

Matrix™ UPS User's Manual

208/240 Vac,
60 Hz version

NOTE: Printing this document may cause
printer overflow. If this occurs, try printing
small groups of pages.

American Power Conversion

American Power Conversion ■ 132 Fairgrounds Road
West Kingston, Rhode Island ■ 02892 ■ Phone (401) 789-5735

Part Number: 990-7007-B Revision: 3 Date: 12/21/94 Approved: DAA

Note: Specifications contained herein are subject to change without notice.
Copyright © 1994 American Power Conversion. All rights reserved.

Table of Contents

1. Introduction

2. Safety

3. Presentation

Isolation Unit (IU)

Electronics Unit (EU)

Battery Pack

4. Installation

Receiving Inspection, Protection Strategies,

Moving the UPS, Placement

Input Voltage Selection

Module Interconnections

Emergency Power Off (EPO) Interface

Start-up

Input Plug Incompatibility

5. Operation

Modes of operation

Display and controls operation

6. UPS Monitoring

Computer interface port

7. Difficulty

Troubleshooting chart

Fault messages

Replacing the Electronics Unit

Replacing or adding Battery Packs

Obtaining service

8. Storing the UPS

9. Specifications

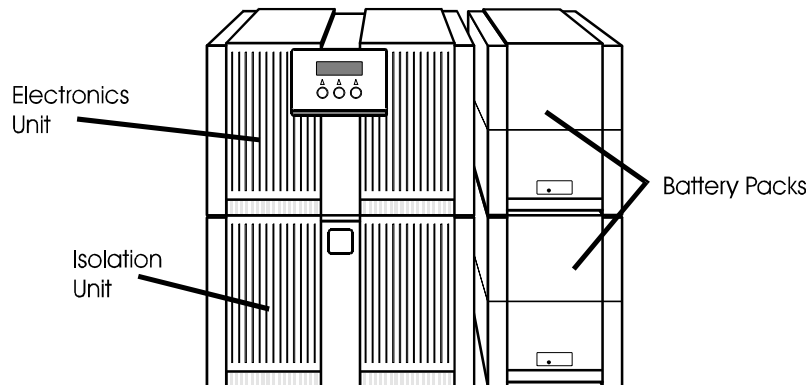
Recharge and Run Times

1. Introduction

1.1 Overview

The UPS is a high-power enhanced line interactive uninterruptible power source designed to provide clean, reliable AC power to computer, data handling, and telecommunications loads. Normally, the UPS operates "on-line" and provides power to the load derived from the input utility source. When operating on-line, the UPS continuously regulates the load voltage by compensating for voltage fluctuations occurring over a wide range on the utility. A multilevel transformer tap changing circuit provides this regulation while attaining extremely high levels of on-line efficiency. In response to the need to adjust the load voltage, the UPS temporarily operates the load from power derived from the battery while an appropriate transformer tap change is made. In the event of unacceptable line conditions, transfer of load power from the utility to the inverter occurs synchronously and is virtually seamless under all conditions. The voltage waveshape delivered during "on-battery" operation is a low distortion sine wave. Resynchronization and retransfer of load power to the utility is automatic upon recovery of the line voltage to within normal limits.

A complete UPS system consists of three module types. The UPS is comprised of an Electronics Unit (EU), mounted atop an Isolation Unit (IU). Numerous Battery Packs can be purchased and plugged together on-site to provide the desired run time. The EU is self-connecting to the IU when mounted and is secured in place with the turn of an oversized hand screw. The EU contains the UPS's microprocessor controls, inverter, battery charger, transfer and tap changing circuits, remote interfaces, and the user control and display panel. The IU contains the UPS's isolation transformer, EMI/RFI filtering and surge suppression circuits, bypass circuit, and the utility and load wiring interfaces. The Battery Packs are "daisy chained" pack-to-pack, and to the EU, using a heavy duty cable and lockable connector system. Intelligent communications between Battery Packs and the EU is provided via a flat cable terminated with modular plugs. Each Battery Pack contains four high capacity batteries and microprocessor controlled electronics for communications and for battery pack voltage and current monitoring.



1.2 Hot Swappable Modules

The Isolation Unit is capable of autonomous operation and allows service or upgrade of the Electronics Unit without interruption of power to the load. In addition, a worn Battery Pack can be replaced, or new packs can be added, while maintaining power to the load. In the event of EU failure, functions controlled by the EU are automatically bypassed and the IU operates autonomously. For servicing, this bypass mode may be selected manually.

1.3 Emergency Power Off (EPO)

For applications where, for safety reasons, power to all room equipment may be cut off, the UPS provides a remote Emergency Power Off interface.

1.4 Display

Local UPS user interface is served by a display and control panel containing a back-lit 2x16 character display and three pushbuttons. Using the pushbuttons, menus for the display of UPS status information, UPS control commands, UPS setup, UPS tests, and UPS diagnostics are shown. Critical UPS functions can be password protected. A loud audible alarm warns of operating modes that could result in the loss of power to the load without user intervention.

1.5 Remote Interfaces

The UPS provides a remote computer interface capable of full RS-232 communications. When combined with PowerDoctor UPS monitoring software and a serially connected local DOS PC, all functions of the local display and control panel are duplicated and power quality related events can be logged. PowerChute *plus* offers all the features of PowerDoctor, plus the ability to control orderly and unattended network or multi-user computer system shutdown during an extended power outage. Also available for the UPS is the SNMP (Simple Network Management Protocol) Adapter to provide load type independent remote monitoring and management across Ethernet or Token Ring based LANs or WANs capable of routing IP messages. Using any standard Network Management System (NMS) and the SNMP Adapter, the UPS becomes manageable through a single familiar interface - from across your building to across the world.

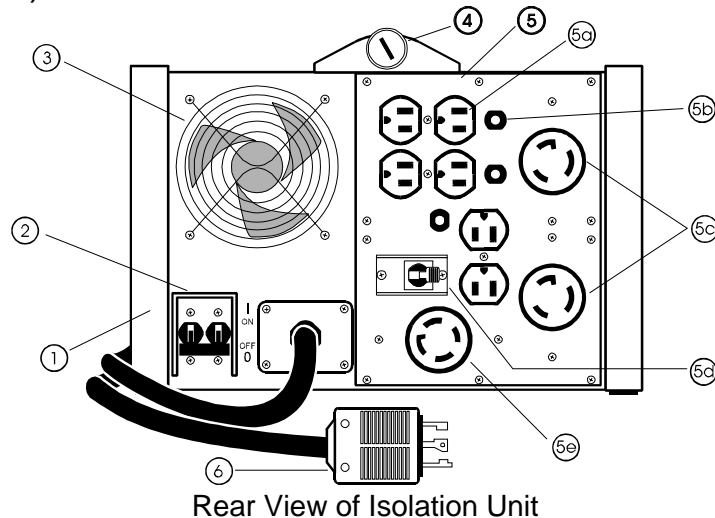
2. Safety



- To reduce the risk of electric shock, disconnect the Uninterruptible Power Source from the mains before installing computer interface signal cable (when used). Reconnect the power cord only after all signalling interconnections have been made.
- Connect the Uninterruptible Power Source to a two-pole, three-wire grounding mains receptacle. The receptacle must be connected to appropriate branch protection (fuse or circuit breaker). Connection to any other type of receptacle may result in a shock hazard and may violate local electrical codes.
- This Uninterruptible Power Source has an internal energy source (the battery) that cannot be de-energized by the user. **The output may be energized when the unit is not connected to a mains supply.**
- To properly de-energize the Uninterruptible Power Source in an emergency, move the rear panel I/O switch to the O (off) position and disconnect the power cord from the mains.
- Avoid installing the Uninterruptible Power Source in locations where there is water or excessive humidity.
- Do not allow water or any foreign object to get inside the Uninterruptible Power Source. Do not put objects containing liquid on or near the unit.
- To reduce the risk of overheating the Uninterruptible Power Source, avoid exposing the unit to the direct rays of the sun. Avoid installing the unit near heat emitting appliances such as a room heater or stove.

3. Presentation

3.1 Isolation Unit (IU)



1. Isolation Unit (IU)

The Isolation Unit contains the UPS's isolation transformer, EMI/RFI and surge suppression, bypass circuits including an auxiliary power supply, and utility and load wiring interfaces. The IU is capable of autonomous operation and allows service of the Electronics Unit without interruption of power to the load.

2. Input circuit breaker (power ON / OFF)

The input circuit breaker controls power to the UPS. It protects the UPS and the service wiring from extreme overloads.

3. Cooling fan

The fan exhausts air from the IU and operates whenever the input circuit breaker is ON (I). If the fan fails, the UPS will indicate an alarm condition. Under such conditions, the UPS will remain operating and is capable of delivering full power to the load.

4. EU separating screw

The Electronics Unit separating screw is turned counter-clockwise to remove the EU for service. If this action is taken while the UPS is on-line, the UPS will automatically transfer to bypass operation. See the **Difficulty** section of this manual for the proper EU replacement procedure.

Note: The UPS's display is blank when the EU separating screw is loosened. Control of the UPS is regained when the screw is tightened and any control button is pressed.

