



Liebert®

NXL™ UPS

Installation Manual — 250-400kVA, 60Hz, Three-Phase, Single-Module and Multi-Module Units

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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 your Liebert NXL UPS. 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.

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 in the Operation and Maintenance Manual, SL-25425, before as well as during performance of all maintenance procedures. Observe all DC safety precautions before working on or near the DC system.

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 ranges from 3965 to 6380 lb. (1768 to 2894kg).

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 modules 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, remove packaging from or preparing unit for 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.



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.

NOTICE

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 communication. Operation of this unit in a residential area may cause harmful interference that the user must correct at his own expense.

1.0 SINGLE-MODULE AND MULTI-MODULE MECHANICAL INSTALLATION

1.1 INTRODUCTION

This following section describes the requirements that must be taken into account when planning the positioning and cabling of the Liebert NXL uninterruptible power supply and related equipment.

This chapter is a guide to general procedures and practices that should be observed by the installing personnel. The particular conditions of each site will determine the applicability of such procedures.

WARNING

Risk of electrical shock. Can cause injury or death.

Special care must be taken when working with the batteries associated with this equipment. When connected together, the battery terminal voltage will exceed 400VDC and is potentially lethal.

NOTICE

All equipment not referred to in this manual is shipped with details of its own mechanical and electrical installation.

NOTICE

Three-phase input supply required.

The standard Liebert NXL UPS is suitable for connection to three-phase, four-wire (+ Earth) TN-C, TN-S, IT-G, IT-IG or, three-phase, three-wire plus ground, IT-UG.

If using with IT Power system, a 4-pole disconnect device must be included as part of building installation.

NOTICE

Do not apply electrical power to the UPS equipment before the arrival of the commissioning engineer.

1.2 PRELIMINARY CHECKS

Before installing the UPS, please carry out the following preliminary checks:

- Visually examine the UPS equipment for transit damage, both internally and externally. Report any damage to the shipper immediately.
- Verify that the correct equipment is being installed. The equipment supplied has an identification tag on the back of the main door reporting: the type, size and main calibration parameters of the UPS.
- Verify that the UPS room satisfies the environmental conditions stipulated in the equipment specification, paying particular attention to the ambient temperature and air exchange system.

1.3 ENVIRONMENTAL CONSIDERATIONS

1.3.1 UPS Room

The UPS module is intended for indoor installation and should be located in a cool, dry, clean-air environment with adequate ventilation to keep the ambient temperature within the specified operating range (see **Environmental Parameters** in **Table 10**).

The Liebert NXL UPS is cooled with the aid of internal fans. To permit air to enter and exit and prevent overheating or malfunctioning, do not cover the ventilation openings.



NOTE

To ensure proper airflow, the unit must be installed only on a solid surface made of a noncombustible material, such as concrete.

The Liebert NXL UPS is equipped with air filters located behind the front doors. A schedule for inspection of the air filters is required. The period between inspections will depend upon environmental conditions.

When bottom entry is used, the conduit plate must be installed.



NOTE

The UPS is suitable for mounting on concrete or other non-combustible surface only.

1.3.2 Storing the UPS and Batteries for Delayed Installation

If the Liebert NXL system will not be installed immediately, it must be stored indoors in a clean, dry and cool location (see **Environmental Parameters** in **Table 10**). 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.

1.4 POSITIONING

The cabinet is structurally designed to handle lifting from the base.

Access to the power terminals, auxiliary terminals blocks and power switches is from the front.

The door can be opened to give access to the power connections bars, auxiliary terminal blocks and power isolators. Front door can be opened at 180° for more flexibility in installations.



NOTE

The UPS must be placed a solid surface. There must be no openings in the surface except those required for conduit landing areas. All provided kick plates must be installed.

1.4.1 Moving the Cabinets

The route to be traveled between the point of arrival and the unit's position must be planned to make sure that all passages are wide enough for the unit and that floors are capable of supporting its weight (for instance, check that doorways, lifts, ramps, etc. are adequate and that there are no impassable corners or changes in the level of corridors).

Ensure that the UPS weight is within the designated surface weight loading (kg/cm²) of any handling equipment. For weight details, see **Table 10**.

The UPS can be handled with a forklift or similar equipment. Ensure any lifting equipment used in moving the UPS cabinet has sufficient lifting capacity. When moving the unit by forklift, care must be taken to protect the panels. Do not exceed a 15-degree tilt with the forklift. Bottom structure will support the unit only if the forks are completely beneath the unit.


Handling with straps is not authorized.

WARNING

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

Because the weight distribution in the cabinet is uneven, use extreme care while handling and transporting. Take extreme care when handling UPS cabinets to avoid equipment damage or injury to personnel.

The UPS module weight ranges from 3965 to 6380 lb. (1768 to 2894kg).

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.

1.4.2 Clearances

The Liebert NXL has no ventilation grilles at either side or at the rear of the UPS. Clearance around the front of the equipment should be sufficient to enable free passage of personnel with the doors fully opened. It is important to leave a distance of 24" (610mm) between the top of the UPS and any overhead obstacles to permit adequate circulation of air coming out of the unit.

1.4.3 Raised Floor Installations

If the equipment is to be located on a raised floor it should be mounted on a pedestal suitably designed to accept the equipment point loading. Refer to the base view to design this pedestal. The top of pedestal must be solid.



NOTE

The UPS must be placed on a solid surface. There must be no openings in the surface except those required for conduit landing areas. All provided kick plates must be installed.

1.4.4 Kick Plate Installation

Kick plates must be installed. If the unit is to be installed in a position that does not permit access to the rear kick plates, then kick plates must be installed before the unit is placed in its final position.

1.4.5 Special Considerations for 1+N Parallel Systems

Consider the grounding configuration of your system before finalizing module placement. See **2.5 - Configuring Neutral and Ground Connections**.

Vertiv recommends matching the impedance in the bypass path of paralleled systems as closely as possible.

The impedance mismatch can be minimized by controlling the wiring length of each unit. The design and the layout of the UPS system and associated panels and cabling should be examined closely to ensure that cable lengths and impedances are closely matched. The Liebert 1+N UPS module is supplied with a sharing reactor to minimize the impact of cable impedance mismatch.

The cabling impedance must be carefully controlled to ensure good bypass current sharing.

For Liebert NXL Systems, the cabling impedances must be within 10% from maximum to minimum. If the cabling impedances need to be greater than 10%, contact your Vertiv representative to calculate whether the system will result in an overload condition when operating on bypass.

When bringing the 1+N system online for the first time or after removing one unit, Vertiv recommends checking the bypass current mismatch. To check the bypass current mismatch:

1. Place a load on the bypass of each UPS module.
2. View the output current of each unit.

The accuracy of the currents displayed on the UPS module is sufficient for this check. If the mismatch is greater than 10%, the bypass impedances must be balanced or the load must be limited to less than the maximum rating.

1.5 SYSTEM COMPOSITION

A UPS system can comprise a number of equipment cabinets, depending on the individual system design requirements, e.g. UPS cabinet, battery cabinet, maintenance bypass cabinet. In general, all the cabinets used in a particular installation are of the same height. Refer to the drawings provided in **4.0 - Installation Drawings** for the positioning of the cabinets as shown in **Figures 1** and **2**.

1.6 CABLE ENTRY

Cables can enter the UPS cabinet from bottom or top into the Input/Output (I/O) section of the unit, see the figures in **4.0 - Installation Drawings**.

Figure 1 Cabinet arrangement—Liebert NXL single-module, battery cabinets, maintenance bypass cabinet

Applicable to:
250 - 400 kVA 480V, 250 - 300 kVA
575/600V except without
Maintenance Bypass Cabinet

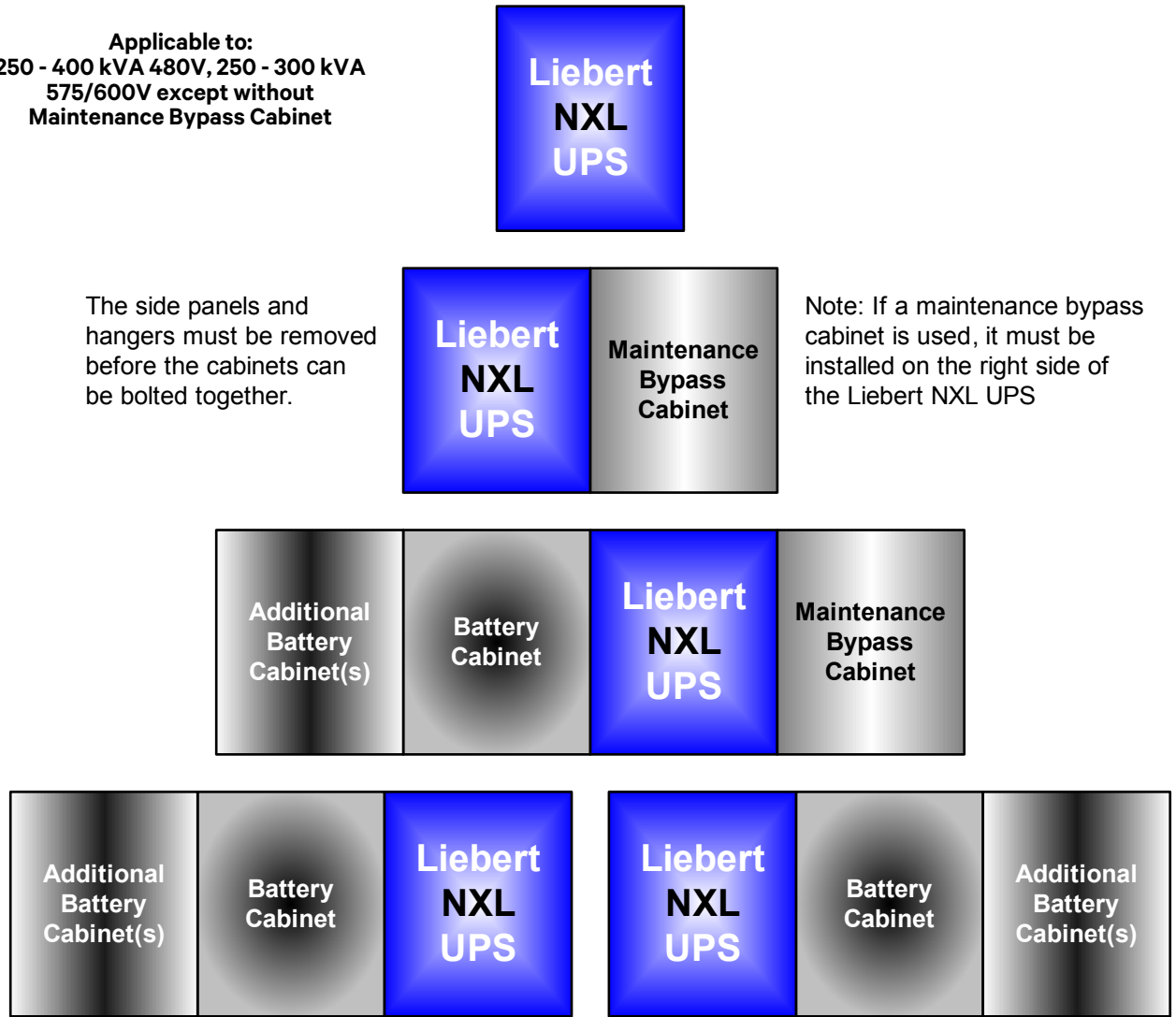
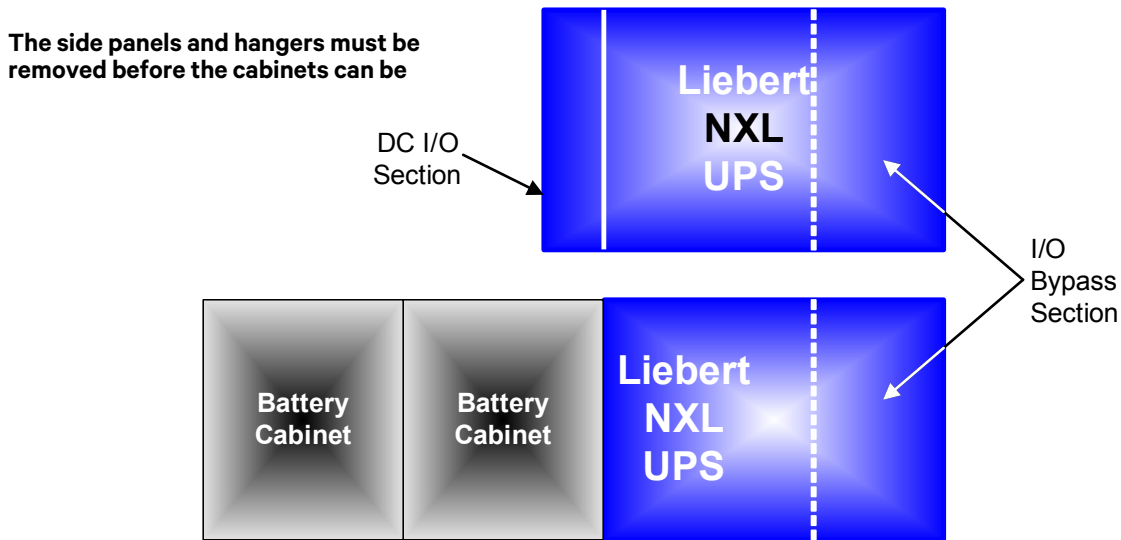


Figure 2 Cabinet arrangement—Liebert NXL 400kVA, 575-600V multi-module and battery cabinets



2.0 UPS ELECTRICAL INSTALLATION

This chapter provides guidelines for qualified installers who must have knowledge of local wiring practices pertaining to the equipment to be installed.

WARNING

Risk of electrical shock. Can cause injury or death.

The UPS contains high DC as well as AC voltages. Check for voltage with both AC and DC voltmeters before working within the UPS.

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.

2.1 EXTERNAL PROTECTIVE DEVICES

For safety, it is necessary to install circuit breakers in the input AC supply and external battery system. Given that every installation has its own characteristics, this section provides guidelines for qualified installation personnel with knowledge of operating practices, regulatory standards and the equipment to be installed.

External overcurrent protection must be provided. See **Table 10 - Liebert NXL UPS specifications** for overload capacity.

Dual Input

When wiring the UPS with a separate rectifier and bypass input, each input must be protected separately. Size the breakers according to the input currents shown in **Table 10**.

2.2 POWER CABLES

The UPS requires both power and control cabling. All control cables, whether shielded or not, should be run separate from the power cables in metal conduits or metal ducts which are electrically bonded to the metalwork of the cabinets to which they are connected

The cable design must comply with the voltages and currents in **Table 10**, follow local wiring practices and take into consideration the environmental conditions (temperature and physical support media), room temperature and conditions of installation of the cable and system's overload capacity (see **5.0 - Specifications**).

For cable entry terminal, refer to **Figures 26 28** and **29**.

WARNING

Risk of electrical shock. Can cause injury or death.

Before cabling the UPS, ensure that you are aware of the location and operation of the external isolators that connect the UPS input/bypass supply to the power distribution panel.

Check that these supplies are electrically isolated, and post any necessary warning signs to prevent their inadvertent operation.

NOTICE

For dual input operation ensure that any busbars between the bypass and the rectifier input are removed.

When sizing battery cables, a maximum volt drop of 2VDC is permissible at the current ratings given in **Table 14**.

The following are guidelines only and superseded by local regulations and codes of practice where applicable:

- Take special care when determining the size of the neutral cable (grounded conductor), because current circulating on the neutral cable may be greater than nominal current in the case of non-linear loads. Refer to the values in **Table 10**.
- The grounding conductor should be sized according to the fault rating, cable lengths, type of protection, etc. The grounding cable connecting the UPS to the main ground system must follow the most direct route possible.
- Consideration should be given to the use of paralleled smaller cables for heavy currents, as this can ease installation considerably.
- AC and DC cables must be run in conduits according to local codes, national codes and standard best practices. This will prevent creation of excess EMI fields.

2.2.1 Sizing the Input Breaker Feeding a Liebert NXL UPS

The rectifier nominal input current value (**Table 11**) is based on providing enough power to operate the inverter at full rated load when the input voltage is nominal. The published rectifier maximum input current value is based on the maximum input current limit setting of 125%.

The recommended input breaker ampacity is based on the NEC calculation for a branch circuit with the current limit set at the maximum value. The calculation for an 80% rated breaker is 125% of the nominal current (continuous) plus 100% of the difference between the nominal and the maximum currents (non-continuous). The calculation for a 100% rated breaker is 100% of the nominal current (continuous) plus 100% of the difference between the nominal and maximum currents (noncontinuous).

The rectifier input current limit can be adjusted from 25% to 125% of the nominal value. This setting is accessible only to a factory-trained service engineer. The effect of changing this setting is similar to that of changing the setting of the trip unit on a solid-state circuit breaker. With a lower current limit setting, the calculation for the branch circuit will result in a lower value.

The input current limit should not be set less than 105% of the current needed to support the inverter at full load for normal operation. This results in sufficient power to recharge the battery in a reasonable time and to operate over the published input voltage range.

2.2.2 Power Cable Connection Procedure

The rectifier input, bypass, output and battery power cables (all require lug type terminations) are connected to busbars situated in the I/O section as shown in **Figures 26** through **31**.

Equipment Ground

The equipment ground busbar is located in the I/O section as shown in **Figures 26** through **31**. The grounding conductor must be connected to the ground busbar and bonded to each cabinet in the system.

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



NOTE

Proper grounding reduces problems in systems caused by electromagnetic interference.



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.

The grounding and neutral bonding arrangement must be in accordance with local and national codes of practice.

Once the equipment has been positioned and secured, connect the power cables as described below (refer to the appropriate cable connection drawing in **4.0 - Installation Drawings**):

1. Verify that the UPS equipment is isolated from its external power source and all the UPS power isolators are open. Check that these supplies are electrically isolated and post any necessary warning signs to prevent their inadvertent operation.
2. Open exterior and interior panels on the front of the I/O.
3. Connect the ground and any necessary main bonding jumper to the equipment ground busbar located in the I/O section.
4. Make power connections and tighten the connections to the proper torque according to one of the two procedures below, depending on the type of installation:
Ensure correct phase rotation.
 - Top Cable Entry (see **Figures 19, 20, 25, 28, 29** and **30**)
 - Bottom Cable Entry (see **Figures 19, 20, 25, 28, 29** and **31**)

Top Cable Entry

When making the power connections for top cable entry, the recommended order of pulling and installing cables is to start from the top connections to the bottom connections. The cables must be routed around the fault braces (see Detail in **Figure 30**). This is to prevent the cables from contacting other busbars. The recommended conduit layout is shown in **Figure 26**.

Bottom Cable Entry

When making the power connections for bottom cable entry, the recommended order of pulling and installing cables is to start from the bottom connections to the top connections. The cables must be routed around the fault braces (see Detail in **Figure 31**). This is to prevent the cables from contacting other busbars. The recommended conduit layout is shown in **Figure 26**.



NOTE

For a single input configuration, linking busbars must be installed between the bypass and the rectifier input.



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.



WARNING

Risk of electrical shock. Can cause injury or death.

When connecting the cables between the battery extremities to the circuit breaker always connect the circuit breaker end of the cable first.

