Liebert® APM2 Battery Cabinet

User Manual

External Battery Cabinet - UL Rated

The information contained in this document is subject to change without notice and may not be suitable for all applications. While every precaution has been taken to ensure the accuracy and completeness of this document, Vertiv assumes no responsibility and disclaims all liability for damages result from use of this information or for any errors or omissions.

Refer to local regulations and building codes relating to the application, installation, and operation of this product. The consulting engineer, installer, and/or end user is responsible for compliance with all applicable laws and regulations relation to the application, installation, and operation of this product.

The products covered by this instruction manual are manufactured and/or sold by Vertiv. This document is the property of Vertiv and contains confidential and proprietary information owned by Vertiv. Any copying, use, or disclosure of it without the written permission of Vertiv is strictly prohibited.

Names of companies and products are trademarks or registered trademarks of the respective companies. Any questions regarding usage of trademark names should be directed to the original manufacturer.

Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit https://www.vertiv.com/en-us/support/ for additional assistance.

Proprietary and Confidential ©2025 Vertiv Group Corp.

TABLE OF CONTENTS

Proprietary and Confidential ©2025 Vertiv Group Corp.

1 Important Safety Instructions

Save these instructions

This manual contains important instructions that should be followed during installation of Vertiv™ Liebert® APM2 Battery Cabinet and accessories. Read this manual thoroughly, paying special attention to the sections that apply to user specific installation, before working with the battery system. Retain this manual for use by installing personnel.

The following warning applies to all battery cabinets supplied with UPS systems.

WARNING!
Internal battery strapping must be verified prior to moving a battery cabinet (after initial installation). Battery cabinets contain non-spillable batteries. Keep units upright, do not stack or tilt. Failure to adhere to this warning could result in smoke, fire or electric hazard. Call 1-800-548-2378 prior to moving battery cabinets (after initial installation).

AVERTISSEMENT!
Le cerclage interne de la batterie doit être vérifié avant de déplacer une armoire de batterie (après l'installation initiale). Les armoires à batteries contiennent des batteries étanches. Gardez les unités à la verticale. Ne pas empiler. Ne pas incliner. Le non-respect de cet avertissement pourrait entraîner de la fumée, un incendie ou un risque électrique. Appelez le 1-800-548-2378 avant de déplacer les armoires de batteries (après l'installation initiale).

WARNING! Risk of electric shock. Can cause personal injury and death. Check for voltage with both AC and DC voltmeters before working within the EBC and before making contact. Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and glasses should be involved in installing the EBC or preparing the EBC for installation. When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats. Lead-acid batteries contain hazardous materials. Batteries must be handled, transported and recycled or discarded in accordance with federal, state and local regulations. Because lead is a toxic substance, lead-acid batteries must be recycled rather than discarded. Do not dispose of battery or batteries in a fire, the battery may explode. Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes, it is toxic.

Proprietary and Confidential ©2025 Vertiv Group Corp.

The following precautions must be observed when working on batteries:

- Remove watches, rings and 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 charging source prior to connecting or disconnecting battery terminals.
- Determine whether the battery is grounded. If it is grounded, remove source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.

AVERTISSEMENT! Risque de décharge électrique pouvant causer des blessures graves, voire mortelles. Vérifiez les tensions au moyen de voltmètres c.a. et c.c. avant d'utiliser le système ASC. Vérifiez les tensions avec des voltmètres c.a. et c.c. avant d'établir tout contact. Seuls des employés qualifiés et dûment formés portant un casque, des gants, des chaussures et des lunettes de écurité adéquats doivent se charger d'installer le système ASC ou de le préparer pour l'installation. Les responsables de l'entretien et l'équipement d'essai doivent reposer sur des tapis de caoutchouc lors de toute intervention sur une pièce d'équipement sous tension. Les batteries au plomb-acide renferment des matières dangereuses. Les batteries doivent être manipulées, transportées, recyclées ou jetées conformément aux règlements fédéraux, provinciaux et municipaux. Étant donné que le plomb est une substance toxique, les batteries au plomb-acide doivent être recyclées plutôt que mises au rebut. Ne jetez jamais de batteries au feu car elles risquent d'exploser. Vous ne devez ni ouvrir ni percer les batteries, car l'électrolyte qui s'en écoulerait est nocif pour la peau et les yeux. Cet électrolyte est toxique.

Lorsque vous travaillez avec des batteries, prenez les précautions suivantes:

- Retirez montre, bagues et tout autre objet métallique.
- Utilisez des outils dont le manche est isolé.
- Portez des gants et des bottes de caoutchouc.
- Ne posez aucun outil ni pièce métallique sur le dessus d'une batterie.
- Déconnectez la source de chargement avant de brancher ou de débrancher les bornes d'une batterie.
- Vérifiez si la batterie est mise à la terre. Le cas échéant, éliminez la cause de la mise à la terre. Le contact avec toute partie d'une batterie mise à la terre peut provoquer une décharge électrique. Pour réduire de tels risques d'accident, débranchez les prises de terre avant de procéder à l'installation ou à l'entretien.

WARNING! Risk of electric shock. Can cause personal injury and death. In case of fire involving electrical equipment, use only carbon dioxide fire extinguishers or those approved for use in fighting electrical fires.

AVERTISSEMENT! Risque de décharge électrique pouvant causer des blessures graves, voire mortelles. En cas d'incendie associé à du matériel électrique, n'utilisez que des extincteurs à dioxyde de carbone ou homologués pour la lutte contre les incendies d'origine électrique.

WARNING! Risk of heavy unit falling over. Improper handling can cause equipment damage, injury or death. Exercise extreme care when handling battery cabinets to avoid equipment damage or injury to personnel. The battery system cabinets weigh from 1398 to 5331 lb. (634 to 2418kg). Locate center of gravity symbols and determine unit weight before handling each cabinet. Test lift and balance the cabinets before transporting. Maintain minimum tilt from vertical at all times. Slots at the base of the module cabinets are intended for forklift use. Base slots will support the unit only if the forks are completely beneath the unit. Read all of the following instructions before attempting to move, lift, or remove packaging from unit, or prepare unit for installation.

AVERTISSEMENT! Le centre de gravité élevé de l'appareil présente un risque de renversement. Une mauvaise manutention peut entraîner des dommages matériels, des blessures et même la mort. Faites preuve d'une extrême prudence lors de la manutention des armoires EBC afin d'éviter de les endommager ou de blesser le personnel. Le poids du EBC varie entre 1398 to 5331 lb. (634 to 2418kg). Identifiez les symboles de centre de gravité et déterminez le poids de l'appareil avant de manipuler chaque armoire. Testez le levage et l'équilibre des armoires avant de transporter l'appareil. Maintenez en tout temps l'inclinaison verticale minimale. Les fentes situées à la base des armoires du module sont conçues pour utiliser le chariot élévateur. Les fentes situées à la base peuvent soutenir le système seulement si les fourches se trouvent complètement sous le système. Lisez toutes les instructions ci-dessous avant de tenter de déplacer, lever, déballer ou préparer le système en vue de son installation.

WARNING! Risk of electrical shock and fire. Can cause equipment damage, personal injury, or death. Under typical operation and with all EBC doors closed, only normal safety precautions are necessary. The area around the EBC system should be kept free of puddles of water, excess moisture, and debris. Only test equipment designed for troubleshooting should be used. This is particularly true for oscilloscopes. Always check with an AC and DC voltmeter to ensure safety before making contact or using tools. Even when the power is turned Off, dangerously high potential electric charges may exist at the capacitor banks and at the DC connections. All wiring must be installed by a properly trained and qualified electrician. All power and control wiring must comply with all applicable national, state, and local codes. One person should never work alone, even if all power is disconnected from the equipment. A second person should be standing by to assist and to summon help in case of an accident.

AVERTISSEMENT! Risque de choc électrique et d'incendie. Peut causer des dommages matériels, des blessures ou la mort. Dans des conditions de fonctionnement normales et avec toutes les portes de l'EBC fermées, seules les précautions de sécurité normales sont nécessaires. La zone autour du système EBC doit être exempte de flaques d'eau, d'excès d'humidité et de débris. Seul l'équipement de test conçu pour le dépannage doit être utilisé. Cela est particulièrement vrai pour les oscilloscopes. Vérifiez toujours avec un voltmètre AC et DC pour garantir la sécurité avant de prendre contact ou d'utiliser des outils. Même lorsque l'alimentation est coupée, des charges électriques potentielles dangereusement élevées peuvent exister au niveau des batteries de condensateurs et des connexions CC. Tout le câblage doit être installé par un électricien dûment formé et qualifié. Tout le câblage d'alimentation et de commande doit être conforme à tous les codes nationaux, étatiques et locaux applicables. Une personne ne doit jamais travailler seule, même si toute alimentation électrique est coupée de l'équipement. Une deuxième personne doit être prête à intervenir et à demander de l'aide en cas d'accident.

Proprietary and Confidential ©2025 Vertiv Group Corp.

NOTICE

This unit complies with the limits for a Class A digital device, pursuant to Part 15 Subpart B of the FCC rules. This device complies with part 15 of the FCC Rules. Operation is subjected to the following two conditions:
(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.

These limits provide reasonable protection against harmful interference in a commercial environment. This unit generates, uses and radiates radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications. Operation of this unit in a residential area may cause harmful interference that the user must correct at his own expense.

2 Mechanical Installation

2.1 Introduction

This section describes the requirements that must be taken into account when planning the positioning and cabling of the Vertiv™ Liebert® APM2 UL external battery cabinet (EBC) equipment. This chapter is a guide to general procedures and practices that should be observed by the installing engineer. The conditions of each site will determine the applicability of such procedures.

NOTICE

Risk of improper startup. Can cause equipment damage. Do not apply electrical power to the EBC equipment before the arrival of the commissioning engineer.

2.2 System Composition

A battery system consists of a number of equipment cabinets, depending on the individual system design requirements, such as Battery Cabinet. See Installation Drawings on page 39 for positioning the cabinets.

2.3 Preliminary Checks

Before installing the battery equipment, carry out the following preliminary checks:

- Remove all panels and visually inspect the cabinet, battery modules, bus connections, and cabinet for any shipping damage. Be careful, there is voltage in the battery modules prior to installation. If there is evidence of damage, do not proceed. Call Vertiv at 1-800-542-2378.
- Report any damage to the shipper immediately.
- Verify that the correct equipment is being installed. The equipment supplied has an identification tag inside the main door.
- Verify that the battery room satisfies the environmental conditions stipulated in the equipment specification, paying particular attention to the ambient temperature and air exchange system.

2.4 Environmental Considerations

2.4.1 Battery Room

Batteries should be installed in an environment where the temperature is consistent and even over the whole battery. Temperature is a major factor in determining the battery life and capacity. Typical battery manufacturer performance data are quoted for an operating temperature between 68 °F and 77 °F (20 °C and 25 °C). Operating above this range will reduce the battery life while operation below this range will reduce the battery capacity.

Battery Temperature: In a normal installation, the battery temperature should be kept between 59 °F and 77 °F (15 °C and 25 °C).

Proprietary and Confidential ©2025 Vertiv Group Corp.

2.4.2 Storing Batteries for Delayed Installation

If the battery system will not be installed immediately, it must be stored indoors in a clean, dry, and cool location. Batteries should be unpacked, installed, and charged as soon as possible after delivery.

NOTICE

Risk of failure to properly charge batteries. Can cause permanent damage to batteries and void the warranty.

Batteries will self-discharge during storage. Batteries must be recharged as recommended by the battery manufacturer. A notice of Charge Before Date is affixed to each unit that has batteries inside. The charge before date is calculated based on the batteries being stored at 77 °F (25 °C). Storage at a higher temperature will increase the rate of self-discharge, requiring earlier recharge. Consult the battery manufacturer on how to determine when the batteries need to be recharged.

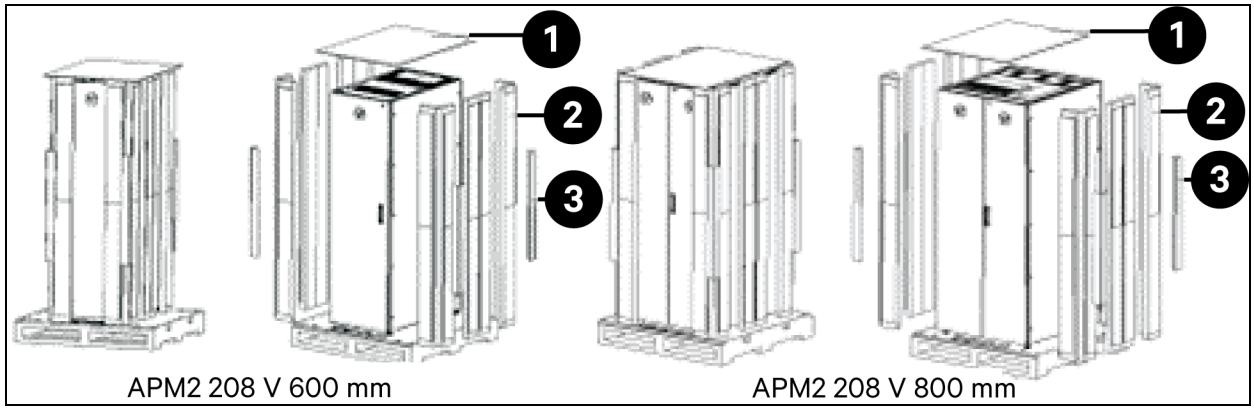
2.4.3 Unpacking the Cabinet

Each Vertiv™ Liebert® APM2 UL EBC VRLA weighs differently because of its size and built-in battery type. The weight of Liebert® APM2 UL EBC VRLA is approximately between 634 kg and 2464 kg (1398 lb and 5432 lb).

The UPS is shipped on a pallet and Liebert® APM2 UL EBC VRLA is shipped with full batteries. Liebert® APM2 UL EBC VRLA needs to be lifted from the pallet by a crane during installation. Use a forklift or pallet jack to move the palleted Liebert® APM2 UL EBC VRLA as close as possible to the installation location before removing packing material or loosening shipping brackets.

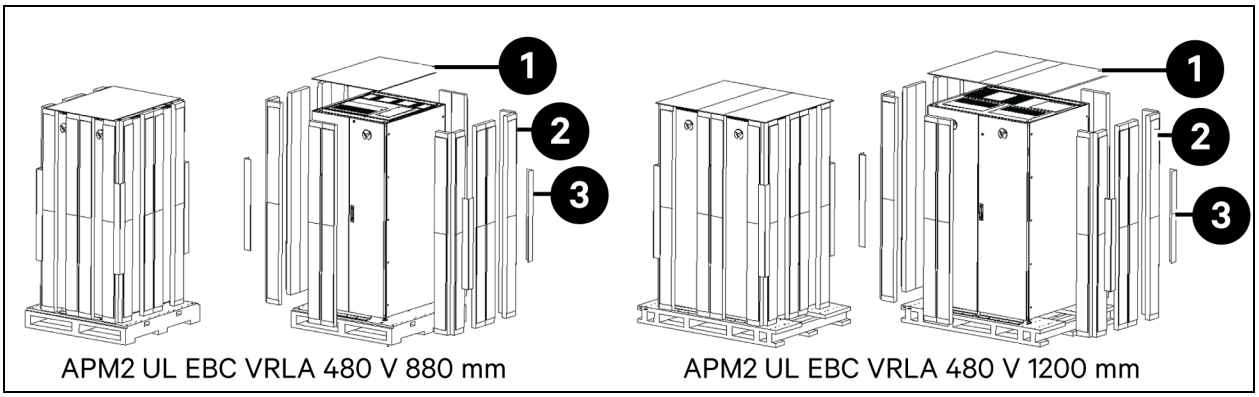
1. Remove the protective packaging, shown in Figure 2.1 below and Figure 2.2 on the facing page.
2. Locate the accessories package on top of the UPS and set aside.
3. Use a 5/8 in. (16 mm) wrench or socket to remove the shipping brackets from the pallet.
4. Remove the shipping brackets from the front and rear of the Liebert® APM2 UL EBC VRLA.
5. Ensure that the leveling feet are raised to prevent interference when rolling the unit on the casters.
6. Use a crane to lower the Liebert® APM2 UL EBC VRLA, then roll the APM2 UL EBC VRLA to the installation location with casters, and finally lower the leveling angle.

Figure 2.1 Liebert® APM2 208 V 600 mm and 800 mm



Item	Description
1	Top Cover
2	Honeycomb board
3	Corner gaurd

Figure 2.2 Liebert® APM2 480 V 880 mm and 1200 mm



Item	Description
1	Top Cover
2	Honeycomb board
3	Corner gaurd

2.4.4 Installation Considerations

- Position: See the product submittals for complete system line-up details. Vertiv™ Liebert® APM2 UL EBC design can be attached to the left side of UPS for 208 V UPS Frames and up to 300 kVA 480 V Frame. 600 kVA UPS Frame requires right side mount for optimized cable routing into IO connection cabinet. Cabinets can also be ordered as standalone option. The front access design eliminates side and rear service clearance requirements. See Table 5.7 on page 48 and Table 5.10 on page 49 for battery cabinet dimensions and weights.
- Bolt-on cabinets: Matching battery cabinets are designed to bolt Liebert® APM2 UL UPS. Use bolts that ship with each unit to connect cabinet frames at posts, two places in the front, and two places in the rear.
- Service clearance: Allow front access to the battery cabinet at all times for maintenance and service. Electrical codes require that the battery cabinet be installed with no less than 36 in. (915 mm) of clearance at the front of the cabinet when operating. No service clearance is required on either the side or rear. Clearance at the top of the cabinet is 24 in. (610 mm).
- Cables: Cables may be run between the cabinets through cutouts on side of the cabinet when attached to UPS configuration eliminating the need for external conduit runs. Route cables before moving cabinets into final position for bolting together. No top or bottom entry cables are required, except for remotely located cabinets which require conduits.
  Power terminals, auxiliary terminals blocks, and circuit breakers are accessed from the front and top. Removable panels on the top are secured to the chassis by screws. The door can be opened to give access to the power connections bars, auxiliary terminal blocks and breakers. The front door can be opened 180 degree for easier service and more flexibility in installation.

