Three-Phase
Emergency Lighting Inverter
Installation and Operation Manual

Wave Rider 3 Standard Units (8-50KW) and OSHPD Series, 8-50KW Certification: (OSP-0499-10)

CRUCIAL POWER PRODUCTS

Document No.: 415-MAN, Rev. D

Contact Numbers: Phone: 800-244-4069

Emergency Lighting Inverter Installation and Operation Manual

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APRIL 15, 2025

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Introduction

This manual tells you how to install, start and operate your unit and lets you know how to get more information for special situations, and provide contact information

Warranty Registration and Warranty Certificate Request

Visit our web site at: www.800pwrsrvc.com under download tab

Scope and Audience

This guide is intended to be used as a reference for users responsible for installing, operating, and maintaining this equipment.

Safety and Warnings

This guide uses the following symbols to draw your attention to certain information.

Symbol	Meaning	Description
	Note	Notes emphasize or supplement important points of the main text.
	Tip	Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Cautions indicate that failure to take specified action could result in damage to the hardware.
	DANGER	The Danger symbol warns users of possible injury or death if instructions are not followed.
	Hazardous voltage	Hazardous voltage inside. Only authorized personnel may service this equipment.
	Electrostatic sensitive	Components are Electrostatic Discharge Susceptible (ESDS) Use a grounded ESD wrist strap.

Accessing Product Documentation

The user documentation for the products is available at our website under downloads tab. Please check this site for the most current documentation, including important updates that may have been made after the release of the product.

Service

If you require assistance, fill out a Service Report Form at www.800pwrsrvc.com, email us at service@800pwrsrvc.com, or call our 24-hour toll free hot line (800-797-7782). Please have the unit's SERIAL NO. from the Start-Up label located on the top left corner of the front door for speed assistance.

Chapter 1. Overview

This chapter provides an overview of the Three-Phase Lighting Inverter Standard Series.

1.1 Specifications

Typical Specifications (Input / Output Current)

kVA/kW	10/8	15/12	20/16	25/20	30/24	40/32	50/40	50kW
Input Voltage (vac)	**208Y/120**							
Output Voltage (vac)	**208Y/120**							
Input Max Current	**31**	**47**	**62**	**77**	**93**	**120**	**145**	**182**
Output Max Current	**22**	**33**	**44**	**56**	**67**	**89**	**111**	**139**
Input Voltage (vac)	**480Y/277**							
Output Voltage (vac)	**480Y/277**							
Input Max Current	**14**	**21**	**27**	**35**	**41**	**50.3**	**63**	**63**
Output Max Current	**10**	**14**	**19**	**24**	**29**	**38**	**48**	**60**
Input Voltage (vac)	**480Y/277**							
Output Voltage (vac)	**208Y/120**							
Input Max Current	**14**	**21**	**27**	**35**	**41**	**50.3**	**63**	**63**
Output Max Current	**22**	**33**	**44**	**56**	**67**	**89**	**111**	**139**
Input Voltage (vac)	**208Y/120**							
Output Voltage (vac)	**480Y/277**							
Input Max Current	**31**	**47**	**62**	**77**	**93**	**120**	**145**	**182**
Output Max Current	**10**	**14**	**19**	**24**	**29**	**38**	**48**	**60**

General Specification

Input	
Voltage Regulation	**+10% -15%**
Frequency (Hz)	**60 Hz ±3%**
Power factor	**0.98 to 1.0 (Typical)**
Overcurrent protection	**Electronic / Circuit Breaker**
Number of wires	**4 Wires plus Ground**
Power connection	**Hard Wired (Terminal Block)**

Output	
Voltage (vac)	**Three Phase, 208Y/120, 480Y/277 VAC**
Voltage regulation	**±3% No Load to Full Load; ±3% High Line to Low Line**
Frequency (Hz)	**60 Hz ± 0.5 Hz (When on Inverter)**
Waveshape	**Sine Wave**
Harmonic distortion	**<5% THD; <3% Single Harmonic**
Crest factor	**Up to 3 to 1**
Power factor	**0.65 Lagging or Leading to Unity**
Overload	**115% overload for 5 to 10 minutes, 125% for 30 seconds.**
Protection	**Electronic / Circuit Breaker**
Noise rejection	**-120 dB Common Mode; -60 dB Normal Mode**
Number of wires	**4 Wires plus Ground**
Power connection	**Hard Wired (Terminal Block)**

Battery								
Battery run time	**90 minutes minimum**							
Battery type	**Sealed, Maintenance-Free, AGM, VRLA type**							
kVA/kW	**10/8**	**15/12**	**20/16**	**25/20**	**30/24**	**40/32**	**50/40**	**50kW**
Nominal dc voltage (VDC)	**192**	**192**	**192**	**288**	**288**	**312**	**480**	**480**
Overcurrent protection	**Circuit Breaker**							
Packaging	**Batteries Housed in External Battery Cabinet**							

Monitoring and communications	
LCD Screen	**Input Voltage; Battery Charger; UPS Output; On Battery; Low Battery; Summary Alarm**

Indicators	**LCD Display Panel (Back lit)**
Relay interface	**Dry Contacts for: Low Battery, On Bypass, Summary Alarm, Input Fail**
Contact rating	**125 Volts (AC or DC) Maximum; 1.25 Amperes Maximum; 30 Watts / 50 VA Maximum**
Interface connection	**Hard Wired (Terminal Block)**
Environmental	
Surge withstandability	**ANSI C62.41-1980 categories A & B**
Operating temperature	**Meets NEMA requirements**
Operating relative humidity	**0 to 95% non-condensing**
Altitude	**Up to 6,000 feet (1,829 meters) with no de-rating**
Cooling	**Air cooled-forced air (fan)**
Physical	
Dimensions (UPS) **(W x H x D in Inches)**	**39 x 68 x 18**
Construction	**Painted Steel Enclosure, Lockable front door, Full length hinged, for indoor installation,**
Color	**Black**
Accessibility	**Front all Servicing is through the front no side or rear access required**
Cable entry	**Sides and top**
Mounting	**Four (4) mounting holes are provided for anchoring to floor, Hardware to be supplied by others**

Due to continuous product improvement, this document is subject to change without prior notice.

1.2 System Description

The Three Phase Lighting Inverter is manufactured to provide critical power for lighting during a power outage. The Lighting Inverter meets or exceeds the life safety codes of UL924, UL1778 and NFPA101. These codes were established to allow emergency lighting inverters to provide critical power to the lighting circuits during a power failure.

The Power Wave Rider 3 equipment herein shall be referred to as UPS or Lighting Inverter.

Three Phase Lighting Inverter Standard Series and Seismic series have been certified to Ul1778, UL924.

Additionally, Seismic Series have been certified to meet the requirement for CBC 2016 and IBC 2015 and have been Shake table tested in accordance with ICC-ES AC156 procedure to SDS level 3.0 g. The systems have received special seismic certification from OSHPD (California Office of Statewide Health Planning and Development). These are the most rigid seismic standards currently being specified.

If input power to the inverter is lost during a power outage, the system draws clean sine wave power automatically from its internal battery supply without any interruption and with zero transfer time. Power is provided for 90 minutes, sufficient time for safe and orderly evacuation from the facility.

The output isolation transformer provides isolation between the inverter and critical load. The power to the primary of this transformer is received form the unit and is transformed to required output voltage levels.

The standard VRLA (Valve Regulated Lead-acid), maintenance-free batteries provide 90 minutes of backup power as standard, sufficient time for safe and orderly evacuation from the facility. Upon restoration of input power, UPS automatically resumes normal operation and immediately begins to recharge the batteries for the next power outage.

The Three Phase Lighting Inverter has an internal bypass circuit, which maintains the power to the load in case of internal system or component malfunction.

The UPS provides comprehensive monitoring capabilities. In addition to the LCD display, it provides four facility Interface (Dry Contacts) for remote monitoring capabilities.

The UPS contains optional; AS 400, RS 232, RS485 data transmission ports RJ45 with optional software and many other communication options.

The unit is an on-line three phase PWM high frequency, digital signal processing, true double conversion inverter system available in output ratings of 8-50KW, see Table -4-1 for available ratings The UPS is listed for compliance to UL1778, UL924, UL924A and CSA107.1 standard. (Need to re-write this sentence) The units are available with an input or output voltages of; 480Y/277 and 208Y/120 VAC.

1.3 Models

The Three-Phase Lighting Inverters are available in two series:

- ✓ Standard series
- ✓ Seismic series

1.3.1 Standard Series

The Standard Series Three-Phase Lighting Inverters are on-line 3- phase PWM inverters. The systems support power ratings from 10KVA/8KW to 50KW power ratings.

All Standard Series systems comply with UL1778, UL924, UL924A, and CSA107.1 standard. They are available with input or output voltages of 480Y/277 or 208Y/120 VAC, Three-phase. This information is shown on the nameplate located on the inside front door.

Table 1-1 Standard Series Cabinet Dimensions

kVA/KW	UPS Cabinet Size (W x H x D in Inches)	Typical Battery Cabinet (Standard Battery) **(W x H x D in Inches)**
8KW	39 X 68 X 18	39 X 68 X 18
12 ~ -50KW		51 x 70 x 30.5, See Figure 4-10

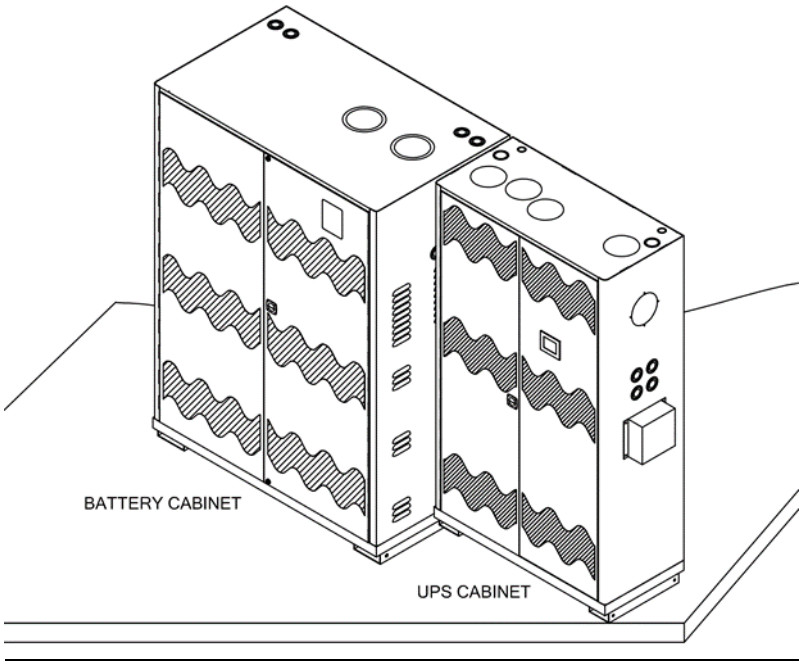


Figure 1-1 Standard Series Cabinet shown with single battery cabinet

Table 1-2 Standard Series (Zone 4 with Seismic Brackets) Cabinet Dimensions

kVA/KW	UPS Cabinet Size (W x H x D in Inches)	Typical Battery cabinet (Standard Battery) **(W x H x D in Inches)**
8KW	**46.75 x 68 x 18 (Including brackets)**	**46.75 x 68 x 18 (Including brackets)**
12 ~ -50KW		**58.75 x 70 x 30.5 (Including brackets) See Figure 4-10**

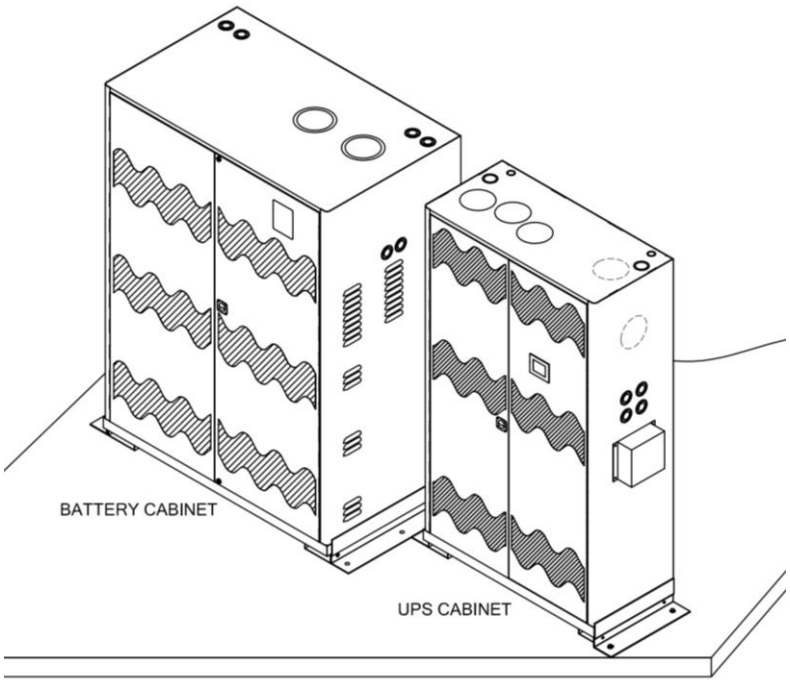


Figure 1-2 Standard Series (Zone 4 with Seismic Brackets) shown with single battery cabinet

1.3.2 Seismic (OSHPD Shake Table Tested) Series

The Seismic Series are OSHPD-certified Three-Phase PWM Lighting Inverters that support power ratings from 8kw to 50kw. In addition to complying with UL1778, UL924, and CSA107.1 standard, these models meet the requirements for CBC 2016 and IBC 2015. They have been Shake table-tested in accordance with the ICC-ES AC156 procedure to SDS level 3.0g. The systems have received special seismic certification from the California Office of Statewide Health Planning and Development (OSHPD), which are the most rigid seismic standards available.

Refer to Table 1-3 for the UPS and typical battery cabinet dimensions

Note: All Seismic Series models have an SV- prefix in their model number.

Table 1-3 Seismic (OSHPD) Series Shock-and Vibration-Approved Cabinet dimensions

KW	UPS Cabinet Size (W x H x D in Inches)	Typical Standard Battery Cabinet (W x H x D in Inches)
8KW	**46 X 68 X 18 (including brackets)**	**46 X 68 X 18 (including brackets)**
12 ~ -50KW		**58.75 x 70 x 30.5 (including brackets)** **See Figure 4-11**

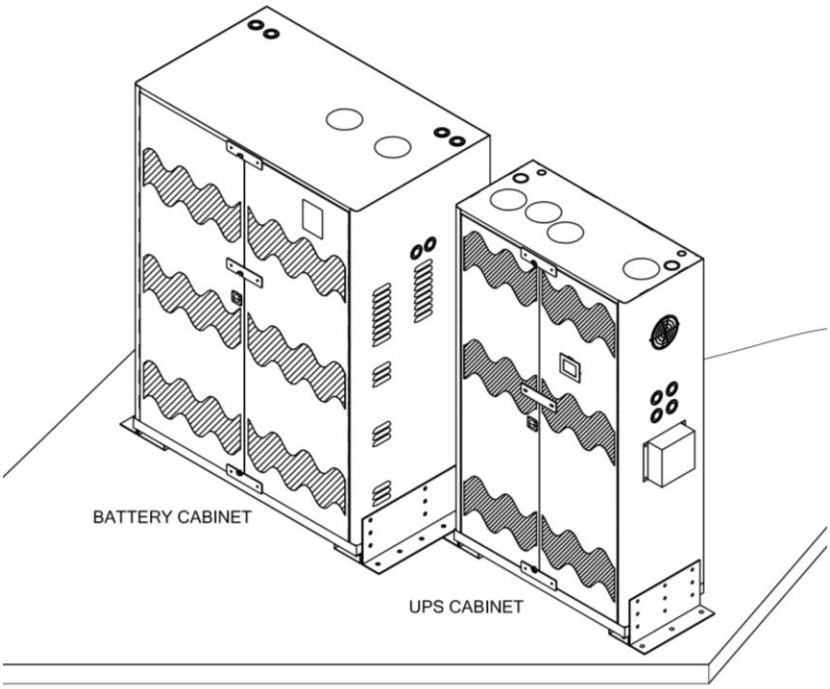


Figure 1-3. Seismic (OSHPD) Series Shock-and Vibration-Approved shown with single battery cabinet

Table 1-4 Shock- and Vibration-Approved Model Numbers

KVA/KW	Input/Output Voltage	Model Number	Mounting Dim: W" X H" X D"		
			Inverter Cabinet	Standard Battery	
				Single Battery Cabinet	Qty
10/8.0	208Y/120 - 208Y/120	SV-WR010B05LHT3-VA	46 X 68 X 18 (including brackets)	58.75 x 70 x 30.5	1
	480Y/277 - 480Y/277	SV-WR010H09LHT3-VA			
	480Y/277 - 208Y/120	SV-WR010H05LHT3-VA			
	208Y/120 - 480Y/277	SV-WR010B09LHT3-VA			
15/12	208Y/120 - 208Y/120	SV-WR015B05LHT3-VA		58.75 x 70 x 30.5	1
	480Y/277 - 480Y/277	SV-WR015H09LHT3-VA			
	480Y/277 - 208Y/120	SV-WR015H05LHT3-VA			
	208Y/120 - 480Y/277	SV-WR015B09LHT3-VA			
20/16	208Y/120 - 208Y/120	SV-WR020B05LHT3-VA		58.75 x 70 x 30.5	1
	480Y/277 - 480Y/277	SV-WR020H09LHT3-VA			
	480Y/277 - 208Y/120	SV-WR020H05LHT3-VA			
	208Y/120 - 480Y/277	SV-WR020B09LHT3-VA			
25/20	208Y/120 - 208Y/120	SV-WR025B05LHT3-VA		58.75 x 70 x 30.5	1
	480Y/277 - 480Y/277	SV-WR025H09LHT3-VA			
	480Y/277 - 208Y/120	SV-WR025H05LHT3-VA			
	208Y/120 - 480Y/277	SV-WR025B09LHT3-VA			
30/24	208Y/120 - 208Y/120	SV-WR030B05LHT3-VA		58.75 x 70 x 30.5	1
	480Y/277 - 480Y/277	SV-WR030H09LHT3-VA			
	480Y/277 - 208Y/120	SV-WR030H05LHT3-VA			
	208Y/120 - 480Y/277	SV-WR030B09LHT3-VA			
40/32	208Y/120 - 208Y/120	SV-WR040B05LHT3-VA		58.75 x 70 x 30.5	2
	480Y/277 - 480Y/277	SV-WR040H09LHT3-VA			
	480Y/277 - 208Y/120	SV-WR040H05LHT3-VA			
	208Y/120 - 480Y/277	SV-WR040B09LHT3-VA			
50/40	208Y/120 - 208Y/120	SV-WR050B05LHT3-VA		58.75 x 70 x 30.5	2
	480Y/277 - 480Y/277	SV-WR050H09LHT3-VA			
	480Y/277 - 208Y/120	SV-WR050H05LHT3-VA			
	208Y/120 - 480Y/277	SV-WR050B09LHT3-VA			
50KW	208Y/120 - 208Y/120	SV-WR050B05LHT3-KW		58.75 x 70 x 30.5	2
	480Y/277 - 480Y/277	SV-WR050H09LHT3-KW			
	480Y/277 - 208Y/120	SV-WR050H05LHT3-KW			
	208Y/120 - 480Y/277	SV-WR050B05LHT3-KW			

1.4 Product Main Features

Item	Components	Function
1	Input Contactor K1	The input contactor is multifunctional. First, it provides connections for the input power to the unit. Secondly, the contactor disconnects the input line when an outage occurs so that there is no back feeding of power into the power line. Finally, the contactor allows for automatic unit operation upon a complete discharge of the batteries. No operator intervention is required when power to the unit is restored after a complete battery discharge.
2	Battery Charger	The battery charger maintains the batteries at full charge. After a battery discharge, the charger will automatically recharge the batteries upon restoration of input power. This circuit is on the Power Board.
3	Power Board Assembly with IGBT's	The Power Board is bolted onto the IGBT (Insulated Gate Bipolar Transistor) blocks that are mounted on a heat sink. The complete Heat Sink Assembly with IGBT's and Power Board is replaceable as a single part. This FRU (Field Replaceable Assembly) converts all the power, i.e. input AC power converted to DC bus, battery power boosted to DC bus, and finally DC bus power converted to output AC power using PWM technology for a smooth AC sine wave. In case of a catastrophic failure, the complete Heat Sink Assembly is easily replaceable using only a screwdriver. The Power Board also contains the housekeeping power supplies and drivers for the IGBT's. The entire assembly provides the landing place for all internal input, output, DC cables and metering devices for control and monitoring of the unit input and output currents.
4	Control Board	The microprocessor with unit specific firmware and control circuitry is located on the Control Board. The Control Board is mounted inside the cabinet door and communicates with the Power Board (A2) via a ribbon cable. It monitors the input and output voltages and generates the command to close or open the input contactor and to sense and change the status of the bypass static switch. The Control Board sends data to the LCD panel located on the door where actual status and parameters are displayed. It additionally has AS400, RS232, and RS485 output capabilities and supports various communication including SNMP options.
5	Static Bypass Switch	The Static Bypass Switch is a fully rated solid-state device capable of switching the critical load between the inverter output and the normal AC bypass line. In the event of a system output overload of 125% or more of the unit full-load current rating, a make-before-break (both directions) transfers power to the bypass source via a static switch.
6	LCD Display Panel	The LCD (**L**iquid **C**rystal **D**isplay) panel a 4 by 20 backlit character provides all the input, output, battery metering and alarm data, and UPS status for customer use on a constantly scrolling set of 2 default screens with continuous update.

Item	Components	Function
7	Input Transformer	The input transformer adjusts the input voltage for proper rectifier DC voltage, depending on the unit rated power and back-up capacity.
8	Output Isolation Transformer	The output isolation transformer provides isolation between the inverter and critical load. The power to the primary of this transformer is received form the unit and is transformed to required output voltage levels.
9	Maintenance Bypass Switch	The MBS (**M**aintenance **B**ypass **S**witch) removes the critical load from the backup power and provides utility input directly to the load in case of a unit malfunction or during system maintenance.
10	Battery Bank (housed in external cabinet)	The battery bank consists of sealed, maintenance-free batteries. The batteries provide emergency power during power outages. The battery bank includes a breaker for over current protection and DC disconnect for each cabinet or string to allow the servicing of the battery.

Chapter 2. Safety

This chapter contains safety precautions to observe when operating or servicing electrical equipment. The symbols shown are used extensively throughout this manual. Always heed these precautions because they are essential to the safe operation and servicing of this product.

DANGER: Only factory-trained or authorized personnel should attempt to install or repair the unit or its battery system. Improper installation has proven to be the single most significant cause of start-up problems. High AC and DC electrical voltages are present throughout the unit(s) and incorrect installation or servicing could result in electrocution, fire, explosion, or equipment failure.

DANGER: Read this manual in its entirety before performing the installation, start-up, operation, or maintenance of the UPS unit or battery systems. Failure to do so could result in electrocution, fire, explosion, or equipment failure.

DANGER: All power connections must be completed by a licensed electrician who is experienced in wiring this type of equipment. Wiring must be installed in accordance with all applicable national and local electrical codes. Improper wiring may cause damage to the equipment, injury or death of personnel. Verify that all high and low voltage input power circuits are de-energized and locked out before installing cables or making any electrical connections.

DANGER: Exercise extreme care when handling unit and battery cabinets to avoid equipment damage or injury to personnel. Cabinets weigh several hundred pounds.

DANGER: Test lift and balance the cabinets before moving. Maintain minimum tilt from vertical at all times. The bottom structure will support the unit only if the forklift forks are completely underneath the unit.

DANGER: Observe all battery safety precautions during installation or service of the unit or batteries. Even with the battery circuit breaker in the off position, the danger of electrocution may still be present. The battery power to the unit must be locked and tagged “off” before performing any service or work on the unit. The battery manufacturer’s safety information and material safety data sheet are located in a pocket attached to the inside of each unit’s left door. Failure to follow those instructions and the instructions listed above and elsewhere in this manual could result in an explosion, fire, equipment failure, or electrocution.

DANGER: All power to the unit must be locked and tagged "off" before performing any service or work on the unit. Failure to do so could result in electrocution.

DANGER: In case of fire involving electrical equipment, only carbon dioxide fire extinguishers, or those approved for use on electrical equipment, should be used. Use of water on fires involving live high voltage electrical circuits could present an electrocution hazard.

DANGER: Extreme caution is required when performing maintenance. Lethal voltages exist within the equipment during operation. Observe all warnings and cautions in this manual. Failure to comply may result in serious injury or death. Obtain qualified service for this equipment as instructed.

DANGER: Be constantly aware that the unit system contains high DC as well as AC voltages. With input power off and the battery disconnected, high voltage at the filter capacitors and power circuits should discharge within 30 seconds. However, power circuit failures can occur, so you should always assume that high voltage might still exist after shutdown. Verify that power is off using AC and DC voltmeters before making contact.

