



TSi POWER

**Operating Manual for:**

**Outdoor XUPS-1500/2200/3000XL**

**MC00046**

**March, 2014**

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TSi Power Corporation warrants this product to be free from defects in materials and workmanship for two (2) years from the date of purchase from TSi Power or its authorized representatives. TSi will repair (or at its option, replace) any defective component(s) during this warranty period.

To make a request or claim for service under this limited warranty, the original purchaser must return the product, in the original shipping container or equivalent, to TSi Power or its authorized agent, accompanied by a written receipt showing the date of purchase and both the model name and serial number of the product.

Warranty does not cover transportation costs. Damage by misuse, accident or unauthorized tampering of the product is not covered by the warranty. NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED. TSI IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

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## **REVISIONS**

<u>ISSUE</u>	<u>DATE</u>	<u>REASON FOR REVISION</u>
1	March, 2014	Initial Issue

## 1. GENERAL

### 1.1 PRODUCT APPLICATION

This outdoor XUPS series is ideal for the protection of connected equipment that requires very long backup times.



**Figure 1: The XUPS-3000XL Cabinet**

### 1.2 SAFETY ALERTS

#### SAFETY SIGNAL WORD DEFINITIONS

This document contains safety alert pictorial Symbols and Words that point out areas and procedures that require special attention with regards to safety. These Symbols and Words are defined in ANSI Z535.4-1998, Product Safety Signs and Labels.



**DANGER:**

***DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.***




**WARNING:**

***WARNING indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.***



**CAUTION:**

***CAUTION indicates an imminently hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.***

The safety alert pictorial symbol  appears in this document to make users aware of important operating and safety concerns.

### **1.3 GENERAL CABINET DESCRIPTION**

- Built-in automatic voltage regulation enables a wide-input voltage window to deliver power while preventing unnecessary battery drain.
- LED status indicators show voltage, load and battery levels.
- The cabinet can be pad, pole, or wall mounted for utmost mounting flexibility.
- Rain tested to NEMA 3R standards.
- Heavy-duty surge protection and noise filtering protects load and UPS.
- The XUPS uses wide-temperature, pure lead, gel batteries and internal cooling fan to extend battery life and protect electronic components.
- Compatible with high-quality generators.
- Operates in line mode with bad battery bank, which prevents unscheduled service calls.
- The XUPS is easier to repair because internal circuit board assemblies are connectorized.
- Precise output current limiting permits start of induction motors and other difficult loads.
- Includes a two-year limited warranty.

**1.4 OVERALL DIMENSIONS** – The XUPS-1500/2200/3000XL cabinet is 36" (914 mm) H x 36" (914 mm) W x 12" (305 mm) D and weigh (with 4 batteries) 678 lbs / 308 kg for the 1500XL; 688 lbs / 312 kg for the 2200XL and 698 lbs / 317 kg for the 3000XL, see Figure 2.

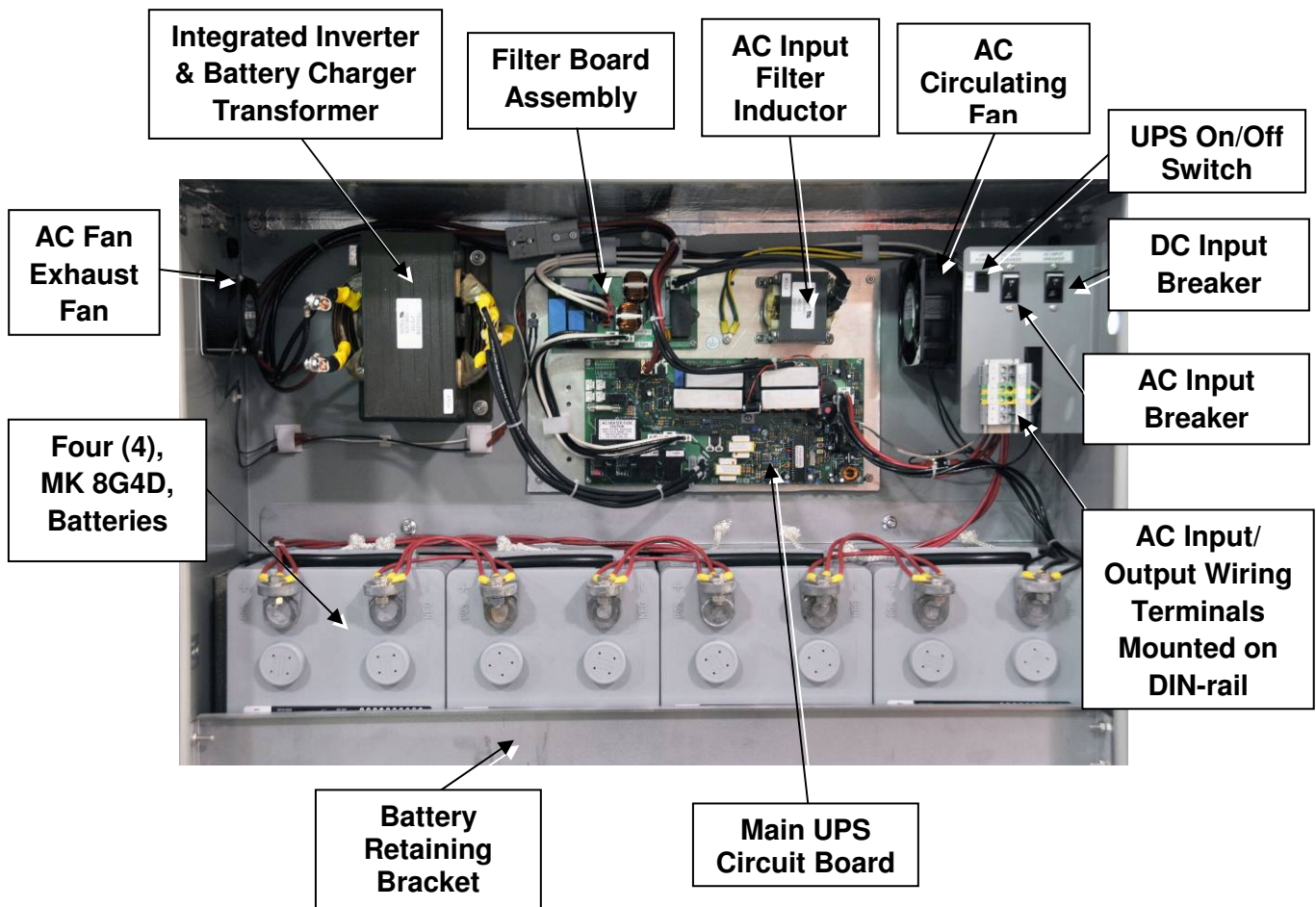


**Figure 2: Outdoor XUPS-1500/2200/3000XL Dimensions**

**1.5 CONSTRUCTION** – The XUPS-1500/2200/3000XL cabinet is constructed of 14 Ga steel with laser welded seams and finished with a gray polyester powder coat that is designed to protect against corrosion, water intrusion UV radiation and impact

resistance. The units output 1050 W for the 1500XL, 1540 W for the 2200XL and 2250 W for the 3000XL, all at 115 V.

**1.6 DOORS & LOCKS** – The electronic/battery compartment is accessed by a front door which is retained by stainless steel hinges and secured by two (2) quarter–turn locks. These locks provide for proper compression gasket sealing and prevent unauthorized entry.



**Figure 3: Electronic/Battery Compartment w/Door Open**

**1.7 FRONT ACCESS (Electronic/Battery Compartment)** See Figure 3

With the front door open, both the electronics and batteries are readily accessible for ease of testing, servicing or component replacement.



