OpenVMS VAX Upgrade and Installation Supplement: VAXstation 2000, MicroVAX 2000

Order Number: AA–PS6YA–TE

May 1993

This document supplements the current version of the *Upgrade and Installation Manual* with information specific to the VAXstation 2000 and MicroVAX 2000 computers. This information includes startup, shutdown, and backup procedures.

Revision/Update Information:	This supplement supersedes the *VMS Upgrade and Installation Supplement: VAXstation 2000, MicroVAX 2000*, Version 5.4.
Software Version:	OpenVMS VAX Version 6.0

Digital Equipment Corporation
Maynard, Massachusetts

May 1993

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

ZK4452

This document was prepared using VAX DOCUMENT, Version 2.1.

Contents

Tables

Preface

OpenVMS VAX Upgrade and Installation Supplement: VAXstation 2000, MicroVAX 2000 contains installation and upgrade information specific to VAXstation 2000 and MicroVAX 2000 computers. Use it in conjunction with the *Upgrade and Installation Manual*.

Important

When you are ready to upgrade, install, or update the VMS operating system, use the supplied documentation as follows:

1. Read all release-specific cover letters (if any) included with your distribution kit.
2. Read the most current version of the *VMS Release Notes*.
3. Consult the *Upgrade and Installation Manual* for the VMS version that you are installing or upgrading to. It is your primary source for step-by-step upgrade and installation procedures.
4. Refer to this supplement for computer-specific information when the *Upgrade and Installation Manual* directs you to do so.
5. Store this supplement and the *Upgrade and Installation Manual* in the binder that contains the *VMS Release Notes*.

Intended Audience

OpenVMS VAX Upgrade and Installation Supplement: VAXstation 2000, MicroVAX 2000 is intended for anyone responsible for installing or upgrading the VMS operating system on VAXstation 2000 and MicroVAX 2000 computers.

Document Structure

This manual is organized as follows:

- Chapter 1 describes the system hardware you use during a VMS upgrade or installation.
- Chapter 2 describes some tasks you need to perform when you install the VMS operating system.
- Chapter 3 contains instructions for starting up the system. It also describes shutdown procedures.
- Chapter 4 describes backup procedures you should perform on a regular basis.
- Appendix A describes how to configure manually the devices attached to the system.

- Appendix B contains information about the physical addresses in the VAXstation 2000/MicroVAX 2000 I/O space.
- Appendix C contains information about the VAXstation 2000/MicroVAX 2000 disk driver.
- The Glossary defines key terms used in this manual.

Associated Documents

You must have and be familiar with the contents of the following documents:

- The *Upgrade and Installation Manual*, which is your primary source of upgrade and installation information. Use the *Upgrade and Installation Manual* in conjunction with *OpenVMS VAX Upgrade and Installation Supplement: VAXstation 2000, MicroVAX 2000* when you are performing an installation or an upgrade.
- The *VMS Release Notes*, which provides important information on various aspects of the VMS operating system. You should read the current version of the *VMS Release Notes* before installing, upgrading, or updating the VMS operating system or using your VAX computer.
- The hardware manuals that are supplied with your VAX computer. These manuals provide detailed information on your system hardware.

Conventions

In this manual, every use of VAX VMS means the OpenVMS VAX operating system.

The following conventions are used in this manual:

Ctrl/*x*	A sequence such as Ctrl/*x* indicates that you must hold down the key labeled Ctrl while you press another key or a pointing device button.
PF1 *x*	A sequence such as PF1 *x* indicates that you must first press and release the key labeled PF1, then press and release another key or a pointing device button.
Return	In examples, a key name enclosed in a box indicates that you press a key on the keyboard. (In text, a key name is not enclosed in a box.)
. . .	A horizontal ellipsis in examples indicates one of the following possibilities: • Additional optional arguments in a statement have been omitted. • The preceding item or items can be repeated one or more times. • Additional parameters, values, or other information can be entered.
. . .	A vertical ellipsis indicates the omission of items from a code example or command format; the items are omitted because they are not important to the topic being discussed.

( )	In format descriptions, parentheses indicate that, if you choose more than one option, you must enclose the choices in parentheses.
[ ]	In format descriptions, brackets indicate optional elements. You can choose one, none, or all of the options. (Brackets are not optional, however, in the syntax of a directory name in a VMS file specification, or in the syntax of a substring specification in an assignment statement.)
{ }	In format descriptions, braces surround a required choice of options; you must choose one of the options listed.
boldface text	Boldface text represents the introduction of a new term or the name of an argument, an attribute, or a reason. Boldface text is also used to show user input in online versions of the manual.
italic text	Italic text emphasizes important information, indicates variables, and indicates complete titles of manuals. Italic text also represents information that can vary in system messages (for example, Internal error *number*), command lines (for example, /PRODUCER=*name*), and command parameters in text.
UPPERCASE TEXT	Uppercase text indicates a command, the name of a routine, the name of a file, or the abbreviation for a system privilege.
-	A hyphen in code examples indicates that additional arguments to the request are provided on the line that follows.
numbers	All numbers in text are assumed to be decimal, unless otherwise noted. Nondecimal radixes—binary, octal, or hexadecimal—are explicitly indicated.
mouse	The term *mouse* refers to any pointing device, such as a mouse, a puck, or a stylus.
MB1, MB2, MB3	MB1 indicates the left mouse button, MB2 indicates the middle mouse button, and MB3 indicates the right mouse button. (The buttons can be redefined by the user.)
PB1, PB2, PB3, PB4	PB1, PB2, PB3, and PB4 indicate buttons on the puck.
SB, SB	SB and SB indicate buttons on the stylus.

1

VAXstation 2000/MicroVAX 2000 Hardware

Before you install or upgrade the VMS operating system, you need to be familiar with the following VAXstation 2000/MicroVAX 2000 hardware components:

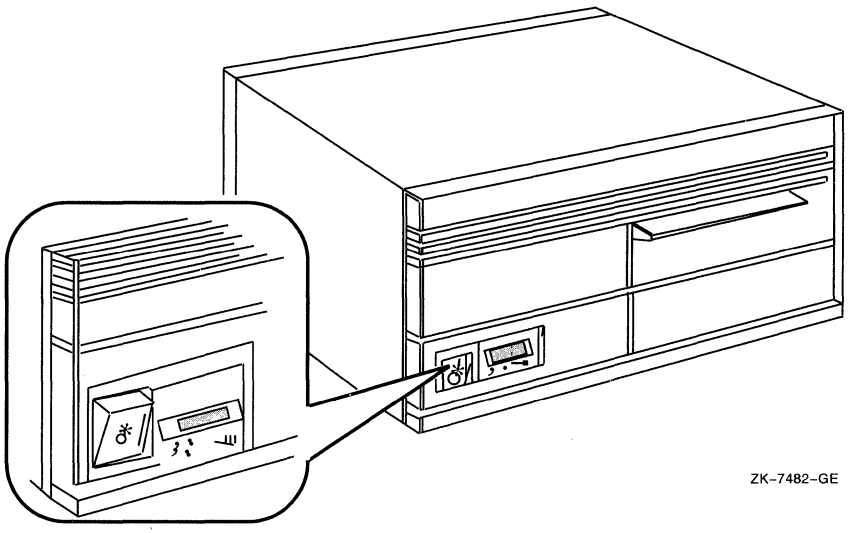
- ON/OFF switch
- HALT button
- Console terminal
- Optional expansion boxes
- Diskette drive
- Tape cartridge drive
- Fixed disk

This chapter describes the system hardware that you use during a VMS installation or upgrade. For a complete description of your system, see the hardware manuals supplied with your VAX computer.

1.1 The ON/OFF Switch

The ON/OFF switch, shown in Figure 1–1, is located on the front panel of the system box and any expansion boxes your system might have. Setting the switch to 1 turns the power on. Setting the switch to 0 turns the power off.

Figure 1–1 VAXstation 2000 ON/OFF Switch



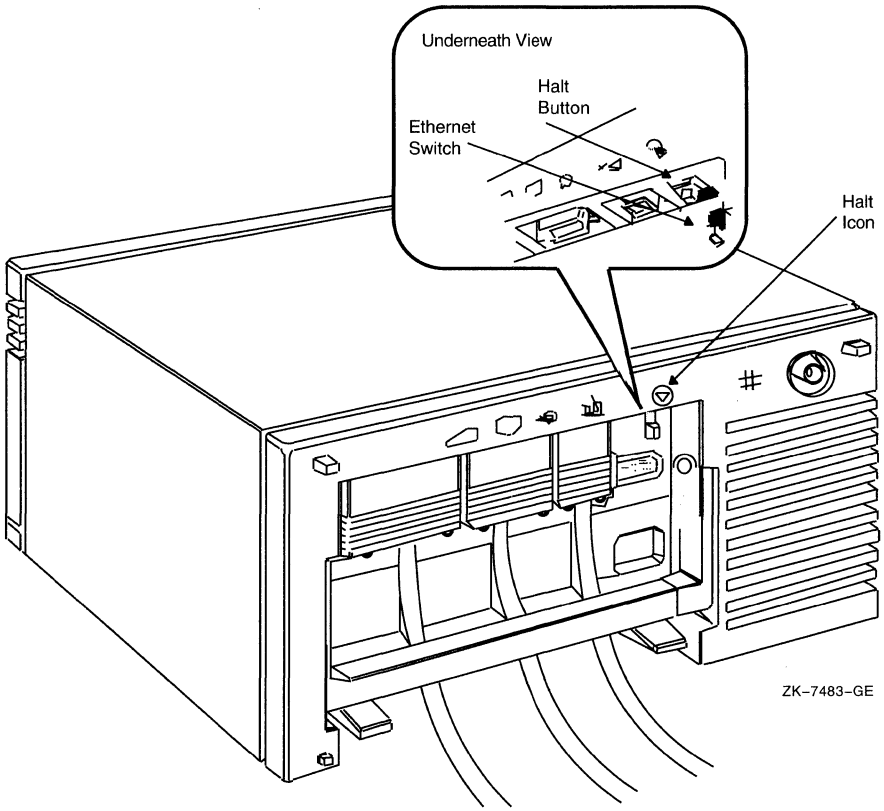
1.2 The HALT Button

The HALT button is located on the panel at the back of the system box, next to the line printer port. The button is indicated by the halt icon, which consists of an inverted triangle within a circle. Figure 1–2 shows the HALT button on the VAXstation 2000. To put the system in console mode, press the HALT button. When the system is in console mode, the console terminal displays the console-mode prompt (>>>).

