

Eaton® 93PM Emergency Lighting UPS

50 kW (480V Three-Wire UL 924)

50 kW (480V Four-Wire UL 924)

Installation and Operation Manual



Powering Business Worldwide

p/n: P-164000569
Revision 09

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.



IMPORTANT

Specifications are subject to change. To ensure you have the most up-to-date content and information for this product, please review the latest manual revision on our website, www.eaton.com/93PM.

Eaton reserves the right to change specifications without prior notice. Modbus is a registered trademark of Schneider Automation, Inc. MOXA is a registered trademark and MGate is a trademark of MOXA, Inc. Spiralock is a registered trademark of Spiralock Corporation. KIRK is a registered trademark of Kirk Key Interlock company, LLC, a subsidiary of Halma plc. National Electrical Code and NEC are registered trademarks of National Fire Protection Association, Inc. ERIFLEX and FLEXIBAR are registered trademark of Erico International Corporation. All other trademarks are property of their respective companies.

©Copyright 2016-2025 Eaton, Raleigh, NC, USA. All rights reserved. No part of this document may be reproduced in any way without the express written approval of Eaton.



P-110000654-001 Revised: December 21st, 2018

EATON END-USER LICENSE AGREEMENT

IMPORTANT, READ CAREFULLY. THIS END USER LICENSE AGREEMENT (THE "AGREEMENT") IS A BINDING CONTRACT BETWEEN YOU, THE END-USER (THE "LICENSEE") AND EATON INTELLIGENT POWER LIMITED, IRELAND, OR ONE OF ITS AFFILIATES ("EATON" OR "LICENSOR"). BY OPERATING THIS **UNINTERRUPTIBLE POWER SUPPLY (UPS)** PRODUCT INCLUDING SOFTWARE EMBEDDED IN IT (FIRMWARE), YOU, THE LICENSEE, ARE AGREEING TO BE BOUND BY THE TERMS, CONDITIONS, AND LIMITATIONS OF THIS AGREEMENT. READ THE TERMS AND CONDITIONS OF THIS AGREEMENT CAREFULLY BEFORE, INSTALLING OR OPERATING THE PRODUCT. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, PROMPTLY RETURN THE UNUSED PRODUCT TO EATON.

1.0 DEFINITIONS

1.1 Documentation. "Documentation" means the user guides and manuals for the installation and use of the UPS, whether made available over the internet, provided in CD-ROM, DVD, hard copy or other form.

1.2 Firmware. "Firmware" means software programs that are embedded in the product for which Licensee is granted a license hereunder, the Documentation therefore and, to the extent available, Updates thereto. The Firmware is licensed hereunder in object code (machine-readable) form only except that certain software programs may include limited portions in source code (human-readable) form.

1.3 Update. "Update" means a subsequent release of the Firmware, if and when developed by Eaton. An Update does not include any release, new version, option, or future product, which Eaton licenses separately.

2.0 FIRMWARE LICENSE

2.1 Ownership. Eaton or its third party licensors retains all title, copyright and other proprietary rights in, and ownership of the Firmware regardless of the media upon which the original or any copy may be recorded or fixed.

2.2 License Grant. Eaton grants to Licensee a limited, revocable, non-exclusive, non-assignable license to use the Firmware in conjunction with the operation of the product to which the Firmware pertains or other products as described by Eaton in the Documentation. Licensee does not acquire any rights, express or implied, other than those expressly granted in this Agreement.

2.3 Restrictions and Requirements. Licensee will not, nor will it permit others to, modify, adapt, translate, reverse engineer, decompile, or disassemble the Firmware or any component thereof (including the Documentation), or create derivative works based on the Firmware (including the Documentation), except to the extent such foregoing restriction is prohibited by applicable law or applicable open source license to, and only to, any open source software component that is incorporated into the Firmware (if any). Copyright laws and international treaties protect the Firmware, including the Documentation. Unauthorized copying of the Firmware, the Documentation or any part thereof, is expressly prohibited. For avoidance of doubt, Eaton does not grant Licensee a license to any of Eaton's brands, logos, designs, trade dress, service marks, trademarks, domain names or trade names, in whole or in part. Licensee agrees to install or allow installation of all corrections of substantial defects, security patches, minor bug fixes and updates, including any enhancements, for the Firmware in accordance with the instructions and as directed by Eaton.

2.4 Transfer and Assignment Restrictions. Licensee will not sell, resell, assign, lease, sublicense, encumber, or otherwise transfer its interest in this Agreement or in the Firmware, or the Documentation in whole or in part, or allow any other person or entity, including any parent or subsidiary of Licensee or other subsidiary of Licensee's parent, to copy, distribute, or otherwise transfer the Firmware without the prior written consent of Eaton. Licensee may transfer the Firmware directly to a third party only in connection with the sale of the Eaton product in which it is installed.

3.0 TERMINATION

3.1 Termination. This Agreement and the license granted hereunder automatically terminates if Licensee breaches any provision of this Agreement. Eaton may terminate this license at any time with or without cause.

3.2 Effect of Termination. Immediately upon termination of this Agreement or the license granted hereunder, Licensee will cease using the product. The parties' rights and obligations under the following sections of this Agreement will survive termination of this Agreement: Article 1.0, Section 2.1, Section 2.3, Section 2.4, Article 3.0, Article 4.0 and Article 5.0.

4.0 INFRINGEMENT AND WARRANTIES

4.1 Infringement. If Licensee learns of a threat, demand, allegation, or indication that the UPS with its firmware infringes or misappropriates any third party intellectual property rights (including but not limited to any patent, copyright, trademark, trade dress, or trade secret) ("Intellectual Property Claim"), Licensee will notify Eaton promptly of such claim. Eaton may, in its sole discretion, elect to assume sole control of the defense and settlement of said Intellectual Property Claim and Licensee will provide reasonable information and assistance to Eaton for the defense of such claim.

4.2 Disclaimer of Warranties. THE FIRMWARE IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND. EATON DOES NOT WARRANT THAT THE FIRMWARE WILL BE ERROR-FREE OR SECURE FROM UNAUTHORIZED ACCESS. THE LICENSEE EXPRESSLY ACKNOWLEDGES THAT TO THE EXTENT PERMITTED BY APPLICABLE LAW, THE USE OF THE PRODUCT IS AT LICENSEE'S SOLE RISK.

5.0 GENERAL PROVISIONS

5.1 Update Policy. Eaton may from time to time, but has no obligation to, create Updates of the Firmware or components thereof.

5.2 Limitation on Liability. NOTWITHSTANDING ANY PROVISION OF THIS AGREEMENT TO THE CONTRARY, LICENSEE EXPRESSLY UNDERSTANDS AND AGREES THAT EATON, ITS AFFILIATES, AND ITS LICENSORS, WILL NOT BE LIABLE FOR: (A) ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES WHICH MAY BE INCURRED BY LICENSEE OR ANY THIRD PARTY, HOWEVER CAUSED AND UNDER ANY THEORY OF LIABILITY, THIS WILL INCLUDE, BUT NOT BE LIMITED TO, ANY LOSS OF PROFIT (WHETHER INCURRED DIRECTLY OR INDIRECTLY), ANY LOSS OF GOODWILL OR BUSINESS REPUTATION, ANY LOSS OF DATA SUFFERED, COST OF PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, OR OTHER INTANGIBLE LOSS; (B) ANY LOSS OR DAMAGE WHICH MAY BE INCURRED BY LICENSEE OR ANY THIRD PARTY. THESE LIMITATIONS ON EATON'S LIABILITY WILL APPLY WHETHER OR NOT EATON HAS BEEN ADVISED OF OR SHOULD HAVE BEEN AWARE OF THE POSSIBILITY OF ANY SUCH LOSSES ARISING.

TO THE EXTENT PERMITTED BY LAW, THE TOTAL LIABILITY OF EATON, ITS AFFILIATES, AND ITS LICENSORS, FOR ANY CLAIMS UNDER THESE TERMS, INCLUDING FOR ANY IMPLIED WARRANTIES, IS LIMITED TO THE AMOUNT PAID FOR THE UPS.

THIS SECTION 5.2 STATES EATON'S ENTIRE LIABILITY AND LICENSEE'S SOLE AND EXCLUSIVE REMEDY UNDER THIS AGREEMENT, AND IS SUBJECT TO ALL LIMITATIONS STATED IN SECTION 4.2.

5.3 Notices. All notices required to be sent hereunder will be in writing and will be deemed to

have been given when mailed by first class mail to the address shown below:

LICENSE NOTICES:
Eaton Intelligent Power Limited
Eaton House,
30 Pembroke Road,
Dublin 4,
D04 Y0C2,
Ireland

5.4 Severability. If any provision of this Agreement is held to be invalid or unenforceable, the remaining provisions of this Agreement will remain in full force.

5.5 Waiver. The waiver by either party of any default or breach of this Agreement will not constitute a waiver of any other or subsequent default or breach. Failure to enforce or delay in enforcing any provision of this Agreement will not constitute a waiver of any rights under any provisions of this Agreement.

5.6 Entire Agreement. This Agreement constitutes the complete agreement between the parties and supersedes all prior or contemporaneous agreements or representations, written or oral, concerning the subject matter of this Agreement. This Agreement may not be modified or amended except in a writing specifically referencing this Agreement and signed by a duly authorized representative of each party. No other act, document, usage or custom will be deemed to amend or modify this Agreement. The Firmware, or portions thereof, may also be subject to additional paper or electronic license agreements. In such cases, the terms of this Agreement will be supplemental to those in the additional agreements, to the extent not inconsistent with the additional agreements. If a copy of this Agreement in a language other than English is included with the Firmware or Documentation, it is included for convenience and the English language version of this Agreement will control.

5.7 Heirs, Successors, and Assigns. Each and all of the covenants, terms, provisions and agreements herein contained will be binding upon and inure to the benefit of the parties hereto and, to the extent expressly permitted by this Agreement, their respective heirs, legal representatives, successors and assigns.

5.8 Export Restrictions. Licensee agrees to comply fully with all relevant export laws and regulations of the United States and all other countries in the world (the "Export Laws") to assure that neither the Firmware nor any direct product thereof are (i) exported, directly or indirectly, in violation of Export Laws; or (ii) are intended to be used for any purposes prohibited by the Export Laws. Without limiting the foregoing, Licensee will not export or re-export the Firmware: (i) to any country to which the U.S. has embargoed or restricted the export of goods or services (see <http://www.treasury.gov/resource-center/sanctions/Programs/Pages/Programs.aspx>), or to any national of any such country, wherever located, who intends to transmit or transport the Firmware back to such country; (ii) to any end user who Licensee knows or has reason to know will utilize the Firmware in the design, development or production of nuclear, chemical or biological weapons; or (iii) to any end-user who has been prohibited from participating in U.S. export transactions by any federal agency of the U.S. government.

5.9 U.S. Government Restricted Rights. The Firmware is a "commercial item" as that term is defined at 48 C.F.R. § 2.101, consisting of "commercial computer software" and "commercial computer software documentation", as such terms are used in 48 C.F.R. § 12.212, and is provided to the U.S. Government only as a commercial end item. Consistent with 48 C.F.R. § 12.212 and 48 C.F.R. §§ 227.7202-1 through 227.7202-4, all U.S. Government End Users acquire the Firmware with only those rights set forth herein. Contractor/manufacturer is Eaton Corporation, 1000 Eaton Boulevard, Cleveland, Ohio 44122.

5.10 Third Party Intellectual Property Rights. The Firmware may contain components (including open source software components) that are owned by third parties ("Third Party Licensors") and are provided with, incorporated into, or embedded in, the Firmware pursuant to license arrangements between Eaton and such third parties. Third Party Licensor components in the Firmware are not licensed or warranted under the terms of this document, but are instead subject to the Third Party Licensors' license agreements. Licensee will not modify, delete, or obfuscate any copyright or other proprietary rights notices of Third Party Licensors contained in the Firmware.

5.11 Indemnity. Licensee shall defend, indemnify and hold Eaton and its officers, directors, employees, and agents harmless from and against all losses, damages, liabilities, claims, actions, and associated costs and expenses (including reasonable attorneys' fees and expenses) by reason of injury or death to any person or damage to any tangible or intangible property arising or resulting from the negligence or willful misconduct of the Licensee, its employees, contractors, or agents, in connection with Licensee's use of Firmware and Documentation.

Licensee shall be responsible for any breach of this Agreement by its officers, directors, employees, contractors, or agents. Licensee shall defend, indemnify, and hold Eaton and its officers, directors, employees, and agents harmless from and against any and all losses, damages, liabilities, claims, actions, and associated costs and expenses (including reasonable attorneys' fees and expenses) arising out of or in connection with any breach of this Agreement.

5.12 Open Source Software. The Firmware may contain certain components owned by Eaton that are provided with, incorporated into, linked to, or embedded in the Firmware that are subject to third party open source licenses ("Eaton Open Source Components"). Eaton Open Source Components are subject to the open source licenses corresponding to the particular software component. To the extent there are any conflicts between the terms of this Agreement and any open source license corresponding to Eaton Open Source Components or additional obligations by such open sources license that are not set forth in this Agreement, the terms of the open source license will control.

5.13 Confidentiality. Licensee acknowledges that confidential aspects of the Firmware (including any proprietary source code) are a trade secret of Eaton, the disclosure of which would cause substantial harm to Eaton that could not be remedied by the payment of damages alone and such confidential aspects of the Firmware shall not be disclosed to third parties without the prior written consent of Eaton. Accordingly, Eaton will be entitled to preliminary and permanent injunctive and other equitable relief for any breach of this Section 5.13.

5.14 Note on JAVA Support. The Firmware may contain support for programs written in JAVA. JAVA technology is not fault tolerant and is not designed, manufactured, or intended for use or resale as online control equipment in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communications systems, air traffic control, direct life support machines, or weapons systems, in which the failure of JAVA technology could lead directly to death, personal injury, or severe physical or environmental damage. EATON DISCLAIMS ALL DAMAGES INCLUDING DIRECT, INDIRECT AND CONSEQUENTIAL DAMAGES RELATING TO THE FAILURE OF ANY SOFTWARE INCLUDING JAVA PROGRAMS AND/OR JAVA TECHNOLOGY.

5.15 Governing Law. This Agreement will be interpreted and enforced in accordance with the laws of Ireland, without regard to choice of law principles. Any claim or suit with respect to this Agreement shall be brought in the Courts of Ireland, unless mandatory law imposes otherwise.

Eaton EULA

Table of Contents

1 Introduction	1
1.1 UPS Standard Features	1
1.1.1 Installation Features	1
1.1.2 Control Panel	3
1.1.3 Customer Interface	3
1.1.4 Energy Saver System Mode	3
1.1.5 Internal Redundancy	3
1.1.6 Advanced Battery Management	3
1.1.7 Emergency Power Off	4
1.2 Options and Accessories	4
1.2.1 Integrated Battery Cabinet	4
1.2.2 Sidecar Integrated Accessory Cabinet-Bypass	5
1.2.3 Top Entry Wiring Sidecar	5
1.2.4 Monitoring and Communication	5
1.2.5 Additional Output Surge Protection	5
1.3 Battery System	6
1.3.1 Battery Configurations	6
1.4 Basic System Configurations	6
1.5 Using This Manual	6
1.6 Conventions Used in This Manual	7
1.7 Symbols, Controls, and Indicators	7
1.8 For More Information	8
1.9 Getting Help	8
1.10 Equipment Registration	8
2 Safety Warnings	9
3 UPS Installation Plan and Unpacking	13
3.1 Creating an Installation Plan	13
3.2 Preparing the Site	13
3.2.1 Environmental and Installation Considerations	13
3.2.2 UPS System Power Wiring Preparation	24
3.2.3 UPS System Interface Wiring Preparation	31
3.3 Inspecting and Unpacking the UPS Cabinets	32
4 UPS System Installation	35
4.1 Preliminary Installation Information	35
4.2 Unloading the UPS Cabinet from the Pallet	35
4.3 Integrated Battery Cabinet Installation	40
4.4 Sidecar Integrated Accessory Cabinet-Bypass Wiring Installation	41
4.5 External AC Power Wiring Installation	42

4.6 Battery Power Wiring	47
4.7 Installing Interface Connections	48
4.7.1 Installing Building Alarm and Relay Contact Connections	48
4.7.2 Installing Battery Detect and Shunt Trip Interface Connections	54
4.7.3 Installing Thermal Sensor Interface Connections	57
4.7.4 Generator Interface Connections	60
4.7.5 Installing Minislot Interface Connections	61
4.8 Initial Startup	61
4.9 Completing the Installation Checklist	62
4.10 Installation Checklist	62
5 Understanding UPS Operation	64
5.1 UPS System Overview	64
5.2 Single UPS	65
5.2.1 Modes	65
5.2.2 Energy Saver System Mode	66
5.2.3 Normal Mode	67
5.2.4 Bypass Mode	68
5.2.5 Battery Mode	69
6 UPS Online Schematics	70
7 UPS Operating Instructions	76
7.1 UPS Controls and Indicators	76
7.1.1 Control Panel	76
7.1.2 Circuit Breakers	76
7.2 Using the Control Panel	77
7.2.1 Status Indicators	78
7.2.2 System Events	79
7.2.3 Using the LCD Touch Screen	79
7.2.4 Using the Menu	80
7.2.5 Mimic Screen	81
7.2.6 Display Menu Operation	82
7.2.7 Sign In	87
7.2.8 System Controls	89
7.3 Single UPS Operation	92
7.3.1 Starting the UPS in Double Conversion Mode	92
7.3.2 Starting the UPS in Bypass Mode	93
7.3.3 Starting the UPS via DC Start Button	94
7.3.4 Starting the UPM	95
7.3.5 Transfer from Double Conversion to Bypass Mode	95
7.3.6 Transfer from Bypass to Double Conversion Mode	96
7.3.7 Transfer from ESS Mode to Double Conversion Mode	96

Table of Contents

7.3.8 Transfer from Double Conversion Mode to ESS Mode	96
7.3.9 Transfer from Double Conversion to Bypass Mode and Shut Down the UPM	96
7.3.10 UPS and Critical Load Shutdown	97
7.3.11 Charger Control	97
7.3.12 Battery Test	98
7.3.13 Using the UPS LOAD OFF Command	98
7.3.14 Using the Remote Emergency Power-off Switch	99
8 Communication	100
8.1 Minislot Cards	100
8.2 Building Alarm Monitoring	101
8.3 General Purpose Relay Contact	101
8.4 PredictPulse Remote Monitoring and Management Service	101
8.4.1 PredictPulse Service Features	101
8.4.2 Installing PredictPulse	102
9 UPS Maintenance	103
9.1 Important Safety Instructions	103
9.2 Performing Preventive Maintenance	104
9.2.1 DAILY Maintenance	104
9.2.2 MONTHLY Maintenance	104
9.2.3 PERIODIC Maintenance	106
9.2.4 ANNUAL Maintenance	106
9.2.5 BATTERY Maintenance	106
9.3 Installing Batteries	106
9.4 Recycling the Used Battery or UPS	106
9.5 Maintenance Training	107
10 Product Specifications	108
10.1 Model Numbers	108
10.2 Specifications	108
10.2.1 UPS Input	108
10.2.2 UPS Output	109
10.2.3 UPS Environmental	109
11 Warranty	110

List of Figures

Figure 1.	Eaton 93PM UPS (50 kW, Three or Four-Wire UL 924)	2
Figure 2.	Eaton 93PM UPS (50 kW, Three or Four-Wire UL 924) with Left or Right Mounted Sidecar	2
Figure 3.	UPS Cabinet Dimensions (Front and Right Side Views)	17
Figure 4.	UPS Cabinet Dimensions (Top and Bottom Views)	18
Figure 5.	UPS Cabinet with Left-Mounted or Right-Mounted Sidecar Dimensions (Front and Right Side Views)	19
Figure 6.	UPS Cabinet with Left-Mounted or Right-Mounted Sidecar Dimensions (Top and Bottom Views)	20
Figure 7.	UPS Cabinet Front and Back Floor Mounting Bracket Mounting Dimensions (Back Views)	21
Figure 8.	UPS Cabinet Center of Gravity	22
Figure 9.	UPS Cabinet with Left-Mounted or Right-Mounted Sidecar Center of Gravity	23
Figure 10.	UPS Cabinet as Shipped on Pallet	33
Figure 11.	UPS Cabinet with Left-Mounted or Right-Mounted Sidecar as Shipped on Pallet	34
Figure 12.	Removing the Pallet Skids and Supports – Eaton 93PM UPS	36
Figure 13.	Removing the Sidecar Pallet Skids and Supports – Eaton 93PM UPS	38
Figure 14.	Removing the Sidecar Rear Shipping Bracket – Eaton 93PM UPS	40
Figure 15.	UPS Conduit and Wire Entry Locations	43
Figure 16.	Sidecar Conduit and Wire Entry Locations	44
Figure 17.	UPS Inter-Cabinet Wiring Access Location	45
Figure 18.	Power Terminal Locations	46
Figure 19.	Power Terminal Detail	47
Figure 20.	Interface Terminal Locations	49
Figure 21.	Interface Terminal Detail	50
Figure 22.	Bottom Access Interface Wiring Locations	51
Figure 23.	Wire Tie Anchors	52
Figure 24.	Building Alarm Terminal Block Connector Assignments	53
Figure 25.	Relay Contact Terminal Block Connector Assignments	53
Figure 26.	Battery Detect and Shunt Trip Terminal Locations	55
Figure 27.	Battery Detect and Shunt Trip Terminal Assignments	56
Figure 28.	Battery Configuration Jumper Assignments	56
Figure 29.	Thermal Sensor Terminal Location	58
Figure 30.	Thermal Sensor Terminal Assignments	59
Figure 31.	Thermal Sensor Jumper Assignments	59
Figure 32.	Main Elements of the UPS System	64
Figure 33.	Path of Current Through the UPS in Energy Saver System Mode	66
Figure 34.	Path of Current Through the UPS in Normal Mode	67
Figure 35.	Path of Current Through the UPS in Bypass Mode	68
Figure 36.	Path of Current Through the UPS in Battery Mode	69
Figure 37.	Eaton 93PM Three-Wire UPS System Oneline	70
Figure 38.	Eaton 93PM Four-Wire UPS System Oneline	71
Figure 39.	Eaton 93PM Three-Wire UPS with Top Entry Sidecar System Oneline	72

List of Figures

Figure 40.	Eaton 93PM Four-Wire UPS with Top Entry Sidecar System Online	73
Figure 41.	Eaton 93PM Three-Wire UPS with Bypass Sidecar (SIAC-B) System Online	74
Figure 42.	Eaton 93PM Four-Wire UPS with Bypass Sidecar (SIAC-B) System Online	75
Figure 43.	UPS Controls and Indicators	76
Figure 44.	AC Input Circuit Breaker Location	77
Figure 45.	UPS Control Panel	78
Figure 46.	Parts of the LCD	80
Figure 47.	Main Menu and Mimic Screen	81
Figure 48.	Typical Meters Summary Screen	83
Figure 49.	Typical Active Events Screen	84
Figure 50.	Typical System Log Screen	84
Figure 51.	Typical Settings User Screen	85
Figure 52.	Typical Information Screen	85
Figure 53.	Typical About Screen	86
Figure 54.	Typical Settings Configuration 1 Screen	86
Figure 55.	Typical Settings Configuration 2 Screen	87
Figure 56.	Typical Statistics Screen	87
Figure 57.	Sign In Password Screen	88
Figure 58.	Sign In Keypad.....	89
Figure 59.	Typical System Control Screen	90
Figure 60.	Typical UPS Control Screen	90
Figure 61.	Typical UPM Select Screen	91
Figure 62.	Typical UPM Control Screen	91
Figure 63.	Typical EAA Control Screen	92
Figure 64.	DC Start Button Location	94
Figure 65.	Optional Minislot Cards	100
Figure 66.	Air Filter Location	105

List of Tables

Table 1.	Battery Cabinet and Battery Type Requirements	6
Table 2.	G1 Equipment Data from ANSI/ISA-71.04-2013	15
Table 3.	Air Conditioning or Ventilation Requirements During Full Load Operation.....	16
Table 4.	UPS Cabinet Weights	16
Table 5.	UPS Cabinet Clearances	16
Table 6.	Input/Output Ratings and External Wiring Recommendations for the Eaton 93PM-50-1	26
Table 7.	UPS External Power Cable Terminations for the Eaton 93PM-50-1	28
Table 8.	Power Cable Conduit Recommendations for the Eaton 93PM-50-1	29
Table 9.	Recommended Input and Bypass Circuit Breaker Ratings	30
Table 10.	Recommended Output Circuit Breaker Ratings	30
Table 11.	Building Alarm Connections and Wire Terminations	52
Table 12.	Relay Contact Connections and Wire Terminations	53
Table 13.	External Battery Detect and Shunt Trip Connections and Wire Terminations.....	56
Table 14.	Thermal Sensor Connections and Wire Terminations.....	59
Table 15.	Status Indicators	79
Table 16.	Display Function Menu Map	81
Table 17.	Display Menu Operation	82
Table 18.	Controls Menu Operation	89
Table 19.	Typical System Status Messages.....	90
Table 20.	IRC-MS Default Triggers	100

Chapter 1 Introduction


The Eaton® 93PM 50 kW, Three-Wire UL 924 Emergency Lighting Uninterruptible Power Supply (UPS) and the Eaton 93PM 50 kW, Four-Wire UL 924 Emergency Lighting Uninterruptible Power Supply (UPS) are true online, continuous-duty, transformerless, double-conversion, solid-state, three-phase system, providing conditioned and uninterruptible AC power for emergency lighting during power failures or other emergency situations.

The Eaton 93PM UL 924 UPS models are certified for UL Standards for Safety for Emergency Lighting and Power Equipment, UL 924. UL 924 models can provide greater than 90 minutes of battery runtime at the rated load.

The Eaton 93PM UL 924 UPS online power protection system is used to power the customer's emergency lighting system and is configured with external line and match or standalone battery cabinets.

The Eaton 93PM UL 924 UPS is available with one Uninterruptible Power Module (UPMs) integrated in one cabinet. The UPM is rated for a maximum of 40 kW. The system maximum rating is 40 kW.

The UPS is housed in a single free-standing cabinet, with safety shields behind the door for hazardous voltage protection. Power wiring is installed through the bottom of the cabinet with an optional sidecar available for top entry wiring. [Figure 1](#) shows the Eaton 93PM 50 kW, Three or Four-Wire UL 924 UPS and [Figure 2](#) shows the Eaton 93PM 50 kW, Three or Four-Wire UL 924 UPS with a left or right mounted sidecar.

NOTE 	Startup and operational checks must be performed by an authorized Eaton Customer Service Engineer, or the warranty terms specified on the product's resources page become void. See Chapter 11 Warranty for details. This service is offered as part of the sales contract for the UPS. Contact an Eaton service representative in advance (a minimum two-week notice is required) to reserve a preferred startup date.
--	---

1.1 UPS Standard 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

- Line-up-and-match or standalone configurations
- Power wiring can be routed through the bottom of the cabinet
- Battery wiring can be run internally through the left or right sides of the UPS cabinet in line-up-and-match configurations
- Easily accessible mechanical terminals located at the bottom front of the cabinet reduce installation time
- Control wiring can be routed through the top or bottom of the UPS cabinet, or through the left or right sides of the UPS cabinet in line-up-and-match configurations
- Built-in casters for easy cabinet placement
- Cabinet bolt holes are provided for permanently mounting the UPS using optional front and back or left and right side floor mounting bracket kits

Figure 1. Eaton 93PM UPS (50 kW, Three or Four-Wire UL 924)

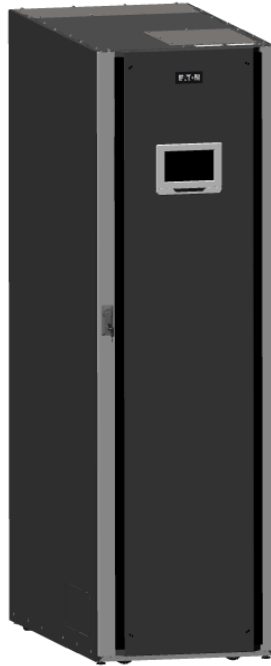


Figure 2. Eaton 93PM UPS (50 kW, Three or Four-Wire UL 924) with Left or Right Mounted Sidecar



UPS with Left-Mounted Sidecar



UPS with Right-Mounted Sidecar

1.1.2 Control Panel

The control panel, located on the front of the UPS, contains a color liquid crystal touch screen display (LCD) and a horizontal row of LED indicators to control the operation of the UPS and to display the status of the UPS system. See [Chapter 7 UPS Operating Instructions](#) for additional information.

1.1.3 Customer Interface

- **Building Alarm Monitoring** – Up to five inputs in the UPS are available to connect the facility's alarm system contacts. Some system configurations may limit the number of inputs available. The UPS uses these inputs to monitor the building alarms in addition to the UPS status.
- **Alarm Contact** – One alarm contact is 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.
- **Minislot Communication Bays** – Four communication bays are standard equipment. One to four optional Minislot® connectivity cards can be installed in the UPS at any time. Minislot cards are quickly installed at the front of the UPS and are hot-pluggable.

For additional information on these topics, see [Chapter 8 Communication](#).

1.1.4 Energy Saver System Mode

The 93PM Series UPS offers an Energy Saver System (ESS) mode that maximizes efficiency by eliminating unnecessary power conversion when the commercial power source is within acceptable voltage and frequency limits. In this mode, the UPS is actively monitoring the critical bus and instantly and seamlessly transitions to double-conversion mode (inverter online) if a commercial electrical power brownout, blackout, overvoltage, undervoltage, or out-of-tolerance frequency condition occurs. See [Chapter 7 UPS Operating Instructions](#) for additional information.

1.1.5 Internal Redundancy

To deliver greater reliability, the Eaton 93PM UPS can be configured for internal redundancy. When configured, the UPS automatically becomes redundant if the load is at or below the capacity of the UPMs minus the capacity of one UPM. Under normal conditions the UPMs in the UPS share the load equally. If one or more UPMs becomes unavailable and the load is at or below the capacity of remaining UPMs, the remaining UPMs supply the load instead of transferring to bypass.

1.1.6 Advanced Battery Management

Advanced Battery Management (ABM) technology uses sophisticated sensing circuitry and a three-stage charger. The charger is a high-frequency, IGBT-based power conversion stage that extends the useful service life of UPS batteries by isolating the battery from the electrical environment, except for periodic charging or reserve mode operation. ABM also protects batteries from damage due to high current charging and inverter ripple currents. Charging at high currents can overheat and damage batteries.

ABM extends battery life by keeping the batteries charged and performing periodic battery testing. The battery test checks the batteries by transferring to battery mode. During the test the battery voltage is constantly monitored to determine Battery Health. ABM is intended for VRLA style batteries.

An ABM charging cycle starts with the charger driving the battery voltage at maximum current limit, to a battery charge level of 2.30volts/cell. The time it takes for the voltage to reach the battery charge level is saved as the battery charge time. If the battery charge time exceeds 24 hours, an alarm sounds.

When the battery reaches the float level, the battery is charged at the float level for 48 hours. Due to charger capability, some battery cabinet configurations extend float level to 72 hours. Twenty-four hours into the float period, a series of battery tests are performed to check the battery health. The float level charge continues after a successful test.

After initial startup, the battery run time on the front panel display indicates two minutes. After the 24-hour float charging period and automated battery testing, the actual battery run time is determined and the actual battery run time is displayed.

After the float period is completed, the charger is disconnected and the batteries are allowed to rest for up to 672 hours (28 days) maximum rest time. If the battery voltage falls below the opportunity charge level of 2.1V/cell during the first 240 hours (10 days) of the rest period, an alarm sounds.

An ABM charge cycle is initiated whenever one of these four conditions occurs since the last charge cycle:

- The batteries have rested over the maximum rest time of 672 hours.
- Accumulated discharge time is over a maximum battery discharge time of 20 seconds.
- Battery voltage is under the opportunity charge level of 2.1 volts/cell and the cabinet has been in rest mode for longer than 240 hours.
- A Battery Test command has been initiated.

1.1.7 Emergency Power Off

WARNING

- Emergency Power Off (EPO) and Remote Emergency Power Off (REPO) functionality has been disabled for UL 924 emergency lighting systems. To remove power from the system a LOAD OFF command (see paragraph [7.3.13 Using the UPS LOAD OFF Command](#)) must be given using the front panel controls and all breakers opened.
- Power is present inside the UPS cabinet until the upstream input feeder circuit breakers and battery breakers are opened.



AVERTISSEMENT!

- Les fonctionnalités de mise hors tension d'urgence (EPO) et de mise hors tension d'urgence à distance (REPO) sont désactivées pour les systèmes UPS configurés pour l'éclairage auxiliaire UL 924. Pour couper l'alimentation du système, une commande LOAD OFF (voir paragraphe [7.3.13 Using the UPS LOAD OFF Command](#)) doit être donnée à l'aide des commandes du panneau avant et de tous les disjoncteurs. ouvert.
 - L'alimentation est présente à l'intérieur de l'armoire de l'onduleur jusqu'à ce que les disjoncteurs d'alimentation d'entrée en amont et les disjoncteurs de batterie soient ouverts.
-

1.2 Options and Accessories

Contact an Eaton sales representative for information about the following options.

1.2.1 Integrated Battery Cabinet

Battery backup protection with additional runtime can be provided by equipping the UPS system with up to four Integrated Battery Cabinets (IBCs) containing sealed lead-acid, maintenance-free batteries. The IBCs are housed in single, free-standing cabinets designed for line-up-and-match installation, but may be installed separate from the UPS cabinet. An external battery disconnect switch or tie point must be used when three or four IBCs are located separate from the UPS cabinet. The IBCs may be installed on either the right or left side of the UPS cabinet. The recommended installation location for adjacent battery cabinets is on the right side of the UPS cabinet.

1.2.2 Sidecar Integrated Accessory Cabinet-Bypass

A Sidecar Integrated Accessory Cabinet-Bypass (SIAC-B) provides maintenance bypass functions. The SIAC-B is available in two, three, or four breaker configurations enabling power to completely bypass the UPS. The UPS can then be safely serviced or replaced without interrupting power to critical systems. The four breaker configuration provides a convenient method for removing power from the UPS when using the maintenance bypass to supply the load. The SIAC-B is housed in a cabinet attached to the UPS cabinet. The SIAC-B may be installed on either the right or left side of the UPS cabinet. The SIAC-B can also be used for top entry wiring access.

1.2.3 Top Entry Wiring Sidecar

If required, a sidecar is available for top entry power wiring. The sidecar performs the function of a wireway routing the wires to the terminals mounted at the bottom of the UPS cabinet. The sidecar can be installed on the left or right side of the UPS cabinet.

1.2.4 Monitoring and Communication

Minislot Cards – Optional Minislot cards support several protocols, such as SNMP, SMTP, HTTP, Modbus®, and TCP/IP. See [Chapter 8 Communication](#) for additional information on monitoring and communication features.

Remote Monitoring Device (RMD) – An optional RMD contains a touch screen status display and a local audible alarm, allowing monitoring of the operational status and alarm condition of the UPS from virtually any location within the facility, up to 300 feet from the UPS. Refer to the *Eaton Remote Monitoring Device (RMD) Installation and Operation Manual*, listed in paragraph [1.8 For More Information](#), for additional information.

PredictPulse™ Remote Monitoring and Management Service – PredictPulse is a subscription monitoring and management service from Eaton that collects and analyzes data from connected power infrastructure devices, providing us with the insight needed to make recommendations and take action on your behalf. It's also powered by CA Technologies, bringing together the best in hardware and software. Like a second set of eyes on your power infrastructure, PredictPulse provides 24/7 remote monitoring of alarms and system performance (load, temperature/humidity, battery health, energy savings and service level) to reduce downtime risk and expedite repairs. PredictPulse also shares real-time status and trend information via an online dashboard and smartphone mobile app (Apple and Android), giving subscribers insights about past and current performance, a list of all active alarms, and asset management data (i.e., battery date codes, last and next scheduled service dates, firmware versions). The service notifies customers of critical alarms, supports remote diagnostics, and facilitates smart dispatch of technicians. PredictPulse requires a Eaton Industrial Gateway Card (INDGW-M2) connectivity card in an Minislot communication bay and an Environmental Monitoring Probe (EMP) for battery temperature/humidity monitoring. See [Chapter 8 Communication](#) for additional information on monitoring and communication features.

1.2.5 Additional Output Surge Protection

The Eaton 93PM UPS complies with ANSI 62.41 for line surges. However, if added security is required an additional Surge Protection Device (SPD) can be installed. For this application, a 480V Delta Style SPD Type 1 or Type 2 installed on the load side is recommended. The SPD must meet the Maximum Continuous Operating Voltage (MCOV) for a 480V Delta Style SPD. Eaton offers a variety of SPD solutions including the Eaton SPD Series with various kA ratings options.

1.3 Battery System

The battery system provides emergency short-term backup power to provide safe lighting during power interruptions.

1.3.1 Battery Configurations

The Eaton 93PM 50 kW, Three or Four-Wire UL 924 UPS battery system uses external Integrated Battery Cabinets (IBC). The external IBCs provide emergency lighting during power interruptions. The battery system is equipped with sealed lead-acid, maintenance-free batteries. External IBCs are available at 480V (240 cell). The type of batteries and number of battery cabinets required for the Eaton 93PM Emergency Lighting UPS are detailed in [Table 1](#).

An external battery disconnect switch or tie point must be used when IBCs are located separate from the UPS cabinet and wiring exceeds the number of battery terminals available.

A supplemental 48 Vdc shunt trip signal for an external battery disconnect device (IBCs only) is provided by the UPS, but is not required for normal operation.

