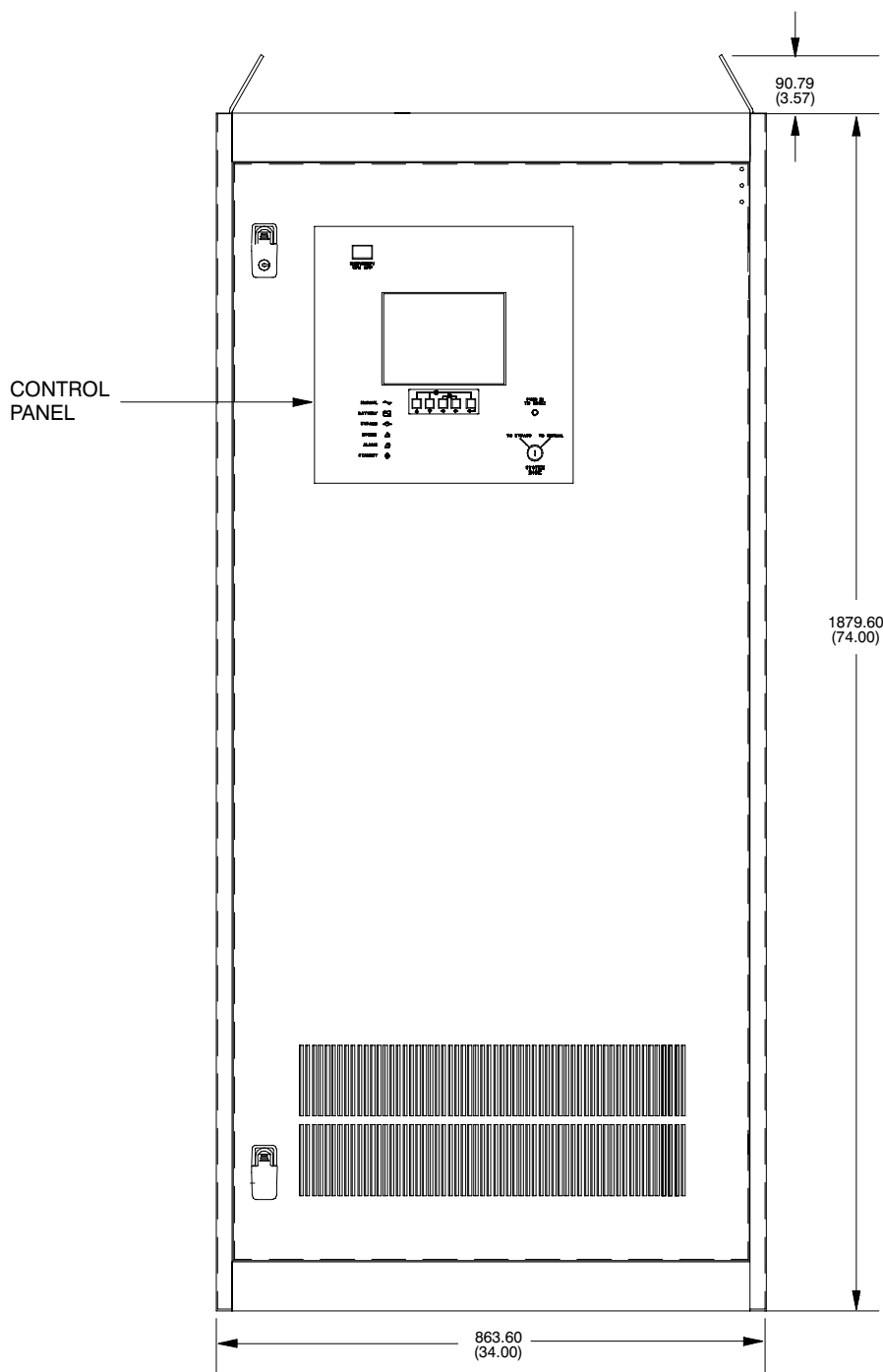
DESCRIPTION:	ONLINE DRAWINGS OF PARALLEL CAPACITY/REDUNDANT SYSTEM	
DRAWING NO:	164201150-4	SHEET: 2 of 3

NOTE: 1. Accommodates one to eight UPMs. Four UPM system shown.

NOTE: 2. A bypass neutral feeder must be installed when the output neutral is used. If no bypass neutral is installed, the output neutral is to be bonded to the chassis in the SBM through the minimum size copper conductor listed in Table I. In either case, fully rated neutral conductors are to be run from the output of each UPM to the neutral buss bar inside the SBM.

SBM Model	Wire Size (kcmil)
1200A	250
1600A	300
2000A	400
2500A	500
3000A	600
4000A	700

DESCRIPTION:	ONLINE DRAWINGS OF PARALLEL CAPACITY/REDUNDANT SYSTEM	
DRAWING NO:	164201150-4	SHEET: 3 of 3

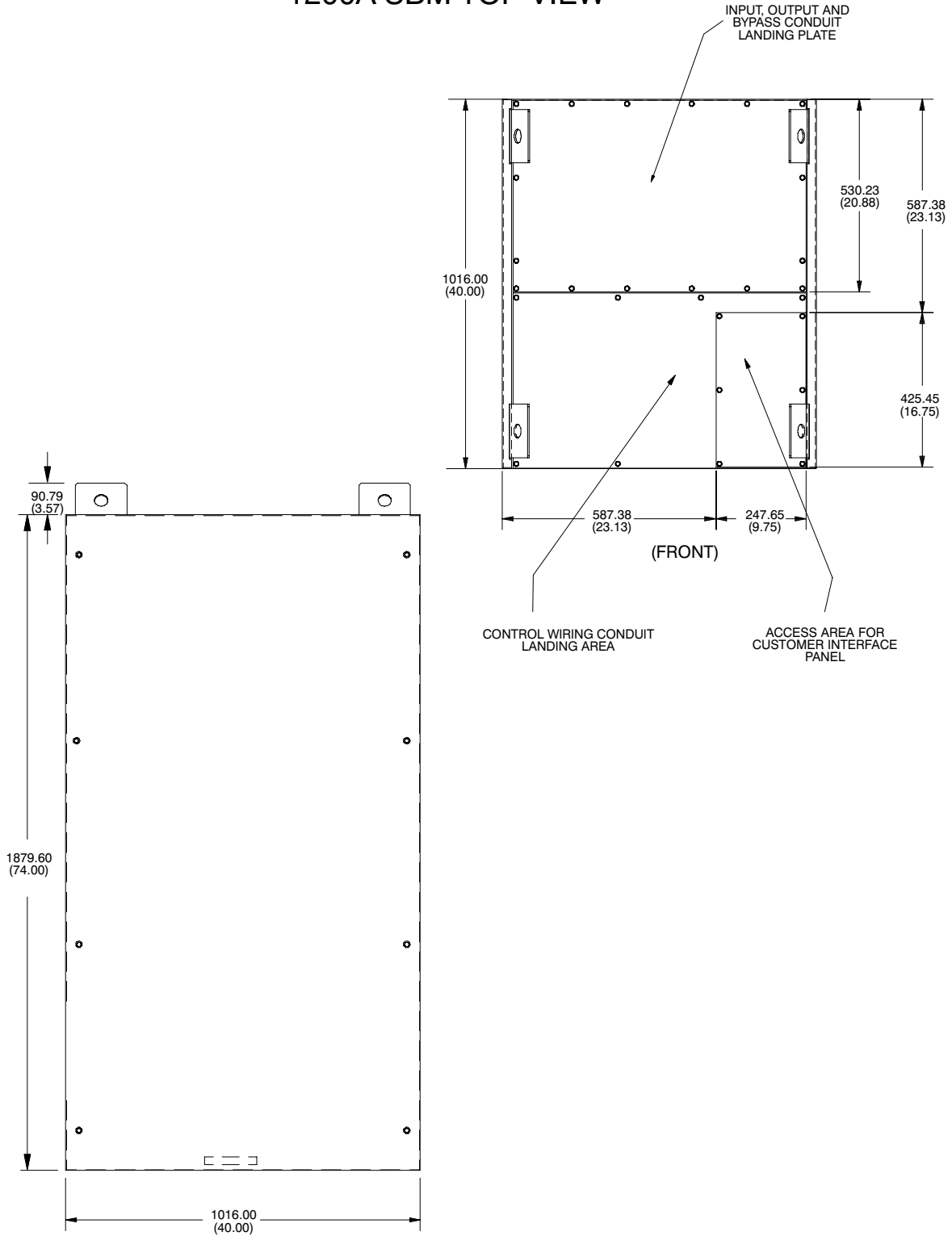


1200A SBM FRONT VIEW

Dimensions are in millimeters (inches)

DESCRIPTION:	
1200A SYSTEM BYPASS MODULE	
DRAWING NO:	164201150-5
SHEET:	1 of 2

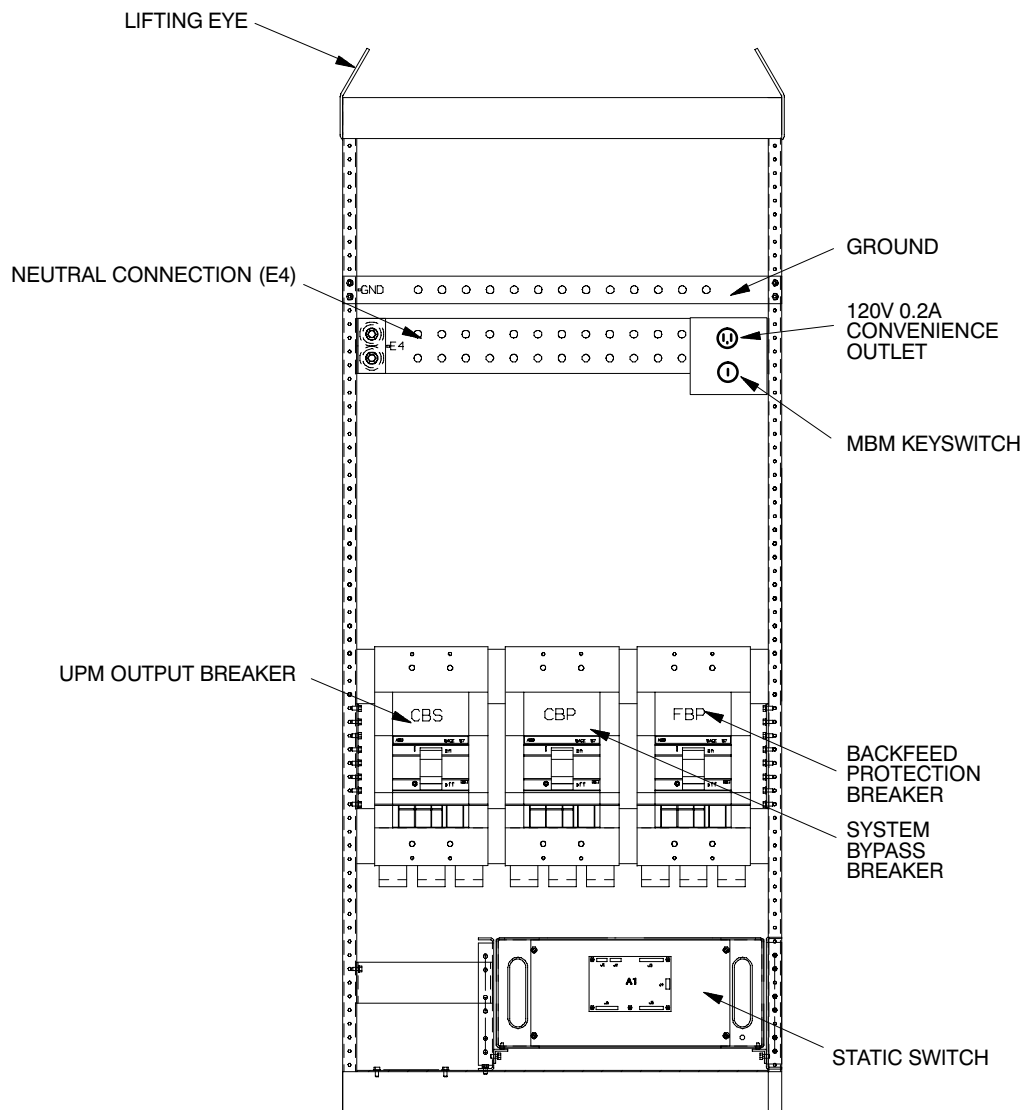
1200A SBM TOP VIEW



1200A SBM SIDE VIEW

Dimensions are in millimeters (inches)

DESCRIPTION:		1200A SYSTEM BYPASS MODULE	
DRAWING NO:	164201150-5	SHEET:	2 of 2

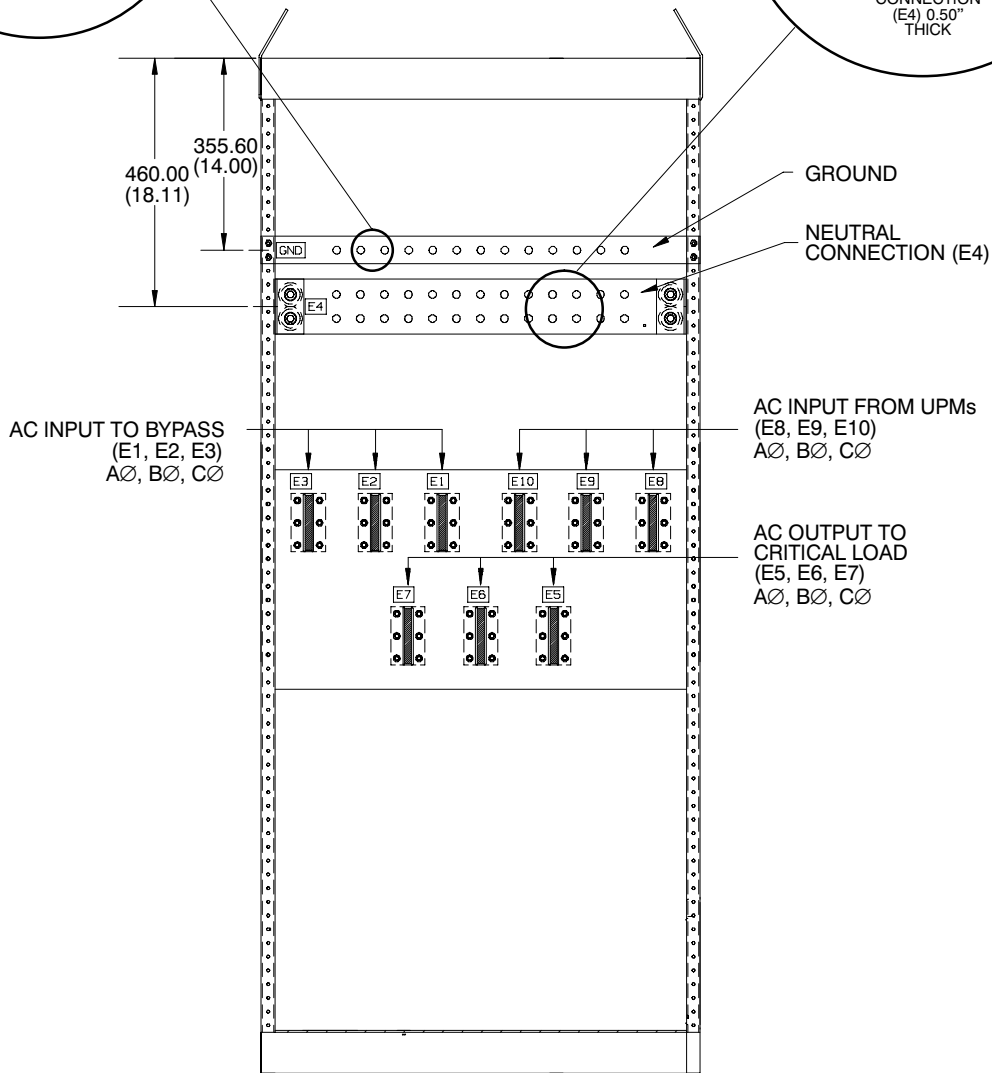
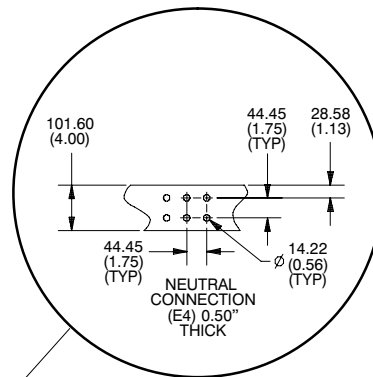
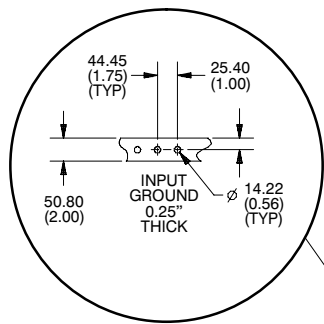


FRONT VIEW

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer terminal locations.

Dimensions are in millimeters (inches)

DESCRIPTION:	
LOCATION OF 1200A SBM TERMINALS	
DRAWING NO:	164201150-6
SHEET:	1 of 4

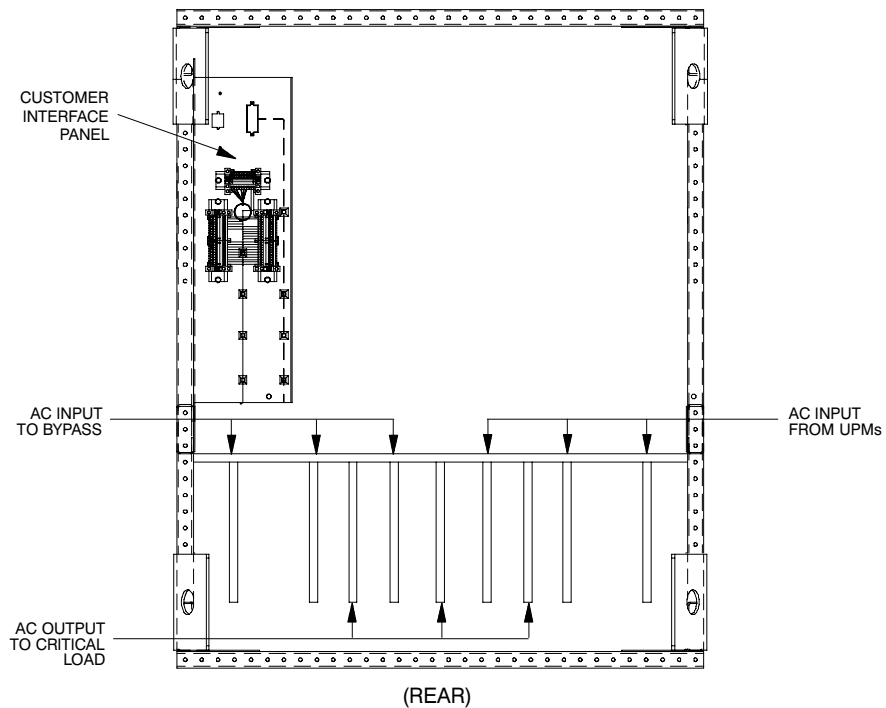


REAR VIEW

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer terminal locations.

Dimensions are in millimeters (inches)

DESCRIPTION:		
LOCATION OF 1200A SBM TERMINALS		
DRAWING NO:	164201150-6	SHEET: 2 of 4

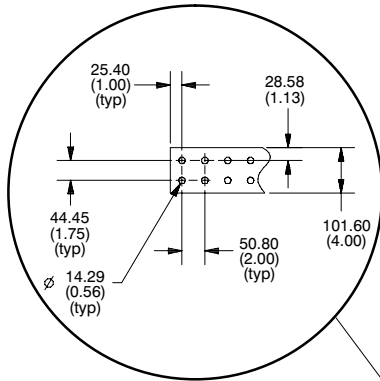


TOP VIEW

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer terminal locations.

