



Operating Manual for:
Outdoor XUPS-1000-mini
MC00050
Issue 1, May, 2013

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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	May, 2013	Issue 1

1. GENERAL

1.1 PRODUCT APPLICATION

This outdoor UPS is ideal for the protection of distributed antenna systems (DAS), sewage control systems / perimeter surveillance and security / gate control systems, LED traffic light / roadway display systems and industrial remote terminal units (RTUs). It is equipped with wide-temperature, pure lead, gel batteries and is housed in a weather-protected enclosure. It offers line-interactive automatic voltage regulation, surge protection with heavy duty noise filtering, communications capability and optional extended battery backup.



Figure 1: The XUPS-1000-mini 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 XUPS is compatible with high-quality generators.
- The cabinet can be pole mounted.
- Rain tested to UL 50E 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.

- 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-1000-mini cabinet is 20.4" (518 mm) H x 16.7" (424 mm) W x 9.7" (246 mm) D and weighs 114 lbs/51.7 kg (with 4 batteries), see Figure 2.



Figure 2: Outdoor XUPS-1000-mini Dimensions

1.5 CONSTRUCTION – The XUPS-1000-mini cabinet is constructed of 5052-H32 aluminum and finished with a gray polyester powder coat that is designed to protect against corrosion, water intrusion UV radiation and impact resistance. The XUPS-1000-mini outputs 1050 W at 127 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 a quarter–turn lock. This lock provides for proper compression gasket sealing and prevents unauthorized entry.

