

# **OPERATIONS AND MAINTENANCE MANUAL**

for

**International Power Machines®**

## **Balanced*Power II***

**Model BP*II*      20**

**Model BP*II*      25**

**Model BP*II*      30**

164201019 Rev A

## **Uninterruptible Power System (UPS)**

### **SAVE THESE IMPORTANT SAFETY INSTRUCTIONS**

**This manual contains important safety instructions that should be followed during installation and maintenance of the UPS and Battery Cabinets.**



**International Power Machines®**

**10451 Brockwood Road**

**Dallas, Texas 75238-1641**

**Phone: (214) 342-6100**

**Service Hotline (800) 777-8922**

# IPM at your service

International Power Machines Corporation considers prompt customer service to be an integral part of its product. Our Field Service Department is accessible by telephone 24 hours a day, seven days a week to implement timely servicing of our equipment.

## IPM 24-HOUR SERVICE HOTLINE:

**Phone: (800) 777-8922**  
**Outside U.S.: (919) 871-1800**

**Fax: (214) 342-6115**

**When calling for service assistance, have the following information and record of readings and alarm lights from the machine's monitor panel available for the IPM service dispatcher.**

**Serial Number:** \_\_\_\_\_  
(On label inside machine's front door)

	<u>Input</u>	<u>Output</u>
Voltage	_____	_____
Frequency (Hz)	_____	_____

**Model No.** \_\_\_\_\_ **Monitor** \_\_\_\_\_



**International Power Machines®**

**10451 Brockwood Rd, Dallas, Texas 75238-1641, U.S.A.**  
**(214) 342-6100**

# **Important Notice**

**The manufacturer recommends that the monitor panel be inspected visually every eight hour shift to see that lights are operating and no alarm conditions exist. If any unusual conditions exist, call facility maintenance personnel or IPM/LorTec Service Hotline:**

**(800) 777-8922**

# How To Use This Manual

A proper understanding and use of this operating and maintenance manual will enhance UPS system reliability. Therefore, the manual should be given equal status with the tools and equipment used to align and maintain the system. Conversely, improper understanding or application of the principles set forth can result in impaired system operation, loss of power to critical equipment loads, injury to personnel and/or damage to the UPS.

The following guidelines will assist in the understanding and use of this manual.

1. Become familiar with the Table of Contents. It is here that the user can first determine where in the manual required information or guidance can be found.
2. Read through the entire manual so as to become familiar with its style and general contents.
3. Know the manual's limitations. It is not the intent of this manual to give a detailed theory of operation of the UPS. Troubleshooting is limited to the isolation and correction of problems that are signaled by the Control/Monitoring/Alarm Panel.
4. Be thoroughly familiar with the safety precautions outlined in Sections II and IV of the manual.
5. Do not take shortcuts when operating the UPS or performing maintenance on the system. A slower, more deliberate pace will give better results because it eliminates confusion and any false conclusions which may be reached by skipping steps. Careful adherence to step sequences presented herein is, more often than not, the fastest way to achieve desired results.
6. This manual is written based on the assumption that maintenance personnel will be fully knowledgeable in electronics and aware of the hazards of working with high voltage equipment. *Always remember that voltages may be present even when the system has been fully shut down.* Use a voltmeter to check terminals to ground. There is **no substitute for common sense**.
7. Don't guess. If you don't know, ask someone who does.
8. Remember that the International Power Machines Service Staff is always available to answer your questions or provide helpful advice about your UPS. Call them on our **Service Hot Line**:

**Telephone: (800) 777-8922**  
**Outside U.S.: (214) 272-8000**

# Handling and Unpacking Instructions

## BP//

### Handling Instructions:

1. Cabinets should always be stored in an upright position. Failure to observe this precaution can cause serious damage and cancellation of warranty.
2. Cabinets should be forklifted only at appropriate lifting points. Make sure that forks are long enough to go entirely under the unit and protrude from the other side. Be careful not to puncture another unit beyond the one being lifted.
3. Chains, cables, ropes or other retaining devices should not be wrapped around a cabinet. The weight of the system is great enough to cause collapse of the cabinet when lifted by these means.
4. Padding must be used when transporting the system so as to help prevent damage to the cabinets.

### Inspection and Unpacking Instructions:

#### **Receiving/Unpacking/Inspection Checklist**

5. Each palletized unit is designed for forklift or liftgate handling. It is recommended that all packaging be left intact until the unit is in close proximity to its final location to prevent incidental damage during movement.
6. Inspect the exterior packaging for obvious damage such as punctures or gashes that are indicative of damage to the unit. If evidence of damage exists, save the packaging material for inspection by the carrier when a claim is filed. Request for inspection should be made immediately.
7. Strapping should be cut and the corrugated cap and/or sleeve carefully removed. Remove padding and plastic sheeting. The cabinet then may be unbolted from the shipping pallet.
8. Inspect each cabinet: check all exterior surfaces for scratches, chips, cracks and/or indentations. Check monitoring panels carefully.
9. Open each door, checking for damage.
10. A label on the outside of the UPS tells the location of the **Operation & Maintenance (O & M) Manuals**.
11. Remove any internal padding/packaging, checking carefully for parts, documents, etc., that might have been shipped inside the cabinet. If foam blocks are inside the battery trays, leave them in place. They are to keep small batteries from moving around inside the trays.

### Damage Documentation:

It is the responsibility of the recipient to file a claim with the carrier for damages to the equipment or notify IPM, depending on the F.O.B. point. Any and all damage noted upon receipt of the UPS, battery pack and/or PDU should be clearly identified in detail on the Bill of Lading. Carrier's claim procedures should be initiated promptly. In the event damage is found after delivery, it should be reported as soon as possible (normally, there is a 15 day time limit on reporting damages incurred in shipment).

Additional information may be obtained by contacting:

**Manager, Quality Assurance**

**Phone: (800) 527-1208**

**International Power Machines**

**Fax: (214) 494-2690**

**2975 Miller Park North**

**Garland, TX 75042**

# Section I

## Theory of Operation

### 1.1 General

The **BalancedPower II** (BP//) Uninterruptible Power System (UPS) presented in this manual is a solid state, online system designed to provide high quality, continuously filtered and conditioned ac power to computers, their peripherals and/or other critical equipment loads. Most commonly, the UPS is configured as a single, stand-alone unit. Seven power ratings ranging from 10 to 30 kVA are available. Information contained herein is applicable only to power ratings 20 to 30 kVA.

A single UPS comprises the following basic components:

- Input transformer\*
- Rectifier/Charger
- Inverter
- Static Bypass Switch
- Bypass Breaker
- System Control Logic and Circuitry
- Digital Monitoring Panel
- DC Circuit Breaker
- Batteries

\* For 60 Hz units the input transformer is optional for 208–220 vac input voltages and required for 240–600 vac inputs.

A one-line diagram in Section II shows the relationship of these various components.

### 1.2 Rectifier/Charger

The UPS input voltage from the utility is fed into the rectifier/charger (usually referred to as the rectifier) which converts the ac to filtered, regulated rectifier dc link voltage. The dc is used to power the inverter and to recharge the batteries as necessary. The assembly consists of an input circuit breaker and a solid-state three-phase rectifier designed to eliminate even ordered harmonics. An optional input filter reduces harmonics caused by rectifier switching, preventing the harmonics from affecting utility distribution.

### 1.3 Inverter

The inverter section first uses a dc booster to increase the rectifier dc link voltage to a dc booster link voltage.



# Section I

## Theory of Operation

The inverter then changes dc booster link voltage to precision ac voltage through pulse width modulation (PWM) inversion. An output filter and a patented\* Software Harmonic Conditioner™ algorithm provide clean, computer grade ac which is then sent to the critical load. When utility power is available, the rectifier supplies power to the inverter. Should the utility power fail, the inverter is powered by the batteries for a predetermined length of time.

\* *Software Harmonic Conditioner™ is a trademark of International Power Machines and is covered by U. S. Patent 5377092.*

### 1.4 Static Bypass Switch

The static bypass switch connects the UPS input to the load in the event of the loss of the inverter output or an overload condition. During normal conditions, the static bypass switch is in the open or disconnected mode which isolates the bypass input from the load.

If the inverter output becomes unavailable or exceeds its specified tolerance, the static bypass switch closes and transfers the load directly to bypass ac power without interruption. This transfer is automatically inhibited in the event the UPS bypass input is not within specified tolerance.

As soon as the inverter becomes available, returns to within tolerance or the overload clears, the static bypass switch disconnects and retransfers the load to the inverter. Note, however, that so long as the inverter is out of specification, the static bypass switch automatically inhibits transfer of the load.

### 1.5 Batteries

The 15 batteries contained in the UPS cabinet supply 180 volts dc nominal. They are the energy reservoir of the UPS and provide dc power to the inverter in case of loss of UPS input power or rectifier malfunction. The Battery Circuit Breaker electrically isolates the batteries from the UPS module for maintenance purposes and provides overcurrent protection at the battery output.

The rectifier/charger normally provides a float charge to the batteries. Following periods of discharge when the batteries have supplied power to the inverter, the rectifier/charger increases power to the batteries to recharge them. This increased voltage level is provided until the battery charging current decreases to a preset level. At that point the rectifier returns to a float charge.



# Section I

## Theory of Operation

### 1.6 Control Logic and Control Circuitry

The software upgradable Digital Signal Processor control logic of the UPS provides the operating and system control for all functions ranging from limiting the inrush current by walking it in, to maintaining the output voltage within rigid specifications, to determining whether or not the static bypass switch should be activated. The control logic is, for all practical purposes, the brain of the UPS.

### 1.7 Digital Monitoring Panel

The UPS is equipped with a standard Digital Monitoring Panel which selectively monitors critical parameters of the UPS, using easy-to-read digital displays. In addition, detailed instructions guide the operator through the UPS startup. An alarm history can be called up on these digital displays when desired.

In the event of an abnormal condition, an audible alarm sounds and the LED illuminates red to identify an alarm condition so that corrective action can be taken. Alarm Silence and Emergency Power Off pushbuttons are provided.

This panel is discussed in greater detail in Section III.

### 1.8 Multi-Level Passwords

A password is required to access and make use of the UPS Maintenance Menu, described in Section 3.6.3. This menu, with five subsections, makes possible the performance of a variety of maintenance functions including transfer and retransfer to bypass, password changes and adjustment of time and date.

All passwords may be changed by a person who already knows either the password in question or a higher level password.

Passwords consist of a minimum of 4 characters and a maximum of 9 characters. The numerals 0 through 9 and letters A through F may be employed.

The first character of the password indicates the privilege level of the password. The higher the privilege level, the more capabilities that password can access.

Privilege level 0:	No password. Used for the front panel display of voltages, currents, etc. only. Does not permit any menus to be accessed.
Privilege level 1:	Reserved for future development.
Privilege level 2:	Remote operator password. Used to monitor the UPS, but not to affect transfers and retransfers.
Privilege level 3:	Reserved for future development.
Privilege level 4:	Operator password. Monitors the UPS as well as allowing transfers, retransfers, transfer enables, retransfer enables, reset faults, etc.
Privilege level 5:	Reserved.
Privilege level 6:	Super-Operator password. Allows access to UPS operating parameters. It is enabled only for users who attend a one week maintenance training course.





# Section I

## Theory of Operation

### 1.9 Phone Home Alarm Reporting

When this UPS is activated for phone home operation and the UPS senses one of several preselected alarm conditions, the UPS automatically dials IPM's Field Service or another designated computer and notifies service personnel of a system problem requiring attention.

Important information downloaded during each phone home event includes:

- 1) UPS name, ID, phone number and serial number
- 2) customer ID and phone number
- 3) list of active alarms.

You obtain the following benefits from this feature:

- a. Immediate service personnel notification of site power or UPS problems, even when the UPS is unattended.
- b. Increased availability due to reduced mean-time-to-repair with automatic notification and complete remote diagnostic capabilities.
- c. 24 hours per day, 7 days per week monitoring of unmanned facilities and locations where operators are unfamiliar with the UPS. Often, service personnel can take steps to solve a UPS problem remotely before the user is aware that there is a problem.

