

2T-HA10F-CD 3.6 kVA Uninterruptible Power System

Operating Information

Order Number: EK-HA10F-OP.B01

Revision Update Information: Revised August 1992.

November 1991
August 1992

© Digital Equipment Corporation 1991, 1992. All rights reserved. Printed in U.S.A.

The reproduction of this material, in part or whole, is strictly prohibited. For copy information, contact the Educational Services Department, Digital Equipment Corporation, Maynard, Massachusetts 01754.

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

Restricted Rights: Use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013.

FCC NOTICE: This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- reorient the receiving antenna
- relocate the computer with respect to the receiver
- move the computer away from the receiver
- plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems."

This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

The postpaid READER'S COMMENTS form in this document requests the user's critical evaluation to assist in preparing future documentation.

The following are trademarks of Digital Equipment Corporation:
VAX DOCUMENT and the DIGITAL logo.

This document was prepared using VAX DOCUMENT, Version 2.1.

Contents

Preface	v
1 Introduction	
1.1 General Description	1-1
1.1.1 Bidirectional Converter	1-2
1.1.2 Battery Backup	1-2
1.2 Digital Modifications	1-3
2 Specifications	
2.1 UPS Electrical Input	2-1
2.2 UPS Electrical Output	2-1
2.3 Environmental	2-1
2.4 UPS Physical	2-1
2.5 Battery Unit Physical	2-2
2.6 Assembly Requirements in an H9702 Cabinet	2-2
3 Operation	
3.1 Controls and Indicators	3-1
3.1.1 UPS Controls	3-2
3.1.1.1 AC Input Circuit Breaker	3-2
3.1.1.2 Battery Circuit Breaker	3-3
3.1.1.3 Alarm Silence Button	3-4
3.1.2 UPS Indicators	3-4
3.1.2.1 Status Lights	3-4
3.1.2.2 Audio Alarm	3-5
3.1.3 Battery Unit Controls	3-6
3.2 Output Distribution	3-6
3.3 Emergency Shutdown Plug	3-6
3.4 Operating Procedures	3-8
3.4.1 Normal UPS Powerup	3-8
3.4.2 Normal UPS Powerdown	3-8
3.4.3 Manual Transfer from Normal to Bypass Mode	3-8
3.4.4 Manual Transfer from Bypass to Normal Mode	3-9

4 Removal and Replacement

4.1	Removal Procedures	4-1
4.2	Replacement	4-2

5 Maintenance

5.1	Preventive Maintenance	5-1
5.2	Customer Troubleshooting	5-1
5.3	Digital Services Troubleshooting	5-1
5.4	Periodic Battery Check	5-4
5.5	Storage Procedures	5-4

Figures

1-1	2T-HA10F-CD UPS Functional Diagram	1-2
3-1	2T-HA10F-CD UPS Front Panel	3-2
3-2	2T-HA10F-CD UPS Rear View with FCC Shielding Removed	3-7

Tables

3-1	Summary of Status Lights	3-5
5-1	Troubleshooting Status Lights	5-3

Preface

OVERVIEW

This manual is intended for users of the 2T-HA10F-CD 3.6 kVA Uninterruptible Power System (UPS). It provides a general introduction to the UPS; specifications; detailed information on system controls and operation; deinstallation procedures; and maintenance, troubleshooting, battery testing, and storage information.

WARNING

This unit contains no user-serviceable parts. If this unit is in need of repair, only qualified personnel familiar with safety procedures for electrical equipment and this specific product should access components inside the unit.

WARNING

The UPS battery unit contains batteries that are wired together to produce a high voltage. Even with no external connections, hazardous voltage exists inside the UPS battery unit that can cause severe burns or death upon contact.

The manual covers the following topics:

- **Chapter 1** provides a general description of the 2T-HA10F-CD UPS.
- **Chapter 2** provides the electrical, environmental, and physical specifications for the 2T-HA10F-CD UPS.
- **Chapter 3** provides a description of the controls and indicators, and the operating procedures for the 2T-HA10F-CD UPS.
- **Chapter 4** provides the removal and replacement procedures for the 2T-HA10F-CD UPS.
- **Chapter 5** provides preventive maintenance, troubleshooting, battery testing, and storage information for the 2T-HA10F-CD UPS.

CONVENTIONS

This section describes the special symbols used in this manual.

- NOTES:** Calls attention to information in text that may be of special importance.
- CAUTIONS:** Calls attention to information in text that is essential in avoiding system or equipment damage.
- WARNINGS:** Calls attention to information in text that is essential to the safety of personnel.

1.1 General Description

The 2T-HA10F-CD UPS is a 208 Vac, 60 Hz, 3.6 kVA UPS that provides back-up power to prevent interruptions in the ac power. The UPS protects sensitive equipment against problems associated with poor quality ac power or a complete loss of ac power. While online the UPS cleans the ac input, maintains a constant voltage, and totally isolates the output to the critical load. These actions keep power-line problems from reaching the load where they can damage software and hardware and cause equipment to operate erratically. Figure 1–1 illustrates the interactions of the major components to accomplish this task.

