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**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.VertivCo.com/en-us/support/ for additional assistance.
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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions that should be followed during installation of the Liebert® EXM™.

Read this manual thoroughly, paying special attention to the sections that apply to your installation, before working with the UPS. Retain this manual for use by installing personnel.

A properly trained and qualified electrical contractor should oversee the installation of the equipment.

The Liebert® EXM™ cannot be put into operation until it is commissioned by the manufacturer or authorized engineer. Otherwise, human safety may be endangered and damage to the UPS will not be covered by the warranty.

The Liebert® EXM™ is designed for commercial and industrial uses and cannot be used as life support equipment.

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.
• Do not tilt.

Failure to heed this warning could result in smoke, fire or electric hazard.

Call 800-543-2378 prior to moving battery cabinets (after initial installation).

AVERTISSEMENT

L’arrimage des batteries internes doit être vérifié avant de déplacer une armoire de batteries (après l’installation initiale).

• Les armoires de batteries contiennent des batteries étanches.
• Maintenir les systèmes à la verticale.
• Ne pas empiler.
• Ne pas incliner.

Le non-respect de ces consignes comporte des risques liés à la fumée, au feu ou à l’électricité.

Composez le 1 800 LIEBERT avant de déplacer des armoires de batteries (après l’installation initiale).
WARNING
Risk of electrical shock and fire. Can cause equipment damage, personal injury or death. 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 et d'incendie, pouvant entrainer des dommages matériels, des blessures et même la mort. 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’enécoulerait 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 electrical shock. Can cause personal injury or death.

This UPS has several circuits that are energized with high DC as well as AC voltages. Check for voltage with both AC and DC voltmeters before working within the UPS. 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 UPS or preparing the UPS for installation. When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats.

In case of fire involving electrical equipment, use only carbon dioxide fire extinguishers or those approved for use in fighting electrical fires.

Extreme caution is required when performing installation and maintenance. Special safety precautions are required for procedures involving handling, installation and maintenance of the UPS system. Observe all safety precautions in this manual before handling or installing the UPS system. Observe all precautions before as well as during performance of all maintenance procedures. Observe all DC safety precautions before working on or near the DC system.

**AVERTISSEMENT**

Risque de décharge électrique pouvant causer des blessures graves, voire mortelles.

Ce système ASC comporte plusieurs circuits à haute tension c.a et c.c. 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 sécurité 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.

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.

Les opérations d'installation et d'entretien requièrrent une extrême prudence.

Des précautions de sécurité spéciales sont requises pour les procédures associées à la manutention, à l'installation et à l'entretien du système ASC. Observez toutes les précautions de sécurité décrites dans le présent manuel avant de manipuler ou d'installer le système ASC. Observez également toutes les précautions avant et pendant toutes les procédures d'entretien. Observez toutes les précautions de sécurité appropriées lorsque vous travaillez sur à proximité d’une source c.c de sécurité appropriées dès que vous vous trouvez à proximité d’une source c.c.
**WARNING**

Risk of heavy unit falling over. Improper handling can cause equipment damage, injury or death.

Exercise extreme care when handling UPS cabinets to avoid equipment damage or injury to personnel. The UPS module weight is up to 956 lb. (434kg).

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 ASC afin d’éviter de les endommager ou de blesser le personnel. Le module ASC pèse jusqu’à 434kg (956lb).


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 UPS doors closed, only normal safety precautions are necessary. The area around the UPS 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 décharge électrique et d’incendie, pouvant entrainer des dommages matériels, des blessures et même la mort.

Les précautions de sécurité habituelles suffisent lorsque le système ASC est en mode de fonctionnement normal et que toutes les portes sont fermées. La zone entourant le système ASC doit être exempte de flaques d’eau, d’humidité excessive et de débris.

Seuls des équipements d’essai conçus pour le dépannage doivent être utilisés. Cette mise en garde couvre notamment les oscilloscopes. Utilisez toujours un voltmètre c.a. et c.c. pour vérifier les tensions avant d’établir un contact ou d’utiliser des appareils. Des tensions dangereusement élevées peuvent demeurer dans les batteries de condensateurs et au niveau des raccords c.c., même une fois l’alimentation coupée.

Tous les raccords doivent être effectués par un électricien dûment formé et qualifié. Tous les câbles d’alimentation et de commande doivent être conformes aux codes nationaux et locaux en vigueur.

Une personne ne devrait jamais travailler seule, même si toute l’alimentation d’entrée est coupée. Une deuxième personne devrait toujours être présente pour porter assistance ou chercher de l’aide en cas d’accident.

**NOTE**

Materials sold hereunder cannot be used in the patient vicinity (e.g., use where UL, cUL or IEC 60601-1 is required). Medical applications such as invasive procedures and electrical life support equipment are subject to additional terms and conditions.
Ground Leakage Currents

**WARNING**
Risk of electric shock from high leakage current. Can cause injury, property damage and death.
EARTH CONNECTION IS ESSENTIAL BEFORE CONNECTING THE INPUT SUPPLY.
Earth leakage current exceeds 3.5 mA and is less than 1000 mA.
Transient and steady-state earth leakage currents, which may occur when starting the equipment, should be taken into account when selecting instantaneous RCCB or RCD devices.
Residual Current Circuit Breakers (RCCBs) must be selected sensitive to DC unidirectional pulses (Class A) and insensitive to transient current pulses.
Note also that the earth leakage currents of the load will be carried by this RCCB or RCD.
This equipment must be earthed in accordance with the local electrical code of practice.

**AVERTISSEMENT**
Risque de décharge électrique due à un courant de fuite élevé pouvant causer des blessures, des dommages matériels et même la mort.
IL EST PRIMORDIAL D’ASSURER UNE CONNEXION DE TERRE AVANT DE BRANCHER L’ALIMENTATION D’ENTRÉE. La fuite à la terre est supérieure à 3,5 mA et inférieure à 1 000 mA.
Vous devez tenir compte des fuites de courant transitoires et permanentes à la terre, susceptibles de se produire au démarrage de l'équipement, lors de la sélection des dispositifs DDFT instantanés.
Vous devez sélectionner des disjoncteurs différentiels de fuite à la terre (DDFT) sensibles aux impulsions unidirectionnelles c.c. (classe A) et insensibles aux impulsions de courant transitoires.
Notez également que les courants de fuite à la terre de la charge seront acheminés par ce dispositif DDFT.
Cet équipement doit être mis à la terre conformément au code national de l'électricité.
WARNING
Risk of electric shock. Can cause injury, property damage and death.
Under typical operation and with all UPS doors closed, only normal safety precautions are necessary. The area around the UPS system should be kept free of puddles of water, excess moisture and debris.
Special safety precautions are required for procedures involving handling, installation and maintenance of the UPS system. Observe all safety precautions in this manual before handling or installing the UPS system as well as during all maintenance procedures.
This equipment contains several circuits that are energized with high voltage. Only test equipment designed for troubleshooting should be used. This is particularly true for oscilloscopes. Always check with AC and DC voltmeters to ensure safety before making contact or using tools. Even when the power is turned Off, dangerously high electric charges may exist within the UPS.
All power and control wiring should be installed by a qualified electrician. All power and control wiring must comply with the NEC and applicable local codes.
ONLY qualified service personnel should perform maintenance on the UPS system.
When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats. The service personnel should wear insulating shoes for isolation from direct contact with the floor (earth ground).
Never work alone, even if all power is removed from the equipment. A second person should be standing by to assist and summon help in case an accident should occur.

AVERTISSEMENT
Risque de décharge électrique pouvant causer des blessures, des dommages matériels et même la mort.
Les précautions de sécurité habituelles suffisent lorsque le système ASC est en mode de fonctionnement normal et que toutes les portes sont fermées. La zone entourant le système ASC doit être exempte de flaques d’eau, d’humidité excessive et de débris. Des précautions de sécurité spéciales sont requises pour les procédures associées à la manutention, à l’installation et à l’entretien du système ASC. Observez toutes les précautions de sécurité décrites dans le présent manuel avant de manipuler ou d’installer le système ASC, ainsi que pendant toutes les procédures d’entretien.
L’entretien du système ASC ne doit être confié qu’à des professionnels qualifiés.
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 responsables de l’entretien doivent porter des chaussures isolantes pour prévenir tout contact direct avec le plancher.
Ne travaillez jamais seul, même si toute l’alimentation d’entrée est coupée de l’équipement. Une seconde personne devrait toujours être présente pour porter assistance ou chercher de l’aide en cas d’accident.
**WARNING**
Failure to follow adequate grounding procedures can result in electric shock hazard to personnel, or the risk of fire, should a ground fault occur.
All operations described in this section must be performed by properly trained and qualified electricians or technical personnel. If any difficulties are encountered, contact Vertiv™. See the back page of this manual for contact information.

**AVERTISSEMENT**
Le non-respect des procédures de mise à la terre peut entraîner des risques d’électrocution du personnel, ou des risques d’incendie en cas de défectuosité de la mise à la terre.
Toutes les opérations décrites dans cette section ne doivent être effectuées que par des électriciens ou des techniciens professionnels dûment formés et qualifiés. En cas de difficultés, communiquez avec Vertiv. Pour obtenir les renseignements de contact, consultez la dernière page de ce manuel.

**NOTICE**
Risk of improper electromagnetic shielding. Can cause radio communication interference.
This unit complies with the limits for a Class A digital device, pursuant to Part 15 Subpart J of the FCC rules. 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.
This unit is not designed for use in a residential area. Operation of this unit in a residential area may cause harmful interference that the user is solely responsible for correcting.
GLOSSARY OF SYMBOLS

- Risk of electrical shock
- Indicates caution followed by important instructions
- AC input
- AC output
- Requests the user to consult the manual
- Indicates the unit contains a valve-regulated lead acid battery
- Recycle
- DC voltage
- AC voltage
- Equipment grounding conductor
- Bonded to ground
1.0 INTRODUCTION

The Liebert® EXM™ UPS can be configured as either a fixed-capacity or scalable, transformer-free, online uninterruptible power system with 208/120V input and 208/120V output capability. The Liebert® EXM™ can operate with either a 50 or 60Hz input and provide a matching output frequency conversion.

When configured for scalability, the UPS’s capacity can be increased in 20kVA increments. Based on the configuration, a power module can be set to a redundant operation mode. Contact Vertiv Services about adding capacity.

Optional transformers are available to add 208V isolation or 480V or 600V input capability to the Liebert® EXM™ in the optional Liebert BDC™ (Bypass Distribution Cabinet) and in the optional Liebert® EXM™ Dual Transformer Cabinet.

The Liebert® EXM™ provides continuous, high-quality AC power to business-critical equipment, such as telecommunications and data processing equipment. The Liebert® EXM™ supplies power free of the disturbances and variations in voltage and frequency common to utility power, which is subject to brownouts, blackouts, surges and sags.

The Liebert® EXM™ utilizes the latest in high-frequency, double-conversion pulse width modulation (PWM) technology and fully digital controls to enhance its reliability and increase the ease of use.

The 10-40kVA/kW Liebert® EXM™ includes internal batteries to support the load when utility power is not present.

1.1 Operator Control and Display Panel

Information about using the UPS control panel is detailed in SL-26200, available at Vertiv’s Web site, www.vertivco.com
2.0 INSTALLATION

This section describes the Liebert® EXM™’s environmental requirements and mechanical considerations that must be taken into account when planning the positioning and cabling of the UPS equipment.

Because each site is unique, this section presents a guide to general procedures and practices that should be observed by the installing engineer, rather than step-by-step installation instructions.

**NOTICE**
Risk of improper installation. Can cause equipment damage.
Do not apply electrical power to the UPS equipment before the commissioning engineer arrives at the installation site.
The UPS must be installed by a properly trained and qualified engineer in accordance with the information contained in this chapter. All the equipment not referred to in this manual is shipped with details of its own mechanical and electrical installation information.

**NOTE**
Three-phase, four-wire input power is required.

**NOTE**
Input power must be supplied to the Liebert® EXM™ from a properly grounded Wye source. The Liebert® EXM™ is not for use with impedance grounded systems, corner-grounded systems or high-leg Delta systems. For these applications, an isolation transformer must be installed between the input power and the Liebert® EXM™.

2.1 Initial Inspections

1. While the Liebert® EXM™ and ancillary cabinets are still on the truck, inspect the equipment and shipping container for any signs of damage or mishandling. Do not attempt to install the system if damage is apparent. If any damage is noted, file a damage claim with the shipping agency immediately and contact Vertiv Services at 800-543-2378 to inform them of the damage claim and the condition of the equipment.
2. Compare the contents of the shipment with the bill of lading. Report any missing items to the carrier and your local Vertiv™ representative immediately.
3. Check the product label on the back of front door and confirm the contents match the UPS model, capacity and main parameters that were ordered.

2.1.1 Storing the UPS and Batteries for Delayed Installation
If the Liebert® EXM™ system will not be installed immediately, it must be stored indoors in a clean, dry and cool location (see 7.2 - UPS Environmental). If the UPS includes batteries, either internally or in a battery cabinet, the batteries’ requirements will dictate the storage conditions. 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.
2.2 Preliminary Checks

2.2.1 Identification
The equipment supplied has an identification tag on the back of the main door listing the type and size of the UPS.

2.3 UPS Location

2.3.1 Positioning the UPS
Choose a location for the UPS that offers:
- Easy connection to inputs, outputs and auxiliary equipment
- Enough space to service the UPS
- Air circulation sufficient to expel heat produced by UPS
- Protection against moisture and excessive humidity
- Protection against dust and other particulate matter
- Compliance with fire prevention regulations and practices
- Operating environment temperature of 74-80°F (23-27°C) for maximum battery life

2.3.2 Environmental Considerations
Before installing the Liebert® EXM™, verify that the UPS room satisfies the environmental conditions stipulated in 7.2 - UPS Environmental, paying particular attention to the ambient temperature and air exchange system.

The UPS unit should be installed in a cool, dry, clean-air environment with adequate ventilation to keep the ambient temperature within the specified operating range 32°F to 104°F (0°C to 40°C).

For optimal UPS system performance and service life, maintain the operating temperature within the range of 74-80°F, (23-27°C).

The Liebert® EXM™ is cooled by internal fans. Cooling air enters the unit through the front of the unit and is exhausted out the top. To permit proper air flow and prevent overheating, do NOT block or cover the ventilation openings or blow air down onto the unit. The UPS requires 24 in. (610mm) ventilation clearance above the unit.

See Table 20 for details on heat dissipation.

2.4 Battery Location
Temperature is a major factor in determining battery life and capacity. Battery manufacturers recommend an operating temperature of 77°F (25°C). Ambient temperatures warmer than this reduce battery life; temperatures below this reduces battery capacity. In a typical installation, battery temperature should be maintained between 74°F and 80°F (23-27°C). Batteries should be placed where there are no main heat sources or air inlets to prevent portions of batteries from being either much warmer or much cooler than other parts of the batteries.

2.5 Considerations in Moving the Liebert EXM
Ensure that the UPS weight is within the designated surface weight loading (lb./ft² or kg/cm²) of any handling equipment. See Table 15 for weights of various units.
The Liebert® EXM™ may be rolled on its casters for short distances only. For longer distances, move the UPS with a forklift or similar equipment to ease the relocation and to reduce vibration.

**WARNING**

Risk of moving heavy unit. Can cause property damage, injury and death. Ensure that any equipment that will be used to move the Liebert® EXM™ has sufficient lifting capacity. The Liebert EXM’s weight ranges from 809 to 956 lb. (367 to 434kg) without batteries. Refer to Table 1 for the unit’s weight with batteries. The UPS presents a tipping hazard. Do not tilt the Liebert® EXM™ more than 15 degrees from vertical. The UPS is fitted with casters—Take care to prevent movement when unbolting the equipment from its shipping pallet. Ensure adequate personnel and lifting equipment are available when taking the Liebert® EXM™ off its shipping pallet.
Final Positioning
When the equipment has been finally positioned, ensure that the adjustable stops are set so that the UPS will remain stationary and stable (see 4.0 - Installation Drawings). The Liebert® EXM™ and its auxiliary cabinets must be installed on a concrete or equivalent, non-resilient floor.

2.6 Mechanical Considerations
The Liebert® EXM™ is constructed with a steel frame and removable panels. Top and side panels are secured to the chassis by screws. The doors may be opened for access to power connection bars, auxiliary terminal blocks and power switches.
The UPS comes with an Operator Control Panel that provides basic operational status and alarm information. The cabinet houses the power components. Cooling is provided by internal
fans. The unit sits on four casters. Adjustable stops are provided to prevent the UPS from moving once it has been moved to its final position.

**WARNING**

Risk of heavy units tipping over while being moved. Can cause property damage, injury and death.
Vertiv™ recommends lifting the units by installing four eyebolts in the factory-fabricated holes, one at each corner of the unit, attaching cables or similar strapping to the eyebolts and lifting with a suitable mechanism.