Note

Although the back of the MicroVAX 2000 is slightly different from the VAXstation 2000, the HALT button is in the same location.

Figure 1–2 VAXstation 2000 HALT Button



1.3 The Console Terminal and Serial Lines

In general, use the console terminal to boot the operating system or to shut it down. During installation use the console terminal to boot the system and monitor the installation process.

- On the VAXstation 2000, the workstation display monitor and keyboard act as the console terminal.
- On the MicroVAX 2000, the terminal that is attached to connector 1 on the DEC423 converter acts as the console terminal. You can use any supported terminal (a VT220 or VT240, for example) as the console terminal on a MicroVAX 2000.

The console terminal runs in two different modes: program mode and console mode.

- Program mode—When the console terminal is in program mode, the VMS operating system is running. In program mode you can enter DCL commands, run programs, and receive system messages.
- Console mode—When the console terminal is in console mode, the VMS operating system is not running. The console terminal displays the console-mode prompt (>>>). In console mode, you can control and monitor system operations by entering console-mode commands.

1.3.1 Turning On the Console Terminal

Turn on the power to the console terminal before turning on the power to the system. To turn on the console terminal, use the following procedure:

1. Make sure that the cable between the console terminal and the system is connected properly.
2. Make sure that the power cable is connected to the terminal and plugged in to a wall outlet.
3. If you have a VAXstation 2000, press the power switch on the back of the workstation monitor.

   If you have a MicroVAX 2000, turn the terminal power switch to the ON position.

The terminal power switch is located in different positions on different types of console terminals. Table 1–1 describes the location of the power switch on some supported terminals and how each terminal should respond. If your terminal is not listed, see the owner's manual for your terminal.

Table 1–1 Turning On the Console Terminal

Terminal Type	Power Switch Location	Terminal Response
VT100-series terminal	Power switch is on the back left.	The terminal beeps and a blinking cursor (either a rectangle or an underscore) is visible on the screen.
VT220 terminal	Power switch is on the back left.	The terminal beeps and displays VT220 OK in the middle of the screen.
VT240 terminal	Power switch is on the left corner at the front of the accompanying terminal box. (On VT200-series graphics terminals, there also is a power switch on the back right of the terminal screen.)	The terminal beeps and displays VT240 OK in the middle of the screen.
VT330 terminal	Power switch is on the left side of the terminal screen.	The terminal beeps and displays VT330 OK in the middle of the screen.
VT340 terminal	Power switch is on the left side of the terminal screen.	The terminal beeps and displays VT340 OK in the middle of the screen.
LA34 hardcopy terminal	Power switch is on the back left.	The type head moves to the first position on a line.
LA120 hardcopy terminal	Power switch is on the front left, halfway down the stand.	The type head moves to the first position on a line.

1.3.2 Diagnostic Console Terminal

Because the console terminal is an important tool in diagnosing system hardware failures, the VAXstation 2000/MicroVAX 2000 provides for a diagnostic console terminal in case the primary console terminal is not working. You can use any supported terminal as the diagnostic console terminal. You can also use a hardcopy terminal (for example, an LA100) as a diagnostic console terminal if you want a hard copy of the installation procedure.

Note

You cannot use a VR260 or VR290 monitor as a diagnostic console terminal.

To attach a diagnostic console terminal to a VAXstation 2000 or MicroVAX 2000, you need a BCC08 cable. To attach a diagnostic console terminal, use the following procedure:

1. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

   ```
   $ @SYS$SYSTEM:SHUTDOWN
   ```

   Answer the questions. When the procedure asks if an automatic reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

   ```
   SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
   ```

2. Turn the ON/OFF switch on the system box and any expansion boxes to the 0 (off) position. Also turn off the power to the console terminal.
3. If you have a MicroVAX 2000, remove the DEC423 converter.
4. Attach the end of the BCC08 cable marked CONSOLE to the serial port of the diagnostic console terminal. Attach the other end to the printer port on the system box. Turn on the diagnostic console terminal.
5. Check the baud rate on the diagnostic console terminal (see the documentation that came with your terminal). The baud rate should be set to 9600.
6. Turn on the system.

The primary console terminal is disabled. You can use the diagnostic console terminal in its place.

Caution

Do not turn off the diagnostic console terminal while the VMS operating system is running, because you might halt the system. If you accidentally turn off the diagnostic console terminal and halt the system, you can resume your process by turning on the terminal, pressing Return to get the console-mode prompt (>>>), and entering the CONTINUE command.

If you do not have a hardcopy terminal, you can still get a hard copy of the installation procedure. To do this, first attach a diagnostic console terminal to the system as described previously. Then, connect a printer to the diagnostic console terminal. For example, if you use a VT220 terminal as the diagnostic console terminal, you could attach an LA50 printer to the diagnostic console terminal. You can set up the terminal so that whatever is displayed on the screen is printed. To attach a printer to the diagnostic console terminal, use the following procedure:

1. Make sure the power to the system box, diagnostic console terminal, expansion boxes (if present), and printer is off.
2. Attach one end of the printer cable to the printer port of the diagnostic console terminal. Attach the other end of the cable to the connector on the printer.
3. Turn on the printer.
4. Check the baud rate on the printer (see the documentation that came with your printer). The baud rate should match what the terminal you are using requires (see the documentation that came with your terminal).
5. Turn on the diagnostic console terminal.
6. Check the setup on the diagnostic console terminal to make sure characters displayed on the terminal are printed (for example, on the VT220 this setup characteristic is called AUTOPRINT MODE).
7. Turn on the expansion boxes (if present), and the system box.

To disconnect the diagnostic console terminal, use the following procedure:

1. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

   ```
   $ @SYS$SYSTEM:SHUTDOWN
   ```

   Answer the questions. When the procedure asks if an automatic reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

   ```
   SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
   ```

2. Turn the ON/OFF switch on the system box and any expansion boxes to the 0 (off) position.
3. Turn off and disconnect the diagnostic console terminal.
4. If you have a MicroVAX 2000, reconnect the DEC423 converter.
5. Turn on the system.

1.3.3 The VAXstation 2000 Serial Lines

The VAXstation 2000 has four serial lines, each with a specific purpose. Serial line 0 is for the LK201 keyboard, and serial line 1 is for a mouse or tablet pointing device. The DCL command SHOW DEVICE displays these serial lines along with the graphics video monitor as VCA0.

Serial line 2 is for a modem or other serial communication device that allows you to dial in to your system. The DCL command SHOW DEVICE displays this serial line as TTA2. Serial line 3 is for a printer. The DCL command SHOW DEVICE displays this serial line as TTA3.

The VAXstation 2000 console terminal is called OPA0. The console terminal normally takes input from the LK201 keyboard and displays output on the workstation display monitor. However, you can connect a diagnostic console terminal to the printer port, as described in Section 1.3.2. The BCC08 terminal cable tells the system that a diagnostic console terminal, not a printer, is attached to the printer port. To connect a printer or terminal for use other than a diagnostic console, you would use a BCC05 terminal cable. The DCL command SHOW DEVICE displays OPA0 in place of TTA3 if you boot the system using the diagnostic console terminal.

By default, the SYSGEN command AUTOCONFIGURE automatically configures the serial lines when you boot the system. Because of the complexity of this process, Digital recommends that you let SYSGEN configure the serial lines automatically. If you need to connect the serial lines manually using the SYSGEN command CONNECT, see Appendix A.

1.3.4 The MicroVAX 2000 Serial Lines

The MicroVAX 2000 has four serial lines to which user terminals can connect. Three of the serial lines have a device name of the form *TTAn*, where *n* is a number between 0 and 3 corresponding to the unit number of the line.

The MicroVAX 2000 console terminal is normally attached to serial line 0 and called OPA0. However, you can connect a diagnostic console terminal to the printer port, as described in Section 1.3.2. The BCC08 terminal cable tells the system that a diagnostic console terminal, not a printer, is attached to the printer port. To connect a printer or terminal for use other than a diagnostic console, you would use a BCC05 terminal cable. The DCL command SHOW DEVICE displays OPA0 in place of TTA3 if you boot the system using the diagnostic console terminal.

By default, the SYSGEN command AUTOCONFIGURE automatically configures the serial lines when you boot the system. Because of the complexity of this process, Digital recommends that you let SYSGEN configure the serial lines automatically. If you need to connect the serial lines manually using the SYSGEN command CONNECT, see Appendix A.

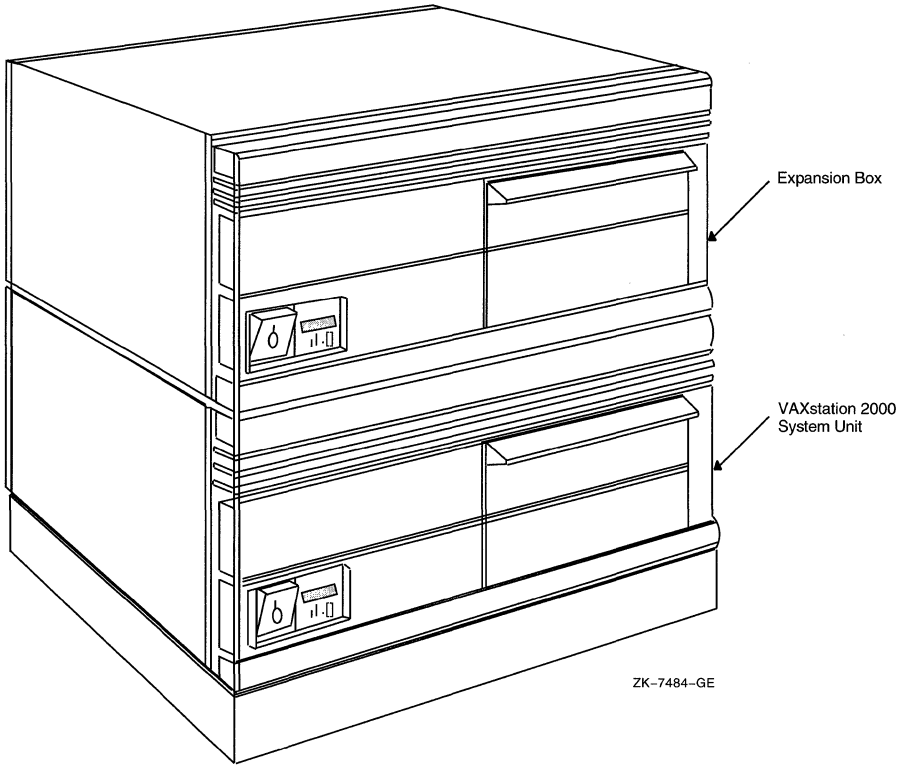
1.4 The Optional Expansion Box

Your VAXstation 2000/MicroVAX 2000 may be equipped with optional expansion boxes. These expansion boxes provide additional storage for the system. There are two different expansion box configurations:

- The tape cartridge expansion box, which contains a TK50 tape cartridge drive
- The fixed disk drive expansion box, which contains an RD53 or RD54 fixed disk

Your system configuration can contain one or both of these expansion boxes in addition to the system box. Each expansion box has an ON/OFF switch identical to the one on the system box. Figure 1–3 shows a VAXstation 2000 expansion box resting on top of the system unit.

