VXT 2000 Model VX227 Windowing Terminal

Service Information

Order Number: EK–VXT17–SV. A01

November 1992

This document describes how to service the VXT 2000 model VX227 terminal:

- Testing
- Troubleshooting
- Removing and replacing field replaceable units
- Aligning the video display
- Recommended spares list

Revision/Update Information: This is a new document.

Digital Equipment Corporation
Maynard, Massachusetts

First Edition, December 1992

The postpaid Reader's Comments forms at the end of this document request your critical evaluation to assist in preparing future documentation.

This document was prepared using VAX DOCUMENT, Version 2.1.

Contents

3 Troubleshooting

4 Removing and Replacing FRUs

5 Aligning the Video Display

A Related Documentation

B Recommended Spares List

C Self-Test Error Descriptions

Index

Figures

Tables

About This Guide

This guide describes how to service the VXT 2000 model VX227 windowing terminal system.

Who Should Use This Guide

This guide is for Digital Services personnel and qualified self-maintenance customers.

Organization

The guide contains five chapters and three appendices:

This Section . . .	Describes . . .
Chapter 1	The terminal's hardware and connectors, operating features, and site requirements.
Chapter 2	How to run the terminal's built-in self-tests and diagnostic tests, determine if there is a memory error, and display video alignment patterns on the monitor.
Chapter 3	How to troubleshoot the terminal, using displayed error codes, LED error codes, and a table of symptoms and solutions.
Chapter 4	How to remove and replace the field replaceable units (FRUs) for the terminal.
Chapter 5	How to align the video display, using test patterns and a radiance meter.
Appendix A	A list of related documents.
Appendix B	A list of recommended spare parts and an illustrated breakdown of FRUs.
Appendix C	Self-test error codes.

Tools and Equipment

You need the following tools to service the terminal:

Tools and Equipment	Part Number
Phillips screwdriver, number 2	29-11005-00
Wrist strap and antistatic mat (included in Digital Services antistatic kit)	29–26246–00
Two Ethernet terminators (H8225-00)[1]	12–26318–01
ThinWire Ethernet T-connector (H8223-00)	12–25869–01
Mouse loopback connector	12–25628–01
Terminal technician tool kit	29–27340–01
Anode discharge tool	29–24717–00
Metric measuring tape	29–25342–00
Safety goggles	29–16141–00
Gloves	29–16146–00

[1]The thickwire and twisted-pair Ethernet connectors do not have a loopback connector.

Conventions

The following conventions are used in this guide:

Convention	Meaning
terminal	Refers to the VXT 2000 model VX227 terminal.
mouse	Refers to any pointing device, such as a mouse, a puck, or a stylus.
MB1, MB2, and MB3	MB1 indicates the left mouse button. MB2 indicates the middle mouse button. MB3 indicates the right mouse button. (The buttons can be redefined by the user.)
Keyboard key	Keys or switches that are labeled appear in a box.
	Example: Press the Return key.
Ctrl *key*	For Ctrl key sequences, hold down Ctrl and press the other key.
Warning	Provides information to prevent personal injury.
Caution	Provides information to prevent damage to equipment or software.
Note	Provides general information about the current topic.
Menu items . . .	Menu items followed by . . . display a dialog box when selected.
PN	This is an abbreviation for part number.

Note to the Reader

The screens and windows shown in this guide represent the latest information available at the time of publication. Some screens and windows may not exactly match those that appear on your terminal or reflect the system-default settings.

1

A Look at the Terminal

This chapter provides an overview of the terminal's hardware and connectors, operating features, and site requirements.

1.1 Product Description

The VXT 2000 model VX227 is an X windowing terminal with a 17-inch monochrome screen. The terminal runs VXT Version 1.2 or higher software, loaded from a host system or InfoServer system. The terminal has a direct-view, antiglare screen and an autoranging power supply for worldwide operation. The built-in tilt-swivel base lets you adjust the screen for viewing comfort. When connected to a host system, the monitor displays information sent by the host.

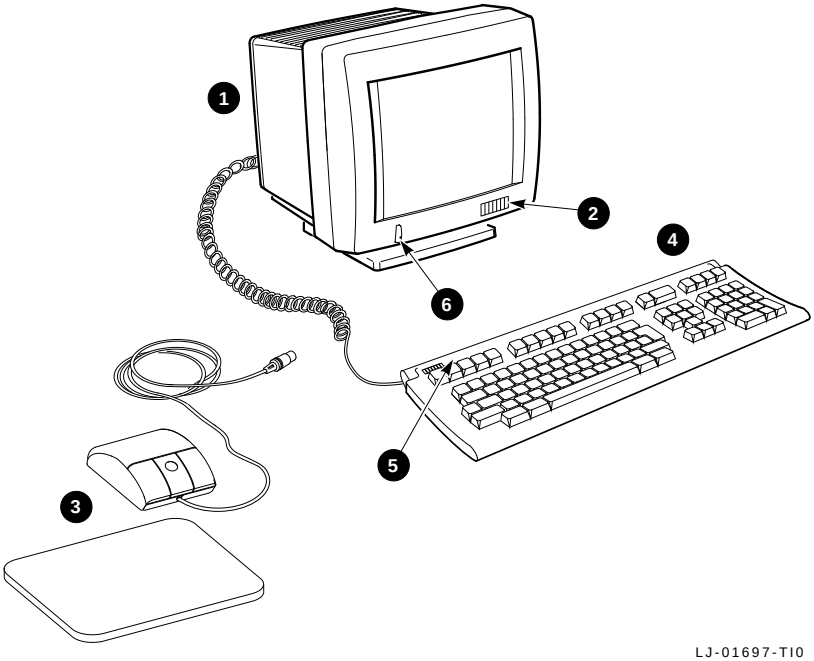
Dimensions: 394 mm (16 in.) deep × 406 mm (16 in.) wide × 419 mm (17 in.) high

The terminal can

- Connect to an Ethernet network through the terminal's thickwire and twisted-pair ports (model VX17–A*n*) or ThinWire port (model VX17–B*n*)
- Connect directly to a computer through the terminal's serial port
- Display multiple DECterm windows and applications over both the Ethernet and serial line simultaneously
- Interact over an Ethernet network with multiple terminal windows, and X window applications running under the UNIX, ULTRIX, or OpenVMS operating system
- Communicate with the transmission control protocol/Internet protocol (TCP/IP) for UNIX and ULTRIX systems, LAT or DECnet protocols for OpenVMS systems, and the local area disk/local area system transport (LASTport) protocol for InfoServer systems

1.2 Terminal Components

The VXT 2000 model VX227 terminal includes the following components:



LJ-01697-TI0

Item	Name	Description
❶	Terminal	Contains the system logic module, memory modules, network module, deflection module, video amp module, power supply, and connectors
❷	Terminal logo	VXT 2000
❸	Mouse	VSXXX–XX
❹	Keyboard	LK400 series (ANSI, short ANSI, or PC)
❺	Keyboard LEDs	LK401/LK402 ANSI: hold and lock indicators LK421 short ANSI: no indicators LK443/LK444 PC: Num Lock, Caps Lock, and Scroll Lock indicators (top right)
❻	AC power switch	On/off switch for the terminal

1.2.1 Keyboard

The terminal uses an LK400 series keyboard– LK401/LK402 ANSI, LK421 short ANSI (UNIX), or LK443/LK444 PC.

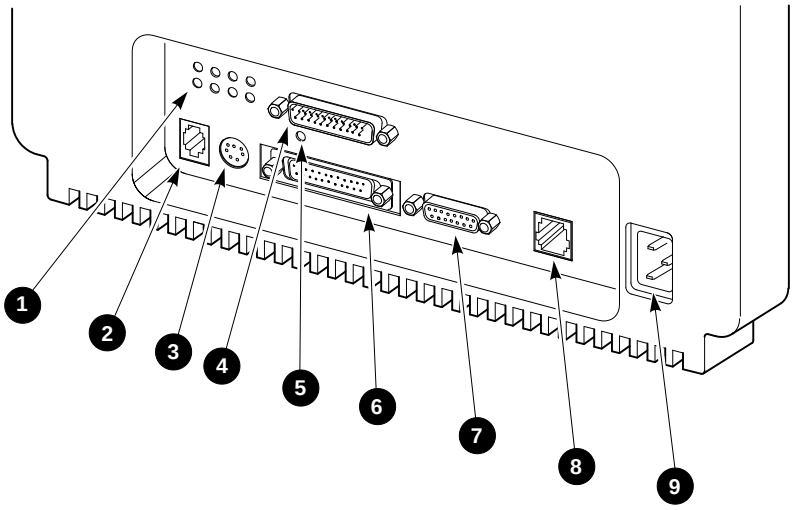
- The LK401–*xx* and LK402–*xx* keyboards have four groups of keys: the main keyboard, numeric and editing keypads, and top-row function keys. The keyboards also have two LED indicators, hold and lock. The LK401-*xx* is the standard version, and the LK402-*xx* is the word processing version.
- The LK421-*xx* is a short version of the LK401 keyboard, often used in UNIX environments. The LK421-*xx* does not have a numeric keypad or LED indicators. Users can still perform numeric keypad functions by using alternate key sequences.
- The LK443-*xx* and LK444-*xx* keyboards are PC keyboards. The LK443-*xx* is a 102-key worldwide model, and the LK444-*xx* keyboard is a 101-key North American model.

1.2.2 Mouse

The mouse is a three-button pointing device. The mouse lets you move the screen cursor and perform many screen actions, such as choosing items from menus, changing button settings in dialog boxes, and moving windows.

1.2.3 Terminal Connectors and Switches

The terminal's rear panel provides the connectors for the keyboard, mouse, a serial or parallel printer, system communication, and power. Some terminals have thickwire and twisted-pair Ethernet connectors (shown); others have a ThinWire Ethernet connector.



LJ-02025-TI0

❶ Diagnostic LEDs
❷ Keyboard
❸ Mouse/pointer
❹ Serial printer port
❺ Halt switch
❻ Parallel port
❼ Thickwire Ethernet connector
❽ Twisted-pair Ethernet connector
❾ Terminal ac power

1.3 Operating Features

This section briefly describes terminal sessions, network protocols, and how to control feature settings on the terminal.

1.3.1 X Window Sessions and Terminal Window Sessions

The terminal lets you open two types of sessions on host computers: X window session, and terminal window session.

X Window Session
To run an X window session, you log in to a host that has X window applications.

You can have one X window session and several terminal window sessions open at the same time. Within the X window session, you can run multiple X window clients. Each X window session and terminal session appear in a separate window.

Terminal Window Session
The terminal has a VXT DECterm terminal emulator window that allows you to log in to a host as you would on a conventional video terminal. VXT DECterm windows are compatible with VT300 series text terminals and offer enhancements such as user-selectable fonts.

1.3.2 Network Communication Protocols

You can use the terminal with UNIX, ULTRIX, or OpenVMS operating systems. You can run video terminal sessions and X window sessions on any of these operating systems.

For UNIX and ULTRIX systems:

The transmission control protocol/Internet protocol (TCP/IP) is the communication protocol. The terminal can use the TCP/IP Telnet or LAT communication protocol to make video terminal connections to UNIX and ULTRIX based host systems in a wide-area network.

For OpenVMS systems:

The LAT and DECnet protocols are the communication protocols.

For InfoServer systems:

The terminal uses the LASTport protocol for InfoServer systems.

1.3.3 Terminal Software

The VXT software is downloaded to the terminal from a host or an InfoServer system. The InfoServer software provides these added capabilities:

- Memory paging
- Configuration and font management for groups of terminals

1.3.4 Customizing the Terminal

There are several ways to check and control the terminal's operating features.

- **Terminal Manager Customize menu**
  When you click on Customize in the Terminal Manager window, the Customize menu appears. This menu lets you view and change many of the terminal's feature settings, such as the keyboard setup, the display language, and the cursor style for the pointer (mouse).

- **VXT DECterm Options menu**
  When you create a Telnet, LAT, DECnet, or serial port terminal window, the terminal displays a VXT DECterm window. The window includes an Options menu that lets you change certain terminal window features while an application is running. Many applications handle customization of the terminal window.
- **Workspace Options menu**
  When you click on the Workspace menu button (MB2 or MB3) outside any window, the Workspace menu displays a window menu. From the window menu, you can choose an Options submenu that lets you customize many window management features.
- **Configuration Manager window**
  Terminals that use VXT server-based software from an InfoServer have a configuration manger. When you click on Configuration . . . in the Terminal Manager window's Customize menu, the terminal displays a Configuration submenu (VXT Version 1.1 or higher software) or a Configuration Manger window (VXT Version 1.0 software). In either case, you can access the Resource Management and Font Management dialog boxes.

1.3.5 Checking the Terminal's System Configuration

From the Terminal Manger window, you can display a System Configuration dialog box to quickly verify many of the terminal's customizable configuration settings, such as the VXT system image version, the terminal's work group, and the Ethernet address. To display this dialog box:

1. Click on the Session menu in the Terminal Manger window.
2. Click on the Status menu item to display the Status submenu.
3. Click on **System Configuration . . .** to display the System Configuration dialog box.

To learn how to use windows and menus, see the chapter on using windows in *VXT 2000 Window Terminal User Information*.

1.4 Site Requirements

The terminal requires certain system software and network hardware to operate. The system manager or responsible site manager must ensure these requirements are met. *VXT Software System Management Information* describes the required system management tasks for the terminal.

1.4.1 Network Hardware Support

The terminal requires one of the following physical connections to connect to a host computer system:

Ethernet connector (thickwire, twisted-pair, or ThinWire)	Allows the terminal to operate with X window applications and multiple terminal sessions, using the TCP/IP, LAT, or DECnet network protocol. An Ethernet connector is needed to operate with X window or DECwindows software.
Serial line	Allows the terminal to connect to a single host, as on traditional VT*xxx* video terminals.

1.4.2 Memory Requirements

When you turn on the terminal, it loads its VXT software from an InfoServer system or from a host computer system. There are different memory requirements for using server-based or host-based software.

If You Use . . .	And . . .	Your Terminal Needs . . .
Server-based VXT software	–	4 megabytes of memory
Server-based VXT software	Image accelerator module	6 megabytes
Host-based VXT software	–	10 megabytes
Host-based VXT software	Image accelerator module	12 megabytes

The standard terminal comes with 4 megabytes of memory. You can add memory by installing memory modules on the terminal's system logic module.

Standard Terminal

- 4-megabyte system logic module

Optional Memory

- 2-megabyte memory module
  or
- 4-megabyte memory module

1.4.3 System Software Support

The following table summarizes the system resources needed to open X window sessions or terminal window sessions:

Operation	Operating System	Communication Protocol
X window session	OpenVMS Version 5.3-1 or higher	LAT/Master 5.4-1 DECnet TCP/IP
	InfoServer Version 2.2 or higher	LAT/Master Version 5.4-1 for setting host to OpenVMS MOP by name LASTport/Disk
	UNIX (any version)	TCP/IP TFTP (UDP) for font service X11R4 xdm X11R5 xdm
	UWS Version 4.1 or higher (includes ULTRIX Version 4.1)	TCP/IP TFTP (UDP) for font service X11R4 xdm X11R5 xdm DECnet

Operation	Operating System	Communication Protocol
Terminal window session	OpenVMS Version 5.3-1 or higher	LAT/Master Version 5.4-1 IP (Telnet) DECnet
	UNIX (any version)	IP (Telnet) DECnet LAT/Master Version 5.4-1
	ULTRIX Version 4.1 UWS Version 4.1	IP (Telnet) LAT/Master Version 5.4-1 DECnet

2

Testing

This chapter describes how to

- Run the terminal's built-in self-tests and diagnostic tests
- Determine if there is a memory error

To troubleshoot the terminal, see Chapter 3. To align the video display and use test patterns, see Chapter 5.

2.1 Self-Tests

The terminal has a series of self-tests to help you isolate failures to faulty device and field replaceable units (FRUs). You can run self-tests in two ways:

- Automatically during power-up
- Manually in console mode

The terminal automatically runs initialization self-tests during power-up. During the power-up process, the diagnostics test the basic functions of all FRUs. When the diagnostics detect an error, they still continue the self-tests if possible. All errors are reported at the end of the self-tests.

2.1.1 Running Self-Tests in Console Mode

Table 2–1 lists the power-up self-tests that run each time you turn on the terminal's power switch or press the halt switch on the rear panel twice. To run individual self-tests, place the terminal in console mode.

You can configure the terminal to run a minimal or extended self-test at power-up by entering a command in console mode. You can also run self-tests manually in console mode.

To enter console mode:

Press the halt switch on the rear panel of the terminal. When you enter console mode, the terminal resets itself and quits all session activity. The system displays the >>> console prompt.

Note

Before running tests in console mode, enter the UNJAM command at the console prompt to clear all pending interrupts.

To choose a minimal or extended power-up self-test:

To run a minimal self-test automatically at power-up, you enable fast boot (FBOOT) mode. To enable fast boot mode, enter the following command:

```
>>> SET FBOOT 1
```

To run the extended self-test automatically at power-up, enter the following command:

```
>>> SET FBOOT 0
```

To run self-tests individually:

You may want to run self-tests at a time other than power-up. You can run individual tests or a range of tests with the TEST command. Use the test numbers listed in Table 2–1. For example, to run all the self-tests, enter the following command:

```
>>> TEST 1:10
```

Note

In console mode, you can use the SHOW CONSOLE command to display the configuration and all available devices in the system. See Section 3.4 for more information.

Testing
2.1 Self-Tests

Table 2–1 Power-Up Self-Tests

Device Number	Device	Test Number
1	NVR test	T 1
2	Video (monochrome)	T 2
3	QDZ (serial port, mouse, and keyboard)	T 3
4	Cache	T 4
5	Memory (MEM)	T 5
6	Floating point unit (FPU)	T 6
7	Interval timer (IT)	T 7
8	System logic	T 8
9	Network interface (NI)	T 9
10	Parallel port	T 10
12	Image (IMG)	T 12

Manufacturing Mode

You can use manufacturing mode to test the communication paths (serial, parallel, and Ethernet) to the terminal. Standard user mode testing only tests to the internal loopback point, which may be three levels of components lower in the communication hardware chain.

Manufacturing mode requires loopback connectors on all communication ports except the keyboard port: the mouse port, the host port, the parallel port, and the Ethernet port. As a safeguard, you cannot select manufacturing mode without a loopback connector attached to the host port.

