State of California

MP SERIES™ Battery Backup System

for Traffic Signals

MP2000E System

Volume One: Operating Manual

MP SERIES™ Battery Backup System for Traffic Signals
MP2000E System
Revision 5.0
Serial Numbers: MC18E16553 to present

IMPORTANT

EMERGENCY SHUTDOWN PROCEDURE IS ON INSIDE OF REAR COVER

For service, parts, or technical support contact Myers Emergency Power Systems at

TEL: (610) 868-3500

FAX: (610) 868-8686

www.myerseps.com

Or scan here

SAVE THESE INSTRUCTIONS

IMPORTANT SAFETY INSTRUCTIONS ARE CONTAINED IN THIS MANUAL

To reduce the risk of electrical shock and to ensure the safe operation of the MP2000E, the important safety instructions are marked with the symbols shown below. These symbols are used throughout this manual to indicate that the instructions being presented are for procedures that should only be carried out by qualified personnel.

Indicates presence of DANGEROUS VOLTAGE. Extreme caution should be used.

Calls ATTENTION to important instructions. Follow them as indicated.

DANGER: Do not expose the MP2000E to rain or moisture.

DANGER: Total earth ground leakage current of loads connected to the MP2000E should not exceed 2.4 mA.

The MP2000E 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 can be confirmed through switching the MP2000E on and off, relocate the radio or TV equipment or use an electrical circuit other than the one used by the MP2000E.

IMPORTANT SAFETY PRECAUTIONS

ONLY QUALIFIED PERSONNEL SHOULD SERVICE OR SUPERVISE THE SERVICE OF THE MP2000E.

DANGER: The MP2000E uses sealed lead-acid batteries with high energy and chemical hazard levels. This manual contains important operation and safety instructions.

MP2000E SYSTEM SAFETY CHECKLIST	
✓	
	Unpack the MP2000E carefully. Report any shipping damage at once.
	Read this manual. **If you have any questions about safe installation, operations, or maintenance of the system, contact the Myers Emergency Power Systems service department at 610-868-5400.**
	Before installation, confirm that the voltage and current requirements of the load(s) is / are compatible with the system's output. Confirm that the line voltage and current are compatible with the system's input requirements.
	Install the MP2000E on a dedicated power circuit.
	Place a warning label on the enclosure indicating that a Battery Back-Up (BBS) is located inside.
	Use proper lifting techniques when moving the system.
	Be advised that the MP2000E 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 Myers Emergency Power Systems cabinet, verify that the environment meets the system specifications as presented in Section 3 of this manual.

SAVE THIS MANUAL
It contains important installation and operating instructions.
Keep it in a safe place.

✓	BATTERY SAFETY CHECKLIST
✓	
	High & dangerous voltages **are present inside the system. Only qualified personnel should perform installation and maintenance.**
	Live battery wires must not touch the MP2000E 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 optimal 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 batteries with new. 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
	Follow local regulations for the disposal of batteries. Recycling is the best method.
	Never burn batteries to dispose of them. ***Doing so may cause them to explode.***
	Do not open the batteries. ***The contents are toxic.***

STANDBY GENERATOR CHECKLIST	
✓	
	⚠ **Note: If the MP2000E constantly switches between Battery and Line modes because of line fluctuations, the input parameters should be *broadened from Normal to Generator* (see Section 6.b.2.1 "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 MP2000E's input voltage requirements as listed on both nameplates. To ensure the system's smooth operation, use a generator capable of supplying 200% or twice as much power as required by the total load.

UNPACKING & INSPECTION CHECKLIST	
✓	
	Carefully remove the MP2000E from the box and inspect the contents.
	Verify that the box contains 1 MP2000E BBS System.
	Verify that the box contains 1 temperature sensor probe cable with three-pin connector
	Verify that the box contains 1 Operating Manual
	Verify that the box contains 1 binder of Electrical/Mechanical Drawings
	The Power Transfer Switch (PTS) and all the associated wiring & hardware required for installation are supplied in a separate box.
	The set of four (4) batteries may be shipped separately, if a large quantity of MP Series systems is supplied.

SAVE THE ORIGINAL SHIPPING MATERIALS

When returning the MP2000E for servicing, use the original shipping box and Styrofoam protectors. Myers Emergency Power Systems is not responsible for damage caused by improper packaging of returned systems.

READ THE OPERATING MANUAL

Before installation, become familiar with the MP2000E by reviewing the procedures and drawings in this manual. If you have any questions about safe installation, operation, or maintenance, contact Myers Emergency Power Systems service department at 866-MY-MYERS.

NOTE

If any items are missing or damaged, contact* Myers Emergency Power Systems *(610-868-3500) and the shipping company immediately. Most shippers have a short claim period.

COMPLETE THE FORMS BELOW FOR YOUR RECORDS & TO ASSIST WITH SERVICE REQUESTS

Model Number	**MP2000E**
Serial Number	**MC**

The serial number can be found on the nameplate label located on the side of the unit.

Myers Emergency Power Systems Sales Order Number	**MP2000E**
MP2000E P/N	**G30219CA2 (Quick Connect VAC Input / Output)**
Your Purchase Order Number	
Purchased From	

INSTALLATION LOCATION DETAILS

Installation Date			
Installed By			
Intersection Street Names			
City			
State/Province		**Zip Code**	
Telephone Number			
Fax Number			
E-Mail Address			
Cabinet / Controller Type			

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Section 1 Glossary

1 Form C	**Dry contact relay configuration.**
1P	**Single Phase (VAC power)**
3P	**Three Phase (VAC power)**
AGM	**Absorbed Glass Mat. A fiberglass mat material used in a lead acid battery to hold the electrolyte to the plates and keep the electrolyte inside the battery if the case is cracked or punctured. A technology for making a battery non-spillable and that allows non-hazardous material handling of AGM batteries on aircraft.**
ASCII	**American Standard Code for Information Interchange. A character-encoding scheme. ASCII codes represent text in computers, communications equipment, and other devices. that use text.**
Alternating Current	**An electrical current that pulsates the direction of flow of electrons. The flow changes from positive to negative. Abbreviated as AC.**
Ambient Temperature	**The temperature of the surrounding environment such as the cabinet or room temperature.**
Amp Meter	**Instrument that measures electrical current in a line.**
Ampere Hour (Ah)	**Term used to convey the capacity of a battery. Ampere hours is the length of time a battery can deliver a rate of discharge under specific conditions.**
AVR	**Automatic Voltage Regulation. MP2000 Buck / Boost operation mode.**
Battery	**A device that produces electricity; may have several primary or secondary cells arranged in parallel or series.**
BBS	**Battery Back-Up System.**
BBU	**Battery Back-Up Unit.**
BJT	**Bi-Polar Junction Transistor. A solid-state device in which the current flow between two terminals (the collector and the emitter) is controlled by the amount of current that flows through a third terminal (the base).**
Breakdown Voltage	**The minimum voltage that causes a portion of an insulator to become electrically conductive.**
BTC	**Battery Temperature Compensation. An allowance made in charge controllers set points for battery temperatures.**
Capacity	**The quantity of electricity a battery can deliver at a given rate over a specific period of time.**
CAT5E	**Category 5 Enhanced cable for 100MHZ, 1Gbps communications.**

Charging	**The process a battery is subjected to return it to full output capacity. The process is accomplished by passing an electrical current through the battery plates and electrolyte to restore the chemicals to their original state.**
Continuity	**The condition of a circuit when it makes a connection between two points.**
CPU	**Central Processing Unit. The "brain" of a computer, the CPU is where data manipulation actually takes place.**
Current	**The rate electrons flowing over a period of time. This is usually expressed in amperes**
Cycling	**The repeated charge and discharge of batteries**
DB-9	**A common type of electrical connector named for the characteristic D-shaped metal shield that surrounds the parallel rows of pins or sockets. A DB-9 connector has nine pins total, arranged in two rows.**
DCE	**Data Communications Equipment. The serial communications host (typically a PC).**
Deep Discharge	**To expend 80% or more of a battery's capacity.**
DHCP	**Dynamic Host Configuration Protocol. A standardized network protocol used on Internet Protocol (IP) networks for dynamically distributing network configuration parameters, such as IP addresses for interfaces and services. With DHCP, computers request IP addresses and networking parameters automatically from a DHCP server, reducing the need for a network administrator or a user to configure these settings manually.**
Direct Current	**Electrons flowing in a single direction. Abbreviated as DC.**
DNS	**Domain Name System. A system that controls a domain name's website and email settings. When visitors go to a domain name, its DNS settings control which entity's server it reaches out to.**
DTE	**Data Terminal Equipment. The serial communications device with which the DCE communicates.**
Electricity	**The flow of electrons through a circuit or device.**
E-Net	**See Ethernet**
Ethernet	**A system for connecting a number of computer systems to form a local area network or a means of connecting a computer to a modem for connection to the Internet.**
ETM	**Ethernet Manager.**
FIFO	**First In First Out**
Form C	**Dry contact relay configuration. The MP2000 uses 1 Form-C dry contact indicators.**
FTP	**File Transfer Protocol.**

Fuse	**A device placed in a circuit designed to open or break the connection at a specific level of current; a device placed in a circuit to protect it from dead shorts and spikes in current.**
Gateway	**A node on a network that serves as an entrance to another network. In enterprises, the gateway is the computer that routes the traffic from a workstation to the outside network that is serving the Web pages.**
Gel Cell	**A form of electrolyte used in lead acid batteries. A gel cell battery is a non-spillable design.**
Generator	**A device that converts mechanical energy to electrical energy, generally using electromagnetic induction. The source of the mechanical energy may be a reciprocating or turbine engine or internal combustion engine.**
Hz	**Hertz. A unit of frequency defined as one cycle per second.**
HTML	**Hypertext Markup Language. A standardized system for tagging text files to achieve font, color, graphic, and hyperlink effects on World Wide Web pages.**
I/P	**Internet Protocol. The communications protocol of the public Internet, many wide area networks (WANs) and most local area networks (LANs).**
Incandescent Light	**The incandescent light bulb or incandescent lamp is a source of artificial light that works by incandescence. An electrical current passes through a thin filament, heating it and causing it to become excited, releasing thermally equilibrated photons in the process. The enclosing glass bulb prevents the oxygen in air from reaching the hot filament, which otherwise would be destroyed rapidly by oxidation.**
IP Address	**An identifier for a computer or device on a TCP/IP network. Networks using the TCP/IP protocol route messages based on the IP address of the destination.**
LCD	**Liquid Crystal Display. The type of display used on the MP2000E.**
LED	**A light-emitting diode (LED) is a semiconductor device that emits incoherent narrow-spectrum light when electrically biased in the forward direction. This effect is a form of electroluminescence. LED lights are used in traffic signals to replace incandescent lights.**
L-N-G	**Line-Neutral-Ground. The three conductors in an electrical circuit.**
Load	**The impedance in a circuit. In a typical traffic intersection the load is the signal heads and the electrical equipment housed in the signal cabinet.**
MAC	**Media Access Control address, a hardware address that uniquely identifies each node of a network.**

Maintenance Free Battery	**A sealed battery that requires no service. The battery is sealed so it requires no water to be added.**
Mask	**A 32-bit number used to differentiate the network component of an IP address by dividing the IP address into a network address and host address.**
MBPS	**Maintenance Bypass Switch. A stand-alone switch used to manually isolate the MP2000E BBS module from utility power and the intersection controller. It facilitates maintenance and BBS replacement operations without turning off power to the loads.**
MIB	**Management Information Base. A database used for managing the entities in a communications network.**
MOSFET	**Metal Oxide Semiconductor Field-Effect Transistor. An isolated gate switching device.**
MOV	**Metal Oxide Varistor. A voltage transient suppression device.**
MPP or MEPS	**Myers Emergency Power Systems.**
MTBF	**Mean Time Between Failures. A measure of hardware product or component reliability.**
mV/°C/Cell	**Millivolts Per Degree Celsius Per Battery Cell. The unit of measure for the ratio of the change in breakdown voltage to changes in temperature.**
OEM	**Original Equipment Manufacturer.**
OHM	**Unit of electrical resistance. An ohm is a resistance that produces a potential difference of one volt when a current of one ampere is flowing through it.**
Ohmmeter	**A device or instrument for measuring resistance in an electrical circuit.**
Pb	**The chemical symbol for lead.**
PFC	**Power Factor Correction. A feature included power supply boxes to reduce the amount of reactive power generated.**
Polarity	**The positive pole and negative pole designation of a DC circuit such as in a battery.**
PTC	**Positive Temperature Coefficient. A type of thermistor (is a type of resistor whose resistance is dependent on temperature) in which resistance rises suddenly at a certain critical temperature.**
PTS	**Power Transfer Switch. A device that moves the electrical load from one power source to another.**
Qualified	**In reference to utility power input, offering steady power at the correct voltage.**
Resistance	**The opposition of a circuit or conductor to allow the passage of electrical current.**

RFI	**Radio Frequency Interference. A disturbance generated by an external source that affects an electrical circuit by electromagnetic induction, electrostatic coupling, or conduction.**
RMS	**Root Mean Square. The method of calculating the effective voltage or current of an AC wave.**
RS232	**RS-232 is a standard for serial communication transmission of data. It formally defines the signals connecting between a DTE (data terminal equipment) such as a computer terminal, and a DCE (data circuit-terminating equipment, originally defined as data communication equipment), such as a modem. The RS-232 standard is commonly used in computer serial ports.**
Sine Wave	**A waveform is a representation of how alternating current (AC) varies with time. The most familiar AC waveform is the sine wave, which derives its name from the fact that the current or voltage varies with the sine of the elapsed time.**
SMTP	**Simple Mail Transfer Protocol. An Internet standard for email transmission.**
SNMP	**Simple Network Management Protocol. A set of standards for collecting information from, and configuring, network devices, such as servers, printers, hubs, switches, and routers on an Internet Protocol (IP) network.**
Surgestor	**A current (amps) transient suppression device.**
TB	**Terminal Block. A connector which allows more than one circuit to connect to another circuit.**
TCP/IP	**Transmission Control Protocol/Internet Protocol. The basic communication language or protocol of the Internet.**
THD	**Total Harmonic Distortion. A measurement of the harmonic distortion present**
TP	**Test Point. A point within a piece of equipment or an equipment string that provides access to signals for the purpose of fault isolation.**
TRL	**Traffic LAN**
TTL	**Transistor-Transistor Logic. A class of digital circuits built from bipolar junction transistors (BJT) and resistors.**
Unqualified	**In reference to utility power input, not offering steady power at the correct voltage.**
uC Microcontroller	**A computer-on-a-chip used to control electronic devices.**
USB	**Universal Serial Bus. An external bus standard that supports data transfer rates of 12 Mbps.**
UPS	**Uninterruptible Power Supply. A secondary power supply used to maintain power in the event of a loss of utility power.**
V	**Volt. A unit of measure for potential electrical energy.**

VA	**Volt-Ampere**
VAC	**Volts Alternating Current**
VDC	**Volts Direct Current.**
VPC	**Volts Per Cell. The amount of potential energy in a single battery cell.**
W	**Watt. Unit of measurement for electrical power.**

Section 2 General Description

2.a Key MP200E System Benefits and Features

- **ADVANCED POWER PROTECTION TECHNOLOGY: MP2000E is a Battery Backup System (BBS) designed for both indoor and outdoor applications. The MP2000E BBS provides continuous power to traffic and signal equipment.**
- **LOCAL AND REMOTE COMMUNICATIONS: USB / DB9 RS232 with optional Ethernet-to-serial adapter or embedded HTML Ethernet.**
- **EASE OF MAINTENANCE: The batteries can be changed without shutting down the intersection loads or the MP2000E.**
- **SMART CHARGING: MP Series smart charge technology ensures the batteries are always at peak performance.**
- **USER-FRIENDLY SUPERVISION: The LCD panel provides "At a Glance" monitoring and control.**

2.b System Description

The MP2000E System provides backup power to traffic control signal equipment. It consists of the MP2000E Battery Back-Up (BBS) 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.

The traffic signal cabinet is powered continuously when a MP2000E 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 BBS to be removed for service on a temporary or permanent basis without disrupting the operation of the traffic signal.

With a fully functioning BBS 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 BBS is not functioning, the PTS will bypass the BBS allowing the utility to flow out to the traffic cabinet. The BBS input is protected with one circuit breaker located on the PTS as well as another one located on the BBS module. When the BBS internal BOOST and BUCK is enabled, the PTS is activated allowing BBS 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°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 BBS 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.

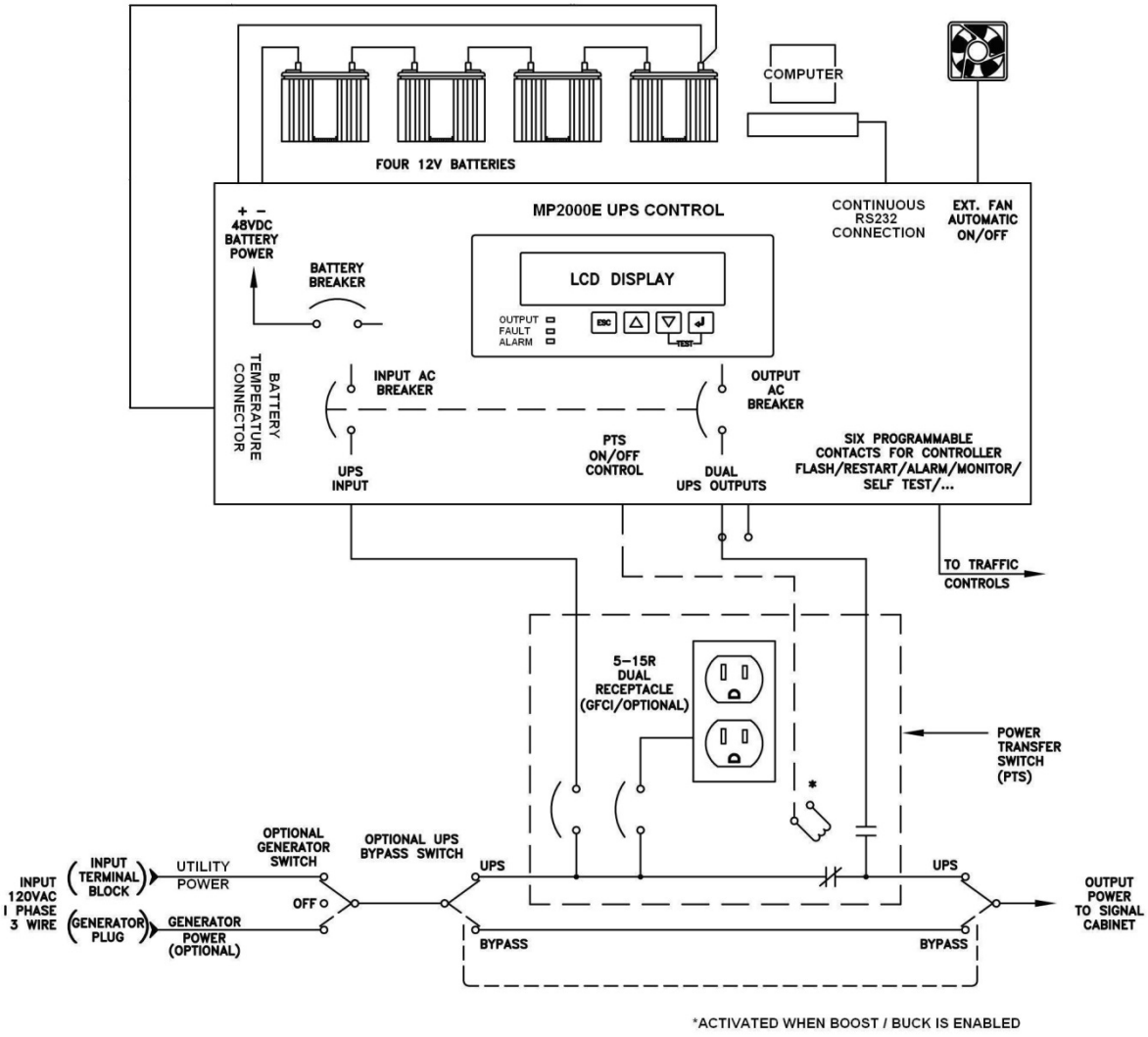
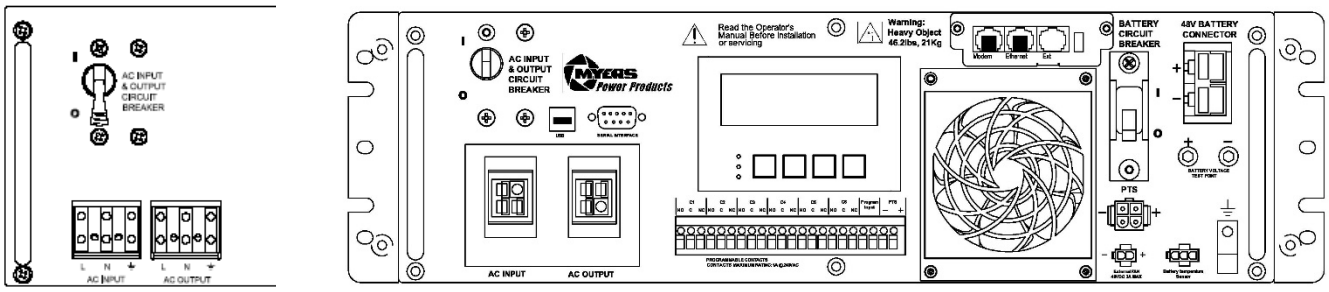


Figure 2-1: Simplified MP2000E System Block Diagram

2.c Battery Backup System Description

The MP2000E BBS System shown in Figure 2-2 below provides control functions and backup power as described above.



Alternate Configuration

Figure 2-2: MP2000E Battery Backup System Front Panel

2.c.1 Battery Backup System Display

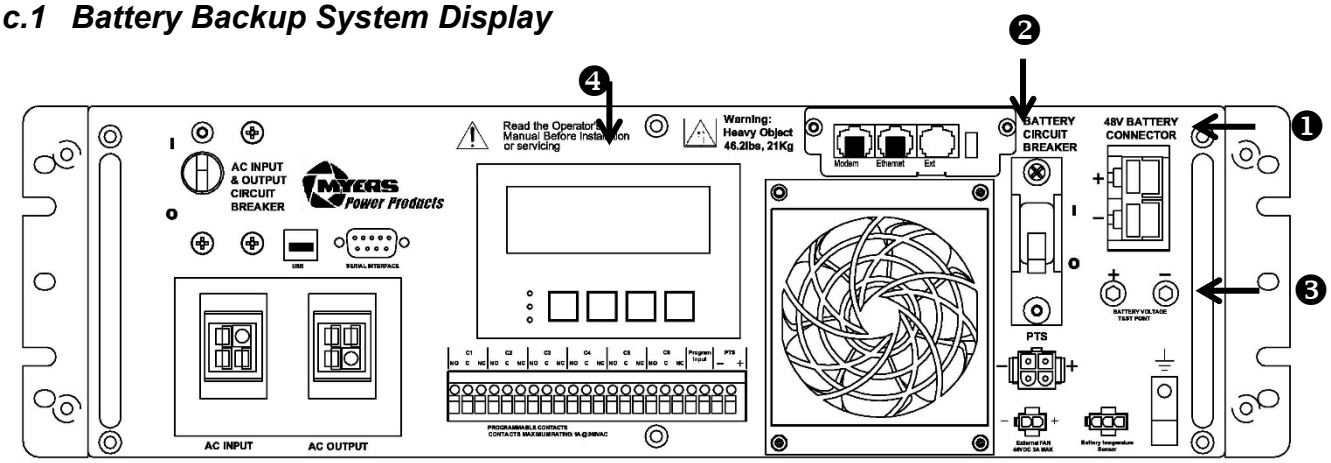


Figure 2-3: MP2000E Battery Backup System Display

Description of Features Highlighted in Figure 2-3			
❶	**48VDC BATTERY CONNECTOR: Connects the battery to the unit. The battery string voltage is 48VDC.**	❸	**BATTERY VOLTAGE TEST POINTS: Battery voltage can be measured at these Test Jacks only when the battery circuit breaker is turned ON. Note: TEST JACKS ARE NOT DC POWER OUTLET TERMINALS.**
❷	**BATTERY CIRCUIT BREAKER: Acts as an ON/OFF switch for battery power. Must be in the ON position for normal operation.**	❹	**LIQUID CRYSTAL DISPLAY (LCD) CONTROL PANEL: The BBS can be controlled and monitored via this LCD panel. See Sections 6.b.7 – 6.b.15 for further information.**

2.c.2 Battery Backup System Power Inputs/Outputs

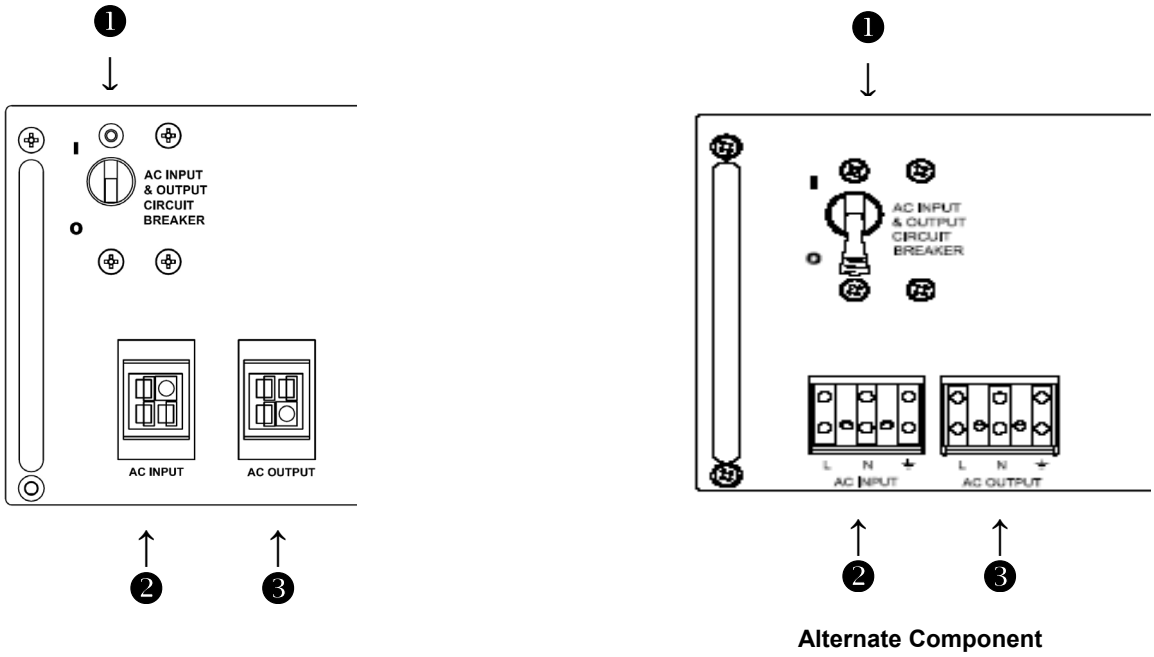


Figure 2-4: MP2000E Battery Backup System Power Inputs/Outputs

Description of Features Highlighted in Figure 2-4			
❶	**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.**	❷	**AC INPUT: Quick Connect socket or Terminal Block for the input line power plug.**
		❸	**AC OUTPUT: Quick Connect socket or Terminal Block for the output line power plug.**

2.c.3 Communication Interface

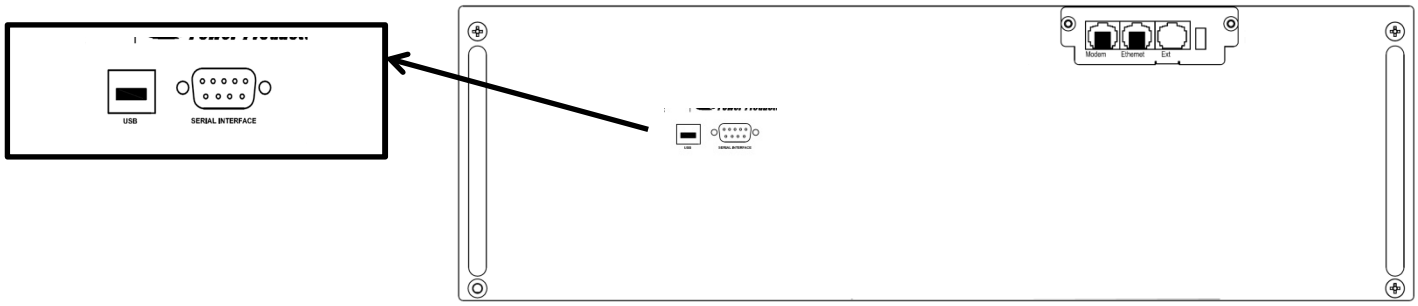


Figure 2-5: MP2000E Battery Backup System USB / Serial Interface / RS232 Connector / Ethernet

The USB and /or DB-9 female connector is used to connect the MP2000E to the host computer for remote control, monitoring, and calibration via RS232 commands.

The MP2000E USB is a USB Type B connection. The MP2000E DB9 connection is female. Use a shielded straight-through cable or use a USB to DB9 adapter for a DTE to DCE serial communications configuration. For Ethernet use CAT5E RJ45 cable.

See Section 6.c for more details about connection and use.

2.c.4 Control Terminal Block

Figure 2-6: MP2000E Battery Backup System Control Terminal Block

This 22 position terminal block provides communication with the intersection controller, controls the Power Transfer Switch (PTS), and starts the self-test. Figure 2-7 describes the terminal block functions. Figure 2-10 shows the operation of the PTS.

Note: Each of the terminal block's six individual dry contact closure indicators are 1 form-C isolated unto themselves. The contact closures default Common (C) to Normally Closed (NC) in the de-energized position.

The PTS (+) and (-) are in parallel with the MP2000E front panel shell connector (+) and (=).

SELECTED CONTROL TERMINAL BLOCK FUNCTIONS	
On Batt	**This relay energizes when utility Input line power is unqualified.**
Low Battery	**These relays energize when the battery drops below the programmed battery capacity. The default value is 47.5VDC or 40% battery capacity. Note: You can change the preprogrammed value to match the batteries used and the actual operating conditions. See Section 6.c.4, Figure 6-19.**
Timer	**These relays energize after the unit has been in Battery mode for the programmed time period. The factory default value is two hours. Note: The time can be programmed to be from 15 min. to 8 hours in 15 minute increments.**

Figure 2-7: Control Terminal Block Functions

SELECTED CONTROL TERMINAL BLOCK FUNCTIONS	
Program Input	**Default = Self-Test, short TB 19 and 20 to trigger.**
Power Transfer Switch (PTS)	**MP2000E 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 4.b, Wiring, of this manual for connection instructions.**

Figure 2-7: Control Terminal Block Functions (continued)

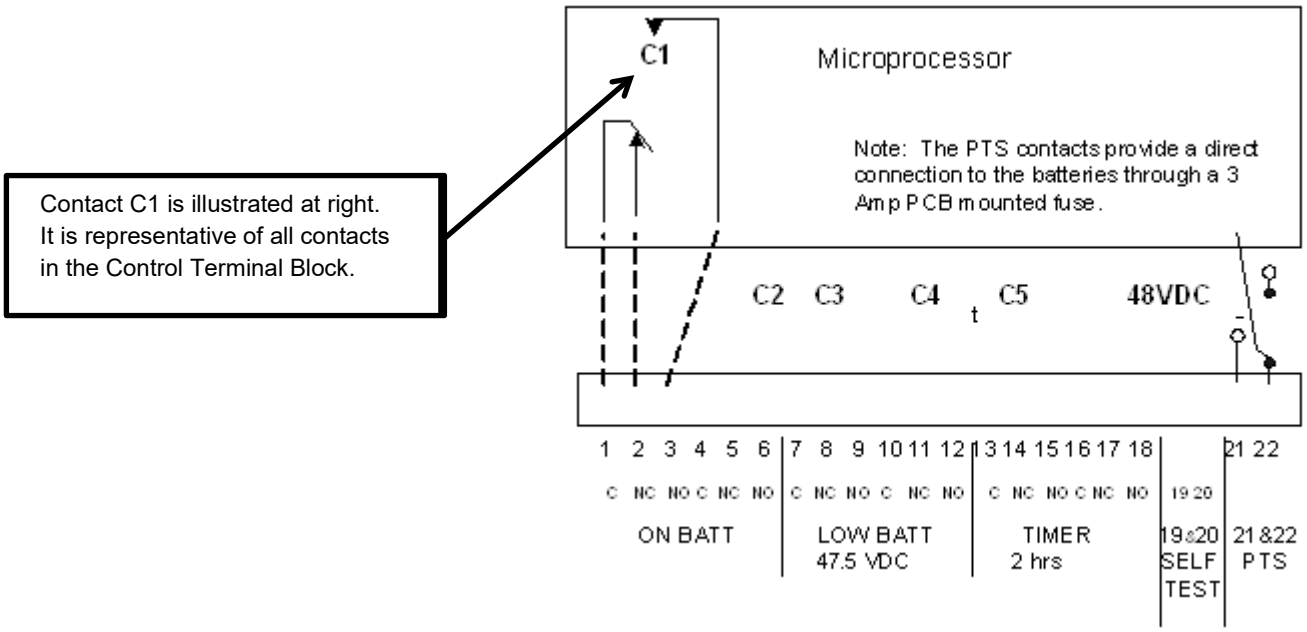


Figure 2-8: MP2000E Control Terminal Block Interior

Notes on Contacts:

- **Contacts C1 — C6 contacts have a maximum rating of 1 Amp at 240VAC.**
- **Factory default settings are as follows:**
  - **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 a selection of different functions. See Section 6.a.1.2 for more detailed information.**
- **The program input (contact closure input) has a selection of different functions. See Section 6.b.10 for more detailed information.**
- **Default for programmable input is SELF TEST. Other options:**
  - **Ext. Alarm**
  - **Ext. Batt Alarm**

- **Ext. Fan Alarm**
- **Door Interlock**

2.c.5 Temperature Sensor and Fans

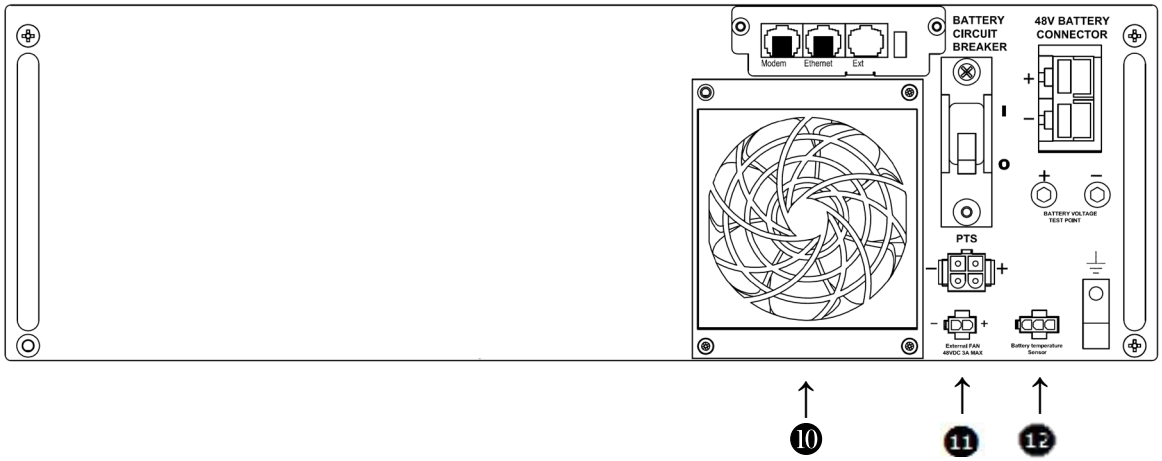


Figure 2-9: MP2000E Temperature Sensor and Fans

Description of Features Highlighted in Figure 2-9			
⑩	**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.** **Note: The filter should be inspected at least every six months. Clean by removing it, running water through the filter, and air-drying before reinstalling.**	⑪	**EXT FAN 48VDC PORT: Provides DC power (48VDC, 3 Amp Max) that can be used to power an optional fan mounted inside the enclosure.**
		⑫	**BATTERY TEMP SENSOR: This port is used to attach the battery temperature probe to the unit. The charging voltage is temperature dependent, and the microprocessor of the smart charger adjusts the voltage for optimal charging. The temperature probe connector must be plugged in for normal operation. The sensor end contains a ring lug and should be secured to the battery terminal.**

⚠	**Note: If the BBS is not charging the batteries check the temperature probe. To test the temperature probe, unplug it from the face of the BBS. Check the resistance of the temperature probe by inserting the probes of an ohmmeter into the top and bottom pins of the connector. The meter should read approximately 12,000 Ω at 25°C (77°F). If resistance is not in this range, replace the temperature probe.**

2.d Power Transfer Switch Description

The Power Transfer Switch (PTS) shown in Figure 2-10 allows the BBS to be removed for service, replacement, or maintenance without interrupting power to the traffic cabinet.

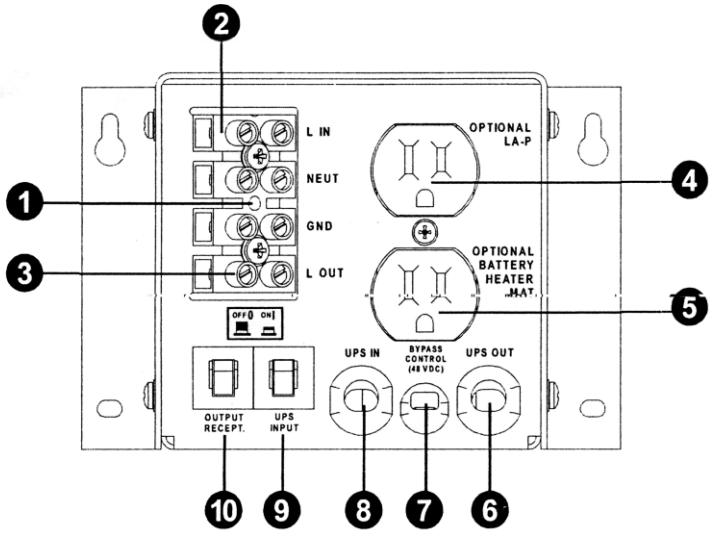


Figure 2-10: Power Transfer Switch Front Panel

Description of Features Highlighted in Figure 2-10			
❶	The wires from the neutral and ground bus of the traffic cabinet are connected	❺	The optional battery heater mat is plugged into this receptacle.
❷	The Input line power is connected to the terminal block marked “L IN”.	❻	The “UPS OUT” cord connects to the MP2000E VAC output.
❸	The Output power is connected to the terminal block marked “L OUT”.	❼	The PTS red wire (+) and black wire (-) connect to the MP2000E front panel PTS shell connector or PTS TB connection.
❹	An optional surge suppressor, external PC, or a vacuum cleaner may be plugged into this receptacle.	❽	The “UPS IN” cord connects to the MP2000E VAC input.
❾	The circuit breaker provides input power protection for the MP2000E BBS.	❿	The dual receptacles are protected by this circuit breaker.

2.e Battery Description

Myers EPS MP2000E is tailored toward the use and maintenance of lead-acid batteries; typically 12V lead-acid batteries with absorbent glass mat (AGM) technology. Different Amp-hour capacities or sizes of batteries can be used in the MP2000E system to provide various backup times. Four batteries are connected in series for the required 48VDC. Contact

customer service at Myers Emergency Power Systems (610-868-3500) 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.

Section 3 General Characteristics

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

3.a General 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 (-2.5mV 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	**Input and output voltages Input line frequency Battery voltage Battery temperature**

MECHANICAL SPECIFICATIONS	
Dimensions (inches / millimeters)	**Width: 17 / 432 Depth: 10.5 / 267 Height: 5.25 / 133 3U rack space**
Weight (pounds / kilograms)	**46.2 / 21**
Input Connection	**Keyed Quick Connect Connector or Set-Screw Terminal Block**
Output Connection	**Keyed Quick Connect Connector or Set-Screw Terminal Block**
Mounting	**19” / 483 mm or 23” / 584 mm rack or shelf mount**
Cooling	**Microprocessor controlled, 12VDC, 3.62” / 92mm fan**
Audible Noise Level, dBA	**<40**

MECHANICAL SPECIFICATIONS	
Operating Temperature (Celsius)	-37°C to +74°C (See Notes 1 and 2)
MECHANICAL SPECIFICATIONS (continued)	
Storage Temperature (Celsius)	-50°C to +75°C
Humidity	Less than or equal to 95%, non-condensing
Altitude (feet / meters)	10,000 / 3048 (See Note 2)

Mechanical Specifications Notes:

1. Between 55°C — 74°C the unit is de-rated to a maximum load of 1600 VA / 1200 W.
2. De-rate operating temperature for altitudes above 4900 feet (1500 meters) by 5°C per each additional 1000 feet (3000 meters).

ELECTRICAL SPECIFICATIONS	
Output Apparent Power, VA	2000 (inverter mode) 2000 (line mode)
Output Active Power, W	1500 (inverter mode) 1500 (line mode)
Power Factor	.75
Input Frequency, Hz + / - 3Hz	60
Input Voltage Range, VAC	90 — 150 VAC user programmable Defaults set at 100 ~ 130 VAC + / - 2 VAC
Output Voltage	120 nominal (tolerances are user-programmable)
Inverter Mode	120 VAC + / - 5%
Maximum Input Current, A	30
Transformer	Linear (non-isolated)
Transfer Time, milliseconds	<65 milliseconds <10 milliseconds when buck & boost enabled
Inrush Current	Load dependent
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	48VDC voltage, VDC
Step Load Response (50%)	1 cycle full recovery
Overcurrent Protection	Double pole single throw circuit Breaker rated to 30A for input and output DC bus: 60A circuit breaker
Transient Suppression	MOV transient suppression elements (>150V)
DC Power	Drawn from batteries

22 POSITION TERMINAL BLOCK SPECIFICATIONS		
Functions	Provides six sets of programmable contacts on pins 1 — 18 for the following: • Intersection flash control • Remote alarms • Pagers • User defined function	
	Contacts are energized under the following conditions:	
	Low Batt:	The batteries reach ~ 40% capacity
	On Batt:	The unit is in inverter mode
	Timer:	The unit has been in inverter mode for two hours
	Alarm:	One or more of the following conditions is present: • Any alarm • Line input frequency error • Output under voltage • Temp probe disconnected • Overload • Battery not connected • Battery high temp >+60°C • Battery low temp >-15°C
	Fault:	One or more of the following conditions is present: • Any fault • Short circuit • Battery under voltage • Battery over voltage • Battery over temperature • Overload
	Program Input:	Momentarily short positions 19 &20: • Self test • External alarm • External battery alarm • External fan alarm • Door interlock
	Provides 48VDC signal to the PTS on pins 21 — 22	
Contact Type	Isolated 1 form-C dry contacts rated to 1A at 240VAC	
Wiring	Uses 14-26 AWG	

COMMUNICATION SPECIFICATIONS	
RS232 female DB9/ RS232 Type B USB	Local monitor & control via front panel connections
RS232	DB-9, female, opto-isolated
Ethernet option	Embedded HTML
Ethernet option	Ethernet-to-Serial Adapter

3.b System Technical Specifications

INPUT	
Voltage Range — VAC	100 ~ 130 VAC (120 VAC nominal) Prog 90 — 150 VAC
Frequency	60 + / - 3 Hz
Current	30A (Resistive)
Step Load Response (50% Load Change)	½ Cycle Full Recovery (full resistive load)
Short Circuit Protection	30A Circuit Breaker
Battery String Voltage	48VDC (four 12VDC batteries)
PERFORMANCE	
PTS Transfer Time	< 65 Milliseconds Buck and Boost Mode

OUTPUT	
Power VA / W (line or inverter mode)	2 kVA / 1.5 kW
Power Factor	.75
Output Voltage VAC Line and Boost Mode, Inverter Mode	100 ~ 130 VAC + / - 2 VAC (follows input voltage) 120 VAC + / - 5%
Output Waveform	Sine Wave
Output Waveform THD	< 3% (resistive load)
Load Crest Factor	3:1 (maximum)
Overload Capacity	100% for 3 Minutes

PTS MECHANICAL	
Input Connection	Terminal Block: “L IN”
Output Connection to Loads	Terminal Block “L OUT”
Output Connection to BBS	Line cords ready for plugging in or hard wiring to BBS terminal blocks
Cooling	Convection (approximately 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

System Technical Specifications Notes:

1. **Between 55°C ~74°C, the system is de-rated to a maximum rectified-capacitive load of 1500 VA / 1200 W.**
2. **De-rate operating temperature in altitudes greater than 4900 ft (1500m) by 2°C per 1000 ft (300m).**

Section 4 Installation

4.a Mounting

The MP2000E system components can be mounted into a single external cabinet or into an existing traffic cabinet.

4.a.1 External Mounting

The factory-supplied external cabinet can be bolted onto an existing or new traffic cabinet, pad mounted on a concrete slab, or pole mounted. The separate base for the cabinet for installation in the concrete slab, bolts and 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, three-point locking mechanism, lockable handle with dual keys and a unique internal keyed lock. The factory-supplied cabinet meets or exceeds the requirements of various NEMA classifications.

Install the cabinet and mounting platform (concrete pad, cat-walk, et al.) in accordance with federal, state, and local ordinances as well as site-specific criteria. Typically use "L" shaped anchor bolts in concrete pads for additional reinforcement. A riser may be used to elevate a cabinet above ground level. Common hand tools are generally used to apply the mounting hardware.

Extract the MP2000 when drilling or cutting into the cabinet above the MP2000. This is to prevent metal shavings from falling through the vent opening in the MP2000 top cover and into the MP2000 interior. Thoroughly inspect for and clear any metal shavings within the cabinet interior. Fashion drip droops when running flex conduit into the cabinet side.

A sunshield provides substantial cooling in hot climates. Textured powder coat diffuses sunlight giving more cooling effect. An anti-condensation heater helps preclude interior water build up in cold climates. Typically maintaining an interior ambient above 65º F prevents condensation.

4.a.2 Internal Mounting

The MP2000E 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 MP2000E 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 and bypass switch comes in many configurations that can be shelf mount, 19" rack mount, back plate mount, etc.

Install the MP2000 inside the cabinet using the supplied mounting brackets. Typically 10-32 mounting hardware is used – of course use the size cut into the cabinet mounting rails.

Visually inspect the VAC power cord input to the MP2000 for correct wiring, as follows:

- **Line (black wire) to Neutral (white wire) should be approximately 120VAC.**
- **Line (black wire) to Ground (green wire) should be approximately 120VAC.**
- **Neutral (white wire) to Ground (green wire) should be zero VAC.**

DANGER: Do not VAC power up the MP2000 with line and neutral transposed.

The battery cabling kit has four quick-connect assemblies and a main harness. Each of the four quick-connect assemblies attach to each individual 12V battery.

- **Attach the red wire to battery positive and attach the black wire to battery negative.**
- **Torque per the specifications provided by the battery manufacturer.**
- **Plug the batteries into the main harness. The main harness puts the four 12V batteries in series for a 48VDC output on the main harness MP2000 quick-connect.**
- **Check the main harness quick-connect voltage and polarity before plugging into the MP2000.**
- **The quick-connect should measure approximately 48VDC, red positive, black negative.**
- **Connect the MP2000 battery temperature sensor lug to the positive-most battery post.**

Ensure the MP2000 front panel PTS (power transfer switch) terminal block connection polarity is correct. Myers EPS PTS is red positive, black negative. Or use the MP2000 front panel PTS shell connector. The MP2000 front panel PTS terminal block take-off and the MP2000 front panel PTS shell connector are electrically in parallel.

The MP2000 front panel external fan connector provides 48VDC, 3 amps for 48VDC cabinet fan(s). The external fan power turns on following the temperature reading taken from the

battery temperature sensor probe IAW the external fan control setting in the MP2000 LCD settings menu.

4.b Wiring

DANGER: The utility input power line must have circuit breaker or fuse protection as per the local electrical code. It is referred as "Upstream Circuit Breaker" in this manual.

Prior to wiring the system, follow the instructions in Figure 4-1 to determine the size of the load.