DANGER: Some components within the cabinets are not connected to chassis ground. Any contact between floating circuits and the chassis is a lethal shock hazard.

DANGER: Internal battery strapping must be verified by the customer prior to moving this unit.

This unit contains non-spillable batteries. Keep the unit upright. Do not stack. Do not tip. Always follow the battery manufacturer’s safety information, located in a pocket attached to the inside of the left door of your unit, to prevent an accident that could result in injury or death.

DANGER: Lead-acid batteries contain hazardous materials. Batteries must be handled, transported, and recycled or discarded in accordance with federal, state, and local regulations. Because lead is a toxic substance, lead-acid batteries should be recycled rather than discarded.

Do not dispose of batteries in a fire, as the batteries may explode.

Do not open or mutilate the batteries. Released electrolytes are harmful to the skin and eyes and may be toxic.

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

1. Remove watches, rings, or other metal objects.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not lay tools or metal parts on top of batteries.
5. Disconnect charging source prior to connecting or disconnecting battery terminals.
6. Determine whether battery is inadvertently grounded. If so, remove the source of the ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.
7. Lead-acid batteries can present a risk of fire because they generate hydrogen gas. The following procedures should be followed:

✓ Do not smoke when near batteries.

✓ Do not cause flame or spark in battery area.

8. Discharge static electricity from your body before touching batteries by first touching a grounded surface.

Chapter 3. Hardware Overview

This chapter provides an overview of the system hardware. It includes a description of the system's theory of operation.

3.1 Key Components

Figure 3-1 shows the key system components and Table 3-1 describes them.

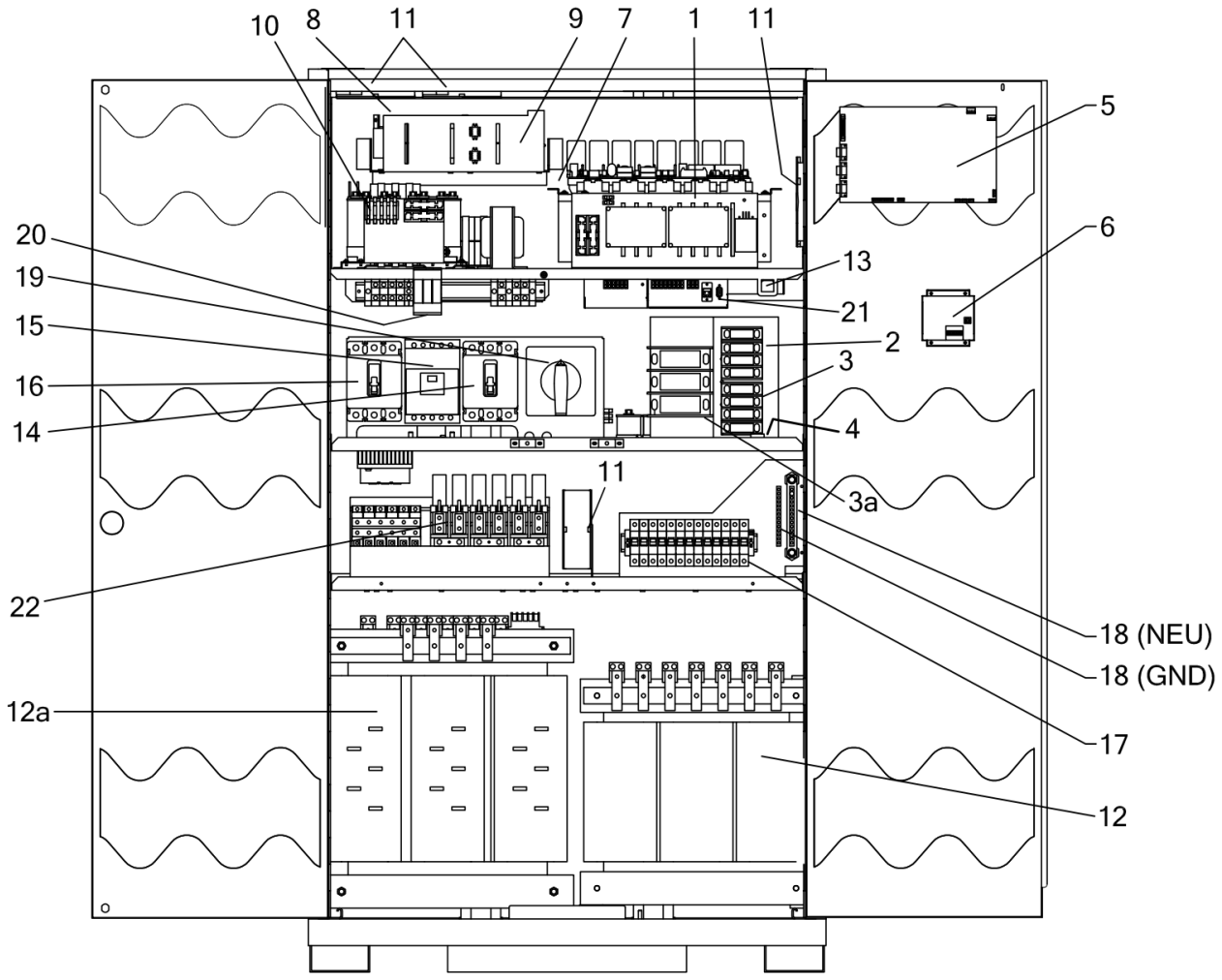


Figure 3-1 Key Components typical location

Table 3-1 Components description

Callout	Component Name		Description
1	Heatsink FRU	Power board (A1)	The power board is bolted onto the Insulated Gate Bipolar Transistor (IGBT) blocks mounted on a heat sink. The complete heat sink assembly with IGBT's and power board is a single Field Replaceable Unit (FRU) that converts all the power: Input AC power converted to DC bus Battery power boosted to DC bus DC bus power converted to output AC power using PWM technology for a smooth AC sine wave If a catastrophic failure occurs, the heat sink assembly can be replaced using only a screwdriver. The power board also has the housekeeping power supplies and drivers for the IGBT's. The entire assembly provides the landing place for all internal input, output, DC cables, and metering devices for controlling and monitoring the unit input and output currents.
2	Input 4-Pole terminal block (TB10)		Customer Input power connection, ØA, B, C and Neu
3	Output 4-Pole terminal block (TB11)		Customer Output power connection, ØA, B, C and Neu
3a	DC Terminal Block, Pos, Neg, Gnd.		DC terminal block for Pos, Neg, Gnd.
4	Ground Lug		2-barrel lug
5	Control board (A2)		The microprocessor with unit specific firmware and control circuitry is located on the Control Board. The Control Board is mounted on the cabinet door and communicates with the Power Board (A2) via a ribbon cable. It monitors the input and output voltages and generates the command to close or open the input contactor and to sense and change the status of the bypass static switch. The Control Board sends data to the LCD panel located on the door where actual status and parameters are displayed. It additionally provides optional AS400, RS232, and RS485 output capabilities and supports various communication including SNMP options.
6	LCD display panel		Provides continuously updated input, output, battery metering and alarm data, and UPS status for customer use on a constantly scrolling set of 2 default screens.
7	Terminal block for removing heatsink assembly, behind heatsink assembly		7-position terminal block (TB4). This terminal block provides quick and easy removal of power assembly.
8	Fan transformer, Control power transformer		Provides 120 VAC to the fans, with taps to match unit output voltages.
9	Control transformer fuse		Control transformer over current protection
10	Fan fuse		Fan overcurrent protection.
11	Fan(s) and under heatsink		Provides system cooling.
12	Output isolation transformer, T1		The output isolation transformer provides isolation between the inverter and critical load. The power to the primary of this transformer is received form the unit and is transformed to required output voltage levels.

Callout	Component Name		Description
12a	Input Transformer, T3		The input transformer adjusts the input voltage for proper rectifier DC voltage, depending on the unit rated power and back-up capacity.
13	Inverter test switch (S2)		Push-button switch for testing the Lighting Inverter and its batteries for proper operation. When the unit is operating, pressing and holding in switch SW-2 transfers the system to battery operation. The system continues to run on batteries until the switch is released. When the switch is released, the system returns to normal operation so long as input power is present.
14	Main Input breaker (CB3)		Provides input overcurrent protection.
15	Battery breaker (CB1)		Provides overcurrent protection for battery bank.
16	Main output breaker (CB2)		Provides output overcurrent protection
17	(Optional) Output Auxiliary Breakers		Normally ON/OFF Output Auxiliary Breakers (Optional)
18	(Optional) Gnd/Neu terminals		Gnd/Neu terminals for optional auxiliary output breakers.
19	Bypass switch		Removes the critical load from the backup power and provides utility input directly to the load in case the unit malfunctions or during system maintenance
20	TVSS (Transient Voltage Surge Suppressor)		This option is a no-fuse, fail-safe surge suppressor featuring a fail-safe self-protected design, visual indicator.
21	(Optional) Interfaces terminal blocks for customer connection (General location)		Options customer connections i.e. form “C” contact terminals, RS232…. each terminal is marked accordingly for proper connection refer to each option for connection details in each cabinet size. See to Figure 8-2 for details
22	Static switch assembly	Bypass static switch (PB2)	The Static Bypass Switch is a fully rated solid-state device capable of switching the critical load between the inverter output and the normal AC bypass line. In the event of a system output overload of 125% or more of the unit full-load current rating, a make-before-break (both directions) transfers power to the bypass source via a static switch.
		Inverter static switch (PB1)	

3.2 Typical Functional Description

Figure 3-2 and Figure 3-3 shows the major blocks within the system and the sections following the figure describe them.

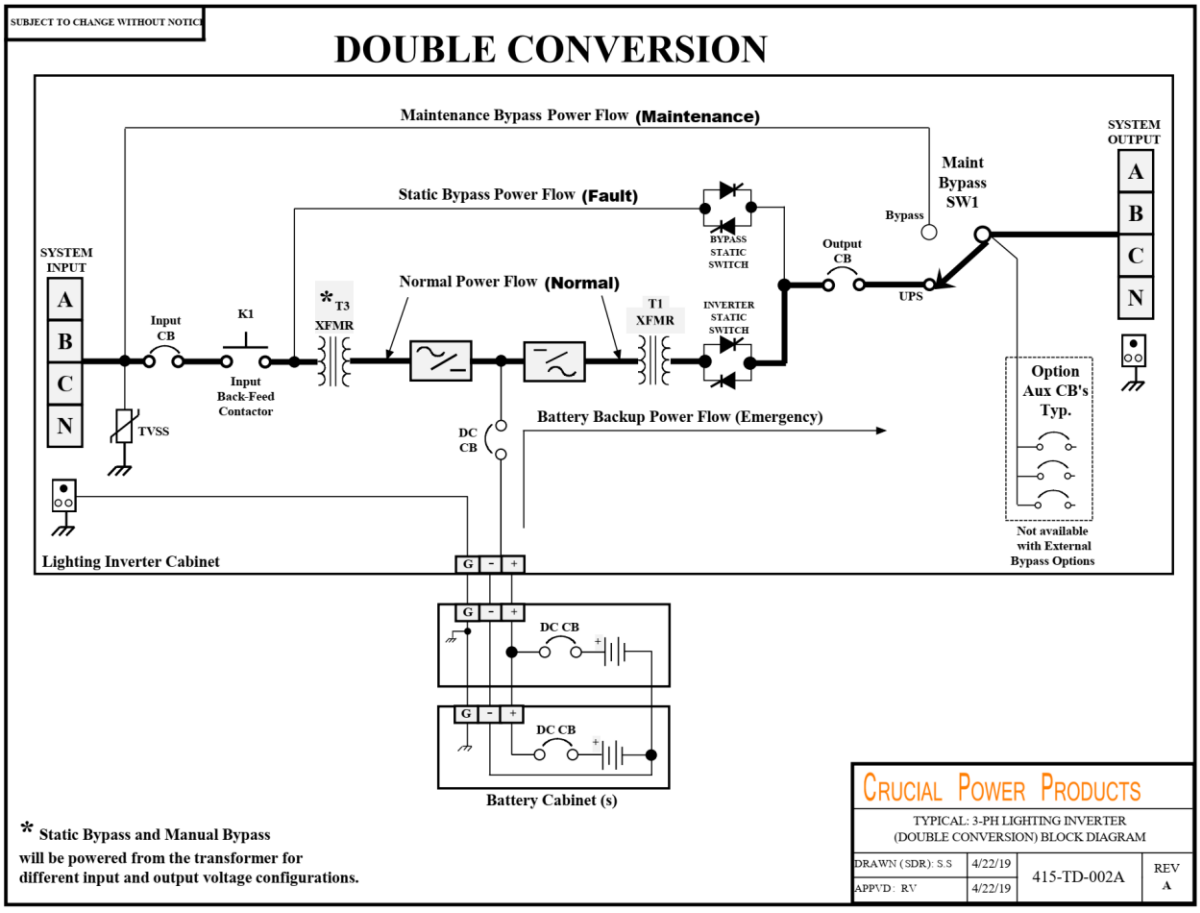


Figure 3-2 System Blocks Diagram

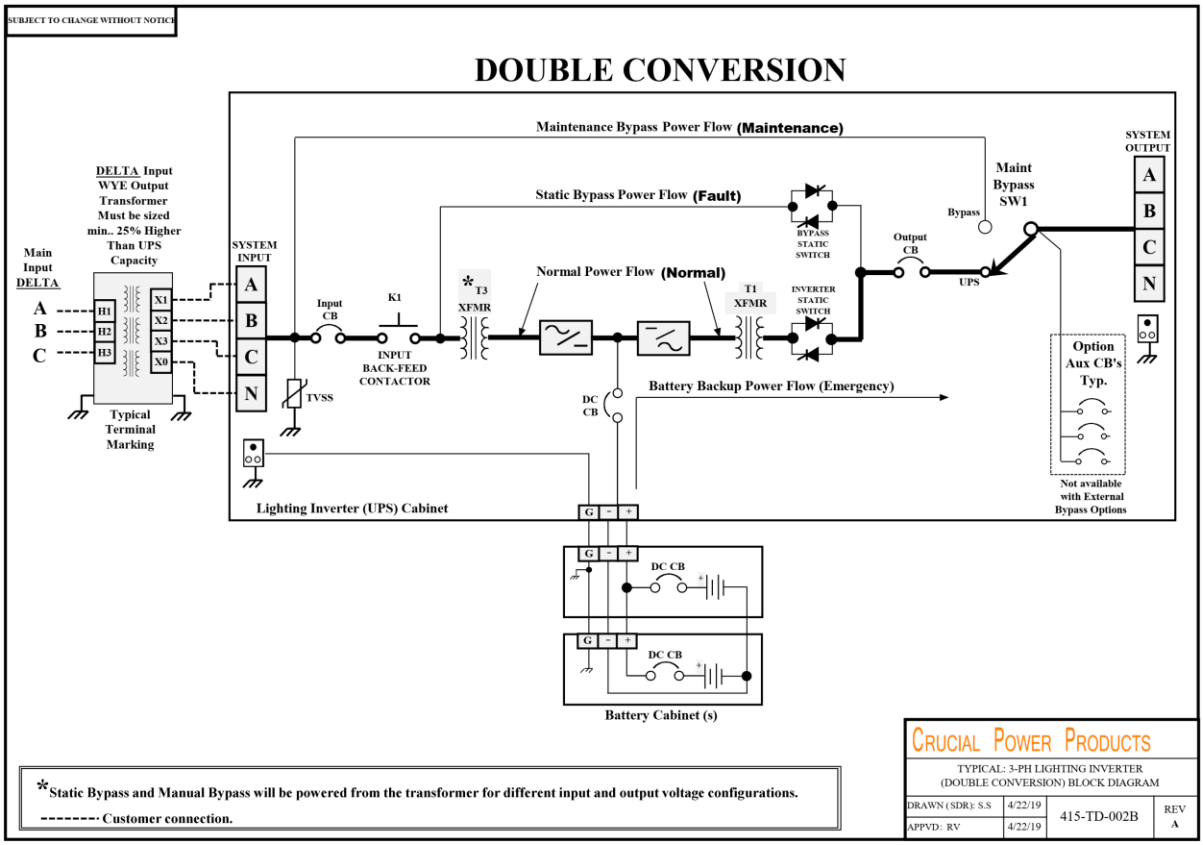


Figure 3-3 System Blocks Diagram (Delta input)

3.2.1 Inverter

The inverter provides continuous power to the load. When the AC input power is not available, the inverter converts the energy stored in the battery bank to AC power to supply the load. The PWM (Pulse Width Modulation) inverter utilizes high frequency, digital signal processing with high efficiency IGBT's for fast accurate measurement and response.

3.2.2 Battery Charger

The constant power battery chargers supply DC power to re-charge and to maintain the charge on the battery bank. The charger is fully automatic with a current tapering feature so that battery damage will be prevented in case of a charger malfunction or increased battery temperature. The charger is sized to maintain a full charge even when the input voltage is at the low line limit for indefinite periods of time, meeting and exceeding the UL 924 requirement.

3.2.3 Battery Bank

The battery bank consists of 16, 24, 26 or 40, 12-volt batteries (depending on the unit's specified capacity). Batteries are housed in an external cabinet providing the reserve energy to sustain the load when suitable AC input power is not present. The battery bank includes a breaker for over current protection and DC disconnect for each cabinet or string to allow the servicing of the battery. The batteries are designed and tested to meet UL 924 requirements.

The standard VRLA (Valve Regulated Lead Acid) batteries are sealed and maintenance-free.

3.2.4 Output Transformer

The Output transformer performs two critical functions. First, it provides excellent common mode and normal mode noise isolation of the load from the input or inverter power. Secondly, it provides voltage transformation and tight regulation of the output voltage while the UPS is operating from its internal inverter, and it can be utilized to provide a different voltage than input (source voltage).

3.2.5 Input Transformer

The input transformer adjusts the input voltage for proper rectifier DC voltage, depending on the unit rated power and back-up capacity.

3.2.6 Input Contactor

The input contactor is multifunctional. First, it provides connections for the input power to the unit. Secondly, the contactor disconnects the input line when an outage occurs so that there is no back feeding of power into the power line. Finally, the contactor allows for automatic unit operation upon a complete discharge of the batteries. No operator intervention is required when power to the unit is restored after a complete battery discharge.

3.2.7 Input Inductors

The input inductors are a three-phase input filter.

3.2.8 Main input circuit breaker

The main input circuit breaker provides UPS with incoming power isolation as well as means of disconnect and input over current protection.

3.2.9 DC Choke

The DC choke helps boost battery voltage to a higher internal DC bus voltage while it reduces high frequency noise.

3.2.10 Output AC Inductor

The Output AC Inductor acts as a filter circuit component to reduce high frequency noise to the output transformer.

3.2.11 Inverter Test Switch

The Inverter Test Switch is a momentary push button for manually testing the UPS and its batteries for proper operation. With the unit in operation, the test switch is pushed and held; the unit will automatically transfer to battery operation manually. The unit will continue to run on batteries until the switch is released. Upon release, the UPS transfers back to utility from the battery and resumes normal operation.

3.2.12 Internal Maintenance Bypass Switch (MBS)

This Maintenance Bypass Switch (MBS) allows the unit to be switched off-line for maintenance or troubleshooting when the inverter malfunctions or periodic Maintenance is required. The MBS transfers the input power directly to critical load without any break or power disruption. Keep the switch on UPS position when the unit is in normal operation. For performing Maintenance or need to transfer the unit to off-line position for any other reason, rotate the switch to BYPASS position without stopping on the middle SBS position.

DANGER: Stopping rotation of the switch between positions will result in removal of the output voltage.

Caution: Do not leave the MBS switch in the SBS position; otherwise, a loss of power to the critical load will occur when the inverter is de-energized.

3.2.13 Efficiency Optimizer Function: (OFF Line Inverter Mode)

When input power is available, the batteries are charged and AC output from the inverter supports the critical load via the inverter static switch. This is normal mode, during which the inverter static switch is closed, and the bypass static switch is opened. The bypass static switch is closed only during inverter faults or manual operation, in which case the critical load is supported by output power from the bypass static switch.

This is normal operation for true-double convention UPS. However, higher efficiency UPS operation can be achieved to reduce electricity costs by operating the unit as an “off-line inverter.” This scenario reverses the normal operating mode. Normally, the bypass static switch is closed as long as the input voltage and input frequency are within ±10% of the normal input voltage range and ±3 Hz of the normal input frequency range, and the inverter static switch is opened. In off-line inverter mode, the inverter static switch is closed only if input power fails or when and out-of-voltage and frequency condition exists.

By eliminating the requirement for an output voltage regulation of ±10% (voltage window range) or ± 15% (selectable) voltage window range:

- ✓ System efficiency increases by 98%.
- ✓ Total power loss is reduced.
- ✓ The output AC voltage in the mode of operation follows proportionally to the input line voltage.

The system supports two off-line inverter modes:

- ✓ A fast transferring version, with a quarter cycle (2.5 milliseconds).
- ✓ A slow transferring version, with 25 cycles (400 milliseconds to 1 second).

Fast transferring time is required when loads are sensitive to voltages such as HID lights and other voltage disturbances that affect their operation. We recommend you use the higher efficiency version if the output voltage regulation is not critical.

3.3 Theory of Operation

The Three Phase Lighting Inverter utilizes on-board microprocessor that continuously monitor, control and display all functions (measurement, alarm, alert, and system status) in real time by utilizing high frequency digital signal processing; a reliable and user-friendly battery backup system.

3.3.1 Standby Mode and Normal Mode

After power is applied to the system, the system enters standby mode and performs a self-test. During this period, the start subroutine checks for input voltage, and proper operation of the inverter and bypass SCRs. After the self-test completes successfully, the system enters normal mode.

3.3.2 Normal mode.

During normal mode:

9. Input contactor K1 receives a closing signal that connects input power to the DC supply transformer.
10. The DC rectifier supplies the battery charger, control board, and the DC/AC inverter circuit.
11. The battery charger is activated, allowing the batteries to be charged continuously.
12. The on-line DC/AC inverter converts the DC voltage to a PWM waveform. This waveform is filtered and reconstructed to a desired AC output.

3.3.3 Response to input Power Abnormal Condition

If the system controller senses a change in input frequency greater than ± 3 Hz or an out-of-range input voltage, it:

- Considers the event as an input malfunction and opens the input contactor immediately, isolating the unit from the facility.
- Turns off the charger and makes the battery bank a DC supply source to the inverter circuit, maintaining an uninterrupted AC supply to the protected load.
- Issues a UNIT PROBLEM /ALARM message on the LCD display panel.

When the facility power returns, stabilizes, and is in phase with the backup power, the system controller closes the input contactor, and the system returns to normal mode. If the battery voltage drops below useable voltage and the facility power remains off, the system will assume a STANDBY mode and will only resume normal operation upon restoration utility power.

The system controller issues a FAILURE/ALERT message on the LCD display panel if any of the following conditions occurs:

- Internal malfunction
- System overheats.
- DC bus Overvoltage/Undervoltage

During a malfunction:

- The system stops its backup operation.
- The inverter SCRs are switched OFF.
- Bypass SCRs are switched ON without interruption to load
- A summary alarm 5V signal is sent to the hardwired interface.
- The system remains in this mode until power is cycled or the system is repaired.

3.3.4 UPS "Problem/Alarm" Message

The system controller issues a UPS ALARM message on the LCD display panel if any of the following conditions occurs:

- Input power abnormality
- Battery bank under voltage
- Charger OFF
- Output overload

When the system is in alarm mode, inverter IGBT's remain on, and an alarm signal may be sent to the signal interface. The system resets itself when the problem no longer exists.

3.3.5 Output Loads

The UPS is designed to power any fluorescent or incandescent, HID lighting. There are, however, certain types of loads that exhibit an excessive inrush current when first turned on or at other times during operation. Please check the load requirements for proper sizing of the system.

Chapter 4. Installation

This chapter describes how to install the system. It includes pre-installation information along with guidelines for storing the system for future use.

4.1 Delivery Space Requirements

Verify that the delivery area, the destination, and the path between them meet the standard delivery clearance and weight requirements of the system.

The delivery area must provide enough space and floor strength to support the packaged equipment cartons for the system. Doorways and hallways must provide enough clearance to move the equipment safely from the delivery area to the destination. Permanent obstructions such as pillars or narrow doorways can cause equipment damage. If necessary, plan for the removal of walls or doors.

Verify that all floors, stairs, and elevators you use when moving the system to its destination can support the weight and size of the equipment. Failure to do so could damage the equipment or your site.

The following figures show the dimensions of the system cabinets as well as key components used for cable access and mounting.

