

INSTALLATION and OPERATION MANUAL for

International Power Machines

BalancedPower *Plus*[®]

10-300 kVA

**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 US.: (919) 871-1800

Fax: (214) 342-6115

When calling for service assistance, have the following information and a 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.)

Input

Output

Voltage

Frequency (Hz)

Model No.

Monitor

International Power Machines
10451 Brockwood Road
Dallas, Texas 75238-1641 U.S.A.
800-527-1208

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)

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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 system. 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 short cuts 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 system. Call them on our **Service Hot Line**:

Telephone: (800) 777-8922

Handling and Unpacking Instructions

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:

The uninterruptible power system (UPS), battery pack cabinet and/or power distribution unit (PDU) is thoroughly checked, both electrically and mechanically, before shipment from the factory. With the extensive protection provided in packaging the unit for shipment, it should be in proper condition upon receipt. However, there is a possibility that the unit might have been damaged in transit so a complete inspection of the equipment should be made before signing receipt. As a minimum, the following inspection procedures should be executed as soon as possible after delivery.

Receiving / Unpacking Inspection Checklist

5. Each palletized unit is designed for forklift or lift gate 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. If door key is needed, locate key envelope taped to rear of cabinet. Open each door, checking for damage.
10. A label on the outside of the UPS tells the location of the Operations & Maintenance (O & M) Manuals.
11. Remove any internal padding/packaging, checking carefully for parts, documentation, etc., that might have been shipped inside the cabinet. If foam
12. blocks are inside the battery trays, leave them in place. The are to keep small batteries from moving around inside the trays.

Damage Documentation

It is the responsibility of the recipient to file 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

International Power Machines

10451 Brockwood Road

Dallas, Texas 75238-1641

Phone: (214) 342-6100

Fax (214) 342-6116

3-phase UPS Warranty

International Power Machines

THREE-PHASE UPS WARRANTY

International Power Machines' (IPM) uninterruptible power systems (UPS) are warranted to be free from defects in design, material and workmanship under normal use and service. Should any such system be found defective, IPM will furnish the necessary parts, labor and expenses to correct such defects (within the 48 contiguous United States) for twelve (12) months from the date of equipment start-up at the job site, or eighteen (18) months from the date of shipment, whichever occurs first. Coverage work is performed 8:00 a.m. to 5:00 p.m. Monday through Friday (excluding holidays). For all three-phase products installed in Alaska and Hawaii, travel time is billable at the applicable field service rate in effect at the time of travel, and travel expense is billable at cost. For units outside the United States, please contact IPM for details. This warranty is subject to the following conditions:

- A. Initial start-up and necessary UPS adjustments at the customer's site shall be performed by IPM or an IPM authorized service representative to ensure that the system is properly started and tested prior to use.
- B. Purchaser shall not operate the system outside the specifications as stated in the system manual, and shall follow all operating instructions therein.
- C. Any necessary repairs made during the period of this warranty shall be made by IPM or by others with IPM's written concurrence.
- D. All parts or devices replaced by IPM shall become the property of IPM.
- E. This warranty will not apply to repair of damage caused by accident, neglect, misuse, misapplication, incorrect installation and repair or alteration not authorized by IPM.
- F. The customer/user shall be liable for the cost of any warranty call found to be due to operator error, in whole or in part.
- G. Battery cells are excluded from system warranty; see below.

INTERNATIONAL POWER MACHINES PROVIDES WARRANTY WITH RESPECT TO BATTERY, PERIPHERAL DEVICE, ATTACHMENT OR APPARATUS EMPLOYED WHICH IS NOT MANUFACTURED BY IPM TO THE EXTENT THAT IPM WILL ASSIGN TO THE PURCHASER ITS RIGHTS UNDER SUCH WARRANTIES AS THE MANUFACTURER OF THE PARTICULAR BATTERY, PERIPHERAL DEVICE, ATTACHMENT OR APPARATUS PROVIDES TO IPM WHEN THE PARTICULAR BATTERY, PERIPHERAL DEVICE, ATTACHMENT OR APPARATUS IS SUPPLIED BY IPM. FOR SPECIFIC CONDITIONS RELATED TO WARRANTY CONSULT THE MANUFACTURER'S DOCUMENTATION.

IN NO EVENT WILL IPM BE LIABLE FOR CONSEQUENTIAL DAMAGES EVEN IF IPM HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS, AND ANY OTHER OBLIGATION ON THE PART OF IPM.

mc: warranty

SECTION I

Theory of Operation

1.1 General

The BalancedPower *Plus*® (BP+) Uninterruptible Power System (UPS) presented in this manual is a solid state, on-line 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. Fifteen (15) power ratings are available from 10 to 300 kVA. Information contained herein is applicable to all power ratings except where specified otherwise.

A single UPS is comprised of the following basic components:

- Input transformer
- Rectifier/Charger
- Inverter
- Static Bypass Switch
- Bypass Breaker
- Output Transformer
- System Control Logic and Circuitry
- Digital Monitoring Panel
- Battery
- DC Disconnect

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 dc voltage. The dc is used to power the inverter and to recharge the batteries as necessary. The assembly consists of an input circuit breaker, a transformer, and a solid-state three-phase rectifier designed to eliminate even ordered harmonics. An optional input filter reduces harmonics caused by rectifier switching. This prevents the harmonics from affecting utility distribution.

SECTION I

Theory of Operation

1.3 Inverter

The inverter changes dc voltage to precision ac voltage through pulse width modulation (PWM) inversion. Output isolation transformers and an output filter 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.

1.4 Static Bypass Switch

The static bypass switch connects the UPS bypass 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 will close and transfer the load directly to 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 will disconnect and retransfer the load to the inverter. Note, however, that so long as the inverter is out of specification, the static bypass switch will automatically inhibit retransfer of the load.

1.5 Batteries

The optional battery pack supplies 216 VDC (10-30 kVA) or 360 VDC (37.5-150 kVA) nominal. It can be attached to the UPS module to form a single unit or may stand alone to accommodate space restrictions. It is the energy reservoir of the UPS and provides dc power to the inverter in case of loss of UPS input power or rectifier malfunction. The DC Disconnect (Battery) Circuit Breaker electrically isolates the battery pack from the UPS module for maintenance purposes and provides overcurrent protection at the battery output.

SECTION I

Theory of Operation

1.5 Batteries (continued)

The rectifier/charger normally provides a maintaining or “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 in order to recharge them.

1.6 Control Logic and Control Circuitry

The control logic and circuitry of the UPS provide the operating logic and system control for all functions ranging from limiting the rectifier/charger inrush current by “walking” it in, to maintaining the inverter 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 bright, easy-to-read digital LED displays. In addition, detailed instructions guide the operator through the UPS startup sequences. 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 corresponding red LED illuminates to identify the 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.

SECTION I

Theory of Operation

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.

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 pre-selected alarm conditions, the UPS automatically dials IPM's Field Service computer without human assistance and notifies IPM's Field Service personnel of a system problem requiring attention.

Important information downloaded during each phone home event includes: 1) UPS name, ID and serial number, 2) customer ID and phone number and 3) list of active alarms. You obtain the following benefits from this feature:

- a. Immediate field service 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 our 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 will validate this password against up to four passwords stored in non-volatile memory. One of the passwords will allow direct communication to commence with the UPS. The other three passwords will have associated telephone numbers. If one of these three passwords receives validation, the UPS logic will hang up and dial back the phone number associated with that password. When connection is made, the remote operator must enter the normal privilege level password for access to the corresponding level of monitoring diagnostics and

SECTION I

Theory of Operation

1.10 Dial-Back Security (continued)

controls. In this way high level security is provided since 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 our Customer Engineer. Phone Home Alarm Reporting and Dial-Back Security can share the same modem and telephone line.

SECTION II

Installation

2.1 General

Your International Power Machines **BalancedPower Plus** 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 and its battery component. Since 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. For environmental considerations, please see the Installation Information at the end of this section.

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.

The **BalancedPower Plus** battery pack supplied by International Power Machines is listed by Underwriters Laboratories only for use with the **BalancedPower Plus** UPS.

2.2 Mechanical Preparation of UPS

The UPS can be fully accessed from the front for operation and maintenance. However, during installation the UPS and any accompanying battery cabinets should be left at least two feet (61 cm) from the wall to allow access to the rear. If optional top cable entry has been purchased, an area of at least three feet (91 cm) is required at the right side for installation.