Figure 1–3 VAXstation 2000 Expansion Box and System Box



1.5 The TK50 Tape Cartridge Drive

If you are installing the VMS operating system from tape cartridges, you should be familiar with the tape cartridge drive in the expansion box. If you are installing the VMS operating system from diskettes, go to Section 1.6.

The device name of the tape cartridge drive is MUA0. Figure 1–4 shows the VAXstation 2000 tape cartridge expansion box resting on top of the system unit.

When using the TK50 tape cartridge drive shown in Figure 1–4, you should be aware of the following:

- The green light blinks when the tape in the drive is moving (being read from or written to). If a tape cartridge is in the drive and this light is off, the drive is inactive and the tape is not positioned at its beginning.

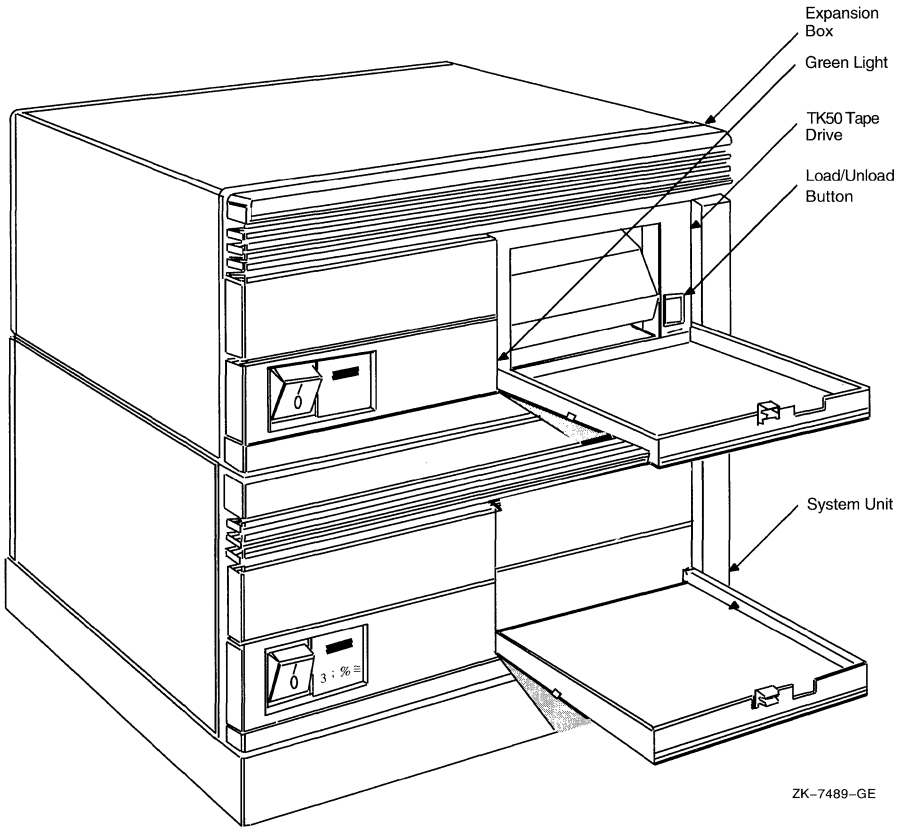
  Note

  Never attempt to remove a tape when the green light is blinking or when it is off; this damages the tape and might damage the drive.

  The green light glows when the drive is empty. It also glows when the drive is inactive and positioned at the beginning of a tape. The only time you can remove a tape cartridge is when the green light is glowing steadily.

- The red LOAD/UNLOAD button controls the loading of the tape.

Figure 1–4 VAXstation 2000 Tape Cartridge Drive



When the button is pressed in, it is in the LOAD position. The red light on the button glows when the tape is loaded. It blinks *slowly* when the tape is rewinding. It blinks *rapidly* when there is a tape error (for some reason the tape could not be read). To clear a tape error, press the button four times.

Note

Never attempt to remove a tape cartridge when the LOAD/UNLOAD button is in the LOAD (in) position (the red light is on); you might damage both the tape and the drive.

When the LOAD/UNLOAD button is released, it is in the UNLOAD (out) position. The only time you can remove a tape is when this button is in the UNLOAD (out) position (the red light is off).

- The cartridge-release handle is located next to the tape access slot. This handle controls the position of the tape drive spindle. Pull the handle open to insert or remove a tape cartridge.

Caution

Pull the cartridge-release handle open *only* when all three of the following are true:

- The green light glows steadily.
- The LOAD/UNLOAD button is in the UNLOAD (out) position.

- The red light on the LOAD/UNLOAD button is off.

Otherwise, you might damage both the tape and the drive.

Table 1–2 summarizes the tape cartridge drive controls. Table 1–3 describes the tape cartridge drive lights.

Table 1–2 TK50 Tape Cartridge Drive Controls

Control	Position	Function
LOAD/UNLOAD button	In	Loads the tape (15 seconds to 3 1/2 minutes).
	Out	Rewinds and unloads the tape.
Cartridge release handle	Open	Lets you insert or remove a tape after rewind and unload operations are complete.
	Closed	Locks tape in operating position.

Table 1–3 Tape Cartridge Drive Indicator Lights

Red Light	Green Light	Condition
Off	Off	No power to the tape drive.
Off	On	Safe to move cartridge release handle. Power is turned on.
On	Off	Do not move the cartridge release handle. One of the following conditions exists: • Power-on self test is occurring. • Cartridge is inserted but handle is still in the up position. • Tape is loading or unloading. • Tape is stopped.
On	On	Tape loaded successfully.
On	Blinking	Tape is moving (except rewind). Read/write commands are being processed. Irregular rapid blinking means tape calibration is occurring.
Blinking	Blinking	Tape is rewinding.
Rapid Blinking	Off	A fault is occurring. Press and release the LOAD/UNLOAD button four times. If the problem persists, do not attempt to remove the tape cartridge. Call Digital Customer Service.

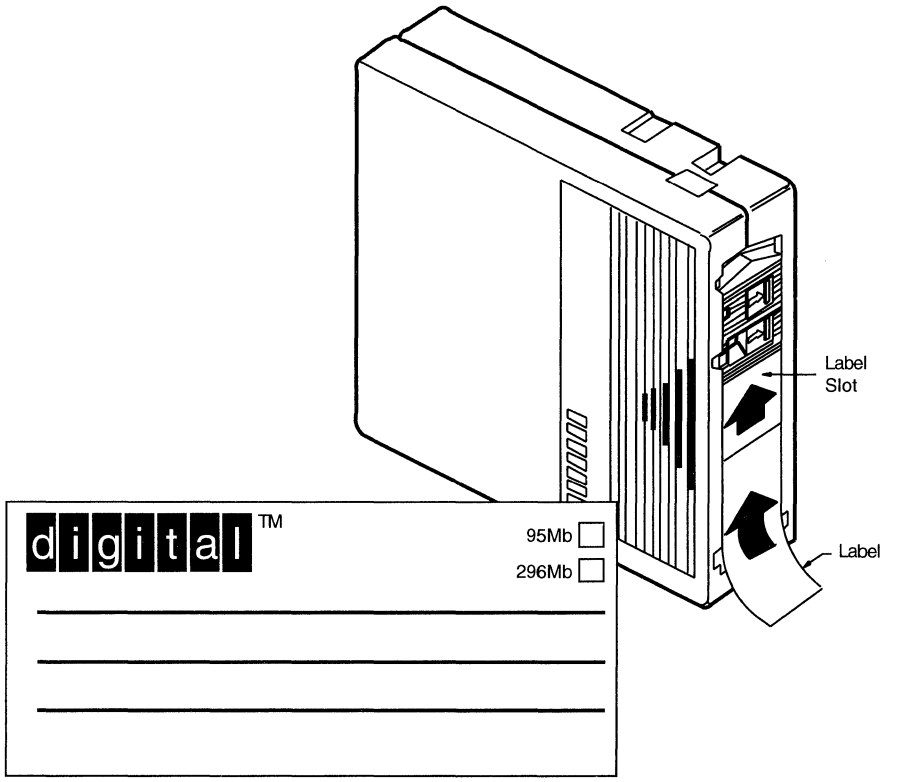
1.5.1 Tape Cartridges

Follow these guidelines when using tape cartridges:

- Tape cartridges come in clear plastic protective cases. You should keep tape cartridges in these cases when you are not using them.
- The label slot holds the label that provides information about the contents of the tape cartridge. Label a tape cartridge if you are going to copy files to it (distribution tape cartridges are already labeled).

  To label a tape cartridge, insert a slide-in label into the slot located on the front of the tape cartridge. Figure 1–5 shows how to insert the label on a tape cartridge.

