EPS-2000" 10 to 40 kVA
Uninterruptible power system
Owner's manual

EPE TECHNOLOGIES, INC.
A subsidiary of Square D Company

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS-This **manual contains important instructions for models EPS-2010 (10 kVA). EPS-2015 (15 kVA), EPS-2020 (20 kVA), EPS-2030 (30kVA)and EPS-2040 (40 kVA) that must be followed during installation, operation, and maintenance of the UPS and its batteries. See page 4-7 for Battery Safety Instructions.**

WARNING

OPENING ENCLOSURES EXPOSES HAZARDOUS VOLTAGES. ALWAYS REFER SERVICE TO QUALIFIED PERSONNEL ONLY.

NOTE

As standards, specifications, and designs change from time to time. please ask for confirmation of the information given in this publication.

NOTE

This equipment generates and uses radio frequency energy, and if not installed and used in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class A computing device in accordance with thespecifications in Part 150f FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

prepared for:

EPS-2000" 10 to 40 kVA
Uninterruptible power system
Owner's manual

for service call:

1 - 800 -GETS - EPE

EPE TECHNOLOGIES, INC.
A subsidiary of Square D Company

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1660 Scenic Avenue
Costa Mesa. CA 92626
(714) 557 - 1636

EPS-2000" 10 to 40 kVA Uninterruptible power system Owner's manual

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Direct questions about the operation, repair, or servicing of this equipment to EPE Technologies, Inc. Customer Support Services. Include the part number, assembly number, and serial number of the unit in any correspondence. Should you require factory service for your equipment, contact EPE Technologies, Inc. Customer Support Services and obtain a Return Goods Authorization (RGA) prior to shipping your unit. Never ship equipment to EPE Technologies, Inc. without first obtaining an RGA.

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Revision history

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10 - 40 kVA
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Section III – OPERATION

Section IV – MAINTENANCE

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Introduction

1.0 scope

This manual provides technical information required for the installation, operation, and maintenance of the EPS-2000™ Uninterruptible Power Supply (UPS) System. Please read this manual thoroughly before installing or operating the EPS-2000™ equipment. The manual is divided into four sections:

Section I — Introduction

This section serves as an introduction to the manual and the EPS-2000™ series of UPS products rated 10 to 40 kVA. The UPS system is described, followed by specifications for standard models, an introduction to controls and indicators, and a description of available options.

Section II — Installation

This section explains procedures for receiving. handling, and storing the equipment, prerequisites to the installation procedure, installation, and equipment start-up procedures.

Section III — Operation

This section describes the EPS-2000™ System Status and Control Panel (SS&CP), including programmable controls and indicators. electromechanical controls. UPS operating modes, and system alarm conditions.

Section IV — Maintenance

This section describes preventive maintenance procedures, diagnostic capabilities of the UPS system, and includes a listing of replacement parts for the various UPS models.

In the rear of the manual is a glossary which provides definitions for terms used within the text. An Index makes it easy to find topics of interest.

Figure 1: EPS-2000™ Pictorial

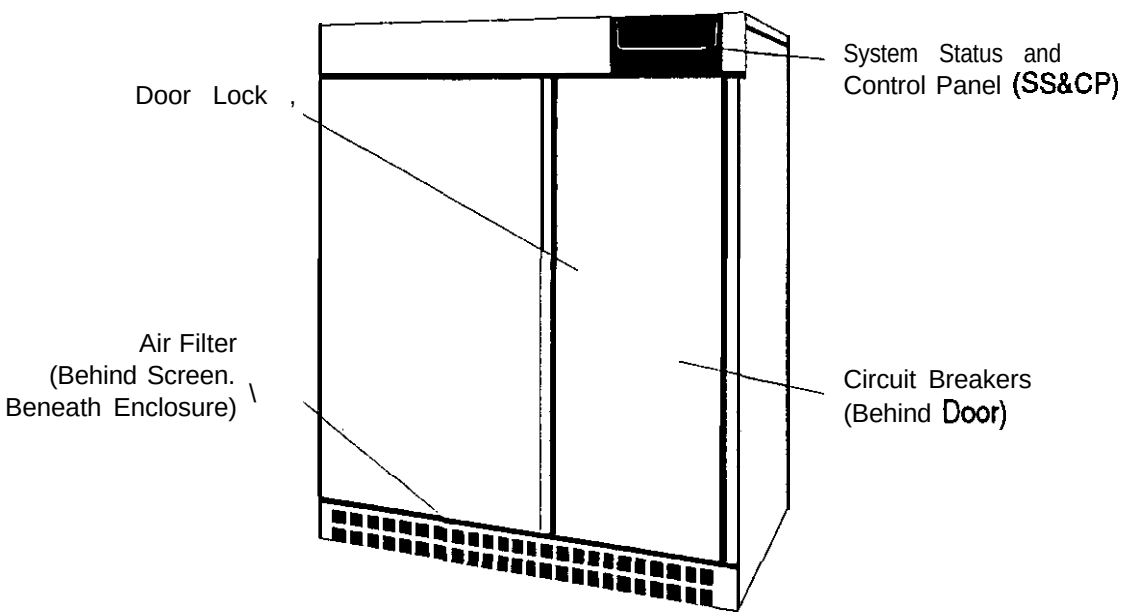
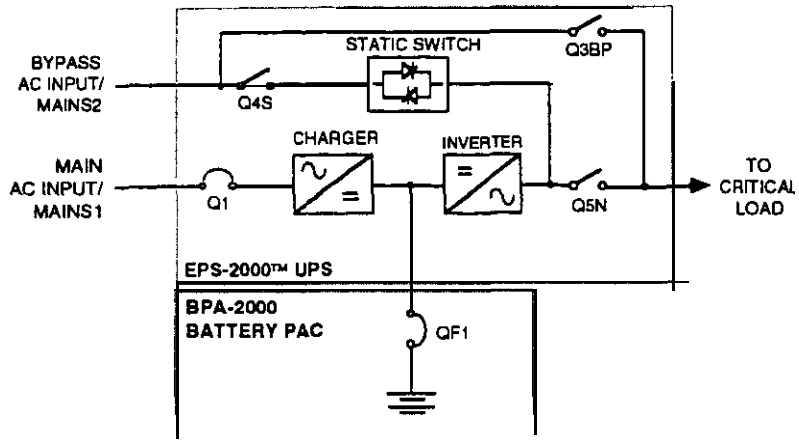


Figure 2: EPS-2000™ UPS Single Line Diagram



1.1 System Description

The EPS-2000™ is an on-line static uninterruptible power supply (UPS) system, designed to protect critical loads from anomalies normally encountered on a building's power distribution system. The EPS-2000™ UPS and its auxiliary equipment can be installed in a computer *room* or an equipment room. Figure 1 is a pictorial of the EPS-2000™ UPS System.

The EPS-2000™ UPS and its auxiliary equipment are listed by Underwriter's Laboratories, Inc. (UL).

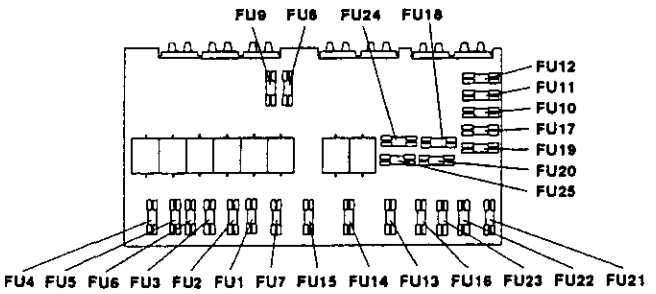
Major components of the EPS-2000™ include a Rectifier/Battery Charger, a transistorized pulse width modulated (PWM) Static Inverter, a continuous duty rated Static Switch which automatically transfers the load to and from the bypass AC input source and the UPS Inverter output, an internal Maintenance Bypass function which is comprised of three separate switches that allows the critical load to be operated from the utility source while the UPS output is isolated for service, and a battery system housed in an external matching enclosure.

A System Status & Control Panel (SS&CP) provides controls to select system operation, and indicators which allow system performance to be monitored. A liquid crystal display (LCD) is used to display system operating parameters, provide step-by-step operating instructions to the system operator, and provide a diagnostic capability to assist in troubleshooting. The built-in EPS Monitor software is programmed to display messages in five languages — English, French, German, Spanish, and Italian.

The EPS-2000" uses microprocessors to precisely control operation of the Rectifier/Battery Charger, transistorized pulse width modulated (PWM) Static Inverter, and Static Switch to insure optimum performance for all line, load, and operating conditions. In addition, a microprocessor-based diagnostic system assists in troubleshooting faulty assemblies for replacement, to minimize service time. Modular construction throughout the EPS-2000™ UPS facilitates maintenance of the system.

A single-line diagram of the EPS-2000"" UPS system is shown in Figure 2. The location of the EPS-2000™ UPS major internal elements is shown in Figure 3A (10. 15. & 20 kVA Models), Figure 3B (30 & 40 kVA Models).

Figure 3A: EPS-2000™ UPS Major Internal Components 10, 15, and 20 kVA Models



FILU PC Assembly Control Fuse Locations

Fuses FU1 and FU2, FU6 and FU7, and FU13 through FU20 rated 5 *4 600 v*

Fuses FU3 through **FU5, FU8** through **FU12, and FU21** through **FU25** **rated** 2 A. 600 V

The optional Remote Communications Link boards (DISP & DIFP PCAs) are mounted on the top of the AQOX PCA.

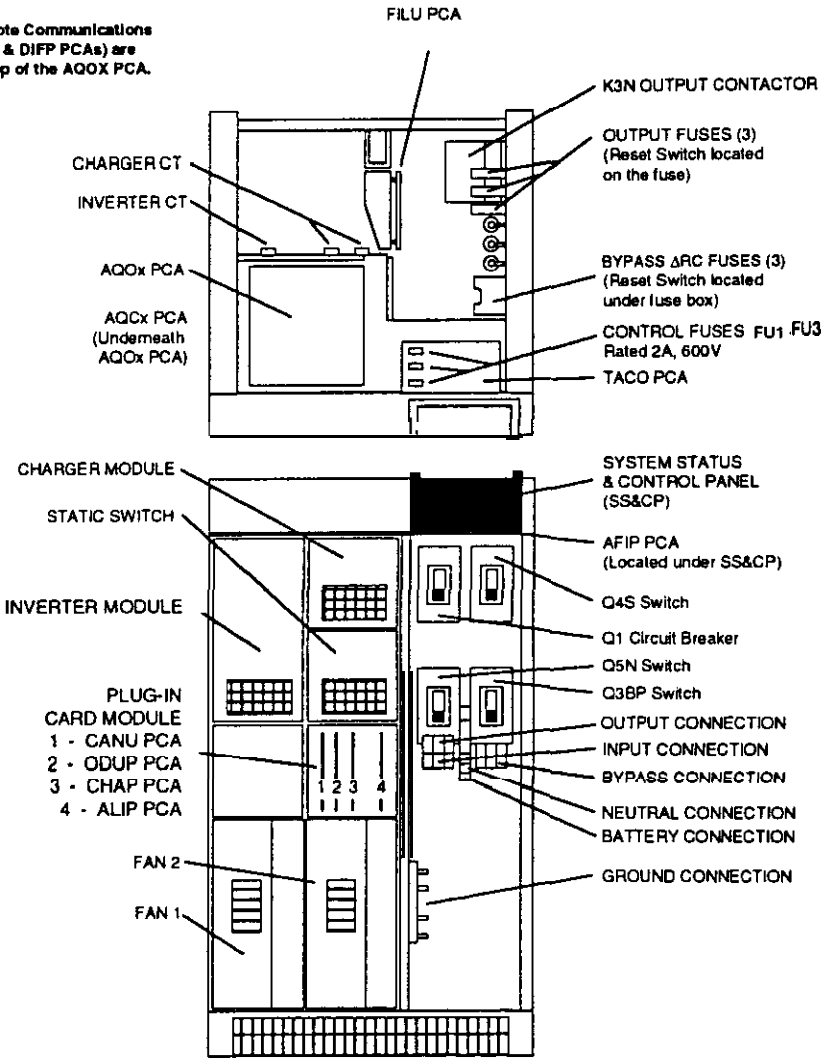
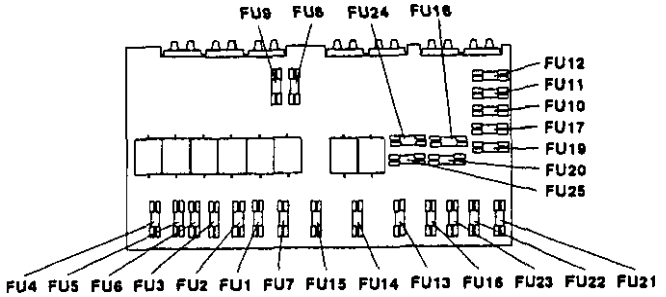


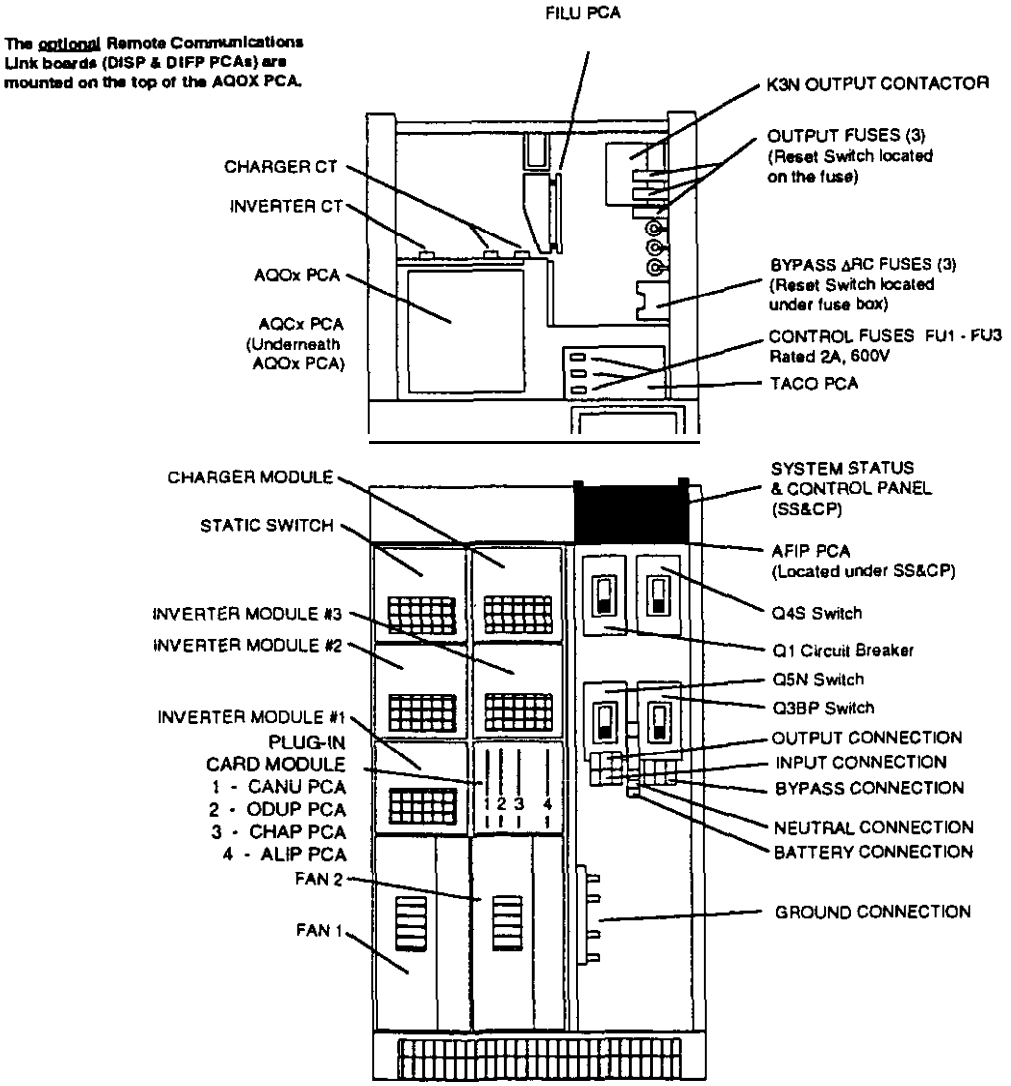
Figure 38: EPS-2000™ UPS Major Internal Components
30 and 40 kVA Models



FILU PC Assembly
Control Fuse Locations

Fuses **FU1** and **FU2, FU6** and **FU7,**
and **FU13** through **FU20**
rated 5 A, **600** V

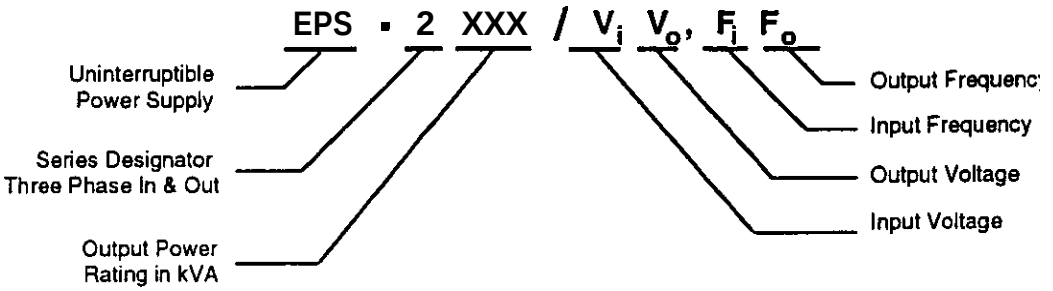
Fuses FU3 through FU5, **FU8 through FU12,**
end FU21 through **FU25**
rated 2 A, 600 V



1.1.1 Model Number Format

The Model Number Format used for the EPS-2000™ series of UPS follows:

Standard Models and characteristics are listed in Table 1.



output Power Rating in kVA	Voltage (VAC)	Frequency (Hertz)
010 = 10	2 = 208	5 = 50
015 = 15	3 = 380	6 = 60
020 = 20	4 = 480	
030 = 30	6 = 600*	
040 = 40	M = 220	
	D = 240*	
	A = 400	
	E = 415	

*Not available as an output voltage

1.1.2 Rectifier/Battery Charger

The Rectifier/Battery Charger consists of:

- **AC Input Circuit Breaker (Q1): The AC** Input Circuit Breaker provides mechanical isolation and electrical protection for the input of the UPS.
- **Input Autotransformer:** The Input Autotransformer is used to match the external AC input source to that internally required for the UPS.
- **Power Module: The Power Module** is a plug-in unit which converts incoming AC power to a regulated DC output voltage. The regulation is carried out by controlling the SCR conduction angles, allowing the Rectifier/Battery Charger to supply a stable DC voltage (± 1%). The DC voltage is filtered by a capacitor bank.
- **DC Shunt: The DC Shunt** is used **to monitor** the battery charge current and provide data for regulating the DC voltage at the desired level. Battery current is normally limited to 10% of the Ampere-Hour (Ah) rating of the battery siring.

1.1.3 Static Inverter

The Static Inverler consists of:

- **Power Module:** The Power Module is a plug-in unit, used to chop the DC voltage to obtain the PWM waveform at the primary of the output transformer. A single power module is used for UPS systems having an output rating of 20 kVA or lower. UPS systems rated above 20 kVA use three power modules, one module per phase.

- **Inverter Transformer:** The Inverter Transformer is a full isolation transformer which provides input/output electrical isolation for the UPS, provides the required output voltage, and provides the required inductance **for** the AC output filter.

- **AC Output Filter:** The output filler is used to achieve a computer grade sine wave output voltage waveform, with a Total Harmonic Distortion (THD) of 4% maximum (3% typical).

1.1.4 Static Switch

The Static Switch transfers the load from the UPS Inverter output to the bypass AC input source, or from the bypass AC input source to the UPS Inverter Output, without any interruption to the load (provided that the UPS Inverter output is synchronized lo the Bypass AC Input source). These transfers take place automatically upon Inverter start-up or shut-down. The Static Switch is rated for continuous duty, and is of plug-in construction for ease of maintenance.

The ARC circuit network protects the Static Switch against high voltage spikes and surges by absorbing the excess energy. The ARC circuit network is protected by fuses, and any failure of these fuses will be displayed on the SS&CP LCD.

1.1.5 Maintenance Bypass

The internal Maintenance Bypass function consists of three switches which, when operated **as** specified, provide a make-before-break transfer of the load from the UPS Inverler output to the bypass AC input source, or from the bypass AC input source to the UPS Inverler output. This feature allows the critical load to be operated from the utility power source while the UPS Inverter output is isolated for maintenance.

The three internal Maintenance Bypass non-automatic switches are designated as:

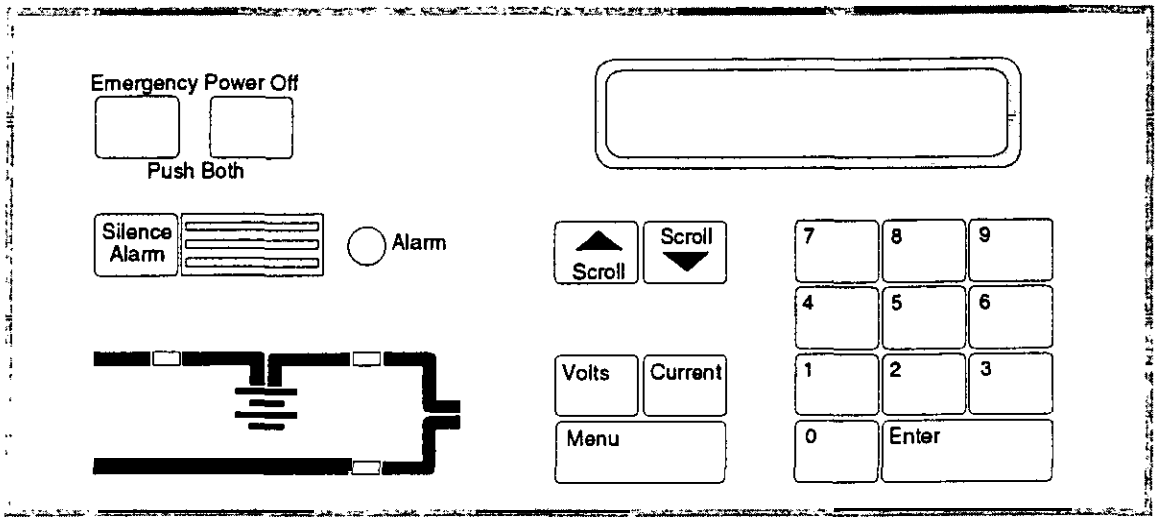
A. Bypass (MAINS2) Input (Q4S)

B. UPS Output Isolation (Q5N)

C. Maintenance Bypass (Q3BP)

Correct operation of the three switches is shown on the Liquid Crystal Display (LCD), located on **the** System Status & Control Panel (SS&CP) as part of the procedure for start-up or shut-down of the equipment.

figure 4: *System Status* **and** *Control Panel (SS&CP)*



1.2 Programmable Controls and Indicators

All EPS-2000™ Programmable Controls (excluding circuit breakers and non-automatic switches) and Indicators are located on the System Status and Control Panel (SS&CP).

