TSi Power Corporation

Outdoor DC-UPs-250-6070

Description, Installation & Maintenance Manual

MC66070
Issue 1, August, 2009

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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 or its authorized representatives. TSi will repair (or at its option, replace) any defective component(s) during this warranty period. *Excluding batteries. Battery manufacturerôs warranty applies to batteries.

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 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.

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REVISIONS

ISSUE	DATE	REASON FOR REVISION
1	August, 2009	Initial Issue

1. GENERAL

1.1 PRODUCT APPLICATION

The Outdoor DC-UPs-250-6070 is designed specifically for powering wireless communication and security equipment. The product is intended for installation on a power pole by means of a customer supplied mounting bracket attached to the two receptacle brackets on the back of the unit. The enclosure is NEMA 3R rated with extra door sealing gaskets to protect the internal components against direct ingress of water and dust. The internal electronic circuit boards are protected by a layer of conformal coating.

Figure 1: The Outdoor DC-UPs-250-6070 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 FEATURES/COMPONENTS

- NEMA 3R metal enclosure with a front access door,
- Screened air exhaust vents at top and bottom of the cabinet,
- Four 12V, 12Ah @ 20hr rate, sealed lead acid (VRLA) batteries forming a 48V, 12AH battery bus,
- AC input surge protection circuit board,
- AC fan for cooling,
- AC input/output wiring terminals mounted for ease of termination,
- AC to DC rectifier module,
- Main circuit board with microprocessor controlled, temperature compensated charger,
- AC input circuit breaker and system on/off switch,
- Battery fuse,
- DB-9 status signal (alarm interface),
- optional battery heater pads and battery heater controller with thermostat

1.4 OVERALL DIMENSIONS – The UPS-250-6070 cabinet is 16" (40.6cm) H x 16" (40.6cm) W x 8.79" (22.3cm) D and weighs 94.6lbs/43kg

