

# The Great Lakes Construction Co.

TRANSMITTAL  
No. 161

10737 Medallion Drive  
Cincinnati, Ohio 45241

**PROJECT:** ODOT 150085 HAM 71-1.34      **DATE:** June 8, 2017

**TO:** ODOT District 8      **REF:** UPS Final Installation Drawings & User  
505 South SR 741      Manual R-01  
Lebanon, OH 45036

**ATTN:** Marvin Lennon

WE ARE SENDING	SUBMITTED FOR:	ACTION TAKEN:
Shop Drawings	Approval	Approved as Submitted
Letter	Your Use	Approved as Needed
Prints	As Requested	Returned after Loan
Change Order	X Review and Comment	Resubmit
Plans		X Submit
Samples	<b>SENT VIA:</b>	Returned
Specifications	X Attached	Returned for Correction
X Other: Submittals per Plan Notes	Separate Cover:	Due Date: 6/14/2017

<u>SUBMITTAL</u>	<u>COPIES</u>	<u>DATE</u>	<u>DESCRIPTION</u>
UPS Final Dwgs & Manual	1pdf	6/7/2017	UPS Final Installation Drawings & User Manual R-01

**REMARKS:** This UPS Final Installation Drawings & User Manual R-01 submittal provides information per plansheet 461/555. 1.04 A & B.

Plan Notes do not include a review/approval timeframe. We are requesting to have the review of submittal completed by 6/14/17.

Signed:



Ryan W. Jones, P.E.

# LYTLE TUNNEL RENOVATION &UPGRADES

## UPS INSTALLATION FINAL DRAWINGS Dwg. 461 of 555, 1.04.A

### HAM-71-01.34

GLENWOOD ELECTRIC, INC.  
12250 CHANDLER DRIVE  
WALTON, KY 41094  
(859)485-3700

I HEREBY CERTIFY THAT THE EQUIPMENT/MATERIAL SHOWN AND MARKED IN THIS SUBMITTAL IS IN COMPLIANCE WITH THE CONTRACT DRAWING AND SPECIFICATIONS, CAN BE INSTALLED IN THE ALLOCATED SPACE, WILL BE STORED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATION, WILL BE INSTALLED PER NEC, AND IS SUBMITTED FOR APPROVAL.

CERTIFIED BY: Phil Thaman

DATE: 5/23/2017



Liebert Products & Service

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Pasig City 1605  
Philippines  
Telephone: 63 2 687 6615  
Facsimile: 63 2 730 9572

# Emerson/Liebert NX 30kVA Emergency Lighting UPS System

Job Name	Lytle Tunnel – Emergency Lighting UPS
Model	38SB030CCC00L-SFA
Quantity	1 System
Date	October 5, 2015 (1/4/2017 Final Version)
Liebert #	Q02254537
Tag #	UPS–30kVA Emergency Lighting & Maintenance Bypass
Submitted By	Liebert Cincinnati Office – Climate Conditioning Co

# Liebert NX 60Hz 30kVA THREE-PHASE UPS ENGINEERING SPECIFICATION SHEET

**Project Name:** Lytle Tunnel –Emergency Lighting UPS

## **Emergency Lighting UPS System (UL924 Label) –**

**One (1) 30kVA Liebert NX UPS System, consisting of the UPS Module, Battery Cabinets System, Bypass Cabinet and Transformer Cabinets.**

- UPS System Dual Input Voltage Configuration:
  - Main UPS Input (Rectifier Input): 480V, 3-wire plus ground
  - Bypass Input: 480V, 3-wire plus ground
- UPS System output voltage configuration: 480/277V, 4-wire plus ground

## **Emergency Lighting UPS Application Note –**

Input voltage configuration: The Liebert UPS is supplied with a 480V, 3-wire plus ground input configuration, in order to be suitable for a 'dual input system configuration' (main UPS input and a separate bypass input). This UPS is listed as a separately derived source and includes a solid system neutral-ground bond with a new system neutral being derived within the UPS System (power quality best practice).

## **UPS Module –**

**THREE-PHASE UPS - Model 38SB030CCC00L, Capacity 30KVA / 24kW**

- Dual input, true on-line, double conversion
- IGBT pulse-width modulated (PWM) rectifier providing 0.99 input power factor and 4% reflected input current distortion (THD)
- IGBT pulse-width modulated (PWM) inverter
- Temperature compensated separate battery charger for use with valve-regulated lead acid (VRLA) batteries
- Service programmable battery charger parameters for use with wet cell lead acid and NiCad battery systems
- Automatic continuous duty static transfer switch
- Internal maintenance bypass switch
- Digital Signal Processing (DSP) control system
- All digital microprocessor based monitoring and ActiveStar Digital Signal Processing (DSP) control system
- Back-lit LCD Graphic Display with multilingual support and user friendly navigation menu
- Alarm History Database
- Redundant Cooling Fans
- Local EPO with provision for Remote EPO
- Three (3) Intellislot Communication Ports
- IP 20 enclosure
- Casters and leveling feet
- Meets ISTA 1B transportation requirements
- Meets FCC Part 15, Class A
- UL 1778 Listed and CSA Certified

- Internal battery system is fused and provides a disconnecting means for servicing
- 1 (One) Intellislot Relay Contact Interface Kit - This hot-installable card provides relay contact signals for " On Battery ", " Low Battery ", " On Bypass ", " UPS Fault ", " Summary Alarm ".Connections are to a DB25F connector or screw-down terminal strip with included adapter. Cabling is not included and must be provided by the end user.
- 1 (One) IS-WEBLB: IntelliSlot Web Card LB. This interface card delivers SNMP, TInet, SMS Text Messaging, Email and web-management capability for enhanced communications and control of Liebert UPS, Power Management, or Precision Cooling systems. The card manages a wide range of operating parameters, alarms and notifications, transmitting data over the network.

### **Battery System –**

#### **External Battery System rated for 128 minutes at a 30 kVA load with the following features:**

- Battery System consisting of two (2) strings of sealed VRLA batteries located in External Battery Cabinets
- **Two (2) External Battery Cabinet model number: 38BP030RWX1BNR**
  - Battery Cabinet is equipped with a means of disconnect for service
  - Battery Cabinet is shipped separately and include interconnecting cables to allow the battery cabinet to be bolted to the Right side of the UPS module.
- The battery is provided with a 3 year full and 7 year prorated warranty
- Listed to UL924 for emergency lighting applications.

### **Maintenance Bypass (Cabinet E-1) & Transformer Cabinet (Cabinet F-1) –**

- Cabinet provides a means to provide wrap-around bypass of the UPS / Battery Cabinets, along with the supplying the voltage step configuration of the System.
- Model 38MB030AAC6FS37 w/ SFA: NX-204127; MBC (Type E-1 and Type F-1 Cabinets)
  - Model includes the dual input configuration and consisting of two (2) cabinets for field connection to the left side of the UPS Cabinet.
  - Cabinet Type E-1 (MBC) – This Cabinet is to be equipped with the bypass input circuit breaker, the maintenance bypass switch, stacked transformers – input transformer (480V – 208/120V) and output transformer (bottom location; with 208V – 480/277V) and the main system output circuit breaker.
  - Cabinet Type F-1 – This cabinet is to be supplied with the rectifier input circuit breaker, the rectifier input isolation transformer (480V – 208/120V) and the neutral to ground bonded.
- Front Access service design
- Casters and leveling feet
- Note: The bypass switch is a single rotary switch interlocked for error free "make-before-break" manual transfers
- N.O. and N.C. auxiliary contacts

### **Additional Options included with the UPS System:**

- Spare parts kit – includes capacitors, monitor board, rectifier control board, SCR driver board, SCR's and fuses.

**System Services included with the UPS System –**

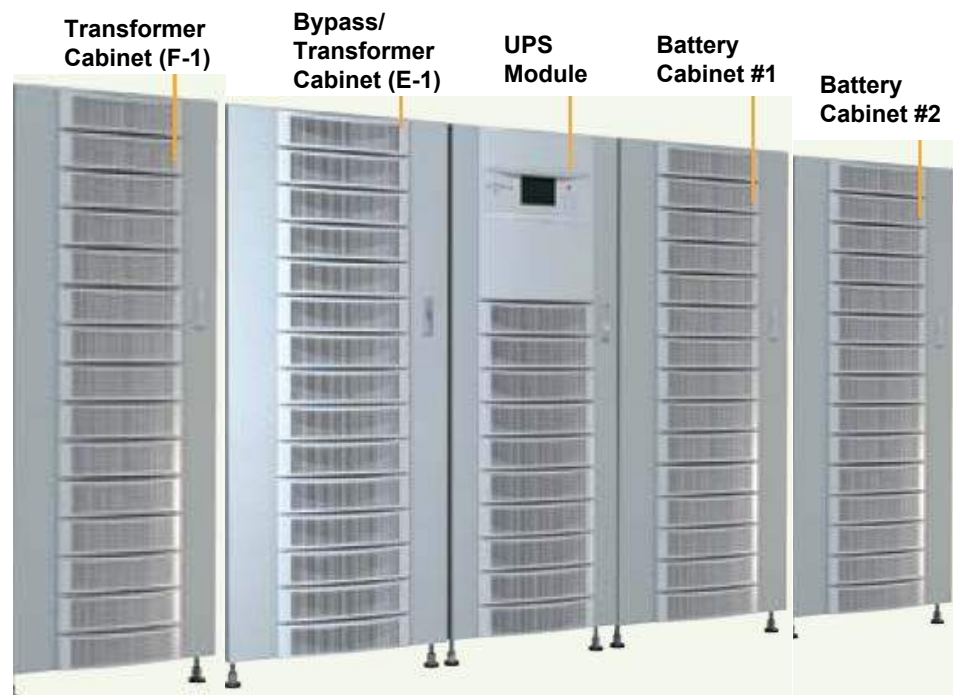
- Factory Certified Test Report
- 8 Hour Factory Burn-in – SFA #: NX-29304-1; NX 10-30: 8 Hour Full-Load Burn In with Data Logging (every 30min).
- Freight to first Cincinnati area destination, dock to dock; FOB factory
- Final System checkout and Startup by Liebert Services
  - Start-up includes one site trip by a Liebert Service customer engineer after the UPS has been installed. The site trip includes the following services for one UPS module: non-powered inspection, UPS electrical and operational checkout, full parts and labor for any remedial work required on the UPS or battery cabinets, and customer operation training. Start-up also includes remedial onsite labor, parts, and travel for the full one-year warranty period.
  - Startup 24x7 is scheduled at the customers designated time
- Liebert Service - Site UPS Installation Review with Installers
- Site Acceptance Test with Load Bank by Liebert Service Engineer

## NX Emergency Lighting UPS

- Dual Input – 480V, 3W plus Ground
- Output – 480V, 4W plus Ground

### System Cabinet Line-Up

- From Left to Right when facing the cabinets –
  - Transformer Cabinet – Bypass Cabinet – UPS Module – Battery #1 – Battery #2



### Dimensional Data - UPS System

Transformer Cabinet (Type F-1): 27.2"W x 32.5"D x 63"H

Bypass/Transformer Cabinet (Type E-1): 27.2"W x 32.5"D x 63"H

UPS Module: 23.62"W x 32.5"D x 63"H

Battery Cabinet #1: 56.8"W x 32.5"D x 63"H

Battery Cabinet #2: 56.8"W x 32.5"D x 63"H

# LIEBERT® NX™ 3-PHASE UPS: 30kVA, 60Hz

The Liebert NX is a true on-line, double conversion, three-phase UPS system that delivers complete, centralized power protection for mission-critical systems.

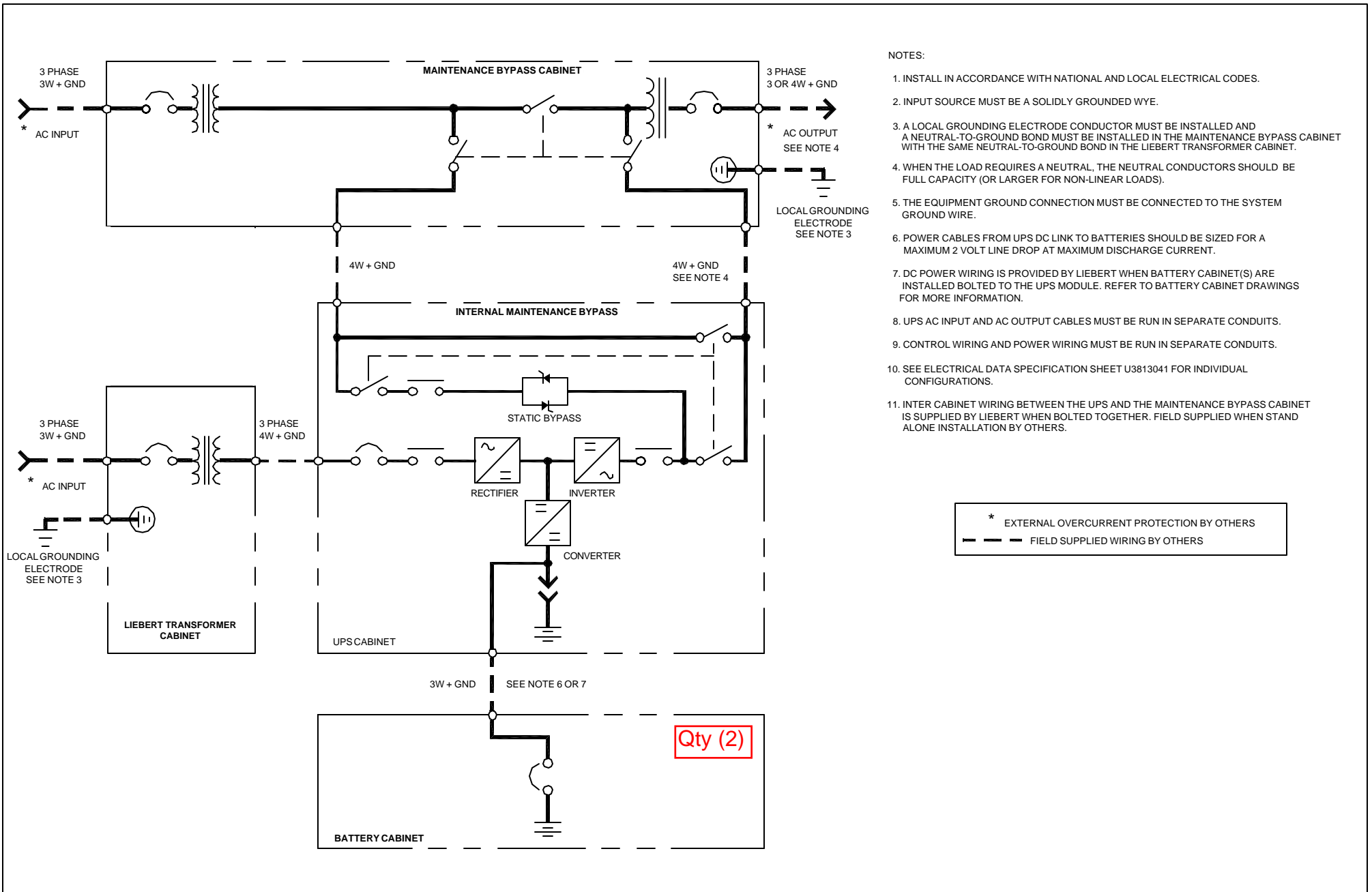
Designed to meet the high availability power needs of a wide variety of IT applications, the UPS combines compact size, advanced operating features and low cost of ownership.

- Increases growth flexibility by handling larger loads, plus the ability to parallel 20 and 30 kVA modules for increased capacity and redundancy.
- Achieves higher availability by reducing the number of UPS units required to power your room.
- Reduces total cost of ownership through the use of longer life batteries and simplified preventive maintenance.

## General Specifications

INPUT		OUTPUT	
<b>Voltage</b>	480V, 3-wire plus Gnd	<b>Voltage</b>	480V, 4-wire plus Gnd
<b>Voltage Range without derating</b>	+10%, -20%	<b>Voltage Adjustment Range</b>	±5%
<b>Frequency Range</b>	57-63Hz	<b>Voltage Regulation</b>	1% for balanced load 2% for 100% unbalanced load
<b>Current Distortion</b>	4% maximum reflected THD at full load	<b>Dynamic Regulation</b>	±5% deviation for 100% load step ±1% for loss or return of AC input
<b>Current Limit</b>	125% of full load input current	<b>Transient Response Time</b>	Recover to ±5% of output voltage within 1/2 cycle
<b>Current Walk-In</b>	20 seconds to full load	<b>Voltage Distortion</b>	For linear loads, 1% THD Less than 4% THD for 100% nonlinear loads without kVA/kW derating
<b>Power Factor</b>	0.99 lagging minimum at full load	<b>Phasing Balance</b>	120° ±0.5° for balanced load 120° ±1° for 100% unbalanced load
<b>Surge Protection</b>	Sustains input surges without damage, per criteria listed in IEC 1000-4-5	<b>Frequency Regulation</b>	±0.05% single module ±0.25% paralleled modules
ENVIRONMENTAL			
<b>Operating Temperature</b>	<b>UPS:</b> 32° to 104°F (0-40°C) <b>Battery:</b> 68° to 86°F (20-30°C)		
<b>Non-Operating Temperature</b>	-4° to 158°F (-20° to 70°C)		
<b>Relative Humidity</b>	0-95% non-condensing		
<b>Operating Altitude</b>	Up to 3,300 ft. (1,000m) without derating		
<b>Acoustical Noise</b>	Less than 54 dBA typical, measured 3.3 ft. (1m) from the UPS Module.		
<b>Load Power Factor Range</b>	0.70 lagging to 0.95 leading without derating		
<b>Overload</b>	125% of full load for 10 minutes 150% for one minute, with true sinusoidal waveform		
STANDARDS			
Listed to UL 1778 UPS standards, and CSA certified. Meets current requirements for safe high performance UPS operation.			





- NOTES:
1. INSTALL IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
  2. INPUT SOURCE MUST BE A SOLIDLY GROUNDED WYE.
  3. A LOCAL GROUNDING ELECTRODE CONDUCTOR MUST BE INSTALLED AND A NEUTRAL-TO-GROUND BOND MUST BE INSTALLED IN THE MAINTENANCE BYPASS CABINET WITH THE SAME NEUTRAL-TO-GROUND BOND IN THE LIEBERT TRANSFORMER CABINET.
  4. WHEN THE LOAD REQUIRES A NEUTRAL, THE NEUTRAL CONDUCTORS SHOULD BE FULL CAPACITY (OR LARGER FOR NON-LINEAR LOADS).
  5. THE EQUIPMENT GROUND CONNECTION MUST BE CONNECTED TO THE SYSTEM GROUND WIRE.
  6. POWER CABLES FROM UPS DC LINK TO BATTERIES SHOULD BE SIZED FOR A MAXIMUM 2 VOLT LINE DROP AT MAXIMUM DISCHARGE CURRENT.
  7. DC POWER WIRING IS PROVIDED BY LIEBERT WHEN BATTERY CABINET(S) ARE INSTALLED BOLTED TO THE UPS MODULE. REFER TO BATTERY CABINET DRAWINGS FOR MORE INFORMATION.
  8. UPS AC INPUT AND AC OUTPUT CABLES MUST BE RUN IN SEPARATE CONDUITS.
  9. CONTROL WIRING AND POWER WIRING MUST BE RUN IN SEPARATE CONDUITS.
  10. SEE ELECTRICAL DATA SPECIFICATION SHEET U3813041 FOR INDIVIDUAL CONFIGURATIONS.
  11. INTER CABINET WIRING BETWEEN THE UPS AND THE MAINTENANCE BYPASS CABINET IS SUPPLIED BY LIEBERT WHEN BOLTED TOGETHER. FIELD SUPPLIED WHEN STAND ALONE INSTALLATION BY OTHERS.

\* EXTERNAL OVERCURRENT PROTECTION BY OTHERS  
 - - - - - FIELD SUPPLIED WIRING BY OTHERS

DRAWN BY	SHEET NO. 1 OF 1
CHK BY	ECN NO.
REF. DWG.	ORDER NO.

ONE - LINE DIAGRAM 10 - 30 KVA UPS MODULE, DUAL INPUT WITH MAINT. BYPASS CABINET, BYPASS SWITCH, INPUT & OUTPUT CIRCUIT BREAKERS, EXTERNAL INPUT TRANSFORMER CABINET AND EXTERNAL BATTERY CABINET LIEBERT NX

DWG. NO.	
REV. NO. 3	DATE 5/29/2015

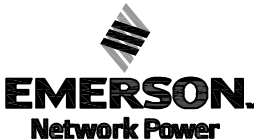
**Liebert**  
 P.O. BOX 29186  
 COLUMBUS, OHIO 43229



MBP-T TYPE F & P	INPUT VOLTAGE	AC RECTIFIER INPUT 3 PHASE 3 OR 4 WIRE AND GND			AC BYPASS INPUT 3 PHASE 3 OR 4 WIRE AND GND		DC INPUT 3 WIRE AND GND POSITIVE, MIDPOINT & NEGATIVE		AC OUTPUT 3 PHASE 3 OR 4 WIRE AND GND		
		CURRENT		RECOMMENDED EXTERNAL OVERCURRENT PROTECTION	NOMINAL CURRENT	RECOMMENDED EXTERNAL OVERCURRENT PROTECTION	NOMINAL VOLTAGE	MAX. DISCHARGE CURRENT	OUTPUT VOLTAGE	NOMINAL CURRENT	RECOMMENDED EXTERNAL OVERCURRENT PROTECTION
		NOM	MAX								
10KVA 8KW	208	26	32	40A	29	40A	288VDC (144 CELLS)	37	208	28	40A
	220	25	31	40A	27	40A					
	480	11	14	20A	12	20A					
	600	9	11	15A	10	15A					
15KVA 12KW	208	39	48	60A	43	60A	288VDC (144 CELLS)	55	208	42	60A
	220	36	46	60A	41	60A					
	480	19	21	30A	19	30A					
	600	13	17	25A	15	30A					
20KVA 16KW	208	51	64	80A	57	80A	288VDC (144 CELLS)	73	208	56	70A
	220	48	61	80A	54	70A					
	480	22	28	40A	25	40A					
	600	19	22	30A	20	30A					
30KVA 24KW	208	76	95	125A	86	125A	288VDC (144 CELLS)	110	208	83	125A
	220	72	90	110A	81	125A					
	480	33	41	50A	37	50A					
	600	26	33	40A	30	40A					
APPLICABLE NOTES		1	1	2	4						3

NOTES:

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. MAXIMUM INPUT CURRENT IS CONTROLLED BY THE CURRENT LIMIT.
2. RECOMMENDED AC INPUT EXTERNAL OVERCURRENT PROTECTION IS BASED ON 80% RATED DEVICES AND MAXIMUM INPUT CURRENT LIMIT SETTING.
3. RECOMMENDED AC OUTPUT EXTERNAL OVERCURRENT PROTECTION IS BASED ON 80% RATED DEVICES.
4. NOMINAL BATTERY VOLTAGE IS SHOWN AT 2.0 VOLTS/CELL.

DRAWN BY V. Carmona	SHEET NO. 1 OF 1	ELECTRICAL DATA SPECIFICATION SHEET 10kVA - 30kVA UPS MODULE, DUAL INPUT WITH MAINT. BYPASS TRANSFORMER CABINETS "F" OR "P" LIEBERT NX	DWG. NO. U3813047	DATE 3/9/15	REV. # 2	1050 DEARBORN DRIVE P.O. BOX 29186 COLUMBUS, OHIO 43229	
	CHK BY M. Dewitt						
REF. DWG.	ORDER NO.						

### NXb UPS Module - CIRCUIT BREAKER INFORMATION

Power	Location	Voltage	Manufacturer	Manufacturer's Part Number	ENPC's Part Number	Frame Amps	Tripe Amps	Interrupting Capacity	Rated
10KVA/8KW	CB1	AC480V	ABB	T1N100 TMF60-1500 3P FFC CuAl	16020774	100A	60A	22kVA	80%
15KVA/12KW	CB1	AC480V	ABB	T1N100 TMF60-1500 3P FFC CuAl	16020774	100A	60A	22kVA	80%
20KVA/16KW	CB1	AC480V	ABB	T1N100 TMF100-1500 3P FFC CuAl	16020775	100A	100A	25kVA	80%
			LG	ABH103U 100A		100A	100A	25kVA	
30KVA/24KW	CB1	AC480V	LG	TD125HU FTU125LL 125A 3P	16020836	125A	125A	65kVA	80%

### NXB MBC Bypass Cabinet PN: 38MB010AAC6FL CIRCUIT BREAKER INFORMATION

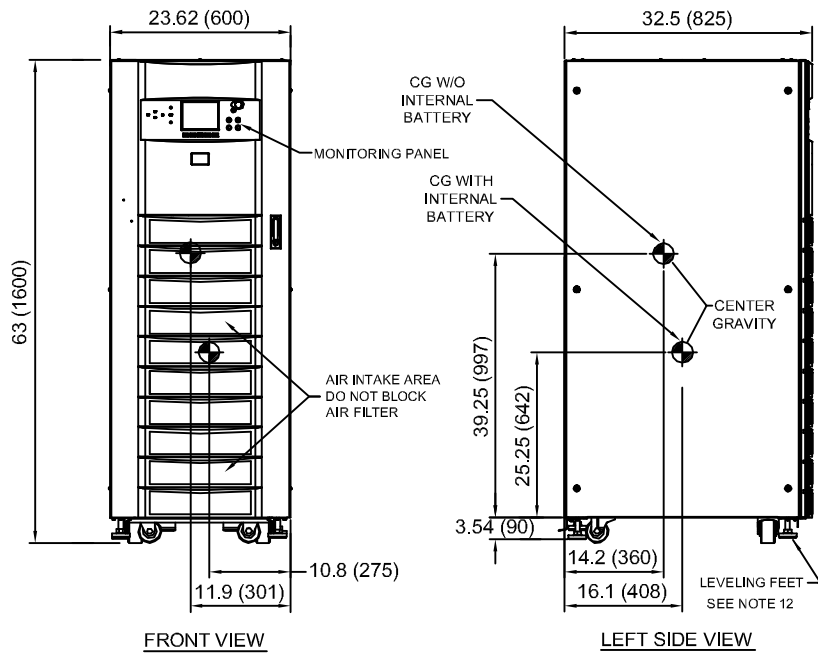
Power	Location	Voltage	Manufacturer	Manufacturer's Part Number	ENPC's Part Number	Frame Amps	Tripe Amps	Interrupting Capacity	Rated
10KVA/8KW	RIB + BIB	AC480V	SquareD	HGM36020TYE	548755P44	100A	60A	35kA	80%

The UPS Module includes the following breaker –

- CB1 / Input Breaker – TD125HU FTU125LL

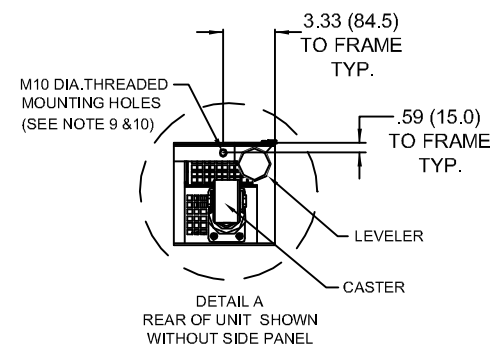
The Maintenance Bypass Cabinet includes the following breakers

- MBC – Rectifier input breaker – manufacturer PN - HGM36060TYE
- Bypass input breaker – manufacturer PN - HGM36060TYE
- Output breaker – manufacturer PN - HGP36125TYE

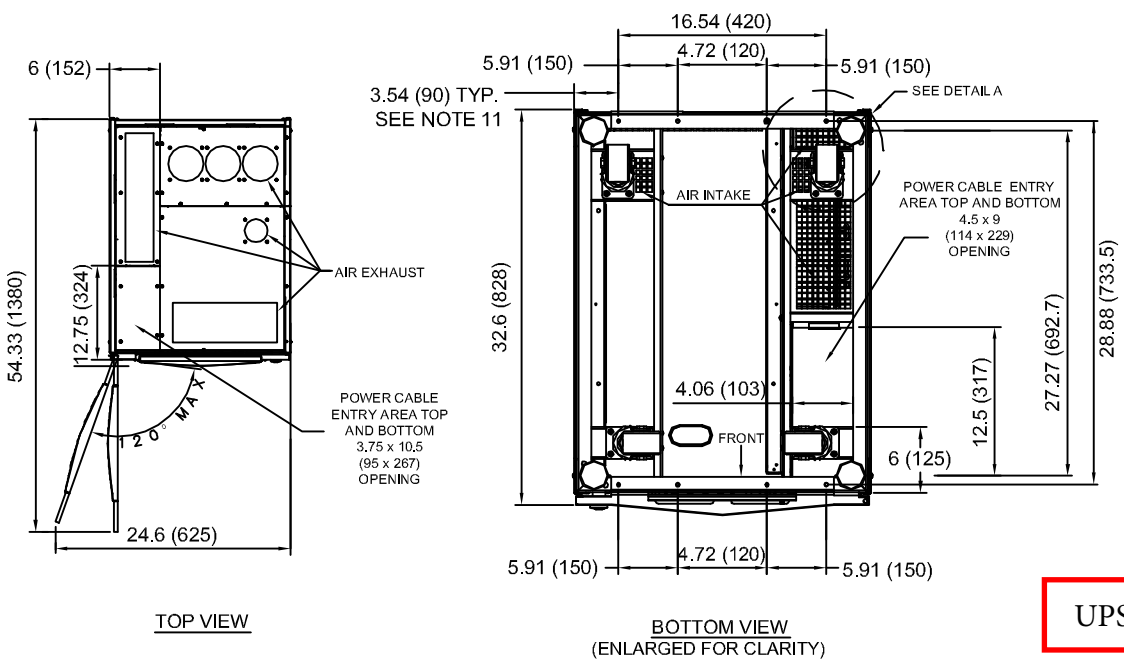


- NOTES:
1. ALL DIMENSIONS ARE IN INCHES (MM).
  2. 24" MINIMUM CLEARANCE ABOVE UNIT REQUIRED FOR AIR EXHAUST.
  3. LEFT SIDE ACCESS REQUIRED FOR INSTALLATION.
  4. KEEP CABINET WITHIN 15 DEG. OF VERTICAL WHILE HANDLING.
  5. TOP AND BOTTOM CABLE ENTRY AVAILABLE THROUGH REMOVABLE ACCESS PLATES. REMOVE, PUNCH TO SUIT CONDUIT SIZE AND REPLACE.
  6. COLOR - GRAY
  7. UNIT BOTTOM IS STRUCTURALLY ADEQUATE FOR FORKLIFT HANDLING.

8. OPEN DOOR TO REPLACE AIR FILTER, WASHABLE TYPE.
9. M10 THREADED MOUNTING HOLES USED FOR SEISMIC ANCHORING OR FLOORSTAND. NOTE, IF FLOORSTAND IS USED THE WEIGHT OF THE UNIT MUST BE SUPPORTED UNDER ALL CASTERS.
10. EACH MOUNTING LOCATION IS SUPPORTED BY (2) 10 GA. (.135") GALVANIZED STEEL. THE THREADED INSERT IS APPROX. 3/4" DEEP. MOUNTING HOLES FROM UNDERNEATH UNIT BASE. MOUNTING BOLTS MUST BE THREADED INTO UNIT
11. INCLUDES SIDE PANEL. REFER TO DETAIL A FOR DIMENSION TO FRAME WITH SIDE PANEL REMOVED. SIDE PANELS ARE REMOVED BETWEEN ADJACENT UNITS WHICH ARE BOLTED TOGETHER.
12. LEVELING FEET ARE NOT DESIGNED TO CARRY THE FULL WEIGHT OF THE CABINET. FINGER-TIGHT LEVELER AGAINST THE FLOOR. THEN TIGHTEN WITH A WRENCH LESS THAN 2 TURNS FOR FRICTION FIT AGAINST FLOOR.



KVA RATING	VOLTAGE		HEAT REJECTION BTU/HR	COOLING AIR CFM
	INPUT	OUTPUT		
10	120/208	120/208	2800	384
15	120/208	120/208	4200	558
20	120/208	120/208	5500	522
<b>30</b>	120/208	120/208	<b>8300</b>	<b>834</b>



KVA RATING	WEIGHT WITH INTERNAL BATTERY *			WEIGHT WITHOUT INTERNAL BATTERY *	
	BATTERY	LBS	KG	LBS	KG
10	FR	1000	454	450	205
	HR	1150	522		
	FX	1024	465	450	205
	HX	1270	576		
15	FR	1000	454	450	205
	HR	1150	522		
	FX	1024	465	450	205
	HX	1270	576		
20	FR	1100	500	550	250
	HR	1250	567		
	FX	1124	510	550	250
	HX	1370	621		
<b>30</b>	HR	1250	567	<b>550</b>	<b>250</b>
	HX	1370	621		

\* ADD 150LBS (68KG) TO GET CRATED WEIGHTS

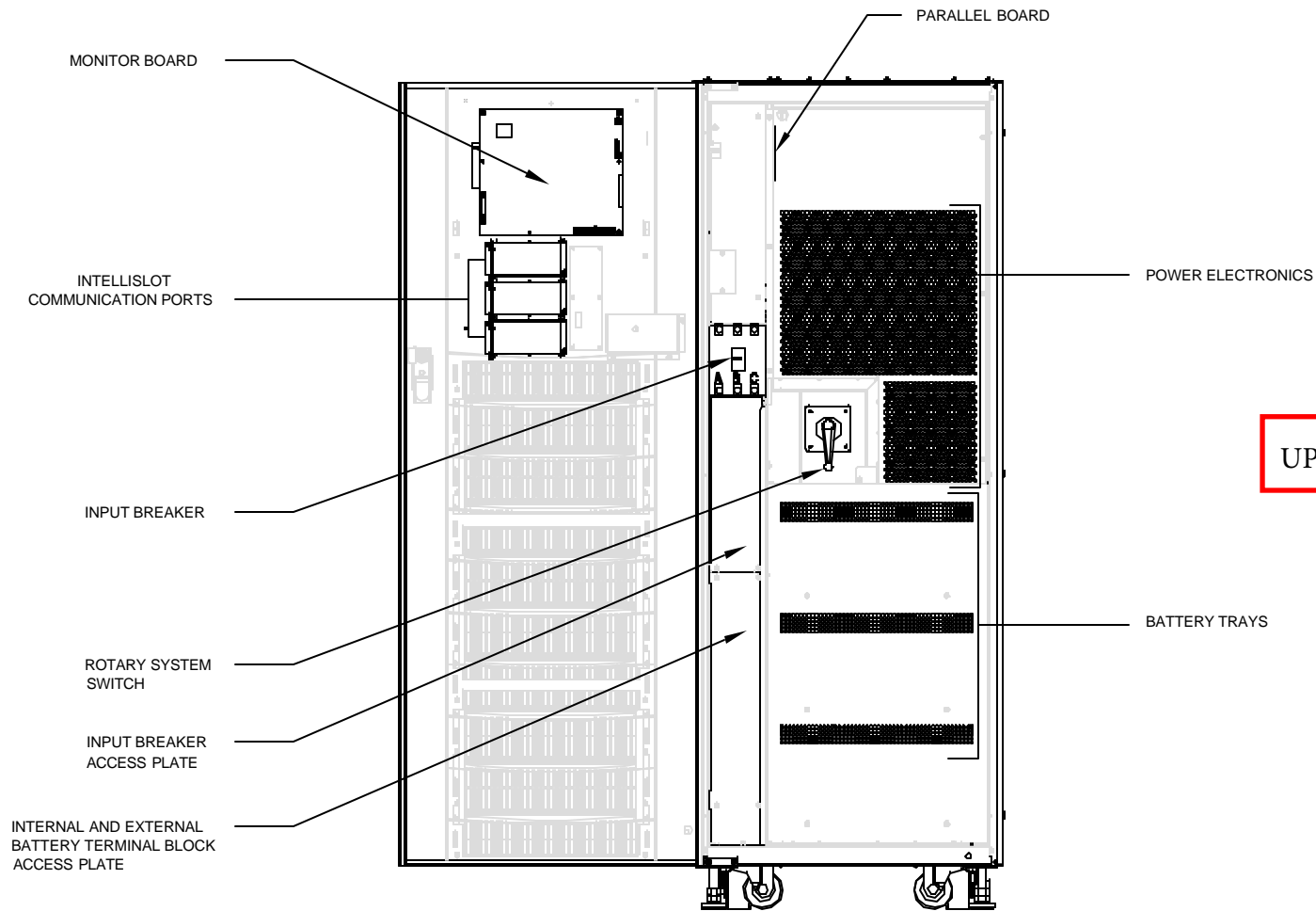
**UPS Module**

DRAWN BY VICTOR CARMONA	SHEET NO. 1 OF 1	UPS OUTLINE DRAWING 10KVA - 30KVA LIEBERT NX	DWG. NO. U3812047	DATE 6/24/2011	REV. # 5	1050 DEARBORN DRIVE P.O. BOX 29186 COLUMBUS, OHIO 43229	
CHK BY JEFF HERRING	ECN NO.						
REF. DWG.	ORDER NO.						

