

# **Multilink EP 2200-T**

**Transportation / ITS UPS  
Battery Backup System**

***EP 2200-T Transportation UPS***

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Installation, Operation and Maintenance Manual

Rev 10 04/05/2017

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# **IMPORTANT SAFETY INSTRUCTIONS ARE**

## **CONTAINED IN THIS MANUAL**

Three different levels of safety admonishments are used within this instruction manual; specifically **DANGER**, **WARNING**, and **CAUTION**.

*Trois niveaux différents d'avertissements de sécurité sont utilisés dans ce mode d'emploi; spécifiquement DANGER, AVERTISSEMENT et ATTENTION.*



**DANGER**

The statement following the **DANGER** heading alerts the equipment user of a potentially life or health-threatening situation unless preCAUTIONs are taken against it. Admonishments of this nature usually entail the hazards of electrical shock or those encountered that may result in physical injury.

*La déclaration sous la rubrique **DANGER** avertit l'utilisateur de l'équipement d'une situation potentiellement mortelle ou mortelle, sauf si des préCAUTIONs sont prises contre lui. Les admonistances de cette nature entraînent habituellement les dangers d'un choc électrique ou ceux rencontrés qui peuvent entraîner des blessures physiques.*



**WARNING / AVERTISSEMENT**

The statement following the **WARNING** heading alerts the equipment user of a condition or procedure that could result in interruption of service to the users or subscribers of the service receiving power from this product.

*La déclaration sous le chapitre **AVERTISSEMENT** avertit l'utilisateur de l'équipement d'une condition ou d'une procédure qui pourrait entraîner une interruption de service pour les utilisateurs ou les abonnés du service qui reçoit l'alimentation de ce produit.*



**CAUTION / ATTENTION**

The statement following the **CAUTION** heading alerts the equipment user of a condition that could result in damage to the subject equipment or ancillary equipment if care is not exercised during certain maintenance or operating procedures.

*La déclaration suivant la rubrique **ATTENTION** avertit l'utilisateur de l'équipement d'une condition qui pourrait endommager l'équipement concerné ou l'équipement auxiliaire si les soins ne sont pas exercés pendant certaines procédures de maintenance ou d'exploitation.*



**DANGER:** Do not expose the EP 2200-T to rain or moisture.



**DANGER:** Total Earth ground leakage current of loads connected to the EP 2200-T should not exceed 2.4 mA.



The EP 2200-T generates, uses and can radiate radio frequencies if not installed and tested in accordance with the instructions contained in this manual. It has been tested and found to comply with the limits established for a Class A computing device pursuant to part 15 of FCC rules when it is operated alone. It also complies with the radio interference regulations of DOC, which are designed to provide a reasonable protection against such interference, when this type of equipment is used in a commercial environment. If there is interference to radio or TV reception, which is determined by switching it on and off. Relocate the equipment or use an electrical circuit other than the one used by the EP 2200-T.

# **IMPORTANT SAFETY PRECAUTIONS**

*Only qualified personnel should service or supervise the service of the EP 2200-T.*



**Danger:** Sealed lead-acid batteries with high energy and chemical hazards are used. This manual contains important operation and safety instructions.

## **EP 2200-T Safety System Checklist**

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- Carefully unpack the EP 2200-T. Report any shipping damage **at once**.
- **Read this manual.** If you have any questions about safe installation, operations or maintenance of the system, contact Manufacturer service department.
- **Before installation**, confirm that the voltage and current requirements of the load(s) are compatible with the system's output. Confirm that the line voltage and current is compatible with the system's input requirements.
- The system should be installed on a dedicated power circuit.
- Place a warning label on the enclosure indicating that an Uninterruptible Power Supply (UPS) is located inside, in case of an emergency.
- Use proper lifting techniques when moving system.
- The EP 2200-T has more than one live circuit. It is fed from AC as well as battery power. Power may be present at the output(s) even if the system is disconnected from line power.
- When installing a system in other than a Manufacturer cabinet, ensure that the environment meets the system specifications shown in Section 1.7, "Specifications" of this manual.

## **SAVE THIS MANUAL**

This manual contains important instructions that should be followed during installation and maintenance of the UPS and batteries.

**Keep it in a safe place**

## Battery Safety Checklist

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- High & **dangerous voltages** are present inside the system. Only qualified personnel should perform installation and maintenance.
- Live battery wires **must not** touch the EP 2200-T chassis or any other metal objects. ***This can cause a fire or explosion.***
- **Inspect** the batteries once a year for signs of cracks, leaks, or swelling. Replace as needed.
- When batteries are in storage, **charge** them at least once every three months for optimum performance and to extend their lifetime.
- **Always** replace batteries with the ones of identical type and rating. **Never** install old or untested batteries. **Never** mix old with new batteries. **Never** mix the different amp hour rated batteries within one system.
- Use **insulated tools** during servicing.
- **Remove** all rings, watches, jewelry, or other conductive items before working inside the enclosure.
- **Follow** local regulations for the disposal of batteries. Recycling is the best method.
- **Never** burn batteries to dispose of them. ***They may explode.***
- Do not open the batteries. ***The contents are toxic.***

## Stand-By Generator

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Note: If the EP 2200-T constantly switches between Battery and Line modes because of line fluctuations, the input parameters should be ***broadened from Normal to Generator*** (see Section 2.2.10 "Sense Type")

In Generator mode, the acceptable range of input frequency and voltage is expanded to accommodate the voltage and frequency fluctuations created by a generator or a power source of such kind.

Use a generator with electronic speed and voltage controls which typically produces the Total Harmonic Distortion in % (THD) to be less than 10%. Generators with mechanical governors can force the system to run continuously in Battery mode.

Before installation, compare the generator's output voltage to the EP 2200-T's input voltage requirements as listed on both nameplates. To insure the system's smooth operation, use a generator capable of supplying 2X or twice as much power as required by the total load.

## Unpacking and Inspection Checklist

Purpose: Describes the unpacking and inspection procedures.

Carefully remove the EP 2200-T from its box. Inspect the contents and make sure the following items are included:

- One EP 2200-T UPS System.
- One plastic bag containing the following:
  - Temperature sensor probe cable with 3-pin connector.
  - Installation, Operations and Maintenance manual.
  - Warranty Card.

The Power Transfer Switch (PTS) and all the associated wiring & hardware required for installation is supplied in a separate box.

The set of four (4) batteries may be shipped separately. For optimum performance Multilink MultiMax UPS Batteries are specified.



Tip: If any items are missing or damaged, contact Manufacturer and the shipping company at once. Most shippers have a short claim period.



## SAVE THE ORIGINAL SHIPPING BOX

When returning the EP 2200-T for servicing, use the original shipping box with the supplied Styrofoam protectors. Manufacturer is not responsible for damage caused by improper packaging of returned systems.

## READ THE OPERATOR'S MANUAL

Before installation, become familiar with the EP 2200-T by reviewing the procedures and drawings in this manual. If you have any questions about safe installation, operation, or maintenance, contact Manufacturer customer service department.

### Complete the following for records & future servicing

Model No.: EP 2200-T

Serial No.: \_\_\_\_\_

(Above items can be found on the nameplate label attached to the side of the unit)

Products Sales Order No. \_\_\_\_\_

EP 2200-T P/N: \_\_\_\_\_

Your Purchase Order No.: \_\_\_\_\_

Purchased from: \_\_\_\_\_

(Following details are for installation location)

Installation date: \_\_\_\_\_

Installed by: \_\_\_\_\_

City: \_\_\_\_\_

State/Province: \_\_\_\_\_

Zip/Postal Code: \_\_\_\_\_

Country: \_\_\_\_\_

Telephone #: \_\_\_\_\_

Fax #: \_\_\_\_\_

E-Mail: \_\_\_\_\_

Street names of location: \_\_\_\_\_

Cabinet / controller type: \_\_\_\_\_



# **Multilink EP 2200-T**

## **Uninterruptible Power Supply / Battery Backup System**

- Section 1: Installation & Start-Up Manual

## 1.1 Description

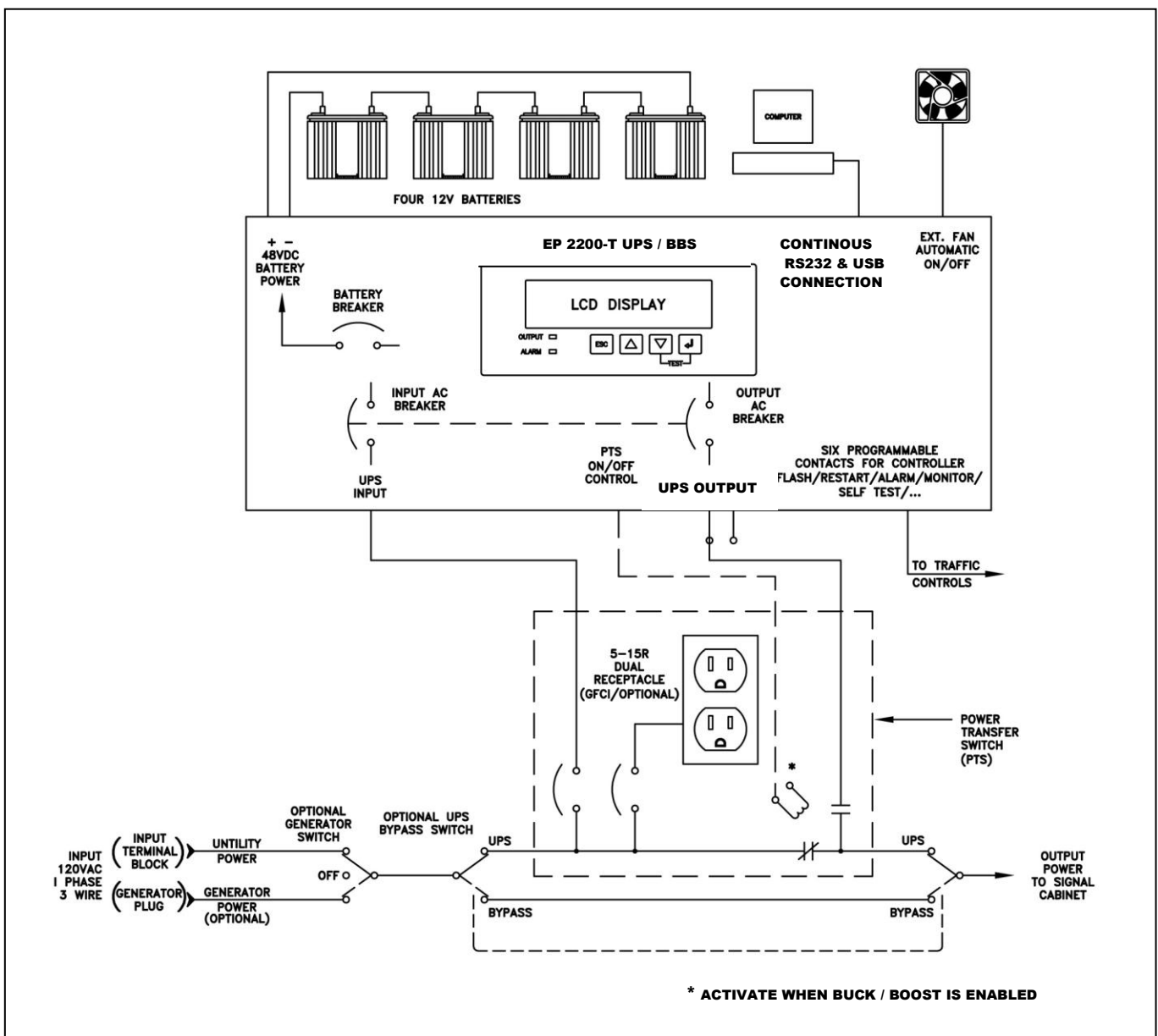
**Purpose:** Describes the operation of the EP 2200-T System (Figure 1, 2 & 3).

### 1.1.1 System Description

The EP 2200-T System provides backup power to traffic control signal equipment. It consists of the EP 2200-T Uninterruptible Power Supply (UPS) System, the Power Transfer Switch (PTS), and batteries that provide back up power when the line is unqualified. These three components can be mounted inside an enclosure to provide protection from most weather conditions.

**Figure 1**

Simplified EP 2200-T System Block Diagram



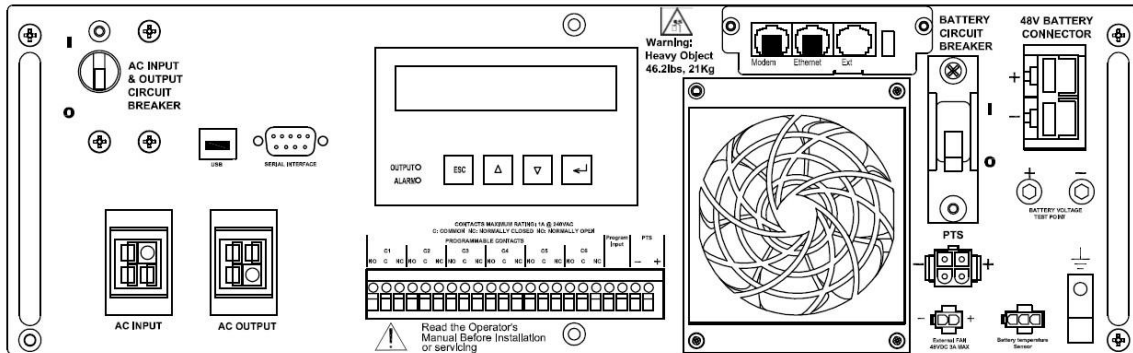
The traffic signal or ITS cabinet is powered continuously when a EP 2200-T system is installed. The system allows connection for the normal utility power using standard terminal blocks or an optional generator power via standard 30 Amp. (optional 50 Amp) generator receptacle. The optional bypass switch redirects utility power to the load and allows the EP 2200-T to be removed for service on a temporary or permanent basis without disrupting the operation of the traffic signal.

With a fully functioning UPS system, the PTS allows utility power to flow out to the traffic cabinet, when the utility line is qualified (within the acceptable range as programmed). If the UPS is not functioning, the PTS will bypass the UPS allowing the utility to flow out to the traffic cabinet. The UPS input is protected with one circuit breaker located on the PTS as well as another one located on the UPS module. When the UPS internal BOOST and BUCK is enabled, the PTS is activated allowing UPS to continuously boost the output when input is lower, buck or lower the output when input is higher or run from batteries when input power is outside the specified acceptable range. The PTS has dual NEMA power receptacles for optional battery heating pads, connecting a vacuum cleaner, or a PC for maintenance.

The smart, temperature compensated internal charger continuously monitors and maintains the batteries in a fully charged state. For the protection of the battery, the charging process is automatically discontinued when the battery temperature exceeds 50 degrees C. When the batteries are fully charged, the smart charger provides a continuously pulsating ON-OFF trickle charge to keep the batteries topped-off or fully charged. When input power is not qualified or is outside the acceptable range, the UPS derives the DC power from the storage tank of four batteries connected in series and maintains output power until the batteries are depleted down to a specified level or the utility power returns within its specified levels. The traffic intersection will continue to operate in full operation AND / OR in flash mode as programmed by the user. Programmable contacts allows the user to place the intersection in flash mode as soon as the input power is lost or after the batteries are depleted down to a certain capacity that is determined and programmed by the user. The amount of back-up time battery power can provide depends on the Amp-hour capacity of the batteries as well as the intersection watt load that requires support.

### 1.1.2 EP 2200-T BBS

The EP 2200-T UPS System shown below provides control functions and backup power as described above. For more information, please see Section 2 of this manual.

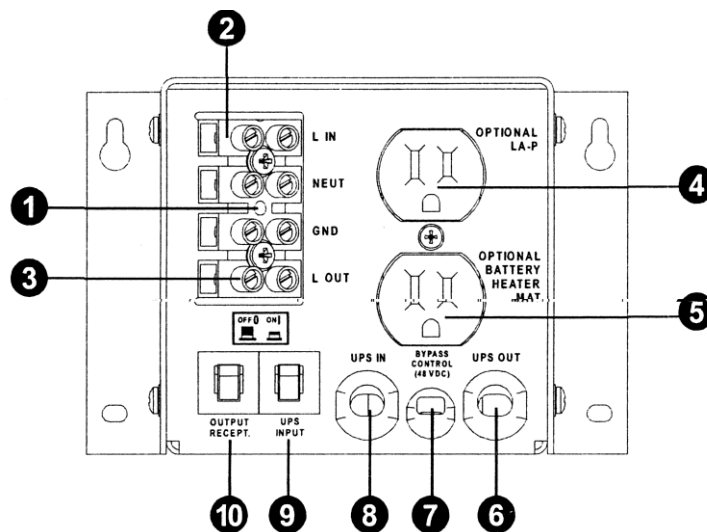


**Figure 2**

EP 2200-T Front Panel

### 1.1.3 Power Transfer Switch

The Power Transfer Switch (PTS) shown below allows the UPS to be removed for service, replacement or maintenance without interrupting power to the traffic cabinet.



**Figure 3**

Power Transfer Switch Front Panel

1. The wires from the neutral and ground bus of the traffic cabinet are connected to this terminal block.
2. The Input line power is connected to the terminal block marked with "L IN".
3. The Output power is connected to the terminal block marked with "L OUT".

4. An optional surge suppressor, external PC or a vacuum cleaner for maintenance may be plugged into this receptacle.
5. The optional battery heater mat is plugged into this receptacle.
6. This "UPS OUT" cord is connected to the OUTPUT AC terminal block on the EP 2200-T.
7. The Black and Red PTS control wires are connected at terminals 21 & 22 of the green terminal block on the EP 2200-T.
8. This "UPS IN" cord is connected to INPUT AC terminal blocks on EP 2200-T.
9. This circuit breaker provides input power protection for the EP 2200-T UPS.
10. The dual receptacles are protected by this circuit breaker.

#### **1.1.4 Batteries**

Different Amp-hour capacities or sizes of batteries can be used in the EP 2200-T system to provide various backup times. Four batteries are connected in series for the required 48VDC. Contact customer service at Manufacturer for information on the battery best suited for your application. The battery harness supplied with the system is polarized and equipped with Molex type connectors. The battery harness provides a heavy-duty connection for each battery, so it is possible to unplug or hot swap them. Each of the four batteries may be connected in any order using the provided harness.

## **1.2 Mounting**

**Purpose:** *Describes how to mount the EP 2200-T System into an enclosure.*

The EP 2200-T system components shall be mounted into a single external cabinet or into an existing traffic cabinet.

#### **EXTERNAL MOUNT:**

The factory supplied external cabinet can be bolted onto an existing or new traffic cabinet or this external cabinet can be pad mounted on a concrete slab or be pole mounted. The separate base for the cabinet for installation in the concrete slab, bolts & hardware for bolting onto the side of the traffic cabinet, bushing for the wire ducts, brackets for pole mounting and all the required accessories including mechanical hardware and electrical wiring are supplied to make the installation easy for the contractor. External cabinets such as BC100, BC80, etc. are outdoor type, weather proofed provided with internal exhaust fan that is temperature controlled, an intake filter that can be cleaned or replaced, a non-corrosive rubber mat for batteries, 3 point locking mechanism, lockable handle with dual keys and a unique internal keyed lock. The quality of cabinets bears a reputable industry trade name such as Manufacturer. The factory-supplied cabinet meets or exceeds the requirements of various NEMA classifications.

#### **INTERNAL MOUNT:**

The EP 2200-T components can also be mounted inside an existing NEMA or 332 or various other traffic cabinets. The special Swing Tray designed to hold the four batteries is easily mounted inside an existing 332 type or other equivalent cabinet using the hardware that is provided, or they can be shelf mounted in a NEMA or equivalent cabinet. The EP 2200-T can be bolted into an industry standard 19" rack using the supplied ears or brackets, or it can be shelf mounted in a NEMA type enclosure. The PTS supplied with or without optional Generator & Bypass switch comes in many configurations that can be shelf mount, 19" rack mount, back plate mount, etc.

