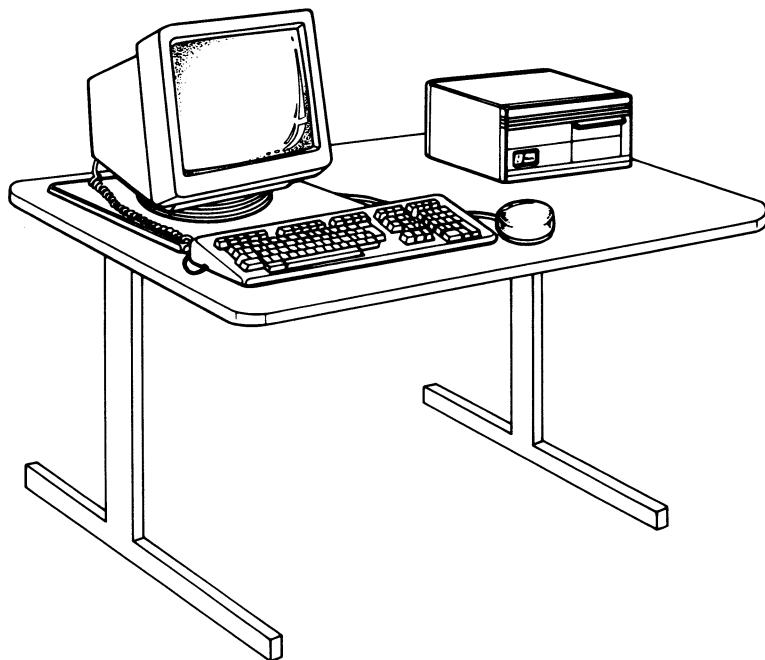


VAXstation 2000 Owner's Manual

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Preface

These update pages describe how to operate and troubleshoot the VAXstation 2000 hardware.

Recommended Reading Path

The VAXstation 2000 hardware and software documentation should be read in the following order:

1. Hardware Installation Information
 - a. *VAXstation 2000 Hardware Installation Guide*
 - b. *Workstations and MicroVAX 2000 Network Guide*
2. Operating System Installation Information
 - a. *VAXstation 2000 Owner's Manual*, Chapter 1 (Operating the VAXstation 2000) (this manual)
 - b. *MicroVMS VAXstation 2000/MicroVAX 2000 Installation Guide*
or
ULTRIX-32w Basic Installation Guide for the VAXstation 2000
3. Reference Information
 - a. *VAXstation 2000 Owner's Manual*
 - b. *MicroVMS VAXstation 2000/MicroVAX 2000 Operations Guide*
or
ULTRIX-32w Installation and Management Guide

VAXstation 2000 Description

The VAXstation 2000 is a single-user standalone workstation using the MicroVAX II processor chip, with 2 megabytes of memory on board. Its desktop enclosure can hold one or two storage devices. Other hardware includes:

- Your choice of one of the following monitors:
 - 47.5 cm (19 in) (diagonal) monochrome monitor (tilt-swivel base optional)

47.5 cm (19 in) (diagonal) color monitor with tilt-swivel base

37 cm (15 in) (diagonal) monochrome monitor

37 cm (15 in) (diagonal) color monitor

- Ethernet controller module (preinstalled)
- Intermediary Ethernet cable (transceiver cable)
- Loopback Connector
- *ThinWire* Ethernet hardware
 - 2 Terminators
 - T-connector

The system unit, monitor, and keyboard can all be placed on a desktop. The following DIGITAL hardware options are offered:

- Mouse
- Keyboard
- 4-plane graphics coprocessor
- 8-plane graphics coprocessor
- 4- and 12-megabyte memory modules
- Expansion box for additional mass storage
- Expansion adapter to connect expansion box to system unit
- Mass storage
 - Fixed disk drives with 40, 71, or 159 megabytes of mass storage
 - Diskette drive with 1.2 megabytes of mass storage
 - Tape drive with 94.5 megabytes of mass storage
- Printers and Plotters
 - LN03, LN03 PLUS, and LN03R laser printers
 - LA210, LA100, LA75, and LA50 dot matrix printers
 - LCG01 color printer
 - LJ250/LJ252 color printers
 - LVP16 color plotter
- Tablet
- Modems
 - DF224, DF124, DF112, DF212, DF124+, DF242 Scholar Plus

The VAXstation 2000 supports either the ULTRIX or VMS operating systems as follows:

- VMS
 - MicroVMS operating system software
 - VWS workstation software
- ULTRIX
 - ULTRIX-32w workstation software

Layered software is also available. Consult your sales representative for information.

System Manager

A system manager should be chosen to oversee the hardware and software for single and multiple VAXstation 2000s and other systems that may be located on the same network or in a local geographical area. The system manager simplifies and centralizes the maintenance of equipment and software.

Special Notices

The following notices appear throughout this manual:

- Notes—Contain general or supplemental information about a topic.
- Cautions—Contain information to prevent damage to equipment.
- Warnings—Contain information to prevent personal injury.

Conventions Used in This Document

Convention	Meaning
-------------------	----------------

Bold	Notes, cautions, and warnings are bolded. User input is also bolded.
-------------	--

<i>Italics</i>	Computer terms defined in the Glossary are italicized the first time the word appears in the text.
----------------	--

Summary of New and Changed VAXstation Features

The following changes have been made for the VAXstation 2000 hardware product and are reflected in this manual:

- 8-plane Graphics Coprocessor — The VAXstation 2000 8-plane graphics coprocessor provides an 8-plane video subsystem for the VAXstation

2000 system. The mnemonics for the 8-plane graphics coprocessor are provided for use in power-up, self test and diagnostic messages.

- Information about new optional DF242 Scholar Plus, DF212 and DF124+ modems.
- The Expansion box with a TK50 tape drive ships without a door.
- Loopback Connector used for testing and diagnostics for standard Ethernet ships with the System Unit Carton.
- Optional 12-Megabyte Memory Expansion Module.
- Secondary power-up error messages—provide information about the monitor screen after power-up.
- Appendix C provides port pin out signal assignments.

Chapter 1

Operating the VAXstation 2000

This chapter describes how to operate the VAXstation 2000 and its mass storage *devices*. Review this chapter before installing *operating system software*. Descriptions and operating information are included for the following:

- Enclosure
- Controls and indicators
- *Fixed disk drives*
- *Diskette drive* and *diskettes*
- Expansion adapter
- Expansion boxes
- *Tape drive* and tape cartridges

Setting Up and Handling the VAXstation 2000

Use the *VAXstation 2000 Hardware Installation Guide* to set up and test your *system* when you first receive it and any time you move the system from one location to another. The *VAXstation 2000 Hardware Installation Guide* describes setting up each system unit and expansion box either on its bottom or on its side. This manual describes and illustrates each system unit and expansion box bottom-side-down only; system operation is the same for either orientation.

Graphic symbols, called *icons*, are molded into the back of the system unit enclosure. They identify the locations of connectors and controls.

On the rear of the system unit (Figure 1-3) and each expansion box is a cable-restraining bar that relieves strain on cables installed. This bar may be used as a handle when carrying the system unit or expansion boxes.

Caution: Do not set the system unit or expansion boxes on their fronts. That procedure may damage the drive doors on the front of the boxes.

Be sure to turn off the VAXstation 2000 before lifting or moving it. Dropping or jarring the system unit or an expansion box can damage a fixed disk drive and lose *data* stored on that *disk*. This is especially true when power is applied to the system and the drive is active.

Never plug, or unplug the power cable while the system unit is on.

Controls and Indicators

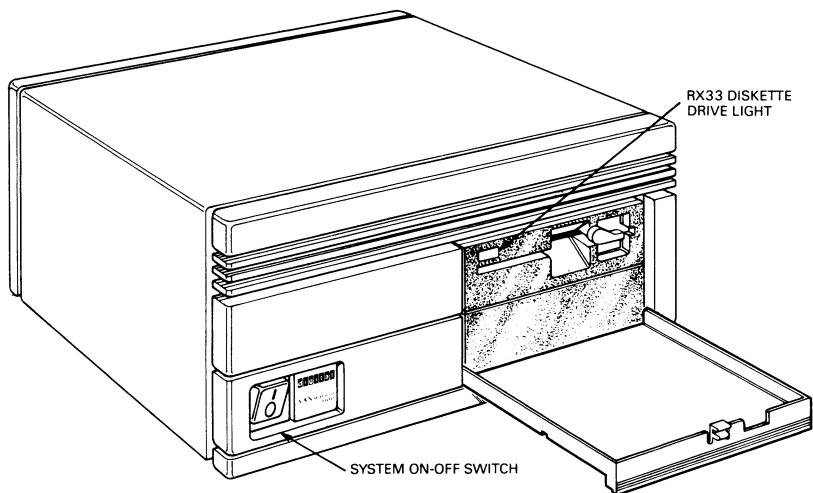
The VAXstation 2000 system unit contains the following controls (see Figures 1-1 through 1-3 and Table 1-1):

- System on-off switch
- Halt button

In addition, the system unit and optional expansion boxes may contain the following controls and indicators:

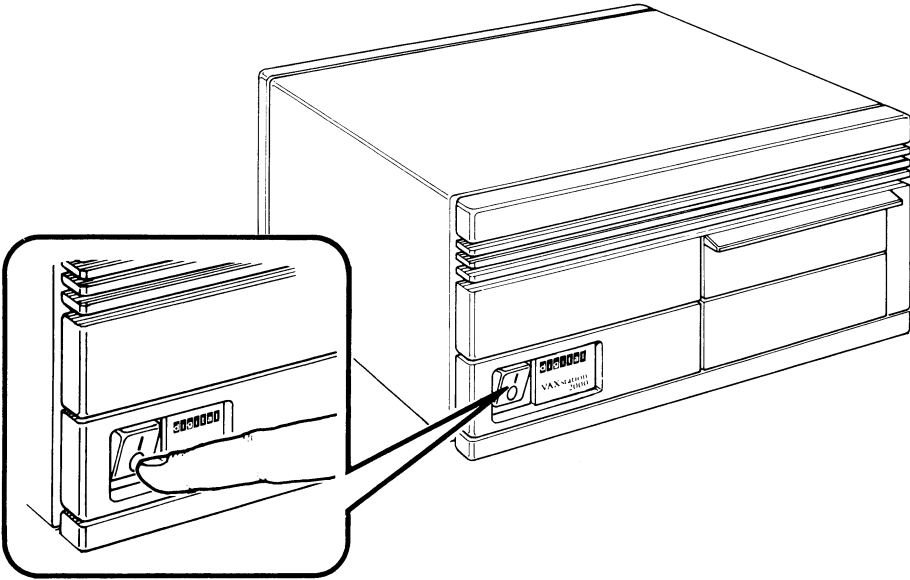
- Red light on RX33 diskette drive
- *Load/unload* pushbutton with integral red light on TK50 tape drive
- Green light on TK50 tape drive

Figure 1-1: System Unit On-Off Switch and Diskette Drive Light



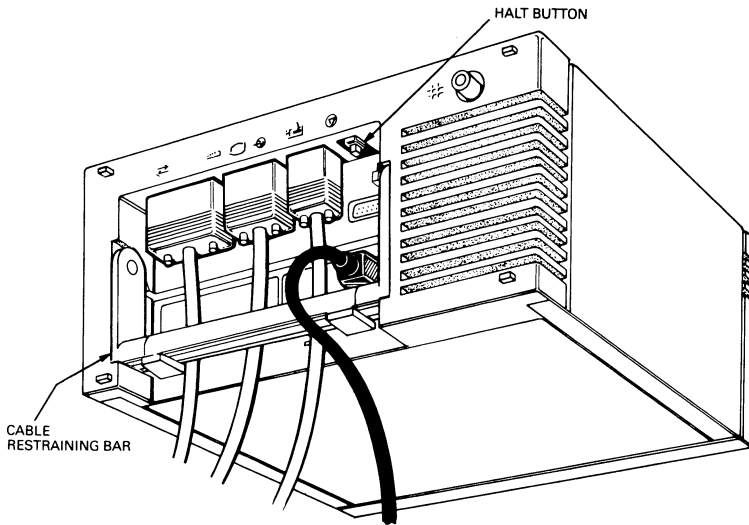
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Figure 1-2: Setting On-Off Switch to 0



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Figure 1-3: Halt Button — Rear of System Unit



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Table 1-1: Controls and Indicators

Control or Indicator	Function
System on-off switch	Controls ac power. Setting this switch to 0 (see Figure 1-2) turns off system power. Setting the switch to 1 turns on the power. The expansion box has its own on-off switch.
Halt button	Stops the normal operation of any software and puts the system in <i>console mode</i> . See Figure 1-3. The halt button is a momentary-contact pushbutton. Console mode lets the user control certain system functions that are usually controlled by operating system software. When the VAXstation 2000 is in console mode, the user types commands at the console <i>prompt(>>>)</i> . The halt button and console commands are discussed further in this manual.

Table 1-1 (Cont.): Controls and Indicators

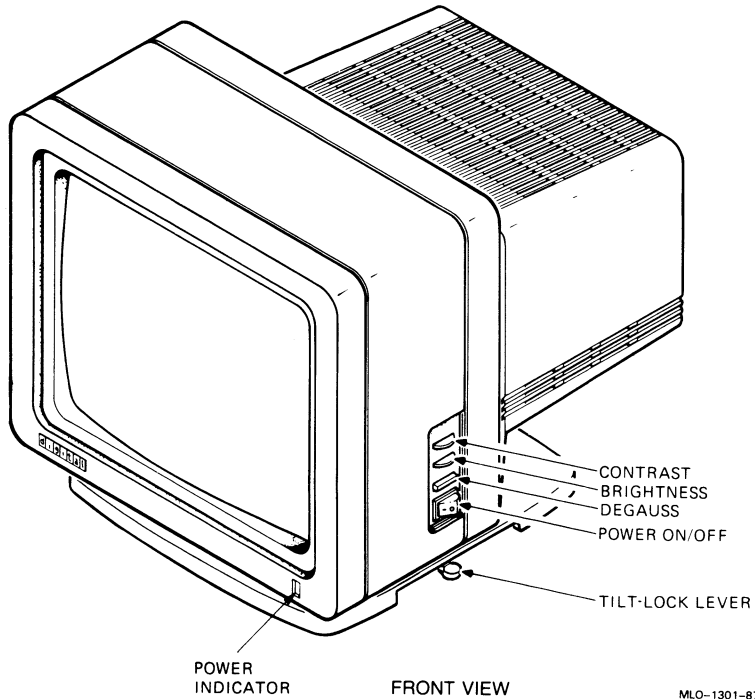
Control or Indicator	Function
	Note: Pressing the halt button may cause unsaved data to be lost. See your software documentation for more information.
Diskette drive light	Glows red when the drive is active.
Tape drive with pushbutton integral red light	This load/unload button controls the loading and unloading of tape cartridges. This button is described in detail later in this chapter.
Tape drive green light	Glows steadily to indicate either that the tape drive is ready for use or that the tape has been successfully loaded. This light is described in detail later in this chapter.

VR290 Color Monitor Controls and Indicators

The front and right side of the VR290 color monitor have the following controls and indicators (Figure 1-4):

- Contrast control—lets you adjust the video display's contrast.
- Brightness control—lets you adjust the brightness of the video raster (background brightness) to compensate for ambient light in the room.
- Degauss switch—lets you clear picture distortion caused by external magnetic interference. Press the degauss switch after moving the monitor on the tilt-swivel base to correct color distortions. If you need to press the degauss switch a second time, wait 10 minutes to allow the circuit to reactivate.
- Power switch—lets you turn the monitor on or off. Press 1 to turn on the power. Press 0 to turn off the power.
- Tilt-lock lever—lets you adjust the angle of the monitor. Set the tilt-lock lever back to adjust the tilt. Pull the lever forward to the original position to lock the monitor at the desired angle. The lock prevents the tilting mechanism from moving the monitor. You can swivel the monitor on the base, and the angle will be maintained.
- Power indicator—glows green when power is applied to the monitor.

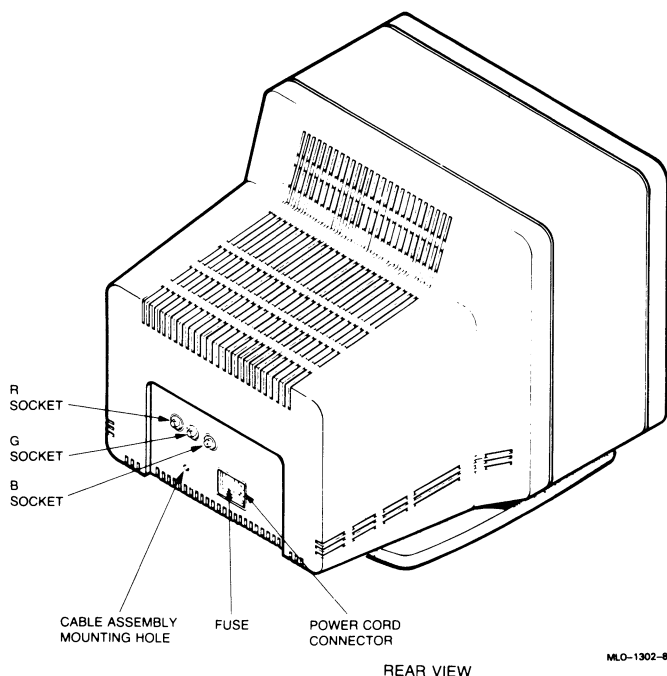
Figure 1-4: Controls and Connectors, VR290 Color Monitor



The rear of the monitor (Figure 1-5) has the following:

- R, G, B sockets—for the video cable connector.
- Cable assembly mounting hole—for attaching the video cable assembly.
- Fuse—protects the monitor from electrical damage.
- Power cord connector—for the monitor power cord.

Figure 1-5: Rear Controls and Connectors, VR290 Color Monitor



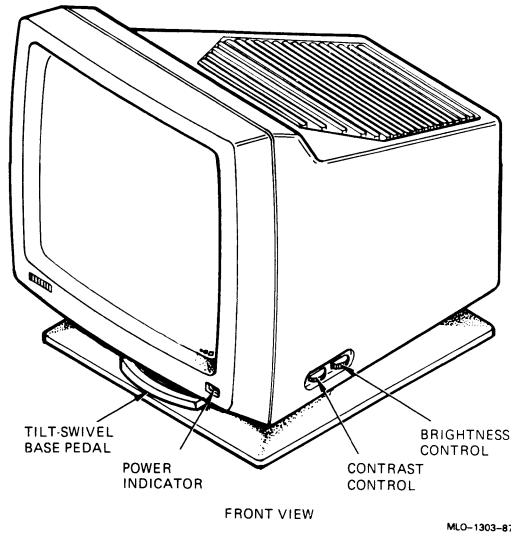
VR260 Monochrome Monitor Controls and Indicators

The front and side of the VR260 monochrome monitor have an indicator and two controls (Figure 1-6):

- Power indicator—glows green when power is applied to the monitor.
- Contrast control—lets you adjust the contrast of the video display.
- Brightness control—lets you adjust the brightness of the video raster (background intensity) to compensate for ambient light in the room.

The pedal on the optional tilt-swivel base lets you adjust the angle of the monitor. To change the angle, press down the base pedal and move the monitor to the desired angle. Taking your hand off the pedal locks the monitor in place. You can swivel the monitor on the base, and the angle will be maintained.

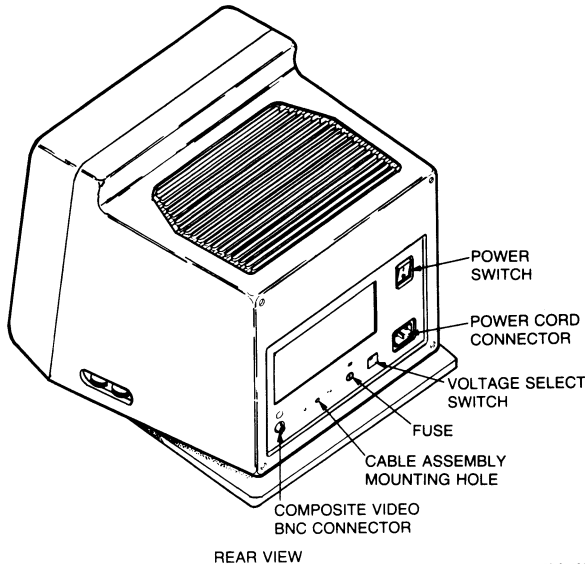
Figure 1-6: Front and Right Side Controls, VR260 Monochrome Monitor



The rear of the monitor has the following six connectors and controls (Figure 1-7):

- On-off switch—lets you control ac power to the monitor. Press 1 to turn on the power. Press 0 to turn off the power.
- Power cord connector—for the monitor power cord.
- Voltage select switch—lets you match the monitor operating voltage to the ac line voltage.
- Fuse—protects the monitor from electrical damage.
- Cable assembly connector—for attaching the video cable assembly from the video cable.
- Composite video connector—for the video cable from the video cable assembly.

Figure 1-7: Rear Controls and Connectors, VR260 Monochrome Monitor

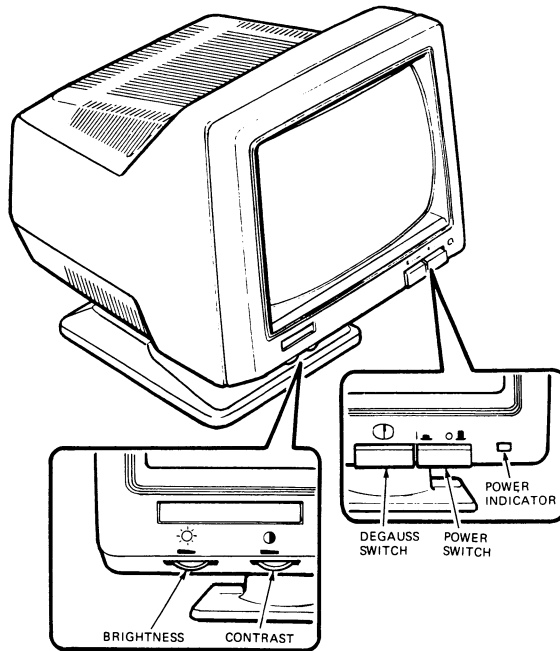


VR160 Color Monitor Controls and Indicators

The front of the VR160 color monitor has the following controls and indicators (Figure 1-8):

- Brightness control—lets you adjust the video raster (background intensity) to compensate for ambient light in the room.
- Contrast control—lets you adjust the video display to a suitable intensity.
- Degauss switch—lets you clear the color picture distortion caused by external magnetic interference.
- Power on-off switch—lets you turn the monitor on and off. Press the switch in to turn the power on. Press the switch out to turn the power off. Turn off the monitor at the end of the workday to extend the life of the monitor.
- Power indicator (green)—turns on to indicate the presence of power. Turns off to indicate the absence of power.