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

SECTION II

Installation

2.2 Mechanical Preparation of UPS (continued)

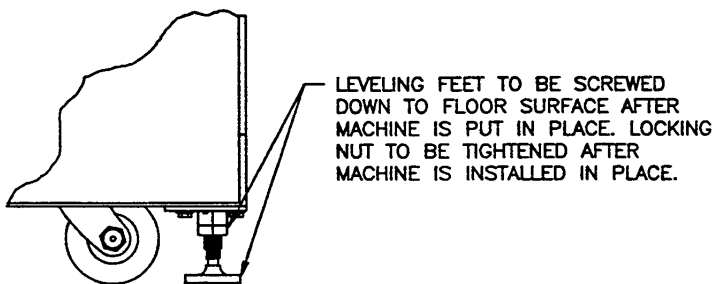
1. Insure that all packing, both external and internal, has been removed from the UPS.
2. Open right-hand front door of the UPS.
3. For standard bottom cable entry, unscrew screws holding the panel around the circuit breakers and remove the panel. Then, remove the cable access panel on the bottom of the UPS by removing six (6) screws.
4. For optional top cable entry, remove the right side cover by removing two (2) screws at the bottom (inside front and back) and lift the cover. Drill holes in the appropriate conduit plate of suitable size for the cables to be inserted through it, and replace the plate.
5. Fasten leveling feet (packed inside) to the four bottom corners of the UPS cabinet. Access to the inside of the cabinet is not required. Refer to Figure 2-1. (An optional pedestal mount may replace leveling feet and casters.)
 - a. First screw the leveling foot screw through the leveling plate.
 - b. Use two sets of 114-20 x 1" screw, flat washer and lock washer to fasten the leveling plate to the bottom of the cabinet. Two threaded holes are in the floor of the cabinet to receive them.
 - c. Screw in each leveling foot until it is a minimum of 0.75 in (1.9 cm) above the floor level. Tighten locking nut to keep it there.
6. **If an IPM battery pack is to be attached to the left side of the UPS**, perform this sequence. If the battery cabinet is not to be attached to the left side of the UPS, skip Step 6.
 - a. Open the left-hand front door of the UPS. Remove eight (8) screws from the lower metal cover to remove the cover. When the three-(3) upper screws are removed, the clear plastic guard above will also come off.

SECTION II

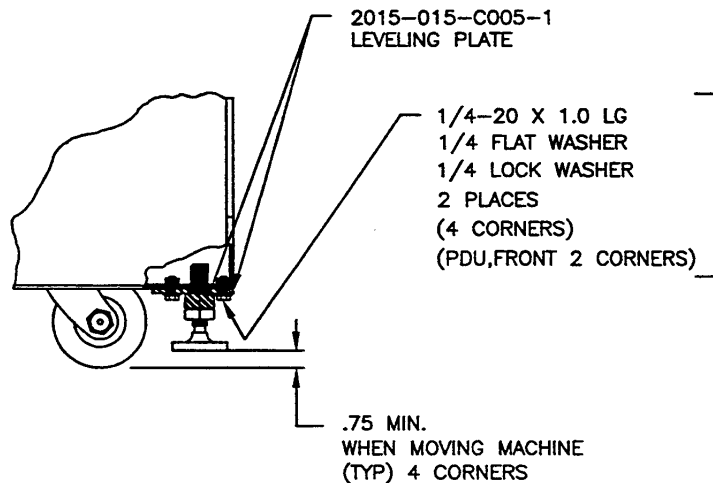
Installation

2.2 Mechanical Preparation of UPS (continued)

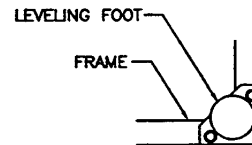
b. **DO NOT REMOVE THE RED GLASTIC GUARD PANEL FROM THE LEFT SIDE OF THE UPS.**



ADJUSTMENT OF LEVELING FEET

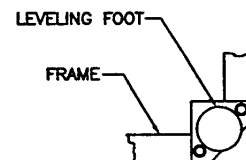


MOVING OF MACHINE TO INSTALLATION SITE



INSTALLATION FOR UPS

NOTE POSITION OF
TRIANGULAR CORNER BRACKET.



INSTALLATION FOR BATTERY CABINETS

Figure 2-1

SECTION II

Installation

2.3 Mechanical Preparation of the Battery Cabinet(s)

If batteries are not provided in IPM cabinets, see Disconnect Installation Drawing at the back of this section for wiring of separate circuit breaker and skip this Section 2.3. For battery preparation refer to the battery manufacturer's manual.

IPM battery trays are shipped screwed to the shelf supports and should be left fastened down.

1. Fasten leveling feet (packed inside) to the four bottom corners of the battery cabinet. Access to the inside of the cabinet is not required. Refer to Figure 2-1. (An optional pedestal mount may replace leveling feet and casters.)

a. First screw the leveling foot screw through the leveling plate.

b. Use two sets of 1/4-20 x 1" screw, flat washer and lock washer to fasten the leveling plate to the bottom of the cabinet. Two threaded holes are in the floor of the cabinet to receive them.

c. Screw in each leveling foot until it is a minimum of 0.75 in (1.9 cm) above the floor level. Tighten locking nut to keep it there.

2. If an IPM battery cabinet is to be attached to the left side of the UPS, remove the fiberboard shipping panels from the left side of the UPS and the right side of the battery cabinet by forcing out the fasteners. Leave the red glastic panel attached. **It is recommended that the battery cabinet not be attached to the right side of the UPS.**

a. If more than one battery cabinet is used, the one with a disconnect circuit breaker should go adjacent to the UPS. This is Battery Cabinet #1.

3. Remove each left battery cabinet cover by removing screws from the inside front. **Be very careful not to touch the screwdriver against the battery terminals.** Then pull side panel forward and lift to remove.

4. In each battery cabinet, cut the straps holding the top tray of 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.

SECTION II

Installation

2.3 Mechanical Preparation of the Battery Cabinets (continued)

5. If Battery Cabinet #1 is to be fastened to the left side of the UPS, place it adjacent to the UPS, but don't bolt them together. If additional battery cabinets are to be fastened together to the left of Cabinet #1, place them adjacent to #1 and each other, but don't bolt them together.

CAUTION: Do not connect the battery trays to each other until instructed in this manual.

6. Remove the cable entry panel located on the top (or bottom) of Battery Cabinet #1. Drill conduit holes in this panel of suitable size for the cables to be inserted through it. Replace panel.

2.4 Signal Wiring

NOTE: Class 1 wiring method must be used for field wiring connections.

Make connections for all optional equipment to the terminal blocks on the lower front or right side of the UPS (see installation drawings).

Electrical connections should now be made between the UPS and Battery Cabinet #1. There is a wiring harness with a connector coiled on the left side of the UPS. This connector plugs into a matching connector on a wiring harness coiled in the lower right corner of Battery Cabinet #1.

If battery cabinet is not to be attached to the UPS, run wiring out through UPS access panel at the bottom or top to the battery cabinet, following information on the installation drawings at the end of this section.

Connections for the following functions are located on the Customer Interface Board:

2.4.1 Remote Control (TB1):

- a. Remote EPO Switch
 - 1. 24 Vdc lamp supply, 0.25 amp max.
 - 2. Isolated contact closure causes EPO.

SECTION II

Installation

2.4 Signal Wiring (continued)

2.4.1 Remote Control (TB1) (continued)

- b. Battery Trip and Position
 - 1. 24 Vdc UVR control for battery disconnect, 0.6 amp max.
 - 2. Contact indicates position of battery disconnect.
- c. Remote On-Generator Condition – Isolated contact closure signals UPS logic that a generator is supplying UPS input power.
- d. Summary Alarm (NO/NC)
 - 1. 120 Vac—0.5 amps ac max.
 - 2. 28 Vdc –1 amp ac max.

Terminal wire sizing : #22-#12 AWG

2.4.2 Optional Remote Status Panel (TB2)

Ten position terminal for direct connection between UPS and TB1 in the Remote Status Panel. Terminal wire size #22-#14 AWG (recommended: #16 AWG).

2.4.3 Optional RS232 Communication (J6-J9)

25 Pin D-Sub Receptacles (male), DTE and DCE are provided for COM Ports 1 and 2. Communication shall be selectable from either standard ANSI terminal format or P-Record protocol.

2.4.4 Optional Modem Connection (J10-J13)

Two modem port line and two modem port phone connections are included. Accepts standard RJ11 plugs. Communication shall be selectable from either standard ANSI terminal format or P-Record protocol.

SECTION II

Installation

2.4 Signal Wiring (continued)

2.4.5 Optional Site Interface Assembly (A26)

This board mounts on top of the Customer Interface Board. The following connections are available from this interface:

- a. Computer Shutdown Interface (AS400) 9 pin D-sub plug.
- b. System 38 BNC connector (jack).
- c. 12 sets of NO and NC contacts are provided for monitoring UPS status and alarm conditions. Connector wire size #22-#12 AWG.

2.4.6 Optional User Specified Alarm (A23)

This board mounts on top of the Customer Interface Board. Three sets of NO contact inputs can be connected for UPS monitoring of external alarms. Connector wire size #22-#12 AWG.

2.5 Power Wiring .UPS to Battery Cabinet

Use separate conduits for power and signal wiring.

When the battery cabinet is attached to the left side of the UPS, there is a power cable with a connector on the left side of the UPS. This connector plugs into a matching connector on the right side of Battery Cabinet running from the circuit breaker.

If additional battery cabinets are to be used, additional cables and wiring harnesses of varying lengths are coiled in Battery Cabinet #1. These must be fed through one or more battery cabinets to connect to matching plugs similarly numbered.

If battery cabinet is not attached to the UPS, run wiring out through UPS access panel at the bottom or top of the battery cabinet, following information on the installation drawings at the end of this section.

SECTION II

Installation

2.6 Connecting the Cabinets

1. If Battery Cabinet #1 is to be attached to the left side of the UPS, fasten the two cabinets together using the four (4) 5/16" x 1" bolts, nuts and washers packed with the leveling feet (see Figure 2-2).