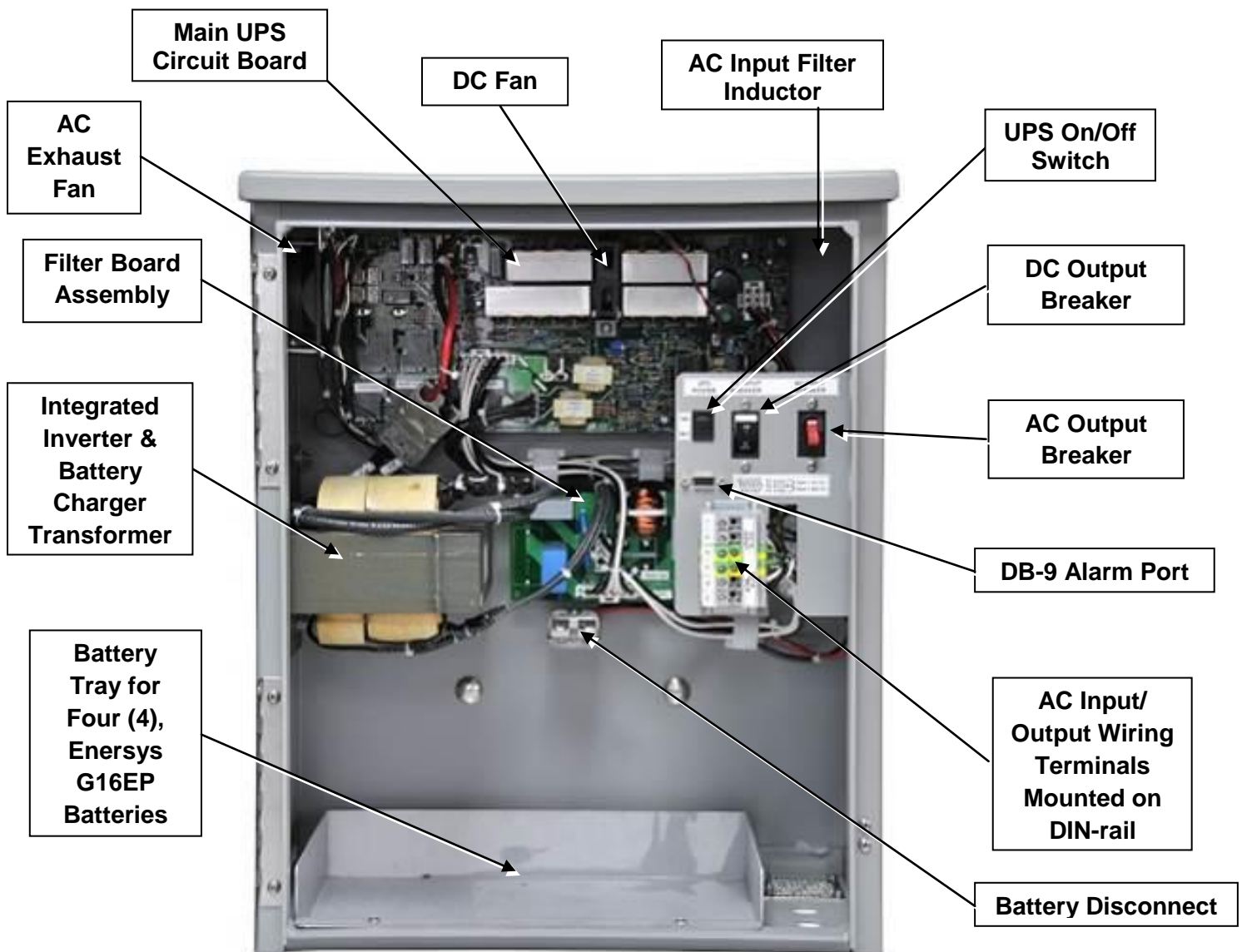


Figure 3: Electronic/Battery Compartment w/Door Open

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 –

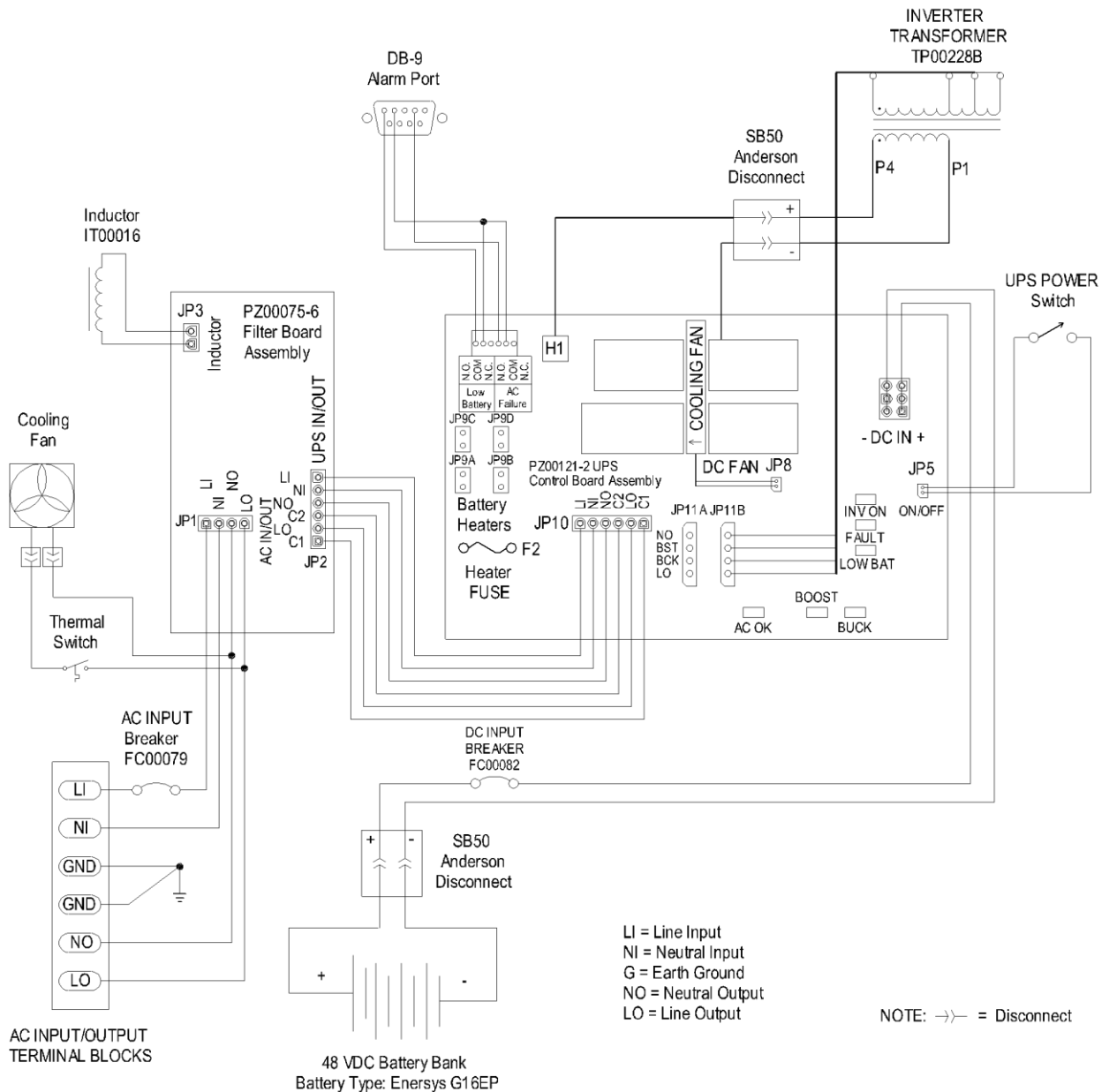


Figure 4: XUPS-1000-mini Wiring Diagram

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 uses 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.