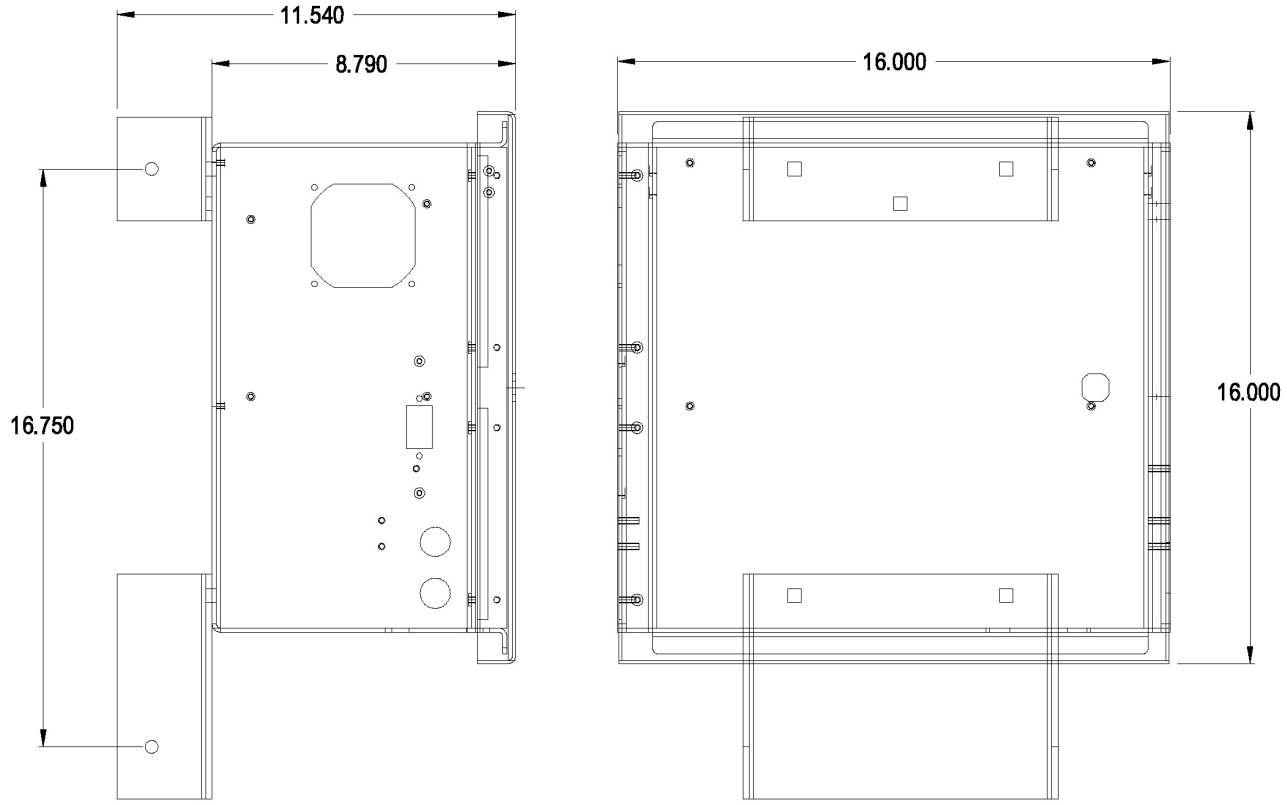

Figure 2: Outdoor UPS-250-6070 Dimensions

1.5 CONSTRUCTION – The Outdoor DC-UPs-250-6070 cabinet is constructed of 5052-H32 Aluminum and finished with a brown (BR), gray (GR) or black (BR) polyester powder coat that is designed to meet Telcordia specifications for protection against corrosion, water intrusion beyond NEMA 3R, UV radiation and impact resistance.

1.6 DOOR & LOCK – The cabinet door is retained by two stainless steel hinges and secured by a telco tool actuated, quarterï turn lock. This lock provides for proper compression gasket sealing and prevents unauthorized entry.