Figure 1-8: Controls and Indicators, VR160 Color Monitor

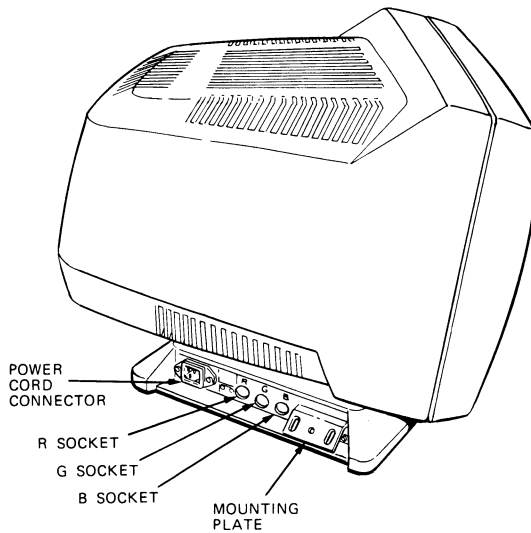


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The rear of the monitor (Figure 1-9) has the following:

- R, G, B sockets—for the video cable connector.
- Cable assembly mounting shelf—for attaching the video cable assembly.
- Power cord connector—for the monitor power cord.

Figure 1-9: Rear Connectors, VR160 Color Monitor



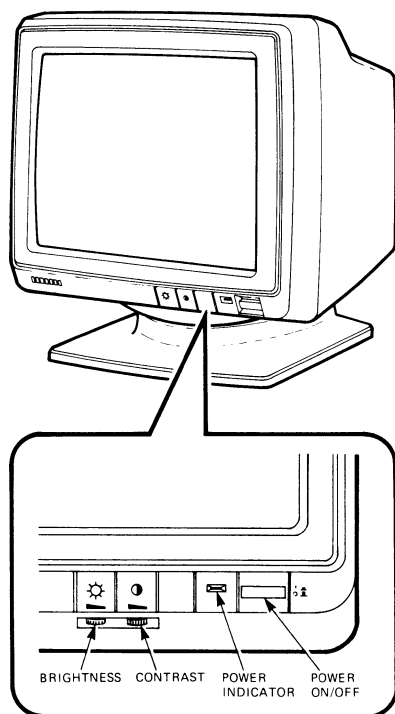
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VR150 Monochrome Monitor Controls and Indicators

The front of the VR150 monochrome monitor has an indicator and the following controls (Figure 1-10):

1. Brightness control—lets you adjust the video raster (background intensity) to compensate for ambient light in the room.
2. Contrast control—lets you adjust the video display to a suitable intensity.
3. Power switch—lets you turn the monitor on and off. Press the switch in to turn the power on. Press the switch out to turn the power off. Turn off the monitor at the end of the workday to extend the life of the monitor.
4. Power indicator (green)—turns on to indicate the presence of power. Turns off to indicate the absence of power.

Figure 1-10: Front Controls, VR150 Monochrome Monitor

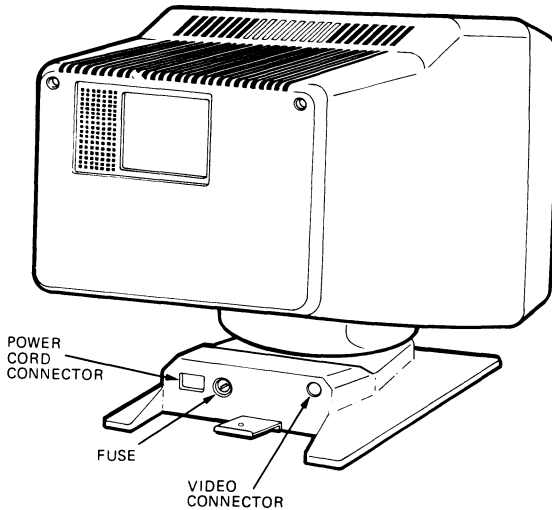


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The rear of the monitor has the following connectors and controls (Figure 1-11):

- Power cord connector—for the monitor power cord.
- Cable assembly shelf—for attaching the video cable assembly from the video cable.
- Composite video connector—for the video cable from the video cable assembly.

Figure 1-11: Rear Connectors, VR150 Monochrome Monitor



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Powering Up the System

Before powering up the system, install it according to the instructions in the *VAXstation 2000 Hardware Installation Guide*.

Note: If operating system software is not installed in the VAXstation 2000, use the documentation that came with your software to complete the installation.

1. Set the monitor on-off switch to 1 (on).
2. *Power up* any expansion boxes and peripheral equipment, such as the printer.
3. Set the system unit on-off switch to 1 (on).

After about 20 seconds, the monitor displays the power-up test sequence.

Note: Important messages are displayed during power up. Read the rest of this section for information on the screen display.

A sample power-up display is shown in Figure 1-12.

Caution: Do not power down the VAXstation 2000 until power-up testing is complete. Wait until you see either the console prompt (>>>) or the first screen of your operating system software. Powering down before testing is complete may destroy data in the system's nonvolatile random-access memory.

Caution: Power up any expansion boxes before powering up the system unit so that any tapes or disks can be included in the configuration.

Table 1-2 lists the system's normal power-up indications. The table includes indicators on optional equipment as well. Your system may not contain all the listed devices.

Table 1-2: Normal Power-up Indications

Indicator	Normal Indication
Monitor power indicator	Glows green
Diskette drive light on system unit	Glows red
Tape drive load/unload button on expansion box	Glows red for approximately 4 seconds and then goes out

Note: The fan in the system box goes on at power up. You may be able to hear it if the room is quiet. You can feel the exhaust from the vents on the rear of the system unit.

If you do not observe the indications listed in Table 1-2, refer to Chapter 2.

Figure 1-12: Sample Power-up Display

```
KA410-A V1.0
F...E...D...C...B...A...9...8...7...6...5...4...3...2...1...
83 BOOT SYS
-DUA2
-DUA0
-
```

The power-up test sequence is displayed each time the VAXstation 2000 is turned on. The display consists of a countdown from the letter F to the number 1. Then the screen clears for a few seconds. The *device names* of one or more mass *storage* devices (if present) are shown (DUA2 and DUA0, for example, in Figure 1-12). The last item on the list identifies the VAXstation 2000 mass storage device that contains *bootable software*. If the last line on the list is MUA0, the VAXstation 2000 is booting from the tape drive. If the last line of the display is ESA0, the VAXstation 2000 is searching for bootable software over the *Ethernet*.

If the system cannot locate any bootable software, one of two things happens. An *error message* may be displayed:

```
%VMB-F-ERR, PC = nnnnnnnn
%VMB-I-STS, RO = nnnnnnnn
84 FAIL
>>>
```

Or, if your system is part of a Local Area VAXcluster, the system may continue to search the Ethernet for bootable software. In this case, the system displays the following message:

```
?54 RETRY
```

and no console prompt is displayed. If this happens, press the halt button. The console prompt is then displayed. Type **BOOT** at the console prompt (>>>) or **BOOT** followed by the name of the device that contains operating system software and press Return.

An underscore following a number in the countdown sequence indicates that the corresponding optional *hardware* has not been included in your system.

Note: If any number in the countdown sequence has a question mark or an asterisk beside it, as shown in Figure 1-13, there may be a fault in the system. See Chapter 2 for more information.

Figure 1-13: Sample Power-up Display with Error Message

```
KA410-A V1.0
F...E...D...C...B...A...9...8...7...6...5...4...3...2...1?...

83 BOOT SYS
- DUA0
  %VMB-F-ERR, PC = nnnnnnnn
  %VMB-I-STS, RO = nnnnnnnn

84 FAIL
>>>
```

As described in the *VAXstation 2000 Hardware Installation Guide*, the VAXstation 2000 displays a request for keyboard language selection the first time the system is powered up. This display follows the power-up display automatically, and the system records your choice in *memory*. Under normal operating conditions, you only need to make this choice the first time you power up the VAXstation 2000. However, certain kinds of failures (such as a discharged battery) or maintenance procedures may erase memory, and the first power up after such an occurrence displays the keyboard language request. Additionally, Chapter 2 contains a procedure for changing the keyboard language.

When the first screen display for the operating system software appears, the system is ready for use. Refer to the software documentation for instructions on using the VAXstation 2000 software.

See Appendix B for a list of related documents.

Powering Down the System

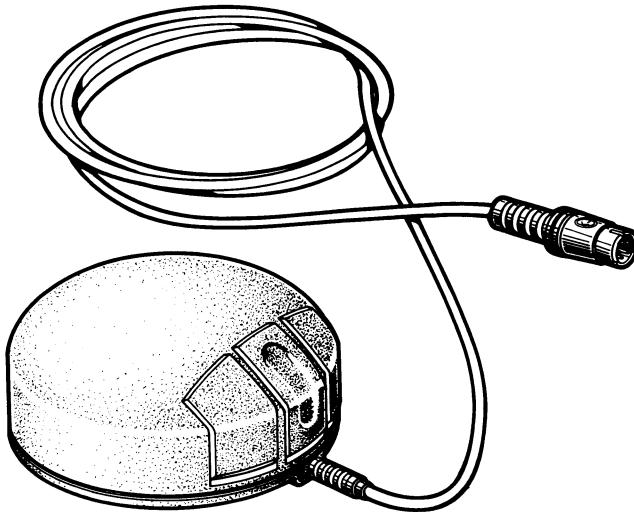
To save data and to ensure an orderly system shutdown, follow the shutdown procedure described in your operating system software documentation. After completing an orderly system shutdown, turn off the system in the following order:

1. Monitor
2. Other peripheral equipment, such as a printer or modem
3. Expansion boxes
4. VAXstation 2000 system unit

Mouse

Use the *mouse* (Figure 1-14) to control movement of a pointer on the monitor screen and to perform other functions determined by the *workstation software* you are using. Use the mouse by moving it across the desktop and pressing or clicking one of the three buttons. The documentation that accompanies your workstation software explains how to use the mouse.

Figure 1-14: Mouse



MLO-317-87

Fixed Disk and Diskette Drives for the System Unit

When you lower the drive door on the front of the VAXstation 2000 system unit, you find one of the following configurations:

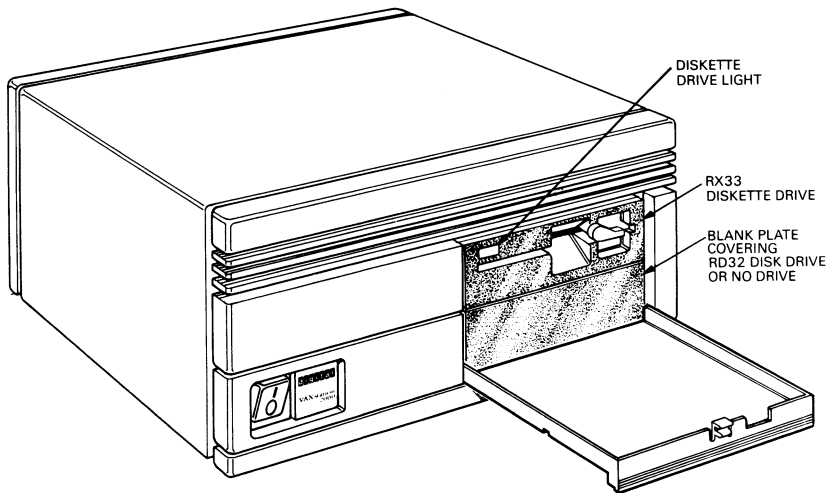
1. An RX33 diskette drive (Figure 1-15) with a lever and slot in the upper portion of the opening and a blank metal plate in the lower portion.

The RX33 diskette drive uses double-sided, high-density removable RX33K diskettes. Up to 1.2 megabytes of data can be stored on each RX33K diskette (.6 megabytes a side). The RX33 diskette drive also uses single-sided normal-density RX50K diskettes. Up to .4 megabytes of data

can be stored on each RX50K diskette. The RX33 diskette drive is a half-height (approximately 1 5/8 in high) device.

The blank metal plate may cover an RD32 fixed disk drive. The RD32 stores up to 40 megabytes of data on a nonremovable disk. The RD32 is a half-height device. The metal plate covers the empty cavity if no RD32 is present.

Figure 1-15: Configuration with RX33 Diskette Drive and RD32 Fixed Disk Drive



2. Two blank metal plates covering the opening (Figure 1-16). The plates cover one of the following possible configurations:

- An RD53 fixed disk drive

The RD53 fixed disk stores up to 71 megabytes of data and is sealed in place and cannot be removed. The RD53 can be used in the system unit or in the expansion box. The RD53 is a full-height (approximately 3 1/4 in high) device.

- No fixed disk drive

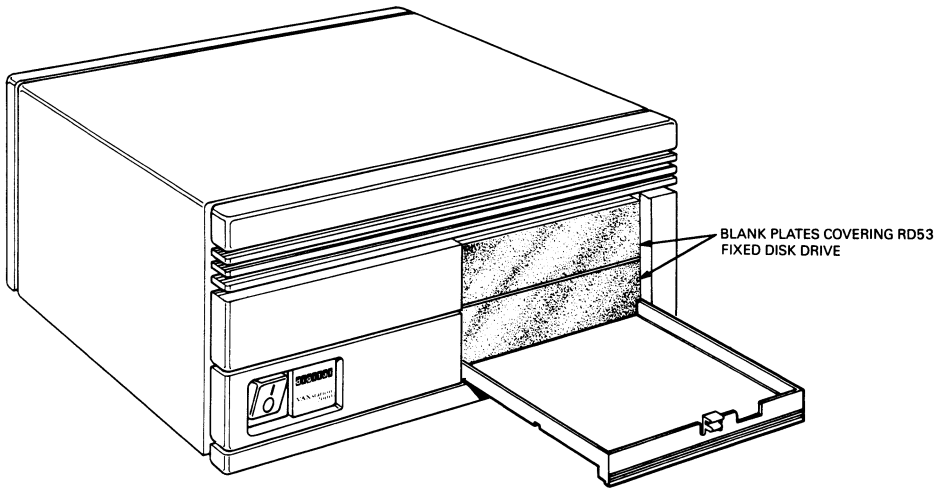
If your VAXstation 2000 is part of a *cluster* (a group of computers *networked* together), you can use devices that reside on other systems

to store your software and data. See your software documentation and the *Workstations and MicroVAX 2000 Network Guide* for more information.

3. Another possible configuration is the RD54 fixed disk drive which has a drive select *LED* on its front.
 - The RD54 fixed disk stores up to 159 megabytes of data. The RD54 can be used in the system unit or in the expansion box. The RD54 is a full-height (approximately 3 1/4 in high) device.

To find the model number of the fixed disk drives in your system, see The Fixed Disk Verifier in Chapter 2.

Figure 1-16: Configuration with Blank Plates



MLO-319-87

Diskettes

The RX33 diskette drive magnetically stores data on removable diskettes. Each RX33K diskette (Figure 1-17) is permanently enclosed in a gray plastic jacket. When a diskette is inserted into the diskette drive and the drive is active, the diskette spins inside the jacket. The read/write *head* of the diskette drive contacts the diskette through the openings in the jacket. The

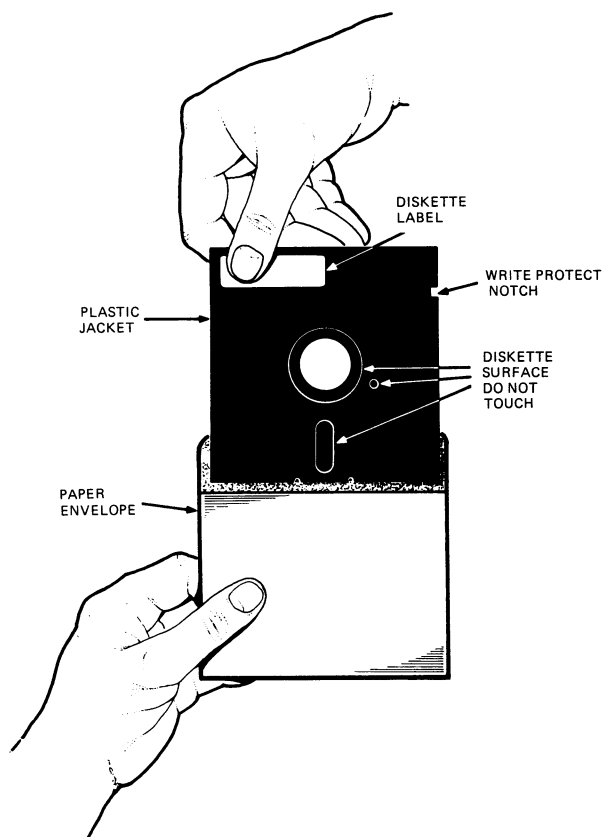
fabric lining of the jacket continuously cleans the diskette. Do not attempt to remove the diskette from its jacket.

The RX33 diskette drive accepts RX50K diskettes as well as RX33K diskettes, but the RX50 has less storage capacity than the RX33.

Note: You cannot use an RX33 diskette on a RX50 diskette drive.

An RX50K diskette can be distinguished from an RX33K diskette by its black plastic jacket with a printed orange arrow. RX50K diskettes are preformatted.

Figure 1-17: RX33K Diskette

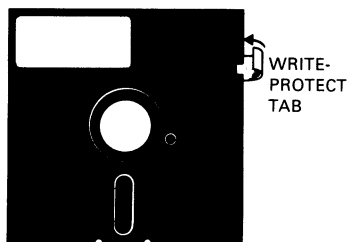


MLO-320-87

Write-protecting Diskettes

Both RX33K and RX50K diskettes have a *write-protect* feature to prevent accidental overwriting. To protect data, cover the *write-protect notch* on the side of the plastic jacket with one of the adhesive foil tabs supplied with your diskettes (Figure 1-18). Remove the tab when you want to add, change, or delete information on the diskette.

Figure 1-18: The Diskette Write-protect Tab



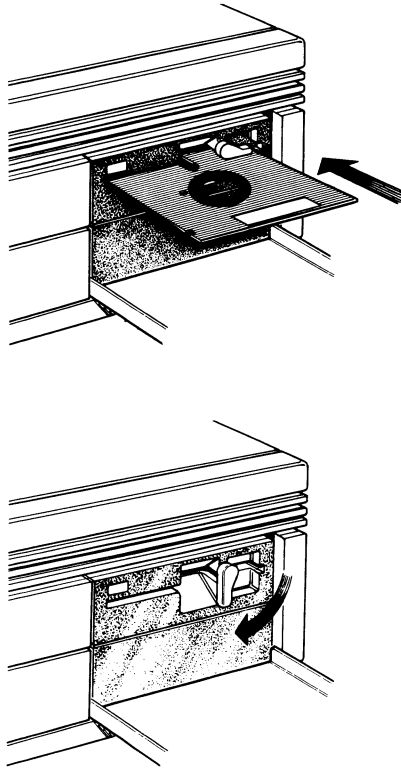
MLO-321-87

Inserting Diskettes

1. Open the door on the front panel of the VAXstation 2000 system unit. Inside is a lever that lets you insert and remove a diskette.
2. Make sure that the light on the front of the drive is not lit.
3. If the lever on the front of the drive is in a vertical position, move it counterclockwise to horizontal (Figure 1-19) and remove the diskette that is in the drive.
4. Remove the diskette to be inserted from its paper envelope. Hold the diskette so that the write-protect notch is to your left and the diskette's label is up.
5. Push the diskette into the slot until it snaps into place.
6. Move the lever clockwise to its vertical position.

Note: Do not force the lever. Make sure that the diskette is fully inserted. The diskette drive lever must be in a vertical position for the drive to function.

Figure 1-19: Inserting Diskettes



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Removing Diskettes

Before removing a diskette, check the light on the front of the drive. If the light glows red, the drive is active. Do not attempt to remove a diskette when the drive is active, or the diskette may be damaged. Once the light is off, move the lever to the horizontal position and remove the diskette.

Note: During software installation, the light may remain lit when the drive is not active. Follow the instructions in your software documentation in this case.

Handling and Storing Diskettes

Incorrect handling and storing of diskettes can damage them and cause loss of data. In turn, damaged diskettes can damage the diskette drive. The following precautions should be taken:

- Keep diskettes in paper envelopes when not in use.
- Do not fold or bend diskettes.
- Do not touch the exposed surface of diskettes. Handle only the top (label area) of diskettes.
- Store diskettes vertically. To prevent warping, avoid tightly packing diskettes.
- Use only a felt-tip pen when labeling diskettes. The pressure of a sharp instrument, such as a pencil or pen, can damage diskette surfaces.
- Store diskettes away from heat and magnetic fields (such as those produced by motors, transformers, and *video terminals* and monitors).

Making Backup Copies

Use the diskette drive to make *backup copies* of files that you have stored on a fixed disk. Refer to your software documentation for instructions.

Formatting RX33K Diskettes

You must *format* each RX33K diskette before using it for the first time. Formatting prepares the diskette to accept data. The process consists of inserting the diskette in the drive and typing commands while in console mode. Formatting a diskette takes about 2 minutes.

Note: RX50K diskettes are preformatted and do not require any preparation for use. Formatting an RX33K diskette that has already been formatted destroys data that may be stored on that diskette.

See the *VAXstation 2000/MicroVAX 2000 Operations Guide* for formatting procedures for systems containing *MicroVMS* operating system software.

1. Check your software documentation for shutdown instructions before you halt the system.
2. Put the system into console mode by pressing the halt button on the rear of the system.
3. Remove from its paper envelope the diskette that you intend to format.

4. Be sure that the diskette is not write protected. (See Write-Protecting Diskettes in this chapter.)
5. With the diskette's label up and the write-protect notch to your left, insert the diskette until it snaps into place. Move the lever clockwise to its vertical position.

Note: Do not force the lever. The diskette must be fully inserted in the drive for the lever to move freely.

6. Put the system into console mode by pressing the halt button on the rear of the system unit.
7. Type **TEST 70** and press Return at the console prompt (>>>). The following text appears on the monitor screen:

```
KA410-A RDRXfmt
VSfmt_QUE_unitno (0-2) ?
```

8. Type the number **2** and press Return. (The number 2 always represents the RX33 drive.)

Caution: Type only the number 2. Typing 0 or 1 starts up the hard disk formatter, which may result in loss of software and data on the hard disk.

If the following text appears, you must start over with the TEST 70 command at the console prompt:

```
VSfmt_RES_ERR #1
84 FAIL
>>>
```

If you continue to get the error message, see Chapter 2 for information on isolating and solving problems.

The following text appears if no errors occur:

```
VSfmt_QUE_RXmedtyp
(1=RX33) ?
```

9. Type 1 and press Return. Any other number causes the following text to be displayed:

```
VSfmt_RES_Err #6
84 FAIL
>>>
```

This message is also displayed if you have mistakenly inserted an RX50K diskette, which is preformatted and should not be formatted in the VAXstation 2000. The message also indicates that no diskette was inserted in the drive, or that the drive lever was not moved to the vertical position.

Start over with the TEST 70 command at the console prompt after this error.