In manufacturing mode, you can select any of the power-up self-tests. Some tests such as the communication test take much longer than in user mode, because of the increased comprehension of the test.

To select manufacturing mode:

First you must install loopback connectors (Appendix B) on the mouse and serial communication ports. Then enter the following console command to select manufacturing mode:

```
>>> SET DIAGENV 3
```

2.1.2 Checking the Self-Test Results

The total test time depends on how much memory is installed and whether or not you are using fast boot (FBOOT) mode. The maximum test time is approximately two minutes.

If a test finds an error:

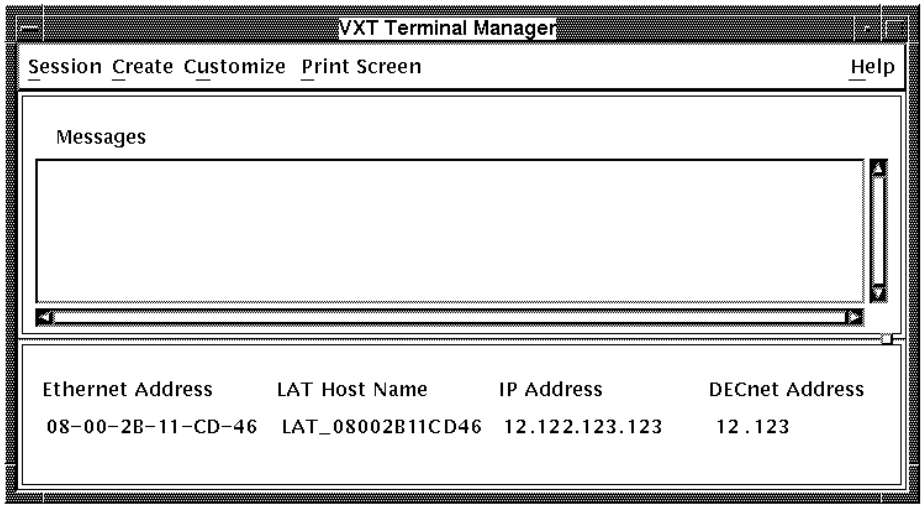
1. Record the error code.
2. Find the error code and suggested solution in Table 3–1.
3. Repeat the tests in this chapter to ensure the terminal operates correctly.

If the power-up self-tests finish successfully:

- The keyboard bell rings.
- On the LK401/LK402 ANSI and LK443/LK444 PC keyboards, the keyboard LEDs turn off. (The LK421–AA short ANSI keyboard does not have any LEDs.)
- The terminal displays the Terminal Manager window (Figure 2–1) after the power-up self-test patterns complete successfully.
- The Messages box in the Terminal Manager window displays the font path status and system-related messages.

  See *VXT 2000 Window Terminal User Information* for general information on the Terminal Manager window and font path settings. The *VXT 2000 Software System Management Information* describes how system managers can manage fonts with the terminal's configuration manager, on InfoServer based systems.

Figure 2–1 Terminal Manager Window



LJ-01140A-RAGS

2.1.3 Diagnostic LED Power-Up Sequence

At power-up, the terminal's self-tests check the system before the system tries to boot. The diagnostic LEDs on the rear of the terminal indicate which test is in progress.

Table 2–2 lists the LED display for each device being tested. If diagnostic testing completes successfully, the LEDs turn off. If an error occurs, the LEDs display a flashing error code to indicate which test failed. See Section 3.6 to troubleshoot the LED error codes.

Table 2–2 Power-Up LED Codes

LED Display		LED Code	
Device 7 6 5 4	Subtest 3 2 1 0	(Hex.)	Description
●●●●	●●●●	FF	Power has been applied, but no instruction has been run.
●●●●	●●●o	FE	Power-up testing has started.
●●●●	●●o●	FD	Waiting for memory to initialize.
●●●●	●●oo	FC	Sizing the memory in the terminal.
●●●●	●o●●	FB	Running a byte mask test on memory needed by the console.
●●●●	●o●o	FA	Performing a full memory data path test on memory needed by the console.
●●●●	●oo●	F9	Initializing the console data structures.
●●●●	●ooo	F8	Performing the auto configuration.
●●●●	o●●●	F7	Testing the NVR device.
●●●●	o●●o	F6	Testing the serial controller (QDZ) device.
●●●●	o●o●	F5	Testing the graphics output device.
●●●●	o●oo	F4	Initializing the console device.
●●●●	oo●●	F3	Starting the console program.
oo●o	oooo	20	Starting the monochrome/SPX self-test.
o●oo	oooo	40	Starting the cache test.
o●o●	oooo	50	Starting the full memory test.
o●●o	oooo	60	Starting the floating-point unit (FPU) test.
o●●●	oooo	70	Starting the interval timer (IT) test.
●ooo	oooo	80	Starting the ROM test.
●oo●	oooo	90	Starting the network interface (NI) self-test.
●●oo	oooo	A0	Starting the parallel port test.

Key to LED Codes

The upper four LEDs = the device number.
The lower four LEDs = the subtest number.

● = LED on; o = LED off.

(continued on next page)

Table 2–2 (Cont.) Power-Up LED Codes

LED Display		LED Code	
Device 7 6 5 4	Subtest 3 2 1 0	(Hex.)	Description
●●oo	ooo●	D1	Starting the parallel port interrupt test.
●●oo	oo●o	D2	Starting the data path test.
●●oo	oo●●	D3	Starting the command signal test.

Key to LED Codes

The upper four LEDs = the device number.
The lower four LEDs = the subtest number.

● = LED on; o = LED off.

Note

In fast boot (FBOOT) mode, LED codes 20, 50, and 60 may be displayed too quickly to be noticed. In FBOOT mode, some devices are not fully tested. This minimizes power-up testing time.

2.2 Displaying the Software Version Number

You can display the software version number by clicking on the Terminal Manager window's title bar (Figure 2–1). You can also check the software version by viewing the System Configuration dialog box (Section 1.3.5). For more information, see *VXT 2000 Window Terminal User Information*.

2.3 Network Service Failure Messages

The terminal may experience network problems even though the power-up self-tests finish successfully. Network problems may occur because vital network services failed.

If the network fails, the terminal may display one of the following network service failure messages in the Terminal Manager window's message box.

```
Cannot locate system image, retrying ...
Cannot connect with system image, retrying ...
Cannot locate free pagefile storage, retrying ...
Cannot locate pagefile, retrying ...
Cannot connect with pagefile, retrying ...
Cannot extend pagefile, more disk space is needed on server
```

If a network error occurs: Check the Ethernet cable connection. If the error continues to occur, contact the system manager or the Digital network service representative.

2.4 Checking for Memory Errors

The terminal displays memory status messages under certain conditions. You can also check for soft memory errors in console mode.

2.4.1 Memory Status Messages

The terminal reports its memory status or potential memory problems in the Messages box of the Terminal Manager window when the terminal is using the host-based VXT system software. Table 2–3 describes possible memory status messages.

Table 2–3 Memory Status Messages

Status Message	Description
Memory Not Low	There is enough memory for the terminal to perform normal operations. The terminal displays a Memory Not Low message in the Terminal Manager window.
Memory Low	If the memory level continues to decrease, then the local VXT DECterm windows and remote client sessions may fail. The terminal continues to operate normally in this state.
Memory Very Low	If the memory level continues to decrease, then all terminal operations may fail. If the memory condition becomes Very Low when the terminal is servicing an X protocol request from a remote client, the request fails and the terminal disconnects the session to the remote client immediately. The terminal will not service any new X session requests, but all other operation continue normally.
No Memory Left	If there is no memory left, all terminal operations may fail until the user clears the No Memory Left condition. The terminal does not display any warning messages and operates as though it is in the Memory Very Low condition. If the terminal cannot recover enough memory to operate normally, the terminal restarts itself.

2.4.2 Soft Error Messages

Because the terminal can operate as a server-based machine with virtual memory, memory errors can be classified as soft errors or hard errors.

- Soft memory errors disable only a limited number of pages of memory. The terminal can still operate satisfactorily.
- Hard memory errors leave less than 0.5 megabytes of usable memory.

During the power-up self-test, the system displays only hard memory errors. Soft errors are recorded, but not displayed.

If you suspect that a terminal has a memory problem, such as not being able to run an application that ran previously, enter the following command in console mode:

```
>>> SHOW ERROR
```

The SHOW ERROR command displays any soft error message along with other errors. See Chapter 3 to troubleshoot either hard or soft errors. A soft error is not fatal; it is a transitory bit set in an arbitrary register. A hard error is fatal, indicating a hardware device has failed.

3

Troubleshooting

This chapter describes how to troubleshoot hard and soft errors on the terminal by

- Using error codes displayed on the screen (Sections 3.4 and 3.5)
- Using error codes displayed by the LEDs (Sections 3.4.2 and 3.6)
- Checking a table of general problems (3.7)

3.1 Troubleshooting Sequence

When troubleshooting the terminal, use the following sequence:

1. Check the console error codes.
2. Check the LED error codes.
3. Check the troubleshooting table in this chapter.

Example

Suppose the system logic module has failed.

1. There are *no console error codes*, because there is no video.
2. There is *no LED error code*, because the LEDs may be running through the test sequence.
3. Check *Table 3–10* for a screen display problem that matches the symptoms of your terminal.
4. Follow the suggested solutions in the order listed in the table.

3.2 Before You Start

The following information will help you troubleshoot the terminal easily and effectively:

WARNING

If you smell burning components, press the terminal's power switch off and disconnect the power cord.

- If you are going to service a display problem, ask the customer to warm the monitor up for at least 20 minutes before you arrive, if possible.
- Magnetic fields affect monitor performance and can give a false indication of a monitor failure. Place the monitor away from any electromagnetic devices (such as printers and terminals) or large magnetized objects (such as filing cabinets and steel beams in walls).

Note

After you replace a video amp assembly, deflection module, or power supply module, always perform all required adjustments. See Chapter 5.

3.3 Hard and Soft Errors

The terminal's power-up tests and self-tests can detect hard errors and soft errors.

- Hard errors are fatal errors that force the terminal to quit all session activity and enter console mode.
- Soft errors are nonfatal errors. Nonfatal errors do not interrupt session activity. Many memory errors may be soft errors, because the terminal can operate as a server-based machine with virtual memory.

3.3.1 Entering Console Mode After a Hard Error

If a self-test detects a hard error on a networked terminal, the terminal automatically enters console mode and displays the >>> console mode prompt. In console mode, you can use the SHOW ERROR command to display error information.

3.4 Troubleshooting Soft Memory Errors

The self-tests report many memory errors as soft errors. When a self-test finds a soft memory error, the terminal still indicates the self-test was successful and does not display an error message when the self-tests have completed. To troubleshoot soft memory errors, you need to display the memory positions and gaps so you can determine which FRU to replace. Therefore, you must correct any video problems before trying to correct any soft memory error.

You can use the SHOW ERROR console command to display error messages. Soft errors begin with one question mark (?). Hard errors begin with two question marks (??).

Some soft errors are due to fast boot (FBOOT) mode. These errors have error numbers of 0fff. These errors indicate a device was not tested because of power-up time limitations. Generally, all soft errors can be ignored unless the terminal is malfunctioning.

3.4.1 Troubleshooting Soft Memory Errors from the Console

To determine if the self-tests detected a memory error:

1. **Enter console mode** by pressing the halt switch on the rear of the terminal.
2. **Enter the SHOW CONFIG command** to list the memory in the system. The display shows
   - Memory locations for components, such as those shown in Figure 3–1
   - The total size of physical memory in megabytes
   - The size of usable memory (minus the console buffers) in kilobytes
   - Devices with hard errors (??) or soft errors (?)

SHOW CONFIG Command

```
>>> SHOW CONFIG

VXT V01.2
08-00-2B-2E-XX-XX
16MB (16263KB)

DEVNUM    DEVNAM          INFO
------    ------          ----------------------------------------
  1        NVR             OK
  2       VMONO            OK?
                           NOT TESTED
  3        QDZ             OK
  4       CACHE            OK
  5        MEM             OK
                           16MB == SY=4MB, S0=4MB, S1=4MB, S2=4MB
  6        FPU             OK
  7         IT             OK
  8        SYS             ??  0000 0066
  9        VNI             OK
 10        PRL             OK
 12        IMG             OK
```

Key to SHOW CONFIG Command

The **DEVNUM** column lists the device number.
The **DEVNAM** column lists the device name.
The **INFO** column lists the test results:

- SY is the 4 MB system logic module.
- S0, S1, and S2 are the optional memory modules in slots J1, J2, and J3, respectively. In this example, each module has 4 MB of memory, so the total memory configuration is 16 MB.
- One question mark (?) indicates a soft error. Use the SHOW ERROR console command to find out more information on the soft error.
- Two question marks (??) indicate a hard error on device SYS. The 0000 0066 code indicates the faulty FRU. See Table 3–1.

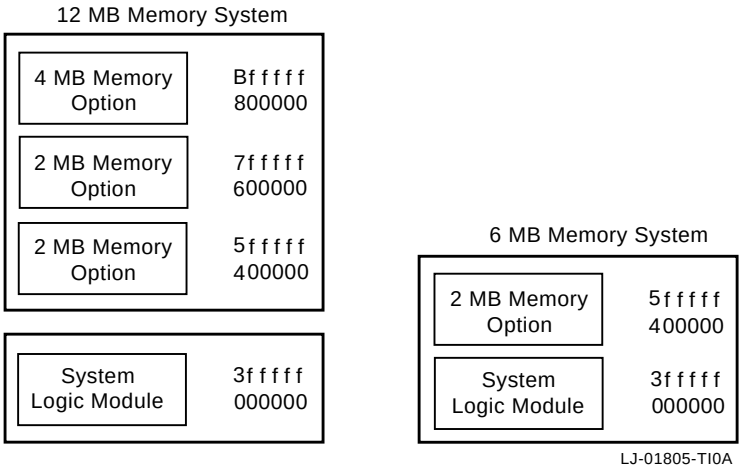
Each 2-megabyte memory module occupies a 1ffff segment of memory.
Each 4-megabyte memory module occupies a 3fffff segment of memory.

For example, if the SHOW CONFIG command listed a 2 MB memory module at S0 and a 4 MB memory module at S1, the memory map would be as follows:

```
000000 3fffff      4K bytes for the system logic module
400000 5fffff      S[0] (2MB MEM)
600000 Afffff      S[1] (4MB MEM)
```

The memory modules can be any combination of 4 MB and 2 MB modules. The only restriction is that you must load the memory slots starting with S0 and progressing to S2. If there is an empty slot between memory modules, the self-tests report a hard memory error (??). Hard memory errors prevent the system from autobooting.

Figure 3–1 Sample Memory Configurations—12 MB and 6 MB Systems



3. **Enter the SHOW ERROR command** at the console prompt.

   If the self-tests detect a memory error, the console displays a memory error code beginning with a question mark. For example:

   `?001 005 MEM` *nnn*

   `?` indicates a soft error.

   `001` is a field reserved for future use.

   `005` indicates the device that failed—memory.

   `MEM` indicates a memory error.

   `nnn` indicates where the memory error occurred.

Note

See Section 3.5 for more information on hardware errors.

4. **Enter the SHOW MEM command** to determine the areas of memory. This command displays any valid gap in the memory areas, as well as any bad memory area. A **valid gap** in memory is space reserved for future memory expansion.

   SHOW MEM Command

```
>>> SHOW MEM

      MEM_TOP = 01000000
      MEM_BOT = 00000000

        MEM_NOT_AVAIL
      ____________________
      00FE1C00:00FFFFFF
```

   Key to SHOW MEM Command

   - **TOP** is the top of the memory area.
   - **BOT** is the bottom of the memory area.
   - **MEM_NOT_AVAIL** lists any memory blocks not available. If the SHOW CONFIG command listed an error next to the MEM device (5), then this field may list memory blocks not available. See the following examples.
   - **00FE1C00:00FFFFFF** is the memory used by the console.

   Examples

   - If the terminal has a valid gap in memory and the maximum memory is 6 MB, then the SHOW MEM command may display the following MEM_NOT_AVAIL information:

```
5dffff   5fffff
3C0000   3fffff
```

     – `3C0000 - 3fffff` is a sample valid gap for a system logic module that has a video frame buffer in resident memory (Figure 3–2).

     – `5dffff - 5fffff` is the **scratch RAM** area. Scratch RAM can be up to 128K bytes of memory reserved for booting, always positioned at the top of memory. As more memory modules are installed, these numbers increase to occupy the last 128K bytes in memory. The last entry (TOP) of the list is always the memory reserved for scratch RAM. If there is any bad memory that is contiguous with scratch RAM, then this area may look considerably larger.

- If the terminal has bad memory and the top of memory is 6 MB, then the SHOW MEM command may display the following information:

  ```
  5dffff 5fffff
  41ffff 42ffff
  3C0000 3fffff
  ```

  – `3C0000 - 3fffff` may be the valid gap on the system logic module.

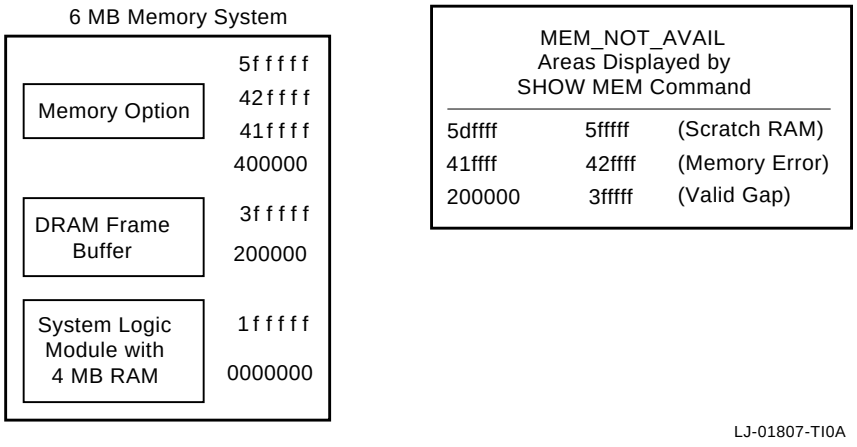
  – `41ffff - 42ffff` is not normal for a 6 MB system. These numbers represent the bottom and top, respectively, of the bad memory area.

  – `5dffff - 5fffff` is the scratch RAM area at the top of memory.

  By analyzing the memory data, you can determine the valid gaps, the scratch RAM area, and any bad memory data. By comparing the memory data with the configuration, you can determine which FRU is showing the bad soft memory error.