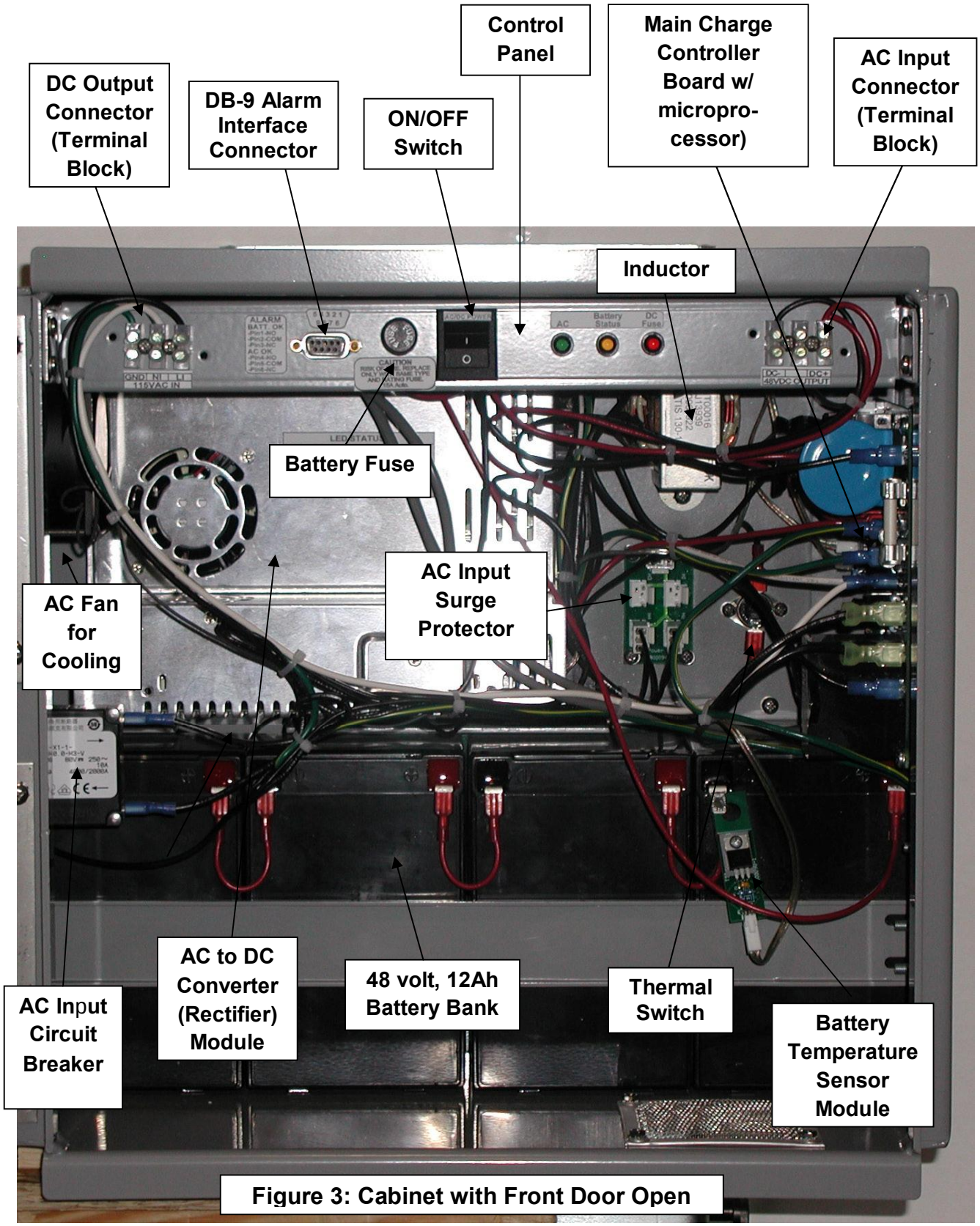

Figure 3: Cabinet with Front Door Open

2. MAJOR COMPONENT/CIRCUIT DESCRIPTIONS

2.1 AC SURGE PROTECTION CIRCUIT ï The Outdoor DC-UPs-250-6070 is protected against AC surge voltages by a proprietary circuit which uses a 40mm MOV in combination with two, 3-element, gas tubes and a series inductor. This surge protection circuit assures that the UPS functions continuously by protecting against dangerous and harmful surge voltages and noise, appearing on the AC mains.

2.2 INPUT FILTER INDUCTOR – This 1mh, iron core filter inductor is off board and is an integral part of the surge protection circuit. It filters out normal mode noise between the line and neutral branches of the incoming AC.

