TSi Power Corporation

Outdoor DC-UPs-1000-7080

Description, Installation & Maintenance Manual

MC67080
Issue 1, August, 2009

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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-1000-7080 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-1000-7080 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 left and right access doors,
- Screened air exhaust and intake vents at the top and bottom of the cabinet,
- Eight 12V, 31Ah @ 20hr rate, gelled, valve-regulated, lead acid batteries forming a 48V, 62AH 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 fuses,
- DB-9 status signal (alarm interface),
- optional battery heater pads and battery heater controller with thermostat

1.4 OVERALL DIMENSIONS – The UPS-1000-7080 cabinet is 26" (66cm) H x 11.5" (29.2cm) W x 15.5" (39.4cm) D and weighs 264lbs/120kg (with 8 batteries)

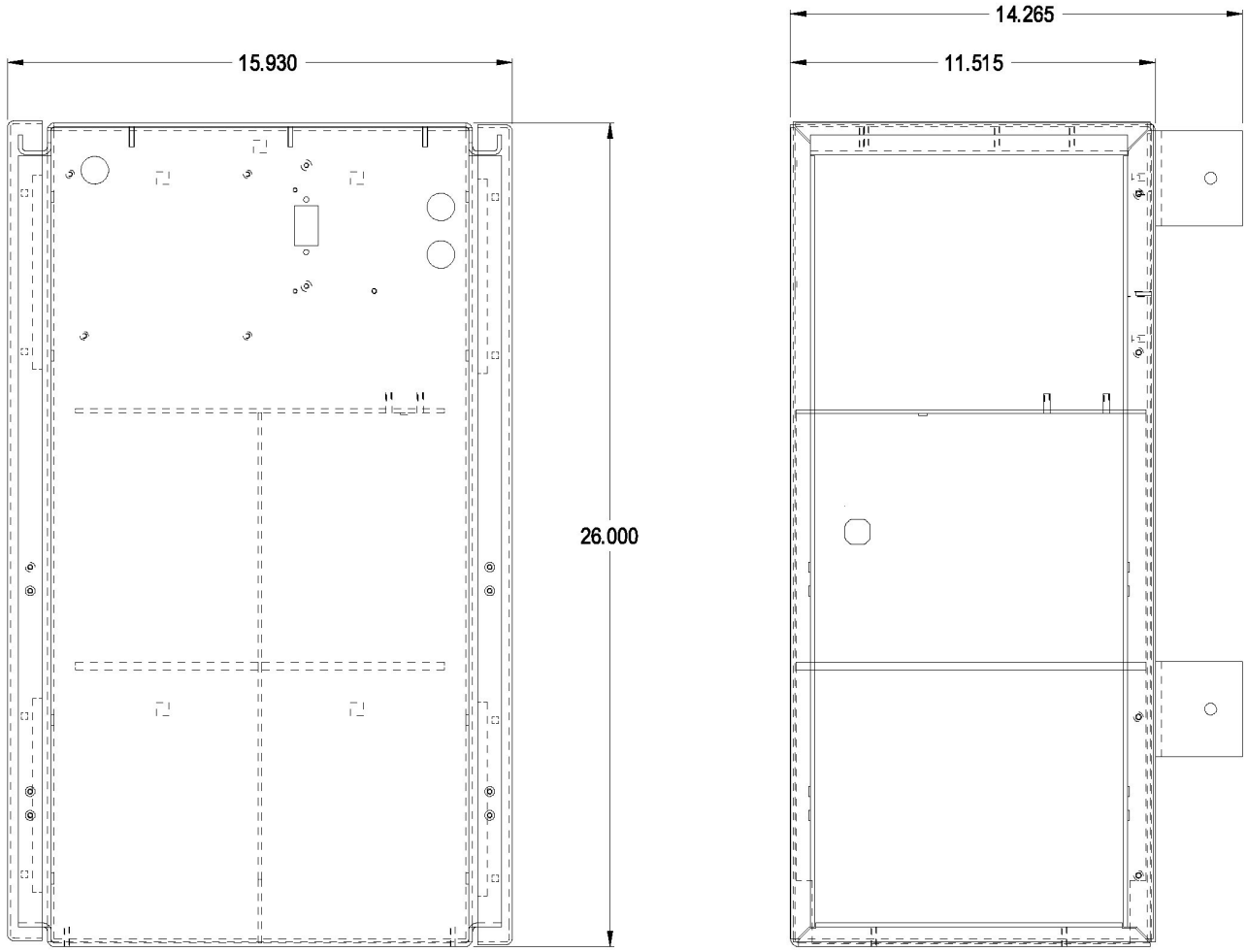

Figure 2: Outdoor UPS-1000-7080 Dimensions

1.5 CONSTRUCTION – The Outdoor DC-UPs-1000-7080 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 DOORS & LOCKS – Each of the two cabinet doors is retained by two stainless steel hinges and secured by a telco tool actuated, quarter–turn lock. This lock provides for proper compression gasket sealing and prevents unauthorized entry.