2. If two or more battery cabinets are to be installed, remove the left-hand fiberboard shipping panel of the first cabinet and the right-hand cover of the second cabinet in the same way. Plug the power and signal wire electrical connectors together. Bolt the two cabinets together as described. Repeat for any additional battery packs.

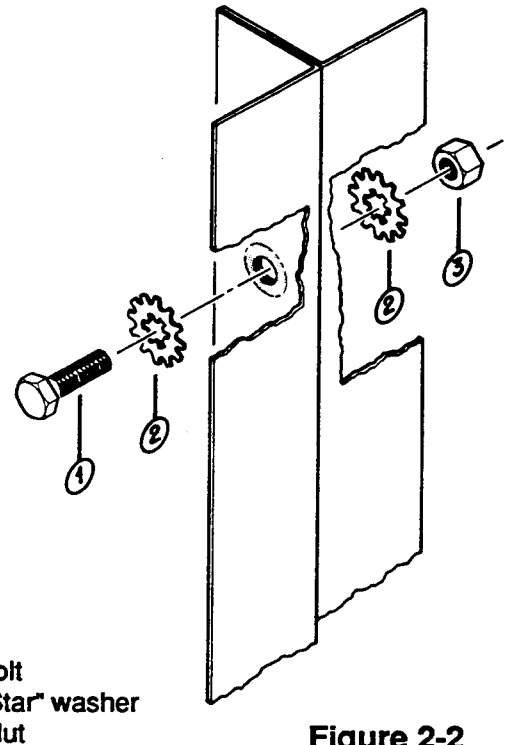


Figure 2-2

2.7 Re-assembly

1. Replace side cover(s) of battery cabinets, attaching screws on inside (removed in Paragraph 2.3, Step 3). **Be very careful not to touch screwdriver against the battery terminals.**

2. Replace the clear plastic guard and metal cover on the front of the UPS (removed in Paragraph 2.2, Step 6a).

3. The complete assembly, UPS and battery cabinet(s), can now be rolled on its casters back to eliminate the work area behind it. When it is in its final location, lower the leveling feet to stabilize and level the cabinets. Tighten locking nuts.

NOTE: For proper maintenance access and ventilation, a clear area three feet (91 cm) in front of the UPS and one foot (30.5 cm) above it is recommended.

SECTION II

Installation

2.8 AC Power Connection

1. **Make sure that all circuit breakers and the battery DC disconnect are open.**

2. Solderless compression type lugs are provided for cable connections. All power connections to the UPS terminal blocks must be torqued in accordance with the table below.

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

TIGHTENING TORQUE FOR PRESSURE WIRE CONNECTORS

Size of Wire Used		Torque Specification	
AWG/kcmil	(mm ²)	lb-in	(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)
3/0-4/0	(85.0-107.2)	250	(28.2)
250-350	(127-177)	325	(36.7)
400	(203)	325	(36.7)
500	(253)	375	(42.4)

3. UPS Input Voltage Configuration.

Run cables for UPS input through the access panel of the UPS and connect to terminal block as shown in installation drawings in this section.

- a. On a single input UPS, when input voltage equals output voltage -3-phase, 4-wire plus ground.

SECTION II

Installation

2.8 AC Power Connection (continued)

3. a. UPS Input Voltage Configuration (continued)

Note: When connecting the UPS to a 3-phase, 3-wire supply, the supply transformer must be a 3-phase, center grounded WYE and the ground conductor must be connected to the UPS ground terminal. The neutral must be grounded and the UPS can only supply power to 3-phase, 3-wire loads. No single-phase loads can be connected to the UPS. For any other configurations consult IPM Application Engineering.

b. On a single input UPS, when input voltage does not equal output voltage and on a dual input UPS –3-phase, 3-wire plus ground.

Note: The UPS 3-phase, 3-wire supply transformer must be a 3-phase, center grounded WYE with neutral grounded. The ground connector must be connected to the UPS ground terminal. For any other configurations, consult IPM Applications Engineering.

4. UPS Output Voltage Configuration.

Referring to the installation drawings in this section, connect UPS output terminals to the equipment to be protected, running the cables out through the access panel.

a. On a single input UPS, when input voltage equals output voltage, and on a dual input UPS –3-phase, 4-wire plus ground can feed WYE-connected or DELTA-connected loads (see Note at 3,a, above).

b. On a single input UPS, when input voltage does not equal output voltage – 3-phase, 4-wire plus ground; can feed WYE-connected or DELTA-connected loads.

Note: This configuration provides a separately derived source. UPS output neutral has been factory connected to system ground. UPS output circuit protection is required.

SECTION II

Installation

2.8 Power Connections (continued)

5. Bypass Input Voltage Configuration (Dual Input UPS)

Bypass input voltage configuration must be the same voltage, frequency, phase sequence and configuration as the UPS ac voltage configuration, i.e., 3-phase, 4-wire plus ground. The UPS output can feed WYE (4-wire) loads or DELTA (3-wire) loads: WYE systems require neutral connections for both bypass input and UPS output; DELTA or 3-wire systems require neutral connection for bypass input only.

6. Ground Connections

Two 3/8-16 x 1.0 LG ground studs are provided for connection to system ground. Ground studs are welded to the cabinet frame and are located near the cable entry points or power terminal.

7. Replace the panel around the circuit breakers (removed in Paragraph 2.2, Step 3). (With top cable entry option, replace right side panel removed in Paragraph 2.2, Step 4.)

2.9 Activating the Battery Cabinet(s)

WARNING

This procedure should be performed only by qualified electrical personnel. Due to potential for arcing, safety equipment such as face shield or eye goggles and gloves must be worn at all times. All tools must be insulated. There will be high voltages present and failure to follow this procedure exactly may lead to injury or death.

- Make sure that all electrical power has been removed from the UPS and battery cabinets.
- Make sure that battery tray cables are **not** plugged together.

SECTION II

Installation

2.9 Activating the Battery Cabinet(s) (continued)

- Make sure that all packing material and shipping straps have been removed from the battery cabinets.
- Make sure that the electrical signal and power connections have been made between Battery Cabinet #1 and any additional cabinets.
- Make sure that the electrical signal and power connections have been made between Battery Cabinet #1 and the UPS.
- Make sure that the mechanical connections have been made between the battery cabinets.

2.9.1 Battery Cabinet #1

1. Open the front doors of Battery Cabinet #1.
2. Using an ohmmeter, measure from each pole on both the top and the bottom of the battery disconnect circuit breaker to frame ground. Verify that no short circuits exist to frame ground. There may be a high impedance between the two cables connecting to the UPS cabinet and frame ground, but no short circuit should exist.
3. Using an ohmmeter, measure between each combination of two poles (A to B, A to C and B to C) on the top of the battery disconnect circuit breaker. Verify that no short circuit exists between any two poles.
4. Using an ohmmeter, measure between each combination of two poles (A to B, A to C and B to C) on the bottom of the battery disconnect circuit breaker. Verify that no short circuit exists between any two poles. **NOTE: There will be a capacitor action between the two cables connecting to the UPS cabinet, but no short circuit should exist.**
5. In Battery Cabinet #1, connect the battery trays to each other as shown in Figure 2-3. The two connectors to be attached at each tray are similarly numbered.

SECTION II

Installation

2.9 Activating the Battery Cabinet(s) (continued)

2.9.1 Battery Cabinet #1 (continued)

6. Using a dc voltmeter, carefully measure the dc voltage at the top of the battery disconnect circuit breaker. The voltage should be slightly above the nominal battery voltage (for example: 380 volts dc for a nominal 360 volt battery cabinet; 230 volts for a nominal 216 vdc). Record the voltage. The polarity should have the positive on the left-hand pole (Phase A) and the negative on the right-hand pole (Phase C) when you are facing the battery disconnect circuit breaker. Verify that the polarity is correct. If it is not, locate and correct the problem.

7. When the polarity is correct, disconnect the top right-hand tray connection to the tray immediately below. Verify there is no voltage present between the left and right poles at the top of the battery disconnect circuit breaker.

2.9.2 Battery Cabinet #2

8. Open the front doors of Battery Cabinet #2 (the one next to Battery Cabinet #1). Connect the battery trays in the cabinet to each other as shown in Figure 2-3. The two connectors to be attached at each tray are similarly numbered.

9. Using a dc voltmeter, carefully measure the dc voltage at the top of the battery disconnect circuit breaker in Battery Cabinet #1. The voltage should be slightly above the nominal battery voltage (for example: 380 volts dc for a nominal 360 volt battery cabinet; 230 volts for a nominal 216 vdc). Record the voltage. The polarity should have the positive on the left-hand pole (Phase A) and the negative on the right-hand pole (Phase C) when you are facing the battery disconnect circuit breaker. Verify that the polarity is correct. If it is not, locate and correct the problem.

10. When the polarity is correct, disconnect the top right-hand tray connection to the tray immediately below in Battery Cabinet #2. Verify there is no voltage present between the left and right poles at the top of the battery disconnect circuit breaker.

SECTION II

Installation

2.9 Activating the Battery Cabinet(s) (continued)

2.9.3 Battery Cabinets #3 and #4

11. Repeat Steps 8, 9 and 10 for the additional battery cabinet(s).

2.9.4 Final Battery Cabinet Connections

12. When connections and polarity have been checked on each additional battery cabinet, verify that there is one connection left unplugged in each cabinet (Steps 7 and 10). In Battery Cabinet #1, reconnect the top right-hand tray to the tray immediately below.

