
HA1000

EK-SPUPS-IN-001

# HA 1000 Series UPS Operator/Installation Manual

**WARNING:**
**This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing device pursuant to Subpart J of Part 15 of the 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 required to correct the interference.**



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Printed in U.S.A.

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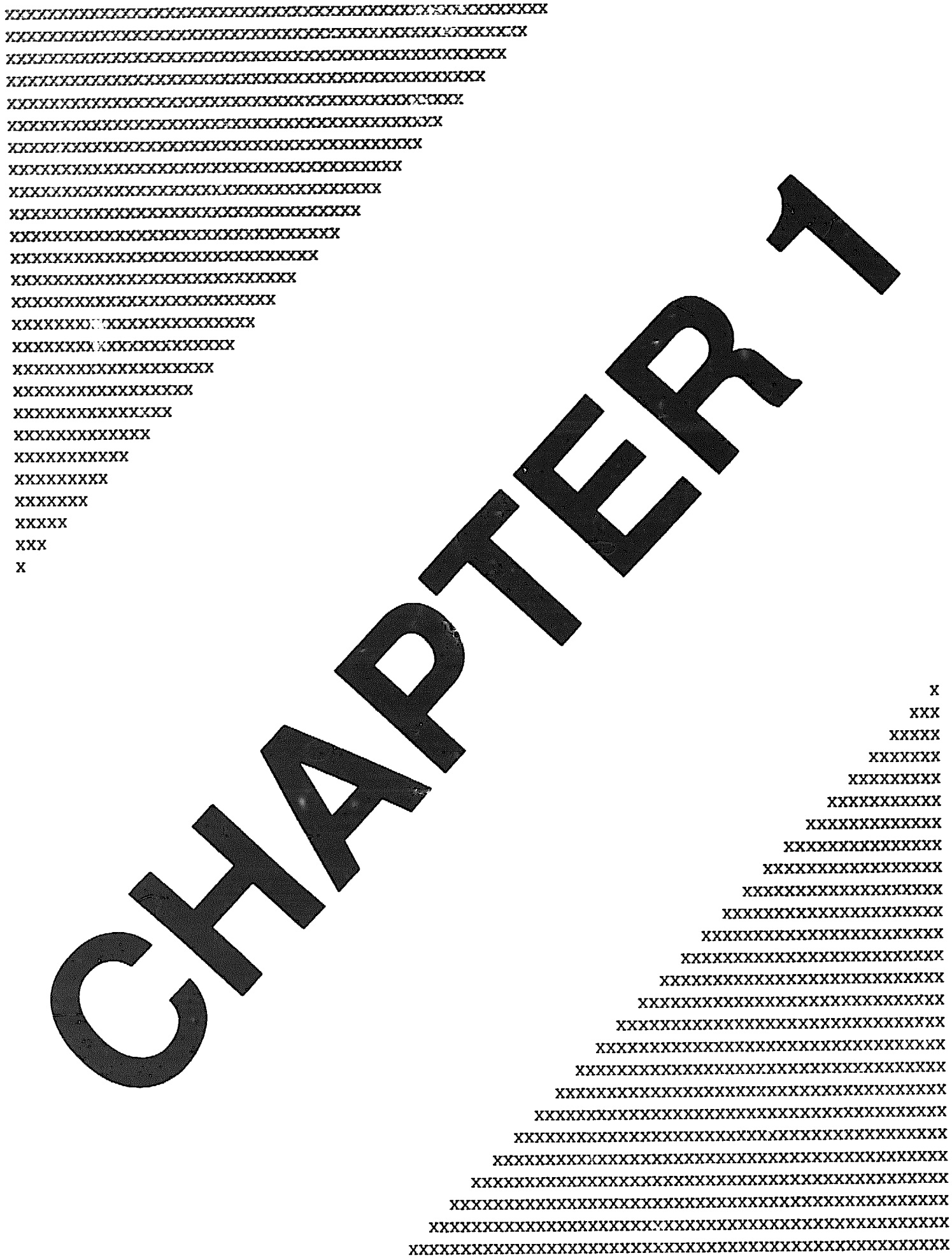
CHAPTER 1

# 1. OVERVIEW

## 1.1. INTRODUCTION

This document describes the features of the HA1000 Uninterruptible Power System (UPS) and gives normal and emergency operating procedures. It also gives installation and routine maintenance instructions.

The functions of the UPS are largely automatic. It requires little attention during normal operation. However, a thorough understanding of the operating procedures described in this manual is essential for continued trouble-free operation and for recovery from abnormal operating modes. In particular you should be thoroughly familiar with the Emergency Power Off procedure.

## 1.2. EQUIPMENT SPECIFICATIONS

| | 3 kVA | 5 kVA | 10kVA |
|---|---|---|---|
| **System Input Characteristics** | | | |
| Input Voltage: | | | |
| 60Hz<br>50 Hz | 120, 208, 240<br>220, 230, 240 | 120, 208 240<br>220, 230, 240 | 208, 240<br>220, 230, 240 |
| Input Voltage Variation: | +13/-20 | +13/-20 | +13/-20 |
| Input Power Factor: | .9 | .9 | .9 |
| Input Current Distortion:<br>*(10% max. with 100% non-lineaer load)* | 5% typical | 5% typical | 5 % typical |
| Input Surge Protection: | IEEE 587 | IEEE 587 | IEEE 587 |
| **Battery Characteristics** | | | |
| Type: | YUASA<br>NP Series | YUASA<br>NP Series | YUASA<br>NP Series |
| Battery Time:<br>*(Minimum, @ .8 pf and full load)* | 9 minutes | 13 minutes | 12 minutes |
| Life Expectancy: | 5 yrs | 5 yrs | 5 yrs |

| | | | |
|---|---|---|---|
| DC Bus: | 135 VDC | 135 VDC | 270 VDC |
| **System Output Characteristics** | | | |
| Output Power Ratings: | 3 kVA | 5 kVA | 10 kVA |
| Output Load Crest Factor: | 3.0 to 1.0 | 3.0 to 1.0 | 3.0 to 1.0 |
| Output Voltage:<br>(60 Hz)<br>(50 Hz)<br>*(Input V must equal Output V for 3 and 5kVA units.)* | 120, 208, 240<br>or 240/120<br>220,230,240 | 120, 208, 240<br>or 240/120<br>220, 230, 240 | 120, 208, 240<br>or 240/120<br>220, 230, 240 |
| Output Voltage Regulation: | +/-2% | +/-2% | +/-3% |
| Output Frequency: | 50 or 60 Hz | 50 or 60 Hz | 50 or 60 Hz |
| Output Frequency Regulation: *(free run)* | +/-.1 Hz | +/-.1 Hz | +/-.1 Hz |
| Output Voltage THD: | 3% | 3% | 3% |
| Output Power Factor: | .8 lag to .9 lead | .8 lag to .9 lead | .8 lag to .9 lead |
| Output Overload Capability: | 100%/1min<br>200%/10 cyc | 100%/1 min<br>200%/10 cyc | 100%/1 min<br>200%/10 cyc |
| Overall Efficiency: (full load) | 90% | 90% | 90% |
| Common Mode Noise | | | |
| Attenuation: | 55 db to 500 kHz | 55 db to 500 kHz | 60 db to 100kHz |
| **Environmental Specifications** | | | |
| Ambient Temp./Operational: | 10° to 40° C<br>50° to 105° F | 10° to 40° C<br>50° to 105° F | 10° to 40° C<br>50° to 105° F |
| Ambient Temp./Storage: | -20° to 60° C<br>-5° to 140° F | -20° to 60° C<br>-5° to 140° F | -20° to 60° C<br>-5° to 140° F |
| BTUs | 1536 | 2560 | 5670 |
| Operating Humidity:<br>*(non-condensing)* | 95% | 95% | 95% |
| *Acoustic Noise: (1 meter)* | 50 db | 50db | 60db |
| Operating Altitude: | 1828.8 m<br>(6000 ft) | 1828.8 m<br>(6000 ft) | 1828.8 m<br>(6000 ft) |

| | | | |
|---|---|---|---|
| Weight: *(including standard battery)* | 204.1 kg (450 lb) | 317.5 kg (700 lb) | 671.4 kg (1480 lb) |
| **Dimensions** | | | |
| Width: | 43.2 cm/17 in | 70 cm/27 in | 111.8 cm/44 in |
| Depth: | 65 cm/25.6 in | 65 cm/25.6 in | 65 cm/25.6 in |
| Height: *(includes casters)* | 95 cm/37.5 in | 95 cm/37.5 in | 95 cm/37.5 in |
| **Agency Approvals** | | | |
| | U.L. 1012<br>FCC Part 15<br>Subpart J,<br>Class A | U.L.1012<br>FCC Part 15<br>Subpart J,<br>Class A | U.L.1012<br>FCC Part 15<br>Subpart J,<br>Class A |

## 1.3. GENERAL DESCRIPTION

The HA1000 Uninterruptible Power System (UPS) will provide non-stop, high quality AC power for critical electronic equipment. The UPS filters momentary dips, surges and interruptions present in utility power. The equipment (critical load) is supplied with conditioned power that is synchronized with the utility power.

If utility power is interrupted, or goes outside predetermined parameters, the UPS acts as an emergency power supply to sustain power to the critical load for a specified maximum period. Transfer is transparent to the load. Backup power enables appropriate action so that shut-down, or transfer to an alternative power system can be conducted in an orderly manner.

Standard features of the UPS include:

- Compact size and low weight giving transportability
- Wide choice of AC supply receptacles
- Alarm condition sensing and reporting
- Display of vital system parameters
- User-friendly operation, low maintenance and ease of service
- Aesthetically attractive for office and computer room environments
- UPS and Batteries are self-contained in one unit

- Communications for remote monitoring of system status via RS232 serial interface.
- Emergency power off (local)
- CSA version
- Maintenance Bypass Switch to isolate the UPS inverter output and static bypass transfer switch for maintenance.

The UPS is available in three capacities: 3 kVA, 5 kVA and 10 kVA. Refer to the SPECIFICATIONS for functional differences. Extra back-up time is available with optional extra battery cabinets which are "daisy-chained" to the UPS cabinet with its existing battery back-up.

## 1.4. OPTIONS AND ENHANCEMENTS

Following are the main features, supplied initially or as enhancements when required.

**ADDITIONAL BACK-UP TIMES**
Increased emergency back-up time can be obtained by the addition of optional battery cabinet(s).

**REMOTE POWER OFF**
A wall-mounted push-button switch disconnects the UPS and loads from all AC power sources.

**HARDWIRE AC INPUT**
Rear entry knockouts available on all models; bottom entry hardwiring available on 5 and 10 kVA UPS only. Refer to Customer Drawing #110254292 or #110254291 as appropriate for your system.

## 1.5. GENERAL SAFETY CONSIDERATIONS

Personnel associated with the UPS should be aware of the presence of potentially lethal voltages within. Observe the following precautions to ensure personnel safety and continued equipment operation.

### 1.5.1 Operating Environment

- Keep surroundings clean and free from excess moisture.
- Do not operate close to gas or electric heat sources.
- The system is not intended for outdoor use.

- Operating environment should be within parameters described in the Specifications.

### 1.5.2 Normal Operation

- Keep equipment doors closed to ensure proper cooling air-flow and to protect from dangerous voltages within.
- Do not make any assumptions about the electrical state of the UPS. IF IN DOUBT, CHECK WITH A VOLTMETER.
- The UPS contains its own power source.

**WARNING:**
**LIFE-THREATENING VOLTAGES ARE PRESENT EVEN WHEN DISCONNECTED FROM UTILITY POWER.**

### 1.5.3 Maintenance and Service

(To be performed by Qualified Service Personnel Only)

- Ensure that the unit is in Maintenance Bypass or that power is disconnected before performing maintenance or service.
- Observe all DANGER, CAUTION and WARNING notices fixed to the inside or outside of the equipment.
- Always conform to more detailed safety precautions described throughout this manual.

### 1.5.4 Batteries

- The lead-acid batteries are sealed and maintenance-free so no electrolyte or water need be added.

**WARNING:**
**LIFE-THREATENING VOLTAGES ARE ALWAYS PRESENT AT THE BATTERY TERMINALS.**

- The battery electrolyte contains sulfuric acid. If any spillage occurs take the following precautions.
  - » CONTACT WITH SKIN...wash immediately with soap and water. Contact a physician if burns result.
  - » ACID SPLASHES IN EYES - wash eyes for twenty (20) minutes under running water and contact a physician.

*The supplier and manufacturer accept no liability, in negligence or otherwise, for any damage or injury resulting from the user's and/or installer's reliance on information contained in this document. The user/installer is responsible for ensuring that the installation is properly inspected for safety and compliance with all local ordinances, and is suitable for its intended use.*

## 1.6. FUNCTIONAL DESCRIPTION

There are three possible modes of operation of the UPS system, NORMAL, BATTERY, and STATIC BYPASS. Each of these modes supplies AC power to critical loads. In Normal mode the incoming utility AC is filtered and conditioned to provide flawless power to the load. In Battery mode the UPS supplies AC power to the load by inverting a DC power source. Bypass mode allows utility AC to feed the load directly. The UPS automatically switches between these modes, as required, with no operator intervention. To achieve this, sophisticated detection and switching logic are used to ensure that any change-over in mode of operation is automatic and transparent to the load. The UPS monitoring system indicates the current mode of operation and various critical parameters.

In NORMAL MODE conditioned power is supplied to the critical load providing utility power and system loading are within specified parameters. In addition, charging current is provided to the DC power source (Battery cabinet). During this mode the battery charge condition is monitored and reported via alarm lamps. If the utility AC fails, or goes "out-of-spec." the UPS automatically, and instantaneously, switches to Battery Mode operation. The UPS will automatically return to Normal mode when the utility power restores to within specified limits.