## 2. MAJOR COMPONENT / CIRCUIT DESCRIPTIONS

### 2.1 XUPS WIRING DIAGRAM –

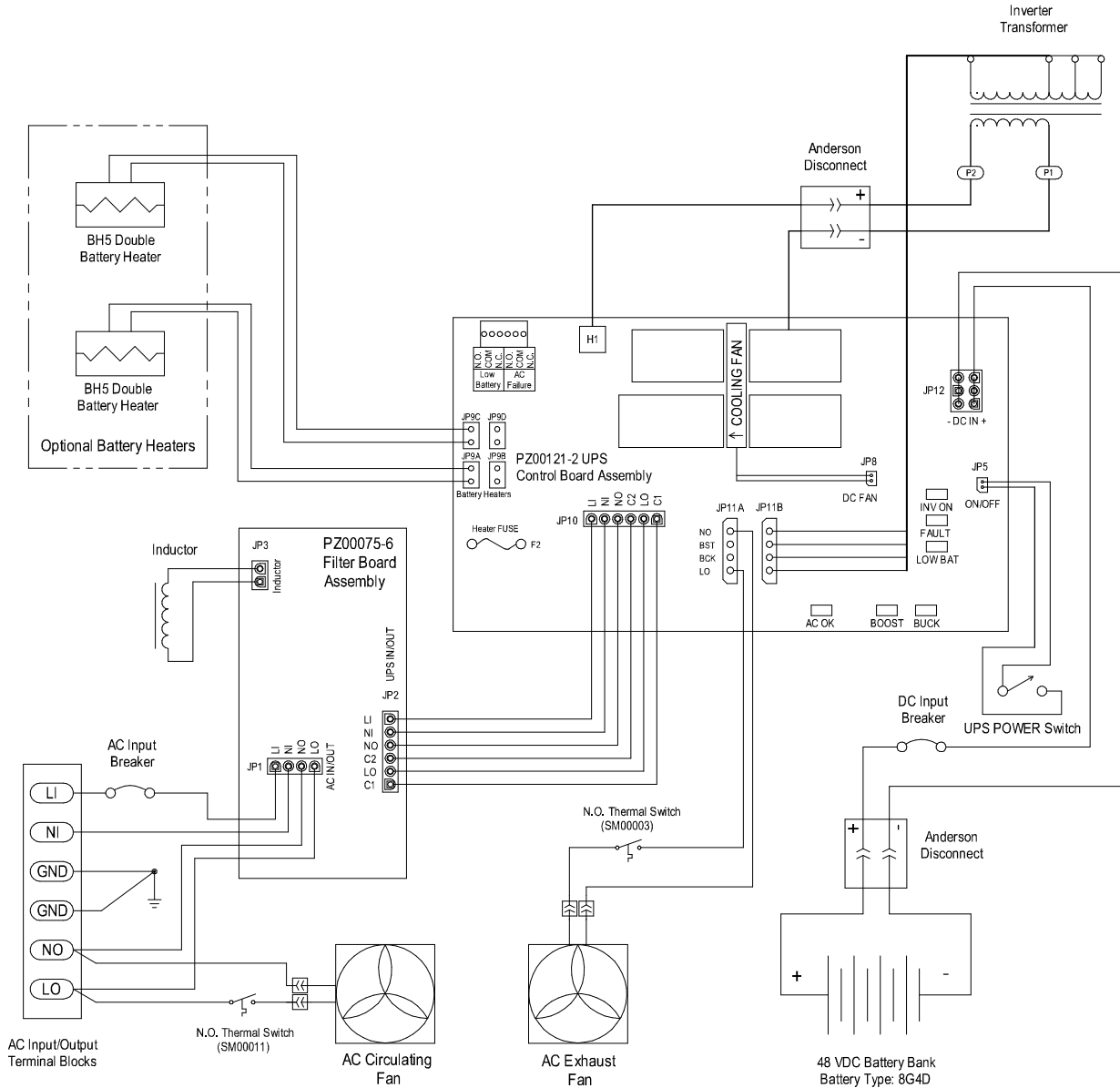


Figure 4: Outdoor XUPS-1500/2200/3000XL Wiring Diagram

### 2.2 INVERTER, CHARGER & VOLTAGE REGULATION TRANSFORMER

The main transformer of the XUPS is connected to the main circuit board and performs three functions: (see Figure 5):

1. Inverter transformer
2. It acts as an auto transformer adjusting the mains voltage as required
3. It charges the Battery Bank as required

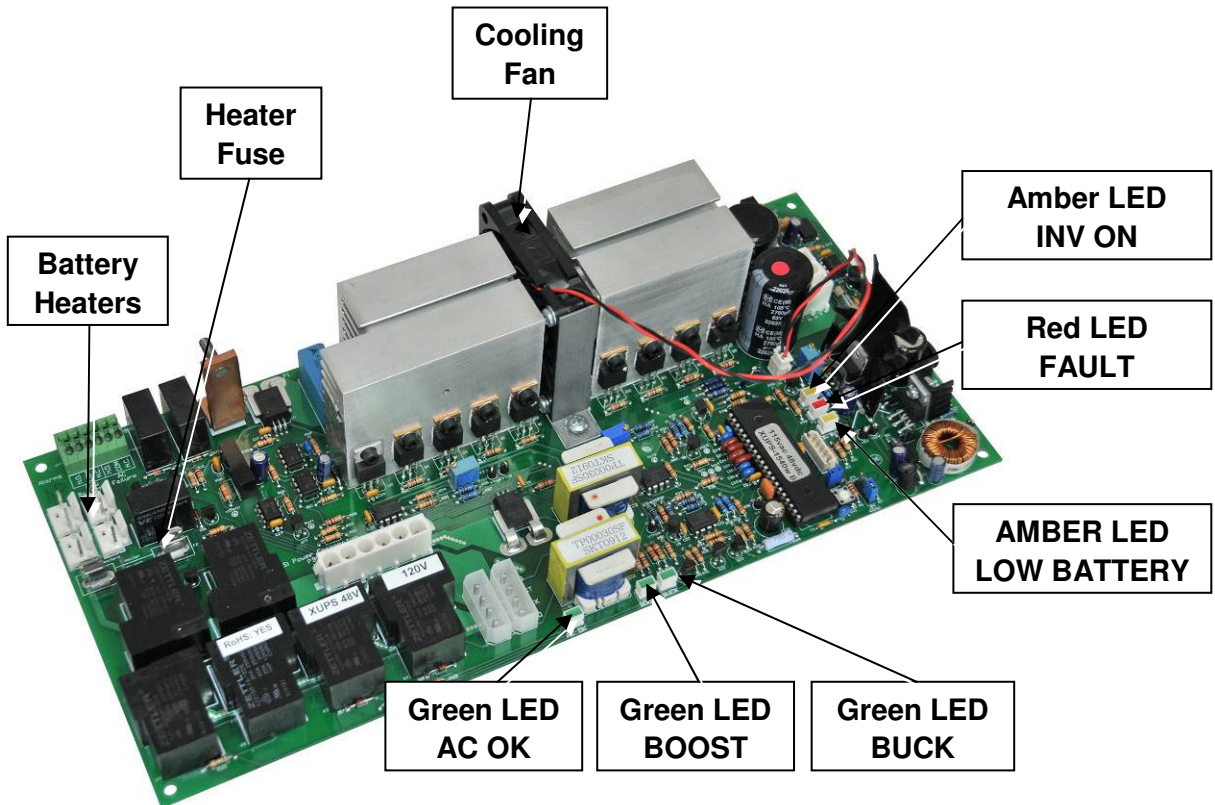


**Figure 5: Inverter & Voltage Regulation Transformer**

### **2.3 INVERTER, CHARGING & VOLTAGE REGULATION MAIN CIRCUIT BOARD**

The control board of the XUPS incorporates a rugged design with a microprocessor-controlled 20 kHz sine wave inverter (see Figure 6). The circuit boards are conformally coated for use in severe outdoor environments. The control board

