

Eaton® Energy Aware Controller

Installation Manual



Powering Business Worldwide

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

This manual contains important instructions that you should follow during installation and maintenance of the controller. 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 de la manette. Veuillez consulter entièrement ces instructions avant de faire fonctionner l'équipement et conserver ce manuel afin de pouvoir vous y reporter ultérieurement.

Class A EMC Statements**FCC Part 15****NOTE**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

**WARNING**

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

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Chapter 1 Introduction

The Eaton® Energy Aware Controller works with an Eaton UPS to provide both traditional mission critical backup power and energy services to participate in energy storage and demand response markets. Market participation takes the form of ancillary services which can include frequency regulation, peak shaving and other services.

Control of the energy storage and service functions can be programmed into the controller or be provided as inputs from an external system.

1.1 Energy Aware Overview

The Controller has the following standard features that provide cost-effective and consistently reliable power and energy services.

- SMP4 site controller with energy management software and configurations
- Ethernet switch for communication interface to other Energy Aware subsystems
- ModBUS to CAN communication for direct interface to UPS
- Power supplies to power all of the above.

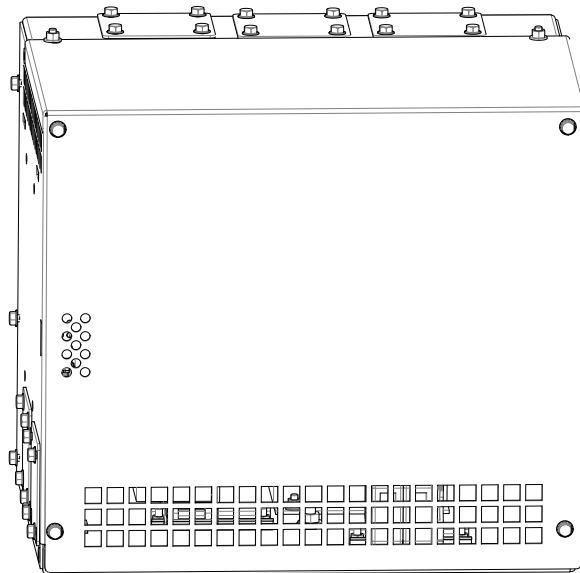


Figure 1. Eaton Energy Aware Controller

1.2 Installation Features

The controller has provisions to be mounted horizontally or vertically. It can also be horizontally mounted directly to the top of 9395P-300 and -600 model UPSs.

Power and control wiring can be routed through access holes provided on the top and sides of the unit.

1.3 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].

1.4 Symbols

The following are examples of symbols used on the Energy Aware Controller 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 waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

1.5 Safety Warnings

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This manual contains important instructions that should be followed during installation and maintenance of the controller. 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 de la manette. Veuillez consulter entièrement ces instructions avant de faire fonctionner l'équipement et conserver ce manuel afin de pouvoir vous y reporter ultérieurement.

DANGER

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

DANGER!

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

WARNING

- To reduce the risk of fire or electric shock, install this controller in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% maximum). The system is not intended for outdoor use.
 - Ensure all power is disconnected before performing installation or service.
 - 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 controller operation by any action that includes removal of the earth (ground) connection with loads attached.
-

AVERTISSEMENT!

- Pour réduire les risques d'incendie et de décharge électrique, installer le manette 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 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.
-

1.6 For More Information

Refer to the Visit www.eaton.com/powerquality or contact an Eaton service representative or information on how to obtain copies of this manual.

1.7 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 technical question this manual does not answer

Please call the Eaton Corporation **Help Desk** 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 for manual comments, suggestions, or to report a technical error.

E-ESSDocumentation@Eaton.com

Chapter 2 Installation

This section explains:

- Installation Options
- Controller Location
- Dimensions
- Wall Mounted Installation
- Horizontal Mount Installation
- UPS Mount Installation
- Input Current and Wire Ratings
- Signal Wire Routing
- UPS Upgrade Procedure

 **WARNING**

Risk of electrical shock. Only qualified service personnel (such as a licensed electrician) should perform the electrical installation.

 **CAUTION**

To prevent electrical shock or damage to the equipment, verify that the circuit breaker or disconnect switch is off at the AC input service panel.

2.1 Installation Options

The controller should be mounted on a flat horizontal or vertical surface using the brackets provided. The brackets can be moved to accommodate either mounting orientation. The controller should be secured to the mounting surface by fasteners appropriately sized for the weight of the device. The controller can also be mounted directly to the top of 9395P 300 or 600 model UPSs only.



NOTE If the controller is not mounted to the top of a UPS, the maximum distance it can be connected through a conduit to the CSB board in the UPS is limited by the 25 ft CAN cable.

2.2 Controller Location

Determine the appropriate location to install the controller in your facility depending on the following factors:

- Environmental conditions (see “Environmental Considerations” on page 6).
- Dimensions and Weight (see “Dimensions and Weight” on page 7).
- Wiring access to UPS, network connections and AC power supply (see “System Wiring Preparation” on page 11).
- controller flat horizontal or vertical surface mount location 25’ maximum from UPS CSB board

2.2.1 Environmental Considerations

For the system to operate properly, the installation site should meet the environmental parameters outlined in this manual and in the manual for the associated UPS.

Make sure that the environment meets the following operating restrictions for the Energy Aware Controller:

The environmental requirements specified below 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.

Observe caution regarding the operating environmental conditions. 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.

Do not expose the UPS for 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.