Figure 1–5 Inserting a Label on a Tape Cartridge



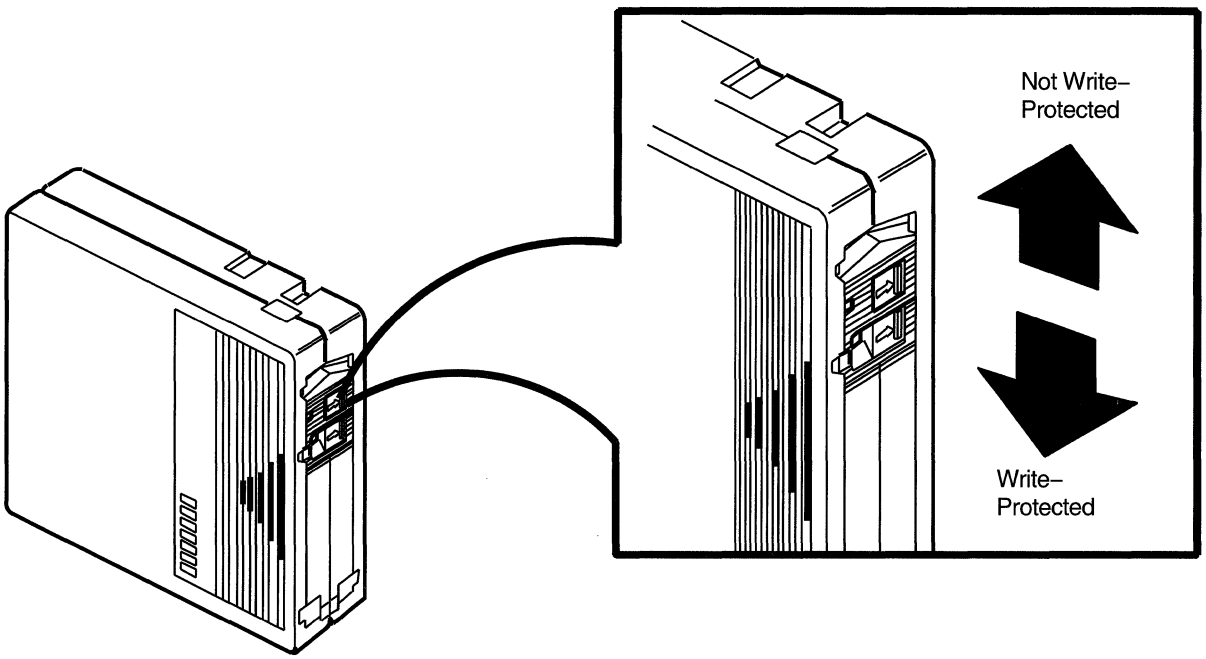
Caution

Use only the label slot to label a tape cartridge. Applying adhesive labels or writing on the tape cartridge can damage it.

- The write-protect switch is a movable switch on the tape cartridge that controls whether you can write to the tape. To write-protect a tape cartridge, slide the write-protect switch toward the label slot. An orange rectangle is visible when the tape cartridge is write-protected.

Always write-protect the distribution tape cartridge before an installation. Figure 1–6 shows how to write-protect a tape cartridge.

Figure 1–6 Positioning the Write-Protect Switch



1.5.2 Inserting a Tape Cartridge in a TK50 Drive

To insert a tape cartridge in the drive, do the following:

1. Make sure the tape drive is empty. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, and a tape cartridge is already in the drive, enter the following command and press Return:

   ```
   $ SHOW DEVICE MUA0
   ```

   If the display indicates that the status of the tape cartridge is MOUNTED, you must first dismount the tape before removing it from the drive. Follow the instructions in Section 1.5.5 to dismount the tape cartridge. Then follow the directions for removing a tape cartridge in Section 1.5.6.

2. Press the LOAD/UNLOAD button so that it is in the UNLOAD (out) position. The green light glows steadily, and the red light is off.

3. Remove the tape cartridge from its plastic case. You should write-protect a tape cartridge containing software that you will install on your system. You should write-enable a tape cartridge if you are going to either copy or back up files to it.

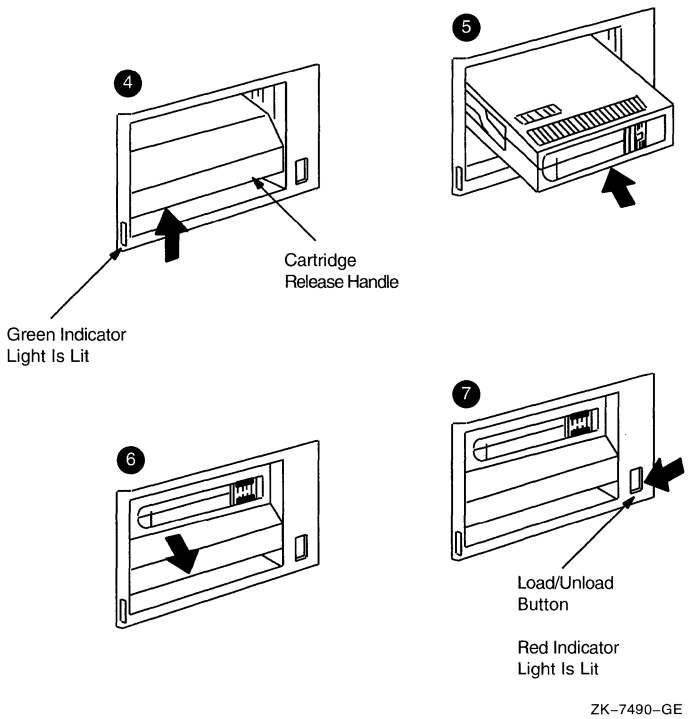
Caution

Never pull open the cartridge-release handle unless the green light glows, the red light is off, and the LOAD/UNLOAD button is in the UNLOAD (out) position; you might damage the drive.

4. Pull open the cartridge-release handle.

   Figure 1–7 illustrates steps 4 through 7 in the insertion procedure.

Figure 1–7 How to Insert a Tape Cartridge



5. Hold the tape cartridge with the label facing you and the large arrow on the top of the tape cartridge pointing in to the drive. Insert the tape cartridge in the drive. Push the tape cartridge in to the drive until it locks in to place. The green light turns off, and the red light glows.
6. Push the cartridge-release handle closed until it locks in to place. The red light turns off, and the green light glows.
7. Press the LOAD/UNLOAD button so that it is in the LOAD (in) position. The red light glows. The tape cartridge goes through a load process that takes between 15 seconds and 3 1/2 minutes. During this time, the green light blinks. When the tape is ready, the green light glows.

1.5.3 Initializing a Tape Cartridge

Note

You do not need to initialize any tape cartridges when you install the VMS operating system.

Initializing a tape cartridge does the following:

- Erases any data stored on the tape cartridge
- Assigns a volume label to the tape cartridge
- Prepares the tape cartridge to store VMS files

You should initialize a new tape cartridge before you use it the first time. Initialize an old tape cartridge to erase its contents.

Before you initialize a tape cartridge, make sure that the account you are logged in to has the volume protection (VOLPRO) privilege. Make sure the tape cartridge is write-enabled.

Caution

Do not initialize a tape cartridge that contains operating system software or files that you want to save. The INITIALIZE command erases the contents of the tape cartridge.

To initialize a tape cartridge, enter the INITIALIZE command in the following format and press Return:

```
$ INITIALIZE MUA0 volume-label
```

where *volume-label* is a 1- to 6-character alphanumeric identification. Write the volume label of the tape cartridge on the tape cartridge label. You will need to know the volume label when you use the tape cartridge.

For example, the following command initializes the tape cartridge in the tape cartridge drive and gives it the label TEST:

```
$ INITIALIZE MUA0 TEST
```

1.5.4 Mounting a Tape Cartridge

Note

You do not need to mount any tape cartridges when you install the VMS operating system. The VMS installation procedure does this automatically.

After you insert a tape cartridge (and initialize it, if it is new), you must mount it, to make it available to the system. To mount a tape cartridge, enter the MOUNT command in the following format and press Return:

```
$ MOUNT MUA0 volume-label
```

where *volume-label* is the one to six character alphanumeric identification you assigned to the tape cartridge with the INITIALIZE command.

If you do not specify the correct volume-label when you mount the tape cartridge, the system displays the following message:

```
%MOUNT-F-INCVOLLABEL, incorrect volume label
```

If you do not remember the volume label, enter the MOUNT command in the following format and press Return:

```
$ MOUNT/OVERRIDE=IDENTIFICATION MUA0
```

Then enter the following command to determine the volume label of the tape cartridge:

```
$ SHOW DEVICE MUA0
```

The system displays the volume label.

1.5.5 Dismounting a Tape Cartridge

Note

You do not need to dismount any tape cartridges when you install the VMS operating system. The VMS installation procedure does this automatically.

When you finish using a tape cartridge, you should dismount it. To dismount a tape cartridge, enter the DISMOUNT command in the following format and press Return:

```
$ DISMOUNT MUA0
```

After you dismount a tape cartridge, you can remove it from the drive.

1.5.6 Removing a Tape Cartridge from a TK50 Drive

To remove a tape cartridge from the drive, do the following:

1. Press the LOAD/UNLOAD button so that it is in the UNLOAD (out) position. If the tape is not rewound, the red and green lights blink slowly as the tape rewinds. When the tape is completely unloaded, the red light turns off and the green light glows.

   Caution

   Never pull open the cartridge-release handle unless the green light glows, the red light is off, and the LOAD/UNLOAD button is in the UNLOAD (out) position; you might damage the tape drive.

2. Pull open the cartridge-release handle. The tape cartridge partially ejects.
3. Remove the tape cartridge and put it in its plastic case.
4. Push the cartridge-release handle closed until it locks firmly in to place.