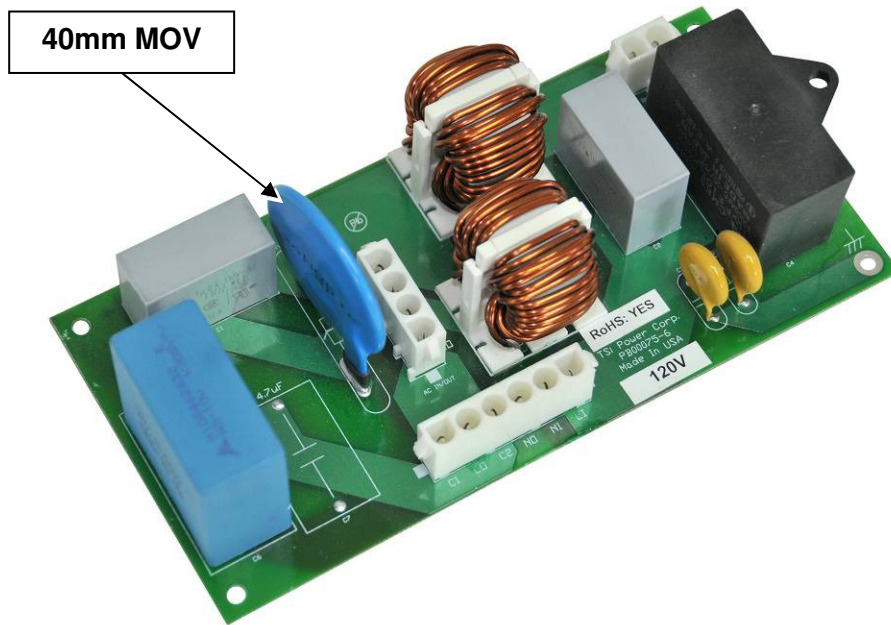
includes integral LED indicators for AC OK, BOOST and BUCK as well as INV ON, FAULT and LOW BAT to provide a real-time status of the XUPS' operation.



**Figure 6: Main Inverter, Charging & Voltage Regulation Circuit Board**

## 2.4 FILTER BOARD ASSEMBLY

The XUPS-1500/2200/3000XL series is protected against surge voltages by a proprietary circuit board. This board uses a 40mm MOV to provide protection and assure the continued function of the XUPS (see Figure 7).



**Figure 7: Filter Board Assembly**

## 2.5 INPUT FILTER INDUCTOR

This 1mh, iron core filter inductor is off board and is placed after the surge protection circuit. It filters out normal mode noise between the line and neutral branches of the incoming AC (see Figure 8).



**Figure 8: AC Input Filter Inductor for 1500XL shown**

## 2.6 ALARM CONNECTIONS

Alarm connection terminations have been integrated into the main control board and are located in the upper left corner of the board. To connect the alarm wires, insert the stripped wire into the desired Wire Inlet and press the corresponding Compression Tab on the connector (see Figure 9).