5. For control connection details, see **2.3 - Control Cable and Communication**.



NOTE

*If fault bracing brackets were removed during installation, they **MUST** be replaced.*

6. Close and secure the interior and exterior doors.

Figure 3 Cabinet grounding plates

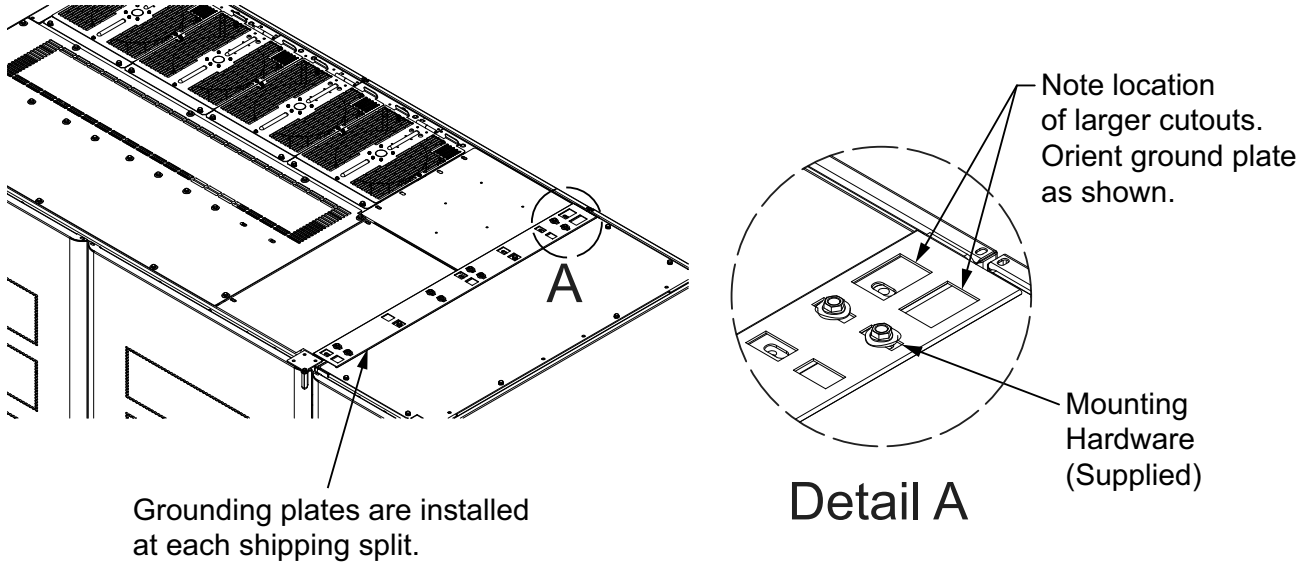
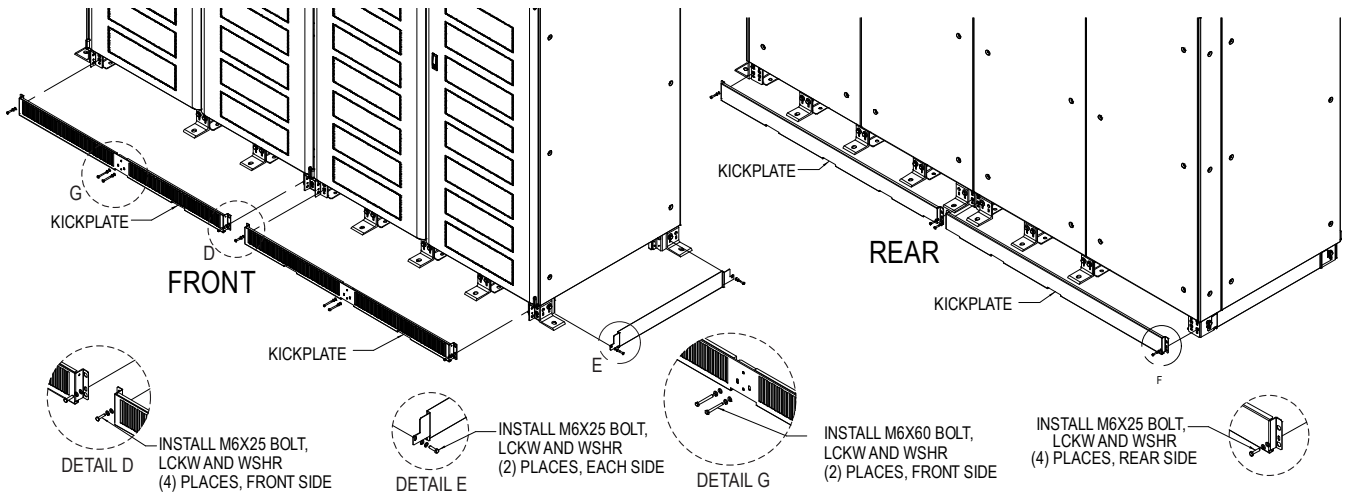


Figure 4 Kick plate and filter locations, typical



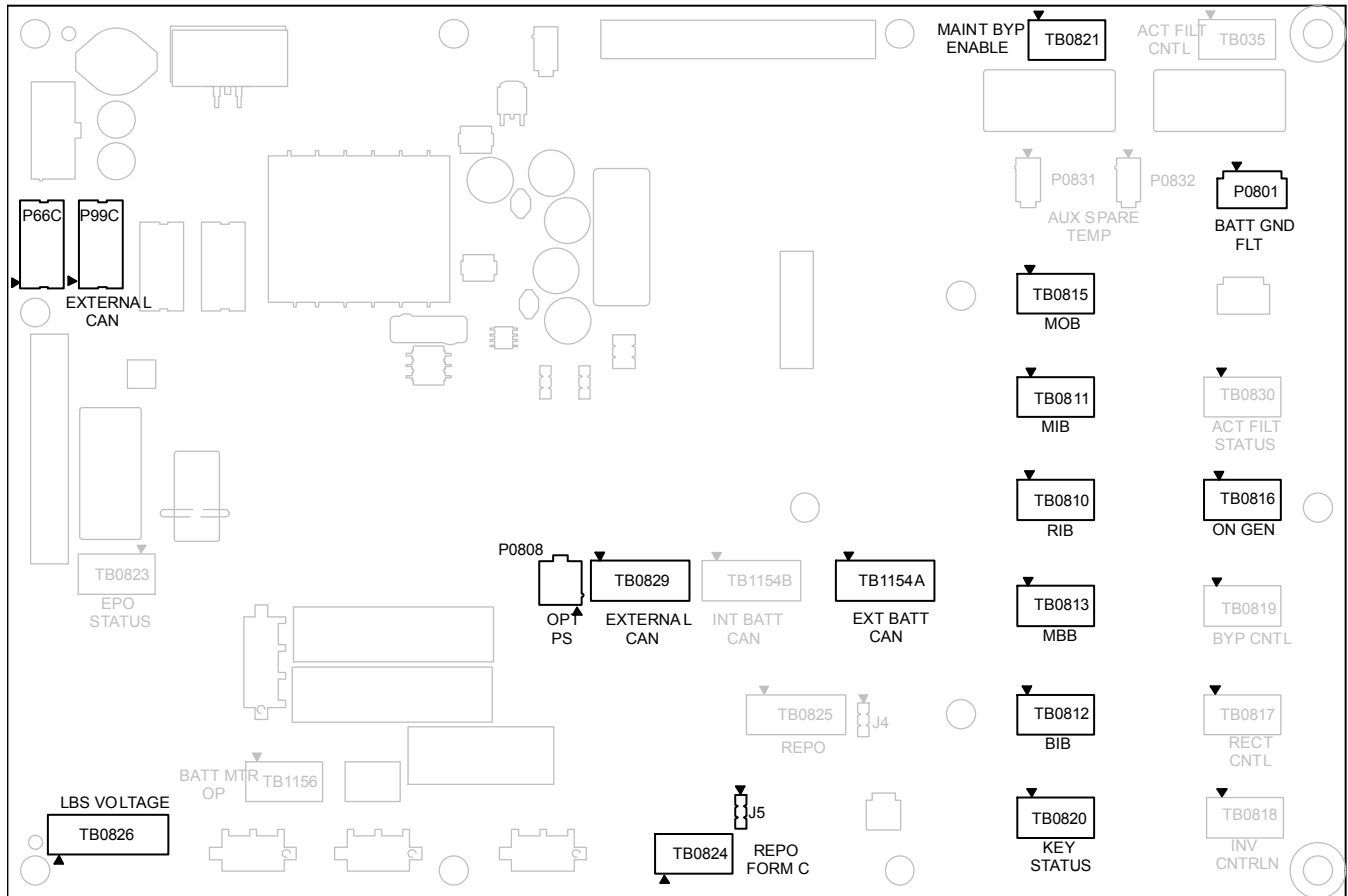
NOTE

Kick plates must be installed. If the unit is to be installed in a position that does not permit access to rear kick plates, then kick plates must be installed before the unit is placed in its final position.

2.3 CONTROL CABLE AND COMMUNICATION

Based on your site's specific needs, the UPS may require auxiliary connections to manage the battery system (external battery circuit breaker), communicate with a personal computer or provide alarm signaling to external devices, or for Remote Emergency Power Off (REPO). The External Interface Board, arranged for this purpose, is next to the option box in the Rectifier section (refer to **4.0 - Installation Drawings**). The contacts are rated for 250VAC @ 2A.

Figure 5 External Interface Board connections layout



2.3.1 Dry Contacts



NOTE

If connection to more than one module is required, use a separate contact for each module.

Table 1 UPS input dry contacts

Item	Terminal Block	Pin	Connects to (Description of External Item)	Wire Size/ Max Length
Remote EPO Input Form C	TB0824	1	REPO Switch, normally open contact	14AWG/ 500ft. (150m).
		2	REPO Switch, common contact	
		3	REPO Switch, normally closed contact, set jumper J5: 1-2 to enable, 2-3 to disable	
On Generator Input Form C	TB0816	1	On Generator switch, closed = On Generator	
		2	On Generator switch, common	
		3	On Generator switch, closed = Not On Generator	

Table 2 UPS control with battery cabinet or module battery disconnect

Item	Terminal Block	Pin	Connects to (Description of External Item)	Wire Size/ Max Length
CAN Bus and 24V Power Supply	TB1154A	1	Battery Interface Board TB1154-1	18 AWG 1000ft. (300m).
		2	Battery Interface Board TB1154-2	
		3	Battery Interface Board TB1154-3	
		4	Battery Interface Board TB1154-4	

Table 3 UPS control contacts with global maintenance bypass

Item	Terminal Block	Pin	Connects to (Description of External Item)	Wire Size/ Max Length
Maintenance Isolation Breaker (MIB) Form C ¹	TB0811	1	CB aux. contact, closed = CB is closed	14AWG/500ft. (150m)
		2	CB aux. contact, common	
		3	CB aux. contact, closed = CB is open	
Maintenance Bypass Breaker (MBB) Form C ¹	TB0813	1	CB aux. contact, closed = CB is closed	14AWG/500ft. (150m)
		2	CB aux. contact, common	
		3	CB aux. contact, closed = CB is open	
Maintenance Bypass Enable Form C ¹	TB0821	1	Maintenance Bypass Cabinet, closed = load not on inverter	14AWG/500ft. (150m)
		2	Maintenance Bypass Cabinet, common	
		3	Maintenance Bypass Cabinet, closed = load on inverter	
Remote EPO Input ¹	TB0825	1	REPO Switch, normally open contact	14AWG/500ft. (150m)
		2	REPO Switch, common contact	
Key Status Input ^{1,3}	TB0820	1	Key status switch, closed = key removed	14AWG/500ft. (150m)
		2	Key status switch, common	
		3	Key status switch, closed = key inserted	
Module Output Breaker (MOB) Form C ²	TB0815	1	CB aux. contact, closed = CB is closed	14AWG/500ft. (150m)
		2	CB aux. contact, common	
		3	CB aux. contact, closed = CB is open	

1. For 1+N systems with a maintenance Bypass, these Aux contacts must be run to each module from an isolated source.
 2. For 1+N systems, these breaker Aux contact go to the UPS that it is associated with.
 3. Key Status Input can be either Form-C, N.O. or N.C. contact.

Table 4 UPS control contacts to remote status panel

Item	Terminal Block	Pin	Connects to (Description of External Item)	Wire Size/Max Length
CAN Bus and 24V Power Supply	TB0829	1	Remote Status Panel TB-2	18 AWG/1000ft. (300m)
		2	Remote Status Panel TB-1	
		3	Remote Status Panel TB-3	
		4	Remote Status Panel TB-4	

2.3.2 Multi-Module Communication

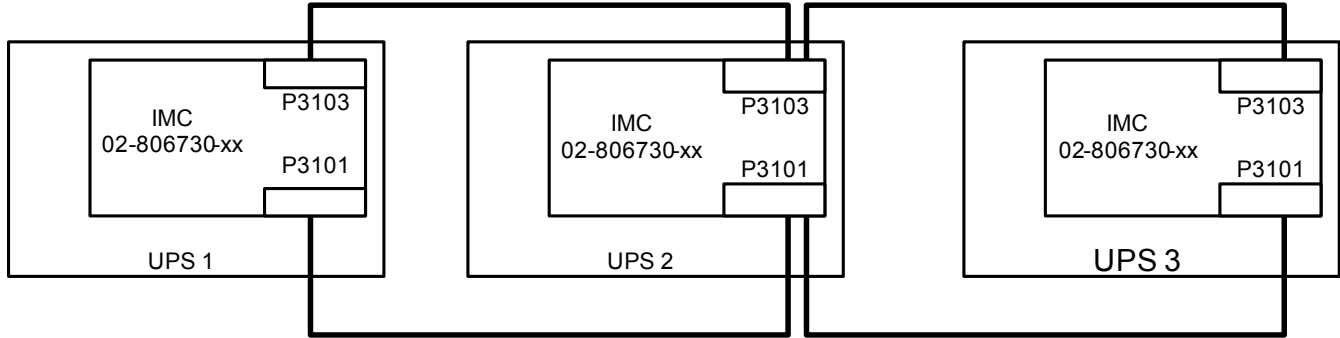
Paralleling cables that connect the module to the system are connected to terminals P3101 and P3103 on the Inter-Module Communication (IMC) board (refer to **4.0 - Installation Drawings**).

Table 5 Parallel from UPS module Inter-Module Communication Board to other Inter-Module Communication Board in system

Terminal Designation		Signal Name	Wire Size/Max Length
From	To		
Primary Connections			
P3101-1	P3101-1	Share CAN +24V	1000ft. (300m)
P3101-2	P3101-2	Share CAN common	
P3101-3	P3101-3	System CAN +24V	
P3101-4	P3101-4	System CAN common	
P3101-5	P3101-5	SER synch CAN+24V	
P3101-6	P3101-6	SER synch CAN common	
P3101-7	P3101-7	Ground - Drain Wire	
P3101-14	P3101-14	Ground	
P3101-8	P3101-8	PWM synch CAN +24V	
P3101-9	P3101-9	PWM synch CAN common	
P3101-10	P3101-10	MMS synch CAN +24V	
P3101-11	P3101-11	MMS synch CAN common	
Redundant Connections			
P3103-1	P3103-1	Redundant share CAN +24V	1000ft. (300m)
P3103-2	P3103-2	Redundant share CAN common	
P3103-3	P3103-3	Redundant system CAN +24V	
P3103-4	P3103-4	Redundant system CAN common	
P3103-5	P3103-5	Redundant SER synch CAN +24V	
P3103-6	P3103-6	Redundant SER synch CAN common	
P3103-7	P3103-7	Ground - Drain Wire	
P3103-14	P3103-14	Ground	
P3103-8	P3103-8	Redundant PWM synch CAN +24V	
P3103-9	P3103-9	Redundant PWM synch CAN common	
P3103-10	P3103-10	Redundant MMS synch CAN +24V	
P3103-11	P3103-11	Redundant MMS synch CAN common	

1. Belden 810x or Belden 89901 cables are the only approved cables.
2. Belden 89901 cable can be used for underground installations.
3. If using multiple parallel cables for each run, all cables must be run in the same conduit.
4. Each cable group should be run in a separate grounded conduit to ensure redundancy.
5. The maximum lengths must include all the parallel cables from the first module to the last module. The primary and redundant cable lengths can be counted separately.
6. The ground pins on the Inter-Module Communication Board (Pins 7 and 14) are connected together on the board. If using cable with only one (1) drain wire, then connect the ground (drain wire) to Pin 7.
7. Care must be taken to prevent the drain wire from touching any other component in the module.
8. Attach control wires to the side of the control door where the Inter-Module Board (IMC) is attached. Do not run wires across the IMC board.

Figure 6 Inter-Module Communication Board wiring diagram—Multi-modules



2.4 DIGITAL LBS

The Load Bus Sync interface enables independent UPS units to remain in sync when operating on battery or when supplied by unsynchronized input sources.

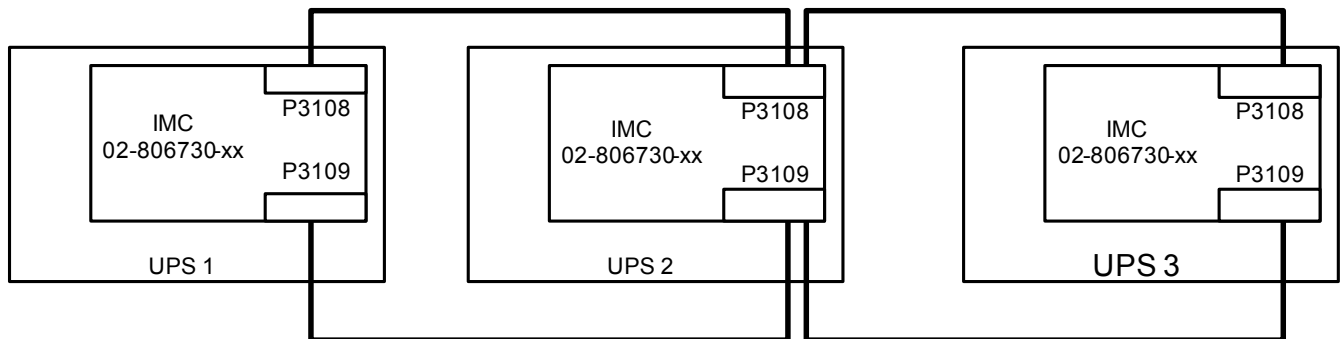
Digital LBS cables that connect the module to the system are connected to terminals P3108 and P3109 on the Inter-Module Communication (IMC) board. See **Figure 7**.

Table 6 Wire size, length for digital LBS connection of UPS Inter-Module Communication Boards

Terminal Designation		Signal Name	Wire Size/ Max Length
From	To		
Digital LBS from UPS inter-module communication board to other UPS inter-module communication board			
P3108-1	P3108-1	LBS Synch CANH	3000ft (900m)
P3108-2	P3108-2	LBS Synch CANL	
P3108-3	P3108-3	Ground - Drain Wire	
Redundant Digital LBS from UPS Inter-Module Communication Board to Other UPS Inter-Module Communication Board			
P3109-1	P3109-1	Redundant LBS Synch CANH	3000ft (900m)
P3109-2	P3109-2	Redundant LBS Synch CANL	
P3109-3	P3109-3	Ground - Drain Wire	

1. Belden 810x or Belden 89901 cables are the only approved cables.
2. Each cable group should be run in a separate grounded conduit to ensure redundancy.
3. The maximum lengths must include all the LBS cables from the first module to the last module.
4. The primary and redundant cable lengths can be counted separately.
5. Belden 89901 cable can be used for underground installations.
6. Attach the control wire to the side of the control door where the Inter-Module Board (IMC) is attached. Do not run wires across the IMC board.

Figure 7 Inter-Module Communication Board wiring diagram—Digital LBS



2.5 CONFIGURING NEUTRAL AND GROUND CONNECTIONS

Improper grounding is the largest single cause of UPS installation and startup problems. Grounding techniques vary significantly from site to site, depending on several factors. Proper grounding should be based on NEC Section 250, but safe and proper equipment operation requires further enhancements. The following pages detail recommendations for grounding various system configurations to ensure optimal UPS system performance.