The following text appears next if no errors exist:

```
VSfmt_QUE_RUsure (DUA2 1/0) ?
```

10. Type the number 1 and press Return to continue. The following message appears slowly:

```
VSfmt_STS_Fmtng .....OK
VSfmt_STS_CkRxfmt .....OK
VSfmt_RES_Succ
>>>
```

The diskette has been successfully formatted and can now be used to store data.

If for any reason you do not want to continue, type the number 0. If you see any device number other than DUA2 in the text, type the number 0. When you do this, you see the following message:

```
VSfmt_RES_Abtd
84 FAIL
>>>
```

The formatter has now stopped. You must start at the beginning of the procedure when you are again ready to format a diskette.

If an error occurred during formatting, one of the following messages appears:

```
VSfmt_RES_ERR #3
84 FAIL
>>>
```

or

```
VS_RES_ERR #5
84 FAIL
>>>
```

Try formatting the diskette again. If that is unsuccessful, try another diskette. If you continue to see either error message, see Chapter 2 to isolate and solve the problem.

Formatting Fixed Disks

Before data can be *stored* on a fixed disk, the disk must be formatted, which prepares the disk to accept data.

Formatting the fixed disk is explained in the *VAXstation 2000 Hardware Installation Guide*. However, it may be necessary to reformat the disk after repair, replacement, or corruption of the data stored on that disk. If you want to determine whether your disk is already formatted, see The Fixed Disk Verifier in Chapter 2.

Caution: Reformatting a disk destroys stored software and data. Back up your disk before reformatting.

To format your fixed disk, follow these steps.

1. At the console prompt (>>>), type **TEST 70** and press Return. The following text appears on the monitor screen:

```
KA410-A RDRXfmt
VSfmt_QUE_unitno (0-2) ?
```

2. Type the number **0** for a fixed disk drive in the system unit. Type the number **1** for a fixed disk drive in the expansion box.

If everything is working normally, the following text appears:

```
VSfmt_STS_Siz
```

If you type an invalid number, the following text appears:

```
VSfmt_RES_ERR #1
```

If this happens, start over at the first step. If you continue to see the error message, turn to Chapter 2 for information on isolating and solving problems.

If no error occurs, you see the following sample text as the formatter *program* determines the type of fixed disk drive you have selected for formatting:

```
VSfmt_STS_Siz ..... RD32
```

In this case, the formatter has identified the disk drive as an RD32.

If you see the following error message:

```
VSfmt_STS_Siz .....??  
VSfmt_RES_Err #2  
84 FAIL  
>>>
```

the fixed disk drive or its *controller* may be faulty. Use Chapter 2 to troubleshoot the problem.

If no problem occurs with the drive, the following appears:

```
VSfmt_QUE_SerNbr (0-99999999) ?
```

Refer to the packing slip that came with your system shipment for the serial number of the fixed disk drive you are formatting. Enter only the numbers. If you cannot locate the serial number, assign a number of your choice to the drive. Be sure to record this number for later reference. Assign a different number to each drive you format.

3. Type the serial number of the disk and press Return.

The following is a sample of the text that appears:

```
VSfmt_QUE_RUsure (DUA0 1/0)?
```

Type the number 1 and press Return to continue. If for any reason you do not want to continue, type 0. If you do this, the following text appears:

```
VSfmt_RES_Abtd  
84 FAIL  
>>>
```


The formatter has now stopped. You must start at the first step when you are again ready to format a drive.

If you choose to continue, the following message appears gradually. It takes approximately 15 minutes to format an RD32 drive, 25 minutes to format an RD53 drive, and 40 minutes to format an RD54 drive.

```
VSfmt_STS_RdMbb .....OK
VSfmt_STS_Fmtng.....OK
VSfmt_STS_ChkPss.....OK
VSfmt_RES_Succ
>>>
```

If you see this message in its entirety, the disk has been successfully formatted and is ready for use.

If a problem occurs, one of the following two messages appears:

```
VSfmt_STS_Fmtng.....??
VSfmt_RES_ERR #3
84 FAIL
>>>
```

or

```
VSfmt_STS_CkPs 1.....??
VS_RES_ERR #4
84 FAIL
>>>
```

If you see either of those messages, refer to Chapter 2 for information on isolating and solving problems.

The Expansion Adapter

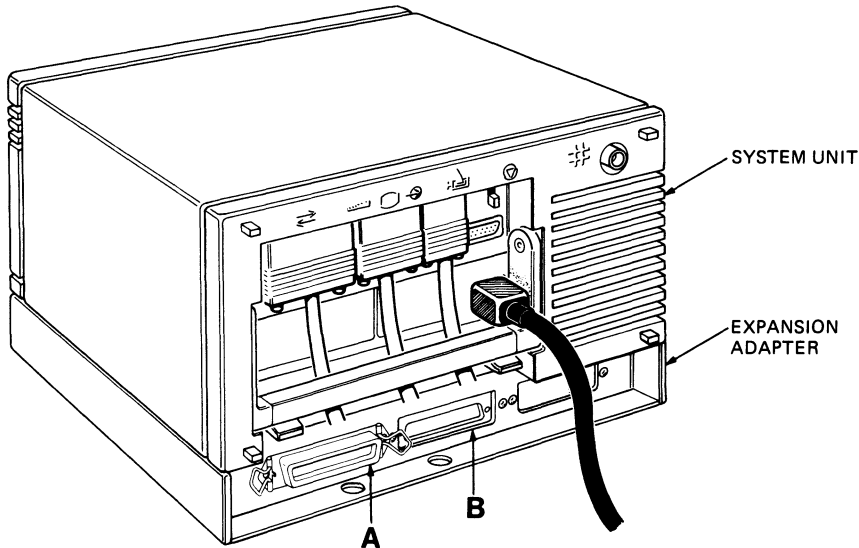
The expansion adapter (Figure 1-20) is an optional attachment for the VAXstation 2000 system unit that permits communication between the expansion box (Figure 1-21 and Figure 1-22) and the system unit.

If your system does not contain an expansion adapter and you want to connect an expansion box, call your service representative.

The expansion adapter contains two connectors: A and B. Those letters are stamped on the expansion adapter to identify the connectors. A is the connector for an expansion box containing a tape drive. B is the connector for

an expansion box containing a fixed disk drive. A third opening is covered by a metal plate and is not used by the VAXstation 2000.

Figure 1-20: The Expansion Adapter—Rear



MLO-000028

Expansion Boxes

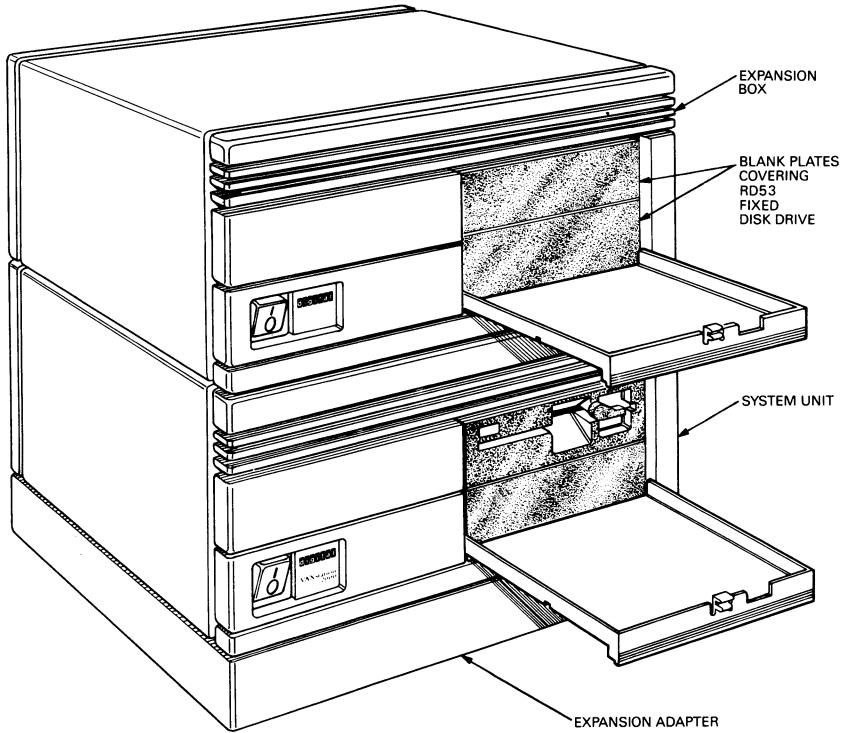
Expansion boxes provide additional storage for the VAXstation 2000. A box can hold an RD53 fixed disk drive, an RD54 fixed disk drive, or a TK50 tape drive. You may use only one additional disk or tape drive with your system.

To connect an expansion box to the VAXstation 2000, an expansion adapter, BA40X-XX, must be installed on the bottom of the system unit. If you want to have an expansion adapter installed, contact your service representative. See the *VAXstation 2000 Hardware Installation Guide* for expansion box installation information.

An expansion box has an on-off switch and drive door like the system unit. An expansion box containing a fixed disk drive has no power or status indicators visible. An expansion box containing a TK50 tape drive contains two lights. More information about those indicators is supplied later in this chapter.

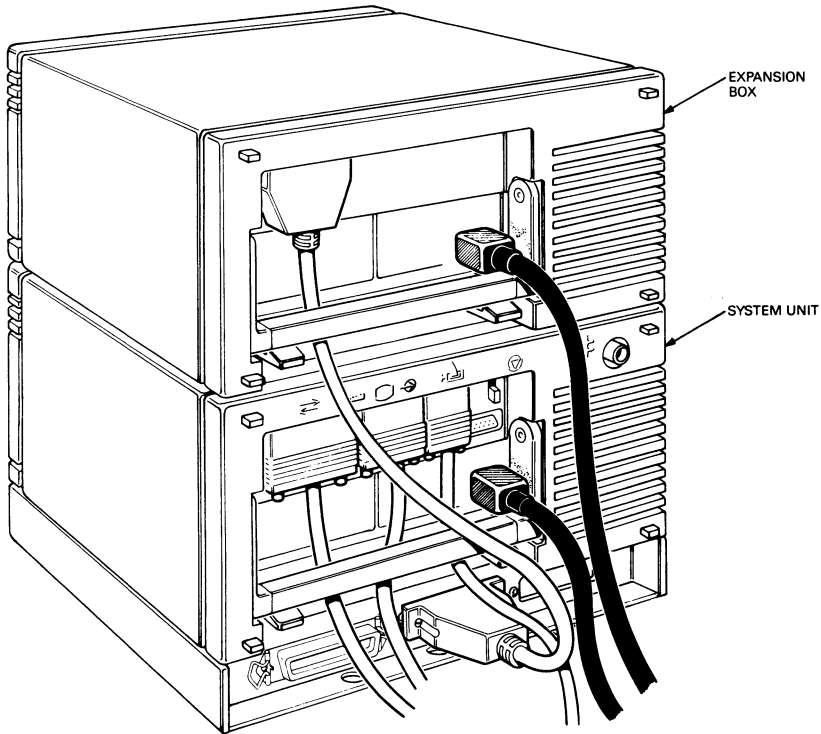
Caution: Only devices such as the RD53-Fx or RD54-Fx, which were specifically designed to operate with the VAXstation 2000, may be attached to connector B. Likewise, devices such as the RD53-Fx or RD54-Fx must not be connected to other systems for which they were not designed. Circuit damage and/or data loss may occur.

Figure 1-21: Expansion Box—Front



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Figure 1-22: Expansion Box—Rear (Fixed Disk Drive Cabling Shown)



MLO-1310-87

The TK50 Tape Drive

The TK50 tape drive (Figure 1-23) holds one removable *magnetic tape* cartridge. The tape cartridge stores up to 94.5 megabytes of data. Use the tape cartridge as an *input device* to load software or data or as an *output device* to make copies (or backups) of software or data.

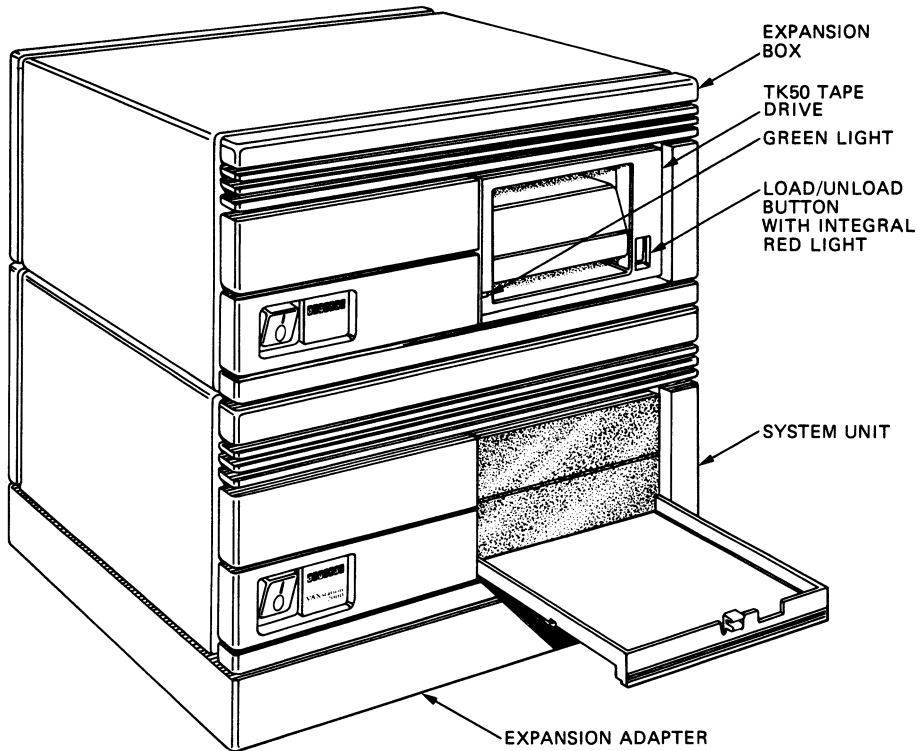
The tape drive has two primary controls: the cartridge release handle and the load/unload button. The cartridge release handle allows cartridges to be inserted and removed and locked into position. The load/unload button controls winding and rewinding of tape. The In position is for loading tape cartridges. The Out position is for unloading tape cartridges.

The tape drive also has two indicators:

- A red light that is integral to the load/unload button
- A green light on the left side of the drive
- When the system is powered up, one or both of these lights will be lit.

Caution: Never remove or attempt to remove a tape cartridge when the LEDs are OFF, or flashing.

Figure 1-23: Expansion Box with TK50 Tape Drive



MLO-000029

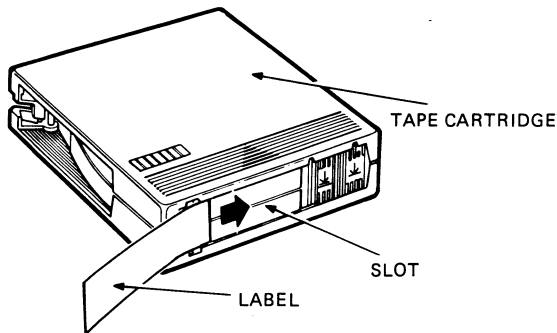
Those controls and indicators are described in Table 1-3.

Refer to the *TK50 User's Guide* for more information on the operation of the TK50.

Labeling a Tape Cartridge

Always label cartridges. A slot for the label is provided on the front of the cartridge (Figure 1-24). This label is visible when the cartridge is in the drive. Labels or markings on any other part of the cartridge can interfere with proper operation of the drive. Do not write directly on the cartridge with pen or pencil.

Figure 1-24: Labeling



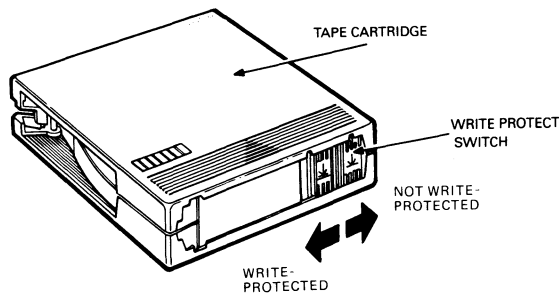
MLO-000030

Write Protecting a Tape Cartridge

Write protecting a tape cartridge prevents accidental erasure of information. Set the write-protect status with the 2-position switch on the cartridge (Figure 1-25). The VAXstation 2000 can read information on the tape regardless of the position of the *write-protect switch*. However, the VAXstation 2000 cannot write data to the tape when it is write protected.

When you use a cartridge to install software on the VAXstation 2000, make sure the write-protect switch on the front of the cartridge is set to write protect. The switch has two icons indicating the write-protect status. An orange rectangle is visible when the switch is in the write-protect position. If you do not see an orange rectangle, slide the switch toward the label slot.

Figure 1-25: Write Protecting a Tape Cartridge



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Note: Early versions of the cartridges do not have the orange rectangle. Use the icons as guides.

When you use a cartridge to make a *backup copy* or to write out data, make sure the write-protect switch is set to enable writing to the tape. To enable writing, slide the switch away from the label slot until the switch locks in place.

Handling and Storing Tape Cartridges

- Do not touch the exposed surface of the tape.
- Do not throw or drop the tape cartridge. The impact can damage the cartridge.
- Allow new tapes to stabilize at room temperature for 24 hours before using them.
- Write on the identification label before putting the label on the tape cartridge. Place the label only in the label slot on the front of the tape cartridge.
- Store tape cartridges away from dust.
- Keep tape cartridges away from direct sunlight, heaters, and other heat sources. Store tape cartridges in an even temperature between 50 and 104°F (10 to 40°C). Store cartridges where the relative humidity is between 20 and 80%.
- Keep tape cartridges away from magnets and equipment that generates magnetic fields, such as motors, transformers, and video monitors and terminals.
- Keep tapes away from x-ray equipment.

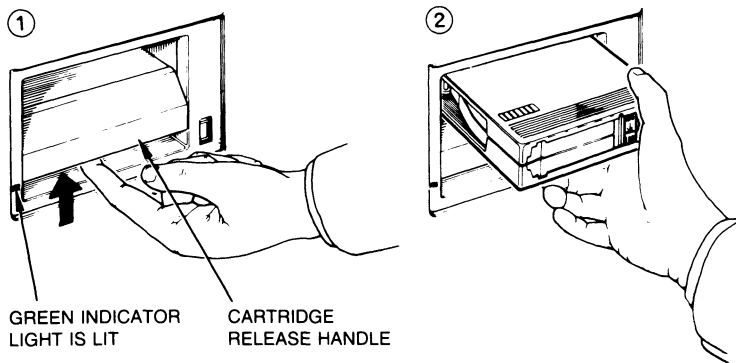
Inserting a Tape Cartridge

Make sure the load/unload button is in the Out (unload) position.

The load/unload button glows red for approximately 4 seconds during the tape drive automatic power-up test.

The red light goes off and the green light goes on, indicating that it is safe to move the cartridge release handle.

Figure 1-26: Lifting Release Handle and Inserting a Cartridge



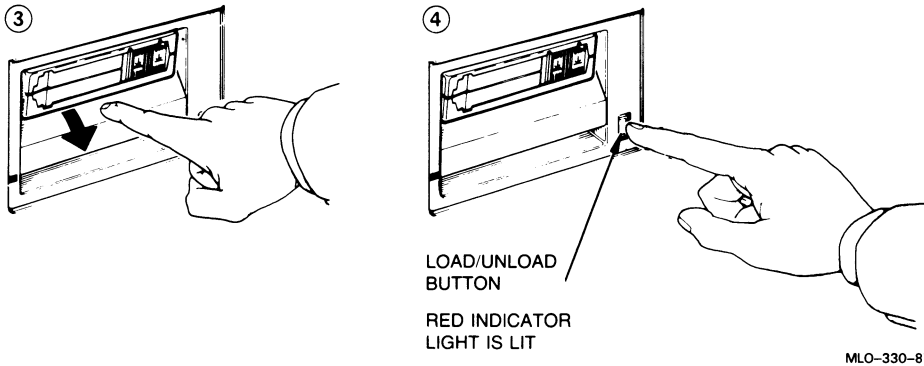
MLO-329-87

1. Pull up the cartridge release handle.
2. With the arrow on the cartridge facing up and pointing toward the drive, insert the cartridge into the TK50 drive.

The red light goes on.

The green light goes off.

Figure 1-27: Pushing Release Handle and Pressing Load/Unload Button



3. Push down the release handle.

The red light goes off.

The green light goes on.

4. Push the load/unload button to the In (load) position.

The red light goes on.

The green light goes off.

The tape loads in 10-15 seconds. During loading, the two leaders couple and tape winds onto the take-up reel inside the tape drive.

The red light remains on.

When the green light also goes on, the tape is ready to use. Refer to your software documentation for further instructions.

Note: If a cartridge is new, the tape drive performs a calibration sequence that takes approximately 40 seconds. The green light flashes rapidly and irregularly during calibration.

Caution: Do not move the cartridge release handle unless the red light is off and the green light is on. Do not move the cartridge release handle while either light is flashing. If the red light flashes rapidly at any time, press the load/unload button four times. If the problem persists, do not attempt to use the tape drive or remove the cartridge. Call your service representative.

Removing a Tape Cartridge

Tape cartridges must be unloaded (rewound and uncoupled) before being removed from the drive. Follow these steps:

Note: Rewinding a tape can also be done under software control. Refer to your software documentation for information.

1. Ensure that the tape drive is not active. The red light should be off and the green light on.
2. Press the load/unload button to the Out (unload) position.

The red and green lights flash slowly as the tape rewinds. This procedure may take up to 90 seconds.

The red light remains on and the green light goes off as the tape unloads into the cartridge.

When the tape is completely unloaded, the red light goes off and the green light goes on.

Caution: Lift the cartridge release handle only if the load/unload button is out, the red light is off, and the green light is on. Otherwise, damage to the tape cartridge and tape drive may result.

3. Pull up the cartridge release handle.
4. Remove the cartridge and store it in its plastic container.
5. Push down the cartridge release handle.

The green light remains on, showing that there is power to the drive and that you can safely move the cartridge release handle.

Caution: Remove the tape cartridge from the tape drive when the cartridge is not in use and before turning off the system. Leaving the cartridge in the drive may result in damage to the cartridge when power is turned off.

Summary of TK50 Controls and Indicators

Table 1-3: TK50 Controls and Indicators

Control	Position	Function
Load/unload button	In	Loads the tape (10-15 seconds).
	Out	Rewinds and unloads the tape.
Cartridge release handle	Up	Lets you insert or remove a tape after rewind and unload operations are completed.
	Down	Locks tape in operating position.

Green light	Red light	Function
Off	Off	No power to the tape drive.
On	Off	Safe to move cartridge release handle. Power is present.
Off	On	Do not move the cartridge release handle. One of the following is in effect: power-up test is occurring, cartridge is inserted but handle is still up, tape is loading or unloading, tape is stopped.
On	On	Tape loaded successfully.
Flashing	On	Tape is in motion (except rewind). Read/write commands are being processed. Irregular fast flashing means tape calibration is occurring.
Flashing slowly	Flashing slowly	Tape is rewinding.
Off	Flashing rapidly	There is a fault. See Chapter 2.

