



Liebert® EXM BDC

Bypass Distribution Cabinet

Installer/User Manual

10-100kVA, 60Hz

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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.Vertiv.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 Vertiv™ Liebert® EXM BDC User Manual (Bypass Distribution Cabinet).

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 BDC 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 BDC is designed for commercial and industrial uses and cannot be used as life support equipment.



WARNING! Risk of moving heavy equipment and electric shock. Can cause damage to the equipment , injury and death. Exercise extreme care when handling UPS cabinets to avoid damage to the equipment or injury to the personnel. The weight of the Liebert EXM BDC ranges from 660lb. to 1752 lb. (300kg to 794kg).

Determine the weight of the unit's and locate the center of gravity symbols  before handling the Liebert EXM BDC. Test lift and balance the cabinet before transporting it. Never tilt the equipment more than 15 degrees from vertical. In the 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 maintenance. Be constantly aware that the UPS system contains high DC as well as AC voltages. Check for the voltage with both the AC and DC voltmeters prior to making contact.



AVERTISSEMENT! Risque lors du déplacement de l'équipement lourd et de décharge électrique pouvant 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. Les armoires Liebert EXM BDC pèsent de 660 lb à 1752 lb (de 300 kg à 794 kg). Déterminez le poids de l'unité et trouvez les symboles  de centre de gravité avant de déplacer l'armoire Liebert EXM BDC. Faites des essais de levage et d'équilibre avant de transporter l'armoire. N'inclinez jamais l'équipement à plus de 15 degrés à la verticale. 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'entretien requièrent une extrême prudence. Soyez toujours conscient du fait que le système ASC contient des tensions c.c. et c.a. élevées. Vérifiez les tensions avec des voltmètres c.a. et c.c. avant d'établir tout contact.



WARNING! Risk of electric shock. it can can cause damage to the equipment, injury and death. As with other types of high power equipment, dangerous voltages are present within the UPS and battery enclosure even after the input power has been disconnected. The risk of contact with these voltages is minimized as the live component parts are housed behind a metal panel. Further internal safety screens make the equipment protected to IP20 standards. Never remove the panels or the covers or open the doors that will expose the internal components to the contact. Read and follow all warnings, cautions and safety and operating instructions to avoid serious injury or death from electric shock. No risk exists to any personnel when operating the equipment in the normal manner, following the recommended operating procedures. All equipment maintenance and servicing procedures involve internal access and should be carried out only by a trained personnel.



AVERTISSEMENT! Risque de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort. À l'instar des autres types d'équipement haute puissance, des tensions dangereuses sont présentes à l'intérieur de l'armoire ASC et du châssis de batteries même après le débranchement de l'alimentation d'entrée. Le risque de contact avec ces tensions est diminué, car les parties de composants sous tension sont abritées derrière un panneau métallique. D'autres écrans de sécurité internes protègent l'équipement en conformité avec les normes IP20. Ne retirez jamais les panneaux ou les couvercles et n'ouvrez pas les portes donnant accès aux composants internes avec lesquels vous pouvez entrer en contact. Veuillez lire et suivre l'ensemble des avertissements, des mises en garde et des instructions de sécurité et de fonctionnement afin d'éviter des blessures graves, voire la mort, pouvant être causées par une décharge électrique. Il n'y a aucun risque pour le personnel lorsque l'équipement est utilisé normalement, en suivant les procédures de fonctionnement recommandées. Toutes les procédures de réparation et d'entretien de l'équipement exigent un accès à l'intérieur de l'armoire et devraient être menées uniquement par du personnel compétent.

Ground Leakage Currents



WARNING! Risk of electric shock from high leakage current. Can cause injury, damage to the property damage and death. EARTH CONNECTION IS ESSENTIAL BEFORE CONNECTING THE INPUT SUPPLY. The 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 the instantaneous Residual Current Circuit Breakers (RCCBs) or Residual Current Devices (RCD). RCCBs must be selected sensitive to DC unidirectional pulses (Class A) and insensitive to the transient current pulses. Note also that the earth leakage currents of the load will be carried by this RCCBs 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 the electric shock. it can cause damage to the property, injury 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 and the internal batteries (internal batteries accommodated by the 10-40kVA frame only). Observe all safety precautions in this manual before handling or installing the UPS system as well as during all the maintenance procedures. Observe all battery safety precautions before working on or near the battery. 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 the oscilloscopes. Always check with the AC and DC voltmeters to ensure safety before making contact or using the 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 the 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, the 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 the power is removed from the equipment. A second person should be standing by to assist and summon help in the case an accident should occurs.



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. Cet équipement comporte plusieurs circuits à haute tension. Seuls des équipements d'essai conçus pour le dépannage doivent être utilisés. Cette mise en garde couvre notamment les oscilloscopes. Utilisez toujours des voltmètres c.a. et c.c. pour vérifier les tensions avant d'établir un contact ou d'utiliser des outils. Des tensions dangereusement élevées peuvent demeurer dans le système ASC même une fois l'alimentation coupée. Tous les câbles d'alimentation et de contrôle doivent être installés par un électricien qualifié. Tous les câbles d'alimentation et de contrôle doivent être conformes au Code national de l'électricité des États-Unis (NEC) et celui du Canada, ainsi qu'aux codes locaux en vigueur. 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.



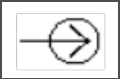
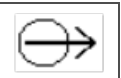

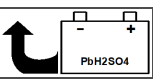





NOTICE

Risk of improper ground connection. It can cause the equipment damage. The ground connection is essential before connecting the input supply. This equipment must be grounded in accordance with the local electrical codes. Maximum load must not exceed that shown on the UPS rating label.

NOTICE

Risk of improper electromagnetic shielding. It 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

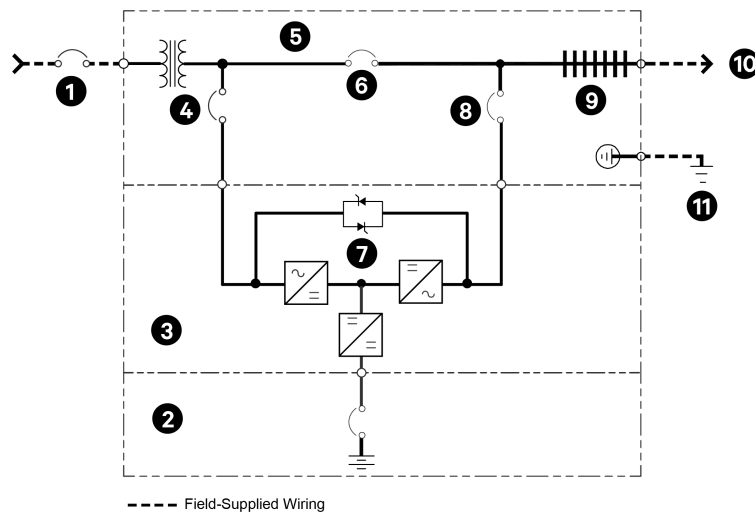
	Risk of Electrical Shock
	Indicates caution followed by important instructions
	AC Input
	DC Output
	Requests the user to consult the manual
	Indicates the unit contains a valve-regulated lead acid battery
	Recycle
	DC Voltage
	AC Voltage
	Equipment grounding conductor
	Bonded to ground

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1 LIEBERT® EXM BDC

The Liebert EXM BDC is designed to operate in UPS normal mode, static bypass mode and maintenance mode. The Liebert EXM BDC offers 10-100kVA capacity to match the associated Vertiv™ Liebert® EXM frame offerings. Each of the Liebert EXM BDC capacities offer optional input 208V, 220V, 480V and 600V internal transformers as well as multiple output distribution selections.

Figure 1.1 Single Input UPS (with External Liebert EXM BDC and Optional Internal Transformer) - Typical Configuration



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	System AC Input 3 Wire + GND	7	STATIC BYPASS
2	BATTERY	8	MIB - Maintenance Isolation Breaker
3	UPS CABINET	9	(Optional) 54 Pole See Note 5
4	BIB - Bypass Isolation Breaker	10	AC Output 208V 4 Wire + GND
5	BYPASS DISTRIBUTION CABINET	11	Local Grounding Electrode See Note 1
6	MBB - Maintenance Bypass Breaker		

*External Overcurrent Protection by Others

NOTES TO FIGURE:

1. Install in accordance with the national and the local electrical codes.
2. Input and bypass must share the same single source.
3. UPS system input and output cables must be run in separate conduits.
4. Control wiring must be run in separate conduits.
5. Optional 54 pole, 225A for 10-40kVA frame only or optional 54 pole 400A for 60-100kVA frame only.
6. Transformers available are with input voltage of 208V, 220V, 480V, and 600V.

1.1 Normal (UPS) Mode

While the Liebert® EXM BDC is in Normal Mode (MBB open; BIB/MIB closed), the UPS is supplying the connected load with continuous, high-quality AC power. In this mode of operation, the load is protected by the UPS.

1.2 Maintenance Mode

When the Liebert EXM BDC is in Maintenance Mode (MBB closed; BIB/MIB open), it provides an alternate path for power to the connected equipment should the UPS need to be taken out of service for limited maintenance or repair. In this mode of operation, no power is supplied to the UPS and the load is NOT protected by the UPS.

1.3 Cable Installation

1.3.1 Wiring Preparation

Be sure that the unit is not connected to any AC utility power source or the UPS before installing any wiring to this unit. This Liebert EXM BDC should be installed by a qualified/certified electrician.

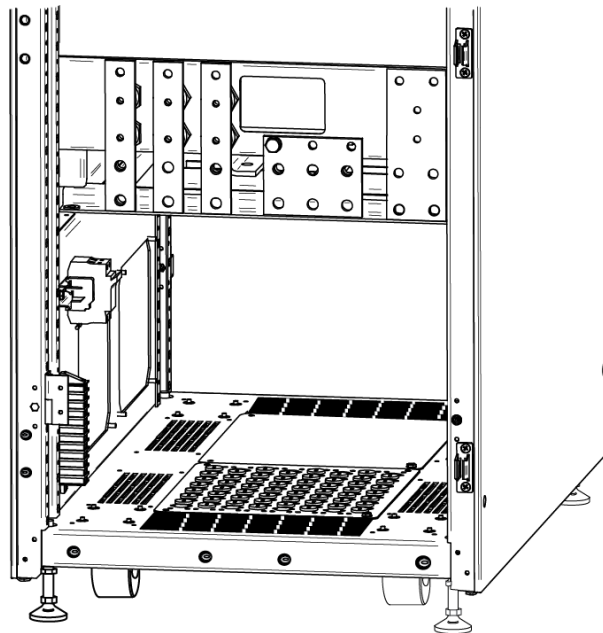


WARNING! Risk of electrical shock and arc flash. Can cause damage to the property, injury and death. Read this section thoroughly before attempting to install wiring to this unit. Read and comply with all the warnings and cautions in this manual.

Removing the Cover Plates

Cover Plates are given to the input and the output terminals on the front of the Liebert EXM BDC (see [Figure 1.2](#) on page no. 8). Remove these plates and keep the screws and plates for reinstallation.

Figure 1.2 Liebert EXM BDC-Access Plate Removed



1.4 Locating the Cabinet

This Liebert® EXM BDC may be mounted to the right of the UPS or installed as a stand-alone unit. Ensure that the unit is placed in a well-ventilated area and that there is clearance for access to the switches and the cable connections as required by the national and the local codes.

1.4.1 Power Cable Installation

NOTE: Transient and steady state earth leakage currents may occur when starting the equipment. This should be taken into account when selecting the ground current detection devices because these will carry the earth leakage currents of both the UPS equipment and the load.

1.4.2 Input/Output Wiring

Follow the steps below to connect the input wiring:

NOTE: Input wiring must be installed using conduit if the cabinet is not mounted to the immediate right of the UPS.

1. Locate the input wiring access (top or bottom access), remove the conduit landing plate and punch the appropriate size hole for the size conduit being used. Pull the three/four input wires through it, allowing some slack for installation. For the cabinets that are located to the immediate left of the UPS, the access plate is on the lower right of the cabinet. Remove the access plate and verify that the edge guarding is installed and intact.
2. Secure the conduit to the access plate of the Liebert® EXM BDC.
3. Input power cables connect to the system input bus; refer to [Figure 2.1](#) on page no. 19 and [Table 2.2](#) on page no. 27
4. Connect the ground (earth) wire to the earth busbar and tighten it to 428 lb.-in. (48Nm) for M12 bolt.
5. Locate the UPS input and output cables and the access panel to the UPS on the lower right side.

NOTE: If the Liebert EXM BDC is not to be bolted to the UPS, use either top or bottom access plate.

6. Connect the system ground cable between the Liebert EXM BDC and the UPS and tighten the connections to 428 lb.-in. (48Nm) for M12 bolt.
7. Connect the system input cables between the Liebert EXM BDC "UPS Input" Busbars (A-B-C-N terminals) and the UPS input busbars (A-B-B N terminals) and tighten the connections to 428 lb.-in. (48Nm) for M12 bolt.
8. Connect the system output cables between the Liebert EXM BDC "UPS Output" Busbars (A-B-B N terminals) and the UPS output busbars (A-B-C N terminals) and tighten the connections to 428 lb.-in. (48Nm) for M12 bolt.
9. Connect TB1 from the Liebert EXM BDC to J23, J24 and J26 on the Liebert® EXM.