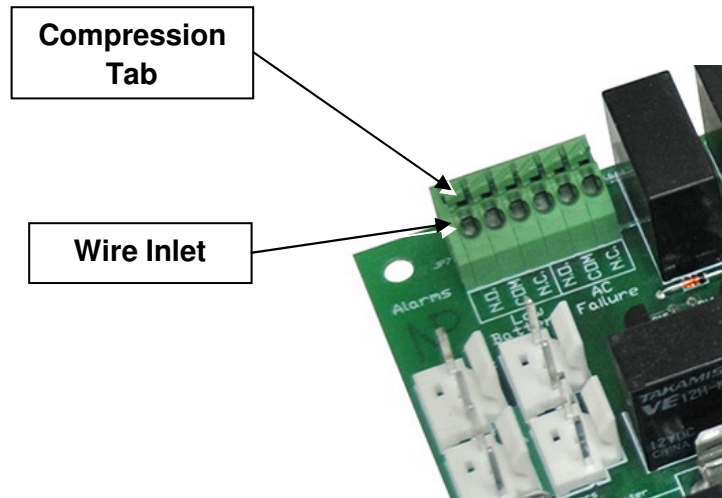


Figure 9: Alarm Connections

### 2.61 Low Battery Alarms

**N.O. – COM:** Open = Battery OK

**N.C. – COM:** Closed = Battery OK

### 2.62 AC Failure Alarms

**N.O. – COM:** Open = AC OK

**N.C. – COM:** Closed = AC OK

## 3. INSTALLATION

**IMPORTANT: ONLY QUALIFIED PERSONNEL SHOULD PERFORM THE INSTALLATION OF THIS PRODUCT.**

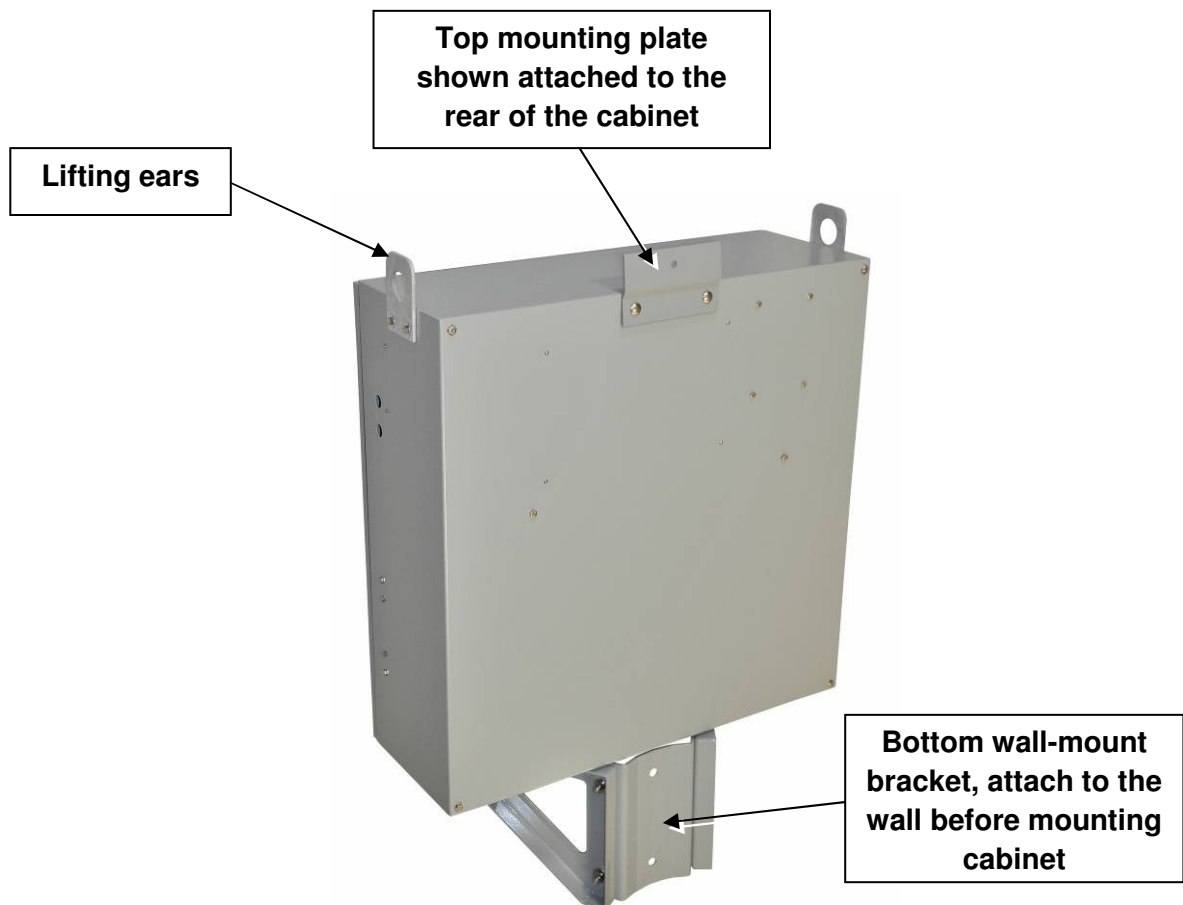


**CAUTION:** *Make sure that appropriate lifting equipment is used and that company safety practices are followed.*

**3.1 TYPE INSTALLATION** – The XUPS Series can be installed in any one of three configurations:

**3.11 Wall Mount**

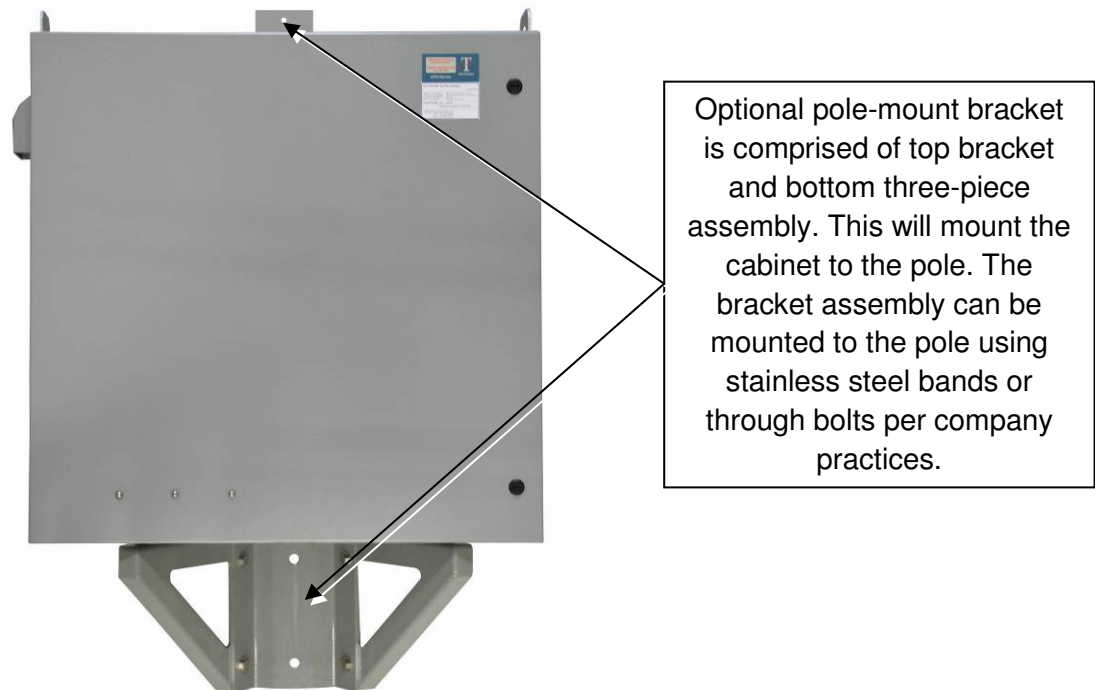
- When ordering the XUPS for this application, an optional Wall/Pole-mount bracket must be included. In this configuration, the unit can be mounted vertically to a solid wall by means of the optional combination Wall/Pole-mount bracket that the cabinet rests on and the mounting plate that is attached to the top rear of the cabinet. The top plate comes attached while the bottom wall-mount bracket comes loose and must be attached to the wall first (see Figure 10).
- Before this unit is mounted, it is important to determine the load bearing capabilities of the mounting surface and to make sure that company practices regarding safety are followed.



**Figure 10: Rear View of Wall Mounting of XUPS**

### 3.12 Pole - Mount

- When ordering the XUPS for this application, an optional Wall/Pole-mount bracket must be included. This bracket will come loose and must be installed on the pole before the cabinet is mounted on top of it. (see Figure 11).



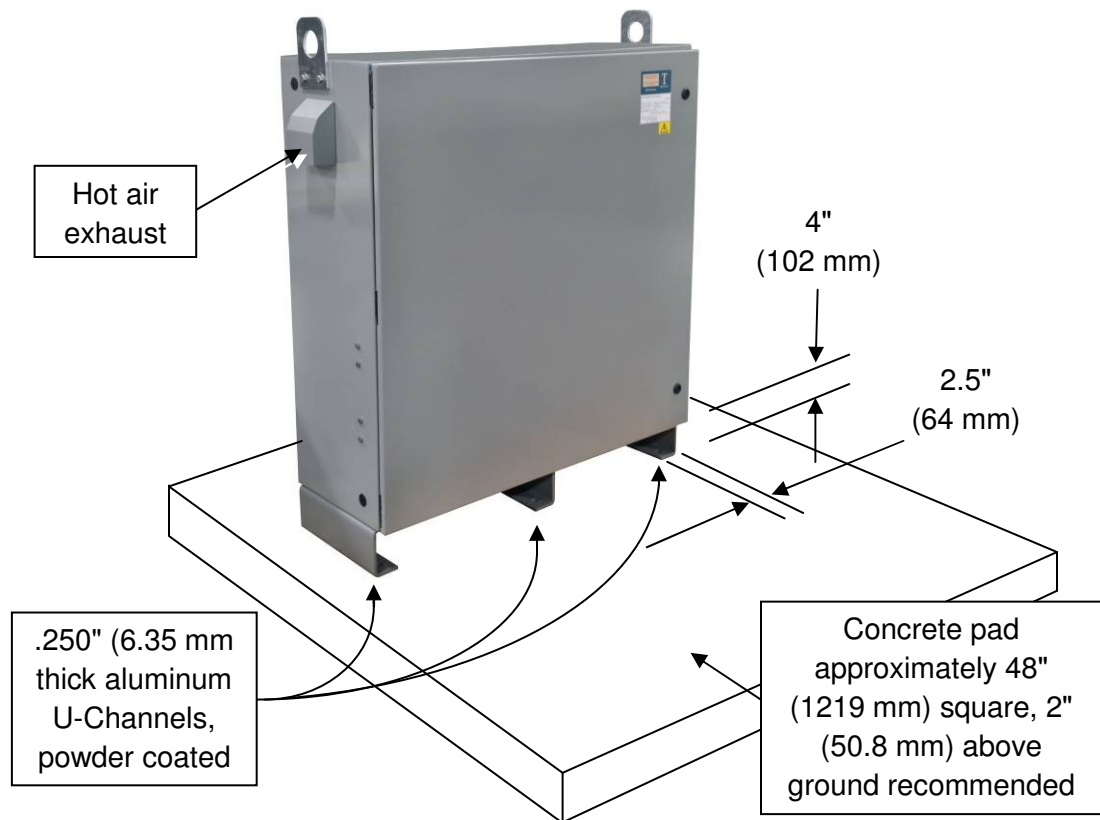
**Figure 11: Mounting of XUPS to a Pole**

- When planning the installation of this product for pole-mounting, it should be installed in RESTRICTED ACCESS LOCATIONS ONLY and as a WALK-UP unit.
- In addition, the cabinet should be mounted on the power pole in such a manner so that the door doesn't open onto a road or a driveway and that the door clearances around the unit provide for unobstructed access.
- Also make sure that the cabinet rests where the cable can easily enter the cabinet from the right side. If bringing in cable through a conduit up the pole, make sure that the trade size of the conduit is no larger than 3/4. Larger conduit will not fit through the cable fitting.
- In order to meet the Walk-Up criteria previously mentioned, mark the pole at eye level and also place a mark on the pole 18" below eye level. This will make sure that

the center of the door is at the eye-level height for optimum accessibility and ease of installation.