1.2.1 System Status and Control Panel (SS&CP)

The System Status & Control Panel (SS&CP) is shown in Figure 4. The SS&CP contains the elements listed below:

- Liquid Crystal Display (LCD)
- Audible Alarm Silence keypad
- Alarm Indication
- Scroll Up keypad
- Scroll Down keypad
- Ten Digit (0 to 9) keypads
- Rectifier/Battery Charger Status Indicator
- Inverter Status Indicator
- Load on Bypass Indicator
- Voltage Measurement keypad
- Current Measurement keypad
- Main Menu Call keypad
- Entry Validation or Return To Menu keypad
- Emergency Power Off (EPO) keypads

Detailed descriptions of the SS&CP indicators and the use of the SS&CP keypads are provided in Section III – OPERATION, ¶ 3.1.

1.3 Specifications

1.3.1 AC Input Ratings

Refer to ¶ 1.1.1 for nominal Voltage (VAC) values available.

Voltage: As specified, nominal plus (+) 10%/minus (-) 15%

Frequency: Nominal, plus (+) or minus (-) 5%

Phases: Three, phase rotation A, B, C

Wires: Three plus equipment ground

Current: See Table 2 (page 2 - 7). Nominal AC Input Current

Power Factor: 0.82 lagging minimum at full load output, nominal input voltage, and normal float voltage on battery

1.3.2 Bypass AC Input Ratings

Voltage: Must match UPS nominal output voltage ± 10%

Frequency Window: Nominal plus (+) or minus (-) 0.25, 0.5, 0.75, or 1.0 Hz. Standard setting for bypass input frequency window is ± 0.5 Hz unless otherwise specified when ordered. The Frequency Window can be changed after the unit is installed, but requires a visit by an EPE authorized Customer Support Services (CSS) representative to modify the equipment, Contact EPE's Customer Support Services organization for further information.

Phase: Three, phase rotation A, B, C

Wires: Four wire WYE

Current: See Table 2 (page'2 - 7). UPS Output and Bypass AC Input Current at specified nominal output voltage.

Power Factor: load dependent

1.3.3 Inverter AC Output Ratings

Refer to ¶ 1.1.1 for nominal Voltage (VAC) values available.

Voltage: Nominal value ± 1% for all conditions of line, load, and temperature

Frequency: Normally synchronized to the bypass AC input source (when available); otherwise the output frequency is the nominal value ± 0.1%.

Phase: Three, phase rotation A, B, C

Wires: Three or four. The UPS Inverter output is a WYE configuration with the neutral grounded. A three wire DELTA load can be connected to the UPS Inverter output. but the phase connections cannot be grounded.

Current: See Table 2 (page 2 - 7), UPS Output and Bypass AC Input Current at specified nominal input voltage.

Power Factor: The UPS Inverter output is rated at full kVA, 0.8 power factor lagging load.

Slew Rate: The rate of change of the UPS Inverter output frequency, (a) while tracking within the frequency window (see Bypass AC Input Ratings - Frequency Window), (b) when synchronizing to the bypass AC input source, or(c) when going to a free running condition after losing AC input power, is 1 Hz/sec maximum.

Overload Characteristics: Applies to the UPS Output when operating from either the bypass AC input source or the UPS Inverter output:

125% for 10 minutes
150% for 1 minute

Overloads in excess of 150% or exceeding the overload time periods previously indicated will cause the load lo be transferred from the UPS Inverter output to the bypass AC input source, provided the sources are synchronized. Once the load is transferred to the bypass AC input source after exceeding the time periods previously indicated, the timed periods will start again for operation on the UPS Static Switch. If the load does not return to less than the unit's full load rating prior to completing the timed overload periods, the load will be disconnected.

Dynamic Characteristics: Peak voltage deviation on the UPS Inverter output is listed below for the conditions indicated:

50% step load change
± 3% maximum

100% step load change
± 5% maximum

Dynamic Response: The UPS Inverter output voltage returns lo ± 1% of nominal within one cycle after experiencing a 100% step load change

1.3.4 Battery Characteristics

DC Voltage Range:

325 Vdc minimum
436 Vdc maximum

DC Current Required:

See Table 2 (page 2 - 7), Maximum Battery Current.

1.3.5 Environmental Characteristics

Temperature:

Operating Range: 0" c. to +40° c. (Excluding battery)

Non-Operating and Storage:

-25" **C. lo +70° C**

NOTE

Batteries should only be stored in a fully charged condition at temperatures less than 80° F. (26.7" C.)

Relative Humidity: 0 to 95%, non-condensing

Recommended Environment: Computer Room or other temperature controlled environment.

Recommended Temperature: 20 to 30" C. (Battery protection time is based on a 25°C. ambient temperature)

Recommended Relative Humidity: 50%

1.3.6 Other Characteristics

Audible **Noise Level:**

10 to 40 kVA ratings: ≤ 60 dBA

Physical Dimensions:

Height: 55.18"/1,402 mm
Depth: 32.18"/817 mm
Width: See Table 1
Weight: See Table 1

Table 1: Standard Models

	Output Rating kVA/kW	Nominal Input Voltage 3Ø (Volts)	Nominal Output Voltage 3Ø (Volts)	Model Number	Input CB Rating (Amps)	Width In/mm	Approximate Weight Lbs/kg	Loss (Full Load) Btu/Hr
EPS-2010								
	10/8	208	208Y/120	EPS-2010/22,66	90	31.5/800	1,075/488	4,436
	10/8	220	220Y/127	EPS-2010/MM,66	90	31.5/800	1,075/488	4,436
	10/8	240	208Y/120	EPS-2010/D2,66	90*	49.5/1,257	1,555/707	5,426
	10/8	380	380Y/220	EPS-2010/33,55	50	31.5/800	1,075/488	4,079
	10/8	400	400Y/230	EPS-2010/AA,55	40	31.5/800	1,075/488	4,079
	10/8	415	415Y/240	EPS-2010/EE,55	40	31.5/800	1,075/488	4,079
	10/8	480	208Y/120	EPS-2010/42,66	40	31.5/800	1,075/488	4,436
	10/8	480	480Y/277	EPS-2010/44,66	40	31.5/800	1,075/488	4,436
	10/8	600	208Y/120	EPS-2010/62,66	90*	49.5/1,257	1,555/707	5,426
EPS-2015								
	15/12	208	208Y/120	EPS-2015/22,66	90	31.5/800	1,075/488	6,142
	15/12	220	220Y/127	EPS-2015/MM,66	90	31.5/800	1,075/488	6,142
	15/12	240	208Y/120	EPS-2015/D2,66	90*	49.5/1,257	1,555/707	7,574
	15/12	380	380Y/220	EPS-2015/33,55	50	31.5/800	1,075/488	5,583
	15/12	400	400Y/230	EPS-2015/AA,55	40	31.5/800	1,075/488	5,583
	15/12	415	415Y/240	EPS-2015/EE,55	40	31.5/800	1,075/488	5,583
	15/12	480	208Y/120	EPS-2015/42,66	40	31.5/800	1,075/488	6,142
	15/12	480	480Y/277	EPS-2015/44,66	40	31.5/800	1,075/488	6,142
	15/12	600	208Y/120	EPS-2015/62,66	80*	49.5/1,257	1,555/707	7,574
EPS-2020								
	20/16	208	208Y/120	EPS-2020/22,66	80	31.5/800	1,075/488	8,189
	20/16	220	220Y/127	EPS-2020/MM,66	80	31.5/800	1,075/488	8,189
	20/16	240	208Y/120	EPS-2020/D2,66	80*	49.5n.257	1,555/707	10,098
	20/16	380	380Y/220	EPS-2020/33,55	50	31.5/800	1,075/488	7,444
	20/16	400	400Y/230	EPS-2020/AA,55	40	31.5/800	1,075/488	7,444
	20/16	415	415Y/240	EPS-2020/EE,55	40	31.5/800	1,075/488	7,444
	20/16	480	208Y/120	EPS-2020/42,66	40	31.5/800	1,075/488	8,189
	20/16	480	480Y/277	EPS-2020/44,66	40	31.5/800	1,075/488	8,189
	20/16	600	208Y/120	EPS-2020/62,66	80*	49.5/1,257	1,555/707	10,098
EPS-2030								
	30/24	208	208Y/120	EPS-2030/22,66	175	31.5/800	1,385/628	11,260
	30/24	220	220Y/127	EPS-2030/MM,66	175	31.5/800	1,385/628	11,260
	30/24	240	208Y/120	EPS-2030/D2,66	175*	49.5/1,257	2,005/911	14,154
	30/24	380	380Y/120	EPS-2030/33,55	90	31.5/800	1,385/628	10,225
	30/24	400	400Y/230	EPS-2030/AA,55	80	31.5/800	1,385/628	10,225
	30/24	415	415Y/240	EPS-2030/EE,55	80	31.5/800	1,385/628	10,225
	30/24	480	208Y/120	EPS-2030/42,66	80	31.5/800	1,385/628	11,260
	30/24	480	480Y/277	EPS-2030/44,66	80	31.5/800	1,385/628	11,260
	30/24	600	208Y/120	EPS-2030/62,66	175*	49.5/1,257	2,005/911	14,154

Height, all units: 55.18"/1,402 mm
Depth, all units: 32.18"/817 mm

*208 VAC on secondary of Input Isolation Transformer

(Continued next page)

Table 1: Standard Mode/s (continued)

	Output Rating kVA/kW	Nominal Input Voltage 3Ø (Volts)	Nominal Output Voltage 3Ø (Volts)	Model Number	Input CB Rating (Amps)	Width In/mm	Approximate Weight Lbs/kg	Heat Loss (Full Load) Btu/Hr
EPS-2040								
	40/32	208	208Y/120	EPS-2040/22,66	175	31.5/800	1,385/628	15,013
	40/32	220	220Y/127	EPS-2040/MM,66	175	31.5/800	1,385/628	15,013
	40/32	240	208Y/120	EPS-2040/D2,66	175*	49.5/1,257	2,005/911	18,726
	40/32	380	380Y/220	EPS-2040/33,55	90	31.5/800	1,385/628	13,495
	40/32	400	400Y/230	EPS-2040/AA,55	80	31.5/800	1,385/628	13,495
	40/32	415	415Y/240	EPS-2040/EE,55	80	31.5/800	1,385/628	13,495
	40/32	480	208Y/120	EPS-2040/42,66	80	31.5/800	1,385/628	15,013
	40/32	480	480Y/277	EPS-2040/44,66	80	31.5/800	1,385/628	15,013
	40/32	600	208Y/120	EPS-2040/62,66	175*	49.5/1,257	2,055/911	18,726

Height, all units: 55.18"/1,402 mm
Depth, all units: 32.18"/817 mm

*208 VAC on secondary of Input Isolation Transforme

1.4 Options

1.4.1 Site Distribution Center (SDC)

The Site Distribution Center (SDC) provides the means of distributing powerfrom the EPS-2000" UPS system to the user's intended equipment. The SDC is furnished in an enclosure matching the other EPS-2000™ series equipment. The SDC attaches to the right side of the EPS-2000™ UPS enclosure, or the right side of the Auxiliary Cabinet Assembly (ACA). EPE provides all the necessary hardware, power and control cables. and the instructions for the task. The customer is responsible for installation of the equipment in the field.

1.4.2 Auxiliary Cabinet Assembly (ACA)

The Auxiliary Cabinet Assembly (ACA) provides the means for incorporating three optional elements into the EPS-2000™ UPS system. The ACA attaches to the right side of the EPS-2000" UPS enclosure. EPE provides all the necessary hardware, power and control cables, and instructions for the task. The customer is responsible for installation of the equipment in the field.

The empty ACA enclosure alone will accommodate top cable entry when required, which may occur if the UPS is installed in an equipment room with limited space available. Alternately, the ACA may include an input isolation transformer, or an input harmonic current filter or both depending on which options are purchased. The input isolation transformer provides complete electrical isolation between the utility line and the input of the UPS (Rectifier/Battery Charger and Battery), providing extra protection against electrical noise and ground faults. The input harmonic current filter limits the amount of harmonic current fed back on to the input AC power source to less than 10% when the EPS-2000™ UPS is operating at full load.

NOTE

Units specified with a 240 VAC or 600 VAC input always include an ACA with an isolation transformer as standard equipment.

1.4.3 BATTERY PAC Assembly (BPA)

Each EPS-2000" UPS is furnished with a BATTERY PAC Assembly (BPA), which contains a battery having sufficient ampere-hour (A-H) capacity to support the UPS and its intended load for the protection time specified.

An EPE BPA features the use of sealed, maintenance-free, lead-calcium, recombination type batteries. The batteries are maintenance-free from the standpoint that they do not require the electrolyte level nor the density of the electrolyte to be checked periodically. However, the BPAs do require that the interior of the assembly, including the exterior surfaces of the individual batteries, be kept clean and free of all foreign matter including dust. The integrity (torque) of the individual battery connections inside the BPA must be verified annually.

The EPA-2000 series BATTERY PACs provide ready access to the batteries, as they are mounted on pull-out rack assemblies.

1.4.4 Remote Monitor (RM)

The Remote Monitor (RM) option is designated as Model Number EPS-2000/RM. The RM may be desk or wall mounted and uses the same SS&CP (without the EPO function) as the EPS-2000™ UPS (see Figure 4). The RM includes the Mimic panel to indicate the flow of Power, an LCD for display of status, alarms and parameters measured, and keypads for requesting voltage and current data. An interface cable between the RM and the EPS-2000™ UPS must be purchased.

Refer to the Installation Drawing for the EPS-2000/RM for size and weight data.

1.4.5 Remote Alarm Panel

The Remote Alarm Panel is a wall-mounted panel, provided with four indicating LEDs that show the status of the UPS system:

- **UPS On Line**
- **Load On Bypass**
- **UPS On Battery**
- **Summary Alarm**

The Remote Alarm Panel also includes an Alarm Reset pushbutton, and audible alarm, and an Alarm Silence pushbutton.

The Remote Alarm Panel requires 120 VAC input power for operation.

1.4.6 Remote Communications Link (RS-232 Port)

The RS-232 port option is designated as model number EPS-2000/PC and allows communication between the EPS-2000™ UPS and an IBM-AT or compatible microcomputer. This option requires an additional printed circuit plug-in assembly be installed in the equipment.

1.4.7 Modem

The Modem option may only be used when the RS-232 port, EPS-2000/PC option has been purchased. The modem option provides remote communication and control of the EPS-2000™ UPS from a computer via telephone lines. This option requires that an additional printed circuit plug-in assembly be installed in the equipment.

1.4.8 Remote Emergency Power Off (REPO)

The Remote Emergency Power Off (REPO) option consists of a two wire pushbutton (EPS-2000/PBO) that performs the same function as that described for the EPO (¶ XI), from a remote location.

1.4.9 DC Ground Fault Indication

The DC Ground Fault Indication option is designated as Model Number EPS-2000/DCF. This option provides an alarm indication on the EPS-2000™ UPS that either polarity of the battery has been grounded. This option requires that a printed circuit assembly be installed in the BATTERY PAC Assembly (EPA).

1.4.10 Smoke/High Temperature Warning (BATTERY PAC)

The Smoke/High Temperature Warning (BATTERY PAC) option is designated as Model Number EPS-2000/STD. This option provides an alarm indication on the EPS-2000" UPS that smoke or a high temperature condition exists in the BATTERY PAC Assembly (BPA). This option requires that an additional assembly be installed in the BPA.

Installation

2.0 scope

This section explains procedures for receiving, handling, and storing the equipment, prerequisites to the installation procedure, installation, and equipment start-up procedures.

2.1 Receiving

Inspect the exterior surfaces of all shipping containers or packaging used and the equipment for damage which may have occurred during transit before accepting the shipment from the freight carrier. If the shipping containers or equipment show evidence of damage, note the damage on the receiving document prior to signing for receipt of equipment.

The equipment should be unpacked immediately after receipt, and inspected again to determine if any internal shipping damage (broken components, disconnected wiring, loose connections, etc.) has occurred. Verify that the equipment nameplates correspond with the equipment ordered.

Damage claims should be filed directly with the carrier. Replacements for damaged components should be ordered through EPE Technologies, Inc. Customer Support Services.

2.2 Handling

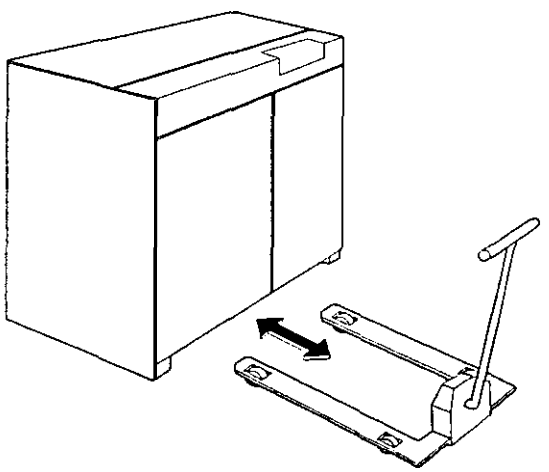
The EPS-2000™ series of UPS equipment is designed for handling primarily from the bottom (see Figure 5). For EPS-2000™ dimensions and weights, refer to Table 1. Weights of the BATTERY PAC Assembly (BPA), Auxiliary Cabinet Assembly (ACA), or the Site Distribution Center (SDC) to be used with your EPS-2000™ UPS are shown in their respective Owner's Manuals.

The individual enclosures are designed to be moved by a pallet mover or a fork lift type truck. The front and rear lower cover plates of each enclosure are removed for shipment. The EPS-2000™ UPS has **a** draw out input air filter located **under the** enclosure which is also removed for handling or transit. The UPS draw out air filter can be pulled out from beneath the enclosure once the front lower cover plate is removed.

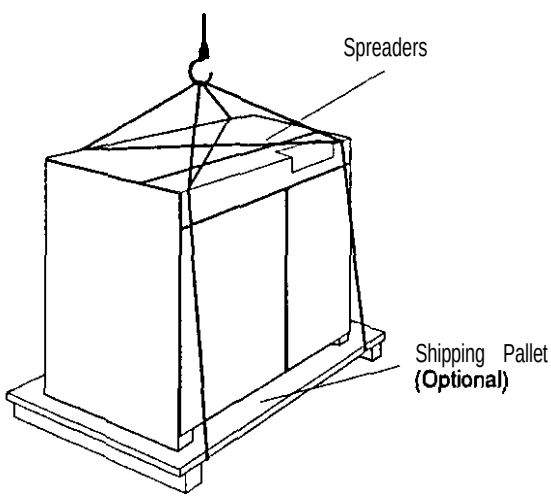
The EPS-2000™ series equipment enclosures can be handled or moved by overhead equip ment after it has been fitted with the necessary slings (see Figure 5) and spreaders. The **enclosures** should be placed on an optional shipping pallet for movement by sling.

Figure 5: Handling

From The Bottom



From The Top



2.3 Storage

If the equipment is to be stored prior to installation, it should be stored in a cool, dry, well-ventilated location which is protected against rain, splashing water, chemical agents, etc. The equipment should be covered with a tarpaulin or plastic wrapper to protect it against dust, dirt, paint, or other foreign materials.

2.4 Prerequisites to the Installation

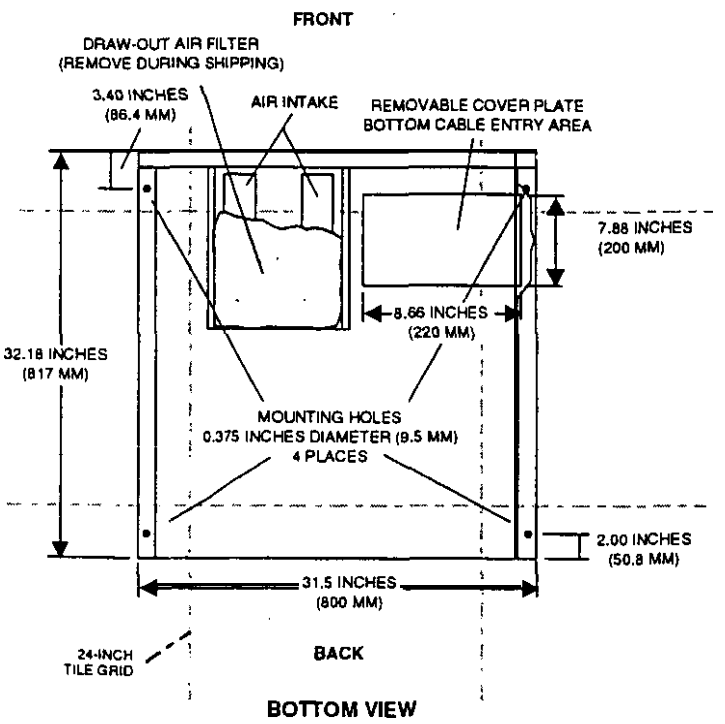
The EPS-2000" series of UPS system equipment is intended for use in a computer room environment (controlled temperature and humidity), and installed on a raised computer room floor. Wiring for power and control cables can primarily be accommodated through the bottom of the equipment, or through the right side of each enclosure. Top wire entry for the EPS-2000™ UPS can be accommodated only by use of the optional ACA. The BPA and SDC can accommodate top wire entry.

The designated bottom cable entry area for the EPS-2000™ UPS is shown in Figure 6 for models rated 10 to 40 kVA. Right side access area for wiring is shown in Figure 6.

For UPS equipment installed on a raised computer room floor, two floor through holes should be provided beneath the enclosure. One for cabling and one to serve as an air inlet for the cooling air required by the UPS. See Figure 6 or Figure 7 for the location of these holes on your UPS system.

The UPS dissipates heat and exhausts warm air through the top portion of the enclosure. Refer to Table 1 for heat dissipated (Btu/hr). Air exhaust for models rated 10 to 40 kVA is 1200 cubic feet per minute (CFM).