13. Move to Battery Cabinet #2.

WARNING

Before reconnecting the top right-hand tray to the tray immediately below in Battery Cabinet #2, measure the voltage between these unplugged connectors with a dc voltmeter. It is expected that this voltage reading will be small. In no case should the connection be made if there is more than 5 volts difference.

14. If there is less than 5 volts between the connectors, plug them together.

15. Repeat Steps 13 and 14 for each additional battery cabinet, making sure to measure the voltage between the unplugged connectors each time.

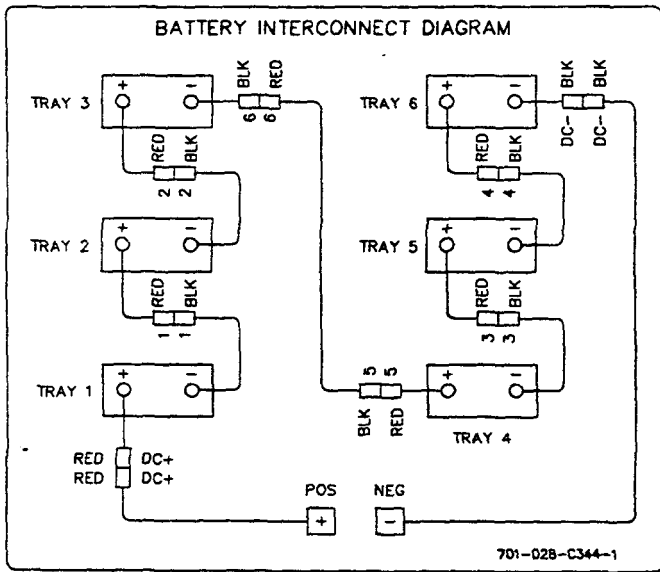
The uninterruptible power system is now ready for startup. See Section **III, Operation**.

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

SECTION II

Installation

2.9 Activating the Battery Cabinet(s) (continued)



6 battery trays

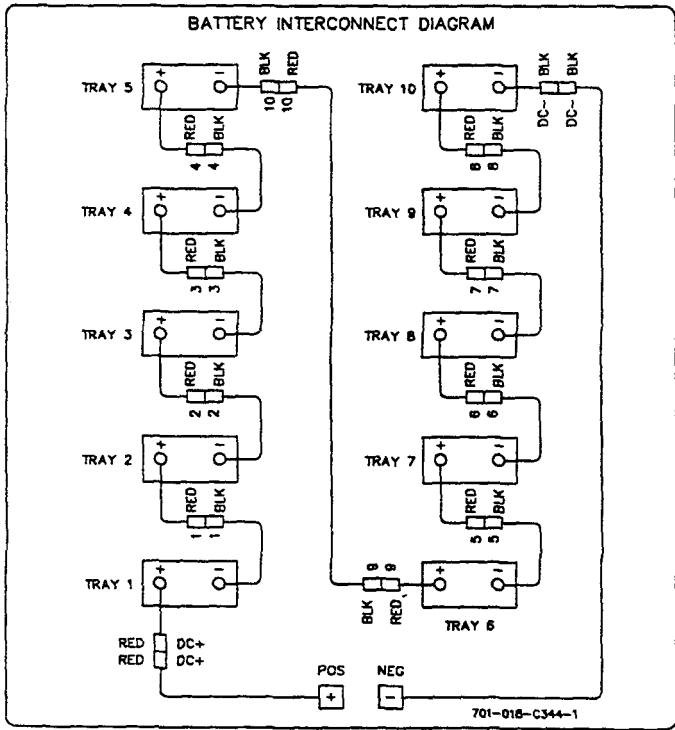


Figure 2-3

10 battery trays

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 in the UPS air filters 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 Safety Considerations (continued)

3.2.3 Security/Personnel

Access to the UPS should be limited to a minimum of personnel. Module doors should be kept locked. 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 or Part 15 of FCC Rules, which are designed 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.

CAUTION

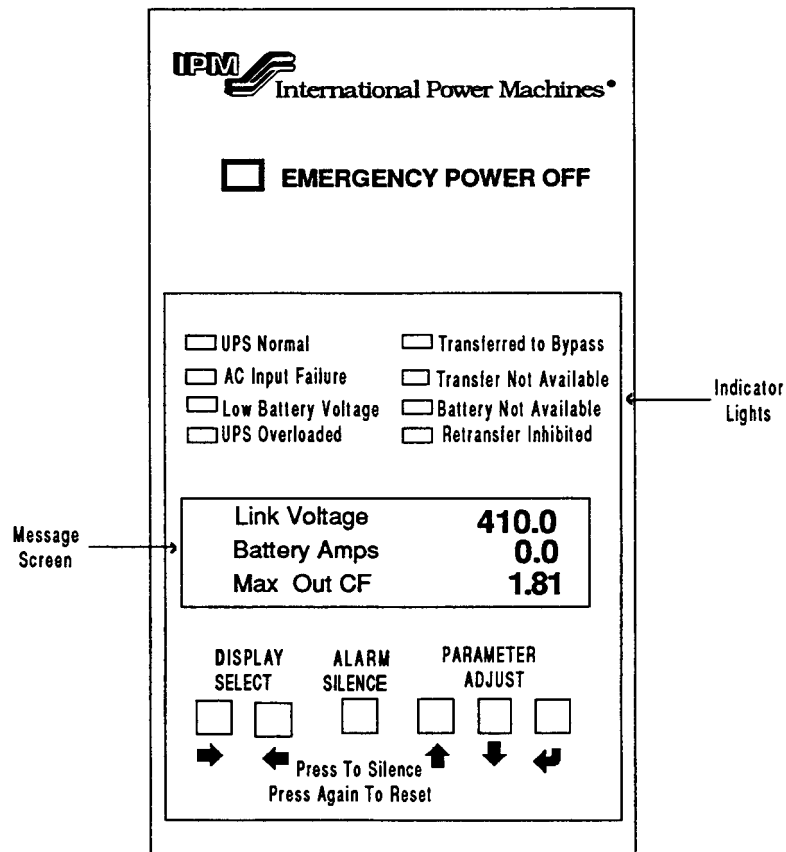
Always be aware that hazardous voltages may be present within the UPS even when the system is not operating.

SECTION III

Operation

3.4 Digital Monitoring Panel

The Digital Alarm Panel consists of eight (8) LED Indicator Lights, one (1) LCD message screen, two Display Select pushbuttons, three (3) Parameter Adjust pushbuttons, an ALARM SILENCE pushbutton and an EMERGENCY POWER OFF (EPO) pushbutton. The Display Select 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.



Digital Monitoring Panel

Figure 3.1

SECTION III

Operation

3.4 Digital Monitoring Panel (continued)

3.4.1 Indicator Lights

The Indicator Lights (LED's), located in the upper part of the panel, are:

- **UPS Normal** (green) - This indicates that the critical load is being powered from the inverter. The LED normally is on and, when this is the only LED lighted on the panel, it represents a fully normal condition. Other LED's may also be lighted simultaneously indicating a problem with the UPS. When this occurs, first record the alarm(s). Then, depress the ALARM SILENCE button to reset the alarm circuitry. Any alarm LED's will go out when the alarm condition is corrected. See Paragraph 3.4.5 for more details.

If "UPS Normal" flashes slowly, this indicates that a non-critical alarm is present, and that message will appear on the message screen. Check Alarm History (Paragraph 3.6.2) to identify the alarm.

- **AC Input Failure** (red) -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** (red) - When the system is operating on battery power, this LED illuminates to show approximately five minutes remains before the UPS system shuts down. A message screen (shown on Page 3.6) displays the amount of battery run time left. Also, the link (battery) voltage maybe monitored (See Paragraph 3.4.2.6). Shutdown occurs when the link voltage drops to 178VDC (15-30kVA) or 297VDC (37.5-300kVA). 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** (red) - 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 out. Otherwise, the UPS will shut down and/or transfer to bypass within 15 minutes. If the indicators are set to latch, the ALARM SILENCE button must be depressed twice to clear it.

SECTION III

Operation

3.4 Digital Monitoring Panel (continued)

3.4.1 Indicator Lights (continued)

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** (red) - 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** (red) - 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** (red) - 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.

- **Retransfer Inhibited** (red) - 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 can not 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 beneath DISPLAY SELECT.

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.

UPS Operating Normally

SECTION III

Operation

3.4 Digital Monitoring Panel (continued)

3.4.2 Message Screens (continued)

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. Voltage shown is link voltage.

Time Left
hhH mmM ssS
Voltage XXX.X VDC

3.4.2.1 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 \uparrow or \downarrow button successively (see paragraph 3.6.2).

Xx/yy/zz tttt
uu :vv.ww.aab
Alarm identity

On this screen the letters are read as follows:

xx = month yy = day of the month zz = year

uu = hour (on the 24-hour clock) vv = minutes of the hour

ww = seconds aa = cycles b = 1/4 cycles

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

3.4.2.2 Input Voltage:

This is a readout of input voltage between phases.

Input Vab
Input Vbc
Input Vca

-and-

This is a readout of input voltage phase to neutral.