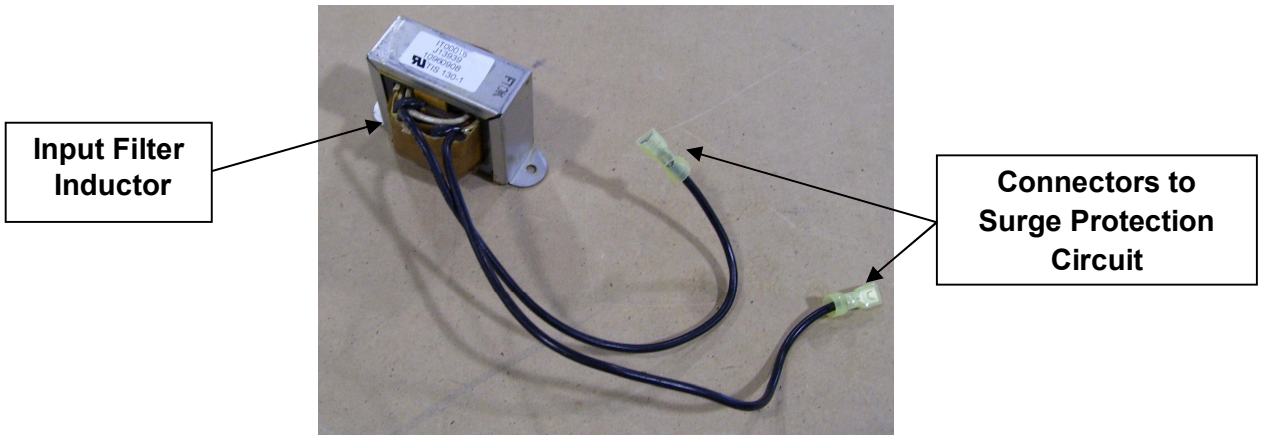

Figure 4: Input Filter Inductor

2.3 MAIN CHARGE CONTROLLER CIRCUIT BOARD – The proprietary main circuit board uses a rugged design with a microprocessor-controlled battery charger controller along with a temperature compensated battery charger circuit. The design reduces the number of solid-state devices and has been conformally coated for use in severe outdoor environments.

2.4 BATTERY TEMPERATURE SENSOR MODULE – This temperature sensor module is placed on (or near) the batteries and sends accurate battery temperature readings continuously to the microprocessor on the main charger controller circuit board.

2.5 AC TO DC CONVERTER (RECTIFER) MODULE – AC to DC converter output voltage is controlled by a microprocessor in order to provide optimized battery charging voltage for a wide temperature range of 14° to 122°F (-10° to +50°C) or [-40 to 122°F (-40 to +50°C) with optional battery heaters].

3. INSTALLATION INSTRUCTIONS

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

This product is intended for installation in "RESTRICTED ACCESS LOCATION" only.

3.1 SITE SELECTION & PREPARATION – Although the customer will be selecting not only a site, but also installing the mounting bracket on the power pole, there are several thoughts to keep in mind when making this installation:

- The cabinet should be mounted on the power pole in such a manner so that the doors donôt open onto a road or a driveway.
- Make sure that door clearances around the unit provide for unobstructed access.
- Provide a 15A, 120V service with a disconnect switch in the near vicinity of the UPS unit.

3. 2 REQUIRED TOOLS

- A 216-type tool to open the compartment doors
- A standard telco socket wrench set and standard mechanic telco tools
- Appropriate lifting equipment to lift and seat the unit onto the mounting bracket on the power pole. Note: The weight of the UPS is 94.6 lbs (43 kg
- A method of lifting the cabinet w/batteries onto pole-mounting bracket in accordance with local practices.
- Standard set of craftsman hand tools and ¾ödeep socket set w/ratchet.

3.3 UNPACKING & INSPECTION

3.31 The unit is shipped in a cardboard box with foam inserts. Multiple units are placed on a pallet, shrink-wrapped and steel-banded.

3.32 Carefully remove steel bands and shrink wrap, making sure not to damage the units.

3.33 Visually inspect each box for physical damage.

3.34 If no damage is found, remove each unit from its box , 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 for assistance if necessary.

3.35 For units shipped without batteries but with battery heater pads: remove pads from enclosure wall and remove silicone bead used to secure during transport.

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

IMPORTANT SAFETY INSTRUCTIONS—SAVE THESE INSTRUCTIONS

This document contains important information for the Outdoor DC-UPS-250-6070. This information should be followed during installation and maintanenace.

3.4 INSTALLING THE UPS

3.41 Attach the unit to the DeltaNode bracket supplied by the customer to a power pole. Slide the unit onto the DeltaNode bracket and tighten the bolts to secure the bracket

⚠ CAUTION: Make sure that appropriate lifting equipment and sufficient numbers of correctly sized steel bands are used and that company safety practices are followed.

4. POWER-UP

CONNECTION

- **For permanently connected equipment, a readily accessible disconnect device shall be incorporated in the building installation wiring.**
- **Ensure that diconnect is on the Off position. Ensure that AC input switch is in the Off position.**

4.1 AC INPUT CONNECTIONS

4.11 Make sure that an 120 vac, 15A service with a disconnect switch is provided near the UPS and make sure that it is switched **OFF.**

4.12 Use ½ò Cantex Enviro-Flex, liquid tight conduit type B. UL/CSA. Part number: V06AEA1. Or similar.

4.13 Use ½ò Cantex Enviro-Flex, straight conduit connector. Part number: 6441001B. Or similar.

4.14 Use 14 AWG or larger wire with a 105°C insulation system for all AC input wires.

4.15 Allow for sufficient wire length to reach the wiring terminals and leave enough slack to reduce the stress in the wires.