Figure 6: Bottom View, 10 to 40 kVA Models



2.5 Installation Procedure

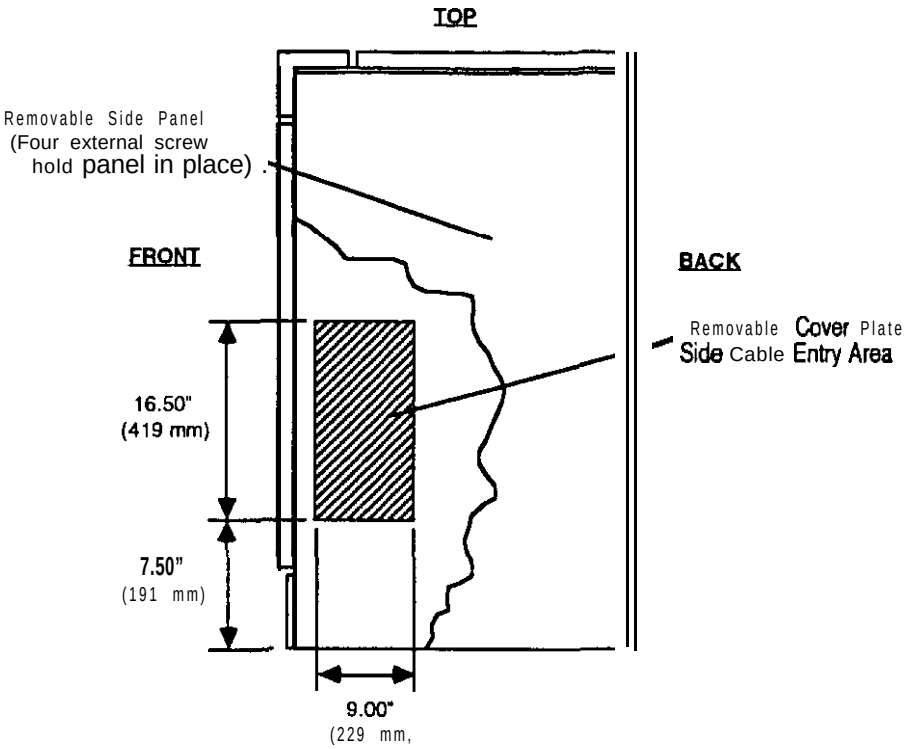
The EPS-2000™ UPS is a stand *alone* enclosure. The ACA-2000, when used, attaches to the right side of the EPS-2000™ UPS. The EPA-2000 is a stand alone enclosure, The SDC-2000, when used, attaches to the right side of the EPS-2000™ UPS, or the right side of the ACA-2000. Refer to the individual manuals for the ACA-2000, BPA-2000, and SDC-2000 for further installation information.

Before *making* any electrical connections. check to see that all AC input feeder circuit breakers or fused switches that will interface with the UPS are in the OFF position. In addition, make certain that the EPS-2000™ UPS AC Input Circuit Breaker (Q1), Bypass AC Input/MAINS2 switch (Q4S), Maintenance Bypass Switch (Q3BP), and UPS Output Isolation Switch (Q5N) are in the OFF position. Also, make sure that the circuit breaker QF1 in the BATTERY PAC Assembly is in the OFF position.

NOTE

Prior **to setting the EPS-2000™ UPS in place, remove the rear cover panel. Remove the shipping brace that secures the Input Transformer (T1) to the right side of the enclosure. The Transformer (T1) is on the left side of the enclosure as you look into the unit from the rear. Replace the rear panel. Install the lower rear cover panel. After the equipment is set in place, install the draw out air filter and the lower front cover panel.**

Figure 8: Right Side Cable Access



RIGHT SIDE VIEW OF UPS

All field wiring connections for the EPS-2000™ UPS are made in the lower right portion of the UPS enclosure (see Figure 9). To gain access to this area, the right front door of the UPS must be unlocked and opened, and the inside cover panel removed. Cables may enter either through the bottom of the UPS (see Figure 6 or Figure 7). or through the side of the UPS (see Figure 8), whichever is the most convenient for your installation. Please refer to "Cable Preparation Procedure for Field Wiring," EPE Document Number 9-00038-00.

Side, back, or rear access to the UPS is not required once the UPS and its auxiliary equip ment have been 'installed.

2.5.1 Air Filter Installation

To install the draw-out air filter brackets, disconnect and remove the left fan. Insert the rear edge of the lefl bracket in the proper slot underneath the unit. Attach the front end of the left bracket to the bottom of the unit with a bolt through the hole near the left side wall. Insert the rear edge of the right bracket in the proper slot underneath the unit. Attach the front end of the right bracket to the bottom of the unit with a bolt through the hole near the left side wall of the cable entry area. Reinstall and reconnect the left fan. Install the air filter.

2.5.2 AC input Connections

Three phase, three wires plus equipment ground: The phase rotation must be A, B, C. Refer to Table 1 for the input circuit breaker rating for the model you have ordered. Refer to Table 2 for the nominal AC input current at nominal input voltage specified. Size the Main input Cables and upstream protection devices accordingly.

NOTE

For ease of installation, the AC input connections should be made first.

NOTE

If only one AC input source is going to be run to the UPS instead of the normal two AC sources (main input and bypass input source), jumpers must be installed from the main AC input connections to the bypass AC input connections. In addition, a four wire WYE source must be run to the UPS and the neutral wire must be connected to the neutral terminal in the UPS. EPE does *not* furnish these jumper cables for field installation. If the original order specifies only one AC feed is planned for the installation, the jumper will be factory installed prior to shipment, provided that the input and output voltages are the same.

2.5.3 Bypass AC Input (MAINS2) Connection

Three phase, four wire WYE plus equipment ground: Phase rotation must be A, B, C. Bypass AC Input/MAINS2 voltage must match the UPS output voltage. Refer to Table 2 for the bypass input current rating at the nominal bypass AC input voltage specified. Size your bypass AC input cables and upstream protection devices accordingly.

NOTE

SINGLE POINT GROUNDING

The EPS-2000™ UPS is shipped from the factory with the neutral bus tied to ground with a jumper. If the Bypass AC Input/MAINS2 source already has the neutral grounded, remove the jumper between the neutral and ground bus bars in the UPS. This will prevent any chance of a ground loop problem.

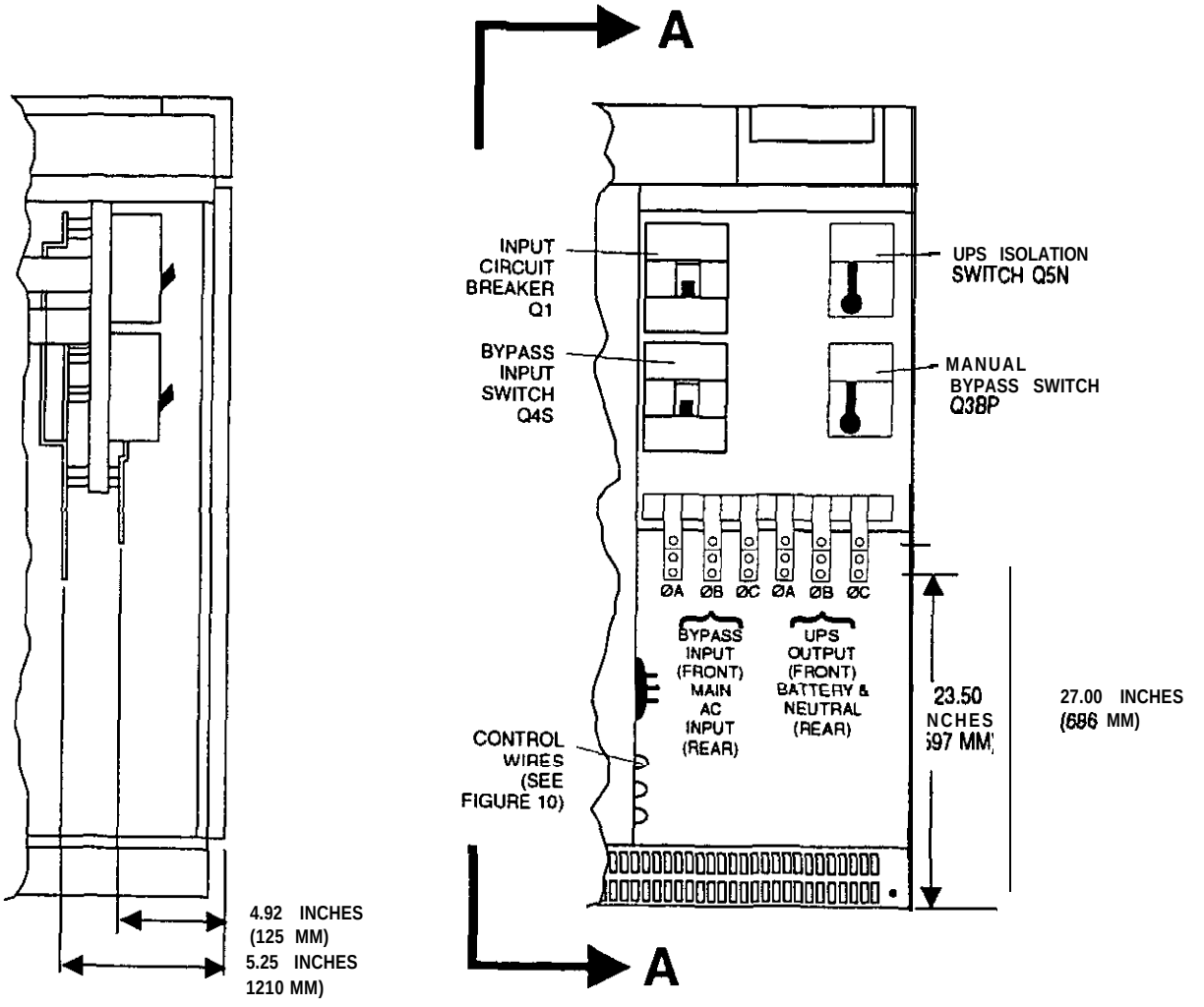
2.5.4 UPS Output Load Connection

Three phase, four wire WYE plus equipment ground: Phase rotation is A, B, C. Refer to Table 2 for the unit AC output current rating at the nominal output voltage specified. Size your output cables and downstream protection devices accordingly.

NOTE

A three-wire DELTA load can be connected to the UPS output, but the phase connection cannot be grounded.

Figure 9: Wiring Area



SIDE VIEW

VIEW A • A

FRONT VIEW

CIRCUIT BREAKER/SWITCH PANEL
RIGHT DOOR & COVER PANEL REMOVED

Tab/e 2A: Cab/e Sizing Data, 60 Hz Models

	EPS-2010	EPS-2015	EPS-2020	EPS-2030	EPS-2040
Output Power Rating					
kVA/kW	, 0/8	15/12	20/16	30/24	40/32
Unit Nominal AC Input Current (Amperes) @ Nominal Input Voltage					
208 VAC	31.9	47.2	61.5	93.2	121.5
220 VAC	31.1	44.6	58.2	88.1	114.9
240 VAC	28.5	40.9	53.3	80.8	105.3
480 VAC	14.2	20.4	29.3	40.4	52.7
600 VAC	11.7	16.2	23.5	32.3	42.1
Unit AC Output and Bypass AC Input Current (Amperes) @ Nominal Voltage (Note 1)					
Full Load Continuous					
208Y/120	27.8	41.6	55.5	83.3	111.0
220Y/127	26.2	39.4	52.5	78.7	105.0
480Y/277	12.0	18.0	24.1	36.1	48.1
125% Overload for 10 Minutes					
208Y/120	34.7	52.0	69.4	104.1	138.8
220Y/127	32.8	49.2	65.6	98.4	131.2
480Y/277	15.0	22.6	30.1	45.1	60.1
150% Overload for 1 Minute					
208Y/120	41.6	62.5	83.3	124.9	166.5
220Y/127	49.2	59.0	78.7	118.1	157.5
480Y/277	16.0	27.1	36.1	54.1	72.2
Maximum Battery Current (Note 2)					
Amperes	29.2	41.9	54.6	83.8	109.2
Battery Circuit Breaker (QF1)					
Rating (Amps)	SO	so	90	125	125

NOTES:

1. **Bypass AC Input power as a minimum should match the UPS output** *rating. However,* **the bypass AC input is recommended to have a continuous rating of 125% of the UPS output power rating to supply fault-clearing current,**

2. **Battery wiring should be sized to keep the total cable voltage drop to less than 0.5 Vdc at the current shown.**

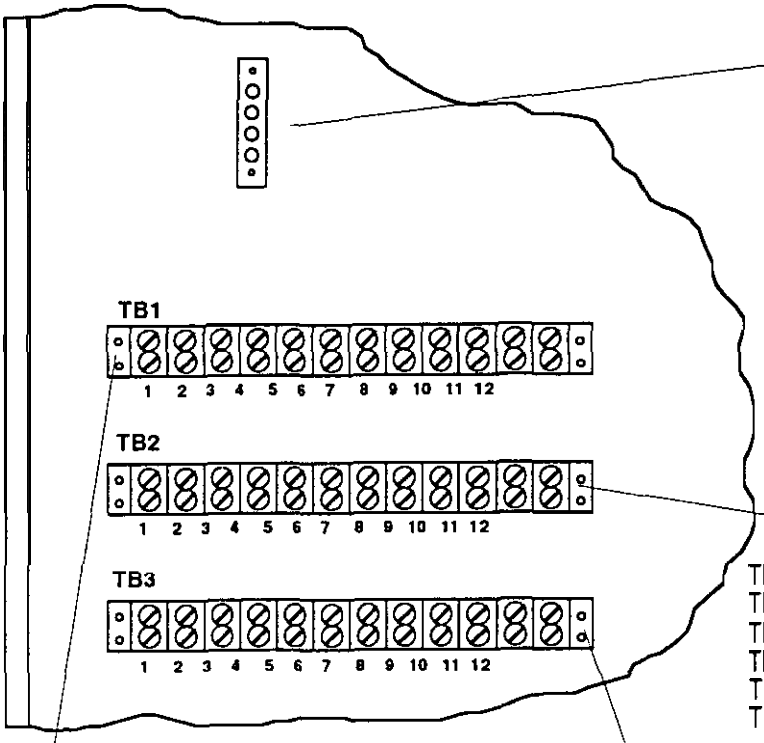
Table 2B: Cab/e Sizing Data, 50 Hz Models

	EPS-2010	EPS-2015	EPS-2020	EPS-2030	EPS-2040
Output Power Rating					
kVA/kW	10/8	15/12	20/16	30/24	40/32
Unit Nominal AC Input Currrent (Amperes) @ Nominal Input Voltage					
380 VAC	16.0	25.6	33.7	51.0	66.5
400 VAC	17.1	24.5	32.0	46.5	63.5
415 VAC	16.5	23.6	30.6	46.7	60.9
Unit AC Output and Bypass AC Input Current (Amperes) @ Nominal Voltage (Note 1)					
Full Load Continuous					
380Y/220	15.2	22.6	30.4	45.6	60.6
400Y/230	14.4	21.7	28.9	43.3	57.7
415Y/240	13.9	20.9	27.6	41.7	55.6
125% Overload for 10 Minutes					
380Y/220	19.0	26.5	38.0	57.0	76.0
400Y/230	16.0	27.1	36.1	54.1	72.2
415Y/240	17.4	26.1	34.0	52.2	69.6
150% Overload for 1 Minute					
380Y/220	22.6	34.2	45.6	66.4	91.2
400Y/230	21.7	32.5	43.3	65.0	66.6
415Y/240	20.9	31.3	41.7	62.6	63.5
Maximum Battery Current (Note 2)					
Amperes	29.2	41.9	54.6	83.8	109.2
Battery Circuit Breaker (QF1)					
Rating (Amps)	90	90	90	125	125

NOTES:

1. Bypass AC Input power as a minimum should match the UPS output rating. However. the bypass AC input is recommended to have a continuous rating of 125% of the UPS output power rating to supply fault-clearing current.
2. Battery wiring should be sized to keep the total cable voltage drop to less than 0.5 Vdc at the Current shown.

Figure 10: Wiring Detail



Ground Connection
(Ground Busbar)

CONTACT CLOSURE CONTROL WIRING

TB2-1 N.O.
TB2-2 COMM. } "ON BATTERY" OPERATION
TB2-3 N.C.

TB2-4 N.O.
TB2-5 COMM. } MAJOR/MINOR FAULT ALARM
TB2-6 N.C.

TB2-7 } REMOTE EMERGENCY POWER OFF (REPO)
TB2-8

TB2-9 } EXTERNAL CONTACTS N.O. (Customer Provided) Auxiliary Cabinet Fault N.O. Contacts
TB2-10
TB2-11 }
TB2-12

BATTERY CIRCUIT BREAKER CONTROL WIRING

TB1-1 } QF1 24 Vdc UV RELEASE
TB1-2

TB1-3 NOT USED
TB1-4 N.O.
TB1-5 COMM. } QF1 AUXILIARY CONTACT
TB1-6 N.C.

TB1-7 } GROUND FAULT (Optional)
TB1-8 } N.O. CONTACTS

TB1-9 } SMOKE DETECTOR (Optional)
TB1-10 } N.O. CONTACTS

TB1-11 +24 Vdc } SMOKE DETECTOR
TB1-12 COMM. } POWER SUPPLY ONLY

REMOTE INTERFACE PANEL WIRING

TB3-1 CHASSIS GROUND
TB3-2
TB3-3 } 120 VAC
TB3-4 R X
TB3-5 R X } Twisted Pair Shielded Cable
TB3-6 T X
TB3-7 T X
TB3-8 NOT USED

TB 3-9 } "ON BY PASS" CONTACTS
TB 3-10 }
TB 3-11 } "UPS ON LINE CONTACTS
TB 3-12 }

2.5.5 Battery Connections

Two wires, positive (+) and negative (–) from the EPA or from an external Battery Disconnect Switch. Refer to Table 2 for the maximum battery current required for the unit specified. Battery cables should be sized to keep the total cable voltage drop to less than 0.5 Vdc at the maximum current specified. A separate equipment ground cable should be run from the EPS-2000™ UPS to the BPA to connect the equipment grounds together to avoid hazard of electrical shock.

2.5.6 Control/Interface Wiring

Refer to Figure 9 for location of the control wiring interface and to Figure 10 for the detail connection information.

2.5.6.1 BPA or External Battery Disconnect Switch (TB1)

The number of #14 AWG tinned stranded cop per wires needed for this connection depends on the options purchased with the BPA. The standard BPA (no options) and the external Battery Disconnect Switch requires five (5) wires (TB1-3 is not used). If the DC ground fault indication option (Model Number EPS-2000/DCF) is used in the BPA, two additional wires are required. If the Smoke/High Temperature Detector option (Model Number EPS-2000/STD) is used in the BPA, four additional wires are required.

2.5.6.2 Contact Closure Control Wiring (TB2)

Form "C" dry contacts, rated at 1 Amp, 24 Vdc or 120 VAC, are provided that may be used to remotely annunciate the conditions (a. & b.), or used to interface with the REPO signal (c.) indicated below:

a. UPS On Battery Operation

b. Major/Minor Fault Alarm has occurred in the UPS.

c. REMOTE EMERGENCY POWER OFF (REPO) Connection requires two wires.

2.5.5.3 Remote Interface Panel Wiring (TB3)

This interface is provided for the Remote Monitor (Model Number EPS-2000/RM) or the Control Monitor (Model Number EPS-2000/CM) options. A special seven conductor shielded cable is required.

2.7 Start-Up Procedure

Prior to beginning the Start-Up procedure, read thoroughly Section III - OPERATION. Be sure you fully understand the operation of the LCD Display (¶ 3.1), use of the SS&CP keypads (¶ 3.1), and the EPS Monitor (¶ 3.3).

2.7.1 Checks Prior to UPS Start-Up

A. Check to insure that all power and control wires have been properly connected and tightened securely.

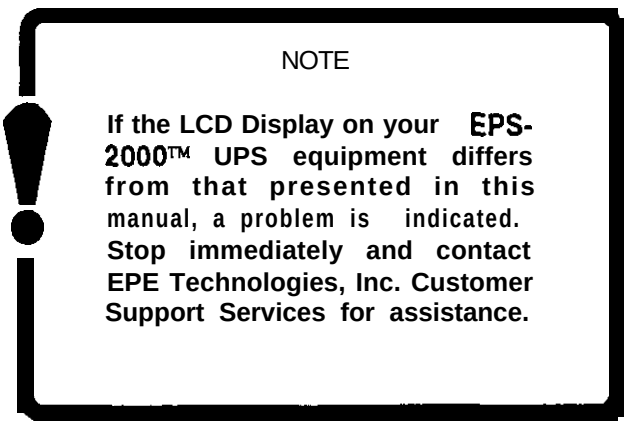
B. Check the trip settings on the upstream and downstream protective devices, and make certain that they are compatible with the UPS and the load requirements.

C. Verify that the voltage of the Main AC input source and the Bypass AC Input/MAINS2 source are indeed those shown on the UPS nameplate located inside the right door of the EPS-2000™ UPS enclosure.

D. Verify that the air filter located under the unit is properly installed and is free of dust and dirt. Make certain that no objects block the air intake at the front bottom of the unit, or the air exhaust at the top rear of the unit.

E. Verify that all four Circuit Breakers and Switches (Q1, Q3BP, Q4S, and Q5N) in the UPS cabinet are in the OFF position.

F. Verify that the Battery Circuit Breaker (QF1) located in the BPA-2000 Battery Cabinet is in the OFF position.



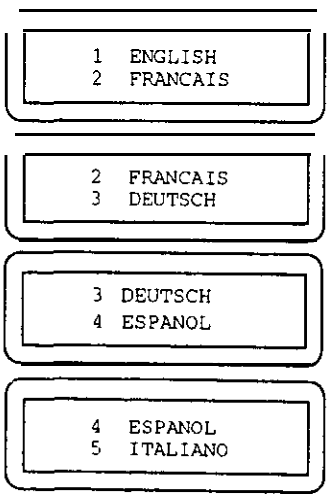
2.7.2 UPS Initial Start-Up Procedure

A. Close the upstream circuit breaker providing power to the UPS Main AC Input/MAINS1, and Bypass AC Input/MAINS2.

B. Measure the upstream supply voltages at the UPS Input and Bypass Input busbars to insure that the voltage is that required by the UPS (see the UPS nameplate located inside the right door of the EPS-2000" UPS enclosure). Make certain that the phase rotation of the Main AC Input/MAINS1 and Bypass AC Input/MAINS2 are A, B, C.

C. Close the UPS Input Circuit Breaker (CI). When Q1 is closed, the EPS-2000™ UPS power supply will turn on and the EPS Monitor will be active. The EPS Monitor will provide instructions for the start-up procedure.

When the UPS is first energized, the LCD will display the Language Selection:

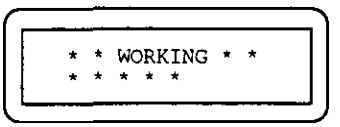


The display will continue to vertically scroll through the above messages until one language is selected. The Alarm LED (Red) on the SS&CP will be flashing.

To select English as the display language, press the 1 key firmly to insure contact. The Audible Alarm will "chirp" indicating that a keypad has been pressed.

Press: **Display Reads:**

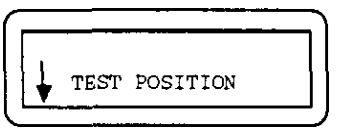
1 (



After a few seconds, the display will present all of the Instructions in a continuous horizontal scroll (across the LCD from right to left). Refer to ¶ 3.3.1 for information about the Instructions.

Then, the Test Position display will appear:

Display Reads:

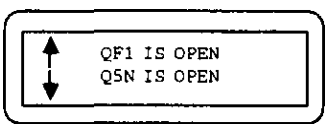


The UPS enters the Test Position when any of the non-automatic switches (Q3BP, Q4S, Q5N) are open, or if circuit breaker QF1 in the BPA is open.

To view the current status of the equipment, press the SCROLL DOWN keypad.

Press: **Display Reads:**

Twice



The battery Circuit Breaker (QF1) is open.

The UPS Output Isolation Switch (Q5N) is open.

(Start-Up Procedure Continues)

Press: **Display Reads:**

Scroll (Twice)

```
Q4S IS OPEN
MIN BAT. VOLTAGE
```

The Bypass Input Switch (Q4S) is open. The Rectifier/Battery Charger is OFF (no DC voltage).