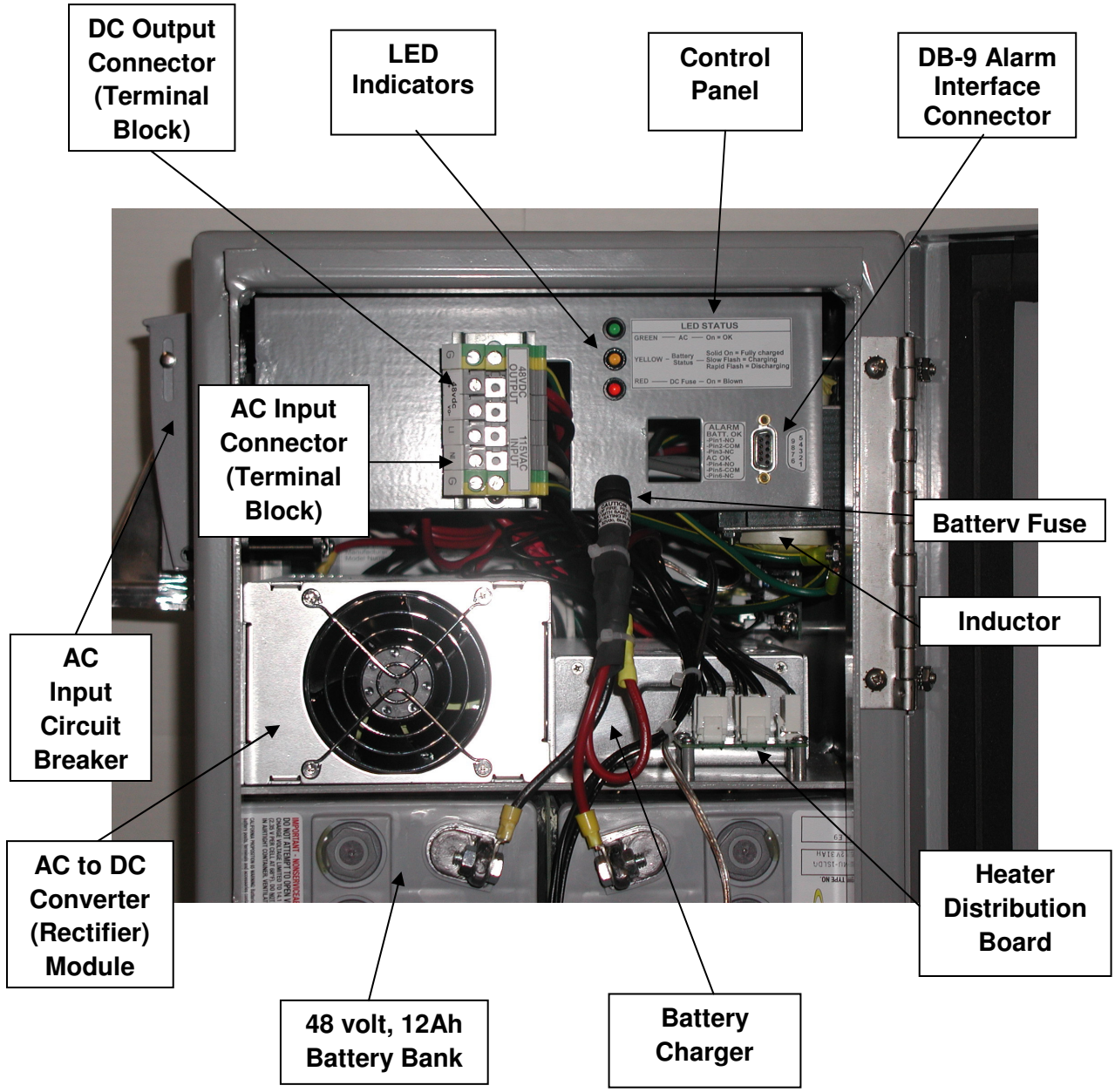

Figure 3: Cabinet—control panel side with Front Door Open

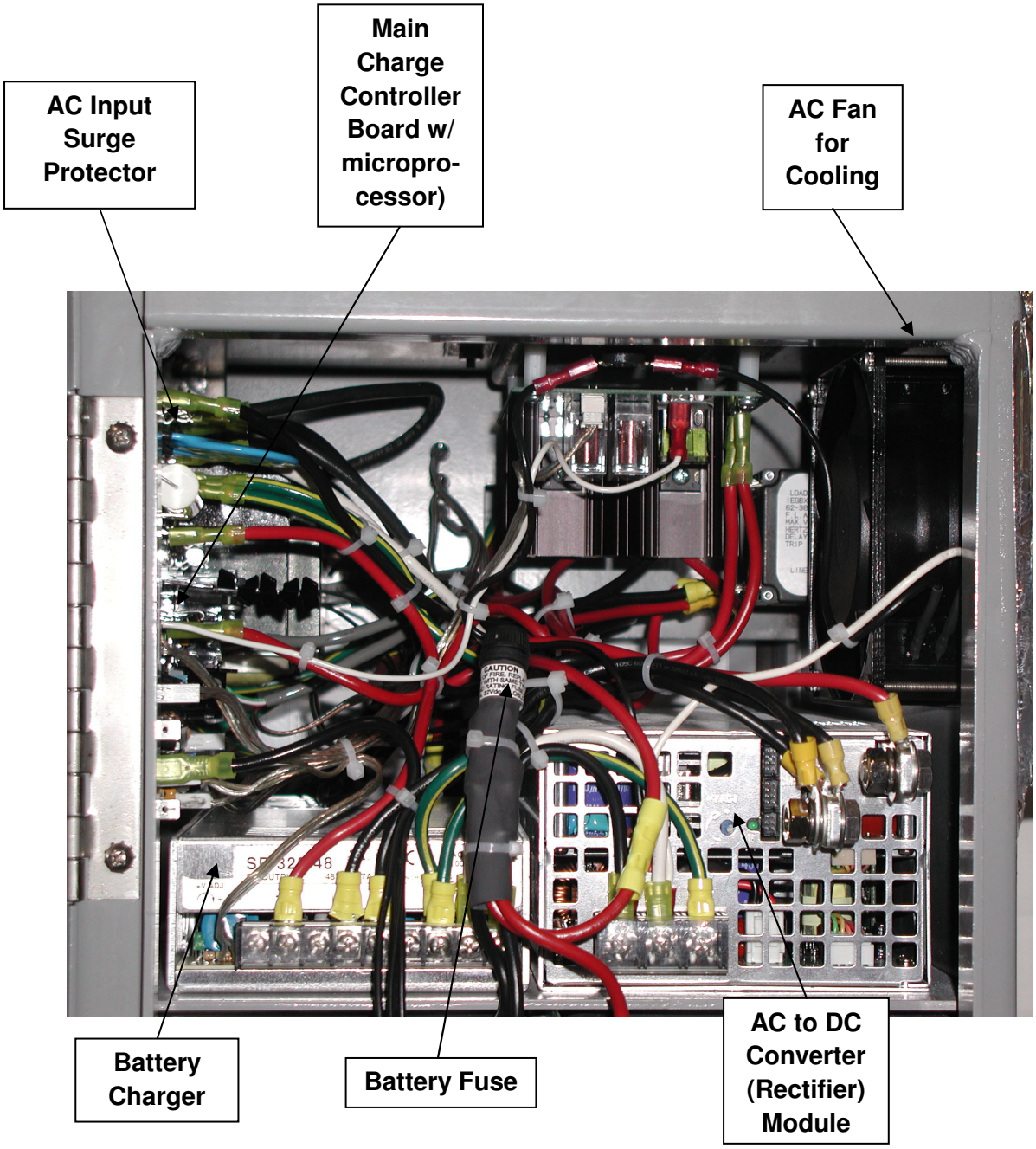

Figure 4: Cabinet—electronic compartment side with Left Side Door Open

2. MAJOR COMPONENT/CIRCUIT DESCRIPTIONS

2.1 AC SURGE PROTECTION CIRCUIT – The Outdoor DC-UPs-1000-7080 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.