5. Power distribution plate

The power distribution plate is removable for access to the input voltage selection taps. Optional Power Distribution Unit (PDU) accessories are available from the factory with wiring devices other than those provided on the power distribution plate. These PDU accessories are plugged into either a NEMA L6-30R receptacle 208 Vac output, or the NEMA L14-30R receptacle 120/240 Vac output.

5a. NEMA 5-15R receptacles

Six 15 Amp rated NEMA 5-15R outlets provide a nominal 120 Vac for multiple small loads.

5b. NEMA 5-15R receptacle circuit breaker

Each NEMA 5-15R duplex receptacle is protected by a circuit breaker. This protection is necessary because the UPS is capable of delivering more than the receptacle's maximum current rating. The 3000VA model UPS power distribution plate's upper two NEMA 5-15R duplex receptacles are protected by a 12 Amp circuit breaker. The lower NEMA 5-15R duplex receptacle is protected by a 15 Amp circuit breaker. All NEMA 5-15R duplex receptacles on the 5000VA model UPS are protected by a 15 Amp circuit breaker.

5c. NEMA L6-30R receptacles

Two 30 Amp rated NEMA L6-30R twist-lock outlets provide 208 Vac for large loads.

5d. NEMA L14-30R receptacle circuit breaker

The 3000VA model UPS power distribution plate's NEMA L14-30R and NEMA 5-15R receptacles are protected by a two pole, 25 A circuit breaker. The 5000VA model UPS power distribution plate's NEMA L14-30R is protected by a two pole, 30 A circuit breaker.

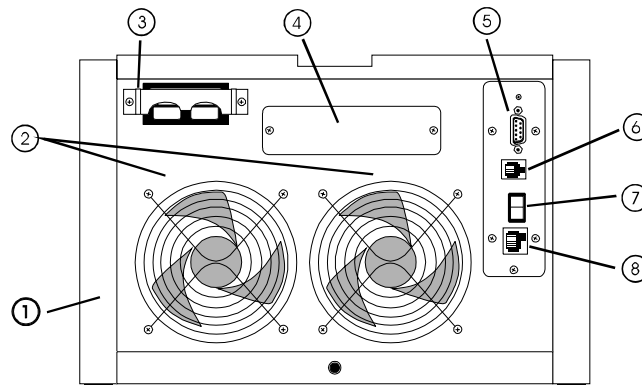
5e. NEMA L14-30R receptacle

The 30 Amp rated NEMA L14-30R receptacle provides a nominal 120/240 Vac output.

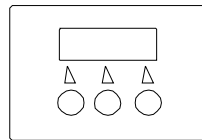
6. NEMA L6-30P input plug

The 30 Amp rated input plug has a twist-lock feature to prevent accidental disconnection.

3.2 Electronics Unit (EU)



Rear View of the Electronics Unit



[See the section
entitled **Operation**.]

1. Electronics Unit (EU)

The Electronics Unit contains the UPS's microprocessor controls, inverter, battery charger, transfer and tap changing circuits, remote interfaces, and the user control and display console. The EU may be separated from the IU for service. See the manual section entitled **Difficulty** for instructions on removal of the EU.

2. Cooling fans

The EU cooling fans operate at two speeds depending upon mode of operation. The fans turn faster when the UPS is heavily loaded while operating on-battery. If either of the fans fail while operating on-line, the UPS will indicate an alarm condition and transfer to bypass operation. If either of the fans fail while operating on-battery, the UPS will immediately indicate an alarm condition. Initially, the UPS will continue to provide power to the load. However, when heavily loaded the UPS will eventually shut down in order to prevent the EU from overheating.

3. Battery Pack coupler

Battery Packs are connected at this coupler. A coupler clamp is installed over the coupler opening as furnished from the factory. See the manual section entitled **Installation** for instructions on how to lock mated couplers.

4. Accessory panel

The EU is furnished with an opening that accepts accessories that work with the UPS. Call your dealer or the factory for information on available accessories.

5. Computer interface port

See **UPS Monitoring** section of this manual for information on this interface port. Connect only factory supplied or authorized UPS monitoring cables to this port.

6. Battery communications jack

The Battery Pack communications cable from the Battery Pack OUTPUT is connected at this jack.

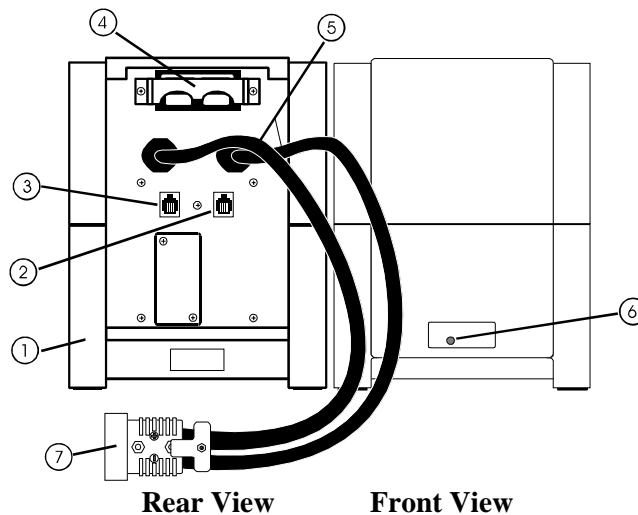
7. Manual bypass switch

Pressing the manual bypass switch causes the UPS to transfer to the bypass mode of operation. While in this mode, the load is supplied with power conditioned by the IU. However, the load will not be protected from utility voltage sags, swells or blackouts. The EU is removed for service when the UPS is operating in bypass. See the **Operation** section of this manual for more details on this mode of operation.

8. Emergency Power Off jack

For applications where, for safety reasons, power to all room equipment must be cut off, the UPS provides a remote Emergency Power Off interface. A modular 6 position plug with offset latch fits this jack. See the **Installation** section of this manual for instructions on how to connect to the jack.

3.3 Battery Pack



1. Battery Pack

The Battery Pack contains four series connected nominal 12 Vdc high-capacity sealed lead-acid batteries. Built-in ultra-low power consumption battery pack voltage and current monitoring electronics report pack status to the UPS. To conserve battery capacity, the internal electronics are shut down when the battery communications cable is not connected to the UPS, or when the UPS is not running.

2. INPUT battery communications jack

This input accepts battery status signals from the OUTPUT of another Battery Pack in the system. No connection is made to this jack in a single Battery Pack system.

3. OUTPUT battery communications jack

The Battery Pack sends status signals to the UPS or to the INPUT of another Battery Pack (in a multiple Battery Pack system) from this jack.

4. Battery Pack panel coupler

Additional Battery Packs are connected to this panel coupler. A coupler clamp is installed over the coupler opening as furnished from the factory. See the **Installation** section of this manual for instructions on how to lock mated couplers.

5. Battery Pack cables

Each Battery Pack cable is made from "welding grade" wire to withstand abrasion or crimping in rough duty applications.

6. Replace Battery indicator

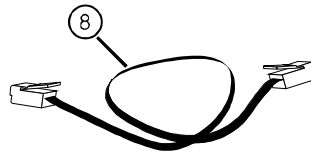
The Replace Battery indicator is illuminated when the Battery Pack can no longer sustain a charge due to wear. See the **Difficulty** section of this manual if the indicator is lit.

7. In-line Battery Pack coupler

The in-line Battery Pack coupler connects to the UPS or to a panel coupler on another Battery Pack.

8. Battery communications cable

Each Battery Pack is supplied with a battery communications cable.



4.0 Installation

4.1 Receiving Inspection

Once the UPS has been removed from its shipping container, it should be inspected for damage that may have occurred while in transit. Immediately notify the carrier and place of purchase if any damage is found. The packing materials are made from recyclable materials and should be saved for reuse or disposed of properly.

4.2 Protection Strategies

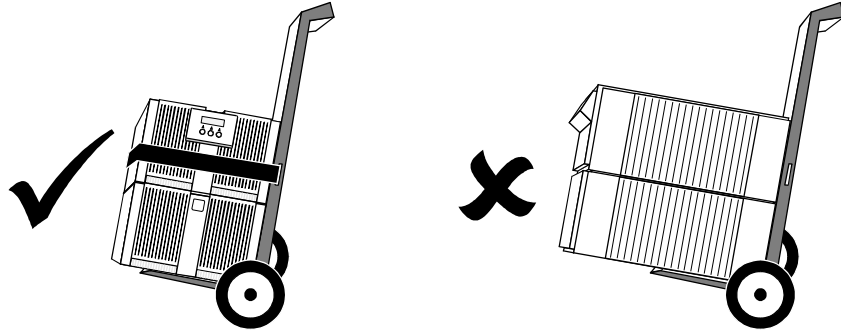
This UPS provides high performance power line protection to the loads. There are, however, other potential entry points for damaging surges in information systems. These include serial ports (RS-232, RS-422, RS-485, etc.), parallel ports, telephone lines, and network connections. These other entry points must be considered in developing a comprehensive system protection strategy. Contact your dealer or call the number on the back cover of this manual for information on a complete set of related products designed to accomplish total system protection.

Sensitive information systems can be further safeguarded by following these guidelines:

- Verify that all electrical outlets are properly grounded.
- Connect information systems to a different electrical service branch than heavy motor loads like air conditioners, copiers, refrigerators, and heavy industrial machinery.
- Plug all power protection and information system equipment into the same branch where possible.