4.16 Strip approximately 3/8ò (9.52mm) insulation from the end of each of the three (3) incoming AC wires and three output DC wires, and terminate them in the wiring terminals on the control panel of the electronics compartment.

4.17 Terminate the Incoming wires on the AC INPUT terminals marked as follows:

- **LI** is for phase conductor (black)
- **NI** is for neutral conductor (white)
- **G** is for safety earth ground (yellow/green)

4.18 Terminate the outgoing DC wires on the DC OUTPUT terminals marked as follows:

- **+** is for positive conductor (+48V)
- **-** is for negative conductor (+48V return)
- **G** is for safety ground

4.19 In terminating the wires as outlined in 4.15 & 4.16 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 screws have been tightened, gently pull on the wires to make sure that they are securely connected.

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

4.2 ENERGIZING THE XUPS – The following steps outline the procedures for putting the UPS into operation:

4.21 Turn on the AC, 15A, 120V service by putting the disconnect switch to the **ON** position.

4.22 Put the battery fuse in its socket.

4.23 Switch on the AC circuit breaker.

4.24 Switch on the master power On/Off switch inside the UPS to the **ON** position.

4.25 Verify that the green and amber LEDs on the status display panel are illuminated one by one. This may take approximately five (5) seconds.

4.26 Verify that either of the following LEDs in table below is illuminated:

LED Indicators	
Output OK DC (Float charging)	Green, Solid
Output OK DC (Charging)	Amber, Slow Blink
Backup ON DC	Amber, Quick Blink
DC output is FAULTY (Fault Condition)	Red, Solid

4.27 Switch AC disconnect switch to Off position. The Amber LED should blink quckly meaning that the unit is in back-up mode. Switch AC disconnect to On position. The unit is now ready for operation.

THE SYSTEM IS NOW READY FOR OPERATION.

5. MAINTAINING THE UPS

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

5.1 UPS OPERATION TEST

5.11 Switch-off the AC input disconnect.

5.12 Verify that the UPS operates in **Battery Mode** (**Amber LED is blinking quickly).**

5.13 Check the operation of all AC and DC fans in the UPS unit. Replace if necessary.

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 and make sure that door seals are still tight and effective.
Replace if necessary.

5.3 BATTERY MAINTENANCE – See Section 6 for battery replacement.

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

5.32 Disconnect battery cable from battery to be checked. Measure the battery terminal voltage of all batteries. Each fully charged battery should have a terminal voltage of 13.5Vdc ±0.3V. Replace **All** batteries if the difference is larger than ±0.3V.

6. TROUBLESHOOTING & COMPONENT REPLACEMENT

6.1 STATUS ALARMS – Relay contact status alarm signals are available through the DB-9 connector located in the top left corner of the electronics compartment. See the table below for the output signal assignment.

Alarm Signals on DB-9 Connector (Relay Contact Closures)	
BATTERY OK	Pin 1: NO, Pin 2: COMMON, PIN 3: NC
AC OK	Pin 4: NO, Pin 5: COMMON, PIN 6: NC

6.11 Open contact between pins 5 and 6 signifies ñAC FAILURE" condition.
Relay contact closes again when utility AC power is restored.

6.12 Open contact between pins 2 and 3 signifies ñLOW BATTERY" condition (battery voltage is less than 44Vdc).
Relay contact closes again when battery bus voltage is 44 Vdc or higher.

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 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 battery terminal.**
- **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.**

SAVE THESE INSTRUCTIONS

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 serat 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 Only the NP12-12 battery (12 volt, 12Ah rated sealed, valve-regulated lead-acid battery made by Yuasa) should be used. Never mix battery brands or different age batteries.