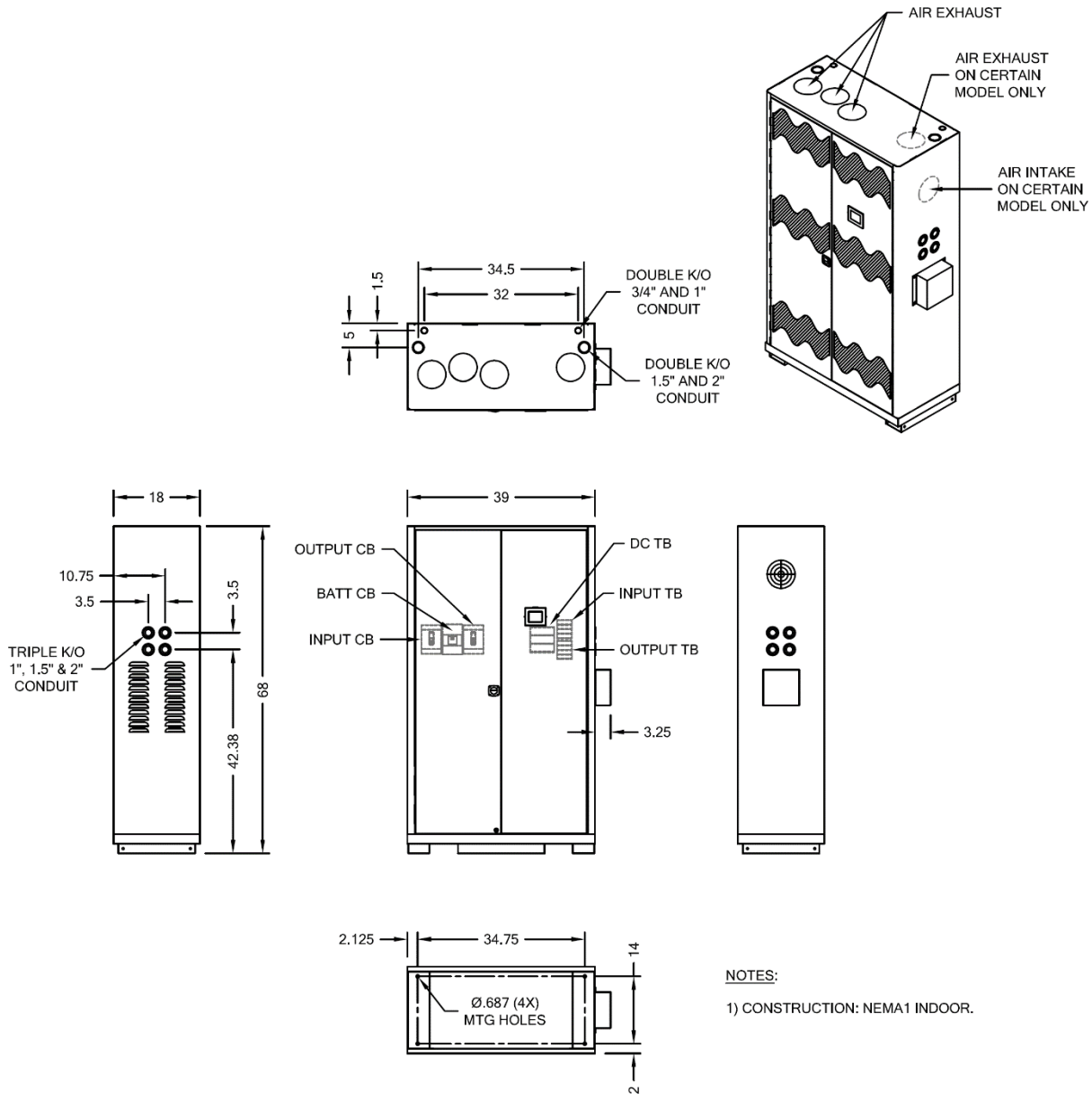


Figure 4-1 UPS Cabinet (8 ~ 50 KW) Access and Mounting (Standard Series)

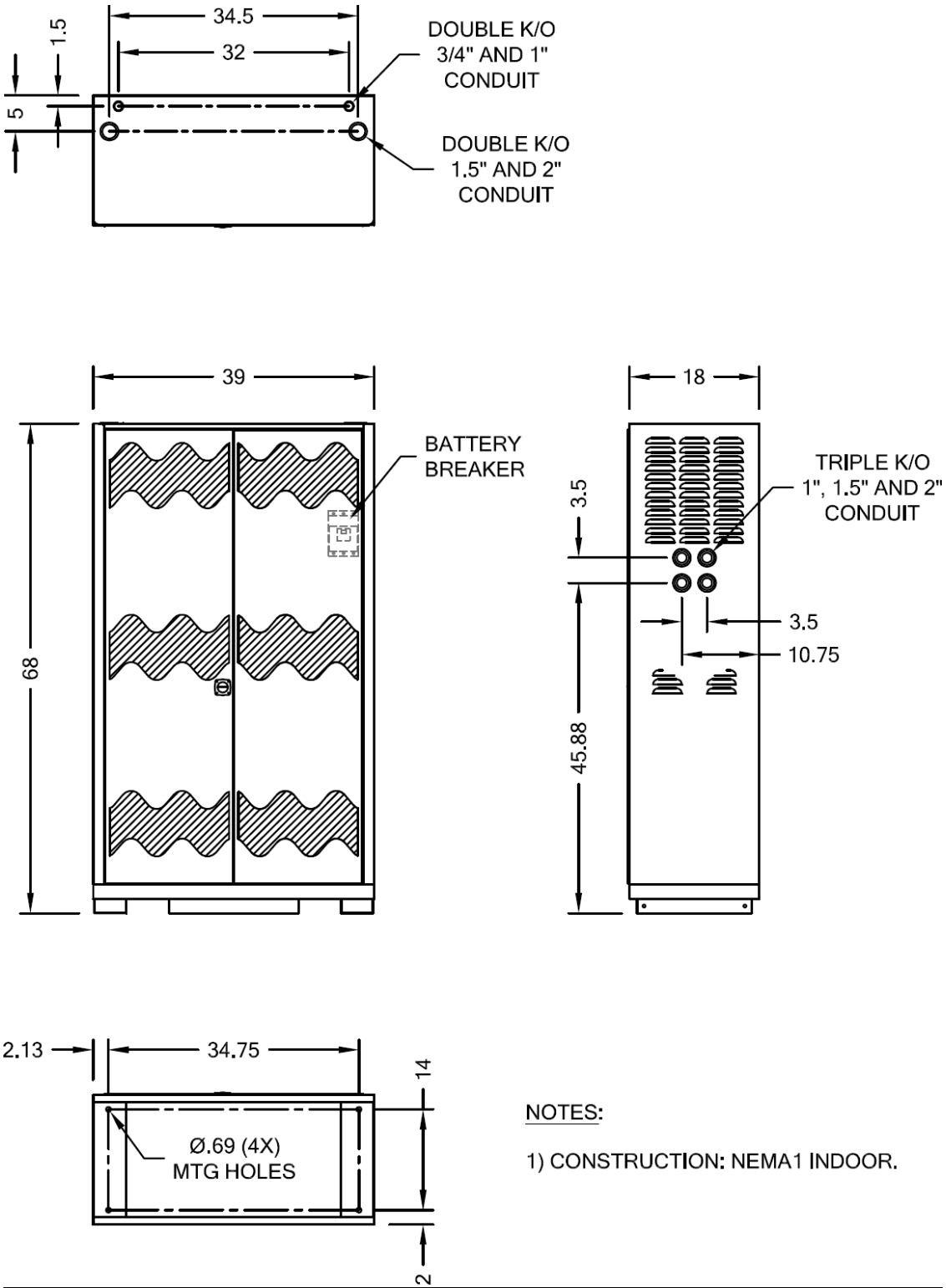


Figure 4-2 Typical Battery Cabinet (8 KW only) Access and Mounting (Standard Series)

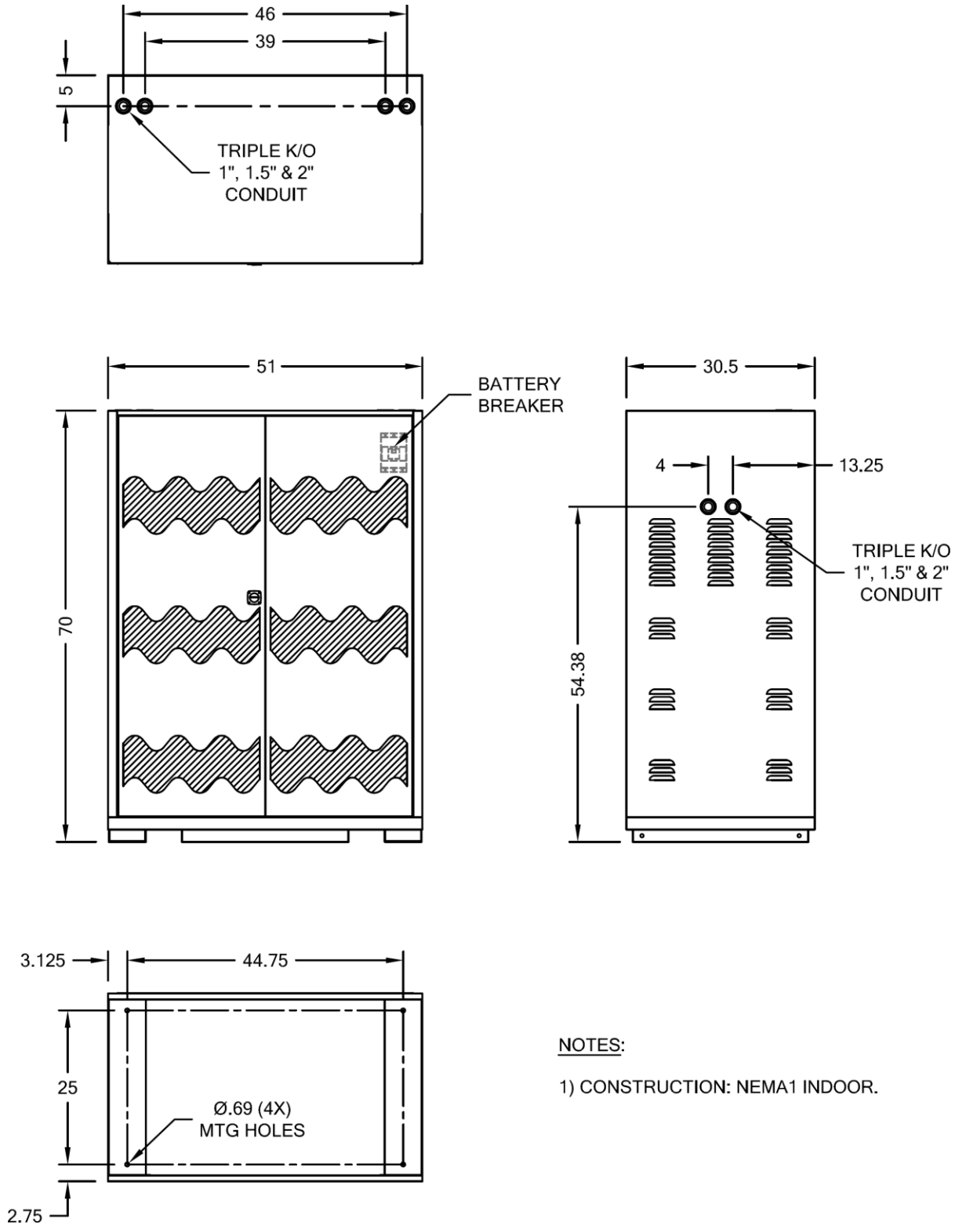


Figure 4-3 Typical Battery Cabinet Access and Mounting (Standard Series)

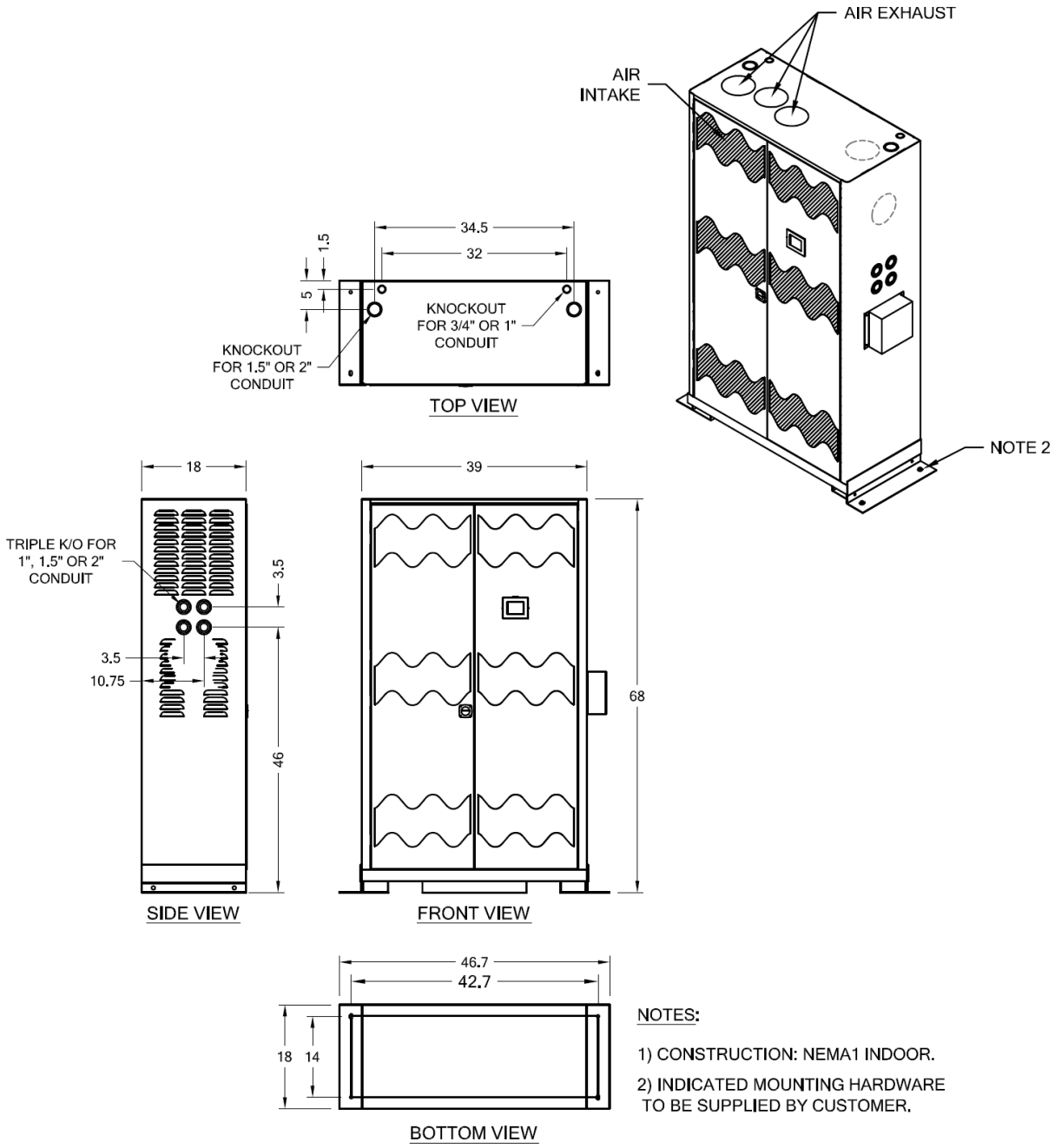


Figure 4-4 .UPS Cabinet (8 ~ 50 KW) Access and Mounting Standard Series (with Optional Zone 4 Seismic Brackets)

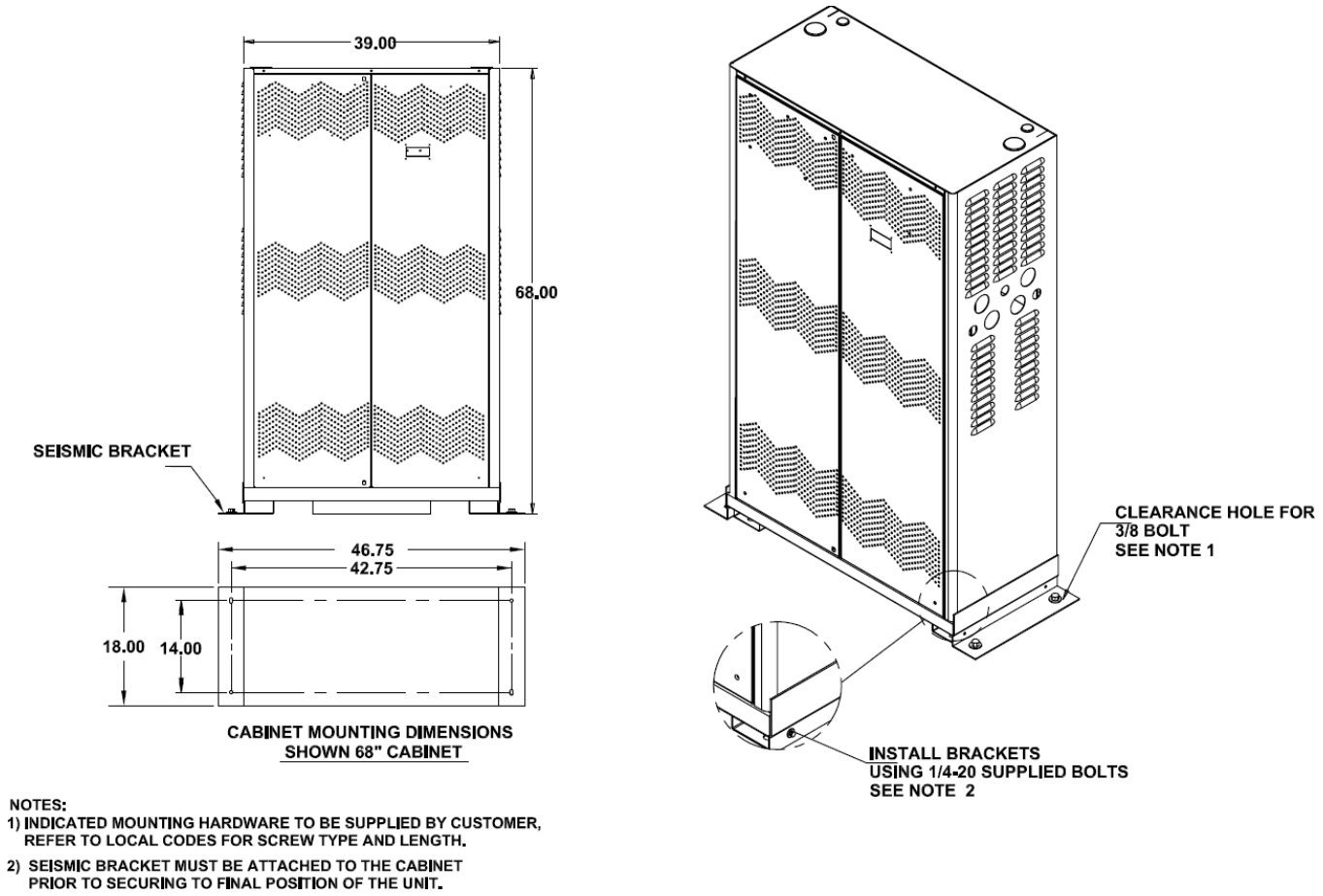


Figure 4-5 Typical Battery Cabinet (8 KW only) Access and Mounting Standard Series (with Optional Zone 4 Seismic Brackets)

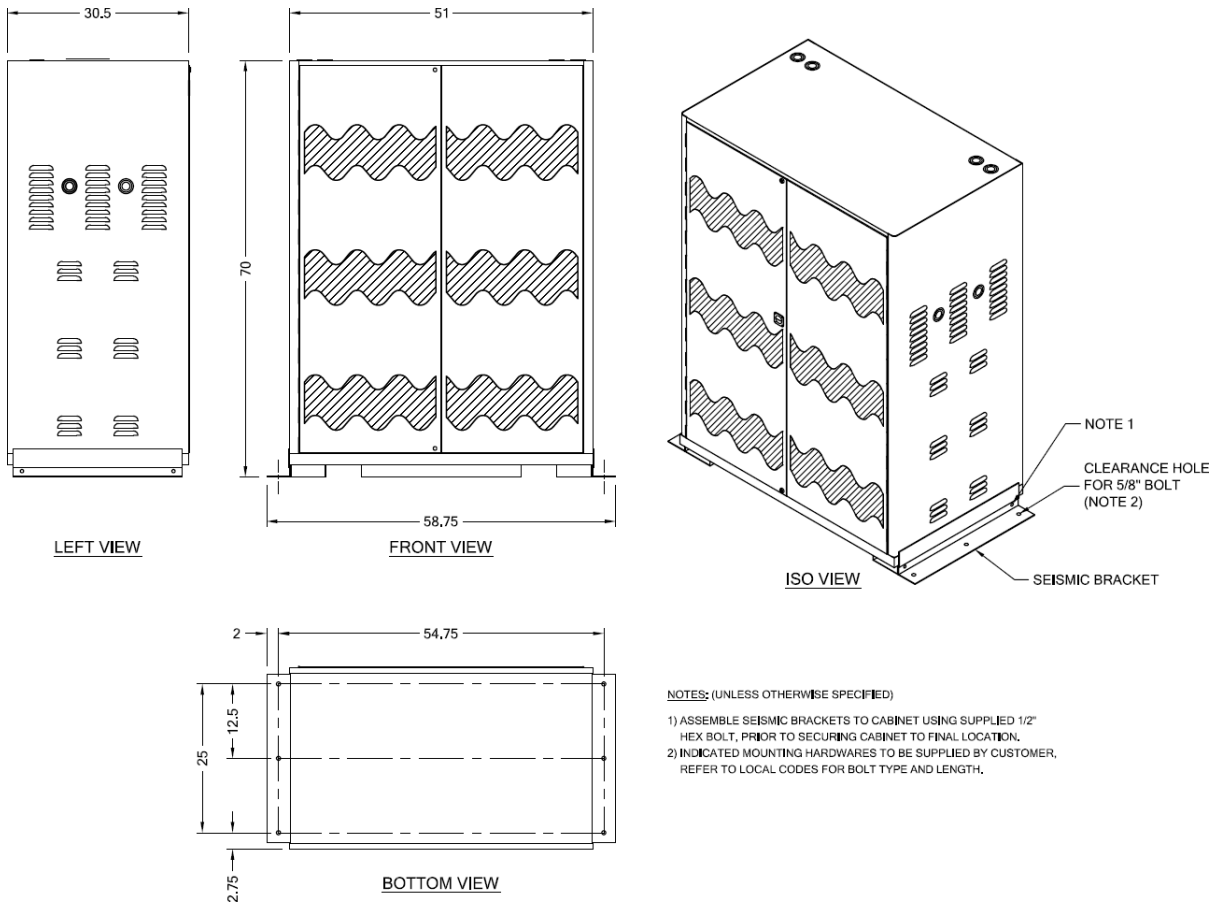


Figure 4-6 Typical Battery Cabinet Access and Mounting Standard Series (with Optional Zone 4 Seismic Brackets)

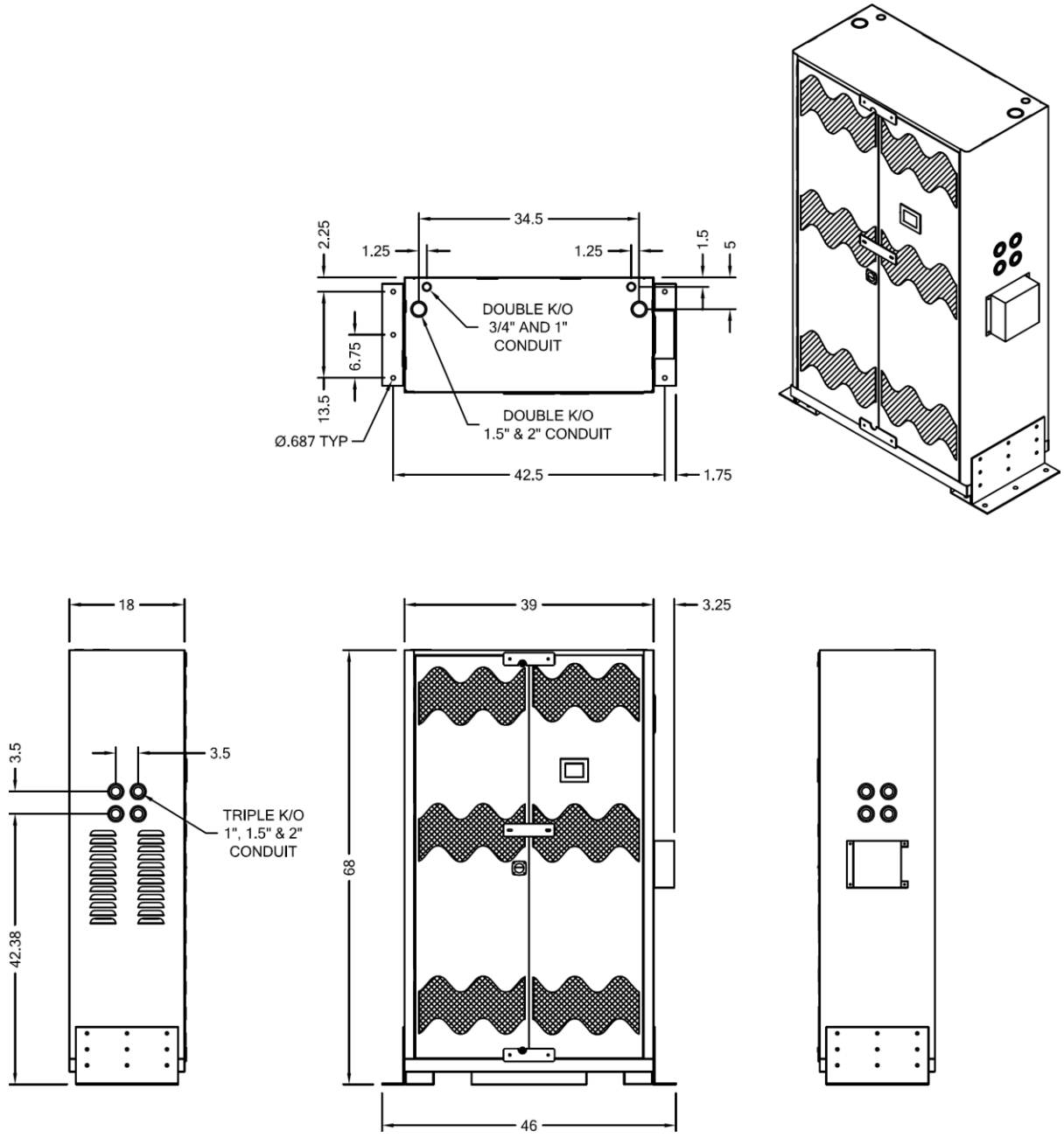


Figure 4-7 UPS Cabinet (8 ~ 50 KW) Access and Mounting (OSHPD-Certified Seismic Series)