There are two aspects of this increased operating environment that can, if ignored, create issues:

1. 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 what the actual temperature is.
2. 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 nighttime into day, and back to night.

2.2.2 Dimensions and Weight

Table 1. Equipment Weight

Model	Weight kg (lbs)	
	Shipping	Installed
Controller	12.5 (28)	11.8 (26)

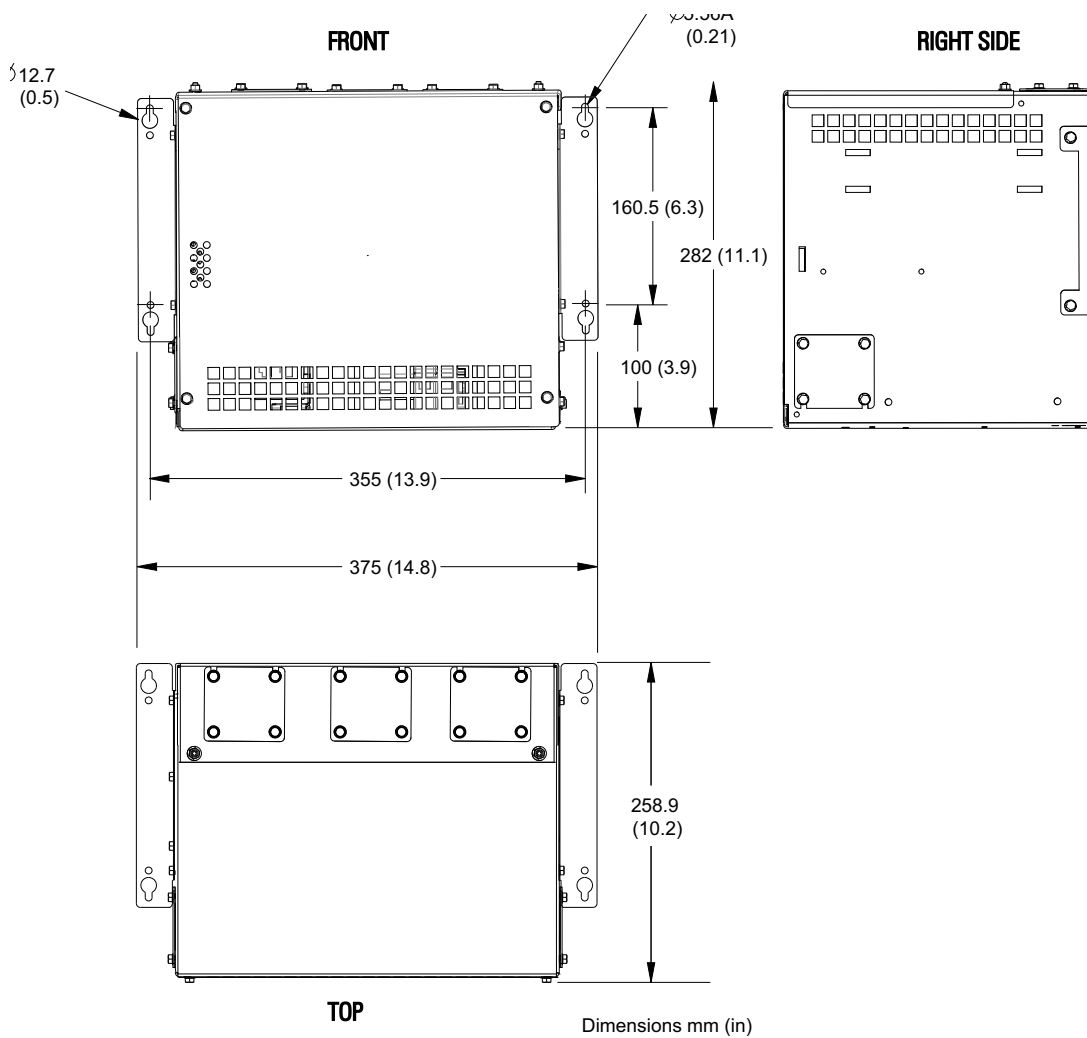


Figure 2. Controller Dimensions

2.3 Installation

The Energy Aware Controller can be installed on a horizontal or vertical (wall) surface.