1.6 The Diskette Drive

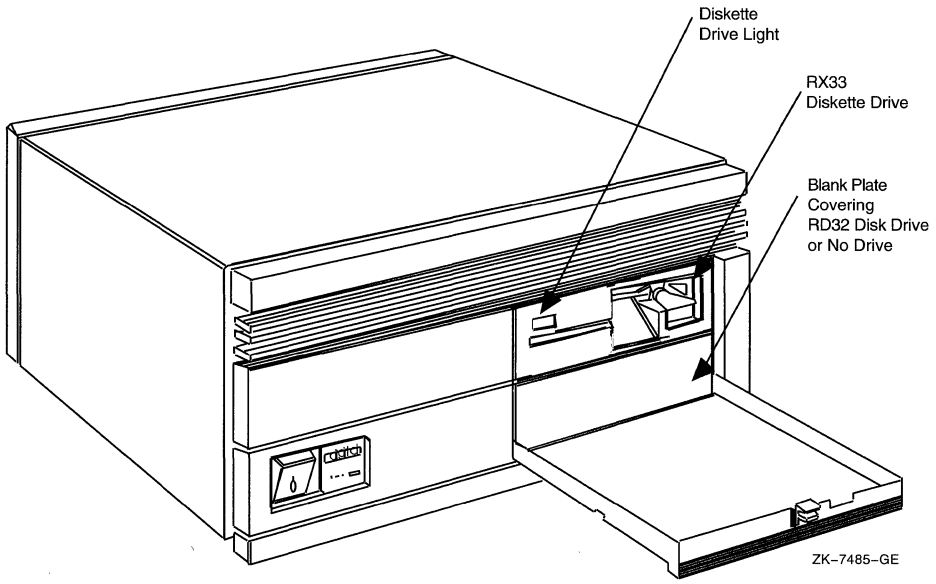
Caution

Use an RX33 diskette only in an RX33 diskette drive. Because RX33 and RX50 diskettes have incompatible formats, using an RX33 diskette in an RX50 drive might destroy the data on the diskette and might damage the drive. You can use an RX50 diskette in an RX33 diskette drive.

If you are installing the VMS operating system from diskettes, you should be familiar with the diskette drive on the front of your system. If you are installing the VMS operating system from a tape cartridge, make sure you read Section 1.5.

The RX33 diskette drive is located behind the drive door on the front of the system box. Figure 1–8 shows a VAXstation 2000 diskette drive with the door open. The diskette drive has an access slot with a drive lever that lets you insert and remove diskettes. The device name of the RX33 diskette drive is DUA2.

Figure 1–8 VAXstation 2000 Diskette Drive



When using the diskette drive shown in Figure 1–8, you should be aware of the following:

- The diskette drive activity light glows red when the diskette in the drive is moving (being read from or written to).

Caution

Never attempt to remove a diskette from the drive when the activity light glows; this damages the diskette and might damage the drive.

- The diskette drive lever holds the diskette in the drive. After you insert a diskette in the drive, turn the lever perpendicular to the access slot. When you turn the lever parallel to the access slot, the diskette pops out of the drive. Never turn the lever parallel to the access slot when the drive activity light is on.

1.6.1 RX33 Diskettes

You can use either RX33 or RX50 diskettes in the RX33 diskette drive. Table 1–4 shows the differences between these two types of diskettes.

Table 1–4 Differences Between RX33 and RX50 Diskettes

Diskette	Description	Storage Capacity	Preformatted?
RX33	Grey or black plastic jacket; no arrow	2400 blocks	No
RX50	Black plastic jacket; red arrow	800 blocks	Yes

Caution

Use an RX33 diskette only in an RX33 diskette drive. Because RX33 and RX50 diskettes have incompatible formats, using an RX33 diskette in an RX50 diskette drive might destroy the data on the diskette and might damage the diskette. You can use an RX50 diskette in an RX33 diskette drive.

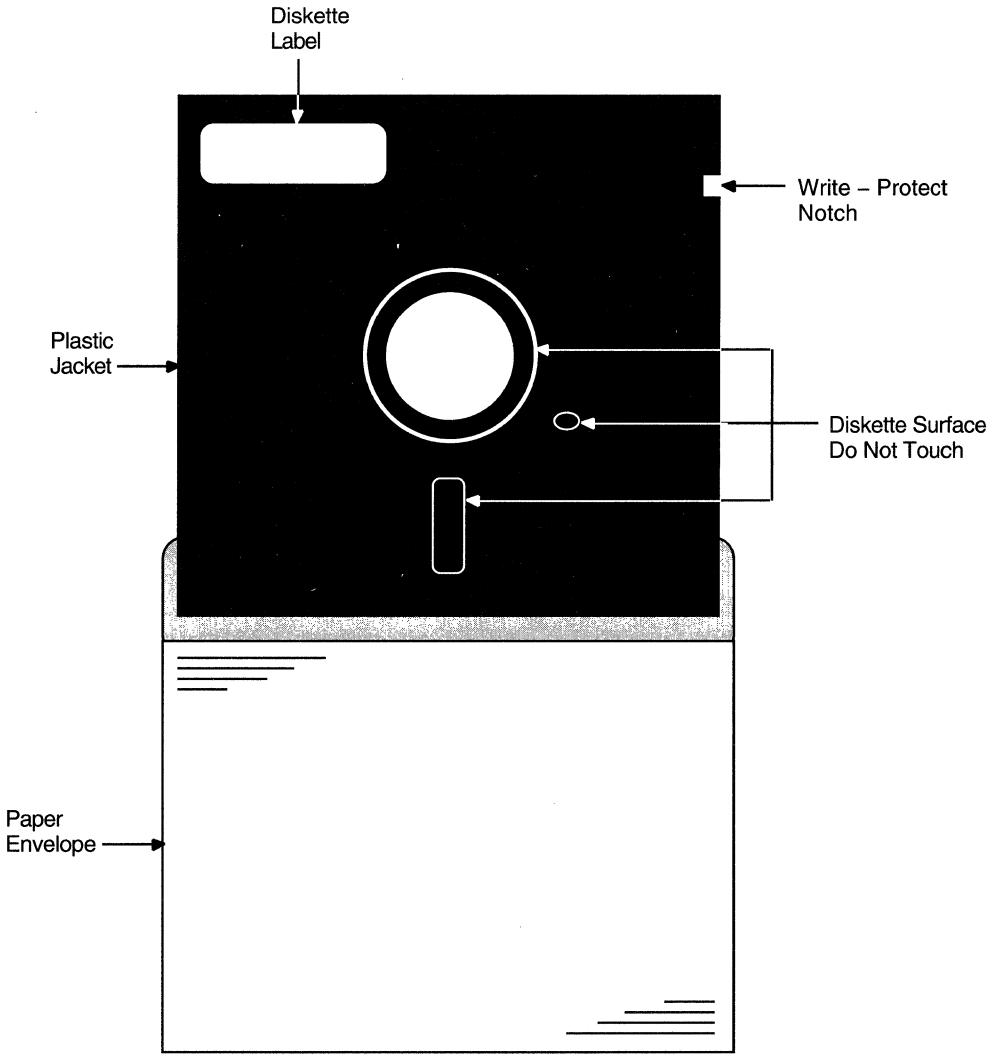
Also, format an RX50 diskette using only Digital Customer Service diagnostic tools. Consider discarding an RX50 diskette rather than formatting it. For more information, contact Digital Customer Service.

Figure 1–9 shows an RX33 diskette.

When using the diskette shown in Figure 1–9, you should be aware of the following:

- Each diskette comes in a protective paper envelope. You should keep diskettes in their paper envelopes when you are not using them.
- The diskette label provides information about the contents of the diskette. Label a diskette if you will copy files to it (distribution diskettes are labeled already). You should write on the diskette label before you affix it to the diskette. To write on a diskette label after you affix it to the diskette, use a felt-tipped pen. If you use a pencil or pen to write on the label, you might damage the diskette.
- The plastic diskette jacket is the protective cover for the diskette surface. There are slots in the cover through which the drive head accesses the diskette. You should avoid touching the diskette surface at these openings.
- The write-protect notch is a square-shaped cut in the side of the diskette that controls whether you can write to the diskette.

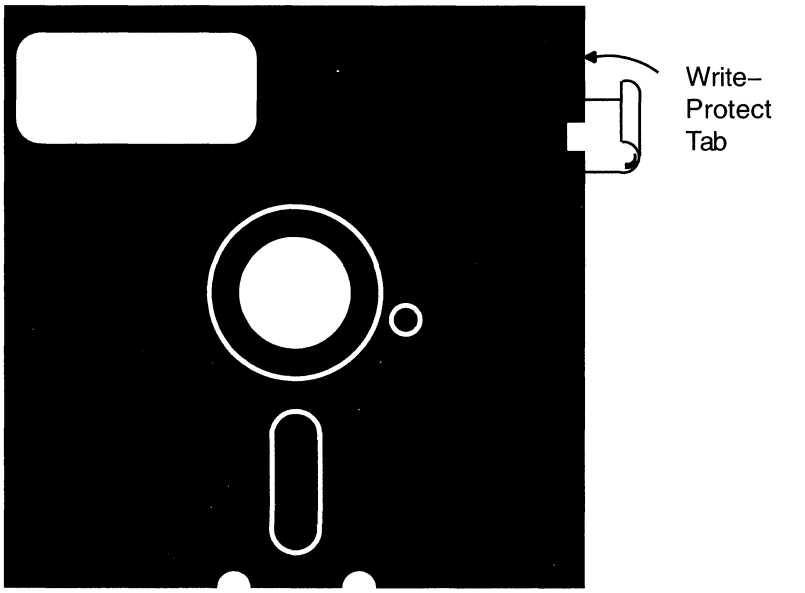
Figure 1–9 RX33 Diskette



To write-protect a diskette, place one of the adhesive foil tabs supplied with your diskettes over the write-protect notch on the side of the plastic cover (see Figure 1–10). Write-protecting diskettes guards against loss of data or accidental overwriting. *Always* write-protect distribution diskettes before an installation.

To write-enable a diskette, make sure that no adhesive foil tab covers the diskette write-protect notch. When the write-protect notch is uncovered, you can add, change, or delete information on the diskette. You should write-enable a diskette if you will copy or back up files to it.

Figure 1–10 The Diskette Write-Protected Tab



ZK–5796–GE

1.6.2 Inserting an RX33 Diskette

To insert a diskette

1. Open the drive door on the front panel of the VAXstation 2000/ MicroVAX 2000.
2. Make sure the drive is empty. If the VMS operating system is not running, go to step 3.

   If the VMS operating system is running and there is a diskette in the drive, enter the following command and press Return:

   ```
   $ SHOW DEVICE DUA2
   ```

   If the display indicates that the status of the diskette is MOUNTED, you must dismount the diskette and remove it from the drive. Follow the directions in Section 1.6.5 to dismount the diskette. Turn the diskette drive lever until it is parallel to the access slot. Remove the diskette from the drive and place the diskette in its paper envelope.