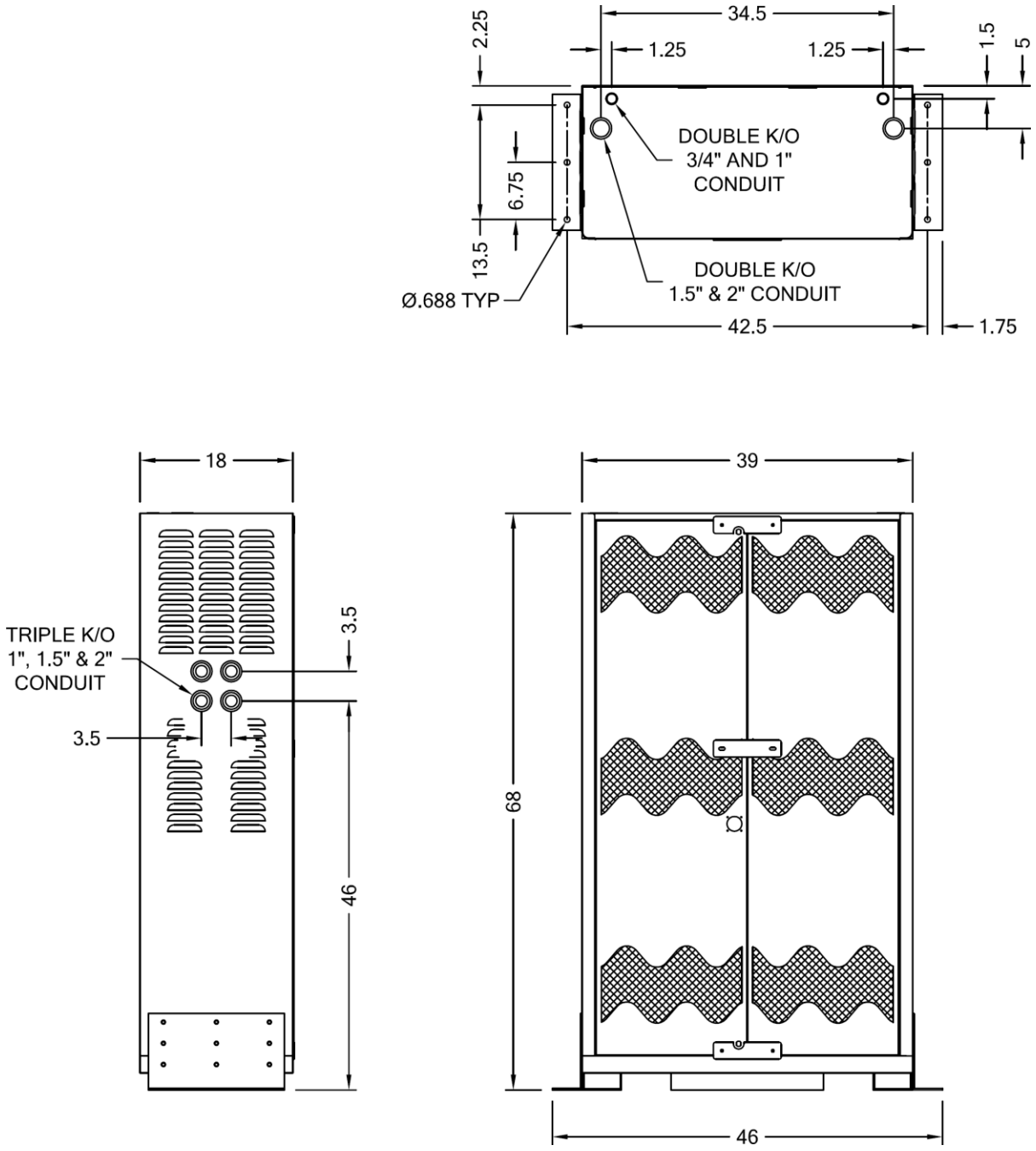


Figure 4-8 Typical Battery Cabinet (8 KW only) Access and Mounting (OSHPD-Certified Seismic Series)

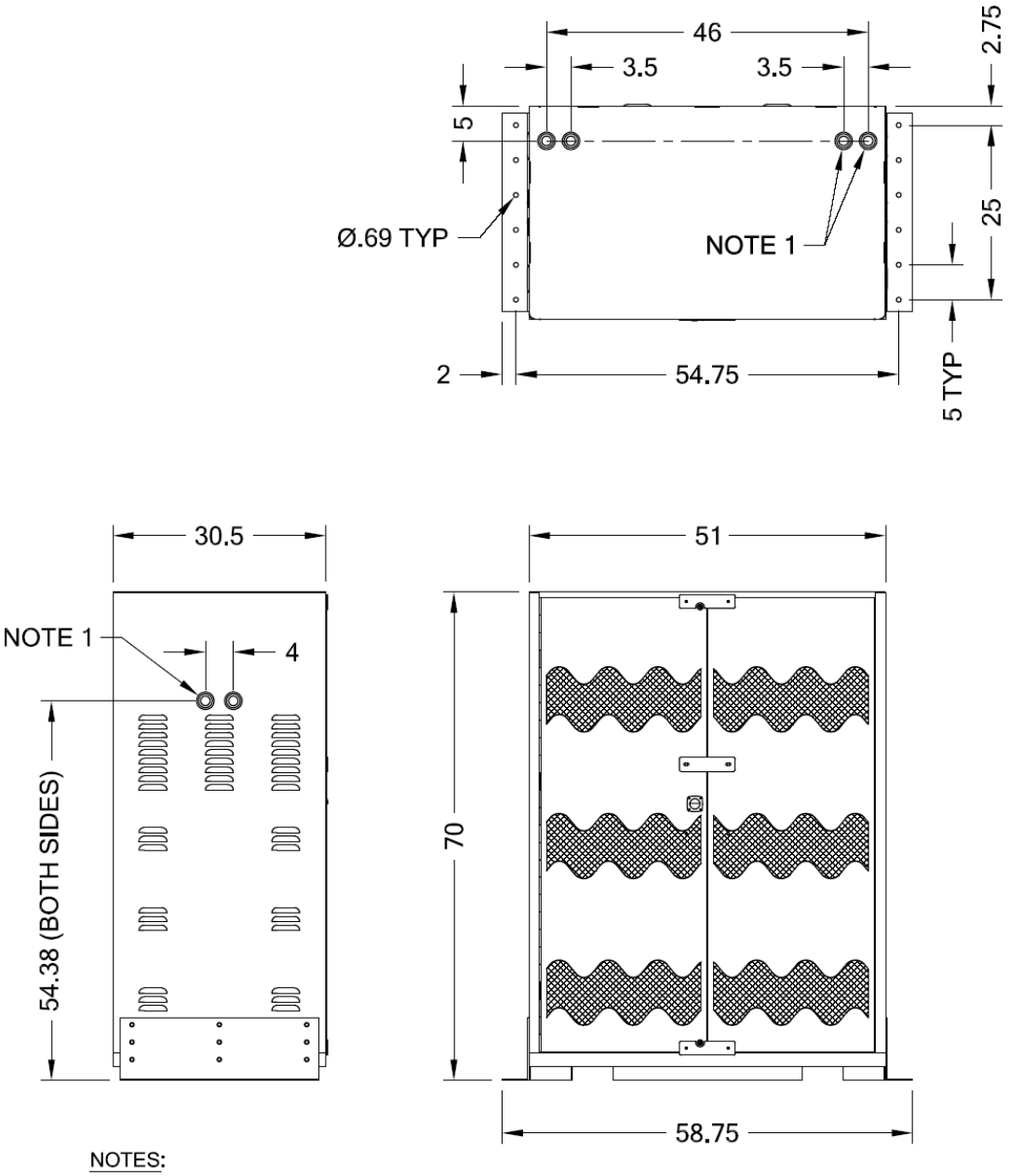


Figure 4-9 Typical Battery Cabinet, Access and Mounting (OSHPD-Certified Seismic Series)

4.2 Site Considerations

Planning the proper location and layout of the system prior to installing it is essential for successful operation. To ensure normal operation and to avoid unnecessary maintenance, plan your site configuration and prepare your site before installation.

The UPS and its associated Battery Cabinet(s) are designed for indoor installation and meet NEMA specifications for operating temperature, humidity, and utility voltage. The system enclosures are rugged and corrosion resistant.

All servicing is performed through the front of the unit; therefore, leave sufficient room in the front of the unit for service access (see Figure 4-10, Figure 4-11) for recommended system layouts.

The following precautions will help you plan an acceptable operating environment for the system:

- ✓ Select a flat location that is clean, with no dust or exposure to direct sunlight or vibrations. The location should provide a sturdy, level surface that can support the system. Avoid locations with inclined floors.
- ✓ The location should not be prone to variations in temperature and humidity or be close to strong magnetic fields or a device that generates electric noise.
- ✓ The Unit should not be placed next to, on top of, or below any device that generates heat or will block the free flow of air through the system's ventilation slots
- ✓ The Lighting Inverter cabinets and its battery cabinets provide cable and conduit openings on the top and sides of the cabinet. Be sure these areas are not blocked and can be easily accessed to expedite installation.
- ✓ Electrical equipment generates heat. Ambient air temperature might not be adequate to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which the system will operate has adequate air circulation. Do not locate the system near machinery which produces metallic dust or powder, or any facility that will produce corrosive substances or vapor.

Caution: Always follow proper ESD-prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

Caution: For sites with **Generator** and **Automatic Transfer Switch** (ATS) in conjunction with the unit, make sure the ATS has an open transition with a minimum 20 milli-seconds transfer time (gap) in **both directions**

Caution: In non-controlled environment the air intake must be filtered to ensure that NO MOISTURE is introduced to the electronics, failure to ensure that the air intake is properly filtered will void the warrantee.

4.2.1 Recommended Facility Protective Device Ratings, BTU/HR, & Floor Loading.

Table -4-1

Unit Rating	Input Volt. 3-Phase	Output Volt. 3-Phase	Unit Input Circuit Breaker (AMPS)	See Note 1: Recommended Input Over Current Protection (AMP)	Unit Output Circuit Breaker (AMPS)	Recommended Output Current Protection	Batt Volt	Max. Batt. Disch AMP	See Note 2: Typical Full Load BTU/HR	Electronic Cabinet Weight Only	Floor Loading LB/SQFT Electronic Cab	No. of Battery Cabinets	Each Battery Cabinet Weight	Floor Loading LB/SQFT Per Batt Cab
10kVA/8KW	208Y/120	208Y/120	40	**Recommended Facility Input Circuit Breaker Should Be Equal to or Larger Than the Unit Input Circuit Breaker Ampacity (See Note 1)**	35	**Recommended Facility Output Circuit Breaker Should Not Be Larger Than the Unit Output Circuit Breaker Ampacity**	192	56	3032	1083	222	1	1752	359
	480/Y277	480Y/277	20		20		192	56	3032	1083	222	1	1752	359
	480Y/277	208Y/120	20		35		192	56	3032	1083	222	1	1752	359
15KVA/12KW	208Y/120	208Y/120	60		50		192	84	4549	1446	297	1	2380	220
	480Y/277	480Y/277	30		20		192	84	4549	1446	297	1	2380	220
	480Y/277	208Y/120	30		50		192	84	4549	1446	297	1	2380	220
20KVA/16KW	208Y/120	208Y/120	80		70		192	112	6066	1679	344	1	3552	329
	480Y/277	480Y277	40		30		192	112	6066	1679	344	1	3552	329
	480Y/277	208Y/120	40		70		192	112	6066	1679	344	1	3552	329
25KVA/20KW	208Y/120	208Y/120	100		90		288	93	7582	1679	344	1	4224	391
	480Y/277	480Y/277	50		40		288	93	7582	1679	344	1	4224	391
	480Y/277	208Y/120	50		90		288	93	7582	1679	344	1	4224	391
30KVA/24KW	208Y/120	208Y/120	125		100		288	111	9098	1719	353	1	4224	391
	480Y/277	480Y/277	50		50		288	111	9098	1719	353	1	4224	391
	480Y/277	208Y/120	50		100		288	111	9098	1719	353	1	4224	391
40KVA/32KW	208Y/120	208Y/120	150		150		312	137	12131	2066	424	2	4074	377
	480Y/277	480/277	70		60		312	137	12131	2066	424	2	4074	377
	480Y/277	208Y/120	70		150		312	137	12131	2066	424	2	4074	377
50KVA/40KW	208Y/120	208Y/120	175		175		480	111	15164	2463	505	2	4074	377
	480Y/277	480Y/277	80		80		480	111	15164	2463	505	2	4074	377
	480Y/277	208Y/120	80		175		480	111	15164	2463	505	2	4074	377
62.5KVA/50KW	208Y/120	208Y/120	225		175		480	139	18000	2565	526	2	3752	347
	480Y/277	480Y/277	100		80		480	139	18000	2565	526	2	3752	347
	480Y/277	208Y/120	100		175		480	139	18000	2565	526	2	3752	347

Notes:

1. The external input circuit breaker protecting the unit must be a delayed trip type. this is due to magnetic inrush current drawn during application of AC power.
2. For fast transfer the values for typical BTU/HR will be 25-30% less.

4.2.2 Operating Environment

The location you choose for the installation should confirm to the following conditions.

Table 4-2 Inverter Environmental Specifications

Inverter Environment	Description
Ambient temperature:	0° to 40°C (0 to 104°F)
Relative humidity:	0% to 95% (non-condensing)
Operating altitude:	1,829 meters (6,000 feet) derate 10% for each additional 305 meters (1,000 feet) up to 2,744 meters (9,000 feet)

Table 4-3 Battery Environmental Specifications

Battery Cabinet Environment	Description
Ambient temperature:	22° to 25°C (72° to 77 °F)
Relative humidity:	0% to 95% (non-condensing)
Operating altitude:	1,829 meters (6,000 feet) derate 10% for each additional 305 meters (1,000 feet) up to 2,744 meters (9,000 feet)

Caution: Operating batteries outside of the specifications shown above will shorten battery life significantly.

4.2.3 Floor Load Ratings

The floor space at the installation site must be strong enough to support the combined weight of the Lighting Inverter unit and all battery cabinets. To ensure adequate load-bearing capacity, plan for the maximum configuration.

4.3 Delivery and Handling

4.3.1 Inspecting the Shipment

The equipment included in your shipment consists of one Lighting Inverter cabinet. Batteries will typically ship separately unless specified otherwise. The contents are covered with protective wrapping and packaged in heavy-duty cardboard. Each item is labeled with a component name for easy identification.

When the equipment arrives, count the number of items delivered to ensure that you have the complete shipment. Inspect all protective wrapping or crates and any boxes for signs of rough handling or damage, such as punctures and crushed sides, preferably without moving the equipment.

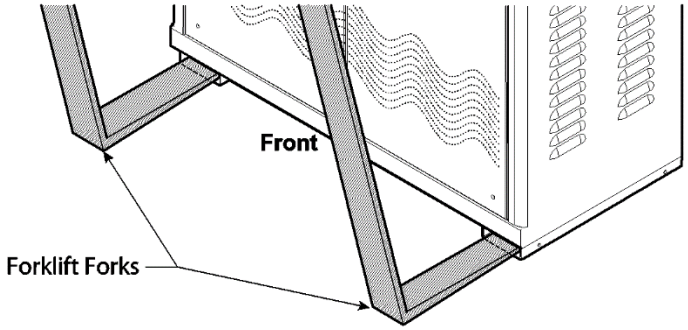
If the shipping container or equipment itself shows evidence of damage, record the damage on the receiving document before signing for receipt of the equipment. Damage claims should be filed directly with the carrier.

Thoroughly inspect each battery for any signs of damage. If there is any damage, reject the shipment and notify the manufacturer by email service@800pwrsrvc.com. If possible, photograph the damage for future reference. As you unpack the pallet or container, check each battery box for damage on all sides, the top and bottom. If there is any sign of damage, photograph the damage if possible, and email service@800pwrsrvc.com.

Offloading the System

Because the system is designed for pad mounting, it is not accompanied by casters. At the user's discretion, a forklift can be used to off load the unit from the shipping pallet. Always be sure that the load capacity of the forklift is sufficient to support the weight of the unit and its battery cabinets.

DANGER: Exercise extreme care when handling the cabinets to avoid equipment damage or injury to personnel. Each cabinet weighs several hundred pounds. Test lift and balance the cabinets before moving. Maintain minimum tilt from vertical at all times. The bottom structure will support the unit only if the forklift forks are completely underneath the unit.



4.3.2 Climatization

Units that are shipped or stored at extreme temperatures require time to adjust to operating temperatures before startup. If the unit arrives in hot or cold weather, do not unpack it until it has been allowed to reach room temperature (one to two hours).

Immediately exposing the unit to warm temperature can cause condensation to occur, which could damage the electronics. If you notice any condensation, allow the unit to stand unattended for one to two hours, and then unpack it.

4.3.3 Unpacking the Equipment

After checking the cartons for signs of damage, perform the following steps to unpack the equipment:

1. Open all cartons.
2. Compare the items received to the packing list. If an item is missing or damaged, contact your place of purchase.
3. Remove all packing materials, envelopes, and boxes from the cartons. Please keep all packing materials and cartons in case you need to transport or ship the unit.

In addition to the contents supplied with the unit, the user must supply a forklift to perform the installation.

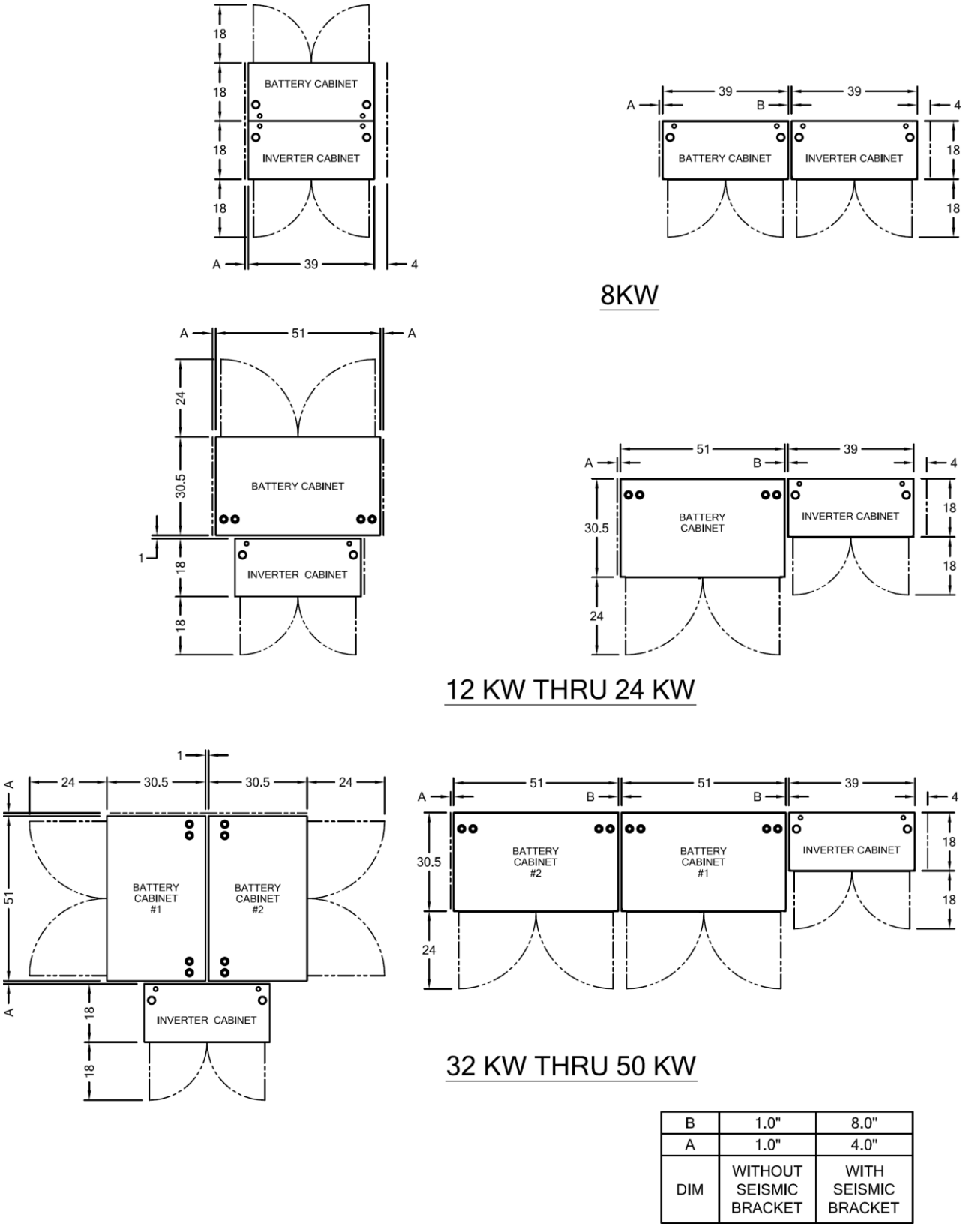
4.3.4 Cabling and Mounting

The top and sides of the unit have conduit openings for running cables.

Before placing the unit onto the mounting bolts where it will be installed, remove the predrilled conduit knockouts on the top and sides of the cabinet (see Figure 4-1 through Figure 4-9).

NOTE: The predrilled conduit knockouts are positioned to prevent airflow disruptions that could cause the unit to overheat. If site restrictions prevent routing the conduit to the locations of the conduit knockouts, do not drill holes in the cabinet without first consulting the factory by emailing service@800pwrsrvc.com our engineers will assist you in locating the conduit to maintain unit reliability.

1. Determine which knockouts will be used to route cables into and out of the unit. Remove only the conduit knockouts that are to be used.
2. Measure the locations for the conduits on the conduit knockouts. (Figure 4-10 through Figure 4-11 for recommended system layouts)
3. Punch holes in the conduit knockouts.
4. Anchor the cabinet to the mounting pad at the mounting locations
5. Anchor the conduits to the conduit knockouts.