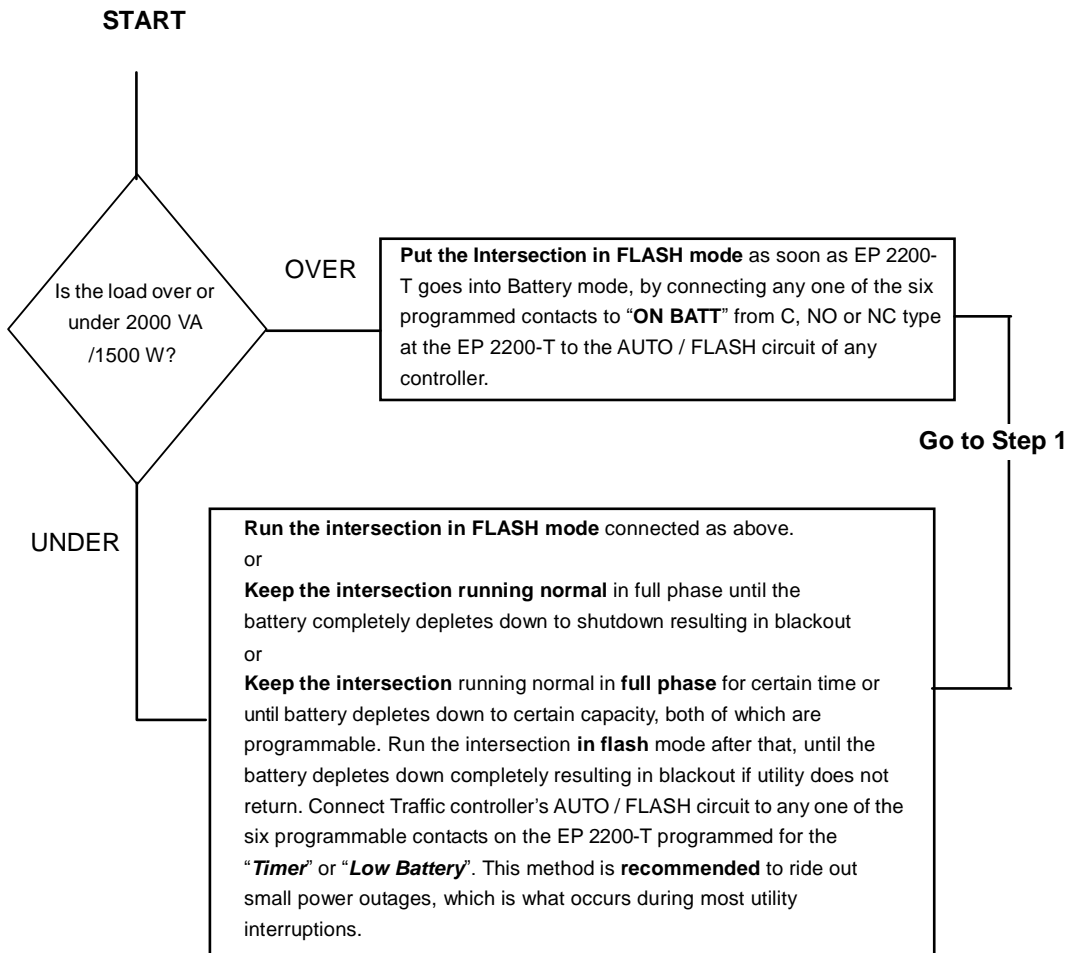
## 1.3 Wiring

**Purpose:** Describes how to wire the EP 2200-T System.



**CAUTION:** To reduce the risk of fire, connect only to a circuit provided with 20A maximum branch circuit overcurrent protection in accordance with the National Electrical code, ANSI/NFPA 70 and the Canadian Electrical Code, Part 1, C22.1

Before wiring the system, determine the size of the load:

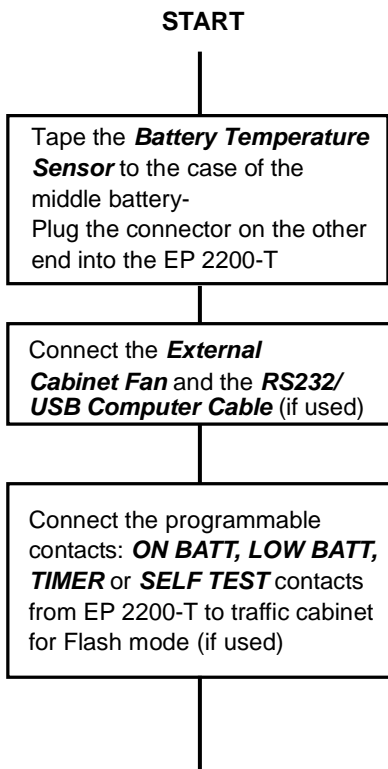


**TIP:** Each of the six contacts are of form C type, meaning Normally Open (NO), Common (C) and Normally Closed (NC) dry contact rated for 1 Amp at 120VAC. Each of these contacts can be individually programmed to energize and stay latched for ON BATTERY, LOW BATTERY, TIMER, ALARM, FAULT and many other conditions as described in subsequent chapters. The ON BATTERY contact(s) are activated as soon as the EP 2200-T is transferred to Battery mode. LOW BATTERY contact(s) are activated only in the Battery mode, as soon as the discharged battery reaches the lower value battery capacity as set by user and remains latched as long as the system remains in Battery mode. The TIMER contact(s) are activated only in the Battery mode after the user-programmed time is attained, that can be set in 15 minutes interval from 15 minutes to 8 hours.

**TIP:** Verify that all breakers, AC and battery breakers are OFF prior to wiring.

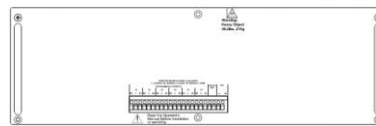


## Step 1: Connect CONTROL wires.



Wrap a tie around the strain relief loop and the battery temperature sensor to prevent the connector from disconnecting during an earthquake or other severe vibrations.

**NOTE:** External chassis ground is provided by ground lug on front of UPS. Max wire size is 10 AWG.



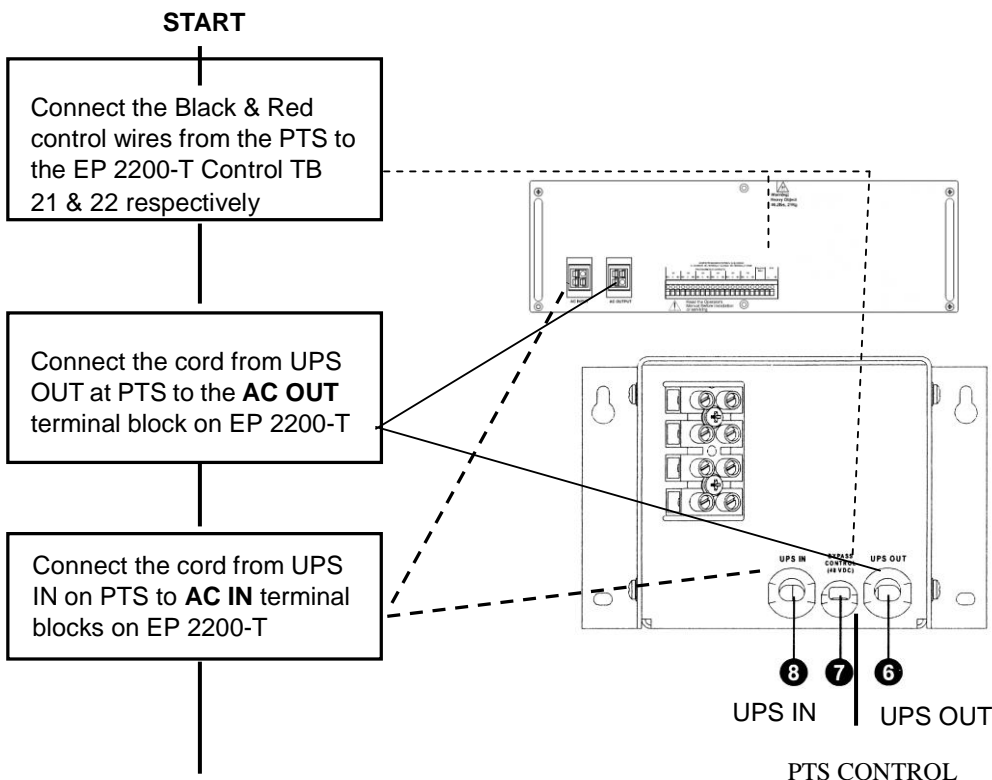
**TIP:** Torque status/self test terminal block to a maximum of 4.4 lb-in (0.5 Nm). Maximum wire size is 14 AWG.

**Figure 4**  
EP 2200-T Front Panel

**TIP:** (See Section 2.1.2, Fig. 16) of this manual for details on the layout, operation, and specifications of the Control Terminal Block.

## GO TO STEP 2

## Step 2: Connect PTS to the EP 2200-T.

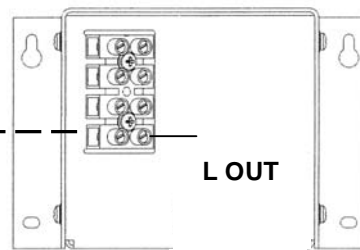
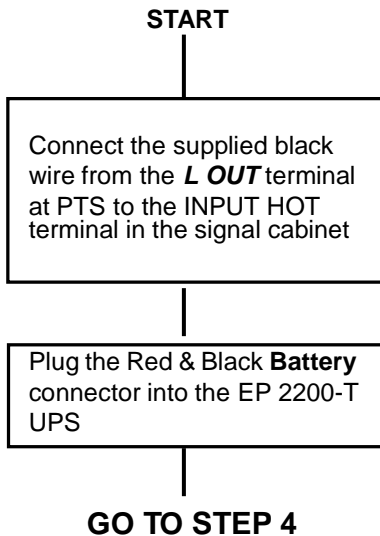


## GO TO STEP 3

**Figure 5**

MP 20 EP 2200-T Front & Power Transfer Switch

### Step 3: Connect the output or Signal Cabinet and Battery.



**Figure 6**  
Power Transfer Switch



**Figure 7**  
EP 2200-T Front Panel

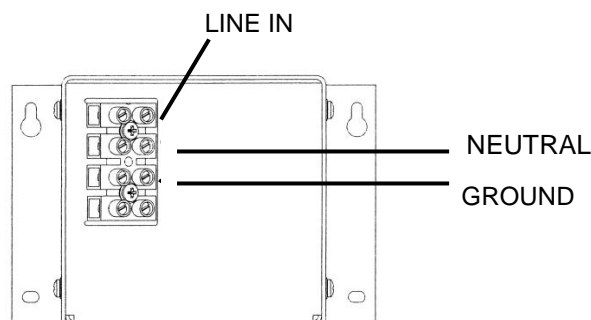
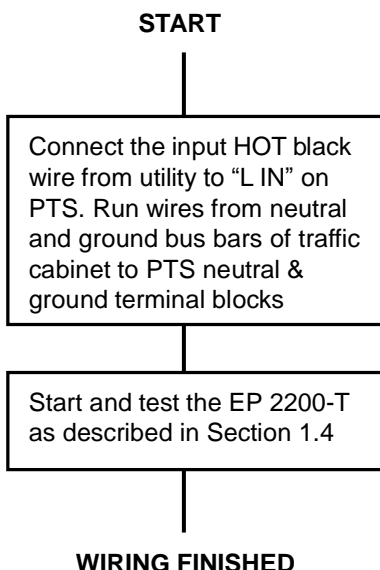
#### TIPS:

1. The wires from Ground and Neutral Bus Bars from the traffic cabinet are extended to PTS Terminal Block as shown in step 4.
2. OPEN the upstream breaker feeding utility power to the signal cabinet.
3. Disconnect the HOT wire (Black) connected between utility and traffic cabinet.
4. The cabinet side HOT wire is connected to "L OUT" on the PTS.
5. The utility side HOT wire is connected to "L IN" on the PTS.
6. Torque the PTS terminal block to a maximum of 10.0 lb-in (1.1 Mm).

### Step 4: Connect the Utility Input Line Power.



**DANGER:** Make sure the upstream circuit breaker feeding the utility power is **OFF** before beginning this step. Leave the NEUTRAL and GROUND wires connected from utility to signal cabinet. Extend the NEUTRAL and GROUND wires from their corresponding bus bars in the traffic cabinet to the terminal block on the PTS.



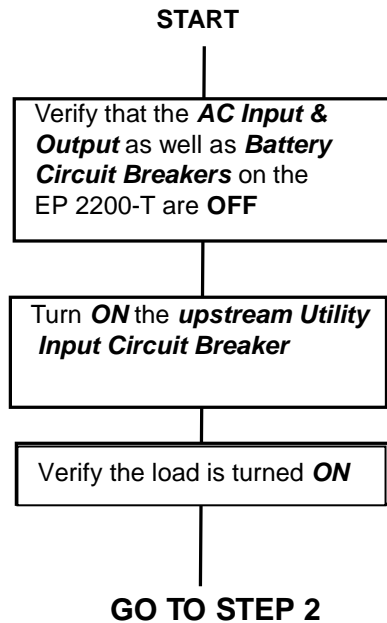
**Figure 8**  
Power Transfer Switch

## 1.4 Start-Up and Test

**Purpose:** Describes how to Start-up and test the system.

**TIP:** If the system does not perform as described below, see the troubleshooting section in Section 1.6 of this manual.

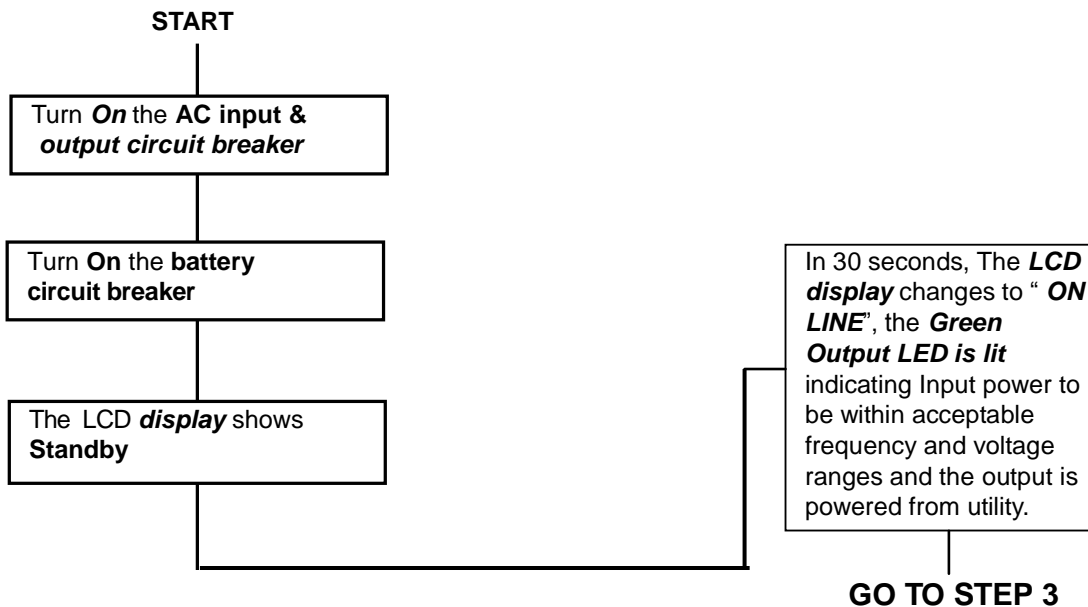
### Step 1: Turn on the Utility Input line Power



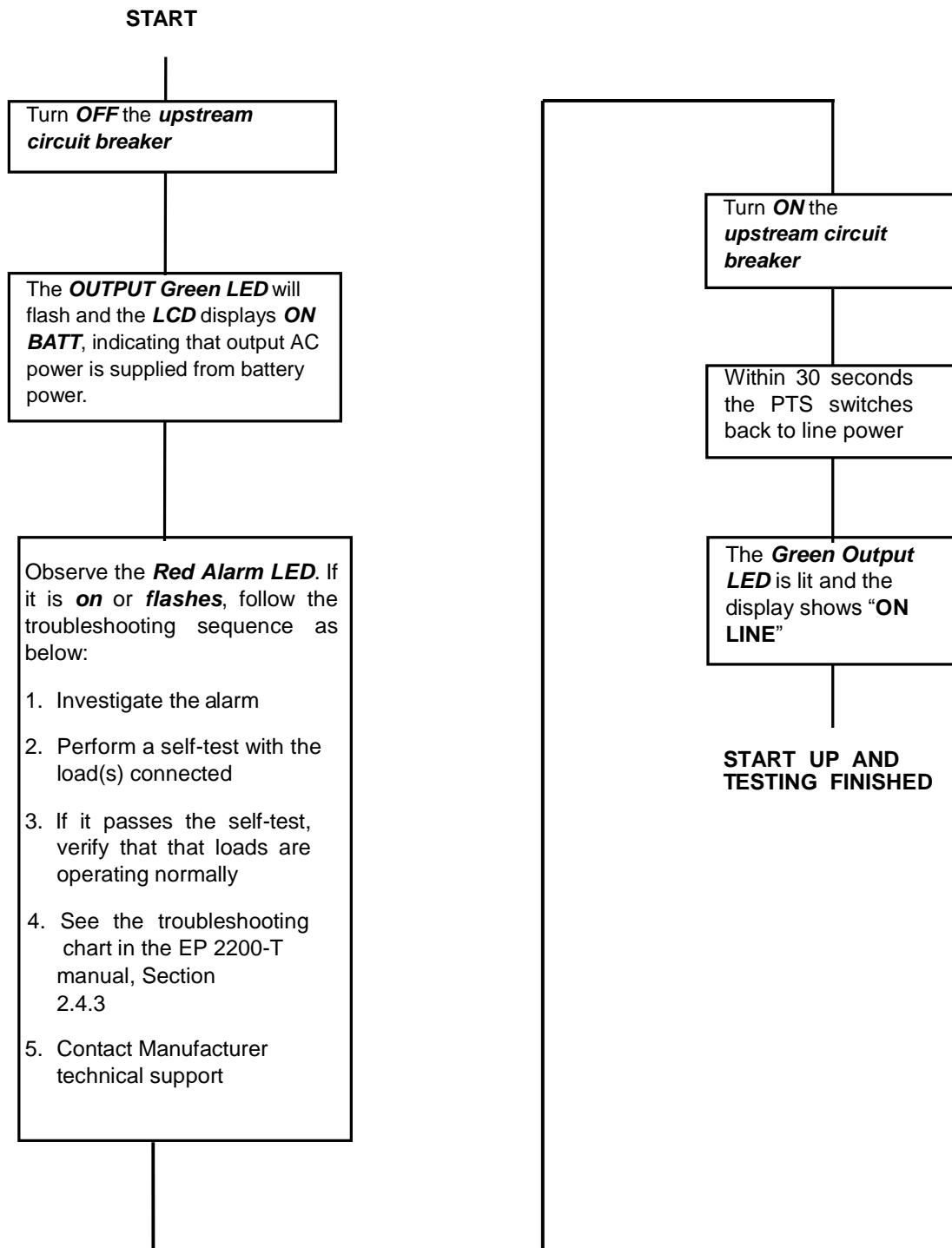
#### STARTUP PROCEDURE TIPS

The EP 2200-T automatically starts up in Standby mode. After the AC line is qualified (default 30 seconds) the BBS switches to On Line mode. The PTS is a safeguard that the cabinet will always revert to utility power if there is ever a failure of the EP 2200-T or batteries.

### Step 2: Turn on the UPS.



### Step 3: Test the system.



**TIP:** To test the UPS, perform the self-test feature via the control submenu (see this manual, Section 2.2.3, "Self Test").