Input Van
Input Vbn
Input Vcn

SECTION III

Operation

3.4 Digital Monitoring Panel (continued)

3.4.2 Message Screens (continued)

3.4.2.3 Input Current:

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

Input Van Input Vbn Input Vcn

3.4.2.4 Bypass Voltage

This is a readout of the bypass voltage between phases.

Bypass Vab Bypass Vbc Bypass Vca
--

3.4.2.5 Frequencies/Temperature

A readout of the input and output frequency (Hz) and the inlet temperature (°C).

Input Freq Output Freq Inlet Temp

3.4.2.6 Link Voltage:

A display of the DC link (battery) voltage, battery current and maximum output crest factor of the load on the UPS.

- **Link voltage** .243 (405)* VDC $\pm 10\%$. If there is an increase to about 246 (410) VDC, it indicates the batteries are being charged. If the voltage goes above 256(426) VDC, the rectifier will shut down. (These values are subject to change according to battery type.)
- **Battery Amps** . A positive number indicates battery charging; a negative number indicates discharging (possibly because UPS is operating on battery power).
- **Max Out CF** Displays maximum output crest factor of the load on the UPS

Link Voltage Battery Amps Max Out CF
--

* Numbers in parenthesis are for 37.5-300 kVA; without parenthesis for 15-30 kVA.

SECTION III

Operation

3.4 Digital Monitoring Panel (continued)

3.4.2 Message Screens (continued)

3.4.2.7 Output Power

A readout of the output kVA, kW and power factor.

Output KW
Output KVA
Output PF

3.4.2.8 Output Voltage:

A readout of output voltage phase to neutral. There normally is up to $\pm 5\%$ variance between phases.

Output Van
Output Vbn
Output Vcn

3.4.2.9 Output Current:

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

Output Van
Output Vbn
Output Vcn

3.4.2.10 Date

Displays today's date.

Date

Actual Date

3.4.2.11 Time

A readout of the current time.

Time

HH:MM:SS

3.4.2.12 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

SECTION III

Operation

3.4 Digital Monitoring Panel (continued)

3.4.2 Message Screens (continued)

The next message is “UPS Operating Normally.”

3.4.2.13 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. (See Page 3.3 regarding arrows.)

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. (See Page 3.3 regarding arrows.)

3.4.5 Alarm Silence Pushbutton

Whenever an alarm condition exists, an audible alarm sounds calling attention to the situation. If set for non-latching alarms, the audible alarm is silenced by depressing the ALARM SILENCE pushbutton once. If set for latching alarms, pressing the ALARM SILENCE pushbutton a second time resets the alarm circuit. Any indicator LED's that remain illuminated represent active alarm conditions that may require immediate action. (See Paragraph 3.6.3.4, Step 4 for selecting “latching” or “non-latching.”)

SECTION III

Operation

3.4 Digital Monitoring Panel (continued)

3.4.6 Emergency Power Off Pushbutton

To be used only for emergency conditions where instant shutdown of the UPS is required. The red EPO pushbutton is normally illuminated so that it may be located easily, even in the dark. 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.)

CAUTION

Any time 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 module indicator panel, are situated inside the right-hand door of the module cabinet. Since the cabinet is routinely kept locked, this provides some degree of security from tampering with the system.

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

INPUT CIRCUIT BREAKER: When closed, allows UPS input power to supply the rectifier and SBS input on units having a single input.

SECTION III

Operation

3.5 System Controls (continued)

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

STATIC SWITCH BYPASS CIRCUIT BREAKER: (On dual input units only.) When closed, allows reserve input to supply power to the Static Switch.

OUTPUT SWITCH: 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 on the battery pack 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. 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 Customer Service at (800) 777-8922 for assistance.

Checksum Bad Service Required

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.1 System Startup Procedure (continued)

Normally, turning on the UPS CONTROL switch should illuminate the following LED's:

AC Input Failure
Retransfer Inhibited

Transfer Not Available
Battery Not Available

... and this screen which will be displayed for a short time,

Checksum
Good

..... then –

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

Close
BYPASS
CKT. BREAKER

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

Close
INPUT
CKT. BREAKER

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.1 System Startup Procedure (continued)

4..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) Disconnect switch. Depress the ALARM SILENCE pushbutton twice to turn off some of the LED's. Now, only the **Transfer Not Available** LED should be lit.

Close
BATTERY
CKT BREAKER

5. When this instruction appears on the Message Screen, close the Output Switch or Circuit Breaker. (When input voltage does not equal output voltage, this is a rotary switch.) This should light the following LED's:

Close
OUTPUT
SWITCH OR BKR

Transferred to Bypass Retransfer Inhibited

6. On dual input UPS only, when this instruction appears on the Message Screen, close **STATIC SWITCH BYPASS CIRCUIT BREAKER**. The same LED's should remain lighted.

Close
SBS INPUT
CKT. BREAKER

7. 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, turning off the two lighted LED's and lighting the UPS Normal LED.

Open
BYPASS
CKT. BREAKER

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.1 System Startup Procedure (continued)

8. This screen will show for a short time.

Wait
Retransfer
Pending

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

UPS
Operating
Normally

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/zz tttt
uu:vv:ww.aab
Alarm identity

xx = month yy = day of the month zz = year
uu = hour (on the 24-hour clock) vv = minutes of the hour
ww = second aa = cycles b = 114 cycles
tttt = alarm sequence number. 0 is most recent. Press ⬇- to scroll from a higher number to ⬆ 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**.

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.2 Alarm Identity/History (continued)

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 below.

Table 3-1
Typical Alarm History Screens

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.

Date	Time I	Alarm	Screen Message
01/01/90	08:30:00.000	CPU Restarted	CPU Restart
01/01/90	08:35:09.452	Input Circuit Breaker Closed	inp bkr clsd
01/01/90	08:35:10.000	Input Voltage Normal	inp vol norm
01/01/90	08:36:00.000	DC Voltage Normal	dc volt norm

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.2 Alarm Identity/History (continued)

Table 3-2

Screen Message	Description	Corrective Action
inp bkr open	Input Circuit Breaker open	Follow System Startup procedure to close Input Circ. Brkr.
inp bkr clsd*	Input Circuit Breaker closed	Verifies that Input Circuit Brkr. 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 input frequency.
inp freq low	Input frequency too low	Verify correct UPS input frequency.
inp frq 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 volt-age and current.
inp cur norma	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 battery.

SECTION III

Operation

Table 3.2 (continued)

Screen Message	Description	Corrective Action
dc volt norm*	DC (battery) voltage normal	No action required
rct fus norm*	Rectifier fuses normal	No action required
rct bin fusA	Rectifier fuse A blown	Test/replace rectifier fuses on A1 power assembly.
rct bln fusB	Rectifier fuse B blown	Test/replace rectifier fuses on A2 power assembly.
rd bin fusC	Rectifier fuse C blown	Test/replace rectifier fuses on A3 power assembly.
rct pwr fail	Rectifier power supply failure	Test/replace rectifier drive board on A1, A2 and A3 power assemblies.
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
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 fusA	Inverter fuse A blown	Test/replace inverter fuses on A1 power assembly

SECTION III

Operation

Table 3.2 (continued)

Screen Message	Description	Corrective Action
inv bln fusB	Inverter fuse B blown	Test/replace inverter fuses on A2 power assembly.
inv bln fusC	Inverter fuse C blown	Test/replace inverter fuses on A3 power assembly.
inv PS fail	Power supply failure	Test/replace inverter drive boards on A1, A2 and A3 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.
inv ovr tmpA	Inverter over temperature. phase A	Verify cooling fans are operating on A1 power assembly.
inv ovr tmpB	Inverter over temperature, phase B	Verify cooling fans are operating on A2 power assembly.
inv ovr tmpC	Inverter over temperature, phase C	Verify cooling fans are operating on A3 power assembly.
inv norm tmp*	Inverter temp. normal	No action required
inv cur norm*	Inverter current normal	No action required
inv OC shtdn	Inverter shut down -over current	Remove some of the load
inv OT shtdn	Inverter shut down -over temperature	Room is too hot or fan failure
inv cur limt	Inverter current limit	Reduce load on UF'S
xfer enabled*	Transfer enabled	No action required
Rexfr enabled*	Retransfer enabled	No action required

* Not an alarm condition.

SECTION III

Operation

Table 3.2 (continued)

Screen Message	Description	Corrective Action
maint by flt	Maintenance bypass fault	Maintenance bypass breaker is closed with inverter operating. Follow Startup procedure to open bypass breaker.
dc hi shtdn'	Rectifier shutdown due to dc output overvoltage	Verify that rectifier automatically restarts
mv mnl strt*	Inverter manual start	No action required
mv mnl stop*	Inverter manual stop	No action required
mv 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.
mv fan fail	Inverter fan failure	Verify all cooling fans are operating.
mv fan norm*	Inverter fan normal	No action required
dc low shtdn	UPS shutdown - DC (battery) voltage low	Batteries are discharged.
mv 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 normal*	Output frequency normal	No action required

* Not an alarm condition.