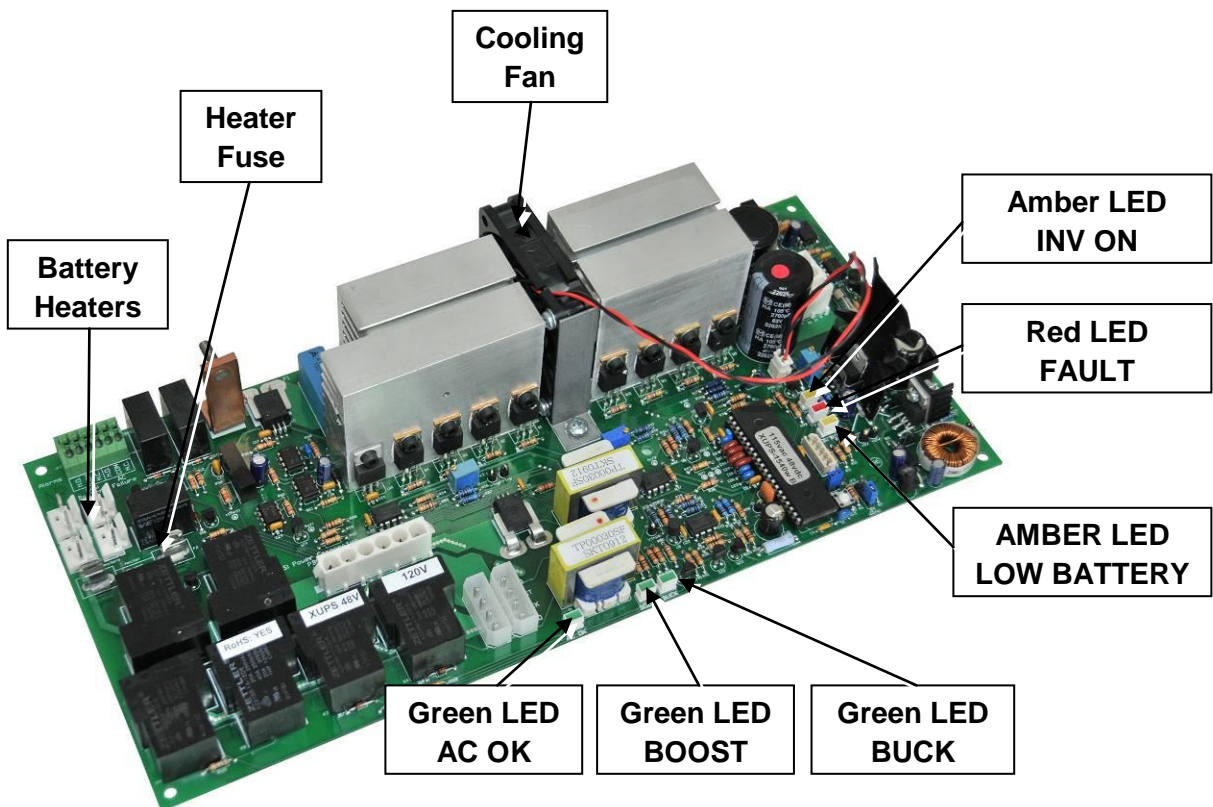


Figure 6: Main Inverter, Charging & Voltage Regulation Circuit Board

2.4 FILTER BOARD ASSEMBLY

The XUPS-1000-mini 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).