When power for the loads comes from an ac input, the UPS uses the following components to improve the quality of the power before it reaches the load:

- Isolation transformer
- Bidirectional converter

These components work together to reduce the inherent problems of raw ac, such as the following:

- No voltage (blackout)
- Undervoltage (brownout)
- Overvoltage
- Surges
- Spikes
- Common-mode noise
- Normal-mode noise

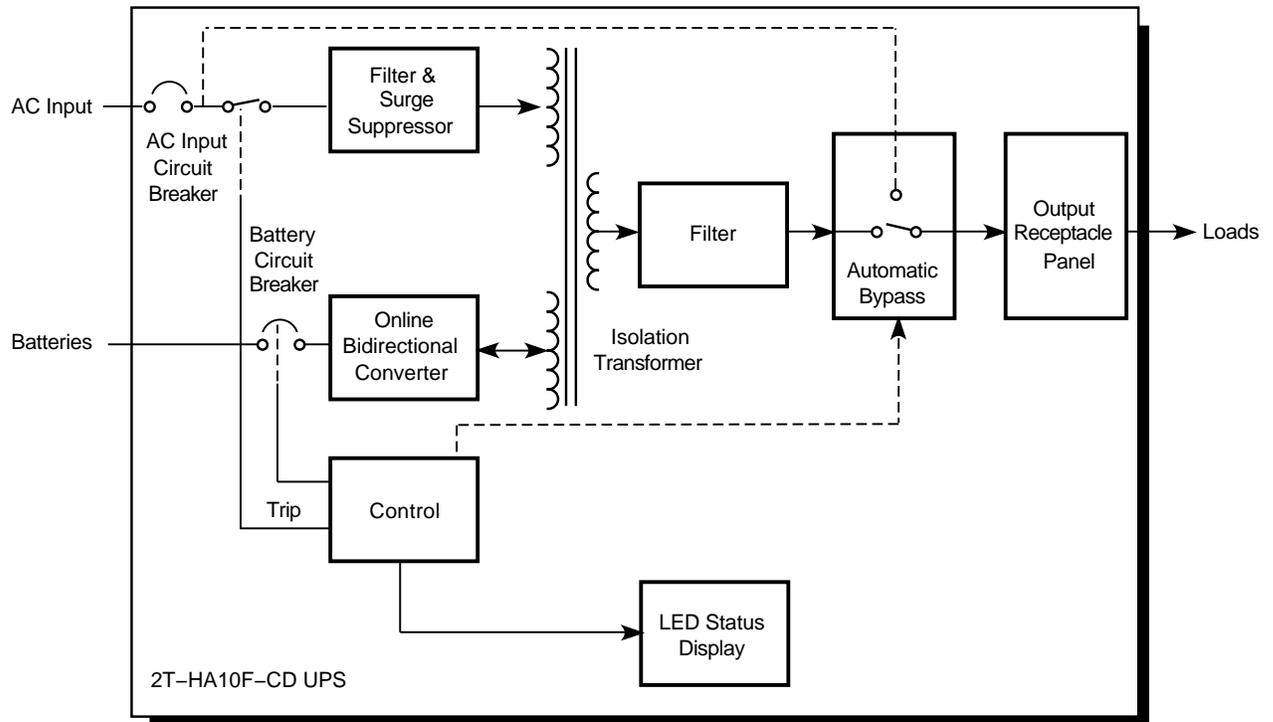
If the ac input fails to supply the power required by the load (during a blackout, for instance), the UPS immediately and automatically draws power from the battery and continues to supply clean power to the load without interruption.

When this happens, the UPS uses the following components:

- Battery
- Bidirectional converter

Introduction

Figure 1–1 2T-HA10F-CD UPS Functional Diagram



MKV-040000216-01-91-RAGS

1.1.1 Bidirectional Converter

The bidirectional converter conditions the electricity that powers the load. When the UPS draws power from an ac input, the bidirectional converter can simultaneously convert ac to dc to charge the batteries, and feed regulated ac voltage to the isolation transformer for output to the load.

When the batteries feed the UPS, the bidirectional converter changes dc to ac, and feeds the ac voltage to the isolation transformer for output to the load.

1.1.2 Battery Backup

In normal operation the ac input powers the loads through the UPS. If the ac input strays outside the specified input tolerance, a relay disconnects the ac input and the UPS draws power for the loads from the batteries. If the ac input returns to the specified tolerance, the relay closes and the UPS continues to provide regulated, conditioned power for the load, while simultaneously recharging the batteries.

The battery unit consists of six 12 Vdc lead-acid batteries connected in series. These batteries provide approximately 10 minutes of back-up time when the UPS is under full-load.

1.2 Digital Modifications

The 2T-HA10F-CD UPS is a Deltec UPS that has been modified by Digital Equipment Corporation to enhance its value and ease of use.

The UPS unit and the battery unit have both been modified by Digital.