  In the Figure 3–2 example, the bad memory area (`41ffff - 42ffff`) is within the memory configuration area of `400000 - 5fffff`. This area is the resident 4 MB RAM on the system logic module, so the system logic module has a soft memory error and should be replaced.

Figure 3–2 Example of 6 MB System with Soft Memory Error



LJ-01807-TI0A

3.4.2 Troubleshooting Soft Memory Errors by LEDs

When your run a memory self-test from the console and it finds the first soft error, the terminal displays the soft error on the screen (Table 3–1). The diagnostic LEDs on the rear of the terminal momentarily display the memory test error code (Section 3.6).

3.5 Troubleshooting Hard Errors

If the terminal's self-tests find an error, the terminal attempts to display an error code on the screen and a device code on the diagnostic LEDs. Table 3–1 lists the error codes reported on the screen. If the video fails, see Section 3.6 to read the error code from the LEDs.

To troubleshoot hard errors:

1. At the >>> console prompt, enter the SET FBOOT 0 command. This command disables fast boot mode for self-tests, so the terminal tests all resident memory.
2. Record any screen error code. If the video failed, record any LED device code.

   Normally, the terminal does not display a code for soft memory errors. If you suspect a soft memory error, see Section 3.4.
3. Check Table 3–1 for screen error code you recorded, to determine if the error is a device error. If the video failed, check the tables in Section 3.6 for the LED device code.

   For a detailed description of the error codes, see Appendix C.

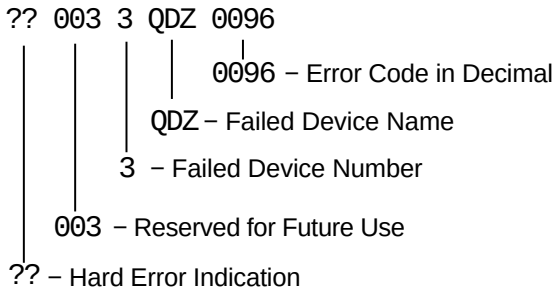
Hard Error Messages in the Power-Up Self-Test

For hard errors, the power-up self-tests may report the following information:

VXT V01.*nnn*	ROM version
nn-nn-nn-nn-nn-nn	The terminal's Ethernet address
2MB	Megabytes of memory installed
?? 001 9 VNI 0168	Error for disconnected network cable
?? 003 3 QDZ 0096	Other error messages (See Figure 3–3 and Table 3–1.)
	Self-test progress indicator (Fills in as tests are completed.)

Figure 3–3 shows the format of an error message.

Figure 3–3 Error Message Format



Self-Test Error Codes

Table 3–1 lists possible error codes. The probable solution for any error code not listed in the table is to replace the system logic module. To display a complete list of all the devices in the terminal's configuration, enter the SHOW CONFIG console command.

Network Interface (NI) Errors If a network interface (NI) error occurs, check the rear of the system box to verify that a loopback connector is installed on the selected network port.

If needed, enter the TEST 9 console command to run the NI self-test again.

Table 3–1 Self-Test Error Codes

Error Code (Decimal)	Replace	Device (Decimal)	Error Code (Decimal)	Replace	Device (Decimal)
0066	System logic module	9	0170	NI module	9
0068	System logic module	9	0172	NI module	9
0071	NI module	9	0256	System logic module	2

(continued on next page)

Table 3–1 (Cont.) Self-Test Error Codes

Error Code (Decimal)	Replace	Device (Decimal)	Error Code (Decimal)	Replace	Device (Decimal)
0080	Keyboard	3	0512	System logic module	2
0096	Mouse	3	0514	System logic module	6
0128	System logic module	2	0770	System logic module	6
0130	NI module	9	1024	System logic module	2
0132	NI module	9	1280	System logic module	2
0160	NI module	9	1536	System logic module	2
0162	NI module	9	1794	Floating point	6
0164	NI module	9	2050	Floating point	6
0166	NI module	9	2304	Memory module	5
0168	NI module	9	2305	Memory module	5

3.6 LED Error Codes

If the screen cannot display an error message, you can check the LED error code displayed by the diagnostic LEDs on the rear of the terminal. Use the following tables to troubleshoot LED error codes. The tables describe the LED error codes and list the suggested action to take.

Table 3–2 NVR LED Error Codes
Table 3–3 Monochrome LED Error Codes
Table 3–4 QDZ LED Error Codes
Table 3–5 Cache LED Error Codes
Table 3–6 MEM LED Error Codes
Table 3–7 SYS Device LED Error Codes
Table 3–8 NI Device LED Error Codes
Table 3–9 Printer Port Device LED Error Codes

Key to Tables

In the **LED Display** column:

The upper four LEDs = the device number.
The lower four LEDs = the subtest number.

• = LED on. o = LED off.

The **Replace** or **Action** column provides a section reference.

Table 3–2 NVR LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Replace
ooo•	ooo•	11	NVR test failed.	System logic module (4.8).

Table 3–3 Monochrome LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Action
oo•o	oooo	20	Monochrome/SPX self-test has been entered. LEDs sequence without returning an error.	Check for loose connectors.
oo•o	ooo•	21	Monochrome configure test failed.	Replace the system logic module (4.8).
oo•o	oo•o	22	Monochrome reset test failed.	Replace the system logic module (4.8).
oo•o	oo••	23	Monochrome memory test failed.	Replace the system logic module (4.8).
oo•o	o•oo	24	Monochrome RAMDAC test failed.	Replace the system logic module (4.8).
oo•o	o•o•	25	Monochrome cursor test failed.	Replace the system logic module (4.8).
oo•o	o••o	26	Monochrome drawing test failed.	Replace the system logic module (4.8).

Table 3–4 QDZ LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Action
oo●●	ooooo	30	QDZ test has been entered. LEDs sequence without returning an error.	Check for loose connectors.
oo●●	ooo●	31	QDZ reset test failed.	Replace the system logic module (4.8).
oo●●	oo●o	32	QDZ modem test failed.	Replace the system logic module (4.8).
oo●●	oo●●	33	QDZ polled test failed.	Replace the system logic module (4.8).
oo●●	o●oo	34	QDZ interrupt test failed.	Replace the system logic module (4.8).
oo●●	o●o●	35	LK400 series test failed.	Replace the keyboard (4.20).
oo●●	o●●o	36	Mouse test failed.	Replace the mouse (4.20).

Table 3–5 Cache LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Replace
o●oo	ooo●	41	Data store read write error.	System logic module (4.8)
o●oo	oo●o	42	Read/write error to the tag area.	System logic module (4.8)
o●oo	oo●●	43	The cache did not contain the proper state of the valid bit. This is part 1 where valid should be set.	System logic module (4.8)
o●oo	o●oo	44	Error during the cache tag validation. The tag diagnostic space is missing.	System logic module (4.8)

(continued on next page)

Table 3–5 (Cont.) Cache LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Replace
o●oo	o●o●	45	Unexpected tag parity error.	System logic module (4.8)
o●oo	o●●o	46	Cache did not provide the expected data during cache hit testing.	System logic module (4.8)
o●oo	o●●●	47	Parity was not expected.	System logic module (4.8)
o●oo	●ooo	48	Tag not valid during cache hit test.	System logic module (4.8)
o●oo	●oo●	49	Data not expected during cache hit test.	System logic module (4.8)
o●oo	●o●o	4A	Cache write-through test failed. The information in the data store did not agree with expected data.	System logic module (4.8)
o●oo	●o●●	4B	Cache write-through test failed. The information in the memory did not agree with expected data.	System logic module (4.8)
o●oo	●●oo	4C	Error occurred during a write miss.	System logic module (4.8)

Table 3–6 MEM LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Replace
o●o●	oooo	50	Memory byte mask test failed.	System logic module (4.8)
o●o●	ooo●	51	Byte mask test fails.	System logic module (4.8)
o●o●	oo●o	52	Memory error occurred in the forward pass.	System logic module (4.8)

(continued on next page)

Table 3–6 (Cont.) MEM LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Replace
o●o●	oo●●	53	Memory error occurred in the reverse pass.	System logic module (4.8)
o●o●	o●oo	54	Memory error in parity test 1.	System logic module (4.8)
o●o●	o●o●	55	Memory error in parity test 2.	System logic module (4.8)
o●o●	o●●o	56	Top of menu conflicts with configuration.	System logic module (4.8)
o●●o	oooo	60	Floating point test.	System logic module (4.8)
o●●●	oooo	70	Interval timer test.	System logic module (4.8)

Table 3–7 SYS Device LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Replace
●ooo	oooo	80	ROM verify test failed.	System logic module (4.8)
●ooo	ooo●	81	Interrupt controller test failed.	System logic module (4.8)

Table 3–8 NI Device LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Action
•oo•	oooo	90	NI self-test has been entered. LEDs sequence without returning an error.	Check for loose connectors.
•oo•	ooo•	91	Network address test failed.	Replace the system logic module (4.8).
•oo•	oo•o	92	NI register test failed.	Replace the system logic module (4.8).
•oo•	oo••	93	NI initialization test failed.	Replace the system logic module (4.8).
•oo•	o•oo	94	NI internal loopback/DMA test failed.	Replace the system logic module (4.8).
•oo•	o•o•	95	NI interrupt test failed.	Replace the system logic module (4.8).
•oo•	o••o	96	NI CRC test failed.	Replace the system logic module (4.8).
•oo•	o•••	97	NI receive miss/buffer test failed.	Replace the system logic module (4.8).
•oo•	•ooo	98	NI collision test failed.	Replace the system logic module (4.8).
•oo•	•oo•	99	NI address filtering test failed.	Replace the system logic module (4.8).
•oo•	•o•o	9A	NI external loopback test failed.	Replace the system logic module (4.8).
•oo•	•o••	9B	NI transmit buffer test failed.	Replace the system logic module (4.8).

Table 3–9 Printer Port Device LED Error Codes

LED Display		LED Code		
Device 7 6 5 4	Test 3 2 1 0	(Hex.)	Description	Action
●●oo	oooo	D0	Entered printer port test. LEDs sequence without returning an error.	Check for loose connectors.
●●oo	ooo●	D1	Started printer port interrupt test.	
●●oo	oo●o	D2	Started data path test.	
●●oo	oo●●	D3	Started command signal test.	

3.7 Troubleshooting General Problems

Table 3–10 describes some general operating problems with suggested solutions. For each symptom described, the table assumes that only one assembly has failed or only one problem exists. However, one symptom may indicate multiple failures. Always troubleshoot the most obvious symptom first. Problems may come from the terminal or from a host system.

Troubleshoot the terminal as follows:

1. Ask the operator to describe the problem. The operator often has the most information about how the problem occurred.
2. Identify the problem. The screen display often helps identify the problem.
3. Isolate the problem. Check column 1 in Table 3–10 for a symptom that matches your problem. Then try the suggested solutions.
4. After you correct a problem, display the host system alignment test patterns to make sure that no other problem exists. See Section 5.2 for displaying test patterns.

Table 3–10 Troubleshooting the Terminal

Symptom	Suggested Solution
Monitor Problems—Blank Screen (No Video or Raster)	
The terminal's power switch is on, but the LED on the power switch is off.	Check the terminal's power cord connection at the rear of the monitor and at the power outlet.
	Use another power outlet. If the problem continues, call the facilities person.
	Replace the power supply module (Section 4.14).
	Replace the deflection module (Section 4.16).
	Replace the video amp assembly (Section 4.13).
The terminal's power LED is on, and the system box LEDs are blinking.	Replace the system logic module. (Section 4.8). Also check the LED error code tables (Section 3.6).
The terminal's power switch and LED are on.	Check the brightness and contrast controls (Section 5.1).
	Replace the system logic module (Section 4.8).
	Replace the deflection module (Section 4.16).
	Replace the video amp assembly assembly (Section 4.13).
	Replace the CRT/chassis assembly (Section 4.17) only after trying the previous solutions.
The terminal's power switch and LED are on.	Check all cabling going to the deflection module and the video amp assembly, including the CRT socket connector. If necessary, secure the cables.
	Check the brightness and contrast controls (Section 5.1).
	Correct the G2 adjustment. (Section 5.4.2).
	Replace the deflection module (Section 4.16).

(continued on next page)

Table 3–10 (Cont.) Troubleshooting the Terminal

Symptom	Suggested Solution
Other Monitor Problems	
The terminal loses power for no apparent reason, or the Terminal Manager window appears after the monitor loses power for no apparent reason.	Check to make sure the power cable is securely connected. Replace the power supply (Section 4.14).
The Terminal Manager window is not displayed.	Check with the system manager to see if the Terminal Manager window is locked or hidden. Replace the network module (Section 4.6). Replace the video amp assembly (Section 4.13). Replace the deflection module (Section 4.16).
Blank Screen (No Video, But Raster Is Present)	
You can display raster by adjusting the brightness control, but there is no video or cursor displayed even when the contrast control is at maximum.	The host system's CRT screen saver feature is activated. Press any key to reactivate the display. Check all the cables to the deflection module and the video amp assembly. Replace the video amp assembly (Section 4.13). Replace the deflection module (Section 4.16). Replace the CRT/chassis assembly (Section 4.17) only after trying the previous solutions.
Poor Display Quality	
Make sure the monitor has warmed up for at least 20 minutes before you troubleshoot display quality problems.	
Geometry, centering, height, width, or linearity are out of adjustment.	Remove any electromechanical devices that are near the terminal or move the terminal to another location. Perform the alignment procedure (Section 5.1). Replace the deflection module (Section 4.16). Replace the CRT/chassis assembly (Section 4.17) only after trying the previous solutions.

(continued on next page)

Table 3–10 (Cont.) Troubleshooting the Terminal

Symptom	Suggested Solution
Poor Display Quality	
The display is not bright enough (using the all-white diagnostic pattern).	Adjust the brightness and contrast controls (Section 5.1).
	Perform the gain adjustment (Section 5.5) and the cutoff adjustment (Section 5.4.2).
	Replace the video amp assembly (Section 4.13).
	Replace the deflection module (Section 4.16).
	Replace the CRT/chassis assembly (Section 4.17) only after trying the previous solutions.
The display is too bright.	Set the brightness control to the optimum range.
	Replace the video amp assembly (Section 4.13).
	Replace the deflection module (Section 4.16).
Vertical lines are not straight.	Remove any electromechanical devices that are near the terminal or move the terminal.
	Perform the alignment procedures (Section 5.1).
	Replace the deflection module (Section 4.16).
	Replace the CRT/chassis assembly (Section 4.17) only after trying the previous solutions.
There is video noise in the display (intermittent flashing or changes in brightness.)	Reseat the connectors on the deflection module.
	Replace the video amp assembly (Section 4.13).
	Replace the deflection module (Section 4.16).
	Replace the power supply module (Section 4.14).
	Replace the system logic module (Section 4.8).
The screen focus is not sharp.	Perform the focus adjustment (Section 5.4.2).
	Replace the deflection module (Section 4.16).
	Replace the video amp assembly (Section 4.13).
	Replace the CRT/chassis assembly (Section 4.17) only after trying the previous solutions.

(continued on next page)

Table 3–10 (Cont.) Troubleshooting the Terminal

Symptom	Suggested Solution
Screen Display Problems	
Curved lines appear on screen during power-up.	Curved lines are part of the normal power-up display. The terminal is operating correctly.
The screen is off-center or rotated.	Move the terminal to another location.
	Check the terminal's rotation adjustment (Section 5.1).
Horizontal or vertical line appears on screen.	Check the terminal's horizontal and vertical adjustments (Section 5.1).
The screen display is distorted or jittery.	Nearby devices are creating electrical interference. Move the terminal away from the electrical devices.
	The monitor is out of alignment. Align the terminal (Section 5.1).
The screen image seems to wobble or jump at the end of a successful power-up sequence.	This action is normal. The terminal is operating correctly.
In local mode, the terminal displays different characters than those typed.	Choose the correct character set from the General Options dialog box in the Options menu of a VXT DECterm window.
	Choose the correct keyboard type by using the Customize Keyboard dialog box, accessed from the Terminal Manager window's Customize menu.
While on-line with the host, the terminal displays different characters than those typed. (The terminal works in local mode.)	The transmit and receive speeds are incorrect. Set the speeds to match the host by using the Serial and Parallel Ports dialog box. To access the dialog box, click on the Terminal Manager window's Customize menu and choose the Customize Communications submenu.
	Bits/character or parity setting is wrong. Set the Word Size or Parity setting to match the host by using the Customize Communications dialog box, accessed from the Terminal Manager window's Customize menu.
	The stop bits setting is incorrect. Set the Stop Bits number to match the host by using the Serial and Parallel Ports dialog box.

(continued on next page)

Table 3–10 (Cont.) Troubleshooting the Terminal

Symptom	Suggested Solution
Screen Display Problems	
Messages are garbled, and reverse question marks appear on the screen.	XON/XOFF flow control is not enabled. Click on the XOFF at 64 or 128 button in the Serial and Parallel Ports dialog box. To access the dialog box, click on the Terminal Manager window's Customize menu and choose the Customize Communications submenu.
The screen display does not scroll.	Press F1 to resume scrolling. On PC keyboards, press Scroll Lock.
The screen is blank.	Press any key to restore the screen display. Check the Screen Saver setting in the Customize Screen Background dialog box, accessed from the Terminal Manager window's Customize menu.
The terminal fails after warming up. The screen goes blank, and the LED on the power switch turns off.	Thermal shutdown occurred. Replace the power supply (Section 4.14).
Memory Problems	
Memory quota seems low.	Check the messages in the Terminal Manager window's Messages box (Section 2.4.1). There is not enough memory installed in the terminal. Memory modules are installed in the wrong slot. Install the memory modules in the correct slot (Section 4.4).
Problems at Power-Up	
The Terminal Manager window appears, but the keyboard bell does not ring.	The power-up self-tests detected a soft or hard error. See Section 3.4 to troubleshoot soft memory errors. See Section 3.5 to troubleshoot hard errors. Check to see that the keyboard is plugged in. Replace the keyboard (Section 4.20).