BATTERY MODE is initiated automatically if utility power exceeds specified parameters, or if an outage occurs. The system automatically switches to emergency Battery power. In this mode the battery system provides power which is inverted to conditioned AC by a Power Inverter Bridge. This is accompanied by various alarm indications, depending on the cause or extent of the failure, and on the battery charge state. In particular Battery Discharge will be indicated. The system operates in this mode for a pre-determined time, depending on loading, battery condition and the amount of available Battery capacity (number of battery cabinets). When the discharging battery reaches the lower limit of UPS operation the UPS will shutdown and the load will be dropped. A Shutdown Imminent alarm is given prior to this. Warning time depends on battery capacity and the amount of loading. If incoming power returns to within specified parameters before shutdown, then the UPS will automatically return to NOR-

MAL mode and alarm indications will clear. This is not instantaneous. The AC supply will gradually take more of the load until Normal mode is achieved. Low Battery will now be indicated until the battery is once again charged.

In STATIC BYPASS MODE the UPS transfers the critical load directly to the utility AC power, providing that the bypass source is available. This will occur under one of the following conditions:

- Output loading exceeds 106% full load (6% overload) for 10 minutes.
- UPS internal temperature exceeds safe operating range.
- UPS output exceeds specified limits of voltage or waveform distortion.
- Input current exceeds specified limits.
- Initial cold start of system (at installation or after servicing).
- Load current inrush (surge) exceeds peak current capability.
- Key OFF operation.

After output overload failure, input current failure, or 3 consecutive unsuccessful attempts to transfer to Inverter, return to Normal must be done manually. Automatic return to Normal occurs when any other alarm condition clears. Transfer to Normal takes approximately one minute, when the battery is charged.

The UPS has two additional modes: RECHARGE and MAINTENANCE BYPASS.

RECHARGE mode enables the UPS to automatically recover excessively discharged batteries. "BATT FAULT" alarm indication prompts user to recognize mode. System processor controlled; when sequence is complete transfer to Normal Mode is automatic.

MAINTENANCE BYPASS is a make-before-break switch allowing electrical isolation of internal components for service purposes.

## 1.7. CONTROLS AND INDICATORS

During normal operation the UPS functions automatically, with minimal operator intervention. Various operator accessible controls and indicators enable monitoring of the system status, manual transfer between modes, system shut-down and system start-up. Individual functions are described below. Refer to Figures 1-1 - 1-3 for locations.

### 1.7.1 Power Controls

**AC LINE BREAKER**
Switches incoming AC power to Inverter.
ON - Enables NORMAL mode operation when valid.
OFF - BATTERY MODE or STATIC BYPASS valid.

**BATTERY BREAKER**
Switches DC power to the UPS.
ON - DC power available when required.
OFF - No Emergency Power. Only Bypass available.

**STATIC BYPASS BREAKER (10 kVA only)**
Enables utility AC to power the load.

**LOAD BREAKER(S) (when equipped)**
Switches AC power to the critical load.
The MAIN breaker switches all loads.
Individual breakers switch individual loads.

**PRIME PUSHBUTTON**
Push-button for forced start of system (no load only). With no AC input starts under Battery control.

**POWER SUPPLY INDICATOR(LED)**
Lit red when power supplies are operational (not visible with doors closed).

The following two items should only be used by a qualified maintenance technician:

**DC FILTER DISCHARGE PUSHBUTTON**
Discharges DC filter capacitors.

**MAINTENANCE BYPASS SWITCH**

### 1.7.2 Alarm Indicators

These are normally invisible labels, located on the System Status Monitor, which illuminate when the appropriate condition is valid. Except for the first three, they are normally hidden by a hinged cover (refer to Figure 1-4).

**SYSTEM NORMAL**
Lit green when system is operating in NORMAL mode. Extinguishes when not in NORMAL mode.

**ALARM**
Flashes red under alarm condition. Reason for alarm shown by other indicators.

**AC INPUT FAILURE**
Lit red when utility power outside specified parameters. System operating in Battery Mode.

**INVERTER FAILURE**
Lit red to indicate UPS fault or failure (can not recover) to transfer to Normal mode after three attempts. Intervention required.

**LOW BATTERY**
Lit red when Batttery voltage falls below 120 V for 3 kVA and 5 kVA; 240 V for 10 kVA. Goes off when voltage reaches 132 V for 3 kVA and 5 kVA; 264 V for 10 kVA.

**BATTERY DISCHARGE**
Lit red when in Emergency Power mode. Battery current is over -5A.

**OUTPUT OVERLOAD**
Lit red when load exceeds 103% of rated full load (transfer to Static Bypass mode after 10 minutes of 6% or greater overload).

**SYNC LOSS**
Lit red when line frequency outside pre-set limits (±1, $\pm^1/_2$ or ±3 Hz, selected at installation), or power phase angle outside ±5 degrees, of pre-set operating point.

**OVER TEMP**
Lit red when internal UPS temperature exceeds 65 degrees C. System transfers to Static Bypass mode.

**SHUTDOWN IMMINENT**
Lit red when UPS is going to Static Bypass mode as follows:
(a) 6% overload for 8 minutes (shutdown in 2 minutes).
(b) UPS overtemperature & Bypass unavailable for 8 minutes (shutdown in 2 minutes).
(c) Inverter out-of-spec & Bypass unavailable (shutdown in 5 seconds).
(d) BATTERY VOLTAGE less than 115.8 - (.17 X absolute battery current) for 3 kVA and 5 kVA; 231.6 - (.34 X absolute battery current) for 10 kVA. Shutdown when battery voltage is less than 112.8 - (.17 X absolute battery current) for 3 kVA and 5 kVA; 225.6 - (.34 X

absolute battery current) for 10 kVA.
**NOTE:** If utility AC is out-of-spec, customer load will be "DROPPED."

**ON BYPASS**
Lit red in Static Bypass mode (Load not protected by UPS).

**INVERTER NOT READY**
Lit red when UPS not ready to transfer from Static Bypass to Normal mode.

**BATTERY FAULT**
Lit red when the UPS is in Recharge Mode. The UPS will automatically resolve the problem although Normal mode operation may not occur for several minutes.

### 1.7.3 System Controls

These controls, accessible on the System Status Monitor Panel, enable various system functions as described.

**VOLUME CONTROL**
3-position switch controls loudness of audible alarm.
LOUD = 85dBA; SOFT = 65dBA; OFF = No audible alarm.

**ALARM SILENCE**
Momentary push-button silences audible alarm. Audible alarm will still be operative for new alarm.

**MANUAL RESTART**
Momentary push-button enables restart from Static Bypass mode. System switches to Normal mode if there are no errors.

**TEST (on front panel)**
Push & hold switch initiates a self-test routine. Transfers system to Battery mode until released.

**ON/OFF KEYSWITCH**
Enables the UPS to operate when AC and Battery applied. Does not affect STATIC BYPASS operation.

**WARNING: DC Power is still present inside the UPS when switch is in the BYPASS position.**

**EMERGENCY POWER OFF**
Push-button shuts down the UPS and removes power from the loads. This push-button interlocks with the ON/OFF Keyswitch and is reset using the ON/OFF Keyswitch. If the UPS is in Maintenance Bypass mode, the Emergency Power Off button will not shut down the UPS.

**WARNING:**
**AC line voltage and DC battery voltage are still present in the cabinet.**

### 1.7.4 System Monitoring

Parameters can be monitored, as selected using a commutative keypad, on a digital display located on the Monitor Panel, behind hinged cover (refer to Figure 1-4).

**DIGITAL METER DISPLAY(3-digit LED)**
Display of parameters selected at Metering Keypad. Current parameter shown by metering indicators.

**SYSTEM METERING KEYPAD (6-keys)**
Two rows of three keys for parameter display selection. Commutative two-key selection (one from each row).
Upper row selects function (Line, Load or Battery).
Lower row selects parameter (Volt, Amp or Frequency)

**METERING INDICATORS**
2 rows of 3 indicators show current displayed parameters. One from each row will be lit: (Line OR Load OR Batt) AND (Volt OR Amp OR Hz).

**DISPLAY CHECK**
Special function. Depress (BATT) and (HZ) on keypad. All alarm indicators activated. Current software release displayed. Initiates hex dump to optional communications interface. These parameters will reset to **LINE & VOLTS** in ten seconds unless another metering function is required.

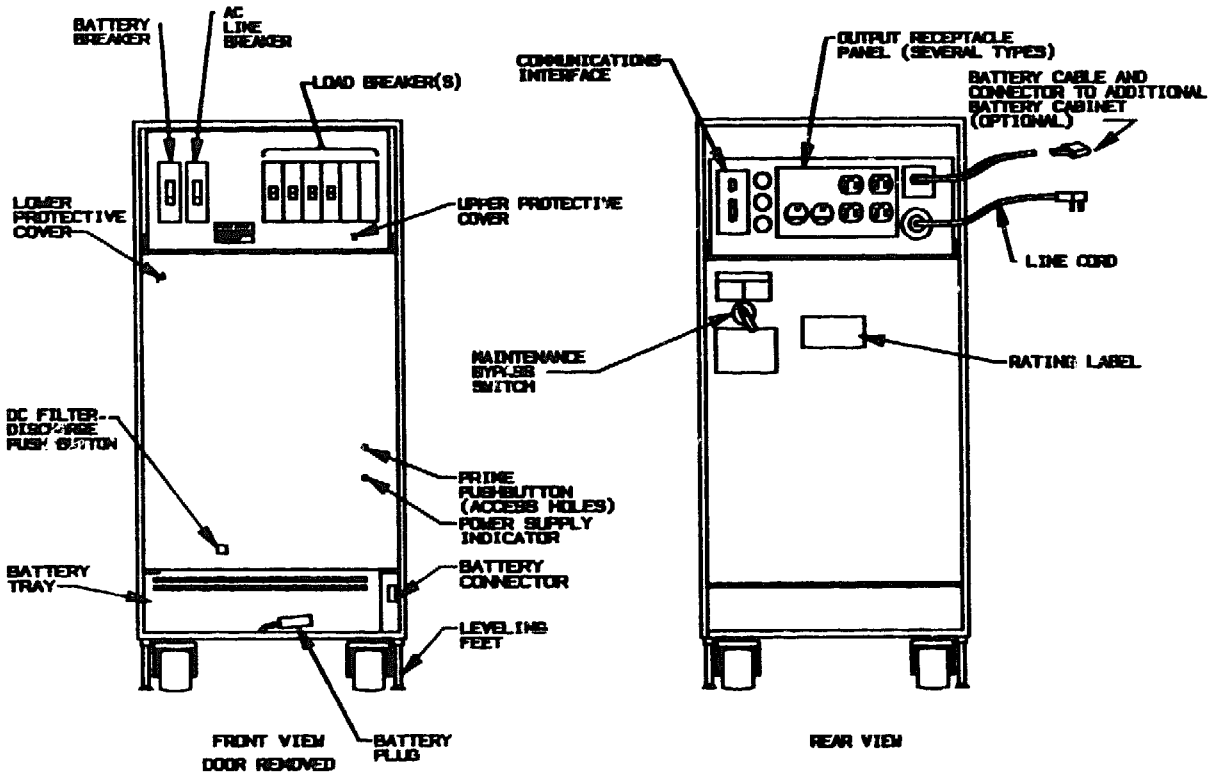


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FIGURE 1-1 LOCATION OF CONTROLS 3 KVA