FILE NAME: I:\APPL\OHIO\APPL\NX\_UPSIC\_OUTLINE\_UPS\_AND\_TERMINAL\_DETAILS\U3812047-05.DWG

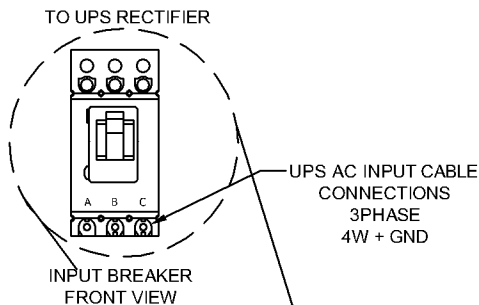
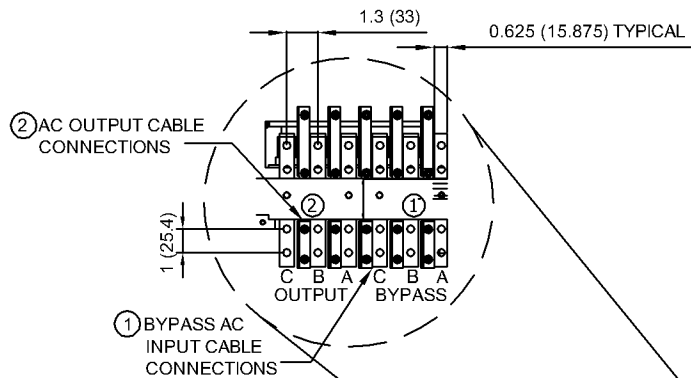
NOTES:

1. MAIN COMPONENTS ARE SHOWN.



FRONT VIEW  
(WITH DOOR OPEN)

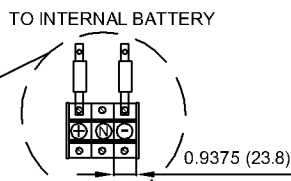
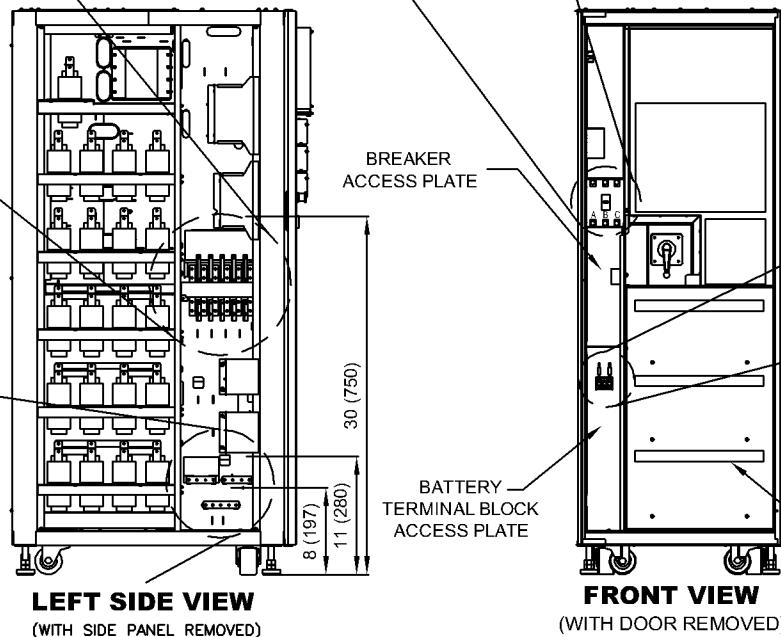
DRAWN BY R LYLES	SHEET NO. 1 OF 1	MAIN COMPONENTS LOCATION DRAWING LIEBERT NX	DWG. NO.	 <b>Liebert</b> P.O. BOX 29186 COLUMBUS, OHIO 43229		
CHK BY J FUCHIK	ECN NO.		REV. NO. <b>1</b>			DATE 2/8/05
REF. DWG.	ORDER NO.					



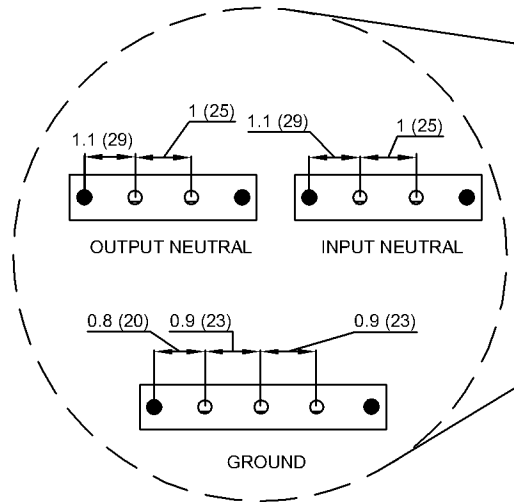
**NOTES:**

1. ALL DIMENSIONS ARE IN INCHES (MM).
2. TOP AND BOTTOM CABLE ENTRY AVAILABLE THROUGH REMOVABLE ACCESS PLATES. REMOVE, PUNCH TO SUIT CONDUIT SIZE, AND REPLACE.
3. CONTROL WIRING AND POWER WIRING MUST BE RUN IN SEPARATE CONDUIT. OUTPUT CABLES MUST BE RUN IN A SEPARATE CONDUIT FROM INPUT CABLES.
4. ALUMINUM AND COPPER CLAD ALUMINUM CABLES ARE NOT RECOMMENDED.
5. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
6. BATTERY CONNECTIONS TO INTERNAL, AND OPTIONAL EXTERNAL, BATTERIES.
7. FOR DUAL INPUT REMOVE THE BREAKER ACCESS PLATE. BYPASS INPUT CONNECTIONS ARE TO THE BYPASS BUS BARS. UPS INPUT CONNECTIONS ARE TO THE INPUT CIRCUIT BREAKER.
8. INTERNAL BATTERIES ARE SHIPPED WITH ANDERSON CONNECTORS DISCONNECTED.

**UPS Module**



TO OPTIONAL EXTERNAL BATTERY CABINET  
SEE NOTE 6  
BATTERY CONNECTIONS (+ N -)  
DISCONNECT INTERNAL BATTERY ANDERSON CONNECTORS BEFORE WORKING WITH EXTERNAL BATTERY CONNECTIONS. REMOVE THE BATTERY TERMINAL BLOCK ACCESS PLATE AND BATTERY ACCESS PANEL.



INPUT CIRCUIT BREAKER

UNIT RATING	BREAKER	AWG WIRE RANGE	TORQUE LB-IN.	TORQUE N-M
10	Gi (60A)	(1)#14-1/0	45	5.1
15	Gi (60A)	(1)#14-1/0	45	5.1
20	Fi (125A)	(1)#3-4/0	50	5.7
30	Fi (125A)	(1)#3-4/0	50	5.7

TERMINAL SPECIFICATIONS

UNIT RATING	UTILITY CONNECTIONS		BATTERY CONNECTIONS			
	BOLT SHAFT SIZE	TORQUE		BOLT SIZE	TORQUE	
		LB-IN	N-M			LB-IN
10	1/4 (M6)	44	5	1/4"(M6)	44	5
15	1/4 (M6)	44	5	1/4"(M6)	44	5
20	1/4 (M6)	44	5	5/16"(M8)	60	6.8
30	1/4 (M6)	44	5	5/16"(M8)	60	6.8

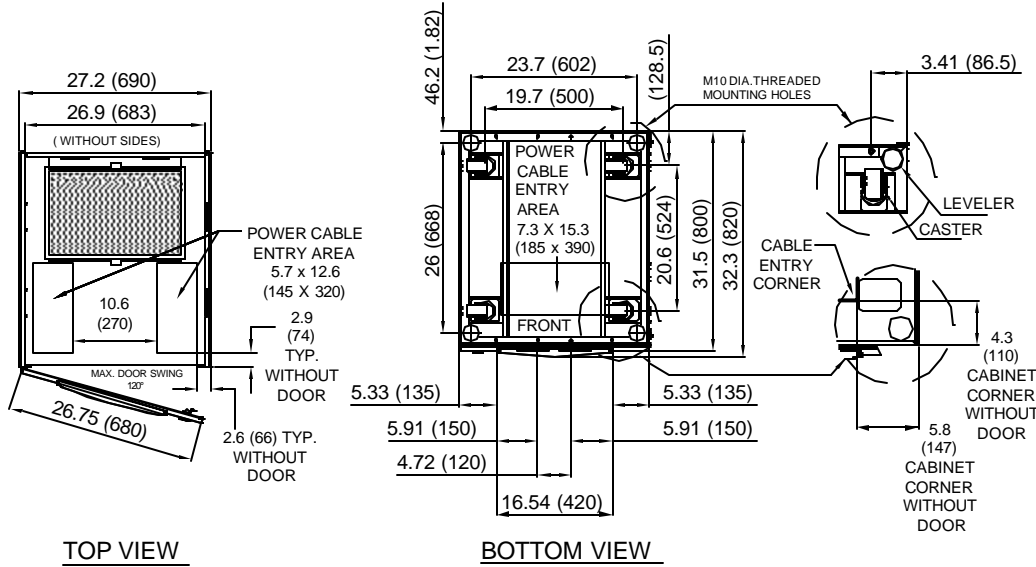
DRAWN BY  
V. CARMONA  
CHK BY  
J. HERRING  
REF. DWG.

DUAL INPUT UPS MODULE  
TERMINAL DETAILS  
LIEBERT NX

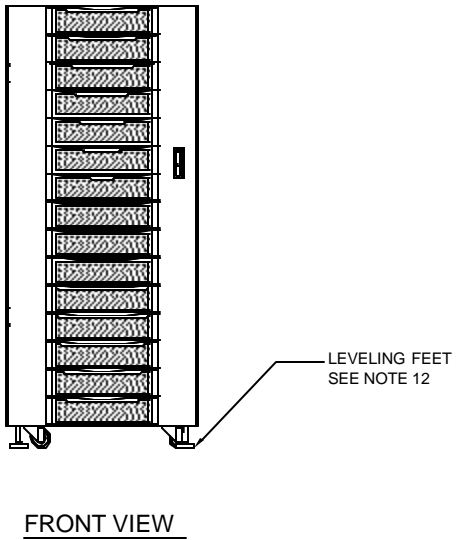
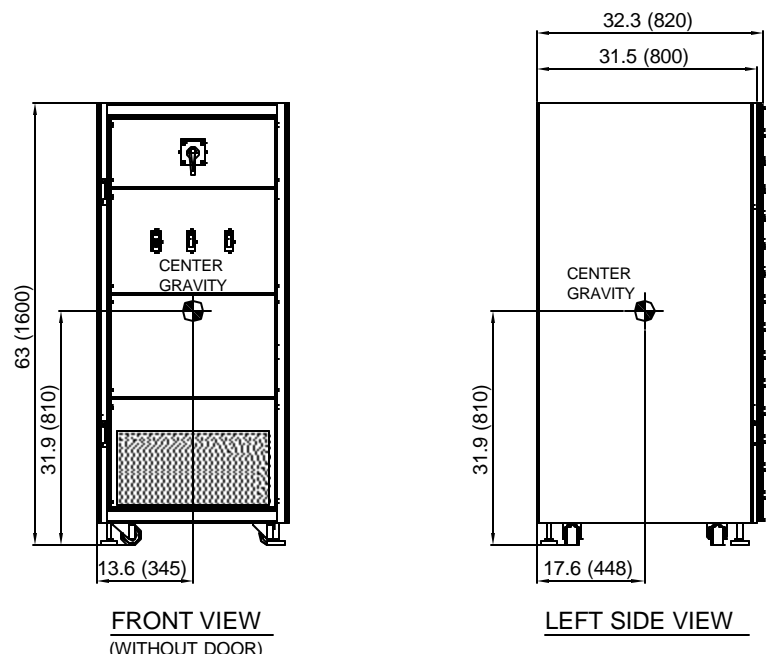
DWG. NO.  
U3813051  
REV. NO.  
3  
DATE  
5/26/09

**Liebert**  
1050 DEARBORN DRIVE,  
COLUMBUS, OHIO 43229





- NOTES:
1. ALL DIMENSIONS ARE IN INCHES (mm)
  2. MIN. CLEARANCE 36" FRONT, 12" TOP FOR AIR EXHAUST.
  3. KEEP CABINET WITHIN 15 DEGREES OF VERTICAL WHILE HANDLING.
  4. UNIT BOTTOM IS STRUCTURALLY ADEQUATE FOR FORKLIFT HANDLING.
  5. TOP AND BOTTOM CABLE ENTRY AVAILABLE THROUGH REMOVABLE ACCESS PLATES. REMOVE PUNCH TO SUIT CONDUIT SIZE AND REPLACE.
  6. SIDE PANELS INCLUDED WHEN ORDERED AS STAND-ALONE CABINET.
  7. SIDE PANELS NOT INCLUDED WHEN ORDERED AS A BOLT-ON CABINET. REMOVE SIDE PANEL FROM UPS MODULE. BOLT CABINET TO UPS, ATTACH SIDE PANEL TO CABINET.
  8. SEE INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR ADDITIONAL INFORMATION.
  9. HARDWARE INCLUDED TO BOLT TO UPS WHEN ORDERED AS A BOLT-ON CABINET.
  10. COLOR - SILVER METALLIC.
  11. M10 THREADED MOUNTING HOLES USED FOR SEISMIC ANCHORING OR FLOORSTAND. NOTE, IF FLOOR STAND IS USED THE WEIGHT OF THE UNIT MUST BE SUPPORTED UNDER ALL CASTERS. MOUNTING HOLES SAME SPACING FRONT AND REAR.
  12. LEVELING FEET ARE NOT DESIGNED TO CARRY THE FULL WEIGHT OF THE CABINET. FINGER-TIGHT LEVELER AGAINST THE FLOOR. THEN TIGHTEN WITH A WRENCH LESS THAN 2 TURNS FOR FRICTION FIT AGAINST FLOOR.



KVA RATING	WEIGHT *		CRATED WEIGHT *	
	LBS	KG	LBS	KG
10	1104	501	1254	569
15	1104	501	1254	569
20	1354	614	1504	682
30	1354	614	1504	682

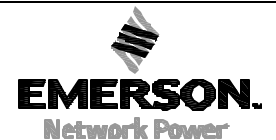
\* WEIGHT FOR CABINET WITHOUT SIDE PANELS, FOR STAND-ALONE CABINET ADD 66LBS (30KG) TO INCLUDE SIDE PANELS.

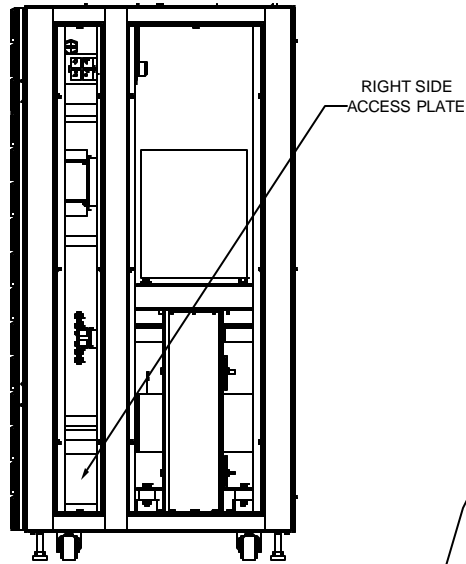
DRAWN BY  
V. CARMONA  
CHK BY  
B. FOX  
REF. DWG.

OUTLINE DRAWING  
MAINTENANCE BYPASS CABINET  
TYPE E-1  
LIEBERT NX

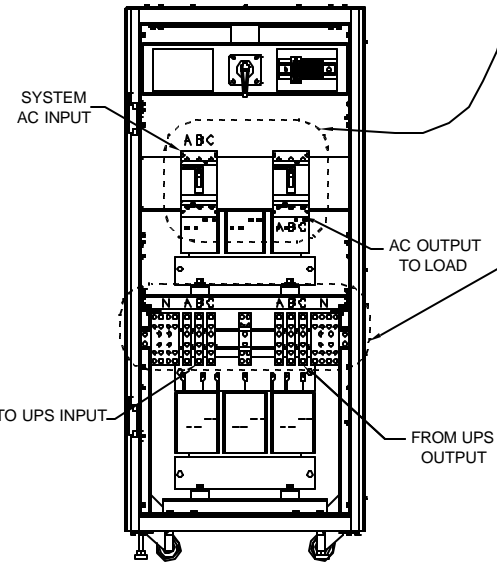
DWG. NO.  
U3813085  
REV. NO.  
2  
DATE  
4/27/07

**Liebert**  
1050 DEARBORN DRIVE,  
COLUMBUS, OHIO 43229

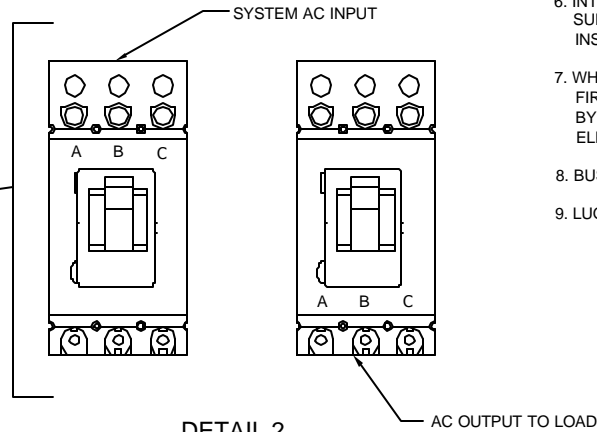




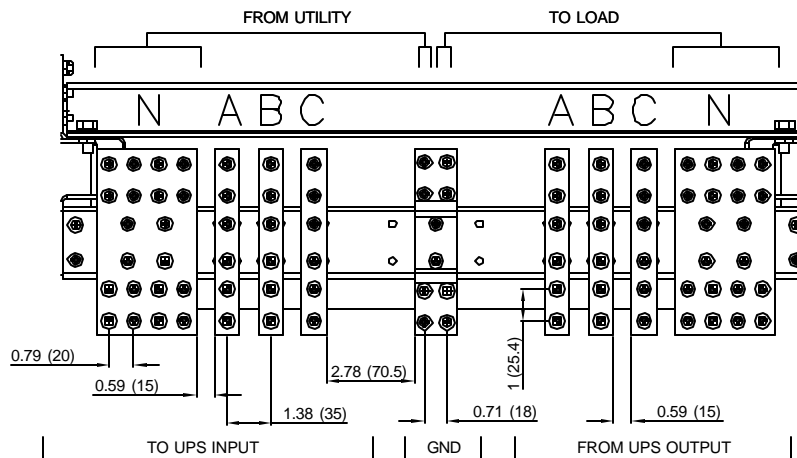
**RIGHT SIDE VIEW**  
(WITHOUT SIDE PANEL AND BARRIERS)



**FRONT VIEW**



**DETAIL 2**



**DETAIL 1**

**NOTES:**

1. ALL DIMENSIONS ARE IN INCHES (mm)
2. TOP, BOTTOM, AND SIDE CABLE ENTRY AVAILABLE THROUGH REMOVABLE ACCESS PLATES. REMOVE, PUNCH TO SUIT CONDUIT SIZE, AND REPLACE.
3. CONTROL WIRING AND POWER WIRING MUST BE RUN SEPARATE CONDUIT. OUTPUT CABLES MUST BE RUN IN A SEPARATE CONDUIT FROM INPUT CABLES.
4. ALUMINUM AND COPPER CLAD ALUMINUM CABLES ARE NOT RECOMMENDED.
5. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
6. INTER CABINET WIRING BETWEEN THE UPS AND THE MAINTENANCE BYPASS CABINET IS SUPPLIED BY LIEBERT WHEN BOLTED TOGETHER. FIELD SUPPLIED WHEN STAND ALONE INSTALLATION BY OTHERS.
7. WHEN INSTALLING AS A BOLT-ON CABINET TO THE UPS, THE ELECTRICAL CONNECTIONS MUST FIRST BE CONNECTED TO THE NX UPS (LEFT SIDE ACCESS). THEN MOVE THE MAINTENANCE BYPASS CABINET INTO POSITION ON THE LEFT SIDE OF THE UPS AND CONNECT THE ELECTRICAL CABLES TO THE MAINTENANCE BYPASS CABINET.
8. BUS BAR BOLTS PROVIDED, SIZE 1/4" (M6), SOCKET SIZE 13MM.
9. LUGS PROVIDED BY OTHERS.

**CIRCUIT BREAKER SPECIFICATIONS**

UNIT RATING	220V		480/600V			
	AWG WIRE RANGE	TORQUE		AWG WIRE RANGE	TORQUE	
		LB-IN	N-M		LB-IN	N-M
10	(1) #14 - 4	106	12	(1) #14 - 4	106	12
15	(1) #4 - 2	180	20.5	(1) #14 - 4	106	12
20	(1) #4 - 3/0	225	25.6	(1) #14 - 4	106	12
30	(1) #4 - 3/0	225	25.6	(1) #14 - 4	106	12

NOTE: USE THE VALUES IN THIS TABLE UNLESS THE EQUIPMENT IS LABELED WITH A DIFFERENT TORQUE VALUE.

**BUS BAR SPECIFICATIONS**

UNIT RATING	BOLTS SHAFT SIZE	TORQUE	
		LB-IN	N-M
10	1/4 (M6)	44	5
15	1/4 (M6)	44	5
20	1/4 (M6)	44	5
30	1/4 (M6)	44	5

DRAWN BY  
K. STACY  
CHK BY  
B. FOX  
REF. DWG.

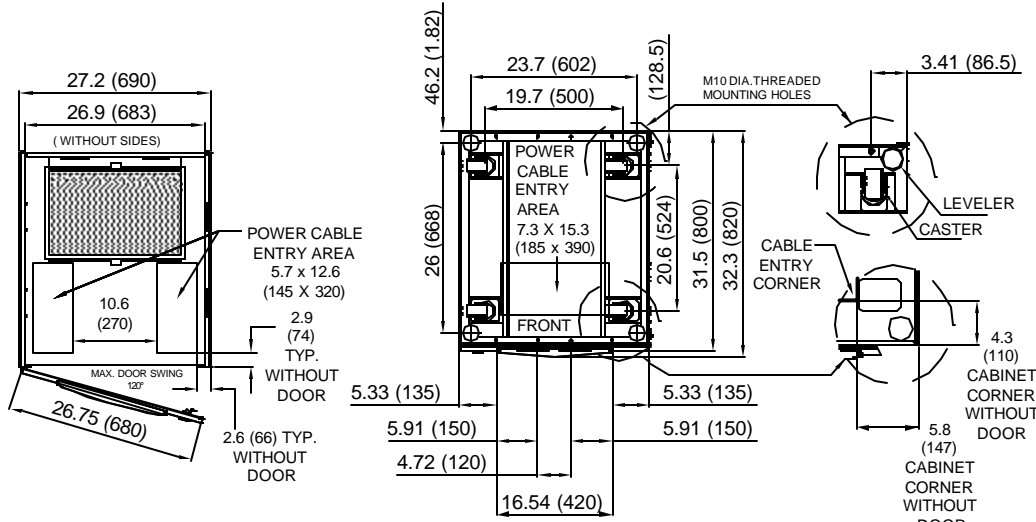
TERMINAL DETAILS  
MAINTENANCE BYPASS CABINET  
TYPE E-1  
LIEBERT NX

DWG. NO.  
U3813068  
REV. NO.  
1  
DATE  
5/10/06

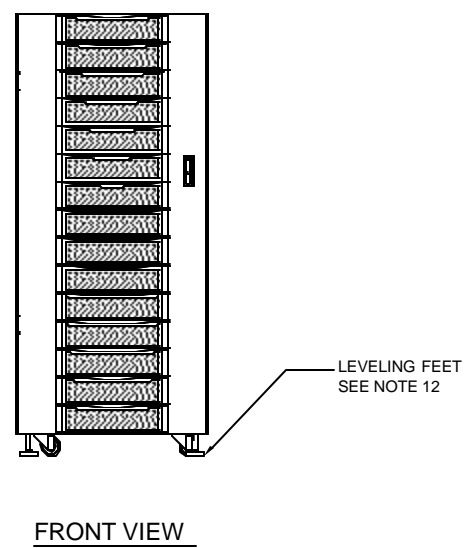
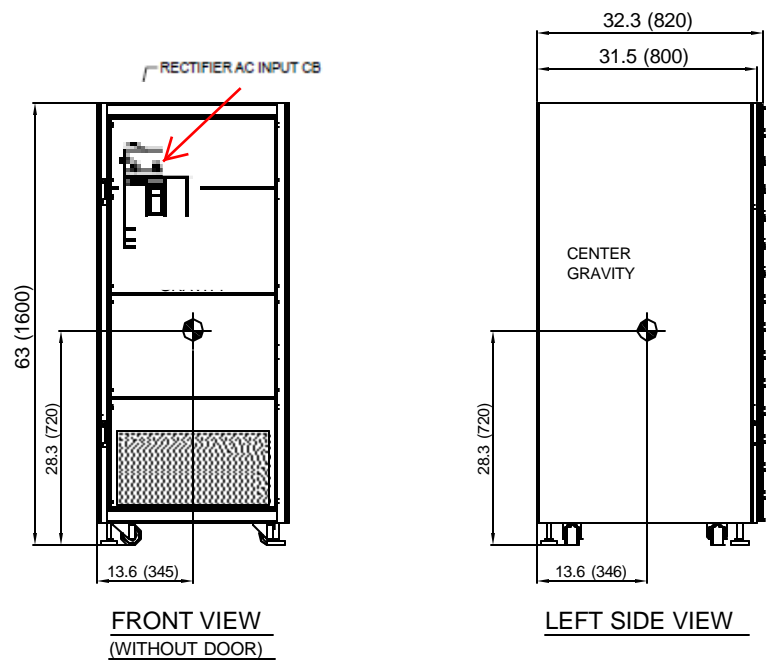
**Liebert**  
1050 DEARBORN DRIVE,  
COLUMBUS, OHIO 43229







- NOTES:
- ALL DIMENSIONS ARE IN INCHES (mm)
  - MIN. CLEARANCE 36" FRONT, 12" TOP FOR AIR EXHAUST.
  - KEEP CABINET WITHIN 15 DEGREES OF VERTICAL WHILE HANDLING.
  - UNIT BOTTOM IS STRUCTURALLY ADEQUATE FOR FORKLIFT HANDLING.
  - TOP AND BOTTOM CABLE ENTRY AVAILABLE THROUGH REMOVABLE ACCESS PLATES. REMOVE PUNCH TO SUIT CONDUIT SIZE AND REPLACE.
  - SIDE PANELS INCLUDED WHEN ORDERED AS STAND-ALONE CABINET.
  - SIDE PANELS NOT INCLUDED WHEN ORDERED AS A BOLT-ON CABINET. REMOVE SIDE PANEL FROM UPS MODULE. BOLT CABINET TO UPS, ATTACH SIDE PANEL TO CABINET.
  - SEE INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR ADDITIONAL INFORMATION.
  - HARDWARE INCLUDED TO BOLT TO UPS WHEN ORDERED AS A BOLT-ON CABINET.
  - COLOR - SILVER METALLIC.
  - M10 THREADED MOUNTING HOLES USED FOR SEISMIC ANCHORING OR FLOORSTAND. NOTE, IF FLOOR STAND IS USED THE WEIGHT OF THE UNIT MUST BE SUPPORTED UNDER ALL CASTERS. MOUNTING HOLES SAME SPACING FRONT AND REAR.
  - LEVELING FEET ARE NOT DESIGNED TO CARRY THE FULL WEIGHT OF THE CABINET. FINGER-TIGHT LEVELER AGAINST THE FLOOR. THEN TIGHTEN WITH A WRENCH LESS THAN 2 TURNS FOR FRICTION FIT AGAINST FLOOR.



KVA RATING	WEIGHT *		CRATED WEIGHT *	
	LBS	KG	LBS	KG
10	1004	455	1154	524
15	1004	455	1154	524
20	1254	569	1404	637
30	1254	569	1404	637

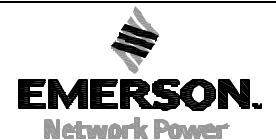
\* WEIGHT FOR CABINET WITHOUT SIDE PANELS, FOR STAND-ALONE CABINET ADD 66LBS (30KG) TO INCLUDE SIDE PANELS.

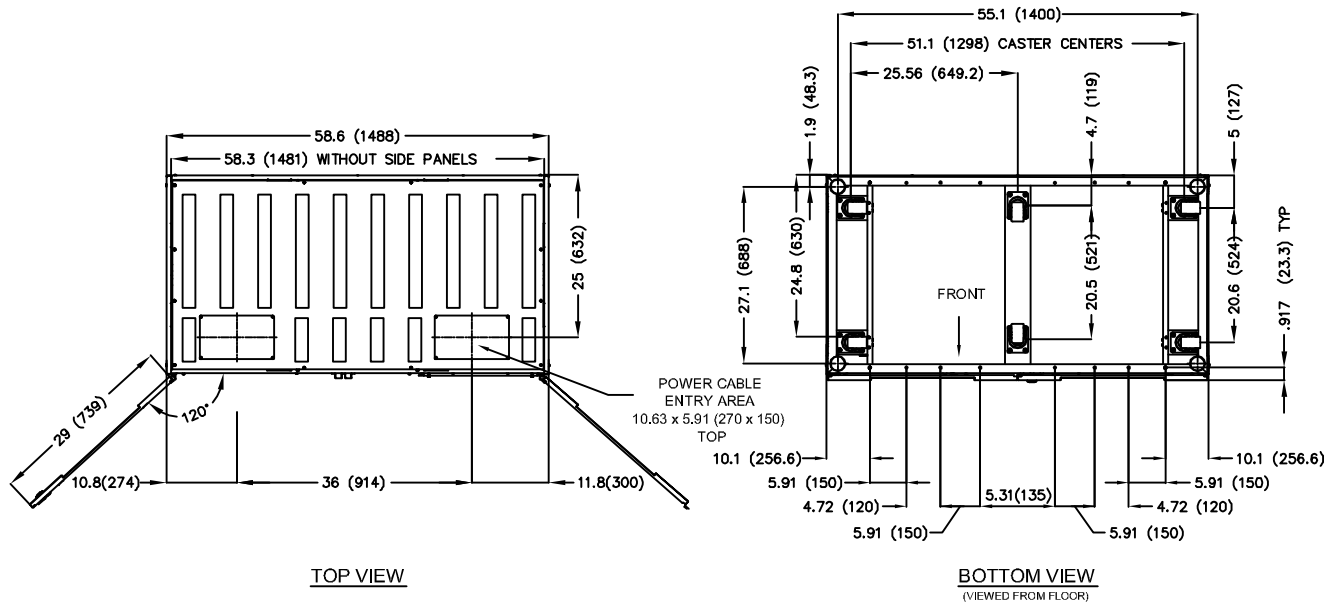
DRAWN BY  
V. CARMONA  
CHK BY  
B. FOX  
REF. DWG.

