



Powerware

**Powerware® 9315 UPS
500–750 kVA
Installation and Operation Manual**

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

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

CONSIGNES DE SÉCURITÉ IMPORTANTES CONSERVER CES INSTRUCTIONS

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

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Special Symbols

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



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



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



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



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



ON – Indicates that the switch is in the ON position.



OFF – Indicates that the switch is in the OFF position.



PHASE – The word "phase."

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Chapter 1

Introduction

The Eaton® Powerware® 9315 (500–750 kVA) uninterruptible power supply (UPS) is an online power protection system that prevents loss of valuable electronic information, minimizes equipment downtime, and minimizes the adverse effect on equipment production because of unexpected power problems.

The Powerware 9315 UPS system continually monitors incoming electrical power and removes the surges, spikes, sags, and other irregularities that are inherent in commercial utility power. Working with your building's electrical system, the UPS system supplies clean, consistent power that your sensitive electronic equipment requires for reliable operation. During brownouts, blackouts, and other power interruptions, optional battery strings provide emergency power to safeguard operation.

The UPS system is housed in a free-standing cabinet, divided into three sections to facilitate shipping. The cabinet sections line up and match in style and color, and have safety shields behind the doors for hazardous voltage protection. Figure 1-1 shows a typical Powerware 9315 (500–750 kVA) UPS system.

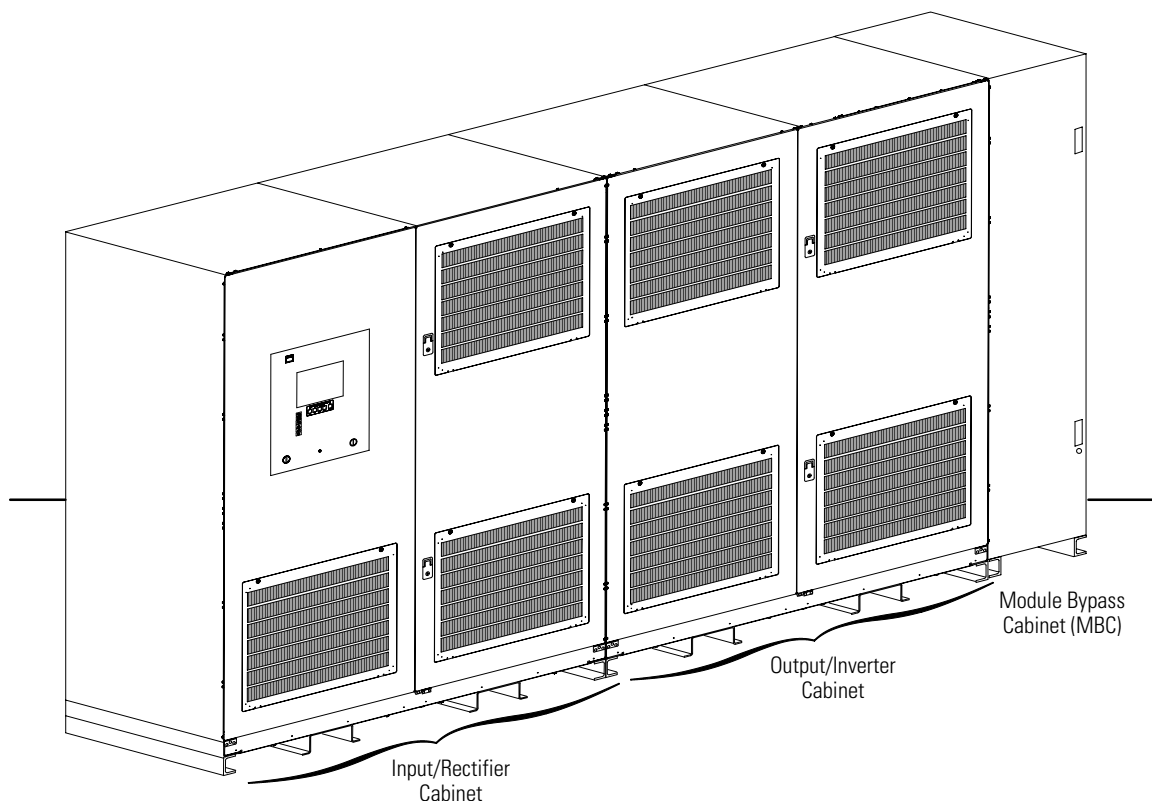


Figure 1-1. Typical Powerware 9315 (500–750 kVA) UPS System

1.1 UPS Features

The UPS has many standard features that provide cost-effective and consistently reliable power protection. The descriptions in this section provide a brief overview of the UPS standard features.

1.1.1 Installation Features

Power wiring can be routed through the top of each cabinet. External sensing and monitoring control wire must be installed according to UL Class I requirements. Class I wiring can be routed through the top of each cabinet.

1.1.2 Customer Interface

The UPS has the following communication features:

- **Building Alarm Monitoring** – The facility's alarm system contacts can be connected to four inputs in the UPS. The UPS uses these inputs to monitor the building alarms in addition to the UPS status. See Chapter 10, "Using Features and Options," for additional information.
- **Summary Alarm Contacts** – Summary alarm contacts are provided for connection to equipment at the facility, such as a light, an audible alarm, or a computer terminal. The equipment connected to this contact alerts you to a UPS alarm. See Chapter 10, "Using Features and Options," for additional information.
- **Computer Interface** – Two serial communication ports are standard on all units, and are electrically isolated from the UPS. You can use these ports to link the UPS to the features described in Chapter 12, "Communication."
- **X-Slot® Communication Bay** – One communication bay is available on the UPS to install an optional X-Slot card. See Chapter 12, "Communication," for additional information.

1.1.3 Customer Convenience Outlet

An uninterruptible 120 Vac, 0.2A, fuse-protected convenience outlet is provided to supply power to the optional modem. It is located on the customer interface panel.

1.1.4 ABM® Technology

A three-stage charging system increases battery service life by optimizing recharge time, and protects batteries from damage due to high current charging and inverter ripple currents. Charging at high currents can overheat and damage batteries.

1.1.5 Automatic Battery Charge Current Limit

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

1.2 Options and Accessories

Contact your Eaton sales representative for information about the following options:

1.2.1 5% Input Filter

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

1.2.2 Battery Racks

You can enhance the protection time provided by the UPS system by adding one or more battery racks. The battery racks should be equipped with sealed, maintenance-free, lead-acid batteries. An external battery disconnect switch must be used. See Chapter 4, "Installing a Remote Battery Disconnect," for additional information.

1.2.3 External Fused Battery Disconnect

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

The breaker switch on the remote battery disconnect is set according to the operation procedures in Chapter 9, "UPS Operating Instructions." When service personnel are performing maintenance on the UPS or battery string, the switch should be set to the OFF position. See Chapter 4, "Installing a Remote Battery Disconnect," for battery disconnect requirements and installation instructions.

1.2.4 Upgrade Capability

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

1.2.5 Parallel Capacity/Redundant System

With Powerware Hot Sync technology and a System Bypass Module (SBM), the Parallel Capacity/Redundant System allows two to eight uninterruptible power modules (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 4000A, 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.

1.2.6 Monitoring and Communication

The following monitoring and communication options are available:

- **Remote Monitor Panel (RMP)** – An optional RMP contains backlit status indicators and a local horn, allowing you to monitor the UPS operational status and alarm condition from virtually any location within your facility. This option is described further in Chapter 10, “Using Features and Options.”
- **Relay Interface Module (RIM)** – An optional RIM uses relay contact closures to indicate the UPS operating status and alarm condition. The module uses a serial interface line and may support up to eight critical loads. This option is described further in Chapter 10, “Using Features and Options.”
- **Supervisory Contact Module (SCM)** – An optional 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. This option is described further in Chapter 10, “Using Features and Options.”
- **X-Slot Cards** – Optional X-Slot cards support several protocols, such as SNMP, AS/400®, and Modbus®. See Chapter 12, “Communication,” for additional information.
- **eNotify Remote Monitoring and Diagnostic Service** – An optional service that provides 7x24 remote monitoring of 43 alarms, temperature/humidity and battery charge information, daily heartbeat check, and monthly report. The eNotify Service also provides customer notification of significant alarms, remote diagnostics, and dispatch of technicians. A ConnectUPS™ X Web/SNMP Card is required in the X-Slot communication bay. An optional Powerware Environmental Monitoring Probe (EMP) is required for temperature/humidity monitoring. See Chapter 12, “Communication,” for additional information.
- **Modem** – An optional modem is available for use with the Remote Notification feature described in Chapter 12, “Communication.” Refer to the modem manufacturer’s manual for modem operating instructions.

1.3 Basic System Configurations

The following basic UPS system configurations are possible:

- Single module UPS and one battery string
- Multi-module (parallel for capacity/redundancy) UPS system consisting of two or more UPS modules, with one battery string for each module, and a Powerware Hot Sync Capacity module
- Multi-module (parallel for capacity/redundancy) UPS system consisting of two or more UPS modules, with one common battery string, and a Powerware Hot Sync® Capacity module

You can enhance the UPS system configuration by adding optional accessories, such as an RMP, RIM, SCM, or remote emergency power-off (REPO) control.

1.4 Safety Warnings

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

- This manual contains important instructions that should be followed during installation and maintenance of the UPS and batteries. Please read all instructions before operating the equipment and save this manual for future reference.
- The UPS cabinet is designed for industrial or computer room applications and contains safety shields behind the front doors. However, the UPS system is a sophisticated power system and should be handled with appropriate care.

DANGER



This UPS contains **LETHAL VOLTAGES**. All maintenance and service should be performed by **AUTHORIZED SERVICE PERSONNEL ONLY**.

WARNING



- Installation and maintenance should be performed only by qualified personnel.
- The UPS system contains its own energy source (batteries). The output terminals may carry live voltage even when the UPS is disconnected from an AC source.
- To reduce the risk of fire or electric shock, install this UPS in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% maximum). The system is not intended for outdoor use.
- Ensure all power is disconnected before performing installation or service.
- **ELECTRIC ENERGY HAZARD**. Do not attempt to alter any battery wiring or connectors. Attempting to alter wiring can cause injury.

CAUTION



- Batteries can present a risk of electrical shock or burn from high short-circuit current. Observe proper precautions. Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.
- Replace batteries with the same number and type of batteries as originally installed in the UPS.
- Proper disposal of batteries is required. Refer to local codes for disposal requirements.
- Never dispose of batteries in a fire. Batteries may explode when exposed to flame.
- Keep the cabinet doors on and secured to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the unit.
- 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. Contacting any part of a grounded battery can cause a risk of electric shock. An electric shock is less likely if you disconnect the grounding connection before you work on the batteries.
- Do not operate the UPS system close to gas or electric heat sources.
- The operating environment should be maintained within the parameters stated in this manual.
- Keep surroundings uncluttered, clean, and free from excess moisture.
- Do not use this equipment for other than intended use.
- The use of accessory equipment not recommended by the manufacturer may cause an unsafe condition.
- Observe all DANGER, WARNING, and CAUTION notices affixed to the inside and outside of the equipment.

AVERTISSEMENT!

- Les batteries peuvent présenter un risque de décharge électrique ou de brûlure par des courts-circuits de haute intensité. Prendre les précautions nécessaires.
- Pour le remplacement, utiliser le même nombre et modèle des batteries.

ATTENTION!

- Une mise au rebut réglementaire des batteries est obligatoire. Consulter les règlements en vigueur dans votre localité.
- Ne jamais jeter les batteries au feu. L'exposition aux flammes risque de les faire exploser.

1.5 Conventions Used in This Manual

This manual uses these type conventions:

- *Italic type* represents variable information that you must replace with an actual value, or a directory or file name.
- **Screen type** represents information that appears on your screen.
- **Bold type** represents a command or option that you type or enter at a prompt.

Icon	Description
------	-------------



Information notes call attention to important features or instructions.

[Keys] Brackets are used when referring to a specific key, such as [Enter] or [Ctrl].

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

1.6 For More Information

Refer to the *Powerware 9315 Parallel Capacity/Redundant UPS Installation and Operation Manual* for the following additional information:

- SBM cabinet and optional accessories installation instructions, including site preparation, planning for installation, wiring and safety information, and detailed illustrations of the cabinet and optional accessories with dimensional and connection point drawings.
- Parallel operation, including procedures for using the SBM cabinet with the UPS, responding to system events, and information about maintenance.
- Describes the SBM control panel and explains the SBM functions; discusses the SBM standard features and optional accessories; provides procedures for starting and stopping the parallel for capacity/redundancy system, and information about maintenance and responding to system events.
- SBM RS-485 and RS-232 serial communication, including connecting optional remote accessories to the SBM and enabling, disabling, and customizing building alarms.

Visit www.powerware.com or contact your Eaton service representative for information on how to obtain copies of this manual.

1.7 Getting Help

If you need help with any of the following:

- Scheduling initial startup
- Regional locations and telephone numbers
- A question about any of the information in this manual
- A question this manual does not answer

Please call the Eaton Help Desk for Powerware products at:

United States: **1-800-843-9433** or **1-919-870-3028**
Canada: **1-800-461-9166 ext 260**
All other countries: **Call your local service representative**

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Section I

Installation

Chapter 2

UPS Installation Plan and Unpacking

Use the following basic sequence of steps to install the UPS:

1. Create an installation plan for the UPS system (Chapter 2).
2. Prepare your site for the UPS system (Chapter 2).
3. Inspect, unpack, and unload the UPS cabinets (Chapters 2 and 3).
4. Wire the system (Chapter 3).
5. Install features, accessories, and/or options, as applicable (Chapters 4 through 6).
6. Complete the installation checklist (Chapter 3).
7. Have authorized service personnel perform preliminary operational checks and startup.



NOTE *Startup and operational checks must be performed by an authorized Eaton Customer Service Engineer, or the warranty terms specified on page 15-1 become void. This service is offered as part of the sales contract for the UPS. Contact your Eaton service representative in advance (usually a two-week notice is required) to reserve a preferred startup date.*

2.1 Creating an Installation Plan

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

2.1.1 Preparing Your Site

For the UPS system to operate at peak efficiency, the installation site should meet the environmental parameters outlined in this manual. If the UPS is to be operated at an altitude higher than 1500m (5000 ft), contact your Eaton service representative for important information about high altitude operation. The operating environment must meet the weight, clearance, and environmental requirements specified in paragraph A.1 starting on page A-1.

The UPS cabinets use forced air cooling to regulate internal component temperature. Air inlets are in the front of the cabinet and outlets are in the top. You must allow clearance in front of and above each cabinet for proper air circulation (see Table B on page A-1).

2.1.2 Environment Considerations

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

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

Failure to follow guidelines may void your warranty.

2.1.3 Preparing for Wiring the UPS System

For external wiring requirements, including the minimum AWG size of external wiring, see Table E through Table G starting on page A-13. The power wiring connections for this equipment are rated at 90°C. If the ambient temperature is greater than 30°C, higher temperature wire and/or larger size wire may be necessary. Control wiring for remote emergency power-off (REPO) and optional accessories (such as building alarms and monitoring interface) should be connected at the customer interface terminal blocks located inside the UPS using UL Class 1 wiring methods.

2.2 Inspecting and Unpacking Each Cabinet

Each cabinet is shipped bolted to wooden pallets and protected with outer protective packaging material and a plastic inner covering (see Figure 2-1).

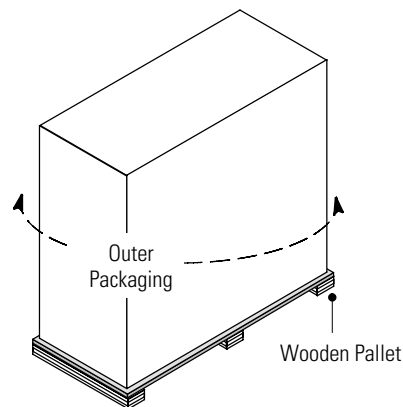


Figure 2-1. Cabinet as Shipped with Outer Packaging and Pallet

WARNING



The UPS cabinets are extremely heavy (see Table A on page A-1). If unpacking instructions are not closely followed, the cabinet may tip and cause serious injury.

CAUTION



- Do not install a damaged cabinet. Report any damage to the carrier and contact your Eaton service representative immediately.
- Do not tilt the UPS cabinets more than 10° from vertical or the cabinet may tip over.



NOTE Verify that the forklift or pallet jack is rated to handle the weight of the cabinets (see Table A on page A-1 for cabinet weights).

To unpack the cabinet:

1. Carefully inspect the outer packaging for evidence of damage during transit.
2. Use a forklift or pallet jack to move the packaged cabinet to the installation site, or as close as possible, before unpacking. Insert the forklift or pallet jack forks between the skids on the bottom of the unit.
3. Set each pallet on a firm, level surface, allowing a minimum clearance of 4.6m (15 ft) on each side for removing the cabinets from the pallets.
4. If outer packaging is secured with steel bands, cut and remove the bands from each cabinet.

5. Remove the protective cardboard covering from the cabinets, cutting where indicated, using a knife blade no longer than 25 mm (1").
6. Remove the plastic bag and foam packing material, and discard or recycle them in a responsible manner.
7. 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 your Eaton service representative immediately to determine the extent of the damage and its impact upon further installation.



NOTE *While waiting for installation, protect the unpacked cabinets from moisture, dust, and other harmful contaminants. Failure to store and protect the UPS system properly may void your warranty.*

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Chapter 3

Installing the UPS System

This section describes the UPS system installation for single modules and multi-modules, including: unloading the cabinets, UPS internal and external wiring, and interface connections.

3.1 Preliminary Installation Information



DANGER

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



WARNING

Installation should be performed only by qualified personnel.

Refer to the following while installing the UPS system:

- See Appendix A for installation drawings and additional installation notes.
- Dimensions are in millimeters and inches.
- Do not tilt the UPS cabinets more than 10° from vertical or the cabinet may tip over.
- Remove the conduit landing plates to add conduit landing holes as required. Plate material is 14 gauge steel (2 mm/0.075" thick).
- The Emergency UPS Off (EPO) and the Remote Emergency Power-off (REPO) buttons normally open all breakers in the UPS, shut down the UPS, and isolate power from the critical load. However, the EPO and REPO may be configured to transfer the UPS to bypass and shut down the UPS. Local electrical codes may also require tripping protective devices upstream from the UPS.
- The UPS cabinets must be installed on a level, sealed concrete pad or floor.
- If perforated floor tiles are required for ventilation, place them in front of the UPS. See Table A on page A-1 for equipment weight.
- Details about control wiring are provided in each procedure for connecting options and features. Paragraph A.5 starting on page A-28 identifies the control wiring terminations.
- All circuit breakers provided as part of the UPS system that employ adjustable trip mechanisms have been set to their maximum settings. Based upon the energy available and other equipment located on-site, these settings may need to be adjusted to ensure proper system operation and coordination. It is the customer's responsibility to conduct a breaker coordination study, so that these breakers can be adequately set for the site.

3.2 Unloading the UPS Cabinets from the Pallet



WARNING

- The UPS cabinets are heavy (see Table A on page A-1). If unpacking instructions are not closely followed, the cabinet may tip and cause serious injury.
- Do not install a damaged cabinet. Report any damage to the carrier and contact your Eaton service representative immediately.
- Do not tilt the UPS or optional cabinets more than 10° from vertical or the cabinet may tip over.



NOTE Verify that the forklift or pallet jack is rated to handle the weight of the cabinet (see Table A on page A-1 for cabinet weights).

Each UPS cabinet is bolted to a wooden pallet supported by wood skids.

To remove the pallet:

1. If not already moved, use a forklift or pallet jack to move the cabinet to the installation site, or as close as possible, before unloading from the pallet. Insert the forklift or pallet jack forks between the skids on the bottom of the unit.
2. Remove the hardware securing each UPS cabinet to the pallet.
3. Using a forklift, raise the UPS cabinet until the cabinet bottom clears the pallet by approximately 3 mm (1/8").
4. When the UPS cabinet is clear of the pallet, pull the pallet from under the cabinet. Discard or recycle the pallets in a responsible manner.
5. Carefully lower the UPS cabinet until the cabinet base touches the floor.
6. Repeat Steps 3 through 5 for the remaining UPS cabinets.

3.3 Single Module Installation

To install a single module UPS system, perform the procedures in the following paragraphs. If a multi-module system is being installed, proceed to "Multi-Module Installation" on page 3-4.

3.3.1 Installing UPS Internal Power and Control Wiring



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

To install the UPS internal power and control wiring (see Table H on page A-16 for tightening torques and paragraph A.4 starting on page A-22 for terminal locations):

1. Remove the plastic shield covering the inverter input section of the Output/Inverter cabinet.
2. Route the DC Link cables from the rectifier output (Input/Rectifier cabinet) to the inverter input (Output/Inverter cabinet) through the knockouts in the cabinet sides.
3. Connect the positive DC Link power wiring to the inverter input. Connect two cables to each inverter.

4. Connect the negative DC Link power wiring to the inverter input. Connect two cables to each inverter.
5. Reinstall the plastic shield to the inverter input section.
6. Remove the plastic shield covering the inverter output section of the Output/Inverter cabinet.
7. Route the MBC input cables from the MBC to the inverter output (Output/Inverter cabinet) through the knockouts in the cabinet sides.
8. Connect phase A, B, and C and Neutral power wiring from the MBC to the respective inverter output.
9. Route the ground braid from the top of the Output/Inverter cabinet to the Input/Rectifier cabinet through the cabinet knockouts. The ground braid is secured at the factory to the Output/Inverter cabinet mounting stud.
10. Connect the ground braid to the Input/Rectifier cabinet mounting stud and secure.
11. Route the ground braid from the top of the MBC to the Output/Inverter cabinet through the cabinet knockouts. The ground braid is secured at the factory to the MBC mounting stud.
12. Connect the ground braid to the Output/Inverter cabinet mounting stud and secure.
13. Reinstall the plastic shield to the inverter output section.
14. Connect the Output/Inverter 15-pin control wiring harness connector to the Input/Rectifier 15-pin control wiring harness connector. See Figure A-12 on page A-22 for connector locations.
15. Connect the MBC 15-pin control wiring harness connector to the Output/Inverter 15-pin control wiring harness connector. See Appendix A for connector locations.
16. Connect the 3-pin control wiring harness connector P6 from the MBC to connector J6 on the Inverter Number 2 control board in the Output/Inverter cabinet. See Figure A-14 on page A-24 and Figure A-16 on page A-26 for connector locations.

3.3.2 Installing UPS External Power and Control Wiring

To install the UPS external power and control wiring (see Appendix A for wiring and termination requirements and wiring access information):

1. Remove the sheet-metal shield covering the input terminal area in the Input/Rectifier cabinet to gain access to the Battery I/O customer interface and CB2TB. See Figure A-12 page A-22 for the shield location.



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

2. Connect phase A, B, and C power wiring from the source to the respective rectifier inputs in the Input/Rectifier cabinet.
3. Connect the positive and negative DC power wiring from the batteries to the respective DC inputs in the Input/Rectifier cabinet.



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

4. Connect phase A, B, and C power wiring from the bypass source to the respective bypass inputs in the MBC.
5. Connect phase A, B, and C and Neutral power wiring from the MBC output to the critical load.
6. Connect the control wiring (battery breaker open and close signals and shunt DC disconnect) between the external battery disconnect and the UPS.
7. After wiring the UPS system to the facility power and critical load, be sure to ground the system according to local and/or national electrical wiring codes.
8. Install the batteries according to the battery and battery rack manufacturer's instructions and all applicable codes and regulations, including the National Electrical Code (NEC), Article 480.



NOTE There is no DC disconnect device within the UPS.

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

3.4 Multi-Module Installation

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

3.4.1 Installing UPS Internal Power and Control Wiring



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

To install the UPS internal power and control wiring in a multi-module system (see Appendix A for terminal locations and wiring access information):

1. Remove the plastic shield covering the inverter input section of the Output/Inverter cabinet.
2. Route the DC Link cables from the rectifier output (Input/Rectifier cabinet) to the inverter input (Output/Inverter cabinet) through the knockouts in the cabinet sides.
3. Connect the positive DC Link power wiring to the inverter input. Connect two cables to each inverter. For tightening torque, see Table H on page A-16.
4. Connect the negative DC Link power wiring to the inverter input. Connect two cables to each inverter. For tightening torque, see Table H on page A-16.
5. Reinstall the plastic shield to inverter input section.
6. Route the ground braid from the top of the Output/Inverter cabinet to the Input/Rectifier cabinet through the cabinet knockouts. The ground braid is secured at the factory to the Output/Inverter cabinet mounting stud.
7. Connect the ground braid to the Input/Rectifier cabinet mounting stud and secure.

8. Connect the Output/Inverter 15-pin control wiring harness connector to the Input/Rectifier 15-pin control wiring harness connector. See Figure A-12 on page A-22 and Figure A-14 on page A-24 for connector locations.
9. Remove the plastic shield covering the inverter output section of the Output/Inverter cabinet.
10. Refer to the *Powerware 9315 Parallel Capacity/Redundant UPS Installation and Operation Manual* for SBM input wiring procedures.
11. Reinstall the plastic shield to the inverter output section.

3.4.2 Installing UPS External Power and Control Wiring

To install the UPS external power and control wiring (see Appendix A for wiring and termination requirements and wiring access information):

1. Remove the sheet-metal shield covering the input terminal area in the Input/Rectifier cabinet to gain access to the Battery I/O customer interface and CB2TB. See Figure A-12 on page A-22 for the shield location.



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

2. Connect phase A, B, and C power wiring from the source to the respective rectifier inputs in the Input/Rectifier cabinet.
3. Connect positive and negative DC power wiring from the batteries to the respective DC inputs in the Input/Rectifier cabinet.
4. Connect the control wiring (battery breaker open and close signals and shunt DC disconnect) between the external battery disconnect and the UPS.
5. Refer to the *Powerware 9315 Parallel Capacity/Redundant UPS Installation and Operation Manual* for SBM output wiring procedures.
6. After wiring the UPS system to the facility power and critical load, be sure to ground the system according to local and/or national electrical wiring codes.
7. Install the batteries according to the battery and battery rack manufacturer's instructions and all applicable codes and regulations, including NEC, Article 480.



NOTE There is no DC disconnect device within the UPS.

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

3.5 Installing Input/Rectifier Customer Connections



NOTE If you are installing connections to the Battery I/O terminal connections and terminal board CB2TB, install conduit between each device and the UPS cabinet for wiring these options.

See paragraph A.5 on page A-28 for the interface point locations within the UPS cabinet.

To prepare the UPS for wiring to customer connections:

1. Verify that the UPS system is turned off and all power sources are removed. See “Shutting Down the UPS and Critical Load” on page 9-6 for shutdown instructions.
2. Remove the sheet-metal shield covering the input terminal area in the Input/Rectifier cabinet to gain access to the Battery I/O customer interface and CB2TB. See Figure A-12 on page A-22 for the shield location.
3. See paragraph A.5 on page A-28 for terminal assignments, and wiring and termination requirements.

3.6 Installing Output/Inverter Customer Connections



NOTE If you are installing connections to a REPO device, building alarm, or relay contacts, install conduit between each device and the UPS cabinet.

See paragraph A.5 on page A-28 for the interface point locations within the UPS cabinet.

To prepare the UPS for wiring to customer connections:

1. Verify that the UPS system is turned off and all power sources are removed. See “Shutting Down the UPS and Critical Load” on page 9-6 for shutdown instructions.
2. See paragraph A.5 on page A-28 for terminal assignments, and wiring and termination requirements.

3.7 Installing Accessories

To install an optional REPO switch, see Chapter 5, “Installing a Remote Emergency Power-off Control.” To install optional accessories [such as the Remote Monitor Panel (RMP) or X-Slot connections], see Chapter 6, “Installing Optional Accessories.” When accessory installation is complete, proceed to paragraph 3.8.

3.8 Initial Startup

Startup and operational checks must be performed by an authorized Eaton Customer Service Engineer, or the warranty terms specified on page 15-1 become void. This service is offered as part of the sales contract for the UPS. Contact your Eaton service representative in advance (usually a two week notice is required) to reserve a preferred startup date.

3.9 Completing the Installation Checklist

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

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



NOTE *The installation checklist MUST be completed prior to starting the UPS system for the first time.*

Installation Checklist

- All packing materials and restraints have been removed from each cabinet.
- Each cabinet in the UPS system is placed in its final installation location.
- A ground bond is installed between any cabinets that are bolted together.
- All switchboards, conduits, and cables are properly routed to the UPS and auxiliary cabinets.
- All power cables are properly sized and terminated.
- A ground conductor is properly installed.
- If a bypass input neutral connection is used, no other N-G bonds exist downstream from the UPS.
- Battery cables and harnesses are terminated on E4 and E5.
- Internal battery cabinet connections have been completed (bus bars, plugs, etc.).
- Shunt trip signal wiring is connected from UPS to battery breaker(s).
- Air conditioning equipment is installed and operating correctly.
- The area around the UPS system is clean and dust-free. (It is recommended that the UPS be installed on a level, sealed concrete pad or floor.)
- Adequate workspace exists around the UPS and other cabinets.
- Adequate lighting is provided around all UPS equipment.
- A 120V service outlet is located within 7.6m (25 ft) of the UPS equipment.
- Each Remote Monitor Panel (RMP) is mounted in its installed location. (OPTIONAL)
- The control wiring for each RMP is terminated inside the UPS cabinet. (OPTIONAL)
- The remote emergency power-off (REPO) device is mounted in its installed location and its wiring terminated inside the UPS cabinet. (OPTIONAL)
- Summary alarms and/or building alarms are wired appropriately. (OPTIONAL)
- A Relay Interface Module (RIM) is mounted in its installed location and its wiring is terminated inside the UPS cabinet. (OPTIONAL)
- A remote battery disconnect control is mounted in its installed location and its wiring is terminated inside the UPS and battery cabinets. (OPTIONAL)
- Circuit breakers with adjustable trip mechanisms adjusted to match site requirements.
- Debris shields covering ventilation grills are removed from all cabinets.
- Startup and operational checks are performed by an authorized Eaton Customer Service Engineer.

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Chapter 4

Installing a Remote Battery Disconnect

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

The remote battery disconnect is set according to the operation procedures in Chapter 9, "UPS Operating Instructions." When service personnel are performing maintenance on the UPS or battery string, the disconnect should be set to the OFF position.

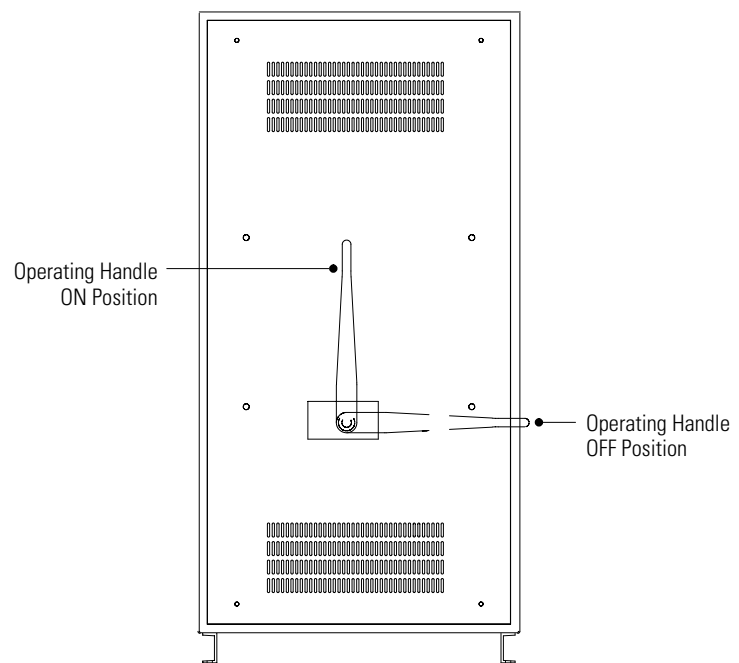


Figure 4-1. Remote Battery Disconnect Enclosure

Consider the following general notes before beginning installation:

- There is no DC disconnect device within the UPS.
- The DC input to the UPS is only protected by internal fuses F30 and F31.
- The UPS DC disconnect trip signal from CB2TB, terminals 9 and 10 (shunt trip) must be connected to the DC source disconnect device.
- See Figure A-30 on page A-42 for battery disconnect dimensions.
- See paragraph A.3 on page A-12 for specific ratings and wiring requirements.
- The material and labor for external wiring requirements is to be supplied by others.
- The knockout pattern for the disconnect is determined by others at the time of installation.
- Power cables and control wiring must be installed in separate conduit.
- The ground conductor is to be sized per National Electrical Code (NEC), Article 250 and local electrical code requirements.
- The maximum current listed is at the minimum DC operating voltage.

- Nominal voltages listed in this chapter are for a lead-acid batteries rated per NEC at 2.00 Vdc per cell.
- Battery strings must be installed according to all applicable codes and regulations, including NEC, Article 480.
- The UPS to battery cable should be sized for a total maximum voltage drop of 1% nominal DC Link voltage at maximum current.
- Table 4-1 details the power cable terminations.
- The remote battery disconnect weighs approximately 60.3 kg (133 lb). It has an ampere interrupting capacity (AIC) of 100,000 at 500 Vdc.

Table 4-1. Remote Battery Disconnect Power Terminations

Number and Type of Accessories Permitted				
Terminal	Terminal Function	Size of Termination	Tightening Torque Nm (lb ft)	Bolt Size
E4 (+)	UPS Battery Input (+)		See Table H on page A-16	
E5 (-)	UPS Battery Input (-)		See Table H on page A-16	
Breaker (+)	Battery Disconnect (+)	8 – 1 Bolt Mounting Bus Bar	76 (56)	1/2"
Breaker (-)	Battery Disconnect (-)	8 – 1 Bolt Mounting Bus Bar	76 (56)	1/2"
Breaker (jumper)	Battery Disconnect (jumper)	8 – 1 Bolt Mounting Bus Bar	76 (56)	1/2"

Table 4-2. Remote Battery Disconnect Circuit Breaker Ratings

UPS Model	Circuit Breaker Rating	DC Voltage
9315-750/500	1600	480
9315-750/625	2000	480
9315-750/750	2500	480

Chapter 5

Installing a Remote Emergency Power-off Control

A latching-type REPO switch can be used in an emergency to shut down the UPS and remove power to the critical load from a location away from where the UPS is installed. Figure 5-1 shows a REPO switch.