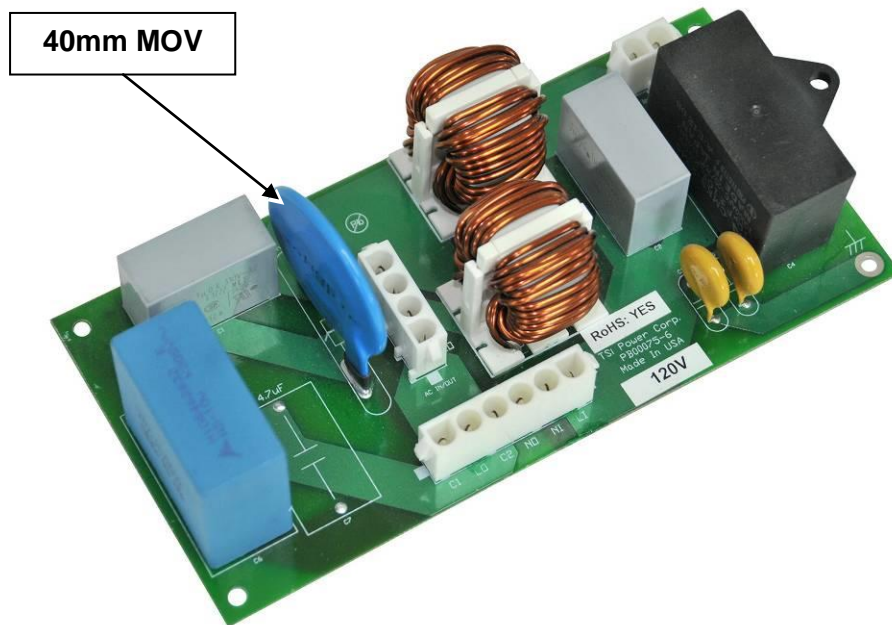


Figure 7: Filter Board Assembly

2.5 INPUT FILTER INDUCTOR

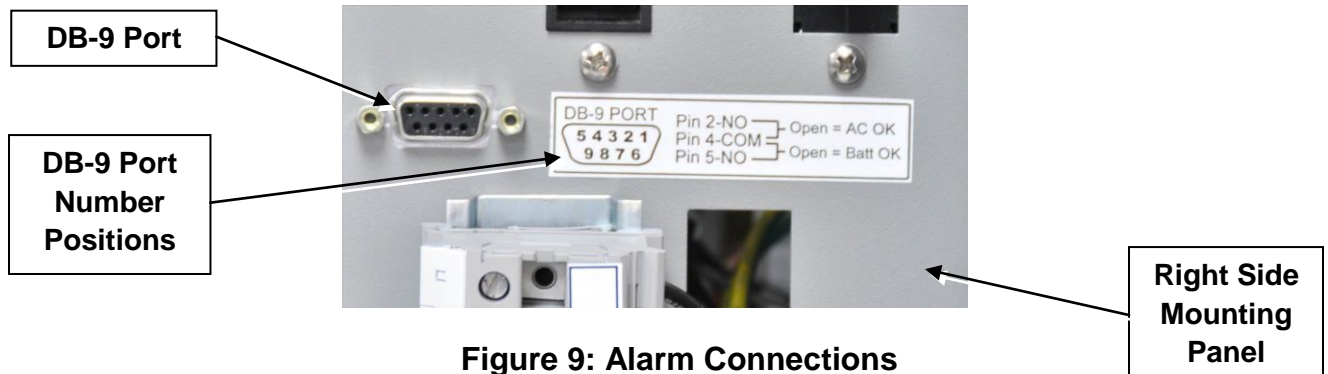
This 1mh, iron core filter inductor is off board and is placed after the surge protection circuit. It filters out normal mode noise between the line and neutral branches of the incoming AC (see Figure 8).



Figure 8: AC Input Filter Inductor

2.6 ALARMS CONNECTIONS

Relay contact status alarm signals are available through the DB-9 Port (see Figure 9) located in the right side of the electronics compartment (see Figure 3). See below for the output signal assignment.



2.61 Low Battery Alarm

Pin 5: N.O. – Pin 4: COM: Open = Battery OK

2.62 AC Failure Alarm

Pin 2: N.O. – Pin 4: COM: Open = 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 – The Outdoor-XUPS-1000-mini is configured for Pole-Mount installation only (see Figure 10).