OUTLINE DRAWING  
Transformer CABINET  
TYPE F-1  
LIEBERT NX

DWG. NO.  
U3813058  
REV. NO.  
3  
DATE  
4/27/07

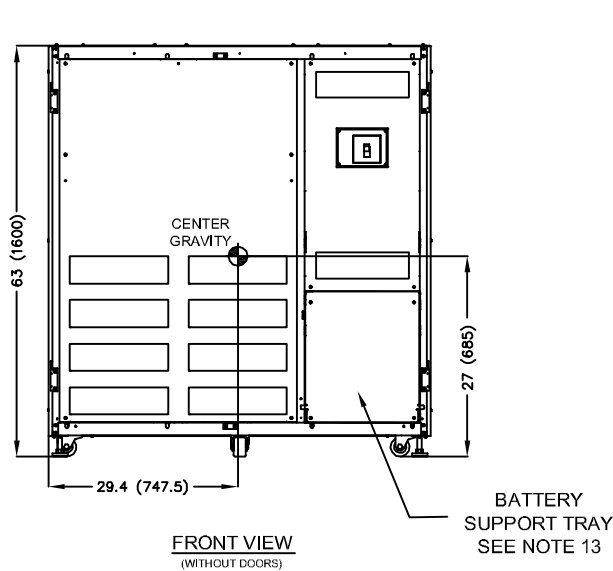
**Liebert**  
1050 DEARBORN DRIVE,  
COLUMBUS, OHIO 43229





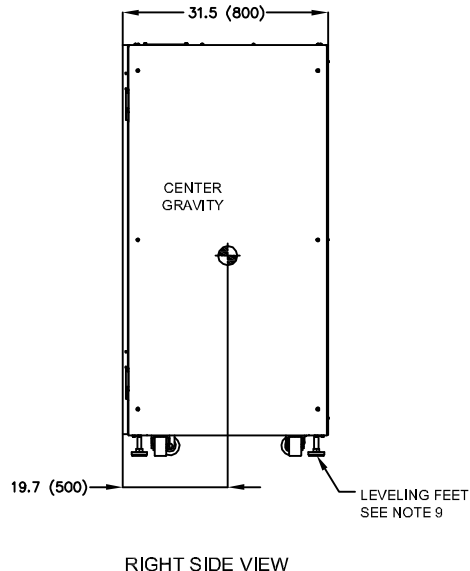
TOP VIEW

BOTTOM VIEW  
(VIEWED FROM FLOOR)



FRONT VIEW  
(WITHOUT DOORS)

BATTERY  
SUPPORT TRAY  
SEE NOTE 13



RIGHT SIDE VIEW

NOTES:

1. ALL DIMENSIONS ARE IN INCHES (mm).
2. MINIMUM CLEARANCE 36" FRONT AND 12" TOP FOR AIR EXHAUST.
3. KEEP CABINET WITHIN 15 DEGREES OF VERTICAL WHILE HANDLING.
4. TOP AND SIDE CABLE ENTRY AVAILABLE THROUGH REMOVABLE ACCESS PLATES.
5. CONTROL WIRING AND POWER WIRING MUST BE RUN IN SEPARATE CONDUIT.
6. ALUMINUM AND COPPER CLAD ALUMINUM CABLES ARE NOT RECOMMENDED.
7. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
8. INTER CABINET WIRING BETWEEN THE UPS AND THE EXTERNAL BATTERY CABINET IS SUPPLIED BY LIEBERT WHEN BOLTED TOGETHER. FIELD SUPPLIED WHEN STAND ALONE INSTALLATION BY OTHERS.
9. LEVELING FEET ARE NOT DESIGNED TO CARRY THE FULL WEIGHT OF THE CABINET. FINGER-TIGHTEN LEVELER AGAINST THE FLOOR, THEN TIGHTEN WITH A WRENCH LESS THAN TWO TURNS FOR FRICTION AGAINST FLOOR.
10. SIDE PANELS INCLUDED WHEN ORDERED AS STAND-ALONE BATTERY CABINET.
11. SIDE PANELS NOT INCLUDED WHEN ORDERED AS A BOLT-ON BATTERY CABINET. REMOVE SIDE PANEL FROM UPS MODULE. BOLT BATTERY CABINET TO UPS, ATTACH SIDE PANEL TO BATTERY CABINET.
12. M10 THREADED MOUNTING HOLES USED FOR SEISMIC ANCHORING OR FLOORSTAND. NOTE, IF FLOORSTAND IS USED THE WEIGHT OF THE UNIT MUST BE SUPPORTED UNDER ALL CASTERS. MOUNTING HOLES SAME SPACING FRONT AND REAR.
13. BEFORE SLIDING A BATTERY TRAY OUT, THE BATTERY SUPPORT TRAY CONNECTS TO THE FRONT OF THE CABINET WITH THE SUPPORT BRACKETS. NOTE, WITHOUT THE SUPPORT THE BATTERY MAY FALL OUT OF THE CABINET.

APPROXIMATE WEIGHTS

BATTERY CABINET MODEL NUMBER	BATTERY TYPE	UNIT WEIGHT *	
		LBS	KG
38BPxxxRRX1Bxx	HX330-FR	2804	1272
38BPxxxRUX1Bxx	HX400-FR	3020	1370
38BPxxxRWX1Bxx	HX505-FR	3572	1621
38BPxxxRXX1Bxx	HX540-FR	3692	1675
38BPxxxRPA1Bxx	24HR3000	2444	1109
38BPxxxRRA1Bxx	27HR3500	2684	1218
38BPxxxRUA1Bxx	31HR4000	2876	1305
38BPxxxRWA1Bxx	31HR5000	3452	1566

FOR SHIPPING WEIGHT ADD 150 LBS. (68KG)

\*WEIGHT FOR CABINET WITHOUT SIDE PANELS, FOR STAND-ALONE CABINET ADD 66LBS (30KG) TO INCLUDE SIDE PANELS.

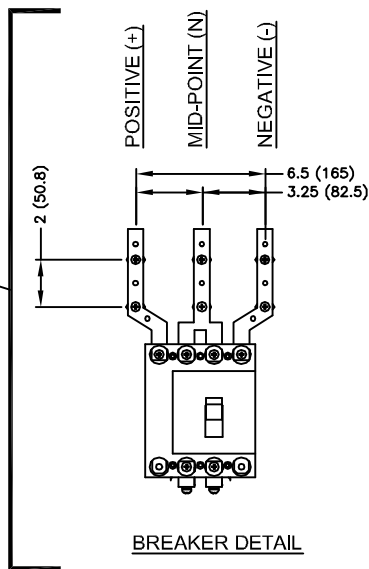
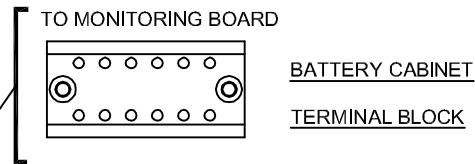
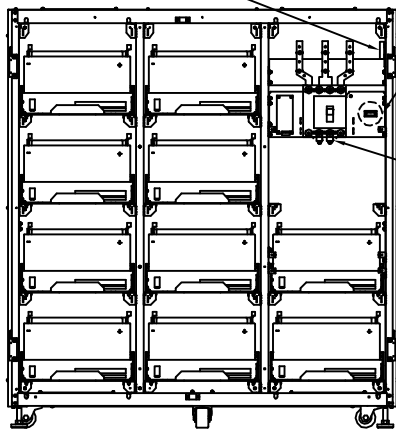
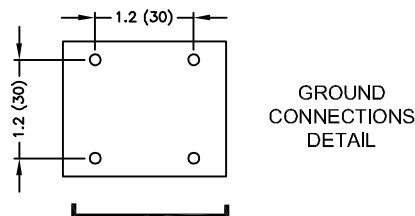
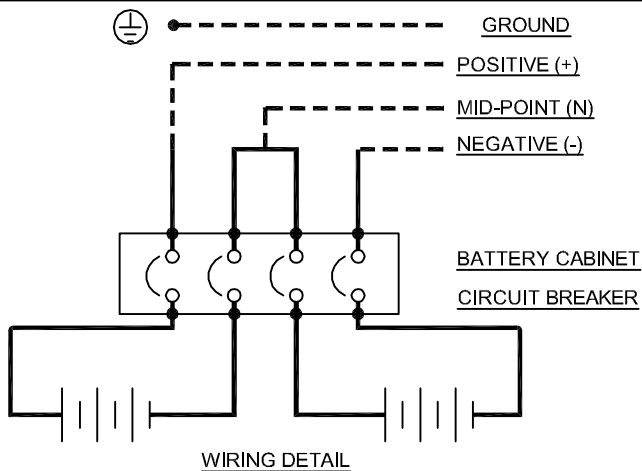
DRAWN BY VICTOR CARMONA	SHEET NO. 1 OF 1
CHK BY JEFF HERRING	ECN NO.
REF. DWG.	ORDER NO.

OUTLINE DRAWING  
59" BATTERY POWER PACK SYSTEM  
SINGLE CABINET  
LIEBERT NX

Qty 2 - 'WX' Battery Cabinets

DWG. NO. U3813052	DATE 11/8/2011	REV. # 7	1050 DEARBORN DRIVE P.O. BOX 29186 COLUMBUS, OHIO 43229
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**NOTES:**

1. ALL DIMENSION ARE IN INCHES (mm)
2. ALL CABLES SHOULD BE ROUTED BEFORE BOLTING CABINETS TOGETHER.
3. WHEN CONNECTED TO A UPS MODULE ALL POWER AND CONTROL WIRING SUPPLIED BY LIEBERT.WHEN REMOTE FROM A UPS MODULE THE CABLES BETWEEN THE BATTERY CABINET AND THE UPS CABINET MUST BE SUPPLIED BY OTHERS.
4. ALL HARDWARE SUPPLIED WITH BATTERY CABINET FOR BOLTING CABINET TO UPS USE M6 HARDWARE PROVIDED. ASSEMBLE AS SHOWN IN DETAIL DRAWING.
5. SEE INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR ADDITIONAL INFORMATION.
6. ALL EXTERNAL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

**BATTERY CABINET CIRCUIT BREAKER**

UNIT RATING	BATTERY CURRENT	OCP DEVICE RATING	BOLT SIZE	TORQUE	
				LB-IN	N-M
10	40	70	1/4" (M6)	44	5
15	60	70	1/4" (M6)	44	5
20	80	125	1/4" (M6)	44	5
30	120	125	1/4" (M6)	44	5

**BATTERY CABINET GROUND**

UNIT RATING	BOLT SIZE	TORQUE	
		LB-IN	N-M
10 - 30	1/4" (M6)	44	5

DRAWN BY  
K. STACY  
CHK BY  
B. FOX  
REF. DWG.

TERMINAL DETAILS  
59" BATTERY POWER PACK SYSTEM  
SINGLE CABINET  
LIEBERT NX

DWG. NO.

U3813075

REV. NO.

DATE

1

5/10/06



1050 DEARBORN DRIVE,  
COLUMBUS, OHIO 43229

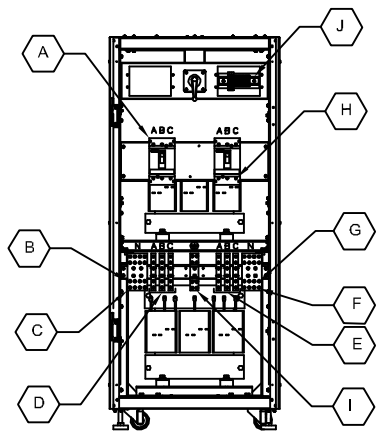




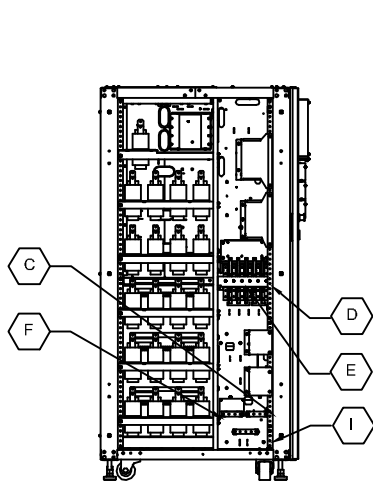
LIEBERT SUPPLIED INTERCONNECT WIRING			
RUN	FROM	TO	CONDUCTORS
A	UTILITY AC SOURCE	MAINTENANCE BYPASS/TRANSFORMER CABINET	PH A,B,C
B	UTILITY AC SOURCE	MAINTENANCE BYPASS/TRANSFORMER CABINET	NEUTRAL (SEE NOTE 4)
C	MAINTENANCE BYPASS/TRANSFORMER CABINET	UPS MODULE AC INPUT	NEUTRAL
D	MAINTENANCE BYPASS/TRANSFORMER CABINET	UPS MODULE AC INPUT	PH A,B,C
E	UPS MODULE AC OUTPUT	MAINTENANCE BYPASS/TRANSFORMER CABINET	PH A,B,C
F	UPS MODULE AC OUTPUT	MAINTENANCE BYPASS/TRANSFORMER CABINET	NEUTRAL
G	MAINTENANCE BYPASS/TRANSFORMER CABINET	LOAD AC CONNECTION	NEUTRAL
H	MAINTENANCE BYPASS/TRANSFORMER CABINET	LOAD AC CONNECTION	PH A,B,C
I	UTILITY AC SOURCE	ALL GROUND CONNECTIONS	GROUND
J	MAINTENANCE BYPASS / TRANSFORMER CABINET AUXILIARY TERMINAL BLOCK	UPS MODULE COMMUNICATIONS BOARD M2	BYPASS AUXILIARY CONTACTS
K	UPS BATTERY TERMINAL BLOCK	EXTERNAL 59" BATTERY CABINET	POSITIVE, MID-POINT, NEGATIVE
L	BATTERY CABINET BREAKER CONTROL TERMINAL BLOCK	UPS MONITORING BOARD	BATTERY BREAKER AUXILIARY CONTACTS

NOTES:

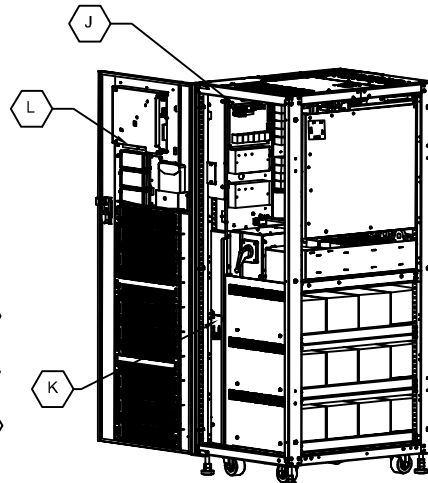
1. ALL LIEBERT SUPPLIED CABLE WILL NEED TO BE REPOSITIONED PRIOR TO AND WHILE SETTING THE CABINETS IN THEIR INSTALLED LOCATION.
2. ALL INTERCONNECTION HARDWARE SUPPLIED BY OTHERS.
3. AC CONNECTIONS MUST BE MADE TO THE UPS MODULE BEFORE ATTACHING MAINTENANCE BYPASS/TRANSFORMER CABINET TO UPS MODULE.
4. UTILITY AC SOURCE NEUTRAL NOT REQUIRED FOR MAINTENANCE BYPASS/TRANSFORMER CABINET TYPES D, E, M, N.
5. ALL CABLING WILL BE FIELD SUPPLIED WHEN MAINTENANCE BYPASS/TRANSFORMER CABINET IS CONFIGURED AS STAND-ALONE CABINET.
6. MAINTENANCE BYPASS/TRANSFORMER CABINETS MUST ATTACH TO THE LEFT SIDE OF THE UPS ONLY.
7. REFER TO THE INDIVIDUAL DRAWING OF EACH PIECE OF EQUIPMENT FOR ADDITIONAL DETAILS
8. ALL CABLING WILL BE FIELD SUPPLIED WHEN BATTERY CABINET IS CONFIGURED AS STAND-ALONE CABINET.



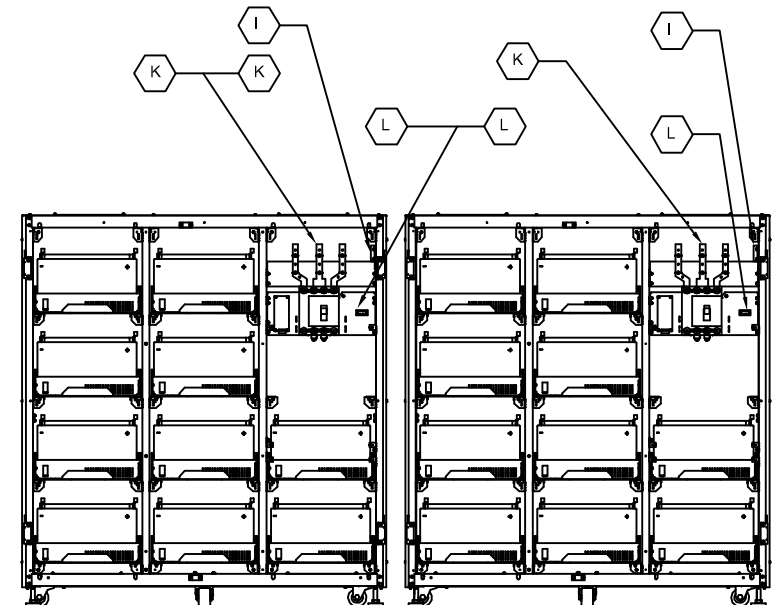
MAINTENANCE BYPASS/TRANSFORMER CABINET  
(FRONT VIEW WITHOUT FRONT DOOR AND PANEL)



UPS MODULE LEFT SIDE VIEW  
(WITHOUT SIDE PANEL)





UPS MODULE FRONT/RIGHT SIDE VIEW  
(WITHOUT SIDE PANEL)



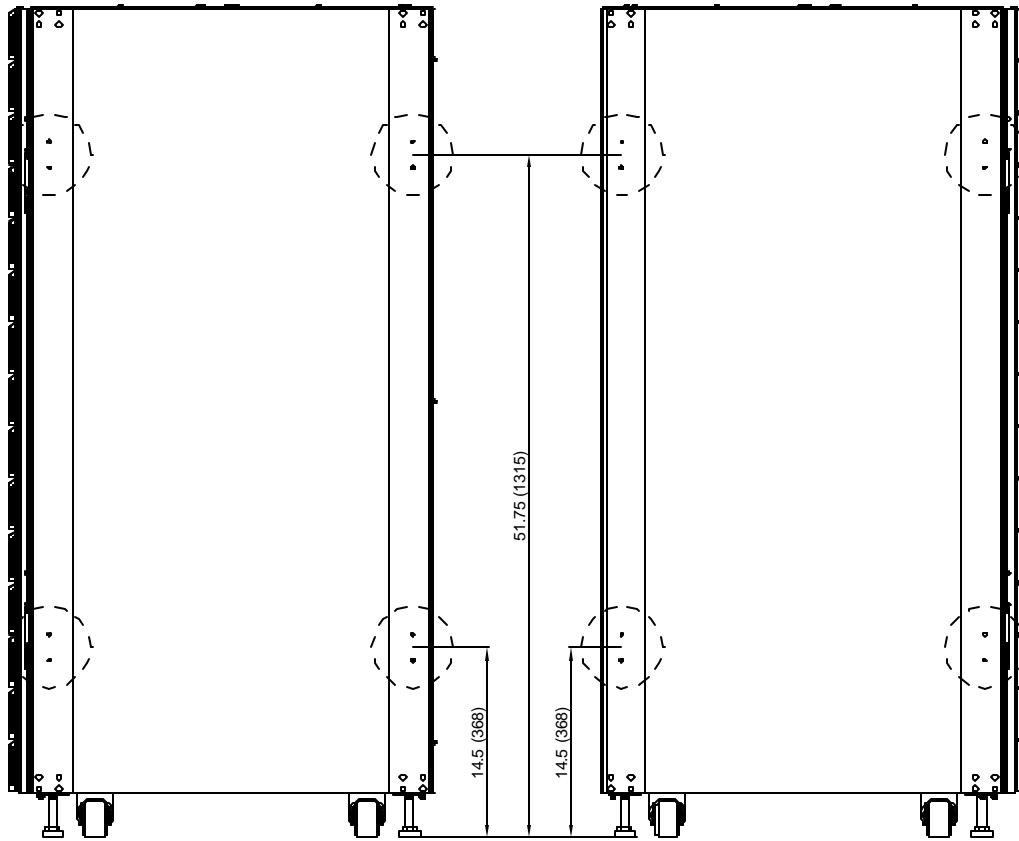
FIRST BATTERY CABINET  
FRONT VIEW  
(WITHOUT DOORS AND PROTECTION PLATES)

ADDITIONAL BATTERY CABINET  
FRONT VIEW  
(WITHOUT DOORS AND PROTECTION PLATES)

DRAWN BY R. LYLES CHK BY J UFFERMAN REF. DWG.	LINEUP DETAIL MAINTENANCE BYPASS/TRANSFORMER CABINET TO NX UPS MODULE TO 59" EXTERNAL BATTERY CABINET(S) NX	DWG. NO. U3812069	 1050 DEARBORN DRIVE, COLUMBUS, OHIO 43229	
		REV. NO. N		

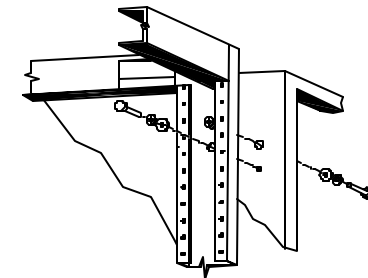
NOTES:

1. ALL DIMENSIONS ARE IN INCHES (MM)
2. ALL CABLES SHOULD BE ROUTED BEFORE BOLTING CABINETS TOGETHER.
3. ANCILLARY CABINETS CONNECTED AS ONE SYSTEM. WHEN CONNECTED TO A UPS MODULE ALL POWER AND CONTROL WIRING SUPPLIED BY LIEBERT. WHEN REMOTE FROM A UPS MODULE THE CABLES BETWEEN THE AUXILIARY CABINETS AND THE UPS CABINET MUST BE SUPPLIED BY CUSTOMER.
4. ALL HARDWARE SUPPLIED WITH ANCILLARY CABINETS FOR BOLTING CABINET TO UPS.
5. USE M6 HARDWARE PROVIDED. ASSEMBLE AS SHOWN IN DETAIL DRAWING.
6. SEE INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR ADDITIONAL INFORMATION.
7. ALL EXTERNAL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.



RIGHT SIDE VIEW  
(WITHOUT SIDE DOOR AND BARRIERS)

LEFT SIDE VIEW  
(WITHOUT SIDE DOOR AND BARRIERS)



TYPICAL (4 PLACES) CABINET BOLTING  
BOLT UP FROM EITHER DIRECTION

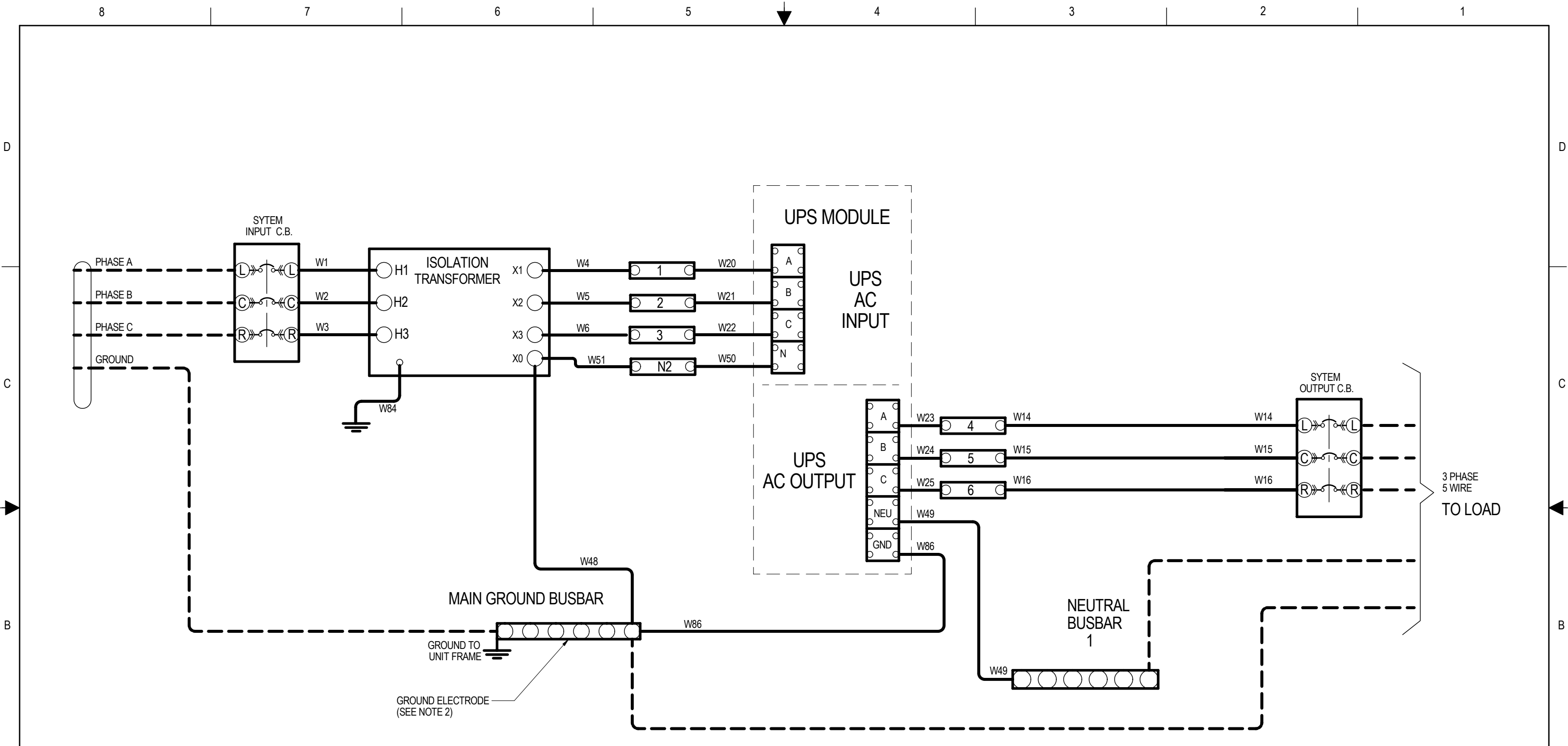
DRAWN BY K. STACY
CHK BY B. FOX
REF. DWG.

LINE-UP DETAIL  
BOLT TOGETHER DESCRIPTION  
LIEBERT NX

DWG. NO. U3812061	
REV. NO. 1	DATE 5/10/06

**Liebert**  
1050 DEARBORN DRIVE,  
COLUMBUS, OHIO 43229





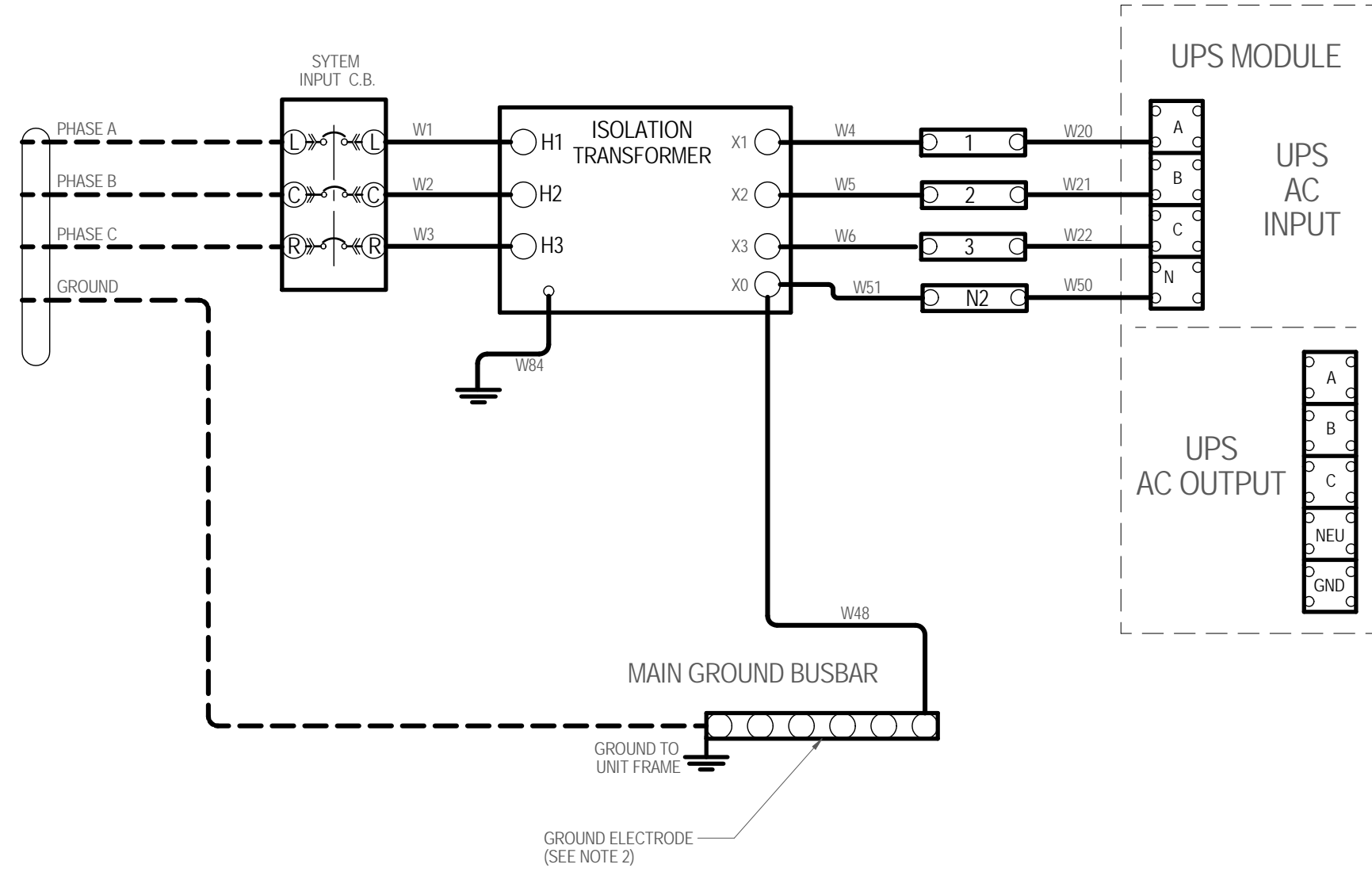
NOTES:  
 1) WIRING FURNISHED BY FACTORY. CONSULT INSTALLATION MANUAL FOR UPS CONNECTIONS  
 2) CUSTOMER FURNISHED GROUNDING ELECTRODE CONDUCTOR TO BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE ARTICLE 250-26.


WIRING LEGEND

	FACTORY SUPPLIED WIRING
	FIELD SUPPLIED WIRING

CONTROL CHARACTERISTICS SYMBOL LEGEND	M DESIGN MAJOR H HIGHLIGHTED	PART NUMBER	DESCRIPTION										
MATERIAL:	NA	 <small>THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION OF LIEBERT CORPORATION AND NEITHER IT NOR THE INFORMATION CONTAINED THEREIN SHALL BE DISCLOSED TO OTHERS OR DUPLICATED OR USED FOR OTHERS WITHOUT THE EXPRESS WRITTEN CONSENT OF LIEBERT CORPORATION.</small>	 <b>EMERSON</b> Network Power										
FINISH:	NONE												
MATERIAL NOTE: FABRICATE FROM THE MATERIAL SPECIFIED IN ACCORDANCE WITH THE CURRENT APPLICABLE LIEBERT ENGINEERING SPECIFICATION OR AS OTHERWISE SPECIFIED ON THIS DRAWING.		CAGE CODE: 55455	TITLE: STANDARD POWER WIRING DIAGRAM NX MAINTENANCE BYPASS CABINET TYPE M										
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED <table border="1"> <tr><td>INCHES</td><td>MM</td></tr> <tr><td>.X ± .1</td><td>X ± 2</td></tr> <tr><td>.XX ± .03</td><td>.X ± .8</td></tr> <tr><td>.XXX ± .015</td><td>.XX ± .38</td></tr> <tr><td>ANGULAR</td><td>± 2°</td></tr> </table>		INCHES	MM	.X ± .1	X ± 2	.XX ± .03	.X ± .8	.XXX ± .015	.XX ± .38	ANGULAR	± 2°	DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED. DO NOT SCALE DRAWINGS THIRD ANGLE PROJECTION 	
INCHES	MM												
.X ± .1	X ± 2												
.XX ± .03	.X ± .8												
.XXX ± .015	.XX ± .38												
ANGULAR	± 2°												
DRAWN:	ZACH THOMPSON	DATE:	02/17/05										
CHECKED:		DATE:											
ENGR:	KEN WAGNER	DATE:	02/17/05										
SIZE:	B	DRAWING NUMBER:	524543										
SHEET:	1/1	REV:	3										

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED



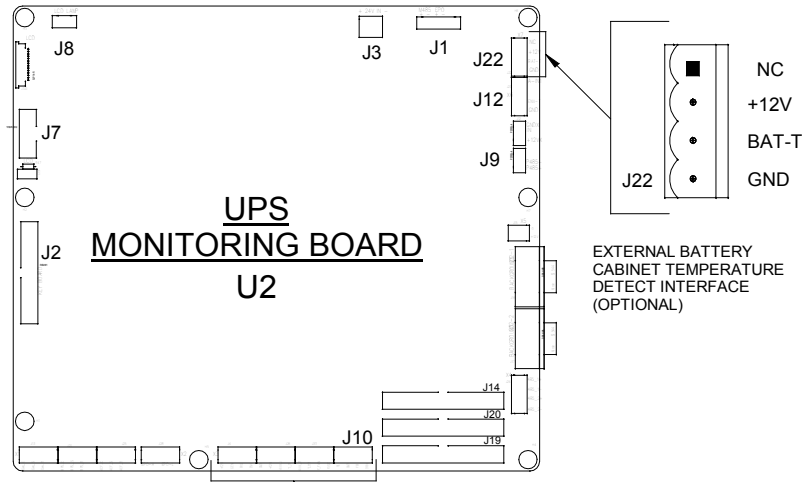
- 1) WIRING FURNISHED BY FACTORY. CONSULT INSTALLATION MANUAL FOR UPS CONNECTIONS
- 2) CUSTOMER FURNISHED GROUNDING ELECTRODE CONDUCTOR TO BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE ARTICLE 250-26.