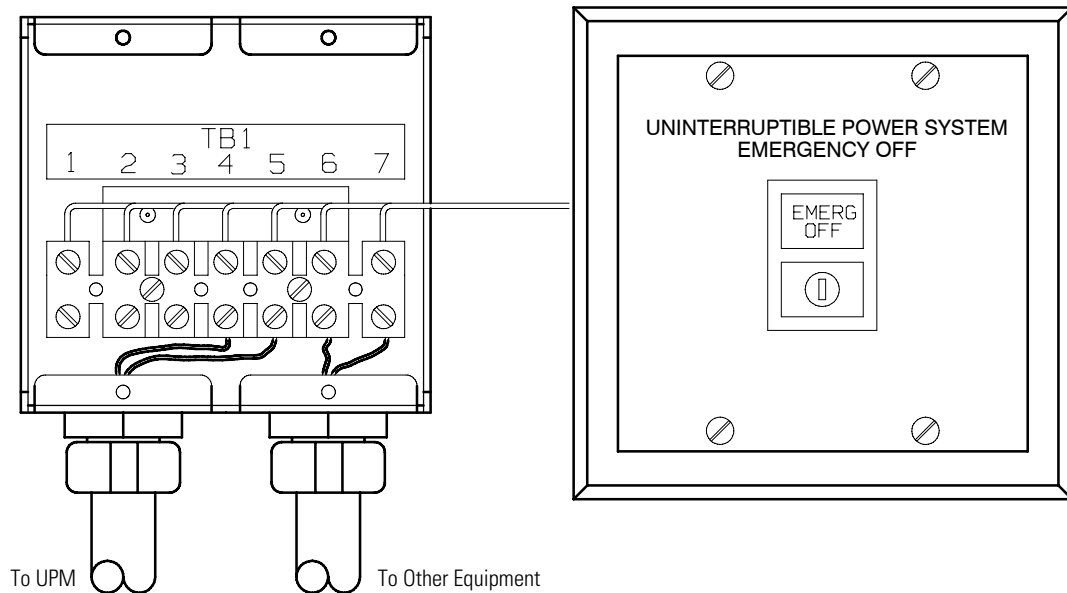


Figure 5-1. Remote Emergency Power-off (REPO) Control



NOTE Before installing a REPO, verify that the UPS was installed according to the instructions in Chapter 3, “Installing the UPS System.”

To install a REPO station:

1. Verify that the UPS system is turned off and all power sources are removed. See Chapter 9, “UPS Operating Instructions,” for shutdown instructions.
2. Securely mount the REPO station. Recommended locations include operator’s consoles or near exit doors. See Figure A-25 page A-37 for enclosure dimensions and wiring knockouts.
3. Install wiring from the REPO station using ½” conduit through the cable entry knockout in the top of the UPS Output/Inverter cabinet. See Appendix A for conduit landing area, terminal board location, and terminal wiring assignments.
4. Connect the REPO wiring as shown in Table 5-1 and Figure 5-2:

Table 5-1. REPO Wire Terminations

From REPO Station(s)	To Customer Interface Terminal Board CUSTTB in UPS Output/Inverter Cabinet	Remarks
TB1-4	CUSTTB-9	Twisted Wires (2) 14–18 Gauge
TB1-5	CUSTTB-10	



NOTE REPO switch rating is 24 Vdc, 1A minimum if supplied by the customer. The REPO switch must be a latching-type switch with a dedicated circuit.

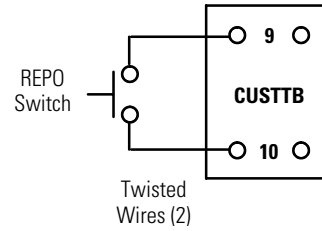


Figure 5-2. REPO Wiring

5. If you are installing multiple REPO stations, wire additional stations in parallel with the first REPO.
6. If required, install ½" conduit and wiring from the REPO station to trip circuitry of upstream protective devices. A normally open contact is provided, as shown in Figure 5-2. REPO switch wiring must be according to UL Class I requirements.
7. Secure the UPS by reversing all steps taken to prepare it for REPO installation.

Chapter 6

Installing Optional Accessories

This chapter contains installation information for the following options:

- Monitoring accessories: Remote Monitor Panel (RMP), Relay Interface Module (RIM), and Supervisory Contact Module (SCM)
- X-Slot cards



NOTE When installing interface connections (such as an RMP, RIM, or SCM), install conduit between each device and the UPS cabinet.

A maximum of two monitoring accessories (RMPs, RIMs, or SCMs) can be installed. An X-Slot card can also be installed with the monitoring accessories. See Table 6-1 for the number of accessories permitted.

Table 6-1. Optional Monitoring Accessories

Number and Type of Accessories Permitted			
RMP	RIM	SCM	X-Slot
2	—	—	1
—	2	—	1
—	—	2	1
1	1	—	1
1	—	1	1
—	1	1	1

6.1 Installing an RMP

As an option, you can install an RMP to monitor the UPS system operation from virtually any location within your facility, up to 152.4m (500 ft) from the UPS. You can flush-mount or surface-mount an RMP on a desktop or on a wall, wherever you have a serial interface line. Figure 6-1 shows an RMP. Figure A-26 on page A-38 shows the enclosure dimensions and cable exit openings.

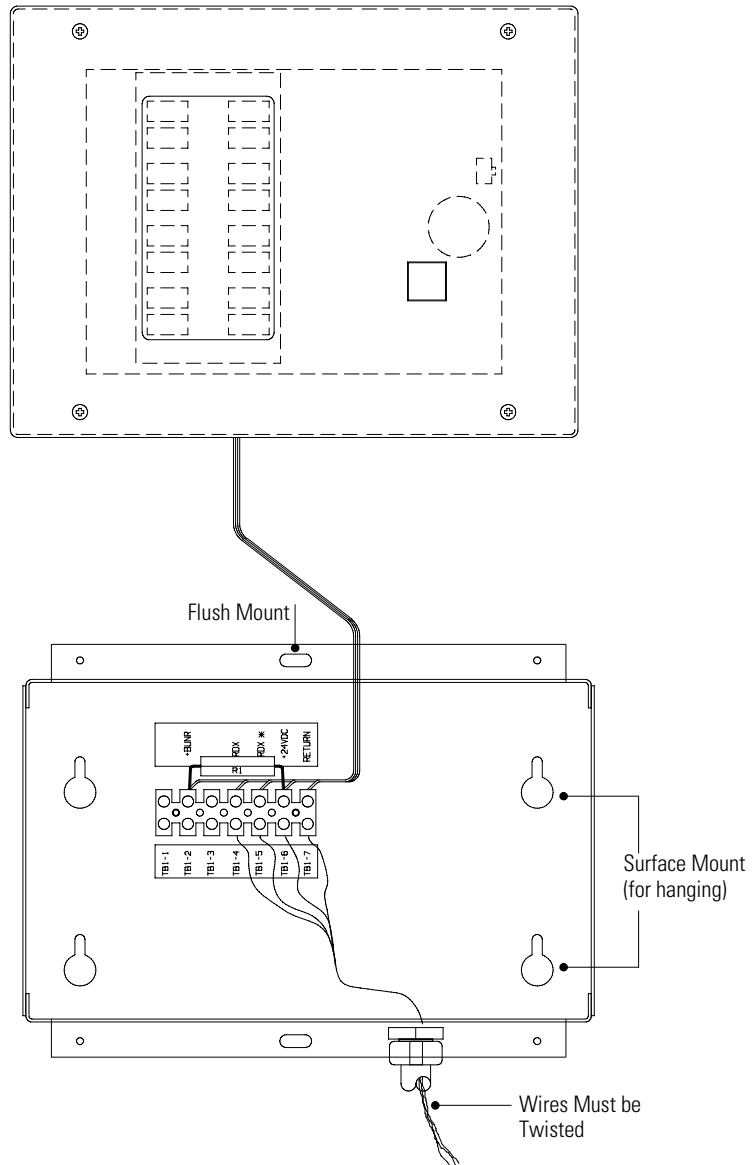


Figure 6-1. RMP

To install an RMP:

1. Verify that the UPS system is turned off and all power sources are removed. See Chapter 9, "UPS Operating Instructions," for shutdown instructions.
2. Remove the access plate on top of the UPS Input/Rectifier cabinet to gain access to the customer interface panel (see Figure A-13 on page A-23).
3. Securely mount the RMP.
4. Install wiring from the RMP using ½" conduit through the cable entry knockout in the top of the UPS Input/Rectifier cabinet. See Figure A-13 on page A-23 for the conduit landing area location.
5. In the spare parts kit, locate the RMP adapter cable assembly (see Figure 6-2). Mate the DB-9 connector on the back of the terminal block to the DB-9 connector (Port 1) on the UPS customer interface panel (see Figure A-19 on page A-30). Use two screws from the spare parts kit to secure the terminal block bracket to the customer interface panel.

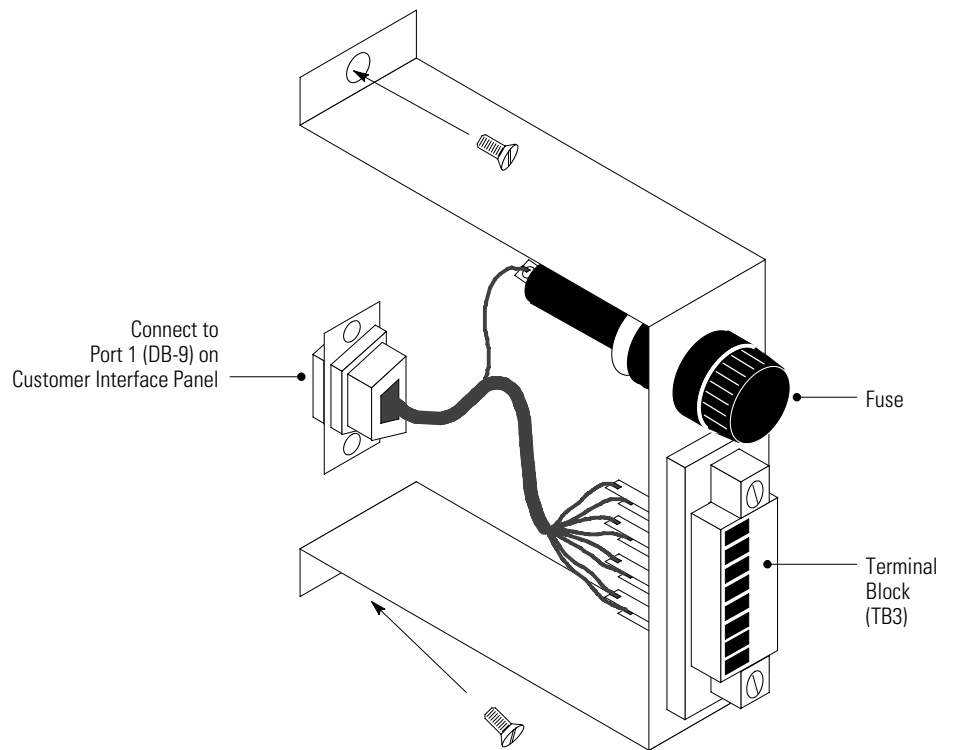


Figure 6-2. Terminal Block Bracket

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

Table 6-2. RMP Wire Terminations

From RMP A	To UPS	Remarks
TB1-4	TB3-1	
TB1-5	TB3-2	Twisted wires (4) 1–2 turns per 3"
TB1-6	TB3-3	
TB1-7	TB3-4	
From RMP B (If Used)	To UPS	Remarks
TB1-4	TB3-5	
TB1-5	TB3-6	Twisted wires (4) 1–2 turns per 3"
TB1-6	TB3-7	
TB1-7	TB3-8	

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

If the communication link between the UPS and the RMP is not present, the RMP conducts a self-test (all indicators flash and the horn beeps at one-second intervals); 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 Eaton service representative for verification that the RMP is working correctly.

8. To test the light emitting diode (LED) lamps behind the indicators, press and hold the horn silence button for three seconds. All the indicators illuminate and the horn sounds continuously until you release the button. If any indicator does not illuminate, its LED lamp may need to be replaced. Contact your Eaton service representative if you have a problem with the LEDs.
9. Repeat Steps 1 through 8 if you are installing another RMP.
10. If you are installing an RIM or SCM in addition to an RMP, proceed to paragraph 6.2 or 6.3, respectively; otherwise, secure the access plate on top of the UPS Input/Rectifier cabinet.

6.2 Installing an RIM

The optional RIM uses relay contact closures to indicate the UPS system operating status and alarm condition. The module uses an RS-422 serial interface line and may support up to eight critical loads. Figure 6-3 shows the RIM with its four 15-pin D-sub connectors labeled J1 through J4. See Figure A-27 and Figure A-28, starting on page A-39, for enclosure dimensions and wiring knockouts.

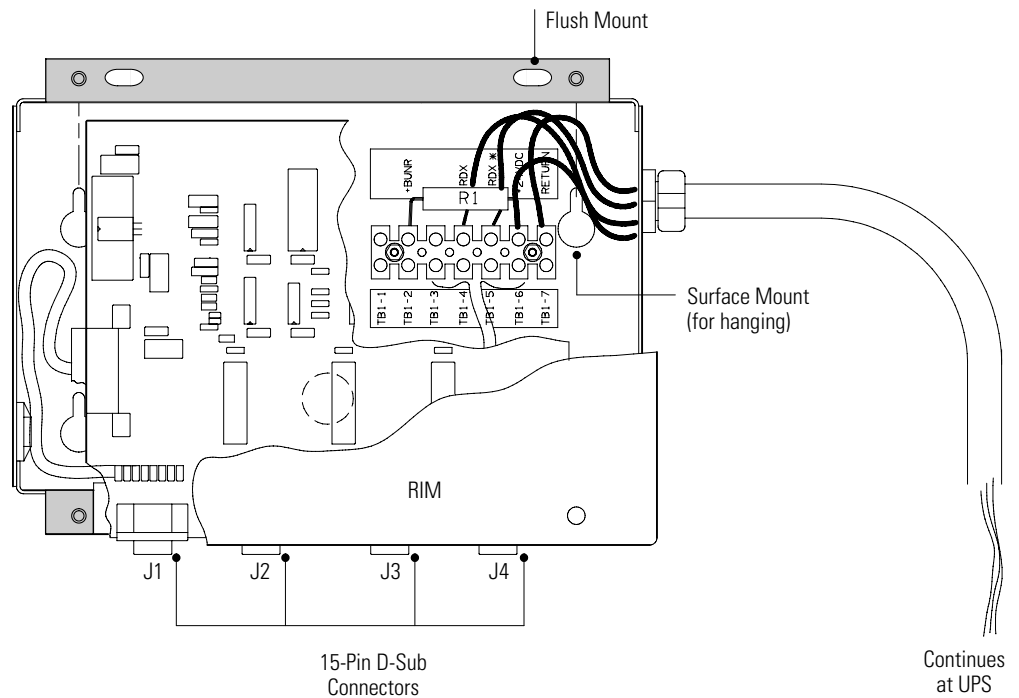


Figure 6-3. RIM

1. Verify that the UPS system is turned off and all power sources are removed. See Chapter 9, "UPS Operating Instructions," for shutdown instructions.
2. Remove the access plate on top of the UPS Input/Rectifier cabinet to gain access to the customer interface panel (see Figure A-13 on page A-23).
3. Securely mount the RIM.
4. Install wiring from the RIM using ½" conduit through the cable entry knockout in the top of the UPS Input/Rectifier cabinet. See Figure A-13 on page A-23 for the conduit landing area location.
5. If not already installed, locate the RMP adapter cable assembly in the spare parts kit (see Figure 6-4). Mate the DB-9 connector on the back of the terminal block to the DB-9 connector (Port 1) on the UPS customer interface panel (see Figure A-19 on page A-30). Use two screws from the spare parts kit to secure the terminal block bracket to the customer interface panel.

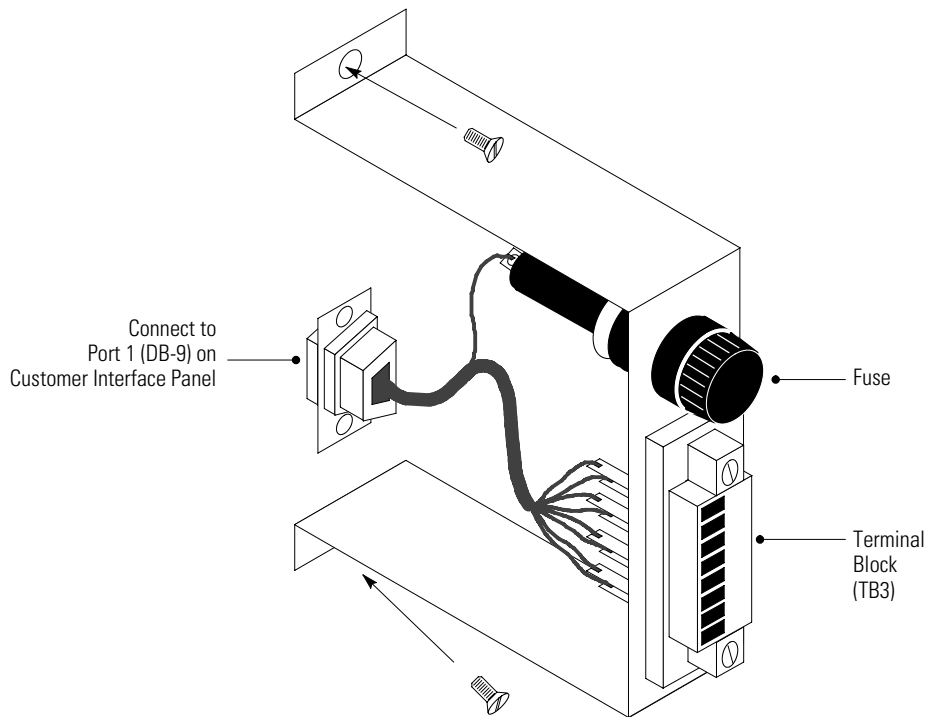


Figure 6-4. Terminal Block Bracket

6. Connect RIM wiring to the terminal block using the terminations shown in Table 6-3.

Table 6-3. RIM Wire Terminations

From RIM A	To UPS	Remarks
TB1-4	TB3-1	
TB1-5	TB3-2	Twisted wires (4) 1–2 turns per 3"
TB1-6	TB3-3	
TB1-7	TB3-4	
From RIM B (If Used)	To UPS	
TB1-4	TB3-5	
TB1-5	TB3-6	Twisted wires (4) 1–2 turns per 3"
TB1-6	TB3-7	
TB1-7	TB3-8	

7. Contact your Eaton service representative for verification and testing of the RIM and its connections prior to making connections to J1 through J4.

You can order interface cables separately for connecting to the 15-pin D-sub connectors.

8. Repeat Steps 1 through 7 if you are installing another RIM.
9. If you are installing an SCM in addition to an RIM, proceed to paragraph 6.3; otherwise, secure the access plate on top of the UPS Input/Rectifier cabinet.

6.3 Installing an SCM

The optional SCM shown in Figure 6-5 provides contacts for monitoring UPS system status. See Figure A-29 page A-41 for enclosure dimensions and knockout patterns.

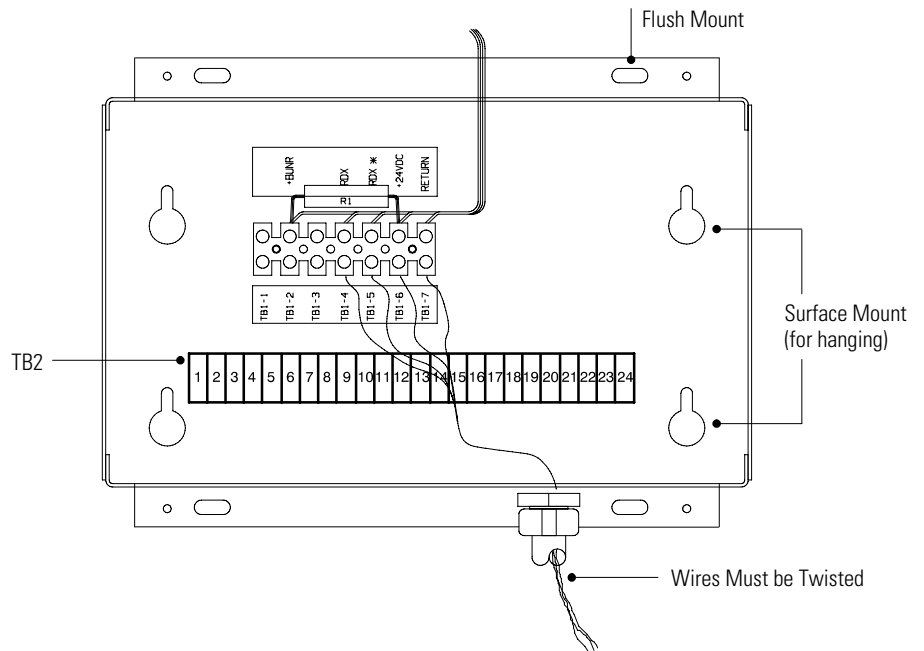


Figure 6-5. SCM

1. Verify that the UPS system is turned off and all power sources are removed. See Chapter 9, "UPS Operating Instructions," for shutdown instructions.
2. Remove the access plate on top of the UPS Input/Rectifier cabinet to gain access to the customer interface panel (see Figure A-13 on page A-23).
3. Securely mount the SCM.
4. Install wiring from the SCM using $\frac{1}{2}$ " conduit through the cable entry knockout in the top of the UPS Input/Rectifier cabinet. See Figure A-13 on page A-23 for the conduit landing area location.
5. If not already installed, locate the RMP adapter cable assembly in the spare parts kit (see Figure 6-6). Mate the DB-9 connector on the back of the terminal block to the DB-9 connector (Port 1) on the UPS customer interface panel (see Figure A-19 on page A-30). Use two screws from the spare parts kit to secure the terminal block bracket to the customer interface panel.

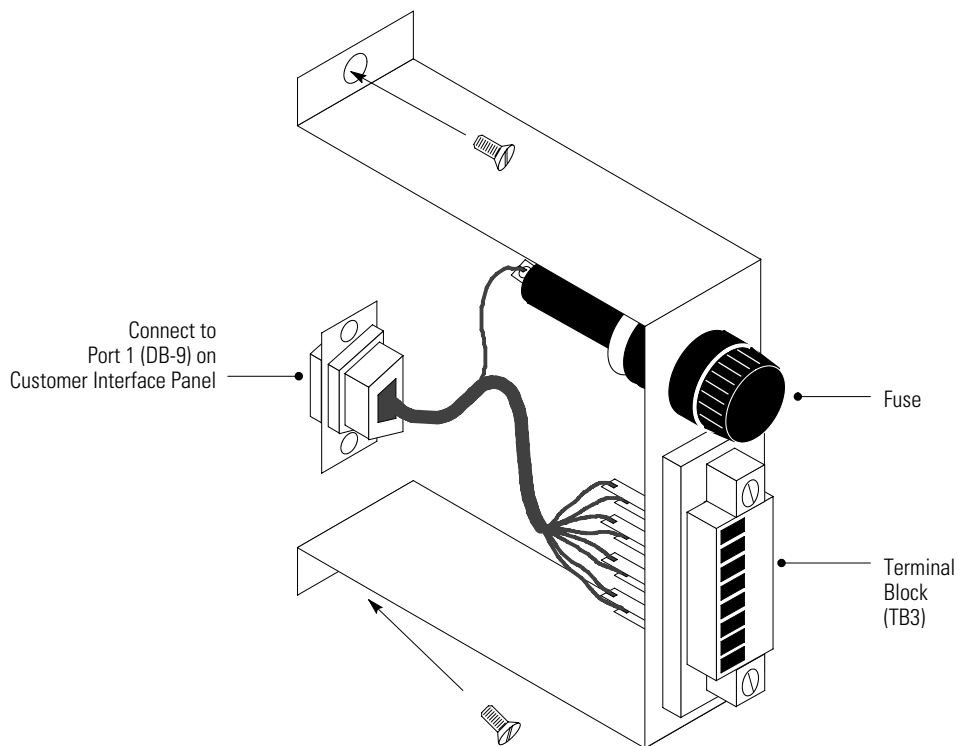


Figure 6-6. Terminal Block Bracket

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

Table 6-4. SCM Wire Terminations

From SCM A	To UPS	Remarks
TB1-4	TB3-1	
TB1-5	TB3-2	Twisted wires (4) 1–2 turns per 3"
TB1-6	TB3-3	
TB1-7	TB3-4	
From SCM B (If Used)	To UPS	Remarks
TB1-4	TB3-5	
TB1-5	TB3-6	Twisted wires (4) 1–2 turns per 3"
TB1-6	TB3-7	
TB1-7	TB3-8	

7. Contact your Eaton service representative for verification and testing of the SCM and its connections prior to making connections to terminal strip TB2 shown in Figure 6-7.
8. Repeat Steps 1 through 7 if you are installing another SCM.
9. Secure the access plate on top of the UPS Input/Rectifier cabinet.

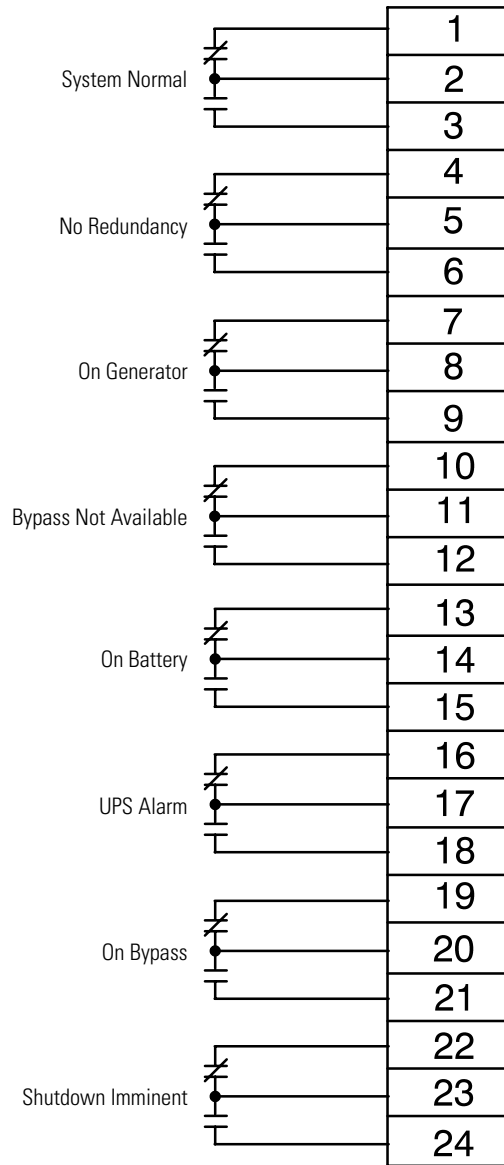


Figure 6-7. SCM TB2



NOTE Supervisory contacts are rated at 2.0A at 28 Vdc or 120 Vac and 0.15A at 115 Vdc.

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

6.4 Installing X-Slot Cards



NOTE LAN and telephone drops for use with X-Slot cards must be provided by facility planners or the customer.

NOTE For setup of an X-Slot card, please contact Eaton (see page 1-7).

To install the X-Slot cards:

1. If not already installed, install the LAN, telephone, or other cables.
2. Remove the access plate on top of the UPS Input/Rectifier cabinet to gain access to the customer interface panel (see Figure A-13 on page A-23).
3. Remove the X-Slot cover plate to gain access to the X-Slot communication bay (see Figure A-19 on page A-30).
4. Install the X-Slot card into the communication bay.
5. Route and install the LAN, telephone, and other cables to the appropriate X-Slot card.
6. Refer to the manual supplied with the X-Slot card for operator instructions.

Section II

Operation

Chapter 7

Understanding UPS Operation

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

In this manual, the power required by your equipment is called the *critical load*. The UPS supplies the critical load with conditioned power that is synchronized with your utility power. Figure 7-1 shows the main elements of the UPS system.

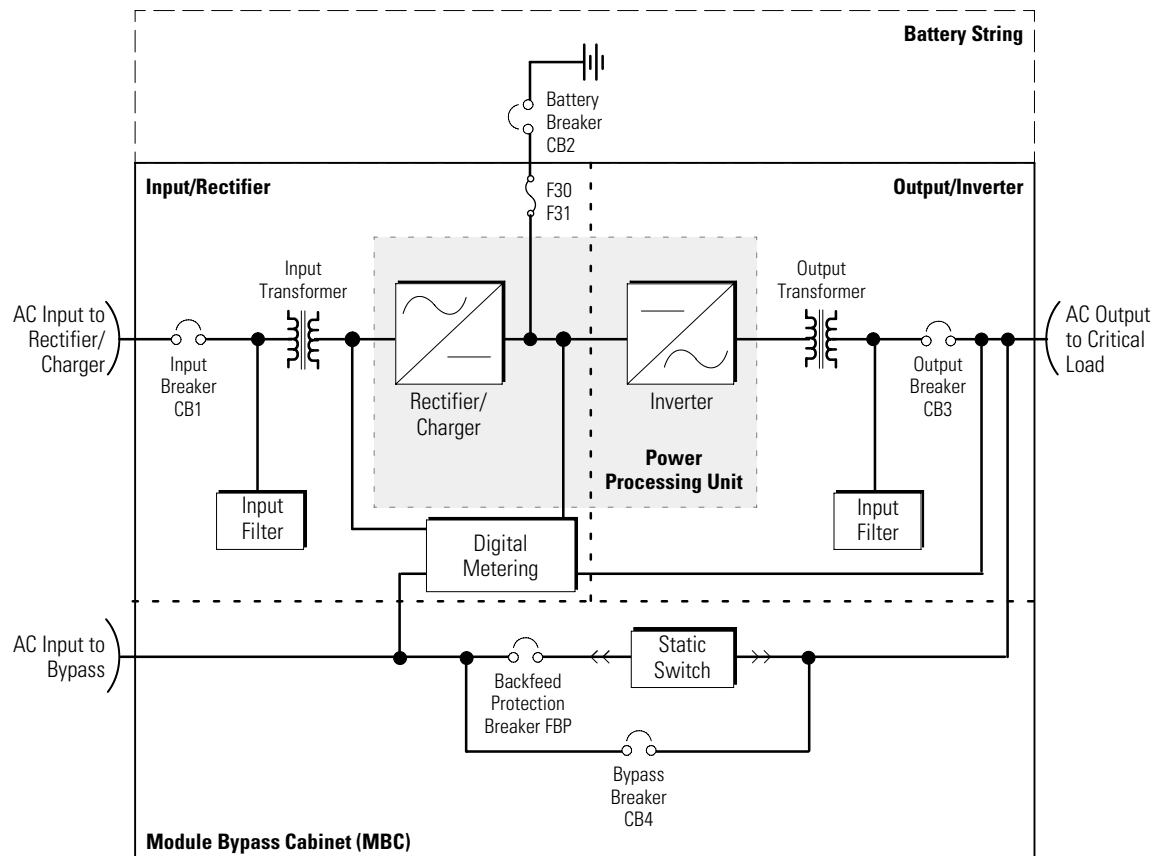


Figure 7-1. Main Elements of the UPS System

The emergency bypass consists of a static switch, a wraparound bypass breaker (CB4) and a Backfeed Protection Breaker (FBP). The FBP is located in series with the static switch and opens so that the UPS cannot backfeed the bypass source.

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

If utility power is interrupted or falls outside the parameters specified in Chapter 14, "Product Specifications," the UPS uses a backup battery supply to maintain power to the critical load for a specified period of time or until the utility power returns. For extended power outages, the backup battery supply allows you to either transfer to an alternative power system (such as a generator) or shut down your critical load in an orderly manner.

7.1 Operating Modes

The UPS system supports the critical load with the following operating modes:

- **Normal mode** – The critical load is supplied by the inverter, which derives its power from rectified utility AC power. In this mode, the rectifier also provides charging power to the battery.
- **Bypass mode** – Utility power directly supplies the critical load.
- **Battery mode** – The battery cabinet provides DC power, which maintains inverter operation. The battery supports the critical load.

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

- A *command* is an intervention that is externally initiated by an operator or by some site action. A command causes the UPS to switch operating modes; it usually does not require any further action.
- A *notice* is a minor system event that may or may not require your attention.
- An *alarm* is a system event that requires immediate operator intervention.

System events, horns, and indicators are described in Chapter 11, "Responding to System Events."

The following paragraphs describe the differences in UPS operating modes, using block diagrams to show the power flow during each mode of operation.

7.1.1 Normal Mode

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

Figure 7-2 shows the path of electrical power through the UPS system when the UPS is operating in Normal mode.

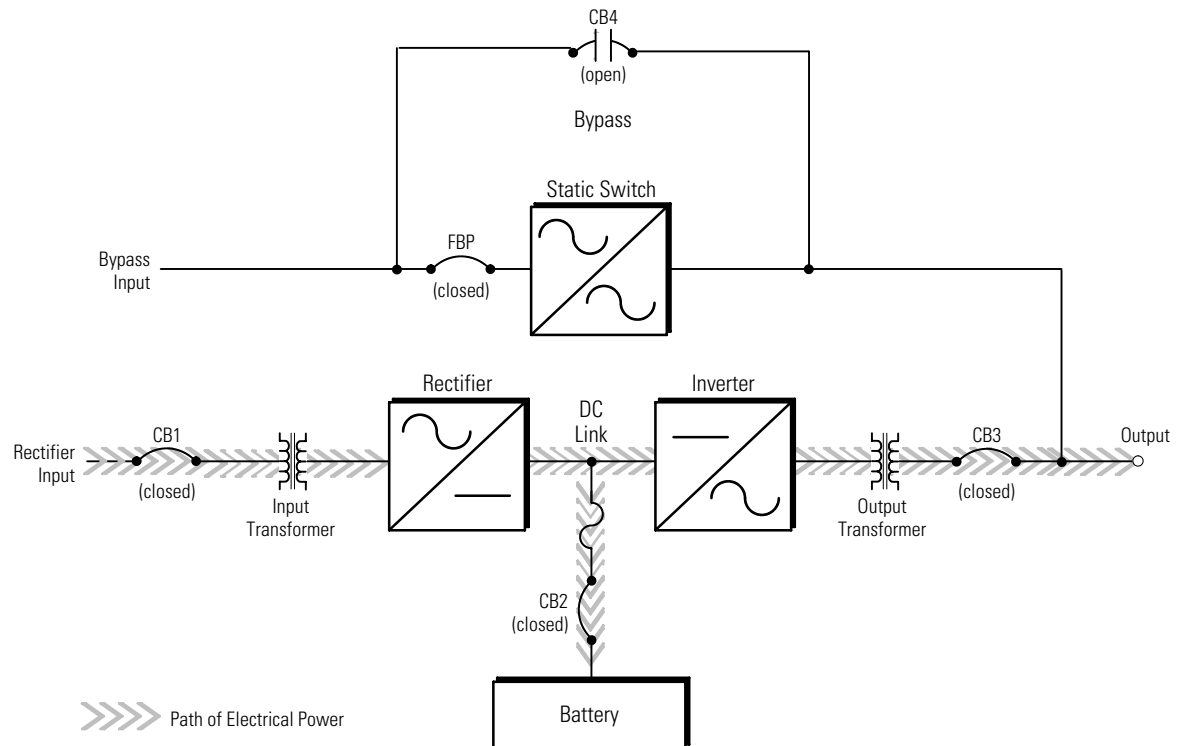


Figure 7-2. Path of Current Through the UPS in Normal Mode

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

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

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

7.1.2 Bypass Mode

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

Figure 7-3 shows the path of electrical power through the UPS system when the UPS is operating in Bypass mode.