Table 1. Battery Cabinet and Battery Type Requirements

Eaton 93PM UPS Frame	UPS Rating	Number of Battery Cabinets	Battery Type
50–1	20 kW	1	E39 – CSB/Eaton
50–1	30 kW	1	E54 – CSB/Eaton
50–1	40 kW	2	E39 – CSB/Eaton

1.4 Basic System Configurations

The following basic UPS system configurations are possible:

- Single UPS with one to four external battery cabinets
- Single UPS with one to four external battery cabinets and accessory cabinets

1.5 Using This Manual

This manual describes how to install and operate the Eaton 93PM 50 kW, Three or Four-Wire UL 924. Read and understand the procedures described in this manual to ensure trouble-free installation and operation. In particular, be thoroughly familiar with the LOAD OFF procedure (see paragraph [7.3.13 Using the UPS LOAD OFF Command](#)).

The information in this manual is divided into sections and chapters. The system, options, and accessories being installed dictate which parts of this manual should be read. At a minimum, [Chapter 1 Introduction](#) through [Chapter 4 UPS System Installation](#) and [Chapter 7 UPS Operating Instructions](#) should be examined.

Read through each procedure before beginning work. Perform only those procedures that apply to the UPS system being installed or operated.

1.6 Conventions Used in This Manual

This manual uses these type conventions:

- **Bold type** highlights important concepts in discussions, key terms in procedures, and menu options, or represents a command or option that you type or enter at a prompt.
- *Italic type* highlights notes and new terms where they are defined.
- `Screen type` represents information that appears on the screen or LCD.

Icon	Description
Note	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 cabinet, an external battery system, and options or accessories installed.

The term line-up-and-match refers to accessory cabinets that are physically located adjacent to the UPS. The term standalone refers to accessory cabinets that are located separate from the UPS.

Left and right side notations are referenced standing in front of the cabinet.

1.7 Symbols, Controls, and Indicators

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



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



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.

1.8 For More Information

Refer to the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Universal Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small*, or *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small Welded* for the following additional information:

- Installation instructions, including site preparation, planning for installation, wiring and safety information, and detailed illustrations of cabinets with dimensional and connection point drawings

Refer to the *Eaton 93PM Sidecar Integrated Accessory Cabinet-Bypass Installation and Operation (50 kW and 100 kW SIAC-B) Manual* for the following additional information:

- Installation instructions, including site preparation, planning for installation, wiring and safety information, and detailed illustrations of cabinets with dimensional and connection point drawings
- Operation, including breakers, standard features and optional accessories, procedures for using the bypass functions, and information about maintenance

Refer to the *Eaton Remote Monitoring Device (RMD) Installation and Operation Manual* for additional installation and operating instructions.

Visit www.eaton.com/powerquality or contact an Eaton service representative for information on how to obtain copies of these manuals.

1.9 Getting Help

If help is needed 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 Customer Reliability Center at:

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

Please use the following e-mail address for manual comments, suggestions, or to report an error in this manual:

E-ESSDocumentation@eaton.com

1.10 Equipment Registration

Please visit www.eaton.com/pg/register to register your new Eaton UPS / Eaton UPS Accessory.

Model Number:

Serial Number:

Chapter 2 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. Read all instructions before operating the equipment and save this manual for future reference.

The UPS is designed for industrial or computer room applications, and contains safety shields behind the door and front panels. However, the UPS is a sophisticated power system and should be handled with appropriate care.



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.



Cet onduleur peut générer des **TENSIONS MORTELLES**. L'installation et l'entretien ne doivent être effectués que par le **PERSONNEL AUTORISÉ**. Ne contient **AUCUNE PIÈCE REMPLAÇABLE**.



- The UPS is powered by 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.
 - As a result of the connected loads high leakage current is possible. Connection to earth ground is required for safety and proper product operation. Do not check UPS operation by any action that includes removal of the earth (ground) connection with loads attached.
 - Emergency Power Off (EPO) and Remote Emergency Power Off (REPO) functionality is disabled for UPS systems configured for UL 924 auxiliary lighting. To remove power from the system a LOAD OFF command must be given using the front panel controls and all breakers opened. Review **Chapter 7 UPS Operating Instructions**, for details.
 - Ensure all power is disconnected before performing installation or service.
 - Batteries can present a risk of electrical shock or burn from high short-circuit current. The following precautions should be observed: 1) Remove watches, rings, or other metal objects; 2) Use tools with insulated handles; 3) Do not lay tools or metal parts on top of batteries; 4) Wear voltage rated gloves and electrical hazard footwear.
 - ELECTRIC ENERGY HAZARD. Do not attempt to alter any UPS or battery wiring or connectors. Attempting to alter wiring can cause injury.
 - Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
-

**AVERTISSEMENT!**

- L'onduleur est alimenté par sa propre source d'énergie (batteries). Les bornes de sortie peuvent être sous tension, même lorsque l'onduleur est débranché d'une source de courant alternatif
 - Pour réduire les risques d'incendie et de décharge électrique, installer l'onduleur à l'intérieur, dans un endroit exempt d'éléments conducteurs et où la température et l'humidité sont régulées. La température ambiante ne doit pas dépasser 40°C (104°F). Ne pas faire fonctionner près d'une source d'eau ou dans un endroit très humide (95% maximum). Le système n'est pas conçu pour une utilisation extérieure.
 - Toutes les sources d'alimentation doivent être débranchées avant de procéder à l'installation et à l'entretien.
 - Les fonctionnalités de mise hors tension d'urgence (EPO) et de mise hors tension d'urgence à distance (REPO) sont désactivées pour les systèmes UPS configurés pour l'éclairage auxiliaire UL 924. Pour couper l'alimentation du système, une commande LOAD OFF doit être donnée à l'aide des commandes du panneau avant et tous les disjoncteurs doivent être ouverts. Consultez **Chapitre 7 Instructions d'utilisation de l'onduleur**, pour plus de détails.
 - Les batteries peuvent présenter un risque de décharge électrique ou de brûlure en raison du courant de court-circuit élevé. Les précautions de base suivantes doivent être suivies : 1) retirer les montres, bagues et autres objets métalliques; 2) utiliser des outils munis d'une poignée isolée; 3) ne pas déposer les outils ou des pièces de métal sur les batteries; 4) porter des gants et des bottes en caoutchouc.
 - DANGERS ÉLECTRIQUES. Ne pas tenter de modifier le câblage et les connecteurs de l'onduleur ou des batteries. Toute tentative de modification peut provoquer des blessures.
 - Les charges raccordées pourraient provoquer un courant de fuite élevé. La mise à la terre est donc obligatoire pour garantir la sécurité et le bon fonctionnement du produit. Lors de la vérification du fonctionnement de l'UPS, ne pas enlever la mise à la terre si des charges y sont raccordées.
 - Ne pas ouvrir ni abîmer les batteries. L'électrolyte qu'elles contiennent est dangereux pour la peau et les yeux. Il peut être toxique.
-

⚠ CAUTION

- Installation or servicing should be performed by qualified service personnel knowledgeable of UPS and battery systems, and required precautions. Keep unauthorized personnel away from equipment. Consider all warnings, cautions, and notes before installing or servicing equipment. **DO NOT DISCONNECT** the batteries while the UPS is in Battery mode.
 - Replace batteries with the same number and type of batteries as originally installed with the UPS.
 - Disconnect the charging source prior to connecting or disconnecting terminals.
 - Proper disposal of batteries is required. Refer to local codes for disposal requirements.
 - Do not dispose of batteries in a fire. Batteries may explode when exposed to flame.
 - Keep the UPS door closed and front panels installed to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the unit.
 - Do not install or operate the UPS system close to gas or electric heat sources.
 - Lead-acid batteries can present a risk of fire because they generate hydrogen gas. Do not smoke when near batteries. Do not cause flame or spark in battery area. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.
 - The operating environment should be maintained within the parameters stated in this manual.
 - Keep surroundings uncluttered, clean, and free from excess moisture.
 - Observe all DANGER, CAUTION, and WARNING notices affixed to the inside and outside of the equipment.
-

**ATTENTION!**

- L'installation et l'entretien doivent être effectués par du personnel qualifié en matière d'onduleurs et de batteries, il doit connaître les précautions qui s'imposent. Le personnel non autorisé doit être tenu à l'écart de l'équipement. Il est important de prendre connaissance des avertissements, des mises en garde et des avis avant de procéder à l'installation ou à l'entretien de l'équipement. *NE PAS DÉBRANCHER les batteries lorsque l'onduleur est en mode Batterie.*
 - Ne jamais jeter les batteries au feu. L'exposition aux flammes risque de les faire exploser.
 - Déconnecter la source d'alimentation avant de brancher ou débrancher les bornes.
 - Vérifier que la batterie n'est pas, par inadvertance, reliée à la terre. Si c'est le cas, couper la source de mise à la terre. Les contacts avec une batterie reliée à la terre peuvent provoquer des risques de décharge électrique. Ces risques sont atténués si la mise à la terre est annulée avant le début des travaux sur les batteries.
 - L'élimination appropriée des batteries est requise. Se reporter aux codes locaux pour connaître les exigences liées à l'élimination
 - Ne pas jeter les batteries au feu. Les batteries peuvent exploser lorsqu'elles sont exposées à des flammes.
 - Garder les portes de l'onduleur fermées et les panneaux avant en place pour garantir une circulation adéquate de l'air de refroidissement et pour protéger le personnel des tensions dangereuses dans l'unité.
 - Ne pas installer ni faire fonctionner l'onduleur près d'une source de chaleur au gaz ou à l'électricité.
 - Le milieu de fonctionnement doit toujours correspondre aux paramètres établis dans ce manuel.
 - Maintenir les lieux rangés, propres et exempts d'une humidité excessive.
 - Respecter les étiquettes DANGER, MISE EN GARDE et AVERTISSEMENT se trouvant à l'intérieur et à l'extérieur de l'équipement.
-

Chapter 3 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.
2. Prepare your site for the UPS system.
3. Inspect and unpack the UPS cabinet.
4. Unload and install the UPS cabinet, and wire the system.
5. Install features, accessories, or options, as applicable.
6. Complete the Installation Checklist.
7. Have authorized service personnel perform preliminary operational checks and start up the system.



NOTE

Startup and operational checks must be performed by an authorized Eaton Customer Service Engineer, or the warranty terms specified on the product's resources page become void. See [Chapter 11 Warranty](#) for details. This service is offered as part of the sales contract for the UPS. Contact an Eaton service representative in advance (a minimum two-week notice is required) to reserve a preferred startup date.

3.1 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 paragraph [3.2 Preparing the Site](#) and [Chapter 4 UPS System Installation](#) to create a logical plan for installing the system.

3.2 Preparing the Site

For the UPS system to operate at peak efficiency, the installation site should meet the environmental parameters outlined in this manual. The operating environment must meet the weight, clearance, and environmental requirements specified.

3.2.1 Environmental and Installation Considerations

General storage requirements for UPS Equipment:

- Equipment which cannot be immediately installed and energized should be stored in an indoor, dry, clean, ventilated area, heated environment (i.e. an temperature and humidity controlled environment). The storage area must be protected from rain, water, chemical agents and gases as shown in [Table 2](#).
- Do not store in areas where conditions such as dampness, changes in temperature, dust, dirt, rubble, paint, conductive particulates, or corrosive atmosphere / gases are present.
- Factory installed packaging and wrapping of the equipment should not be removed until equipment is ready to install.
- Equipment should be checked periodically for any signs of deterioration. It is the responsibility of the receiving contractor to ensure protection during storage.
- Equipment should be placed on true and solid level surfaces for storage.
- Have a plan for condensation and environmental mitigation prior to equipment arrival.

The UPS system installation must meet the following guidelines:

- The system must be installed on a level floor suitable for computer or electronic equipment.
- The system must be operated at an altitude no higher than 1500m (5000 ft) without derating. For additional assistance with high altitude operation, contact an Eaton service representative (see paragraph [1.9 Getting Help](#)).
- The system must be installed in a temperature and humidity controlled indoor area free of conductive contaminants.

CAUTION

Do not expose the UPS to overly aggressive environments, like salt mist or corrosive gases. High relative humidity accelerates the effects of contaminants. The UPS should be installed in a G1 environment (based on ANSI/ISA S-71.04 classifications). If the UPS is used in a more aggressive environment, it can cause reduced product life and possibly early failure. If the installation location does not meet the recommended environment, contact Eaton service representative for further information (see paragraph).

**ATTENTION!**

N'exposez pas l'onduleur à des environnements trop agressifs, comme du brouillard salin ou des gaz corrosifs. Une humidité relative élevée accélère les effets des contaminants. L'onduleur doit être installé dans un environnement G1 (basé sur les classifications ANSI/ISA S-71.04). Si l'onduleur est utilisé dans un environnement plus agressif, cela peut entraîner une durée de vie réduite du produit et éventuellement une panne précoce. Si l'emplacement d'installation ne correspond pas à l'environnement recommandé, contactez le représentant du service Eaton pour plus d'informations (voir le paragraphe).

- The environmental requirements specified below are for the air at the intake ports of the 93PM UPS, and are the maximum, not to exceed, ratings.
 - There shall be at least a 1.8°F (1.0°C) difference between the dry bulb temperature and the wet bulb temperature, at all times, to maintain a non-condensing environment.
 - The maximum rate of temperature change shall be limited to 3°F over 5 minutes (36°F/hour), based on the ASHRAE Standard 90.1-2013.
- The newer, more energy efficient data center cooling methods (such as air side economization) can create much wider ranges of temperature and Relative Humidity (RH) in the UPS room and/or data center. There are two aspects of this increased operating environment that can, if ignored, create issues.
 - One is the creation of microclimates, which are persistent variations of temperature and/or RH within a single room. For example one side of the room is always cooler than the other side, no matter the actual temperature.
 - The other aspect is the rate of change of temperature and/or RH, which can occur during transitions within the cooling system. Examples: changing the mixture ratio of inside versus outside air, or external changes in the outside air when going from night to day, and back to night.
 - When ignored, either one of these aspects can create an undesirable microclimate at the UPS location. If the environment created by this microclimate exceeds the UPS operating specification, the UPS reliability, over time, will be reduced. These same environmental extremes will also create reliability concerns for any servers that are exposed to them.

Failure to follow guidelines may void your warranty.

The basic environmental requirements for operation of the UPS are:

- Storage Temperature: -25°C to +55°C (-13°F to 131°F)

- Ambient Temperature Range: 5°C to +40°C (41°F to 104°F)
- Recommended Operating Temperature Range: -0°C to +40°C (32°F to 104°F)
- Storage and Use Maximum Relative Humidity: 5 to 95%, noncondensing
 - There shall be at least a 1.8°F (1.0°C) difference between the dry bulb temperature and the wet bulb temperature, always, to maintain a non-condensing environment
- This product was designed for installation and use in a G1 environment as defined in ANSI/ISA-71.04-2013. Refer to [Table 2](#) for gas concentration limits.

Table 2. G1 Equipment Data from ANSI/ISA-71.04-2013

Contaminant	Gas	Gas Concentration in ppbv
Group A	H ₂ S	<3
	SO ₂ SO ₃	<10
	Cl ₂	<1
	NO _x	<50
Group B	HF	<1
	NH ₃	<500
	O ₃	<2

NOTE: Table information copied from Table B1 of ANSI/ISA-71.04-2013 for G1 equipment

CAUTION

If battery systems are located in the same room as the UPS, the battery manufacturer's environmental requirements should be followed if they are more stringent than the UPS requirements. Operating temperatures above the recommended range will result in decreased battery life and performance, and may reduce or void the battery warranty.

ATTENTION!

Si les systèmes de batteries sont situés dans la même pièce que l'onduleur, les exigences environnementales du fabricant de la batterie doivent être respectées si elles sont plus strictes que les exigences de l'onduleur. Des températures de fonctionnement supérieures à la plage recommandée entraîneront une diminution de la durée de vie et des performances de la batterie et pourront réduire ou annuler la garantie de la batterie.

The UPS ventilation requirements are shown in [Table 3](#).

To allow for future power upgrades, Eaton recommends using air conditioning or ventilation sized for the fully rated UPS kW frame size installed instead of the derated kW ordered. Sizing the site cooling infrastructure to be capable of cooling the maximum kW frame size will allow a full power rating upgrade without having to modify the infrastructure.



NOTE

The battery system's capacity must also be considered when planning for future power upgrades. The battery system must either be sized to the anticipated future rating or upgraded with the power upgrade. See [Table 1](#) for battery cabinet requirements.

Table 3. Air Conditioning or Ventilation Requirements During Full Load Operation

Model	UPS Rating	Input/Output Voltage	Heat Rejection BTU/hr x1000 (kg-cal/hr)	Minimum Required Cooling Air Flow
Eaton 93PM-50-1	20 kW	480/480	2.55 (643)	189 liter/sec (400 cfm)
Eaton 93PM-50-1	30 kW	480/480	3.58 (903)	
Eaton 93PM-50-1	40 kW	480/480	4.56 (1150)	

The UPS equipment operating environment must meet the weight requirements shown in [Table 4](#) and the size requirements shown in [Figure 3](#) through [Figure 9](#). Dimensions are in millimeters (inches).

**NOTE**

Refer to the *Eaton 93PM Sidecar Integrated Accessory Cabinet-Bypass Installation and Operation (50 kW and 100 kW SIAC-B) Manual*, listed in paragraph [1.8 For More Information](#), for Sidecar Integrated Accessory Cabinet-Bypass (SIAC-B) size requirements.

Table 4. UPS Cabinet Weights

Model	Frame	Weight kg (lb)		
		Shipping	Installed	Point Loading
Eaton 93PM-50-1	Capacity	338 (745)	318 (702)	4 at 80 (176)
Eaton 93PM-50-1 with UPS Top Entry Wiring Sidecar (no breakers)	Capacity	425 (937)	402 (887)	4 at 101 (222)
Eaton 93PM-50-1 with SIAC-B (4-Breaker)	Capacity	460 (1014)	429 (947)	4 at 107 (237)

The UPS cabinet uses forced air cooling to regulate internal component temperature. Air inlets are in the front of the cabinet and outlets are on top or in the back of the cabinet. Allow clearance in front of and on top or in back of the cabinet for proper air circulation. The clearances required around the UPS cabinet are shown in [Table 5](#).

Table 5. UPS Cabinet Clearances

From Front of Cabinet	914.4 mm (36") working space
From Top of Cabinet with Top Exhaust (Zones 1 and 3 - see Figure 4)	457.2 mm (18") minimum clearance for ventilation
From Top of Cabinet (Zones 2 and 3- see Figure 4)	457.2 mm (18") working space
From Top of Cabinet with rear service access (Zone 2- see Figure 4)	Can be less than 457.2 mm (18")
From Back of Cabinet with Rear Exhaust	254 mm (10") minimum clearance for ventilation
From Back of Cabinet with Top Exhaust	None Required
From Back of Cabinet - Seismic Installation	914.4 mm (36") working space
From Right Side of Cabinet	None Required
From Left Side of Cabinet	None Required

Figure 3. UPS Cabinet Dimensions (Front and Right Side Views)

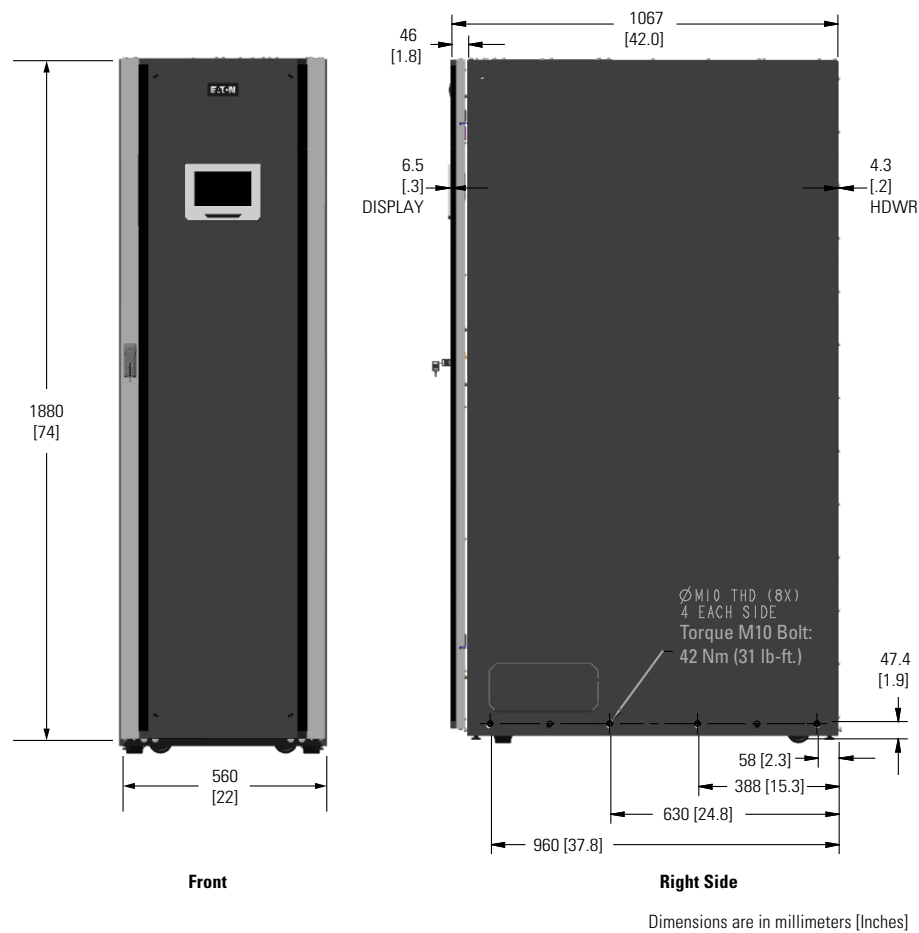
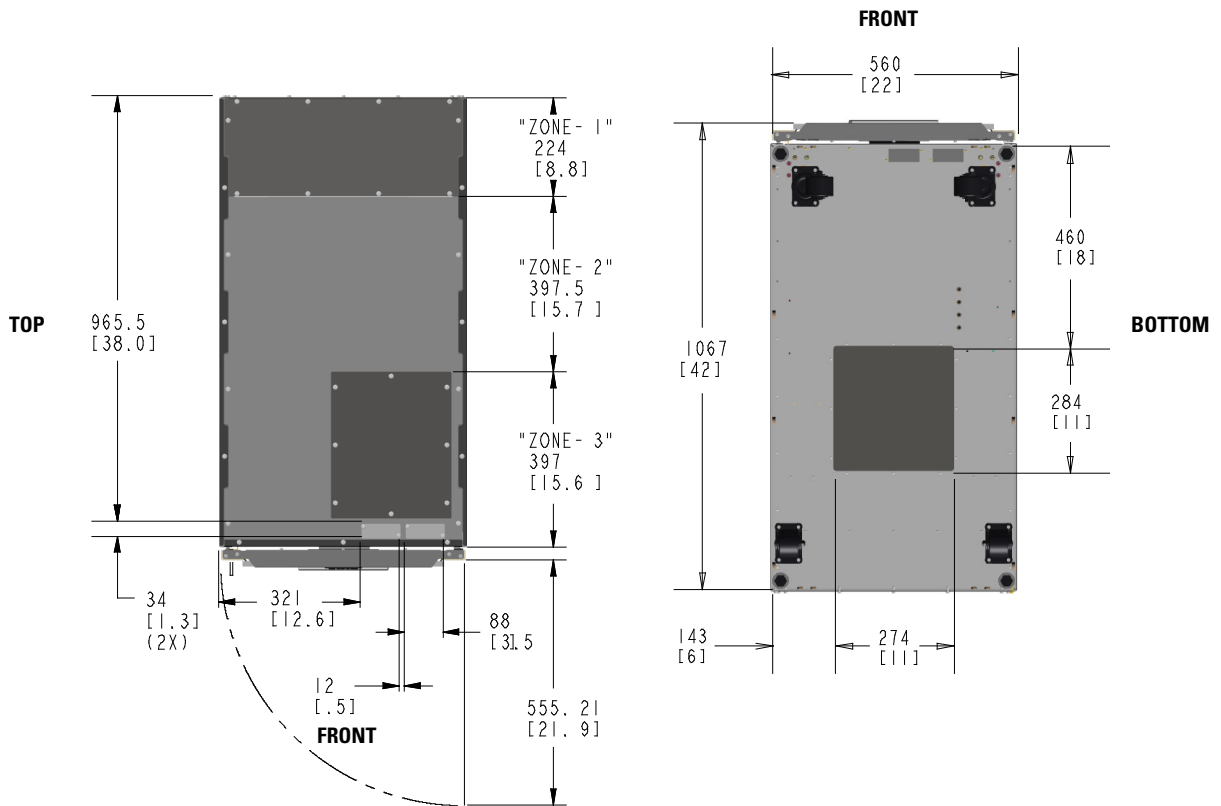


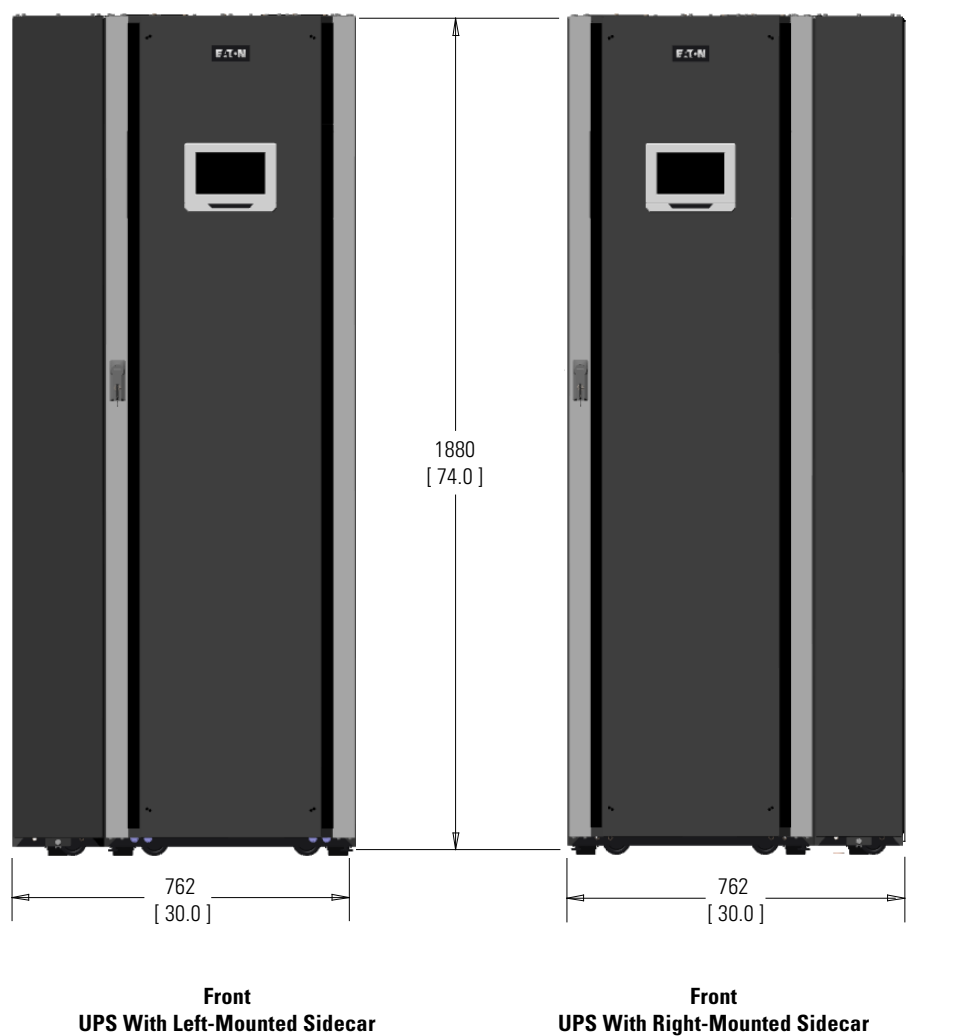
Figure 4. UPS Cabinet Dimensions (Top and Bottom Views)



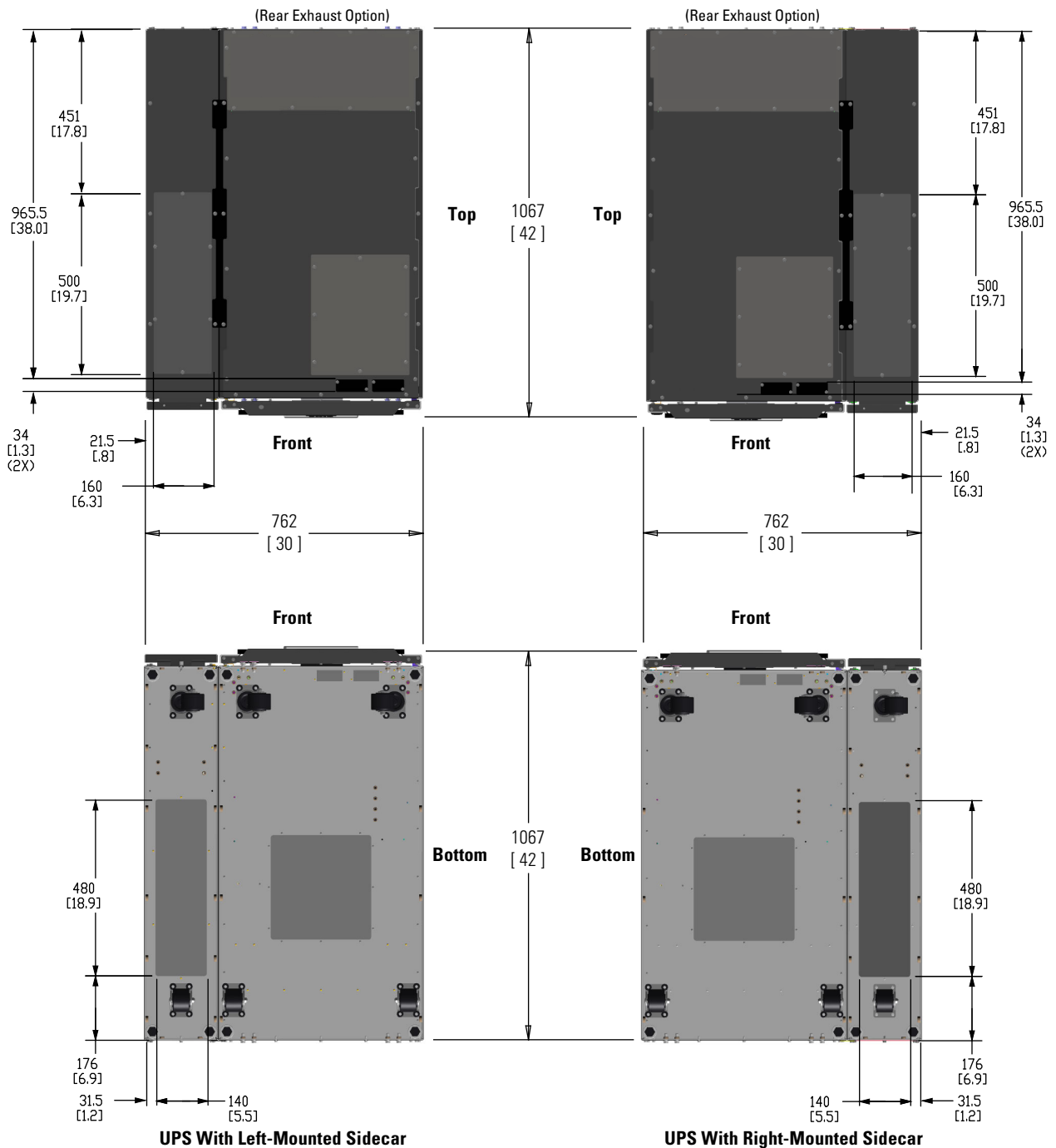
NOTE: Rear exhaust configuration shown.

Dimensions are in millimeters [inches]

Figure 5. UPS Cabinet with Left-Mounted or Right-Mounted Sidecar Dimensions (Front and Right Side Views)

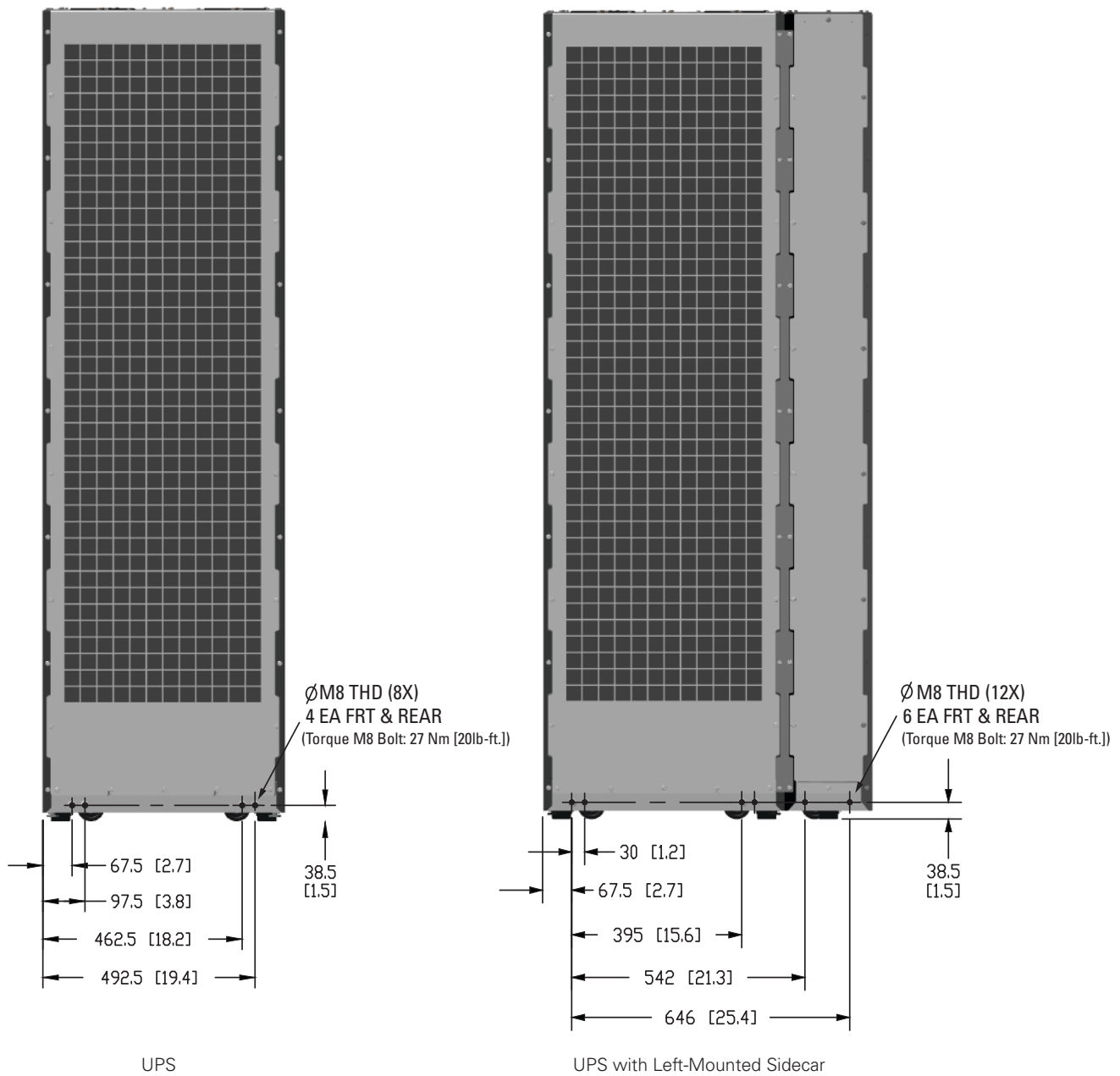


Dimensions are in millimeterse [Inches]

Figure 6. UPS Cabinet with Left-Mounted or Right-Mounted Sidecar Dimensions (Top and Bottom Views)

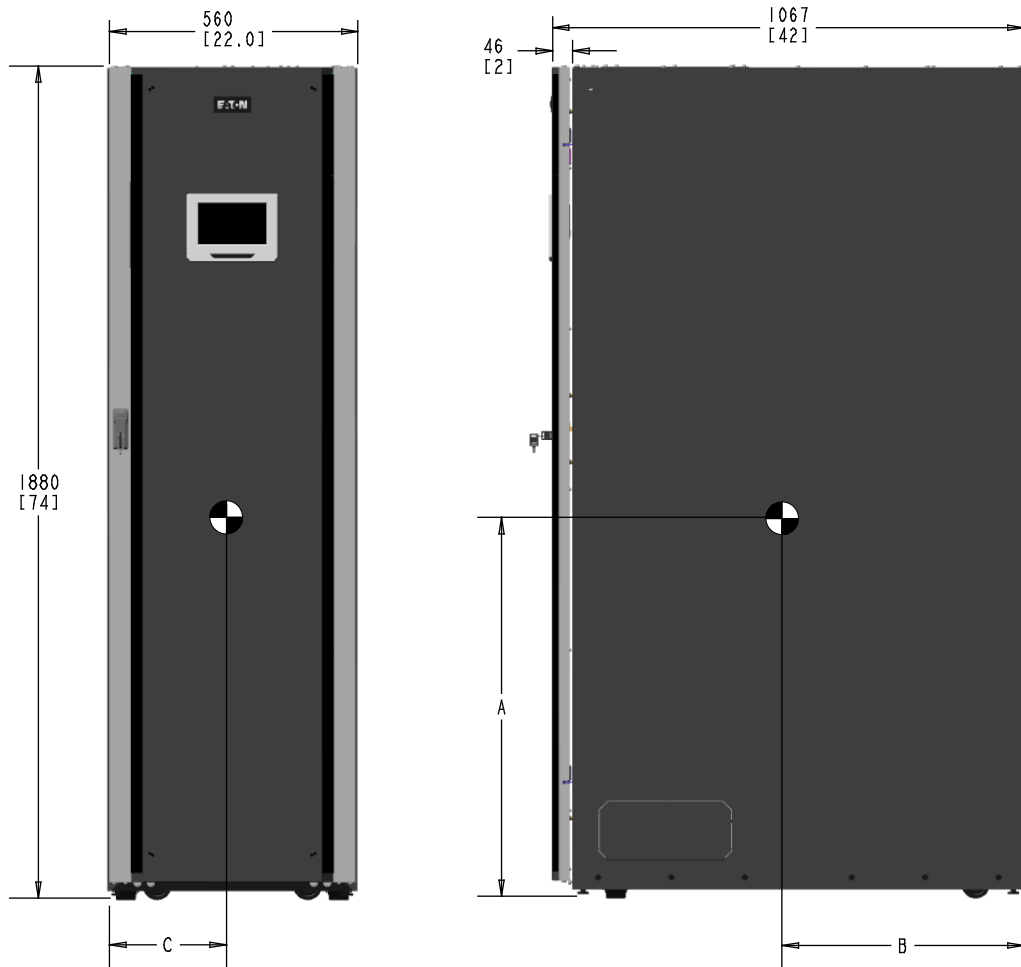
Dimensions are in millimeters [Inches]

Figure 7. UPS Cabinet Front and Back Floor Mounting Bracket Mounting Dimensions (Back Views)



NOTE: Examples shown with top exhaust option.