The following modifications have been made to the UPS unit:

- Addition of a metal distribution panel box containing six 240 V output receptacles
- Addition of wiring from the UPS unit to the output receptacles
- Addition of ac input power wiring pigtail with connectors
- Addition of dc power wiring pigtail with connectors

The following modifications have been made to the battery unit:

- Addition of dc power wiring pigtail with connectors
- Addition of a cover plate over the battery connection terminal strip

Specifications

2.1 UPS Electrical Input

Voltage: 208 Vac +10%/-15%

Maximum Input Current: 20.0 A at 208 Vac

Frequency: 60 Hz

Current Distortion: Less than 10% (typically 5%) with full, nonlinear load

2.2 UPS Electrical Output

Voltage: 208 Vac \pm 2%

Frequency: 60 Hz

Regulation: 2%, steady state

Voltage Distortion: Less than 3%, total harmonic distortion

Overload Rating: 150% of full-load for 30 seconds

2.3 Environmental

Operating Temperature: 0°C to 40°C (32°F to 104°F); safety agency tested at 25°C (77°F)

Relative Humidity: 95% maximum at 25°C (77°F), noncondensing

Audible Noise: Less than 58 dBA

2.4 UPS Physical

UPS Unit Dimensions:

Width: 42.24 cm (16.63 in.)

Height: 21.92 cm (8.63 in.)

Depth: 63.83 cm (25.13 in.)

UPS Front Panel Dimensions:

Width: 48.26 cm (19.00 in.)

Height: 22.23 cm (8.75 in.)

UPS Weight: 73 kg (160 lb)

Specifications

2.5 Battery Unit Physical

Battery Unit Dimensions:

Width: 42.24 cm (16.63 in.)

Height: 16.84 cm (6.63 in.)

Depth: 63.83 cm (25.13 in.)

Battery Front Panel Dimensions:

Width: 48.26 cm (19.00 in.)

Height: 17.78 cm (7.00 in.)

Battery Weight: 67 kg (148 lb)

2.6 Assembly Requirements in an H9702 Cabinet

Width: 48.26 cm (19.00 in.)

Height: 48.89 cm (19.25 in.)

Depth: 71.12 cm (28.00 in.)

3.1 Controls and Indicators

The 2T-HA10F-CD UPS uses four controls and two indicators for routine operation.

Controls

- AC input circuit breaker
- Battery circuit breaker
- Audio alarm silence button
- Battery unit circuit breaker