Chapter 2

Troubleshooting

This chapter guides you through a troubleshooting procedure, suggests corrective actions, and explains how to use the *diagnostic* programs in the VAXstation 2000's *read-only memory (ROM)*. For more serious problems, contact your service representative.

Basic Troubleshooting

Use the troubleshooting flowchart to help you pinpoint a problem. The flowchart assumes that your VAXstation 2000 has been installed according to the instructions in the *VAXstation 2000 Hardware Installation Guide*.

If the problem with your VAXstation 2000 remains, call your service representative. Your sales representative will give you service information.

How to Use the Troubleshooting Flowchart

To determine the point at which your VAXstation 2000's problem occurs, follow these steps:

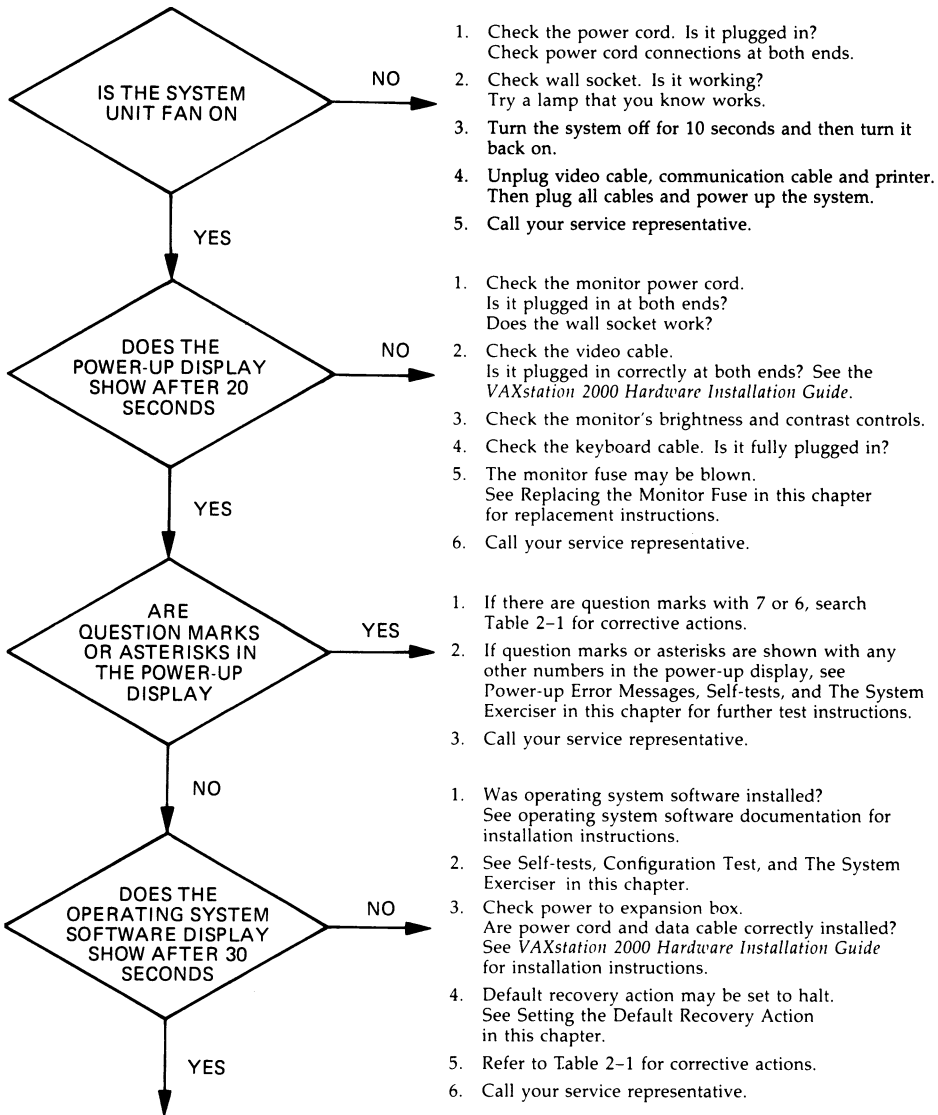
1. Turn off the monitor and all peripherals such as printer and modem.
2. Turn off any expansion boxes.
3. Turn off the VAXstation 2000 system unit.

At this point all components should be off.

1. Turn on the monitor and expansion boxes.
2. Turn on the VAXstation 2000 system unit.

Observe the results. Read the flowchart (Figure 2-1) and follow the suggested actions on the right side of the chart in order. Make notes of the system conditions when failures occur. Also note the results you obtain from tests and procedures.

Figure 2-1: Troubleshooting Flowchart



Troubleshooting Table

Table 2-1 suggests corrective actions for certain system problems. Before you use the table, review the troubleshooting chart on the previous page.

When you have a problem, follow these steps:

1. Note the symptoms of the problem.
2. Check the Symptom column in Table 2-1 for a match.
3. Check the conditions for that symptom in the Possible Cause column. If the column contains more than one possible cause, check the possible causes and their suggested solutions in the order listed.
4. Follow the advice in the Suggested Solution column.

If you perform all the suggested solutions and the problem still exists, call your service representative.

Information on diagnostic test messages follows this table.

Table 2-1: Basic Troubleshooting

Symptom	Possible Cause	Suggested Solution
VR290 and VR260 MONITOR PROBLEMS		
Screen goes blank after the monitor is left inactive.	The CRT-Saver feature is activated.	Press the CTRL key to reactivate the display.
Power indicator on the front of the monitor is lit and keyboard "wait" light flashes.		
Screen display is distorted, rolling, or flickering.	Video cable is incorrectly installed.	Make sure that the cable is installed properly. See the <i>VAXstation 2000 Hardware Installation Guide</i> .
Raster (background light field) does not fill the screen.	Video cable is disconnected or faulty.	Connect or replace the video cable.

Table 2-1 (Cont.): Basic Troubleshooting

Symptom	Possible Cause	Suggested Solution
	System unit is off.	Power up the system unit.
Poor color purity (color monitor only).	Electromagnetic interference exists.	Press the degauss switch for a few seconds. After 30 seconds, recheck color purity. Move electromechanical devices away from the monitor or move the monitor.

VR160 MONITOR PROBLEMS

Power indicator does not turn on when you turn the monitor on.	Power cord is not connected to the power source or the monitor.	Turn the monitor off. Reconnect the power cord to the power source and the monitor. Turn the monitor on.
	No power at wall outlet.	Check the outlet by plugging in a lamp. If the lamp does not work, call the responsible facilities person.
	Monitor is faulty.	Turn the monitor off. Contact Field Service.
Screen is blank but power indicator is on.	The system's cathode-ray tube (CRT) screen saver feature is activated.	Press any key to reactivate the display.
	Brightness and contrast controls are turned down.	Turn brightness and contrast controls up.

Table 2-1 (Cont.): Basic Troubleshooting

Symptom	Possible Cause	Suggested Solution
	Signal cables are not connected to the monitor or the system.	Refer to <i>VAXstation 2000 Hardware Installation Guide</i> for correct procedures to install the cables. Reconnect the signal cables.
	Monitor or system is faulty.	Turn the monitor and system off. Contact Field Service.
Video is displayed but display does not respond to input devices (keyboard, mouse, tablet). An error message may be displayed.	One of the input devices is disconnected.	Turn the monitor and system off. Connect the input device. Turn the monitor and system on.
	One of the input devices has a faulty or loose connection.	Turn the monitor and system off. Disconnect and reconnect the input devices. Turn the monitor and system on.
	System or one of the input devices is faulty.	Turn the monitor and system off. Contact Field Service.
Raster can be displayed by turning up the brightness control, but no video or cursor can be seen even when the contrast control is at maximum.	Signal cables are disconnected on the monitor or the system.	Refer to the <i>VAXstation 2000 Hardware Installation Guide</i> for correct procedures to install the cables. Reconnect the signal cables.
	Monitor or system is faulty	Turn the monitor and system off. Contact Field Service.

Table 2-1 (Cont.): Basic Troubleshooting

Symptom	Possible Cause	Suggested Solution
Screen display is distorted, flickering, or rolling.	Green signal cable has loose connection, or is not connected to the monitor or the system.	Refer to <i>VAXstation 2000 Hardware Installation Guide</i> for correct procedures to install the cables. Reconnect the green signal cable. Monitor or system is faulty. Turn the monitor and system off. Contact Field Service.
Red or blue color is missing.	Red or blue signal cable has loose connection, or is not connected to the monitor or system.	Refer to the <i>VAXstation 2000 Hardware Installation Guide</i> for correct procedures to install the cables. Reconnect the red or blue signal cable.
	System or cable for the missing color is faulty. Verify this problem by swapping the red and blue signal cables on the monitor. If the missing color returns, the system or the cable for the missing color is faulty.	Turn the monitor and system off. Contact Field Service.
	Monitor is faulty. Verify this problem by performing the same procedure described in the previous step. If the missing color does not return, the monitor is faulty.	Turn the monitor off. Contact Field Service.
Screen displays foreign colors (bad purity).	Monitor has been swiveled.	Press degauss switch for 5 seconds.

Caution: Before moving the monitor, turn the monitor off and wait 20 seconds to allow static electricity on the CRT to dissipate.

Table 2-1 (Cont.): Basic Troubleshooting

Symptom	Possible Cause	Suggested Solution
	Electromagnetic interference exists. In most cases, if purity problems cannot be corrected by pressing the de-gauss switch for 5 seconds, then electromagnetic interference exists.	Move any electromechanical device, such as an electric pencil sharpener, away from the monitor or move the monitor.
	Monitor is faulty.	Turn the monitor off. Contact Field Service.
VR150 MONITOR PROBLEMS		
Power indicator does not turn on when you turn the monitor on.	Power cord is not connected to the power source or the monitor.	Turn the monitor off. Reconnect the power cord to the power source and the monitor. Turn the monitor on.
	No power at wall outlet.	Check the outlet by plugging in a lamp. If the lamp does not work, call the responsible facilities person.
	Monitor is faulty.	Turn the monitor off. Contact Field Service.
Screen is blank, but power indicator is on.	System's cathode-ray tube (CRT) saver feature is activated.	Press any key to reactivate display.
	Brightness and contrast controls are turned down.	Turn brightness and contrast controls up.
	Video cable assembly is loose or installed incorrectly on the monitor or system.	Refer to the <i>VAXstation 2000 Hardware Installation Guide</i> for correct procedures to install the video cable assembly. Reconnect the cable.

Table 2-1 (Cont.): Basic Troubleshooting

Symptom	Possible Cause	Suggested Solution
	Monitor or system is faulty.	Turn the monitor off. Contact Field Service.
Video is displayed but screen display does not respond to input devices (keyboard, mouse, tablet). An error message may be displayed.	One of the input devices is disconnected.	Turn the monitor and system off. Reconnect the input device. Turn the monitor and system on.
	One of the input devices has a faulty or loose connection.	Turn the monitor and system off. Disconnect and reconnect the input devices. Turn the monitor and system on.
Raster is present, but no cursor or video appears.	System or one of the input devices is faulty.	Turn the monitor off. Contact Field Service.
	Video cable assembly is disconnected from either the monitor or system.	Refer to the <i>VAXstation 2000 Hardware Installation Guide</i> for correct procedures to install the video cable assembly. Reconnect the cable.
	Monitor or system is faulty.	Turn the monitor and system off. Contact Field Service.
Caution: Before moving the monitor, turn the monitor off and wait 20 seconds to allow static electricity on the CRT to dissipate.		
Screen display is rotated (Display appears to be tilted to the left or right).	Electromagnetic interference exists. To test for electromagnetic interference, slowly swivel the monitor. If the degree of rotation changes significantly, the rotation is caused by electromagnetic interference.	Move any electromechanical device, such as an electric pencil sharpener, away from monitor or move monitor.

Table 2-1 (Cont.): Basic Troubleshooting

Symptom	Possible Cause	Suggested Solution
	Monitor is faulty. Slowly swivel the monitor. If the degree of rotation does not change significantly, the monitor is faulty.	Turn the monitor off. Contact Field Service.
Screen display is distorted, flickering, or rolling.	Monitor is faulty.	Turn the monitor off. Contact Field Service.
MOUSE PROBLEMS		
Mouse does not track properly.	The tracking ball is dirty.	Clean the tracking ball. See the Mouse Maintenance section.
<i>Pointing device</i> (mouse or optional <i>tablet</i>) pointer does not appear on the monitor screen, or the monitor does not respond to the pointing device commands.	Cable is installed incorrectly.	Unplug and then re-plug the cable to reset the device. See the <i>VAXstation 2000 Hardware Installation Guide</i> .
	The VAXstation 2000 is in console mode, therefore, no pointer appears on the screen.	
	The pointer may be off screen under certain conditions governed by workstation software. Check your software documentation.	

Table 2-1 (Cont.): Basic Troubleshooting

Symptom	Possible Cause	Suggested Solution
DISK AND DISKETTE PROBLEMS		
Software does not boot from fixed disk drive.	A problem exists with the fixed disk.	See The Fixed Disk Verifier in this chapter to <i>run</i> the fixed disk verifier. See Self-tests, Configuration Display, and The System Exerciser for instructions on those tests.
	Default <i>boot device</i> is set incorrectly.	See Changing the Default Boot Device in this chapter to set the default boot device.
	Recovery action may be set to halt. See Setting Recovery Action.	
Software does not boot from diskette drive. or Diskette read or write error message is displayed.	A problem exists with the software (if installed) on the fixed disk.	Refer to your software documentation for help.
	No diskette is in the diskette drive.	Insert a diskette with bootable software. Use instructions in software documentation.
	Diskette was inserted incorrectly.	Check that the write-protect notch on the diskette is to your left when you insert the diskette and that the label is up.
	Diskette is damaged or does not contain bootable software.	Try another diskette that contains bootable software.

Table 2-1 (Cont.): Basic Troubleshooting

Symptom	Possible Cause	Suggested Solution
TAPE DRIVE PROBLEMS		
TK50 tape drive red light flashes rapidly.	The drive mechanism is faulty.	Press and release the load/unload button four times to clear the fault. If the condition persists, do not attempt to remove the tape cartridge or use the tape drive. Call your service representative.
TK50 passes power-up test but does not operate.	No cartridge in drive or the cartridge is not loaded.	Insert the cartridge and press the load/unload button.
Cartridge release handle does not lift.	Power-up display is still in progress.	Wait for red light to go out and try again. If the problem persists, do not use the drive. Call for service.
Cartridge release handle does not lock.	Cartridge is not inserted properly.	Reinsert the cartridge. If the problem persists, call for service.
Tape does not load.	The load/unload button is in unload position.	Put load/unload button in load position. Wait for light to go out before removing tape.

Power-up Error Messages

Note: If your monitor does not display any information on the screen after the power-up test sequence (approximately 1 second), you may have a monitor, video or system board failure. Check the monitor LED, then check the LEDs on your keyboard for secondary power-up error messages. If any of the LEDs on the keyboard are lit, call your service representative.

The VAXstation 2000 displays important information during its power-up test sequence, as described in Chapter 1. If the sequence displayed during power

up contains question marks or asterisks, failures may exist in the system. Use Table 2-2 to identify the faulty device.

An asterisk indicates that a ROM has been found for the option, but no test code exists.

If	Then there is a
The Hold Screen keyboard LED is lit	System failure
The Lock keyboard LED is lit	Video board failure
The Compose keyboard LED is lit	Communication option failure

A single question mark indicates status information. An example of this is:

```
? E 0040 0000.0005
```

Some common power-up status messages are:

1. Clock not set

```
? E 0040 0000.0005
```

This message indicates that the system clock has not been set. Setting the clock is part of the operating system software installation; see your operating system software documentation for instructions.

2. Low battery

```
? D 0050 0000.0005
```

This message indicates that the system battery's charge is low or completely discharged. Run the system for about 17 hours to fully recharge the battery.

3. Monochrome monitor with 4- or 8-plane *graphics coprocessor*

```
? 4 00D0 0009.0213
```

This message indicates that a monochrome monitor is connected to a 4- or 8-plane graphics coprocessor.

If you see single question marks on the power-up display, especially next to a 7 or 6 (disk and tape drive controllers), but operation of the VAXstation 2000 seems normal, continue to use the system. If you continue to see errors of this type during the power-up display, use the information in the rest of this chapter to solve the problems. See The System Exerciser and The Fixed Disk Verifier sections. If the system

continues to display error information or fails to operate normally, call your service representative.

A double question mark indicates a "hard" error. This indicates a serious problem that may affect normal operation and use of some component of the VAXstation 2000. An example is:

```
?? 1 00C0 0001.7004
```

4. No Ethernet cable

```
?? 1 00C0 0000.7004
```

This message indicates that the Ethernet option *module* is present in the system, but no cable has been installed on the connector on the rear of the system unit. To install this cable, see the *Workstations and MicroVAX 2000 Network Guide* for instructions. If you still get the hard error message after installing the cable, call your service representative or network manager.

Table 2-2: Power-up and Self-Test Display Identifiers

Test Identifier	Device
F	Base Video
E	System Clock
D	Nonvolatile Random Access Memory (RAM)
C	Serial Line Controller
B	Memory
A	Memory-management Unit
9	Floating Point Unit
8	Interval Timer
7	Disk Controller
6	Tape Controller
5	Interrupt Controller and Ethernet ID ROM
4	Optional 4-plane or 8-plane Graphics Coprocessor
3	Reserved for later use
2	Reserved for later use
1	Ethernet Network Interconnect Module

Self-tests

The self-test diagnostic programs reside permanently in your VAXstation 2000's ROM, as the other diagnostics do. You can *run* self-tests from the keyboard. Type TEST 50 or T 50 after each self-test to display the status on the device tested.

To test a device in your VAXstation 2000, follow these steps:

1. Use Table 2-2 to find the number or letter that represents the device(s) you want to test.

Note: Read your software documentation for shutdown procedures before halting the system.

2. Put the VAXstation 2000 in console mode by pressing the halt button on the rear of the system. (See Chapter 1 for information on the halt button.)
3. Type **TEST** or just **T**, and a space followed by the appropriate number or letter, then press Return:

```
>>> TEST 7
```

If you want to test a consecutive series of devices, type **TEST** followed by the first and last numbers of the series, then press Return:

```
>>> TEST F 1
```

The system displays the number of each device as it is tested, followed by a series of periods.

If the self-test is successful, no question mark or error message is displayed, and the console prompt appears:

```
7...  
>>>
```

If a device fails the self-test, a failure message is displayed before the console prompt is returned.

```
7?...  
84 FAIL  
>>>
```

If a self-test results in a failure, run the configuration display.

Configuration Display

Note: Read your software documentation for shutdown procedures before halting the system.

1. Put the VAXstation 2000 in console mode by pressing the halt button on the rear of the system. (See Chapter 1 for information on the halt button.)
2. Type **TEST 50** at the console prompt (>>>), then press Return. This procedure displays the system configuration and status information, which will be similar to the one shown in Figure 2-2. The mnemonics for each device in the configuration are listed in Table 2-3. Error information in this display is valuable to your service representative. Record this information before calling for service.

Figure 2-2: Sample System Configuration

```
>>> TEST 50

KA410-B V2.1
ID 08-00-2B-02-CF-A4

MONO      0000.0001
CLK       0000.0001
NVR       0000.0001
DZ        0000.0001
00000001 00000001 00000001 00000001 00000001 000012A0
MEM       000E.0001 <----- 12MB memory option installed.
00E00000 <----- E represents total memory of 14MB.
MM        0000.0001
FP        0000.0001
IT        0000.0001
HDC       1710.0001
^         ~~~~
|         |||----- Controller
|         |||----- DUA0
|         ||
Device    ||----- DUA1
Controller |
           |----- DUA2
```

See Table 2-4 for more information.

Figure 2-2 Cont'd. on next page

Figure 2-2 (Cont.): Sample System Configuration

```
000146B8 00000000 00000320
  ^           ^           ^
  |           |           |
  |           |           | ---Tells you what type of media is in DUA2
  |           |           |-----Tells you what type of drive is in DUA1
  |           |           |-----Tells you what type of drive is in DA0
```

See Table 2-5 for more information on determining the device installed in your system.

```
TPC          0000.4001
FFFFFFFF03 FFFFFFF05 FFFFFFF05 FFFFFFF05 FFFFFFF05 FFFFFFF05 FFFFFFF05 FFFFFFF05
SYS          0000.0001
4PLN        0000.0001 V1.0
NI          0000.7004 V1.1
>>>
```

Table 2-3: Definition of Mnemonics

Mnemonics	Device
CLK	System Clock
4PLN	4-plane Graphics Coprocessor
8PLN	8-plane Graphics Coprocessor
DZ	Serial Line Controller
FP	Floating Point
HDC	Disk Controller
IT	Interval Timer
MEM	Memory
MM	Memory Management
MONO	Monochrome Video Circuits on System Module
NI	Network Interconnect Option Module
NVR	Nonvolatile RAM
SYS	Interrupt Controller and Ethernet ID ROM
TPC	Tape Controller

The HDC mnemonic represents the disk controller. The first 3 numbers to the right of HDC are explained in Table 2-4.

Table 2-4: Installed Devices

If Numerical Position Is:	And Number Is:	Then
1st	1	Drive is installed in DUA2 and diskette is formatted.
1st	7	Drive is not installed in DUA2 or formatted diskette is not loaded.
1st	any other number	Call service representative.
2nd	1	Drive is installed in DUA1.
2nd	7	Drive is not installed in DUA1 or powered on.
2nd	5	Not formatted.
2nd	any other number	Call service representative.
3rd	1	Drive is installed in DUA0.
3rd	7	Drive is not installed in DUA0.
3rd	5	Not formatted.
3rd	any other number	Call service representative.

The second line of the HDC line in the screen display tells you what type of device is installed. Look at Table 2-5 to determine the type of device installed in your system.

Table 2-5: Device Numbers

Number	Device	Formatted Capacity	Physical Size
146B8	RD32	40MB	1/2 height
22000	RD53	71MB	full height
4C437	RD54	159MB	full height
960	RX33 media in disk drive	1200KB (2 sided)	1/2 height
320	RX50 media in disk drive	400KB (1 sided)	1/2 height

The second line of the "DZ" line in the screen display tells you information about the keyboard and the pointing device. If the last group of numbers is 000012A0, then the pointing device is present. If the next to the last group of numbers is 00000001, then the keyboard is present.

Run the system exerciser to obtain additional error information.

The System Exerciser

The system exerciser tests the interaction between devices within the system. Use the system exerciser when the VAXstation 2000 has intermittent problems, or when you see errors associated with 7 or 6 in the power-up displays or self-tests. The system exerciser takes up to 11 minutes to complete.