Press: **Display Reads:**

Scroll (Twice)

```
INVERTER OV OR UV
K3N IS OPEN
```

The Inverter is OFF (no output voltage). The Output Contactor (K3N) is open.

Press: **Display Reads:**

Scroll (Twice)

```
CHARGER OFF
M2 OVER/UNDER VOLT
```

The Rectifier/Battery Charger is OFF. The Bypass AC Input/MAINS2 source is not available (Q4S is open).

Press: **Display Reads:**

Scroll (Twice)

```
M2 OVER/UNDER FREQ
MAINS2 UNSYNCHRON
```

The Bypass AC Input/MAINS2 source is not available (Q4S is open).

Press: **Display Reads:**

Scroll (Twice)

```
MAINS2 UNSYNCHRON
INV. PHASE OUT TOL
```

The Inverter is OFF

These alarm conditions, as displayed after Test Position, are the normal alarm conditions that should appear for the present status (initial start-up) of the equipment If other alarm conditions are displayed, refer to the DIAGNOSIS Menu to resolve these conditions (see ¶ 3.3.2.7).

Press: **Display Reads:**

Menu

```
1 START-UP
2 INVERTER ON/OFF
```

1

```
CLOSE OUTPUT SWITCH
ITEM: Q5N
```

Close the UPS Output Isolation switch Q5N. Refer to Figure 3 for location.

```
CLOSE MAINS2 SWITCH
ITEM: Q4S
```

Close the Bypass Input/MAINS2 switch Q4S. Refer to Figure 3 for location.

NOTE

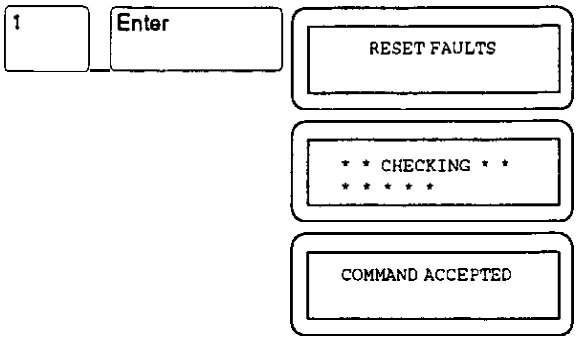
Closing Q4S will energize the output busbars. Work Carefully!

The Static Switch is now ON. The Critical Load Bus is energized. The Bypass LED (Green) on the SS&CP is ON. The internal fans are operating.

```
START THE CHARGER
1 = START
```

The EPS Monitor is waiting for your command lo start the Rectifier/Battery Charger.

Press: **Display Reads:**

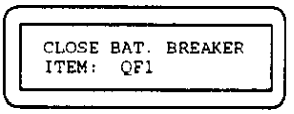


The Rectifier/Battery Charger is ON.

The DC Bus voltage is at its preset value.

The Rectifier/Battery Charger LED (Green) or the SS&CP is ON.

Display Reads:

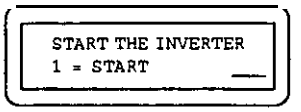


Close the Battery Circuit Breaker QF1 locater inside the BPA enclosure door.

The Audible Alarm will sound once every three seconds,

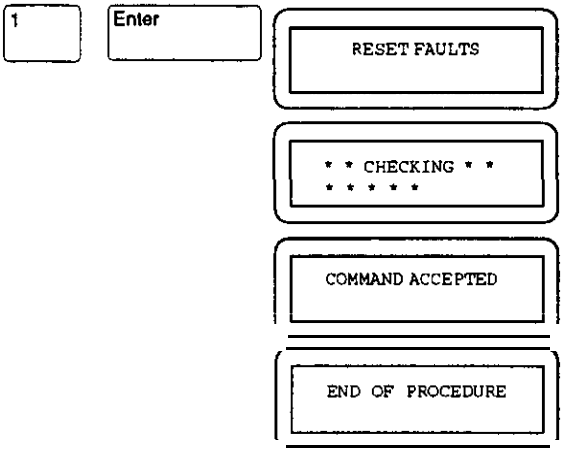
To Silence the Audible Alarm, press:

Display Reads:



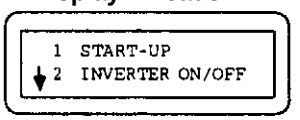
The EPS Monitor is waiting for your command to start the Inverter.

Press: **Display Reads:**

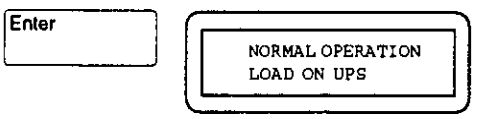


The Inverter will start, The Audible Alarm will silence, and the flashing Alarm LED (Red) on the SS&CP will turn off. The Inverter LED (Green) on the SS&CP is ON, and the Bypass LED is OFF.

Display Reads:



Press: **Display Reads:**



The EPS Monitor has assumed its normal operating condition.

(Start-Up Procedure Continues)

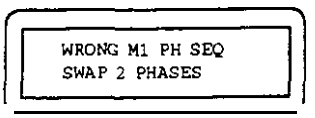
The EPS-2000™ UPS is now in its normal operating condition. Voltage and Current measurements are performed continuously and can be displayed by pressing the V and A keypads respectively on the SS&CP. See ¶ 2.9 for instructions.

The EPS-2000™ can be adjusted for the requirements of your installation if you desire settings other than the standard factory settings. Refer to the Personalization Menu (¶ 3.3.2.9).

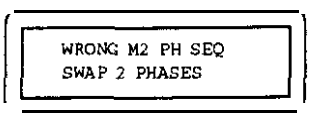
2.7.3 Anomalies

During the Start-Up Procedure, the LCD on your EPS-2000™ may indicate:

Display Reads:



The Main AC Input/MAINS1 (Ml) source phases are out of sequence. Corrective action is requested by the EPS Monitor during start-up; in this case, reverse two phases of the Main AC Input/MAINS1 source. To perform this correction, the UPS must be isolated and completely shut down by switching off the upstream circuit breakers supplying power to the UPS.



The Bypass AC Input/MAINS2 (M2) source phases are out of sequence. To correct this condition, the UPS must be isolated and completely shut down by switching off the upstreams circuit breakers supplying power to the UPS.

After performing the required corrective action, repeat the Initial Start-Up procedure from the beginning.

2.8 Tests Afler Initial Start-Up

After performing the initial start-up procedure, the following tests should be performed to insure proper operation of your EPS-2000™ UPS,

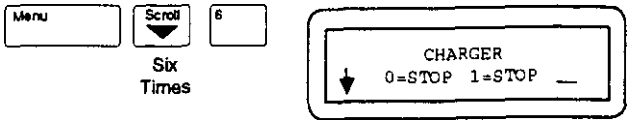
2.8.1 Start/Stop Tests

For location of the keypads and LEDs, see Figure 11, page 3 - 1.

2.8.1.1 Rectifier/Battery Charger

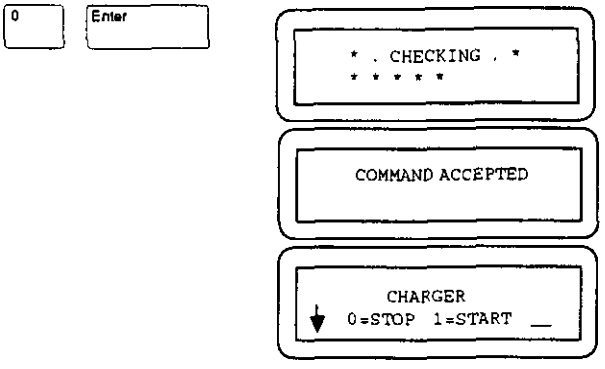
- Press the MENU keypad to return to the Main Menu.

Press: Display Reads:



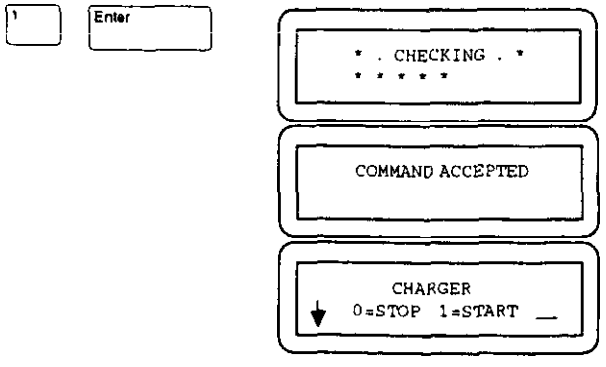
- Press the 0 keypad to stop the Rectifier/ Battery Charger. Validate the command by pressing the ENTER keypad. The Rectifier/ Battery Charger LED (Green) on the SS&CP should be OFF, and the Inverter LED (Green) should be on, indicating that the Inverter is supplying load power from the battery.

Press: Display **Reads:**



- **Press** the 1 keypad followed by the ENTER keypad to restart the Rectifier/Battery Charger. The Rectifier/Battery Charger LED (Green) on the SS&CP should be ON again.

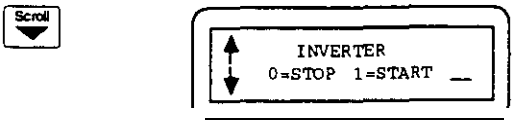
Press: **Display Reads:**



2.8.1.2 Inverter

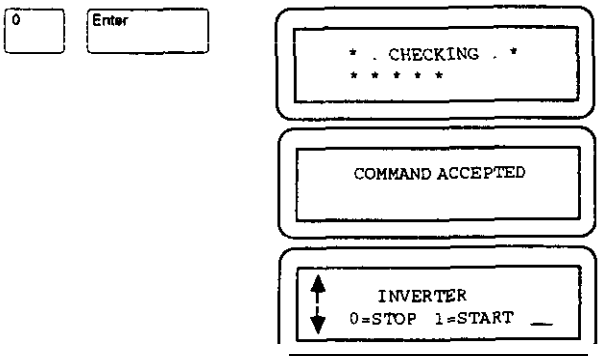
- Press the SCROLL DOWN keypad to display the next two lines of the Command submenu.

Press: **Display Reads:**



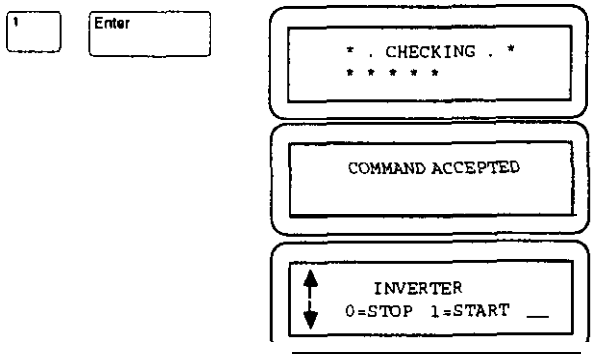
Press the 0 keypad and **then the ENTER** keypad to stop the Inverter. The Inverter LED (Green) on the SS&CP should be OFF and the Bypass LED (Green) should be ON, indicating that the **load** has been transferred from the UPS Inverter output to the Bypass AC Input/MAINS2 source.

Press: **Display Reads:**



- Press the 1 keypad, then the ENTER keypad to restart the Inverter and return the UPS to normal operation. The Bypass LED (Green) on the SS&CP should be OFF and the Inverter LED (Green) on the SS&CP should be ON.

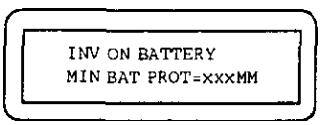
Press: **Display Reads:**



2.8.2 On Battery Operation Test

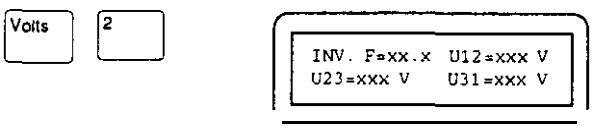
- The UPS should be operating in a *normal* manner, with a load connected to the UPS Inverter output,

- Turn off the Main External AC input circuit breaker (supplying the UPS) to simulate a utility failure. The UPS Inverter should operate on battery power. The Rectifier/ Battery Charger LED (Green) on the SS&CP should be OFF. The Inverter LED (Green) on the SS&CP should be ON. The display should indicate:



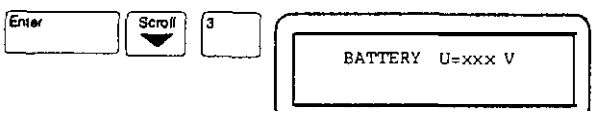
- Check the UPS Output voltages (see Voltage Measurements, ¶2.9.1). Press the Volts keypad, then the 2 keypad, to monitor the Inverter output voltage and frequency.

Press: **Display Reads:**



- Monitor the decrease in battery voltage (see Voltage Measurements, ¶2.9.1). Press the ENTER, SCROLL DOWN, and 3 keypads to display Battery Voltage and Time.

Press:



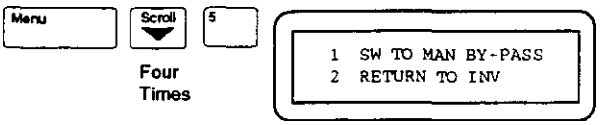
- Turn on the Main External AC Input circuit breaker to the UPS. The Rectifier/Battery Charger should start automatically (the Charger LED (Green) will be ON), providing power to the UPS Inverter and recharging the battery. The Battery Charger Current can be displayed by using the current measurements (see Current Measurements, ¶ 2.9.2).

2.8.3 Manual Bypass Operation

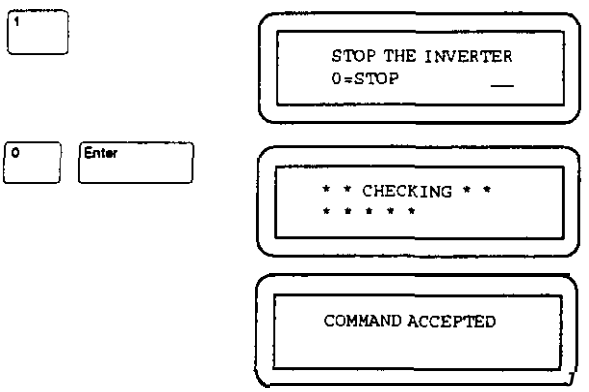
A. Transfer To Maintenance Bypass

- The UPS should be operating in a normal manner, with a load connected to the UPS Inverter output. The UPS Inverter Output must be synchronized to the Bypass AC Input/MAINS2 source.

Press: **Display Reads:**

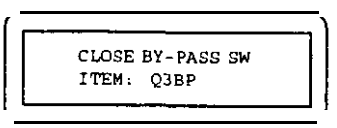


To Transfer To Maintenance Bypass



The Inverter turns OFF. The load is transferred to the Bypass AC Input/MAINS2 source. The Inverter LED (Green) is OFF. The Bypass LED (Green) is ON. The Audible Alarm is activated. The Alarm LED (Red) is flashing.

Display Reads:



Close the Maintenance Bypass Switch Q3BP. The Audible Alarm turns OFF.

Display Reads:

```
OPEN MAINS2 SWITCH
ITEM: Q4S
```

Open the Bypass AC Input/MAINS2 source switch Q4S. The Bypass LED (Green) turns OFF.

Display Reads:

```
OPEN OUTPUT SWITCH
ITEM: Q5N
```

Open the UPS Isolation Switch Q5N.

Display Reads:

```
END OF PROCEDURE
```

The output of the UPS is now isolated for maintenance.

NOTE

To completely isolate the UPS from all power sources, the UPS Input Circuit Breaker Q1 and the Battery Disconnect Circuit Breaker QF1 must be turned off.

B. Return To Inverter

To return the UPS to normal (Inverter) operation, follow this procedure:

Press: Display Reads:

```
1 SW TO MAN BY-PASS
2 RETURN TO INV
```

Press: 2

```
CLOSE OUTPUT SWITCH
ITEM: Q5N
```

Close the UPS Output Isolation switch Q5N.

Press: Display Reads:

```
CLOSE MAINS2 SWITCH
ITEM: Q4S
```

Close the Bypass AC Input/MAINS2 switch Q4S. The Bypass LED (Green) turns ON.

```
OPEN BY-PASS SWITCH
ITEM: Q3BP
```

Open the Maintenance Bypass switch Q3BP. The Audible Alarm is active.

```
START INVERTER
1=START __
```

Press: 1 Enter

```
RESET FAULTS
```

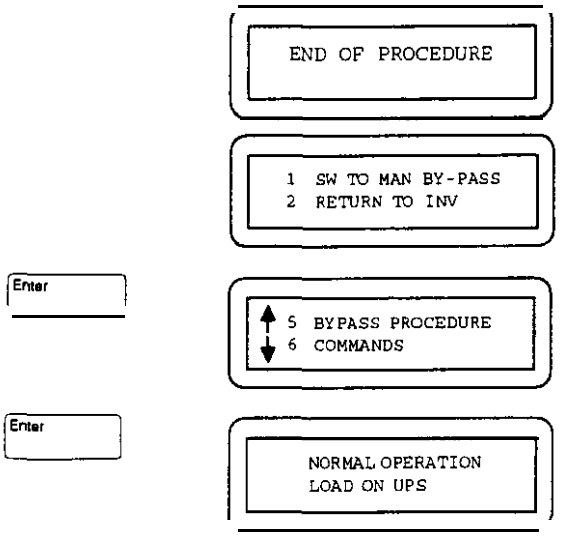
```
* * CHECKING * *
* * * * *
```

```
COMMAND ACCEPTED
```

The UPS Inverter provides load power. The Inverter LED (Green) turns ON. The Alarm LED (Red) is OFF. The Audible Alarm is OFF. The Bypass LED (Green) turns OFF.

Press:

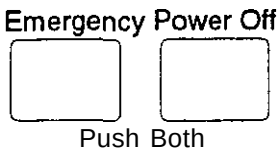
Display **Reads:**



The UPS has resumed normal operation

2.8.4 Emergency Power Off (EPO)

Two Emergency Power Off (EPO) keypads are provided on the upper **left** portion of the **SS&CP.**



When these keypads are pressed simultaneously, the **EPS-2000™** UPS and corresponding BPA will shut down. The UPS AC Input circuit breaker **Q1** will trip off. The Rectifier/Battery Charger, the **Inverter,** and the Static Switch will all turn **off.** The Bypass AC **Input/MAINS2** switch **Q4S** will trip off. Power to the load will cease. The Battery Disconnect circuit breaker **QF1** in the BPA will trip off.

To restart the UPS, follow **the** procedure as indicated in ¶ 2.7.2.

2.8.5 Site Environment Test/External Contacts

2.8.5.1 Battery Ventilation Fault

NOTE

This test applies only when either the DC Ground Fault Indication (EPS-2000/DCF) or Smoke/ High Temperature Warning (EPS-2000/STD) or both options have been purchased and installed in the BPA.

When the **EPS-2000™** UPS receives an **external** dry contact closure, the Rectifier/Battery Charger is turned off, forcing the UPS **Inverter** to go on Battery Operation. The UPS AC Input circuit breaker **(Q1)** will open, isolating the battery from the utility power source. The LCD will indicate an ENVIRONMENTAL FAULT,

Restart **the** Rectifier/Battery Charger using the COMMANDS section of the Main Menu after the external normally open dry contacts have been reset.

2.8.5.2 Remote Emergency Power Off (REPO)

An external dry contact closure can be used to cause a complete shut down of the UPS. This action is the same as indicated in ¶ 2.8.4, except that it is initiated from a remote location.

To restart the UPS, follow the procedure indicated in ¶ 2.7.2 after the external dry contact REPO has been reset.

2.8.5.3 External Contact Closures

Activation of the Outside Contact Closures can perform one of four functions as selected during UPS personalization. Refer to ¶ 3.3.2.8, SELECT EXTERNAL CONTACT response for the available functions.

2.8.5.4 Auxiliary Cabinet Fault Contact Closure

When the EPS-2000™ receives a contact closure from the Auxiliary Cabinet, the UPS will trigger an alarm. This is shown on the LCD as an ENVIRONMENTAL FAULT. No shut-down will take place; this is only a warning alarm. Refer to the ACA-2000 Owner's Manual for more detailed information.

2.9 Voltage and Current Measurements

Voltage and Current measurements can be obtained instantly by pressing the Volts and Current keypads respectively on the SS&CP.

Voltage [Volts] [Current] *Current*

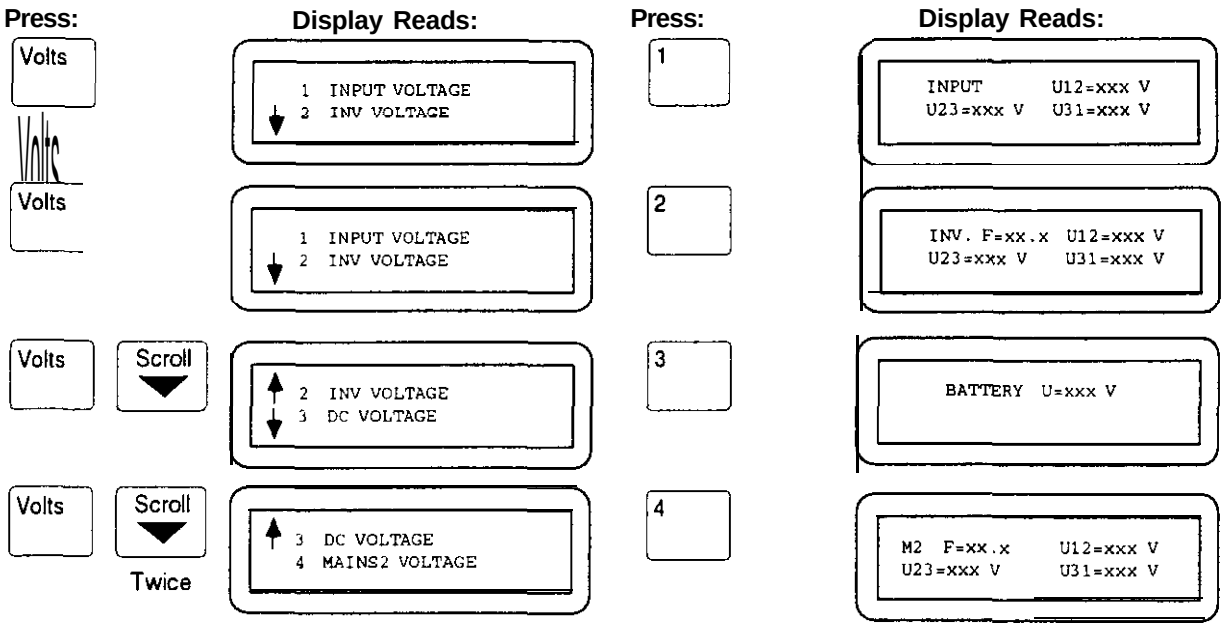
2.9.1 Voltage Measurements

The following voltage parameters (L - L) are continuously monitored, and displayed on the LCD when selected:

- UPS Input Voltage (MAINS1)
- DC Bus Voltage (Battery)
- Inverter Voltage (UPS Output) And Frequency
- MAINS2 Voltage (Bypass AC Input) And Frequency

Press the [Volts] keypad to display

Voltage Measurements



NOTES:

(1) The desired menu must appear on the LCD before it can be selected for access.