**AVERTISSEMENT**

Le centre de gravité élevé des appareils présente un risque de renversement lors des déplacements, peut entraîner des dommages matériels, des blessures et même la mort. Vertiv™ recommande de soulever les appareils en installant quatre anneaux de levage dans les ouvertures fabriquées en usine, avec un anneau dans chaque coin de l'appareil, pour ensuite fixer les câbles ou sangles aux anneaux afin d'effectuer le levage à l'aide d'un mécanisme approprié.
2.6.1 Dimensions

Figure 1  UPS dimensions

Table 1  Weights for Liebert® EXM™ 10-40kVA frame

<table>
<thead>
<tr>
<th>UPS Rating, kVA</th>
<th>No Internal Batteries</th>
<th>12HX100</th>
<th>12HX150E</th>
<th>12HX205</th>
<th>HR1500</th>
<th>HR2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>684 (310)</td>
<td>1212 (550)</td>
<td>1308 (593)</td>
<td>1716 (778)</td>
<td>1332 (812)</td>
<td>1644 (746)</td>
</tr>
<tr>
<td>15</td>
<td>684 (310)</td>
<td>1212 (550)</td>
<td>1308 (593)</td>
<td>1716 (778)</td>
<td>1332 (812)</td>
<td>1644 (746)</td>
</tr>
<tr>
<td>20</td>
<td>684 (310)</td>
<td>1212 (550)</td>
<td>1308 (593)</td>
<td>1716 (778)</td>
<td>1332 (812)</td>
<td>1644 (746)</td>
</tr>
<tr>
<td>30</td>
<td>758 (344)</td>
<td>N/A</td>
<td>1382 (627)</td>
<td>1790 (812)</td>
<td>1406 (638)</td>
<td>1718 (779)</td>
</tr>
<tr>
<td>40</td>
<td>758 (344)</td>
<td>N/A</td>
<td>N/A</td>
<td>1790 (812)</td>
<td>N/A</td>
<td>1718 (779)</td>
</tr>
</tbody>
</table>

Add 100 lb. (45 kg) for shipping weights.

2.6.2 Clearances

Provide at least the minimum clearance required by NEC on all sides of Liebert® EXM™, including 36” (914mm) in front, to permit routine tightening of power terminations within the UPS and free passage of personnel with the door fully opened. Depending on the floor anchoring system used, up to 5” (127mm) may be required in the rear of the UPS.
There are no ventilation grilles on the sides or back of the UPS. Leave a minimum of 24 in. (610mm) between the top of the UPS frame and the ceiling to permit adequate air circulation above the unit. Vertiv™ recommends against using air conditioning or other systems that blow air onto the top of the unit.

Figure 2  Clearances—Front, side and rear

2.6.3 Floor Installation
If the Liebert® EXM™ is to be placed on a raised floor, the UPS should be mounted on a pedestal that will support the equipment point loading. Refer to the bottom view in Figure 1 to design this pedestal.
2.6.4 Cable Entry
Cables can enter the Liebert® EXM™ from the top or bottom through removable 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.

The UPS must be accessible from the front to allow personnel to complete the cable connections and make necessary adjustments.

NOTE
When installing the UPS, the customer must provide a disconnect with overcurrent protection at the output of the UPS.

Figure 3 Cable entry locations

2.7 Auxiliary Cabinets
The Liebert® EXM™ 10-40kVA UPS can be integrated with the following auxiliary cabinets:

Battery Cabinets—Optional Liebert® EXM™ Battery Cabinets™ are available for each Liebert® EXM™ model to provide extended run times, large battery system solutions and optional integrated Alber® battery monitoring. The battery cabinets are designed to be bolted to the left side of the UPS (see Figure 4). Refer to SL-25651, the Liebert® EXM™ Battery Cabinet manual, for details.

Maintenance Bypass Cabinets—Optional Liebert® EXM™ Bypass Cabinets™ are available to provide a full or partial wraparound maintenance bypass for servicing the UPS. Liebert bypass cabinets are designed to be bolted to the right side of the UPS (see Figure 4). Refer to SL-25652, the Liebert® EXM™ Maintenance Bypass Cabinet manual, for further details.

Bypass Distribution Cabinet—Optional Liebert® EXM™ Bypass Distribution Cabinets™ are available to provide a full wraparound maintenance bypass for servicing the UPS with optional input transformer and output distribution. Liebert bypass cabinets are designed to be bolted to
the right side of the UPS (see Figure 4). Refer to SL-25653, the Liebert® EXM™ Bypass Distribution Cabinet manual, for further details.

**Paralleling Cabinet**—Optional Liebert® EXM™ Paralleling Cabinets™ are available to provide connections enabling parallel operation of up to three Liebert® EXM™ UPS’s in applications offering increased capacity and redundant protection (1+1, 2+0, 2+1). A partial wraparound maintenance bypass for servicing of the parallel UPS system is included. Refer to SL-25654, the Liebert® EXM™ Paralleling Cabinet manual, for further details.

**Dual Transformer Cabinet**—Optional Liebert® EXM™ Dual Transformer Cabinets™ are available to provide step-down voltage transformation for dual-input UPS applications. Refer to SL-25655, the Liebert® EXM™ Dual Transformer Cabinet manual, for further details.

**System Composition**
A UPS system can comprise a number of optional equipment cabinets, depending on the system design requirements—e.g., UPS cabinet, External Battery Cabinet and External Bypass Cabinet. All cabinets used will be the same height and will be designed to be positioned side-by-side to form an aesthetically appealing equipment suite.

**Figure 4 Cabinet arrangement**

---

**ALL UNITS VIEWED FROM ABOVE**

Layouts shown are typical. Not all auxiliary cabinets are shown. Refer to the submittal drawings for the exact configuration of your system.

Liebert® EXM™ connected only to Liebert BDC™/MBC™ (The BDC/MBC must be on right side of the Liebert® EXM™)

Liebert® EXM™ connected to Battery Cabinet (Battery Cabinets must be on the left side of the Liebert® EXM™)

Liebert® EXM™ connected to Liebert® BDC/MBC and Battery Cabinets (BDC/MBC must be on the right side of the Liebert® EXM™) (Battery Cabinets must be on the left side of the Liebert® EXM™)
2.8 Power Module Assembly

Figure 5  Power Module Assembly indicators and controls

The Battery Start button allows starting the UPS on battery.
The Run LED is illuminated Green when the Liebert Power Module Assembly is operating normally.
The Fault LED will illuminate red when the Liebert Power Module Assembly has a problem.

Table 2  LED indications on power module assembly

<table>
<thead>
<tr>
<th>LED Status</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Run LED (Green)</strong></td>
<td></td>
</tr>
<tr>
<td>Flashing Green</td>
<td>The inverter is starting, but has no output yet.</td>
</tr>
<tr>
<td>Constant Green</td>
<td>The inverter has started to supply power.</td>
</tr>
<tr>
<td>OFF</td>
<td>The inverter has not started up.</td>
</tr>
<tr>
<td><strong>Fault LED (Red)</strong></td>
<td></td>
</tr>
<tr>
<td>Constant Red</td>
<td>Auxiliary power failure (15V or 24V), rectifier overtemperature, rectifier failure (including battery SCR short circuit), battery converter failure, soft start failure, main circuit back feed, abnormal input current, inverter failure, output short circuit, bypass SCR short circuit fault, inverter relay short circuit fault, abnormal bus voltage, module not ready, module ID out of range and duplicated module ID.</td>
</tr>
<tr>
<td>Flashing Red</td>
<td>Charger failure, abnormal main circuit voltage, abnormal main circuit frequency, main circuit undervoltage, main circuit reverse phase, battery unavailable, reverse battery, input zero-loss, current sharing failure, module overload, inverter relay disconnection fault, bypass SCR disconnection fault and input fuse blown.</td>
</tr>
<tr>
<td>OFF</td>
<td>No above failures or alarms.</td>
</tr>
</tbody>
</table>
2.9 Static Bypass Assembly

Figure 6 Static Bypass Assembly connections

See Figures 15-18 for details.

The Static Bypass Assembly has three Liebert IntelliSlot™ interface card bays and connections for optional ancillary cabinets and for other options.
3.0 ELECTRICAL CONNECTIONS—UPS

The UPS requires both power and control cabling once it has been mechanically installed. All control cables must run separate from power cables in metal conduits or metal ducts that are electrically bonded to the metalwork of the cabinets to which they are connected.

**WARNING**
Risk of electric shock. Can cause property damage, injury and death.
Before connecting input power to the Liebert EXM, ensure that you are aware of the location and operation of the overcurrent protection devices that connect the UPS input/bypass supply to the power distribution panel.
De-energize and lockout or tagout all incoming high- and low-voltage power circuits before installing cables or making any electrical connections.

**AVERTISSEMENT**
Risque de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort.
Avant de procéder au branchement de l'alimentation d'entrée du système EXM de Liebert, veillez à prendre connaissance de l'emplacement et du fonctionnement des dispositifs de protection de surintensité qui raccordent l'alimentation d'entrée ou de dérivation du système ASC au panneau de distribution électrique.
Coupez l'alimentation et appliquez le verrouillage ou l’étiquetage à tous les circuits d'alimentation haute tension et basse tension avant d'installer les câbles ou d'effectuer tout autre branchement électrique.

3.1 Power Cabling

3.1.1 Lug Size and Cable Rating
The main factors affecting the choice and size of cable are voltage, current (also taking into account overcurrent), room temperature and conditions of installation of the cable. Refer to ANSI/NFPA 70.

The power cables of the system must be sized with respect to the following description:

- **UPS input cables**—The UPS input cables must be sized for the maximum input current, including the maximum battery recharge current, given in Table 16, with respect to the unit rating and the input AC voltage.
- **UPS bypass and output cables**—The bypass and output cables must be sized for the nominal output current, given in Table 16, with respect to the unit rating and the output AC voltage.
- **Battery cables**—See the Liebert® EXM™ External Battery Cabinet manual, SL-25651, for battery installation guidelines and instructions. The manual ships with the battery cabinet and is available at Vertiv’s Web site: www.vertivco.com

**NOTE**
Table 16 gives nominal currents for determining the size of UPS power cables. Other important factors to consider include cable route length and coordination with protective devices.

The power cables can be sized to suit the UPS unit rating according to Table 16.

**Torque Requirements**
Refer to Tables 3 and 4 for lug size and torque requirements.

<table>
<thead>
<tr>
<th>Bolt Shaft Size</th>
<th>Lb-in (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot; (M10)</td>
<td>192 (22)</td>
</tr>
</tbody>
</table>
3.2 External Protective Devices

For safety concerns, it is necessary to install external circuit breakers or other protective devices for the input AC supply of the UPS system. This section provides generic practical information for qualified installation engineers. The installation engineers should be knowledgeable about regulatory wiring standards and the equipment to be installed.

To reduce the risk of fire, connect only to a circuit provided with branch circuit overcurrent protection in accordance with NEC ANSI/NFPA 70.

### 3.2.1 Rectifier and Bypass Input Supply of the UPS

**Overcurrents**

Install suitable protective devices in the distribution unit of the incoming mains supply, considering the power cable current-carrying capacity and overload capacity of the system. Generally, the magnetic circuit breaker with IEC60947-2 tripping curve C (normal) at the 125% of the nominal current listed in Table 16 is recommended.

Split bypass: In case a split bypass is used, separate protective devices should be installed for the rectifier input and bypass input in the incoming mains distribution panel. A shunt trip coil of 120V must be installed in the bypass and rectifier input breakers if the system does not include a Liebert Bypass Cabinet.

**NOTE**

The rectifier input and bypass input must use the same neutral line.

**Earth Leakage, RCD Devices**

Any residual current detector (RCD) installed upstream of the UPS input supply:

- Must be sensitive to DC unidirectional pulses (Class A)
- Must be insensitive to transient current pulses, and
- Must have an average sensitivity, adjustable between 0.3 and 1A.

To avoid false alarms, earth leakage monitoring devices when used in systems with split bypass input or when used in paralleled UPS configurations, must be located upstream of the common neutral sinking point. Alternatively, the device must monitor the combined four-wire rectifier and split bypass input currents.

### 3.2.2 UPS Output

If an external distribution panel is used for load distribution, the selection of protective devices must provide discrimination with those that are used at the input to the UPS (see Table 21).

### 3.2.3 UPS Input Configuration

By default, the Liebert® EXM™ ships with internal links installed between the bypass input and main (rectifier) input (single input configuration).

**Figures 7 and 8** show the Liebert® EXM™ in a split bypass (single source dual-input) configuration. In this configuration, the static bypass and the maintenance bypass lines are
supplied by the same source using separate feeds. Both feeds must be protected externally with properly sized protective devices.
To wire the Liebert® EXM™ as a single source dual-input UPS, remove the links and wire the bypass feed to the bypass busbars, then wire the main feed to the main busbars (see Figure 10).

Figure 7  Single UPS block diagram—Dual input, single source configuration, without bypass cabinet

NOTES
1. Install in accordance with national and local electrical codes.
2. Input and bypass must share the same single source.
3. A neutral is required from the system AC input source. Vertiv recommends a full-capacity neutral conductor and grounding conductors.
4. Bypass and rectifier inputs and output cables must be run in separate conduits.
5. Control wiring must be run in separate conduits.
6. Customer must supply shunt trip breakers with 120V coils to the bypass and rectifier.
Figure 8  Single UPS block diagram—Dual input, single source configuration

NOTES
1. Install in accordance with national and local electrical codes.
2. Input and bypass must share the same single source.
3. A neutral is required from the system AC input source. Vertiv recommends a full capacity neutral conductor and grounding conductors.
4. Bypass and rectifier inputs and output cables must be run in separate conduits.
5. Control wiring must be run in separate conduits.
6. Optional 54-pole, 225A distribution panel.
7. Customer must supply a shunt trip breaker with 120V coil. If an optional Liebert BDC is not present, the shunt trip must be installed to the bypass and rectifier breaker.

BIB - Bypass Isolation Breaker
MBB - Maintenance Bypass Breaker
MIB - Maintenance Isolation Breaker
* External Overcurrent Protection by others

Field-Supplied Wiring
3.2.4 UPS Input Configuration with Transformers

Figure 9 shows the Liebert® EXM™ in a split bypass (dual-source, dual-input) configuration using two transformers inside a dual-transformer cabinet.

In this configuration, the static bypass and the rectifier lines can be supplied by independent sources. The Liebert® EXM™ Dual Transformer Cabinet is the only approved method for supplying the EXM from two independent sources. See SL-25655 for details. Both feeds must be protected externally with properly sized protective devices.

Figure 9 Liebert® EXM™ in a split bypass configuration

3.2.5 Cabling Guidelines

The following are guidelines only and are superseded by local regulations and codes of practice where applicable. Use wiring rated at 75°C or greater.

1. Take special care when determining the size of the neutral cable, as current circulating on the neutral cable may be greater than nominal current in the case of non-linear loads. Refer to the values in 7.3 - UPS Electrical Characteristics.
2. The ground conductor should be sized according to such factors as the fault rating, cable lengths and type of protection. The ground cable connecting the UPS to the main ground system must follow the most
direct route possible. Control wiring and power wiring must be run in separate conduit. Output and input cables must be run in separate conduit.

3. Consider using paralleled smaller cables for heavy currents—this can ease installation.

4. Refer to SL-25651 for guidelines and instructions when sizing battery cables for optional external battery cabinets.

5. In most installations, the load equipment is connected to a distribution network of individually protected busbars fed by the UPS output, rather than connected directly to the UPS itself. When this is the case, the UPS output cables can be rated to suit the individual distribution network demands rather than being fully load-rated.

6. When laying power cables, do not form coils; this will help avoid increasing formation of electromagnetic interference.

3.2.6 Cable Connections

The rectifier input, bypass, output and battery are easily accessible from the front of the unit for installation. All require lug type terminations. They are connected to busbars on the front of the Liebert® EXM™, as shown in Figure 10. These busbars are accessible when the I/O panel is removed.

NOTICE
Risk of improper installation. Can cause equipment damage.
When wiring a single-input only system, connect only the power wiring to the input busbars.

NOTE
If more load is added to the distribution panel, the unit’s cabling must be resized.
Figure 10  Input busbars—Liebert® EXM™ 10-40kVA frame

FRONT VIEW
Door Removed

23.6”
(600mm)

78.5”
(1994mm)

Batteries

See Detail A

Rectifier Input Phase A
Rectifier Input Phase B
Rectifier Input Phase C
Input Neutral
Bypass Input Phase A
Bypass Input Phase B
Bypass Input Phase C
Batt +
Batt -
Output Phase A
Output Phase B
Output Phase C
Output Neutral

DETAIL A
EXM16002
Rev. 0

Ground
3.2.7 Accessory Fuses and Back-Feed Breaker Wiring

Two fuse blocks provide power for the back-feed breakers (standard) and the Alber® BDSUi (optional). The fuse blocks are at the lower right of the I/O panel on the front of the Liebert® EXM™ UPS. See Figure 11 for fuse-holder locations.