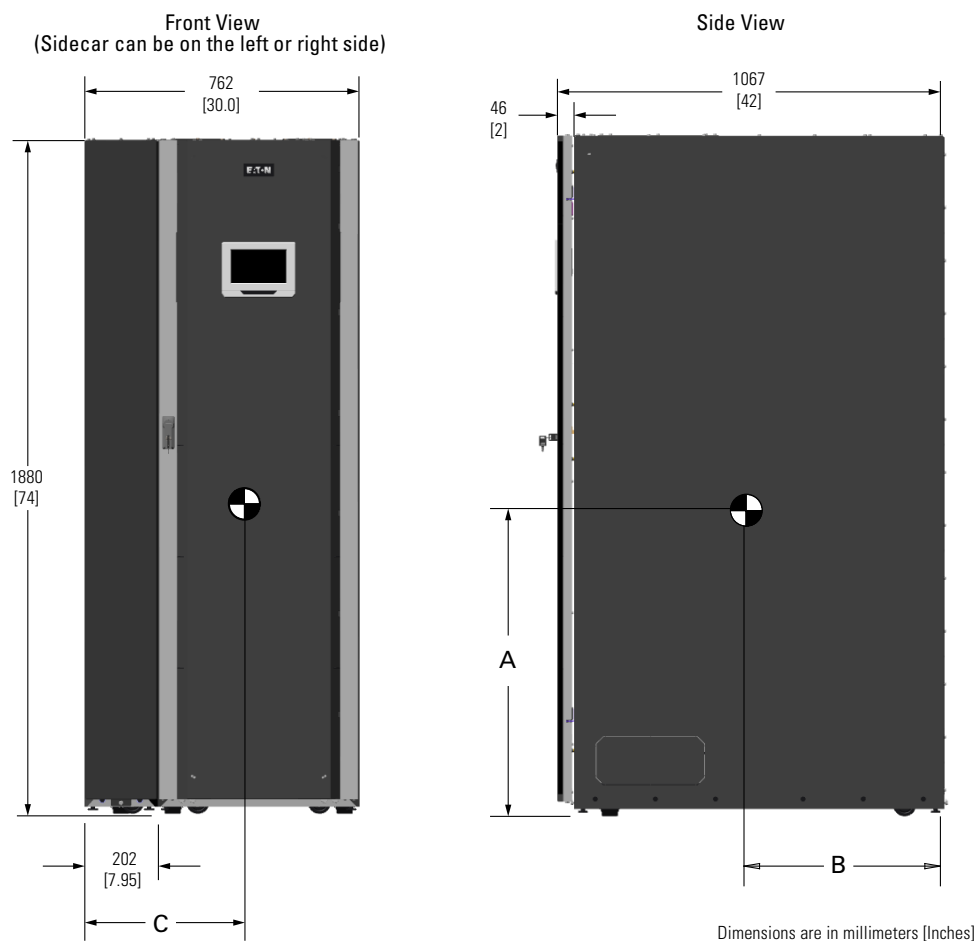
Dimensions are in millimeters [inches]

Figure 8. UPS Cabinet Center of Gravity

Dimensions are in millimeters [Inches]

Weight and Center of Gravity (letters A, B, and C map to Figure 8)				
	A mm (in)	B mm (in)	C mm (in)	Installed Weight kg (lb)
Eaton 93PM-50-1 UPS	985 (38.7)	560 (22)	273 (10.7)	318 (702)

Figure 9. UPS Cabinet with Left-Mounted or Right-Mounted Sidecar Center of Gravity



Weight and Center of Gravity with Left-Mounted Sidecar (letters A, B, and C map to Figure 9)				
	A mm (in)	B mm (in)	C mm (in)	Installed Weight kg (lb)
Eaton 93PM-50-1 UPS with Top Entry Wiring Sidecar (no breakers)	961 (37.8)	561 (22)	406 (16.0)	402 (887)
Eaton 93PM-50-1 UPS with SIAC-B (4-Breaker)	964 [37.9]	586 [23]	386 [15.2]	429 [947]

Weight and Center of Gravity with Right-Mounted Sidecar (letters A, B, and C map to Figure 9)				
	A mm (in)	B mm (in)	C mm (in)	Installed Weight kg (lb)
Eaton 93PM-50-1 UPS with Top Entry Wiring Sidecar (no breakers)	961 (37.8)	561 (22)	346 (13.6)	402 (887)
Eaton 93PM-50-1 UPS with SIAC-B (4-Breaker)	964 [37.9]	586 [23]	386 [15.2]	429 [947]

3.2.2 UPS System Power Wiring Preparation



NOTE

Refer to the *Eaton 93PM Sidecar Integrated Accessory Cabinet-Bypass Installation and Operation (50 kW and 100 kW SIAC-B) Manual*, listed in paragraph [1.8 For More Information](#), for SIAC-B power wiring preparation and requirements.

Read and understand the following notes while planning and performing the installation:

WARNING

As a result of the connected loads high leakage current is possible. Connection to earth ground is required for safety and proper product operation. Do not check UPS operation by any action that includes removal of the earth (ground) connection with loads attached.



AVERTISSEMENT!

En raison des charges connectées, un courant de fuite élevé est possible. Une connexion à la terre est requise pour la sécurité et le bon fonctionnement du produit. Ne vérifiez pas le fonctionnement de l'onduleur par une action incluant le retrait de la connexion à la terre avec les charges connectées.

- Refer to national and local electrical codes for acceptable external wiring practices.
- To allow for future power upgrades, Eaton recommends installing the UPS using wiring and external overcurrent protection breakers sized for the fully rated UPS kW frame size installed instead of the derated kW ordered. Wiring for the maximum kW frame size will allow a full power rating upgrade without having to modify the site wiring infrastructure.
- For external wiring, use 75°C copper wire.



IMPORTANT

This product has been evaluated for use with **copper wire only**. For external wiring, use only 75°C copper wire.

NOTICE

Ce produit a été évalué pour une utilisation avec du fil de cuivre uniquement. Pour le câblage externe, utilisez uniquement du fil de cuivre à 75°C.

Wire sizes listed in [Table 6](#) are for copper wiring only. If wire is run in an ambient temperature greater than 30°C, larger size wire may be necessary. Wire sizes are based on using the specified breakers.

- The AC output and output ground wiring to the critical load should be sized the same as the UPS rectifier, bypass, and rectifier and bypass ground wiring if the recommended output breaker listed in [Table 10](#) is not installed in the system.

- Recommended wire sizes are based on NFPA National Electrical Code® (NEC®) 70 Table 310.15(B)(16) 75° C ampacity with 30°C ambient correction factors.
- Three-wire UPS models do not use a neutral. Four-wire UPS models use a neutral for bypass input and load output, but not for rectifier input.
- The neutral conductor (if 4-wire) is sized the same as the phase conductor for balanced and resistive loads. Non-linear loads, up to the maximum of 1.5x the load current, require a larger neutral conductor and should be sized in accordance with NFPA NEC 70 Article 310.15(B)(5).
- In three-wire applications connect the rectifier input, grounded Wye source or in single source applications, to a three-wire High Resistance Ground (HRG) source. In three-wire applications, a neutral conductor is not used from the rectifier source.
- Supported single source, single or dual feed power sources:
 - 3-wire grounded Wye (TN, TT)
 - 3 or 4-wire grounded Wye (TN, TT) - Bypass Input
- Supported dual source, dual feed power sources:
 - 3-wire grounded Wye (TN, TT)
 - 3 or 4-wire grounded Wye (TN, TT) - Bypass Input
- Phase rotation must be clockwise starting with phase A (rotation A, B, C).
- If four-wire UPS, the bypass feed into this equipment uses four wires, otherwise three wires. The rectifier feed into this equipment uses three wires. The phases must be symmetrical about ground (from a Wye source, phase rotation clockwise A, B, C) for proper equipment operation.
- If installing an external maintenance bypass, all feeds to the UPS including the Rectifier Input Breaker (RIB) (if installed) must have a service disconnect independent of the maintenance bypass power path. Most maintenance bypass solutions provide UPS input feeds derived from but isolated from the maintenance bypass power path. If the maintenance bypass solution being installed does not provide such functionality, DO NOT use a single feeder breaker to supply both the UPS and the maintenance bypass.

For external wiring recommendations, including the minimum AWG size of external wiring, see [Table 6](#). Wire sizes listed are for copper wiring only.

Table 6. Input/Output Ratings and External Wiring Recommendations for the Eaton 93PM-50-1

Basic Unit Rating	Units		Rating 50/60 Hz	
	kW	20	30	40
Input and Output Voltage	Volts	480/480	480/480	480/480
AC Input to UPS Rectifier (0.99 Minimum pF) Full load current plus battery recharge current (3) Phases, (1) Ground	Amps	48	60	73
Minimum Conductor Size (Phase A, B, and C) Number per Phase	A			
	AWG or kcmil (each)	6 (1)	4 (1)	3 (1)
	-			
Minimum Conductor Size (Ground) Number	AWG or kcmil (each)	8 (1)	8 (1)	8 (1)
AC Input to UPS Bypass (Dual-Feed) Full Load Current (3) Phases, (1) Neutral (if 4-Wire), (1) Ground	Amps	48	60	73
Minimum Conductor Size (Phase A, B, and C, and Neutral) Number per Phase	B			
	AWG or kcmil (each)	4 (1)	3 (1)	2 (1)
	-			
Minimum Conductor Size (Ground) Number	AWG or kcmil (each)	8 (1)	8 (1)	8 (1)
DC Input from External Battery (Line-Up-and-Match Eaton 93PM IBC) (1) Positive, (1) Negative, (1) Ground	C			
Minimum Conductor Size (Phase Positive and Negative) Number per Pole	Voltage	480	480	480
	Total Amps	45	67	89
Minimum Conductor Size (Phase Positive and Negative) Number per Pole	AWG or kcmil (each)	2/0 (1)	2/0 (1)	2/0 (1)
		See Note	See Note	See Note
	-			
Minimum Conductor Size (Ground) Number	AWG or kcmil (each)	4 (1)	4 (1)	4 (1)
DC Input from External Battery (Standalone Eaton 93PM IBC) (1) Positive, (1) Negative, (1) Ground	C			
Minimum Conductor Size (Phase Positive and Negative) Number per Pole	Voltage	480	480	480
	Total Amps	45	67	89
Minimum Conductor Size (Phase Positive and Negative) Number per Pole	AWG or kcmil (each)	3/0 (2)	3/0 (2)	3/0 (2)
	-			
Minimum Conductor Size (Ground) Number	AWG or kcmil (each)	4 (1)	4 (1)	4 (1)
AC Output to Critical Load Full Load Current (3) Phases, (1) Neutral (if 4-Wire), (1) Ground	Amps	24	36	48
Minimum Conductor Size (Phase A, B, and C, and Neutral [if 4-Wire]) Number per Phase	D			
	AWG or kcmil (each)	8 (1)	6 (1)	4 (1)

Table 6. Input/Output Ratings and External Wiring Recommendations for the Eaton 93PM-50-1 (Continued)

Minimum Conductor Size (Ground) Number	-	AWG or kcmil (each)	10 (1)	10 (1)	8 (1)
<p>NOTE Callout letters A, B, C and D map to the Online Schematics detailed in Chapter 6 UPS Online Schematics.</p> <p>NOTE Line-up-and-match battery wiring with a 105°C rating is factory supplied with the Eaton 93PM Integrated Battery Cabinet (IBC).</p> <p>NOTE The neutral conductor is sized the same as the phase conductor for balanced and resistive loads. Non-linear loads, up to the maximum of 1.5x the load current, require a larger neutral conductor and should be sized in accordance with NFPA NEC 70 Article 310.15(B)(5).</p>					

The power wiring terminals are pressure terminations, UL and CSA rated. See [Table 7](#) for external power cable terminations.

[Figure 18](#) and [Figure 19](#) show the location of the UPS power cable terminals.

Table 7. UPS External Power Cable Terminations for the Eaton 93PM-50-1

Terminal Function	Terminal	Function	Number and Size of Pressure Termination AWG or kcmil	Tightening Torque Nm (lb in)	Screw Size and Type
AC Input to UPS Rectifier	E1	Phase A	1- #14-2/0 kcmil	12.4 (110)	1/4" Hex
	E2	Phase B	1- #14-2/0 kcmil	12.4 (110)	1/4" Hex
	E3	Phase C	1- #14-2/0 kcmil	12.4 (110)	1/4" Hex
AC Input to Bypass	E6	Phase A	1- #14-2/0 kcmil	12.4 (110)	1/4" Hex
	E7	Phase B	1- #14-2/0 kcmil	12.4 (110)	1/4" Hex
	E8	Phase C	1- #14-2/0 kcmil	12.4 (110)	1/4" Hex
(4-Wire version only)	E12	Neutral	(2) 6-300 kcmil	31.0 (275)	5/16" Hex
AC Output to Critical Load	E9	Phase A	1- #14-2/0 kcmil	12.4 (110)	1/4" Hex
	E10	Phase B	1- #14-2/0 kcmil	12.4 (110)	1/4" Hex
	E11	Phase C	1- #14-2/0 kcmil	12.4 (110)	1/4" Hex
(4-Wire version only)	E12	Neutral	(2) 6-300 kcmil	31.0 (275)	5/16" Hex
DC Input from Battery	E4	Battery (+)	4 - #6-300 kcmil	31.0 (275)	1/4" Hex
	E5	Battery (-)	4 - #6-300 kcmil	31.0 (275)	1/4" Hex
Customer Ground	Ground	Ground	6 - #14-1/0 kcmil	5.1 (45)	Slotted

NOTE Customer ground, sized in accordance with NEC Table 250.122, can be run in any conduit listed in [Table 8](#).

Conduit sizes were chosen from NEC Table 4, Electrical Metallic Tubing (EMT). See [Table 8](#) for conduit requirements.

Per NEC article 300, 3(B), all three-phase conductors must be run in the same conduit. A ground wire must be run in the same conduit as the phase conductors.

When running parallel wires in multiple conduits a ground wire must be run in each conduit in accordance with NEC Table 250.122.

Conduit is sized to accommodate neutral conductors the same size as the phase conductor. If an oversized neutral conductor is to be installed, check the conduit size needed to accommodate the oversized neutral and use that conduit in place of the conduit listed in [Table 8](#).

Conduit is sized to accommodate one ground conductor per conduit, sized in accordance with NEC Table 250.122.

Conduit sizes listed are for copper wiring only.

Table 8. Power Cable Conduit Recommendations for the Eaton 93PM-50-1

UPS Model	UPS Rating	Voltage	Terminal	Number of Wires in Conduit	Minimum Conduit Trade Size (inches)	Number of Conduits
Eaton 93PM-50-1	20 kW	480 Vac	AC Input to UPS Rectifier (A, B, C, Ground)	4	1"	1
			AC Input to UPS Bypass (A, B, C, Neutral, Ground)	5 (4-wire UPS) or 4 (3-wire UPS)	1-1/4"	1
			AC Output (A, B, C, Neutral, Ground)	5 (4-wire UPS) or 4 (3-wire UPS)	1"	1
		DC	Battery (Positive, Negative, Ground)	3	1-1/2"	2
Eaton 93PM-50-1	30 kW	480 Vac	AC Input to UPS Rectifier (A, B, C, Ground)	4	1-1/4"	1
			AC Input to UPS Bypass (A, B, C, Neutral, Ground)	5 (4-wire UPS) or 4 (3-wire UPS)	1-1/4"	1
			AC Output (A, B, C, Neutral, Ground)	5 (4-wire UPS) or 4 (3-wire UPS)	1-1/4"	1
		DC	Battery (Positive, Negative, Ground)	3	1-1/2"	2
Eaton 93PM-50-1	40 kW	480 Vac	AC Input to UPS Rectifier (A, B, C, Ground)	4	1-1/4"	1
			AC Input to UPS Bypass (A, B, C, Neutral, Ground)	5 (4-wire UPS) or 4 (3-wire UPS)	1-1/4"	1
			AC Output (A, B, C, Neutral, Ground)	5 (4-wire UPS) or 4 (3-wire UPS)	1-1/4"	1
		DC	Battery (Positive, Negative, Ground)	3	1-1/2"	2

NOTE Wires per conduit include neutral (if 4-Wire) and ground wire.

External overcurrent protection and disconnect are not provided by this product, but are required by codes. See [Table 6](#) for wiring recommendations. If an output lockable disconnect is required, it is to be supplied by the customer.

[Table 9](#) lists the recommended rating for input and bypass circuit breakers.

Table 9. Recommended Input and Bypass Circuit Breaker Ratings

UPS Model	UPS Rating	Input Rating	
		Load Rating	480V
Eaton 93PM-50-1	20 kW	80% Rated	60A
		100% Rated	50A
Eaton 93PM-50-1	30 kW	80% Rated	80A
		100% Rated	60A
Eaton 93PM-50-1	40 kW	80% Rated	100A
		100% Rated	80A

CAUTION

To reduce the risk of fire, connect only to a circuit provided with maximum input circuit breaker current ratings from [Table 9](#) in accordance with the NEC, ANSI/NFPA 70.

**ATTENTION!**

Pour réduire le risque d'incendie, ne brancher qu'à un circuit avec le courant nominal maximal du disjoncteur d'entrée indique dans le tableau ([Table 9](#)) conformément à la norme ANSI/ NFPA 70 du NEC.

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 6](#). The recommended line-to-line load unbalance is 50% or less.

Bypass and output overcurrent protection and bypass and output disconnect switches are to be supplied by the customer. [Table 10](#) lists the recommended rating for output circuit breakers.

Table 10. Recommended Output Circuit Breaker Ratings

UPS Model	UPS Rating	Output Rating	
		Load Rating	480V
Eaton 93PM-50-1	20 kW	80% Rated	35A
		100% Rated	25A
Eaton 93PM-50-1	30 kW	80% Rated	50A
		100% Rated	40A
Eaton 93PM-50-1	40 kW	80% Rated	60A
		100% Rated	50A

No manual DC disconnect device is provided within the UPS.

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

For details on the type of batteries and number of battery cabinets required for the Eaton 93PM Emergency Lighting UPS, refer to [Table 1](#).

3.2.3 UPS System Interface Wiring Preparation



NOTE

Refer to the *Eaton 93PM Sidecar Integrated Accessory Cabinet-Bypass Installation and Operation (50 kW and 100 kW SIAC-B) Manual*, listed in paragraph [1.8 For More Information](#), for SIAC-B power wiring preparation and requirements.

Control wiring for features and options should be connected at the customer interface terminal blocks located inside the UPS.

WARNING

Do not directly connect relay contacts to the mains related circuits. Reinforced insulation to the mains is required.



ATTENTION!

Ne pas directement brancher les contacts de relais aux circuits du réseau. Une isolation renforcée des réseaux est nécessaire.

Read and understand the following notes while planning and performing the installation:

- Use Class 1 wiring methods (as defined by the NEC) for interface wiring from 30V to 600V. The wire should be rated for 600V, 1A minimum. 12 AWG maximum wire size.
- Use Class 2 wiring methods (as defined by the NEC) for interface wiring up to 30V. The wire should be rated for 24V, 1A minimum.
- Because of the battery shunt trip wiring route in the UPS cabinet, the wire should be rated for a minimum of 600V.
- Use twisted-pair wires for each input and return or common.
- All interface wiring and conduit is to be supplied by the customer.
- When installing external interface wiring between a building alarm, relay output, battery breaker trip, or Minislot and the UPS interface terminals, conduit must be installed between each device and the UPS cabinet.
- If using conduit, install the interface wiring in separate conduit from the power wiring.
- All building alarm inputs require an isolated normally-open contact or switch (rated at 24 Vdc, 20 mA minimum) connected between the alarm input and common terminal. All control wiring and switch contacts are customer-supplied.
- LAN and telephone drops for use with Minislot connectivity cards must be supplied by the customer.
- The UPS battery detect signal wiring from an UPS building alarm must be connected to the battery disconnect device.
- Program the battery detect building alarm to read battery open and for normally open contacts.
- A supplemental 48 Vdc shunt trip signal for the battery disconnect device is provided, but is not required for normal operation.
- Battery detect and 48 Vdc shunt trip wiring should be a minimum of 18 AWG.
- Alarm relay contacts have a maximum current rating of 5A and a switched voltage rating of 30 Vac or 28 Vdc.
- Alarm relay wiring should be a minimum of 18 AWG (recommended 18 AWG).

3.3 Inspecting and Unpacking the UPS Cabinets

The cabinet is shipped bolted to a metal and wood pallet (see [Figure 10](#) or [Figure 11](#)) with outer protective packaging material covering the cabinet.



NOTE

Startup and operational checks must be performed by an authorized Eaton Customer Service Engineer, or the warranty terms specified on the product's resources page become void. See [Warranty](#) for details. This service is offered as part of the sales contract for the UPS. Contact an Eaton service representative in advance (a minimum two-week notice is required) to reserve a preferred startup date.

⚠ WARNING

The UPS cabinet is heavy (see [Table 4](#)). If unpacking and unloading instructions are not closely followed, the cabinet may tip and cause serious injury or death.



AVERTISSEMENT!

Les sections de l'onduleur sont lourdes (voir le [Table 4](#)). Suivre attentivement les instructions de déchargement et de déballage pour éviter de renverser les armoires, ce qui pourrait causer de graves blessures.

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

⚠ CAUTION

Do not install a damaged cabinet. Report any damage to the carrier and contact an Eaton service representative immediately.



ATTENTION!

Ne pas installer une armoire endommagée. Signaler les dommages au transporteur et communiquer avec un représentant du service Eaton immédiatement.



NOTE

For the following step, verify that the forklift or pallet jack is rated to handle the weight of the cabinet (see [Table 3-2](#) for cabinet weight).

2. Use a forklift or pallet jack to move the packaged cabinet to the installation site, or as close as possible, before unpacking. If possible, move the cabinet using the pallet. Insert the forklift or pallet jack forks between the supports on the bottom of the pallet (see [Figure 8](#) or [Figure 9](#) for the UPS cabinet center of gravity measurements).

⚠ CAUTION

Do not tilt the UPS cabinet more than 10° from vertical or the cabinet may tip over.



ATTENTION!

Ne pas incliner les armoires d'onduleur à plus de 10 degrés de la verticale puisqu'elles pourraient se renverser.

3. Set the pallet on a firm, level surface, allowing a minimum clearance of 3m (10 ft) on each side for removing the cabinet from the pallet.

4. Remove the protective packaging material from the cabinet and recycle in a responsible manner. Retain any parts kits packaged with the cabinet.
5. 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 an Eaton service representative immediately to determine the extent of the damage and its impact on further installation.

**NOTE**

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

Figure 10. UPS Cabinet as Shipped on Pallet

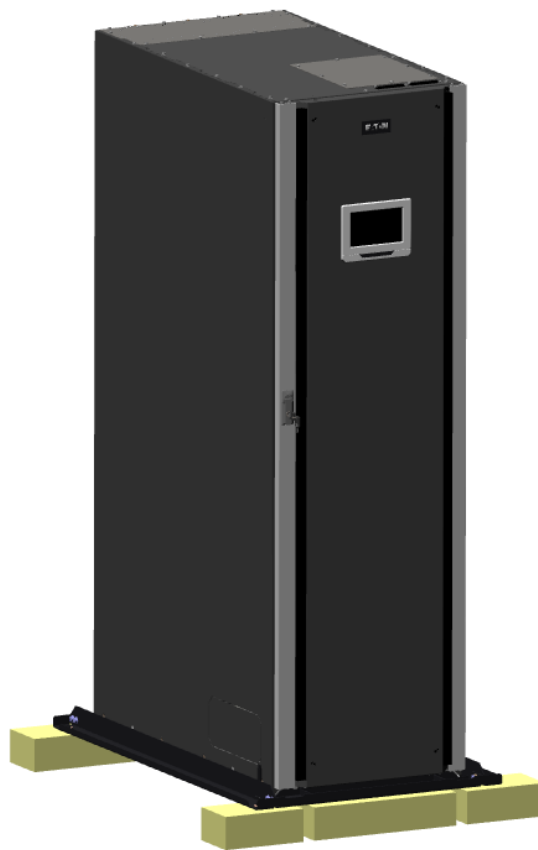


Figure 11. UPS Cabinet with Left-Mounted or Right-Mounted Sidecar as Shipped on Pallet



Chapter 4 UPS System Installation

4.1 Preliminary Installation Information

⚠ WARNING

Installation should be performed only by qualified personnel.



AVERTISSEMENT!

L'installation ne doit être effectuée que par du personnel qualifié.

Refer to the following while installing the UPS system:

- Review [Chapter 3 UPS Installation Plan and Unpacking](#) for cabinet dimensions, equipment weight, wiring and terminal data, and installation notes.
- Do not tilt the cabinets more than $\pm 10^\circ$ during installation.
- Remove conduit landing plates to add conduit landing holes as required.
- If perforated floor tiles are required for ventilation, place them in front of the UPS.

4.2 Unloading the UPS Cabinet from the Pallet

⚠ WARNING

- The UPS cabinet is heavy (see [Table 4](#)).
- Do not tilt cabinet more than 10° from vertical.
- Lift the cabinets only with a forklift or damage may occur.
- Ensure the forklift is rated to handle the weight of the cabinet.

Failure to follow these instructions may result in severe injury or death.



AVERTISSEMENT!

- L'armoire UPS est lourde (voir [Table 4](#)).
- N'inclinez pas l'armoire à plus de 10° par rapport à la verticale.
- Soulevez les armoires uniquement avec un chariot élévateur, sinon des dommages pourraient survenir.
- Assurez-vous que le chariot élévateur est conçu pour supporter le poids de l'armoire.

Le non-respect de ces instructions peut entraîner des blessures graves, voire la mort.



NOTE

For the following steps, verify that the forklift or pallet jack is rated to handle the weight of the cabinet (see [Table 4](#) for cabinet weight).

The UPS cabinet is bolted to a pallet consisting of four metal angle supports secured to two wood supports.

To remove the pallet:

1. If not already accomplished, use a forklift or pallet jack to move the UPS cabinet to the installation area, or as close as possible, before unloading from the pallet. Insert the forklift or pallet jack forks between the supports on the bottom of the pallet (see [Figure 8](#) or [Figure 9](#) and their corresponding tables for the UPS cabinet center of gravity measurements).
2. Open the front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
3. Locate the four 1/2" jacking bolts from the parts kit and install them in the threaded holes in the front and rear supports as shown in [Figure 12](#). Place a floor protector from the parts kit underneath each jacking bolt, and screw the bolts down against them.

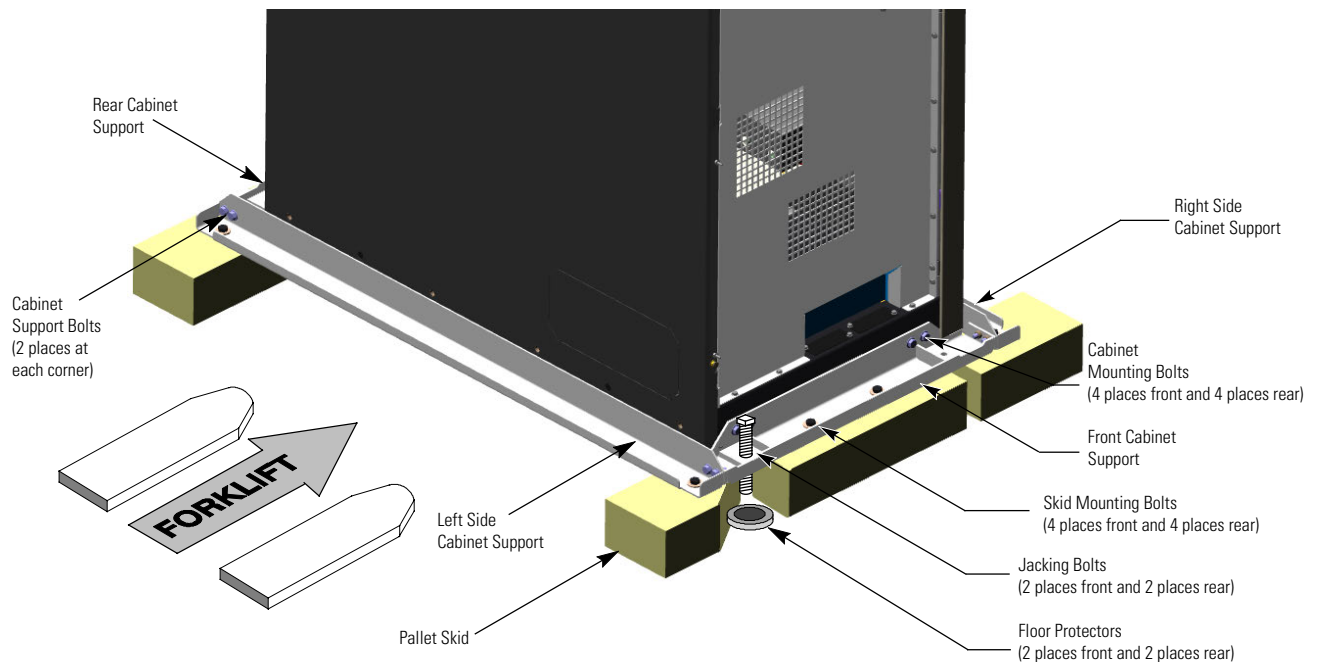
The floor protectors protect the floor from being marred by the jacking bolts.

NOTE Parts kit containing the Jacking Bolts location:



- UPS cabinet without a sidecar: Remove the lower dead-front panel of the UPS.
 - UPS cabinet with a sidecar: Remove the lower dead-front panel of the sidecar.
-

Figure 12. Removing the Pallet Skids and Supports – Eaton 93PM UPS



⚠ WARNING

Do not remove or loosen the cabinet mounting or cabinet support bolts until instructed. Failure to follow these instructions may result in severe injury or death.



AVERTISSEMENT!

Ne retirez pas et ne desserrez pas les boulons de montage ou de support de l'armoire avant d'y être invité. Si les instructions de déballage et de déchargement ne sont pas scrupuleusement suivies, l'armoire peut basculer et provoquer des blessures graves, voire la mort.

4. Loosen, but do not remove, the skid mounting bolts holding the pallet skids to the front and rear supports, and to the left and right side supports (see [Figure 12](#)).
 5. If a sidecar is attached to the UPS, loosen, but do not remove, the sidecar skid mounting bolts holding the sidecar pallet skids to the sidecar front and rear supports, and to the left and right supports (see [Figure 12](#) and [Figure 13](#)).
-

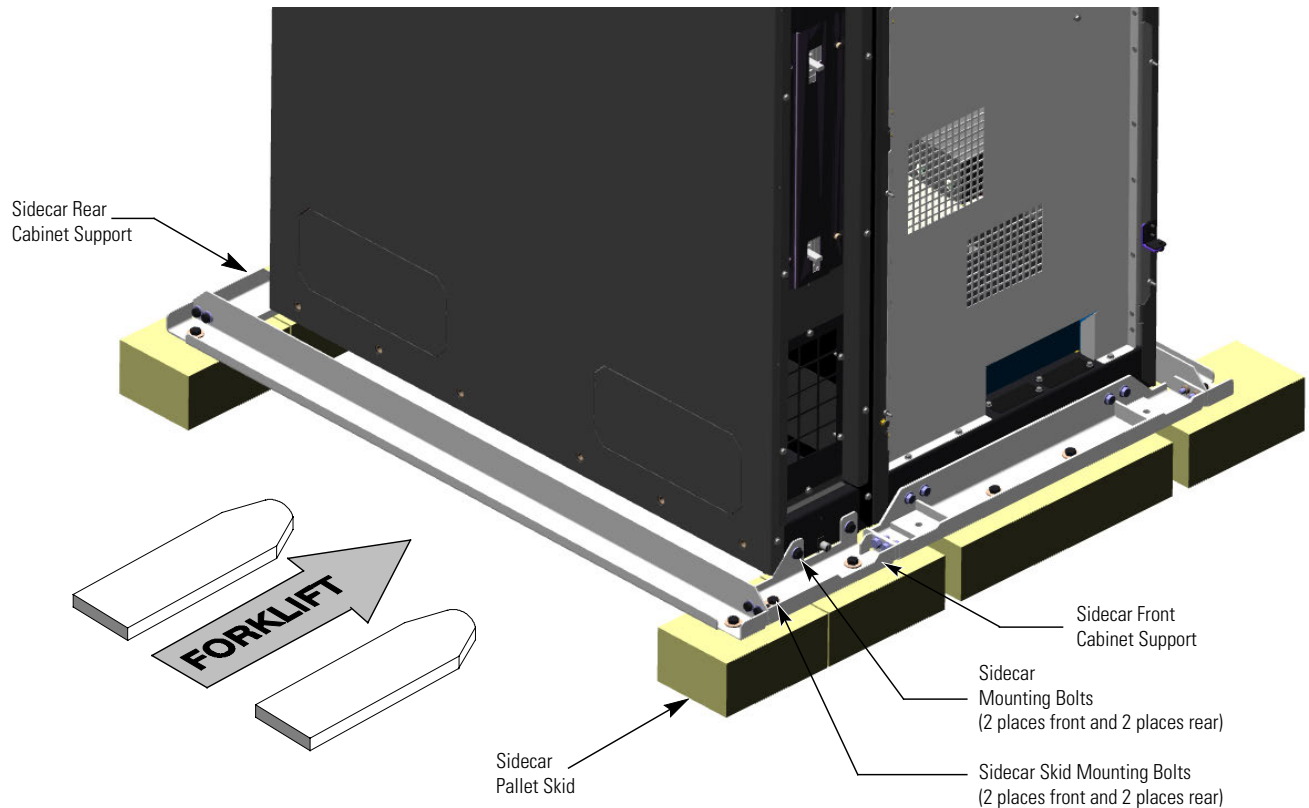


RISK OF INSTABILITY. Turning the jacking bolts unevenly may cause the cabinet to become unbalanced. To prevent tipping the cabinet, raise the cabinet no more than 3 mm (1/8") above the floor (just enough to allow the removal of the pallet skids). Failure to follow these instructions can result in serious injury or death.



AVERTISSEMENT!

RISQUE D'INSTABILITÉ. Une rotation inégale des boulons de levage peut entraîner un déséquilibre de l'armoire. Pour éviter de renverser l'armoire, ne la soulevez pas à plus de 3 mm (1/8") au-dessus du sol (juste assez pour permettre le retrait des patins de palette). Le non-respect de ces instructions peut entraîner des blessures graves, voire la mort.

Figure 13. Removing the Sidecar Pallet Skids and Supports – Eaton 93PM UPS

6. Turn each jacking bolt consecutively, two full turns, until the pallet skids clear the floor by approximately 3 mm (1/8").
7. Remove the hardware loosened in [Step 4](#).
8. If a sidecar is attached to the UPS, remove the hardware loosened in [Step 5](#).
9. Pull the pallet skids out from under the metal angle supports without disturbing the jacking bolts. Recycle the pallet skids and hardware in a responsible manner.

CAUTION

CABINET MAY FALL. Do not loosen the hardware attaching the front supports to the cabinet base. The cabinet must be lowered by the jacking bolts before the supports can be removed.

ATTENTION!

LE CABINET PEUT TOMBER. Ne desserrez pas la quincaillerie fixant les supports avant à la base de l'armoire. L'armoire doit être abaissée par les boulons de levage avant de pouvoir retirer les supports. Si les instructions de déballage et de déchargement ne sont pas scrupuleusement suivies, l'armoire peut basculer et provoquer des blessures graves, voire la mort.

10. Carefully and evenly **lower the cabinet by turning each jacking bolt consecutively two full turns (maximum)** until the casters contact the floor and the cabinet is no longer supported by the jacking bolts.

11. After the UPS is resting on the floor, remove the jacking bolts and floor protectors. Recycle them in a responsible manner.
12. Remove the cabinet support bolts fastening the front, rear, and side cabinet supports together and remove the side supports (see [Figure 12](#)).
13. If a sidecar is attached to the UPS, remove the bottom screw securing the sidecar front panel. Lift the panel straight up to remove from the panel hanger brackets at the top of the cabinet.
14. If a sidecar is attached to the UPS, remove the sidecar mounting bolts holding the front and rear sidecar supports to the cabinet base (see [Figure 13](#)).
15. Remove the cabinet mounting bolts holding the front and rear supports to the cabinet base (see [Figure 12](#)).
16. If installing the cabinet permanently, retain the cabinet mounting bolts; otherwise, recycle the bolts along with the support brackets in a responsible manner.
17. Close the door and secure the latch.
18. If a sidecar is attached to the UPS, remove the screws securing sidecar rear shipping bracket. Remove the bracket and reinstall the screws (see [Figure 14](#)).
19. If the leveling feet are not retracted, turn all four leveling feet until they are retracted as far into the cabinet as possible.