   Caution

   Never attempt to remove a diskette from the drive when the red activity light glows or blinks; you might damage the diskette drive.

3. Remove the diskette you want to insert from its paper envelope. When you remove the diskette, make sure you handle only the edges. Do not touch exposed surfaces of the diskette.
4. Write-protect a diskette that contains software that you will install on your system. Write-enable a diskette if you will copy or back up files to it.

5. Hold the diskette so that the write-protect notch is to your left and the diskette label faces up. Slide the diskette in the drive until it clicks displays the following message when you try to access the diskette:

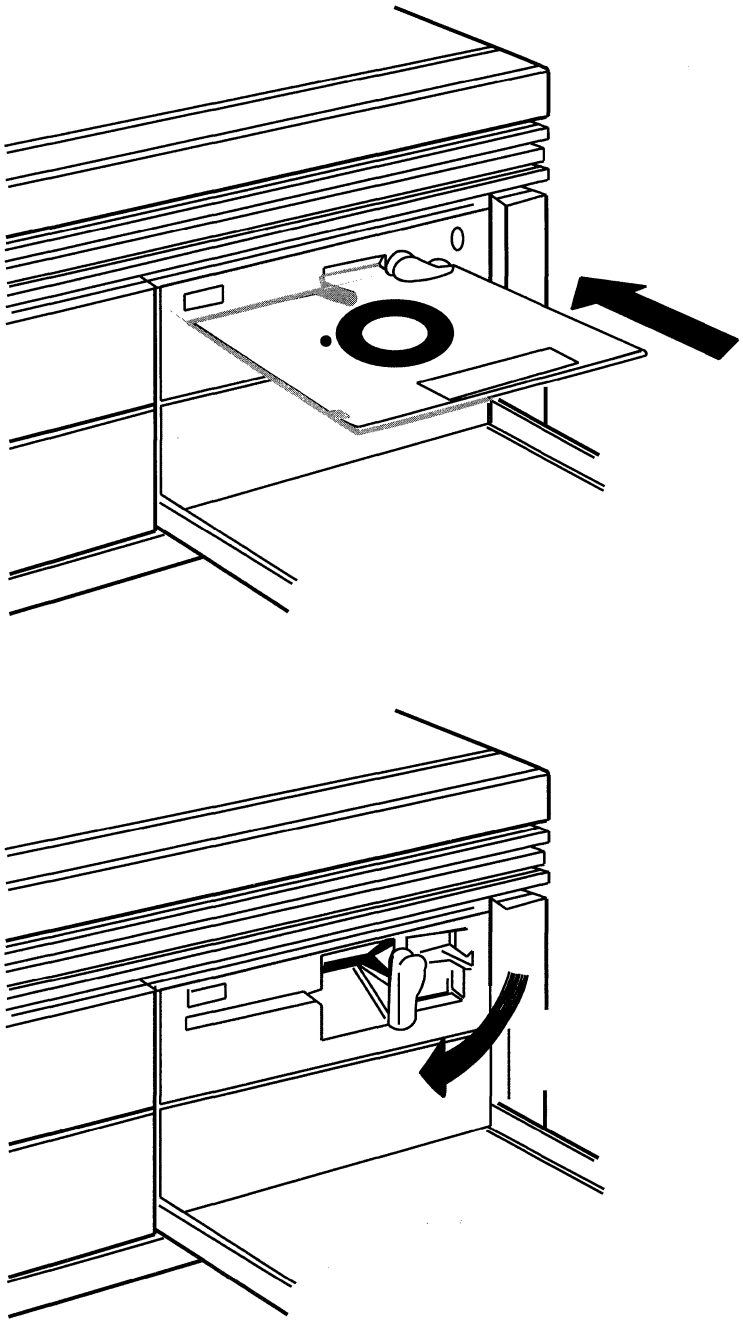
   ```
   %INIT-F-MEDOFL, medium is offline
   ```

   If the system displays this error message, remove the diskette from the drive and reinsert it.

6. Turn the diskette drive lever until it is perpendicular to the access slot.

Figure 1–11 illustrates this procedure.

Figure 1–11 Diskette Being Inserted into Drive



ZK–7488–GE

1.6.3 Initializing and Formatting an RX33 Diskette

Note

You do not need to initialize and format any diskettes when you install the VMS operating system.

The INITIALIZE command does the following:

- Erases any data stored on the diskette
- Assigns a volume label to the diskette
- Prepares the diskette to store VMS files

You should initialize and format a new diskette before you use it the first time. Initialize and format an old diskette to erase its contents.

Before you initialize and format a diskette, make sure that the account you are logged in to has the volume protection (VOLPRO) privilege. Make sure the diskette is write-enabled.

Caution

Do not initialize and format diskettes that contain operating system software or files that you want to save. The INITIALIZE command erases the contents of the diskette.

To initialize and format an RX33 diskette, enter the following command and press Return:

```
$ INITIALIZE/DENSITY=DOUBLE DUA2 volume-label
```

where *volume-label* is a 1- to 6-character alphanumeric identification. Write the volume label of the diskette on the paper label. You will need to know the volume label when you use the diskette.

For example, the following command initializes and formats the diskette in the system box and labels it TEST:

```
$ INITIALIZE/DENSITY=DOUBLE DUA2 TEST
```

1.6.4 Mounting an RX33 Diskette

Note

You do not need to mount any tape diskettes when you install the VMS operating system. The VMS installation procedure does this automatically.

After you insert a diskette (and initialize it, if it is new), you must mount it, to make it available to the system. To mount a diskette, use the MOUNT command in the following format:

```
$ MOUNT DUA2 volume-label
```

where *volume-label* is the label you assigned to the diskette with the INITIALIZE command.

If you do not specify the correct volume label when you mount the diskette, the system displays the following messages:

```
%MOUNT-F-INCVOLLABEL, incorrect volume label
```

If you do not remember the volume label, enter the MOUNT command in the following format and press Return:

```
$ MOUNT/OVERRIDE=IDENTIFICATION DUA2
```

Then enter the following command to determine the volume-label of the diskette:

```
$ SHOW DEVICE DUA2
```

The system displays the volume label.

1.6.5 Dismounting an RX33 Diskette

Note

You do not need to dismount any diskettes when you install the VMS operating system. The VMS installation procedure does this automatically.

When you finish using a diskette, you should dismount it. To dismount a diskette, enter the DISMOUNT command in the following format and press Return:

```
$ DISMOUNT DUA2
```

After you have dismounted the diskette, you can remove it from the diskette drive.

1.6.6 Removing an RX33 Diskette

To remove a diskette from the drive, use the following procedure:

1. Open the door on the front panel of the VAXstation 2000/MicroVAX 2000 system unit.
2. Make sure that the red activity light on the drive is off.

Caution

Never turn the diskette-drive lever if the activity light glows or blinks; you might damage the diskette drive.

3. Turn the diskette drive lever until it is parallel to the access slot.
4. Gently remove the diskette from the drive. Make sure you handle only the edges of the diskette.
5. Put the diskette in its paper envelope.

1.7 The Fixed Disk Drive

Your VAXstation 2000/MicroVAX 2000 contains a fixed disk drive permanently sealed within the system box. The system box contains either an RD32 or RD53 fixed disk drive. If your configuration includes an expansion box, the expansion box contains an RD53 or RD54 fixed disk drive. Table 1–5 lists the capacity of these fixed disk drives.

Table 1–5 Fixed Disk Drives

Drive	Height	Storage Capacity
RD32	Half	83,204 blocks
RD53	Full	138,672 blocks
RD54	Full	311,200 blocks

2

Installing the VMS Operating System

The *Upgrade and Installation Manual* is your primary source for step-by-step upgrade and installation procedures. Start any VMS installation or upgrade by following the instructions in the *Upgrade and Installation Manual.*

Refer to this chapter for installation information specific to the VAXstation 2000 and MicroVAX 2000 computers, such as the following:

- Determining device names
- Turning on the system
- Booting standalone BACKUP
- Booting the new system disk

Note

The screen displays and examples in this manual depict the installation of VMS Version 5.4. Your screen displays reflect the version that you are installing.

If you are installing the VMS operating system on a VAX computer that is part of a VAXcluster environment, read the *VAXcluster Systems for OpenVMS.*

2.1 Device Names

Before you install the VMS operating system, you must determine the device names for the drive that contains the distribution media and the drive that contains the system disk. A device name has the following format:

ddcu

where:

- *dd* is the *device code.* The device code tells what type of device you are using.
- *c* is the *controller designation.* A controller designation can be one of the alphabetic letters A through Z. The controller designation, along with the unit number, identifies the location of the device.
- *u* is the *unit number.* The unit number is a decimal number that, along with the controller designation, identifies the location of the device.

For example, DUA2 is the device name for the diskette drive (if your system has one). *DU* is the device code for the diskette drive, *A* names the controller (the controller provides the interface between the processor and the drive), and *2* is the unit number.

The device names for the VAXstation 2000/MicroVAX 2000 are as follows:

Note

Your configuration might not include all of these devices

- DUA0—fixed disk in the system box
- DUA1—fixed disk in an expansion box
- DUA2—RX33 diskette drive
- MUA0—TK50 tape cartridge drive
- ESA0—network

If your system has more than one fixed disk, you can use either as the system disk. When choosing a system disk, you need to be aware of the capacity of the disk as well as the size of the VMS operating system. Keep in mind that a system disk in a VAXcluster environment needs more space for the operating system than a system disk for a standalone system.

Before you begin the installation procedure, make sure you know the device names for both the drive that will hold the distribution media and the fixed disk that will be the system disk.

Return to the *Upgrade and Installation Manual* to continue with the installation.