- **Software:** For the UPS to accurately display battery run-time, the number of battery modules, system voltage, and battery voltage must be noted during initial startup and setup using the configuration software. This is performed by the Vertiv engineer when commissioning the unit.
- **Casters and adjustable leveling feet:** The leveling feet are not designed to bear the full weight of the cabinet. Lower the stops until they are finger-tight in contact with the floor. Tighten a small amount with a wrench (less than two turns) to give a good friction fit. When mounting the battery cabinet on seismic stands, ensure that the casters are bearing the weight of the cabinet.

2.5 Moving the Battery Cabinets

The battery cabinets should be moved with a forklift or similar equipment. The battery cabinet has casters for movement over short distances. The bottoms of the battery cabinets are reinforced to permit lifting by forklift to move them longer distances. The bottom structure will support the unit only if the forks are completely beneath the unit.

The route between the point of arrival and the unit's installation location must be planned to make sure that all passages are wide enough for the unit and that floors will support its weight (for instance, check that doorways, lifts, or ramps, are big enough and that there are no impassable corners or changes in the level of corridors). Ensure that the cabinet weight is within the designated surface weight loading (kg/cm^2) of any handling equipment. See Table 5.7 on page 48 and Table 5.10 on page 49 for weight details. Ensure that any lifting equipment used to move the battery equipment has sufficient lifting capacity. Because the weight distribution in the cabinet is not symmetrical, use extreme care during handling and transporting. When moving the unit by forklift, care must be taken to protect the panels. Handling the unit with straps is not authorized.

WARNING! Risk of heavy unit falling over. Improper handling can cause equipment damage, injury or death. Exercise extreme care when handling battery cabinets to avoid equipment damage or injury to personnel. The battery system cabinets weigh from 1398 lb. to 5331 lb. (634 kg to 2418 kg). Locate center of gravity symbols and determine the unit's weight before handling a cabinet. Test lift and balance the cabinets before moving them. Maintain minimum tilt from vertical at all times. Read all the instructions before attempting to move, lift, or remove packaging from unit, or prepare unit for installation.

AVERTISSEMENT! Le centre de gravité élevé de l'appareil présente un risque de renversement. Une mauvaise manutention peut entraîner des dommages matériels, des blessures et même la mort. Faites preuve d'une extrême prudence lors de la manutention des armoires ASC afin d'éviter de les endommager ou de blesser le personnel. Le poids du module ASC varie entre 1398 lb. to 5331 lb. (634 kg to 2418 kg). Identifiez les symboles de centre de gravité et déterminez le poids de l'appareil avant de manipuler chaque armoire. Testez le levage et l'équilibre des armoires avant de transporter l'appareil. Maintenez en tout temps l'inclinaison verticale minimale. Lisez toutes les instructions ci-dessous avant de tenter de déplacer, lever, déballer ou préparer le système en vue de son installation.

2.5.1 Raised-Floor Mounting

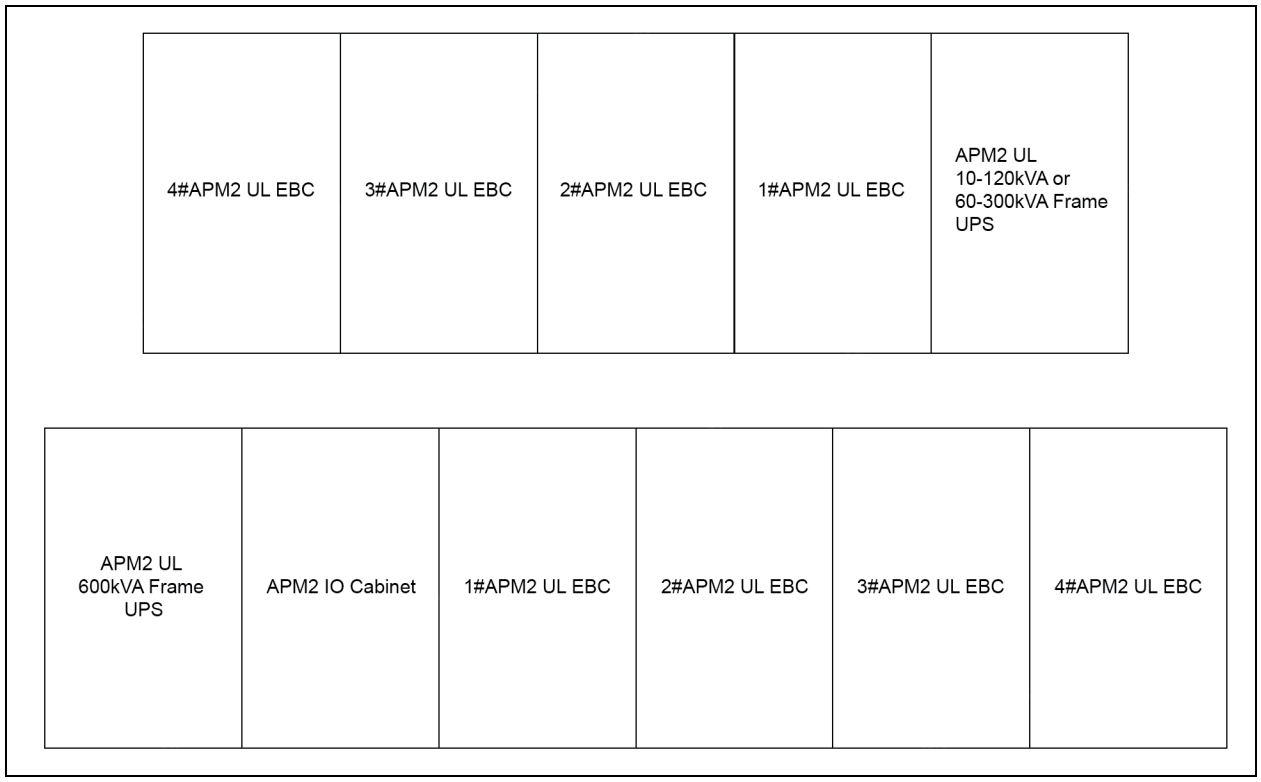
If the equipment is to be placed on a raised floor, it should be mounted on a pedestal suitably designed to accept the equipment point loading.

2.6 Layout

Depending on the site layout, the battery cabinets can be installed in any of several ways:

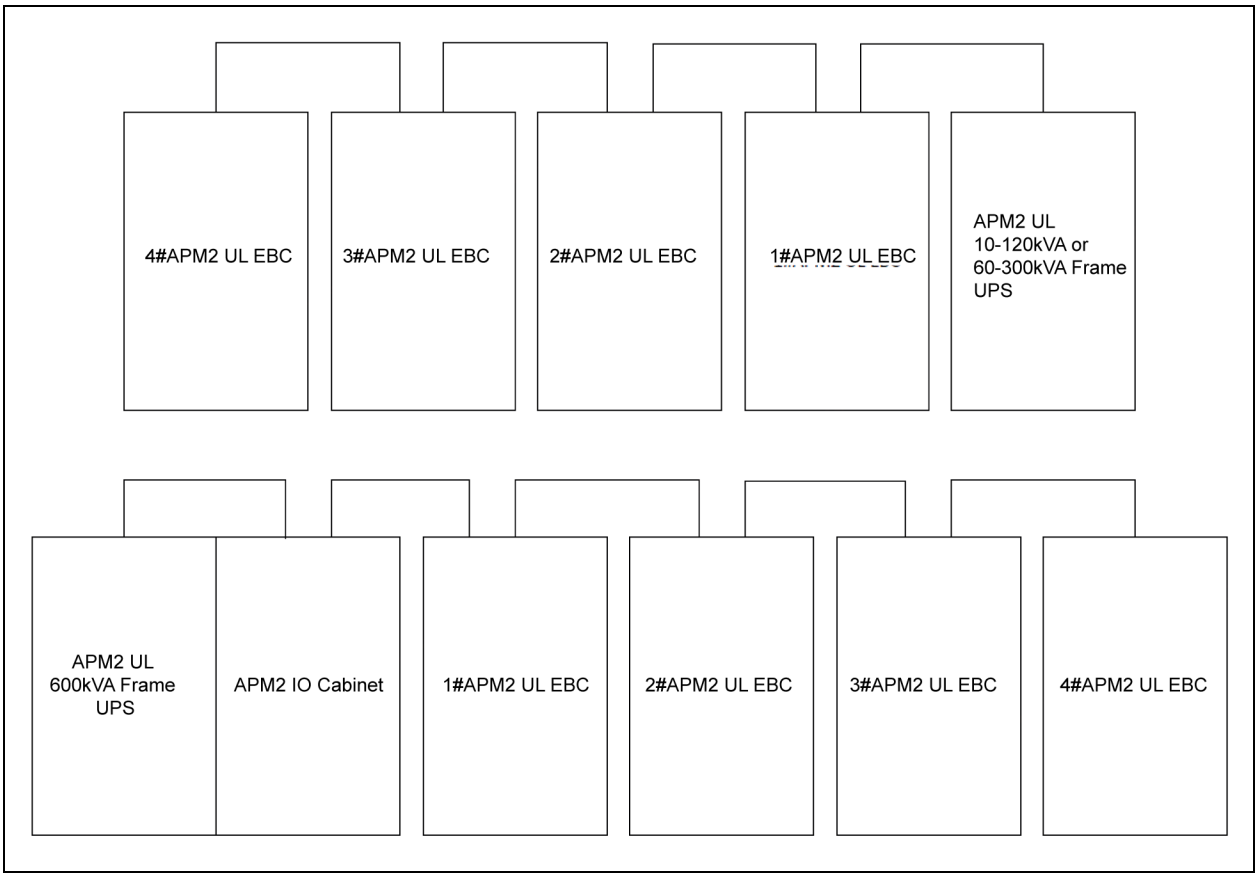
- Connected: Multiple battery cabinets bolted together as shown in Figure 2.3 below.
- Stand-Alone System: Cabinets not bolted to the Vertiv™ Liebert® APM2 as shown in Figure 2.4 on the next page.

Figure 2.3 Battery Cabinets Connected, Attached to UPS (Bolted Together)



Proprietary and Confidential ©2025 Vertiv Group Corp.

Figure 2.4 Battery Cabinets Connected, Attached to UPS(Standalone)



2.6.1 Connecting the Vertiv™ Liebert® APM2 Battery Cabinet to the UPS

After the battery cabinet equipment has been positioned and secured for operation and the batteries have been connected, connect the power cables as shown in Figure 3.5 on page 19.

1. Verify that all incoming high and low voltage power circuits are de-energized and locked out or tagged out before installing cables or making any electrical connections.
2. Remove the UPS front input output panel to gain access to the ground and battery busbars.
3. Remove the battery cabinet front panel to gain access to the busbars.
4. Connect the safety ground and any necessary bonding ground cables to the copper ground busbar. (Example: UPS located behind the output busbars.). All cabinets in the UPS system must be connected to the user's ground connection.
5. Connect the system battery cables from the UPS battery terminals (+, -) to battery cabinet copper (+, -) as shown in Figure 3.5 on page 19. Be sure that the battery connections are made with the right polarity, and tighten the connections to the torque specified in Table 6.1 on page 53. Do not close the battery circuit breaker before the equipment has been commissioned.
6. Connect the UPS and battery cabinet according to Batteries Approved for Use in Liebert® APM2 Battery Cabinet Systems on page 16.

3 Battery Installation

3.1 Safety

Special care should be taken when working with the batteries associated with the Vertiv™ Liebert® APM2 Battery Cabinet System equipment. When all the cells are connected together, the battery terminal voltage will exceed 288 VDC and is potentially lethal. A primary safety consideration is to install the battery equipment in an isolated area, accessible only to properly trained and qualified maintenance personnel.

WARNING! Risk of electrical shock and fire. Can cause equipment damage, personal injury, or death. Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

AVERTISSEMENT! Risque de décharge électrique et d'incendie. Pouvant entraîner des dommages matériels, des blessures et même la mort. Le remplacement des batteries doit être effectué ou supervisé par des membres du personnel dotés des compétences requises et connaissant les précautions à prendre. Le personnel non autorisé ne doit pas avoir accès aux batteries.

Lead-acid batteries can present a risk of fire because they generate hydrogen gas. In addition, the electrical connections must be protected against accidental short circuits which can cause sparks.

The following procedures should be followed:

- 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.
- After replacing battery jars in a battery cabinet, replace the retaining straps that hold the jars in place on the shelves. This will limit accidental movement of the jars and connectors should the cabinet ever need to be repositioned or relocated. Regular maintenance of the battery module is an absolute necessity. Periodic inspections of battery and terminal voltages, specific gravity and connection resistance should be made. Strictly follow the procedures outlined in the battery manufacturer's manual, available on the manufacturer's website. Valve regulated lead-acid (sealed-cell) batteries do require periodic maintenance. Although maintenance of electrolyte levels is not required, visual inspections and checks of battery voltage and connection resistance should be made.

NOTICE

Risk of equipment damage. Batteries should be cleaned with a dry cloth or a cloth lightly moistened with water. Do not use cleaners on the batteries. Solvents can make the battery cases brittle because individual battery characteristics are not identical and may change over time, the UPS module is equipped with circuitry to equalize battery cell voltages. This circuit increases charging voltage to maintain flooded type battery cells at full capacity.

Proprietary and Confidential ©2025 Vertiv Group Corp.

WARNING! Risk of electric shock, explosive reaction, hazardous chemicals and fire. Can cause equipment damage, personal injury, and death. Do not use equalize charging with valve regulated, lead-acid batteries, such as those in Vertiv™ Liebert® APM2 Battery Cabinet. Refer to the battery manufacturer's manual, available on the manufacturer's website, for specific information about equalize charging.

AVERTISSEMENT! Risque de décharge électrique, de réaction explosive, d'incendie et d'exposition à des produits chimiques dangereux pouvant entraîner des dommages matériels, des blessures et même la mort. N'utilisez pas de charge d'égalisation avec des batteries d'accumulateurs au plomb à régulation par soupape, comme celles utilisées dans les armoires de batterie Liebert. Reportez-vous au manuel du fabricant des batteries, disponible sur le siteweb du fabricant, pour obtenir des renseignements précis sur la charge d'égalisation.

The following general battery safety precautions and warnings must be observed at all times:

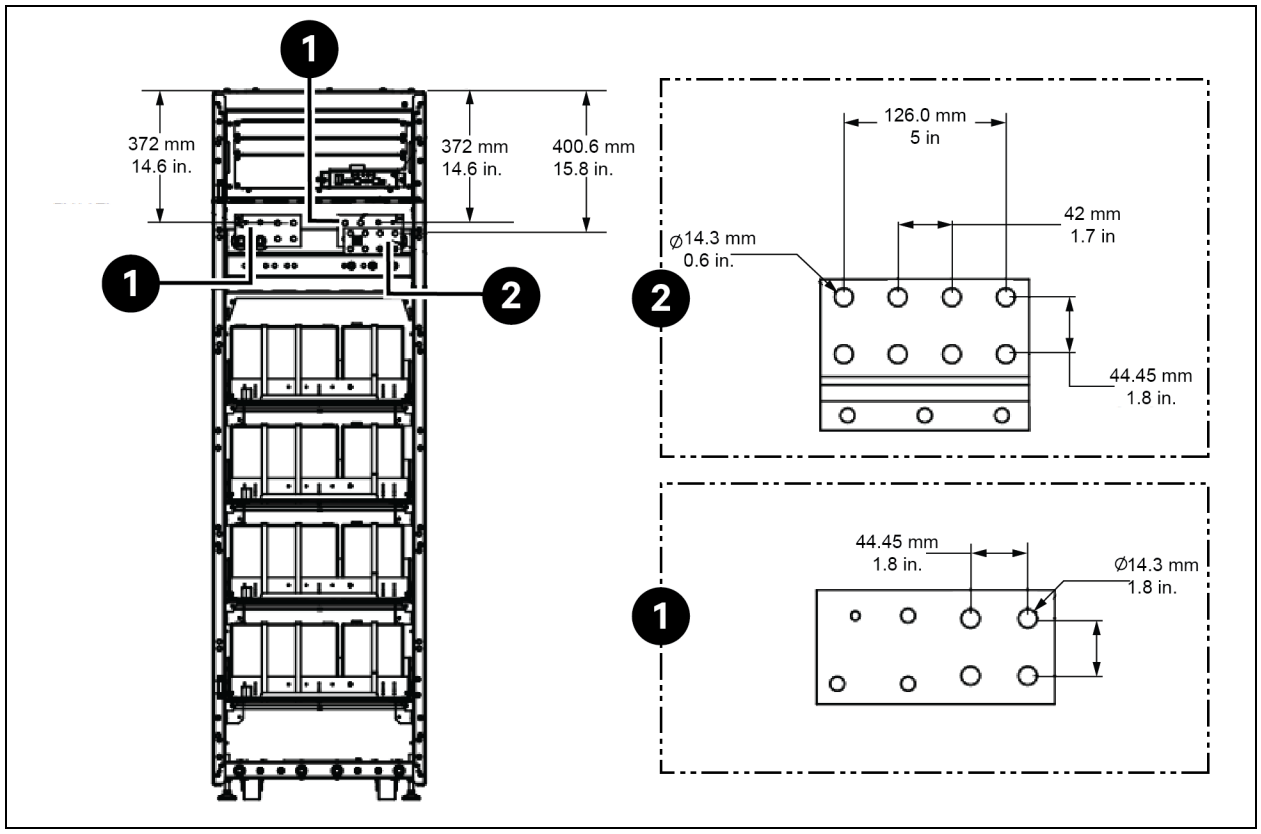
- A battery can present risk of electric shock or burn from high short circuit currents.
- When connected in a string, the voltage will exceed 288 VDC. This voltage is potentially lethal. Always observe high-voltage precautions.
- Eye protection must be worn to prevent injury from accidental electrical arcs.
- Remove rings, watches, necklaces, bracelets and all other metal objects.
- Use only tools with insulated handles.
- Wear appropriate personal protective equipment when handling batteries.
- If a battery leaks electrolyte or is otherwise physically damaged, it should be placed in a container resistant to wire and disposed of in accordance with local regulations.
- If electrolyte comes into contact with the skin, the affected area should be washed immediately with plenty of clean water.
- Batteries must always be disposed of according to local environmental laws.
- When replacing batteries, use the same number and type that were originally fitted.
- Disconnect charging source prior to connecting or disconnecting battery terminals.
- Determine if the battery is grounded. If it is grounded, remove source of ground. Contact with any part of a grounded battery can result in electrical shock.
- Battery support tray must be used whenever a battery tray is being pulled out.