CAUTION: The following precautions should be observed when working on batteries:

a. Remove watches, rings, or other metal objects.

b. Use tools with insulated handles.

c. Wear rubber gloves and boots.

d. Do not lay tools or metal parts on top of batteries.

e. Disconnect charging source prior to connecting or disconnecting battery terminals.

f. 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.

6.22 The following battery replacement procedure should be followed:

- Turn off AC circuit breaker,
- Switch off disconnect,
- Turn off external disconnect,
- Remove DC battery fuse.,
- Remove the 3 battery jumper wires first and set them aside.
- Remove the last (+) and (-) battery wires from battery terminals
- 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 securely to the battery terminals,
- Check all connections,
- Re-energize the UPS system,
- Dispose of old batteries in accordance with battery manufacturerôs instructions.

* Duration of storage will determine the need for supplemental charge, especially at elevated temperatures.

** Extended exposure to temperature > 104° F (40° C) may shorten battery life.

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. The AC current flows through the resistors to generate heat. By being pressed against both internal walls of the batteries, the batteries are heated. Installation procedure for the heater pads is as follows:

- Turn the AC circuit breaker off,
- Remove the DC battery fuse,

- Remove jumper wires between batteries (and save the jumper wires),
- Remove battery brackets,
- Remove batteries from the cabinet,

- Place heating pad on rear wall of enclosure,
- Put batteries back in,
- The heating pad should now be secure between the batteries and rear wall,
- Replace battery brackets,
- Run the wires back to the heater control PCB and mate connector with header,
- Restart the UPS.

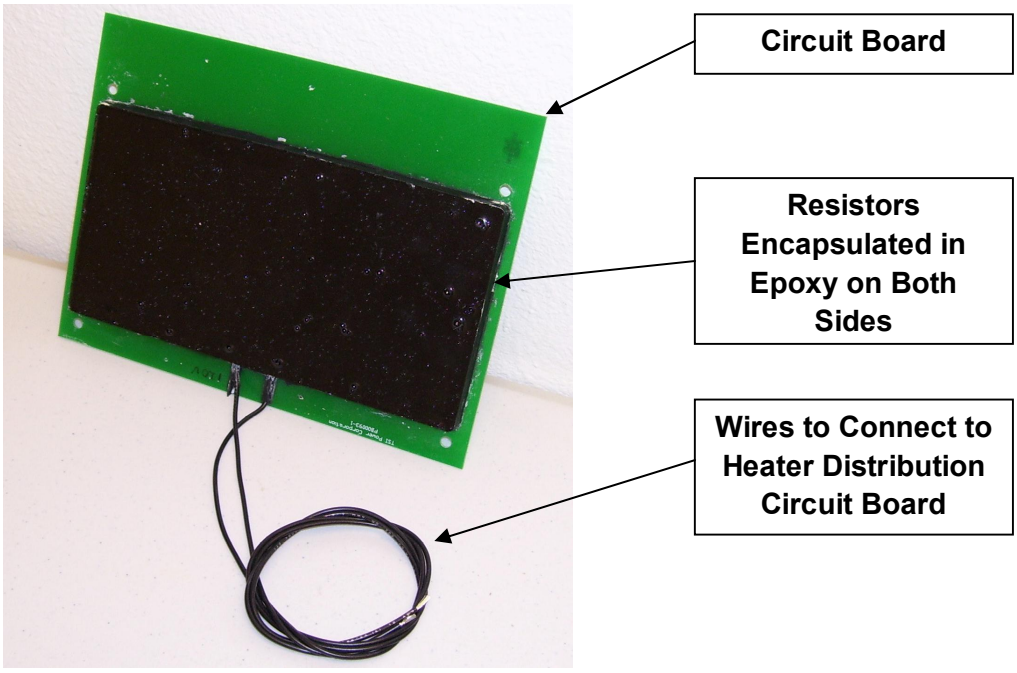

Figure 6: Optional Battery Heater Circuit Board

8. REPAIRS, SERVICE & SPARE PARTS

8.1 REPAIRS - The Outdoor DC-UPs-250-6070 should be repaired only 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 if the unit must be repaired at TSi Power.