4.3 Moving the UPS

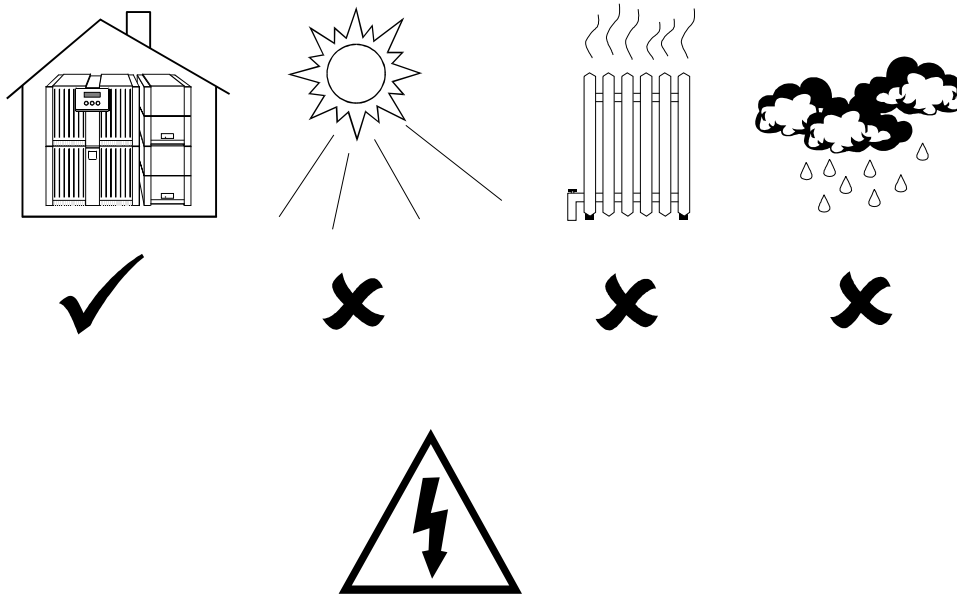
The UPS is heavy and should be moved to the operating site by hand truck. Two people are necessary to load the UPS into position on the truck noseplate. Load the UPS onto the hand truck as shown below. Use hand truck straps to stabilize the load while moving.



■ **Caution:** Never attempt to lift the UPS by the Electronics Unit or by the EU separating screw!.

4.4 Placement

The UPS may be installed in any protected environment. The location should provide adequate air flow around the unit, in an atmosphere free from excessive dust. Do not operate the UPS in an environment where the ambient temperature or humidity is outside the limits given in the **Specifications** section of this manual.



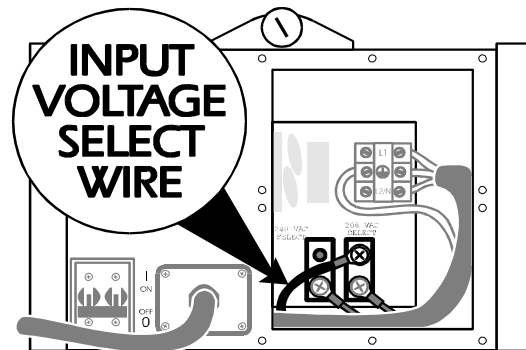
■ **Warning:** Risk of electric shock exists inside the UPS. Input voltage tap selection and power distribution panel replacement should be performed only by qualified service personnel.

4.5 Input Voltage Selection

As furnished, the UPS is configured to operate from a single phase 208 Vac source. In applications where it is desired to operate from a 240 Vac source, the UPS must be reconfigured. To reconfigure the UPS, follow the steps listed below.

4.5.1. Turn off (0) the UPS's input circuit breaker and unplug the input cord.

4.5.2. Using a medium size phillips screwdriver, remove all 10 screws that secure the power distribution plate to the rear of the Isolation Unit. Move aside the power distribution plate. Take care not to strain the wires connected to the devices on the plate.

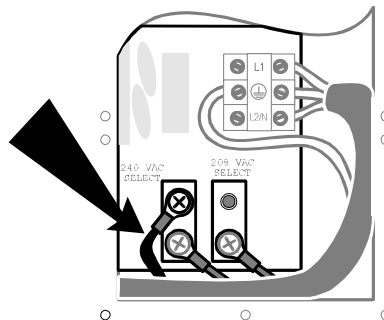


208 Vac Input Configuration

4.5.3. Remove the phillips head 10-32 x 3/8" SEM screw holding the red Input Voltage Select Wire (see illustration) to the tap bar marked "208 VAC SELECT."

4.5.4. Move the red Input Voltage Select Wire to the tap bar marked "240 VAC SELECT" and tighten the screw.

4.5.5. Check your work before reattaching the power distribution plate. Take care not to crimp or pinch any of the wires connected to the devices on the power distribution plate.



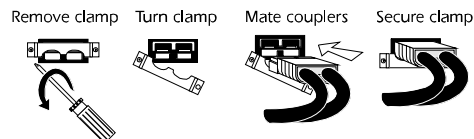
240 Vac Input Configuration

4.6 Module Interconnections

Follow the instructions listed below to install and lock the battery couplers.

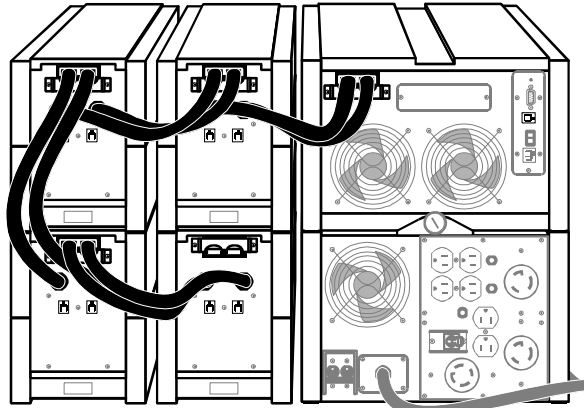
4.6.1. Using a phillips screwdriver, remove the battery coupler clamps from the Electronics Unit and from all but one Battery Pack.

4.6.2. Turn the battery coupler clamp and refasten loosely at one side.



4.6.3. Mate the battery couplers in the fashion shown below. The Battery Packs are electrically connected in parallel.

4.6.4. Fasten remaining side of battery coupler clamp to lock couplers in place.



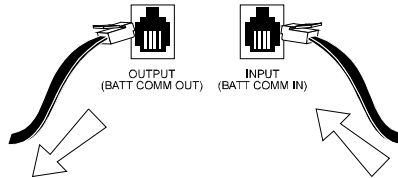
Typical installation showing mated battery couplers

Note: To reduce the risk of toppling, do not stack equipment more than 2 units high.

Follow the instructions listed below to install the battery communications cables.

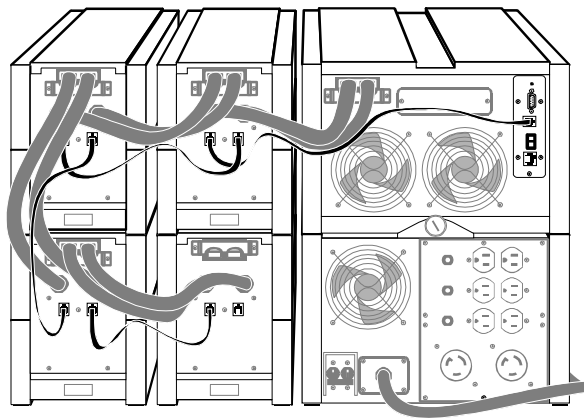
4.6.5. Mate the battery cable plugs in the fashion illustrated below.

4.6.6. Each cable must connect between a Battery Pack OUTPUT and either the UPS's BATT COMM input, or another Battery Pack INPUT.



TO: UPS BAtt COM, or
TO: Battery Pack INPUT

From: Battery Pack OUTPUT
(multiple Battery Pack systems)



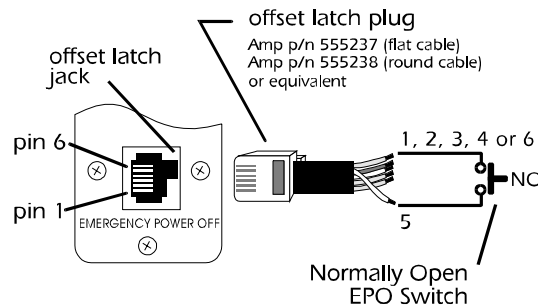
Typical installation showing mated battery communications cables

4.7 Emergency Power Off (EPO) Interface

The UPS may be switched off by a remotely operated Emergency Power Off control. Such a configuration is common in computer rooms and laboratories where, for safety reasons, power to the loads must be disconnected. The EPO interface is a 6 position modular jack with an offset latch. Connection to a remotely located EPO switch may be accomplished as shown below.

Caution: The EPO interface is a Safety Extra Low Voltage (SELV) circuit and may be connected only to other SELV circuits.

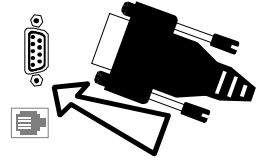
Caution: The EPO interface is designed to monitor circuits that have no determined voltage potential. Such closure circuits may be provided by a switch or relay properly isolated from the utility. Connection of the EPO interface to any circuit other than a closure type circuit may cause damage to the Electronics Unit.