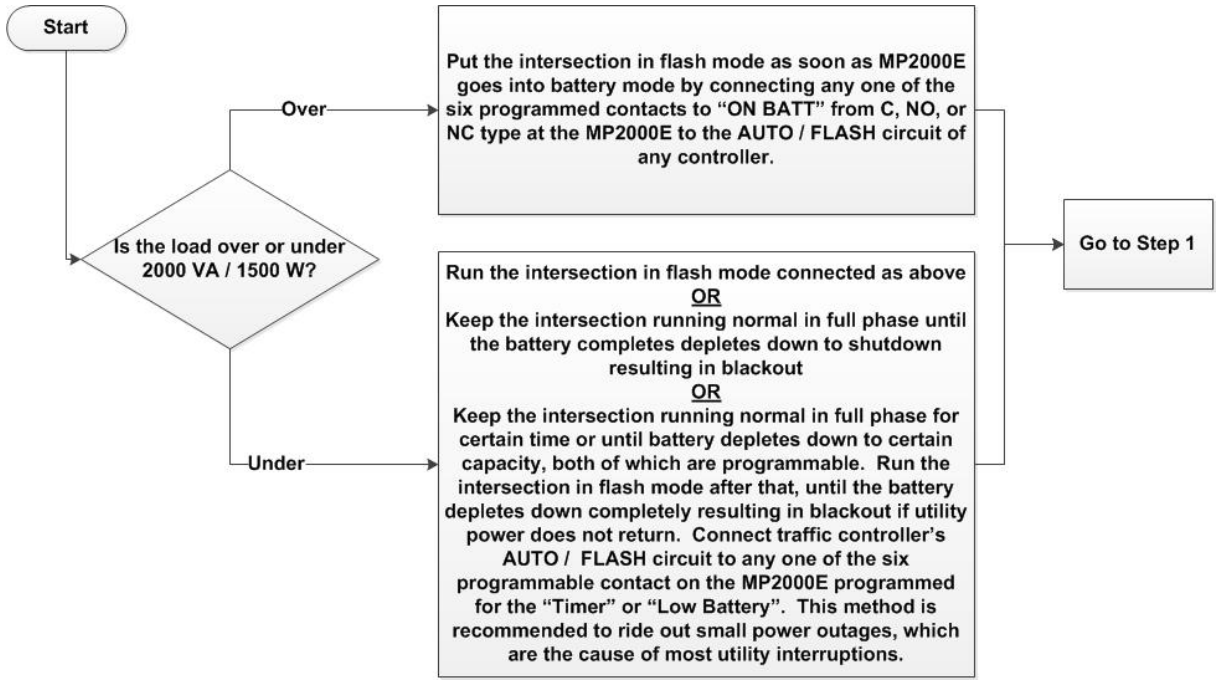


Figure 4-1: Determine the Size of the Load

NOTE: 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 240VAC. 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 elsewhere in this manual. The ON BATTERY contact(s) are activated as soon as the MP2000E 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 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.

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

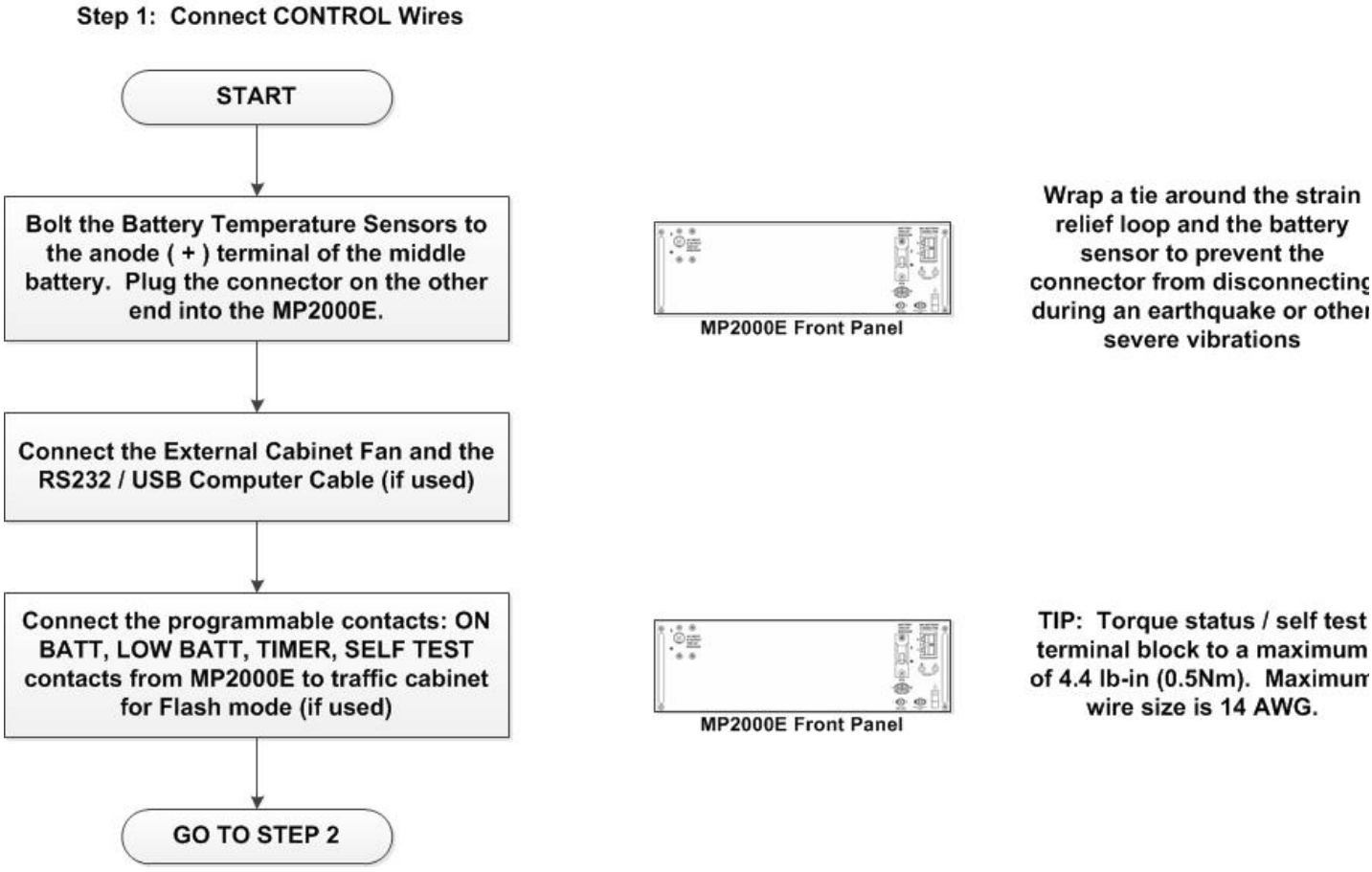


Figure 4-2: Wiring Step 1: Connect Control Wires

NOTE: Detail regarding the layout, operations, and specifications of the Control Terminal Block are provided in Section 2 of this manual.

Step 2: Connect Power Transfer Switch to MP2000E

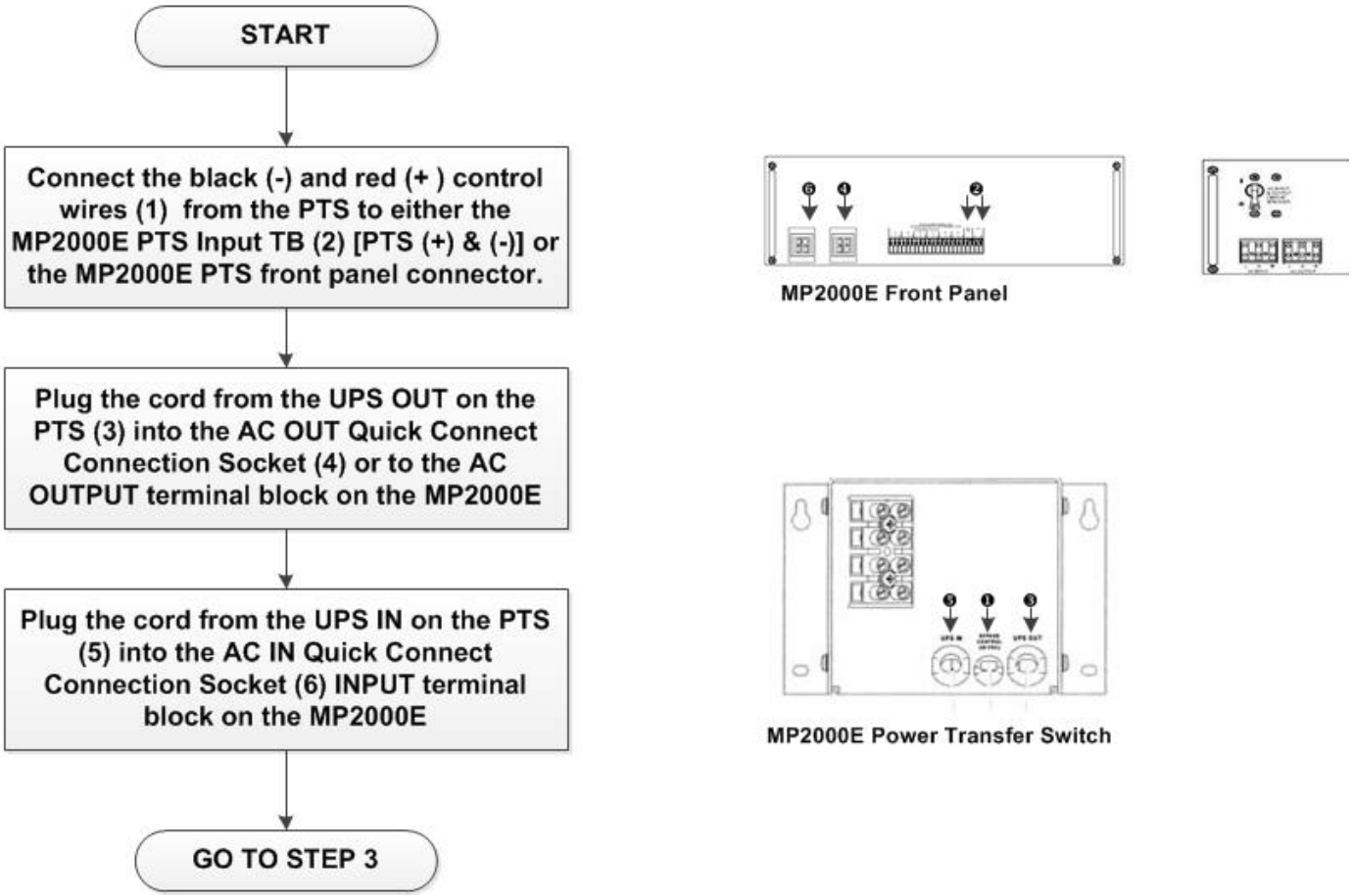


Figure 4-3: Wiring Step 2: Connect Power Transfer Switch to MP2000E

Step 3 Connect Output or Signal Cabinet and Battery

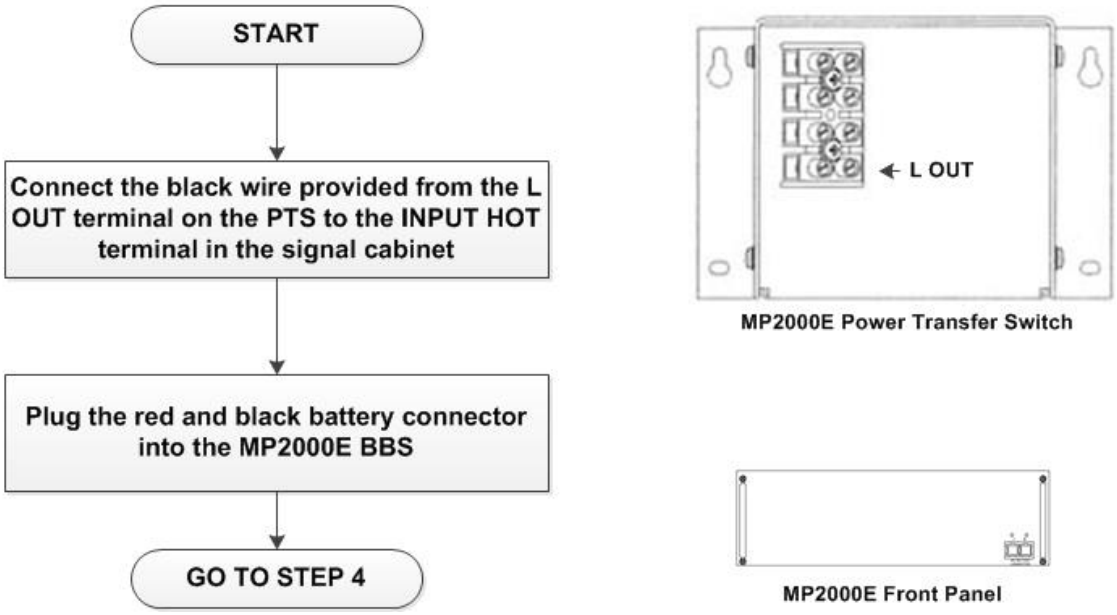


Figure 4-4: Wiring Step 3: Connect Output or Signal Cabinet and Battery

DANGER: Make sure the upstream circuit breaker feeding the utility power is OFF before beginning Step 4. 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.

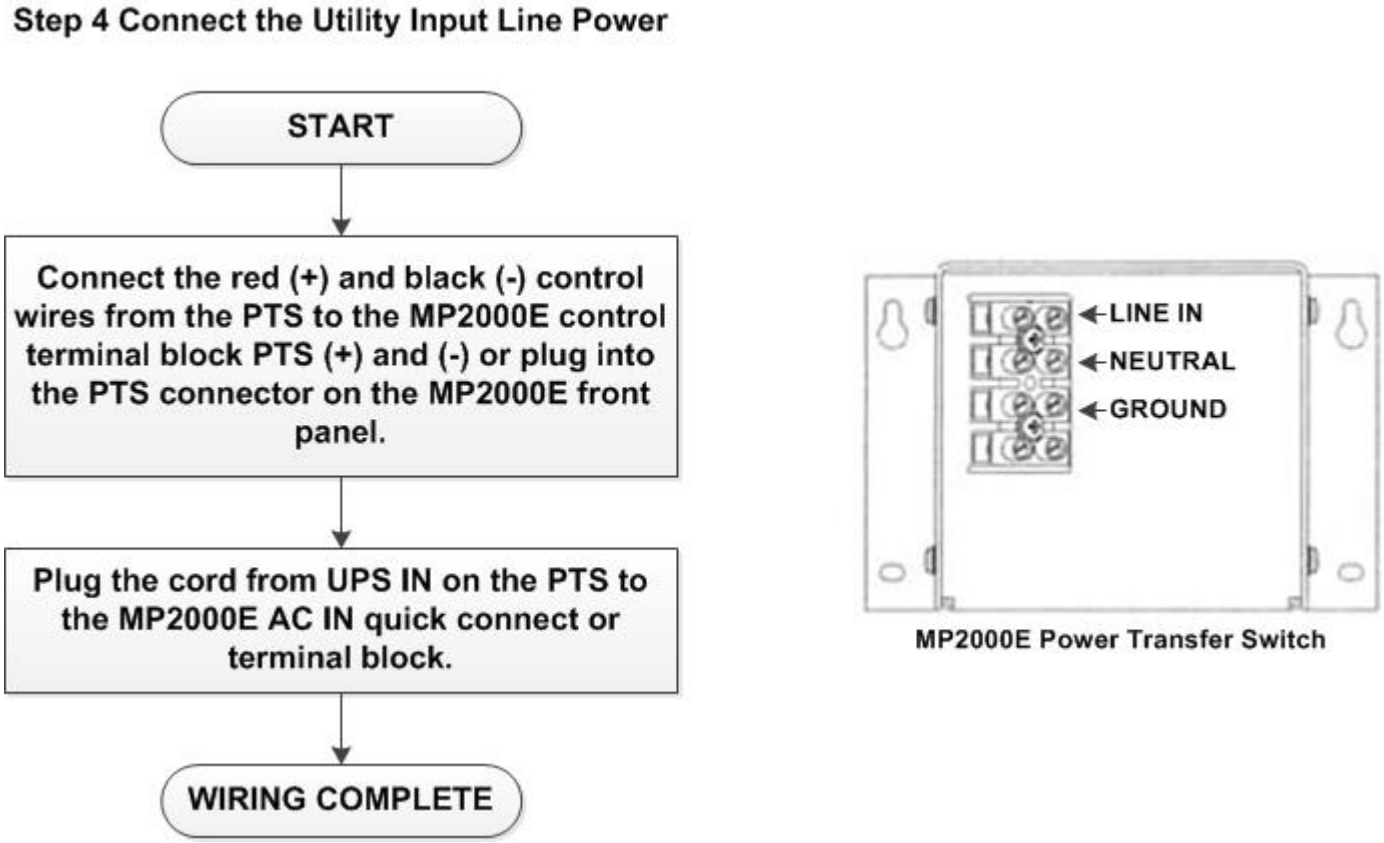


Figure 4-5: Wiring Step 4: Connect the Utility Input Line Power

Step 4 Notes:

1. **The wires from Ground and Neutral bus bars from the traffic cabinet are extended to the PTS terminal block.**
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).**

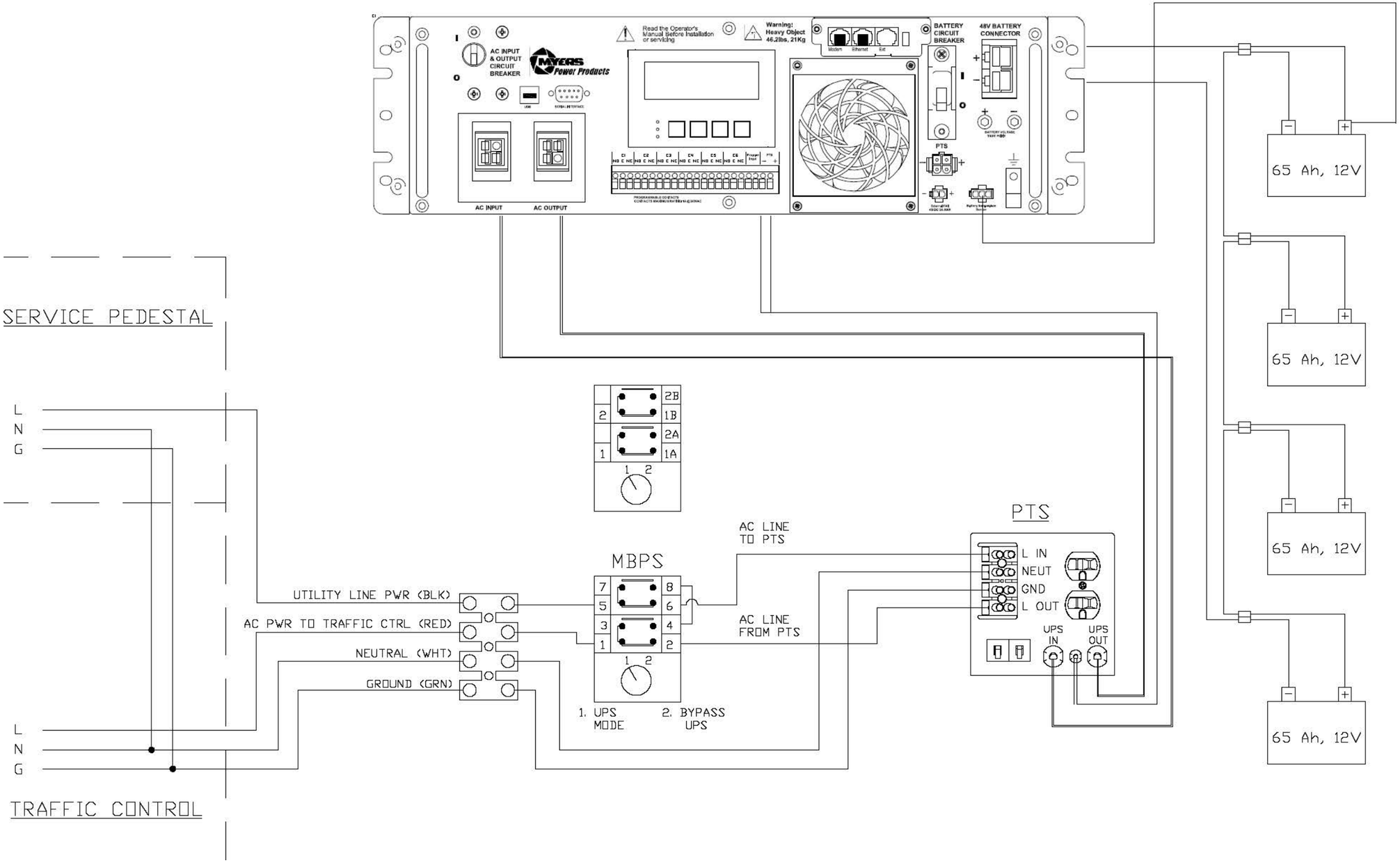


Figure 4-6: Installation Guide

4.c Start Up and Testing

NOTE: If the system does not perform as described below, see the troubleshooting guide in Sections 7.b and 7.c of this manual.

Start Up Procedure Tips

- **The BBS 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 causes the cabinet to revert to utility power in the event of a failure of the BBS or the batteries.**

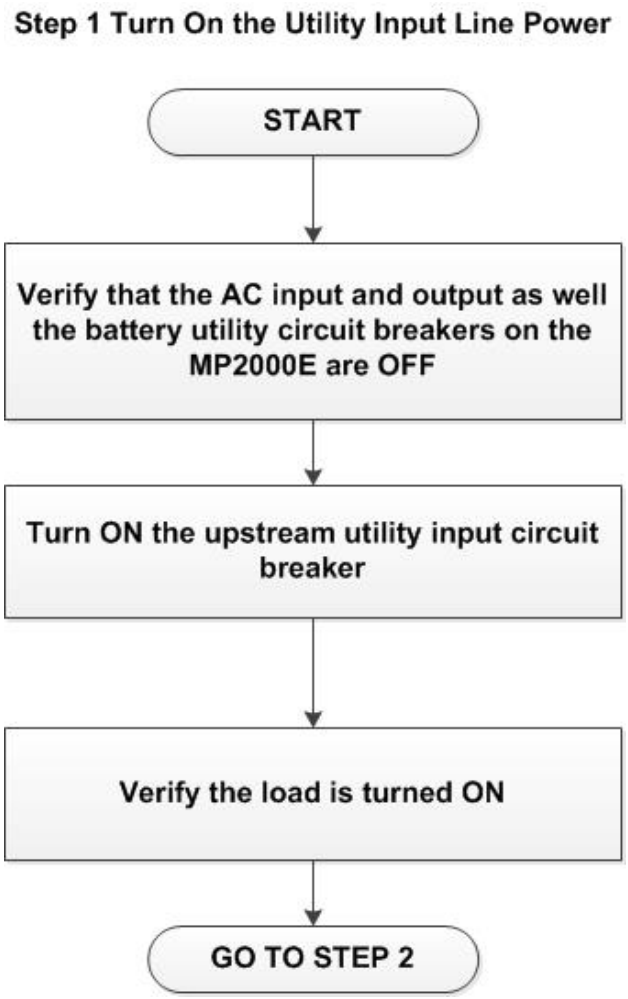


Figure 4-7: Start Up and Testing Step 1: Turn on the Utility Input Line Power

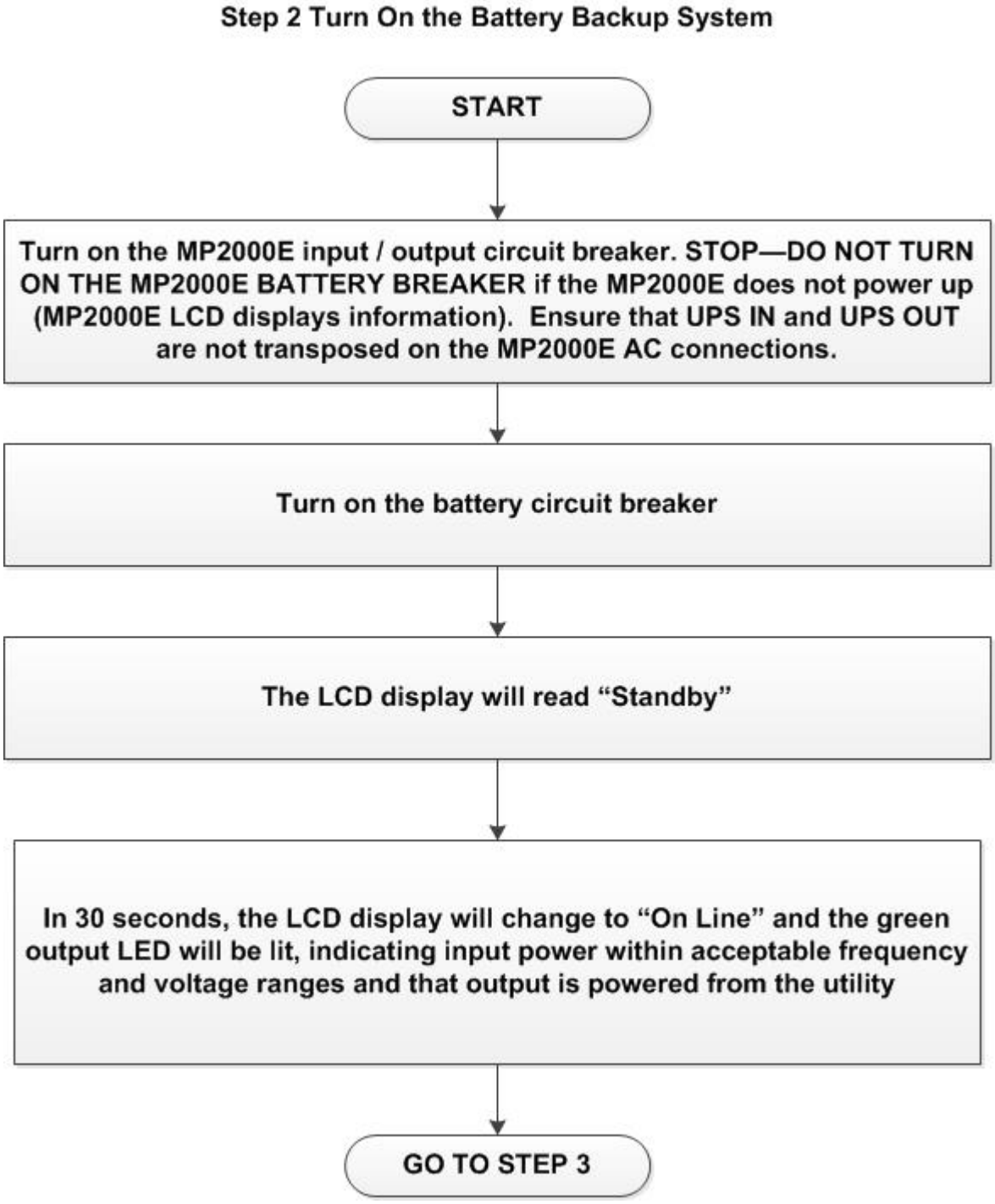


Figure 4-8: Start Up and Testing Step 2: Turn on the BBS

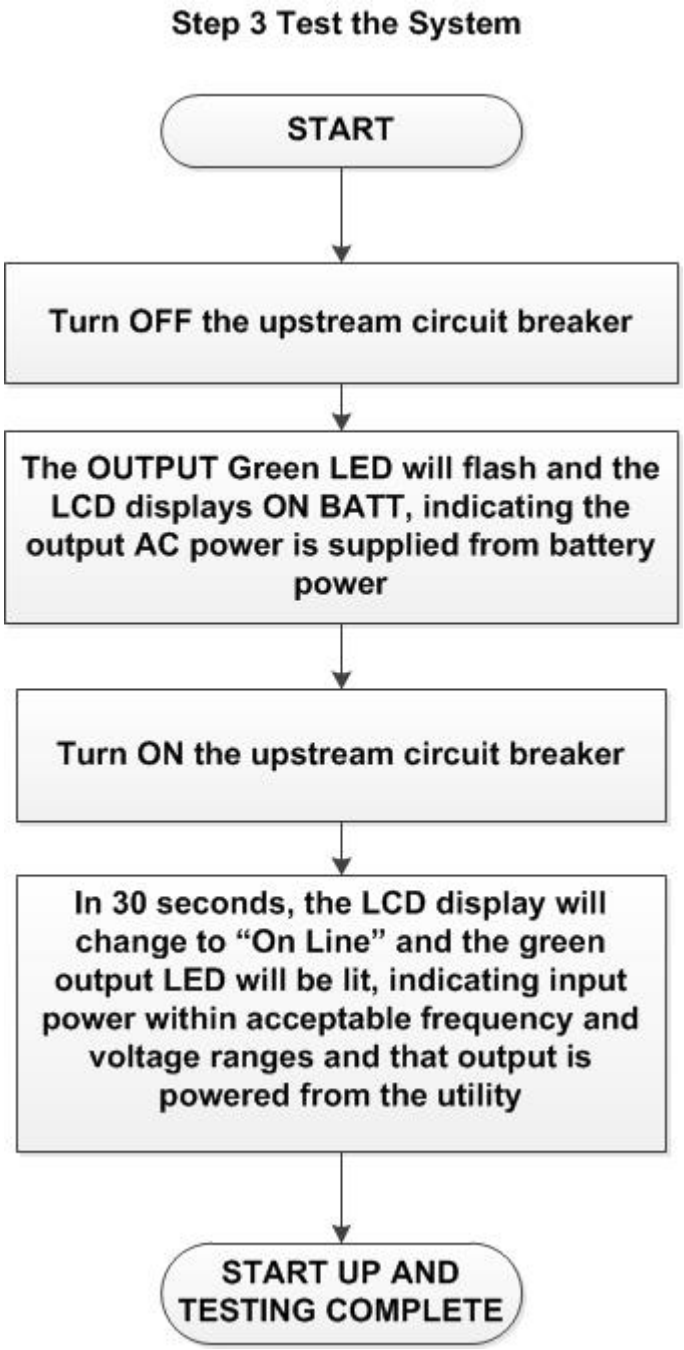


Figure 4-9: Start Up and Testing Step 3

NOTE: To test the BBS, perform the self-test procedure in Section 6.b.3 of this manual.

4.d Shut Down

4.d.1 BBS Shut Down

DANGER: Shutting down the MP2000E does not necessarily disconnect power to the loads.

DANGER: The disconnected AC input wires from the PTS will still be HOT or LIVE. Insulate the bare wires using wire nuts.

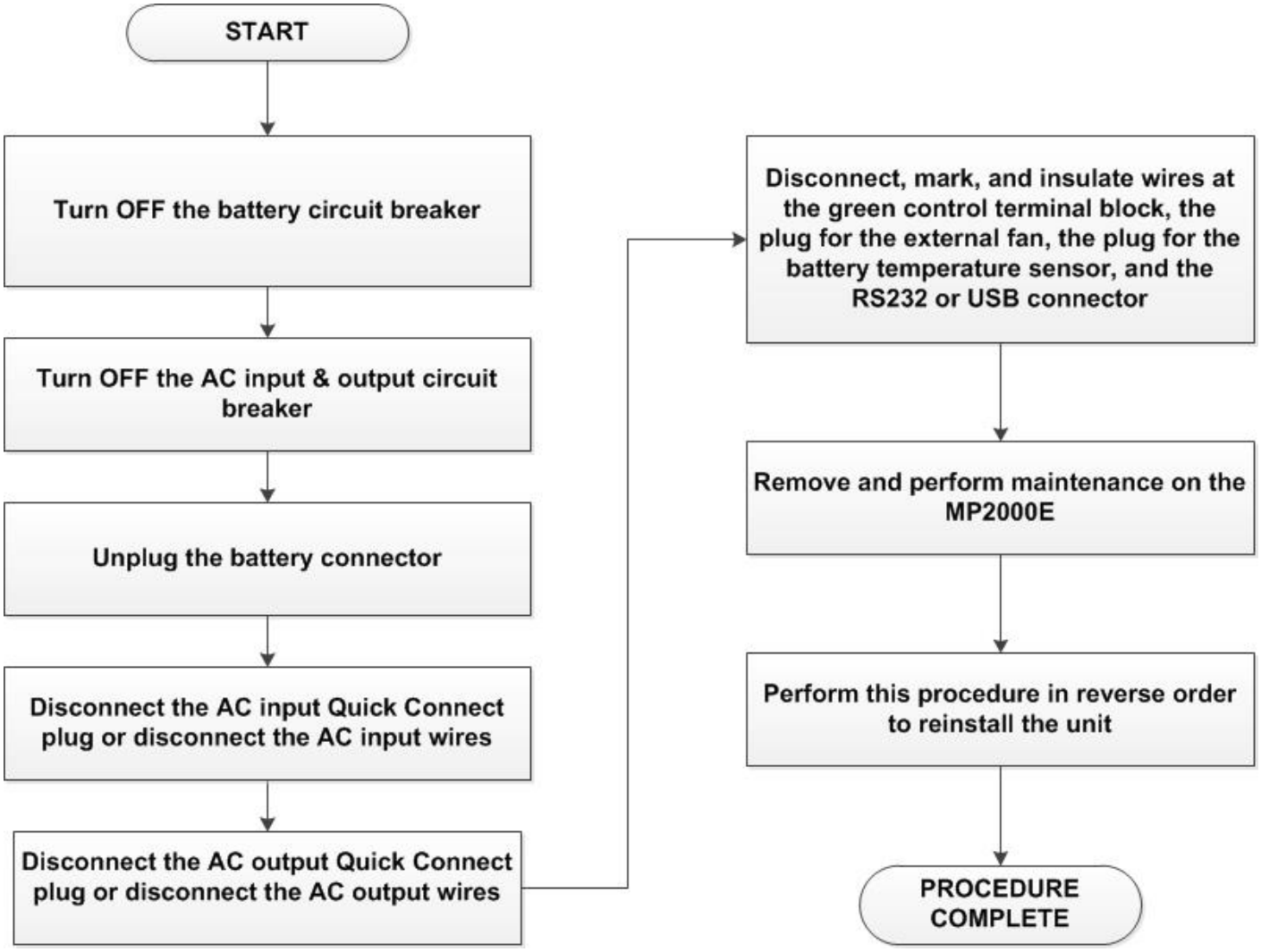
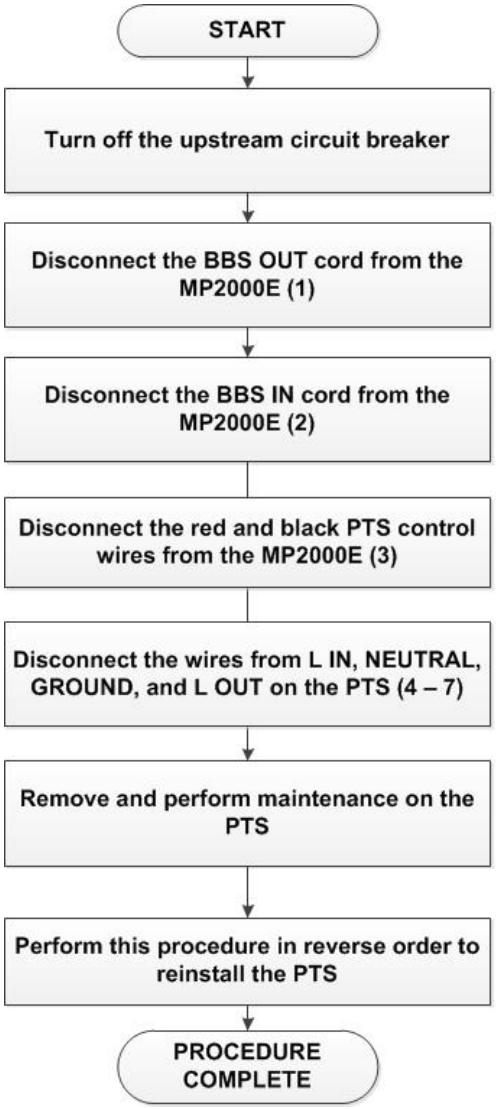


Figure 4-10: BBS Shut Down Procedure

NOTE: For additional information on how to operate the MP2000E manually refer to Section 6.a.

4.d.2 Power Transfer Switch Shut Down

NOTE: Before beginning the shutdown procedure, verify that both the AC and Battery Breaker are OFF at the MP2000E.



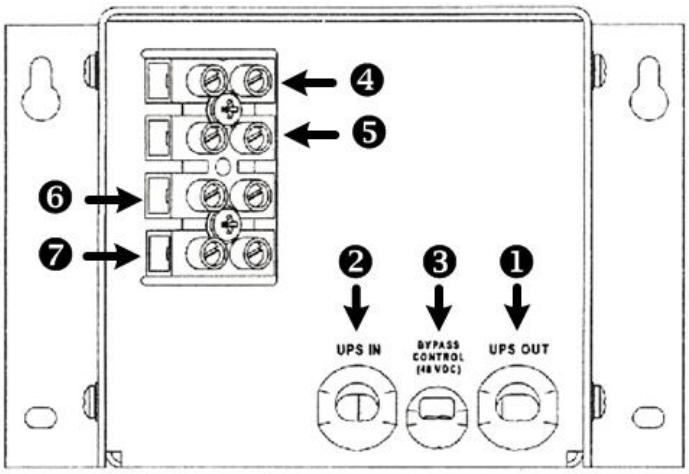


Figure 4-11: PTS Shut Down Procedure

4.d.3 Emergency Shut Down Procedure

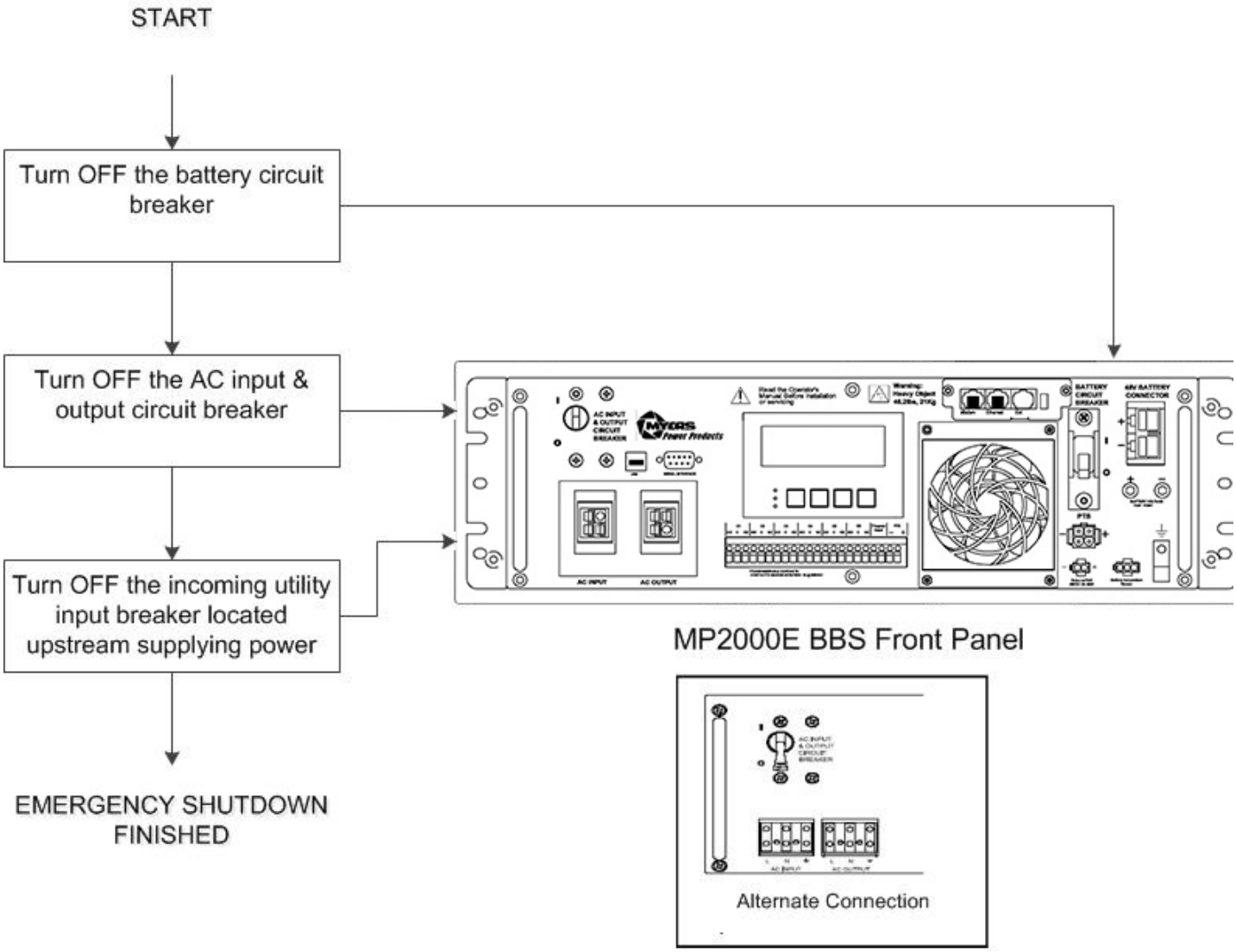


Figure 4-12: Emergency Shut Down Procedure

Section 5 Adjustments

The MP2000E does not have any hardware adjustments. All of the adjustments are controlled through software parameters that are set either through the front keypad or the RS232 port.

5.a Contrast Adjustment

The LCD display has a contrast adjustment. Press and hold the ESC button, then within two seconds, press the ENTER button. Use the Up / Down arrow keys to adjust the contrast. Press ENTER to save the setting. This setting is not available through the RS232 port.

Note that pressing and holding the ESC alone for more than two seconds gives a "LCD Reset" message. Press the ENTER key to reset.

5.b Line Conditioning Adjustments

Line detection settings are used for two purposes:

- **To allow the BBS to transfer to and from the battery.**
- **To Buck or Boost the input to maintain output voltage in tolerance, in the event that the input voltage drops or rises.**

There are two adjustments that set up the transfer to battery function and two adjustments that set up the Buck and Boost function. Each corresponding hysteresis is set automatically. These adjustments are made through the keypad as follows:

- **Enter the Maintenance menu**
- **Input the correct password (if password enabled in the Control menu)**
- **Enter the Line Conditioning menu**
- **Select the parameter listed in Figures 5-1, 5-2, and 5-3**

The same adjustments can be made in the RS232 menu by selecting the parameter listed in Figures 5-1, 5-2, and 5-3 and entering the correct password.

NOTE: Menu item numbers marked with an asterisk (*) are automatically set hysteresis.

NUMBER	PARAMETER NAME	DESCRIPTION
40	Hi Lmt	When the input utility line exceeds this voltage setting the BBS will transfer to Battery Mode from Line Mode or Buck Mode.

Figure 5-1: Parameters for Transfer to Battery Adjustments

NUMBER	PARAMETER NAME	DESCRIPTION
42*	Hi Hyst	When the input utility line drops below this voltage setting the BBS will transfer to Line Mode or Buck Mode from Battery Mode.
41	Low Lmt	When the input utility line drops below this voltage setting the BBS will transfer to Battery Mode from Line Mode or Boost Mode.
43*	Low Hyst	When the input utility line exceeds this voltage setting the BBS will transfer to Line Mode or Boost Mode from Battery Mode.

Figure 5-1: Parameters for Transfer to Battery Adjustments (continued)

NOTE: The Buck and Boost adjustments require the Buck or Boost feature to be enabled.

NUMBER	PARAMETER NAME	DESCRIPTION
BUCK ADJUSTMENTS		
46	Buck High	When the input utility line exceeds this voltage setting the BBS will transfer to Buck Mode when enabled.
47*	Buck Low	When the input utility line drops below this voltage setting the BBS will transfer to Line Mode from Buck Mode.
BOOST ADJUSTMENTS		
45	Boost Low	When the input utility line drops below this voltage setting the BBS will enable Boost Mode
44*	Boost High	When the input utility line exceeds this voltage setting the BBS will transfer to Line Mode from Boost Mode.

Figure 5-2: Parameters for Buck and Boost Adjustments

NUMBER	PARAMETER NAME	DESCRIPTION
BUCK ADJUSTMENTS		
48	High Gap	Leeway at which high setting will toggle.
49	Low Gap	Leeway at which low setting will toggle.

Figure 5-3: Parameters for Gap Adjustments

5.c Line Qualify Adjustments

This adjustment sets the time duration the line must be qualified prior to transferring to line mode. The setting can either be 3, 10, or 30 seconds. To make this adjustment:

- **Enter the Settings menu**
- **Enter the Line Qualify menu**
- **Select the desired set point**

The same adjustment can be made in the RS232 menu as follows:

- **Enter 34 from the Main menu screen**
- **Enter the desired time**

5.d External Fan Control Adjustment

This adjustment allows the user to set the temperature above which the 48VDC power will be provided for the external fan. The setting is adjusted from 20°C to 55°C in increments of one degree. To make this adjustment:

- **Enter the Settings menu**
- **Enter the Ext Fan Control menu**

Select the desired set point

The same adjustment can be made in the RS232 menu as follows:

- **Enter 39 from the Main menu screen**
- **Input the desired temperature**

5.e Battery Charging Temp Comp

This adjustment allows the user to set the temperature compensation for the battery charger. The setting is adjusted to either -2.5, -3.0, -4.0, or -5.0 mv/ºC/Cell. To make this adjustment:

- **Enter the Settings menu**
- **Enter the Batt Comp menu**
- **Select the desired set point**

The same adjustment can be made in the RS232 menu as follows:

- **Enter 38 from the Main menu screen**
- **Input the desired set point**

5.f Program Contacts Low Battery Setting

- **On the LCD interface, go to Settings>Program Contacts>(select a contact C1 to C6)>Lo Batt>Adjust Voltage**

- **On the RS232 menu, select Item 5>(select a contact C1 to C6)>Item 2>Set to [Lo Batt]>Enter New Value**

5.g Battery Low Voltage Warning Setting

This is the Battery Low Voltage alarm. It is unrelated to the Program Contacts Low Battery Setting. It is available in the RS232 menu settings only. To make adjustments, enter 35 in the MAIN menu screen, then enter the new voltage value.

5.h Program Contacts Timer Setting

- **On the LCD interface, go to Settings>Program Contacts>(select a contact C1 to C6)>Timer>Adjust Time**
- **On the RS232 menu, select Item 5>(select a contact C1 to C6)>Item 3>Set to [Timer]>Enter New Value**

5.i Battery Test Option Time Setting

- **On the LCD interface, go to Maintenance>Batt Test Option>Adjust Number of Minutes for Self-Test**
- **On the RS232 Main menu screen, enter 300> Enter Number of Minutes**

Section 6 Theory of Operation

6.a Systems Description

The Myers Emergency Power Systems MP2000E battery backup system (BBS) is comprised of three main components, which are described in the subsections below.

6.a.1 MP2000E BBS Module

The BBS module has two main operating modes: On Line and On Battery.

- **ON LINE MODE: When in On Line mode, the BBS functions as a line interactive back up system. Line interactive BBS units are designed so that the inverter is always connected to the output of the BBS. When line power is present, the inverter operates in reverse to charge the battery. When utility power fails, the BBS reverses the power flow from the inverter and provides power to the load. This design provides better filtering than a standby unit because the inverter is always connected to the load.**

  The MP2000E also incorporates Buck and Boost, an automatic voltage regulator. Buck and Boost allows the BBS to effectively step-up or step-down the incoming line voltage without switching to battery power. This allows the BBS to correct most long term over-voltages or under-voltages without draining the batteries. The Buck and Boost features also extend the life of the batteries by reducing the number of transfers to battery power.

- **ON BATTERY MODE: In On Battery Mode, the batteries supply direct current to the MP2000E inverter. The BBS filters the DC input through input capacitors and metal oxide silicon field effect transistors (MOSFET) that feeds a transformer that steps the voltage up to 120 VAC. The 120VAC, 60Hz waveform generated by the MP2000E inverter is a pure sine wave.**

6.a.1.1 Operation Within On Battery Mode

- **FULL INTERSECTION OPERATION: The MP2000E is designed to supply full backup power within the BBS rating.**
- **RED FLASH INTERSECTION OPERATION: Intersections can be programmed to be in red flash mode by wiring and programming any one of the six dry contacts on the MP2000E to the traffic signal controller red flash circuit.**

6.a.1.2 Green Terminal Block Programming Options

Each of the terminal block's six individual dry contact closure indicators are a 1 Form-C isolated unto themselves. The contact closures default Common (C) to Normally Closed (NC) in the de-energized position.

Each of the six programmable contacts can be programmed for one or more functions such as:

- **On Batt: This relay energizes when Utility Input line power is unqualified.**
- **Low Battery: These relays energize when the battery drops below the programmed battery capacity. The default value is 47.5VDC or 40% battery 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.**

6.a.1.3 Return to On Line Mode

Once the BBS begins receiving external utility power the BBS module senses its presence and qualifies the power. The BBS then switches off the inverter and switches on the battery charger. At this point, all loads attached to the MP2000E AC output terminal will be operated directly using the external utility power.