CAUTION

The UPS ground lug must be solidly connected to the service entrance ground by an appropriately sized wire conductor per NEC Article 250. Each conduit or raceway containing phase conductors must also contain a ground wire, both for UPS input and output, which are solidly connected to the ground terminal at each termination point. Conduit-based grounding systems tend to degrade over time. Therefore, using conduit as a grounding conductor for UPS applications may degrade UPS performance and cause improper UPS operation.

2.5.1 Four-Wire Input connections

The UPS module main input and bypass input are connected to a grounded service. In this configuration, the UPS module is not considered a separately derived source. The UPS module output neutral is solidly connected to the building service neutral, which is bonded to the grounding conductor at the service entrance equipment.

Advantages of this configuration include:

- A measure of common-mode noise attenuation, since the isolation (common-mode rejection) occurs as close to the load as practical (i.e., at the PDU).
- The UPS module can be located remotely from the PDU without compromising common-mode noise performance.
- By using UPS modules with 480VAC input and output and creating 208VAC at the PDU, smaller and less costly power feeders can be used and less voltage drop (as a percent of nominal) occurs.

2.5.2 Three-Wire Input Connections

This configuration must NOT be used when single-phase loads are directly connected to the UPS.

The UPS output transformer is considered a separately derived source. The UPS module neutral is bonded to the UPS ground, which is connected to a local grounding electrode in accordance with NEC 250-26. Please note that this configuration represents a price/performance trade-off. Whenever the UPS module transfers to or from bypass, two AC sources (input and bypass) are briefly connected together and circulating current must flow. In this configuration, the current flows through the ground path, possibly tripping ground fault interrupters (GFIs) and distorting the bypass waveform reference. Proper adjustment of ground fault interrupters is necessary to avoid unwanted tripping. The time delay should be set to at least 0.2 seconds to prevent tripping when the UPS performs a transfer or retransfer operation.

NOTICE

Risk of improperly set ground fault interrupters. Can cause equipment damage.
Failure to set the ground fault interrupters properly could cause loss of power to the critical load.

2.5.3 Preferred Grounding Configuration, Battery Systems

Open-rack battery systems, depending on local code requirements and customer preference, are normally:

- Floating (ungrounded)
- OR
- Center-tapped and floating

Battery cabinet systems must be connected as floating (ungrounded) systems. Center-tapped or grounded battery systems are not possible with battery cabinet systems. Whether the battery system is open-rack or cabinet, the metal rack parts or cabinet must be grounded to the UPS module ground bus.

2.5.4 Multi-Module Systems

For both N+1 and 1+N systems, the neutrals of all UPS modules in the system must be connected together inside the switchgear or parallel cabinet. The neutral conductors must be rated for 20% of phase conductor current minimum. Site and load conditions will determine if larger neutrals are required.

For Multi-Module systems using a 3-wire bypass, the Neutral-Ground bond must be made at the common neutral connection point in the switchgear or parallel cabinet.

2.5.5 High Resistance Ground Systems

The Liebert NXL is compatible with High Resistance Ground Systems. See your local Vertiv representative for details.

2.6 GROUNDING DIAGRAMS, SINGLE- AND MULTI-MODULE SYSTEMS

Figure 8 Grounding diagram, three-wire single-module system

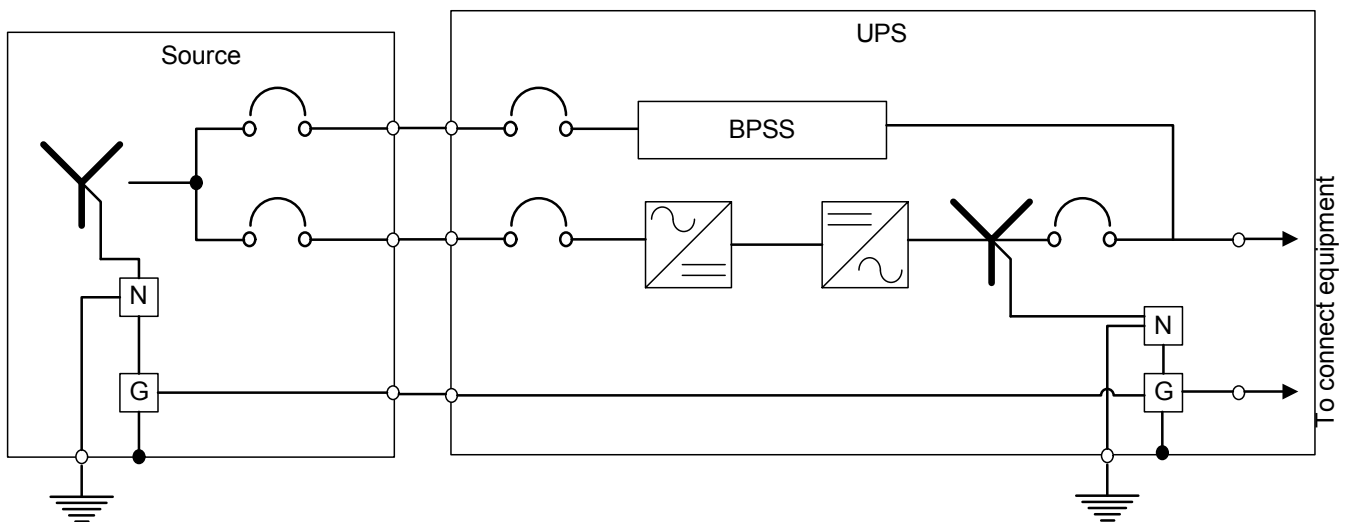


Figure 9 Grounding diagram, four-wire single-module system

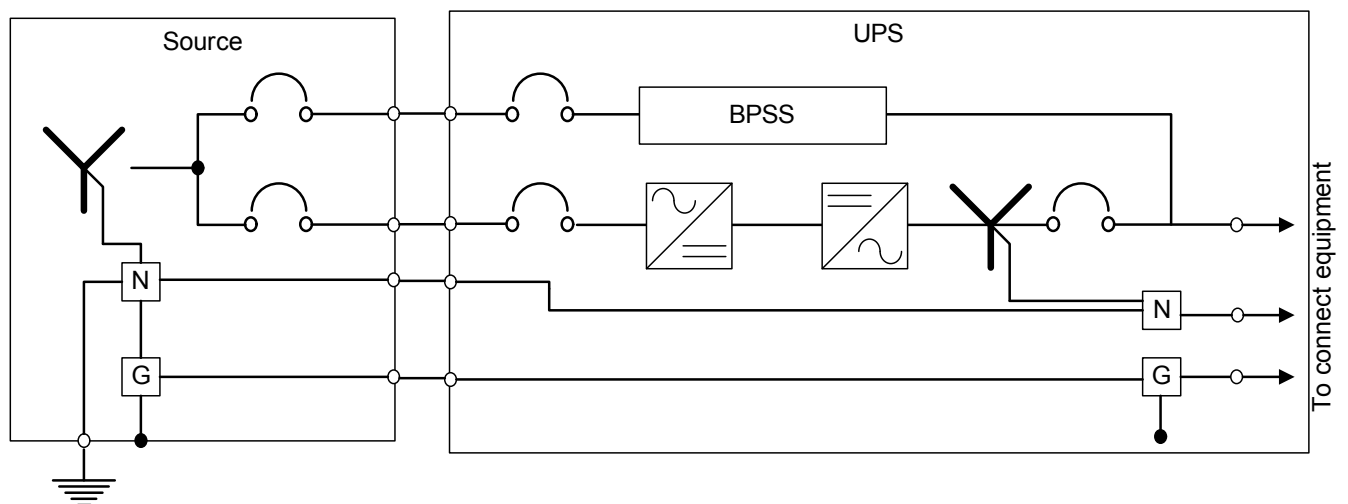


Figure 10 Grounding diagram, three-wire multi-module system

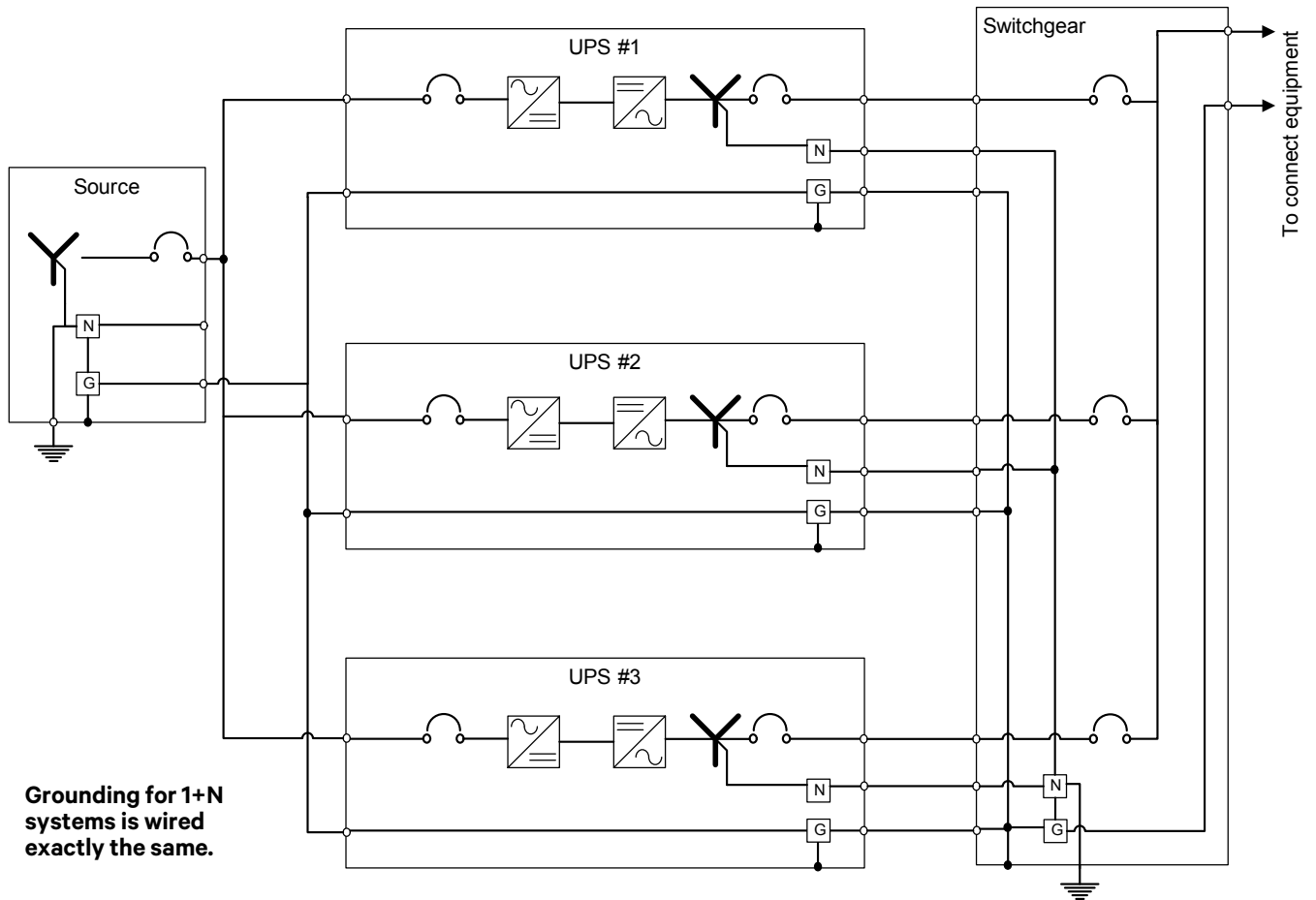
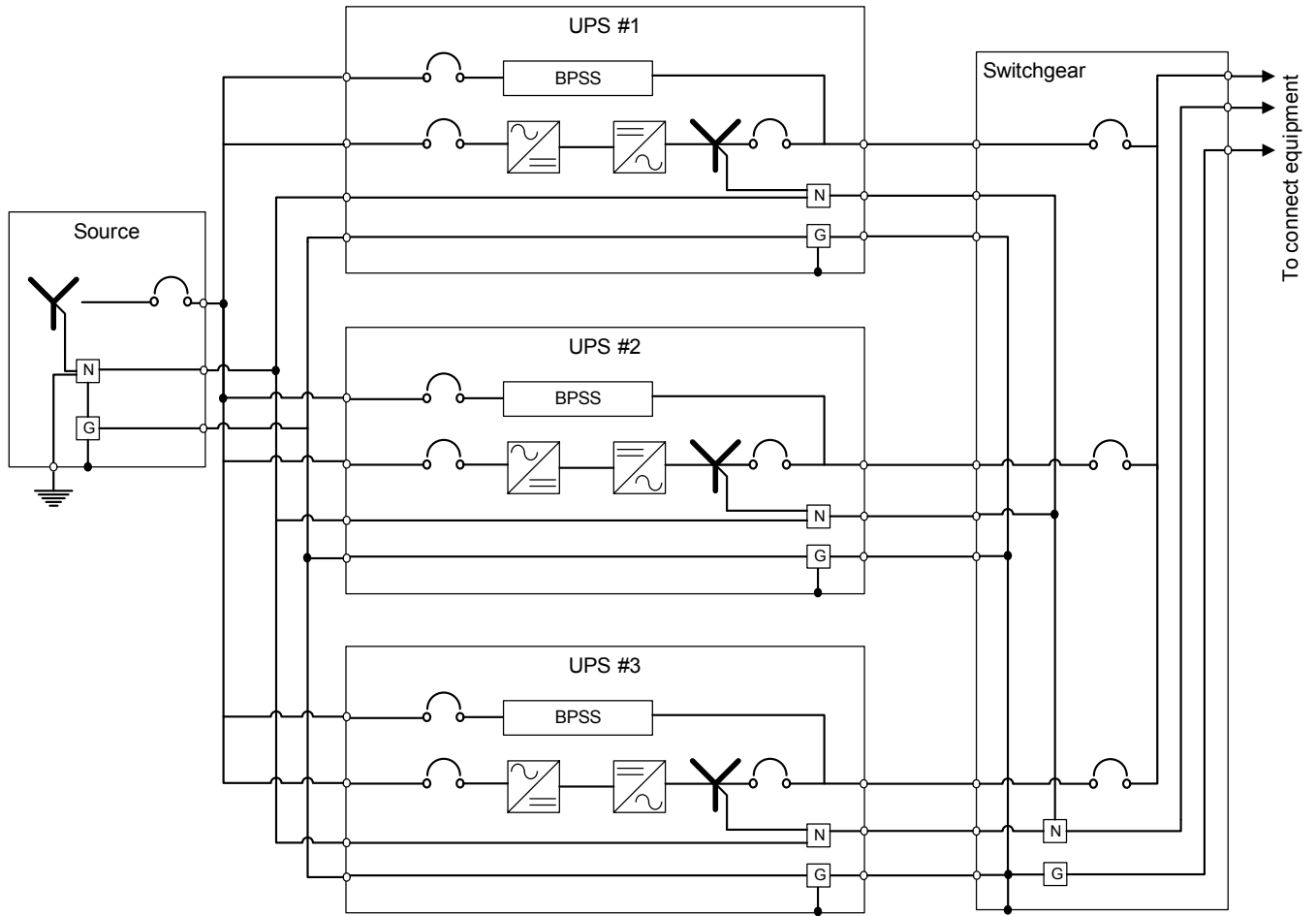


Figure 11 Grounding diagram, four-wire multi-module system



3.0 OPTIONAL EQUIPMENT

3.1 SINGLE-MODULE SYSTEM OPTIONS

3.1.1 Matching Maintenance Bypass Cabinet

A matching Liebert NXL Maintenance Bypass cabinet is available. See Maintenance Bypass Cabinet Installation Manual (SL-24532) for more details.

3.1.2 Battery Temperature Sensor

The optional external battery temperature sensor kit, supplied separately from the battery circuit breaker, contains one probe and one temperature transport board.

3.1.3 Load Bus Synch

An optional Load Bus Synch (LBS) system can be used to synchronize two Liebert NXL UPSs or an Liebert NXL UPS to a Liebert Series 610 UPS.

3.1.4 Remote Alarm Panel

The remote alarm panel has LED alarm lights. An audible alarm sounds upon any alarm condition. The surface- or flush-mounted NEMA 1 enclosed panel indicates: Load on UPS, Load on Bypass, Battery Discharging, Low Battery Warning, Overload Warning, Ambient Overtemp Warning, UPS Alarm Condition and New Alarm Condition (for a second UPS alarm condition).

3.2 COMMUNICATION AND MONITORING

- Liebert IntelliSlot™ Unity Card
- Alber Battery Monitoring System
- Programmable Relay Board
- Input Contact Isolator Board

3.2.1 Alber® Monitoring System

The matching Liebert NXL Battery Cabinet allows installing an optional Alber Battery monitoring system in the cabinet. The Alber Battery Monitoring by Liebert continuously checks all critical battery parameters, such as cell voltage, overall string voltage, current and temperature. Automatic periodic tests of internal resistance of each battery will verify the battery's operating integrity. Additional capabilities include automatic internal DC resistance tests and trend analysis providing the ability to analyze performance and aid in troubleshooting.

3.2.2 Programmable Relay Board

The Programmable Relay Board (PRB) provides a means to trigger an external device when an event occurs in the Liebert NXL. Each PRB has eight channels. Each channel has Form-C dry contacts rated at 1A @ 30VDC or 125VAC @ 0.45A.

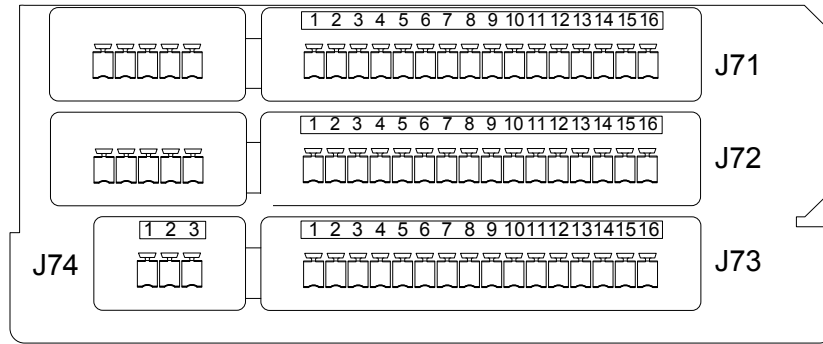
Any alarm/event can be programmed to any channel or channels. Up to four (4) events can be programmed to a relay. If multiple events are grouped to one relay, group the events logically to simplify troubleshooting when an event is triggered. The same alarm/event can be programmed to more than one channel. Up to two Programmable Relay Boards can be installed in the Liebert NXL for a total of 16 channels. Programming is performed through the HMI touchscreen display.



NOTE

Up to two (2) PRB's can be installed in the Liebert NXL.

Figure 12 Control wiring, Programmable Relay Board



1. Customer control wiring connection points are terminals 1 through 15. (Pin 16 not used on J71, J72, and J73.)
2. Programmable Relay Board option includes eight signal channels with two Form-C dry contacts per channel (see **Table 7**).
3. All control wiring (by others) must be run separate from power wiring. Control wiring runs should not be combined in the same conduit.
4. Contact ratings: 1A @ 30VDC or 125VAC @ 0.45A
5. Maximum cable length 500 ft. (152m) with #16AWG and flexible stranded cable.