CAUTION

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

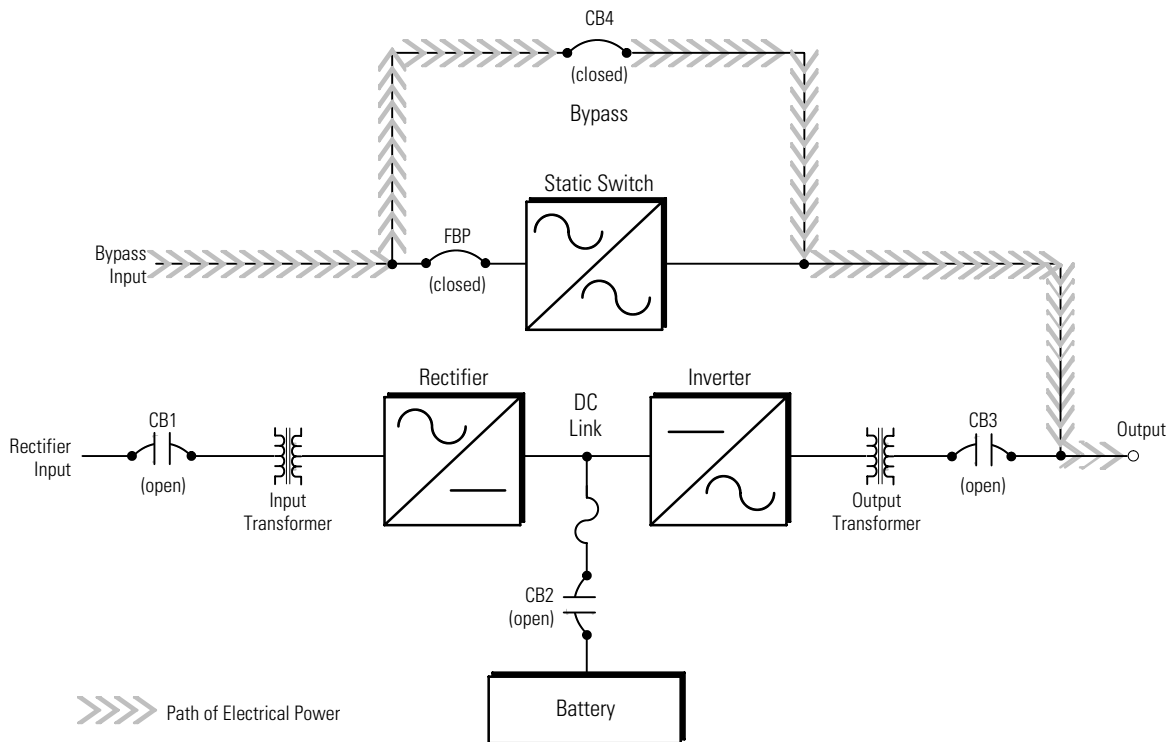


Figure 7-3. Path of Current Through the UPS in Bypass Mode

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

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

7.1.3 Battery Mode

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

Figure 7-4 shows the path of electrical power through the UPS system when the UPS is operating in Battery mode.

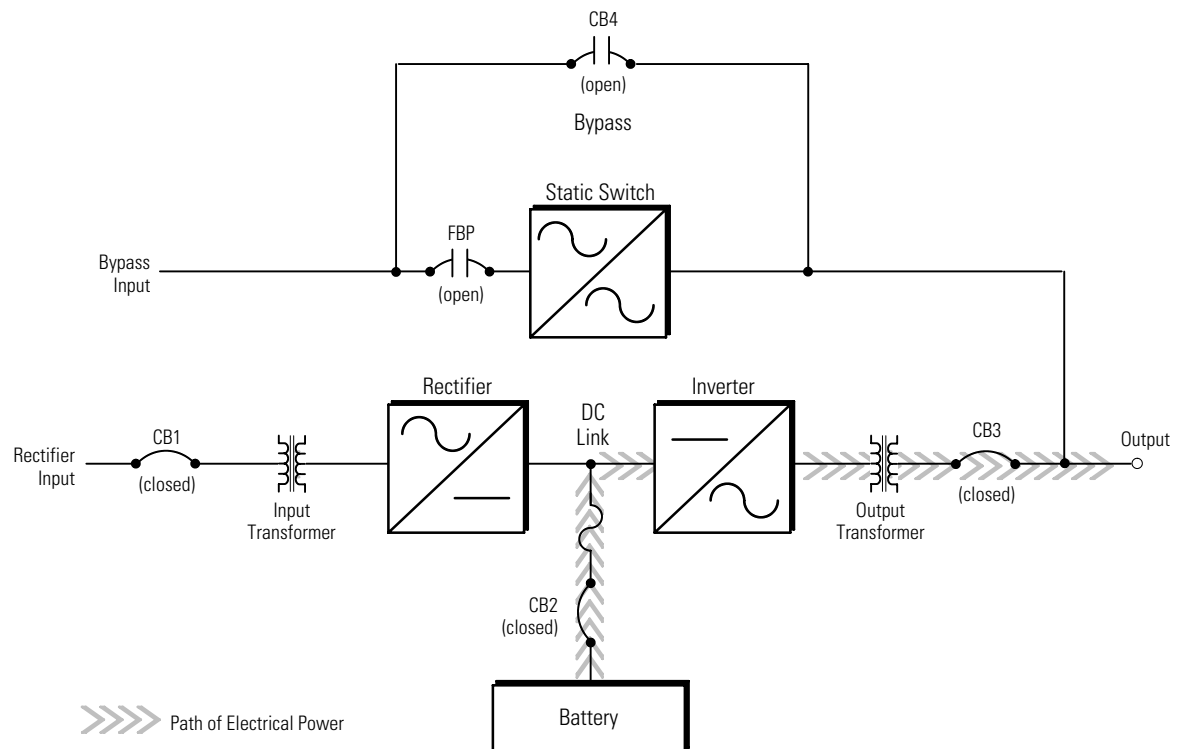


Figure 7-4. Path of Current Through the UPS in Battery Mode

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

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

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Chapter 8

Using the Control Panel

This chapter describes the UPS control panel, including controls and indicators, and how to monitor UPS operation. The control panel is a black square area on the front of the UPS (see Figure 8-1).

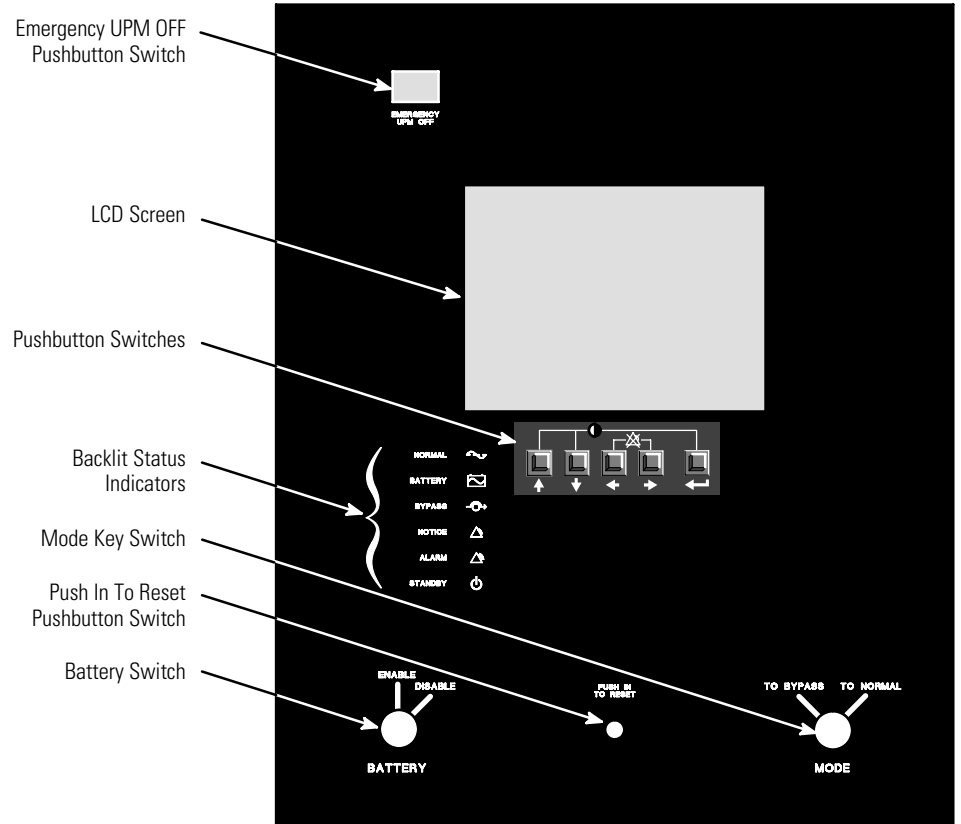


Figure 8-1. UPS Control Panel

The following sections describe using the UPS control panel to monitor the UPS. See Chapter 9, "UPS Operating Instructions," for use of the operational controls.

8.1 Using the LCD Screen

The LCD screen at the top of the control panel provides an operator interface with the UPS system. Figure 8-2 identifies the display fields discussed in the following sections.

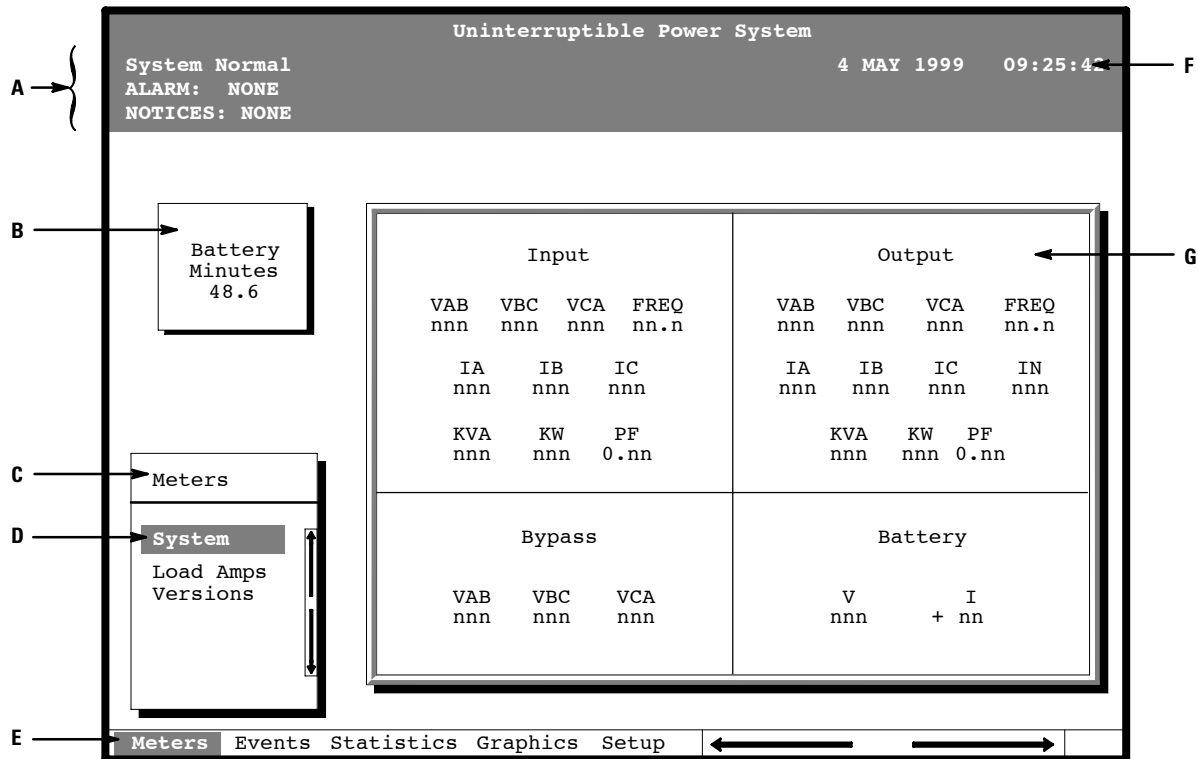


Figure 8-2. LCD Screen

- A** The *UPS status area* contains three lines that display the current UPS state. The first line shows the present UPS operational mode. 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, see 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 (**C**). 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 menu title currently displayed in the menu box (**C**) is highlighted. When you press the \leftarrow and \rightarrow pushbuttons to move the highlight left or right, the data in the menu box (**C**) and the information area (**G**) change accordingly.
- F** The *time stamp* shows the current date and time. This date and time are recorded in the Event Log when an alarm or notice is activated.
- G** The *information area* contains data about UPS status and operation. Select a menu option to display statistics or graphics.

Use the LCD screen and the pushbuttons beneath it to:

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

8.2 Using the Pushbuttons

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

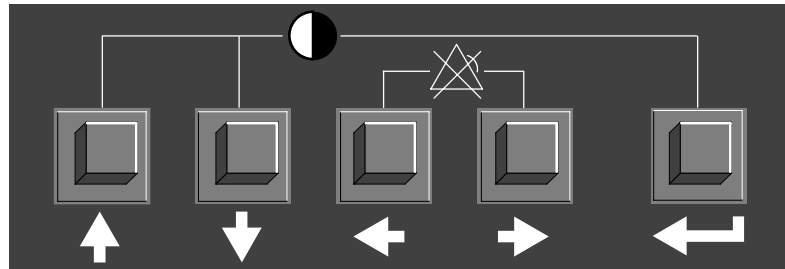












Figure 8-3. LCD Pushbuttons

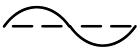
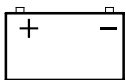



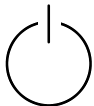
- Press the  and  pushbuttons to move through the options in a menu, or to scroll through the list of alarms and notices in the Event History Log.
- Press the  and  pushbuttons to move through the menu titles on the menu bar. Press them simultaneously to silence the horn, or to test the LED lamps behind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

8.3 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.

8.4 Reading the Status Indicators

The six symbols on the left side of the control panel are status indicators. They are backlit by colored LED lamps, and they work in conjunction with the horn to let you know the UPS operating status.

Normal		This green symbol illuminates when the UPS is operating in Normal mode. The power processing unit (PPU) is supplying power to the critical load.
Battery		This yellow symbol illuminates when the UPS is operating in Battery mode. Because Battery mode is a normal condition of the UPS, the Normal indicator also remains illuminated.
Bypass		This yellow symbol illuminates when the UPS is operating in Bypass mode. The critical load is supported by the bypass source. The Normal indicator is not illuminated when the system is in Bypass mode.
Notice		This yellow symbol illuminates when the system needs attention. The LCD screen shows all active notices. Some notices may be accompanied by a horn. To silence the horn, press the ← and the → pushbuttons simultaneously. The Notice indicator may be illuminated along with other indicators.
Alarm		This red symbol illuminates when a situation requires immediate attention. The LCD screen shows the highest priority active alarms. All alarms are accompanied by a horn. To silence the horn, press the ← and the → pushbuttons simultaneously. The Alarm indicator may be illuminated along with other indicators.
Standby		This yellow symbol illuminates when electricity is present in the PPU of the UPS and the Normal indicator is not illuminated. During normal startup, this indicator illuminates until the the UPS transfers to Normal mode, at which point the Normal indicator illuminates. During normal shutdown, the Standby indicator illuminates until all energy in the UPS is dissipated and shutdown is complete.

For more information about horns, see “System Event Horns” on page 11-1.

To test the LED lamps behind the status indicators, press and hold the ← and → pushbuttons simultaneously for three seconds. All the indicators should illuminate until you release the pushbuttons. If any indicator does not illuminate, its LED lamp may need to be replaced. Contact your Eaton service representative if you have a problem with the indicator lamps.

8.5 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 operation 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 communication port and set the date and time for the time stamp.

8.5.2 Load Amps Meters Screen

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

Figure 8-5 shows the Load Amps Meters screen.

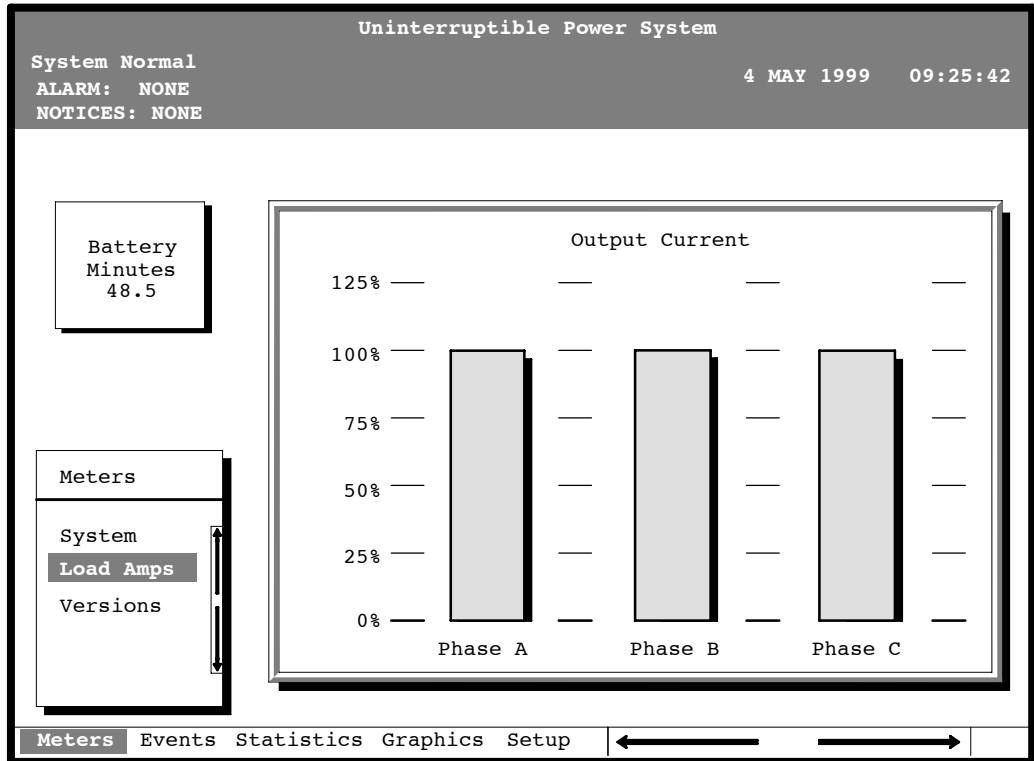


Figure 8-5. Load Amps Meters Screen

8.5.3 Software Versions Screen

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

Figure 8-6 shows the Software Versions screen.

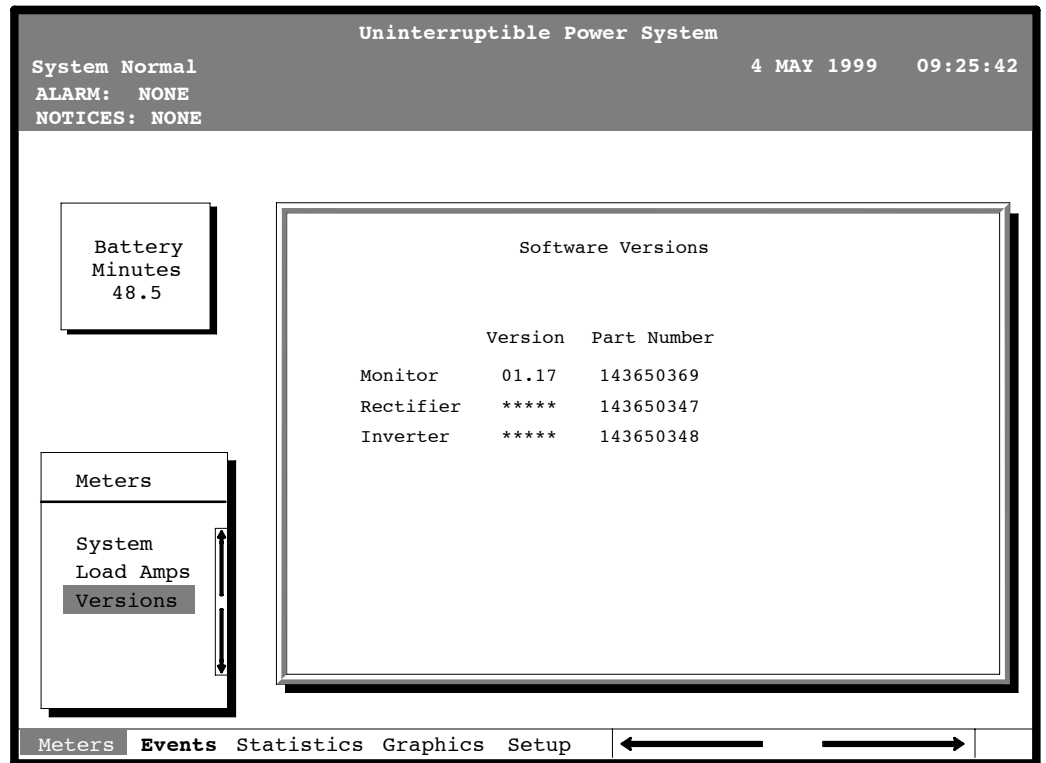


Figure 8-6. Software Versions Screen

8.5.4 Event History Log 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; scroll upward to view older event listings.

Figure 8-7 shows the Event History Log screen.

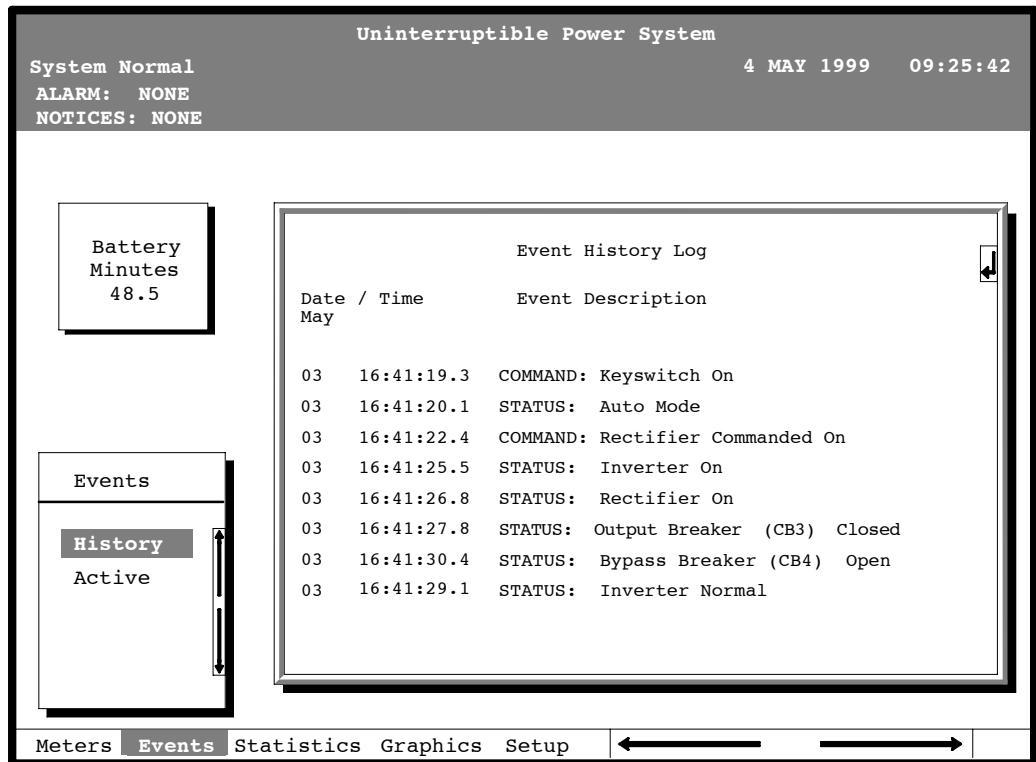


Figure 8-7. Event History Log Screen

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 control 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.

8.5.5 Active System Events Screen

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

Figure 8-8 shows the Active System Events screen.

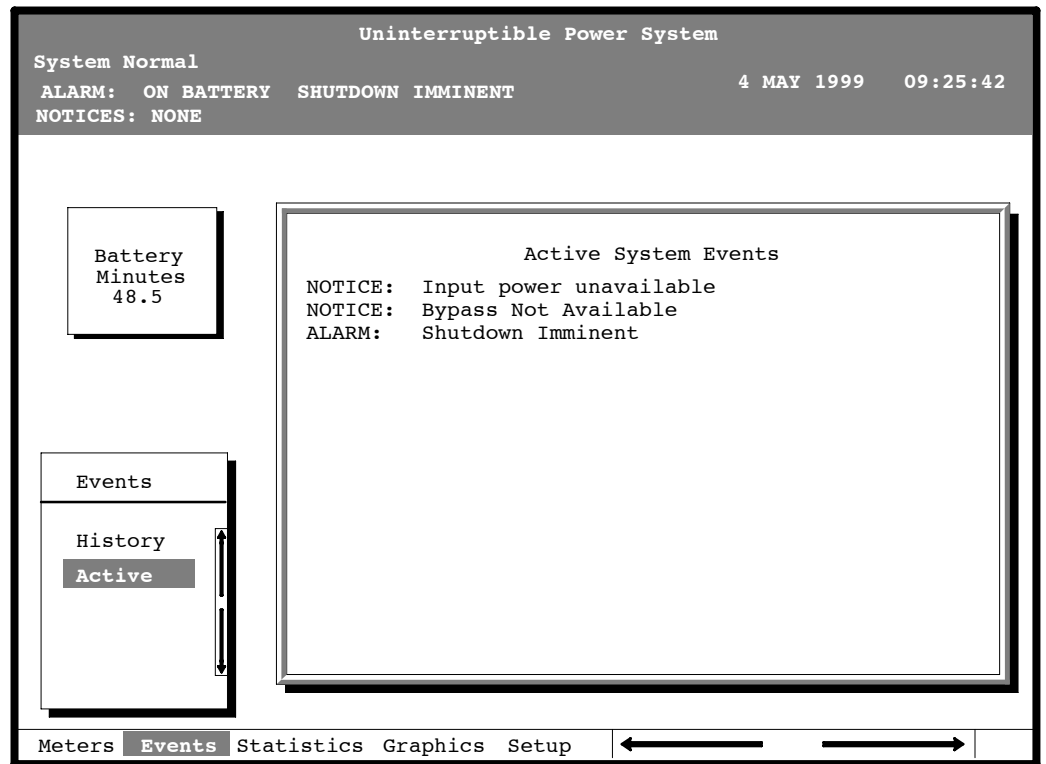


Figure 8-8. Active System Events Screen

8.5.6 Unit Statistics Screen

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

Figure 8-9 shows the Unit Statistics screen.

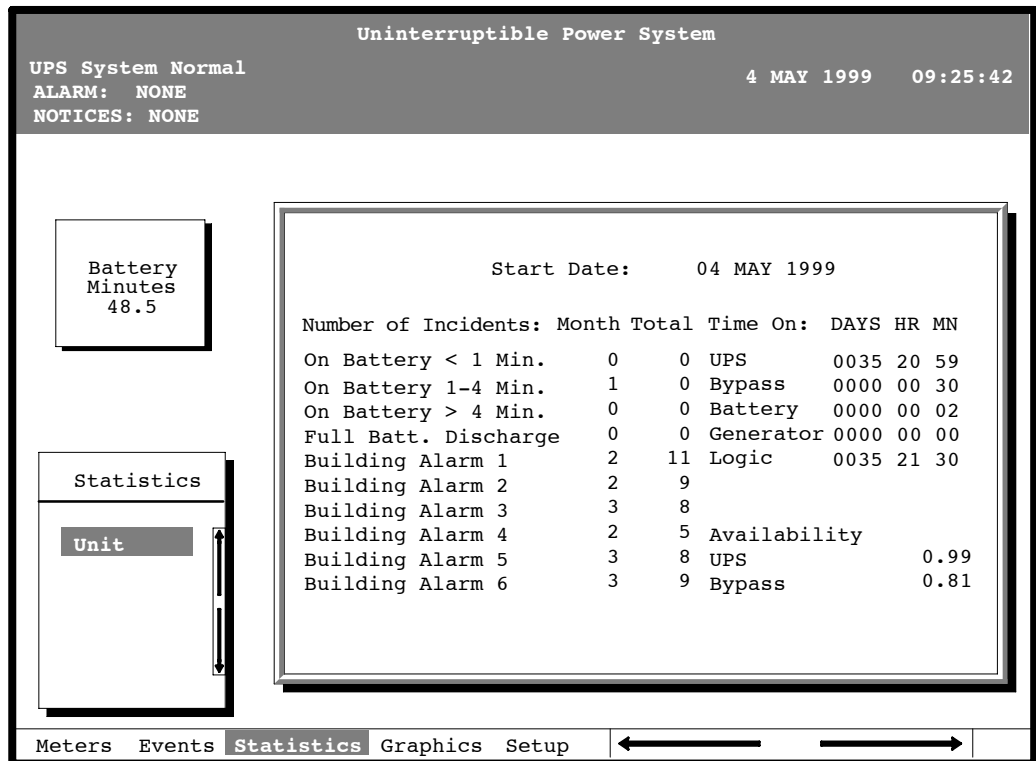


Figure 8-9. Unit Statistics Screen

The left column shows the number of UPS incidents for the current month and since the start date shown at the top of the information area. 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.

8.5.7 Mimic Screen

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

Figure 8-10 shows the Mimic screen.

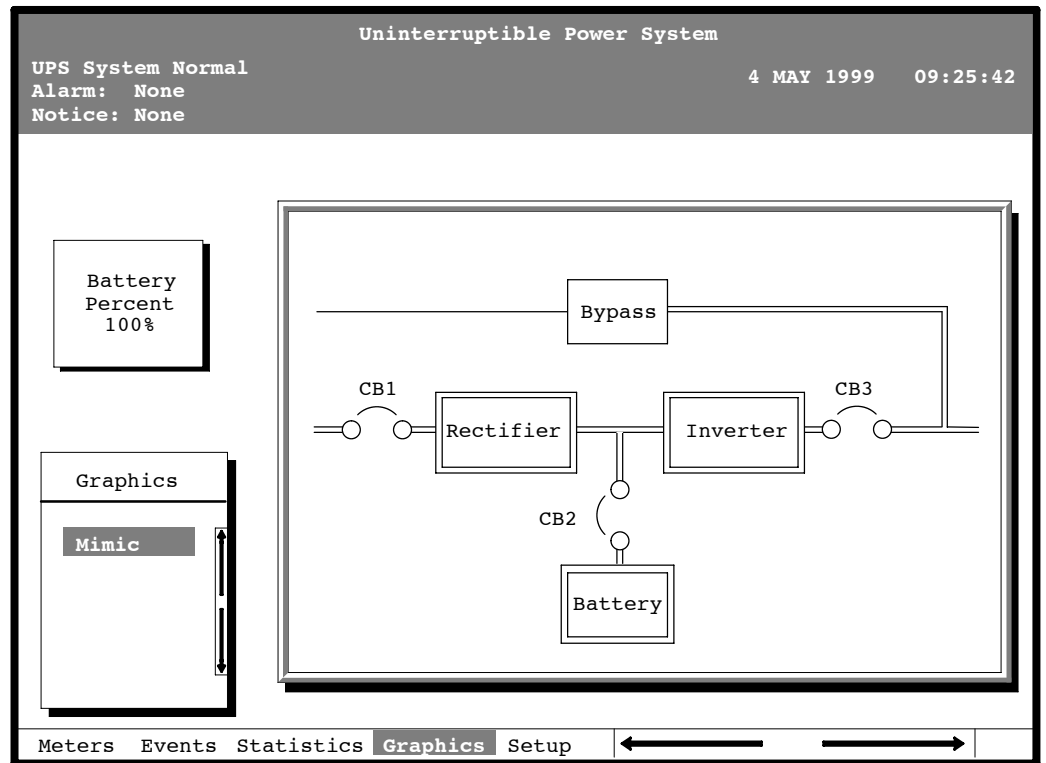


Figure 8-10. Mimic Screen

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

8.5.8 Time Setup Screen

Select **Time** from the Setup menu to display the Time Setup screen. The Time Setup screen allows you to set the internal time stamp of the UPS. The time stamp is used for logging events in the Event History Log. Figure 8-11 shows the Time Setup screen.

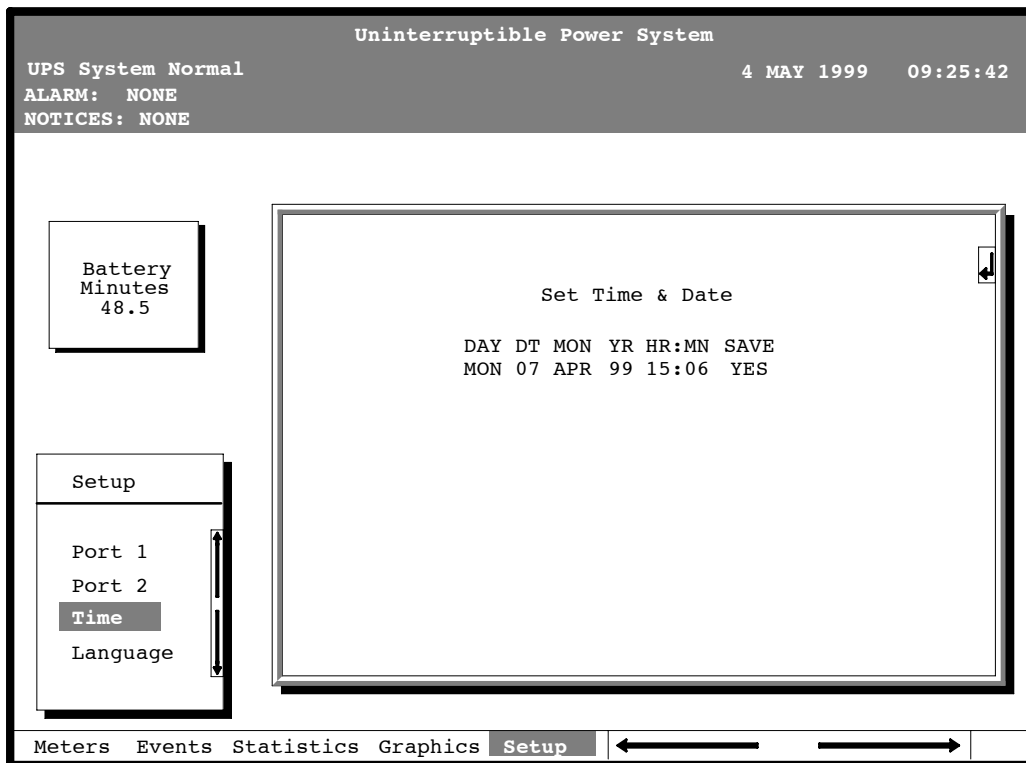


Figure 8-11. Time Setup Screen

A small return arrow (↵) appears in the upper right corner of the information area of the Time Setup screen. This arrow is a reminder that you can press the ↵ pushbutton on the control 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 appears in the information area, you can use the pushbuttons to change the time stamp settings. To change a setting, press the ⬅ and ➡ pushbuttons to highlight the setting you want to change. To increase the setting (make it a higher value), press the ⬆ pushbutton. To decrease the setting (make it a lower value), press the ⬇ pushbutton. To save the settings upon exit from this screen, be sure the Save field is set to YES.