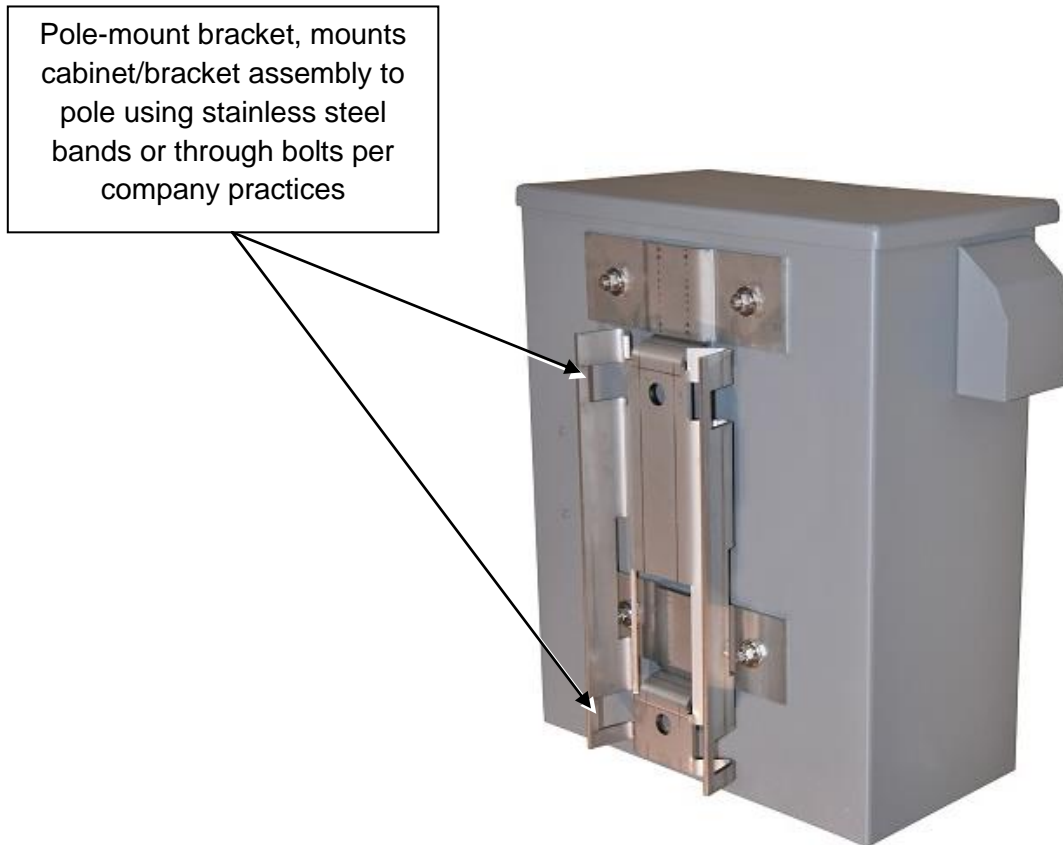


Figure 10: Mounting of XUPS to a Pole

- This product is intended for installation in RESTRICTED ACCESS LOCATIONS ONLY.
- It is recommended that this unit be installed as a Walk-Up unit making sure that the center of the door is at an eye-level height for optimum accessibility and ease of installation.
- 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.
- Position the cabinet on the pole so that the cabinet rests where the cable can easily enter the cabinet from the bottom. If bringing in cable through a conduit up the pole, make sure that the trade size of the conduit is no larger than ½". Larger conduit will not fit through the cable fitting.

- Make sure that the door clearances around the unit provide for unobstructed access.
- Fasten the pole-mount bracket to the pole by means of through bolts or stainless steel banding of size and type to be determined by local practices.
- Slid the unit onto the pole-mount bracket as shown in figure 10.
- Provide a 15 A, 127 V service with a disconnect switch in the near vicinity of the XUPS.

3.2 REQUIRED TOOLS

- Southco key to open the cabinet door (a key is provided with each new unit)
- 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. The weight with four batteries is 114 lbs (51.7 kg).

3.3 UNPACKING & INSPECTION

- 3.31** The units are shipped one per box or in wooden crates, each containing up to twelve units. The units are placed on a pallet 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. BATTERY INSTALLATION

- Check **UPS Power** switch, **AC Input Breaker** and **DC Input Breaker** are in the **off** position (see Figure 12),
- Remove **Battery Tray** from XUPS (see Figure 3),
- Install four (4) new Energys G16EP batteries (see Figure 14), *Note: Battery Positive (+) terminals toward front edge of Battery Tray,*
- Connect battery jumpers and cables (supplied with UPS) as shown in Figure 14, using the hardware that came with the new batteries. Tighten bolts and nuts lightly.
- Torque bolts in accordance with battery manufacturer's specifications.
- Using a Voltmeter, verify that the voltage across the **Wire Kit Battery Disconnect** (battery Bank) is approximately +48 VDC (see Figure 14),
- Install Battery Tray with Batteries into the XUPS enclosure (see figure 13),
- Connect **Wire Kit Battery Disconnect** (see Figure 14) to **UPS battery Disconnect** (see Figure 3) as shown in figure 13,
- Check all connections,
- XUPS is now ready to be powered up.

5. POWERING UP THE XUPS

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

5.1 AC INPUT CONNECTIONS

- 5.11** Make sure that an AC, 15 A, 127 V service with a disconnect switch is provided near the XUPS and confirm that it is switched **OFF**.
- 5.12** If bringing in cable through a conduit up the pole, make sure that the trade size of the conduit is ½" and not larger. Larger conduit will not fit through the 1/2" conduit holes for cable entry which are on the bottom of the unit, see Figure 11. Cool air intake vent is also located on the bottom.