CAUTION

To prevent tipping when rolling the cabinet, push the cabinet from the rear whenever possible.

**ATTENTION!**

Pour éviter de basculer lorsque vous faites rouler l'armoire, poussez-la autant que possible par l'arrière.

20. Roll the cabinet to the final installation location.
21. Lower the UPS's leveling feet and using a bubble level, adjust the leveling feet accordingly until the cabinet is level.
22. Locate the top splice bracket shipped with the UPS.
23. Remove the screws along each adjacent cabinet top panel securing the top panels. Retain the hardware for later use.
24. Install the top splice bracket between the adjacent cabinet and secure the tie strap with retained hardware.

**NOTE**

Either front and back floor mounting brackets or left and right side floor mounting brackets are available for permanently mounting the UPS.

25. If permanently mounting the UPS using the left and right side floor mounting brackets, proceed to [Step 26](#); if using the front and rear floor mounting brackets, proceed to [Step 30](#); otherwise, proceed to [Step 33](#).
26. Locate the left and right side floor mounting brackets from the floor mounting kit.
27. Using the retained cabinet mounting bolts, install the floor mounting brackets to the left and right side of the UPS with the angle facing outward.
28. Secure the cabinet to the floor with customer-supplied hardware.
29. Proceed to paragraph [4.3 Integrated Battery Cabinet Installation](#).
30. Locate the front and back floor mounting brackets from the floor mounting kit.

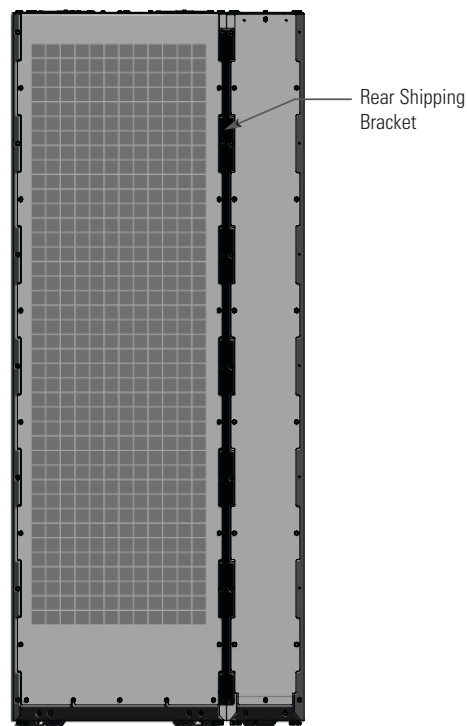
31. Using the retained cabinet mounting bolts, install the floor mounting brackets to the front and rear of the UPS with the angle facing outward.
32. Secure the cabinet to the floor with customer-supplied hardware.

**NOTE**

Black cover dots are provided, if side mounting bracket holes need to be covered for aesthetic reasons.

33. Locate the black cover dots from the parts kit and install over the left and right side bracket mounting holes.
34. Proceed to paragraph [4.3 Integrated Battery Cabinet Installation](#).

Figure 14. Removing the Sidecar Rear Shipping Bracket – Eaton 93PM UPS



4.3 Integrated Battery Cabinet Installation

If installing Integrated Battery Cabinets (IBCs), refer to the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Universal Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small*, or the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small Welded*, listed in paragraph [1.8 For More Information](#), for installation instructions.

After the IBC is installed, proceed to paragraph [4.4 Sidecar Integrated Accessory Cabinet-Bypass Wiring Installation](#) if a Sidecar Integrated Accessory Cabinet-Bypass (SIAC-B) is attached to the UPS.

4.4 Sidecar Integrated Accessory Cabinet-Bypass Wiring Installation

If an SIAC-B is attached to the UPS, refer to the *Eaton 93PM Sidecar Integrated Accessory Cabinet-Bypass Installation and Operation (50 kW and 100 kW SIAC-B) Manual*, listed in paragraph [1.8 For More Information](#), for wiring installation instructions.

After the SIAC-B is wired, proceed to paragraph [4.5 External AC Power Wiring Installation](#) to complete the wiring of the UPS.

4.5 External AC Power Wiring Installation



IMPORTANT

This product has been evaluated for use with **copper wire only**. For external wiring, use only 75°C copper wire.

To install wiring:

1. Open the front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swinging the door open.
2. Remove the screws securing the lower internal safety shield panel and remove the panel to gain access to the input, output, and battery power wiring terminals. Retain the hardware for later use.
3. If wiring the UPS using the top entry sidecar, proceed to [Step 7](#); otherwise proceed to [Step 4](#).
4. **Bottom Entry Wiring.** Remove the bottom conduit plate (see [Figure 15](#)) from the inside bottom of the UPS. Identify all conduit requirements and mark their location. Drill and punch all conduit holes in the bottom conduit plate prior to mounting on the UPS. Install the conduit plate and install all conduit runs into the plate. Pull the wiring through conduit into the wiring area.
5. Route the input and output cables through the bottom of the cabinet to the UPS terminals. See [Figure 15](#) for wiring access information, and [Figure 18](#) for terminal locations.
6. Proceed to [Step 11](#).
7. If not already accomplished, remove the bottom screw securing the sidecar front panel. Lift the panel straight up to remove from the panel hanger brackets at the top of the cabinet.
8. Remove the screws securing the sidecar internal safety shield panel and remove the panel to gain access to the interior of the sidecar and the UPS inter-cabinet wiring access pass-through. Retain the hardware for later use.
9. **Top Entry Wiring.** Remove the top conduit plate (see [Figure 16](#)) from the top of the sidecar. Identify all conduit requirements and mark their location. Drill and punch all conduit holes in the top conduit plate prior to mounting on the sidecar. Install the conduit plate and install all conduit runs into the plate. Pull the wiring through the conduit into the wiring area.
10. Route the input and output cables through the top of the UPS sidecar and the UPS inter-cabinet wiring access pass-through to the UPS terminals. See [Figure 16](#) and [Figure 17](#) for wiring access information, and [Figure 18](#) for terminal locations.

WARNING

As a result of the connected loads high leakage current is possible. Connection to earth ground is required for safety and proper product operation. Do not check UPS operation by any action that includes removal of the earth (ground) connection with loads attached.



AVERTISSEMENT!

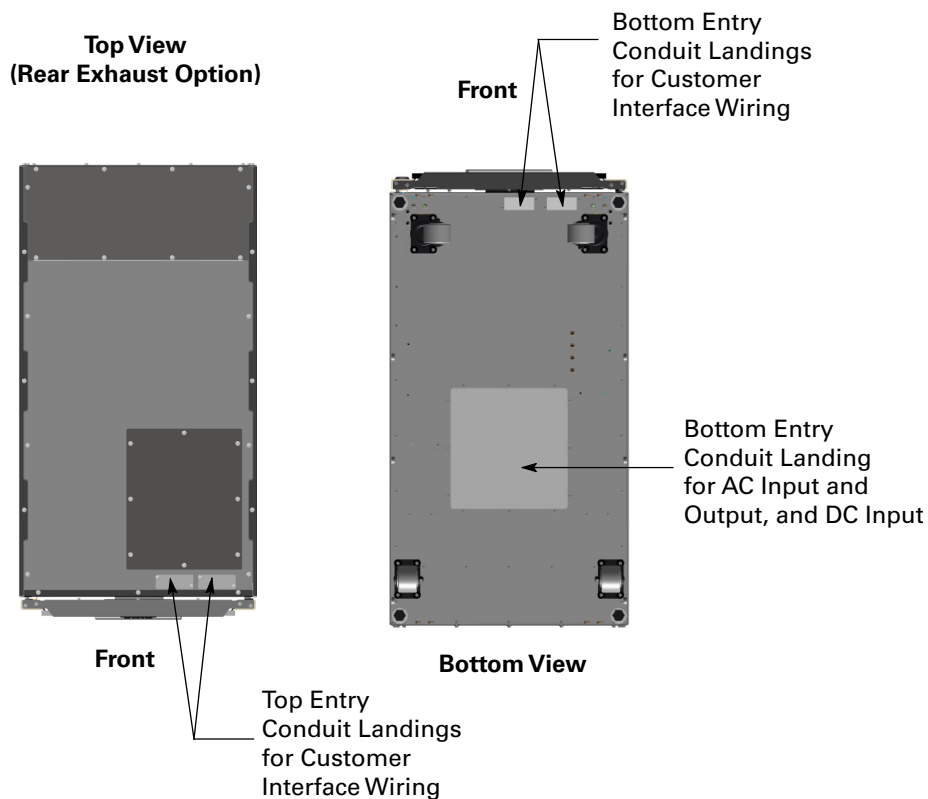
En raison des charges connectées, un courant de fuite élevé est possible. Une connexion à la terre est requise pour la sécurité et le bon fonctionnement du produit. Ne vérifiez pas le fonctionnement de l'onduleur par une action incluant le retrait de la connexion à la terre avec les charges connectées.

11. Ground the UPS according to local and/or national electrical wiring codes by routing and connecting the ground wire to the input ground lug. See [Figure 18](#) for UPS terminal locations.

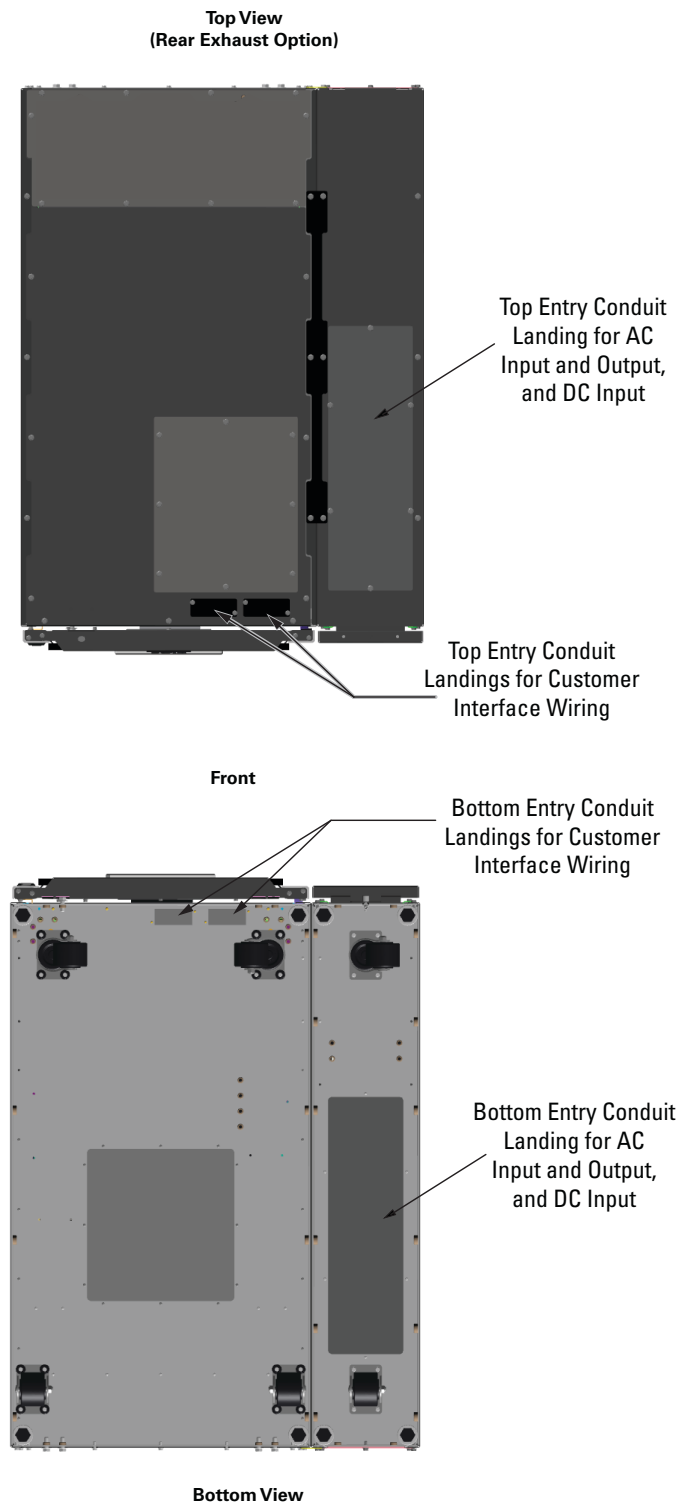
For a detailed view of the UPS ground terminals, see [Figure 19](#).

12. Connect phase A, B, and C rectifier input power wiring from the utility source to the rectifier input terminals. See paragraph [3.2.2 UPS System Power Wiring Preparation](#) for wiring and termination requirements.
For a detailed view of the UPS terminal blocks, see [Figure 19](#).
13. Connect phase A, B, C and Neutral (if 4-Wire) bypass input power wiring from the utility source to the bypass input terminals.
14. Connect phase A, B, C and Neutral (if 4-Wire) power wiring from the output terminals to the critical load.
15. Proceed to paragraph [4.6 Battery Power Wiring](#).

Figure 15. UPS Conduit and Wire Entry Locations



NOTE: Remove panels to drill or punch conduit holes.

Figure 16. Sidecar Conduit and Wire Entry Locations

NOTE: Remove panels to drill or punch conduit holes.

Figure 17. UPS Inter-Cabinet Wiring Access Location

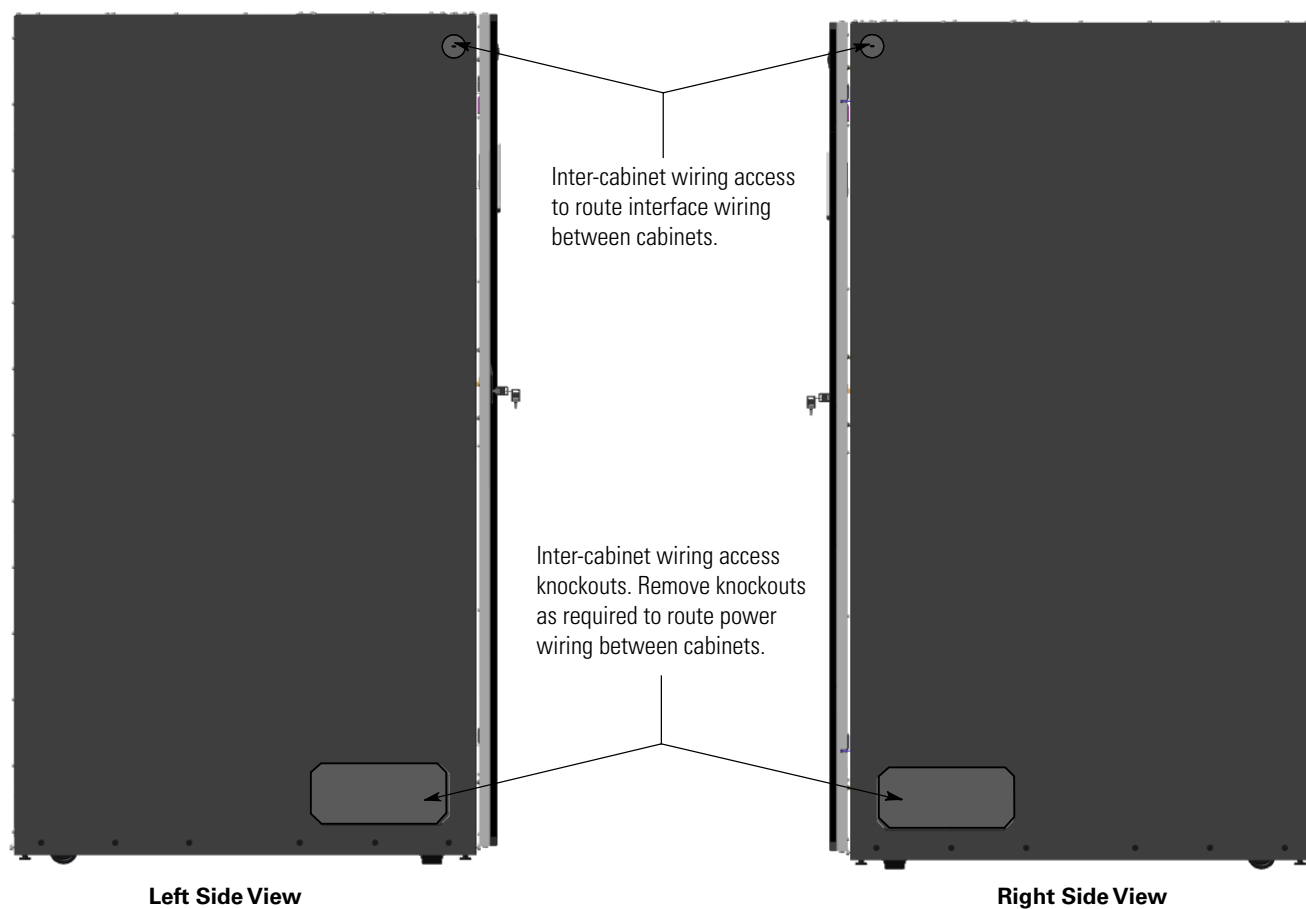


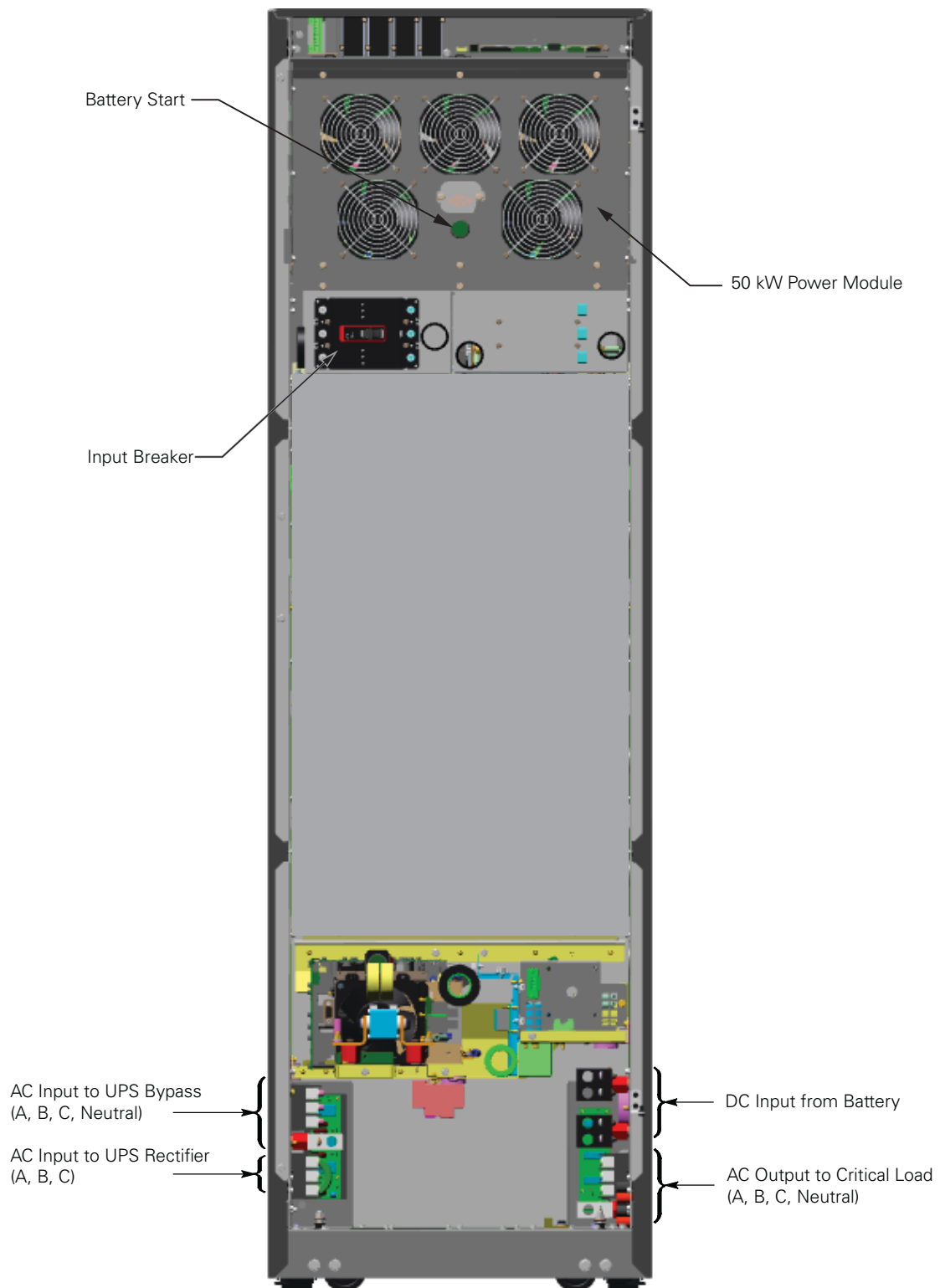
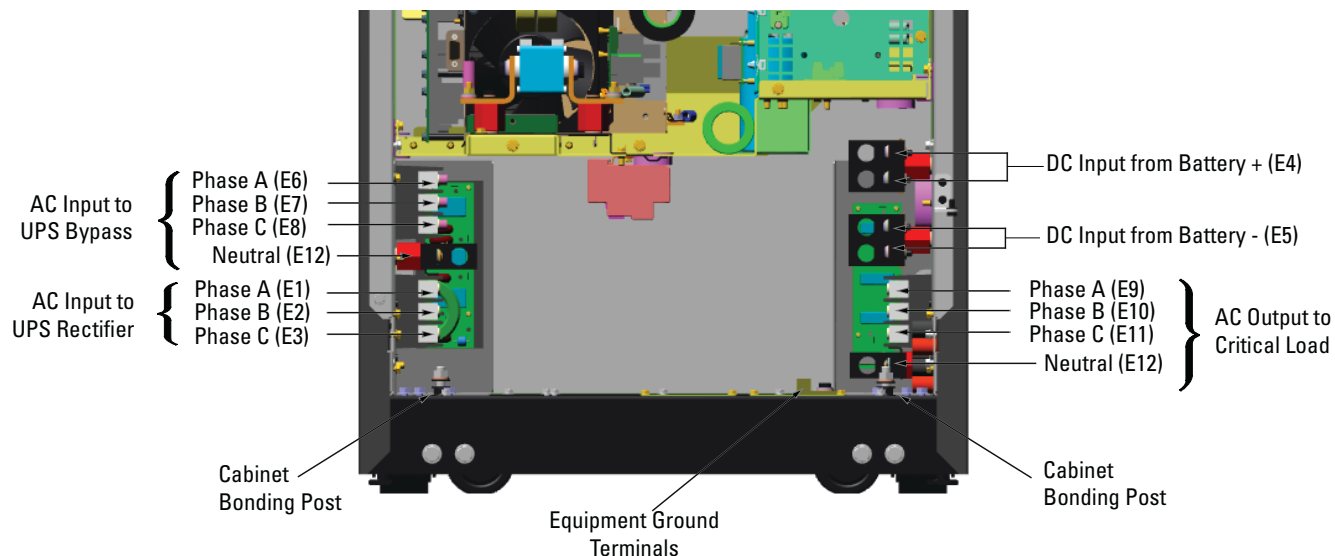
Figure 18. Power Terminal Locations

Figure 19. Power Terminal Detail

4.6 Battery Power Wiring

⚠ CAUTION

When sizing the battery system, do not exceed the internal battery charger capabilities. See [Chapter 10 Product Specifications](#) for maximum battery charger currents.



ATTENTION!

Lors de l'évaluation du système de batterie, ne pas dépasser les capacités internes du chargeur de batteries. Se reporter au chapitre [Chapter 10 Product Specifications](#) sur les notices techniques pour connaître les tensions maximales du chargeur de batteries. Ne pas installer une armoire endommagée. Signaler les dommages au transporteur et communiquer avec un représentant du service Eaton immédiatement.

To install wiring:

1. Route and connect the battery cables between the UPS and battery cabinet or battery disconnect according to the instructions in the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Universal Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small*, or the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small Welded*, listed in paragraph [1.8 For More Information](#). See [Figure 15](#), [Figure 16](#), and [Figure 17](#) for wiring access information, and [Figure 18](#) for terminal locations.
2. Connect the ground, positive, and negative DC power wiring from the battery cabinet or disconnect to the UPS cabinet battery and ground terminals. See paragraph [3.2.2 UPS System Power Wiring Preparation](#) for wiring and termination requirements.
For a detailed view of the UPS terminal block, see [Figure 19](#).
3. 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.

4. If wiring interface connections, proceed to paragraph [4.7 Installing Interface Connections](#); otherwise, proceed to [Step 5](#).
5. Reinstall all safety shield panels previously removed and secure with the retained hardware.
6. If removed, reinstall the sidecar front panel and secure with the retained hardware.
7. Close the UPS outside door and secure the latch.

4.7 Installing Interface Connections

Use the procedures in the following paragraphs to connect the customer and battery interface connections.

4.7.1 Installing Building Alarm and Relay Contact Connections



NOTE 1 If installing interface wiring connections between standalone cabinets or separate devices, conduit must be installed between each cabinet or device.

NOTE 2 Disconnect terminal block plugs from terminal blocks to wire plugs.

To install wiring:

1. Verify the UPS system is turned off and all power sources are removed. See [Chapter 7 UPS Operating Instructions](#) for shutdown instructions.
2. If not already opened, open the front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
3. If wiring the interface terminals from the bottom of the UPS, proceed to [Step 8](#); otherwise, proceed to [Step 4](#).
4. **Top Entry Wiring.** Remove the top interface entry conduit landing plates to drill or punch holes (see [Figure 15](#)).
5. Reinstall the interface entry plates and install the conduit.
6. Route the UPS building alarm and relay output interface wiring through the top interface entry conduit landing plates to the UPS building alarm and relay output terminals. See [Figure 15](#) for wiring access information, and [Figure 20](#) and [Figure 21](#) for UPS interface terminal locations.
7. Proceed to [Step 13](#).
8. **Bottom Entry Wiring.** Remove the bottom interface entry conduit landing plates to drill or punch holes (see [Figure 22](#)).
9. Reinstall the interface entry plates and install the conduit.
10. Route the UPS building alarm and relay output interface wiring through the bottom interface entry conduit landing plates to the bottom access interface wiring channel along the inside of the front door (see [Figure 22](#)).
11. Route the wiring along the interface wiring channel (see [Figure 22](#)) to the UPS building alarm and relay output terminals. See [Figure 20](#) and [Figure 21](#) for UPS interface terminal locations.
12. Secure the wiring to the wire tie anchors provided (see [Figure 23](#)) using Zip ties.
13. Connect the building alarm interface wiring to the building alarm terminals. See paragraph [3.2.3 UPS System Interface Wiring Preparation](#) and [Table 13](#) for wiring and termination requirements, and [Figure 24](#) for terminal assignments.
14. Connect the relay output interface wiring to the relay output terminals. See paragraph [3.2.3 UPS System Interface Wiring Preparation](#) and [Table 13](#) for wiring and termination requirements, and [Figure 25](#) for terminal assignments.

15. If wiring battery detect and shunt trip connections, proceed to paragraph [4.7.2 Installing Battery Detect and Shunt Trip Interface Connections](#); if wiring generator interface connections, proceed to paragraph [4.7.4 Generator Interface Connections](#); if wiring Minislot connections, proceed to paragraph [4.7.5 Installing Minislot Interface Connections](#); otherwise, proceed to [Step 16](#).
16. Close the UPS outside door and secure the latch.

Figure 20. Interface Terminal Locations

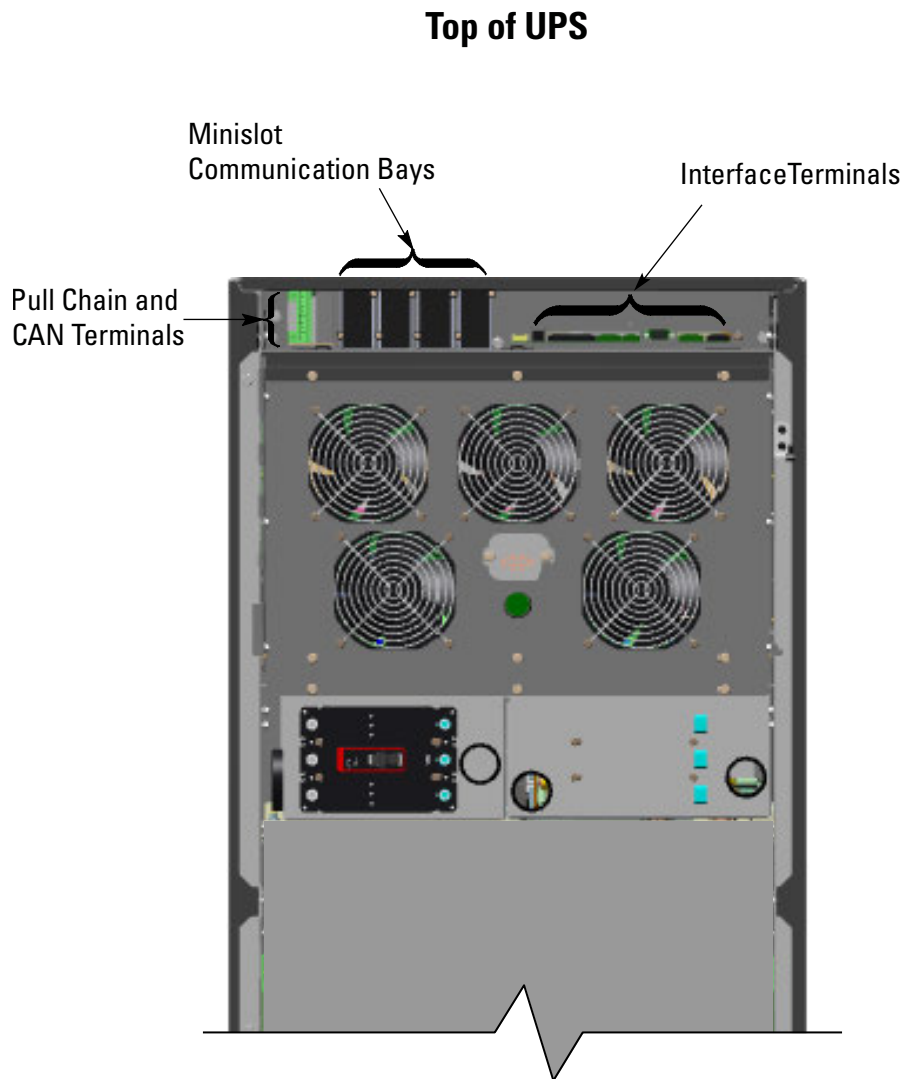


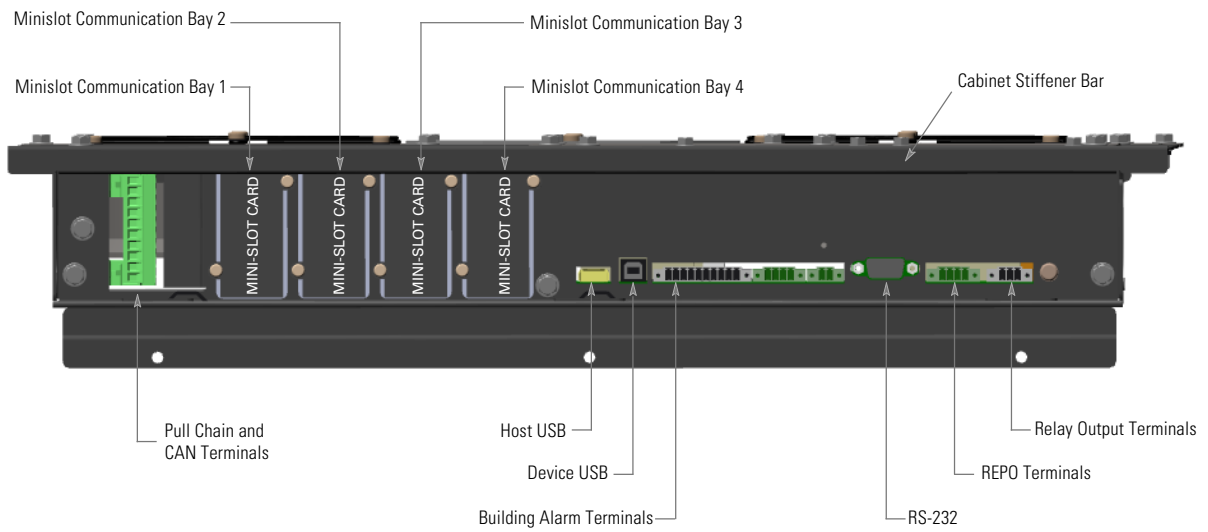
Figure 21. Interface Terminal Detail

Figure 22. Bottom Access Interface Wiring Locations

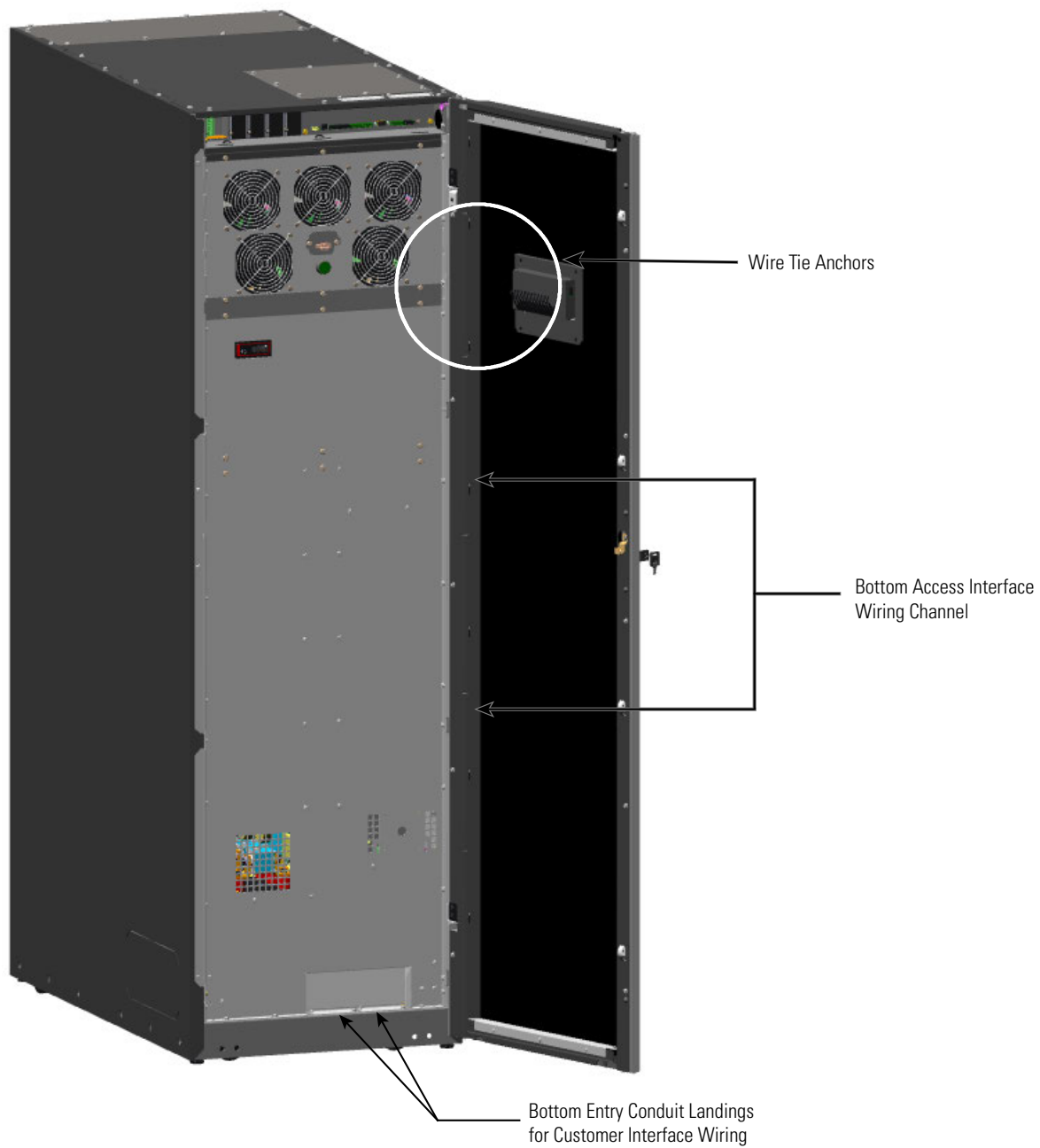
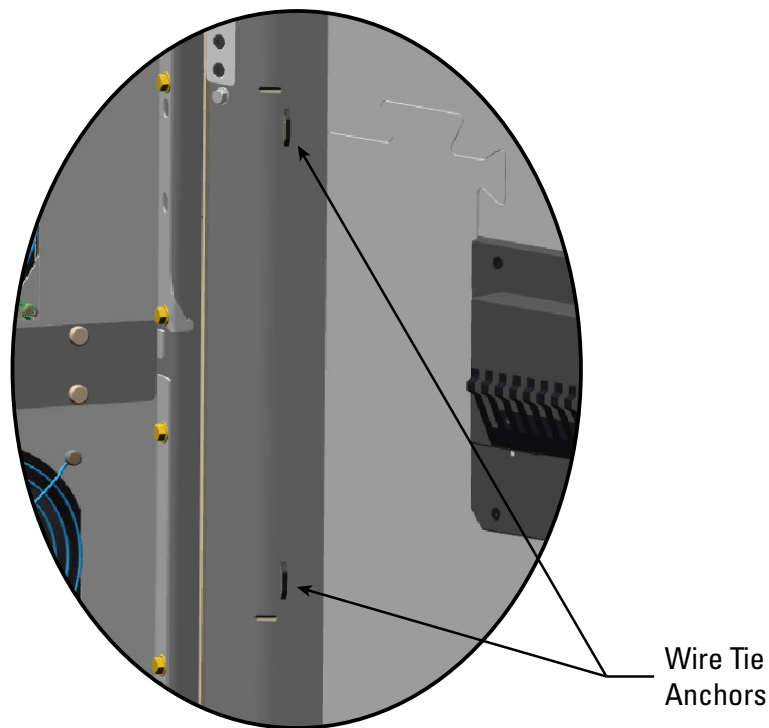


Figure 23. Wire Tie Anchors**Table 11. Building Alarm Connections and Wire Terminations**

Terminal	Name	Description	Recommended Wire Size	Size of Pressure Termination	Tightening Torque
10	Building Alarm 1	Input: Programmable UPS alarm, activated by a remote dry contact closure	Twisted Pair Wires #18 AWG	#14-#30 AWG	2 lb in (0.22-0.25 Nm)
9	Building Alarm 1 Return				
8	Building Alarm 2	Input: Programmable UPS alarm, activated by a remote dry contact closure			
7	Building Alarm 2 Return				
6	Building Alarm 3	Input: Programmable UPS alarm, activated by a remote dry contact closure			
5	Building Alarm 3 Return				
4	Building Alarm 4	Input: Programmable UPS alarm, activated by a remote dry contact closure			
3	Building Alarm 4 Return				
2	Building Alarm 5	Input: Programmable UPS alarm, activated by a remote dry contact closure			
1	Building Alarm 5 Return				

Figure 24. Building Alarm Terminal Block Connector Assignments

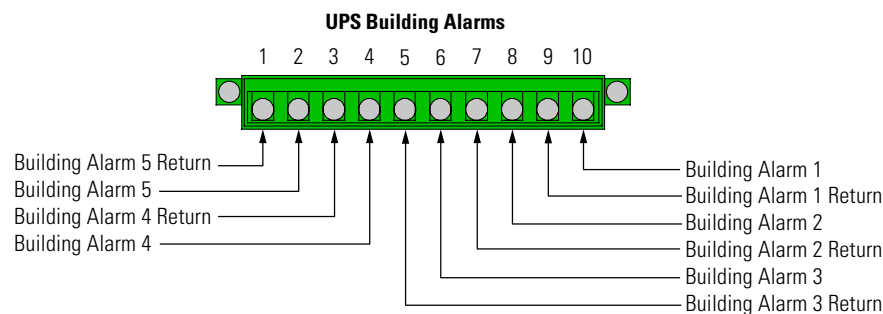
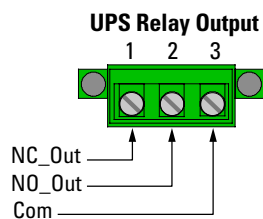


Table 12. Relay Contact Connections and Wire Terminations

Terminal	Name	Description	Recommended Wire Size	Size of Pressure Termination	Tightening Torque
1	Relay Contact NC	Output: General purpose normally-closed (NC) relay contact.	Twisted Pair Wires #18 AWG	#14-#30 AWG	2 lb in (0.22-0.25 Nm)
3	Relay Contact Common				
2	Relay Contact NO	Output: General purpose normally-closed (NO) relay contact.	Twisted Pair Wires #18 AWG	#14-#30 AWG	2 lb in (0.22-0.25 Nm)
3	Relay Contact Common				

Figure 25. Relay Contact Terminal Block Connector Assignments



4.7.2 Installing Battery Detect and Shunt Trip Interface Connections

NOTE 1 If installing interface wiring connections between standalone cabinets, conduit must be installed between cabinets.