The back-feed breaker fuse block provides 120V nominal provided from the UPS output (L-N) and the fuse is rated for 8 amps. Figure 12 shows the back-feed breaker wiring, located on the bypass static switch assembly.

The Liebert® EXM™ does not include internal back-feed protection. A shunt trip coil of 120V must be installed in the bypass and rectifier input breakers if the system does not include a Liebert Bypass Cabinet. This is a safety feature and will prevent the UPS inverter from back-feeding the input source.

The Alber BDSUi fuse block provides 208V nominal from the UPS output (L-L) and the fuse is rated at 8A. The Alber BDSUi power wiring is shown in SL-25651, the Liebert® EXM™ Battery Cabinet manual.

![Figure 11 Accessory fuses](image-url)
Figure 12  Dual input back-feed breaker wiring when bypass distribution cabinet not used

1. Auxiliary contacts not needed for backfeed breaker operation.
2. A 120V shunt trip coil is required for proper operation.

NOTE

A shunt trip of the upstream Rectifier Input Breaker is required.
3.2.8 Safety Ground

The safety ground busbar is below the neutral input and output busbars as shown in Figure 13 below. The safety ground cable must be connected to the ground busbar and bonded to each cabinet in the system. This ground busbar is then connected to the ground electrode conductor (GEC).

All cabinets and cable conduit should be grounded in accordance with local regulations.

**WARNING**

Failure to follow adequate grounding procedures can result in electric shock hazard to personnel, or the risk of fire, should a ground fault occur.

All operations described in this section must be performed by properly trained and qualified electricians or technical personnel. If any difficulties are encountered, contact Vertiv™. See the back page of this manual for contact information.

**NOTE**

Proper grounding significantly reduces problems caused by electromagnetic interference.

**NOTE**

The ground and neutral busbars are easily accessible when the I/O panel is removed. Cable connections should be made before a cabinet is attached to the right side of the Liebert® EXM™ or before the UPS is placed where another obstruction, such as a wall, is against the Liebert EXM’s the right side.
3.2.9 Protective Devices

For safety, it is necessary to install circuit breakers in the input AC supply external to the UPS system. Given that every installation has its own characteristics, this section provides guidelines for qualified installation engineers with knowledge of operating practices, regulatory standards and the equipment to be installed.
UPS Rectifier and Bypass Input Supply
Protection from excessive overcurrents and short circuits in power supply input

- External overcurrent protection for the AC output circuit is to be provided. See 7.3 - UPS Electrical Characteristics and Table 21 for recommended breaker ratings.
- Overcurrent protection for the battery circuit must be provided by the customer when using an optional External Battery Cabinet.

**Dual Input Single Source**
When wiring the UPS with dual inputs but with a single input source, the Rectifier input and the Bypass input must be protected separately. Size the breakers according to the input currents shown in Tables 16 through 19.

**NOTE**
For single or dual input, a 120V shunt trip coil(s) is required when a breaker is supplied by the customer. See Figures 8 and 9 for details.

System Output
When using an external distribution panel for load distribution, the output neutral and input neutral must be separated at the input to the UPS.
3.2.10 Cabling Procedure

**WARNING**

All operations described in this section must be performed by properly trained and qualified electricians or technical personnel. If any difficulties are encountered, contact Vertiv®. See the back page of this manual for contact information.

**AVERTISSEMENT**

Toutes les opérations décrites dans cette section ne doivent être effectuées que par des électriciens ou des techniciens professionnels dûment formés et qualifiés. En cas de difficultés, communiquez avec Vertiv. Pour obtenir les renseignements de contact, consultez la dernière page de ce manuel.

**NOTE**

Hydraulic pressure pliers, combinative tools and piston ring pliers should be used to connect AC wiring.

Once the equipment has been positioned and secured for operation, and the battery and ground lugs have been connected (see **3.2.6 - Cable Connections**), connect the power cables as described below. (Study the reference drawing in **4.0 - Installation Drawings**.)

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 front I/O panel to gain easier access to the connections busbars.
3. Connect the facility ground and ancillary ground bus cables to the copper ground busbar located in the middle of the Liebert® EXM™ behind the output connections. All cabinets in the UPS system must be connected to the user’s ground connection.

4. Identify and make power connections with incoming cables according to **Steps 5 through 8**.

**Common Input Connections**

5. For common bypass and main inputs, connect the AC input supply cables to the UPS input terminals (A2-B2-C2-N1) and tighten the connections to 240lbs-in. (27N-m) (M10 Bolt). Ensure correct phase rotation.

**NOTE**

For common bypass and main inputs, the AC input cables must be connected to the bypass terminal (A2-B2-C2-N1) but not the main input terminal (A2-B2-C2).

**Split Bypass Connections**

6. If a split bypass configuration is used, connect the AC input supply cables to the rectifier input terminals (A1-B1-C1-N1) and the AC bypass supply cables to the bypass input terminals (A2-B2-C2-N1) and tighten the connections to 240lbs-in. (27N-m) (M10 Bolt). Ensure correct phase rotation.

**NOTE**

For split bypass operation, ensure that the busbars between bypass and rectifier inputs are removed. The neutral line of the bypass input must be connected to that of the rectifier input.
Output System Connections—Ensure Correct Phase Rotation

7. Connect the system output cables between the UPS output busbars (A-B-C-N terminals) and the critical load and tighten the connections to 240lb-in. (27N-m) (M10 bolt).

**WARNING**
Risk of electrical shock. Can cause injury or death.
If the load equipment will not be ready to accept power on the arrival of the commissioning engineer, ensure that the system output cables are safely isolated at their termination.

**AVERTISSEMENT**
Risque de décharge électrique pouvant causer des blessures graves, voire mortelles. Si les équipements branchés ne sont pas prêts à être alimentés à l’arrivée de l’ingénieur de mise en service, assurez-vous que les bornes des câbles de sortie du système soient isolées de façon sécuritaire.

Observe the battery cable polarity. Be sure that the battery connections, if any, are made with the correct polarity.

8. Refit all protective covers removed for cable installation.

3.3 Control Cables Details

3.3.1 Static Bypass Assembly Features

Based on your site’s specific needs, the UPS may require auxiliary connections to manage the battery system (external battery circuit breaker, battery temperature sensor), communicate with a personal computer or provide alarm signaling to external devices or for Remote Emergency Power Off (REPO). Terminations for these functions are located at the front of the static bypass assembly. The main features are:

- Input and output dry contacts signal (one pair of contacts of relay)
- Emergency Power Off control (EPO)
- Environmental parameter input interface
- User communication (for data setting and user background monitor)
- Liebert IntelliSlot™ interface
- Temperature detect interface

**Figure 14** Static bypass assembly connections to display cabinet and options
3.4 Dry Contacts

The UPS provides input dry contacts and output dry contacts on the Auxiliary Terminal Block (ATB).
3.4.1 **Input Dry Contacts**

External input dry contacts are connected via the ATB. Dry contacts are available for environment detection, battery ground fault detection, etc.

The UPS accepts external signal from zero-voltage (dry) contacts connected through external dry contact terminals produced, and these terminals are on the static bypass assembly. Through software programming, these signals become active when these contacts connect to +12V to ground (in the most left side). The cables connected to the monitor board must be separated from power cables. Moreover, these cables should be double-insulated with a typical cross-section of 0.5 to 1mm² for a maximum connection length between 82 and 165ft. (25-50m). The ATB has several input dry contacts.

**Figure 16  Input dry contacts**
### Table 5  Input dry contacts—J26

<table>
<thead>
<tr>
<th>Port</th>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J26</td>
<td>1</td>
<td>Q1 STATUS</td>
<td>The main input switch status signal</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Q2 STATUS</td>
<td>The bypass input switch status signal</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Q3 STATUS</td>
<td>External maintenance switch status signal</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Q5 STATUS</td>
<td>External output switch status signal</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>RESV2</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>RESV3</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>UT1 485+</td>
<td>485+</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>UT1 485-</td>
<td>485-</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>GND_MON</td>
<td>Monitor ground</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>GEN MODE</td>
<td>Generator mode input. Generator mode when not connected.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>TMP_BATT_IN</td>
<td>Internal Battery Temperature Detect</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>+12V_DRY</td>
<td>Power</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>ENV_DET</td>
<td>Battery room temperature detect</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>GND_DRY</td>
<td>Common ground</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>CHG SHUT</td>
<td>Charger off contact</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>RESV1</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>UT2 485+</td>
<td>485+</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>UT2 485-</td>
<td>485-</td>
</tr>
</tbody>
</table>
3.4.2 Output Dry Contacts

The Auxiliary Terminal Block has three output dry contact relays (see Figure 17 and Table 6).

Figure 17  Output dry contacts and EPO wiring

See Table 6 for pins and description.

Table 6  Output dry contact relays

<table>
<thead>
<tr>
<th>Port</th>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J24</td>
<td>1</td>
<td>MFP_O</td>
<td>Rectifier back-feed normally open contact. Open when there is no back-feed.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>MFP_S</td>
<td>Rectifier back-feed common contact.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>MFP_C</td>
<td>Rectifier back-feed normally closed contact. Closed when there is no back-feed.</td>
</tr>
<tr>
<td>J23</td>
<td>2</td>
<td>INV_O</td>
<td>Inverter state normally open contact. Open when the inverter is abnormal.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>INV_S</td>
<td>Inverter state common contact.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>INV_C</td>
<td>Inverter state normally closed contact. Closed when the inverter is normal.</td>
</tr>
<tr>
<td>J23</td>
<td>1</td>
<td>BFP_O</td>
<td>Bypass back-feed normally open contact. Open when there is no back-feed.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>BFP_S</td>
<td>Bypass back-feed common contact.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>BFP_C</td>
<td>Bypass back-feed normally closed contact. Closed when there is no back-feed.</td>
</tr>
<tr>
<td>J24</td>
<td>2</td>
<td>MAIN_O</td>
<td>Rectifier input state normally open contact. Open when the rectifier is abnormal.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>MAIN_S</td>
<td>Rectifier input state common contact.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>MAIN_C</td>
<td>Rectifier input state normally closed contact. Closed when the rectifier is normal.</td>
</tr>
</tbody>
</table>

NOTE

All auxiliary cables of terminal must be double-insulated. Wire should be 20-16AWG stranded for maximum runs between 80 and 200 feet (25-60m), respectively.
3.4.3 Liebert BDC Interface
The Liebert BDC interface is on the Auxiliary Terminal Block at J26. Refer to Figure 16 for circuit details.

Table 7 Liebert BDC interface

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J26.1</td>
<td>Q1 STA</td>
<td>The main input switch status signal</td>
</tr>
<tr>
<td>J26.5</td>
<td>Q2 STA</td>
<td>The bypass input switch status signal</td>
</tr>
<tr>
<td>J26.9</td>
<td>Q3 STA</td>
<td>External maintenance switch status signal</td>
</tr>
<tr>
<td>J26, 3, 7, 11</td>
<td>GND</td>
<td>Dry ground</td>
</tr>
</tbody>
</table>

These contacts cannot be active unless they are set via software.

NOTE
All auxiliary cables of terminal must be double-insulated. Wire should be 20-16AWG stranded for maximum runs between 80 and 200 feet (25-60m), respectively.

NOTE
Refer to SL-25653, the Liebert® EXM™ Bypass Distribution Cabinet manual for the Liebert BDC wiring.

3.4.4 Battery Cabinet Interface Connectors
The battery cabinet interface is on the Auxiliary Terminal Block at J22. Refer to Figure 18 for circuit details.

Figure 18 Battery cabinet interface—J22

See Table 8 for pins and

Table 8 Battery cabinet interface—J22

<table>
<thead>
<tr>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12V_DRV</td>
<td>BCB driver signal</td>
</tr>
<tr>
<td>3</td>
<td>BCB STATUS</td>
<td>BCB state signal</td>
</tr>
<tr>
<td>5</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td>7</td>
<td>BCB_ON</td>
<td>BCB on line signal</td>
</tr>
<tr>
<td>9</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>
3.4.5 EPO Input—Optional

**NOTICE**
Risk of exceeding internal voltage limits. Can cause equipment damage.

Do not apply more than 12V to the Emergency Power Off (EPO) input. Exceeding 12V on this input can damage the Liebert EXM’s internal circuitry and control boards. Exceeding 12V will also put the Liebert EXM in an EPO state, and the unit will not reset, making it non-functional.

The UPS has an Emergency Power Off (EPO) function operated by a button on the control panel or by a remote contact provided by the user. The EPO button is under a hinged, clear plastic shield.

The J2 connector, in **Figure 19**, is the remote EPO input interface. The EPO has NO/NC contacts that become active when shorting terminals J2: 3 and 4 or open terminal connection J2: 2 and 1.

If an external Emergency Stop capability is required, it is connected at terminals J2: 1 and 2 and at J2: 3 and 4 on the monitor board. It also is connected to the Normally Open or Normally Closed remote stop switch between these two terminals using shielded cable (see **Figure 19** and **Table 9**). If this function is not used, terminals J2:3 and 4 must be opened and J2:1 and 2 must be closed.

### Table 8  Battery cabinet interface—J22

<table>
<thead>
<tr>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td>13</td>
<td>TMP_BATT</td>
<td>External Battery temperature</td>
</tr>
<tr>
<td>15</td>
<td>12V_A</td>
<td>Power</td>
</tr>
<tr>
<td>17</td>
<td>GND_DRY</td>
<td>Dry ground</td>
</tr>
<tr>
<td>19</td>
<td>BATT_GND_FAULT</td>
<td>Battery ground fault signal</td>
</tr>
</tbody>
</table>

**NOTE**
All auxiliary cables of terminal must be double-insulated. Wire should be 20-16AWG stranded for maximum runs between 80 and 200 feet (25-60m), respectively.
**Figure 19  EPO wiring and signal names for J2**

See Table 9 for pins and

![Diagram of J2 EPO wiring](image)

**Table 9  EPO input contact relays—J2**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EPO-NC</td>
<td>EPO activated when opened to Pin 2</td>
</tr>
<tr>
<td>2</td>
<td>+12V</td>
<td>EPO activated when opened to Pin 1</td>
</tr>
<tr>
<td>3</td>
<td>+12V</td>
<td>EPO activated when shorted to Pin 4</td>
</tr>
<tr>
<td>4</td>
<td>EPO-NO</td>
<td>EPO activated when shorted to Pin 3</td>
</tr>
</tbody>
</table>

**NOTE**

The Emergency Stop action within the UPS shuts down the rectifier, inverter and static bypass. It does not internally disconnect the input power supply. To disconnect ALL power to the UPS, open the upstream feeder breaker(s) after the remote EPO is activated.

**NOTE**

Normally Closed EPO – J2: 12, these terminals are supplied factory-linked on the Bypass Module on the UPS and must remain installed if using NO contacts.

**NOTE**

All auxiliary cables of terminal must be double-insulated. Wire should be 20-16AWG stranded for maximum runs between 80 and 200 feet (25-60m), respectively.
3.5 Parallel Cable Connections

Figure 21 Parallel cable wiring diagram
4.0 INSTALLATION DRAWINGS

The diagrams in this section illustrate the key mechanical and electrical characteristics of the Liebert® EXM™ UPS System cabinets (UPS, Liebert BDC and battery).

Figure 22  UPS dimensions

1. 24” (610mm) minimum clearance above unit for air exhaust.
2. 36” (914mm) front access required for service.
3. No clearance required in rear except when using seismic anchoring: allow 5” (127mm) clearance.
4. Keep cabinet within 15 degrees of vertical.
5. Top and bottom cable entry available through removable access plates. Remove, punch to suit conduit size and replace.
6. Unit bottom is structurally adequate for forklift handling.
7. Control wiring and power wiring must be run in separate conduits.
8. All wiring is to be in accordance with national and local electrical codes.
9. Overall dimensions are shown with side panels.
Figure 23  UPS main components—Typical 10-40kVA unit
Figure 24 UPS cable connections—10-40kVA frames

FRONT VIEW
Door Removed

23.6”
(600mm)

78.5”
(1994mm)

See Detail A

Batteries

DETAIL A

EXM16002
Rev. 0

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5.0 OPTION INSTALLATION

5.1 Liebert IntelliSlot™ Communication
The Liebert® EXM™ has three Liebert IntelliSlot ports to allow field-installation of optional communication cards. Liebert IntelliSlot cards communicate via Liebert’s proprietary Velocity protocol to cards that translate the information into such protocols as SNMP and Modbus. Other cards provide dry contact signals for external signaling of operating status. The Liebert IntelliSlot communication ports may be installed or removed while the Liebert® EXM™ is operating.

5.2 Liebert IntelliSlot Web Card—SNMP/HTTP Network Interface Card
This network interface card provides all real-time data and status information as SNMPv1 traps for connection to a 10/100-baseT Ethernet connection. The same card also will transmit the same status information and all measured parameters for display via a Web browser. The Liebert IntelliSlot bays are on the right side of the control module and labeled as IntelliSlot1, IntelliSlot2, and IntelliSlot3.