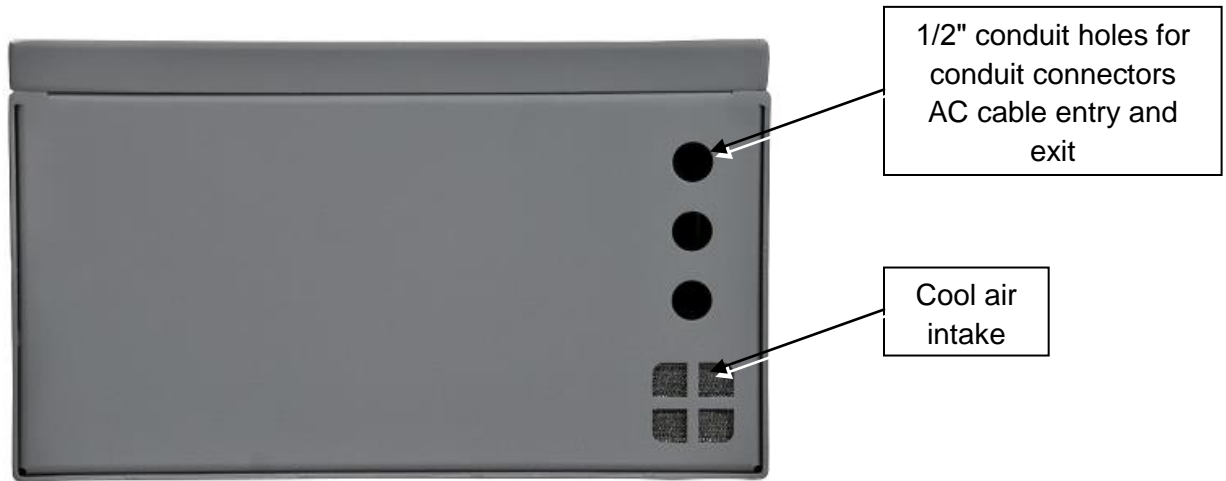


Figure 11: Cable Entry and Exit Ports in Bottom of Cabinet

- 5.13** Use 12 AWG wire with a 105° C insulation system for all conductors.
- 5.14** Allow for sufficient wire length to reach the wiring terminals and leave enough slack to reduce the stress in the wires.
- 5.15** Strip approximately 3/8" (9.52 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 12).
- 5.16** Terminate the incoming wires on the terminals marked as shown in Figure 12 and as follows:
- **LI** is for phase conductor (black)
 - **NI** is for neutral conductor (white)
 - **G** is for safety ground
- 5.17** Terminate the outgoing wires on the terminals marked as shown in Figure 12 and as follows:
- **LO** is for phase conductor (black)
 - **NO** is for neutral conductor (white)
 - **G** is for safety ground