FACTORY SUPPLIED WIRING  
 FIELD SUPPLIED WIRING

CONTROL CHARACTERISTICS SYMBOL LEGEND		M DESIGN MAJOR
		H HIGHLIGHTED
MATERIAL: NA		
FINISH: NONE		
MATERIAL NOTE: FABRICATE FROM THE MATERIAL SPECIFIED IN ACCORDANCE WITH THE CURRENT APPLICABLE LIEBERT ENGINEERING SPECIFICATION OR AS OTHERWISE SPECIFIED ON THIS DRAWING.		
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED		THIRD ANGLE PROJECTION
INCHES (PRIMARY)	MM (SECONDARY)	
X ± .1	(X) ± .2	
XX ± .03	(XX) ± .8	
XXX ± .015	(XXX) ± .38	
ANGULAR	± 2°	
DRAWN: SANTIAGO GUZMAN	DATE: 3/2/2016	CORPORATE CAGE CODE: 55455
CHECKED: HUGO GAXIOLA	DATE: 3/2/2016	1050 DEARBORN DRIVE P.O. BOX 29186 COLUMBUS, OHIO 43229
ENGR: SANTIAGO GUZMAN	DATE: 3/2/2016	

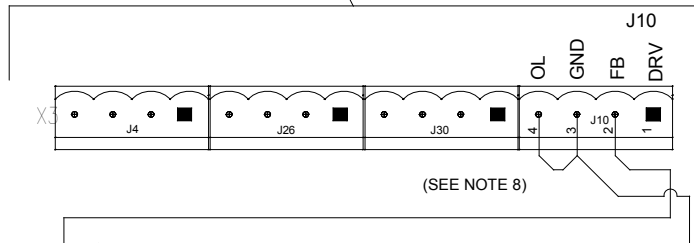
PART NUMBER	DESCRIPTION
<small>EMERSON NETWORK POWER - CONFIDENTIAL AND PROPRIETARY - ALL RIGHTS RESERVED THIS DOCUMENT (AND THE INFORMATION IT CONTAINS) ARE THE PROPERTY OF EMERSON NETWORK POWER. BY ACCEPTING IT INTO YOUR POSSESSION, YOU AGREE THAT YOU WILL KEEP THIS DOCUMENT, AND ALL INFORMATION CONTAINED HEREIN, IN STRICTEST CONFIDENCE, AND WILL NOT COPY, REPRODUCE, TRANSMIT, OR OTHERWISE DISSEMINATE IT IN ANY MANNER WITHOUT THE EXPRESS WRITTEN PERMISSION OF EMERSON NETWORK POWER. AND THIS DOCUMENT SHALL BE RETURNED TO EMERSON NETWORK POWER IMMEDIATELY UPON REQUEST.</small>	
<b>TITLE: STANDARD POWER WIRING DIAGRAM          NX MAINTENANCE BYPASS CABINET          TYPE M SPCL NO/OUTPUT</b>	
DRAWING NUMBER	SHEET REV.
558227	1/1 0





NOTES:

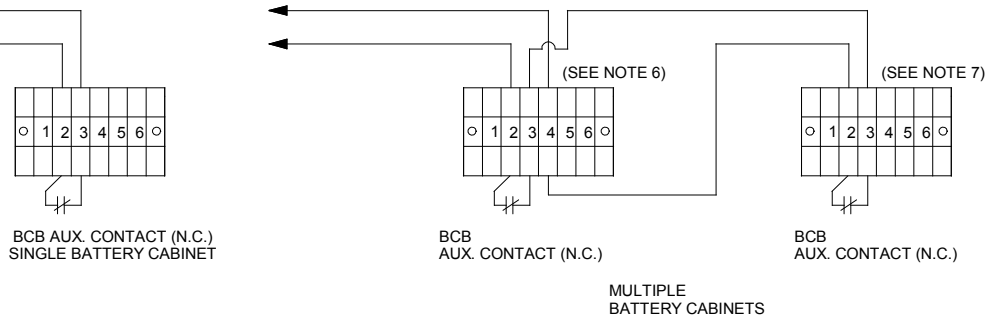
1. CUSTOMER CONTROL WIRING CONNECTION POINTS ARE J10 AND J22.
2. INTER CABINET WIRING BETWEEN THE UPS AND THE EXTERNAL BATTERY CABINET IS SUPPLIED BY LIEBERT WHEN ORDERED AS BOLTED TOGETHER. FIELD SUPPLIED WHEN STAND ALONE, INSTALLATION BY OTHERS.
3. WHEN STAND ALONE INSTALLATION, CONTROL WIRING AND POWER WIRING MUST BE RUN IN SEPARATE CONDUITS.
4. MAXIMUM CONTROL CABLE LENGTH 164 FT (50M) FOR 20-16AWG. DOUBLE INSULATED STRANDED CABLE.
5. N.C. = NORMALLY CLOSED
6. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
7. TYPICAL CONNECTIONS FOR MULTIPLE BATTERY CABINETS. USE SAME CONFIGURATION FOR ALL EXCEPT LAST BATTERY CABINET.
8. CONNECTION TO LAST BATTERY CABINET ONLY.
9. JUMPER CONNECTION BETWEEN PINS 3 AND 4 OF J10. SUPPLIED BY LIEBERT WHEN ORDERED AS BOLTED TOGETHER. FIELD SUPPLIED WHEN STAND ALONE, INSTALLATION BY OTHERS.



TERMINAL BLOCK COMPRESSION LUGS (FOR CONTROL WIRING)

AWG WIRE SIZE OR RANGE	Lb-in	N-m
#20 - #16	3.5 TO 5.3	0.4 TO 0.6

NOTE: USE THE VALUES IN THIS TABLE UNLESS THE EQUIPMENT IS LABELED WITH A DIFFERENT TORQUE VALUE.



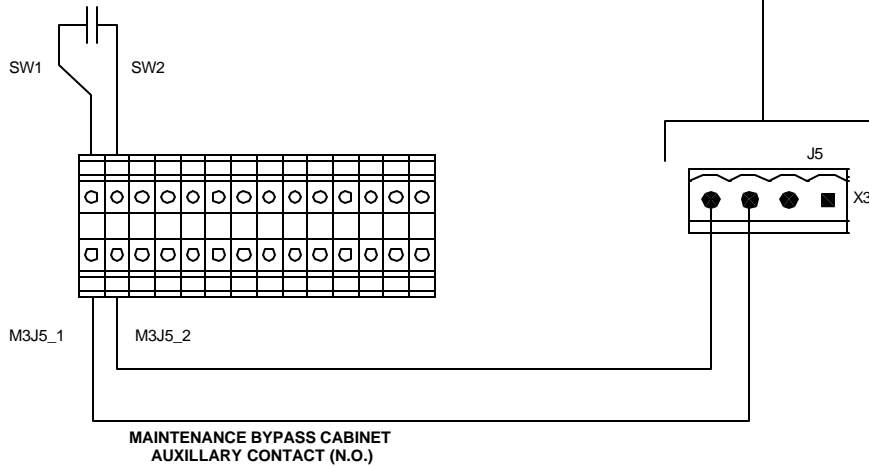
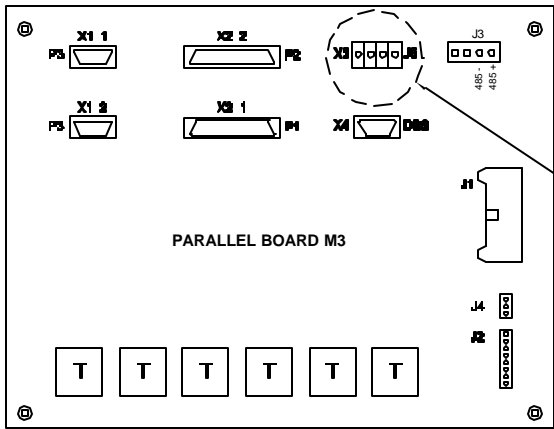
DRAWN BY: K. STACY	SHEET NUMBER: 1 OF 1
CHECKED BY: S. CHILDERS	ECN NUMBER: N/A
REFERENCE DRAWING: N/A	QUOTE NUMBER: N/A

CONTROL WIRING  
EXTERNAL BATTERY CABINET INTERFACE  
LIEBERT NX

DRAWING NUMBER: U3813580	
REV. NUMBER: 3	DATE: 1/28/08

**Liebert**  
1050 DEARBORN DRIVE, P.O. BOX 29186 COLUMBUS, OHIO 43229







NOTES:

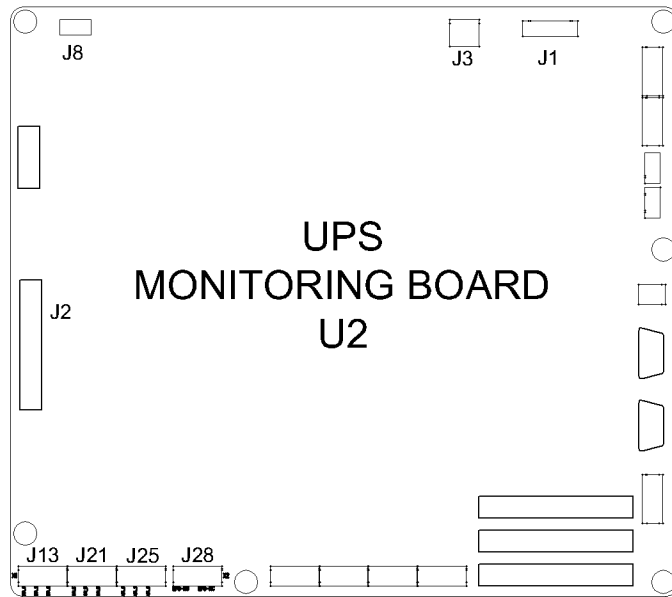
1. CUSTOMER CONTROL WIRING CONNECTION POINT IS J5 MAINTENANCE BYPASS.
2. INTER CABINET WIRING BETWEEN THE UPS AND THE EXTERNAL BATTERY CABINET IS SUPPLIED BY LIEBERT WHEN ORDERED AS BOLTED TOGETHER. FIELD SUPPLIED WHEN STAND ALONE, INSTALLATION BY OTHERS.
3. WHEN STAND ALONE INSTALLATION, CONTROL WIRING AND POWER WIRING MUST BE RUN IN SEPARATE CONDUITS.
4. MAXIMUM CONTROL CABLE LENGTH 7FT (2.1M) TO 15FT (4.5M) FOR 20-16AWG DOUBLE INSULATED STRANDED CABLE
5. N.O. = NORMALLY OPEN
6. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

TERMINAL BLOCK COMPRESSION LUGS (FOR CONTROL WIRING)

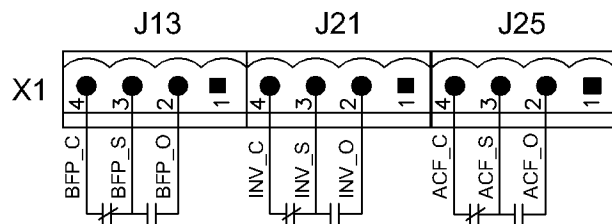
AWG WIRE SIZE OR RANGE	Lb-in	N-m
#20 - #16	3.5 TO 5.3	0.4 TO 0.6

NOTE: USE THE VALUES IN THIS TABLE UNLESS THE EQUIPMENT IS LABLED WITH A DIFFERENT TORQUE VALUE.

DRAWN BY K. STACY CHK BY B. FOX REF. DWG.	CONTROL WIRING MAINTENANCE BYPASS CABINET INTERFACE LIEBERT NX	DWG. NO. U3813582		 1050 DEARBORN DRIVE, COLUMBUS, OHIO 43229	
		REV. NO. 1	DATE 5/10/06		
		FILE NAME: I:\APPI\Ohio And NY - UPSIG Control Wiring Connections\U3813582.dwg			



SEE DETAILS BELOW FOR  
J13, J21, J25, & J28



OUTPUT CONTACT RELAY

POSITION	NAME	DESCRIPTION
J13.2	BFP_O	BYPASS FEEDBACK PROTECTION RELAY - NORMALLY OPEN. CLOSED WHEN BYPASS SCR IS SHORTED.
J13.3	BFP_S	BYPASS FEEDBACK PROTECTION RELAY - CENTER
J13.4	BFP_C	BYPASS FEEDBACK PROTECTION RELAY - NORMALLY CLOSED. OPEN WHEN BYPASS SCR IS SHORTED.
J21.2	INV_O	INVERTER MODE RELAY - NORMALLY OPEN. CLOSED WHEN UPS IS IN INVERTER MODE.
J21.3	INV_S	INVERTER MODE RELAY - CENTER
J21.4	INV_C	INVERTER MODE RELAY - NORMALLY CLOSED. OPEN WHEN UPS IS IN INVERTER MODE.
J25.2	ACF_O	MAIN INPUT FAULT RELAY - NORMALLY OPEN. CLOSED WHEN MAIN INPUT IS IN FAULT.
J25.3	ACF_S	MAIN INPUT FAULT RELAY - CENTER
J25.4	ACF_C	MAIN INPUT FAULT RELAY - NORMALLY CLOSED. OPEN WHEN MAIN INPUT IS IN FAULT.

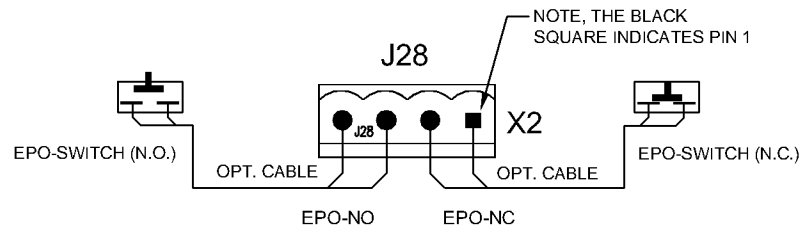
NOTES:

1. CUSTOMER CONTROL WIRING CONNECTION POINTS ARE J13, J21, J25, AND J28.
2. INTERCABINET WIRING BETWEEN THE UPS AND THE EXTERNAL BATTERY CABINET IS SUPPLIED BY LIEBERT WHEN ORDERED AS BOLTED TOGETHER. FIELD SUPPLIED WHEN STAND ALONE, INSTALLATION BY OTHERS.
3. WHEN STAND ALONE INSTALLATION, CONTROL WIRING AND POWER WIRING MUST BE RUN IN SEPARATE CONDUITS.
4. MAXIMUM CONTROL CABLE LENGTH 7FT (2.1M) TO 15FT (4.5M) FOR 20-16AWG DOUBLE INSULATED STRANDED CABLE
5. N.O. = NORMALLY OPEN, N.C. = NORMALLY CLOSED.
6. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

TERMINAL BLOCK COMPRESSION LUGS (FOR CONTROL WIRING)

AWG WIRE SIZE OR RANGE	Lb-in	N-m
#20 - #16	3.5 TO 5.3	0.4 TO 0.6

NOTE: USE THE VALUES IN THIS TABLE UNLESS THE EQUIPMENT IS LABELED WITH A DIFFERENT TORQUE VALUE.



NOTE, THE BLACK SQUARE INDICATES PIN 1

REPO INPUT CONTACT RELAY

POSITION	NAME	DESCRIPTION
J28.1	EPO_NC	EPO ACTIVATED WHEN OPENED TO J28.2
J28.2	EPO_NC	EPO ACTIVATED WHEN OPENED TO J28.1
J28.3	EPO_NO	EPO ACTIVATED WHEN SHORTED TO J28.4
J28.4	EPO_NO	EPO ACTIVATED WHEN SHORTED TO J28.3

IF THE REPO IS NOT REQUIRED, THE CONNECTION BETWEEN TERMINALS EPO-NO AND EPO-NC MUST BE OPEN.

DRAWN BY V. CARMONA	SHEET NO. 1 OF 1
CHK BY B. FOX	ECN NO.
REF. DWG.	

CONTROL WIRING  
INPUT AND OUTPUT RELAY CONTACTS  
(FOR UNITS BUILT AFTER MAY 2006)  
LIEBERT NX

DWG. NO.  
U3813585

REV. NO. 2 DATE 12/13/07

 **Liebert**  
P.O. BOX 29186  
COLUMBUS, OHIO 43229



# NX UPS – Unit LCD Control Panel and Display

## 8.0 OPERATOR CONTROL AND DISPLAY PANEL

### 8.1 Operator Control Panel

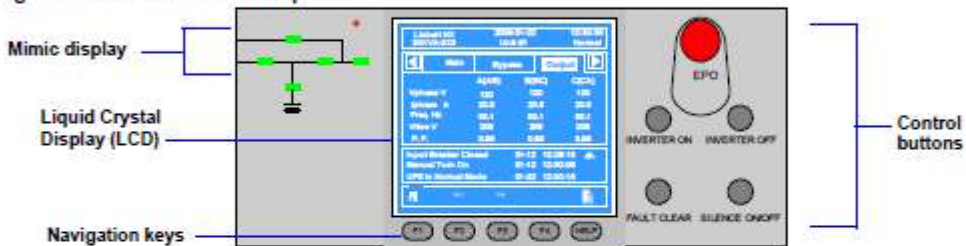
The control panel and LCD on the front of the Liebert NX lets the operator:

- turn the UPS on or off
- transfer into the various operating modes
- silence alarms
- check the status of the UPS and its batteries, including all measured parameters, events and alarms

The main areas of the control panel are shown below in Figure 46 and detailed in Figure 47.

- **Mimic Display** - view the status of the NX in single-line diagram format—indicators show status by changing color when ON, flashing or OFF
- **Liquid Crystal Display (LCD)** and **Navigation keys** - view status and operational data from the NX in tabular format
- **Control buttons** - turn the NX on or off, silence alarms

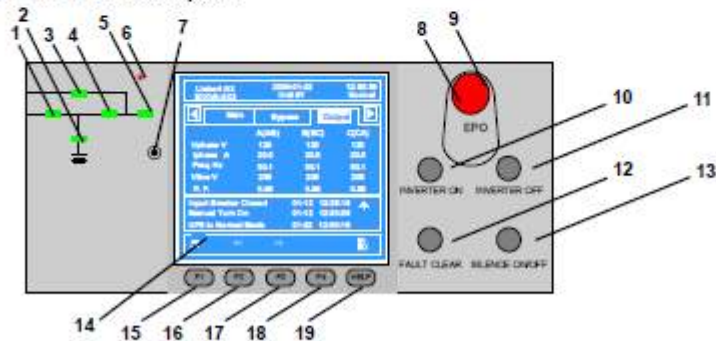
Figure 46 Overview of control panel



#### 8.1.1 Display Panel Layout

Figure 47 shows the control panel in greater detail, identifying individual items that are described in the rest of this section.

Figure 47 Detailed view of control panel

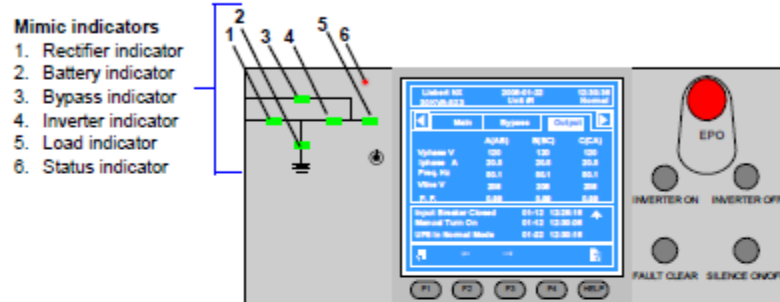


Mimic indicators	Control buttons	Navigation keys
1. Rectifier indicator	8. Button cover	15. F1
2. Battery indicator	9. EPO button	16. F2
3. Bypass indicator	10. INVERTER ON button	17. F3
4. Inverter indicator	11. INVERTER OFF button	18. F4
5. Load indicator	12. FAULT CLEAR button	19. Help
6. Status indicator	13. SILENCE ON/OFF button	
7. Buzzer	14. LCD	

## 8.2 Mimic Display Indicators

The Mimic display on the front panel consists of six indicators arranged in a single-line diagram depicting the various paths of UPS power, as shown in Figure 48.

Figure 48 Mimic display indicators location



The current operational status of the Liebert NX is indicated by the color of the indicators—green, amber or red—and whether they are ON (solid), flashing or OFF. Table 18 provides a guide to interpreting the various states of the indicators.

Table 18 Mimic display status indicators

Indicator (see Figure 48)	Green	Flashing Green / Amber	Red	Off
1. Rectifier	Load on rectifier	Flashing Green: Utility normal, but rectifier not operating	Rectifier fault	Rectifier is normal, but utility is abnormal
2. Battery	Battery powering the load	Flashing Green: Battery pre-warning (low battery)	Battery or battery converter abnormal*	Battery and converter are normal, and battery is not discharging
3. Bypass	Load on Bypass power	—	Bypass out of normal range	Bypass Normal
4. Inverter	Inverter powering the load normally	Flashing Green: Inverter on standby	Inverter fault	Inverter normal, but off
5. Load	UPS output on	—	UPS output overloaded	UPS no output power
6. Status	No alarms—UPS working normally	Amber: UPS has a general alarm	UPS has a serious alarm	—

\* Battery or battery converter abnormal events include these event messages (see Table 44 in Appendix A): No Battery, Battery Replaced, Battery Reverse, Batt. Conv. Over. Curr., Batt. Converter Fault, Batt. Converter Overtemp.

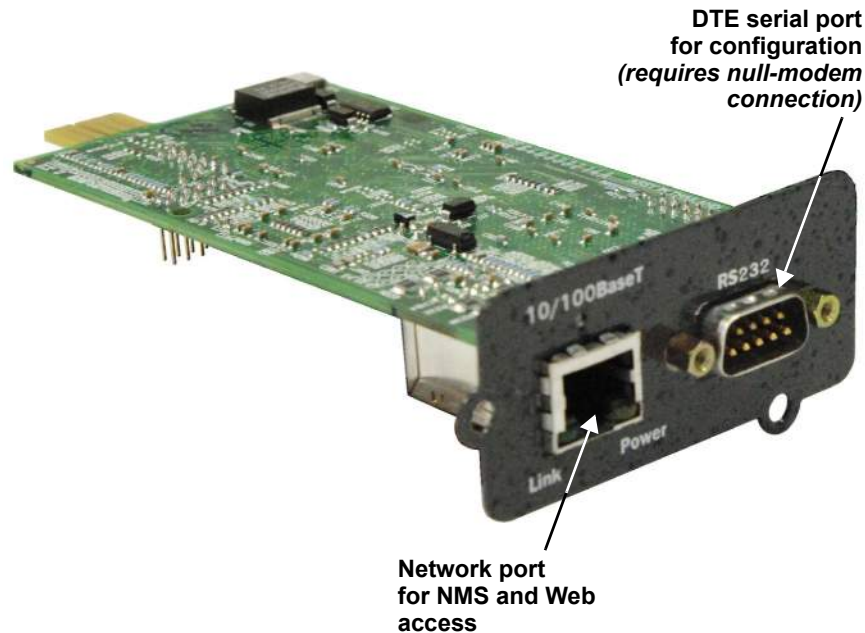
## LIEBERT® INTELLISLOT® WEB CARDS

LIEBERT INTELLISLOT WEB CARD  
LIEBERT INTELLISLOT WEB CARD-LB  
LIEBERT INTELLISLOT WEB CARD-LBDS  
LIEBERT INTELLISLOT WEB CARD-X  
LIEBERT INTELLISLOT WEB CARD-L

LIEBERT INTELLISLOT WEB CARD-IPBML MODBUS IP / BACNET IP  
LIEBERT INTELLISLOT WEB CARD-S  
LIEBERT INTELLISLOT WEB CARD-IPBMS MODBUS IP  
LIEBERT INTELLISLOT WEB CARD-IPBMX MODBUS IP

*Note: Liebert IntelliSlot Web cards are a form, fit and function replacement for the existing Liebert OpenComms™ Web cards.*

### Product Specification/Installation Sheet



### Description

The Liebert IntelliSlot Web Card family delivers enhanced communications and control to Liebert UPS, AC Power and Thermal Management systems.

Liebert IntelliSlot Web cards bring SNMP, Telnet, Modbus IP, BACnet IP and Web-management capability to many models of Emerson Network Power's line of Liebert UPS, power and cooling equipment. See **Table 1** for equipment supported and **Table 2** for communication protocols supported.

The cards employ an Ethernet network to monitor and manage a wide range of operating parameters, alarms and notifications.

### Additional Features

- SNMP v1, v2c with MIB-II support
- SNMP v3 (for IS-WEBCARD HID9 only)
- HTTP/HTTPS 1.1
- Telnet
- BootP, DHCP per RFC2131/2132
- Secure Sockets (SSL)
- Remote firmware updates via HTTP

# Compatibility With Other Emerson Products and Communication Protocols

The Liebert IntelliSlot® Web Card family, formerly the Liebert OpenComms™ line, includes:

**Table 1 Compatibility With Liebert equipment**

Liebert IntelliSlot Card	Part Number	Compatible with:
Liebert IntelliSlot Web Card	IS-WEBCARD	<ul style="list-style-type: none"> <li>Liebert GXT™</li> <li>Liebert GXT3™</li> <li>Liebert GXT2U™</li> <li>Liebert Nfinity® (prior to July 2008)</li> <li>Liebert PowerSure PSI™</li> </ul>
Liebert IntelliSlot Web Card-LB	IS-WEHLB	<ul style="list-style-type: none"> <li>Liebert Hinet™</li> <li>Liebert NX™</li> </ul>
Liebert IntelliSlot Web Card-LBDS	IS-WEHLBDS	<i>Units with Liebert iCOM® Firmware prior to PA1.04.033.STD:</i> <ul style="list-style-type: none"> <li>Liebert Challenger 3000™</li> <li>Liebert Challenger ITR™</li> <li>Liebert CW™</li> <li>Liebert Deluxe System/3™</li> <li>Liebert DS™</li> <li>Liebert PeX™</li> <li>Liebert XDC™ with Liebert iCOM</li> <li>Liebert XDF™</li> </ul>
Liebert IntelliSlot Web Card-L Liebert IntelliSlot Web Card-IPBML Modbus IP / BACnet IP	IS-WEBL IS-IPBML	<ul style="list-style-type: none"> <li>Liebert APM™ (Modbus IP only)</li> <li>Liebert CRV™</li> <li>Liebert HPC™</li> <li>Liebert HPM™</li> <li>Liebert XDP™ with Liebert iCOM</li> </ul> <i>Units with Liebert iCOM Firmware PA1.04.033.STD or later:</i> <ul style="list-style-type: none"> <li>Liebert Challenger 3000</li> <li>Liebert Challenger ITR</li> <li>Liebert CW</li> <li>Liebert Deluxe System/3</li> <li>Liebert DS</li> <li>Liebert PeX</li> <li>Liebert XDC with Liebert iCOM</li> </ul>
Liebert IntelliSlot Web Card-S Liebert IntelliSlot Web Card-IPBMS Modbus IP	IS-WEBS IS-IPBMS	<i>Units with Liebert IntelliSlot support only:</i> <ul style="list-style-type: none"> <li>Liebert FDC™</li> <li>Liebert FPC™</li> <li>Liebert PPC™</li> <li>Liebert RDC™</li> <li>Liebert RX™</li> </ul>
Liebert IntelliSlot Web Card-X Liebert IntelliSlot Web Card-IPBMX Modbus IP	IS-WEBX IS-IPBMX	<ul style="list-style-type: none"> <li>Liebert NXL™ (SA, SR, SN, MM, CD), Alber® BDSU™</li> </ul>

The Web cards support the following protocols:

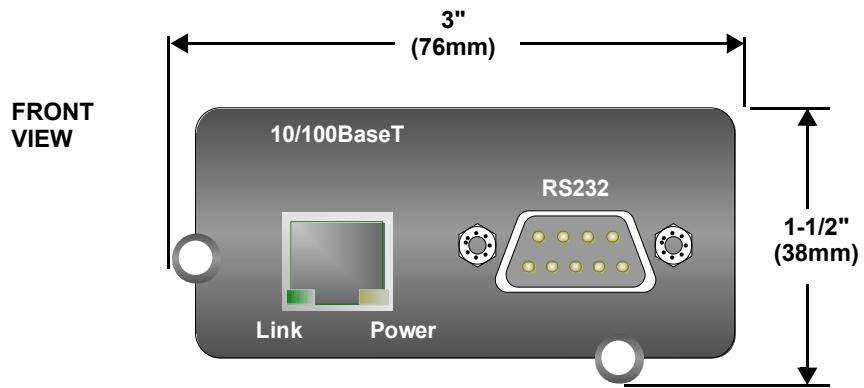
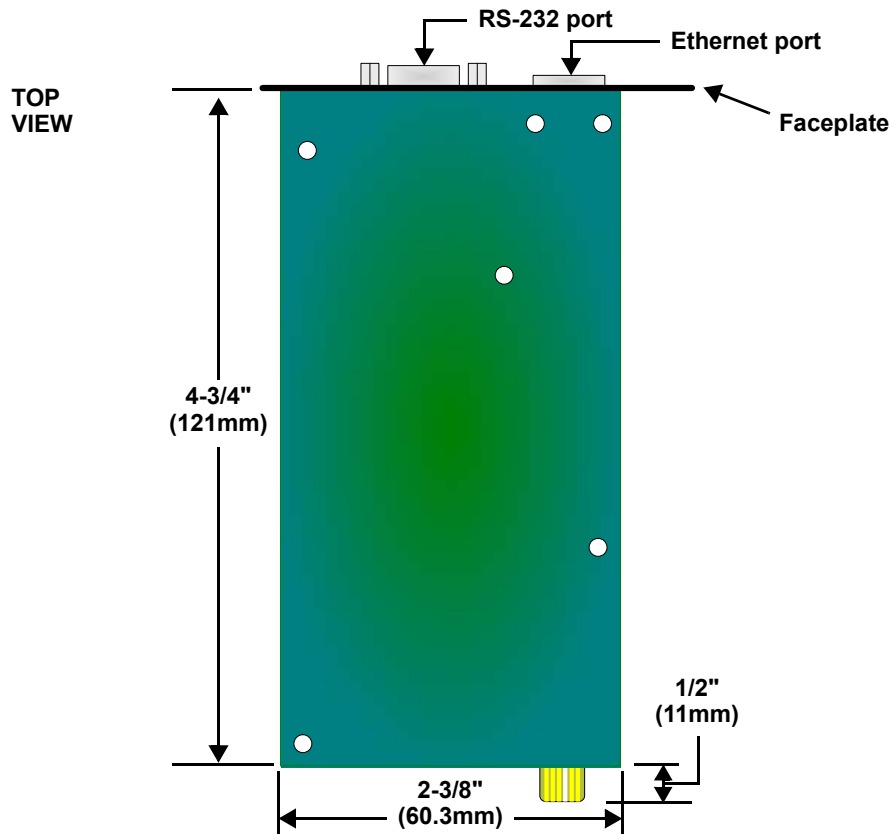
**Table 2 Liebert IntelliSlot card communication protocols**

Liebert IntelliSlot Card	Part Number	Communication Protocol								
		SNMP v1,v2c	SNMP v3	HTTP	HTTPS	EMAIL	SMS	TELNET	MODBUS IP/ BACNET IP	EMERSON PROTOCOL
Liebert IntelliSlot Web Card	IS-WEBCARD	✓	✓*	✓	✓	✓	✓	✓	—	—
Liebert IntelliSlot Web Card-LB	IS-WEHLB	✓	—	✓	✓	✓	✓	✓	—	—
Liebert IntelliSlot Web Card-LBDS	IS-WEHLBDS	✓	—	✓	—	—	—	✓	—	—
Liebert IntelliSlot Web Card-L	IS-WEBL	✓	—	✓	✓	✓	✓	✓	—	✓
Liebert IntelliSlot Web Card-S	IS-WEBS	✓	—	✓	✓	✓	✓	✓	—	✓
Liebert IntelliSlot Web Card-X	IS-WEBX	✓	—	✓	✓	✓	✓	✓	—	✓
Liebert IntelliSlot Web Card-IPBML Modbus IP / BACnet IP	IS-IPBML	—	—	✓	✓	—	—	✓	✓ Both	✓
Liebert IntelliSlot Web Card-IPBMS Modbus IP	IS-IPBMS	—	—	✓	✓	—	—	✓	✓ Modbus IP only	✓
Liebert IntelliSlot Web Card-IPBMX	IS-IPBMX	—	—	✓	✓	—	—	✓	✓ Modbus IP only	✓

\* SNMP v3 available for Liebert GXT3 only

\*\* Modbus IP only for IS-IPBMS and IS-IPBMX

# Dimensions





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## Specifications

<b>Power Requirements</b>	DC Inputs	9 to 12VDC, 3.6W maximum
	Power Consumption	6VA maximum (1.75W)
<b>Dimensions - W x D x H: in. (mm)</b>		3 x 5-1/4 x 1-1/2 (76 x 134 x 38)
<b>Weight</b>	Net - oz. (kg)	7 (0.2)
	Shipping - lb. (kg)	1.3 (0.6)
<b>Ambient Operating Environment, °F (°C)</b>		32 to 131 (0 to 55); 10% to 90% RH (non-condensing)
<b>Ambient Storage Temperature, °F (°C)</b>		-4 to 140 (-20 to 60)
<b>Protection</b>		SELV Isolated User Connections, Watchdog Timer Circuitry
<b>Communication Ports</b>	Service Terminal (RS-232)	DB9F, DTE
	Ethernet Communications	RJ45

## Wiring Specifications

Connection	Supported Wire Type	Maximum Wire Length
RS-232 DB-9F Connector	Null Modem Cable DTE Null Modem Cable	50 ft. (15.3m)
RJ-45 Connector	Standard Category 5 Cable	328 ft. (100m)

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## Liebert Corporation

1050 Dearborn Drive Telephone: 1-800-877-9222  
P.O. Box 29186 Facsimile: 1-614-841-6022  
Columbus, OH 43229 www.liebert.com



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SL-29115\_REV12\_08-13

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# LYTLE TUNNEL RENOVATION &UPGRADES

UPS USER MANUAL  
Dwg. 461 of 555, 1.04.B

**HAM-71-01.34**

GLENWOOD ELECTRIC, INC.  
12250 CHANDLER DRIVE  
WALTON, KY 41094  
(859)485-3700

I HEREBY CERTIFY THAT THE EQUIPMENT/MATERIAL SHOWN AND MARKED IN THIS SUBMITTAL IS IN COMPLIANCE WITH THE CONTRACT DRAWING AND SPECIFICATIONS, CAN BE INSTALLED IN THE ALLOCATED SPACE, WILL BE STORED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATION, WILL BE INSTALLED PER NEC, AND IS SUBMITTED FOR APPROVAL.

CERTIFIED BY: Phil Thaman

DATE: 5/23/2017

**POWER AVAILABILITY**

**NX<sup>™</sup>**

**INSTALLATION MANUAL**



**10-30kVA  
208V, 60Hz**

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## CONTACTING LIEBERT FOR SUPPORT

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To contact Liebert Global Services for information or repair service in the United States, call 1-800-LIEBERT (1-800-543-2378). Liebert Global Services offers a complete range of start-up services, repair services, preventive maintenance plans and service contracts.

For repair or maintenance service outside the 48 contiguous United States, contact Liebert Global Services, if available in your area. For areas not covered by Liebert Global Services, the authorized distributor is responsible for providing qualified, factory-authorized service.