6.a.2 MP2000E Manual Bypass Switch Module

The Manual Bypass Switch (MBPS) module is a stand-alone switch used to manually isolate the MP2000E BBS module from utility power and the intersection controller. It facilitates maintenance and BBS replacement operations without turning off power to the loads. The switch is rated at 120VAC and 40 amps.

6.a.3 MP2000E Power Transfer Switch Module

The Power Transfer Switch (PTS) is the third module in the BBS system. The PTS is rated at 120VAC and 40 amps. The PTS requires from the MP2000E a 48VDC PTS signal and 120VAC output to engage either the MP2000E battery backup or boost / buck VAC power output to the end equipment. The PTS ensures that a continuous flow of power reaches the traffic controller cabinet. The PTS defaults to commercial power in the de-energized position.

6.b Detailed Description of Circuit Operation

6.b.1 The LCD Panel

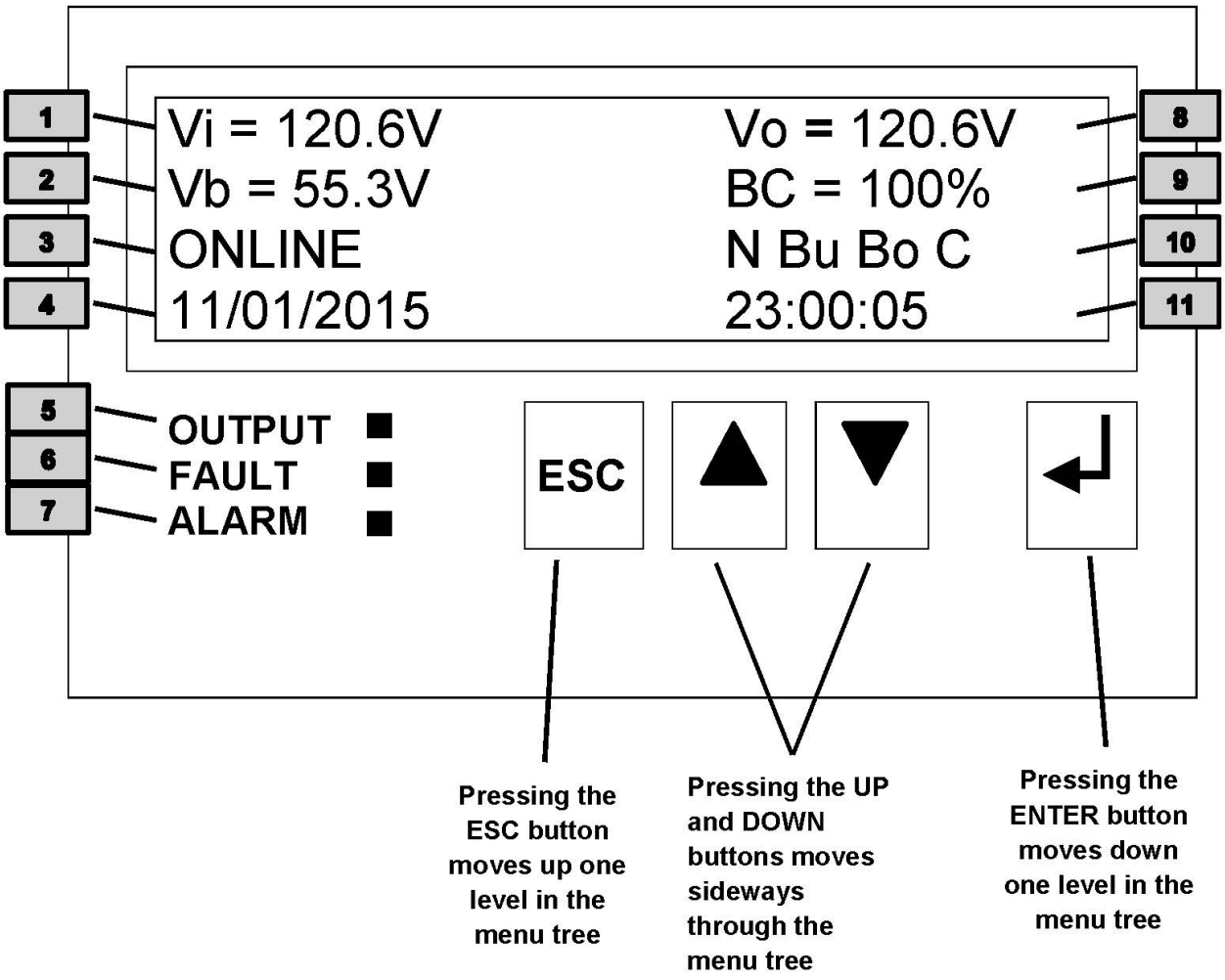
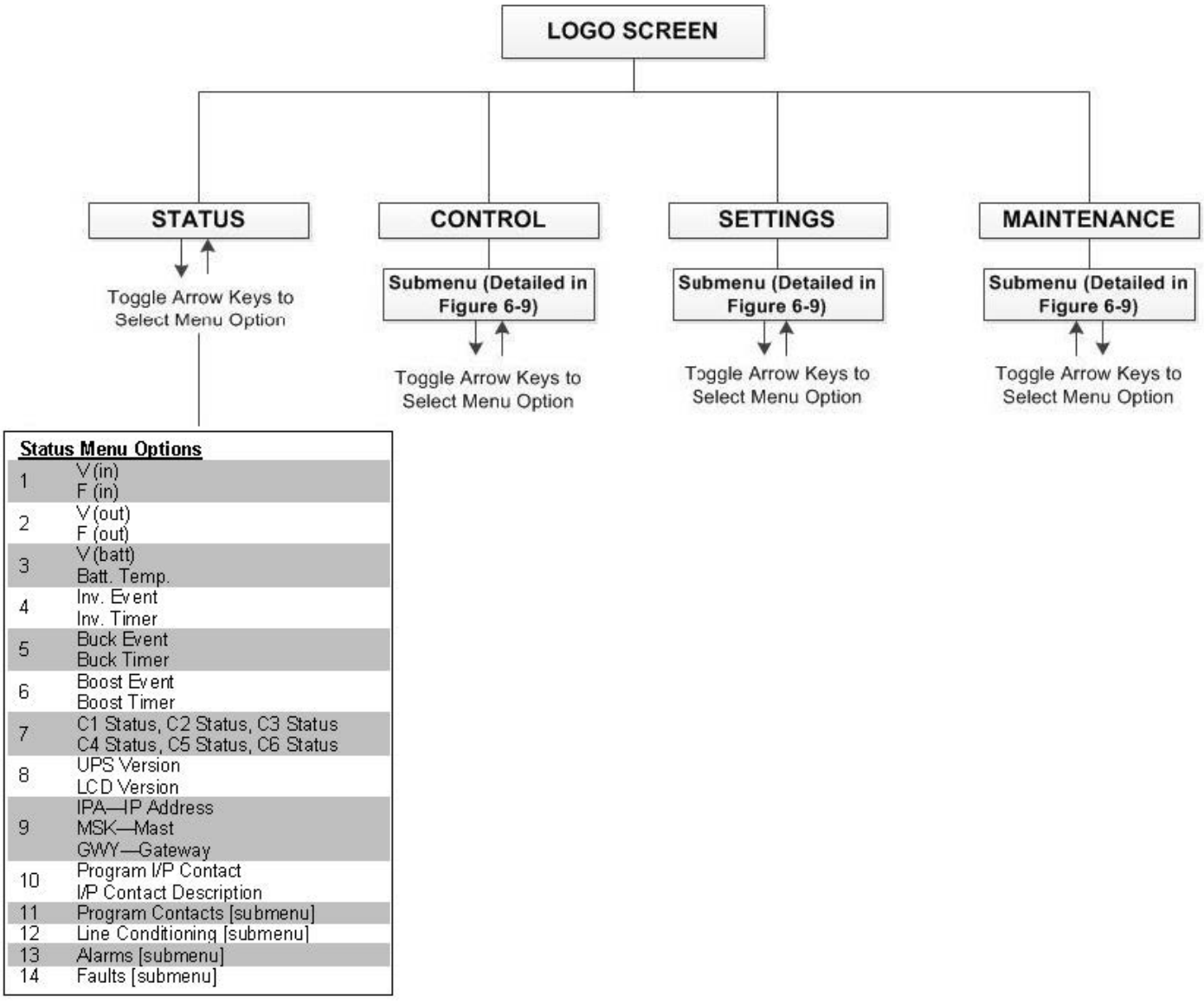


Figure 6-1: MP2000E LCD Panel Display

<table>
<tr><th colspan="4">Legend</th></tr>
<tr><td>1</td><td>Input Voltage</td><td rowspan="2">7</td><td rowspan="2">Alarm LED (Yellow): When the alarm LED is lit the unit has detected an alarm. Pushing the ENTER button displays the alarm.</td></tr>
<tr><td>2</td><td>Battery Voltage</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">UPS Status: The UPS status indicates the status of the system. If there more than one status the screen will alternate between displaying the two statuses. For example, if the UPS is online and an alarm exists the screen will alternate between displaying the words “ONLINE” and “ALARM”.</td><td>8</td><td>Output Voltage</td></tr>
<tr><td>9</td><td>Battery Capacity</td></tr>
<tr><td>4</td><td>Date: The date format is MM / DD / YYYY. The date and time [11] will display unless an alarm exists, in which case, the alarm will be shown. If more than one alarm is present, it will display “See Status Menu,” through which the alarms can be viewed.</td><td rowspan="2">10</td><td rowspan="2">This line displays the following information, from left to right:
<table>
<tr><td>Sense Type</td><td>N = Normal
G = Generator</td></tr>
<tr><td>AVR Buck</td><td>The letters Bu indicate that BUCK mode is enabled. If these letters are not displayed, BUCK is not enabled.</td></tr>
<tr><td>AVR Boost</td><td>The letters Bo indicate that BOOST mode is enabled. If these letters are not displayed, BOOST is not enabled.</td></tr>
<tr><td>Contacts Status</td><td>C123456
e.g. C 3 contact ON</td></tr>
</table></td></tr>
<tr><td>5</td><td>Output LED (Green): When the output LED is lit, the line is qualified. When it is flashing, the unit is in battery mode. If it is not lit, the output is off, the input line is not qualified, or the unit has detected a fault. If none of the three LEDs is lit and the LCD display is blank, the unit is shut off.</td></tr>
<tr><td>6</td><td>Fault LED (Red): When fault LED is lit, the unit has detected a fault. Pushing the ENTER button displays the fault.</td><td>11</td><td>Time: The time format is HH:MM:SS. The date and time [4] will display unless an alarm exists, in which case, the alarm will be shown. If more than one alarm is present, it will display “See Status Menu,” through which the alarms can be viewed.</td></tr>
</table>

Figure 6-1: MP2000E LCD Panel Display (continued)



Status Menu Options	
1	V (in) F (in)
2	V (out) F (out)
3	V (batt) Batt. Temp.
4	Inv. Event Inv. Timer
5	Buck Event Buck Timer
6	Boost Event Boost Timer
7	C1 Status, C2 Status, C3 Status C4 Status, C5 Status, C6 Status
8	UPS Version LCD Version
9	IPA—IP Address MSK—Mast GWY—Gateway
10	Program I/P Contact I/P Contact Description
11	Program Contacts [submenu]
12	Line Conditioning [submenu]
13	Alarms [submenu]
14	Faults [submenu]

Figure 6-2: MP2000E LCD Panel Display

6.b.2 The MP2000E Operating Modes

The LCD automatically displays the modes listed in Figure 6-3 when they change.

LCD DISPLAY	EXPLANATION
STNBY (Standby)	This mode is displayed when the unit is first turned on. The inverter remains off and the MP2000E 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 6.b.9).
ONLNE (Online)	The normal operating mode. Input line power is provided to the loads, the batteries are charging and the MP2000E 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. *=When enabled
ONBAT (On Battery)	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. *=When enabled
SLFTST (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.
LOBAT (Low Battery)	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, warning appears.

Figure 6-3: Operating Modes

6.b.2.1 Normal Versus Generator Mode

As illustrated in Figure 6-4, Generator Mode 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, in which the unit runs on normal parameters. Switching to Generator allows it to 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.

Instructions for switching from Normal to Generator Mode are located in Section 6.b.10.

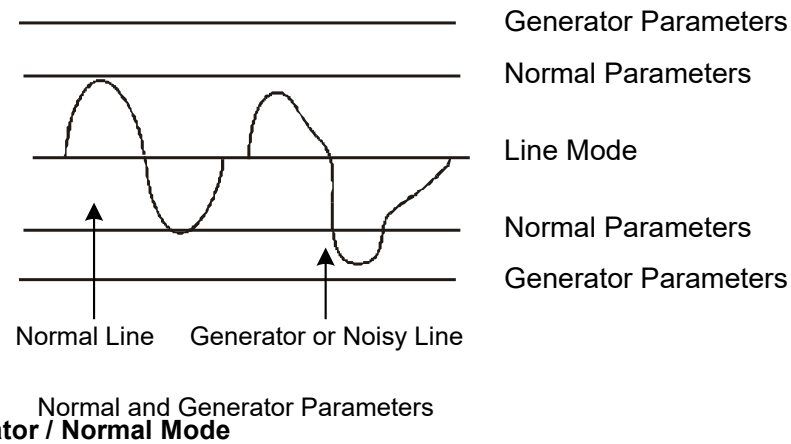


Figure 6-4: Generator / Normal Mode

6.b.3 The Self-Test

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

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

	**Note: The duration of the self-test can be adjusted via RS232 / USB menu. See Section 6.c for details.**

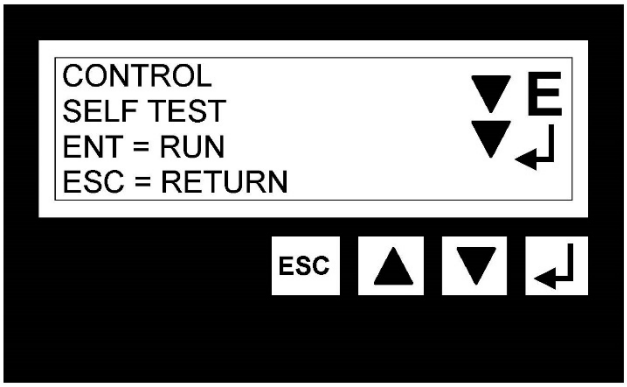


Figure 6-5: LCD Screen in Self-Test Mode

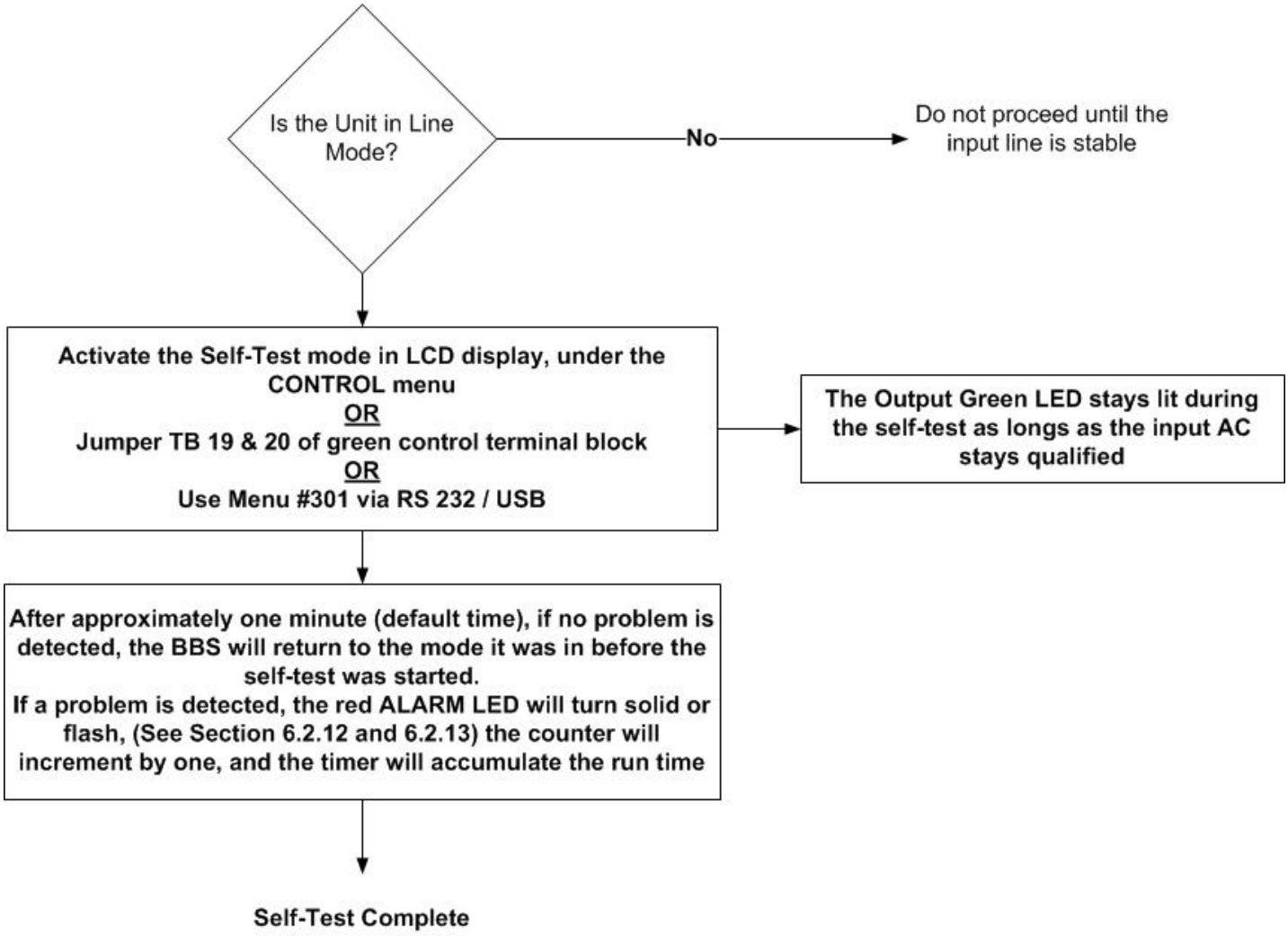


Figure 6-6: Self-Test

6.b.4 Start-Up

The procedure for starting up the MP2000E is described in Figure 6-7.

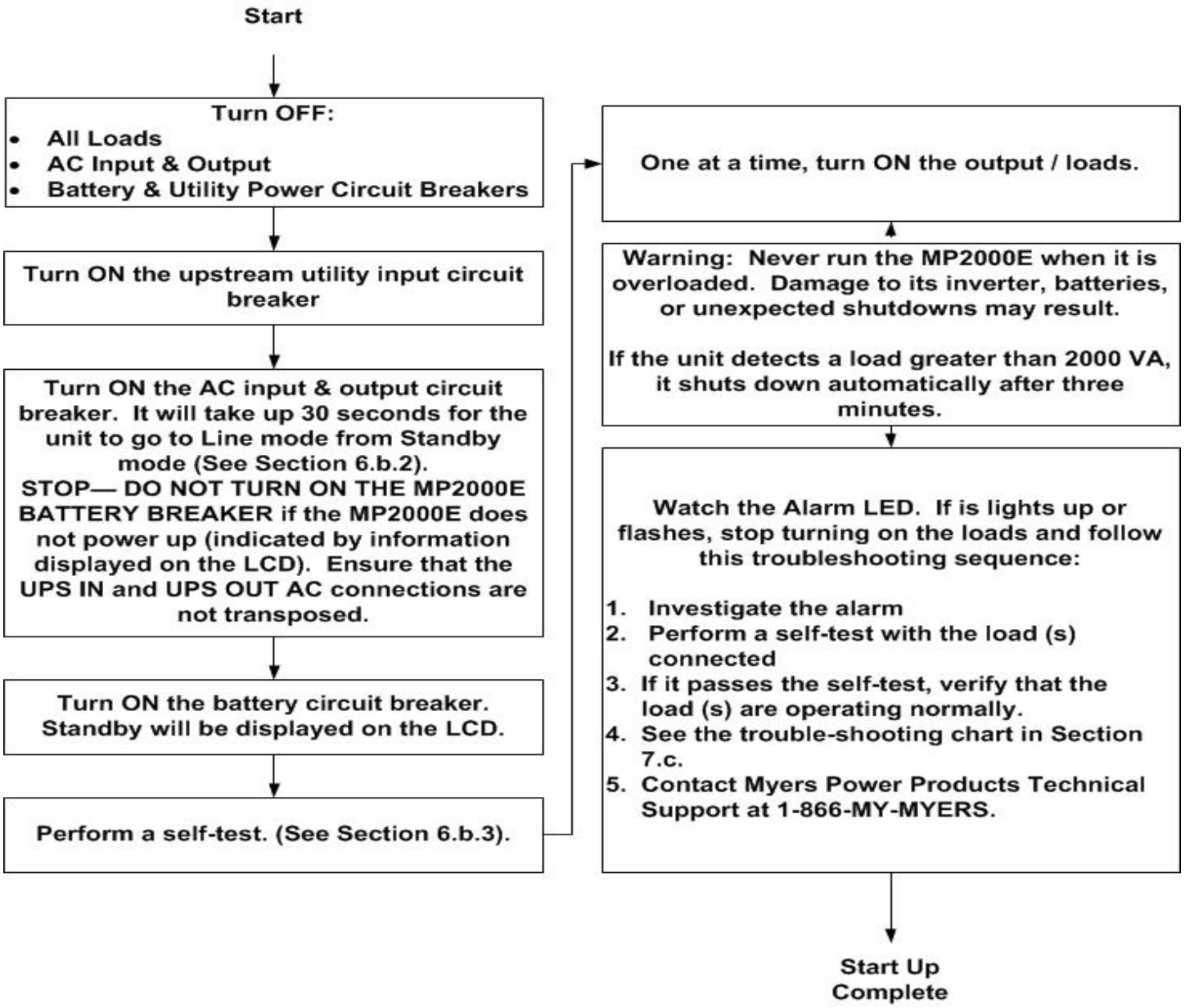


Figure 6-7 Start up Procedure

6.b.5 Shut Down

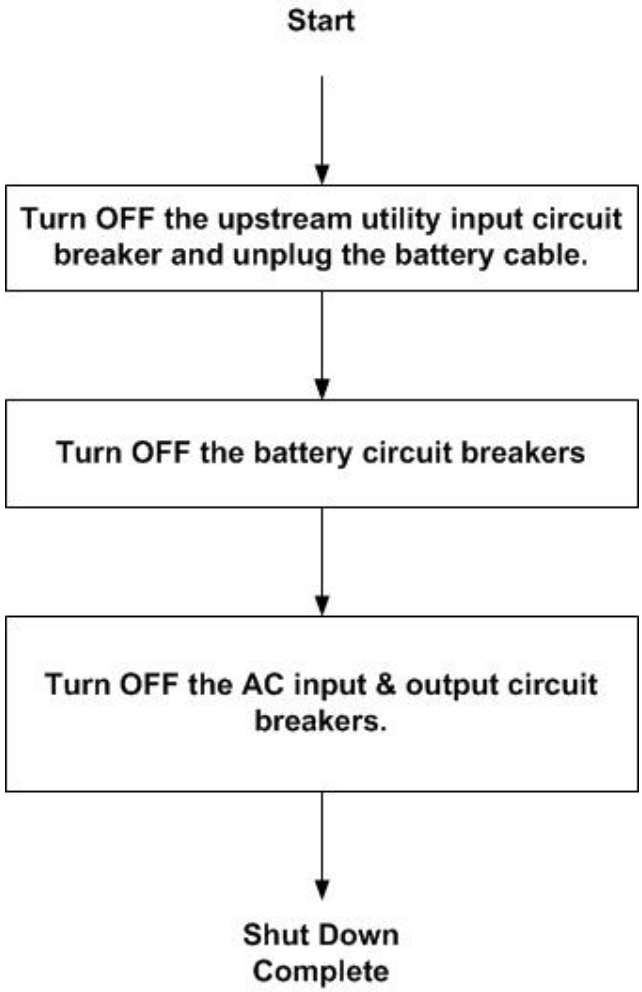


Figure 6-8: Shut Down Procedure

6.b.6 Battery Replacement

⚠	**Caution: While the battery is being changed, the MP2000E cannot provide backup power. This procedure should not be done while critical loads that depend upon the MP2000E's backup power are running.**

⚠	**Note: The ALARM LED remains ON during this procedure.**

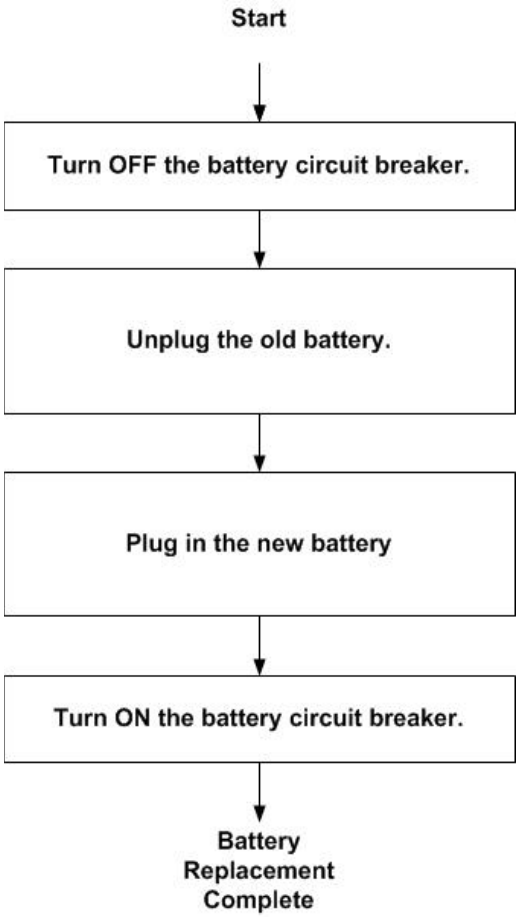


Figure 6-9: Battery Replacement Procedure

6.b.7 LCD Menu Tree

Best practices and hints for working with the LCD menus:

- **The ALARM and FAULT submenus alert the operator of a problem with the MP2000E. Go to the LCD interface STATUS submenu ALARM info or FAULT info to determine the cause.**
- **The STATUS submenu provides measurements of important MP2000E inputs, output, and other parameters via the LCD screen (Section 6.b.8).**
- **The CONTROL submenu allows the operator to manage the MP2000E (Section 6.b.9)**
- **To learn the value of a specific measurement press the ENTER button when it is displayed on the LCD screen.**
- **To execute a command press the ENTER button when it is displayed on the LCD screen.**
- **For details on Event Log View under MAINTENANCE submenu, see Section 6.b.14.**

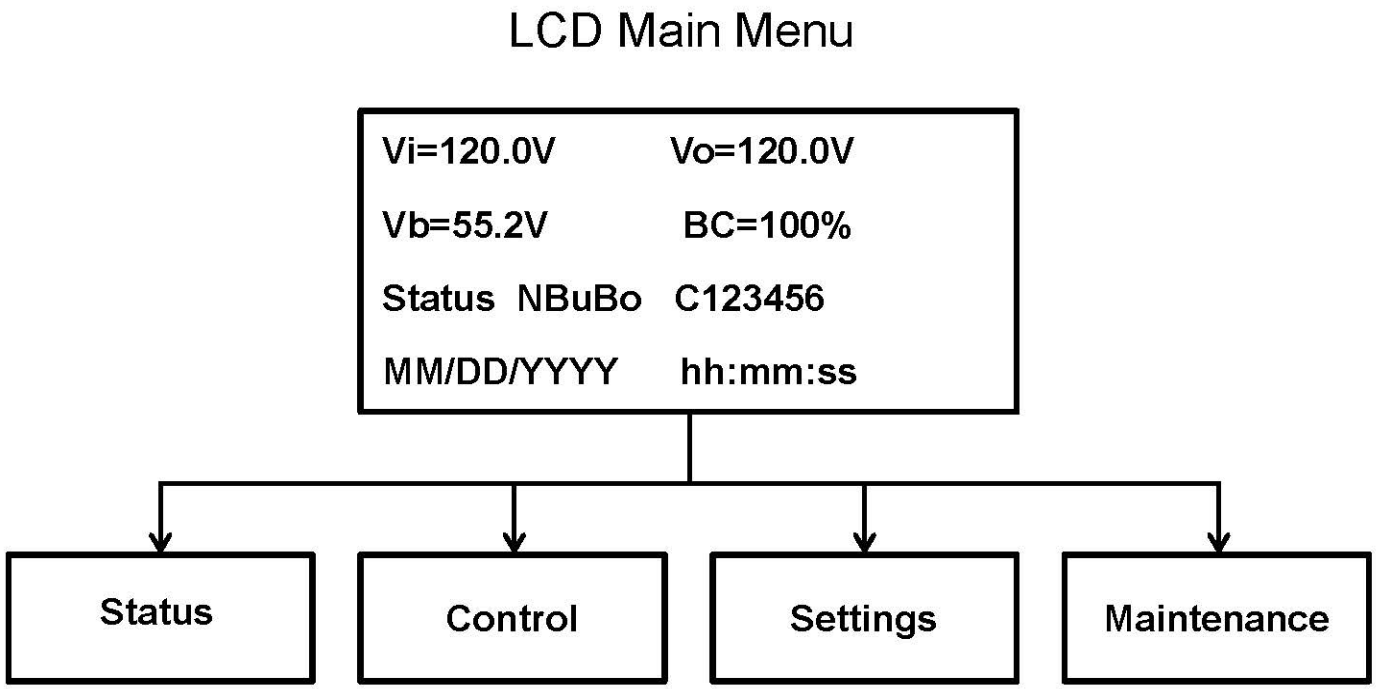


Figure 6-10: LCD Menu Tree

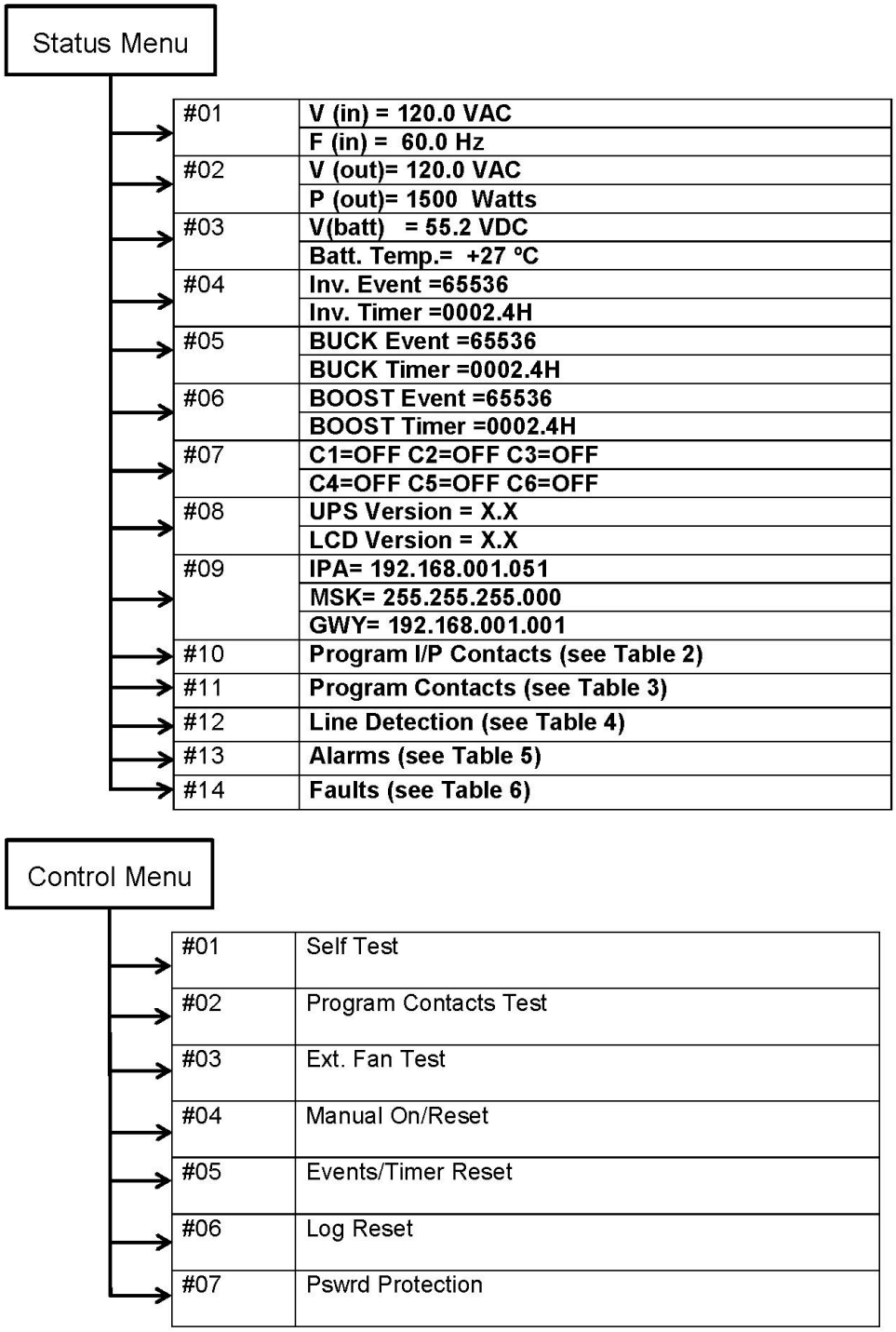
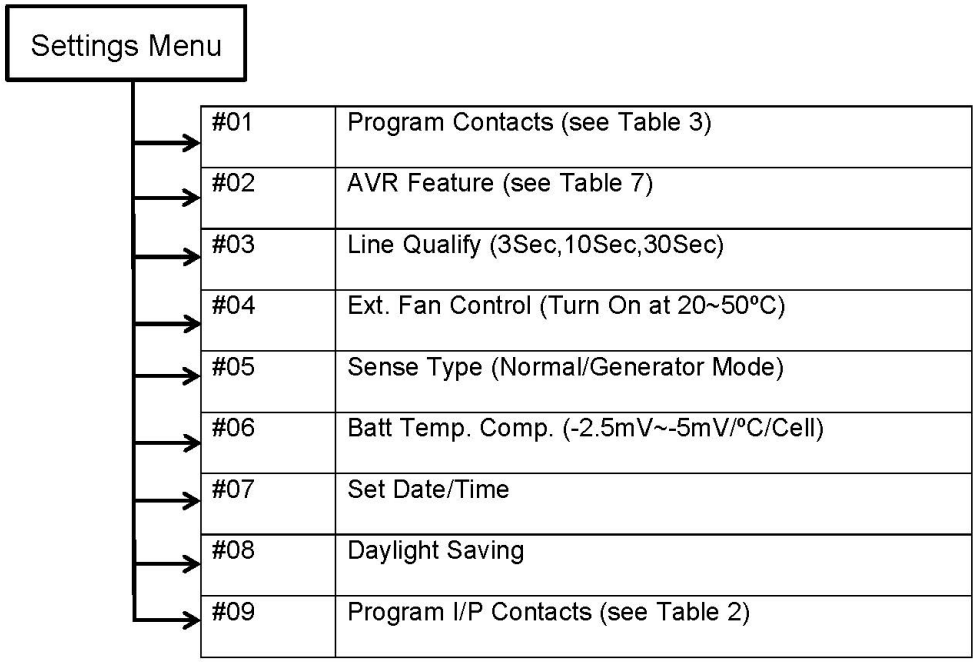


Figure 6-10: LCD Menu (continued)



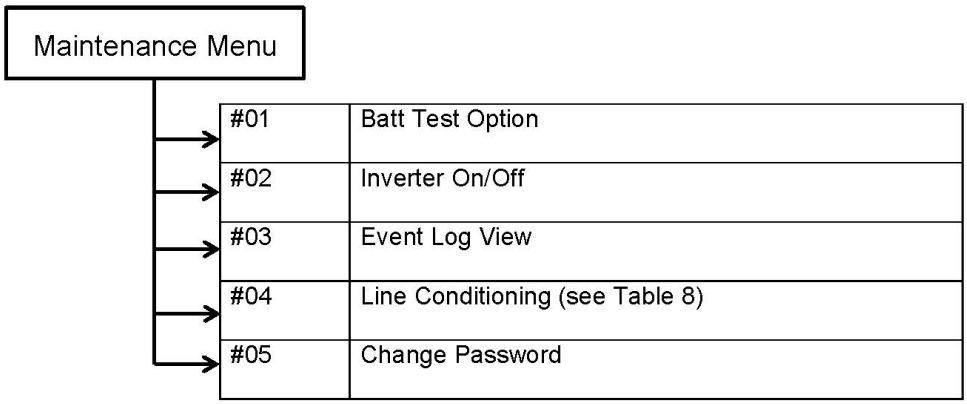


Table 1: UPS Status	
#01	SFTST
#02	BOOST
#03	ONLNE
#04	BUCK
#05	LOBAT
#06	ONBAT
#07	STNBY
#08	ALARM (see Table 5)
#09	FAULT (see Table 6)

Figure 6-10: LCD Menu (continued)

Table 2: Program I / P Contacts	
#01	Self Test
#02	EXT Alarm
#03	EXT Battery Alarm
#04	EXT Fan Failure
#05	Door Interlock

Table 3: Program Contacts	
#01	ON BATT
#02	ON BATT
#03	LO BATT (42.0-55.0V/0.5V increment)
#04	LO BATT (42.0-55.0V/0.5V increment)
#05	TIMER (0.25-8hr / 0.25 increment)
#06	TIMER (0.25-8hr / 0.25 increment)

Table 4: Line Detection	
#01	Hi Lmt = 150 VAC
	Hi Hyst = 145 VAC
#02	Hi Buck = 130 VAC
	Lo Buck = 125 VAC
#03	Hi Boost = 107 VAC
	Lo Boost = 102 VAC
#04	Lo Hyst = 095 VAC
	Lo Lmt = 090 VAC

Table 5: Alarm Message	
#01	Line Freq
#02	Low O/P Volt
#03	NO Temp. Probe
#04	Over Load
#05	BATT not Conn
#06	High Temp.
#07	Low Temp.
#08	Ext. Alarm
#09	Ext. Batt Alarm
#10	Ext. Fan Fail
#11	Door Interlock
#12	See Status Menu (Complex Alarm)

Figure 6-10: LCD Menu (continued)

Table 6: Fault Message	
#01	Short Circuit
#02	BATT Low Volt
#03	BATT High Volt
#04	High Temp.
#05	Over Load
#06	See Status Menu (Complex Fault)

Table 7: AVR Feature	
#01	Buck Feature
#02	Boost Feature

Table 8: Line Conditioning	
#01	Hi Lmt = 150 VAC
#02	Hi Buck = 130 VAC
#03	High_gap = 005 VAC
#04	Low_gap = 005 VAC
#05	Lo_Boost = 102 VAC
#06	Lo Lmt = 090 VAC

Figure 6-10: LCD Menu (continued)

6.b.8 STATUS Submenu

When the desired item appears on the LCD screen, press ENTER to measure it. To see the updated reading, press ENTER again. Figure 6-11 details the STATUS Submenu.

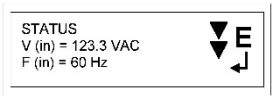
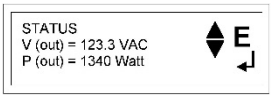
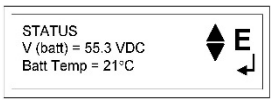
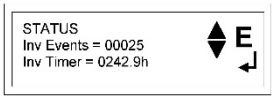
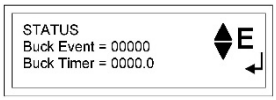
NUMBER	ITEM	LCD SHOWS	DESCRIPTION
1	Input Voltage & Input Frequency		The utility input line voltage and input line frequency (Hz)
2	Output Voltage & Output Power		The output voltage (true RMS) and power output (watts)
3	Battery Voltage & Battery Temperature		The battery / charge voltage and the temperature of the battery temperature probe sensor.
4	Inv. Events & Inv. Timer		The number of times the unit has been in Battery Mode and the total amount of time the unit has been in Battery Mode since the last reset. In the Inv. Timer each decimal indicates 6 minutes (0.1 x 6 minutes). For example, displayed 1.4 hours indicates that, since the last reset, unit has been in battery mode for a total of 1 hour and (0.4 x 60) min = 1 hour and 24 minutes.
5	Buck Event & Buck Timer		The number of times unit has been in Buck Mode and the total amount of time the unit has been in Buck Mode since the last reset. In the Buck Timer, each decimal indicates 6 minutes (0.1 x 6 minutes). For example, displayed 1.4 hours indicates that, since the last reset, unit has been in battery mode for a total of 1 hour and (0.4 x 60) min = 1 hour and 24 minutes.

Figure 6-11: Status Submenu

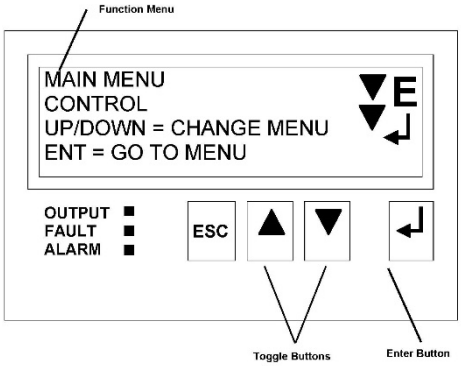
NUMBER	ITEM	LCD SHOWS	DESCRIPTION
6	Boost Event & Boost Timer	STATUS Boost Event = 00025 Boost Timer = 00000	The number of times unit has been in Boost Mode and the total amount of time the unit has been in Boost Mode since the last reset. In the Boost Timer, each decimal indicates 6 minutes
7	C1 — C6 Status	STATUS C1=off C2=off C3=off C4=off C5=off C6=off	Indicates the current Status of C1 through C6 programmable contacts.
8	Firmware Versions	STATUS UPS Version = 4.0 LCD Version = 4.0	UPS control PCB firmware version and LCD control PCB firmware version
9	HTML Ethernet card IP Settings	STATUS IPA = 010.016.000.250 MSK = 255.240.000.000 GWY = 010.016.000.001	IP settings for HTML Ethernet card (only) Ethernet-to-serial card (or no card) shows all zeros
10	Program I/P Contact & I/P Contact Description	STATUS Program IP Contact Door Interlock	Indicates Programmed Value of the input contact.
11	Program Contacts [submenu]	STATUS Program Contacts	Displays the programming of the 6 front panel contact closures
12	Line Conditioning [submenu]	STATUS Line Conditioning	Allows user to access menu that displays the Programmed Value of all input Line Detection parameters and warning levels
13	Alarms [submenu]	STATUS Alarms	Allows user to access menu that displays Alarms. Alarms are described in Section 6.b.12.
14	Faults [submenu]	STATUS Faults	Allows user to access menu that displays Faults. Faults are described in Section 6.b.12.

Figure 6-11: Status Submenu (continued)

6.b.9 CONTROL Submenu

When the desired function appears on the LCD screen, pressing the ENTER button opens its submenu.

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. Figure 6-12 details these functions.



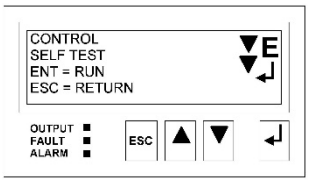
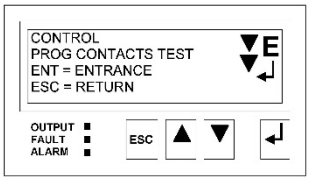
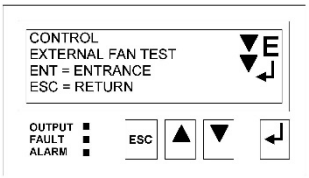
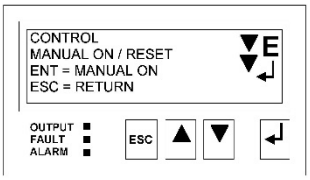
FUNCTION	LCD SHOWS	DESCRIPTION
SELF TEST		**Pressing ENTER starts the self- test (Section 6.b.3).** **CAUTION: Ensure that the unit is in Line Mode before starting the self-test.**
PROGRAM CONTACTS TEST		**Pressing ENTER will toggle the six programmable output contacts. A status will show whether the inputs are all on or all off.** **NOTE: For proper operation, make sure the contacts are in the off state prior to leaving the test.**
EXTERNAL FAN TEST		**Pressing ENTER will toggle the external fan output. A status will show whether the fan is on or off.** **NOTE: For proper operation, make sure the fan contact is in the OFF state prior to leaving the test.**
MANUAL ON / RESET		**This function is available only when the unit is first turned on and the LCD shows Standby. Pressing ENTER manually starts the unit and the battery supplies the output power.**

Figure 6:12: Control Submenu

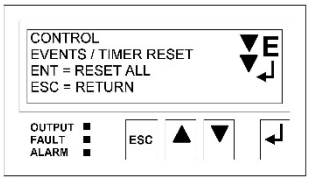
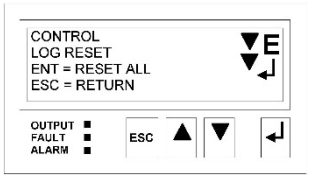
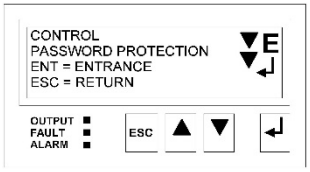
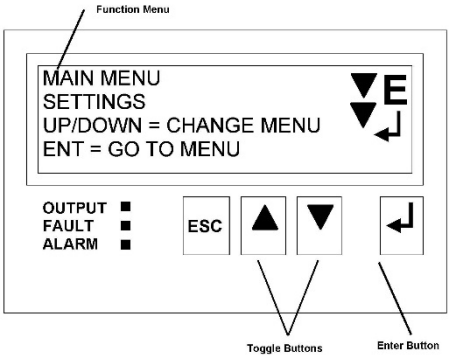
FUNCTION	LCD SHOWS	DESCRIPTION
EVENTS / TIMER RESET		**Press ENTER when the LCD displays the message.**
LOG RESET		**This resets the event and timer counters to zero.**
PASSWORD		**Enable / Disable Password Protection.**

Figure 6:12: Control Submenu (continued)

6.b.10 SETTINGS Submenu



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. Figure 6-13 details the SETTINGS Submenu.

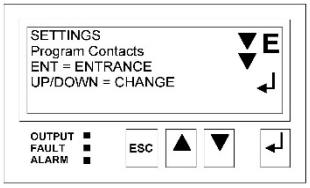
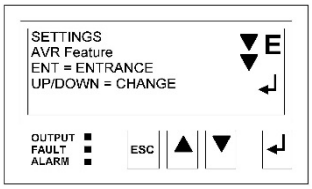
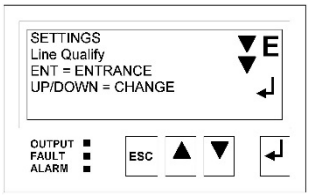
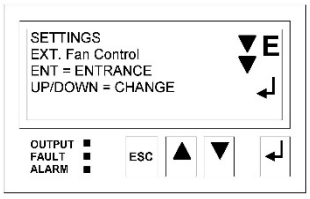
FUNCTION	LCD SHOWS	ACTION
PROGRAM CONTACTS		**Indicates programmed values of all six contacts and allows values to be changed.**
AVR FEATURE		**Allows the user to enable or disable Buck mode and Boost mode.**
LINE QUALIFY		**Indicates the setting for AC recovery time. The selection options are:** • **3 sec** • **10 sec** • **30 sec** **Default recovery time is 30 sec.**
EXT. FAN CONTROL		**Indicates temperature setting to turn on fan inside the cabinet.**

Figure 6:13: Settings Submenu

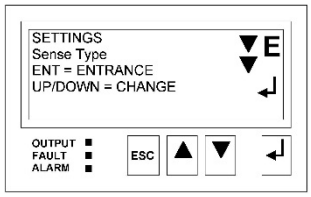
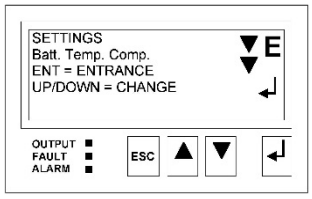
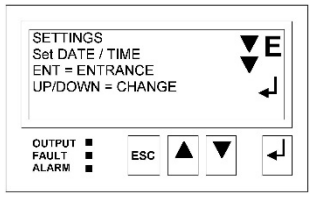
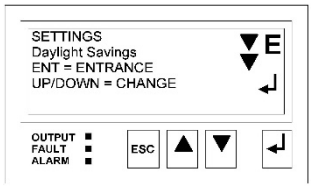
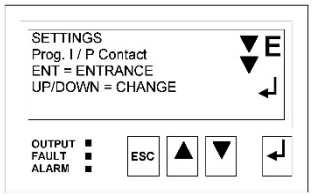
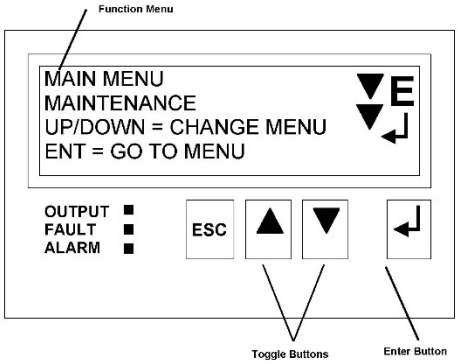
SENSE TYPE		**Toggle between Generator (Generator parameter) and Normal (Normal parameters). This broadens the unit's input parameters to accommodate the fluctuations created by a generator or noisy line.**
BATT COMP		**This adjusts the battery charging temperature compensated voltage to -2.5 / -3 / -4 / or -5 mV/°C/ Cell. 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.**
SET DATE/TIME		**Set BBS date and time.**
DAYLIGHT SAVING TIME		**Turns on and off daylight savings time to adjust the internal clock.**
PROGRAMMABLE INPUT		**Sets the function that is executed when the programmable input is activated.**

Figure 6:13: Settings Submenu (continued)

6.b.11 MAINTENANCE Submenu



As this menu is normally used by trained and qualified personnel ONLY, users have the option of creating a password to access this menu. Instructions on password creation are presented in Section 6.c.4.2.1.