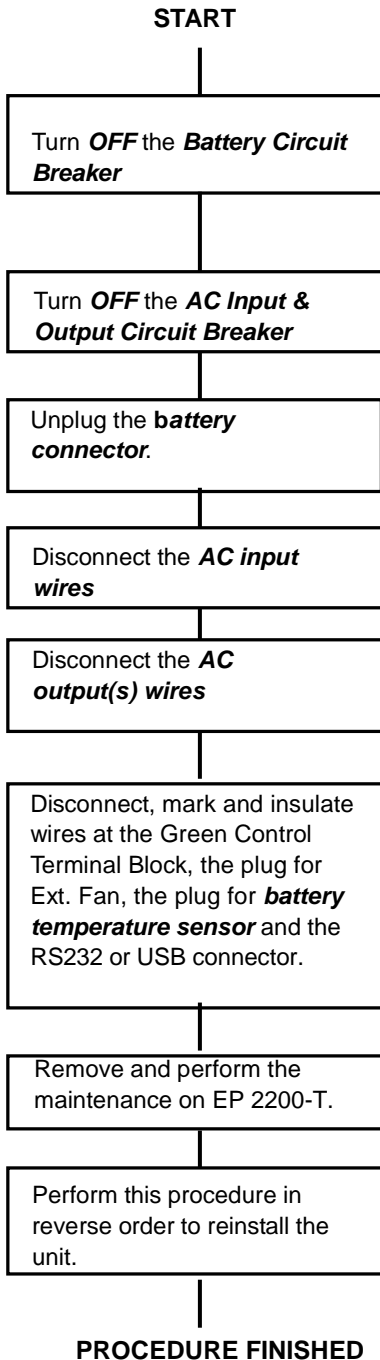
## 1.5 Shutdown

**Purpose:** Describes how to shut down the system components for removal or maintenance.

### 1.5.1 EP 2200-T UPS



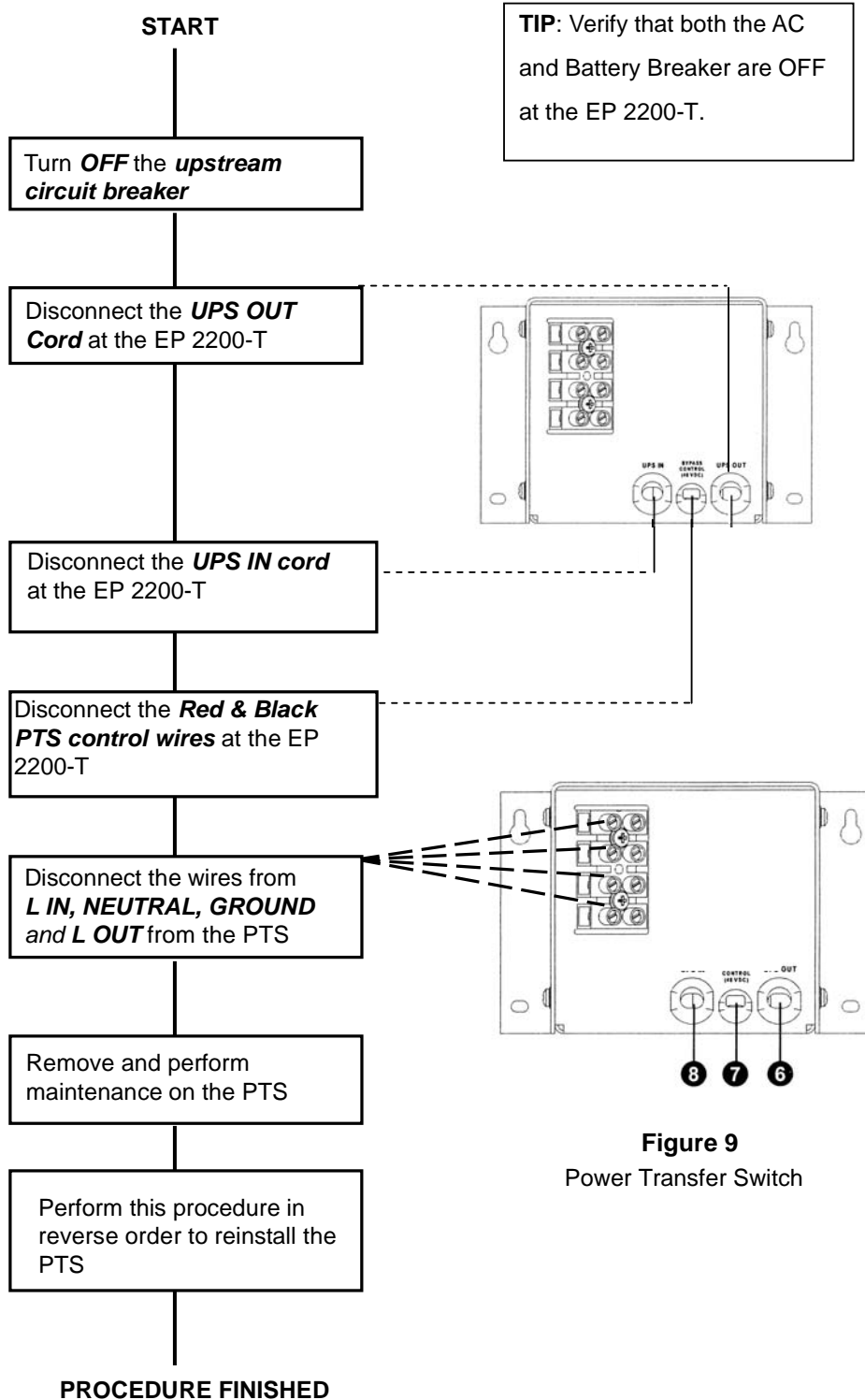
**DANGER:** Shutting down the EP 2200-T **does not** necessarily disconnect power to the loads.



**DANGER:** The AC input wires from PTS are still HOT or Live. Insulate the bare wires using wire nuts.

**TIP:** For additional information on how to operate the EP 2200-T manual, (see Section 2.2).

## 1.5.2 PTS



## 1.6 Troubleshooting

**TIP:** For troubleshooting the EP 2200-T UPS, (see Sections 2.2.3 and 2.4.3) of this manual.

EP 2200-T System Troubleshooting Chart		
SYMPTOM	CAUSE	REMEDY
<b>No Output</b> available from PTS	Upstream utility circuit breaker or fuse may be OPEN	CLOSE the upstream utility breaker or fuse
	Utility AC Power not available	Check with the AC voltmeter & contact the Utility Company
	Wiring error PTS terminal block	Correct wiring at PTS
	Faulty PTS	If 120 VAC is present at “L IN” and NEUTRAL at the PTS terminal block, replace the PTS
<b>PTS won’t allow</b> transfer to Battery mode	EP 2200-T output power not connected to PTS	Verify that “UPS OUT” cord from PTS is properly connected to the AC OUTPUT terminal block at the EP 2200-T
	“UPS INPUT” circuit breaker at PTS is open	Reset the breaker & clear the fault
	Black and red control wires from PTS are not connected at the Green Control terminal block TB 21 & 22 on the EP 2200-T	Check the connection at the EP 2200-T
	48VDC signal missing at TB 21 and 22 of Green Control terminal block at the EP 2200-T	Refer to Section 2.4.3 of this manual for further troubleshooting
	Faulty PTS	Replace PTS
<b>EP 2200-T</b> does not return back to input Line mode	Utility input line power is missing	Verify that “UPS IN” cord from PTS is properly connected to the AC INPUT Terminal Block at the EP 2200-T
		Verify that the “UPS INPUT” circuit breaker at PTS is closed
		Ensure that the utility input is present

**Figure 10**  
Troubleshooting Table

## 1.7 Specifications

System Technical Specifications	
<b>INPUT</b>	
Voltage Range, VAC	100~130VAC (120 VAC Nominal) Prog. 90~150VAC
Frequency	60 +/- 3 Hz
Current	30A (Resistive)
Step Load Response (50% Load Change)	1/2 Cycle Full Recovery (Full resistive load)
Short Circuit Protection	15 A circuit breaker
Battery String Voltage	48VDC (Four 12VDC Battery)
<b>OUTPUT</b>	
Power, VA / W (Line or Inverter mode)	2000VA / 1500W
Power Factor	0.75
Output Voltage, VAC Line and Boost Mode	100~130 +/- 2 VAC (follows the input voltage)
Inverter Mode	120VAC +/- 5%
Output Waveform	Sine Wave
Output Waveform THD	< 3% (Resistive load)
Load Crest Factor	3:1 (Max)
Overload Capacity	110% for 3 minutes
<b>PERFORMANCE</b>	
PTS Transfer Time	< 65 ms Buck & Boost mode <10 ms

ENVIRONMENTAL	
Operating Temp (See Notes below)	-34 to + 74 °C
Storage Temp	-50 to +75 °C
Humidity (Non-Condensing)	< 95%
Altitude (Note 2)	10,000ft /3000 m
PTS MECHANICAL	
Dimensions (WxDxH) inch/mm	4.75/ 120.6 (W) 6.5/165 (D) 4.6/116.8 (H)
Weight (lb/kg)	7.0/3.2
Mounting	Rack Mount EARS, 4 points optional 19" rack mount
Input Connection	Terminal block
Output Connection To Loads	Terminal block
Output Connection To UPS	6 foot line cords ready for hard wiring to UPS terminal blocks
Cooling	Convection (Approx 7 W contactor coil dissipation)
DESIGNED TO MEET	
Electrical Safety	UL -1778, CSA-107.1, UL 60950-1
EMI	FCC Class A
Surge Immunity	IEC 1000-4-5, IEEE C62.41

### Note:

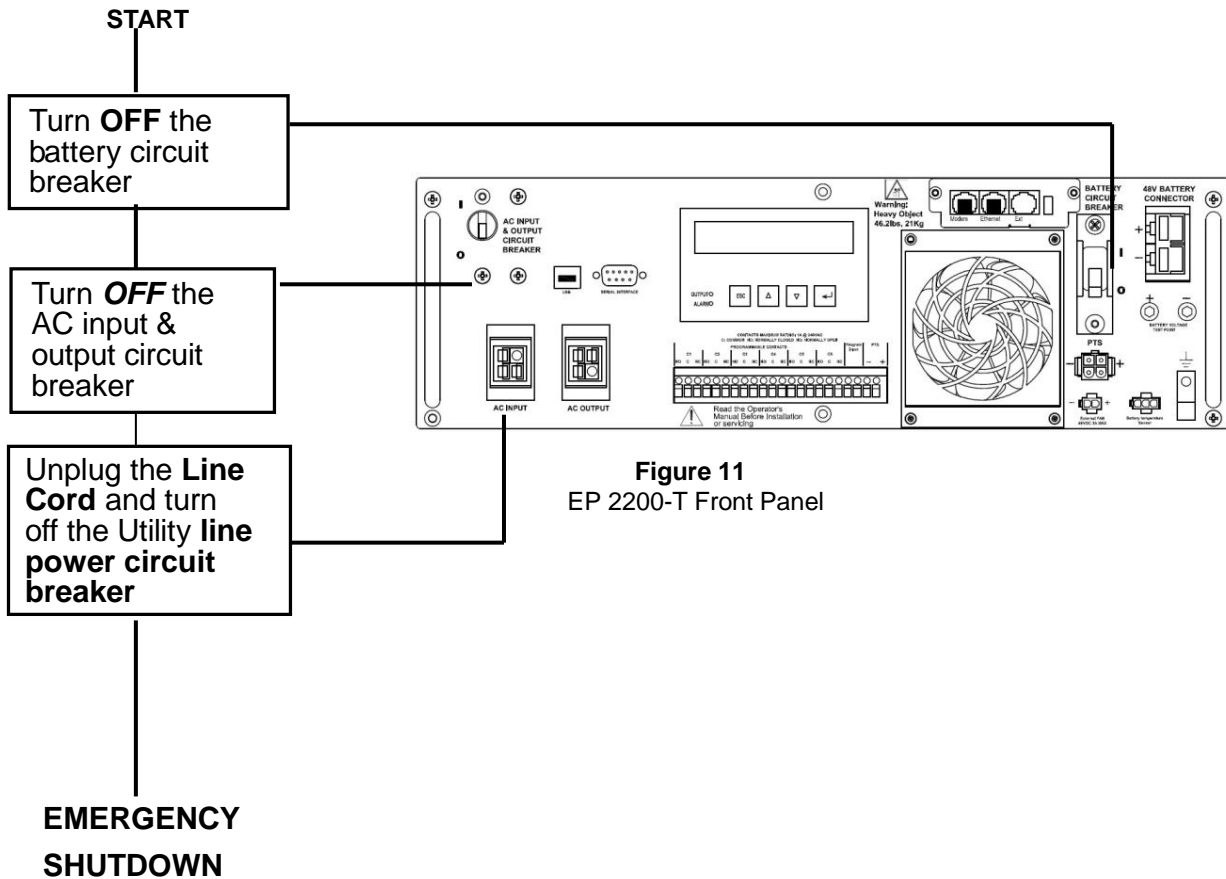
- Between 55 ~ 74 °C, the system is de-rated to a maximum rectified-capacitive load of 1500 VA /1200 W.
- De-rate operating temperature above 4900 ft (1500m) by 2°C per 1000 ft (300m).
- Refer to Section 2.4.5 at the end of this manual for additional specifications.

Due to ongoing product improvements, specifications are subject to change without notice.



## 1.8 EMERGENCY SHUTDOWN PROCEDURE

The EP 2200-T UPS is connected to more than one energy source. In an emergency, DISCONNECT utility input power, battery power, as well as an optional generator power, if utilized. Disconnecting all the AC and DC power sources will ensure that the output circuit is not live.



# **Multilink EP 2200-T System**

## **Battery Backup / Uninterruptible Power Supply System**

- Section 2: Operator's Manual

## **Section 2.1**

### **Introduction**

This section introduces the various features of the Multilink EP 2200-T UPS / BBS System

#### **2.1.1 The Advantages**

#### **2.1.2 A Tour of the EP 2200-T**

## **2.1.1 The Advantages**

### **Advanced Power Protection Technology**

EP 2200-T is an Uninterruptible Power Supply (UPS) also known as a Battery Backup System (BBS) designed for both indoor and outdoor applications. The EP 2200-T provides continuous power to traffic and signal equipment.

#### **◆ Advanced Communications**

The RS232 and/or USB ports allow for local or remote monitoring of the EP 2200-T.

#### **◆ Smart Charging**

Multilink smart charge technology ensures the batteries are always at peak performance.

#### **◆ User Friendly Supervision**

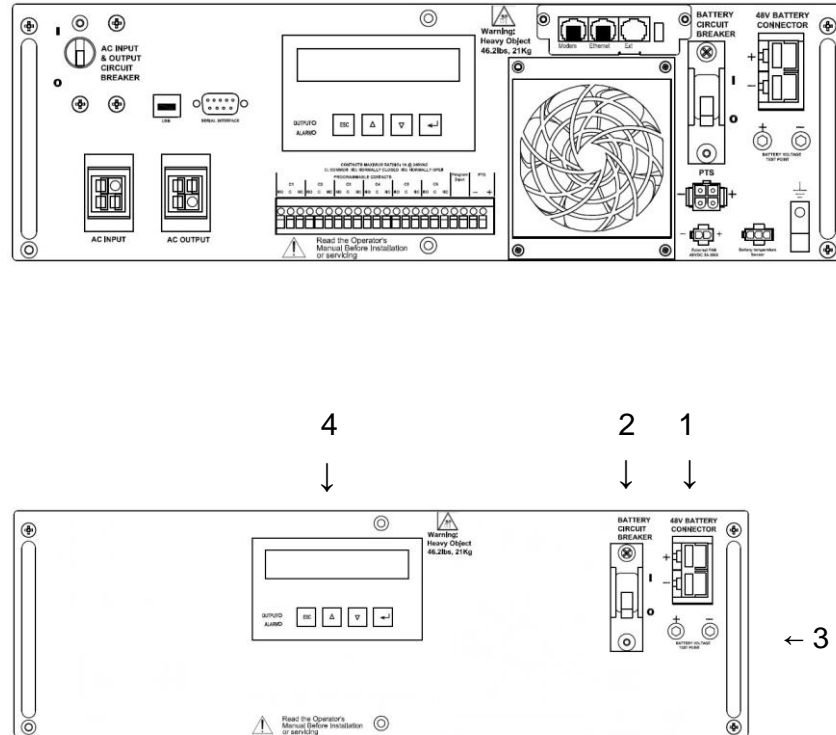
The LCD panel provides “At A Glance” monitoring and control.

#### **◆ Service Friendly**

The batteries can be changed without shutting down the intersection loads or the EP 2200-T.

## 2.1.2 A Tour of the EP 2200-T

**Purpose:** Describes the display, connections and switches on the EP 2200-T front panel (Figures 12, 13 & 14).



**Figure 12**  
EP 2200-T Front Panel

### 1. 48VDC Battery Connector

Connects the battery to the unit. The battery string voltage is 48VDC.

### 2. Battery Circuit Breaker

Acts as an ON/OFF switch for battery power. Must be in the **ON** position for normal operation.

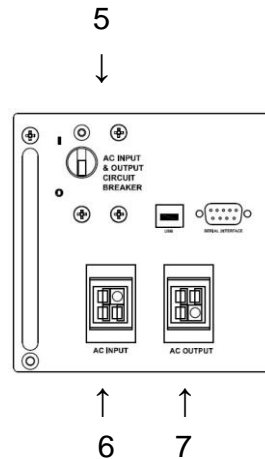
### 3. Battery Voltage Test Points

Battery voltage can be measured at these Test Jacks only when the battery circuit breaker is turned **ON**.

**TIP:** TEST JACKS ARE NOT DC POWER OUTLET TERMINALS.

### 4. Liquid Crystal Display (LCD) Control Panel

The UPS can be controlled and monitored via this LCD panel. See Section 2.2 for further information.



**Figure 13**  
EP 2200-T Front Panel

## 5. AC Input & Output Circuit Breaker

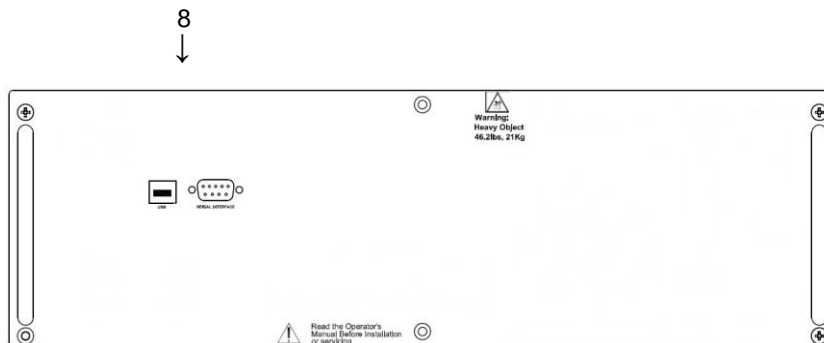
Acts as a line and output power ON/OFF switch to facilitate the unit's maintenance or replacement. Must be in the **ON** position for normal operation.

## 6. AC Input

Inlet Anderson PP45/4P provided for the input of line power.

## 7. AC Output

Outlet Anderson PP45/4P provides the connection for the output of line power.



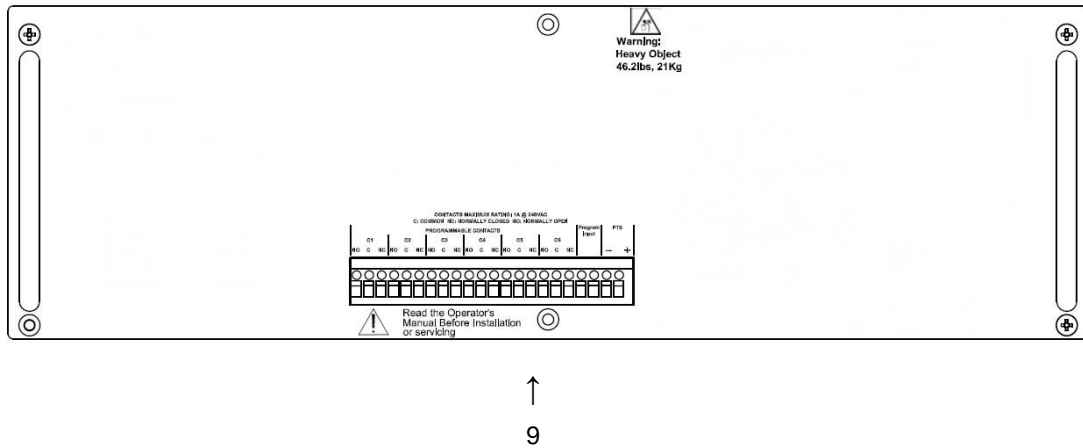
**Figure 14**  
EP 2200-T Front Panel

## 8. USB / Serial Interface / RS232 Connector

The USB and /or DB-9 female connector is used to connect the EP 2200-T to the host computer for remote control, monitoring and calibration via RS232 commands.

For the USB or DB-9 female RS232 connections use computer industry standard computer cable between the computer's USB or RS232 port and the EP 2200-T unit's USB or RS232 ports.

See Section 2.3 for more details about connection and use.



**Figure 15**  
EP 2200-T Front Panel

## 9. Green Control Terminal Block

This 22 position terminal block provides communication with the intersection controller, controls the Power Transfer Switch (PTS) and Programmable Input contact. Figure 16 shows its layout and operation.

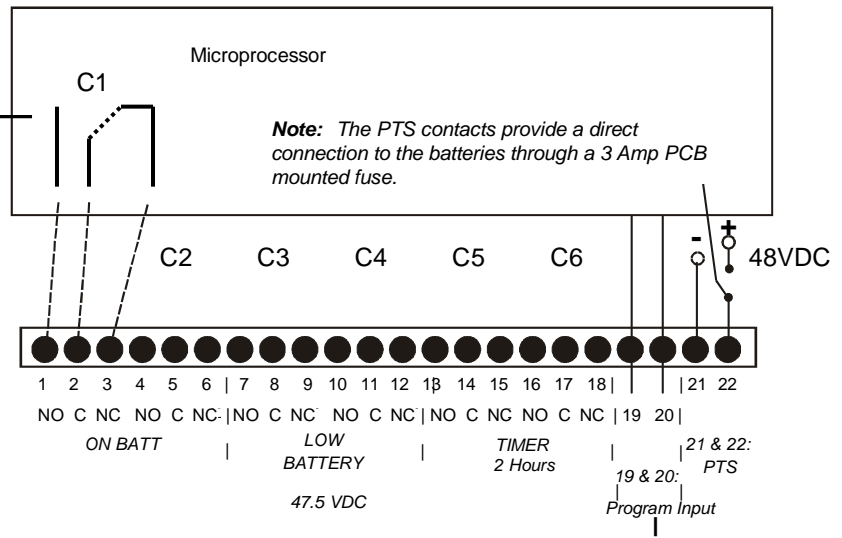


**Note:** This terminal block is opto-isolated and shares a common ground with the serial interface. Each of the six programmable contacts can be programmed for one or more functions such as: **The Timer, Low Battery** and **On Batt.** The relay contacts are Form C type, i.e. Each of the six programmable contacts has Common (C); Normally Closed (NC) and Normally Open (NO) contact position.