For LGS to assist you promptly, please have the following information available:

Tag Number \_\_\_\_\_

Site ID \_\_\_\_\_

Part numbers: \_\_\_\_\_

Serial numbers: \_\_\_\_\_

Rating: \_\_\_\_\_

Date purchased: \_\_\_\_\_

Date installed: \_\_\_\_\_

Location: \_\_\_\_\_

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# TABLE OF CONTENTS

<b>CONTACTING LIEBERT FOR SUPPORT</b> .....	<b>INSIDE FRONT COVER</b>
<b>IMPORTANT SAFETY INSTRUCTIONS</b> .....	<b>1</b>
<b>GLOSSARY OF SYMBOLS</b> .....	<b>3</b>
<b>1.0 INSTALLATION</b> .....	<b>4</b>
1.1 External Inspections .....	4
1.2 Internal Inspections .....	4
1.2.1 Storing for Delayed Installation .....	5
1.3 Preliminary Checks .....	5
1.3.1 Identification .....	5
1.4 UPS Location .....	5
1.4.1 Environmental Considerations .....	5
1.5 Mechanical Considerations .....	5
1.5.1 System Composition .....	6
1.5.2 10-30kVA UPS .....	6
1.5.3 Positioning the UPS .....	6
1.5.4 Clearances .....	7
1.5.5 Floor Installation .....	7
1.5.6 Cable Entry .....	7
1.5.7 Optional Cabinets .....	8
<b>2.0 ELECTRICAL CONNECTIONS</b> .....	<b>9</b>
2.1 Power Cabling .....	9
2.1.1 Cable Rating .....	9
2.1.2 UPS Input Configuration .....	10
2.1.3 Cabling Guidelines .....	10
2.1.4 Cable Connections .....	11
2.1.5 Safety Ground .....	12
2.1.6 Protective Devices .....	12
2.1.7 Cabling Procedure .....	13
2.2 Control Cables .....	14
2.2.1 Monitor Board Features .....	14
2.2.2 Dry Contact .....	15
2.3 UPS Start-Up .....	17
2.3.1 Start-Up Procedure .....	17
2.4 Switching the UPS from Normal to Maintenance Bypass .....	18
2.5 Powering Down the UPS .....	19

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<b>3.0</b>	<b>BATTERY INSTALLATION</b> . . . . .	<b>20</b>
3.1	Introduction . . . . .	20
3.2	Safety . . . . .	20
3.3	UPS Batteries . . . . .	20
3.4	Temperature Considerations . . . . .	20
3.5	Battery Protection . . . . .	21
	3.5.1 Battery Undervoltage Pre-Warning . . . . .	21
	3.5.2 Battery End-of-Discharge (EOD) Protection . . . . .	21
	3.5.3 Battery Fuse-Blow Warning . . . . .	21
3.6	External Battery Cabinet Installation . . . . .	21
	3.6.1 Fitting the Batteries . . . . .	21
	3.6.2 Connecting the Batteries . . . . .	21
3.7	Matching Battery Cabinets . . . . .	24
	3.7.1 Installation Considerations . . . . .	24
	3.7.2 Connecting the Battery Cabinet to the UPS . . . . .	25
3.8	Non-Standard Batteries . . . . .	26
<b>4.0</b>	<b>MAINTENANCE BYPASS CABINET</b> . . . . .	<b>27</b>
4.1	Bypass Switch . . . . .	27
4.2	UPS Mode . . . . .	27
4.3	Bypass Mode . . . . .	28
4.4	Maintenance Mode . . . . .	28
4.5	Mounting the Cabinet . . . . .	28
4.6	Cable Installation . . . . .	28
	4.6.1 Wiring Preparation . . . . .	28
	4.6.2 Power Cable Installation . . . . .	29
	4.6.3 Input/Output Wiring . . . . .	29
4.7	Bolting Cabinets Together . . . . .	30
4.8	Operating Procedures . . . . .	31
	4.8.1 Start-Up and Initialization . . . . .	31
	4.8.2 Shutting Down the UPS . . . . .	31
	4.8.3 Transferring System from UPS to Maintenance Bypass Operation . . . . .	31
	4.8.4 Transfer the System from Maintenance Bypass to UPS Operation . . . . .	31
	4.8.5 Transfer the System from UPS Operation to Maintenance Bypass . . . . .	31

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<b>5.0</b>	<b>SPECIFICATIONS</b> .....	<b>32</b>
5.1	Conformity and Standards .....	32
5.2	UPS Environmental .....	32
5.3	UPS Mechanical Characteristics .....	32
5.4	UPS Electrical Characteristics .....	33
5.4.1	Battery Manufacturers and Models .....	33
5.4.2	Input Rectifier .....	33
5.4.3	DC Intermediate Circuit .....	33
5.4.4	Inverter Output .....	34
5.4.5	Bypass Input .....	34
<b>6.0</b>	<b>INSTALLATION DRAWINGS</b> .....	<b>35</b>
<b>7.0</b>	<b>SPECIFICATIONS AND TECHNICAL DATA</b> .....	<b>44</b>
7.1	Lug Size and Torque Requirements .....	44
7.2	Cable Lengths: Floor to Connection Point Inside UPS .....	47

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## FIGURES

Figure 1	Cabinet arrangement . . . . .	8
Figure 2	Single module block diagram (dual input configuration) . . . . .	10
Figure 3	Input busbars . . . . .	11
Figure 4	Battery fuses and connections . . . . .	11
Figure 5	Ground and neutral busbar connections . . . . .	12
Figure 6	Monitor board U2 . . . . .	14
Figure 7	Auxiliary terminal block detail . . . . .	14
Figure 8	Input dry contacts at X3 slot . . . . .	15
Figure 9	Output dry contacts (X1) and REPO input wiring (X2) . . . . .	16
Figure 10	Narrow battery cabinet, 27 in. (690mm) - rear view . . . . .	22
Figure 11	Wide battery cabinet, 57 in. (1450mm) - front view . . . . .	22
Figure 12	Battery cabinet - details . . . . .	23
Figure 13	Battery tray and supports . . . . .	25
Figure 14	Single UPS with external Maintenance Bypass Cabinet—typical configuration . . . . .	27
Figure 15	Maintenance Bypass Cabinet—access plate removed . . . . .	28
Figure 16	Maintenance Bypass Cabinet wiring access panel . . . . .	29
Figure 17	Dry contact for X3 . . . . .	30
Figure 18	Dimensional view- front and left side views . . . . .	35
Figure 19	Dimensions continued - top and bottom views . . . . .	36
Figure 20	Main components—typical unit . . . . .	37
Figure 21	Cable connections . . . . .	38
Figure 22	Location of battery inside UPS . . . . .	39
Figure 23	Battery connections . . . . .	40
Figure 24	Electrical connections . . . . .	41
Figure 25	Battery Cabinet interconnection . . . . .	42
Figure 26	Maintenance Bypass interconnection . . . . .	43

## TABLES

Table 1	UPS unit cabinet power cable rating . . . . .	9
Table 2	Input dry contact relays . . . . .	15
Table 3	Output dry contact relays . . . . .	16
Table 4	REPO input contact relays . . . . .	16
Table 5	Environmental characteristics . . . . .	32
Table 6	Mechanical characteristics . . . . .	32
Table 7	Approved batteries . . . . .	33
Table 8	Rectifier input power . . . . .	33
Table 9	DC intermediate circuit . . . . .	33
Table 10	Inverter output . . . . .	34
Table 11	Linear load derating . . . . .	34
Table 12	Bypass input . . . . .	34
Table 13	Liebert -supplied interconnect wiring . . . . .	42
Table 14	Liebert-supplied interconnect wiring for Maintenance Bypass Cabinet . . . . .	43
Table 15	Torque specifications . . . . .	44
Table 16	Battery torque rating . . . . .	44
Table 17	Wire sizing—UPS terminal . . . . .	45
Table 18	Wire sizing—Maintenance Bypass Cabinet . . . . .	46
Table 19	Maintenance Bypass Cabinet weights . . . . .	47
Table 20	Distance to connection points on the NX . . . . .	47
Table 21	Battery cabinet physical characteristics . . . . .	47



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## IMPORTANT SAFETY INSTRUCTIONS

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### SAVE THESE INSTRUCTIONS


This manual contains important instructions that should be followed during installation of your Liebert NX™ UPS and batteries.

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

Exercise extreme care when handling UPS cabinets to avoid equipment damage or injury to personnel. The UPS module weight ranges from 850 to 1400 lbs. (386 to 635kg).

Determine unit weight and locate center of gravity symbols  before handling the UPS. Test lift and balance the cabinet before transporting. Maintain minimum tilt from vertical at all times.

Battery manufacturers supply details of the necessary precautions to be observed when working on, or in the vicinity of, a large bank of battery cells. These precautions should be followed implicitly at all times.

Follow all battery safety precautions when installing, charging or servicing batteries. In addition to the hazard of electric shock, gas produced by batteries can be explosive and sulfuric acid can cause severe burns. When connected, the nominal battery voltage is 324VDC and is potentially lethal.

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 maintenance.

Be constantly aware that the UPS system contains high DC as well as AC voltages.

Check for voltage with both AC and DC voltmeters prior to making contact.



#### WARNING

As with other types of high power equipment, dangerous voltages are present within the UPS and battery enclosure. The risk of contact with these voltages is minimized as the live component parts are housed behind a hinged, lockable door. Further internal safety screens make the equipment protected to IP20 standards.

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 trained personnel.



#### WARNING

High ground leakage current: Ground connection is essential before connecting the input supply.

This equipment must be grounded in accordance with local electrical codes.

Maximum load must not exceed that shown on the UPS rating label.



## CAUTION

This equipment is fitted with RFI suppression filters.

Ground leakage current exceeds 3.5 mA and is less than 1000 mA.

Transient and steady-state ground leakage currents, which may occur when starting the equipment, should be taken into account when selecting instantaneous residual current circuit breakers (RCCBs) or residual current devices (RCDs).

RCCBs must be selected sensitive to DC unidirectional pulses (Class A) and insensitive to transient current pulses.

Note also that the ground leakage currents of the load will be carried by this RCCB or RCD.



## WARNING

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 battery. Observe all safety precautions in this manual before handling or installing the UPS system. Observe all precautions in the Operation and Maintenance Manual, before as well as during performance of all 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 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 electric charges may exist within the UPS.

**All power and control wiring should be installed by a qualified electrician.** All power and control wiring must comply with the NEC and applicable local codes.

**ONLY qualified service personnel should perform maintenance on the UPS system.**

When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats. The service personnel should wear insulating shoes for isolation from direct contact with the floor (earth ground).

Never work alone, even if all power is removed from the equipment. A second person should be standing by to assist and summon help in case an accident should occur.



## CAUTION

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 must correct at his own expense.

### Battery Cabinet Precautions

The following warning applies to all battery cabinets supplied with UPS systems. Additional warnings and cautions applicable to battery cabinets may be found in **3.0 - Battery Installation**.



## WARNING

Internal battery strapping must be verified by manufacturer prior to moving a battery cabinet (after initial installation).

- Battery cabinets contain non-spillable batteries.
- Keep units upright.
- Do not stack.
- Do not tilt.






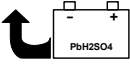





Failure to heed this warning could result in smoke, fire or electric hazard.

Call 1-800-LIEBERT before moving battery cabinets (after initial installation).

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## GLOSSARY OF SYMBOLS

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

## 1.0 INSTALLATION

---

The Liebert NX™ UPS is designed primarily for telecommunications and data processing applications. Liebert Corporation neither recommends nor knowingly sells this product for use with life support and other designated “critical” devices.

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

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



### WARNING

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



### WARNING

The UPS equipment should be installed by a qualified engineer in accordance with the information contained in this section.



### WARNING

Special care should be taken when working with the batteries associated with this equipment. When connected together, the nominal battery voltage is 324 VDC and is potentially lethal.

- Eye protection should be worn to prevent injury from accidental electrical arcs.
- Remove rings, watches and all metal objects.
- Only use tools with insulated handles.
- Wear rubber gloves.

If a battery leaks electrolyte or is otherwise physically damaged, it must be replaced, stored in a container resistant to sulfuric acid and disposed of in accordance with local regulations.

If electrolyte comes into contact with skin, the affected area should be washed immediately with large amounts of water.



### NOTE

*The NX UPS can be used in TN utility system.*

### 1.1 External Inspections

1. While the UPS system is still on the truck, inspect the equipment and shipping container(s) for any signs of damage or mishandling. Do not attempt to install the system if damage is apparent. If any damage is noted, file a damage claim with the shipping agency within 24 hours and contact Liebert Global Services at 1-800-LIEBERT to inform them of the damage claim and the condition of the equipment.
2. Compare the contents of the shipment with the bill of lading. Report any missing items to the carrier and your local Liebert representative immediately.

### 1.2 Internal Inspections

1. Remove any packaging material, then visually examine the UPS and battery equipment for transit damage, both internally and externally. Report any such damage to the shipper and to Liebert immediately.
2. Check the nameplate inside the cabinet door to verify that the model number and rating correspond to the ones specified. Record the model number and serial number in the front of this installation manual. This information is necessary should service be required.
3. Check for loose connections or unsecured components in the cabinet.
4. Check for shipping damage to internal components.

## 1.2.1 Storing for Delayed Installation

If the equipment will not be installed immediately, it must be stored indoors where the humidity is no higher than 90% and the temperature is no higher than 104°F (40°C). The storage area must protect the NX from excessive moisture (see **5.0 - Specifications**).



### CAUTION

If the UPS must remain disconnected from power for more than six (6) months, the battery must be recharged before use. To charge the batteries, the unit must be connected to utility power and started up—the charger operates only while the NX is operating.



### CAUTION

When batteries are installed in the UPS or are cabinet-mounted adjacent to the UPS unit, the battery—not the UPS—dictates the designed maximum ambient temperature.

## 1.3 Preliminary Checks

### 1.3.1 Identification

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

## 1.4 UPS Location

### 1.4.1 Environmental Considerations

Before installing the NX, verify that the UPS room satisfies the environmental conditions stipulated in **5.0 - Specifications**, paying particular attention to the ambient temperature and air exchange system.

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

All NX models are cooled by internal fans. Cooling air enters the devices through ventilation grids at various points on the cabinet and is released through grids on the top of the unit. To permit proper airflow and prevent overheating or malfunctioning, do NOT cover the ventilation openings or allow fans or equipment to blow air down onto the NX.

If necessary, a system of extractor fans should be installed to aid cooling-air flow. If the unit is to be operated in an environment that is not clean-air, a suitable air filtration system should be used to ensure the unit works properly.

See **Table 6** for details on heat dissipation.



### CAUTION

When batteries are installed in the UPS or are cabinet-mounted adjacent to the UPS unit, the battery—not the UPS—dictates the designed maximum ambient temperature.

### Battery Location

Temperature is a major factor in determining battery life and capacity. Battery manufacturers recommend an operating temperature of 77°F (25°C). Ambient temperatures warmer than this reduce battery life; temperatures below this reduces battery capacity. In a typical installation, battery temperature should be maintained between 68°F and 86°F (20-30°C). Batteries should be placed where there are no main heat sources or air inlets to prevent portions of batteries from being either much warmer or much cooler than other parts of the batteries.

## 1.5 Mechanical Considerations

The NX is constructed with a steel frame and removable panels. Top and side panels are secured to the chassis by screws. The doors may be opened for access to power connections bars, auxiliary terminals blocks and power switches.

The UPS comes with an operator control panel, which provides basic operational status and alarm information. The cabinet houses both the power components and the internal batteries. Cooling is provided by internal fans. The unit sits on four casters. Adjustable leveling feet are provided to prevent the UPS from moving once it has been moved to its final position.

### 1.5.1 System Composition

A UPS system can comprise a number of equipment cabinets, depending on the individual system design requirements—e.g., UPS cabinet and External Bypass cabinet. In general, all cabinets used will be the same height and are designed to be positioned side-by-side to form an aesthetically appealing equipment suite.

Refer to **6.0 - Installation Drawings** for the positioning of the cabinets described below.

### 1.5.2 10-30kVA UPS

The 10-30kVA NX consists of a single cabinet housing the UPS and its internal battery string.

An extended battery option kit is available. This comprises a separate cabinet containing additional batteries that can be connected to the UPS to increase its total battery capacity (see **3.6 - External Battery Cabinet Installation**).

Maintenance Bypass-Transformer Cabinet options are available to:

- Provide an external wraparound maintenance bypass switch
- Change input voltage
- Change output voltage
- Provide three-wire input and four-wire output
- Provide load neutral isolation

For details on installing a Maintenance Bypass Cabinet or Transformer Cabinet, see **6.0 - Installation Drawings**.

### 1.5.3 Positioning the UPS

Choose a location for the UPS that offers:

- Easy connection to inputs, outputs and auxiliary equipment
- Enough space to service the UPS
- Air circulation sufficient to expel heat produced by UPS
- Protection against moisture and excessive humidity
- Protection against dust and other particulate matter
- Compliance with fire prevention regulations and practices
- Operating environment temperature of 68°F to 77°F (20°C to 25°C) for maximum battery efficiency

#### Considerations in Moving the NX

Ensure that the UPS weight is within the designated surface weight loading (lbs/ft<sup>2</sup> or kg/cm<sup>2</sup>) of any handling equipment. See **Table 6** for weights of various units.

To move the UPS and optional battery cabinets:

- The NX may be rolled on its casters when moving the unit a short distance. For longer distances, move the UPS with a forklift or similar equipment to ease the relocation and to reduce vibration.

The optional battery cabinets should be moved with a forklift or similar equipment.



## WARNING

Ensure that any equipment that will be used to move the NX has sufficient lifting capacity. The NX weight ranges from 850 to 1400 lbs. (386 to 635kg). See **Table 6** for details. The UPS presents a tipping hazard. Do not tilt the NX further than 15 degrees from vertical.

The UPS is fitted with casters—take care to prevent movement when unbolting the equipment from its shipping pallet. Ensure adequate personnel and lifting equipment are available when taking the NX off its shipping pallet. Do not tilt the unit more than 15 degrees from center.



## WARNING

The casters are strong enough for movement across even surfaces only. Casters may fail if they are subjected to shock loading, such as being dropped or rolled over holes in the floor or obstructions. Such failure may cause the unit to tip over, injuring personnel and damaging the equipment.

Care must be taken when maneuvering units fitted with batteries. Keep such moves to a minimum. For further information, see **Battery Cabinet Precautions on page 2**.

### Leveling in Final Position

When the equipment has been finally positioned, ensure that the adjustable leveling feet are set so that the UPS will remain stationary and stable (see **6.0 - Installation Drawings**).

#### 1.5.4 Clearances

There are no ventilation grilles on the sides or rear of the UPS. The sides must be accessible during installation. After installation, the unit may be placed with the rear against a wall and optional cabinets on either side.

To enable routine tightening of power terminations within the UPS, make sure there is sufficient clearance in front of the NX to permit free passage of personnel with the door fully opened.

Leave a minimum of 2 ft. (610mm) between the top of the UPS and the ceiling to permit adequate air circulation above the unit. Liebert recommends against using air conditioning or other systems that blow air onto the top of the unit.

#### 1.5.5 Floor Installation

The diagrams in **6.0 - Installation Drawings** show the location of holes in the base plate for bolting the equipment to the floor. An optional anchoring kit is available. For information, see your local Liebert representative.

If the equipment is to be placed on a raised floor, it should be mounted on a pedestal that will support the equipment point loading. Refer to the bottom view in **Figure 18** to design this pedestal.

#### 1.5.6 Cable Entry

Cables can enter the NX from the top, through the bottom or through the left side. Cable entry is made possible by removing the left-side panel or a metal plate attached to the top or bottom of the UPS.

Connecting cables to the NX requires that the UPS be accessible from the left side to allow personnel to complete the connections and make necessary adjustments. After installation is complete, the NX may be serviced from the front.



#### NOTE

*When installing the UPS, the customer must provide a disconnect at the output of the UPS.*

### 1.5.7 Optional Cabinets

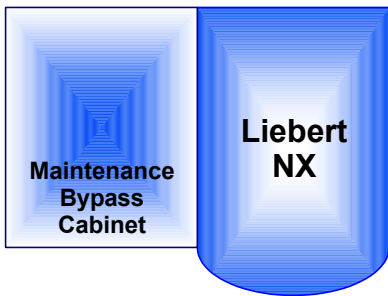
If your NX installation includes a Maintenance Bypass Cabinet, the NX must be positioned to allow the Maintenance Bypass Cabinet to be bolted to **left** side of the NX (see **Figure 1**). Cables from the Maintenance Bypass Cabinet must be brought through the bottom side of the NX for connection.

The Maintenance Bypass Cabinet must be cabled and bolted to the NX **before** the UPS and bypass cabinet are moved into their final position. Connect the input wiring to the Maintenance Bypass Cabinet **ONLY** after the units are connected and positioned.

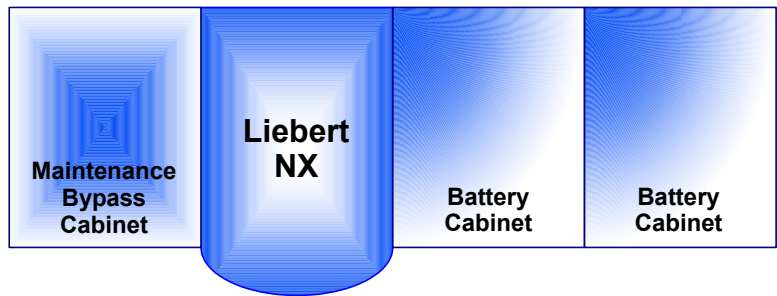
Battery cabinets may be bolted to either side of the NX, unless used in configurations that include a Maintenance Bypass Cabinet; refer to **1.5.7 - Optional Cabinets**.

**Figure 1 Cabinet arrangement**

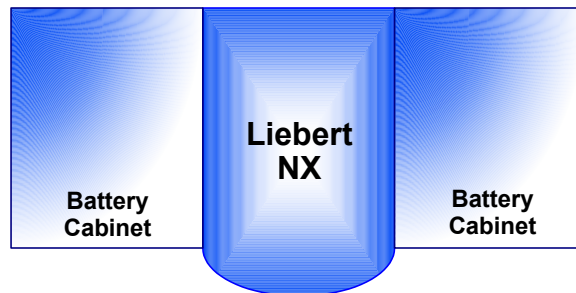
ALL UNITS VIEWED FROM ABOVE



NX connected only to MBC  
(MBC must be on left side of the NX)



NX connected to Maintenance Bypass Cabinet and Battery Cabinets  
(MBC must be on left side of the NX)  
(Battery Cabinets may be on either side of the NX)



NX connected to Battery Cabinets  
(Battery Cabinets may be on either side of the NX)



## 2.0 ELECTRICAL CONNECTIONS

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



### WARNING

Before connecting input power to the NX, ensure that you are aware of the location and operation of the overcurrent protection devices that connect the UPS input/bypass supply to the power distribution panel.

De-energize and lockout or tagout all incoming high- and low-voltage power circuits before installing cables or making any electrical connections.

For cable entry information, refer to **1.5.6 - Cable Entry**.

## 2.1 Power Cabling

### 2.1.1 Cable Rating

The main factors affecting the choice and size of cable are voltage, current (also taking into account overcurrent), room temperature and conditions of installation of the cable.

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

- **UPS input cables** - The UPS input cables must be sized for the maximum input current, including the maximum battery recharge current, given in **Table 1**, with respect to the unit rating and the input AC voltage.
- **UPS bypass and output cables** - The bypass and output cables must be sized for the nominal output current, given in **Table 1**, with respect to the unit rating and the output AC voltage.
- **Battery cables** - Each UPS unit has its own internal batteries factory-wired. If connecting an external battery cabinet, the battery cables must be sized for the battery discharge current at the end-of-discharge voltage, as given in **Table 1**, with respect to the unit rating.



### NOTE

*Table 1 gives nominal currents for determining the size of UPS power cables. Other important factors to consider include cable route length and coordination with protective devices.*

The power cables can be sized to suit the UPS unit rating according to **Table 1**.

**Table 1 UPS unit cabinet power cable rating**

UPS RATING (kVA)	Nominal Current: Amps				Battery at Minimum Battery Voltage	Busbar Stud Size				Breaker Size for Dual Input	
	Input Power With Full Battery Recharge		Bypass/ Output at Full Load			Input/Output/ Bypass Cables		Torque Load lb-in. (N-m)	Bypass Breaker	Input breaker	
	200V	208V	200V	208V		Bolt	Ø holes				Battery Cables (Bolts)
10	33	32.6	29	28	40	M8	8	M6 Ø 6	5	50	50
15	50	48.3	43	42	60					80	80
20	67	65.1	58	56	80	M8	8	M8 Ø 8	5	100	100
30	100	96.6	87	84	120					150	150

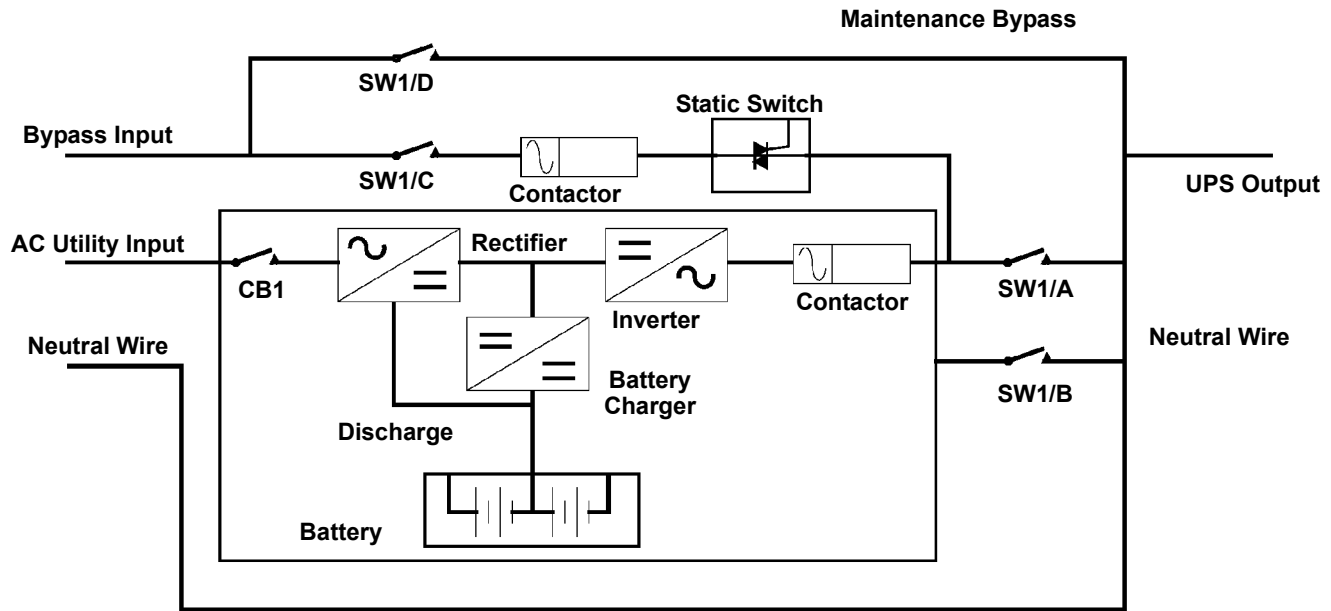
### Lug Size and Torque Requirements

Refer to **Table 15** for lug size and torque requirements.

## 2.1.2 UPS Input Configuration

**Figure 2** illustrates the NX in a split bypass (dual-input) configuration. In this configuration the Static Bypass and the Maintenance Bypass lines are supplied from a separate feed from the Main input. Both sources must be protected externally with properly sized protective devices. By default, the unit ships with internal links installed between the Bypass input and Main input (Single Input configuration). To wire the unit as a dual input UPS, remove the links and wire the bypass to the input bus bars, then wire the Main input directly to CB1 (see **Figure 3**).

**Figure 2** Single module block diagram (dual input configuration)



## 2.1.3 Cabling Guidelines

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

1. Take special care when determining the size of the neutral cable, as current circulating on the neutral cable may be greater than nominal current in the case of non-linear loads. Refer to the values in **5.4 - UPS Electrical Characteristics**.
2. The ground conductor should be sized according to such factors as the fault rating, cable lengths and type of protection. The ground cable connecting the UPS to the main ground system must follow the most direct route possible.
3. Consider using paralleled smaller cables for heavy currents—this can ease installation.
4. When sizing battery cables, a maximum voltage drop of 4VDC is permissible at the current ratings in **Table 1**. For terminal connection sizing, see **Table 17**.
5. In most installations, especially parallel multi-module systems, the load equipment is connected to a distribution network of individually protected busbars fed by the UPS output, rather than connected directly to the UPS itself. When this is the case, the UPS output cables can be rated to suit the individual distribution network demands rather than being fully load-rated.



### NOTE

*If more load is added to the distribution panel, the unit's cabling must be resized.*

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



### NOTE

*Left-side access is required when making power connections. Cable connections must be made before a cabinet is attached to the left side of the NX or before the UPS is placed where another obstruction, such as a wall, is against the NX's the left side.*

### 2.1.4 Cable Connections

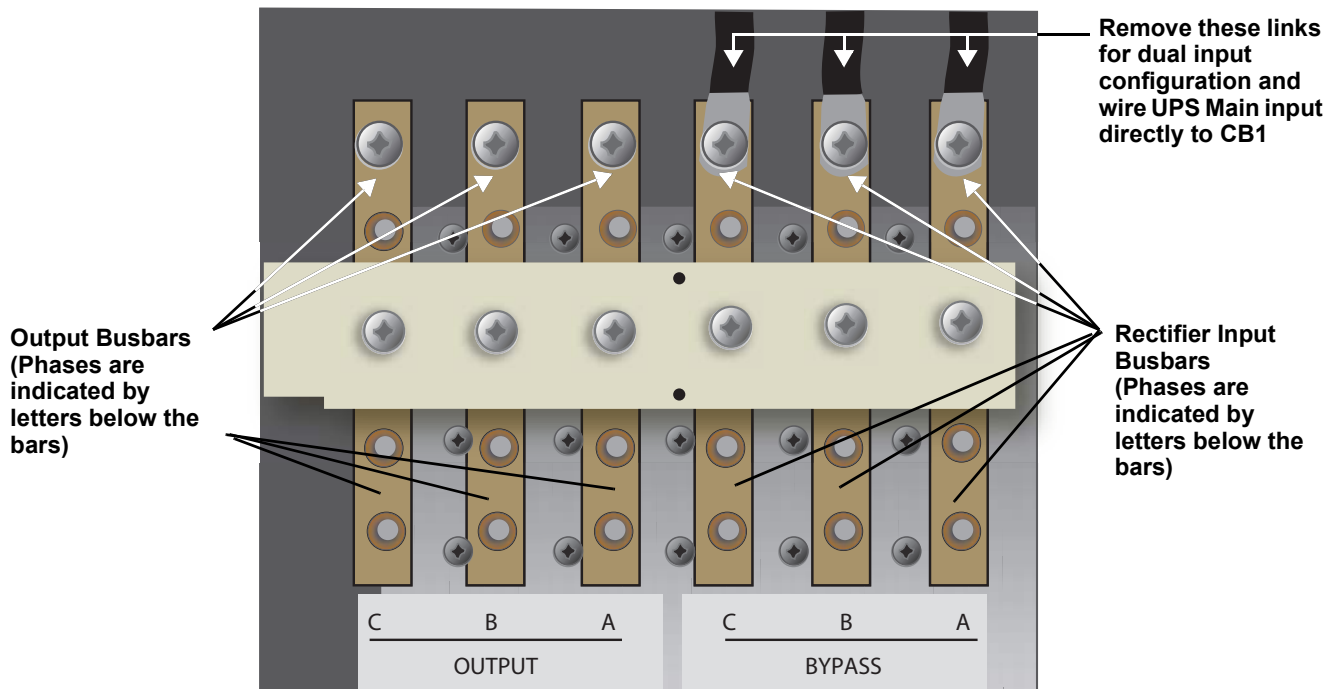
The rectifier input, bypass and output are accessible from the left side of the unit for installation. All require lug type terminations. They are connected to busbars on the left side of the NX and below the switch, as shown in **Figure 3**. These busbars are accessible when the left side panel is removed. Busbars to connect external batteries are accessible from the front of the UPS.



**NOTE**

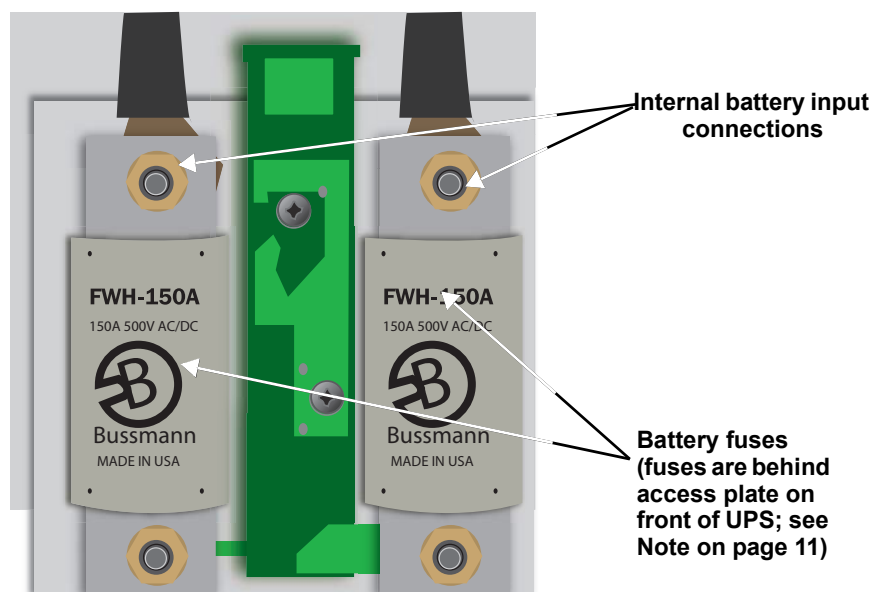
*External battery connection access requires removal of a protective panel on the lower front of the UPS to the left of the bottom two battery shelves.*

**Figure 3 Input busbars**



The internal batteries are connected with Anderson connectors inside the battery compartment. The batteries are connected to fuses to protect the NX and connected equipment (see **Figure 4**).

**Figure 4 Battery fuses and connections**



### 2.1.5 Safety Ground

The safety ground busbar is located below the neutral input and output busbars as shown in **Figure 5** below. The safety ground cable must be connected to the ground busbar and bonded to each cabinet in the system.