3.1.1 Connecting the Batteries

The Vertiv™ Liebert® APM2 Battery Cabinet are mounted adjacent to each other on a solid floor, cables can be routed between cabinets through the sides or tops of the cabinets. Inter-tray connections must be made before using the battery cabinets.

If the Liebert® APM2 Battery Cabinet are installed adjacent to one another on a solid floor, these cables may be passed between the cabinets through the sides of the cabinets. Intertray connections must be made before the battery cabinet may be used.

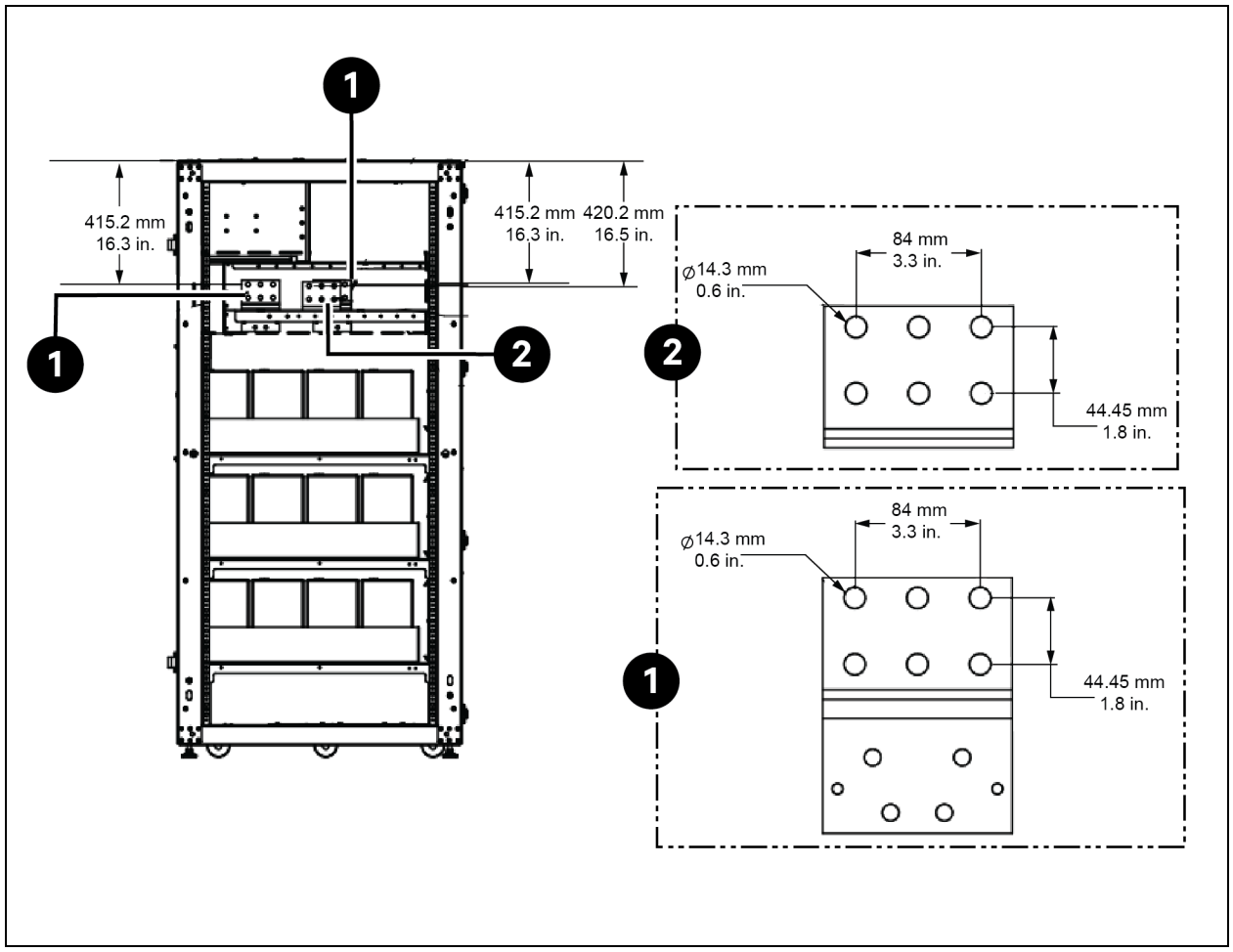
Figure 3.1 Battery Cabinet Terminal Detail for 600 mm Cabinet



Item	Description
1	Battery (+ and - terminal)
2	Ground busbar

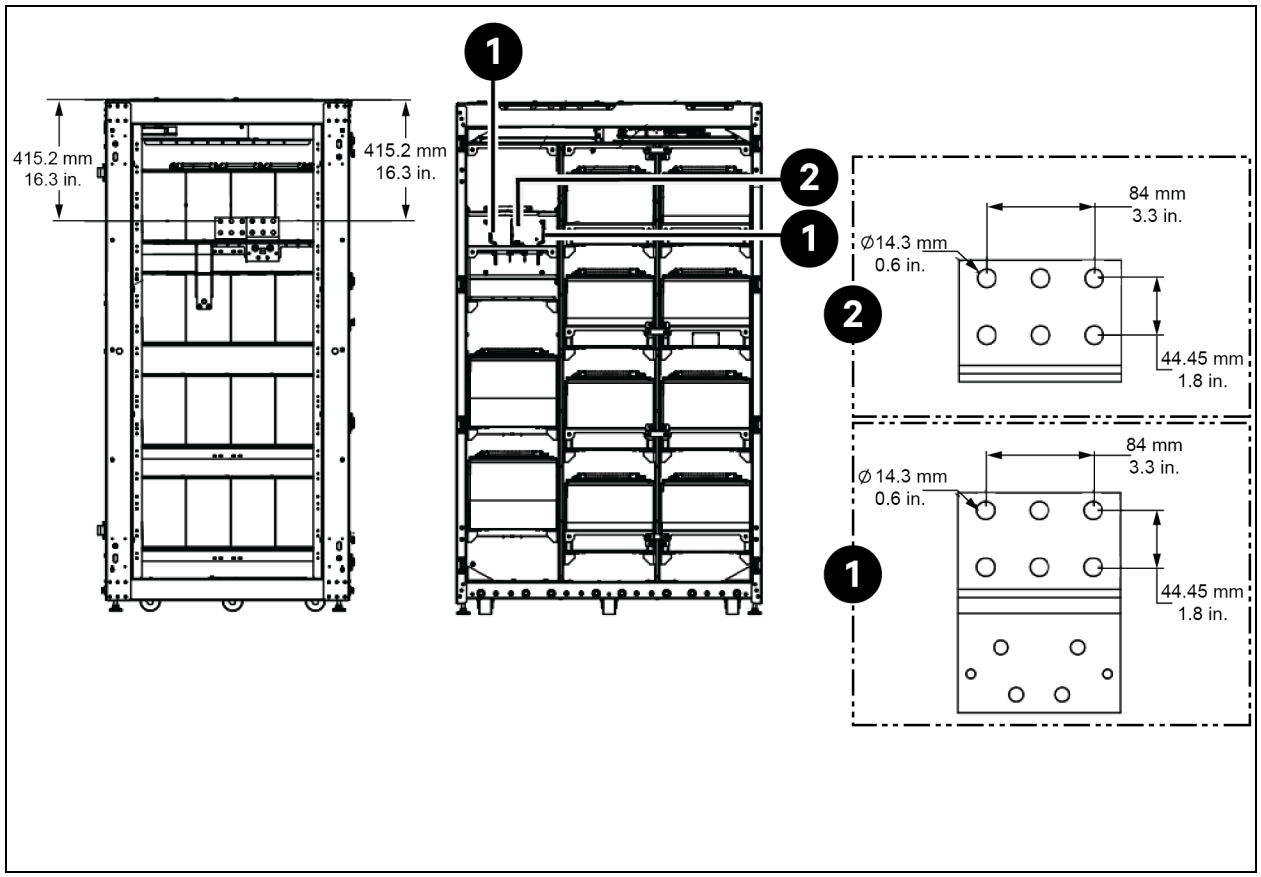
Proprietary and Confidential ©2025 Vertiv Group Corp.

Figure 3.2 Battery Cabinet Terminal Detail for 880 mm Cabinet



Item	Description
1	Battery (+ and - terminal)
2	Ground busbar

Figure 3.3 Battery Cabinet Terminal Detail for 1200 mm Cabinet



Item	Description
1	Battery (+ and - terminal)
2	Ground busbar

3.2 Power Connection

Depending on the site layout, the battery cabinets can be cabled as shown in Figure 2.3 on page 9 and Figure 2.4 on page 10.

3.2.1 Connected System

For cabinets ordered as connected (battery cabinets will bolt to each other), the busbars are connected between battery cabinets with the supplied power cables.

3.2.2 Stand-Alone Systems

The customer must supply all interconnecting cables and hardware for stand-alone cabinets. See Table 5.3 on page 48 for current ratings and recommended cable sizes according to local codes.

Proprietary and Confidential ©2025 Vertiv Group Corp.

3.2.3 Grounding

The ground cables and hardware will be supplied for cabinets ordered as connected or attached. The customer must supply the cables and hardware for detached and stand-alone cabinets. Size grounding conductor according to local codes. See terminal detail drawings for the location of the ground busbar.

3.3 Control Connection

Each APM2 Battery Cabinet contains a Lead-acid collection battery management system (BMS). See Figure 3.5 on page 19 through 3.8 on page 23 for control wiring between the Vertiv™ Liebert® APM2 Battery Cabinet and Vertiv™ Liebert® APM2 UL UPS.

3.4 Non-Standard Batteries

When batteries other than a matching battery cabinet are used, a remote battery disconnect switch with overcurrent protection is required per the National Electrical Code. Contact your local Vertiv sales representative about this option.

Verify that the battery area has adequate ventilation and battery operating temperature complies with the manufacturer's specifications and with all applicable national and local codes.

If you have any questions concerning batteries, battery racks or accessories, contact Vertiv at 1-800-542-2378.

3.5 Batteries Approved for Use in Liebert® APM2 Battery Cabinet Systems

Table 3.1 Batteries Approved for Use in 208 V and 600 mm Liebert® APM2 UL EBC

Supplier	Part Number	Single Battery Weight in lb. (kg)
EnerSys	12HX150-E	26 (11.8)
	12HX205-FR	43 (19.5)
	12HX300-FR	60 (27.2)
	12HX330-FR	71 (32.2)

Table 3.2 Batteries Approved for Use in 208 V and 880 mm Liebert® APM2 UL EBC

Supplier	Part Number	Single Battery Weight in lb. (kg)
EnerSys	12HX400-FR	80 (36.3)
	12HX505-FR	103 (46.7)
	12HX540-FR	106 (48.1)

Table 3.3 Batteries Approved for Use in 480 V and 880 mm Vertiv™ Liebert® APM2 UL EBC

Supplier	Part Number	Single Battery Weight in lb. (kg)
EnerSys	12HX150-E	26 (11.8)
	12HX205-FR	43 (19.5)
	12HX300-FR	60 (27.2)

Table 3.4 Batteries Approved for Use in 480 V and 1200 mm Liebert® APM2 UL EBC

Supplier	Part Number	Single Battery Weight in lb. (kg)
EnerSys	12HX330-FR	71 (32.2)
	12HX400-FR	80 (36.3)
	12HX505-FR	103 (46.7)
	12HX540-FR	106 (48.1)

3.5.1 Floor Installation

If the Liebert® APM2 Battery Cabinet is to be placed on a raised floor, the APM2 Battery Cabinet should be mounted on a pedestal that will support the equipment point loading. See the bottom view in Figure 4.1 on page 39 through Figure 4.10 on page 44 to design this pedestal.

The leveling feet are used to prevent the cabinet from rolling and should not be used for leveling or bearing the weight of battery cabinet.

3.5.2 Cable Entry

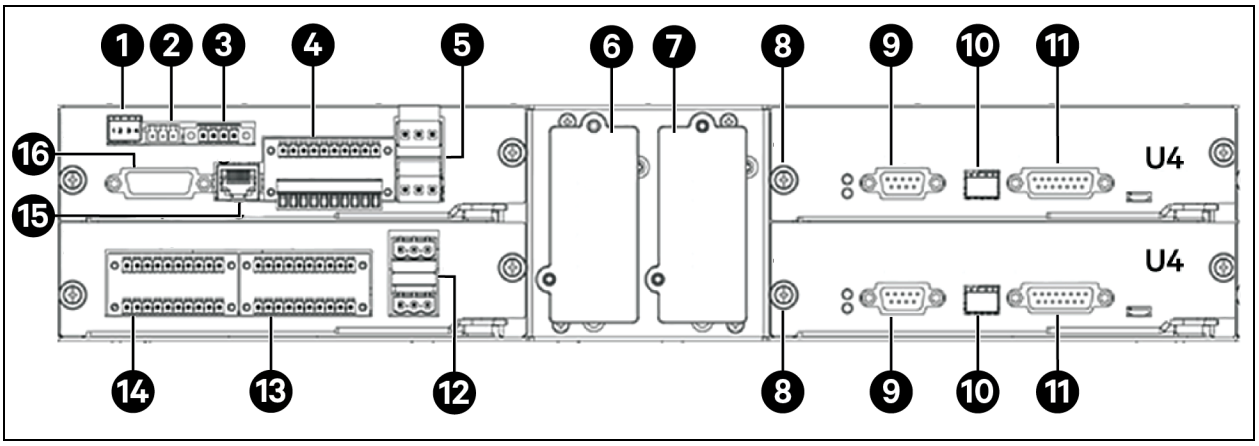
Cables can enter the Liebert® APM2 Battery Cabinet from the top or bottom through removal metal plates.

Some plates have factory-punched holes and others are designed to allow the personnel to punch holes for fitting and securing the conduit. Once the conduit holes are punched, these plates should be reattached to the UPS. The conduit size and wiring method must be in accordance with all local, regional and national codes and regulations, including NEC ANSI/NFPA 70.

Proprietary and Confidential ©2025 Vertiv Group Corp.