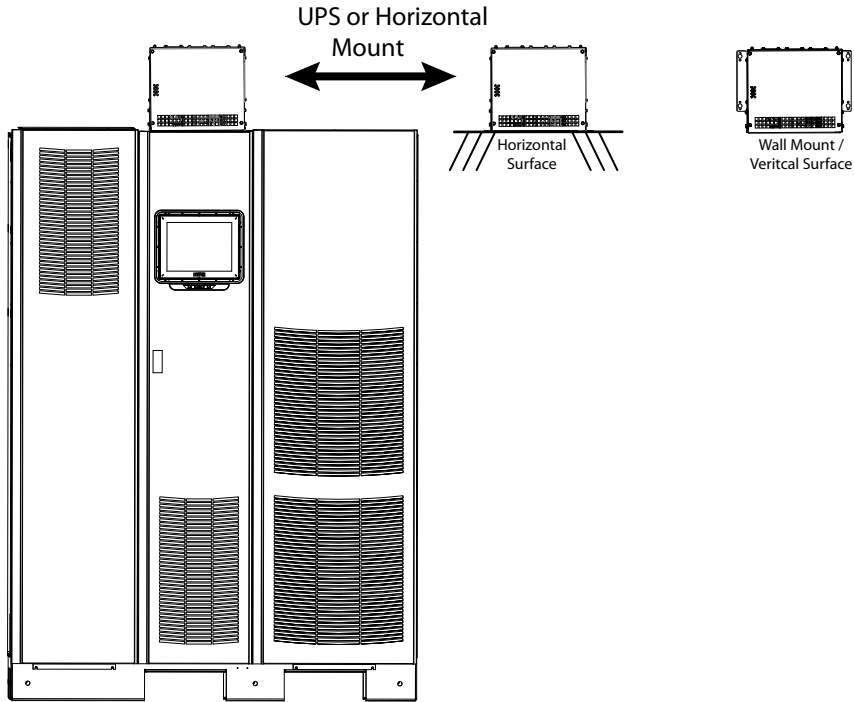


Figure 3. Mounting Options

Install the Energy Aware Controller as follows:

1. Place the controller on a flat surface.
2. Remove the front cover (see Figure 4).

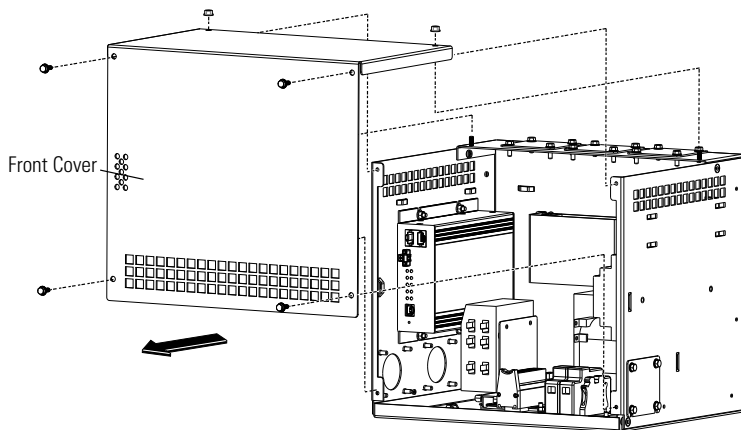


Figure 4. Remove Front Cover

3. Install the supplied mounting brackets on the controller for the desired mounting location (see Figure 5):
 - a. For a wall-mounted position, remove the bolts from and install the mounting brackets in the upper side holes.

or

 - b. For a horizontal or UPS - mounted position, remove the bolts and install the mounting brackets in the lower side holes.

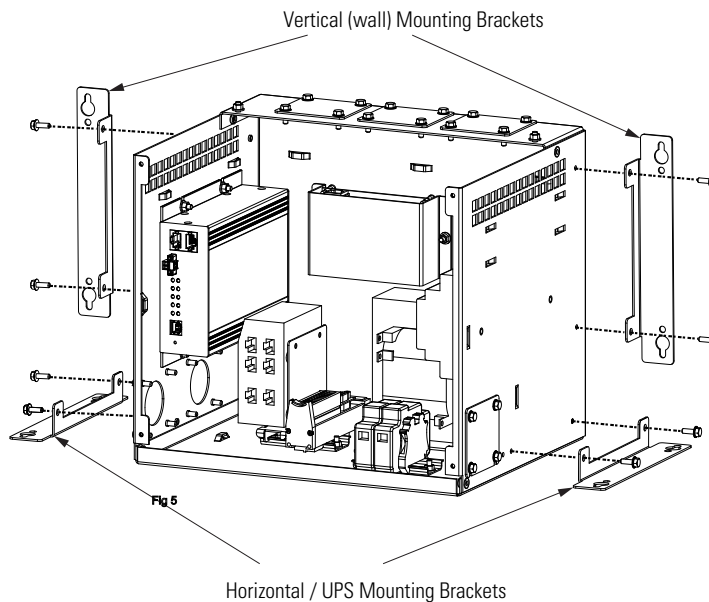


Figure 5. Mounting Bracket Installation

2.3.1 Wall-mount installation:

NOTE Make sure you use all four bolt attachment points to install the controller. Anchors or other mounting hardware must also be rated at 50 pounds each or more in the mounting surface material used.



NOTE The maximum distance the controller can be mounted from the UPS is limited by the 25' CAN cable.

1. Mark the location of the vertical bracket holes and install appropriate anchors in the wall if required (see Figure 2).



NOTE The mounting bracket can also be used as a guide to mark the hole spacing.