SECTION III

Operation

Table 3.2 (continued)

Screen Message	Description	Corrective Action
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 on A1 power assembly.
sbs pwr falB	Static Bypass Switch power supply failure – Phase B	Test/replace SBS drive board on A2 power assembly.
sbs pwr falC	Static Bypass Switch power supply failure - Phase C	Test/replace SBS drive board on A3 power assembly.
bypass open*	Bypass Circuit Breaker Open	No action required
bypass clsd	Bypass Circuit Breaker closed	Follow Startup pro-cedure 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 (Step 6)
sbs enabled*	Static Bypass Switch enabled	No action required
ups amb high	UPS ambient temp. high	Room is too hot. Lower temperature
ups amb norm	UPS ambient temp. normal	No action required

* Not an alarm condition.

SECTION III

Operation

Table 3.2 (continued)

Screen Message	Description	Corrective Action
ups amb shdn	UPS ambient temp. shutdown	Room is too hot. Lower temperature.
byp volt hi	Static Bypass Switch by-pass voltage high	Verify SBS input voltage. Decrease if necessary.
byp volt low	Static Bypass Switch by-pass voltage low	Verify SBS input voltage. crease if necessary.
byp volt nml*	Static Bypass Switch by-pass voltage normal	No action required
byp freq. hi	Static Bypass Switch by-pass frequency high	Verify SBS input Frequency.
byp freq. low	Static Bypass Switch by-pass frequency low	Verify SBS input frequency.
byp f req. nml*	Static Bypass Switch by-pass 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
mv summary	Inverter summary alarm	Review other inverter alarms for cause
mv inhibit	Inverter inhibited	Review other inverter alarms for cause
mv normal*	Inverter normal	No action required
sbs summary	Static Bypass Switch summary alarm	Review other SBS alarms for cause

* Not an alarm condition.

SECTION III

Operation

Table 3.2 (continued)

Screen Message	Description	Corrective Action
sbs inhibit	Static Bypass Switch inhibited	Review other SBS alarms for cause
sbs normal*	Static Bypass Switch 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
rd wdog f lt	Rectifier watchdog fault	Call Customer Service
rct hi shtdn	Rectifier high shutdown	Call Customer Service
dr rd wdog*	Rectifier watchdog fault cleared	No action required
pwrsply fail	Power supply failure	Call Customer Service
pwrsply nrml*	Power supply normal	No action required
ps inp fail	Power supply input failure	Call Customer Service

* Not an alarm condition.

SECTION III

Operation

Table 3.2 (continued)

Screen Message	Description	Corrective Action
PS inp normal*	Power supply input normal	No action required
bat vlt nrm1*	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
xfer dsabld*	Retransfer disabled	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

* Not an alarm condition.

SECTION III

Operation

Screen Message	Description	Corrective Action
ph fail*	Phone home connection attempt failed	No action required
out overload	The load on the UPS has exceeded 100%	Reduce the load
load normal*	The load on the UPS is < or = 100%	No action required
bln trap fuse	The input trap fuse has blown	Call Customer Service
trap fuse ok*	The fuse on the input filter is normal	No action required
inp 5 th high	The 5 th harmonic content of the input current is too high	Perform bypass shutdown and call Customer Service
inp 5 th norm*	The 5 th harmonic content of the input current is at an acceptable level	No action required
unused*	Unused alarm appears when alarm history is cleared	No action required

* Not an alarm condition.

NOTE: If a message requires action you can not perform, call Factory Customer Service (800) 777-8922.

2. 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.

3. To exit Alarm History, depress **◀** or **▶**.

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu

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

<u>3.6.3.1</u>	<u>Rectifier Maintenance Menu</u>
<u>3.6.3.2</u>	<u>Inverter Maintenance Menu</u>
<u>3.6.3.3</u>	<u>SBS Maintenance Menu</u>
<u>3.6.3.4</u>	<u>System Maintenance Menu</u>
<u>3.6.3.5</u>	<u>Password Maintenance Menu</u>

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

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

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

7. 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

1. When in the Rectifier Maintenance Menu, depress ⬅. When this screen is displayed, press ⬆ to reset the faults.

Reset Rect Faults

UP = Reset

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.1 Rectifier Maintenance Menu (continued)

2. This message will appear on the screen. To confirm the previous action, press **↑** again,

Confirm
Yes =UP No=DN

- returning the screen to -

Reset Rect Faults
UP = Reset

3. Press **➡** to obtain this screen:

Return to
Previous Menu

4. Press **⬅** to return to the Rectifier Maintenance Menu.

Rectifier
Maintenance
Menu

3.6.3.2 Inverter Maintenance Menu

1. Press **➡** to advance to the Inverter Maintenance Menu.

Inverter
Maintenance
Menu


SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.2 Inverter Maintenance Menu (continued)

2 Press  to obtain this screen. The crest factors shown here are for information only. No adjustments can be made.

Output CF A B C

XX.X XX.X XX.X

3. Press  to obtain this screen.

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

Reset Inv Faults (UP)

Ready to Start

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)

Ready to Start

7. Press  to obtain –

Return to
Previous Menu


SECTION III

Operation

3.6 UPS Operating Procedures (continued)


3.6.3 UPS Maintenance Menu (continued)

3.6.3.2 Inverter Maintenance Menu (continued)

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.

Bypass/Shutdown UPS

UP=Bypass

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.

Confirm
Yes=UP No=DN
Menu

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

4. When this message appears, close the BYPASS CIRCUIT BREAKER.

Close
Bypass
Breaker

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.3 SBS Maintenance Menu (continued)

5. When this message appears, open the **OUTPUT SWITCH** or **CIRCUIT BREAKER**. [On single-input UPS, when the input voltage does not equal the output voltage, place the rotary switch in “maintenance” (open) position.]

Open
Output
Breaker

Warning: With rotating Output Switch, output transformer (T2) is energized in Maintenance Bypass mode.

6. When this message appears, open the **BATTERY CIRCUIT BREAKER**.

Open
Battery
Breaker

7. On dual input UPS only – when this message appears, open **SBS INPUT CIRCUIT BREAKER**.

Open SBS
Input
Breaker

8. When this message appears, open the **INPUT CIRCUIT BREAKER**.

Open
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 link voltage has decreased to the proper value, the following screen message will appear.

Waiting...
DC Link=
XXX.X Vdc

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.3 SBS Maintenance Menu (continued)

10. This message indicates that the Maintenance Bypass Shutdown procedure is complete.

Bypass/
Shutdown
Complete

11. You may turn off the **UPS CONTROL** switch. This message appears briefly.

You may
turn off
UPS control

Manual Transfer to Bypass

12. 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 reserve power source. This will inhibit retransfer and light the **Transferred to Bypass** and **Retransfer Inhibited** LED's. It will also change the "Inv Running" on the screen to "Wait Rexfr."

Man Transfer
/Retransfer
Inv Running

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.3 SBS Maintenance Menu (continued)

15. If it is desired to manually retransfer to primary UPS input, press **↓** and wait 10 seconds for this screen to appear. This will turn off all the LED's except **UPS Normal**.

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

3.6.3.4 System Maintenance Menu

1. Press **➡** to advance to the System Maintenance Menu.

System
Maintenance
Menu

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4 System Maintenance Menu (continued)

2. Press **←** to obtain this screen. The “X.XX” represents the latest software release number.

Software Rev.
Level
X.XX 60 Hz

3. Pressing the **➡** key will obtain this screen. Press **⬆** to execute the LED/lamp test. All of the LED's will light and a test pattern will be displayed for 3 seconds in both the text and numerical display areas.

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.

Language

English

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 UP again.

Confirm

Yes=UP No=DN

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

Sprache

Deutsch

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

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4 System Maintenance Menu (continued)

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 DOWN to change the language. Refer to the manual written in the appropriate language for screen messages and instructions.

Confirm
Yes=UP No=DN

8. Press ➡ to obtain this screen. This is the start of the procedure if it is necessary to change the date setting.

Date
mm/dd/yy

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 ⬇.

Confirm
Yes=UP No=DN

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.

Enter Date
mm/dd/yy
(actual date)

11. Press ⬅. This will display the new month/day/year you have set.

Date
mm/dd/yy

12. Press ➡ to obtain this screen. This is the start of the procedure to change the time setting. (Time readings are based on a 24 hour clock.)

Time
(actual time)

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4 System Maintenance Menu (continued)

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

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.

Enter Time
hh:mm:ss
(actual time)

15. Press **↵**. This will display the new time you have set.

Time
(actual time)

16. This sequence is only for those units with LCD display screens. The 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 **↵**.

LCD display
view angle
XX

17. Press **➡** to obtain this screen. Pressing **↑** will save all the changes to the menu made before this.

Save
Personality
UP=Save

18. Pressing **↑** in the step above will bring out this screen. It is necessary to confirm by pressing **↑** again.

Confirm
Yes=UP No=DN

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4 System Maintenance Menu (continued)

19. Pressing **↑** or **↓** will return to this screen.

Save
Personality
UP=Save

3.6.3.4.1 Alarm Configuration Menu

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

Alarm
Configuration
Menu

21. Press **⬅** to obtain this screen.
CAUTION: Pressing **↑** will clear the Alarm History records.

Clear Alarm
History?
UP = Clear

3.6.3.4.2 Latching Alarms Menu

The purpose of this procedure is to allow the user to set the various alarms as latching or non-latching. Pressing **➡** successively through this section will leave all the settings as they are.