(continued on next page)

Table 3–10 (Cont.) Troubleshooting the Terminal

Symptom	Suggested Solution
Problems at Power-Up	
The Terminal Manager window appears, and the bell tone sounds, but the terminal cannot communicate with host.	Check the Ethernet cable connection on the rear of the terminal. Enter the terminal's correct IP address. For information on entering the IP address, see the system manager or *VXT 2000 Window Terminal User Information*. Check the terminal's serial port and parallel port cable connections on the rear of the terminal. The serial communication port circuits are faulty. Run the serial port loopback tests. See test 9 (NI test) in Section 2.1.1. The baud rate is incorrect. Check the Transmit and Receive speeds in the Customize Communications, Serial and Parallel Ports dialog box (Customize menu in the Terminal Manager window).
A keyclick sound stays on continuously at power-up.	Check for a stuck keyboard key. Replace the keyboard (Section 4.20).
The terminal cannot save customized settings.	Check with the system manager to see if customized settings are locked. If the system logic module was replaced, make sure that the Ethernet chip from the old module was installed on the new module (Section 4.8).
Customized settings are lost without any apparent reason.	Ask the system manager or site manager to check if the terminal is set to read-only mode. See the configuration management chapter in *VXT Software System Management Information*.
InfoServer based systems: The system does not respond, even though the mouse pointer moves on the screen.	Check if there are network messages (Section 2.3) at the top of the screen. If network messages appear, then the InfoServer system is having problems. The terminal is operating correctly.

4

Removing and Replacing FRUs

This chapter describes how to remove and replace the field replaceable units (FRUs) for the terminal. See Appendix B for the recommended spares lists.

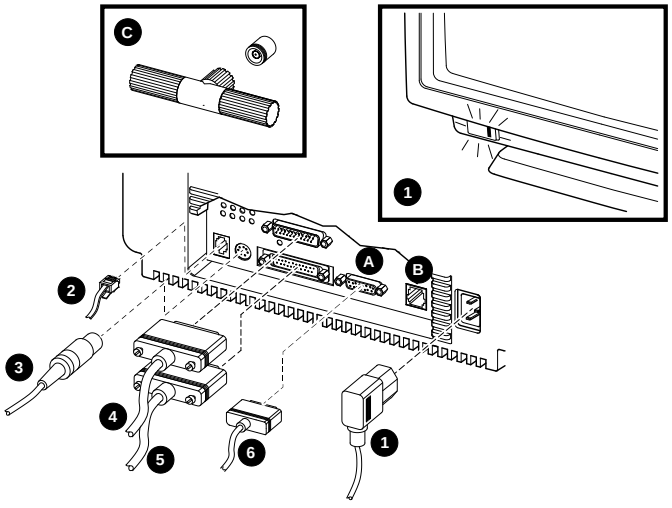
Caution

Always use a static protection kit (PN 29–26246–00) when handling any internal components.

4.1 External Cables

To remove the external cables:

1. Make sure the power switch at the front of the terminal is off (pressed out). Unplug the power cord from the power outlet first, then from the terminal.
2. Disconnect the keyboard cable from the terminal.
3. Disconnect the mouse cable from the terminal.
4. If you have a serial printer or secondary host computer, disconnect the printer or host cable from the terminal.
5. If you have a parallel printer, disconnect the printer cable from the terminal.
6. Disconnect the network cable from the terminal. Your terminal may have one or two network connectors:
    - (a) a thickwire connector and (b) a twisted-pair connector
    - (c) a ThinWire connector



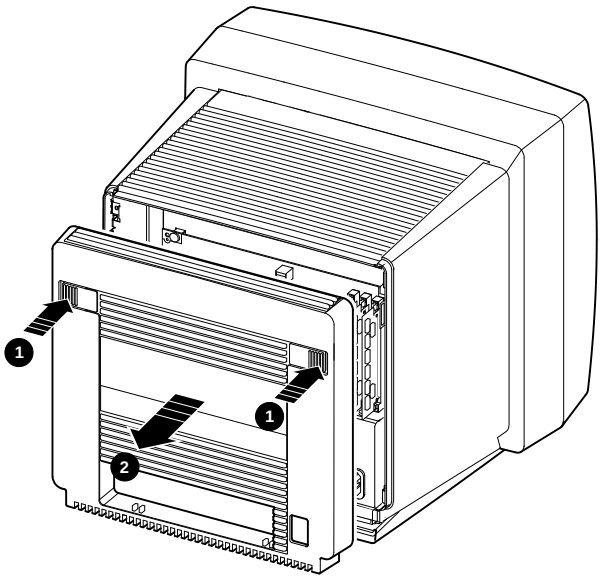
LJ-02026-TI0

4.2 Rear Cover

To remove the rear cover:

1. Disconnect the external cables from the rear of the terminal (Section 4.1).
2. Release the terminal's rear cover by pressing in the two locking tabs ❶ with your thumbs.
3. Remove the cover by pulling the cover's slotted tabs straight out of their grooves ❷.

To close the rear cover: First insert the lower tabs in their grooves. Then press in the two locking tabs ❶ with your thumbs and push the cover into place. Release the tabs to lock the cover into place.



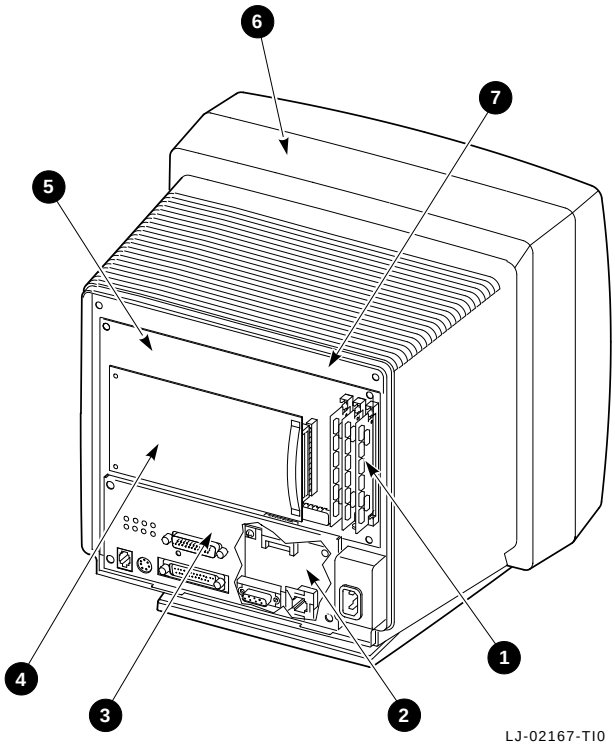
LJ-02166-TI0

4.3 System FRUs

When you remove the rear cover, you can see the FRUs in the system section of the terminal. Appendix B lists all FRU part numbers. When replacing any FRU, tilt the terminal from the back to the front to allow easier access to the modules.

WARNING

Turn the power off and remove the power cord before disconnecting or replacing any FRU.



LJ-02167-TI0

1. Memory modules
2. Network module
3. Bulkhead panel
4. Image accelerator module
5. System logic module
6. Outer cover
7. Safety wall

4.4 Memory Modules

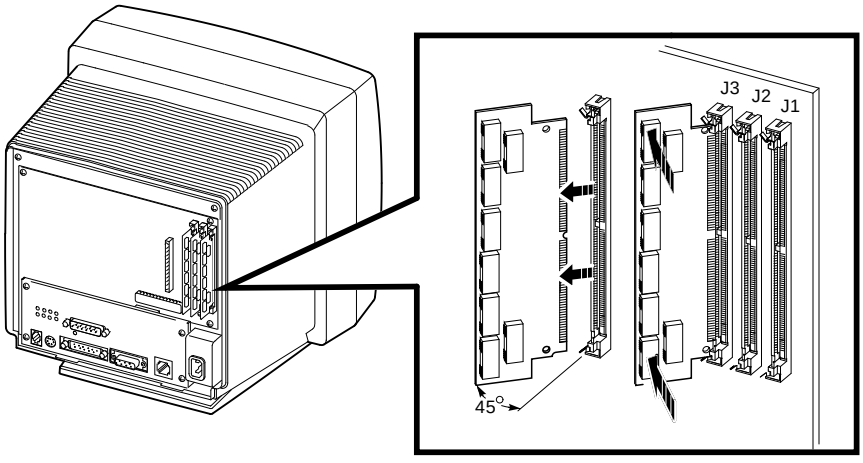
Caution

Memory modules can be damaged by electrostatic discharge. Handle the memory module by the side edges of the module. Avoid contact with the gold contact fingers on the module.

4.4.1 Removing Memory Modules

To remove memory modules from the system logic module:

1. Remove the rear cover (Section 4.2).
2. If you have an image accelerator module installed, remove it before removing the memory module in slot J3 (Section 4.7).
3. Remove the memory modules from left to right, starting with the module in slot J3.
   a. Release both sides of the memory module from the connector by gently pushing each clip away from the sides of the module.
   b. Grasp the edges of the memory module firmly and lift up to remove the module from the connector.
   c. Repeat these steps for each module you want to remove. Remove the module in slot J2, then the module in slot J1.

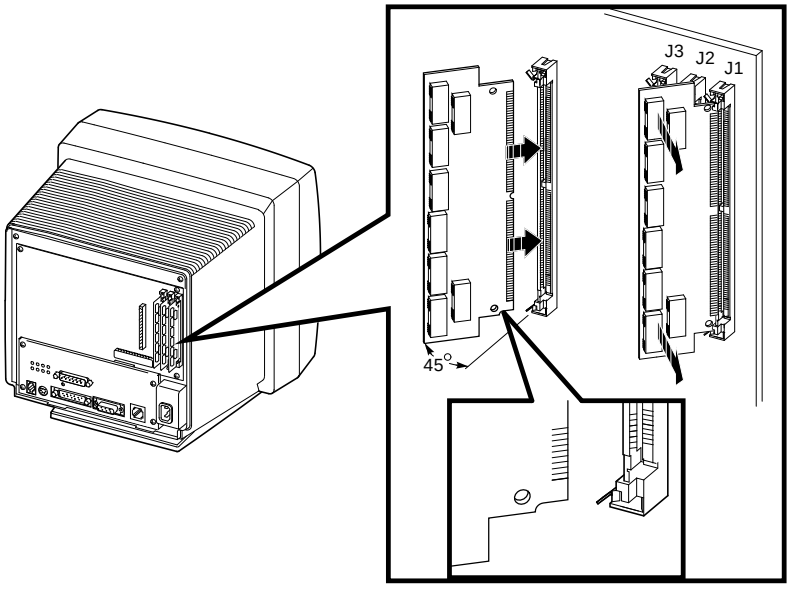


LJ-02168-TI0

4.4.2 Installing Memory Modules

To install memory modules on the system logic module:

1. Remove the memory modules from the shipping bag.
2. Remove the rear cover (Section 4.2).
3. If you are installing three memory modules, remove the image accelerator module (if installed) to allow access to slot J3 (Section 4.7).
4. Install the memory modules from right to left, starting with slot J1 closest to the edge of the system logic module.
   a. Place the first memory module into slot J1 at a 45-degree angle. Face the memory module so that the notch on the bottom corner is at the bottom of the connector.



LJ-02169-TI0

   b. While pushing in on the memory module, move it into a standup position. Both sides of the module lock into the metal connector clips. Make sure the plastic tabs go into the holes on the memory module. Also make sure the metal connector clips return to their original position, locked in place.

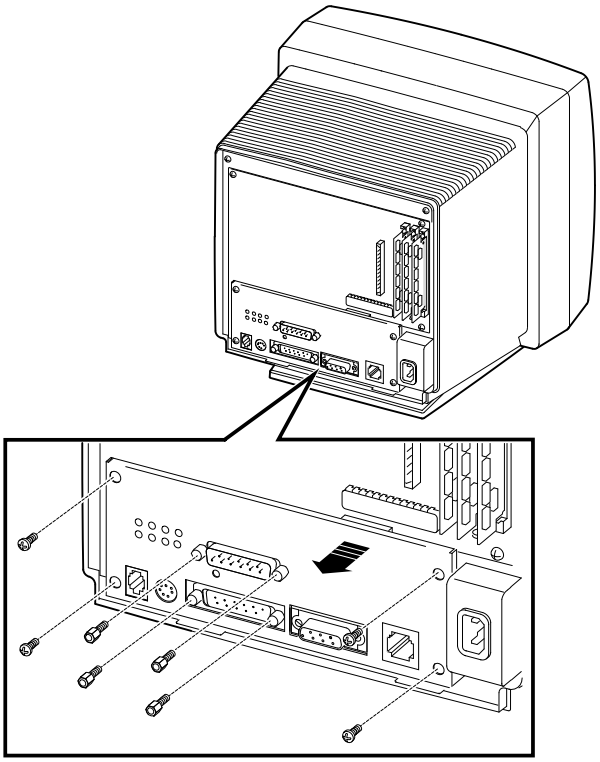
c. Repeat these steps for a second and third memory module, if you have them. Insert the second module into slot J2 and the third module into slot J3.

4.5 Bulkhead Panel

To remove the bulkhead panel:

1. Remove the rear cover (Section 4.2).
2. Remove the four Phillips screws at the edges of the bulkhead panel, as shown.
3. Remove the four hex screws on the serial and parallel port connectors.
4. Remove the bulkhead panel by pulling it toward you.

To install the bulkhead panel: Reverse steps 1 through 4.



LJ-02170-TI0

4.6 Network Module

Caution

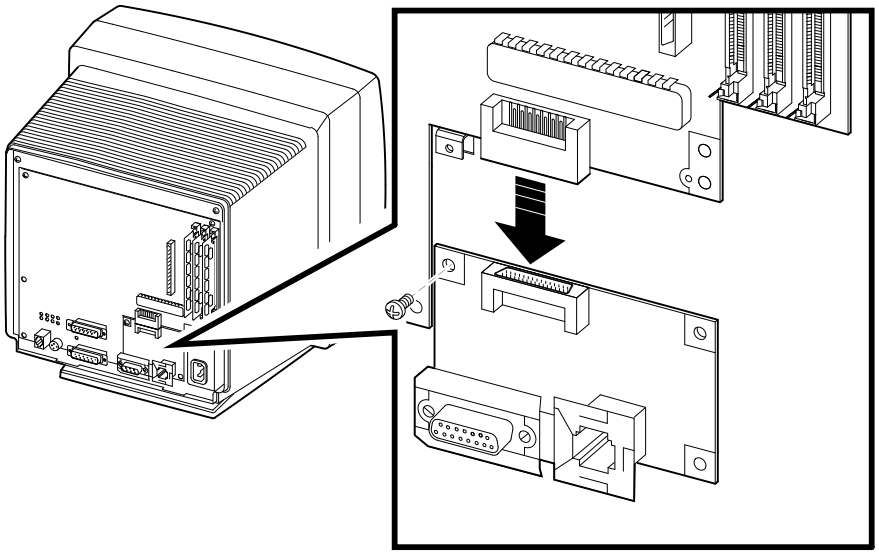
The network module can be damaged by electrostatic discharge. Handle the network module by its edges.

There are two variations of the network module. One type has a thickwire connector and a twisted-pair connector. The other type has only a ThinWire connector. The removal and replacement procedures are the same for both types.

To remove the network module:

1. Remove the rear cover (Section 4.2).
2. Remove the bulkhead panel (Section 4.5).
3. Remove the Phillips screw holding the network module to the safety wall.
4. Grasp the connectors on the bottom of the network module and pull down gently to release the network module connector from the system logic module. Pull the module out of the terminal.

To install the network module: Reverse steps 1 through 4.



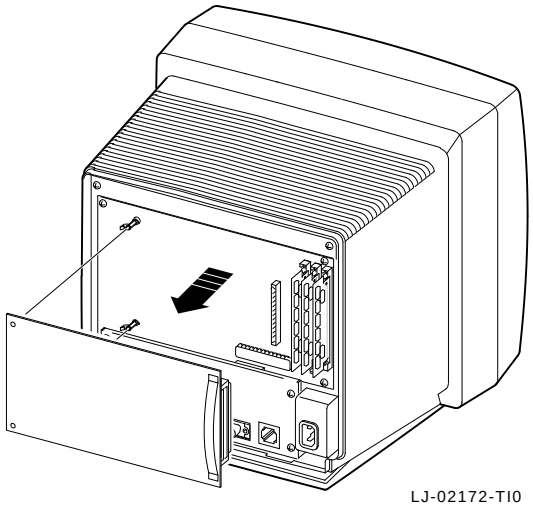
LJ-02171-TI0

4.7 Image Accelerator Module

To remove the image accelerator module:

1. Remove the rear cover (Section 4.2).
2. Release the two standoffs by gently pulling up.
3. Disconnect the image accelerator module connector from the system logic module by gently pulling the module towards you.

To install the image accelerator module: Reverse steps 1 through 3.



LJ-02172-TI0

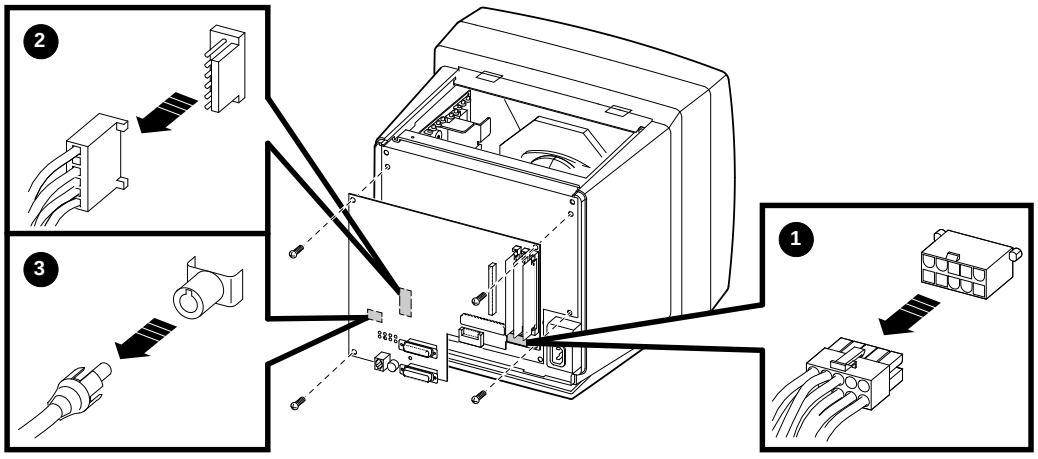
4.8 System Logic Module

Reentering Customized Settings (Host-Based Systems)

On host-based terminals, the user's customized settings are saved in the terminal's local memory. After you replace the system logic module, the user must reenter and save required settings such as the host name or IP address of the host system, font paths, and the terminal's IP address. Before you replace the system logic module, make sure the user or system manager has a record of the customized settings.