NOTICE

Risk of improper wiring connection. Can cause damage to the equipment. The control wire must be installed to ensure proper operation of the system and fully protect the load when switching between the bypass cabinet and the UPS.

Notes

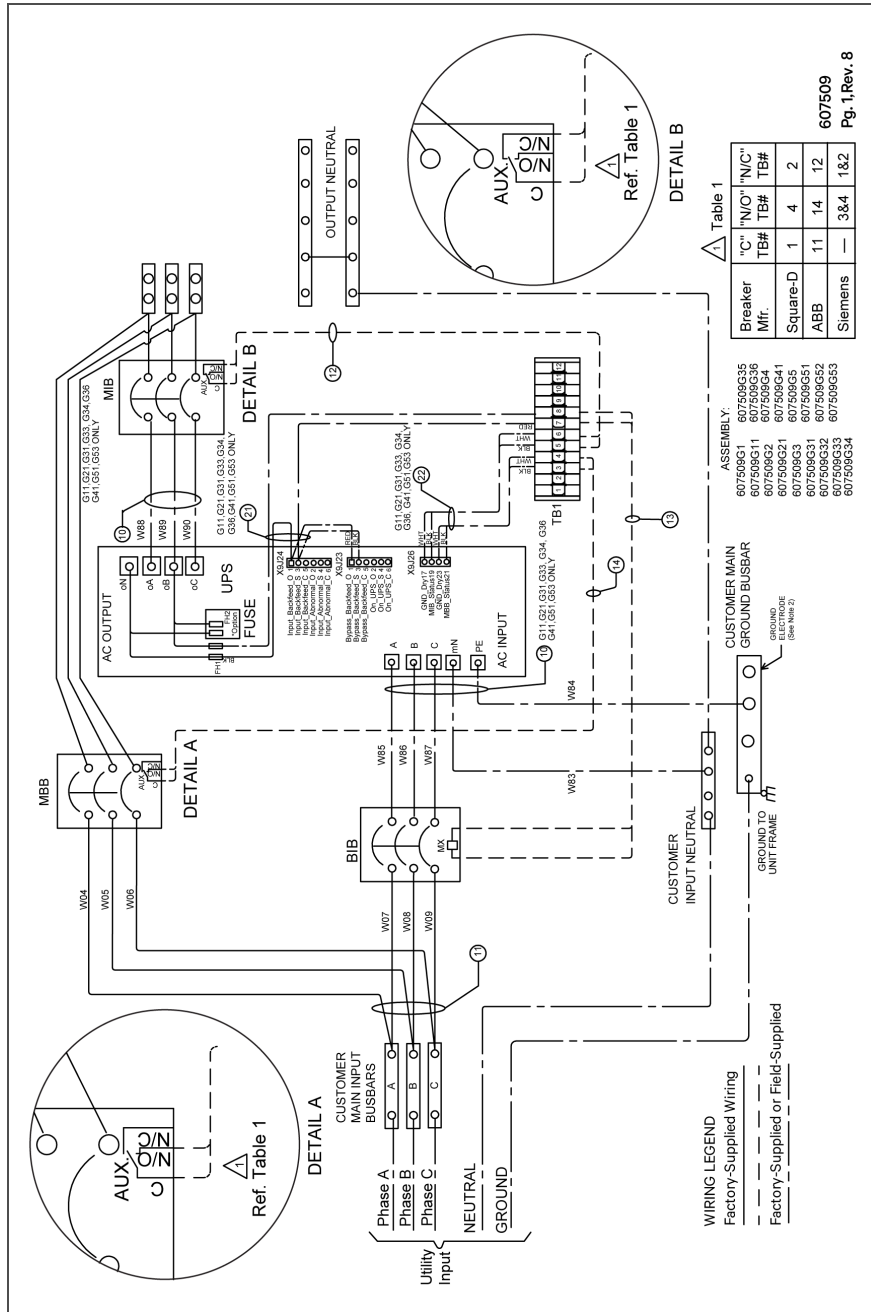
1. All interconnection hardware will be supplied by Vertiv™.
2. AC connections must be made to the UPS module before attaching the Liebert EXM BDC to the UPS module.
3. All cabling will be field-supplied when a Liebert EXM BDC is configured as a stand-alone cabinet.
4. Liebert EXM BDC's must attach to only the right side of the Liebert® EXM UPS.
5. Refer to individual drawing of each piece of the equipment for additional details.

Table 1.1 Control Wiring for Liebert® EXM to Liebert EXM BDC

FROM	TO	FROM	TO
Liebert EXM UPS Bypass Module (X9 J23, J24 and J26)	Liebert EXM BDC Terminal Strip (TB1)	Liebert EXM UPS Bypass Module (X9 J23, J24 and J26)	Liebert EXM BDC Terminal Strip (TB1)
J24-3	TB1-7	J26-21	TB1-3
FH1-B	TB1-8	J23-4	TB1-11
J26-17	TB1-6	J23-6	TB1-12
J26-19	TB1-5	FH1-N	J24-1
J26-23	TB1-4		
Refer to 1.4.3 on page no. 11 for the location of fuse block FH1 and to Figure 1.1 on page no. 1 for the location of J23, J24 and J26			

1.4.3 Accessory Fuses and Back-Feed Breaker Wiring

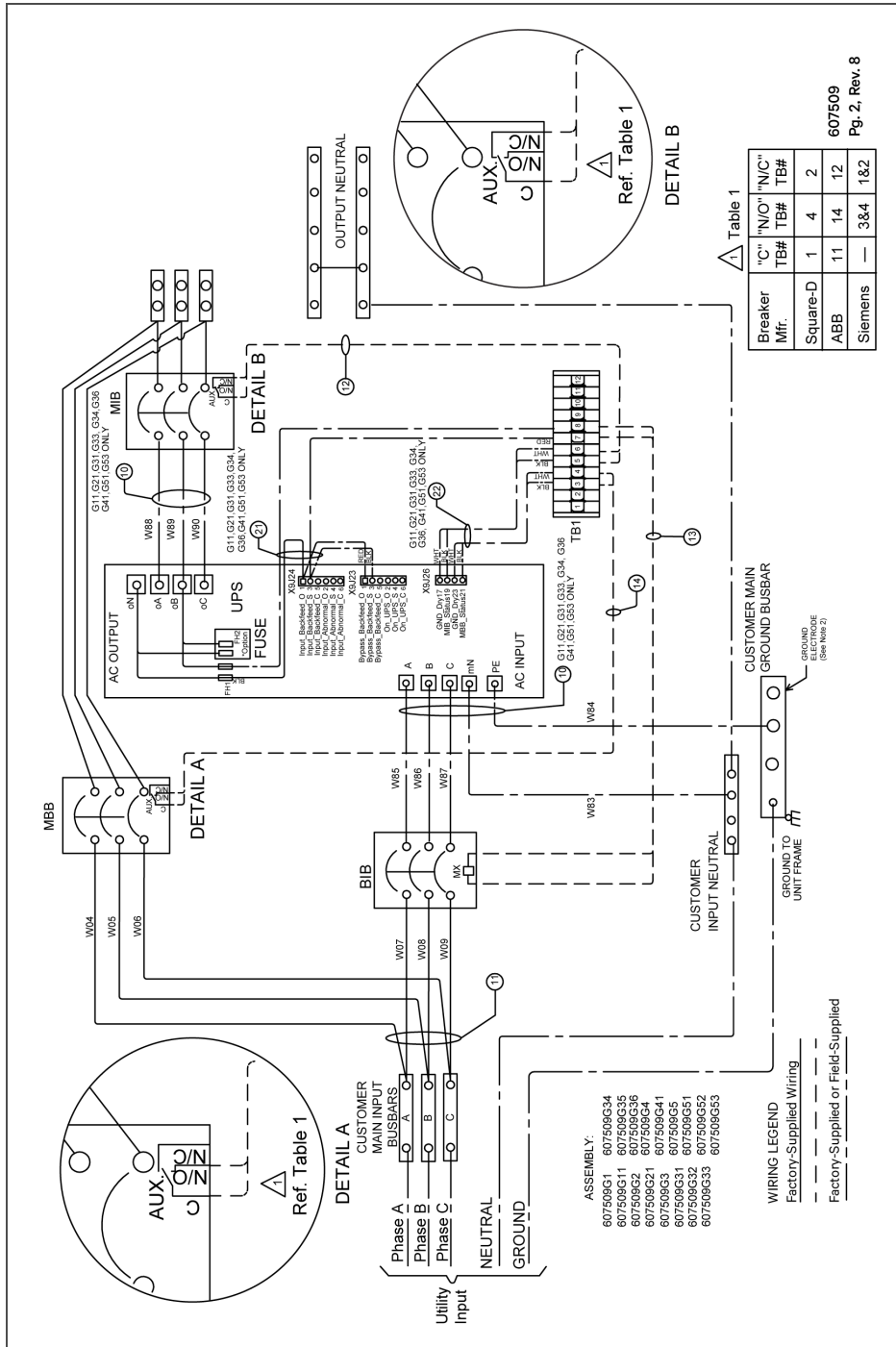
Figure 1.3 Liebert® EXM BDC Liebert EXM BDC wiring, Without Transformer Option, Single Input



NOTES TO FIGURE:

1. Wiring furnished by factory.
2. Customer-furnished grounding electrode conductor to be installed in accordance with the National Electric Code Article 250-26.

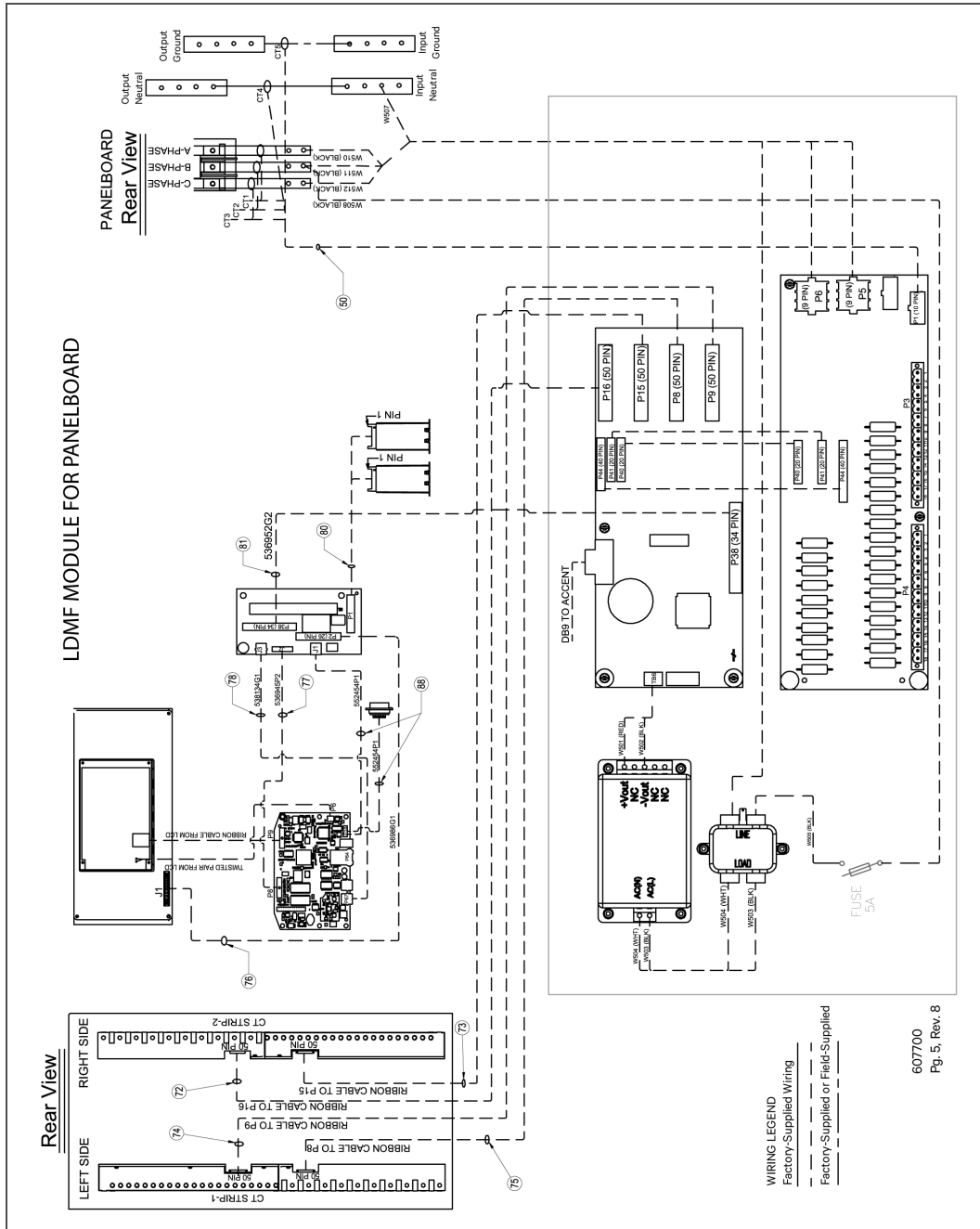
Figure 1.4 Liebert® EXM BDC Wiring with Transformer Option, Single Input



NOTES TO FIGURE:

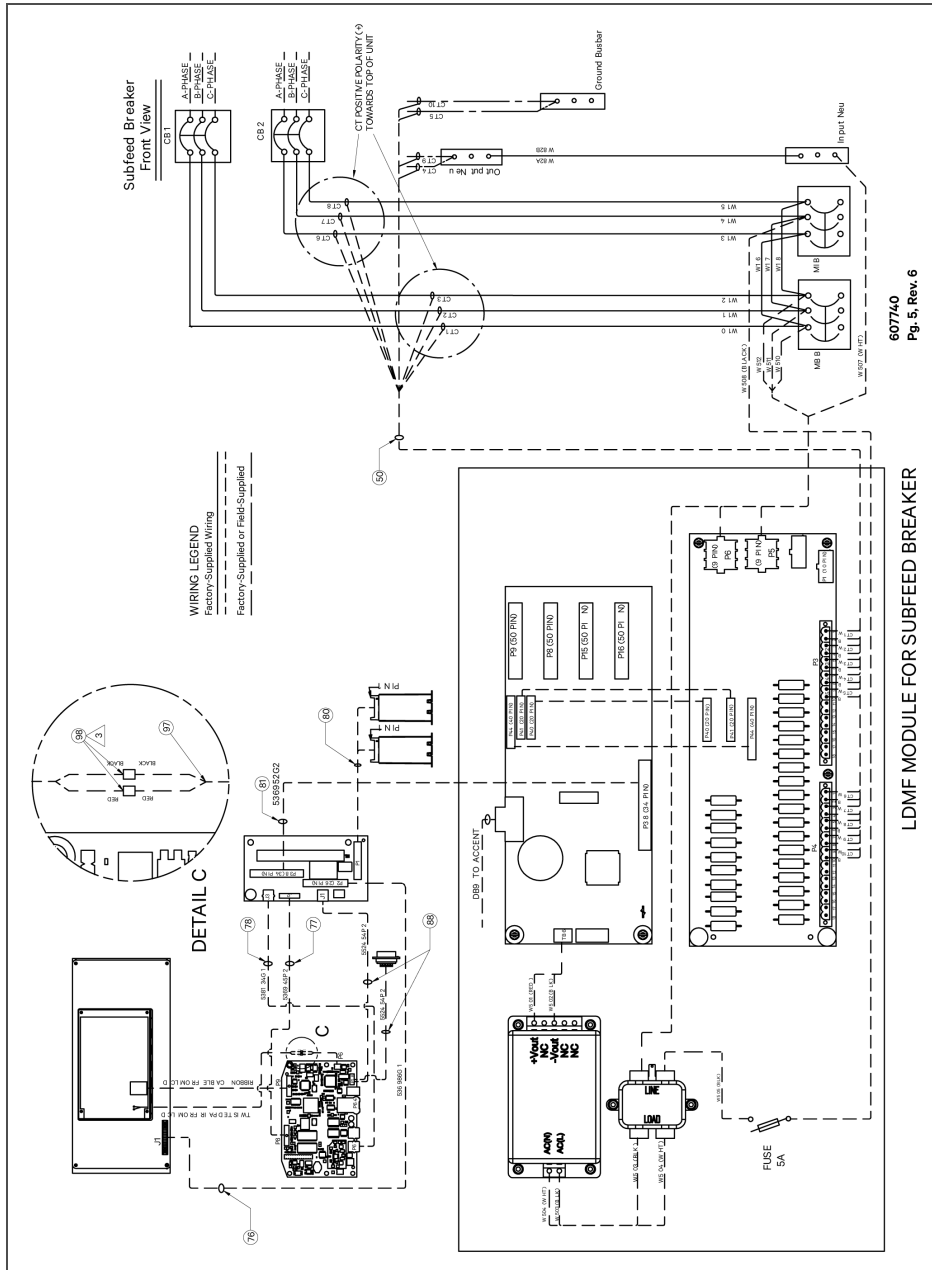
1. Wiring furnished by factory.
2. Customer-furnished grounding electrode conductor to be installed in accordance with the National Electric Code Article 250-26.

Figure 1.5 Wiring For LDMF with Panelboard



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Figure 1.6 Wiring for LDMF with subfeed breakers



NOTES TO FIGURE:

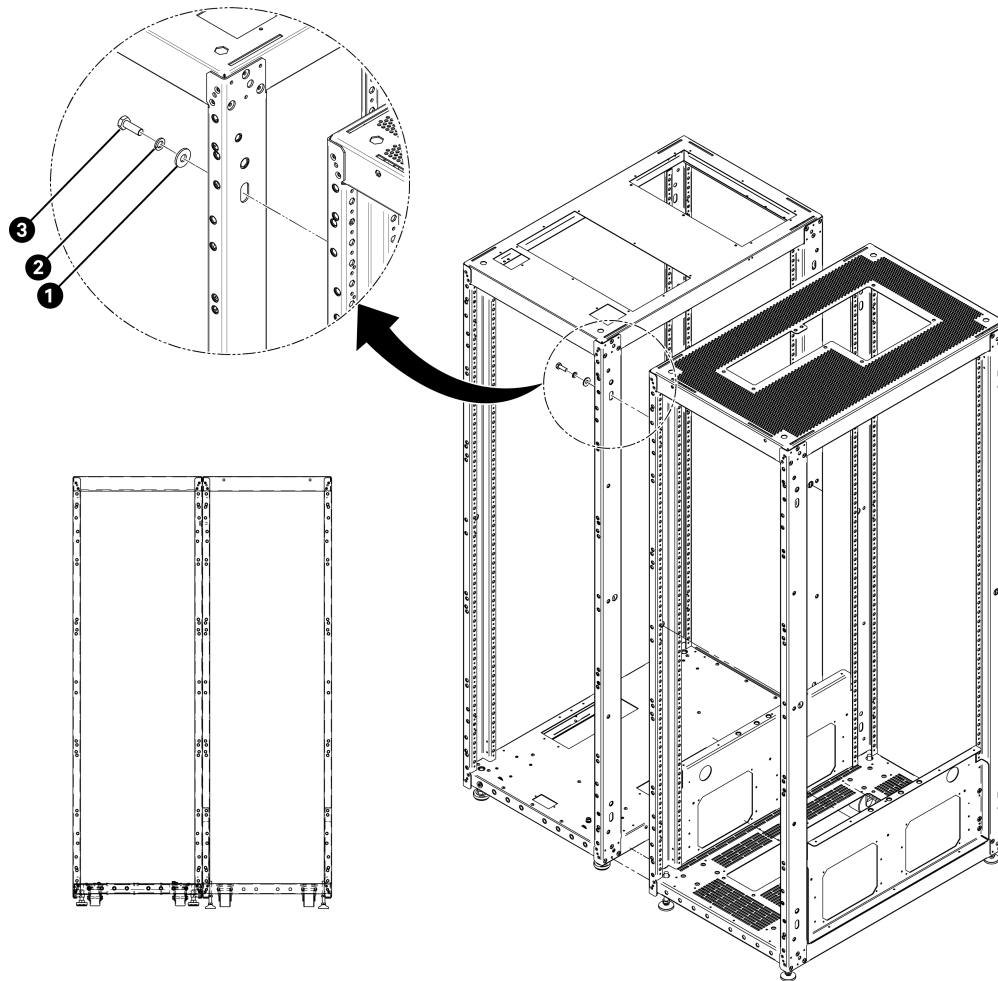
1. Wiring furnished by factory.
2. Customer-furnished grounding electrode conductor to be installed in accordance with the National Electric Code, Article 250-26.
3. Cut off the connector from the end of the wires and discard it. Then splice Item 97 to the wires on the display board using Item 98 as shown.

1.5 Bolting Cabinets Together

NOTE: The UPS wiring must be completed before the cabinets are bolted together.

1. Line up the cabinets so that the mounting holes are aligned.
2. Using supplied hardware, bolt the cabinets together. The bolts may be inserted from either the UPS side or from the Liebert® EXM BDC side, whichever is more convenient.

Figure 1.7 Bolting Liebert EXM UPS to a Liebert EXM BDC



ITEM	DESCRIPTION
1	Washer Flat, M10
2	Washer Split, M10
3	Hex Head Bolt, M10 x 30mm

NOTES TO FIGURE

1. Place the cabinets so that the mounting holes are aligned.
2. A bolt from the adjacent cabinet may be screwed into the threaded top hole or a bolt may be inserted through the lower and screwed into the threaded hole in the adjacent cabinet.



WARNING! Risk of heavy units tipping over while being moved. Can cause damage property, injury and death. The Liebert® EXM BDC and battery cabinets must be properly prepared and secured for lifting. Improper lifting may cause the cabinets to fall, causing the equipment damage, personal injury and death. Vertiv™ recommends lifting the units by placing the suitable straps on the Liebert EXM BDC or the battery cabinet. The straps must go under the unit to be lifted.



AVERTISSEMENT! Le centre de gravité élevé des appareils présente un risque de renversement lors des déplacements, pouvant entraîner des dommages matériels, des blessures et même la mort. Les armoires Liebert® EXM BDC et de batterie doivent être correctement préparées et sécurisées avant d'être levées. Un mauvais levage peut faire tomber les armoires, causant des dommages à l'équipement, des blessures, voire la mort. Vertiv™ recommande de soulever les unités en suivant l'une des méthodes suivantes :

- 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.
- En plaçant des sangles convenables sur l'armoire Liebert ou de batterie. Les sangles doivent passer sous l'unité à soulever.

1.5.1 Floor Installation

If the Liebert EXM BDC is to be placed on a raised floor, the Liebert® EXM UPS should be mounted on a pedestal that will support the equipment point loading. Refer to the **Liebert® EXM UPS Installer/User Guide, (SL-25648 or SL-25650)**, to design this pedestal.

1.5.2 Cable Entry

The Cables can enter the Liebert EXM BDC from the top or bottom through the removable metal plates.

Some plates have factory-punched holes and others are designed to allow the personnel to punch the 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 the local, regional and national codes and regulations, including the NEC ANSI/NFPA 70.

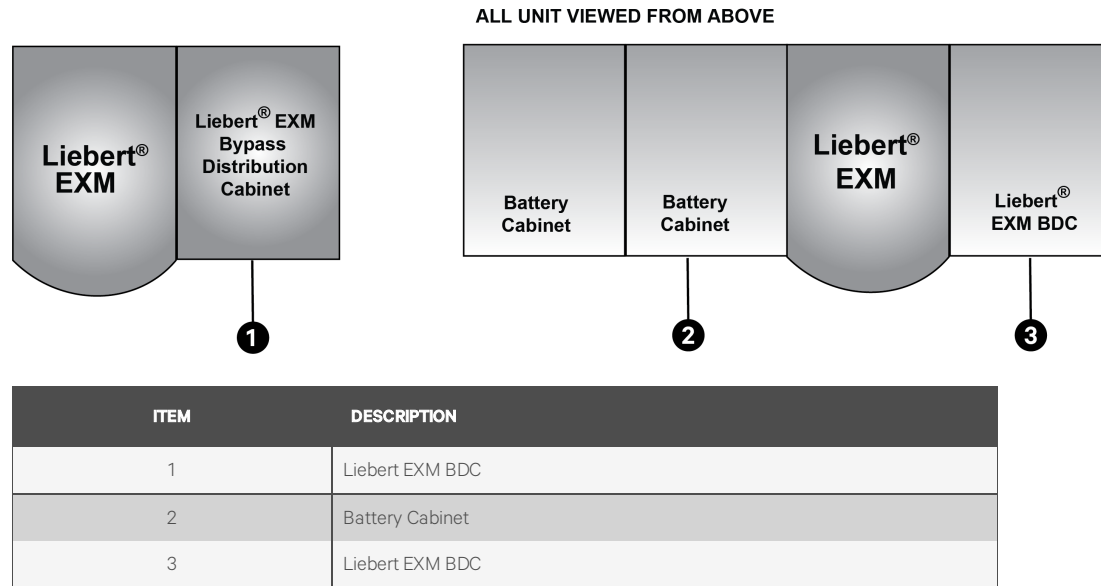
NOTE: When installing the UPS, the customer must provide a disconnect with overcurrent protection at the output of the UPS.

1.5.3 Optional Cabinets

The Liebert® EXM BDC must be bolted to the right side of the Liebert EXM (see [Figure 18](#) on page no. 17).

The Liebert EXM BDC must be cabled and bolted to the Liebert EXM before the UPS and the bypass distribution cabinet are moved into their final position. Connect input wiring to the Liebert EXM BDC ONLY after the units are internally cabled and positioned.