NOTE 2 Disconnect terminal block plugs from terminal blocks to wire plugs.

NOTE 3 Use wire rated for 600V and Class 1 wiring methods.

1. Verify the UPS system is turned off and all power sources are removed. See [Chapter 7 UPS Operating Instructions](#) for shutdown instructions.
2. If not already opened, open the front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
3. If not already removed, remove the screws securing the lower internal safety shield panel and remove the panel. Retain the hardware for later use.
4. If wiring the battery detect and shunt trip connections using the inter-cabinet wiring access pass-through (line-up-and-match configurations), proceed to [Step 5](#); if wiring the battery detect and shunt trip connections using bottom entry access, proceed to [Step 7](#); if wiring the battery detect and shunt trip connections using top entry access, proceed to [Step 9](#).
5. **Pass-through Wiring.** Route the battery detect and shunt trip wiring from the battery cabinet through the bottom UPS inter-cabinet wiring access pass-through to the UPS battery detect and shunt trip terminals. See [Figure 17](#) for UPS wiring access information, and [Figure 26](#) for UPS terminal locations. Refer to the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Universal Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small*, or the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small Welded*, listed in paragraph [1.8 For More Information](#), for battery cabinet wiring access information and instructions.
6. Proceed to [Step 10](#).
7. **Bottom Entry Wiring.** Route the battery detect and shunt trip wiring from the battery cabinet or battery disconnect through the bottom of the UPS to the UPS battery detect and shunt trip terminals. See [Figure 15](#) for UPS wiring access information and [Figure 26](#) for UPS terminal locations.
8. Proceed to [Step 10](#).
9. **Top Entry Wiring.** Route the battery detect and shunt trip wiring from the battery cabinet or battery disconnect through the top of the UPS sidecar and the bottom UPS inter-cabinet wiring access pass-through to the UPS battery detect and shunt trip terminals. See [Figure 16](#) and [Figure 17](#) for UPS wiring access information, and [Figure 26](#) for UPS terminal locations.
10. Connect the wiring to the battery detect and shunt trip terminals. See paragraph [3.2.3 UPS System Interface Wiring Preparation](#) and [Table 13](#) for wiring and termination requirements, and [Figure 27](#) for terminal assignments.
11. Verify jumpers are in position as shown in [Figure 28](#). If jumpers are not installed or are in the incorrect position, move or install the jumpers as shown in the figure.
12. If wiring thermal sensor connections, proceed to paragraph [4.7.3 Installing Thermal Sensor Interface Connections](#); if wiring generator interface connections, proceed to paragraph [4.7.4 Generator Interface Connections](#); if wiring Minislot connections, proceed to paragraph [4.7.5 Installing Minislot Interface Connections](#); otherwise, proceed to [Step 13](#).
13. Reinstall all safety shield panels previously removed and secure with the retained hardware.
14. If removed, reinstall the sidecar front panel and secure with the retained hardware.
15. Close the UPS outside door and secure the latch.

Figure 26. Battery Detect and Shunt Trip Terminal Locations

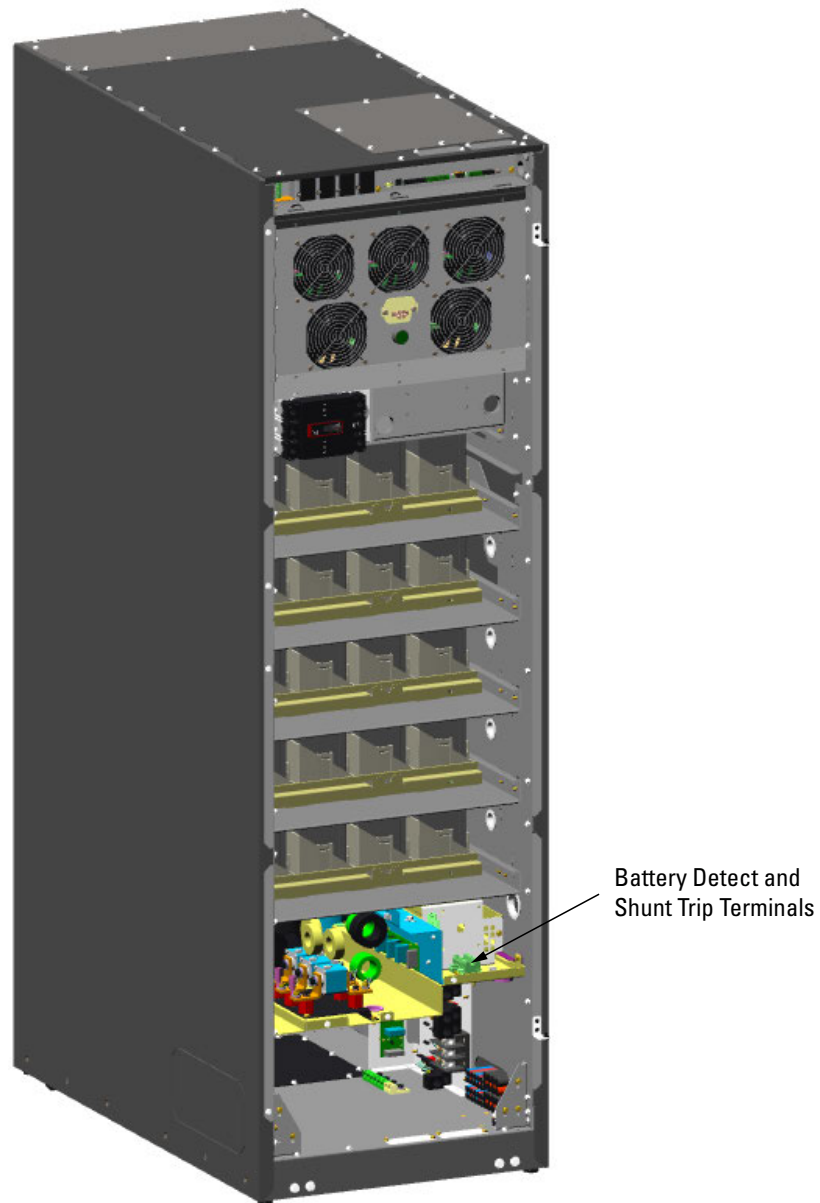
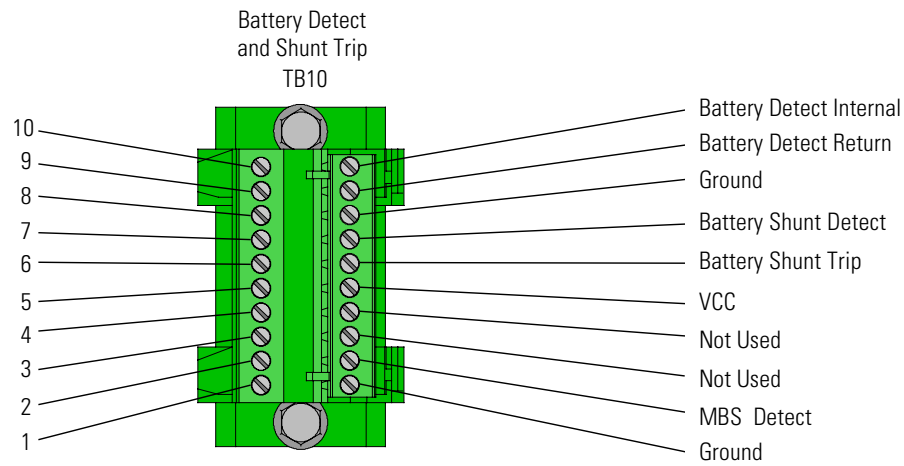
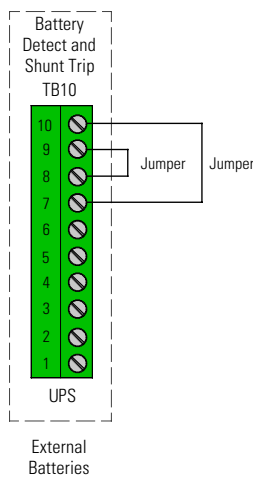


Figure 27. Battery Detect and Shunt Trip Terminal Assignments**Table 13. External Battery Detect and Shunt Trip Connections and Wire Terminations**

Terminal	Name	Description	Recommended Wire Size	Size of Pressure Termination	Tightening Torque
5	VCC	Output: Signal used to open battery breaker or disconnect	Twisted Pair Wires #18 AWG Use wire rated for 600V and Class 1 wiring methods.	#12-#22 AWG	5–7 lb in (0.56–0.79 Nm)
6	Battery Shunt Trip				
7	Battery Shunt Detect				
8	Ground	Input: Signal used to indicate an open battery breaker. Also used to select battery configuration.			

Figure 28. Battery Configuration Jumper Assignments

4.7.3 Installing Thermal Sensor Interface Connections

NOTE 1 The UPS thermal sensor signal is used to indicate a thermal trip condition and to turn off the battery charger.

NOTE 2 Disconnect terminal block plug from terminal block to wire plug.



NOTE 3 If the inter-cabinet wiring access pass-through is not used to install the thermal sensor interface wiring connections, conduit must be installed between the battery cabinet and the UPS cabinet.

NOTE 4 Use wire rated for 600V and Class 1 wiring methods.

To install wiring:

1. Verify the UPS system is turned off and all power sources are removed. See [Chapter 7 UPS Operating Instructions](#) for shutdown instructions.
2. If not already opened, open the front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
3. If not already removed, remove the screws securing the lower internal safety shield panel and remove the panel. Retain the hardware for later use.
4. If wiring the thermal sensor connections using the inter-cabinet wiring access pass-through (line-up-and-match configurations), proceed to [Step 5](#); if wiring the thermal sensor connections using bottom entry access, proceed to [Step 7](#); if wiring the thermal sensor connections using top entry access, proceed to [Step 9](#).
5. **Pass-through Wiring.** Route the thermal sensor wiring from the battery cabinet through the bottom UPS inter-cabinet wiring access pass-through to the UPS thermal sensor terminals. See [Figure 17](#) for UPS wiring access information, and [Figure 29](#) for UPS terminal locations. Refer to the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Universal Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small*, or the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small Welded*, listed in paragraph [1.8 For More Information](#), for battery cabinet wiring access information and instructions.
6. Proceed to [Step 10](#).
7. **Bottom Entry Wiring.** Route the thermal sensor wiring from the battery cabinet through the bottom of the UPS to the UPS thermal sensor terminals. See [Figure 15](#) for UPS wiring access information and [Figure 29](#) for UPS terminal locations.
8. Proceed to [Step 10](#).
9. **Top Entry Wiring.** Route the thermal sensor wiring from the battery cabinet through the top of the UPS sidecar and the bottom UPS inter-cabinet wiring access pass-through to the UPS thermal sensor terminals. See [Figure 16](#) and [Figure 17](#) for UPS wiring access information, and [Figure 29](#) for UPS terminal locations.
10. Connect the wiring to the thermal sensor terminals. See paragraph [3.2.3 UPS System Interface Wiring Preparation](#) and [Table 14](#) for wiring and termination requirements, and [Figure 30](#) for terminal assignments.
11. Verify jumpers are in position as shown in [Figure 31](#). If jumpers are not installed or are in the incorrect position, move or install the jumpers as shown in the figure.
12. If wiring generator interface connections, proceed to paragraph [4.7.4 Generator Interface Connections](#); if wiring Minislot connections, proceed to paragraph [4.7.5 Installing Minislot Interface Connections](#); otherwise, proceed to [Step 13](#).
13. Reinstall all safety shield panels previously removed and secure with the retained hardware.
14. If removed, reinstall the sidecar front panel and secure with the retained hardware.

15. Close the UPS outside door and secure the latch.

Figure 29. Thermal Sensor Terminal Location

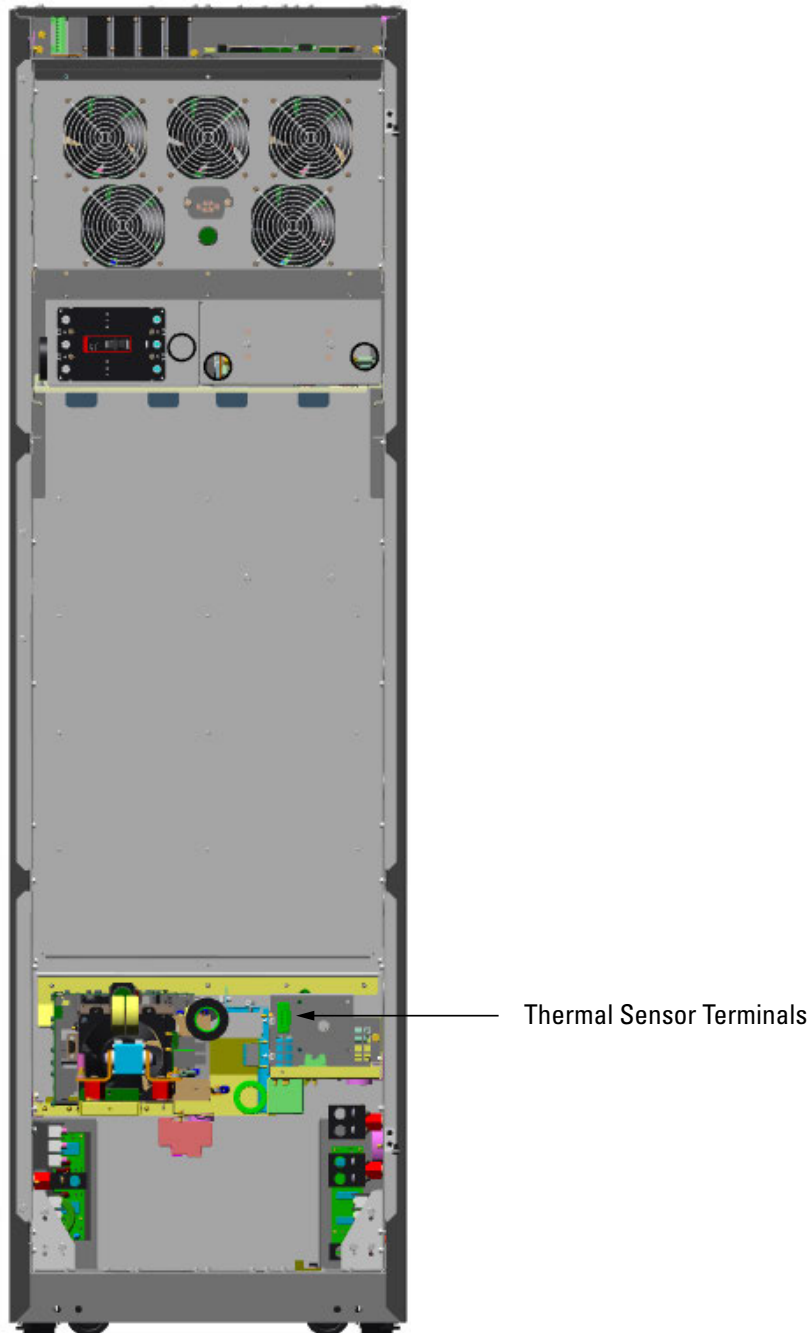


Figure 30. Thermal Sensor Terminal Assignments

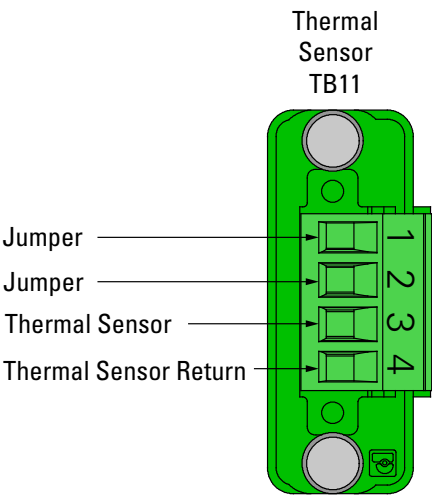
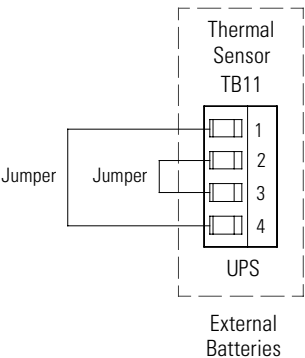


Table 14. Thermal Sensor Connections and Wire Terminations

Terminal	Name	Description	Recommended Wire Size	Size of Pressure Termination	Tightening Torque
1	Jumper	Used to select battery configuration	Twisted Pair Wires #18 AWG Use wire rated for 600V and Class 1 wiring methods.	#12-#22 AWG	5–7 lb in (0.56–0.79 Nm)
2	Jumper				
3	Thermal Sensor	Input: Used to signal a battery temperature out of specification and to turn off the battery charger to prevent thermal runaway.			
4	Thermal Sensor Return				

Figure 31. Thermal Sensor Jumper Assignments



4.7.4 Generator Interface Connections

If ESS is enabled and the UPS will be fed by a site generator at any time, the On Generator building alarm must be wired and configured to a Building Alarm Input. Wiring the On Generator sensing circuit to a building alarm allows the UPS to optimize its operation with the generator by transferring the UPS from ESS mode to Normal (double conversion) mode.

NOTE 1 An UPS building alarm input is used to indicate On Generator.

NOTE 2 Any pair of unused building alarm terminals may be used for On Generator connections.



NOTE 3 Program the building alarm to read On Generator and for either Normally Open (default) or Normally Closed as required by the generator sensing output.


NOTE 4 If installing interface wiring connections between standalone cabinets, conduit must be installed between cabinets.

NOTE 5 Disconnect terminal block plugs from terminal blocks to wire plugs.

To Install wiring:

1. Verify the UPS system is turned off and all power sources are removed. See [Chapter 7 UPS Operating Instructions](#) for shutdown instructions.
2. If not already opened, open the front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
3. If wiring the interface terminals from the bottom of the UPS, proceed to [Step 8](#); otherwise, proceed to [Step 4](#).
4. **Top Entry Wiring.** Remove the top interface entry conduit landing plates to drill or punch holes (see [Figure 15](#)).
5. Reinstall the interface entry plates and install the conduit.
6. Route the UPS building alarm interface wiring through the top interface entry conduit landing plates to the UPS building alarm terminals. See [Figure 15](#) for wiring access information, and [Figure 20](#) and [Figure 21](#) for UPS interface terminal locations.
7. Proceed to [Step 13](#).
8. **Bottom Entry Wiring.** Remove the bottom interface entry conduit landing plates to drill or punch holes (see [Figure 22](#)).
9. Reinstall the interface entry plates and install the conduit.
10. Route the UPS building alarm interface wiring through the bottom interface entry conduit landing plates to the bottom access interface wiring channel along the inside of the front door (see [Figure 22](#)).
11. Route the wiring along the interface wiring channel (see [Figure 22](#)) to the UPS building alarm terminals. See [Figure 20](#) and [Figure 21](#) for UPS interface terminal locations.
12. Secure the wiring to the wire tie anchors provided (see [Figure 23](#)) using Zip ties.
13. Connect the building alarm interface wiring to the building alarm terminals. See paragraph [3.2.3 UPS System Interface Wiring Preparation](#) and [Table 11](#) for wiring and termination requirements, and [Figure 24](#) for terminal assignments.
14. If wiring Minislot connections, proceed to paragraph [4.7.5 Installing Minislot Interface Connections](#); otherwise, proceed to [Step 15](#).
15. Close the UPS outside door and secure the latch.

4.7.5 Installing Minislot Interface Connections

-
- NOTE 1** LAN drop for use with Minislot cards must be provided by the customer.
-  **NOTE 2** When installing interface wiring connections, conduit must be installed between each device and the UPS cabinet.
- NOTE 3** Remove the cabinet stiffener bar (see [Figure 4-10](#)) before installing or removing Minislot cards. Reinstall the bar after the procedure is completed.
-


For installation and setup of a Minislot card, contact an Eaton service representative (see paragraph [1.9 Getting Help](#)).

To install wiring:

1. If not already installed, install the LAN drop.
2. If not already opened, open the front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
3. If wiring a Minislot card from the bottom of the UPS, proceed to [Step 8](#); otherwise, proceed to [Step 4](#).
4. Remove the top interface entry conduit landing plate to drill or punch holes (see [Figure 15](#)).
5. Reinstall the interface entry plate and install the conduit.
6. Route the Minislot card interface wiring through the top interface entry conduit landing plate to the Minislot card terminals. See [Figure 15](#) for wiring access information, and [Figure 20](#) and [Figure 21](#) for Minislot card locations.
7. Proceed to [Step 13](#).
8. Remove the bottom interface entry conduit landing plate to drill or punch holes (see [Figure 22](#)).
9. Reinstall the interface entry plate and install the conduit.
10. Route the Minislot card interface wiring through the bottom interface entry conduit landing plate to the bottom access interface wiring channel along the inside of the front door (see [Figure 22](#)).
11. Route the wiring along the interface wiring channel (see [Figure 22](#)) to the Minislot card terminals. See [Figure 20](#) and [Figure 21](#) for Minislot card locations.
12. Secure the wiring to the wire tie anchors provided (see [Figure 23](#)) using Zip ties.
13. Install the LAN and other cables to the appropriate Minislot cards. Refer to the manual supplied with the Minislot card for terminal assignments.
14. Refer to the manual supplied with the Minislot card for operator instructions.
15. Close the UPS outside door and secure the latch.

4.8 Initial Startup

Startup may be performed by the customer's battery qualified electrical contractor for single (not parallel) UPS installations without any accessory cabinets such as an External Battery Cabinet.

-
-  **NOTE** Startup and operational checks for parallel systems or installations with accessory cabinets must be performed by an authorized Eaton Customer Service Engineer, or the warranty terms specified on the product's resources page become void. See [Chapter 11 Warranty](#) for details. This service is offered as part of the sales contract for the UPS. Contact an Eaton service representative in advance (a minimum two-week notice is required) to reserve a preferred startup date.
-

4.9 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. Complete all items listed on the checklist to ensure a smooth installation. Make a copy of the Installation Checklist before filling it out, and retain the original.

After the installation is complete, an Eaton Customer Service Engineer must verify the operation of the UPS system 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 verify all applicable equipment installations have been completed.



NOTE

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

4.10 Installation Checklist

- ☐ All packing materials and restraints have been removed from each cabinet.
- ☐ The UPS cabinet is placed in its installed location.
- ☐ All conduits and cables are properly routed to the UPS and any ancillary cabinets.
- ☐ All power cables are properly sized and terminated.
- ☐ Battery cables are terminated on E4 (+) and E5 (–).
- ☐ Battery shunt trip signal wiring is connected from the UPS to the battery cabinet or battery disconnect.
- ☐ Battery detect signal wiring is connected from the UPS to the battery cabinet or battery disconnect.
- ☐ Battery thermal sensor signal wiring is connected from the UPS to the battery cabinet or battery disconnect.
- ☐ A ground conductor is properly installed.
- ☐ Building alarms and alarm relays are wired appropriately. (Optional)
- ☐ LAN drops are installed. (Optional)
- ☐ LAN connections have been completed. (Optional)
- ☐ All internal safety shields are installed.
- ☐ Accessories are mounted in installed locations and wiring is terminated inside the UPS cabinet. (Optional)
- ☐ Air conditioning equipment is installed and operating correctly.
- ☐ The area around the installed UPS system is clean and dust-free. (Eaton recommends that the UPS be installed on a level floor suitable for computer or electronic equipment.)
- ☐ Adequate workspace exists around the UPS and other cabinets.
- ☐ Adequate lighting is provided around all UPS equipment.
- ☐ A 120 Vac service outlet is located within 7.5m (25 ft) of the UPS equipment.
- ☐ Startup and operational checks are performed by an authorized Eaton Customer Service Engineer for parallel systems or installations with accessory cabinets.
- ☐ Visit www.eaton.com/pg/register to register your new Eaton UPS / Eaton UPS Accessory.

Notes:

[illegible]

Chapter 5 Understanding UPS Operation

5.1 UPS System Overview

The Eaton 93PM UPS is a continuous-duty, solid-state, transformerless, three-phase, true online system that provides conditioned and uninterruptible AC power to the UPS system's output and critical load.

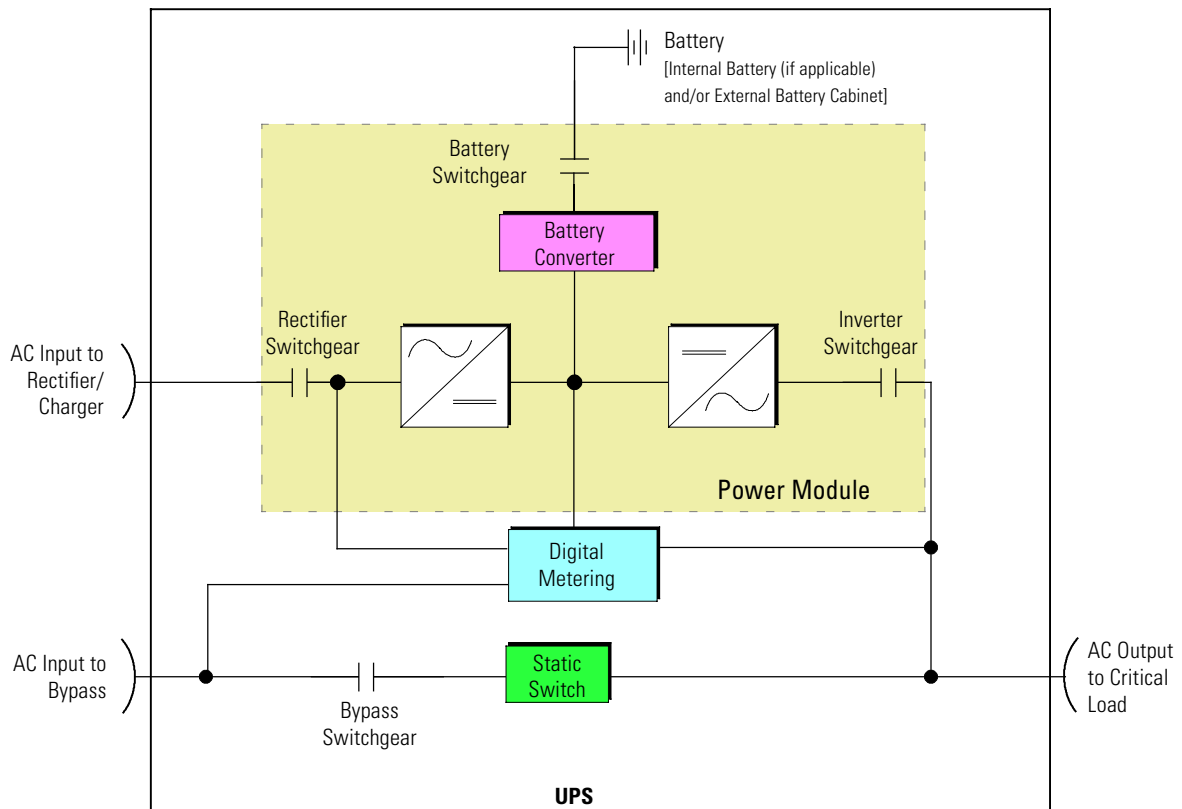
The basic system consists of a rectifier, battery converter, inverter, monitoring/operation control panel, integrated communication server, and digital signal processor (DSP) logic. [Figure 32](#) shows the main elements of the UPS system.

If utility power is interrupted or falls outside the parameters specified in **Chapter 10 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 UPS allows you to either transfer to an alternative power system (such as a generator) or shut down your critical load in an orderly manner.

The emergency bypass consists of a continuous static switch, and bypass switchgear. The bypass switchgear is located in series with the static switch. The static switch is armed and ready during normal operation.

This unit is a three-wire device. The loss of a single input phase will be considered a complete loss of input power and discharge the battery to provide power to the load.

Figure 32. Main Elements of the UPS System



5.2 Single UPS

A single UPS operates independently to support an applied load from the inverter, providing conditioned and uninterruptible AC power to the critical load from the output of the module. During an outage, the inverter continues to operate, supporting power to the load from the battery supply. If the unit requires service, applied loads are transferred to the internal bypass either automatically or manually.

5.2.1 Modes

The Eaton 93PM UPS supports a critical load in four different modes of operation:

- In Energy Saver System (ESS) mode, commercial AC power is supplied directly to the critical load through the internal bypass and transfers automatically to Normal mode (double-conversion on demand) if an abnormal condition is detected. The battery charger also provides charging current for the battery, if needed.
- In Normal (double-conversion) mode, the critical load is supplied by the inverter, which derives its power from rectified utility AC power. In this mode, the battery charger also provides charging current for the battery, if needed.
- In Bypass mode, the critical load is directly supported by utility power. The battery charger also provides charging current for the battery, if needed.
- In Battery mode, the battery provides DC power, which maintains inverter operation. The battery supports the critical load.

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

5.2.2 Energy Saver System Mode

When the UPS is operating in ESS mode, commercial AC power is supplied directly to the critical load through the internal bypass with the power module in a standby state. Surge protection and some filtering is also provided, ensuring that clean power is delivered to the load equipment. If a commercial power brownout, blackout, overvoltage, undervoltage, out-of-tolerance frequency condition occurs, or any other disturbance is detected in the incoming power, the system forward transfers to normal mode (double-conversion on demand). In case of a complete utility outage or if input power is outside the tolerances of the system, the UPS transfers to battery mode and continues to supply conditioned, clean power to the critical load. When the input line returns to normal operating range, the UPS returns to ESS operation. For charging batteries, the UPS will not enter ESS mode until charger output is 25% or less of maximum charger current.

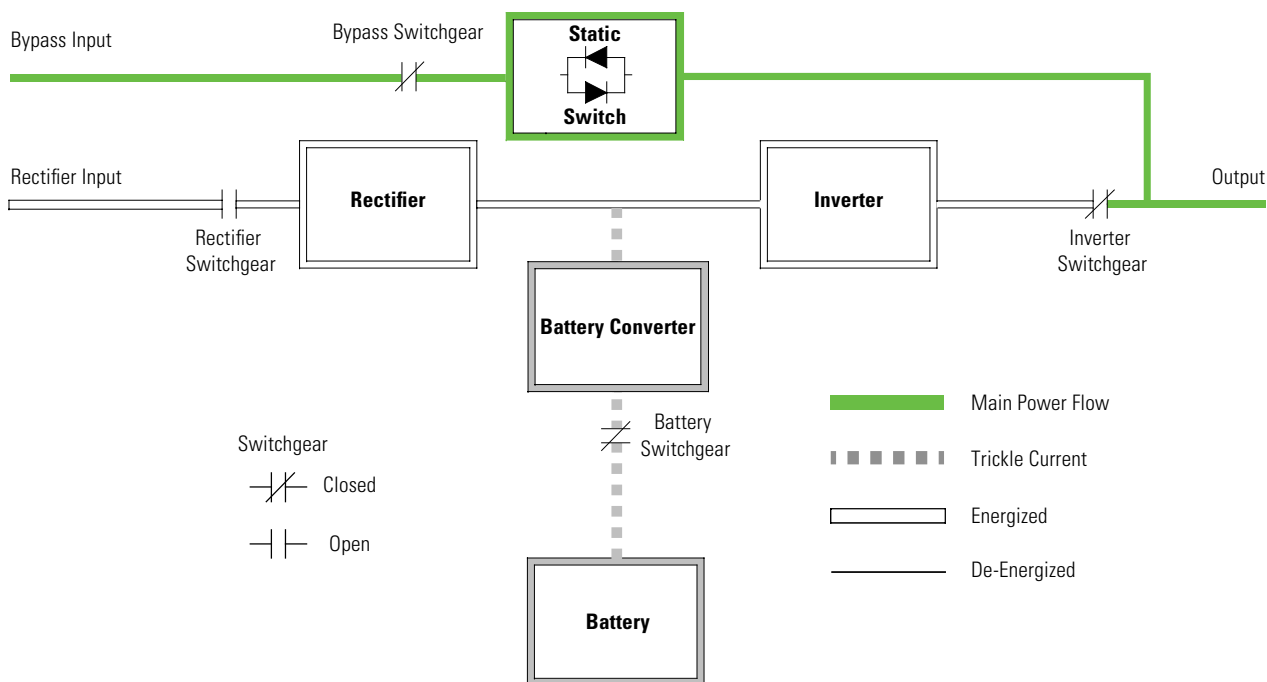
When operating in ESS, the UPS detection and control algorithms continuously monitor incoming power quality and allow the fast engagement of power converters. Typical transition time to double conversion is less than two milliseconds, which is practically seamless. If the UPS detects a fault condition while operating in ESS, it is also able to detect and determine whether the fault is caused by the load or if it is upstream from the UPS. A fault at the bypass source results in an immediate switch over to the inverter. A fault in the utility switches the UPS out of Energy Saver System (ESS) mode while a fault in the load keeps the UPS in ESS mode.

When power conditions are within acceptable limits, the UPS operates as a high-efficiency, energy-saving system — providing surge protection for IT equipment and ensuring clean power is delivered to the critical load. Energy saver system increases system efficiency to 99% at 100% linear load and nominal V_{in} .

[Figure 33](#) shows the path of electrical power through the UPS system when the UPS is operating in Normal mode.

ESS mode is a normal operating mode, and not an alarm condition. While the UPS is in this mode, the NORMAL light on the front display will illuminate.

Figure 33. Path of Current Through the UPS in Energy Saver System Mode



5.2.3 Normal Mode

During Normal mode, power for the system is derived from a utility input source through the rectifier switchgear. Three-phase AC input power is converted to DC using IGBT devices to produce a regulated DC voltage to the inverter. When the battery switchgear is closed the battery is charged directly from the regulated rectifier output through a buck or boost DC converter, depending on the system voltage and the size of the battery string attached to the unit.

[Figure 34](#) shows the path of electrical power through the UPS system when the UPS is operating in Normal mode.

The battery converter derives its input from the regulated DC output of the rectifier and provides a bucked regulated DC voltage charge current to the battery. The battery is always connected to the UPS and ready to support the inverter should the utility input become unavailable.