2. Place the controller in position and attach with bolts to the wall (see Figure 6).

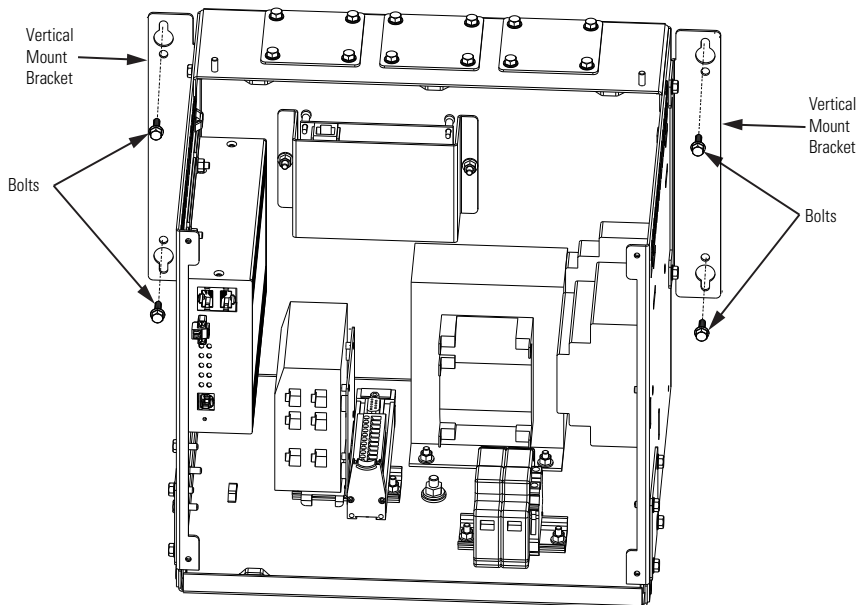


Figure 6. Wall Mount Installation

2.3.2 Horizontal Mount to a Surface Installation:

NOTE Make sure you use all four bolt attachment points to install the controller. Anchors or other mounting hardware must also be rated at 50 pounds each or more in the mounting surface material used.



NOTE The maximum distance the controller can be mounted from the UPS is limited by the 25' CAN cable.

1. Mark the location of the bracket holes and install appropriate anchors in the mounting surface (see Figure 2).

NOTE The mounting bracket can also be used as a guide to mark the hole spacing.

2. Place the controller in position and attach with bolts to the surface.

2.3.3 UPS Mount Installation:



NOTE The controller can only be directly mounted on the 9395 300 and 600kW models. For other UPS applications the controller must be mounted separate from the UPS as described above.

1. Remove the four bolts from the top of the UPS (see Figure 7).

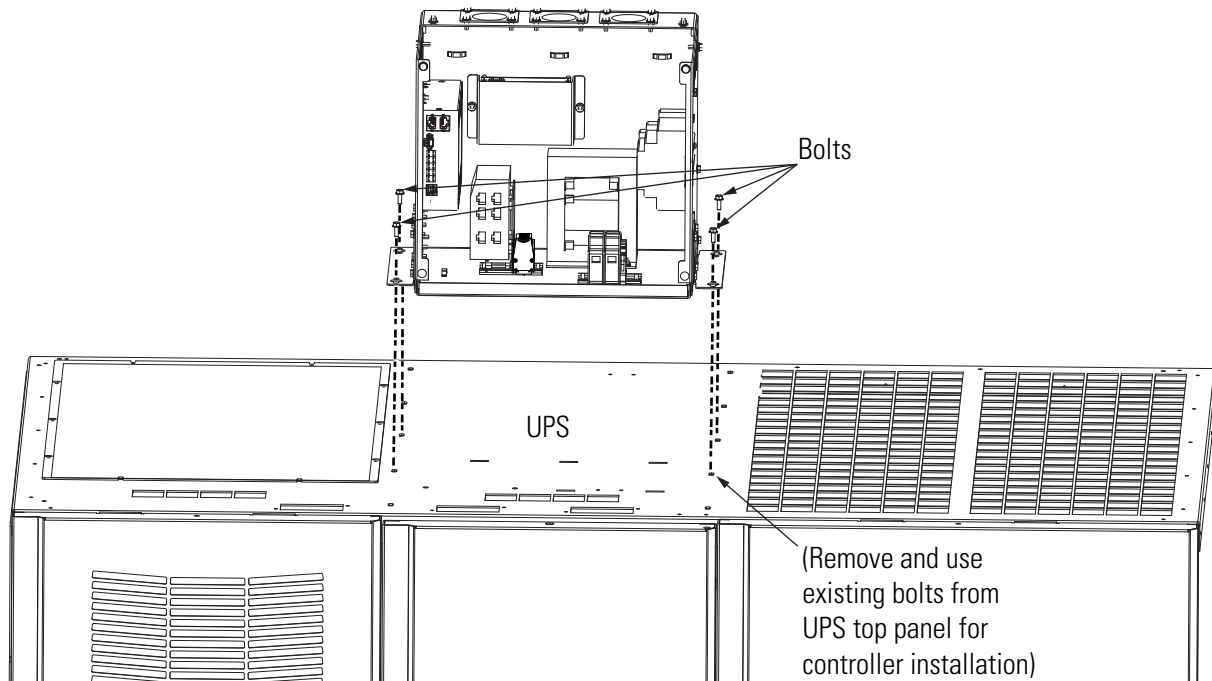


Figure 7. Controller UPS Installation

2. Install the controller in position and fasten with the bolts.
3. If installing on a surface other than the UPS, use the same bolt holes in the horizontal brackets and secure with appropriate hardware.

System Wiring Preparation

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

- Refer to national and local electrical codes for acceptable external wiring practices.
- Material and labor for external wiring requirements are to be provided by designated personnel.
- The controller is designed for operation on a grounded source of supply.
- Follow all applicable NEC and local codes.
- Wire sizes listed are for copper wiring only.