An internal modem and a dedicated telephone line are required. Phone Home Alarm Reporting can be activated only with a Field Service level of password. It is normally done at the time of startup by a Customer Engineer.

### 1.10 Dial-Back Security

This security feature is provided to insure system integrity. It prevents hackers or other unauthorized persons from intentionally or unintentionally accessing the UPS database. Anyone calling the UPS must establish authority through the use of a dial-back password. The unit validates this password against up to four passwords stored in nonvolatile memory. One of the passwords allows direct communication to commence with the UPS. The other three passwords have associated telephone numbers. If one of these three passwords receives validation, the UPS logic hangs up and dials back the phone number associated with that password. When the connection is made, the remote operator must enter the normal privilege level password for access to the corresponding level of monitoring diagnostics and controls. In this way high level security is provided because the remote operator must know the dial-back and access passwords and be calling from the proper associated phone number.

An internal modem and a dedicated telephone line are required. Dial-Back Security can be activated only with a Field Service level of password. It is normally done at the time of startup by a Customer Engineer.



# Section II

## Installation

### 2.1 General

Your International Power Machines **BalancedPowerII** UPS is UL-listed and designed for installation on the computer room floor. Its attractive computer-like appearance and quiet operation eliminate any necessity of creating special facilities to house the UPS. Because all modern computer rooms utilize environmentally controlled conditions, installation in such a locale will normally suffice to meet the needs of the UPS.

In the event that computer room installation is not practical, the selection of a location for the UPS is critical to the performance of the system and to the life expectancy of its components. Failure to select a site which meets all requirements specified in this section can result in excessive maintenance problems.

Operating temperature range for batteries is 0°C to 40°C (32°F to 104°F). Battery warranty is conditional upon application at or below 25°C (75°F). Continuous operation above 25°C may reduce or void battery warranty.

### 2.2 Mechanical Preparation of UPS

The UPS can be fully accessed from the front, top and left side for operation and maintenance. Rear access is required for installation.

The following steps should be taken, in the order indicated:

1. Ensure that all packing is removed from the UPS.
2. Remove the cardboard outerwrap. The UPS can be rolled off the shipping pallet by removing the support block at the rear of the unit and using the plywood backing as a ramp.

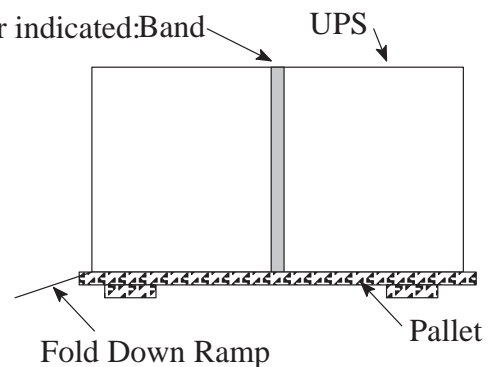


Figure 2-1.



## Section II

### Installation

3. Remove the screws holding the conduit cover to expose the terminals at the rear of the cabinet in the projecting enclosure. Knockouts can be made in this cover for input/output conduit connections. For ease of installation, input/output connections can be made with flexible conduit. This will enable the UPS to be rolled back toward a wall, reducing floor space requirements.
4. The UPS cabinet can now be rolled on its casters to its final destination. When it is in that location, tightening the locking bolt on each caster will hold the unit in place.

*NOTE: For proper ventilation and maintenance access, a clear area three (3') feet (91.4 cm) on the left side, six (6") inches (15.2 cm) on the right side and one (1') foot (30.5 cm) at the rear is recommended.*

5. Remove the right front panel by removing a screw at the bottom and lifting the panel to expose the batteries. If foam blocks are inside the battery trays, leave them in place. They are to keep small batteries from moving around inside the trays.

The battery trays are shipped bolted to the shelf supports and should be left fastened down.

### 2.3 AC Power Connection

1. Make sure that all switches/circuit breakers, including the Battery Circuit Breaker, are open.

#### **WARNING**

*Verify that power cabling is de-energized before proceeding.*

2. All power connections to the UPS terminal blocks must be torqued in accordance with the table below.

#### TIGHTENING TORQUE FOR PRESSURE WIRE CONNECTORS

<u>Size of Wire Used</u>		<u>Torque Specification</u>	
AWG/kcmil	(mm <sup>2</sup> )	in-lb	(N-m)
6-4	(13.3-21.2)	110	(12.4)
3	(26.7)	150	(16.9)
2	(33.6)	150	(16.9)
1	(42.4)	150	(16.9)
1/0-2/0	(53.5-67.4)	180	(20.3)



## Section II

# Installation

3. Referring to the installation drawings in this section, connect UPS output terminals to the equipment to be protected, running the cables out through the conduit holes or access plate.
4. Run cables for UPS input through the conduit holes and connect to terminal block as shown in installation drawings in this section. See notes on installation drawings for single input or dual input installations.
5. Replace the conduit cover over the terminal block.

## 2.4 Activating the Batteries

Make sure that all packing material has been removed from the battery section. If foam blocks are inside the battery trays, leave them in place. They are to keep small batteries from moving around inside the trays.

1. Connect the batteries as shown in Figure 2–2, plugging in similarly numbered connectors. The two connectors (red and black) are attached together to provide the final connection for the battery system. Plug these into the base of the left side wall of the battery enclosure.
2. Replace the front panel removed at 2.2, step 5.

The uninterruptible power system is now ready for startup. See Section III, Operation.

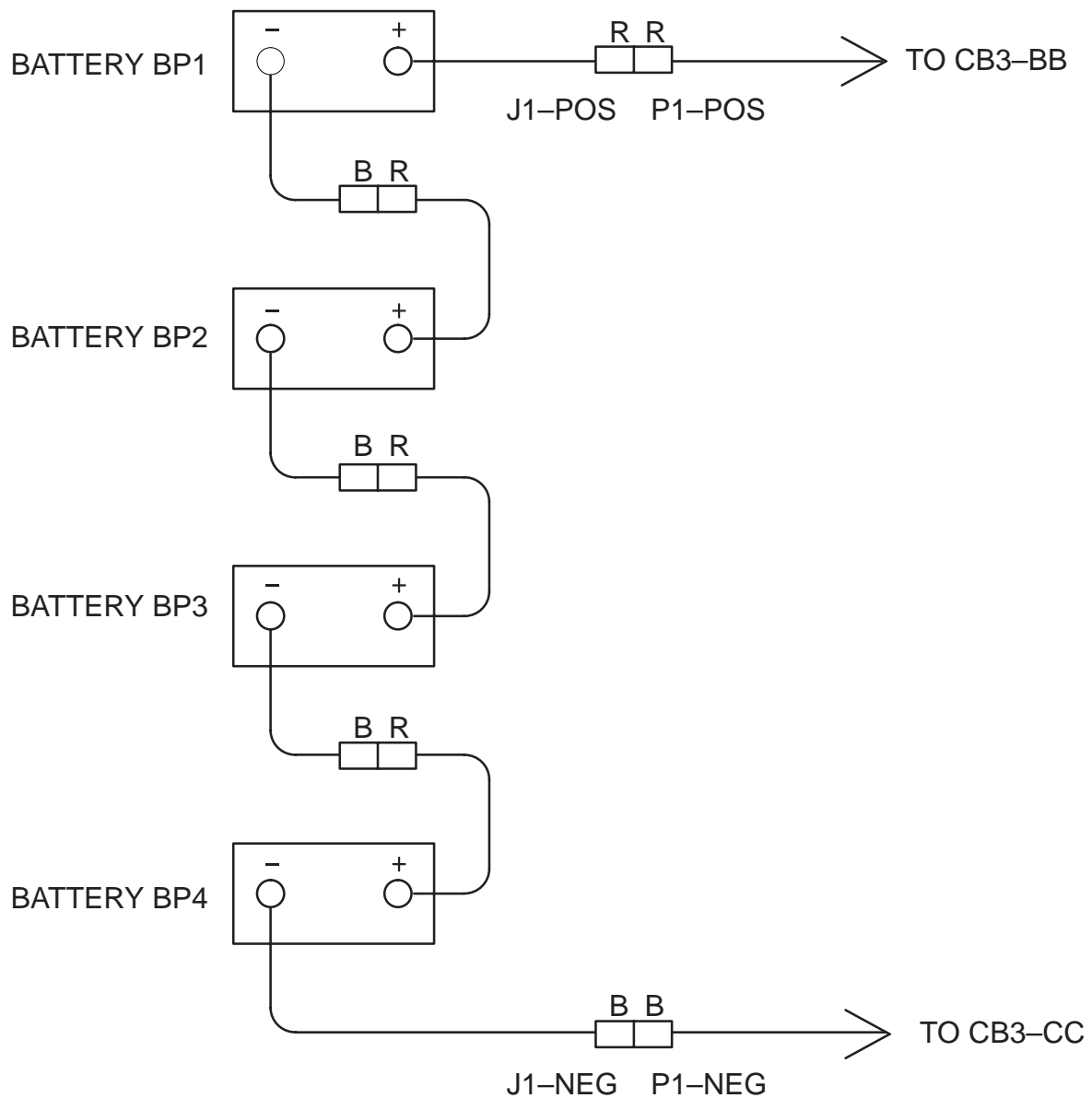


*Do not close the battery circuit breaker until instructed to do so in the startup procedure.*



## Section II

### Installation



4 battery trays  
15 batteries

*Figure 2-2. Battery Interconnection Diagram*



# Section III

## Operation

### 3.1 General

This section contains safety considerations, UPS operational procedures, and an overview of the monitoring panel and operating controls for the system. Prior to operation, ensure that the UPS has been installed correctly as outlined in Section II of this manual. Ensure that correct input/output phase rotation and battery polarities have been observed. **Failure to do so can result in damage to the UPS and/or injury to personnel.** Operators should be thoroughly familiar with the contents of this manual and with the location and function of all system controls and indicators.

### 3.2 Safety Considerations

Safety considerations are divided into several areas which are discussed below. Refer also to Section IV of this manual, **Maintenance**, for safety precautions to be taken whenever operating or working on the UPS.

#### 3.2.1 Cleanliness

Litter or trash of any sort should not be allowed to accumulate in or around the UPS. Liquid spills or metal objects carelessly dropped or placed can cause shorts and damage to the system as well as possible injury to personnel. Dirt and dust accumulating at the UPS air inputs can impede air flow, thereby decreasing the cooling effectiveness of the blowers and possibly resulting in an overtemperature shutdown of the system.

#### 3.2.2 Fire

In order to minimize the possibility of a fire and to reduce the extent of any damage resulting from such an incident, the walls, ceiling and floor of the UPS room should be constructed of noncombustible materials. A portable carbon dioxide extinguisher should be located in the UPS room. Personnel involved in operating and/or maintaining the UPS should be familiar with Class C hazard fires.



## Section III

## Operation

### 3.2.3 Security/Personnel

Access to the UPS should be limited to a minimum of personnel. All personnel who operate or maintain the UPS should be proficient in normal and emergency operational procedures. A refresher briefing or test at specific intervals is recommended to maintain this proficiency. New personnel should be trained and tested prior to operating the equipment. A thorough knowledge of first aid procedures, especially those pertaining to electrical shock or burns, and the use of carbon dioxide fire extinguishers should be mandatory.