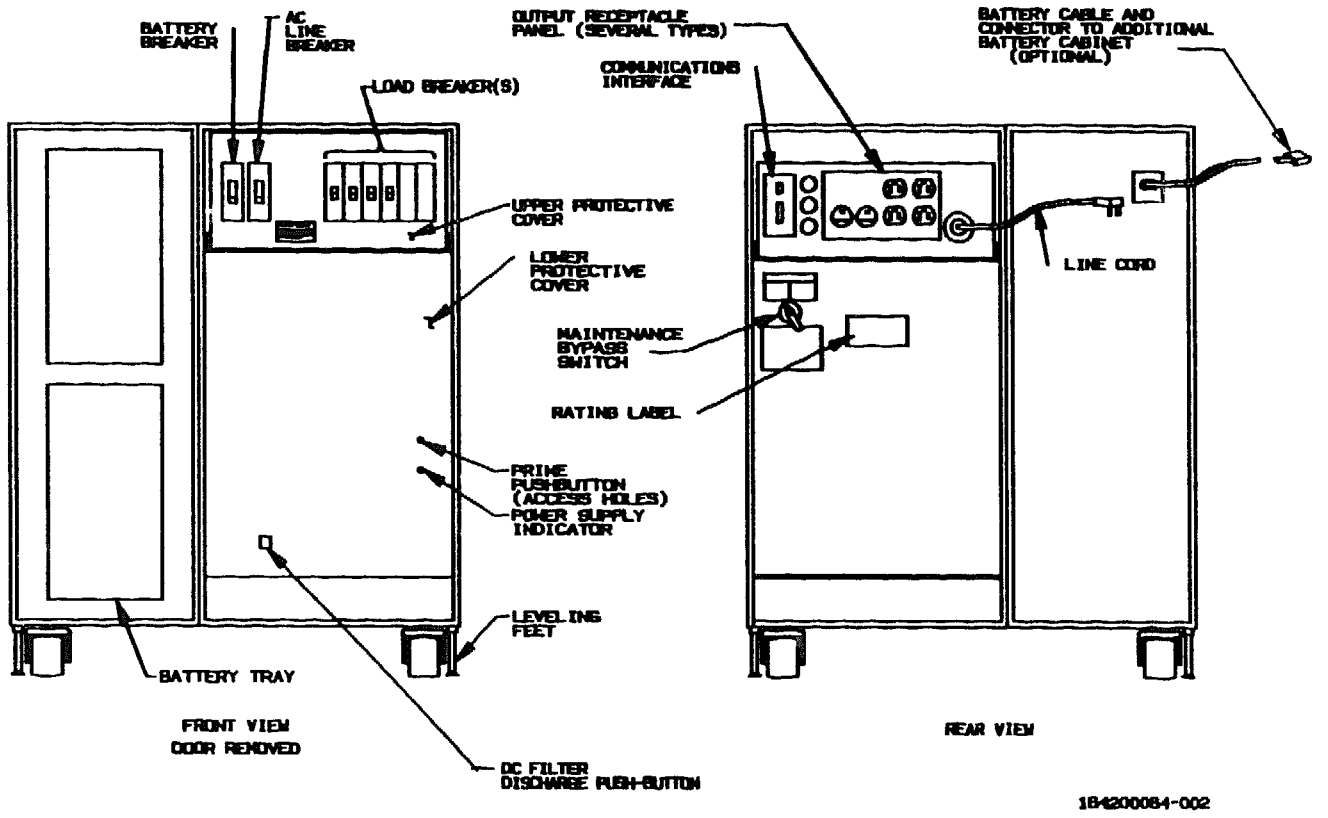



FIGURE 1-2 LOCATION OF CONTROLS 5KVA

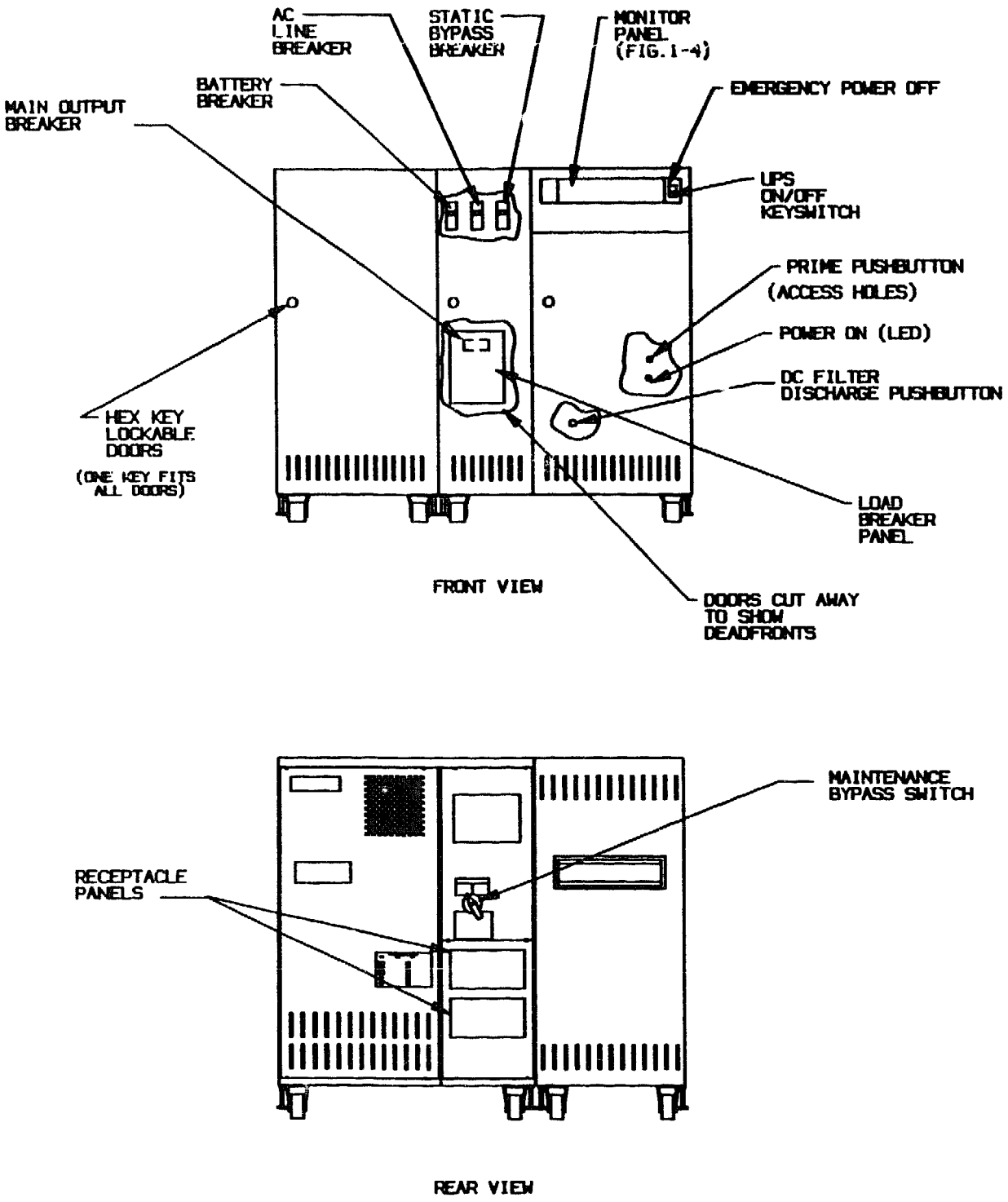
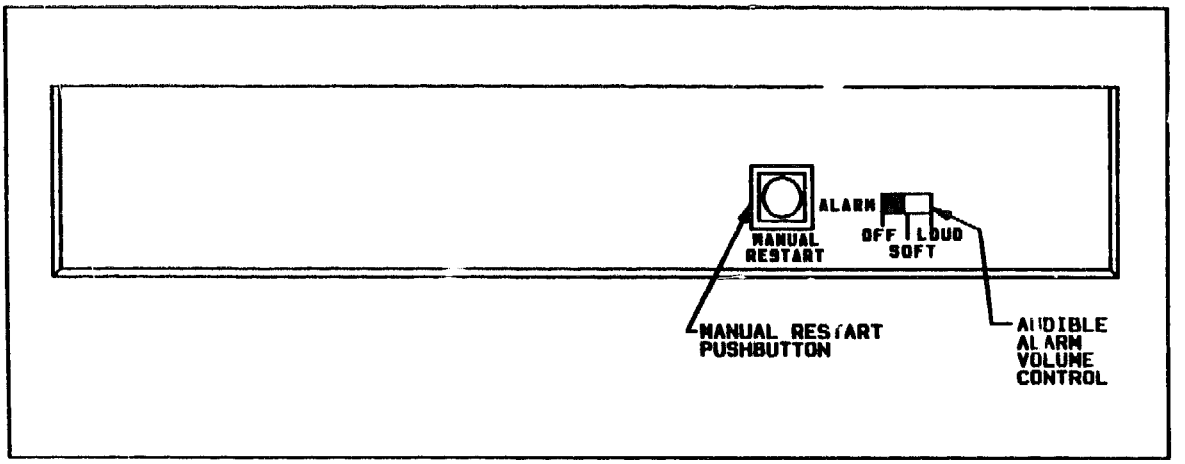



FIGURE 1-3 LOCATION OF CONTROLS 10 KVA




REAR VIEW

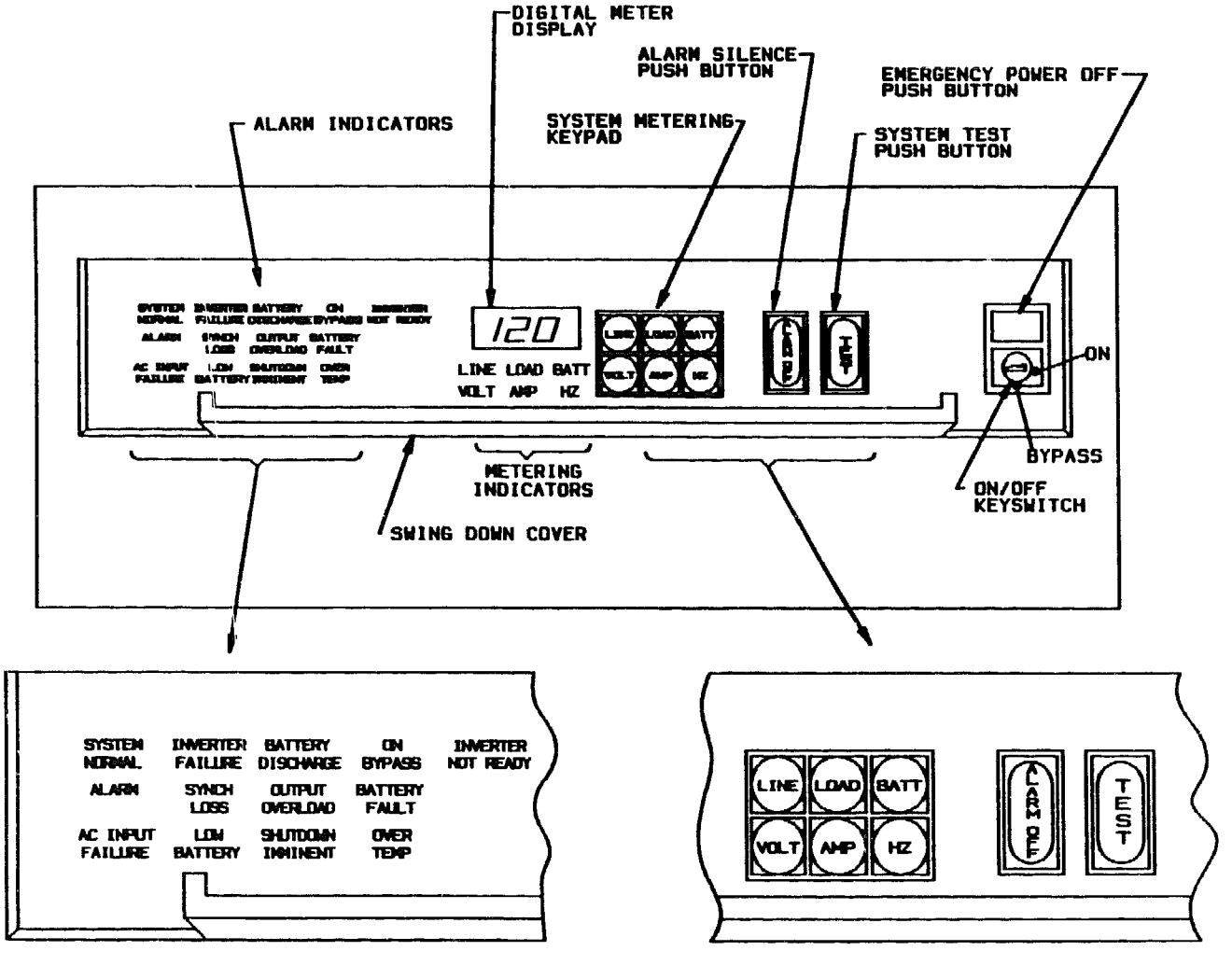
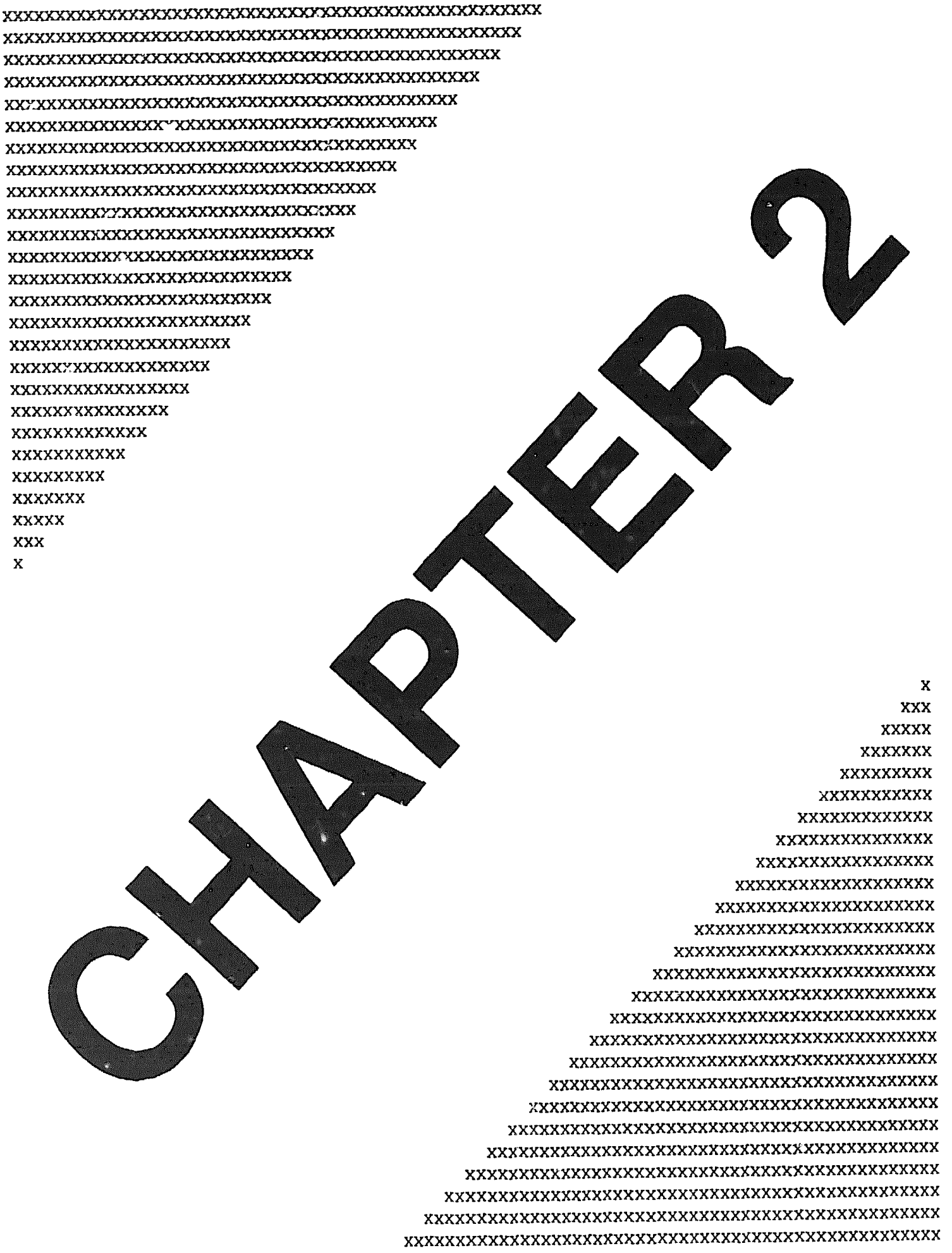



FIGURE 1-4 MONITOR PANEL


CHAPTER 2

# 2. OPERATION 3 KVA AND 5 KVA SYSTEMS

## 2.1. INTRODUCTION

The procedures described here enable initial start-up, recovery from abnormal modes (Battery or Static Bypass) and power down (normal and emergency). The monitoring functions are also described. Location of controls and indicators mentioned in these procedures is provided in the Controls and Indicators section. You must familiarize yourself with the location of all Remote Power Off push-buttons when the system is equipped with this option. Once your UPS system is operating normally (in Normal mode), no intervention by operator is necessary, except for monitoring of system parameters as required.