Table 2. Wiring

Connection Points			
Controller	External device		
Controller AC Power	Fuse inputs	AC source	Use minimum 14 AWG wire protected with a 15A circuit breaker + ground
Customer network	Controller ENET1	Customer system	Ethernet cable, Cat 5e or Better
Battery BMS	Ethernet Switch	Battery BMS	Ethernet cable, Cat 5e or Better
Input Power meter	TB-1	Input Meter RS-485 Terminal Block	Shielded twisted pair cable, minimum 22 AWG. TB-1 Pin 3 to RS485 (-). TB-1 Pin 5 to SH (for shielding). TB-1 Pin 7 to RS485 (+). Note: This connection is "if required" depending on customer functionality. Consult with factory.
Output Power meter	Input Meter RS-485 Terminal Block	Output Meter RS-485 Terminal Block	Shielded twisted pair cable, minimum 22 AWG. RS485(-) to RS485 (-). SH to SH (for shielding). RS485 (+) to RS485 (+). Note: This connection is "if required" depending on customer functionality. Consult with factory.
UPS	2 pole CAN connector	UPS internal CAN connection	Cable provided Note: The CAN connection cable provided is the longest length, 762 cm (25 ft) that should be used to ensure proper communication with the UPS

Controller AC Input rating: 380-480VAC, 50/60 Hz, 2.4A

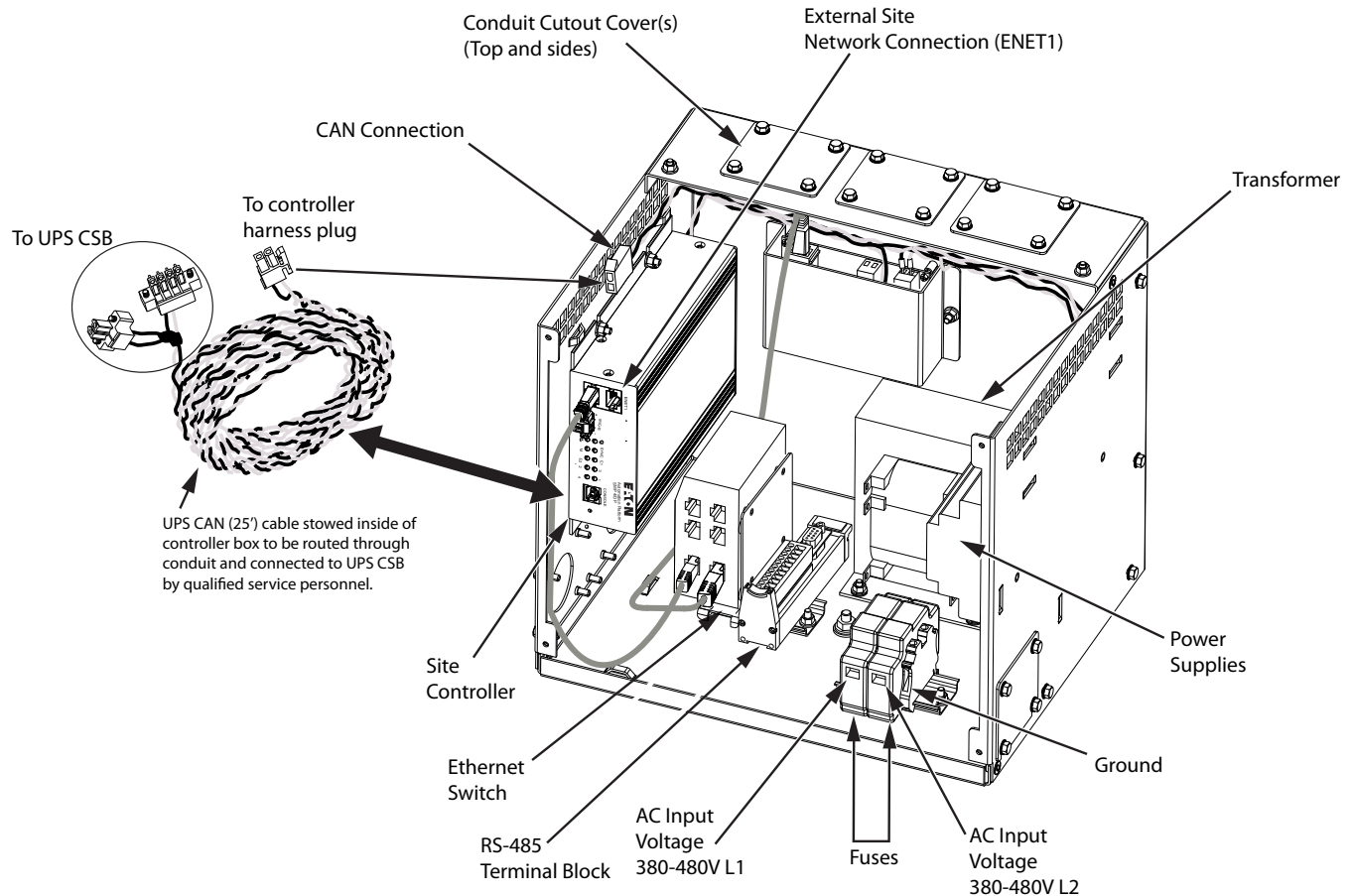


Figure 8. Controller Components

2.4 Controller Wiring

Install and connect the controller wiring and cables (see Table 2 and Figure 8 and Figure 9).



NOTE Remove the access cutout covers and attach cable routing to the standoffs as required for the applicable controller installation location.

1. Route UPS CAN Cable from the controller enclosure to the UPS. In the UPS leave the wires unconnected. Final connections will be made by Eaton Service personnel during startup and commissioning.
2. Connect UPS CAN Cable to the controller using the 2 pole connector shown.
3. Connect Input AC Voltage cables to the controller



NOTE Connecting the power cables connects the UPS output to the power supply isolation transformer input located inside the controller.