### 3.3 Radio Frequency Energy Hazard

#### **WARNING**

*This equipment generates, uses and can radiate radio frequency and if not installed and used in accordance with instructions may cause interference to radio communications. It has been designed to comply with the limits for Class A computing devices pursuant to Subpart J, Part 15 of FCC Rules, which are intended to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be necessary to correct such interference.*

*Always be aware that hazardous voltages may be present within the UPS even when the system is not operating.*



### 3.4 Digital Monitoring Panel

The UPS Digital Monitor Panel consists of a multicolor LED Status Indicator Light, an LCD message screen, two Menu (Display Select) pushbuttons, three (3) Parameter Adjust pushbuttons and an ALARM SILENCE pushbutton. The Menu buttons provide access to the various data and messages which are displayed on the Message Screen. These include detailed instructions for startup sequence, alarm parameters, available battery run time and alarm conditions. An EMERGENCY POWER OFF (EPO) pushbutton is located in the upper left corner of the front panel.

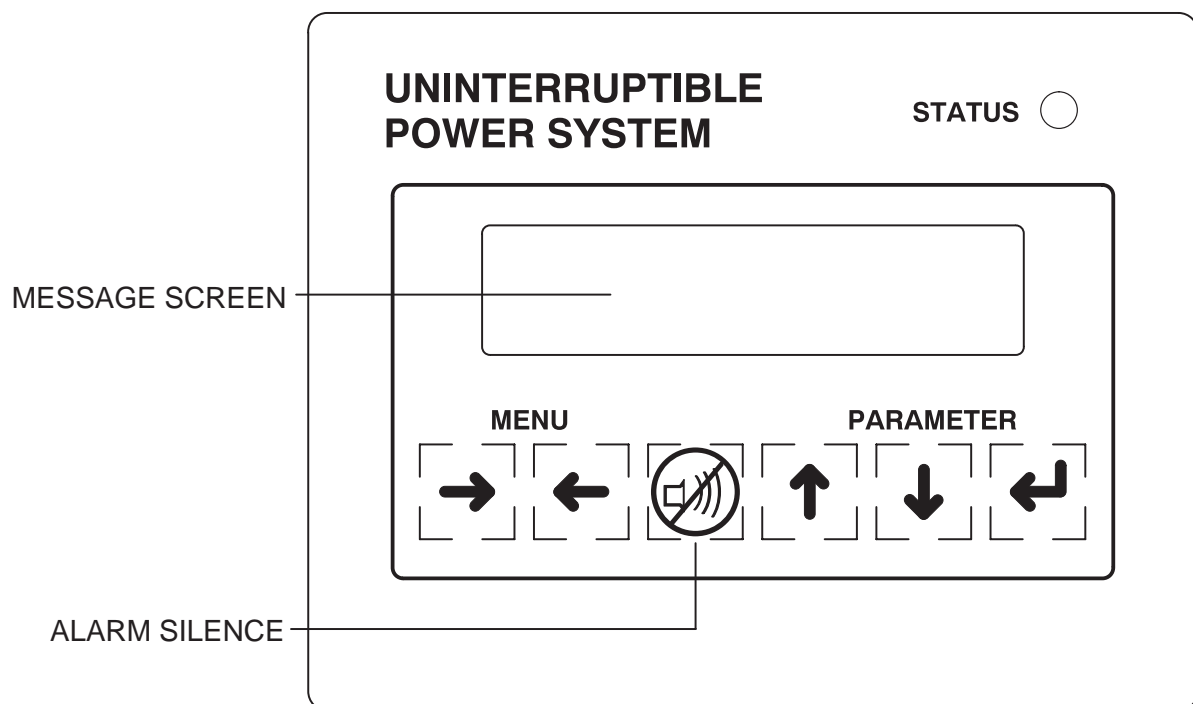


Figure 3–1. Digital Monitoring Panel

#### 3.4.1 Indicator Light

If the multicolor indicator light (LED), located in the upper part of the panel, is:

- **Green: UPS Normal** – This indicates that the critical load is being powered from the inverter. It represents a fully normal condition. With any alarm the LED will change color to indicate a noncritical or actual alarm. When the alarm condition is corrected, the LED will turn green again. See Paragraph 3.4.5 for more details.
- **Green/Red: NonCritical Alarm** – This indicates that a noncritical alarm is present, and that message will appear on the message screen. Check Alarm History (Paragraph 3.4.2.2) to identify the alarm.





## Section III

### Operation

- **Red: Alarm Condition** – When the LED turns red, a problem exists with the UPS. Alarms such as ac input failure, low battery voltage, UPS overload, transferred to bypass, transfer not available, battery not available and/or retransfer inhibited may exist. Check active alarm conditions (Paragraph 3.4.2.1) or alarm history (Paragraph 3.4.2.2) to identify the alarm.
  - **AC Input Failure** – The UPS input power has been disrupted or gone out of specification limits. The system goes to battery power and the alarm sounds, alerting the operator to a brownout or power failure. When the batteries run down, the critical load will shut off unless steps are taken to correct the situation or another source of input power is provided.
  - **Low Battery Voltage** – When the system is operating on battery power, this condition indicates approximately five minutes remains before the UPS system shuts down. A message screen (Section 3.4.2) displays the amount of battery run time left. Also, the rectifier link (battery) voltage may be monitored (See Paragraph 3.4.2.8). Shutdown occurs when the link voltage drops to 148.5 VDC (selectable). If utility power can not be restored or an auxiliary power source be activated, the critical load should be shut down in an orderly procedure.
  - **UPS Overload** – The load on the UPS output is in excess of 105% of rated load. If the condition exists for more than a few seconds, enough of the critical load should be powered down or removed to make the indicator go green. Otherwise, the UPS will shut down and/or transfer to bypass within 15 minutes.

This condition may occur when the UPS is loaded close to 100% and a large disk drive or other motor load is started. These loads draw currents many times their normal level for a few seconds when first started. The UPS is designed to handle this short overload condition.

- **Transferred to Bypass** – An indication that the critical load is being powered directly from the UPS bypass power source. This situation is created when maintenance personnel want to bypass the UPS through the static bypass switch for routine maintenance or when an abnormal condition exists in the inverter, such as failure or extended overload. When in this operational mode, the critical load does not have UPS protection.
- **Transfer Not Available** – An indication that transfer to the static bypass switch is not possible. This may be caused by the UPS bypass input power source being out of specification or a power outage.
- **Battery Not Available** – The battery's DC Disconnect (circuit breaker) is open or a battery cabinet fuse is blown. The battery is not available to power the inverter if needed.



## Section III

# Operation

- **Retransfer Inhibited** – An indication that the inverter is out of specification or has lost phase lock with the bypass power source. When active in conjunction with the Transferred to Bypass indicator, power cannot be retransferred from the static bypass switch back to the inverter.

### 3.4.2 Message Screens

Message screens display the status of the UPS. To scroll through these screens, depress ◀ or ▶ buttons.

Following are the legends that appear in this area while the UPS is running normally. To display these in this order, start with the screen at right and depress the ▶ button to show each screen in turn.

If the UPS is operating on battery power, this screen will appear instead. It can be monitored to determine the battery run time remaining during a power outage.

UPS  
Operating Normally

Time Left XXX Min  
XXX Sec

#### 3.4.2.1 Active Alarm Condition

If any active UPS alarm conditions exist, the condition(s) will be shown on this screen. When NONE is indicated, no alarm conditions are active. With activation of alarm condition(s), one or more of the following abbreviations will be displayed:

ALM: NONE  
N/A:

##### ALM – ALARM

INP – AC Input Failure  
LBT – Low Battery Voltage  
BYP – Transferred to Bypass  
OVL – UPS Overload

ALM: INP LBT BYP OVL  
N/S BSTT XFR RXFR

##### N/A – Not Available

BATT – Battery Not Available  
XFR – Transfer Not Available  
RXFR – Retransfer Inhibited



Description for each alarm condition is provided in Paragraph 3.4.1.





# Section III

## Operation

### 3.4.2.2 Alarm History

This is a sequence of entries showing as many as the last 1500 alarm and status conditions that have occurred. To see them all, scroll through the list depressing the  or  button successively (see paragraph 3.6.2).

xx/yy uu:vv:ww tttt  
Alarm identity\*

On this screen the letters are read as follows:  
xx = month    yy = day of the month    uu = hour (on the 24-hour clock)  
vv = minutes of the hour    ww = seconds  
tttt = alarm sequence number. 0 is most recent. Press  to scroll from a higher number to 0 or press  to scroll from 0 to a higher number.

\*    The identity of the alarm is abbreviated on the screen. The full identification of each and corrective action are given in Table 3–2.

### 3.4.2.3 Input Voltage

This is a readout of input voltage between phases.

Input Vab Vbc Vca

—and—

This is a readout of input voltage phase to neutral.

Input Van Vbn Vcn

### 3.4.2.4 Input Current:

This is a readout of the input current, measured in amps per phase.

Input Ia Ib Ic

### 3.4.2.5 Bypass Voltage

This is a readout of the bypass voltage between phases.

Bypass Vab Vbc Vca

### 3.4.2.6 Input/Output Frequency

A readout of the input and output frequency in Hz.

Freq. input/Output



## Section III

### Operation

#### 3.4.2.7 Inlet Temperature

A readout of the inlet temperature in °C.

Inlet Temp.

#### 3.4.2.8 Rectifier/Booster Link Voltage

Rectifier link voltage is 205 VDC  $\pm$  10%. If there is an increase to about 212 VDC, it indicates the batteries are being charged. If the voltage goes above 229 VDC, the rectifier will shut down. (These values are subject to change according to battery type.)

Rct/Booster Link  
xxx.x yyy.y

Booster link voltage is 400 VDC  $\pm$  10%. If the booster voltage goes above 450 VDC or below 350 VDC, the inverter will shut down and the UPS will transfer to bypass.

#### 3.4.2.9 Battery Amps

A positive number indicates battery charging; a negative number indicates discharging (possibly because UPS is operating on battery power).

Battery Amps

#### 3.4.2.10 Maximum Output Crest Factor

Displays maximum output crest factor of the load on the UPS.

Max Out CF

#### 3.4.2.11 Output kW/kVA

Output kW/kVA

#### 3.4.2.12 Output Power Factor

Output Power Factor



## Section III

## Operation

### 3.4.2.13 Output Voltage

A readout of output voltage phase to neutral. There is a maximum variance of 5% between phases.

Output Van Vbn Vcn

### 3.4.2.14 Output Current

A readout of output current, measured in amperes per phase.

Output Ia Ib Ic

### 3.4.2.15 Date

Displays today's date.

Date  
*Actual Date*

### 3.4.2.16 Time

A readout of the current time.

Time  
HH:MM:SS

### 3.4.2.17 UPS Maintenance Menu

This screen allows entrance into the UPS Maintenance Menu described in Paragraph 3.6.3. A password is required to use this menu.

UPS Maintenance Menu

The next message is "UPS Operating Normally."

### 3.4.2.18 Other Messages

Under certain conditions other messages may appear on the message screens.

## 3.4.3 Display Select Pushbuttons

The ➡ and ⬅ pushbuttons are used to select the desired display on the Message Screen, as described in Paragraph 3.4.2.

## 3.4.4 Parameter Adjust Pushbuttons

These pushbuttons, labeled ⬆, ⬇, and ⬅, are used with Alarm Identity/History procedures (Paragraph 3.6.2) and to set or alter the parameters of the UPS.



## Section III

# Operation

### 3.4.5 Alarm Silence Pushbutton

Whenever an alarm condition exists, an audible alarm sounds calling attention to the situation. The audible alarm is silenced by depressing the ALARM SILENCE pushbutton once. A red LED indicates an active alarm condition that may require immediate action.

### 3.4.6 Emergency Power Off Pushbutton

To be used only for emergency conditions where instant shutdown of the UPS is required. Depressing the EMERGENCY POWER OFF (EPO) pushbutton results in immediate shutdown of operations, opening all UPS breakers and the DC (battery) disconnect, the audible alarm sounds and all power to the critical load is shut off. Once the EPO has been activated, the UPS must be manually restarted. (The EPO also may be activated remotely by a contact closure.)



*Anytime the UPS has been shut down by using the EPO, the system should be carefully checked by trained facilities personnel before restarting.*

## 3.5 System Controls

Controls for the UPS, with the exception of the pushbuttons located on the face of the UPS monitor panel, are situated inside the front door at left side of the cabinet.