The factory default password is 1111. If the password is lost or forgotten, contact Myers EPS MP2000E Technical Support.

Figure 6-14 details the MAINTENANCE Submenu.

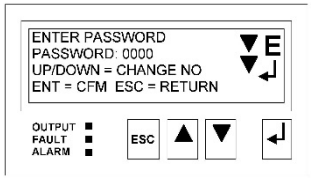
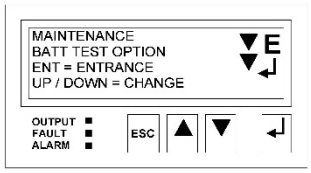
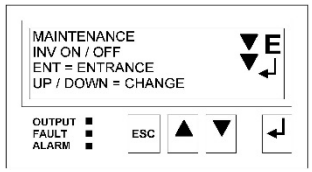
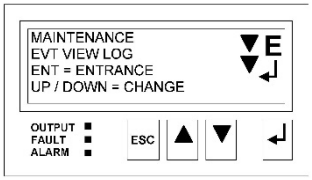
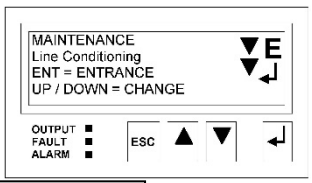
FUNCTION	LCD SHOWS	ACTION
PASSWORD ACCESS		**If the MAINTENANCE Menu has been password protected, the password must be entered here. Use the UP / DOWN arrow key with ENTER keys to confirm a correct Password. Reentry is required if an error is made entering a password.**
BATT TEST OPTION		**Battery Test Option can be verified here. Battery Test period of 1 to 255 minutes can be selected here in 1 minute increments** **The MP2000E can be tested to run on battery for Maintenance purposes.**
INV ON / OFF		**Inverter can be turned ON or OFF. This option is available ONLY when the MP2000E is in BATTERY or STANDBY Mode**
EVENT LOG VIEW		**The Event Log with Date & Time is viewed here in Binary digital format. See Section 6.b.14 for details**
LINE CONDITIONING		**Allows setting of line detection parameters.**

Figure 6-14: Maintenance Submenu

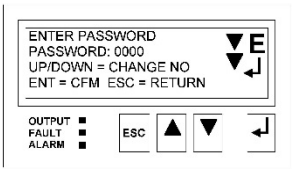
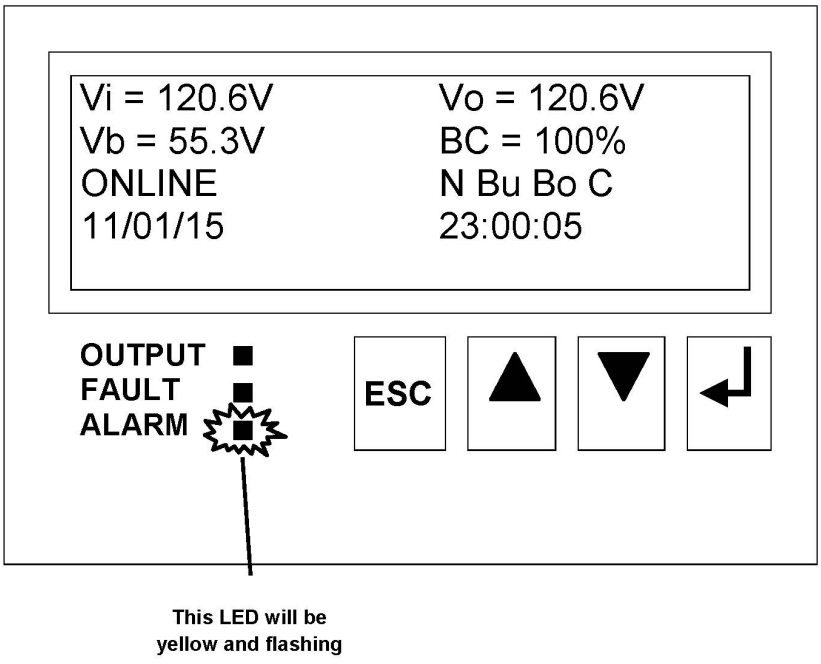
FUNCTION	LCD SHOWS	ACTION
CHANGE PASSWORD		**The Password for the access of the Maintenance Menu is changed here. Use the UP / DOWN arrow key with ENTER keys to enter a correct Password. Reentry is required if an error is made entering a Password.**

Figure 6-14: Maintenance Submenu continued

6.b.12 ALARM Menu

When the yellow ALARM LED is FLASHING, the unit has an alarm, indicating a condition that requires attention but is not serious enough to stop it from providing output power. The initial screen will display the alarm that has occurred. For multiple alarms the alarm list can be viewed in the alarm. Figure 6-15 shows the LCD Screens in alarm status. Figure 6-16 details the ALARM Menu.



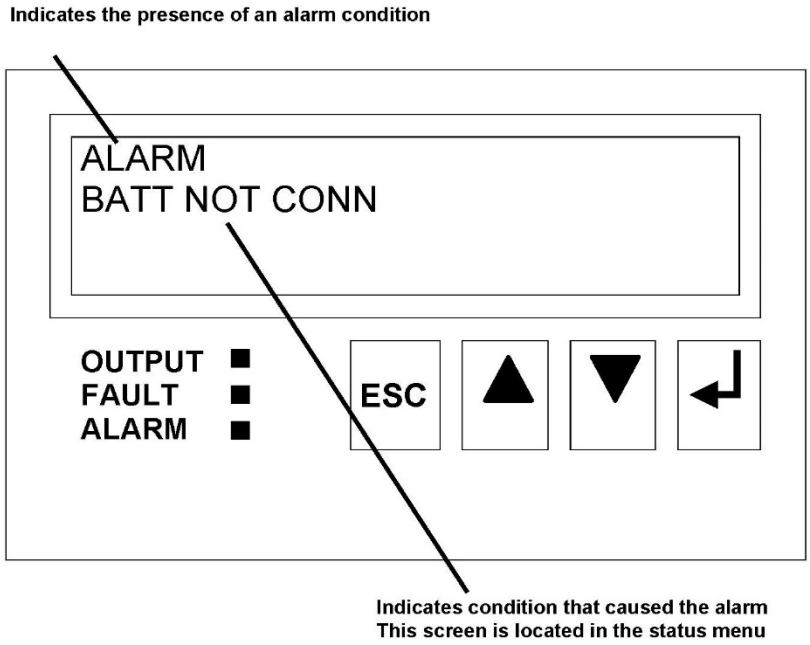


Figure 6-15: LCD Screens in Alarm Status

ALARM	LCD SHOWS	DESCRIPTION
Line Frequency	Line Freq	Input frequency is fluctuating and out of tolerance.
Low Output Voltages	Low O/P Volt	The output voltage is low but still usable.
Temperature Probe Unplugged	No Temp Probe	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.
Overload	Overload	The loads are drawing more power than the MP2000E can provide
Battery Not Connected	Batt Not Conn	The battery is not connected
High Temperature	High Temp	The battery temperature is high
Low Temperature	Low Temp	The battery temperature is low
Alarm	Ext Alarm Battery Alarm Fan Failure Door Interlock	This alarm will be signaled by closure on Pin 19 and Pin 20 of the Green Terminal Block

Figure 6-16: Alarm Menu

	**Note: The unit will self-reset when the alarm condition is no longer present. Once the alarm condition is removed, the unit will automatically return to LINE mode if the line is qualified or BATTERY mode if the line is unqualified.**

6.b.13 FAULT Menu

When the red ALARM LED is continuously ON, the unit has a fault, indicating a condition in which backup power is unavailable. Press ENTER to display FAULT description. Figure 6-17 shows the LED screens in Fault status and Figure 6-18 details the FAULT Menu.

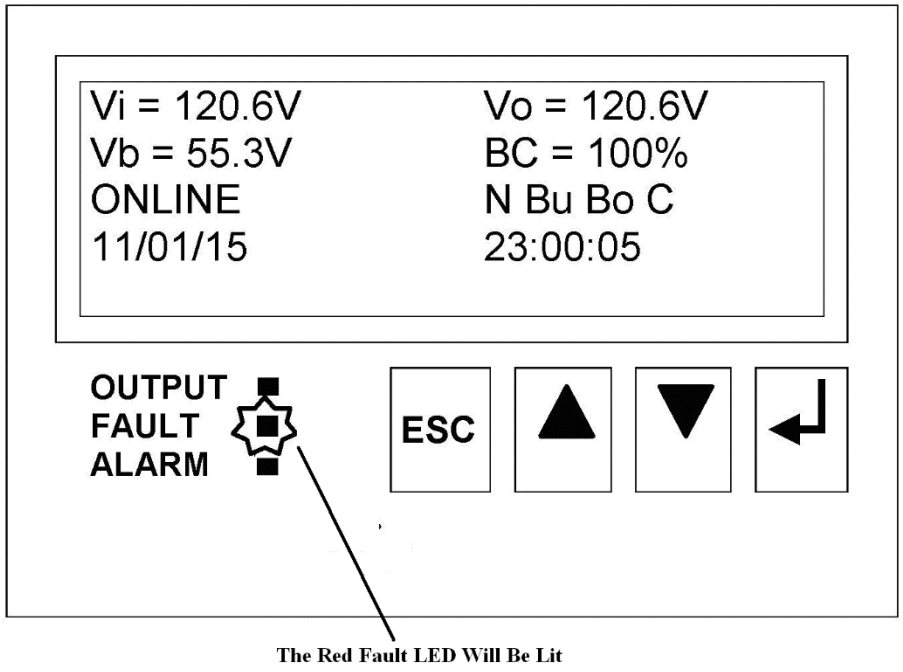


Figure 6-17: LCD Screens in Fault Status

FAULT	LCD SHOWS	DESCRIPTION
Short Circuit	Short Circuit	The load is short-circuited or the inverter did not start.
Low Battery Voltage*	Batt Low Volt	The battery's output voltage is low.
High Battery Voltage	Batt High Volt	The battery's output voltage is high.
High Temperature*	Temp High	The temperature of the battery or the internal temperature of the MP2000E are too high
Overload	Overload	The loads are drawing more power than the MP2000E can provide

Figure 6-18: Fault Menu

The unit will self-reset when the fault conditions marked with an asterisk are remedied. The MP2000E will automatically return to LINE mode if the line is qualified or BATTERY mode if it is not. For the other faults, the unit is reset by shutting it down and restarting, using AC & battery breakers. The faults can also be reset in the CONTROL menu of the LCD display.

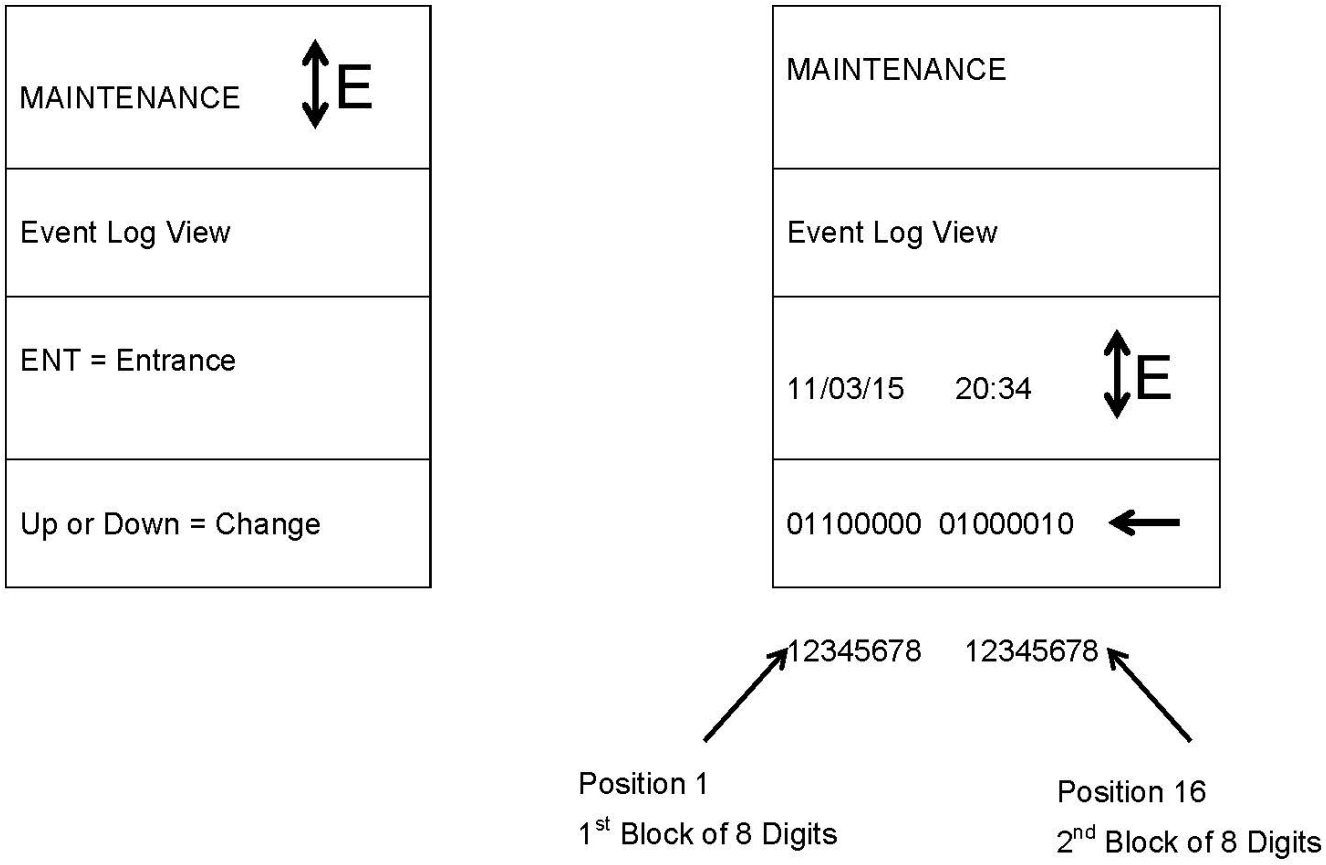
	**Note: When the unit has a fault and line power is qualified and available, the output loads are directly connected to the Input line with no line conditioning or backup power provided.**

6.b.14 Event Log View

To access the EVENT LOG VIEW, select the MAINTENANCE menu and use the up/down arrow keys to enter the password as needed (See Section 6.b.11). EVENT LOG VIEW is the last item in the MAINTENANCE menu. Press ENTER to display each event that has been logged by the system.

Data is displayed in digital binary form. The first line indicates the date (DD/MM/YY) and time (HH:MM) of the event occurrence. The second line shows Events in BBS. Pressing the up arrow displays the next event, pressing the down arrow displays the previous event.

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 1 indicates an event, a 0 indicates no event. Figure 6-19 provides detail on the Event Log View.



Legend for First Block of Eight Digits							
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
AC High	**AC Low**	**Black Out**	**Overload**	**Hi Temp**	**Batt Hi Volt**	**Batt Lo Volt**	**Short Circuit**
Legend for Second Block of Eight Digits							
9	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Batt Low	**Freq. Low**	**Freq High**	**AC Fail**	**Reserved**	**Batt Over Temp**	**No Temp Probe**	**Batt Not Conn**

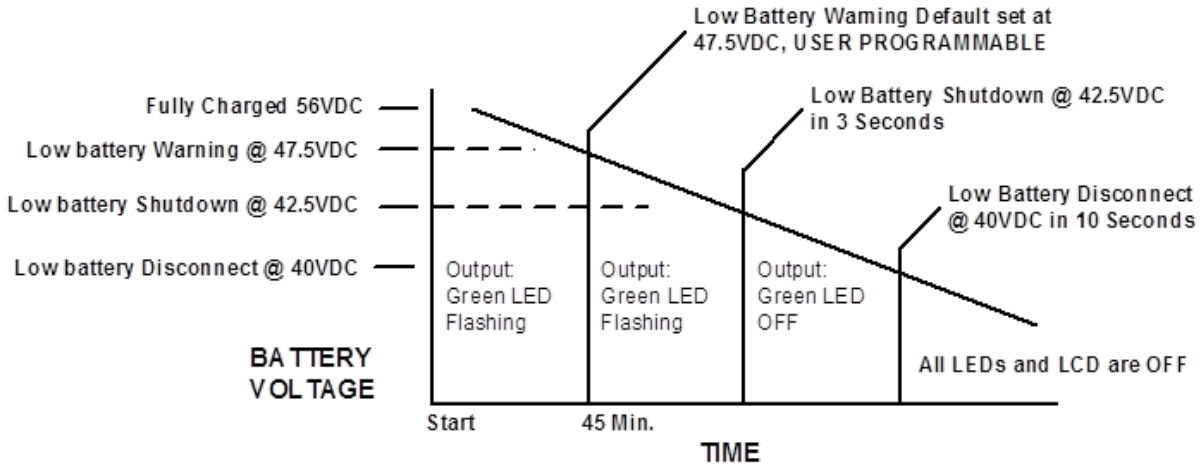
Figure 6-19: Event Log View

6.b.15 LOW BATTERY Mode Status

LOW BATTERY mode includes three conditions: Low Battery Warning, Low Battery Shutdown, and Low Battery Disconnect that occur as the remaining battery voltage drops

below the default or user-defined threshold. Figure 6-20 illustrates the relationship between these conditions and battery voltage / run time.

Figure 6-20 is not to scale and all values and times are shown for illustrative purposes only. To determine actual discharge rates under application-specific operating conditions perform a Battery Back Up Time test. See Section 7.a.1 for instructions on performing this test.



Low Battery Mode States	
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. If the BBS is to remain in a low battery disconnect state for an extended period, the BBS and battery circuit breakers must be switched OFF and the manual bypass switch must be switched to the Bypass position to prevent battery damage. For**

Low Battery Mode States	
	additional protection, disconnect the Quick Connect style battery connector from the BBS.

Figure 6-20: Battery Voltage and Low Battery Mode States

6.b.16 Adjustments

All adjustments to the MP2000E are controlled through software parameters that are set either through the front keypad or the RS232 port.

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

6.b.16.1 Contrast Adjustment

The LCD display has a contrast adjustment that is set by pressing the ESC and ENTER buttons at the same time. Adjust the contrast by using the Up/Down arrow keys. Pressing the ENTER button again will save the current contrast setting. This function is not available through the RS232 port.

6.b.16.2 Line Detection Adjustments

Line detection settings are used for two purposes:

- **To allow the BBS to transfer to and from the battery.**
- **To Buck or Boost the input to maintain output voltage in tolerance, in the event that the input voltage drops or rises.**

To enable Buck and Boost modes:

- **Enter the SETTINGS Menu**
- **Enter the AVR feature**
- **Enter either BUCK or BOOST feature**
- **Toggle ENABLE or DISABLE**

There are four adjustments that set up the transfer to battery function and four adjustments that set up the Buck and Boost function. These adjustments are made through the keypad by:

- **entering the MAINTENANCE Menu**
- **inputting the correct password**
- **entering Line Conditioning Mode**

The same adjustments can be made in the RS232 Menu by entering the parameter value below from the MAIN Menu screen and then inputting the correct password.

Note: Certain line detection parameters are dependent on other line detection parameters. This inter-relationship is provided to minimize incorrectly setting parameters. A brief explanation is provided in the Figure 6-21.

Transfer to Battery Adjustments		
Parameter Number	**Parameter Name**	**Description**
40	**Hi Lmt**	**When the input utility line exceeds this voltage setting the BBS will transfer to Battery Mode from Line Mode or Buck Mode.**
42	**Hi Gap**	**Hi Gap is the hysteresis value that is used to transfer to Line Mode or Buck Mode from Battery Mode. The hysteresis value is also used to transfer to Line Mode from Buck Mode.**
41	**Low Lmt**	**When the input utility line drops below this voltage setting the BBS will transfer to Battery Mode from Line Mode or Boost Mode.**
43	**Low Gap**	**Low Gap is the hysteresis value that is used to transfer to Line Mode or Boost Mode from Battery Mode. The hysteresis value is also used to transfer to Line Mode from Boost Mode.**

Buck & Boost Adjustments (Buck / Boost Feature Must Be Enabled to Make Adjustments)			
Mode	**Parameter Number**	**Parameter Name**	**Description**
Buck	**46**	**High Buck**	**When the input utility line exceeds this voltage setting the BBS will transfer to Buck Mode when enabled.**

Figure 6-21: Line Detection Adjustments

Buck & Boost Adjustments (Buck / Boost Feature Must Be Enabled to Make Adjustments)			
Mode	**Parameter Number**	**Parameter Name**	**Description**
Boost	**45**	**Low Boost**	**When the input utility line drops below this voltage setting the BBS will enable Boost Mode.**

Figure 6-21: Line Detection Adjustments (continued)

6.b.16.3 Line Qualify Adjustment

This adjustment sets the time duration the line must be qualified prior to transferring to line mode. The setting can either be 3, 10, or 30 seconds. This adjustment can be made by entering the Settings Menu, then the Line Qualify Menu, and selecting the desired set point. The same adjustments can be made in the RS232 Menu by entering 34 from the Main Menu screen and then entering the desired time.

6.b.16.4 Ext Fan Control Adjustment

This adjustment allows the user to set the temperature above which the 48VDC power will be provided for the external fan. The setting is adjusted from 20°C to 55°C in 1°C increments. The adjustment can be made by entering the Settings Menu, then the Ext Fan Control, and selecting the desired set point. The same adjustments can be made in the RS232 Menu by entering 39 from the Main Menu screen and then entering the desired temperature.

6.b.16.5 Battery Charging Temp Comp

This adjustment allows the user to set the temperature compensation for the battery charger. The setting is adjusted to either 2.5, 3, 4, or 5mv/ºC. This adjustment can be made by entering the SETTINGS Menu, then Batt. Comp, and selecting the desired set point. The same adjustments can be made in the RS232 Menu by entering 38 from the Main Menu screen and then entering the desired set point.

6.c Communications

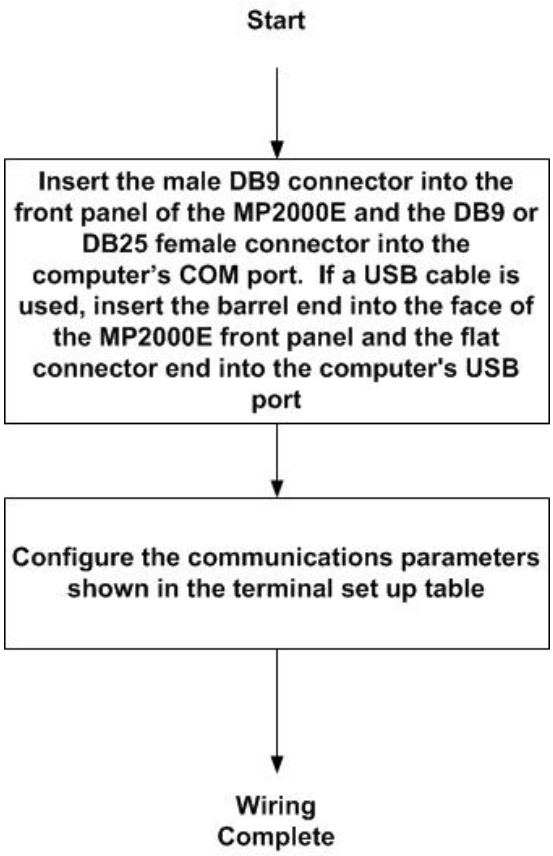
6.c.1 RS232 / USB Set-up

To enable the MP2000E to communication with a PC, use the RS232 or USB port. The MP Series BBS uses a standard DB-9, RS232 cable, or USB cable. The USB requires a Prolific driver installation in the PC.

When the DB-9F, (female connector) on the front panel is connected to a PC with Windows 3.1, 9X, 7, XP terminal emulation software, the MP2000E can be remotely monitored, controlled, and calibrated using RS232 ASCII commands.

Instructions on connecting the MP2000E with Window's HyperTerminal are presented in Section 6.c.2.

6.c.1.1 Wiring Set-Up Procedure



TERMINAL SETUP TABLE	
Emulation Type	VT 100 or Compatible
Duplex Mode	Half Duplex
Xon/Xoff Flow Control	NONE
RTS/CTS Flow Control	OFF
Line Wrap	ON
Screen Scroll	ON
CR Translation	CR
Back Space	N/A (See Note)
Break Length	N/A
Inquiry	N/A
COMMUNICATION PARAMETERS	
Handshaking	Software Handshake
Baud Rate	2400 bps
Data Format	8 Bit Data, No Parity, 1 Stop Bit

Figure 6-22: Wiring Procedures

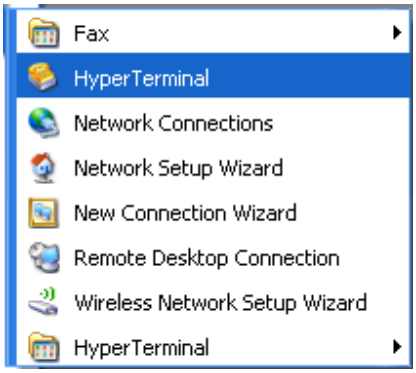
Notes on Wiring Procedures

- **The program ignores the Backspace and Delete keys. If a command is wrong, press Enter and retype the command.**
- **In Windows the path is: Start/Programs/Accessories/Communication/HyperTerminal**
- **The Ethernet card loses communication with the BBS during RS232 communications.**

6.c.2 HyperTerminal Set-up

The following HyperTerminal setting is needed for local or remote communication between MP2000E and a PC. In this example, Com 1 is used. Verify the designation of COM port, where RS232/USB cable to PC is connected such as COM1, COM2, etc. A direct USB communication requires the Prolific driver installation on the PC. Alternatively use a USB-to-DB9 adapter.

Step 1: Navigate to the HyperTerminal using the following path: Programs/Accessories / Communications/HyperTerminal

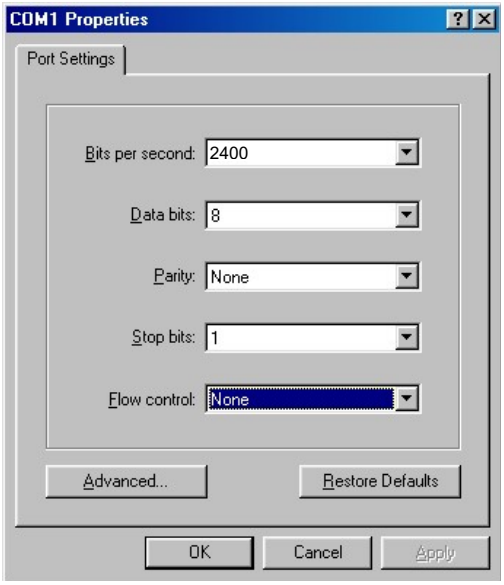


Step 2: Click on the HyperTerminal icon. The Connection Description screen appears as shown at right. Enter a name and icon for your unit and click OK.

Step 3: The Connect To screen shown at right appears. Select the COM port to be used from the drop down menu in the "Connect Using" field, then click OK.

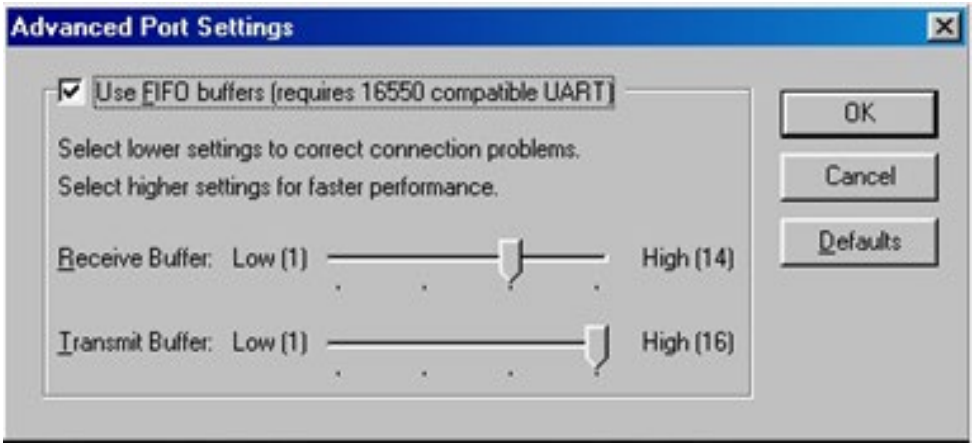
Step 4: The COM Properties screen appears. Select the port settings shown at right.

Step 5: Click the Advanced button.



Step 6: In the Advanced Port Settings screen, select the fields as shown at right, then click OK.

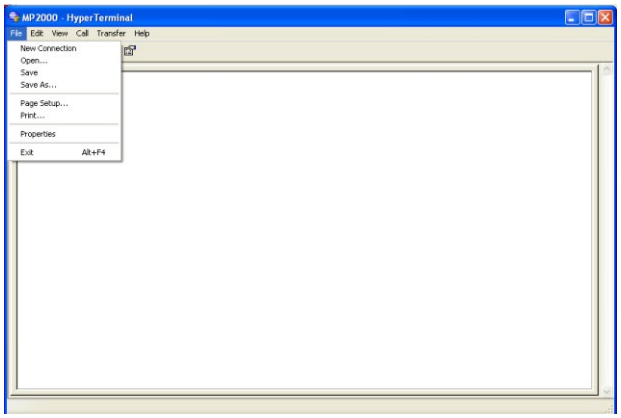
NOTE: The Use FIFO buffers only applies to computers with 56Kbs modems or faster. For slower connections, leave box unchecked.



Click OK when the COM Properties Screen reappears.

Step 7: A blank window with the entered file name appears as shown at right.

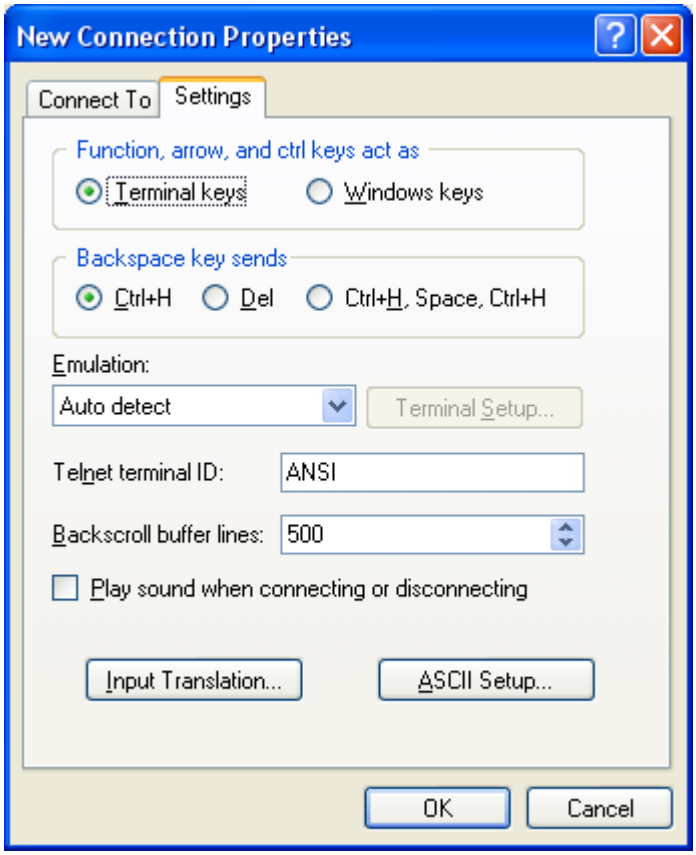
In the File menu click on Properties.



Step 8: The Properties screen Appears as shown at right.

Click on the Settings Tab. Select the fields as shown.

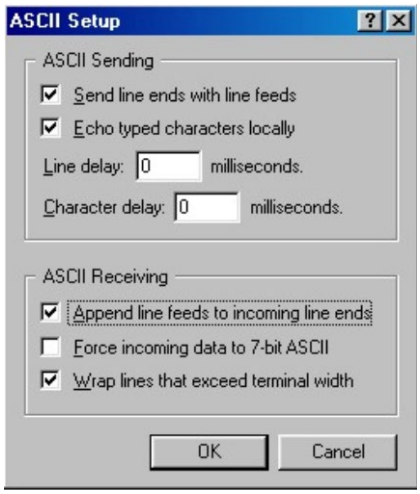
Step 9: Click the ASCII Setup button



Step 10: Select the fields in the ASCII Setup screen as shown at right.

Step 11: Click OK. The properties window reappears.

Step 12: Click OK



HyperTerminal setup is complete. Press Enter to go to MP2000E screen, then press Enter to access the unit via RS232 / USB communications. The MAIN Menu appears

6.c.3 The MAIN Menu

The RS232 / USB menus are hierarchical. Press ENTER to access the top-level menu.

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

⚠	**Note: The factory set default password 1111 is required to access and set many functions.**

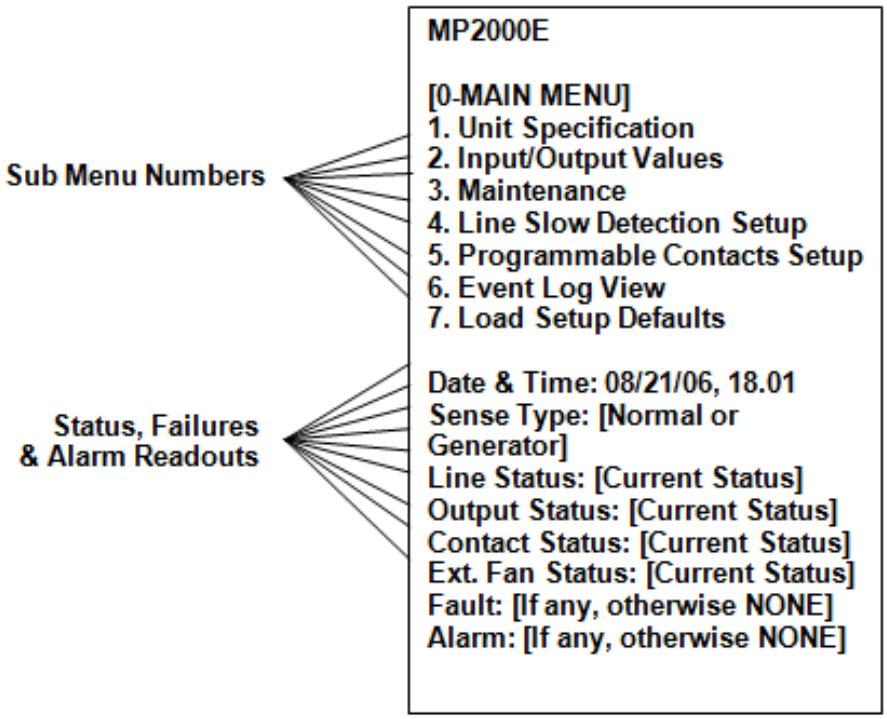


Figure 6-23: Main Menu

⚠	**Note: The STATUS, FAULT, and ALARM readouts are not automatically updated. Press ENTER to obtain the up to date status.**

6.c.3.1 Line Status Submenu

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]
>_

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 established threshold.
High	Input voltage is higher than established threshold.
Freq Low	Input frequency is too low (<55Hz)
Freq High	Input frequency is too high (>65Hz)

Figure 6-24: Line Status Options

6.c.3.2 Output Status Submenu

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]
>_

OUTPUT STATUS
Line Mode
Inverter Mode
Inverter Mode, Low Battery 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 6-25: Output Status Options

6.c.3.3 Fault and Alarm Submenus

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]
>_

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

Figure 6-26: Fault Displays Options

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]
>_

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
Tmp_Probe_Disconnect	Temperature Probe Uninstalled or Disconnected
Batt_Brk_Off	The Battery Breaker is Off or the Batteries are Discharged

Figure 6-27: Alarm Displays Options

6.c.4 RS232 / USB Menu Tree and Sub Menus

As shown in Figure 6-23, The RS232 / USB Menu Tree is comprised of the following submenus:

- **Unit Specifications**
- **Input / Output Values**
- **Maintenance**
- **Line Slow Detection Setup**
- **Programmable Contacts Setup**
- **Event Log View**
- **Load Setup Defaults**

Detail regarding the Unit Specifications, Input / Output Values, Maintenance, and Line Slow Detection Parameters menus is provided in the subsections to follow.

The complete MENU Tree with all default values is presented as Figure 6-28..

	**Note: To access any item from the MAIN Menu, type in the function number and press ENTER.** **To return to the MAIN menu from any of the submenus, press ENTER.**

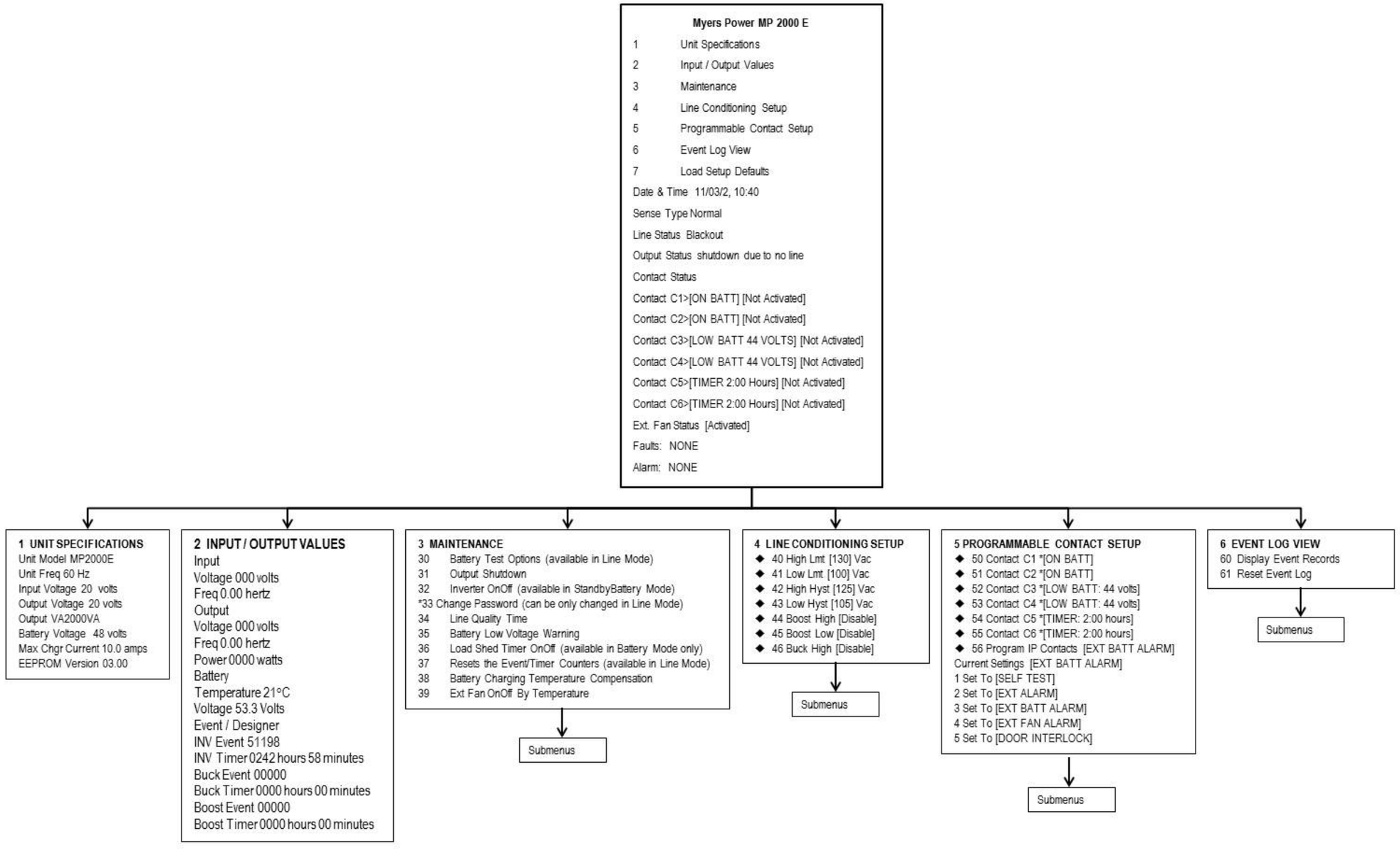


Figure 6-28: RS232 / USB Menu Tree

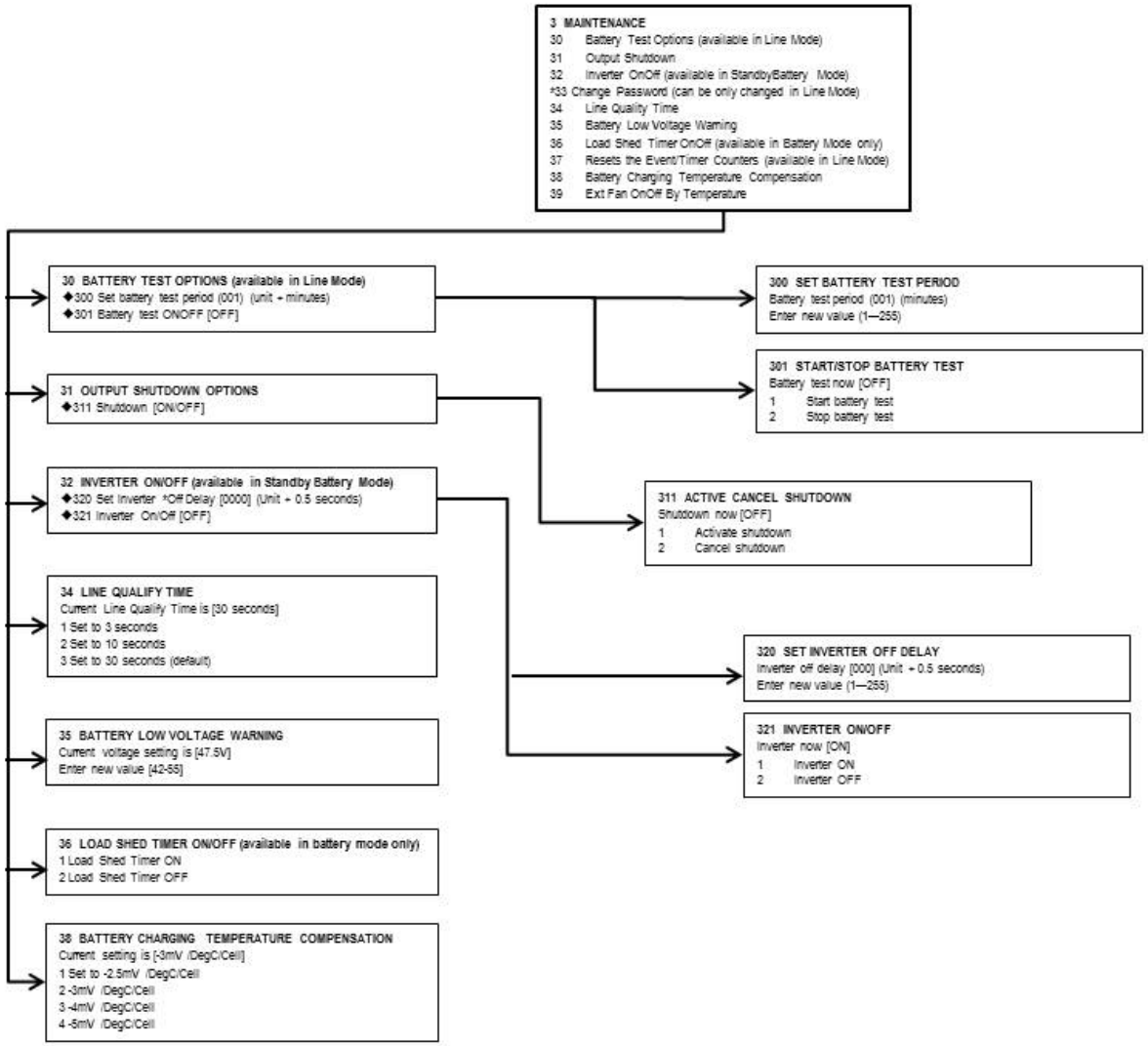


Figure 6-28: RS232 / USB Menu Tree (continued)

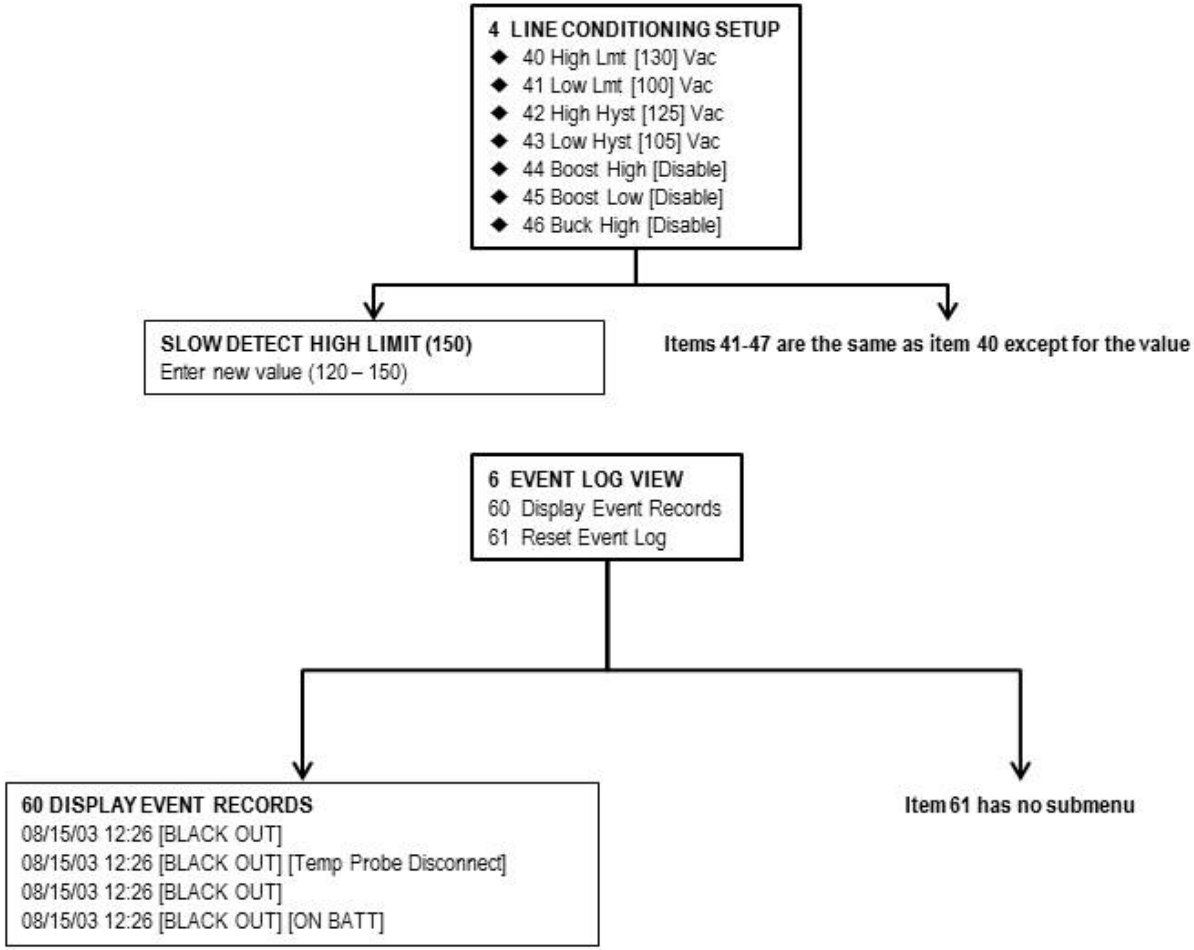


Figure 6-28: RS232 / USB Menu Tree (continued)

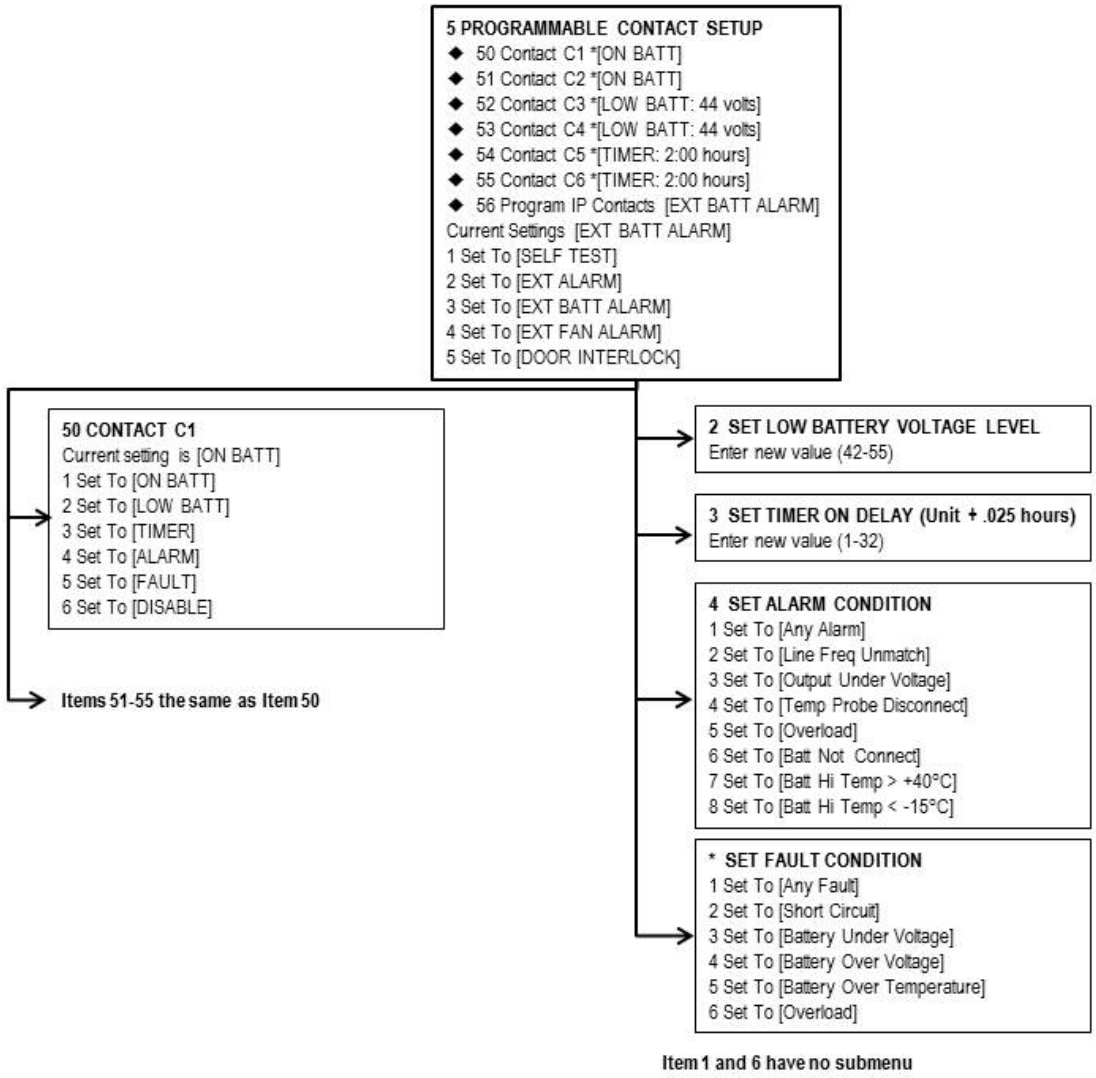


Figure 6-28: RS232 / USB Menu Tree (continued)

6.c.4.1 Unit Specifications, Input / Output Values

To access the Unit Specifications Menu from the MAIN menu, type 1 and press ENTER. To access the Input / Output Values Menu from the MAIN menu, type 2 and press ENTER. To return to the MAIN menu from either submenu, press ENTER.