Table 10  Liebert® EXM™ communication options
<table>
<thead>
<tr>
<th>Port Type and Location</th>
<th>Labeled ID Name of Port</th>
<th>Monitoring Devices Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Liebert IntelliSlot</td>
<td>IntelliSlot 1</td>
<td>IS-Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IS-Unity-DP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IS-Unity-LIFE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IS-485EXI</td>
</tr>
<tr>
<td>Center Liebert IntelliSlot</td>
<td>IntelliSlot 2</td>
<td>IS-Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IS-Unity-DP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IS-Unity-LIFE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IS-485EXI</td>
</tr>
<tr>
<td>Right Liebert IntelliSlot</td>
<td>IntelliSlot 3</td>
<td>IS-Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IS-Unity-DP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IS-Unity-LIFE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IS-485EXI</td>
</tr>
</tbody>
</table>

5.2.1 Liebert IntelliSlot Unity Cards—IS-UNITY-LIFE, IS-UNITY-S, IS-UNITY-DP
- **IS-UNITY-LIFE**: This standard card is used for communication between the Liebert® EXM™ and Vertiv’s Trellis™ NMS and LIFE™ services.
- **IS-UNITY-DP**: This card can be used instead of the standard card if communication to two third-party platforms is required. Third-party platforms include SNMP and 485 (Modbus/BACnet) protocols. This card would still be used for communication between the Liebert EXM and Vertiv’s Trellis NMS and LIFE Services. All communication protocols are active simultaneously.
- **Liebert IntelliSlot Dry Contact Card (IS-RELAY)**: Provides dry contact alarm information, including: On Battery, On Bypass, Low Battery, Summary Alarm, UPS Fault and On UPS signals for communication to a remote monitoring system.
- **IS-485EXI**: The Liebert IntelliSlot 485 EXI Card provides connection to a Liebert SiteLink-e™ allowing Liebert SiteScan™ Web 4.0 monitoring and control of your Liebert equipment.
5.3 Liebert IntelliSlot™ Web Card—Optional
An optional Web card is available that provides remote access to the UPS. A wide variety of status and summary information is available through an Ethernet connection.

Figure 25 Liebert IntelliSlot Web card display

5.4 Liebert IntelliSlot Relay Card
The Liebert IntelliSlot Relay card (IS-RELAY) provides voltage-free contact closures for remote monitoring of alarm conditions.
Delivering **On Battery, On Bypass, Low Battery, Summary Alarm, UPS Fault** and **On UPS** signals, the easy-to-install card integrates with AS/400 computers (additional cable required) and other relay contact monitoring systems.
The relay card is rated for 24 VAC/DC at 1A. and supported in any of the three Liebert IntelliSlot bays on the Liebert® EXM™.

5.4.1 Liebert IntelliSlot Relay Card Pin Configuration
The card has two terminals blocks, TB1 (green, numbered 1-9) and TB2 (black, 10-18), as shown in **Figure 26**.
Refer to your Liebert product user manual for the pin configuration for the terminal blocks.

**Table 11  Relay card pin configuration**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Common - Low Battery</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Low Battery</td>
<td>Closed if Low Battery point occurs.</td>
</tr>
<tr>
<td>3</td>
<td>Low Battery</td>
<td>Closed if battery is OK</td>
</tr>
<tr>
<td>4</td>
<td>Common - UPS Fault</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>UPS Fault</td>
<td>Closed if UPS fault occurs</td>
</tr>
<tr>
<td>6</td>
<td>UPS Fault</td>
<td>Closed if no UPS failure</td>
</tr>
<tr>
<td>7</td>
<td>Common - On Battery</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>On Battery</td>
<td>Closed if On Battery power (Utility failure)</td>
</tr>
<tr>
<td>9</td>
<td>On Battery</td>
<td>Closed if not On Battery power (Utility OK)</td>
</tr>
<tr>
<td>10</td>
<td>Not Used</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Not Used</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Not Used</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Summary Alarm*</td>
<td>Closed if no alarm conditions are present</td>
</tr>
<tr>
<td>14</td>
<td>Summary Alarm*</td>
<td>Closed if Summary Alarm occurs</td>
</tr>
<tr>
<td>15</td>
<td>Common - Summary Alarm</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>On UPS</td>
<td>Closed if On UPS (inverter) power</td>
</tr>
<tr>
<td>17</td>
<td>On Bypass</td>
<td>Closed if On Bypass</td>
</tr>
<tr>
<td>18</td>
<td>Common - On Bypass</td>
<td></td>
</tr>
</tbody>
</table>
5.4.2 Liebert IntelliSlot™ Relay Card Jumper Setup

The Liebert IntelliSlot Relay Card has five jumpers, P3 through P7, as shown in Figure 27. Each jumper connects two pins.

By default, all five jumpers have shunts installed. The two pins are shunted together to provide the functions shown in Table 12, allowing relay commons to be tied together.

The jumpers should be removed if there is any external voltage source that may intentionally or inadvertently be connected to the relay.

Removing the shunt from any two pins breaks the connection between the relay commons so they are not tied together.

<table>
<thead>
<tr>
<th>Jumper</th>
<th>Relay</th>
</tr>
</thead>
<tbody>
<tr>
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**NOTE**

Refer to the Liebert IntelliSlot Relay Card manual, SL-23211 for additional details. The document is available at the Vertiv Web site, www.vertivco.com
6.0 OPERATION

**WARNING**
Risk of electrical shock. Can cause personal injury or death. This UPS has several circuits that are energized with high DC as well as AC voltages. Check for voltage with both AC and DC voltmeters before working within the UPS. 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 UPS or preparing the UPS for installation.* When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats.

**AVERTISSEMENT**
Risque de décharge électrique pouvant causer des blessures graves, voire mortelles. Ce système ASC comporte plusieurs circuits à haute tension c.a et c.c. 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 sécurité 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.

The Liebert® EXM™ operates in the modes shown in **6.4 - Liebert® EXM™ Operating Modes**. This section describes various kinds of operating procedures under each operating mode, including transfer between operating modes, UPS setting and procedures for turning on/off inverter. As shown in SL-25656, the Liebert® EXM™ Battery Cabinet manual, the AC utility source is supplied through the input breaker, and the rectifier converts the alternating current into DC power. The inverter converts the AC power from the utility—or DC power from an optional External Battery Cabinet—into AC power for the load. The batteries power the load through the inverter in the event of a power failure. The utility source can also power the load through the static bypass. If maintenance or repair of the UPS is necessary, the load can be switched without interruption in service using the optional Liebert MBC.
6.1 Touchscreen Control Panel
The Liebert® EXM’s™ Touchscreen Control Panel is active whenever the UPS has input power. The touchscreen LCD on the front of the UPS permits:

- Logging in to the system
- Customizing the user interface
- Checking the status of the UPS and its external batteries, including all measured parameters, events and alarms
- Determining when users logged in and out
- Silencing alarms
- Turning the UPS On and Off
- Resetting faults
- Enabling Energy Saving Mode

Scan the QR code at right to obtain a copy of the Touchscreen Control Panel manual.

6.2 Access Level Log-In
The Touchscreen Control Panel provides security by limiting the authority to change how the UPS operates. Each of the four access levels offers different authority:

- Observer—Viewing permission only, can choose graphic or text display, view logs and silence alarms; no PIN required
- Operator—Permission to start and shut down the UPS, edit the display layout, test the battery, reset faults, enable or disable Eco Mode operation, enable equalize battery charging and acknowledge alarms; PIN required
- Administrator—All functions of Operator plus permission to change PIN’s for Operator and Administrator level, configure the Status Gauge, set energy saving mode and change network communication protocols; PIN required
- Service—All functions of Administrator plus permission to alter system configuration and change Service PIN; PIN required.

6.3 Default PIN’s
Vertiv Services sets PIN’s when setting up the UPS. These default PIN’s may be changed by those with Administrator or Service access (see above). Default PIN’s are:

- Operator: 1234
- Administrator: 2345

NOTICE
Risk of unauthorized changes to operational settings. Can cause equipment damage. The default PIN numbers should be changed immediately to prevent unauthorized personnel from changing UPS operation or even shutting down the UPS. Refer to the Touchscreen Control Panel, SL-26200, available at Vertiv’s Web site, www.vertivco.com for details.

6.4 Liebert® EXM™ Operating Modes
The UPS is designed to operate as an on-line, double-conversion, reverse-transfer system in the following modes:

- Load on Inverter Mode
- Load on Battery Mode
- Auto-Restart Mode
- Maintenance Mode (Manual Bypass)
- Sleep Mode
- Paralleling Mode
Load on Inverter Mode
Operating in Mode, the Liebert EXM’s rectifier derives power from a utility AC source and supplies regulated DC power to the inverter, which regenerates precise AC power to supply the connected equipment. The rectifier also uses the utility source power to charge the batteries.

NOTE
1. The user controls and indicators referred to in these procedures are detailed in the UPS control panel manual, SL-26200, available at Vertiv’s Web site, www.vertivco.com
2. The audible alarm may sound at various points during these procedures. It can be canceled at any time by pressing the menu button (under any login), pressing Alarms and then pressing Alarms.

NOTE
This unit refers to some modes and conditions that are set or adjusted using proprietary service software. To take advantage of all the available features for the Liebert EXM, the unit must be commissioned by a Vertiv-authorized engineer.
Module Redundancy Mode
When the Liebert® EXM™ is in module redundancy mode, the load percentage is calculated using the available power module capacity or nameplate rating capacity, whichever capacity is lower.

Module redundancy mode can be set at the factory or by the user. A maximum of one module can be set for redundancy. Availability of this feature depends on module capacity of the frame. Refer to the UPS control manual, SL-26200, for instructions on setting this feature. The manual is available at Vertiv’s Web site, www.vertivco.com

Example 1
- Two 20 kVA power modules installed
- Nameplate rating capacity = 20 kVA
- One power module in redundant mode
- Configured capacity = 20kVA
- Load = 20kVA

Load percentage will be calculated based on nameplate rating capacity = 20kVA capacity. In the event of a single power module fault, the system will signal a Loss of Redundancy Alarm and a Power Hardware Mismatch and continue in double-conversion mode and provide up to 20kVA capacity.

Example 2
- Two 20kVA power modules installed
- Nameplate rating capacity = 40kVA
- One power module in redundant mode
- Configured capacity = 20kVA
- Load = 20kVA

Load percentage will be calculated based on available power module capacity = 40kVA capacity. In the event of a single power module fault, the system will signal a Loss of Redundancy Alarm and a Power Hardware Mismatch Alarm. The system will continue in double-conversion mode and provide up to 20kVA capacity.

Example 3
- Two 20kVA power modules installed
- Nameplate rating capacity = 40kVA
- One power module in redundant mode
- Configured capacity = 20kVA
- Load = 30kVA

Load percentage will be calculated based on available power module capacity = Loss of Redundancy Alarm. The system will continue in double-conversion mode and provide up to 40kVA capacity.

Load on Battery Mode—Requires Optional External Battery Cabinet
When utility AC power fails, the Liebert® EXM™ protects the critical load by instantaneously channeling battery power from optional External Battery Cabinets to the inverter, which continues supporting the critical load without interruption. When utility power returns and is within acceptable limits, the Liebert® EXM™ automatically shifts back to Load on Inverter Mode, with the rectifier powering the critical load.

Auto-Restart Mode
The battery may become exhausted following an extended AC utility failure. The inverter shuts down when the battery reaches the End of Discharge voltage (EOD). The UPS may be programmed to “Auto Recovery after EOD” after a delay time if the AC utility recovers. This mode and any delay time may be programmed by the commissioning engineer.
Load on Bypass Mode
When the Liebert® EXM™ load is supplied by the bypass, the load is directly supported by utility power and is without battery backup protection.

The Liebert EXM’s static transfer switch will shift the load from the inverter to the bypass without interruption in AC power if the inverter is synchronous with the bypass and any of the following occurs:

- inverter fails
- inverter overload capacity is exceeded
- inverter is manually turned Off by user

NOTE
If the inverter is asynchronous with the bypass, the static switch will transfer the load from the inverter to the bypass WITH interruption in AC power to the critical load. This interruption will be less than 15ms (in 50Hz), or less than 13.33ms (in 60Hz). This interruption time may be altered by modifying the Output transfer interrupt time setting.

ECO Mode (Single-Module UPS System Only)
When ECO mode is selected, the Liebert® EXM™ switches inverter power from the UPS input to the bypass input to save energy by improving UPS efficiency. In this mode, the bypass is the preferred source. If the bypass voltage or frequency becomes outside preset limits, the UPS load is transferred back to the inverter.

Maintenance Mode
For maintenance or repair, the Liebert® EXM™ may be operated in maintenance mode. To place the Liebert® EXM™ in maintenance mode, follow the instructions in 6.6 - Switching the UPS from Normal Operation to Maintenance Bypass.

WARNING
Risk of arc flash and electric shock. Can cause equipment damage, injury and death
The UPS input and output must be protected with external overcurrent protection devices. In maintenance mode, the input and output busbars remain energized and present an electric shock hazard.

AVERTISSEMENT
Risque d’arc ou de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort.
L’entrée et la sortie du système ASC doivent être protégées par des dispositifs de protection de surintensité externes. En mode d’entretien, les barres omnibus d’entrée et de sortie demeurent sous tension et présentent un risque de décharge électrique.

Output Voltage Adjustment
This feature allows a Liebert Customer Engineer to adjust the Liebert EXM’s output voltage over a range of -5% to +5% of nominal. The output voltage adjustment can be used to compensate for any drop in line voltage that may occur when the UPS is a significant distance from the protected load. In addition, it can be used to optimize the UPS output voltage for loads that operate more efficiently at a voltage different from the nominal Liebert® EXM™ output voltage.
Generator Mode
The Liebert® EXM™ UPS can be set up for operation in Generator Mode by a Vertiv Services engineer. The setup requires connecting J26 Pin 2 to Pin 4.

6.5 UPS Startup
The Liebert® EXM™ must be fully installed and commissioned before startup, and external power isolators must be closed. Once those general conditions are met, the UPS may be started.

**WARNING**
Risk of electrical shock and arc flash. Can cause property damage, injury and death. During this procedure the output terminals will become live. If any load equipment is connected to the UPS output terminals, please check with the load user and ascertain whether it is safe to apply power to the load. If the load is not ready to receive power, then ensure that it is safely isolated from the UPS output terminals.

**NOTICE**
Risk of improper startup when feeding a downstream transformer. Can cause damage to connected equipment. If the UPS is supplying a downstream transformer not provided by Liebert, the UPS should be put on maintenance bypass to energize it to mitigate the risk of in-rush current.

6.5.1 Startup Procedure
To start the UPS from a fully powered-down condition:

1. Log in as Operator, Administrator or Service.
2. Ensure that the Liebert Power Module Assembly ready switches are latched (in Down position).
3. Close the external input circuit breaker and connect input power. The touchscreen activates.
4. The rectifier goes through its startup sequence and the bypass static switch is activated.
5. Close the external output circuit breaker.
6. Touch the OPERATE tab
7. Touch the Inverter On radio button. When asked to confirm, touch On again. The power module run lights will start flashing green while the unit goes through the inverter startup sequence. After about a minute, the inverter will turn On, the static bypass will open and the power module run lights will be solid green.
8. Close the battery breaker.
6.5.2 Startup in Eco Mode
Eco Mode is available only on a single-module Liebert® EXM™.
1. Log in as Operator, Administrator or Service.
2. Touch the OPERATE tab.
3. Touch Energy Saving Mode Activation Setup.
4. In the drop-down menu, touch Enable.
5. Touch Save.
The UPS load should now be supplied by the bypass with the inverter on standby. The status bar at the top of the screen will say ENERGY SAVING MODE ACTIVE.

6.5.3 Switching Between UPS Operation Modes
To switch from Load on Inverter Mode to Load on Bypass Mode
1. Log in as Operator, Administrator or Service.
2. Touch the OPERATE tab.
3. Touch Inverter Off radio button to switch to Load on Bypass Mode.
4. To continue, confirm turning Off the inverter when prompted.

**NOTICE**
Risk of power loss to connected load. Can cause damage to equipment.
The load equipment is not protected from normal supply aberrations, such as spikes, sags and failure, when the Liebert® EXM™ load is supplied by the bypass or maintenance bypass.

To Switch from Load on Bypass Mode to Load on Inverter Mode
1. Log in as Operator, Administrator or Service.
2. Touch the OPERATE tab.
3. Touch the Inverter On radio button.

To continue, confirm turning On the inverter when prompted.

6.6 Switching the UPS from Normal Operation to Maintenance Bypass
Follow the procedure below to transfer the load from the UPS inverter output to the Maintenance Bypass system.