## 2.2. AUTOMATIC SYSTEM START-UP

This is the normal procedure for starting (transfer from Static Bypass to Normal) when all parameters are as specified. Ignore any alarms which occur. The system will not auto-start if Battery voltage is below 80 V.

1. Perform UPS Stand-Alone Check if desired.(Section 2.7)

2. Connect loads if desired (auto start can be performed with no loads).

3. Turn ON (close) the Battery and AC Line breakers.

NOTE: If Battery breaker fails to operate in two attempts then Start-up is not possible. Contact Customer Service for assistance.

**CAUTION:**
**If any breakers open, stop and call Customer Service.**

4. Close door and set On/Off Keyswitch to UPS ON (horizontal) position.

5. For successful automatic start-up observe System Normal indicator lights. If this does not occur within 2 minutes Start-up has failed. You can monitor load voltage as it rises to System Normal value.

6. Observe alarm indicators. Low Battery may be lit, all others cleared.

## 2.3. MANUAL START-UP

System start-up procedure when AC supply voltage or Battery voltage is below the levels required for auto-start (these levels are within 13% of nominal). Ignore any alarms which occur, providing successful start-up is achieved.

1. Ensure that the loads are operative, if desired.

2. Turn ON (close) the Battery and AC Line breakers.

3. Ensure that the On/Off Keyswitch is in the UPS ON (horizontal) position.

4. Observe that the automatic start-up failed (system remains in STATIC BYPASS).

5. Momentarily depress Power Supply Prime push-button. Use a non-conductive tool to access the button through the hole in the dead-front.

6. Observe that the UPS starts and transfers to Normal when Battery volts exceeds 132 V. If battery voltage is initially below 102 V this may take several minutes.

## 2.4. MANUAL RESTART

This enables the operator to attempt transfer from Static Bypass to Normal when self re-start does not occur after an alarm clears.

1. Press the Manual Restart push-button.

2. If the system fails to transfer to Normal, or returns to Static Bypass, then there is still an error present. Contact your Customer Service office.

## 2.5. SYSTEM SHUTDOWN

**CAUTION:**
**The system must be shut down following the steps below to avoid inadvertently dropping the load.**

1. Turn the On/Off Keyswitch to the BYPASS (vertical) position.

2. Open the front door and turn the AC Line and Battery breakers OFF (open).

**WARNING:**
**The load is still powered and the inverter is still live even in BYPASS mode.**

3. To de-activate the load, if required, turn the Load breaker(s) OFF (open).

4. To isolate the UPS from the utility power, turn OFF the utility power.

## 2.6. SYSTEM TEST

This procedure ensures that the system can successfully transfer from Normal to Battery mode and will re-start automatically. This procedure should only be performed twice a month at most.

1. Ensure that the system is operating in Normal mode.

2. Observe that no alarms are lit (battery is fully charged).

3. Press and hold TEST push-button.

4. Observe UPS transfers to Battery mode and Battery Discharge alarm lit. Denoted by negative (discharge) battery current on system status monitor.

5. Release TEST push-button and observe UPS transfers to Normal mode within a few seconds.

## 2.7. UPS STAND-ALONE CHECK

This enables UPS operation to be checked using its own Battery supply, with utility AC power off. Critical load(s) cannot be connected or run during this check. The UPS cannot be unplugged during his check to prevent the removal of safety ground. It ensures that the Battery power source is operational (Battery charged and inverter working) so that the automatic start-up procedure is valid. Ignore alarms generated during this procedure.

1. Ensure that the Battery is connected and that all UPS breakers are OFF (open).

2. Set Battery breaker ON (close). If the breaker does not operate after two attempts there is an UPS error. Call Customer Service for assistance.

3. Set On/Off Keyswitch to UPS ON (horizontal) position.

4. Momentarily depress the Power Supply Prime push-button. Insert a non-conductive tool through the access hole in dead-front to push the button.

5. Monitor system status and load parameters as listed below. If any of the indications are not as specified call Customer Service for assistance.

- Power Supply On indicator lit (observe through hole in dead-front).
- Power Supply On indicator remains lit. It goes off if the Battery voltage is too low to operate the inverter (battery discharged). If this occurs you cannot proceed with this test. You should perform Manual Start-up procedure.
- Status indication occurs within 30 seconds.
- "LOAD" "VOLT" metering within 2% of nominal (printed on nameplate).

6. Turn the On/Off Keyswitch to Bypass (vertical) position and turn the Battery breaker OFF (open).

## 2.8. SYSTEM STATUS MONITORING (Local)

The following will enable an operator to identify system status and to take appropriate action if required. Not all possible conditions are described. If in doubt, contact your Customer Service office.

The three indicators at left of UPS front panel give basic system status.

A. SYSTEM NORMAL is Green
B. ALARM is flashing Red
C. AC INPUT FAILURE is Red

**SYSTEM NORMAL IS ON; ALARM AND AC INPUT FAILURE ARE OFF:**
Normal mode, supplying conditioned power to the load.

**SYSTEM NORMAL AND ALARM ARE ON; AC INPUT FAILURE IS OFF:**
Normal mode, but battery is not fully charged. Low Battery alarm should be lit. Any other sustained alarm indication is a fault requiring attention.

**SYSTEM NORMAL IS OFF; ALARM AND AC INPUT FAILURE ARE ON:**
UPS probably in Battery mode, horn sounding. The following alarms may be lit:

Utility AC error:
AC INPUT FAILURE: AC off or voltage out-of-spec.
SYNC LOSS: AC frequency or phase out-of-spec.

Battery condition:
BATTERY DISCHARGE: DC supplying load.
LOW BATTERY: Battery voltage below 120 V
SHUTDOWN IMMINENT: Battery capacity almost used.

When error is cleared, return to Normal mode is automatic. Pressing MANUAL RESTART button will cause UPS to attempt transfer to Normal mode.

**SYSTEM NORMAL AND AC INPUT FAILURE ARE OFF; ALARM IS ON:**
An alarm condition exists not due to AC input error. System may be in Battery or Bypass mode. Refer to the Controls and Indicators section for alarm indication. If the system does not return to Normal when MANUAL RESTART is pressed, call Customer Service Office.

## 2.9. SYSTEM PARAMETERS MONITORING (Local)

At any time you can display a selected system parameter on the 3-digit display by depressing the appropriate keys on the metering keypad as listed below.

| First Key | Second Key | Status Requested |
|---|---|---|
| LINE | VOLT | Input AC voltage (In Bypass this is applied to load). Normally within + 13% and -20% of nominal (Rating label voltage). |
| LOAD | VOLT | UPS output AC voltage. Normally within ±2% of nominal. |
| BATT | VOLT | Battery voltage at Inverter input. Normally more than 135 V (float). Will decrease when system transfers to Battery mode. Increases during recharge. |
| LINE | AMP | Input line current. |
| LOAD | AMP | UPS load current (close to zero in Static-Bypass mode). |
| BATT | AMP | Battery current. (positive = charge, negative = discharge). |
| LINE | HZ | Frequency of utility supply. Normally within ±1Hz, ± ½ Hz or ±3Hz (selected at installation) of nominal. |

| | | |
|---|---|---|
| LOAD | HZ | Frequency of UPS output. Normally within ±1Hz of nominal. |
| BATT | HZ | Display check. All alarms light and horn sounds. Software revision level is displayed. Initiates hex dump to communications interface. These parameters reset to **LINE & VOLTS** after ten seconds unless another metering function is requested. |

## 2.10. COMMUNICATIONS FEATURE

This procedure describes system monitoring using a remote terminal which operates according to the following communications specifications. Refer to the terminal operator's manual to set the following protocol:

| | |
|---|---|
| **Baud Rate:** | 300 baud |
| **Word Structure** | 8 data bits, 1 stop bit |
| **Parity** | None |
| **Data Format** | ASCII |
| **Interface** | EIA RS232C, duplex. |

The UPS is configured as a DCE (Data Communications Equipment). To connect the UPS to a DTE (Data Terminal Equipment) such as a terminal, a straight pin-to-pin interface cable is required. To connect the UPS to another DCE, such as modem, a null-modem cable with pins 2 and 3 crossed in the cable is required. If the UPS is connected directly to a modem, the modem must have auto-answer capability. Refer to the modem operator's manual for additional information.

Ensure that the Remote Terminal is connected to the RS-232C connector at rear of UPS. Connect the terminal to the RS-232 Communications port when the UPS is not in Normal mode. Figure 2-1 shows the switch and jumper positions on the Communications Interface Board. Figure 2-2 shows the DB-25 pin assignments for the Interface Option.

To select one of four languages, position JP1 and JP2 on the Communications Interface Board (refer to Figure 2-1) as follows:

| JP1 | JP2 | |
|---|---|---|
| 0 | 0 | English |
| 0 | 1 | Spanish |
| 1 | 0 | French |
| 1 | 1 | German |

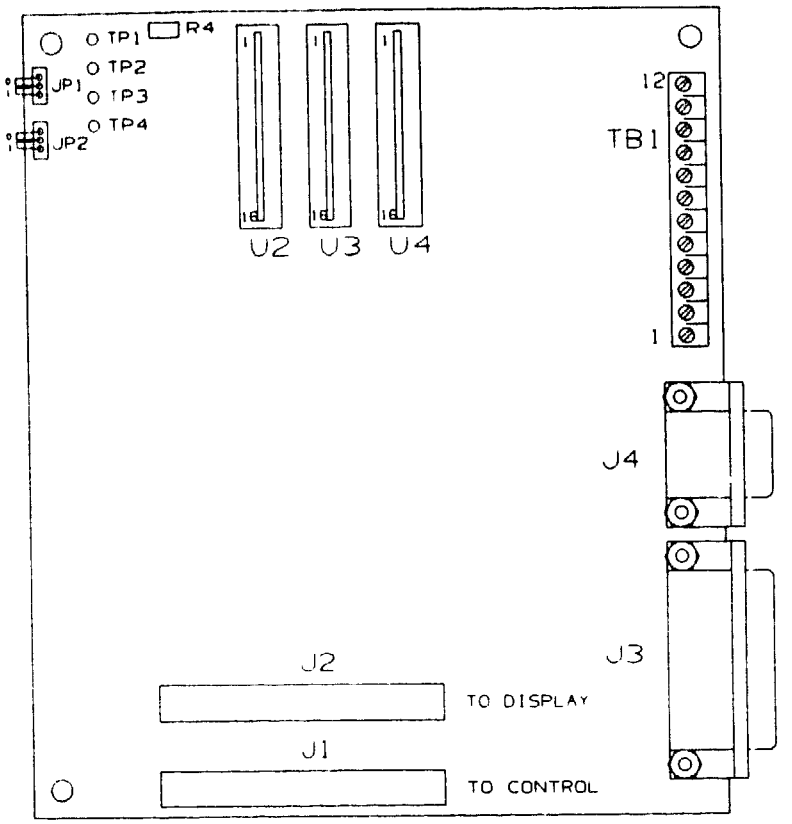



**FIGURE 2-1 COMMUNICATIONS INTERFACE BOARD**

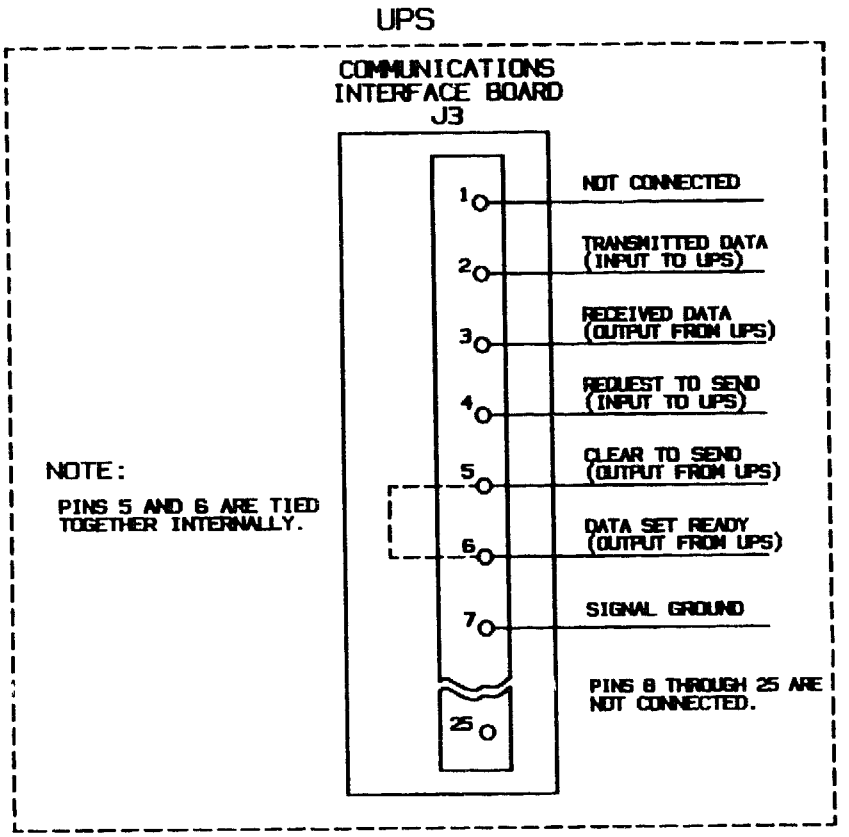



**FIGURE 2-2 PIN ASSIGNMENTS/COMMUNICATIONS INTERFACE**

Ensure that the terminal is ON-LINE and CAPS LOCK is engaged.