- The bracket assembly should then be fastened to the pole by means of stainless steel banding of size and type to be determined by local practices, or by means of two (2) Square-Head Machine thru bolts per company practices.
- After the bracket assembly has been secured to the pole, place the cabinet on the bracket, open the door and secure the cabinet to the bracket using the four (4) nuts, bolts and lockwashers provided.
- Next drive-in a lag screw through the hole in the bracket located on the top-rear of the unit (see Figure 11).
- Provide a 15 A, 120 V service for the 1500XL, a 20 A, 120 V service for the 2200XL and a 30 A, 120 V service for the 3000XL unit all with a disconnect switch. Locate this switch near the vicinity of the XUPS.

### 3.13 Pad-Mount



**Figure 12: Pad-Mounting the XUPS**



- When the XUPS is to be mounted on a pad, three optional painted U-channels must also be ordered. They will be attached to the cabinet when shipped.
- Prepare ground surface and pour concrete pad per local company practices and to approximate size as shown in Figure 12. If composite pad is used, follow manufacturer's instructions.
- Use the four (4) pre-punched holes in the U-channels to position and mount the cabinet assembly to the pad per local practices.

### 3.2 REQUIRED TOOLS

- A standard screwdriver to open the cabinet door
- A standard telco socket wrench set and standard mechanic telco tools
- Appropriate lifting equipment to lift and secure the unit to the appropriate mounting location, pole, pad or wall. The weight with four batteries is 678 lbs (308 kg) for the 1500XL unit, 688 lbs (312 kg) for the 2200XL unit and 698 lbs (317 kg) for the 3000XL unit.

### 3.3 UNPACKING & INSPECTION

- 3.31** The units are shipped in wooden crates, each containing one, two or three units. The units are placed on a pallet, back-to-back, with protective material between them.
- 3.32** Carefully open the crates, making sure not to damage the units, and remove the protective wrap and packing material.
- 3.33** Before the units are removed from the crates, inspect them for physical damage.
- 3.34** If no damage is found, remove the units from the crates, open the door and again inspect for damage. If damage is found in either steps 3.32 or 3.33, do not accept the shipment and file a claim with the carrier. Contact TSi Power for assistance if necessary.



**CAUTION: The units may contain charged batteries capable of causing fire and injury if shorted across terminals. Be very careful not to short terminals accidentally when unpacking.**

## 4. OUTDOOR XUPS-1500/2200/3000XL START-UP PROCEDURES

**Before powering up the unit, make sure that the air inlet and exhaust ports are free of obstruction to prevent overheating.**



**CAUTION: Only people familiar with electricity should perform start-up of the XUPS.**



**CAUTION: Remove metallic watches and rings. Always wear safety glasses, insulated gloves and shoes.**



**CAUTION: Do not dispose of batteries in a fire. The batteries may explode.**



**DANGER: Battery acid is highly corrosive, never touch eyes after handling a battery. Wash hands thoroughly with soap and water after touching a battery.**

#### **4.1 AC INPUT CONNECTIONS**

- 4.1.1** Make sure that an AC, 120 V, 60 Hz mains input service with a disconnect switch is provided near the XUPS and confirm that it is switched **OFF**.

Note: 15A minimum input 120 V service is needed for XUPS-1500XL  
20A minimum input 120 V service is needed for XUPS-2200XL  
30A minimum input 120 V service is needed for XUPS-3000XL

- 4.1.2** If bringing in cable through a conduit, make sure that the conduit is 3/4 trade size and not larger. Larger conduit will not fit through the 1.12" (28.4 mm) dia. holes for cable entry which are on the right side of the unit, see Figure 13.
- 4.1.3** Use 12 AWG (3.31 mm<sup>2</sup>) wire for the 1500XL, 10 AWG (5.26 mm<sup>2</sup>) wire for the 2200XL and 8 AWG (8.26 mm<sup>2</sup>) for the 3000XL, with a 105° C insulation system for all conductors.
- 4.1.4** Allow for sufficient wire length to reach the wiring terminals and leave enough slack to reduce the stress in the wires.
- 4.1.5** Strip approximately 3/8" (10 mm) insulation from the end of each of the six (6) incoming / outgoing AC wires and terminate them in the wiring terminals located on the right side of the cabinet (see Figure 14).
- 4.1.6** Terminate the incoming wires on the terminals marked as shown in Figure 14 and as follows:

- **LI** is for phase conductor (brown or black)

- **NI** is for neutral conductor (blue or white)
- **G** is for safety ground (green/yellow or green)

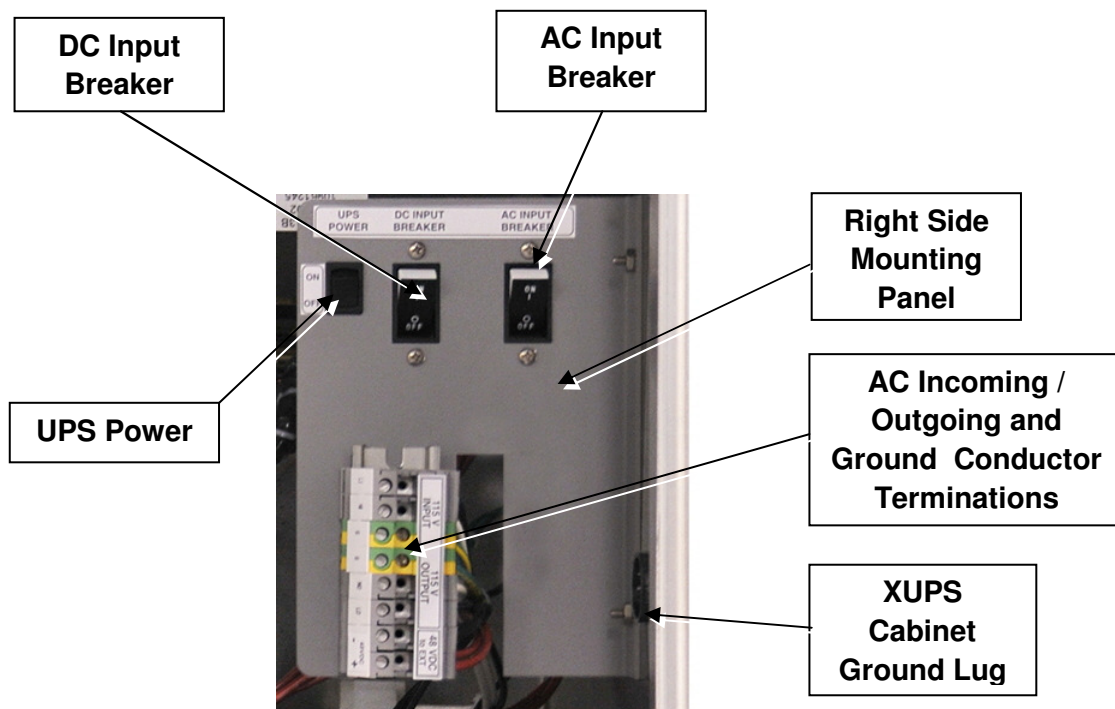


**Figure 13: Cable Entry and Exit Ports in Right Side of Cabinet**

**4.17** Terminate the outgoing wires on the terminals marked as shown in Figure 14 and as follows:

- **LO** is for phase conductor (brown or black)
- **NO** is for neutral conductor (blue or white)
- **G** is for safety ground (green/yellow or green)

- 4.18** In terminating the wires as outlined in 4.16 & 4.17 above, use a slotted screwdriver to tighten the terminal screws until the wires are secure. Do not apply excessive torque to make sure that the terminal screws are not damaged. Once the screws have been tightened, gently tug on the wires to make sure that they are properly connected.