A replacement unit will be shipped to certain customers with service agreements. TSi retains the repaired unit to be used as a next "replacement" or "exchange" 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.
Heater PCB	PB00093-1	TSi Power	N/A
Charge controller PCB	PZ00089-1	TSi Power	N/A
Input inductor	IT00016	Johnson Electric Coil	J13939
AC input switch	SE00001A	CW Industries	GR-2022-0007
Battery fuse	313020	Littelfuse	TBD
AC cooling fan	VF00015	Minebea	3115FS-12T-B30
12V, 12Ah battery	VB00022	Yuasa	NP12-12
48Vdc power supply	VP00074	Meanwell	SP320-48
48Vdc charger	VP00074-X	TSi Power	N/A

9. REFERENCE

9.1 Outdoor DC-UPs-250-6070 Specifications

Input	
Voltage Range	95 to 140Vac
Frequency	60Hz +-5%
Current	8.0A
Circuit Breaker	10A
Output	
Output Power	250W
Output Voltage	48Vdc
Current	5.2A
Power Efficiency in AC Line Mode	>88%
Power Efficiency in Backup Mode	>99%
Transfer Time Line to Backup	0ms
Fuse	7A
Battery	
Type	Four sealed 12Vdc suspended electrolyte, valve-regulated, lead-acid, maintenance free (sold separately) NP 12-12 Yuasa
Temperature - °F (°C) (Charge/Discharge/Storage)	5°F to 122°F/-4°F to 140°F/-4°F to 122°F (-15°C to 50°C / -20°C to 60°C / -20°C to 50°C)
Battery Bus Voltage	48Vdc
Capacity	12Ah @ 20 hour rate per battery
Battery Fuse	15A
Weight (lb/kg) per battery	8.9/4.05
Dimensions (in/mm)	5.94L x 3.86W x 3.84H / 151L x 98W x 97.5H

Runtime	1hr @ 250W
Recharge Time	8hrs to 90% after full discharge
Battery Heater Pad (Two required)	34W x 2
LED Indicators	
Output OK DC (Float charging)	Green, Solid
Output OK DC (Charging)	Amber, Slow Blink
Backup ON DC	Amber, Quick Blink
Fault DC	Red, Solid
Mechanical	
Dimensions (in/mm)	16W x 8D x 16H / 406W x 203D x 406H
Weight, without batteries (lb/kg)	59 / 26.8
Environmental	
Operating Temperature* (with heater)	-40°F to 122°F (-40°C to 50°C)
Operating Temperature** (without heater)	14°F to 122°F (-10°C to 50°C)
Storage Temperature	-4°F to 122°F (-20°C to 50°C)
Humidity	0 to 95% non-condensing
Mounting Configuration	
Pole-mount. Customer supplied bracket.	
Agency Compliance	
FCC part 15 Class B	
cETLus tested to UL 60950-1, UL 1778 4th Edition & CSA C22.2 No. 107.3-05	
RoHS compliant, per EU Directive 2002/95/EC, Restrictions of Hazardous Substances	
NEMA 3R	

9.2 ORDERING CONFIGURATION – When ordering the **Outdoor DC-UPs-250-6070**, the following example provides the methodology that is used to arrive at the product ordering number:

9.21 The product comes in three (3) different colors designated as:

- Outdoor DC-UPs-250-6070-BR **(Brown)**
- Outdoor DC-UPs-250-6070-GR **(Gray)**
- Outdoor DC-UPs-250-6070-BL **(Black)**

9.22 The following suffixes are added to represent the heater and battery configurations:

- **- 00**: No batteries, no heaters
- **- 02**: No batteries, two (2) heaters
- **- 20**: Four (4) batteries, no heaters
- **- 22**: Four (4) batteries, two (2) heaters

9.23 As an example, the following ordering number represents a complete brown unit with four (4) batteries and two (2) heaters:

Outdoor DC-Ups-250-6070-BR-22

9.3 TSi POWER CONTACT INFORMATION

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