3.6 Control Module Connection

Figure 3.4 Control Module



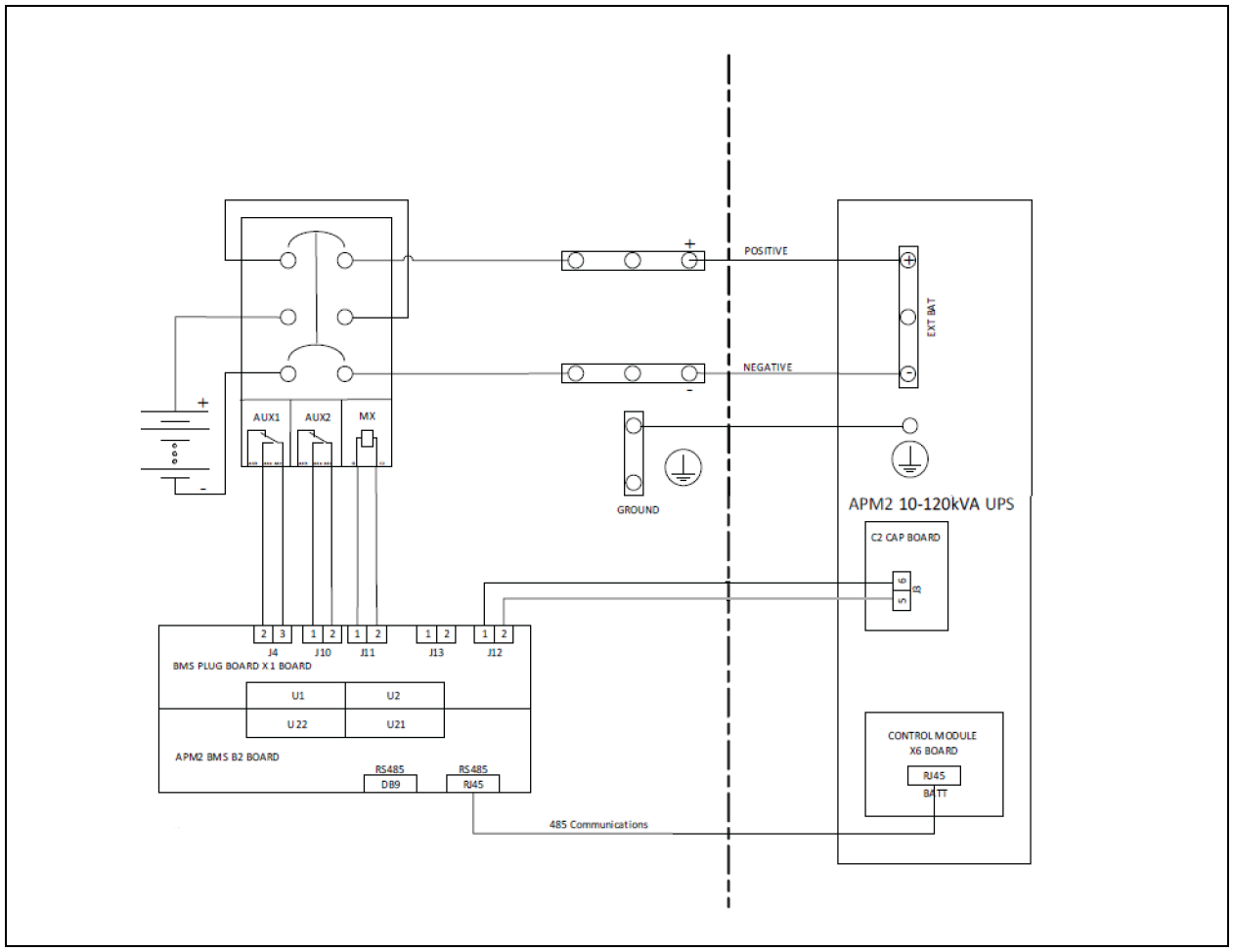
Item	Description	Item	Description
1	X6 SW1	9	U4 LBS: LBS sync signal port
2	X6 RS-485	10	U4 SW
3	X6 REPO port	11	U4 Parallel communication port
4	X6 J3: BCB and I/O dry contact ports	12	X7 J3: Other programmable output dry contact port
5	X6 J22: Backfeeding port	13	X7 J2: I/O dry contact ports
6	Liebert® IntellSlot™ 1	14	X7 J1: BCB and I/O dry contact ports
7	Liebert® IntellSlot™ 2	15	X6 BATT: Battery temperature or BMS communication port
8	Screw (quantity = 8)	16	X6 HMI port

The battery cabinet interface is on the a lead-acid collection BMS, a lead-acid collection backplane and battery copper. See 3.6 above and Figure 3.7 on page 23 for additional details.

3.7 Control Wiring

3.7.1 Battery Cabinet Interface Connectors

Figure 3.5 Vertiv™ Liebert® APM2 UL EBC Connection to Vertiv™ Liebert® APM2 10 kVA to 120 kVA UPS



Proprietary and Confidential ©2025 Vertiv Group Corp.

Figure 3.6 Vertiv™ Liebert® APM2 UL EBC Connection to Vertiv™ Liebert® APM2 60 kVA to 300 kVA and Vertiv™ Liebert® 300 kVA to 600 kVA UPS

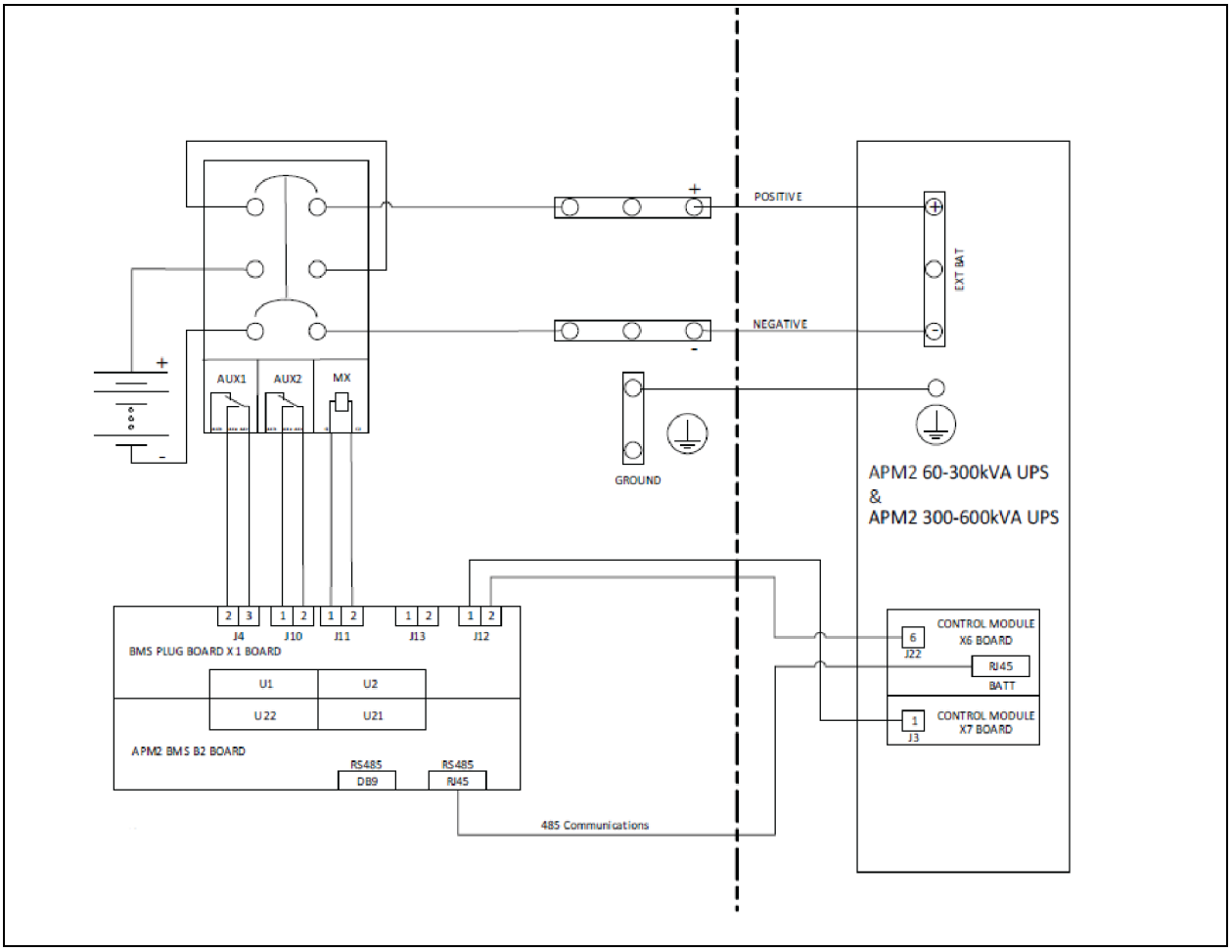


Table 3.5 Wiring for Vertiv™ Liebert® APM2 UL UPS to APM2 UL EBC

Liebert® APM2 UL EBC	Liebert® APM2 UL UPS
EBC BAT+ Copper bar	UPS BAT+ Copper bar
EBC BAT- Copper bar	UPS BAT- Copper bar
EBC_BMS plug board_J12	Liebert® APM2 UL FR1_C2 board _J3 (Liebert® APM2 UL FR3 and FR4_X6 board _J22 and X7 board _J3)
EBC_BMS 485 RJ45	Liebert® APM2 UL UPS X6 board _RJ45

Matching Battery Cabinets—Optional

Although the individual battery cells are sealed (valve regulated) and require only minimal maintenance, the Battery Cabinets should be given a periodic inspection and electrical check. Checks should be performed at least annually to ensure years of trouble-free service.

Voltage records: With the battery cabinet DC circuit breaker closed and the connected UPS operating, measure and record battery float voltage. With the DC circuit breaker open, measure and record the nominal (open circuit) voltage. Both these measurements should be made across the final positive and negative terminal lugs. Compare these values with those shown below. The recorded nominal voltage should be no less than the value shown; while the recorded float voltage should be within the range shown. If a discrepancy is found, contact Vertiv.

Table 3.6 Battery Voltage, Rated and Float

Vertiv™ Liebert® APM2 UL EBC			
Liebert® UL EBC Width	**Number of Cells**	**Rated Voltage (VDC)**	**Float Voltage (VDC)**
208 V and 600 mm	144	288	327
208 V and 880 mm	144	288	327
480 V and 880 mm	216	432	491
480 V and 1200 mm	240	480	545

Power connections: Check for corrosion and connection integrity. Inspect wiring for discolored or cracked insulation. Clean and/or retighten as required. Refer to torque specifications in Table 6.3 on page 54.

Battery cell terminals: Check for discoloration, corrosion, and connection integrity. Clean and tighten if necessary. Note that when installing a new battery, the initial torque value is 5 lb.-in. more than the retorque value. Table 6.3 on page 54 shows battery retorque values. All batteries are supplied with tab washers for easier connection to the lead acid.

If the system uses a different model battery, contact Vertiv for the required torque value.

To access battery cell terminals, disconnect the inter-tier cable and two shelf retaining screws. Once disconnected, insulate (with protective boot or electrical tape) the cables to prevent accidental shorts. The battery shelf can now be pulled out. Tighten each terminal connection to the retorque value. When replacing a battery, the terminal connections must be cleaned and tightened. Disconnect and insulate the cables connected to the battery. Secure each battery shelf with retaining screws when maintenance is complete.

WARNING! Risk of heavy unit tipping over while being moved. Can cause property damage, injury and death. The casters are strong enough for movement across even surfaces only. Casters may fail if they are subjected to shock loading, such as being dropped or rolled over holes in the floor or obstructions. Such failure may cause the unit to tip over, injuring personnel and damaging the equipment.

AVERTISSEMENT! Risque de renversement de l'unité lourde lors de son déplacement. Peut causer des dommages matériels, des blessures, voire la mort. Les roulettes sont suffisamment solides pour se déplacer uniquement sur des surfaces planes. Les roulettes peuvent tomber en panne si elles sont soumises à des chocs, comme une chute ou un retournement sur des trous dans le sol ou des obstructions. Une telle défaillance pourrait faire basculer l'unité, blessant le personnel et endommageant l'équipement.

Proprietary and Confidential ©2025 Vertiv Group Corp.

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

WARNING! Risk of electrical shock. Can cause personal injury and death. Check for voltage with both AC and DC voltmeters before working within the EBC. Check for voltage with both AC and DC voltmeters before making contact. Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes, and glasses should be involved in installing the EBC or preparing the EBC for installation. When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats. Lead-acid batteries contain hazardous materials. Batteries must be handled, transported, and recycled or discarded in accordance with federal, state and local regulations. Because lead is a toxic substance, lead-acid batteries must be recycled rather than discarded.
Do not dispose of battery or batteries in a fire. The battery may explode. Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It is toxic.

The following precautions must be observed when working on batteries:

- Remove watches, rings and 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 charging source prior to connecting or disconnecting battery terminals.
- Determine whether the battery is grounded. If it is grounded, remove source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.

AVERTISSEMENT! Risque de choc électrique. Peut causer des blessures corporelles, voire la mort.
Vérifiez la tension avec les voltmètres AC et DC avant de travailler dans l'EBC. Vérifiez la tension avec les voltmètres AC et DC avant de prendre contact. Seul le personnel correctement formé et qualifié portant un casque de sécurité, des gants, des chaussures et des lunettes appropriés doit être impliqué dans l'installation de l'EBC ou dans la préparation de l'EBC pour l'installation. Lors de l'exécution d'une maintenance avec une partie de l'équipement sous tension, le personnel d'entretien et l'équipement de test doivent se tenir debout sur des tapis en caoutchouc. Les batteries au plomb contiennent des matières dangereuses. Les batteries doivent être manipulées, transportées et recyclées ou jetées conformément aux réglementations fédérales, étatiques et locales. Le plomb étant une substance toxique, les batteries au plomb doivent être recyclées plutôt que jetées. Ne jetez pas la ou les piles dans le feu. La batterie pourrait exploser. N'ouvrez pas et ne mutilez pas la ou les piles. L'électrolyte libéré est nocif pour la peau et les yeux. C'est toxique.

Lorsque vous travaillez avec des batteries, prenez les précautions suivantes :

- Retirez montre, bagues et tout autre objet métallique.
- Utilisez des outils dont le manche est isolé.
- Portez des gants et des bottes de caoutchouc.
- Ne posez aucun outil ni pièce métallique sur le dessus d'une batterie.
- Déconnectez la source de chargement avant de brancher ou de débrancher les bornes d'une batterie.
- Vérifiez si la batterie est mise à la terre. Le cas échéant, éliminez la cause de la mise à la terre.
- Le contact avec toute partie d'une batterie mise à la terre peut provoquer une décharge électrique. Pour réduire de tels risques d'accident, débranchez les prises de terre avant de procéder à l'installation ou à l'entretien.

3.8 Vertiv™ Liebert® APM2 Battery Cabinet Monitoring System

Figure 3.7 Liebert® APM2 UL EBC Monitoring System

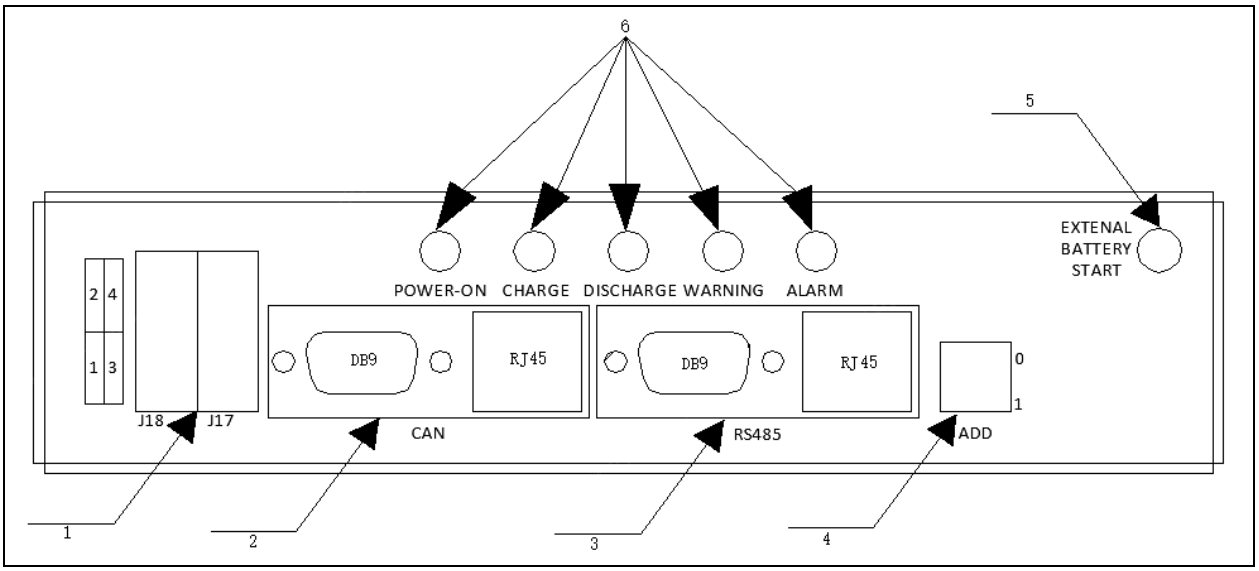


Table 3.7 Lead-acid BMS Schedule

Number	Name	Function
1	Dry contact	There are four dry contacts, one for BCB online and the other three for reservation.
2	CAN communication	Reserve
3	RS485 communication	EBC communicates with UPS through RS485.
4	DIP switch	UPS identifies the EBC through this DIP switch number: • APM2 UL EBC：1000 • APM2 UL EBC：0100 • APM2 UL EBC：1100 • APM2 UL EBC：0010
5	Lead-acid BMS start button	Push the button and the lead-acid acquisition BMS will work.
6	BMS indicator light	**Power-on:** The light is on, indicating that the lead-acid collection board is working normally. **Charge and discharge:** Display function reserved. **Warning:** Lead-acid collection system abnormality. **Alarm:** Lead-acid collection system failure.

Liebert® APM2 UL EBC includes a battery monitoring system (lead acid collection BMS) inside the cabinet. The monitoring system continuously checks battery parameters, such as overall string voltage, current and temperature. Automatic periodic tests of battery will verify the battery's operating integrity.

The lead acid collection BMS is installed inside the battery cabinet as shown in Figure 3.7 above.

Connect the BMS according to Figure 3.7 above and 3.8 above.

Proprietary and Confidential ©2025 Vertiv Group Corp.