**Figure 14: Incoming & Outgoing Wire Terminations**



**WARNING: TO PREVENT DAMAGE MAKE SURE TO CHECK THAT THE INPUT & OUTPUT WIRES ARE NOT REVERSED.**

## **4.2 ENERGIZING THE OUTDOOR XUPS**

The following steps outline the procedures for putting the XUPS into operation:

- 4.21** A DMM (Digital Multimeter) is required.
- 4.22** Make sure that all AC and DC circuit breakers are in the **OFF** position. Ensure that the UPS On/Off switch is in the **OFF** position.
- 4.23** Check for damage to ensure no components or wires have been damaged in transit.

**4.24** Using the DMM, measure the voltage across the terminals of each battery. Voltages must be 11.5 V each or higher for all 4 batteries (total battery bank end-to-end voltage must be 46 V or higher)

Note: All battery voltages must be within 0.3 V of each other.

**4.25** Make sure that the AC input and output are wired correctly. The Input voltage should be 100 to 130 V, 60 Hz and the load equipment should be turned **OFF**.

**4.26** Turn **on** the **DC INPUT BREAKER**.

**4.27** Turn **on** the **UPS POWER SWITCH** and wait **5 sec.** for **INVERTER** to turn **ON**.

**4.28** Measure UPS output voltage between **LO** and **NO** output terminals. Acceptable voltage range is 115 V  $\pm$ 5%. The UPS is now in battery/inverter mode.

**4.29** Turn **on** the **AC INPUT BREAKER**.

**4.30** Verify that the following LEDs are illuminated:

1. **AC OK** green LED illuminated in approximately 5 seconds.
2. If AC input is too low: Green - Boost LED will illuminate. If AC input is too high: Green - Buck LED will illuminate.
3. If LED **INV ON** remains on or fluctuates between **AC OK** and **INV ON**, check with the power company for out of mains voltage tolerance.
4. Verify that green LED marked as **AC OK** stabilizes and remains ON:

**THE SYSTEM IS NOW READY FOR OPERATION.**

**4.31** Measure output voltage between LO and NO output terminals: Acceptable voltage range is 106 – 126 V, which confirms normal output voltage when AC input is present.

**4.32** Simulate a power outage by switching the AC circuit breaker to the OFF position. The UPS is now in battery/inverter mode. Measure the output voltage between the LO and NO output terminals. Acceptable voltage range is 115 V  $\pm$ 5%.

**4.33** Repeat steps in 4.29 through 4.31 to verify restoration of normal AC operation. The UPS is now operating correctly without load.

**4.34** **Now switch OFF the AC input breaker, UPS switch and DC input breaker. The UPS is now turned OFF.** Connect the load to output terminals marked **LO** and **NO**.

- 4.35 Switch **ON** any downstream circuit breaker between the UPS and the load.
- 4.36 Switch **ON** DC breaker and UPS switch. Wait for 5 seconds until yellow INV LED is **ON**.
- 4.37 Switch **ON** AC breaker. Relays on control board will make a clicking noise. AC OK green LED should illuminate in approximately 5 seconds.
- 4.38 Verify that the load equipment is operating properly
- 4.39 Simulate transfer to battery/inverter and return to normal AC operation by following steps in paragraphs 4.31 to 4.33. Verify that the load equipment continues to operate normally and without interruption.

## 5. MAINTAINING THE OUTDOOR XUPS-1500/2200/3000XL

To make sure that the unit is functioning properly and safely, check the following periodically or at least once a year:

### 5.1 OUTDOOR XUPS OPERATION

- 5.11 Switch-**OFF** the AC Breaker disconnect.
- 5.12 Verify that the XUPS operates in **Inverter Mode** with **Amber LED ON**.
- 5.13 Simulate a 10 minute power outage.

After 10 minutes of operation on Inverter Mode (after 10 minutes of battery discharge), measure the battery terminal voltages to verify that each battery voltage is 12.5 V or higher (and that the maximum voltage differential between batteries is 0.3 V).

Replace batteries if they do not meet the minimum requirements as specified above. All batteries must be replaced—even if one battery appears OK. If they are not equal, battery life will be shortened drastically due to uneven cell voltages.

### 5.2 CABINET INTEGRITY

- 5.21 Check the air intake and exhaust for dust and debris. Remove as required.
- 5.22 Check for moisture and water accumulation and remove as necessary.
- 5.23 Check to make sure locks are functioning properly and have not been vandalized. Replace if necessary.

**5.24** Check the gasketing to make sure that door seals are still tight and effective. Replace if necessary.

### **5.3 ANNUAL BATTERY MAINTENANCE**

See Section 6 for battery replacement.

**5.31** Check the batteries for electrolyte leakage. Clean up and replace if necessary.

**5.32** Measure the battery terminal voltage of all batteries (when the batteries are fully charged). Each battery should have a terminal voltage of  $13.5\text{ V} \pm 0.3\text{V}$ . Replace **All** batteries if the difference is larger than  $\pm 0.3\text{V}$ .

## **6. TROUBLESHOOTING & COMPONENT REPLACEMENT**

### **6.1 TROUBLESHOOTING**

This XUPS is designed to facilitate quick replacement of circuit boards in the field. Therefore, troubleshooting procedures described in this manual are limited to visual inspection and board and battery replacement only. More detailed troubleshooting, repair and calibration can only be done at the TSi Power factory. It is recommended that customers outside North America maintain a small inventory of replacement circuit board assemblies. Please check with TSi for specifics.

### **6.2 REPLACING BATTERIES**



**DANGER:** *The servicing or replacement of batteries should be restricted to qualified and experienced personnel.*

- **Use extreme care when handling the batteries.**
- **When lifting the batteries wear heavy gloves and safety glasses at all times.**
- **Do not wear rings, metal wrist bands, or bracelets.**
- **Do not allow metal objects to come in contact with the terminal side of the batteries.**
- **Use tools with insulated handles.**
- **Disconnect charging source prior to connecting or disconnecting battery terminals.**

- **Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electric shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance.**



**CAUTION: Do not dispose of batteries in a fire. The batteries may explode.**



**CAUTION: Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.**



**CAUTION: A battery can present a risk of electric shock and high short-circuit current.**

**AVERTISSEMENT: Ne jetez pas les batteries dans un feu. Elles pourraient exploser.**

**AVERTISSEMENT: N'ouvrez pas et n'altérez pas physiquement les batteries. La solution électrolyte qui sera libérée est dangereuse pour la peau et des yeux. Elle pourrait même être toxique.**

**ATTENTION: Une batterie peut présenter un risque de décharge électrique et un fort courant de court-circuit.**

**6.21** The battery compartment accommodates four (4) 183 Ah, 12 V batteries (MK Battery, 8G4D batteries), connected in series to form 48 V, 183 Ah battery bank Batteries. See Figure 15. Note: The MK 8G4D battery is Hazmat. Refer to MSDS link at MK web site for shipping and handling.