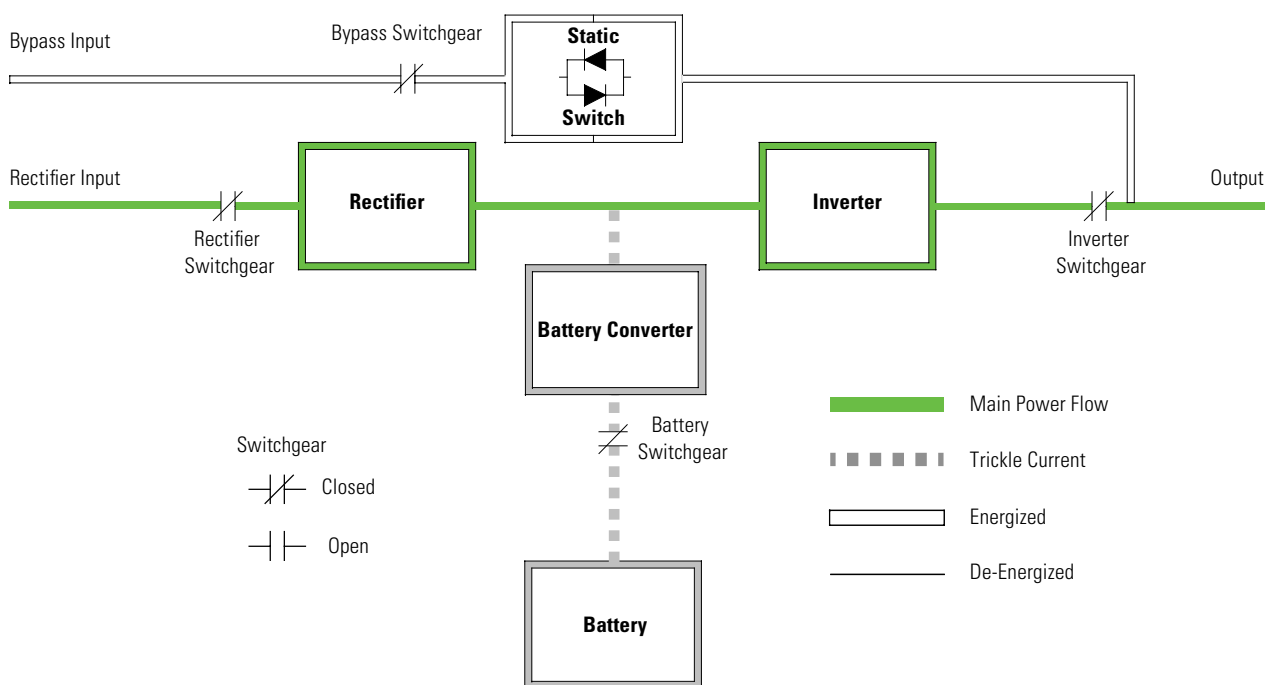
The inverter produces a three-phase AC output to a customer's load without the use of a transformer. The inverter derives regulated DC from the rectifier and uses IGBT devices and pulse-width modulation (PWM) to produce a regulated and filtered AC output. The AC output of the inverter is delivered to the system output through the inverter switchgear.

If the utility AC power is interrupted or is out of specification, the UPS automatically switches to Battery mode to support the critical load without 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 overload condition is cleared and system operation is restored within specified limits.

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

Figure 34. Path of Current Through the UPS in Normal Mode



5.2.4 Bypass Mode

CAUTION

The critical load is not protected from voltage or frequency fluctuations or power outages while the UPS is in Bypass mode.

The UPS automatically switches to Bypass mode if it detects an overload, load fault, or internal failure (if configured for capacity). If configured for redundancy (N+1) the UPS would remain on line in Normal mode if one UPM failed. The UPS can also be transferred from Normal mode to Bypass mode manually. The bypass source supplies the commercial AC power to the load directly. [Figure 35](#) shows the path of electrical power through the UPS system when operating in Bypass mode.

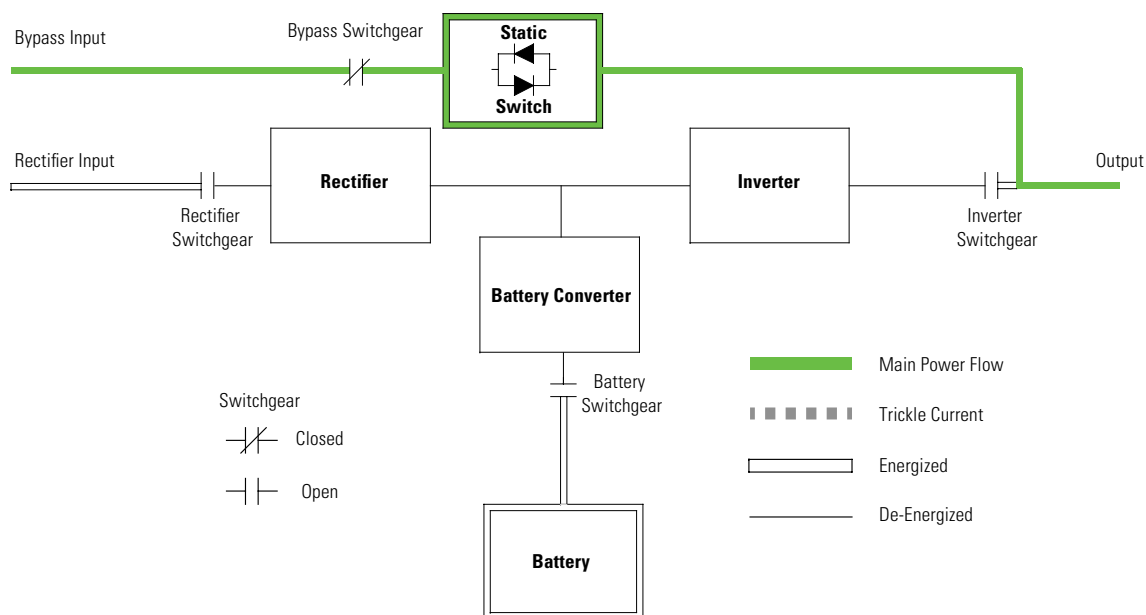
In Bypass mode, the output of the system is provided with three-phase AC power directly from the system input. While in this mode, the output of the system is not protected from voltage or frequency fluctuations or power outages from the source. Some power line filtering and surge protection is provided to the load but no active power conditioning or battery support is available to the output of the system in the Bypass mode of operation.

The internal bypass is comprised of a solid-state, silicon-controlled rectifier (SCR) continuous duty static switch, and bypass switchgear. The static switch is used instantaneously anytime the inverter is unable to support the applied load. The continuous static switch is wired in series with the bypass switchgear, and together they are wired in parallel with the rectifier and inverter.

The static switch, being an electronically-controlled device, can be turned on immediately to pick up the load from the inverter while the inverter switchgear opens to isolate the inverter. The bypass switchgear is normally closed, ready to support the static switch unless the bypass input source becomes unavailable.

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 attempt locks the critical load to the bypass source and requires operator intervention to transfer.

Figure 35. Path of Current Through the UPS in Bypass Mode



5.2.5 Battery Mode

The UPS automatically transfers to Battery mode 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.

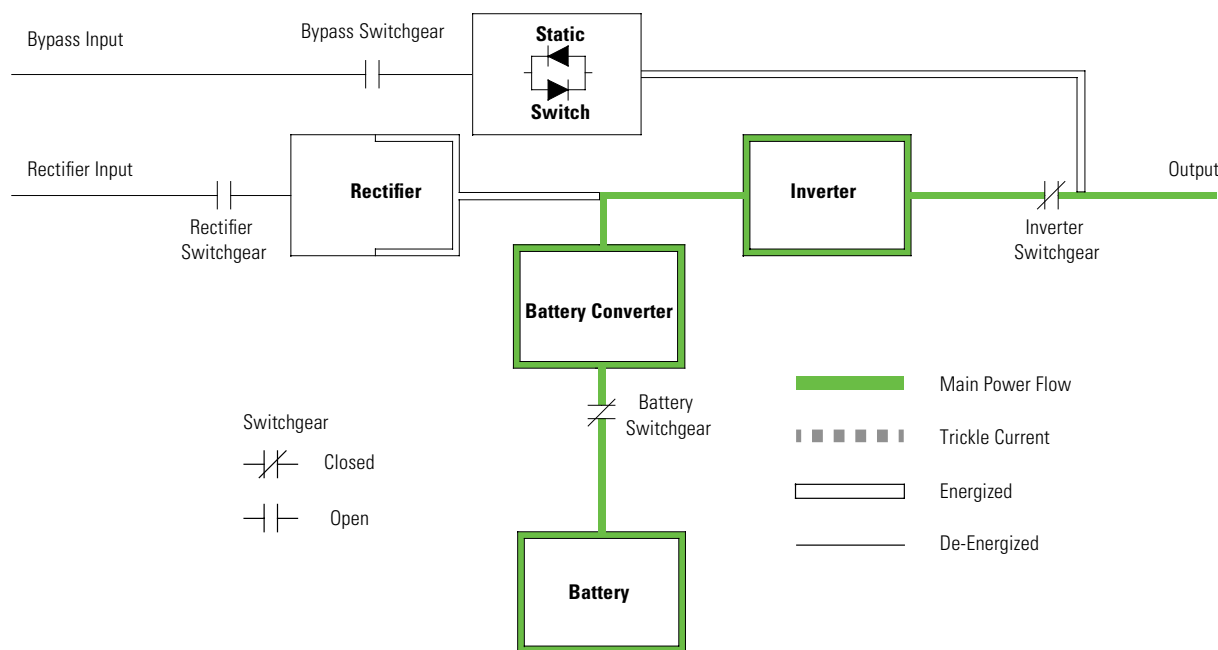
[Figure 36](#) shows the path of electrical power through the UPS system when operating in Battery mode.

During a utility power failure, the rectifier no longer has an AC utility source from which to supply the DC output voltage required to support the inverter. The rectifier switchgear opens and the battery instantaneously supplies energy to the battery converter. The converter boosts the voltage so that the inverter can support the customer's load without interruption. If bypass is common with the rectifier input, the bypass switchgear also opens. The opening of the rectifier and bypass switchgear prevent system voltages from bleeding backwards through the static switch and rectifier snubber components to the utility source.

If the input power fails to return or is not within the acceptance windows required for normal operation, the battery continues discharging until a DC voltage level is reached where the inverter output can no longer support the connected loads. When this event occurs, the UPS issues another set of audible and visual alarms indicating SHUTDOWN IMMINENT. Unless the rectifier has a valid AC input soon, the output can be supported for only two minutes before the output of the system shuts down.

If at any time during the battery discharge the input power becomes available again, the rectifier and the bypass switchgear close and the rectifier begins to supply DC current to the converter and inverter. At this point, the unit returns to Normal mode. Depending on the total load and the duration of the battery discharge, battery current limit alarms may be seen for a short time due to the current required to recharge the battery.

Figure 36. Path of Current Through the UPS in Battery Mode



Chapter 6 UPS Online Schematics

The system online drawings in this section show the simplified internal structure of the UPS, battery supply, and basic maintenance bypass.

Figure 37. Eaton 93PM Three-Wire UPS System Online

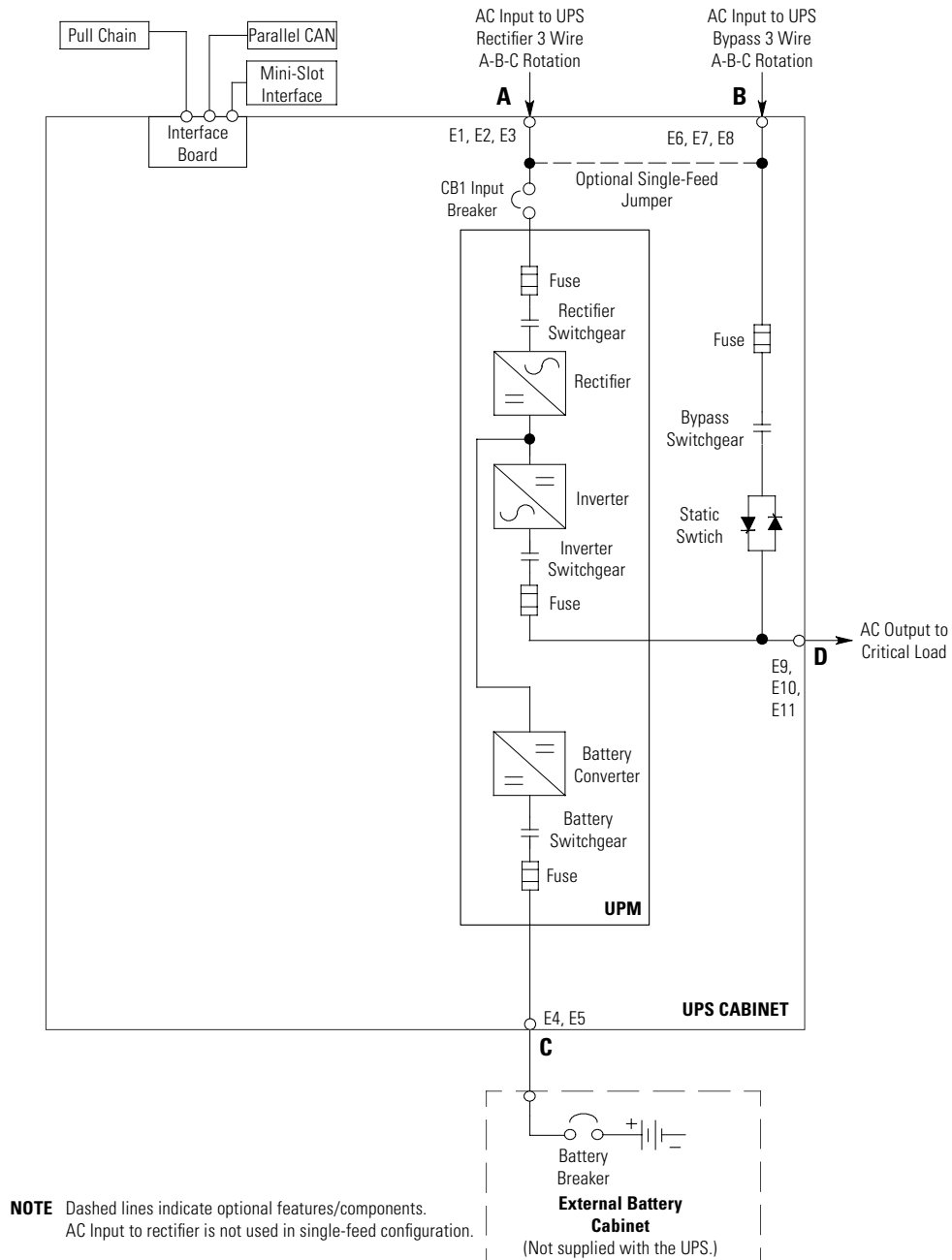


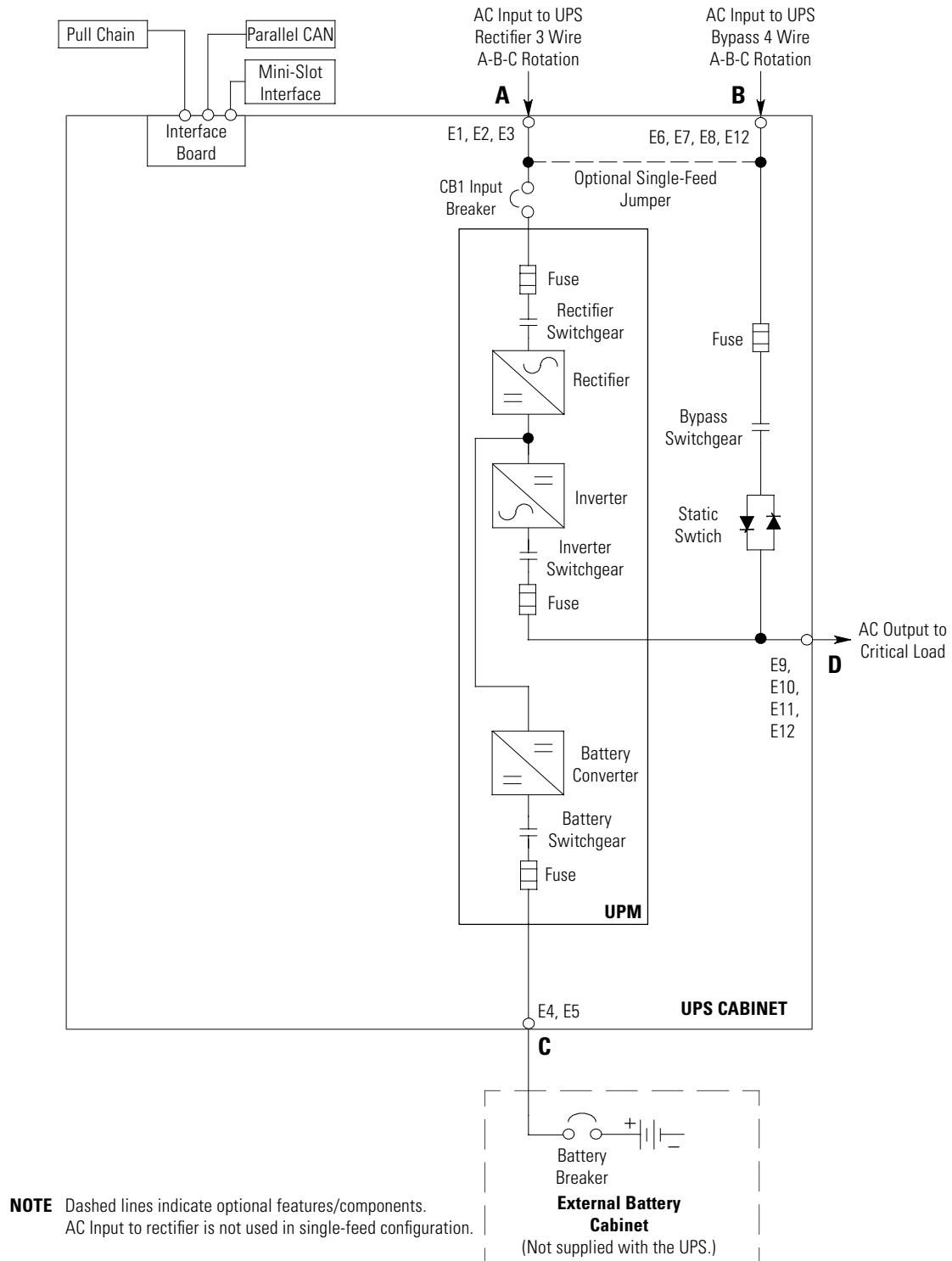
Figure 38. Eaton 93PM Four-Wire UPS System Online

Figure 39. Eaton 93PM Three-Wire UPS with Top Entry Sidecar System Online

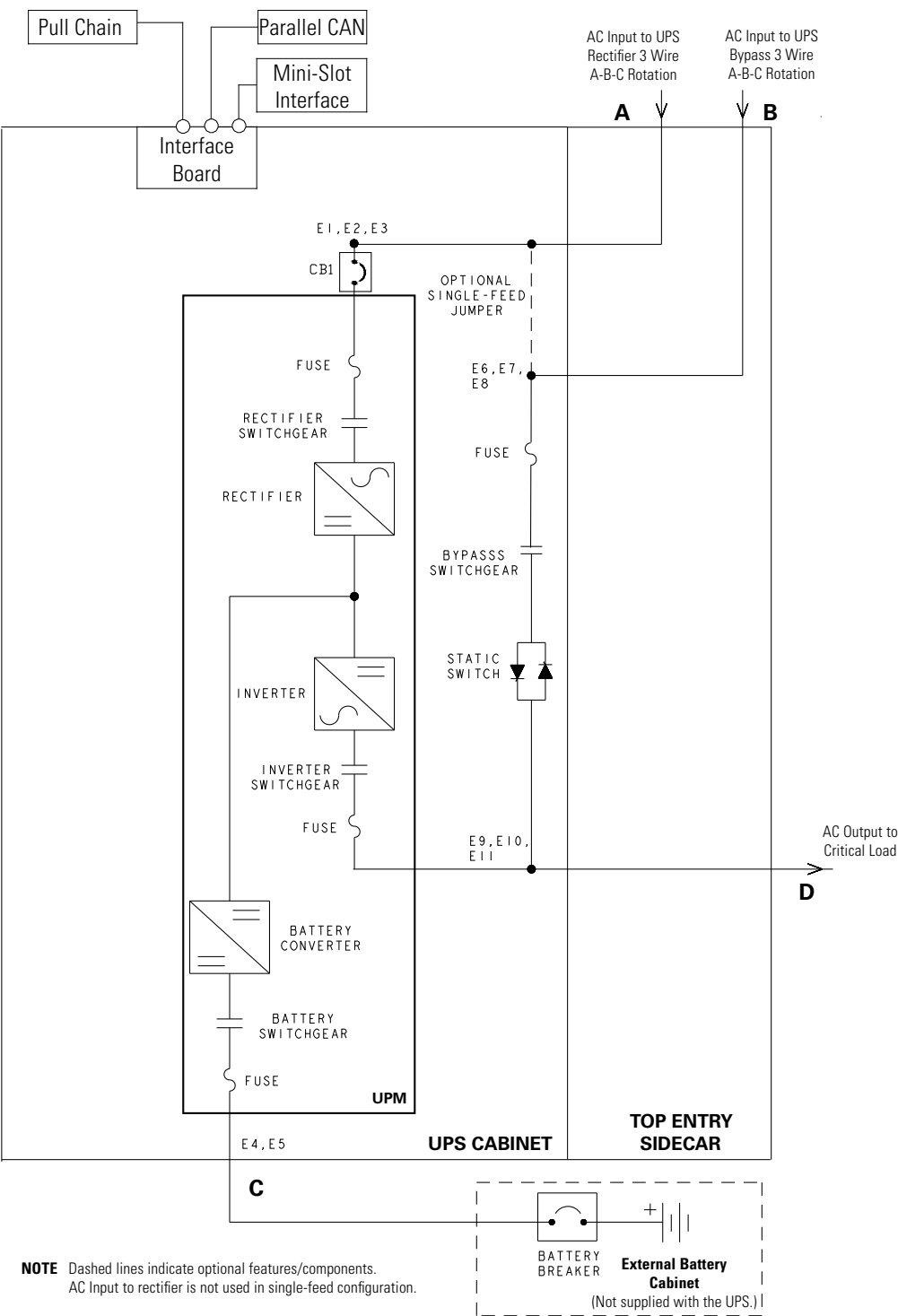


Figure 40. Eaton 93PM Four-Wire UPS with Top Entry Sidecar System Online

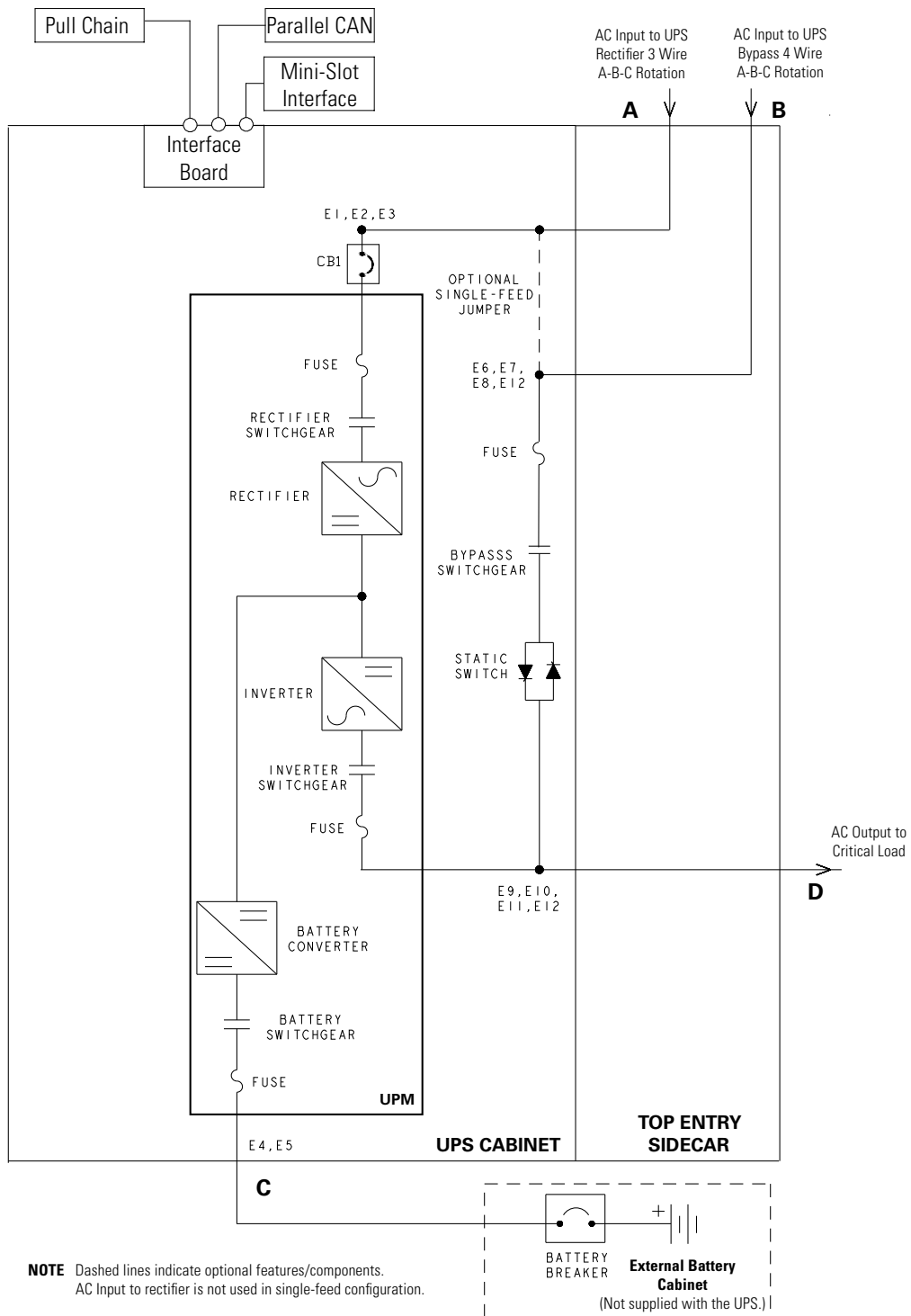


Figure 41. Eaton 93PM Three-Wire UPS with Bypass Sidecar (SIAC-B) System Online

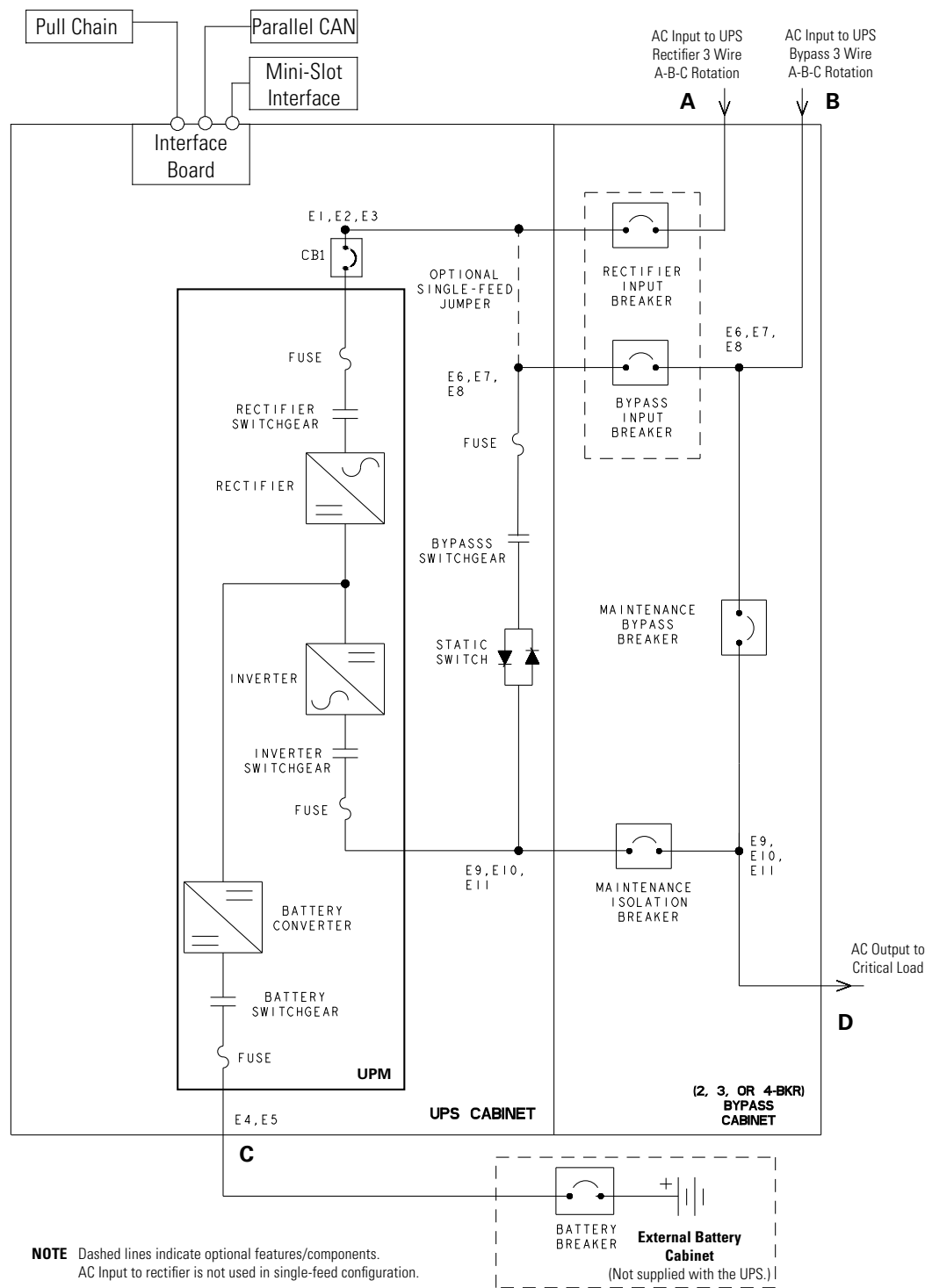
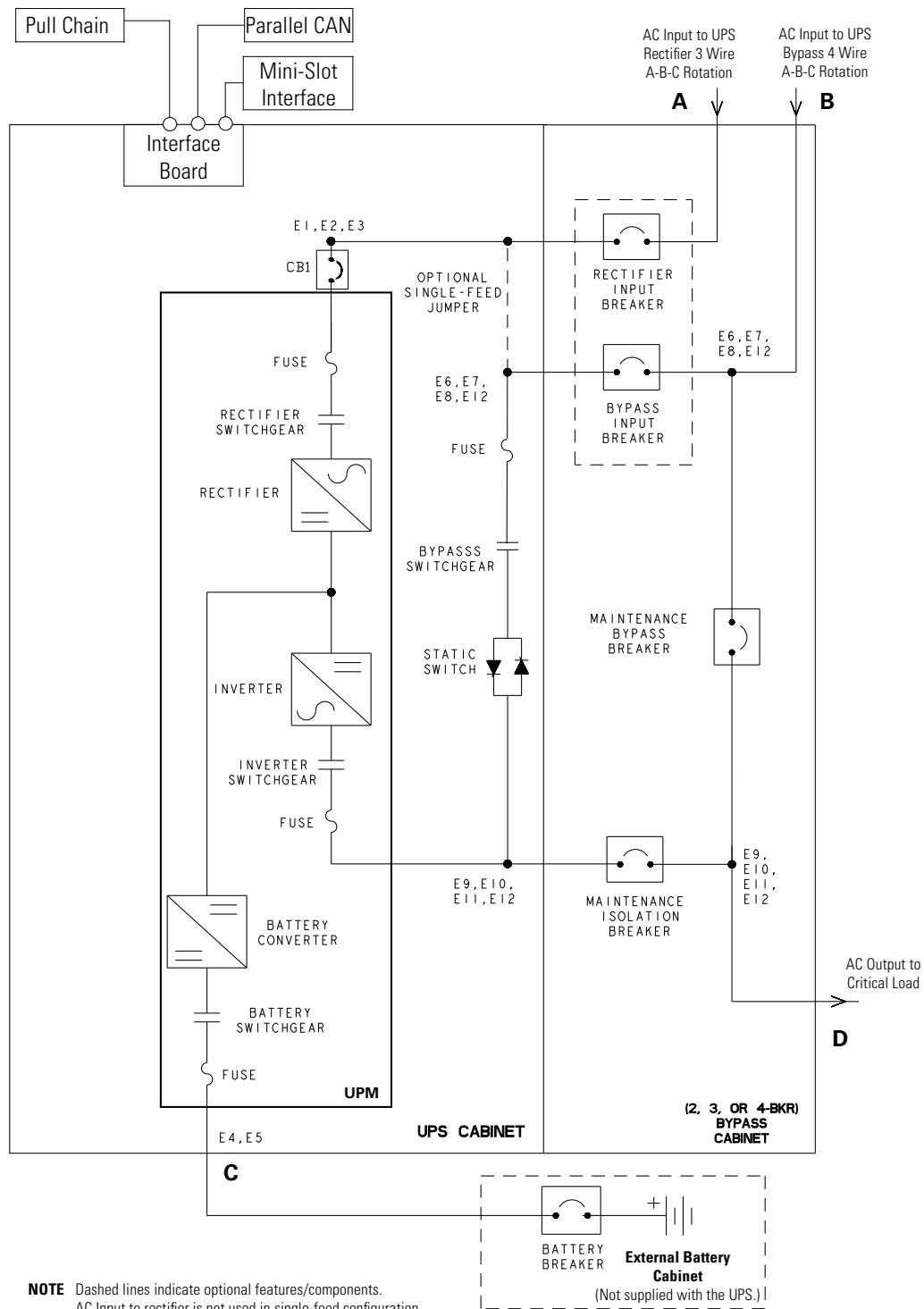


Figure 42. Eaton 93PM Four-Wire UPS with Bypass Sidecar (SIAC-B) System Online



Chapter 7 UPS Operating Instructions

This section describes how to operate the UPS.



NOTE

Before starting the UPS, ensure all installation tasks are complete and a preliminary startup has been performed by authorized service personnel. The preliminary startup verifies all electrical interconnections to ensure the installation was successful and the system operates properly.



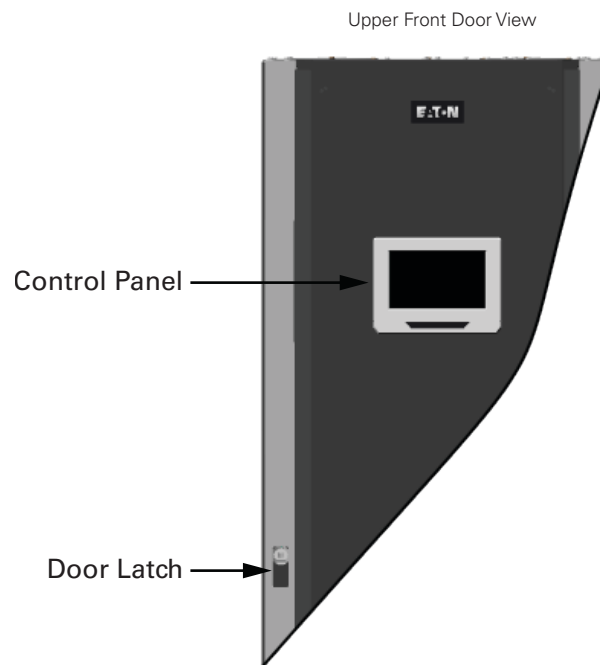
NOTE

Read this section of the manual and have thorough knowledge of UPS operation before attempting to operate any of the controls.

7.1 UPS Controls and Indicators

The controls and indicators identified and described in this section are used to set up, control, and monitor UPS operation. [Figure 43](#) shows the control panel location on the front door of the UPS. [Figure 44](#) shows the UPS input breaker.

Figure 43. UPS Controls and Indicators



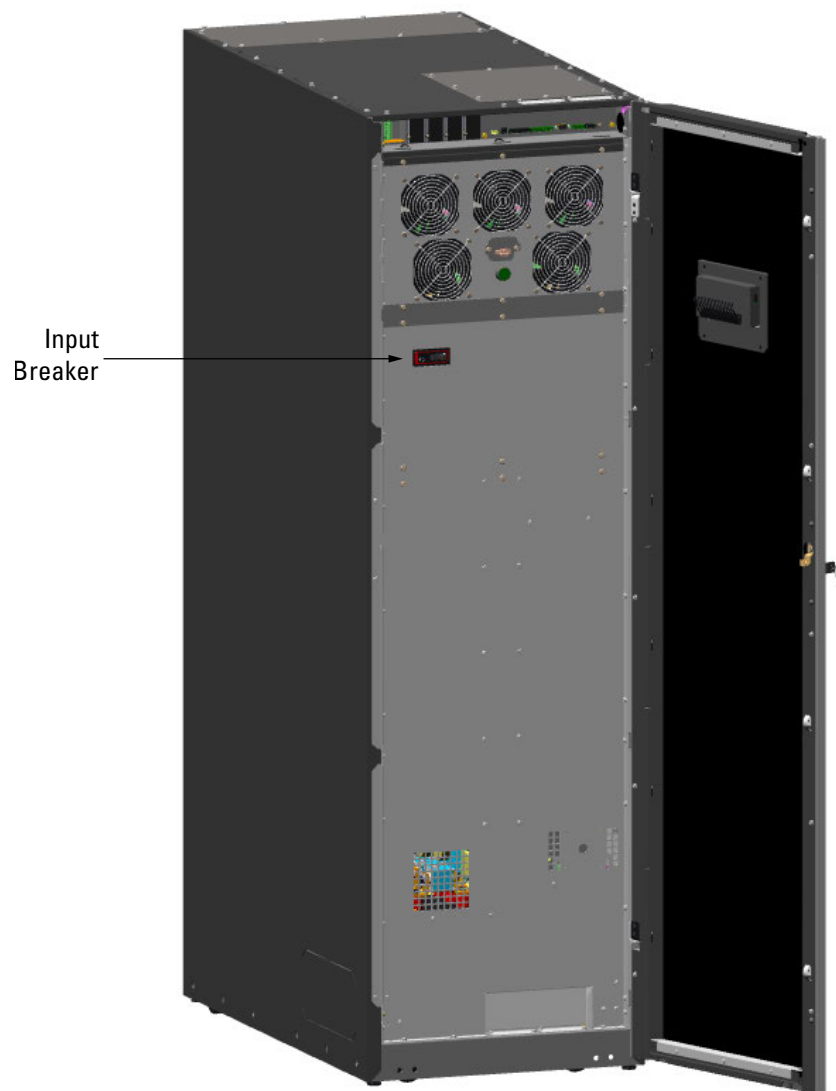
7.1.1 Control Panel

The control panel is used to set up and control the UPS, and to monitor UPS operation. For a description of the UPS control panel functions, see paragraph [7.2 Using the Control Panel](#).