4. Install Ethernet cabling between the key system components listed below and the Ethernet network switch located inside the controller.
 - Battery Management System (BMS)
 - Input and Output Power Meters
5. Connect the site network cable to the controller

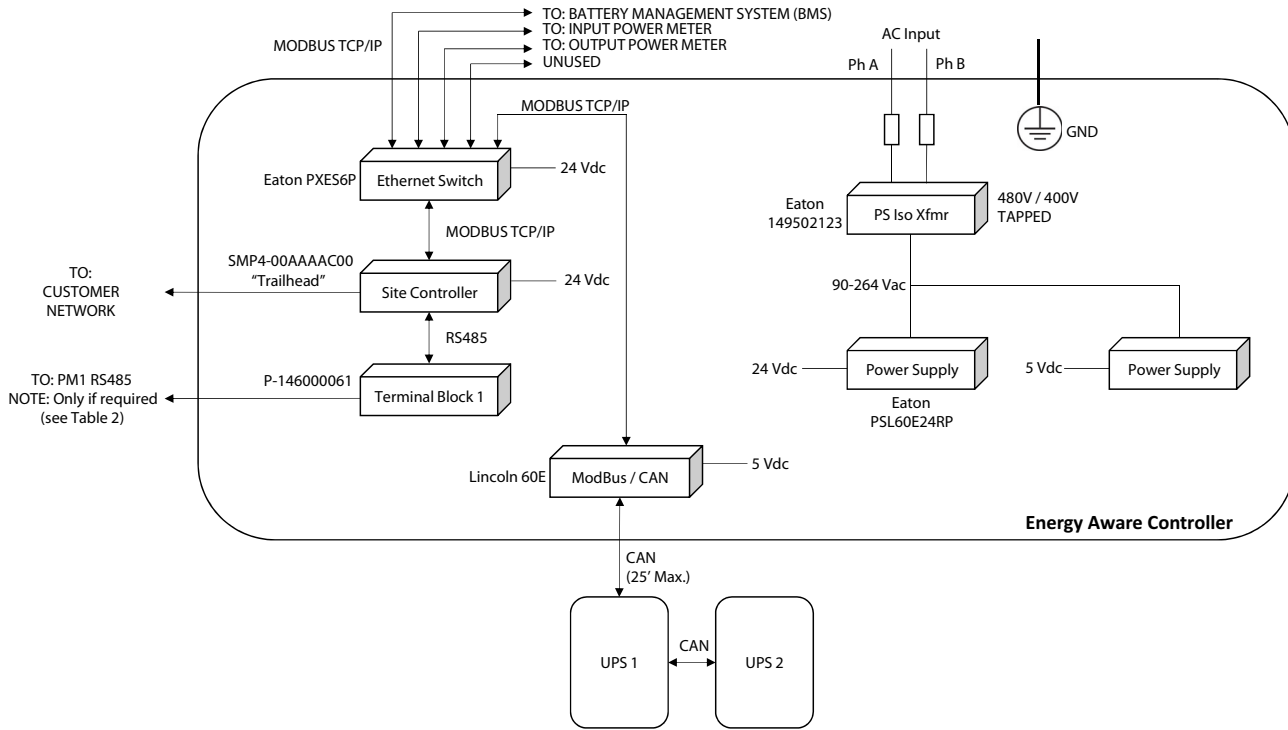


Figure 9. Block Diagram

2.5 Energy Aware Software and Firmware Installation

The UPS must be properly configured to support the Energy Aware Controller features. Configuration, upgrades and any required software or firmware installation will be performed by qualified Eaton Service personnel during startup and commissioning.

Chapter 3 Warranty

3.1 Limited Factory Warranty

Eaton Power Distribution Unit Products

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

LIMITED WARRANTY: This limited warranty (this "Warranty") applies only to the original end-user (the "End-User") of the Power Xpert Gateway PXGX PDP Card (the "Product") and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by Eaton for resale to an End-User. **This warranty is not valid unless a separately purchased Startup service is purchased.**

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

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

WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, fire, flood, lightning, vandalism, acts of God, Customer's neglect, abuse, misuse, misapplication, incorrect installation; (d) repair or alteration not authorized in writing by Eaton personnel or performed by an authorized Eaton Customer Service Engineer or Agent; or (e) improper testing, operation, maintenance, adjustment, or any modification of any kind not authorized in writing by Eaton personnel or performed by an authorized Eaton Customer Service Engineer or Agent.

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

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

LIMITATION OF LIABILITY: In no event shall Eaton be liable for any indirect, incidental, special, or consequential damages of any kind or type whatsoever, or based on any claim or cause of action, however denominated. Eaton shall not be responsible for failure to provide service or parts due to causes beyond Eaton's reasonable control. In no case will Eaton's liability under this Warranty exceed the replacement value of the Warranted Items.

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

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

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

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

3.2 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.

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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 OpenSource 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.

3.3 Eaton Cybersecurity Recommendations

EnergyAware UPS has been designed with cybersecurity as an important consideration. A number of features are offered in the product to address cybersecurity risks. These Cybersecurity Recommendations provide information to help users to deploy and maintain the product in a manner that minimizes the cybersecurity risks. These Cybersecurity Recommendations are not intended to provide a comprehensive guide to cybersecurity, but rather to complement customers' existing cybersecurity programs.

Eaton is committed to minimizing the cybersecurity risk in its products and deploying cybersecurity best practices in its products and solutions, making them more secure, reliable and competitive for customers.