**MAIN INPUT CIRCUIT BREAKER:** *Available with optional input isolation transformer only.* When closed, allows input power to activate the input isolation transformer which supplies control power, rectifier, SBS and maintenance bypass inputs.

**UPS CONTROL switch:** This switch is rotated clockwise to energize the power supply to turn on the Digital Signal Processor logic.

**RECTIFIER INPUT CIRCUIT BREAKER:** When closed, allows UPS input power to supply the rectifier and, on units having an optional input isolation transformer, the SBS input.

**BYPASS CIRCUIT BREAKER:** Used primarily for maintenance purposes. When closed, it enables the UPS electronics to be de-energized for maintenance procedures while continuing to supply power to the critical load.

**STATIC SWITCH BYPASS CIRCUIT BREAKER:** *Not available with input isolation transformer.* When closed, allows bypass input to supply power to the Static Switch.



## Section III

## Operation

**OUTPUT BREAKER:** When closed, connects the critical load to the inverter and static bypass switch.

### 3.6 UPS Operating Procedures

*It is important for safety and the protection and performance of the UPS that the step-by-step instructions for each procedure be followed in the sequence given.*

#### 3.6.1 System Startup Procedure

Before initiating UPS startup, make sure that:

- All circuit breakers/switches are OFF (open).
- The DC (Battery) disconnect switch is OFF (open).

Then —

**Each of the following steps must be completed before going to the next step. Failure to do so may result in interruption of power to the critical load.**

1. (NOTE: If the UPS does not have an input isolation transformer, skip this step.) If the UPS has an optional input isolation transformer (see one-line diagram in Section II), close the **MAIN INPUT CIRCUIT BREAKER**. This will activate the input transformer which supplies control power, rectifier, SBS and maintenance bypass.
2. Rotate UPS CONTROL switch knob clockwise to ON to energize the system or DSP logic. If this screen appears, the UPS is not in operable condition. Phone Service Hotline at **(800) 777-8922** or **(214) 272-8000** for assistance.

Checksum Bad  
Service Required

Normally, turning on the UPS CONTROL switch should illuminate the red LED.  
... and this screen which will be displayed  
for a short time,

Checksum  
Good

... then —

3. When this instruction appears on the Message Screen, close **BYPASS CIRCUIT BREAKER**. The red LED should remain lighted. Power is available now on the UPS output.

Close BYPASS  
CKT. BREAKER



## Section III

### Operation

4. When this instruction appears on the Message Screen, close the **RECTIFIER INPUT CIRCUIT BREAKER**.

Close RCT INPUT  
CKT. BREAKER

5. This screen will appear for a short time, then —

Waiting  
DC Link = XXX.X VDC

When this instruction appears on the Message Screen, close the **DC (Battery) Circuit Breaker**. Depress the ALARM SILENCE pushbutton. The red LED should remain lit.

Close BATTERY  
CKT. BREAKER

6. When this instruction appears on the Message Screen, close the **Output Circuit Breaker**.

Close OUTPUT  
SWITCH OR BKR

7. *This step does not apply to UPS with the optional input transformer.* When this instruction appears on the Message Screen, close **STATIC BYPASS SWITCH CIRCUIT BREAKER**. The red LED should remain lighted.

CLOSE SBS INPUT  
CKT. BREAKER

8. When this instruction appears on the Message Screen, open the **BYPASS CIRCUIT BREAKER**. Within approximately 2 minutes the audible alarm will sound. Depress the ALARM SILENCE pushbutton, silencing the alarm.

Open BYPASS  
CKT. BREAKER

9. This screen will show for a short time.

Wait  
Retransfer Pending

10. Then this screen will appear, indicating that the UPS is now in normal operation.

UPS  
Operating Normally







## Section III

## Operation

### 3.6.2 Alarm Identity/History

As described in Paragraph 3.4.2.1, this is the first Alarm History screen. It can be displayed by pressing the  or  button, going through the sequence of screens described in Paragraph 3.4.2 until this screen appears.



xx/yy uu:vv:ww tttt

*Alarm identity\**



On this screen the letters are read as follows:

xx = month    yy = day of the month    uu = hour (on the 24-hour clock)



vv = minutes of the hour    ww = seconds

tttt = alarm sequence number. 0 is most recent. Press  to scroll from a higher number to 0 or press  to scroll from 0 to a higher number.

\* The identity of the alarm is abbreviated on the screen. The full identification of each and corrective action are given in Table 3–2.

The principal use of the Alarm History screen is to identify the source of audible alarms so that corrective action can be taken. When the audible alarm sounds, press  or  until this Alarm History screen appears. You may depress the ALARM SILENCE button once to silence the alarm.

You may find it advantageous to leave the message screen on Alarm History during normal operations. Then, if an alarm sounds, its identity will be seen immediately.

It may be helpful to view the Alarm History as a list of alarms, ordered by date and time. Whenever the Alarm History screen is first selected, the first entry shown on the screen is the latest entry on the list. Pressing  moves you toward the top of the list and pressing  moves you toward the bottom of the list. See an example in Table 3–1.


Following is the beginning of a typical list of messages from the Alarm History screen as the startup procedure is begun. The date, time, and alarm identity are shown on the screen in the first Alarm History screen after system startup. By depressing  you can scroll the screen up one message at a time to the oldest (earliest) message. Thinking of the Alarm History screens as part of a list will help you visualize what is happening.

Table 3–1. Typical Alarm History Screens

Date	Time	Alarm	Screen Message
01/01	08:30:00	CPU Restarted	CPU Restart
01/01	08:35:09	Input Circuit Breaker Closed	inp bkr clsd
01/01	08:35:10	Input Voltage Normal	inp vol norm
01/01	08:36:00	DC Voltage Normal	dc volt norm



## Section III

# Operation

*Table 3–2. Alarm History Messages and Descriptions with Corrective Actions*

Screen Message	Description	Corrective Action
inp bkr open	Rectifier Input Circuit Breaker open	Follow System Startup procedure to close Rectifier Input Circuit Breaker.
inp bkr clsd*	Rectifier Input Circuit Breaker closed	Verifies that Rectifier Input Circuit Breaker is closed.
bat bkr open	Battery (DC Disconnect) switch open	Follow System Startup procedure to close Battery (DC Disconnect) switch.
bat bkr clsd*	Battery (DC Disconnect) switch closed	Verifies that Battery (DC Disconnect) switch is closed.
inp vlt high	Input voltage too high	Verify correct UPS input voltage. Decrease if necessary.
inp vlt low	Input voltage too low	Verify correct UPS input voltage. Increase if necessary.
inp vlt norm*	Input voltage normal	No action required
inp freq hi	Input frequency too high	Verify correct UPS frequency.
inp freq low	Input frequency too low	Verify correct UPS frequency.
inp freq norm*	Input frequency normal	No action required
inp cur high	Input current too high	Reduce load on UPS output.
inp cur imbl	Input current out of balance	Verify correct UPS input voltage and current.
inp cur norm*	Input current normal	No action required
dc volt high	DC (battery) voltage too high	Verify correct battery voltage. Decrease if necessary.
dc volt low	DC (battery) voltage too low	UPS is operating off the battery.
dc volt norm*	DC (battery) voltage normal	No action required
rct fus norm*	Rectifier fuses normal	No action required
rct bln fus	Rectifier fuse blown	Test/replace rectifier fuses.
rct pwr fail	Rectifier power supply failure	Test/replace rectifier drive boards.
rct pwr norm*	Rectifier power normal	No action required
rct lock*	Rectifier phase locked	No action required
rct not lock	Rectifier not phase locked	Verify UPS input voltage and frequency.
rct cur limt	Rectifier current limit	Reduce load on UPS output.
rct cur aval*	Rectifier current not available	No action required
rct on gen*	Rectifier on generator	No action required

\* – Not an alarm condition.

*(continued next page)*



## Section III

### Operation

*Table 3–2. Alarm History Messages and Descriptions with Corrective Actions (continued)*

Screen Message	Description	Corrective Action
rct in rechg*	Rectifier in recharge mode (battery being recharged)	No action required
rct in float*	Rectifier in float (battery is recharged)	No action required
bat volt low	Battery voltage low (LED warning also)	UPS will shut down in a few minutes. Initiate shutdown of critical loads.
inv fus norm*	Inverter fuse normal	No action required
inv bln fus	Inverter fuse blown	Test/replace dc booster inverter fuses.
inv ps fail	Power supply failure	Test/replace inverter drive/power assemblies.
inv ps norml*	Power supply normal	No action required
inv locked*	Inverter phase locked	No action required
inv not lock	Inverter not phase locked	Verify UPS input voltage and frequency.
boost fail	DC booster failure	Test/replace dc booster drive/power assembly.
boost normal*	DC booster normal	No action required
inv ovrtmpA	Inverter over temperature	Verify cooling fans are operating on power assembly.
inv norm tmp*	Inverter temperature normal	No action required
inv cur norm*	Inverter current normal	No action required
inv OC shtdn	Inverter shutdown – over current	Remove some of the load.
inv OT shtdn	Inverter shutdown – over temperature	Room is too hot or fan failure.
inv cur limt	Inverter current limit	Reduce load on UPS.
xfer enabled*	Transfer enabled	No action required
rexfr enable*	Retransfer enabled	No action required
maint by flt	Maintenance bypass fault	Maintenance bypass breaker is closed with inverter operating. Follow Startup procedure to open bypass breaker.
bst hi shtdn	Inverter shutdown due to dc booster overvoltage	Verify rectifier dc voltage. Decrease if necessary.
bst low shtdn	Inverter shutdown due to dc booster undervoltage	Verify rectifier dc voltage.

\* – Not an alarm condition.

*(continued next page)*



## Section III

# Operation

*Table 3–2. Alarm History Messages and Descriptions with Corrective Actions (continued)*

Screen Message	Description	Corrective Action
bst vlt norm*	Inverter booster voltage normal	No action required
dc hi shtdn	Rectifier shutdown due to dc output overvoltage	Verify that rectifier automatically restarts.
inv mnl strt*	Inverter manual start	No action required
inv mnl stop*	Inverter manual stop	No action required
inv mnl xfer*	Inverter manual transfer	No action required
inverter on*	Inverter on	No action required
inverter off	Inverter off	Follow Startup procedure to restart UPS.
inv fan fail	Inverter fan failure	Verify all cooling fans are operating.
inv fan norm*	Inverter fan normal	No action required
dc low shtdn	UPS shutdown – DC (battery) voltage low	Batteries are discharged.
inv phrt nml*	Inverter phase rotation normal	No action required
out volt hi	Output voltage high	Verify UPS output voltage. Decrease if necessary.
out volt low	Output voltage low	Verify UPS output voltage. Increase if necessary.
out volt nml*	Output voltage normal	No action required
out frq high	Output frequency high	Verify UPS output frequency.
out frq low	Output frequency low	Verify UPS output frequency.
out frq norm*	Output frequency normal	No action required
out cur high	Output current high	Reduce load on the UPS.
out cur norm*	Output current normal	No action required
out bkr open	UPS Output Circuit Breaker (Switch) open	Follow Startup procedure to close.
out bkr clsd*	UPS Output Circuit Breaker (Switch) closed	No action required
sbs pwr norm*	Static Bypass Switch power normal	No action required
sbs pwr falA	Static Bypass Switch power supply failure – Phase A	Test/replace SBS drive board.
sbs pwr falB	Static Bypass Switch power supply failure – Phase B	Test/replace SBS drive board.
sbs pwr falC	Static Bypass Switch power supply failure – Phase C	Test/replace SBS drive board.

\* – Not an alarm condition.