4.8 Start-Up

To start the UPS, follow the instructions listed below.

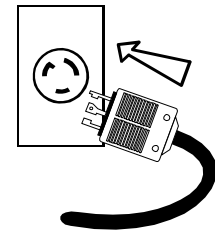
4.8.1 If a UPS monitoring signal cable is to be installed, connect it to the Electronic Unit's Computer Interface Port. For more details on the computer interface port, see the manual section entitled **UPS Monitoring**.



4.8.2 Plug the UPS's input plug into a twist-lock L6-30R two-pole, three wire grounding outlet.

Note: See section 4.9 if the UPS's plug is not compatible with the available wall outlet.

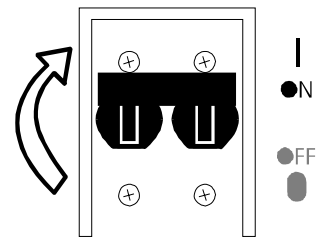
4.8.3 Plug all loads to be protected into the UPS. Do not exceed the UPS's maximum capacity as listed in the **Specifications** section of this manual. The total load capacity is continuously monitored by the UPS and is displayed once the UPS is switched on.



4.8.4 Power the UPS by switching On the input circuit breaker.

Note: The UPS may make a "bump" noise when first switched on. This is normal. The UPS will not make this sound again.

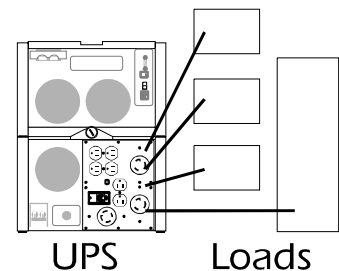
Note: If the input circuit breaker is rapidly switched On - Off - On, the UPS may be caused to operate in the bypass mode. Follow the display prompts to return to normal on-line operation.



4.8.6 The UPS should display its status as "On-Line." When first turned on, the UPS may adjust the on-line output voltage. Soft "clicking" sounds may be heard when this is accomplished. This is normal.

Note: See the *Difficulty* section of this manual if the UPS displays a fault message.

4.8.7 Switch on the protected loads and check the UPS's display. Total load capacity is displayed as a percent of the UPS's full rated capacity. It should read below 100%. If above 100%, the UPS



OnLine 0% Load
Press Any Key

will indicate an overload.

4.8.8

4.9 Input Plug Incompatibility

The UPS is furnished with a twist-lock L6-30P input plug rated to 250V/30A. If it is found that this plug is not compatible with the available wall outlet, the outlet receptacle should be changed. In some cases, new service wiring must be installed.

4.9.1 If the service wiring has been installed correctly using one of the receptacle types listed below, a qualified electrician may be called to replace the receptacle with an L6-30R. In these installations, new service wiring will not be required. The receptacle type is normally embossed on the receptacle face (the suffix "R" may not be present).

- L6-20R (only the 3000VA model UPS can be used with this service)
- 6-20R (only the 3000VA model UPS can be used with this service)
- 6-30R
- 6-50R
- 7-30R
- 7-50R
- L14-30R
- L15-30R
- L21-30R

4.9.2 If the service wiring has been installed correctly using one of the receptacle types listed below, a qualified electrician must be called to install new service wiring for the UPS. In general, these receptacle types are used at installations where only 120V service is available or where no service ground exists. The receptacle type is normally embossed on the receptacle face (the suffix "R" may not be present).

- L5-15R
- 5-15R
- L5-20R
- 5-20R
- L5-30R
- 5-30R
- 5-50R
- L18-30

5.0 Operation

5.1 Modes of Operation

When switched on, the UPS will operate in any of five modes of operation depending upon the condition of the UPS, the UPS's batteries, the UPS's loads, and the input utility voltage. These five modes are sleep, standby, on-line, on-battery, and bypass.

5.1.1 Sleep Mode

While in the sleep mode of operation, the UPS's display is inactive and no voltage is present at the output. The UPS enters the sleep mode following a 5 minute interval when no commands are given while in the standby mode (see following section). Following a 5 minute interval, the UPS will enter the sleep mode from the on-battery mode when shut down due to battery capacity exhaustion or overload. This is done to conserve battery capacity. To "awaken" the UPS to make it receptive to commands, any one of the front panel pushbuttons may be pressed.

Some versions of PowerChute *plus* allow the user to put the UPS to sleep and awaken it after a user set interval.

5.1.2 Standby mode

While in the standby mode of operation, the UPS's display and control interface is active, but no voltage is present at the output. The UPS enters the standby mode of operation when first "awakened" from the sleep mode. The UPS is awakened when any one of the three front panel pushbuttons is pressed.

5.1.3 On-line mode

Once commanded to power the loads, the UPS is normally in the on-line mode of operation. While in this mode, the UPS delivers power to the loads derived from the utility and maintains proper battery charge. In this mode, the UPS regulates the output voltage to within a narrow band and serves to isolate the load from surges and electrical noise brought by the service wiring. A multilevel transformer tap changing circuit provides this regulation and isolation while maintaining extremely high efficiency. In response to the need to adjust the load voltage, the UPS temporarily operates the load from power derived from the battery while an appropriate transformer tap change is made. Remote on-battery signalling is disabled when this action is accomplished.

The UPS's display indicates the percent of rated load applied at the output when operating on-line.

5.1.4 On-battery mode

When in the on-battery mode of operation, the UPS provides power to the load derived by the UPS's inverter from the Battery Packs. The voltage waveshape delivered during on-battery operation is a low distortion sine wave. While on-battery, the UPS regulates the output voltage and frequency to within a narrow band. The UPS operates in the on-battery mode during the user defeatable start-up or scheduled battery tests. The UPS operates on-battery when the line voltage or frequency has fallen outside the limits given in the **Specifications** section of this manual or has become extremely distorted by, for example, noisy adjacent service branch loads or an overburdened fuel generator source.

Operation on-battery is limited in duration and is dependent upon available battery capacity and load. Local users are alerted to this mode of operation by visual and audible indicators. When on-battery, the UPS displays available run time and emits a sequence of four "beeps" every 30 seconds. During an extended utility failure, the battery capacity will eventually become too low to support the load and the UPS will shut down. The UPS will alert the user to a low battery condition 2, 5, 7, or 10 minutes prior to shut down, depending upon the user setting. The UPS will emit a "beep" once every second to warn local users of the low battery condition. The UPS alerts remote users to on-battery operation and low battery conditions via serial communications or simple signalling from the computer interface port.

5.1.5 Bypass mode

When in the bypass mode of operation, the load is supplied power conditioned by the Isolation Unit. However, the load will not be protected from utility voltage sags, swells or blackouts. The UPS will automatically transfer to bypass operation when a failure occurs within the Electronics Unit. Detected EU failures include blocked fan, battery charger fault, overtemperature and welded main relay; see section 7.2 for a complete list of fault messages. The UPS will also automatically transfer to bypass if the EU separating screw is loosened (as if the EU were to be pulled off the IU). A manual bypass switch located on the EU is used when maintenance of the EU is required. In all cases, the UPS must be returned to on-line operation manually.

Local users are alerted to this mode of operation by visual and audible indicators. When in bypass, the UPS displays the reason for bypass (fan failure, EU switch actuated, etc.) and "beeps". The UPS alerts remote users to the bypass conditions via serial communications from the computer interface port.

5.1.6 Transfer between modes of operation

Transfer of load power to and from all modes of operation occurs synchronously with the utility voltage phase. See the **Specifications** section of this manual for transfer time ratings.

5.2 Display and Controls Operation

The UPS is equipped with a 2x16 character back lit liquid crystal display (LCD) and three button keypad user interface. The display is structured with five main menu screens and a default screen. Each main menu screen allows access to several sub-menu screens. Using the pushbuttons, the user can scroll through the menus and access information or control choices for UPS operation, status, diagnostics, set-up, and tests. The main menu and sub-menu selections are described in the following sections.

5.2.1 Default screens

```
OnLine xxx% Load
Press Any Key
```

```
On Battery
xxx Mins Remain
```

```
In Bypass Mode
Press Any Key
```

The UPS's mode of operation is displayed by the default screen. Important fault messages are also communicated by the default screen. The UPS will show the default screen and the main menu screens when the Menu key is successively pressed. The UPS will automatically show the default screen after there has been no keypad activity in the previous 3 minutes or whenever warranted by a change in mode of operation or failure. Examples of the most common default screens are shown at the left.

5.2.2 Main menu screens

```
UPS Control
Menu Scroll
```

```
UPS Status
Menu Scroll
```

```
UPS Diagnostics
Menu Scroll
```

```
UPS Setup
Menu Scroll
```

```
UPS Tests
Menu Scroll
```

The UPS will show the main menu screens when any default screen key is pressed or when the Menu key is successively pressed. The five main menu screens are show in order at the left.

The main menu screens allow access to screens that display operational choices or show information on UPS status, diagnostics, set-up and tests. Access to the sub-menu screens is gained by pressing the Scroll key. To return to the main menu, press the Menu key.