Note: Read your software documentation for shutdown procedures before halting the system.

1. Put the VAXstation 2000 in console mode by pressing the halt button on the rear of the system. (See Chapter 1 for information on the halt button.)
2. Type **TEST 0** at the console prompt (>>>), then press Return.

Different graphics tests display on the screen during the system exerciser. A sample system exerciser display is shown in Figure 2-3 with elements of the display identified. If you get any errors call your service representative for assistance.

Figure 2-3: System Exerciser Sample Display

```

KA410-B V2.1      01      CU

  F 00B0 MONO 0000.0001      1 0 00:00:35.47
  C 0080 DZ  0300.0001      1 0 00:01:12.90
  B 0010 MEM 0000.0001      0 0 00:02:02.06
  7 0090 HDC 1F00.0000      1 0 00:02:23.71
  ?          0701.21E1 <-  1 0 00:02:25.71
  ^ 6 00A0 TPC 8000.0001      | 1 0 00:02:56.60
  | 4 00D0 4PLN 0000.0001    | 1 0 00:03:55.76
  | 1 00C0 NI  0000.0001    | 0 0 00:04:01.82
  | ^          ^          ^          |
  | |          |          |          | error information for individual drives
  | |          |          |          | connected to disk drive controller
  | |          |          |          |
  | |          |          |          | error information for each device
  | |          |          |          |
  | |          |          |          | mnemonic for the device
  | |          |          |          |
  | |          |          |          | device identifier
  |
status indicators

```

Single question marks provide status information and do not interfere with the operation of the system.

Double question marks indicate errors. Note the mnemonic associated with the question mark. Table 2-6 gives the devices that correspond to each mnemonic. Record this information for your service representative.

Table 2-6: Definition of Mnemonics

Mnemonics	Device
MONO	Base Video
CLK	System Clock
4PLN	4-plane Graphics Coprocessor
8PLN	8-plane Graphics Coprocessor
NVR	Nonvolatile RAM
DZ	Serial Line Controller
MEM	Memory
HDC	Disk Controller
MM	Memory Management
FP	Floating Point
IT	Interval Timer
TPC	Tape Controller
NI	Ethernet Network Interconnect Module

Type **BOOT** (or **BOOT** followed by the name of the device that contains operating system software) at the console prompt and press Return to return to normal operation.

The Fixed Disk Verifier

The Fixed Disk Verifier can:

1. determine what kind of drives are installed in the system.
2. determine if a fixed disk has been formatted.
3. determine if there are any faults in the fixed disks.

If you see single question marks for the disk drive controller (mnemonic HDC) during power up or while running the system exerciser, run the fixed disk verifier. This test locates and reports any faults in the fixed disks in the system. Give this information to your service representative.

The verifier takes 5 minutes for an RD32 fixed disk drive, 8 minutes for an RD53, and 20 minutes for an RD54.

Note: The fixed disk verifier does not destroy software or data on the disk.

Note: Read your software documentation for shutdown procedures before halting the system.

1. Put the VAXstation 2000 in console mode by pressing the halt button on the rear of the system unit.
2. Type **TEST 71** at the console prompt (>>>), then press Return.

The following text is displayed:

```
VSmsv_QUE_unitno (0-1)?
```

3. Type **0** to verify a fixed disk drive in the system unit or **1** to verify a fixed disk in the expansion box, then press Return.

The following text is displayed:

```
VSmsv_STS_Siz ..... RDxx [xx represents 32, 53, or 54 depending
                             on the type of fixed disk drive.]
```

```
VSmsv_QUE_RUsure (DUAx 1/0) ? [x represents the number
                                chosen, 0 or 1.]
```

If the disk has not been formatted or a problem occurs with the disk, the following text appears:

```
VSmsv_STS_Siz ..... ??
```

```
VSmsv_RES_Err #2
```

```
84 FAIL
```

```
>>>
```

If you see this text and you want to format your disk, format it according to the instructions in Chapter 1. If the disk is faulty, the formatter program will not be able to complete the formatting procedure. If this happens, call your service representative.

4. Type **1** and press Return if you want to continue. To stop the verifier, type anything other than 1. The verifier stops, an error message is displayed, and the console prompt (>>>) is returned. You may start over with the **TEST 71** command or any other command.

The following sample text is displayed after you type 1:

```
VSmsv_STS_RDing .....OK
VSmsv_STS_OBBcnt = 14
VSmsv_STS_NBBcnt = 0
VSmsv_RES_Succ
>>>
```

This text verifies that the disk is in good operating condition. However, if you see the following text, the fixed disk is faulty and may need repair or replacement.

```
VSmsv_STS_NBBcnt = X [X indicates any number higher than 50]
```

Call your service representative.

5. Type **BOOT** (or **BOOT** followed by the name of the device that contains operating system software) at the console prompt and press Return to return to normal operation.

Setting the Default Recovery

During manufacture, your system is set to automatically start up the operating system software every time you power up or in the event of an operating system software crash. To change this recovery action setting, follow these steps:

Note: Check your software documentation for shutdown procedures before halting your system.

1. Put the VAXstation 2000 in console mode by pressing the halt button on the rear of the system.
2. At the console prompt (>>>) type **TEST 53**, then press Return.

If the system is already set to reboot automatically, the following is displayed:

```
2 ? >>>
```

3. Press Return at the console prompt if you want to retain this setting.

If 3 is displayed instead of 2, your system is set to halt automatically after every power up. If you want to change from automatic halt to automatic reboot, type **2** at the console prompt and press Return. If you want to automatically RESTART should the system go down, type **1** at the console and press Return.

4. If you want your system to halt after every power up, type 3 at the console prompt and press Return.

In this case, your system will display the console prompt after every power-up sequence, and you must type **BOOT** (or **BOOT** followed by the device name of the device containing operating system software) every time you power up.

Changing the Default Boot Device

The default boot device should be set during installation of the VAXstation 2000, when the installer determines where the operating system software resides. The VAXstation 2000 then *boots* from that device at power up, provided the default recovery action is set to **BOOT**. (See Setting the Default Recovery Action for more information.) The operating system software can reside in one of the following places:

- A fixed disk in the system unit
- A fixed disk in the expansion box
- A remote system that you access through the Ethernet

Table 2-7 shows the name of each default boot device.

Table 2-7: Default Boot Device Names

Device and Location	Device Name
Fixed disk in system unit	DUA0
Fixed disk in expansion box	DUA1
Remote system accessed by Ethernet	ESA0
Diskette drive in system unit	DUA2
Tape drive in expansion box	MUA0

Devices DUA2 and MUA0, although valid default boot devices, do not have enough storage capacity to contain most operating system software.

To change the default boot device, follow these steps.

Note: Check your software documentation for shutdown procedures before halting your system.

1. Put the VAXstation 2000 in console mode by pressing the halt button on the rear of the system.
2. At the console prompt (>>>) type **TEST 51**, then press Return.
3. If no boot device has been previously selected, the following is displayed:

```
.... ? >>>
```

Type the default boot device name you want, then press Return.

If a boot device has previously been chosen, that device is displayed as follows (DUA0 is a sample):

```
DUA0 ? >>>
```

To change the default boot device, enter the name of the device you want, followed by Return. If you do not want to change the default device, press Return. To change the default back to no device, type a period (.) at the console prompt. At subsequent power ups, the VAXstation 2000 will attempt to boot each device in the system in turn.

4. Type **BOOT** (or **BOOT** followed by the name of the device that contains operating system software) at the console prompt and press Return to return to normal operation.

Note: If you type in a boot command, the default will not apply.

Setting the Keyboard Language

Note: Check your software documentation for shutdown procedures before halting your system.

1. Put the VAXstation 2000 in console mode by pressing the halt button on the rear of the system.
2. To reset the keyboard language, type **TEST 54** at the console prompt. A list of languages is displayed. Choose the number of the language you want and press Return.
3. Type **BOOT** (or **BOOT** followed by the name of the device that contains operating system software) at the console prompt and press Return to return to normal operation.

Monitor Screen Pattern Tests

Screen pattern tests are useful if you suspect a malfunction in your monitor. Record what you see to report to your service representative.

Note: Check your software documentation for shutdown procedures before halting your system.

Put the VAXstation 2000 in console mode by pressing the halt button on the rear of the system. Then run any of the tests listed. When you have finished, type **BOOT** (or **BOOT** followed by the name of the device that contains operating system software) at the console prompt and press Return to return to normal operation.

Color Monitor

1. Screen of Es Pattern

Type **TEST 81** and press Return.

The monitor displays a full screen of Es. Press Return to stop the display and return the console prompt.

2. White Screen

Type **TEST 82** and press Return.

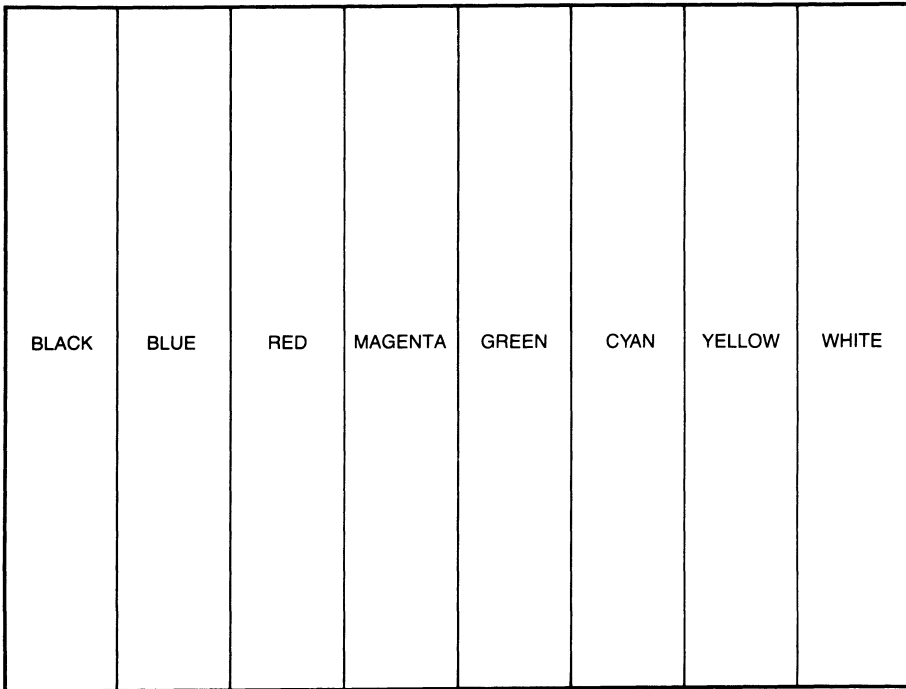
The monitor displays a white screen. Press Return to stop the display and return the console prompt.

3. Eight color bars

Type **TEST 87** and press Return.

The monitor displays the following eight color bars (Figure 2-4).

Figure 2-4: Color Bars



MLO-1312-87

Gray-scale Patterns

If you are using *gray-scale* on your color or monochrome monitor and suspect a malfunction in your monitor, use the following test for gray-scale patterns:

1. Eight gray-scale bars

Type **TEST 88** and press Return.

The monitor displays eight gray-scale bars from black to white.

Monochrome Monitor

1. Screen of Es Pattern

Type **TEST 61** and press Return.

The monitor displays a full screen of Es. Press Return to stop the display and return the console prompt.

2. White Screen

Type **TEST 62** and press Return.

The monitor displays a white screen. Press Return to stop the display and return the console prompt.

Restarting the System After Running Tests

While you are running any of the tests or procedures in this chapter, you are in console mode. To resume normal operation of the VAXstation 2000, you must reenter *program mode*. The two ways to do this are:

1. Type **BOOT** at the console prompt and press Return. The system then searches each device in turn for operating system software.
2. Type **BOOT** followed by a space and the name of the device that contains operating system software and then press Return, as shown in this example:

```
>>> BOOT DUA0
```

This procedure lets the system boot the operating system software immediately, without searching.

See your software documentation for more information.

Summary of TEST Commands

A list of all TEST commands and the tests or utility programs they execute is shown in Table 2-8.

Table 2-8: Summary of TEST Commands

Command	Test or Utility Program
TEST 0	System exerciser
TEST F-1	Self-tests of each device in the system. (See Table 2-2.)
TEST 50	Configuration
TEST 51	Sets default boot device
TEST 52	Sets default boot flags (operating system dependent)
TEST 53	Sets default recovery action
TEST 54	Sets keyboard language
TEST 61	Screen of Es (Monochrome Monitor)
TEST 62	White screen (Monochrome Monitor)
TEST 70	Diskette and fixed disk formatter
TEST 71	Fixed disk verifier
TEST 81	Screen of Es (Color Monitor)
TEST 82	White screen (Color Monitor)
TEST 87	8 color bars (Color Monitor)
TEST 88	8 gray-scale bars (Color or Monochrome Monitor)

Maintenance

Cleaning the Screen of the Monitor

Note: Before cleaning the screen, turn your monitor off and wait 20 seconds to let static electricity dissipate.

Clean the screen with a good quality, nonabrasive and nonflammable glass cleaner.

To clean the color video monitor cover, use a soft cloth dampened with a mild solution of soap and water.

Replacing Monitor Fuses

Use the following procedure after reading the troubleshooting flowchart at the beginning of this chapter. You can replace fuses for the VR290 color monitor, the VR260 monochrome monitor and the VR150 monochrome monitor only.

VR290 Color Monitor

The VR290 color monitor has an automatic voltage-switching mechanism. Therefore, you do not need to change the voltage switch setting.

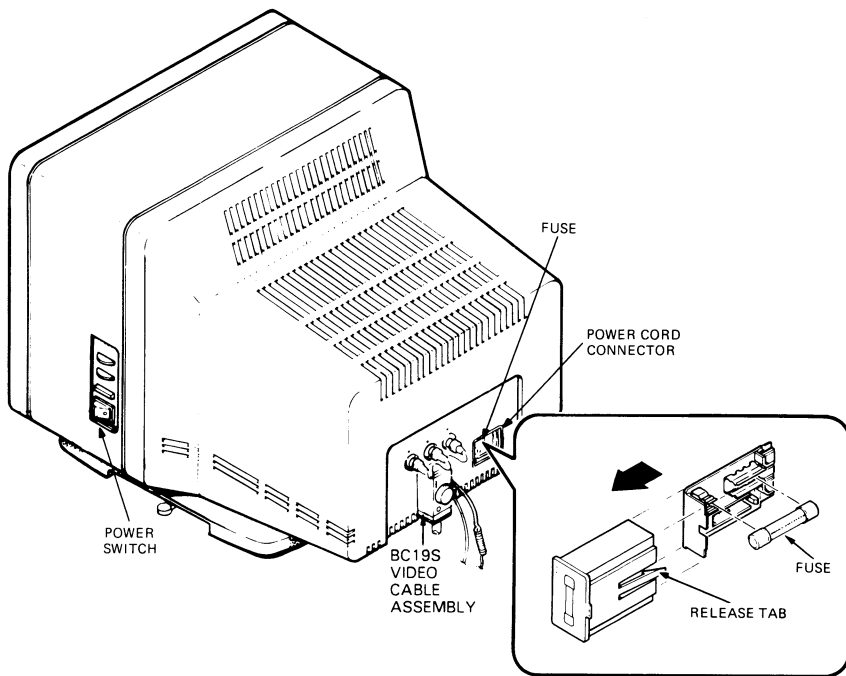
Your monitor contains one of the following fuses:

- 3AG—a 2-amp, 250-volt slow-blow fuse. (DIGITAL part number 12-14676-04).
- IEC—a 2-amp, 250-volt slow-blow fuse. (DIGITAL part number 12-19283-03).

Replace the fuse (Figure 2-5) as follows:

1. Turn off the power and wait 30 seconds to allow voltage to dissipate.
Warning: Wait 30 seconds to eliminate chance of shock.
2. Unplug the power cord from the wall outlet and then from the back of the monitor.
3. Carefully pry out the fuse carrier with the screwdriver.
4. Carefully pry open the release tab, remove the inner fuse holder, and replace the fuse.

Figure 2-5: Replacing Fuse, VR290 Color Monitor



MLO-1313-87

5. Return the fuse carrier to its container in the back of the monitor.
6. Replug the power cord into the monitor and then into the wall outlet.
7. Turn on the power.

VR260 Monochrome Monitor

Check to see whether the voltage switch is set properly. See Chapter 1 in the *VAXstation 2000 Hardware Installation Guide*.

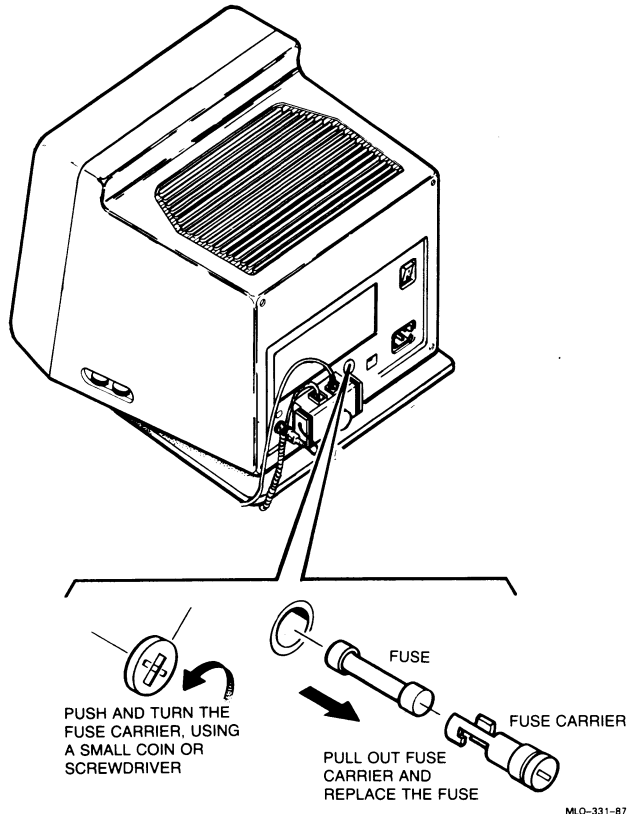
Caution: An incorrect setting of the voltage select switch will damage the monitor.

- If your monitor requires 100–120 volts, use a 1-amp, 250-volt slow-blow fuse.
- If your monitor requires 200–250 volts, use a .5-amp, 250-volt slow-blow fuse.

Replace the fuse (Figure 2-6) as follows:

1. Turn off the power and wait 30 seconds to allow the voltage to dissipate.
Warning: Wait 30 seconds to eliminate chance of shock.
2. Unplug the power cord from the wall outlet and then from the back of the monitor.
3. Remove the video cable assembly.
4. Push and turn the fuse carrier, using a small coin or screwdriver.
5. Carefully pull out the fuse carrier, release the inner fuse holder, and replace the fuse.

Figure 2-6: Replacing Fuse, VR260 Monochrome Monitor



6. Return the fuse carrier to its cavity in the back of the monitor.
7. Replace the video cable assembly.
8. Replug the power cord into the monitor and then into the wall outlet.
9. Turn on the power.

VR150 Monochrome Monitor

The VR150 color monitor has an automatic voltage-switching mechanism. Therefore, you do not need to change the voltage switch setting.

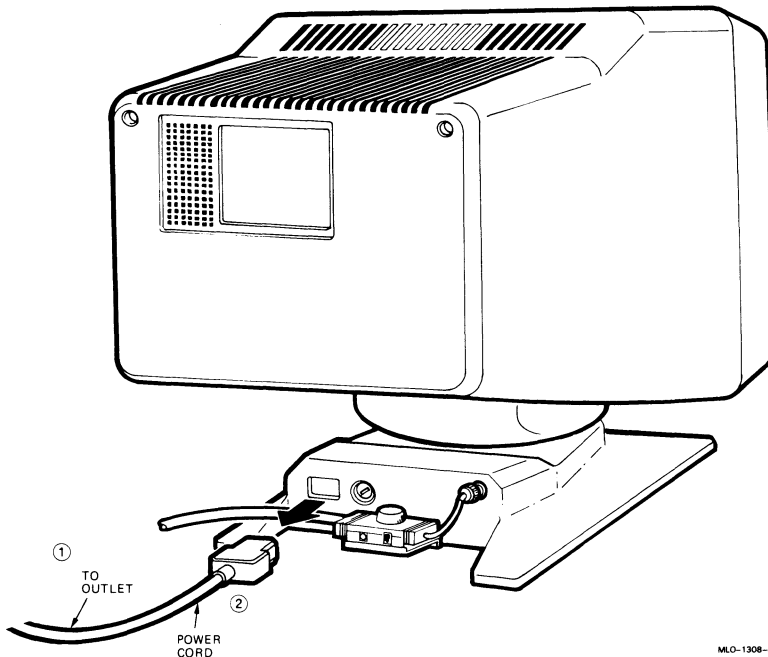
Note: Before replacing the fuse, turn your monitor off and wait 20 seconds. Disconnect the power cord first from the wall outlet, then from the monitor.

Your monitor uses a 4-amp, 250-volt slow-blow fuse (T4-amp, 250-volt slow-blow fuse for the international version).

To replace the fuse:

1. Turn your monitor off and wait 20 seconds; then unplug the power cord (Figure 2-7).

Figure 2-7: Removing Power Cord, VR150 Monochrome Monitor

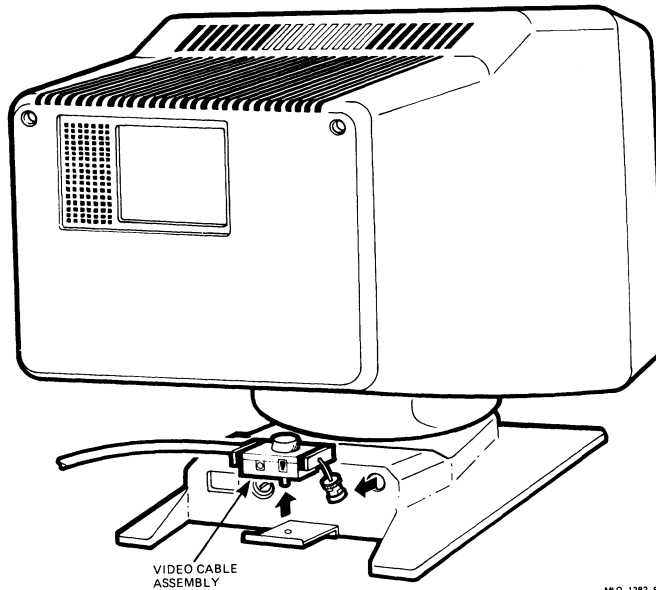


ML0-1308-87

2. Remove the video cable assembly, including the video cable, from the cable mounting plate (Figure 2-8).

Note: Failure to remove the video cable causes strain on the video cable assembly.