**NOTICE**
Risk of loss of power to the connected load. Can cause equipment damage.
This procedure must be performed by properly trained and qualified personnel who are knowledgeable about the operation of this system. Failure to follow these instructions will result in loss of power and possible damage to critical equipment.
Before performing this operation, read any messages on the touchscreen to be sure that bypass supply is regular and the inverter is synchronous with it. If those conditions are not present, there is a risk of a short interruption in powering the load.
This procedure assumes that UPS is operating normally.

1. Log in as Operator, Administrator or Service.
2. Touch the OPERATE tab.
3. Touch the Inverter Off radio button.
4. To continue, confirm turning Off the inverter when prompted.

**NOTE**

Pressing Silence from the OPERATE tab cancels the audible alarm, but leaves the warning message displayed until the appropriate condition is rectified.

5. Open the Liebert MBC door to gain access to the bypass isolation breaker (BIB), maintenance bypass breaker (MBB) and maintenance isolation breaker (MIB).
6. When the lamp indicator on the MBC is illuminated, press and hold the adjacent push button and remove the key from the lock (K0).
7. Insert the key into the lock on the MBB and turn the key.
8. Close the MBB.
9. Verify the MBB is closed. Failure to close the MBB will interrupt power to the load.
10. Open the MIB.
11. Remove the key from the lock on the MIB. Insert the key into the lock (K0) and turn the key.
12. The UPS system is now isolated from the critical load.
13. For a single-input system, the bypass isolation breaker (BIB) remains closed; this allows power to remain present at the UPS input; refer to Figure 28.
14. For a single-source, dual-input system, the bypass isolation breaker (BIB) can be opened to further isolate the UPS from input power; refer to Figure 29.
**WARNING**
Risk of electrical shock and arc flash. Can cause property damage, injury and death.
Wait 5 minutes for the internal DC busbar capacitors to discharge before attempting to remove the internal protective barriers.

**AVERTISSEMENT**
Risque d’arc ou de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort.
Attendez 5 minutes que les condensateurs de barre omnibus c.c. internes se déchargent avant d’essayer de retirer les barrières de protection internes.

**WARNING**
Risk of electrical shock and arc flash. Can cause property damage, injury and death.
Even with the UPS in maintenance bypass and Off, portions of the Liebert® EXM™ system are still energized. Service must be performed by properly trained and qualified personnel only.

**AVERTISSEMENT**
Risque d’arc ou de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort.
Même lorsque le système ASC est en mode de dérivation d’entretien et hors tension, des parties du système EXM de Liebert demeurent sous tension. L’entretien ne doit être confié qu’à un personnel qualifié et dûment formé.

**NOTICE**
Risk of power loss to connected load. Can cause damage to equipment.
The load equipment is not protected from normal supply aberrations, such as spikes, sags and failure, when the Liebert® EXM™ load is supplied by the bypass or maintenance bypass.
6.7 Switching the UPS from Maintenance Bypass to Normal Operation

Follow the procedure below to transfer the load from the Maintenance Bypass system to the UPS inverter output.

These conditions must be met for this operation to proceed:

- the UPS must be operating normally
- the BIB breaker must be closed
- the UPS system must be supplying the load by the bypass.

**NOTICE**

Risk of loss of power to the connected load.
Can cause equipment damage.

This procedure must be performed by properly trained and qualified personnel who are knowledgeable about the operation of this system. Failure to follow these instructions will result in loss of power and possible damage to critical equipment.

Before performing this operation, read any messages on the touchscreen to be sure that bypass supply is regular and the inverter is synchronous with it. If those conditions are not present, there is a risk of a short interruption in powering the load.
1. Verify that the Liebert® EXM™ is in supplying power to the load from the bypass.

   **NOTE**

   *Pressing the Alarm Silence Switch cancels the audible alarm, but leaves the warning message displayed until the appropriate condition is rectified.*

2. Open the Liebert MBC door to gain access to the bypass isolation breaker (BIB), maintenance bypass breaker (MBB) and the maintenance isolation breaker (MIB).
3. When the Lamp indicator on the MBC is illuminated, press and hold the adjacent push button and remove the key from the lock (K0).
4. Insert the key into the lock on the MIB, and turn the key.
5. Close the MIB.
6. Verify the MIB is closed. Failure to close the MIB will interrupt power to the load.
7. Open MBB.
8. Remove the key from the lock on the MBB.
9. Insert the key into the lock (K0) and turn the key.

The UPS system is now supplying power to the critical load.

10. Log in as Operator, Administrator or Service.
11. Touch the OPERATE tab.
12. Touch the Inverter On radio button.
13. To continue, confirm turning On the inverter when prompted.
6.8 De-Energize Liebert® EXM™ with Maintenance Bypass Cabinet

**NOTICE**
Risk of loss of power to the connected load. Can cause equipment damage.
This procedure must be performed by properly trained and qualified personnel who are knowledgeable about the operation of this system. This procedure will remove power from the critical bus.
Take precautions by providing a backup power supply or shutting down equipment before de-energizing the Liebert EXM.

To de-energize the system:
1. Log in as Operator, Administrator or Service.
2. Touch the OPERATE tab.
3. Touch the **Inverter Off** radio button.
4. To continue, confirm turning Off the inverter when prompted.
5. Open all battery circuit breakers(s) including the internal battery breaker (if applicable).
6. If the MBC is a Vertiv cabinet, open the Maintenance Isolation Circuit Breaker (MIB). If the MBC is a customer-issued switchgear or a non-Vertiv cabinet, open the breaker(s) that supply power to the critical bus.
7. Open the Rectifier Input Circuit Breaker and Bypass Input Breaker (if dual input). If the MBC is a customer-issued switchgear or a non-Vertiv cabinet, open the breaker(s) that supply power to the UPS input and bypass input (if dual input).
8. Allow 5 minutes for all DC circuits and capacitors to fully discharge.
9. Open the external feeder breaker to the MBC or bypass switchgear.
10. Install a Lockout/Tagout on the external feeder breaker to the MBC or bypass switchgear.
11. Use a digital multimeter to verify there is no AC or DC voltage present at the UPS input, output and bypass bus bars.
12. Use a digital multimeter to verify there is no AC or DC voltage present at the MBC BIB, MIB and MBB breakers.

6.9 De-Energize Liebert® EXM™ Without Maintenance Bypass Cabinet

**NOTICE**
Risk of loss of power to the connected load. Can cause equipment damage.
This procedure must be performed by properly trained and qualified personnel who are knowledgeable about the operation of this system. This procedure will remove power from the critical bus.
Take precautions by providing a backup power supply or shutting down equipment before de-energizing the Liebert EXM.

To de-energize the Liebert® EXM™:
1. Log in as Operator, Administrator or Service.
2. Touch the OPERATE tab.
3. Touch the **Inverter Off** radio button.
4. To continue, confirm turning Off the inverter when prompted.
5. Open all battery circuit breakers(s) including the internal battery breaker (if applicable).
6. Open the UPS output circuit breaker(s).
7. Open the UPS input circuit breaker and bypass circuit breaker (dual input systems only).
8. Allow 5 minutes for all DC circuits and capacitors to fully discharge.
9. Use a digital multimeter to verify there is no AC or DC voltage present at the UPS input, output and bypass bus bars.
Figure 29  Typical configuration for single UPS

Notes:
1. Install in accordance with national and local electrical codes.
2. Input and bypass must share the same single source.
3. A neutral is required from the system AC input source. Vertiv recommends a full-capacity neutral conductor and grounding conductors.
4. Bypass and rectifier inputs and output cables must be run in separate conduits.
5. Control wiring must be run in separate conduits.
6. Customer must supply shunt trip breakers with 120V coils to the bypass and rectifier inputs.

* Bypass
AC Input
4 Wire + GND
See Note 6

* Rectifier
AC Input
4 Wire + GND
See Note 6

AC Output
208V
4 Wire + GND

UPS
BATTERY

* External Overcurrent Protection By Others

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Field-Supplied Wiring
6.10  Parallel Operations—Determine Control Panel Firmware Version

Parallel operation differs depending on the software in the control menu. To determine which version is installed on the UPS, activate the touchscreen menu, touch the Context Menu and touch About.

If the firmware is V1.1, perform the appropriate steps in 6.11 - Parallel Operations—Software Version 1.1.

If the firmware is V1.0, perform the appropriate steps in 6.12 - Parallel Operations—Software Version 1.0

6.11  Parallel Operations—Software Version 1.1

6.11.1  De-Energize a Liebert® EXM™ Parallel System—Software Version 1.1

To shut down a UPS parallel system using V1.1 controller software:

1. Log in as Operator, Administrator or Service.
2. Verify that the system and the connected load are prepared for shutdown.
3. Touch the OPERATE tab
4. Touch the Inverter Off radio button. A pop-up window states that the system is operating in a multi-module system and asks whether to control one inverter or the entire system.
5. Touch System.

The power module run lights will start flashing yellow while the unit goes through the inverter shutdown sequence. After a few seconds, the inverter will turn Off, the static bypass will close and the power module run lights will be Off. All UPS units in the system will go to bypass

6. Check the parallel switchgear.

**NOTICE**

Risk of loss of power to the connected load. Can cause equipment damage. The following procedure will remove power from the critical bus. Before beginning these steps, shut down the connected load or transfer the connected load to an input power supply not dependent on the Liebert® EXM™ system that is being de-energized.

a. If the parallel switchgear is a matching Vertiv cabinet, open the Maintenance Isolation Circuit Breaker (MIB).

b. Open all Module Output Breakers (MOB).

7. Open the input breaker for each UPS and the breaker feeding the Maintenance Bypass Breaker (MBB) in the parallel switch gear.

The system is now de-energized, and its output power supply is Off.
6.11.2 Re-Energize a Liebert® EXM™ Parallel System—Software Version 1.1

To restart Liebert® EXM™ parallel system from a fully powered-down condition using V1.1 controller software:

1. Log in as Operator, Administrator or Service.
2. Close the input breakers for all UPS’s.
3. The LCD on each UPS will turn On, the LCD icons will begin flashing green and the rectifier will start. The bypass and output icons will illuminate green. The battery LED will illuminate red.
4. Close the Module Output Breakers (MOB) circuit breaker to each UPS.
5. Close the MIB circuit breaker.

6. Touch the OPERATE tab.
7. Touch the Inverter On radio button. A pop-up window states that the system is operating in a multi-module system and asks whether to start one inverter or the entire system.
8. Touch System.
The LCD icons will start flashing green while the unit goes through the inverter startup sequence. After about a minute, the inverter will turn On, the static bypass will open and the icons will be solid green.
9. Close all battery breakers.

6.12 Parallel Operations—Software Version 1.0

6.12.1 De-Energize a Liebert® EXM™ Parallel System—Software Version 1.0

To de-energize a parallel system:

1. Log in as Operator, Administrator or Service.
2. Touch the OPERATE tab on the control panel of UPS 1.
3. Touch Inverter Off.
4. Repeat Steps 2 and 3 for UPS 2. If the system is 1+1 or 2+0, both units will go to bypass. If the system is 2+1, the output for UPS 2 will be disabled.
5. Repeat Steps 2 and 3 for UPS 3 and any other UPS in the system if applicable. All units in the system will go to bypass.
6. Open all battery circuit breakers, if applicable.
7. Check the parallel switchgear.

**NOTICE**
Risk of loss of power to the connected load. Can cause equipment damage. The following procedure will remove power from the critical bus. Before beginning these steps, shut down the connected load or transfer the connected load to an input power supply not dependent on the Liebert® EXM™ system that is being de-energized.

a. If the parallel switchgear is a matching Vertiv cabinet, open the Maintenance Isolation Circuit Breaker (MIB).
b. Open all Module Output Breakers (MOB).
8. Open the input breaker for each UPS and the breaker feeding the Maintenance Bypass Breaker (MBB) in the parallel switch gear.

The system is now de-energized, and its output power supply is Off.
6.12.2 Re-Energize a Liebert® EXM™ Parallel System—Software Version 1.0

To re-energize a parallel system:

1. Close the input breakers for all UPS's in the system.
2. The LCD on each UPS will turn On and the rectifier will begin to start.
3. Close the Module Output Breakers (MOB) circuit breaker to each UPS.
   The static switch will turn On.

**WARNING**

Risk of electric shock. Can cause equipment damage, injury and death.
The following procedure will supply power to the critical bus. Before beginning,
notify all personnel that input power is being supplied to the circuits and verify
that the connected load is prepared for input current.

5. Verify that the KO light illuminates.
6. Log in as Operator, Administrator or Service on UPS 1
7. Touch the OPERATE tab on the control panel of UPS 1.
8. Touch Inverter On.
9. Repeat Steps 7 and 8 for UPS 2 and any other UPS in the system.
The UPS's will all synchronize and transfer online. The load will now be supported by the inverters.
10. Close all battery circuit breakers if applicable.
11. Verify that all the power modules have green Run lights.
12. Verify that the LED light bar (if applicable), the LED on the control panel and the status bar are green.
6.12.3 De-Energize and Isolate a Single Liebert® EXM™ in a Parallel System—Software Version 1.0

**NOTICE**
Risk of loss of power to the connected load. Can cause equipment damage.
The following procedure will remove power from one UPS in the parallel system. Do not proceed if the other UPS’s supplying the critical load cannot accommodate the additional load. If the UPS’s remaining energized cannot supply the full critical load, the system will go into overload and may switch the load to bypass power, where it will not be protected from utility power failure.

1. Determine whether the parallel system is set up for capacity or redundancy.
2. Verify that the UPS’s in the parallel system that will remain energized can support the connected load.
3. Log in as Operator, Administrator or Service on the UPS to be de-energized.
4. Touch the OPERATE tab on the control panel of the UPS to be de-energized.
5. Touch *Inverter Off*.

6. Open the Module Output Breaker (MOB) associated with the isolated UPS.
7. Open all battery circuit breakers associated with the UPS.
8. Open the input breaker feeding the UPS being de-energized.

The UPS to be removed from the system is in the Off state. The other UPS’s in the system will display `parapowerCANCommAbnorm` and an alarm will sound on the other UPS’s because they lost communication with the isolated UPS.

6.12.4 Re-Energize a Single Liebert® EXM™ in a Parallel System—Software Version 1.0

**WARNING**
Risk of electric shock. Can cause equipment damage, injury and death.
The following procedure will supply power to the critical bus. Before beginning, notify all personnel that input power is being supplied to the circuits and verify that the connected load is prepared for input current.

1. Close the input breaker feeding the Liebert® EXM™ to be re-energized.
2. The LCD on the isolated UPS will turn On and the rectifier will start.
3. On the parallel switchgear, close the Module Output Breaker (MOB) for the isolated UPS.
4. Log in as Operator, Administrator or Service on the control panel of the isolated UPS.
5. Touch the OPERATE tab on the control panel of the UPS to be re-energized.
6. Touch *Inverter On*.
7. Close all battery circuit breakers, if applicable.
8. Verify that all the power modules have green Run lights.
9. Verify that the LED light bar (if applicable), the LED on the control panel and the status bar are green.
6.12.5 Place a Liebert® EXM™ Parallel System with SKRU Interlock in Maintenance Bypass—Software Version 1.0

NOTICE
Risk of loss of power to the connected load. Can cause equipment damage.
The UPS's will not be supporting the connected load. The load will not be protected from utility input power failure.
1. Log in as Operator, Administrator or Service on the control panel of the UPS to be placed in bypass.
2. Touch the OPERATE tab on the control panel of UPS1.
3. Touch Inverter Off.
4. Repeat Steps 2 and 3 on UPS 2.
   If the system is 1+1 or 2+0, both units will transfer to bypass.
   If the system is 2+1, the output of UPS 2 will be disabled.
5. Repeat Steps 2 and 3 on UPS 3 and any other UPS in the system, if applicable.
   All UPS's in the system will transfer to bypass.
6. Open all battery circuit breakers, if applicable.
7. Check the parallel switch gear.
   Steps a through d are applicable only if the system has a Kirk key interlock. If the system does not have a Kirk key interlock, skip to Step e.
   a. Verify that the KO light illuminates.
   b. Press and hold the interlock push button.
   c. While holding the push button, turn and release the key from the Kirk key interlock.
   d. Insert the key into the Maintenance Bypass Breaker (MBB) lock and turn to unlock the latch from the breaker.
   e. Close MBB.
   f. Open the Maintenance Isolation Breaker (MIB)
      Steps g and h are applicable only if the system has a Kirk key interlock. If the system does not have a Kirk key interlock, skip to Step 8.
      g. Turn the key, locking the MIB in place, then remove key.
      h. Insert the key into KO and turn it to lock the key in place.
   i. The critical load is now on external maintenance bypass.
8. Open all Module Output Breakers (MOB)
9. Open the input breakers that feed each UPS.
10. The UPS's are now Off, and the load is supplied by external maintenance bypass.
6.12.6 Re-Energize a Liebert® EXM™ Parallel System with SKRU Interlock Online from Maintenance Bypass—Software Version 1.0

1. Close the input breaker feeding all UPS's. The LCD on all the UPS's will turn On and the rectifier will start.
2. On the parallel switchgear, close the Module Output Breaker (MOB) for all the UPS's. Verify that the output LED turns solid green on all UPS's in the system.
3. This will energize the output of the UPS, and illuminate the interlock push button if the system has a Kirk key interlock.
4. Check the parallel switch gear.
   Steps a through c are applicable only if the system has a Kirk key interlock. If the system does not have a Kirk key interlock, skip to Step e.
   a. Press and hold the interlock push button.
   b. While holding, turn and release the key from K0.
   c. Insert the key into the Maintenance Isolation Breaker (MIB) lock and turn to unlock the latch from the breaker.
   d. Close the MIB.
   e. Open the Maintenance Bypass Breaker (MBB)
   Steps f and g are applicable only if the system has a Kirk key interlock. If the system does not have a Kirk key interlock, skip to Step 5.
   f. Turn the key, locking MBB in place, and then remove the key.
   g. Insert the key into the K0 and turn to lock the key in place. The critical load is now powered by the UPS static switch.
5. Log in as Operator, Administrator or Service on UPS 1.
6. Touch the OPERATE tab.
7. Touch Inverter Off.
8. Repeat Steps 5, 6 and 7 on UPS 2.
9. Repeat Steps 5, 6 and 7 on UPS 3 and any other UPS in the system, if applicable.
10. Close all battery circuit breakers, if applicable.
11. Verify that all the power modules have green Run lights.
12. Verify that the LED light bar (if applicable), the LED on the control panel and the status bar are green.
13. Check the LCD’s on each UPS to verify that there are no alarms on any UPS.