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



## WARNING

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



### NOTE

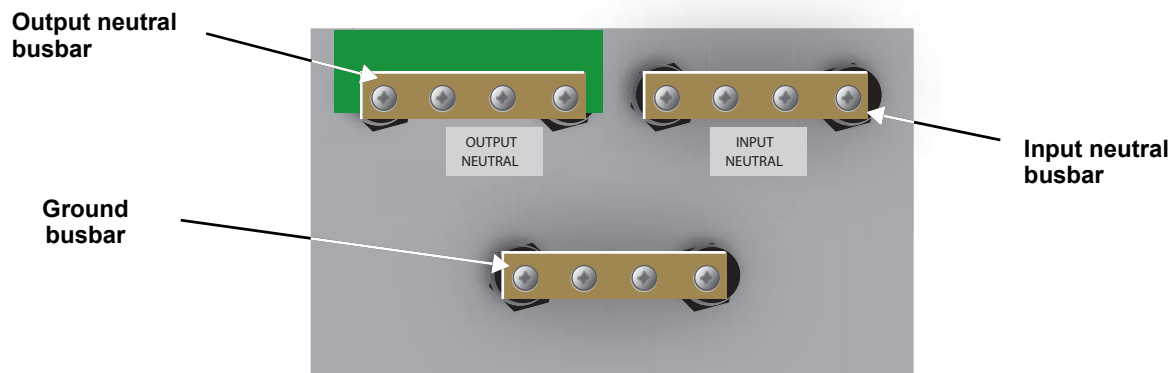
*Proper grounding significantly reduces problems in systems caused by electromagnetic interference.*



### NOTE

*The ground and neutral busbars are accessible when the left protective cover plate is removed. Cable connections must be made before a cabinet is attached to the left side of the NX or before the UPS is placed where another obstruction, such as a wall, is against the NX's left side.*

**Figure 5** Ground and neutral busbar connections



### 2.1.6 Protective Devices

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

#### UPS Rectifier and Bypass Input Supply

- **Protection from excessive overcurrents and short circuits in power supply input**

External overcurrent protection for the AC output circuit is to be provided. See **5.4 - UPS Electrical Characteristics** and **Table 8** for overload capacity.

High-speed fuses and SCRs are used for internal battery circuit overcurrent protection. When an external battery supply is used, overcurrent protection for the battery circuit is to be provided by the customer.

- **Dual Input**

When wiring the UPS with dual inputs, the Rectifier input and the Bypass input must be protected separately. Size the breakers according to the input currents shown in **Table 1**.

#### System Output

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

## 2.1.7 Cabling Procedure



### CAUTION

The operations described in this section must be performed by authorized electricians or qualified technical personnel. If you have any difficulties, contact your local Liebert representative or Liebert Global Services.



### NOTE

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

Once the equipment has been positioned and secured for operation, and the battery and ground collars have been connected (see **2.1.4 - Cable Connections**), connect the power cables as described below. (Study the reference drawing in **6.0 - Installation Drawings**.)

1. Verify that all incoming high and low voltage power circuits are de-energized and locked out or tagged out before installing cables or making any electrical connections.
2. Remove the left side panel to gain access to the connections bars.
3. Connect the safety ground and any necessary bonding ground cables to the copper ground busbar located on the bottom of the equipment below the power connections. All cabinets in the UPS must be connected to the user's ground connection.



### NOTE

*The grounding and neutral bonding arrangement must comply with the National Electrical Code and all applicable local codes.*

4. Identify and make power connections with incoming cables according to **Steps 5** through **11**.

### Common Input Connections

5. For common bypass and rectifier inputs, connect the AC input supply cables between the power distribution panel and the UPS input busbars (A-B-C terminals) and tighten the connections to 44 lb-in. (5 N-m) (M6 bolt).
6. The input neutral cable must be connected to the input neutral busbar (N). See **Figure 5**.

### Dual Input Connections

7. For bypass connect the AC input supply cables between the power distribution panel and the UPS input busbars (A-B-C terminals) and tighten the connections to 44 lb-in. (5 N-m) (M6 bolt).
8. For Rectifier Input connect AC input supply cables between the power distribution panel and the UPS input Circuit Breaker (A-B-C terminals)
9. The bypass input neutral cable must be connected to the input neutral busbar (N). See **Figure 5**.

### Output System Connections (Ensure Correct Phase Rotation)

10. Connect the system output cables between the UPS output busbars (A-B-C N terminals) and the critical load and tighten the connections to 44 lb-in. (5 N-m) (M6 bolt).



### WARNING

If the load equipment will not be ready to accept power on the arrival of the commissioning engineer, then ensure that the system output cables are safely isolated.

### Internal UPS Battery Connections

The UPS internal batteries will be connected at the factory, EXCEPT the Anderson connections between the shelves and to the fuses.



### WARNING

The DC bus is live when this internal battery connection is made. This connection is to be performed ONLY by Liebert Global Services at startup.

**Observe the battery cable polarity.** Be sure that the battery connector is made with the correct polarity.

11. Refit all protective covers removed for cable installation

## 2.2 Control Cables

### 2.2.1 Monitor Board Features

Based on your site's specific needs, the UPS may require auxiliary connections to manage the battery system (external battery circuit breaker, battery temperature sensor), communicate with a personal computer or provide alarm signaling to external devices or for Remote Emergency Power Off (REPO). The monitor board, arranged for this purpose, is located on the rear of the operator access door. The main features are:

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

Figure 6 shows the relationship and connection between the monitoring (U2) board and other boards in the UPS.

Figure 6 Monitor board U2

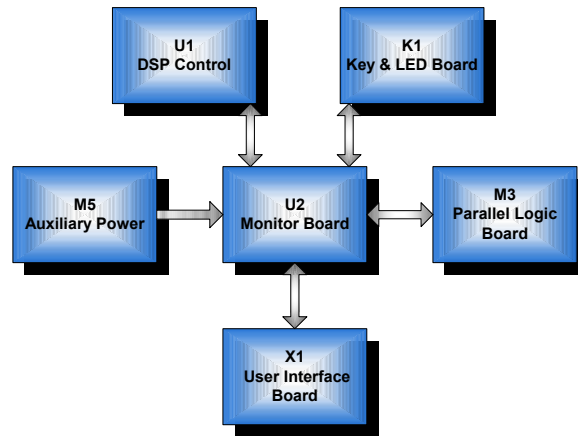
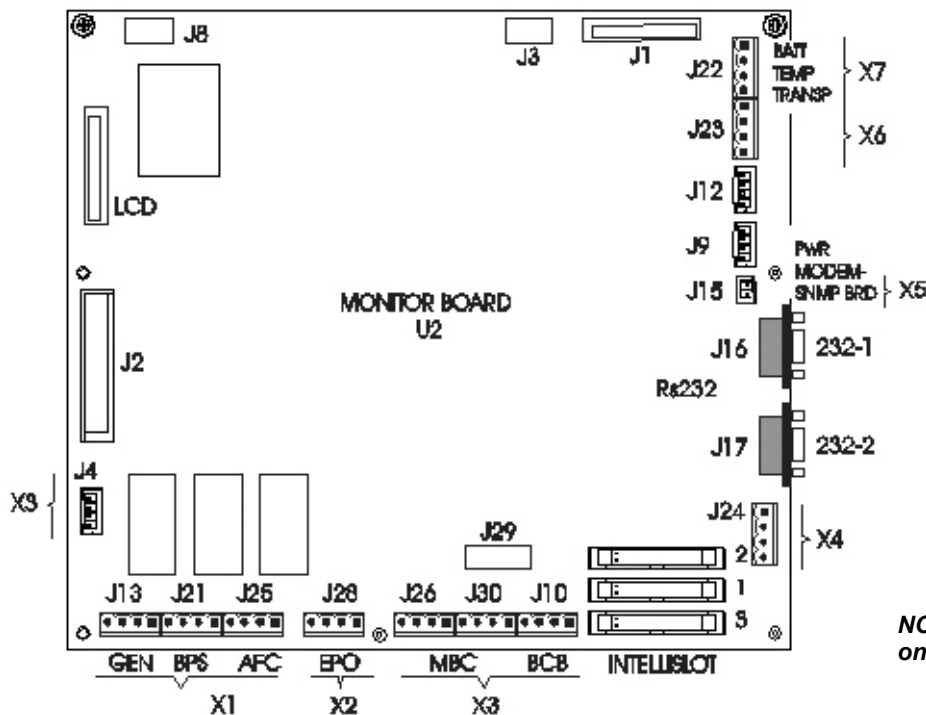


Figure 7 Auxiliary terminal block detail



## 2.2.2 Dry Contact

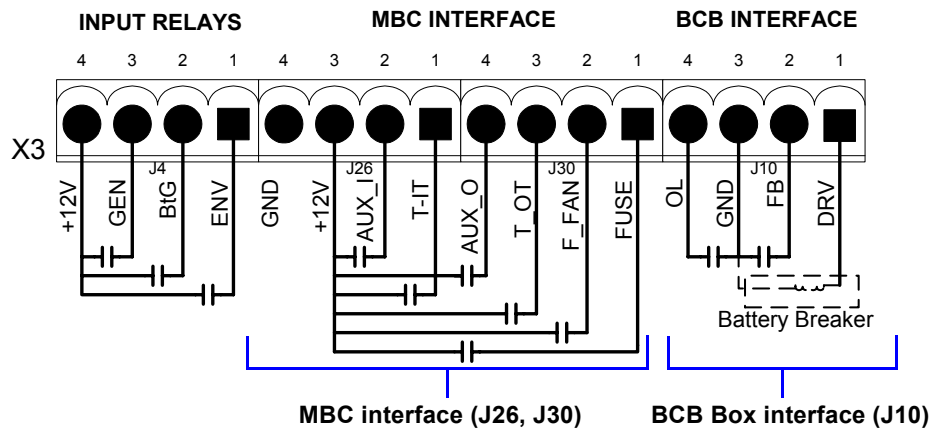
The UPS provides three input dry contacts, three output dry contacts and a REPO input contact.

### Input Dry Contacts

There are three input dry contacts at the X3 slot, as shown in **Figure 8** and described in **Table 2**.

Input dry contact active when it is shorted to +12V.

**Figure 8** Input dry contacts at X3 slot



**Table 2** Input dry contact relays

Contact #	Position	Name	Description
1	J4.1	ENV	(Reserved)
2	J4.2	BtG	(Reserved)
3	J4.3	GEN	(Reserved)
4	J4.4	+12V	(Reserved)
<b>MBC interface: J26, J30</b>			
1	J26.1	T_IT	(Reserved)
2	J26.2	AUX_I	(Reserved)
3	J26.3	+12V	(Reserved)
4	J26.4	GND	(Reserved)
5	J30.1	FUSE	(Reserved)
6	J30.2	F_FAN	(Reserved)
7	J30.3	T_OT	(Reserved)
8	J30.4	AUX_O	(Reserved)
<b>BCB Box interface: J10</b>			
1	J10.1	DRV	BCB driver signal - Output - Active when pulled high
2	J10.2	FB	BCB contact state - Input - Active when pulled low
3	J10.3	GND	Power ground
4	J10.4	OL	BCB on line - Input - This pin will be put to active when BCB interface is connected. - Active when pulled low



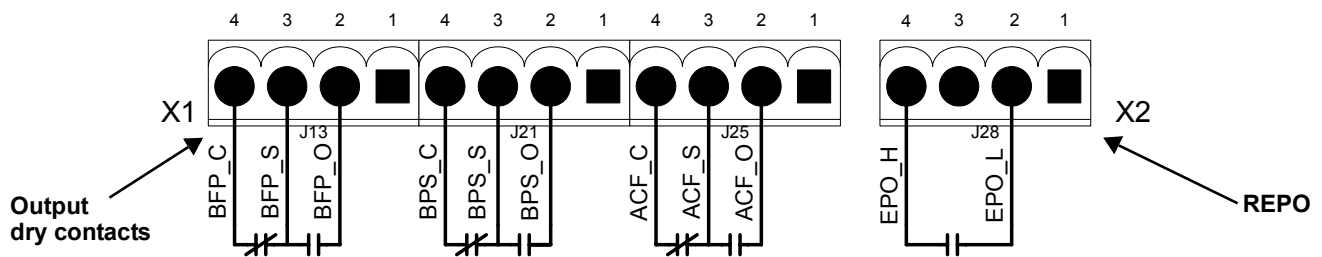
### NOTE

All auxiliary cables of terminal must be double insulated. Wire should be 16-20AWG stranded.

### Output Dry Contacts

There are three output dry contact relays at the X1 slot, shown in **Figure 9** and described in **Table 3**.

**Figure 9** Output dry contacts (X1) and REPO input wiring (X2)



**Table 3** Output dry contact relays

Contact #	Position	Name	Description
1	J13.2	BFP_O	Bypass Feedback Relay Protection - normally open
	J13.3	BFP_S	Bypass Feedback Relay Protection - common
	J13.4	BFP_C	Bypass Feedback Relay Protection - normally closed
2	J21.2	BPS_O	Bypass mode relay - normally open
	J21.3	BPS_S	Bypass mode relay - common
	J21.4	BPS_C	Bypass mode relay - normally closed
3	J25.2	ACF_O	Main input fault relay - normally open
	J25.3	ACF_S	Main input fault relay - common
	J25.4	ACF_C	Main input fault relay - normally closed



**NOTE**

*The auxiliary cables of the dry contact must be double insulated. Use 16-20 AWG stranded wire.*

### REPO Input (Optional)

The UPS has a Remote Emergency Power Off (REPO) function.

The X2 slot, shown in **Figure 9**, is the REPO (remote emergency power off) input interface. It is active when shorted EPO-L to EPO-H.

To make the REPO functional, connect terminals EPO-L and EPO-H of the Auxiliary Terminal Block (X2) with a shielded cable (see **Figure 9** and **Table 4**). The REPO connection is normally open.

**Table 4** REPO input contact relays

Contact #	Position	Name	Description
1	J28.2	EPO_L	Emergency Power Off Low
	J28.4	EPO_H	Emergency Power Off High

If the REPO is not required, the connection between terminals EPO-L and EPO-H must be open.



**NOTE**

*The Emergency Stop action within the UPS shuts down the rectifier, inverter and static bypass. It does not, however, internally disconnect the input power supply.*



## 2.3 UPS Start-Up

The NX must be fully installed and commissioned before startup, and external power isolators must be closed. Once those general conditions are met, the UPS may be started.

### 2.3.1 Start-Up Procedure

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

1. Open the UPS door to gain access to the main power switches.



### WARNING

During this procedure the output terminals will become live.

If any load equipment is connected to the UPS output terminals, please check with the load user and ascertain whether it is safe to apply power to the load. If the load is not ready to receive power, then ensure that it is safely isolated from the UPS output terminals.



### CAUTION

Do not operate the rotary switch too fast. Always wait at least three seconds when rotating the switch from one position to another.

2. Turn the rotary switch to TEST.
3. Close CB1.

The bypass contactor (M2) closes automatically and the LCD begins to show start-up screens.

The Rectifier indicator flashes green while the rectifier is starting up. It stops flashing and becomes solid green about 30 seconds after the rectifier enters the normal operation state.

After initialization, the bypass static switch closes.

Because output switch SW1-A is still open, the UPS channels power through Maintenance Bypass Supply line (SW1-D). The bypass indicator extinguishes, provided that the bypass is normal.

The opening display is shown at right.

The UPS Mimic display indicators will be:

Indicator	State
Rectifier indicator	Off
Battery indicator	Off
Bypass indicator	Off
Inverter indicator	Off
Load indicator	Off
Alarm indicator	Off



### WARNING

Do NOT turn the rotary switch until the rectifier indicator stops flashing green.

4. Turn the rotary switch to BYPASS.

#	Indicator	State
1	Rectifier indicator	Green
2	Battery indicator	Off
3	Bypass indicator	Green
4	Inverter indicator	Off
5	Load indicator	Green
6	Alarm indicator	Amber

The maintenance switch SW1-D opens and output switch SW1-A closes. The UPS powers from static bypass instead of from maintenance bypass. The bypass and load indicators turn on. The design of the rotary switch ensures uninterrupted output.

- Turn the rotary switch to NORMAL, then press the INVERTER ON control button for 2 seconds. The inverter will start and the inverter indicator will flash green. After the inverter is ready, the UPS transfers from bypass to inverter, the bypass indicator turns off and the inverter and load indicators turn on.

The UPS is operating normally. The UPS Mimic display indicators will:

Indicator	State
Rectifier indicator	Green
Battery indicator	Off
Bypass indicator	Off
Inverter indicator	Green
Output indicator	Green
Alarm indicator	Green

## 2.4 Switching the UPS from Normal to Maintenance Bypass

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



### CAUTION

Before performing this operation, read the messages on the LCD to be sure that bypass supply is regular and the inverter is synchronous with it. If those conditions are not present, there is a risk of a short interruption in powering the load.

This procedure assumes that UPS is operating normally.

- Press the INVERTER OFF button on the right side of the operator control panel for longer than 2 seconds.

The Inverter indicator will turn off and the alarm indicator (6) will turn amber and an audible alarm will sound. The load will transfer to bypass and the inverter will shut off.



### NOTE

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

- Open the UPS door to gain access to the main power switches, SW1 and CB1.
- Turn the rotary switch to BYPASS position. The UPS Bypass Static Switch still supply power to load.
- Turn the rotary switch to TEST. The load is now on maintenance bypass.
- Turn the rotary switch to MAINT.
- Open rectifier switch CB1. All operator indicators and messages will turn off as the utility driven internal power supplies decay. The unit will power down, but the load will continue to be supplied by the manual Maintenance bypass.



### WARNING

Wait 5 minutes for the internal DC busbar capacitors to discharge.



### WARNING

Even with the UPS in maintenance bypass and “Off,” portions of the unit are still energized. Service must be performed only by qualified personnel.



### CAUTION

The load equipment is not protected from normal supply aberrations when operating in the maintenance bypass mode.

## **2.5 Powering Down the UPS**

To power down the UPS completely, follow the procedures in **2.4 - Switching the UPS from Normal to Maintenance Bypass**.

To completely isolate the UPS from the AC supplies, the main external power input isolator (both isolators, where separate supplies are provided for rectifier and bypass) should be opened (see **Figure 14**).



### **WARNING**

To prevent injury to personnel, lockout or tagout the service supplies.

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## 3.0 BATTERY INSTALLATION

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### 3.1 Introduction

Liebert recommends that the batteries in external cabinets match the internal batteries be the same type used internally in the NX.

If using multiple sets of batteries connected in parallel to provide the required battery backup run times, fit each set with an isolating device to permit working on one of the battery sets while leaving the others in service and providing backup protection.

When replacing batteries, replace with the same manufacturer and type, or equivalent. See your Liebert representative for a list approve batteries.

**NOTE**

*The NX, as shipped, has 24 12-volt batteries installed internally in each unit.*

### 3.2 Safety

Special care should be taken when working with the batteries associated with the NX system equipment. When all batteries are connected together, the battery terminal voltage will exceed 324V and is **POTENTIALLY LETHAL**.

**WARNING**

The NX's internal batteries are connected and energized even if the UPS is turned Off. To minimize the risk of injury, a qualified service person should disconnect internal batteries before any maintenance is performed on the unit.

The center of the battery is connected to the neutral of the UPS and is grounded.

A battery can present a risk of electrical shock and high short circuit current. The following precautions should be observed when working on batteries:

- Remove watches, rings and other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect charging source prior to connecting or disconnecting battery terminals.

### 3.3 UPS Batteries

The NX's internal batteries are fully charged before the unit is shipped. During storage and transportation, some charge is lost. All batteries should be recharged before use. The battery charger works only when the NX is connected to input power and turned On.

### 3.4 Temperature Considerations

Battery performance depends on the battery temperature.

When batteries are installed in the same room as the UPS, the battery dictates the designed maximum ambient temperature, not the UPS. In the case of valve-regulated batteries, for example, the ambient room temperature should be kept between 68°F and 86°F (20-30°C), not between 32°F and 104°F (0-40°C), which is the specified operating temperature range for the UPS.

**NOTE**

*Full safety instructions concerning the use and maintenance of UPS batteries are provided in the appropriate battery manufacturer's manuals, available on the manufacturer's Web site.*

*The battery safety information contained in this section relates to key considerations that must be taken into account during the installation design process and might affect the design outcome, depending on your installation.*

## 3.5 Battery Protection

### 3.5.1 Battery Undervoltage Pre-Warning

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

### 3.5.2 Battery End-of-Discharge (EOD) Protection

If the battery voltage is lower than the end-of-discharge voltage, the battery converter will be shut down.

### 3.5.3 Battery Fuse-Blow Warning

Battery current protection is provided by the battery fuses FU7 and FU8. If a battery fuse blows, the NX displays the battery fuse-blow warning and the battery converter will be shut down.



#### NOTE

*All equipment servicing procedures must be carried out only by trained personnel.*

## 3.6 External Battery Cabinet Installation

The following notes, in conjunction with the diagrams (**Figure 10** through **12**), illustrate the broad principles to be followed when fitting and connecting the majority of battery cabinet installations.

When installing an external battery cabinet, the customer must provide overcurrent protection. See **Table 17** for sizing of protection devices.

### 3.6.1 Fitting the Batteries



#### NOTE

*When using an external battery supply that is not provided with the UPS, please make reference to the battery manufacturer's installation manual for battery installation and maintenance instructions, available on the manufacturer's Web site. When replacing batteries, Liebert recommends that the batteries in external cabinets be the same type used internally in the NX. See **Table 7** for a list of batteries that are approved for use with this product.*

1. Leave at least 3/8 in. (10mm) on all vertical sides of the battery to permit free air circulation around the batteries.
2. Allow adequate clearance between the top of the batteries and the underside of the shelf above for monitoring and servicing the batteries.
3. When installing the batteries, always work from the bottom shelf up to prevent raising the center of gravity, which could cause a tip-over hazard.

### 3.6.2 Connecting the Batteries

If the NX battery cabinet are installed on a raised floor, the battery power cables and circuit breaker control cables may be routed to the UPS cabinet via the floor of the cabinet (bottom entry).



#### NOTE

*If a battery breaker cabinet is not used, the customer must provided an isolating disconnect device on the output of the battery cabinet.*

If the NX battery cabinet are installed adjacent to one another on a solid floor, these cables may be passed between the cabinets through lifting slots in the lower sides of the cabinets.

Liebert recommends connecting the batteries in the following sequence:

1. Connect cables between batteries on each individual tray.
2. Attach cables connecting the battery trays
3. Connect the cables to the circuit breaker.

An insulating shroud should be fitted to each terminal after its connection has been made.

When connecting the cables between the batteries to the circuit breaker, always connect the circuit breaker end of the cable first.

Figure 10 Narrow battery cabinet, 27 in. (690mm) - rear view

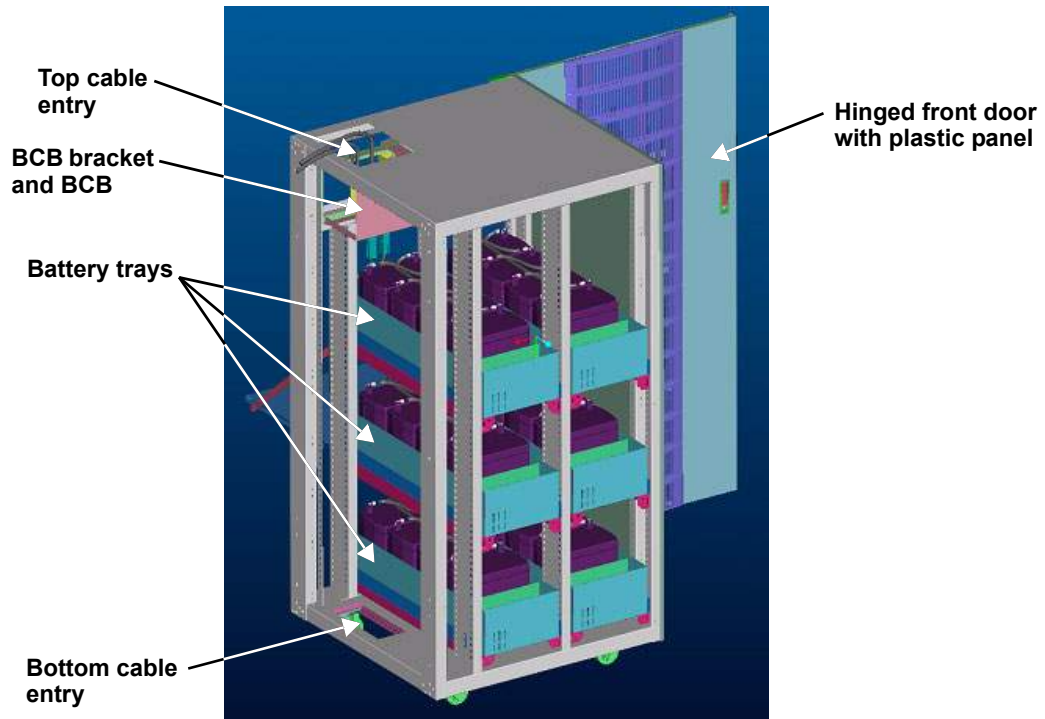


Figure 11 Wide battery cabinet, 57 in. (1450mm) - front view

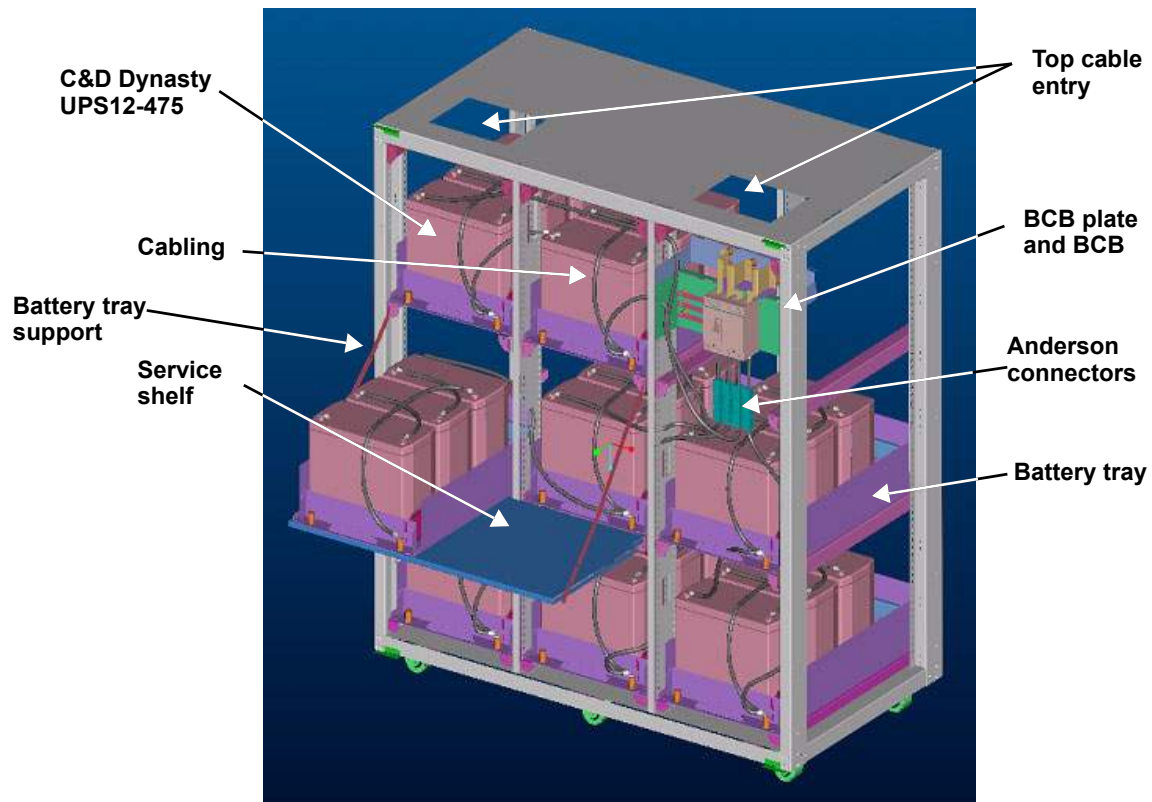
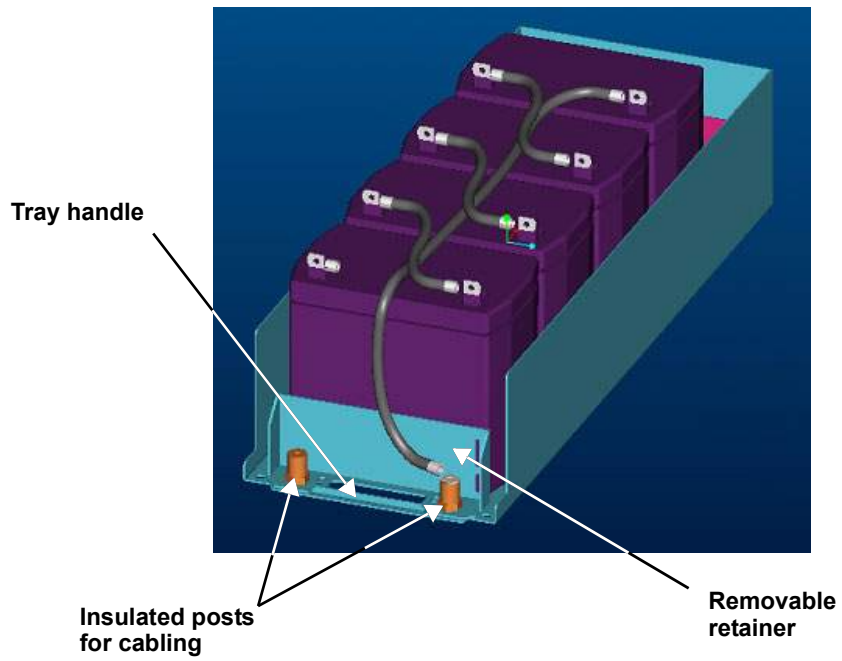


Figure 12 Battery cabinet - details



## 3.7 Matching Battery Cabinets

Two sizes of optional battery cabinets are available. Refer to **Figures 10** and **11**. The same model battery cabinet may be installed in parallel in multiple cabinet strings for additional capacity. Battery run time depends on the cabinet model, the number of cabinets and the load on the UPS.

**Handling**—The battery cabinet has casters to facilitate movement over short distances. The bottoms of the battery cabinets are reinforced to permit movement by forklift over longer distances.

**Inspection**—Remove all panels and visually inspect the batteries, bus connections, and cabinet for any damage. Exercise caution; voltage is present within the battery cabinet even before installation. If there are signs of damage, do not proceed. Call Liebert Global Services at 1-800-542-2378.

**Storage**—The batteries can be stored for up to six months without appreciable deterioration. If planning to store a battery cabinet for longer than six months or at temperatures higher than 77°F (25°C), contact Liebert Customer Service for recommended precautions.

### 3.7.1 Installation Considerations

The battery cabinet(s) can be located conveniently next to each UPS module, and are also available in stand-alone configurations with painted side panels. The front access design eliminates side and rear service clearance requirements. Refer to **Table 19** for battery cabinet dimensions and weights.

**Environment**—Install the battery cabinet in a clean, dry environment. The recommended temperature range for optimum performance and lifetime is 68 to 77°F (20-25°C).

**Position**—Liebert battery cabinets come in versions specific to either the left or right side of the UPS. Control wires and power cables are cut to different lengths for the different versions. For systems with multiple battery cabinets, the cabinets have different part numbers indicating placement of the cabinet relative to the UPS. An “A” or “1” designation means the cabinet is adjacent to the UPS. Cabinet “B” will be adjacent to cabinet “A.” If the system includes a matching maintenance bypass cabinet (MBC), the MBC should be mounted to the left of the UPS (nearest the busbars) and the battery cabinet(s) should be installed to the right of the UPS. Likewise left-side placement of the battery cabinet is preferable.

**Service Clearance**—Allow front access to the battery cabinet at all times for maintenance and servicing. Electrical codes require that the battery cabinet be installed with no less than 3 feet (1m) of clearance at the front of the cabinet when operating. Side and rear panels do not require service clearance.

**Cables**—Cables may be run between the cabinets through cutouts in the top of the cabinet, eliminating the need for external conduit runs. Route cables before moving cabinets into final position for bolting together. Remove top panels for access, if required. No top or bottom entry cables are required, except for remotely located cabinets which require conduits. Refer to **Figures 10** and **11**.

**Bolt-On Cabinets**—Matching battery cabinets are designed to bolt onto the side of the UPS module cabinet. Use bolts that ship with each unit to connect cabinet frames at posts, two places in the front and two places in the rear.

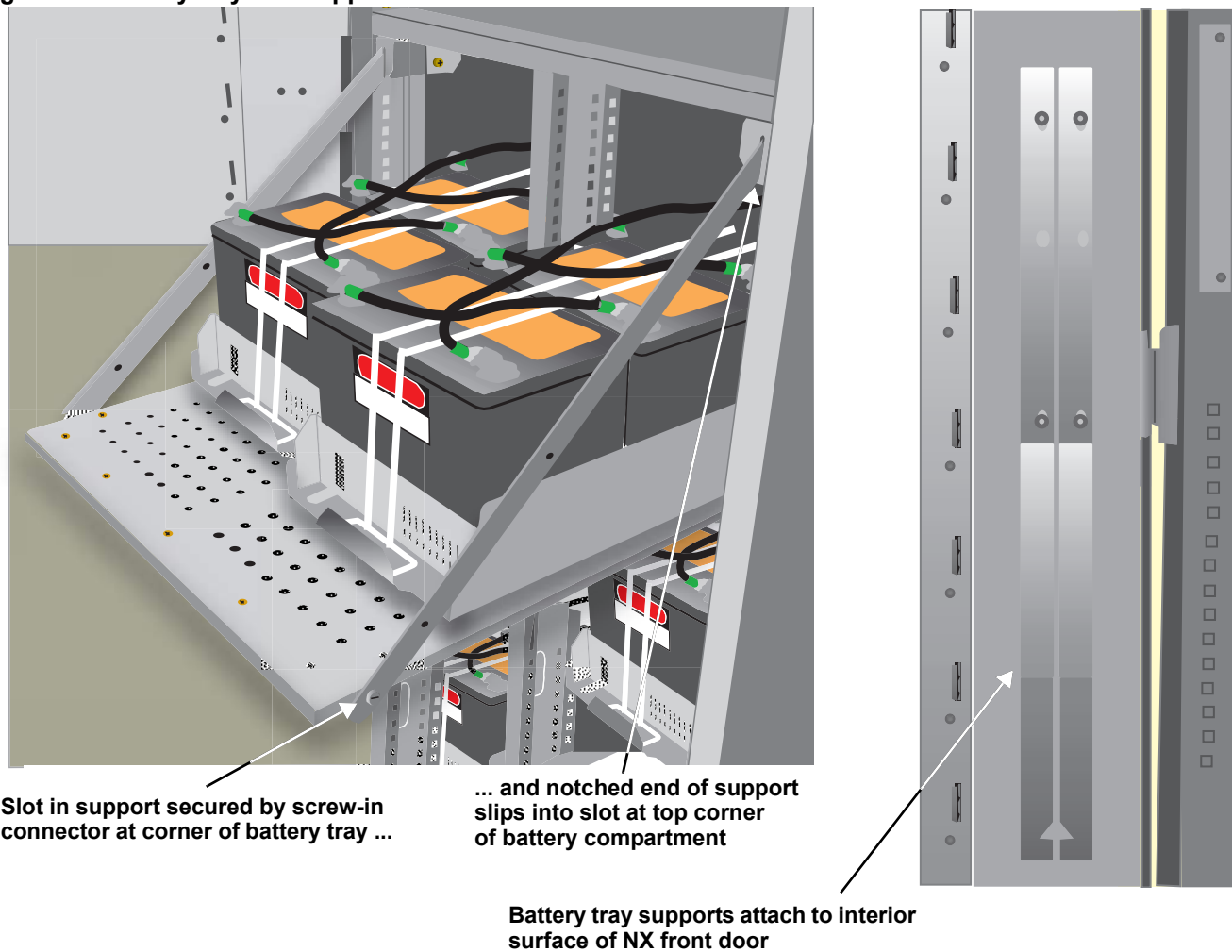
**Software**—The number of battery cabinets must be noted when performing initial startup and setup using the configuration software.