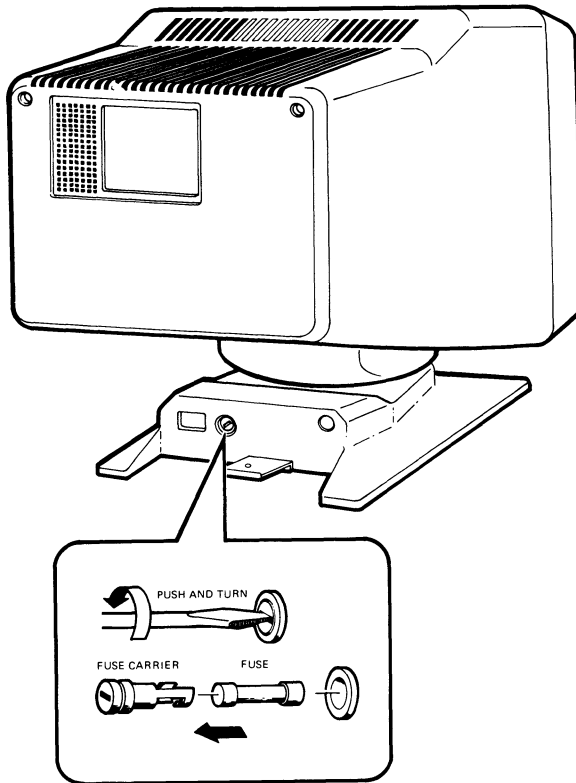
Figure 2-8: Removing Video Cable Assembly, VR150 Monochrome Monitor



MLO-1282-87

3. Push and turn the fuse carrier, using a screwdriver (Figure 2-9).
4. Pull out the fuse carrier and replace the fuse.
5. Replace the video cable assembly. (Refer to *VAXstation 2000 Hardware Installation Guide*.)

Figure 2-9: Replacing Fuse, VR150 Monochrome Monitor



ML0-1305-07

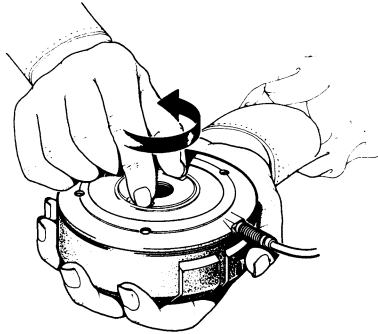
Mouse Maintenance

The rubber-coated ball under the mouse can be removed for cleaning or replacement. Clean the ball when the mouse fails to move the *cursor* smoothly on the screen. In an average office environment, cleaning the ball every 6 months is sufficient.

The following steps detail how to remove and clean the mouse ball:

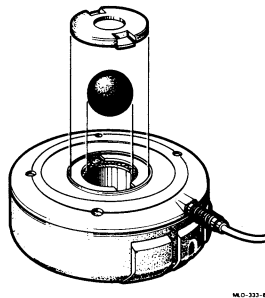
1. Turn the mouse upside down. Remove the ball housing cover plate by placing your fingers in the grooves on the plate and turning the plate counterclockwise (Figure 2-10).

Figure 2-10: Turning the Cover Plate



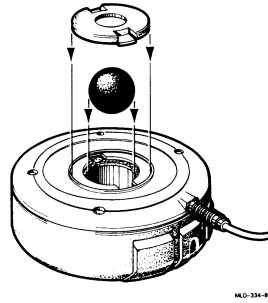
2. Lift off the cover plate and remove the ball (Figure 2-11).

Figure 2-11: Removing the Ball



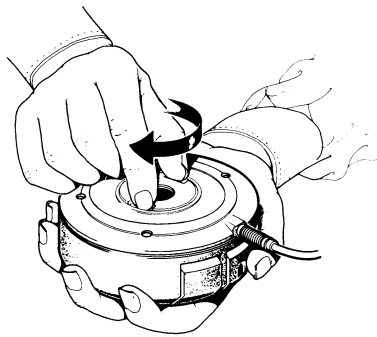
3. To clean the ball, use lukewarm water and, if necessary, a mild soap. However, do not use organic solvents, such as toluene, which will damage the rubber coating.
4. Dry the ball with a soft, lint-free cloth.
5. Replace the ball and the cover plate (Figure 2-12).

Figure 2-12: Replacing the Ball



6. Lock the cover plate into position by placing your fingers in the grooves on the cover plate and turning it clockwise (Figure 2-13).

Figure 2-13: Replacing Cover Plate



Service Information

If you have followed the corrective actions listed in this chapter and you continue to have problems with your VAXstation 2000, call your service representative.

Your sales representative will give you the name and telephone number of your service representative.

Before you call:

1. Make notes based on the troubleshooting chart at the beginning of Chapter 2. This information helps your service representative know the state of your system when the problem occurred.
2. Write down the serial and model numbers of your system. They are located on the back of the system unit.
3. Be prepared to read information from the screen and to type commands at the keyboard while you talk to your service representative on the telephone.



Chapter 3

Options for the VAXstation 2000

The options supported by the VAXstation 2000 fall into the following categories:

- Hard-copy Output Devices—Printers and plotters
- Communication Devices—Modems and standard Ethernet connector
- Pointing Device—Tablet
- Memory—Memory modules
- Video—Color monitor and 4-plane graphics coprocessor
- Mass Storage Devices—Expansion box, expansion adapter, fixed disk drive, diskette drive, and tape drive

This chapter describes each option. To install the printers, modems, tablet, and expansion box (containing the fixed disk drive or tape drive), see the *VAXstation 2000 Hardware Installation Guide*. To install standard Ethernet, see the *Workstations and MicroVAX 2000 Network Guide*. Contact your service representative if you do not wish to install an option yourself. You must contact your service representative to install the expansion adapter, *memory modules*, diskette drive, or fixed disk drive into the system unit.

Documentation for each option is listed in Appendix B.

To order an option or cables after initial installation of your system, contact your sales representative.

Hard-copy Output Devices

The VAXstation 2000 can be used with the following hard-copy output devices: the LN03, LN03 PLUS, LN03R ScriptPrinter, and LPS40 laser printers, the LA210, LA100, LA75, and LA50 dot matrix printers, LCG01 color printer, and the LVP16 color *plotter*. For installation information, see the *VAXstation 2000 Hardware Installation Guide*.

The LN03

The LN03 laser printer is a desktop, nonimpact printer that produces letter-quality text at 8 pages/minute. For systems running MicroVMS or VMS, the printer can also display graphics.

The LN03 offers 16 fonts, including Courier, Elite, and the VT100 Line-Drawing Set (the DIGITAL standard set). ASCII multinational technical character sets and 12 national language character sets can also be used.

The printer comes with three character sets. The LN03 can print up to 24 fonts on a page. To expand memory or add additional fonts, you can purchase more programmable RAM or precoded ROM cartridges from DIGITAL.

The LN03 uses only cut sheet paper. A paper cassette holds 250 sheets of paper. The printer automatically collates output for you in its face-down output tray. The LN03 can also handle preprinted single-part forms, transparencies, and labels. The LN03 can print in either landscape (horizontal) or portrait (vertical) mode.

The LN03 weighs 28 kg (66 lb).

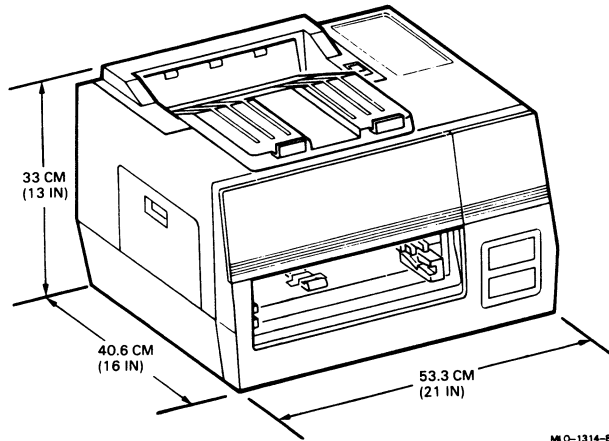
To order an LN03 printer after the initial system installation, contact your sales representative. You can install the LN03 printer yourself. After assembling the printer, see the *VAXstation 2000 Hardware Installation Guide*.

The LN03 PLUS

The LN03 PLUS is the upgrade configuration of the LN03 laser printer. The LN03 PLUS system consists of a base LN03 laser printer and an LN03S *bitmap* option module. The LN03 PLUS requires the firmware microcode V4.4 to be installed in the base LN03 printer.

The LN03 PLUS enhances the ability of the LN03 printer to print documents composed of text and graphics. The LN03 PLUS lets you process ANSI and Tektronix data files with any ratio of text to graphics and with no limits on image complexity.

Figure 3-1: The LN03



The LN03S bitmap option module consists of a *printed circuit board* that is inserted into the available option slot of the LN03 printer. This option module's key feature is an on-board memory capacity of one *Mbyte* of dynamic RAM used for bitmap storage. The LN03S option module also contains up to 128 Kbytes of ROM for program and font storage.

The printer and *host system* communicate through the standard RS232-C serial *interface*.

All setup features in the LN03 PLUS are the same as in the base LN03 and are controlled through the default setting of configuration switches or under program control.

To order an LN03 PLUS printer or an LN03S option module for installation into an existing LN03 printer, contact your sales representative. You can install the LN03 PLUS printer yourself. After assembling the printer, see the *VAXstation 2000 Hardware Installation Guide*.

The LN03R SCRIPTPRINTER

The LN03R SCRIPTPRINTER is a nonimpact page printer that uses laser recording technology to produce high-quality prints. Using the POSTSCRIPT¹ language, the SCRIPTPRINTER can combine and print complex pages, including text, graphics, and sampled images.

The SCRIPTPRINTER provides 750 dots/centimeter (300 dots/inch), both vertically and horizontally, and prints eight pages per minute.

The printer and host system communicate through the standard EIA-RS232-D serial interface.

To order an LN03R SCRIPTPRINTER after the initial system installation, contact your sales representative. You can install the LN03R SCRIPTPRINTER yourself. After assembling the printer, see the *VAXstation 2000 Hardware Installation Guide*.

The LA210

The LA210 is a *dot matrix* desktop printer that can produce high-speed drafts (240 characters/second) or near letter-quality correspondence (40 characters/second). With the addition of an optional font cartridge, the LA210 can print memo-quality correspondence (80 characters/second). The LA210 also prints *bitmap graphics*.

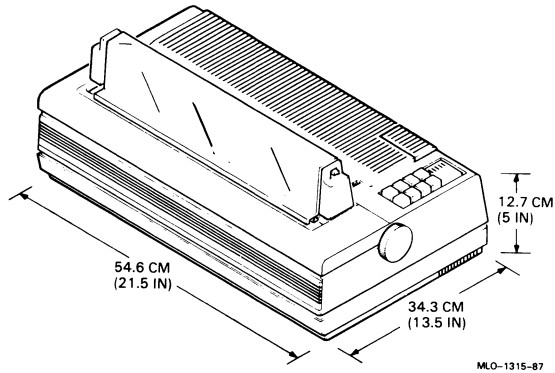
The printer can print in US ASCII, 10 national languages in Courier 10, and the VT100 line-drawing set (the DIGITAL standard set). Other features include three optional typefaces: Gothic, Orator, and Italic. Over 30 optional character sets, including symbols and technical characters, can be added by plug-in font cartridges. You can select up to eight character widths.

The LA210 prints on single-sheet and fanfold paper and handles forms with up to four parts. The printer's carriage accommodates paper ranging in width from 8.9 cm (3.5 in) to 37.8 cm (14.9 in).

The printer weighs 11.3 kg (25 lb).

¹ POSTSCRIPT is a trademark of Adobe Systems Inc.

Figure 3-2: The LA210



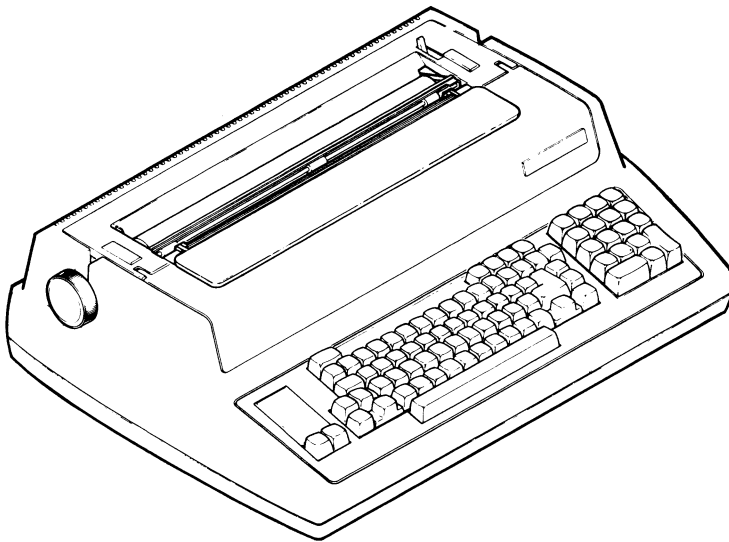
To order an LA210 printer after the initial system installation, contact your sales representative. You can install the LA210 printer yourself. After assembling the printer, see the *VAXstation 2000 Hardware Installation Guide*.

The LA100

The LA100 is a dot matrix desktop printing terminal. The LA100 produces high-speed drafts (240 characters/second) or near letter-quality correspondence (40 characters/second). With the addition of an optional font cartridge, the LA100 can print memo-quality correspondence (80 characters/second). The LA100 produces text, graphics, and line-drawing at a rate of 40 to 132 characters per line.

The LA100 contains a 39 cm (15 in) carriage that accommodates fanfold paper and forms in up to four parts. The LA100 weighs 9.1 kg (20 lb).

Figure 3-3: The LA100



MLO-336-87

To order an LA100 after the initial system installation, contact your sales representative. You can install an LA100 printer yourself. After assembling the printer, see the *VAXstation 2000 Hardware Installation Guide*.

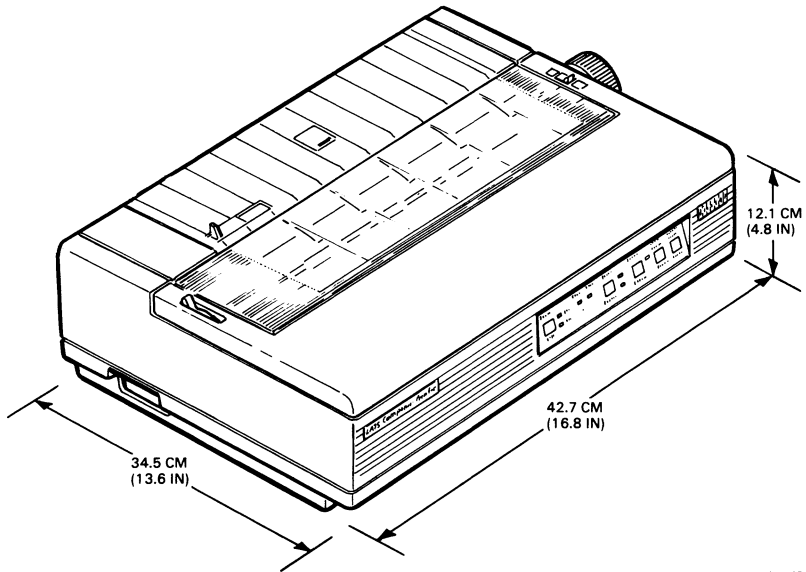
The LA75

The LA75 is a desktop dot matrix printer that can produce sixel-protocol bitmap graphics. The LA75 prints in draft speed (250 characters/second), memo speed (125 characters/second), and letter-quality speed (32 characters/second). The printer offers optional font cartridges and international character sets. You can use office stationery or fanfold paper.

The LA75 is compatible with DIGITAL's LA50 and LA210 printers as well as IBM's PRO printer. The LA75 uses the DEC423 serial interface.

The LA75 weighs 10 kg (22 lb).

Figure 3-4: The LA75



MLO-337-87

To order an LA75 printer after the initial system installation, contact your sales representative. You can install the LA75 printer yourself. After assembling the printer, see the *VAXstation 2000 Hardware Installation Guide*.

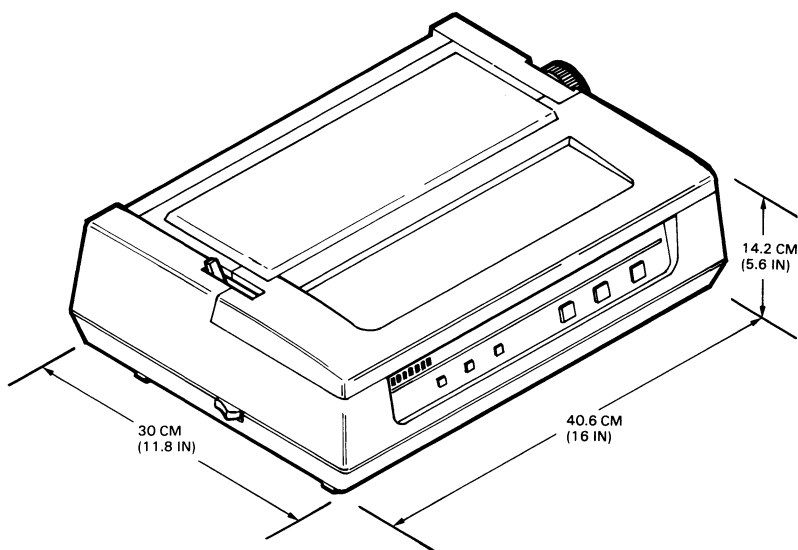
The LA50

The LA50 is a desktop dot matrix printer that can produce bitmap or character cell graphics.

The LA50 prints in draft speed (100 characters/second) and memo speed (50 characters/second). The printer offers one font and six character widths. Ten national character sets are available. You can use office stationery or fanfold paper.

The LA50 weighs 8.5 kg (18.7 lb).

Figure 3-5: The LA50



To order an LA50 after the initial system installation, contact your sales representative. You can install an LA50 printer yourself. After assembling the printer, see the *VAXstation 2000 Hardware Installation Guide*.

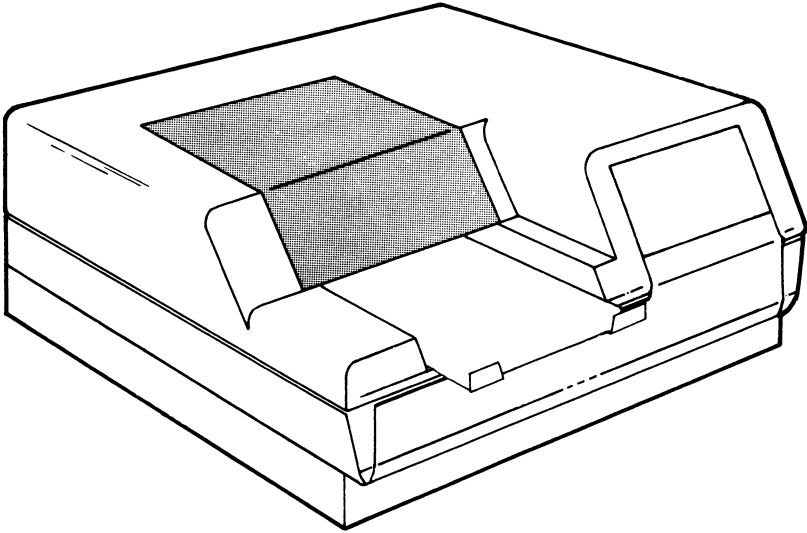
The LCG01

The LCG01 is a high-resolution serial ink-jet color printer. The LCG01 provides 154 dots/inch resolution and it prints in 216 colors.

The printer offers five fonts. One is ROM resident, and the others are *down-line loaded* at system startup. The LCG01's automatic sheet feeder holds paper and transparencies.

The LCG01 color printing system consists of the LCG01 color printer and an LCG01 graphics protocol processor. The LCG01 printer weighs 31.8 kg (70 lb), and the controller weighs 11.7 kg (26 lb). The printer measures 21.6 cm (8.5 in) x 61 cm (24 in) x 61.6 cm (24.25 in).

Figure 3-6: The LCG01



MLO-566-87

To order an LCG01 color printing system after the initial system installation, contact your sales representative. You can install the LCG01 yourself. After assembling the printer, see the *VAXstation 2000 Hardware Installation Guide*.

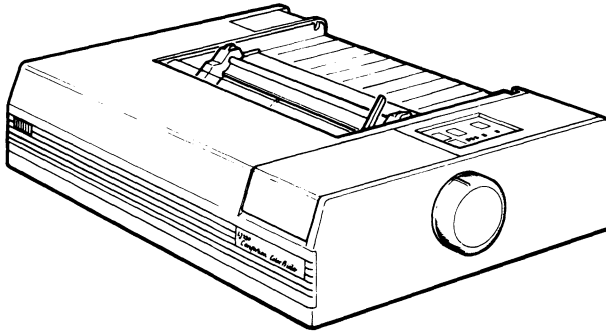
The LJ250/252 Color Printer

The LJ25x desk-top dot matrix color printer is available either in serial (LJ250) or parallel (LJ252) versions. Other than the interface portion (including the connectors and configuration switches) of the logic module, the serial and parallel printers are the same. The printers can print both text and graphics in color, and come with an optional paper tray.

The LJ250/252 provide up to 457 dots/centimeter (180 dots/inch) graphics resolution. Both printers come with two different fonts and print in standard US ASCII, the VT100 Special Graphic set, DEC Supplemental Graphics, DEC Technical Set, National Replacement (NRC), and ISO 8-bit Supplemental sets.

The LJ250/252 weighs 4.5 kg (10 lb).

Figure 3-7: The LJ250/252



MLO-1316-87

To order the LJ250/252 printer after the initial system installation, contact your sales representative. You can install the LJ250/252 yourself. After assembling the printer, see the *VAXstation 2000 Hardware Installation Guide*.

Plotters

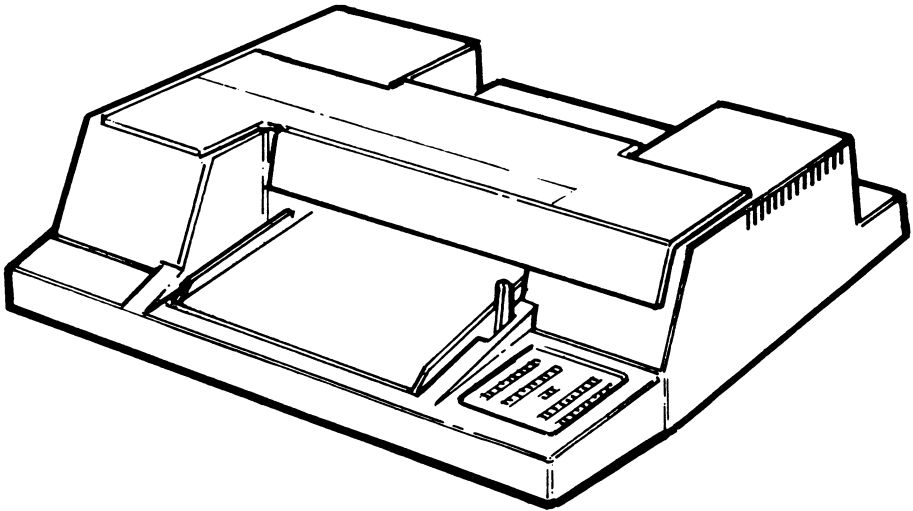
The LVP16

The LVP16 is a high-performance 6-pen color graphics plotter. The LVP16 prints graphics at 15 in/second. Using any of the 19 character sets, the LVP16 can annotate graphs with text in any direction, with or without character slant, and in varying sizes. The LVP16 is accurate to 0.001 inch.