Figure 3.8 Multiple Vertiv™ Liebert® APM2 UL EBC Connection to Vertiv™ Liebert® APM2 UPS Diagram

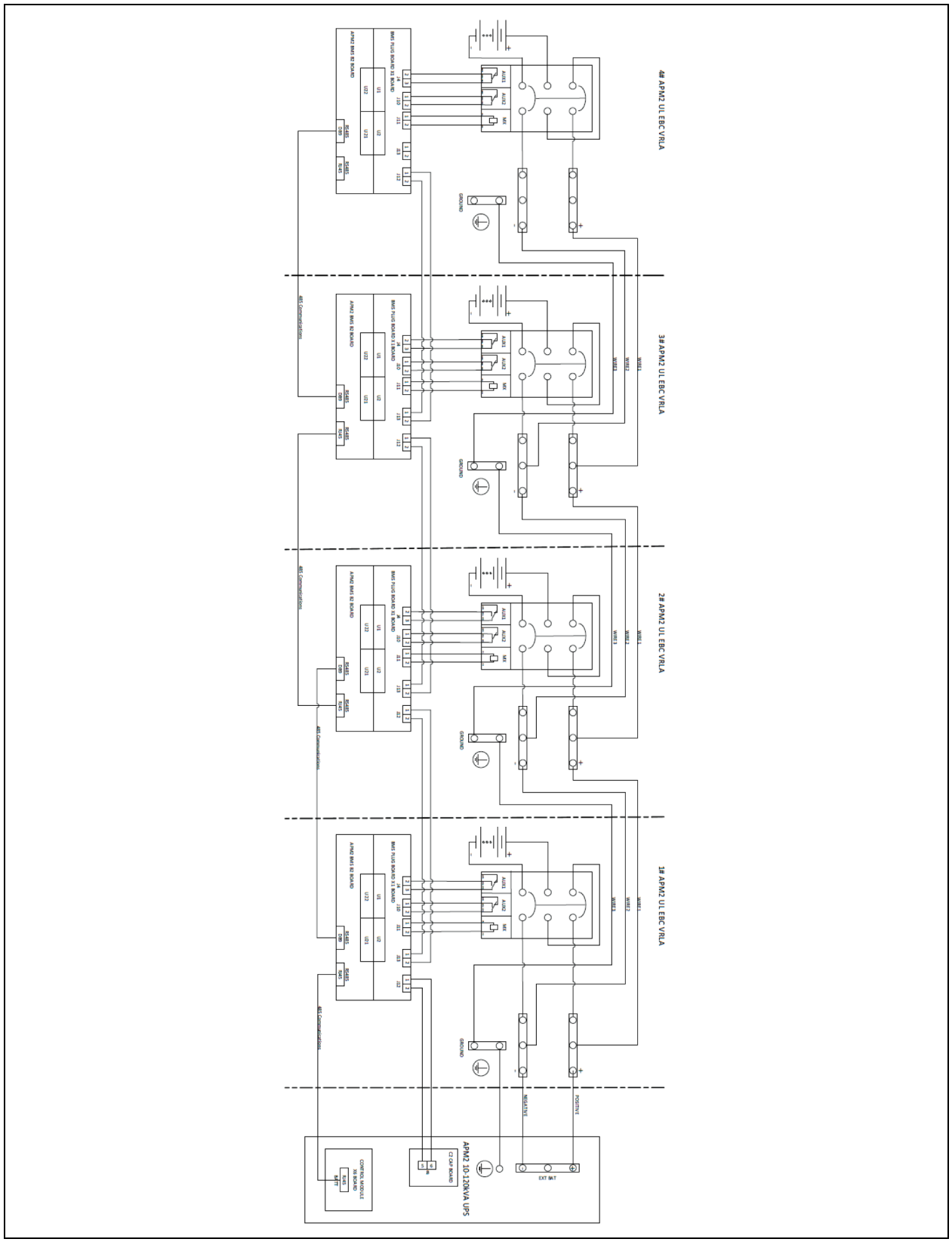
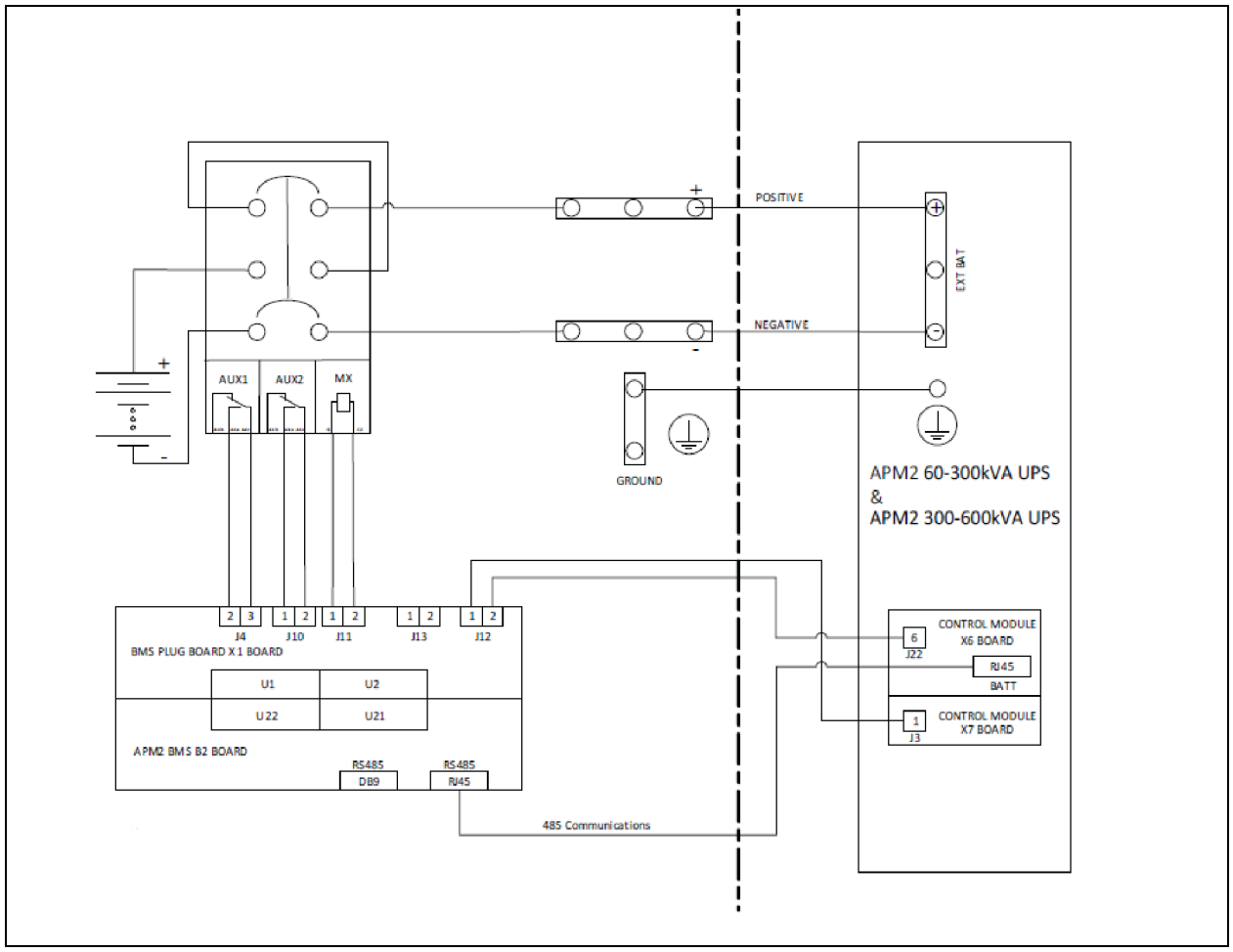


Figure 3.9 Multiple Vertiv™ Liebert® APM2 UL EBC Connection to Vertiv™ Liebert® APM2 60 kVA to 300 kVA UPS and Vertiv™ Liebert® APM2 300 kVA to 600 kVA UPS



3.9 Circuit Breaker Control Cable Wiring

The circuit breaker control cable includes the circuit breaker and auxiliary contact cable. The shunt tripping realizes the circuit breaker tripping control, and the auxiliary contact feedback the circuit breaker switch status. See wiring diagram in Figure 3.5 on page 19 and 3.8 on page 23. Liebert® APM2 Battery Cabinet circuit breaker parameters shown in Table 3.8 below.

Table 3.8 UL EBC Circuit Breaker Schedule

Battery Cabinet	Amp Frame (AF) /Amp Trip (AT)	IR Setting	Li Setting	MFG
208 V and 600 mm UL EBC	400/400	400	2000	LS
208 V and 880 mm UL EBC	600/600	600	3000	LS
480 V and 880 mm UL EBC	400/400	400	2000	LS
480 V and 1200 mm UL EBC	600/600	600	3000	LS

Proprietary and Confidential ©2025 Vertiv Group Corp.

3.10 Battery Protection

3.10.1 Battery Low-Voltage Warning

Before the end of discharge (EOD), the UPS displays a low battery warning. After this warning, the battery has the capacity for 5 minutes discharging with full load (default time). The UPS can be user-configured to display this warning from 3 to 60 minutes before EOD.

3.10.2 Battery End of Discharge Protection

If the battery voltage is lower than the EOD voltage, the battery converter will be shut down.

3.10.3 Battery Short Circuit Protection

When the UL EBC circuit breaker is turned on, if there is a positive and negative short circuit at the circuit breaker output terminal, the circuit breaker will trip, which can protect the UL EBC.

3.11 Vertiv™ Liebert® APM2 UL EBC Backup Times

Each Liebert®APM2 Battery Cabinet contains a string of valve regulated lead-acid batteries connected in series and placed in a matching cabinet. Multiple battery cabinets can be combined into systems by connecting the cabinets together with internal wiring rated for the UPS. Each Liebert®APM2 Battery Cabinet has a built-in circuit breaker. The UPS will support additional strings of the same battery, up to a maximum of four strings per UPS.

The Liebert®APM2 Battery Cabinet is designed to be connected to Liebert®APM2 Battery Cabinet to provide a line-up with all interconnected power and control wiring.

The Liebert®APM2 Battery Cabinet can be installed separately from the UPS module. Contact Application Engineering for assistance to meet site conditions.

The Liebert®APM2 Battery Cabinet itself has a one-year parts and field labor warranty. Battery warranty is provided by the manufacturer.

- All control wiring and cabinet-to-UPS power cables must be field-supplied for stand-alone cabinet applications.
- Liebert®APM2 Battery Cabinet are intended for use with individual UPS units only.
- The run time listed in this section reflect the UPS unit system voltage 208/208 V, 480/480 V. For systems voltages that are 208-208 V / 120 V, 480-208 V/ 120 V or 480-480 V/ 277 V that include an output transformer, contact Applications Engineering for updated run times for these systems.

Table 3.9 Vertiv™ Liebert® APM2 UL EBC — 208 V and 600 mm Backup Time Table

kVA (100% load BoL)	10	15	20	25	30	40	45	50	60	75	80	90	100	120	140	150	Cabinet Strings
Output Load (W)	10k	15k	20k	25k	30k	40k	45k	50k	60k	75k	80k	90k	100k	120k	140k	150k	
Battery Power per Cell W	75	113	151	189	226	302	340	377	453	566	604	679	755	906	1057	1132	1
Backup Time BOL (12HX150) min	43	25	17	12	9	5	3										
Backup Time BOL (12HX150-E) min	33	19	13	8	6												
Backup Time BOL (12HX205-FR) min	53	32	23	17	14	9	8	7	4								
Backup Time BOL (12HX300-FR) min	76	54	38	27	21	14	12	10	8	5	4	2					
Backup Time BOL (12HX330-FR) min	82	63	45	35	27	18	15	13	10	7	6	4	2				
Battery Power per Cell W	38	57	75	94	113	151	170	189	226	283	302	340	377	453	528	566	2
Backup Time BOL (12HX150) min	80	60	43	32	25	17	14	12	9	6	5	3					

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.9 Vertiv™ Liebert® APM2 UL EBC — 208 V and 600 mm Backup Time Table (continued)

kVA (100% load BoL)	10	15	20	25	30	40	45	50	60	75	80	90	100	120	140	150	Cabinet Strings
Output Load (W)	10k	15k	20k	25k	30k	40k	45k	50k	60k	75k	80k	90k	100k	120k	140k	150k	
Backup Time BOL (12HX150-E) min	72	45	33	25	19	13	10	8	6								
Backup Time BOL (12HX205-FR) min	83	68	53	41	32	23	19	17	14	10	9	8	7	4			
Backup Time BOL (12HX300-FR) min		87	76	65	54	38	31	27	21	15	14	12	10	8	6	5	
Backup Time BOL (12HX330-FR) min			82	72	63	45	40	35	27	19	18	15	13	10	8	7	
Battery Power per Cell W	25	38	50	63	75	101	113	126	151	189	201	226	252	302	352	377	3
Backup Time BOL (12HX150) min		80	67	54	43	29	25	21	17	12	11	9	8	5	3		
Backup Time BOL (12HX150-E) min		72	51	41	33	23	19	17	13	8	7	6	4				
Backup Time BOL (12HX205-		83	73	63	53	38	32	28	23	17	16	14	12	9	7	7	

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.9 Vertiv™ Liebert® APM2 UL EBC — 208 V and 600 mm Backup Time Table (continued)

kVA (100% load BoL)	10	15	20	25	30	40	45	50	60	75	80	90	100	120	140	150	Cabinet Strings
Output Load (W)	10k	15k	20k	25k	30k	40k	45k	50k	60k	75k	80k	90k	100k	120k	140k	150k	
FR) min																	
Backup Time BOL (12HX300-FR) min				83	76	61	54	46	38	27	25	21	18	14	11	10	
Backup Time BOL (12HX330-FR) min				88	82	69	63	57	45	35	31	27	23	18	14	13	
Battery Power per Cell W	19	28	38	47	57	75	85	94	113	142	151	170	189	226	264	283	4
Backup Time BOL (12HX150) min			80	70	60	43	37	32	25	18	17	14	12	9	7	6	
Backup Time BOL (12HX150-E) min			72	55	45	33	28	25	19	14	13	10	8	6	3		

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.9 Vertiv™ Liebert® APM2 UL EBC — 208 V and 600 mm Backup Time Table (continued)

kVA (100% load BoL)	10	15	20	25	30	40	45	50	60	75	80	90	100	120	140	150	Cabinet Strings
Output Load (W)	10k	15k	20k	25k	30k	40k	45k	50k	60k	75k	80k	90k	100k	120k	140k	150k	
Backup Time BOL (12HX205-FR) min			83	76	68	53	45	41	32	25	23	19	17	14	11	10	
Backup Time BOL (12HX300-FR) min					87	76	70	65	54	41	38	31	27	21	17	15	
Backup Time BOL (12HX330-FR) min						82	77	72	63	49	45	40	35	27	22	19	

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.10 Vertiv™ Liebert® APM2 Battery Cabinet — 208 V and 880 mm Backup Time Table

kVA (100% load BoL)	10	15	20	25	30	40	45	50	60	75	80	90	100	120	140	150	Cabinet Strings
Output Load (W)	10k	15k	20k	25k	30k	40k	45k	50k	60k	75k	80k	90k	100k	120k	140k	150k	
Battery Power per Cell W	75	113	151	189	226	302	340	377	453	566	604	679	755	906	1057	1132	1
Backup Time BOL (12HX400-FR) min	87	70	53	40	31	21	18	15	12	9	8	6	5				
Backup Time BOL (12HX505-FR) min		80	67	55	43	30	27	23	18	13	12	10	8	5	2		
Backup Time BOL (12HX540-FR) min		82	70	59	48	34	29	26	20	14	13	11	9	6	3		
Battery Power per Cell W	38	57	75	94	113	151	170	189	226	283	302	340	377	453	528	566	2
Backup Time BOL (12HX400-FR) min			87	78	70	53	45	40	31	24	21	18	15	12	9	9	
Backup Time BOL (12HX505-FR) min				86	80	67	61	55	43	33	30	27	23	18	14	13	
Backup Time BOL (12HX540-FR) min				87	82	70	65	59	48	37	34	29	26	20	16	14	

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.10 Vertiv™ Liebert® APM2 Battery Cabinet — 208 V and 880 mm Backup Time Table (continued)

kVA (100% load BoL)	10	15	20	25	30	40	45	50	60	75	80	90	100	120	140	150	Cabinet Strings
Output Load (W)	10k	15k	20k	25k	30k	40k	45k	50k	60k	75k	80k	90k	100k	120k	140k	150k	
Battery Power per Cell W	25	38	50	63	75	101	113	126	151	189	201	226	252	302	352	377	3
Backup Time BOL (12HX400-FR) min					87	76	70	65	53	40	37	31	28	21	17	15	
Backup Time BOL (12HX505-FR) min						84	80	76	67	55	51	43	39	30	25	23	
Backup Time BOL (12HX540-FR) min						85	82	78	70	59	55	48	42	34	28	26	
Battery Power per Cell W	19	28	38	47	57	75	85	94	113	142	151	170	189	226	264	283	4
Backup Time BOL (12HX400-FR) min						87	83	78	70	58	53	45	40	31	26	24	
Backup Time BOL (12HX505-FR) min							89	86	80	70	67	61	55	43	37	33	
Backup Time BOL (12HX540-FR) min							90	87	82	73	70	65	59	48	40	37	

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.11 Vertiv™ Liebert® UL EBC — 480 V and 880 mm Backup Time Table

kVA (100% load BoL)	20	30	40	50	60	80	90	100	120	150	Cabinet Strings
Output Load (W)	20k	30k	40k	50k	60k	80k	90k	100k	120k	150k	
Battery Power per Cell W	107	161	215	269	322	430	483	537	644	806	1
Backup Time BOL (12HX150) min	27	15	10	7	4						
Backup Time BOL (12HX150-E) min	20	11	6	3							
Backup Time BOL (12HX205-FR) min	35	21	14	11	9	5	3				
Backup Time BOL (12HX300-FR) min	57	34	23	16	13	9	7	6	3		
Battery Power per Cell W	54	81	107	134	161	215	242	269	322	403	2
Backup Time BOL (12HX150) min	63	40	27	19	15	10	8	7	4		
Backup Time BOL (12HX150-E) min	48	30	20	16	11	6	5	3			
Backup Time BOL (12HX205-FR) min	70	49	35	27	21	14	13	11	9	6	
Backup Time BOL (12HX300-FR) min	88	73	57	43	34	23	19	16	13	9	
Battery Power per Cell W	36	54	72	90	107	143	161	179	215	269	3
Backup Time BOL (12HX150) min	82	63	45	35	27	18	15	13	10	7	
Backup Time BOL (12HX150-E) min	76	48	35	27	20	14	11	9	6	3	
Backup Time BOL (12HX205-FR) min	85	70	56	43	35	25	21	18	14	11	
Backup Time BOL (12HX300-FR) min		88	78	67	57	40	34	29	23	16	
Battery Power per Cell W	27	40	54	67	81	107	121	134	161	201	4
Backup Time BOL (12HX150) min		78	63	50	40	27	23	19	15	11	
Backup Time BOL (12HX150-E) min		66	48	38	30	20	18	16	11	7	
Backup Time BOL (12HX205-FR) min		81	70	60	49	35	29	27	21	15	
Backup Time BOL (12HX300-FR) min			88	80	73	57	49	43	34	25	