7.1.2 Circuit Breakers

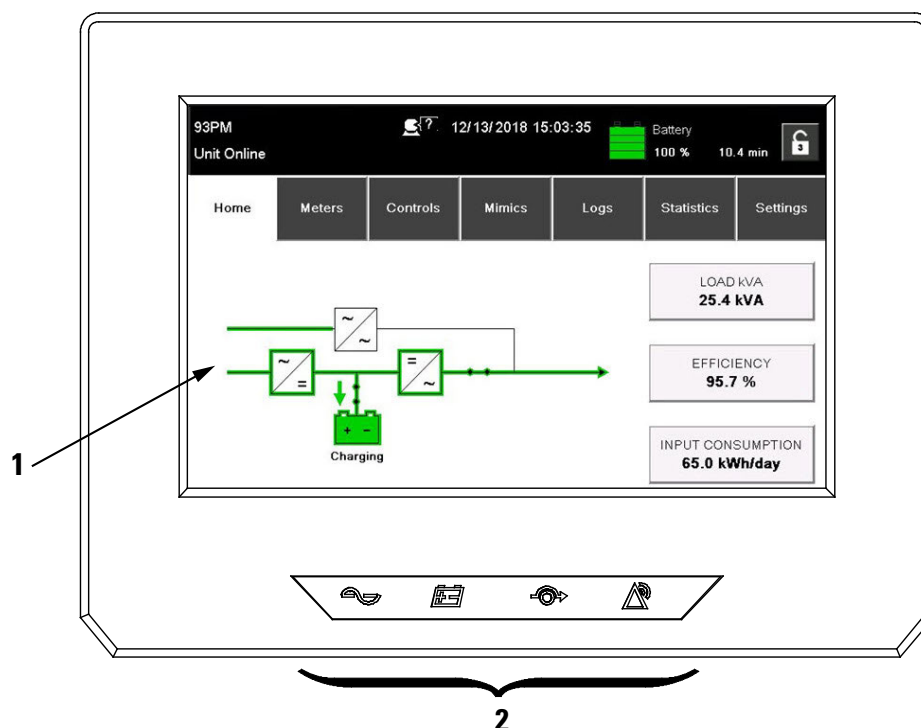
- **Input Circuit Breaker** – The Input circuit breaker is used to control the AC input to the UPS rectifier.

Figure 44. AC Input Circuit Breaker Location



7.2 Using the Control Panel

The following paragraphs describe the UPS control panel, including controls and indicators, and how to monitor UPS operation. The control panel is shown in [Figure 45](#).

Figure 45. UPS Control Panel

The control panel consists of:

- A color liquid crystal touch screen display (1).
- A horizontal row of status indicators (2). See paragraph [7.2.1 Status Indicators](#).

The following paragraphs describe using the UPS control panel to monitor the UPS. See paragraph [7.3 Single UPS Operation](#) for use of the operational controls.





When the unit powers up, the screen displays the as shown in [Figure 45](#).

7.2.1 Status Indicators

The four symbols on the bottom of the control panel are status indicators. These colored light emitting diode (LED) lamps work with the alarm horn to provide the operating status of the UPS.

[Table 15](#) describes the status indicators.

Table 15. Status Indicators

Indicator	Status	Description
 Green	On	The UPS is in Double Conversion mode. The power module is supplying power to the critical load.
	Off	The UPS is turned off.
	On	The UPS is in Battery mode. Because Battery mode is a normal condition of the UPS, the normal indicator also remains illuminated.
 Yellow	On	The UPS is 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.
 Red	On	The UPS has an active alarm and requires immediate attention. The LCD shows the highest priority active alarms. All alarms are accompanied by an audible horn. To silence the horn, touch any control panel button. The Alarm indicator may be illuminated along with other indicators.
	Flashing	There is a new UPS alarm condition. The indicator flashes until acknowledged by touching any control panel button once.

7.2.2 System Events

When the UPS system is running in Double Conversion 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 Double Conversion mode. System events on the UPS can be indicated by horns, lights, messages, or all three.

Select the **LOGS** tab from the navigation bar on main menu screen to display the active events screen. This screen shows any currently active alarms, notices, or commands. For more information on using the events screen, see paragraph [7.2.6 Display Menu Operation](#).

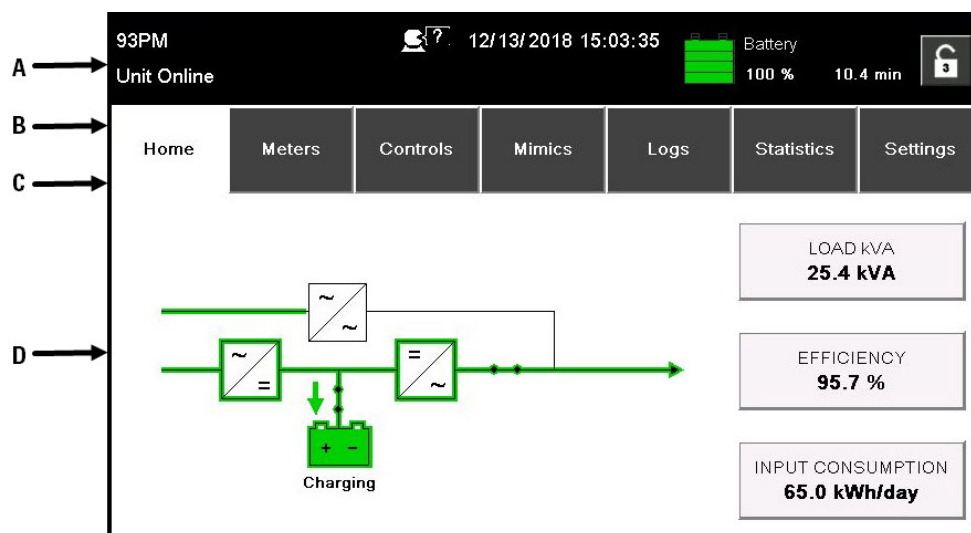
- **System Event Horns** – The system event horn beeps to alert an operator that an event needing attention is taking place. The horn cycles at a half-second rate. To silence the horn, touch any control panel button.
- **System Event Indicators** – The status indicators on the UPS control panel work with the event horn to let the operator know when the UPS is operating in any mode other than double conversion. Only the normal mode indicator is illuminated during normal UPS system operation. The other indicators 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 [7.2.1 Status Indicators](#).
- **System Event Messages** – When a system event occurs, a message appears on the LCD in the UPS status area. This message is also written to the Events Log and may be added to the History Log. The messages are divided into four categories: alarms, notices, status, and commands.

7.2.3 Using the LCD Touch Screen

The LCD touch screen on the control panel provides an operator interface with the UPS system. [Figure 46](#) identifies the display areas discussed in the following sections.

All functions and commands are accessed by touching or tapping the screen tabs or buttons. When text input is required, either a Qwerty keyboard or numeric keypad will be displayed.

Figure 46. Parts of the LCD



A Status Bar displays the UPS name, UPS state, current date and time, meter information, active alarms and notices, and a sign in/sign out button. For more information about alarms and notices, see paragraph [7.2.2 System Events](#).

B Main Menu Navigation Bar displays main menu functions and selections as tab buttons. To select a screen function touch the tab name.

C Secondary Menu Navigation Bar displays functions and selections related to the current screen as tab buttons. To select a screen function touch the tab name.

D Information Area contains status data, operational controls, acknowledgments, action confirmations, and screen prompts.

You can use the LCD touch screen to:

- Look at a log of UPS events (alarms, notices, and commands) (see paragraph [7.2.6 Display Menu Operation](#))
- Monitor UPS operation (see paragraph [7.2.6 Display Menu Operation](#))
- Set UPS parameters (see paragraph [7.2.6 Display Menu Operation](#))
- Control UPS operation (see paragraphs [7.2.6 Display Menu Operation](#) and [7.2.8 System Controls](#))

7.2.4 Using the Menu

The UPS navigation tab menu bar allows you to display data in the information area to help you monitor and control UPS operation. [Table 16](#) shows the basic menu structure.

Table 16. Display Function Menu Map

Menu Option	Description
HOME	Displays the system status both graphically (mimic) and written.
METERS	Displays performance meters for the system or critical load.
CONTROLS	Displays the Controls screen.
MIMIC	Displays the mimic screens and access to system information screens.
LOGS	Displays the list of active events and provides access to historical system events.
STATISTICS	Displays UPS statistical data (uptime, downtime, maintenance, efficiency, etc.
SETTINGS	Allows access to various screen controlled variables for the system operation. Settings include date and time for the time stamp, display language, the unit name, meter subscripts, password, and view the firmware version numbers Used only by service personnel.

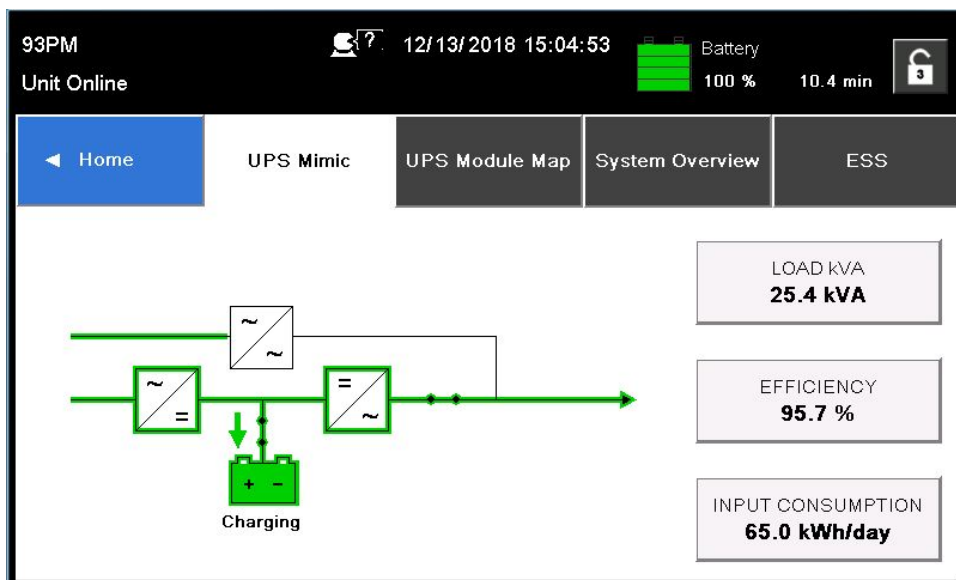
**NOTE**

Screens shown are representative examples of system operation. The screen data will vary based on system activity at the time of observation.

7.2.5 Mimic Screen

[Figure 47](#) shows the Main Menu and Mimic screen.

The Mimic screen shows the internal components of the UPS cabinet and a real-time graphical representation of the operating status of the system.

Figure 47. Main Menu and Mimic Screen

7.2.6 Display Menu Operation

[Table 17](#) describes the menu functions and how to use them.

Table 17. Display Menu Operation

Function	Subfunction	Operation
Home		An overview of UPS operation, including information on load, efficiency and consumption.
Meters – UPS		The meter screens show the UPS meter readings for the unit. The default voltage displayed on these screens is phase-to-neutral. These can be changed to display the voltage phase-to-phase (A-B, B-C, C-A). Tap the METERS tab on the main menu navigation bar to display the METER SUMMARY screen (see Figure 48). The current UPS readings are displayed in the information area of the screen. To display individual meter details, tap the desired meter button to display the detailed meter screen.
	Output – UPS	The Output screen shows output voltage (phase to neutral), output current (each phase), and frequency being supplied by the UPS, as well as the kVA, kW, and power factor measurements.
	Input – UPS	The Input screen shows input voltage (phase to neutral), input current (each phase), and frequency of the incoming utility source, as well as the kVA, kW, and power factor measurements.
	Bypass	The Bypass screen shows the bypass input voltage (phase to neutral), input current (each phase), and frequency of the incoming utility source, as well as the kVA, kW, and power factor measurements.
	Battery – UPS	The Battery screen displays the battery voltage (Vdc) and the battery current (Idc).
Mimics	UPS Mimic	Tap the MIMICS tab on the main menu navigation bar to display an overview of UPS operation, including information on load, efficiency and consumption. If there is an error, an error indicator is displayed next to the affected part. Active events log can be opened by tapping the error indicator.
	UPS Module Map	Tap the UPS MODULE MAP tab on the secondary menu navigation bar to display the status of each UPM.
	System Overview	Tap the SYSTEM OVERVIEW tab on the secondary menu navigation bar to display the status and meters summary for each UPS.
	ESS	Tap the ESS tab on the secondary menu navigation bar to display the approximate consumption and energy savings of ESS mode.
Logs	Active	Tap the LOGS tab on the main menu navigation bar to display the ACTIVE EVENTS screen (see Figure 49). A listing of all system events that are currently active is displayed. The most recent event is listed first. As events clear, they are removed from the Events listing. To scroll through the events, press the up or down scroll bar.
	System Log (Historical)	Tap the SYSTEM LOG tab on the secondary menu navigation bar to display the SYSTEM LOG screen (see Figure 50). The history Log lists up to 512 events in chronological order, with the most recent event listed last (once 512 is reached, the earliest event is overwritten). The end of the log (the most recent events) is displayed first; scroll upward to view older event listings. To scroll through the events, press the up or down scroll bar.

Table 17. Display Menu Operation (Continued)

Function	Subfunction	Operation
Settings		Configurable system settings. Tap the SETTINGS tab on the main menu navigation bar to display the settings screen. Settings may be password restricted. Settings Level 2 default password is 0101.
	User	Tap the USER tab on the secondary menu navigation bar to display the USER screen (see Figure 51). Tap the INFORMATION or ABOUT button to display system information (see Figure 52 and Figure 53).
	Configuration	Tap the CONFIGURATION tab on the secondary menu navigation bar to display the screen. Tap the function to be changed. Make and save the changes. Follow screen prompts to accept or abort changes. For additional functions, tap the 2 button. See Figure 54 and Figure 55 for configuration screens.
Statistics	Statistics Summary	Tap the STATISTICS tab on the main menu navigation bar to display a summary of UPS statistics (see Figure 56).
	Statistics Details	Tap the desired statistic button to display the detailed statistic screen.
Controls		See paragraph 7.2.8 System Controls for details.

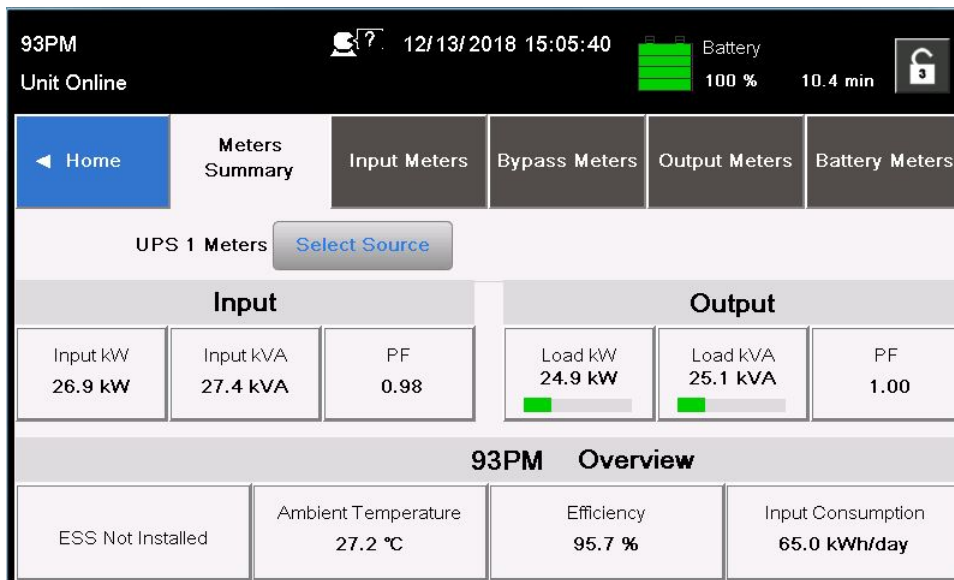
Figure 48. Typical Meters Summary Screen

Figure 49. Typical Active Events Screen

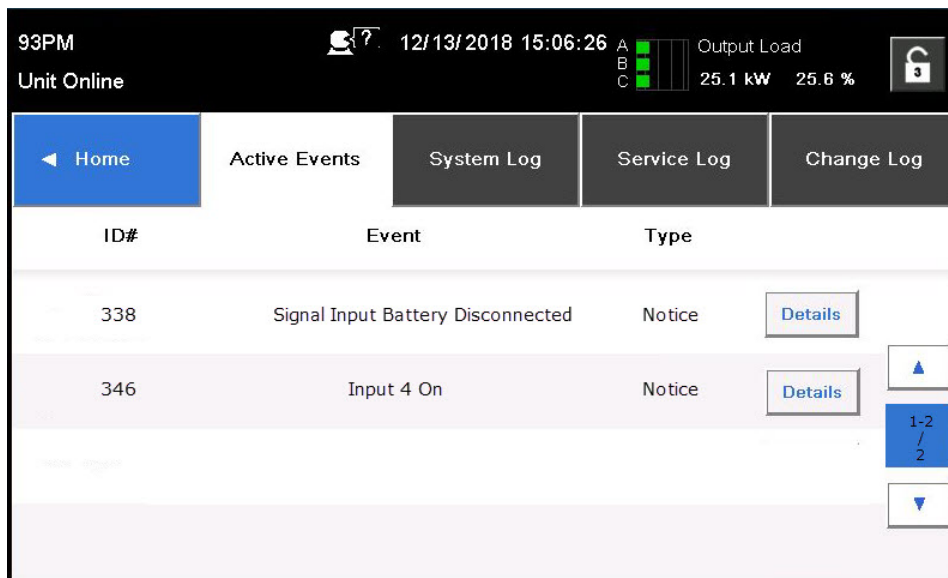


Figure 50. Typical System Log Screen

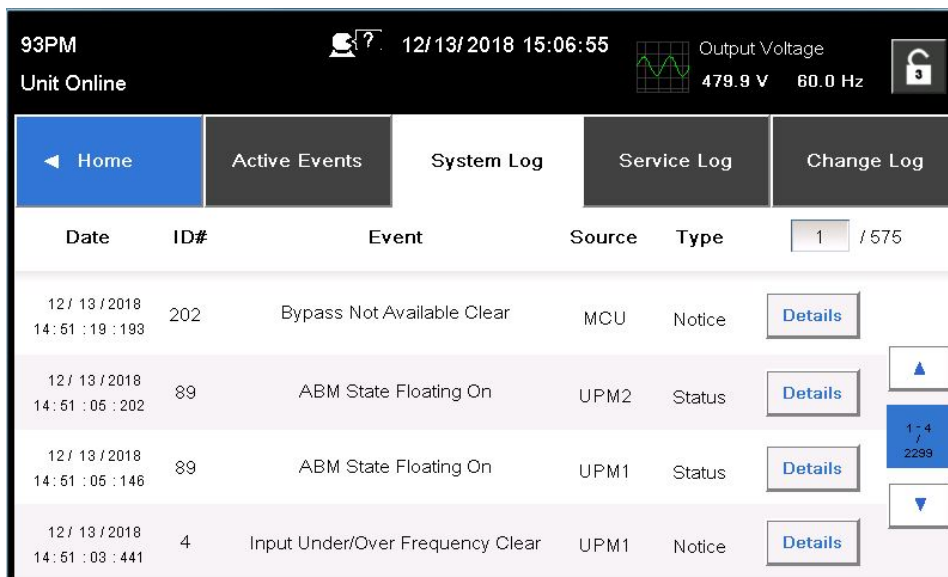


Figure 51. Typical Settings User Screen

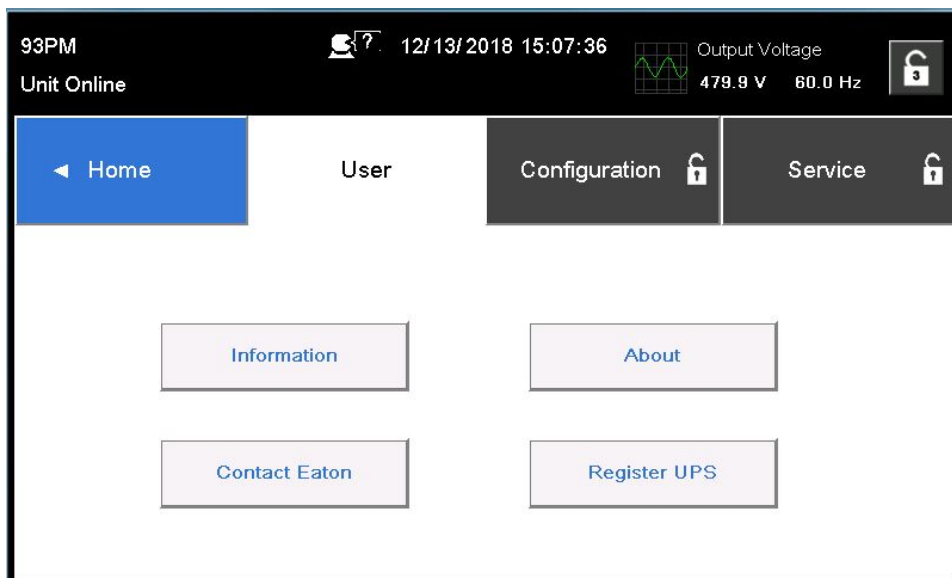


Figure 52. Typical Information Screen

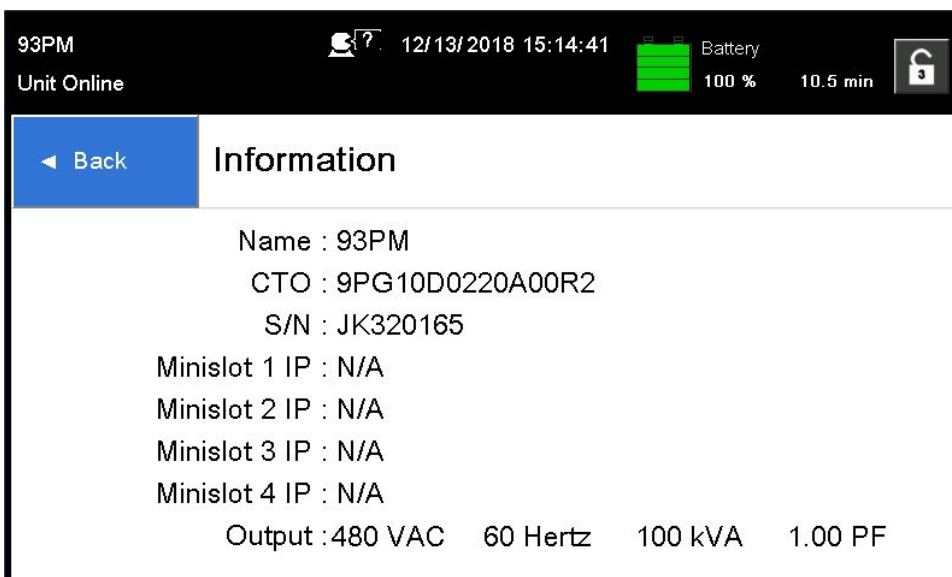


Figure 53. Typical About Screen

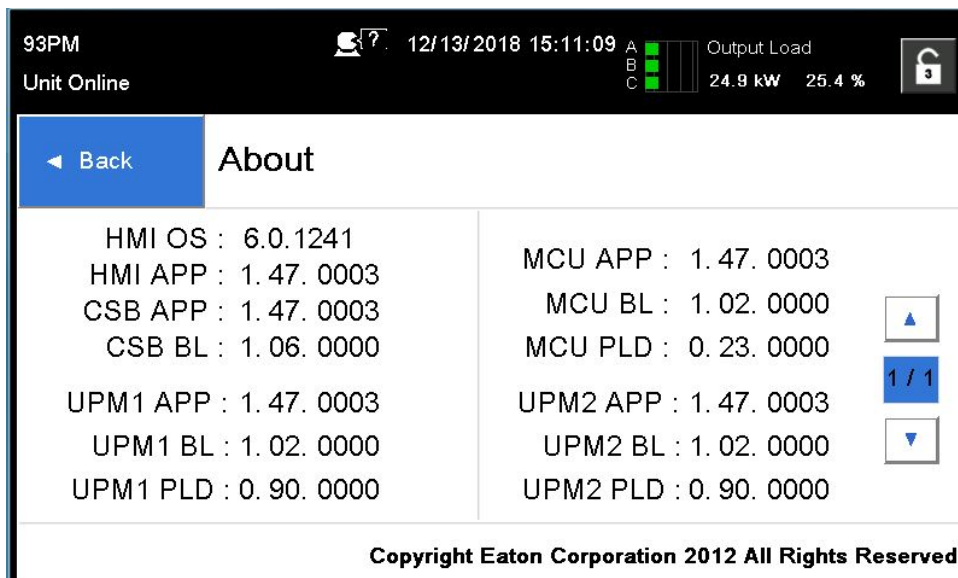


Figure 54. Typical Settings Configuration 1 Screen

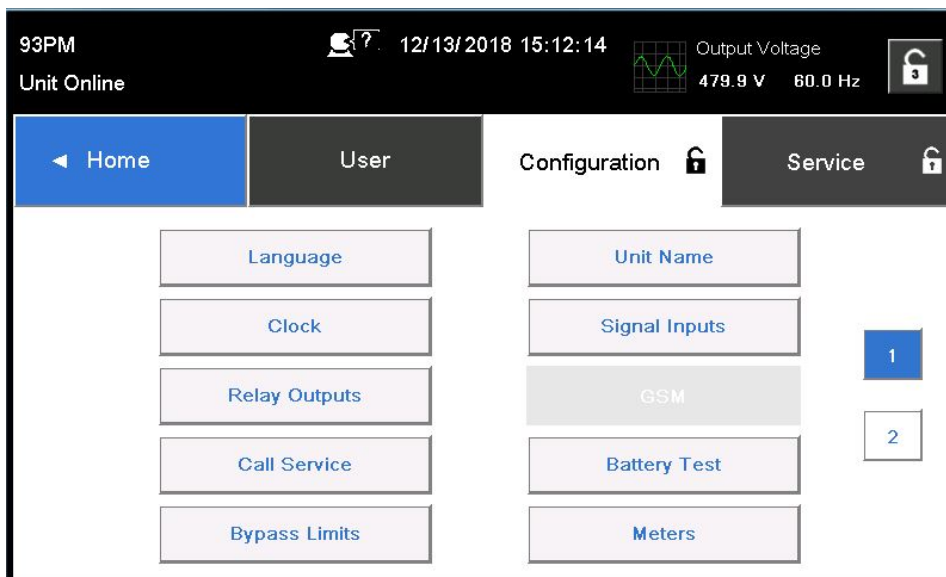
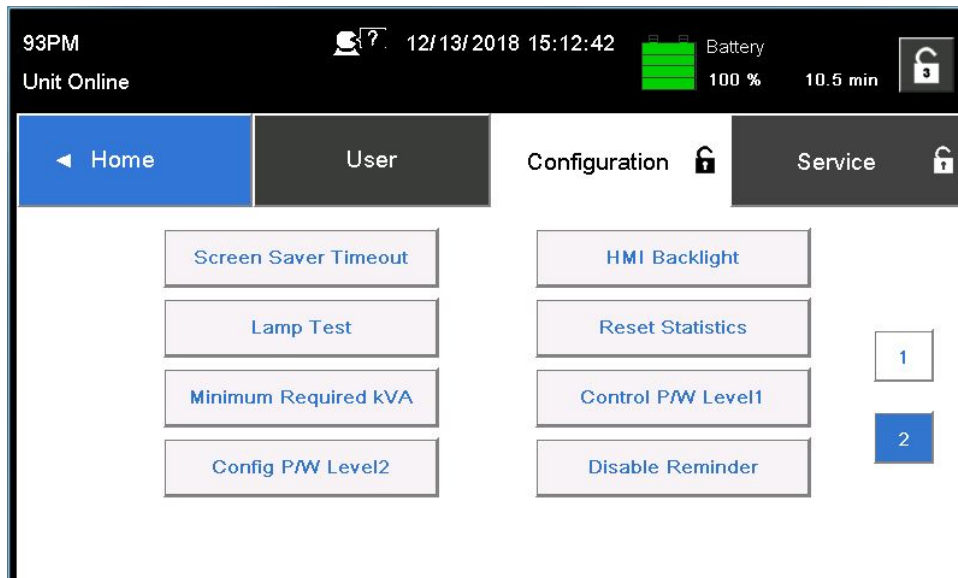
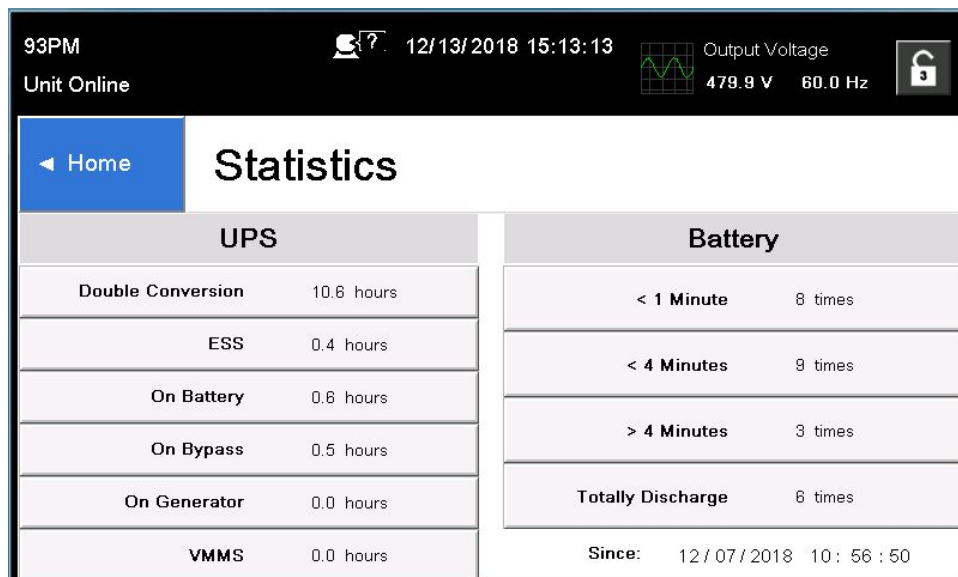


Figure 55. Typical Settings Configuration 2 Screen**Figure 56. Typical Statistics Screen**

7.2.7 Sign In

The Controls and Setting screens are restricted. The user must sign in using a password to gain access.

CAUTION

To prevent inadvertent or unauthorized power disruption to the emergency lighting system, change the Level 1 and Level 2 default passwords when system commissioning startup is performed.

**ATTENTION!**

Pour éviter toute coupure de courant accidentelle ou non autorisée de la charge critique ou du système d'éclairage auxiliaire, modifiez les mots de passe par défaut de niveau 1 et de niveau 2 lors du démarrage de la mise en service du système.

To Sign in:

1. Tap the lock button in the upper right corner of the screen. The sign in screen is displayed (see [Figure 57](#)).
2. Tap the password entry area on the screen.
3. Enter the password using the keypad displayed and tap the return key (see [Figure 58](#)).
Level 1 default password is **1111**. Settings Level 2 default password is **0101**.
4. Sign in is complete. Tap continue to return to previous screen.

Figure 57. Sign In Password Screen

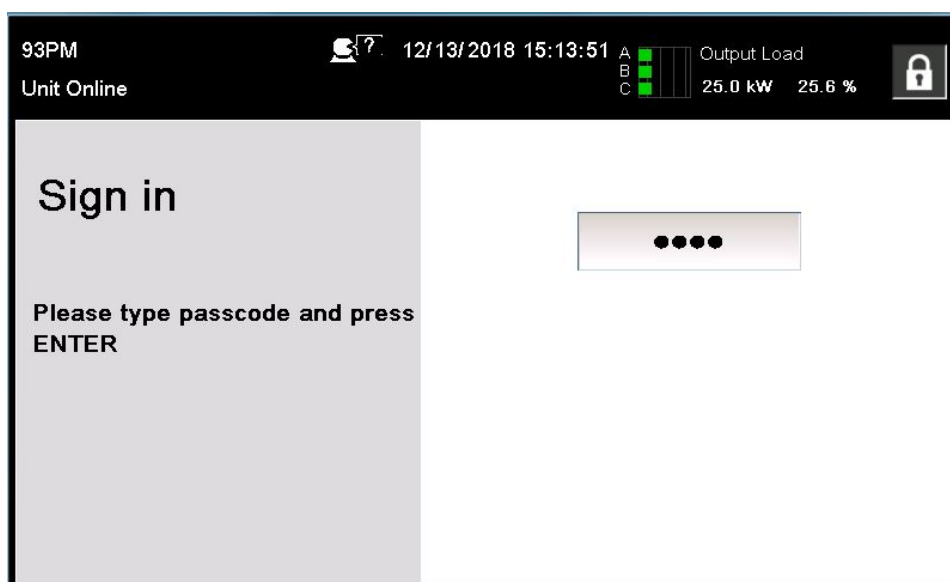
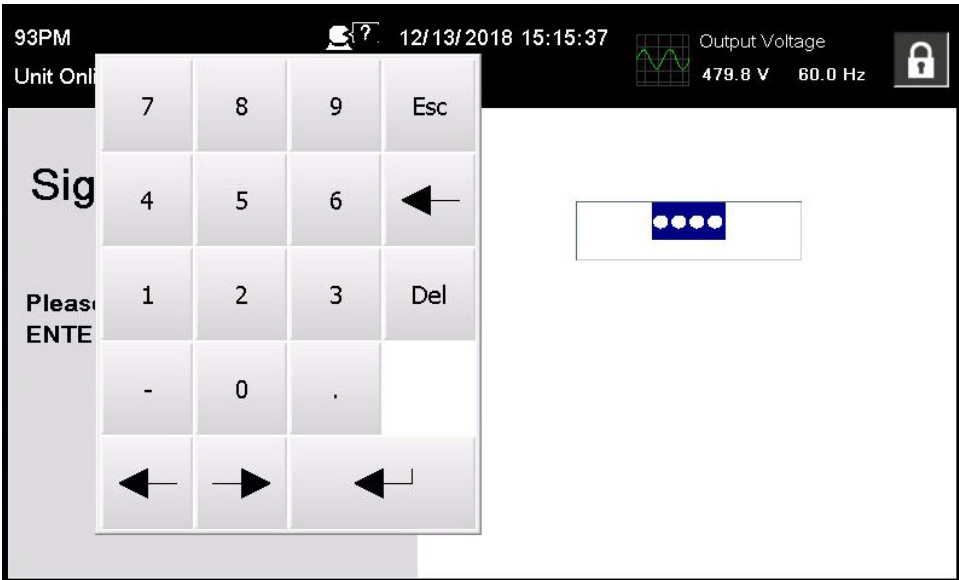


Figure 58. Sign In Keypad



7.2.8 System Controls

Tap the **CONTROLS** tab on the main menu navigation bar to display the Controls screen. Double conversion operation, transfer to bypass, shutdown, and charger control commands are controlled through this screen. In addition, the screen displays the current status of the UPS.

[Table 18](#) describes the control functions and provides instructions to access and use the command menu screens.

[Table 19](#) lists the typical System Status Screen Messages that are displayed during UPS operation.

For UPS operating instructions using the System Controls, see paragraph [7.3 Single UPS Operation](#).

[Figure 59](#) through [Figure 63](#) show the major control screens.

Table 18. Controls Menu Operation

Function	Subfunction	Operation
System Controls		The CONTROLS tab on the main menu navigation bar displays the System Controls screen.
	System Status	GO ONLINE starts the UPS in Double Conversion mode or transfers the UPS to Double Conversion mode from Bypass mode.
	Bypass	GO TO BYPASS starts the UPS in Bypass mode or transfers the UPS to Bypass mode from Double Conversion mode.
	Charger	TURN ON CHARGER/TURN OFF CHARGER sets the battery charger on or off.
	Battery Test	RUN BATTERY TEST starts the battery test.