8.5.9 Port Setup Screen

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

Figure 8-12 shows the Setup Serial Port 1 screen.

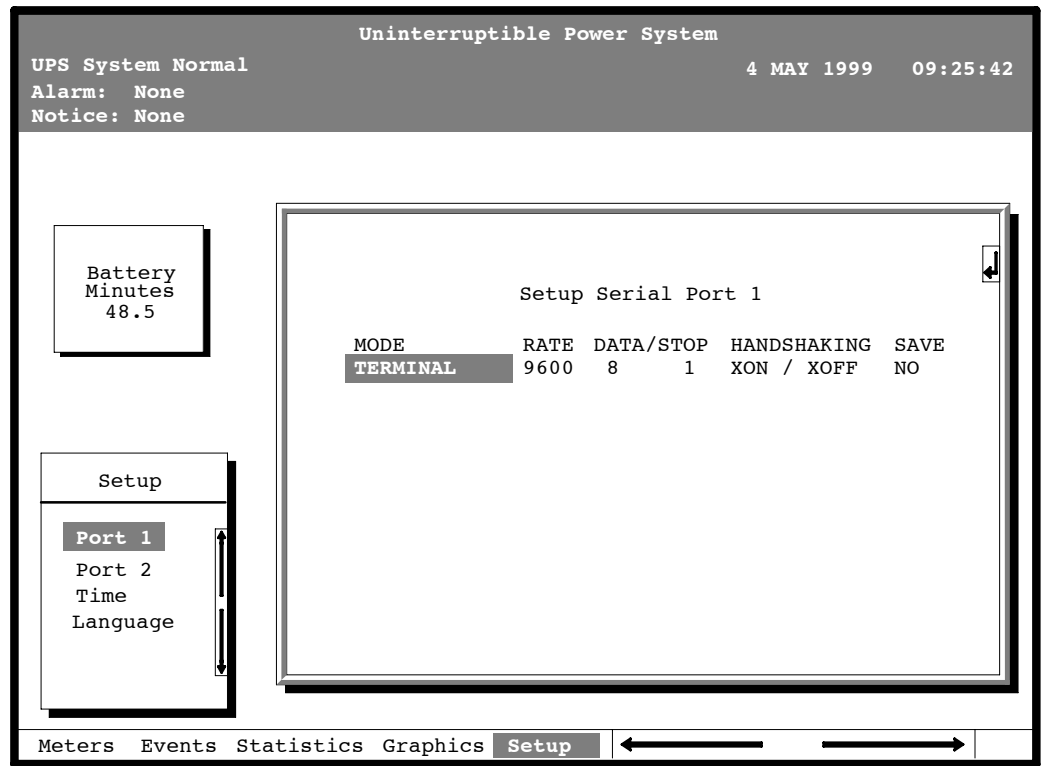


Figure 8-12. Port Setup Screen

A small return arrow (↵) appears in the upper right corner of the information area of the Port Setup screen. This arrow is a reminder that you can press the ↵ pushbutton on the control 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 appears in the information area, you can use the pushbuttons to change the port configuration. To change a setting, press the ⏪ and ⏩ pushbuttons to highlight 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, see Chapter 12, "Communication."

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This chapter describes the UPS controls and instructions for operating the UPS system.



NOTE Before starting the UPS, ensure all installation tasks are complete and an authorized Eaton Customer Service Engineer has performed a preliminary startup. The preliminary startup verifies all electrical interconnections to ensure the installation was successful and the system operates properly.

NOTE The following procedures are applicable for systems with the optional internally installed rectifier input breaker CB1 and inverter output breaker CB3.

NOTE For System Bypass Module (SBM) operation in a multi-module system, refer to the Powerware 9315 Parallel Capacity/Redundant UPS Installation and Operation Manual.

9.1 UPS Controls and Indicators

The controls and indicators identified and described in this section are used to control and monitor UPS operation. Figure 9-1 shows the UPS controls and indicators.

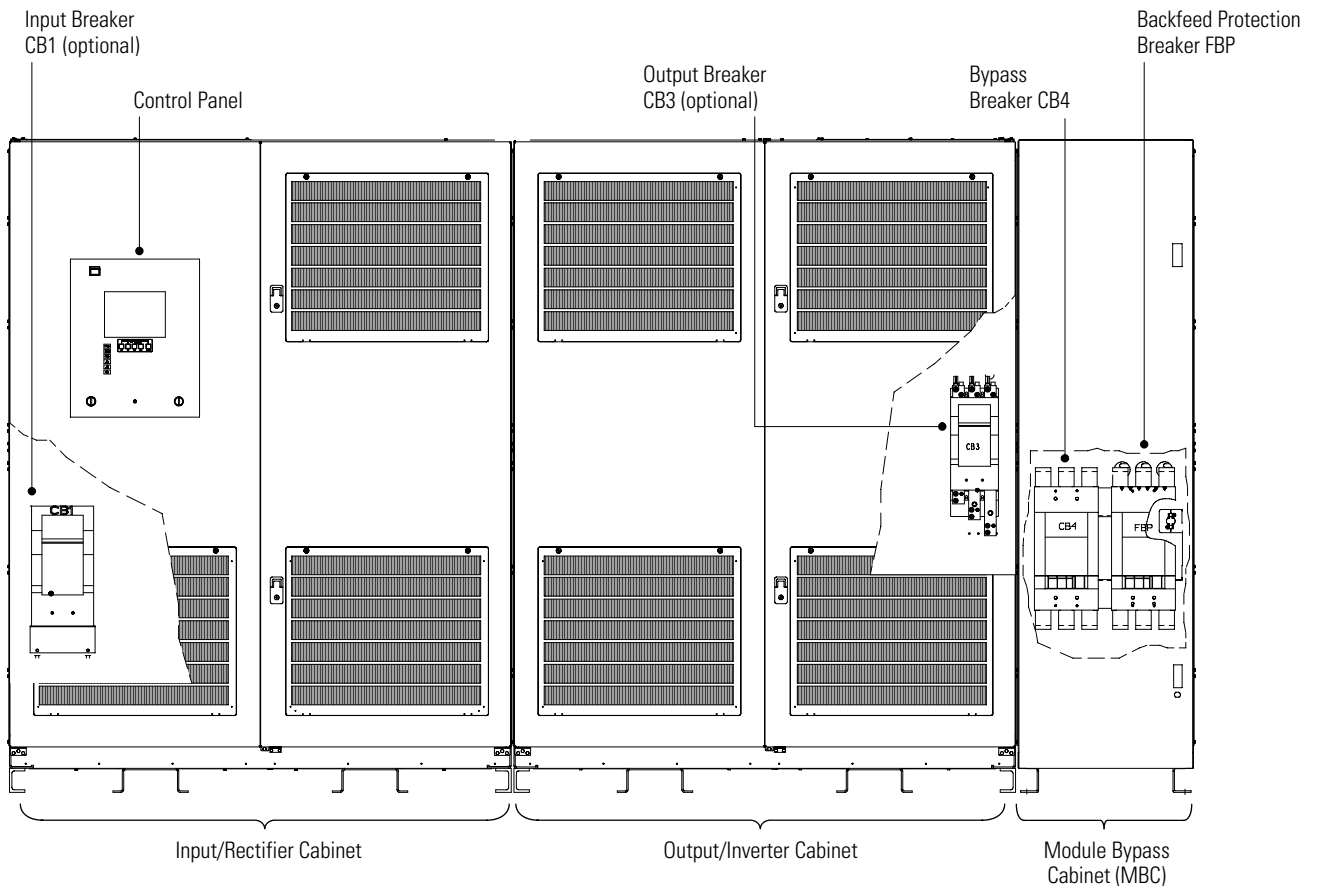


Figure 9-1. UPS Controls and Indicators

9.1.1 Control Panel

The UPS control panel contains an LCD screen to display the current UPS system status. 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 UPS operating mode and alert you to system events.

The control panel is described in Chapter 8, "Using the Control Panel." The Battery switch controls the application of battery power to the UPS. The Mode key switch, also located on this panel, is used to start and stop the system and transfer the load between normal UPS operation and bypass operation. The Emergency UPM Off pushbutton is located at the top of the control panel, and the Push In To Reset button for the Emergency UPM Off is located between the Battery switch and the Mode key switch.

9.1.2 UPS Circuit Breakers

The UPS can contain as many as four circuit breakers:

- UPS Input Breaker (CB1)
- UPS Output Breaker (CB3)
- UPS Bypass Breaker (CB4)
- Backfeed Protection Breaker (FBP)

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

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

Multi-module systems replace the MBC of the UPS with an SBM. Refer to "SBM Circuit Breakers" in the *Powerware 9315 Parallel Capacity/Redundant UPS Installation and Operation Manual*.

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

9.1.3 Emergency UPM Off

An Emergency UPM Off pushbutton is provided for situations where you must instantaneously control the UPS output. The pushbutton is located on the front of the UPS for quick access and is covered with a clear plastic shield to prevent accidental activation. The shield must be raised before pressing the pushbutton. The Emergency UPM Off pushbutton is described in Chapter 9, "UPS Operating Instructions."

9.2 Starting the UPS

To start the UPS system:



NOTE *This procedure assumes Automode is enabled.*

1. Verify that the UPS circuit breakers are set as follows:

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



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

2. Ensure the Push In To Reset pushbutton is pressed in.
3. Close the UPS input feeder circuit breaker.
4. Observe the UPS LCD screen becoming active, indicating logic power.
5. Close the UPS Bypass input feeder circuit breaker. Breakers CB4 and FBP close as soon as charged.

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

6. On the UPS, set the Battery switch to ENABLE.
7. If system is equipped with motor operated breaker CB1, proceed to Step 8; otherwise, proceed to Step 11.
8. On the UPS, turn the Mode key switch to NORMAL for one second.



NOTE *If system is equipped with Inrush Protection Option, the inrush contactor closes before UPS breaker CB1 closes.*

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

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

10. Proceed to Step 13.

11. Close UPS breaker CB1.

The input/rectifier cooling blowers turn on.

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

The rectifier turns on.

13. If system is equipped with motor operated breaker CB2, proceed to Step 14; otherwise, proceed to Step 16.
14. Confirm UPS Battery Breaker CB2 has closed by viewing the breaker position on the LCD Mimic screen.

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

15. Proceed to Step 18.
16. When the UPS Battery Disconnected alarm and notification is received, close UPS Battery Disconnect CB2.
17. On the UPS, turn the Mode key switch to NORMAL for one second.

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

18. The UPS system is now operating in Normal mode.

9.3 Starting the UPS in Bypass Mode

To start the UPS when the inverter output of the UPS is not available and the critical load needs to be energized:

1. Verify that the UPS circuit breakers are set as follows:

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

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

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

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

9.4 Transferring to Bypass Mode



NOTE In the following step, holding the Mode key switch in the BYPASS position for three seconds transfers the load to Bypass and shuts down the UPS.

To transfer the critical load to Bypass mode:

1. On the UPS, turn the Mode key switch to BYPASS for one second.
2. Confirm UPS breaker CB4 closes and UPS breaker CB3 opens.

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

3. On the UPS LCD screen, verify that the **On Bypass** message appears and the Bypass Mode indicator illuminates on the control panel. The UPS system is now on bypass and UPS power processor remains on.



WARNING

Power is present inside Input/Rectifier and Output/Inverter cabinets.

9.5 Transferring to Normal Mode

To transfer the critical load to Normal mode:

1. On the UPS, turn the Mode key switch to NORMAL for one second.
2. Confirm UPS breaker CB3 closes and UPS breaker CB4 opens.

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

3. On the UPS LCD screen, verify that the **Normal** message appears and the Normal Mode indicator illuminates on the control panel. The UPS system is now in Normal mode.

9.6 Transferring to Bypass and Shutting Down the UPS

To transfer the critical load to Bypass mode and shut down the UPS:

1. On the UPS, turn the Mode key switch to BYPASS for one second.
2. Confirm UPS breaker CB4 closes and UPS breaker CB3 opens.

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

3. On the UPS LCD screen, verify that the **On Bypass** message appears and the BYPASS Mode indicator illuminates on the control panel. The UPS system is now on bypass.
4. On the UPS, turn the Mode key switch to BYPASS for one second.
5. Observe that UPS breaker CB1 and Battery Disconnect CB2 open.

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

WARNING



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

9.7 Shutting Down the UPS and Critical Load

To perform maintenance or service on the critical load, shut down power to the load:

1. Transfer the critical load to bypass by performing the procedure in paragraph 9.4.
2. Turn off all equipment that is being powered by the UPS.
3. Press the Emergency UPM Off pushbutton on the control panel.

WARNING



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

4. Open the UPS input feeder circuit breaker.

9.8 Using the UPS Emergency UPM Off Pushbutton

Initiate a UPS Emergency UPM Off using the covered, red Emergency UPM Off pushbutton on the UPS control panel. This pushbutton is protected by a clear plastic shield to prevent accidental activation. In an emergency, you can press this pushbutton to instantaneously control the UPS output. The UPS Emergency UPM Off pushbutton functions differently, depending on the Emergency Power-off option specified when ordered. The options available are as follows:

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

The UPS (including Bypass) remains locked off until you reset the Emergency UPM Off pushbutton.

To restart the UPS after pressing the Emergency UPM Off pushbutton, follow the procedure in paragraph 9.8.2, “Resetting the UPS System after an Emergency UPM Off,” before starting the system.



NOTE The remote emergency power-off (REPO) option functions the same way as the Emergency UPM Off pushbutton on the UPS control panel.

9.8.1 Using the UPS Emergency UPM Off Pushbutton

1. Raise the clear plastic shield covering the red UPS Emergency UPM Off pushbutton on the UPS control panel.
2. Press the Emergency UPM Off pushbutton.

The breakers open (you can hear them opening) and the Push In To Reset pushbutton on the UPS control panel pops out.

9.8.2 Resetting the UPS System after an Emergency UPM Off

CAUTION



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

The Push In To Reset pushbutton is a small white button on the UPS control panel. The Push In To Reset pushbutton pops out when the Emergency UPM Off pushbutton on the UPS control panel is activated.

To reset the UPS system:

1. Press the Push In To Reset pushbutton until it clicks in and remains recessed.
2. Breakers CB4 and FBP charge and close.
3. Reset tripped circuit breakers on UPS systems with manually controlled CB1 and CB2 breakers.
4. The UPS system is now reset. To restart the UPS system, see “Starting the UPS” on page 9-3.

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Chapter 10

Using Features and Options

The many standard features of your UPS system provide consistent, economical, and dependable power protection. In addition, you can add available options to enhance the performance of your system. This chapter provides descriptions of some of the features and options introduced earlier in this manual. For the customer interface panel and terminal locations and for terminal wiring information, see:

- Paragraph A.3 starting on page A-12
- Paragraph A.4 starting on page A-22
- Paragraph A.5 starting on page A-28

10.1 Building Alarm Monitoring

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

Regardless of how you assign the building alarms, the default is to display the alarms as Building Alarm 1, Building Alarm 2, Building Alarm 3, and so on, on the UPS control panel. Use twisted-pair wires for each alarm input and common.

10.2 General Purpose Relay Contacts

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

You can specify that each contact be either normally-closed (NC) or normally-open (NO). If the state of the contact changes from the state you specify as normal, 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 UPS. This feature is useful if the UPS is located in a remote area where the UPS horn may not be heard immediately.



CAUTION

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

10.3 Optional Remote Monitor Panel

The optional Remote Monitor Panel (RMP) monitors the UPS system operating status and alarm condition from virtually any location within your facility, up to 152.4m (500 ft) from the UPS. You can flush-mount or surface-mount an RMP on a desktop, wall, or wherever you have a serial interface line. Figure 10-1 shows an RMP.

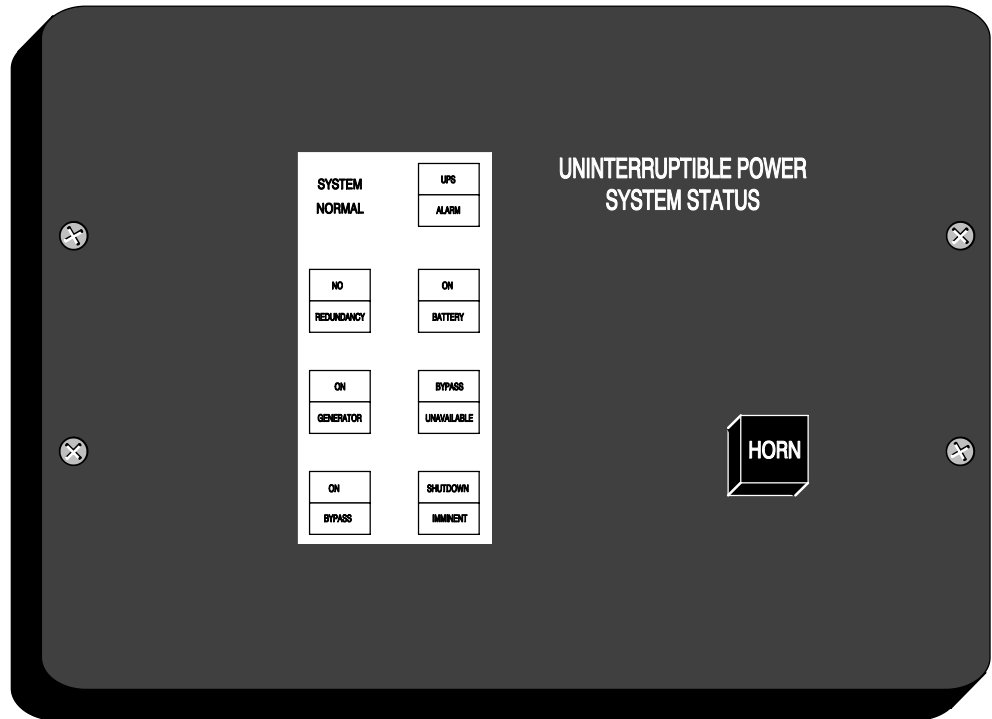


Figure 10-1. RMP

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 indicators and horn on the UPS.

ON BATTERY

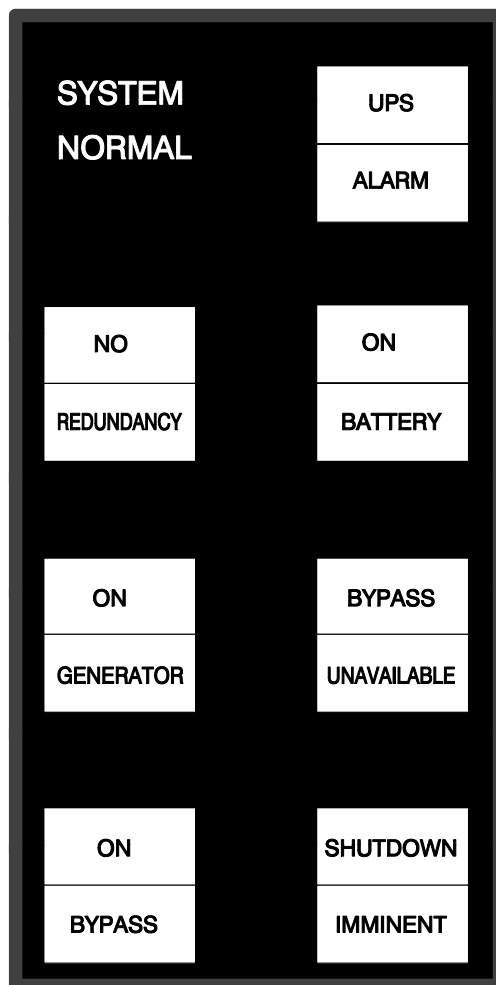
The UPS battery backup is supplying the critical load. The utility power is either interrupted or out of specification. The SYSTEM NORMAL indicator is also lit.

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 indicator is accompanied by a horn.



10.4 Optional Relay Interface Module

The optional Relay Interface Module (RIM) uses relay contact closures to indicate the operating status and alarm condition of the Parallel Capacity/Redundant system. Figure 10-2 shows the RIM with its four 15-pin connectors labeled J1 through J4.

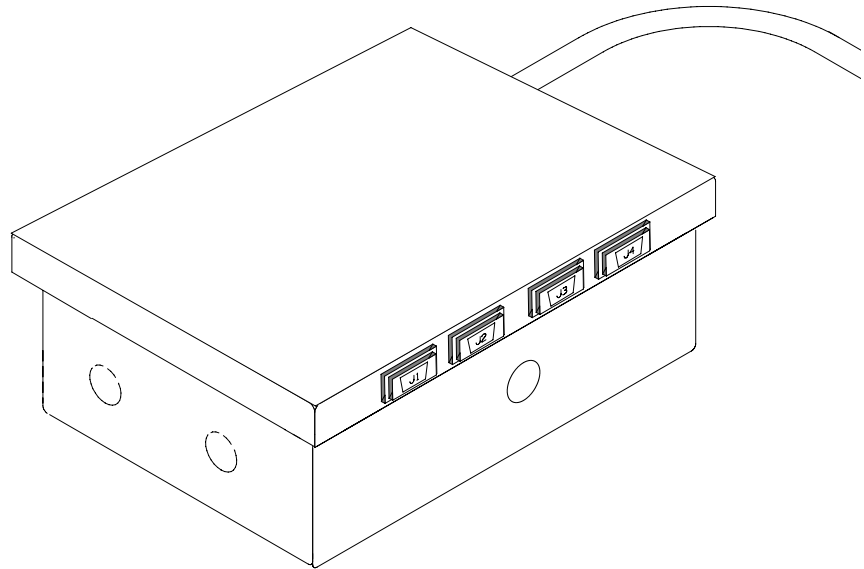


Figure 10-2. RIM

The RIM can provide the following 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.
BATTERY WEAK	Pins 5 and 14	Contacts are closed when approximately two minutes of battery time is remaining, before the critical load is lost.
UTILITY FAILURE	Pins 6 and 15	Contacts are closed when Utility Failure is detected.

10.5 Optional 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. Figure 10-3 shows the SCM, input connections on TB1, and output connections on TB2.

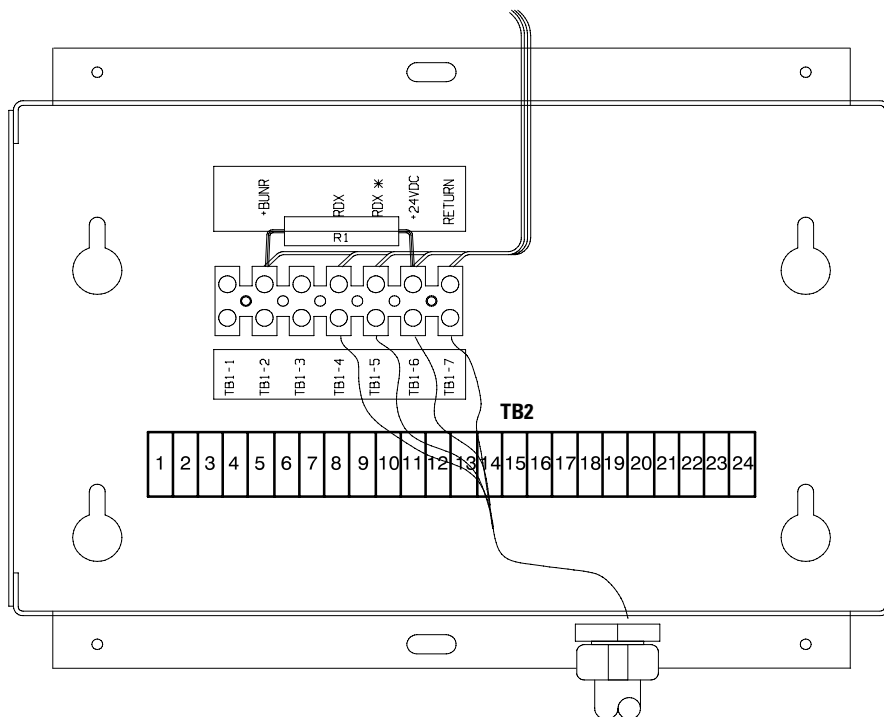


Figure 10-3. SCM

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

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Chapter 11

Responding to System Events

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

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

11.1 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 half-second intervals.
- When a notice occurs, the horn beeps at two-second intervals.

11.2 System Event Indicators

The status indicators on the UPS control panel work in conjunction with the horn to let you know when the UPS system is operating in any mode other than Normal mode. Only the Normal indicator is illuminated during normal UPS system operation. The others illuminate to indicate alarms or events. When an alarm occurs, first check these indicators to see what type of event has taken place. For descriptions of the status indicators, see paragraph 8.4 on page 8-4.

11.3 System Event Messages

When a system event occurs, a message is added to the Event History Log. A message may also appear on the UPS control panel. The Event History Log contains all system event messages, whether or not they were displayed on the control panel.

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Chapter 12

Communication

This chapter describes the communication features of the Powerware 9315 UPS and provides information about connecting hardware, configuring the ports, changing settings, and changing modes.

12.1 Locating the Customer Interface Panel

The customer interface panel inside the UPS contains:

- Two serial communication 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.
- A 120 Vac, 0.2A convenience outlet for powering a modem used for remote notification.
- An X-Slot communication bay for installing an optional X-Slot card.

See Appendix A for the UPS customer interface panel location.

12.2 Connecting Equipment to a Serial Port

The UPS serial communication ports are designed to accept a wide variety of data communication equipment (DCE), such as terminals, printers, and computers. Use an appropriate cable for the type of equipment you are connecting to the UPS. Cables should be no longer than 16m (50 ft) and have a male connector.

Port 1 cable pins are identified in Figure 12-1 and the pin functions are described in Table 12-1. Port 2 cable pins are identified in Figure 12-2 and the pin functions are described in Table 12-2.

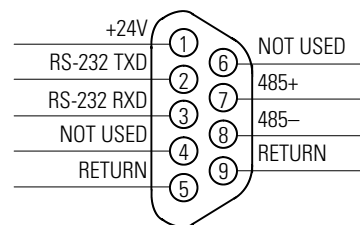


Figure 12-1. Port 1 (DB-9)

Table 12-1. Pin Assignments for Port 1 (DB-9)

Pin Number	Symbol	Function	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+	RS-485 + Data	
8	485-	RS-485 - Data	
9	RTN	Return	

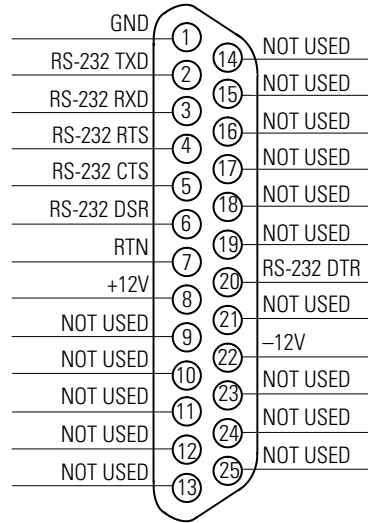


Figure 12-2. Port 2 (DB-25)

Table 12-2. Pin Assignments for Port 2 (DB-25)

Pin Number	Symbol	Function	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.

12.3 Configuring the Serial Ports

Configure the communication port using the LCD screen and pushbuttons on the UPS control 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 12-3 shows the Setup Serial Port 1 screen.

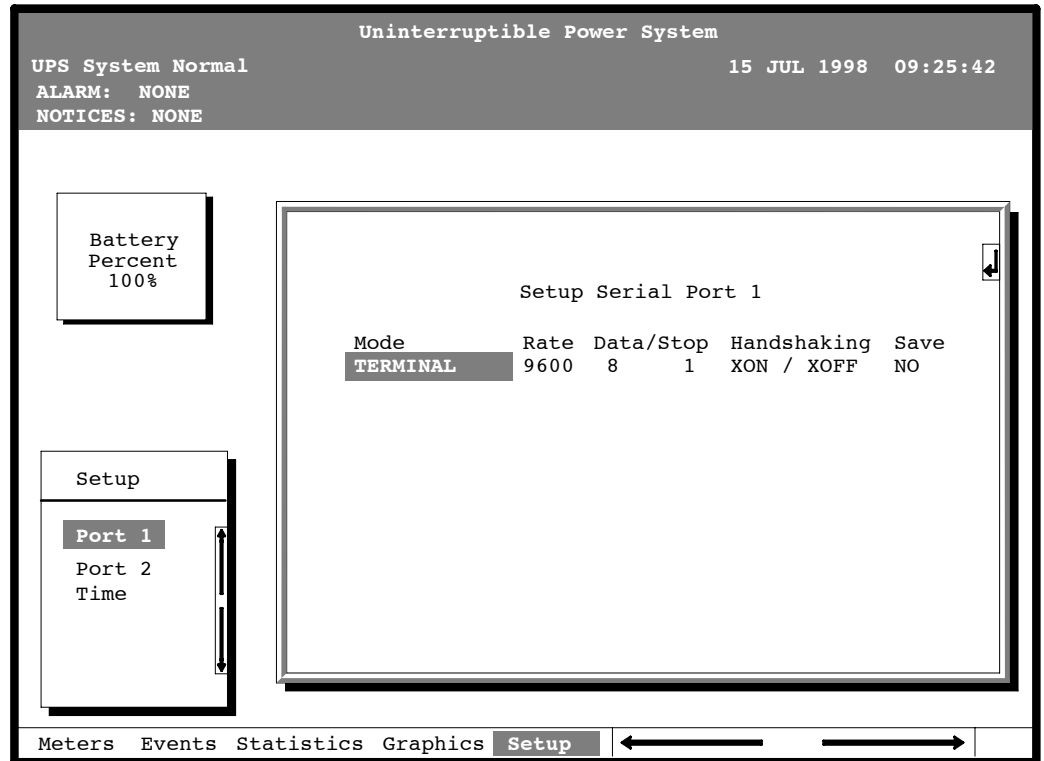


Figure 12-3. Setup Serial Port 1 Screen

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 control 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 12-3 shows which options are available for each port. The sections that follow describe the configuration settings you can change.

Table 12-3. Options Available for Each Communication Port

Port 1	Port 2	Options
X	X	Terminal Mode
X	X	System Configuration Mode
	X	Calibration Mode
	X	Computer Mode
X		Remote Monitor Mode
X	X	Baud rate of 300, 1200, 2400, 4800, 9600, or 19200
X	X	Data size/stop bits of 8/1 or 8/2
	X	Data size/stop bits of 7/1 or 7/2
X	X	Disabled handshaking
X	X	XON/XOFF handshaking

12.3.1 Modes

Each communication port operates in one of the following modes:

- **Terminal Mode** – System events are logged immediately as they occur.
- **System Configuration Mode** – Allows you to set building alarms, battery tests, and other UPS functions. (Check with your sales or service representative for availability.)
- **Calibration Mode** – Used only by service personnel; available for Port 2 only.
- **Computer Mode** – Provides an Eaton proprietary Binary Computer Mode (BCM) Interface facility monitoring or network communication via a Powerware .ConnectUPS Card. Available for Port 2 only.
- **Remote Monitor Mode** – 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.

12.3.2 Rate

The baud rate determines the speed of data transferred between the UPS and the connected equipment. For Remote Monitor mode, the baud rate must be set to 300. All other modes should operate at the highest baud rate available with the connected equipment.

You can select a baud rate of 300, 1200, 2400, 4800, 9600, or 19200.



NOTE 300 baud is not recommended for any mode except Remote Monitor.

12.3.3 Data/Stop

The data size and stop bits of the equipment connected to this port 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, set your equipment to *NO PARITY*.

12.3.4 Handshaking

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

- **XON/XOFF** – If handshaking is enabled, the UPS uses special characters (XON and XOFF) to handshake with the host terminal. The XON character is defined to be ASCII value 11 hex, and the XOFF character is defined to be ASCII value 13 hex. Upon reception of an XOFF command, the UPS halts transmission until an XON command is received. In the same way, if the terminal receives an XOFF command, the UPS expects the terminal to halt transmission until the UPS sends an XON command.
- **Disabled (No Handshaking)** – If handshaking is disabled, the UPS transmits and receives data via the serial port, ignoring all inputs from handshaking lines.

12.3.5 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.