UNIT SPECIFICATIONS MENU		
Unit Model	**MP2000E**	**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 Voltage**
Max Charge Current	**10 Amps**	**MAX Charge Capacity**
EEPROM Version	**4.0**	**EEPROM Version of the MP2000E**

Figure 6-29: Unit Specifications Submenu

INPUT / OUTPUT VALUES MENU			
Input	Voltage	120 Volts	The Input Voltage
	Freq	60.1 Hertz	The Input Frequency
Output	Voltage	120 Volts	The Output Voltage
	Freq	60.1 Hertz	The Output Frequency
	Power	0000 Watts	The Output Power in Watts
Battery	Temperature	25 ° C	The Ambient Temperature of the Battery Case as Read Via Attached Temperature Probe
	Voltage	53.8 Volts	The Battery DC Voltage
Event Timer	Inv. Event	0004	The Quantity of Input Power Failures
	Inv. Timer	0001 Hour 36 Min	The Total Time that the Battery was Discharged Since Last Reset
	Buck Event	0004	The Number of Times the BBS Has Entered Buck Mode
	Buck Timer	0001 Hour 36 Min	The Total Time that the BBS Entered Buck Mode Since Last Reset
	Boost Event	0004	The Number of Times the BBS Has Entered Boost Mode
	Boost Timer	0001 Hour 36 Min	The Total Time that the BBS Entered Boost Mode Since Last Reset

Figure 6-30: Input / Output Values Submenu

6.c.4.2 Maintenance Menu

To access the Maintenance Menu from the MAIN menu, type 3 and press ENTER. To return to the MAIN menu from the Maintenance Menu, press ENTER. Figure 6-31 details the Maintenance Menu.

MAINTENANCE MENU		
30	**Battery Test Options**	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. Note: The time duration can be changed only when BBS is in Line Mode.
31	**Output Shutdown**	This allows output to be switched OFF or shut down. MP2000 switches to STANDBY mode when this option is activated.
32	**Inverter On/Off**	1. During the BATTERY or STANDBY mode, this option allows the inverter to be switched OFF or turned ON after the user-programmable delay time. 2. The delay can be user-programmable in 0.5 second steps from 0 to a maximum setting of 255 steps (128 seconds). The delay is only available in BATTERY or STANDBY modes. When the unit returns to LINE mode, the delay resets back to a default of 0 seconds. Thus during a battery discharge or ON BATTERY mode, operator can stop the inverter immediately after user programmable delay time of 0 seconds to a maximum of 300 seconds, prior to making the intersection dark.
33	**Change Password**	This option allows for the change of password. The factory set default password is 1111. Note: The password can be changed only when BBS is in Line Mode. Password reset instructions are provided in Section 6.c.4.2.1.

Figure 6-31: Maintenance Menu

MAINTENANCE MENU		
34	**Line Qualify Time**	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. This delay is a user-programmed 3, 10, or 30 second period intended to allow the returned utility power to become stable. The factory set default value is 30 seconds.
35	**Battery Voltage Level**	The threshold for the LOW BATTERY ALARM is set here. 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 varies according to the characteristics of the batteries used.
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 backup time. Note: This function is available only in BATTERY mode.
37	**Reset The Event/Timer Counters**	Resets EVENT to 0; Resets TIMER to 0 Note: This function is available only in LINE mode.
38	**Battery Charging Temperature Compensation**	The MP2000E incorporates a temperature-compensated smart charger. The rate of charging is adjusted here based on the battery case temperature. The factory default value is set at -3mv/°C. It can be configured to -2.5 with -3, -4, & -5mV/ºC.
39	**Ext. Fan On/Off By Temperature**	Users can set the temperature above which the 48VDC power will be provided for the external cooling fan. The temperature can be set in 1° increment from 20° to 55°C. The factory default temperature is set at +25°C.

Figure 6-31: Maintenance Submenu (continued)

6.c.4.2.1 Password Reset Procedure

To reset re-set the password, follow the steps below:

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" appear on the screen. Type the new password (any combination of 4 digits) and press ENTER. NOTE: The password can be comprised of digits only. The system does not allow for letters or special characters.**
4. **The words "Re-enter New Password" appear on the screen. Retype the new password and press ENTER. If the passwords do not match, the screen displays "Error in entering data… please try again." Re-enter the new password and press ENTER.**
5. **If the retyped password is correct, the screen returns to the MAIN menu.**

6.c.4.3 Line Conditioning Set Up

This option allows user to change various detection and warning levels for input AC voltages, qualified and unqualified values, and transfer and retransfer set points for going in and out of BATTERY, BOOST, and BUCK modes.

The MP2000E comes programmed with default values for these parameters that are consistent with those specified by major Departments of Transportation. See Figure 6-33 for a description of each parameter.

⚠	**Note: Improperly set parameter values can cause permanent damage to the unit. Changes should only be made by Myers Emergency Power Systems trained personnel.** **Contact Myers Emergency Power Systems Technical Support at 610-868-5400 before making any adjustment.**

To change the line slow detection parameters:

1. **In the MAIN menu, select 4.**
2. **"Enter Password" appears (the factory set password is 1111). Type the password and press ENTER. If the screen displays "Error in entering data… please try again," the password has been entered incorrectly. Enter the correct password, then press ENTER.**
3. **The Parameter Change Screen appears (Figure 6-32). Type in a new value that is within the range of acceptable parameter limits and press ENTER.**
4. **The screen returns to the Line Conditioning Screen.**

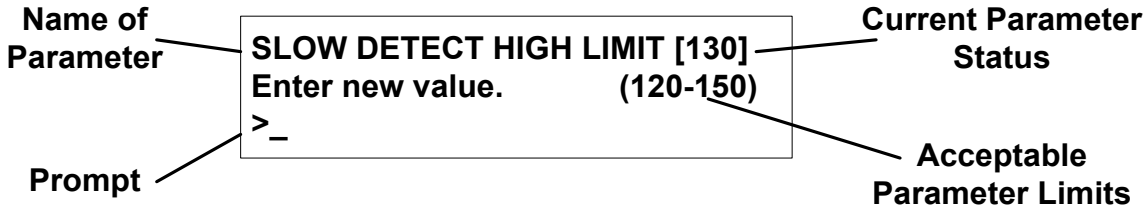


Figure 6-32: Parameter Change Screen

Details on using the menu screen are presented in Section 6.c.5.

SETPOINT		DESCRIPTION/REMARKS	DEFAULT SETTINGS	SETTINGS RANGE
Number	Name			
40	Hi Lmt	On Battery Mode Line / Buck to Battery: Detect Hi Lmt and transfer to BATTERY mode (when enabled) or LINE mode when line voltage exceeds setting.	Buck Off 130 VAC Buck On 150 VAC	 120~150 VAC
46	Buck Hi	Line to Buck: Activate BUCK Mode (when enabled) when line voltage exceeds setting, reducing the output.	130 VAC	120~144 VAC
42	Hi Hyst	Battery to Line: Detect Hi Hyst when input voltage returns below this level; transfers back to LINE mode from BATTERY mode.	Buck Off 125 VAC Buck On 145 VAC	Auto Auto
47	Buck Lo	Buck to Line: Detect Buck Low when input voltage returns below this level; releases the BUCK mode (when enabled) and transfers back to LINE mode.	125 VAC	Auto
Normal		-	120 VAC	
44	Boost Hi	Boost to Line: Detect Boost High when input voltage returns above this level; releases the BOOST mode (when enabled) and transfers back to the LINE mode.	107 VAC	Auto
45	Boost Lo	Line to Boost: Detect Boost Low when input voltage is reduced below this level; transfers unit to BOOST mode (when enabled) increasing the output.	102 VAC	96~120 VAC
43	Ly Hyst	Battery to Line:	Boost Off 105 VAC	Auto Auto

SETPOINT		DESCRIPTION/REMARKS	DEFAULT SETTINGS	SETTINGS RANGE
Number	Name			
		Detect Low Hyst when input voltage returns above this level; transfers unit back to LINE mode from BATTERY mode.	**Boost On 95 VAC**	

Figure 6-33: Parameter Descriptions (continued)

SETPOINT		DESCRIPTION/REMARKS	DEFAULT SETTINGS	SETTINGS RANGE
Number	Name			
41	Lo Lmt	Line/Boost to Battery On Battery Mode: Detect Low Limit when input voltage is reduced below this level; transfers unit to BATTERY mode from either BOOST mode (when enabled) or LINE mode	Boost Off 100 VAC Boost On 90 VAC	90~120 VAC
48	Hi Gap	User Definable Gap (3-7 VAC) between selectable values for High Hyst and High Limit	005 VAC	3~7 VAC
49	Lo Gap	User Definable Gap (3-7 VAC) between selectable values for Low Hyst and Low Limit	005 VAC	3~7 VAC

Figure 6-33: Parameter Descriptions (continued)

6.c.5 Menu Tutorial

The same procedure is used for accessing and working with options within each of the submenus. To illustrate these procedures, this section will explain how to change Battery Test Options.

In the MAIN menu, type 3 and press ENTER. This will bring up the MAINTENANCE menu, which is shown in Figure 6-34 below.

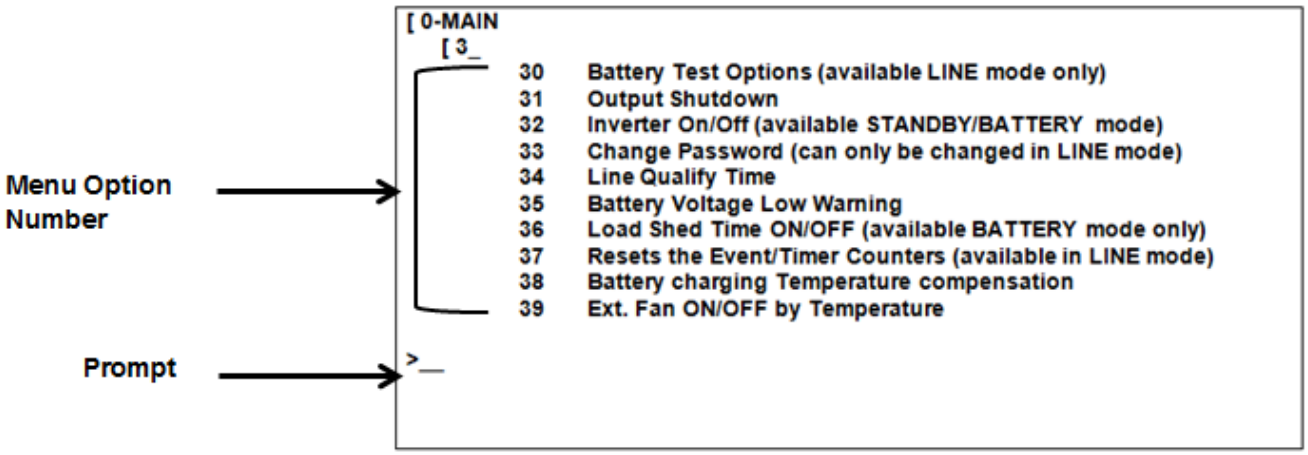


Figure 6-34: Maintenance Menu

To bring up the Battery Test Options menu, type 30 next to the prompt on the MAINTENANCE menu screen. Then press ENTER.

The screen will then display the values currently entered for the options that can be changed through the menu. This is illustrated in Figure 6-35.

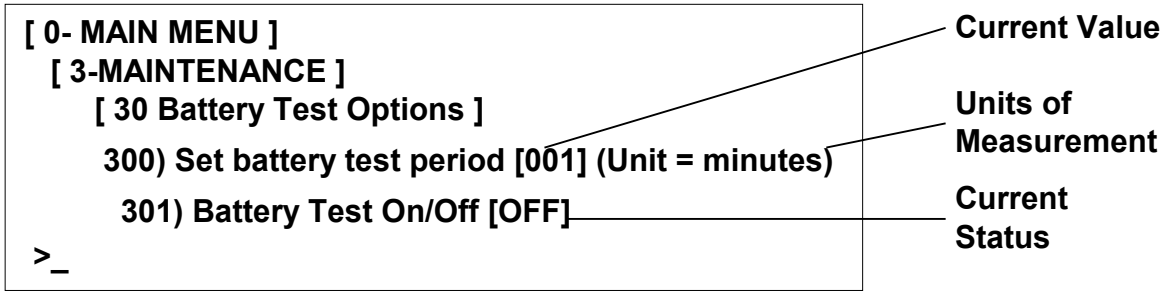


Figure 6-35: Battery Test Options Screen

6.c.5.1 Battery Test Period

The battery test period is displayed in brackets and defined in one minute increments. Therefore, in Figure 6-24, "001" indicates that the battery test period is one minute:

Period = Current Value X Units

EXAMPLE: Test Period = 001x 1 Minute = 1 Minute

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 shown in Figure 6-36.

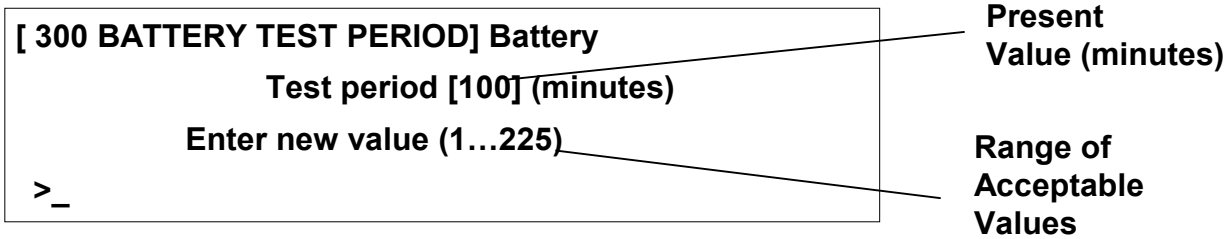


Figure 6-36: Changing the Battery Test Period

To change the Battery Test Period duration, type a number between 1 and 225 next to the prompt, then press ENTER. The duration of the Battery Test Period will be updated and the display will return to the MAINTENANCE menu.

6.c.5.2 Battery Test Status

To change the Battery Test On/Off status, type 301 next to the prompt in the MAINTENANCE menu screen, then press ENTER. The words "Enter Password" appear on the screen. Type the password and press ENTER.

The Battery Test Screen will appear, as shown in Figure 6-37.

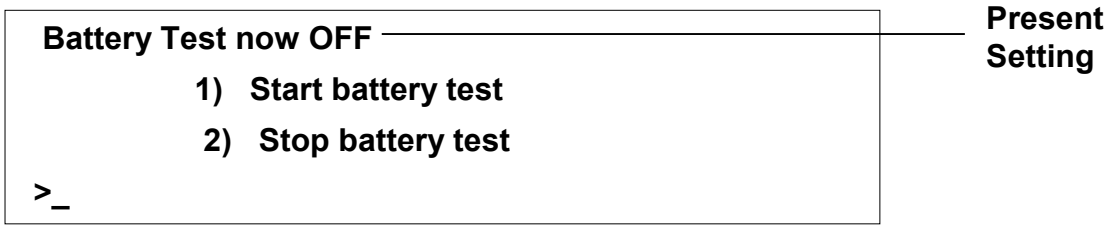


Figure 6-37: Battery Test Screen

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.

Note: After "2) Stop battery test" there will be the (default 30 seconds) line qualify time.

6.c.6 Ethernet Card Options

MP2000E models with serial numbers that begin with MC (e.g. MC18E16553) have either an embedded HTML Ethernet card or an Ethernet-to-serial adapter card (or no Ethernet card). The HTML Ethernet card, shown in Figure 6-38, interfaces with a web browser.

Yellow LED flashing indicates the card is booting up
Yellow LED steady indicates boot up complete
Red LED flashing indicates serial communication loss between the card and the MP2000E
(Any RS232/USB connection to the MP2000E front panel directs serial communication from the HTML card to the MP2000E front panel RS232/USB connection. Recovery is automatic once the RS232/USB connection is undone.)
Red LED steady indicates the HTML card is in alarm
Green LED steady normal operation.

The Ethernet RJ45 Connector features a green LED auto-sense 10 / 100 Mbps Indicator and yellow LED link indicator and uses CAT5E cabling.

Figure 6-38: NetAgent Embedded HTML Ethernet Card Front Panel

The Ethernet-to-serial-adapter, shown in Figure 6-39, interfaces with a terminal emulator (such as Hyperterminal) and with Myers Emergency Power Systems MEMS software.

Figure 6-39: Ethernet-to-Serial Adapter Card Front Panel.

The Ethernet RJ45 Connector features a green LED auto-sense 10 / 100 Mbps Indicator and yellow LED link indicator and uses CAT5E cabling.

Interior views of each card type are shown in Figure 6-40. These are as follows:

- **Left: NetAgent HTML Ethernet Card. This card is used with MP2000E models with serial numbers that begin with MC. The coin battery maintains the Ethernet card clock.**
- **Center: Serial-to-Ethernet Adapter Card (long version). This card is used with MP2000E models with serial numbers that begin with MC.**
- **Right: Serial-to-Ethernet Adapter Card (short version). This card is used with MP2000E models with serial numbers that begin with MD.**

Figure 6-40: HTML Ethernet and Ethernet-to-Serial Adapter Card Interior Views

6.c.6.1 NetAgent Ethernet Card Default IP / Default Logon

The procedures described in this section restore the factory default Ethernet card settings.

Figure 6-41: NetAgent HTML Ethernet Card Front Panel

HTML Ethernet Card

Default IP:	**192.168.1.51**	**The MP2000E LCD Status menu displays the IP address, Subnet Mask address, and Gateway address of the HTML Card**
Subnet Mask:	**255.255.255.0**	
Default Login:	**admin**	
Default Password:	**user**	

The default login & password is the same for a web browser and for Telnet.

NOTE THESE SETTINGS ARE FOR THE NETAGENT HTML CARD.
FOR THE ETHERNET-TO-SERIAL ADAPTER CARD SEE THAT SECTION ELSEWHERE IN THIS MANUAL

6.c.6.2 Making the IPV4 Ethernet Connection

For the initial connection, use the Netility.exe program (on the accompanying DVD) OR a direct PC (web browser) to Ethernet card connection using an RJ45 cross-over cable.

6.c.6.2.1 Using a Direct PC to Ethernet Card Connection with RJ45 Cross Over Cable

IMPORTANT NOTE…FOR A DIRECT (PC TO ETHERNET CARD RJ45 CROSS OVER CABLE CONNECTION) YOU MUST BE LOGGED INTO THE PC UNDER THE PC'S NAME, NOT e.g. LOGGED IN UNDER A NETWORK NAME…otherwise a web browser will not find the HTML Ethernet card.
YOU MUST HAVE ADMINISTRATOR'S ACCESS TO THE PC.

- **Set the PC for a fixed IP address 192.168.1.xxx (xxx = 0 to 255 except 51) (UPS Ethernet card at default 192.168.1.51)**
- **Set the PC's subnet mask for 255.255.255.0.**
- **Go to the PC's Network Connections to access the LAN configuration screens as shown in Figure 6-42.**
- **The Internet Protocol Connection Authentication Box shown in Figure 6-43 will appear.**

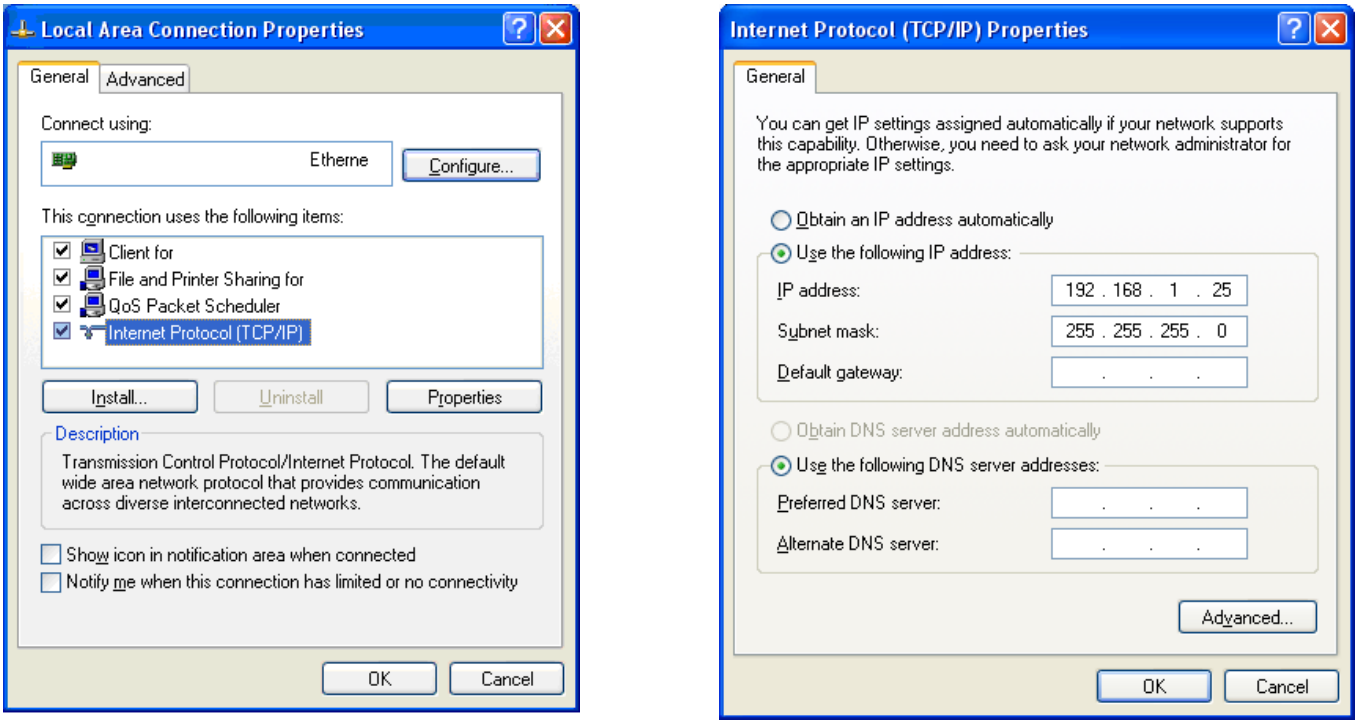


Figure 6-42: LAN Configuration Screens

⚠	**Note: You must have administrator's access to the PC to access these screens.** **Some older PC operating systems require reboot for the changes to take effect. You can verify by running command line "ipconfig"…C:\>ipconfig.**

Enter the Ethernet card default IP address 192.168.1.51 in the web browser URL.

- **In the Authentication Box, enter the following credentials using all lowercase letters:**
  - **User Name: admin**
  - **Password: user**

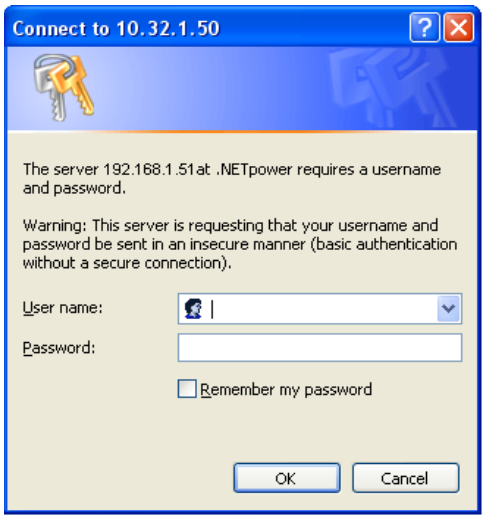


Figure 6-43: Internet Protocol Connection Authentication Box

The NetAgent Interface screen shown in Figure 6-44 will appear.

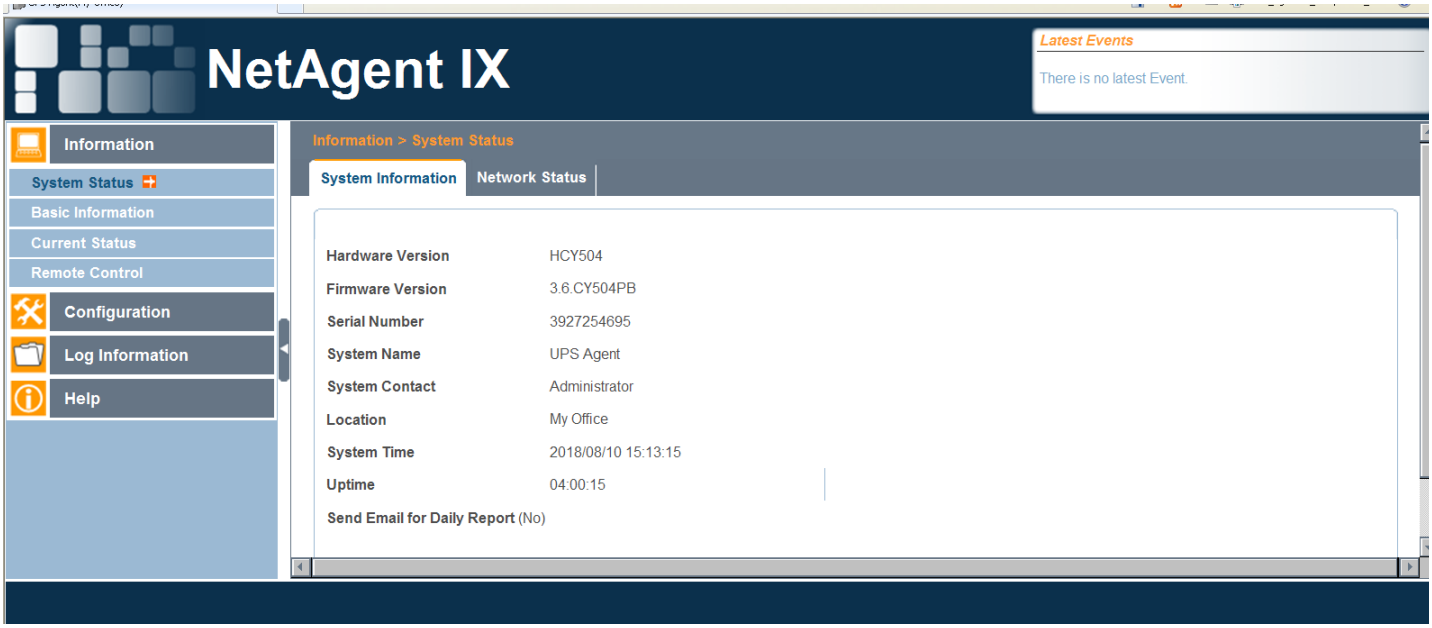


Figure 6-44: NetAgent Initial Browser Screen

6.c.6.2.2 Making the Ethernet Connection Using Netility.exe

(from the accompanying DVD)

Using Netility.exe finds the HTML Ethernet card on a network by the card's MAC address. Upon running, Netility immediately searches for any NetAgent cards on the network.

Figure 6-45: Netility Initial Screen

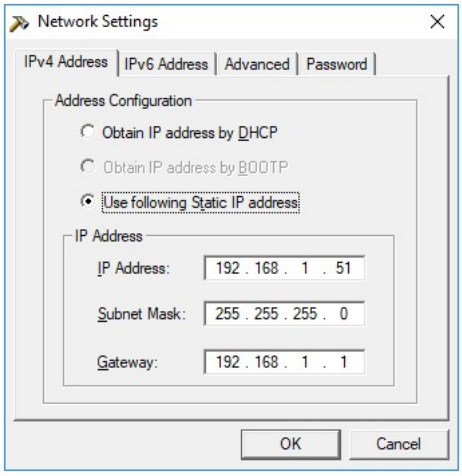


Figure 6-46: Netility Network Settings Box (Default Settings Shown Here)

These IPV4 settings also appear in the MP2000E LCD Status menu.

Enter a static IP address or choose DHCP.

Open a web browser and enter the Ethernet card IP address in the web browser URL. Figure 6-47 will appear.

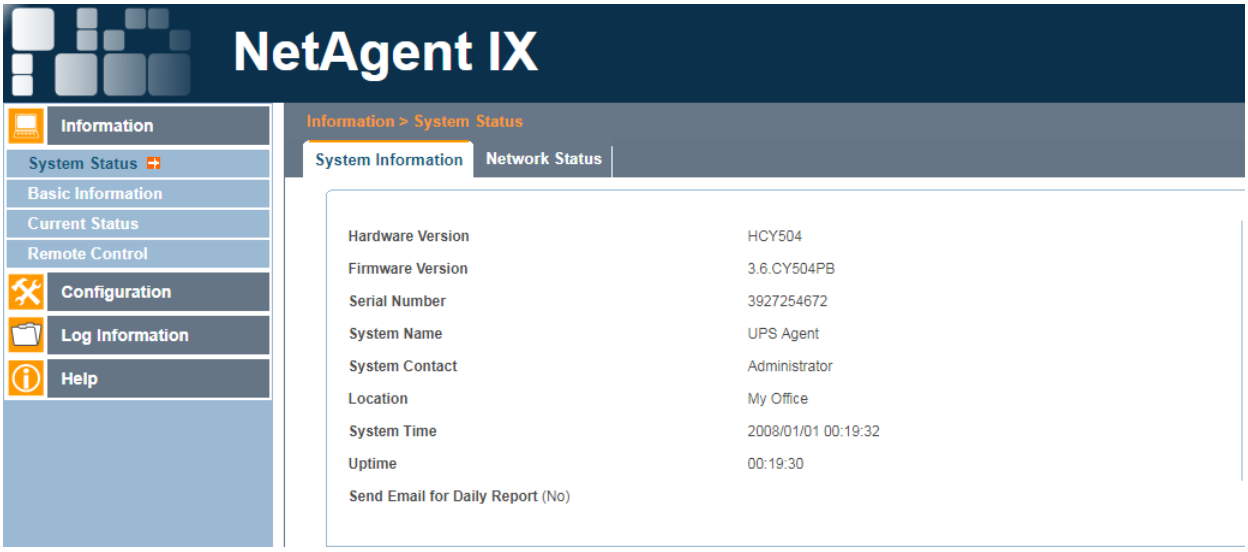


Figure 6-47: NetAgent Initial Browser Screen

6.c.6.3 Making Changes to Settings on Information Tab

Upon opening, NetAgent IX will display the Information tab. The Information tab allows users to view the following sets of information:

- **System Status**
- **Basic Information**
- **Current Status**
- **Remote Control**

Use the smaller tabs between the larger tabs to navigate between tabs.

6.c.6.3.1 System Status

Upon opening, the Information tab will display the first item in the middle menu, System Status, as shown in Figure 6-47.

The System Status tab then also has two smaller tabs to the right. The first tab is System Information (Fig. 6-47). The second tab is Network Status (Fig. 6-48).

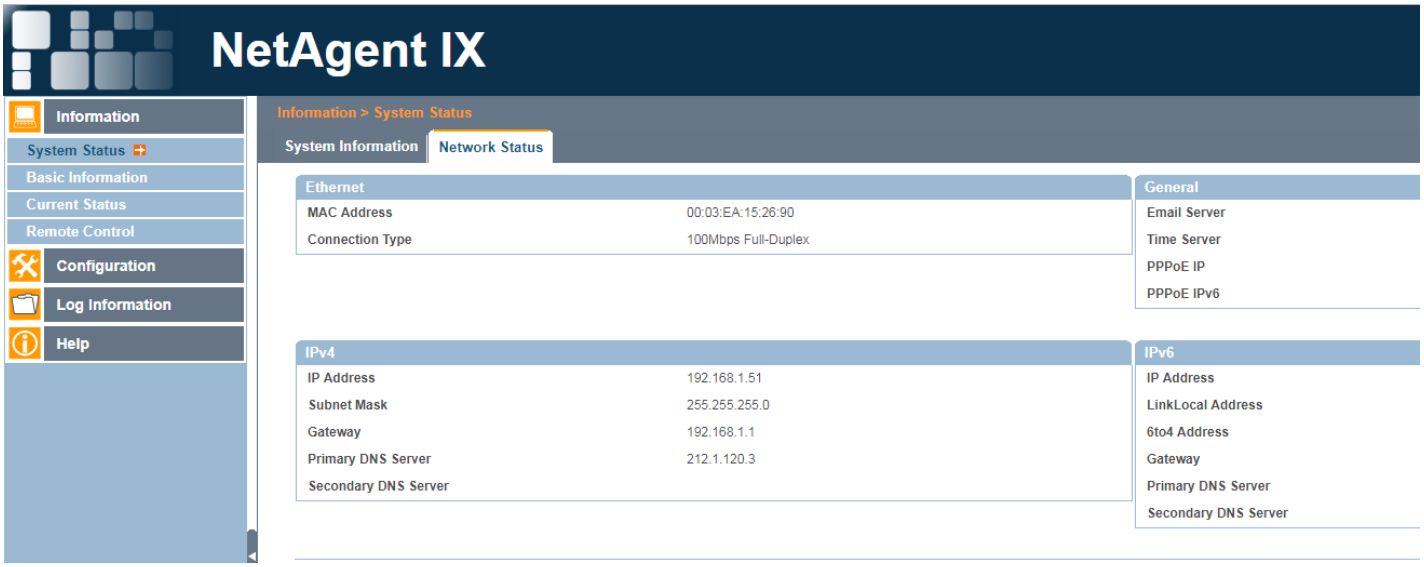


Figure 6-48: System Status / Network Status on Information Tab

6.c.6.3.2 Basic Information

The Basic Information tab, shown in Figure 6-49, indicates the VAC input level at which the UPS transfers to battery backup. The values in these fields are rated indications rather than measured readings. Explanations of each field are as follows:

- **Low Voltage Transfer is (default) 100VAC with AVR Boost feature OFF.**
- **Low Voltage Transfer is (default) 90VAC with AVR Boost feature ON.**
- **High Voltage Transfer is (default)130VAC with AVR Buck feature OFF.**
- **High Voltage Transfer is (default) 150VAC with AVR Buck feature ON.**

See Configuration – Transfer Point for all AVR (Automatic Voltage Regulation) settings.

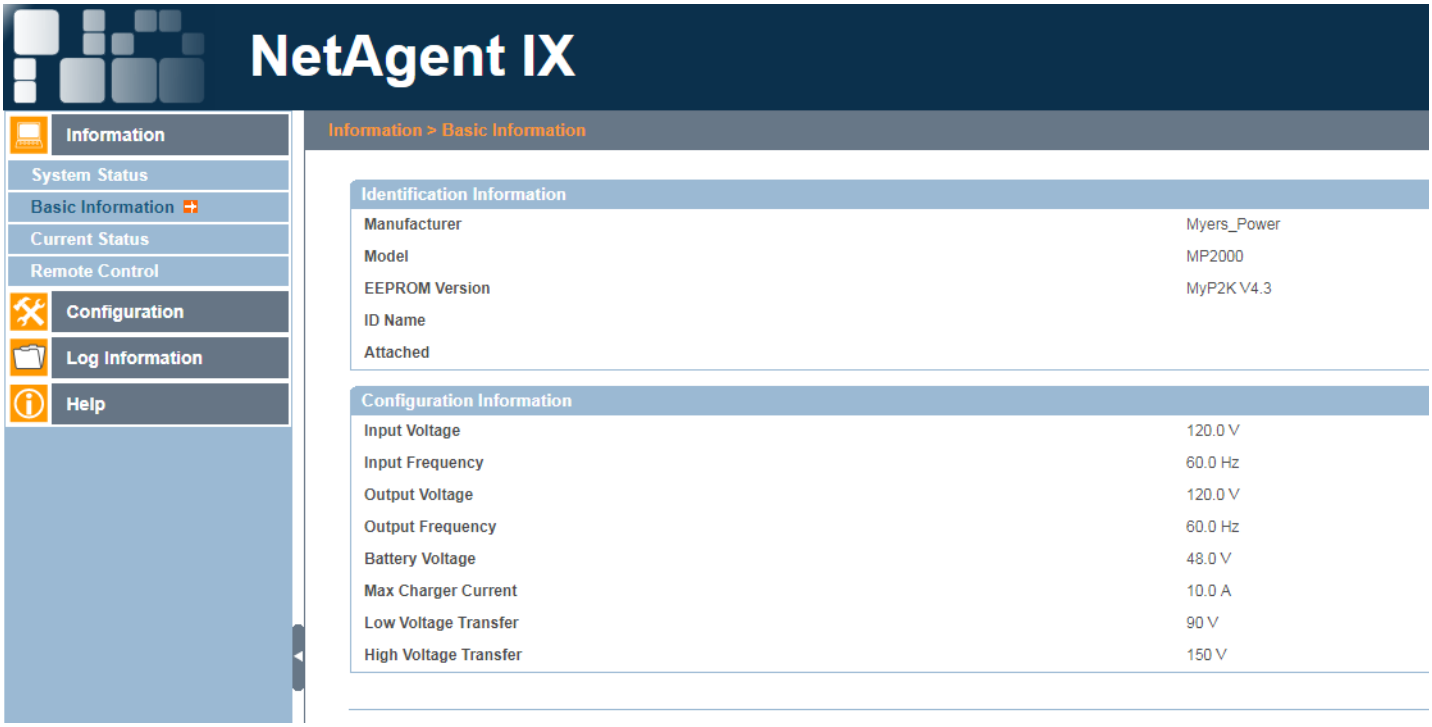


Figure 6-49: Basic Information on Information Tab

6.c.6.3.3 Current Status

As shown in Figure 6-50, the Current Status screen displays actual input, output, and battery voltages, temperature, summary contact states, and timers for various events. These can all be viewed by mousing over the upper tabs. Current Status refreshes every 10 seconds (unless changed at bottom of the screen). Temperature UPS is measured from the battery temperature probe. The Summary and Contact Status tabs, shown in Figure 6-50, displays the status of inputs, outputs, faults, alarms, contacts, and other components. Additional detail on each field is as follows:

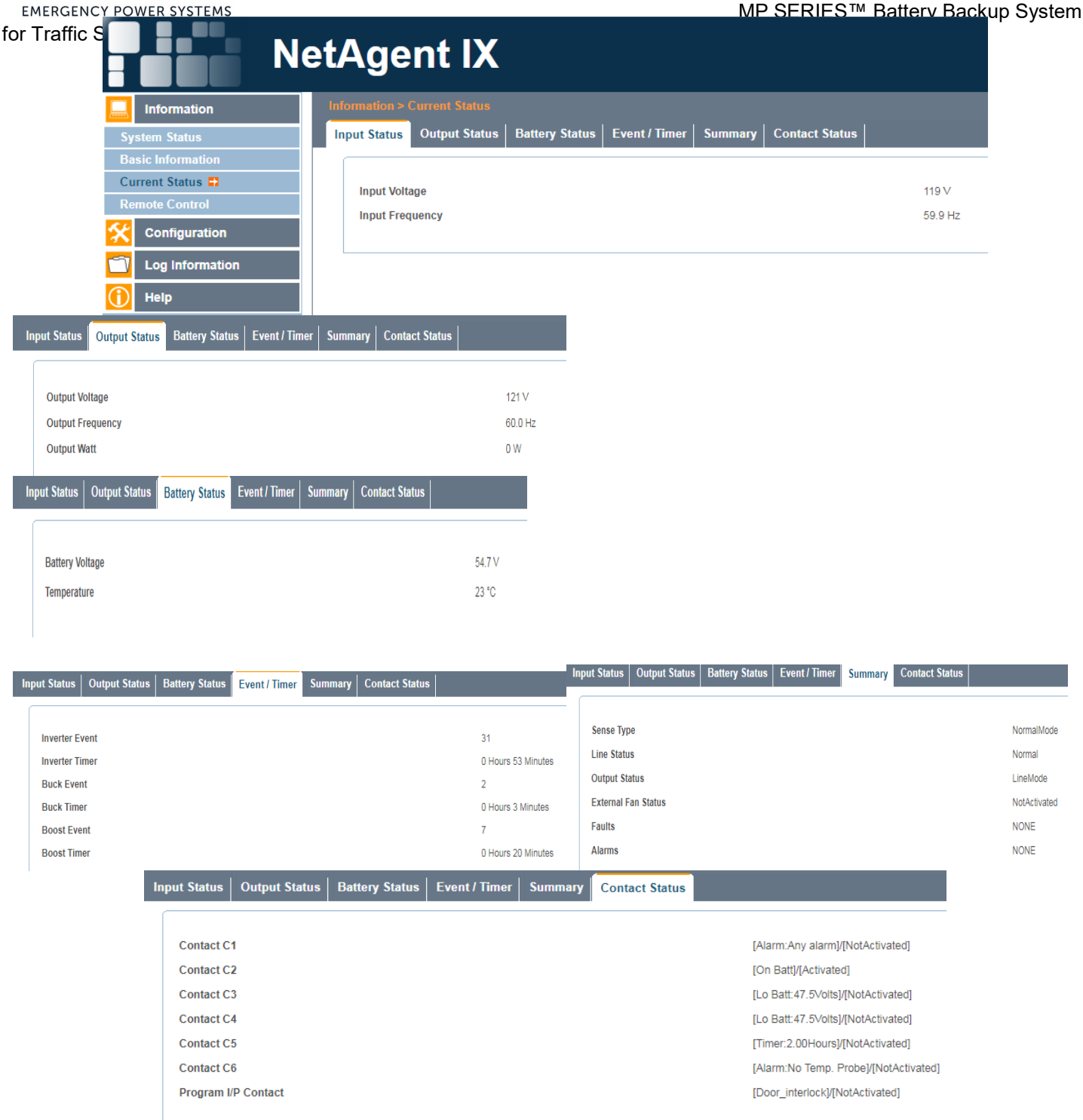


Figure 6-50: Current Status on Information Tab

- **Sense Type can be Normal (commercial power) or Generator. The Sense Type is set in the MP2000E front panel LCD Settings menu.**
- **The External Fan turns ON/OFF according to the battery temperature reading. The default setting is 25°C.**

- **Contact C1 thru C6 are the isolated 1-form C contact closures on the MP2000E front panel.**
- **Program I/P Contact is the programmable input contact closure on the MP2000E front panel.**
- **Contact C1 thru C6 and the Program I/P can be configured in Control – Contacts; the RS232 Hyperterminal menus and in the MP2000E front panel LCD Settings menu.**

6.c.6.3.4.1 Remote Control

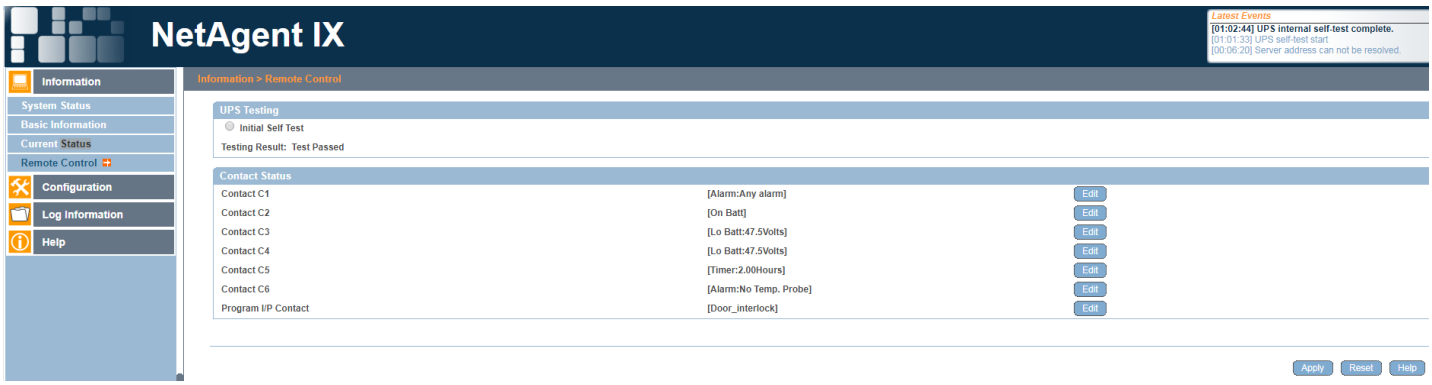


Figure 6-51: Remote Control on Information Tab

The Remote Control tab is where you can initialize a Self Test or configure the Contacts.