*(continued next page)*



## Section III

### Operation

*Table 3–2. Alarm History Messages and Descriptions with Corrective Actions (continued)*

Screen Message	Description	Corrective Action
bypass open*	Bypass Circuit Breaker open	No action required
bypass closed	Bypass Circuit Breaker closed	Follow Startup procedure to open.
sbs on	Static Bypass Switch on (closed)	Follow Startup procedure to return to normal.
sbs off*	Static Bypass Switch off (open)	No action required
sbs disabled	Static Bypass Switch disabled	Enter SBS Maintenance Menu and enable transfer.
sbs enabled*	Static Bypass Switch enabled	No action required
ups amb high	UPS ambient temperature high	Room is too hot. Lower temperature.
ups amb norm*	UPS ambient temperature normal	No action required
ups amb shdn	UPS ambient temperature shutdown	Room is too hot. Lower temperature.
byp volt hi	Static Bypass Switch bypass voltage high	Verify SBS input voltage. Decrease if necessary.
byp volt low	Static Bypass Switch bypass voltage low	Verify SBS input voltage. Increase if necessary.
byp volt nml*	Static Bypass Switch bypass voltage normal	No action required
byp freq. hi	Static Bypass Switch bypass frequency high	Verify SBS input frequency.
byp freq. low	Static Bypass Switch bypass frequency low	Verify SBS input frequency.
byp freq. nml*	Static Bypass Switch bypass frequency normal	No action required
rct summary	Rectifier summary alarm	Review other rectifier alarms for cause.
rct inhibit	Rectifier inhibited	Review other rectifier alarms for cause.
rct normal*	Rectifier normal	No action required
dc low shdn	UPS dc link low shutdown	Complete UPS restart procedure is required.
dc link norm*	UPS dc link normal	No action required
inv summary	Inverter summary alarm	Review other inverter alarms for cause.
inv inhibit	Inverter inhibited	Review other inverter alarms for cause.
inv normal*	Inverter normal	No action required

\* – Not an alarm condition.

*(continued next page)*



## Section III

# Operation

*Table 3–2. Alarm History Messages and Descriptions with Corrective Actions (continued)*

Screen Message	Description	Corrective Action
sbs summary	Static Bypass Switch summary alarm	Review other SBS alarms for cause.
sbs inhibit	Static Bypass Switch summary inhibited	Review other SBS alarms for cause.
sbs normal*	Static Bypass Switch summary normal	No action required
ups summary	UPS summary alarm	Review all alarms for cause.
ups inhibit	UPS inhibited	Review all alarms for cause.
ups normal*	UPS in normal condition	No action required
CPU normal*	UPS processor normal	No action required
UPS Powerup*	UPS processor initialized	No action required
EPO btn pshd	EPO pushbutton pressed	Complete UPS restart procedure is required.
EPO btn rlsd	EPO pushbutton released	Complete UPS restart procedure is required.
ctl pwr on*	Control power on	No action required
ctl pwr off	Control power off	Turn on Control Power switch.
rct wdog flt	Rectifier watchdog fault	Call Service Hotline.
rct hi shtdn	Rectifier high shutdown	Call Service Hotline.
clr rct wdog*	Rectifier watchdog fault cleared	No action required
pwrsply fail	Power supply failure	Call Service Hotline.
pwrsply nrml*	Power supply normal	No action required
ps inp fail	Power supply input failure	Call Service Hotline.
ps inp normal*	Power supply input normal	No action required
bat vlt nrml*	Battery voltage normal	No action required
sbs scr normal*	Static bypass switch — normal	No action required
rct on util*	Rectifier served by utility power	No action required
sbs inp open	Static bypass switch breaker open	Follow Startup procedure to close circuit breaker.
sbs inp closed*	Static bypass input switch or circuit breaker closed	No action required
sbs out open	Static bypass output switch is open	Follow Startup procedure to close switch.
sbs out clsd*	Static bypass output switch is closed	No action required

\* – Not an alarm condition.

*(continued next page)*



## Section III







### Operation

*Table 3–2. Alarm History Messages and Descriptions with Corrective Actions (continued)*

Screen Message	Description	Corrective Action
xfer dsabld*	Retransfer disabled	No action required
rexfer inhibit*	Retransfer inhibit	No action required
inv no ovrlld*	Inverter drive no overload	No action required
trnsnt overld	Inverter drive transient overload	Decrease load.
Inv Overload	Inverter drive overload	Decrease load.
ram normal*	RAM is normal	No action required
ph dial*	Phone home dialout	No action required
ph connect*	Phone home connection established	No action required
ph test*	Phone home test performed	No action required
ph fail*	Phone home connection attempt failed	No action required
out overload	The load on the UPS has exceeded 100%	Decrease the load.
load normal*	The load on the UPS is less than or equal to 100%	No action required
bln trap fuse	The input trap fuse has blown	Call Service Hotline.
trap fuse ok*	The fuse on the input filter is normal	No action required
inp 5 <sup>th</sup> high	The 5 <sup>th</sup> harmonic content of the input current is too high	Perform bypass shutdown and call Service Hotline.
inp 5 <sup>th</sup> norm*	The 5 <sup>th</sup> harmonic content of the input current is at an acceptable level	No action required
unused*	Unused alarm appears when alarm is cleared	No action required

\* – Not an alarm condition.

**NOTE:** *If a message requires action you cannot perform, call Service Hotline: (800) 777–8922 or (214) 272–8000.*

1. Depress  to display the next most recent alarm. You can repeatedly depress  to review past alarms in receding order. Continue as long as desired. After you have started this repeated depressing of , depressing  will display more recent alarms back to the current alarm.
2. To exit Alarm History, depress,  or .




## Section III

# Operation

### 3.6.3 UPS Maintenance Menu

The UPS Maintenance Menu performs a variety of maintenance functions including password changes and adjustment of time and date. It is divided into the following secondary menus in the order stated. The detailed instructions for each are given on the following paragraphs.

- 3.6.3.1 Rectifier Maintenance Menu
- 3.6.3.2 Inverter Maintenance Menu
- 3.6.3.3 SBS Maintenance Menu
- 3.6.3.4 System Maintenance Menu
- 3.6.3.5 Password Maintenance Menu




1. To bring the UPS Maintenance Menu to the screen, depress the  pushbutton as many times as necessary until the screen reads like this.

UPS  
Maintenance Menu




2. Press . This will display–

Enter Password  
  
0


NOTE: there is a further discussion of multi-level passwords in Section 1.8.

3. The UPS is shipped with the password 4F00. To enter this password, depress  or  to change the first digit to “4”.  is the shortest way to get to the “4” the first time. The screen will now look like this.


Enter Password  
  
4

4. Now depress  to activate the second digit. Press  or  until the “F” shows, like this:

Enter Password  
  
4F

5. Depress  to activate the third digit. The screen will show:

Enter Password  
  
4F0

6. Depress  again to activate the fourth digit to obtain:




Enter Password  
  
4F00





## Section III




### Operation

- Depress  to bring up the first of the secondary menus. Depress  to bring up the other four Maintenance Menus in turn. Sometimes it will be faster to depress  to obtain the desired menu.

Rectifier  
Maintenance Menu

#### 3.6.3.1 Rectifier Maintenance Menu

*To be used only when advised by qualified service personnel.*

- When in the Rectifier Maintenance Menu, depress . When this screen is displayed, press  to reset the faults.
- This message will appear on the screen. To confirm the previous action, press  again.

Reset Rect. Faults  
UP = reset

Confirm  
Yes = UP No = DN

– returning the screen to –

Reset Rect. Faults  
UP = Reset



- Press  to obtain this screen.

Return to  
Previous Menu

- Press  to return to the Rectifier Maintenance Menu.

Rectifier  
Maintenance Menu

#### 3.6.3.2 Inverter Maintenance Menu

- Press  to advance to the Inverter Maintenance Menu.
- Press  to obtain this screen. The crest factors shown here are for information only. No adjustments can be made.

Inverter  
Maintenance Menu

Output CF A B C  
X.XX X.XX X.XX




## Section III

### Operation

3. Press  to obtain this screen.

Reset Inv. Faults (UP)  
Rdy to Start

*Steps 4,5 and 6 should only be performed when advised by qualified service personnel.*

4. Press  to reset the inverter faults.  
5. This screen will ask you to confirm that you wish to reset inverter faults.

Confirm  
Yes = UP No = DN

6. Press  again to return to this screen

Reset Inv. Faults (UP)  
Rdy to Start

7. Press  to obtain—

Return to  
Previous Menu

8. Press  to return to the Inverter Maintenance Menu.






Inverter  
Maintenance Menu

#### 3.6.3.3 SBS Maintenance Menu

1. Press  to advance to the SBS Maintenance Menu.

SBS  
Maintenance Menu

#### Bypass/Shutdown Procedure

2. Press  to obtain this screen. Press  to begin the Bypass/Shutdown Procedure. Retransfers are disabled by this procedure.  
To skip Bypass/Shutdown procedure and go directly to Manual Transfer to Bypass (Step 12), press  instead of .
3. Press  to continue the Bypass/Shutdown procedure.

Bypass/ Shutdown UPS  
UP = Bypass

Confirm  
Yes = UP No = DN



## Section III

### Operation

#### **WARNING**

*Bypass/Shutdown procedure may not be exited without performing all steps in the order shown.*



4. When this message appears, close the <b>BYPASS CIRCUIT BREAKER</b> .	Close Bypass Breaker
5. When this message appears, open the <b>OUTPUT CIRCUIT BREAKER</b> .	Open Output Breaker
6. When this message appears, open the <b>BATTERY CIRCUIT BREAKER</b> .	Open Battery Breaker
7. <u>On a UPS without the input transformer option</u> —when this message appears open the <b>SBS INPUT CIRCUIT BREAKER</b> .	Open Sbs Input Breaker
8. When this message appears, open the <b>RECTIFIER INPUT CIRCUIT BREAKER</b> .	Open RCT Input Breaker
9. While this message is on the screen, the link voltage will be gradually decreasing. XXX.X represents the actual voltage as displayed. When the rectifier link voltage has decreased to the proper value, the following screen message will appear	Waiting. . . DC Link = XXX.X Vdc
10. This message indicates that the Maintenance Bypass Shutdown procedure is complete.	Bypass Shutdown Complete
11. You may turn off the <b>UPS CONTROL</b> switch. This message appears only briefly.	You may turn off UPS Control




## Section III

### Operation


#### Manual Transfer to Bypass

12. Perform this step only if Bypass/Shutdown was skipped at Step 2. Press  and  to obtain this screen.


Man. Transfer/Retransfer  
Inv Running

13. Press  to obtain this screen.




Confirm  
Yes = UP No = DN

14. Press  to manually transfer input to bypass power source. This will inhibit transfer and activate a red LED. It will also change the “Inv Running” on the screen to “Wait Rexfr.”

Man. Transfer/Retransfer  
Inv Running

15. If it desired to manually retransfer to primary UPS input, press  and wait 10 seconds for this screen to appear. This will turn the LED to green.


Man. Transfer/Retransfer  
Inv Running

16. Normally, the system will be left so that transfer and retransfer are enabled. Following Step 11 of this subsection, press  once or twice to obtain this screen with either “transfers” or “retransfers” on the top line. Pressing  or  will change between “enabled” and “disabled” on the bottom line.

Retransfers  
Enabled

17. Press  to obtain—

Return to  
Previous Menu

18. Press  to return to the SBS Maintenance Menu.




SBS  
Maintenance Menu



## Section III

### Operation

#### 3.6.3.4 System Maintenance Menu





1. Press  to advance to the System Maintenance Menu.
2. Press  to obtain this screen. The X.XX represents the latest software release number.
3. Pressing the  key will obtain this screen. Press UP to execute the LED/lamp test. The LED will light and a test pattern will be displayed for 3 seconds in the display area.

System  
Maintenance Menu

Software Rev. Level  
X.XX 60Hz

LED/Lamp Test  
UP = Test

NOTE: This test can be performed only from the front panel display.


4. Press  to obtain this message. This is the beginning of a procedure to change the language on the monitor panel if desired. To leave it in English, press . This will skip to Step 7, below.
5. Pressing  in the step above will bring out this screen. If you wish to change the language, it is necessary to confirm by pressing  again.