Multicolor high-quality graphics are produced by programs, using the front-panel selection of six pens. For drawing with additional colors, the program can be stopped, and additional pens can be manually installed. The fiber-tip pens are available in two nib sizes along with a selection of ten colors for paper and seven for transparencies.

The LVP16 can be used with plain paper or transparencies. Each page is manually removed and inserted for every plotting. The LVP16 weighs 7 kg (16 lb) and measures 12.7 cm (5 in) x 56.8 cm (22.4 in) x 36.7 cm (14.5 in).

Figure 3-8: The LVP16



MLO-000035

Modems

To order a modem after initial system installation, contact your sales representative. To install a modem, see the *VAXstation 2000 Hardware Installation Guide*. Table 3-1 lists the modems available for use with the VAXstation 2000.

Table 3-1: Optional Modems

Modem	Description
DF242 Scholar Plus	300, 1200, and 2400 bps (bits per second) full-duplex synchronous/asynchronous
DF224	300, 1200, and 2400 bps full-duplex synchronous/asynchronous
DF212	300, 600, and 1200 bps full-duplex synchronous/asynchronous
DF124+	1200, to 9600 bps full-duplex synchronous/asynchronous
DF124	1200 and 2400 bps full-duplex synchronous/asynchronous
DF112	300 and 1200 bps full-duplex synchronous/asynchronous

DF242 Scholar Plus

The DF242 Scholar Plus modem provides full-duplex communication at speeds of 300, 1200, and 2400 bps (asynchronous) and 1200 or 2400 bps (synchronous). The DF242 is protected by a modem access security system with password verification. It features speed buffering and the support of two error correction protocols.

DF224

The DF224 modem provides full-duplex communication at speeds of 300, 1200, and 2400 bps (asynchronous) and 1200 and 2400 bps (synchronous). The DF224 allows both rotary pulse and pushbutton dialing over dial-up or leased-line networks.

The DF224 contains an autodialer with memory and provides autoanswer capability in addition to manual operation. A data/talk switch and automatic adaptive equalizer are also provided. The DF224's diagnostics test the modem at each power up.

DF212

The DF212 modem provides full-duplex communication at speeds of 300, 600, and 1200 bps (asynchronous) or 1200 and 600 bps (synchronous). The DF212 is protected by a modem access security system with password verification. It features speed buffering and the support of two error correction protocols.

DF124+

The DF124+ modem operates in either asynchronous or synchronous mode, in full-duplex, with speed buffering from 1200 to 9600 bps without terminal adjustment. The DF124+ also provides a four-level access security system with password validation and two error correction protocols. The autofallback feature keeps you in touch by providing communication, regardless of line conditions, over private (leased) lines or the Public Switch Telephone Network (PSTN).

DF124

The DF124 modem provides full-duplex communication at speeds of 1200 and 2400 bps (asynchronous and synchronous) over dial-up or leased-line networks. The DF124 contains an autodialer with memory, a data/talk switch, and diagnostic self-tests.

DF112

The DF112 modem communicates at 300 and 1200 bps full-duplex (asynchronous and synchronous) over dial-up or leased-line networks. An autodialer with memory and data/talk switch are provided. The DF112 is compatible with rotary dial and pushbutton dialing.

Tablet

The VSXXX-AB tablet system consists of a digitizing tablet, a 4-button *puck*, a 2-button *stylus*, and a 5-foot power/signal cable. The tablet with the puck or stylus may be used as a pointing device instead of the mouse for menu selection, graphics entry, and pointer control.

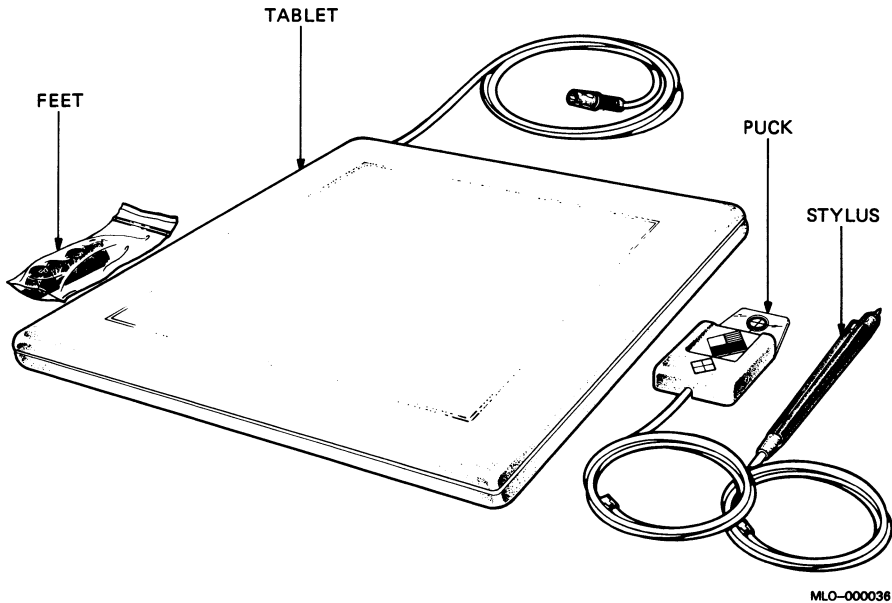
The tablet is an input device that sends X-Y coordinates to the VAXstation 2000 on the tablet's surface. The tablet has a resolution of 20 counts/millimeter (508 counts/inch). The stylus is used like a pen, while the puck is similar to a mouse.

The tablet communicates with the VAXstation 2000 through an asynchronous, full-duplex serial interface at 4800 *baud* ($\pm 2\%$).

The active area of the tablet is 279 mm x 279 mm (11 in x 11 in). The tablet weighs 3.2 kg (7 lb).

To order a tablet after the initial system installation, contact your sales representative. To install the tablet yourself, see the *VAXstation 2000 Hardware Installation Guide*.

Figure 3-9: The Tablet



Memory

The VAXstation 2000 contains two megabytes of memory on its system module. Optional memory expansion modules let you expand to a total of fourteen megabytes of memory. The additional memory expansion modules are shown in Table 3-2:

Table 3–2: Optional Memory Expansion Modules

Module Number	Description†
MS400–BA	4-Megabyte Memory Expansion Module
MS400–CA	12-Megabyte Memory Expansion Module

†Consult your sales representative for the available memory expansion modules.

To order a memory module after the initial system installation, contact your sales representative. Contact your service representative to install a memory module.

Color or Gray-scale Option

To order a color or gray-scale upgrade kit after the initial system installation, contact your sales representative. Contact your service representative to install the 4- or 8-plane graphics coprocessor. You can install the monitor yourself (see the *VAXstation 2000 Hardware Installation Guide*).

The order numbers for the 4- and 8-plane graphics coprocessor are shown in Table 3–3:

Table 3–3: Optional 4- or 8-plane Graphics Coprocessors

Description	Order Number
4-plane Graphics Coprocessor	VS40X-MA
8-plane Graphics Coprocessor	VS40X-PA

The 4-plane Graphics Coprocessor

The VAXstation 2000 4-plane graphics coprocessor provides a 4-plane video subsystem for the VAXstation 2000 system. This raster scan video subsystem provides a resolution of 1024 by 864 pixels and displays up to 16 gray-scales or 16 colors from a palette of 4097.

A bitmap display provides variable character size or positioning and inherent graphics capability. The display provides about 850,000 pixels refreshed on the screen at 60 Hertz, avoiding flicker and smear that is associated with an interlaced display.

The 8-plane Graphics Coprocessor

The VAXstation 2000 8-plane graphics coprocessor provides an 8-plane video subsystem for the VAXstation 2000 system. This raster scan video subsystem provides a resolution of 1024 by 864 pixels and displays up to 256 gray-scales or 256 colors from a palette of 16.7 million. Realistic 3-dimensional shading is possible with 256 colors.

A bitmap display provides variable character size or positioning and inherent graphics capability. The display provides about 850,000 pixels refreshed on the screen at 60 Hertz, avoiding flicker and smear of an interlaced display.

VAXstation 2000 Monitors

The VAXstation 2000 monitor information is shown in Table 3-4. Choose the monitor you want for the voltage in your country.

Table 3-4: Available Monitors

Type	Size	Voltage	Order Number
Monochrome	15 in	120 V	VR150-AA
		240 V	VR150-A3
	19 in	120 V	VR260-AA
		240 V	VR260-A3
Color	15 in	120 V	VR160-DA
		240 V	VR160-D3
		240 V SH	VR160-D4
	19 in	120 V	VR290-DA
		240 V	VR290-D3
		240 V SH	VR290-D4

Mass Storage Devices

Caution: Only devices such as the RD53-Fx or RD54-Fx, which were specifically designed to operate with the VAXstation 2000, may be attached to connector B. Likewise, devices such as the RD53-Fx or RD54-Fx, must not be connected to other systems for which they were not designed. Circuit damage and/or data loss may occur.

Expansion Box and Expansion Adapter

An expansion box allows for the configuration of additional storage devices in your system. The expansion box contains a power supply, fan, and a cavity that can hold an RD53 full-height fixed disk drive, an RD54 full-height fixed disk drive, or a TK50 tape drive.

A VAXstation 2000 system may include a maximum of two expansion boxes: one containing a fixed disk drive and one containing a tape drive.

The expansion adapter is attached to the VAXstation 2000 system box and allows for communication between the expansion box and system box.

For a description of the expansion box and expansion adapter, see Chapter 1 (Operating the VAXstation 2000). To order an expansion box or expansion adapter after initial system installation, contact your sales representative.

Contact your service representative to install the expansion adapter. You may install an expansion box (containing a fixed disk drive or a tape drive) yourself; see the *VAXstation 2000 Hardware Installation Guide*.

Fixed Disk Drives

A fixed disk drive stores information on a nonremovable disk. The fixed disks available for the VAXstation 2000 are the RD5x series which are full-height, and the RD3x series which are half-height. Only one fixed disk drive may be installed in the system unit and only one in the expansion box, for a total of two fixed disk drives in the system.

For a description of the fixed disk drives, see Chapter 1. To order a fixed disk drive after initial system installation, contact your sales representative.

The Diskette Drive

The half-height RX33 diskette drive may be installed in the system unit. It may not be installed in an expansion box. For a description of the half-height RX33 diskette drive, see Chapter 1. The RX33 diskette drive uses RX33K and RX50K diskettes. To order an RX33 diskette drive after initial

system installation, contact your sales representative. Contact your service representative to install this option.

The Tape Drive

The TK50 tape drive is available only in the expansion box. For a description of the TK50 tape drive, see Chapter 1. The TK50 tape drive requires TK50K tape cartridges. To order a TK50 tape drive after initial system installation, contact your sales representative.

Appendix A

System Specifications

Table A-1: System Dimensions

System Unit

Width	33 cm (12.75 in)
Depth	29 cm (11.25 in)
Height	14 cm (5.5 in)
Weight	12.7 kg (28 lb)

**System Unit
with Expansion
Adapter**

Width	33 cm (12.75 in)
Depth	29 cm (11.25 in)
Height	18 cm (7 in)
Weight	13.6 kg (30 lb)

Expansion Box

Width	33 cm (12.75 in)
Depth	29 cm (11.25 in)
Height	14 cm (5.5 in)
Weight	12.7 kg (28 lb)

Table A-2: System Electrical Requirements

Input	115 Vac	230 Vac
Voltage tolerance	88-132 V rms	176-264 V rms
Power source phasing	single	single
Frequency	60 Hz	50 Hz
Line frequency tolerance	47-63 Hz	47-63 Hz
Power consumption (maximum)	160 W	160 W

Table A-3: System Environmental Requirements

	Operating	Nonoperating	Storage
Maximum altitude	2400 m at 36°C	4900 m	2400 m
Temperature range	10°C-40°C	-40°C-66°C	5°C-50°C
Temperature change rate	11°C/hr max	—	—
Maximum wet bulb temperature	28°C	28°C	32°C
Relative humidity	10-90% (noncondensing, no diskette) 20-80% (diskette in use)	95% at 66°C (may condense)	10-95% (noncondensing)
Minimum dew point	2°C	2°C	2°C
Heat dissipation	155 W max	—	—

Table A-4: VR290 Color Monitor Specifications

Dimensions

Height	47 cm (18.5 in)
Width	51.8 cm (20 in)
Depth	54.6 cm (21.5 in)
Weight	36 kg (80 lb)

Picture Tube Size (diagonal) (19 in) 480 mm viewable

Video Format RGB color
Composite video

Display Characteristics 0.31 mm dot pitch with high efficiency antiglare treatment

1024 (horizontal) x 864 (vertical) giving approximate picture size of 326 x 275 mm

Timing

Vertical rate	60 Hz (typical)
Horizontal rate	54 kHz

Video R and B Input Signals 0.7 Vpp/76 ohm

Video G Composite Signal (with Sync) 1.0 Vpp/75 ohm

Power

AC input 88-132 Vac, 50/60 Hz

Power consumption 150 W (nominal)

Fuse 2 A, 250 V slow-blow, U.S.

T2A, 250 V, European

External Controls

Brightness

Contrast

Degauss

On/off

Tile lock

Table A-4 (Cont.): VR290 Color Monitor Specifications

Operating Temperature Range	50°F–104°F (10°C–40°C)
Humidity	10%–95% relative humidity noncondensing

Table A-5: VR260 Monochrome Monitor Specifications**Dimensions**

Height	39 cm (15.4 in)
Width	45.5 cm (17.5 in)
Depth	39.5 cm (15.6 in)
Weight	18 kg (40 lb)
Picture tube size (diagonal)	480 mm (19 in) viewable

Video Format

Composite video
Black negative
60 MHz bandwidth

Display Characteristics

High resolution
Spot size approximately 0.3 mm
Approximately 1024 (horizontal) x 864 (vertical) giving an approximate picture size of 334 mm x 282 mm

Timing

Vertical rate	60 Hz
Horizontal rate	54 kHz

Power

Power supply type	Transistor, switch type ac-dc converter
ac input	Switch-selectable
115 V nominal	Single-phase, 3-wire 88 to 132 V rms,
110/115/120	47 to 63 Hz line frequency
230 V nominal	Single-phase, 3-wire 185 to 264 V rms,
	47 to 63 Hz line frequency

Table A-5 (Cont.): VR260 Monochrome Monitor Specifications

Power consumption	Approximately 65 W
Fuse	100-120 Vac, 1 A 1/4 x 1-1/4 in slow-blow 220-240 Vac, 0.5 A 50 mm x 20 mm slow-blow
Temperature	10°C to 40°C, 50°F to 104°F
Humidity	10% to 90% relative humidity with a maximum wet bulb of 28°C and a minimum dewpoint of 2°C
External Controls	Brightness Contrast Power on-off switch

Table A-6: VR160 Color Monitor Specifications

Dimensions	
Height	39.4 cm (15.5 in)
Width	36.9 cm (14.5 in)
Depth	45.7 cm (18 in)
Weight	23 kg (51 lb)
Shipping weight	Less than 29.5 kg (65 lb)
Tilt Range	-7 to +16 degrees
Swivel Range	± 60 degrees
Display	
Cathode-ray tube (CRT)	383 mm (15 in) diagonal Color phosphor, medium persistence P22 RGB phosphor Color 0.28 pitch shadow mask

Table A-6 (Cont.): VR160 Color Monitor Specifications

	High efficiency antiglare treatment, reflects less than 1% of incident light within the visible spectrum.
Video Input	Composite video Red: 0.7 Vpp/75 ohm Green (with sync): 1 Vpp/75 ohm Blue: 0.7 Vpp/75 ohm
Display Characteristics	1024 pixels horizontal x 864 lines vertical giving approximate picture size of 240 mm x 203 mm Maximum contrast no less than 25 footlambert (fl)
Timing	
Horizontal rate timing	
Frequency	54.054 kHz
Front porch	160 ns
Sync pulse	1850 ns
Back porch	1680 ns
Blanking interval	3.70 μ s (maximum)
Active video time	14.8 μ s
Horizontal period	18.5 μ s
Pixels displayed	1024
Vertical rate timing	
Frequency	60 Hz
Front porch	0 Horizontal lines
Sync pulse	3 Horizontal lines
Blanking interval	37 Horizontal lines
Active video time	16.0 ms
Vertical period	16.67 ms
Lines displayed	864

Table A-6 (Cont.): VR160 Color Monitor Specifications

Video Rate (Bandwidth)

Pixel frequency	70 MHz
Pixel period	14.45 ns (nominal)

Power

Voltage range (switch selectable)	DA model, 88-132 Vac
	D3, D4 models, 185-264 Vac
Frequency	50/60 Hz
Power consumption	125 W/200 VA (nominal)
	150 W/250 VA (maximum)

External Controls and**Indicators**

Brightness
Contrast
Degauss
Power switch
Power indicator

Operating Temperature

10°C to 40°C (50°F-104°F)

Humidity

10% to 95% relative humidity (with maximum wet bulb of 32°C and minimum dew-point of 2°C noncondensing)

Table A-7: VR150 Monochrome Monitor Specifications

Dimensions	
Height	39.4 cm (15.5 in)
Width	36.9 cm (14.5 in)
Depth	40.3 cm (15.9 in)
Weight	16.34 kg (36 lb)
Shipping weight	Less than 19.43 kg (45 lb)
Tilt Range	-5 to +13 degrees
Swivel Range	± 60 degrees
Display	
Cathode-ray tube (CRT)	383 mm (15 in) diagonal flat square Paper white phosphor High efficiency antiglare treatment, reflects less than 1% of incident light within the visible spectrum.
Video Input	75 ohms terminated BNC composite video
Video Composite Signal (with sync)	1.0 Vpp/75 ohm
Display Characteristics	
	1024 pixels horizontal x 864 lines vertical giving approximate picture size of 240 mm x 203 mm Maximum contrast no less than 30 footlambert (fl)
Timing	
Horizontal rate timing	
Frequency	54.054 kHz
Front porch	160 ns
Sync pulse	1850 ns
Back porch	1680 ns
Blanking interval	3.70 μ s (maximum)
Active video time	14.8 μ s

Table A-7 (Cont.): VR150 Monochrome Monitor Specifications

Horizontal period	18.5 μ s
Pixels displayed	1024
Vertical rate timing	
Frequency	60 Hz
Front porch	0 Horizontal lines
Sync pulse	3 Horizontal lines
Blanking interval	37 Horizontal lines
Active video time	16.0 ms
Vertical period	16.67 ms
Lines displayed	864
Video Rate (Bandwidth)	
Pixel frequency	70 MHz
Pixel period	14.45 ns (nominal)
Bandwidth	70 MHz
Power	
AC input voltage	88-132/185-264 Vac
Frequency	50/60 Hz
Power consumption	70 W (nominal)
External Controls and Indicators	
	Brightness
	Contrast
	Power switch
	Power indicator
Operating Temperature	10°C to 40°C (50°F-104°F)
Humidity	10% to 95% relative humidity (with maximum wet bulb of 32°C and minimum dew-point of 2°C noncondensing)

Table A-8: Mouse Specifications

Physical	Measurements
Height	3.8 cm (1.6 in)
Diameter	8.3 cm (3.5 in)
Weight	0.17 kg (0.4 lb)
Power consumption	250 mA at +5 Vdc
Operating temperature	10°C–40°C
Nonoperating temperature	–40°C–66°C
Interface	RS232 voltage level compatible TTL compatible
FCC/EMI	Class B certified
Resolution	200 dots/0.125 mm (1 in)
Baud rate	4600 baud

Table A-9: RD32 Fixed Disk Drive

Physical	Measurements
Storage capacity	41,820 kilobytes
Average seek time	40 ms
Data bit rate	5.0 MHz
Rotation speed	3600 rpm
Cylinders	820
Heads	6
Height	4.3 cm (1.7 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8 in)
Weight	1.31 kg (2.9 lb)

Table A-10: RD53 Fixed Disk Drive

Physical	Measurements
Storage capacity	69,632 kilobytes
Average seek time	30 ms
Data bit rate	5.0 MHz
Rotation speed	3600 rpm
Cylinders	1024
Heads	8
Height	8.25 cm (3.25 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8 in)
Weight	3.18 kg (7 lb)

Table A-11: RD54 Fixed Disk Drive

Physical	Measurements
Storage capacity	155,677 kilobytes
Average seek time	30 ms
Data bit rate	5.0 MHz
Rotation speed	3600 rpm
Cylinders	1221
Heads	15
Height	8.25 cm (3.25 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8.0 in)
Weight	3.18 kg (7.0 lb)

Table A-12: RX33 Diskette Drive

Physical	Measurements
Number of tracks	80
Number of heads	2
Track density	96 tracks/in
Track step rate	3 ms/track
Diskette size	13.13 cm (5.25 in)
Diskettes/diskette drive	1
Data capacity	1200 kilobytes (RX33K) 400 kilobytes (RX50K)
Recording surfaces/diskette	2 (RX33K) 1 (RX50K)
MFM data bit rate	500 kHz (RX33K) 250 kHz (RX50K)
Rotation speed	360 rpm (RX33K) 300 rpm (RX50K)
512-byte sectors per track	15 (RX33K) 10 (RX50K)
Height	4.3 cm (1.7 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8 in)
Weight	1.31 kg (2.9 lb)

Table A-13: TK50 Tape Drive

Physical	Measurements
Mode of operation	Streaming
Read/write method	Serpentine
Recording method	MFM
Recording medium	magnetic tape
Tape width	1.2 cm (0.5 in)
Tape length	185 m (600 ft)
Recording density	6667 bits/in
Number of tracks	22
Capacity	131.0 megabytes (unformatted) 94.5 megabytes (formatted)
Tape speed	75 in/second
Read time	35 min for full tape
Tape start time	300 ms maximum



Appendix B

Associated Documents

Note: For option and system hardware part numbers, consult your sales representative.

Not all the following documents are available in every country. Check with your sales representative for availability.