To conduct a Self Test, click the "Initial Self Test" check box in the UPS Testing box, then click "Apply" button in the lower right. After the test is completed, the results (passed or failed) will display in the field below the button. (Use Figure 6-51&52 for reference)

Figure 6-52: UPS Testing & "Apply" Button

Self Test runs for the period set in
Configuration – UPS Configuration – Maintenance – Battery Test Options

6.c.6.3.4.2 Contacts

The MP2000E front panel terminal block features six 1 Form-C isolated contact closures as well as a Program I/P (Input) Contact Closure. These are edited and programmed through the Contacts screen, which is shown in Figure 6-51.

The Contact Status screen lists each of the contacts and their assigned functions. To edit any of the Form C contact functions, click the "Edit" button to the right of the function description. Doing so will cause the Contact Control box to appear in a pop-up window. This is illustrated in Figure 6-53.

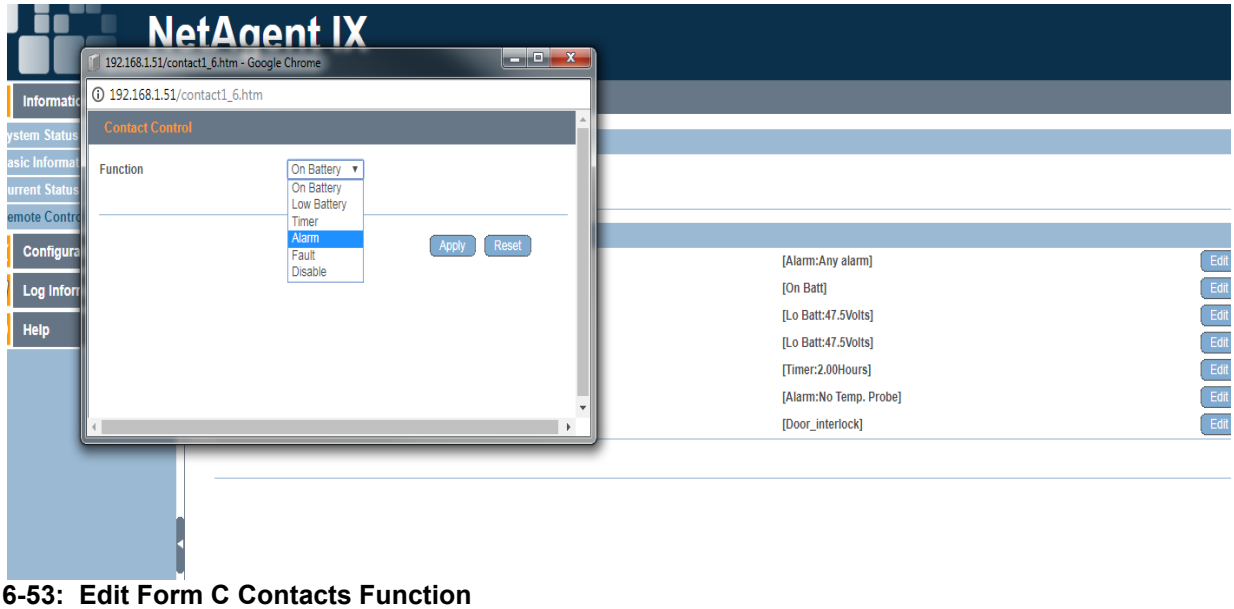


Figure 6-53: Edit Form C Contacts Function

As shown in Figure 6-53, there are six assignable functions for these contacts. Functions may be selected through the drop down menu.

Similarly, the parameters associated with each function can be selected through a drop down menu associated with this field. This is illustrated in Figure 6-54.

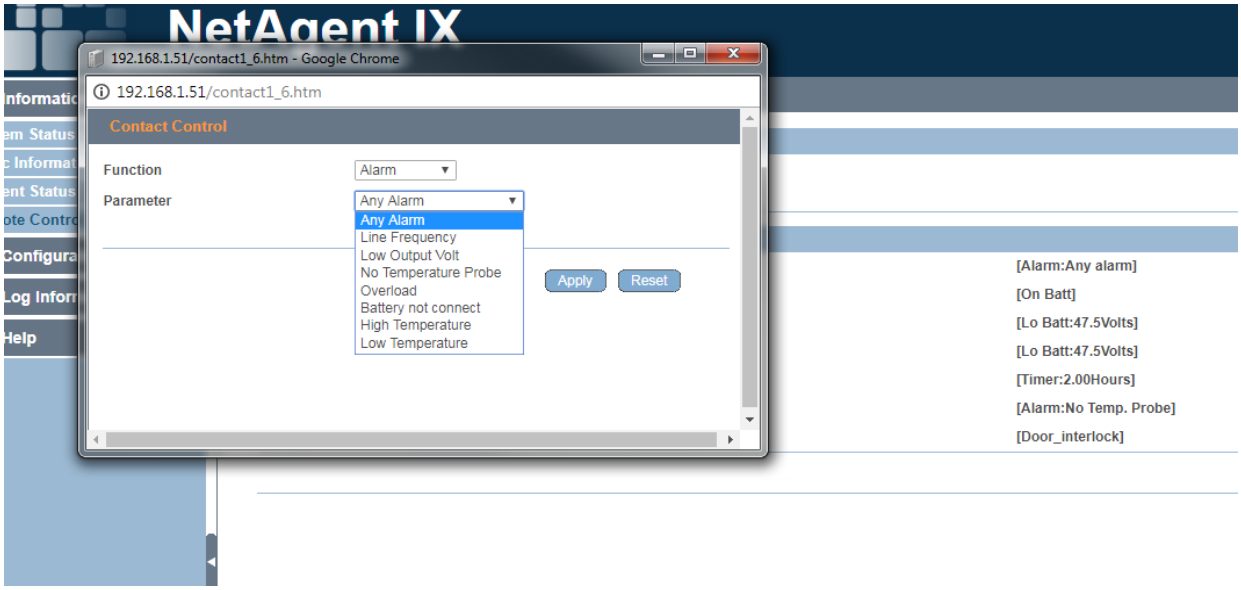


Figure 6-54: Edit Form C Contacts Parameters

To program the I/P Contact, click the edit button next to the function displayed for it. This will cause the Contact Control box for this contact to open, as shown in Figure 6-55. To choose a function for the contact, make a selection from the drop down menu.

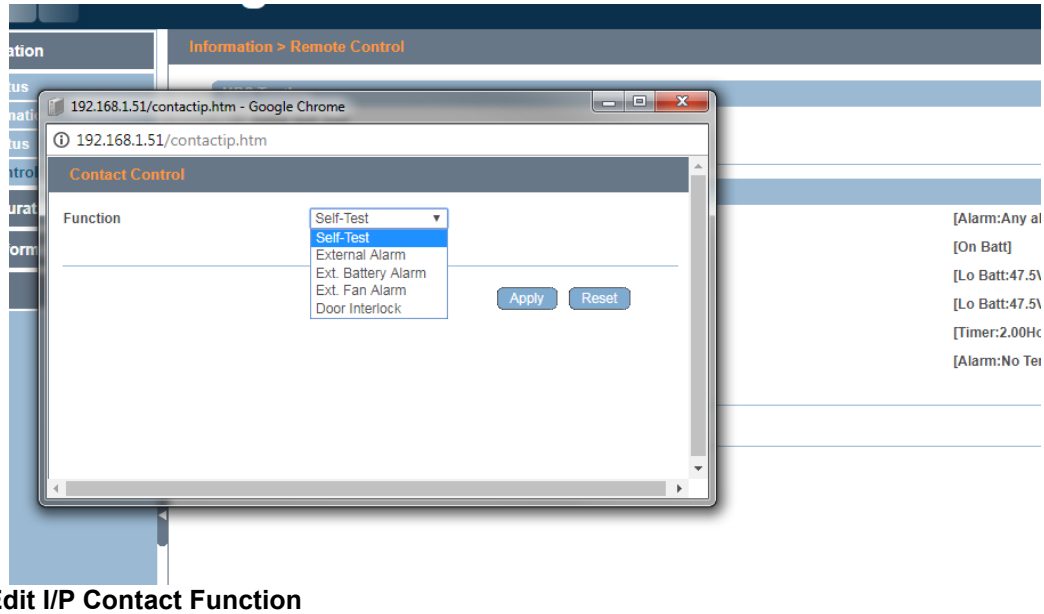


Figure 6-55: Edit I/P Contact Function

6.c.6.4 Making Changes to Settings on Configuration Tab

Click on the Configuration tab to open it and access its settings. The Configuration tab allows users to change the following sets of information:

- **UPS Configuration**
- **Network**
- **SNMP**
- **Email**
- **SMS**
- **Web/Telnet/ FTP**
- **System Time**
- **Language**

To navigate between items, use the tabs on the left.

6.c.6.4.1.1 UPS Configuration

Upon opening the Configuration tab the first item in the left menu, UPS Configuration, is automatically displayed, as shown in Figure 6-56. The MP2000E is designed for 120VAC, 60Hz.

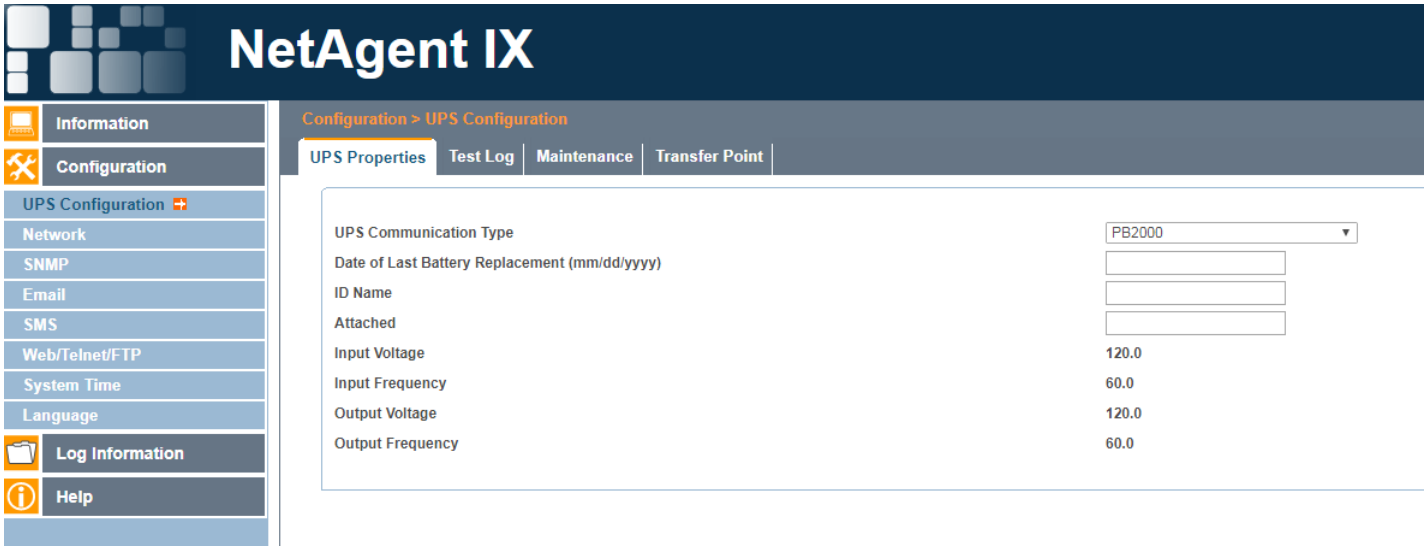


Figure 6-56: UPS Configuration on Configuration Tab

UPS Configuration's upper tabs include Properties, Test Log, Maintenance, and Transfer Points.

6.c.6.4.1.2 Test Log

The Test Log tab is used to set the time intervals at which the UPS logs data.

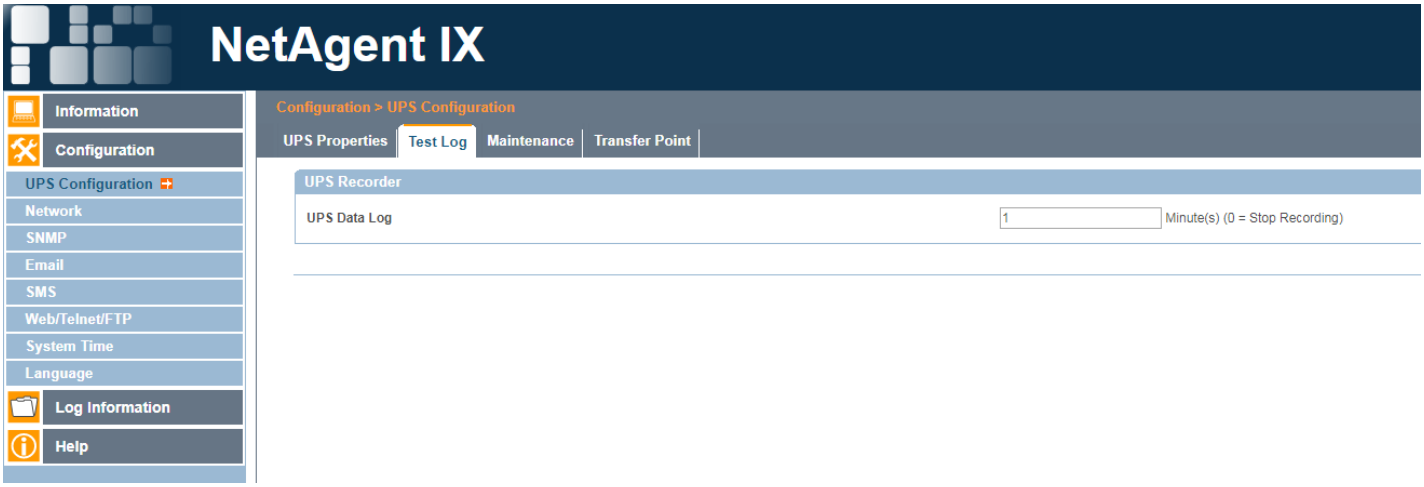


Figure 6-57: UPS Configuration/Test Log on Configuration Tab

6.c.6.4.1.3 Maintenance Configuration

The Maintenance Configuration displays and allows users to modify options related to maintenance. Figure 6-58 details the fields in the form.

FIELD	DETAILS
Line Qualify Options – Line Qualify	This amount of time (in seconds) the MP2000E will remain in standby after VAC (utility) power input while the line is qualified for On Line operation. The default is 30 seconds. Other options are 3 seconds and 10 seconds.
Battery Charging Temperature Compensation	Battery temperature compensation (BTC) is a lead-acid battery charge maintenance function. It is the amount of battery charge voltage rise or fall caused by the battery temperature as determined by the battery temperature probe. Warmer temperatures lower the battery charge voltage and cooler temperatures raise the battery charge voltage. The default value is -3.0 mV / degree Celsius / per (battery) cell. Other options are -2.5mV, -4.0mV, or -5.0mV. Obtain the BTC setting from the battery OEM specification.
Battery Low Voltage Warning	The point at which the system issues a low voltage warning. The default is 47.5 VDC. Values can be selected from the drop-down menu. Note this setting is separate from the Low Battery Contact Closure settings

Figure 6-58: Maintenance Form Fields

FIELD	DETAILS
External Fan On / Off By Temperature	The temperature at which 48VDC (battery voltage) is put to the External Fan connector on the MP2000E front panel. This is typically an exhaust fan to draw air out of an enclosure housing the MP2000E and other equipment. The temperature is determined by a reading taken from the battery temperature probe. The default setting for this function is 25ºC.
Battery Test Options	The number of minutes to test run on batteries.
Inverter On / Off	This function allows the inverter output from the batteries with no VAC input to the UPS. Note the VAC breaker must be ON to get the inverter VAC output. The VAC breaker turns ON / OFF both the VAC input and VAC output simultaneously.
Reset the Event / Timer Counters	Returns the event counters and the timers to zero.
Change Password	Allows the users to reset the MP2000E front panel interface password from the factory default of 1111. Passwords may contain numeric characters only.

Figure 6-58: Maintenance Form Fields (continued)

Figure 6-59 shows the Maintenance Form.

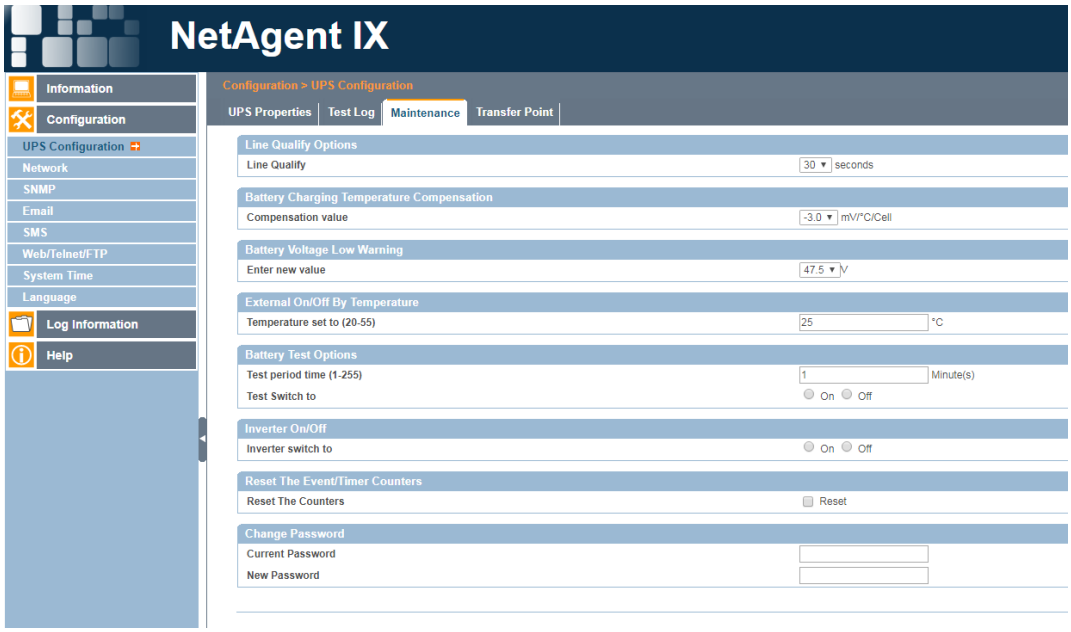


Figure 6-59: Maintenance Form

6.c.6.4.1.4 Automatic Voltage Regulation (AVR) Transfer Point Configuration

AVR is an automatic autotransformer function that steps up (Boost mode operation) UPS output VAC when the VAC input is low and steps down (Buck mode operation) UPS output VAC when the VAC input is high. During AVR, the MP2000E front panel PTS output is constantly energized so that VAC output comes from the UPS rather than bypassing VAC power through the power transfer switch (PTS). Figures 6-60 and 6-61 show the AVR Off Settings and AVR On Settings screens.

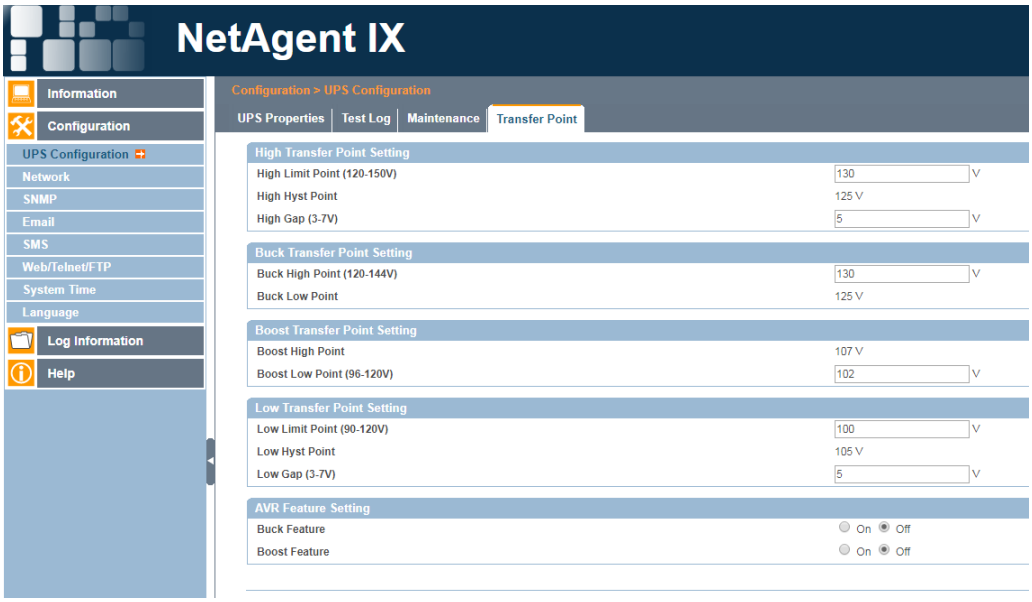


Figure 6-60: AVR Off Settings Form

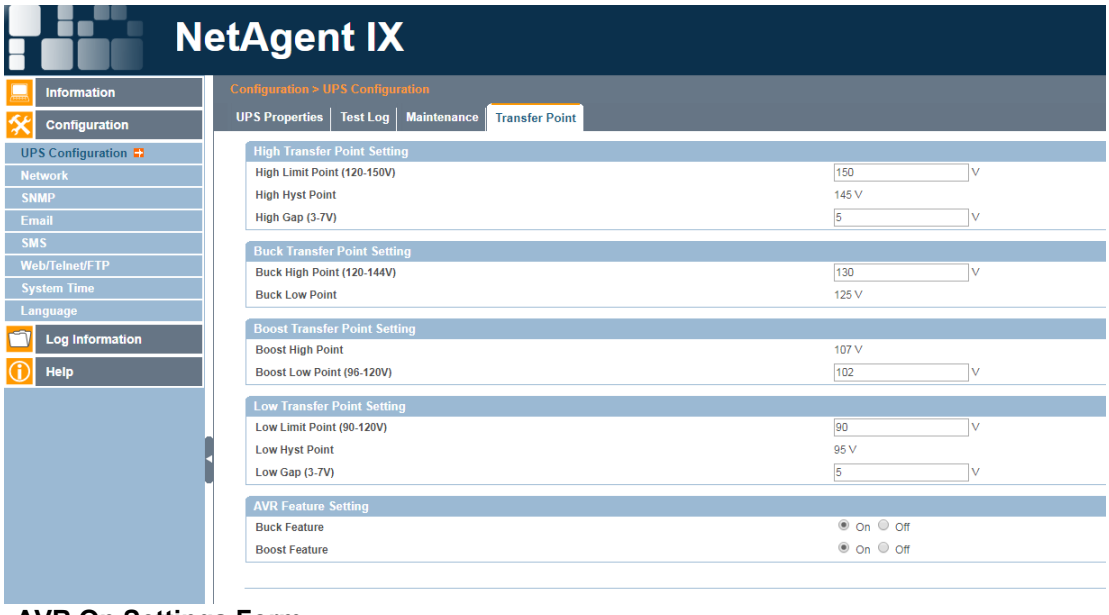


Figure 6-61: AVR On Settings Form

Figure 6-62 describes the fields in the forms.

FIELD	DETAILS
High Voltage Transfer Point Setting	This is the VAC input voltage level at which the UPS switches from On Line to On Battery.
High Limit Point	VAC voltage setting at which the UPS switches from On Line to On Battery.
High Hyst Point	High Hysteresis Point — This is the VAC voltage level down to which the VAC input must lower (after being above High Limit Point) before qualifying for On Line operation.
High Gap	This is a hysteresis of the High Limit Point and the High Hyst Point.
Buck Transfer Point Setting	With AVR Off these settings have no effect.
Buck High Point	VAC voltage setting at which the UPS switches from On Line to Buck mode operation (step down voltage).
Buck Low Point	This is the VAC voltage level down to which the VAC input must lower (after being above Buck High Point) before qualifying for On Line operation.
Boost Transfer Point Setting	With AVR Off these settings have no effect.
Boost High Point	VAC voltage setting at which the MP2000E switches from On Line to Boost mode operation (step up voltage).
Boost Low Point	This is the VAC voltage level down to which the VAC input must raise (after being below Boost Low Point) before qualifying for On Line operation.
Low Voltage Transfer Point Setting	This is the VAC input voltage level at which the MP2000E switches from On Line to On Battery.
Low Limit Point	VAC voltage setting at which the MP2000E switches from On Line to On Battery.
Low Hyst Point	Low Hysteresis Point – This is the VAC voltage level up to which the VAC input must rise (after being below Low Limit Point) before qualifying for On Line operation.
Low Gap	This is a hysteresis of the Low Limit Point and the Low Hyst Point.
AVR Feature Setting	Turn On or Off boost and / or buck operation.

Figure 6-62: AVR Transfer Point Form Fields

6.c.6.4.2 Network

In the Network tab under the larger Configuration tab is where you can edit and configure:

- **IPv4**
- **IPv6**
- **Ethernet**
- **Dynamic DNS**
- **PPPoE**

Fields associated with each of these settings are described in Figure 6-63.

FIELD	DETAILS
IPV4 Method	To have a Dynamic Host Configuration Protocol (DHCP) server assign the IP address: • Click the drop down button next to "Obtain an IP address" • Select "using DHCP • Reboot the HTML Ethernet card to get the DHCP IP address assignment • Use the Netility to find the card by its MAC address Doing so will populate the following fields: • IP Address • Subnet Mask • Default Gateway
Manual Method	Click this drop-down button to set a fixed IP address. Then, enter values into the following fields: • IP Address • Subnet Mask • Default Gateway
MAC Address	The Media Access Control (MAC) address is the unique number on each HTML Ethernet card. The numbering is hexadecimal.
DNS Server 1 IP DNS Server 2 IP	Enter the IP address(es) of up to three Domain Name Servers

Figure 6-63: System Network Screen Fields

Figure 6-64 shows the System Network Screen.

Figure 6-64: Network Screen

6.c.6.4.3 SNMP Configuration

Contact Myers EPS for the MP2000E MIB.

6.c.6.4.4 Email Configuration

In the Email tab under the larger Configuration tab is where the user can set up the ability to send Email notifications.

FIELD	DETAILS
SMTP Server	Enter the IP address of the Simple Mail Transfer Protocol (SMTP) network e-mail server
SMTP Port	Enter the TCP port number used for the SMTP. This is typically port 25.
Authorized	Select enable if the recipient e-mail account requires a user name and password. Select disable otherwise (The typical setting is disable).
From	Enter an e-mail address to which an e-mail reply will be sent.
User Name Password	Enter a user name and password if Authorized enable has been selected.

Figure 6-65: Email Screen Fields

Figure 6-66 shows the E-mail Setting Screen.

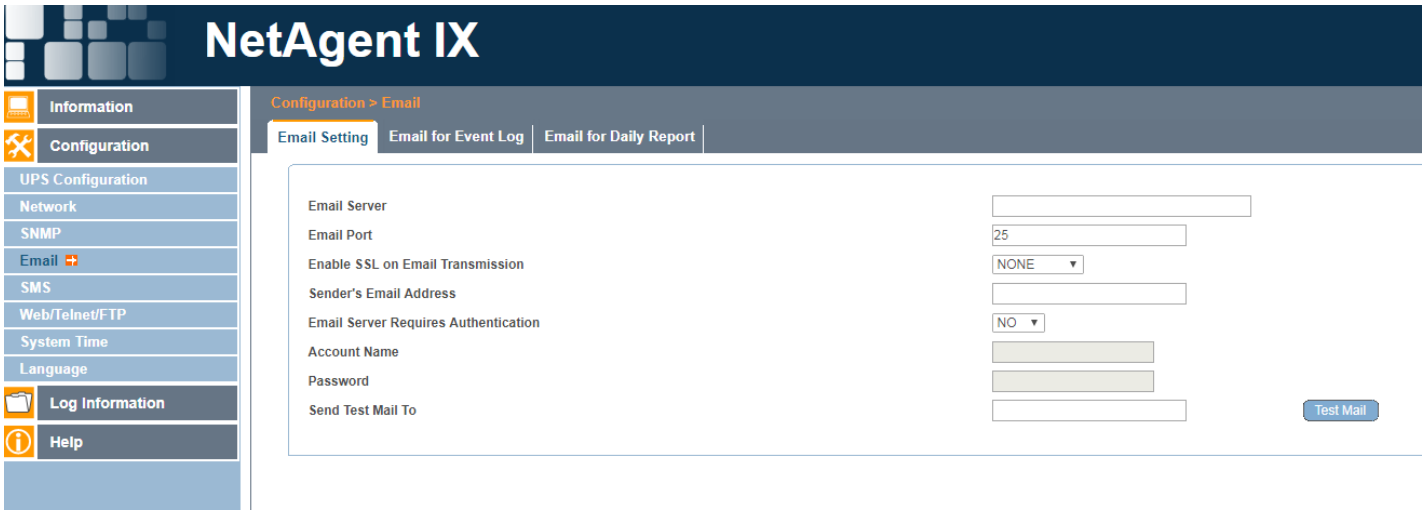


Figure 6-66: Email Settings Screen

After entering data, click the "Apply" button to save the information. Once the information has been saved, click the "Test" button to send a test e-mail to the e-mail address in the From field.

To receive Emails on events click the upper tab labeled "Email for Event Log". Change "Send Email When Event Occurs" to "YES", then add the recipients Email to the list. To select which events the recipient will be Emailed about, click "Select" button next to their Email and a pop up box will appear with a list to select from (Figure 6-67). Once done click "Apply" in the pop up window then again on the main Email for Event Log page.

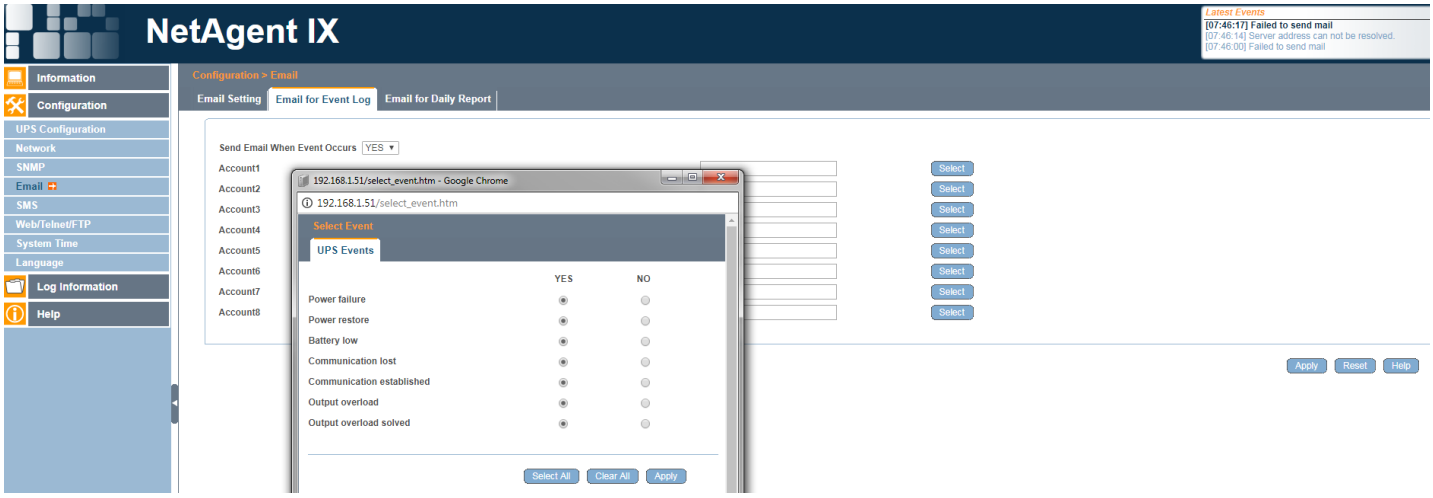


Figure 6-67: Email for Event Log Screen

To enable daily reports, click the last upper tab in the Email section labeled "Email for Daily Report". Change the setting for "Send Email for Daily Report" to "YES", then add the recipients Email address to the list and select "Apply" to save.

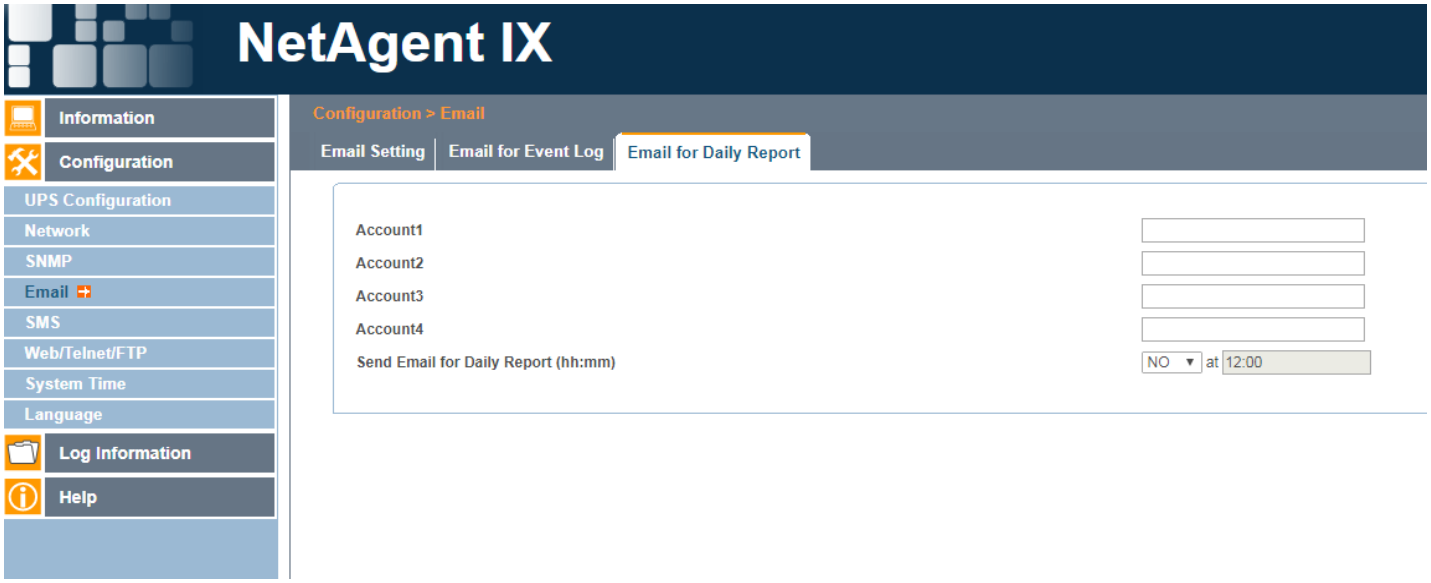


Figure 6-68: Email for Daily Report Screen

6.c.6.4.5 SMS Configuration

Under SMS tab the user can set up mobile alerts by filling their information for SMS Server, SMS Port, Account Name, and Password.

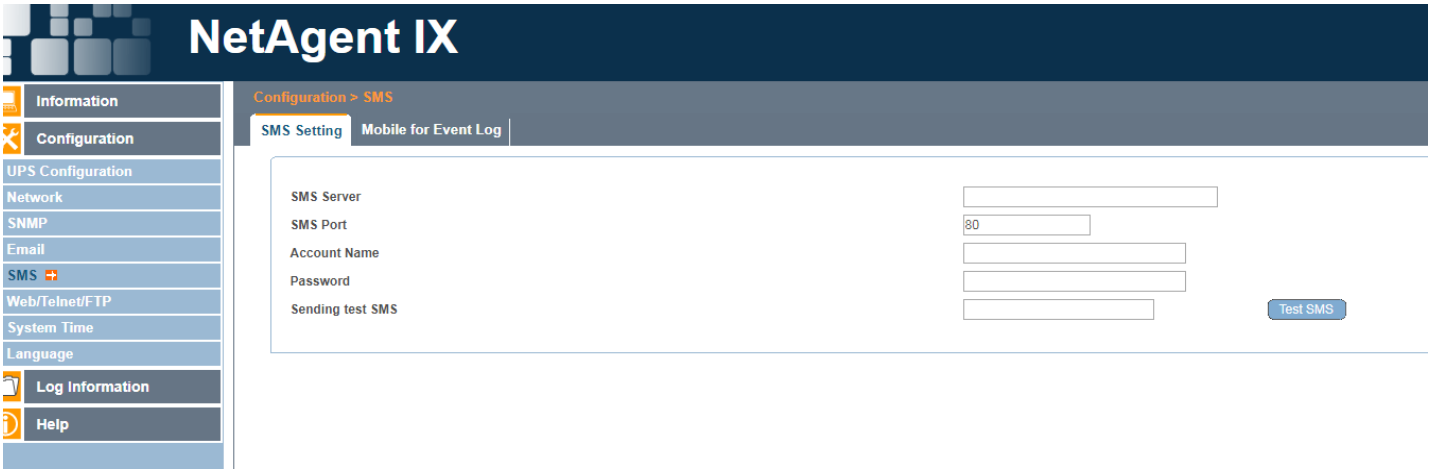


Figure 6-69: SMS Settings Screen

After entering data, click the "Apply" button to save the information.

To receive SMS on events click the upper tab labeled "Mobile for Event Log". Change "Send SMS When Event Occurs" to "YES", then add the recipients cellular phone number to the list. To select which events the recipient will be SMS about, click "Select" button next to their Email and a pop up box will appear with a list to select from (Figure 6-70). Once done click "Apply" in the pop up window then again on the main Mobile for Event Log page.

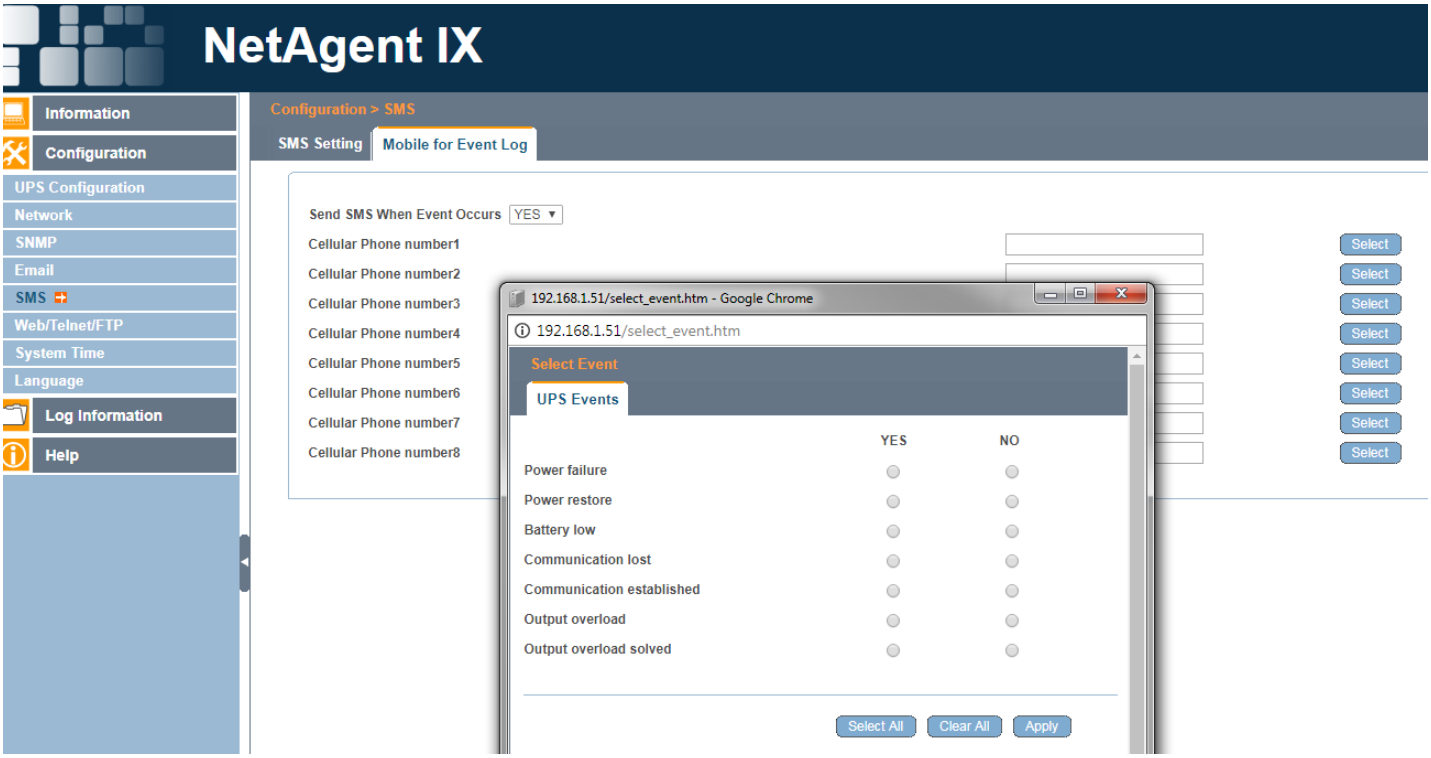


Figure 6-70: SMS for Event Log Screen

6.c.6.4.6 Web/Telnet/FTP Configuration

Under this tab the user can edit login information, User permissions, as well as enabling auto Log Off.

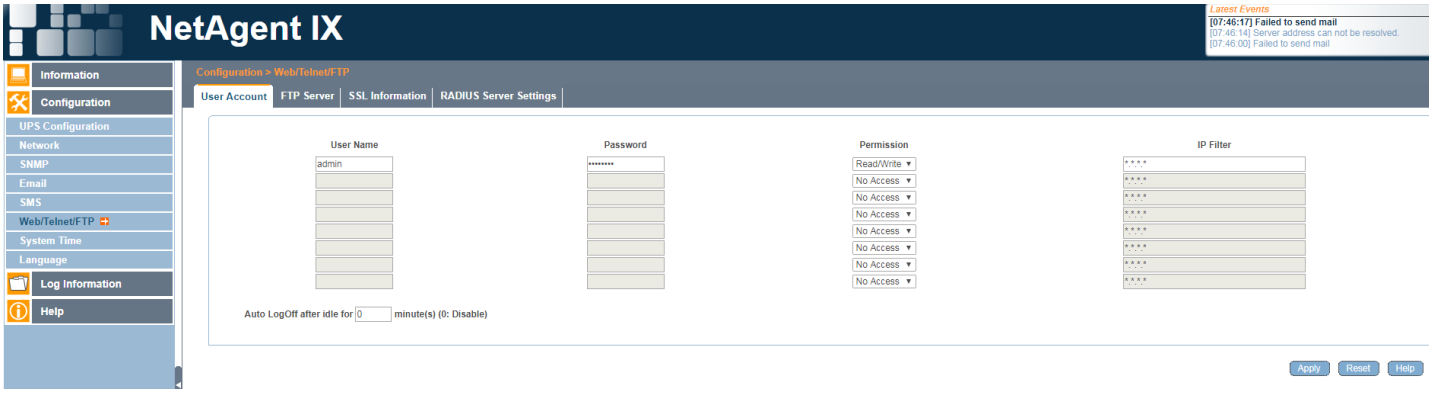


Figure 6-71: User Account Screen

6.c.6.4.7 System Time

The System Time screen allows users to adjust the system date, time, and time zone settings. The date and time settings in this screen set the date and time on the HTML Ethernet card, which provides the date and time stamp in the following Event Actions messages:

- **Log Tab Event Log screen**
- **Log Tab Data Log screen**
- **Information Tab Summary screen**

Details on the fields in this screen are presented in Figure 6-72.

FIELD	DETAILS
Date	Use the pull down menus to select the correct date.
Time	The MP2000E uses a 24-hour (military) time system. Use the pull down menus to select the correct time.
Time Zone	The time zone is set through a drop down menu. Time zone 0 is Greenwich Mean Time. U.S. time zones are as follows: • -5 is Eastern Standard Time • -6 is Central Standard Time • -7 is Mountain Time • -8 is Pacific Standard Time

Figure 6-72: Date and Time Screen Fields (continued)

The date and time stamps controlled by the settings in this Date and Time screen do not control the date/time stamps in the UPS Event Log. These are controlled by the clock on the MP2000E LCD display PCB.

Figure 6-73 shows the Date and Time screen.

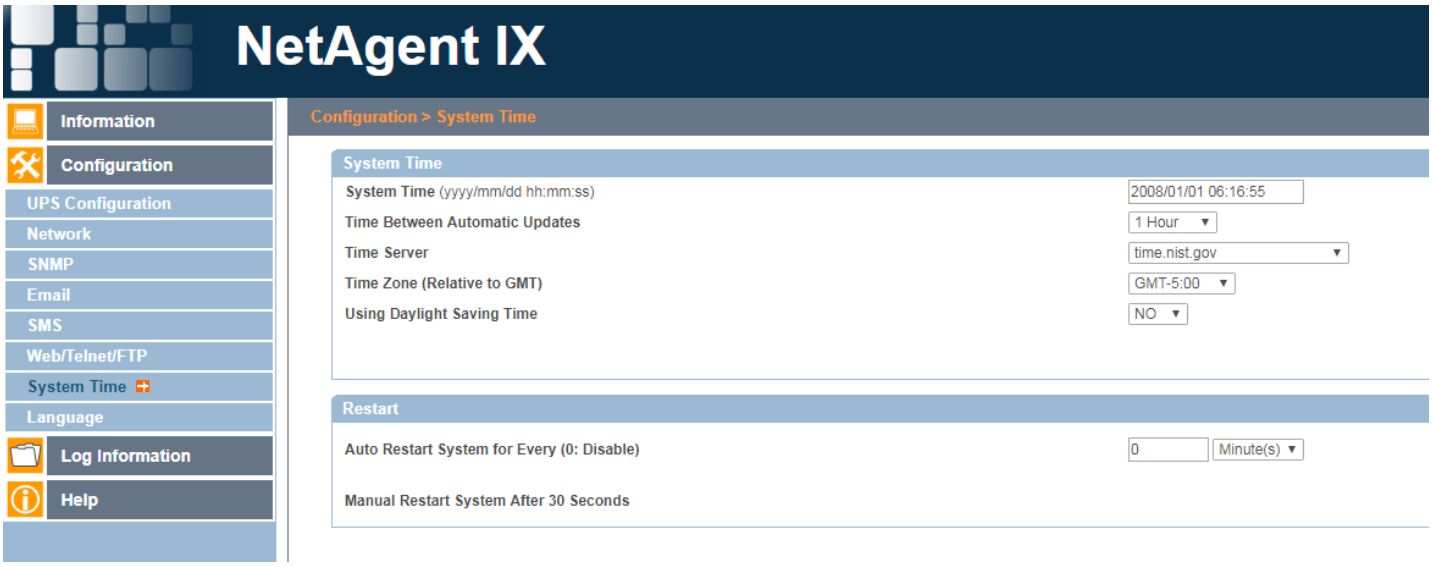


Figure 6-73: Date and Time Screen

6.c.6.4.8 Language

NetAgent IX Language can be set under this tab, as well as the language in which you would like to receive Emails and SMS.

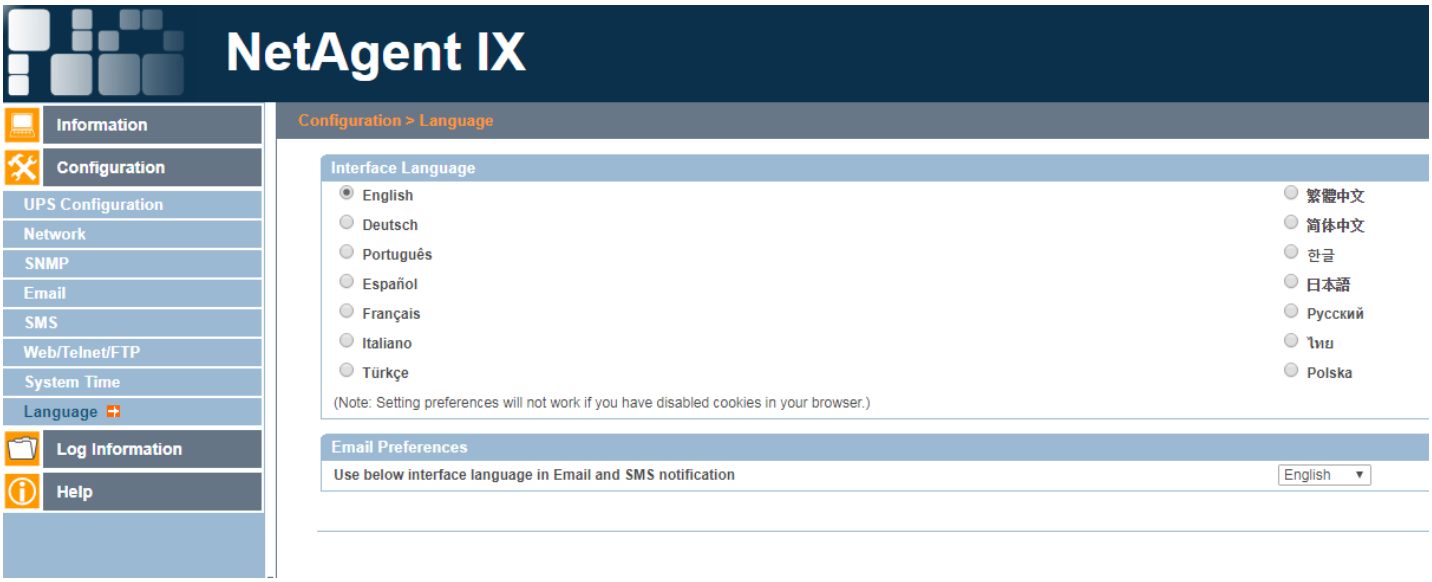


Figure 6-74: Date and Time Screen

6.c.6.4.9 Making Changes to the Log Information Tab

Click on the Log tab to open it and access its settings. The Log tab allows users to change the following sets of information:

- **Event Log**
- **Data Log**
- **UPS Event Log**

To navigate between items, use the tabs on the left.