<http://www.mkbattery.com/documents/118EPM%20Gel%20MSDS.pdf>

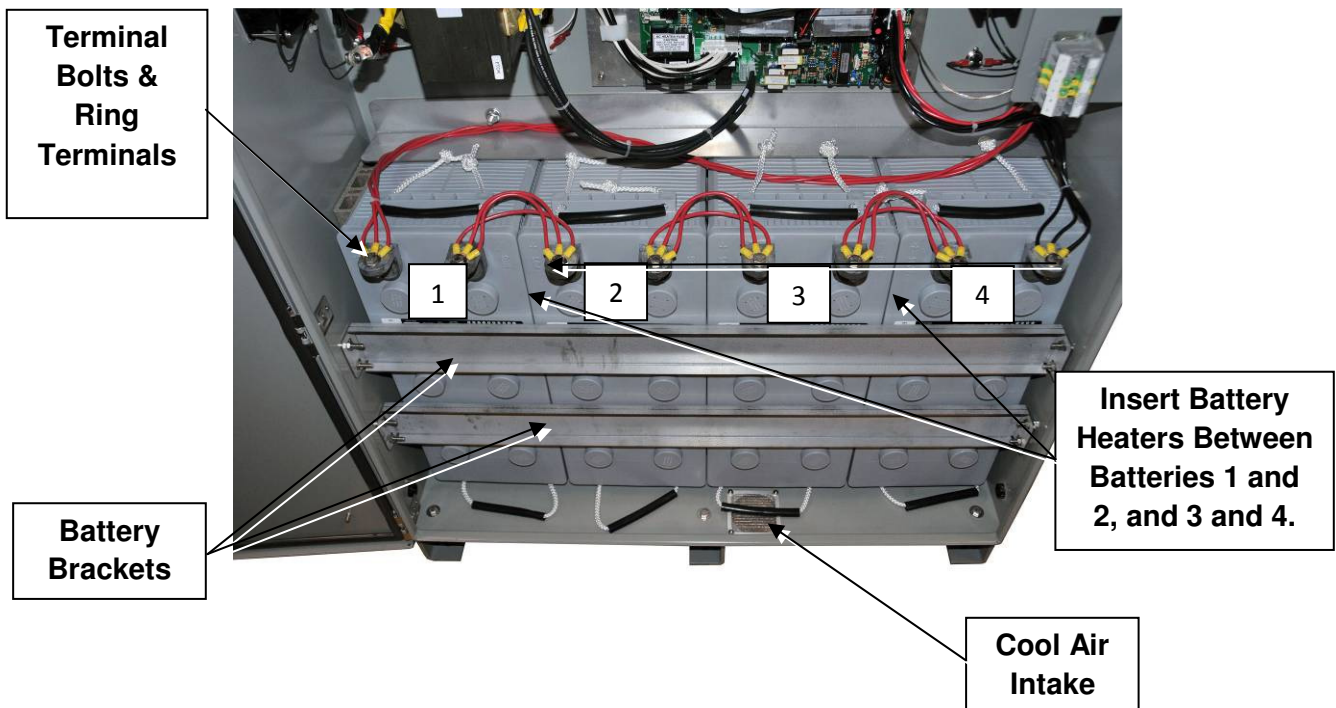
**6.22** Only wide-temperature rated, valve-regulated sealed gel batteries such as MK Battery's 8G4D should be used (TSi Power's part number for the 8G4D battery is VB00014).

**6.23** The following battery replacement procedure should be followed:

- Turn off AC circuit breaker,
- Turn off external disconnect,
- Turn off DC circuit breaker,
- Loosen terminal bolts,
- Remove ring terminal connections one by one and save hardware,
- Set battery jumpers aside,
- Remove battery brackets.
- Pull out old batteries carefully, set them aside,
- If heating pads are used, set them aside,



- Install new batteries. If heating pads are used, follow the instructions shown in section 7.
- Reinstall battery brackets,
- Connect battery jumpers and cables using the hardware that came with the new batteries. Tighten bolts and nuts lightly.
- Torque bolts in accordance with battery manufacturer's specifications.



**Figure 15: Four (4), 8G4D Battery Configuration Shown in Open Battery Compartment**

- Check all connections,
- Re-energize system,
- Dispose of old batteries in accordance with battery manufacturer's instructions.

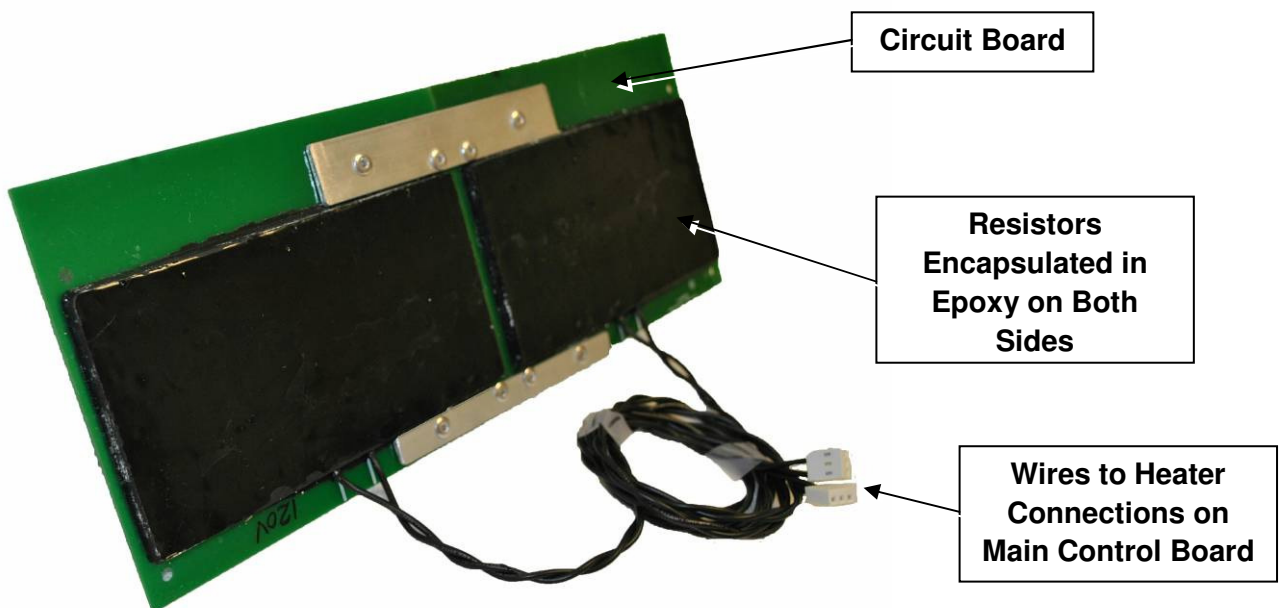
## 7. OPTIONAL EQUIPMENT

### 7.1 OPTIONAL BATTERY HEATER CIRCUIT BOARD

The optional battery heating pads are constructed from printed circuit boards with resistor networks that are encapsulated in epoxy (see Figure 16). The AC current flows through the resistors to generate heat. By being pressed against the walls of the batteries, the batteries are heated.