- **On Batt:** This relay energizes when Utility Input line power is unqualified.
- **TIP:** When the AC input and output circuit breaker is turned **OFF**, an auxiliary switch of the circuit breaker opens which disables the On Batt. contact at the Green Control Terminal Block. This prevents the intersection lights from flashing.
- **Low Battery:** These relays energize when the battery drops below the programmed battery capacity. The default value is 47.5VDC or 40% battery capacity.
- **TIP:** You can change the preprogrammed value to match the batteries used and the actual operating conditions. See Section 2.3.4.4, "Maintenance" # 35, "Battery Voltage Level @40% of Capacity".
- **Timer:** These relays energize after the unit has been in Battery mode for the programmed time period. The factory default value is 2 hours.
- **TIP:** The time can be programmed to be from 15 min. to 8 hours in 15 minute increments
- **Program Input :** The programmable input contact can be programmed for one function such as : **Self-test, EXT Alarm, EXT Battery Alarm, EXT Fan Failure, Door Interlock.** Jumper the TB 19 & 20 on the Green Control Terminal Block and the program alarm will show on LCD display.
- **PTS:** EP 2200-T sends a 48VDC signal from the batteries to the PTS, which activates the PTS, resulting in transfer from Input power to BBS power. See Section 1.3, Wiring, of this manual for connection instructions.

## EP 2200-T Interior

**Note:** These contacts have a maximum rating of 1 Amp at 120V. Only the first On Batt contact is illustrated. The remaining 5 contacts for Low Battery, Timer, etc., are similar.



**Note:**

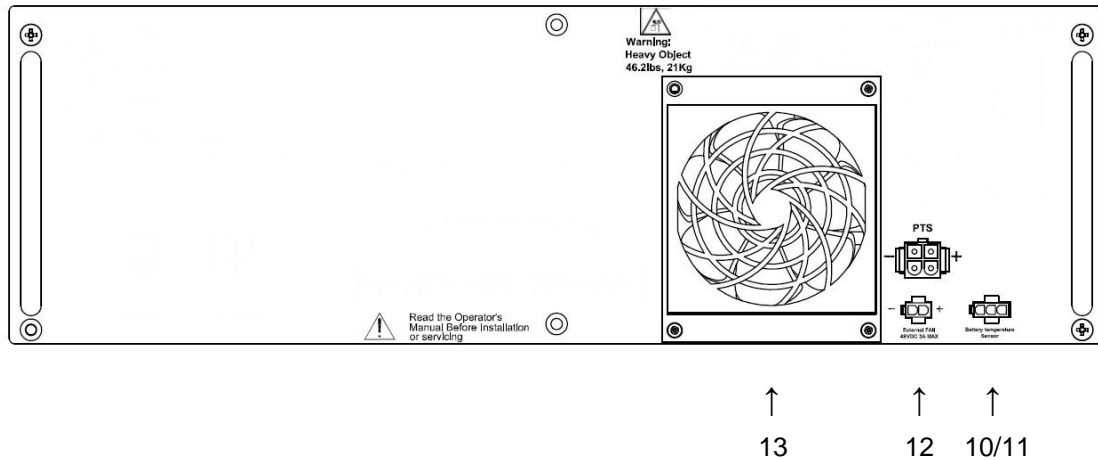
- 6 sets of programmable contacts have the following factory default settings:  
C1, C2 = "On Batt"  
C3, C4 = "Low Batt @ 47.5VDC"  
C5, C6 = "Timer @ 2.00 Hours"
- User may program each of the six contacts for one or more functions. See Section 2.2 Sub Menus for more detailed information.

**Note:** The Programmable Input is performed by jumpering TB19 & 20

**Figure 16**

Green Control Terminal Block  
Layout and Operation





**Figure 17**

EP 2200-T Front Panel

## 10. Battery Temperature Sensor Strain Relief

This secures the Battery Temperature Sensor cord to the panel and prevents connector disconnection during an earthquake or other severe vibrations.

First plug the sensor cable into the connector. Then use one of the ties provided in the mounting kit to attach the sensor cord to the strain relief loop. Ensure that the cable is secure.

## 11. Battery Temp Sensor

It attaches the battery temperature probe to the unit for monitoring battery temperature. The charging voltage is temperature dependent. The microprocessor of the smart charger adjusts the voltage for optimum charging.

The temperature probe connector **must** be plugged in for normal operation. The sensor end should be firmly attached to the terminal of the battery.



**TIP:** If the EP 2200-T is not charging the batteries check the temperature probe. To test the temperature probe unplug it from the face of the UPS. Check the resistance of the temperature probe by inserting the probes of an ohm meter into the top and bottom pins of the connector. The meter should read approximately 12,000 Ohms at 25°C (77 °F). If resistance is not in this range, replace temperature probe.

## 12. Ext Fan 48VDC

Provides DC Power (48VDC, 1 Amp (Max)), which could be used to power an optional 48VDC fan, mounted inside the enclosure for regulation of the interior temperature.

## 13. Internal Fan

This microprocessor-controlled fan regulates the unit's internal temperature. It must not be blocked. The filter in front of the fan is removable for cleaning.

**TIP:** Inspect the filter every 6 months, or as often as required. Clean by removing it, running water through the filter and air-drying before reinstallation.

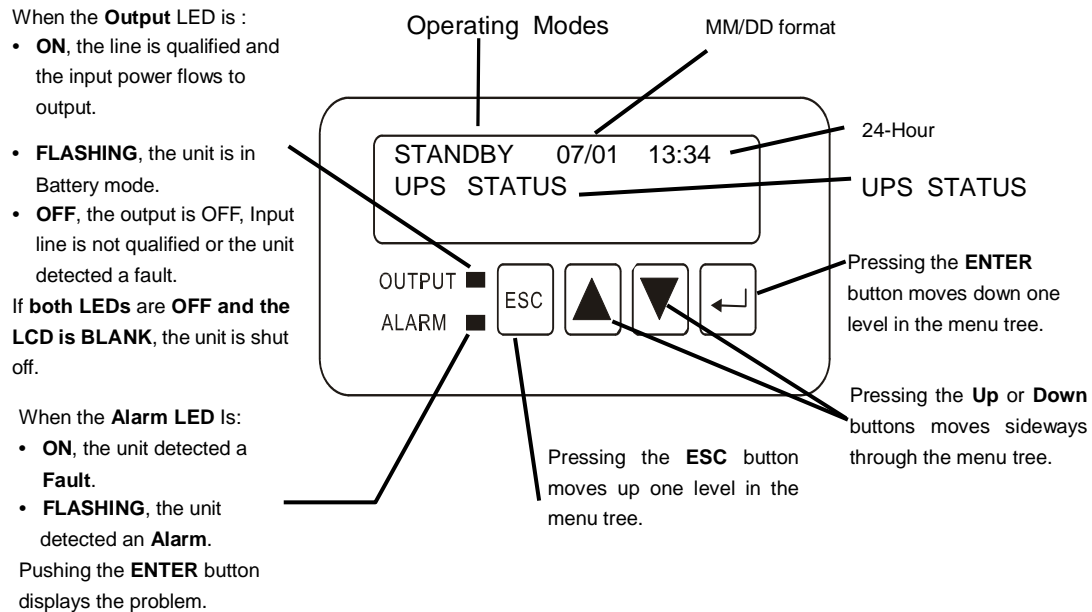
## Section 2.2 Operation

This section describes how to start, shutdown and operate the EP 2200-T:

- 2.2.1 The LCD Panel
- 2.2.2 The EP 2200-T Operating Modes
- 2.2.3 The Self-Test
- 2.2.4 Start-Up
- 2.2.5 Shutdown
- 2.2.6 Battery Replacement
- 2.2.7 LCD Menu Tree
- 2.2.8 STATUS Submenu
- 2.2.9 CONTROL Submenu
- 2.2.10 SETTINGS Submenu
- 2.2.11 MAINTENANCE Submenu
- 2.2.12 ALARM Menu
- 2.2.13 FAULT Menu
- 2.2.14 Event Log View
- 2.2.15 Low Battery Mode Status
- 2.2.16 Parameter Changes

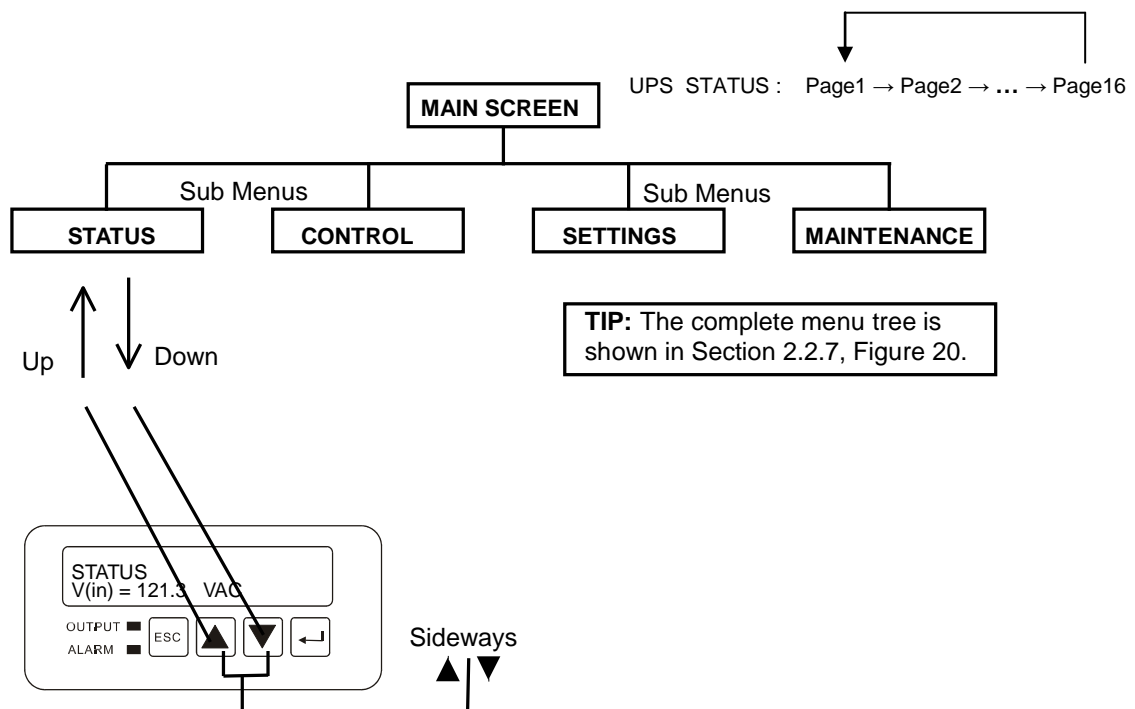
## 2.2.1 LCD Panel

*Purpose: Describes the LCD display menus (Figure 18) and use of user-friendly sub-menus (Figure 19).*



**Figure 18**  
LCD Panel Key Functions

**TIP:** When the ambient air temperature drops below -20°C (-4°F), the LCD may turn DARK until the temperature rises above -20°C (-4°F). However the unit will operate normally.



**Figure 19**  
LCD Panel and the Menu Tree

## 2.2.2 EP 2200-T Operating Modes

**Purpose:** Describes the Operating modes.

**TIP:** The LCD automatically displays the following modes when they change.

LCD Shows	Explanation
STANDBY	This mode is displayed when the unit is first turned on. The inverter remains off and the EP 2200-T does not provide output power to the loads. If input line power is qualified, it automatically switches to line mode. To provide battery power to the loads, use the manual on function (see Section 2.2.9)
ON LINE	The normal operating mode. Input line power is provided to the loads, the batteries are charging and the EP 2200-T is ready to provide backup power
BOOST*	The unit automatically transfers to BOOST mode to raise the lower input line voltage when output drops below the user programmable preset limit
ON BATT	The unit automatically transfers to battery when input line power is unqualified or not present. The batteries provide power to the loads
BUCK*	The unit automatically transfers to BUCK mode to reduce the higher input line voltage when output raises above the user programmable preset limit
SELF TEST	When "Self Test" mode is active, the unit will enter "Battery Mode" automatically to test or check if output voltage and waveform is correct. After the programmed duration, the unit returns back to "Line Mode". Users may use "Maintenance Mode" to configure a longer time for self-test. Default time for self-test is 1 minute.
LOW BATT	When the unit is in "Battery Mode" the batteries begins to discharge. If the battery voltage falls below the user programmed (40% default setting) of its capacity, "Low Bat" warning appears.

\* When enabled.

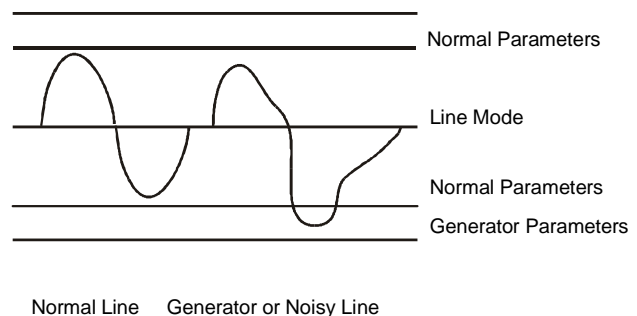
The following mode may be programmed by the User (see Section 2.2.10)

### Sense Type (Generator / Normal Mode)

This is used to broaden the input parameters to accommodate the voltage fluctuations created by a backup generator or a noisy line.

The factory default setting is normal, where the unit runs on normal parameters. Switching to Generator makes it run on noisy generator parameters.

If the unit constantly switches between line and battery modes due to a noisy line, select generator mode to prevent unnecessary transfers / returns.



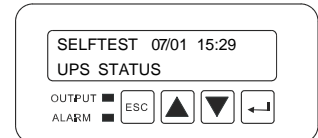
## 2.2.3 Self Test

**Purpose:** Describes the Self-Test.

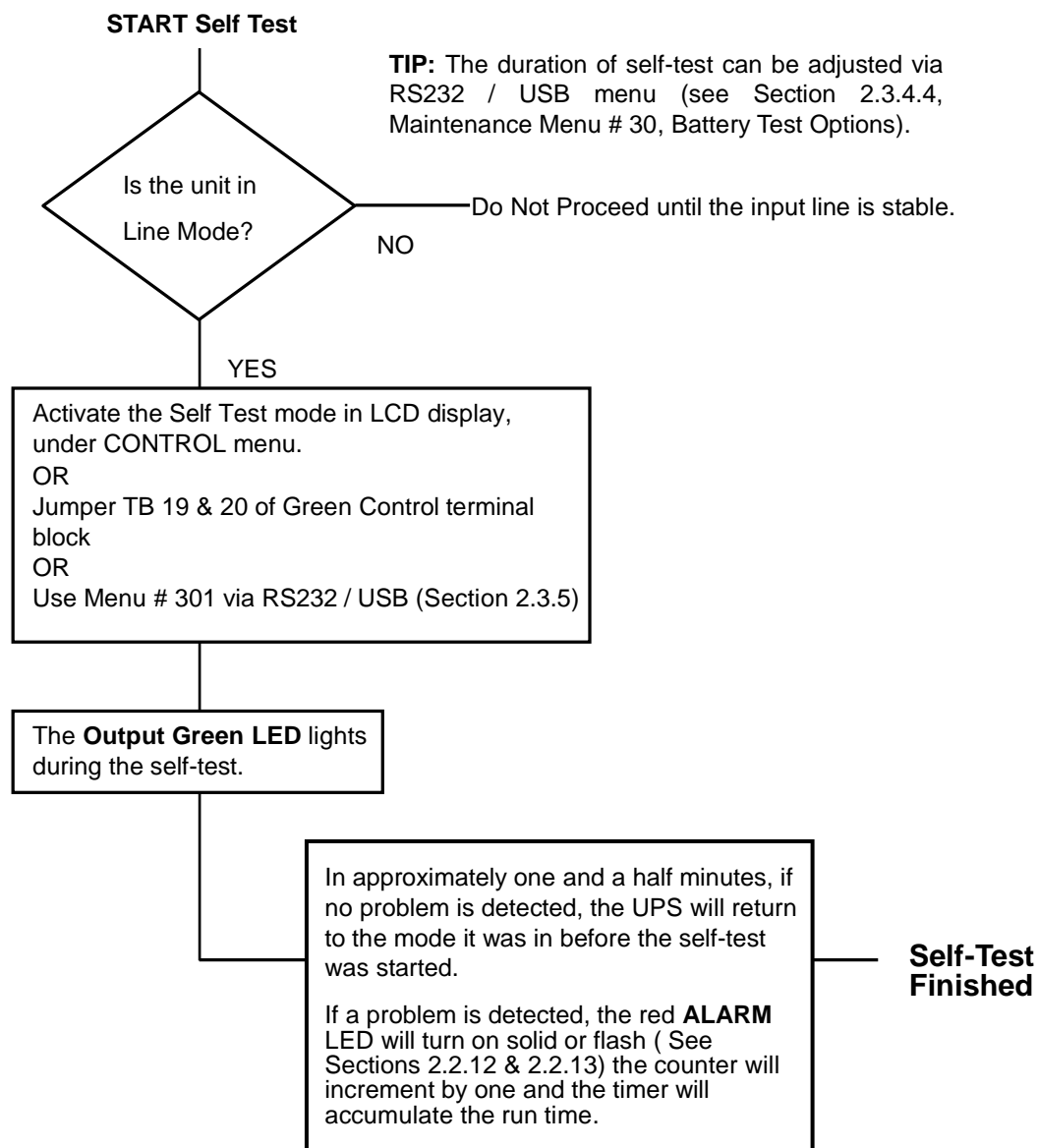


**CAUTION:** This procedure should not be performed when critical loads are running that depend on the unit for backup power.

The Self Test confirms that the unit can transfer into and out of Battery mode while supporting the output load at the same time.