Figure 1.8 Cabinet Arrangement



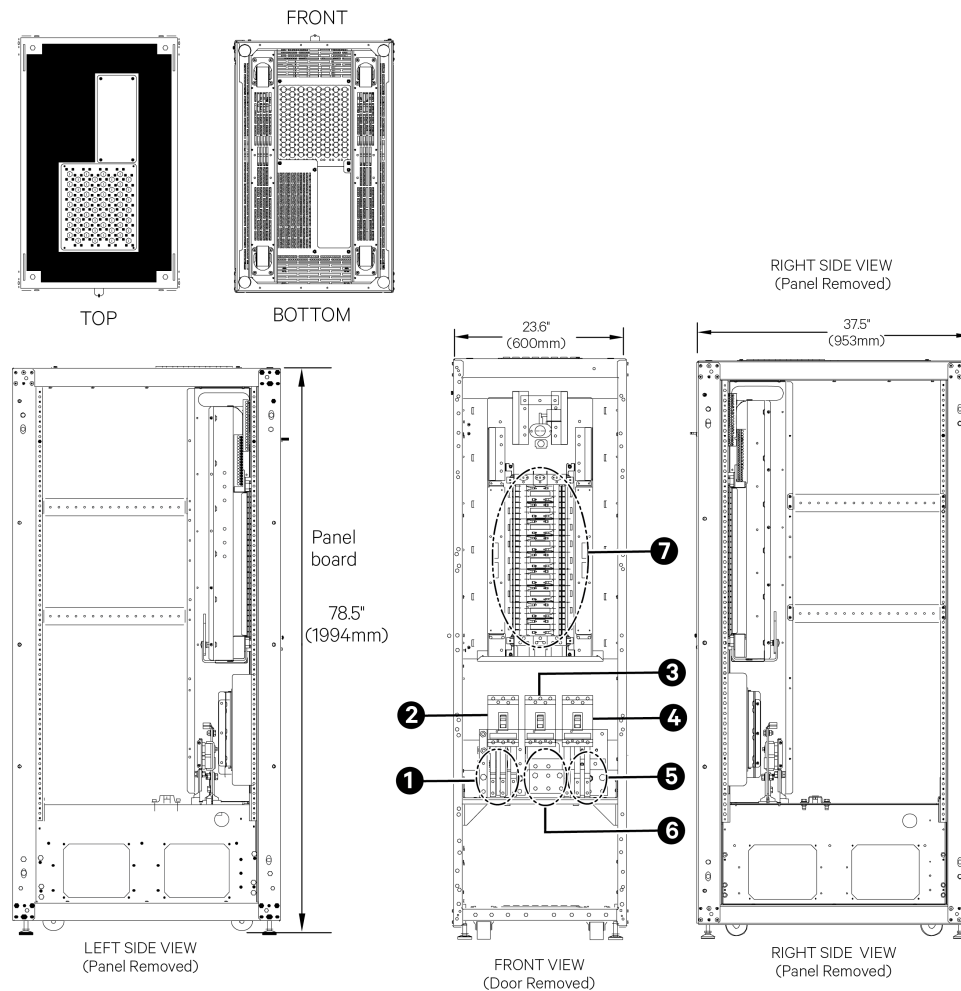
NOTES TO FIGURE:

1. The Liebert EXM UPS connected to the Liebert EXM BDC (The Liebert EXM BDC must be on the right side of the Liebert EXM UPS)
2. The Liebert EXM UPS connected to the Liebert EXM BDC and the Battery Cabinets (the Liebert EXM BDC must be on the right side of the Liebert EXM UPS) the (Battery Cabinets must be on the left side of the Liebert EXM UPS)

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2 INSTALLATION DRAWINGS

Figure 2.1 Liebert® EXM BDC with 225A or 400A Panelboards—Main Components

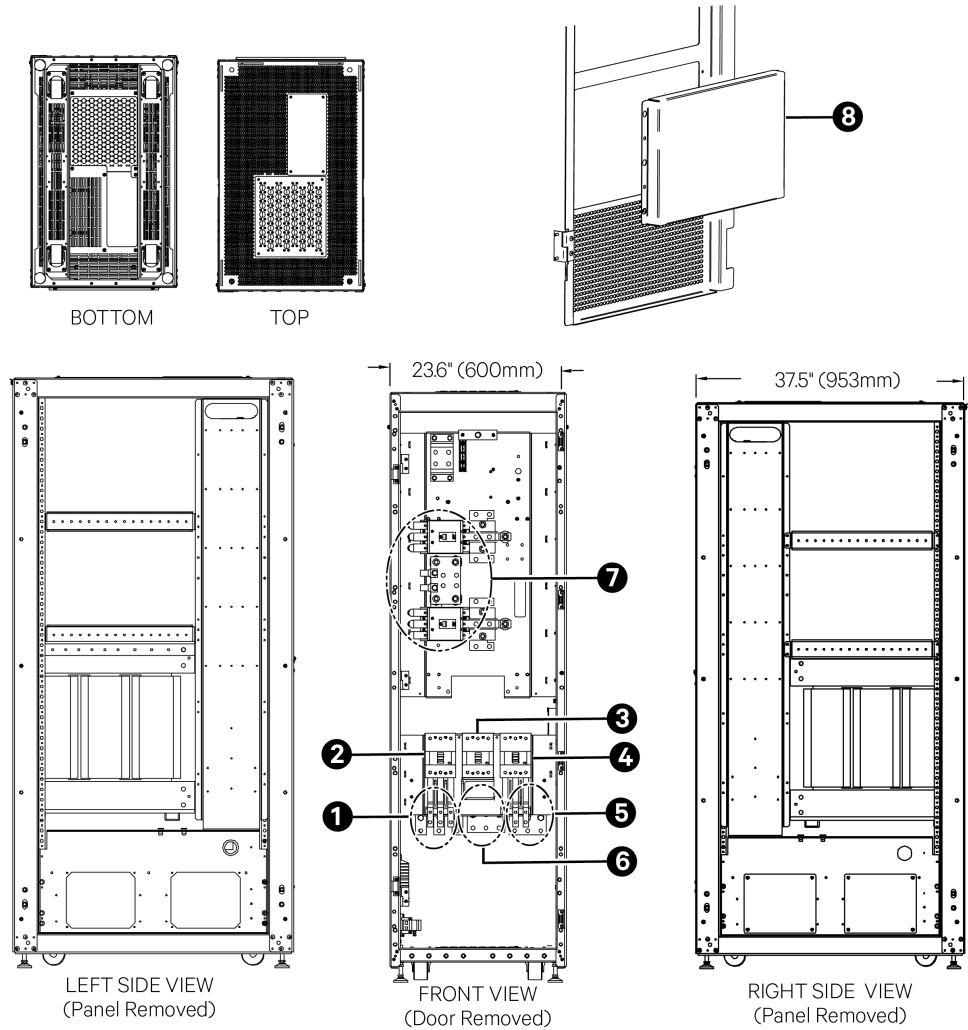


ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	System Input Bus	5	Neutral Bus
2	BIB - Bypass Isolation Breaker	6	Ground Bus
3	MBB - Maintenance Bypass Breaker	7	Panelboard
4	MIB - Maintenance Isolation Breaker		

NOTES TO FIGURE

1. Dimensions are in inches (mm).
2. The control wiring and the power wiring must be run in separate conduits.
3. All wiring must be in accordance with the national and the local electrical codes.
4. If the bypass distribution cabinet is attached to the right side of the UPS, Vertiv™ will supply the interconnection cables.

Figure 2.2 Liebert® EXM BDC with Two Subfeed Breakers - Main Components

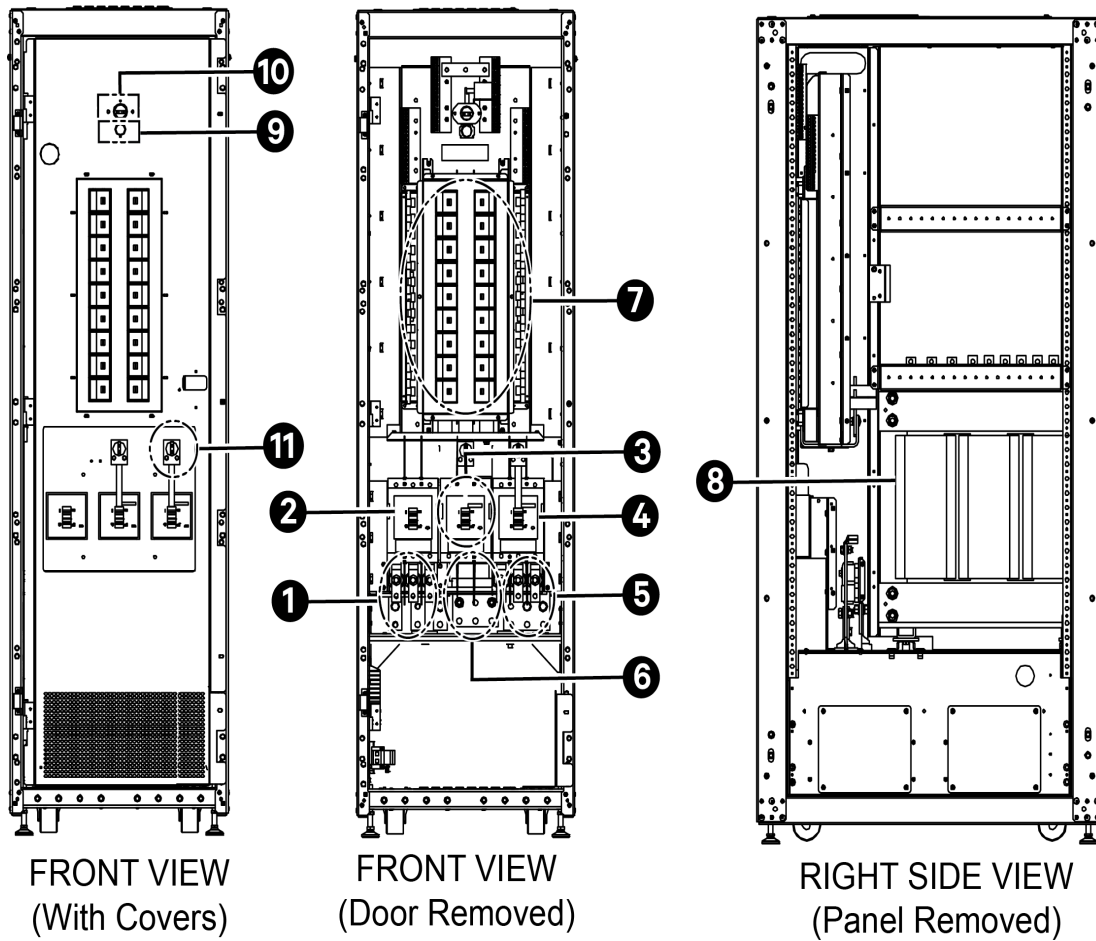


ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	System Input Bus	5	Neutral Bus
2	BIB - Bypass Isolation Breaker	6	Ground Bus
3	MBB - Maintenance Bypass Breaker	7	Subfeed Breakers
4	MIB - Maintenance Isolation Breaker	8	LDMF inside front door

NOTES TO FIGURE

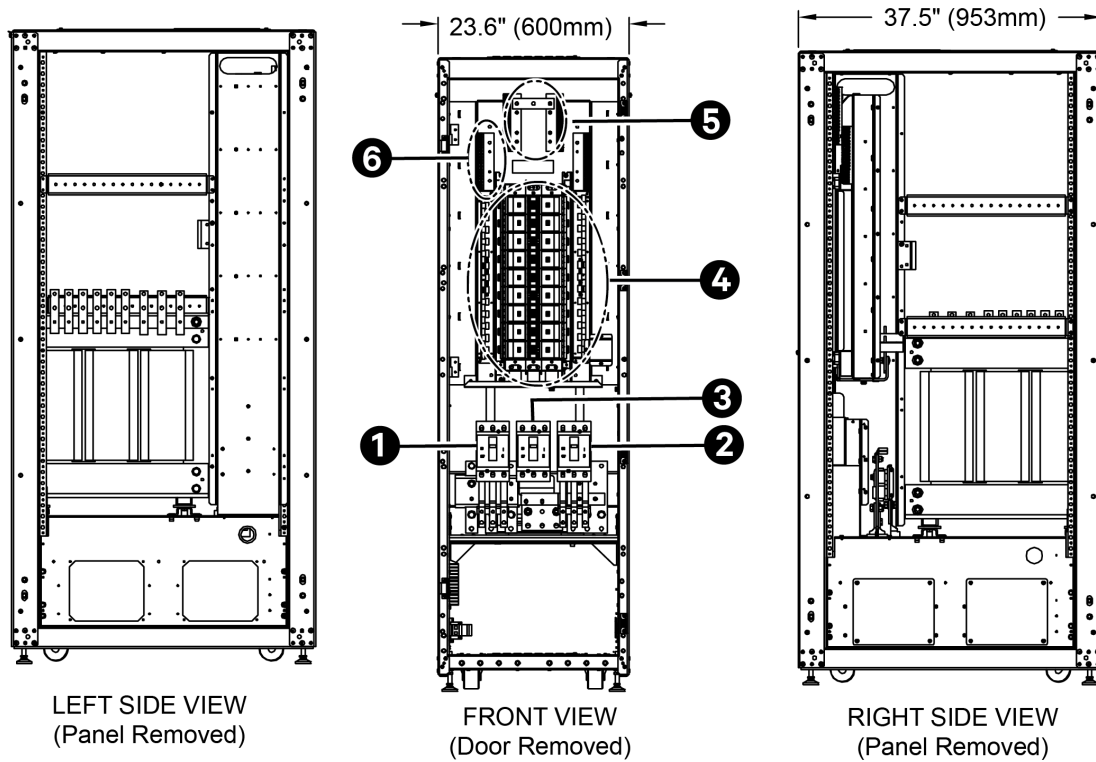
1. All dimensions are in inches (mm).
2. The control wiring and the power wiring must be run in separate conduits.
3. Copper cables only are recommended.
4. All the wiring is to be in accordance with the national and the local electrical codes.
5. When the Liebert EXM BDC is attached to the UPS, Vertiv™ will supply the interconnection cables.
6. 225A panelboard for 10-40kVA only. 400A panelboard for 60-100kVA only