**Casters and Leveling Feet**—The leveling feet are not designed to bear the full weight of the cabinet. Lower the feet until they are finger-tight in contact with the floor. Then tighten a small amount with a wrench (less than two turns) to give a good friction fit. When mounting the battery cabinet on seismic stands, ensure that the casters are bearing the weight of the cabinet.

**Battery Support Tray**—Be sure to connect the battery tray support to the front of the cabinet before sliding a battery tray out for connection or service. Without the support, the battery tray may fall out of the cabinet. See **Figure 13** for details.



Figure 13 Battery tray and supports



### 3.7.2 Connecting the Battery Cabinet to the UPS

After the battery cabinet equipment has been positioned and secured for operation and the batteries have been connected, connect the power cables as described below. (See **Figure 25**.)

1. Verify that all incoming high and low voltage power circuits are de-energized and locked out or tagged out before installing cables or making any electrical connections.
2. Remove the UPS left side panel to gain access to the connection bars.
3. Remove the battery cabinet front panel to gain access to the connection bars.
4. Connect the safety ground and any necessary bonding ground cables to the copper ground busbar. (example: UPS located on the bottom of the equipment below the power connections).  
All cabinets in the UPS system must be connected to the user's ground connection.



#### NOTE

*The grounding and neutral bonding arrangement must be in accordance with the National Electrical Code and all applicable local codes.*

5. Connect the system battery cables from the UPS battery output terminals (+ N -) to battery cabinet BCB (+ N -) as shown in **Figure 25**. Be sure that the battery connector is made with the right polarity, and tighten the connections to 44 lb-in. (5 N-m) (M6 Bolt). Do not close the battery circuit breaker before the equipment has been commissioned.
6. Connect supplied auxiliary control cable to pins J10.2 and J10.3 on the U2 Monitoring board (see **2.2.2 - Dry Contact**). Add a jumper wire between J10.3 and J10.4.

### **3.8 Non-Standard Batteries**

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

Install battery racks, cabinets and batteries in accordance with the manufacturer's instructions.

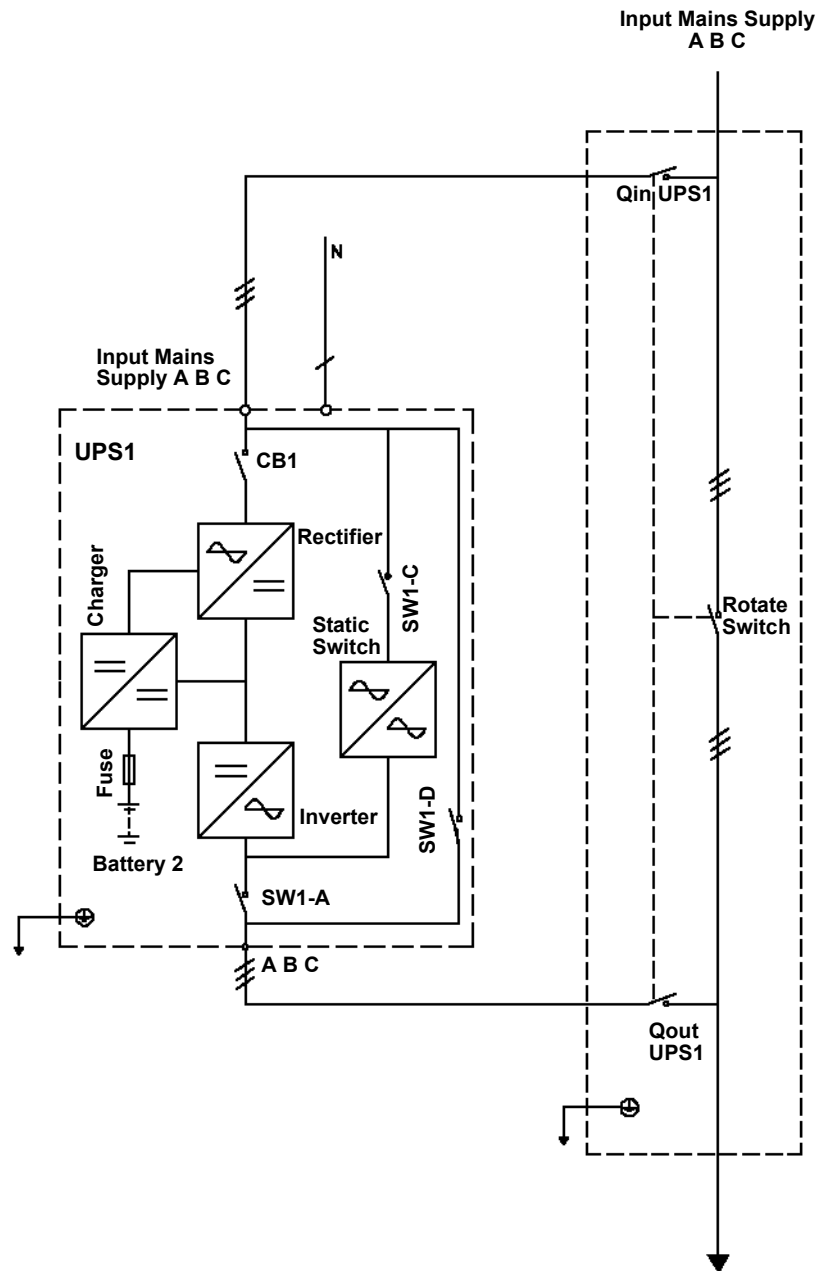
Verify that the battery area has adequate ventilation and battery operating temperature complies with the manufacturer's specifications.

If you have any questions concerning batteries, battery racks or accessories, contact Liebert Global Services at 1-800-543-2378.

## 4.0 MAINTENANCE BYPASS CABINET

The Maintenance Bypass Cabinet is designed to operate in UPS mode, bypass mode and maintenance mode. The mode is selected using the Bypass Switch.

**Figure 14 Single UPS with external Maintenance Bypass Cabinet—typical configuration**



### 4.1 Bypass Switch

The Bypass Switch allows easy and rapid transfer of connected loads between the UPS and Bypass source.

### 4.2 UPS Mode

While the Maintenance Bypass Cabinet is in UPS Mode, 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.

The Bypass Switch is in the NORMAL position for this mode.

### 4.3 Bypass Mode

When the Maintenance Bypass Cabinet is in the Bypass mode 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, manual activation of the bypass will cause an immediate transfer of the equipment from the UPS inverter to the bypass source. In this mode, power will still be supplied to the UPS; however, the load is NOT protected by the UPS. The bypass switch is in the BYPASS position for this mode.

### 4.4 Maintenance Mode

When the maintenance bypass cabinet is in the Maintenance mode 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 the load is NOT protected by the UPS. The Bypass Switch is in the MAINTENANCE position for this mode.

### 4.5 Mounting the Cabinet

This Maintenance Bypass Cabinet may be mounted to the left of the UPS or installed as stand-alone unit. In both cases, ensure that the unit is in a well-ventilated area with at least 12 inches (305mm) clearance for access to the switches and cable connections.

### 4.6 Cable Installation

#### 4.6.1 Wiring Preparation

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



## WARNING

Please read this section thoroughly before attempting to install wiring to this unit.

### Removing the Cover Plates

Plates cover the input and output terminals on the front of the Maintenance Bypass Cabinet (see **Figure 15**). Remove these and keep the screws and plates for reinstallation.

**Figure 15 Maintenance Bypass Cabinet—access plate removed**

Extract screws  
from corners to  
remove the access  
plate



## 4.6.2 Power Cable Installation

Refer to **Table 18** when selecting cables.



### NOTE

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

## 4.6.3 Input/Output Wiring

Follow the steps below to connect the input wiring:



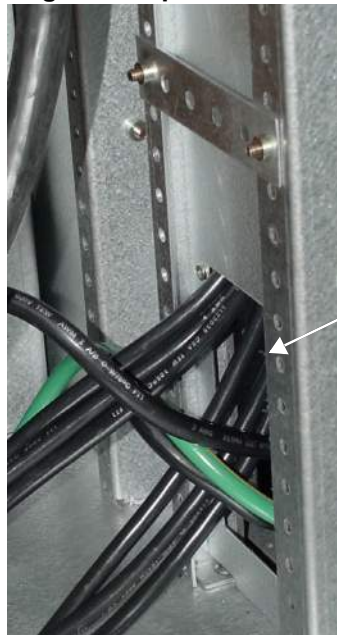
### NOTE

*Input wiring must be installed using conduit.*

1. Locate the input wiring access (top or bottom access), remove the knockout and pull the three/four input wires through it, allowing some slack for installation. See **Figure 16**

**Figure 16 Maintenance Bypass Cabinet wiring access panel**

**Wiring access is on lower right side of Maintenance Bypass Cabinet**



**Access panel removed, wiring connects NX and MBC**

2. Secure the conduit to the access plate of the Maintenance Bypass Cabinet.
3. Input power cables connect to the system input circuit breaker. Refer to **Figure 26 - Maintenance Bypass interconnection**
4. Connect the ground (earth) wire to the earth busbar and tighten it to 44 lb-in. (5 N-m) (M6 bolt).
5. Locate UPS input and output cables and access panel to UPS on lower right side.



### NOTE

*Cabinet is not to be bolted to the UPS, use either top or bottom access plate.*

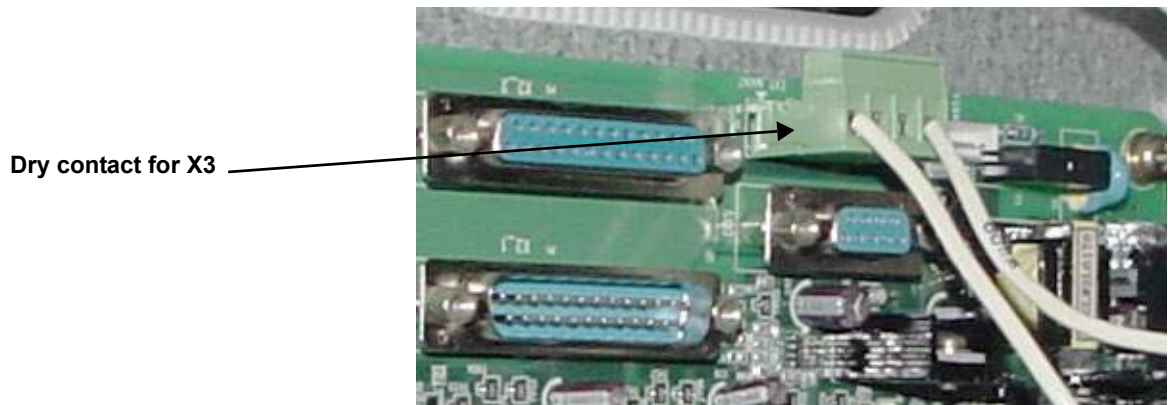
6. Connect the system ground cable between the Maintenance Bypass Cabinet and UPS and tighten the connections to 44 lb-in. (5 N-m) (M6 bolt).
7. Connect the system input cables between the Maintenance Bypass Cabinet 'UPS Input' Busbars (A-B-C N terminals) and UPS input busbars (A-B-C N terminals) and tighten the connections to 44 lb-in. (5 N-m) (M6 bolt).
8. Connect the system input cables between the Maintenance Bypass Cabinet 'UPS Output' Busbars (A-B-C N terminals) and UPS output busbars (A-B-C N terminals) and tighten the connections to 44 lb-in. (5 N-m) (M6 bolt).
9. Connect supplied dry contact wire to X3 on the M2 board (see **Figure 17**).



## WARNING

The dry contact wire must be installed to ensure proper operation of the system and fully protect the load when switching between bypass cabinet and UPS.

Figure 17 Dry contact for X3



## 4.7 Bolting Cabinets Together

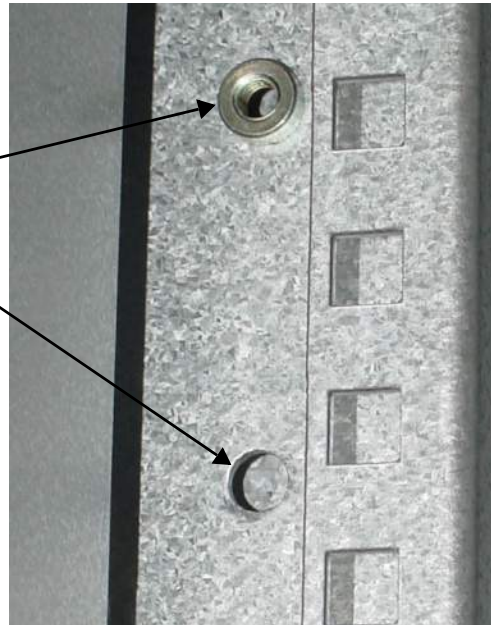


### NOTE

*UPS wiring must be completed before the cabinets are bolted together.*

1. Line up cabinets so that mounting holes are aligned.

**Place cabinets so mounting holes are aligned.  
A bolt from the adjacent cabinet may be screwed into threaded top hole or bolt may enter through lower hole and screw into threaded hole in adjacent cabinet.**



2. Using supplied hardware, bolt the cabinets together. The bolts may be inserted from either the UPS side or from the MBS side, whichever is more convenient.

## 4.8 Operating Procedures

### 4.8.1 Start-Up and Initialization

Follow these steps to start up the UPS while connected to the Maintenance Bypass.

1. Set Maintenance Bypass switch to the Normal position on Maintenance Bypass Cabinet.
2. Close the system input circuit breaker.
3. Start the UPS as instructed in **2.3 - UPS Start-Up**
4. Close system output circuit breaker.

### 4.8.2 Shutting Down the UPS

Use the following procedure to power down the system.

1. Turn the NX off by following the procedures in **2.5 - Powering Down the UPS**.
2. Open system output circuit breaker.
3. Open system input circuit breaker.

### 4.8.3 Transferring System from UPS to Maintenance Bypass Operation

1. Turn the bypass switch (SW1) to the bypass position on the Maintenance Bypass Cabinet. The UPS will switch to bypass mode.  
The connected equipment is now powered from the bypass source and is NOT protected.
2. To isolate the UPS from the system, rotate the bypass switch to the maintenance position.

### 4.8.4 Transfer the System from Maintenance Bypass to UPS Operation

1. Turn the bypass switch (SW1) to the Normal position on the Maintenance Bypass Cabinet. The UPS will go to bypass mode.
2. Press the “Inverter On” button on the UPS and allow the UPS to go to normal mode.
3. The connected equipment is now powered and protected by the UPS.

### 4.8.5 Transfer the System from UPS Operation to Maintenance Bypass

If the UPS needs to be shut down completely while maintaining power to the load, follow these steps:

1. Perform **Steps 1 through 5 in 2.4 - Switching the UPS from Normal to Maintenance Bypass**.
2. Rotate Maintenance Bypass Switch to Maintenance position.
3. Post a label on the primary input distribution panel, which often is installed outside the UPS area, advising personnel that the UPS circuit is under maintenance.

The UPS is now completely powered down.



## WARNING

Wait 5 minutes for the internal DC busbar capacitors to discharge.



## NOTE

*The Maintenance Bypass power switch may be operated at any time while the UPS is powered down to connect the load to the maintenance bypass supply.*

The procedure can be performed only after the installation has been completed (which includes the maintenance bypass cabinet), after the system has been placed in operation by authorized personnel and after the external power switches have been closed. See **Figure 14** for more information



## 5.0 SPECIFICATIONS

These specifications describe requirements for the Liebert NX Uninterruptible Power System (UPS).

### 5.1 Conformity and Standards

The UPS has been designed to conform to the following standards:

- IEEEC1000-4-5
- ASME
- CSA 22.2, No. 107.1
- FCC Part 15, Class A
- ISO 9001
- National Electrical Code (NFPA-70)
- NEMA PE-1
- OSHA
- UL Standard 1778

The UPS has UL and CSA approval.

### 5.2 UPS Environmental

The UPS is designed to operate under the following environmental conditions without damage or degradation in electrical operating characteristics:

**Table 5 Environmental characteristics**

Rated Power	10-30kVA
Operating Temperature, UPS	32°F to 104°F (0°C to 40°C)
Optimal Operating Temperature, Battery	68°F to 86°F (20°C to 30°C)
Relative Humidity	0 to 95%, non-condensing
Acoustical Noise, dBA at 39 in. (1m)	54
Altitude of Operation	≤1000m per IEC 62040/3
Storage-Transport Temperature, UPS	-4°F to 158°F (-20°C to 70°C)
Storage-Transport Temperature, Battery	-4°F to 86°F (-20°C to 30°C)

### 5.3 UPS Mechanical Characteristics

**Table 6 Mechanical characteristics**

Parameter	10kVA	15kVA	20kVA	30kVA
Width, in. (mm)	24 (600)			
Depth, in. (mm)	32.5 (825)			
Height, in. (mm)	63 (1600)			
Weight Without Inner Batteries, lbs. (kg)	450 (205)	450 (205)	550 (250)	550 (250)
Ventilation	By internal extract fans			
Heat Dissipation, BTU/H (kWH)	2800 (0.82)	4200 (1.23)	5500 (1.61)	8300 (2.43)
Airflow, CFM (m <sup>3</sup> /h)	400 (680)	500 (850)	600 (1019)	1000 (1699)
Cable Entry	Bottom or top			
Color	PMS 877			
Protection Grade (with open/closed front doors)	IP 20			



## 5.4 UPS Electrical Characteristics

### 5.4.1 Battery Manufacturers and Models

Either of two manufacturers' batteries will be installed in the Liebert NX for 10-30 KVA 208v NX as shipped. Below are the battery makers and the models they supply.

**Table 7 Approved batteries**

Battery Manufacturer	Models Supplied		
Energys Yuasa	NPX-80FR	NPX-100FR	NPX-150FR
C&D Dynasty	UPS12-100FR	UPS12-140FR	-

### 5.4.2 Input Rectifier

**Table 8 Rectifier input power**

Rated Power	10kVA	15kVA	20kVA	30kVA
Rated Voltage, VAC	120/208			
Supply	3-phase, 4-wire plus ground			
Input Voltage Tolerance, VAC (without derating)	166-228			
Frequency, Hz	50 / 60			
Input Frequency Tolerance %	±10			
Power Factor	≤ 0.99 at full load ≤ 0.95 at 50% load			
Harmonic Current	Less than 4% at full rated UPS output load			
Rated Power (208V), kVA	10	15	20	30
Input Current, <sup>1</sup> Nominal, A	28	42	56	83
Output Current, Nominal, A	28	42	56	83
<b>Notes</b>				
1. Overload capacity of input current: 100% I <sub>max</sub> <I<125% I <sub>max</sub> : 10 min. 125% I <sub>max</sub> <I<150% I <sub>max</sub> : 1 min. I>150%: Limits input current immediately				

### 5.4.3 DC Intermediate Circuit

**Table 9 DC intermediate circuit**

Rated Power	10kVA	15kVA	20kVA	30kVA
Voltage range for inverter operation, VDC	DC voltage is positive 210V and negative 210V for 200/208 input and output in normal mode <b>NOTE:</b> When the DC bus voltage is less than 190V between positive and negative, the UPS will transfer to battery mode.			
Recommended number of lead-acid batteries	Number of batteries is field-selectable from 20 to 24 jars (12V per jar), or from 120 to 144 cells (2V per cell) when battery type is VRLA. The unit is shipped with a nominal voltage of 324VDC.			
Recommended float charge voltage	2.25VDC*			
Recommended boost charge voltage	2.3VDC*			
Recommended end of discharge voltage	1.65-1.8 VDC			
Maximum recharge battery current, A	7.5	7.5	15	15
Maximum boost charge duration, min.*	1440			
Boost-float threshold current, A*	0.1 C default			
Temperature voltage compensation, mV/°C*	2			
Ripple voltage superimposed %	≤ 1			

\* Set by configuration software

### 5.4.4 Inverter Output

**Table 10 Inverter output**

Rated Power	10kVA	15kVA	20kVA	30kVA
Rated voltage, VAC	120/208			
Supply	3-phase, 4-wire plus ground			
Frequency, Hz	50 / 60			
Rated Power, kVA	10	15	20	30
Rated Power, kW	8	12	16	24
Three -phase transient overload, min. load	10 minutes - 105-125% load			
	1 minute - 126-150% load			
Voltage Regulation %	±1.0% three-phase RMS average for a balanced three-phase load ±2.0% three-phase RMS average for a 100% unbalanced load			
Frequency Regulation %	Nominal frequency regulation is ±0.05% in single module mode, and +/- 0.25% in parallel mode.			
Maximum rate of change of frequency, Hz/sec	For single mode, the slew rate is adjustable from 0.1Hz/s to 3Hz/s			
Current rating of neutral cable, A	1.5 x input current			

**Table 11 Linear load derating**

PF	Lagging						Leading				
	0.5	0.6	0.7	0.8	0.9	1.0	0.9	0.8	0.7	0.6	0.5
<b>K (200V)</b>	1.00	1.00	1.00	1.00	0.88	0.80	0.75	0.73	0.72	0.71	0.71
<b>K (208V)</b>	1.00	1.00	1.00	1.00	0.88	0.80	0.75	0.73	0.72	0.71	0.71

### 5.4.5 Bypass Input

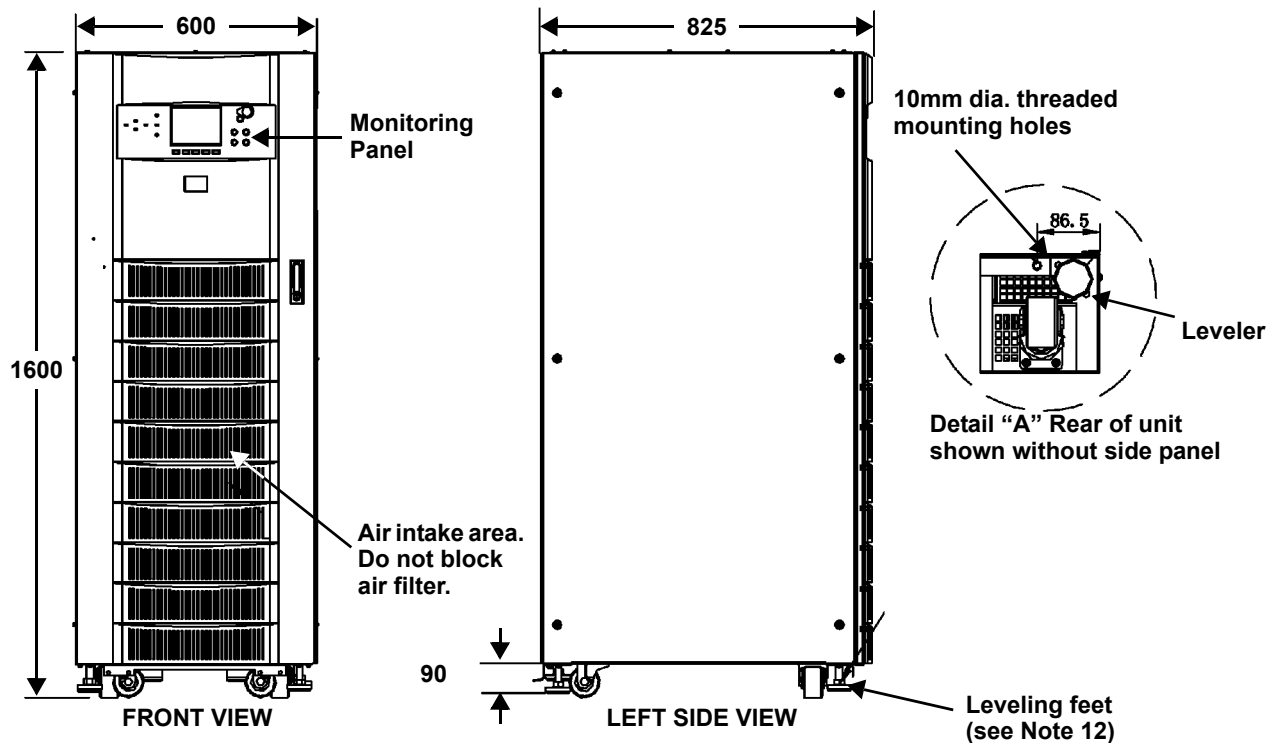
**Table 12 Bypass input**

Rated Power	10kVA	15kVA	20kVA	30kVA												
Rated voltage, VAC	120/208															
Supply	Three-phase, 4-wire plus ground															
Rated Current, A																
200VAC, A	32	48	64	96												
208VAC, A	28	42	56	83												
Bypass voltage tolerance %	Upper limit: +10%, +15% or +20% Lower limit: -10%, -20%, -30% or -40%		Upper limit default: +15% Lower limit default: -20%													
Delay time to recognize bypass voltage returned to window, sec.	2															
Inverter output voltage window %	± 10															
Frequency, Hz	50 / 60															
Input frequency tolerance %	± 10 or ± 20%; default ±10%															
Maximum frequency slew rate, Hz/sec	For single mode, the slew rate should be adjustable from 0.1Hz/s to 3Hz/s															
Current rating of neutral cable, A	1.5 x input current															
Bypass overload capacity (all ratings)	<table border="0"> <tr> <td></td> <td><b>Time</b></td> <td><b>Load</b></td> </tr> <tr> <td></td> <td>Long-term operation:</td> <td>&lt;135% load</td> </tr> <tr> <td></td> <td>10 minutes:</td> <td>135% - 170% load</td> </tr> <tr> <td></td> <td>100milliseconds:</td> <td>1000% full UPS rated output current</td> </tr> </table>					<b>Time</b>	<b>Load</b>		Long-term operation:	<135% load		10 minutes:	135% - 170% load		100milliseconds:	1000% full UPS rated output current
	<b>Time</b>	<b>Load</b>														
	Long-term operation:	<135% load														
	10 minutes:	135% - 170% load														
	100milliseconds:	1000% full UPS rated output current														

## 6.0 INSTALLATION DRAWINGS

The diagrams in this section illustrate the key mechanical and electrical characteristics of the NX UPS System cabinets.

**Figure 18 Dimensional view- front and left side views**



1. All dimensions are metric.
2. A minimum of 24 inches clearance above the unit is required for air exhaust.
3. Installation and service access required. Remove left plate. Left-side access recommended for maximum ease of installation.
4. Keep cabinet within 15 degrees of vertical while handling.
5. Top and bottom cable entry available through removal access plates. Remove punch to suit conduit size and replace.
6. Color - PMS 877.
7. Unit bottom is structurally adequate for forklift handling.
8. Open door to replace air filter, disposable type, size 354x314.
9. Threaded mounting holes used for seismic anchoring or floor stand. **Note:** If a floor stand is used, the weight of the unit must be supported under all casters.
10. Each mounting location is supported by two 10 GA. (.135") galvanized steel. The threaded 12mm insert is approximately 3/4" deep. Mounting bolts must be threaded into unit.
11. Includes side panel. Refer to Detail A for dimension to frame with side panel removed. Side panels are removed between adjacent units that are bolted together.
12. Leveling feet are not designed to carry the full weight of the cabinet. Finger-tighten leveler against the floor, then tighten with a wrench less than two turns for friction against floor.

kVA Rating	Voltage		Weight		Heat Rejection BTU/Hr	Cooling Air CFM
	Input	Output	Lbs	kg		
10	208	208	550	250	3422	324
15	208	208	550	250	4107	468
20	208	208	638	290	6844	540
30	208	208	682	310	8215	900

Figure 19 Dimensions continued - top and bottom views

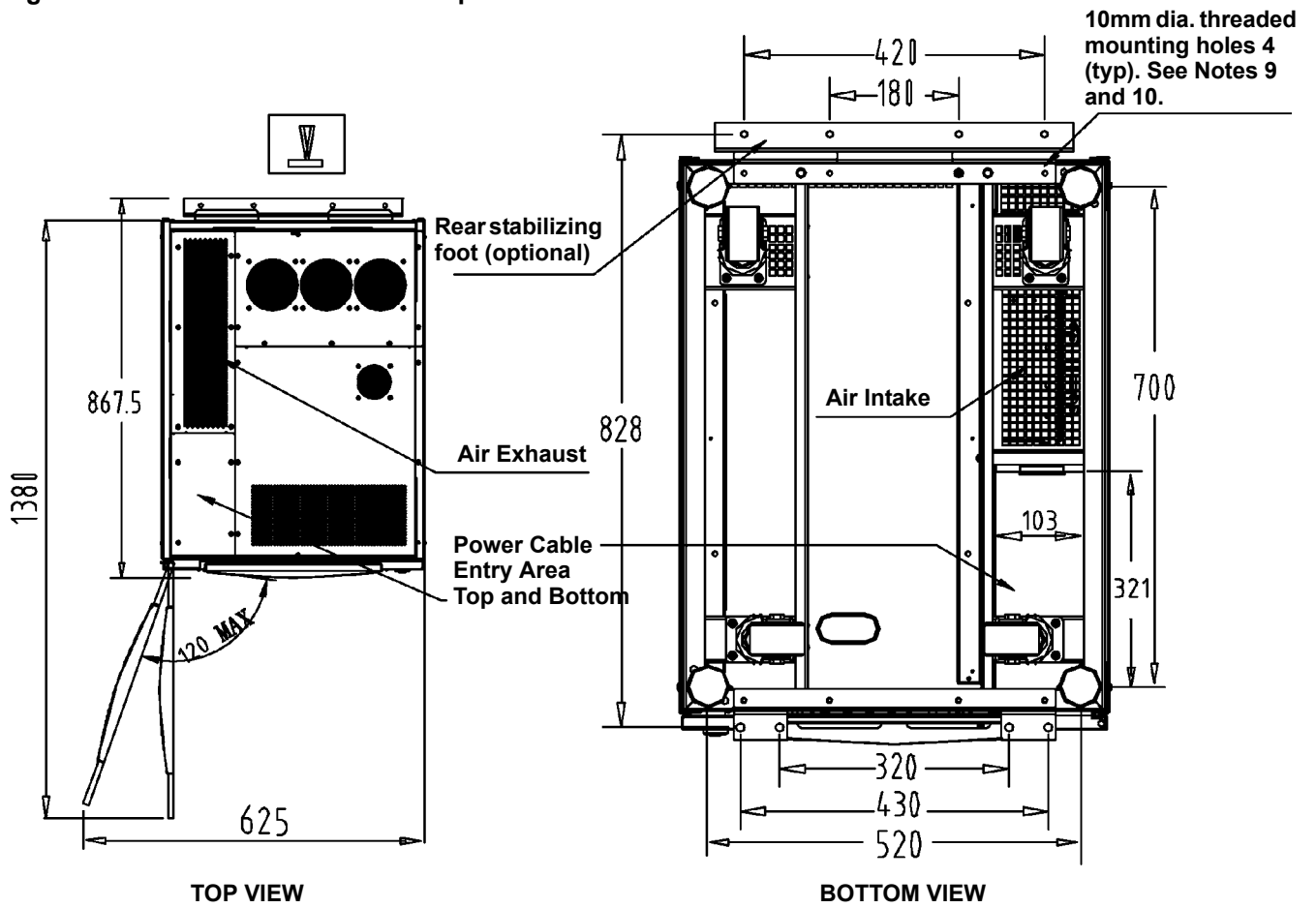
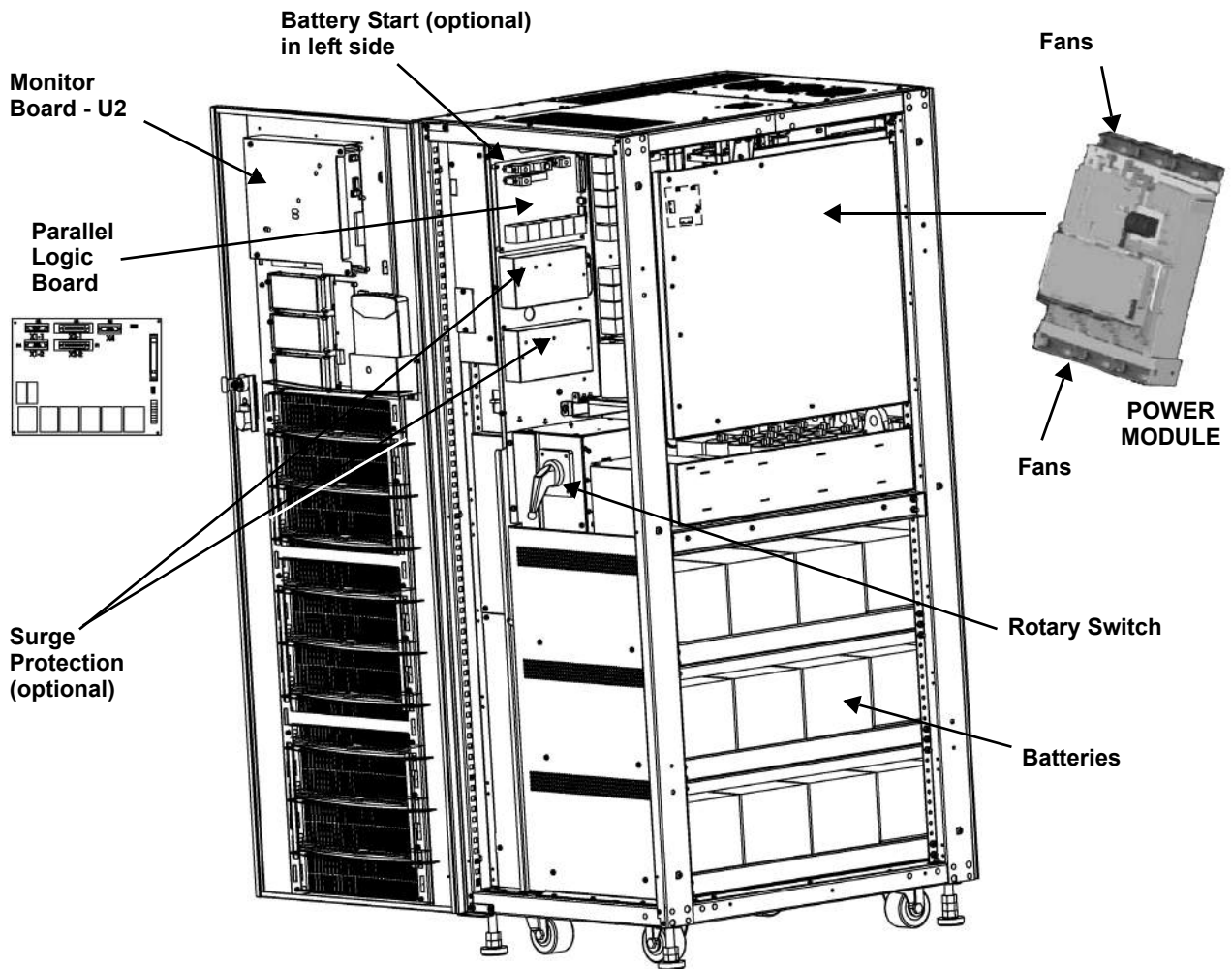


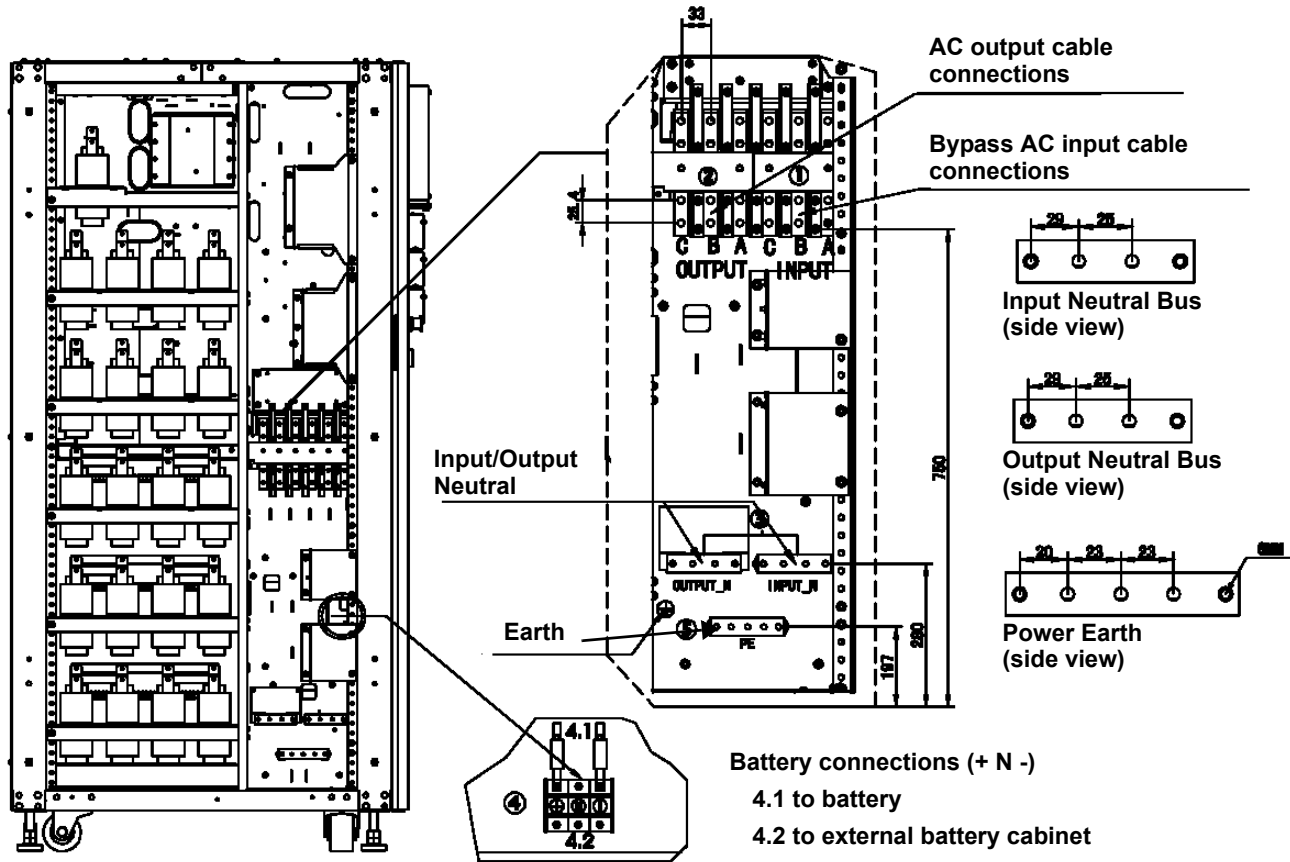
Figure 20 Main components—typical unit



**Notes**

1. Main components are shown in the drawing.
2. Typical options are shown; actual positions on control wiring may vary depending on which options are included on your unit.
3. Refer to **3.0 - Battery Installation** for battery installation details.
4. All wiring must be installed in accordance with all national and local electrical codes.