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.12 Vertiv™ Liebert® APM2 UL EBC — 480 V and 1200 mm Backup Time Table

kVA (100% load BoL)	20	30	40	50	60	80	90	100	120	150	180	200	225	240	250	300	360	400	420	480	500	540	600	Cabinet Strings
Output Load (W)	20k	30k	40k	50k	60k	80k	90k	100k	120k	150k	180k	200k	225k	240k	250k	300k	360k	400k	420k	480k	500k	540k	600k	
Battery Power per Cell W	88	132	175	219	263	351	395	439	526	658	789	877	987	1053	1096	1316	1579	1754	1842	2105	2193	2368	2632	1
Backup Time BOL (12HX330-FR) min	76	54	38	28	22	14	12	10	8	5														
Backup Time BOL (12HX400-FR) min	81	62	44	33	26	17	14	13	9	7	4													
Backup Time BOL (12HX505-FR) min	88	74	59	45	37	26	22	19	15	10	8	6	4	2										
Backup Time BOL (12HX540-FR) min	89	76	63	50	40	28	24	20	16	12	8	7	5	3	3									

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.12 Vertiv™ Liebert® APM2 UL EBC — 480 V and 1200 mm Backup Time Table (continued)

kVA (100% load BoL)	20	30	40	50	60	80	90	100	120	150	180	200	225	240	250	300	360	400	420	480	500	540	600	Cabinet Strings
Output Load (W)	20k	30k	40k	50k	60k	80k	90k	100k	120k	150k	180k	200k	225k	240k	250k	300k	360k	400k	420k	480k	500k	540k	600k	
Battery Power per Cell W	44	66	88	110	132	175	197	219	263	329	395	439	493	526	548	658	789	877	921	1053	1096	1184	1316	2
Backup Time BOL (12HX330-FR) min		87	76	65	54	38	32	28	22	16	12	10	9	8	7	5								
Backup Time BOL (12HX400-FR) min			81	72	62	44	38	33	26	19	14	13	10	9	9	7	4							
Backup Time BOL (12HX505-FR) min			88	81	74	59	52	45	37	28	22	19	16	15	14	10	8	6	5	2				
Backup Time BOL (12HX540-FR) min			89	83	76	63	56	50	40	30	24	20	18	16	15	12	8	7	6	3	3			

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.12 Vertiv™ Liebert® APM2 UL EBC — 480 V and 1200 mm Backup Time Table (continued)

kVA (100% load BoL)	20	30	40	50	60	80	90	100	120	150	180	200	225	240	250	300	360	400	420	480	500	540	600	Cabinet Strings
Output Load (W)	20k	30k	40k	50k	60k	80k	90k	100k	120k	150k	180k	200k	225k	240k	250k	300k	360k	400k	420k	480k	500k	540k	600k	
Battery Power per Cell W	29	44	58	73	88	117	132	146	175	219	263	292	329	351	365	439	526	585	614	702	731	789	877	3
Backup Time BOL (12HX330-FR) min				83	76	61	54	47	38	28	22	19	16	14	14	10	8	6	6	4	3			
Backup Time BOL (12HX400-FR) min				88	81	68	62	56	44	33	26	23	19	17	16	13	9	8	8	6	5	4		
Backup Time BOL (12HX505-FR) min					88	79	74	69	59	45	37	32	28	26	24	19	15	13	12	9	9	8	6	
Backup Time BOL (12HX540-FR) min					89	80	76	72	63	50	40	36	30	28	27	20	16	14	13	10	10	8	7	

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 3.12 Vertiv™ Liebert® APM2 UL EBC — 480 V and 1200 mm Backup Time Table (continued)

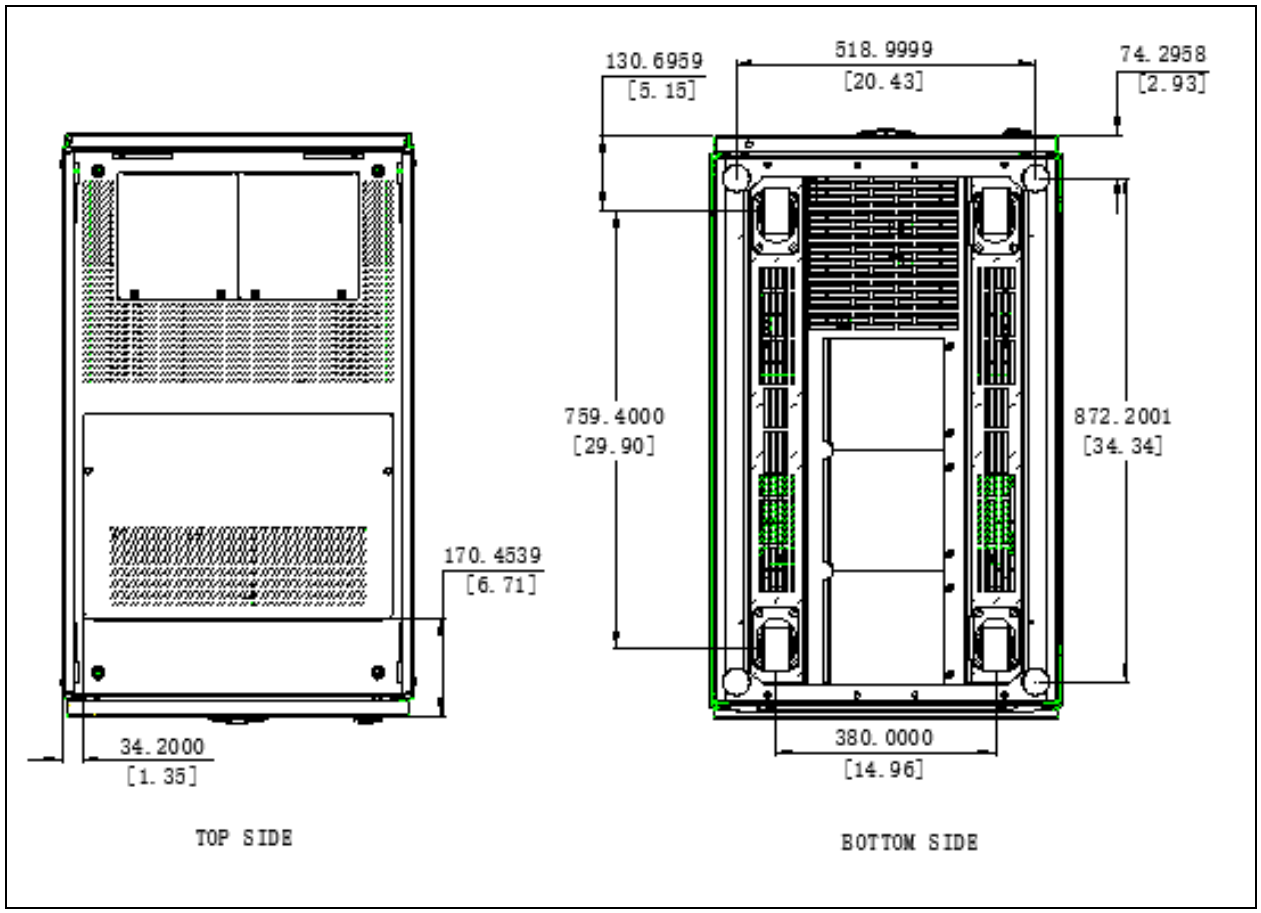
kVA (100% load BoL)	20	30	40	50	60	80	90	100	120	150	180	200	225	240	250	300	360	400	420	480	500	540	600	Cabinet Strings
Output Load (W)	20k	30k	40k	50k	60k	80k	90k	100k	120k	150k	180k	200k	225k	240k	250k	300k	360k	400k	420k	480k	500k	540k	600k	
Battery Power per Cell W	22	33	44	55	66	88	99	110	132	164	197	219	247	263	274	329	395	439	461	526	548	592	658	4
Backup Time BOL (12HX330-FR) min					87	76	70	65	54	41	32	28	24	22	20	16	12	10	9	8	7	6	5	
Backup Time BOL (12HX400-FR) min						81	77	72	62	47	38	33	28	26	25	19	14	13	12	9	9	8	7	
Backup Time BOL (12HX505-FR) min						88	85	81	74	63	52	45	40	37	35	28	22	19	18	15	14	12	10	
Backup Time BOL (12HX540-FR) min						89	86	83	76	66	56	50	43	40	39	30	24	20	19	16	15	14	12	

Proprietary and Confidential ©2025 Vertiv Group Corp.

This page intentionally left blank

4 Installation Drawings

Figure 4.1 Vertiv™ Liebert® APM2 Battery Cabinet — 208 V and 600 mm



Proprietary and Confidential ©2025 Vertiv Group Corp.

Figure 4.2 Vertiv™ Liebert® APM2 Battery Cabinet — 208 V and 600 mm Main Component

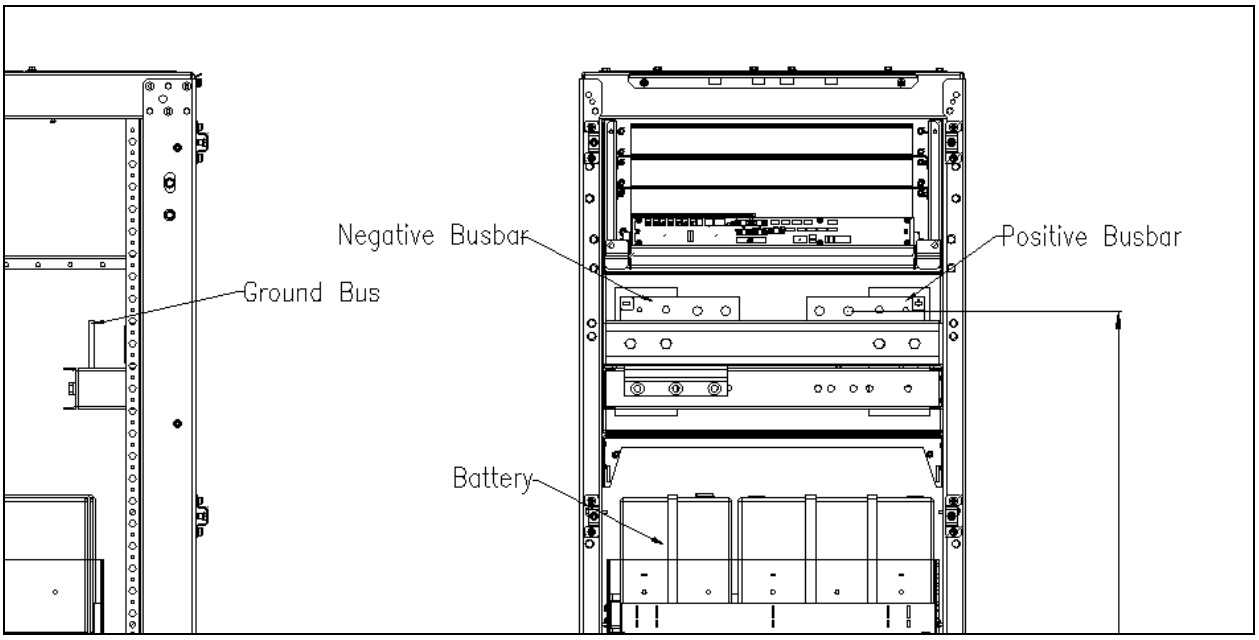


Figure 4.3 Liebert® APM2 Battery Cabinet — 208 V and 600 mm Outline Drawing and Main Component

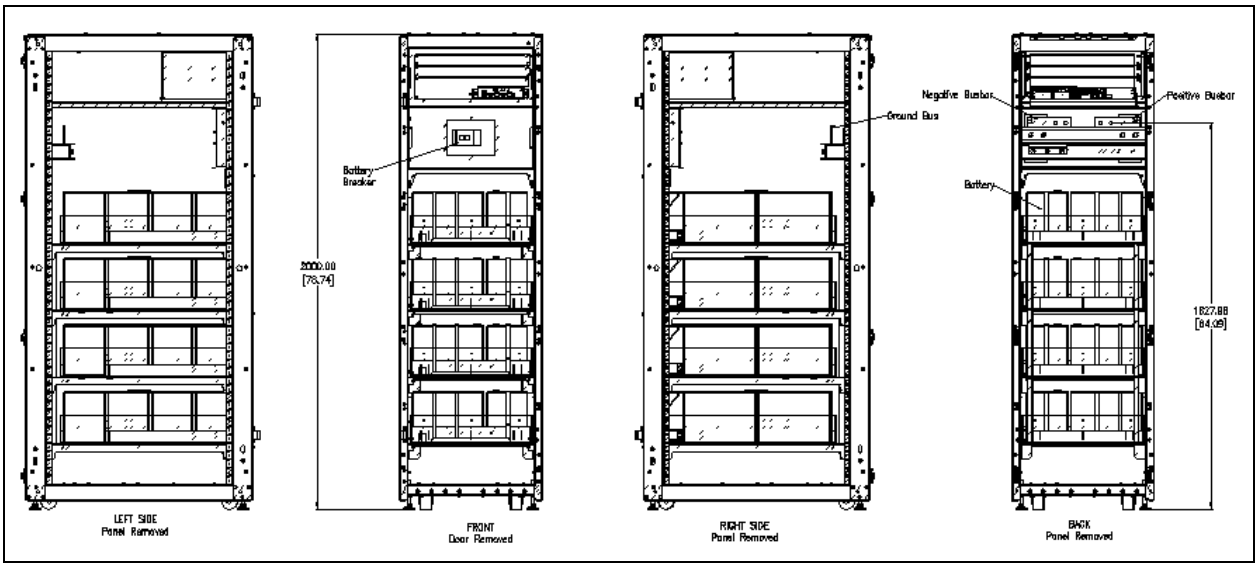


Figure 4.4 Vertiv™ Liebert® APM2 Battery Cabinet— 208 V and 880 mm

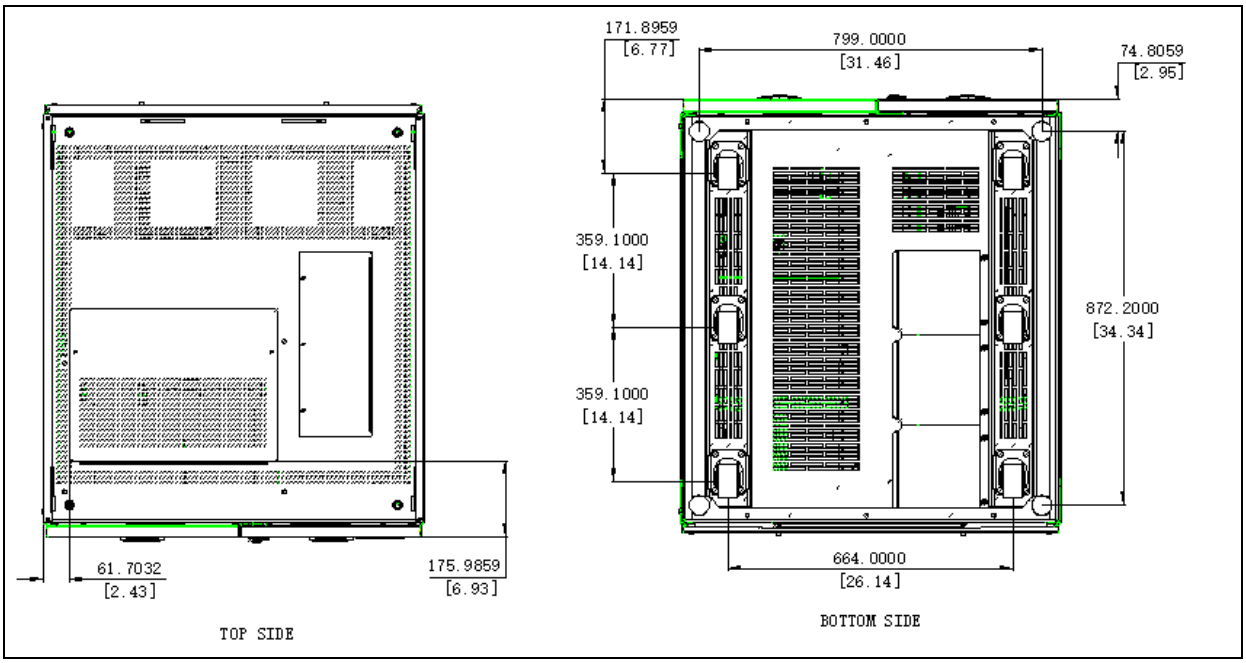
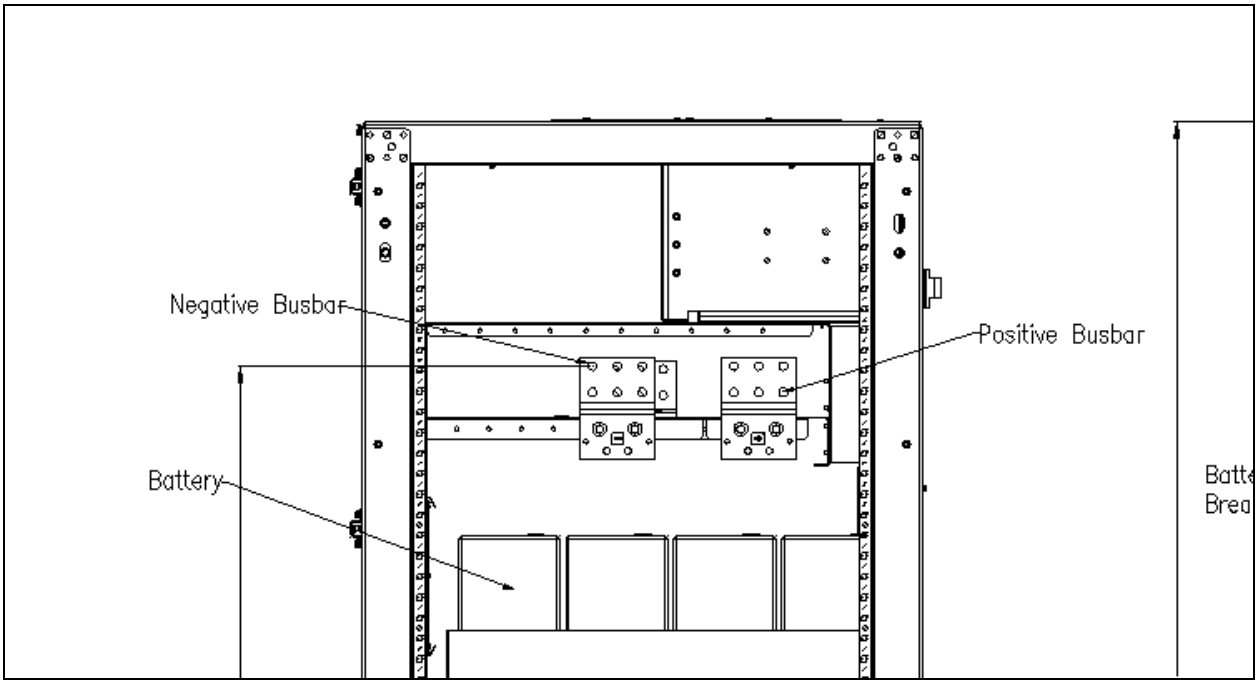


Figure 4.5 Liebert® APM2 Battery Cabinet — 208 V and 880 mm Main Component



Proprietary and Confidential ©2025 Vertiv Group Corp.