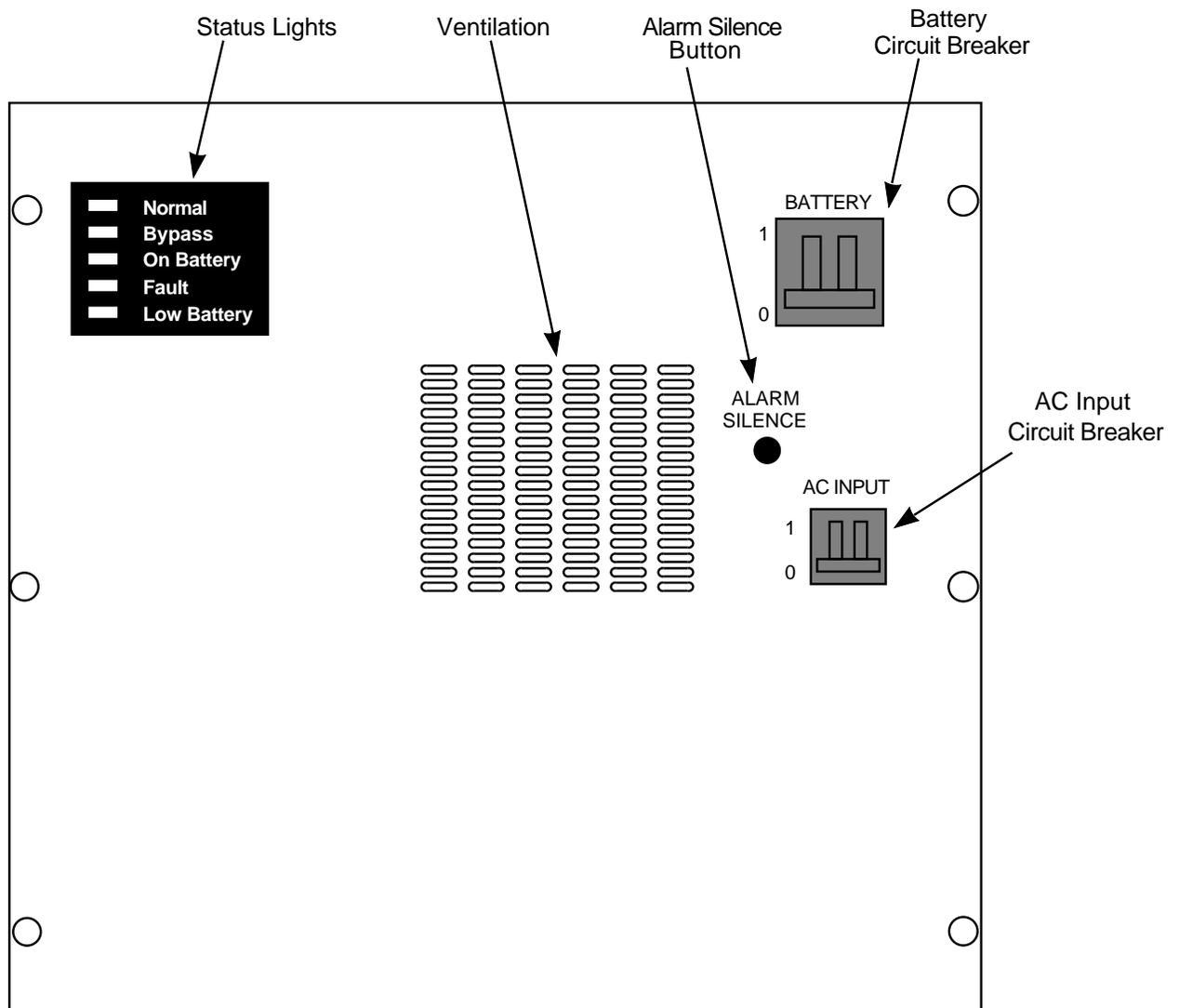
Indicators

- Status lights
 - Normal
 - Bypass
 - On Battery (ac input failure)
 - Fault (includes overtemperature and overload)
 - Low Battery
- Audio alarm

All of the controls and indicators are mounted on the front panel of the UPS except for the battery unit circuit breaker, which is located on the rear panel of the battery unit. Figure 3–1 shows the location of the UPS controls and indicators located on the front panel.

Operation

Figure 3–1 2T-HA10F-CD UPS Front Panel



MKV-040000216-03-91-RAGS

3.1.1 UPS Controls

The following sections describe the controls for the UPS unit.

3.1.1.1 AC Input Circuit Breaker

The ac input circuit breaker on the front panel must be ON before the UPS can receive power from an ac input source and charge the batteries. It opens and closes the circuit between the ac input power and the UPS. When the ac input circuit breaker is OFF, or the ac input power has failed for other reasons, the UPS will draw power from the batteries (if they are available).

3.1.1.2 Battery Circuit Breaker

The battery circuit breaker on the front panel must be ON before the UPS can charge the batteries or receive battery back-up power. It opens and closes the circuit between the battery unit and the UPS. If the ac input circuit breaker is OFF or tripped and the battery circuit breaker on the front panel is ON, the UPS will drain the batteries until the batteries reach a predetermined low-voltage level. When the battery reaches that level, the UPS will shut down and the load will be dropped.

WARNING

The UPS is connected to charged batteries and contains HIGH VOLTAGES. When the battery circuit breaker on the front panel is ON, the receptacles on the back of the unit (see Figure 3-2) can deliver an electrical shock. This condition can occur even when the UPS is disconnected from an ac power source and the ac input circuit breaker is OFF. These high voltages can injure or kill personnel and damage equipment.

WARNING

When the battery circuit breaker on the front panel is tripped or turned OFF, but the ac input circuit breaker is ON, the UPS output receptacles still have HIGH VOLTAGES present. These high voltages can injure or kill personnel and damage equipment.

CAUTION

To avoid discharging the batteries, DO NOT leave the battery circuit breaker on the front panel ON when the ac input circuit breaker is OFF.

NOTE

If the battery circuit breaker on the front panel is turned OFF, the UPS will go into Bypass mode. If the load is to be shut down completely, turn OFF the battery circuit breaker on the front panel AND the ac input circuit breaker.

Operation

3.1.1.3 Alarm Silence Button

When the audio alarm is activated, it can be silenced by pushing the alarm silence button. This button is located next to the ac input circuit breaker. Pressing the alarm silence button does not silence the audio alarm permanently. The audio alarm will be activated again the next time the UPS has an alarm condition.

3.1.2 UPS Indicators

The following sections describe the indicators for the UPS unit.

3.1.2.1 Status Lights

The status lights, a column of five LEDs, show the UPS's status. The print next to each color coded status light briefly describes the condition that the status light indicates.

A description of each status light follows, along with a summary of the status lights found in Table 3-1.

Normal Status Light

The green status light labeled "Normal" is lit when the UPS draws power from the ac input line and the ac input power meets input specifications. The UPS is in Normal mode when the ac line voltage is 208 Vac (+10%/-15%) and the output voltage is 208 Vac ($\pm 2\%$) and locked to the line frequency.

Bypass Status Light

The yellow status light labeled "Bypass" is lit when the UPS switches to Bypass mode. In Bypass mode the ac input bypasses the conditioning and battery charging electronics, but is still available at the output receptacles. The power available at the output receptacles is unconditioned and unregulated ac.

On Battery Status Light

The yellow status light labeled "On Battery" is lit when the UPS draws power from the battery unit. This occurs when the ac input voltage drops below 177 Vac. The "On Battery" status also activates the audio alarm.

The battery backup is limited (back-up time is typically 10 minutes under full-load). If the UPS does not return to normal operation before the batteries reach a predetermined low-battery cutoff, the UPS will shut down and the load will be dropped.

Fault Status Light

The red status light labeled "Fault" is lit when an overload, overtemperature, or internal failure occurs. The "Fault" status also activates the audio alarm. If the condition is harmful and persistent, the battery circuit breaker on the front panel will trip. When the battery circuit breaker on the front panel trips, the UPS will automatically transfer to Bypass mode.

If ac input power is available, the load will receive unconditioned and unregulated ac power. If ac input power is not available, the load will be dropped.