To view particular status information, depress the corresponding two-key sequence at your terminal in the order indicated.

| First Key | Second Key | Status Requested |
|---|---|---|
| I | V | AC Input Volts (LINE VOLT) |
| O | V | Output Volts (LOAD VOLT) |
| B | V | Battery Volts (BATT VOLT) |
| I | C | Input Current (LINE AMP) |
| O | C | Output Current (LOAD AMP) |
| B | C | Battery Current (BATT AMP) |
| I | F | Input Frequency (LINE HZ) |
| O | F | Output Frequency (LOAD HZ) |
| B | F | Buffer Hex Dump |

NOTE: The following command requires one key entry only.

| | |
|---|---|
| A | Alarms Present |

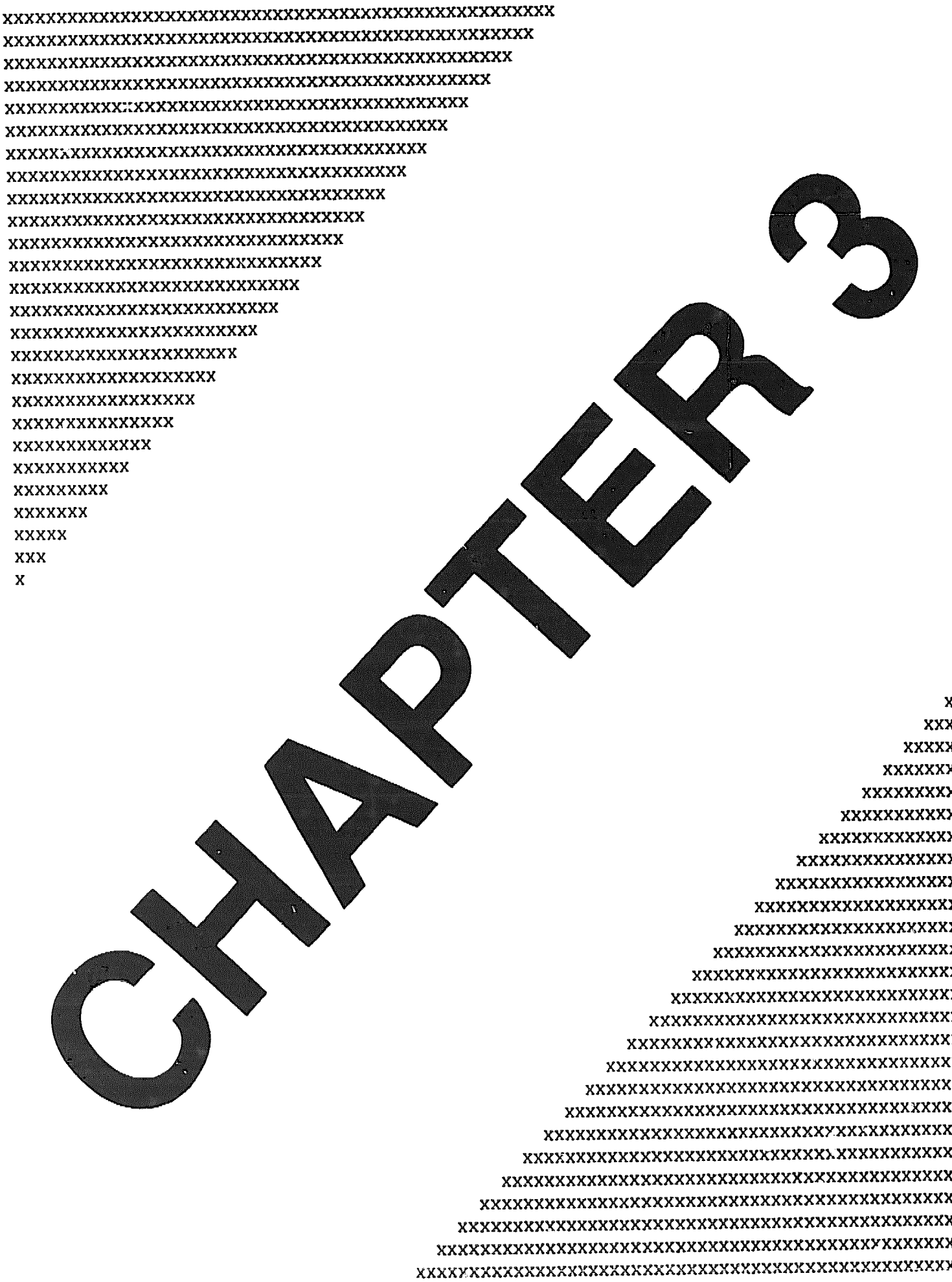
NOTE: If you enter an incorrect sequence then "I Beg Your Pardon" is displayed to indicate invalid entry. Re-enter valid sequence.

Observe that any change of system status is automatically described. New alarm conditions are indicated as they occur. Automatic return to Normal is also displayed.

To force the unit to " STATIC BYPASS", type TERMINATE on the remote terminal. Characters must be in ALL CAPS, entered within 11 seconds and in the correct sequence.

**CAUTION:**
**If UTILITY POWER is NOT available, the unit will shutdown and the load will be dropped.**

When shutdown occurs, the UPS will remain OFF until "acceptable" utility power returns. The UPS will then automatically sequence through start-up steps to Normal operation.


CHAPTER 3

# 3. OPERATION 10 KVA SYSTEMS

## 3.1. INTRODUCTION

The procedures described herein enable initial start-up, recovery from abnormal modes (Battery or Static Bypass) and power down (normal and emergency). The monitoring functions are also described. Location of controls and indicators mentioned in these procedures is provided in the Controls and Indicators section of this manual. You must familiarize yourself with the location of all Remote Emergency Power Off push-buttons when the system is equipped with this option. Once your UPS system is operating normally (In Normal mode), no intervention by operator is necessary, except for monitoring of system parameters as required.

## 3.2. AUTOMATIC SYSTEM START-UP

This is the normal procedure for starting (transfer from Static Bypass to Normal) when all parameters are as specified. Ignore any alarms which occur. The system will not auto-start if Battery voltage is below 204V.

1. Perform UPS Stand-Alone Check if desired. (Section 3.7)

2. Ensure that the Static Bypass breaker is ON (closed). Loads may be connected, if desired.

3. Turn ON (close) the Battery and AC Line breakers.

NOTE: If Battery breaker fails to operate in two attempts then Start-up is not possible. Contact Customer Service for assistance.

**CAUTION:**
**If any breakers open, stop and call Customer Service.**

4. Close the door and set the On/Off Keyswitch to UPS ON (horizontal) position.

5. For successful automatic start-up observe System Normal indicator lights. (You can monitor load volts as it gradually rises to normal operating voltage.) If this does not occur within 2 minutes, Start-up has failed.

6. Observe alarm indicators. Low Battery may be lit, all others cleared.

## 3.3. MANUAL START-UP

This is the system start-up procedure when the AC supply voltage or Battery voltage is below the levels required for auto-start. (These levels are within 13% of nominal.) Ignore any alarms which occur, providing successful start-up is achieved.

1. Ensure that the Static Bypass breaker is ON (closed) and loads are operative, if desired.

2. Turn ON (close) the Battery and AC Line breakers.

3. Ensure that the On/Off Keyswitch is in the UPS ON (horizontal) position.

4. Observe that Automatic Start-Up failed (system remains in Static Bypass).

5. Momentarily depress Power Supply Prime push-button. Use a non-conductive tool to access the button through the hole in the dead-front.

6. Observe that the UPS starts and transfers to Normal when the DC volts exceed 264 V. If battery voltage is initially below 204 V this may take several minutes.

## 3.4. MANUAL RESTART

This enables the operator to attempt transfer from Static Bypass to Normal when self restart does not occur after an alarm clears.

1. Press the Manual Restart push-button.

2. If system fails to transfer to Normal, or returns to Static Bypass, then there is still an error. Contact your Customer Service office.

## 3.5. SYSTEM SHUTDOWN

**CAUTION:**
**The system must be shut down following the steps below to avoid inadvertently dropping the load.**

1. Turn the On/Off Keyswitch to the BYPASS (vertical) position.

2. Open the front door and turn the AC Line and Battery breakers OFF.

**DANGER:**
**The load is still powered and the Inverter is still live even in Bypass mode.**

3. To de-activate the load, if required, turn the Load breaker(s) OFF (open).

4. To remove AC power from the Load breakers, turn the Static Bypass breaker OFF (open).

5. To isolate the UPS from utility power, turn off the utility power.

## 3.6. SYSTEM TEST

This procedure ensures that the system can successfully transfer from Normal to Battery mode and will return automatically. This procedure should only be performed twice a month at most.

1. Ensure that the system is operating in Normal mode.

2. Observe that no alarms are lit (battery is fully charged).

3. Press and hold the TEST push-button.

4. Observe UPS transfers to Battery mode and that the Battery Discharge alarm is lit.

5. Release the TEST push-button and observe UPS transfers to Normal mode within a few seconds.

## 3.7. UPS STAND-ALONE CHECK

This enables UPS operation to be checked using its own Battery supply, with utility AC power off. Critical load(s) cannot be connected or run during this check. The UPS cannot be unplugged during this check to prevent the removal of safety ground. It ensures that the Battery power source is operational (Battery charged and inverter working) so that the automatic start-up procedure is valid. Ignore alarms generated during this procedure.

1. Ensure that the Battery is connected and all UPS breakers are OFF (open).

2. Turn the Battery breaker ON (closed). If the breaker does not operate after 2 attempts there is a UPS error. Call Customer Service.

3. Turn the On/Off Keyswitch to the UPS ON (horizontal) position.

4. Momentarily depress Power Supply Prime push-button. Insert a non-conductive tool through the access hole in the dead-front to push the button.

5. Monitor system status and load parameters as listed below. If any of the indications are not as specified call Customer Service for assistance.

- Power Supply indicator lit (observe through hole in dead-front).
- Power Supply indicator remains lit. It goes off if the Battery voltage is too low to operate the inverter (battery discharged). If this occurs you cannot proceed with this test. You should perform Manual Start-up procedure.
- Status indication occurs within 30 seconds.
- "LOAD" "VOLT" metering within 2% of nominal (printed on nameplate).

6. Turn the On/Off Keyswitch to the Bypass (vertical) position and turn the Battery breaker OFF (open).

## 3.8. SYSTEM STATUS MONITORING (Local)

The following will enable an operator to identify system status and to take appropriate action if required. Not all possible conditions are described. If in doubt, contact your Customer Service office.

The three indicators at the left of the UPS Monitor Panel give basic system status.

A. SYSTEM NORMAL is green.
B. ALARM is flashing red.
C. AC INPUT FAILURE is red.

**SYSTEM NORMAL IS ON; ALARM AND AC INPUT FAILURE ARE OFF:**
Normal mode, supplying conditioned power to the load.

**SYSTEM NORMAL AND ALARM ARE ON; AC INPUT FAILURE OFF:**
Normal mode, but battery not fully charged. Low Battery alarm should be lit. Any other sustained alarm indication is a fault requiring attention.

**SYSTEM NORMAL IS OFF; ALARM AND AC INPUT FAILURE ARE ON:**
UPS probably in Battery mode, horn sounding. The following alarms may be lit:

Utility AC error:
AC INPUT FAILURE: AC off or voltage out-of-spec.
SYNCH LOSS: AC frequency or phase out-of-spec.

Battery condition:
BATTERY DISCHARGE: Battery supplying load.
LOW BATTERY: Battery voltage below 240 V
SHUTDOWN IMMINENT: Battery capacity almost used.

When error is cleared, return to Normal mode is automatic. Pressing MANUAL RESTART button will cause UPS to attempt transfer to Normal mode.

**SYSTEM NORMAL AND AC INPUT FAILURE ARE OFF; ALARM IS ON:**
An alarm condition exists due to something other than AC input error. System may be in Emergency Power or Bypass mode. Refer to Controls and Indicators section for alarm indication. If the system does not return to Normal when MANUAL RESTART is pressed, call Customer Service.

## 3.9. SYSTEM PARAMETERS MONITORING (Local)

At any time you can display a selected system parameter on the 3-digit display by operating the appropriate keys on the metering keypad as listed below.