Table 7 Programmable Relay Board pinout

Terminal Block	Channel	Pin No.	Common	Normally Closed	Normally Open		
J71	CH1	A	1-3	1	2	3	
		B	4-6	4	5	6	
	CH2	A	7-9	7	8	9	
		B	10-12	10	11	12	
	CH3	A	13-15	13	14	15	
		B	1-3	1	2	3	
J72	CH4	A	4-6	4	5	6	
		B	7-9	7	8	9	
	CH5	A	10-12	10	11	12	
		B	13-15	13	14	15	
	TB3	CH6	A	1-3	1	2	3
			B	4-6	4	5	6
CH7		A	7-9	7	8	9	
		B	10-12	10	11	12	
J74	CH8	A	13-15	13	14	15	
		B	1-3	1	2	3	

Note: Pin 16 not used on J71, J72, and J73.

Configuring the Programmable Relay Board Settings

1. Press Internal Option Settings from the Config menu.
2. Press which Programmable Relay Board will be configured. The Programmable Relay Board dialog box is displayed.
3. Press the Relay channel
4. Press up to four (4) events. Selected events will show up under Relay 1 Assignment.

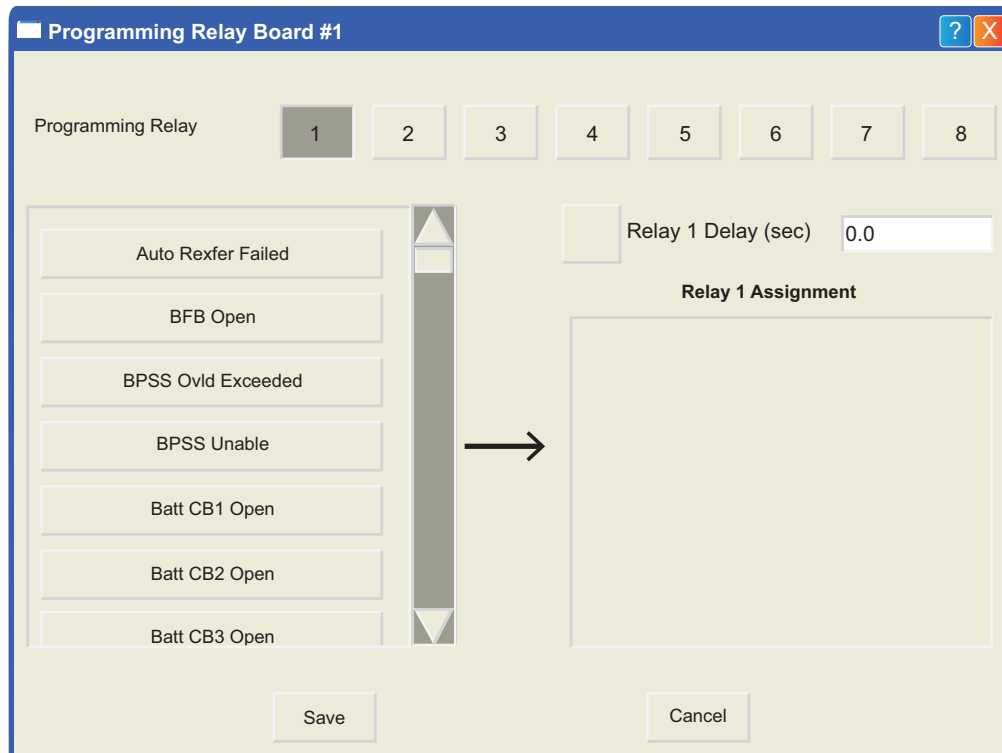


NOTE

To deselect an event, click on the event.

5. Repeat **Steps 3** and **4** for each relay.
6. Press SAVE to keep the settings.

Figure 13 Programmable relay board dialog box



- Assignment—0 to 4 event (default: 0)
- Delay, sec—0 to 99.9 (default: 0)

3.2.3 Input Contact Isolator Board

The Input Contact Isolator Board (ICI) provides a Liebert NXL module interface for up to eight external user alarm or message inputs to be routed through the NXL’s alarm network. The eight contacts are normally open dry contacts. When a contact closes, an event is triggered.



NOTE

Up to two (2) ICI's can be installed in a Liebert NXL.

The Input Contact Isolator options are configured through the Input Contact Isolator dialog box, which is accessed from the Internal Option Settings under the Config dialog box on the HMI touchscreen display. The Input Contact Isolator dialog box contains eight choices to match the eight channel input board. You can label each button to identify the event associated with the contact. When the dialog box is accessed, each button flashes to display the Input Contact Isolator number and the user entered label. This label also appears in the Display Panel when an event related to an Input Isolator Connector is triggered.

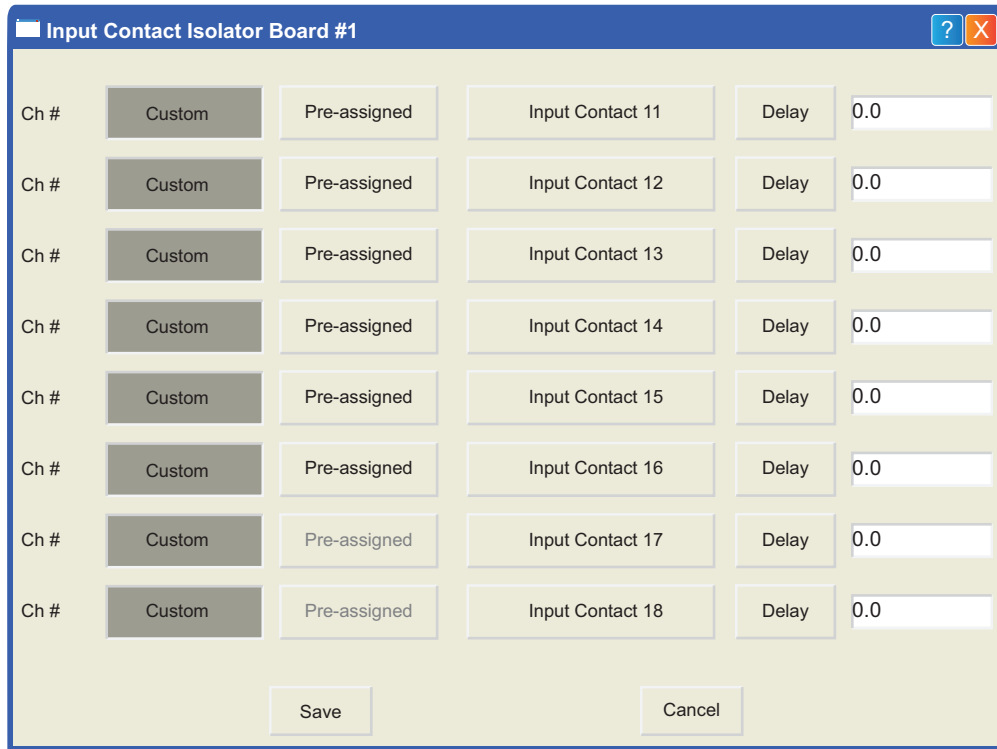
The Input Contact Isolator dialog box allows you to:

- Label the input contact assignments for your setup.
- Set the delay for an external event triggering an alarm.
- Review the isolator contact assignments, once the labels are entered.

The delay allows setting the number of seconds that a condition must exist before it will trigger an alarm. To configure the Input Contact Isolator relays:

1. Press Internal Option Settings from the Config menu.
2. Press which Input Contact Isolator is to be configured. The Input Contact Isolator dialog box is displayed.

Figure 14 Input contact isolator dialog box



- Assignment—Custom, Pre-assigned (default: “Input Contact” XY)
 - Delay, sec—0 to 99.9 (default: 0)
 - Message—Custom: 0-19 characters
3. To assign labels for each channel:
 - a. Press *Pre-assigned* for default labels on Channels 1-6 (See **Table 8**)
 - b. For Custom labels
 1. Press *Custom* to access unique labels.
 2. Click on *Input Contact XX* button. A keyboard is displayed to allow naming alarms.
 3. Enter the name of the alarm set for that input. For example, a fan problem could be indicated by naming the button *FAN*.
 4. Press *OK* on the keyboard to keep your label.
 4. Press *DELAY*.
 - a. A keypad is displayed prompting you for a delay time, in seconds, for a condition to exist before the alarm is triggered.
 - b. Enter the delay value. The range for the values are from 0 (zero) to 99.9 seconds.
 - c. Press *OK* on the keypad to keep your setting. The value you entered is displayed in the field adjacent to the corresponding input contact.
 5. Repeat **Steps 3** and **4** for each input contact.
 6. Press *SAVE* after you have configured all input contacts.
Be sure to press *SAVE* even if you have accessed this dialog only to change a setting.
 7. This information is not saved if control power is removed.

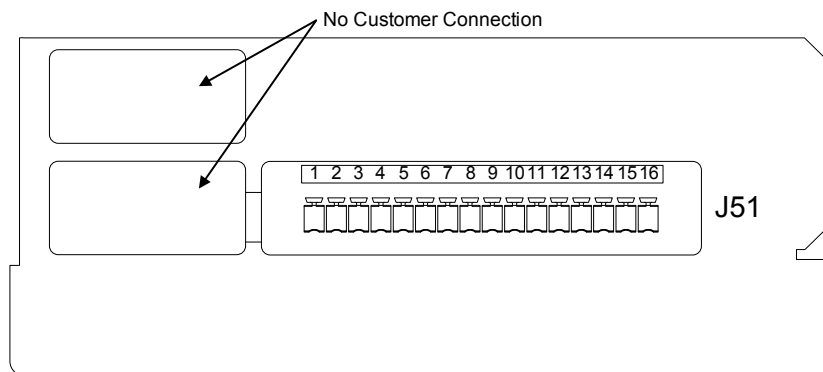
Table 8 Input Contact Isolator Board pre-assigned values

Channel Number	ICI #1 Pre-Assigned Label	ICI #2 Pre-Assigned Label
1	Reduced Rect ILimit	Stop Battery Charge
2	Reduced Batt ILimit	Stop Battery Charge
3	Stop Battery Charge	Stop Battery Charge

Table 8 Input Contact Isolator Board pre-assigned values

Channel Number	ICI #1 Pre-Assigned Label	ICI #2 Pre-Assigned Label
4	Inhibit Rect Restr	Stop Battery Charge
5	Inhibit Byp Restr	Stop Battery Charge
6	Inhibit Inv Restr	Stop Battery Charge
7	Input Trap Filter Disconnect	Inhibit IP Standby
8	Suspend ECO Mode	

Figure 15 Optional Input Contact Isolator Board



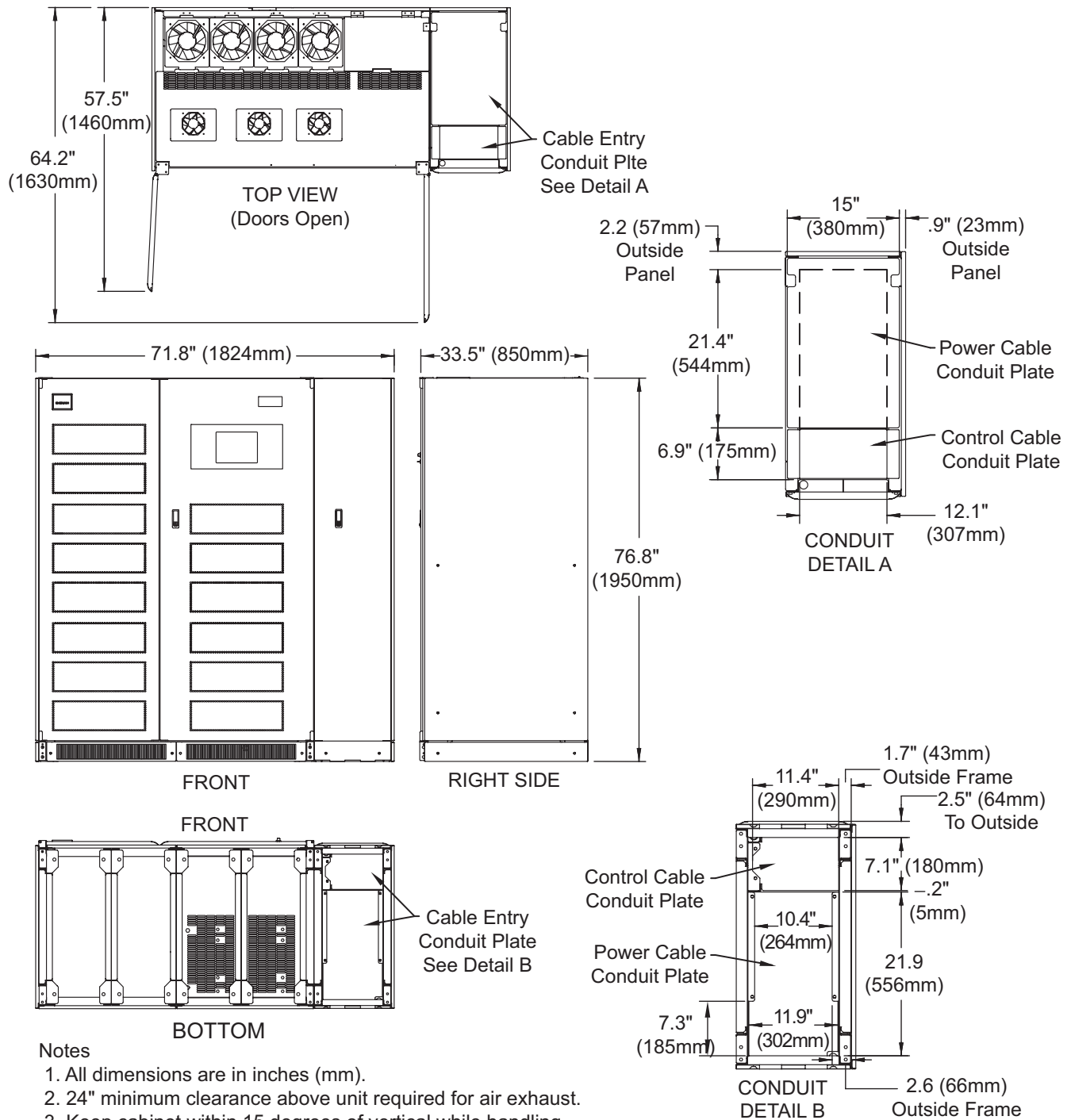
1. Customer control wiring connection points are terminals 1 through 16 (see **Table 9**).
2. Customer provided normally open dry contacts for user alarm messages.
3. All control wiring (by others) must be run separate from power wiring. Control wiring runs should not be combined in the same conduit.
4. Signal voltage: 100mA @ 12VDC.
5. Maximum cable length 500 ft. (152m) with #16AWG and flexible stranded cable.

Table 9 Input Contact Isolator Board control wiring connections

Input Contact	Pin No.
1	1
	2
2	3
	4
3	5
	6
4	7
	8
5	9
	10
6	11
	12
7	13
	14
8	15
	16

4.0 INSTALLATION DRAWINGS

Figure 16 Outline drawing, 250kVA, 480V Liebert NXL

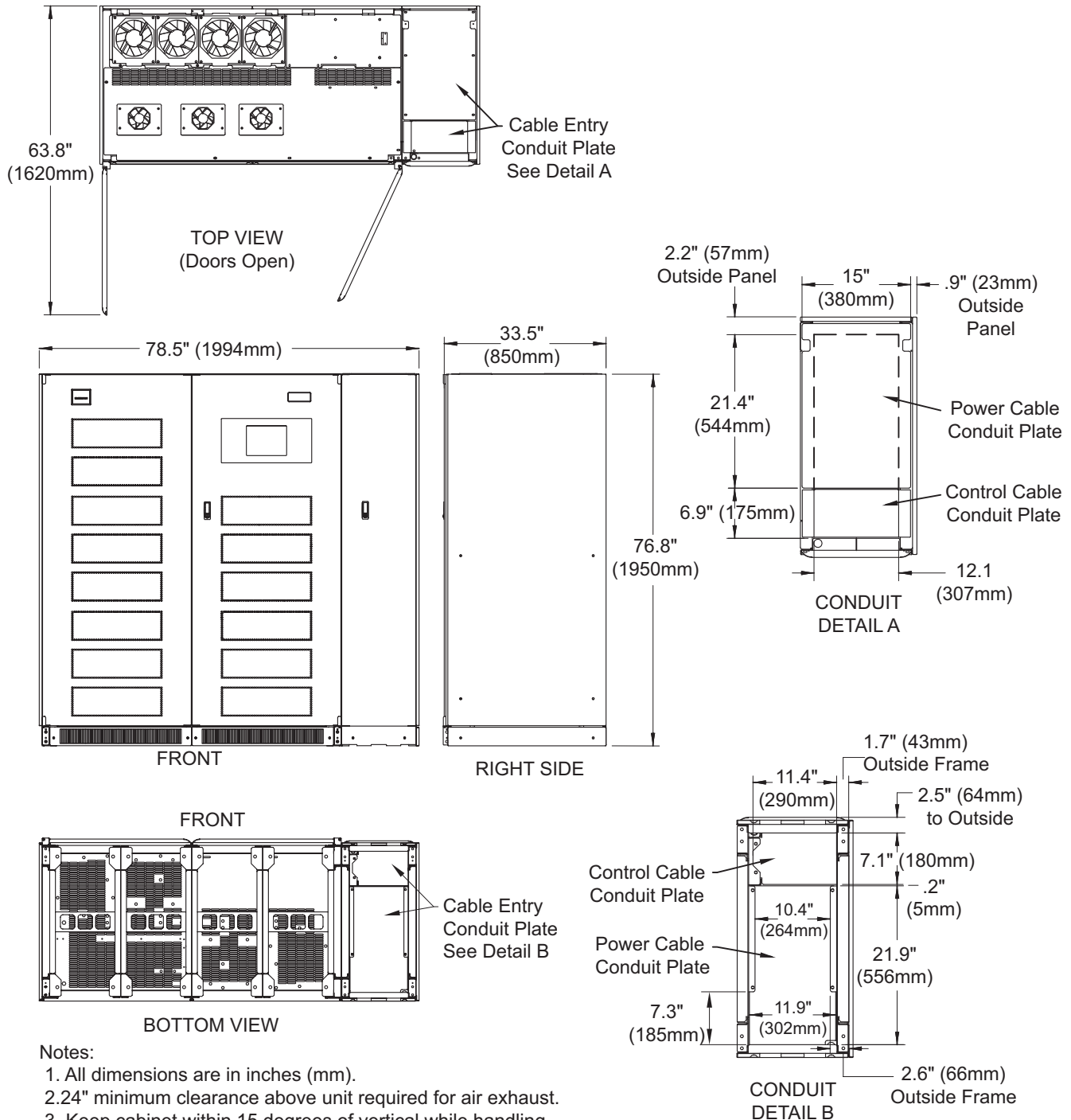


Notes

1. All dimensions are in inches (mm).
2. 24" minimum clearance above unit required for air exhaust.
3. Keep cabinet within 15 degrees of vertical while handling.
4. Top and bottom cable entry available through removable conduit plates. Remove, punch to suit conduit size and replace.
5. Unit bottom is structurally adequate for forklift handling.
6. Control wiring and power wiring must be run in separate conduits.
7. All wiring is to be in accordance with national and local electrical codes
8. Width dimension is with side panels. Subtract 1.4" (35mm) for dimensions with both side panels removed.
9. Depth dimension includes the front door and rear panel.
10. Refer to technical information drawing for 250kVA/225kW UPS.