The system is now online and supporting the load.

6.13 Emergency Shutdown With EPO
This circuit has been designed to switch Off the UPS in emergency conditions (e.g., fire, flood, etc.). The system will turn Off the rectifier, inverter and stop powering the load immediately (including the inverter and bypass), and the battery stops charging or discharging.
If the input utility is present, the UPS's controls will remain active; however, the output will be turned Off. To remove all power from the UPS, the external feeder breaker should be opened.

6.14 Auto Restart
When the main and bypass sources fail, the UPS draws power from the battery system to supply the load until the batteries are depleted. When the UPS reaches its end of discharge (EOD) threshold, it will shut down.
The UPS will automatically restart and enable output power:
- after utility power is restored
- if “Auto Recovery after EOD Enabling” is enabled in the UPS configuration (set by factory or by Vertiv Services)
- after the “Auto Recovery after EOD Delay Time” expires (the default delay is 10 minutes)
During the auto recovery delay, the Liebert® EXM™ will be charging its batteries to provide a safety margin for equipment shutdown if input power fails again.
If the “Auto Recovery after EOD Enabling” feature is disabled, the system must be restarted manually.
6.15 Reset After Shutdown for Emergency Stop (EPO Action) or Other Conditions

Once all appropriate measures have been taken to correct the problem indicated by the alarm message appearing on the Operator Control Panel, carry out this procedure to restore the UPS to regular operation following an EPO action or for the following reasons: Inverter Overttemperature, Cut-Off Overload, Battery Overvoltage, excessive switching (BYP: XFER COUNT BLOCK), etc.

When the user confirms that the fault is cleared:

1. Log in as Operator, Administrator or Service.
2. Touch the OPERATE tab.
3. Touch the yellow Reset button to clear the Emergency Power Off state.
4. Press the Inverter On radio button on the right side of the Operator Control Panel for longer than 2 seconds (after the rectifier has qualified).

NOTE

The rectifier will start automatically 5 minutes after the overtemperature fault is cleared.

After the EPO button is pressed, if the input utility is removed, the UPS will shut down completely. When input utility is restored, the EPO condition will clear, and the UPS will enable the static bypass and restore the output.

6.16 Battery Protection

6.16.1 Battery Undervoltage Warning

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

6.16.2 Battery End-of-Discharge (EOD) Protection

If the battery voltage is lower than the end-of-discharge voltage, the battery converter will be shut down. Refer to Table 24.
6.17 Operation

**WARNING**
Risk of electrical shock and arc flash. Can cause property damage, injury and death. The Liebert® EXM™ contains high voltages internally. Components that can only be accessed by opening the protective cover with tools cannot be serviced or replaced by the user.
Only properly trained and qualified service personnel are authorized to remove the protective covers.

**AVERTISSEMENT**
Risque d’arc ou de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort.
L’armoire Liebert® EXM™ contient des tensions élevées à l’interne. L’utilisateur ne peut ni entretenir ni remplacer des composants accessibles uniquement en ouvrant le couvercle de protection avec des outils.
Seul du personnel de service qualifié et dûment formé est autorisé à retirer les couvercles de protection.

The Liebert® EXM™ operates in the modes shown in **Table 13**. This section describes various kinds of operating procedures under each operating mode, including transfer between operating modes, UPS setting and procedures for turning on/off inverter.

**Table 13  UPS operating modes**

<table>
<thead>
<tr>
<th>Operating Mode</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load on Inverter</td>
<td>NORMAL</td>
</tr>
<tr>
<td>Load on Bypass</td>
<td>BYPASS</td>
</tr>
<tr>
<td>Maintenance Mode</td>
<td>MAINT</td>
</tr>
</tbody>
</table>

As shown in SL-25656, the Liebert® EXM™ Battery Cabinet manual, the AC utility source is supplied through the input breaker, and the rectifier converts the alternating current into DC power. The inverter converts the AC power from the utility—or DC power from an optional External Battery Cabinet—into AC power for the load. The batteries power the load through the inverter in the event of a power failure. The utility source can also power the load through the static bypass.

If maintenance or repair of the UPS is necessary, the load can be switched without interruption in service using the optional Liebert MBC.

6.18 Static Bypass Switch

The circuit block labeled “Static Bypass” contains an electronically controlled switching circuit that enables the critical load to be connected to either the inverter output or to a bypass power source via the static bypass line. During normal system operation, the load is connected to the inverter and the inverter contactor is closed; but in the event of a UPS overload or inverter failure, the load is automatically transferred to the static bypass line.

To provide a clean (no-break) load transfer between the inverter output and static bypass line, the static switch activates, connecting the load to bypass. To achieve this, the inverter output and bypass supply must be fully synchronized during normal operating conditions. This is
achieved through the inverter control electronics, which make the inverter frequency track that of the static bypass supply, provided that the bypass remains within an acceptable frequency window.

**NOTICE**
Risk of power loss to connected load. Can cause damage to equipment.
The load equipment is not protected from normal supply aberrations, such as spikes, sags and failure, when the Liebert® EXM™ load is supplied by the bypass or maintenance bypass.
7.0 SPECIFICATIONS AND TECHNICAL DATA

7.1 Conformity and Standards
The Liebert® EXM™ has been designed to conform to the following standards:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Standard/Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>UL1778 4th Edition, CSA 22.2</td>
</tr>
<tr>
<td>Surge</td>
<td>IEC 61000-4-5 Criteria B</td>
</tr>
<tr>
<td>Harmonics</td>
<td>IEC 61000-3-4</td>
</tr>
<tr>
<td>Electrical Fast Transient</td>
<td>IEC 61000-4-4, Criteria B</td>
</tr>
<tr>
<td>ESD</td>
<td>IEC 61000-4-2, Criteria B</td>
</tr>
<tr>
<td>FCC</td>
<td>Part 15, Class A</td>
</tr>
<tr>
<td>Radiated Immunity</td>
<td>IEC 61000-4-3, Criteria A</td>
</tr>
<tr>
<td>Conducted Immunity</td>
<td>IEC 61000-4-6, Criteria A</td>
</tr>
<tr>
<td>Low-Frequency Signals</td>
<td>IEC 61000-2-2 Criteria A</td>
</tr>
<tr>
<td>Transportation</td>
<td>ISTA Procedure 1H</td>
</tr>
<tr>
<td>ISO</td>
<td>9001</td>
</tr>
<tr>
<td>Misc</td>
<td>OSHA, ASME, NEMA PE-1</td>
</tr>
</tbody>
</table>

The Liebert® EXM™ has UL and c-UL approval.

7.1.1 ENERGY STAR® Certification
The Liebert® EXM™ UPS is ENERGY STAR certified satisfying “ENERGY STAR Program Requirements Product Specification for Uninterruptible Power Supplies (UPSs) - Eligibility Criteria, Version 1.0.”

7.2 UPS Environmental
The Liebert® EXM™ is designed to operate under the following environmental conditions without damage or degradation in electrical operating characteristics:

Table 14 Environmental requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoustical Noise, dBA, at 55 in. (1.4m)</td>
<td>59</td>
</tr>
<tr>
<td>Operating Altitude</td>
<td>3281 ft. (1000m) 1% maximum kW derate per 328 ft. (100m) rise between 3281 and 9843 ft. (1000m and 3000m)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>95%</td>
</tr>
<tr>
<td>Operating Temperature, °F (°C)</td>
<td>104 (40)</td>
</tr>
<tr>
<td>UPS Storage/Transport Temperature, °F (°C)</td>
<td>-4 to 158 (-20 to 70)</td>
</tr>
</tbody>
</table>
### 7.3 UPS Electrical Characteristics

Refer to additional circuit breaker notes in **3.2.7 - Accessory Fuses and Back-Feed Breaker Wiring.**

**NOTE**

The breakers and cables used must be in accordance with NEC ANSI/NFPA 70. A disconnect breaker must be provided for AC input, DC input and AC output. Recommended cable sizes are suitable for operation at a maximum temperature of 104°F (40°C).

---

**Table 15  UPS mechanical characteristics**

<table>
<thead>
<tr>
<th>Featured</th>
<th>Dimension, <strong>W x D x H</strong>, in (mm)</th>
<th><strong>Rated Power, kVA</strong></th>
<th><strong>Weight, lb (kg)</strong></th>
<th><strong>Color</strong></th>
<th><strong>Protection Degree IEC (60529)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>23-5/8 x 39-3/8 x 78-3/4 (600 x 1000 x 2000)</td>
<td>10 - 40</td>
<td>See Table 1 for weights.</td>
<td>RAL 7021 (Black)</td>
<td>IP20</td>
</tr>
</tbody>
</table>

---

**Table 16  UPS currents and terminals—Input (for single-input unit, 208V operation)**

<table>
<thead>
<tr>
<th>Unit Rating</th>
<th>Nominal Input Current</th>
<th>Maximum Input Current</th>
<th>OCP Device Rating</th>
<th>Bolt Size</th>
<th>75°C Wire Current, Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
<td>34</td>
<td>45</td>
<td>M10</td>
<td>65</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) #6</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>51</td>
<td>70</td>
<td>M10</td>
<td>85</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) #4</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>68</td>
<td>90</td>
<td>M10</td>
<td>115</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) #2</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>102</td>
<td>150</td>
<td>M10</td>
<td>175</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) 2/0</td>
</tr>
<tr>
<td></td>
<td>119</td>
<td>136</td>
<td>175</td>
<td>M10</td>
<td>230</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) 4/0</td>
</tr>
</tbody>
</table>

---

**Table 17  UPS currents and terminals—Input (for dual-input unit only, 208V operation)**

<table>
<thead>
<tr>
<th>Unit Rating</th>
<th>Nominal Input Current</th>
<th>Maximum Input Current</th>
<th>OCP Device Rating</th>
<th>Bolt Size</th>
<th>75°C Wire Current, Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
<td>34</td>
<td>45</td>
<td>M10</td>
<td>65</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) #6</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>51</td>
<td>70</td>
<td>M10</td>
<td>85</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) #3</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>68</td>
<td>90</td>
<td>M10</td>
<td>115</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) #2</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>102</td>
<td>150</td>
<td>M10</td>
<td>175</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) 2/0</td>
</tr>
<tr>
<td></td>
<td>119</td>
<td>136</td>
<td>175</td>
<td>M10</td>
<td>230</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) 4/0</td>
</tr>
</tbody>
</table>

---

**Table 18  UPS currents and terminals—Bypass input (for dual-input units, 208V operation)**

<table>
<thead>
<tr>
<th>Unit Rating</th>
<th>Nominal Input Current</th>
<th>OCP Device Rating</th>
<th>Bolt Size</th>
<th>75°C Wire Current, Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28</td>
<td>40</td>
<td>M10</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>(1) #6</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>60</td>
<td>M10</td>
<td>85</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td>(1) #4</td>
</tr>
<tr>
<td></td>
<td>56</td>
<td>70</td>
<td>M10</td>
<td>115</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td>(1) #2</td>
</tr>
<tr>
<td></td>
<td>83</td>
<td>110</td>
<td>M10</td>
<td>130</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td>(1) 2/0</td>
</tr>
<tr>
<td></td>
<td>111</td>
<td>150</td>
<td>M10</td>
<td>175</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td>(1) 4/0</td>
</tr>
</tbody>
</table>
Table 19  UPS currents and terminals—Output 208V

<table>
<thead>
<tr>
<th>Unit Rating</th>
<th>Nominal Output Current</th>
<th>OCP Device Rating</th>
<th>Bolt Size</th>
<th>75°C Wire Current, Total</th>
<th>Copper Wire</th>
<th>Aluminum Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>28</td>
<td>40</td>
<td>M10</td>
<td>50</td>
<td>(1) #6</td>
<td>(1) #2</td>
</tr>
<tr>
<td>15</td>
<td>42</td>
<td>60</td>
<td>M10</td>
<td>85</td>
<td>(1) #4</td>
<td>(1) #2</td>
</tr>
<tr>
<td>20</td>
<td>56</td>
<td>70</td>
<td>M10</td>
<td>115</td>
<td>(1) #2</td>
<td>(1) #2</td>
</tr>
<tr>
<td>30</td>
<td>83</td>
<td>110</td>
<td>M10</td>
<td>130</td>
<td>(1) #1/0</td>
<td>(1) 2/0</td>
</tr>
<tr>
<td>40</td>
<td>111</td>
<td>150</td>
<td>M10</td>
<td>175</td>
<td>(1) 3/0</td>
<td>(1) 4/0</td>
</tr>
</tbody>
</table>

Table 20  AC/AC efficiency, loss and air exchange

<table>
<thead>
<tr>
<th>AC/AC Efficiency</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load on Inverter (dual conversion), %</td>
<td>95.6% Max</td>
</tr>
<tr>
<td>Inverter Efficiency (DC/AC) (Battery at Nominal Voltage 288 VDC and Full-Rated Linear Load)</td>
<td></td>
</tr>
<tr>
<td>Rated Power, kVA</td>
<td>10-40K</td>
</tr>
<tr>
<td>Load on Battery, %</td>
<td>94.8% Max</td>
</tr>
<tr>
<td>Heat Losses &amp; Air Exchange</td>
<td></td>
</tr>
<tr>
<td>Rated Power, kVA</td>
<td>10</td>
</tr>
<tr>
<td>Load on Inverter, kW</td>
<td>0.45</td>
</tr>
<tr>
<td>No Load, kW</td>
<td>0.3</td>
</tr>
<tr>
<td>Maximum Forced Air Cooling (Front Intake, Rear Exhaust), L/sec (m³/hr)</td>
<td>32 (115)</td>
</tr>
<tr>
<td>Heat Dissipation, BTU/Hr (kW)++</td>
<td>2217 (0.65)</td>
</tr>
</tbody>
</table>

Table 21  Rectifier input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>10-40 kVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated AC Input Voltage</td>
<td>208/120V or 220/127V, 50/60Hz, 3-Phase, 4-Wire Plus Ground</td>
</tr>
<tr>
<td>Input Voltage Range, Startup/Operating</td>
<td>102-146VAC</td>
</tr>
<tr>
<td>Input Voltage Range, Operating</td>
<td>72-146VAC (72-102VAC Derating)</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 or 60Hz (40-70Hz Range)</td>
</tr>
<tr>
<td>Power Factor</td>
<td>0.99 Full Load, 0.98 Half Load</td>
</tr>
<tr>
<td>Input Current, Rated</td>
<td>29/44/59/88/117</td>
</tr>
<tr>
<td>Input Current, Max</td>
<td>33/51/68/101/135</td>
</tr>
<tr>
<td>THD</td>
<td>5% Full load</td>
</tr>
</tbody>
</table>

Table 22  Recommended lug sizes (compression type) M10, 3/8" bolt

<table>
<thead>
<tr>
<th>Cable Size</th>
<th>T&amp;B Copper One Hole</th>
<th>T&amp;B Aluminum One Hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>#8AWG</td>
<td>54132</td>
<td>60104-TB</td>
</tr>
<tr>
<td>#6AWG</td>
<td>54136</td>
<td>60109</td>
</tr>
<tr>
<td>#4AWG</td>
<td>54140</td>
<td>60114</td>
</tr>
<tr>
<td>#2AWG</td>
<td>54143</td>
<td>60118</td>
</tr>
<tr>
<td>#1AWG</td>
<td>54148</td>
<td>60124</td>
</tr>
<tr>
<td>#1/0AWG</td>
<td>54109</td>
<td>60130</td>
</tr>
<tr>
<td>#2/0AWG</td>
<td>54110</td>
<td>60136</td>
</tr>
</tbody>
</table>
Table 22  Recommended lug sizes (compression type) M10, 3/8" bolt