2.2 Turning On the System

This procedure assumes that the system is not turned on when you start the installation. The following steps describe turning on the system for the installation:

1. Turn on the console terminal.
   - If you have a VAXstation 2000, press the power switch on the back of the workstation monitor.
   - If you have a MicroVAX 2000, your console terminal must be set to 8 bits, no parity transmit, and no parity receive. This is the default for most terminals, except the LA120. The baud rate of the console terminal should be set to 9600 baud. For instructions on checking these settings, see the owner's manual provided with your terminal.
2. Push the power switch on the front of the system box and any expansion boxes to the 1 (On) position.
3. The VAXstation 2000/MicroVAX 2000 should display self-test messages similar to the following:

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

OK
>>>
```

   If the console-mode prompt (>>>) does not appear on the screen, press the HALT button.

If the system does not power up properly (for example, if you receive the message ?84 FAIL), refer to the troubleshooting section of the hardware manual supplied with your system.

4. Return to the *Upgrade and Installation Manual* to continue with the installation.

2.3 Booting Standalone BACKUP

This section describes the steps for booting standalone BACKUP. Standalone BACKUP lets you transfer the VMS *required* save set from the distribution tape cartridge to your system disk. You need the tape cartridge from the VMS distribution kit that is labeled as follows:

Paper Label[1]	Volume Label[2]
VMS V5.n BIN TK50 2/2 DECWINDOWS & S/A BKUP	DECW54

[1]A paper label is the label affixed to a tape cartridge.

[2]A volume label is the name the VMS operating system uses to refer to a tape cartridge. During the installation, the procedure displays the volume label, not the paper label, in messages.

Booting standalone BACKUP takes approximately 20 minutes.

1. Insert the tape cartridge labeled VMS V5.n BIN 2/2 DECWINDOWS & S/A BKUP into the tape cartridge drive.
2. To boot standalone BACKUP, enter the following command and press RETURN:

   ```
   >>> B MUA0
   ```

   Ignore any error messages about missing drivers that resemble the following:

   ```
   %SYSGEN-I-OPENIN, error opening SYS$SYSROOT:[SYSEXE]VEDRIVER.EXE; as input
   %SYSGEN-E-FNF, file not found
   ```

   These messages might be displayed during the installation.
3. Standalone BACKUP displays the following message:

   ```
   VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
   ```
4. The procedure might ask you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

   ```
   PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
   ```
5. The procedure displays a list of the local devices on your system and, if you have them, HSC and MSCP-served devices. For example:

   ```
   Available device DUA0:                    device type Generic_DU
   Available device MUA0:                    device type TK50
   ```

   Check the list of devices. If the list is incomplete, make sure that all the drives are properly connected to the system. See your hardware manuals for details.
6. When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt ($):

   ```
   %BACKUP-I-IDENT, Stand-alone BACKUP V5.4; the date is 19-JUN-1990 15:00
   $
   ```

7. Return to the *Upgrade and Installation Manual* to continue with the installation.

2.4 Booting the New System Disk

As a result of the BACKUP command you type to start an installation, the *required* save set from the distribution media is transferred to your system disk. You know the *required* save set is on the new system disk when you see the following message:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

This message indicates that the *required* save set has been transferred to the system disk and the files are being checked for errors. Approximately 25 minutes later the procedure displays the following message:

```
%BACKUP-I-PROCDONE, Operation completed. Processing finished at 19-APR-1990
15:45 If you do not want to perform another standalone BACKUP operation,
use the console to halt the system.

If you do want to perform another standalone BACKUP operation,
ensure the standalone application volume is online and ready.
Enter "YES" to continue:
```

To continue the installation, boot the new system disk as follows:

1. Press the HALT button located on the back of the system box.
2. To boot the system disk, enter the BOOT command in the following format:

   ```
   >>> B ddcu
   ```

   Substitute the device name of the system disk for *ddcu*. The device name of the system disk is either DUA0 or DUA1, the disk you chose to be the system disk.

   Note

   If the system does not boot, a hardware or software problem might exist. Refer to Section 3.1.8 for the symptoms of hardware and software problems and the actions you can take to correct these problems.

3. When the boot is complete, the procedure displays some messages and asks for the date and time. Enter the date and time using the 24-hour clock format and press Return.
4. Return to the *Upgrade and Installation Manual* to continue with the installation.

3

Startup and Shutdown Procedures

During a VMS installation or upgrade, your system will shut down and reboot several times. Although the installation and upgrade procedures usually can perform these tasks automatically, you might need to manually shut down or reboot your system. Also, you will occasionally need to reboot the system during normal operation. This chapter describes different ways to boot and shut down the system.

3.1 Booting the System

The VAXstation 2000/MicroVAX 2000 uses an internal memory device to boot the VMS operating system from the system disk into memory. The boot process consists of the following steps:

1. You enter the BOOT command. The boot procedure deposits information in the general purpose registers.
2. VMB, the primary boot program, is loaded from random access memory (RAM) into main memory. VMB is a program that allows access to the system disk. VMB locates SYS$SYSTEM:SYSBOOT.EXE on the system disk and loads it into memory.
3. SYSBOOT.EXE loads the SYSGEN parameters stored in SYS$SYSTEM:VAXVMSSYS.PAR and checks the conversational boot flag. If the flag is set, the procedure stops and displays the SYSBOOT> prompt. If the flag is not set, SYSBOOT loads the VMS executive into memory and transfers control to the VMS executive.
4. When the VMS executive finishes, it executes the SWAPPER process.
5. The SWAPPER creates the SYSINIT process.
6. SYSINIT creates the STARTUP process.
7. STARTUP executes SYS$SYSTEM:STARTUP.COM (unless you indicated another file at the SYSBOOT> prompt) and SYSTARTUP_V5.COM. The current values of SYSGEN parameters are written back to VAXVMSSYS.PAR.
8. The boot process finishes, and you can log into the VMS operating system.

3.1.1 Sniffer Boot

A sniffer boot lets you boot the system without specifying a device name.

To cause a sniffer boot, do the following:

1. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, log into the SYSTEM account. Enter the following command and press Return:

   ```
   $ @SYS$SYSTEM:SHUTDOWN
   ```

Answer the questions. When the procedure asks if an automatic reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

2. Press the HALT button.
3. Enter the following command and press Return:

```
>>> B
```

The system successively tries boot devices until it finds one it can boot from. The system searches in the following order for a device from which it can boot:

- Floppy diskette drives
- Fixed disks
- Tape cartridge drives
- The network

If the system does not find any device from which to boot, it continues to try to boot from the network indefinitely.

When the system boots automatically, it does a sniffer boot if you have not specified a default boot device, or if you cleared the default boot device.

3.1.2 Automatic Boot

The VMS operating system can boot automatically from the disk designated in nonvolatile RAM. When you installed the system hardware, you designated the default boot device. If you want to boot automatically from a different device, you must change the designation in nonvolatile RAM (see Section 3.1.2.1).

You can set the system so it boots automatically from the default boot device under the following conditions:

- When you first turn on system power
- When system power comes on after a power failure
- After you shut down the system (if you entered Y at the auto reboot prompt)
- After a bugcheck
- If the system halts under program control

To control whether the system boots automatically in these situations, do the following:

1. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, log into the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

   Answer the questions. When the procedure asks if an automatic reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

2. Press the HALT button.

3. Type the following and press Return:

```
>>> TEST 53
```

The system displays a prompt that indicates whether the system can reboot automatically. For example:

```
2 ? >>>
```

In this case, the value has been set to 2. You can enter either of the following values at this prompt or press Return to accept the current value:

2—If the power comes on or the system halts under program control, the system attempts to reboot from the default boot device designated in RAM.
3—When power comes on to the system or the system halts under program control, it displays the console-mode prompt (>>>), and does not attempt to reboot.

3.1.2.1 Changing the Default Boot Device

To change the default boot device, do the following:

1. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, log into the SYSTEM account. Enter the following command and press Return:

   ```
   $ @SYS$SYSTEM:SHUTDOWN
   ```

   Answer the questions. When the procedure asks if an automatic reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

   ```
   SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
   ```

2. Press the HALT button.
3. Type the following and press Return:

   ```
   >>> TEST 51
   ```

4. The system displays a prompt that indicates the current default boot device. For example:

   ```
   DUA0? >>>
   ```

5. To change the default boot device, enter a new device name from those listed in Table 3–1 and press Return. To clear the default boot device, enter a period (.) and press Return.

Table 3–1 Default Boot Device Names

Device	Name
Fixed disk in system box	DUA0
Fixed disk in expansion box	DUA1
Diskette drive	DUA2
Tape cartridge drive	MUA0
Network	ESA0

3.1.3 Manual Boot

To boot the system manually, use the following procedure:

1. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

   ```
   $ @SYS$SYSTEM:SHUTDOWN
   ```

   Answer the questions. When the procedure asks if an automatic reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

   ```
   SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
   ```

2. Press the HALT button.

3. Enter the BOOT command in the following format and press Return:

   ```
   >>> B ddcu
   ```

   Substitute the name of the system disk for *ddcu*. For an explanation of device names, see Section 2.1.

   For example, to boot from the fixed disk in the system box, enter the following command and press Return:

   ```
   >>> B DUA0
   ```

4. The procedure might ask for the date and time. Enter the date and time using the 24-hour clock and press Return. For example:

   ```
   PLEASE ENTER THE DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990
   ```

5. The final message should look like the following:

   ```
   SYSTEM       job terminated at 19-JUN-1990 15:14:32.13
   ```

3.1.4 Conversational Boot

A conversational boot is most commonly used in research and development environments and during software upgrades. Perform a conversational boot to stop the boot process before it completes. The boot process stops after it loads SYS$SYSTEM:SYSBOOT.EXE and displays the SYSBOOT> prompt. At the SYSBOOT> prompt, you can enter certain SYSGEN commands to do the following:

- Look at system parameter values
- Change system parameter values
- Specify another parameter file
- Specify another system startup command procedure
- Select the default system parameter file if you modified system parameters to values that render the system unbootable
- Specify a minimum startup

There are several ways to perform a conversational boot. The following procedure is the most direct:

1. If the VMS operating system is not running, go to step 2.

If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE - USE CONSOLE TO HALT SYSTEM
```

2. Press the HALT button.
3. To begin the conversational boot, enter the following command and press Return:

   ```
   >>> B/1 [ddcu]
   ```

   Substitute the device name of the system disk for *ddcu*. If you do not specify a system disk, the system does a sniffer boot.
4. At the SYSBOOT> prompt, you can enter any of the SYSGEN commands listed in Table 3–2. For more information about these SYSGEN commands, see the *OpenVMS System Management Utilities Reference Manual*.
5. When you finish using the SYSGEN commands, enter the CONTINUE command to complete the boot process.