Figure 2.3 Liebert® EXM BDC with Optional SKRU and Transformer



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	System Input Bus	7	LDB
2	BIB - Bypass Isolation Breaker	8	Transformer Option for 208V, 220V, 480V or 600V Input
3	MBB - Maintenance Bypass Breaker	9	Lamp
4	MIB - Maintenance Isolation Breaker	10	Key Operator
5	Neutral Bus	11	Kirk Keys
6	Ground Bus		

Figure 2.4 Busbars - Liebert® EXM BDC with Panelboard

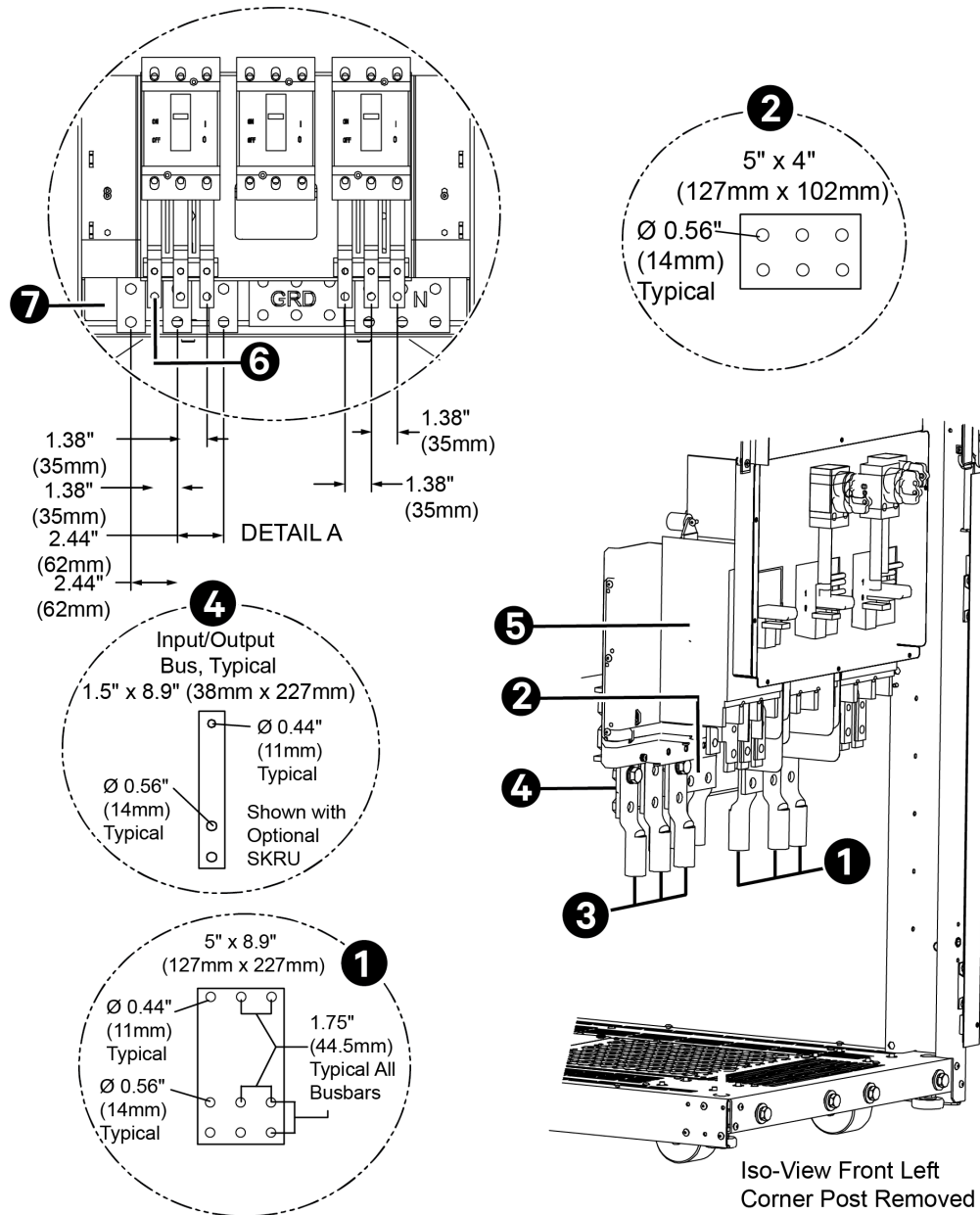


ITEM	DESCRIPTION
1	BIB - Bypass Isolation Breaker
2	MIB - Maintenance Isolation Breaker
3	MBB - Maintenance Bypass Breaker
4	Panelboard
5	Ground Busbar
6	Neutral Busbar

NOTES TO FIGURE

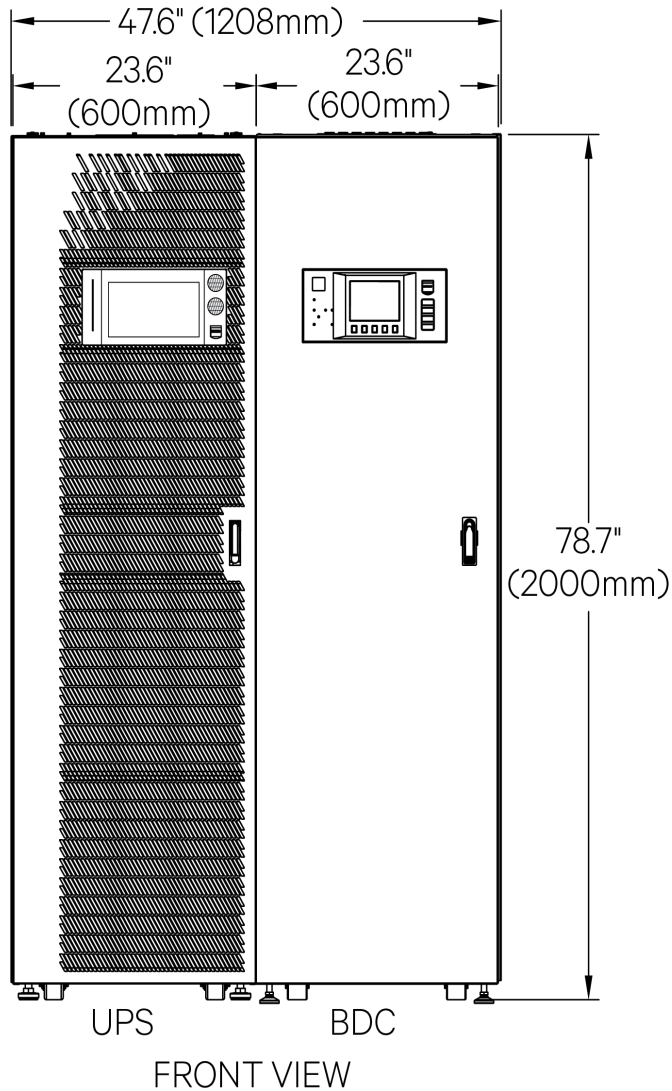
1. All dimensions are in inches (mm).
2. The control wiring and power wiring must be run in separate conduits.
3. All wiring is to be in accordance with the national and the local electrical codes.
4. Vertiv™ will supply the interconnection cables when the Liebert® EXM BDC is attached to the UPS.
5. 225A panelboard for 10-40kVA only. 400A panelboard for 60-100kVA only.

Figure 2.5 Busbars - Liebert® EXM BDC



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Neutral Input/Output Connections	5	Input Breaker
2	Input Ground Bus	6	UPS Bus Ø 0.44" (11mm) Typical
3	System Input Connections	7	System Input Bus See Detail B
4	System Input Busbar at Rear, Typical		

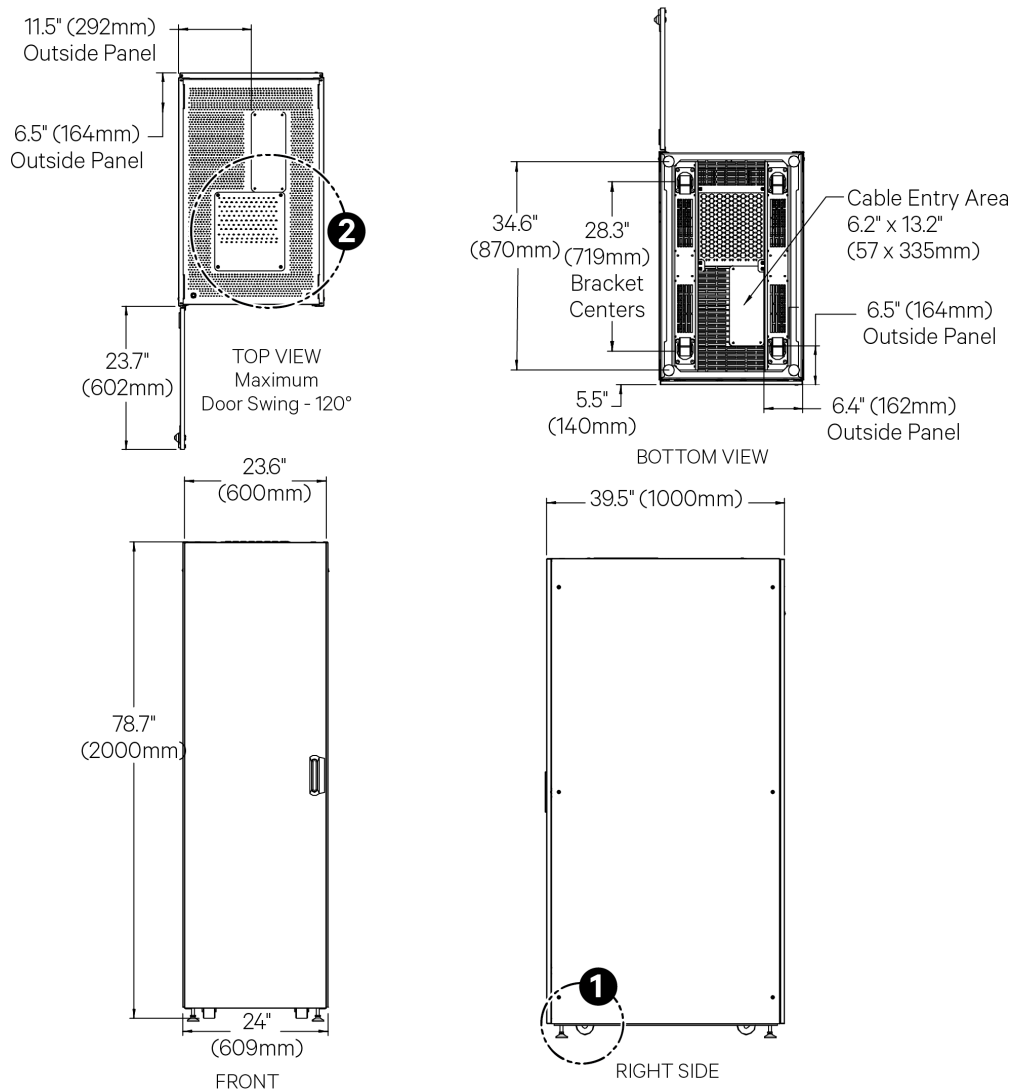
Figure 2.6 Lineup Arrangement, Liebert® EXM with Liebert® EXM BDC



NOTES TO FIGURE

1. All dimensions are in inches (mm).
2. 24" (610mm) minimum clearance above the unit. 36" (914mm) front access required for service. For seismic mounting only, 5" (102mm) in rear for mounting brackets.
3. Keep the cabinet within 15 degrees of vertical.
4. Top and bottom cable entry available through removable access plates. Remove, the punch to suit the conduit size and replace.
5. Unit bottom is structurally adequate for forklift handling.
6. The control wiring and the power wiring must be run in the separate conduits.
7. All the wiring is to be in accordance with national and local electrical codes.
8. Bypass distribution cabinet must be positioned on the right side of the UPS.