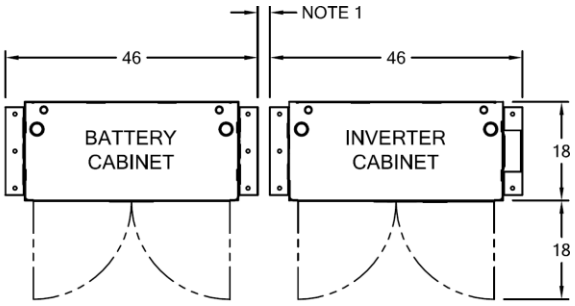


B	1.0"	8.0"
A	1.0"	4.0"
DIM	WITHOUT SEISMIC BRACKET	WITH SEISMIC BRACKET

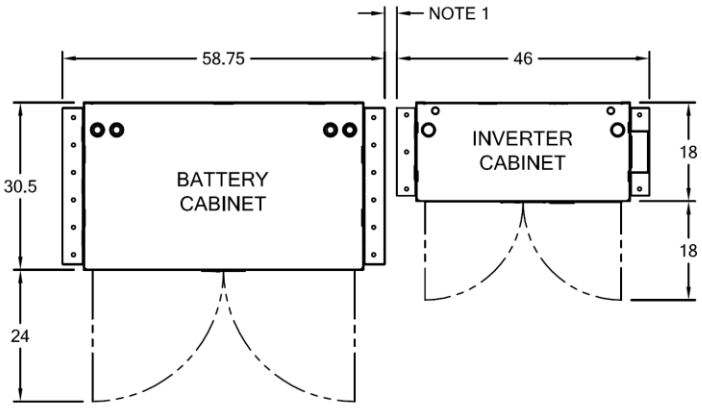
Figure 4-10 Typical system layout (with or without zone 4 seismic bracket)

NOTES:

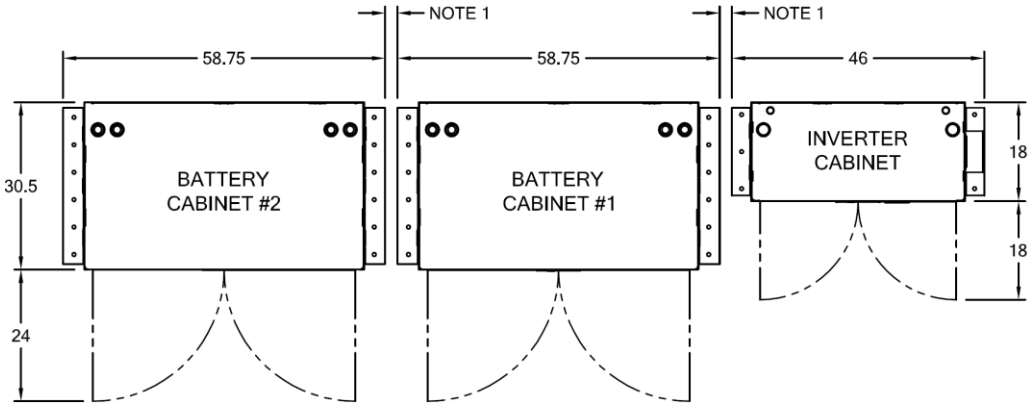
1) SPACING IS OPTIONAL
NOT REQUIRED BY MFG.



8 KW



12 KW THRU 24 KW



32 KW THRU 50 KW

Figure 4-11 Typical system layout (Seismic OSHPD Series)

4.3.5 Electrical Connections

The following sections describe how to perform the electrical connections. In these sections, “TB” refers to terminal block. Before making electrical connections, observe the following:

DANGER: Verify that all customer-supplied wiring is de-energized before performing any electrical work. Failure to do so could result in electrocution, injury, or damage to equipment**.**

DANGER: Even when the unit is off, there are potentially dangerous voltages within the power wave unit due to the batteries. Exercise extreme care when working within the power wave enclosure to avoid the possibility of electrocution, injury or damage to the equipment.

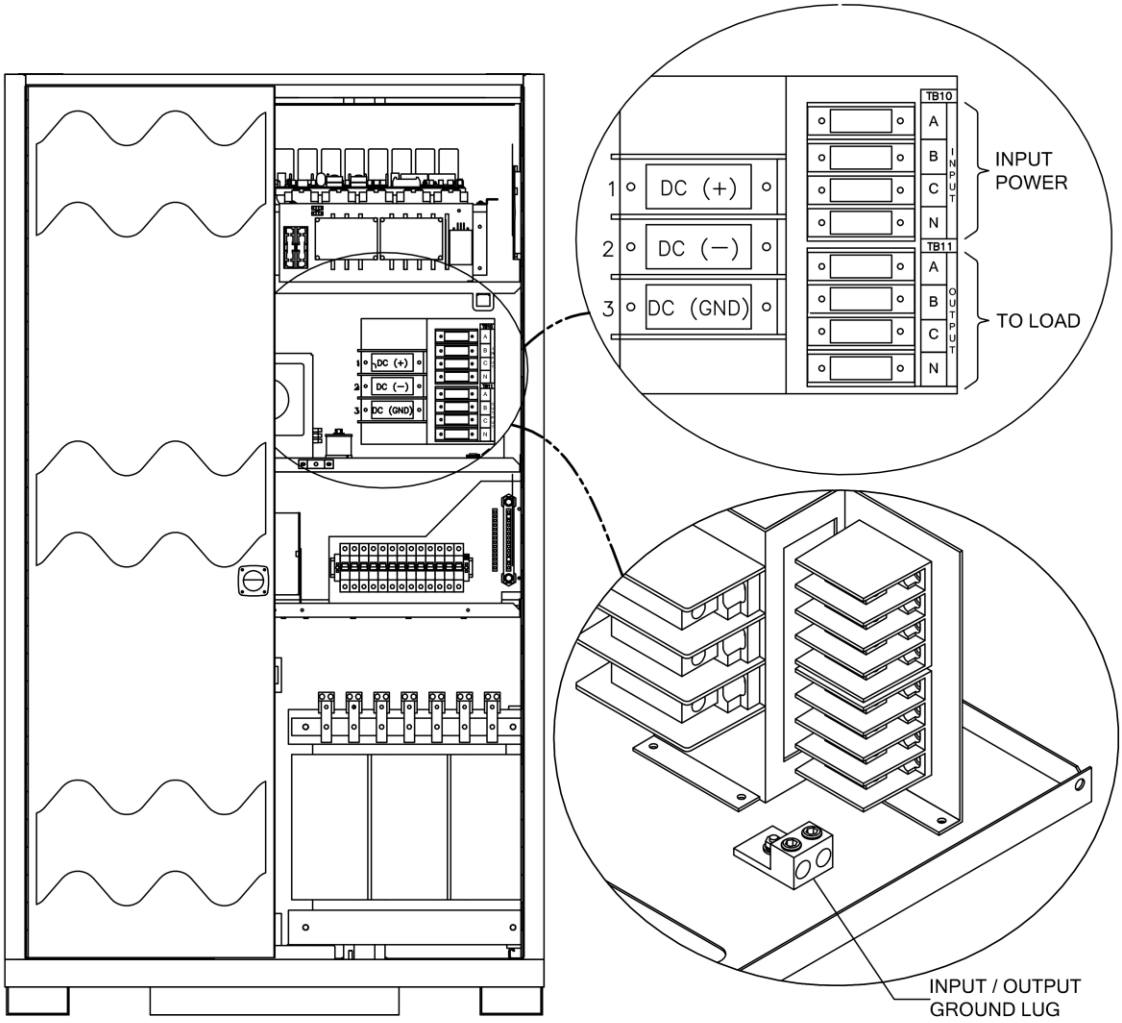


Figure 4-12 Customer Connections to the Input / Output / Battery (DC) Terminal Block and Ground (Typical)

Caution: Voltages on input terminal block TB10 must have correct Phase Rotation and proper voltage (Clockwise ØA, ØB, ØC).

4.3.6 Output Load Connections

1. If no Aux. output CBs are used, connect the critical load to one output terminal Block.
2. Connect the main load to TB11 (Output Terminal Block) as shown on Figure 4-12.

Caution: If any Auxiliary output Breaker(s) are used when there is Main Input Breaker in the unit, Critical load should be connected directly to Auxiliary Breaker(s) not the Output terminal block (TB11).

4.3.7 Battery Connections

There are various battery configurations based on battery run time and battery bus voltages. For reference purposes, see Chapter 8 for information about specific battery connections, refer to the battery connection diagram for each sales order.

Caution: Ensure that the DWG NO of the system matches the DWG NO on the nameplate. See Figure 4-13 Sample Nameplate**.**

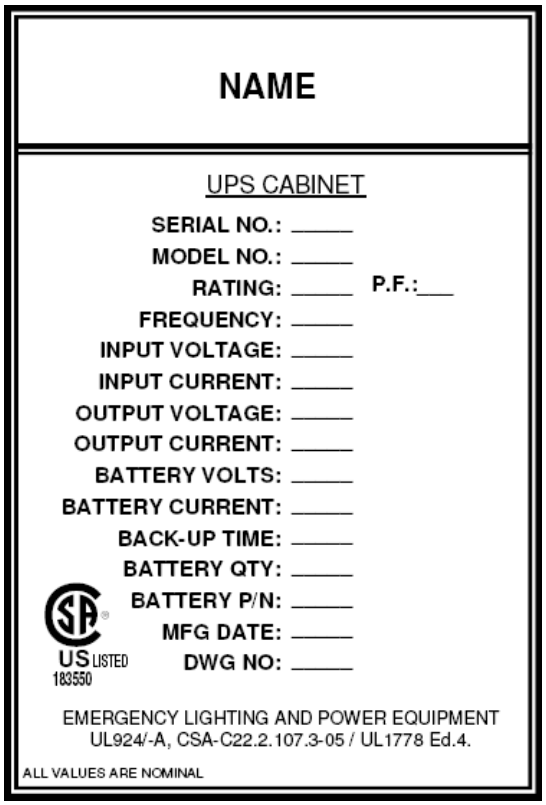


Figure 4-13 Sample Nameplate

4.3.8 The Optional Remote Signaling Connections

4.3.8.1 Form “C” N/O Contacts for Alarms

Refer to 8.13 on page 88 for connection details.

4.3.8.2 Dry Contact, N/O or N/C Contact with Isolated Common

Refer to 8.14 on page 88 for connection details.

4.4 Storing the System

If you will not be using the system as soon as you receive it, keep it in its original packing material and store it in an indoor environment that meets the following conditions.

Table 4-4

Specification	Description
Ambient temperature:	-20° to 70°C (-4° to 158°F)
Relative humidity:	0% to 95% (non-condensing)

NOTE: After unpacking and before turn-on:

Use plastic cover provided in the pouch on the front door to cover the unit during installation and while waiting for turn on, to prevent dust, construction debris and any other foreign object entering the unit.

Accumulation of dust and debris on all electronics will cause damage which will not be covered by warranty.

4.4.1 Recharging Batteries During Storage

If the unit will be stored for three months or longer, visually inspect, and charge the batteries for 24 hours at regular, three-month intervals, refer to the battery label for battery voltage and use appropriate charger.

Chapter 5. Operation

This chapter describes how to operate the unit.

5.1 Starting the Unit

5.1.1 Pre-start up

The unit's batteries are shipped directly from manufacturer to ensure brand new batteries and allow an opportunity for the installing contractor to schedule their arrival when they are ready to commission the system. The battery cabinet and the interconnect cables are shipped with the electronics section of the inverter in a cardboard box located inside each battery cabinet.

Please be sure not to start up the unit without the assistance of a factory trained, authorized personnel as failure to do so may damage the unit and void the unit warrantee.

To request a start-up: Either complete the form on line (6002-1545) and email it to service@800pwrsrvc.com or fax a printed copy to Power Services at (323) 721-3929.

Caution: Ensure the unit is clean and free of dust and debris.

5.1.2 Preparation of Battery Cabinet(s)

a. Ensure proper number of batteries are delivered with your order. Verify quantity against battery drawing located in the inner door pouch.

b. Place battery ID (Number) labels on each battery, refer to Battery Installation and Connection Instruction: Document No. 6005-329.

c. Ensure batteries are charged within a 3 month period, after the initial receipt, follow the Service Log sheet (6002-2017) for battery maintenance scheduling to protect the warranty.

d. Ensure that battery cables are properly torqued to the battery terminals. See battery drawing for torque values, found within the unit's door panel.

e. Verify that the batteries are in a temperature-controlled environment.

5.1.3 Preparation of Electronic Cabinet

Caution: Ensure there is proper ventilation and temperature control to ensure NO MOISTURE is introduced to the electronics which will void the warrantee.

a. Ensure facility load is within full load rating of the electronics. Full load power rating of the unit can be found on name plate within the inner cabinet door.

b. Load imbalance must Not Be Greater Than 25%.

c. Ensure incoming power has correct phase rotation and proper voltage (Clockwise A, B, C).

d. Make sure all input power, output power and DC terminal blocks are properly torqued.

Caution: All loads must be verified for short circuit test before connecting to the output of the unit.

Note: The pre start-up procedure described in this manual is a reference only to a start-up of the UPS for maintenance and shutdown.

5.2 Turning Off the Unit

There may be times when you need to turn off the unit, such as for planned maintenance.

To turn off the unit, perform this procedure in the following order:

1. Turn off the output breakers.
2. Turn off the battery breaker.
3. Turn off the input breaker.

5.3 Start-up procedure after shut-down or maintenance (Post Initial Start-Up)

Use the following procedure to start the unit after a planned maintenance shutdown or after a power outage. (Follow instruction on the label placed on the Maintenance Bypass Switch if the unit is in Maintenance Bypass Mode).

1. Apply input power.
2. With input power available, turn on the main input circuit breaker.
3. Wait until you hear the input contactor closing and fan running.
4. After the LCD display is lit and shows the following:

5. Close the battery circuit breaker.
6. Verify that all parameters on the LCD display panel matches the Nameplate.

7. Close the output circuit breaker.
8. Turn on the auxiliary output circuit breakers.

Chapter 6. Maintenance

This chapter describes how to maintain the system.

6.1 Safety Precautions

Observe the following safety precautions when performing maintenance on the unit.

DANGER: Read and understand this section thoroughly before performing any maintenance work on or around the UPS. Read the battery manufacturer's manual and material safety data sheets before working on or near the batteries. Only normal safety precautions are required when the UPS is operating with all cabinet doors closed. However, the UPS cabinets or Battery cabinets (if applies) must be kept free of standing puddles of water, excess moisture, or debris. Debris can consist of excessive dust in and around the unit, as the cooling fans in the UPS will pull this dust into the unit.

DANGER: Only factory trained, or authorized personnel should attempt to install or repair the UPS or its battery system. Improper installation has proven to be the single most significant cause of start-up problems. Service personnel should wear insulating shoes for isolation from direct contact with the floor (earth ground) and should make use of rubber mats when performing maintenance on any portion of the unit while it is under power. High AC and DC electrical voltages are present throughout the unit(s) and incorrect installation or servicing could result in electrocution, fire, explosion, or equipment failure.

DANGER: Special safety precautions and lockout tagout procedures are required for all operations involving the handling, installation, or maintenance of the UPS system and any associated batteries or battery cabinets (if applies). Failure to follow safety procedures could result in death, injury or damage to equipment.

DANGER: This equipment contains circuits that are energized with high voltages. Only test equipment designed for troubleshooting high voltages should be used, particularly for oscilloscopes and probes. Always check with an AC and DC voltmeter to ensure safety before initiating contact or using tools. Even when the power is off, dangerously high potential voltages may exist at capacitor banks. Always observe battery precautions when operating near any batteries. Failure to observe these precautions could result in death or in injury or damage to equipment.

DANGER: Observe all battery safety precautions during installation or service of the Electronics or batteries. Even with the battery circuit breaker in the off position, the danger of electrocution may still be present. The battery power to the unit must be locked and tagged "off" before performing any service or work on the unit. The battery manufacturer's safety information and material safety data sheet are located in a pocket attached to the inside of left door of each UPS. Failure to follow those instructions and the instruction listed above and elsewhere in this manual could result in an explosion, fire, equipment failure, or electrocution.

DANGER: Be constantly aware that the system contains high DC as well as AC voltages. With input power, off and the battery disconnected, high voltage at the filter capacitors and power circuits should discharge within 30 seconds. However, power circuit failures can occur, so you should always assume that high voltage might still exist after shutdown. Verify that power is off using AC and DC voltmeters before making contact.

6.2 Preventative Maintenance

UPS operator maintenance consists of the basic tasks in this section. Other maintenance functions require factory Certified Service personnel.

6.2.1 Maintaining an Operator's Log

Careful record-keeping ensures proper maintenance of the unit and assists in the correction of any abnormal conditions.

The Service Log Sheet should contain the following information (you can download the document at www.800pwrsrvc.com):

- ✓ Date of system start-up
- ✓ Dates that battery maintenance was performed
- ✓ Dates that input, output, and battery status readings were checked, and the values displayed for these readings
- ✓ Dates and summaries of all communications with Service personnel
- ✓ A copy of Service Log Sheet is provided with each unit, the form 6002-2017 can also be requested by calling customer service support or down loaded at www.800pwrsrvc.com):.
- ✓ Use battery drawing as an aid (located in the front door inner pouch) for measuring battery voltages and impedance.

Note: Use form 6002-2017 to record data.

6.2.2 Periodically Testing the UPS

The unit should be manually exercised on a periodic basis (for example, once every three months) to force the UPS unit to transfer to the battery and return to main power. This process activates self-diagnostic testing that can reveal conditions that require attention.

6.2.3 Maintaining the Batteries

Note: Use battery drawing as an aid (located within the inner door pouch) to measure battery voltage, impedance, and temperature. Use form 6002-2017 (download from www.800pwrsrvc.com) to record data. Caution: Absent this data the warrantee will be affected.

DANGER: The battery circuit breaker operates at the rated battery voltages at all times. A tripped battery circuit breaker indicates a serious problem that may result in serious injury or damage to the equipment. Determine the cause and take appropriate action as necessary. For example, check for a short circuit in the battery. For guidance, email Power Services at service@800pwrsrvc.com

DANGER: The battery electrolyte is a diluted sulfuric acid that is harmful to the skin and eyes. It is electrically conductive and corrosive. Wear full eye and hand protection along with protective clothing. If the electrolyte contacts the skin, wash it off immediately with water. If electrolyte contacts the eyes, flush thoroughly and immediately with water. Seek immediate medical attention. Spilled electrolyte should be washed down with a suitable acid neutralizing agent. One common practice is to use a solution of approximately one pound (450 grams) of bicarbonate of soda to approximately one gallon (4 liters) of water. The bicarbonate of soda solution should be applied to the spill until evidence of chemical reaction (foaming) has ceased. The resulting liquid should be flushed with water and the area dried.

DANGER: Do not dispose of a battery or batteries in a fire. The batteries may explode causing death or serious injury.

Caution: Do not substitute batteries from other manufacturers without the express approval of the manufacturer Customer Service personnel.

Caution: Lead-acid batteries contain hazardous materials and must be handled, transported, and recycled or scrapped in accordance with federal, state, and local regulations. Since lead is a toxic substance, lead-acid batteries should be recycled rather than scrapped.

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

1. Remove watches, rings, or other metal objects.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not lay tools or metal parts on top of batteries.
5. Disconnect charging source prior to connecting or disconnecting battery terminals.
6. Determine whether battery is inadvertently grounded. if so, remove the source of the ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.
7. Lead-acid batteries can present a risk of fire because they generate hydrogen gas. The following procedures should be followed:

- ✓ Do not smoke when near batteries.
- ✓ Do not cause flame or spark in battery area.
- ✓ Discharge static electricity from your body before touching batteries by first touching a grounded surface.

DANGER: Do not ground battery positive or negative.

Caution: Lead-acid batteries can present a risk of fire because they generate hydrogen gas. The following safety procedures must be followed:

- ✓ Do not smoke when near batteries.
- ✓ Do not cause flame or sparks in battery areas.
- ✓ Discharge static electricity from your body before touching batteries by first touching a grounded metal surface.

Caution: Use of any non-Factory Tested/UL924 Certified batteries, including those with similar brand name and part number, will void the systems UL 924 Safety Certification Listing. Please call or e-mail Power Services for tested/certified replacement batteries.

Caution: The average annual ambient temperature of the batteries shall not exceed 77° F.

Caution: Battery Cell temperatures shall not exceed 92° F for more than 30 days annually.

Caution: Batteries are required to be installed and charged within 90 days of shipment.

6.2.4 Batteries

Although the individual batteries are sealed and require only minimal maintenance, they should be given a periodic inspection and electrical check. (Refer to schedule in log sheet provided inside front door pocket) to ensure years of trouble-free service. Tightness of battery terminal connections and interconnections between cabinets should be tested to recommended torque values. Battery Service Agreements are available through www.800pwrsrvc.com. For information about battery environment specifications, see Table 4-3.

To qualify for battery-warranty replacement, you will need to show records of the battery maintenance history including battery numbers, battery voltages (individual cells), terminal torque measurements and dates of maintenance.

Caution: Use of any non-Factory Tested/UL924 Certified batteries, including those with similar brand name and part number, will void the systems UL 924 Safety Certification Listing. Please call or e-mail Power Services for tested/certified replacement batteries.

6.2.5 Power Connections

Check for corrosion and connection integrity. Visually inspect wiring for discolored or cracked insulation. Clean and/or re-torque as required.

All battery terminal connections must be tightened with the proper torque value set in accordance with the torque value on the Battery Connection Diagram provided with each system.

Use the correct torque tool to tighten the terminal bolts shown on the drawings shipped with each system. Use all hardware provided with the batteries.

Caution: Torque all connections in accordance with specified values provided. Failure to do so can create an unsafe condition or fire hazard.

6.2.6 Preventative maintenance

Programs are available through the Customer Service representative.

6.2.7 Battery Terminals

Check for discoloration, corrosion, and connection integrity. Clean and tighten as necessary.

To access battery terminals:

1. Remove the top strapping material located at the lower front of the battery shelf.
2. Pull the battery forward to access the battery connections.
3. Disconnect the cables connected to the battery and then use a protective boot or electrical tape to insulate the cables to prevent accidental shorts.
4. Before replacing the battery connections, clean and re-torque the connection hardware.

6.3 FRU Replacement

Some components can be replaced by qualified factory-trained service personnel only. These components are referred to as Field Replaceable Units (FRUs).

Refer to Table 6-1 for ordering the replacement parts from the factory. Provide the unit's Serial No. from the Start-Up label located on the right front door.

Email service@800pwrsrvc.com for replacement parts. Replacement parts must be replaced by certified factory-trained service personnel only.

Electrostatic Sensitive: Circuit boards and IGBT's contain Electrostatic Discharge Susceptible (ESDS) components. Handle and package ESDS devices in accordance with JEDEC standard JESD625-A. Use a grounded ESD wrist strap when handling the devices and circuit boards. Always package components and circuit boards in static-dissipative plastic bags before transporting even if a device has failed. Failure to do so could result in further damage, complicating repair and failure analysis.

Table 6-1 Replacement Parts

Item	Description	Designator
1	Bypass Static Switch	PB1, PB3, PB5
2	Output Static Switch	PB2, PB4, PB6
3	Control Board	A2 1625-296-XX (Standard) see Figure 6-3 1625-55-XX (Event Log options) see Figure 6-4 1625-405,406,407-XX (Fast transfer) see Figure 6-5
4	LCD Display Board	A5
5	Input Contactor	K1
6	SCR Driver	
7	Control Power Transformer	T2
8	Control Transformer Fuse	F4.5
9	Fan Fuse	F11-14
10	Heat Sink Assembly	HS1
11	Fan(s)	B1~9

6.3.1 Replacing Heatsink Assembly for 40KVA and below

- ***To replace Heatsink Assembly:***

1. Disconnect wires:

P4	P7	J1	Ribbon Cable	P1 (when fast transfer option is used)	TB4-B (All wires)

2. Remove heatsink (3) mounting screws and slide the assembly out
3. Use assembly handles to pull the assembly out

Caution: Do not use the cables as handle as this will cause damage

4. Install the replacement heatsink onto the tray and wire it to the unit by completing step 1-3 in reverse (see Figure 6-1).
5. Verify all connections are tight and correct prior to starting up the unit.