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Rev. 6

Figure 17 Outline drawing, 250kVA, 575/600V; and 300kVA, 480/575/600V Liebert NXL

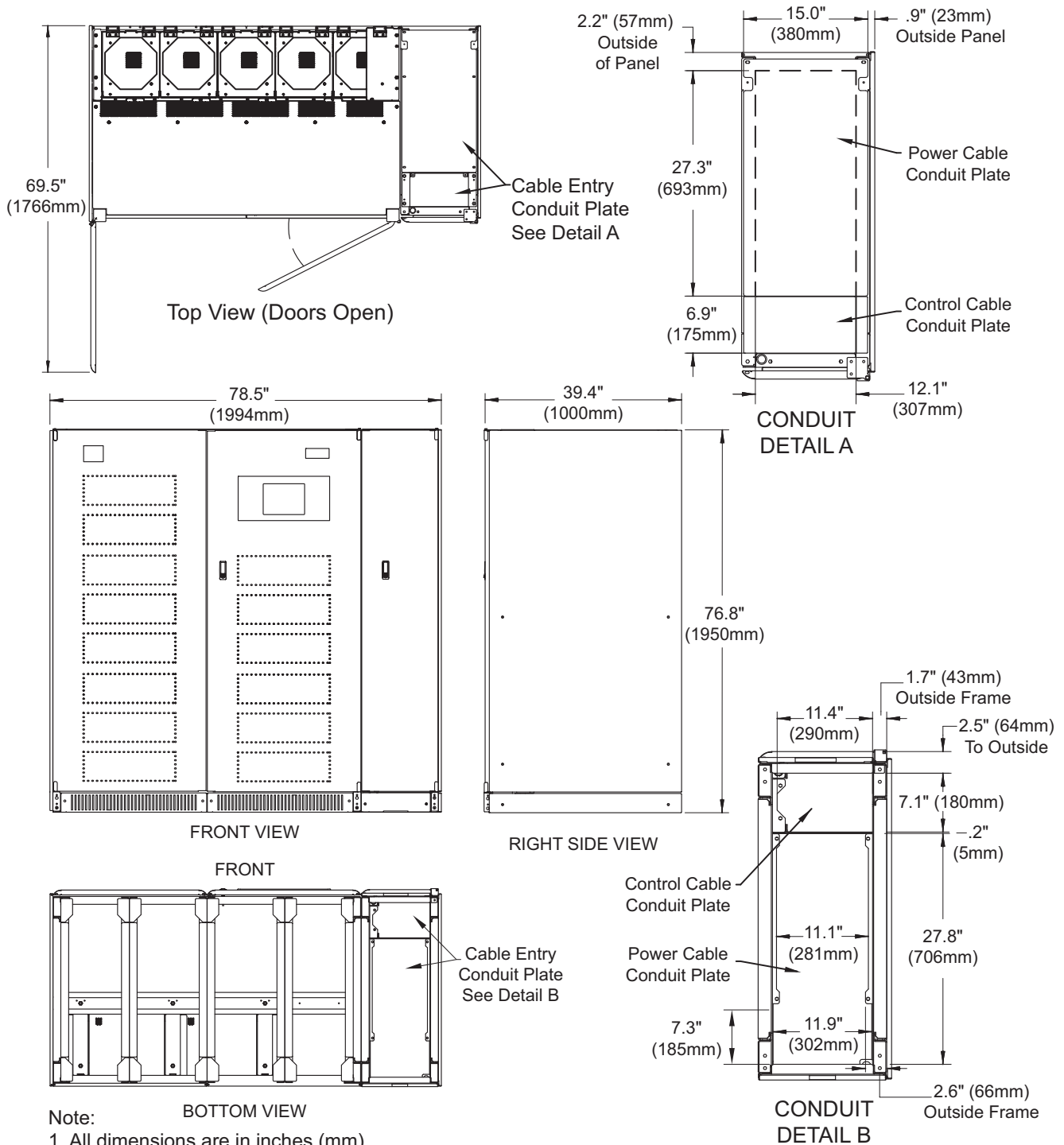


Notes:

1. All dimensions are in inches (mm).
2. 2.24" minimum clearance above unit required for air exhaust.
3. Keep cabinet within 15 degrees of vertical while handling.
4. Top and bottom cable entry available through removable conduit plates. Remove, punch to suit conduit size and replace.
5. Unit bottom is structurally adequate for forklift handling.
6. Control wiring and power wiring must be run in separate conduits.
7. All wiring is to be in accordance with national and local electrical codes.
8. Width dimension is with side panels. Subtract 1.4" (35mm) for dimensions with both side panels removed.
9. Depth dimension includes the front door and rear panel.
10. Refer to technical information drawing for 250kVA 575V or 600V UPS.

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Rev. 2

Figure 18 Outline drawing, 400kVA, 480V Liebert NXL

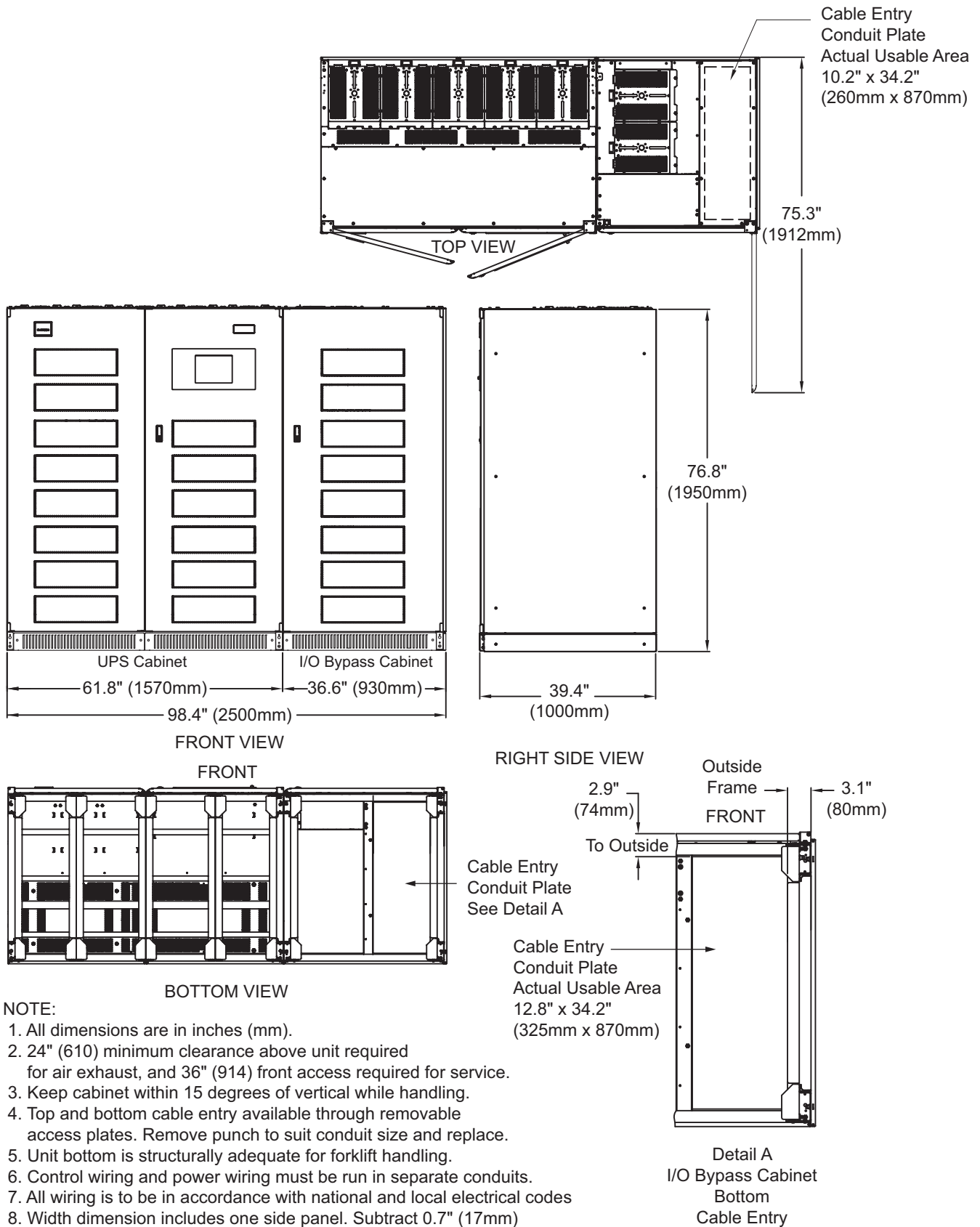


Note:

1. All dimensions are in inches (mm).
2. 24" (610) minimum clearance above unit required for air exhaust and 36" (914) front access required for service.
3. Keep cabinet within 15 degrees of vertical while handling.
4. Top and bottom cable entry available through removable access plates. Remove, punch to suit conduit size and replace.
5. Unit bottom is structurally adequate for forklift handling.
6. Control wiring and power wiring must be run in separate conduits.
7. All wiring is to be in accordance with national and local electrical codes.
8. Width dimension includes side panels. Subtract 1.4" (35mm) when removing both side panels.
9. Depth dimension includes the front door and rear panel.
10. See technical information drawing for shipping weights.

U40-4C-1001
Rev. 5

Figure 19 Outline drawing, 400kVA, 575V/600V Liebert NXL



NOTE:

1. All dimensions are in inches (mm).
2. 24" (610) minimum clearance above unit required for air exhaust, and 36" (914) front access required for service.
3. Keep cabinet within 15 degrees of vertical while handling.
4. Top and bottom cable entry available through removable access plates. Remove punch to suit conduit size and replace.
5. Unit bottom is structurally adequate for forklift handling.
6. Control wiring and power wiring must be run in separate conduits.
7. All wiring is to be in accordance with national and local electrical codes
8. Width dimension includes one side panel. Subtract 0.7" (17mm) when removing the side panel.
9. Depth dimension includes the front door and rear panel.
10. See technical information drawing for shipping weights.

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Rev. 2

Figure 20 Outline drawing, 400kVA, 575V/600V Liebert NXL with DC I/O cabinet

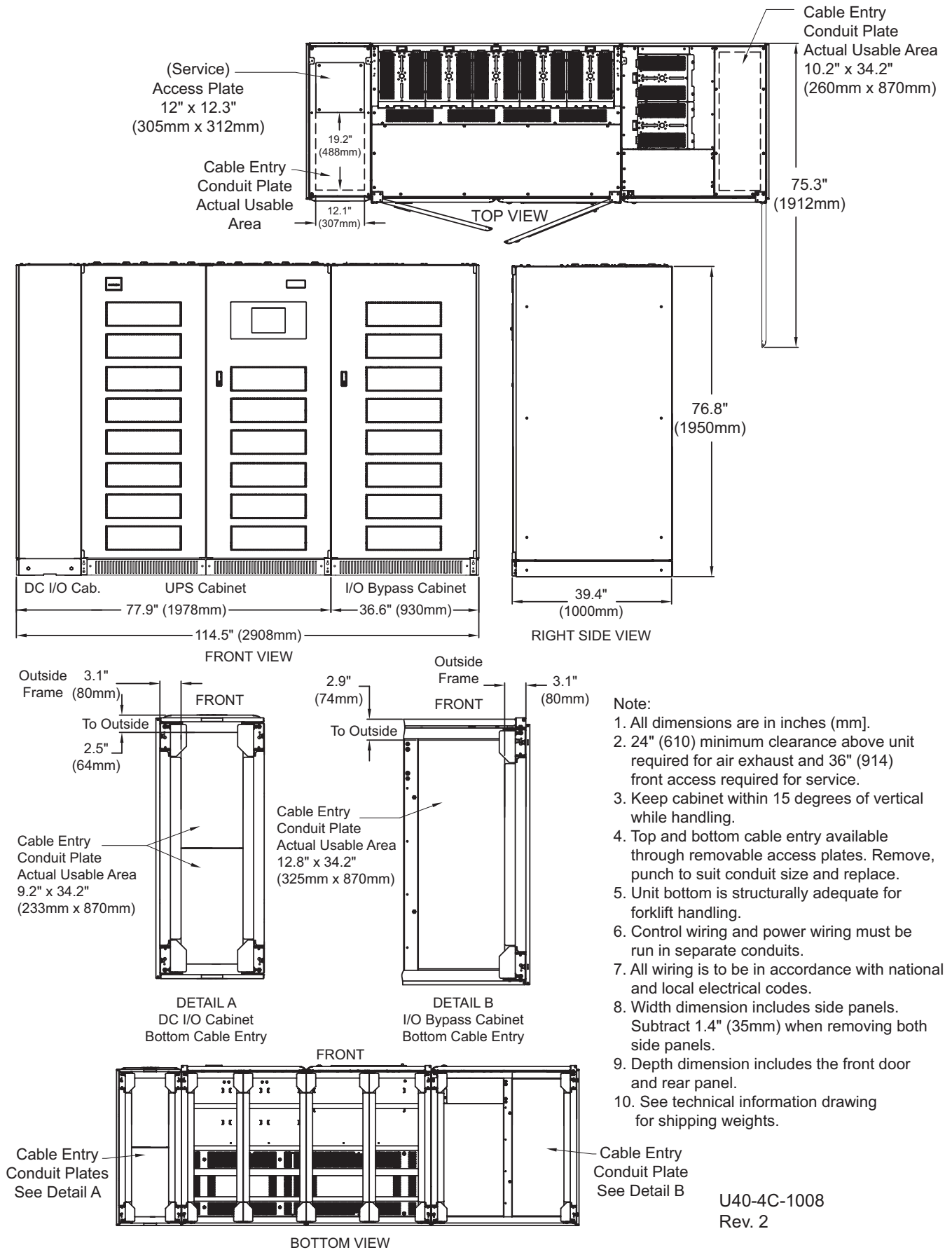


Figure 21 Main components, 250kVA, 480V Liebert NXL

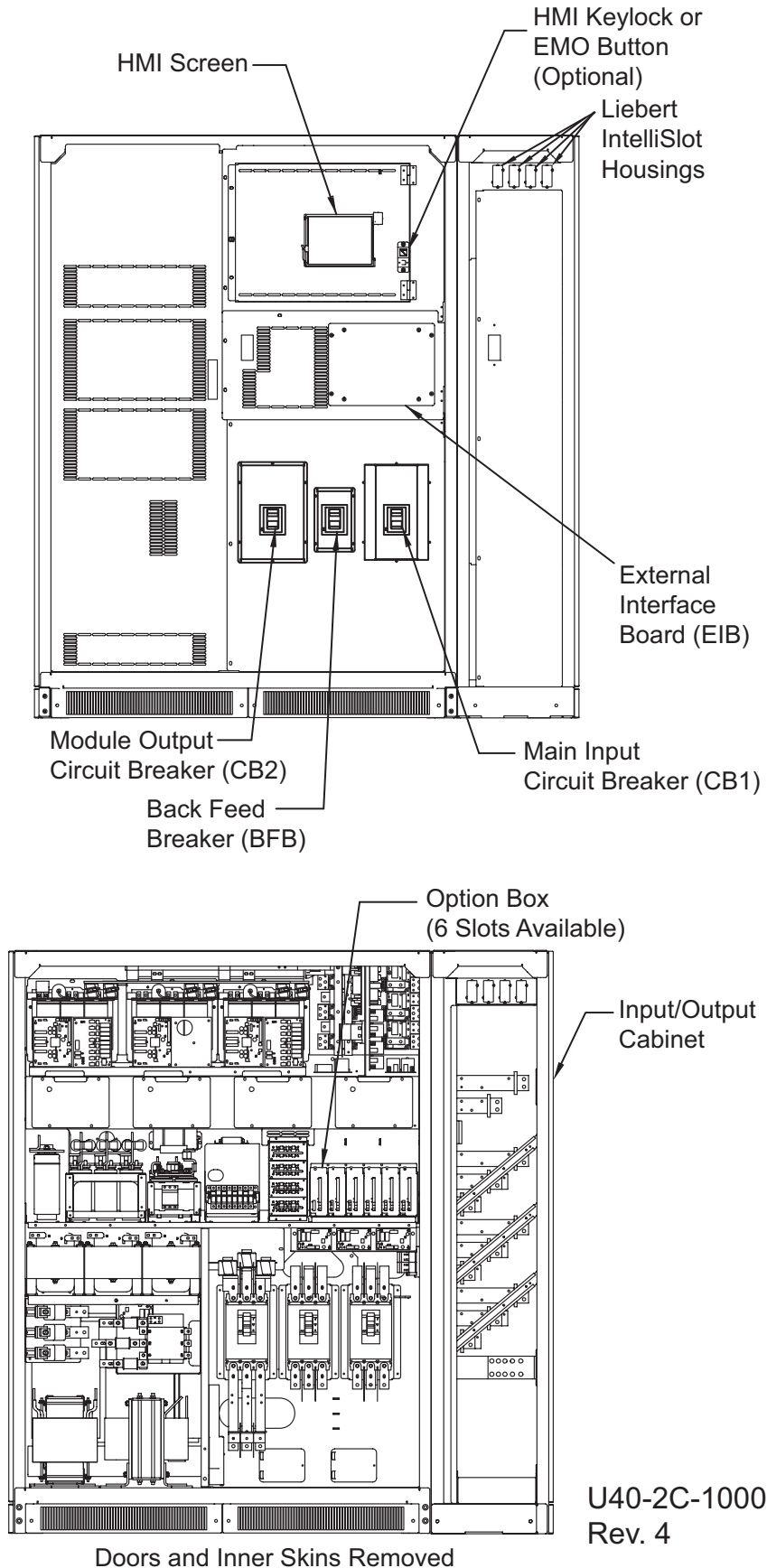
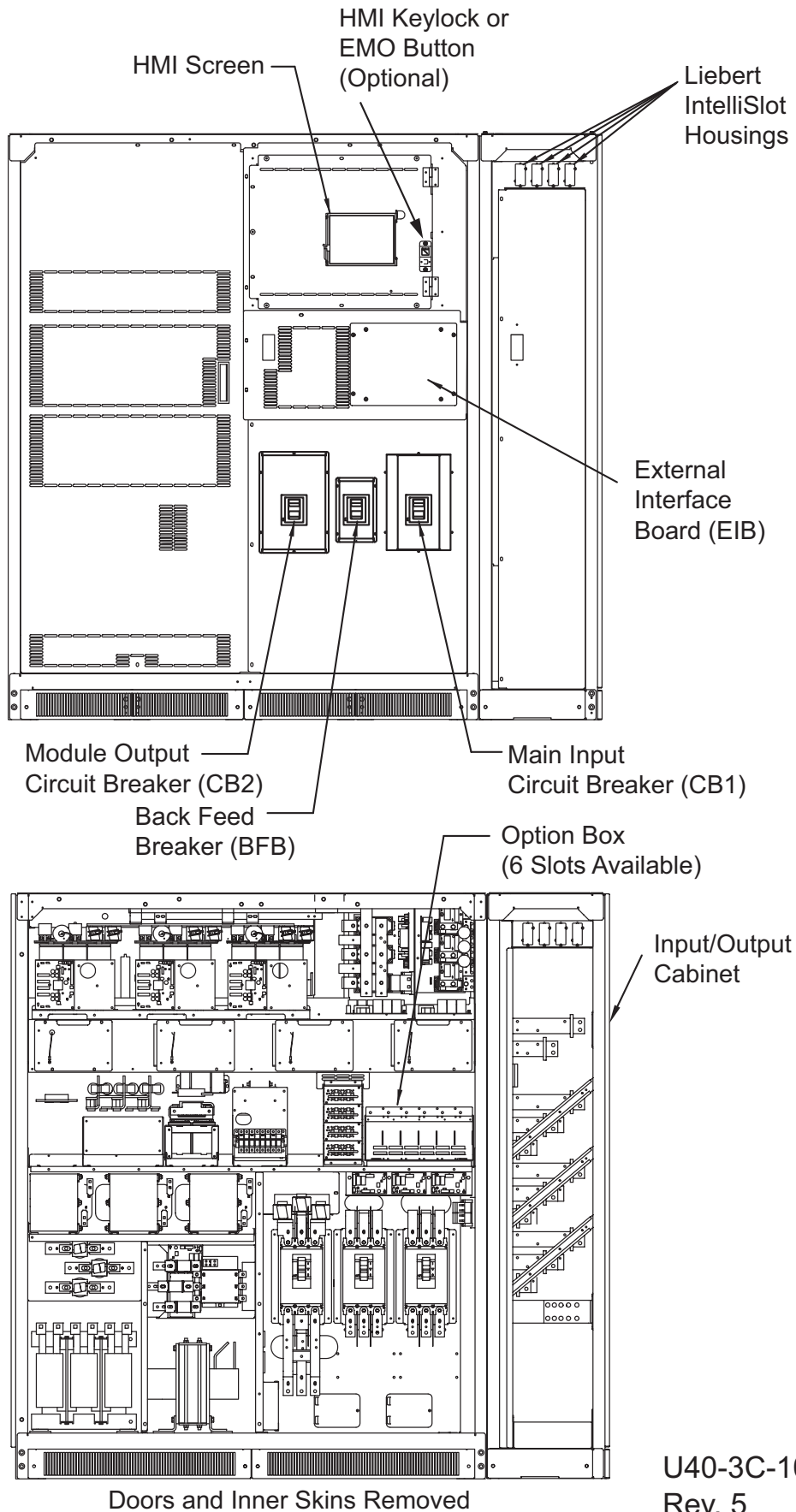