12.3.6 Default Settings

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

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

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

12.4 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 Event History 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>
```

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

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

12.4.1 Printing Selected Information



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

If a port is operating in Terminal mode and is connected to a computer, use the following key combinations at any time to print 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

12.4.2 Entire Log [Ctrl]+[P]

The [Ctrl]+[P] key sequence prints the entire UPS Event History Log 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. Figure 12-4 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 12-4. Event History Log

12.4.3 Meters Printout [Ctrl]+[M]

The [Ctrl]+[M] key sequence prints the current readings of the UPS system meters. The Input area shows the phase-to-phase voltage, frequency, and phase current of the incoming utility, followed by the kVA, kW, and power factor measurements. The output area shows the same information for the power being output by the UPS. The Bypass area shows the phase-to-phase voltage of the bypass source. The Battery area displays the DC voltage (V) and the DC current (I). Figure 12-5 shows a sample System 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 12-5. System Meters Screen

12.4.4 System Information Printout [Ctrl]+[A]

The [Ctrl]+[A] key sequence prints a listing of all available serial data. This printout contains the information shown on the Event History Log and System Meters screens of the UPS (see Figure 12-4 and Figure 12-5).

12.5 System Configuration Mode

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

12.5.1 System Configuration Mode Main Menu

When the System Configuration mode is selected with a terminal attached, you are 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 is 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:

12.5.2 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:

12.5.3 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, 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 **1**, **2**, or **3** from this menu, the following menu is 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 text 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 is 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 text 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.

12.5.4 Customize Alarm Messages

If Customize Alarm Message (option **2**) is selected from the Program Building Alarms 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 is 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 the building alarm. 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 is displayed:

Enter E to Enable Custom Message

Enter D to Disable Custom Message

Enter <CR> for No Change

Enter Selection:

If **E** is entered at the prompt, the custom messages are used for the building alarm. If **D** is entered, the default messages are used for the building alarm.

12.5.5 Program Unit Name

If Program Unit Name (option **2**) is selected from the Main menu (see page 12-9), the following is displayed:

Program Unit Name

Unit Name:

Enter New Name or <CR> No Change:



NOTE *The Unit Name is 45 characters maximum, including spaces and punctuation.*

NOTE *If the user wants to center the text portion of the name, the appropriate number of leading spaces should be included when entered.*

The current Unit Name is displayed. This name is displayed on the second line of the display and in the headers of printouts from Terminal mode. If a change is desired, the new Unit Name should be entered at the prompt.

12.5.6 Change Password

If Change Password (option **4**) is selected from the Main menu (see page 12-9), the following menu is displayed:

Change Password

Enter New Password:

Verify New Password:

<CR> to return with no change.



NOTE *The password must be six characters in length.*

The password is changed if the user enters and verifies a new password.

12.5.7 Battery Test Setup

If Battery Test Setup (option **5**) is selected from the Main menu (see page 12-9), the following menu is displayed:



NOTE If a message stating "Battery Test Requires Calibration" appears, please notify your Eaton 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 battery tests, review scheduled battery tests, or cancel pending battery tests. If you select **1**, **2**, or **3** from this menu, the following menu is displayed:

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):

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



NOTE Follow each entry with a carriage return <CR>.

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

If **4** is selected from the Battery Test Setup menu, you are 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 **5** is selected from the Battery Test Setup menu when a Battery Test is scheduled, the following is displayed:

Next Battery Test Scheduled

WK DAY MON HR:MN

4 FRI MAR 15:34

Enter <CR> to return to Battery Test Setup Menu

If **5** is selected from the Battery Test Setup menu when a Battery Test is not scheduled, the following is 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.

12.5.8 Modify Low Battery Time

If Modify Low Battery Time (option **6**) is selected from the Main menu (see page 12-9), the following menu is displayed:

```
Modify Low Battery Time
Low Battery Time (Minutes): 004
Enter New Low Battery Time:
<CR> to return with no change.
```



NOTE *Low Battery Time should be no greater than 999.*

To change the Low Battery Time warning level, enter a new time.

12.6 Calibration Mode

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



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

12.7 Computer Mode

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

12.8 Remote Monitor Mode

Remote Monitor mode provides the interface for the RMP, RIM, or SCM described earlier. Port 1 operates by default in Remote Monitor mode.

12.9 eNotify Service

The Powerware 9315 UPS supports Eaton's eNotify Remote Monitoring and Diagnostic Service. The eNotify Service is included at no charge during the first year of operation (warranty period), and also with the purchase of an Eaton PowerTrust™ Support Agreement after the initial warranty expires. eNotify and support agreement availability or specific features may vary by market; for more information, refer to: www.powerware.com/enotify/.

12.9.1 eNotify Service Features

The eNotify Service provides proactive monitoring and a monthly report detailing the ongoing health of your Powerware 9315 UPS:

- Proactive monitoring, called Anomaly Detection, automatically analyzes the status of the Powerware 9315 UPS on a daily basis. All data gathered from the unit, current and historical, is analyzed at the Customer Reliability Center (CRC) for trending issues. A set of factors, or rules, compared against your UPS's data can indicate a potential impending failure and trigger an appropriate anomaly notification to a CRC Analyst. Critical events are checked for additional anomalies. Through this service, the CRC can take pre-emptive, corrective action to ensure the highest level of availability of your Powerware 9315 UPS.
- The Customer Monitoring Report delivers information about Eaton's analysis of your Powerware 9315 UPS on a monthly basis. Depending on the model, the report provides detailed information about voltages, loads, external factors such as temperature and humidity, the attached batteries, and system availability. All of these factors contribute to the Relative Health Index (RHI) score that allows you to compare your unit's health relative to Eaton's optimum Powerware UPS operating levels.

12.9.2 Installing eNotify Service

A quick start guide and self-installation wizard tool are available on both the Software Suite CD included with the Powerware 9315 UPS documentation and on the Web at: www.powerware.com/enotify/. For the latest updates, installation tips, and information on connecting eNotify, visit the eNotify Web page. For installation support or questions about the eNotify Service, contact crctriagegroup@eaton.com.

The eNotify Service relies on a ConnectUPS-X Web/SNMP Card (or Power Xpert® card) installed with the UPS sending one-way status and event e-mails to Powerware Remote Monitoring servers that analyze and store the data. Those servers also take the appropriate actions of sending notifications and reports. The ConnectUPS Card gathers information from the UPS directly and from any external sensors that are attached. The card also records all events that are generated by the UPS. This data is stored within the non-volatile memory logs on the ConnectUPS Card.

The eNotify Service runs on common protocols and transport mechanisms, making the connectivity between the Powerware 9315 UPS and the Powerware Remote Monitoring servers easy to set up. By using common e-mail transport mechanism, you do not have to open your network to proprietary or potentially unsecure protocols and transports.

12.10 Remote Notification

For connection and setup of a modem, or to enable Remote Notify and Call Home features within the UPS, please contact Eaton (see page 1-7).

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

- Call a remote terminal or pager based on programmable events and alarms
- Four separate, programmable notification groups (phone numbers)
- Automatic answering (user-configurable) for access to the Terminal mode of the UPS
- Remote and local ability to clear Call Out alarms and events
- Error detection and correction for misconfigured and disconnected modems.

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

Remote Notification is an extension of the Terminal mode with the additional support algorithms necessary to control an external modem. Connection to the UPS is made when a user calls the UPS on the phone. The user has exactly the same capabilities as if using a terminal connected directly to an RS-232 port.

Remote Notification differs from the basic Terminal mode with the addition the following functions:

- **Call Answer** – The Call Answer function allows the user to call into the UPS from a remote location and enter Terminal mode.
- **Call Out** – The Call Out function allows the UPS to be configured to call either a remote computer or numeric paging service over the phone line. Call Out allows the UPS to call a remote computer and leave a one-line descriptive message of the alarm or notice condition. Numeric paging support allows the UPS to call a paging service and send numeric messages.
- **Housekeeping** – The Housekeeping function maintains the link between the UPS and modem.

12.11 X-Slot Cards

The Powerware 9315 UPS has one factory-installed X-Slot communication bay. See Figure A-13 on page A-23 for the bay location. The UPS is compatible with the following X-Slot cards (see Figure 12-6):



NOTE Only one of the following cards can be installed in the X-Slot at a time.

- **Power Xpert Gateway Card** - provides a data gateway from the UPS to the Power Xpert Software; provides remote monitoring through a Web browser interface, e-mail, and a network management system using SNMP; connects to a twisted-pair Ethernet (10/100BaseT) network. Modbus TCP support provides direct integration of the UPS's parameters to a Building Management System (BMS). It has a built-in switching hub that allows a second network device to be connected to the network without the requirement of an additional network drop.
- **ConnectUPS-X Web/SNMP Card** - has SNMP and HTTP capabilities as well as monitoring through a Web browser interface; connects to a twisted-pair Ethernet (10/100BaseT) network. It has a built-in switching hub that allows three additional network devices to be connected to the network without the requirement of additional network drops. In addition, a Powerware Environmental Monitoring Probe (EMP) can be attached to obtain humidity, temperature, smoke alarm, and security information.
- **Relay Interface Card (AS/400)** - has isolated dry contact (Form-C) relay outputs for UPS status: Utility failure, Low battery, UPS alarm/OK, or On bypass when interfacing with IBM® AS/400 computers, other relay connected computers, and industrial applications.
- **Modbus Card** - provides direct integration of UPS information (meters and status) to a BMS using the Modbus RTU protocol.
- **Multi-Server Card** - has six serial communication ports that can communicate simultaneously with other computers using Powerware LanSafe® Power Management Software (provided on the Software Suite CD).
- **Modem Card** - provides out-of-band remote notification and monitoring using modem communication directly to cell phones and pagers.
- **Single-Port Card** - provides serial communication.

LAN and telephone drops for use with X-Slot cards must be provided by facility planners or the customer.

For installation and setup of an X-Slot card, please contact Eaton (see page 1-7). Refer to the manual supplied with the X-Slot card for user instructions.

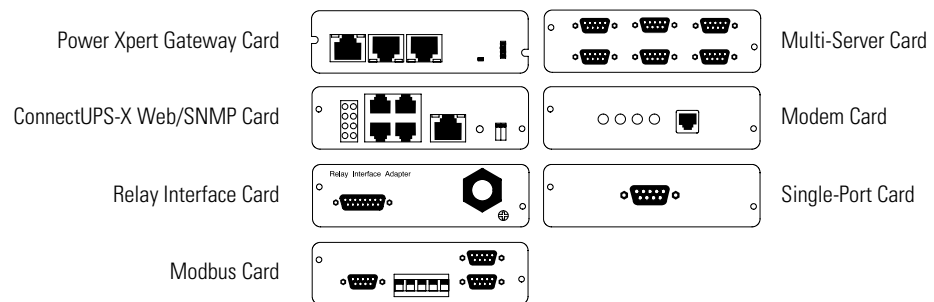


Figure 12-6. Optional X-Slot Cards

Chapter 13

Maintaining the UPS System

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

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

13.1 Important Safety Instructions

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

DANGER



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

WARNING



- Servicing and maintenance should be performed by qualified service personnel only.
- **LETHAL VOLTAGE PRESENT. DO NOT** operate with the cabinet doors open or safety shields removed. Do not make any assumptions about the electrical state of any cabinet in the UPS system.
- See "Safety Warnings" on page 1-5.

Since each battery string is an energy source in itself, opening the Battery Circuit Breaker does not de-energize the voltage within the battery string. **DO NOT ATTEMPT TO ACCESS ANY INTERNAL AREA OF THE BATTERY STRING YOURSELF. VOLTAGES ARE ALWAYS PRESENT IN THE BATTERY STRING.**

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

13.2 Performing Preventive Maintenance

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



13.2.1 Daily Maintenance

Perform the following steps daily:

1. Check the area surrounding the UPS system. Ensure that the area is not cluttered, allowing free access to the unit.
2. Ensure that the air intakes (vents on the front doors) and exhaust opening (on top of the UPS cabinets) are not blocked.
3. Ensure that the operating environment is within the parameters specified in Chapter 14, "Product Specifications," and paragraph A.1 starting on page A-1.
4. Ensure that the UPS is in Normal mode (Normal status indicator is illuminated). If an alarm lamp is illuminated or the Normal status indicators are not illuminated, contact your Eaton service representative.

13.2.2 Monthly Maintenance

Perform the following steps monthly:

1. Ensure all status indicator lamps are operative. (Press the  and  pushbuttons simultaneously to test the lamps.)
2. Monitor system parameters as described in Chapter 8, "Using the Control Panel."
3. The UPS cooling air intake filters (located behind grills on the front doors) are washable. Check the air filters and wash or replace them as necessary. The filter size is 20" x 25" x 1".

To remove filters:

- a. Loosen captive screws at top of filter grill.
 - b. Rotate grill out and down from door.
 - c. Remove and replace filter.
 - d. Close filter grill and secure with captive screws.
4. Record the results of your checks and any corrective actions in a suitable log.

13.2.3 Annual Maintenance

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

13.2.4 Battery Maintenance



NOTE DO NOT DISCONNECT the batteries while the UPS is in Battery mode.

Contact your Eaton service representative for battery maintenance. Battery replacement and maintenance should be performed only by authorized service personnel.

13.3 Recycling the Used Battery or UPS

Contact your local recycling or hazardous waste center for information on proper disposal of the used battery or UPS.

WARNING



- Do not dispose of the battery or batteries in a fire. Batteries may explode. Proper disposal of batteries is required. Refer to your local codes for disposal requirements.
- Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

CAUTION



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

CAUTION



Do not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

13.4 Maintenance Training

A basic training course, available from Eaton, gives you a competent working knowledge of the UPS system operation and teaches you how to perform first level corrective maintenance. For more information about training and other services, contact the Eaton Help Desk for Powerware products (see page 1-7).

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Chapter 14

Product Specifications

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

14.1 Model Numbers

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

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

14.2 UPS System Input

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

14.3 UPS System Output

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

14.4 Environmental Specifications

Operating Temperature	0 to 40°C (32–104°F) without derating. The recommended operating temperature is 25°C (77°F).
Operating Altitude	Maximum 1500m (5000 ft) at 40°C without derating
Storage Temperature	-20 to +70°C (prolonged storage above 40°C will cause rapid battery self-discharge)
Relative Humidity (Operating and Storage)	95% maximum noncondensing
Acoustical Noise	75 dBA at a 1m distance
Electrostatic Discharge (ESD) Immunity	Meets IEC 801-2 specifications.

Limited Factory Warranty