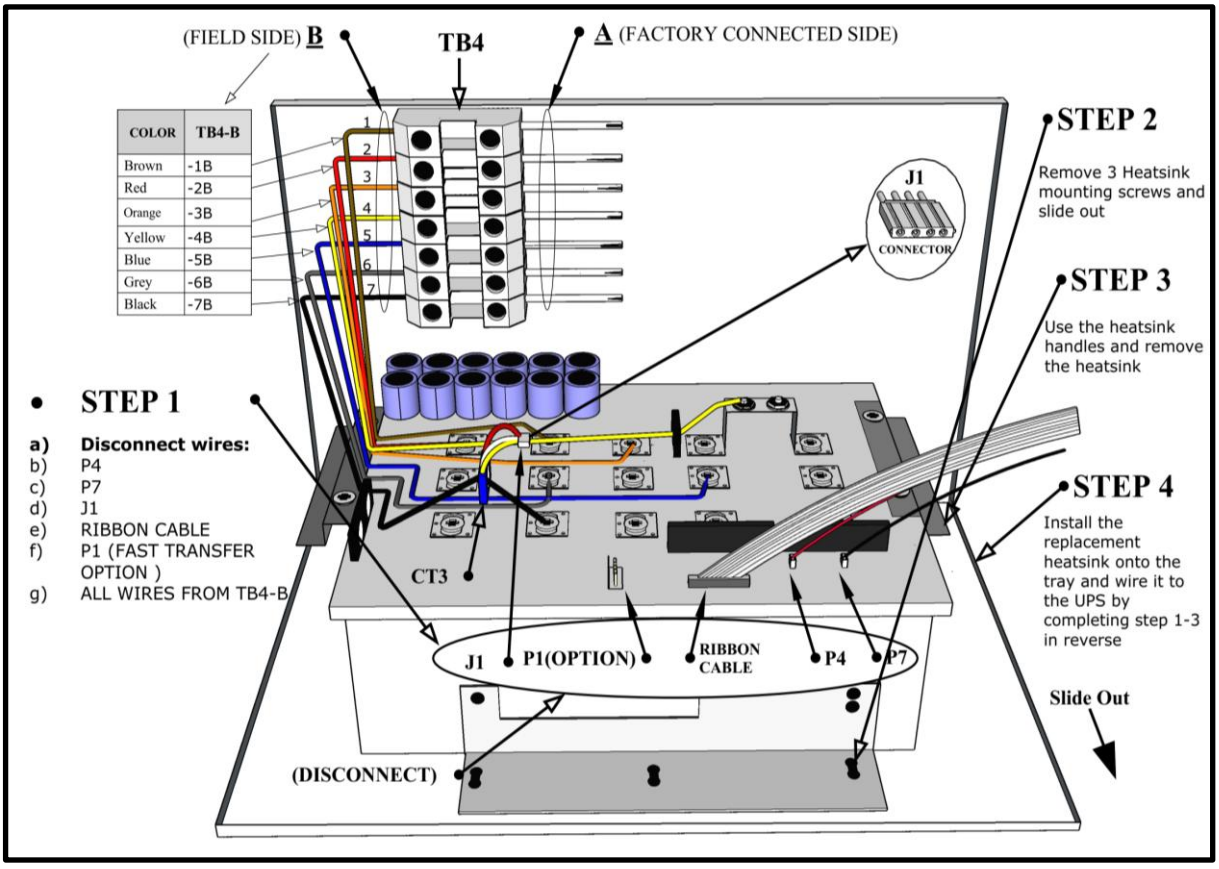


Figure 6-1 Heat sink assembly (10KVA ~ 40KVA)

6.3.2 To replace Heatsink Assembly for 50KVA, 50KW:

- ***To replace Heatsink Assembly:***

1. Disconnect wires:

P4	P7	J1	Ribbon Cable	P1 (when fast transfer option is used)	TB4-B (All wires)

2. Remove heatsink (2) mounting screws and slide the assembly out
3. Use assembly handles to pull the assembly out

Caution: Do not use the cables as handle as this will cause damage

4. Install the replacement heatsink onto the tray and wire it to the unit by completing step 1-3 in reverse (see Figure 6-2).
5. Verify all connections are tight and correct prior to starting up the unit.

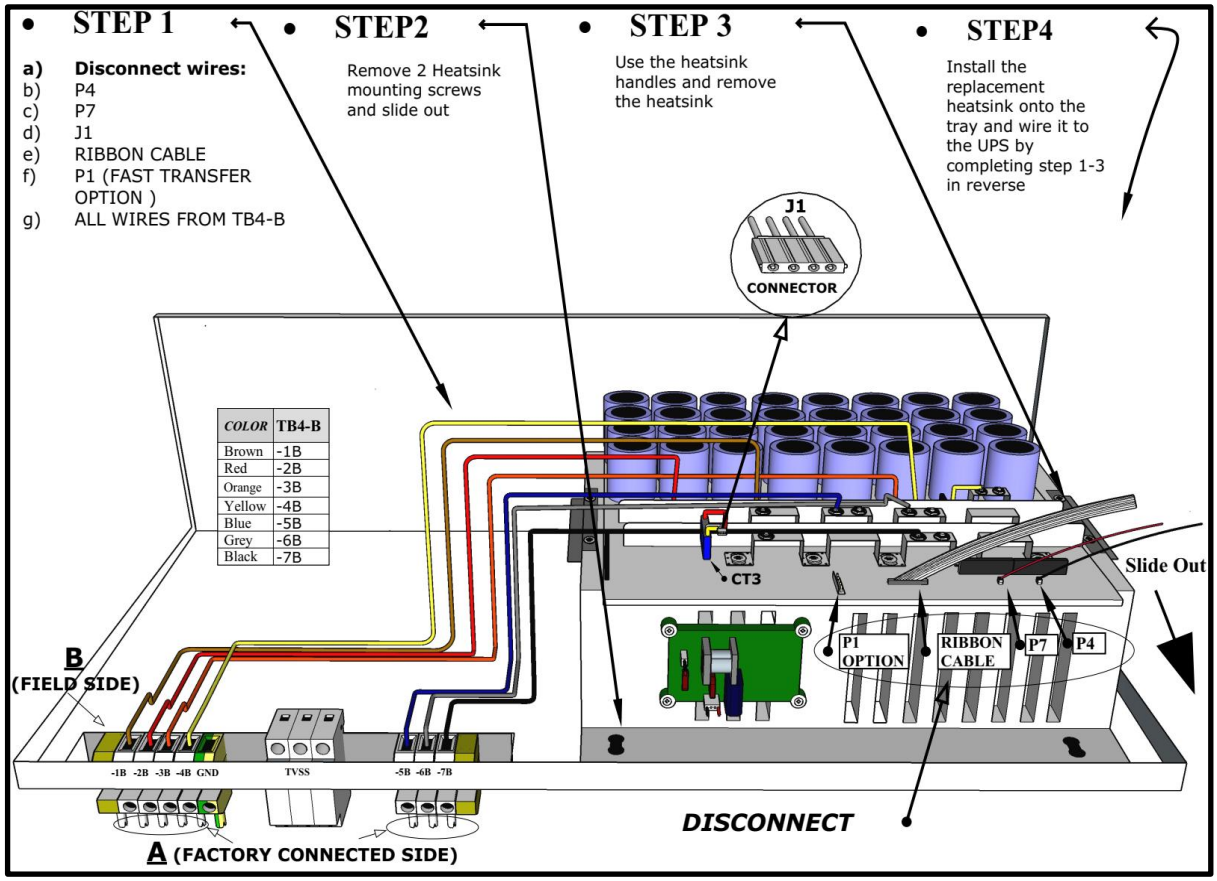


Figure 6-2 Heat sink assembly (50KVA ~ 50KW)

6.3.3 Replacing the Control Board (1625-296-XX) Standard

The control board is located on the inside right door on the top.

3 Phase 1625-296-XX Control PCBA Replacement Procedure

Step	Tasks	Reference (Picture, Drawing, etc)
1.	Look at the PCBA 1625-296-XX on the unit and take note of all the connectors connected to the PCBA. Disconnect all the connectors from PCBA 1625-296-XX.	
2.	Hold the PCBA and remove the 4 mounting screws. Leave the harness holders on the standoffs. Remove the PCBA.	
3.	Install the replacement PCBA 1625-296-XX by completing step 1, and step 2 in reverse. Torque value 5 in-lbs.	

Connector	To PCBA	Standard
Ribbon cable	* J1	Yes
P7	J7	Yes
P3	J3	Yes
P12	J12	Yes
P15	J15	Yes
P2	J2	**Option
P9	J9	**Option
P11	J11	**Option
P13	J13	**Option
P14	J14	**Option
P5	J5	Yes
A2-J4	J4	Yes
P8	J8	**Option
P6	J6	**Option
P10	J10	**Option

*cable goes thru ferrite core.
**may not be required. Only required if the unit has the option.

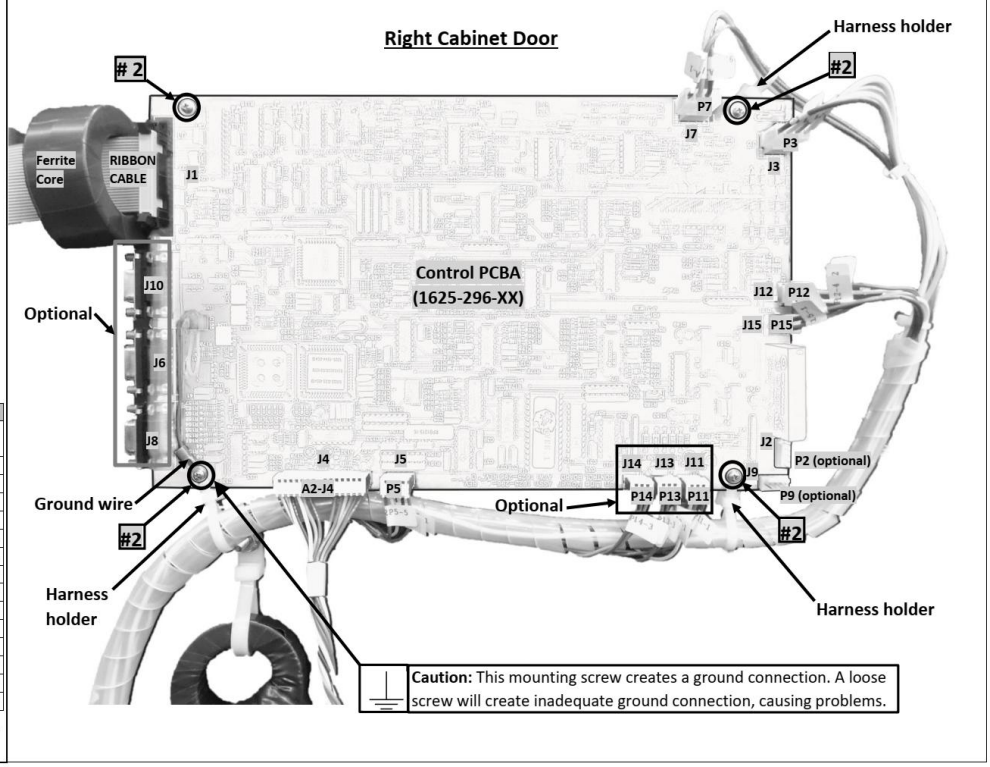


Figure 6-3 Control Board (standard)

6.3.4 Replacing the Control Board (1625-355-XX) Event Log option

The control board is located on the inside right door on the top.

3 Phase 1625-355-XX Control PCBA Replacement Procedure

Step	Tasks	Reference (Picture, Drawing, etc.)
1.	Look at PCBA 1625-355-XX on the unit and take note of all the wires connected to the PCBA. Disconnect all the wire connectors from PCBA 1625-355-XX.	
2.	Hold the PCBA and remove the 4 mounting screws. Leave the harness holders on the standoffs. Remove the PCBA.	
3.	Install the replacement PCBA 1625-355-XX by completing step 1, and step 2 in reverse. Torque value 5 in-lbs.	

Connector	To PCBA	Standard
Ribbon cable	* J1	Yes
A2P7	J7	Yes
A2P3	J3	Yes
A2P12	J12	Yes
A2P15	J15	Yes
A2P2	J2	**Option
A2P9	J9	**Option
A2P11	J11	**Option
A2P13	J13	**Option
A2P14	J14	**Option
A2P5	J5	Yes
J8	J8	**Option
J6	J6	**Option
J10	J10	**Option

*cable goes thru ferrite core.
**may not be required. Only required if the unit has the option.

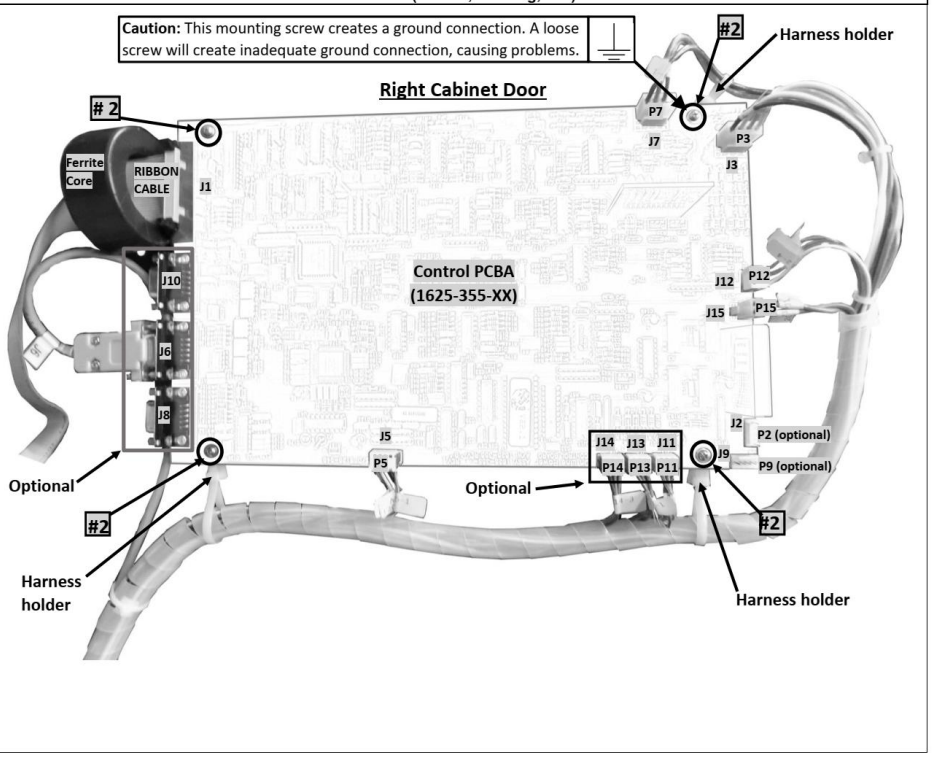


Figure 6-4 Control Board (event log)

6.3.5 Replacing the (1625-405,406,407-XX) Fast Transfer option

This control board is located on the inside right door when fast transfer option is used

3 Phase Fast Transfer 1625-405-XX, 1625-406-XX, and 1625-407-XX Replacement

Step	Tasks
1.	Disconnect all the connectors from PCBA 1625-405-XX, and 1625-406-XX.
2.	Remove the 4 mounting screws and remove PCBA 1625-406-XX. Then remove the 4 standoffs and remove PCBA 1625-405-XX.
3.	Install the replacement PCBA's 1625-405-XX and 1625-406-XX by completing step 1, and step 2 in reverse. Torque value 5 in-lbs.

Connector	To PCBA 1625-405	To PCBA 1625-406
Overlay cable	n/a	J7
A10J8	n/a	J8
A10J5	n/a	J5
A10J3	n/a	J3
A10J4	n/a	J4
A10J2	n/a	J2
A10J1	n/a	J1
A9J7	J7	n/a
A2P11	J3	n/a
A2P13	J4	n/a
A2P14	J5	n/a
A9J8	J8	n/a
A9J2	J2	n/a
A9J1	J1	n/a

Step	Tasks
4.	Connect PCBA 1625-407-XX to PCBA 1625-406-XX.

Reference (picture, drawing, etc.)

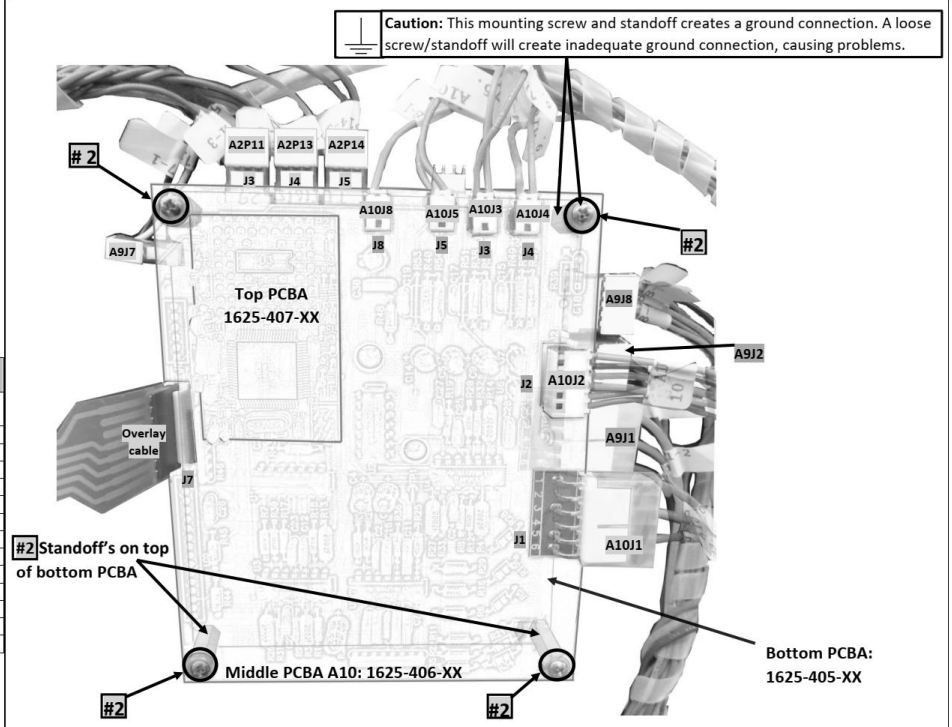


Figure 6-5 Fast Transfer option

6.3.6 All Other Parts

Verify that the cables are marked before disconnecting. Replace the defective part with the new part. Reconnect wiring the same way as it was disconnected.

6.3.7 Calling for Service

Call for service if you encounter any of the following conditions:

- ✓ Repeated start-up attempts are unsuccessful.
- ✓ A UPS fault occurs that cannot be cleared.
- ✓ Normal operation of the critical load repeatedly causes an overload condition. This is not a UPS fault. A qualified person must analyze the total load connected to the UPS to prevent unit failure. Momentary overload conditions will be handled within the parameters of the UPS unit, but sustained overloads will cause the UPS Unit to fail.

- ✓ Any indicators or alarms operate abnormally or continuously.
- ✓ Any other abnormal function of the system occurs.
- ✓ If any abnormal battery condition is detected.
- ✓ When you are unsure of what action to take.
- ✓ If any of the above occurs:

Fill out a service request form by visiting www@800pwrsrvc.com or email service@800pwrsrvc.com

DANGER: Lethal voltages are present inside the equipment even when there appears to be no input power to the unit. Protect yourself from the risk of electrocution by referring service to qualified personnel only.

6.4 Customer Service and Support

Start-up, UPS maintenance, battery maintenance, and preventative maintenance programs are available through your Factory sales representative.

6.4.1 Start-Up Services

Various start-up services are available. Contact your sales representative or email us at service@800pwrsrvc.com

6.4.2 Maintenance Agreements

Standard Full Service, 24/7 Full Service, and Extended On or Off-Site Maintenance agreements are available. Contact your sales representative or email service@800pwrsrvc.com

6.4.3 Warranties

If you have any questions about the warranty on your UPS System or the batteries contact or email us at service@800pwrsrvc.com or contact Customer Service and Support at 1-800-PWR-SRVC (800-797-7782).

Chapter 7. Troubleshooting

This chapter describes typical LCD screens and some typical troubleshooting steps.

7.1 Reset Instruction

Due to facility and/or incoming power abnormalities, prior to initiating a service call please attempt a System "RESET" by following the Reset Instructions described below:

- *Instructions:*

1. **Turn off all system output breakers.**
2. **Turn off the system's battery breaker.**
3. **Turn off unit Main Input Breaker that supplies input voltage to the unit.**
4. **Check the system's LCD display to make sure it is completely off.**
5. **When it has been verified to be completely off, turn the Main Input Breaker back on.**
6. **Wait 20 seconds for contactor to close and wait for the LCD display to cycle two times.**
7. **If the LCD display reads "UPS NORMAL", turn on the systems battery breaker.**
8. **If the LCD display still reads "UPS NORMAL" after turning on the battery breaker, commence to turning on the system output breakers.**
9. **Check to see if your output voltage is back to normal.**
10. **If the LCD display still reads "UPS NORMAL" and all your output voltages are back to normal, your system has been fully reset. Close and lock the system doors.**

Caution: If the unit does not go back to normal operation, please take pictures of each display and email **(service@800pwrsrvc.com**) the details. Upon, receipt your information will be forwarded to the proper personnel for handling.

7.2 Troubleshooting Guide and System Alarms

Table 7-1

Case	Symptoms		Causes	Action
	Description	LCD Display		
1	Input power is applied	LCD display panel is not lit		Email service@800pwrsrvc.com for further action.
2	Attempt to turn on and unit remains in BYPASS and LCD screen shows input OK	UPS ALERT @ ## KVA INPUT OK @ CHRG OFF BATTERY OK @ DC OK ON BYPASS @ OUT BAD	Output is short-circuited	Replace Heatsink assembly. If problem still persists, go to step next.
			Heatsink assembly has failed	Disconnect all loads then turn the unit back on. If it runs normally, request facility manager to check output loads for possible short. If problem still persists, go to next step.
			Not Listed	Email service@800pwrsrvc.com further action.
3	Attempt to turn on and unit remains in BYPASS_ and LCD screen shows input BAD	UPS ALERT @ ## KVA INPUT BAD @ CHRG OFF BATTERY OK @ DC OK ON BYPASS @ OUT BAD	Connector P3 on control PCB is loose	Check connector for proper fitting. If problem still persists, go to next step.
			Connector P3 has bad connection	Unplug P3, verify voltages are present across pins 1 & 2 and 3 & 4. If no voltage is present, go to next step.
			Control PCB failure	Replace control PCB. If problem still persists, go to next step.
			Not listed	Email service@800pwrsrvc.com further action.
4	Contactor keeps cycling or chattering	UPS ALARM @ ## KVA INPUT BAD @ CHRG ON BATTERY OK @ DC OK ON INVERTER @ OUT OK	Fluctuation in input voltage and frequency	Verify input voltage to be within ±10% and frequency to be ±3Hz compared with nameplate spec. If these readings are OK, go to next step.
			Contactor coil connector gets loose	Check contactor connections on control PCB. P15. If problem still persists go to next step.
			Contactor coil failed	Unplug P15 on control PCB to verify coil resistance on the harness side. If open circuit is found, replace the contactor. If problem still persists and go to next step.
			Control PCB failure	Replace Control PCB. If problem still persists, Email service@800pwrsrvc.com further action.
			Heatsink assembly failure	Replace Heatsink assembly. If problem still persists, Email service@800pwrsrvc.com further action.
			Not listed	Email service@800pwrsrvc.com further action.
5	Unit went into FAILURE mode			Email service@800pwrsrvc.com further action.

Case	Symptoms		Causes	Action
	Description	LCD Display		
		UPS ALERT @ ## KVA INPUT OK @ CHRG OFF BATTERY OV @ DC OV ON BYAPSS @ OUT BAD **Or** UPS ALERT @ ## KVA INPUT OK @ CHRG OFF BATTERY LOW @ DC UV ON BYAPSS @ OUT BAD		
6	**Output voltage sags**	UPS ALARM @ ## KVA INPUT OK @ CHRG ON BATTERY OK @ DC OK ON INVERTER @ OUT OL	**Possible unit is overloading**	**Use current clamp to verify that output current is within the nameplate range. If the readings are over the range, report the problem to the facility manager.**
			Not listed	**Email service@800pwrsrvc.com further action.**

7.3 Using the LCD Display Panel

The system utilizes an on-board microprocessor that continuously monitors and displays all functions (measurement, alarm, alert, and system status) in real time by utilizing high frequency digital signal processing for a reliable and user-friendly battery backup system.

When Input power is applied the LCD, panel lights up

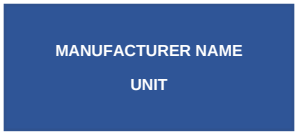


Figure 7-1. Message That Appears at Power-on

If your LCD display panel is not lit, the unit has a problem. Email factory service service@800pwrsrvc.com .

7.3.1 Default Screen 1

Figure 7-2 shows the second default screen and Table 7-2 describes the messages.

Figure 7-2 Default Screen 1

Table 7-2 Description of Default Screen 1

Line	Message	Description
1	UPS NORMAL @ 25 KVA	25 KVA indicates the KVA rating. STAND BY or NORMAL = normal operating modes. STAND BY ALARM FAILURE = UPS alarm condition. FAILURE = unit failed or persistent alarm condition. Shut off the system and wait for the LCD to go dark, then restart the unit.
2	INPUT OK @ CHG ON	Shows one of the following conditions: INPUT OK = input within an acceptable range. INPUT BAD = input out of range. CHRG ON = charger on. CHRG OFF = charger is off. This occurs if the input capacitor is open or the system is in a failure mode (UPS ALARM).

Line	Message	Description
3	BATTERY OK @ DC OK	Shows one of the following conditions. Note that the typical DC bus voltage should be higher than the battery voltage. BATTERY OK = battery voltage within an acceptable range. BATTERY OV = battery voltage high. This is normal when the battery is charging. BATTERY LOW = battery voltage low. Recharge battery. DC OK = DC bus voltage within an acceptable range. DC OV = DC bus voltage too high (UPS ALARM). DC UV = DC bus voltage too low (UPS ALARM).

Note: The typical DC buss voltage should be higher than the battery voltage

7.3.2 Default Screen 2

shows the second default screen Table 7-3 describes the messages.

Figure 7-3. Default Screen 2

Table 7-3 Description of Default Screen 2

Line	Description
1	Shows output voltage and power in watts
2	Shows input volts and amps.
3	Shows the internal DC bus condition (for factory use).
4	Shows the battery voltage. (+) = current in Amps indicates charging Amps. (-) = discharging Amps.