Dimensions are in millimeters (inches)

DESCRIPTION:		LOCATION OF 1200A SBM TERMINALS
DRAWING NO:	164201150-6	SHEET: 3 of 4



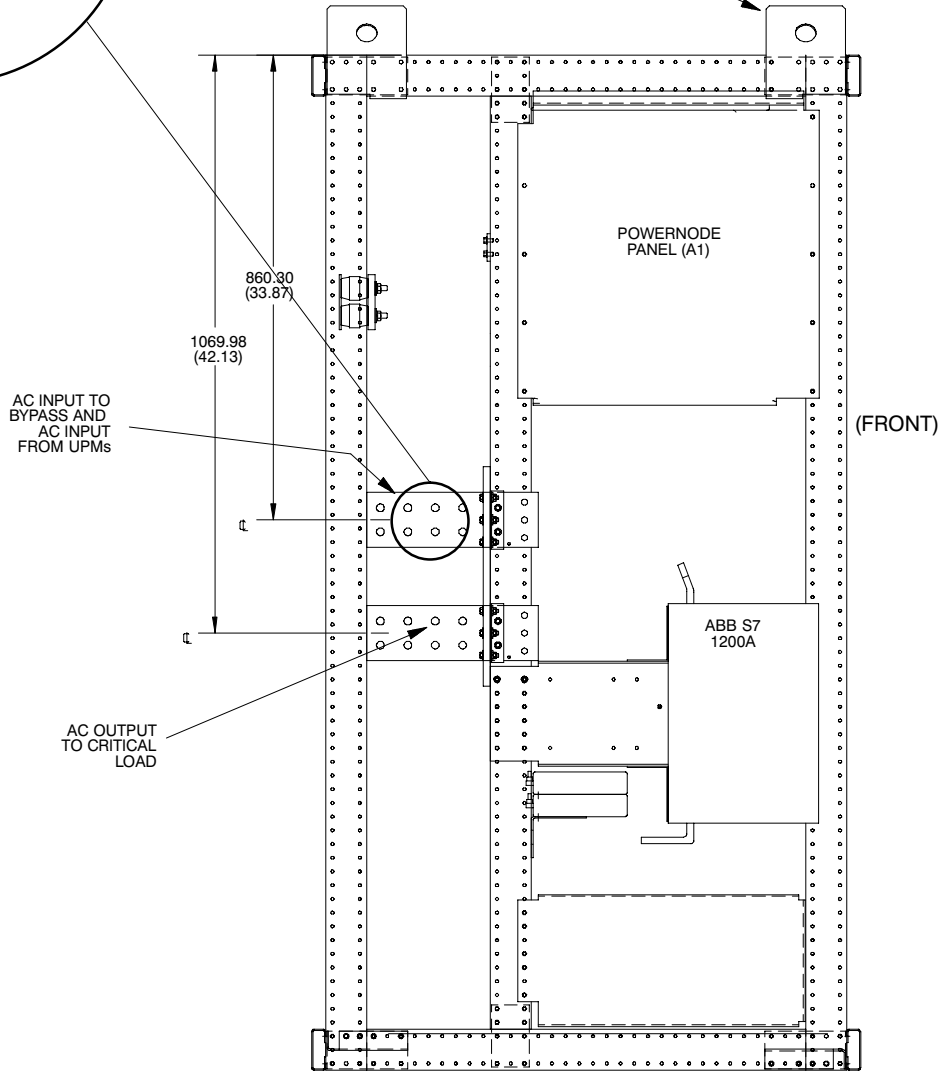
AC INPUT TO BYPASS
(E1, E2, E3)
AØ, BØ, CØ

AC OUTPUT TO CRITICAL LOAD
(E5, E6, E7)
AØ, BØ, CØ

AC INPUT FROM UPMs
(E8, E9, E10)
AØ, BØ, CØ

0.50" THICK

LIFTING EYE

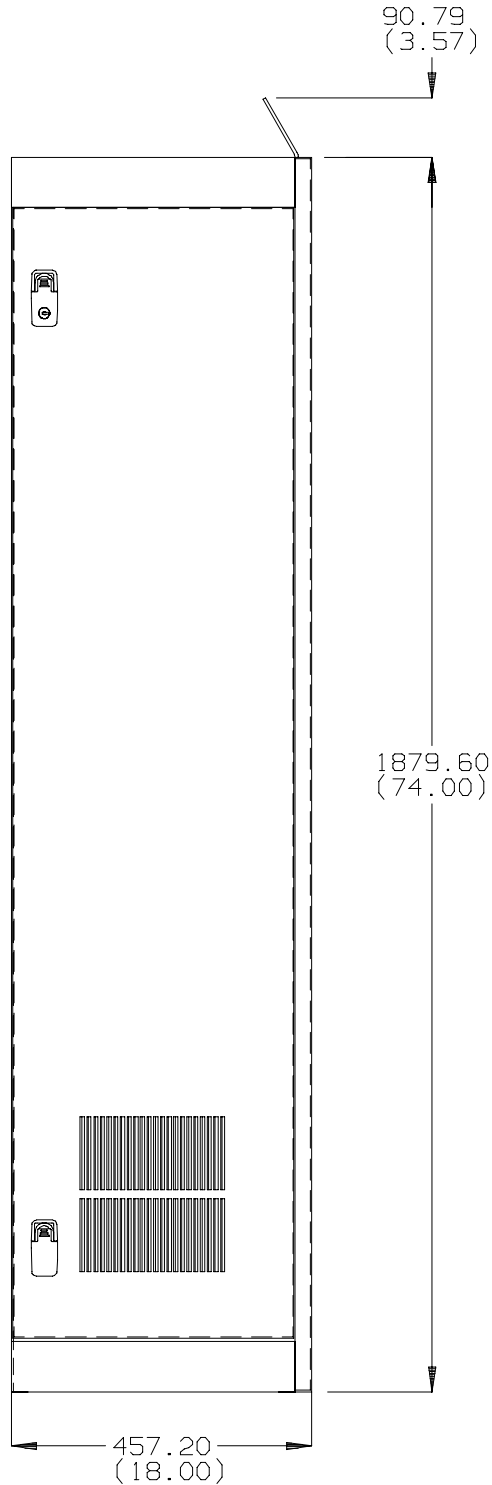


LEFT SIDE VIEW

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPms, for UPm, battery, and optional input transformer terminal locations.

Dimensions are in millimeters (inches)

DESCRIPTION:		LOCATION OF 1200A SBM TERMINALS
DRAWING NO:	164201150-6	SHEET: 4 of 4



FRONT VIEW

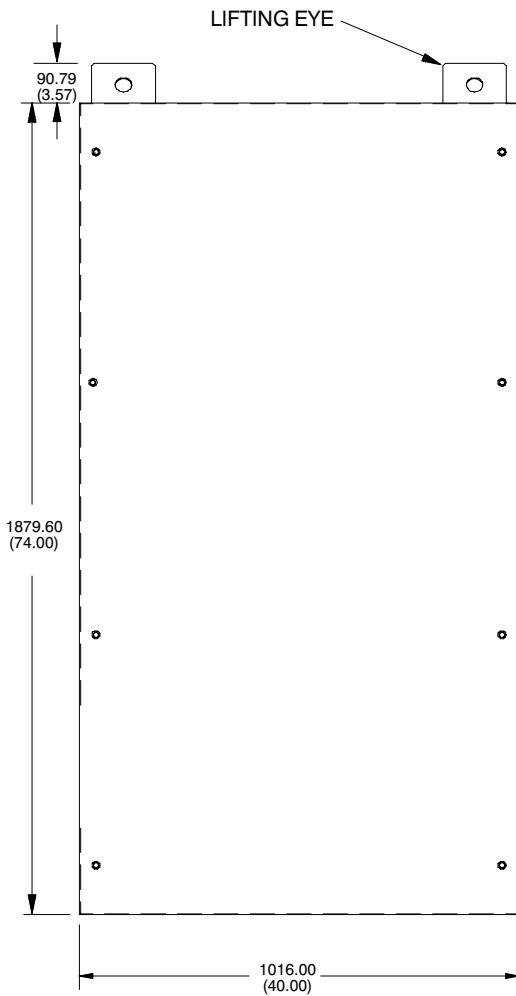
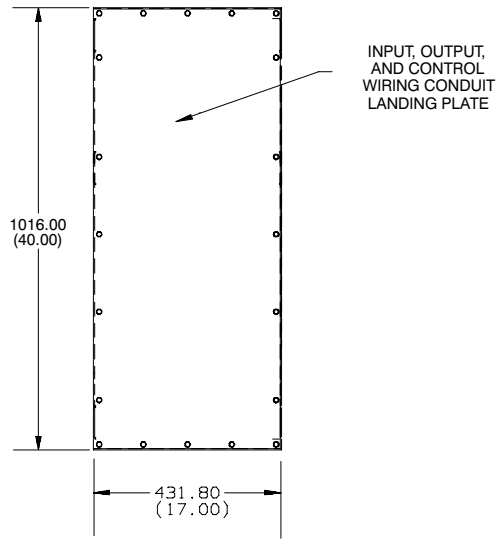
NOTE:

The 1200A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

DESCRIPTION:	
1200A SYSTEM MAINTENANCE BYPASS (SMB)	
DRAWING NO:	164201150-7
SHEET:	1 of 2

TOP VIEW



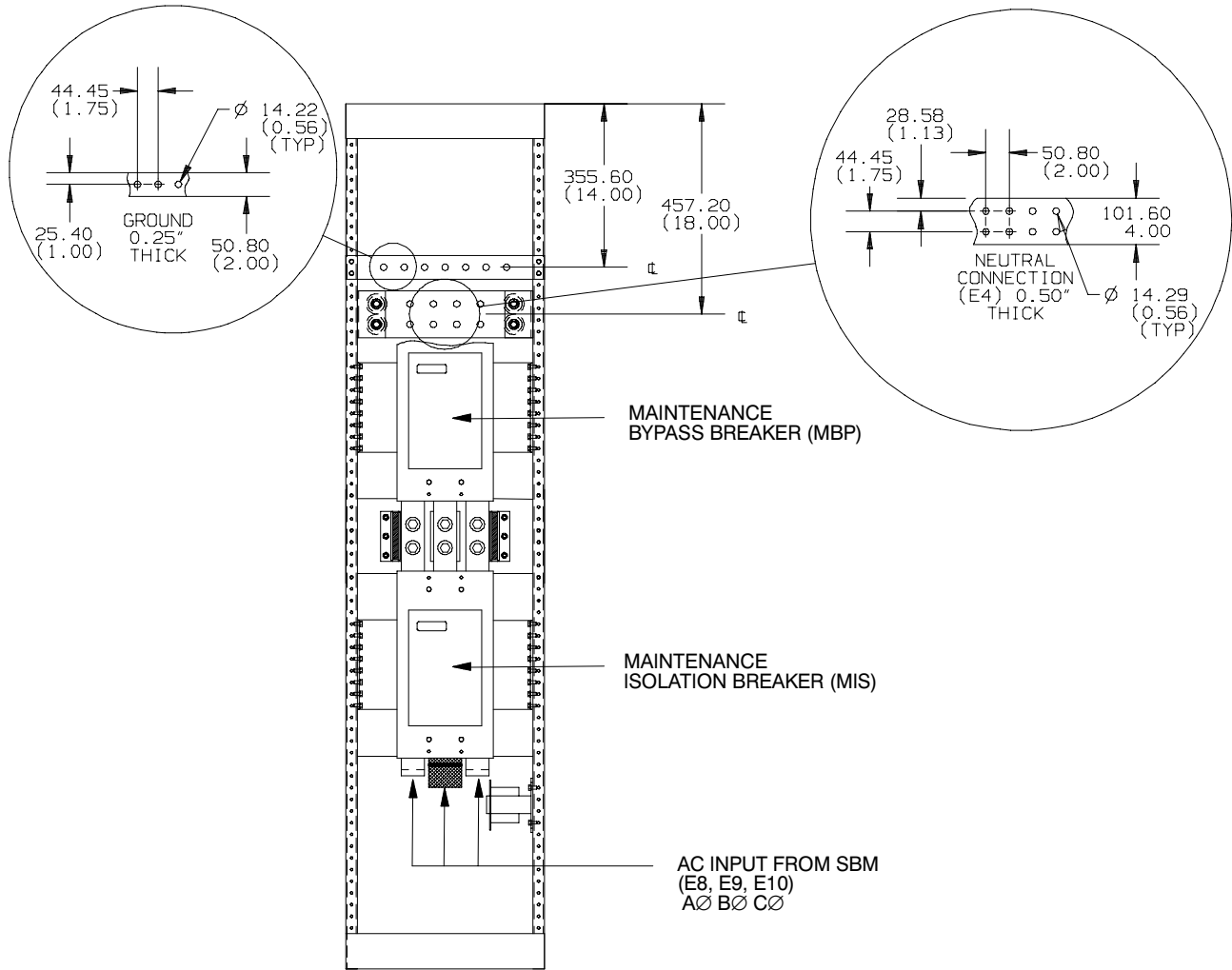
SIDE VIEW

NOTE:

The 1200A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

DESCRIPTION:		1200A SYSTEM MAINTENANCE BYPASS (SMB)
DRAWING NO:	164201150-7	SHEET: 2 of 2



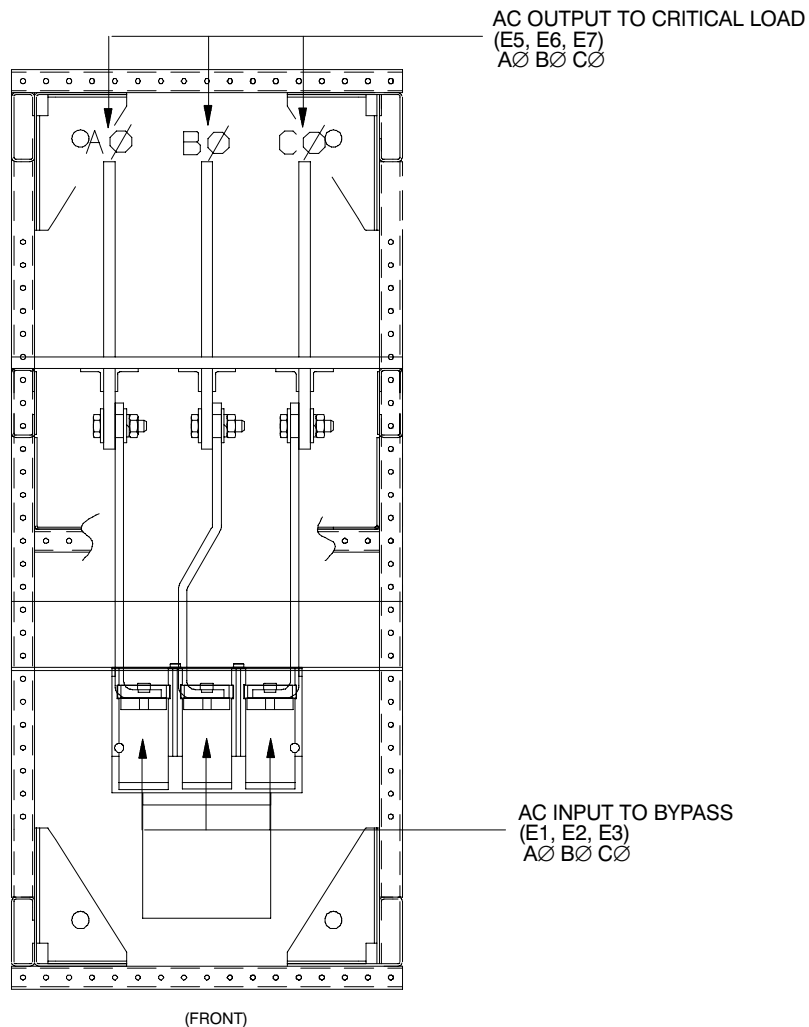
FRONT VIEW

NOTE:

The 1200A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

DESCRIPTION:	
LOCATION OF 1200A SMB TERMINALS	
DRAWING NO:	164201150-8
SHEET:	1 of 3



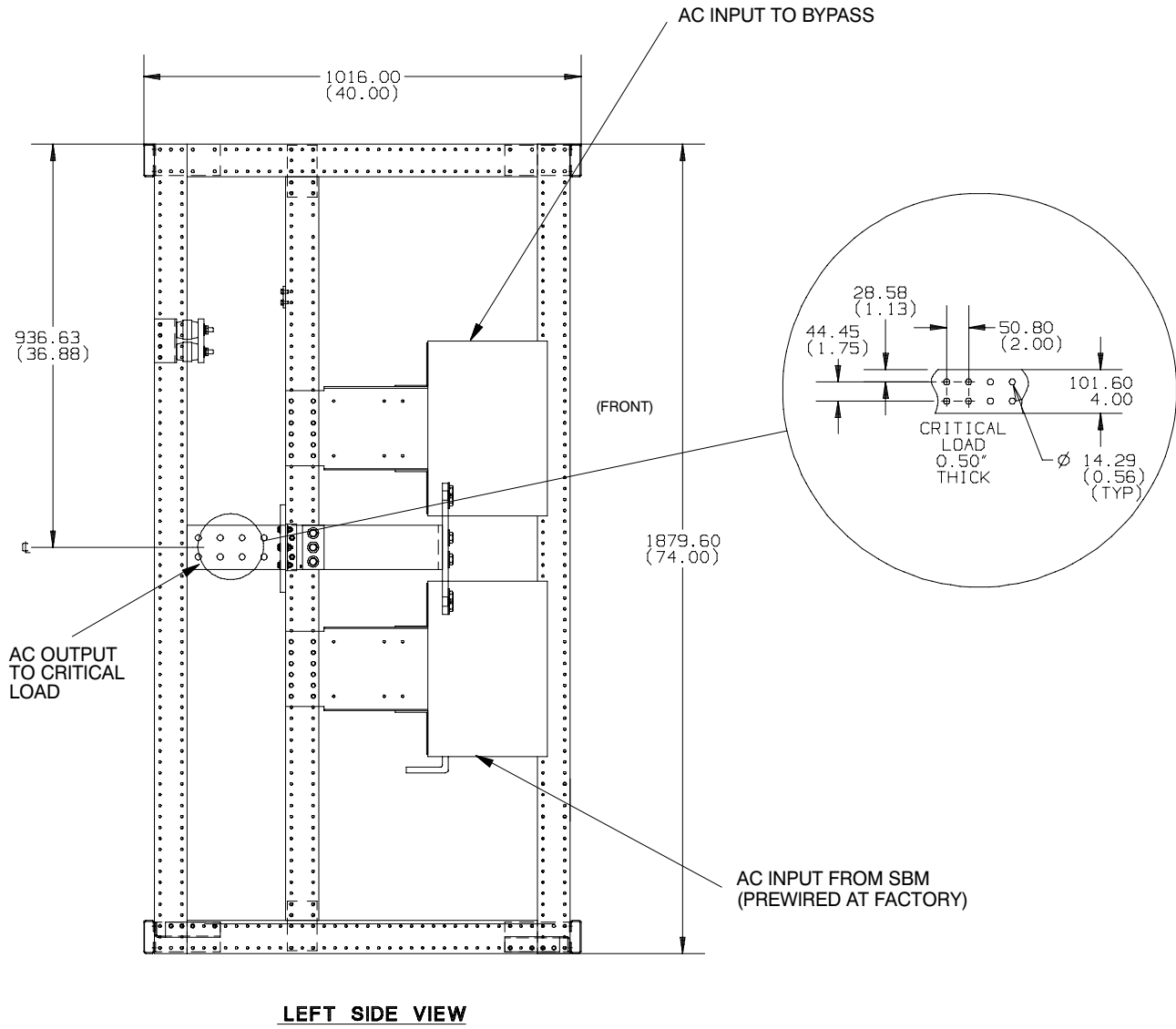
TOP VIEW

NOTE:

The 1200A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

DESCRIPTION:	LOCATION OF 1200A SMB TERMINALS	
DRAWING NO:	164201150-8	SHEET: 2 of 3

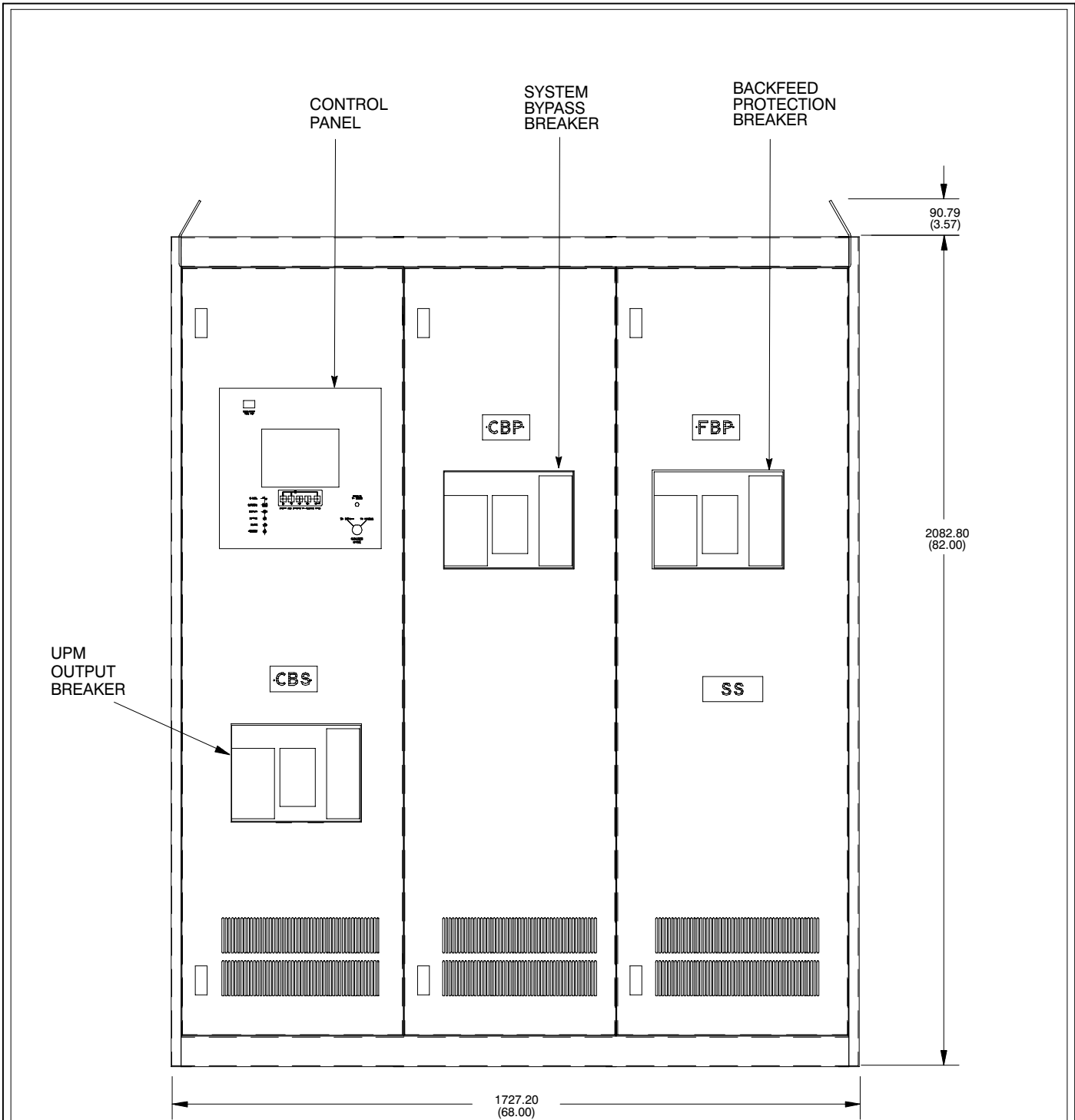


NOTE:

The 1200A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

DESCRIPTION:	
LOCATION OF 1200A SMB TERMINALS	
DRAWING NO:	164201150-8
SHEET:	3 of 3

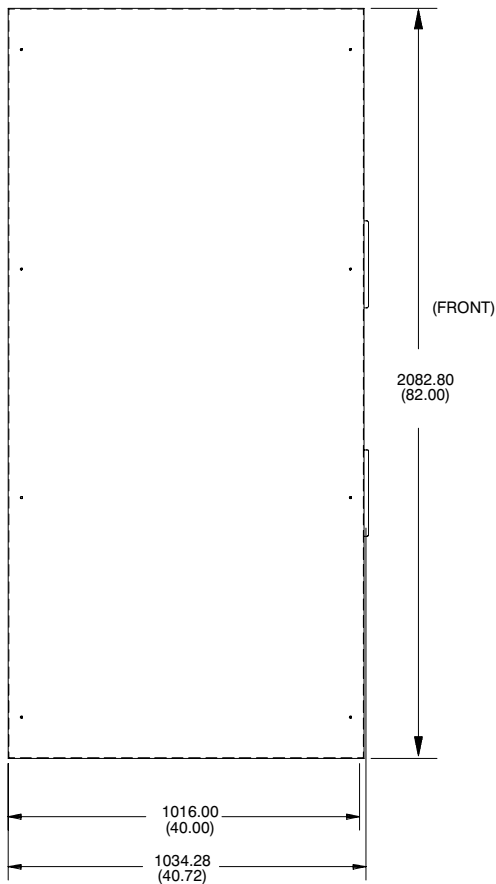
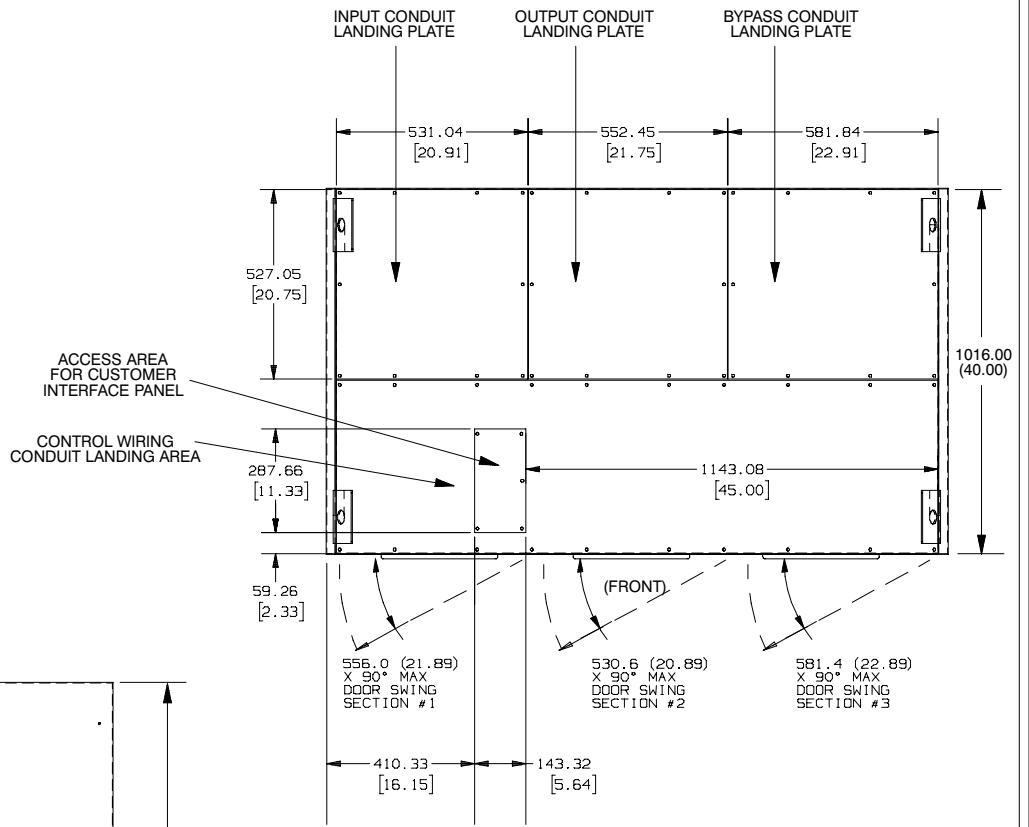


2000A SBM FRONT VIEW

DESCRIPTION:		2000A SYSTEM BYPASS MODULE	
DRAWING NO:	164201150-9	SHEET:	1 of 2

Dimensions are in millimeters (inches)

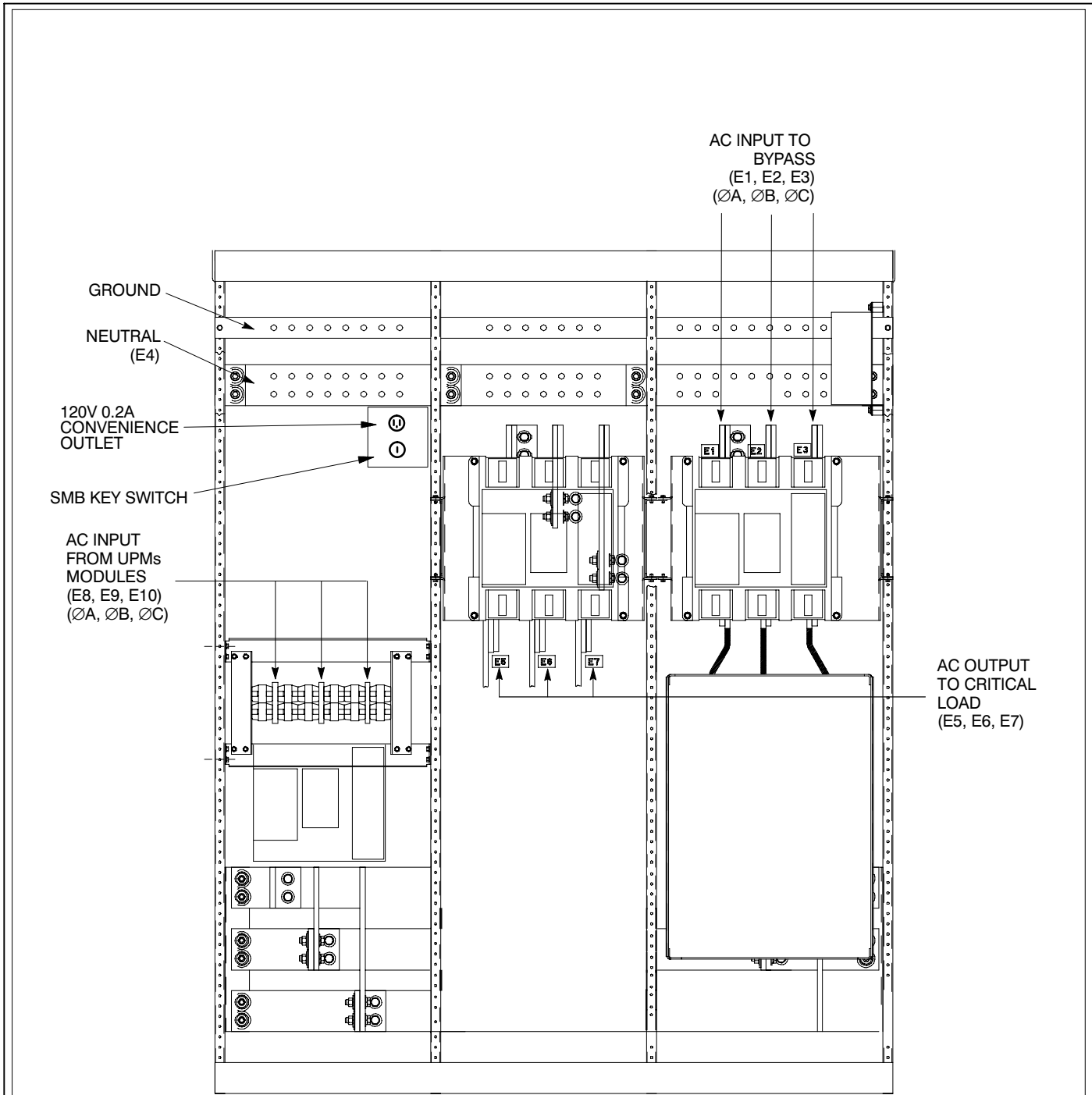
2000A SBM TOP VIEW



2000A SBM SIDE VIEW

Dimensions are in millimeters (inches)

DESCRIPTION:	2000A SYSTEM BYPASS MODULE	
DRAWING NO:	164201150-9	SHEET: 2 of 2

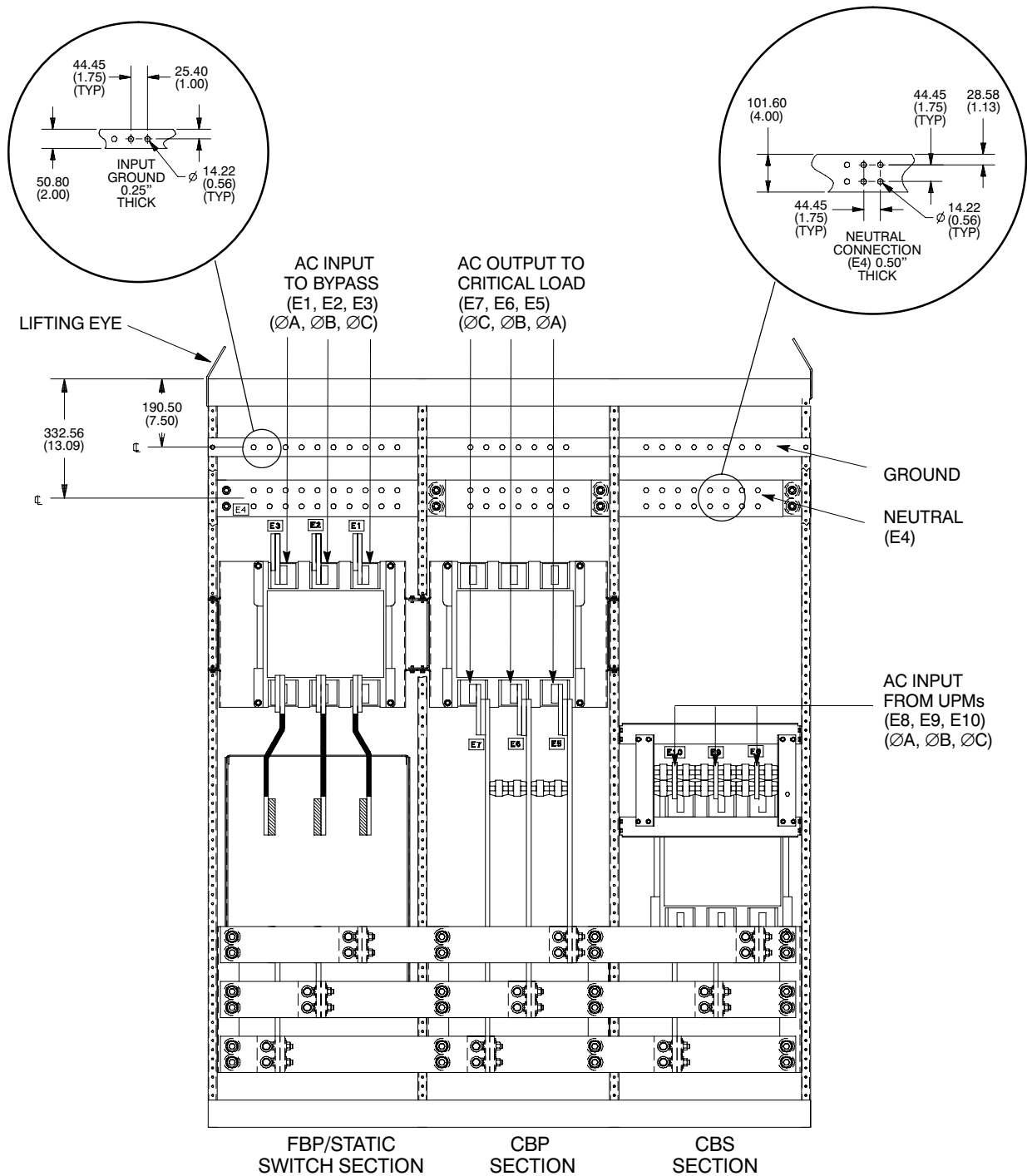


CBS SECTION CBP SECTION FBP/STATIC SWITCH SECTION

FRONT VIEW

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer and terminal locations.

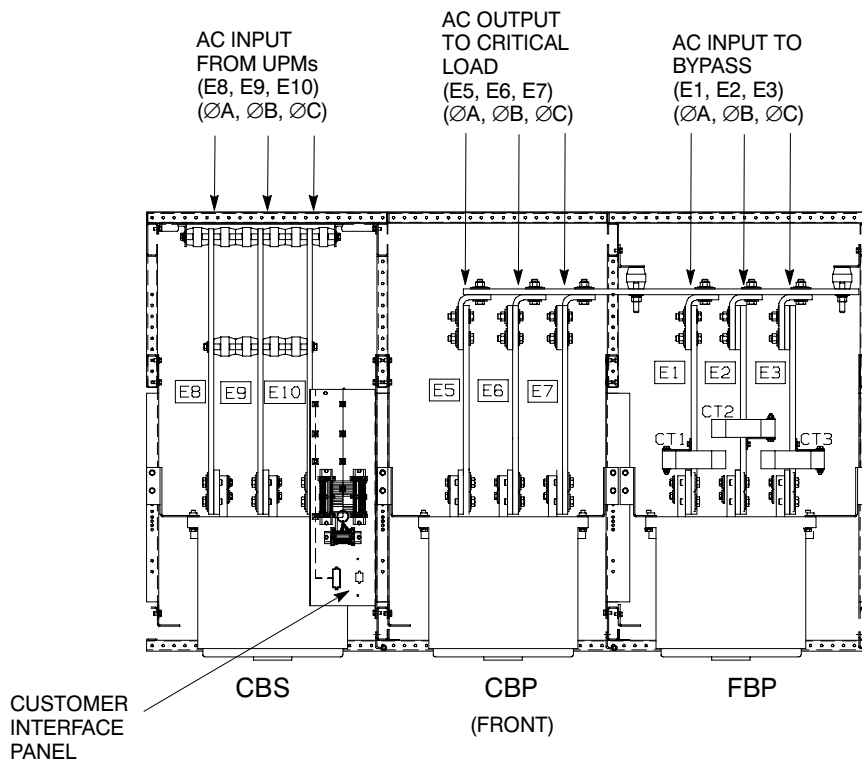
DESCRIPTION:		LOCATION OF 2000A SBM TERMINALS
DRAWING NO:	164201150-10	SHEET: 1 of 6



REAR VIEW

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer and terminal locations.