5.18 In terminating the wires as outlined in 5.16 & 5.17 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.

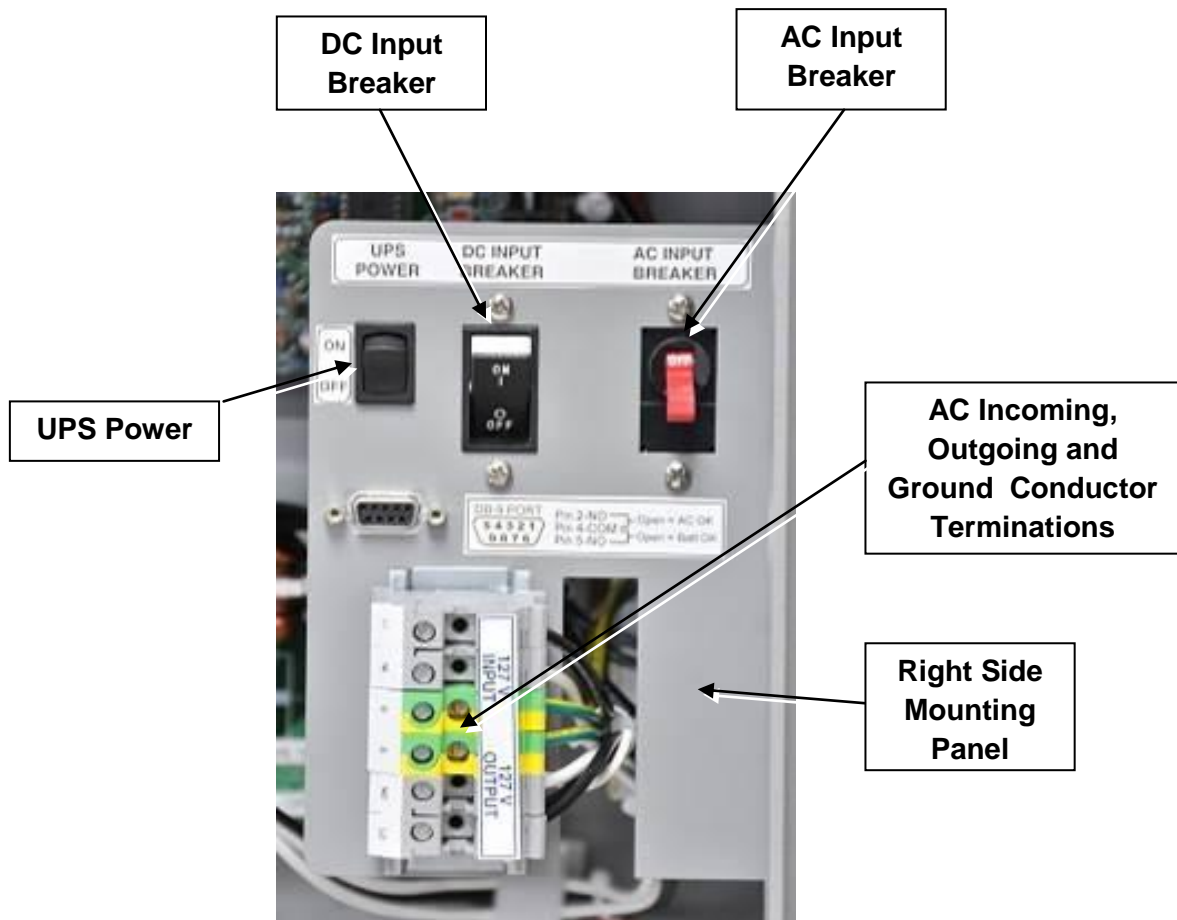


Figure 12: Incoming & Outgoing Wire Terminations



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

5.2 ENERGIZING THE XUPS

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

- 5.21 Turn on the AC, 15 A, 127 V service by putting the **AC INPUT BREAKER** to the **ON** position (see Figure 12).
- 5.22 Turn **on** the **DC INPUT BREAKER**.
- 5.23 Turn **on** the **UPS POWER SWITCH**.
- 5.24 Verify that all LEDs on the Control Board Assembly (see Figure 6) illuminate one by one. **THIS MAY TAKE APPROXIMATELY FIVE (5) SECONDS.**
- 5.25 Verify that the following LEDs are illuminated:
 - 1. Verify that the **AC OK** is illuminated.
 - 2. If LED **INV ON** remains on or fluctuates between **AC OK** and **INV ON**, check with power company for out of mains voltage tolerance.
 - 3. Once the green LED **AC OK** stabilizes and remains ON: **THE SYSTEM IS NOW READY FOR OPERATION.**

6. MAINTAINING THE XUPS-1000-mini

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

6.1 XUPS OPERATION

- 6.11 Switch-off **AC INPUT BREAKER** (see Figure 12).
- 6.12 Verify that the XUPS operates in **Inverter Mode** with **INV ON, Amber LED ON** (see Figure 6).

6.2 CABINET INTEGRITY

- 6.21 Check the air intake and exhaust for dust and debris. Remove as required.
- 6.22 Check for moisture and water accumulation and remove as necessary.
- 6.23 Check to make sure locks are functioning properly and have not been vandalized. Replace if necessary.
- 6.24 Check the gaskets to make sure that door seals are still tight and effective. Replace if necessary.

6.3 BATTERY MAINTENANCE

See Section 7 for battery replacement.

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

6.32 Disconnect battery cable from battery to be checked. Measure the battery terminal voltage of all batteries. Each battery should have a terminal voltage of 13.5 VDC $\pm 0.3V$. Replace **All** batteries if the difference is larger than $\pm 0.3V$.

7. TROUBLESHOOTING & COMPONENT REPLACEMENT

7.1 TROUBLESHOOTING

The Outdoor XUPS-1000-mini 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.

7.2 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.

7.21 The battery compartment accommodates four (4) 16 Ah, G16EP, EnerSys Batteries. See Figure 13.

7.22 Only G16EP wide temperature, sealed, valve-regulated gel batteries made by EnerSys Battery should be used.

7.23 The following battery replacement procedure should be followed:

- Turn off **UPS Power** switch (see Figure 12),
- Turn off **AC Input Breaker**,
- Turn off **DC Circuit Breaker**,
- Disconnect **Battery Disconnect** (see Figure 14) from **UPS Battery Disconnect** (see Figure 3)
- Remove **Battery Tray with batteries** from XUPS (see Figure 13),
- Loosen terminal bolts,
- Remove ring terminal connections one by one and save hardware,
- Set battery jumpers aside,
- Pull out old batteries carefully, set them aside,
- Install new batteries (see Figure 14), *Note: Battery Positive (+) terminals toward front edge of Battery Tray,*
- 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.
- Using a Voltmeter, verify that the voltage across the **Wire Kit Battery Disconnect** (battery Bank) is approximately +48 VDC (see Figure 14),
- Install Battery Tray with Batteries into the XUPS enclosure (see figure 13),
- Connect **Wire Kit Battery Disconnect** (see Figure 14) to **UPS battery Disconnect** (see Figure 3) as shown in figure 13.