Language  
English

Confirm  
Yes = UP No = DN

 **WARNING**

*If you don't speak German, don't perform this step. You may get lost trying to get back into English.*




















6. Pressing  the second time changed the language and obtained this message (example shown in German).

Sprache  
Deutsch



## Section III

### Operation

7. Press  to obtain this message in the language displayed in Step 6. The message screens will now all be in that language. Press  to confirm that this is the desired language. Press  to change the language. Refer to the manual written in the appropriate language for screen messages and instructions.
8. Press  to obtain this screen. This is the start of the procedure if it is necessary to change the date setting.
9. Press . the screen will ask you to confirm that you want to reset the date. If you do not wish to reset the date, press .
10. Press  to obtain this screen. If desired, press  or  to change the year. Press . Then, if desired, press  or  to change the month. Then press . If desired, press  or  to change the day.
11. Press . This will display the new month/day/year you have set.
12. Press  to obtain this screen. This is the start of the procedure if it is necessary to change the time setting. (Time readings are based on a 24-hour clock.)
13. Press . The screen will ask you to confirm that you want to reset the time. If you do not wish to reset the time, press .

Confirm  
Yes = UP No = DN

Date  
mm/dd/yy

Confirm  
Yes = UP No = DN

Enter Date  
mm/dd/yy  
(actual date)

Date  
mm/dd/yy




















Time  
(actual time)

Confirm  
Yes = UP No = DN



## Section III

### Operation

14. If you press , you will obtain this screen. If desired, press  or  to change the second. Press  then, if desired, press  or  to change the hour. Then press . If desired, press  or  to change the minute.
15. Press . This will display the new time you have set.
16. The LCD screen may be tilted up and down to give persons of different height a better view of the messages. Press  or  to increase or decrease the reference number. A higher number tilts the screen down; a lower number tilts it up. When finished, press .
17. Press  to obtain this screen. Pressing  will save all the changes to the menu made before this.
18. Pressing  in the step above will bring out this screen. It is necessary to confirm by pressing  again.
19. Pressing  or  will return to this screen.

Enter Time  
hh:mm:ss  
(actual time)

Time  
(actual time)



LCD display  
view angle  
XX

Save Personality?  
UP = Save

Confirm  
Yes = UP No = DN

Save Personality?  
UP = Save

#### 3.6.3.4.1 Alarm Configuration Menu

20. Press  to obtain this screen, beginning the Alarm Configuration Menu.
21. Press  to obtain this screen.

Alarm Configuration  
Menu


Clear Alarm History?  
UP = Clear



## Section III

### Operation


#### CAUTION

Pressing  will clear the Alarm History records.

22. Press  and  to proceed.

Return to  
Previous Menu



#### 3.6.3.4.2 Communications Menu

23. Press  to obtain this screen.

Communications  
Menu

24. Press  to obtain this screen.

COM1 Menu

25. Press  to obtain this screen. Pressing  at this point will reset the optional COM1 serial port. (See NOTE 1.)

COM1 Device UP to Reset  
Power UP Init.

*NOTE 1: The last display line shows the present state of the COM port.*

*Following is list of valid messages:*

*Power Up Init*

*Wait on call*


*Get Password*

*Dev. Online*

*Dev. Offline*

*Log out*

*Resetting....*




*NOTE: COM1 and COM2 in some of the following displays apply only to an optional modem or RS232 customer interface described fully in Section VII. They can be skipped by pressing  until you get to Step 37.*











## Section III


### Operation

26. Press  once to obtain one of the “Com1 Display screens. Press  or  to obtain another of these three screens, as desired.

Pressing  will display the “Save Change?” screen. User Interface enables the UPS to communicate in a standard ANSI terminal format (VT100 emulation or equivalent). P-Rec Proto allows computer-to-computer communications with user developed software per the protocol provide in Section VII or optional Windows-based UPS Manager Plus software. BCM Proto enables communications with optional OnliNet<sup>®</sup> network power management software.

27. Pressing  will select the desired program and will bring back the previous COM1 screen.

28. Press  once to get this screen. If your wish to change the Com 1 baud rate, press  to increase baud rate from 2400 to 9600, or press  to decrease from 9600 to 2400. Pressing  will display the “Save Change?” screen.

29. Pressing  will select the desired baud rate and will bring back the previous COM 1 screen.

30. Press ,  and  to proceed.

31. Press  to obtain this screen.

COM1 Display

User Interface

COM1 Display  
P – Rec Proto

COM1 Display  
BCM Proto

Save Change?

Yes = UP No = DN

Com 1 Baud Rate  
2400

Save Change?

Yes = UP No = DN



Return to  
Previous Menu

COM 2 Menu







## Section III

### Operation

32. Press  to obtain this screen. Pressing  at this point will reset the optional COM2 serial port (see Note 1).

COM2 Device UP to Reset  
Power UP Init.


33. Press  once to obtain one of the “Com 2 Display” screens. Press  or  to obtain another of these three screens, as desired. Pressing  will display the “Save Change?” screen. User Interface enables the UPS to communicate in a standard ANSI terminal format (VT100 emulation or equivalent). P-Rec Proto allows computer-to-computer communications with user developed software per the protocol provided in Section VII or optional Windows-based UPS Manger Plus™ software. BCM Proto enables communication with optional OnliNet® network power management software.

COM2 Display

User Inerface





COM2 Display  
P – Rec Proto

COM2 Display  
BCM Proto


34. Pressing  will select the desired program and will bring back the previous COM 2 screen.

Save Change?

Yes = UP No = DN

35. Press  once to get this screen. If you wish to change the Com 2 baud rate, press  to increase baud rate from 2400 to 9600, or press  to decrease 9600 to 2400. Pressing  will display the “Save Change?” screen.

Com 2 Baud Rate  
2400

36. Pressing  will select the desired baud rate and will bring back the previous COM 2 screen.

Save Change?

Yes = UP No = DN

37. Press , , and  to proceed.


Return to  
Previous Menu




## Section III

### Operation


#### 3.6.3.4.3 UPS Identification Menu

38. Press  to obtain this screen.


UPS Identification  
Menu

39. Press  to obtain this screen.







UPS name


40. Press  and this confirmation screen will appear asking whether you want to enter a name.

Confirm  
Yes = UP No = DN

41. Press  again if you do wish to enter a name. This screen will appear.

Enter name:  
—


Notice the blinking cursor at the bottom line. Pressing  or  will change the character under the cursor (originally a space). You can move through the available characters faster by holding down the ALARM SILENCE button while pressing  or . To move the cursor to the right, press ; to move it to the left, press .

42. When all the characters have been entered the screen will look like this.  
Press .


Enter name:  
ABC COMPANY

43. Press  to save the change.

Save Change?  
Yes = UP No = DN

44. Press  to obtain this screen.

UPS Unit ID


45. Press  and this confirmation screen will appear, asking whether you want to enter a unit identification.

Confirm  
Yes = UP No = DN









## Section III

### Operation

46. Press  again if you do wish to enter a unit identification. This screen will appear.

Enter unit ID:



—

Notice the blinking cursor at the bottom line. Pressing  or  will change the character under the cursor (originally a space). You can move through the available characters faster by holding down the ALARM SILENCE button while pressing  or . To move the cursor to the right, press ; to move it to the left, press .


47. Press  to save the change.

Save Change?

Yes = UP No = DN


48. If “Phone Home” feature is being used, the UPS modem phone number must be entered. Press  once to obtain this screen. If you wish to skip this sequence, press  twice to go to step 59.

UPS Phone Number

49. Press  and this confirmation screen will appear, asking whether you want to enter a phone number.







Confirm


Yes = UP No = DN

50. Press  again if you do wish to enter a phone number. This screen will appear.

Enter Phone Number:

—

Notice the blinking cursor at the bottom line. Pressing  or  will change the character under the cursor (originally a space). You can move through the available characters faster by holding down the ALARM SILENCE button while pressing  or . To move the cursor to the right, press ; to move it to the left, press .

51. When all the characters have been entered, the screen will look like this.  
Press .

Enter Phone Number:

XXXXXXXXXX

52. Press  to save the change.



Save Change?

Yes = UP No = DN




## Section III

### Operation


53. This sequence is for entering a 24-hour telephone number which can be called by Factory Field Service personnel to tell you that your UPS has reported an alarm condition via its Phone Home capability. Press  once to obtain this screen. If you wish to skip this sequence, press  twice to go to Step 64.

24 Hr. Voice Phone  
Number







54. Press  and this confirmation screen will appear asking whether you want to enter a phone number.


Confirm

Yes = UP No = DN


55. Press  again if you do wish to enter a phone number. This screen will appear.

Enter Phone Number:  
\_


Notice the blinking cursor at the bottom line. Pressing  or  will change the character under the cursor (originally a space). You can move through the available characters faster by holding down the ALARM SILENCE button while pressing  or . To move the cursor to the right, press ; to move it to the left, press .

56. When all the characters have been entered, the screen will look like this.  
Press .


Enter Phone Number:  
XXXXXXXXXX

57. Press  to save the change.

Save Change?  
Yes = UP No = DN  
XXXXXXXXXX

58. Press  to obtain this screen.

Return to  
Previous Menu

59. Press  to return to the System Maintenance Menu.









System  
Maintenance  
Menu



## Section III

# Operation

### 3.6.3.5 Password Maintenance Menu

1. Press  to advance to the Password Maintenance Menu.
2. Press  to obtain this screen. There are four (4) levels of passwords. Press  as often as necessary to reach the desired level. The number in the lower left will change, indicating the level attained. (NOTE: You cannot go beyond the level for which the system is set when you start.)
3. Press . The system will ask you to confirm the password level.
4. Press  as requested in the previous message. You are now ready to modify the password. Follow the procedure you used in steps 3 through 6, pages ??? through ??? to get to the UPS Maintenance Menu. When you have finished, press .
5. You will see this message briefly flashed on the screen –
6. Then this message will appear again. It is necessary to repeat step 4, entering the new password again. Then press .
7. Press  to save the new password.

Password  
Maintenance  
Menu

No Password  
Password

Confirm  
Yes = UP No = DN

Enter  
Password

0

Verify  
Password

Enter  
Password

0

Save Change?

Yes = UP No = DN



## Section III


### Operation

8. Press  to obtain this screen.

Return to  
Previous Menu

9. Press  to return to the Password Maintenance Menu.

Password  
Maintenance  
Menu

10. Press  to leave the UPS Maintenance Menu.

#### 3.6.4 System Shutdown

1. Perform the Bypass/Shutdown procedure (Paragraph (3.6.33)).

*NOTE: This leaves the critical load powered by the utility power source through the bypass.*

2. To remove all power to the load, open the **BYPASS CIRCUIT BREAKER**.

#### 3.6.5 CPU Fault

If this message should appear on the screen, the UPS is transferred to bypass. Call **Service Hotline** at **(800) 777-8922**.

CPU fault  
Service  
Required



# Section IV

## Maintenance

### 4.1 General

Proper maintenance, both preventive and remedial, is the key to optimal operation of the UPS and will ensure a long and useful life of the equipment. Preventive maintenance includes regularly performed procedures designed to prevent system malfunction and obtain maximum operational efficiency. Remedial maintenance consists of troubleshooting the system in order to effect repairs. Troubleshooting the UPS involves following a logical sequence of steps which will determine the cause of an alarm and/or malfunction within the shortest time frame safely possible so as to expedite the repair and return of the equipment to normal service.

The manufacturer recommends that the monitor panel be inspected visually every eight-hour shift to see that the green light is visible, indicating no alarm conditions exist. The Alarm History should be checked at this time (see Paragraph 3.6.2) to determine if any recent alarms have gone un-noticed. If any unusual conditions exist, call facility maintenance personnel or IPM Service Hotline (800-777-8922) or 214-272-8000.