To remove the system logic module:

1. Remove the rear cover (Section 4.2).
2. Remove memory modules if installed (Section 4.4.1).
3. Remove the bulkhead panel (Section 4.5).
4. Remove the network module (Section 4.6).
5. Remove the image accelerator module if installed (Section 4.7).
6. Remove four Phillips screws securing the system logic module to the safety wall, as shown.



LJ-02175-TI0

7. Slowly pull the system logic module toward you, until you have enough clearance to reach behind the module. Then disconnect the 8-wire, 10-pin power cable ❶ at the lower right of the module, by pressing in on the tab in the center of the connector.
8. Disconnect the 5-wire, 6-pin deflection cable ❷ at the left-center of the module, by pulling the tab away from the connector and pulling the cable out. You may need a small screwdriver to release the tab.
9. Disconnect the coaxial video amp cable ❸ at the lower left of the module, by gently pulling it away from its connector.
10. Remove the system logic module by pulling it out of the terminal.

To install the system logic module: Reverse steps 1 through 10.

Note

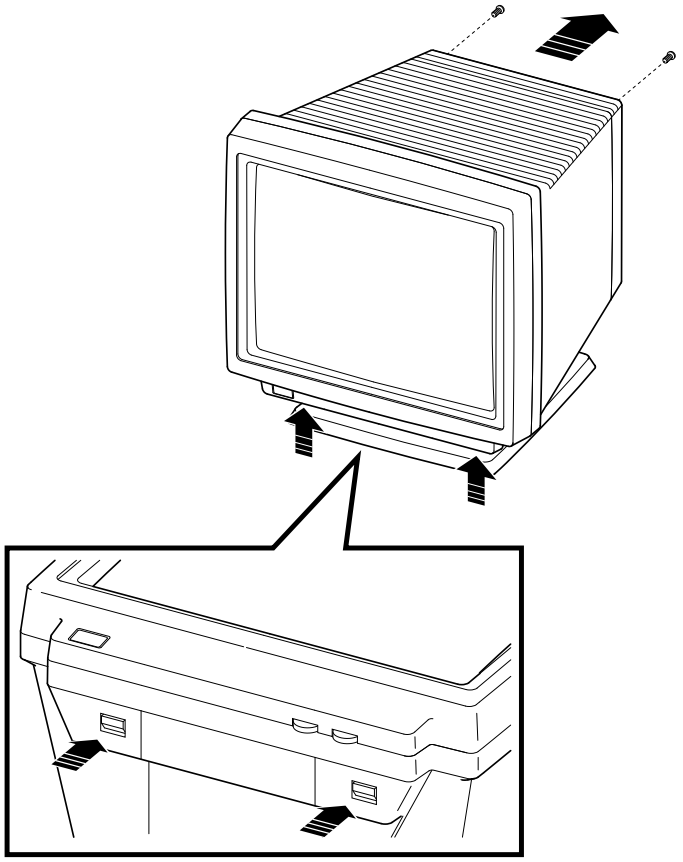
You must remove the Ethernet address chip from the system logic module and reinstall it onto the replacement module. Make sure the chip aligns with the notches when you seat it.

4.9 Outer Cover

To remove the outer cover:

1. Remove the rear cover (Section 4.2).
2. Remove the two Phillips screws at the top of the safety wall.
3. Release the tabbed hinges from the front of the chassis by pressing in with your fingers, as shown.
4. Remove the cover from the rear of the terminal, by slowly pulling the cover toward you.

To install the outer cover: Reverse steps 1 through 4.



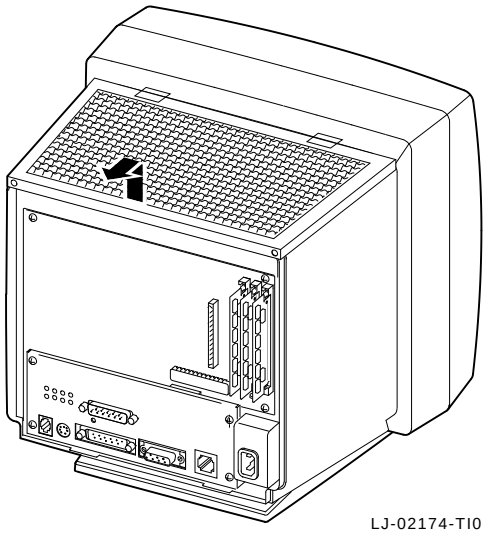
LJ-02173-TI0

4.10 Mesh Shield

To remove the mesh shield:

1. Remove the rear cover (Section 4.2).
2. Remove the outer cover (Section 4.9).
3. From the rear of the terminal, lift the mesh shield up. Pull the shield toward you to release it from the slotted tabs at the front of the terminal.

To install the mesh shield: Reverse steps 1 through 3.

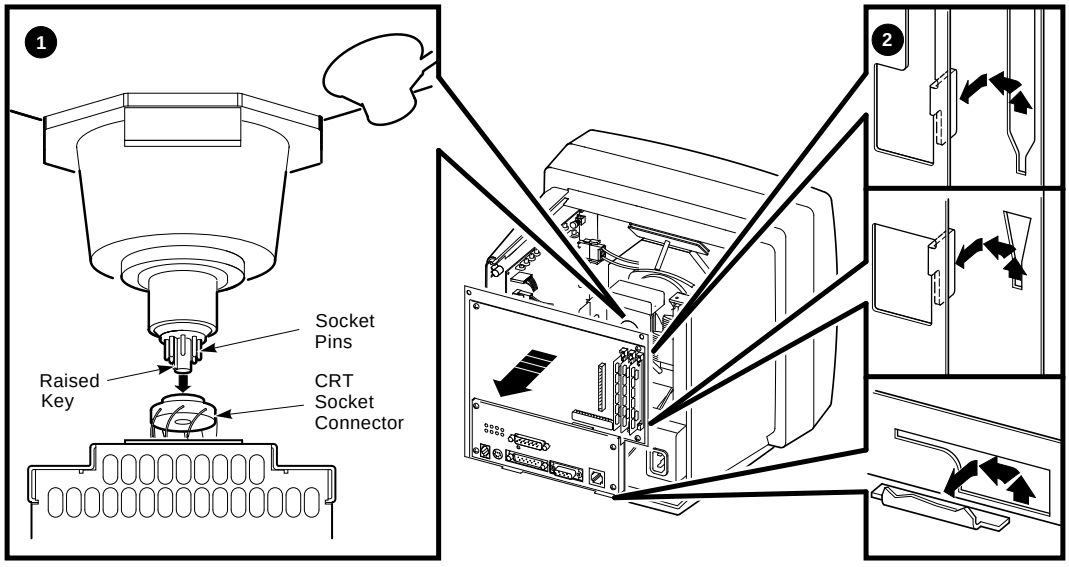


LJ-02174-TI0

4.11 Safety Wall

To remove the safety wall:

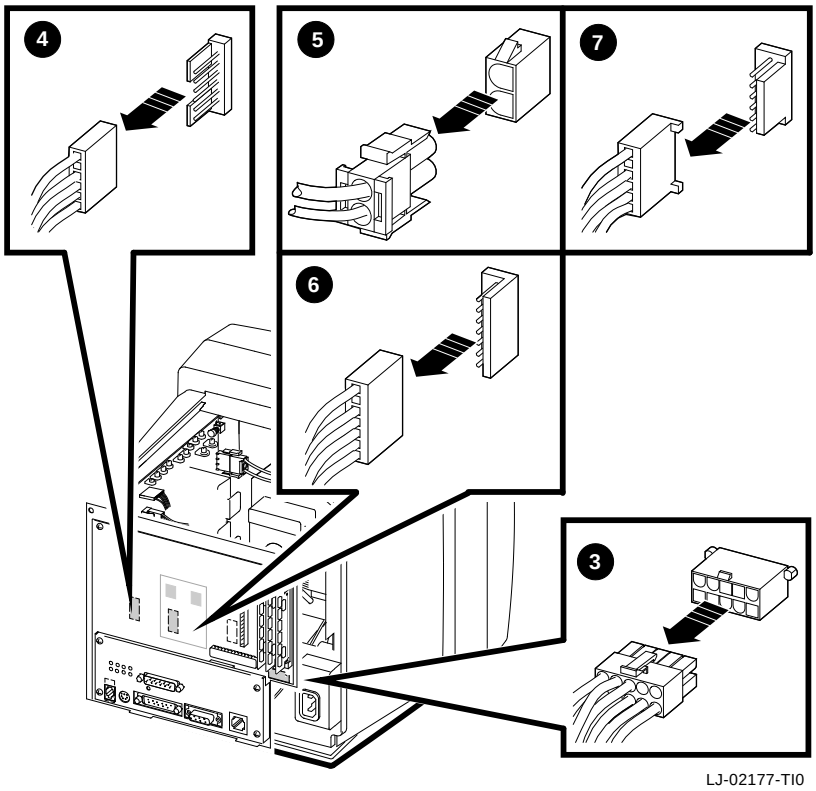
1. Remove the rear cover (Section 4.2).
2. Remove the outer cover (Section 4.9).
3. Remove the mesh shield (Section 4.10).
4. Remove the CRT socket connector ❶ by gently pulling the connector away from the socket.
5. From the top of the terminal, grasp the safety shield and gently pull up ❷ to release the shield from the metal slots on the sides and bottom of the shield.
6. From the rear of the terminal, tilt the shield toward you and slide the shield to the left to completely release the shield from the bottom slots.



LJ-02176-TI0

7. Disconnect the 8-wire, 10-pin power supply cable from the lower right of the system logic module ❸, by pressing in on the tab at the center of cable connector.
8. Disconnect the 5-wire, 6-pin deflection cable ❹ from the left center of the system logic module, by pulling the tab away from the connector and pulling the cable out. You may need a small screwdriver to release the tab.

9. Disconnect the 2-wire, 2-pin deflection cable from its connector ❺ at the top left of the video amp module, by pressing on the sides of the connector and pulling it out.
10. Disconnect the 6-wire, 7-pin brightness/contrast cable from its connector ❻ at the bottom left of the video amp module, by pulling away from its connector.
11. Disconnect the 5-wire, 6-pin power cable from its connector ❼ at the top right of the video amp module, by pulling the tab away from the connector. You may need a small screwdriver to release the tab.



12. Remove the safety wall by lifting it up and out.

4.11 Safety Wall

To install the safety wall: Reverse steps 1 through 12.

Caution

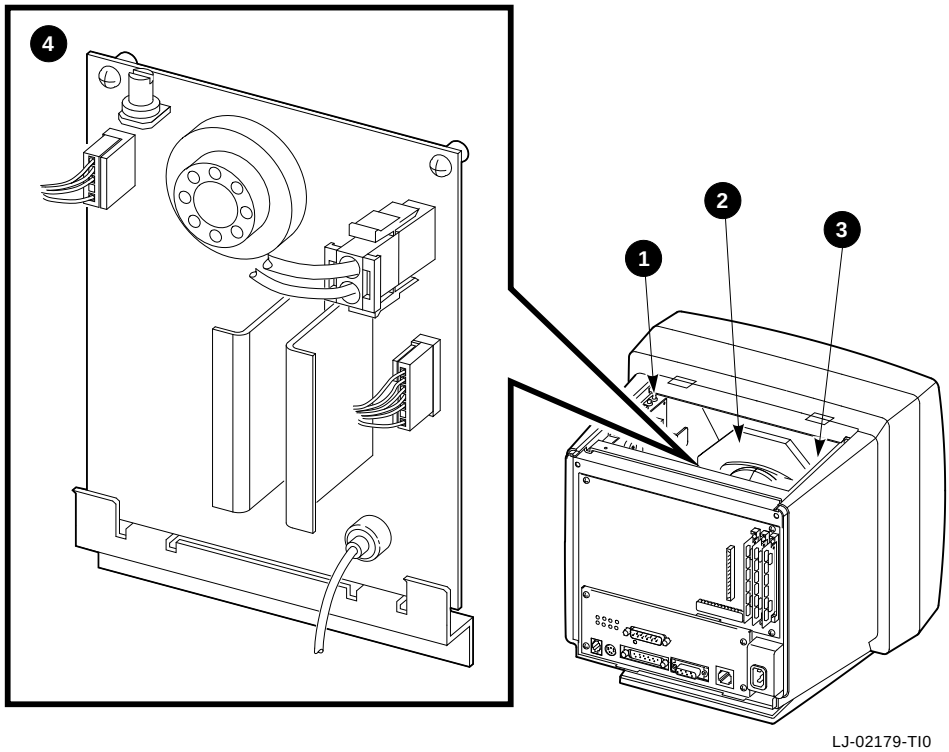
When you install the safety wall, carefully push the CRT socket connector onto the CRT neck. Be careful not to bend the pins during this procedure.

4.12 Monitor FRUs

The following figure shows the FRUs in the monitor section of the terminal, behind the safety wall. Appendix B lists all FRU part numbers. When replacing any FRU, tilt the monitor from the back to the front to allow easier access to the modules. Whenever you replace a video amp module, deflection module, or power supply module, always perform all required adjustments.

WARNING

Turn the power off and remove the power cord before disconnecting or replacing any FRU.



LJ-02179-TI0

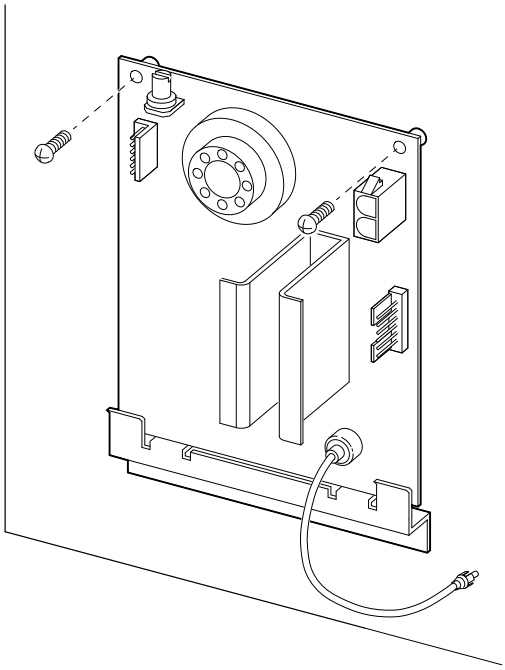
❶ Deflection module
❷ Cathode ray tube
❸ Power supply module
❹ Video amp module

4.13 Video Amp Module

To remove the video amp module:

1. Remove the rear cover (Section 4.2).
2. Remove the outer cover (Section 4.9).
3. Remove the mesh shield (Section 4.10).
4. Disconnect the video amp module's coaxial cable from the lower left of the system logic module, by gently pulling the cable out of its connector.
5. Remove the safety wall (Section 4.11).
6. Remove the two Phillips screws securing the video amp module to the rear of the safety wall.
7. Slowly pull the module up and out of the card guide.
8. Adjust the display if needed.

To install the video amp module: Reverse steps 1 through 8.

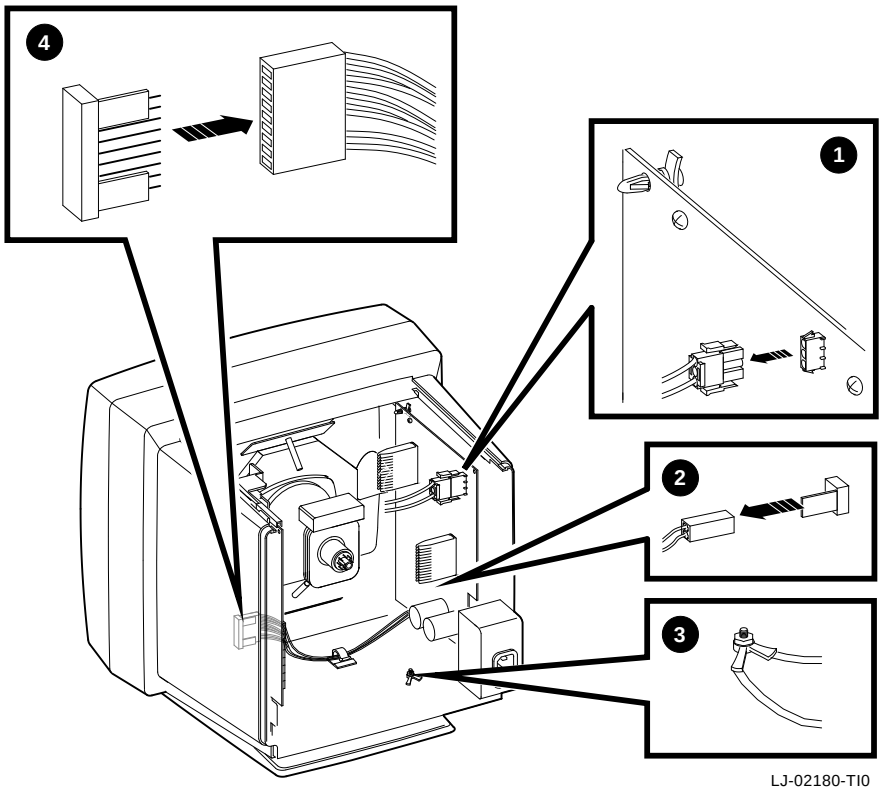


LJ-02178-TI0

4.14 Power Supply Module

To remove the power supply module:

1. Remove the rear cover (Section 4.2).
2. Remove the outer cover (Section 4.9).
3. Remove the mesh shield (Section 4.10).
4. Remove the safety wall (Section 4.11).
5. Disconnect the 2-wire, 3-pin line filter cable ❶ from the top of the power supply module, by pressing the tabs on the sides of the connector and pulling it out.
6. Disconnect the 2-wire, 2-pin LED cable ❷ from the lower right of the power supply module, by pulling the cable away from the connector.



LJ-02180-TI0

7. Use a 3/8-inch wrench to remove the nut ❸ from the bottom right of the chassis, and disconnect the ground wire for the power supply.
8. Disconnect the 8-wire, 9-pin power cable ❹ from the deflection module, by pulling it away from the connector.
9. Remove the two Phillips screws from the top of the power supply module. Then release the standoff at the top left of the module by pressing in on the standoff lock.
10. Lift the power supply module up and out of the card guide.

To install the power supply module: Reverse steps 1 through 10. Adjust the display if needed (Chapter 5).