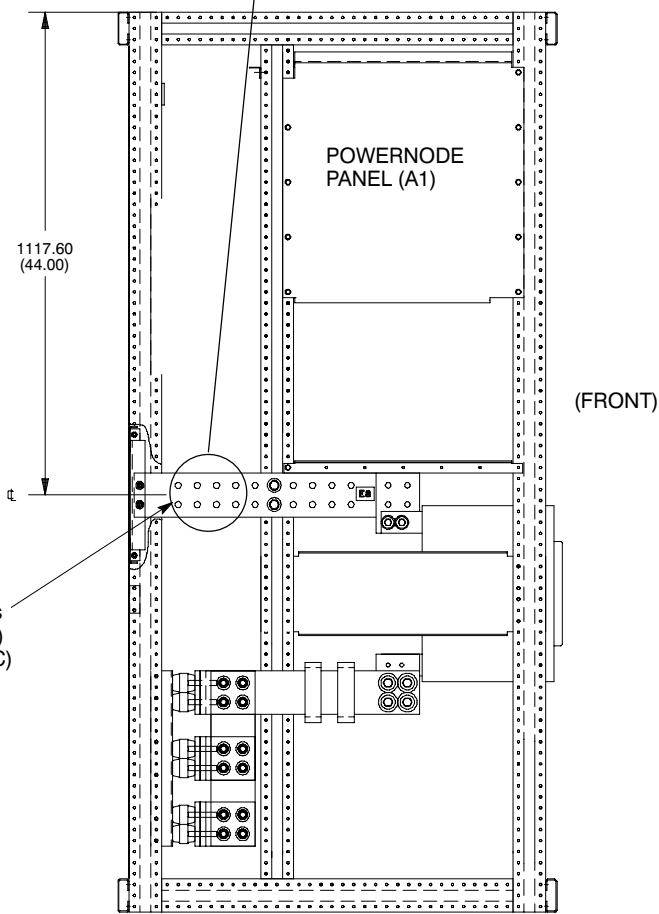
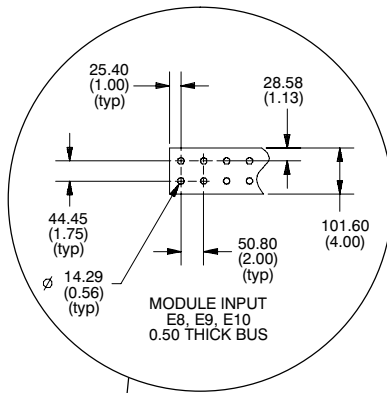
DESCRIPTION:		LOCATION OF 2000A SBM TERMINALS	
DRAWING NO:	164201150-10	SHEET:	2 of 6



TOP VIEW

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer and terminal locations.

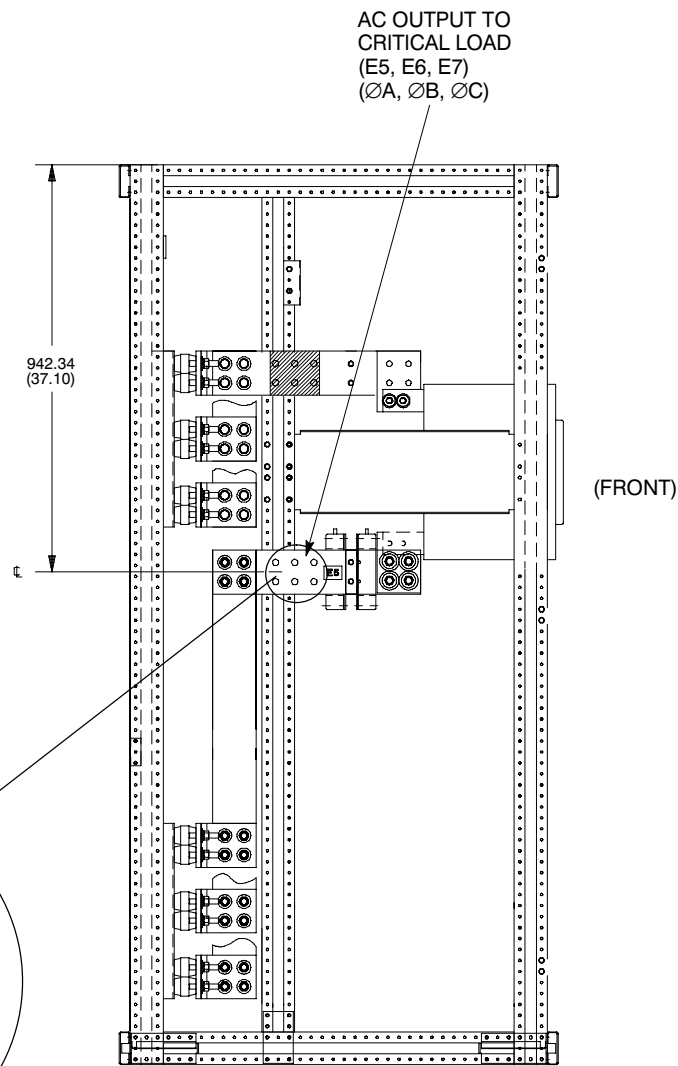
DESCRIPTION:		LOCATION OF 2000A SBM TERMINALS
DRAWING NO:	164201150-10	SHEET: 3 of 6



LEFT SIDE VIEW
(CBS SECTION)

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer and terminal locations.

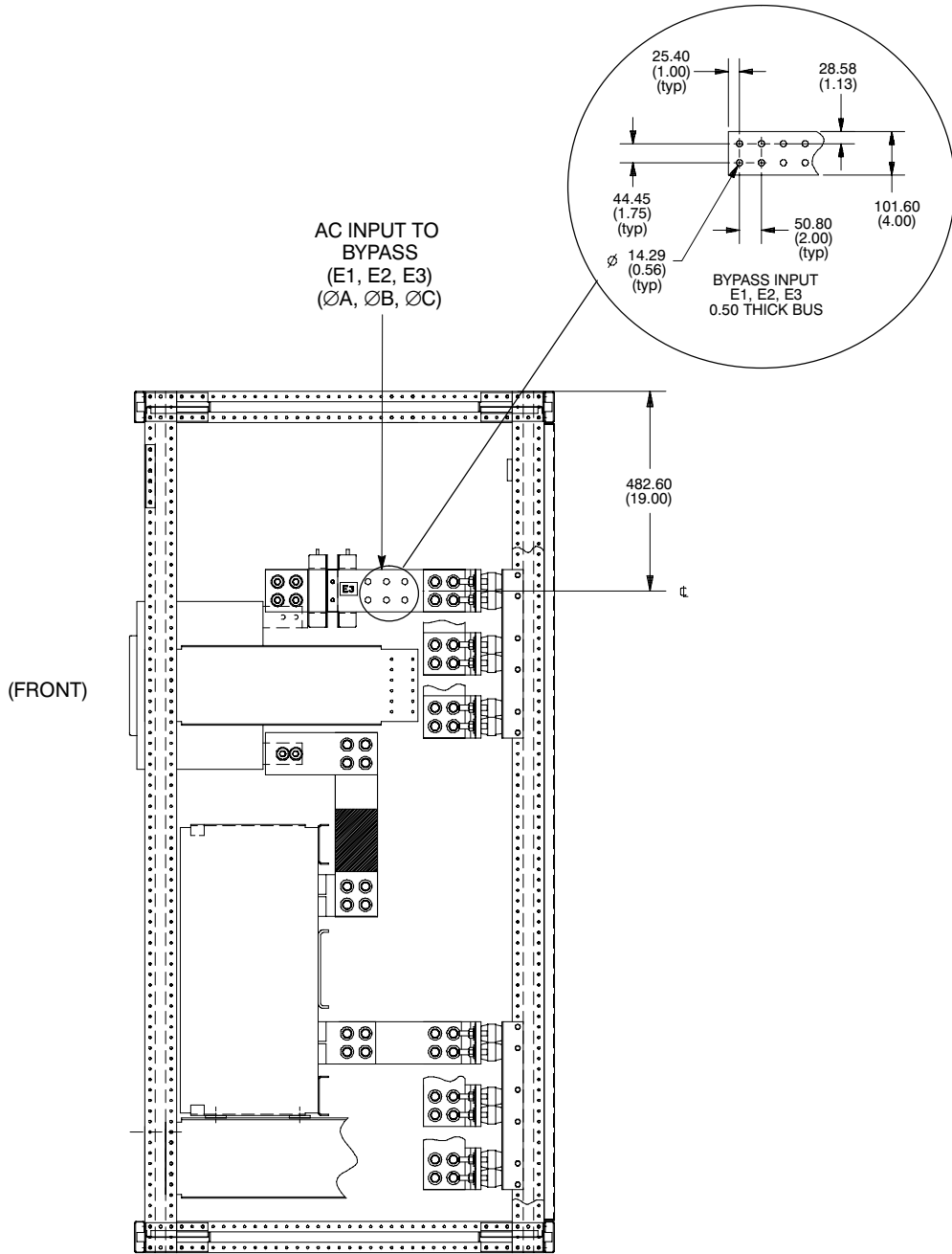
DESCRIPTION:		LOCATION OF 2000A SBM TERMINALS
DRAWING NO:	164201150-10	SHEET: 4 of 6



CENTER SECTION VIEW
VIEWED FROM LEFT SIDE
(CBB SECTION)

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer and terminal locations.

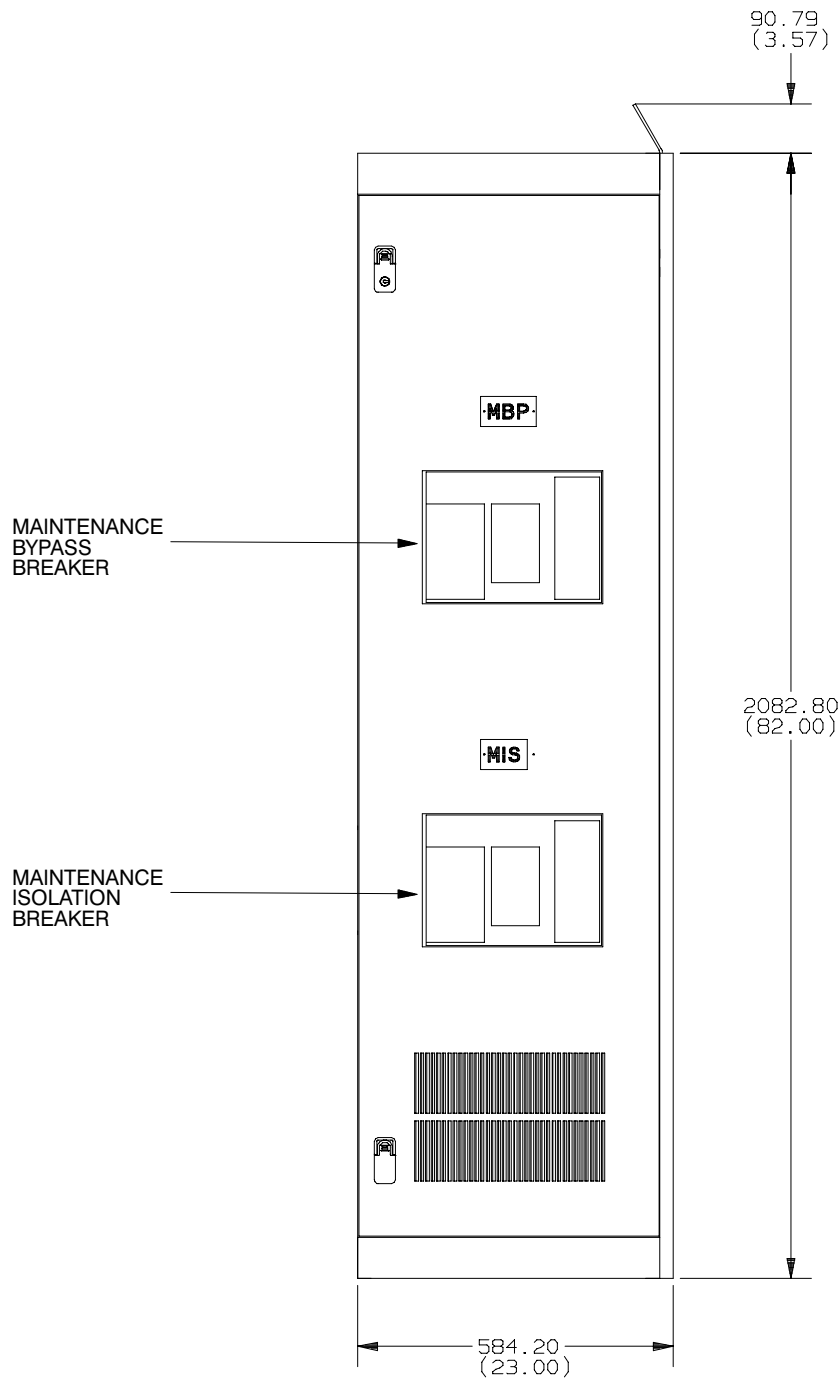
DESCRIPTION:		LOCATION OF 2000A SBM TERMINALS
DRAWING NO:	164201150-10	SHEET: 5 of 6



RIGHT SIDE VIEW
(FBP/STATIC SWITCH SECTION)

NOTE: Refer to the Powerware® 9315 UPS Installation manual provided with the UPMs, for UPM, battery, and optional input transformer and terminal locations.

DESCRIPTION:		LOCATION OF 2000A SBM TERMINALS
DRAWING NO:	164201150-10	SHEET: 6 of 6

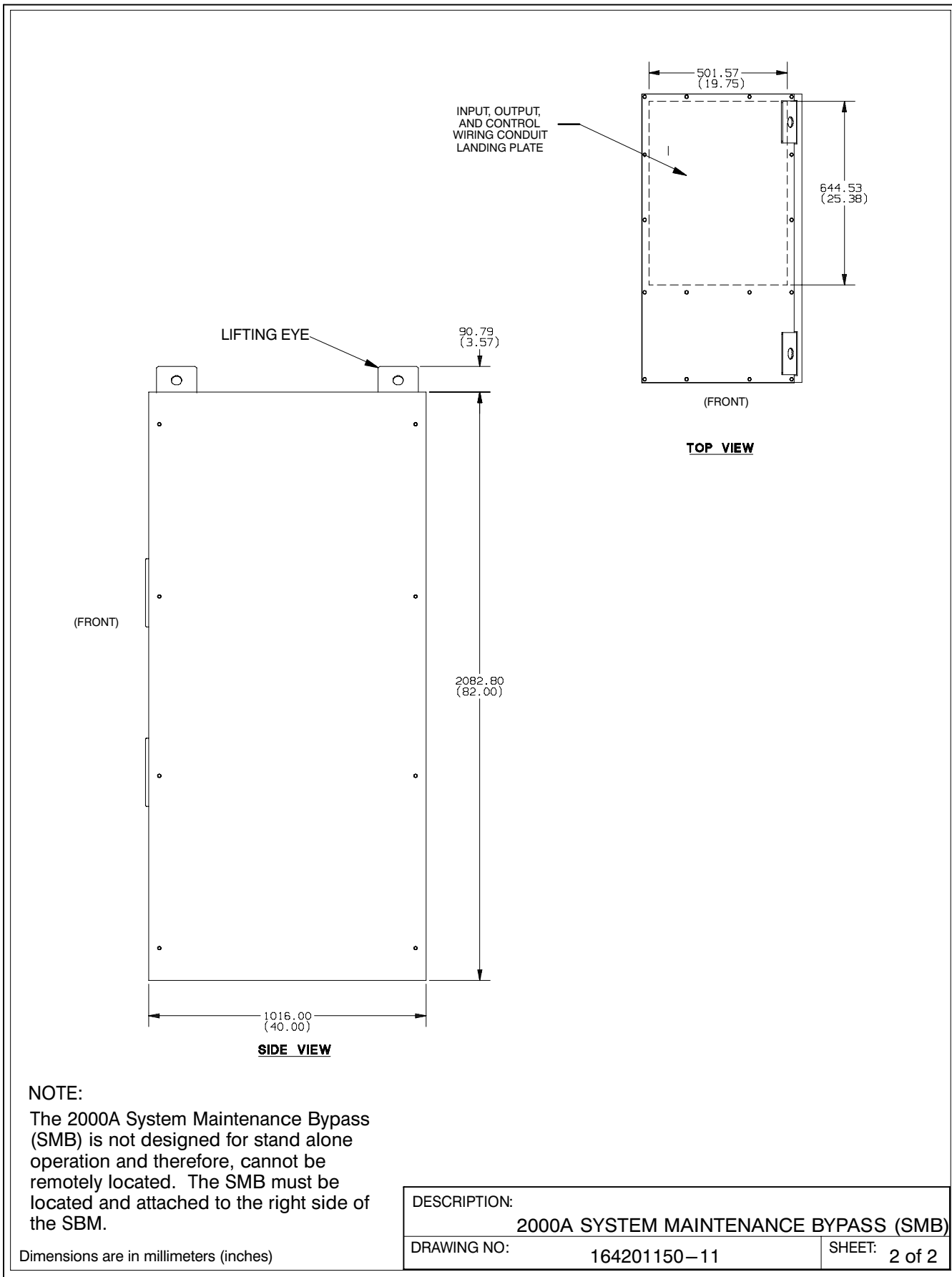


FRONT VIEW

NOTE:

The 2000A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

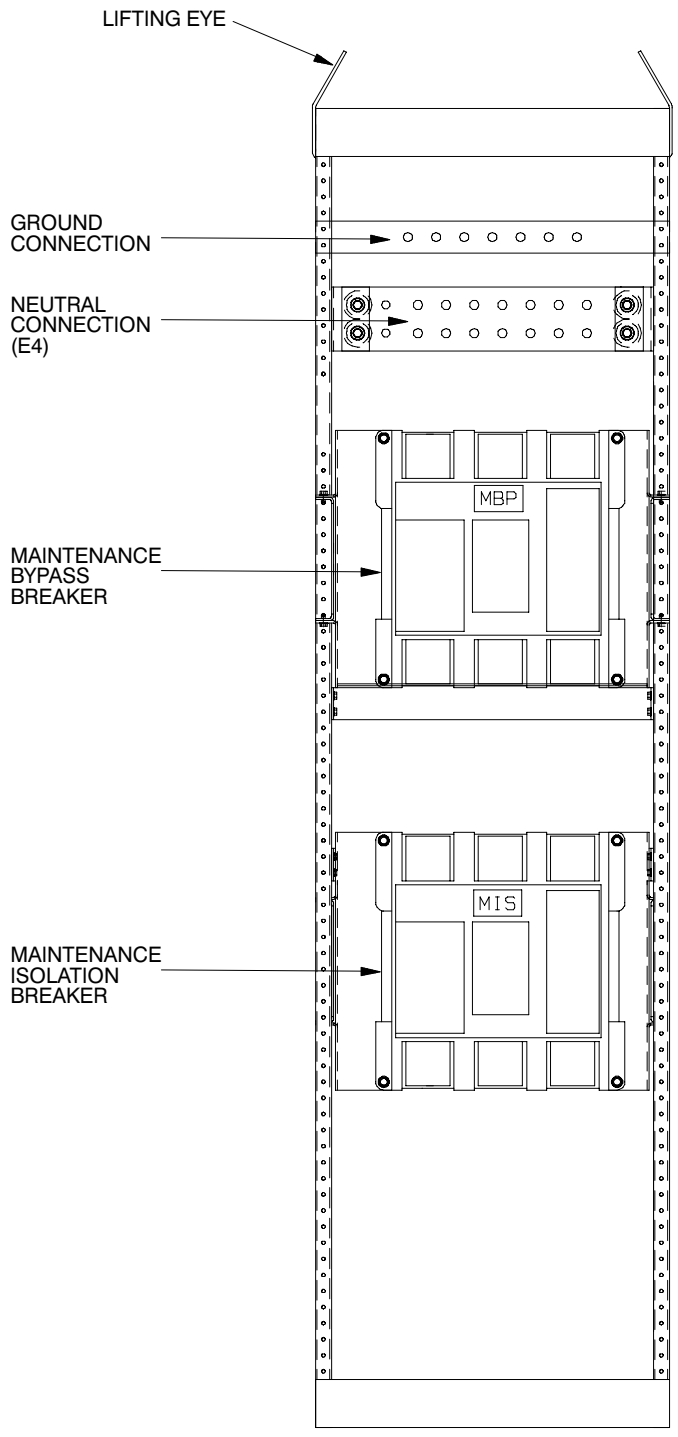
DESCRIPTION:	
2000A SYSTEM MAINTENANCE BYPASS (SMB)	
DRAWING NO:	164201150-11
SHEET:	1 of 2