<table>
<thead>
<tr>
<th>Cable Size</th>
<th>T&amp;B Copper One Hole</th>
<th>T&amp;B Aluminum One Hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>#3/0AWG</td>
<td>54111</td>
<td>60142</td>
</tr>
<tr>
<td>#4/0AWG</td>
<td>54112</td>
<td>60148</td>
</tr>
<tr>
<td>250kcmil</td>
<td>54174</td>
<td>60154</td>
</tr>
<tr>
<td>300kcmil</td>
<td>54179</td>
<td>60160</td>
</tr>
<tr>
<td>350kcmil</td>
<td>256-30695-112</td>
<td>—</td>
</tr>
<tr>
<td>400kcmil</td>
<td>256-30695-1403</td>
<td>—</td>
</tr>
<tr>
<td>500kcmil</td>
<td>256-30695-339</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 23  Battery cabinet system—UPS and battery cabinet

<table>
<thead>
<tr>
<th>UPS Rating, kVA</th>
<th>Battery Cabinet Breaker</th>
<th>Maximum Battery Current, A</th>
<th>Battery Cabinet Size, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-40</td>
<td>225A</td>
<td>187</td>
<td>320, 600, 880</td>
</tr>
</tbody>
</table>

Table 24  Battery DC intermediate circuit

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter 10 - 40kVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery Bus Voltage</td>
<td>288</td>
</tr>
<tr>
<td>Number of Lead-Acid Cells</td>
<td>144 = (24 x 6 cell [12V] blocks), nominal</td>
</tr>
<tr>
<td>Float Voltage</td>
<td>2.25V/cell, selectable from 2.2 - 2.3V/cell</td>
</tr>
<tr>
<td>Temperature Compensation</td>
<td>-3.0mV/°C, selectable from 0 to -5.0mV/°C around 77°F (25°C) or 86°F (30°C) or inhibit</td>
</tr>
<tr>
<td>Ripple Voltage</td>
<td>≤1%</td>
</tr>
<tr>
<td>Ripple Current</td>
<td>≤5%</td>
</tr>
<tr>
<td>Boost Charge Voltage</td>
<td>2.35V/cell (selectable from 2.30-2.40V/cell)</td>
</tr>
<tr>
<td>Boost Control</td>
<td>Float-boost current trigger 0.050 C10 (selectable 0.030-0.070) Boost-float current trigger 0.010 C10 (selectable 0.005-0.025) 24 hr safety time-out (selectable 8-30 hr) Boost charge mode inhibit also selectable</td>
</tr>
<tr>
<td>End of Discharge</td>
<td>1.67 V/cell (selectable from 1.60-1.750V/cell)</td>
</tr>
<tr>
<td>Battery Charge</td>
<td>2.35 V/cell (selectable from 2.3-2.4V/cell) Constant current and constant voltage charge mode Programmable auto trigger or inhibit of boost mode</td>
</tr>
<tr>
<td>Battery Charging Power Maximum Current</td>
<td>UPS (kVA) 10, 15, 20, 30, 40 Battery Charging Power (kW) 1.5, 2.25, 3.0, 4.5, 6 Maximum Charging Current (A) 4, 7, 9, 13, 18</td>
</tr>
</tbody>
</table>

Table 25  Inverter output to critical load

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter 10-40 kVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated AC Voltage</td>
<td>208/120V or 220/127V, 50/60Hz, 3-Phase, 4-Wire Plus Ground</td>
</tr>
<tr>
<td>Frequency *</td>
<td>50/60</td>
</tr>
<tr>
<td>Overload Capacity</td>
<td>105% load, continuous 110% load, 60 min 125% load, 10 min 150% load, 60 sec</td>
</tr>
<tr>
<td>Fault Current</td>
<td>Short Circuit for 200 ms</td>
</tr>
<tr>
<td>Non-Linear Load Capability</td>
<td>100%</td>
</tr>
<tr>
<td>Neutral Current Capability</td>
<td>170%</td>
</tr>
</tbody>
</table>
### Table 25  Inverter output to critical load

<table>
<thead>
<tr>
<th>Parameter</th>
<th>10-40 kVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady State Voltage Stability</td>
<td>±1% (balanced load)</td>
</tr>
</tbody>
</table>
| Voltage Regulation                     | ±1% for balanced load  
|                                        | ±5% for 100% unbalanced load |
| Phase Balance                          | 120° ±1° for balanced load  
|                                        | 120° ±15° for 100 unbalanced load |
| Transient Voltage Response             | 5%       |
| THD                                    | <1.5% (0-100% linear load)  
|                                        | <4% (0-100% non-linear load) |
| Sync Frequency Range                   | Rated Frequency ± 2Hz (selectable ± 0.5 to ± 3Hz) |
| Frequency Slew Rate                    | 0.1-3Hz  |
| Frequency Regulation                   | ±0.1% (Single Power Module)  
|                                        | ±0.25% (Two Power Modules) |
| Voltage Adjustment Range               | ±5%       |

* Factory-set to 60Hz; 50Hz selectable by commissioning engineer. Frequency converter operation is also selectable.

### Table 26  Bypass input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>10-40 kVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated AC Voltage</td>
<td>208/120V or 220/127V, 50/60Hz, 3-Phase, 4-Wire Plus Ground</td>
</tr>
<tr>
<td>Rated Current: 208V</td>
<td>29/44/59/88/117</td>
</tr>
<tr>
<td>220V</td>
<td>26/39/52/79/105</td>
</tr>
<tr>
<td>Overload</td>
<td>110% load, Continuous</td>
</tr>
<tr>
<td>Upstream Protection, Bypass Line</td>
<td>Thermomagnetic Circuit Breaker, rated up to 125% of nominal output current</td>
</tr>
<tr>
<td>Current Rating of Neutral Cable, A</td>
<td>1.7&quot;In</td>
</tr>
<tr>
<td>Frequency, Hz</td>
<td>50 or 60</td>
</tr>
</tbody>
</table>
| Transfer Time Between Bypass and Inverter, ms | Uninterrupted Transfer: <1ms  
|                                        | Interrupted Transfer: <20ms(40,60,80,100, can be selected) |
| Bypass Voltage Tolerance, %VAC         | Upper Limit: +10, +15 or +20, default +15  
|                                        | Lower Limit: -10, -20, -30 or -40; default: -20 (delay time to accept steady bypass voltage: 10 sec) |
| Bypass Frequency Tolerance, %          | ±10% or ± 20% default: ± 20% |
| Synchronization-Window                 | ±0.5,1.2,3Hz  
|                                        | Default: ±2Hz |
8.0 MAINTENANCE

8.1 Safety Precautions

Observe the safety precautions in Important Safety Instructions on page 1.

Only properly trained and qualified personnel should perform maintenance on the UPS system. Observe all of the warnings and cautions below before performing any maintenance on the UPS system and associated equipment. Also observe the manufacturer’s safety precautions pertaining to the battery, along with the battery safety precautions in this document.

**WARNING**

Risk of electrical shock and high short circuit current. Can cause equipment damage, injury and death.

Always identify connecting wiring prior to disconnecting any wiring.

Do not substitute parts except as authorized by Vertiv™.

Maintain the UPS cabinets free of foreign materials such as solder, wire cuttings, etc.

Contact Vertiv Services if there is any uncertainty about the procedures to follow or if personnel are unfamiliar with the circuitry.

**AVERTISSEMENT**

Risque de décharge électrique et de présence de courant de court-circuit élevé pouvant entraîner des dommages matériels, des blessures et même la mort.

Identifiez tous les circuits de connexion avec de débrancher des câbles.

Ne remplacez aucun composant sans l'autorisation expresse d'Vertiv.

Assurez-vous que les armoires d'ASC sont exemptes de matériaux étrangers tels que des résidus de soudure, des bouts de câble, etc.

Communiquez avec Vertiv Services si vous doutez de la procédure à suivre ou si les circuits ne vous sont pas familiers.

**WARNING**

Risk of electrical shock and arc flash. Can cause property damage, injury and death.

Only Vertiv or Vertiv-trained service personnel should work on this equipment. Both AC and DC high voltages are present in lethal amounts within this equipment. Extreme care should be taken when working around UPS equipment.

Always identify the source of connecting wiring prior to disconnecting. Mark any disconnected wires, so they can be properly reconnected.

Do not substitute parts except as authorized by Vertiv.

Maintain the UPS cabinets free of foreign materials such as solder, wire cuttings, etc.

Call Vertiv Services if you are not sure of the procedures to follow or if you are not familiar with the design or operation of the equipment.
AVERTISSEMENT
Risque d'arc ou de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort.
L'entretien et la réparation de cet équipement doivent être confiés exclusivement à un personnel qualifié de Vertiv™ ou formé par Vertiv™. Des hauteurs tensions c.a. et c.c. mortelles sont présentes dans cet équipement. Faites preuve d'une grande prudence lorsque vous travaillez à proximité d'un système ASC.
Identifiez toujours la source d'un câble de raccordement avant de le débrancher. Identifiez les câbles déconnectés afin de pouvoir les reconnecter correctement.
Ne remplacez aucun composant sans l'autorisation expresse de Vertiv.
Assurez-vous que les armoires d'ASC sont exemptes de matériaux étrangers tels que des résidus de soudure, des bouts de câble, etc.
Communiquez avec Vertiv Services si vous doutez de la procédure à suivre ou si la conception ou le fonctionnement de l'équipement ne vous sont pas familiers.

WARNING
Risk of electrical shock and high short circuit current. Can cause equipment damage, personal injury and death.
Extreme caution is required when performing maintenance.
Be constantly aware that the UPS contains high DC as well as AC voltages. With input power Off and the DC source disconnected, high voltage at filter capacitors and power circuits should be discharged within 5 minutes. However, if a power circuit failure has occurred, assume that high voltage may still exist after shutdown. Check with a voltmeter before making contact.
AC voltage will remain on the bypass and output circuit breakers and the static bypass switch, unless associated external circuit breakers are opened.
Check for voltage with both AC and DC voltmeters before making contact.
When the UPS is under power, both the operator and any test equipment must be isolated from direct contact with earth ground and the UPS chassis frame by using rubber mats.
Some components within the cabinets are not connected to chassis ground.
Any contact between floating circuits and the chassis is a lethal shock hazard. Use differential oscilloscopes when measuring a floating circuit.
Exercise caution that the test instrument exterior does not make contact, either physically or electrically, with earth ground.
In case of fire involving electrical equipment, use only carbon dioxide fire extinguishers or others approved for use in fighting electrical fires.
8.2 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 d'arc ou de décharge électrique pouvant entraîner des dommages matériels, des blessures et même 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.

8.3 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.

**WARNING**

Check for voltage with both AC and DC voltmeters before working within the UPS. 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 UPS or preparing the UPS 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.
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 web site.)

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 damage to battery cases. Do not use cleaners on the batteries. Solvents can make the battery cases brittle. Use only a dry cloth or a cloth moistened in 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 Liebert battery cabinets. Refer to the battery manufacturer’s manual, available on the manufacturer’s Web site, for specific information about equalize charging.
8.4 Limited-Life Components

The Liebert EXM UPS has a design life well in excess of 10 years. Well-maintained units can continue to provide economic benefits for 20 years or more. Long-life components are used in the UPS wherever practical and cost effective. However, due to the currently available component material, manufacturing technology limitations and the general function and use of the component, a few components in your Liebert UPS will have a shorter life cycle and require replacement in less than 10 years.

The following components utilized in your UPS system have a limited life cycle and are specifically exempt from warranty. To prevent a wear-out failure of one of these components affecting your critical load operations, Vertiv recommends these components be periodically inspected and replaced before the expected expiration of their life cycle. The expected life of each component listed below is simply an estimate and is not a guarantee. Individual users may have site-specific requirements, maintenance and other environmental conditions that affect the length of the component’s useful life cycle.

<table>
<thead>
<tr>
<th>Component</th>
<th>Expected Life</th>
<th>Replace in:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air filters</td>
<td>5 years</td>
<td>Check four times per year</td>
</tr>
<tr>
<td>Power Modules &amp; Static Bypass</td>
<td>20 years</td>
<td>18 years</td>
</tr>
<tr>
<td>Assembly</td>
<td>10 years</td>
<td>8 years</td>
</tr>
</tbody>
</table>

NOTE

Component Expected Life requires ambient temperature conditions <25°C. If temperature conditions are higher, expected life will be shorter.

In most cases, replacement components must exactly match the original component specifications. These replacement components are not readily available from third-party component distributors. For assistance with your specific component specifications, replacement component selection and sourcing, call 1-800-LIEBERT. For customers using Vertiv Services’ preventive maintenance services, periodic inspection of these components is part of this service, as well as recommending component replacement intervals to customers to avoid unanticipated interruptions in critical load operations.

8.5 Routine 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. If you have any doubt as to what must be done, call Vertiv Services at 800-543-2378 for further
instructions. The UPS is designed for unattended operation, but does require some common sense maintenance.

- Keep good records—Troubleshooting is easier if you maintain historical service records.
- Keep the UPS free of dust and any moisture.
- Keep the UPS cool:
  - Battery systems must be kept in the range of 72-77°F (22-25°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 8.5.3 - Torque Requirements).
8.5.1 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 walk-through 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.

8.5.2 Air Filters
The air filters must be inspected and serviced on a regular schedule. The period between inspections will depend upon environmental conditions. Under normal conditions, the air filters will require cleaning or replacement approximately every two months.

All Liebert® EXM™ models have replaceable filter elements behind the grille in the front of the unit. This element can be changed with the UPS operating by opening the outer door. The Liebert EXM’s air filters are washable and reusable. One set of air filters is shipped with each Liebert® EXM™.

Abnormal or dusty conditions will require more frequent cleaning and replacement of air filters. Inspect installations in new buildings more often, then extend the inspection period as experience dictates.

Replacing Air Filters
Installing the two air filter sizes in a Liebert® EXM™ requires only a Phillips screwdriver. Each filter is held in place by a bracket on either side of each filter. Refer to 8.5.2 - Air Filters for details about filter maintenance.

To replace a filter:
1. Open the UPS front door and locate the filters on the back side of the front door (see Figure 30).
2. Remove one bracket and loosen the screw on the second bracket. The second bracket need not be removed.
3. Remove the dust filter to be replaced.
4. Insert the clean filter.
5. Reinstall the bracket, tightening the screw securely.
6. Tighten the screw on the second bracket.
8.5.3 Torque Requirements

All electrical connections must be tight.

Tables 28 through 29 provide the torque values for the connections in the UPS and batteries. Use these values unless the equipment is labeled otherwise.

Table 28 Busbars (for power wiring)

<table>
<thead>
<tr>
<th>Bolt Shaft Size</th>
<th>Lb-in (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot; (M10)</td>
<td>192 (22)</td>
</tr>
<tr>
<td>1/2&quot; (M12)</td>
<td>428 (48)</td>
</tr>
</tbody>
</table>

Table 29 Terminal block with compression lugs (for control wiring)

<table>
<thead>
<tr>
<th>AWG Wire Size or Range</th>
<th>Lb-in (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#22 - #14</td>
<td>3.5 to 5.3 (0.4 to 0.6)</td>
</tr>
</tbody>
</table>
8.6 Detecting Trouble

It is important that the operator check the instrument readings if abnormal equipment performance is suspected. Any metered value that differs appreciably from normal could mean an impending malfunction, and should be investigated.

Items to check on the various UPS display screens include:

1. Output voltage of all phases should be within 2% of normal voltage. Output currents on each phase should not normally differ by more than 20%. If a greater difference is noted, the load is unbalanced and corrective action should be taken to redistribute the load, if possible.
2. If the UPS has not operated on battery power during the last 10 hours, the batteries should require little charging current. Battery mimic should indicate normal DC voltage with relatively little battery charge current.
3. Input current on each phase should be within 10% of the average input current. Alarm messages indicate malfunction or impending malfunction. A daily check of the Operator Control Panel will help to provide an early detection of problems. Refer to Appendix B - UPS Status Messages to interpret alarm messages.
4. Tracing a problem to a particular section is facilitated by alarm messages and the metered parameter indications. These are stored in the Status Reports and can be displayed at the Operator Control Panel or at an optional terminal.

NOTE

If the UPS system has a blown fuse, the cause should be determined before you replace the fuse. Contact Vertiv Services.

8.7 Reporting a Problem

If a problem occurs within the UPS, review all alarm messages along with other pertinent data. This information should be given to the Vertiv Services dispatcher. Call 800-543-2378 to report a problem or to request assistance.

8.8 Corrective Actions

Recommended corrective actions for each alarm message on the Operator Control Panel and the Remote Alarm Status Panel may be found in Appendix B - UPS Status Messages.