Chapter 8. Option

This appendix provides detailed information about the options available for the Three-Phase Lighting Inverter.

8.1 External Wrap-around Manual Bypass Switch (same Input and Output Voltage)

The external maintenance bypass switch is mounted in a box that is field-installed and can be installed on adjacent wall. The single control simplifies the operation of the external manual bypass switch; however, operating instructions must be carefully observed before using the switch.

To access the operator control switch for the external manual bypass switch, open the cabinet front door. The manual bypass switch has three positions:

UPS – connects the critical load to the output of the inverter and establishes normal operation.

SBS – connects power to the critical load through the static bypass switch (for 0° phase angle synch).

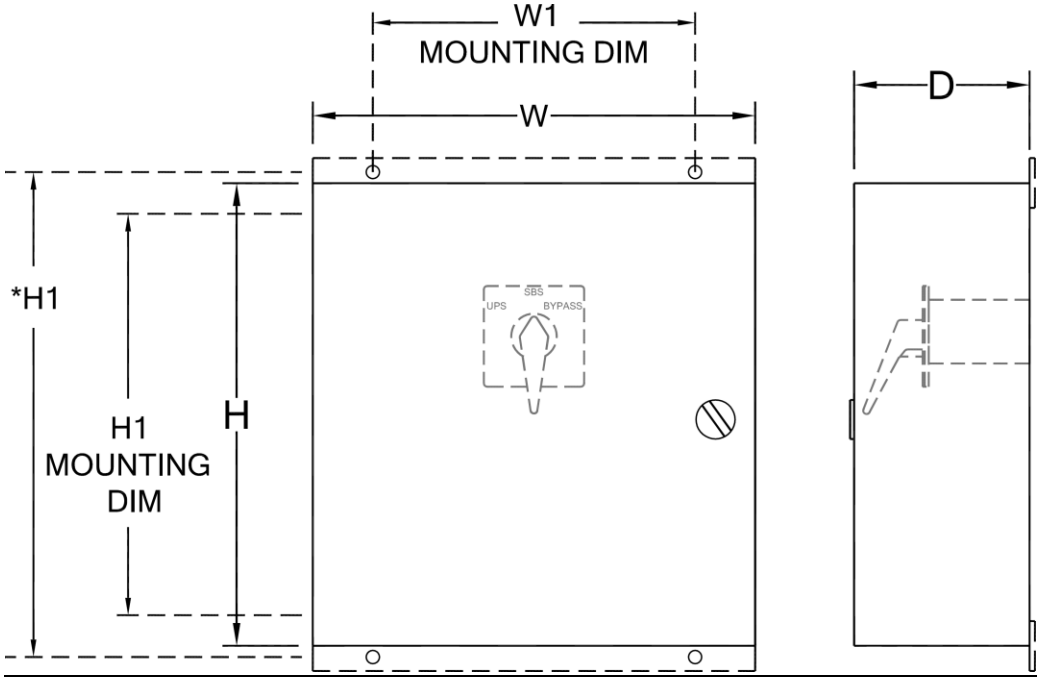
BYPASS – connects power to the critical load through the bypass switch to bypass the inverter.

The BYPASS Switch is a 4 pole “MAKE BEFORE-BREAK". type. Contacts are Marked as

“UPS”, “SBS”, and “BYPASS”.

Use the wrap-around bypass switch with same input and output voltage only. For different input/output systems, use a switch with an external transformer. A wraparound bypass switch can be used with systems without any “built in secondary distribution circuit breaker” within the unit.

Refer to Figure 8-1 for Interface terminal blocks in the UPS cabinet.



Enclosure Dimensions

Amp	Voltage Class	Dimension (inches)				
		W	H	D	W1	H1
55 AMP	600V	14	16	8	*12	*16.75
110 AMP	600V	14	16	10	*12	*16.75
175 AMP	600V	20	20	12	18.5	18.5
240 AMP	600V	30	30	12	28.5	28.5
350 AMP	600V	30	36	16	28.5	34.5

Note: This option is offered for same Input / Output voltage only.

Note: Do not leave the switch in “SBS” position

Note: Wraparound bypass switch can’t be used with units that have “Internal Secondary Distribution Circuit Breaker”

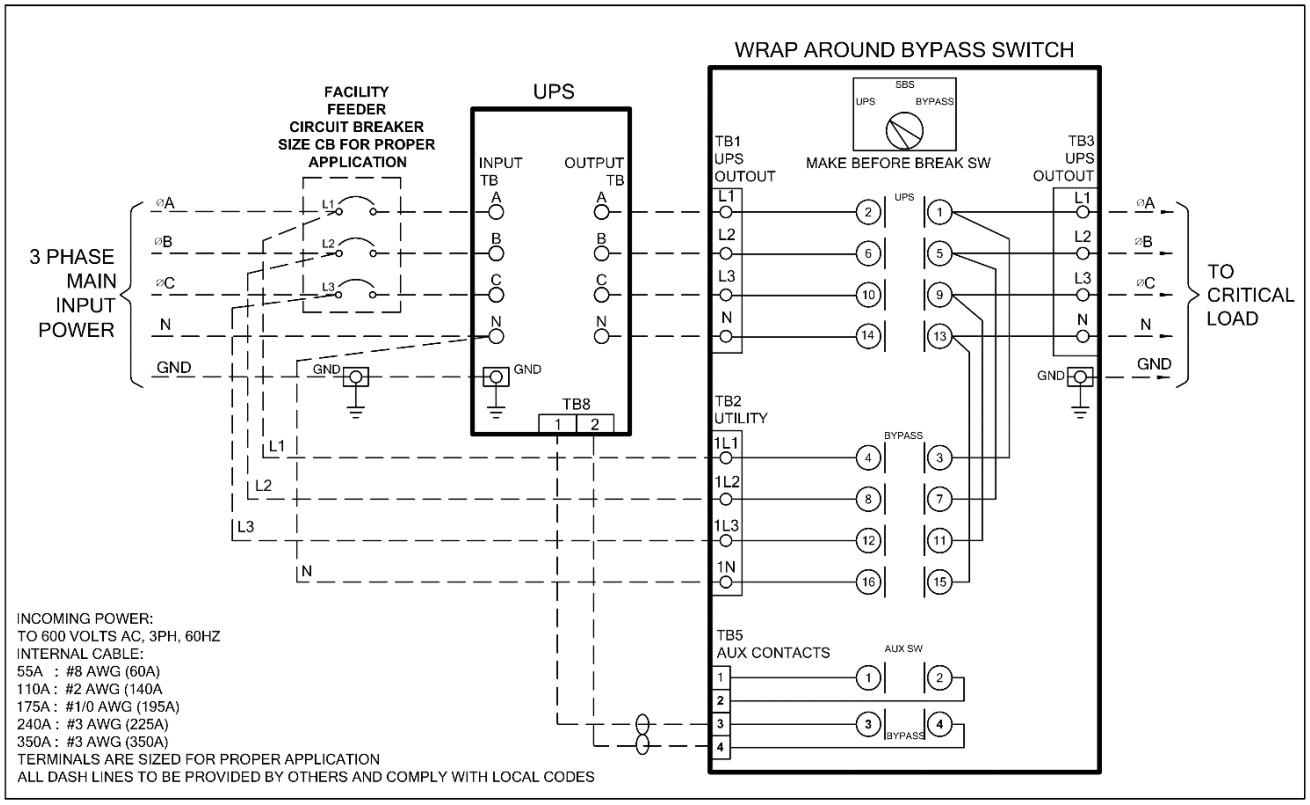


Figure 8-1 External Wrap-around Manual Bypass Switch (same Input and Output Voltage connection diagram (Typical)

- ***To install the maintenance bypass switch***

1. Always allow front access to the MBS box for maintenance and servicing.
2. Electrical codes require that the maintenance bypass switch box be installed with no less than 3 feet at the front of the cabinet.
3. Side and rear panels do not require service clearance; however, side vents must not be blocked.
4. Verify all power connections are tight.
5. Verify all control wire terminations are tight.
6. Verify all power wires and connections have proper spacing between exposed surfaces, phase-to-phase and phase-to-ground.
7. Connect Control wire TB5-3, and TB5-4 (Aux contact) to UPS cabinet Terminal Block (TB8-1, TB8-2) Ext Bypass Sync using 22 AWG.
8. Verify that all control wires are run in individual, separate steel conduit.

DANGER: All power connections must be completed by a licensed electrician who is experienced in wiring this type of equipment. Wiring must be installed in accordance with all applicable national and local electrical codes. Improper wiring may cause death, injury, explosion, fire, or damage to the equipment. Verify that all incoming high and low voltage power circuits are de-energized and locked out before installing cables or making any electrical connections.

8.2 Audio Alarms with Silence Switch

The audio alarms with silence switch provides an audible warning signal, acknowledge, and reset for Input Fail, On Bypass, Inverter On, Low Battery and Summary Alarm for any of the foregoing alarm conditions.

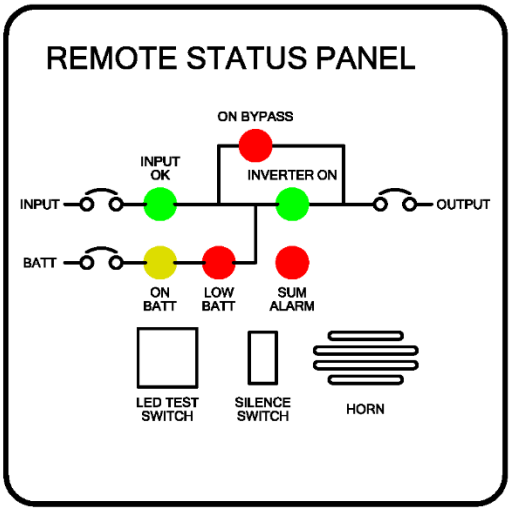
8.3 Remote Status Panel

The remote UPS status panel is a console mount style box that can also be wall mounted. It comes in a black finish and includes a 10-foot-long cable for hard wiring to TB9 terminal block. An optional length cable up to 1000-feet long is also available.

The remote status panel has the following status LEDs.

- ✓ INPUT OK = input power is within acceptable range.
- ✓ INVERTER ON = inverter is ON.
- ✓ ON BYPASS = unit is in bypass mode.
- ✓ ON BATT = unit is operating from battery power.
- ✓ LOW BATT = battery voltage is low prior to shut down.
- ✓ SUM ALARM = unit is experiencing a critical alarm such as an over-temperature condition.
- ✓ HORN = audible warning for an alarm condition.
- ✓ SILENCE SWITCH = silences the audible warning.

An LED TEST push-button allows you to test the LEDs.



Remote Status Panel

Refer to Figure 8-2 for Interface terminal blocks.

8.4 Offline Inverter Operation

The offline inverter operation consists of a slow transfer unit and a fast transfer unit.

8.5 Normally ON/OFF Output Aux. Circuit Breakers

These 1-pole or 3-pole circuit breakers are designed to protect customer circuits and are offered as the following options:

- ✓ Normally ON C.B.
- ✓ Normally OFF C.B.
- ✓ Normally OFF Delay C.B.
- ✓ Custom KAIC

8.6 Main Input CB custom KAIC

8.7 Main Output CB custom KAIC

8.8 Power Flow Mimic

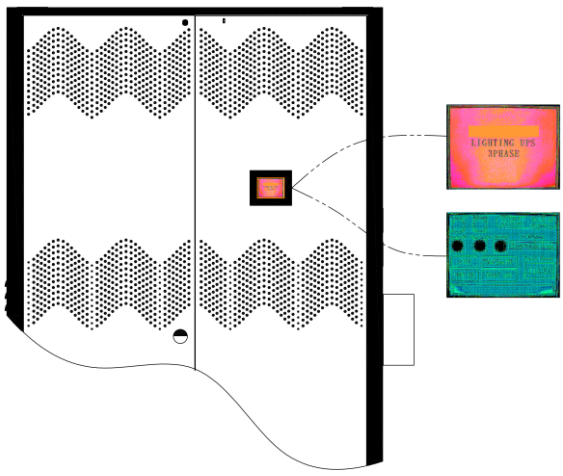
8.9 Global Monitoring Systems (GMS)

8.9.1 Touch Screen event logger, Auto Battery testing.

The easy to read Touch Screen display allows user to

- ✓ View and Scroll through the different meter parameters.
- ✓ View all system alarms.
- ✓ Retrieve event logs via PC.
- ✓ Schedule Auto Battery testing.

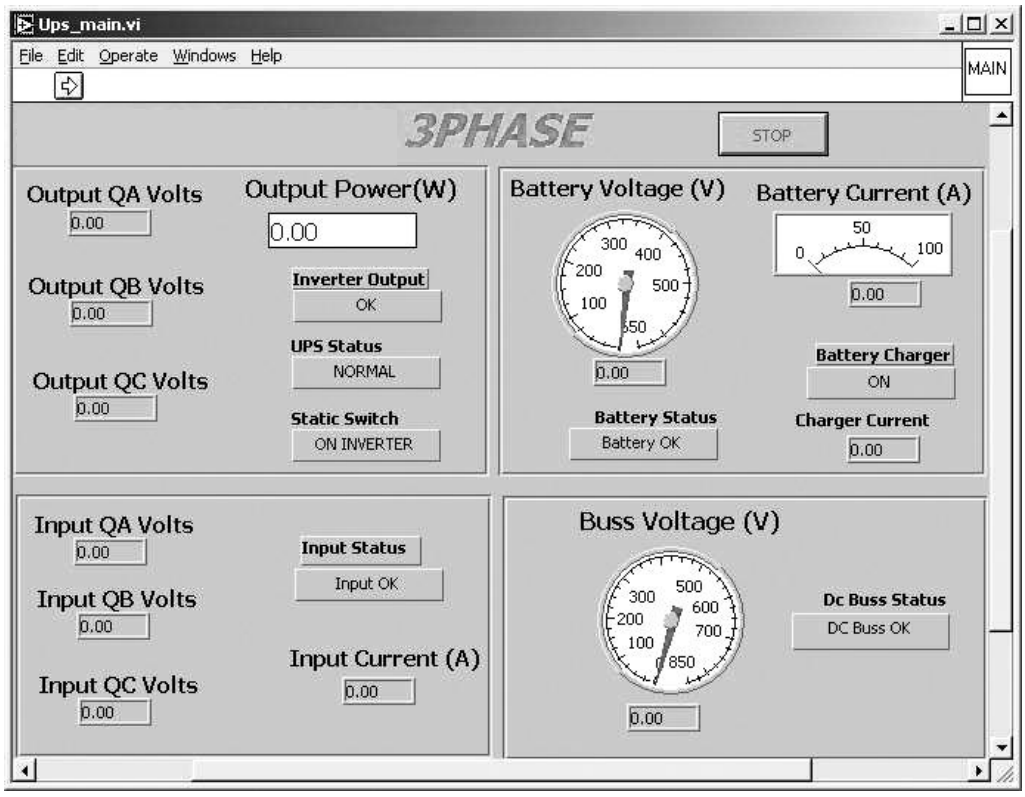
For detail operation of the Touch Screen display refer to manual 6005-151.



8.9.2 Local Monitoring via PC with RS-232

The local monitoring via PC with RS-232 option requires a PC and LabView monitoring software. The software is provided on a disc that installs easily on any Windows operating system. An attached cable of a specified length plugs into a PC serial port and connector J6 on the Control Board located inside right door. LabView software must be configured to use COM port 1.

The LabView software translates data protocol coming to COM port from an active unit via the RS-232/RS-485 interface and displays the parameters and active alarms on a PC monitor. The following figure shows an example of a PC screen with measured parameters and actual unit status.



8.9.3 Local Monitoring via PC with RS-485

This option is similar to the local monitoring via PC with RS-232 option, except that an RS-485 cable is used instead of an RS-232 cable.

8.9.4 RJ45 Ethernet connection

Ethernet connection “RJ45” is available as an option. RJ45 has a bandwidth of up to 100 MHz, and supports 10 or 100 Mbps speeds.

8.9.5 Simple Network Management Protocol

This option consists of an advanced SNMP NetAgent device.

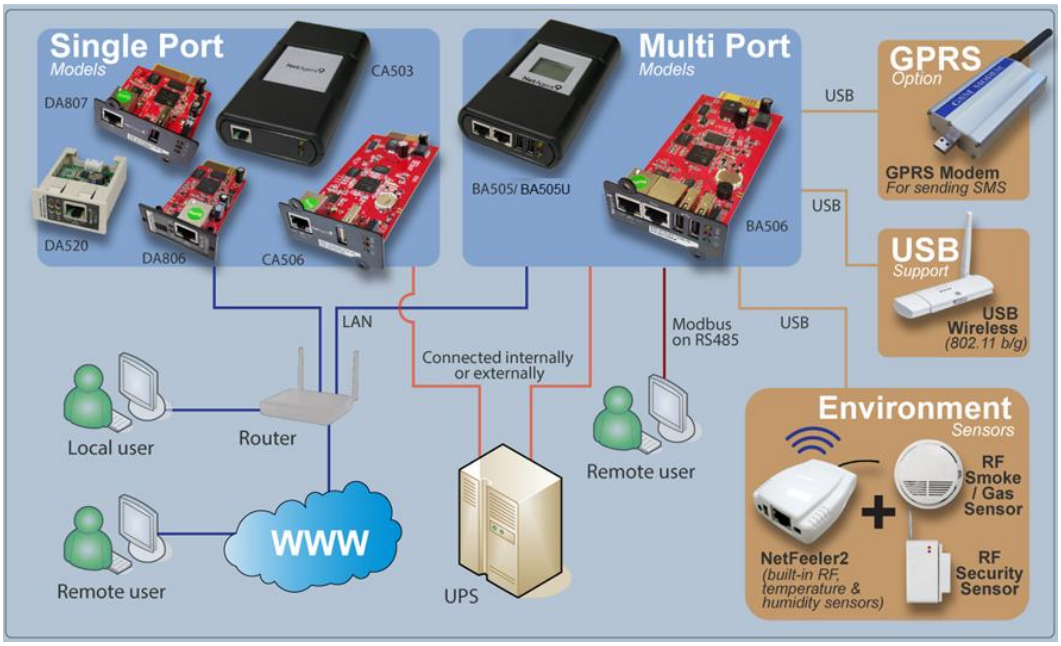
Advanced NetAgent Device

This option is available in the following offerings:

- ✓ Basic NetAgent SNMP with WI-FI HUB application
- ✓ Advance NetAgent SNMP with WI-FI HUB.
- ✓ Advance NetAgent SNMP with GPRS mobile modem.
- ✓ Advance NetAgent SNMP with dial-up modem

The following figures show examples of how this option can be used. In these figures,

NetAgent SNMP modules are installed inside the front door of the inverter cabinets.



8.10 Seismic Mounting Bracket

The seismic floor mounting bracket includes one left bracket and one right bracket per cabinet (UPS and Battery)

8.11 Battery String Monitoring (Wireless).

The wireless battery monitoring system continuously monitors and communicates with the data collector to provide Real-time data. It analyzes and stores battery string voltage, current and (optional) cabinet temperature. For detail information request literature or visit our website.

8.12 Battery (Individual) Monitoring (Wireless)

The wireless battery monitoring system for individual battery block monitors each battery voltage, battery impedance and (optional) battery temperature. For detail information request literature or visit our website.

8.13 N/O Dry Contacts for Alarms

The optional alarm relay board has a terminal strip TB for user connection to the individual alarm contacts. The Remote Contact Board includes isolated Form C contacts for the alarm signals in the following table.

Terminal Number	Signal	Description
TB30-1	LOW BATTERY	N/O contact that closes when the unit is on battery operation and the batteries approach inadmissible discharge status.
TB30-2	ON BYPASS	N/O contact that closes when the unit transfers the load to static by-pass.
TB30-3	SUMMARY ALARM	N/O contact that closes when the unit has any one of the following alarm conditions. Internal Failure, System Overheat, Battery under-voltage.
TB30-4	NOT USED	-
TB30-5	INPUT FAIL	N/O contact that closes upon loss of input power.
TB30-6	COMMON	Common Terminal

Refer to Figure 8-2 for Interface terminal blocks.

8.14 Dry Contact, N/O or N/C Contact with Isolated Common

Terminal Number	Signal	Description
TB18-1 (COM)	SUMMARY ALARM	

Terminal Number	Signal	Description
TB18-2 (N/O)		When the unit has any one of the following alarm conditions. Internal Failure, System Overheat, Battery under-voltage.
TB18-3 (N/C)		
TB18-4 (COM)	ON BYPASS	When the unit transfers the load to static by-pass.
TB18-5 (N/O)		
TB18-6 (N/C)		
TB18-7 (COM)	LOW BATTERY	When the unit is on battery operation and the batteries approach inadmissible discharge status.
TB18-8 (N/O)		
TB18-9 (N/C)		
TB18-10 (COM)	INVERTER ON	Upon Inverter turned ON
TB18-11 (N/O)		
TB18-12 (N/C)		
TB18-13 (COM)	ON BATTERY	Upon loss of input power.
TB18-14 (N/O)		
TB18-15 (N/C)		
TB18-16 to TB18-18	Spare	

Refer to Figure 8-2 for Interface terminal blocks.

8.15 Battery Thermal Runaway Control

This option provides protection in case of over-temperature condition in the battery compartment. If such a condition occurs, this option shuts off the charger. Charging resumes when the temperature returns to normal. A dry contact (N/O, N/C) relay interface is provided for this option for user interface per following:

Terminal Number	Signal	Description
TB121-1	N/C	N/C contact that opens when the critical temperature has reached
TB121-2	COM	Common
TB121-3	N/O	N/O contact that closes when the critical temperature has reached

Refer to Figure 8-2 **for Interface terminal blocks.**

8.16 Battery Breaker alarm

It provides a signal when the battery breaker is in OFF position.

8.17 Battery Thermal Runaway Control with dry contact for remote monitoring

Provides protection in case of over temperature condition in each battery cabinet (s) by shutting off the charger, it allows remote monitoring of the condition and will resume charging when temperature has return to normal.

8.18 Battery Cabinet exhaust fan only without alarm and indicator

8.19 Battery Cabinet exhaust fan with local alarm, indicator and dry contact for remote monitoring

It provides a local alarm, indicator and remote signal through Dry contact in case of the fan failure in the battery cabinet (s).

8.20 Delta Input System

Dual Input System includes an external Iso-Care Transformer (Delta input WYE output). Consult factory for proper kVA and model number for each UPS system. Refer to Figure 3-3 block diagram.

8.21 Stackable Rack

This option will provide flexibility of installation where space is limited, it is available only when battery cabinet size 39” x 68” x 18” is used.