Category	Description
Asset Management	<p>Keeping track of software and hardware assets in your environment is a pre-requisite for effectively managing cybersecurity. Eaton recommends that you maintain an asset inventory that uniquely identifies each important component. To facilitate this, EnergyAware UPS supports the following identifying information:</p> <p>Hardware - manufacturer, type, serial number, f/w version number, and location.</p> <p>Software - publisher, name, version, and version date.</p> <p>SMP Manager provides asset information about the device.</p> <p>See SMP Gateway User Manual.pdf Chapter 4 SMP Manager</p> <p>The HMI to serve up a webpage that identifies the software loaded on the device. This is the software developed by Eaton and also maintained in a version control system</p>
Risk Assessment	<p>Eaton recommends conducting a risk assessment to identify and assess reasonably foreseeable internal and external risks to the confidentiality, availability and integrity of the system device and its environment. This exercise should be conducted in accordance with applicable technical and regulatory frameworks such as IEC 62443 and NERC-CIP. The risk assessment should be repeated periodically.</p>
Physical Security	<p>An attacker with unauthorized physical access can cause serious disruption to system/device functionality. Additionally, Industrial Control Protocols don't offer cryptographic protections, making ICS and SCADA communications especially vulnerable to threats to their confidentiality. Physical security is an important layer of defense in such cases. EnergyAware UPS is designed to be deployed and operated in a physically secure location. Following are some best practices that Eaton recommends to physically secure your system/device:</p> <ul style="list-style-type: none"> • Secure the facility and equipment rooms or closets with access control mechanisms such as locks, entry card readers, guards, man traps, CCTV, etc. as appropriate. • Restrict physical access to cabinets and/or enclosures containing EnergyAware UPS and the associated system. Monitor and log the access at all times. • Physical access to the telecommunication lines and network cabling should be restricted to protect against attempts to intercept or sabotage communications. It's a best practice to use metal conduits for the network cabling running between equipment cabinets. • EnergyAware UPS supports the following physical access ports. No ports are accessible without removing physical covers. • RJ-45 and USB Type B connectors. <p>RJ-45 connector is used for Modbus communication and always enabled. USB Type B connector is used for configuring the SMP device using the SMP Manager tool.</p> <ul style="list-style-type: none"> • Do not connect removable media (e.g., USB devices, SD cards, etc.) for any operation (e.g., firmware upgrade, configuration change, or boot application change) unless the origin of the media is known and trusted. • Before connecting any portable device through a USB port or SD card slot, scan the device for malware and viruses. Delete
Account Management	<p>Logical access to the system device should be restricted to legitimate users, who should be assigned only the privileges necessary to complete their job roles/functions. Some of the following best practices may need to be implemented by incorporating them into the organization's written policies:</p> <ul style="list-style-type: none"> • Ensure default credentials are changed upon first login. EnergyAware UPS should not be deployed in production environments with default credentials, as default credentials are publicly known.

Category	Description
Account Management (cont'd)	<ul style="list-style-type: none"> • No account sharing - Each user should be provisioned a unique account instead of sharing accounts and passwords. Security monitoring/logging features in the product are designed based on each user having a unique account. Allowing users to share credentials weakens security. • Restrict administrative privileges - Attackers seek to gain control of legitimate credentials, especially those for highly privileged accounts. Administrative privileges should be assigned only to accounts specifically designated for administrative duties and not for regular use. • Leverage the roles / access privileges to provide tiered access to the users as per the business /operational need. Follow the principle of least privilege (allocate the minimum authority level and access to system resources required for the role). • Perform periodic account maintenance (remove unused accounts). • Ensure password length, complexity and expiration requirements are appropriately set, particularly for all administrative accounts (e.g., minimum 10 characters, mix of upper- and lower-case and special characters, and expire every 90 days, or otherwise in accordance with your organization's policies). • Enforce session time-out after a period of inactivity. <p>See SMP Gateway User Manual.pdf Chapter 15 Security for setting up accounts and creating passwords.</p>
Time Synchronization	<p>Many operations in power grids and IT networks heavily depend on precise timing information.</p> <ul style="list-style-type: none"> • Ensure the system clock is synchronized with an authoritative time source (using manual configuration, NTP, SNTP, or IEEE 1588). <p>See SMP Gateway User Manual.pdf Chapter 22 Time Adjustment</p>
Network Security	<p>EnergyAware UPS supports network communication with other devices in the environment. This capability can present risks if it's not configured securely. Following are Eaton recommended best practices to help secure the network. Additional information about various network protection strategies is available in Eaton Cybersecurity Considerations for Electrical Distribution Systems [R1].</p> <p>Eaton recommends segmentation of networks into logical enclaves, denying traffic between segments except that which is specifically allowed, and restricting communication to host-to-host paths (for example, using router ACLs and firewall rules). This helps to protect sensitive information and critical services and creates additional barriers in the event of a network perimeter breach. At a minimum, a utility Industrial Control Systems network should be segmented into a three-tiered architecture (as recommended by NIST SP 800-82[R3]) for better security control.</p> <p>Communication Protection: -EnergyAware UPS provides the option to encrypt its network communications. Please ensure that encryption options are enabled. You can secure the product's communication capabilities by taking the following steps:</p> <p>See SMP Gateway User Manual.pdf Chapter 15 Security Section 15.8 Secure Authentication Eaton recommends using your own certificate.</p> <p>Eaton recommends opening only those ports that are required for operations and protect the network communication using network protection systems like firewalls and intrusion detection systems / intrusion prevention systems. Use the information below to configure your firewall rules to allow access needed for EnergyAware UPS to operate smoothly</p> <p>See SMP Gateway User Manual.pdf Chapter 15 Security Section 15.6.1 Specifying Firewall Rules. Eaton recommends using "whitelisting" when allowing access to the EnergyAware UPS.</p>