4.15 Discharging the CRT and Removing the Anode Cap

Discharging the CRT is a process that drains to ground any voltages remaining on the extra-high tension (EHT) cable after power is removed. Discharge the CRT as follows:

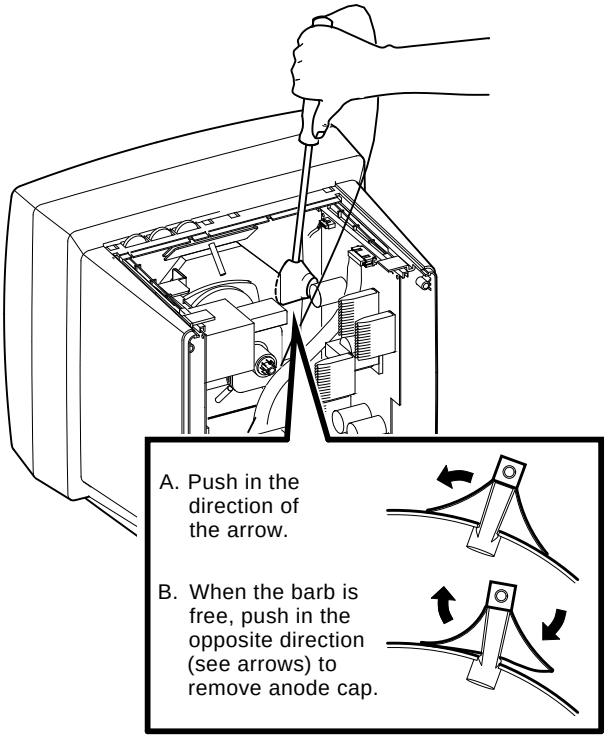
1. Remove the rear cover (Section 4.2).
2. Remove the outer cover (Section 4.9).
3. Remove the mesh shield (Section 4.10).
4. Remove the safety wall (Section 4.11).
5. Remove the power supply module (Section 4.14).

WARNING

The following steps expose you to the CRT anode, which may store a high voltage. Keep your free hand away from any part of the monitor during the anode discharge process.

6. Attach the clip end of the anode discharge tool (PN 29–24717–00) to a chassis ground point near the CRT anode. See the Section 4.16 illustration, point ❺ for a ground point.

4.15 Discharging the CRT and Removing the Anode Cap



LJ-02766-TI0

Note

Be careful when you use the anode discharge tool. Do not tap the CRT. Avoid scratching or marring the CRT glass when you insert or remove the tool.

7. Use one hand to carefully slip the anode discharge tool under the CRT anode connector cup until it touches the connector prongs. Maintain contact for at least 10 seconds.
8. Remove the CRT anode cap from the CRT, as shown.

To install the anode cap: Reverse steps 1 through 8.

4.16 Deflection Module

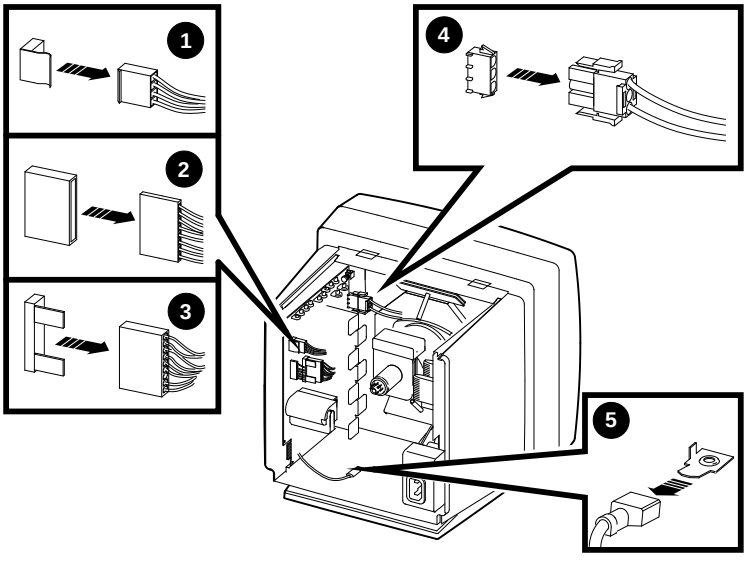
To remove the deflection module:

1. Remove the rear cover (Section 4.2).
2. Remove the outer cover (Section 4.9).
3. Remove the mesh shield (Section 4.10).
4. Remove the safety wall (Section 4.11).
5. Discharge the CRT and remove the anode cap (Section 4.15).

WARNING

You must complete the discharge procedure for the CRT (Section 4.15) before removing the deflection module.

6. Disconnect the 4-wire, 4-pin CRT/yoke cable ❶ from the deflection module, by pulling the tab away from the connector.
7. Disconnect the 8-wire, 8-pin raster control cable ❷ from the left of the deflection module, by pulling the cable away from its connector.



LJ-02181-TI0

8. Disconnect the 8-wire, 9-pin power cable ❸ from the left of the deflection module by pulling the cable away from its connector.
9. Disconnect the 2-wire, 3-pin CRT/yoke cable ❹ from its connector on the deflection module, by pressing in on the tabs on the side of the connector.
10. Disconnect the deflection module's single ground wire ❺ from the bottom of the terminal's chassis by pulling the cable away from its connector.
11. At the top of the module, remove the single Phillips screw and release the standoff.
12. Lift the module out of the card guide.

To install the deflection module: Reverse steps 1 through 12. Adjust the display if needed (Chapter 5).

4.17 CRT/Chassis Assembly

To disassemble the CRT/chassis assembly:

1. Remove the rear cover (Section 4.2).
2. Remove the outer cover (Section 4.9).
3. Remove the mesh shield (Section 4.10).
4. Remove the safety wall (Section 4.11)
5. Remove the power supply module (Section 4.14)
6. Discharge the CRT and remove the anode cap (Section 4.15).

WARNING

You must discharge the CRT and remove the anode cap (Section 4.15) before removing the deflection module.

7. Remove the deflection module (Section 4.16)

4.18 CRT Disposal (Trained Service Personnel Only)

Note

This procedure supersedes all other tech tips about replacing and disposing of CRTs. This procedure is for Digital personnel only, and is not intended for use by OEM and self-maintenance customers.

This section describes how to safely dispose of the monitor's cathode-ray tube (CRT). CRTs are glass vacuum tubes. Because air pressure outside the tube is greater than air pressure inside, there is always the possibility of accidental implosion.

WARNING

You must handle CRTs very carefully to avoid accidental implosion and shattering glass. Use the following guidelines and disposal procedure to remove and dispose of a CRT. These guidelines and procedure are Digital policy for all CRTs with a diameter or more than three inches.

Location
Work in areas where risks and exposure are limited to trained Digital personnel. Only Digital personnel should be in the area during CRT removal and replacement.

Handling a CRT

- Never handle the CRT by the neck. Always use two hands and hold the CRT by the sides near the face of the tube.
- Keep the CRT away from your body during handling.
- Do not let the neck strike anything.
- Do not rest the CRT on its neck.
- Do not let the CRT touch any tools, such as screwdrivers and soldering irons.

Stocking and Storage
All CRTs must be kept in a closed container or mounted in the device cabinetry.

4.18 CRT Disposal (Trained Service Personnel Only)

CRT Disposal

Use the following procedure to safely dispose of CRTs. Always perform this procedure at a Digital facility.

WARNING

Do not dispose of any CRT until it is rendered inoperative and safe to dispose.

Never perform the following disposal procedure at the customer site. Return the defective CRT to the local Digital facility for disposal.

At the Digital facility you must

- Clear the area of nonessential personnel
- Have a second person in the area in case of an emergency
- Wear safety goggles (PN 29–16141–00)
- Wear gloves (PN 29–16146–00)
- Use pliers

WARNING

To avoid injury to your eyes or hands, always wear goggles and gloves when you work with a CRT. Never handle pieces of phosphor-coated glass without wearing protective gloves.

Before you perform the following procedure, remove the FRUs listed in Section 4.17.

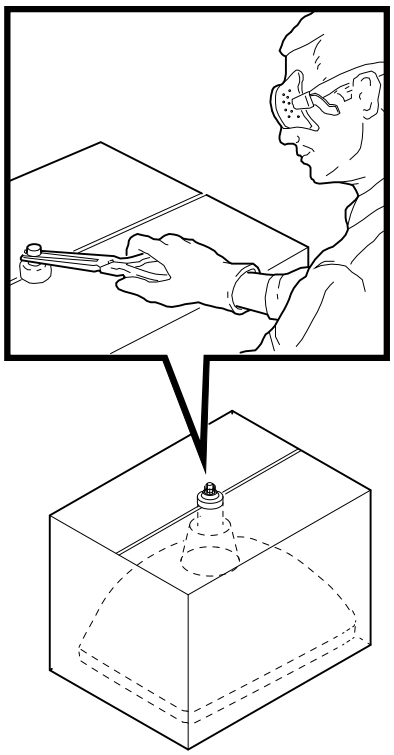
1. Place the old CRT/chassis assembly and the original packing material in the container from which you removed the new CRT/chassis assembly.
2. Using pliers, slowly crush, **but do not snap,** the evacuation point. Do not move or disturb the CRT until the hissing sound of inrushing air stops.

Caution

Use care not to break the unprotected glass area of the CRT neck that surrounds the evacuation point.

4.18 CRT Disposal (Trained Service Personnel Only)

The evacuation point is a protrusion that extends from the circular area defined by the CRT neck pins. The glass protrusion is sometimes encased in a protective plastic cap, and more force is required to crush it.



MA-X0667-88

3. Seal the carton with packing tape and dispose of it in the Digital site's trash receptacle.

Note

The safe gassing of the CRT is necessary to prevent liability and safety problems that may arise from accidental CRT implosion.

4.19 Tilt-Swivel Base

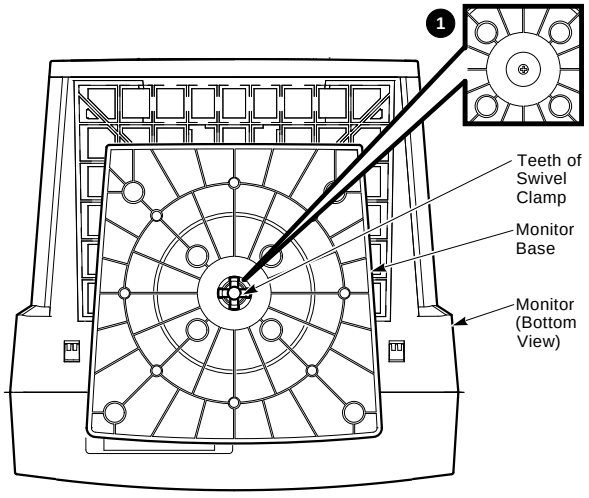
There are two versions of the tilt-swivel base. One version comes with a retainer plug, and the other comes with a set screw in the base. During normal use, the tilt-swivel base should not come off the unit.

The retainer plug version has a retainer plug (PN 74–39791–01) in the center of the swivel retainer to hold the base on. If the tilt-swivel base comes off but the retainer teeth are not broken, you do not have to take the monitor apart.

To reattach the tilt-swivel base to the monitor:

1. Place the terminal screen facedown on a soft pad.
2. Turn the tilt-swivel base so the wider part is tilted downward toward the screen.
3. Place a curved tool, such as a long Allen wrench, through the center of the swivel retainer inside the base.
4. While pressing on the base with one hand, pull the swivel retainer toward the base until the retainer teeth click into position.
5. Install a retainer plug (PN 74–41176–01) in the retainer to keep the teeth apart.

   If you have the set screw version, adjust the set screw ❶ in the base to the proper tension for the best tilt-swivel action.



LJ-01806-TI0

4.20 Keyboard, Mouse, and Printer

Disconnect the keyboard, mouse, and printer cables from the rear of the terminal. You do not have to turn off the power.

To install a keyboard, mouse, and printer, connect its cable to the appropriate connector on the rear of the terminal.

The terminal can support a serial or parallel printer. The user can select the active printer port (serial or parallel) by using the Customize Serial and Parallel Ports dialog box. To display this dialog box, pull down the Customize menu in the Terminal Manager window and choose the Serial and Parallel Ports... menu item.

5

Aligning the Video Display

This chapter describes how to align the monitor display. The chapter covers the following major topics:

- Before You Start (Section 5.1)
- Screen Alignment Patterns (Section 5.2)
- Video Adjustments (Section 5.4)
- Using the Radiance Meter (Section 5.3)
- Cutoff Adjustment (Section 5.4.2)

You do not have to perform every adjustment procedure each time you align the monitor. However, you should check all adjustments in the order shown, because many adjustments affect each other. Exceptions are the FOCUS and G2 adjustments. If a setting is already correct, you can skip that adjustment and go on to the next one.

5.1 Before You Start

Before you make adjustments, set up the monitor as described in this section. Use the screen alignment test patterns to make all adjustments.

WARNING

Do not use a metal screwdriver when making video adjustments. Use plastic video tools supplied in the terminal technician tool kit (PN 29–27340–01).

Aligning the Video Display
5.1 Before You Start

Let the monitor warm up for at least 20 minutes before performing any adjustments. The warm-up time ensures that the circuitry is at a stable temperature before you do any adjustments.

Note

If a customer calls with a display problem, ask the customer to leave the monitor on until you arrive. If the monitor is left on, you only need to warm up the monitor for 5 minutes after you remove the rear cover.

1. Clean the Monitor

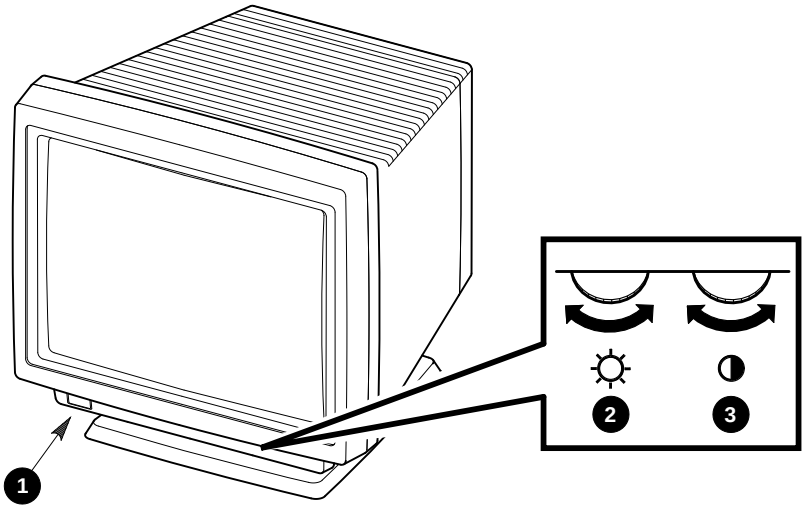
Use a soft tissue or cloth with a nonabrasive, nonflammable glass cleaner, or use Digital's video screen cleaner (PN VT3XX–SC).

2. Set Up the Monitor

Before you perform adjustments, set up the monitor as follows:

1. Place the monitor on a nonconductive surface.
2. Remove the rear cover (Section 4.2).
3. Remove the outer cover (Section 4.9).
4. Remove the mesh shield (Section 4.10).
5. Reconnect the power cord.
6. Turn on power by pressing in the power switch. Wait for a video display to appear on the screen.
7. Set the monitor's brightness and contrast controls to their center position (Figure 5–1).
8. Turn the monitor so the adjustment controls on the deflection module are on the right and the screen is on the left.

Figure 5–1 External User Controls and Indicators



LJ-02185-TI0

Item	Control/Indicator	Function
❶	Power switch and indicator light	Turns the power on and off. When the power is on, the indicator light is on. For extended monitor life, switch the power off when not in use.
❷	Brightness	Adjusts the video background intensity.
❸	Contrast	Adjusts the video display intensity.

3. Adjust the Rotation and Centering Controls (If Needed)

To center or rotate the screen display, you use your keyboard and a simple setup screen accessed from the Customize pull-down menu in the Terminal Manager window.

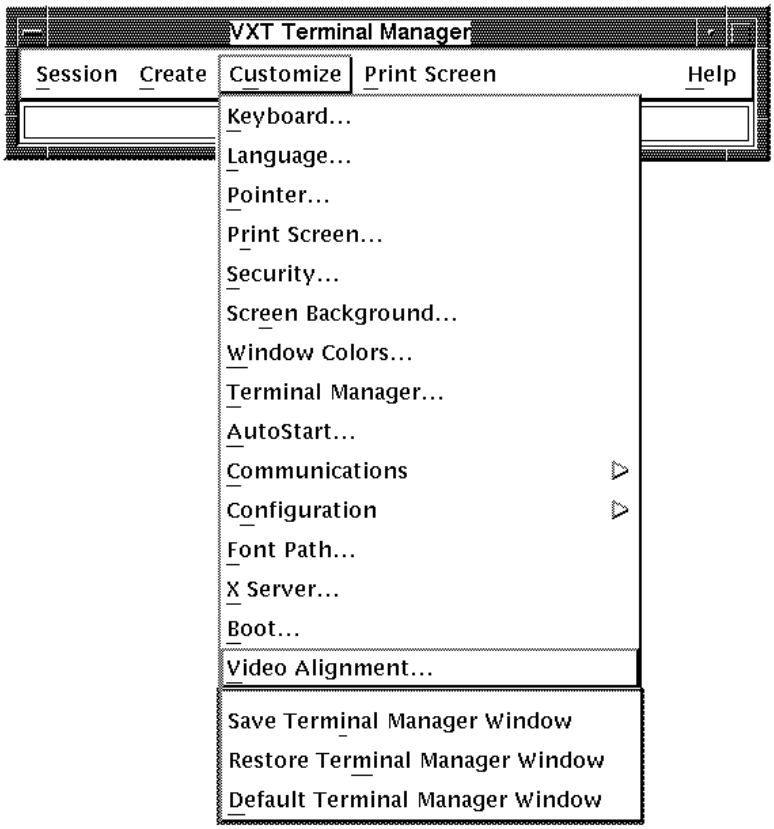
Note

If the terminal does not display the Terminal Manager window, it may be hidden or locked. You can use the F3 toggle key on the keyboard to display a hidden Terminal Manager window, if the key function is enabled. If the window is locked, see the system manager.