Figure 22 Main components, 250kVA, 575/600V, and 300kVA, 480/575/600V Liebert NXL



U40-3C-1000
Rev. 5

Figure 23 Main components, 400kVA, 480V Liebert NXL

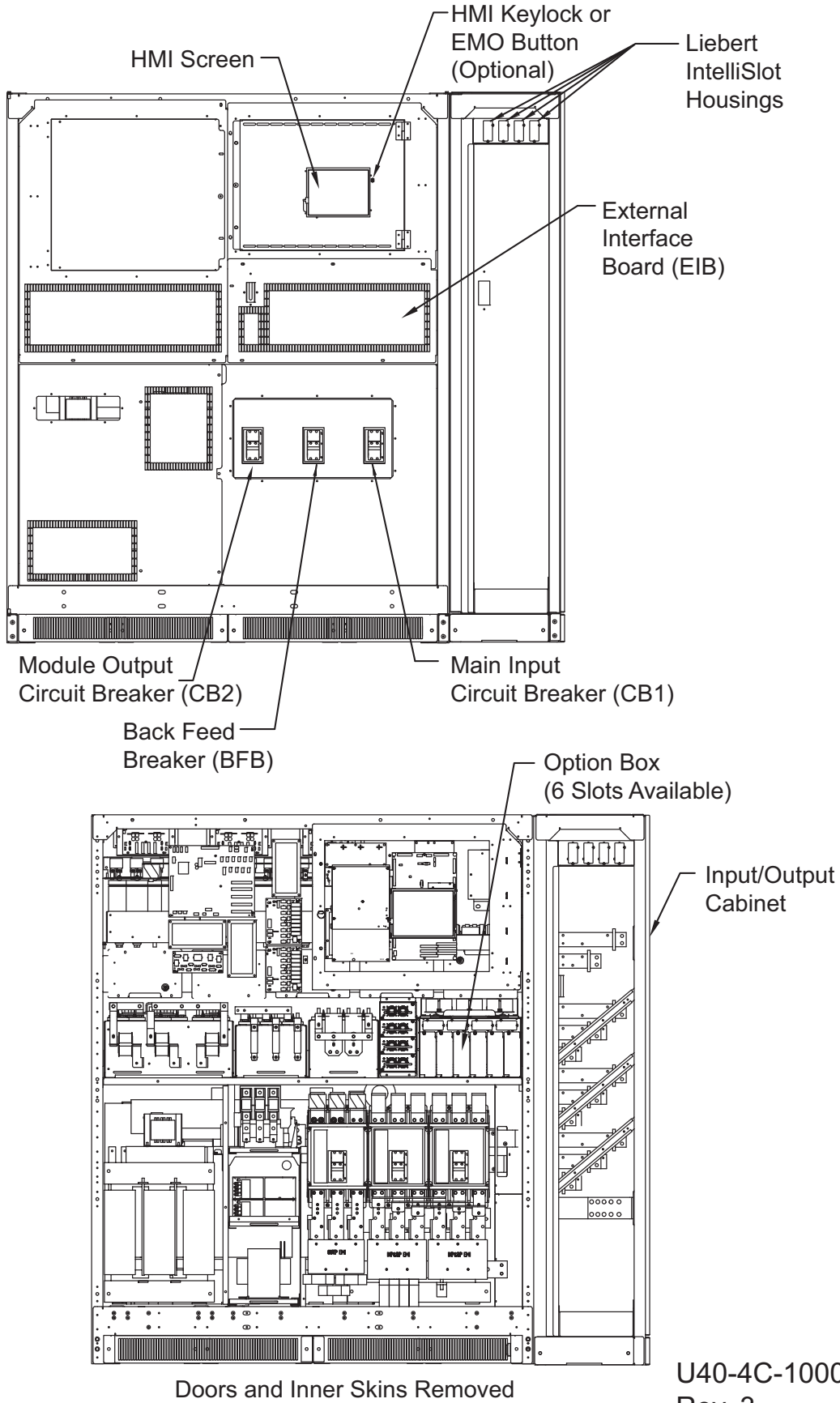


Figure 24 Main components, 400kVA, 575V/600V Liebert NXL

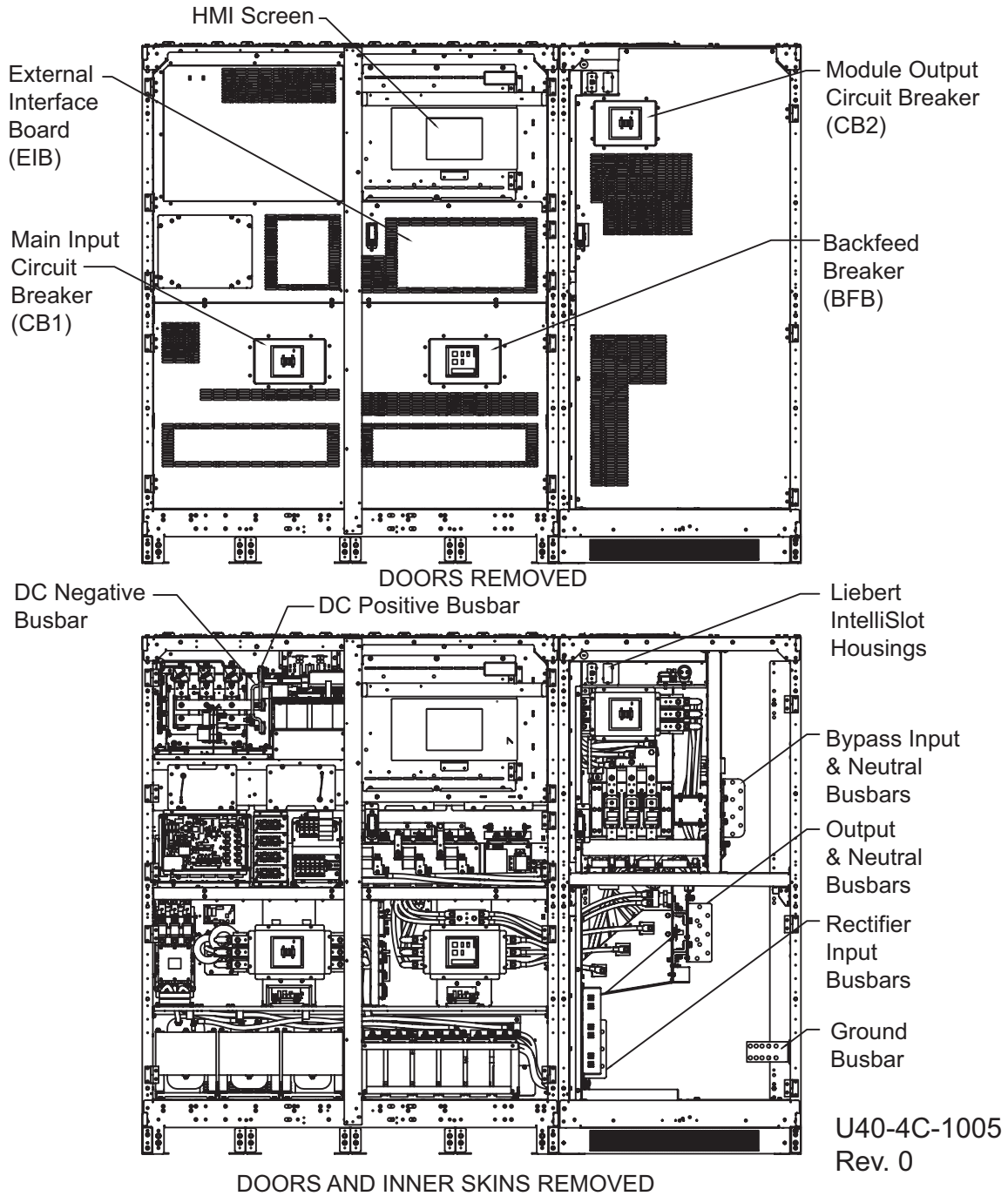


Figure 25 Main components, 400kVA, 575V/600V Liebert NXL with DC I/O cabinet

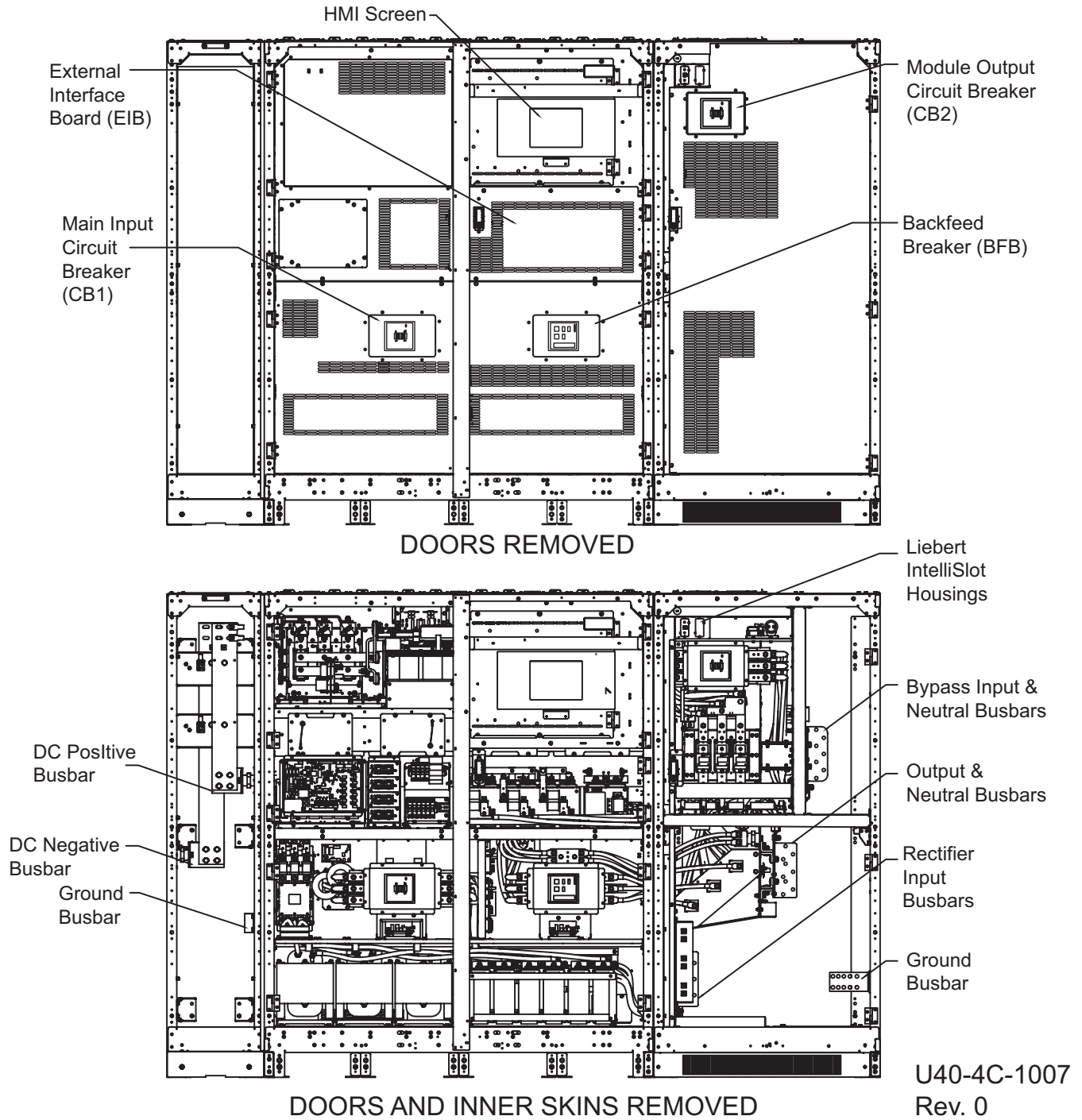


Figure 26 Input/output conduit detail drawing, 250-300kVA, all voltages, Liebert NXL

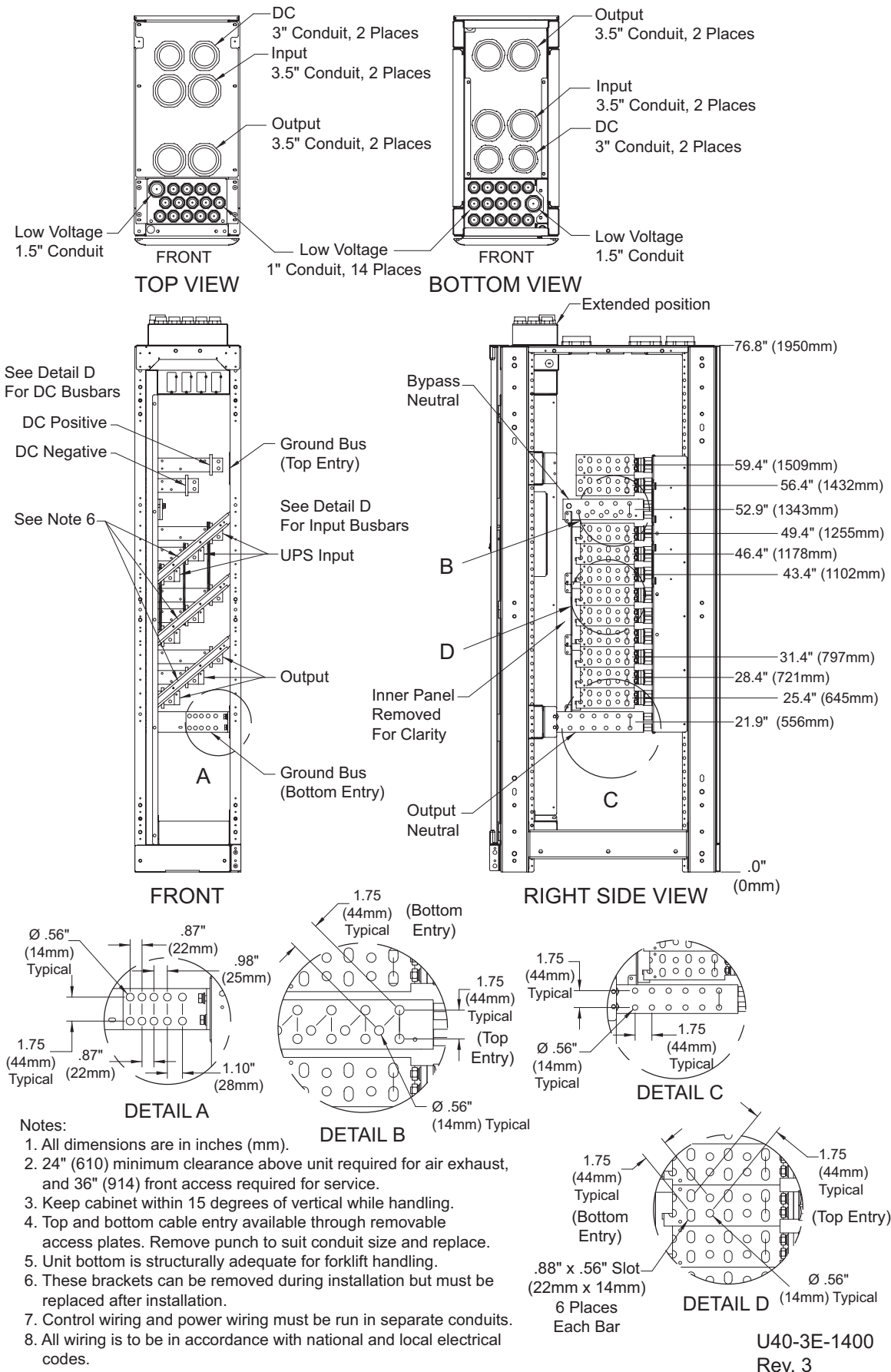
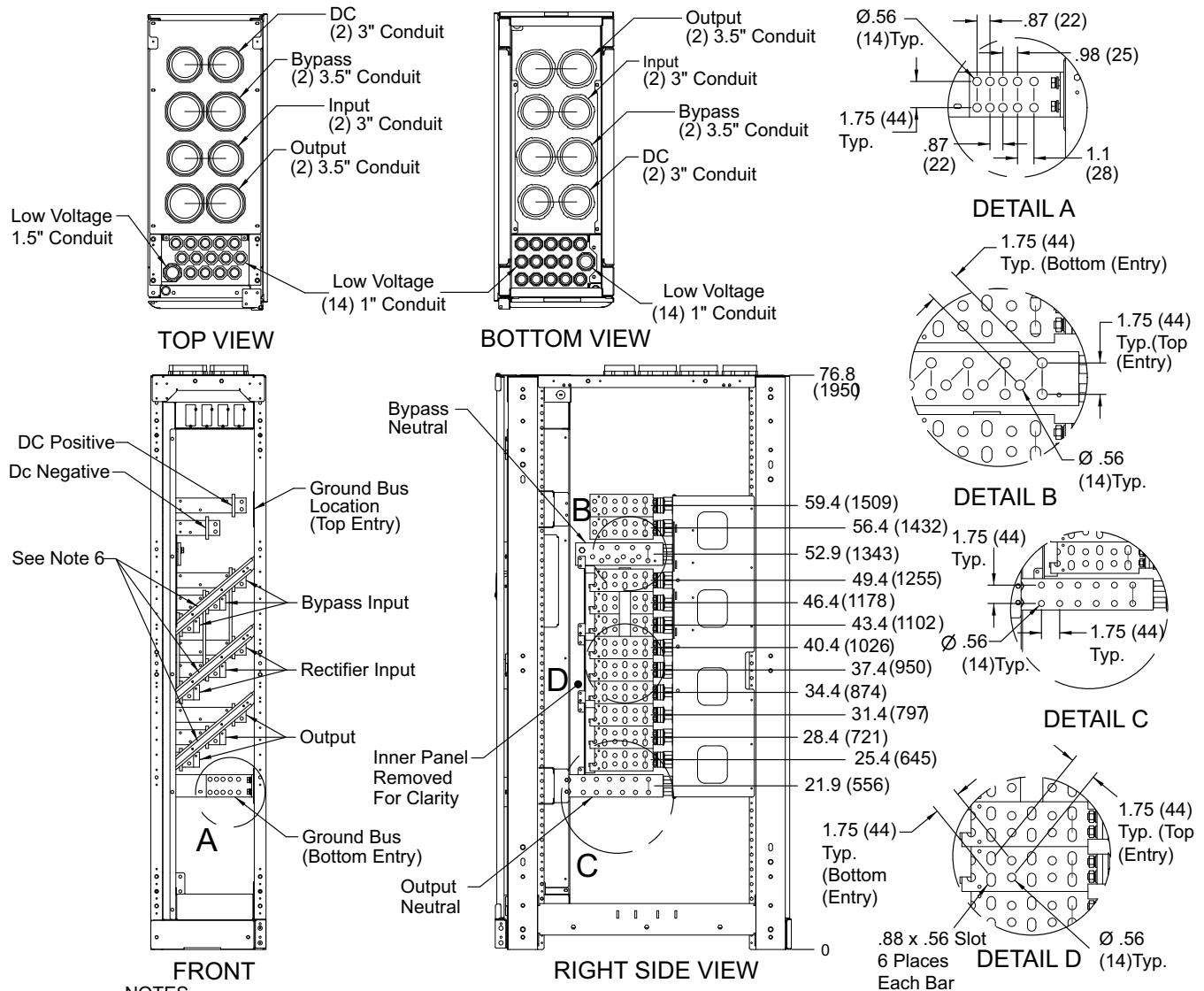


Figure 27 Input/output terminal detail, 400kVA, 480V Liebert NXL



NOTES

1. All dimensions are in inches (mm).
2. 24" minimum clearance above unit required for air exhaust.
3. Keep 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. Unit bottom is structurally adequate for forklift handling.
6. These brackets can be removed during installation but must be replaced after installation.
7. Control wiring and power wiring must be run in separate conduits.
8. Unless otherwise noted, use copper or aluminum conductors suitable for at least 75°C.
9. All wiring is to be in accordance with national and local electrical codes.