Low Battery Status Light

The red status light labeled "Low Battery" is lit when the battery voltage drops to a level where only 2 to 3 minutes of back-up time remains at full-load during a prolonged ac line failure. The "Low Battery" status also causes the audio alarm to change tone.

If the battery voltage continues to drop, the UPS will eventually stop operating and the load will be dropped. After the UPS stops operating, it will wait 3 hours for the return of the normal ac line power. If the normal ac line power returns within 3 hours, the UPS will turn on automatically. If the power outage lasts more than 3 hours, the battery circuit breaker on the front panel will trip and the UPS will have to be manually restarted.

CAUTION

The UPS must be turned OFF if it is not connected to an ac source or the batteries will slowly discharge. If the facility power is turned OFF for an extended period, turn the UPS OFF as well (after properly shutting down all connected loads).

CAUTION

DO NOT store the UPS with discharged batteries. If the batteries are allowed to remain discharged for long periods, their life will be significantly shortened.

Table 3–1 Summary of Status Lights

Name of Indicator	Color of Indicator	Audio Alarm	Condition
Normal	Green	No	Normal
Bypass	Yellow	No	Warning
On Battery	Yellow	Yes	Warning
Fault	Red	Yes	Danger
Low Battery	Red	Yes	Danger

3.1.2.2 Audio Alarm

The audio alarm is activated whenever the UPS switches to battery backup. The yellow "On Battery" status light will light up at the same time. If the UPS remains on battery backup until there are only 2 to 3 minutes of back-up power left, the audio alarm remains active but changes tone. At that time, the red "Low Battery" status light will light up.

The audio alarm will also be activated whenever the UPS has an overload, overtemperature, or internal failure. These conditions cause the red "Fault" status light to light up at the same time.

Operation

3.1.3 Battery Unit Controls

The battery unit circuit breaker (see Figure 3-2), located on the rear panel of the battery unit, must be ON before the UPS can charge the batteries or receive battery back-up power. It opens and closes the circuit between the battery unit and the battery circuit breaker on the UPS front panel.

When the battery unit circuit breaker is ON, battery voltage is applied to the battery circuit breaker on the UPS front panel. When the battery unit circuit breaker is tripped or turned OFF, all battery voltage is removed from the UPS.

3.2 Output Distribution

Output distribution for the 2T-HA10F-CD UPS is provided through a distribution panel located on the rear panel of the UPS (see Figure 3-2). This distribution panel contains six NEMA 6-15R (15 A, 208 V) receptacles.

3.3 Emergency Shutdown Plug

The 2T-HA10F-CD UPS is shipped with an emergency shutdown plug installed in the emergency shutdown jack on the rear of the UPS (see Figure 3-2).

The UPS will not operate if the emergency shutdown plug is not installed or if the circuit between the terminals of the emergency shutdown plug is broken.

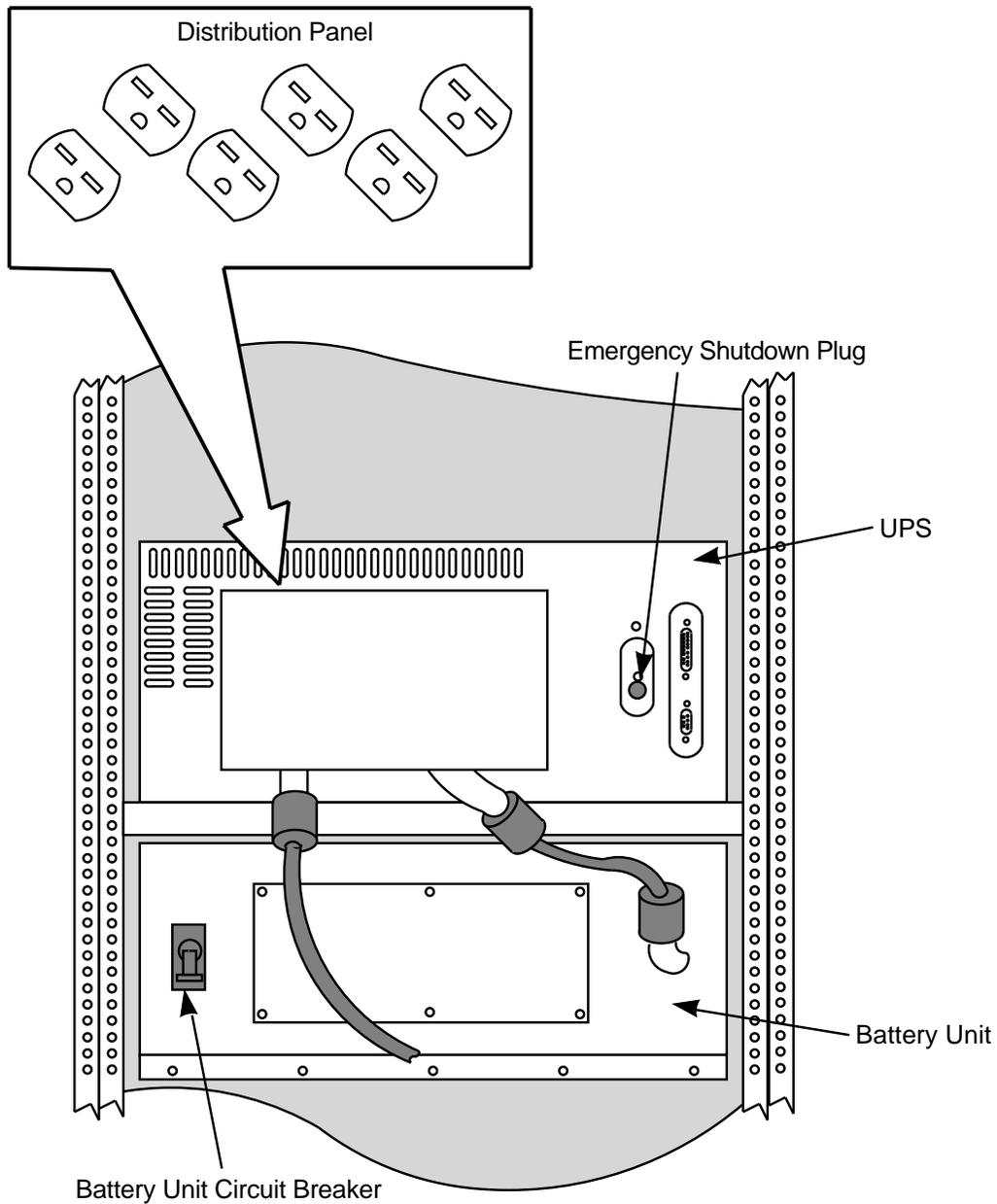
Pulling the emergency shutdown plug out of the emergency shutdown jack shuts down the UPS by tripping the ac input circuit breaker and the battery circuit breaker on the front panel.