6.c.6.4.9.1 Event Log Screen

The Event Log in NetAgent IX is the utility that records from the HTML Ethernet card itself and is different from the UPS event log. The Date and Time are the settings of the HTML Ethernet card clock rather than the MP2000E clock. The HTML Ethernet card clock is set in the Configuration – System Time screen. Clicking the "Save" button downloads a text file version of the event log.

Figure 6-75 shows the Event Log screen.

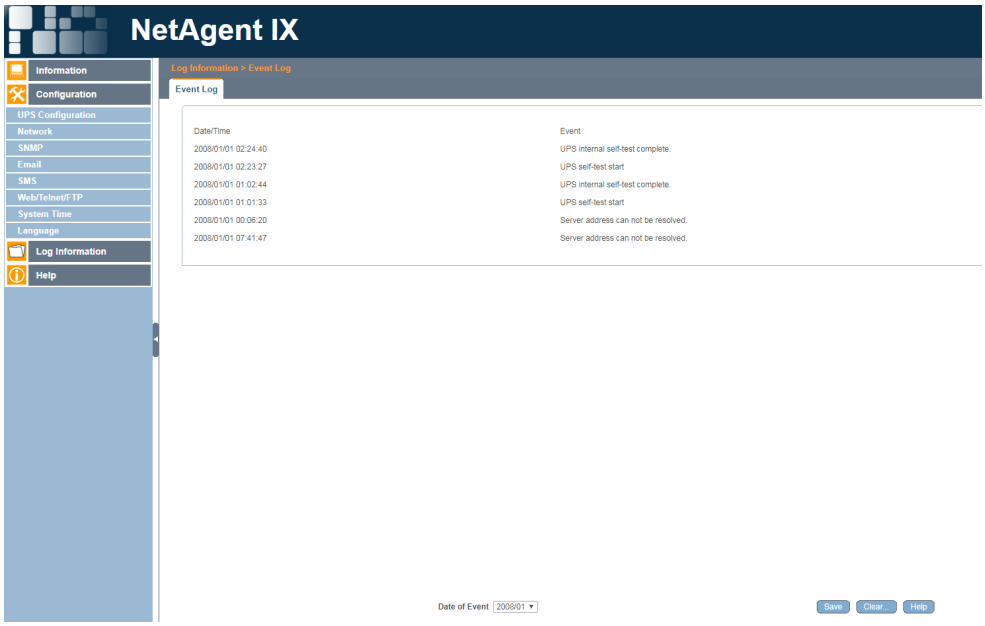


Figure 6-75: Event Log Screen.

6.c.6.4.9.2 Data Log Screen

The Data Log Screen displays the continuous log of readings. To adjust logging intervals, use the Configuration – UPS Configuration - Test Log screen, which is described in Section 6.c.6.4.1.2. Detail regarding the fields on this screen is presented in Figure 6-76.

FIELD	DETAILS
Date and Time	Date and Time are the settings of the HTML Ethernet card clock rather than the MP2000E clock. The HTML Ethernet card clock is set in the System – Date and Time screen.

Figure 6-76: Data Log Screen Fields

FIELD	DETAILS
Temp	The battery temperature probe reading, in degrees Celsius.
Download	This button downloads a text version of the data log.

Figure 6-76: Data Log Screen Fields (continued)

Figure 6-77 shows the Data Log screen.

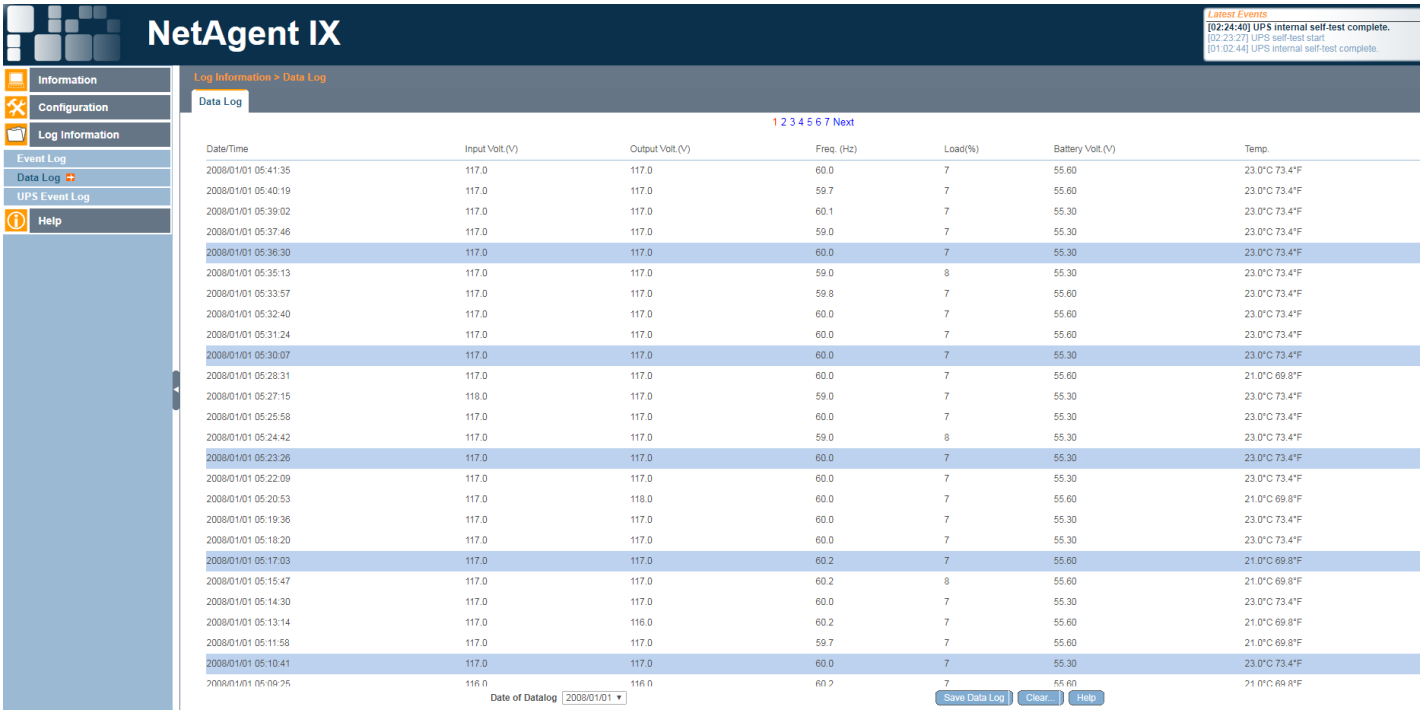


Figure 6-77: Data Log Screen

6.c.6.4.9.3 UPS Event Log

The UPS Event Log screen records various readings and statuses related to the state of the UPS. Figure 6-78 provides a description of each field in the log.

FIELD	DETAILS
Date and Time	The settings of the MP2000E clock rather than the HTML Ethernet card clock.
Vin	MP2000E VAC input.
Vout	MP2000E VAC output
Fin	MP2000E VAC line frequency input, in hertz
Pout	MP2000E power output, in watts
Vbat	Battery voltage / (fluctuating) battery charge voltage
Tbat	Battery temperature probe measurement, in degrees Celsius
Ths, Vds1, Vds2	Values used by engineering for detailed theory of operation analysis
AVR Status	Automatic Voltage Regulation status; indicates MP2000E operating status (e.g. On-Line Boost, On-Line Buck, On-Line Normal, On-Batt, etc.) See the Section 6.c.6.4.1.4 for details on AVR.

Figure 6-78: UPS Event Log Screen Fields

To access log data, click the update buttons next to the event numbers you wish to view. Doing so will cause them to be displayed in the UPS Event Log box in the upper half of the screen. This view is shown in Figure 6-79.

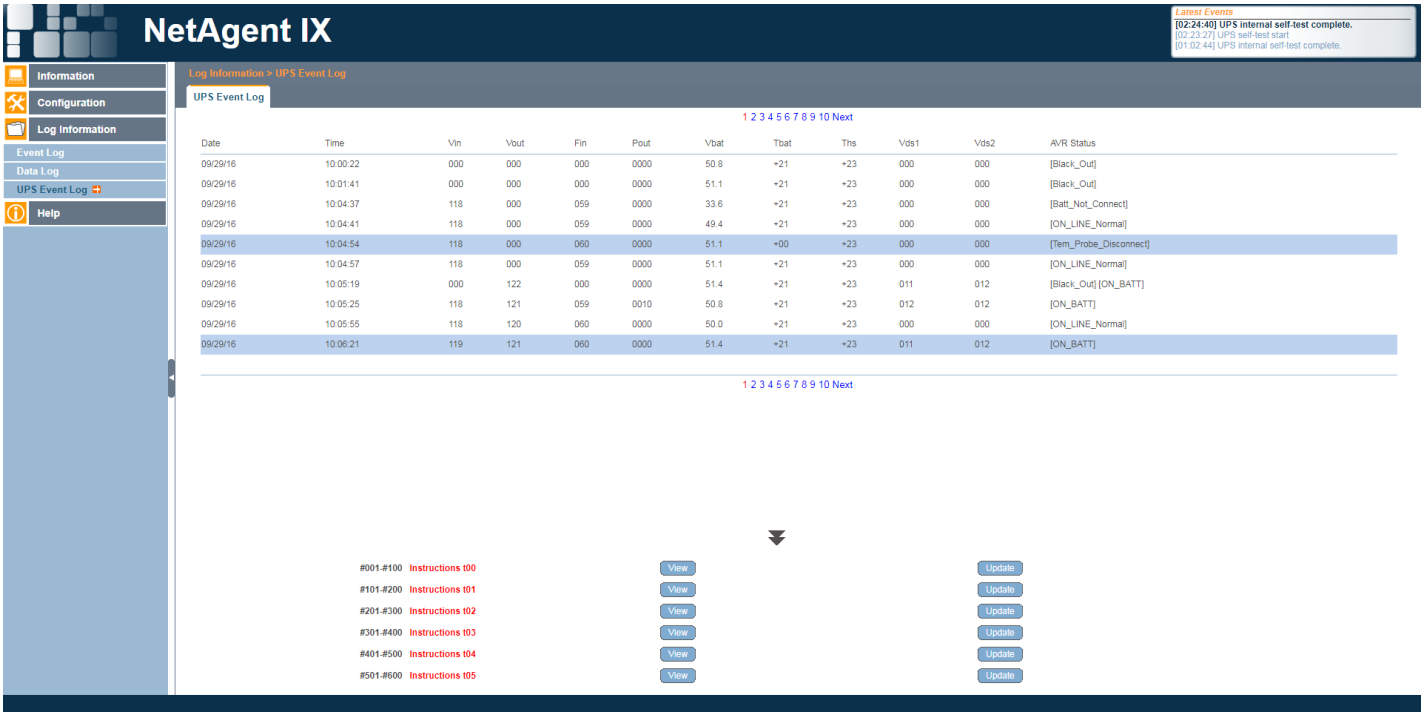


Figure 6-79: UPS Event Log Screen With Detail

6.c.6.4.10 NetAgent Help

NetAgent search screen is similar to Netility search…finds NetAgent cards on the network by their MAC address.

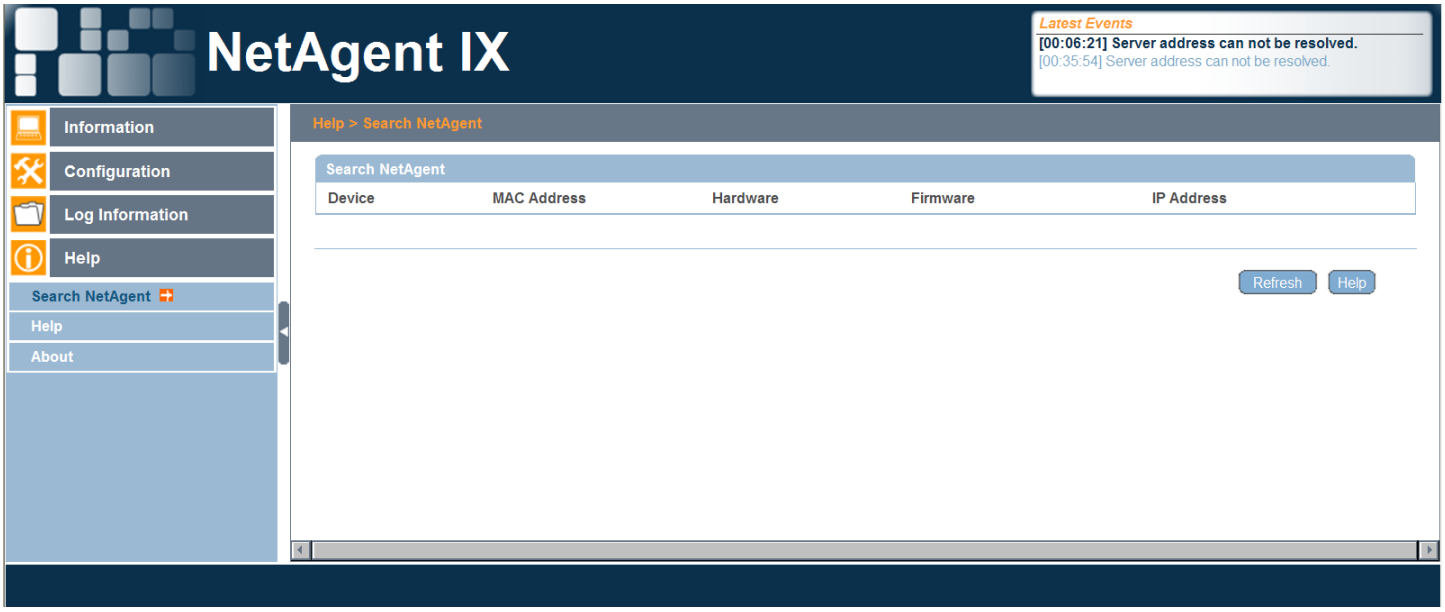


Figure 6-80: NetAgent Search Screen

The Help link brings up the NetAgent OEM help website.

The NetAgent About screen allows for saving and restoring current configurations as well as resetting to factory defaults.

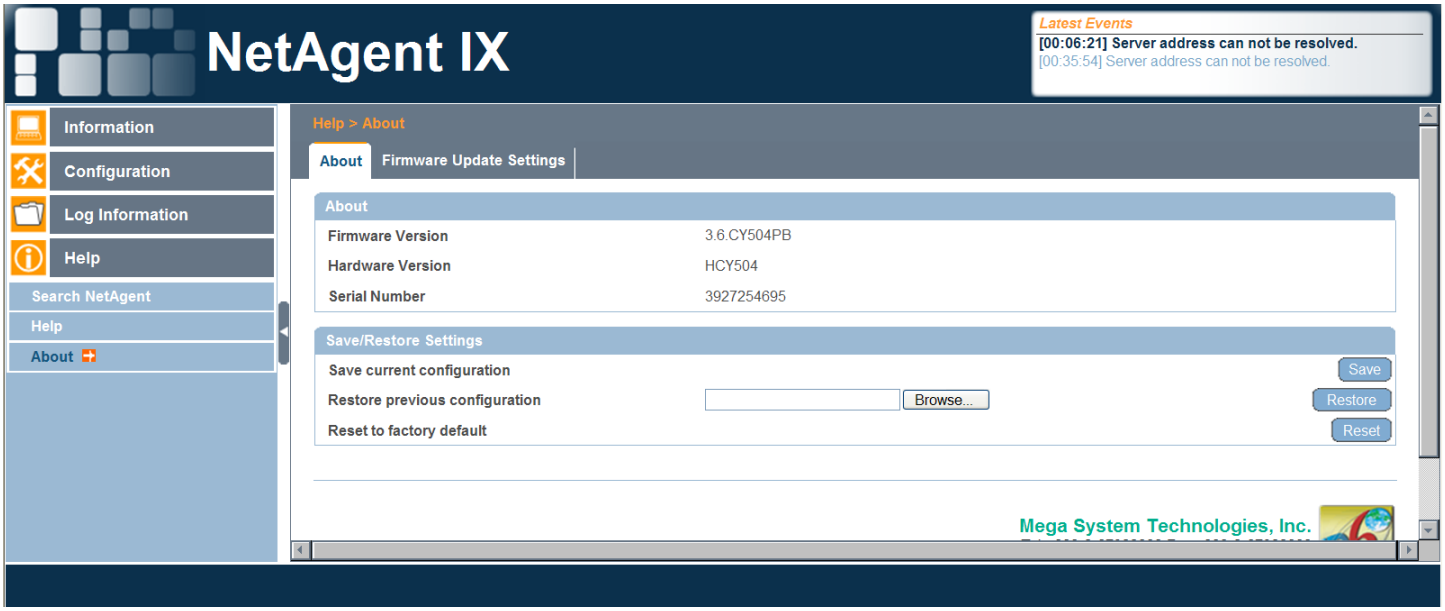


Figure 6-81: NetAgent About OEM Firmware Screen with Settings Save / Restore / Reset to Default

Figure 6-82 shows the NetAgent OEM firmware update screen…
for the CY504-01g-PB-LF card installed in Myers EPS MP2000E
use the Netility.exe firmware update provision (Netility is on the accompanying DVD)

A firmware .bin file associated with the Myers MP2000E power supply comes from Myers EPS.

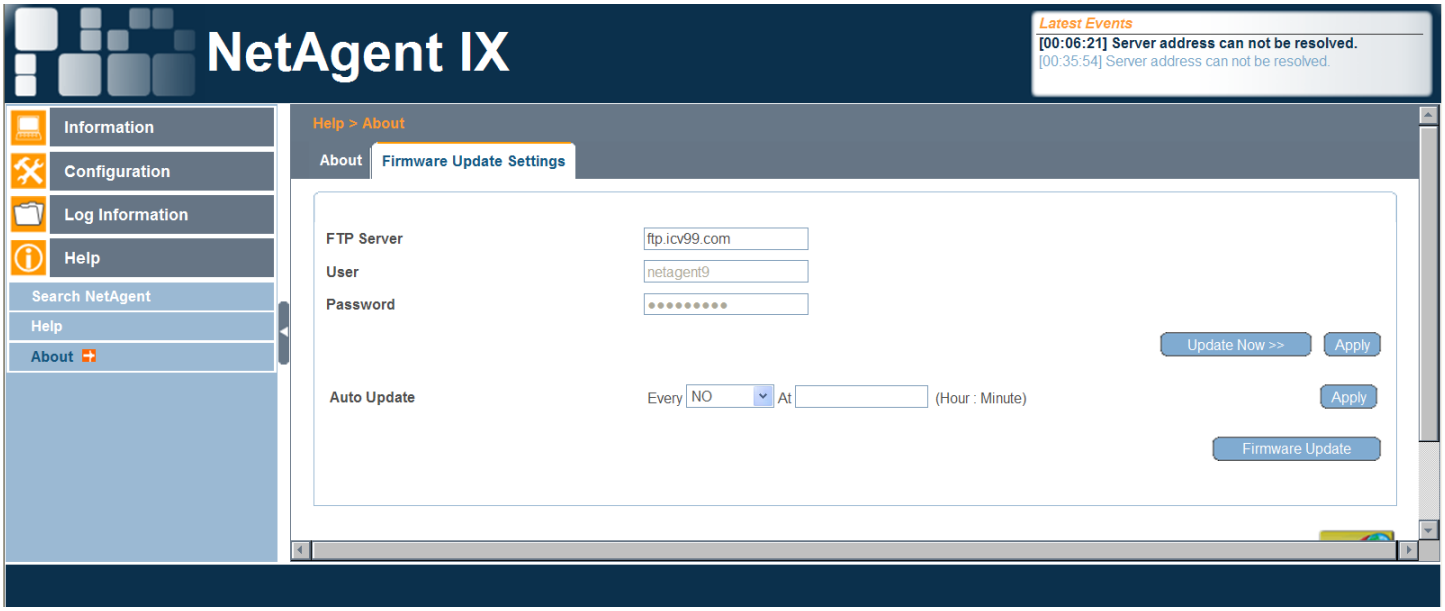


Figure 6-82: NetAgent OEM Firmware Screen

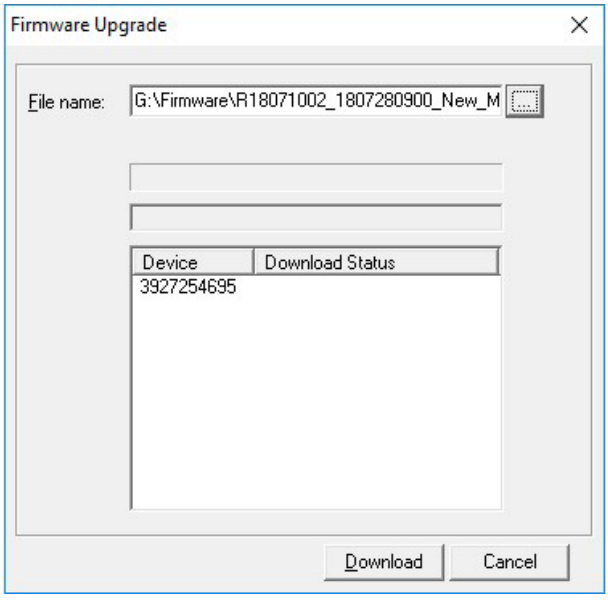


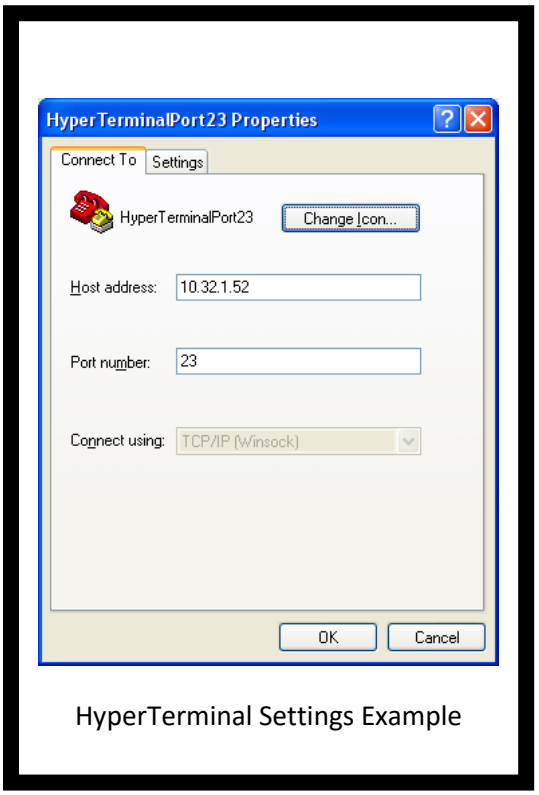
Figure 6-83: Netility Firmware Update Screens

6.c.6.4.11 NetAgent Telnet Screens

From the command line prompt e.g. C:>telnet [NetAgent card IP address]
Alternatively use a terminal emulator such as Hyperterminal

<<<<< Main Menu >>>>>
<<<<<----------->>>>>
1. Set IP Address.
2. Set SNMP MIB System.
3. Set SNMP Access Control.
4. Set SNMP Trap Notification.
5. Set UPS Properties.
6. Set UPS Devices Connected.
7. Set System Time & Time Server.
8. Set Web and Telnet User Account.
9. Set E-mail.
a. Reset Configuration to Default & Reboot
c. Save & Reboot.
0. Exit Without Saving.

Select =>



HyperTerminal Settings Example

<<<<< Set IP Address >>>>>
<<<<<----------->>>>>
1. IP Address. (192.168.1.51)
2. Gateway Address. (192.168.1.1)
3. Subnet Mask. (255.255.255.0)
4. Obtain an IP address automatically. (By manual)
5. IPv6 Address. (::)
6. Obtain an IPv6 address method. (Automatic)
7. Router Discovery Autoresend. (YES)
8. Obtain an DNS Server IP address method. (By manual)
9. Primary DNS Server IP. (212.1.120.3)
a. Secondary DNS Server IP. (nameserver)
b. Third DNS Server IP. ()
c. Fourth DNS Server IP. ()
0. Return to Main Menu.

Select =>

<<<<< Set SNMP MIB System >>>>>

<<<<<----------->>>>>

1. System Contact. (Administrator)
2. System Name. (UPS Agent)
3. System Location. (My Office)
0. Return to Main Menu.

SNMP Access Control Settings:

Manager IP	Community	Permission	
1)	public	Read/Write	*.*.*.*
2)	public	No Access	*.*.*.*
3)	public	No Access	*.*.*.*
4)	public	No Access	*.*.*.*
5)	public	No Access	*.*.*.*
6)	public	No Access	*.*.*.*
7)	public	No Access	*.*.*.*
8)	public	No Access	*.*.*.*

Obtain the MP2000E MIB from Myers EPS

<<<<< SNMP Access Control >>>>>

<<<<<----------->>>>>

1. Add.
2. Delete.
0. Return to Main Menu.

Select =>

SNMP Trap Notification Settings:

	Receiver IP	Community	Trap Type	Severity	Accept
1)		public	PPC	INFORMATIONAL	NO
2)		public	PPC	INFORMATIONAL	NO
3)		public	PPC	INFORMATIONAL	NO
4)		public	PPC	INFORMATIONAL	NO
5)		public	PPC	INFORMATIONAL	NO
6)		public	PPC	INFORMATIONAL	NO
7)		public	PPC	INFORMATIONAL	NO
8)		public	PPC	INFORMATIONAL	NO

<<<<< SNMP Access Control >>>>>
<<<<<----------->>>>>
1. Add.
2. Delete.
0. Return to Main Menu.

Select =>

<<<<< Set UPS Properties >>>>>
<<<<<----------->>>>>
1. UPS Communication Type. (Not Defined)
2. UPS Device Name. ()
3. Last Battery Replacement Date.(mm/dd/yyyy) ()
4. UPS Model. ()
5. UPS Voltage Rating. (1100)
0. Return to Main Menu.

Select =>

Devices Connected Settings:

	System Name	Rating	Connected
1		0 (%)	NO
2		0 (%)	NO
3		0 (%)	NO
4		0 (%)	NO

<<<<< Set Devices Connected >>>>>
<<<<<----------->>>>>
1. Add.
2. Delete.
0. Return to Main Menu.

Select =>

<<<<< Set System Time & Time Server >>>>>
<<<<<----------->>>>>
1. Set Date(yyyy/mm/dd HH:MM:SS). (2008/01/01 01:34:19)
2. Automatically Check Every (60) Minutes
3. Set Time Server. (time.nist.gov)
4. Set Time Zone. (-800)
5. Using Daylight Saving Time.(YES)
0. Return to Main Menu.

Select =>

Web and Telnet User Account:

	User Name	Password	Access Rights	IP Address
1)	admin	****	Read/Write	*.*.*.*
2)			No Access	*.*.*.*
3)			No Access	*.*.*.*
4)			No Access	*.*.*.*
5)			No Access	*.*.*.*
6)			No Access	*.*.*.*
7)			No Access	*.*.*.*
8)			No Access	*.*.*.*

<<<<< User Account >>>>>

<<<<<----------->>>>>

1. Add.
2. Delete.
0. Return to Main Menu.

Select =>

<<<<< Set E-mail >>>>>

<<<<<----------->>>>>

1. Email Server Name or IP. ()
2. Email Server Port. (25)
3. Email Server Requires Authentication. (NO)
4. Email Account Name. ()
5. Email Password. ()
6. Sender Account. ()
7. Event Email Recipient. ()
8. Send Email When Trap Occurs. (NO)
9. Send Email for Daily Report. (NO)
a. Daily Report Email Recipient.() at (12:00:00)
0. Return to Main Menu.

Select =>

6.c.6.4.12 Ethernet-to-Serial Adapter Card IPV4

The Ethernet-to-serial card inserts into the MP2000E UPS front panel. Figure 6-84 shows the front panel with annotations.

Figure 6-84: MP2000E UPS Front Panel

Default IP: **192.168.0.10**
SubNet Mask: **255.255.255.0**

Default Password: 1111

NOTE THESE SETTINGS ARE FOR THE ETHERNET-TO-SERIAL ADAPTER CARD. FOR THE NETAGENT HTML CARD SEE THAT SECTION ELSEWHERE IN THIS MANUAL

The Ethernet-to-serial adapter interfaces with a terminal emulator (such as Hyperterminal) and with Myers Emergency Power Systems MEMS software.

There are two versions of the Ethernet-to-serial adapter card, one of which is longer than the other. The MP2000E models with serial numbers that begin "MC" use the longer version of the card and those with serial numbers that begin with "MD" use the shorter version of the card. Both versions are shown in Figure 6-85…functionally they're identical.

Figure 6-85: Ethernet to Serial Adapter Cards

6.c.6.12.1 Making the IPV4 Ethernet-to-Serial Connection

Use either the Etm.exe utility or make a RJ45 cross-over cable direct connection between
a PC and the MP2000E Ethernet-to-serial adapter.
An RJ45 cross-over cable direct connection requires administrator's access to the PC.

6.c.6.12.1.1 Using a Direct PC to Ethernet Card Connection

Interconnect the MP2000E Ethernet card and PC with an RJ45 cross-over cable.
Go to the PC's Networks Settings and select
" Internet Protocol (TCP/IP)" then "Properties."

With the Ethernet-to-serial adapter card set to default IP 192.168.0.10
set the PC to a fixed IP address of 192.168.0.xxx, where xxx is any number zero to 255 except 10.
Leave the subnet mask at 255.255.255.0. These steps are illustrated in Figure 6-86.

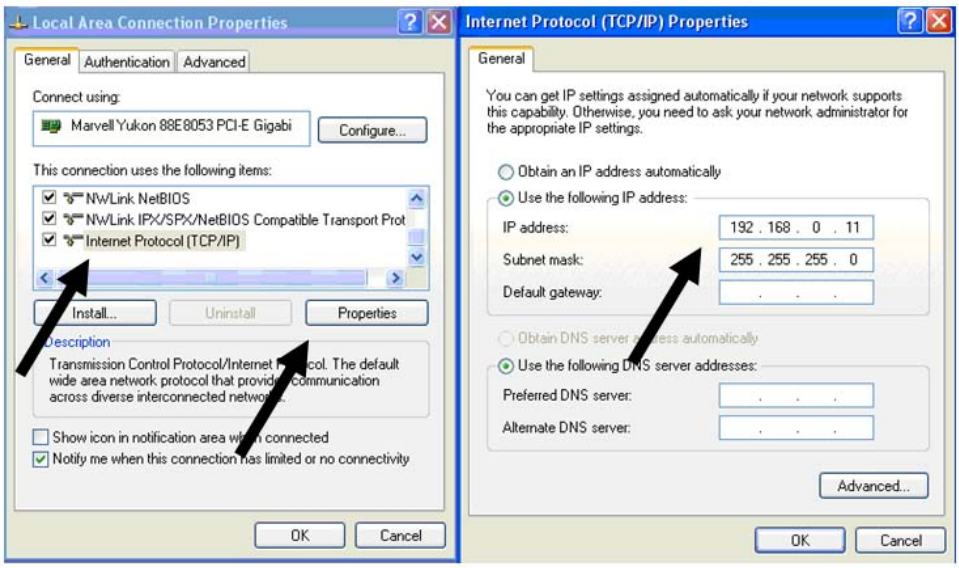


Figure 6-86: Using a Direct PC to Ethernet Card Connection

Performing these tasks requires Administrator's access to the PC.

6.c.6.12.1.2 Using the ETM.exe Utility

Use the ETM.exe utility to find the Ethernet to serial adapter card on the network by its MAC address. The default IP address is 192.168.0.10 with subnet 255.255.255.0, as shown in Figure 6-87.

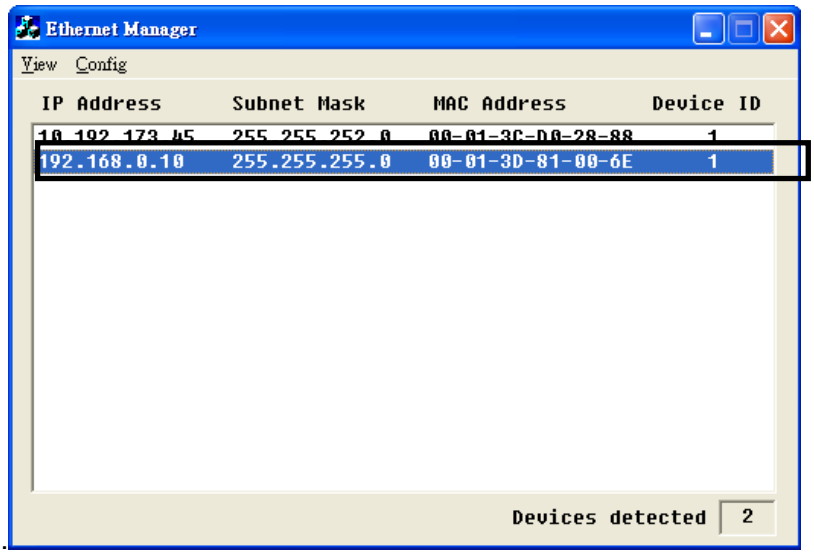


Figure 6-87: Ethernet Manager Dialog Box

Click on "Config" to change the IP address, as shown in Figure 6-88. The card can be set for DHCP later in the web browser controller setup screen.

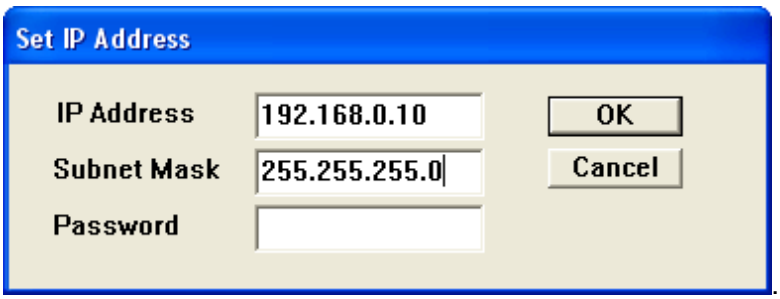


Figure 6-88: Set IP Address Dialog Box

The default password is 1111.

6.c.6.12.1.3 Controller Setup Web Browser Screen

Open a web browser and enter the Ethernet card's IP address in the URL field. This will access to Controller Status screen, which is shown in Figure 6-89.

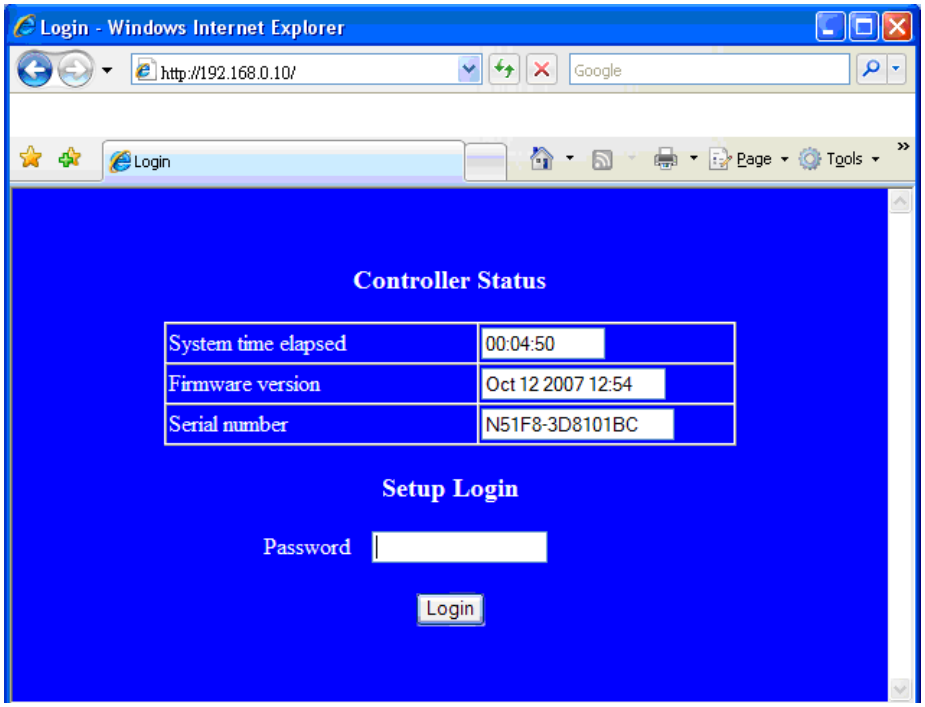


Figure 6-89: Controller Status Screen

The default password is 1111.

The Controller Setup screen appears after the login. The fields in this screen are detailed in Figure 6-90. See Figure 6-92 controller setup screen shot.

FIELD	DETAILS
IP Address Subnet Mask Default Gateway	If not using DHCP, enter data into these fields
Network Link Speed	The Network link speed is set through a pull-down menu. It is typically set to "auto" although other available values are: • 10 full-duplex • 100 full-duplex • 10 half-duplex • 100 half-duplex
DHCP Client	If you have manually entered IP address data, choose "disable" from the pulldown menu in this field.
Socket Port of HTTP Setup	This is the IP socket port number. Port 80 is the standard (TCP) socket port number for hyper text transfer protocol (HTTP). Other values are "81" and "disabled."
Socket Port of Serial I / O	The Default is 100 — make the number correspond to the terminal emulator (HyperTerminal) serial I / O setting or Myers Emergency Power Systems MEMS serial I / O setting. Configure the card for TCP server.
Destination IP Address / Socket Port (TCP Client and UDP) Connection	These settings correspond to the "TCP Client" and "UDP" selection in "Socket port of serial I/O." Refer to the Hyperterminal Example in Figure 6-113.
TCP Socket Inactive Timeout (in minutes)	The default is 10 minutes.
Serial I / O Settings Interface of Serial I / O Packet Mode of Serial Input	With the Ethernet-to-serial adapter card installed in the MP2000E, leave these settings unchanged. These are the RS232 Communication settings between the Ethernet card and the MP2000E. Serial I/O settings (baud rate, parity, data bits, stop bits): 2400 N 8 1 Interface of serial I/O: RS 232 Packet mode of serial input: Disable
Setup Password	This allows the Controller Setup access password to be changed. The default is 1111.

Figure 6-90: Controller Setup Screen Fields

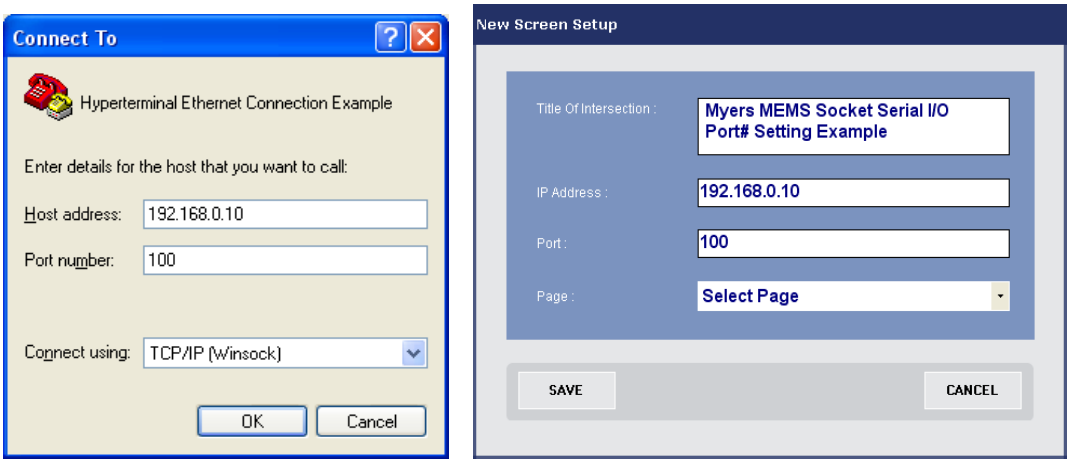


Figure 6-91: HyperTerminal Example

The Ethernet to serial adapter card defaults to port 100.

Figure 6-92 shows the Controller Set Up Screen.

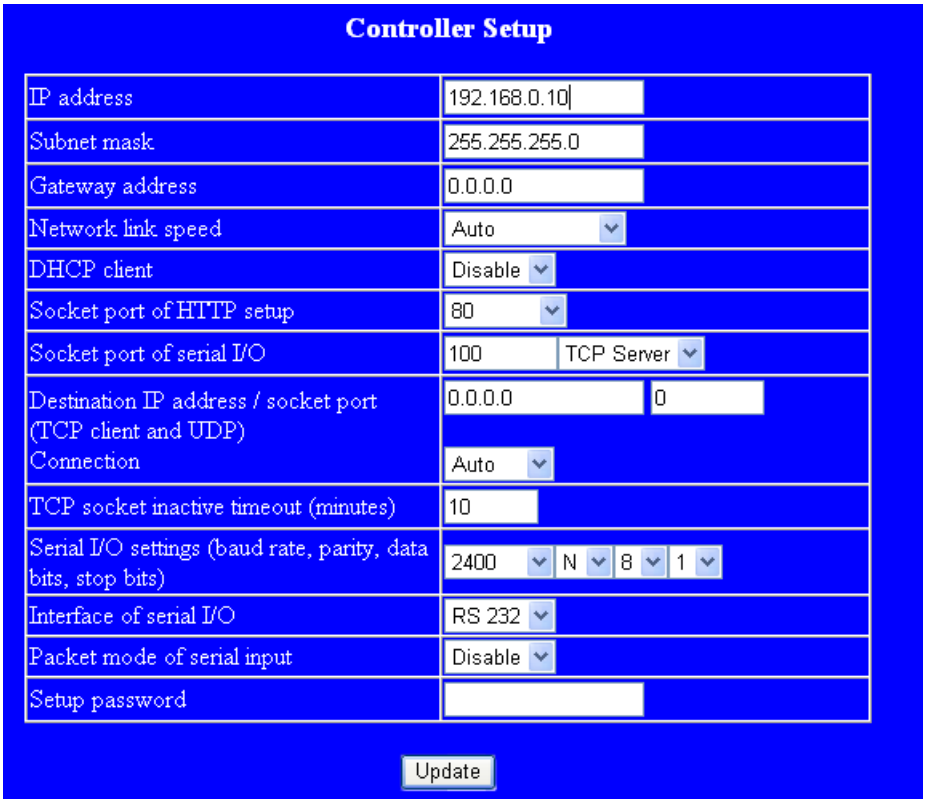


Figure 6-92: Controller Set Up Screen

6.c.6.12.2 Terminal Emulator Setup Example

To follow is an example of HyperTerminal setup.

1. **Start the HyperTerminal program and assign it a name, as shown in Figure 6-93.**

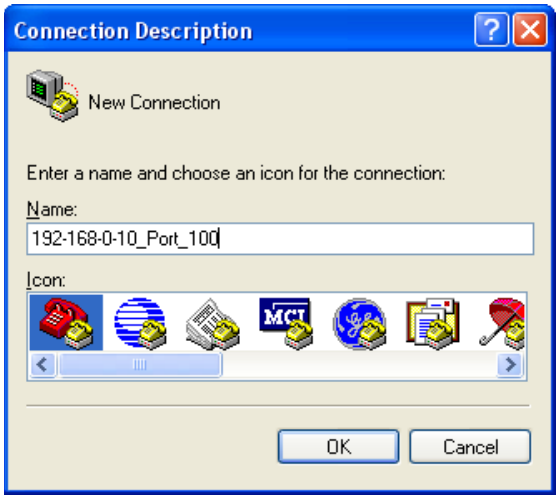


Figure 6-93: Start HyperTerminal Program

Press OK. This will bring up the Connect To screen. Select the TCP / IP (Winsock) from the drop down menu as shown in Figure 6-94.

Figure 6-94: Connect To Screen

Enter the IP address and port number of the Ethernet–to–serial adapter card, then press OK. This is shown in Figure 6-95.