(2) Use the ❑ and [Scroll] keypads for menu review.

(3) By pressing the [Enter] keypad once. you will return to the next higher menu where you exited il.

2.9.2 Current Measurements

The following current parameters are continuously monitored, and displayed on the LCD when selected:

- UPS Input Current (MAINS1) All Three Phases
- Battery Current (if positive [+], indicates Battery Charging Current) (If negative [-], indicates Battery Discharging Current)
- Inverter Current (UPS Output Current)
- UPS Output current in Percent for the most Heavily Loaded Phase
- MAINS2 Current (Bypass AC Input Current)
- MAINS2 Current in Percent for the most Heavily Loaded Phase

Press the Current keypad to display.

Current Measurements

Press:	Display Reads:	Press:	Display Reads:
Current	1 INPUT CURRENT 2 INV CURRENT	1	INPUT I1=xxx A I2=xxx A I3=xxx A
Current	1 INPUT CURRENT 2 INV CURRENT	2	INV IC=xxx% I1=xxx A I2=xxx A I3=xxx A
Current, Scroll	2 INV CURRENT 3 BAT CURRENT	3	BATTERY I=xxx.x A
Current, Scroll Twice	3 BAT CURRENT 4 MAINS2 CURRENT	4	M2 IC=xxx% I1=xxxA I2=xxx A I3=xxx A

NOTES:

(1) The desired menu must appear on the LCD before it can be selected for access.

(2) Use the ❑ and Scroll keypads for menu review.

(3) By pressing the Enter keypad once. you will return to the next higher menu where you exited it.

Operation

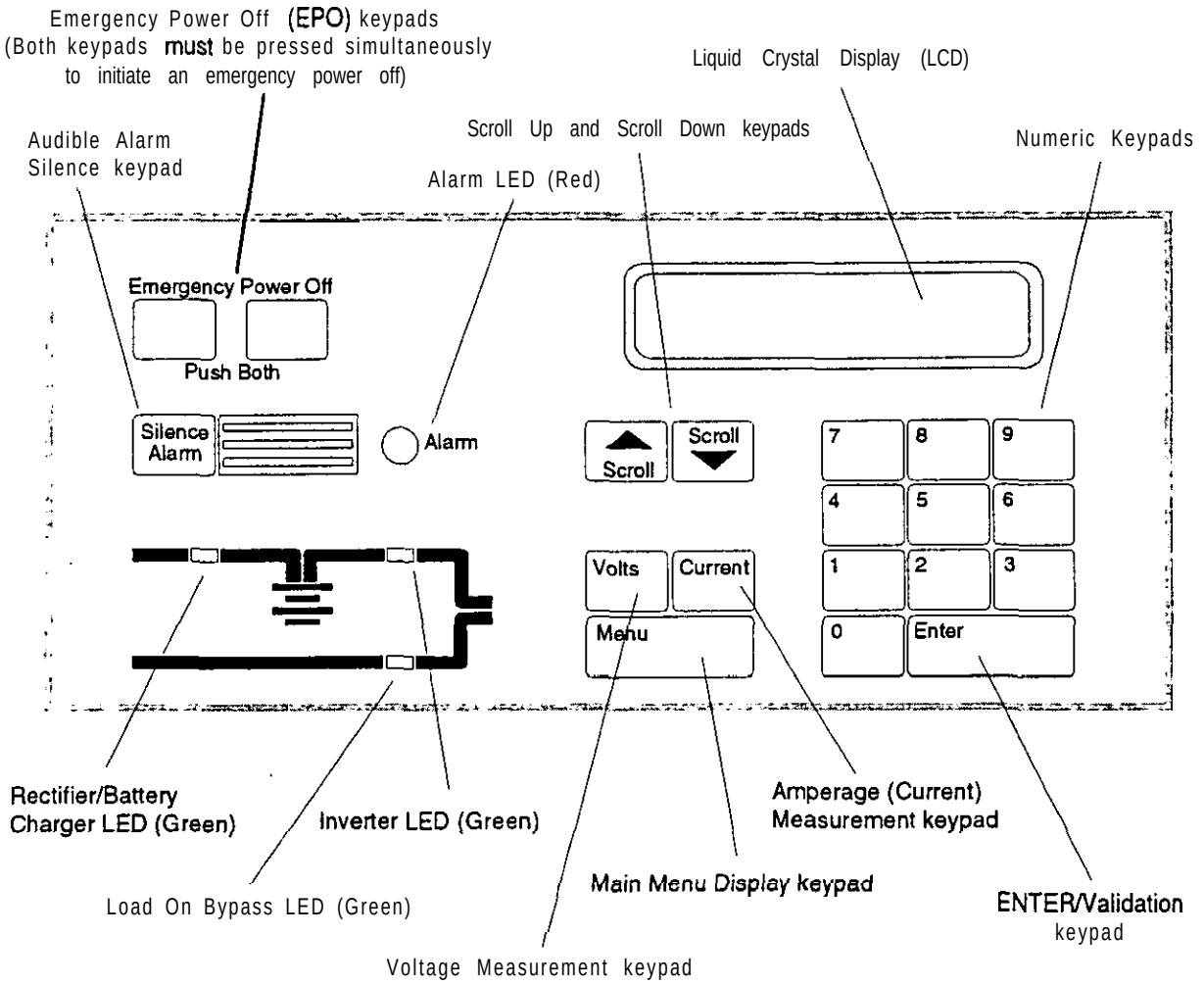
3.0 scope

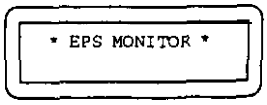
This section describes the EPS-2000™ System Status and Control Panel (SS&CP), including programmable controls and indicators, electro-mechanical controls, operating modes, and alarm conditions.

3.1 System Status & Control Panel (SS&CP)

The SS&CP, shown in Figure 11 below, is located on the upper right portion of the EPS-2000™ UPS enclosure. The SS&CP contains the elements listed on the following pages.

Figure 11: System Status and Control Panel (SS&CP)





. LCD

The Liquid Crystal Display (LCD) consists of two lines, 20 characters per line. It is used to display measurements, start-up and operating procedures, diagnostics, and alarm messages. Contrast of the LCD can be adjusted to suit the viewing environment: see ¶ 3.3.2.3.

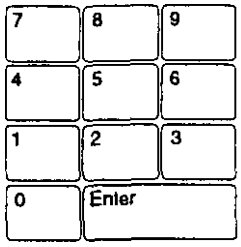
- Audible Alarm Silence keypad

This keypad is used to silence the Audible Alarm.

- **Scroll Up** keypad

- **Scroll Down** keypad

The SCROLL keypads allow the operator to scroll up or down menus on the LCD display, When arrows appear on the left side of the LCD, additional text is available which can be brought into view by pressing either the SCROLL UP or SCROLL DOWN keypads.



- **Ten Digit** (0 to 9) keypads

These keypads are used to select Menus, to select items from Menus, and to enter or change system settings. When the LCD prompt indicates that a number is to be entered, press the appropriate numbered keypad. The number which you have pressed will appear on the right portion of the LCD. All entries can be modified by re-entering as long as they have not been validated by pressing the ENTER keypad. If the number has been validated, then the operational sequence needs to be repeated to change the number.

. **Voltage Measurement** keypad

This keypad, when pressed, causes the LCD to display submenus which can be used to monitor:

UPS Input Voltage (MAINS1)
DC Bus Voltage (Battery)
Inverter Voltage (UPS Output)
MAINS2 Voltage (Bypass AC Input)

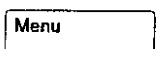
Refer to ¶ 2.9.1 for instructions on the use of **the** Voltage Measurement keypad.

- **Current Measurement keypad**

This keypad, when pressed, causes the LCD display submenus which can be used to monitor:

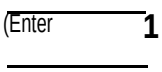
UPS Input Current (MAINS1)
Battery Current
(If negative (-), indicates Battery Discharging)
(If positive (+), indicates Battery Charging)
Inverter Current (UPS Output)
MAINS2 Current (Bypass AC Input)

Refer to ¶ 2.92 for instructions on the use of the Current Measurement keypad.



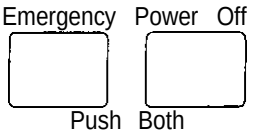
- **Main Menu Call** keypad

This keypad, when pressed, returns the operator to the Main Menu display. Should you make an error while working with the EPS-2000" UPS, pressing the MENU keypad twice will always return you to the Main Menu.



- **Entry Validation or Return To Menu keypad**

This keypad is used to validate an entry, or to return to the last menu where you exited from it.



- **Emergency Power Off (EPO)** keypads,

The two EPO keypads must be pressed simultaneously to initiate an EPO shut-down. When an EPO shut-down is initiated, the UPS is turned off (the Main AC Input/MAINS1 circuit breaker Q1 and Bypass AC Input/MAINS2 switch Q4S are turned off), the battery circuit breaker QF1 (located in the BATTERY PAC Assembly) is opened, and the load is disconnected from the AC power sources

NOTE

Each key on the SS&CP, when pressed, emits a short tone to indicate to the user that a key has been pressed.

INDICATORS

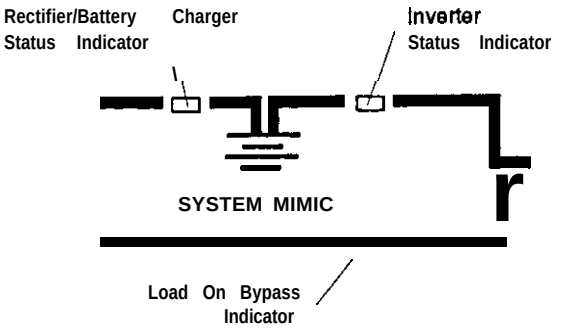
0 Alarm

- **Alarm Indicator**

This Red LED flashes to indicate a major or minor alarm condition has occurred. The actual alarm(s) is shown on the LCD.

Use the 

and  keypads to review all alarm conditions.



- **Rectifier/Battery Charger Status Indicator**

The Rectifier/Battery Charger Status Indicator, when on, indicates that the Rectifier/Battery Charger is operational.

- **Inverter Status Indicator**

The Inverter Status Indicator, when on, indicates that the Inverter is supplying power to the load.

- Load **on Bypass Indicator**

The Load on Bypass Indicator. when **on,** indicates that the load power is being provided by the Bypass AC Input/MAINS2 source.

3.2 Controls

Controls for the EPS-2000" UPS are of two types: programmable controls and electro-mechanical controls.

3.2.1 Electro-Mechanical Controls

The EPS-2000™ UPS has the following compliment of electro-mechanical switching devices. See Figure 3 for the location of these devices.

Circuit Reference Designator	Function
Q1	Main AC Input/MAINS1 circuit breaker. Used to apply input voltage to the Rectifier/Battery Charger, and provides input current protection.
Q3BP	Manual maintenance bypass non-automatic switch. Used to bypass the UPS. Used in conjunction with Q4S and Q5N.
Q4S	Bypass AC Input/MAINS2 On/Off switch. Applies power to the Static Switch. Used to isolate the Static Switch. Used in conjunction with Q3BP and Q5N.
Q5N	UPS Isolation On/Off Switch. Used to isolate the UPS Output. Used in conjunction with Q3BP and Q4S.
K3N	Inverter Output Contactor. Used to mechanically isolate the UPS Inverter from the Static Switch. When the Static Switch is ON, K3N is open; when the Static Switch is OFF, K3N is closed.

3.2.2 Programmable Controls

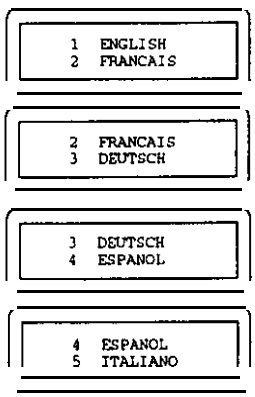
The Programmable Controls are covered under the Main Menu headings, ¶ 3.3.1, and include such control functions as:

- Rectifier/Battery Charger Start and Stop
- Inverter Start and Stop
- Clearing of Faults
- Synchronized/Non-Synchronized UPS Inverter Operation
- Output AC Voltage Adjustment
- DC Voltage and Battery Charger Current Limit Adjustments
- Boost or Equalize Charging of the Battery
- Selection of Display Language
- Diagnostic and Test Routines
- Adjusting Display Contrast

3.3 EPS Monitor

The EPS Monitor is a software package through which the operator interacts with the EPS-2000™ UPS system. The EPS Monitor is menu-driven; to perform a function (such as Start-Up), the appropriate menu is selected, from which the operator selects the chosen function.

When the EPS-2000™ UPS is first energized, the Language Selection menu is displayed:



The LCD will continue to scroll vertically through the above displays until a language is selected. To select a language, simply press the numbered keypad corresponding to the desired language (for example, press 1 for English). The desired selection need not be shown on the LCD to make the selection, nor does it require validation.

3.3.1 Instructions

The INSTRUCTIONS Menuaredisplayed **after the** Language Selection command has been executed (see COMMANDS Menu, ¶ 3.3.2.6):

The LCD will continuously scroll the **SS&CP In**structions horizontally across the screen from right to left. These instructions will appear:

l " ' - • m
Four Times

Display Reads:	Comments:	
*** * * EPS MONITOR * * ***		
INSTRUCTIONS		
: AUDIO ALARM OFF :	Refers to the **AUDIBLE ALARM SILENCE keypad**	
u : VOLTAGE MEASUREMENTS :u	Refers to the **VOLTAGE MEASUREMENT keypad**	
1 : CURRENT MEASUREMENTS :I	Refers to the **CURRENT MEASUREMENT keypad**	
? : ACCESS TO MAIN MENU :?	Refers to the MENU keypad	
↑ or ↓: MENU SCROLLING :↑ or ↓	Refers to the SCROLL UP or SCROLL DOWN keypads	
↵ : COMMAND VALIDATION :↵	Refers to the ENTER keypad	
↵ : RETURN TO LAST MENU :↵		
↵ : ALARM DISPLAY : ↵		

After the message:

↵ : ALARM DISPLAY : ↵

appears, the LCD will return to the TEST **POSITION** display automatically during Start-Up.

3.3.2 Menus

Operation of the EPS Monitor is divided into nine menus:

Menu 1 – START-UP
Menu 2 – INVERTER ON/OFF
Menu 3 – DISPLAY CONTRAST
Menu 4 – BATTERY TRANSFER TEST
Menu 5 – BYPASS PROCEDURE
Menu 6 – COMMANDS
Menu 7 – DIAGNOSTICS
Menu 9 – PERSONALIZATION
Menu 9 – COMMUNICATION

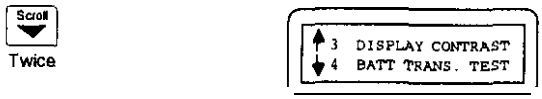
When the MENU keypad is pressed, the menu listing will be displayed **on the LCD:**

Press: **Display Reads:**

For the **START-UP** Menu, see ¶ 3.3.2.1

For the **INVERTER ON/OFF** Menu, see ¶ 3.3.2.2

Press: **Display Reads:**



For the **DISPLAY CONTRAST** Menu, see ¶ 3.3.2.3

For the **BATT TRANS. TEST** Menu. see ¶ 3.3.2.4

Press: **Display Reads:**

For the **BYPASS PROCEDURE** Menu, see ¶ 3.3.2.5

For the **COMMANDS Menu, see ¶ 3.3.2.6**

Press: **Display Reads:**

For the DIAGNOSIS Menu, see ¶ 3.327

For the PERSONALIZATION Menu, see ¶ 3.3.2.8

Press: **Display Reads:**

For the COMMUNICATION Menu, see ¶ 3.3.2.9

You can manually scroll through the available menus by pressing the SCROLL UP or SCROLL DOWN keypads respectively. To select a menu. press the numbered keypad which corresponds to the desired **menu** (for example, press 1 for Instructions) only when it is displayed on the LCD.

If you selected the wrong menu, or have made an error, press the MENU keypad again to return to the menu listing. By pressing the ENTER keypad once, you can return to the next higher menu from where you exited.

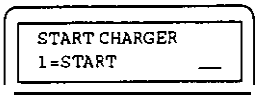
3.3.2.1 Start-Up

A step-by-step Start-Up procedure is furnished along with a troubleshooting guide. Refer to ¶ 2.7.2.

To access the Start-Up Menu:

Press: [Menu] [1]

Display Reads:



Or, follow the prompt indicated on the LCD

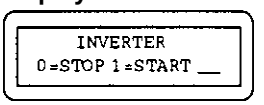
3.3.2.2 Inverter On/Off

This menu is used to turn the UPS Inverter on and off.

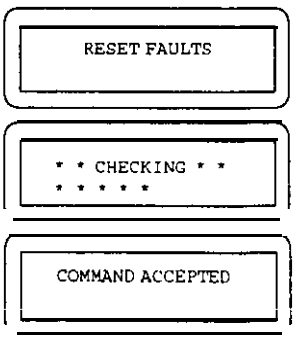
To access the Inverter On/Off Menu:

Press: [Menu] [2]

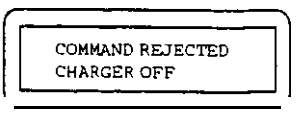
Display Reads:



To start the Inverter, press: [1] [Enter]



If the Inverter was commanded to start with the Rectifier/Battery Charger OFF, the display will indicate:

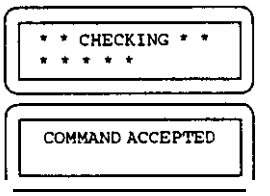


System Start-Up is required; refer to ¶ 2.7.2.

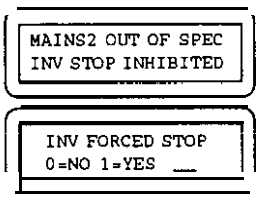
To stop the Inverter:

Press: [0] [Enter]

Display Reads:



If the Inverter is commanded to stop during non-synchronous operation (refer to ¶ 3.4.1.4 for an explanation of this condition), the display will indicate:

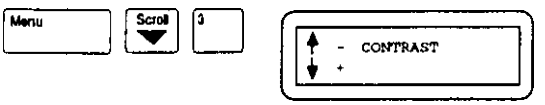


Refer to 3.3.2.6. Synchronous/Non-Synchronous Operation for the Out Of Sync shut-down procedure.

3.3.2.3 Display Contrast

This command allows you to adjust the contrast of the LCD to suit your environment.

Press: **Display Reads:**



To decrease contrast (lightens the LCD), press:

❑

To increase contrast (darkens the LCD), press:

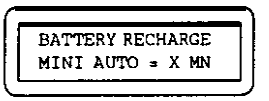
❑

3.3.2.4 Battery Transfer Test

The Battery Transfer Test is used to simulate an input power failure by turning off the Rectifier/Battery Charger, and allowing the Inverter to operate from battery power for two minutes, then returning the UPS to normal operation.

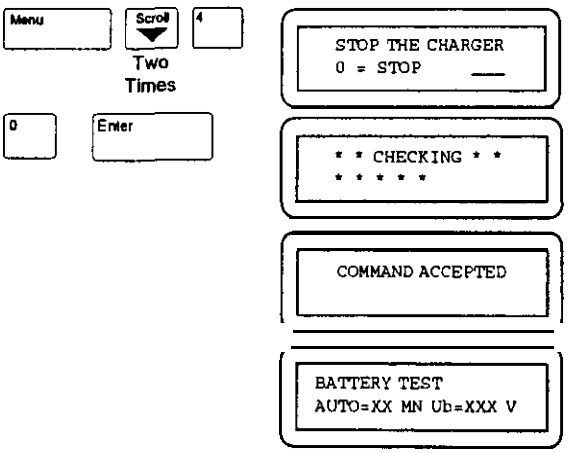
This test is only possible if the battery has been charged for at least ten (10) hours. Also, the Bypass AC Input/MAINS2 source frequency and voltage must be within the prescribed limits for a no-break transfer to the Bypass AC Input/MAINS2 source in the event of a battery problem.

If the battery has been discharged within the last ten hours, this message is displayed immediately:

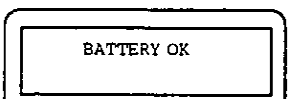


To execute the Battery Transfer Test:

Press: **Display Reads:**



The battery voltage is displayed during discharge, along with the lime remaining on battery operation. The test ends with the display of:



3.3.2.5 Bypass Procedure

The Bypass Procedure is presented in detail in ¶ 2.7.3. The procedure is intended for manual transfer of the load to the Bypass AC Input/ MAINS2 source without interruption to the load, for maintenance purposes (Bypass), or for reverse transfer by returning the load to the UPS Inverter output (Return To Inverter).

If the Bypass AC Input/MAINS2 source is out Of tolerance, these operations will result in a 0.8 second load interruption, and can only be performed with a FORCED OFF or FORCED ON (see ¶ 3.3.2.6). The FORCED OFF and FORCED ON commands can only be issued after entering the two-digit password.

This procedure assumes that the UPS is operating in a normal manner, with the Inverter providing load power. The Inverter output must be synchronized to the Bypass AC Input/MAINS2 power source.

3.3.2.6 Commands

The COMMANDS Menu can be reached by pressing the MENU keypad, pressing the SCROLL DOWN keypad four times, then the 6 keypad. The COMMANDS Menu is used to initiate the following operations:

- Rectifier/Battery Charger Start and Stop
- Inverter Start and Stop
- Clearing Memorized Faults
- Synchronized/Non-Synchronized UPS Inverter Operation
- Boost or Equalize Charging of the Battery
- Selection of Display Language
- SS&CP Instructions

While a function is being executed, the LCD will display:

```
*.      CHECKING      .     *
•    COMMAND     ACCEPTED     *
```

Rectifier/Battery Charger* Start and *Stop

The SCROLL UP and SCROLL DOWN keypads are used to select from the available commands. Procedures for each command are listed below:

Press:	Display Reads:
[Menu] [Scroll ▼] Four Times [6]	CHARGER ↓ 0=STOP 1=START _

Brings up the COMMAND Menu. The Rectifier/ Battery Charger Start/Stop is the first command on the menu.

To START the Rectifier/Battery Charger, press:

[1] [Enter]

To STOP the Rectifier/Battery Charger, press:

[0] [Enter]

Inverter Start and Stop

Press:	**Display Reads:**
[Scroll ▼]	↑ INVERTER ↓ 0=STOP 1=START _

To START the Inverter, press:

[1] [Enter]

To STOP the Inverter, press:

[0] [Enter]

Clearing Memorized Faults

❑	↑ CLEAR FAULTS ↓ 1=YES _

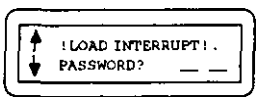
To clear memorized faults, press:

❑ [Enter]

Synchronous/Non-Synchronous Operation

Press **Display Reads:**

Scroll



Synchronizing and de-synchronizing the Inverter requires entry of the two-digit password supplied with this manual. Enter the password:

X X Enter

NOTE

The two-digit password will NOT appear on the LCD.

The passwords are provided on the Title Page of this manual.

NOTE

The !LOAD INTERRUPT! messaga indicates that the load will be interrupted for a minimum of, 800 milliseconds. Be certam that the load can tolerate this interruption.