The emergency shutdown plug also provides the connections for a Remote Emergency Power Off (REPO) device. The REPO device must have contacts that are normally closed and rated for a minimum of 80 V and 10 mA.

Use the following procedure to connect a REPO device to the emergency shutdown plug:

1. Turn the UPS OFF.
2. Remove the emergency shutdown plug from the emergency shutdown jack on the back of the UPS (see Figure 3-2).
3. Disassemble the emergency shutdown plug and remove the metal strip that connects the plug's two terminals to each other.
4. Route the wire from the REPO device through the rubber grommet on the back of the system cabinet.
5. Connect one wire per terminal from the REPO device to the plug's terminals.
6. Reassemble the emergency shutdown plug and plug it into the emergency shutdown jack on the back of the UPS.

Figure 3-2 2T-HA10F-CD UPS Rear View with FCC Shielding Removed



MKV-040000216-02-91-RAGS

Operation

3.4 Operating Procedures

The following sections contain the operating procedures for the 2T-HA10F-CD UPS.

3.4.1 Normal UPS Powerup

Use the following procedure to power up the UPS:

1. Ensure that all circuit breakers are turned OFF and that the system power cord is plugged into the proper electrical outlet.
2. Ensure that the load plugs are properly connected to the distribution receptacles located on the rear panel of the UPS (see Figure 3-2), and that the power switch(es) on the load(s) are turned OFF.
3. Place the battery unit circuit breaker, located on the rear panel of the battery unit (see Figure 3-2), to the ON position.
4. Place the ac input circuit breaker, located on the front panel of the UPS (see Figure 3-1), to the ON position.
5. Place the battery circuit breaker, located on the front panel of the UPS (see Figure 3-1), to the ON position.

After approximately 2 seconds, the green "Normal" status light on the UPS front panel should light to indicate that the UPS is operating normally.

6. Turn the individual load(s) on by placing their power switches to the ON position.

3.4.2 Normal UPS Powerdown

Use the following procedure to power down the UPS:

1. Turn the individual load(s) off by placing their power switches to the OFF position.
2. Place the battery circuit breaker, located on the front panel of the UPS (see Figure 3-1), to the OFF position.

The yellow "Bypass" status light on the UPS front panel should light to indicate that the UPS is operating in Bypass mode.

3. Place the ac input circuit breaker, located on the front panel of the UPS (see Figure 3-1), to the OFF position.
4. If the UPS is being shut down for an extended period of time or for service, place the battery unit circuit breaker, located on the rear panel of the battery unit (see Figure 3-2), to the OFF position. Access to the battery unit circuit breaker requires the removal of an access plate located in the lower left rear of the cabinet.
5. Unplug the system power cord from the electrical outlet.

3.4.3 Manual Transfer from Normal to Bypass Mode

The automatic bypass feature is an internal UPS transfer switch that breaks one circuit before another circuit is made. It transfers the load to the UPS bypass line whenever the ac input circuit breaker is ON and the battery circuit breaker on the front panel trips or is turned OFF.

Typically, the UPS logic trips the battery circuit breaker on the front panel if there is a failure in the UPS, or if the battery system needs protection. Tripping the battery circuit breaker on the front panel causes the UPS to automatically transfer the load to the bypass line. The UPS can also be forced to transfer the load to the bypass line, by manually turning the battery circuit breaker on the front panel to the OFF position.

CAUTION

If the UPS is transferred from Normal mode to Bypass mode when ac input is available and the loads are ON, the loads may be dropped because of a momentary power interruption during transfer.

Use the following procedure to manually transfer the UPS from Normal to Bypass mode.