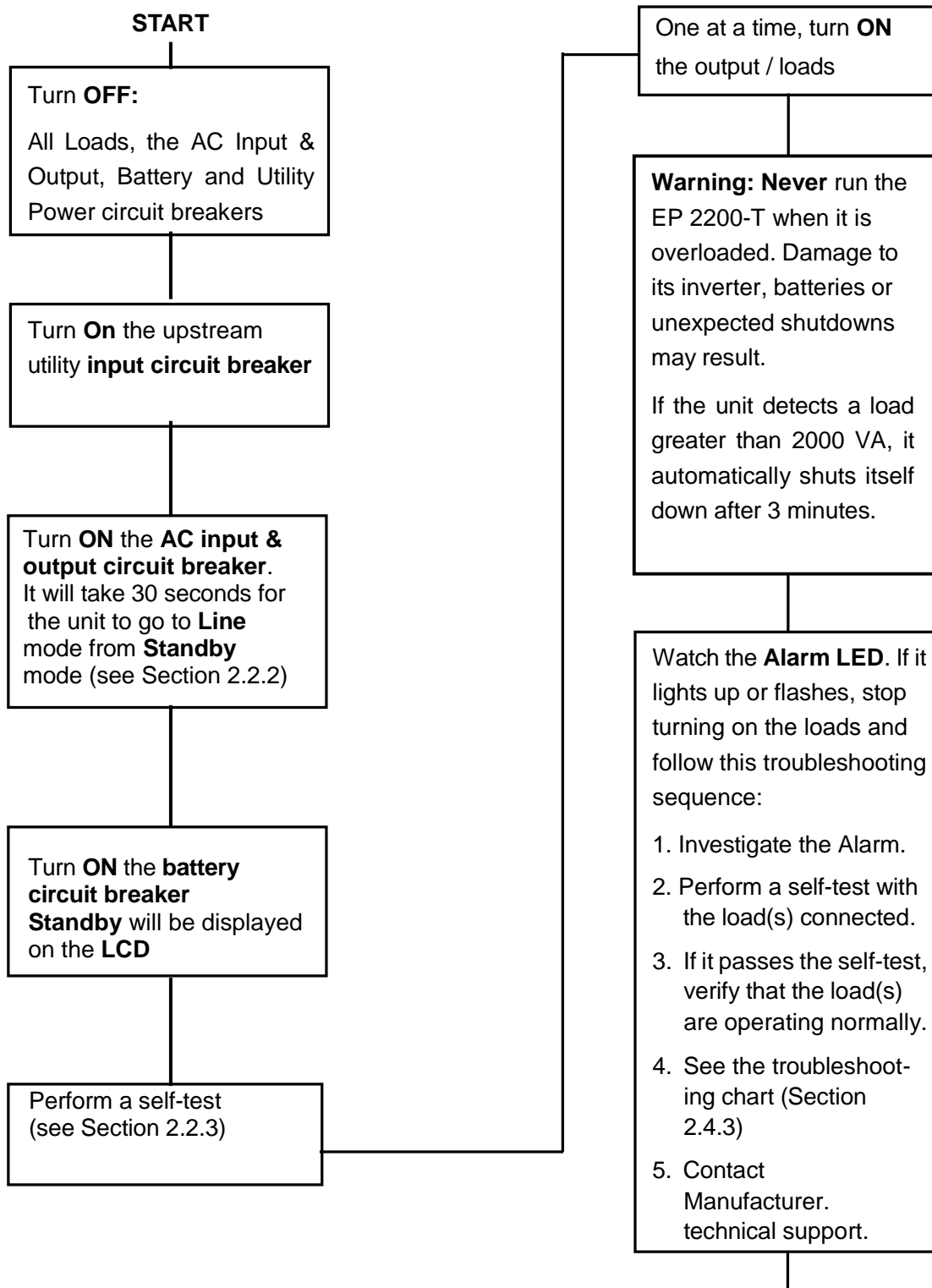


### Procedure:



## 2.2.4 Start Up

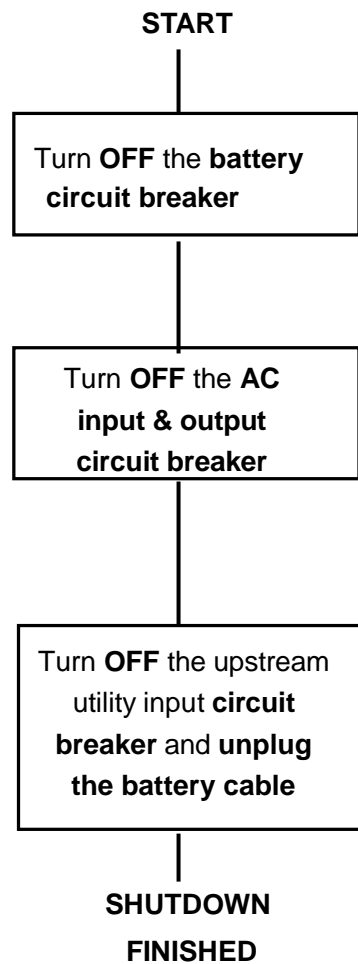
**Purpose:** Describes the Start Up procedure.



**START UP FINISHED**

## 2.2.5 Shutdown

**Purpose:** Describes the shutdown procedure.



## 2.2.6 Battery Replacement

**Purpose:** Describes how to change the battery.



**CAUTION:** While the battery is being changed, the EP 2200-T cannot provide backup power. This procedure should not be done while critical loads are running that depend upon the EP 2200-T's backup power.



**CAUTION:** a) Risk of energy hazard, 12V, 110Ahr battery. Before replacing batteries, remove conductive jewelry such as chains, wrist watches, and rings. High energy through conductive materials could cause sever burns.



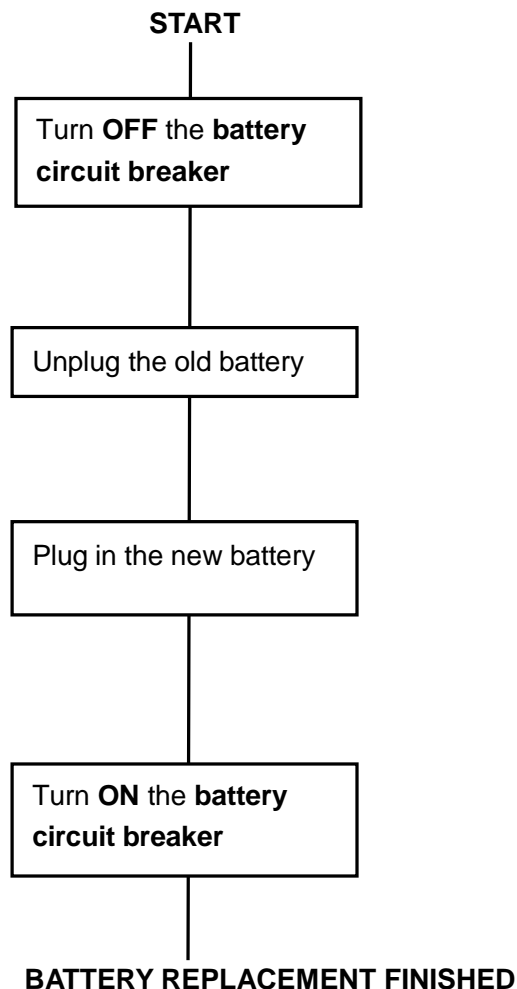
**CAUTION:** b) Do not dispose of batteries in a fire. The batteries may explode.



**CAUTION:** c) Do not open or mutilate batteres. Released material is harmful to the ksine and eyes. It may be toxic.

### BATTERY CHANGING PROCEDURE

**NOTE:** The **ALARM LED** remains **ON** during this procedure.





## 2.2.7 LCD Menu Tree and Main Screen

**Purpose:** Shows the Menu Tree (Figure 20).

**TIP:**

- The Alarm and Fault submenus alert the operator of a problem with the EP 2200-T. When the alarm LED is **ON** or **FLASHING**, press the **ENTER** button. One of the conditions described in Section 2.2.12 or 2.2.13 appears on the LCD screen.
- The status submenu provides measurements of important EP 2200-T inputs, output, and other parameters via the LCD screen (Section 2.2.8).
- The control submenu allows the operator to manage the EP 2200-T (Section 2.2.9)
- To learn the value of a specific measurement, when it appears on the LCD screen, press the **ENTER** button.
- To start a command, when it appears on the LCD screen, press the **ENTER** button.

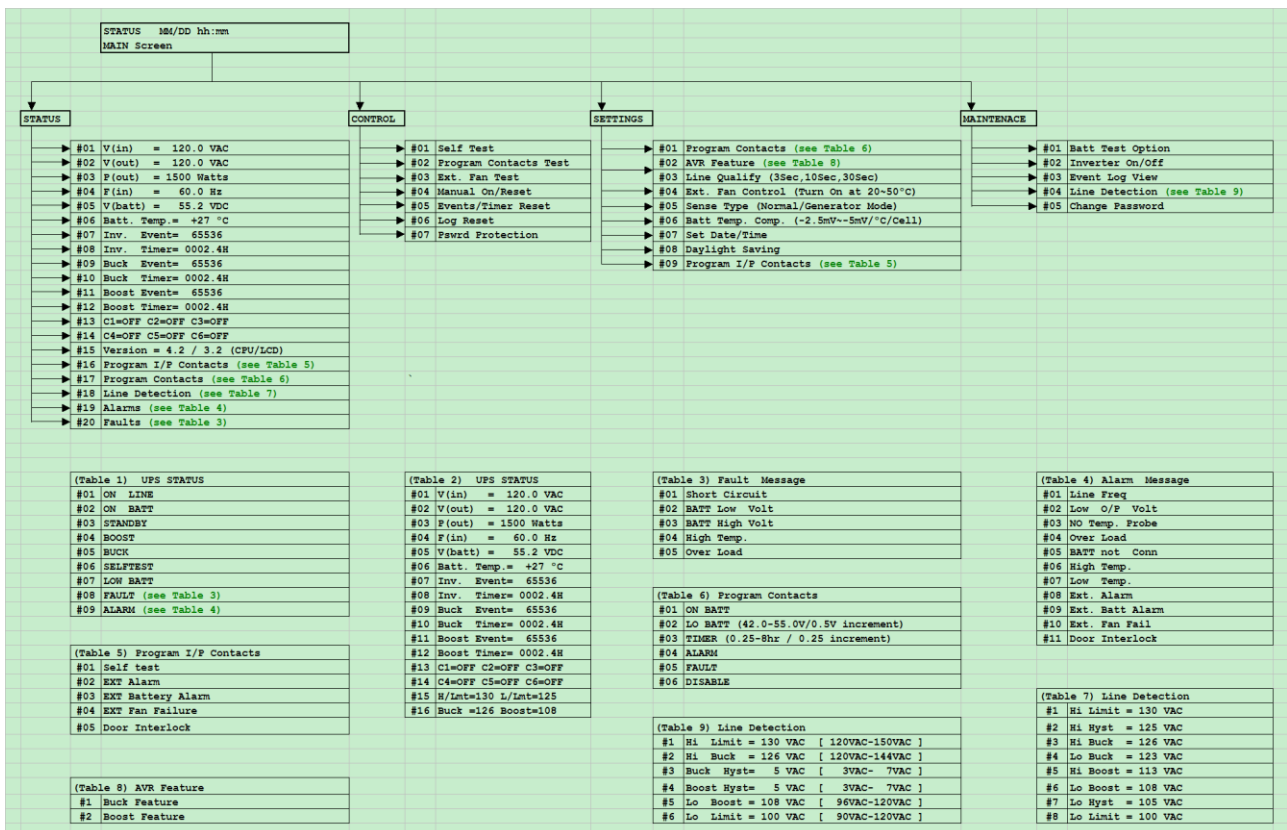


Figure 20

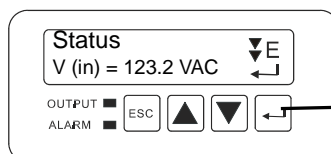
**Purpose:** Shows the Main screen.

ITEM	LCD SHOWS	DESCRIPTION
Page 1 Input Voltage	ON LINE 07/05 13:00 V (in) = 120.0 VAC	The Utility Input line voltage
Page 2 Output Voltage	ON LINE 07/05 13:02 V (out) = 120.0 VAC	The output voltage (ture RMS)
Page 3 Output Power	ON LINE 07/05 13:04 P (out) = 1230 Watts	The output Power (watts)
Page 4 Input Frequency	ON LINE 07/05 13:06 F (in) = 60.0 Hz	The Utility Input line frequency
Page 5 Battery Voltage	ON LINE 07/05 13:08 V (batt) = 55.2 VDC	The average battery voltage
Page 6 Battery Temperature	ON LINE 07/05 13:10 Batt. Temp. = +24 °C	The temperature of Battery case
Page 7 Inv. Events	ON LINE 07/05 13:12 Inv. Events = 00016	The number of times the unit has been in Battery Mode
Page 8 Inv. Timer	ON LINE 07/05 13:14 Inv. Timer = 0000.1h	The Total amount of time the unit has been in Battery Mode since the last reset. Each decimal indicates 6 minutes (0.1 x 6 minutes). The decimal increments by 2 or every 12 minutes.
Page 9 Buck Events	ON LINE 07/05 13:16 BUCK Events = 00002	The number of times the unit has been in Buck Mode
Page 10 Buck Timer	ON LINE 07/05 13:18 BUCK Timer = 0000.6h	The Total amount of time the unit has been in Buck Mode since the last reset.
Page 11 Boost Events	ON LINE 07/05 13:20 BOOST Events= 00000	The number of times the unit has been in Boost Mode
Page 12 Boost Timer	ON LINE 07/05 13:22 BOOST Timer= 0000.6h	The Total amount of time the unit has been in Boost Mode since the last reset.
Page 13 Program Contact C1~C3 status	ON LINE 07/05 13:24 C1=OFF C2=OFF C3=OFF	The status of the program contact C1,C2,C3.
Page 14 Program Contact C4~C6 status	ON LINE 07/05 13:26 C4=OFF C5=OFF C6=OFF	The status of the program contact C4,C5,C6.
Page 15 Line Detection High Limit and Low Limit	ON LINE 07/05 13:28 H/Lmt=130 L/Lmt=100	The values of the line detection high limit and low limit.
Page 16 Line Detection High Buck and Low Boost	ON LINE 07/05 13:28 Buck =126 Boost=108	The values of the line detection high buck and low boost.

## 2.2.8 Status Submenu

**Purpose:** Describes how to use the Status Submenu to measure the input and output parameters.

**Procedure:** When the desired item appears on the LCD screen, press **ENTER** to measure it. To see the updated reading, press **ENTER** again.



Push **ENTER** to measure the item (Output VA shown)

ITEM	LCD SHOWS	DESCRIPTION
Input Voltage	<div> S T A T U S ↓E </div> V (in) = 120.0 VAC	The Utility Input line voltage
Output Voltage	<div> S T A T U S ↕E </div> V (out) = 120.0 VAC	The output voltage (ture RMS)
Output Power	<div> S T A T U S ↕E </div> P (out) = 1230 Watts	The output Power (watts)
Input Frequency	<div> S T A T U S ↕E </div> F (in) = 60.0 Hz	The Utility Input line frequency
Battery Voltage	<div> S T A T U S ↕E </div> V (batt) = 55.2 VDC	The average battery voltage
Battery Temperature	<div> S T A T U S ↕E </div> Batt. Temp. = +24 °C	The temperature of Battery case
Inv. Events	<div> S T A T U S ↕E </div> Inv. Events = 00016	The number of times the unit has been in Battery Mode
Inv. Timer	<div> S T A T U S ↕E </div> Inv. Timer = 0000.1h	The Total amount of time the unit has been in Battery Mode since the last reset. Each decimal indicates 6 minutes (0.1 x 6 minutes). The decimal increments by 2 or every 12 minutes.
Buck Events	<div> S T A T U S ↕E </div> BUCK Events = 00002	The number of times the unit has been in Buck Mode
Buck Timer	<div> S T A T U S ↕E </div> BUCK Timer = 0000.6h	The Total amount of time the unit has been in Buck Mode since the last reset.
Boost Events	<div> S T A T U S ↕E </div> BOOST Events= 00000	The number of times the unit has been in Boost Mode

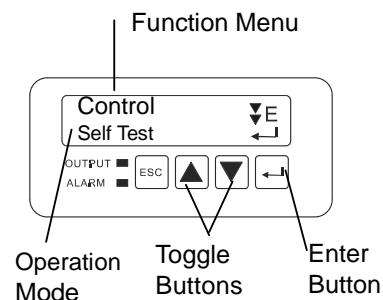
Boost Timer	<div> <div>S T A T U S</div> <div> <div>◆</div> <div>⏏</div> </div> <div>BOOST Timer= 0000.6h</div> </div>	The Total amount of time the unit has been in Boost Mode since the last reset.
Program Contact C1~C3 status	<div> <div>S T A T U S</div> <div> <div>◆</div> <div>⏏</div> </div> <div>C1=OFF C2=OFF C3=OFF</div> </div>	The status of the program contact C1,C2,C3.
Program Contact C4~C6 status	<div> <div>S T A T U S</div> <div> <div>◆</div> <div>⏏</div> </div> <div>C4=OFF C5=OFF C6=OFF</div> </div>	The status of the program contact C4,C5,C6.
Version No.	<div> <div>S T A T U S</div> <div> <div>◆</div> <div>⏏</div> </div> <div>Version = 2.2 / 2.2</div> </div>	The software version used in this unit. 2.2⇒Control board, 2.2⇒LCD Board
Program Input Contact	<div> <div>S T A T U S</div> <div> <div>◆</div> <div>⏏</div> </div> <div>Program I/P Contact↓</div> </div>	It indicates Programmed values of Input Contact
Program Contact	<div> <div>S T A T U S</div> <div> <div>◆</div> <div>⏏</div> </div> <div>Program Contact ↓</div> </div>	It indicates Programmed values of all 6 Contacts
Line Conditioning	<div> <div>S T A T U S</div> <div> <div>◆</div> <div>⏏</div> </div> <div>Line Conditioning ↓</div> </div>	It indicates Programmed values of all input Line Detection parameter & warning levels
Alarms	<div> <div>S T A T U S</div> <div> <div>◆</div> <div>⏏</div> </div> <div>Alarms ↓</div> </div>	It indicates Alarms (see 2.2.12)
Faults	<div> <div>S T A T U S</div> <div> <div>▲</div> <div>⏏</div> </div> <div>Faults ↓</div> </div>	It indicates Faults (see 2.2.13)

## 2.2.9 Control Submenu

**Purpose:** Describes how to use the control submenu to operate the unit.

**Procedure:** When the desired function appears on the LCD screen, pressing the **ENTER** button calls it up.

Many functions have more than one option available. Scroll through them by pressing the toggle buttons. When the desired option appears, pressing the **ENTER** button switches the unit to the new option.



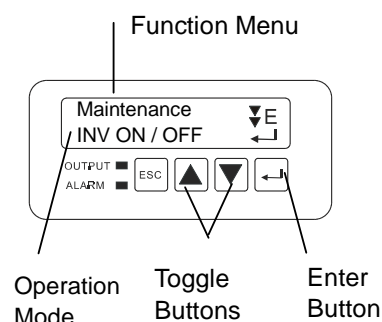
FUNCTION	LCD SHOWS	ACTION
<b>SELF TEST</b>	<div> C O N T R O L    ▾ E  Self Test        ⏴ </div>	Pressing <b>ENTER</b> starts the self test [Section 2.2.3]  <b>CAUTION:</b> The unit must be in Line Mode before starting the self-test.
<b>PROGRAM CONTACTS TEST</b>	<div> C O N T R O L    ⬆ E  Pro. Contacts Test ⏴ </div>	Pressing <b>ENTER</b> starts the program contact switch test.
<b>EXTERNAL FAN TEST</b>	<div> C O N T R O L    ⬆ E  Ext. Fan Test    ⏴ </div>	Pressing <b>ENTER</b> starts the external fan switch test.
<b>MANUAL ON/RESET</b>	<div> C O N T R O L    ⬆ E  Manual On/Reset ⏴ </div>	This function is available only when the unit is first turned on the LCD shows Standby. Pressing <b>ENTER</b> manually starts the unit and the Battery supplies the output power.
<b>EVENTS/TIMER RESET</b>	<div> C O N T R O L    ⬆ E  Events/Timer Reset ⏴ </div>	Press <b>ENTER</b> when the LCD displays the message.  This resets the event and timer counters to zero.
<b>LOG RESET</b>	<div> C O N T R O L    ⬆ E  Log Reset        ⏴ </div>	Press <b>ENTER</b> when the LCD displays the message.  This clears all the messages from the Event Log.
<b>PASSWORD PROTECTION</b>	<div> C O N T R O L    ⬆ E  Pswrd Protection ⏴ </div>	This feature allows user to control the access of the Maintenance Menu with or without the password.  When the Password access to the Maintenance Menu is Enabled here, the Maintenance Menu can ONLY be accessed when the correct Password is entered.  When the Password access to the Maintenance Menu is DISABLED here, the Maintenance Menu can be accessed without the Password.

## 2.2.10 Settings Menu

**Purpose:** Describes how to access and program various critical parameters.

**Procedure:** When the desired function appears on the LCD screen, pressing the **ENTER** button calls it up.

Many functions have more than one option available. Scroll through them by pressing the toggle buttons. When the desired option appears, pressing the **ENTER** button switches the unit to the new option.

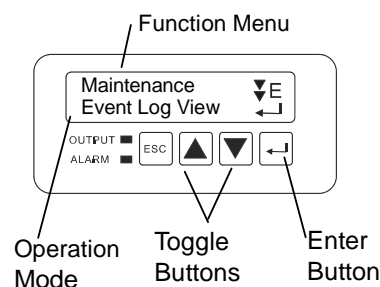


FUNCTION	LCD SHOWS	ACTION
PROGRAM CONTACTS	<div> <div>SETTINGS</div> <div>Program contacts</div> </div>	Indicates programmed values of all 6 contacts and allows values to be changed.
AVR FEATURE	<div> <div>SETTINGS</div> <div>AVR Feature</div> </div>	Enable and Disable Buck and Boost function.
LINE QUALITY	<div> <div>SETTINGS</div> <div>Line Quality</div> </div>	Indicates the setting for AC recovery time. The selection options are: 3 sec, 10 sec, or 30 sec. Default recovery time is 30 sec.
EXTERNAL FAN CONTROL	<div> <div>SETTINGS</div> <div>Ext. Fan Control</div> </div>	Indicates temperature setting for external fan.
SENSE TYPE	<div> <div>SETTINGS</div> <div>Sense Type</div> </div>	Toggle between Generator [Generator parameter] and Normal [Normal parameters]. This broadens the unit's input parameters to accommodate the fluctuations created by a generator or noisy line
BATTERY TEMPERATUER COMPENSATED	<div> <div>SETTINGS</div> <div>Batt Temp. Comp.</div> </div>	<p>This adjusts the battery charging temperature compensated voltage to -3 / -4 / or -5 mV/°C/Cell.</p> <p>Consult the manufacture's specifications to find out which setting is best suited for your batteries. The factory default setting is -3 mV/°C /Cell.</p>
SET DATE/TIME	<div> <div>SETTINGS</div> <div>Set Date/Time</div> </div>	It indicates setting for date and time.
DAYLIGHT SAVING	<div> <div>SETTINGS</div> <div>Daylight Saving</div> </div>	Enable and Disable daylight saving function.
PROGRAM INPUT CONTACT	<div> <div>SETTINGS</div> <div>Program I/P Contact</div> </div>	Indicates programmed value of input contact and allow value to be changed.