8.9 Recommended Test Equipment

Table 30 lists recommended test equipment and tools required to maintain, troubleshoot and repair the UPS module. Instruments of equivalent range and accuracy may be substituted. All instruments should be calibrated and be within the current calibration cycle. Calibration data for the instruments should be maintained in equipment-history files and the instruments labeled for audit and verification.

<table>
<thead>
<tr>
<th>Qty</th>
<th>Test Equipment</th>
<th>Manufacturer</th>
<th>Model or Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oscilloscope</td>
<td>Tektronix, H-P or Fluke</td>
<td>DC to 50 MHz</td>
</tr>
<tr>
<td>2</td>
<td>Voltage Probes</td>
<td>Tektronix, H-P or Fluke</td>
<td>10X, with 10 ft. Cable</td>
</tr>
<tr>
<td>2</td>
<td>Voltage Probes</td>
<td>Tektronix, H-P or Fluke</td>
<td>100X, with 10 ft. Cable</td>
</tr>
<tr>
<td>1</td>
<td>Digital Multimeter</td>
<td>Fluke</td>
<td>8060, with Test Leads</td>
</tr>
<tr>
<td>1</td>
<td>Tool Kit</td>
<td>N/A</td>
<td>Standard electrical contractor tools</td>
</tr>
</tbody>
</table>

NOTE

If the UPS system has a blown fuse, the cause should be determined before you replace the fuse. Contact Vertiv Services.
## APPENDIX A - HAZARDOUS SUBSTANCES OR ELEMENTS ANNOUNCEMENT

### Table 31 Hazardous substances or elements

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Lead (Pb)</th>
<th>Mercury (Hg)</th>
<th>Cadmium (Cd)</th>
<th>Chrome (Cr6+)</th>
<th>Polybrominated Biphenyl (PBB)</th>
<th>Polybrominated Diphenyl Ethers (PBDE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hex copper stud</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>PCBA</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>AC capacitor</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>DC capacitor</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Fan</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Cables</td>
<td>X</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>LCD</td>
<td>X</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Sensors</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Large-medium power magnetic components</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Circuit breaker / rotating switch</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Semiconductors</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Battery (when applicable)</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Insulation monitoring device (when applicable)</td>
<td>X</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>X</td>
</tr>
</tbody>
</table>

4 - Means the content of the hazardous substances in all the average quality materials of the part is within the limits specified in SJ/T-11363-2006
X - Means the content of the hazardous substances in at least one of the average quality materials of the part is outside the limits specified in SJ/T11363-2006

Vertiv has been committed to the design and manufacturing of environment-friendly products. It will reduce and eventually eliminate the hazardous substances in the products through unremitting efforts in research. However, limited by the current technical level, the following parts still contain hazardous substances due to the lack of reliable substitute or mature solution:

1. All solders in the products contain lead.
2. Copper alloy contains lead.
4. The ceramic materials of the ceramic capacitor, the copper terminals and copper leads of metallic film capacity contain lead.
5. The glass of resistor contains lead.
6. The glass of LCD contains lead, and the backlight lamp contains mercury.
7. The lead in the battery is determined by the battery feature and technical levels.
8. The insulation monitoring device contains lead and PBDE.

About Environment Protection Period: The Environment Protection Period of the product is marked on the product. Under normal working conditions and normal use of the products observing relevant safety precautions, the hazardous substances in the product will not seriously affect the environment, human safety or property in the Environment Protection Period starting from the manufacturing date. About Battery: The battery life is dependent on the ambient temperature and charging / discharging times. The battery life will be shortened if the battery is used under high temperature or in deep discharging status. Refer to the manufacturer’s product literature for details.
APPENDIX B - UPS STATUS MESSAGES

Table 32 shows all event messages as they appear in the current status area of the LCD or the history log, along with a description and recommended actions, if any.

**Table 32 UPS status messages**

<table>
<thead>
<tr>
<th>Event Message</th>
<th>Description / Suggested Action (if any)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comm. Fail</td>
<td>The CAN communication between internal monitor and rectifier/inverter/bypass fails. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>Battery Overtemp</td>
<td>The battery temperature is over the limit. Check the battery temperature and ventilation.</td>
</tr>
<tr>
<td>Ambient Overtemp</td>
<td>The ambient temperature is over limit. Check the ventilation of UPS room.</td>
</tr>
<tr>
<td>Replace Battery</td>
<td>Battery should be replaced. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>Battery Low Pre-warning</td>
<td>Before the end of discharging, battery undervoltage pre-warning should occur. After this pre-warning, battery should have the capacity for 3 minutes discharging with full load. The time is user configured from 3 to 60 minutes. Shut down the load in time.</td>
</tr>
<tr>
<td>Battery End of Discharge</td>
<td>Inverter turned off due to low battery voltage. Check the utility failure and try to fix it.</td>
</tr>
<tr>
<td>Mains Volt. Abnormal</td>
<td>Mains voltage exceeds the upper or lower limit and results in rectifier shutdown. Check the input line-to-neutral voltage amplitude of rectifier.</td>
</tr>
<tr>
<td>Mains Undervoltage</td>
<td>Mains voltage is undervoltage (120V-132V). Check the input line-to-line voltage amplitude of rectifier.</td>
</tr>
<tr>
<td>Mains Freq. Abnormal</td>
<td>Mains frequency is out of limit range and results in rectifier shutdown. Check the rectifier’s input voltage frequency.</td>
</tr>
<tr>
<td>Rectifier Fault</td>
<td>Rectifier fault; contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>Rectifier Overtemp</td>
<td>The temperature of the heat sink is too high to keep the rectifier running. The UPS can recover automatically. Check the environment and ventilation.</td>
</tr>
<tr>
<td>Charger Fault</td>
<td>The charger has failed. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>Input Fuse Fail</td>
<td>Input fuse is open. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>Control Power 1 Fail</td>
<td>Control Power 1 has failed or has been lost. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>Mains Phase Reversed</td>
<td>Input phase sequence is reversed. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>Soft Start Fail</td>
<td>Rectifier could not start due to low DC bus voltage. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
</tbody>
</table>
| Bypass Unable to Trace | This alarm is triggered by an inverter software routine when the amplitude or frequency of bypass voltage is beyond the normal range. The amplitude threshold is fixed for positive and negative 10% rating. This alarm automatically resets once the bypass voltage goes normal.  
  1. First verify that the bypass voltage and frequency displayed on the panel is within the selected range. Note here the rated voltage and frequency are specified by “Output voltage level” and “Output frequency level” respectively.  
  2. If the displayed voltage is believed to be abnormal, then verify the bypass voltage and frequency presented to the UPS. Check the external supply if it is found to be faulty. Contact Vertiv Services at 800-543-2378 for assistance. |
<table>
<thead>
<tr>
<th>Event Message</th>
<th>Description / Suggested Action (if any)</th>
</tr>
</thead>
</table>
| **Bypass Abnormal** | This alarm is triggered by an inverter software routine when the amplitude or frequency of bypass voltage exceeds the limit. This alarm automatically resets once the bypass voltage goes normal. First check if there are some relevant alarms such as “Bypass disconnect open”, “Bypass phase reverse” and “Mains neutral lost”. If they appear, solve them first.  
1. Then verify that the bypass voltage and frequency displayed on the panel is within the bypass limit. Note here the rated voltage and frequency are specified by “Output voltage level” and “Output frequency level” respectively.  
2. If the displayed voltage is believed to be abnormal, then verify the bypass voltage and frequency presented to the UPS. Check the external bypass supply if it is found to be faulty. If the utility is likely to trigger this alarm frequently, the bypass limit can be changed a little larger through the configuration software according to the customer’s agreement.  
Contact Vertiv Services at 800-543-2378 for assistance. |
| **Inverter Asynchronous** | This alarm is triggered by an inverter software routine when the inverter and bypass waveforms are misaligned by more than 6 degrees in phase. This alarm resets automatically once the condition is no longer true.  
1. First check if the alarm “Bypass unable to trace” or “Bypass abnormal” occurs. If so, solve it first.  
2. Verify the waveform of the bypass voltage. If it is too distorted, ask the customer to verify and seek any possible measurements.  
Contact Vertiv Services at 800-543-2378 for assistance. |
| **Inverter Fault** | This alarm indicates a fault condition exists within the inverter.  
Contact Vertiv Services at 800-543-2378 for assistance. |
| **Fan Fault** | At least one of the cooling fans failed. Contact Vertiv Services at 800-543-2378 for assistance. |
| **Inverter STS (relay) Fail** | At least one of the static switches of inverter side is open or short circuit. This fault is locked until power off. Contact Vertiv Services for assistance at 800-543-2378 for assistance. |
| **Bypass STS Fail** | At least one of the static switches of bypass side is open or short circuit. This fault is locked until power off. Contact Vertiv Services at 800-543-2378 for assistance. |
| **Output Fuse Fail** | At least one of the output fuses is open. Contact Vertiv Services at 800-543-2378 for assistance. |
| **Control Power 2 Fail** | Control Power 2 is abnormal or lost. Contact Vertiv Services at 800-543-2378 for assistance. |
| **Unit Overload** | The UPS is confirmed to be overload when the load arises above 105% nominal rating. The alarm automatically resets once the overload condition is removed.  
1. Confirm that the alarm is true by checking the load percent indicated on the LCD panel to determine which phase is being overloaded.  
2. If the alarm is true, measure the actual output current to verify that the indications are valid. Disconnect unnecessary load and ensure the safety. In a parallel system, a severe load sharing error can also leads to the alarm.  
Contact Vertiv Services at 800-543-2378 for assistance. |
| **System Overload** | The UPS parallel system is confirmed to overload when the total load arises above 105% nominal rating for the set basic number of UPSs. The alarm automatically resets once the overload condition is removed.  
1. Confirm that the alarm is true by checking the system load percent indicated on the LCD panel to determine which phase is being overloaded.  
2. If the alarm is true, measure the actual output current to verify that the indications are valid. Disconnect unnecessary load and ensure the safety. In a parallel system, a severe load sharing error can also leads to the alarm. |
Table 32  UPS status messages (continued)

<table>
<thead>
<tr>
<th>Event Message</th>
<th>Description / Suggested Action (if any)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Overload Timeout</td>
<td>The UPS is confirmed to overload and the overload times out. <strong>Note 1:</strong> The highest loaded phase will indicate overload timing-out first. <strong>Note 2:</strong> When the timer is active, then alarm “unit overload” should also be active as the load is above nominal. <strong>Note 3:</strong> When the timer has expired, the inverter Static Switch is opened and the load transferred to bypass. The inverter shutdown and will restart after 10 seconds. <strong>Note 4:</strong> If the load decreases lower than 95% after 5 minutes, the system will transfer back to inverter mode. Confirm that the alarm is genuine by checking the load percent indicated on the LCD. If an overload is indicated then check the load, and investigate any additional load connected prior to the alarm (if applicable).</td>
</tr>
<tr>
<td>Bypass Phase Reversed</td>
<td>The phase sequence direction of bypass voltage is reversed. Normally, the phase of Phase B lags 120 degrees behind Phase A, and the phase of Phase C lags 120 degrees behind Phase B. Verify that the phase rotation of the bypass supply presented to the UPS is correct, and rectify it if it is wrong. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>Load Impact Transfer</td>
<td>A transfer to bypass occurred due to a large step load. The UPS should recover automatically. Turn On connected equipment in sequential order to reduce the step loading of the inverter.</td>
</tr>
<tr>
<td>Transfer Timeout</td>
<td>The load is on bypass power due to excessive number of transfers that occurred within the last hour. The UPS will recover automatically and will transfer the load back to inverter power within an hour.</td>
</tr>
<tr>
<td>Load Sharing Fault</td>
<td>UPS working within a parallel system are not sharing load current correctly. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>DC Bus Abnormal</td>
<td>Shut off inverter due to abnormal DC bus voltage. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>System Transfer</td>
<td>The whole paralleled UPS system transferred to bypass at the same time. This message will appear on the UPS which passive transfer to bypass.</td>
</tr>
<tr>
<td>DC Bus Overvoltage</td>
<td>Rectifier, inverter and battery converter were shutdown because DC bus voltage is too high. Check whether there is a fault in rectifier side. If no, then check whether overload occurs. Restart the inverter after resetting the fault. If fault does not clear, contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>LBS Active</td>
<td>The LBS setting is active. The UPS is acting as an LBS master or slave in a dual bus configuration.</td>
</tr>
<tr>
<td>Battery ground fault</td>
<td>Battery ground fault from dry contact signal. Contact Vertiv Services at 800-543-2378 for assistance.</td>
</tr>
<tr>
<td>Inverter turned On manually</td>
<td>Manual turn On via front panel</td>
</tr>
<tr>
<td>Inverter turned Off manually</td>
<td>Manual turn Off via front panel</td>
</tr>
<tr>
<td>EPO</td>
<td>Emergency power off</td>
</tr>
<tr>
<td>Transfer Confirm</td>
<td>Interrupted transfer confirm</td>
</tr>
<tr>
<td>Transfer Cancel</td>
<td>Interrupted transfer is cancel</td>
</tr>
<tr>
<td>Unit Off Confirm</td>
<td>Unit turned off confirm</td>
</tr>
<tr>
<td>System Off Confirm</td>
<td>System turned off confirm</td>
</tr>
<tr>
<td>Fault Reset</td>
<td>Fault reset</td>
</tr>
<tr>
<td>Alarm Silence</td>
<td>Alarm silence</td>
</tr>
<tr>
<td>Turn On Fail</td>
<td>Turn on fail</td>
</tr>
<tr>
<td>Alarm Reset</td>
<td>Audible alarm reset</td>
</tr>
<tr>
<td>Load on Bypass</td>
<td>UPS load is supplied by the bypass</td>
</tr>
</tbody>
</table>
### Table 32  UPS status messages (continued)

<table>
<thead>
<tr>
<th>Event Message</th>
<th>Description / Suggested Action (if any)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load on Inverter</td>
<td>UPS load is supplied by the inverter</td>
</tr>
<tr>
<td>Load on Battery</td>
<td>UPS load is supplied by the battery</td>
</tr>
<tr>
<td>Output Disabled</td>
<td>UPS output disabled</td>
</tr>
<tr>
<td>Maint. Disconnect</td>
<td>Maintenance disconnect closed</td>
</tr>
<tr>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>Output Disconnect Open</td>
<td>Output disconnect open</td>
</tr>
<tr>
<td>Battery Reverse</td>
<td>Connect the battery again and check the wiring of batteries.</td>
</tr>
<tr>
<td>No Battery</td>
<td>Check the battery and the wiring of batteries.</td>
</tr>
<tr>
<td>Auto start</td>
<td>After UPS was shutdown at EOD, inverter auto starts when utility is restored.</td>
</tr>
<tr>
<td>BCB closed</td>
<td>BCB closed from dry contact signal.</td>
</tr>
<tr>
<td>BCB open</td>
<td>BCB open from dry contact signal.</td>
</tr>
<tr>
<td>Battery Float Charging</td>
<td>Battery is float charging.</td>
</tr>
<tr>
<td>Battery Boost Charging</td>
<td>Battery is boost charging.</td>
</tr>
<tr>
<td>Battery Discharging</td>
<td>Battery is discharging.</td>
</tr>
<tr>
<td>Battery Period Testing</td>
<td>Battery is period self-testing.</td>
</tr>
<tr>
<td>Batt. Capacity Testing</td>
<td>Battery is capacity self-testing.</td>
</tr>
<tr>
<td>Batt. Maint. Testing</td>
<td>Battery is maintenance self-testing.</td>
</tr>
<tr>
<td>Inverter in Setting</td>
<td>Inverter is in parameter setting.</td>
</tr>
<tr>
<td>Rectifier in Setting</td>
<td>Rectifier is in parameter setting.</td>
</tr>
<tr>
<td>Batt. Converter Fault</td>
<td>Battery converter output voltage beyond limits or battery fuse failed. Battery converter shuts down. Battery backup not available.</td>
</tr>
<tr>
<td>Operation Invalid</td>
<td>This record is registered following an incorrect operation.</td>
</tr>
<tr>
<td>Byp. Abnormal Shutdown</td>
<td>Both bypass and inverter voltages unavailable. Load interruption.</td>
</tr>
<tr>
<td>Mains Neutral Lost</td>
<td>AC input mains reference neutral not detected.</td>
</tr>
<tr>
<td>Battery Room Alarm</td>
<td>Environment in battery room needs attention.</td>
</tr>
<tr>
<td>Rec Flash Update</td>
<td>Rectifier firmware is being updated.</td>
</tr>
<tr>
<td>Inv Flash Update</td>
<td>Inverter firmware is being updated.</td>
</tr>
<tr>
<td>Monitor Flash Update</td>
<td>Monitor firmware is being updated.</td>
</tr>
<tr>
<td>LBS abnormal</td>
<td>LBS is abnormal.</td>
</tr>
</tbody>
</table>