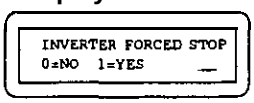
NOTE

When the UPS Inverter is operated in a Non-Synchronous mode in relation to the Bypass AC Input/MAINS2 source, operation of the Static Switch is inhibited for 800 milliseconds.

Should you make an error, the EPS Monitor will allow you to re-enter the password number.

After the password is entered, the Inverter Forced Stop screen is presented:

Display Reads:



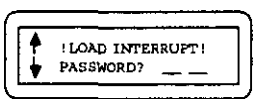
For Synchronous operation. press:

0 Enter

For Non-Synchronous (free-running) operation, press:

Enter

After the Unsynch Decision screen has been presented, the LCD will display:

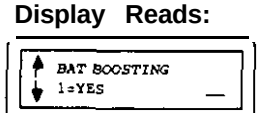


Battery Boost Charge

This command applies charge voltage to the battery.

Press: **Display Reads:**

Scroll



To apply boost charge, press:

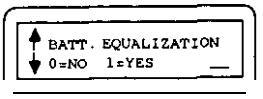
1 Enter

Battery Equalization Charge

This command applies an equalization charge to the battery.

Press: **Display Reads:**

Scroll



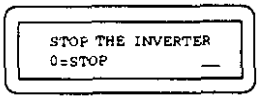
To continue without applying equalization charge. press:

0 Enter

To apply equalization charge, press:

9 0 9

The Inverter must be shut down to apply the equalization charge. The LCD will display:



Press 0 and ENTER to stop the Inverter

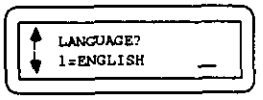
0 Enter

The Inverter stops and Battery Equalization begins.

Language Selection

Press: **Display Reads:**

scroll



To select English as the display language, press:

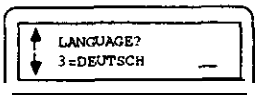
1 Enter

Scroll

To select French as the display language, press:

2 Enter

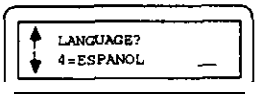
Scroll



To select German as the display language, press:

3 Enter

Scroll



To select Spanish as the display language, press:

4 Enter

Scroll

To select Italian as the display language, press:

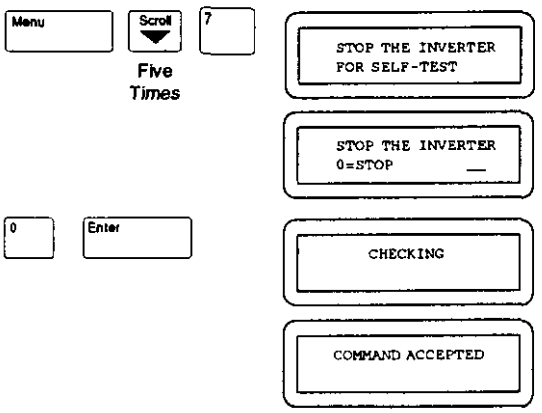
5 Enter

After selecting the display language and pressing the ENTER keypad, the LCD will present all of the SS&CP Instructions (see ¶ 33.1). The Instructions will scroll horizontally across the LCD (from right to left).

3.3.2.7 Diagnostics

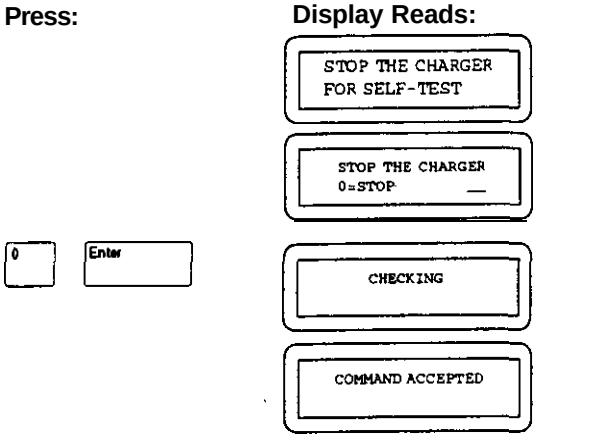
Follow this procedure to implement the Standard Diagnostic Routine:

Press: **Display Reads:**

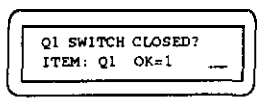


The Inverter LED (Green) will be OFF. The Load On Bypass LED (Green) will be ON. The load will be on Bypass. The Alarm LED (Red) will be flashing. The Audible Alarm will be ON.

Press: **Display Reads:**



The Rectifier/Battery Charger LED (Green) will be OFF.



If Q1 is closed, press:

(Diagnostic Routine Continues)

(Diagnostic *Routine Continued)*

Press: **Display Reads:**

If Q4S is closed, press:

1 Enter

NOTE THE ALARMS
THEN PUSH ON ↵

ALARMS
INVERTER OFF

Scroll Twice

INVERTER OV OR UV
K3N IS OPEN

Scroll Twice

INVERTER OV OR UV
K3N IS OPEN

These five alarms are the normal alarm conditions which should appear for the present status of the UPS (both the Inverter and the Rectifier/Battery Charger are OFF).

If other alarm conditions are displayed (see ¶ 3.5 for all alarm conditions), immediate actior should be taken. Write down all of the alarms and contact EPE Customer Support Services for assistance.

After viewing all the alarm conditions, press:

1 Enter

* . SELF TESTING . *
* * * * *

SELF TEST RESULT
LOGIC OK ↵

Enter

ANALOG TEST
PCB AQCX

ANALOG TEST
PCB AQOX

Press: **Display Reads:**

1 Enter

START THE CHARGER
1=START _

RESET FAULTS

CHECKING

COMMAND ACCEPTED

The Rectifier/Battery Charger LED (Green) will be ON.

Enter

START THE INVERTER
1=START _

RESET FAULTS

CHECKING

COMMAND ACCEPTED

The Inverter LED (Green) will be ON. The Load On Bypass LED (Green) will be OFF. The load is supplied by the UPS Inverter Output. The Alarm LED (Red) will be OFF. The Audible Alarm will be OFF.

END OF PROCEDURE

6 COMMANDS
7 DIAGNOSIS

Enter

NORMAL OPERATION
LOAD ON UPS

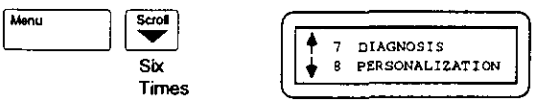
The UPS has resumed normal operation.

3.3.2.8 Personalization

The PERSONALIZATION menu allows access to routines which tailor the operation of the UPS to your installation.

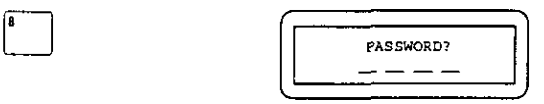
To use the PERSONALIZATION menu, both the Rectifier/Battery Charger and the Inverter must be shut down.

Press: Display Reads:

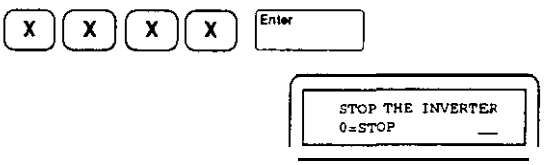


Enter Password

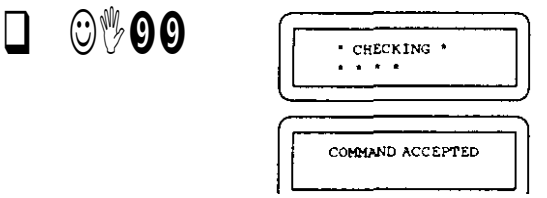
Press:



This is the four digit password number provided on the Title Page of this manual.

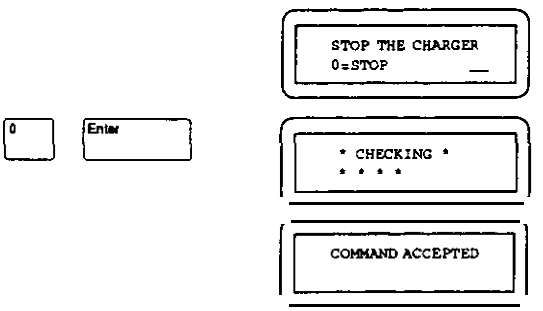


Stop The Inverter



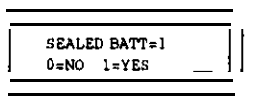
The Inverter LED (Green) turns OFF. The Load On Bypass LED (Green) turns ON. The Alarm LED (Red) will Flash. The Audible Alarm will sound. To silence the Audible Alarm, press:

Press: **Display Reads:**

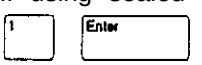


The Rectifier/Battery Charger LED (Green) turns OFF.

Select Seated Batteries

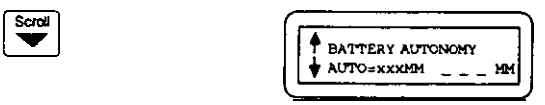


If using sealed batteries, press:



If using wet cell batteries, press:

Set Battery Autonomy



The EPS Monitor expects three digits to be entered on the numbered keypads. As you enter the numbers, your entry will be displayed ***on*** the right of the LCD. If ten minutes of battery protection, for example, is to be specified, press:

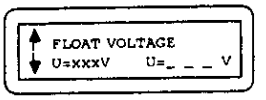
The number:

010MM

Will change to the value as entered.

Set Float Voltage

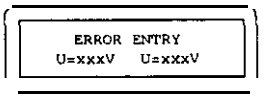
Press: **Display Reads:**



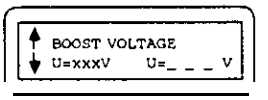
The EPS Monitor expects three digits to be entered on the numbered keypads. As you enter the numbers, your entry will be displayed on the right of the LCD. Float Voltage must be specified if wet cell batteries are being used.

Enter the number as in the previous procedure.

If you attempt to set Float Voltage when sealed batteries are being used (unnecessary), the display will indicate:



Set Boost Voltage



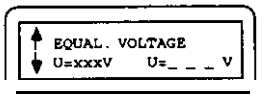
The EPS Monitor expects three digits to be entered on the numbered keypads. As you enter the numbers, your entry will be displayed on the right of the LCD.

Enter the number as in the previous procedure.

THE VALUE ENTERED MUST COMPLY WITH BATTERY MANUFACTURER'S RECOMMENDATION AND UPS DC BUS VOLTAGE SETTING. REFER TO ¶ 1.3.4 FOR BATTERY CHARACTERISTICS.

Set Equalization Voltage

Press: **Display Reads:**

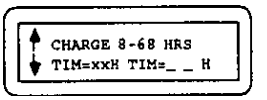


The EPS Monitor expects three digits to be entered on the numbered keypads. As you enter the numbers, your entry will be displayed on the right of the LCD.

Enter the number as in the previous procedure.

THE VALUE ENTERED MUST COMPLY WITH BATTERY MANUFACTURER'S RECOMMENDATION AND UPS DC BUS VOLTAGE SETTING. REFER TO ¶ 1.3.4 FOR BATTERY CHARACTERISTICS.

Sat Charge Time



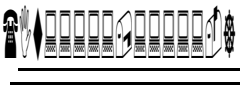
The EPS Monitor expects two digits to be entered on the numbered keypads. As you enter the numbers, your entry will be displayed on the right of the LCD.

Enter the number as in the previous procedure.

CHARGE is the time in hours that the Rectifier/ Battery Charger will keep the batteries on Boost Voltage before returning to the normal Float Voltage.

Set Charge Masking Time

Press: ❑ **Display Reads:**



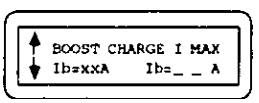
The EPS Monitor expects three digits to be entered on the numbered keypads. As you enter the numbers, your entry will be displayed on the right of the LCD.

Enter the number as in the previous procedure.

Charge Masking Time represents the time in seconds that an AC power outage can last without the Rectifier/Battery Charger applying Boost Voltage lo the batteries when Main AC Input/ MAINS1 power is restored. The time is selectable in 15 second increments.

Set Boost Charge Current

Press: ❑ **Display Reads:**



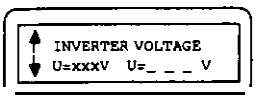
The EPS Monitor expects two digits to be entered on the numbered keypads. As you enter the numbers, your entry will be displayed on the right of the LCD.

Enter the number as in the previous procedure.

THE SELECTED CHARGING CURRENT MUST COMPLY WITH THE BATTERY MANUFACTURER'S SPECIFICATION.

Set Inverter Voltage

Press: Scroll **Display Reads:**

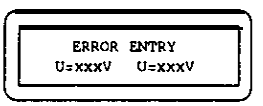


The EPS Monitor expects three digits to be entered on the numbered keypads. As you enter the numbers, your entry will be displayed on the right of the LCD.

Enter the number as in the previous procedure.

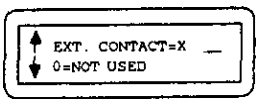
Only ±3% of the nominal Inverter output voltage can be entered. Use the numbered keypads to enter the new value, then press the ENTER key. For a 206 VAC output system, for example, the new value ***must*** be within the range of 202 - 214 VAC. For a 460 VAC output system, the new value must be within the range of 466 - 494 VAC.

If you select a value outside these range limits, the display will indicate:



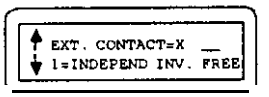
Select External Contact Response

Press: **Display Reads:**



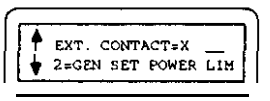
One of Four options can be selected.

If this feature is not to be used, press:

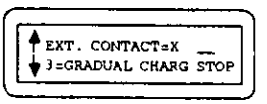


To select the INVERTER FREE RUNNING (the output frequency of the Inverter is at nominal, and not tracking the Bypass AC Input/MAINS2 power source), press:

Note that when this option is selected, the op eration of the Static Switch is inhibited.

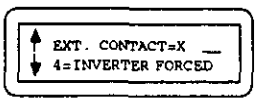


To select SECOND STEP INPUT CURRENT LIMIT (see GEN SET POWER LIMIT below for values), press:



To select CHARGER GRADUAL SHUTDOWN, press:

Press: **Display Reads:**

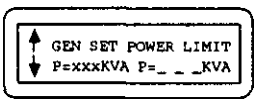


To select INVERTER FORCE TRANSFER (used for frequency convert applications), press:

NOTE

An external dry contact closure furnished by the customer must be provided to initiate any one of the above options (refer to Figures 9 and 10 for location and wiring of this feature).

Set Generator Power Limit



The EPS Monitor expects three digits to be entered on the numbered keypads. As you enter the numbers, your entry will be displayed on the right of the LCD.

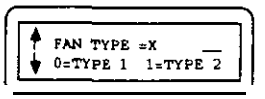
Enter the number as in the previous procedure.

If SECOND STEP INPUT CURRENT LIMIT was selected as Option 2 above, the value in kVA (input voltage times second step current limit value) must be entered.

Set Fan Type

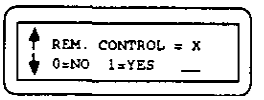
Press: **Display Reads:**

Scroll



Select Remote Control

Scroll



If the Remote Control Panel option is being used, press:

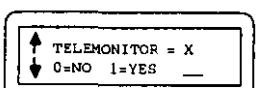
1 Enter

If the Remote Control Panel option is not being used, press:

0 Enter

Select Telemonitor

Scroll



If the Building Management System Interface option is being used, press:

1 Enter

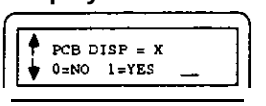
If the Building Management System Interface option is not being used, press:

0 Enter

Select RS232

Press: **Display Reads:**

Scroll



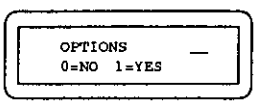
If the RS-232 port option is being used, press:

1 Enter

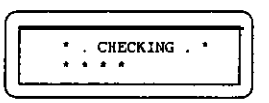
If the RS-23'2 port is option is not being used. press:

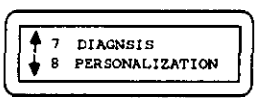
0 Enter

Scroll

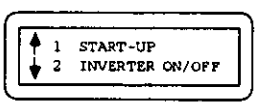


Enter





Menu

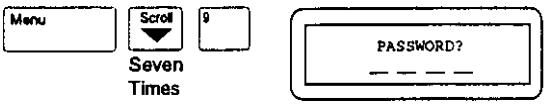


The EPS-2000™ UPS can now be restarted. See ¶ 3.3.2.1 for the Start-Up Procedure.

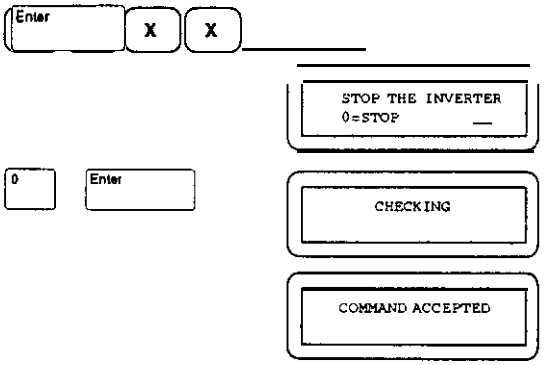
3.3.2.9 Communication

This menu is used to enter the interface parameters required for an EPS-2000™ UPS equipped with the optional RS-232 port, Model Number EPS-2000/PCA.

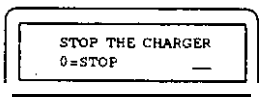
Press: **Display Reads:**



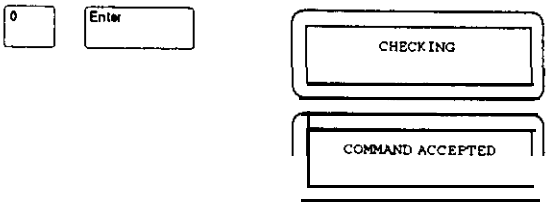
You must enter the four digit password to gain access to this submenu. This password is sup plied with this manual.



The Inverter LED (Green) will turn OFF. The Load On Bypass LED (Green) will turn ON. The Alarm LED (Red) will be flashing. The Audible Alarm will sound.

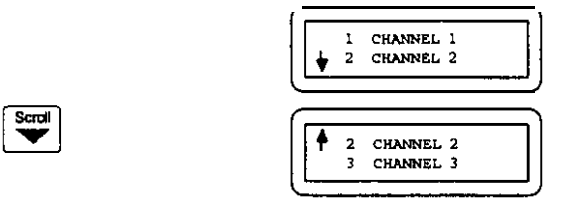


To stop the Rectifier/Battery Charger, press:

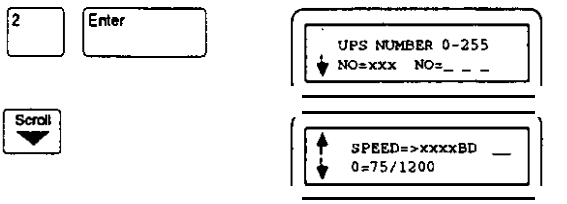


The Rectifier/Battery Charger LED (Green) will turn OFF.

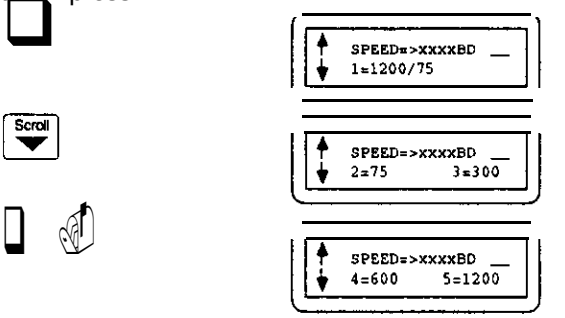
Press: **Display Reads:**



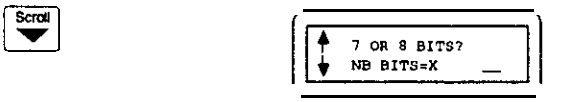
Programming information is the same for all three channels (example is channel 2).



Select a Baud Rate value between 1 and 5. then press ENTER.

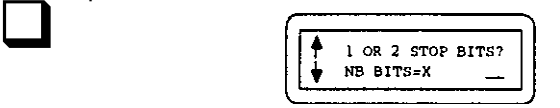


Set 7 or 8 data bits,



Press 7 or 8, then press ENTER.

Set Stop Bits.



Press 1 or 2, then press ENTER.

(Communication Routine Continues)

Set Parity:

Press: Display Reads:

Scroll

```
PARITY = X
0=NO PARITY
```

Scroll

```
PARITY = X
1=ODD PARITY
```

Scroll

```
PARITY = X
2=EVEN PARITY
```

Press 0, 1, or 2, and ENTER.

Set Modem Type:

Scroll

```
MODEM TYPE=X
0=MODEM NOT USED
```

Scroll

```
MODEM TYPE=X
1=MANUAL MODEM
```

Scroll

```
MODEM TYPE=X
2=AUTO CALL MODEM
```

Scroll

```
MODEM TYPE=X
3=AUTO REPLY MODEM
```

Press 0, 1, 2, or 3, and ENTER.

Set Dialogue Type:

Press: Display Reads:

Scroll

```
DIALOGUE TYPE=X
0=FORCED DIAL
```

Scroll

```
DIALOGUE TYPE=X
0=DIAL ON EVENT
```

Press 0 or 1. and ENTER.

Enter

```
2 CHANNEL 2
3 CHANNEL 3
```

To bring the UPS back on line, follow the procedure defined in ¶ 2.7.2.

3.4 Operating Modes

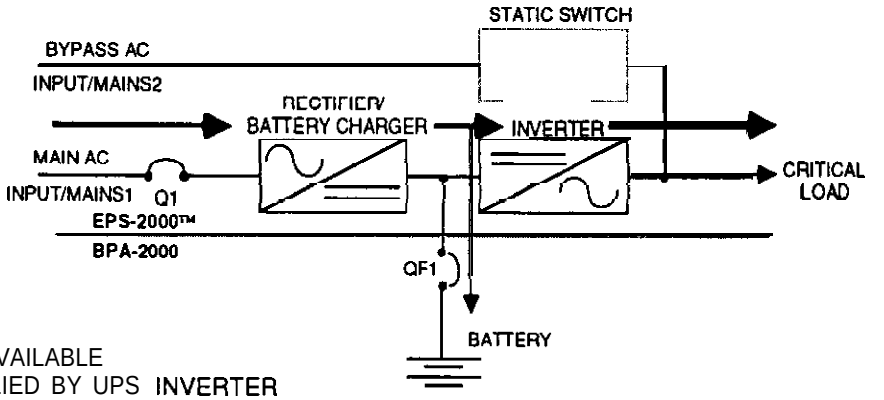
3.4.1 Automatic Operating Sequences

3.4.1.1 Normal Operation

Normal operation is defined as that time when Main **AC** input power and Bypass **AC Input/** MAINS2 power are available and within the prescribed tolerances. The critical load is being supplied by the Inverter Output, which in turn is supplied by the Rectifier/Battery Charger. The BPA is on Float Charge condition.

Flow of power during normal operation is illustrated in Figure 12.