Category	Description
Remote Access	<p>Remote access to devices/systems creates another entry point into the network. Strict management and validation of termination of such access is vital for maintaining control over overall ICS security.</p> <p>See SMP Gateway User Manual.pdf Chapter 24 SMP Tools Remote Access to the SMP Gateway</p>
Logging and Event Management	<ul style="list-style-type: none"> • Eaton recommends logging all relevant system and application events, including all administrative and maintenance activities. • Logs should be protected from tampering and other risks to their integrity (for example, by restricting permissions to access and modify logs, transmitting logs to a security information and event management system, etc.). • Ensure that logs are retained for a reasonable and appropriate length of time. • Review the logs regularly. The frequency of review should be reasonable, taking into account the sensitivity and criticality of the system device and any data it processes. <p>See SMP Gateway User Manual.pdf Chapter 19 Using Syslog with an SMP Gateway</p>
Malware Defenses	<p>See SMP Gateway Malware Protection.pdf</p>
Secure Maintenance	<p>Best Practices</p> <p>Update device firmware prior to putting the device into production. Thereafter, apply firmware updates and software patches regularly.</p> <p>Eaton publishes patches and updates for its products to protect them against vulnerabilities that are discovered. Eaton encourages customers to maintain a consistent process to promptly monitor for and install new firmware updates.</p> <p>Please check Eaton's cybersecurity website for information bulletins about available firmware and software updates.</p> <p>See Vulnerability Management below</p>
Business Continuity / Cybersecurity Disaster Recovery	<p>Software can be re-installed from released software packages in the event of corrupted software.</p>
Sensitive Information Disclosure	<p>Eaton recommends that sensitive information (i.e. connectivity, log data, personal information) that may be stored by EnergyAware UPS be adequately protected through the deployment of organizational security practices.</p> <p>Device does not store sensitive information.</p>
Decommissioning or Zeroisation	<p>It is a best practice to purge data before disposing of any device containing data. Guidelines for decommissioning are provided in NIST SP 800-88. Eaton recommends that products containing embedded flash memory be securely destroyed to ensure data is unrecoverable.</p> <ul style="list-style-type: none"> • <u>Embedded Flash Memory on Boards and Devices</u> <p>Eaton recommends the following methods for disposing of motherboards, peripheral cards such as network adapters, or any other adapter containing non-volatile flash memory.</p> <ul style="list-style-type: none"> - Destroy: Shred, disintegrate, pulverize, or Incinerate by burning the device in a licensed incinerator.

Warranty

Category	Description						
Vulnerability Management	<p>In general, Eaton recommends monitoring vendor sites, the ICS CERT, and NIST National Vulnerability Database (NVD) for known vulnerabilities in products and mitigating or remediating the vulnerabilities as recommended through patches, updates, or compensating controls.</p> <p>Eaton publishes cybersecurity notifications and known vulnerabilities for its products on www.eaton.com/cybersecurity. Users are also able to report cybersecurity issues and receive automated cybersecurity notifications on this site. Eaton recommends registering for these notifications.</p> <p>The product is composed of components that can be configured to meet a range of connectivity, functionality, and security needs. For cybersecurity notifications, general software updates, and vulnerability management policies the user should reference then individual vendor sites.</p> <table border="1"><tbody><tr><td>Eaton</td><td>www.eaton.com/cybersecurity</td></tr><tr><td>Eaton</td><td>https://www.eaton.com/us/en-us/company/news-insights/cybersecurity/security-notifications.html</td></tr><tr><td>Eaton</td><td>https://www.cybectec.com/customers/</td></tr></tbody></table> <p>Users are encouraged to keep a track of the security patches released by the COTS vendors and apply them to their environment as appropriate.</p> <p>Note: Many compliance frameworks and security best practices require a monthly vulnerability review. For many non-COTS products vulnerabilities will be communicated directly through the vendor site.</p>	Eaton	www.eaton.com/cybersecurity	Eaton	https://www.eaton.com/us/en-us/company/news-insights/cybersecurity/security-notifications.html	Eaton	https://www.cybectec.com/customers/
Eaton	www.eaton.com/cybersecurity						
Eaton	https://www.eaton.com/us/en-us/company/news-insights/cybersecurity/security-notifications.html						
Eaton	https://www.cybectec.com/customers/						

References

[R1] Cybersecurity Considerations for Electrical Distribution Systems (WP152002EN):

http://www.eaton.com/ecm/groups/public/@pub/@eaton/@corp/documents/content/pct_1603172.pdf

[R2] Cybersecurity Best Practices Checklist Reminder (WP910003EN):

http://www.cooperindustries.com/content/dam/public/powersystems/resources/library/1100_EAS/WP910003EN.pdf

[R3] NIST SP 800-82 Rev 2, Guide to Industrial Control Systems (ICS) Security, May 2015:

<https://ics-cert.us-cert.gov/Standards-and-References>

[R4] National Institute of Technology (NIST) Interagency "Guidelines on Firewalls and Firewall Policy, NIST Special Publication 800-41", October 2009:

<http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-41r1.pdf>

[R5] NIST SP 800-88, Guidelines for Media Sanitization, September 2006:

http://ws680.nist.gov/publication/get_pdf.cfm?pub_id=50819