## 2.2.11 Maintenance Menu

**Purpose:** Describes how to access, and view and modify various parameters for the maintenance.

ONLY trained and qualified personnel normally use this menu, consequently the password protection option is provided to access this Menu.



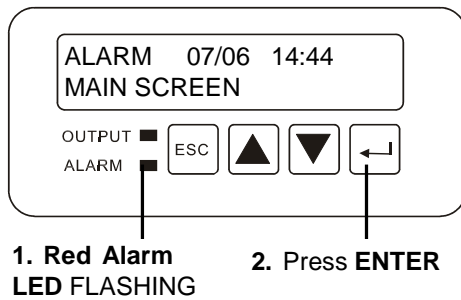
FUNCTION	LCD SHOWS	ACTION
<b>PASSWORD ACCESS</b>	<div> Enter Password <div> </div> Password : 0000 <div> </div> </div>	<p>If a Password access is Enabled in CONTROL Menu, than it must be entered here before the Maintenance Menu can be accessed.</p> <p>Use the UP / DOWN arrow key with ENTER keys to enter a correct Password. Reentry is required if an error is made entering a Password.</p>
<b>BATTERY TEST OPTION</b>	<div> MAINTENANCE <div> </div> Batt Test Option <div> </div> </div>	<p>Battery Test Option can be verified here. Battery Test period of 1 to 255 minutes can be selected here in 1 minute increments.</p> <p>The EP 2200-T can be tested to run on Battery for Maintenance purposes here.</p>
<b>INVERTER ON/OFF</b>	<div> MAINTENANCE <div> </div> Inverter On/Off <div> </div> </div>	<p>Inverter can be turned ON or OFF. This option is available ONLY when the EP 2200-T is in Battery or Standby Mode.</p>
<b>EVENT LOG VIEW</b>	<div> MAINTENANCE <div> </div> Event Log View <div> </div> </div>	<p>The Event Log with Date &amp; Time is viewed here in Binary digital format. (See Section 2.2.14) for details.</p>
<b>LINE CONDITIONING</b>	<div> MAINTENANCE <div> </div> Line Conditioning <div> </div> </div>	<p>Indicates programmed values of all input Line Detection parameters &amp; warning levels and allows values to be changed.</p>
<b>CHANGE PASSWORD</b>	<div> MAINTENANCE <div> </div> Change Password <div> </div> </div>	<p>The Password for the access of the Maintenance Menu is changed here. Use the UP / DOWN arrow key with ENTER keys to enter a correct Password. Reentry is required if an error is made entering a Password.</p>

## 2.2.12 Alarm Menu

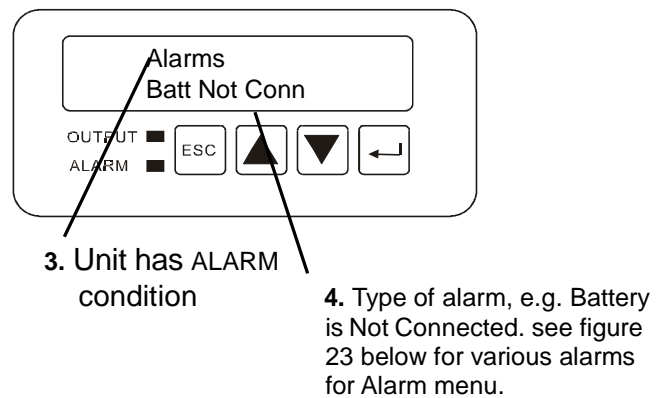
**Purpose:** Describes the Alarm Submenu and how to use the LCD for troubleshooting. (Figures 21, 22 and 23)

### Procedure:

When the **Red ALARM LED** is **FLASHING**, the unit has an alarm, indicating a condition not serious enough to stop it from providing output power. Press **ENTER** to see the alarm.



**Figure 21**  
LED Shows an Alarm



**Figure 22**  
LCD Displays the Alarm

LCD SHOWS	Alarm	DESCRIPTION
Line Freq	Line Frequency	The Input frequency is fluctuating & out of tolerance.
Low O/P Volt	Low Output Voltage	The output voltage is low, but still usable.
NO Temp. Probe	Temperature Probe Unplugged	The battery temperature probe is unplugged or damaged. When the unit detects the probe is unplugged, it will continue to operate but the charger voltage will automatically be set to the lowest value.
Over Load	Overload	The loads are drawing more power from the EP 2200-T than it can provide.
BATT not Conn	Battery Not Connect	The Battery is not connected.
High Temp	High Temperature	The Battery temperature is high.
Low Temp	Low Temperature	The Battery temperature is low.
Ext. Alarm	External Alarm	The external alarm of the program input contact.
Ext. Batt Alarm	External Battery Alarm	The external battery alarm of the program input contact.
Ext. Fan Fail	External Fan Fail	The external fan fail of the program input contact.
Door Interlock	Door Interlock	The door interlock of the program input contact.

Note: The alarms are self-resetable. After the alarm condition is removed, the unit automatically returns to Line mode if the line is qualified, or battery mode if the line is unqualified.

**Figure 23**  
Alarm Table



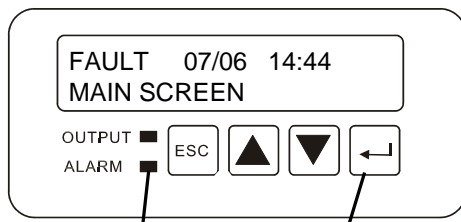
## 2.2.13 Fault Menu

**Purpose:** Describes the Fault Submenu and how to use the LCD for troubleshooting. (Figures 24, 25 and 26)

### Procedure:

When the red **ALARM LED is continuously ON**, the unit has a fault, indicating a condition where backup power is unavailable. Press **ENTER** to display fault description.

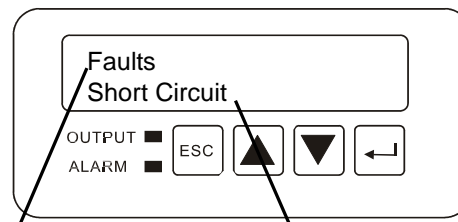
**TIP:** When the unit has a fault and line power is qualified and available, the output loads are directly connected to the Input line with no line conditioning or backup power provided.



1. Alarm LED on steady  
2. Press ENTER

**Figure 24**

LED Shows a Fault



3. Unit has FAULT  
4. Type of fault (e.g. short circuit). See Fig. 26 below for various faults.

**Figure 25**

LCD Displays Fault

LCD SHOWS	Fault	DESCRIPTION
Short Circuit	Short Circuit	The load is short-circuited or the inverter did not start.
Batt. Low Volt	Low Battery Voltage *	The batteries output voltage is low.
Batt. High Volt	High Battery Voltage *	The batteries output voltage is high.
Temp High	High Temperature *	The battery temperature or the EP 2200-T internal temperature is high.
Over Load	Overload	The loads are drawing more power than the EP 2200-T can provide.

**Figure 26**

Fault Table

\* These faults are self-resetting. After the fault condition is removed, the unit automatically returns to Line mode if the line is qualified or Battery mode if not. For all other faults, the unit is reset by shutting it down and restarting it using the AC and battery breakers. The faults can also be reset in the Control Menu of the LCD display.

## 2.2.14 Event Log View

**Purpose:** Describes how to view and interpret the Event Log or Alarm Log.

**Procedure:**

In the LCD panel, scroll down to the Maintenance Menu. Enter the password, using up / down arrows, to access the Maintenance Menu. The password is required only when the access to this menu is password protected in the control menu. The factory default password is 1111. Consult the factory if the programmed password is lost or forgotten. The last item in the Maintenance Menu is the EVENT LOG VIEW. The LCD screen displays the information in digital binary form. The full descriptive details can be seen using your PC in RS232 / USB mode.

### ALARM IS DISPLAYED IN THE DIGITAL BINARY FORM

Two blocks of numbers appear on the second line of the LCD screen. Each block has 8 digits, for a total of 16 digits. The position of each one of the 16 digits indicates a unique event. A value of 1 indicates the presence of an event represented by the position of that digit, while a value of 0 indicates an absence of that event. The assignment of events for each of these 16 digits is identified below.

Example

MAINTENANCE	↑E
Event Log View	←



07/06/11	14:57	↑E
01100000	01000010	←

Position 1 \_\_\_\_\_ 12345678    12345678 \_\_\_\_\_ Position 16

1<sup>st</sup> Block of 8 digits    2<sup>nd</sup> block of 8 digits

At the Event Log view menu press ENTER to access the Event Log View function. The first line indicates the date (MM/DD/YY) and time (HH:MM) of the event occurrence. The second line shows Events in UPS. Pressing UP allows to the next event, pressing DOWN allows to view the previous event.

### 1st Block of 8 Digits:

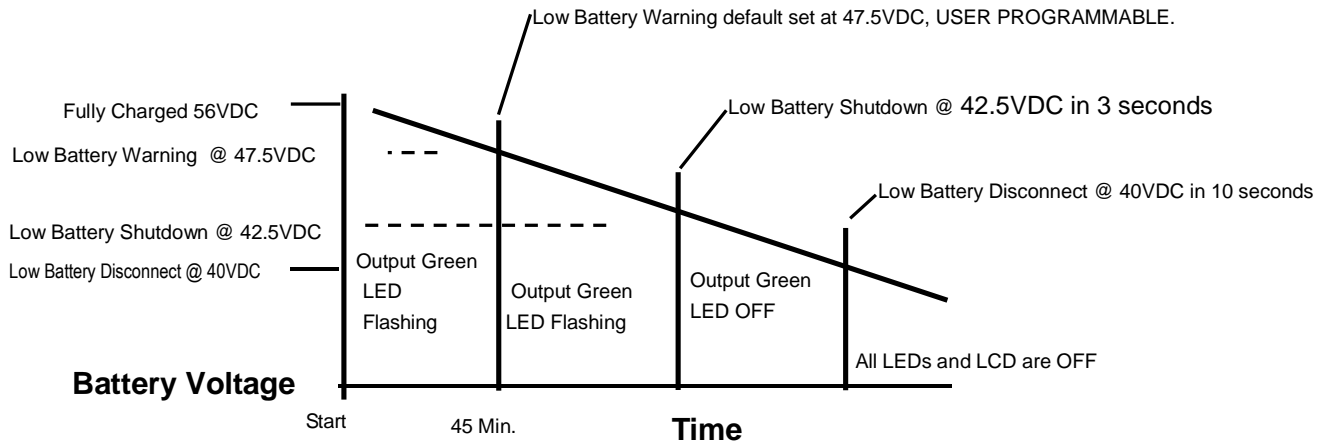
1	2	3	4	5	6	7	8
AC High	AC Low	Black-Out	Over Load	Hi Temp	Battery High Voltage	Battery Low Voltage	Short Circuit

### 2nd Block of 8 Digits:

9	10	11	12	13	14	15	16
Battery Low	Freq Low	Freq High	AC Fail	External Alarm	Battery Temp Over-Range	No Temp. Probe	Battery Not Connect

## 2.2.15 Low Battery Mode Status

**Purpose:** Describes the various states of the Low Battery Mode (Figure 27).



**Figure 27**  
Low Battery Modes Status

**Note:** Not to scale. All values are shown for illustrative purpose *only* and will **change under different operating and battery conditions**. Actual times will be different. Perform a run time test (Section 2.4.1) for application specific operating conditions.

### Low Battery Warning

The batteries will continue to power the load, but they are almost discharged and cannot provide power much longer.

**TIP:** The operator should shut down unnecessary loads to extend battery backup time.

### Low Battery Shutdown

When the battery decreases to 42.5VDC for 3 seconds, the unit automatically shuts output OFF and goes into SLEEP mode waiting for input power to return. The batteries are considered fully discharged and can no longer support the load, but they have enough power to keep the unit's monitoring and control circuits active. The housekeeping power supply is kept alive.

### Low Battery Disconnect

When the battery discharges to 40VDC for 10 seconds, the unit automatically goes into this mode. The batteries are disconnected from the unit to protect the batteries from being damaged by a deep discharge. Both the LED and LCD shut OFF, showing the unit is shut off. The unit stays off until line power or a backup generator is available or fresh batteries are connected. To prevent battery damage, if the EP 2200-T is to remain in a low battery disconnect state for an extended period. The EP 2200-T and battery circuit breakers **must be** switched OFF and the manual bypass switch **must be** switched to the Bypass position. For additional protection disconnect the Anderson style battery connector from the EP 2200-T.



Note: only authorized personnel should perform all parameter changes, as it may affect the performance of the traffic intersection.

## **Section 2.3**

### **Communication**

This section describes how to communicate with EP 2200-T using a Personal Computer via RS232 / USB communications:

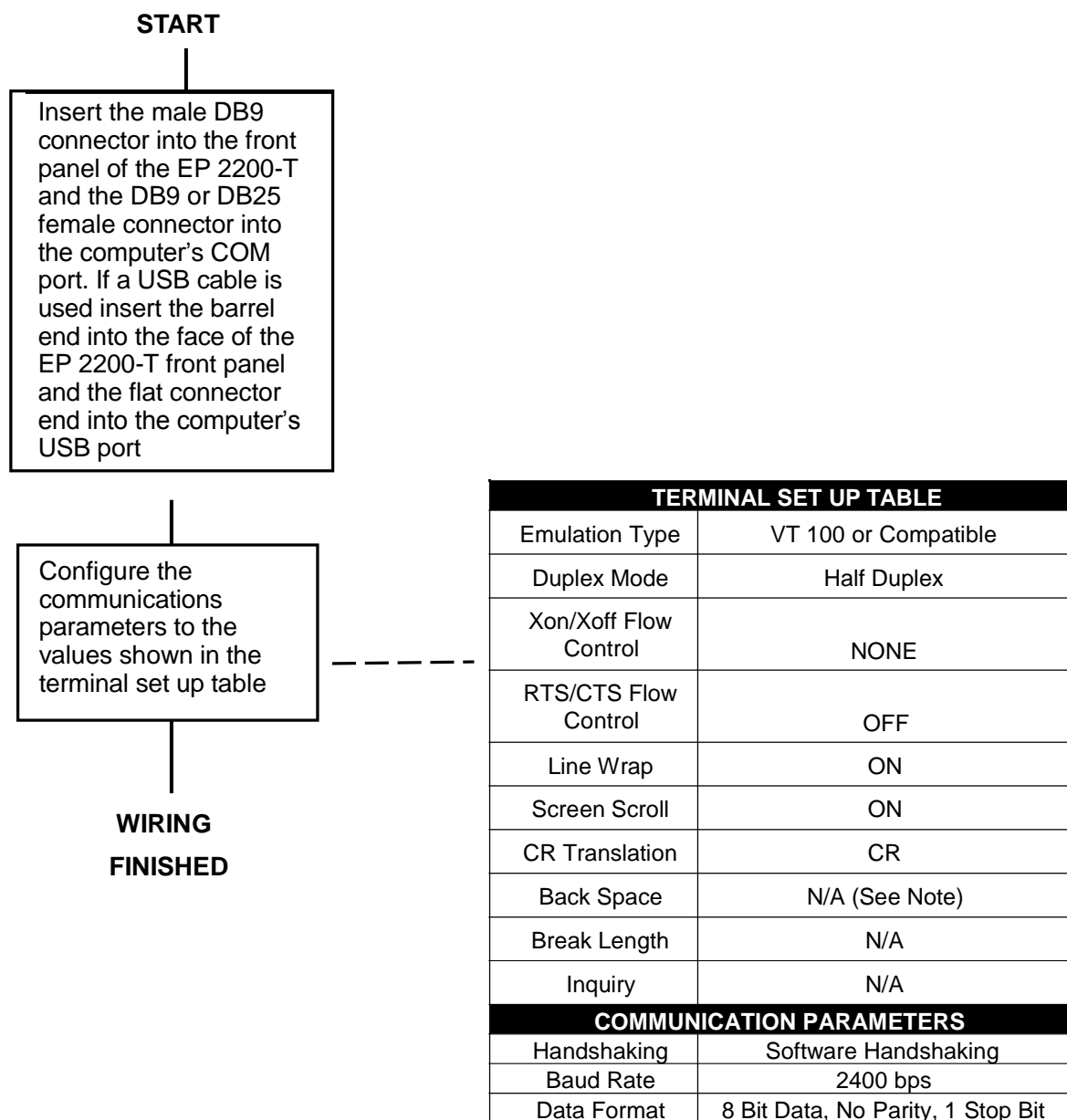
- 2.3.1 RS232 / USB Set-Up
- 2.3.2 The Main Menu
- 2.3.3 Menu Tree and Sub Menus
- 2.3.4 Menu Tutorial

## 2.3.1 RS232/USB Set-Up

**Purpose:** Describes how to set-up communication between any PC and the EP 2200-T using the RS232 or USB port. The EP 2200-T uses a standard DB-9, RS232 cable or USB cable.

When the DB-9F, (female connector) on the front panel is connected to a PC with Windows 3.1, 9X, XP terminal emulation software, the EP 2200-T can be remotely monitored, controlled and calibrated using RS232 ASCII commands.

### 2.3.1.1 Wiring Set-Up Procedure



**TIP:** the program ignores the Backspace and Delete keys. If a command is wrong, press **Enter** and retype the command.

*Consult the manual provided with you terminal emulation software for instructions on how to apply the required terminal settings.*



## 2.3.2 Main Menu

**Purpose:** Describes the Main Menu (Figures 36 to 39).

The RS232 / USB menus are hierarchical. Press **ENTER** to access the top-level menu (Figure 36).

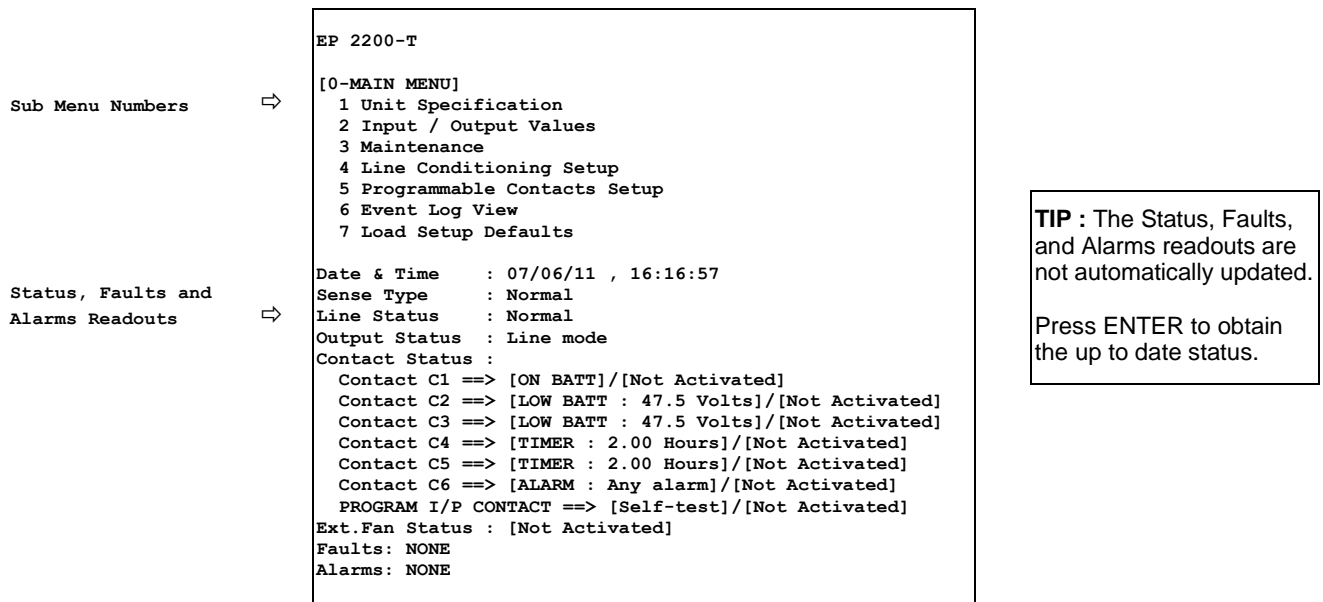
Figure 40 shows the menu tree.