5.2.3 UPS Control menu

The UPS Control menu allows the user to access sub-menus that show UPS switch on/off and bypass in/out operation choices. To avoid accidentally powering or unpowering the load when a UPS on/off control choice is mistakenly entered, the UPS will ask the user to confirm the choice.

5.2.4 UPS Status menu

The UPS Status menu allows the user to access sub-menus that show UPS, Battery Pack, utility, and load parameter values. These parameters are described below.

Line = xxx.x VAC
Menu Scroll

This screen shows the true rms input line voltage. The accuracy of this measurement is $\pm 5\%$ of the full scale value of 285 Vac.

Output=xxx.x VAC
Menu Scroll

This screen shows the UPS's true rms line-line output voltage. The accuracy of this measurement is $\pm 5\%$ of the full scale value of 285 Vac.

Load = xxx.x %
Menu Scroll

This screen shows the applied load as a percentage of the UPS's full rated capacity. The accuracy of this measurement is $\pm 4\%$ of the full scale value of 105%.

Est run xxx min
Menu Scroll

This screen shows the estimated run time available in minutes. The indication is based on available battery capacity and the applied load. The UPS keeps track of changing battery performance and adjusts the available run time indicated for weak batteries nearing the end of their service life.

Temp= xx.x °C
Menu Scroll

This screen shows the internal temperature of the Electronics Unit in degrees Centigrade. The indicated temperature rises when the UPS is operating on-battery and when the ambient temperature rises.

Battery= xxx.x %
Menu Scroll

This screen shows the available battery capacity as a percent of the fully charged condition.

Line = xx.xx Hz
Menu Scroll

This screen shows the frequency to which the UPS's output is synchronized. The accuracy of this measurement is $\pm 1\%$ of the full scale value of 63 Hz.

Batt packs: xx
Menu Scroll

This screen shows the number of Battery Packs connected in the system.

XR packs: xx
Menu Scroll

This screen shows the number of XR Battery Packs connected in the system.

BAD batts: xx
Menu Scroll

This screen shows the number of bad or worn battery Packs connected in the system. To identify the bad Battery Packs, locate the packs having an illuminated Replace Battery indicator.

5.2.5 UPS Diagnostics menu

The UPS Diagnostic menu allows the user to access information that may be useful when troubleshooting the UPS.

UPS id: xxxxxxxx
Menu Scroll

This screen shows the UPS's identity name. The name set by the factory can be changed to an 8 character alphanumeric name using optional UPS monitoring application software.

UPS SN: xxxxxxxx
Menu Scroll

This screen shows the UPS's serial number set by the factory.

UPS MFG xx/xx/xx
Menu Scroll

This screen shows the UPS's date of manufacture set by the factory.

Batt: xx/xx/xx
Menu Scroll

This screen shows the date of the last Battery Pack replacement. It is set to the date of manufacture by the factory. The date set by the factory can be updated when new Battery Packs are installed using optional UPS monitoring application software.

UPS FW rev: xxM
Menu Scroll

This screen shows the firmware instruction set revision for the Electronic Unit's UPS control microprocessor.

Display rev: xx
Menu Scroll

This screen shows the firmware instruction set revision for the Electronic Unit's display microprocessor.

Bad batts: xx
Menu Scroll

This screen shows the number of bad or worn Battery Packs connected in the system. To identify the bad Battery Packs, locate the packs having an illuminated Replace Battery indicator.

Flood batt: xx
Menu Scroll

This screen shows the number of Battery Packs reporting that their voltage level has reached the proper "float" voltage.

Batt = xx.xx VDC
Menu Scroll

This screen shows the UPS's battery voltage. The accuracy of this measurement is $\pm 5\%$ of the full scale value of 68 Vdc.

Xfer:xxxxxxxxxx
Menu Scroll

This screen shows the cause of the latest transfer to on-battery operation. This information is updated each time the UPS is caused to transfer to on-battery operation.

- If the UPS has transferred to on-battery operation due to a utility voltage notch or spike, the display will report the transfer cause as a notch/spike.
- If the UPS has transferred to on-battery operation due to an unacceptable rate of change in the output voltage, the display will report the transfer cause as dV/dt.
- If the UPS has transferred to on-battery operation to maintain proper output voltage regulation in response to high or low utility voltage, the display will report the transfer cause as Hi Line V or Lo Line V.
- If the UPS has transferred to on-battery operation to conduct battery tests, the display will report the transfer cause as Self test.

Load amps= xx.xx
Menu Scroll

This screen shows the rms current drawn by the UPS's load in Amps. The accuracy of this measurement is $\pm 5\%$ of the full scale value of 35 Amps.

Load VA pct= xxx
Menu Scroll

This screen shows the Volt-Amps drawn by the UPS's load as a percent of full rated capacity. The accuracy of this measurement is $\pm 5\%$ of the full scale value of 105%.

5.2.6 UPS Setup

The UPS Setup menu allows the user access to sub-menus that show special UPS function choices. Function choices are selected with the Select key. Other sub-menus and function choice confirmation can be accessed by pressing the Ok key. The sub-menus and function choices are described below. All sub-menu screens are shown with the factory set function choice.

Note: *Function choice values are subject to change - when necessary, the meaning of new values will be explained in errata sheets.*

Self Test: ON
Menu Select Ok

This screen shows selected UPS self test function choice. The self test determines the readiness of the UPS to supply power to the load in the event of utility failure. The benefit of this test is that the user is warned of conditions that could otherwise cause unexpectedly short run times.

- ON - UPS conducts self test immediately upon start-up.
- OFF - Self test function is disabled.
- 7 day - The UPS conducts the self test automatically upon start-up and once every 7 days thereafter.
- 14 day - The UPS conducts the self test automatically upon start-up and once every 14 days thereafter.

Snstvtty: Auto
Menu Select Ok

This screen shows the selected utility failure sensitivity function choice. The UPS can be set to automatically adapt to utility service conditions where extreme voltage distortion is present or where severe rapid voltage excursions occur. Such conditions are typically created by inexpensive fuel generators or by unusually long branch circuits burdened by heavy cyclic loads. Nearby arc welding or heavy industry equipment can also affect the quality of service.

● AUTO - UPS automatically adapts to utility service quality. This adaptive mode is selected to reduce frequent transfers to on-battery operation which could unnecessarily exercise the battery, shortening its life. Normally, the UPS provides load voltage regulation within a narrow band. In response to rapid and frequent utility voltage fluctuations, the UPS relaxes the load voltage regulation. This relaxed regulation band remains within the bounds recommended by telecommunications and computer manufacturers.

See the **Specifications** section of the manual for the regulation ratings.

- High - UPS remains sensitive to aberrant line voltages. Load voltage regulation stays within the narrow band.
- Low or Medium - UPS is insensitive to aberrant line voltages. The load voltage regulation is relaxed to a widened band.

Upper xfer=240 V
Menu Select Ok

The voltage at which the UPS will transfer to on-battery operation is adjustable for service conditions where extremely high utility voltages persist and it is known that the loads can withstand the elevated voltage.

- When configured for operation from a 208V service, the transfer voltage choices are 240V, 244V, 248V, and 252V.
- When configured for operation from a 240V service, the transfer voltage choices are 276V, 264V, 253V, and 282V.

Lobat warn= 2 m
Menu Select Ok

The minimum interval between activation of the UPS's audible, visual and signalled low battery alarm warnings and shut down of the UPS due to battery capacity exhaustion is user settable.

- The function choices are 2, 5, 7, and 10 minutes.

Sdown Wndo: NO
Menu Select Ok

The UPS may be set to shut down before usable battery capacity is spent. This conserves battery capacity in the event of successive outages.

- The function choices for the amount of on-battery run time to be conserved are NO (none) and 2, 5, and 8 minutes.

Alarm: All imed
Menu Select Ok

For applications where the UPS is used as a remote power source or where the UPS frequently transfers to on-battery operation due to poor service quality, the function of the audible alarm may be altered so that it will not become an annoyance.

- All imed - A sequence of four beeps is sounded immediately upon transfer to on-battery operation. The UPS sounds the beep sequence every 30 seconds while operating on-battery. When low battery conditions are reached, the alarm changes to a beep once every second.
- 30s delay - The on-battery audible alarm is disabled for the first 30 seconds of on-battery operation.
- Low Batt - The audible alarm is disabled during on-battery operation until low battery conditions are reached.
- Disable - The audible alarm is disabled during on-battery operation and low battery conditions.

T-off dly= 20 s
Menu Select Ok

Many computer networks that issue UPS shutdown commands are unable to do so as the last part of a shutdown routine. For these applications, the UPS provides a settable delay interval before shut down to allow the network to finish its shutdown routine.

- Shut down delay function choices are 20, 180, 300, and 600 seconds.

T-on dly = 0 s
Menu Select Ok

A delay interval before energizing the output following return of normal utility voltage, or following a scheduled shut down, may be set by the user. This delay is useful in applications that require staggered power up of equipment connected at various sources.

- Load power delay function choices are 0, 60, 180, and 300 seconds.

Set Output=208 V
Menu Select Ok

This function has no meaning for the 208/240 Vac, 60 Hz version UPS. The display will always respond 208 V.