Figure 21 Cable connections



**NOTES**

1. All dimensions are millimeters.
2. Top and bottom cable entry available through removable access plates. Remove, punch to accommodate conduit size and replace.
3. Control wiring and power wiring must be run in separate conduit. Output and input cables must be run in separate conduit.
4. Aluminum and copper-clad aluminum cables are not recommended.
5. All wiring is to be in accordance with national and local electrical codes.

Figure 22 Location of battery inside UPS

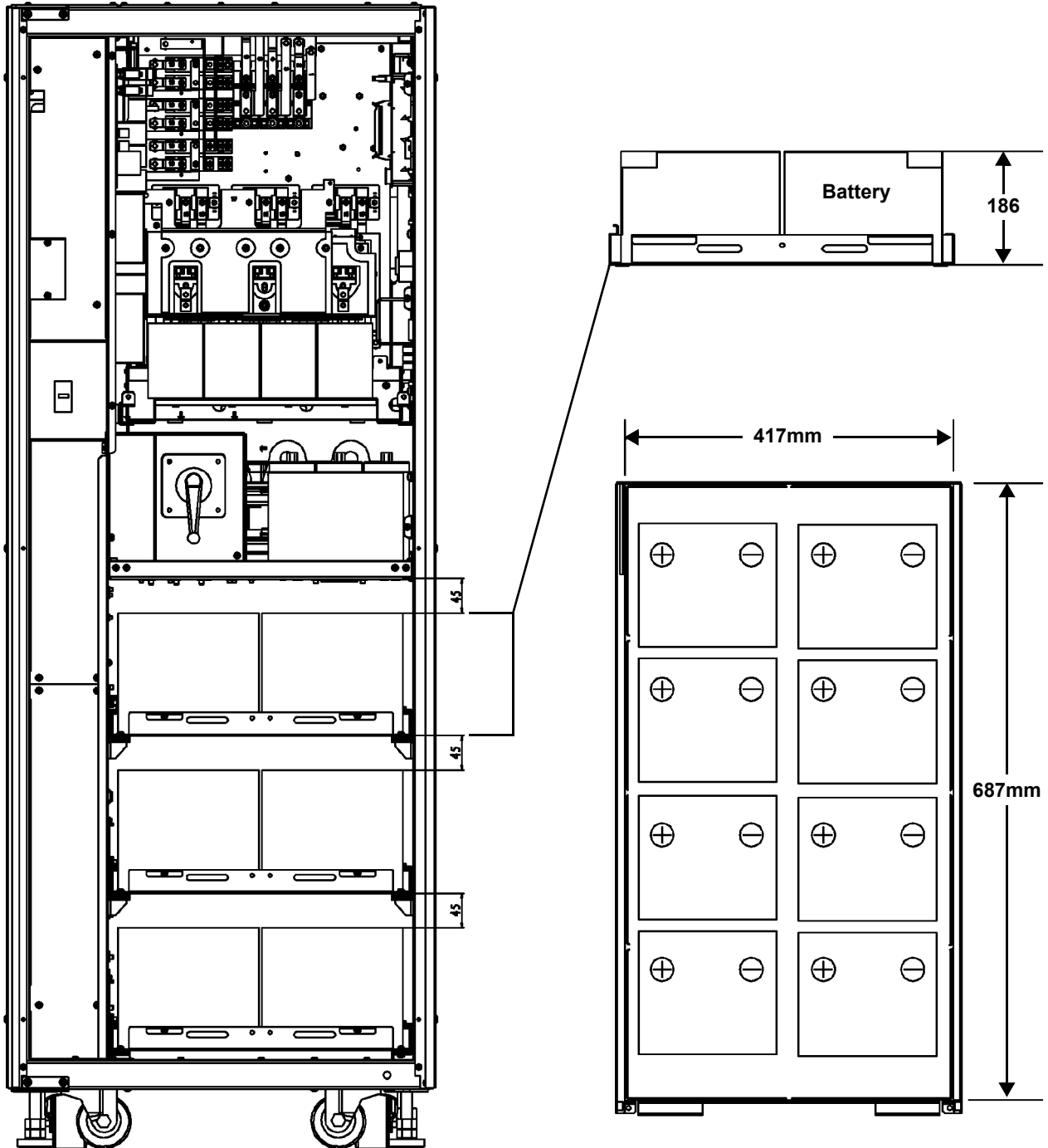


Figure 23 Battery connections

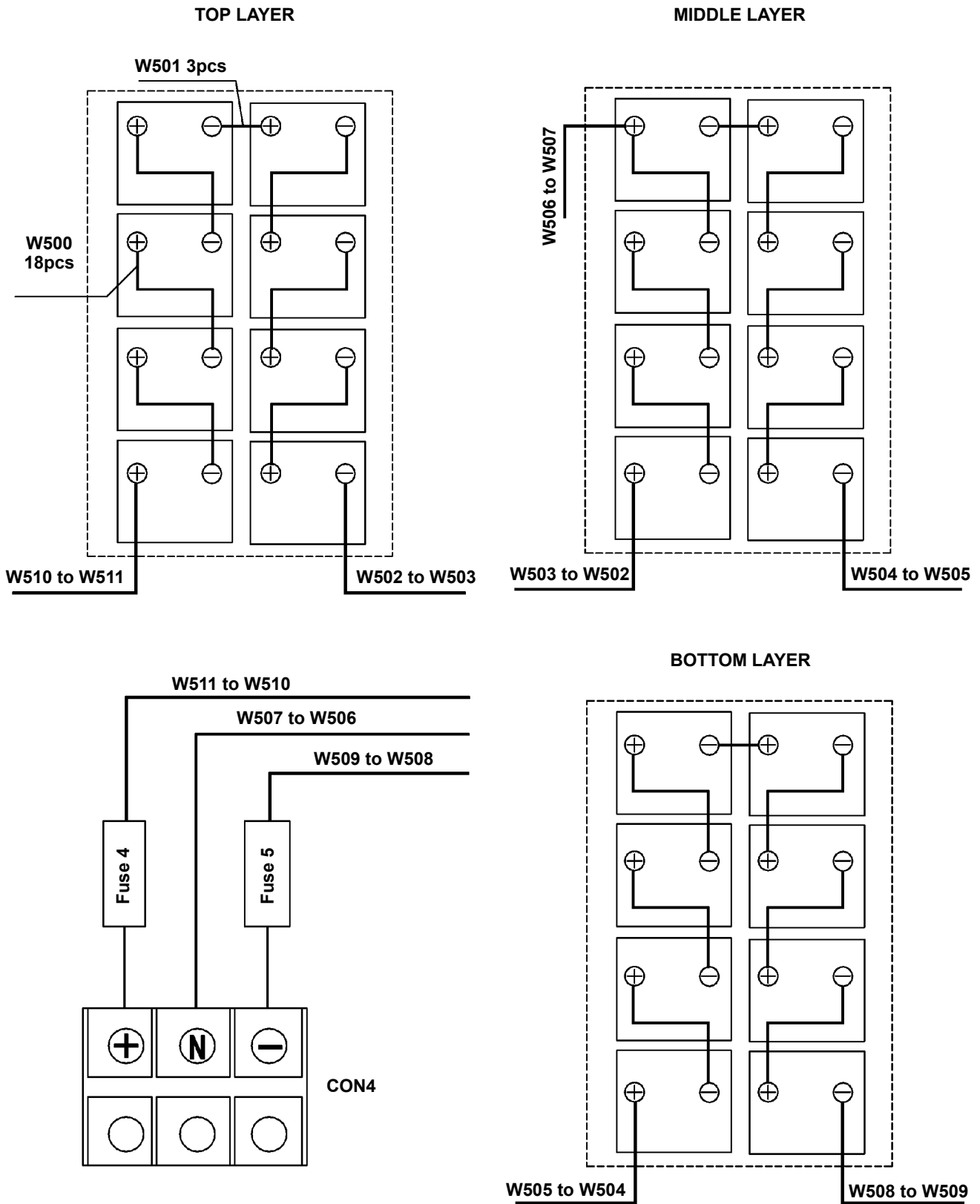




Figure 24 Electrical connections

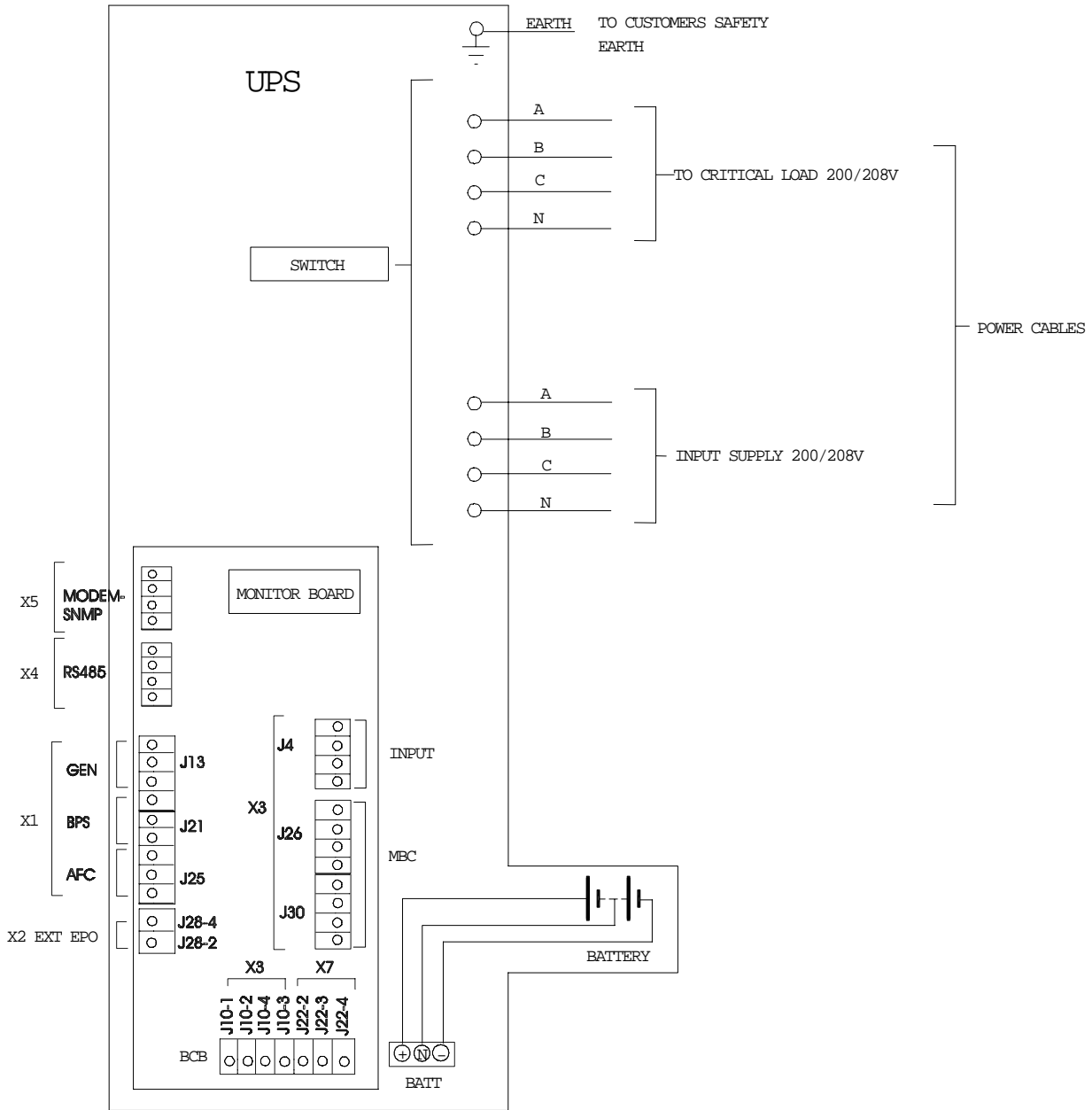
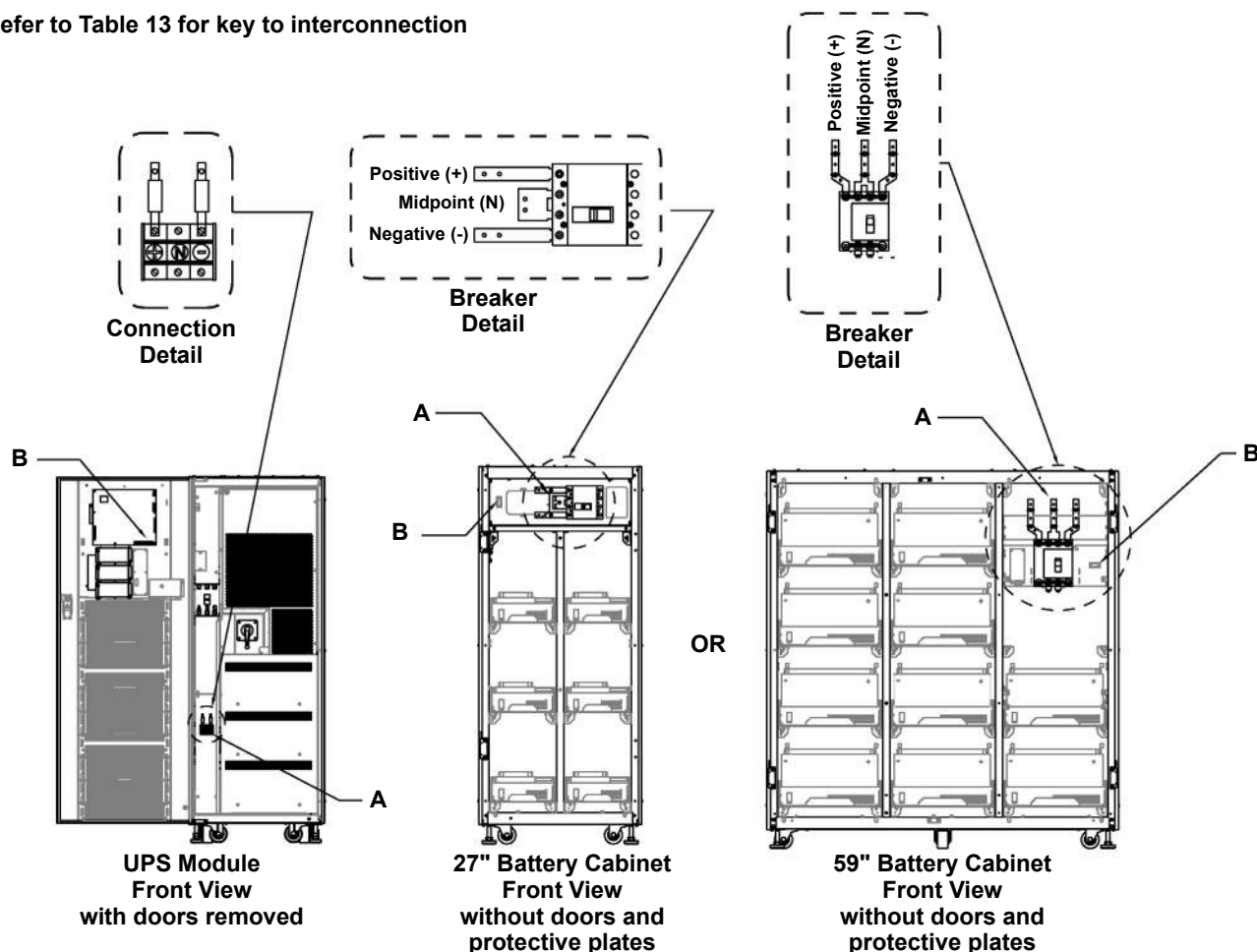


Figure 25 Battery Cabinet interconnection

Refer to Table 13 for key to interconnection



**NOTES:**

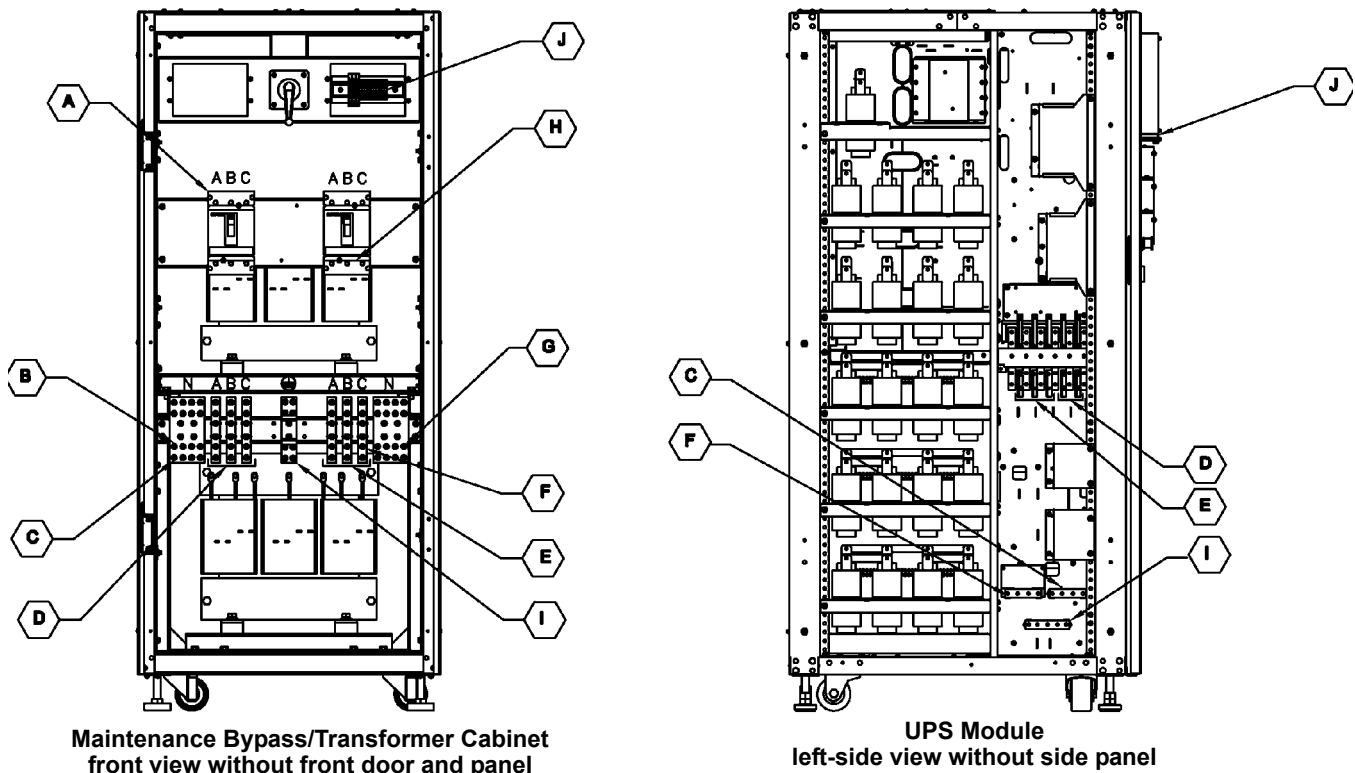
1. All Liebert-supplied cable must be repositioned prior to and while the cabinets are being placed in their final installed location.
2. All interconnection hardware supplied by Liebert
3. All interconnection cables supplied by liebert when bolted together.
4. Interconnection cables field-supplied when battery cabinets are stand-alone.
5. Refer to the individual drawing of each piece of equipment for additional details.

Table 13 Liebert -supplied interconnect wiring

Run	From	To	Conductors
A	UPS battery terminal block	External 27" or 59" battery cabinet	Positive, midpoint, negative
B	Battery cabinet terminal block	UPS monitor board	Battery breaker aux contacts

Figure 26 Maintenance Bypass interconnection

Refer to Table 14 for key to interconnection



**NOTES**

1. All Liebert-supplied cable must be repositioned prior to and while the cabinets are being placed in their final installed location.
2. All interconnection hardware supplied by Liebert.
3. AC connections must be made to the UPS module before attaching maintenance bypass/transformer cabinet to UPS module.
4. Utility AC source neutral not required for maintenance bypass/transformer cabinet types D, E, M, N.
5. All cabling will be field-supplied when maintenance bypass/transformer cabinet is configured as stand-alone cabinet.
6. Maintenance bypass/transformer cabinets must attach to the left side only.
7. Refer to the individual drawing of each piece of equipment for additional details.

**Table 14 Liebert-supplied interconnect wiring for Maintenance Bypass Cabinet**

Run	From	To	Conductors
A	Utility AC source	Maintenance	Ph A, B, C bypass/ transformer cabinet
B	Utility AC source	Maintenance	Neutral bypass/ transformer cabinet
C	Maintenance	UPS module AC input	Neutral byp cabinet
D	Maintenance	UPS module AC input	Ph A, B, C byp cabinet
E	UPS module AC output	Maintenance	Ph A, B, C bypass/transformer cabinet
G	UPS module AC output	Maintenance	Neutral bypass/transformer cabinet
F	Maintenance	Load AC connection	Neutral byp cabinet
H	Maintenance	Load AC connection	Ph A, B, C byp cabinet
I	Utility AC source	All ground connections	Ground
J	Monitoring terminal block	UPS terminal block	Bypass contacts

## 7.0 SPECIFICATIONS AND TECHNICAL DATA

### 7.1 Lug Size and Torque Requirements

Use commercially available solderless lugs for the wire size required for your application. Refer to **Table 15**. Connect wire to the lug using tools and procedures specified by the lug manufacturer.

**Table 15 Torque specifications**

<b>NUT AND BOLT COMBINATIONS</b>				
<b>Bolt Shaft Size</b>	<b>Grade 2 Standard</b>		<b>Electrical Connections with Belleville Washers</b>	
	<b>Lb-in</b>	<b>N-m</b>	<b>Lb-in</b>	<b>N-m</b>
1/4	53	6.0	46	5.2
5/16	107	12	60	6.8
3/8	192	22	95	11
1/2	428	22	256	29

<b>CIRCUIT BREAKERS WITH COMPRESSION LUGS (FOR POWER WIRING)</b>		
<b>Wire Size or Range</b>	<b>Lb-in</b>	<b>N-m</b>
#6 - #4	100	11
#3 - #1	125	14
1/0 - 2/0	150	17
3/0 - 200 MCM	200	23
250 - 400 MCM	250	28
500 - 700 MCM	300	34

<b>CIRCUIT BREAKERS WITH COMPRESSION LUGS (FOR POWER WIRING)</b>		
<b>Current Rating</b>	<b>Lb-in</b>	<b>N-m</b>
400 - 1200 Amps	300.00	34.00

<b>TERMINAL BLOCK COMPRESSION LUGS (FOR CONTROL WIRING)</b>		
<b>AWG Wire Size or Range</b>	<b>Lb-in</b>	<b>N-m</b>
#22 - #14	3.5 to 5.3	0.4 to 0.6

**NOTE:** Use the values in this table unless the equipment is labeled with a different torque value.

**Table 16 Battery torque rating**

<b>Battery</b>	<b>Initial Torque in-lbs (N-m)</b>	<b>Annual Torque in-lbs (N-m)</b>
UPS12-100FR	40 (4.5)	32 (3.48)
UPS12-140FR	40 (4.5)	32 (3.48)
UPS12-200FR	40 (4.5)	32 (3.48)
UPS12-270FR	40 (4.5)	32 (3.48)
UPS12-310FR	65 (7.4)	52 (5.88)
UPS12-370FR	65 (7.4)	52 (5.88)
UPS12-475FR	110 (12.4)	110 (12.4)
NPX-80FR	26 (2.9)	26 (2.9)
NPX-100FR	26 (2.9)	26 (2.9)
NPX-150FR	26 (2.9)	26 (2.9)

**Table 17 Wire sizing—UPS terminal**

<b>Bypass Input (Single or Dual Input Unit)</b>								
<b>Unit Rating</b>	<b>Nominal Output Current</b>	<b>Max. Input Current</b>	<b>OCP Current</b>	<b>OCP Device Rating</b>	<b>Cable Size, AWG</b>	<b>Bolt Size in. (m)</b>	<b>Lug T&amp;B One Hole 54000</b>	<b>Lug T&amp;B One Hole REDDY</b>
10	28	35	42	45	6	1/4 (6m)	54105	62204
15	42	53	63	70	4	1/4 (6m)	54106	62204
20	56	70	84	90	2	1/4 (6m)	54107	62204
30	84	105	126	150	1/0	1/4 (6m)	54152	62205

**Rectifier Input (for Dual input unit only)**

<b>Unit Rating</b>	<b>Nominal Output Current</b>	<b>Max. Input Current</b>	<b>OCP Current</b>	<b>OCP Device Rating</b>	<b>Cable Size, AWG</b>	<b>Bolt Size in. (m)</b>	<b>Lug T&amp;B One Hole 54000</b>	<b>Lug T&amp;B One Hole REDDY</b>
10	24.9	31	37	40	8	1/4 (6m)	54130	62204
15	37.3	47	56	60	4	1/4 (6m)	54106	62204
20	49.8	62	75	80	3	1/4 (6m)	54107	62204
30	74.7	93	112	125	1/0	1/4 (6m)	54152	62205

**Output**

<b>Unit Rating</b>	<b>Nominal Output Current</b>	<b>OCP Current</b>	<b>OCP Device Rating</b>	<b>Cable Size, AWG</b>	<b>Bolt Size in. (m)</b>	<b>Lug T&amp;B One Hole 54000</b>	<b>Lug T&amp;B One Hole REDDY</b>
10	28	35	35	8	1/4 (6m)	54130	62204
15	42	53	60	4	1/4 (6m)	54106	62204
20	56	70	70	4	1/4 (6m)	54106	62204
30	84	105	110	1	1/4 (6m)	54108	62205

**Battery**

<b>Unit Rating</b>	<b>Battery Current</b>	<b>OCP Current</b>	<b>OCP Device Rating</b>	<b>Cable Size, AWG</b>	<b>Bolt Size in. (m)</b>	<b>Lug T&amp;B One Hole 54000</b>	<b>Lug T&amp;B One Hole REDDY</b>
10	40	40	40	8	1/4 (6m)	54130	62204
15	60	60	60	4	1/4 (6m)	54106	62204
20	80	80	80	2	5/16 (8m)	54142	62212
30	120	120	125	1/0	5/16 (8m)	54153	62212

**Table 18 Wire sizing—Maintenance Bypass Cabinet**

<b>Input</b>						
<b>Unit Rating</b>	<b>Nominal System Input Voltage</b>	<b>Nominal System Input Current</b>	<b>Maximum Input Current</b>	<b>OCP Current</b>	<b>OCP Device Rating</b>	<b>Cable Size, AWG</b>
30	600	31	38	46	50	6
30	480	38	48	58	60	4
30	220	85	106	127	150	1/0
30	208	87	108	130	150	1/0
20	600	21	26	31	35	8
20	480	26	32	39	40	8
20	220	56	71	85	90	2
20	208	58	72	87	90	2
15	600	16	19	23	25	10
15	480	19	24	29	30	10
15	220	42	53	63	70	4
15	208	43	54	65	70	4
10	600	10	13	15	15	14
10	480	13	16	19	20	12
10	220	28	35	42	45	6
10	208	29	36	43	45	6

**Output**

<b>Unit Rating</b>	<b>Nominal System Output Voltage</b>	<b>Nominal System Output Current</b>	<b>OCP Current</b>	<b>OCP Device Rating</b>	<b>Cable Size, AWG</b>
30	600	28.9	36.1	40	8
30	480	36.1	45.1	50	6
30	220	78.7	98.4	100	1
30	208	83.3	104.1	110	1
20	600	19.2	24.0	25	10
20	480	24.1	30.1	35	8
20	220	52.5	65.6	70	4
20	208	55.5	69.4	70	4
15	600	14.4	18.0	20	12
15	480	18	22.5	25	10
15	220	39.4	49.3	50	6
15	208	41.6	52.0	60	4
10	600	9.6	12.0	15	14
10	480	12	15.0	15	14
10	220	26.2	32.8	35	8
10	208	27.8	34.8	35	8

**Table 19 Battery cabinet physical characteristics**

Battery Cabinet Type	Dimensions WxDxH In. (mm)	Net Weight Without Batteries, lbs.(kg)
Short Narrow	27.2x31.4x63 (690x800x1600)	551 (250)
Short Wide	58.5x31.4x63 (1488x800x1600)	889 (400)

**Table 20 Maintenance Bypass Cabinet weights**

UPS Rating	Maintenance Bypass Cabinet Style, lbs. (kgs)									
	A	B	C	D	E	L	J	K	M	N
10kVA	408 (185)	545 (247)	675 (306)	602 (273)	732 (332)	670 (304)	403 (183)	540 (245)	597 (271)	728 (330)
15kVA	408 (185)	567 (257)	728 (330)	659 (299)	822 (373)	723 (328)	403 (183)	562 (255)	655 (297)	818 (371)
20kVA	408 (185)	646 (293)	842 (382)	739 (335)	935 (424)	838 (380)	403 (183)	642 (291)	734 (333)	930 (422)
30kVA	408 (185)	694 (315)	893 (405)	807 (366)	1027 (466)	888 (403)	403 (183)	690 (313)	802 (364)	1023 (464)

Maintenance Bypass Cabinet Dimensions, in. (kg): 27.2x31.4x63 (690x800x1600)

## 7.2 Cable Lengths: Floor to Connection Point Inside UPS

To help calculate the total cable length required, refer to **Table 21** for the distance from the floor to selected connection points inside the NX. Determine the cable length required to reach the NX, then add the appropriate length from the table and adequate slack for repair and maintenance.

**Table 21 Distance to connection points on the NX**

Connection Point on UPS	Distance	
	From Floor in. (mm)	From Top of Unit in. (mm)
Bypass AC input supply	30 (750)	30 (750)
UPS output AC	30 (750)	30 (750)
Neutral busbars—Input and Output	11 (280)	55 (1397)
Battery power	16 (400)	58 (1474)
Auxiliary cables: Monitor board (U2)	60 (1500)	20 (508)
Communications	55 (1400)	25 (635)
Ground	8 (197)	56 (14227)







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With over a million installations around the globe, Liebert is the world leader in computer protection systems. Since its founding in 1965, Liebert has developed a complete range of support and protection systems for sensitive electronics:

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