22. Press **➡** to obtain this screen, beginning the procedure.

Latching
Alarms
Menu

23. Press **⬅** to obtain this screen.

Set all alarms latching

UP = Yes

24. If you press **↑**, this screen will appear to confirm that you wish to latch all alarms.

Confirm

Yes = UP No = DN

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4.2 Latching Alarms Menu (continued)

25. If you press ➡ after step 23, you will obtain this screen. Pressing ⬆ will ask you to confirm that you wish to clear all latched alarms. Pressing ➡ will obtain the following screen.

Set all alarms latching

UP = Yes

26. If you have cleared all latched alarms in Step 25, this will read “Non-latching.” If you wish to change the latching instructions on any of the screens from Step 26 through Step 32, press ⬆, change the latching instructions, confirm and press ⬅. To go from step 26 to step 27 without making a change, press ➡.

Transfer to
Bypass
Latching

27. Press ➡ to go to the following screen.

Transfer not
Available
Latching

28. Press ➡ to go to the following screen.

Battery not
Available
Latching

29. Press ➡ to go to the following screen.

Retransfer
Inhibited
Latching

30. Press ➡ to go to the following screen.

Low Battery
Voltage
Latching

31. Press ➡ to go to the following screen.

AC Input
Failure
Latching

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4.2 Latching Alarms Menu (continued)

32. Press ➡ to go to the following screen.

UPS Overload
Latching

33. Press ⬅ ➡ and ⬅ to proceed.

Return to
Previous
Menu

3.6.3.4.3 Communications Menu

34. Press ➡ to obtain this screen.

Communications
Menu

35. Press ⬅ to obtain this screen.

COM1 Menu

36. 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 a list of valid messages:

Power Up Init
Wait on call
Get Password
Dev. Online
Dev. Offline
LogOut
Resetting

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4.3 Communications Menu (continued)

NOTE 2: COM1 and COM2 in some of the following displays will 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 48.

37. Press ➡ once to obtain one of the “Com 1 Display screens. Press ⬆ or ⬇ to obtain another of these three screens, as desired. Pressing ⬅ will display the “Save Changes?” 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 Manager Plus™ software. BCM Proto enables communications with optional Onlinet® network power management software.

COM1 Display

User Interface

COM1 Display

P-Rec Proto

COM1 Display

BCM Proto

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

Save Changes?

Yes = UP No = DN

39. Press ➡ once to get to this screen. If you 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 Changes?” screen.

COM1 Baud Rate

2400

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Onlinet® is a registered trademark of Exide Electronics Group.

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4.3 Communications Menu (continued)

40. Pressing ^ will select the desired baud rate and will bring back the previous COM1 screen.

Save Changes?

Yes = UP No = DN

41. Press ← → and ← to proceed.

Return to
Previous
Menu

42. Press ← to obtain this screen.

COM2 Menu

43. 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

44. 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 Changes?” 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 Manager Plus™ software. BCM Proto enables communications with optional Onlinet® network power management software.

COM2 Display

User Interface

COM2 Display

P-Rec Proto

COM2 Display

BCM Proto

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4.3 Communications Menu (continued)

45. Pressing **↑** will select the desired program and will bring back the previous COM2 screen.

Save Changes?

Yes = UP No = DN

46. Press **➡** once to get to 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 from 9600 to 2400. Pressing **←** will display the "Save Changes?" screen.

COM1 Baud Rate

2400

47. Pressing **^** will select the desired baud rate and will bring back the previous COM1 screen.

Save Changes?

Yes = UP No = DN

48. Press **← ➡** and **←** to proceed.

Return to
Previous
Menu

3.6.3.4.4 UPS Identification Menu

49. Press **➡** to obtain this screen.

UPS
Identification
Menu

50. Press **➡** to obtain this screen.

UPS Name

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4.4 UPS Identification Menu (continued)

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

Confirm
Yes = UP No = DN

52. Press **↑** again if you 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 to the left press **⬅**.

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

Enter Name
ABC COMPANY

54. Press **↑** to save the changes.

Save Changes?
Yes = UP No = DN

55. Press **➡** to obtain this screen.

UPS Unit ID

56. Press **↑** and this confirmation screen will appear asking whether you want to enter a unit identification.

Confirm
Yes = UP No = DN

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4.4 UPS Identification Menu (continued)

57. 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 to the left press **⬅**.

58. Press **↑** to save the changes.

Save Changes? Yes = UP No = DN

59. 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

60. Pressing **↑** and this confirmation screen will appear asking whether you want to enter a phone number.

Confirm Yes = UP No = DN

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

Enter Phone Number: —

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4.4 UPS Identification Menu (continued)

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 to the left press **⬅**.

62. When all characters have been entered, the screen will look like this. Press **⬅**.

Enter Phone Number:

XXXXXXXXXX

63. Press **↑** to save the changes.

Save Changes?

Yes = UP No = DN

64. 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:

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

Confirm

Yes = UP No = DN

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

Enter Phone Number:

—

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.4.4 UPS Identification Menu (continued)

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 to the left press **⬅**.

67. When all characters have been entered, the screen will look like this: Press **⬅**.

Enter Phone Number:

XXXXXXXXXX

68. Press **↑** to save the changes.

Save Changes?

Yes = UP No = DN

69. Press **➡** to obtain this screen.

Return to
Previous
Menu

70. Press **⬅** to return to the System Maintenance Menu.

System
Maintenance
Menu

3.6.3.5 Password Maintenance Menu

1. Press **➡** to advance to the Password Maintenance Menu.

Password
Maintenance
Menu

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.5 Password Maintenance Menu (continued)

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 can not go beyond the level for which the system is set when you start.)

No Password
Password
Menu

3. Press **↑**. The system will ask you to confirm the password level.

Confirm
Yes = UP No = DN

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 3.25 and 3.26 to get into the UPS Maintenance Menu. When you have finished, press **←**.

Enter
Password
0

5. You will see this message briefly flashed on the screen –

Verify
Password

6. Then this message will appear again. It is necessary to repeat step 4, entering the new password again. Then press **←**.

Enter
Password
0

7. Press **↑** to save the new password.

Save Changes?
Yes = UP No = DN

SECTION III

Operation

3.6 UPS Operating Procedures (continued)

3.6.3 UPS Maintenance Menu (continued)

3.6.3.5 Password Maintenance Menu (continued)

8. Press **↑** to obtain this screen.

Return to
Previous
Menu

9. Press **←** to return to the Password Maintenance Menu.

Password
Maintenance
Menu

10. Depress **➡** to return to Previous Menu.

11. Depress **←** to leave UPS Maintenance Menu.

3.6.4 System Shutdown

1. Perform the Bypass/Shutdown procedure (Paragraph 3.6.3.3).

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**.

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 lights are operating and 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 Service Hotline: 800-777-8922 or (outside U.S.) 919-871-1800.

4.2 Safety Precautions

For safe and successful 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.

WARNING
On a single-input UPS, when input voltage does not equal output voltage, output transformer (T2) is energized in Maintenance Bypass Mode.

2. Ensure that UPS operating and maintenance personnel are thoroughly familiar with the equipment and with the contents of this manual.

SECTION IV

Maintenance

4.2 Safety Precautions (continued)

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.
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 Filters

Filters, installed in the bottom of the cabinet, eliminate particles from the air which is used to cool the UPS. In time, particle accumulation in the filters will reduce airflow through the system causing a rise in operating temperatures, triggering an alarm condition and resulting in shut down of the UPS. Filters should be checked and cleaned or replaced at least every 30 days in a clean environment, and no more than 7 days in a dirty environment.

Models of 125 and 150 kVA have two filters; other models have only one. Loosening a clip beneath the UPS near the front allows the filter to drop down and you can slide it out. Insert new filter and twist clip to secure it in place.

Filters are standard fiberglass furnace filters of the following sizes:

10-100 kVA UPS - 16" x 25" x 1"

125-150 kVA UPS - 14" x 25" x 1"

SECTION IV

Maintenance

4.3 Preventive Maintenance (continued)

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; (outside U.S.) 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 **BalancedPower Plus** 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

4.4 Remedial Maintenance (continued)

4.4.1 General (continued)

Because of the modular design of the **BalancedPower Plus** 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 1PM 24-Hour Hotline for assistance.

In general the BalancedPower Plus 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, switch and fuses inside the right-hand door.

WARNING
Do not remove front plastic shield, 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 Indicators

The LED status/alarm indicators on the monitor panel are 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.

SECTION IV

Maintenance

4.5 Fuses

There are four (4) fuses adjacent to the UPS CONTROL switch inside the front door. If one of these fuses is blown, the control logic will not become energized at startup. Once the UPS is started, it will operate even though one or more of the fuses is blown.

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

These are the only fuses available to the user unless he or she has had authorized factory training.

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.**

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

CAUTION: 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.

SECTION IV

Maintenance

4.6 Battery Maintenance (continued)

4.6.1 Safety Precautions (continued)

3. Wear rubber gloves and boots.
4. Do not lay tools or metal parts on top of batteries.
5. Open DC Disconnect switch 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 Battery Pack

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

Perform the following steps in the order presented:

1. Verify that each UPS attached to the battery pack is running on UPS input ac power by noting the dc link voltage. Depress ➡ or ⬅ beneath DISPLAY SELECT to obtain the Link Voltage message on the screen. Voltage should be 234 VDC (10-30 kVA) or 390 VDC (37.5-150 kVA) or greater.