Figure 2.7 Outline Drawing, Liebert® EXM BDC For Liebert® EXM, 10-100kVA

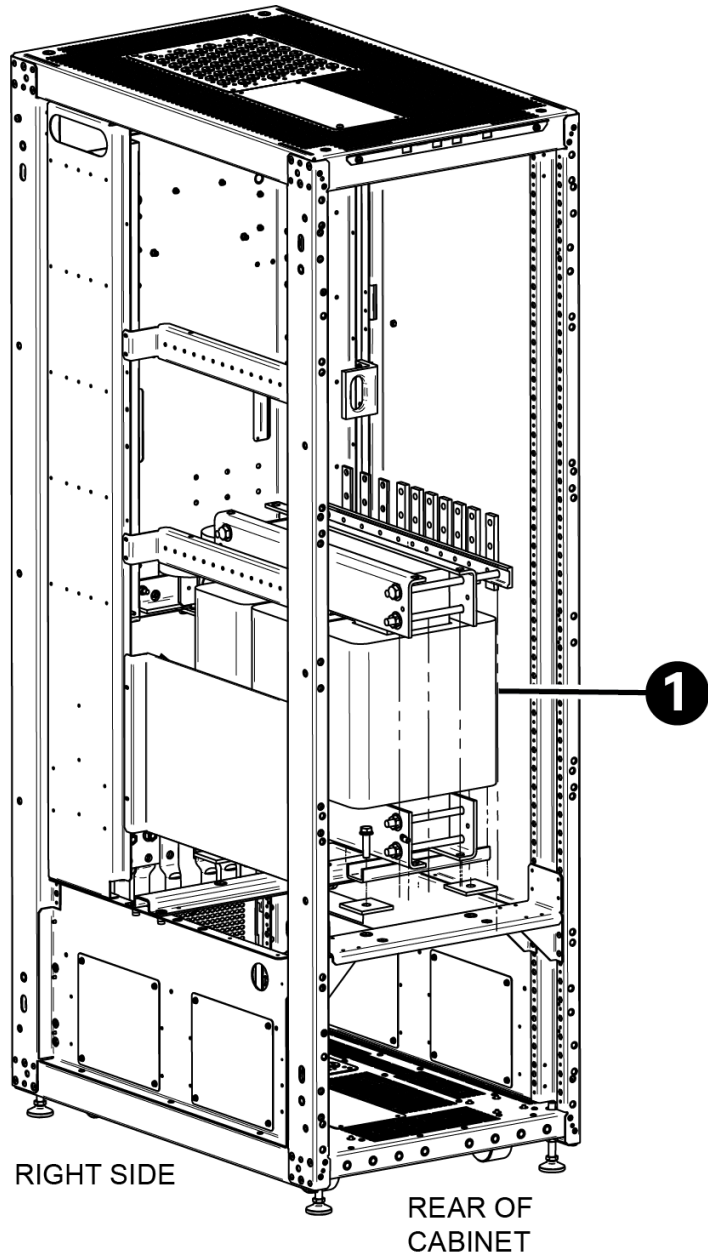


ITEM	DESCRIPTION
1	Leveling Feet
2	Cable Entry Area 11.4" x 13.2" (290 x 335mm)

NOTES TO FIGURE

1. All dimensions are in inches (mm).
2. 24" (610mm) minimum clearance above unit; 36" (914mm) front access required for service.
3. Keep the cabinet within 15 degrees of vertical.
4. Top and bottom cable entry available through removable access plates. Remove, punch to suit conduit size and replace.
5. The control wiring and the power wiring must be run in separate conduits.
6. All wiring is to be in accordance with national and local electrical codes.

Figure 2.8 Liebert® EXM BDC Transformer Location



ITEM	DESCRIPTION
1	Transformer

Table 2.1 Wiring for Liebert® EXM to Liebert® EXM BDC

RUN	FROM	TO	CONDUCTORS
A	Utility AC source	BDC System Input Bus	Phase A, B, C
B	Utility AC source	BDC System Input Bus	Neutral
C	BDC Bypass Isolation Breaker	UPS Main Input	Phase A, B, C
D	BDC Bypass Isolation Breaker	UPS Main Input	Neutral
E	UPS Output	Liebert EXM BDC Maintenance Isolation Breaker	Phase A, B, C
F	UPS Output	Liebert EXM BDC Maintenance Isolation Breaker	Neutral
G	BDC Panelboard	Load AC Connection	Phase A, B, C
H	BDC Panelboard	Load AC Connection	Neutral
I	Utility AC Source	All Ground Connections	Ground
J	BDC Terminal Block TB1	UPS Static Bypass Module J23, J24 and J26	Wiring for KO on Liebert EXM BDC

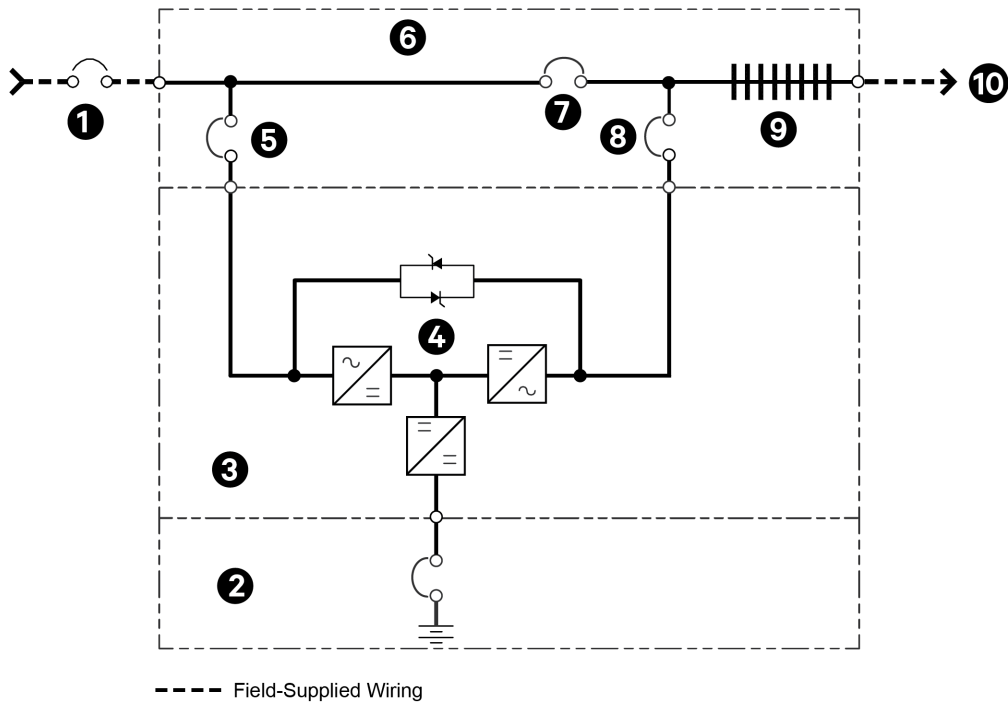
See [1.4.3](#) on page no. 11 and [Table 1.1](#) on page no. 10 for additional details.

NOTE: Interconnection wiring between the UPS and bypass distribution cabinet is supplied by Vertiv™ when the Liebert EXM BDC and Liebert® EXM UPS are ordered as a system.

Table 2.2 Hardware Torque Values

HARDWARE	TWO BELLEVILLE WASHERS
M10 (3/8")	240 lb-in. (27 Nm)
M12 (1/2")	428 lb-in (48 Nm)

Figure 2.9 One-Line Diagram, 208V Single Input 10-100kVA UPS with Three-Breaker Liebert® EXM BDC and Panelboard



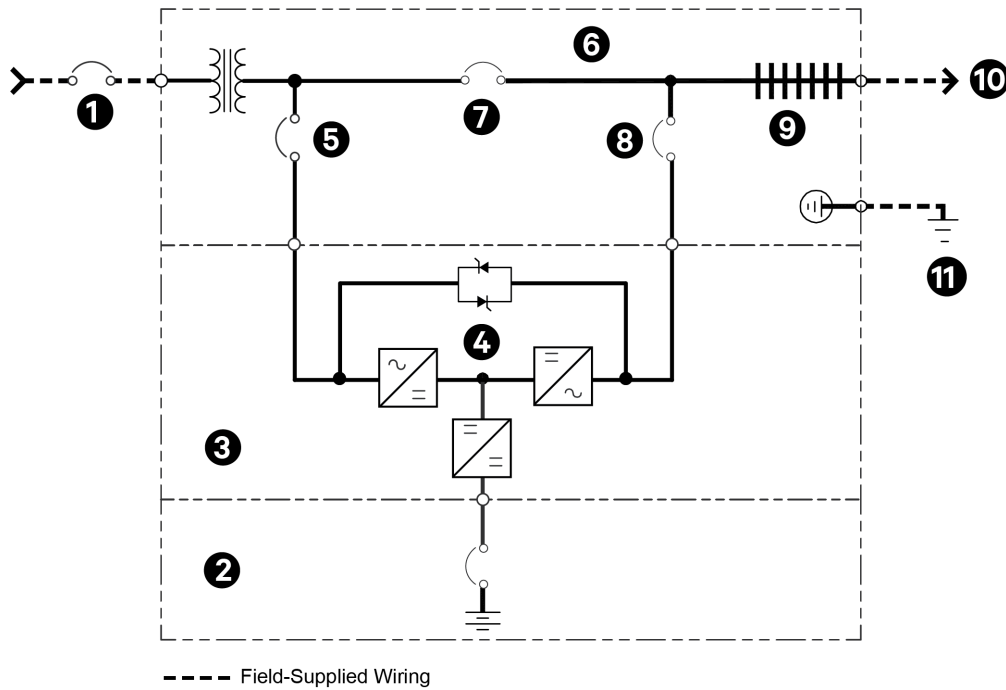
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	System AC Input 4 Wire + GND	6	BYPASS DISTRIBUTION CABINET
2	BATTERY	7	MBB - Maintenance Bypass Breaker
3	UPS CABINET	8	MIB - Maintenance Isolation Breaker
4	STATIC BYPASS	9	(Optional) 54 Pole See Note 6
5	BIB - Bypass Isolation Breaker	10	AC Output 208V 4 Wire + GND

* External overcurrent protection by others.

NOTES TO FIGURE:

1. Install in accordance with the national and the local electrical codes.
2. The input and the bypass must share the same single source.
3. A neutral is required from the system AC input source.
4. The UPS system input and output cables must be run in separate conduits.
5. The control wiring must be run in separate conduits.
6. Optional 54 pole, 225A for 10-40kVA frame only or optional 54 pole 400A for 60-100kVA frame only.

Figure 2.10 One-Line Diagram, 208V Single Input 10-100kVA UPS with Three-Breaker Liebert® EXM BDC, Input Isolation Transformer and Panelboard



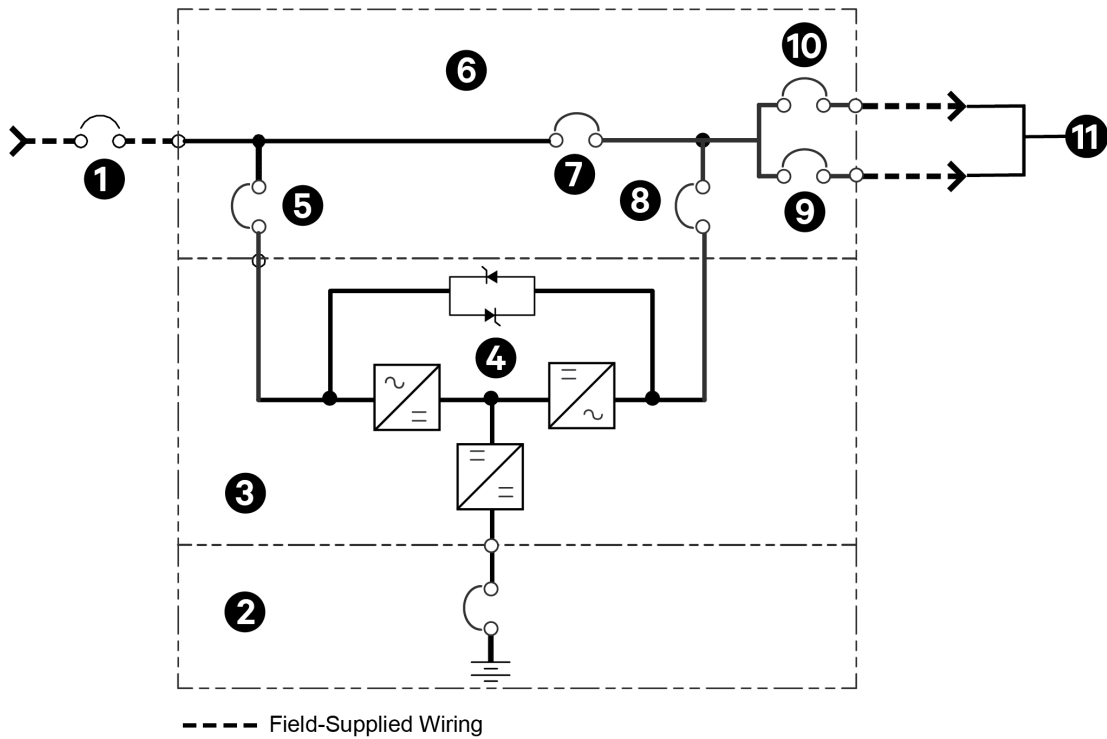
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	System AC Input 3 Wire + GND	7	MBB - Maintenance Bypass Breaker
2	BATTERY	8	MIB - Maintenance Isolation Breaker
3	UPS CABINET	9	(Optional) 54 Pole See Note 5
4	STATIC BYPASS	10	AC Output 208V 4-Wire + GND
5	BIB - Bypass Isolation Breaker	11	Local Grounding Electrode See Note 1
6	BYPASS DISTRIBUTION CABINET		

* External overcurrent protection by others.

NOTES TO FIGURE:

1. Install in accordance with the national and the local electrical codes.
2. The input and the bypass must share the same single source.
3. The UPS system input and output cables must be run in separate conduits.
4. The control wiring must be run in separate conduits.
5. Optional 54 pole, 225A for 10-40kVA frame only or optional 54 pole 400A for 60-100kVA frame only.
6. Optional transformers are available with input voltage 208V/220V/480V/600V.