Aligning the Video Display
5.1 Before You Start

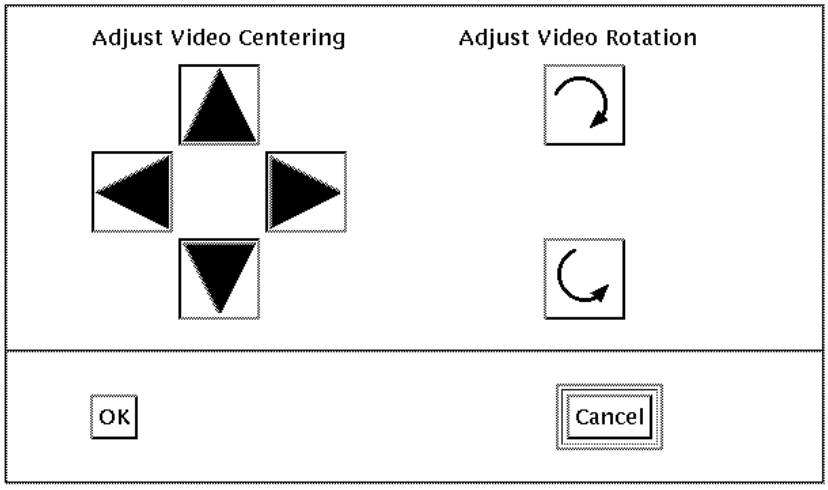
To view the video alignment screen:

1. Pull down the Customize menu in the Terminal Manager window's menu bar.



LJ−02193−RAGS

2. Choose the Video Alignment . . . menu item to display the video alignment dialog box.



LJ−01139−RAGS

3. If the display is off-center, click MB1 on the horizontal or vertical centering arrows. Each time you click on an arrow, the display shifts in the direction of the arrow.
4. If the display is tilted, click MB1 on the rotation arrows. Each time you click on a rotation arrow, the display rotates in the direction of the arrow.
5. Click on OK to save your new settings and dismiss the video alignment dialog box.

   Click on Cancel to dismiss the dialog box without saving your new settings.

4. Check the LEDs and Heater Filament

Visually check the monitor to ensure that the following components are on:

- LED on the power switch
- CRT heater filament (on the neck of the CRT)

5.2 Screen Alignment Patterns

You must use screen alignment test patterns to make all video adjustments. To display a test pattern, you use the screen alignment test patterns menu in console mode.

1. To enter console mode, press the halt switch on the rear of the terminal (Section 1.2.3). When you enter console mode, the terminal quits all session activity, performs a software reset, and displays the console >>> prompt.
2. To view the screen alignment test patterns menu, enter the following command at the >>> console prompt:

   ```
   >>> T/UTIL 2
   ```

3. From the menu, choose the alignment pattern that you will be using for video alignment.

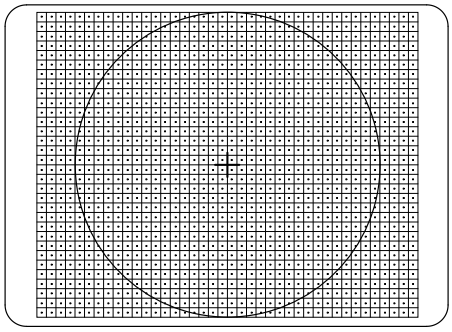
   To return from a display pattern to the menu, press the space bar. To return to the console prompt, press Ctrl C.

5.2.1 Displaying Alignment Patterns

You use the following test patterns to perform the adjustment procedures:

- Circle-crosshatch alignment test pattern (test pattern 6) (Figure 5–2)
- Raster pattern (test pattern 4)
- All-white test pattern (test pattern 0)
- Focus test pattern (test pattern f)

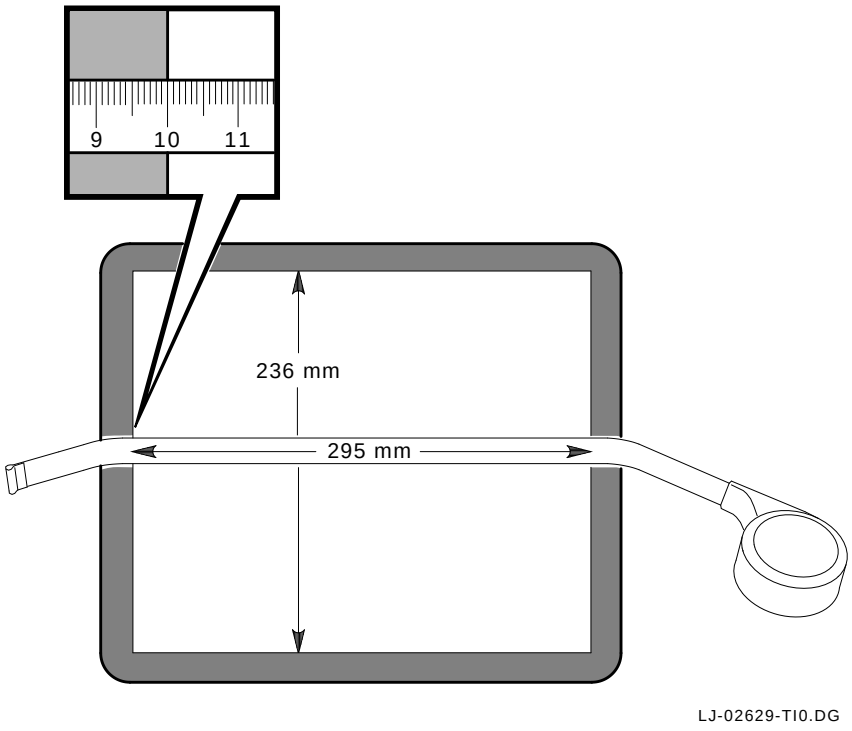
Figure 5–2 Circle-Crosshatch Pattern



MA-X0889-88

Use a metric measuring tape (PN 29–25342) and the raster test pattern to measure the dimensions of the screen display. To avoid scratching the screen with the tape's metal clip, start the measurement at 10 cm (Figure 5–3).

Figure 5–3 Using the Metric Measuring Tape



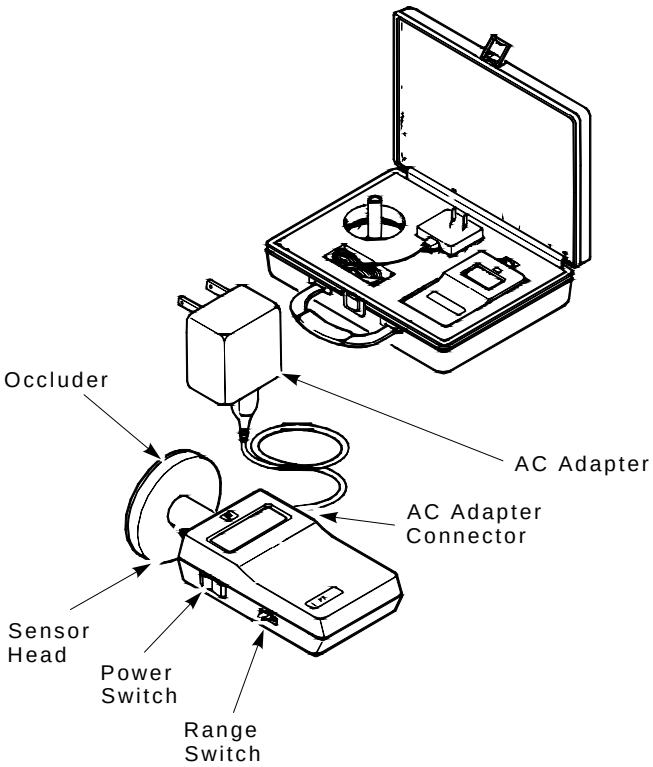
5.3 Using the Radiance Meter

You use a radiance meter to perform the cutoff adjustment. To use the radiance meter:

1. Remove the cap from the radiance meter sensor head and connect the occluder to the radiance meter.

Caution

Avoid excessive force when tightening the occluder or you may damage the radiance meter. Do not touch the exposed filter after the protective cap is removed.



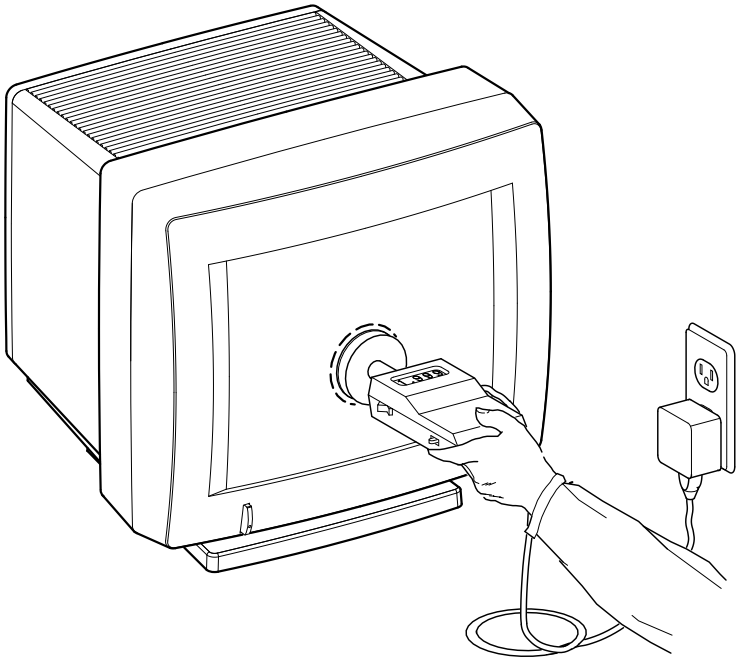
MA-X0665-88

2. Connect the ac line adapter to the radiance meter and plug the adapter into a wall outlet.

Ensure that your radiance meter is calibrated correctly. Do not use the POWER ON W/BACKLIGHT position when you are using the radiance meter with batteries.

3. Turn on the power switch.
4. Set the range switch to the second position from the top (1.999).
5. Place the occluder firmly against the center of the screen, as shown. Take a red china pencil to draw an arc or circle around the occluder.

   You must take all meter readings with the meter centered in this arc or circle.

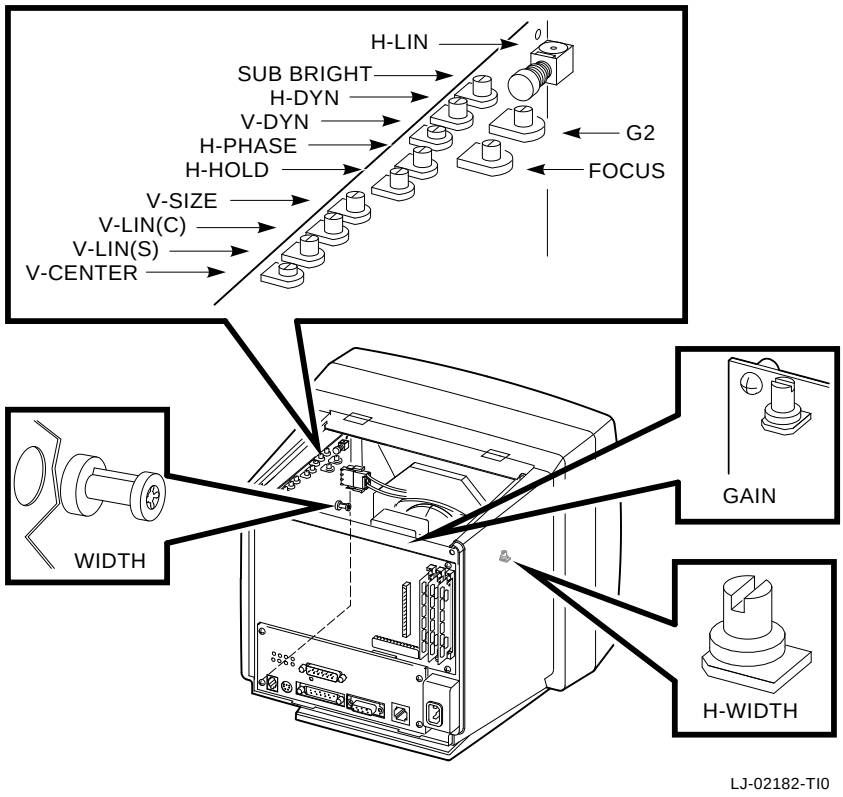


MA-0302-90.DG

5.4 Video Adjustments

Perform the following adjustments in order. Figure 5–4 shows the location of adjustment controls.

Figure 5–4 Adjustment Controls



5.4.1 Linearity Adjustment

Check and adjust linearity as follows. Figure 5–4 shows the location of controls.

1. Set the brightness control on the bottom front of the monitor to display the raster (Figure 5–1).
2. Set the vertical and horizontal centering and the rotation to the center (default) positions (Section 5.1).

3. Set the H-PHASE control so the video display is centered horizontally in the raster.
4. Use a plastic hex-head screwdriver to turn the H-LIN control clockwise until the horizontal width is at the maximum setting. Then turn H-LIN counterclockwise until the left and right sides of the display are equally linear.
5. Repeat steps 2, 3, and 4 until the correct size, centering, and linearity is obtained. Then continue with step 6.
6. Adjust the V-SIZE control to obtain the correct height of 236 mm.
7. Adjust the V-CENTER control so that the display is centered in the bezel.
8. Adjust the V-LIN (C) control until the top and bottom of the display are equally linear.
9. Adjust the V-LIN (S) control until the top, bottom and sides are equally linear.
10. Repeat steps 7, 8, and 9 until you achieve good vertical linearity.

5.4.2 Cutoff Adjustment

Check and adjust the cutoff setting as follows. Figure 5–4 shows the location of controls.

When you adjust the G2 cutoff control, use the radiance meter on the screen (Section 5.3). Check and adjust G2 as follows:

1. Turn the brightness control clockwise to the maximum setting. Turn the contrast control counterclockwise to the minimum setting (Figure 5–1).
2. Display the raster pattern (test pattern 4) and turn the G2 and SUB BRIGHT controls clockwise to their maximum settings.
3. Use the radiance meter to monitor the raster light output. Adjust either G2 or SUB BRIGHT until the radiance meter displays 0.010 luminance.
   a. If the luminance is larger than 0.010, adjust G2 counterclockwise to obtain a 0.010 reading.
   b. If the luminance is less than 0.010, adjust SUB BRIGHT counterclockwise to to obtain a 0.010 reading.
4. Turn the contrast control clockwise to the maximum setting.
5. Display the white pattern (test pattern 0).
6. Turn the brightness control counterclockwise to the minimum setting.

7. Adjust the GAIN control on the video amp module to obtain a meter reading of 0.276 at screen center.

5.5 Focus Adjustment

1. Display the all-white pattern (test pattern 0).
2. Turn the V-DYN control clockwise to the maximum setting.
3. Set the H-DYN control to its approximate center position.
4. Turn the contrast control clockwise to the maximum setting (Figure 5–1). Turn the brightness control counterclockwise until the raster just disappears.
5. Use the radiance meter and set the GAIN control to obtain a 0.217 luminance at the center of the screen.
6. Display the inverse focus test pattern (test pattern f).
7. Adjust the FOCUS control for the best overall focus.
8. Adjust H-DYN to fine-tune the overall focus.
9. Adjust V-DYN for the best overall focus.
10. Repeat steps 8 and 9 until you obtain the best overall display focus.

A

Related Documentation

This appendix lists related documentation that you can order from Digital. Check with your Digital sales representative for availability in your country.

User Documentation	Part Number
VXT 2000 Models VX225 and VX227 User Documentation Kit	EK–VXT15–DK
VXT 2000 Windowing Terminal Models VX225 and VX227 Installation Information	EK–VXT15–IN
VXT 2000 Windowing Terminal Getting Started	EK–VXT20–GS
VXT 2000 Window Terminal User Information	EK–VXT20–UG
VXT 2000 Window Terminal Release Notes	EK–VXT20–RN

Software and Service Documentation	Part Number
VXT Software System Management Information	AA–PPSAB–TE
VXT Software Version 1.2 Installation Information	AA–PJHFC–TE
VXT Software Release Notes	AA–PKWSC–TE
VXT 2000 Model VX225 Windowing Terminal Service Information	EK–VXT15–SV
VXT 2000 Model VX227 Windowing Terminal Service Information	EK–VXT17–SV

A.1 Ordering Information

You can order options and documentation by mail, phone, or electronically.

Need Help?

If you need help deciding which documentation best meets your needs, please call 800–DIGITAL (800–344–4825) and press 2 for technical assistance.

Electronic Orders

To place an order through your account at the Electronic Store, dial 800–234–1998, using a modem set to 2400 or 9600 baud. You must use a VT terminal or terminal emulator set at 8 bits, no parity. If you need help, call 800–DIGITAL (800–344–4825) and ask for an Electronic Store specialist.

Telephone or Direct Mail Orders

If You Are From . . .	Call . . .	Or Write . . .
U.S.A.	DECdirect Phone: 800–DIGITAL (800–344–4825) FAX: (603) 884–5597	Digital Equipment Corporation P.O. Box CS2008 Nashua, NH 03061
Puerto Rico	Phone: (809) 781–0505 FAX: (809) 749–8377	Digital Equipment Caribbean, Inc. 3 Digital Plaza, 1st Street Suite 200 Metro Office Park San Juan, Puerto Rico 00920
Canada	Phone: 800–267–6215 FAX: (613) 592–1946	Digital Equipment of Canada Ltd. 100 Herzberg Road Kanata, Ontario, Canada K2K 2A6 Attn: DECdirect Sales
International	–	Local Digital subsidiary or approved distributor

Digital Personnel

You can order documentation by electronic mail. Contact the following organizations for instructions:

If You Need . . .	Call . . .	Contact . . .
Software documentation[1]	DTN: 241–3023 (508) 874–3023	Software Supply Business Digital Equipment Corporation 1 Digital Drive Westminster, MA 01473
Hardware documentation	DTN: 234–4325 (508) 351–4325 FAX: (508) 351–4467	Publishing & Circulation Services Digital Equipment Corporation NRO2-2/I5 444 Whitney Street Northboro, MA 01532

[1]Call to request an Internal Software Order Form (EN–01740–07).