Figure 4.6 Vertiv™ Liebert® APM2 Battery Cabinet — 208 V and 880 mm Outline Drawing and Main Component

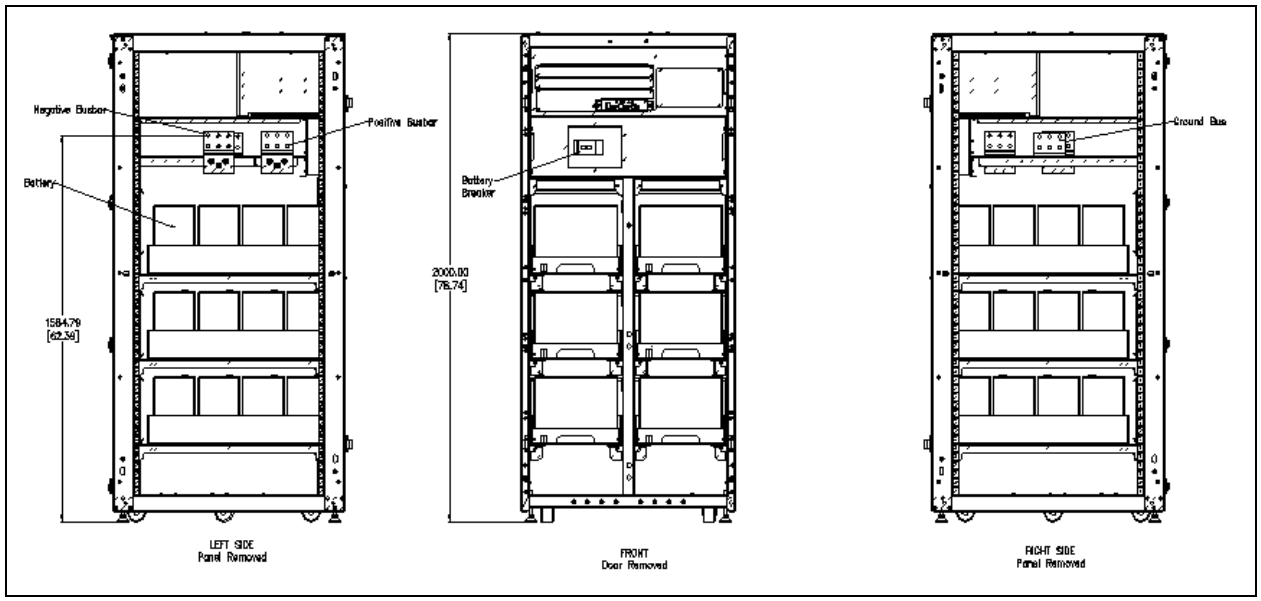


Figure 4.7 Liebert® APM2 Battery Cabinet — 480 V and 880 mm

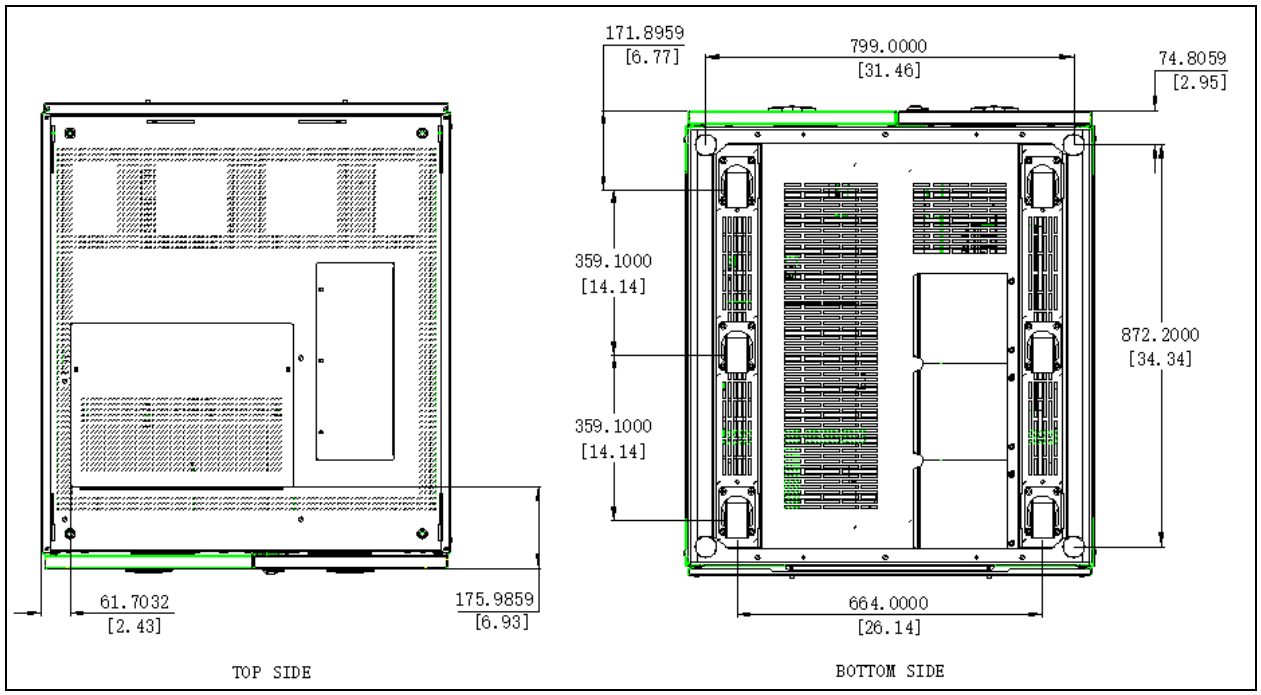


Figure 4.8 Vertiv™ Liebert® APM2 Battery Cabinet — 480 V and 880 mm Main Component

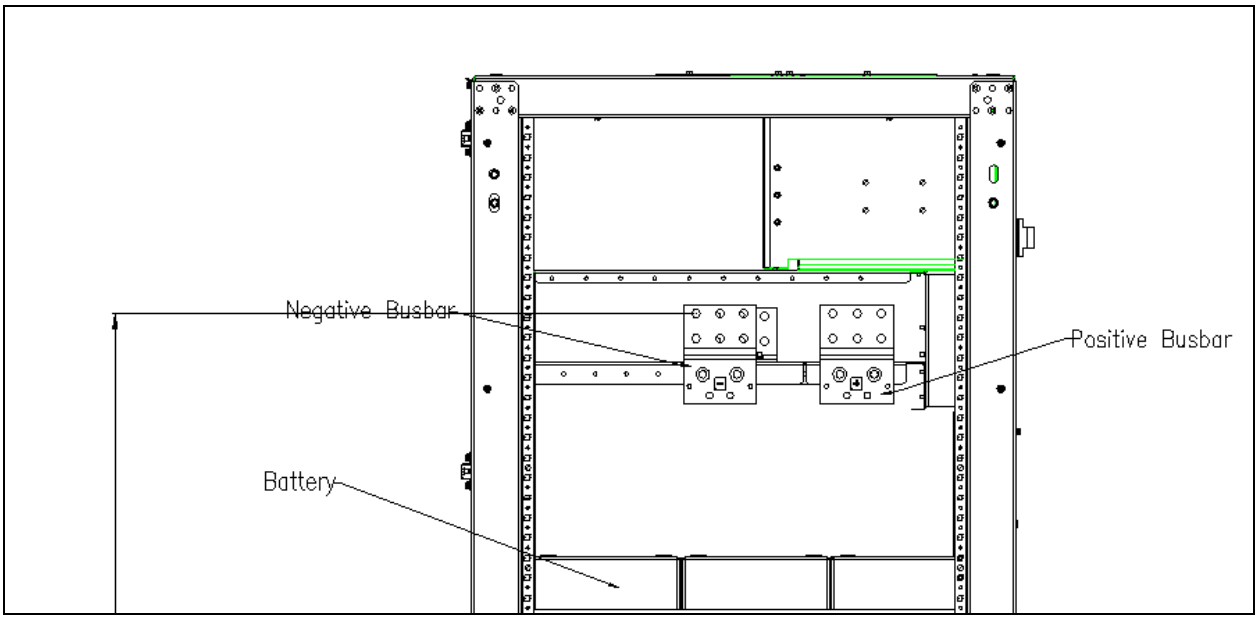
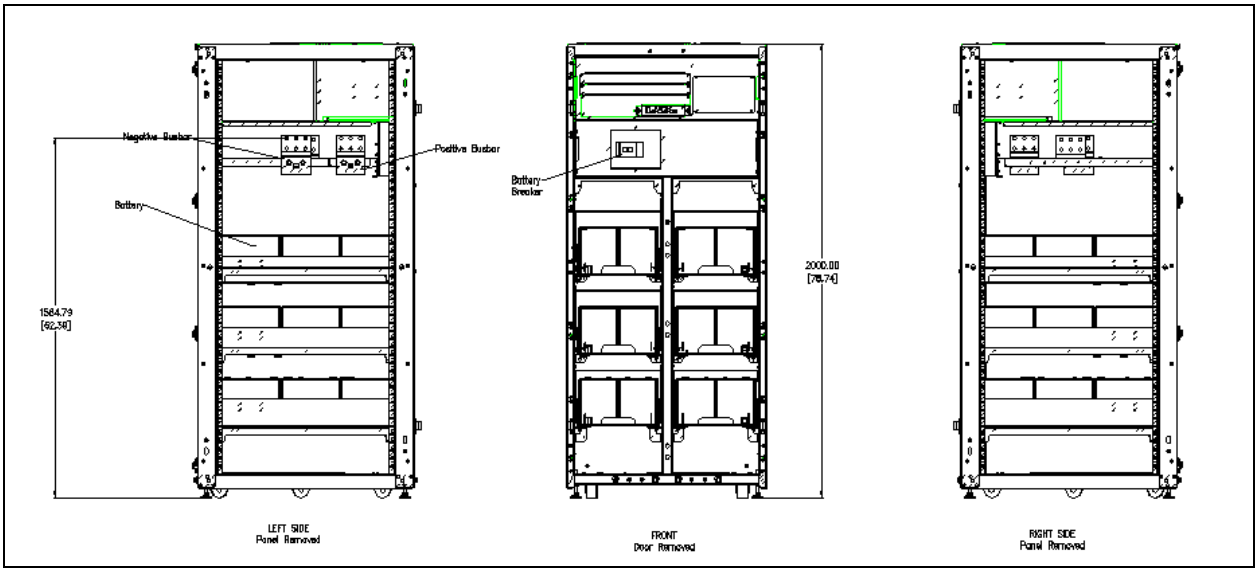


Figure 4.9 Liebert® APM2 Battery Cabinet — 480 V and 880 mm Outline Drawing and Main Component



Proprietary and Confidential ©2025 Vertiv Group Corp.

Figure 4.10 480 V and 1200 mm Vertiv™ Liebert® APM2 Battery Cabinet Outline Drawing and Main Components

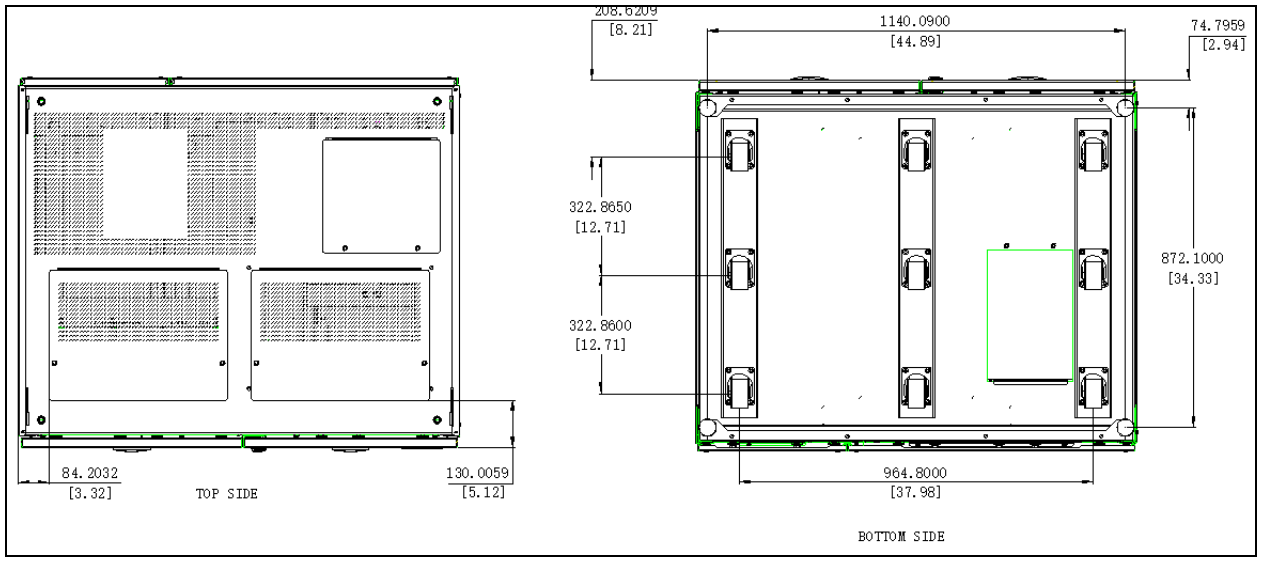


Figure 4.11 Liebert® APM2 Battery Cabinet — 480 V and 1200 mm Main Component

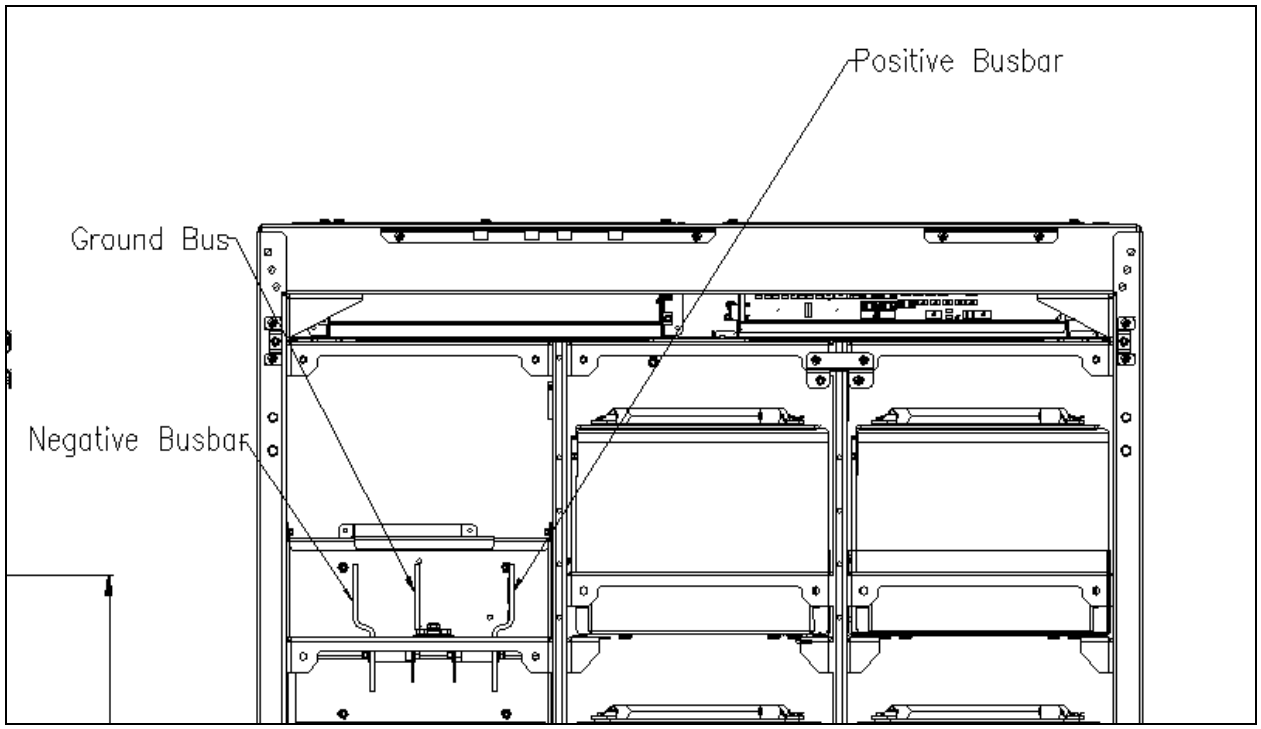


Figure 4.12 Vertiv™ Liebert® APM2 Battery Cabinet — 480 V and 1200 mm Outline Drawing and Main Component