Figure 12: Power Flow -Norma/ Operation



NORMAL OPERATION

. AC INPUT POWER AVAILABLE
. LOAD POWER SUPPLIED BY UPS INVERTER VIA RECTIFIER/BATTERY CHARGER AND ISOLATED FROM AC INPUT SOURCE
• BATTERY CHARGING

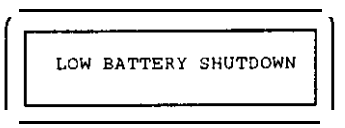
3.4.1.2 On Battery Operation

On Battery operation occurs when Main AC Input power is lost, or if Main AC Input voltage drops more than 15% below nominal value. The critical load is fully protected via the UPS Inverter Output, which is supplied power by the BPA. The UPS is On Battery operation, as illustrated in Figure 13.

Battery protection periods depend on the installed ampere-hour capacity of the batteries, and power consumed by the load. The specified battery protection period for your equip ment is the minimum duration, operated at 25" C., the Inverter Output under full rated load (rated kVA @ 0.8 P.F. lagging).

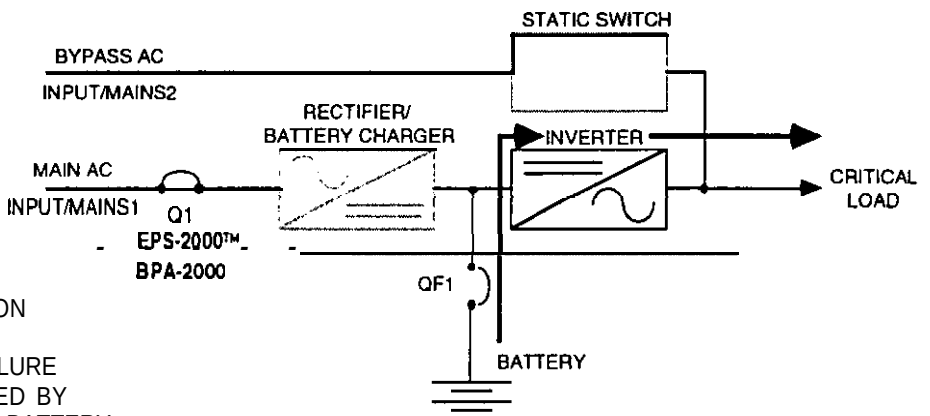
Actual protection time can be greater than specified protection time if the Inverter is operating at less than full load. During a Main AC Input power failure, operation on battery power can be extended beyond the specified time by reducing the load (non-critical equipment).

The battery protection period ends when the battery voltage reaches the Inverter cut-off voltage. When the battery voltage is 10 Vdc above the Inverter cut-off voltage, the LCD will display the message:



This is a warning that the battery is approaching the end point of discharge, and that the protection period is nearly expired.

Figure 13: Power Flow - On Battery Operation



ON BATTERY OPERATION

- AC INPUT POWER FAILURE
- LOAD POWER SUPPLIED BY UPS INVERTER FROM BATTERY
- BATTERY DISCHARGING

3.4.1.3 input Power Restored/Battery Charging

As soon as Main AC input power is restored (the voltage and frequency within specified tolerances) the UPS returns to normal operation, as described in ¶ 3.4.1 .1. However if the battery reached its end point of discharge before the Main AC Input power was restored, the UPS Inverter will have shut down, and must be manually restarted. Follow the Start-Up Procedure as indicated in ¶ 2.7.2.

Under normal circumstances the Rectifier/Battery Charger immediately begins recharging the battery, initially providing maximum recharge current. Then, a two-step battery charge cycle is used, as shown in Figure 14.

step 1

The charge current is limited to about 0.1 C 10 (i.e., 1/10th of the battery capacity specified for a 10 hour discharge rate). The DC voltage level gradually increases over time until the float charge level is reached.

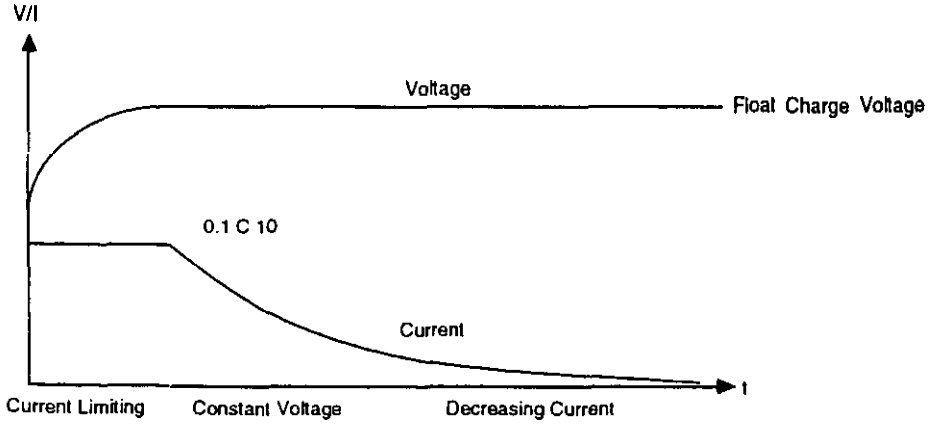
step 2

The battery is charging at the Float Charge voltage. Charging current gradually decreases to a value that maintains the battery in a fully charged condition.

When wet-cell or stationary type lead acid batteries are used (as opposed to sealed, maintenance free, recombination type batteries), the Rectifier/Battery Charger provides a charge voltage slightly higher than the normal Float Voltage for a 24 hour period. After this 24 hour period, the Rectifier/Battery Charger automatically returns to the lower float charge condition. This two level Rectifier/Battery Charger operation is only initiated if the power has failed for longer than 15 seconds, or for the time set for the "Set Charge Masking Time' function (see ¶ 3.3.2.8). Otherwise, the Rectifier/Battery Charger operates at the float charge voltage only.

If the Main AC Input/MAINS1 power source is restored after the battery has reached its end point of discharge and the Inverter has turned off, the equipment will have to be manually restarted. Refer to ¶ 2.7.2 for the Start-Up Procedure.

Figure 14: Battery Charge Cycle



3.4.1.4 UPS Inverter Shut-Down or Major Overload

In the event of **a** UPS Inverter **shut-down,** either manually initiated by the user or caused by the UPS internal protective devices, the load is automatically transferred to the Bypass AC Input/MAINS:! power source without interruption of load power. Refer to Figure 15 for power flow after experiencing this condition.

In the event of a major overload transient (in-rush condition) on the output of the UPS Inverter, an immediate transfer of the load to the Bypass AC Input/MAINS2 power source takes place as previously described. The load is automatically returned to the UPS Inverter output without interruption when the inrush condition is over. This operating mode allows start-up of load devices demanding short-term high in-rush currents, provided of course that the UPS Inverter is synchronized to the Bypass AC Input/MAINS2 power source.

The UPS Inverler output will synchronized lo the Bypass AC Input/MAINS2 power source when the following conditions are satisfied:

A. Bypass Voltage must be within ± 10% of nominal value

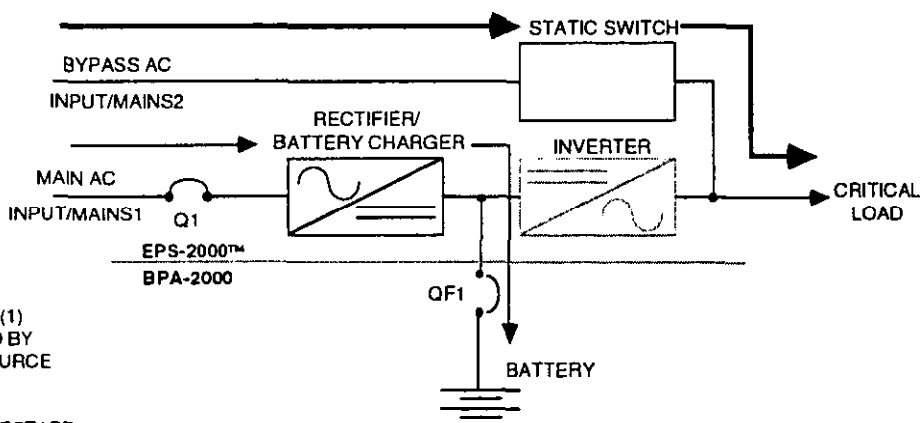
B. Bypass Frequency *must* be within the frequency window selected

C. Bypass Phase must be within 3" of the UPS Inverler output.

NOTE

OUT OF SYNCHRONIZATION messages will be displayed on the LCD as minor alarms.

Figure ***15: Power Flow – UPS Shut-Down*** or Major Overload



UPS INVERTER SHUT-DOWN OR MAJOR OVERLOAD

- AC INPUT POWER AVAILABLE (1)
- OVERLOAD POWER SUPPLIED BY BYPASS AC INPUT/MAINS2 SOURCE VIA STATIC SWITCH
- INVERTER OFF
- INVERTER AUTOMATICALLY RESTARTS AS SOON AS OVERLOAD CLEARS
- TRANSFER OF LOAD TO AND FROM BYPASS AC INPUT/MAINS2 SOURCE OCCURS WITHOUT LOSS OF LOAD POWER

NOTE: (1) In the event that an overload occurs when the Bypass AC Input/MAINS2 source is not available, the UPS Inverter will limit the output current to its 150% current rating at reduced voltage.

If an overload condition occurs and the UPS Inverter output is not synchronized lo the Bypass AC Input/MAINS2 power source, the UPS Inverter will limit the output current at 150% of its full load current rating for 0.6 seconds before shutting down and forcing an interrupted transfer of the load to the Bypass AC Input/MAINS2 power source.

For loads which exceed the UPS Inverter full load continuous rating (In). the time-current Overload Curve shown in Figure 16 applies. This curve is dependent on the magnitude and duration of the overload (e.g., the UPS Inverter will provide full output voltage at 125% overload for 10 minutes, or at 150% overload for 1 minute).

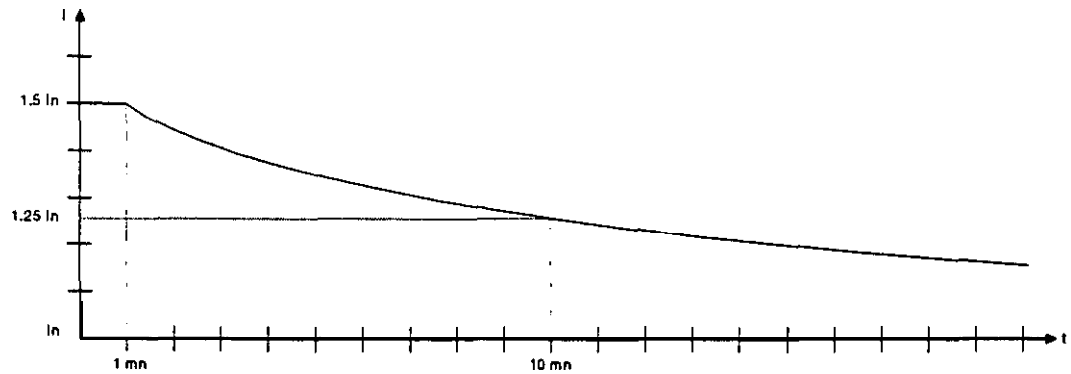
The lime-current overload curve also applies when the load is operating from the static bypass. If the overload period exceeds the time limit, the load power will be disconnected.

Overloads which exceed the time-current curve will cause the Static Switch to transfer the load to the Bypass AC Input/MAINS2 power source.

Short term overloads in excess of 150% and less than one minute duration will allow an automatic forward transfer to be made after the current demand is reduced to within the UPS 100% continuous rating.

Long term overloads exceeding the time- current curve limit will require the UPS Inverter to be manually restarted. Refer to the Main Menu, Item 2, INVERTER ON/OFF (¶ 3.3.2.2).

Figure 16: Overload Curve



3.4.2 Manual Operating Sequences

3.4.2.1 Rectifier/Battery Charger Start or Stop

These operation sequences can be implemented by following the instructions provided by the Main Menu, item 6. labeled COMMANDS (¶ *3.3.2.6).*

3.4.2.2 UPS *Inverter* Start or Stop

These operation sequences can be implemented by following the instructions provided by the Main Menu, item 2, labelled INVERTER ON/ OFF (¶ 3.3.2.2).

3.4.2.3 UPS Isolation for Maintenance

To isolate the output of the UPS for maintenance, refer to the BYPASS PROCEDURE as described in ¶ 2.7.3. Once the UPS is isolated for maintenance, perform the following operations:

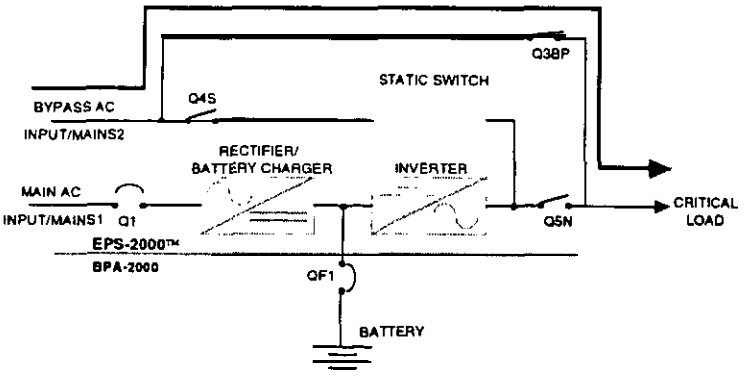
- Stop the Rectifier/Battery Charger (see the Main Menu, Item 6, COMMANDS, ¶ 3.3.2.6)
- Turn off the Battery Disconnect Circuit Breaker QF1 located in the Battery Cabinet (BPA).
- Turn off the Main AC Input/MAINS1 circuit breaker Q1 on the EPS-2000" UPS.
- Turn off the external main AC circuit breaker providing AC power to the UPS.
- Wait several minutes before opening the EPS-2000™ enclosure to allow internal capacitors to discharge. See Figure 17, Power Flow During Maintenance Bypass.

The EPS-2000™ UPS is now isolated for maintenance except for the wires connected to the Bypass AC Input/MAINS:! terminals and switches Q4S, Q3BP and Q5N. These are protected by a cover which should not be removed. **IF THE EXTERNAL MAIN AC INPUT PROTECTIVE DEVICE COULD NOT BE TURNED OFF, THE AC INPUT TERMINALS AND THE TERMINALS ON THE LINE SIDE OF CIRCUIT BREAKER Q1, ALSO PROTECTED BY A COVER, ARE LIVE.**

Figure 17: Power Flow – UPS Maintenance

UPS MAINTENANCE

- AC INPUT POWER AVAILABLE
- LOAD POWER SUPPLIED BY BYPASS AC INPUT/MAINS2 POWER SOURCE
- RECTIFIER/BATTERY CHARGER AND UPS INVERTER ARE OFF AND ISOLATED



3.4.2.4 Returning The UPS To Normal Operation

- Turn on the external AC input circuit breaker supplying the UPS.
- Turn on the Main AC Input/MAINS1 circuit breaker Q1 on the EPS-2000™ UPS.
- The EPS-2000™ Monitor is now operational.
- Start the Rectifier/Battery Charger - see the Main Menu, Item 6, COMMANDS for instructions. After entering the Start Charger command, press the ENTER keypad to return to the Main Menu.
- Scroll down by pressing the SCROLL DOWN keypad to hem 5, and press 5. Select submenu 2. entitled RETURN TO INV, and follow the instructions presented on the display to transfer the UPS back on line.

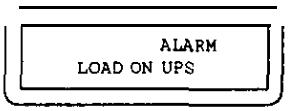
3.5 Alarm Conditions

Alarms fall into two categories: Minor or Major alarms.

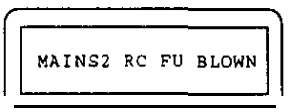
3.5.1 Minor Alarms

Minor alarms are those abnormalities or anomalies which occur during normal operation and which do not interfere with the normal function of the UPS, but should be corrected in the near future. These are indicated on the LCD like this:

Display Reads:

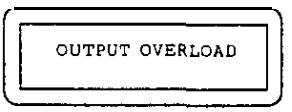


Alarms which could appear under this category include those listed below **and** would appear on the LCD after pressing the SCROLL DOWN keypad.

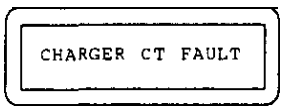


Bypass AC Input/MAINS:! spike protection RC network fuse has blown.

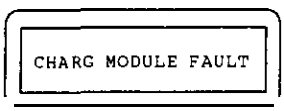
Either one of the two internal fans have failed.



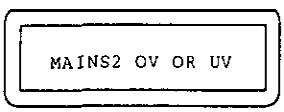
One or more of the three output phases is providing more than 100% of the full load current rating of the UPS.



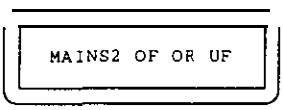
Input current sensing circuit is not operating correctly.



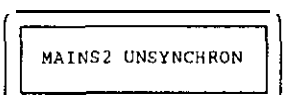
A fault has occurred in the Rectifier/Battery Charger power module.



The UPS Inverter is not synchronized to the Bypass AC Input/MAINS2 source because that voltage is outside the ± 10% tolerance. Operation of the Static Switch is inhibited.



The UPS Inverter is not synchronized to the Bypass AC Input/MAINS2 source because that frequency is outside the set Frequency Window (¶ 1.3.2). Operation of the Static Switch is inhibited.



The UPS Inverter is not synchronized to the Bypass AC Input/MAINS2 source because the phase differential between the two is greater than 3 degrees. Operation of the Static Switch is inhibited.

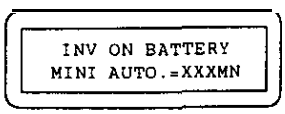
3.5.2 Major Alarms

Major alarms are listed for the Rectifier/Battery Charger, and the UPS Inverter.

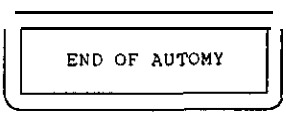
3.5.2.1 Rectifier/Battery Charger Major Alarms

Rectifier/Battery Charger major alarms result when the Rectifier/Battery Charger is not operating, and the UPS is providing the load power from the batteries. This On Battery condition is indicated on the UPS LCD with this display:

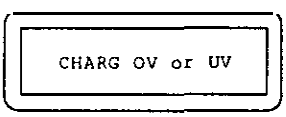
Display Reads:



The alarms which could appear under this category include those listed below and would appear on the LCD after pressing the SCROLL DOWN keypad.

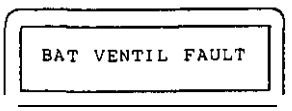


Battery has reached its end point of discharge and the UPS Inverter is turned off.

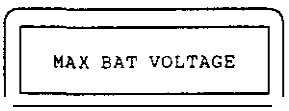


Rectifier/Battery Charger has turned off due to an input AC over- or under-voltage condition,

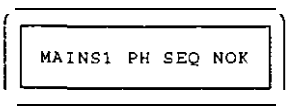
(Major Alarms Continues)



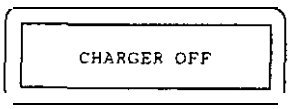
Only used when either or both the DC Ground Fault Indication (Model Number EPS-2000/DCF) or Smoke/High Temperature Warning (Model Number EPS-2000/STD) options have been purchased and installed in the BPA.



Rectifier/Battery charger has turned off due to a high DC voltage condition.



This indicates the Rectifier/Battery Charger will not start due to an incorrect phase rotation sequence on the input.

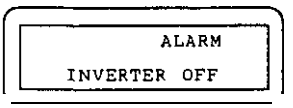


Indicates the Rectifier/Battery Charger has been programmed OFF.

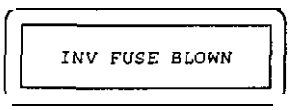
3.5.2.2 UPS Inverter Major Alarms

UPS Inverter Major alarms result when the UPS Inverter is not operating and the load is being supplied power from the Bypass AC Input/ MAINS2 source after a successfulstatic transfer. This condition is indicated on the UPS LCD with this display:

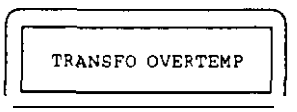
Display Reads:



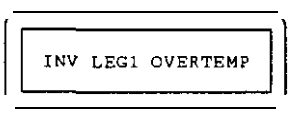
The alarms which could appear under this category include those listed below and will appear on the LCD after pressing the SCROLL DOWN keypad:



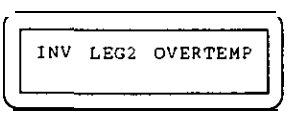
One or more Inverter fuses have blown.



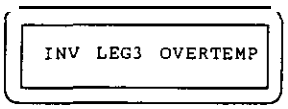
Inverter transformer over-temperature.



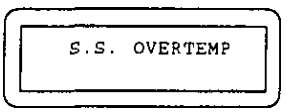
Inverter LEG1 Power Module over-temperature.



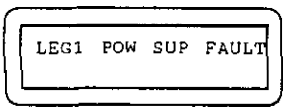
Inverter LEG2 Power Module over-temperature.



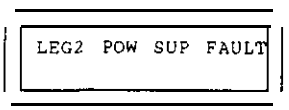
Inverter LEG3 Power Module over-temperature.



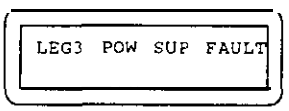
Static Switch over-temperature.



Inverter LEG1 Power Module supply fault

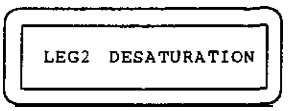


Inverter LEG2 Power Module supply fault

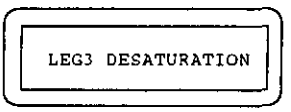


Inverter LEG3 Power Module supply fault,

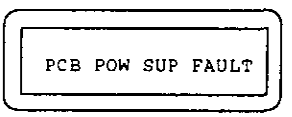
Inverter LEG1 Power Module not operating in saturation,



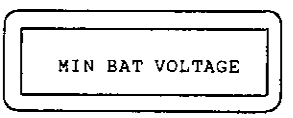
Inverter LEG2 Power Module not operating in saturation.



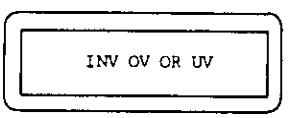
Inverter LEG3 Power Module not operating in saturation.



Logic card power supply fault.



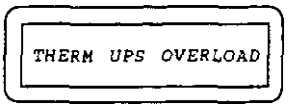
UPS Inverter turned off due to low battery voltage.



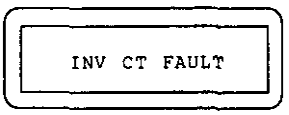
UPS Inverter turned off due to output voltage tolerance condition.

(Alarms Continues)

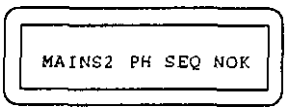
(Alarms Continued)



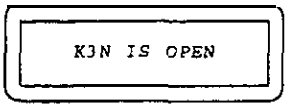
UPS shut down due to an over-temperature condition.



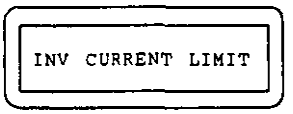
Inverter output current sensing circuits not op erating correctly.