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 startup or eighteen (18) months from the date of Product shipment, whichever occurs first, for parts coverage and 90 days from the date of Product startup 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 startup 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 user’s guide, 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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Appendix A

Installation Reference

The information in this appendix will help you plan for and install the Powerware 9315. This appendix contains the following information:

- Physical features and requirements, including dimensions
- UPS system online configurations
- Power wiring installation notes
- Location of UPS terminals, including the Inverter/Rectifier, Output/Inverter, and Module Bypass Cabinets (MBCs)
- Customer interface wiring notes
- Typical remote emergency power-off (REPO)
- Remote Monitor Panel (RMP) dimensions
- Relay Interface Module (RIM) dimensions
- Supervisory Contact Module (SCM) dimensions
- Battery disconnect switch dimensions

A.1 Physical Features and Requirements

1. The UPS equipment operating environment must meet the size and weight requirements shown in Table A, according to your UPS system configuration.
2. In the UPS system, the UPS, Input/Rectifier, Output/Inverter, and MBC or System Bypass Module (SBM) are palletted separately for shipping.
3. Do not tilt the UPS or optional cabinets more than 10° from vertical or the cabinet may tip over.
4. Dimensions are in millimeters [inches].

Table A. Equipment Weight

Powerware 9315 Component	Weight kg (lb)	
	Shipping	Installed
Power Control Module (PCM) 1 (Input/Rectifier)	2818 (6200)	2682 (5900)
PCM 2 (Output/Inverter)	2909 (6400)	2773 (6100)
PCM 3 (MBC)	272.7 (600)	250 (550)

5. The clearances required around the UPS cabinet are shown in Table B.

Table B. UPS Cabinet Clearances

From the Top of the Cabinet	Minimum clearance over the UPS cabinet is 30.5 cm (12")
From the Front of the Cabinet	91.4 cm (36") working space

6. The basic environmental requirements for UPS system operation 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 UPS ventilation requirements are shown in Table C.

Table C. Air Conditioning or Ventilation Requirements During Full Load Operation

Rating	Input/Output Voltage	Heat Rejection BTU/hr × 1000/hr (kg-cal/hr)	Ventilation Required for Cooling Air Exhaust
500 kVA	400/400	109 (27.5)	1420 liter/sec (3000 cfm)
625 kVA	400/400	130.8 (33)	
625 kVA	480/480, 600/600	109 (27.5)	
750 kVA	480/480, 600/600	130.8 (33)	

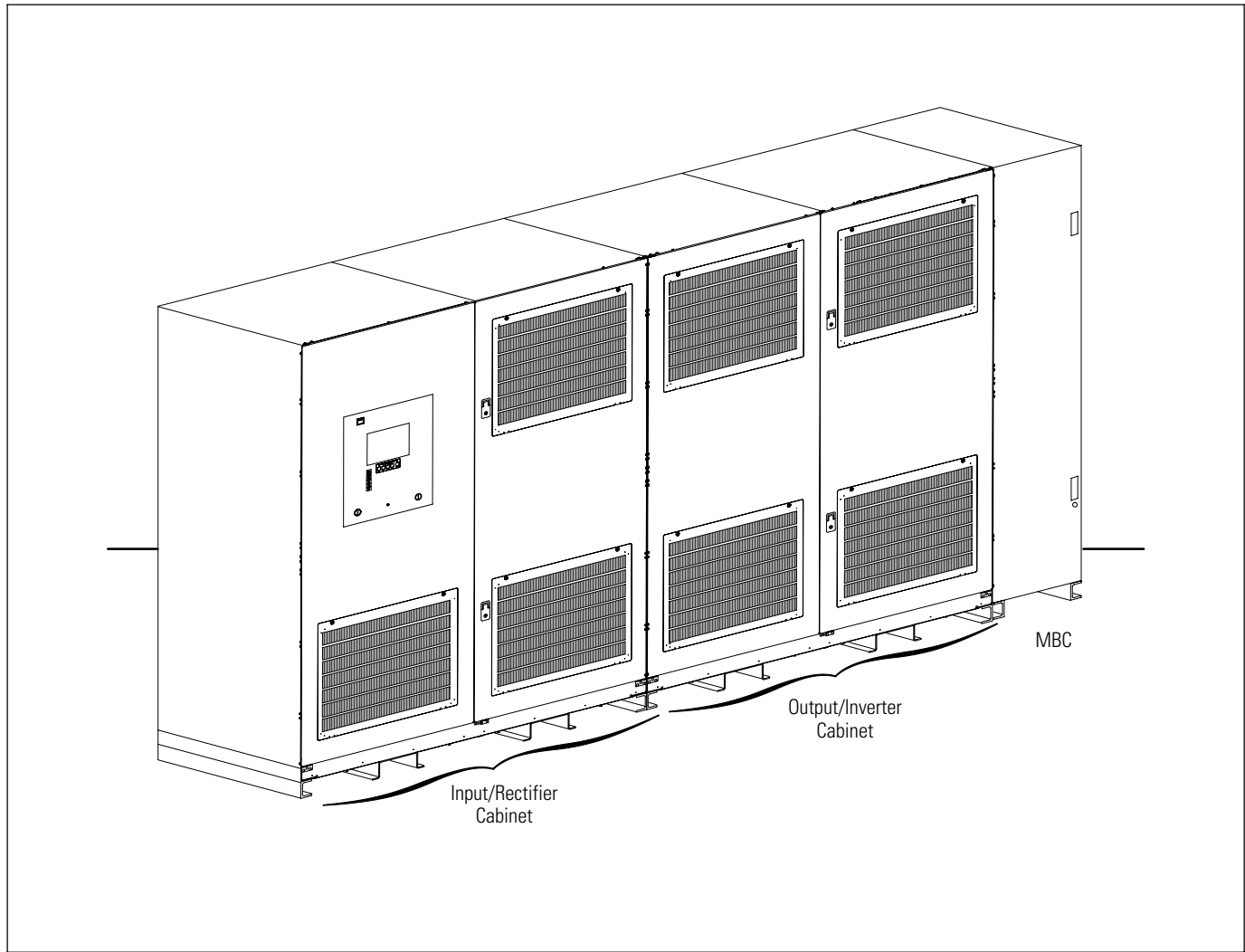


Figure A-1. Typical Powerware 9315 (500–750 kVA) UPS System

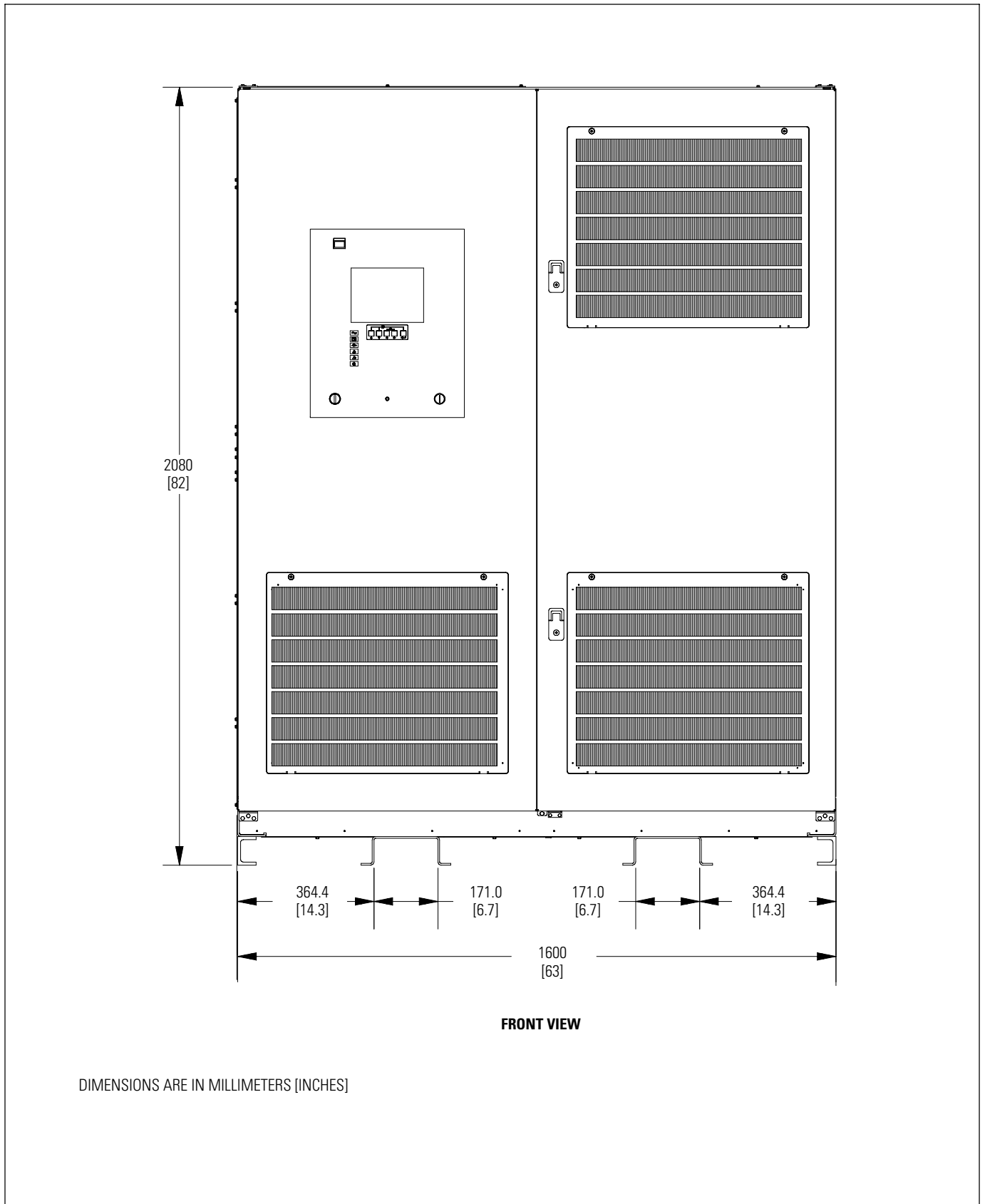


Figure A-2. Inverter/Rectifier Cabinet – PCM 1 Dimensions

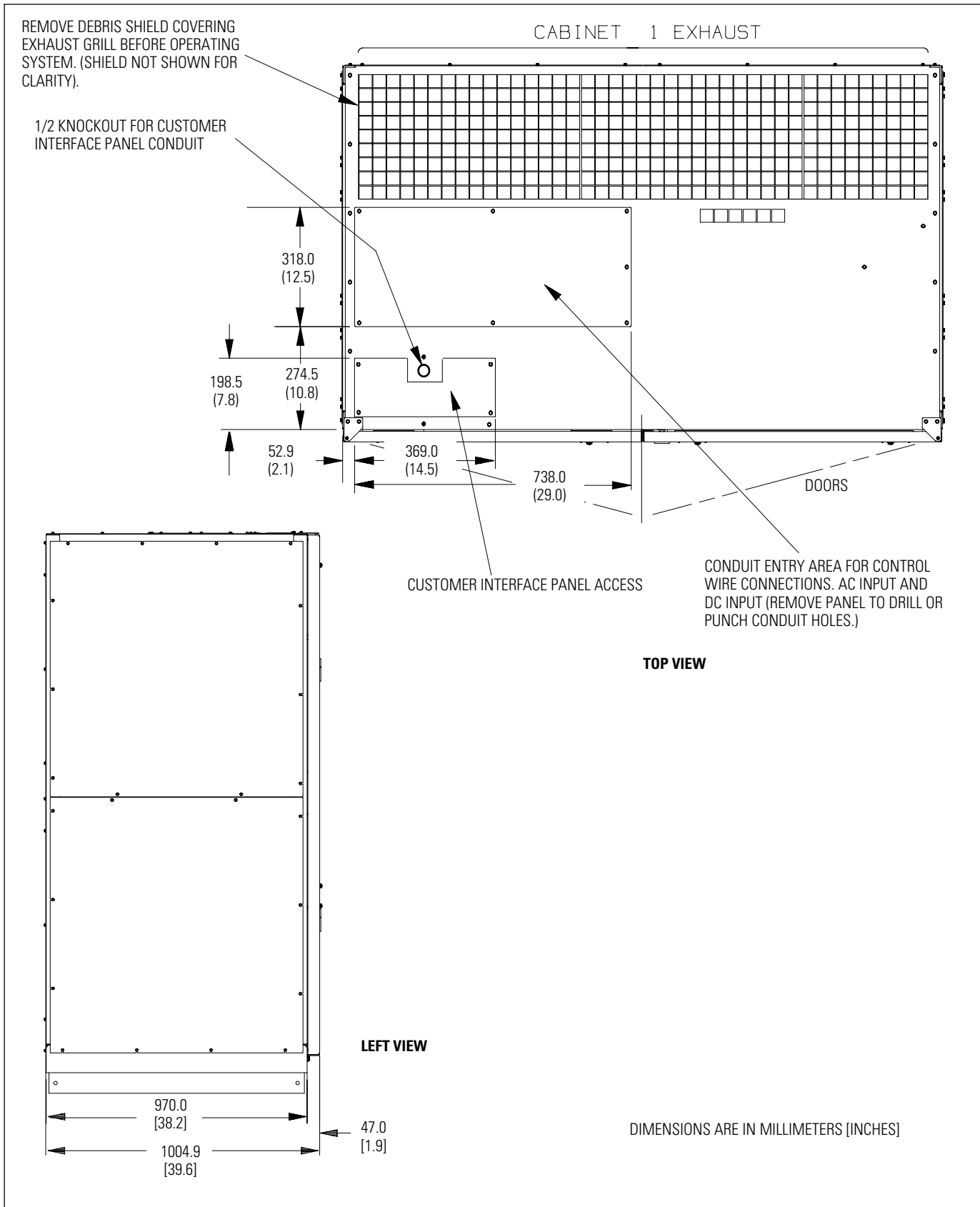


Figure A-3. Inverter/Rectifier Cabinet – PCM 1 Dimensions (continued)

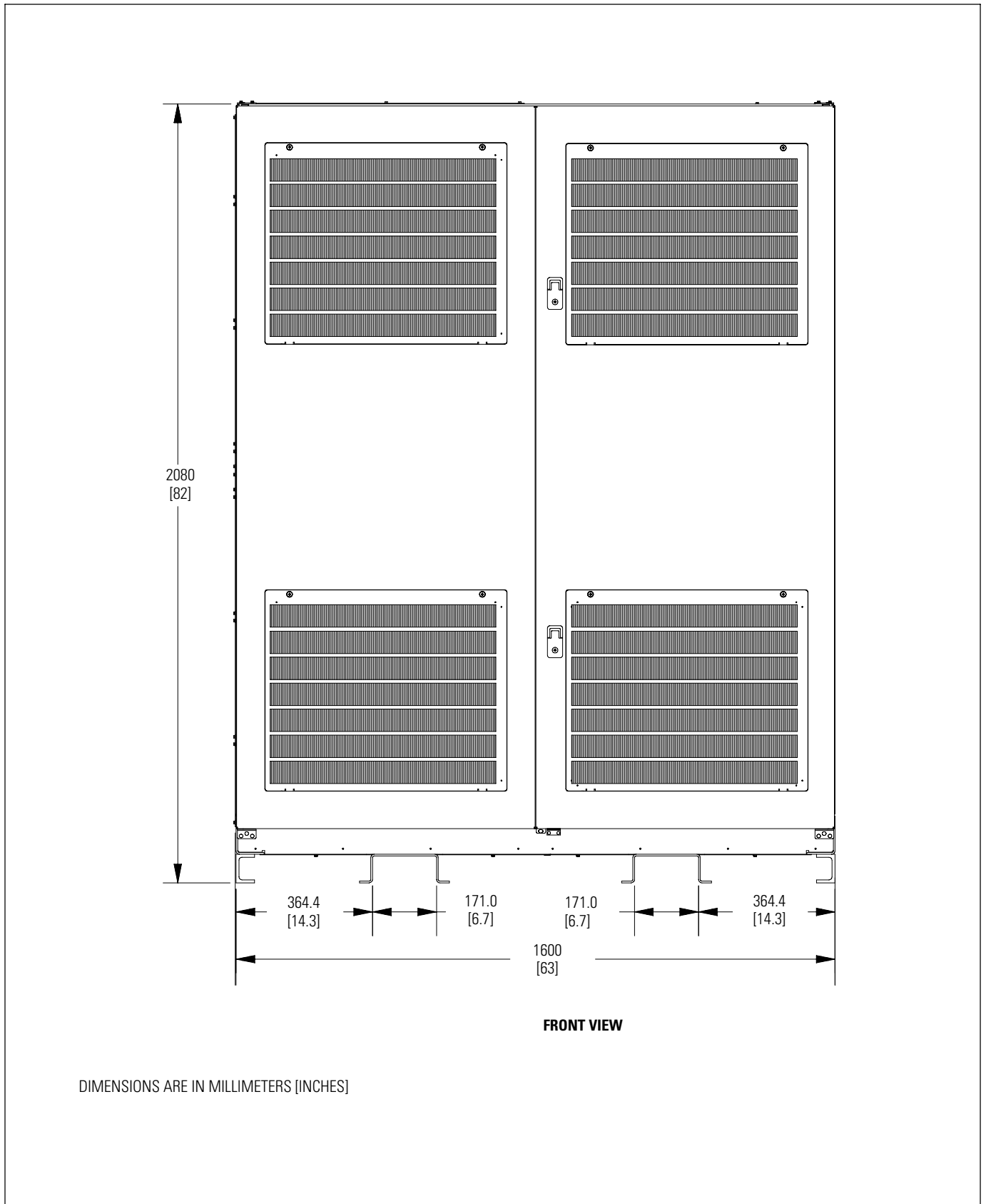


Figure A-4. Output/Inverter Cabinet – PCM 2 Dimensions

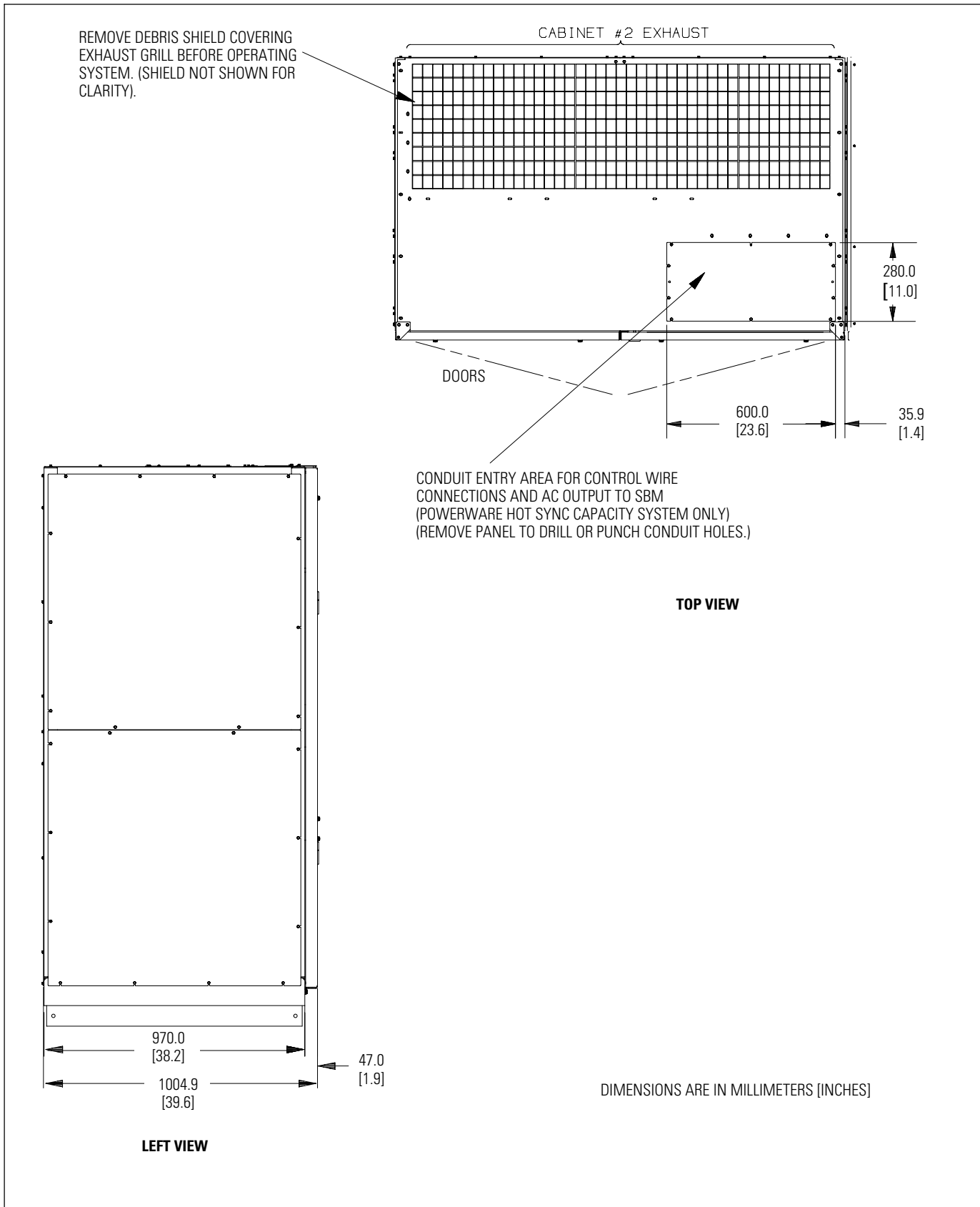
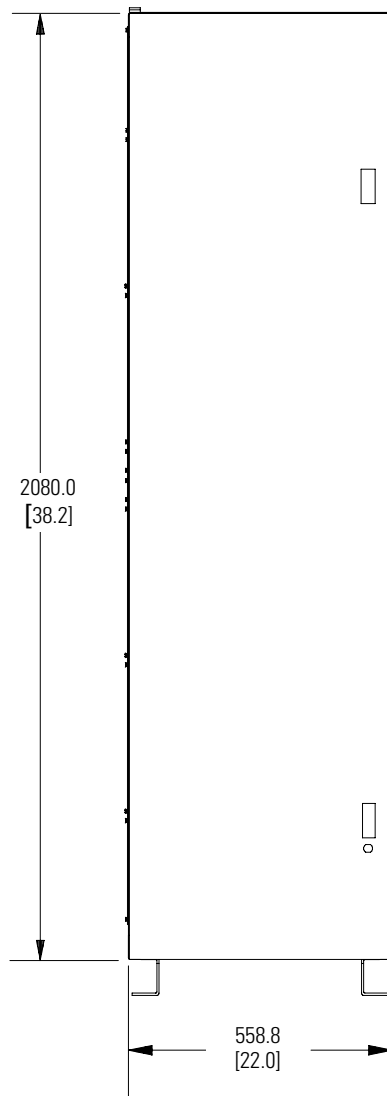


Figure A-5. Output/Inverter Cabinet – PCM 2 Dimensions (continued)



FRONT VIEW

DIMENSIONS ARE IN MILLIMETERS [INCHES]

Figure A-6. MBC – PCM 3 Dimensions

CONDUIT ENTRY AREA FOR CONTROL WIRE CONNECTIONS, BYPASS INPUT, AND AC OUTPUT TO CRITICAL LOAD (REMOVE PANEL TO DRILL OR PUNCH CONDUIT HOLES.)

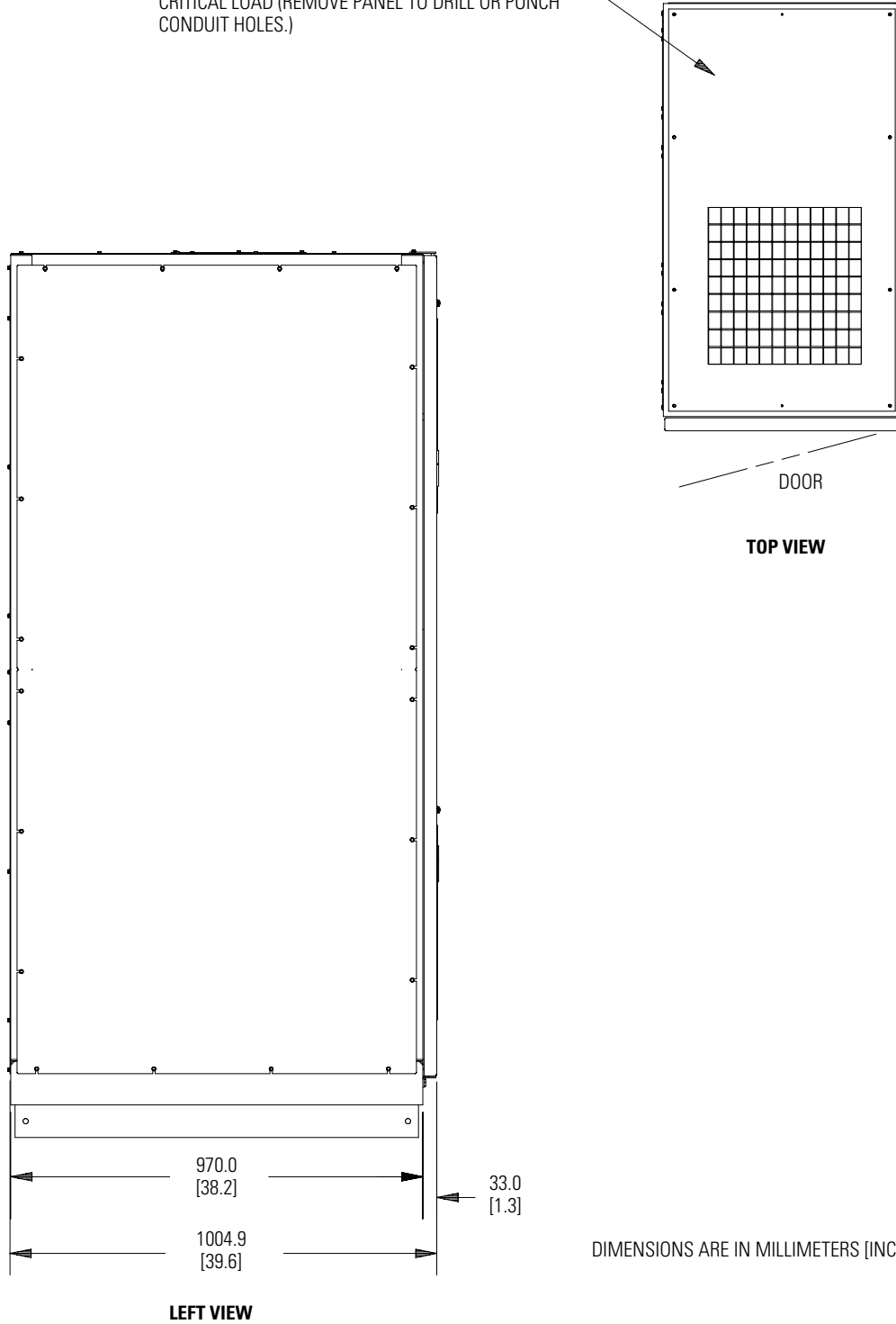


Figure A-7. MBC – PCM 3 Dimensions (continued)

A.2 UPS System Oneline Configurations



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

NOTE Output voltage must match bypass input voltage.

Table D. Powerware 9315 UPS System Oneline Configurations

Oneline Drawing	Powerware Model	Vin / Vout	System Type
Figure A-8	PW9315-625/500	400/400	Single Module – Reverse Transfer Single or Dual Feed
	PW9315-625/625		
	PW9315-750/625	480/480	
	PW9315-750/750		
	PW9315-750/625	600/600	
	PW9315-750/750		
Figure A-9	PW9315-625/500	400/400	Multi-Module – Parallel Capacity/Redundant
	PW9315-625/625		
	PW9315-750/625	480/480	
	PW9315-750/750		
	PW9315-750/625	600/600	
	PW9315-750/750		

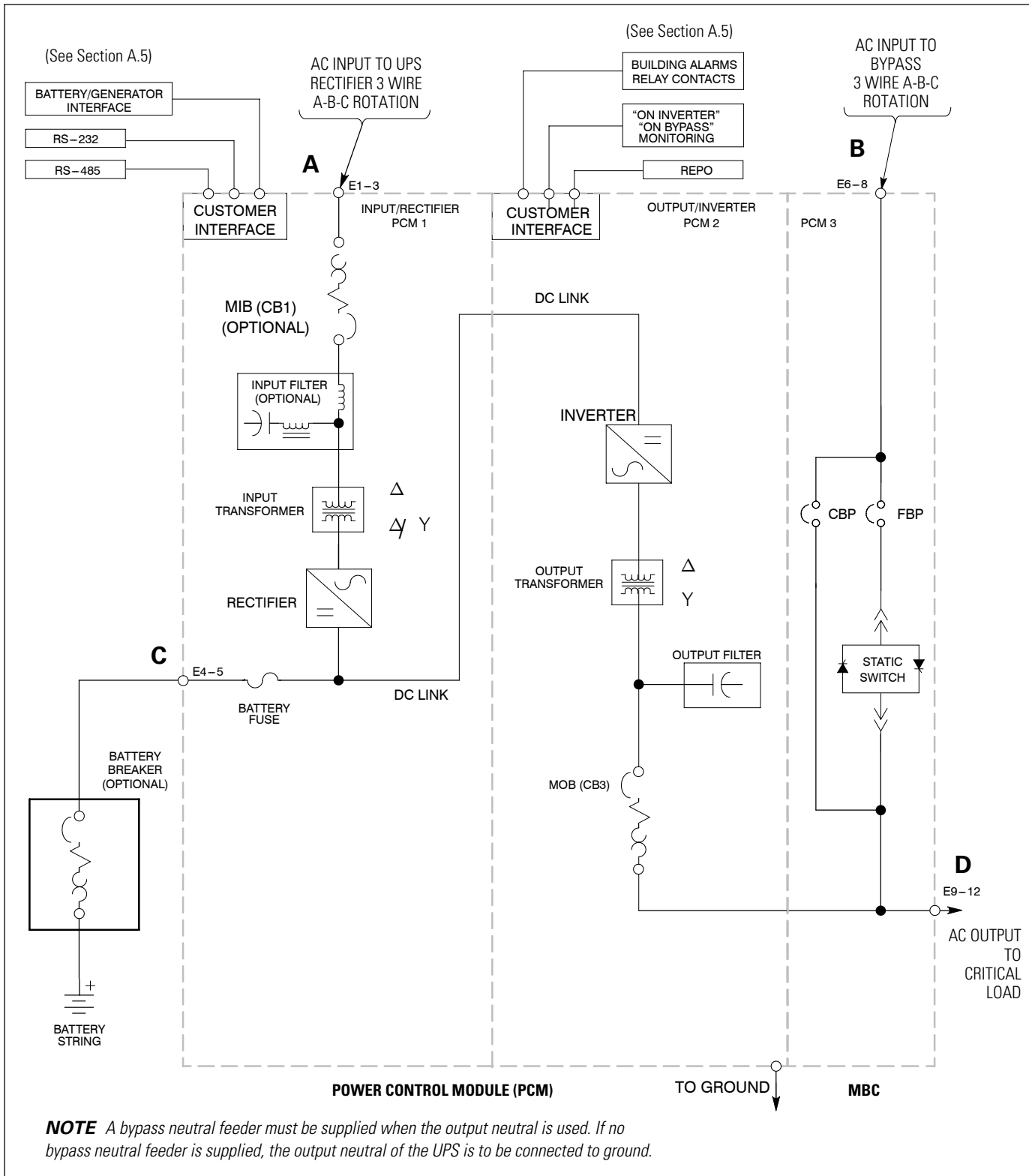


Figure A-8. Single Module UPS System Online Drawing (480/480V and 600/600V Input/Output)

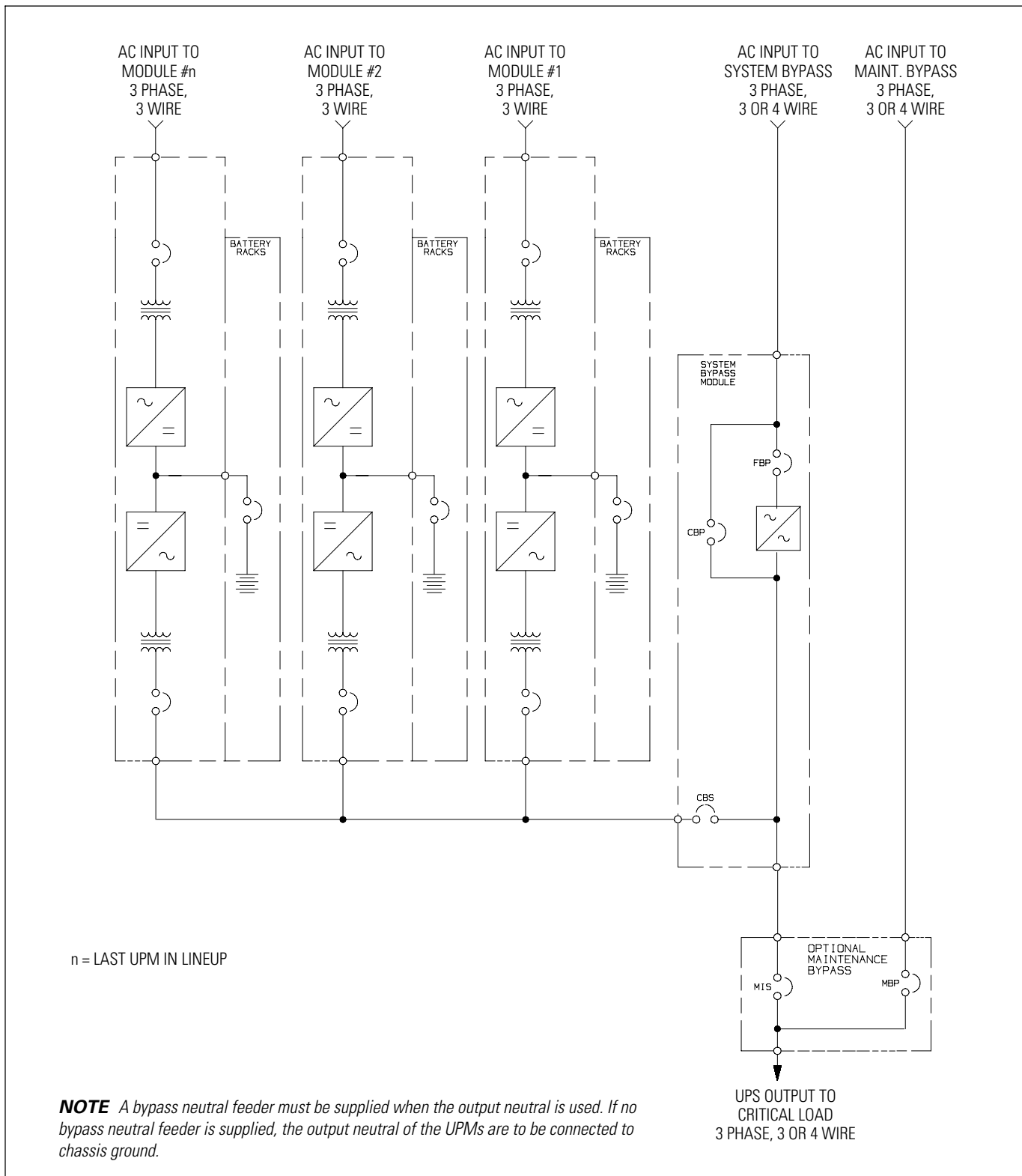


Figure A-9. Multi-Module UPS System Online Drawing (with Powerware Hot Sync Capacity, 480/480V and 600/600V Input/Output)

A.3 Power Wiring Installation Notes

Read and understand the following notes while planning your installation:

1. Refer to national and local electrical codes for acceptable external wiring practices.
2. Material and labor for external wiring requirements are to be provided by designated personnel.
3. For external wiring, use 90°C copper wire. See the appropriate column in Table E through Table G. Wire sizes are based on using a continuous duty rated breaker.
4. Wire ampacities are chosen from Table 310-16 of the National Electrical Code (NEC). Wire is 90°C specification.
5. The neutral conductor is considered to be a current-carrying conductor per note 10 of the Notes to Ampacity Table 310 of the NEC. If a neutral is used, the wire is derated by 80% per Note 8(a) of the Notes to Ampacity Table 310 assuming 4–6 conductors in a raceway. If there is no neutral, it is assumed that there are only 3 current carrying conductors in a raceway (one per phase).
6. All circuit breakers provided as part of the UPS system that employ adjustable trip mechanisms have been set to their maximum settings. Based upon the energy available and other equipment located on-site, these settings may need to be adjusted to ensure proper system operation and coordination. It is the customer's responsibility to conduct a breaker coordination study, so that these breakers can be adequately set for the site.
7. A bypass neutral feeder must be supplied when the output neutral is used. If no bypass neutral feeder is supplied, the output neutral of the UPS is to be connected to chassis ground.
8. See Section I for installation instructions.

Table E. Input/Output Ratings and External Wiring Requirements (PW9315-625/400, PW9315-625/450, PW9315-625/500, and PW9315-625/562)

Basic Unit Rating PW9315-625/400 and PW9315-625/500 at 0.8 Lagging pF Load PW9315-625/450 and PW9315-625/562 at 0.9 Lagging pF Load	Units	Rating 50/60 Hz			
	kVA/kW	500/400	500/450	625/500	625/562
Input and Output Voltage	Volts	400	400	400	400
AC Input to UPS Rectifier (0.95 Min. pF) (3) Phases, (1) Neutral, (1) Ground	Amps*	880	910	1100	1138
Minimum Conductor Size Number per Phase * Maximum amps includes full load current plus battery recharge current	A AWG or kcmil (each)	350 (4)	400 (4)	600 (4)	700 (4)
AC Input to MBC (UPS Bypass) Full Load Current (3) Phases, (1) Neutral, (1) Ground	Amps	722	722	902	902
Minimum Conductor Size Number per Phase	B AWG or kcmil (each)	300 (4)	300 (4)	500 (4)	500 (4)
DC Input from Battery to UPS (1) Positive, (1) Negative	Vdc Amps @ (2.0V/cell)	480 877	480 987	480 1097	480 1234
Minimum Conductor Size Number per Pole	C AWG or kcmil (each)	400 (3)	400 (3)	400 (4)	500 (4)
AC Output to Optional SBM Full Load Current (3) Phases, (1) Neutral, (1) Ground	Amps	722	722	902	902
Minimum Conductor Size Number per Phase	E AWG or kcmil (each)	300 (4)	300 (4)	500 (4)	500 (4)
AC Output to Critical Load Full Load Current (3) Phases, (1) Neutral, (1) Ground	Amps	722	722	902	902
Minimum Conductor Size Number per Phase	D AWG or kcmil (each)	300 (4)	300 (4)	500 (4)	500 (4)

NOTE Callout letters A, B, C, D, and E map to Figure A-8.

Table F. Input/Output Ratings and External Wiring Requirements (PW9315-700/500 and PW9315-750/562)

Basic Unit Rating PW9315-750/500 at 0.8 Lagging pF Load PW9315-750/562 at 0.9 Lagging pF Load	Units	Rating 50/60 Hz			
	kVA/kW	625/500	625/500	625/562	625/562
Input and Output Voltage	Volts	480	600	480	600
AC Input to UPS Rectifier (0.95 Min. pF) (3) Phases, (1) Neutral, (1) Ground	Amps*	951	761	984	787
Minimum Conductor Size Number per Phase * Maximum amps includes full load current plus battery recharge current	A AWG or kcmil (each)	400 (4)	350 (4)	500 (4)	350 (4)
AC Input to MBC (UPS Bypass) Full Load Current (3) Phases, (1) Neutral, (1) Ground	B Amps	752	601	752	601
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	500 (3)	350 (3)	500 (3)	350 (3)
DC Input from Battery to UPS (1) Positive, (1) Negative	C Vdc Amps @ (2.0V/cell)	480 1096	480 1096	480 1234	480 1234
Minimum Conductor Size Number per Pole	AWG or kcmil (each)	400 (4)	400 (4)	500 (4)	500 (4)
AC Output to Optional SBM Full Load Current (3) Phases, (1) Neutral, (1) Ground	E Amps	752	601	752	601
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	500 (3)	350 (3)	500 (3)	350 (3)
AC Output to Critical Load Full Load Current (3) Phases, (1) Neutral, (1) Ground	D Amps	752	601	752	601
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	500 (3)	350 (3)	500 (3)	350 (3)

NOTE Callout letters A, B, C, D, and E map to Figure A-8.

Table G. Input/Output Ratings and External Wiring Requirements (PW9315-750/600 and PW9315-750/675)

Basic Unit Rating PW9315-750/600 at 0.8 Lagging pF Load PW9315-750/675 at 0.9 Lagging pF Load	Units	Rating 50/60 Hz			
	kVA/kW	750/600	750/600	750/675	750/675
Input and Output Voltage	Volts	480	600	480	600
AC Input to UPS Rectifier (0.95 Min. pF) (3) Phases, (1) Neutral, (1) Ground	Amps*	1141	913	1181	945
Minimum Conductor Size Number per Phase * Maximum amps includes full load current plus battery recharge current	A AWG or kcmil (each)	700 (4)	500 (4)	700 (4)	500 (4)
AC Input to MBC (UPS Bypass) Full Load Current (3) Phases, (1) Neutral, (1) Ground	Amps	902	722	902	722
Minimum Conductor Size Number per Phase	B AWG or kcmil (each)	400 (4)	500 (3)	400 (4)	500 (3)
DC Input from Battery to UPS (1) Positive, (1) Negative	Vdc Amps @ (2.0V/cell)	480 1315	480 1315	480 1480	480 1480
Minimum Conductor Size Number per Pole	C AWG or kcmil (each)	600 (4)	600 (4)	700 (4)	700 (4)
AC Output to Optional SBM Full Load Current (3) Phases, (1) Neutral, (1) Ground	Amps	902	722	902	722
Minimum Conductor Size Number per Phase	E AWG or kcmil (each)	400 (4)	500 (3)	400 (4)	500 (3)
AC Output to Critical Load Full Load Current (3) Phases, (1) Neutral, (1) Ground	Amps	902	722	902	722
Minimum Conductor Size Number per Phase	D AWG or kcmil (each)	400 (4)	500 (3)	400 (4)	500 (3)

NOTE Callout letters A, B, C, D, and E map to Figure A-8.

9. Terminals E1 through E12 are 2-hole bus bar mountings for standard NEMA 2-hole barrel lugs. See Table H for power cable terminations, Table I for conduit requirements, and Table J for recommended installation parts and tools not supplied by Eaton. Section A.4 shows the location of the power cable terminals inside the UPS.

Table H. Powerware 9315 UPS (500–750 kVA) Cabinet Power Cable Terminations

Terminal Function	Terminal	Function	Size of Pressure Termination	Tightening Torque Nm (lb in)	Bolt Size
AC Input to UPS Rectifier (CB1 Input)	E1	Phase A	4 - 2 bolt mounting	76 (56)	1/2"
	E2	Phase B	4 - 2 bolt mounting	76 (56)	1/2"
	E3	Phase C	4 - 2 bolt mounting	76 (56)	1/2"
AC Input to MBC (UPS Bypass)	E6	Phase A	4 - 2 bolt mounting	76 (56)	1/2"
	E7	Phase B	4 - 2 bolt mounting	76 (56)	1/2"
	E8	Phase C	4 - 2 bolt mounting	76 (56)	1/2"
AC Output from Inverter to MBC or SBM	E9	Phase A	4 - 2 bolt mounting	76 (56)	1/2"
	E10	Phase B	4 - 2 bolt mounting	76 (56)	1/2"
	E11	Phase C	4 - 2 bolt mounting	76 (56)	1/2"
	E12	Neutral	4 - 2 bolt mounting	76 (56)	1/2"
AC Input to MBC from Inverter	E9	Phase A	4 - 1 bolt mounting	76 (56)	1/2"
	E10	Phase B	4 - 1 bolt mounting	76 (56)	1/2"
	E11	Phase C	4 - 1 bolt mounting	76 (56)	1/2"
	E12	Neutral	4 - 1 bolt mounting	76 (56)	1/2"
AC Output to Critical Load from MBC	E9	Phase A	12 - 2 bolt mounting	76 (56)	1/2"
	E10	Phase B	4 - 2 bolt mounting	76 (56)	1/2"
	E11	Phase C	4 - 2 bolt mounting	76 (56)	1/2"
DC Input from Battery to UPS	E4	Positive	6 - 2 bolt mounting	76 (56)	1/2"
	E5	Negative	6 - 2 bolt mounting	76 (56)	1/2"
DC Link Output from Rectifier to Inverter	(+)	DC Link (+)	4 - 1 bolt mounting	20 (15)	Supplied
	(-)	DC Link (-)	4 - 1 bolt mounting	20 (15)	Supplied
DC Link Input to Inverter from Rectifier	Inverter (+)	DC Link (+)	6 - 1 bolt mounting	20 (15)	Supplied
	Inverter (-)	DC Link (-)	6 - 1 bolt mounting	20 (15)	Supplied
Neutral, Output	E12	Neutral	12 - 2 bolt mounting	76 (56)	1/2"
Customer Ground	Ground	Ground	8 - 2 bolt mounting	76 (56)	1/2"

NOTE Customer ground, size 2/0, can be run in any conduit listed in Table I on page A-17.

10. Per NEC, Article 300-20(a), all three-phase conductors must be run in the same conduit. If a neutral and/or ground is used, it must be run in the same conduit as the phase conductors.
11. Conduit is sized to accommodate one neutral conductor the same size as the phase conductor (if applicable) and one 2/0 ground conductor.