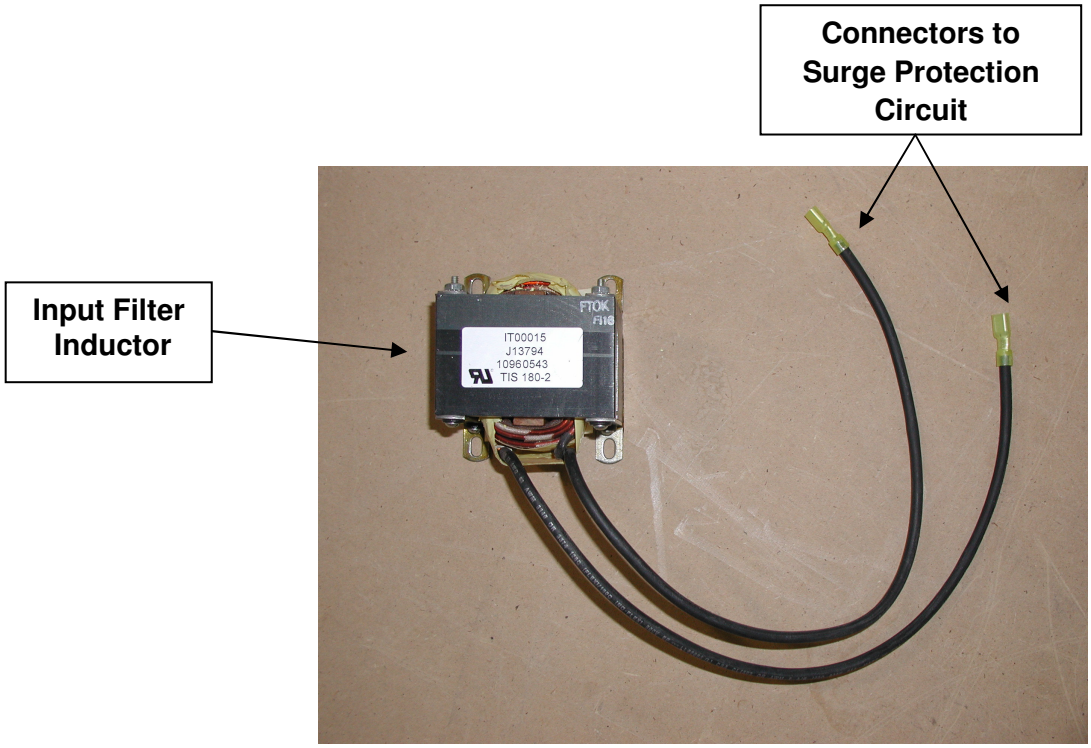

Figure 5: Input Filter Inductor

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 BATTERY CHARGER MODULE – The charger 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 don't open onto a road or a driveway.
- Make sure that door clearances around the unit provide for unobstructed access.
- Provide a 30A, 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 264 lbs/120 kg (with 8 batteries).
- A method of lifting cabinet w/batteries onto pole-mounting bracket in accordance with local practices.
- Standard set of craftsman hand tools and ¾" deep socket set w/ratchet.