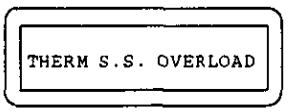
UPS Inverter turned off and prevented a Static Switch transfer due to an incorrect phase sequence on the Bypass AC Input/MAINS2 source.



Inverter output contactor fault.



UPS Inverter turned off due to an overload condition on the UPS Inverter output.



Static Switch thermal overload.

Maintenance

4.0 scope

This section describes preventative maintenance procedures, EPS-2000™ UPS diagnostic capabilities, and includes a listing of replacement parts.

4.1 Preventive Maintenance

The following preventive maintenance routines should be considered as the minimum requirements; your installation and site may require additional preventive maintenance to insure optimal performance from your UPS system. These routines should be performed twice a year (more often if required).

A. Isolate and de-energize the UPS equipment for all maintenance operations (see ¶ 3.4.2.3).

B. Insure that the equipment is clean, and free of loose dust, dirt, and debris.

C. Inspect the air intake and outlet grates (see Figure 6) and clean as required. Verify that the air flows freely through the equipment. Clean the grates and the enclosure interior with a vacuum cleaner if required.

D. The EPS-2000™ UPS is equipped with a dust filter which should be changed at regular intervals. Inspect the filter regularly to determine how long the filter will last in your installation.

E. Check the inter-battery connection terminals. Disconnect and clean them if required.

WARNING

A short circuit between two battery terminals can be extremely hazardous! When working with batteries and battery connections, it is essential to use tools equipped with an insulating sheath, and to wear gloves.

F. Initiate the Start-Up Procedure, as described in ¶ 2.7.2.

G. Test the main operating sequences as described in ¶2.8 through 2.8.5.3 (as applicable to your equipment).

4.2 General Diagnostic Capability

The EPS MONITOR **provides full** UPS diagnostics for:

- Carrying out adequate remedial action in the event of an anomaly or abnormality
- Locating a faulty PC Assembly or subassembly
- Replacement of faulty components (following the indicated procedure)

When the required action is highly involved, or when the fault cannot be located by the EPS MONITOR software, the EPS MONITOR will recommend calling a maintenance specialist. Contact EPE Technologies, Inc. Customer Support Services for assistance.

Diagnostic routines are available under Menu 7 (DIAGNOSIS) from the Main Menu (see ¶3.3.2.7).

The terms displayed on the LCD are explained in the glossary at the rear of this manual.

In the event of a serious problem, a general electronics self-test can be executed. To execute the self-test, the Inverter and Rectifier/ Battery Charger must be turned off. Refer to ¶ 3.3.2.7 for the self-test procedure,

4.3 Component Replacement

Any component replacement indicated by the procedure must be carried out with the equipment fully isolated and de-energized. Refer to UPS Isolation For Maintenance, ¶ 3.4.2.3. The system memorizes the step being carried out before isolation, and continues the procedure at the same place when power is restored. Figure 3 shows the location of the various parts which may require replacement.

4.3.1 Replacing Plug-In Power Modules

The Rectifier/Battery Charger, Inverter, and Static Switch power modules are of plug-in/pull-out rack design for ease of maintenance. These power modules are secured with two screws on the side of each power module (different location on some modules).

To remove a power module, remove the screws (which also serve as the ground connection for the module) and pull-out the power module until it is free from its runners, The maximum weight of a power module is 33 pounds.

To install a power module, return the module to the runners, plug-in the power module, and install the retaining screws,

4.32 Replacing Printed Circuit Assemblies (PCAs)

Four Printed Circuit Assemblies (PCAs) are located in the plug-in Card Module which is mounted in a manner similar to the power modules. The four PCAs in the plug in Card Module are listed below and are positioned from left to right as viewed from the front of the module.

PCA	Function
CANU	Main microprocessor
ODUP	Inverter controller
CHAP	Rectifier/Battery Charger controller
ALIP	Main logic power supply

To remove the plug-in Card Module, first disconnect the four control wire cables from the front of the module. Then disconnect the ground screw through the side of the unit. Pull out the plug-in Card Module slowly until you can reach the ribbon cable that attaches in two places on the back of the Card Module. Disconnect the ribbon cable. The plug-in Card Module is now free of the unit.

To replace a particular PCA, first remove the retaining barrier that runs horizontally across the back of the plug-in Card Assembly by removing the two screws that hold it in place. Disconnect the ribbon cable at the rear of the PCA that is to be replaced. Pull the PCA out through the rear of the unit. To remove the ALIP PCA, four additional screws (two on the top and two on the bottom of the plug-in Card Module) must be removed before the PCA can be pulled out through the back of the Card Module. The sequence is reversed when installing a good PCA.

4.4 Replacement Parts

Three levels of replacement parts are available for each model of the EPS-2000™ UPS. The 60 Hz models only are summarized in Table 3.

The three levels of replacement parts are designated A, B, and C. These levels depend on the type of maintenance planned on-site for the UPS. A description of the levels is provided below:

Level	Description
A	This level of replacement parts consists of the consumable items, specifically fuses. It is recommended to have these items on hand during installation, which includes the initial start-up of the UPS system. This will prevent any unanticipated delays in obtaining fuses during a critical period of time. Fuses used during start-up will be replaced by EPE at no charge.
B	This level of replacement parts consists of consumable items, specifically fuses, the CANU PCA (main microprocessor), and one Inverter Plug-In Power Module. This level of replacement parts is recommended when the user can afford short duration UPS down-time to obtain replacement parts.
C	This level of replacement parts consists of the consumable items, specifically fuses, a compliment of PCAs, and one Inverter Plug-In Power Module. This level of replacement parts is recommended when the users can only tolerate a minimum down-time in the event of a UPS failure.

Refer to Table 3 for contents of the Replacement Parts kits. Find the Model Number of your EPS-2000™ UPS at the top right of the table; the table identifies parts contained in each kit level.

Table 3A: Replacement Parts – EPS-2010, EPS-2015, EPS-2020

PART NO.	DESCRIPTION	QTY/UNIT	QUANTITY RECOMMENDED PER SPARE PART LIST	Levels Requiring Spare Parts: EPS-2010/22,66 EPS-2010/62,66 EPS-2010/D2,66 EPS-2015/22,66 EPS-2015/62,66 EPS-2015/D2,66 EPS-2020/22,66 EPS-2020/62,66 EPS-2020/D2,66	Levels Requiring Spare Parts: EPS-2010/42,66 EPS-2015/42,66 EPS-2020/42,66	Levels Requiring Spare Parts: EPS-2010/44,66 EPS-2015/44,66 EPS-2020/44,66
04-22041-02	FUSE, CONTROL, 2A, 600V	13	26	A,B,C	A,B,C	A,B,C
04-22041-04	FUSE, CONTROL, 4A, 600V	10	20	A,B,C	A,B,C	A,B,C
04-22058-06	FUSE, OUTPUT, 63A, 600V	3	6	N/A	N/A	A,B,C
04-22058-10	FUSE, OUTPUT, 100A, 600V	3	6	A,B,C	A,B,C	N/A
04-22044	FUSE DELTA RC FILTER, 25A, 600V	3	6	A,B,C	A,B,C	A,B,C
6716702	PCA CHAP (Charger Controller)	1		C	C	C
6716710	PCA CANU (Microprocessor)	1	1	B,C	B,C	B,C
6716746	PCA AFIP (Display)	1		C	C	C
6716750	PCA ODUP (Inverter Controller)	1	1	C	C	C
6730180	PCA TACO (Auxiliary Power Supply)	1		C	C	C
6730706F	PCA AQOF (Acquisition Inverter)		1	N/A	N/A	C
6730706T	PCA AQOT (Acquisition Inverter)	1		C	C	N/A
6730714F	PCA AQCF (Acquisition Charger)			N/A	C	C
6730714T	PCA AQCT (Acquisition Charger)	1	1	C	N/A	N/A
6730726	PCA ALIP (Power Supply)			C	C	C
6730020MU	INVERTER PLUG-IN POWER MODULE	1	1	B,C	B,C	B,C

Tab/e 38: Replacement *Parts – EPS-2030, EPS-2040*

PART NO.	DESCRIPTION	QTY/UNIT	QUANTITY RECOMMENDED PER SPARE PART LIST	Levels Requiring Spare Parts: EPS-2030/22,66 EPS-2030/62,66 EPS-2030/D2,66 EPS-2040/22,66 EPS-2040/62,66 EPS-2040/D2,66	Levels Requiring Spare Parts: EPS-2030/42,66 EPS-2040/42,66	Levels Requiring Spare Parts: EPS-2030/44,66 EPS-2040/44,66
04-22041-02	FUSE, CONTROL, 2A, 600V	13	26	A,B,C	A,B,C	A,B,C
04-22041-04	FUSE, CONTROL, 4A, 600V	10	20	A,B,C	A,B,C	A,B,C
04-22058-08	FUSE, OUTPUT, 80A, 600V	3	6	N/S	N/A	A,B,C
04-22058-16	FUSE, OUTPUT, 160A, 600V	3	6	A,B,C	A,B,C	N/A
04-22044	FUSE DELTA RC FILTER, 25A, 600V	3	6	A,B,C	A,B,C	A,B,C
6716702	PCA CHAP (Charger Controller)	1	1	C	C	C
6716710	PCA CANU (Microprocessor)	1	1	B,C	B,C	B,C
6716746	PCA AFIP (Display)	1	1	C	C	C
6716750	PCA ODUP (Inverter Controller)	1	1	C	C	C
6730180	PCA TACO (Auxiliary Power Supply)	1	1	C	C	C
6730706F	PCA AQOF (Acquisition Inverter)	1	1	N/A	N/A	C
6730706T	PCA AQOT (Acquisition Inverter)	1	1	C	C	N/A
6730714F	PCA AQCF (Acquisition Charger)	1	1	N/A	C	C
6730714T	PCA AQCT (Acquisition Charger)	1	1	C	N/A	N/A
6730726	PCA ALIP (Power Supply)	1	1	C	C	C

4.5 Battery maintenance

IMPORTANT SAFETY INSTRUCTIONS FOR SERVICING BATTERIES

A. Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

B. When replacing batteries, use the same model and manufacturer of batteries.

C. CAUTION -- Do not dispose of battery or batteries in a fire. The battery may explode.

D. CAUTION -- Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

E. CAUTION -- A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working with batteries:

1. Remove watches, rings, orothermetal objects.
2. Use tools with insulated handles
3. Wear rubber gloves and boots.
4. Do not lay tools or metal pans on top of batteries,
5. Disconnect charging source prior to connecting or disconnecting battery terminals.
6. Determine if the battery is inadvertently grounded. If inadvertently grounded, remove the source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.

GLOSSARY

SYMBOLS

¶	Used to reference paragraph headings which are listed in the table of contents,
/	Used to represent "and/or".
%	Percent; of each hundred.
°F	Degrees Fahrenheit.
°C	Degrees Centigrade.
@	At.
±	Plus or minus.
#	Number.
Ø	Phase.
Ω	Ohms.
2nd	Second.

A

ABC Normal sequence of phases in three phase power.

AC ... Alternating current.

Ambient air temperature The temperature of the surrounding air.

AWG American Wire Gauge, formerly Brown & Sharp gauge.

B

B or BAT or BATT. ... Battery.

BAT TRANS. TEST ... Battery Transfer Test; simulates a Main Input power failure and tests Inverter operation on the battery for two minutes.

BATTERY OV Battery Over-Voltage.

BATTERY UV Battery Under-Voltage.

EPA . BATTERY PAC Assembly.

BREAKER Circuit Breaker.

British Thermal Unit ... A unit of heat equal to 252 calories. (Definition below.)

BTU British Thermal Unit. Defined as the amount of energy required to raise the temperature of 1 pound of water by 1° F.

BYP Bypass.

BYPASS ... Maintenance Bypass; manual maintenance bypass without interruption to the load using the Bypass Circuit Breaker Q3BP in conjunction with Q4S and Q5N.

BYPASS AC INPUT MAINS2.

BYPASs PROCEDURE Main Menu selection for access to the procedure for transferring the load to the Bypass AC Input/MAINS2 source for isolation of the UPS equipment and returning the load to the Inverter output.

C

Calorie ... A unit of heat. 1 calorie is the amount of energy required to raise the temperature of one gram of water by one degree Celsius.

Carrier ... The company or individual responsible for delivering goods from one area to another.

CAPAC DISCHARGING Capacitors Discharging; indicates that the capacitors are discharging. The voltage across the capacitor terminals is indicated on the next LCD line. When this indication appears on the LCD, wait until the capacitor voltage reaches zero before carrying out any operations on the equipment.

CB ... Circuit Breaker.

CH Rectifier/Battery Charger.

CHANGE OK=1 ... Prompt requesting replacement of subassembly indicated on the preceding LCD line, By entering 1, you indicate to the EPS MONITOR that the change has been made.

CHARG. Rectifier/Battery Charger.

CHARGE I MAX Prompt for entry of the maximum battery charge current value.

CHARGER ACQUISITION FAULT ... The Rectifier/Battery Charger is not receiving information required for operation.

CHARGER CT FAULT indicates a fault on Current Transformer T1 or T2, installed on the Rectifier/Battery Charger input lines.

CHECK LOAD ... Transfer the load to the Bypass AC Input Source/MAINS2, and check to see that the currents of the three phases do not exceed the Inverter current rating (In=Pn/3Un where In = Inverter nominal current rating in kVA, Pn = Inverter current rating in kVA, and Un = Inverter line-to-neutral voltage).

CHECK MAINS ... Measure the Main AC Input (+10/-15%) voltages to insure that they are within tolerance.

CHGR. ... Rectifier/Battery Charger.

COMMUNICATION ... Main Menu selection providing access to parameter programming for communication with a C.T.M. or a PC.

Conduit A flexible or rigid tube surrounding electrical conductors.

C.S.S. ... Customer Support Services.

CT Current Transformer.

C.T.M. ... Centralized Technical Management; a system providing overall supervision of the various installations,

Curr. ___ Current,

Current Rating ... The maximum current which a piece of electrical equipment was designed to carry.

D

DC ... Direct Current.

DC FAULT ... Indicates and internal fault at the DC voltage level (between the Rectifier/ Battery Charger, the Inverter, and the battery).

DESIG. ... Designation.

DIAGNOSIS ... Main Menu heading providing access to UPS diagnostic routines for troubleshooting the EPS-2000" UPS system.

E

Earth ground ... A ground circuit which has contact with the earth.

Electrician Refers to an installation electrician qualified to install heavy-duty electrical components in accordance with local codes and regulations. Not qualified to maintain or repair electrical or electronic equipment: compare to Technician.

ENVIRONMENTAL FAULT ... Indicates a dc ground fault has occurred in the battery (option model number EPS-2000/DCF), or Smoke/High Temperature Warning condition exists in the battery cabinet (option model number EPS-2000/ STO). or a failure has occurred in the Auxiliary Cabinet.

EPE ... EPE Technologies, Inc.

EPO ... Emergency Power Off.

F

FAN FAILURE ... Failure of a UPS enclosure cooling fan. For normal room temperatures, the remaining fan is sufficient for continued UPS operation.

FAULT CLEAR Clearing of memorized faults after the condition(s) causing the fault(s) has been corrected.

FORCED OFF ___ Inverter shut-down, with an 0.8 second load interruption caused by incorrect Bypass AC Input/MAINS2 characteristics.

FORCE ON Load transferred to Inverter with an 0.8 second interruption.

FORCE TRANSFER Prompt requesting password entry to obtain load transfer to Inverter after an interruption of 0.8 seconds.

FREE RUNNING ... Indicates that the Inverter frequency is stable and independent of the Bypass AC Input/MAINS2 frequency.

FREQ ... Frequency.

Fusible ... Capable of being melted with heat.

G

GEN SET DESYNCHRO ... Inverterfrequency de-synchronization action with respect to the Bypass AC Input/MAINS2 upon transfer to a motor-generator set.

GEN SET POW LIMIT ... Motor-Generator Set Power Limit; reducing the power consumed by the Rectifier/Battery Charger during operation of the UPS on a motor-generator set.

GND Ground.

GRAD CH STOP Gradual Rectifier/Battery Charger Shut-Down; a gradual shut-down of the Rectifier/Battery Charger initiated by the closure of an external contact.

H

HZ ... Hertz; one cycle per second equals one Hertz.

I

I ... Current.

I SENSOR FAULT ... indicates a fault on the Inverter output current sensor.

Input Branch Circuit ... The Input Circuit from the building Power Panel circuit breaker to the UPS module.

INV. Inverter.

INV FUSE BLOWN ... Inverter Fuse Blown; indicates that fuse F1, F2, or F6 has blown on the Inverter output.

INV LEG THERM0 ... Indicates over-temperature on the transistors of the Inverter leg.

INV NON SYNC ... Indicates that the phase shift between the Inverter and the Bypass AC Input/MAINS2 is outside of tolerance (±3°). Transfer of the load without interruption is not possible.

INV STOP DISABLED . . . Indicates that the Inverter cannot be stopped using the INVERTER STOP command, since the Bypass AC Input/MAINS2 characteristics are incorrect, which would lead to an 0.8 second interruption to the load if the Inverter were stopped.

INVERT 2 PHASES ... The Main AC Input or bypass AC Input/MAINS2 connections are incorrect. Swap any 2 phases to correct the phase sequence.

INVERTER ACQUISITION FAULT Indicates that the Inverter is not receiving information required for operation.

INVERTER FORCED Load supplied by the Inverter regardless of circumstances (transfer to Bypass AC Input/MAINS2 is locked out).

INVERTER RETURN Prompt requesting the entry of the number 2 for access to the LOAD RETURN TO INVERTER procedure from maintenance bypass status.

I/P ... Input,

J

K

kVA ... Kilovolt Ampere: a measure of apparent power.

kW ... Kilowatt; a measure of real power.

L

LCD ... Liquid Crystal Display.

LED ... Light Emitting Diode.

LEG Inverter phase

LEG DESATURATION ... Indicates that the power transistors are not operating in saturation.

LEG POWER SUP FAULT . . Inverter Leg Power Supply Fault; indicates a power supply fault on the PC Board controlling the transistors of the Inverter leg.

LOAD INTERRUPT...! Warning that impending action will, cause an 0.8 second load interruption.

M

MAINS1 ... Main AC Input source.

MAINS2 ... Bypass AC Input source.

MAINS2 FU RC BLOWN ... Indicates blown fuses (F4, F5, or F6) on the voltage surge suppression circuit connected to the Bypass AC Input/MAINS2.

MAINS2 NOT OK Indicates that the Bypass AC Input/MAINS2 voltage or frequency is outside tolerance limits (±10% and ±0.5% of nominal respectively).

MAINS2 PHASING Indicates zero volts on one phase of the Bypass AC Input/MAINS2 source.

MAINS PH SEQ NOK ... MAINS Phase Sequence Not Okay; indicates that the phase rotation is incorrect; swap any two phases to correct this condition.

MAX ... Maximum.

MCM ... Thousand Circular Mil; wire size for multiple stranded conductors over 4/0 AWG in diameter. M is from the Roman Numeral system symbol for 1,000.

MG Motor Generator.

MOV ... Metal Oxide Varistor.

N

NEC National Electric Code.

NFPA National Fire Protection Association.

NO. or No. Part Number.

NOK Not Okay

O

OSHA ... Occupational Safety and Health Act.

OF ... Over-Frequency.

OF/UF Over- or Under-Frequency.

O.T. ... Out of Tolerance.

OUTPUT OVERLOAD ... Indicates that an overload (110%) has occurred.

OUTSIDE CONTACT ... An external contact supplied by the user and initiating either independent Inverter frequency, or a reduction in the power consumed on the MAINS/Main AC Input line, or force load supply by the Inverter, or a gradual Rectifier/Battery Charger shut down.

OV ... Over-Voltage.

OV/UV ... Over- or Under Voltage.

P

Packing List The list of articles included in a given shipment.

PCA ... Printed Circuit Assembly, refers to the electronic cards used in the UPS.

PERSONALIZATION ... Main Menu heading for access to the programming of non-standard equipment characteristics.

P.F. ... Power Factor.

PH Phase.

PIA Plug-In Assembly.

POWER SUPPLY FAULT Indicates a fault on the control electronics power supply board ALIP.

Q

Q1 ... UPS Main AC Input/MAINS1 circuit breaker designation.

Q3BP ... Maintenance Bypass switch desig nation.

Q4S ... Bypass AC Input/MAINS2 switch designation.

Q5N ... UPS Output Isolation switch designation.

QF1 ... BPA circuit breaker designation.

R

Remote Emergency Power Off ... A switch used for shutting down electrical equipment.

REPO See Remote Emergency Power Off.

REP. ... Replacement.

RMTE CNTRL ENABLE ... Remote Control Enable, indicating that the Inverter *and* Rectifier/Battery Charger can be stopped and started from the control module unit telemonitor.

S

SCR Silicon-Controlled Rectifier

SEQ Sequence.

S.G. Specific Gravity (see below).

Shipping damage ... Any damage done to an article while it is in transit.

Shipping pallet ... A platform on which articles are fixed for shipping. Not used when equipment is shipped by air ride padded van.

Specific **Gravity** ... The ratio of the weight of a given volume of substance (such as electrolyte) to that of an equal volume of another substance (such as water) used as a reference.

SPEED = BAUDS ... Programming of the transmission speed in bits per second (baud rata).

S.S. or STATIC SW ... Static Switch, used to transfer the load to the Bypass AC Input/MAINS2 source without interruption to the load.

S.S. PROTECTIVE DEVICE FAULT ... Indicates a fault on the voltage surge protection circuit connected to the Bypass AC Input/MAINS2 source.

S.S. THERM0 Indicates an over-temperature condition on the SCRs of the Static Switch assembly.

SS&CP ... System Status And Control Panel.

SYNC. or SYNCHRO Synchronization,

SW **or** SWITCH . . Switch.

SW **TO MAN BY-PASS** ... Switch To Manual Bypass; should be used prior to performing maintenance on the UPS.

T

Technician ... Refers to an electronic technician qualified to maintain and repair electronic equipment. Not qualified to install electrical wiring. Compare with Electrician.

Temp. ... Temperature.

TEST POSITION Indicatesthat the Inverter has been stopped for maintenance and is not available. The load is on maintenance bypass (Q4S is open, Q5N is open, and Q3BP is closed).

THERMAL OVERLOAD ... Indicates that an overload (between 120% and 150%) has occurred.

THERM0 ... Abbreviation for Over-Temperature.

TRANSF. ... Transfer

TRANSFO ... Transformer.

TRANSFO THERM0 ... Indicates an over-temperature condition on the Inverter output transformer T5.

U

U Voltage.

UF ... Under Frequency.

UL Underwriters Laboratories, Inc.

UPS ... Uninterruptible Power Supply

UV ... Under Voltage

V

VAC ___ Volts of Alternating Current,

Vb ... Battery Voltage (in Volts)

Vdc ... Volts of Direct Current.

Via By way of

Volt. ... Voltage.

VPC ... Volts Per Cell, the measure of the electrical potential of a storage cell, such as **a** battery.

W

W/O ... Without.

X

XFMR ... Transformer.

Y

Z

▪ The End

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