B

Recommended Spares List

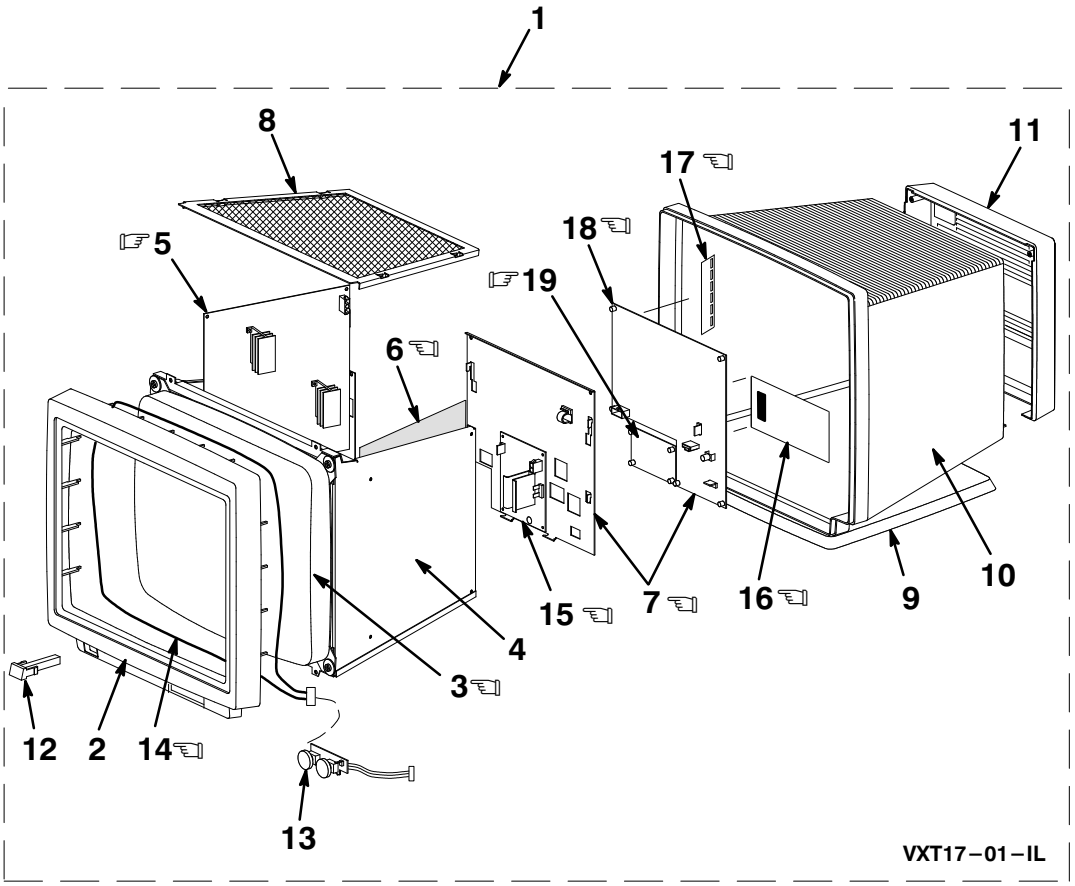
This appendix lists the recommended spares for the terminal, including an illustrated breakdown of field replaceable units (FRUs).

B.1 VX17A Terminal Unit Assembly

This section provides an illustrated breakdown of the terminal's FRUs.

Illustrated Parts Breakdown

☞ ☜ **INDICATES FRU LEVEL PARTS.** **PARTS LIST**



Recommended Spares List
B.1 VX17A Terminal Unit Assembly

Figure Ref.		Description	Part Number	Used on Code
		Model VX17A–A2 with thickwire and twisted pair interface (U.S.)	VX17A–A2	A
		Model VX17A–B2 with ThinWire interface (U.S.)	VX17A–B2	B
		Model VX17A–A4 with thickwire and twisted pair interface (Southern Hemisphere)	VX17A–A4	C
		Model VX17A–B4 with ThinWire interface (Southern Hemisphere)	VX17A–B4	D
		Model VX17A–A9 with thickwire and twisted pair interface (Northern Hemisphere)	VX17A–A9	E
		Model VX17A–B9 with ThinWire interface (Northern Hemisphere)	VX17A–B9	F
	1	Terminal subassembly	70–30015–01	ABEF
		Terminal subassembly	70–30015–02	CD
	2	Bezel assembly	70–30016–01	
☞	3	CRT/chassis assembly	70–30020–01	ABEF
☞		CRT/chassis assembly	70–30020–02	CD
	4	Main chassis assembly	70–30019–01	
☞	5	Power supply module	54–20022–01	
☞	6	Deflection module	54–20024–01	
☞	7	Video/logic assembly	70–30021–01	
	8	Top shield assembly	70–30667–01	
	9	Tilt-swivel assembly	70–30024–01	
	10	Chassis cover	70–45000–01	
	11	Rear panel assembly	70–30023–01	
	12	Switch cap assembly	70–30674–01	
	13	Control assembly	70–30018–01	
☞	14	Cancellation coil	70–30555–01	
☞	15	Video amp module	54–22020–01	
☞	16	Image accelerator module	54–22339–01	
☞	17	Memory module (2 MB)	20–35194–05	
☞		Memory module (4 MB)	20–36835–05	
☞	18	CPU module	54–21580–01	
☞	19	Network interface module (ThinWire)	54–22341–01	BDF
☞		Network interface module (thickwire /twisted pair)	54–22343–01	ACE

B.2 General Recommended Spares

This section lists other recommended spares not unique to the terminal.

Part	Part Number
Power Cables	
Australia, New Zealand	BN25R–2E
Austria, Belgium, Finland, France, Germany, Netherlands, Norway, Portugal, Spain, Sweden	BN20V–2E
Canada	BN20P–2E
Ireland, United Kingdom	BN26C–2E
Italy	BN24Z–2E
Switzerland	BN22A–2E
USA	17–00606–02
Network Cables	
Thickwire Ethernet cable	17–01321–01
Twisted-pair Ethernet cable (uncrossed)	BN24G–03
Twisted-pair Ethernet cable (crossed)	BN24F–03
Loopback Connectors	
Loopback connector, MMJ (H3103–00)	12–25083–01
Mouse loopback connector	12–25628–01
Options	
Mouse	VSXXX–GA
Mouse pad	12–34174–01,–02
Tablet	VSXXX–AB
Stylus	29–25995–00
Tablet puck	29–25996–00
Tablet assembly	29–25997–00
Tablet printed circuit board and cable	29–25998–00
Tablet top enclosure	29–25999–00

Part	Part Number
Tablet bottom enclosure	29–26000–00

B.3 Keyboard Models

The following keyboard models are available:

	Model Number	
Country	**Standard**	**WPS**
LK401 ANSI Keyboard		
North America/United Kingdom	LK401–AA	LK402–AA
Belgium (Flemish)	LK401–AB	LK402–AB
Canada (English)	LK401–AQ	LK402–AQ
Canada (French)	LK401–AC	LK402–AC
Denmark	LK401–AD	LK402–AD
Finland	LK401–AF	LK402–AF
France/Belgium	LK401–AP	LK402–AP
Germany/Austria	LK401–AG	LK402–AG
Hebrew	LK401–AT	None
Italy	LK401–AI	LK402–AI
Netherlands (Dutch)	LK401–AH	LK402–AH
Norway	LK401–AN	LK402–AN
Portugal	LK401–AV	LK402–AV
Spain	LK401–AS	LK402–AS
Sweden	LK401–AM	LK402–AM
Switzerland (French)	LK401–AK	LK402–AK
Switzerland (German)	LK401–AL	LK402–AL
LK421 Short ANSI (UNIX) Keyboard		
North America/United Kingdom	LK421–AA	—

Country	Standard	WPS
LK443 PC Keyboard		
North America	LK443–AA	—
LK444 (PC) Keyboard		
Australia/New Zealand	LK444–AZ	—
Belgium	LK444–AB	—
Canada (English)	LK444–AQ	—
Canada (French)	LK444–AC	—
Denmark	LK444–AD	—
Finland/Sweden	LK444–CA	—
France	LK444–AP	—
Germany/Austria	LK444–AG	—
Italy	LK444–AI	—
Norway	LK444–AN	—
Portugal	LK444–AV	—
Spain	LK444–AS	—
Switzerland (French/German)	LK444–CH	—
United Kingdom/Ireland	LK444–AE	—

C

Self–Test Error Descriptions

Table C–1 lists the device numbers for all possible devices in the terminal's configuration. Table C–2 through Table C–11 describe the meaning for all terminal errors.

Table C–1 Configuration Devices

Device Number	Device	Refer to ...
1	Nonvolatile RAM (NVR)	Table C–2
2	Monochrome (MONO)	Table C–3
3	Serial line controller (QDZ)	Table C–4
4	Cache self-test	Table C–5
5	Memory module (MEM)	Table C–6
6	Floating point unit (FPU)	Table C–7
7	Interval timer (IT)	Table C–8
8	System logic module (SYS)	Table C–9
9	Network interface (NI)	Table C–10
10	Parallel interface	Table C–11
13 to 99	Reserved for future use	–

Table C–2 NVR Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
4	4	Bad battery.	System logic module
8	8	NVR register test failed.	System logic module
12	C	Battery down and NVR register test failed.	System logic module
64	40	Battery check test failed (hard error).	System logic module
65	41	Battery check test failed (soft error).	System logic module
72	48	Battery check test failed and NVR register test failed.	System logic module

Table C–3 Monochrome Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
128	080	No memory to use for data area.	System logic module
256	100	Monochrome configuration failed.	System logic module
512	200	Monochrome reset failed.	System logic module
1024	300	Monochrome RAMDAC failed.	System logic module
1280	400	Monochrome cursor failed.	System logic module
1536	600	Byte mask test of VMEM failed.	System logic module
1794	702	Data compare error occurred during the forward pass of VMEM.	System logic module
2050	802	Data compare error occurred during the reverse pass of VMEM.	System logic module
4095	0FFF	Monochrome test run in FBOOT mode.	Not necessarily an error.

Self-Test Error Descriptions

Table C–4 QDZ Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
16	10	QDZ reset test failed.	System logic module
32	20	QDZ modem test failed.	System logic module
48	30	QDZ polled test failed.	System logic module
64	40	QDZ interrupt driver transfer test failed.	System logic module
80	50	QDZ LK401 test failed.	Keyboard
96	60	QDZ mouse test failed.	Mouse
112	70	QDZ INIT driver failed.	System logic module
128	80	No memory to use for data area.	System logic module
144	90	QDZ AB timer failed.	System logic module
160	A0	QDZ CD timer failed.	System logic module
224	E0	QDZ modem signal interrupt failed.	System logic module

Table C–5 Cache Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
512	200	Read/write error to the data store.	System logic module
768	300	Read/write to the tag store.	System logic module
1024	400	Valid bit failed to set as designed.	System logic module
1280	500	Tag does not contain tag for diagnostic space.	System logic module
1536	600	Unexpected tag parity error.	System logic module
1792	700	Cache failed to provide expected data during a cache hit.	System logic module
2048	800	Cache data parity error.	System logic module
2304	900	Tag not valid during cache hit testing.	System logic module

(continued on next page)

Table C–5 (Cont.) Cache Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
2560	A00	Data not valid during cache hit testing.	System logic module
2816	B00	Cache data write-through test failed, because of invalid data in the cache data store.	System logic module
3072	C00	Cache data write-through test failed, because of invalid data in memory.	System logic module

Table C–6 MEM Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
66	042	A gap was found between MEM pairs.	System logic module
68	044	Illegal MEM configuration register.	System logic module
256	100	Byte mask test failure.	System logic module
514	202	Data compare error occurred during the forward pass.	System logic module
770	302	Data compare error occurred during the reverse pass.	System logic module
1280	500	Default memory pattern (01010101) deposit failure.	System logic module
1536	600	No contiguous 512K bank in option memory.	System logic module
2304	900	Main memory configuration does not match the top of memory (hard error) in keyboard loopback mode.	System logic module
2305	901	Main memory configuration does not match the top of memory (soft errors) except in manufacturing mode.	System logic module

(continued on next page)

Table C–6 (Cont.) MEM Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
2560	A00	Bottom 256K of memory has bad pages	System logic module

Table C–7 FPU Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
258	102	MOVE instruction test failed.	System logic module
260	104	Unexpected exception occurred during MOVE test.	System logic module
514	202	MNEGF instruction test failed.	System logic module
516	204	Unexpected exception occurred during MNEGF test.	System logic module
770	302	ACBF instruction test failed.	System logic module
772	304	Unexpected exception occurred during ACBF test.	System logic module
1026	402	ADDF2/ADDF3 instruction test failed.	System logic module
1028	404	Unexpected exception occurred during ADDF*x* test.	System logic module
1282	502	CMPF instruction test failed.	System logic module
1284	504	Unexpected exception occurred during CMPF test.	System logic module
1538	602	CVTFD/CVTFG instruction test failed.	System logic module
1540	604	Unexpected exception occurred during CVTFD/CVTFG test.	System logic module
1794	702	CVTF*x* instruction test failed.	System logic module
1796	704	Unexpected exception occurred during CVTF*x* test.	System logic module
2050	802	CVT*x*F instruction test failed.	System logic module

(continued on next page)

Table C–7 (Cont.) FPU Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
2052	804	Unexpected exception occurred during CVT*x*F test.	System logic module
2306	902	DIVF2/DIVF3 instruction test failed.	System logic module
2308	904	Unexpected exception occurred during DIVF*x* test.	System logic module
2562	A02	EMODF instruction test failed.	System logic module
2564	A04	Unexpected exception occurred during EMODF test.	System logic module
2818	B02	MULF2/MULF3 instruction test failed.	System logic module
2820	B04	Unexpected exception occurred during MULF*x* test.	System logic module
3074	C02	POLYF instruction test failed.	System logic module
3076	C04	Unexpected exception occurred during POLYF test.	System logic module
3330	D02	SUBF2/SUBF3 instruction test failed.	System logic module
3332	D04	Unexpected exception occurred during SUBF*x* test.	System logic module
3586	E02	TSTF instruction test failed.	System logic module
3588	E04	Unexpected exception occurred during TSTF test.	System logic module
4095	0FFF	FPU not tested in FBOOT mode.	Not necessarily an error.

Self-Test Error Descriptions

Table C–8 IT Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
x	*xx*02	Interval timer failed to interrupt at the correct rate.	System logic module Neglect the *xx* output; however, this will be calculated in the decimal error results.

Table C–9 SYS Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
*xx*2	*xx*02	System ROM test failed.	System logic module Neglect the *xx* output; however, this will be calculated in the decimal error results.
4095	0FFF	System not tested in FBOOT mode.	Not necessarily an error.

Table C–10 NI Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
If an NI error occurs, verify that a loopback connector is installed on the selected network port on the rear of the terminal or that the network cable is firmly connected. Rerun the NI self-test, if necessary.			
16	10	Network address ROM error: read access failed.	System logic module
18	12	Network address ROM error: null address.	System logic module
20	14	Network address ROM error: bad group address.	System logic module
22	16	Network address ROM error: bad checksum.	System logic module
24	18	Network address ROM error: bad group 2.	System logic module

(continued on next page)

Table C–10 (Cont.) NI Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
26	1A	Network address ROM error: bad group 3.	System logic module
28	1C	Network address ROM error: bad test patterns.	System logic module
30	1E	SGEC CSR0 read/write error.	System logic module
32	20	SGEC CSR0 read/write error.	System logic module
34	22	SGEC CSR0 read/write error.	System logic module
36	24	SGEC CSR0 read/write error.	System logic module
38	26	SGEC CSR0 read/write error.	System logic module
40	28	SGEC CSR0 read/write error.	System logic module
42	2A	SGEC CSR0 read/write error.	System logic module
44	2C	SGEC CSR0 read/write error.	System logic module
46	2E	SGEC CSR0 read/write error.	System logic module
48	30	SGEC CSR0 read/write error.	System logic module
50	32	SGEC CSR0 read/write error.	System logic module
52	34	SGEC CSR0 read/write error.	System logic module
54	36	SGEC CSR0 read/write error.	System logic module
56	38	SGEC CSR0 read/write error.	System logic module
58	3A	SGEC CSR0 read/write error.	System logic module
60	3C	SGEC CSR0 read/write error.	System logic module
62	3E	SGEC chip self-test: ROM error.	System logic module
64	40	SGEC chip self-test: RAM error.	System logic module
66	42	SGEC chip self-test: address filter RAM error.	System logic module
68	44	SGEC chip self-test: transmit FIFO error.	System logic module
70	46	SGEC chip self-test: receive FIFO error.	System logic module
72	48	SGEC chip self-test: self-test loopback error.	NI module

(continued on next page)

Self-Test Error Descriptions

Table C–10 (Cont.) NI Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
74	4A	SGEC initialization: setup frame send failure.	System logic module
76	4C	SGEC interrupts: initialization failed.	System logic module
78	4E	SGEC interrupts: transmit failed.	System logic module
80	50	SGEC interrupts: receive failed.	System logic module
82	52	SGEC interrupts: packet comparison failed.	System logic module
84	54	SGEC interrupts: NI ISR not entered.	System logic module
86	56	SGEC interrupts: NI ISR entered multiple times.	System logic module
88	58	SGEC CRC: initialization failed.	System logic module
90	5A	SGEC CRC: transmit failed.	System logic module
92	5C	SGEC CRC: receive failed.	System logic module
94	5E	SGEC CRC: packet comparison failed.	System logic module
96	60	SGEC CRC: SGEC generated bad CRC.	System logic module
98	62	SGEC CRC: SGEC rejected good CRC.	System logic module
100	64	SGEC CRC: SGEC accepted bad CRC.	System logic module
102	66	SGEC CRC: other error.	System logic module
104	68	SGEC collision: initialization failed.	System logic module
106	6A	SGEC collision: unknown transmit error.	System logic module
108	6C	SGEC collision: RETRY not flagged.	System logic module
110	6E	SGEC collision: transmitter disabled.	System logic module

(continued on next page)

Table C–10 (Cont.) NI Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
112	70	SGEC address filtering: initialization failed.	System logic module
114	72	SGEC address filtering: transmit failed.	System logic module
116	74	SGEC address filtering: receive failed.	System logic module
118	76	SGEC address filtering: packet comparison failed.	System logic module
120	78	SGEC address filtering: broadcast filtering failed.	System logic module
122	7A	SGEC address filtering: promiscuous mode failed.	System logic module
124	7C	SGEC address filtering: null destination accepted.	System logic module
126	7E	SGEC address filtering: good logical address rejected.	System logic module
128	80	SGEC external loopback: initialization failed.	NI module
130	82	SGEC external loopback: packet comparison failed.	NI module
132	84	SGEC external loopback: check NI port connector.	NI module

Table C–11 Printer Port Self-Test Error Codes

Error (Decimal)	Error (Hex.)	Meaning	Replace
32	20	Data path error.	System logic module
48	30	Control signal path error.	System logic module
64	40	Interrupt signal path error.	System logic module
128	80	No memory available for data area.	System logic module

Index

D

E

F

G

H

I

K

L

M

N

O

P

Q

R

S

T

U

V

W

X