3.3 UNPACKING & INSPECTION

3.31 The units are shipped in wooden crates, each containing two or four units. The crates 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 doors 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.

⚠ 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-1000-7080. This information should be followed during installation and maintenance.

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.

3.42 Lock the cabinet onto the DeltaNode bracket by tightening all the bolts

⚠ 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 circuit breaker is in the Off position.**

4.1 AC INPUT CONNECTIONS

4.11 Make sure that an 120 vac, 30A service with a disconnect switch is provided near the UPS and make sure that it is switched **OFF.**

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

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

4.12 Use 10 AWG wire with a 105℃ insulation system for all AC input wires.

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

4.14 Strip approximately 3/8" (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.

4.15 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)

4.16 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

4.17 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, 30A, 120V service by putting the disconnect switch to the **ON** position.

4.22 Switch on the battery circuit breaker..

4.23 Switch on the AC circuit breaker.

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

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

4.26 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 disconnect.

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

5.13 Check the operation of all 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 “AC FAILURE" condition. Relay contact closes again when utility AC power is restored.

6.12 Open contact between pins 2 and 3 signifies “LOW 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

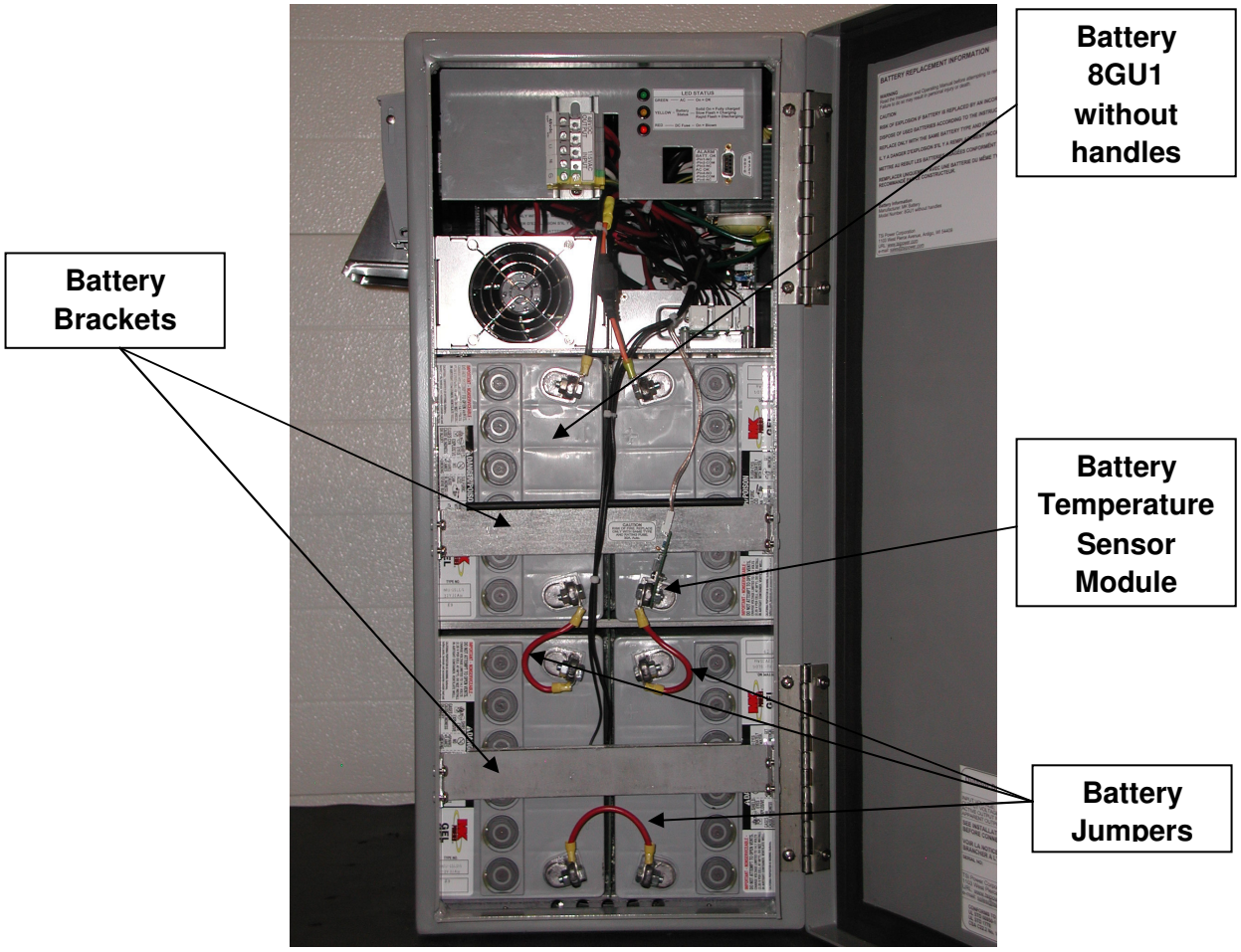

Figure 6: Cabinet—right battery compartment with Front Door Open

⚠ 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 8GU1 battery without handles (12 volt, 31Ah rated gelled, valve-regulated lead-acid battery made by MK Battery) should be used. See Figure 6. 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 battery circuit breaker,
- Remove the 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, follow instructions in section 7,
- Install new batteries.
- 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 manufacturer's 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,
- Turn the DC circuit breaker off,
- Remove jumper wires between batteries (and save the jumper wires),
- Remove battery brackets,
- Remove batteries from the cabinet,
- Place new batteries gently into compartment, form a wedge,
- Insert heating pad between batteries,
- Push batteries back in,
- The heating pad should now be secure between the batteries,
- Replace battery brackets,
- Run the wires back to the heater control PCB and mate connector with header,
- Restart the UPS.