The main menu displays the sub menu numbers, the line status, the unit's output status and any faults or alarms that may be present.

**TIP:** The factory set default password **1111** is required to access and set many functions, such as in menu 34 & menu 35.

### Procedure:

To access a particular sub menu, type in the sub menu number and press Enter. To update the screen, press **Enter**.



**Figure 36**  
Main Menu Screen

Tabulation of various items that appears under the Line Status, Output Status, Faults and Alarms are shown in Figures: 37, 38 and 39.

<div> Line Status: [Current Status] Output Status: [Current Status] Content Status: [Current Status] Ext. Fan Status: [Current Status] Faults: [If any, otherwise blank] Alarms: [If any, otherwise blank] &gt;_ </div>	LINE STATUS	
	Normal	Input power is normal
	Boost	Input power is out of tolerance. Boost mode is activated
	Buck	Input power is out of tolerance. Buck mode is activated
	Blackout	Input voltage is not available
	Low	Input voltage is lower than programmed low limit
	High	Input voltage is higher than programmed Hi limit
	Freq low	Input frequency is too low (<55 Hz)
	Freq high	Input frequency is too high (>65 Hz)

**Figure 37**  
Line Status Displays

<div> Line Status: [Current Status] Output Status: [Current Status] Content Status: [Current Status] Ext. Fan Status: [Current Status] Faults: [If any, otherwise blank] Alarms: [If any, otherwise blank] &gt;_ </div>	OUTPUT STATUS
	Line mode
	Inverter mode
	Inverter mode. Low bat, warning
	Inverter mode (testing battery)
	Boost mode
	Buck mode
	Hot swap mode
	Shutdown due to fault
	Shutdown due to low battery
	Shutdown due to no line

**Figure 38**  
Output Status Displays



<div> Line Status: [Current Status]  Output Status: [Current Status]  Content Status: [Current Status]  Ext. Fan Status: [Current Status]  Faults: [If any, otherwise blank]  Alarms: [If any, otherwise blank]  &gt;_ </div>	FAULT DISPLAYS	
	Short-Circuit	Output Short Circuit
	Vout_Hi	Output Voltage High
	Vbat_Hi	Battery Voltage High
	Vbat_Lo	Battery Voltage Low
	Temp_Hi	Ambient Battery Temperature High or Internal Temperature High
	Lout_Hi	Output Current High
	EEPROM_ERROR	Error Reading EEPROM
	Wout_Hi	Output Power High (Overload)
	Bad_Battery	Bad battery
	ALARM DISPLAYS	
	Vout_Lo	Output Voltage Low
	Lout_Hi	Output Current High
	Overload	Output Overload
	Temp_Hi	Ambient Battery Temperature High
	Temp_Lo	Ambient Battery Temperature Low
	Pll	Phase Lock Loop Cannot Lock with Input
	Line_Freq	AC Line Frequency High or Low
	Temp_Probe_Disconnect	Temperature probe uninstalled or disconnected.
	Batt_Brk_Off	The battery breaker is off or the batteries are discharged
	Program Input Alarm	The program input contact alarm detected.

**Figure 39**  
Fault and Alarm Displays

### 2.3.3 Menu Tree & RS232 / USB Sub Menus

**Purpose:** Describes the RS232 / USB Menu Tree that include: Unit Specifications, Input/Output Values, Maintenance and Line Slow Detection Setup Sub Menus (Figures 40 to 45)

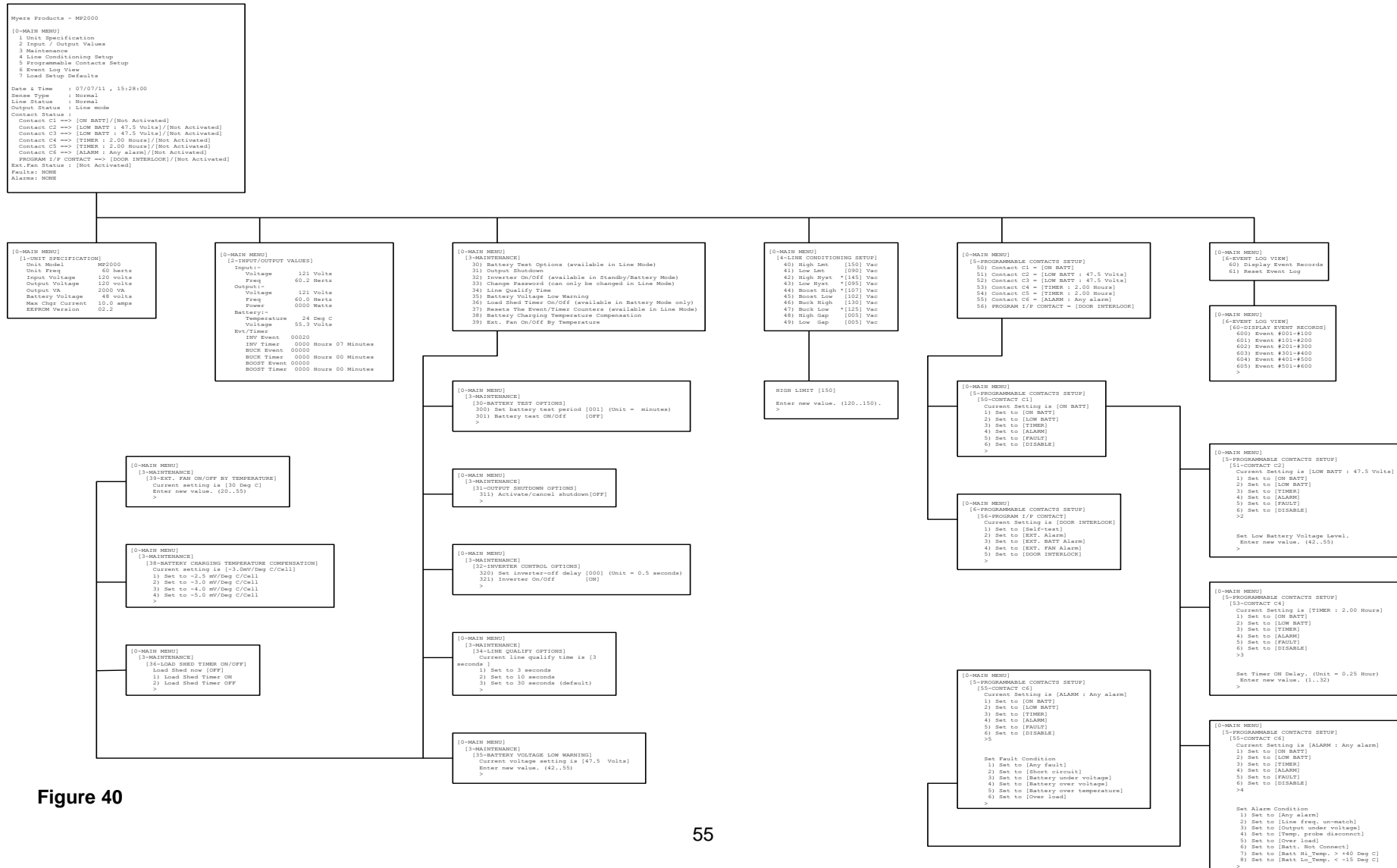
#### 2.3.4.1 RS232 / USB Menu Tree

The complete MENU Tree is shown on the next page with all default values.

Press ENTER to  
go back to the  
Main Menu

TIP: To access any item from the Main Menu. Type in the  
function number and press ENTER.

## RS232 / USB Menu Tree



**Figure 40**

### 2.3.3.2 Unit Specifications, Input/Output Values

Menu 1 below (Figure 41) lists the EP 2200-T's specifications.

**Procedure:** At the main menu, type **1** and press Enter. The screen displays the Unit Specifications as shown below. To return to the main menu, press **Enter**.

[ 1 - Unit Specifications ]		
Unit Model	EP 2200-T	The model name
Unit Freq	60 hertz	Nominal operating frequency
Input Voltage	120 Volts	Nominal Input voltage
Output Voltage	120 Volts	Nominal output voltage
Output VA	2000 VA	The output VA capacity
Battery Voltage	48 Volts	Nominal battery capacity
Max Charge Current	10 amps	MAX charge capacity
EEPROM Version	02.2	EEPROM version of the EP 2200-T

**Figure 41**

Unit Specifications Menu

### 2.3.3.3 Input / Output Values

Menu 2 below (Figure 42) lists the actual measurements of various input / output parameters.

**Procedure:** At the main menu, type **2** and press Enter. The screen displays the Unit Specifications as shown below. To return to the main menu, press **Enter**.

[ 2 – Input / Output Value ]		
<b>INPUT</b>		
Voltage	120 Volts	The Input voltage
Freq	60.0 Hertz	The Input frequency
<b>OUTPUT</b>		
Voltage	120 Volts	The output voltage
Freq	60.0 Hertz	The output frequency
Power	0000 Watts	The output power in watts
<b>BATTERY</b>		
Temperature	25 Deg C	The ambient temperature of the battery case as read via attached temperature probe
Voltage	55.3 Volts	The battery DC voltage
<b>EVT/TIMER</b>		
INV Event	00019	The numbers of Input Power Failures
INV Timer	0000 Hours 07 Minutes	Total time that the battery was discharged since the last RESET
BUCK Event	00000	The numbers of BUCK function active
BUCK Timer	0000 Hours 00 Minutes	Total time that the BUCK function since the last RESET
BOOST Event	00000	The numbers of BOOST function active
BOOST Timer	0000 Hours 00 Minutes	Total time that the BOOST function since the last RESET

**Figure 42**

Input/Output Values Menu

### 2.3.3.4 Maintenance

Menu 3 below (Figure 43) lists the various maintenance options.

#### Procedure

At the main menu, type 3 and press ENTER. The Maintenance Menu shown below is displayed. To return to the main menu, press ENTER.

[ 3 - Maintenance ]	
30 Battery Test Options	<p>The start - stop for the Battery Test / Self Test is initiated here. The test duration is user programmable in 1 minute intervals from 1 to 255 minutes. The factory default setting is 1 minute.</p> <p>Tip: The time duration can be changed only when EP 2200-T is in line mode.</p>
31 Output Shutdown	<p>This allows output to be switched OFF or Shutdown. EP 2200-T switches to STANDBY mode when this option is activated.</p>
32 Inverter On/Off	<p>During the BATTERY or STANDBY mode, this option allows the inverter to be switched OFF or turned ON after the user programmable delay time.</p> <p>The delay can be user programmable in 0.5 seconds steps from 0 to a maximum setting of 255 steps (128 seconds). The delay is only available in Standby or Battery modes. When the unit returns to Line Mode, the delay resets back to a default of 0 seconds.</p> <p>Thus during a battery discharge or ON BATTERY mode, operator can stop the inverter immediately after user.</p>
33 Change Password *	<p>This option allows for the change of password. The factory set default password is 1111.</p> <p>Tip: the password can only be changed in Line mode.</p>
34 Line Qualify Time	<p>When the input power returns and it is qualified, i.e. it is within acceptable range, the transfer from Battery mode to Line mode is delayed by user programmed 3 / 10 / 30 seconds herein that allows the returned utility power to settle down. The factory set default value is 30 seconds.</p>
35 Battery Voltage Low Warning	<p>The level for LOW BATTERY ALARM is set here.</p> <p>The Voltage level is user programmable in 0.5VDC increments from 42VDC to 55VDC. The factory default setting is 47.5VDC or 40%). The relationship between Remaining % capacity of battery and its DC Voltage depends on the characteristics of the batteries used.</p>

36 Load Shed Timer On/Off	The programmable timer contacts are manually activated / deactivated ON DEMAND using this option. Certain Loads / Signals connected to this timer can be shed or dropped earlier to extend the back-up time.  This function is available only in "Battery Mode".
37 Resets The Event/Timer Counters	Resets INV, BUBK, BOOST Event to 0 Resets INV, BUBK, BOOST Timer to 0
38 Battery Charging Temperature Compensation	Temperature compensated smart charger is utilized in EP 2200-T. The rate of charging is adjusted here based on the battery case temperature. The factory default value is set at -3mv/deg°C /Cell. It can be configured to -3 / -4 / -5 mv/deg°C /Cell.
39 Ext. Fan On/Off By Temperature	Set the temperature in °C, above which the 48VDC power will be provided for external cooling fan. The temperature can be set in 1°C increment from 20 to 55°C. The factory default temperature is set at +25°C.

**Figure 43**  
Maintenance Menu

### **\*Password Changing Procedure**

1. Go to Menu 33.
2. Type the current password (the factory set password is 1111) and press **Enter**.
3. The words "Enter New Password" appears on the screen. Type the new password (any combination of 4 digits) and press **Enter**.

**NOTE:** The password can ONLY be four numeric digits – NO ALPHA CHARACTERS.

4. The words "Re-enter New Password" appear on the screen. Retype the new password and press **Enter**. If the wrong password is retyped, the screen displays "Error in entering data... please try again." Type the correct password and press **Enter**.

If the retyped password is correct, the screen returns to the main menu.

*For a tutorial on how to use the menu screens, (see Section 2.3.5).*

### 2.3.3.5 Line Slow Detection Parameters

This option allows user to change various detection and warning levels for input AC voltages, qualified and unqualified values, Transfer & Retransfer set points for going in & out of Battery mode / Boost / Buck modes. The factory set default values concur with those specified by major DOTs (Department of Transportations). See Figure 45 for a description of each parameter.

Electrical equipment is designed to operate at maximum efficiency at a specific standard supply voltage. Buck and boost is an ideal solution when the line voltage is consistently higher or lower than nominal. The transformer can buck (lower) or boost (raise) the supply voltage without having to go onto battery or involve any other active EP 2200-T board level components. The EP 2200-T input transformer has a second tap off the primary winding. When activated, the transformer will automatically switch to the secondary tap to buck or boost the voltage output 10%, thereby keeping the output within an acceptable range.



**CAUTION:** Improperly set parameter values can cause **permanent damage** to the unit. Changes should only be made by Manufacturer trained personnel.

**Contact Manufacturer before making any adjustment.**

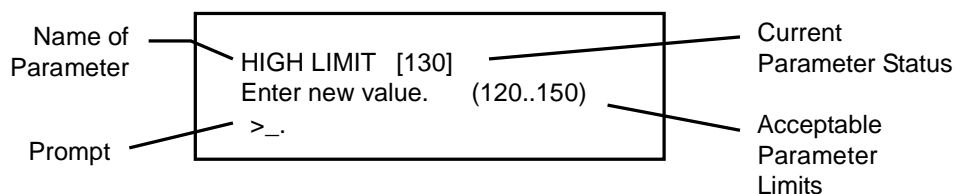


**Note:** Parameter values are interdependent, changing one value can affect range and permissible value in another field. This feature is to protect the user from entering conflicting values.

#### 2.3.3.5.1 Parameter Change Procedure

1. Go to the Menu 4.
2. "Enter Password" appears (the factory set password is 1111), Type the password and press **Enter**.  
  
If the wrong password is typed, the screen displays "Error in entering data... please try again." Type the correct password.
3. The Parameter Change Screen appears (Figure 44). Type the new value that is within the range of acceptable parameter limits and press **Enter**.

The screen returns to the Line Slow Detection Screen. For example:



**Figure 44**

Parameter Change Screen  
(Slow Detect High Limit Screen Shown)

For a tutorial on how to use the menu screen, see Section 2.3.5

### 2.3.3.5.2 Parameter Descriptions (All levels are user programmable; some values are interdependent)

		AVR Feature Disable		AVR Feature Enable	
		Default Setting	RANGE	Default Setting	RANGE
40 Slow Detect High Lmt When input voltage exceeds this level, EP 2200-T transfers to Battery Mode from either Buck Mode (when enabled) or Line mode.	On Battery Mode Line / Buck to Battery	130VAC	120~150VAC	150VAC	120~150VAC
42 Slow Detect High Hyst When input voltage returns below this level, EP 2200-T transfers back to Line Mode from Battery Mode.	Battery to Line -----	*125VAC ( High Lmt - High Gap )		*145VAC ( High Lmt - High Gap )	
46 Slow Detect Buck High When input voltage exceeds this level, EP 2200-T transfers to Buck Mode (when enabled) reducing the output.	Line to Buck -----	[DISABLE]		130VAC	[DISABLE]
47 Slow Detect Buck Low When input voltage returns below this level, EP 2200-T releases the Buck Mode (when enabled) and transfers back to the Line Mode.	Buck to Line -----	[DISABLE]		*125VAC ( Buck High - High Gap )	
	Normal -----				
44 Slow Detect Boost High When input voltage returns above this level, EP 2200-T releases the Boost Mode (when enabled) and transfers back to the Line Mode.	Boost to Line -----	[DISABLE]		*107VAC ( Boost Low + Low Gap )	
45 Slow Detect Boost Low When input voltage reduces below this level, EP 2200-T transfers to Boost Mode (when enabled) increasing the output.	Line to Boost -----	[DISABLE]		102VAC	[DISABLE]
43 Slow Detect Low Hyst When input voltage returns above this level, EP 2200-T transfers back to the Line Mode from Battery Mode.	Battery to Line -----	*105VAC ( Low Lmt + Low Gap )		*95VAC ( Low Lmt + Low Gap )	
40 Slow Detect Low Lmt When input voltage reduces below this level, EP 2200-T transfers to Battery Mode from either Boost Mode (when enabled) or Line Mode.	Line / Boost to Battery On Battery Mode	100VAC	90~120VAC	90VAC	90~120VAC
48 High Gap		5VAC	3~7VAC	5VAC	3~7VAC
49 Low Gap		5VAC	3~7VAC	5VAC	3~7VAC

**Figure 45**  
Parameter Values



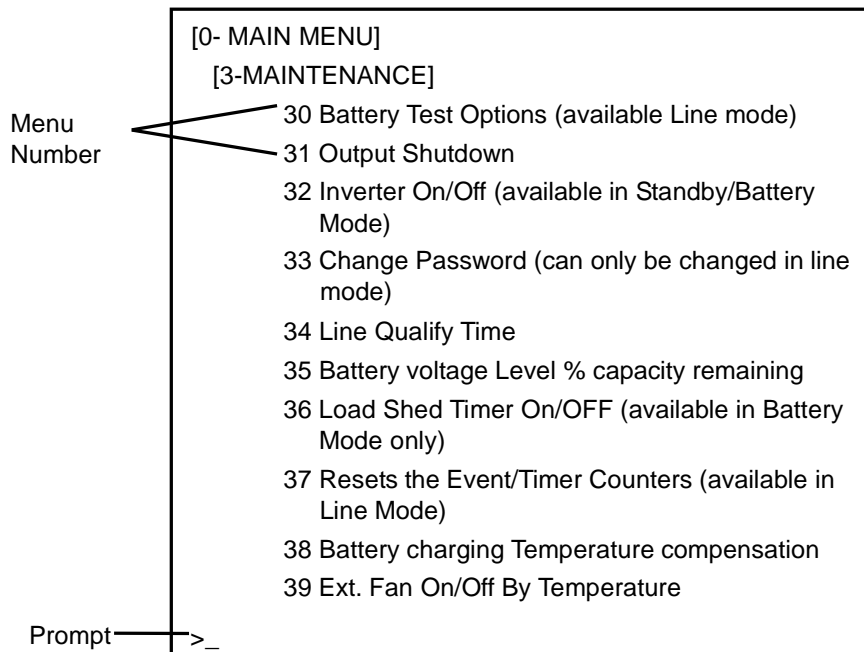
## 2.3.4 Menu Tutorial

**Purpose:** shows how to use the menus (Figures 46 to 49)

This tutorial shows how to change the Battery Test Options. The other menus function in the same manner.

1. At the main menu (Figure 36), type 3 and press **Enter**.

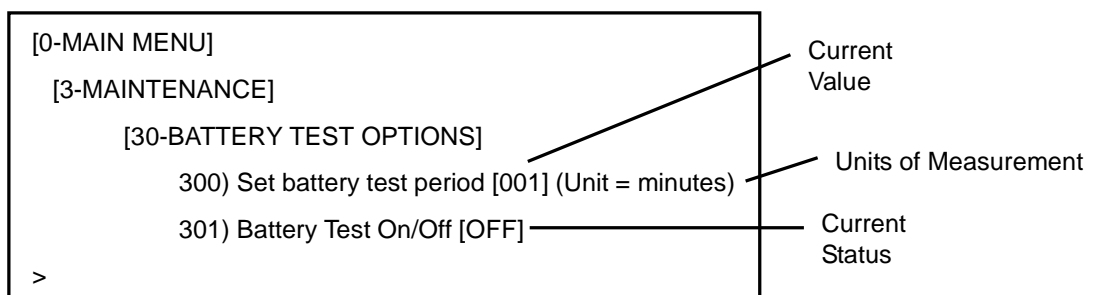
The Maintenance Menu 3 appears as below (Figure 46).