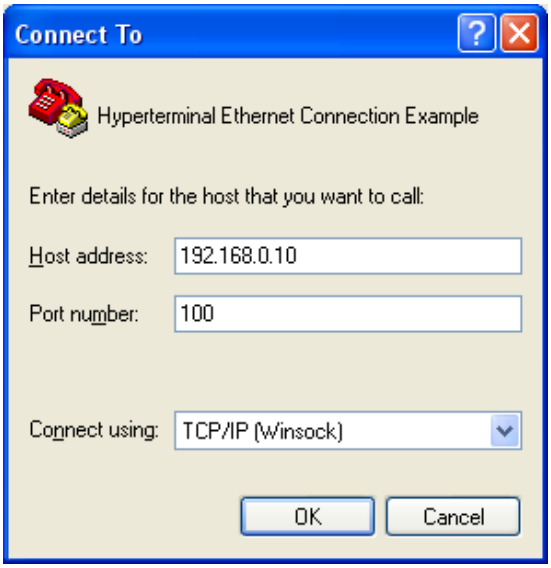


Figure 6-95: Enter IP Address

3. **The terminal emulator screen interface will appear while HyperTerminal connects to the card. This is shown in Figure 6-96.**

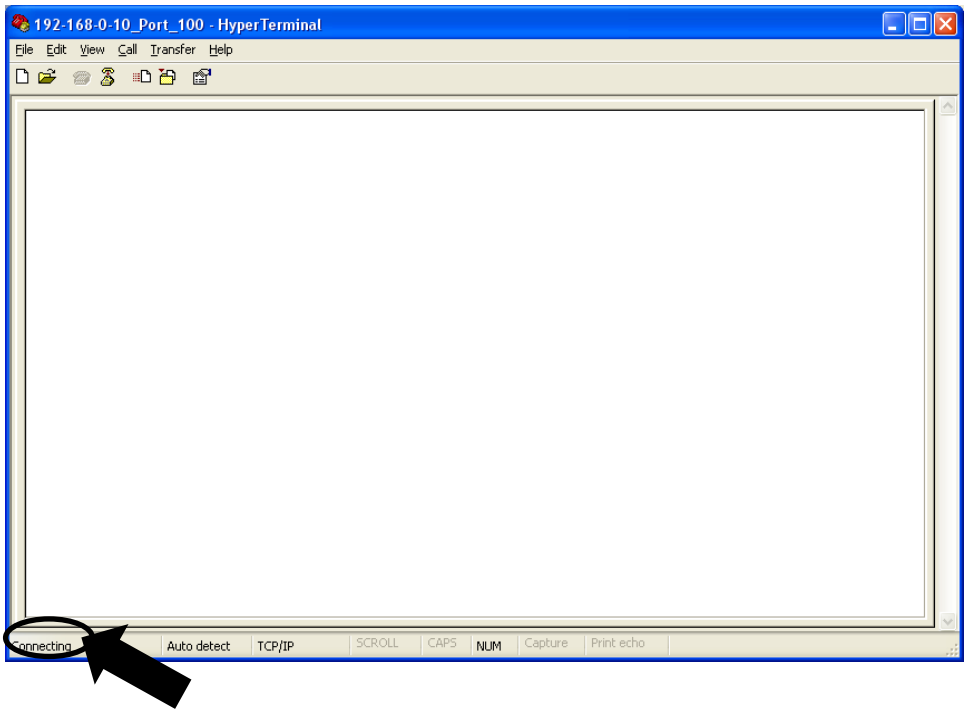


Figure 6-96: Terminal Emulator Screen Interface

4. **Next, set up the ACSII text formatting by going to File>Properties>Settings>ASCII Set. Make the selections shown in Figure 6-97.**

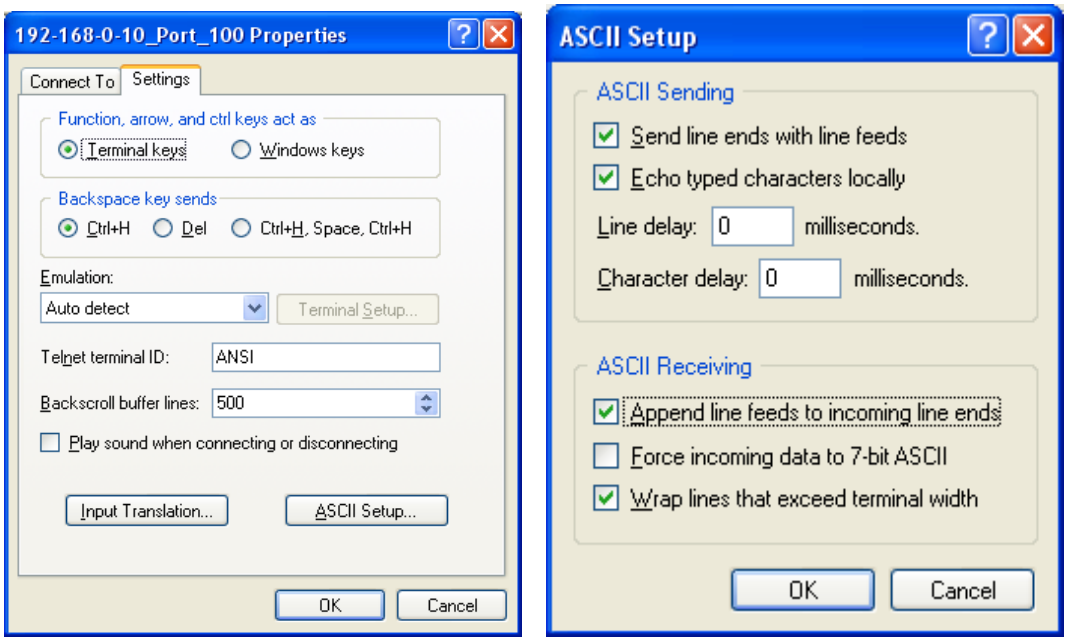


Figure 6-97: ASCII Text Formatting Set Up

5. **Go to the HyperTerminal Interface Screen and press "Enter" on the PC keyboard, as shown in Figure 6-98.**

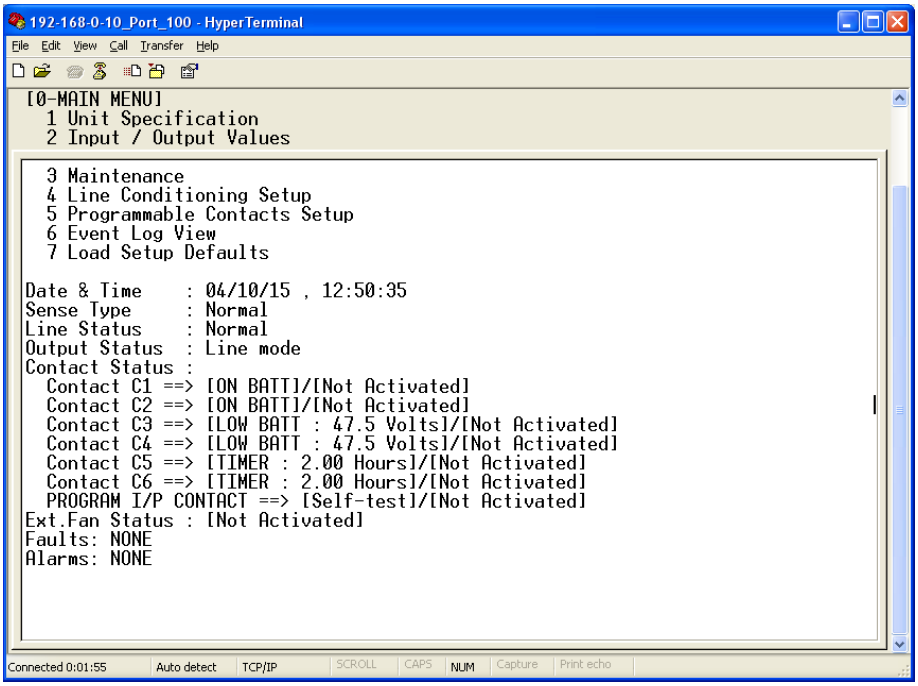


Figure 6-98: HyperTerminal Main Menu Screen

See the HyperTerminal menu information elsewhere in this manual.

Section 7 Maintenance

7.a Preventive Maintenance

7.a.1 Battery Backup Time Test

This Battery Backup Time Test measures 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. It is recommended that this test be performed every six months.

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.

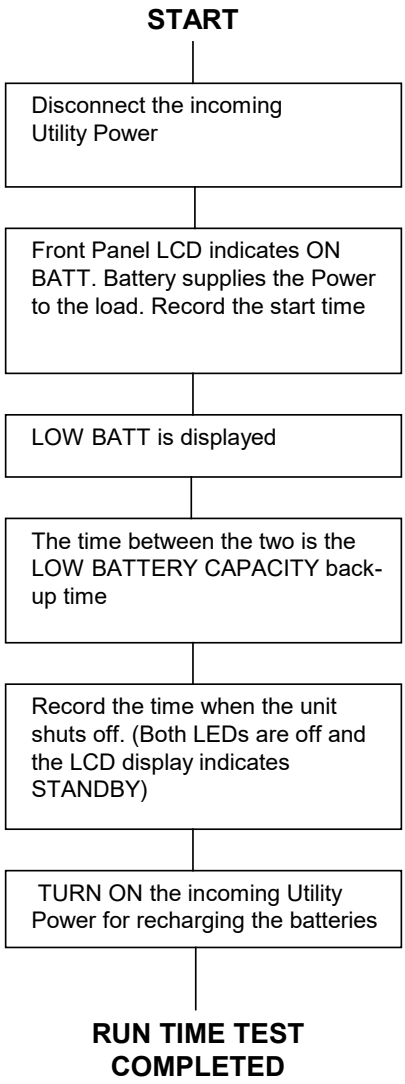


Figure 7-1: Battery Backup Time Test Procedure

Note: Make sure the batteries are fully charged before starting the Battery Backup Time Test.

7.a.2 Battery Maintenance

The batteries are maintenance-free. Battery life can be affected by such factors as: operating temperature, number of discharges during the battery's life, and periodic Battery Backup Time Tests, as described in Section 7.a.1. This system complies with the battery manufacturer's specifications for optimum performance and the longest possible battery life.

7.a.c LCD Contrast Adjustment

- **While holding down the ESC button on the front panel, press the ENTER button and release both**
- **Use the UP and DOWN arrow keys to adjust the contrast**
- **Press ENTER when the contrast on the LCD display is as desired**

7.b Trouble Analysis

The normal operation of the MP2000E is to allow a qualified utility line to pass through the BBS system to the output load. If the line drops out of tolerance then the MP2000E will assume the load until the utility line is re-qualified or the batteries are depleted. Oscilloscope traces are included at the end of this section illustrating what typical in tolerance waveforms should look like. Following are some general troubleshooting guidelines to isolate a problem within the BBS system.

7.b.1 Manual Bypass Switch

The Manual Bypass Switch is used when the MP2000E requires servicing. During normal operation the MBPS is set to UPS mode. This will allow the utility input line to pass through the MBPS to the PTS input as well as allowing the PTS output to pass through to the load.

7.b.1.1 Troubleshooting the Manual Bypass Switch in UPS Mode

To check the MBPS when it is set to UPS mode, first verify that the position of the MBPS is in UPS mode as shown in Figure 7-2, then follow these steps:

- **Measure the voltage on position 2 of the MBPS with respect to neutral. Note: All neutral wires in the system are common, so the neutral wire can be found on the input terminal block of the PTS, on the input block in the cabinet, or on the MP2000E input terminal block.**
- **If the utility voltage is not present then check the wiring from the utility entrance to the MBPS.**

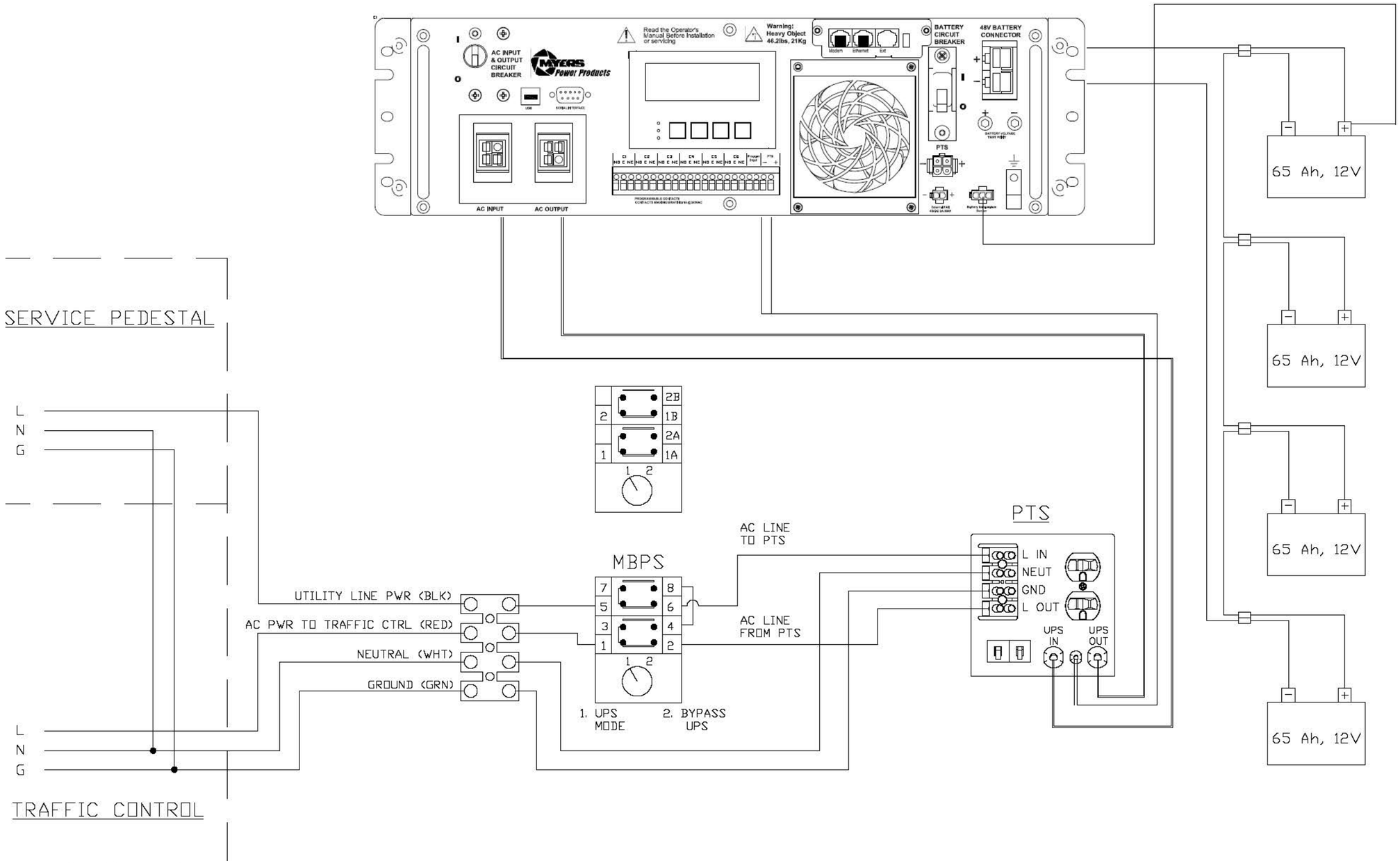


Figure 7-2: UPS Wiring Diagram

- **If the utility voltage is present measure the voltage on position 1B of the MBPS with respect to neutral. If the voltage is not present then the MBPS switch is defective.**
- **If the utility voltage is present, measure the voltage from the line out terminal block on the PTS. If the voltage is not present there is a problem with the PTS or MP2000E. See troubleshooting instructions presented in Sections 7.b.2 and 7.b.3.**
- **If the utility voltage is present, measure the voltage on terminal 1 of the MBPS with respect to neutral. If the utility voltage is not present the MBPS switch is defective.**
- **If the utility voltage is present on terminal 1 with respect to neutral but not present at the load then check the wiring between the MBPS and the load.**

7.b.1.2 Troubleshooting the Manual Bypass Switch in Bypass Mode

- **Ensure the MBPS in UPS mode as shown in Figure 7-2.**
- **Measure the voltage on position 2B of the MBPS with respect to neutral. Note: All neutral wires in the system are common, so the neutral wire can be found on the input terminal block of the PTS, on the input block in the cabinet, or on the MP2000E input terminal block.**
- **If the utility voltage is present, measure the voltage on position 2A of the MBPS with respect to neutral. If the voltage is not present then replace the jumper wire between position 2B and position 2A.**
- **If the utility voltage is present, measure the voltage on position 1 of the MBPS with respect to neutral. If the utility voltage is not present the MBPS switch is defective.**

7.b.2 Power Transfer Switch

The Power Transfer Switch is used to control the flow of power between the utility line, the MP2000E, and the output load. During normal operation, the utility line is fed into the PTS and the PTS distributes the utility line power to the load as well as the BBS to allow battery charging to occur. If the utility line fails, buck mode or boost mode operation is enabled. The PTS will only supply the utility line to the MP2000E and direct the output of the MP2000E to support the load.

To troubleshoot the Power Transfer Switch:

- **Verify the utility line is reaching the PTS by measuring the voltage on the L IN terminal with respect to ground. If voltage is not present see the troubleshooting sequence chart in Section 7.c.**
- **Verify buck and boost operation is disabled and the MP2000E is operating in line mode. If any of these conditions exist see troubleshooting MP2000E Section 7.b.3.**
- **Measure the voltage at the AC input to the MP2000E with respect to neutral. If voltage is not present check the BBS input AC breaker on the PTS. If it is reset then the PTS is**

defective. If the breaker cannot be reset, open the AC input breaker on the MP2000E and try to reset the breaker. If it still cannot be reset then the PTS is defective. If the breaker can be reset the see troubleshooting MP2000E in Section 7.b.3.

- **Unplug all devices from the 5-15R duplex outlet. Measure the voltage at the 5-15R duplex outlet. If voltage is not present, ensure the circuit breaker labeled outlet receptacle is reset. If the circuit breaker cannot be reset or the circuit breaker is reset but there still is no voltage at outlet, the PTS is defective.**
- **Measure the voltage at the L OUT terminals of the PTS with respect to neutral. If no voltage is present ensure the upstream utility breaker or fuse is closed, check the wiring from the PTS to ensure it is connected to the PTS terminal location on the MP2000E, and then measure the DC voltage on the MP2000E Terminal Block pin 22 (positive) with respect to pin 21 (negative) to ensure the voltage is zero. If the voltage is not zero then the MP2000E is defective. If the voltage is zero then the PTS is defective.**
- **Measure the line voltage on the AC output terminal block of the MP2000E with respect to neutral. If the voltage is zero see troubleshooting MP2000E in Section 7.b.3..**
- **If the voltage is present, enable the MP2000E in buck mode or boost mode. You should immediately hear the contactor in the PTS engage.**
- **If you do not hear the contactor engage, measure the DC voltage on the MP2000E Terminal Block pin 22 (positive) with respect to pin 21 (negative) to ensure the voltage is between 40-60VDC. If the voltage is not then the MP2000E is defective. If the voltage is between 40-60VDC and the contactor has not picked up then the PTS is defective.**
- **Measure the voltage at the L OUT terminal block with respect to neutral. If the voltage is not present the PTS is defective.**

7.b.3 MP2000E Battery Back-up System

The MP2000E is a Battery Backup System that under normal operation passes the AC input to the AC output. If the utility line falls out of tolerance, the unit will disconnect from the AC utility source and invert the batteries' DC voltage to an AC voltage to support the load.

7.b.3.1 Troubleshooting the MP2000E Battery Back-up System in Line Mode

- **Ensure the status of the MP2000E is in line mode and no faults are present. If an alarm or fault is present, see Section 6.b.12 for details on alarms or Section 6.b.13 for details on faults. If a fault persists when power is cycled by turning the AC breaker off and back on then the MP2000E is defective. Once the MP2000E is cycled off and then back on allow 1 minute for the qualification process before checking if the unit is on line.**
- **If the unit is in line mode and no faults are present check that the line voltage is supplied to the output by measuring the output line terminal with respect to neutral. If voltage is not present then the MP2000E is defective.**

7.b.3.2 Battery Charging Check

- **If the MP2000E is in line mode with no faults present the batteries should be getting charged. In order to measure the charging current ensure the load is powered by the utility line so there is no load current going through the MP2000E. To check the charger operation measure the AC input current into the MP2000E. If the battery voltage at the battery test point is less than 48VDC then the charger should be in full operation. This should be seen by an AC line current of approximately 4 amps. If a battery voltage is greater than 48VDC then the charger may be in float voltage operation. During float voltage operation a fluctuating current will be seen in the AC line that will be a low as zero and as high as 4 amps.**
- **If the AC line current is less than 1 amp then the battery is not charging. This can be caused by a faulty sensor. Shut the MP2000E off and remove the battery temperature sensor. Check the probe tip to ensure it is not crushed, inspect the wire for damage, and inspect the connector for corrosion. The resistance of the probe should be approximately 10,000 ohms at 25°C, 20,000 at 10°C, and 5000 at 40°C.**
- **If the sensor is OK check the temperature of the battery in the meter menu. If the temperature of the battery is above 50°C then the unit will not charge.**

7.b.3.3 Battery Backup Check

- **The Battery backup is tested by actuating a self-test by shorting the front panel control contacts 19 and 20 labeled self-test, through the keypad self-test, which is described in Section 6.b.9 or the RS232 menu under maintenance mode battery test as described in Section 6.c.4. Once the MP2000E is placed in self-test the MP2000E should transfer to battery backup mode.**
- **If the MP2000E exhibits a short circuit fault when transferring to battery backup mode check the wiring to the load and ensure that the load is not too large for the unit. Remove the load and retry the test if a short circuit appears with no load connected then the MP2000E is defective.**
- **If the MP2000E exhibits a Battery low voltage fault check the battery health and the wiring connection from the MP2000E to the battery.**

7.b.4 Self -Test

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

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

	Note: The duration of the self-test can be adjusted via RS232 / USB menu. See Section 6.c for details.

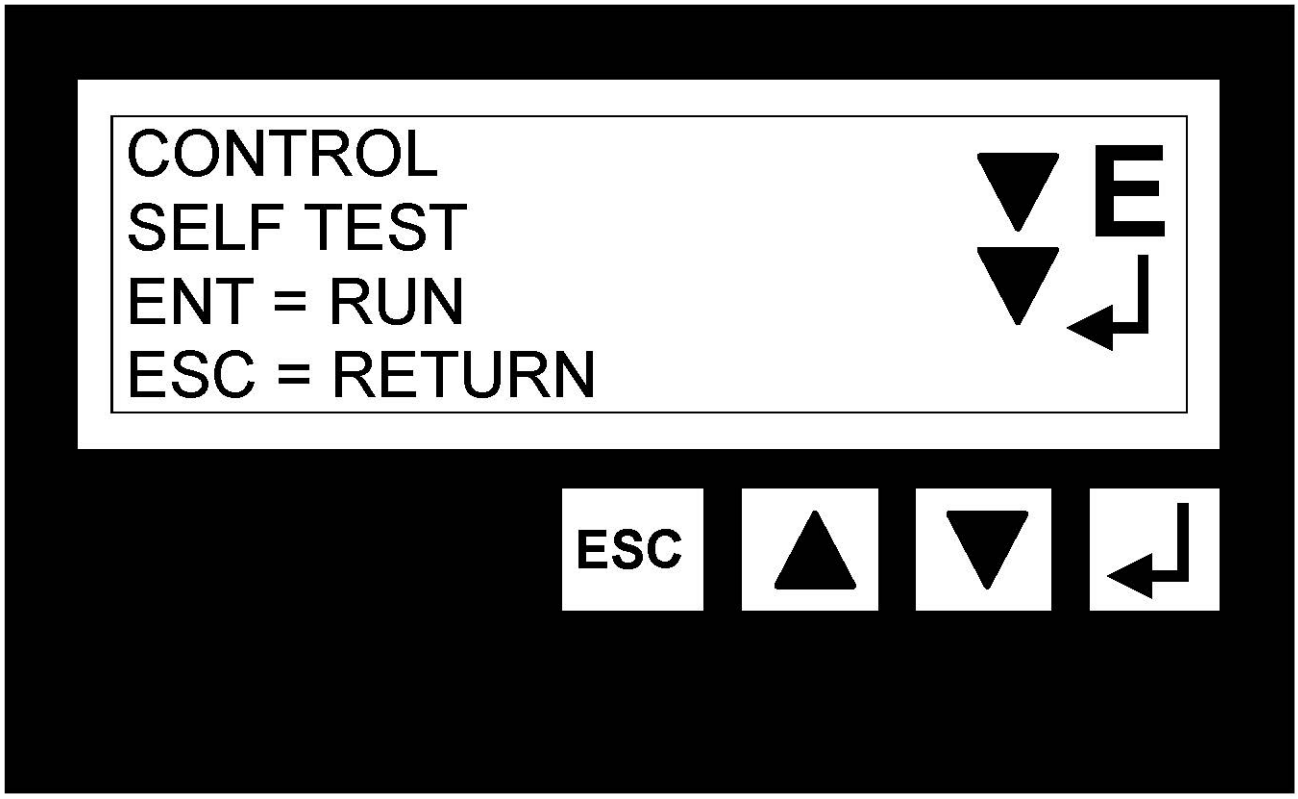


Figure 7-3: LCD Screen in Self-Test Mode

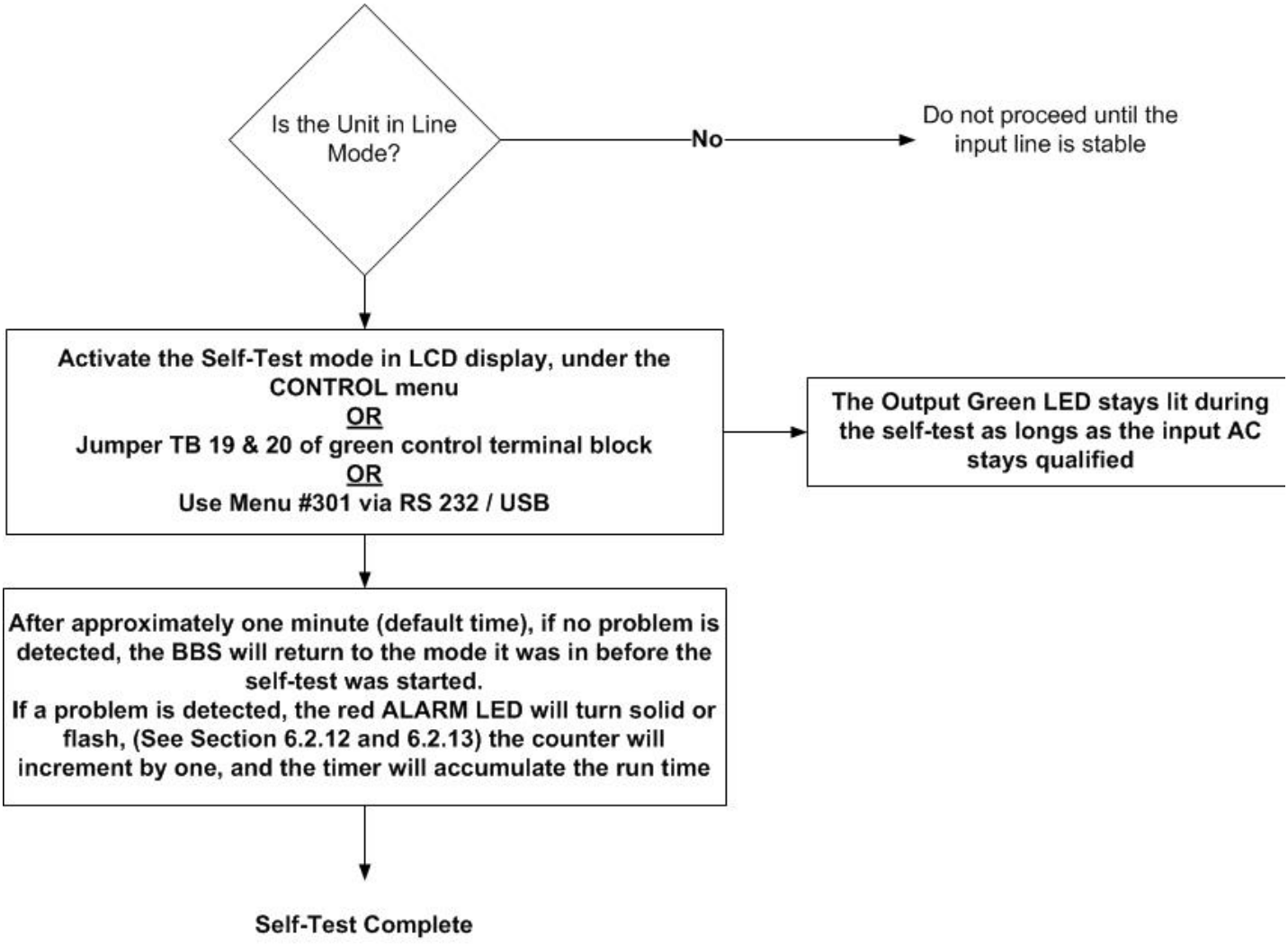


Figure 7-4: Self-Test

7.b.5 Return Procedures

⚠	**Note: Myers Emergency Power Systems does not assume responsibility for damage caused by improper packaging of returned units.**

Before returning an MP2000E for repair, obtain a Return Material Authorization (RMA) number from a Myers Emergency Power Systems customer service representative (CSR) at 610-868-3500. Clearly write the RMA number on the shipping container. If you do not have the original container, pack the replacement carton 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).

For service, parts, or technical support contact Myers Emergency Power Systems at:

TEL: (610) 868-5400

FAX: (610) 868-8686

www.myerseps.com

Or scan here

7.b.1 Warranty

Myers Emergency Power Systems provides a warranty as described in the Caltrans TEES July 2009 Chapter 4 for BBU Systems. Specifically: Myers Emergency Power Systems provides a five (5) year warranty. The first three (3) years shall be termed the "Advanced Replacement Program". Under this program, Myers Emergency Power Systems will send out a replacement within two business days of the call notifying them of an issue. The replacement unit may be either a new unit or a re-manufactured unit that is up to the latest revision. The last two years of the warranty will be factory-repair warranty for parts and labor on the BBS.

7.c Trouble Shooting Sequence Chart

There are NO Maintenance items inside the MP2000E and it should be opened or serviced only by factory authorized service personnel. Failure to do so will void the warranty. If the unit fails to perform a specific function, refer to Figure 7-5 for typical symptoms, causes, and solutions. If you cannot resolve a problem, contact the Myers Emergency Power Systems customer service department (610) 868-3500.

SYMPTOM	CAUSE	REMEDY
No Output from Unit	AC input and output circuit breakers are OFF	Turn AC input and output circuit breakers ON
	No incoming utility line power	Apply incoming utility power by closing upstream breaker

Figure 7-5: MP2000E Troubleshooting Guide

SYMPTOM	CAUSE	REMEDY

SYMPTOM	CAUSE	REMEDY
	System has a fault (indicated by solid red LED on LCD screen	Access the status menu as described in Section 6.b.13 to determine the nature of the fault. Clear the fault, then shut off both breakers on the front panel and restart the system. If the fault persists, contact Myers Emergency Power Systems Technical Support at (610) 868-3500.
No Output 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 an 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
Output LED is OFF	Incoming utility power or battery power is not available	Apply qualified input power and verify battery breaker is closed
	Faulty unit	Contact Myers Emergency Power Systems Technical Support at (610) 868-5400.
Alarm LED is lit	Red LED steady ON indicates fault	Correct the fault as described in Section 6.b.13
	Flashing red LED indicates alarm	Correct the alarm as described in Section 6.b.12

Figure 7-5: MP2000E Troubleshooting Guide (continued)

SYMPTOM	CAUSE	REMEDY
Unit does not transfer to Battery mode during a power failure OR Backup time is less than rated	Battery not connected	Connect batteries (48 VDC nominal)
	Battery circuit breaker OFF	Close battery breaker
	Battery is not fully charged	Fully recharge the battery, then test backup time as described in Section 7.a.1
	Dead battery	Replace with a new battery
	Battery failure	Clean and tighten battery connections Check batteries and replace if needed
	Faulty unit	Contact Myers Emergency Power Systems Technical Support (610) 868-5400.
PTS won't allow transfer to Battery mode	MP2000E output power not connected to PTS	Verify that "BBS OUT" cord from PTS is properly connected to the AC OUTPUT Quick Connect socket or terminal block on the MP2000E
	"BBS INPUT" circuit breaker at PTS is open	Reset the breaker & clear the fault
	Black and red control wires from PTS are not connected to the MP2000E	Check the connection at the MP2000E
	48VDC signal missing at PTS connector or TB 21 and 22 of Green Control terminal block at the MP2000E	Refer to Section 7.b.2 of this manual for further trouble shooting
	Faulty PTS	Replace PTS
MP2000E does not return back to input Line mode	Utility input line power is missing	Verify that "BBS IN" cord from PTS is properly connected to the AC INPUT Quick Connect socket or terminal block on the MP2000E
		Verify that the "BBS INPUT" circuit breaker at PTS is closed
		Ensure that the utility input is present

Figure 7-5: MP2000E Troubleshooting Guide (continued)

SYMPTOM	CAUSE	REMEDY
Batteries will not charge	Battery circuit is open	Check that the battery connections have the proper torque
		Verify that 46 VDC to 56 VDC of output is present at the MP2000E battery connector
		Check the battery cable harness for connection errors or loose / open connections
		Verify the battery breaker is closed
		Replace the battery if bad / dead
	Wrong or faulty temperature probe is connected at the front panel	Use factory-supplied temperature probe reading approximately 12,000 Ω at 25°C (77°F)
LCD screen is not readable	Adjust the contrast	Press and hold the ESC button, then press the ENTER while holding the ESC button. Release both buttons and use the UP and DOWN arrow buttons to adjust the contrast. Press the ENTER button when the desired contrast is achieved
	Faulty unit	Contact Myers Emergency Power Systems Technical Support at (610) 868-5400.
Password access is not available	Password has been forgotten / lost	If you have not created a unique password, use the factory default password 1111
		If you have created a unique password, Contact Myers Emergency Power Systems Technical Support at (610) 868-5400 to reset the password.

Figure 7-5: MP2000E Troubleshooting Guide (continued)

7.d Wave Forms

7.d.1 Transfer from LINE Mode to BATTERY BACKUP Mode

Figure 7-6 is a waveform illustrating the transfer from line mode to battery backup mode. The top trace is the line output of the PTS with respect to neutral and the lower trace is the line input of the utility with respect to the neutral. When the utility line drops to zero, there is a transfer time of 50ms before the inverter supports the load.

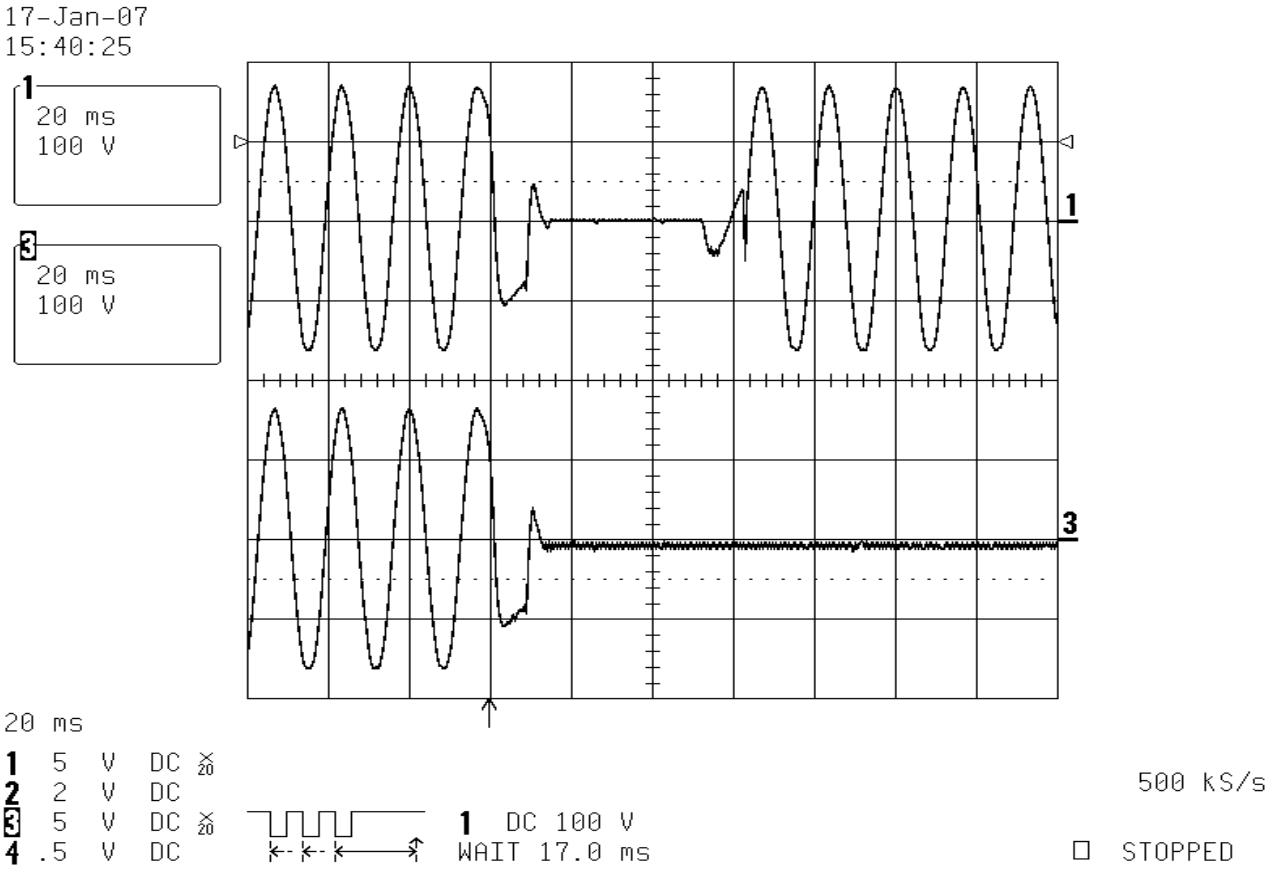


Figure 7-6: Transfer from LINE Mode to BATTERY BACKUP Mode

7.d.2 Transfer from BATTERY BACKUP Mode to LINE Mode

Figure 7-7 is a waveform illustrating the transfer from battery backup mode back to line mode. The top trace is the line output of the PTS with respect to neutral and the lower trace is the line input of the utility with respect to the neutral. When the utility line is qualified, there is a short transfer time of 10ms before the utility supports the load.

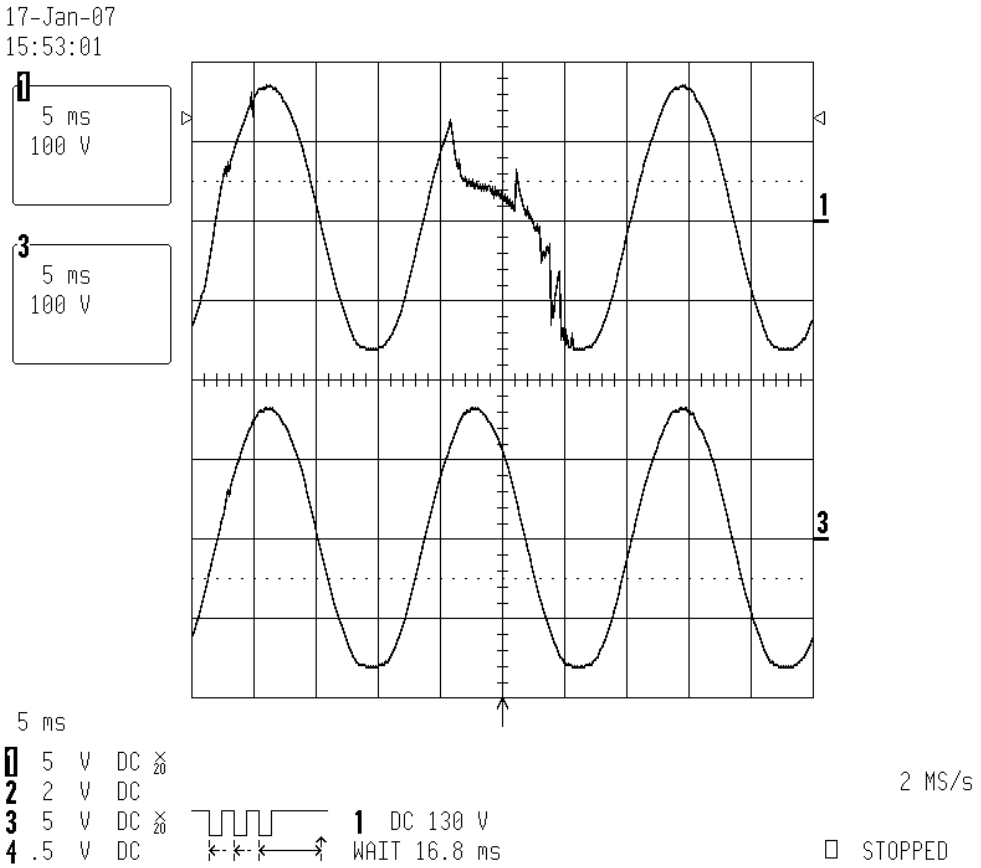


Figure 7-7: Transfer from BATTERY BACKUP Mode to LINE Mode

7.d.3 Normal Waveforms During LINE Mode

Figure 7-8 is a waveform illustrating normal waveforms during line mode. The top trace is the line output of the PTS with respect to neutral and the lower trace is the line input of the utility with respect to the neutral. The utility line is 118VAC, 60Hz which is within the normal specification for the MP2000E. The exact transfer set points are adjustable by the parameters in the line detection area of the menu. For further details, refer to the Adjustments section of the manual, under Line Detection Adjustments.

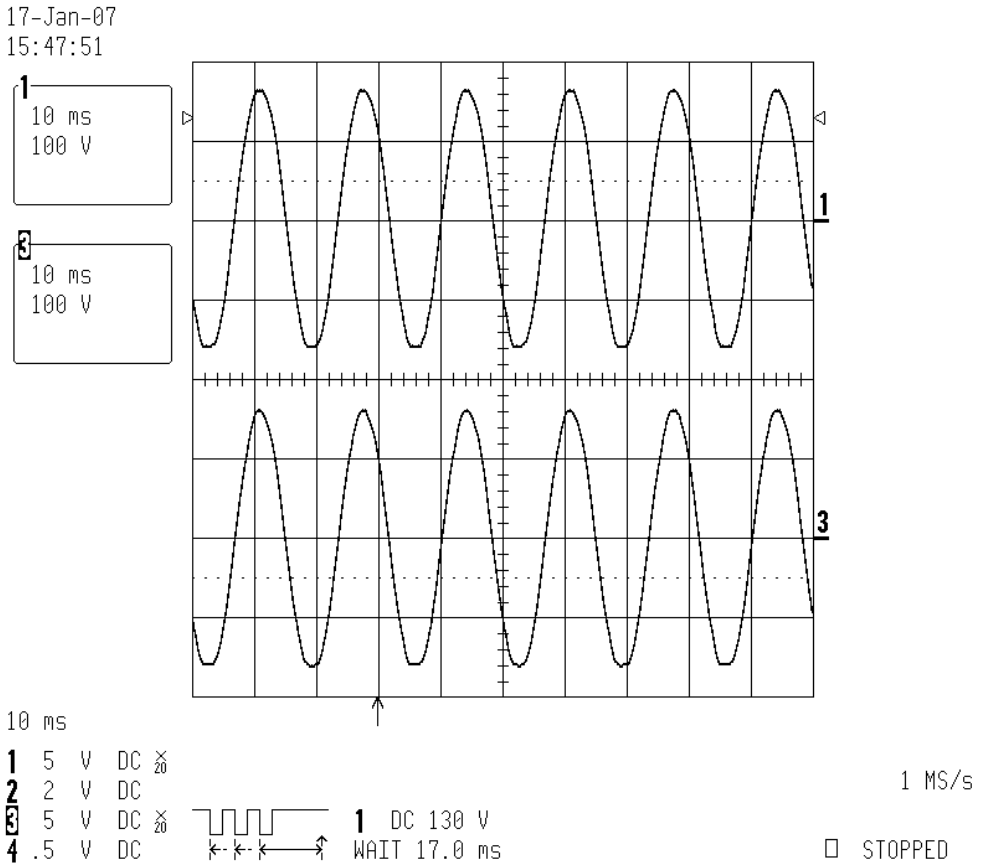


Figure 7-8: Normal Waveforms During LINE Mode

7.e Voltage Measurements

Visually inspect at the VAC power cord input to the MP2000 for correct wiring, as follows:

- **Line (black wire) to Neutral (white wire) should be approximately 120VAC.**
- **Line (black wire) to Ground (green wire) should be approximately 120VAC.**
- **Neutral (white wire) to Ground (green wire) should be zero VAC.**

	**Caution: Do not VAC power up the MP2000 with line and neutral transposed.**

Measure VAC during normal (end equipment powered up) on-line MP2000 operation.

Generally, charging depleted batteries in hot weather and while the MP2000 operates in boost mode results in low VAC input conditions due to line loss.

The VAC input reading in the MP2000 LCD default display and Status menu is the reading on which the MP2000 will act regards – switch to battery backup and buck / boost (AVR) operation.

Use a calibrated, high quality, hand-held digital multi-meter (DMM) (battery powered, no VAC cords to preclude isolation issues) to make external voltage measurements.

Check the MP2000 front panel test points during normal on-line operation for battery charge voltage. The battery charge voltage will fluctuate around approximately 55VDC while occasionally lowering to battery voltage checking for a "Battery Not Connected" condition.

7.f Alignment Procedures

Set up the MP2000 to correspond to:

- **end equipment voltage requirements**
- **battery OEM specifications**
- **site specific criteria**

7.f.1 Site Specific Criteria

Site specific criteria affecting alignment procedures include:

- **PROGRAMMABLE INPUT CONTACT CLOSURE: (input to the MP2000 front panel terminal block). Refer to the MP2000 LCD settings menu for contact closure input selection.**
- **INTERSECTION FLASH OPERATION: typically the "battery low" contact closure is put to a conflict monitor to initiate flash. See the MP2000 LCD settings menu contact closures to set a battery level for battery runtime versus flash operation.**
- **LOAD SHED: See the MP2000 LCD settings menu contact closures for timer load shed functionality (to extend battery runtime operation).**
- **GENERATOR POWER VERSUS UTILITY POWER: Generator power may be less voltage and frequency stable than commercial power. See the MP2000 LCD settings – sense type menu option.**
- **SET DATE / TIME AND DAYLIGHT SAVINGS TIME: Typically MP2000 LCD settings menu date and time are set for the time zone at the site. This is the date and time that appears in the UPS log versus e.g. a network operating center (NOC) location that monitors readings and alarms. Log date and time readings may be instrumental in resolving extraneous anomalies and issues.**

- **EXTERNAL FAN CONTROL: Set so that an MP2000 controlled 48VDC exhaust fan does not conflict with an anti-condensation heater or an air conditioner. An external button thermostat in front of an air conditioner cool air outlet and electrically in-line with the exhaust fan will preclude simultaneous air conditioner and exhaust fan operation after the cabinet door is closed on a hot day. See MP2000 LCD settings menu external fan control. The fan ON/OFF follows the battery temperature reading.**
- **PASSWORD PROTECTION: Use the MP2000 LCD control menu to enable / disable password protection. Use the MP2000 LCD maintenance menu to change the password.**
- **BATTERY TEST SETTING: Reference the battery OEM ah capacity and runtime chart to make the battery test (self-test) setting. See the MP2000 LCD maintenance menu battery test setting. Typically set the battery test according to site criteria for runtime.**

7.f.2 Battery OEM Specifications

Battery OEM specifications affecting alignment procedures include:

- **Set battery temperature compensation per the battery manufacturer's specification. See MP2000 LCD settings menu battery temperature compensation.**
- **Reference the battery OEM ah capacity and runtime chart to make the battery test (self test) setting. See the MP2000 LCD maintenance menu battery test setting. Typically prioritize the setting per site criteria for runtime.**

7.f.3 End Equipment Voltage Requirement

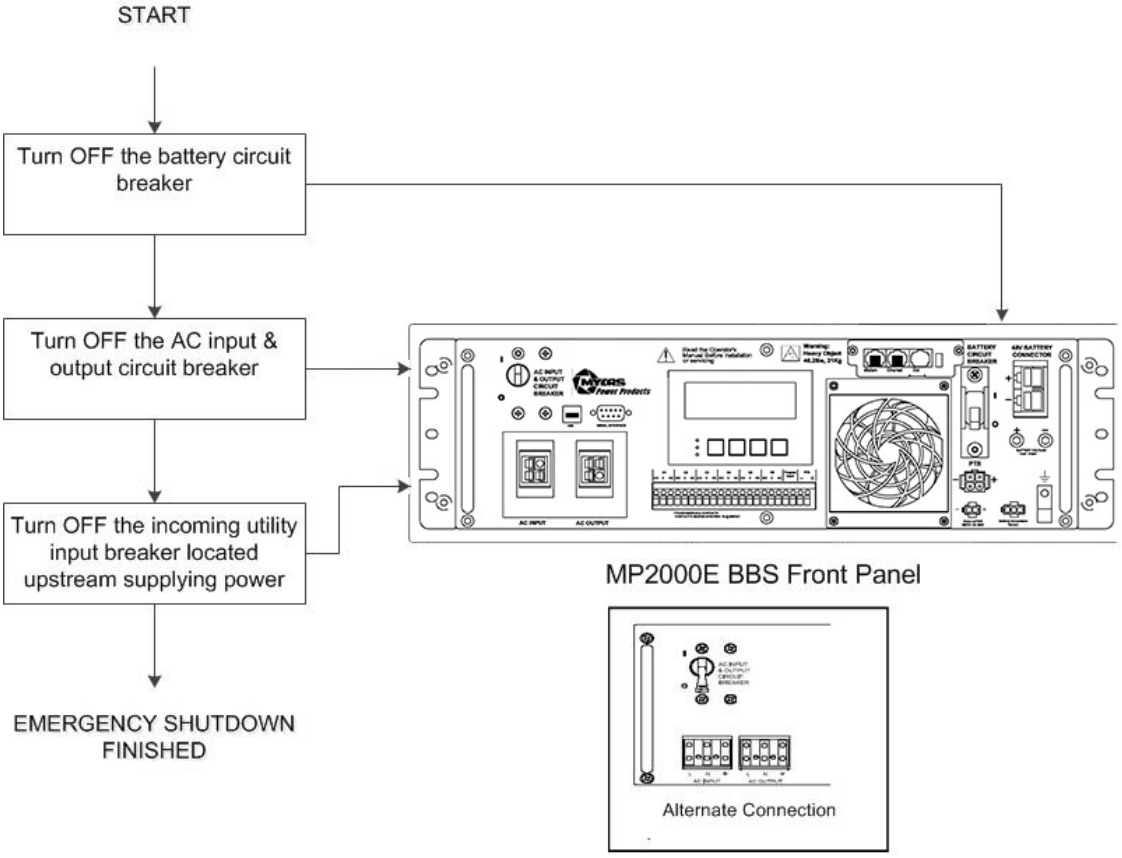
Use the end equipment VAC range specifications as criteria to make the high limit, low limit, and buck / boost (AVR) settings. See the Voltage Measurement section of this manual. See also the line qualify time – MP2000 LCD settings menu line qualify.

Section 8 Parts List

PART NUMBER	DESCRIPTION
G30219CA2	MP2000E w/ Quick Connect VAC I/O / Ethernet Slot
G30222CA2	Ethernet Card HTML / SNMP
G30222LR	Ethernet Card Serial-to-Ethernet Adapter
G30302	Batt Temp Extender Cable
G30303	Batt Temp Sensor Lug
722535CT-REV	PTS / MBPS w/ Quick Connect VAC I/O / Duplex Receptacle
722506	Mounting Bracket Kit for MP2000E
739575M	Battery Cable Kit for MP2000E (10ft)

EMERGENCY SHUTDOWN PROCEDURE

TURN-OFF BOTH THE AC & BATTERY BREAKER IN AN EMERGENCY. The MP2000E BBS 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.



For service, parts, or technical support contact Myers Emergency Power Systems:

TEL: (610) 868-3500

FAX: (610) 868-8686

www.myerseps.com

Or scan here