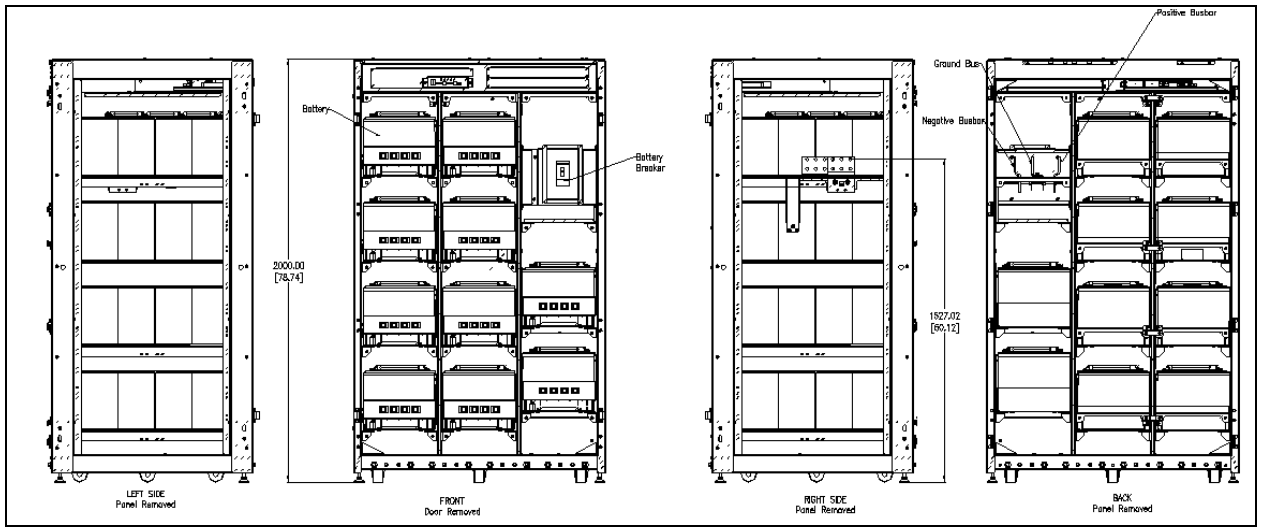


Table 4.1 Center of Gravity for Different Models

Description	Center of Gravity		
	X	Y	Z
Frame - No Batteries	440	410	1185
12HX150E	440	410	1010
12HX205	440	410	1080
12HX300	440	410	1065
HR1500	440	410	1095
HR2000	440	410	1085
HR3000	440	410	1075
UPS12-150MR	440	410	1095
UPS12-210MR	440	410	1085

Proprietary and Confidential ©2025 Vertiv Group Corp.

This page intentionally left blank

5 Specifications

Table 5.1 Physical Standards and Parameters

Battery Cabinet Parameters	Values
Standard Color	Black (ZP-7021)
Front Door Opening (for serviceability)	180 degrees
Degree of Protection for EBC Enclosure	IP 20 (with and without front door open)
Minimum Clearance, Top	24 in. (610 mm)
Minimum Clearance, Back	0 in.
Minimum Clearance, Sides	
Cable Entrance	Top or Bottom
Standards and Conformities	UL 1778 5th Edition CSA 22.2 107.3-14 FCC Part 15, Class A ISTA Procedure 1H WEEE IBC2021 UL1973 for Enersys HX Series
Storage Temperature Range, °F (°C)	-13 to 158 (-25 to 70) 74 to 80 (23 to 27) for optimal battery life
Operating Temperature Range, °F (°C)	32 to 104 (0 to 40) 74 to 80 (23 to 27) for optimal battery life
Relative Humidity	Up to 95% Non-Condensing (Operating and Non-Operating)
Maximum Altitude Above MSL, ft. (mm)	4920 (1500) (as per IEC 62040/3) - 1% Maximum kW derate per 100 m rise between 1500 m to 3000 m

Table 5.2 Battery Cabinet System — Vertiv™ Liebert® UPS and Vertiv™ Liebert® APM2 Battery Cabinet

UPS Rating kVA	Rated Battery Current (A)	Battery Cabinet Size	Copper Wire	Quantity	Bolt Size (in.)
60	231	208 V and 600 mm, 208 V and 880 mm	2/0 AWG	2	1/2
120	292	480 V and 880 mm, 480 V and 1200 mm	3/0 AWG	2	1/2
150	579	208 V and 600 mm, 208 V and 880 mm	600 kcmil	2	1/2
300	658	480 V and 1200 mm	700 kcmil	2	1/2
600	1316	480 V and 1200 mm	800 kcmil	6	1/2
NOTE: 300 kVA requires a minimum of two cabinets and 600 kVA requires a minimum of three cabinets.					

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 5.3 Battery Short Circuit Current

Supplier	Part	Short Circuit Current (A)
EnerSys	12HX150-E	1800
	12HX205-FR	2775
	12HX300-FR	3175
	12HX330-FR	3700
	12HX400-FR	4225
	12HX505-FR	4510
	12HX540-FR	4775

Table 5.4 Vertiv™ Liebert® APM2 Battery Cabinet—208 V and 600 mm，208 V and 880 mm Battery Parameters

Parameters	Values
Battery Rated Voltage	288 V
Number of Lead-Acid Cells	144(24×6)
Float Voltage	2.27 V/cell, selectable from 2.2 to 2.3 V/cell

Table 5.5 Liebert® APM2 Battery Cabinet — 480 V and 880 mm Battery Parameters

Parameters	Values
Battery Rated Voltage	432 V
Number of Lead-Acid Cells	216 (36×6)
Float Voltage	2.27 V/cell, selectable from 2.2 to 2.3 V/cell

Table 5.6 Liebert® APM2 Battery Cabinet — 480 V and 1200 mm Battery Parameters

Parameters	Values
Battery Rated Voltage	480 V
Number of Lead-Acid Cells	240 (40×6)
Float Voltage	2.27 V/cell, selectable from 2.2 to 2.3 V/cell

Table 5.7 Liebert® APM2 Battery Cabinet — 208 V and 600 mm Mechanical Characteristics

Parameters	Values
Dimensions, W x D x H, in. (mm)	23.622 x 38.425 x 78.75 (600 x 976 x 2000)
Weight, lb. (kg)	
With 12HX150-E Batteries	1398 (634)
With 12HX205-FR Batteries	1806 (819)
With 12HX300-FR Batteries	2213 (1004)
With 12HX330-FR Batteries	2477 (1124)
Color	ZP-7021 (Black)
Protection Degree IEC (60529)	IP20 (finger-proof with front doors open or closed)

Table 5.8 Vertiv™ Liebert® APM2 Battery Cabinet — 208 V and 800 mm Mechanical Characteristics

Parameters	Values
Dimensions, W x D x H, in. (mm)	34.645 x 38.425 x 78.75(880 x 976 x 2000)
Weight, lb. (kg)	
With 12HX400-FR Batteries	2693 (1222)
With 12HX505-FR Batteries	3245 (1472)
With 12HX540-FR Batteries	3323 (1507)
Color	ZP-7021 (Black)
Protection Degree IEC(60529)	IP20 (finger-proof with front doors open or closed)

Table 5.9 Liebert® APM2 Battery Cabinet — 480 V and 880 mm Mechanical Characteristics

Parameters	Values
Dimensions, W x D x H, in. (mm)	34.645 x 38.425 x 78.75 (880 x 976 x 2000)
Weight, lb. (kg)	
With 12HX150-E Batteries	1738 (788)
With 12HX205-FR Batteries	2350 (1066)
With 12HX300-FR Batteries	2962 (1344)
Color	ZP-7021 (Black)
Protection Degree IEC (60529)	IP20 (finger-proof with front doors open or closed)

Table 5.10 Liebert® APM2 Battery Cabinet — 480 V and 1200 mm Mechanical Characteristics

Parameters	Values
Dimensions, W x D x H, in. (mm)	47.244 x 38.425 x 78.75 (1200 x 976 x 2000)
Weight, lb. (kg)	
With 12HX330-E Batteries	3931 (1783)
With 12HX400-FR Batteries	4290 (1946)
With 12HX505-FR Batteries	5212 (2364)
With 12HX540-FR Batteries	5331 (2418)
Color	ZP-7021 (Black)
Protection Degree IEC (60529)	IP20 (finger-proof with front doors open or closed)

Proprietary and Confidential ©2025 Vertiv Group Corp.

This page intentionally left blank

6 Maintenance

Become thoroughly familiar with the equipment, but at no time go beyond the specific procedures in this manual while performing maintenance or correcting a malfunction. In case of doubt, call Vertiv for further instructions. The EBC is designed for unattended operation, but does require some basic maintenance.

- Keep good records. Troubleshooting is easier if you maintain historical service records.
- Keep the EBC free of dust and any moisture.
- Keep the EBC cool.
- Battery systems must be kept in the range of 72 °F to 77 °F (22 °C to 25 °C) in order to meet design specifications for capacity and longevity.
- The UPS will reliably meet all performance specifications at temperatures up to 104 °F (40 °C), and can be slightly derated for operation at even higher temperatures. However, performance and longevity will be optimized when the UPS is operated at the same temperature as the batteries.
- Keep connections tight.
- Tighten all connections at installation and at least annually thereafter. See Torque Requirements on page 53 for more details.

6.1 Record Log

Set up a maintenance log to record scheduled checks and any abnormal conditions. The log should have space for all metered data including phase readings, alarm messages, UPS mode of operation, air filter replacement date and observation notes. A second log should be maintained for the battery module as directed by the battery manufacturer.

Vertiv recommends a periodic inspection of the UPS and battery rooms to check for visible and audible indications of problems. Log the inspection, metered parameter indications and any discrepancies.

6.2 Battery Maintenance

WARNING! Risk of electrical shock and arc flash. Can cause property damage, injury and death. These maintenance procedures will expose hazardous live parts. Refer servicing to properly trained and qualified personnel.

AVERTISSEMENT! Risque de choc électrique et d'arc électrique. Peut causer des dommages matériels, des blessures, voire la mort. Les procédures d'entretien ci-dessous exposent des composants sous tension dangereuse. Les interventions d'entretien doivent être confiées à du personnel qualifié et dûment formé.

6.3 Battery Safety Precautions

Servicing of batteries should be performed or supervised by personnel experienced with batteries and the required precautions. Keep unauthorized personnel away from batteries. When replacing batteries, use the same number and type of batteries.

Proprietary and Confidential ©2025 Vertiv Group Corp.

WARNING! Risk of electrical shock. Can cause personal injury and death. Check for voltage with both AC and DC voltmeters before working within the EBC. Check for voltage with both AC and DC voltmeters before making contact. Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and glasses should be involved in installing the EBC or preparing the EBC for installation. When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats. Lead-acid batteries contain hazardous materials. Batteries must be handled, transported and recycled or discarded in accordance with federal, state and local regulations. Because lead is a toxic substance, lead-acid batteries must be recycled rather than discarded.
Do not dispose of battery or batteries in a fire. The battery may explode. Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It is toxic.

The following precautions must be observed when working on batteries:

- Remove watches, rings, and 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 charging source prior to connecting or disconnecting battery terminals.
- Determine whether the battery is grounded. If it is grounded, remove source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.

AVERTISSEMENT! Risque de décharge électrique pouvant causer des blessures graves, voire mortelles. Vérifiez les tensions au moyen de voltmètres c.a. et c.c. avant d'utiliser le système EBC. Vérifiez les tensions avec des voltmètres c.a. et c.c. avant d'établir tout contact. Seuls des employés qualifiés et dûment formés portant un casque, des gants, des chaussures et des lunettes de écurité adéquats doivent se charger d'installer le système EBC ou de le préparer pour l'installation. Les responsables de l'entretien et l'équipement d'essai doivent reposer sur des tapis de caoutchouc lors de toute intervention sur une pièce d'équipement sous tension. Les batteries au plomb-acide renferment des matières dangereuses. Les batteries doivent être manipulées, transportées, recyclées ou jetées conformément aux règlements fédéraux, provinciaux et municipaux. Étant donné que le plomb est une substance toxique, les batteries au plomb-acide doivent être recyclées plutôt que mises au rebut. Ne jetez jamais de batteries au feu car elles risquent d'exploser.
Vous ne devez ni ouvrir ni percer les batteries, car l'électrolyte qui s'en écoulerait est nocif pour la peau et les yeux. Cet électrolyte est toxique.

Lorsque vous travaillez avec des batteries, prenez les précautions suivantes :

- Retirez montre, bagues et tout autre objet métallique.
- Utilisez des outils dont le manche est isolé.
- Portez des gants et des bottes de caoutchouc.
- Ne posez aucun outil ni pièce métallique sur le dessus d'une batterie.
- Déconnectez la source de chargement avant de brancher ou de débrancher les bornes d'une batterie.
- Vérifiez si la batterie est mise à la terre. Le cas échéant, éliminez la cause de la mise à la terre.
  Le contact avec toute partie d'une batterie mise à la terre peut provoquer une décharge électrique. Pour réduire de tels risques d'accident, débranchez les prises de terre avant de procéder à l'installation ou à l'entretien.

Regular maintenance of the battery module is an absolute necessity. Periodic inspections of battery and terminal voltages, specific gravity, and connection resistance should be made. Strictly follow the procedures outlined in the battery manufacturer's manual. (See battery manufacturer's website.)

valve regulated lead-acid batteries do require periodic maintenance. Although they do not require maintenance of electrolyte levels, visual inspections and checks of battery voltage and connection resistance should be made.

NOTICE

Risk of damaging battery cases. can cause breakage and leaking electrolyte.
Do not use cleaners on the batteries. Solvents can make the battery cases brittle. Use only a dry cloth or a cloth moistened with water.
Since individual battery characteristics are not identical and may change over time, the UPS module is equipped with circuitry to equalize battery cell voltages. This circuit temporarily increases charging voltage to maintain flooded type battery cells at full capacity.

WARNING! Risk of electric shock, explosive reaction, hazardous chemicals and fire. Can cause equipment damage, personal injury and death. Do not use equalize charging with valve regulated, lead-acid batteries, such as those used in APM2 UL EBC. Refer to the battery manufacturer's manual, available on the manufacturer's website, for specific information about equalize charging.

AVERTISSEMENT! Risque de décharge électrique, de réaction explosive, d'incendie et d'exposition à des produits chimiques dangereux pouvant entraîner des dommages matériels, des blessures et même la mort. N'utilisez pas de charge d'égalisation avec des batteries d'accumulateurs au plomb à régulation par soupape, comme celles utilisées dans les armoires de batterie Liebert. Reportez-vous au manuel du fabricant des batteries, disponible sur le siteweb du fabricant, pour obtenir des renseignements précis sur la charge d'égalisation.

6.4 Torque Requirements

All electrical connections must be tight.

Table 6.1 below through Table 6.3 on the next page provide the torque values for the connections in the UPS and batteries. Use these values unless the equipment is labeled otherwise.

Table 6.1 Busbars (for Power Wiring)

Bolt Shaft Size in Inch	lb-in	Nm
1/2 (M12)	428	48

Table 6.2 Terminal Block with Compression Lugs (for Control Wiring)

Wire Size or Range (AWG)	lb-in	Nm
22 to 14	3.5 to 5.3	0.4 to 0.6

Proprietary and Confidential ©2025 Vertiv Group Corp.

Table 6.3 Battery Retorque Values

MFG	Battery Model	Torque Value in Lb. (Nm)
EnerSys	12HX150-E	40 (4.5)
	12HX205-FR	65 (7.3)
	12HX300-FR	65 (7.3)
	12HX330-FR	65 (7.3)
	12HX400-FR	65 (7.3)
	12HX505-FR	65 (7.3)
	12HX540-FR	65 (7.3)

Appendices

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2778

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

505 N Cleveland Ave

Westerville, OH, 43082, USA

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

Proprietary and Confidential ©2025 Vertiv Group Corp.

This page intentionally left blank

Connect with Vertiv on Social Media

 https://www.facebook.com/vertiv/

 https://www.instagram.com/vertiv/

 https://www.linkedin.com/company/vertiv/

 https://www.x.com/Vertiv/

Vertiv.com | Vertiv Headquarters, 505 N Cleveland Ave, Westerville, OH 43082 USA

©2025 Vertiv Group Corp. All rights reserved. Vertiv™ and the Vertiv logo are trademarks or registered trademarks of Vertiv Group Corp. All other names and logos referred to are trade names, trademarks or registered trademarks of their respective owners. While every precaution has been taken to ensure accuracy and completeness here, Vertiv Group Corp. assumes no responsibility, and disclaims all liability, for damages resulting from use of this information or for any errors or omissions.

SL-71958_REVA_01-25