1. Ensure that the green status light labeled "Normal" is lit to indicate that the UPS is in Normal mode.
2. Place the battery circuit breaker, located on the front panel of the UPS (see Figure 3-1), to the OFF position.

The yellow "Bypass" status light on the UPS front panel should light to indicate that the UPS is operating in Bypass mode.

NOTE

If the UPS was not forced into Bypass mode by turning OFF the battery circuit breaker on the front panel, the UPS probably transferred into Bypass mode automatically because of an abnormal condition. If the UPS automatically transferred to Bypass mode, correct the condition that caused the transfer before transferring the UPS back to Normal mode.

3.4.4 Manual Transfer from Bypass to Normal Mode

Use the following procedure to manually transfer the UPS from Bypass to Normal mode.

1. Ensure that the yellow status light labeled "Bypass" is lit to indicate that the UPS is in Bypass mode.
2. Place the battery circuit breaker, located on the front panel of the UPS (see Figure 3-1), to the ON position.

The green "Normal" status light on the UPS front panel should light to indicate that the UPS is operating in Normal mode.

Removal and Replacement

4.1 Removal Procedures

This section contains the procedures for removing the UPS and battery unit from a H9702 cabinet.

WARNING

The UPS unit and battery unit contain high voltage. Use extreme care, remove all jewelry, and observe all safety precautions when removing or working on the 2T-HA10F-CD.

Use the following procedure to remove the UPS and battery unit from the H9702 cabinet:

1. Turn the individual load(s) off by placing their power switches to the OFF position.
2. Place the battery circuit breaker, located on the front panel of the UPS (see Figure 3-1), to the OFF position.
3. Place the ac input circuit breaker, located on the front panel of the UPS (see Figure 3-1), to the OFF position.
4. Place the battery unit circuit breaker, located on the rear panel of the battery unit (see Figure 3-2), to the OFF position. Access to the battery unit circuit breaker requires the removal of an access plate located in the lower left rear of the cabinet.
5. Unplug the system power cord from the electrical outlet.
6. Remove (in one piece) the three rows of EMI panels that are above the bottom EMI-H panel by using the following steps:
 - a. Remove the seven 6-32 screws along the top edge of the third EMI panel row from the bottom.
 - b. Remove the seven 6-32 screws along the bottom edge of the first EMI panel row from the bottom.
 - c. Remove the nine 10-32 screws (three per EMI panel row) down the right side of the bottom three EMI panel rows.
 - d. Remove the nine 10-32 screws (three per EMI panel row) down the left side of the bottom three EMI panel rows.
 - e. Lift out the bottom three EMI panel rows in one piece.
7. Unplug all load plugs from the distribution receptacles located on the rear panel of the UPS (see Figure 3-2).

Removal and Replacement

8. Disconnect the three-wire (red, green, black) plastic connector pair that connects the battery unit to the UPS unit by pulling them straight apart.
9. Disconnect the standard L6-30R/L6-30P twistlock connector pair that connects the system power cord to the UPS unit by untwisting them and pulling them apart.
10. The UPS unit and the battery unit are attached to their respective shelves at the rear of the H9702 cabinet.
 - a. Remove the two 10-32 screws that secure the rear flange of the UPS unit to its shelf.
 - b. Remove the two 6-32 screws that secure the battery unit to the bracket on the rear edge of its shelf.
11. At the front of the H9702 cabinet, remove the six 10-32 screws that secure the front cover plate to the front of the UPS and battery units.

WARNING

The UPS unit weighs 73 kg (160 lbs) and the battery unit weighs 67 kg (148 lbs). Use the proper number of people and observe proper lifting techniques when removing these units.

12. Slide the units forward, one at a time, and out through the front of the H9702 cabinet.

4.2 Replacement

Use the reverse order of the removal procedures to replace the UPS and battery units in a H9702 cabinet.

5.1 Preventive Maintenance

The user can expect long, trouble-free operation from the 2T-HA10F-CD UPS with a minimum of preventive maintenance. Keep the area around the unit, especially the air inlet, clean and free of dust and moisture. This is the best preventive measure. If the atmosphere is very dusty, pull dust out of the system periodically with a vacuum cleaner.

5.2 Customer Troubleshooting

WARNING

THE UPS MAY CONTAIN HAZARDOUS VOLTAGES. Because the UPS and the battery unit may contain high voltages, ONLY qualified Digital Services technicians should perform troubleshooting and repair.

If the loads do not appear to be receiving power from the UPS, or if the audio alarm is sounding and the "Fault" status light is lit, call Digital Services for service.

When calling for service, check the status lights on the UPS front panel and be prepared to inform the service personnel which status lights, if any, are illuminated.

5.3 Digital Services Troubleshooting

WARNING

THE UPS MAY CONTAIN HAZARDOUS VOLTAGES. Because the UPS and the battery unit may contain high voltages, ONLY qualified Digital Services technicians should perform troubleshooting and repair.