NOTE:
 The 2000A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

DESCRIPTION:	
2000A SYSTEM MAINTENANCE BYPASS (SMB)	
DRAWING NO:	164201150-11
SHEET:	2 of 2

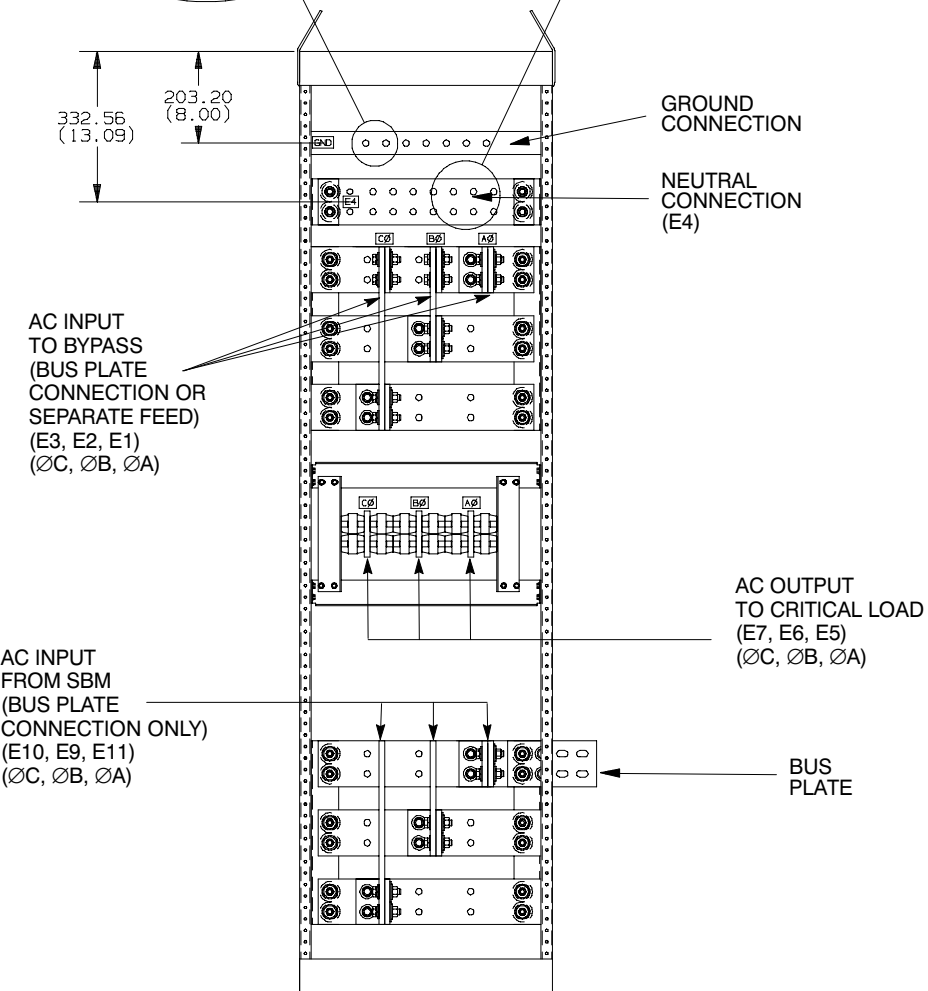
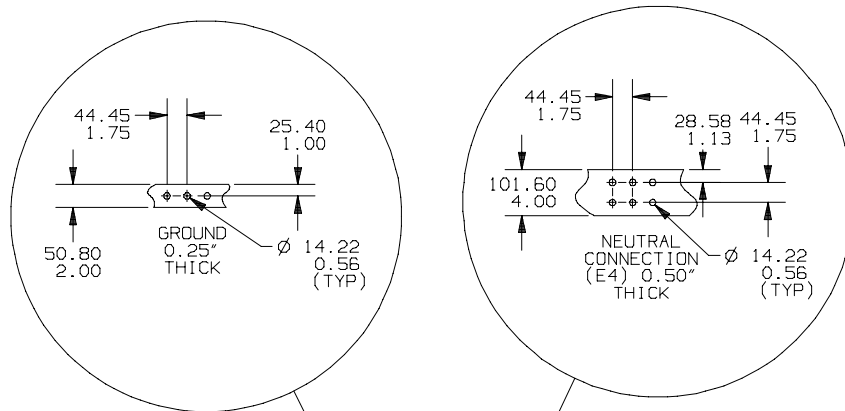


FRONT VIEW

NOTE:
 The 2000A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

DESCRIPTION:		LOCATION OF 2000A SMB TERMINALS
DRAWING NO:	164201150-12	SHEET: 1 of 4



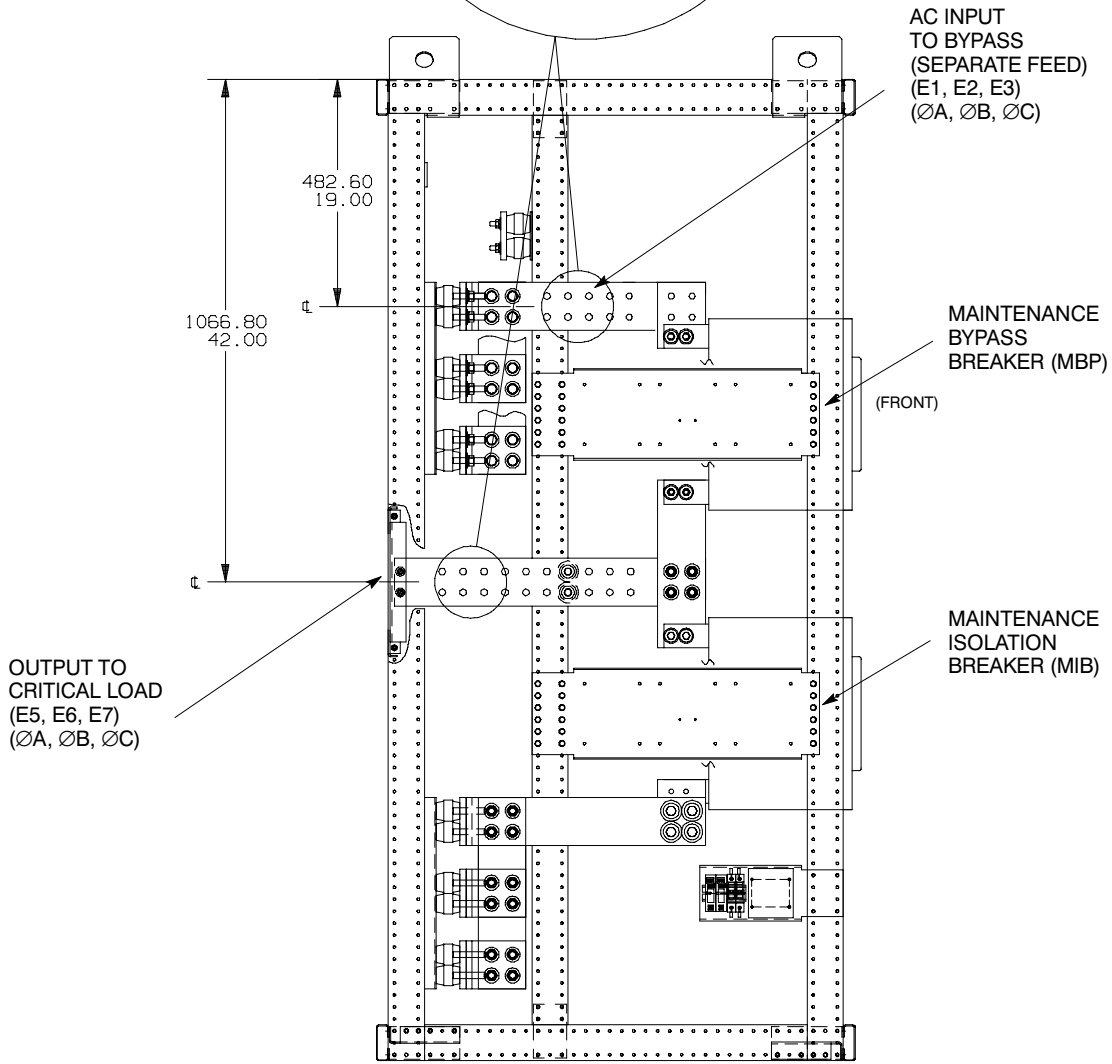
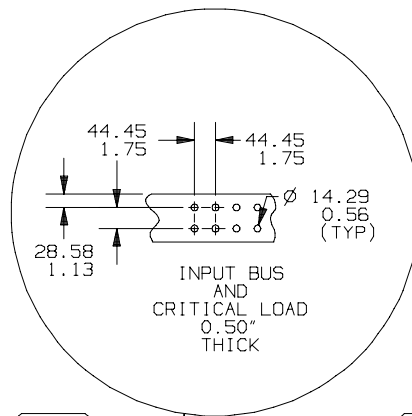
REAR VIEW

NOTE:

The 2000A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

DESCRIPTION:	
LOCATION OF 2000A SMB TERMINALS	
DRAWING NO:	164201150-12
SHEET:	2 of 4



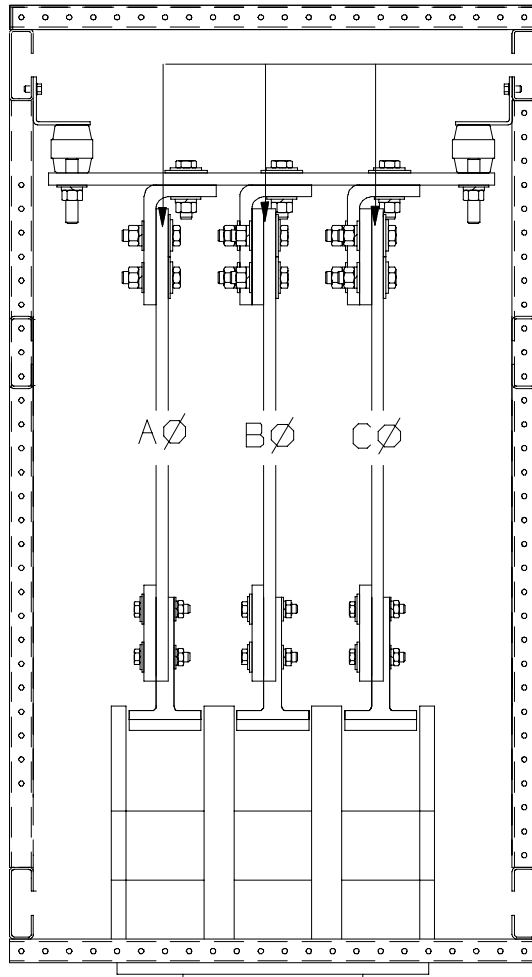
LEFT SIDE VIEW

NOTE:

The 1200A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

DESCRIPTION:	
LOCATION OF 2000A SMB TERMINALS	
DRAWING NO:	SHEET:
164201150-12	3 of 4



(FRONT)

TOP VIEW

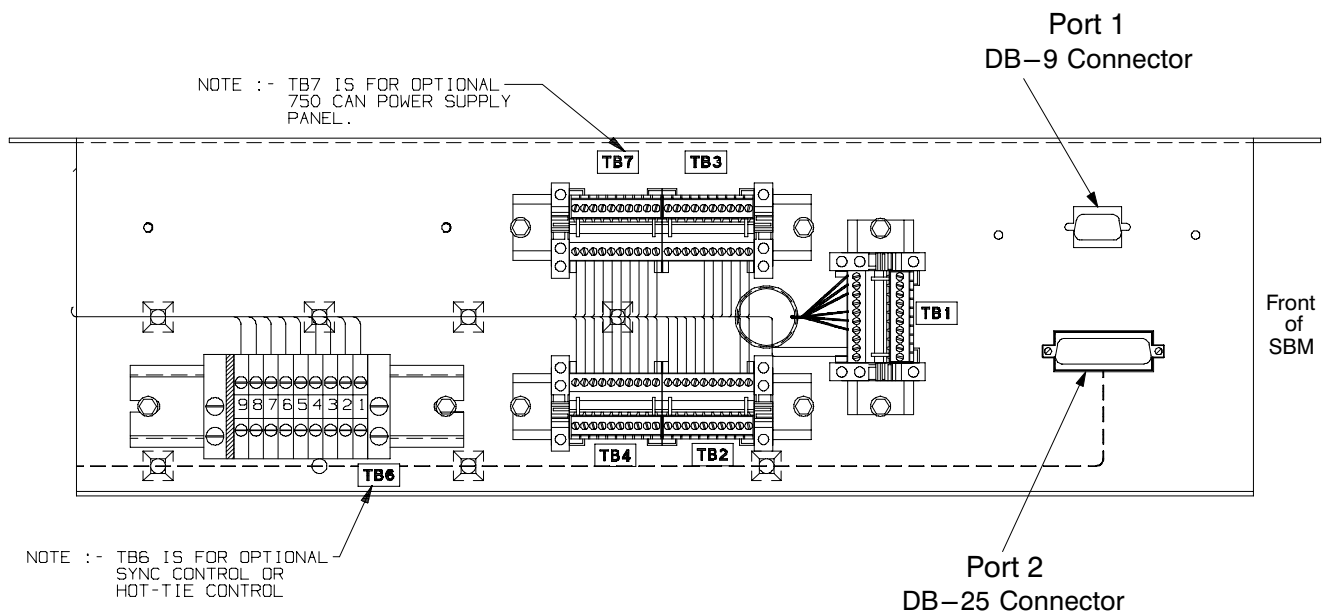
NOTE:

The 1200A System Maintenance Bypass (SMB) is not designed for stand alone operation and therefore, cannot be remotely located. The SMB must be located and attached to the right side of the SBM.

Dimensions are in millimeters (inches)

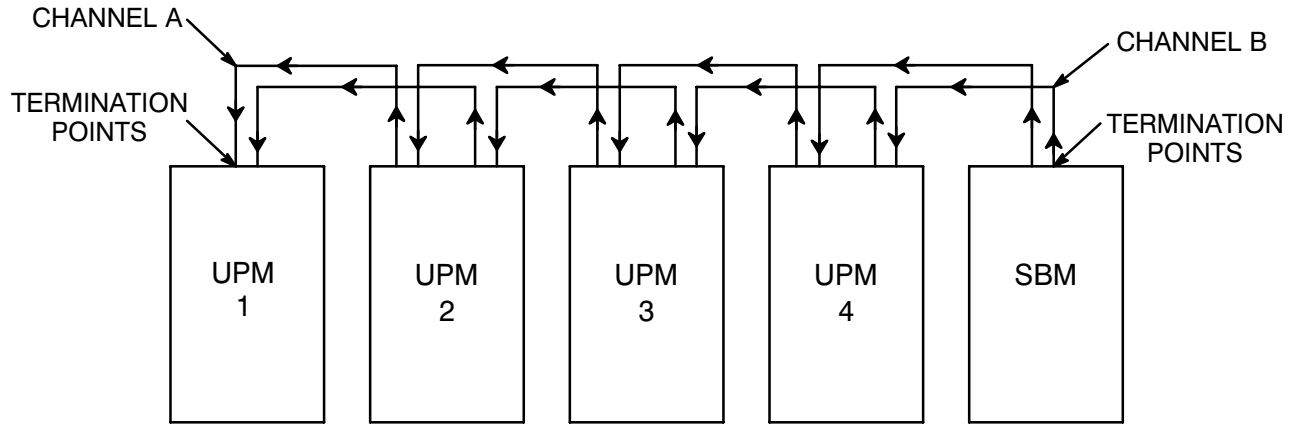
DESCRIPTION:	
LOCATION OF 2000A SMB TERMINALS	
DRAWING NO:	164201150-12
SHEET:	4 of 4

1. Two redundant PowerNet control networks connect UPM module to UPM module and UPM module to the SBM. Each network requires only one shielded twisted pair of wires.
2. Refer to drawings 164201150–5 and 164201150–9 for location of the Customer Interface panel.
3. Use Class 1 wiring methods (as defined by the NEC) for control wiring. Install the control wiring in separate conduits from the power wiring. Install the twisted pair of each redundant PowerNet network in separate conduits. The wire should be rated at 24 volts, 1 amp minimum. The recommended wire for the PowerNet network is shielded 20 gauge twisted pair Belden 8762 (Powerware Part Number 175090703) or equivalent.
4. Control wiring run may not exceed 100 meters.
5. Refer to sheet 2 for typical control wiring routing. Use Arrangement C for a more robust network.
6. Connect control wiring and terminating resistor (if applicable) to the removable portion of the terminal block.
7. Terminate each redundant PowerNet network at the end modules in the system. Use a 120 ohm, 1/4 watt, 5% resistor (Powerware Part Number 141202041). Refer to sheet 2 for typical termination points.
8. If SBM is to be terminated, install terminating resistors onto terminal block TB1. Refer to sheet 3 for terminal location. Connect each resistor across terminals 1 and 2 and 6 and 7.
9. Refer to Tables J, K, and L, and to applicable chapters for information about installing control wiring.