OutV Report:Auto
Menu Select Ok

The UPS can be set to report the output voltage from either the nominal 208V or 240V output. This can be accomplished regardless of whether the input is configured for operation from 208V or 240V service. When an optional power distribution plate or Power Distribution Unit (PDU) is installed, the UPS should be set to report the correct output voltage. When the Auto function is chosen, the reported nominal output voltage is scaled according to the input tap selected (see section 4.5).

Language:English
Menu Select Ok

The UPS can be set to display all menu choices in either English, French, German, or Spanish.

5.2.7 UPS Tests

The UPS Tests menu allows the user to access sub-menus that show operation confirmation functions.

Alarm Test
Menu Do Scroll

This screen shows the audible alarm test sub-menu. When the Do key is pressed, the UPS will briefly sound the audible alarm.

Battery Test
Menu Do Scroll

This screen shows the battery test sub-menu. When the Do key is pressed, the UPS will perform a self test to determine the readiness of the UPS and the batteries to operate the load while on-battery. When conducting this test, the UPS operates on-battery. The UPS does not signal the on-battery condition at the computer interface port during this test. The display will report PASS or FAIL at the end of the test.

Battery Cal Test
Menu Do Scroll

This screen shows the battery run time calibration test sub-menu. To calibrate the UPS's run time display following installation, press the Do key. If the calibration test is not conducted, the UPS provides only a rough estimate of run time until actual battery statistics can be acquired during an extended utility failure. When the Do key is pressed, the UPS will perform the test only if battery capacity is at 100%. The test is completed and the UPS returns to normal on-line operation when the batteries are discharged to approximately 25% of their full capacity. The calibration test can be aborted at any time during the test.

5.2.8 Password protection

All functions accessed by the UPS Control, UPS Setup and UPS Tests menus may be password protected to prevent operation of the unit in a fashion not intended by the UPS manager. The password settings are accessed by optional UPS monitoring application software.

6.0 UPS Monitoring

6.1 Overview

A UPS system alone provides excellent protection from brief power problems. However, during an extended power outage an unattended computer system will eventually shut down due to battery capacity exhaustion. To prevent data corruption when the UPS shuts down, the computer must be informed by the UPS of *impending* shut down and take appropriate file-saving measures. This important function is called UPS monitoring. The UPS's computer interface port is the means by which your UPS communicates with a computer system.

Some computer operating systems have built-in UPS monitoring. These systems require various hardware interfaces. Interface kits for all operating systems that support UPS monitoring are available from your dealer. In addition, your dealer also offers PowerChute software which enhances such built-in UPS monitoring. Versions of PowerChute are available which add the UPS monitoring function to the many operating systems which do not inherently provide UPS monitoring.

6.2 Interface Kits

A series of interface kits is available for operating systems that provide UPS monitoring. Each interface kit includes the special interface cable required to convert status signals from the UPS into signals which individual operating systems recognize. Each kit includes all necessary installation instructions. Systems for which interface kits are offered include Novell, LAN Manager, LANtastic, Banyan VINES and IBM AS/400.

6.3 PowerChute Software

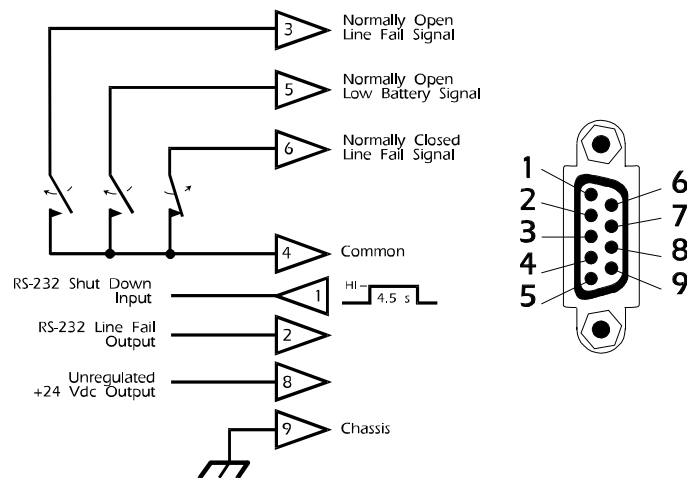
PowerChute software provides complete data protection for most operating systems. This software is a background process that monitors the UPS through a RS-232 serial port on the host. PowerChute offers user notification of impending shutdown, power event logging, auto-restart upon power return and UPS battery conservation features. For selected operating systems, PowerChute offers sophisticated power diagnostic and network power management features. These include interactive battery testing; scheduled server shutdowns, reboots and battery testing; detailed power quality logging and a remote, real time, graphical power status display showing UPS loading and battery conditions. PowerChute is available for many platforms including Novell, OS/2, AppleShare, XENIX, most UNIX-based operating systems, and DEC VAX/VMS.

Caution: *Use only factory supplied or authorized UPS monitoring cables!*

6.4 Computer Interface Port

The computer interface port is diagrammed below for your reference. Those with technical abilities wishing to use this port in a special application should be aware of the following limitations and capabilities of the interface.

- Outputs at pins 3, 5 and 6 are actually open collector outputs which must be pulled up to a common referenced supply no greater than +40 Vdc. The transistors are capable of a maximum non-inductive load of 25 mAdc. Use only Pin 4 as the common.
- The output at Pin 2 will generate a LO to HI RS-232 level upon transfer of the output load to power derived from the UPS's battery. The pin is normally at a LO RS-232 level.
- The UPS will shut down when a HI RS-232 level, sustained for 4.5 s, is applied to Pin 1. The UPS responds to this signal, following a delay, only during utility failures (load is operating from the UPS's internal power source).
- An unregulated +24 Vdc appears at Pin 8 of the interface port whenever the UPS is powered. The supply is limited to 40 mAdc maximum.

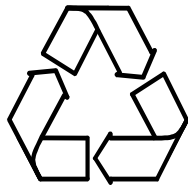


7.0 Difficulty



CAUTION !

- This Uninterruptible Power Source contains potentially hazardous voltages. Do not attempt to disassemble the unit. The unit contains no user serviceable parts. Repairs are performed only by factory trained service personnel.
- This Uninterruptible Power Source uses batteries. The batteries will eventually become too weak to provide rated autonomous operation. To obtain battery replacement or repair service, please call the Customer Service telephone number written on the cover of this manual for information on the Service Center nearest you.



- **The batteries used by this Uninterruptible Power Source are recyclable. Proper disposal of the batteries is required. The batteries contain lead and pose a hazard to the environment and human health if not disposed of properly. Please refer to local codes for proper disposal requirements or return the unit to a factory authorized Service Center for battery replacement or disposal.**
- Battery replacement should be performed or supervised by personnel familiar with the danger of batteries and the required precautions. Keep unauthorized personnel away from batteries. When replacing batteries, use the same number and type of sealed lead acid batteries as were originally contained in your UPS.
- **CAUTION** - Do not dispose of battery or batteries in a fire. The batteries may explode.
- **CAUTION** - Do not open or mutilate the battery or batteries. They contain an electrolyte which is toxic and harmful to the skin and eyes.
- **CAUTION** - A battery can present a risk of electrical shock and high short circuit current. When replacing batteries, wrist watches and jewelry such as rings should be removed. Use tools with insulated handles.

7.1 Troubleshooting Chart

Problem	Possible Cause	Action to Take
UPS will not turn on.	The UPS's input circuit breaker is tripped (1/2 of handle is down).	Reduce the load on the UPS by unplugging equipment and reset the circuit breaker.
	EU separating screw is loose.	Tighten the EU separating screw (do not overtighten).
	Circuit closure present at the Emergency Power Off interface.	Check the EPO connections. See section 4.7.
UPS operates on-battery even though normal utility voltage is thought to exist.	Very high line voltage.	Test the line voltage with the UPS voltage meter (see section 5.2.4). If necessary, adjust the UPS upper transfer voltage (see section 5.2.5).
	Highly distorted line voltage.	Inexpensive fuel powered generators can cause distorted line voltages. Desensitize the UPS to the distortion (see section 5.2.5).
UPS beeps occasionally.	This is normal.	None. The UPS is protecting the loads.
UPS does not provide expected back up time.	The UPS's batteries are discharged from recent utility outage.	None. The UPS's batteries require recharging after extended or successive outages.
	The UPS's batteries are weak due to age or wear.	The batteries wear faster when put into service often and when operated at elevated temperatures.
UPS display shows "No Battery Communication".	One or more battery pack cables is not properly connected.	Check connections to and from each battery pack and the EU. See section 4.6.
UPS display shows "In Bypass Mode Press Any Key".	Battery pack coupler not properly mated with the EU coupler.	Check battery pack connections. See section 4.5.
	Input circuit breaker cycled on-off-on too quickly.	Follow display prompts to return to normal on-line operation.
UPS display shows "UPS in BYPASS chk rear switch"	The manual bypass switch at the rear of the EU is in the bypass position.	Change the switch setting to resume normal on-line operation.
Output voltage reading incorrect after installation of a new power distribution plate.	Output voltage reporting incorrectly set.	Change the output voltage reporting setup. See section 5.2.6.
Output voltage outside rated regulation band.	Upper transfer voltage set higher than the factory setting.	If necessary, change the upper transfer voltage setting. See section 5.2.5.
	The UPS has relaxed load voltage regulation to compensate for distorted or fluctuating utility voltage.	Set the UPS's utility failure sensitivity to "High" to maintain narrow band regulation. See section 5.2.5.
The UPS does not power the load immediately following the return of normal utility voltage.	The turn on delay set to a non-zero value.	Set the turn on delay to the desired value. See section 5.2.6.