Option

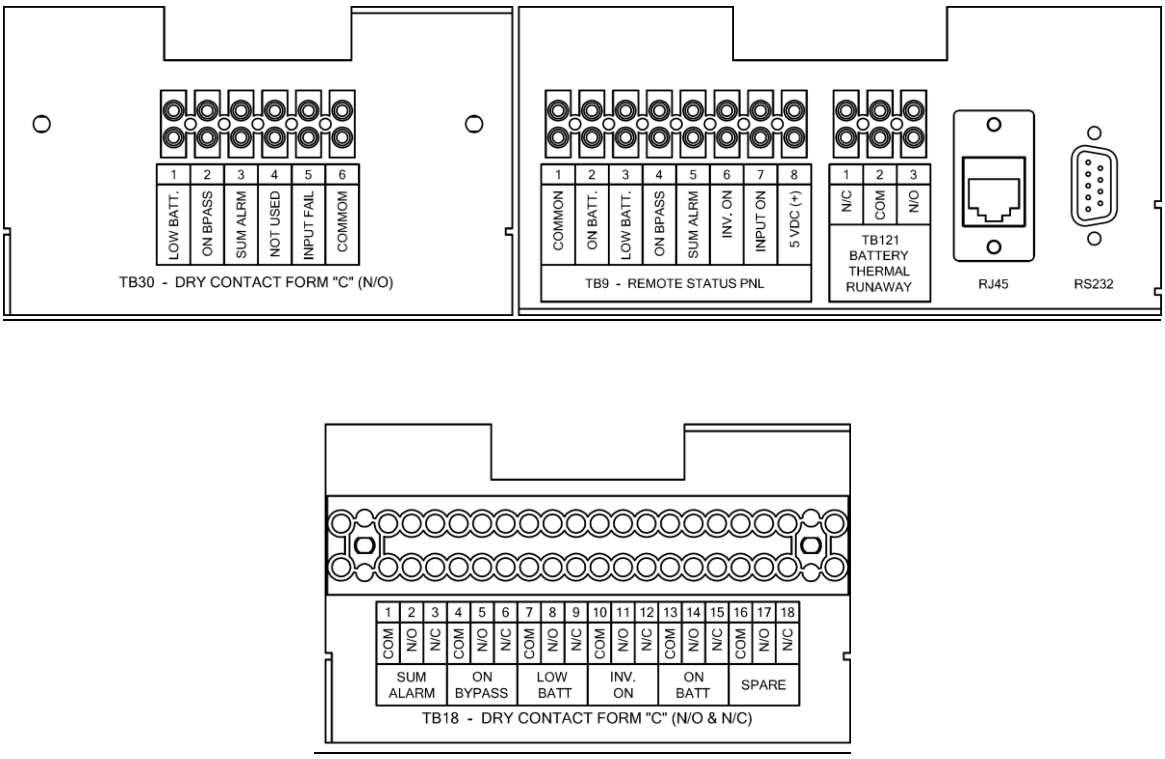


Figure 8-2 (Communications and Alarm Signaling Interfaces)

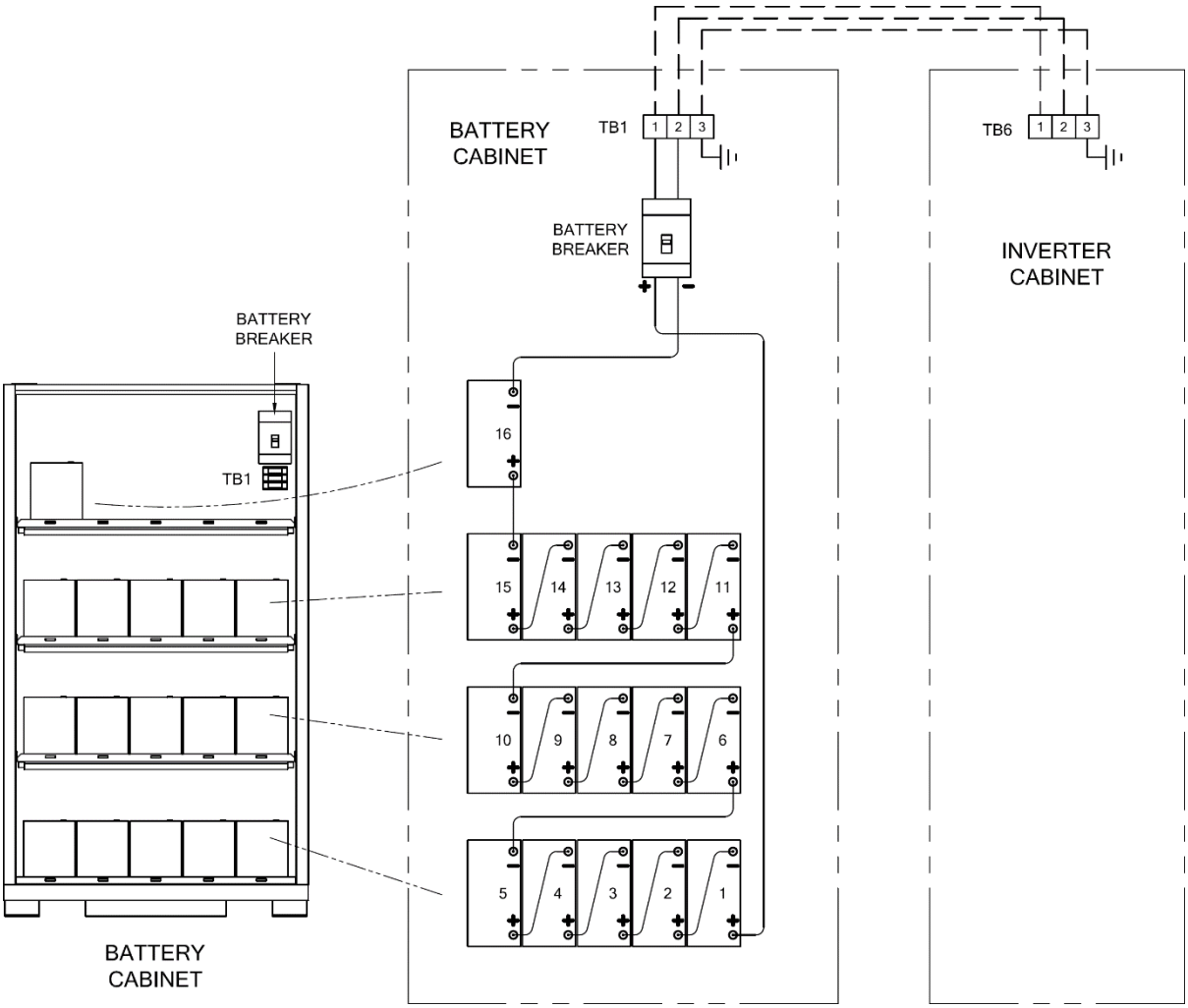
APPENDIX A - BATTERY CONNECTIONS

This appendix shows typical battery connection diagrams. The figures are provided for electrical connection only and do not necessarily match the actual battery layout in your unit. The arrangement may be different from the figures. Each system is shipped with its own battery connection diagram located inside the front door pocket.

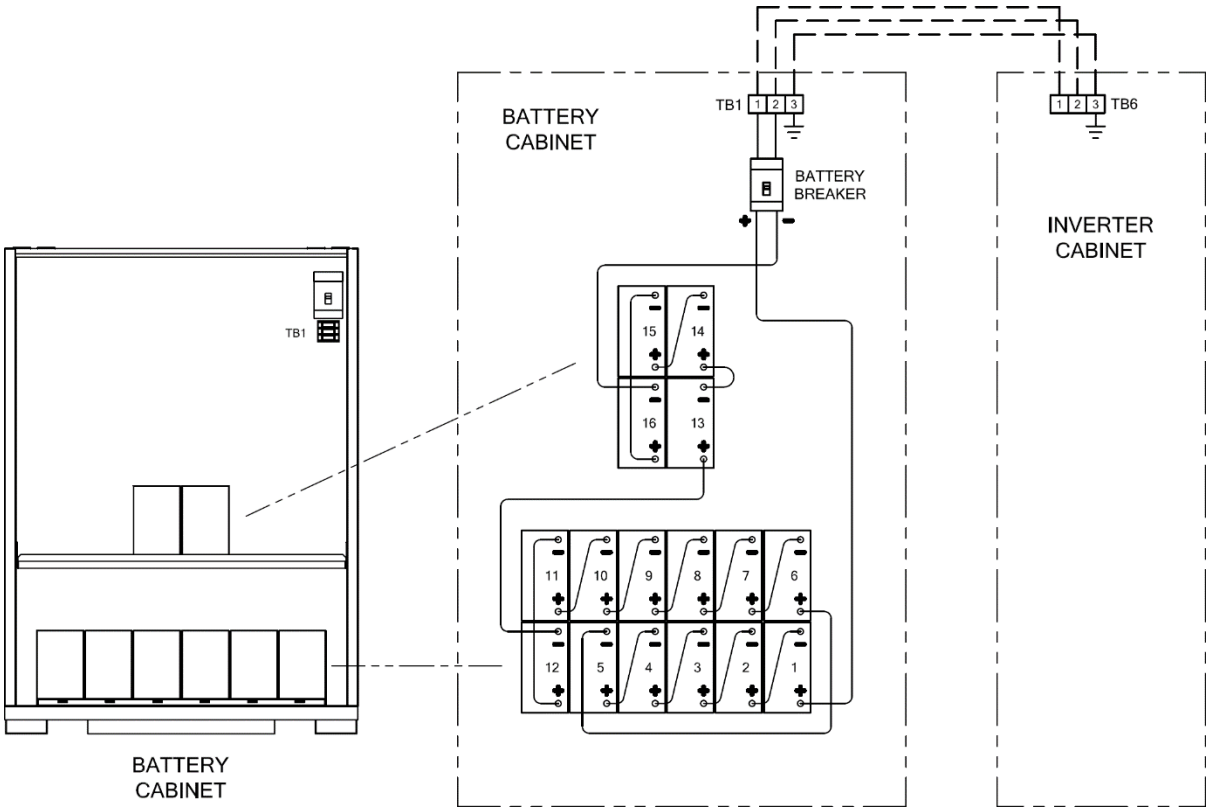
Caution: Ensure that the drawing DWG NO shipped with the system matches the DWG NO on the nameplate. See Figure 4-13 Sample Nameplate.

DANGER: The use of a physically damaged battery can cause a catastrophic system failure and can even result in a fire or explosion that could endanger life and property. Before accepting a battery shipment from the carrier, please read and follow these instructions:

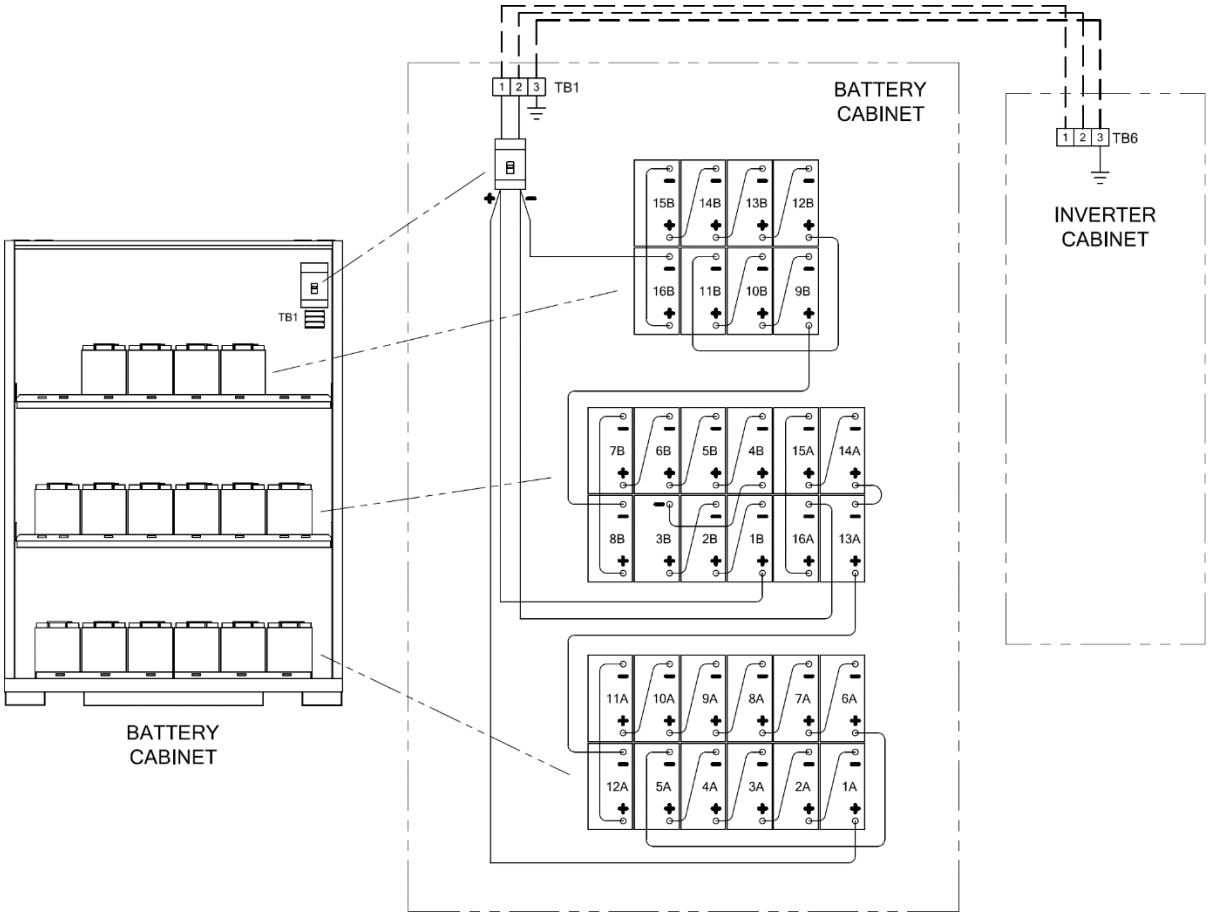
1. Thoroughly inspect each battery for any signs of damage. If there is any damage, reject the shipment and notify the manufacturer. If possible, photograph the damage for future reference.
2. As you unpack the pallet or container, check each battery box for damage on all sides, the top and bottom. If there is any sign of damage, photograph the damage if possible, and contact Power Service.
3. Before you install each battery in the cabinet, remove it from its carton and thoroughly inspect it again on every side, the top and bottom for any signs of physical damage including, but not limited to, cracks, chips, leaks, bulges, and so forth.
4. If a battery is dropped or makes hard contact with any object, inspect it again.
5. Batteries are heavy, so exercise care when lifting them on to the shelves.
6. Use of any non-Factory Tested/UL924 Certified batteries, including those with similar brand name and part number, will void the systems UL 924 Safety Certification Listing. Please call or e-mail Power Services for tested/certified replacement batteries.
7. If at any time you have any questions regarding the condition of a battery, set it aside and notify the manufacturer email: www.800pwrsrvc.com, or call at 800-PWR-SRVC (800-797-7782). Do not use a questionable battery under any circumstances, even temporarily



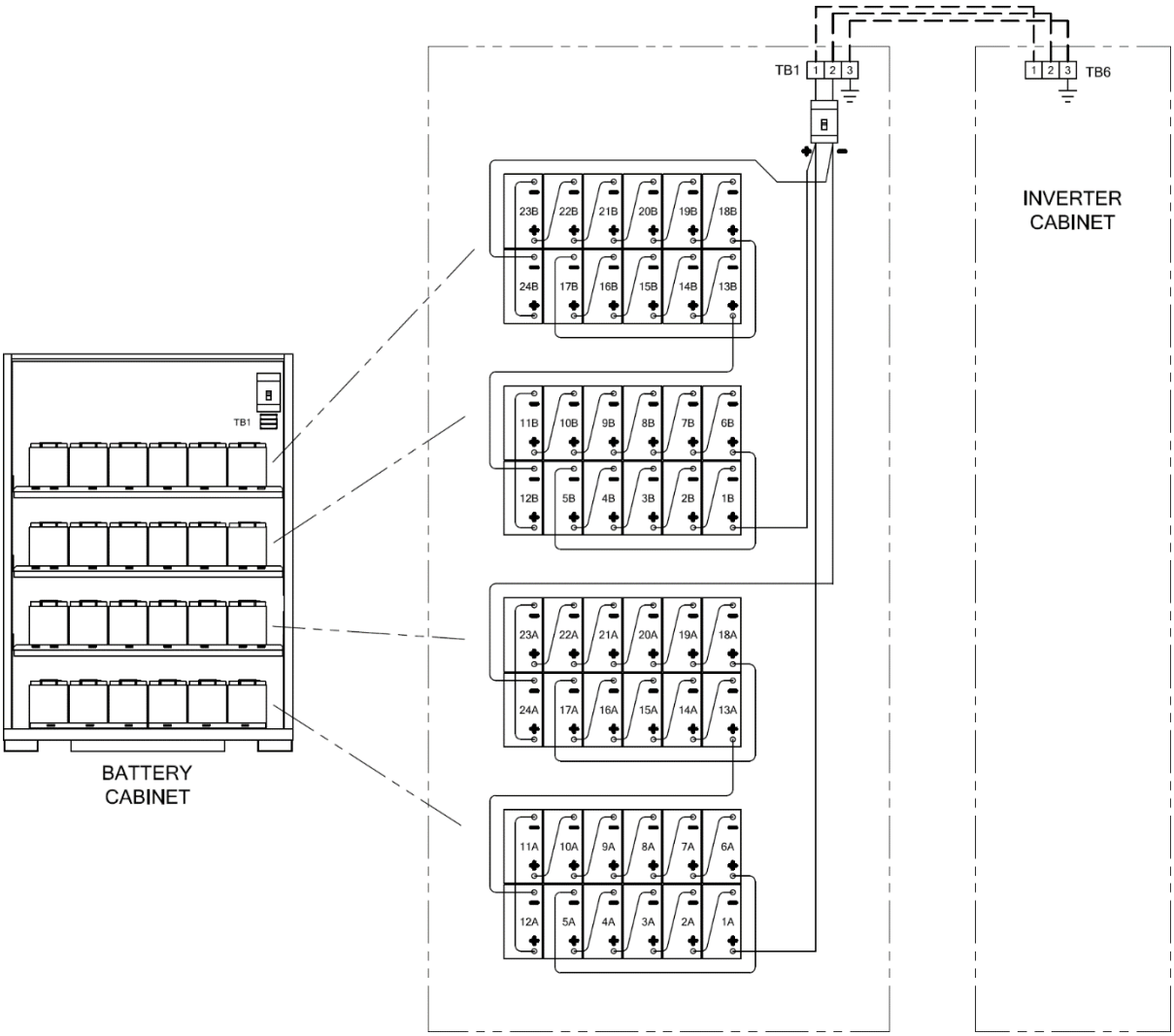
192-Volt Nominal DC Voltage, 1 String of 16 Battery (1 cabinet, size: 39" X 68" X 18") Typical



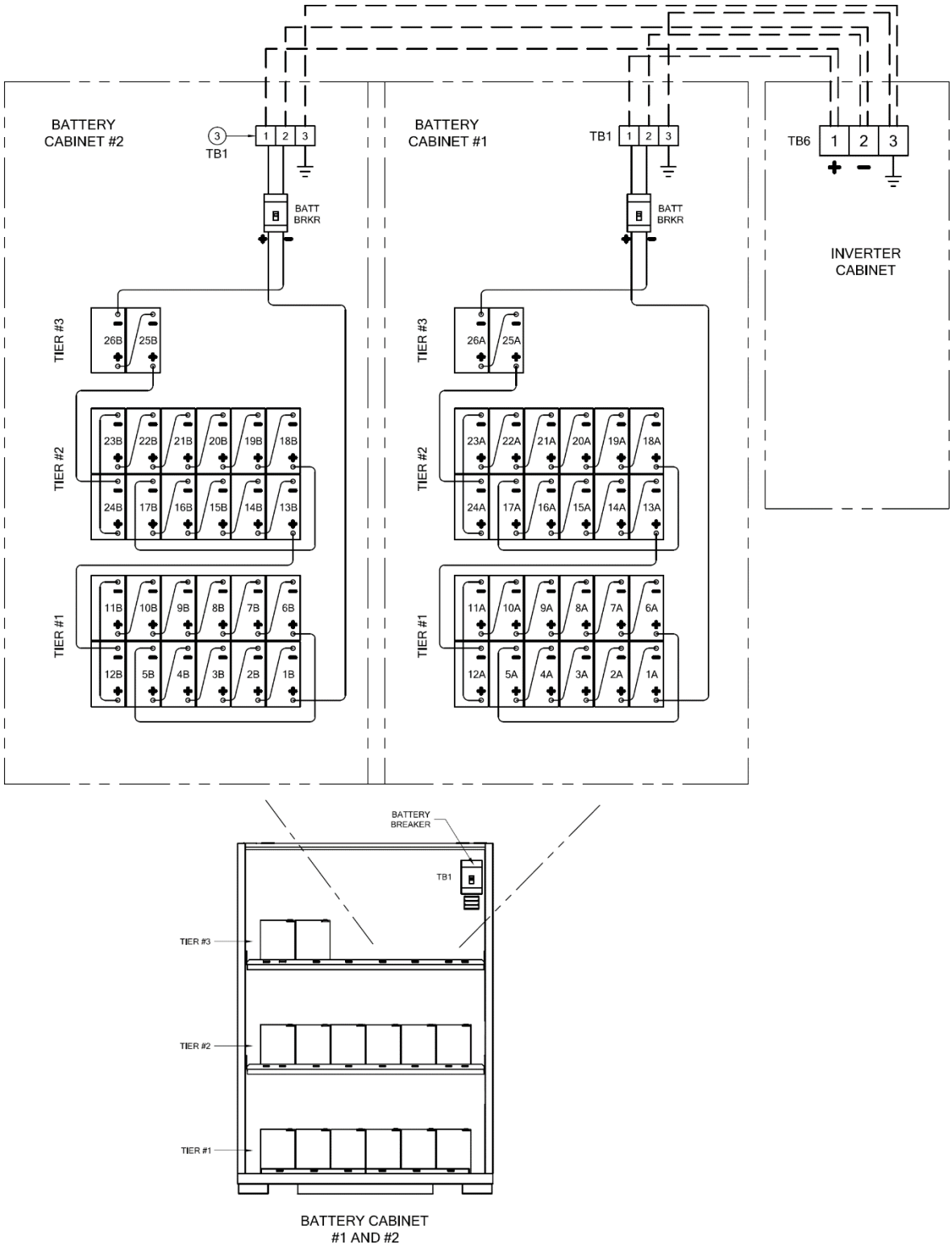
192-Volt Nominal DC Voltage, 1 String of 16 Battery (1 cabinet, size: 51" x 70" x 30.5") Typical



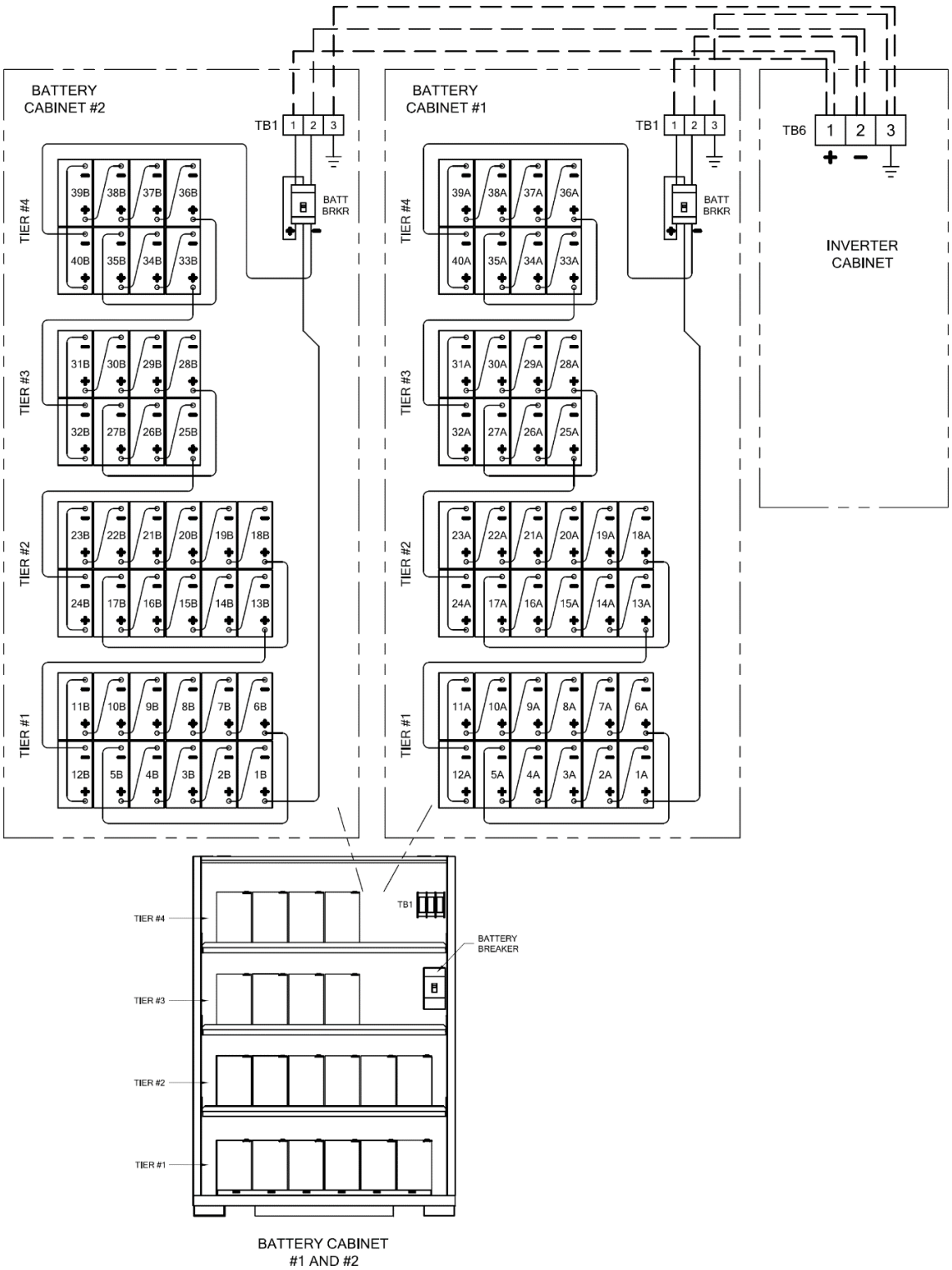
192-Volt Nominal DC Voltage, 2 Strings of 16 Battery (1 cabinet, size: 51" x 70" x 30.5") Typical



288-Volt Nominal DC Voltage,2 Strings of 24 Batteries (1 cabinet, size: 51" x 70" x 30.5") Typical



312-Volt Nominal DC Voltage, 2 Strings of 26 Batteries (2 cabinets, size each: 51" x 70" x 30.5") Typical



480-Volt Nominal DC Voltage, 2 Strings of 40 Batteries (2 cabinets, size each: 51" x 70" x 30.5") Typical

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