Installation of the heater pads is as follows:

- Turn the AC circuit breaker off,
- Turn the DC circuit breaker off,
- Remove connections between batteries (save hardware),
- Remove battery brackets,
- Remove batteries by pulling them out of compartment,
- Remove spacers from both side walls of compartment (if present),
- Push batteries 1 and 4 gently back into compartment and against back wall,
- Place heating pads so that they press against the sides of batteries 1 and 4 so that they are facing toward the middle of the cabinet,
- Push batteries 2 and 3 back into the compartment, making sure they rest up against the heating pads which are now between batteries 1 and 2 and 3 and 4,
- The heating pads should now be secure between the batteries,
- Replace battery brackets,
- Run the heater wires back to the heater connections on the Control PCB and mate the connectors with the headers,
- Reconnect the battery wires to the batteries,
- Restart the XUPs.



**Figure 16: Optional Battery Heater BH5 Double Circuit Board**

## 8. REPAIRS, SERVICE & SPARE PARTS

**8.1 REPAIRS** - The Outdoor XUPS-1500XL, 2200XL and 3000XL should only be repaired by persons with knowledge of power electronics and electrical safety procedures. Others should contact TSi Power Corporation for help. The TSi service representative will determine the nature of the problem and replacement parts will then be shipped as required.

**8.2 SPARE PARTS** - The table below contains information on replaceable parts that can be ordered from TSi Power if necessary.

Description	TSi Part Number	Manufacturer	Mfg. Part No.
Main UPS PCB	PZ00121-2	TSi Power	N/A
Filter/Surge Protection PCB	PZ00075-6	TSi Power	N/A
120 V Epoxy Encased Battery Heater	BH5 Double	TSi Power	N/A
Input inductor for XUPS-1500XL	IT00016	Johnson Electric Coil	J13939
Input inductor for XUPS-2200XL and 3000XL	IT00015	Johnson Electric Coil	J13794
Inverter transformer for XUPS-1500XL	TP00236B	Johnson Electric Coil	J15208 (RoHS Compliant)
Inverter transformer for XUPS-2200XL	TP00213B	Johnson Electric Coil	J14394 (RoHS Compliant)
Inverter transformer for XUPS-3000XL	TP00225B	Johnson Electric Coil	J15105 (RoHS Compliant)
DC Battery breaker-40 A	FC00082	Carling Technologies	C11-B0-36-640-211-E
DC Battery breaker-60 A	FC00093	Carling Technologies	C11-B0-36-660-211-E
DC Battery breaker-80 A	FC00083	Carling Technologies	C11-B0-36-680-211-E

AC Input Breaker-15 A	FC00021	Carling Technologies	A11-B0-24-615-111-E
AC Input Breaker-20 A	FC00017	Carling Technologies	A11-B0-24-620-111-E
AC Input Breaker-30 A	FC00019	Carling Technologies	A11-B0-24-630-111-E
183 Ah battery	VB00014	MK Battery	8G4D
AC Fan (hot air exhaust, 80 mm)	VF00015	NMB Technologies	3115FS-12W-B30-A00
AC Fan (air circulation, 120 mm)	VB00009	NMB Technologies	4715FS-12T-B50-D00

- 8.3 FIRMWARE UPDATE** - TSi products are continuously improved. As such, we release upgraded firmware with the latest improvements. To request a programmed microprocessor with the most current revision level, please contact us. When installing the upgraded chip please follow the instructions below.
- 8.31** Shut down the XUPS in accordance with procedure in Section 4.
- 8.32** Equalize static electricity charge by touching the XUPS enclosure.
- 8.33** Locate component U1 on the PZ00121 main control board. There are four heatsinks on this board. U1 is located close to the center of this board. Take note of the orientation of the chip in the socket (the semi circle depression located on one end of the chip will be closest to the four aluminum heatsinks). (See Figure 6).
- 8.34** Extract the 40-pin microprocessor by using the supplied extraction tool. To position This tool, it might be necessary to slightly bend the yellow decoupling capacitor away from the bottom of the header.
- 8.35** After removing the chip, firmly place the new chip into the header. The orientation should be identical to the extracted chip. Make sure that all 40 pins are firmly inside the socket positions. This concludes the firmware upgrade.
- 8.36** Verify that the XUPS with new microprocessor is operating correctly using system start-up & functional testing procedures per Sections 4.21 to 4.40.

## 9. REFERENCE

### 9.1 SPECIFICATIONS

SPECIFICATION	1500XL	2200XL	3000XL
<b>INPUT</b>			
Nominal voltage & frequency	115 V, 57 - 63 Hz		
Operating voltage	96 - 136 V without transferring to inverter		
Current @96 V & max charging	13 A	17 A	25 A
Circuit breaker	15 A	20 A	30 A
Surge voltage test condition	ANSI/IEEE: 6 kV, 1.2 x 50 $\mu$ s / 3k A, 8 x 20 $\mu$ s		
Surge voltage let-through	L-N: 450 V L-G: 300 V N-G: 300 V		
<b>OUTPUT</b>			
Output power	1050 W	1540 W	2250 W
Voltage	115 V $\pm$ 8%		
Crest factor	3 : 1		
Waveform and THD	Sine wave, < 3% THD with linear load		
Power efficiency	Line: 97%, Inverter: 92% under full load conditions		
Transfer time	0 to 8 milliseconds		
<b>BATTERY</b>			
Type / MK battery part number	Wide-temperature, sealed gel cells pure lead, MK battery / 8G4D		
Dimensions: L x W x H Inch / mm	20.73 / 527 x 8.44 / 214 x 10 / 254		
Weight: lbs ( kg )	136.6 ( 62 )		
Ah @ 20hr rate and bus voltage	183 Ah, 48 VDC		
Number of batteries	4		
Battery circuit breaker	40 A	60 A	80 A
Temp. range fully charged	-15° to +50° C / 5° to +122° F / -40° to +50° C / -40° to +122° F with optional battery heater		
Battery heater pad BH 5-double: W, quantity	34 W, 2 double		
Battery backup time vs. load - Actual time may vary due to battery condition and ambient temperature	6.5 hrs	4 hrs	2.3 hrs
Recharge time	Temperature compensated charger, charge to 90% capacity after full discharge		
	36 hrs		
<b>INDICATORS AND ALARMS</b>			
LED Status indicators on control board	Inverter on: Amber: Low battery: Amber after inverter shut down following low battery, after long outage Fault: Red for overload / red blinks for high temp; AC ok: Green when AC in buck, bypass or boost mode		
N / O or N / C contacts	Two (2) relay contact signals are provided for AC Failure and Low Battery ( lower than 45 V ) Alarm		
<b>PHYSICAL</b>			
Dimensions: W x H x D Inch / mm	36 x 36 x 12 / 914 x 914 x 305		
Aluminum cabinet	Outdoor type, powder coated, rain tested to NEMA 3R UL 50E		
Input / output connections	3 position terminal block provided for 3 conductors with 1.12" dia. hole for 3/4" conduit connectors		
Weights with batteries lbs ( kg )	678 ( 308 )	688 ( 312 )	698 ( 317 )
Mounting option	Pad (ground) with bottom mounted u-channels, optional pole mounting bracket PM		
<b>ENVIRONMENTAL</b>			
Operating temperature	-14° to +113° F ( -10° to +45° C ) ambient air temperature		
Battery heater option: BH5-double	-40° to +113° F ( -40° to +45° C ) with optional battery heater		
Cooling method	Thermostat controlled exhaust fan		
Moisture protection	Conformal coating of electronic boards for moisture resistance		
<b>SAFETY</b>			
Standards	Designed to conform to UL 60950-1 and UL 1778		
<b>WARRANTY</b>			
Warranty	Two-year limited warranty on parts and labor. Manufacturer warranty on batteries.		

## 9.2 TSi POWER CONTACT INFORMATION

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