7.2 Fault Messages

The UPS will display one of the below illustrated screens when a fault internal to the UPS has been detected. See section 7.5 which covers obtaining service.

7.2.1 Replace Electronics Unit (EU)

DC imbalance
Call for service

A DC imbalance fault results in bypass operation - load power is lost during a utility failure.

WARNING!
UPS too Hot!

Overheating within the EU results in bypass operation - load power is lost during a utility failure.

Top fan fault
UPS on Battery

Failure of either EU fan while operating on-battery may cause overheating within the EU. Overheating while on-battery will result in the loss of load power.

Top fan fault
UPS in Bypass

Failure of either fan while operating on-line will result in bypass operation - load power may be lost during a utility failure.

Battery charger
has failed!

A battery charger fault results in bypass operation - load power is lost during a utility failure.

Main relay fault
call for service

A main relay fault results in loss of load power. Remove the EU to resume load power in the bypass mode - load power is lost during a utility failure.

7.2.2 UPS requires service

Bottom fan fail
call for service

The UPS may remain operating when this IU fan fault message is encountered. Schedule UPS service when convenient.

Aux Pwr Sup Fail
call for service

Do not attempt manual bypass operation when this fault message is encountered as load power will be lost. Schedule UPS service when convenient.

Out V selct fail
call for service

If the input voltage tap configuration has been changed, a qualified technician should reinspect the connections - see section 4.5. An output voltage select fault results in bypass operation - load power is lost during a utility failure.

Bypass rly fault
call for service

A bypass relay fault will result in permanent bypass operation - load power will be lost during a utility failure.

7.2.3 Battery status

The UPS's battery status displays alert you to problems with the batteries connected to the UPS

Check batt pack
connections

This screen indicates that there may be problems with the connections between Battery Packs or between the UPS and the Battery Packs.

Batt too low
cannot start

This screen indicates that the UPS's batteries are too low to support the load connected to the UPS. The UPS cannot restart until the batteries have recharged.

Battery packs
need replacement

This screen indicates that one or more battery packs connected to the UPS need to be replaced. Check the Replace Battery indicators on the front of the Battery Packs to see which ones need to be replaced.

No Battery
communication

This screen indicates that the UPS cannot establish communications with any Battery Packs. Verify that the battery communications cables are secure.

Number battery
packs changed

This screen indicates that the UPS detected a change in the number of Battery Packs connected to the UPS. Check that the number of battery packs connected to the UPS matches the number shown on the display. If the numbers do not match, check the battery communications cable connections.

Low battery
Load is off

Press a key to clear the message.

This screen indicates that the battery is low and requires recharging after an extended mains failure (on-battery). The load has been shut off.

7.3 Replacing the Electronics Unit

The UPS allows replacement of a failed Electronics Unit without interruption of power to the load.

The Isolation Unit is capable of autonomous operation and provides power to the load isolated from EMI/RFI noise and surges.

To replace a failed EU, follow the procedures listed below.

7.3.1 Put the UPS into the bypass mode of operation by actuating the manual bypass switch at the rear of the EU.

Note: Transfers to bypass mode using the manual bypass switch occur within 10 mS typically. The transfer back from the bypass mode occurs in 0 mS.

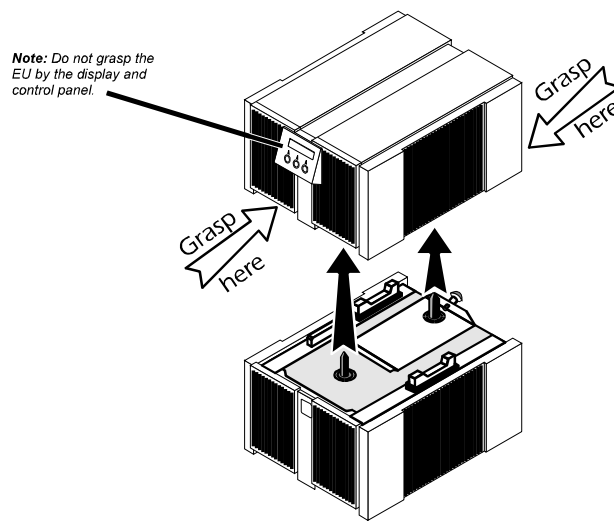
7.3.2 Using a coin or large flat blade screwdriver, unscrew the EU separating screw and pull back.

7.3.3 Using a Phillips screwdriver, loosen the Battery Pack coupler lock at the rear of the EU and disconnect the pack coupler. Disconnect the Battery Pack communications cable from the jack at the rear of the EU.

7.3.4 If necessary, disconnect cables connected at the computer interface port and the Emergency Power Off interface.

7.3.5 Grasp the EU at the slots shown in the illustration and pull straight up and away from the IU.

7.3.6 Follow the above procedures in reverse to install the replacement EU. Once the replacement EU is installed, press any key to regain control of the UPS.



7.4 Replacing or Adding Battery Packs

You can expect to receive 3 to 6 years of service life from the Battery Packs when installed in a cool, dry location. The Battery Pack's life is shortened when operated in an environment where the ambient temperature is normally above 30°C (86°F).

Battery packs
need replacement

The Electronics Unit will display this message when any one of the connected Battery Packs require replacement. Battery Packs that can no longer sustain a charge are identified by an illuminated Replace Battery icon.

Battery Packs can be added or replaced at any time, regardless of mode of operation. See the procedures listed below to replace a worn Battery Pack.

Caution: If the first Battery Pack in the string (connected directly to the Electronics Unit) is replaced, the UPS will not be able to support the load in the event of a utility failure during the time that the battery string is uncoupled from the EU. Always place the UPS in bypass when this Battery Pack is replaced.

7.4.1 Disconnect both INPUT and OUTPUT battery communications cables connected at the worn Battery Pack.

7.4.2 Remove the clamps securing the in-line coupler and panel coupler (if necessary) at the worn Battery Pack.

7.4.3 Unmate the couplers at the worn Battery Pack and return it to the factory for recycling.

7.4.4 If necessary, remove the panel coupler clamp. Set the new Battery Pack in place.

7.4.5 Mate the in-line and panel couplers on the new Battery Pack.

7.4.6 Secure the couplers with the coupler clamps.

7.4.7 Plug-in the battery communications cables at the new Battery Pack. See the illustration in section **4.9.6**.

Number battery
packs changed

Note: Always check the number of Battery Packs reported by the UPS (UPS Status menu) after connecting the new Battery Packs.

No Battery
communication

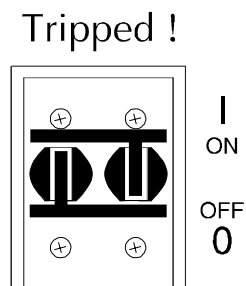
Note: If this fault message is encountered, check the communications cables to, and from each Battery Pack. See section **4.9.6**.

7.5 Obtaining Service

The troubleshooting chart in section 7.1 covers most of the difficulties that a user may encounter under conditions other than a failure of the UPS itself. For problems not covered in the chart, or when the UPS's display shows Call for service, the procedures outlined below should be followed.

If your UPS should require service:

- See the troubleshooting chart and eliminate the obvious. **A tripped UPS circuit breaker is the most common problem encountered and is user resettable once excessive loads are unplugged from the UPS.**



- If the circuit breaker is OK, note your UPS model, serial number and date of purchase. Contact the Customer Service Department at the phone number given on the cover of this booklet.
- Be prepared to provide a description of the problem. A technician will help you solve the problem over the phone if possible, or will give you a Return Material Authorization Number (RMA#).
- If the UPS is within the warranty period, repairs will be performed free of charge. If it is not within the warranty period, there will be a charge for repair.
- Pack the UPS in its original packaging. *If you no longer have the original shipping materials, ask the technician about obtaining a new set.* It is very important that you pack the UPS properly to avoid damage in transit. Never use styrofoam beads for packaging a Battery Pack or Electronics Unit because they will settle through beads and become damaged. Damages sustained in transit are not covered under warranty. Enclose a letter in the package with your name, RMA#, address, copy of sales receipt, description of trouble, phone number and check (if necessary).
- Mark your RMA# on the outside of the package. *The factory cannot accept any package without this marking.*
- Return your UPS via insured, prepaid carrier to the address on the rear of this booklet.

8.0 Storing the UPS

8.1 Storage Conditions

The UPS should be covered and stored in a cool dry location. The UPS should be stored with the Battery Packs in a fully charged state. That is, the reported battery capacity should be at 100% before the UPS is switched off for storage. Disconnect the Battery Packs from the UPS and from each other (where applicable). Store the Battery Packs in an upright position.

8.2 Extended Storage

To achieve expected run time following extended storage, the UPS should be allowed to refresh the Battery Packs every 6 months in environments where the ambient temperature is -15°C to $+30^{\circ}\text{C}$ (5°F to 86°F). For extended storage in environments where the ambient temperature is $+30^{\circ}\text{C}$ to $+45^{\circ}\text{C}$ (86°F to 113°F), the UPS should be allowed to refresh the Battery Packs every 3 months.