12. Conduit sizes were chosen from NEC Table C1, type letters RHH, RHW, RHW-2, TW, THW, THHW, THW-2.

Table I. Power Cable Conduit Requirements

UPS Model	Voltage	Terminal	Number of Wires in Conduit	Minimum Conduit Trade Size	Number of Conduits
PW9315-750/600 PW9315-750/675	600	AC Input to UPS (A, B, C, Ground)	5	3.5"	3
		AC Input to MBC (A, B, C, Ground)	4	3"	3
		Output (A, B, C, Neutral, Ground)	4	3"	3
	480	Battery (Positive, Negative, Ground)	4	3.5"	2
PW9315-750/600 PW9315-750/675	480	AC Input to UPS (A, B, C, Ground)	5	4"	3
		AC Input to MBC (A, B, C, Ground)	6	3.5"	3
		Output (A, B, C, Neutral, Ground)	6	3.5"	3
	480	Battery (Positive, Negative, Ground)	4	3.5"	2
PW9315-750/500 PW9315-750/562	600	AC Input to UPS (A, B, C, Ground)	5	3"	3
		AC Input to MBC (A, B, C, Ground)	5	3"	3
		Output (A, B, C, Neutral, Ground)	5	3"	3
	480	Battery (Positive, Negative, Ground)	4	3"	2
PW9315-750/500 PW9315-750/562	480	AC Input to UPS (A, B, C, Ground)	5	3.5"	3
		AC Input to MBC (A, B, C, Ground)	4	3"	3
		Output (A, B, C, Neutral, Ground)	4	3"	3
	480	Battery (Positive, Negative, Ground)	4	3"	2
PW9315-625/500 PW9315-625/562	400	AC Input to UPS (A, B, C, Ground)	4	3.5"	4
		AC Input to MBC (A, B, C, Ground)	5	3.5"	3
		Output (A, B, C, Neutral, Ground)	5	3.5"	3
	480	Battery (Positive, Negative, Ground)	4	3"	2
PW9315-625/400 PW9315-625/450	400	AC Input to UPS (A, B, C, Ground)	5	3"	3
		AC Input to MBC (A, B, C, Ground)	5	3"	3
		Output (A, B, C, Neutral, Ground)	5	3"	3
	480	Battery (Positive, Negative, Ground)	6	3.5"	1

Table J. Recommended Installation Parts and Tool (Not Supplied by Eaton)

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

- 13.** Standard breakers used in the UPS are rated for 65 KAIC, with optional breakers rated for 100 KAIC. To prevent cable whipping, secure cables as shown in Figure A-10. Wrap line cables together with nominal 9.5 mm (3/8") nylon rope or rope having a minimum tensile strength of 8896 N (2000 pounds). Wrap line cables at 152 mm (6") and 1305 mm (2") from the line terminals with 5 wraps. Wrap each additional 152.4 mm (6") interval with 5 wraps or 25.4 mm (1") intervals with 1 wrap.

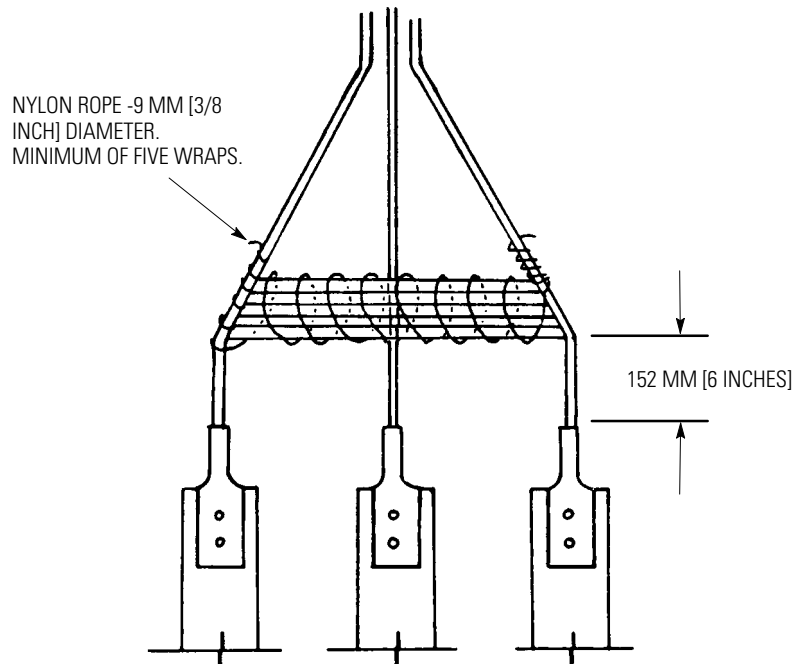


Figure A-10. Securing Cables

14. External overcurrent protection is not provided by this product, but is required by codes. See Table E through Table G starting on page A-13 for wiring requirements. If an output lockable disconnect is required, it is to be supplied by designated personnel.
15. Table K lists the maximum rating for continuous duty rated input circuit breakers.



CAUTION

To reduce the risk of fire, connect only to a circuit provided with maximum input circuit breaker current ratings from Table K according to the NEC, ANSI/NFPA 70.

Table K. Maximum Input Circuit Breaker Ratings

UPS Model	Input Voltage Rating		
	400V	480V	600V
PW9315-625/400 PW9315-625/450	1000A	N/A	N/A
PW9315-625/500 PW9315-625/562	1200A	N/A	N/A
PW9315-750/500 PW9315-750/562	N/A	1000A	800A
PW9315-750/600 PW9315-750/675	N/A	1200A	1000A

16. Source protection for the AC input should be treated as if you were supplying a 750 kVA three-phase transformer, to allow for inrush current.
17. The input breaker (CB1) has a trip rating of 1200 amps AT and a standard ampere interrupting capacity (AIC) of 65,000 in symmetrical RMS amps. An optional 100,000 AIC breaker is available.
18. The input and bypass three-phase feeds should be symmetrical about ground, due to the existence of voltage surge protection devices.
19. The line-to-line unbalanced output capability of the UPS is limited only by the full load per phase current values for AC output to critical load shown in Table E through Table G. The recommended line-to-line load unbalance is 50% or less.
20. Output overcurrent protection and output disconnect switch are to be provided by the user. Table L lists the maximum rating for continuous duty rated output circuit breakers satisfying the criteria for both.

Table L. Maximum Output Circuit Breaker Ratings

UPS Model	Output Voltage Rating		
	400V	480V	600V
PW9315-625/400 PW9315-625/450	800A	N/A	N/A
PW9315-625/500 PW9315-625/562	1000A	N/A	N/A
PW9315-750/500 PW9315-750/562	N/A	800A	700A
PW9315-750/600 PW9315-750/675	N/A	1000A	800A

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

Table M. Maximum DC Input Circuit Breaker Ratings

UPS Model	Output Voltage Rating		
	400V	480V	600V
PW9315-625/400 PW9315-625/450	1600A	N/A	N/A
PW9315-625/500 PW9315-625/562	1800A 2000A	N/A	N/A
PW9315-750/500 PW9315-750/562	N/A	1800A 2000A	1800A 2000A
PW9315-750/600 PW9315-750/675	N/A	2000A 2300A	2000A 2300A

22. Table N lists the battery shunt trip wiring requirements.

Table N. Battery Shunt Trip Wiring Requirements

Description	ST
CB2TB Points	9, 10
Output Max Pulse	220 VA instantaneous
Wiring	#18 AWG minimum

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

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

25. Recommended wire size is #18–14 AWG.

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

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

- 28. A battery disconnect switch is recommended, and may be required by NEC or local codes when batteries are remotely located. The battery disconnect switch may be supplied as an accessory, and should be installed between battery and UPS.
- 29. If the conductors used for DC input from the battery string to the UPS are those provided by the UPS manufacturer, and the UPS and battery string are manufactured by the same supplier, then it is acceptable if they do not meet the noted minimum conductor sizes.
- 30. The UPS DC disconnect trip signal from CB2TB, points 9 and 10 (shunt trip) must be connected to the DC source disconnect device.

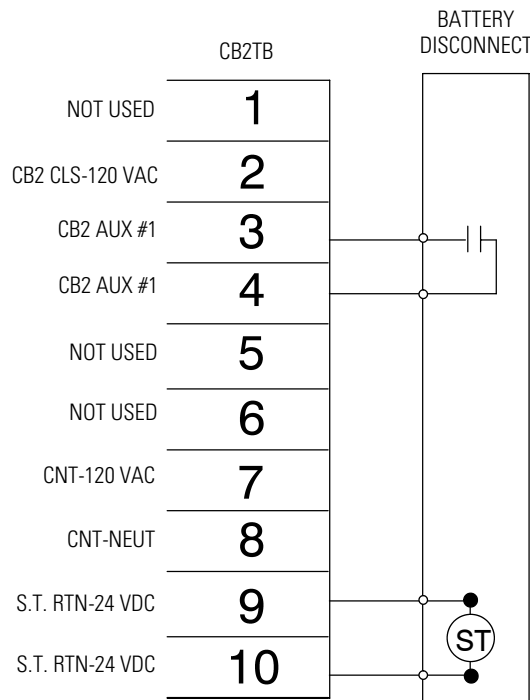


Figure A-11. CB2TB to DC Source Disconnect Device

A.4 Location of UPS Terminals

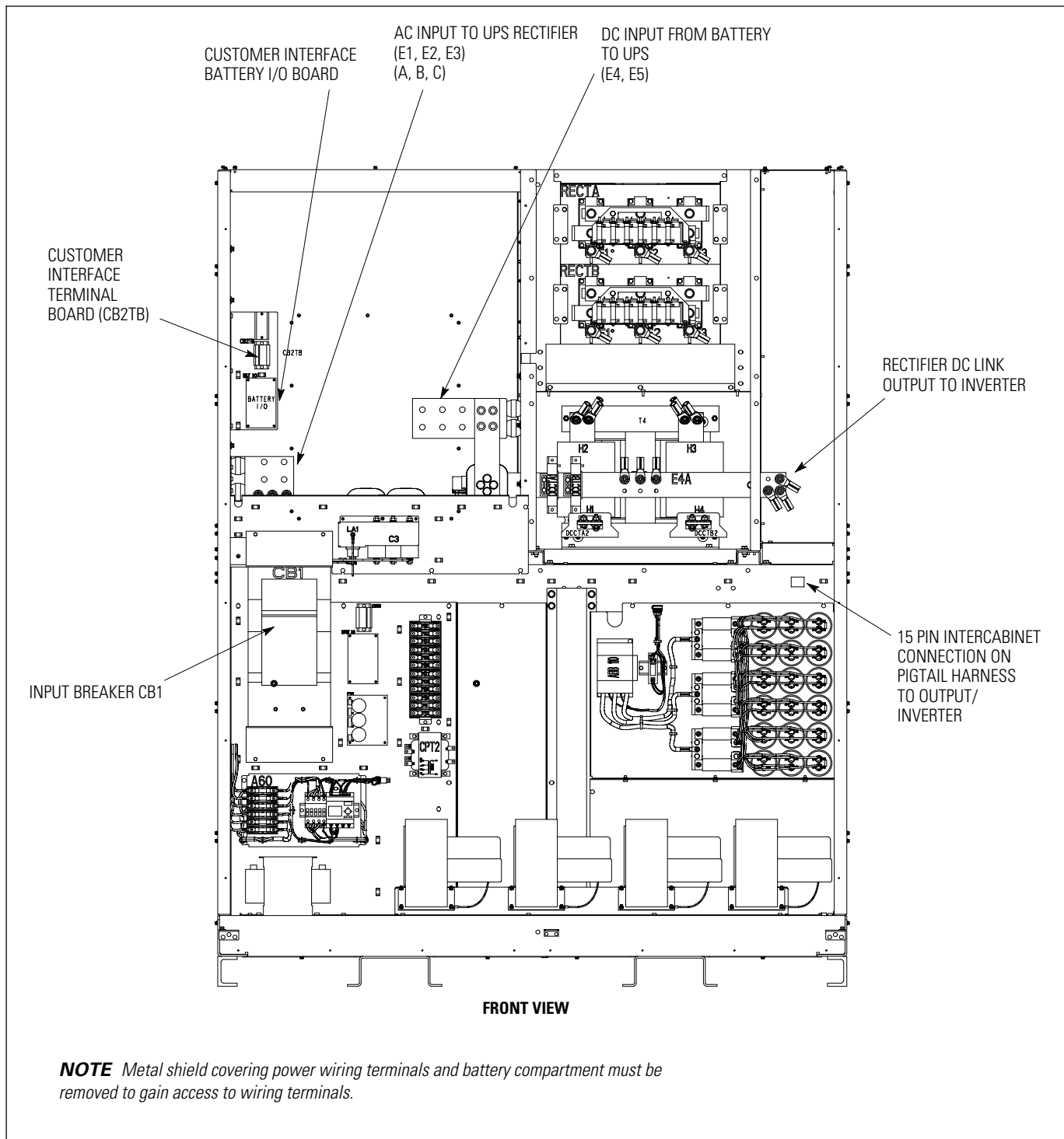


Figure A-12. Inverter/Rectifier Cabinet – PCM 1 Terminals

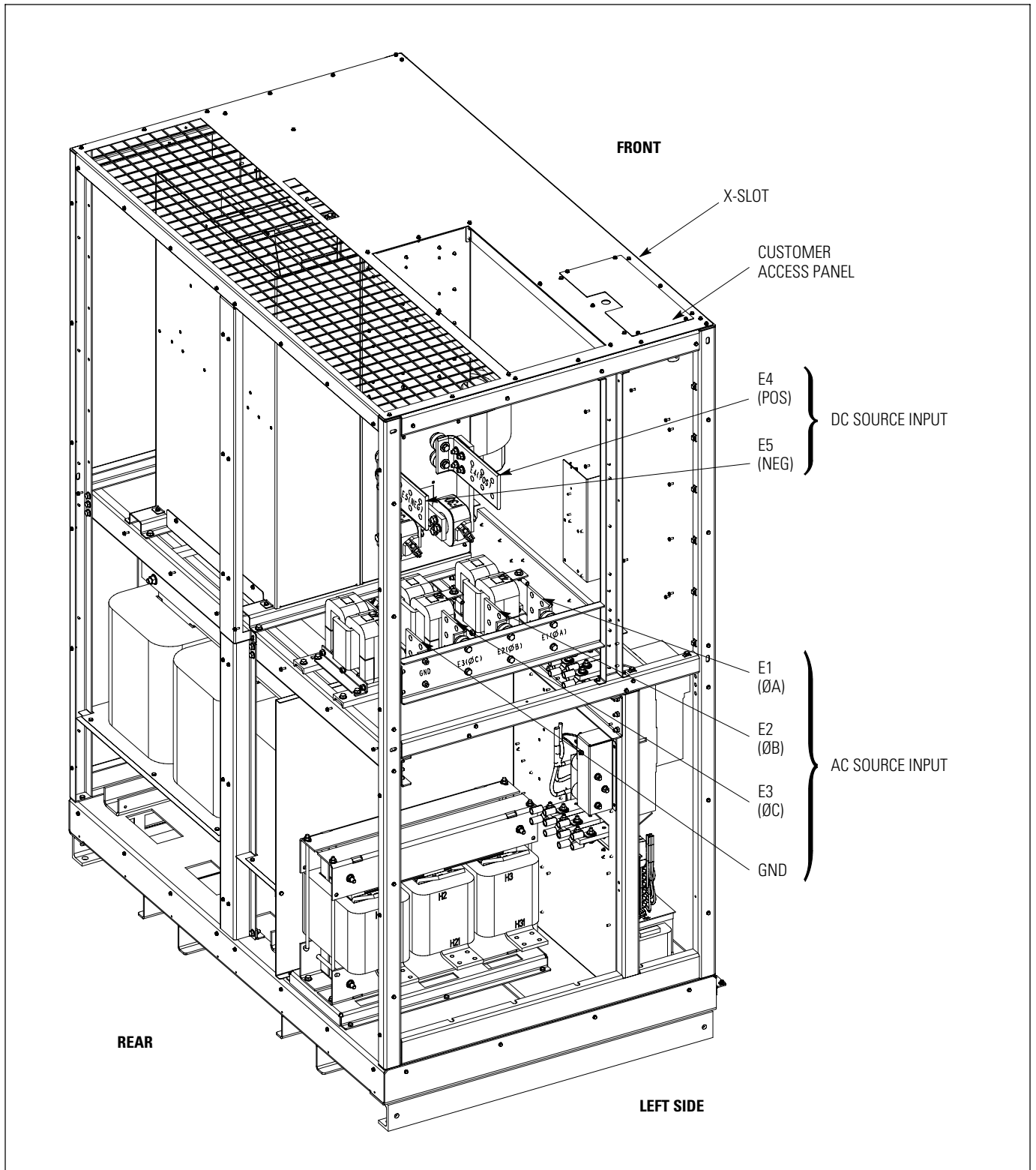


Figure A-13. Inverter/Rectifier Cabinet – PCM 1 Terminals (continued)

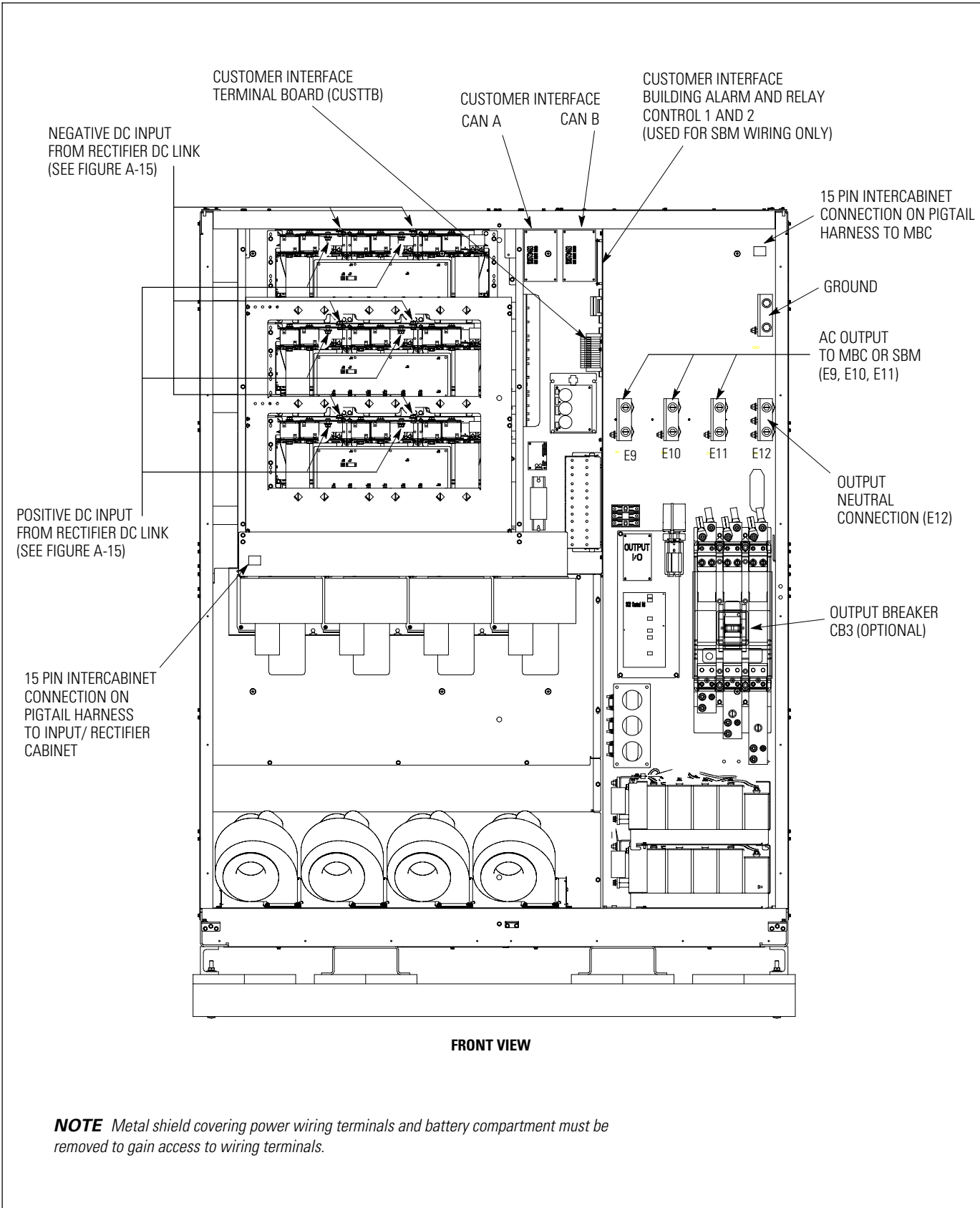


Figure A-14. Output/Inverter Cabinet – PCM 2 Terminals

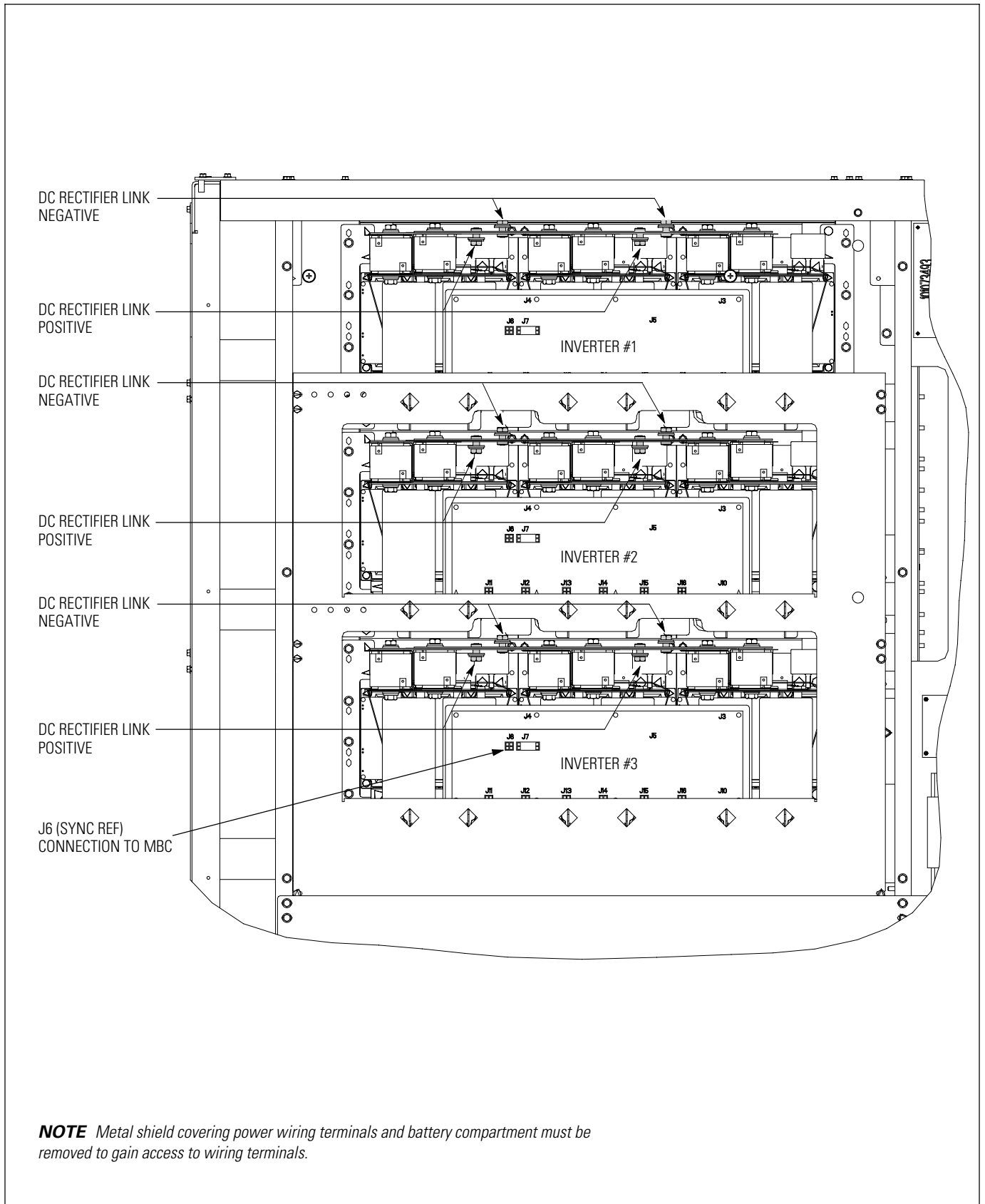


Figure A-15. Output/Inverter Cabinet – PCM 2 Terminals (continued)

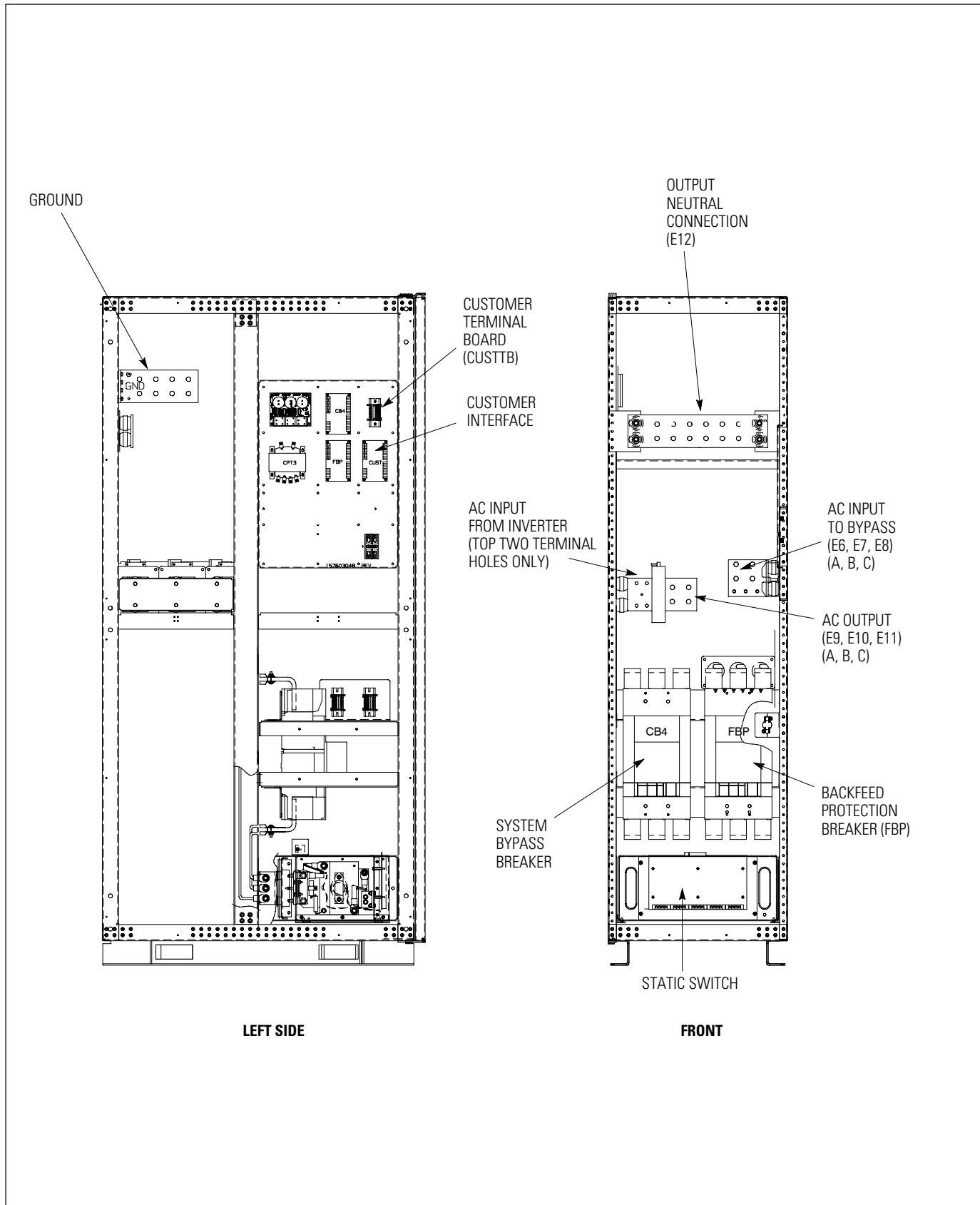


Figure A-16. MBC – PCM 3 Terminals

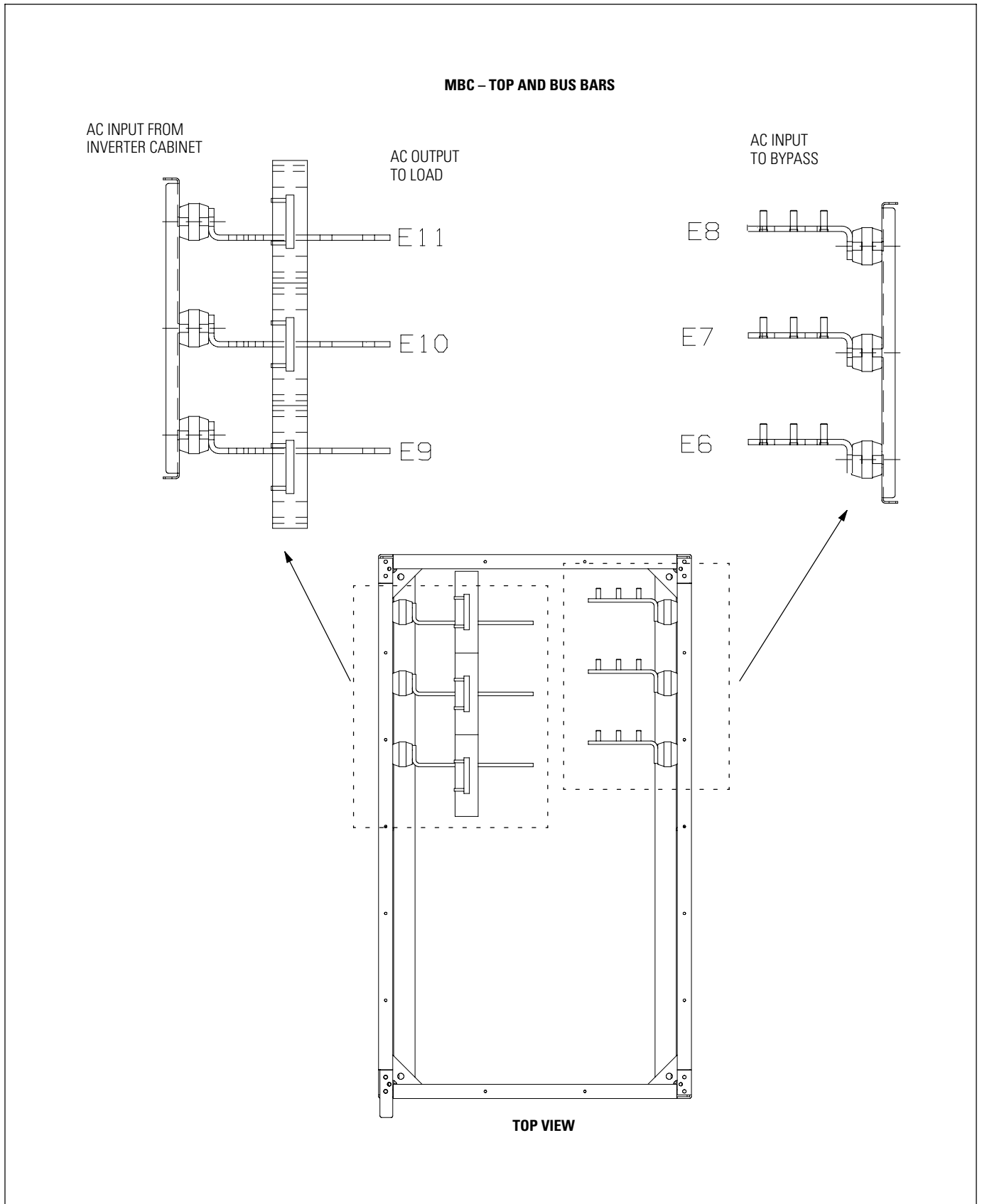


Figure A-17. MBC – PCM 3 Terminals (continued)

A.5 Customer Interface Wiring Notes

1. Use Class 1 wiring methods (as defined by the NEC) for control wiring. Install the control wiring in separate conduit from the power wiring. The wire should be rated at 24V, 1A minimum.
2. See Table O through Table Q and Figure A-18 through Figure A-30 for customer interface wiring.

Table O. Input/Rectifier Cabinet Customer Interface Connections

CUSTJ4 Terminal	Name	Description
1	Open Filter	Dry contact used to deactivate input filter.
2	Open Filter Return	
3	No Sync	Dry contact used to deactivate UPS synchronization to bypass.
4	No Sync Return	
5	On Generator	Dry contact used to indicate UPS is being supplied power by the generator.
6	On Generator Return	
7	Battery Disconnect Open	Dry contact used to indicate UPS Battery Disconnect is open.
8	Battery Disconnect Open Return	
9	Not Used	
10	Not Used	

CB2TB Terminal	Name	Description
1	Not Used	
2	CB2 Close - 120 Vac	Close circuit breaker CB2 signal.
3	CB2 - AUX #1	Circuit breaker CB2 auxiliary contact.
4	CB2 - AUX #1	
5	Not Used	
6	Not Used	
7	Control - 120 Vac	Breaker charge power.
8	Control - Neutral	
9	Shunt Trip - 24 Vdc	Open circuit breaker CB2 signal.
10	Shunt Trip - 24 Vdc	

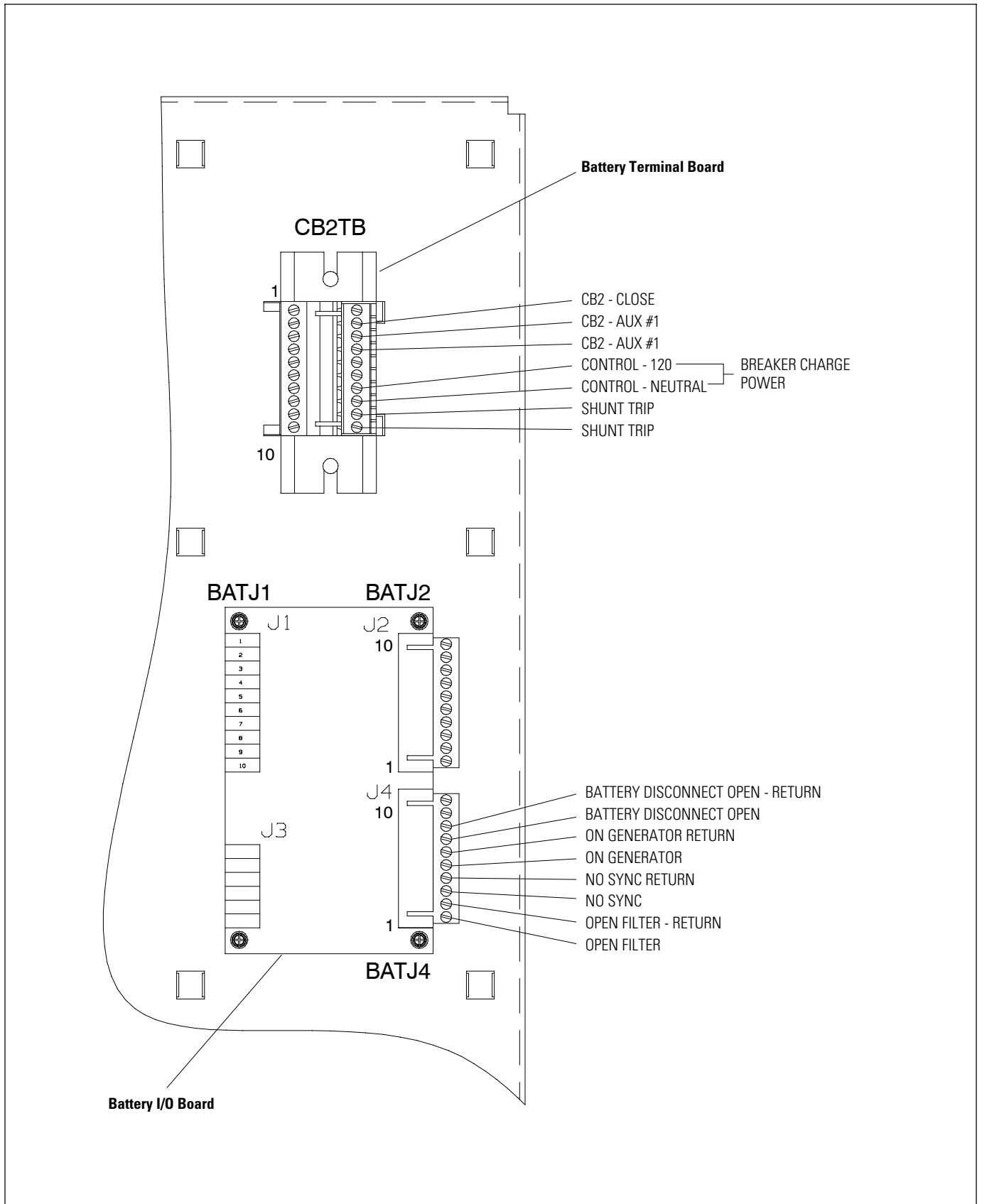


Figure A-18. Inverter/Rectifier Cabinet – PCM 1 Customer Interface Wiring

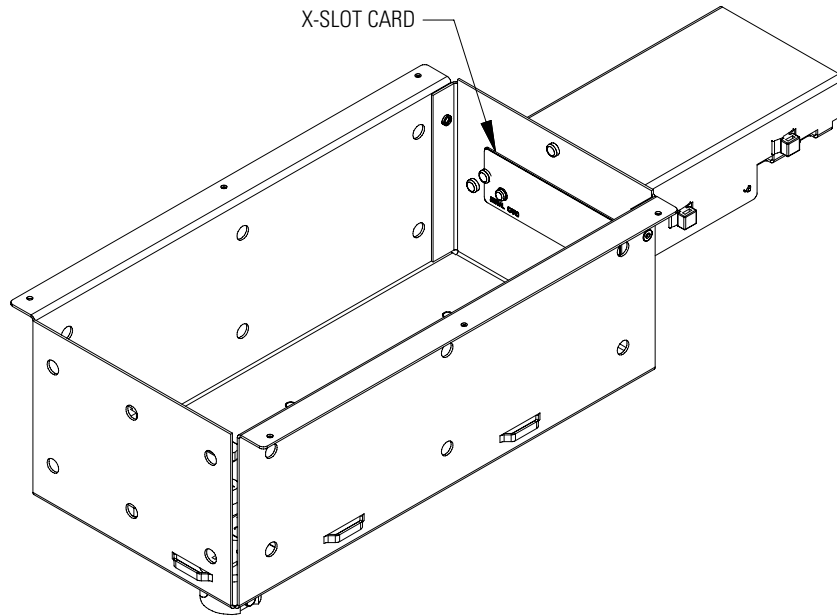
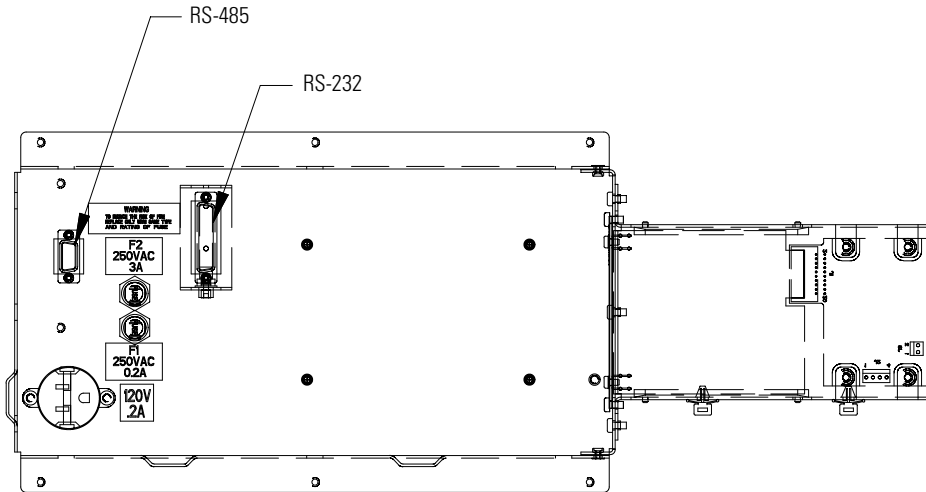


Figure A-19. Inverter/Rectifier Cabinet – PCM 1 Customer Interface Wiring (continued)

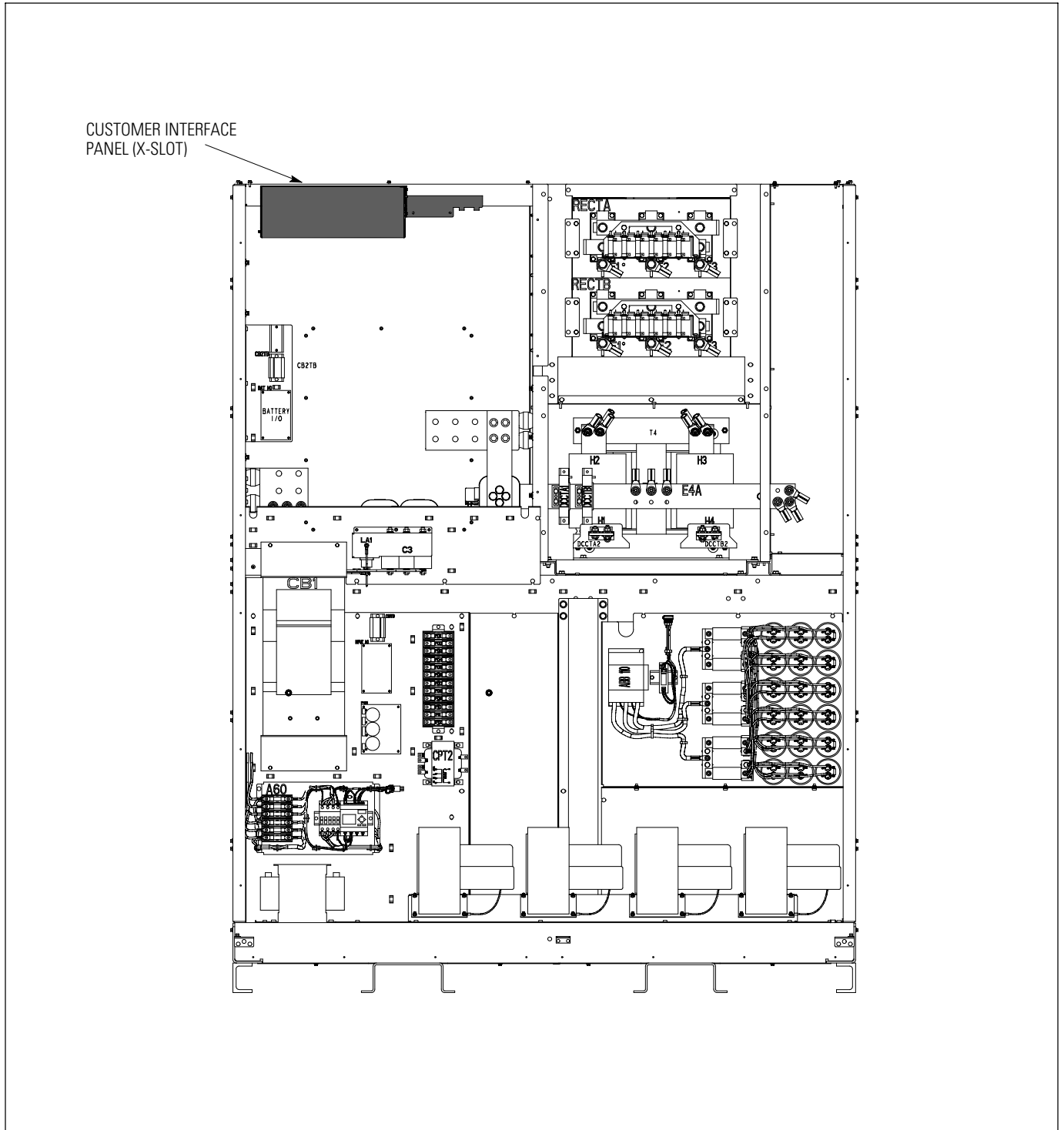


Figure A-20. Inverter/Rectifier Cabinet – PCM 1 Customer Interface Wiring (continued)

Table P. Output/Inverter Cabinet Customer Interface Connections

CUSTJ4 Terminal	Name	Description
1	Building Alarm 2	Programmable UPS alarm. Activated by a remote dry contact closure.
2	Building Alarm 2 Return	
3	Building Alarm 3	Programmable UPS alarm. Activated by a remote dry contact closure.
4	Building Alarm 3 Return	
5	Building Alarm 4	Programmable UPS alarm. Activated by a remote dry contact closure.
6	Building Alarm 4 Return	
7	Building Alarm 5	Programmable UPS alarm. Activated by a remote dry contact closure.
8	Building Alarm 5 Return	
9	Not Used	
10	Not Used	

CUSTJ2 Terminal	Name	Description
1	Relay 1 NC	General purpose normally-open and normally-closed relay contacts.
2	Relay 1 Common	
3	Relay 1 NO	
4	Building Alarm 1	Programmable UPS alarm. Activated by a remote dry contact closure.
5	Building Alarm 1 Return	
6	Relay 2 NC	General purpose normally-open and normally-closed relay contacts.
7	Relay 2 Common	
8	Relay 2 NO	
9	Not Used	
10	Not Used	

CUSTTB Terminal	Name	Description
1	CB3 - Aux #2	Circuit breaker CB3 auxiliary contact.
2	CB3 - Aux #2*	
3	Not Used	
4	Remote to Bypass	Dry contact used to activate remote transfer to bypass.
5	Remote to Bypass Return	
6	Remote to UPS	Dry contact used to activate remote transfer to UPS.
7	Remote to UPS Return	
8	Not Used	
9	REPO	Dry contact used to activate REPO of UPS.
10	REPO Common	

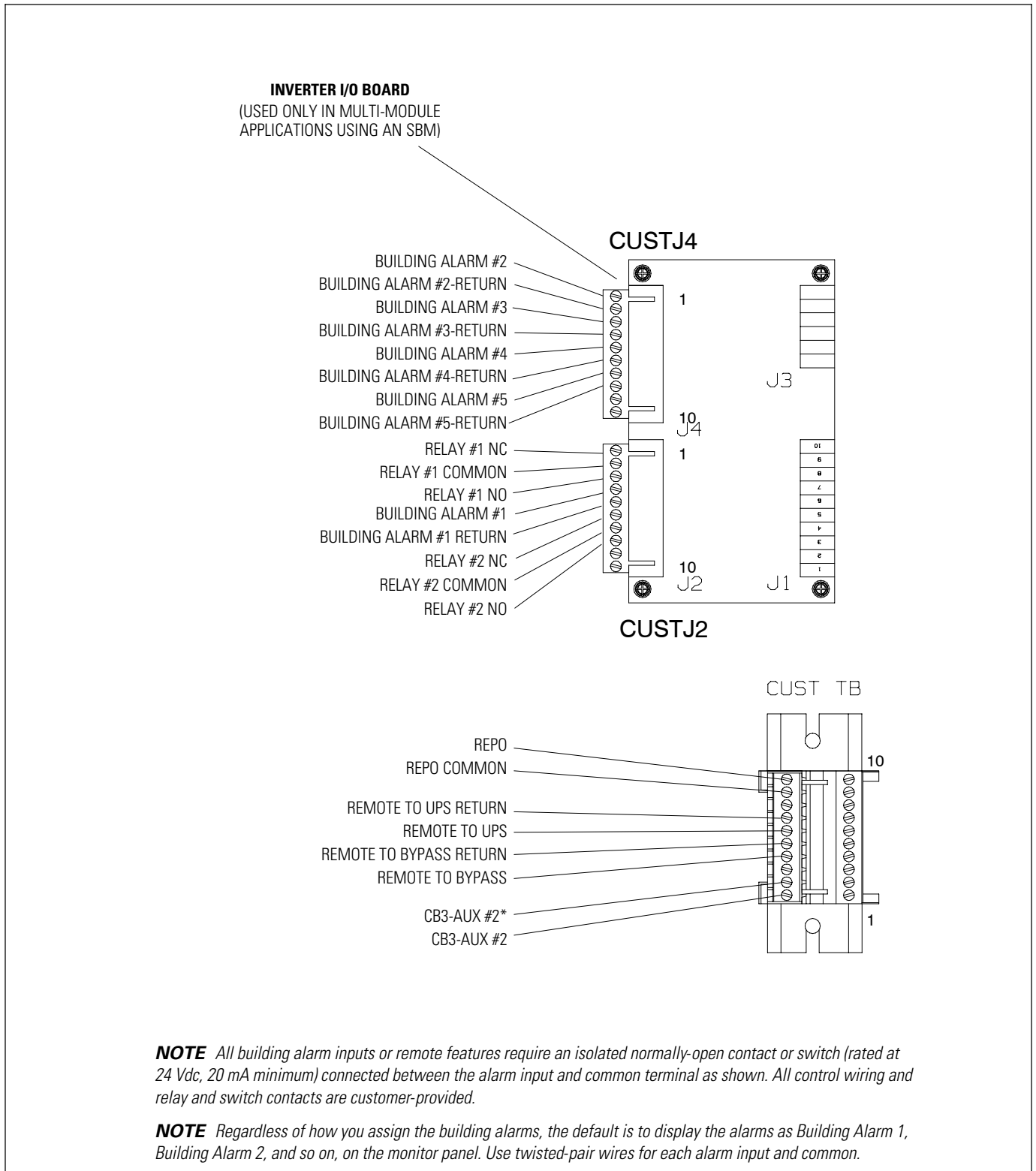


Figure A-21. Output/Inverter Cabinet – PCM 2 Customer Interface Wiring

Table Q. MBC Customer Interface Connections

CUSTJ4 Terminal	Name	Description
1	Building Alarm 2	Programmable UPS alarm. Activated by a remote dry contact closure.
2	Building Alarm 2 Return	
3	Building Alarm 3	Programmable UPS alarm. Activated by a remote dry contact closure.
4	Building Alarm 3 Return	
5	Building Alarm 4	Programmable UPS alarm. Activated by a remote dry contact closure.
6	Building Alarm 4 Return	
7	Building Alarm 5	Programmable UPS alarm. Activated by a remote dry contact closure.
8	Building Alarm 5 Return	
9	Not Used	
10	Not Used	
CUSTJ2 Terminal	Name	Description
1	Relay 1 NC	General purpose normally-open and normally-closed relay contacts.
2	Relay 1 Common	
3	Relay 1 NO	
4	Building Alarm 1	Programmable UPS alarm. Activated by a remote dry contact closure.
5	Building Alarm 1 Return	
6	Relay 2 NC	General purpose normally-open and normally-closed relay contacts.
7	Relay 2 Common	
8	Relay 2 NO	
9	Not Used	
10	Not Used	
CUSTTB Terminal	Name	Description
1	CB3 - Aux #2	Circuit breaker CB3 auxiliary contact.
2	CB3 - Aux #2*	
3	Not Used	
4	CB4- Aux #2	Circuit breaker CB4 auxiliary contact.
5	CB4- Aux #2*	
6	Not Used	
7	Not Used	
8	Not Used	
9	REPO	Dry contact used to activate REPO of UPS.
10	REPO Common	

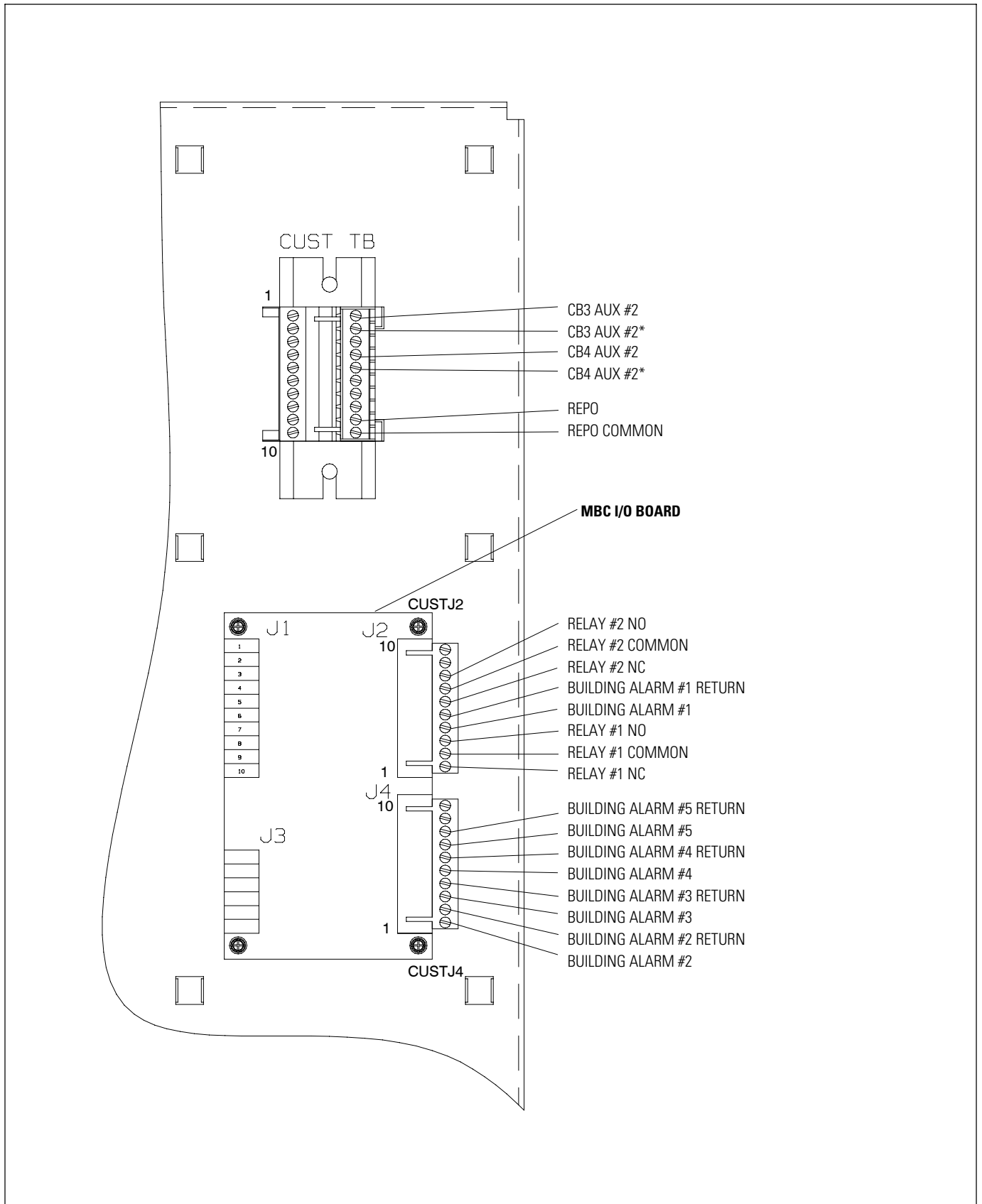


Figure A-22. MBC – PCM 3 Customer Interface Wiring (Single Module System Only)



NOTE The Summary Alarm Relay contact rating is 32 Vac/42 Vdc maximum switched voltage and 1A maximum current.

NOTE Relays are shown in de-energized state. Relays change state when an UPS alarm event occurs.

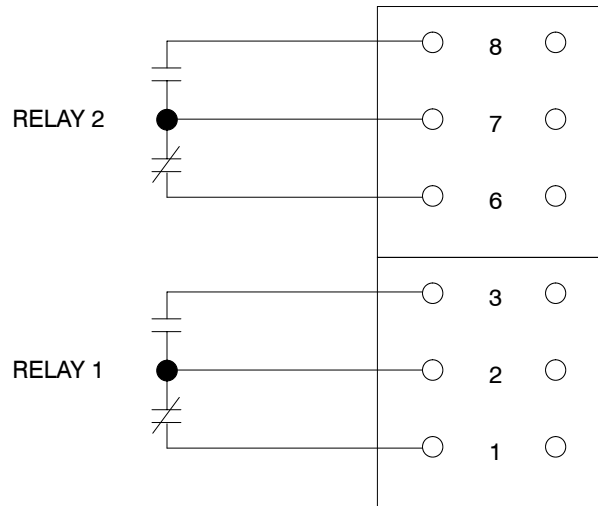


Figure A-23. Summary Alarm Relay Contacts

A.6 Typical REPO

The REPO feature opens all contactors in the UPS cabinet and isolates power from your critical load. Local electrical codes may also require tripping upstream protective devices to the UPS.



NOTE REPO switch rating is 24 Vdc, 1A minimum if supplied by the customer. The REPO switch must be a latching-type switch with a dedicated circuit.

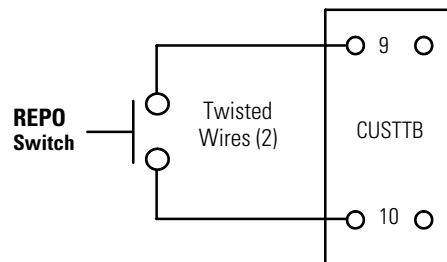
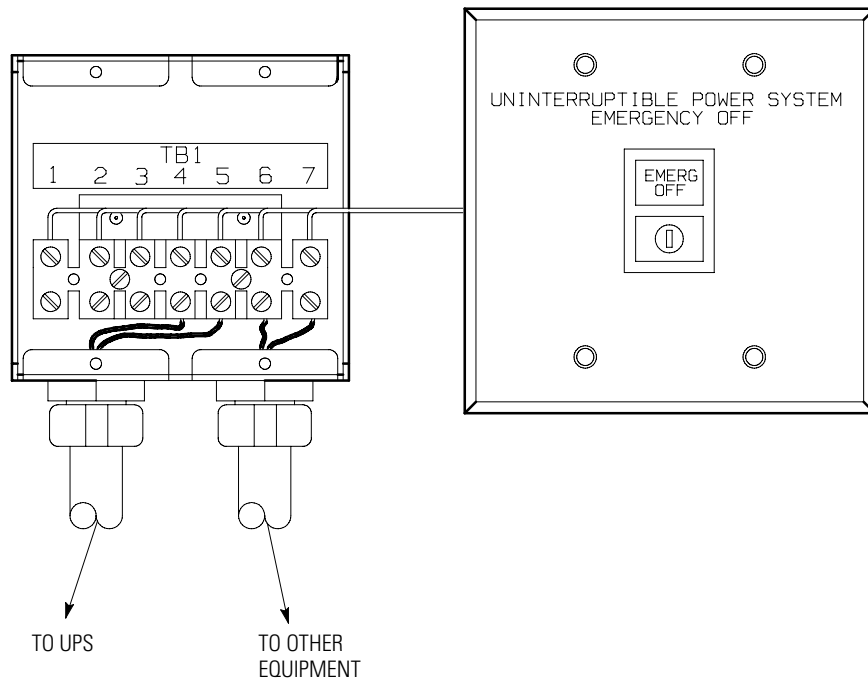
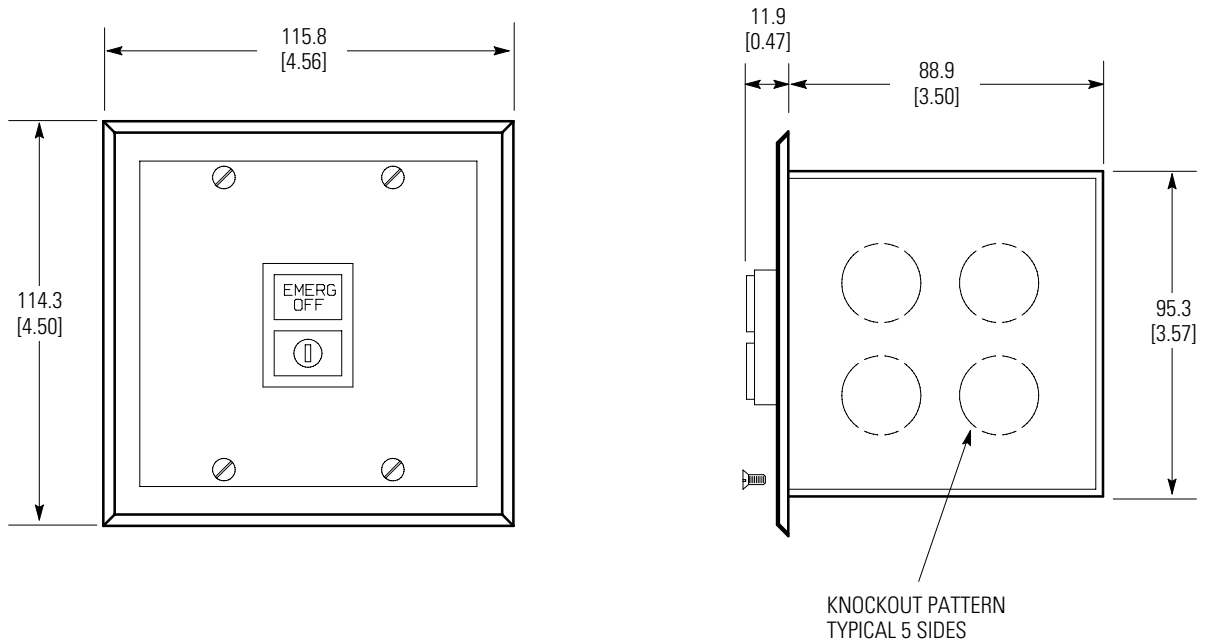


Figure A-24. REPO Wiring

NOTE Interface wiring and conduit between the REPO switch and the UPS are to be supplied by the customer.



DIMENSIONS ARE IN MILLIMETERS [INCHES]

Figure A-25. Typical REPO Switch

A.7 RMP Dimensions and Mounting Details

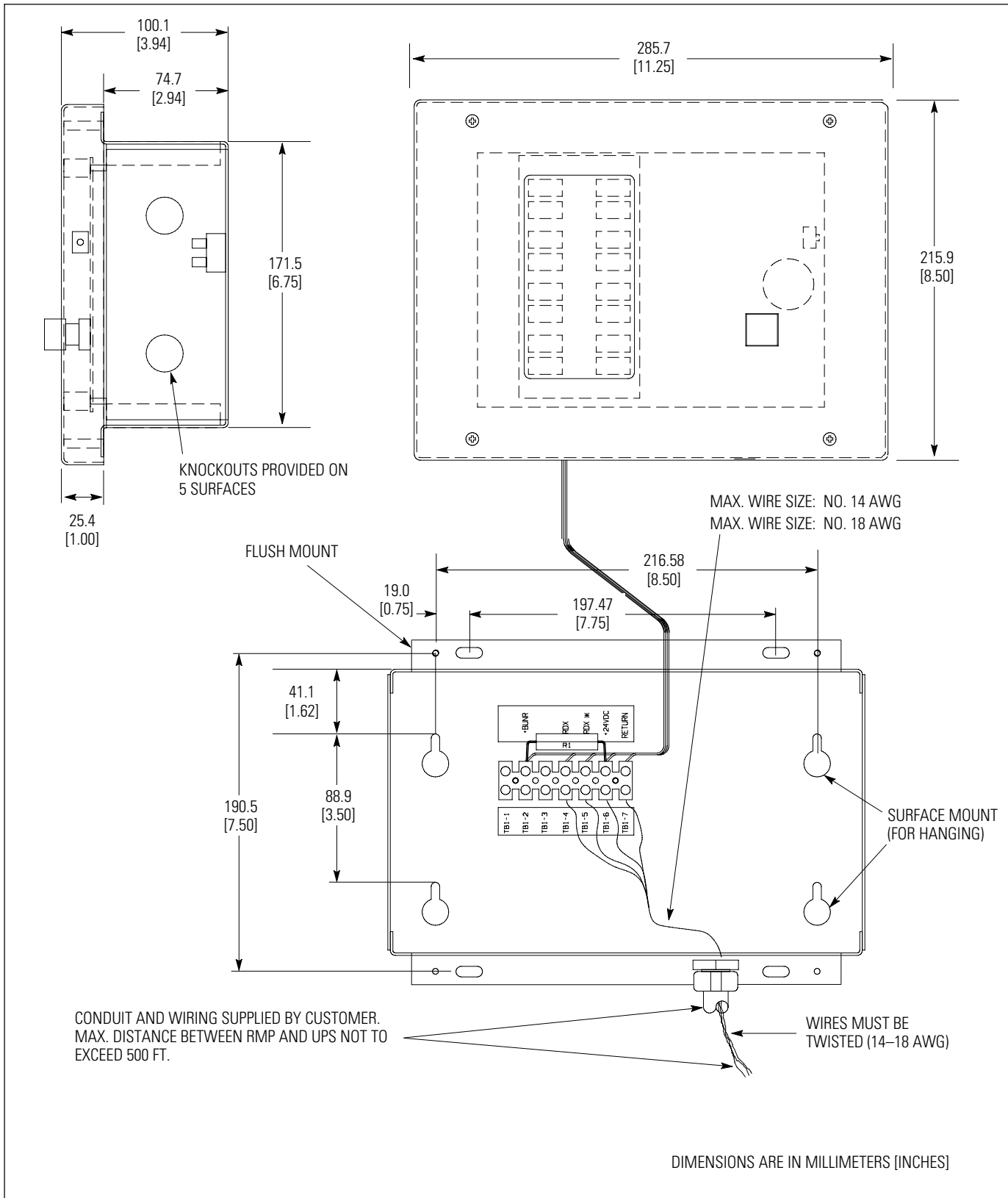


Figure A-26. RMP Dimensions and Mounting Details

A.8 RIM Dimensions and Mounting Details

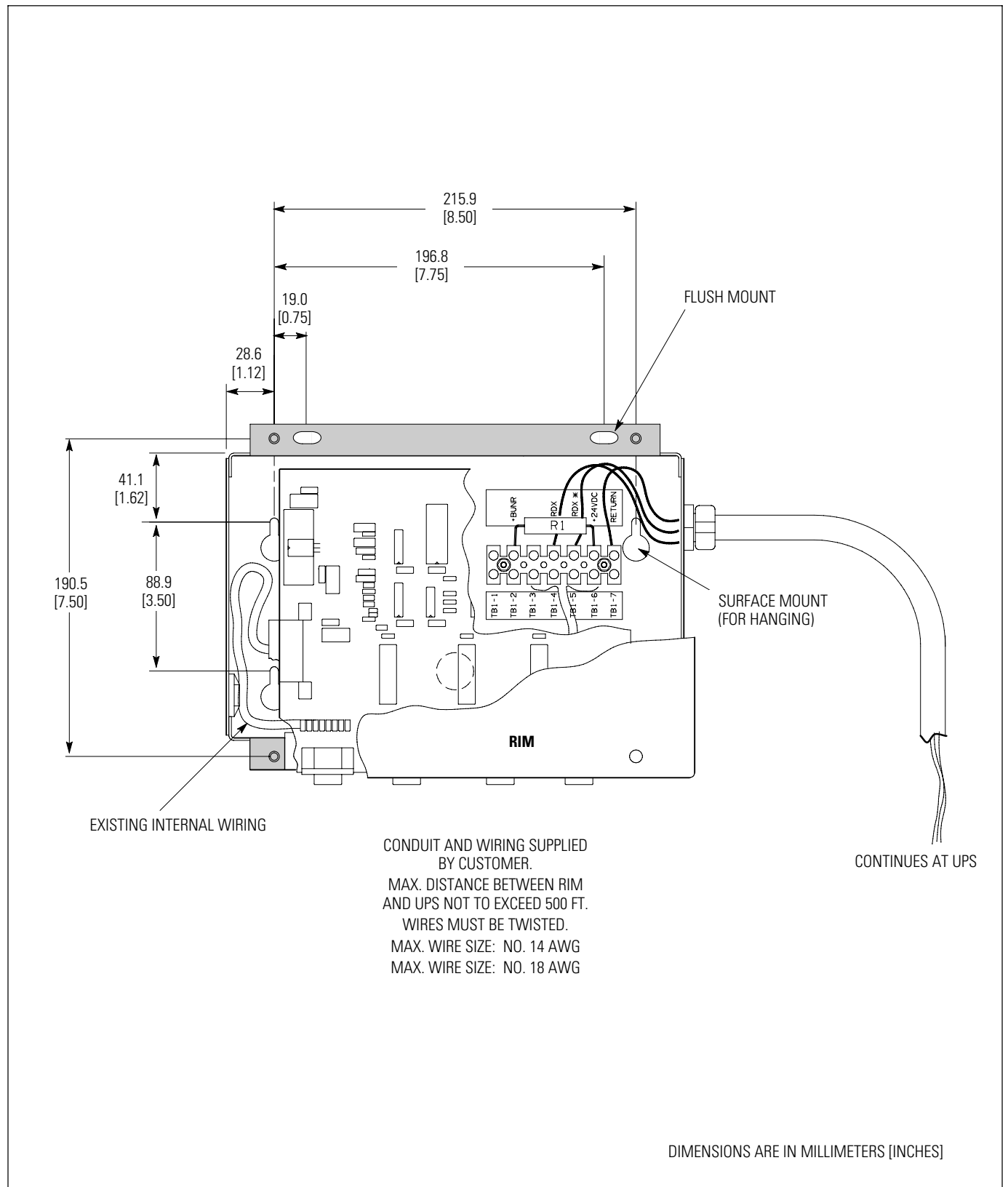
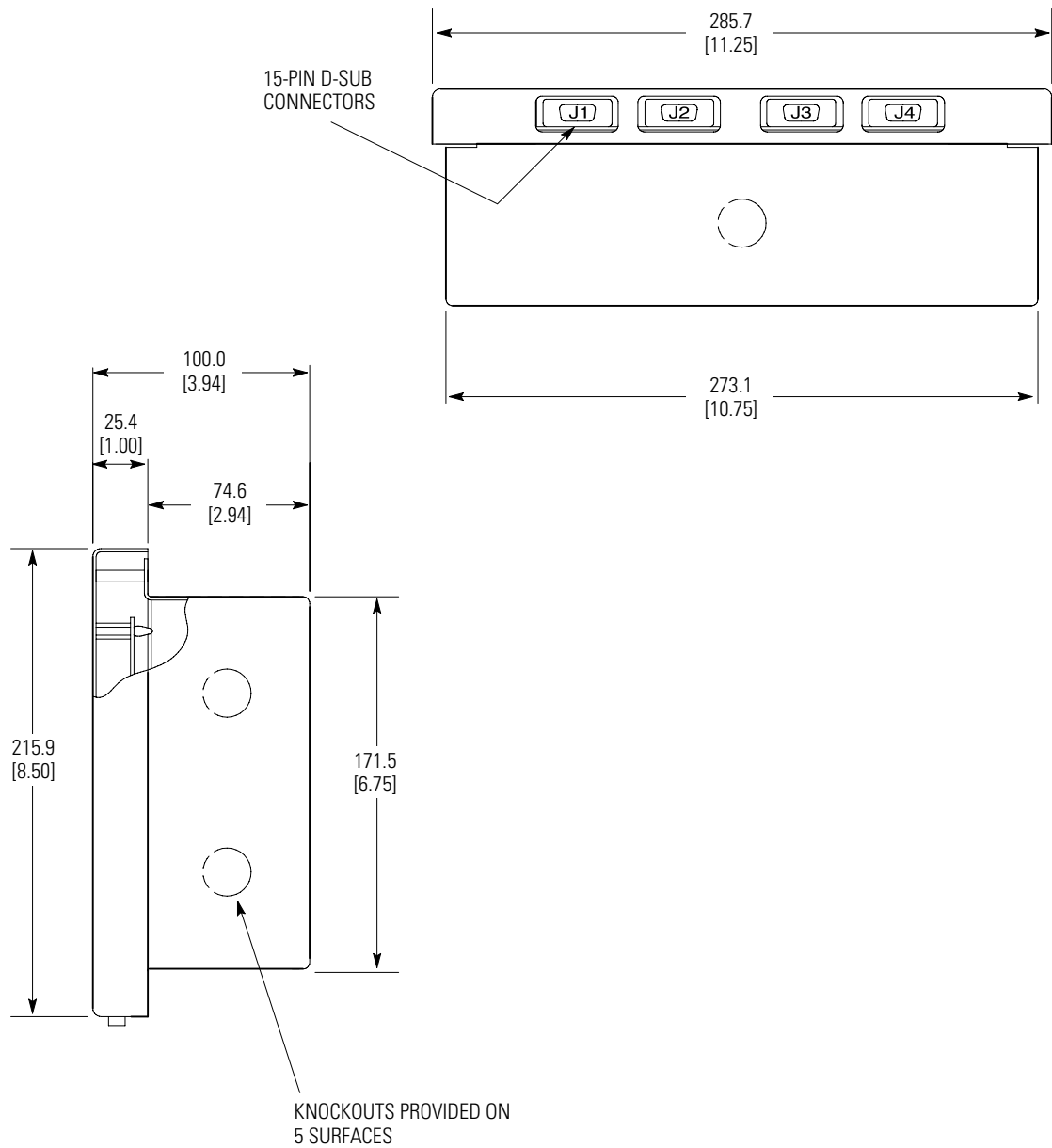


Figure A-27. RIM Dimensions and Mounting Details



DIMENSIONS ARE IN MILLIMETERS [INCHES]

Figure A-28. RIM Dimensions and Mounting Details (continued)

A.9 SCM Dimensions and Mounting Details

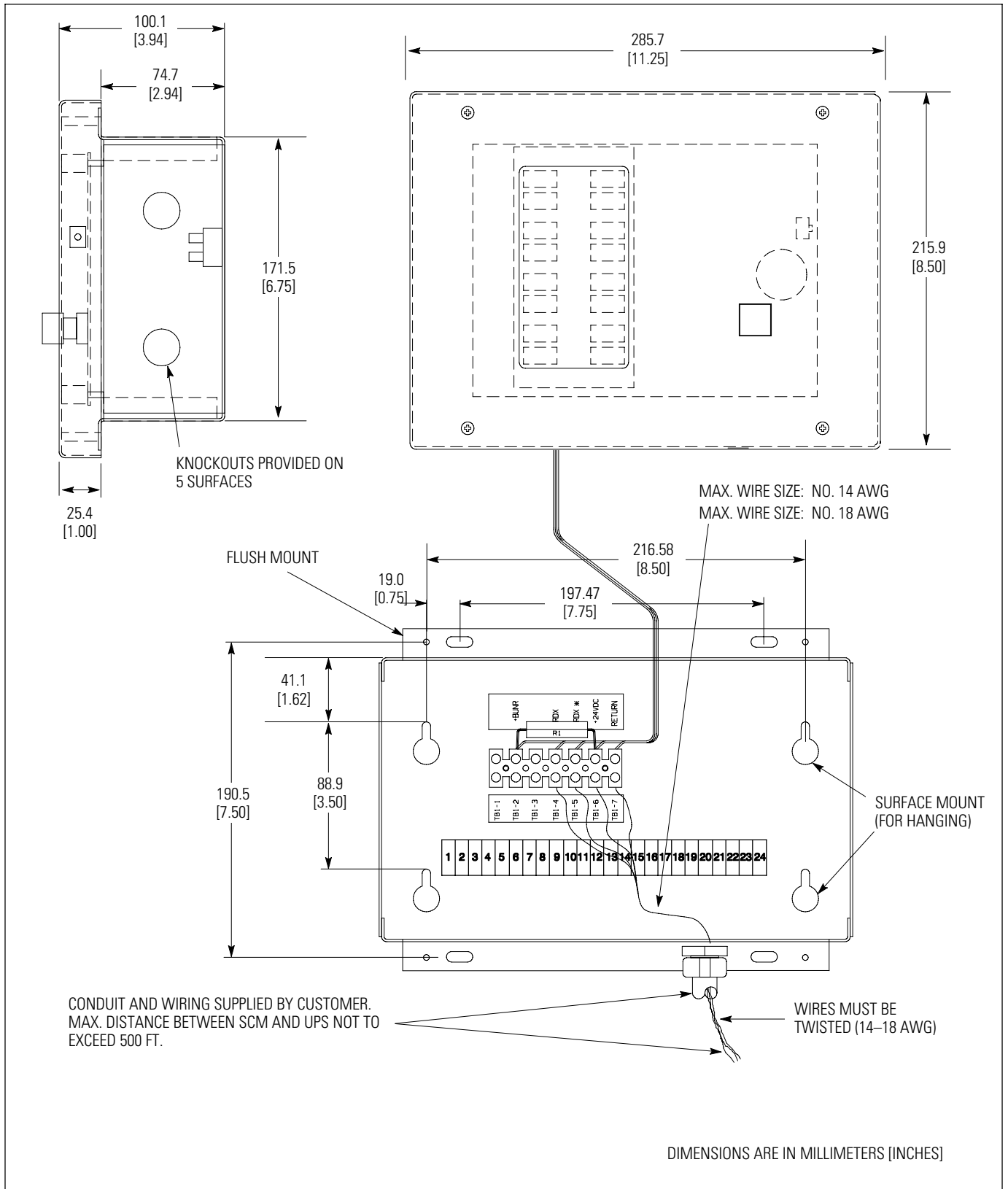


Figure A-29. SCM Dimensions and Mounting Details

A.10 Battery Disconnect Switch Dimensions

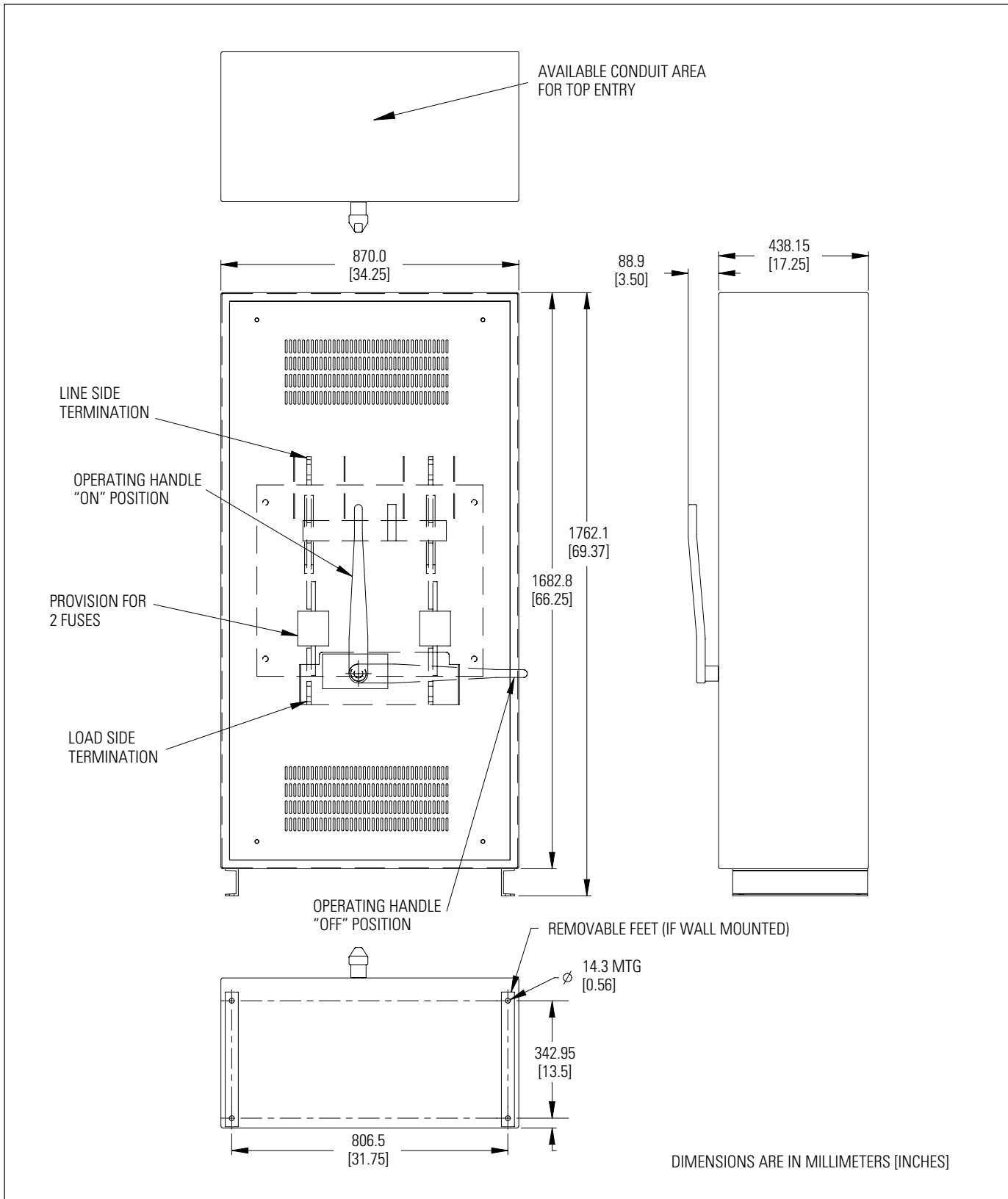


Figure A-30. Battery Disconnect Switch Dimensions



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