**Figure 46**  
Maintenance Menu Screen

To the left of each maintenance option is a Menu number. Typing **30** and pressing **Enter** calls up the Battery Test Options screen (Figure 47).

2. Numbers or words inside square brackets show the present status value of that menu item.



To calculate the Test Period: Test Period = Current Value X Units

*Example: Test Period = 001 x 1 Minute = 1 Minute*

**Figure 47**  
Battery Test Options Screen

3. To change the battery test period, type **300** and press **Enter**.

The words “Enter Password” appear on the screen. Type the password (the factory set password is 1111) and press **Enter**. If the wrong password is typed, the screen displays “Error in entering data... please try again.” Type the correct password and press **Enter**.

The Set Battery Test Period screen appears as below (Figure 48).

[300-SET BATTERY TEST PERIOD] Battery

Test period [100] (minutes)

Enter new value (1...225)

>\_

Present Value (minutes)

Range of Acceptable Values

**Figure 48**  
Set Battery Test Period Screen

Type in the new value within the acceptable range and press **Enter** to change the test period and go back to the maintenance menu screen.

4. To change the Battery Test On/Off status, type **301** and press **Enter**.

The words “Enter Password” appear on the screen. Type the password and press **Enter**.

The battery Test Screen appears (Figure 49).

Battery Test now OFF

1) Start battery test

2) Stop battery test

>\_

Present setting

**Figure 49**  
Battery Test Screen

Type **1** to start the battery test, or **2** to stop the battery test, and press **Enter**. This will change the battery test status and return you to the maintenance menu screen.

## **Section 2.4**

### **Maintenance**

This section describes how to maintain the EP 2200-T:

- 2.4.1 Battery Back-Up Time Test
- 2.4.2 EP 2200-T Return Instruction
- 2.4.3 Troubleshooting
- 2.4.4 Battery Maintenance
- 2.4.5 Specification
- 2.4.6 Warranty
- 2.4.7 Emergency Shutdown Procedure

## 2.4.1 Battery Back-Up Time Test

**Purpose:** Describes how to measure the back up capacity of batteries.

This test provides the measurement of back-up time during power outage by actually discharging the batteries. The back-up time is load as well as battery dependent, thus more back-up time is available with a lower load (in Amps or Watts) and less time with more load.

**Tip:** It is recommended to perform this test every 6 months.

**Tip:** Make sure the batteries are fully charged before starting this test.

### PROCEDURE

#### **EXAMPLE:**

Start time is **1PM**.

ON BAT contact if selected, is activated.

Low Battery Alarm LED appears at **4PM**.

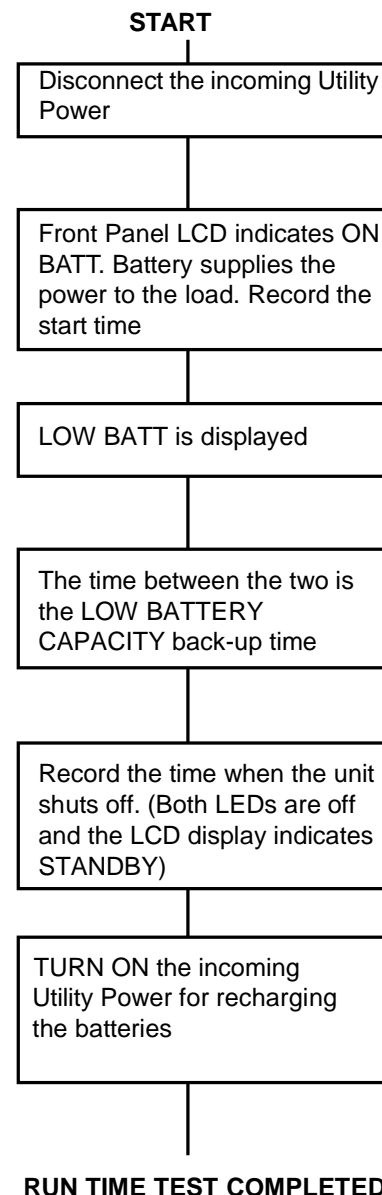
LOW BAT contact at selected value will be activated.

Low Battery capacity battery back-up time will be the time difference between 4PM and 1PM or **3 hours**.

Shutdown time is **5PM**.

Battery reserve time will be the time difference between 4PM and 5PM or **1 hour**.

The **Total Battery Back-up** time is the sum of Low Battery capacity back-up time and Battery Reserve time or the time difference between 5PM and 1PM or 4 hours.



## 2.4.2 EP 2200-T Return Instructions

*Purpose: Describes how to return the EP 2200-T for repairs.*



Note: Manufacturer does not assume responsibility for damage caused by improper packaging of returned units. The EP 2200-T weighs approximately 46 lbs and should only be shipped in a box or carton of sufficient thickness to withstand handling.

Before returning a EP 2200 or any system component for repair or replacement, including batteries, a Return Material Authorization (RMA) number must be obtained from Customer service at the following Telephone / Address. Clearly write the RMA number on the original shipping container. If you do not have the original container, pack the unit with at least three inches of shock absorbing material, but do not use popcorn type material. Returns should be prepaid and insured (COD and freight collect cannot be accepted).

Contact Customer Service for ordering any parts or service.

For service, parts or technical information  
contact:

### 2.4.3 Troubleshooting

**Purpose:** Describes the most common problems with the EP 2200-T.

There are NO Maintenance items inside the EP 2200-T and it should be opened or serviced only by factory authorized service personnel, failure to do so will void the WARRANTY. If it fails to perform a specific function, Figure 50 below lists typical symptoms, causes and solutions. If you cannot resolve a problem, contact Manufacturer customer service department (see 2.4.2 above).

SYMPTOM	CAUSE	REMEDY
<b>No Output</b>	AC input & output circuit breaker is OFF	Turn input & output circuit breaker on
	No incoming utility line power	Apply incoming utility power by closing upstream breaker
	Red LED is lit solid on front indicating FAULT	Read the FAULT under Status Menu of LCD display. See 2.2.13. Clear the fault. Shut off both the breakers on the front panel. Restart. Contact the factory, if fault persists
<b>Output LED OFF</b>	Incoming utility power or battery power not available	Apply qualified input power and verify battery breaker is closed
	Faulty unit	Contact factory
<b>Unit does not transfer to Battery mode during a power failure</b>  <b>OR</b>  <b>Backup time is less than rated</b>	Battery Not connected	Connect batteries (48VDC nominal)
	Battery circuit breaker OFF	Close battery breaker
	Battery is not fully charged	Fully recharge the battery then test backup time (see 2.4.1)
	Dead battery	Replace with a good battery
	Battery failure	Clean and tighten battery connections Check batteries and replace if needed
	Faulty unit	Contact vendor
<b>Alarm LED is lit</b>	Red LED steady ON indicates FAULT	Correct the Fault (see 2.2.13)
	Red LED flashing indicates ALARM	Correct the Alarm (see 2.2.12). Contact the factory if Alarm persists

<b>Batteries will NOT charge</b>	Battery circuit OPEN	Check that battery connections have proper torque Check battery cable harness for connection error, loose / open connections Check 46 to 53VDC present at the battery connector to EP 2200-T Check if battery breaker is closed Replace the bad battery, if any
	Wrong or bad temperature probe connected at front panel	Use Factory supplied temperature probe reading approximately 12,000 OHMS @ 25°C (77°F)
<b>LCD screen NOT readable</b>	Adjust the contrast for LCD screen	Press and hold ESC button. Press ENTER button Adjust the contrast using UP or DOWN arrow buttons Press ENTER when completed
	Faulty unit	Contact Factory
<b>Password Access NOT available</b>	Entered Password is LOST or forgotten	Call factory for resetting of the new password

**Figure 50**  
Troubleshooting Table

<b>CONTRAST ADJUSTMENT FOR LCD DISPLAY</b>	
1. While pushing the ESC button on the front panel 2. Press the ENTER button and adjust the contrast up or down 3. Press ENTER when adjustment is complete	

#### **2.4.4 Battery Maintenance**

The batteries are maintenance-free. Battery life can be affected by many factors such as: operating temperature, number of discharges during the battery's life, and periodic Preventative Maintenance (see 2.4.1). This system complies with the battery manufacturer's specifications for optimum performance and the longest possible battery life.

## 2.4.5 Specifications

Functions	
Brownout Protection	This unit boosts the output voltage (or transfers to battery) during brownout or low input line conditions and returns to On Line when input power stabilizes and returns to normal. The values for Transfer / Retransfer, To / From Battery / Boost mode are user programmable.
Generator Compatibility	Generator mode allows for more variations in input voltage and frequency for use with an AC generator.
Battery Charger 10A	PFC switch-mode charger is temperature-compensated (-3 to -5 mV/°C /Cell) with automatic shut off above 50°C.
Inverter Mode	Capable of running continuously in inverter mode.
Inverter Mode Current Limit	Continuous electronic current limit is provided.
Measurements available for remote monitoring	<ul style="list-style-type: none"> <li>- Input and output voltages</li> <li>- Input line frequency</li> <li>- Battery voltage and current</li> <li>- Battery and heat sink temp</li> </ul>

Mechanical Specifications	
Dimensions (H x W x D), inch (mm)	5.25" x 17" x 10.5", 3U size (133 mm x 432 mm x 267 mm)
Weight, lb (kg)	46.2 (21)
Input Connection	Anderson PP45/4P Connect
Output Connection	Anderson PP45/4P Connect
Mounting	19" (483 mm) or 23" (584 mm) rack or shelf mount
Cooling	Microprocessor controlled, 12VDC, 3.62" (92 mm) fan
Audible Noise Level, dBA	<40
Operating Temperature, °C	-37° to +74°C (See Notes 1 and 2)
Storage Temperature °C	-50° to +75°C
Humidity	Less than or equal to 95%, Non-Condensing
Altitude, ft (m)	10, 000 (3048) (See Note 2)

Electrical Specifications	
Output Apparent Power, VA	2000 (Inverter Mode) 2000 (Line Mode)
Output Active Power, W	1500 (Inverter Mode) 1500 (Line Mode)
Power Factor	0.75
Input Frequency, Hz +/- 3HZ	60
Input Voltage Range, VAC	90 to 150 VAC User programmable. Defaults set @ 100 ~ 130 VAC +/- 2 VAC.
Output Voltage	120 Nom (Tolerances are user programmable)
Inverter Mode	120 VAC +/- 5%
Maximum Input Current, A	30
Transformer	Linear (Non-Isolated)
Transfer Time, msec	<65 msec. Buck & Boost enabled <10 msec.
Inrush Current	Load dependant
Output Waveform THD, %	< 3 (Resistive Load)
Load Crest Ratio	3:1
Efficiency, Line Mode	> 95% (Resistive Load)
Efficiency, Inverter Mode	> 80% (Resistive Load)
Nominal Battery String Voltage, VDC	48VDC
Step Load Response (50%)	1Cycle full recovery
Over current Protection	Double Pole Single Throw Circuit Breaker Rated at 30 Amp for input and output  DC Bus: 60 Amp circuit breaker
Transient Suppression	MOV transient suppression elements (>150V)
DC Power	Drawn from batteries

### NOTES:

1. Between 55° and 74°C, the unit is de-rated to a maximum load of 1600VA/1200W.
2. De-rate operating temperature above 4900 ft (1500m) by 5 deg. C per each additional 1000 ft (300m).

**Note:** Specifications subject to change without notice.

Certain functions require activation.



## 22 Position Terminal Block

Functions	<p>A. Provides 6 sets of programmable contacts at pin 1 thru pin 18 for intersection flash control, Remote Alarms, Pagers or other user interface.</p> <ol style="list-style-type: none"> <li>1. "Low Batt": batteries have reached approximately 40% capacity remaining</li> <li>2. "On Batt": unit is in inverter mode</li> <li>3. "Timer": unit has been in inverter mode for 2 hours (programmable)</li> <li>4. "Alarm": any of the following conditions occur: <ol style="list-style-type: none"> <li>a. Line Frequency error</li> <li>b. Low Output voltage</li> <li>c. No Temperature Probe</li> <li>d. Overload</li> <li>e. No battery connected</li> <li>f. High temperature</li> <li>g. Low temperature</li> </ol> </li> <li>5. "Fault": any of the following conditions occur: <ol style="list-style-type: none"> <li>a. Short circuit</li> <li>b. Batt low voltage</li> <li>c. Batt high voltage</li> <li>d. High temperature</li> <li>e. Overload</li> </ol> </li> </ol> <p>B. Provides 48 VDC signal to PTS on pins 21 &amp; 22</p> <p>C. Provides programmable input contact on pins 19&amp;20.</p> <ol style="list-style-type: none"> <li>1. Self-test</li> <li>2. EXT Alarm</li> <li>3. EXT Battery Alarm</li> <li>4. EXT Fan Alarm</li> <li>5. Door Interlock</li> </ol>
Contact Type	Form C. Dry contacts rated 1 Amp at 120V
Wiring	Uses 14-26 AWG
<b>Communication Specifications</b>	
RS-232/USB/Ethernet ports	Monitors, controls and calibrates with terminal emulation software for service personnel to obtain unit diagnostics
RS-232	DB-9, Female, Opto-Isolated, straight-thru cable
USB	B-Type receptacle
Ethernet (optional)	10/100 Mbps Ethernet, auto-detected
Display Panel	2-line LCD

**Note:** Specifications subject to change without notice.

## **2.4.6 WARRANTY**

### **LIMITED 24-MONTH WARRANTY**

Manufacturer warrants its equipment to be free of manufacturing defects in material and workmanship for a period of 24 months from the date of shipment. The liability of Manufacturer under this warranty is solely limited to repairing, replacing, or issuing credit for such equipment (at the discretion of Manufacturer) provided that: Manufacturer's Customer Service Department is promptly notified, by facsimile or telephone, that a failure or defect has occurred.

Manufacturer's Customer Service Department issues a Return Materials Authorization (RMA) number, and designates the service location. The RMA must be clearly marked on the outside of the shipping container. Purchaser is responsible for all in-bound shipping and handling charges (COD and freight collect will not be accepted without prior approval from Manufacturer). Manufacturer will pay out-bound surface shipping charges for return of repaired equipment.

A satisfactory examination of the returned unit by Manufacturer's Customer Service personnel shall disclose that defects have not been caused by misuse, neglect, improper installation, repair, alteration, or accident, or failure to follow instructions furnished by Manufacturer. If Manufacturer's Customer Service personnel determine that the unit has been damaged due to one of these causes, or if the unit is free of defects, a handling or repair fee may be assessed prior to returning the unit.

BATTERIES, PERIPHERAL DEVICES, ATTACHMENTS OR APPARATUS MANUFACTURED BY THIRD PARTIES: MANUFACTURER WILL ASSIGN TO THE PURCHASER, ITS RIGHTS UNDER THE THIRD PARTY MANUFACTURER'S WARRANTY OF SUCH BATTERIES, PERIPHERAL DEVICES, ATTACHMENTS OR APPARATUS, BUT OFFERS NO ADDITIONAL WARRANTIES IN CONNECTION THEREWITH. BATTERIES SHALL NOT BE CONSIDERED FOR WARRANTY REPLACEMENT UNLESS THEY HAVE DROPPED TO LESS THAN 80% OF ORIGINAL NEW CAPACITY DURING THE WARRANTY PERIOD AS DEMONSTRATED BY CAPACITY TESTING THAT MEETS IEEE STANDARD 1188-2005 PRACTICES. THE WARRANTY PERIOD MAY BE REDUCED BASED ON OPERATING TEMPERATURES, FREQUENCY AND DEPTH OF DISCHARGE. RESETTING OF INVERTER EVENT COUNTER AND TIMER INVALIDATES BATTERY WARRANTY.

THIS LIMITED 24-MONTH WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO CASE SHALL MANUFACTURER BE LIABLE FOR ANY INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES WHATSOEVER, INCLUDING WITHOUT LIMITATION ANY CLAIM FOR LOST PROFITS OR REVENUES, EVEN IF MANUFACTURER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH, FOR BREACH OF THIS OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.

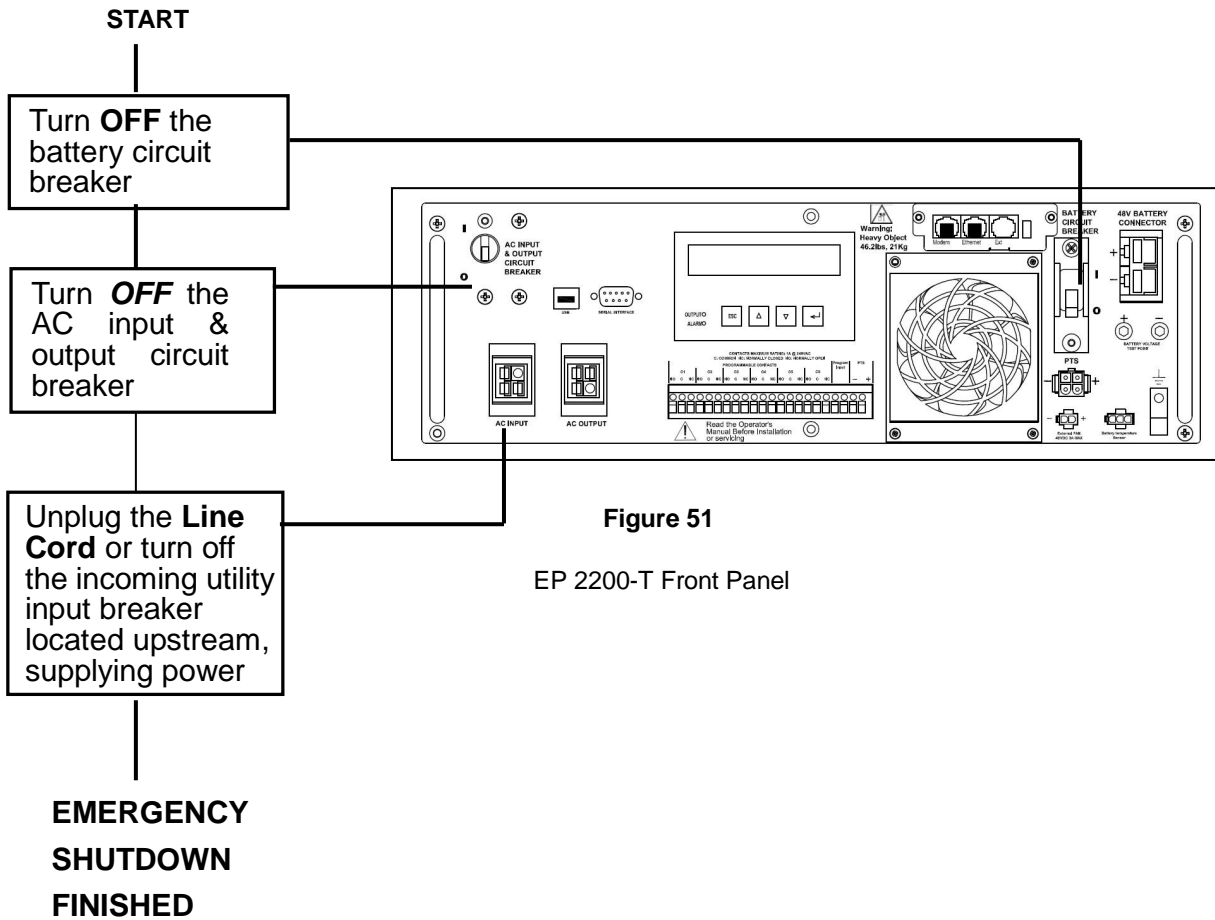
Any action for breach of this limited 24-month warranty must be brought within a period of 24 months from date of shipment.

This limited 24-month warranty does not extend to any unit that has been repaired or altered by any party other than Manufacturer, or its Authorized Customer Service Center.

Manufacturer reserves the right to discontinue particular models and to make modifications in design and/or function at any time, without notice and without incurring obligations to modify previously purchased units.

## 2.4.7 EMERGENCY SHUTDOWN PROCEDURE

TURN-OFF BOTH THE AC & BATTERY BREAKER IN AN EMERGENCY. The EP 2200-T contains more than one live circuit. In an emergency, AC line power may be disconnected at the system's input, but output AC power may still be present from batteries.



## RELEASE HISTORY

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