Figure 2.11 One-Line Diagram, 208V Single Input 10-100kVA UPS with Three-Breaker Liebert® EXM BDC and Two Subfeed Breakers



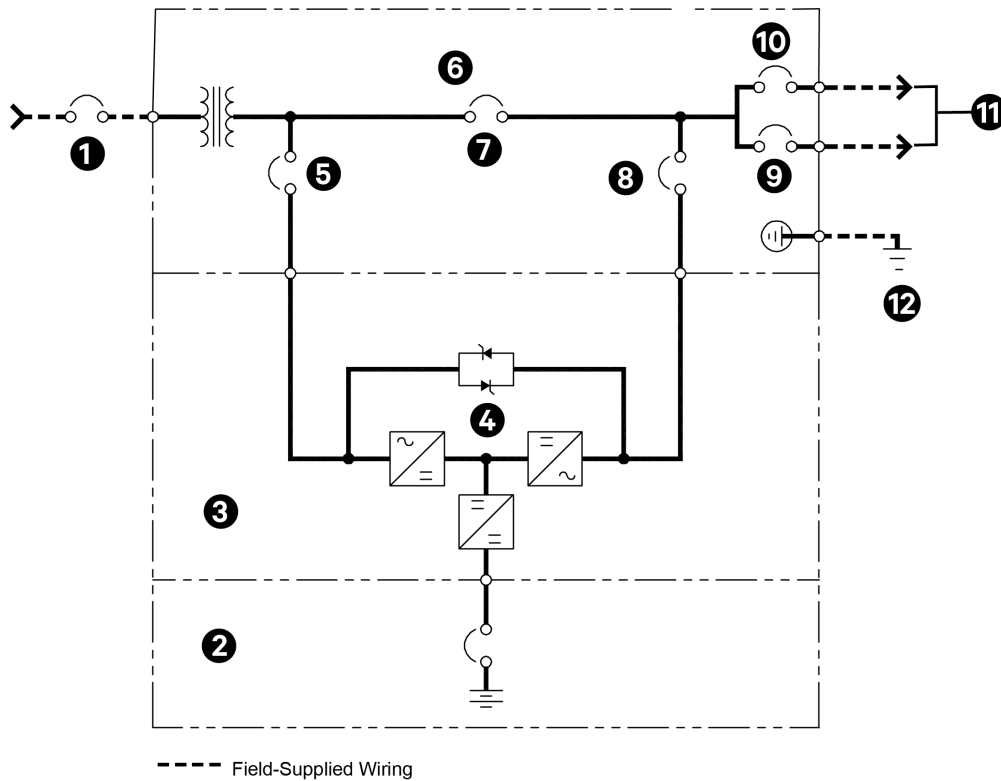
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	System AC Input 4 Wire + GND	7	MBB - Maintenance Bypass Breaker
2	BATTERY	8	MIB - Maintenance Isolation Breaker
3	UPS CABINET	9	(Optional) (2) 225A See Note 6
4	STATIC BYPASS	10	LDB-Load Distribution Breaker
5	BIB - Bypass Isolation Breaker	11	AC Output 208V 4 Wire + GND
6	BYPASS DISTRIBUTION CABINET		

* External overcurrent protection by others.

NOTES TO FIGURE:

1. Install in accordance with the national and the local electrical codes.
2. The input and the 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. The UPS system input and output cables must be run in separate conduits.
5. The control wiring must be run in separate conduits.
6. Optional (2) 225A LDB for 60-100kVA frame only. Optional single 225A LDB for 10-40kVA frame.

Figure 2.12 One-Line Diagram, 208V Single Input 60-100kVA UPS with Three-Breaker Liebert® EXM BDC, Input Isolation Transformer and Two Subfeed Breakers



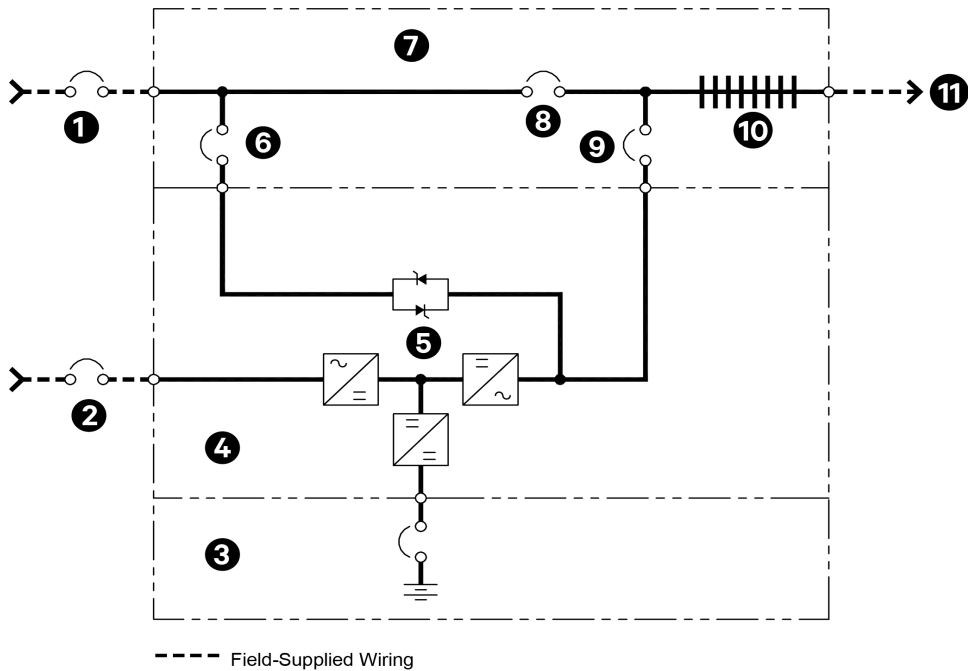
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	System AC Input 3 Wire + GND	7	MBB - Maintenance Bypass Breaker
2	BATTERY	8	MIB - Maintenance Isolation Breaker
3	UPS CABINET	9	(Optional) (2) 225A See Note 5
4	STATIC BYPASS	10	LDB - Load Distribution Breaker
5	BIB - Bypass Isolation Breaker	11	AC Output 208V 4 Wire + GND
6	BYPASS DISTRIBUTION CABINET	12	Local Grounding Electrode See Note 1

* External overcurrent protection by others.

NOTES TO FIGURE:

1. Install in accordance with the national and the local electrical codes.
2. The Input and the bypass must share the same single source.
3. The UPS system input and output cables must be run in separate conduits.
4. The control wiring must be run in separate conduits.
5. Optional (2) 225A LDB for 60-100kVA frame only. Optional single 225A LDB for 10-40kVA frame.
6. Optional Transformers are available with input voltage 208V/220V/480V/600V.

Figure 2.13 One-Line Diagram, 208V Dual Input 10-100kVA UPS with Three-Breaker Liebert® EXM BDC and Panelboard



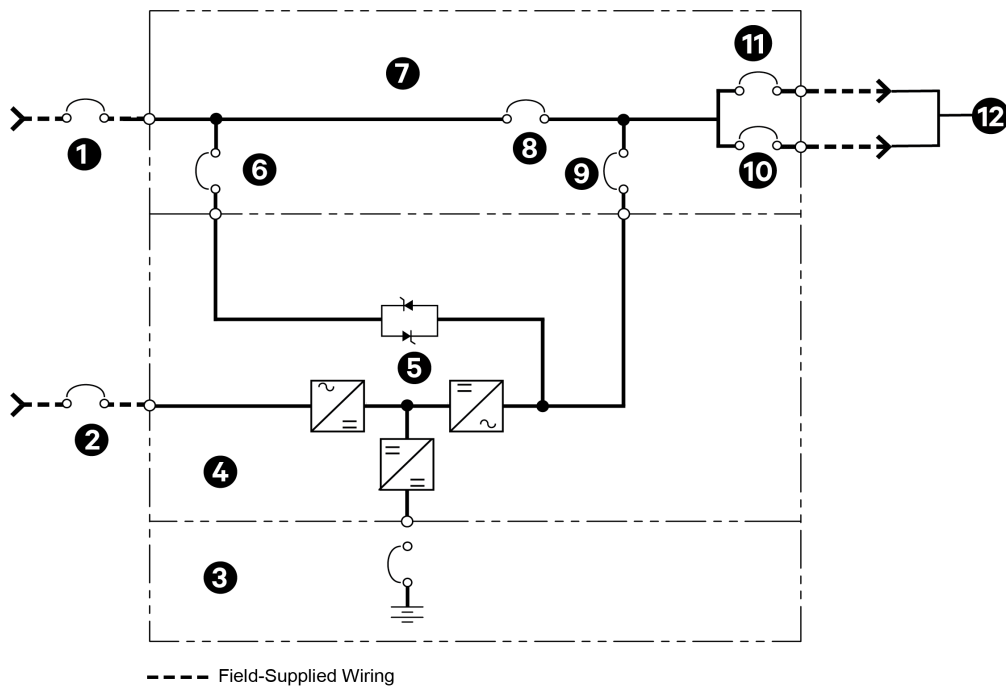
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Bypass AC Input 4 Wire + GND	7	BYPASS DISTRIBUTION CABINET
2	Rectifier AC Input 4 Wire + GND See Note 7	8	MBB - Maintenance Bypass Breaker
3	BATTERY	9	MIB - Maintenance Isolation Breaker
4	UPS CABINET	10	(Optional) 54 Pole See Note 6
5	STATIC BYPASS	11	AC Output 208V 4 Wire + GND
6	BIB - Bypass Isolation Breaker		

* External overcurrent protection by others.

NOTES TO FIGURE:

1. Install in accordance with the national and the local electrical codes.
2. The Input and the 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.
4. The bypass and the rectifier inputs and output cables must be run in separate conduits.
5. The Control wiring must be run in separate conduits.
6. Optional 54 pole, 225A for 10-40kVA frame only or optional 54 pole 400A for 60-100kVA frame only.
7. The Customer must supply shunt trip breaker with 120V coil.
8. Remove the bypass jumper busbars inside the UPS to configure a dual input system.

Figure 2.14 One-Line Diagram, 208V Dual Input 10-100kVA UPS with Three-Breaker Liebert® EXM BDC and Two Subfeed Breakers



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Bypass AC Input 4 Wire + GND	7	BYPASS DISTRIBUTION CABINET
2	Rectifier AC Input 4 Wire + GND See Note 7	8	MBB - Maintenance Bypass Breaker
3	BATTERY	9	MIB - Maintenance Isolation Breaker
4	UPS CABINET	10	(Optional) (2) LDB See Note 6
5	STATIC BYPASS	11	LDB - Load Distribution Breaker
6	BIB - Bypass Isolation Breaker	12	AC Output 208V 4 Wire + GND

* External overcurrent protection by others.

NOTES TO FIGURE:

1. Install in accordance with the national and the local electrical codes.
2. The Input and the 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. The bypass and the rectifier inputs and output cables must be run in separate conduits.
5. Control wiring must be run in separate conduits.
6. Optional (2) 225A LDB for 60-100kVA frame only.
7. The Customer must supply shunt trip breaker with 120V coil.
8. Remove the bypass jumper busbars inside the UPS to configure a dual input system.

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3 SPECIFICATIONS

Table 3.1 Physical Standards and Parameters

BYPASS DISTRIBUTION CABINET PARAMETERS		VALUES
Standard Color	Black (ZP-7021)	
Front Door Opening (for serviceability)	More than 180°	
Degree of Protection for UPS Enclosure	IP 20 (with and without front door open)	
Minimum Clearance, Top	24" (610mm)	
Minimum Clearance, Back	0" (5" [127mm] when seismic brackets are used)	
Minimum Clearance, Sides	0"	
Cable Entrance	Top or Bottom	
Standards and Conformities	UL 1778 5th Ed. ; CSA 22.2 107.3 -14 FCC Part 15, Class A ; ISTA Procedure 1H; WEEE; IBC 2012/CBC 2010	
Environmental		
Storage Temperature Range, °F (°C)	-13°F to 158°F (-25°C to 70°C)	
Operating Temperature Range, °F (°C)	32°F to 104°F (0 to 40°C) 32°F to 86°F (0-30°C) when seismic brackets are used	
Relative Humidity	up to 95% Non-Condensing (Operating and Non-Operating)	
Maximum Altitude Above MSL, ft. (m)	4920 (1500) (as per IEC 62040/3) - 1% Maximum kW derate / 100m rise between 1500m-3000m	

The following are approved branch breakers for the panel boards used in the Liebert® EXM BDC Liebert EXM BDC.

Listed (DIVQ), Schneider Electric Square D branch circuit breakers:

- Type QOB, rated 22 kA, 150A maximum.
- Type QO, rated 22 kA, rated 100A maximum.
- Type QOB, rated 10 kA, rated 100A maximum.
- Type QO, rated 10 kA, rated 100A maximum.