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

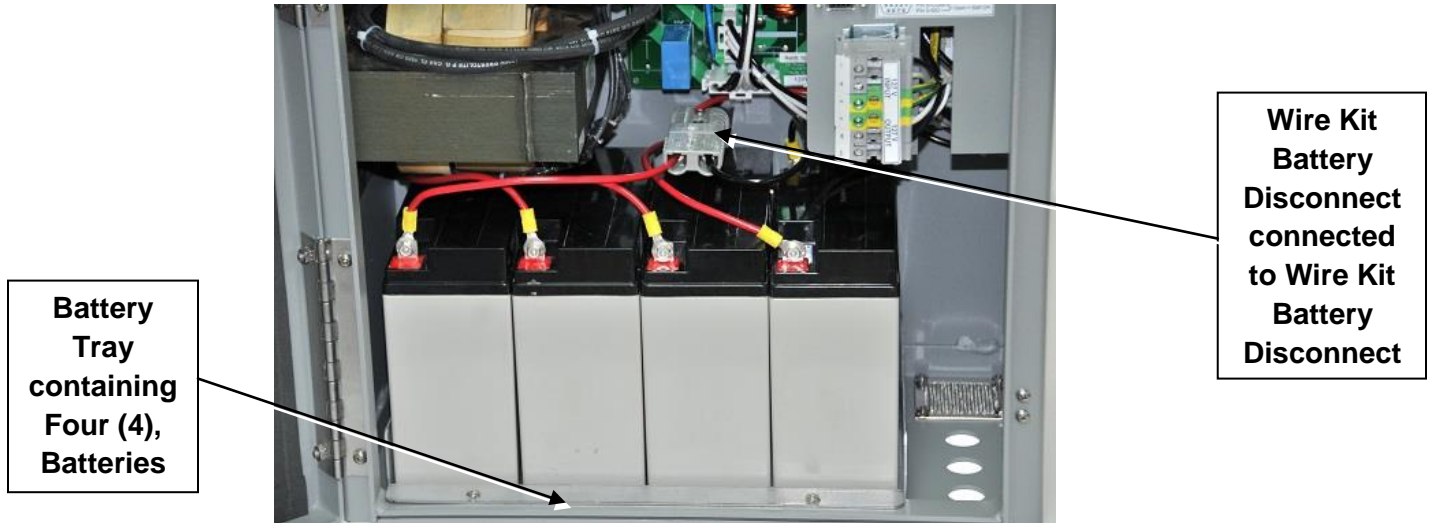


Figure 13: Four (4), G16EP Battery Configuration Shown in Open Battery Compartment

Note: Batteries shown are for instructional purposes only and are not actual Energys G16EP batteries.



Figure 14: Four (4), G16EP Battery Configuration Shown on removed Battery Tray

Note: Batteries shown are for instructional purposes only and are not actual Energys G16EP batteries.

8. REPAIRS, SERVICE & SPARE PARTS

8.1 REPAIRS - The Outdoor XUPS-1000-mini should only be repaired by persons with knowledge of power electronics and electrical safety procedures. Others should contact TSi Power Corporation for a Return Material Authorization (RMA). The TSi service representative will determine if factory repair is necessary and issue an RMA. A replacement unit will be shipped to certain customers with service agreements. TSi retains the repaired unit.

8.2 SPARE PARTS - The table below contains information on replaceable parts that can be ordered from TSi 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
Input inductor	IT00016	Johnson Electric Coil	J13939
Inverter transformer	TP00228B	Johnson Electric Coil	J15137 (RoHS Compliant)
DC Battery breaker	FC00082	Carling Technologies	C11-80-36-640-211-E
AC Input breaker	FC00079	Carling Technologies	C11-80-34-615-211-E
16 Ah battery	N/A	Enersys	G16EP

9. REFERENCE

9.1 SPECIFICATIONS

Input	
Voltage range	106 to 150 V
Nominal voltage	127 V
Frequency	47 - 63 Hz \pm 5%
Current max charging	12.85 A
Surge voltage test condition	ANSI/IEEE: 6 kV, 1.2 x 50 μ s/3 kA, 8 x 20 μ s
Surge voltage let-through	L-N: 450 V L-G: 300 V N-G: 300 V
Circuit Breaker	15 A
Output	
Output Power	1050 W at 0.7 lagging power factor
Voltage	127 V \pm 8%
Crest Factor	3 : 1
Waveform & Harmonic Distortion	Sine wave, <3% THD with linear load
Power Efficiency in AC Line Mode	Line: 97%
Power Efficiency in Inverter Mode	Inverter: 92% under full load conditions
Transfer Time AC Line to Inverter	0 to 8 ms
Battery	
Type	Four (4), wide temperature, sealed 12 VDC gel, valve-regulated, lead-acid, maintenance free Energysys Battery: G16EP (sold separately)
Temperature Range	-40° to +176° F (-40° C to +80° C)
Capacity Ah @ 10 hr rate and bus voltage	16 Ah, 48 VDC

Number of batteries	4
Circuit Breaker	40 A magnetic type
Weight per battery (lb/kg)	13.5 / 6.1
Dimensions (in/mm)	7.15L x 3.01W x 6.61H/182L x 76W x 168H
Battery backup time vs. load	0.22 hrs at 1050 W / 0.5 hrs at 525 W
Recharge Time	Temperature compensated charger, charge to 90% capacity after full discharge – 5.25 hrs
LED Indicators	
INVERTER ON	Amber, Solid
FAULT ON	Red, Solid
LOW BATT ON	Amber, Solid
BUCK ON	Green, Solid
BOOST ON	Green, Solid
AC OK ON	Green, Solid
Mechanical	
Dimensions (in/mm)	20.4H x 16.7W x 9.7D / 518H x 424W x 246D
Weight, without batteries (lb/kg)	60 / 27
Environmental	
Operating Temperature	14° to +122° F (-10° C to +50° C)
Storage Temperature	-76° F to 140° F(-60° C to 60° C)
Humidity	0 to 95 % non-condensing
* Duration of storage will determine the need for supplemental charge, especially at elevated temperatures. ** Extended exposure to temperatures >40° C may shorten battery life.	
Mounting Configuration	

Pole-Mount (comes equipped w/Pole-Mount Bracket – PM1).
Agency Compliance
Rain tested to UL 50E and designed to UL 60950-1 and UL 1778

9.2 TSi POWER CONTACT INFORMATION

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