### 4.2 Safety Precautions

In order to safely and successfully perform maintenance on the system, certain basic safety precautions must be observed, necessary tools and test equipment must be available, and properly trained maintenance personnel must be involved.

The following basic safety practices should always be observed:

- 1. Always be aware that hazardous voltages are present within the UPS even when the system is not operating.**
2. Ensure that UPS operating and maintenance personnel are thoroughly familiar with the equipment and with the contents of this manual.
3. Never wear metal jewelry such as rings or wrist watches when working on the UPS equipment.
4. Keep cabinet doors closed and secured during normal operation.
5. Never guess about safety procedures. If any doubt exists, ask someone who knows.





## Section IV

### Maintenance

6. Always be aware of the presence of high voltage within the UPS. Check with a voltmeter to make sure power is off and conditions are safe before attempting to make repairs, adjustments, etc. within the unit.
7. Above all, always USE COMMON SENSE!

#### 4.3 Preventive (Periodic) Maintenance

The following paragraphs describe preventive maintenance procedures which, when followed, will increase the reliability and efficiency of the UPS system operations.

##### 4.3.1 Air Flow

Blower fans should be checked for cleanliness and proper operation at least annually. These are located within the power section and should be checked only during a period when the UPS is in Maintenance Bypass mode. Excessive dirt or imbalance can reduce blower effectiveness, causing a rise in system temperature which will result in an overtemperature alarm and possible system shutdown.

##### 4.3.2 Cable Connections

Cable connections to circuit breaker and switch terminals should be checked whenever the system is powered down and at least annually. This necessitates removal of the circuit breaker panel to gain access.

#### WARNING

*Be aware of the presence of high voltages within the UPS! When the system is shut down, wait at least five (5) minutes after all panel lights go out before proceeding. Then check for the presence of power with a voltmeter across the input and output terminals.*

#### 4.4 Remedial Maintenance (Troubleshooting)

Remember the International Power Machines 24-Hour Hot Line:

Phone: (800) 777-8922 or (214) 272-8000

is always available to provide advice and assistance on your UPS.

##### 4.4.1 General

When properly installed, operated and maintained your International Power Machines **BalancedPowerII** UPS will provide long, reliable power protection with little need of remedial or corrective maintenance actions. However, this section contains information as to problem isolation techniques and recommended actions to be taken so as to effect repairs on the UPS.



## Section IV

# Maintenance

Because of the modular design of the **BalancedPowerII** UPS, corrective action in many instances requires replacement of a major assembly or subassembly. For this reason, troubleshooting information as contained herein is generally limited to immediate action that may be taken on site to correct a specific alarm condition. If such immediate action does not remedy the situation, contact the IPM 24–Hour Hotline for assistance.

In general the **BalancedPowerII** UPS is designed so that the operator should not find it necessary to have access to any area of the equipment except the Digital Monitor Panel and the circuit breakers, switches and fuses inside the front doors.



*Do not remove the top panel, front panel around the circuit breakers or either side panel unless all power to the UPS is OFF. Only trained maintenance personnel should remove any of these panels.*

### 4.4.2 Status/Alarm Indicator

The LED status/alarm indicator on the monitor panel is described in Paragraph 3.4.1. Specific action that may be taken in case of alarm conditions is described in Table 3–2, a part of Paragraph 3.6.2.

## 4.5 Fuses

There are four (4) fuses below the UPS CONTROL switch inside the front door. If one of these fuses is blown, the control logic may not become energized at startup. Once the UPS is started, it will operate even though one or more of the fuses is blown. These are the only fuses available to the user unless he or she has had authorized factory training.

In case a fuse blows, replace it with a fuse of the same make and size.

## 4.6 Battery Maintenance

### 4.6.1 Safety Precautions

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

When replacing batteries, use the same number and the following type of batteries: sealed lead acid. All batteries in a cabinet should be from the same manufacturer and of the same part number.



## Section IV

# Maintenance

### CAUTION

*Do not dispose of battery or batteries in a fire. The battery may explode.*

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

### CAUTION

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

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

#### 4.6.2 Maintenance Shutdown of Batteries

This procedure is for shutting down the UPS batteries. It does not require that the protected load be removed from the UPS.

Perform the following steps in the order presented:

1. Verify that the UPS is running on input ac power by noting the dc link voltage. Depress or to obtain the Rectifier/Booster Link voltage message on the screen. Rectifier voltage should be 195 VDC or greater.

Rectifier/ Booster Link

xxx.x yyy.y



## Section IV

# Maintenance

**Do not proceed if batteries are supplying power to any protected equipment.**

2. Shut off Battery Circuit Breaker.
3. A general alarm will appear as the circuit breaker is opened. This is normal. Depress the ALARM SILENCE button once to turn off the audible alarm.

### 4.6.3 Inspection and Periodic Maintenance

This procedure should be performed annually or whenever batteries need to be replaced.

1. Place the batteries in Maintenance Shutdown condition (Paragraph 4.6.2).
2. Remove the top and left side panels. Visually inspect the inside of the cabinet for:
  - a. Leaking acid.
  - b. Corrosion on frame and electrical parts.
  - c. Loose or discolored electrical connections, especially around the cable connections.
3. Disconnect the DC+/DC– connector from the left partition of the battery compartment, at the bottom..
4. Disconnect the battery trays from each other (connectors 1, 2, and 3).
5. Remove the vertical support bar (2 screws at top; 2 at bottom).
6. Very carefully pull the trays forward, one at a time. Care should be taken that the tray doesn't come all the way out. The tray is heavy—weighing as much as 300 pounds (136 kg) or more.
7. Use a lift hand truck to remove the tray completely from its slide.
8. Inspect each battery post for corrosion or discoloration. If post is discolored or corroded remove battery cable and clean the post and cable connector shiny bright. Replace cable, torque cable connector bolt to the battery manufacturer's recommended torque\*, and apply a generous amount of grease (Dow Corning silicone grease or equal) to the battery posts and connectors.
9. If not removed and cleaned, torque all cable connector bolts to battery manufacturer's retorque specifications.
10. Repeat until all battery trays have been inspected, cleaned and greased. Do one tray at a time and be sure to return tray to its original location. Bolt in place. Trays are numbered in accordance with Figure 4–1.
11. Replace vertical support bar. Reconnect the battery trays to each other. Plug in DC+/DC– connector at lower left partition opening. Replace panel cover.



## Section IV

### Maintenance

#### CAUTION

*The battery tray may weigh in excess of 300 lbs (136 kg). Use lift hand truck to remove it.*

#### 4.6.4 Battery Test

Batteries should be tested whenever a battery-related problem is suspected or at annual intervals. The procedure described is for individual batteries and requires the use of a Balkamp 700–112 Battery Tester or equivalent. The Balkamp unit is available at most NAPA auto parts stores or from IPM.

The tester is rated for 100 amps, 12 vdc. It checks voltage under load.

Batteries should be tested in their fully-charged state, but not within 24 hours of having been equalized (recharged). Batteries should be left in their trays during testing.

1. Perform Maintenance Shutdown procedure (Paragraph 4.6.2).
2. Slide out the desired battery tray onto a lift hand truck.

#### CAUTION

*The battery tray may weigh in excess of 200 lbs (91 kg). Use lift hand truck to remove it.*

3. Test each battery separately.
4. Using a digital voltmeter which can be read to 0.01 vdc, check the voltage across the posts of the batteries, one at a time. Record the voltage readings for each battery. If the voltage does not read at least 12.40 vdc, the battery probably should be replaced. You may try to recharge the battery, but it probably won't hold a charge. For replacement procedure see Paragraph 4.6.5.
5. If the battery's voltage is satisfactory, use the battery tester. Attach the red battery tester cable to the positive (+) battery pole; attach the black cable to the negative (–) battery pole.
6. Press the LOAD switch. (If using a brand of tester other than the Balkamp, follow the tester's operating instructions.)
7. In approximately 10 seconds, the tester needle should be in the good (green) area. If not, the battery should be replaced.
8. Perform the same tests on all batteries in the cabinet. (Allow the tester to cool between tests.)



## Section IV

# Maintenance

9. For proper operation, each battery in the cabinet should show voltage readings within  $\pm 0.10$  vdc of their average. If full agreement of battery voltages cannot be obtained, contact Service Hotline 800-777-8922.
10. Return the battery trays to their normal position. When each tray is fully back, replace the two bolts that fasten it to the slide. Reconnect the battery tray cables.

### 4.6.5 Battery Replacement

1. Perform Maintenance Shutdown procedure (Paragraph 4.6.2).



*The battery tray may weigh in excess of 300 lbs (136 kg). Use lift hand truck to remove it.*

2. Slide out the desired battery tray onto a lift hand truck.
3. Disconnect battery and remove it from the tray. Note battery polarity.
4. Mount new battery in tray, clean the posts and cable lugs and connect cables, observing polarity (see Figure 4.1).
5. Torque cable connector bolts to battery manufacturer's specifications.

#### Battery Manufacturers' Torque Specifications

Manufacturer/Model	Bolt Size	Wrench Size	Initial Torque	Annual Retorque
Johnson Controls/UPS 12-140FR	1/4	7/16	40 in-lbs	30 in-lbs
Johnson Controls/UPS 12-170FR	1/4	7/16	40 in-lbs	30 in-lbs
Power/TC-1235X	1/4	7/16	40 in-lbs	35 in-lbs
Power/TC-1250X	1/4	7/16	40 in-lbs	35 in-lbs

**GNB** 100 in-lbs

**C & D** 100 in-lbs

NOTE: To obtain N-m, multiply in-lb by 0.113.

6. Using a digital voltmeter which can be read to 0.01 vdc, check voltage across the poles of the new battery. Voltage should be at least 12.40 vdc.
7. Apply a generous amount of grease (Dow Corning silicone grease or equal) to the battery posts and connectors.



## Section IV

### Maintenance

8. Return the battery trays to their normal position. Reconnect the battery tray cables.

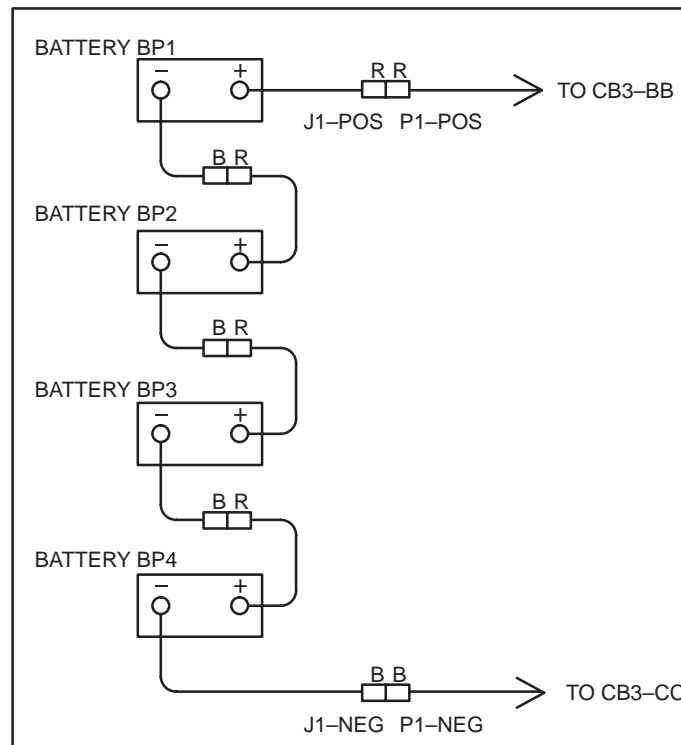


Figure 4-1.

#### 4.6.6 Reactivating the Batteries

1. After all battery trays and their batteries are in place and reconnected, verify the UPS rectifier DC link voltage is at proper value: 195 VDC minimum.
2. Replace top and left side panels.
3. Close the Battery Circuit Breaker only if the link voltage is correct.