Link Voltage Battery Amps Max Out CF
--

Do not proceed if battery system is supplying power to any protected equipment.

2. Shut off DC Disconnect switch. This will illuminate the **Battery Not Available** LED.

3. A general alarm will appear at each UPS as the Disconnect device is opened. This is normal. Depress the ALARM SILENCE button once to turn off the audible alarm.

SECTION IV

Maintenance

4.6 Battery Maintenance (continued)

4.6.3 Inspection and Periodic Maintenance

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

1. Place the battery pack in Maintenance Shutdown condition (Paragraph 4.6.2).

2. Open the front doors of each battery pack and 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 all the battery cable connectors.

4. Each battery tray is held in place by two bolts that fasten it to a slide. Remove the bolts from one tray at a time and very carefully pull the tray forward. Care should be taken that the tray doesn't come all the way out. The tray is heavy weighing as much as 200 pounds (91 kg) or more.

5. Use a lift hand truck to remove the tray completely from its slide.

CAUTION
The battery tray weighs as much as 200 lbs (91 kg). Use lift hand truck to remove it.

6. 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.

* Torque specifications may be found on the battery itself or in specifications at the end of this section.

SECTION IV

Maintenance

4.6 Battery Maintenance (continued)

4.6.3 Inspection and Periodic Maintenance (continued)

7. If not removed and cleaned, torque all cable connector bolts to battery manufacturer's retorquing specifications.

8. 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 or 4-2 on Page 4.11.

9. Retighten power cable connections between the DC Disconnect switch and the UPS. Refer to torque table in Paragraph 2.7, AC Power Connection.

10. Reconnect the battery trays to each other as described in Paragraph 2.8, Activating the Battery Pack. Close the battery pack door.

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. Remove two bolts and slide out the desired battery tray onto a lift hand truck.

CAUTION
The battery tray weighs as much as
200 lbs (91 kg). Use lift hand truck to remove it.

SECTION IV

Maintenance

4.6 Battery Maintenance (continued)

4.6.4 Battery Test (continued)

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.)

9. For proper operation, each battery in the cabinet should show voltage readings within ± 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.

SECTION IV

Maintenance

4.6 Battery Maintenance (continued)

4.6.5 Battery Replacement

1. Perform Maintenance Shutdown procedure (Paragraph 4.6.2).
2. Disconnect the desired battery tray, unbolt it from its slide and slide it out onto a lift hand truck.

CAUTION
The battery tray weighs as much as 200 lbs (91 kg). Use lift hand truck to remove it.

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 or 4-2 on next page).
5. Torque cable connector bolts to battery manufacturer's specifications.
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.
8. Push battery tray back to its original position. When the tray is fully back, replace the two bolts that fasten it to the slide.
9. Reconnect the battery tray cables.

4.6.6 Reactivating the Battery Pack

1. After all battery trays and their batteries are in place and reconnected, close the battery pack doors.
2. Verify UPS rectifier DC link voltage is at proper value (234VDC for 10-30kVA; 390VDC for 37.5-300kVA).
3. Close the DC Disconnect switch **only if link voltage is correct**.

SECTION IV Maintenance

4.6 Battery Maintenance (continued)

4.6.6 Reactivating the Battery Pack (continued)

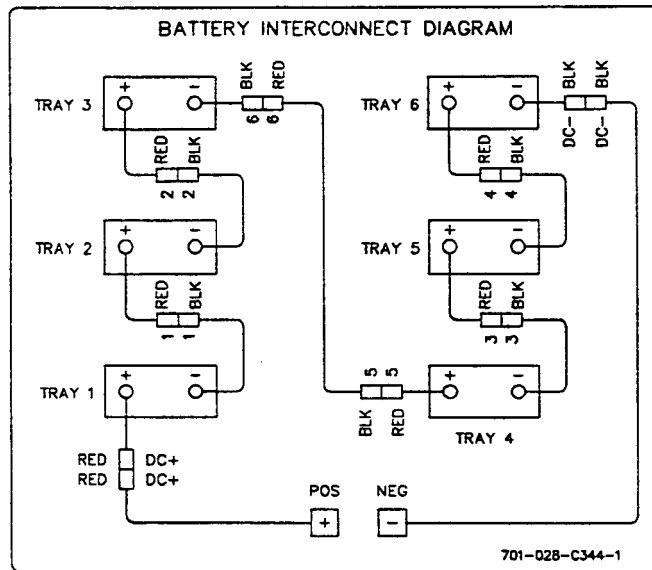


Figure 4-1

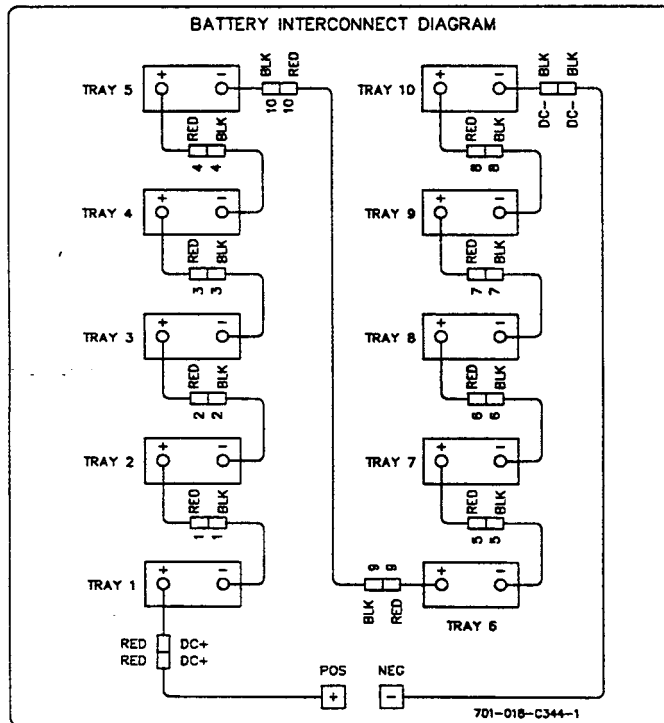


Figure 4-2

Polarity of Batteries in Tray

SECTION IV

Maintenance

Battery Manufacturers' Torque Specifications

Johnson Controls:

Item	Bolt Size	Wrench Size	Initial Torque	Annual Retorque
UPS 12-140FR	1/4	7/16	40 lb-in	30 lb-in
UPS 12-170FR	1/4	7/16	40 lb-in	30 lb-in
UPS 12-270FR	1/4	7/16	40 lb-in	30 lb-in
UPS 12-310FR	1/4	7/16	65 lb-in	50 lb-in
UPS 12-370FR	1/4	7/16	65 lb-in	50 lb-in
UPS 12-475FR	1/4	7/16	110 lb-in	60 lb-in

Power Batteries:

Recommended torque is on label on top of each battery.

GNB

100 lb-in

C&D

100 lb-in

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

SECTION V

Spares, Training Maintenance

5.1 Spare Parts

To facilitate service on the **BalancedPower Plus** 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
10451 Brockwood Road
Dallas, Texas 75238-1641

Phone: (214) 342-6104 ● Fax: (214) 214-342-6115

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 LINK-

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

DIGITAL SIGNALPROCESSOR (DSP) -

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

SECTION VI

Glossary

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 give 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.

SECTION VII

Remote Video Terminal

7.1 General

An optional remote video terminal, supplied by LorTec or by the customer, is plugged into the optional RS232 communication or telephone modem port. If this port was not purchased, this section does not apply to your UPS.

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

7.2 RS232 Interlace

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

```

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

UPS Maintenance      Input Van      121.1   Link Voltage      400.1
Menu                 Input Vbn      121.8   Battery Amps       -7.2
                                Input Vcn      121.0   Max Out CF         1.86

UPS                  Input Ia        62.7   Output KW           0.0
Operating            Input Ib        62.5   Output KVA          1.0
Normally             Input Ic        62.6   Output PF           0.00

08/30/95             Bypass Vab      216.2   Output Van          120.1
10:07:01.314         Bypass Vbc      215.6   Output Vbn          120.3
ups normal           Bypass Vca      224.7   Output Vcn          119.9

Input Vab            210.1   Input Freq          60.00   Output Ia           3.3
Input Vbc            209.2   Output Freq          60.00   Output Ib           3.3
Input Vca            210.4   Inlet Temp           19.9    Output Ic           3.3
[N]ext [P]revious [S]ilence [U]p [D]own [E]nter [^R]efresh [H]istory

```

The top segment represents the LED's on the front of the UPS monitor panel. The four-column segment represents the messages which appear on the monitor panel's message screen. (Numbers are typical; actual values will appear.)

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7.2 RS232 Interface (continued)

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	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.
[^R]efresh	(Press Control R.) Clears the screen and redraws it.
[H]istory	Full screen alarm history display.
[LO]g out	(Not shown on screen.) Disconnects the modem.

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

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

- Scrolls down one page

M Monitors the occurrence of alarms. All new alarms are added to the bottom of the screen.

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7.5 P-Record

P-Record format is for users who need to query the UPS periodically for information as to its status or develop custom monitoring software. It is used also when the "phone home" capability is enabled.

For additional information on the P-Record protocol, refer to document 950-010-A416, Revision C, *UPS Remote Monitor Protocol*.