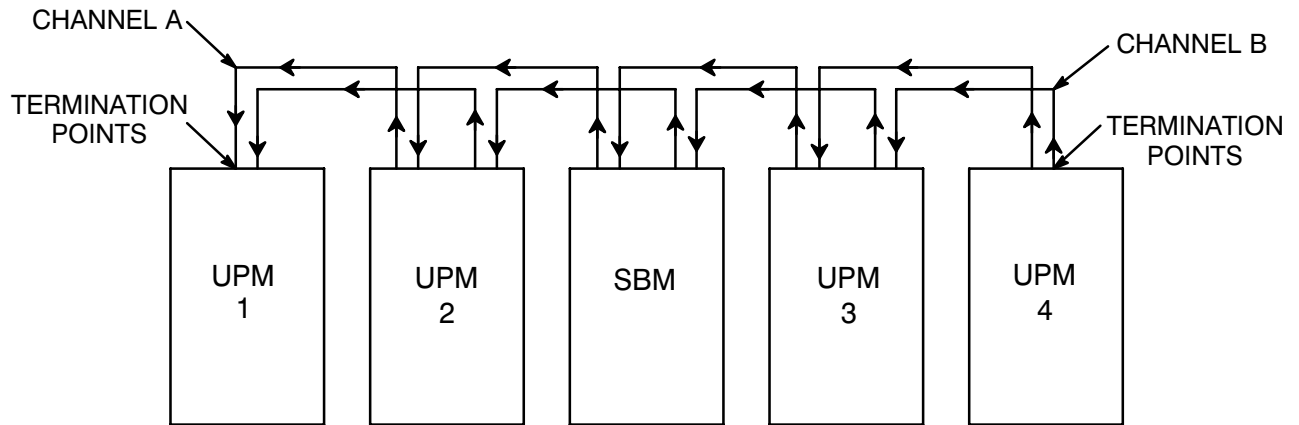


1200 and 2000 Amp SBM Customer Interface Panel Top View

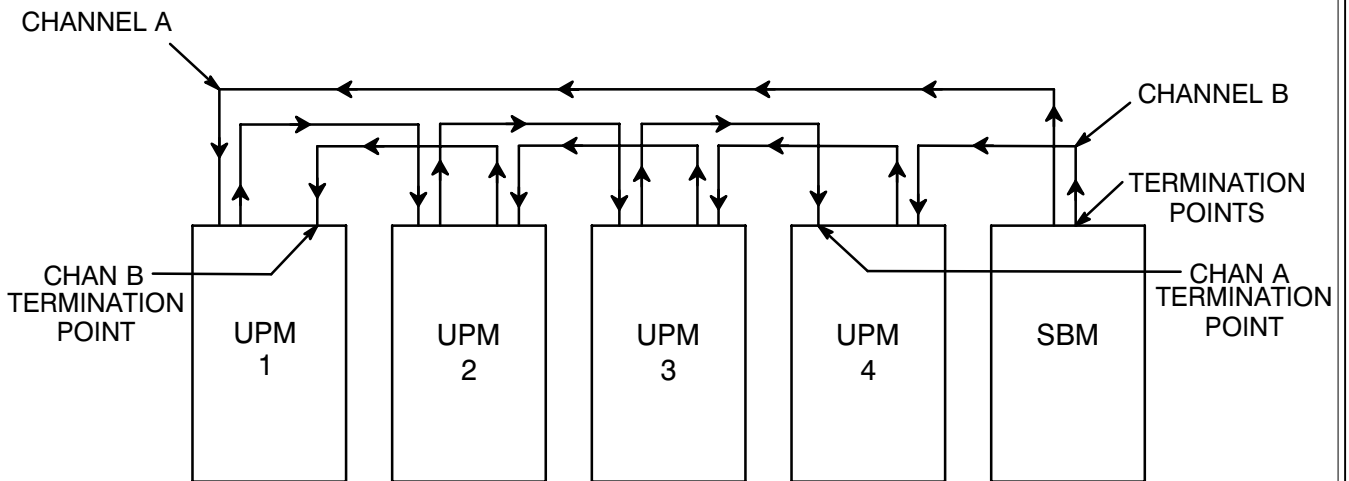
DESCRIPTION:	
SBM CUSTOMER INTERFACE PANEL	
DRAWING NO:	164201150-13
SHEET:	1 of 7



Arrangement A



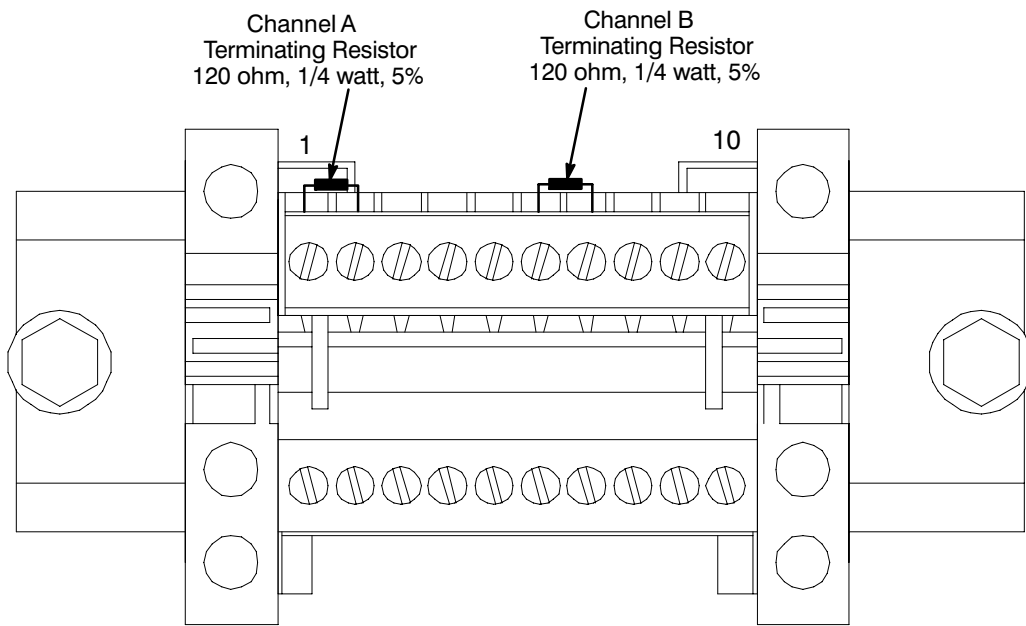
Arrangement B



Arrangement C (Robust Network Routing)

**1200 and 2000 AMP SBM
TYPICAL POWERNET NETWORK
WIRING AND TERMINATIONS**

DESCRIPTION:		SBM CUSTOMER INTERFACE PANEL
DRAWING NO:	164201150-13	SHEET: 2 of 7



**SBM and UPM PowerNet Interface Terminal Block
Terminating Resistor Location**

DESCRIPTION:	
SBM CUSTOMER INTERFACE PANEL	
DRAWING NO:	164201150-13
SHEET:	3 of 7

Table J. Control Wiring Terminations

Terminal	Description	Terminal Function
TB1	Compression Terminal Block with removable customer wiring plug	Channel A PowerNet
		Channel B PowerNet
		EPO to UPS Module
TB2	Compression Terminal Block with removable customer wiring plug	Remote EPO
		Building Alarms 1 through 3
TB3	Compression Terminal Block with removable customer wiring plug	Building Alarms 4 through 6
TB4	Compression Terminal Block with removable customer wiring plug	On UPS Monitoring
		On Bypass Monitoring
		Summary Alarm & Notice Contact
TB6	Compression Terminal Block	Optional Powerware 9315 Sync Control Connections
TB7	Compression Terminal Block with removable customer wiring plug	Optional CAN Power Supply Panel (A13) Terminal Block for Powerware 9315 (500 kVA–750 kVA) Models only

DESCRIPTION:

SBM CUSTOMER INTERFACE PANEL

DRAWING NO:

164201150–13

SHEET:

4 of 7

Table K. Customer Interface Panel Inputs and Outputs

Terminal Block	TB Pin #	Name	Description
TB1	1	CHANNEL A POWERNET – HIGH	Channel A connection of PowerNet from UPS Modules. Used to control and monitor UPS modules.
	2	CHANNEL A POWERNET – LOW	
	3	CHANNEL A POWERNET – GND	
	4	NOT USED	
	5	NOT USED	
	6	CHANNEL B POWERNET – HIGH	Channel B connection of PowerNet from UPS Modules. Used to control and monitor UPS modules.
	7	CHANNEL B POWERNET – LOW	
	8	CHANNEL B POWERNET – GND	
	9	EPO TO UPS MODULE – RTN	Emergency Power Off control connections for UPS modules
	10	EPO TO UPS MODULE	
TB2	1	REMOTE EPO	Contacts used to activate remote EPO of SBM and UPS.
	2	REMOTE EPO RTN	
	3	NOT USED	
	4	NOT USED	
	5	BLDG ALARM 1	Programmable UPS alarm. Activated by a remote contact closure.
	6	BLDG ALARM 1 RTN	Programmable UPS alarm. Activated by a remote contact closure.
	7	BLDG ALARM 2	Programmable UPS alarm. Activated by a remote contact closure.
	8	BLDG ALARM 2 RTN	Programmable UPS alarm. Activated by a remote contact closure.
	9	BLDG ALARM 3	Programmable UPS alarm. Activated by a remote contact closure.
	10	BLDG ALARM 3 RTN	
TB3	1	BLDG ALARM 4	Programmable UPS alarm. Activated by a remote contact closure. Default is Go To Bypass.
	2	BLDG ALARM 4 RTN	
	3	BLDG ALARM 5	Programmable UPS alarm. Activated by a remote contact closure. Default is Go To UPS.
	4	BLDG ALARM 5 RTN	
	5	BLDG ALARM 6	Programmable UPS alarm. Activated by a remote contact closure. Default is On Generator.
	6	BLDG ALARM 6 RTN	
	7	NOT USED	
	8	NOT USED	
	9	NOT USED	
	10	NOT USED	

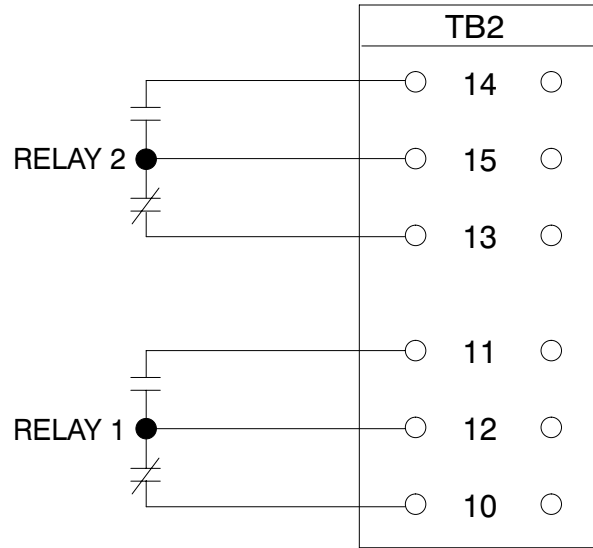
DESCRIPTION:		SBM CUSTOMER INTERFACE PANEL
DRAWING NO:	164201150–13	SHEET: 5 of 7

Table K. Customer Interface Panel Inputs and Outputs (Cont'd)

Terminal Block	TB Pin #	Name	Description
TB4	1	ON UPS	Contacts used to indicate On UPS status of Parallel Capacity/Redundant System
	2	ON UPS RTN	
	3	ON BYPASS	Contacts used to indicate On Bypass status of Parallel Capacity/Redundant System
	4	ON BYPASS RTN	
	5	RELAY # 1 NC	General purpose NO and NC relay contacts.
	6	RELAY # 1 NO	
	7	RELAY # 1 RTN	
	8	RELAY # 2 NC	General purpose NO and NC relay contacts.
	9	RELAY # 2 NO	
	10	RELAY # 2 RTN	
TB6	1	Bypass Ø A	Optional Powerware 9315 Sync Control Control Connections
	2	Bypass Ø B	
	3	Bypass Ø C	
	4	Sync Reference Ø A	
	5	Sync Reference Ø B	
	6	Sync Reference Ø C	
	7	Output Ø A	
	8	Output Ø B	
	9	Output Ø C	
TB7	1	+12VDC	Optional CAN Power Supply Panel (A13) Terminal Block for Powerware 9315 (500 kVA–750 kVA) Models only
	2	+12VDC RTN	
	3	+12VDC	
	4	+12VDC RTN	
	5	+12VDC	
	6	+12VDC RTN	
	7	+12VDC	
	8	+12VDC RTN	
	9	+12VDC	
	10	+12VDC RTN	

DESCRIPTION:	SBM CUSTOMER INTERFACE PANEL	
DRAWING NO:	164201150-13	SHEET: 6 of 7

Table L. Summary Alarm Relay Contacts



CONTACT RATING:

Maximum Switched Voltage	32 VAC	42 VDC
Maximum Carrying Current	1A	

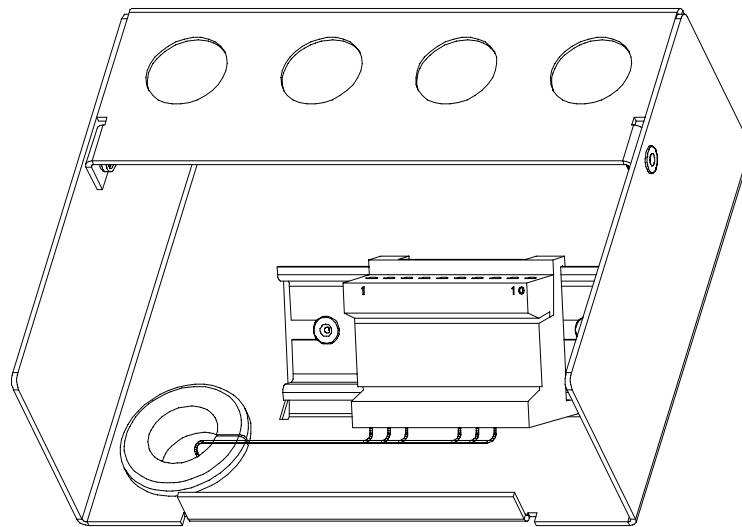
DESCRIPTION:

SBM CUSTOMER INTERFACE PANEL

DRAWING NO: 164201150-13

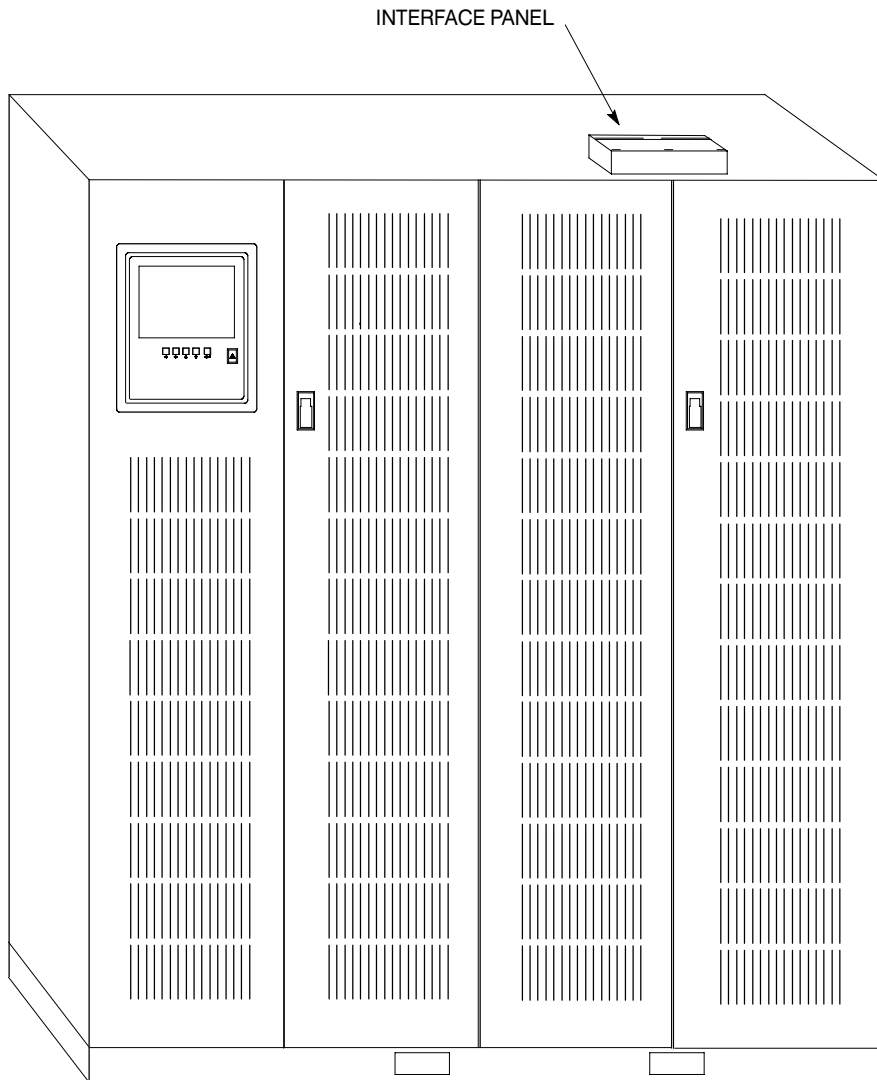
SHEET: 7 of 7

1. Two redundant PowerNet control networks connect the UPMs to each other and the UPMs to the SBM. Each network requires only one shielded twisted pair of wires.
2. Refer to sheets 2 and 3 for location of the UPM Powernet Interface Panel.
3. Use Class 1 wiring methods (as defined by the NEC) for control wiring. Install the control wiring in separate conduits from the power wiring. Install the twisted pair of each redundant PowerNet network in separate conduits. The wire should be rated at 24 volts, 1 amp minimum. The recommended wire for the PowerNet network is shielded 22 gauge twisted pair Belden 8761 or equivalent.
4. Control wiring run may not exceed 100 meters.
5. Connect control wiring and terminating resistor (if applicable) to the removable portion of the terminal block.
6. Terminate each redundant PowerNet network at the end modules in the system. Use a 120 ohm, 1/4 watt, 5% resistor (Powerware Part Number 141202041). Refer to drawing 164201150–13, sheet 2 for typical termination points.
7. Install terminating resistors onto appropriate UPM PowerNet Interface Panel terminal block. Refer to drawing 164201150–13, sheet 3 for terminal location. Connect each resistor across terminals 1 and 2 and 6 and 7.
8. Refer to Tables M and N, and to applicable chapters for information about installing control wiring.



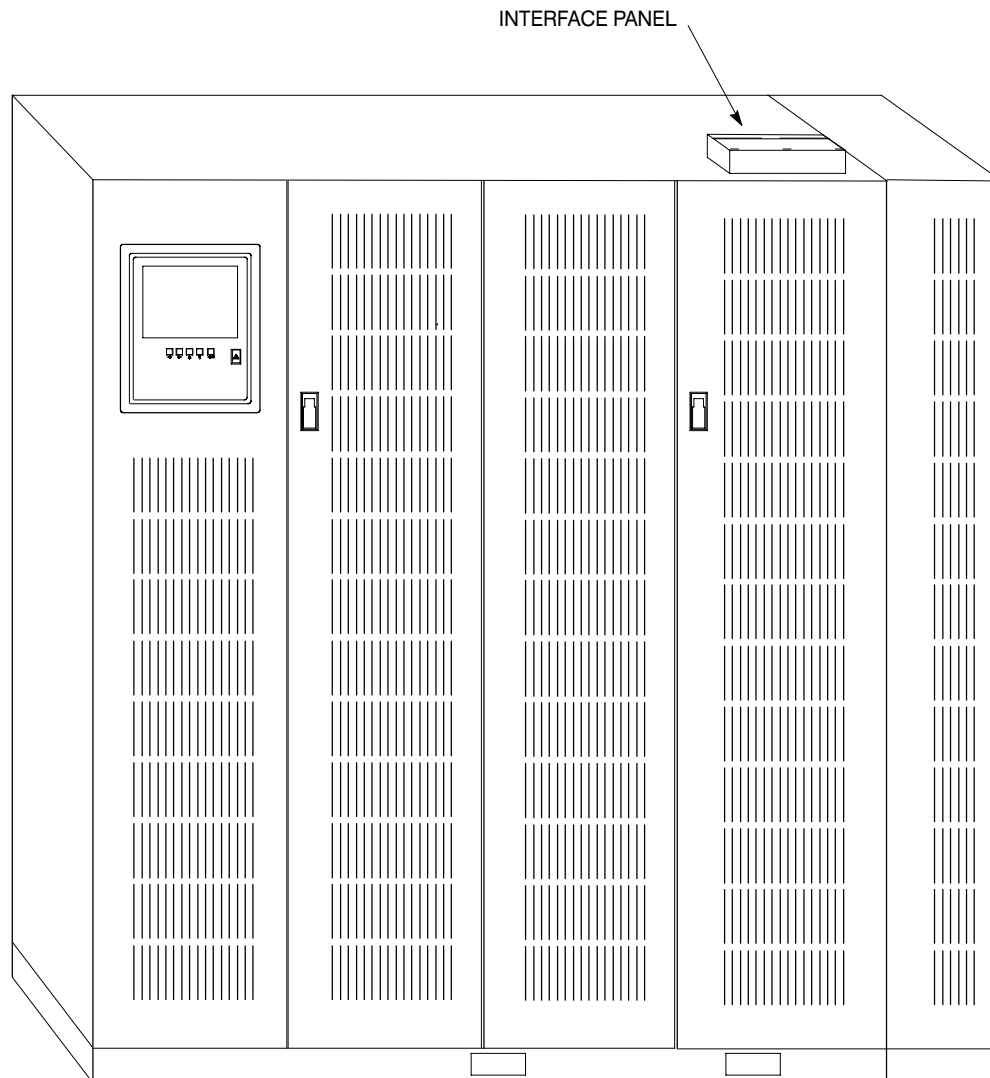
UPM Powernet Interface Panel

DESCRIPTION: UPM POWERNET INTERFACE PANEL	
POWERWARE 9315–200 TO –500 UPMs	
DRAWING NO: 164201150–14	SHEET: 1 of 4



Powerware 9315 (200 kVA–300 kVA) PowerNet Interface Panel Location

DESCRIPTION: SBM CUSTOMER INTERFACE PANEL	
POWERWARE 9315–200 TO –500 UPMs	
DRAWING NO:	164201150–14
SHEET:	2 of 4



Powerware 9315 (400 kVA–500 kVA) PowerNet Interface Panel Location

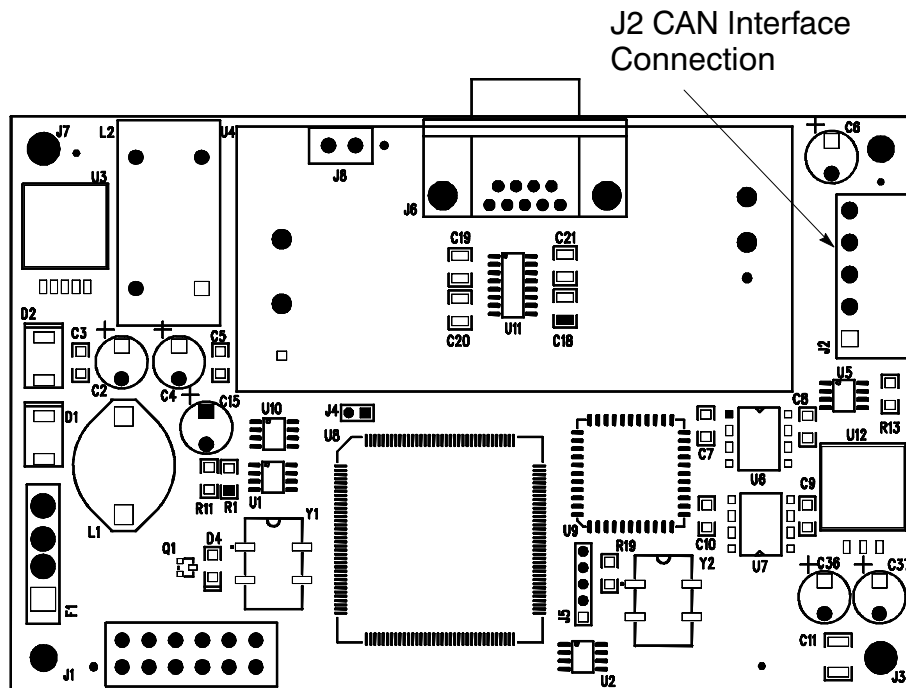
DESCRIPTION: SBM CUSTOMER INTERFACE PANEL POWERWARE 9315–200 TO –500 UPMs	
DRAWING NO: 164201150–14	SHEET: 3 of 4