Depress two buttons sequentially in the order indicated. An indicator will light to show the selection made.

| First Key | Second Key | Status Requested |
|---|---|---|
| LINE | VOLT | Input AC voltage (In Static Bypass AC Line voltage is stepped up or down depending on configuration).Normally within + 13% and - 20% of nominal. |
| LOAD | VOLT | Inverter AC voltage.<br>120 V on 120 V/240 V system.<br>208 V on 208 V system<br>Normally within ± 2% of nominal. |

| | | |
|---|---|---|
| BATT | VOLT | Battery voltage at inverter input. Normally more than 270V (float). Will decrease when system transfers to Battery mode. Increases during recharge. |
| LINE | AMP | Input line current . |
| LOAD | AMP | UPS load current (also enabled in Static Bypass mode).<br><br>Current as for 120 V in 120 V/240 V system. (Note that displayed VxA would be correct). |
| BATT | AMP | Battery current. (positive = charge, negative = discharge). |
| LINE | HZ | Frequency of utility supply. Normally within ± 1Hz, ± 1/2 Hz or ±3Hz (selected at installation) of nominal. |
| LOAD | HZ | Frequency of UPS output. Normally within ±1Hz of nominal. |
| BATT | HZ | Display check. All alarms lit and horn sounds. Software revision level displayed. Initiates hex dump to communications interface. These parameters reset to **LINE & VOLTS** after ten seconds unless another metering function is requested. |

## 3.10. COMMUNICATIONS FEATURE

This procedure describes system monitoring using a remote terminal which operates according to the following communications specifications. Refer to the terminal operator's manual to set the following protocol:

| | |
|---|---|
| **Baud Rate** | 300 baud |
| **Word Structure** | 8 data bits, 1 stop bit |
| **Parity** | None |
| **Data Format** | ASCII |
| **Interface** | EIA RS232C, duplex |

The UPS is configured as a DCE (Data Communications Equipment). To connect the UPS to a DTE (Data Terminal Equipment) such as a terminal, a straight pin-to-pin interface cable is required. To connect the UPS to another DCE, such as modem, a null-modem cable with pins 2 and 3 crossed in the cable is required. If the UPS is connected directly to a modem, the modem must have auto-answer capability. Refer to the modem operator's manual for additional information.

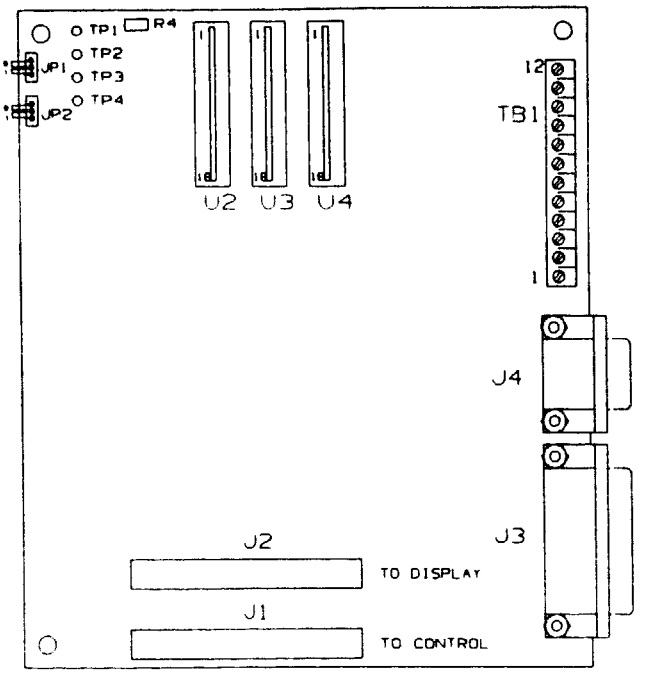



**FIGURE 3-1 COMMUNICATIONS INTERFACE BOARD**

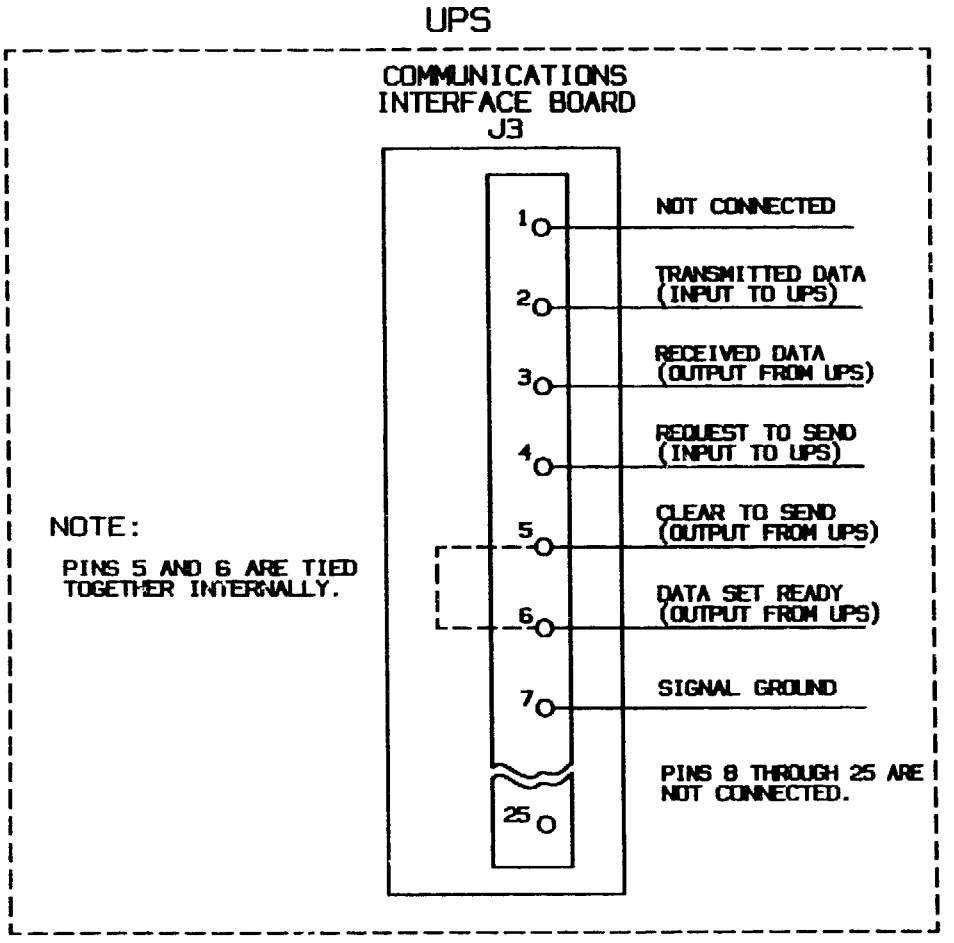



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**FIGURE 3-2 PIN ASSIGNMENTS/COMMUNICATIONS INTERFACE**

Ensure that the Remote Terminal is connected to the RS232 connector at the rear of the UPS. Connect the terminal to the RS232 Communication port when the UPS is not in NORMAL mode. Ensure that the terminal is ON-LINE and CAPS LOCK is engaged. Figure 3-1 shows the switch and jumper positions on the Communications Interface Board. Figure 3-2 shows the DB-25 pin assignments for the Interface Option.

To select one of four languages, position JP1 and JP2 on the Communications Interface Board (refer to Figure 3-1) as follows:

| JP1 | JP2 | |
|---|---|---|
| 0 | 0 | English |
| 0 | 1 | Spanish |
| 1 | 0 | French |
| 1 | 1 | German |

To view particular status information, depress the corresponding two-key sequence at your terminal in the order indicated below:

| First Key | Second Key | Status Requested |
|---|---|---|
| I | V | AC Input Volts (LINE VOLT) |
| O | V | Output Volts (LOAD VOLT) |
| B | V | Battery Volts (BATT VOLT) |
| I | C | Input current (LINE AMP) |
| O | C | Output current (LOAD AMP) |
| B | C | Battery current (BATT AMP) |
| I | F | Input frequency (LINE HZ) |
| O | F | Output frequency (LOAD HZ) |
| B | F | Buffer Hex dump |

**NOTE:** The following command requires one key entry only.

| | |
|---|---|
| A | Alarms Present |

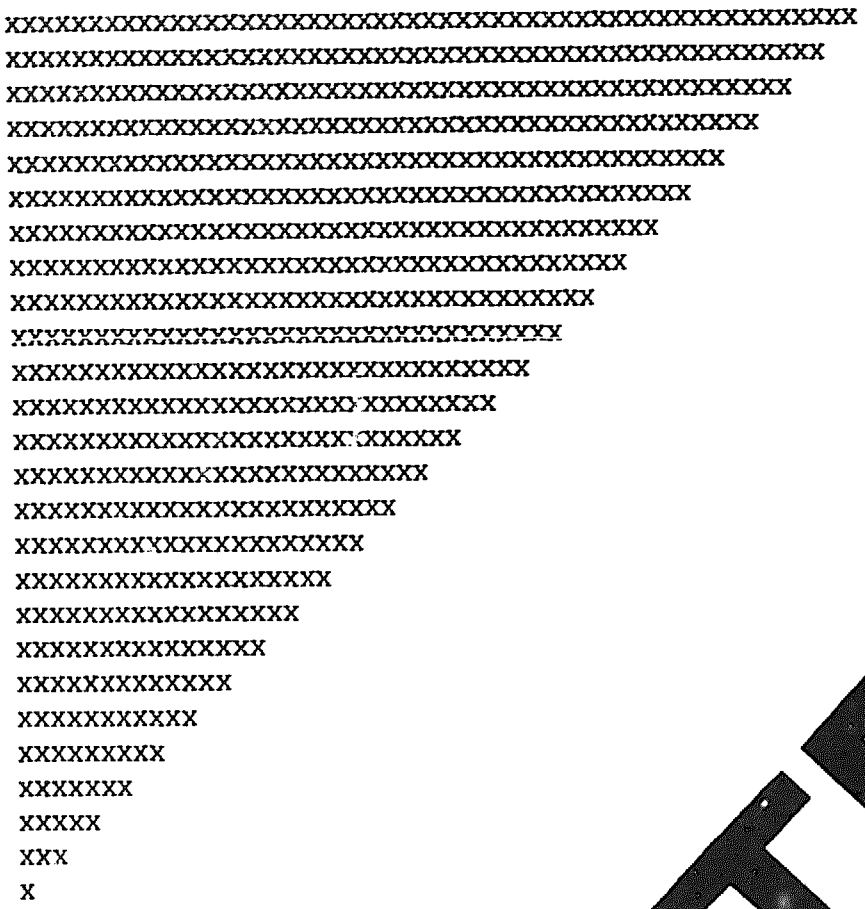
**NOTE:** If you enter a sequence differing from the ones above, the message "I Beg Your Pardon" will be displayed to indicate an invalid entry. Re-enter a valid sequence.

Observe that any change of system status is automatically described. Any new alarm conditions are indicated. Automatic return to Normal is also indicated.

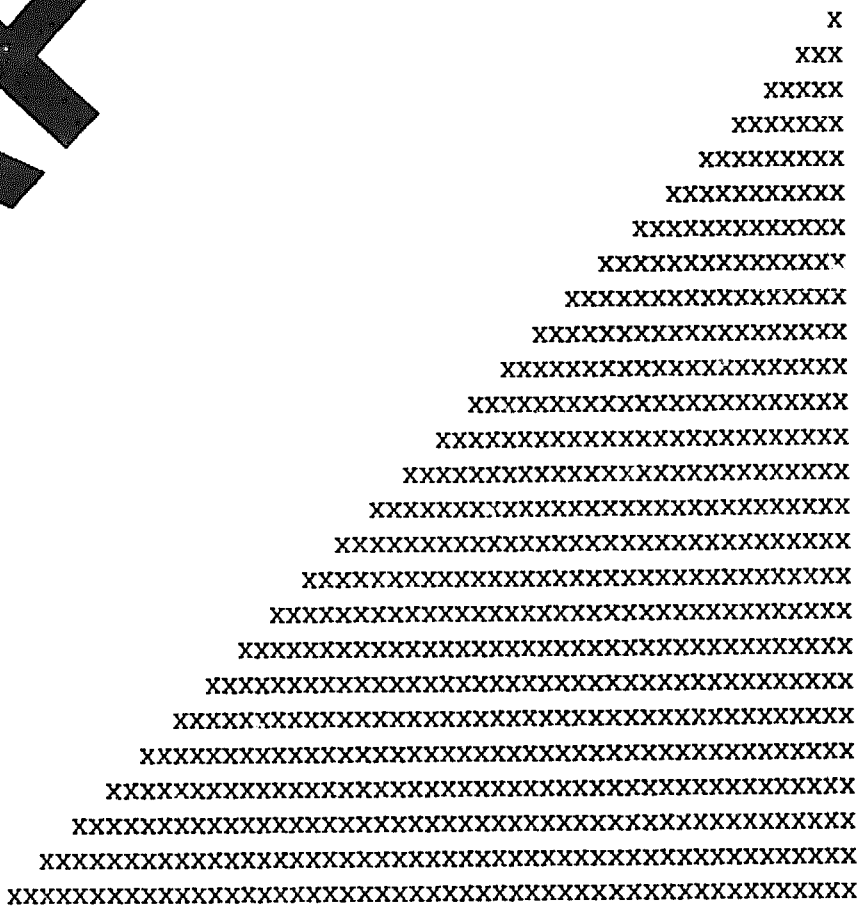
To force the unit to " STATIC BYPASS" type TERMINATE on the remote terminal. Characters must be in ALL CAPS, entered within 11 seconds and in the correct sequence.

**CAUTION:**
**If UTILITY POWER is NOT available, the unit will shutdown and the load will be dropped.**

When shutdown occurs, the UPS will remain OFF until "acceptable" utility power returns. The UPS will then automatically sequence through start-up steps to Normal operation.