Table 3.2 Mechanical Characteristics, Liebert® EXM BDC, 10-100kVA

DIMENSIONS, W x D x H, IN (MM)			23.625 X 39.375 X 78.73		
			Weight, lb. (kg)		
Weight lb. (kg)	Rating kVA	No Transformer, No Distribution	No Transformer with Panelboard or Subfeed Breaker	With Transformer, No Distribution	With Transformer and Panelboard or Subfeed Breaker
600	10-40	525(238)	625(283)	914(415)	1014 (460)
600	60	550(249)	650(295)	1125(509)	1223 (555)
600	80	550(249)	650(295)	1249(567)	1349 (612)
600	100	550(249)	650(295)	1365(619)	1465 (665)

Add 27 lb. (12 kg) for monitoring

Table 3.3 Liebert EXM BDC 60-100kVA, Mechanical Characteristics

RATED POWER, KVA		60-100
Dimensions, W x D x H, in. (mm)		23.625 x 39.375 x 78.75 (600 x 1000 x 2000)
Weight, lb. (kg)		
No Distribution		550 (250)
Two 225A Subfeed Breakers		660 (300)
400A Panelboard		660 (300)
No Distribution and 480V Transformer		1549 (704)
No Distribution and 600V Transformer		1538 (699)
Two 225A Subfeed Breakers and 480V Transformer		1669 (759)
Two 225A Subfeed Breakers and 600V Transformer		1648 (749)
400A Panelboard and 480V Transformer		1669 (759)
400A Panelboard and 600V Transformer		1648 (749)
Color		ZP 7021 (Black)
Protection Degree IEC (60529)		IP20 (finger-proof with front doors open or closed)

Table 3.4 Liebert® EXM BDC Heat Dissipation

LIEBERT EXM BDC RATING, KVA	LIEBERT EXM BDC HEAT DISSIPATION 208:208 TRANSFORMER BTU/HR (KW)	LIEBERT EXM BDC HEAT DISSIPATION 208:208 TRANSFORMER BTU/HR (KW)	LIEBERT EXM BDC HEAT DISSIPATION 220:220 TRANSFORMER BTU/HR (KW)	LIEBERT EXM BDC HEAT DISSIPATION 220:220 TRANSFORMER BTU/HR (KW)
10	1966 (0.576)	1808 (0.530)	1723 (0.505)	1750 (0.513)
15	2504 (0.734)	2320 (0.680)	2474 (0.725)	2453 (0.719)
20	2938 (0.861)	2593 (0.760)	2958 (0.867)	2986 (0.875)
30	4847 (1.421)	4408 (1.292)	4343 (1.273)	4896 (1.435)
40	5676 (1.664)	5166 (1.514)	5005 (1.467)	4988 (1.462)
60	7479 (2.192)	6804 (1.994)	6670 (1.955)	6445 (1.899)
80	9612 (2.817)	8711 (2.553)	9001 (2.638)	8892 (2.606)
100	9728 (2.851)	8881 (2.603)	9953 (2.917)	10042 (2.943)

3.1 Electrical Characteristics

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

Table 3.5 Liebert EXM BDC Input Currents, Single Input, Main, Without Transformer

VOLTAGE 3-PH, 60HZ	BDC RATING KVA	SYSTEM INPUT CURRENT, A, MAX	PHASE	RECOMMENDED UPSTREAM PROTECTION, A	75°C WIRE CURRENT, A, TOTAL	COPPER WIRE	ALUMINUM WIRE	BOLT SIZE
208/120 220/127	10	34	3W + N + G	45	65	(1) #6	(1) #4	M12
208/120 220/127	15	51	3W + N + G	70	85	(1) #4	(1) #2	M12
208/120 220/127	20	68	3W + N + G	90	115	(1) #2	(1) 1/0	M12
208/120 220/127	30	102	3W + N + G	150	175	(1) 2/0	(1) 4/0	M12
208/120 220/127	40	136	3W + N + G	175	230	(1) 4/0	(2) 1/0	M12
208/120 220/127	60	205	3W + N + G	300	400	(2) 3/0	(2) 4/0	M12
208/120 220/127	80	273	3W + N + G	350	460	(2) 4/0	(2) 300kcmil	M12
208/120 220/127	100	341	3W + N + G	450	610	(2) 350kcmil	(2) 400kcmil	M12

Table 3.6 Liebert® EXM BDC Input Currents, Dual Input, Rectifier, Without Transformer

VOLTAGE 3-PH, 60HZ	BDC RATING KVA	RECTIFIER INPUT CURRENT RIB, A, MAX	RECTIFIER RECOMMENDED UPSTREAM PROTECTION, A	PHASE	75°C WIRE CURRENT, A, TOTAL	COPPER WIRE	ALUMINUM WIRE	BOLT SIZE
208/120 220/127	10	34	45	3W + N + G	65	(1) #6	(1) #4	M12
208/120 220/127	15	51	70	3W + N + G	85	(1) #3	(1) #2	M12
208/120 220/127	20	68	90	3W + N + G	115	(1) #2	(1) 1/0	M12
208/120 220/127	30	102	150	3W + N + G	175	(1) 2/0	(1) 4/0	M12
208/120 220/127	40	136	175	3W + N + G	230	(1) 4/0	(2) 1/0	M12
208/120 220/127	60	205	300	3W + N + G	400	(2) 3/0	(2) 4/0	M12
208/120 220/127	80	273	350	3W + N + G	460	(2) 4/0	(2) 300kcmil	M12
208/120 220/127	100	341	400	3W + N + G	610	(2) 350kcmil	(2) 400kcmil	M12

Refer to [Figure 2.13](#) on page no. 32 and [Figure 2.14](#) on page no. 33 for additional details about this system configuration.

Table 3.7 Liebert® EXM BDC Input Currents, Dual Input, Bypass, Without Transformer

VOLTAGE 3-PH, 60HZ	BDC RATING KVA	BYPASS INPUT CURRENT BIB/MBB, A, MAX	BYPASS RECOMMENDED UPSTREAM PROTECTION, A	PHASE	75°C WIRE CURRENT, A, TOTAL	COPPER WIRE	ALUMINUM WIRE	BOLT SIZE
208/120 220/127	10	28	40	3W + N + G	50	(1) #6	(1) #4	M12
208/120 220/127	15	42	70	3W + N + G	85	(1) #4	(1) #2	M12
208/120 220/127	20	56	80	3W + N + G	115	(1) #2	(1) #2	M12
208/120 220/127	30	83	125	3W + N + G	130	(1) 1/0	(1) 2/0	M12
208/120 220/127	40	111	175	3W + N + G	175	(1) 3/0	(1) 4/0	M12
208/120 220/127	60	167	250	3W + N + G	285	(1) 350kcmil	(2) 2/0	M12
208/120 220/127	80	222	350	3W + N + G	400	(2) 3/0	(2) 4/0	M12
208/120 220/127	100	278	450	3W + N + G	460	(2) 4/0	(2) 300kcmil	M12

Refer to [Figure 2.13](#) on page no. 32 and [Figure 2.14](#) on page no. 33 for additional details about this system configuration.

Table 3.8 Liebert® EXM BDC Output Currents

VOLTAGE 3-PH, 60HZ	BDC RATING KVA	SYSTEM OUTPUT CURRENT A, MAX	PHASE	RECOMMENDED UPSTREAM PROTECTION, A	75°C WIRE CURRENT, A, TOTAL	COPPER WIRE	ALUMINUM WIRE	BOLT SIZE
208/120 220/127	10	28	3W + N + G	40	50	(1) #6	(1) #4	M12
208/120 220/127	15	42	3W + N + G	60	85	(1) #4	(1) #2	M12
208/120 220/127	20	56	3W + N + G	70	115	(1) #2	(1) #2	M12
208/120 220/127	30	83	3W + N + G	110	130	(1) 1/0	(1) 2/0	M12
208/120 220/127	40	111	3W + N + G	150	175	(1) 3/0	(1) 4/0	M12
208/120 220/127	60	167	3W + N + G	225	285	(1) 350kcmil	(2) 2/0	M12
208/120 220/127	80	222	3W + N + G	300	400	(2) 3/0	(2) 4/0	M12
208/120 220/127	100	278	3W + N + G	350	460	(2) 4/0	(2) 300kcmil	M12

Table 3.9 Recommended Lug Sizes (Compression type) M12, 1/2" Bolt

CABLE SIZE	T&B COPPER TWO HOLE	T&B ALUMINUM TWO HOLE
#6AWG	256-030695-868	—
#4AWG	256-030695-733	—
#2-3AWG	54811BE	—
#1AWG	54857BE	—
#1/0AWG	256-30695-593	—
#2/0AWG	54862BE	60238
#3/0AWG	54864BE	60244
#4/0AWG	54866BE	60250
250kcmil	54868BE	60256
300kcmil	54870BE	60262
350kcmil	54872BE	60267
400kcmil	54874BE	60269
500kcmil	54876BE	60273
600kcmil	54878BE	60275
700kcmil	54879BE	60277
750kcmil	54880BE	60278

3.2 Torque Requirements

All electrical connections must be tight.

Table 3.10 on page no. 41 and **Table 3.11** on page no. 41 provide the torque values for the connections to the Liebert® EXM BDC. Use these values unless the equipment is labeled otherwise.

Table 3.10 Busbar torque for power wiring

BOLT SHAFT SIZE	TORQUE LB. IN. (NM)
3/8" (M10)	192 (22)
1/2" (M12)	428 (48)

Table 3.11 Terminal block torque with compression lugs for control wiring

AWG WIRE SIZE OR RANGE	TORQUE LB. IN. (NM)
#22 - #14	3.5 to 5.3 (0.4 to 0.6)

NOTE: Refer to the manufacturer's data for proper torque for circuit breaker power connections.

Table 3.12 Breaker Torque

MANUFACTURER	PART NUMBER	TORQUE, NM
ABB	Tmax2	7.0
	Tmax3	8.0
	Tmax5	25.0
	XT1	6
	XT3	8
Siemens	D Frame	5.5
	F Frame	22.0
	J Frame	31.0

Table 3.13 Electrical data-Liebert® EXM BDC, 480VAC Input, 208VAC Output, Single Input, with 480V:208V Transformer

LIEBERT EXM BDC RATING, KVA	MAXIMUM SYSTEM INPUT CURRENT, A	PHASE	RECOMMENDED UPSTREAM PROTECTION, A	75°C WIRE CURRENT, A, TOTAL	COPPER WIRE	ALUMINUM WIRE	BOLT SIZE
10	15	3W + G	20	40	(1) #8	(1) #8	M12
15	23	3W + G	30	40	(1) #8	(1) #8	M12
20	31	3W + G	40	40	(1) #8	(1) #8	M12
30	46	3W + G	60	65	(1) #6	(1) #4	M12
40	61	3W + G	80	85	(1) #4	(1) #2	M12
60	91	3W + G	125	150	(1) #2	(1) 1/0	M12
80	122	3W + G	175	200	(1) 1/0	(1) 3/0	M12
100	152	3W + G	200	205	(1) 4/0	(1) 250 kcmil	M12

See [NOTES ON TABLES](#) on page 44

Table 3.14 Electrical Data-Liebert® EXM BDC, 600VAC Input, 208VAC Output, Single Input, with 600V:208V Transformer

LIEBERT EXM BDC RATING, KVA	MAXIMUM SYSTEM INPUT CURRENT, A	PHASE	RECOMMENDED UPSTREAM PROTECTION, A	75°C WIRE CURRENT, A, TOTAL	COPPER WIRE	ALUMINUM WIRE	BOLT SIZE
10	12	3W + G	20	40	(1) #8	(1) #8	M12
15	18	3W + G	25	40	(1) #8	(1) #8	M12
20	25	3W + G	35	40	(1) #8	(1) #8	M12
30	37	3W + G	50	50	(1) #8	(1) #6	M12
40	49	3W + G	70	65	(1) #5	(1) #4	M12
60	73	3W + G	100	90	(1) #3	(1) #2	M12
80	98	3W + G	125	120	(1) #1	(1) 1/0	M12
100	122	3W + G	175	150	(1) 1/0	(1) 3/0	M12

See [NOTES ON TABLES](#) on page 44

Table 3.15 Electrical Data-Liebert EXM BDC, 208VAC or 220VAC Input, Single Input, with 208V:208V or 220V:220V Transformer

LIEBERT EXM BDC RATING, KVA	MAXIMUM SYSTEM INPUT CURRENT, A	PHASE	RECOMMENDED UPSTREAM PROTECTION, A	75°C WIRE CURRENT, A, TOTAL	COPPER WIRE	ALUMINUM WIRE	BOLT SIZE
10	36	3W + G	45	65	(1) #6	(1) #4	M12
15	53	3W + G	70	85	(1) #4	(1) #2	M12
20	71	3W + G	90	100	(1) #3	(1) #1	M12
30	107	3W + G	150	175	(1) 2/0	(1) 4/0	M12
40	141	3W + G	200	230	(1) 4/0	(1) 300 kcmil	M12
60	211	3W + G	300	335	(1) 400 kcmil	(2) 4/0	M12
80	281	3W + G	400	460	(2) 4/0	(2) 300 kcmil	M12
100	352	3W + G	450	510	(2) 250 kcmil	(2) 400 kcmil	M12

See [NOTES ON TABLES](#) on page 44

NOTES ON TABLES.

Notes apply to [Table 3.13](#) on page no. 42 through [Table 3.15](#) on page no. 43

1. Nominal input current (considered continuous) is based on full rated output load maximum current includes nominal input current and maximum battery recharge current (considered noncontinuous). Continuous and noncontinuous current are defined in the NEC 100. Recommended overcurrent protection is based on 80% rated devices.
*The recommended overcurrent protection represents 125% of nominal full load current (continuous) per the NEC 215.
2. The maximum input current is controlled by the current limit setting.
3. The recommended AC input external overcurrent protection is based on 80% rated devices and maximum input current limit setting.
4. The recommended AC output external overcurrent protection is based on 80% rated devices and full rated output current.
5. The nominal battery voltage is shown at 2 volts per cell.
6. The input power factor of 0.99 is used for the calculations.





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