Table B-1: Documentation

Document	Order Number
HARDWARE DOCUMENTATION	
Microsystems Site Preparation Guide	EK-BA023-SP
VAXstation 2000 Hardware Information Kit	EK-ZNAGG-GZ
VAXstation 2000 Hardware Installation Guide	EK-VAXAC-IN
VAXstation 2000 Owner's Manual	EK-VAXAC-OM
Workstations and MicroVAX 2000 Network Guide	EK-NETAB-UG
VAXstation 2000/MicroVAX 2000 Maintenance Kit	EK-ZNAGX-GZ
VAXstation 2000/MicroVAX 2000 Maintenance Guide	EK-VSTAB-MG
VAXstation 2000/MicroVAX 2000 Technical Manual	EK-VTTAA-TM
Other Standard Hardware Documentation	
VR260 Installation/Owner's Guide	EK-VR260-IN
Mouse Installation Sheet	EK-VSXXA-IN

Table B-1 (Cont.): Documentation

Document	Order Number
Microcomputer Handbook Series	
VAX Achitecture Handbook	EB-19580-20
VAX Software Handbook	EB-21812-20
Microcomputer Interfaces Handbook	EB-20175-20
Microcomputers and Memories Handbook	EB-18451-20
A Technical Summary of Digital's VAXstation Family	EB-29389-51
SOFTWARE DOCUMENTATION	
MicroVMS Software	
MicroVMS, VAXstation 2000/MicroVAX 2000 Software Installation Guide	AA-JR84A-TN
VAXstation 2000/MicroVAX 2000 Operations Guide	AA-JR83A-TN
MicroVMS Workstation Installation Guide	AA-AX11C-TN
MicroVMS Workstation Graphics Programming Guide	AI-GI10B-TN
MicroVMS Workstation Video Device Driver Manual	AA-DY65D-TE
MicroVMS Workstation Video Device Drive Manual Update	AD-DY65D-T1
MicroVMS Workstation User's Guide	AA-EZ24C-TN
MicroVMS Workstation Guide to Printing Graphics	AA-HQ85A-TN
MicroVMS Release Notes	AA-KX25A-TN
MicroVMS Supplemental Information	AA-KX24A-TN
MicroVMS User's Primer	AA-Z210C-TE
MicroVMS User's Pocket Reference	AA-Z211C-TE
MicroVMS FORTRAN Programmer's Primer	AA-Z213A-TE
MicroVMS FORTRAN Programmer's Manual	AA-Z212C-TE
MicroVMS Programming Support Manual	AA-DC87B-TE
MicroVMS Programming Pocket Reference	AA-Z214C-TE

Table B-1 (Cont.): Documentation

Document	Order Number
VMS Software	
VMS Local Area VAXcluster Manual	AA-JP20C-TE
ULTRIX Software	
ULTRIX-32w Basic Installation Guide for the VAXstation 2000	AA-KU45A-TE
ULTRIX-32w Advanced Installation Guide for the VAXstation 2000	AA-KU43A-TE
ULTRIX-32w Documentation Kit Overview	Q4X32-GZ
ULTRIX WS Release Notes	AA-HF07B-TN
ULTRIX-32w Technical Summary	AA-GT87A-TN
ULTRIX-32w Installation and Management Guide	AA-GT88A-TN
Using and Customizing the Window Manager	AA-GT89A-TN
ULTRIX-32w QDSS/VCB02 Driver Reference	AA-GT90B-TN
ULTRIX-32w QDSS Interface Library Programming	AA-GT91B-TN
ULTRIX-32w Xlib Programming Reference	AA-GT92A-TN
ULTRIX-32w GKS/2b Programming	AA-GT93B-TN
ULTRIX-32w Services Reference	AA-GT94B-TN
C Language X Interface	AA-HF10A-TN
The LN03 Printer	
Installing and Using the LN03	EK-0LN03-UG
LN03 Programmer Reference Manual	EK-0LN03-RM
The LN03 PLUS Printer	
LN03 PLUS User Guide	EK-LN03S-UG
LN03 PLUS Programmer Reference Manual	EK-LN03S-RM
LN03S Bitmap Option Installation Guide	EK-LN03S-IG

Table B-1 (Cont.): Documentation

Document	Order Number
The LN03R ScriptPrinter	
LN03R ScriptPrinter Installation Guide	EK-LN03R-UG
LN03R ScriptPrinter Operator Guide	EK-LN03R-OG
The LA210 Printer	
Installing the LA210 Letterprinter	EK-LA210-IN
LA210 Letterprinter User Guide	EK-LA210-UG
LA210 Letterprinter Programmer Reference Manual	EK-LA210-RM
LA210 Letterprinter Operator and Programmer Reference Guide	EK-LA210-RC
LA210 Letterprinter Emulation Modes Reference Guide	EK-LA210-RG
The LA100 Printer	
LA100 Letterwriter User Documentation Kit	EK-LW100-UG
The LA75 Printer	
Installing and Using the LA75 Companion Printer	EK-OLA75-UG
LA75 Companion Printer Programmer Reference Manual	EK-OLA75-RM
LA75 Companion Printer Programmer Reference Card	EK-OLA75-RC
LA75/LA75P Pocket Service Guide	EK-OLA75-PS
LA75/LA75P Technical Manual	EK-OLA75-TM
The LA50 Printer	
Installing and Using the LA50 Printer	EK-OLA50-UG
LA50 Printer Programmer Reference Manual	EK-OLA50-RM

Table B-1 (Cont.): Documentation

Document	Order Number
The LCG01 Installation	
LCG01 and Operator Manual	EK-LCG01-IN
LCG01 User's Guide	EK-LCG01-UG
LCG01 Pocket Service Guide	EK-LCG01-PS
The LJ250/252 Printer	
Installing and Using the LJ250/252 Companion Color Printer	EK-LJ250-DK
The LVP16	
LVP16 Graphics Plotter Owner's Manual	EK-LVP16-OM
LVP16 Graphics Plotter Programmer Reference Manual	EK-LVP16-RM
The LVP16 Reference Card	
The Tablet	
Tablet Information Sheet	EK-VSXXB-IN
The RX33 Diskette Drive	
The RX33 Diskette Drive Technical Description	EK-RX33T-TM
The RD53 Fixed Disk	
RD53 Fixed Disk Technical Description	EK-RD53A-TD
The RD54 Fixed Disk	
RD54 Disk Drive Technical Description	EK-ORD54-TD

Table B-1 (Cont.): Documentation

Document	Order Number
The TK50 Tape Drive	
TK50 Tape Drive Subsystem Owner's Manual	EK-LEP05-OM
TK50 User's Guide	EK-OTK50-UG
TK50 Technical Manual	EK-OTK50-TM
The VR290 Color Monitor	
VR290 Installation/Owner's Guide	EK-VR290-IN
The VR260 Monochrome Monitor	
VR260 Installation/Owner's Guide	EK-VR260-IN
The VR160 Color Monitor	
VR160 Installation/Owner's Guide	EK-VR160-IN
The VR150 Monochrome Monitor	
VR150 Installation/Owner's Guide	EK-VR150-IN
DECconnect and Standard Ethernet	
DECconnect System General Description	EK-DECSY-GD
DECconnect System Requirements Evaluation Workbook	EK-DECSY-EG
DECconnect System Installation and Verification Guide	EK-DECSY-VG
DECconnect System Stand-alone ThinWire Networks: Planning and Installation Guide	EK-DECSY-TG
DECconnect System Planning and Configuration Guide	EK-DECSY-CG
Remote System Manager Server Documentation Kit	QLB13-GZ
Remote System Manager Client Documentation Kit	QLB14-GZ

Appendix C

Port Pin Out Signal Assignments

Table C-1: Printer Connector (J3)

Pin	Signal	Pin	Signal	Pin	Signal
1	Chassis ground	2	PTR_XDAT	3	PTR_RDATA
4	No connection	5	+12 Vdc	6	No connection
7	Chassis ground	8	Ground	9	FER_ENA

Table C-2: Video Connector (J5)

Pin	Signal	Pin	Signal	Pin	Signal
1	VID_RED	2	Color return	3	Monochrome return
4	Fused +5 Vdc	5	AUX_RDAT	6	Keyboard ground
7	Chassis ground	8	Fused +12 Vdc	9	Monochrome signal
10	VID_GREEN	11	VID_BLUE	12	-12 Vdc
13	AUX_XDAT	14	KBD_RDAT	15	KBD_XDAT

Table C-3: Communication Connector (J10)

Pin	Source	CCITT	EIA	DEC	DESCRIPTION
2	DTE	103	BA	TxD	Transmitted Data
3	Modem	104	BB	RxD	Received Data
4	DTE	105	CA	RTS	Request to send
5	Modem	106	CB	CTS	Ready for sending
6	Modem	107	CC	DSR	Data set ready
7		102	AB	SIG GND	Common signal return
8	Modem	109	CF	CD	Received line signal detect
12	Modem	112	C1	SPQMI	Speed mode indicate
18	DTE	141		LLBK	Local Loopback
20	DTE	108/2	CD	DTR	Data terminal ready
22	Modem	105	CB	RI	Calling indicator
23	DTE	111	CH	DSRS	Data signalling rate select
24	Modem	142		TMI	Test mode indicate

Glossary

application program

A program, such as a financial spreadsheet program, that performs an end-user task.

ASCII

American Standard Code for Information Interchange. A set of 7- or 8-bit binary numbers representing the alphabet, punctuation, numerals, and other special symbols used in text representation and communications protocol.

backup copy

A copy of data stored on your disk. The duplicate copy is stored on either RX33 diskettes or TK50 tape cartridges.

backup process

The process of making copies of the data stored on your disk so that you can recover that data after an accidental loss. You make backup copies on RX33 diskettes, TK50 tape cartridges, or over a network.

baud rate

The speed at which signals are serially transmitted along a communications line. One baud equals one bit/second.

binary

A number system that uses two digits: 0 and 1. They are represented in system circuitry by two voltage levels, and programs are executed in binary form.

bit

A binary digit; the smallest unit of information in a binary system of notation, designated as a 0 or a 1.

bitmap

Memory used to store an array of graphic image data. Each element of the array corresponds to one or more pixels in a video display or one or more dots on a laser printer.

bitmap graphics

The type of graphics supported by the VAXstation 2000. Bitmap graphics are defined by the workstation software and can individually set the shade of gray (or color) of each picture element (pixel) on the screen.

boot

See **bootstrap**.

bootable medium

A fixed disk, diskette, or magnetic tape cartridge containing software (such as an operating system) a bootstrap program can load into the system memory and execute.

boot device

The device that is booted at system startup. (See **bootstrap** and **device**.)

bootstrap (or boot)

To execute the bootstrap loader program, a program that is always resident in the system when the power is on. In the VAXstation 2000, this happens automatically whenever system power is turned on. The bootstrap loader loads the operating system software from a mass storage device and executes it. A bootstrap program.

byte

A group of eight binary digits (bits). A byte is one-quarter of a VAX system word.

central processing unit (CPU)

The part of the system that controls the interpretation and execution of instructions. In the VAXstation 2000, CPU functions are contained on one MicroVAX II CPU chip.

cluster

A group of computers networked together that share disk storage, application programs, and other computer resources.

communications

A cable along which electrical signals are transmitted. Devices or systems that are connected by a communications line can share information and resources.

computer system

A combination of system hardware, software, and external devices that performs operations and tasks.

console mode

The state in which the computer is controlled from the console terminal. The VAXstation 2000 can be put in console mode by pressing the halt button on the rear of the VAXstation 2000 system unit. Console mode is indicated by the console prompt (>>>) on the monitor screen. The other mode the system can operate in is program mode. (See **program mode**.)

controller

A system component, usually a printed circuit board, that regulates the operation of one or more peripheral devices.

CPU

Abbreviation for central processing unit. (See **central processing unit**.)

CRT (cathode ray tube)

A vacuum tube that generates and guides electrons onto a fluorescent screen to produce characters or graphics. This term is often used to refer to a monitor.

cursor

A blinking line or figure on the screen that indicates where the next character the user types will appear.

data

A formal representation of information suitable for communication, interpretation, and processing by humans or computers.

data transmission

The movement of data in the form of electrical signals along a communications line.

debug

To detect, locate, and correct errors (bugs) in hardware or software.

device

The general name for any unit connected to the system that is capable of receiving, storing, or transmitting data. (See **input/output (I/O) device** and **controller**.)

device name

The name by which a device or controller is identified in the system. Use that name to refer to that device when you are communicating with the system.

diagnostics

Programs that detect and identify abnormal system hardware operation. The diagnostics for the VAXstation 2000 is located in read-only memory. (See **read-only memory**.)

disk

A flat circular plate with a coating on which data is magnetically stored in concentric circles (tracks). A fixed disk resides permanently inside a disk drive, while a diskette is removable.

disk drive

A device that holds a disk. The drive contains mechanical components that spin the disk and move the read/write heads that store and read information on the surface of the disk.

diskette

A flexible, "floppy" disk contained in a square jacket. Diskettes can be inserted and removed from diskette drives.

diskette drive

A disk drive that only reads or writes on removable diskettes.

dot matrix

A method of generating characters for printing that uses dots to produce readable characters.

down-line load

To send a copy of a system image or other file over a line to the memory of a target node.

error message

A message displayed by a system to indicate a mistake or malfunction.

Ethernet

A type of local area network based on Carrier Sense Multiple Access with Collision Detection (CSMA/CD).

file

A collection of related information treated by the system as a single unit.

fixed disk

See **disk**.

format

To prepare a diskette to accept data.

formatted data

Data that is structured in a particular pattern to be understood by the system software.

GKS

Graphics Kernel System. GKS acts as one of the graphics interfaces for the VAXstation 2000. GKS is an international standard for graphics applications that run on many different devices and equipment.

graphics coprocessor

A special-purpose CPU, with its own set of commands, data formats, and an instruction counter, that executes a sequence of display instructions to create a drawing on the display device.

gray-scale

Sixteen levels of intensity from black to white available with the 4-plane graphics coprocessor option.

hard-copy terminal

A terminal that displays information on paper. Compare to Video terminal.

hardware

The physical components—mechanical and electrical—that make up a system. Compare to Software.

head

The part of a fixed disk drive, diskette drive, or tape drive that reads, records, and erases data. Also called read/write head.

host system

The primary or controlling computer in a multiple computer network.

icon

A graphic symbol that gives a visual image of a device or a procedure's function. Icons often appear on the system's enclosure to aid the user in locating connectors and controls. On a workstation, a graphic symbol displayed on a monitor or terminal screen, which represents a window or action. A window may be shrunk to an icon.

input/output (I/O) device

A piece of equipment that accepts data for transmission to (input) and from (output) the system. For example, a terminal.

interactive

A method of communicating with the system. In an interactive session, you type a command at the keyboard and the system executes the command and responds with a prompt character for another command.

interface

A device or piece of software that allows the components of the system to communicate with each other.

I/O

Abbreviation for input/output. (See **input/output (I/O) device**.)

K

The symbol that means 2 to the 10th power (or 1024 in decimal notation). Also, an abbreviation for kilo (thousand).

kilobyte

1024 bytes.

LED

Light-emitting diode. LEDs are used as indicators on the system enclosure.

load

To copy software (usually from a peripheral device) to memory. To physically place a disk in a disk drive or a tape in a tape drive.

local area network (LAN)

A data communications system designed for a small geographic area that offers high-speed communications channels optimized for connecting information-processing equipment. For example, ThinWire Ethernet.

M

The symbol for 1024 squared (1,048,576 in decimal notation). Also, an abbreviation for mega (million).

magnetic tape

A tape used for storing data that is made of plastic and coated with magnetic oxide. Also called magtape.

megabyte

1,048,576 bytes.

memory

The area of the system that electrically stores instructions and data, often temporarily.

memory module

A printed circuit board that contains additional memory for the system.

MicroVMS

The VAX/VMS operating system software. This operating system is specifically designed for MicroVAX-based systems.

MicroVMS workstation software

Window management software for a MicroVAX-based system. The system must run MicroVMS as the operating system. Workstation software allows you to control and view several programs on one screen. You specify the window with which to interact by using a pointing device, such as a mouse.

module

A printed circuit board that contains electrical components and electrically conductive pathways between components. A module stores data or memory or controls the functions of a device. (See **printed circuit board**.)

mouse

A relative-positioning input device that is rolled across the desktop to move the pointer or mouse cursor on the monitor screen and is used to select menu options and draw graphics. The mouse is palm sized and contains three buttons (function keys) and a ball bearing.

network

A group of individual computer systems that are connected by communications lines to share information and resources.

node

An individual information-processing unit, such as a computer, workstation, or peripheral device, that is connected to a network.

off-line

Pertaining to equipment, devices, and events that are not controlled by the system, or have been logically disconnected from the system.

on-line

Pertaining to equipment, devices, and events that communicate with the system.

operating system

A collection of system programs that controls the operation of the system and allows the user access to data files, input/output devices, and applications programs. The operating system software performs such tasks as assigning memory to programs and data, processing requests, and scheduling jobs. MicroVMS and ULTRIX are the two operating systems offered for the VAXstation 2000.

output device

A device that accepts data from the system. A printer is an example of an output device.

peripheral device

A device that provides the CPU with additional memory storage or communication capability. Examples are disk and diskette drives, video terminals, and printers.

plotter

A device to construct visual representations of data by an automatic pen or pencil. Plotters can also receive plotting coordinates from digital computers.

pointing device

A terminal input device that allows you to make a selection from a menu or to draw graphics. (See **mouse** and **tablet**.)

port

The name of the socket or connector at the back of the computer to which a terminal, printer, or other communication devices are connected.

power-up sequence (power up)

A series of ordered events that occur when you supply power by turning on the system.

printed circuit board

A piece of fiberglass board used to make modules. (See **module**.)

printer

A peripheral device that provides paper copies of information stored on the system.

program

The sequence of instructions the system uses to perform a task. (See **software**.)

program mode

The state in which the computer is controlled by the operating system. After the operating system is installed, the system will always operate in program mode, unless you put it into console mode. (See **console mode**.)

prompt

Words or characters that the system displays to indicate that it is waiting for you to type a command.

puck

A palm-sized device that slides on the tablet's surface and together function as a pointing device. (See **pointing device** and **tablet**.)

RAM

Abbreviation for random-access memory. (See **random-access memory (RAM)**.)

random-access memory (RAM)

Memory that can be both read and written into and randomly access any one location during normal operations. The type of memory the system uses to store the instructions of programs currently being run.

raster

A linear measurement unit for graphics characters on the video screen.

read-only memory (ROM)

A memory whose contents cannot be modified. The system can use the data contained in a ROM but cannot change it.

remote install

See **down-line load**.

ROM

Abbreviation for read-only memory. (See **read-only memory (ROM)**.)

run

A single continuous execution of a program (noun). To execute a program (verb).

software

Programs executed by the system to perform a chosen or required function. Compare to Hardware.

storage medium

Any device capable of recording information; for example, a diskette.

store

To enter data into a storage device, such as a disk, or into memory.

stylus

A penlike device that draws on the tablet's surface and together function as a pointing device. (See **pointing device** and **tablet**.)

system

A combination of system hardware, software, and peripheral devices that performs specific processing operations.

system image

The image that is read into memory from disk when the system is started up (booted).

system management tasks

Tasks performed by an assigned person to operate and maintain the system. That person is usually the system manager.

tablet

An absolute-positioning input device composed of a flat-surfaced digitizing tablet, a puck, and a stylus. The tablet is a drawing surface. The puck and stylus are pointing devices that move the cursor on the monitor screen, draw graphics, and make selections from the menu.

tape drive

A device that contains mechanical components and holds, turns, reads, and writes on magnetic tape.

T-connector

Connector used to join ThinWire Ethernet cable sections. The connector also has a connector that is attached directly to a station.

terminal

An input/output device that allows you to communicate with the system. Terminals are divided into two categories: video and hard-copy.

terminator

A special connector used on one or both ends of an Ethernet segment that provides the 50-ohm termination resistance needed for the cable.

text cursor

A block or line, usually blinking, displayed on a CRT screen to indicate where the next character typed will appear.

ThinWire

A DIGITAL trademark used to describe its 10base2 (IEEE standard 802.3 compliant) Ethernet products used for local distribution of data.

ThinWire connector

The connector on the rear of the VAXstation 2000 system unit to which the ThinWire Ethernet cable is attached.

32-bit length

The length of the internal data path of the CPU. This length provides more concentrated data, allows more data types, and enables more data to be transferred at one time than a 16-bit internal data path.

ULTRIX-32w

The window management software for a MicroVAX-based system. The system must run ULTRIX-32m as the operating system. Workstation software allows you to control and view several programs on one screen. You specify the window with which to interact by using a pointing device.

user command

An order you give to the system through a keyboard, mouse, or other input device.

user input device

A piece of equipment that is used to transfer data to the system. For example, keyboard, disk, tape, and system are input devices.

video terminal

A terminal that displays information on the screen of a cathode ray tube (CRT). Compare to Hard-copy terminal.

VLSI

Very Large Scale Integration of integrated circuit chips. A large number of chips can fit on a printed circuit board; therefore, fewer boards are needed, and the system can be smaller.

Winchester disk

A hard disk permanently sealed in a drive unit to prevent contaminants from affecting the read/write head. The sealed head/disk assembly (HDA) helps to increase drive reliability and ensure data integrity. (See **fixed disk**.)

window

An area on your monitor screen in which you can start, run, and view a separate process. Windowing is supported by both MicroVMS and ULTRIX workstation software.

word

The largest number of bits (32) that the VAXstation 2000 system can handle in an operation. These systems can also handle longwords (that is, two words or 64 bits).

write-protect

To protect a disk, diskette, or other storage medium from the addition, revision, or deletion of information.

write-protect notch

The small notch on the side of an RX33 or RX50 diskette that you can cover with an adhesive-backed foil label or tab to prevent loss of data by accidental overwriting.

write-protect switch

The switch that you slide down on a TK50 tape cartridge to prevent loss of data by accidental overwriting.

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Warranty and Registration Information for United States Customers Only

(Non-US customers should contact their local DIGITAL Sales office for information about MicroVAX 2000 or VAXstation 2000 warranty.)

To facilitate your hardware and software warranty, you need to register your system with DIGITAL's Customer Support Center by calling: 1-800-DEC-8000.

Instructions

1. Locate your system model number and serial number (from the back of the system box) and record in the spaces provided below.

SYSTEM TYPE _____ SERIAL NUMBER _____

2. Call the Customer Support Center at 1-800-DEC-8000 and register your system. Please be ready to give your Company name, address, telephone number, and the Contact person for this system.



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Provides for the repair and replacement of defective equipment, including parts and labor for the system and tape and disk drives purchased with the system. Support is available up to 9 hours a day, Monday through Friday (8 A.M. to 5 P.M.) by calling 1-800-DEC-8000.

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Access to Digital toll-free helpline (1-800-DEC-8000), 24 hours a day, 7 days a week. Customer Support engineers are available to answer your questions concerning installation and hardware and software. Coverage includes all DIGITAL developed software running on the system.



Right to Use Updates

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Provides an on-line database to research problems and solutions. It also contains notice of any time-critical problems or messages that have been identified by DIGITAL. Upon warranty registration, you will be sent information on how to access and use DIGITAL's Software Information Network.

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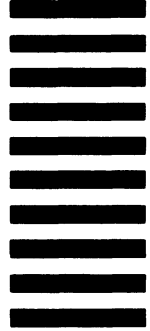
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