# CHAPTER 4



# 4. EMERGENCY POWER OFF

**WARNING:**
**Battery DC power is still present inside the UPS and AC input power may be present.**

## REMOTE POWER OFF (If you have this option)

Press any Remote Power Off push-button. This locks off the system until keyswitch is turned to its alternate position.

OR

## LOCAL EPO

Press Emergency Off push-button on the UPS System Status Control Panel. This locks off the system until keyswitch is turned to its alternate position.

OR

Turn ON/OFF Keyswitch to the Bypass (vertical) position, open front door of UPS and turn off all breakers.

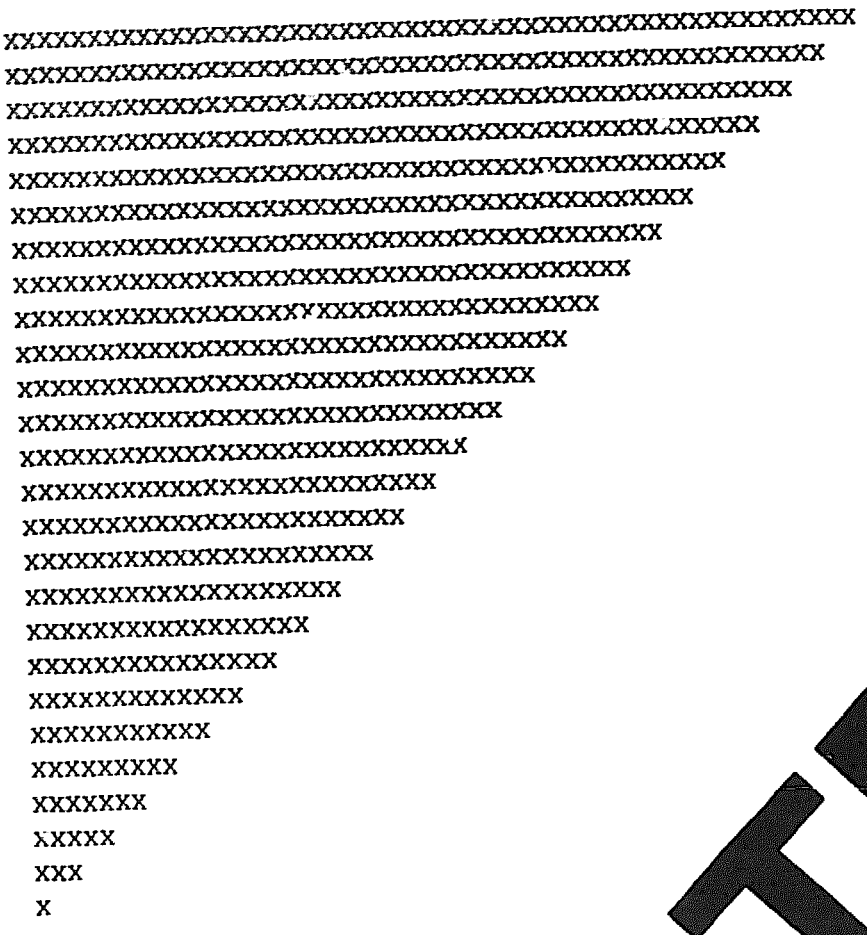
After Emergency Power Off, disconnect the system from all power as described in System Shutdown procedure.

**WARNING:**
**DO NOT ATTEMPT TO RESTART THE SYSTEM UNTIL THE CAUSE OF THE EMERGENCY HAS BEEN IDENTIFIED AND CORRECTED.**

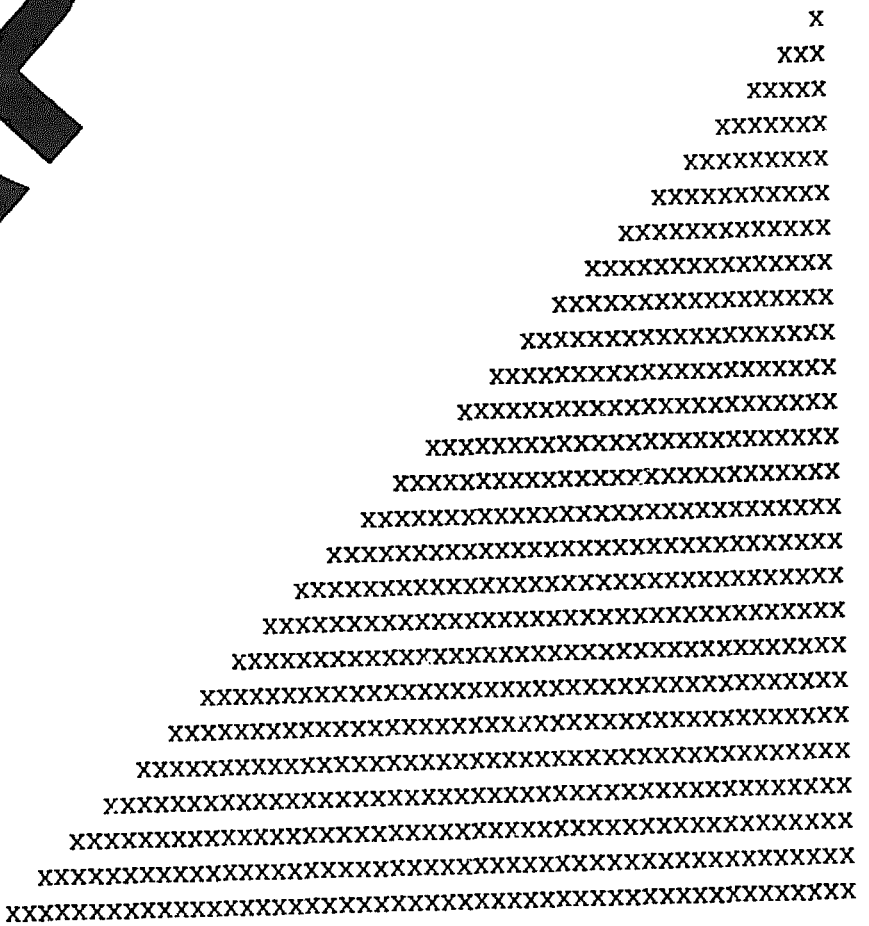
INSTALLATION IN COMPUTER ROOMS

1. Consult country codes (NEC for USA) for regulations on computer room power.

2. Local authority must inspect/approve RPO and EPO wiring and operation.



# CHAPTER 5



# 5. MAINTENANCE

Periodic preventive maintenance of your UPS system is minimal. Operational checks and monitoring of system parameters will enable your system to function "in the background" for many trouble-free hours. The following list gives the important procedures described in this section for safe and trouble-free operation.

- Safety Information
- Operator/Service Training
- Periodic Preventive Maintenance
- Corrective Maintenance
- Service Locations

## 5.1. SAFETY INFORMATION

**WARNING:**
**POTENTIALLY LETHAL VOLTAGES PRESENT. Operation of this equipment with the cabinet doors open or protective panels removed must be performed by qualified customer service personnel only.**

Should you suspect that Battery Cabinet service is needed, refer the work to properly trained and authorized personnel. **LETHAL VOLTAGES ARE ALWAYS PRESENT IN THE BATTERY CABINET.** Since the battery system is an energy source in itself, opening the Battery Circuit Breaker does not de-energize the voltage within the cabinet. Do not attempt to access any area internal to the Battery Cabinet.

Always remember that the system is designed to supply power EVEN WHEN DISCONNECTED FROM UTILITY POWER. The UPS cabinet is unsafe until the Battery power source is disconnected and reservoir capacitors discharged.

**WARNING:**
**THE UPS MUST NOT BE OPERATED UNPLUGGED OR DISCONNECTED FROM SAFETY GROUND.**

## 5.2. TRAINING

A basic training course is available in which the student will learn to perform first level corrective maintenance, and have a competent

knowledge of UPS operation. Each student will be provided with all necessary materials required for completion of the course.

For further information regarding training and other services provided, contact your sales or service representative.

## 5.3. PREVENTIVE MAINTENANCE

The UPS requires little preventive maintenance other than periodic inspection to verify that the unit is operating normally and that the battery is in good condition. Note that the batteries used are maintenance free.

### DAILY USER CHECKS

- Check that the area surrounding UPS is uncluttered, giving free access to the unit.
- Check that the air intakes (front and rear bottom) and exhaust (top) are not blocked.
- Ensure that the operating environment is as specified. See SPECIFICATIONS.
- Ensure that the system is in Normal mode (System Normal lit). If an alarm lamp is lit, or system not in Normal mode, refer to Section 1.6.

### MONTHLY USER CHECKS

- Check that all alarm indicators are operative. (Enter BATT & HZ at keyboard and observe all indicators light).
- Monitor system parameters as described in the OPERATION section of this manual.
- Ensure that the system is NOT in Static Bypass mode.
- Perform System Test procedure: Depress Test push-button (on front panel) and observe transfer to Battery mode with Battery Discharge alarm indication. Release push-button and observe transfer to Normal mode (refer to OPERATION section).

### ANNUALLY

Annual maintenance should be done by qualified service personnel.

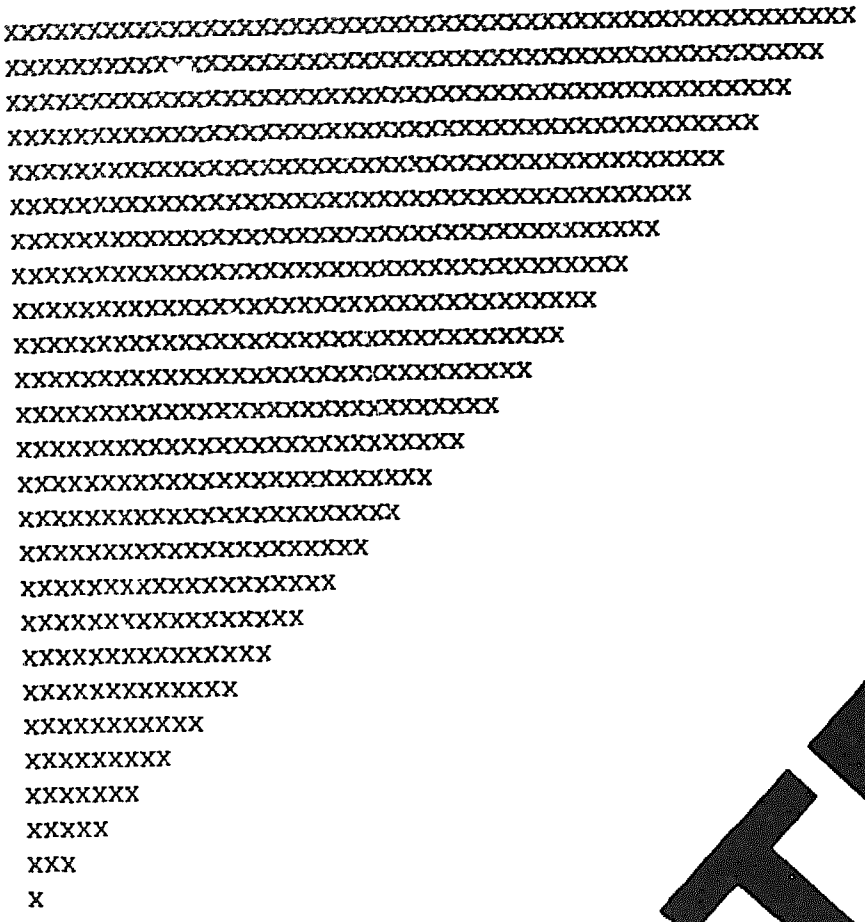
## 5.4. CORRECTIVE MAINTENANCE

Contact your service representative for corrective maintenance. Contracts for this service are available.

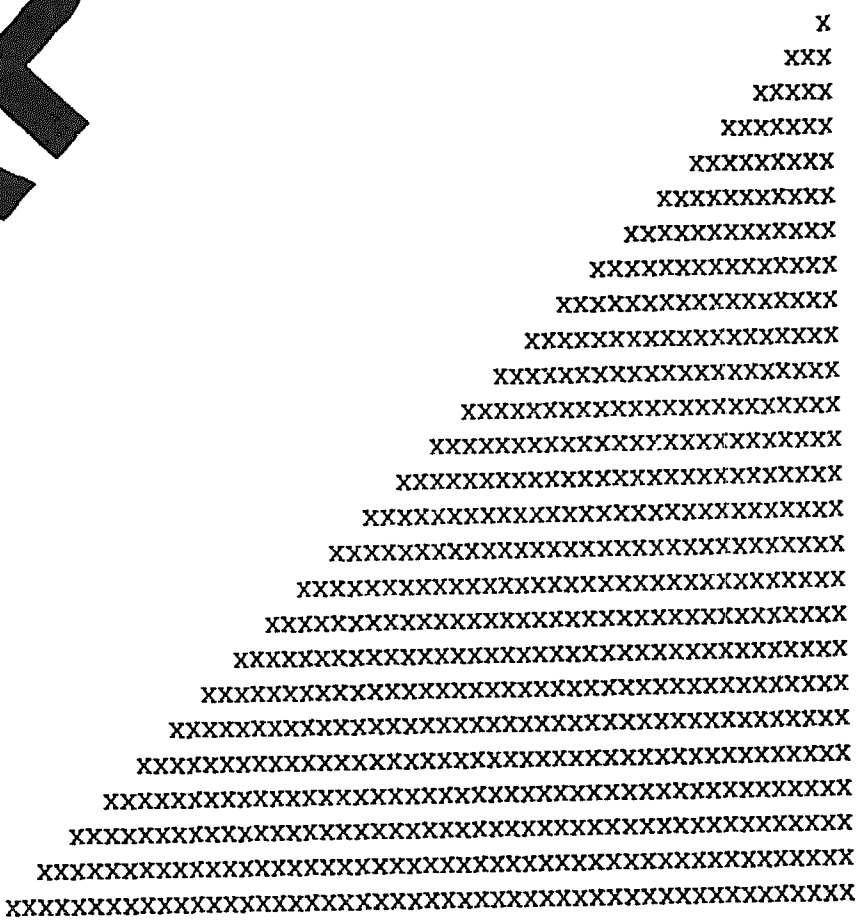
In the event that a Customer Service Engineer is needed, you may contact the nearest Customer Service Office.