9.0 Specifications

Note: Where specification ratings differ, values for the UPS configured for 240 Vac operation are given in brackets [].

9.1 Input

Nominal input voltage: single phase 208 Vac [240 Vac].

Nominal input frequency: 60 Hz.

On-line efficiency @ full load: $> 92\%$, $> 93\%$ with fully charged batteries for the 3000VA and 5000VA models, respectively.

Input circuit breaker: 20 Amp, 30 Amp; for the 3000VA and 5000VA models, respectively.

Input connector: NEMA L6-30P (250V/30A).

9.2 Transfer Characteristics

Frequency limits for on-line operation: 60 Hz, $\pm 5\%$.

Input voltage limits for on-line operation: -25% to $+15\%$ of the nominal input voltage.

Transfer to/from on-battery: 0 ms typical with computer loads, 1.5 ms maximum. Transfer occurs synchronous with the utility voltage phase.

Transfer to/from bypass: Transfers to and from bypass occur synchronously with the utility voltage phase. Transfers both to and from bypass mode occur in 0 mS typically.

9.3 Output Characteristics

Maximum load: 3000 VA or 2250 W @ 0.75 power factor; 4700 VA or 3750 W @ 0.8 power factor [5000 VA, 3750 W @ 0.75 power factor] for the 3000VA and 5000VA models, respectively.

Nominal output voltages: 208 Vac / 120 Vac [240 Vac / 120 Vac].

On-line voltage regulation: $\pm 5\%$. When "Auto" or "Low" utility failure sensitivity is selected by the user, the output voltage regulation may become relaxed to $+5\%$, -12% .

On-line frequency regulation: 60 Hz, $\pm 5\%$ (synchronized to the utility).

On-battery output voltage regulation: $\pm 5\%$.

On-battery output frequency regulation: 60 Hz, ± 0.1 Hz unless synchronized to utility frequency during utility brownout.

On-battery output voltage total harmonic distortion: $< 5\%$.

Protection: overcurrent and short circuit protected, latching shutdown upon overload.

Output connections: (6) NEMA 5-15R receptacles, (1) NEMA L14-30R receptacle, and (2) NEMA L6-30R receptacles.

9.4 Noise and Surge Isolation

Isolation: galvanic isolation, output neutral bonded to ground.

Normal mode EMI/RFI noise attenuation: 40 to 60 dB over 100 kHz to 30 MHz range.

Common mode EMI/RFI noise attenuation: 40 to 60 dB over 100 kHz to 30 MHz range.

Normal mode let-through: < 1% of applied ANSI C62.41 Category A or B ± 6 kV test.

Common mode let-through: < 2% of applied ANSI C62.41 Category A or B ± 6 kV test.

9.5 Battery Pack

Battery type: spill proof, maintenance free sealed lead-acid.

Nominal battery pack voltage: 48 Vdc.

Typical battery life: 3 to 6 years (depends upon number of discharge cycles and normal ambient temperature).

Recharge time: see table in section 9.9.

Maximum number of Battery Packs: limited only by desired recharge time.

9.6 Environment

Operating temperature: 0°C to 40°C (32°F to 104°F).

Storage temperature: -15°C to 45°C (5°F to 113°F).

Operating and storage relative humidity: 0 to 95%, non-condensing.

Operating elevation: 0 to 3,000 m (10,000 ft).

Storage elevation: 0 to 15,000 m (50,000 ft).

Electromagnetic immunity: IEC 801-2, 801-3, 801-4, 801-5; severity level III or IV.

Audible noise: < 55 dBA at 1 m (3 ft).

9.7 Physical

UPS dimensions (EU and IU mated): 17.8" H x 13.8" W x 17.8" D (45.2 x 35.1 x 45.2 cm).

Battery pack dimensions: 9.1" H x 6.9" W x 17.8" D (23.1 x 17.5 x 45.2 cm).

UPS weight (EU and IU mated): 145 lb (65.8 kg), 176 lb (79.8 kg) for the 3000VA and 5000VA models, respectively.

Electronics Unit (EU) weight: 40 lb (18.1 kg), 45 lb (20.4 kg) for the 3000VA and 5000VA models, respectively. Add 8 lbs (3.6 kg) for shipping independent of IU.

Battery pack weight: 64 lbs (29.0 kg). Add 5 lbs (2.3 kg) for shipping independent of UPS.

Total shipping weight - 3000VA model: 244 lb (110.7 kg). Includes weight of packaging, mated EU and IU, and one (1) Battery Pack.

Total shipping weight - 5000VA model: 344 lb (156.0 kg). Includes weight of packaging, mated EU and IU, and two (2) Battery Packs.

Color: beige.

9.8 Approvals

Safety approvals: UL per 1778, CSA per C22.2.

EMC verification: FCC, CDC Class A verified.

9.9 Typical On-Battery Run Times

Typical On-Battery Run Time Versus Load, 3000 VA Matrix-UPS with SmartCells, in Hours								
	Number of SmartCells							
Computer Load (VA)	1	2	3	4	5	6	7	8
250	3.07	7.20	11.56	15.93	20.29	24.65	29.02	33.38
500	1.46	3.52	5.80	8.24	10.69	13.13	15.57	18.01
1000	0.57	1.46	2.46	3.52	4.58	5.80	7.02	8.24
1500	0.33	0.83	1.46	2.11	2.81	3.52	4.23	4.99
2000	0.22	0.57	0.99	1.46	1.93	2.46	2.99	3.52
2500	0.17	0.46	0.78	1.18	1.59	1.99	2.45	2.90
3000	0.13	0.36	0.62	0.92	1.25	1.59	1.92	2.30
	Recharge Time, in Hours							
	1.2	2.8	2.7	3.8	4.9	6	7	8.1
Calculations based on loads with a .75 power factor. Lower power factor loads will yield higher run times. Run times are typical at 25° C (77° F). Recharge times to 90% of rated capacity after discharge into 50% of rated load.								

Typical On-Battery Run Time Versus Load, 3000 VA Matrix-UPS with SmartCell XR Battery Packs, in Hours								
	Number of SmartCell XR Battery Packs							
Computer Load (VA)	1	2	3	4	5	6	7	8
1000	3	6.75	10.75	14.75	18.75	22.75	26.75	30.75
1500	1.8	4.3	6.9	9.5	12.1	14.7	17.3	19.9
2000	1.2	3	5	7	9	11	13	15
2500	0.9	2.4	4	5.6	7.2	8.8	10.4	12
3000	0.75	1.8	3.25	4.7	6.15	7.6	9.05	10.5
	Recharge Time, in Hours							
	3.8	8.1	12.5	16.9	21.3	25.7	30.1	34.5
Calculations based on loads with a .75 power factor. Lower power factor loads will yield higher run times. Run times are typical at 25° C (77° F). Recharge times to 90% of rated capacity after discharge into 50% of rated load.								

Typical On-Battery Run Time Versus Load, 5000 VA Matrix-UPS with SmartCells, in Hours								
	Number of SmartCells							
Computer Load (VA)	2	3	4	5	6	7	8	
500	3.07	5.02	7.20	9.38	11.56	13.75	15.93	
1000	1.46	2.46	3.52	4.58	5.80	7.02	8.24	
1500	0.83	1.46	2.11	2.81	3.52	4.23	4.99	
2000	0.57	0.99	1.46	1.93	2.46	2.99	3.52	
2500	0.46	0.78	1.18	1.59	1.99	2.45	2.90	
3000	0.36	0.62	0.92	1.25	1.59	1.92	2.30	
4000	0.24	0.42	0.62	0.83	1.08	1.33	1.59	
5000	0.17	0.31	0.46	0.62	0.78	0.98	1.18	
	Recharge Time, in Hours							
	2.8	2.7	3.8	4.9	6	7	8.1	
<p>The case of one SmartCell does not apply to 5000 VA Matrix-UPS. Calculations based on loads with a .75 power factor. Lower power factor loads will yield higher run times. Run times are typical at 25° C (77° F). Recharge times to 90% of rated capacity after discharge into 50% of rated load.</p>								

Typical On-Battery Run Time Versus Load, 5000 VA Matrix-UPS with SmartCell XR Battery Packs, in Hours									
	Number of SmartCell XR Battery Packs								
Computer Load (VA)	1	2	3	4	5	6	7	8	
1000	3	6.75	10.75	14.75	18.75	22.75	26.75	30.75	
1500	1.8	4.3	6.9	9.5	12.1	14.7	17.3	19.9	
2000	1.2	3	5	7	9	11	13	15	
2500	0.9	2.4	4	5.6	7.2	8.8	10.4	12	
3000	0.75	1.8	3.25	4.7	6.15	7.6	9.05	10.5	
4000	0.53	1.25	2.25	3.25	4.25	5.25	6.25	7.25	
5000	0.37	0.9	1.6	2.4	3.2	4	4.8	5.6	
	Recharge Time, in Hours								
	3.8	8.1	12.5	16.9	21.3	25.7	30.1	34.5	
<p>Calculations based on loads with a .75 power factor. Lower power factor loads will yield higher run times. Run times are typical at 25° C (77° F). Recharge times to 90% of rated capacity after discharge into 50% of rated load.</p>									