Figure 28 Input/output terminal detail, 400kVA, 575V/600V Liebert NXL

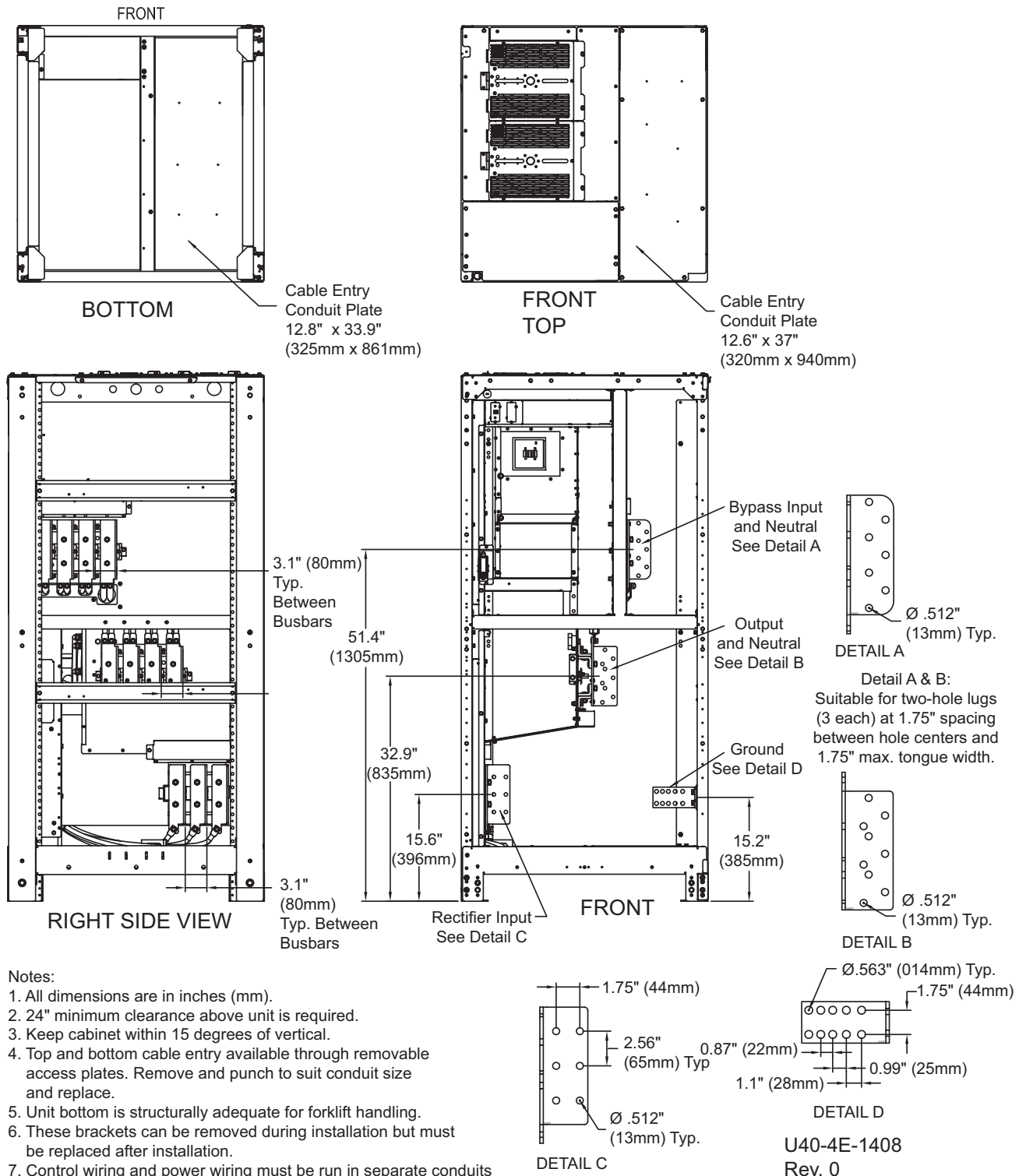


Figure 29 Input/output terminal detail, 400kVA, 575V/600V Liebert NXL with DC I/O cabinet

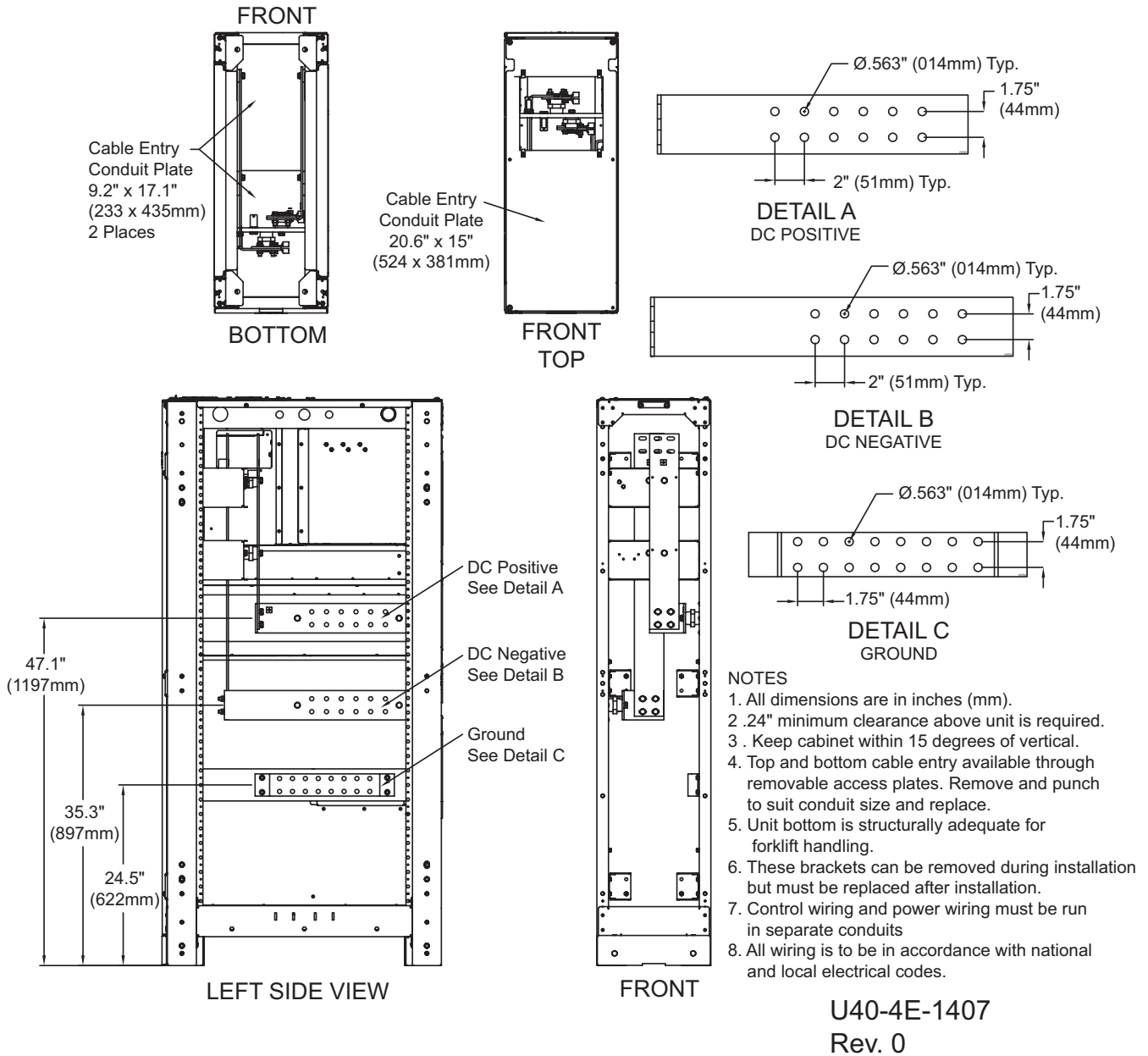


Figure 32 Single-input busbar arrangement—250-400kVA units

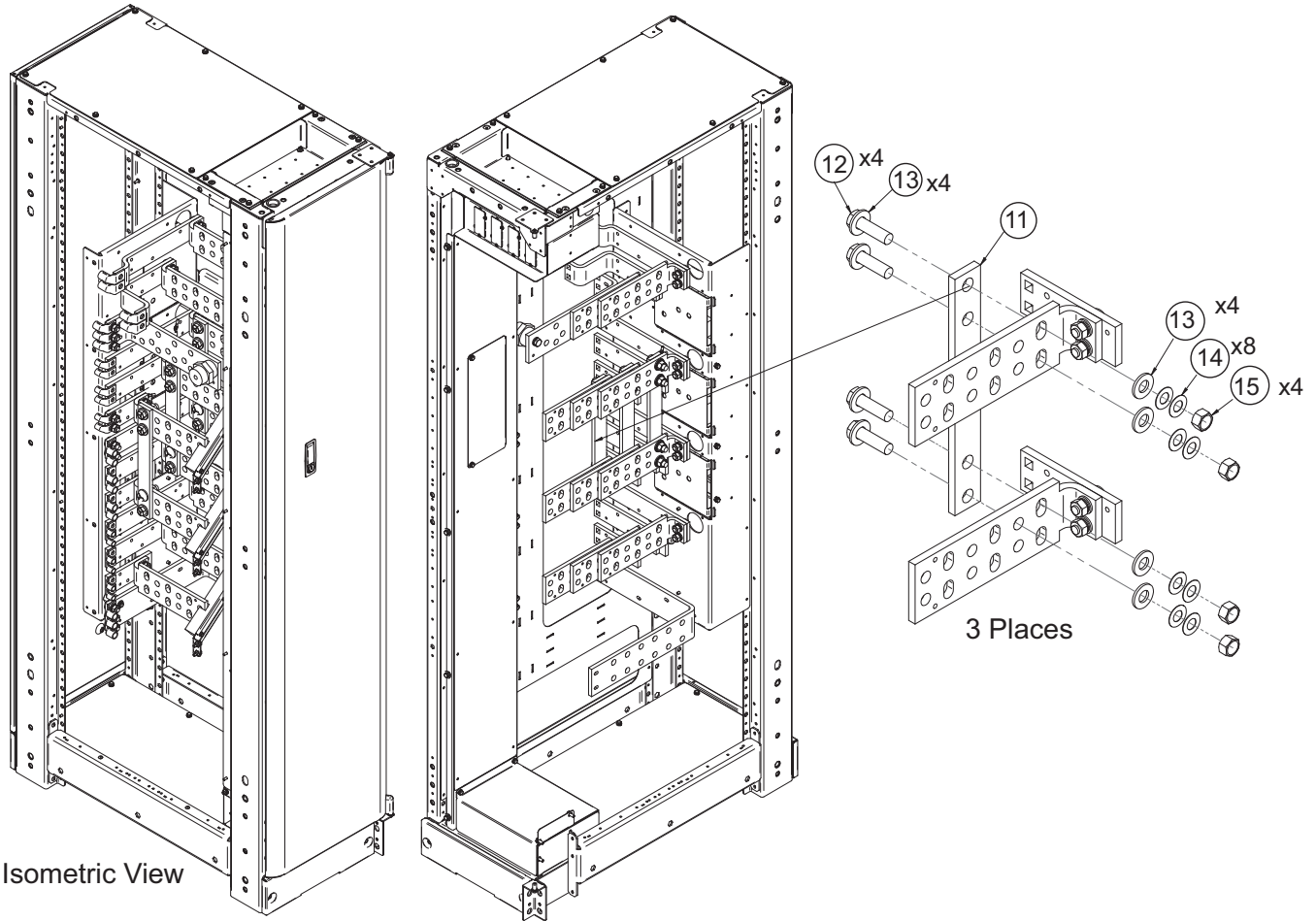
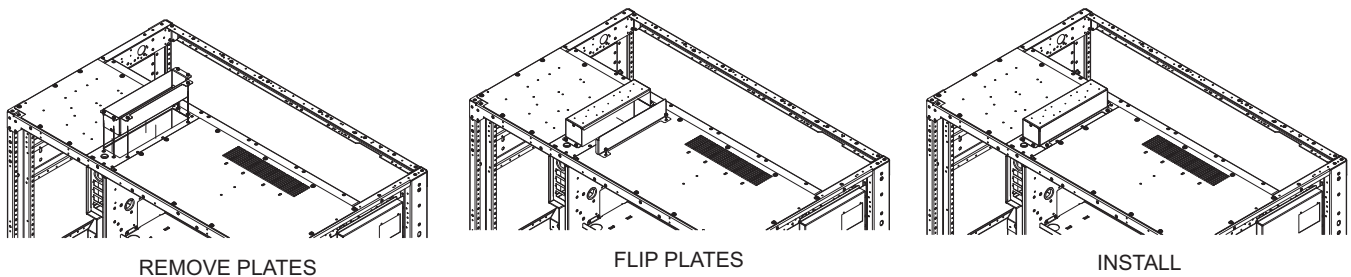


Figure 33 Low-voltage cable entry—250-400kVA units



Low-voltage cables can be installed through the top of each unit. The entry conduit landing plate is shipped inverted. To install, remove conduit plate, flip and reinstall. Removal of side plate is for access to pull wires.

5.0 SPECIFICATIONS

Table 10 Liebert NXL UPS specifications

	250kVA 480V	250kVA 575/600 V	300kV A 480V	300kVA 575/600 V	400kV A 480V	400kVA 575/600 V	400kVA 575/600 V with DC I/O Cabinet
Input Parameters							
Input Voltage to Rectifier, VAC	480/575/600V 3-phase, 3-wire						
Input Voltage to Bypass, VAC	480/575/600V 3-phase, 3-wire						
Input Voltage Range, VAC	+10% to -15 -15% to -20% * -20% to -30% ** <-30% ***						
Input Frequency, Hz	60						
Permissible Input Frequency Range, Hz	55 to 65						
Reflected Input THDi at Nominal Voltage at Full Load, %	<10% with 6-Pulse & Passive Filter						
Power Walk-In, sec	1 to 30 (selectable) in 1 sec. Increment						
Bypass Neutral Current	1.7 times full-phase current						
Battery & DC Parameters							
Battery Type	VRLA (Valve Regulated Lead Acid) or (FLA) Flooded Lead Acid						
Nominal Battery Bus, VDC	480V						
Battery Float Voltage, VDC	540V						
Minimum End of Discharge Voltage, VDC	384V (for VRLA / Flooded Lead Acid)						
DC Ripple Voltage in Float & Const V Ch. Mode, %	<1 (RMS value) < 3,4% Vpp						
Temperature Compensated Battery Charging	Standard (with temperature probe)						
Output Parameters							
Inverter Type	IGBT-based Sine-Sine PWM Controlled						
Output Power, kW	225	270			360		
Output Voltage, VAC	480V 3-ph, 4-w						
Output Voltage Regulation, %	< 1% (3-phase RMS average)						
Output Voltage Regulation (100% Unbalanced Load)	< 2% (3-phase RMS average)						
Output Frequency, Hz	60						
Output Frequency Regulation, %	± 0.1						
Output THDv Linear Load at Nominal Voltage, %	<2%						
Output THDv at Nominal Voltage Including a 100kVA Non Linear Load per EN 62040-3, %	2.5% (max)						
Capacity to Handle High Crest Factor Load	3:1						
Capacity to handle Step Load, %	0-100 or 100-0						
Transient Recovery (linear loads), %	Within 5% peak-to-peak in one line cycle.						
Unbalance Loads Current Capacity	100% of nominal phase current						

* The UPS will operate at full load, but the battery charge will either be reduced or off (depending on input current).

** The UPS will operate at full load, but UPS may source share with the batteries (depending on input current).

*** UPS will be in Battery mode

Table 10 Liebert NXL UPS specifications (continued)

	250kVA 480V	250kVA 575/600 V	300kV A 480V	300kVA 575/600 V	400kV A 480V	400kVA 575/600 V	400kVA 575/600 V with DC I/O Cabinet
Capacity to Handle Leading PF Load							
0.9 lag to Nom	Subject to Max. kW rating						
at 0.95 Lead	Subject to Max. kW rating						
at 0,9 Lead	Subject to 12.5% kW derate or same Rating and 50°F (10°C) Temp. Derate						
Voltage Displacement, ° el	120° ±1° el (with 100% unbalanced load)						
Overload Conditions, % FL	105% for 85 minutes 110% for 60 minutes 125% for 10 minutes 150% for 1 minute						
Physical Parameters and Standards, in (mm)							
Width, With Side Panels ¹	71.8 (1823)	78.5 (1993)				98.4 (2500)	114.5 (2908)
Depth ²	33.5 (850)	39.4 (1000)					
Height	76.8 (1950)						
SMS Weight, Unpacked, lb. (kg) approximate	3965 (1798)	5440 (2468)	4840 (2195)	5440 (2468)	6280 (2849)	7945 (3604)	8275 (3754)
1+N Weight, Unpacked, lb. (kg) approximate	4040 (1833)	5515 (2502)	4915 (2229)	5515 (2502)	6380 (2894)	8045 (3649)	8375 (3799)
Max heat Dissipation, Full Load, BTU/hr (kW)	<54,000 (15.8)	<54,000 (15.8)	<62,000 (18.2)	<64,500 (18.9)	<74,500 (21.8)	<86,300 (25.3)	<86,300 (25.3)
Cooling Air CFM	5894				7092		
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, in (mm)	24 (610)						
Minimum Clearance, Back, in (mm)	0						
Minimum Clearance, Sides, in (mm)	0						
Location of Cable Entrance	Top or Bottom						
Standards and Conformities	UL 1778, 4th Ed; CSA 22.2 107.3; FCC Part 15, Class A FCC, Class A—Standard; IEC62040-2, Level 4, Criteria A EN61000-4-3, Level 3, Criteria A; EN61000-4-6, Level 4, Criteria A; EN61000-2-2, Criteria A EN61000-4-4, Level 4, Criteria A ANSI C62.41, Category A3 & B3; IBC 2012/CBC 2010 ISTA Procedure 1H; WEEE						
Environmental Parameters							
Storage Temperature Range, °F (°C)	-13 to 158 (-25 to 70)						
Operating Temperature Range, °F (°C)	32 to 104 (0 to 40) (UPS)						
Acoustical Noise, dBA	68						
Relative Humidity	95% or less Non-Condensing (Operating and Non-Operating)						
Maximum Altitude Above MSL, ft (m)	4920 (1500) (as per IEC 62040/3) - 1% Max kW derate / 328 rise between 4921-9842 (100m rise between 1500-3000m)						

1. Width dimensions are with side panels attached. Subtract 1.4" (35mm) for dimensions without side panels.
2. Depth dimensions include the front door and rear panel.