# Section V

## Spares, Training, Maintenance

### 5.1 Spare Parts

To facilitate service on the **BalancedPowerII** UPS, it is recommended that a spare parts stock be maintained on site. Investment in a spares stock ensures immediate parts availability when required, thereby providing for faster service and greater protection from costly system downtime.

International Power Machines can supply any of several recommended Spares Levels to meet differing requirements. The desired Mean-Time-To-Repair and the travel time from IPM's nearest Service Center would normally determine the approximate level of spares to be stocked.

This section lists typical spare parts for a UPS of the size shown on the cover page of this manual. It is not applicable to other size UPS.

For further information concerning the stocking of spare parts, or to order replacement parts, please contact:

Customer Services Representative  
International Power Machines  
Worldwide Services Group, IPRC  
2708 Discovery Drive  
Raleigh, NC 27604  
Domestic: Phone: (919) 981-8127  
Fax: (919) 981-8150  
Outside U.S.: Phone: (919) 870-3208  
Fax: (919) 870-3300





## Section V

# Spares, Training, Maintenance

## 5.2 Training

To insure that our customers derive maximum benefit from their UPS and related equipment, IPM offers a variety of training classes tailored to specific interests and requirements. These courses include a one-day Operator Seminar, a Basic Maintenance class for facilities personnel and specialized training for unique equipment configurations. Most classes can be presented either at our Training and Support Center or at the customer's site.

Additional information and rates may be obtained from:

WSG Training and Support Center  
International Power Machines  
3401 Spring Forest Road  
Raleigh, NC 27604  
Phone: (919) 871-1812      Fax: (919) 871-1822

## 5.3 Continuing Maintenance Program

We consider regular maintenance of your UPS to be insurance for your equipment investment. We have, therefore, developed a continuing maintenance program, available throughout the 50 states, that can go into effect upon the expiration of the standard warranty on new equipment. Basically, the program provides for one preventive maintenance call per year, plus unlimited remedial maintenance calls as required, with all parts, labor and expenses included. Similar battery maintenance programs are available.

Additional information and prices may be obtained from:

Worldwide Services Group  
International Power Machines  
Maintenance Sales Department  
2975 Miller Park North  
Garland, Texas 75042-7799  
Phone: (214) 205-1401      Fax: (214) 205-1492



## Section VI

# Glossary

### AC –

Alternating current (normally AC).

### AC POWER –

AC input to the UPS. Also identified as UPS Input.

### ALARM –

An abnormal condition within the UPS.

### ALARM SIGNAL –

A loud piercing electronic tone signaling an alarm condition.

### APPARENT POWER (kVA) –

The product of voltage and current. This is used to state the maximum rating of power generating devices.

### AUTO RETRANSFER –

A feature which allows the Static Bypass Switch to place the UPS back on line without manual intervention.

### CIRCUIT BREAKER PANEL –

That portion of the cabinet behind the right-hand door, containing the UPS Input Circuit Breaker, Static Bypass Circuit Breaker, Bypass Circuit Breaker and Output Circuit Breaker.

### CURRENT LIMIT –

Electronically governing the maximum current output from the rectifier and/or the inverter.

### DC –

Direct current (normally DC).

### DC BOOSTER –

A UPS power section. Its function is to boost the rectifier DC link voltage to a level required by the inverter for normal operation.



**DC LINK –**

DC voltage output of the rectifier and booster input to the inverter. Is maintained by a battery bank during a power outage.

**DIGITAL SIGNAL PROCESSOR (DSP) –**

The brain of the control logic system.. Receives and analyzes data, and provides control and monitoring for the UPS.

**EMERGENCY POWER OFF (EPO) –**

A means of cutting power from the UPS in emergency situations. The EPO switch is located on the Monitor Panel.

**EQUALIZE –**

See RECHARGE.

**FLOAT CHARGE –**

A dc voltage applied to a battery at a level which maintains the battery in a fully-charged state.

**HERTZ (Hz) –**

The measure of electrical frequency in cycles per second.

**INVERTER –**

A major component of the UPS. Its primary function is to change DC to AC.

**LED –**

Light-emitting diode. A semiconductor that gives off light when it is energized.

**LOGIC CIRCUIT –**

A network of electronic components that performs a specific function.

**OUTAGE –**

Loss of UPS input or bypass power.

**PHASE LOCK –**

A condition in which the inverter output is frequency and phase synchronous with the utility ac source.

**PHASE SEQUENCE –**

The order in which the fundamental components of a poly-phase set of voltages/currents reach a particular value.

**POWER FACTOR –**

The ratio of real power to apparent power. Equal to the cosine of the phase angle between the current and voltage for sinusoidal voltages and currents.



## Section VI

### Glossary

**REAL POWER (kW) –**

The portion of apparent power which actually performs work or generates heat.

**RECHARGE –**

A dc voltage applied to a battery for a given period of time which will equalize unevenly charged cells. After an emergency discharge, it will restore the batteries to full charge.

**RECTIFIER/CHARGER –**

A major component of the UPS. Its primary function is to change AC to DC for the inverter input. It also supplies current to recharge or maintain the charge of the batteries.

**REMOTE ALARM CONTACTS –**

Relay switch/contact arrangement which opens or closes in response to an alarm condition within the UPS. The contacts are connected to terminals which are easily accessible to the customer. They provide the ability to remotely sense an alarm condition.

**STATIC BYPASS SWITCH (SBS) –**

A major component of the UPS. Connects the UPS Input to the load if the rectifier and/or the inverter become unavailable or unacceptable.

**TRANSFER –**

A static bypass switch operation which exchanges load power sources from the UPS to utility power.

**UPS –**

Uninterruptible power system. UPS are on-line units which deliver power to the critical load from the inverter on a full-time basis. A power outage does not require load switching manually since the battery instantaneously takes over to supply dc power to the inverter. Due to the ac to dc to ac conversion, most UPS units offer superior ac transient noise suppression.

**WYE OUTPUT –**

A wiring configuration. Wye utilizes four wires to furnish a neutral. The output of the UPS is a WYE configuration.



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# Section VII

## Remote Video Terminal

### 7.1 General

An optional remote video terminal, supplied by IPM or by the customer, may monitor or control the UPS by connection to the optional RS232 communication port. The UPS also may communicate by an analog telephone line connected to the modem port.

The remote monitor needs to be a video display terminal or computer capable of emulating VT100 or equivalent.

### 7.2 RS232 Interface

When COM1 or COM2 is selected for user interface (see Paragraph 3.6.3.4), the basic CRT Menu Screen looks like this during normal UPS operation. A valid password must be entered to access this screen.

```

International Power Machines          12/13/94
Uninterruptible Power System         08:25
Unit (15 KVA)

[*] UPS Normal           [ ] Transferred to Bypass
[ ] AC Input Failure     [ ] Transfer not Available
[ ] Low Battery Voltage  [ ] Battery not Available
[ ] UPS Overload         [ ] Retransfer Inhibited

UPS Maintenance Menu      Input  Van   Vbn   Vcn   Rct/Booster Link Voltage
                          120.2  121.2  120.9  204.7  396.5

UPS Operating Normally    Input  Ia    Ib    Ic    Battery Amps
                          51.1   51.6  51.4   0.3

ALM: NONE                 Bypass Vab   Vbc   Vca   Max Out CF
N/A:                      213.0  211.9  212.3  1.46

12/12 18:06:29 0          Freq. Input/Output      Output KW/KVA
rct in float              60.03  60.03              12.1  12.2

Input  Vab   Vbc   Vca   Inlet Temp      Output PF
      208.5  206.9  206.9  23.1              0.99

[N]ext [P]revious [S]ilence [U]p [D]own [E]nter [^R]efresh [C]ommand

```



## Section VII

### Remote Video Terminal

The top segment represents UPS active alarm conditions displayed by the LCD monitoring panel. The lower segment represents the messages which appear on the monitor panel's other message screens. (Numbers are typical; actual values will appear.)

The lower segment shows the keyboard keys to be used to change the message screens (in place of the pushbuttons on the monitor panel). Briefly, the functions of these keys are as follows:

Key and Monitor Panel Equivalent	Function
[N]ext ➡	Scrolls data up the display area. Displays next item in a submenu list.
[P]revious ⬅	Scrolls data down the display area. Displays previous item in a submenu list.
[S]ilence	Alarm silence.
[U]p ⬆	Displays next alarm entry in Alarm History when Alarm History is active. Increment displayed value of modifiable elements.
[D]own ➡	Displays previous alarm entry in Alarm History when Alarm History is active. Decrement displayed value of modifiable elements.
[E]nter ↵	Select the menu displayed in active area. Save changes of modifiable elements.
Alarm [H]istory	Full screen alarm history display.

The other three keys are not available to operator password (level 4).

The upper left-hand message is the only one that is active at any given time. On the sample CRT screen "UPS Maintenance Menu" is in the active area. Other message screens can be brought into this active area by depressing [N]ext or [P]revious on the keyboard, causing the messages to rotate. Do this as often as necessary until the desired message is in the upper left-hand corner.



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### 7.3 UPS Maintenance Menu

The description given in Section 3.6.3 for the UPS Maintenance Menu applies equally to its use from a remote terminal. Make sure that “UPS Maintenance Menu” is in the upper left-hand area of the CRT screen. Then use the keys that correspond to the pushbuttons described in this manual. You will need to use the operator password (level 4) in order to obtain access to the UPS Maintenance Menu. The various screen messages will appear on the CRT also in the upper left-hand area.

### 7.4 Alarm History Screen

Below is a typical Alarm History screen. The alarms are displayed in date/time order with the most recent alarm at the bottom of the screen.

Mo/Dy/Yr	Hr:Mn:Sc:Cy:Q	Alarm (U=Up D=Dn +=PgUp -=PgDn T=Top B=Bot M=Monitor)
09/20/91	14:59:27.07.0	sbs output breaker closed
09/20/91	14:59:27.07.0	inv not phase locked
09/20/91	14:59:27.07.0	Inv transfer enabled
09/20/91	14:59:27.07.0	inv retransfer enabled
09/20/91	14:59:27.07.0	inv fan normal
09/20/91	14:59:27.08.0	input frequency normal
09/20/91	14:59:27.08.0	sbs bypass frequency normal
09/20/91	14:59:27.10.0	sbs bypass voltage low
09/20/91	14:59:28.41.0	rct phase locked
09/20/91	14:59:28.42.0	input voltage low
09/20/91	14:59:32.23.0	input voltage normal
09/20/91	14:59:32.23.0	sbs bypass voltage normal
09/20/91	14:59:32.23.0	inv phase rotation normal
09/20/91	14:59:32.23.0	rectifier normal
09/20/91	14:59:37.07.1	inv normal temperature
09/20/91	14:59:37.08.0	inv fuse normal
09/20/91	14:59:37.08.0	inv power supply normal
09/20/91	14:59:37.18.0	inv current normal
09/20/91	14:59:37.18.0	output voltage low
09/20/91	14:59:37.18.0	inverter off
09/20/91	14:59:37.18.0	sbs off
09/20/91	14:59:39.09.0	inv phase locked
09/20/91	14:59:47.33.0	dc voltage normal





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A convenient way of viewing the Alarm History screen is to use the commands at the top of this screen:

U	Scrolls up one alarm	T	Goes to the top of the alarm history buffer
D	Scrolls down one alarm	B	Goes to the bottom of the alarm history buffer
+	Scrolls up one page	M	Monitors the occurrence of alarms. All new alarms are added to the bottom of the screen.
–	Scrolls down one page		

## 7.5 P-Record

P-Record format is for users who need to query the UPS periodically for information as to its status using custom-developed monitoring software. It is used also when the phone home capability is enabled or when monitoring the UPS by optional UPS Manager Plus<sup>™</sup> software (available from IPM).

If development of custom monitoring software is required, see Drawing 950-010-A416, Revision C, UPS Remote Monitor Protocol, Sheets 2 through 28 following this page. Sheet 1, a cover sheet, has been omitted.