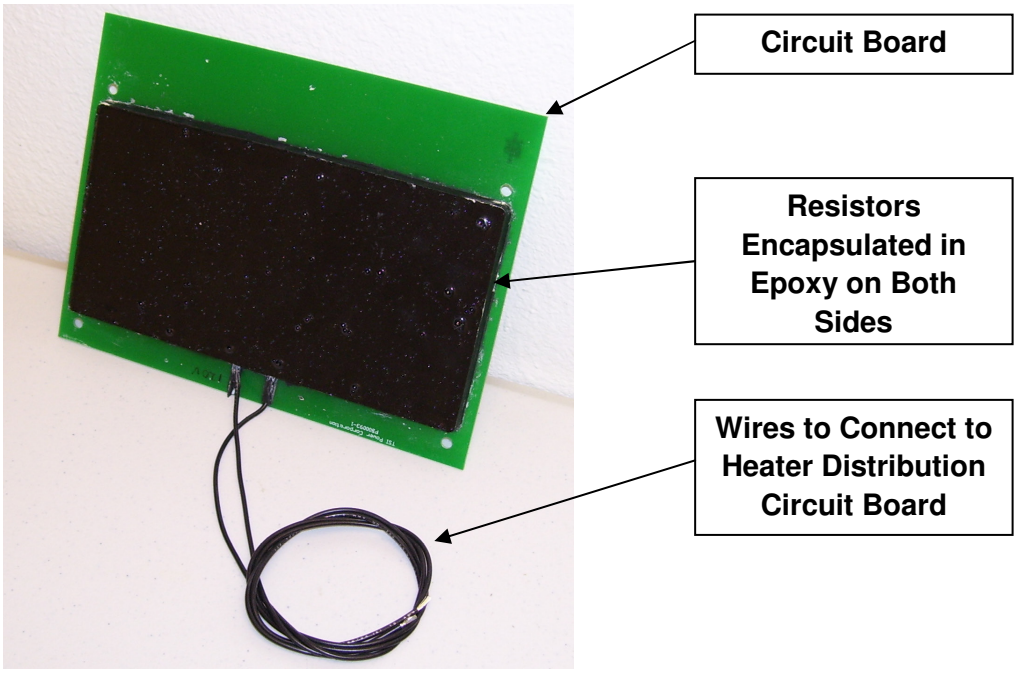

Figure 7: Optional Battery Heater Circuit Board

8. REPAIRS, SERVICE & SPARE PARTS

8.1 REPAIRS - The Outdoor DC-UPs-1000-7080 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	IT00015	Johnson Electric Coil	J13794
AC input circuit breaker	FC00017	Sensata/Airpax	IEGBX66-1-62-30.0-M3-V
Battery fuse	TBD	Littelfuse	313020
AC cooling fan	VF00015	Sunon	SP100A 1123XBT.GN
12V, 31Ah battery	VB00010	MK Battery	8GU1 w/o handles
48Vdc power supply	VP00073	Meanwell	RSP-1500-48
48Vdc charger	VP00074-X	TSi Power	N/A

9. REFERENCE

9.1 Outdoor DC-UPs-1000-7080 Specifications

Input	
Voltage Range	95 to 140Vac
Frequency	60Hz +-5%
Current	14.8A
Circuit Breaker	20A
Output	
Output Power	1000W
Output Voltage	48Vdc
Current	20.8A
Power Efficiency in AC Line Mode	>90%
Power Efficiency in Backup Mode	>99%
Transfer Time Line to Backup	0ms
Fuse	25A
Battery	
Type	Eight sealed 12Vdc gelled, valve-regulated, lead-acid, maintenance free (sold separately) 8GU1, MK Battery
Temperature (Charge/Discharge/Storage)	60C
Battery Bus Voltage	48Vdc
Capacity	31Ah @ 20 hour rate per battery
Battery Fuse	30A
Weight (lb/kg) per battery	23 / 10.5
Dimensions (in/mm)	7.71L x 5.18W x 7.22H / 196L x 132W x 183H
Runtime	11.5hrs @ 250W; 3hrs @ 750W
Recharge Time (31Ah bus/62Ah bus)	10 / 15hrs to 90% after full discharge

Battery Heater Pad (Two/four required)	34W x 2/4
LED Indicators	
Output OK DC (Float charging)	Green, Solid
Output OK DC (Charging)	Green, Slow Blink
Backup ON DC	Green, Quick Blink
Fault DC	Red, Solid
Mechanical	
Dimensions (in/mm)	11.5W x 15.5D x 26H / 292W x 394D x 660H
Weight, without batteries (lb/kg) Four (4) batteries Eight (8) batteries	40 / 18 152 / 69 264 / 120
Environmental	
Operating Temperature* (with heater) ℉/℃	-40 to 122 / -40 to 50
Operating Temperature** (without heater) ℉/℃	14 to 122 / -10 to 50
Storage Temperature ℉/℃	-4 to 140 / -20 to 60
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 and UL 1778	
RoHS compliant, per EU Directive 2002/95/EC, Restrictions of Hazardous Substances	
NEMA 3R	

9.3 ORDERING CONFIGURATION

Product:

Outdoor DC-UPs-1000-7080-BR (Brown)

Outdoor DC-UPs-1000-7080-GR (Gray)

Outdoor DC-UPs-1000-7080-BL (Black)

Suffixes:

-00: No batteries, no heaters

-02: No batteries, two heaters

-04: No batteries, four heaters

-20: Four batteries, no heaters

-30: Eight batteries, no heaters

-22: Four batteries, two heaters

-24: Eight batteries, four heaters

Example:

Outdoor DC-UPs-1000-7080-BR-22: Complete brown unit with four batteries and two heaters.

9.2 TSi POWER CONTACT INFORMATION

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