Table M. Control Wiring Terminations		
Terminal	Description	Terminal Function
PowerNet Terminal Block	Compression Terminal Block with removable customer wiring plug	Channel A PowerNet
		Channel B PowerNet
		EPO to UPM (Optional)

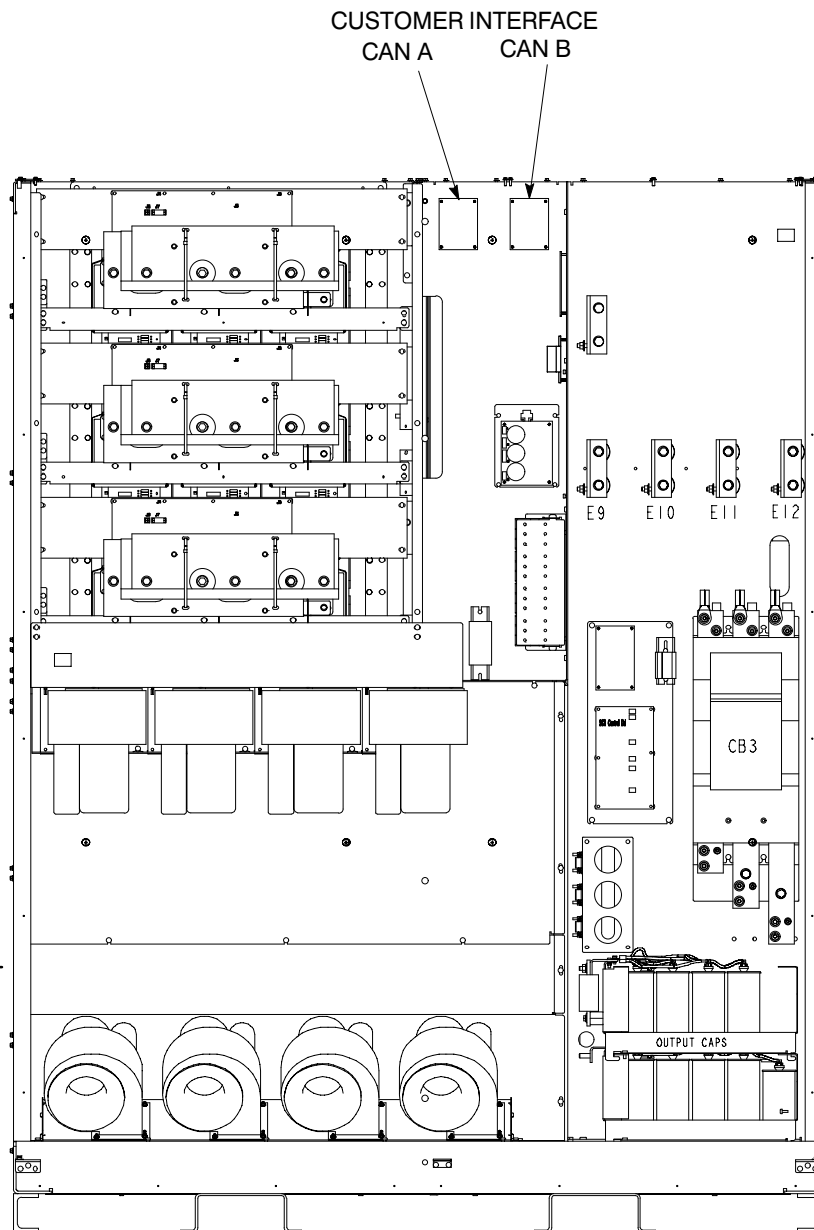
Table N. UPM PowerNet Interface Panel Inputs and Outputs			
Terminal Block	TB Pin #	Name	Description
PowerNet	1	CHANNEL A POWERNET – HIGH	Channel A connection of PowerNet from SBM. Used to control and monitor UPMs.
	2	CHANNEL A POWERNET – LOW	
	3	CHANNEL A POWERNET – GND	
	4	NOT USED	
	5	NOT USED	
	6	CHANNEL B POWERNET – HIGH	Channel B connection of PowerNet from SBM. Used to control and monitor UPMs.
	7	CHANNEL B POWERNET – LOW	
	8	CHANNEL B POWERNET – GND	
	9	EPO TO UPS MODULE – RTN	Emergency Power Off control connections for UPMs. (Optional)
	10	EPO TO UPS MODULE	

DESCRIPTION: UPM POWERNET INTERFACE PANEL POWERWARE 9315–200 TO –500 UPMs	
DRAWING NO: 164201150–14	SHEET: 4 of 4

1. Two redundant PowerNet control networks connect the UPMs to each other and the UPMs to the SBM. Each network requires only one shielded twisted pair of wires and one twisted pair of wires for the redundant power supplies. The control wiring is connected at J2 of the CAN interface. See drawing below.
2. Refer to sheets 2 and 3 for location of the CAN A and CAN B Logic Boards.
3. Use Class 1 wiring methods (as defined by the NEC) for control wiring. Install the control wiring in separate conduits from the power wiring. Install the twisted pair of each redundant PowerNet network in separate conduits. The wire should be rated at 24 volts, 1 amp minimum. The recommended wire for the PowerNet network is shielded 20 gauge twisted pair Belden 8762 or equivalent. The recommended wire for the power supplies is 14 gauge twisted pair
4. Control wiring run may not exceed 100 meters.
5. Connect control wiring to the removable portion of the terminal block.
6. Terminate each redundant PowerNet network at the end modules in the system. Refer to drawing 164201150–13, sheet 2 for typical termination points.
7. Refer to applicable chapters for information about installing control wiring.



DESCRIPTION:	UPM CAN INTERFACE: POWERWARE 9315–625/750 UPMs	
DRAWING NO:	164201150–15	SHEET: 1 of 3



Powerware 9315 750 CAN A and CAN B Interface Location

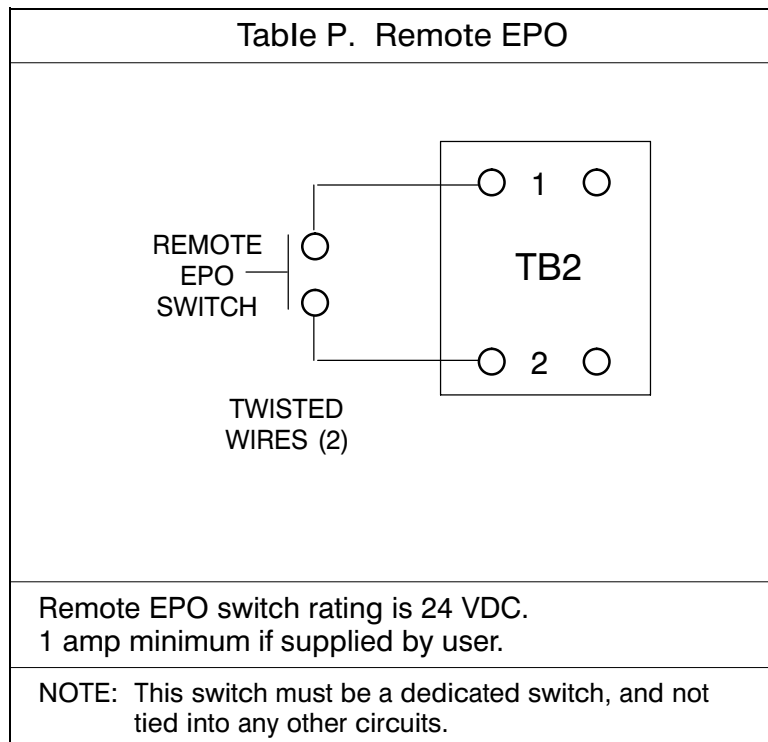
DESCRIPTION:	UPM CAN INTERFACE: POWERWARE 9315-625/750 UPMs	
DRAWING NO:	164201150-15	SHEET: 2 of 3

Table O. UPM CAN A & CAN B Interface Inputs and Outputs

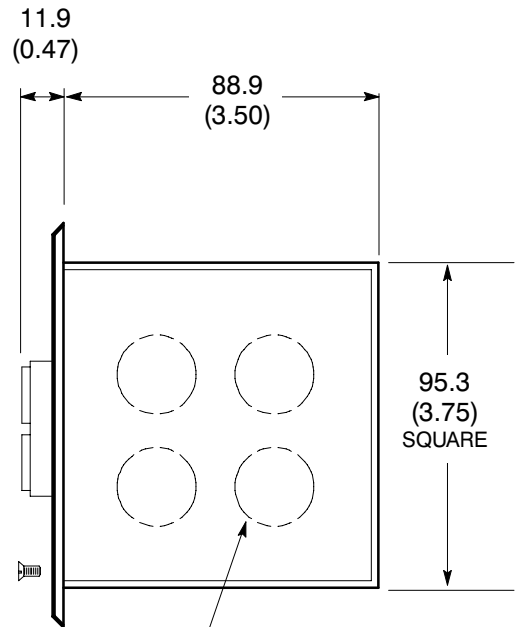
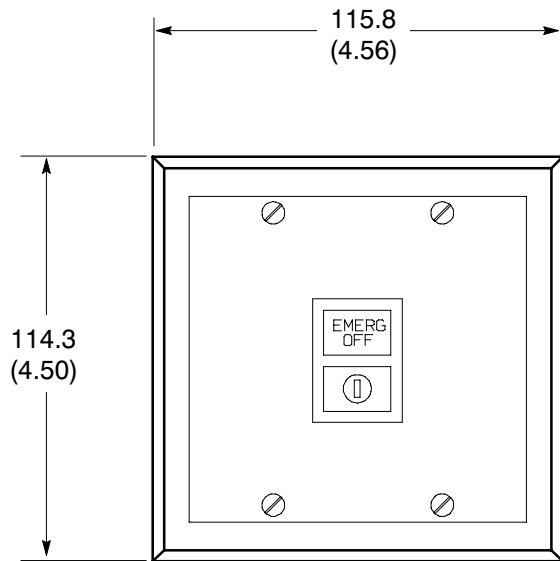
From SBM	To UPM	Name	Description
A1TB1-1	CAN A J2-3	CHANNEL A POWERNET – HIGH	Channel A connection of PowerNet from SBM. Used to control and monitor UPMs.
A1TB1-2	CAN A J2-4	CHANNEL A POWERNET – LOW	
A1TB1-3	CAN A J2-5	CHANNEL A POWERNET – GND	
A1TB7-1	CAN A J2-1	CONTROL POWER – 12VDC	Control power connection for Channel A CAN Logic Board from SBM.
A1TB7-2	CAN A J2-2	CONTROL POWER – GND	
A1TB1-6	CAN B J2-3	CHANNEL B POWERNET – HIGH	Channel B connection of PowerNet from SBM. Used to control and monitor UPMs.
A1TB1-7	CAN B J2-4	CHANNEL B POWERNET – LOW	
A1TB1-8	CAN B J2-5	CHANNEL B POWERNET – GND	
A1TB7-3	CAN B J2-1	CONTROL POWER – 12VDC	Control power connection for Channel B CAN Logic Board from SBM.
A1TB7-4	CAN B J2-2	CONTROL POWER – GND	

DESCRIPTION:	UPM CAN INTERFACE: POWERWARE 9315-625/750 UPMs	
DRAWING NO:	164201150-15	SHEET: 3 of 3

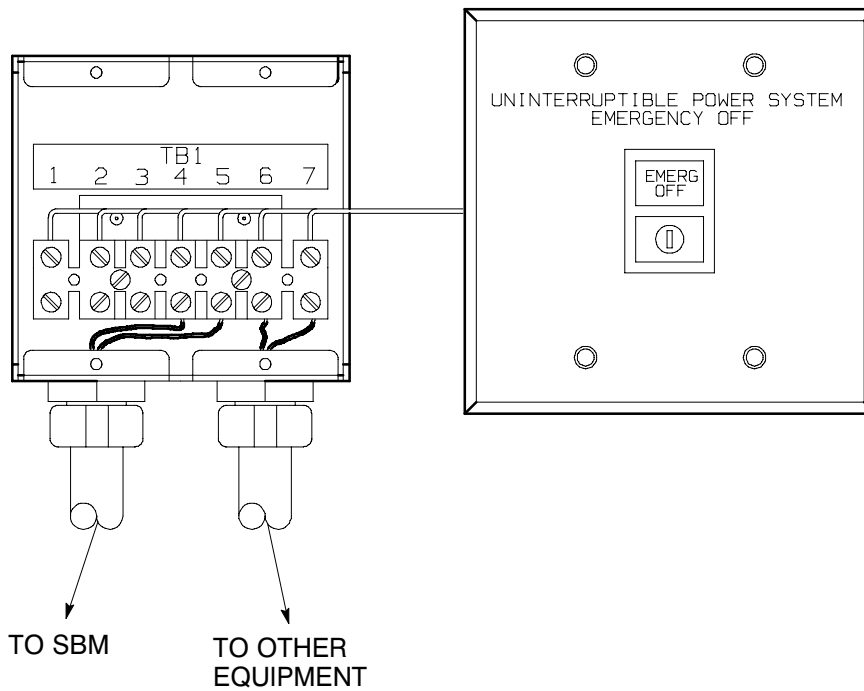
1. The Remote EPO feature shuts down the UPS modules, opens all breakers in the System Bypass Module and isolates power from your critical load. Local electrical codes may also require tripping upstream protective devices to the UPS modules.
2. To open all UPM breakers, a separate twisted pair of wires and an EPO Kit (sold separately) must be installed to the modules from the SBM.
3. 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.
4. Refer to Table P of this drawing and to applicable chapters for information about installing control remote EPO.
5. Refer to drawings 164201150–5 and 164201150–9 for location of the Customer Interface panel and drawing 164201150–14 for terminal block location on the Customer Interface Panel.