The following procedures will allow you to recover from errors detected during routine monitoring of system.

- If system is in Static Bypass mode then press Manual Restart. If automatic start-up does not occur, then call for service.
- If any alarms are lit then refer to the OPERATION section. If alarms cannot be cleared then contact your local Customer Service Office.



# CHAPTER 6



# 6. SYSTEM INSTALLATION

## 6.1. INTRODUCTION

The UPS cabinet is shipped on a wooden pallet. Instructions for unloading a cabinet are printed on the outer protective packaging. This also applies to optional battery cabinet(s). Physical installation is achieved by rolling the cabinet(s) to the site on casters and joining them using hardware supplied with each cabinet. The UPS is plugged directly into your normal facility power source. If you have opted for hard-wired AC input, AC input wiring must conform with local and/or national electrical wiring codes, using your own cabling and conduit. Load circuit breakers are supplied by the customer for the hard-wired option and mounted in the UPS cabinet at installation by the customers electrician.

NOTE: During installation follow recommended grounding procedure per Article 250 of NEC practices (U.S. code) and/or local electrical codes. If in doubt, consult a qualified local electrical inspector.

All possible modes of operation (STATIC BYPASS, NORMAL and BATTERY) should be checked before the final installation is complete.

The installation sequence is outlined below. More detailed procedures are outlined in the text following.

- Verification of site preparation
- Receiving inspection, unpacking and unloading
- Physical installation
- Battery cabinet interconnection if required
- AC interconnection (utility and load)
- Connection to utility AC power
- Optional UPS stand-alone check
- Connection to critical load
- Start-up
- Operational checks

## 6.2. VERIFICATION OF SITE PREPARATION

Operate the UPS within the environmental parameters given in the Specifications. Verify correct receptacle type. Verify correct input voltage.

## 6.3. RECEIVING INSPECTION, UNPACKING AND UNLOADING

Unpacking steps are:

- Inspect the shipment
- Collect tools and resources
- Remove system cabinet from the pallet

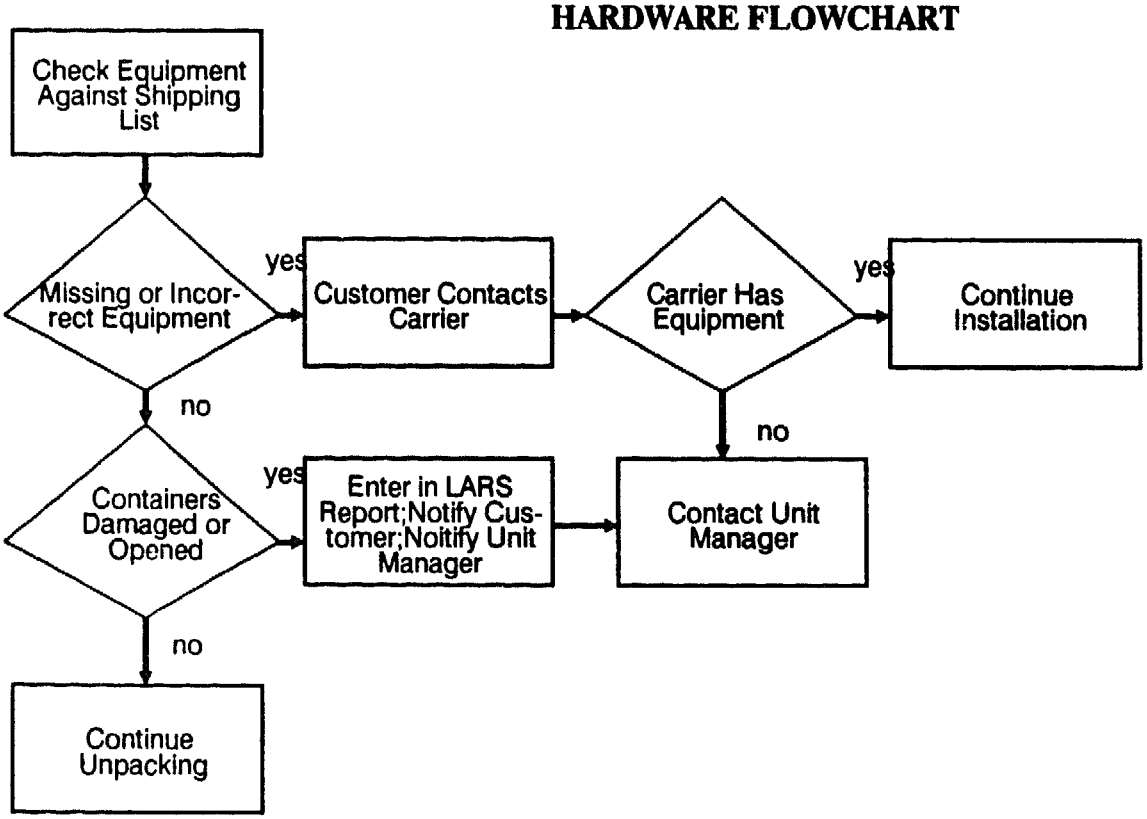
### 6.3.1 Inspect The Shipment

Check to ensure that all system equipment is at the installation site.

If you find a damaged container or package, notify the customer. Wait until the customer contacts the insurance company and gives you permission to continue unpacking.

It is important to record information on damaged or opened containers on the Labor Activity Reporting Systems (LARS) form.

**HARDWARE FLOWCHART**



### 6.3.2 Collect Tools and Resources

To unpack the cabinet you will need two people, the packing slip, the tools listed below, and a prepared site.

**Items Needed for Unpacking:**

- 4" Crescent Adjustable Wrench, used to remove pallet brackets and to lower leveler feet.
- Level used to verify that the cabinet is properly leveled.

Use the packing slip to verify that all system hardware has been delivered.
Review Site Preparation Guide for power, environmental, and space requirements for the system.
The removal of the UPS and/or battery cabinet from the pallet requires at least two people.

### 6.3.3 Remove System Cabinet(s) From The Pallet

**Remove Carton and Packing Material**

Take off the carton and packing material to prepare the system cabinet.

1. Cut the shipping straps from the carton.
2. Remove the top cap.
3. Remove corner fillers and lift off box enclosure.
4. Remove the wooden ramps (see Figure 6-2, position 3).
5. Remove the plastic bag.

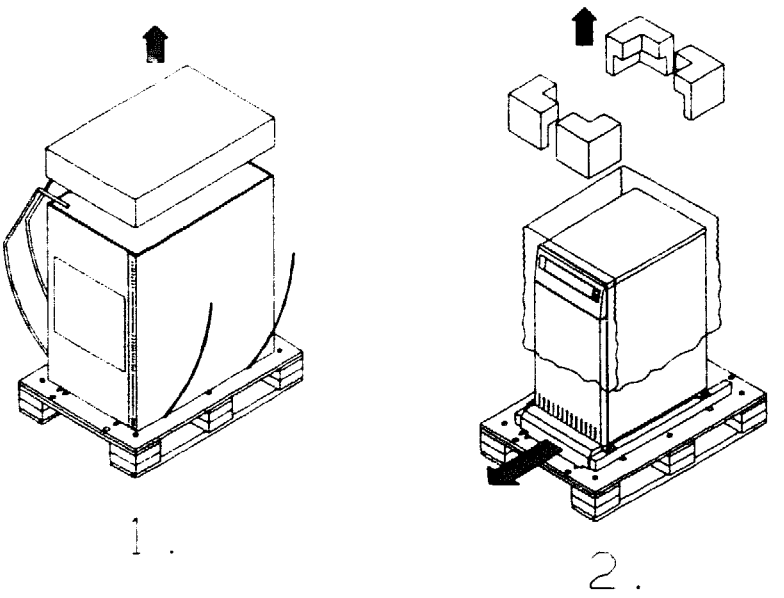



**FIGURE 6-1 SYSTEM CABINET UNPACKING**

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NOTE:
AT LEAST TWO PEOPLE ARE REQUIRED TO REMOVE THE CABINET FROM THE PALLET.

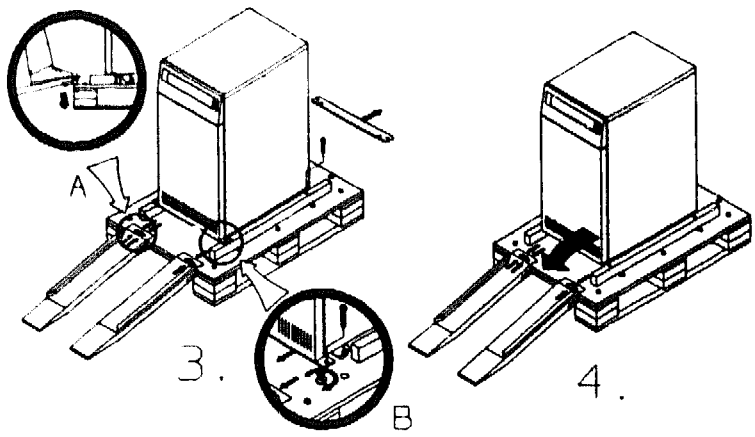


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**FIGURE 6-2 PREPARATION AND REMOVAL FROM PALLET**

1. Check the cabinet sides, top, and front and rear doors for damage. If the cabinet is damaged, do the following:
   a. Enter the location and extent of the damage on the LARS report.
   b. Notify the customer and your unit manager.
   c. Stop unpacking until the customer give you permission to continue.

If there is not damage, continue with Step 2.

2. Attach the ramps by fitting the prongs into the holes on the pallet. Place the ramps so that the runners are on the raised edge on outside. (see Figure 6-2, position 3A). Align the arrows on the ramps and pallet.

3. Check that the leveler feet are screwed up into the cabinet.

4. Using a 4" Crescent adjustable wrench, loosen 4 nuts holding brackets that hold the cabinet to the pallet, and slide brackets out (see Figure 6-2, position 3B).

5. With one person at the front of the cabinet, and the other person pushing from the rear of the UPS, slowly roll the cabinet off the pallet and down the ramps (See Figure 6-2, position 4).

6. Move the cabinet into position.

7. Lower and adjust the leveler feet using a 4" Crescent adjustable wrench.

8. Using a bubble level, check to see if the cabinet is properly leveled.

## 6.4. PHYSICAL INSTALLATION

1. Roll the cabinet(s), on their casters, to the operating site. Ensure that there is a minimum of 24 in in front and rear for service clearance.

2. For 10 kVA battery cabinet, use the kit supplied to join cabinets together as shown in Battery Cabinet Installation Drawing #110618896. Optional extra battery cabinets are joined in the same way.

3. Make electrical connections as required. See Sections 6.5 & 6.6.

4. With internal battery (3 kVA & 5 kVA), insert battery plug into connector. For external battery (10 kVA) see Section 6.7.

5. Ensure the cabinets are secure using the built-in leveling jacks.

## 6.5. CONNECTION TO INCOMING AC POWER

**WARNING:**
**LETHAL VOLTAGE is always present within the UPS when the DC power is connected.**

1. Ensure that the AC LINE, BATTERY and LOAD breakers (and STATIC BYPASS BREAKER on 10 kVA UPS) in the UPS are OFF.

2. Ensure that the DC power (battery) is disconnected by unplugging it at the first battery cabinet or by removing remote DC supply if applicable.

3. Ensure that the site utility AC power is OFF.

4. Ensure that the UPS AC power requirements conform to utility AC power available. The UPS power requirements are on the label at rear of cabinet. Connect the input power plug in the appropriate receptacle.

## 6.6. CONNECTION TO THE CRITICAL LOAD

There are two possible configurations of critical load connection.

(1) Receptacles and breakers custom fitted.
(2) Hardwiring to user supplied breakers.

**To install configuration (1):**

1. Ensure all LOAD breakers (front left of UPS) are OFF.
2. Plug critical load(s) in appropriate receptacle(s) (on rear of UPS).

**To install configuration (2):**

> **WARNING:**
> **LETHAL VOLTAGES. This installation should only be performed by a qualified electrician.**

1. Ensure that all AC and DC (battery) inputs to the UPS are disconnected.

2. Ensure that the required LOAD breakers are installed.

3. Affix AC output conduit(s) to appropriate "knockout" hole positions. Refer to Customer Drawing #110614133, 110614134 or #110714296 as appropriate for your system.

4. Ensure that the conduit is grounded to cabinet frame.

> **WARNING:**
> **LETHAL VOLTAGES. Do not rely on mechanical assembly to provide electrical ground.**

5. Pull through sufficient cable and connect to the appropriate LOAD breaker. Refer to Customer Drawing #110254291 or #110254292 as appropriate for your system.

6. Re-connect AC and optional DC (battery) input to the UPS.

## 6.7. BATTERY INTERCONNECTION WITH UPS (Local)

1. Ensure that the UPS BATTERY breaker on UPS front (door open) is OFF.

2. Open hinged cover at the rear of the 10 kVA battery cabinet (secured with 2 screws).

3. Plug in the cable from the UPS cabinet rear into leftmost receptacle (viewed from rear) on the 10 kVA battery cabinet.

4. For additional battery cabinets, detach rightmost connector (2 screws) and pull enough cable to connect to the next cabinet's leftmost receptacle (refer to Customer Drawing # 110618896 or #110618897 as appropriate for your system).

5. Close hinged cover (s) and screw down.