Table 11 Current ratings—rectifier input

UPS Rating		Voltage, VAC	Nominal Current	Maximum Current
kVA	kW			
250	225	480	312	389
250	225	575	260	326
250	225	600	250	312
300	270	480	371	464
300	270	575	308	386
300	270	600	295	368
400	360	480	497	621
400	360	575	419	524
400	360	600	401	502

Table 12 Current ratings—bypass input

UPS Rating		Voltage, VAC	Nominal Current
kVA	kW		
250	225	480	301
250	225	575	251
250	225	600	241
300	270	480	361
300	270	575	301
300	270	600	289
400	360	480	481
400	360	575	402
400	360	600	385

Table 13 Current ratings—output

UPS Rating		Voltage, VAC	Nominal Current
kVA	kW		
250	225	480	301
250	225	575	251
250	225	600	241
300	270	480	361
300	270	575	301
300	270	600	289
400	360	480	481
400	360	575	402
400	360	600	385

Notes on Tables

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 NEC 100.
2. Maximum input current is controlled by the current limit setting, which is adjustable. Values shown are for a maximum setting of 125%. The standard factory setting is 125%. If a smaller input feed breaker is used, the input current limit must be adjusted accordingly.
3. For units with an input transformer, the Rectifier Input Feed Breaker must be set to handle the Liebert NXL transformer inrush of up to eight times the nominal current.
4. For breaker coordination while the module is overloaded, see the current-versus-time values on the overload curves, **Figures 34 and 35**.
5. The battery current is at an EOD voltage of 1.61 volts/cell.

Table 14 Current ratings—battery

UPS Rating		AC Input/Output Voltage, VAC	Maximum Battery Current at EOD
kVA	kW		
250	225	480, 575 and 600	615
300	270	480, 575 and 600	730
400	360	480	980
400	360	600	990

Table 15 Recommended conduit and cable sizes

UPS Rating		Voltage (VAC)	(# of conduits); size of conduits; # -size of phase cables per conduit; size of cable for ground per conduit	
kVA	kW		Copper Conductors	Aluminum Conductors
250	225	480	(2) 2C 3-250kcmil, #3AWG	(2) 2C 3-350kcmil, #1AWG
250	225	575	(2) 1.5C 3-#4/OAWG, #3AWG	(2) 1.5C 3-250kcmil, #1AWG
250	225	600	(2) 1.5C 3-#4/OAWG, #3AWG	(2) 1.5C 3-250kcmil, #1AWG
300	270	480	(2) 2C 3-350kcmil, #2AWG	(2) 2.5C 3-500kcmil, #1/OAWG
300	270	575	(2) 2C 3-250kcmil, #3AWG	(2) 2.0C 3-350kcmil, #1AWG
300	270	600	(2) 1.5C 3-#4/OAWG, #3AWG	(2) 2.0C 3-300kcmil, #1AWG
400	360	480	(2) 2.5C, 3-500kcmil, #1/OAWG	(2) 2.5C 3-750kcmil, #3/OAWG
400	360	575	(2) 2.5C 3-350kcmil, #2AWG	(2) 2.5C 3-500kcmil, #1/OAWG
400	360	600	(2) 2.5C 3-350kcmil, #2AWG	(2) 2.5C 3-500kcmil, #1/OAWG
Bypass Input				
UPS Rating		Voltage (VAC)	(# of conduits); size of conduits; # -size of phase cables per conduit; # -size of neutral cables per conduit; size of cable for ground per conduit	
kVA	kW		Copper Conductors	Aluminum Conductors
250	225	480	(2) 2.5C 3-250kcmil, 2-#4/OAWG, #3AWG	(2) 2.5C 3-350kcmil, 2-#250kcmil, #1AWG
250	225	575	(2) 2C 3-#4/OAWG, 2-#2/OAWG, #4AWG	(2) 2.0C 3-250kcmil, 2-#4/OAWG, #2AWG
250	225	600	(2) 2C 3-#4/OAWG, 2-#2/OAWG, #4AWG	(2) 2.0C 3-250kcmil, 2-#4/OAWG, #2AWG
300	270	480	(2) 2.5C 3-350kcmil, 2-#4/OAWG, #3AWG	(2) 2.5C 3-500kcmil, 2-300kcmil, #1AWG
300	270	575	(2) 2.5C 3-250kcmil, 2-#4/OAWG, #3AWG	(2) 2.5C 3-350kcmil, 2-250kcmil, #1AWG
300	270	600	(2) 2C 3-#4/OAWG, 2-#4/OAWG, #4AWG	(2) 2.5C 3-300kcmil, 2-250kcmil, #2AWG
400	360	480	(3) 3.5C, 3-600kcmil, 2-500kcmil, #1/OAWG	(2) 3.5C 3-750kcmil, 2-500kcmil, #1/OAWG
400	360	575	(2) 2.5C 3-#4/OAWG, 2-#4/OAWG, #2AWG	(2) 3C 3-300kcmil, 2-300kcmil, #1/OAWG
400	360	600	(2) 2.5C 3-#4/OAWG, 2-#4/OAWG, #2AWG	(2) 3C 3-300kcmil, 2-300kcmil, #1/OAWG
Output				
UPS Rating		Voltage (VAC)	(# of conduits); size of conduits; # -size of phase cables per conduit; # -size of neutral cables per conduit; size of cable for ground per conduit	
kVA	kW		Copper Conductors	Aluminum Conductors
250	225	480	(2) 2.5C 2-250kcmil, 2-#4/OAWG, #3AWG	(2) 2.5C 3-350kcmil, 2-#250kcmil, #1AWG
250	225	575	(2) 2C 3-#4/OAWG, 2-#2/OAWG, #4AWG	(2) 2.0C 3-250kcmil, 2-#4/OAWG, #2AWG
250	225	600	(2) 2C 3-#4/OAWG, 2-#2/OAWG, #4AWG	(2) 2.0C 3-250kcmil, 2-#4/OAWG, #2AWG
300	270	480	(2) 2.5C 3-350kcmil, 2-#4/OAWG, #3AWG	(2) 2.5C 3-500kcmil, 2-300kcmil, #1AWG
300	270	575	(2) 2.5C 3-250kcmil, 2-#4/OAWG, #3AWG	(2) 2.5C 3-350kcmil, 2-250kcmil, #1AWG
300	270	600	(2) 2C 3-#4/OAWG, 2-#4/OAWG, #4AWG	(2) 2.5C 3-300kcmil, 2-250kcmil, #2AWG
400	360	480	(3) 3.5C, 3-600kcmil, 2-500kcmil, #1/OAWG	(2) 3.5C 3-750kcmil, 2-500kcmil, #1/OAWG
400	360	575	(2) 2.5C 3-#4/OAWG, 2-#4/OAWG, #2AWG	(2) 3C 3-300kcmil, 2-300kcmil, #1/OAWG
400	360	600	(2) 2.5C 3-#4/OAWG, 2-#4/OAWG, #2AWG	(2) 3C 3-300kcmil, 2-300kcmil, #1/OAWG
Battery				
UPS Rating		(# of conduits); size of conduits; # -size of phase cables per conduit; size of cable for ground per conduit		
kVA	kW	Copper Conductors	Aluminum Conductors	
250	225	(2) 2C 2-600kcmil, #1/OAWG	(2) 2.5C 2-750kcmil, #3/OAWG	
300	270	(2) 2.5C 2-750kcmil, #1/OAWG	(3) 2.0C 2-500kcmil, #3/OAWG	

Table 15 Recommended conduit and cable sizes (continued)

400	360	(3) 2C, 2-500kcmil, #2/OAWG	(3) 2.0C 2-600kcmil, #4/OAWG
Bonding			
UPS Rating		Main Bonding Jumper/Grounding Electrode Conductor	
kVA	kW	Copper Conductors	Aluminum Conductors
250	225	(1) #1/OAWG/ (1) #1/OAWG	(1) #1/OAWG/ (1) #1/OAWG
300	270	(1) #2/OAWG/ (1) #2/OAWG	(1) #2/OAWG/ (1) #2/OAWG
400	360	(1) #2/OAWG/ (1) #2/OAWG	(1) #2/OAWG/ (1) #2/OAWG

1. Recommended cable sizes are 167°F (75°C) (THW) wire at 86°F (30°C) ambient. Unless otherwise noted, use copper or aluminum conductors suitable for at least 75°C.
2. For continuous operations not at 86°F (30°C), recommend that the site planner choose the appropriate cable type based on the particular installation requirements.
3. Conduit size is based on FMC type conduit with two neutral conductors rated at 200% of phase.

Figure 34 Inverter overload data

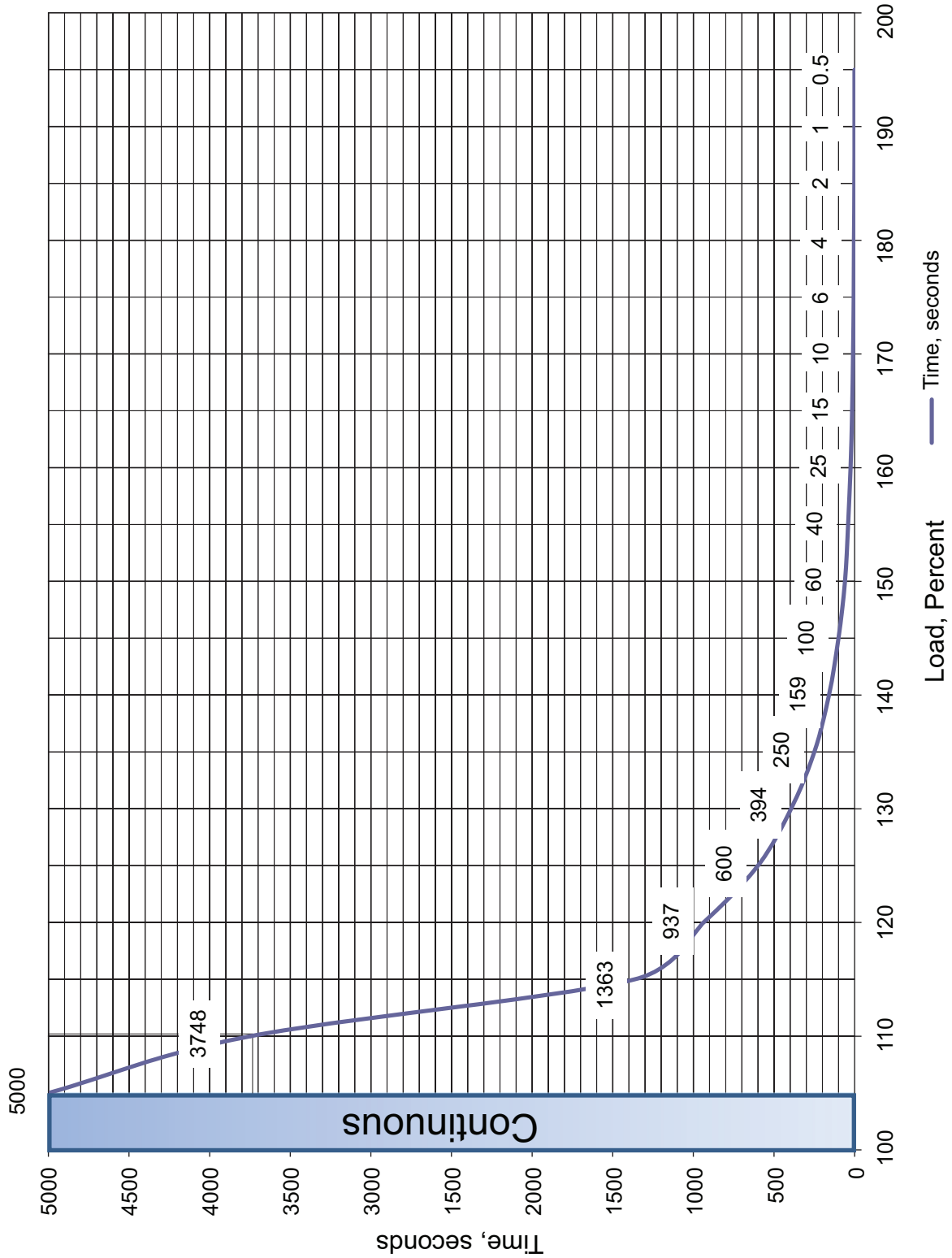


Figure 35 Bypass overload data

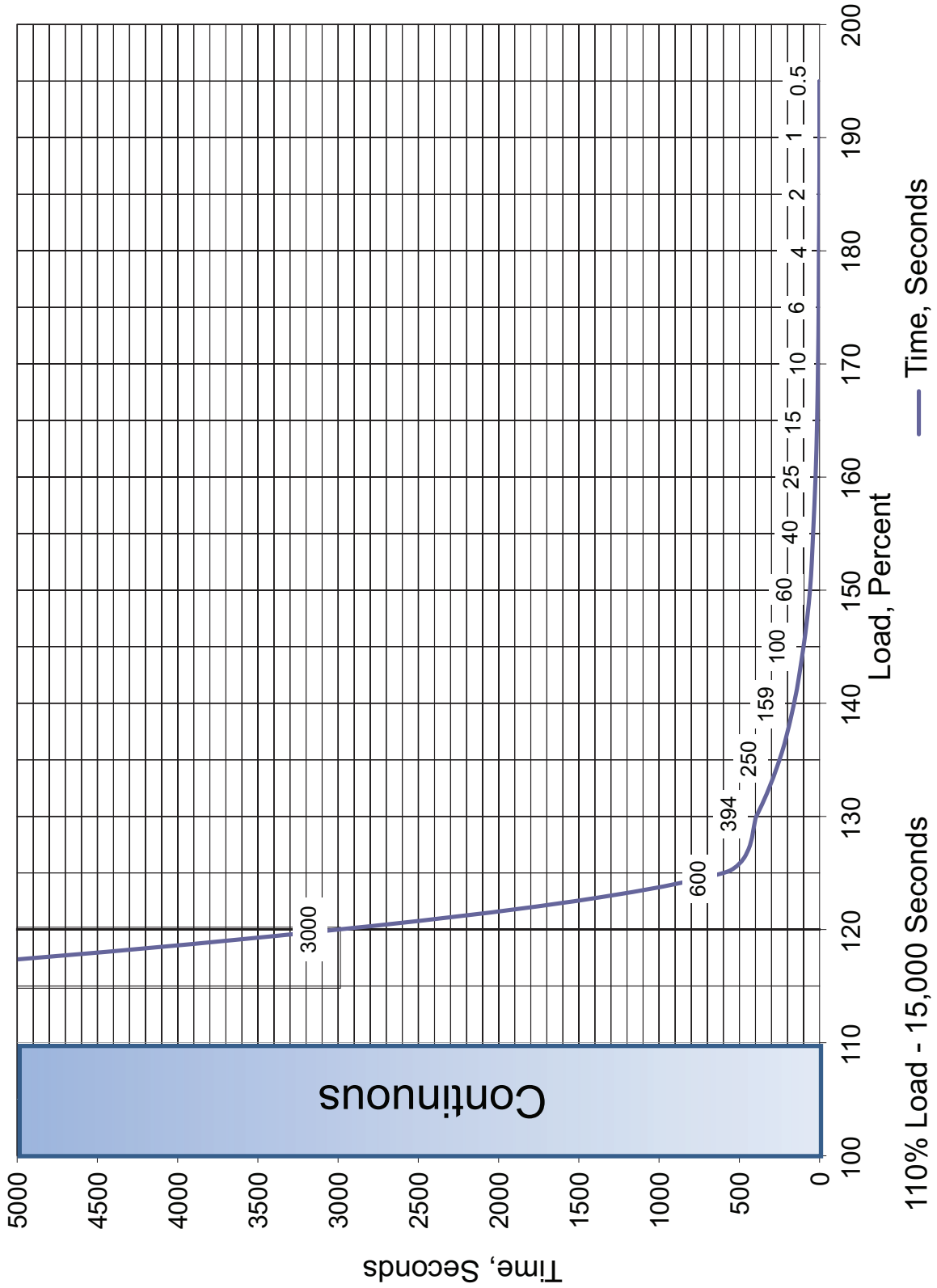


Table 16 Recommended lug sizes

Cable Size	T&B Copper One Hole	T&B Copper Two Hole	T&B Aluminum One Hole	T&B Aluminum Two Hole
#8AWG	54930BE	54850BE	60104-TB	—
#6AWG	54905BE	256-30695-868	60109-TB	—
#4AWG	54906BE	256-30695-733	60114-TB	—
#2-3AWG	54942BE	54811BE	60120	—
#1AWG	54947BE	54857BE	60126	—
#1/0AWG	54950BE	256-30695-593	60132	—
#2/OAWG	54951BE	54862BE	60138	60238
#3/OAWG	54965BE	54864BE	60144	60244
#4/OAWG	54970BE	54866BE	60150	60250
250kcmil	54913BE	54868BE	60156	60256
300kcmil	54914BE	54870BE	60162	60262
350kcmil	54915BE	54872BE	60165	60267
400kcmil	54916BE	54874BE	60168	60269
500kcmil	54918BE	54876BE	60171	60273
600kcmil	54920BE	54878BE	60176	60275
750kcmil	54922BE	54880BE	60178	60277

Table 17 Recommended torque values

Grade 5 Steel – Unified Thread System Torque Units - lbf.*in.						Class 8.8 Steel – Metric Thread System Torque Units - N*m					
Fastener Finish =>		Plain Steel		Zinc Plating		Fastener Finish =>		Plain Steel		Zinc Plating	
Size	Threads/Inch, Tpi	No Washer/Flat Washer	Lock Washer	No Washer/Flat Washer	Lock Washer	Size	Thread Pitch Tp	No Washer/Flat Washer	Lock Washer	No Washer/Flat Washer	Lock Washer
1/4	20	101	—	91	—	M5	0.8	6.1	—	5.5	—
	28	116	—	104	—		0.5	6.9	—	6.2	—
5/16	18	209	224	188	203	M6	1	10	—	9	—
	24	231	246	208	223		0.75	11	—	10	—
3/8	16	370	392	333	355	M8	1.25	25	—	23	—
	24	420	442	378	400		1	27	—	24	—
7/16	14	593	—	534	—	M10	1.5	50	64	45	59
	20	662	—	596	—		1.25	53	67	47	61
1/2	13	904	934	814	844	M12	1.75	87	128	78	119
	20	1,020	1,050	918	948		1.25	95	136	86	127
9/16	12	1,305	—	1,175	—	M14	2	139	—	125	—
	18	1,456	—	1,310	—		1.5	151	—	136	—