DESCRIPTION:	REMOTE EMERGENCY POWER OFF	
DRAWING NO:	164201150–16	SHEET: 1 of 2

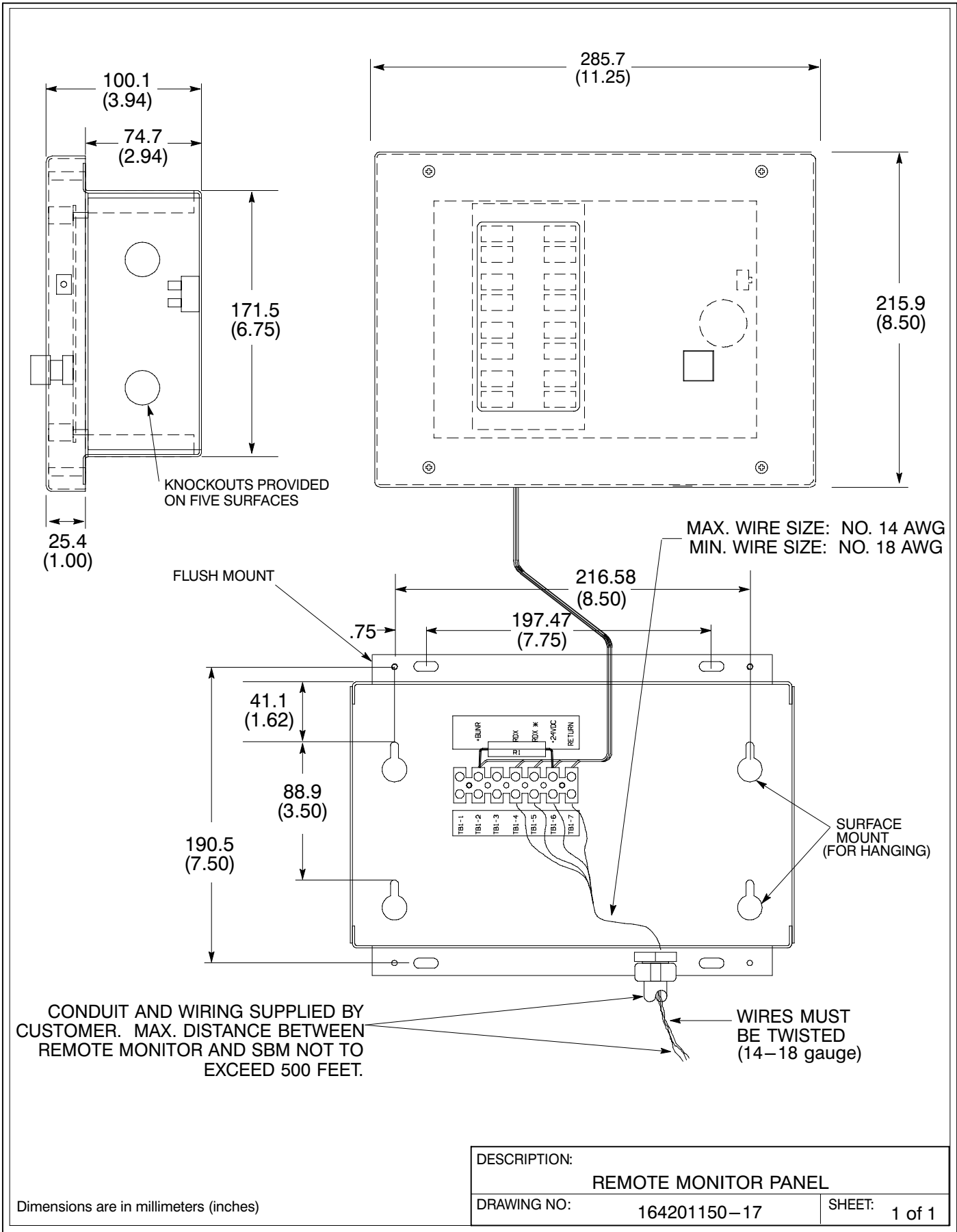


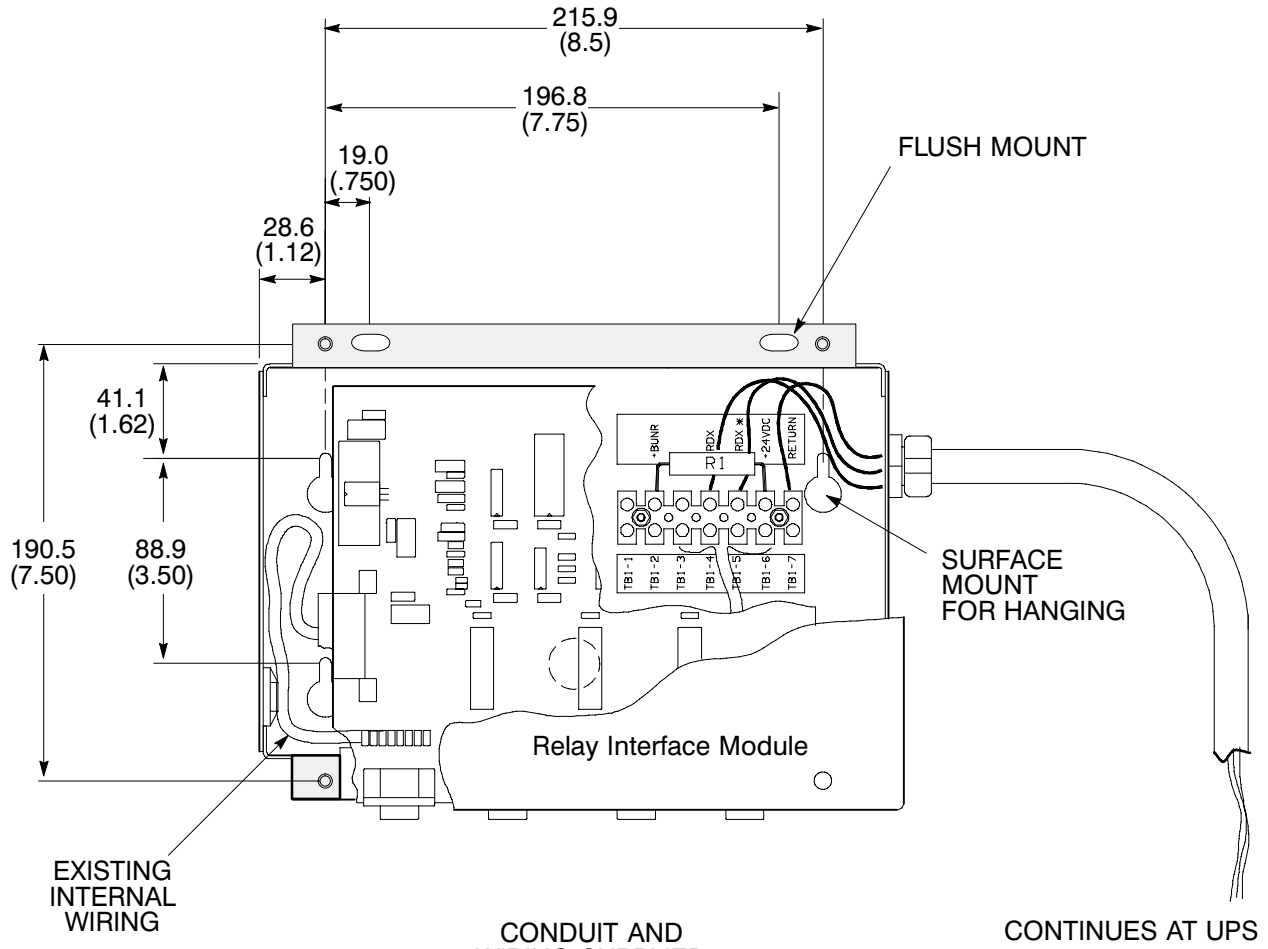
Knockout pattern
typ. 5 sides



Dimensions are in millimeters (inches)

DESCRIPTION:	
REMOTE EMERGENCY POWER OFF	
DRAWING NO:	164201150-16
SHEET:	2 of 2

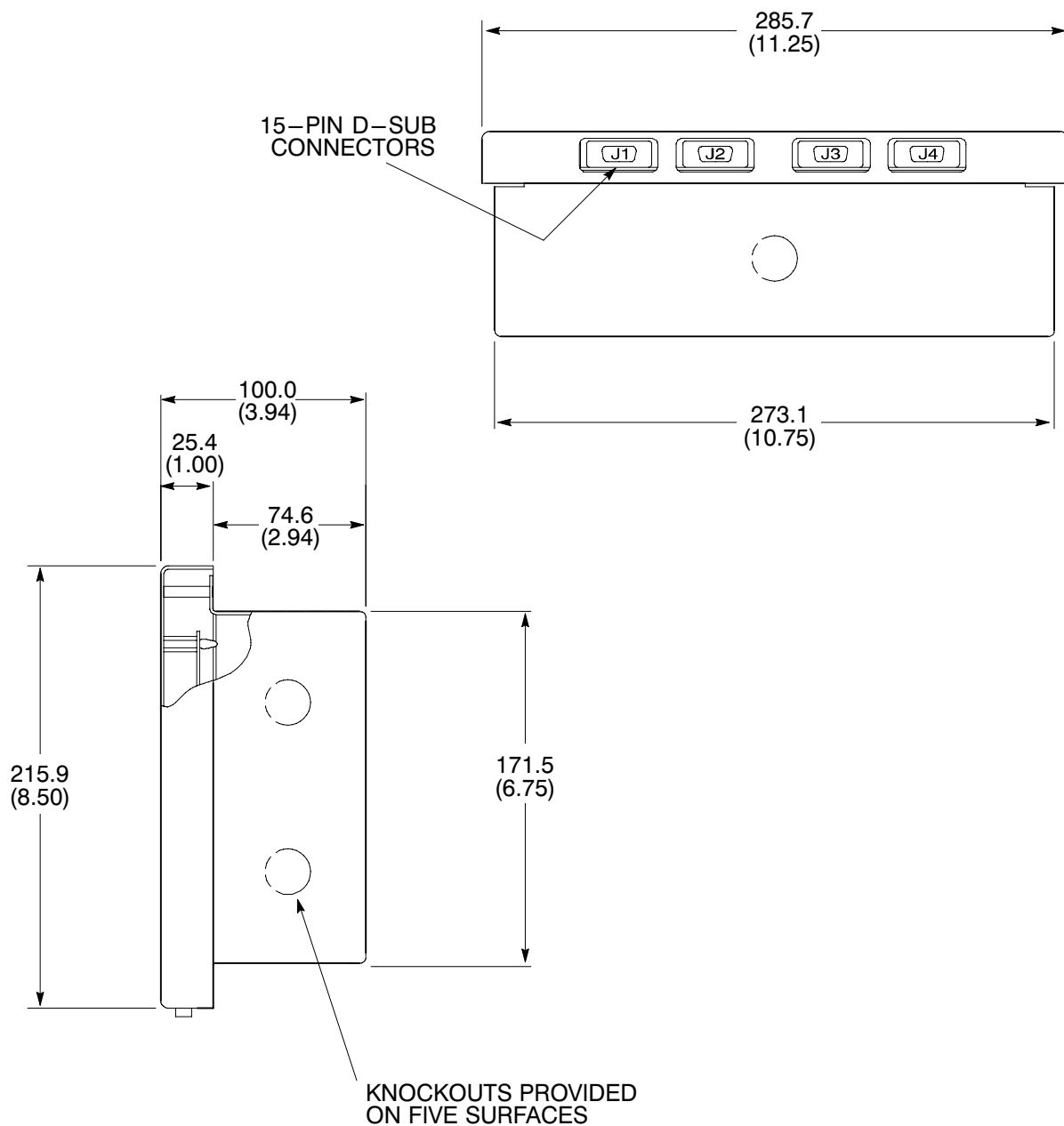




CONDUIT AND WIRING SUPPLIED BY CUSTOMER.
 Maximum distance between RIM and SBM not to exceed 500 feet. Wires must be twisted.
 MAX WIRE SIZE NO. 14 AWG.
 MIN WIRE SIZE NO. 18 AWG.

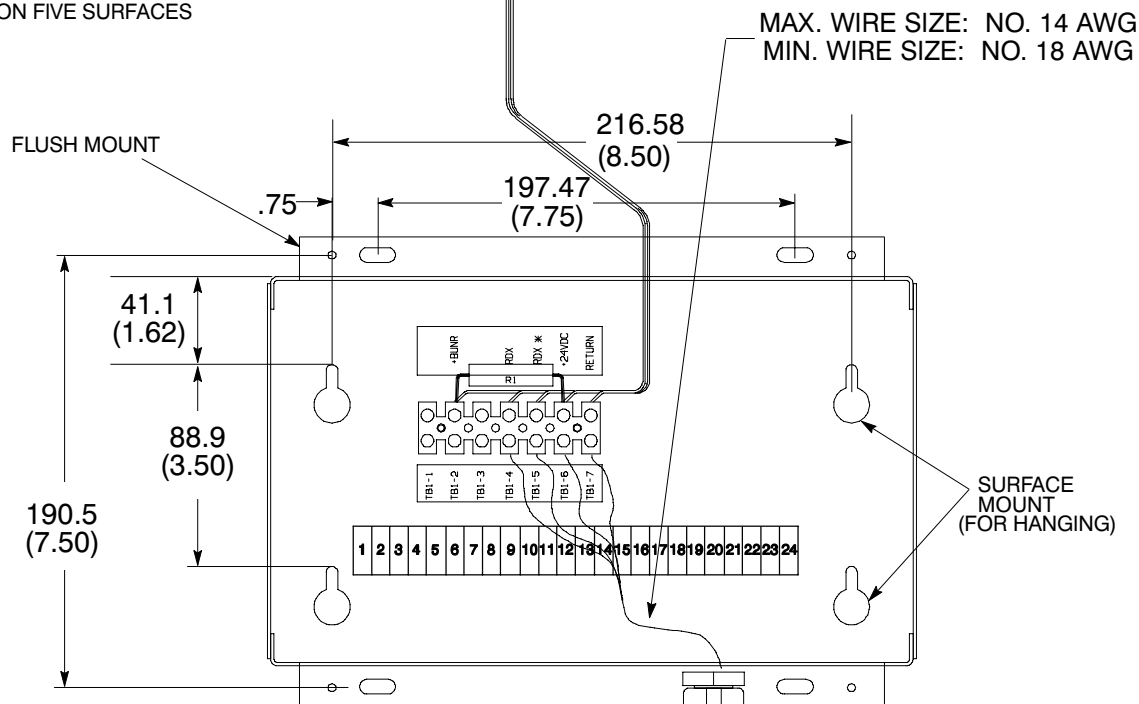
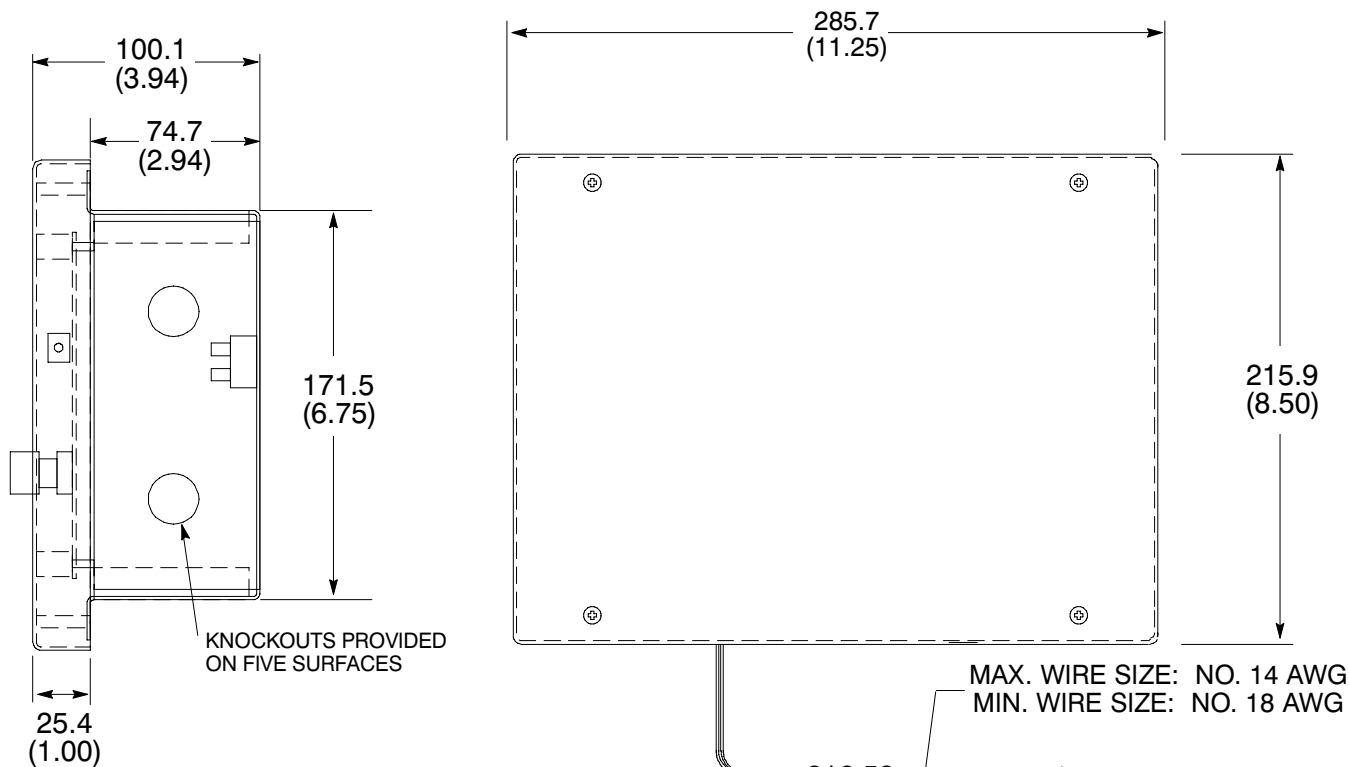
DESCRIPTION:	
RELAY INTERFACE MODULE	
DRAWING NO:	164201150-18
SHEET:	1 of 2

Dimensions are in millimeters (inches)



Dimensions are in millimeters (inches)

DESCRIPTION:	
RELAY INTERFACE MODULE	
DRAWING NO:	164201150-18
SHEET:	2 of 2



CONDUIT AND WIRING SUPPLIED BY CUSTOMER. MAX. DISTANCE BETWEEN REMOTE MONITOR AND SBM NOT TO EXCEED 500 FEET.

WIRES MUST BE TWISTED

DESCRIPTION:	
SUPERVISORY CONTACT MODULE	
DRAWING NO:	164201150-19
SHEET:	1 of 1

Dimensions are in millimeters (inches)

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LIMITED FACTORY WARRANTY FOR THREE-PHASE POWERWARE® UPS PRODUCTS

WARRANTOR: The warrantor for the limited warranties set forth herein is Eaton Electrical Inc., a Delaware Corporation ("Eaton").

LIMITED WARRANTY: This limited warranty (this "Warranty") applies only to the original end-user (the "End-User") of the Powerware Three-Phase UPS Products (the "Product") and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by Eaton for resale to an End-User.

LIMITED WARRANTY PERIOD: The period covered by this Warranty for Product installed [and currently located] in the fifty (50) United States and the District of Columbia is twelve (12) months from the date of Product start-up or eighteen (18) months from the date of Product shipment, whichever occurs first, for parts coverage and 90 days from the date of Product start-up for labor coverage. The period covered by this Warranty for Product installed [and currently located] outside of the fifty (50) United States and the District of Columbia is twelve (12) months from the date of Product start-up or eighteen (18) months from the date of Product shipment, whichever occurs first, for parts coverage.

WHAT THIS LIMITED WARRANTY COVERS: The warrantor warrants that the Powerware three-phase UPS electronics, Eaton-built accessories, and Powerware-built battery cabinets (individually and collectively, the "Warranted Items") are free from defects in material and workmanship. If, in the opinion of Eaton, a Warranted Item is defective and the defect is within the terms of this Warranty, Eaton's sole obligation will be to repair or replace such defective item (including by providing service, parts, and labor, as applicable), at the option of Eaton. The Warranted Item will be repaired or replaced onsite at the End-User's location or such other location as determined by Eaton. Any parts that are replaced may be new or reconditioned. All parts replaced by Eaton shall become the property of Eaton.

WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the "trickle charge" of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, fire, flood, lightning, vandalism, acts of God, Customer's neglect, abuse, misuse, misapplication, incorrect installation; (d) repair or alteration not authorized in writing by Eaton personnel or performed by an authorized Eaton Customer Service Engineer or Agent; or (e) improper testing, operation, maintenance, adjustment, or any modification of any kind not authorized in writing by Eaton personnel or performed by an authorized Eaton Customer Service Engineer or Agent.

This Warranty is not valid: (a) unless an authorized Eaton Customer Service Engineer (in the USA) or Agent (outside of the USA) performs startup and commissioning of the Product; (b) if the Product is moved to a new location by someone other than an authorized Eaton Customer Service Engineer (in the USA) or Agent (outside of the USA); or (c) if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof. Labor warranty is not provided for Product located outside of the fifty (50) United States or the District of Columbia. **Any equipment, parts, or materials included in the Product and not manufactured by Eaton are warranted solely by the manufacturer of such equipment, parts, or materials and are not included as part of this Warranty. Batteries are not warranted by Eaton.**

THIS WARRANTY IS THE END-USER'S SOLE REMEDY AND IS EXPRESSLY IN LIEU OF, AND THERE ARE NO OTHER EXPRESSED OR IMPLIED GUARANTEES OR WARRANTIES (INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE, WHICH ARE EXPRESSLY DISCLAIMED).

LIMITATION OF LIABILITY: In no event shall Eaton 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. Eaton shall not be responsible for failure to provide service or parts due to causes beyond Eaton's reasonable control. In no case will Eaton's liability under this Warranty exceed the replacement value of the Warranted Items.

END-USER'S OBLIGATIONS: In order to receive the benefits of this Warranty, the End-User must use the Product in a normal way, follow the Product's installation, operation and maintenance manual, and protect against further damage to the Product if there is a covered defect.

OTHER LIMITATIONS: Eaton's obligations under this Warranty are expressly conditioned upon receipt by Eaton of all payments due to it (including interest charges, if any). During such time as Eaton has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Eaton shall have no obligation under this Warranty. Also during such time, the period of this Warranty shall continue to run and the expiration of this Warranty shall not be extended upon payment of any overdue or unpaid amounts.

COSTS NOT RELATED TO WARRANTY: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Warranty, including without limitation site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Eaton representatives outside the terms of this Warranty will be borne by the End-User.

OBTAINING WARRANTY SERVICE: In the USA, call the Eaton Customer Reliability Center 7x24 at 800-843-9433. Outside of the USA, call your local Eaton sales or service representative, or call the Eaton Customer Reliability Center in the USA at 919-870-3028. For comments or questions about this Limited Factory Warranty, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.

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