Use the following procedure to troubleshoot the 2T-HA10F-CD UPS:

1. Check for the following indications:
 - a. Are there any lights lit on the load(s) or sounds coming from the load(s) that would indicate that they are receiving power from the UPS?
 - b. Are any of the lights on the UPS indicator panel lit? (See Table 5-1)

Maintenance

- c. Is the audio alarm sounding?
2. If the load does not seem to be receiving power from the UPS (no lights lit on the load(s) or sounds coming from the load(s)), check the following:
 - a. Ensure that the UPS is correctly connected to an electrical outlet.
 - b. Ensure that all load plugs are correctly and securely inserted into the proper receptacles. (Refer to Section 4.1 Step 6 for the procedures for removing the EMI panels to gain access to the distribution panel.)
 - c. Ensure that the ac input circuit breaker and the battery circuit breaker on the front panel, and the battery unit circuit breaker on the rear panel of the battery unit are ON (not tripped).
 - d. Ensure that the emergency shutdown plug is correctly wired and installed (see Section 3.3).

If the UPS still does not function properly, Digital Services should call Deltec Customer Service. When calling for service, check the status lights on the UPS front panel and be prepared to inform the service personnel which status lights, if any, are illuminated.

3. If there are lights lit on the load(s) and/or sounds coming from the load(s), there are probably normal ac voltages present at the UPS load receptacles. This can be checked by measuring the voltage at the load receptacles with a voltmeter.

If normal voltage is present at the load receptacles, determine whether that voltage is from the ac line or from the battery backup by observing the LED status lights on the UPS and referring to Table 5-1.

4. If the UPS unit or battery unit is determined to be faulty, use the procedures in Section 4.1 to remove and replace the faulty unit.

Table 5–1 Troubleshooting Status Lights

Lit Status Light	Indication	Corrective Action
Normal (green)	Normal operation. The UPS is drawing power from the ac input line and the ac input power meets input specifications. The UPS is in Normal mode when the ac line voltage is 208 Vac (+10%/-15%) and the output voltage is 208 Vac ($\pm 2\%$) and locked to the line frequency.	None
Bypass (yellow)	The UPS is in Bypass mode. There is a problem in the conditioning or battery charging electronics in the UPS, or the battery circuit breaker on the front panel has tripped OFF. The ac input is bypassing the conditioning and battery charging electronics, but is still available at the output receptacles as unconditioned and unregulated ac.	Reset the battery circuit breaker on the front panel. If the UPS does not return to Normal mode, call Digital Services.
On Battery (yellow)	<p>The UPS is drawing power from the battery unit. The ac input voltage has dropped below 177 Vac. The "On Battery" status also activates the audio alarm.</p> <p>The battery backup is limited (backup time is typically 10 minutes under full-load). If the UPS does not return to normal operation before the batteries reach a predetermined low-battery cutoff, the UPS will shut down and the load will be dropped.</p>	Perform an orderly shutdown of the load(s) before the batteries reach the low-battery cutoff.
Fault (red)	<p>An overload, overtemperature, or internal failure has occurred. The "Fault" status activates the audio alarm. If the condition is harmful and persistent, the battery circuit breaker on the front panel will trip. When the battery circuit breaker on the front panel trips, the UPS will automatically transfer to Bypass mode.</p> <p>If ac input power is available, the load will receive unconditioned and unregulated ac power. If ac input power is not available, the load will be dropped.</p>	Call Digital Services.
Low Battery (red)	The battery voltage has dropped to a level where only 2 to 3 minutes of backup time remains at full-load during a prolonged ac line failure. The "Low Battery" status also causes the audio alarm to change tone.	Perform an orderly shutdown of the load(s) before the batteries reach the low-battery cutoff and drop the load.

Maintenance

5.4 Periodic Battery Check

After the first 3 years, perform a load test every 6 months to confirm the capacity of the battery system.

To perform a load test follow these steps:

1. Turn OFF the ac input power to the UPS so that the UPS draws power from the batteries.
2. With a full-load on the UPS, battery capacity may be considered adequate if the batteries discharge for at least 7 minutes before the red "Low Battery" status light illuminates.
3. As soon as the red "Low Battery" status light illuminates, turn ON the ac input power for the UPS to avoid interrupting power to the load.

If a full-load is not used to test the battery capacity, determine the back-up time achieved during the first year of operation (assuming the load remains the same). Compare these results with future tests.

5.5 Storage Procedures

If the 2T-HA10F-CD UPS is going to be stored, the following guidelines *must* be followed to protect the batteries:

1. Charge the batteries fully before the UPS is stored by connecting the UPS to an ac source and operating it for 12 hours with all three circuit breakers in the ON position.
2. Turn the UPS OFF. Ensure that the ac input circuit breaker and the battery circuit breaker on the front panel, and the battery unit circuit breaker on the rear panel of the battery unit are OFF (not tripped or ON).
3. Avoid storage temperatures above 27°C (80°F). The preferred storage temperature is 21°C (70°F).
4. Every 90 days, connect the UPS to an ac source and operate it for 12 hours to recharge the batteries. The batteries may suffer damage if they are not recharged every 90 days during storage. Be sure that the ac input circuit breaker and the battery circuit breaker on the front panel, and the battery unit circuit breaker on the rear panel of the battery unit are OFF, not tripped or ON, when the UPS is returned to storage.
5. When moving, storing, or operating the UPS it must be kept in an upright position.