Table 19. Typical System Status Messages

Function	Message
UPS	Double Conversion; Bypass; ESS
Bypass	Off; On; Available
Charger	Charger Resting; Charger

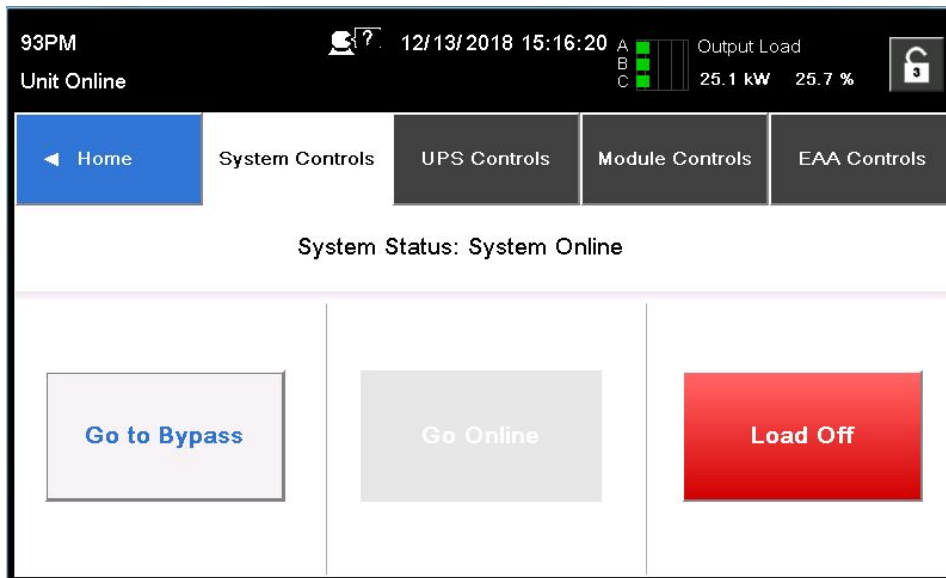
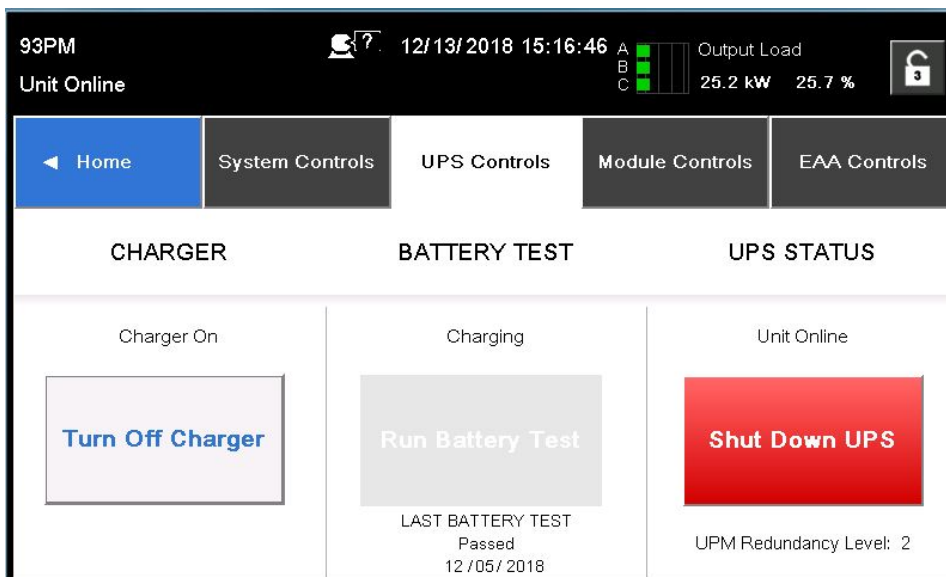
Figure 59. Typical System Control Screen**Figure 60. Typical UPS Control Screen**

Figure 61. Typical UPM Select Screen

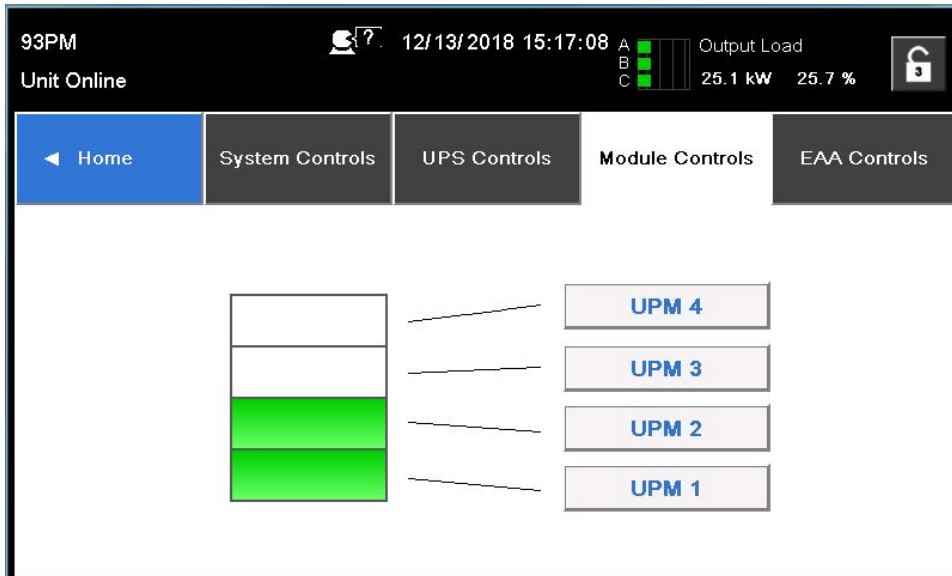


Figure 62. Typical UPM Control Screen

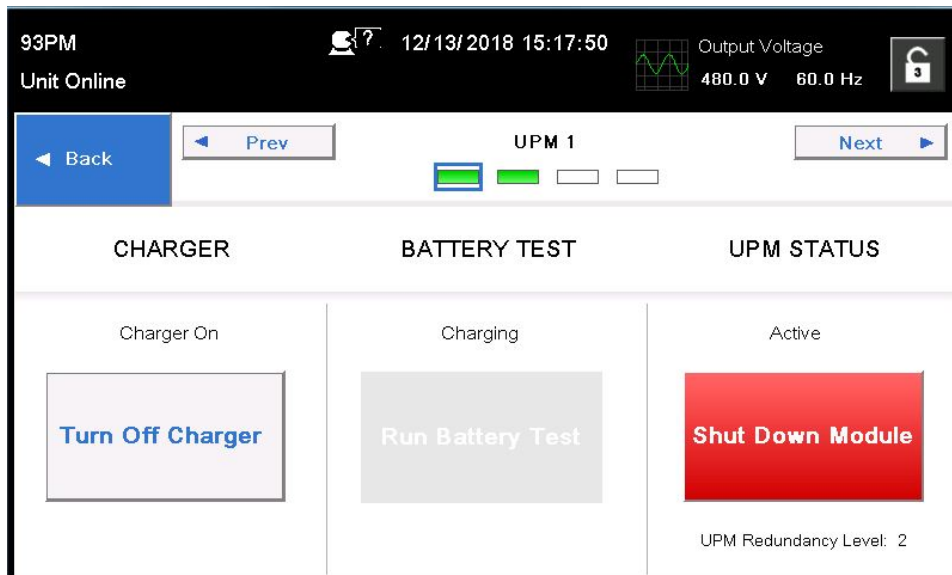
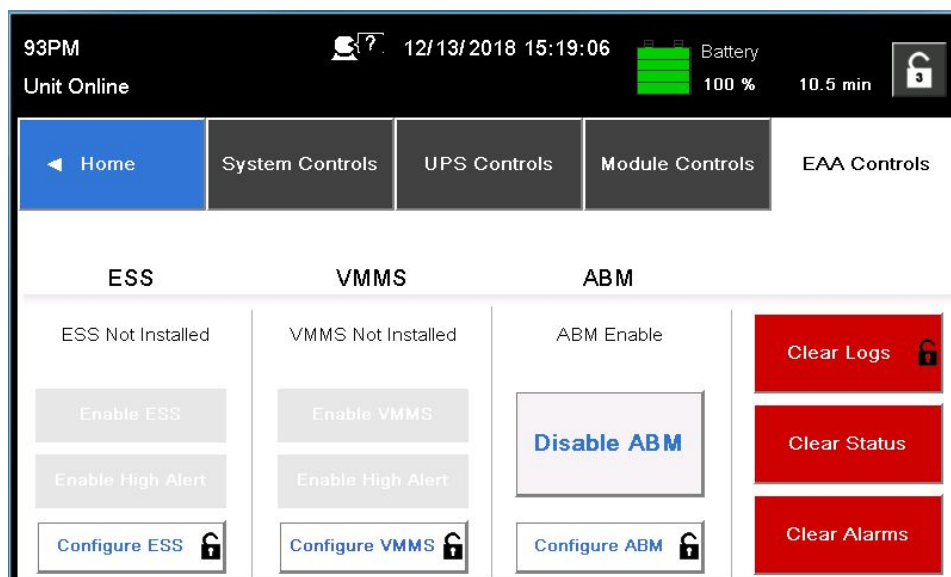


Figure 63. Typical EAA Control Screen



7.3 Single UPS Operation

NOTE



For the location of the Integrated Battery Cabinet's (IBC) battery breaker, refer to the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Universal Integrated Battery Cabinet Installation Manual-Large and Large High Rate*, the *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small*, or *Eaton 93PM Integrated Battery Cabinet Installation Manual-Small Welded* listed in paragraph [1.8 For More Information](#).

NOTE



If a Sidecar Integrated Accessory Cabinet-Bypass (SIAC-B) is installed, refer to the *Eaton 93PM Sidecar Integrated Accessory Cabinet-Bypass Installation and Operation (50 kW and 100 kW SIAC-B) Manual*, listed in paragraph [1.8 For More Information](#), for operating instructions.

NOTE



This unit is a four-wire device that complies with the UL 924 standard. The loss of a single input phase or the loss of neutral with unbalanced four-wire loads will be considered a complete loss of input power and discharge the battery to provide power to the load.

7.3.1 Starting the UPS in Double Conversion Mode

To start the UPS system:

1. Open the UPS front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
2. Verify that the UPS input breaker is open.
3. Close the UPS input feeder circuit breaker.
4. If dual feed, close the UPS bypass feeder circuit breaker.
5. Close the UPS input breaker.
6. Close the door and secure the latch.

7. If IBCs are installed, close the IBC battery breakers.
8. Observe the UPS control panel display becoming active, indicating logic power.
9. Verify no alarms are active.
10. Tap the **CONTROLS** tab on the main menu navigation bar. The System Control screen is displayed.
11. Tap the **GO ONLINE** button.
12. If requested, enter the Level 1 password. Default password is 1111.

The rectifier and inverter turn on. The inverter continues to ramp up to full voltage.

Once the inverter reaches full voltage, the UPS inverter switchgear closes and the static switch turns off. Power is now supplied to the critical load in dual conversion mode. It takes approximately one minute for the UPS to achieve the dual conversion mode.

The Normal status indicator is illuminated.

7.3.2 Starting the UPS in Bypass Mode

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



In Bypass mode, the critical load is not protected from commercial power interruptions and abnormalities.



En mode Bypass, la charge critique n'est pas protégée contre les interruptions et anomalies de l'alimentation commerciale.

1. Open the UPS front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
2. Verify that the UPS input breaker is open.
3. Close the UPS input feeder circuit breaker.
4. If dual feed, close the UPS bypass feeder circuit breaker.
5. Close the UPS input breaker.
6. Close the door and secure the latch.
7. If IBCs are installed, close the IBC battery breakers.
8. Observe the UPS control panel display becoming active, indicating logic power.
9. Verify no alarms are active.
10. Tap the **CONTROLS** tab on the main menu navigation bar. The System Control screen is displayed.
11. Tap the **GO TO BYPASS** button.

The critical load is immediately supplied by the bypass source, in Bypass mode.

The **BYPASS** status indicator is illuminated.

7.3.3 Starting the UPS via DC Start Button



IMPORTANT

Secure the UPS output. Performing DC start will energize UPS Output and customer loads (verify that no work is being done downstream).

If installed, verify that the Maintenance Bypass Breaker (MBP) is Open.



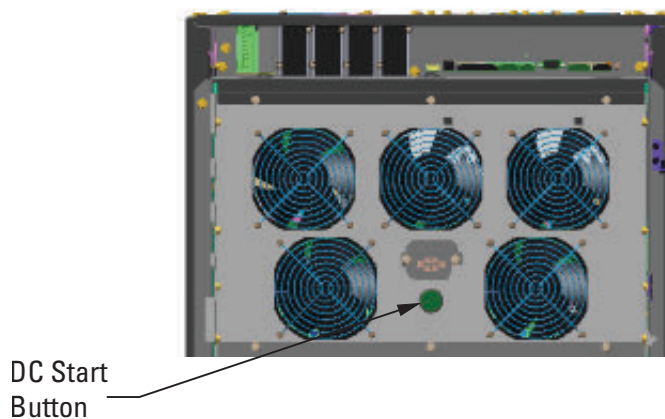
IMPORTANT

Sécurisez la sortie de l'onduleur. L'exécution d'un démarrage CC alimentera la sortie de l'onduleur et les charges client (vérifiez qu'aucun travail n'est effectué en aval).

S'il est installé, vérifiez que le disjoncteur de dérivation de maintenance (MBP) est ouvert.

1. Open the UPS front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
2. Verify that the UPS input breaker is open.
3. Close the UPS input feeder circuit breaker.
4. If dual feed, close the UPS bypass feeder circuit breaker.
5. Close the UPS input breaker.
6. If the UPS contains a Rectifier Input Breaker (RIB), close the Rectifier Input Breaker.
7. If the UPS contains a battery breaker, close the UPS battery breaker.
8. If Integrated Battery Cabinets (IBCs) are installed, close the IBC battery breakers.
9. Press the DC Start button on the front of each UPM to power on the UPM power supply. (See [Figure 64](#) for DC Start Button location).

Figure 64. DC Start Button Location



10. Close the door and secure the latch.
11. Observe the UPS control panel display becoming active, indicating logic power.
12. Verify no alarms are active.

13. Tap the **CONTROLS** tab on the main menu navigation bar. The System Control screen is displayed.
14. Tap the **GO ONLINE** button.

If requested, enter the Level 1 password. Default password is **1111**.

The unit will start on battery power. Restoration of utility power during this time will transfer the system to normal operation.

7.3.4 Starting the UPM

To start the power module without transferring the critical load to Double Conversion mode:

1. Open the UPS front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
2. Verify that the UPS input breaker is open.
3. Close the UPS input feeder circuit breaker.
4. If dual feed, close the UPS bypass feeder circuit breaker.
5. Close the UPS input breaker.
6. Close the door and secure the latch.
7. Observe the UPS control panel becoming active, indicating logic power.
8. Verify no alarms are active.
9. Tap the **CONTROLS** tab on the main menu navigation bar. The System Control screen is displayed.
10. Tap the **MODULES CONTROLS** tab on the secondary Control menu navigation bar. The UPM Select screen is displayed.
11. On the UPM Select screen, select UPM 1. The UPM Control Screen is displayed.
12. Tap the **START MODULE** button.

The UPM 1 rectifier and inverter turn on. When the inverter reaches full voltage, the UPS is ready to transfer to the Double Conversion mode and supply the critical load.

7.3.5 Transfer from Double Conversion to Bypass Mode

To transfer the critical load to Bypass mode:

CAUTION

In Bypass mode, the critical load is not protected from commercial power interruptions and abnormalities.

ATTENTION!

En mode Bypass, la charge critique n'est pas protégée contre les interruptions et anomalies de l'alimentation commerciale.

1. Tap the **CONTROLS** tab on the main menu navigation bar. The System Control screen is displayed.
2. Tap the **GO TO BYPASS** button.

The UPS transfers to Bypass mode, and the critical load is immediately supplied by the bypass source. If the bypass source is not available, the power module remains on and an alarm sounds.

The **BYPASS** status indicator is illuminated. The power module remains on.

⚠ WARNING

Power is present inside the UPS cabinet.

**AVERTISSEMENT!**

L'alimentation est présente à l'intérieur de l'armoire de l'onduleur.

7.3.6 Transfer from Bypass to Double Conversion Mode

To transfer the critical load to Normal mode:

1. Tap the **CONTROLS** tab on the main menu navigation bar. The System Control screen is displayed.
2. Tap the **GO ONLINE** button.

The UPS transfers to Double Conversion mode. If the power module is not available, the system remains on bypass and an alarm sounds.

The **NORMAL** status indicator is illuminated.

7.3.7 Transfer from ESS Mode to Double Conversion Mode

To transfer the load to Standard Normal mode:

1. Tap the **CONTROLS** tab on the main menu navigation bar. The Control screen is displayed.
2. Tap the **EAA CONTROLS** tab on the secondary Control menu navigation bar. The **EAA CONTROLS** screen is displayed.
3. Tap the **DISABLE ESS** button.

The UPS transfers to Double Conversion mode.

The **NORMAL** status indicator is illuminated.

7.3.8 Transfer from Double Conversion Mode to ESS Mode

To transfer the load to HE Normal mode:

1. Tap the **CONTROLS** tab on the main menu navigation bar. The Control screen is displayed.
2. Tap the **EAA CONTROLS** tab on the secondary Control menu navigation bar. The **EAA CONTROLS** screen is displayed.
3. Tap the **ENABLE ESS** button.

The UPS transfers to ESS mode if no abnormal power conditions are detected. If abnormal power conditions are detected, the UPS will wait and transfer to ESS mode when conditions are cleared.

The **NORMAL** status indicator is illuminated.

7.3.9 Transfer from Double Conversion to Bypass Mode and Shut Down the UPM

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

1. Transfer the critical load to bypass by performing the procedure in paragraph [7.3.5 Transfer from Double Conversion to Bypass Mode](#).
2. Tap the **CONTROLS** tab on the main menu navigation bar. The System Control screen is displayed.
3. Tap the **MODULES CONTROLS** tab on the secondary Control menu navigation bar. The UPM Select screen is displayed.
4. On the UPM Select screen, select UPM 1. The UPM Control Screen is displayed.

5. Tap the **SHUT DOWN MODULE** button.

The UPM status indicates SHUTDOWN. The power module is turned off.

Logic power remains on.

7.3.10 UPS and Critical Load Shutdown

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

1. Turn off all equipment that is being powered by the UPS.
2. Perform the Load Off procedure in paragraph [7.3.13 Using the UPS LOAD OFF Command](#).

The inverter and bypass switchgear open, and the power module is turned off.

3. Perform the battery charger off procedure in paragraph [7.3.11 Charger Control](#).

The rectifier and battery switchgear open.

WARNING

Power is present inside the UPS cabinet until the upstream input feeder circuit breakers and battery breakers are opened. Wait at least 5 minutes before accessing internal components.



AVERTISSEMENT!

L'alimentation est présente à l'intérieur de l'armoire de l'onduleur jusqu'à ce que les disjoncteurs d'alimentation d'entrée en amont et les disjoncteurs de batterie soient ouverts. Attendez au moins 5 minutes avant d'accéder aux composants internes.

4. Open the UPS front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
5. Open the UPS input breaker.
6. Close the door and secure the latch.
7. Open the UPS input feeder circuit breaker.
8. If dual feed, open the UPS bypass feeder circuit breaker.
9. If IBCs are installed, open all battery breakers.

7.3.11 Charger Control

To turn the battery charger on:

1. Tap the **CONTROLS** tab on the main menu navigation bar. The Control screen is displayed.
2. Tap the **UPS CONTROLS** tab on the secondary navigation bar. The UPS Control screen is displayed.
3. Tap the **TURN ON CHARGER** button.

To turn the battery charger off:

4. Tap the **CONTROLS** tab on the main menu navigation bar. The Control screen is displayed.
5. Tap the **UPS CONTROLS** tab on the secondary navigation bar. The UPS Control screen is displayed.
6. Tap the **TURN OFF CHARGER** button.

7.3.12 Battery Test


NOTE

The UPS has a user initiated battery test intended to determine if the batteries are able to support the load.


NOTE

The battery test is only able to be initiated when the battery is fully charged. This normally occurs within 72 hours of the start of a charging cycle. The command will not be shown if the test is not able to be run.

To start the battery test:

1. Tap the **CONTROLS** tab on the main menu navigation bar. The System Control screen is displayed.
2. Tap the **UPS CONTROLS** tab on the secondary navigation bar. The UPS Control screen is displayed.
3. Tap the **RUN BATTERY TEST** button.

7.3.13 Using the UPS LOAD OFF Command

An UPS shutdown is initiated by the **LOAD OFF** command on the UPS Control screen. The **UPS LOAD OFF** controls the UPS output by powering down the UPS and de-energizing the critical load.

The UPS (including Bypass) remains off until restarted.

To use the **LOAD OFF** command:

1. Tap the **CONTROLS** tab on the main menu navigation bar. The System Control screen is displayed.

CAUTION

All power to the critical load is lost when LOAD OFF is selected in the following step. You should use this feature only when you want to de-energize the critical load.



IMPORTANT

Toute l'alimentation de la charge critique est perdue lorsque LOAD OFF est sélectionné à l'étape suivante. Vous ne devez utiliser cette fonctionnalité que lorsque vous souhaitez mettre hors tension la charge critique.

2. Tap the **LOAD OFF** button.

An action confirmation screen is displayed. Follow the on screen prompts to shut down the UPS or to cancel the shutdown. Selecting **YES** will immediately shut down the UPS and de-energize the critical load. Selecting **NO** will abort the shutdown.

CAUTION

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



ATTENTION!

N'essayez pas de redémarrer le système après l'arrêt du chargement tant que la cause de l'arrêt n'a pas été identifiée et éliminée.

3. To restart the UPS after using the **LOAD OFF** follow the procedure in paragraph [7.3.1 Starting the UPS in Double Conversion Mode](#) or [7.3.2 Starting the UPS in Bypass Mode](#).

⚠ WARNING

Power is present inside the UPS cabinet until the upstream input feeder circuit breakers and battery breakers are opened. Wait at least 5 minutes before accessing internal components.



AVERTISSEMENT!

L'alimentation est présente à l'intérieur de l'armoire de l'onduleur jusqu'à ce que les disjoncteurs d'alimentation d'entrée en amont et les disjoncteurs de batterie soient ouverts. Attendez au moins 5 minutes avant d'accéder aux composants internes.

7.3.14 Using the Remote Emergency Power-off Switch

⚠ WARNING

- Emergency Power Off (EPO) and Remote Emergency Power Off (REPO) functionality has been disabled for UL 924 emergency lighting systems. To remove power from the system a LOAD OFF command (see paragraph [7.3.13 Using the UPS LOAD OFF Command](#)) must be given using the front panel controls and all breakers opened.
 - Power is present inside the UPS cabinet until the upstream input feeder circuit breakers and battery breakers are opened. Wait at least 5 minutes before accessing internal components.
-



AVERTISSEMENT!

- Les fonctionnalités de mise hors tension d'urgence (EPO) et de mise hors tension d'urgence à distance (REPO) sont désactivées pour les systèmes UPS configurés pour l'éclairage auxiliaire UL 924. Pour couper l'alimentation du système, une commande LOAD OFF (voir paragraphe [7.3.13 Using the UPS LOAD OFF Command](#)) doit être donnée à l'aide des commandes du panneau avant et de tous les disjoncteurs. ouvert.
 - L'alimentation est présente à l'intérieur de l'armoire de l'onduleur jusqu'à ce que les disjoncteurs d'alimentation d'entrée en amont et les disjoncteurs de batterie soient ouverts. Attendez au moins 5 minutes avant d'accéder aux composants internes.
-

Chapter 8 Communication

This chapter describes the communication features of the Eaton 93PM UPS.

8.1 Minislot Cards

The Eaton 93PM UPS has four standard, factory-installed Minislot communication bays. The UPS is compatible with the following Minislot cards (see [Figure 65](#)):

- Eaton Industrial Gateway Card (INDGW-M2) – combines the features of an SNMP agent, HTTP/web server and a Modbus card to facilitate remote monitoring of your UPS system through any Building Management System. Enjoy the freedom to customize and schedule actions, like shutdown protocols and load shedding, and receive immediate notifications during power events, without having to be onsite.
- Industrial Relay Card-Minislot (IRC-MS) – can be used to indicate the operating status of the UPS system using the customer's monitoring equipment. The Industrial Relay Card uses five isolated normally-open or normally-closed dry relay contacts to indicate the UPS status. Normal, Bypass, Battery, and Alarm modes can be monitored. See [Table 20](#) for default triggers. The contact ratings and wire range are listed in the IRC-MS installation guide. One input can be activated by a switch or dry contact. The voltage source is provided by the card, no external voltage source is needed.

For installation and setup of a Minislot card, contact an Eaton service representative. Refer to the manual supplied with the Minislot card for user instructions.

Figure 65. Optional Minislot Cards

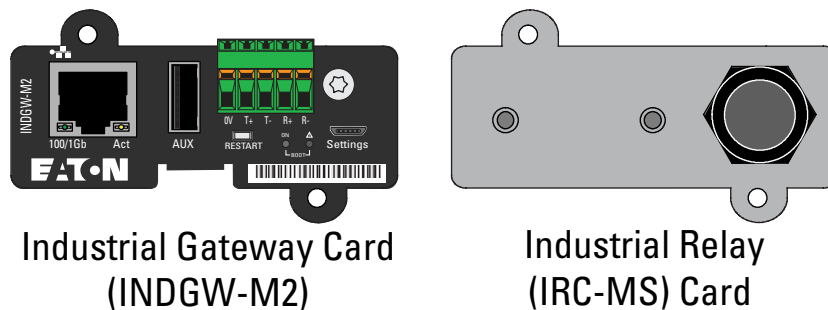


Table 20. IRC-MS Default Triggers

Relay	Trigger
K1	UPS supporting the load
K2	UPS on Battery
K3	Summary alarm
K4	UPS on bypass
K5	UPS battery low

8.2 Building Alarm Monitoring

This standard feature lets you connect the UPS to your building alarms, such as smoke detectors or overtemperature alarms. The building alarm customer interface terminals for external are located inside the UPS. Use twisted-pair wires for each alarm input and common.

The building alarms can be programmed to display the alarm functional name.

8.3 General Purpose Relay Contact

One general purpose relay contact is provided as a standard feature on the UPS. The relay contact customer interface terminals are located inside the UPS. Use twisted-pair wires for the normally-closed or normally-open and common connections.

Normally-closed or normally-open contacts can be used. If the state of the contact changes from the state specified as normal, a signal is issued. This contact can be connected to equipment at the facility (such as a light or an alarm bell) to notify the operator 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 28 Vdc @ 5A.



NOTE

If contact ratings are required that can be operated above the rated voltage and current available with the UPS general purpose relay contacts, an IRC-MS card should be used.

8.4 PredictPulse Remote Monitoring and Management Service

The Eaton 93PM UPS supports Eaton's PredictPulse remote monitoring and management service. PredictPulse is a subscription monitoring and management service that collects and analyzes data from connected power infrastructure devices, providing us with the insight needed to make recommendations and take action on your behalf. It's also powered by CA Technologies, bringing together the best in hardware and software. PredictPulse Service is included at no charge during the first year of Eaton 93PM UPS operation (warranty period) along with the required connectivity parts. Beyond that, it may be purchased with Eaton Support Agreements or as a standalone subscription after the initial warranty expires. PredictPulse may also be subscribed to for free as part of a 90-day trial period. PredictPulse availability and first year bundled offers may vary by market. For more information, visit www.eaton.com/predictpulse.

8.4.1 PredictPulse Service Features

PredictPulse provides proactive monitoring, an online dashboard, mobile app with alarm status information and a monthly report detailing the ongoing health of your Eaton 93PM UPS. Features include:

- Proactive monitoring that automatically analyzes the status of the Eaton 93PM UPS 96 times every day (every 15 minutes). All health data gathered from the unit, current and historical, is analyzed at the Customer Reliability Center (CRC). Algorithms and sophisticated analytics software is constantly scanning your UPS's data for potential failures. Anomalies are escalated to a Software and Monitoring analyst or Technical Support specialist. Critical events are remotely diagnosed to expedite repairs, including smart dispatch of field technicians with probable cause and likely parts (avoiding return visits due to lack of required parts). Through this service, the CRC can take pre-emptive, corrective action to ensure the highest level of availability of your Eaton 93PM UPS.
- Easy self-installation in minutes from a wizard installer or directly from the INDGW-M2 card. PredictPulse uses standard Eaton connectivity hardware, requiring no special software (devices only need to be connected to a network).
- Ability to give an unlimited number of coworkers access to the real-time data and reports found in PredictPulse's online dashboard and mobile app. This allows you to collaborate and Eaton to notify the most appropriate person responsible for a specific site or device.

- Real-time access to key performance information, alarms and trended health data about your Eaton 93PM UPS via the PredictPulse online dashboard. Depending on the model, the dashboard aggregates all subscribed devices and provides detailed information about voltages, loads, energy savings, service levels, external factors such as temperature and humidity, attached batteries, and system availability. All of these factors contribute to the Relative Performance Index (RPI) score that allows you to compare your unit's health relative to Eaton's optimum UPS operating levels.
- Real-time alarm events for all subscribed devices via the PredictPulse mobile app (Apple and Android). You can track all alarms by device. As critical alarms occur, Eaton will acknowledge them so you know when Eaton has diagnosed the alarm (and pending notification of resolution).
- A monthly summary report that delivers key performance information, alarms and trended health data about your Eaton 93PM UPS, based on the prior month's data.
- A foundation based on CA Technologies' leading Data Center Infrastructure Management (DCIM) software application. This enables powerful reporting, analytics, security, and compatibility with hundreds of power infrastructure devices.

8.4.2 Installing PredictPulse

A quick start guide and self-installation wizard tool are available at www.eaton.com/predictpulse. The latest updates, installation tips and information on connecting PredictPulse are also available at that link. For installation support or questions about PredictPulse, contact predictpulsesupport@eaton.com.

PredictPulse relies on a INDGW-M2 card installed with the UPS to send one-way outbound SMTP e-mails to Eaton, as well as an Environmental Monitoring Probe (EMP) for battery temperature/humidity monitoring. PredictPulse is secure as Eaton never communicates through your firewall—it only listens for health data and alarm data—and uses industry-standard security protocols. By using a common e-mail transport mechanism, you do not have to open your network to proprietary or potentially unsecure protocols and transports. The INDGW-M2 Connectivity Card gathers information directly from the UPS and any external sensors that are attached, and transmits that data every 15 minutes (or 96 times per day), enabling real-time monitoring and advanced virtual preventive maintenance.

Chapter 9 UPS Maintenance

The components inside the UPS cabinet are secured to a sturdy metal frame. All repairable parts and assemblies are located for easy removal, with very little disassembly. This design allows authorized service personnel to perform routine maintenance and servicing quickly.

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

9.1 Important Safety Instructions

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

WARNING

- Servicing and maintenance should be performed by qualified service personnel only.
- LETHAL VOLTAGE PRESENT. This unit should not be operated with the cabinet doors open or protective panels removed. Do not make any assumptions about the electrical state of any cabinet in the UPS system.



AVERTISSEMENT!

- L'installation et l'entretien ne doivent être effectués que par du personnel qualifié.
- PRÉSENCE DE TENSIONS MORTELLES. Ne pas faire fonctionner cette unité lorsque les portes de l'armoire sont ouvertes ou si les panneaux de protection ne sont pas en place. Ne jamais faire de suppositions au sujet de l'état électrique des armoires du système d'onduleur.

Each battery string is an energy source in itself. **DO NOT ATTEMPT TO ACCESS ANY INTERNAL AREA OF THE BATTERY STRING YOURSELF. VOLTAGES ARE ALWAYS PRESENT IN THE BATTERY STRING.** If you suspect that a battery string needs service, contact an Eaton service representative.

If the string requires service contact an Eaton service representative.

Observe these precautions when working on or around batteries:

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect the charging source prior to connecting or disconnecting terminals.
- Determine if the battery is inadvertently grounded. If it is, remove the source of the ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock is reduced if such grounds are removed during installation and maintenance.
- When replacing batteries, use the same number of sealed, lead-acid batteries.

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

9.2 Performing Preventive Maintenance

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

9.2.1 DAILY Maintenance

Perform the following steps daily:

1. Check the area surrounding the UPS system. Ensure the area is not cluttered, allowing free access to the unit.
2. Ensure the air intakes (vents on the front door of the UPS cabinet and the exhaust openings (on the rear of the UPS cabinet) are not blocked.
3. Ensure the operating environment is within the parameters specified in paragraph [3.2.1 Environmental and Installation Considerations](#) and [Chapter 10 Product Specifications](#).
4. Ensure the UPS is in Normal mode (Normal status indicator is illuminated). If an alarm lamp is illuminated or the Normal status indicator is not illuminated, contact an Eaton service representative.

9.2.2 MONTHLY Maintenance

Perform the following steps monthly:

1. Monitor system parameters as described in paragraph [7.2 Using the Control Panel](#).
2. Check the UPS air filter (located behind the front door) and wash or replace as necessary. See [Figure 66](#) for filter location. Contact an Eaton service representative for replacement filters.

CAUTION

Verify washed filter is thoroughly dry before reinstalling.

ATTENTION!

Vérifier que les filtres sont bien secs avant de les réinstaller.

To remove the filters:

- a. Unfasten the front door by lifting the latch from the bottom and turning to the right (counterclockwise) and swing the door open.
 - b. Remove the foam filters from the frame on the front door.
 - c. Install the spare foam filters, either washed or new foam filters, into the frame on the front door.
-

IMPORTANT

The foam filters are to be replaced with new or washed filter immediately. The UPS is not meant to be run without filters installed.



IMPORTANT

Les filtres en mousse doivent être remplacés immédiatement par des filtres neufs ou lavés. L'onduleur n'est pas destiné à fonctionner sans filtres installés.

- d. Close the front door and secure the latch.
3. Record maintenance results and any corrective actions in a suitable log.

Figure 66. Air Filter Location



9.2.3 PERIODIC Maintenance

Periodic inspections of the UPS should be made to determine if components, wiring, and connections exhibit evidence of overheating. Particular attention should be given to the compression lug connections. Maintenance procedures should specify that the compression lug connections be retorqued to values listed in this manual.

9.2.4 ANNUAL Maintenance

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

9.2.5 BATTERY Maintenance

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

9.3 Installing Batteries



NOTE

There is no manual DC disconnect device within the UPS.

Install batteries in accordance with the battery and battery system manufacturer's instructions.

9.4 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.
 - A battery can cause electrical shock, burn from high short-circuit current, or fire. Observe proper precautions.
-

⚠ WARNING

- Une batterie peut présenter un risque de choc électrique, de brûlure, ou d'incendie. Suivre les précautions qui s'imposent.
 - Pour le remplacement, utiliser le même nombre et modèle des batteries.
 - L'élimination des batteries est réglementée. Consulter les codes locaux à cet effet.
-



NO DISPOSAL

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.



ATTENTION!

Ne pas jeter l'onduleur ou ses batteries aux ordures. Ce produit contient des batteries au plomb scellées, il est important de l'éliminer convenablement. Pour plus de renseignements, communiquer avec le centre régional de récupération/réutilisation ou d'élimination des déchets dangereux.



NO DISPOSAL

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



ATTENTION!

Ne pas éliminer les déchets d'équipements électriques et électroniques (DEEE) aux ordures. Pour connaître la méthode d'élimination appropriée, communiquer avec le centre régional de récupération/réutilisation ou d'élimination des déchets dangereux.

9.5 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 Customer Reliability Center (see paragraph [1.9 Getting Help](#)).

Chapter 10 Product Specifications



IMPORTANT

Specifications are subject to change. To ensure you have the most up-to-date content and information for this product, please review the latest manual revision on our website, www.eaton.com/93PM.

10.1 Model Numbers

The UPS is housed in a free-standing cabinet with safety shields behind the door. The UPS is available in 50 or 60 Hz with various output power ratings.

Model	Power Rating	Frequency
Eaton 93PM-50-1	20 kW	50/60 Hz
Eaton 93PM-50-1	30 kW	50/60 Hz
Eaton 93PM-50-1	40 kW	50/60 Hz

10.2 Specifications

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

10.2.1 UPS Input

Operating Input Voltage	Rectifier: 480 Vac Wye, 3W + ground. Neutral not used. Bypass: 480 Vac Wye, 3W or 4W + ground.
Operating Input Frequency Range	50/60 Hz
Operating Input Current	See Table 6 . Reduced for Generator Adjustable
Input Current Harmonic Content	3% THD at full load
Power Factor	Minimum 0.99
Line Surges	6 kV OC, 3 kA SC per ANSI 62.41 and IEC 801 4
Battery Voltage	240 cell – 480 Vdc
Battery Charging Capacity	29.3 A maximum per 50 kW module at full load at nominal input voltage

10.2.2 UPS Output

Output Voltage Regulation	$\pm 1\%$ (10% to 100% load)
Output Voltage	480 Vac Wye, 3W or 4W + ground
Output Voltage Harmonic Content	1.5% maximum THD (linear load) 5% maximum THD (nonlinear load)
Output Current	See Table 6 .
Output Voltage Balance	< 2% for 100% maximum load imbalance (linear load)
Output Voltage Phase Displacement	< 2.5° for 100% maximum load imbalance (linear load)
Frequency Regulation	0.1 Hz free running
Synchronous to Bypass	± 4 Hz (default setting)
Frequency Slew Rate	1 Hz per second (default setting)
Load Compatibility	0.8 pF Leading 0.8 pF Lagging
Overload Capability	<110% for 10 minutes <125% for 60 seconds <150% for 10 seconds >150% for 300 milliseconds

10.2.3 UPS Environmental

Operating Temperature	25 +/- 5°C (68–86°F) without derating. The recommended operating temperature is 25°C (77°F).
Operating Altitude	Maximum 1500m (5000 ft) at 30°C without derating
Storage Temperature	-25 to +55°C, excluding batteries (prolonged storage above 40°C causes rapid battery self-discharge)
Relative Humidity (operating and storage)	5 to 95%, noncondensing
Acoustical Noise	50 kW at 100% load – 65 dBA at a 1m distance, per ISO 7779
Agency Markings	UL 924 Emergency Lighting and Power Equipment Safety: UL1778 5th Ed./CSA22.2 No. 107.3-14 3rd Ed.
EMI Emissions and Immunity	Meets IEC 62040-2 C3 and FCC Part 15 Subpart B Class A, ICES-003, CISPR 22.
Electrostatic Discharge (ESD) Immunity	Meets IEC 61000-4-2 Level 3 specifications. Withstands up to 4 kV contact pulse without damage and with no disturbance or adverse effect to the critical load.

Chapter 11 Warranty

To view the UPS warranty please click on the link or copy the address to download from the Eaton website:
[UPS Product Warranty](https://www.eaton.com/content/dam/eaton/products/backup-power-ups-surge-it-power-distribution/backup-power-ups/portfolio/eaton-three-phase-ups-warranty.pdf)

<https://www.eaton.com/content/dam/eaton/products/backup-power-ups-surge-it-power-distribution/backup-power-ups/portfolio/eaton-three-phase-ups-warranty.pdf>

EQUIPMENT REGISTRATION

Please visit www.eaton.com/pg/register to register your new Eaton UPS / Eaton UPS Accessory.

Model Number:

Serial Number:



P-164000569 09