Table 3–2 SYSGEN Commands Used in SYSBOOT

Command	Description
CONTINUE	Resumes the boot procedure.
DISABLE CHECKS	Inhibits checking of parameter values specified with the SET command.
ENABLE CHECKS	Permits checking of parameter values specified with the SET command.
HELP	Displays a summary of the SYSBOOT commands on the terminal screen.
SET parameter-name	Establishes the value of a system parameter.
SET/STARTUP	Sets the name of the system startup command procedure.
SHOW [parameter]	Displays active, current, default, maximum, and minimum values for specific parameters. Use qualifiers to display characteristics of parameters grouped by categories.
USE [file-spec]	Specifies a parameter file to be used as a source of values (you must enter the entire file specification, including device and directory; you cannot specify a logical name).

The following examples illustrate some operations you can perform during a conversational boot.

You can enter the following commands to set a new value for the SYSGEN parameter WSMAX to 512. The CONTINUE command completes the boot process:

```
SYSBOOT> SET WSMAX 512
SYSBOOT> CONTINUE
```

When the VMS operating system displays the following message, the new SYSGEN parameter value becomes active.

```
SYSTEM   job terminated at 19-JUN-1990 15:05:11.01
```

If you modified the system parameters to values that render the system unbootable, enter the following commands to boot using default system parameter values:

```
SYSBOOT> USE DEFAULT
SYSBOOT> CONTINUE
```

You can also use the conversational boot operation to specify a minimum startup. For example, if you want to boot the system and avoid autoconfiguring all the peripheral devices, enter the following command and press Return:

```
SYSBOOT> SET STARTUP_P1 "MIN"
```

This command initiates a minimum startup that performs the following sequence of operations:

1. Starts the processes that control error logging, the job controller, and the operator's log
2. Installs known images
3. Defines the number of interactive users as eight
4. Logs off

Because this procedure does not invoke SYSTARTUP_V5.COM, it does not autoconfigure the system's peripheral devices.

The value of STARTUP_P1 is saved and affects future boot operations. After the operating system boots, you can log in to the SYSTEM account and run SYSGEN to reset STARTUP_P1. For example, enter the following commands to reset STARTUP_P1 to its default value (null):

```
$ RUN SYS$SYSTEM:SYSGEN
SYSGEN> USE CURRENT
SYSGEN> SET STARTUP_P1 ""
SYSGEN> WRITE CURRENT
SYSGEN> EXIT
```

3.1.5 Booting with XDELTA

XDELTA is a debugging tool that system programmers use. To use XDELTA, you need to boot the system in a special way. For information on booting with XDELTA, see the *OpenVMS Delta/XDelta Debugger Manual*.

3.1.6 Booting from SYSF During an Upgrade

When you perform a VMS upgrade, you must boot the system from the SYSF directory on the system disk. To boot from [SYSF], enter the BOOT command in the following format and press Return:

```
>>> B/F0000000 [ddcu]
```

Substitute the device name of the system disk for *ddcu*. If you do not specify the device name of the system disk, the system does a sniffer boot.

3.1.7 Booting from a Different Directory on the System Disk

The VMS operating system is installed on the system disk in the system root directory named [SYS0]. You can use VMSKITBLD, described in the *OpenVMS System Manager's Manual*, to add a copy of the VMS operating system to another system root directory on the system disk.

To boot the system from a directory other than [SYS0], enter the BOOT command in the following format and press Return:

```
>>> B/n0000000 [ddcu]
```

Substitute the boot name of the system disk for *ddcu*, and specify the system root for *n*. If you do not specify the device name of the system disk, the system does a sniffer boot.

For example, if you want to boot from the SYSC root on a device named DUA0, enter the following command:

```
>>> B/C0000000 DUA0
```

3.1.8 If the System Does Not Boot

If the system does not boot because a hardware problem occurs, a question mark (?) usually precedes the error message displayed on the console terminal. An example of a hardware problem is a read error on a disk or tape cartridge drive. If you suspect a hardware problem, do the following:

1. Consult the hardware manual for your VAX processor
2. Contact the appropriate Digital Customer Service representative

When the operating system is loaded into memory, a message similar to the following appears on the terminal screen:

```
SYSTEM         job terminated at 19-JUN-1990 15:05:03.17
```

If the system does not display this message, a software problem has probably occurred. Do the following:

1. Turn off the system box. Turn it back on and try to reboot.
2. Do a conversational boot using default SYSGEN parameters as described in Section 3.1.4. If the system boots, run AUTOGEN. For more information on AUTOGEN, see the *OpenVMS System Manager's Manual*.

3.2 If the System Fails

Your system can fail in the following ways:

- Bugcheck—The system displays a bugcheck message on the console terminal and shuts itself down. This happens because the system encountered a problem that made further operation impossible. Reboot the system.
- Hang—The system stops responding to your commands. The problem could be a failure in system software or a hardware component or a power failure.
- Erratic behavior—The system does not respond according to specifications. The problem could be a failure in system software or a hardware component.

To see if the failure is a system problem and not something you have done, try the following:

- Make sure that you did not press the F1 key (the NO SCROLL key on a VT100 series terminal) accidentally.
- Press CTRL/T to check the status of your process. A status line should appear, indicating the name of the program that is executing and other information. If the status line does not appear, the program you are executing might be hung. (If you have disabled CTRL/T by entering the command SET NOCONTROL=T or have set the terminal to nobroadcast mode by entering the command SET TERMINAL/NOBROADCAST, this procedure does not work.)
- Make sure the cable connecting the terminal or monitor to the system box is secure.

Usually you can force an exit from a hung program by pressing Ctrl/Y. When you press Ctrl/Y, any work performed by the program and not saved on disk is lost.

If the system is hung, press the HALT button and reboot without a normal shutdown.

If you have a problem with the system that Digital has not warned you about, note in detail the sequence of events that caused the problem and notify your Digital Customer Service representative.

3.3 Shutting Down the System

Before you shut down the operating system, decide if you want it to reboot automatically or if you want to enter console-mode commands after the shutdown completes.

If you want the system to reboot automatically after the shutdown, see Section 3.1.2.

You can perform the following three types of shutdown operations:

1. **An orderly shutdown with SYS$SYSTEM:SHUTDOWN.COM**–See Section 3.3.1.
2. **An emergency shutdown with OPCCRASH.EXE**–See Section 3.3.2.
3. **An emergency shutdown with CRASH** –See Section 3.3.3.

3.3.1 Orderly Shutdown with SHUTDOWN.COM

SHUTDOWN.COM shuts down the system while performing maintenance functions such as disabling future logins, stopping the batch and printer queues, dismounting volumes and stopping user processes. To use the SHUTDOWN command procedure, log in to the SYSTEM account, enter the following command, and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

To halt the system after the procedure completes, press the HALT button on the back of the system box.

For more information about the SHUTDOWN command procedure, see the *OpenVMS System Manager's Manual.*

3.3.2 Emergency Shutdown with OPCCRASH.EXE

If you cannot perform an orderly shutdown with SHUTDOWN.COM, run the OPCCRASH emergency shutdown program. Enter the following command and press Return:

```
$ RUN SYS$SYSTEM:OPCCRASH
```

To halt the system after the procedure completes, press the HALT button on the back of the system box.

For more information about the OPCCRASH program, see the *OpenVMS System Manager's Manual.*

3.3.3 Emergency Shutdown with CRASH Commands

Note

Use CRASH commands only if the system is hung and you cannot log in to SYSTEM to use SHUTDOWN or OPCCRASH.

To force your computer to fail, do the following:

1. Press the HALT button.
2. To examine processor registers, enter the following command and press Return:

   ```
   >>> E/G/N:F 0
   ```

   The system displays the contents of the registers. Write these values down if you want to save information about the state of the system.
3. Enter the following commands and press Return:

   ```
   >>> D PC FFFFFFFF
   >>> D PSL 041F0000
   ```

   By depositing these values, you cause the system to write a memory dump to the system dump file on disk.
4. Enter the following command and press Return:

   ```
   >>> CONTINUE
   ```

   This causes the system to perform a bugcheck.
5. After the system reboots, you can examine the dump file. Log into the SYSTEM account.
6. Enter the following commands. Press Return after each one:

   ```
   $ ANALYZE/CRASH SYS$SYSTEM:SYSDUMP.DMP
   SDA> SHOW CRASH
   ```

   For more information about the System Dump Analyzer (SDA) see the *VMS System Dump Analyzer Utility Manual.*

4
Backup Procedures

Use Standalone BACKUP to make a complete backup of the system disk. Standalone BACKUP is a version of the Backup Utility that runs without the support of the entire VMS operating system.

You should back up the system disk for the following reasons:

- In case a problem occurs during a VMS upgrade or update, or during the installation of other software products. *Before* you attempt any of these procedures you should back up the system disk. If a problem does occur, you can restore the backup copy to the system disk.
- To prevent loss of system files if they are accidentally deleted. *After* you install or upgrade the VMS operating system, or any other software products, you should back up the system disk. If a system file is deleted and renders the system disk inoperable, you can restore the backup copy and continue to use the system.
- In case the system disk malfunctions. If you have a backup copy of the VMS operating system, you can restore it to a functioning disk and continue to use the system.
- To eliminate disk fragmentation, which happens when files are stored noncontiguously on the disk. Back up the system disk to a tape cartridge, diskettes, or another disk. Then restore the files to the original system disk. The BACKUP command creates a copy on which files are stored contiguously.

Digital recommends that you use standalone BACKUP to back up your system disk.

This chapter describes the following procedures:

- Installing and booting standalone BACKUP on the system disk
- Installing and booting standalone BACKUP on a diskette
- Installing and booting standalone BACKUP on a tape cartridge
- Backing up and restoring the system disk

4.1 Using Standalone BACKUP

The Backup Utility lets you create and restore backup copies of files, directories, and user disks. Because the Backup Utility copies only what is on the disk and ignores sections of any open files contained in memory, you should use it to back up user disks, not the system disk. If you use the Backup Utility to back up the system disk, the portions of the files that were in memory and data about files not yet written back to the disk (cache) will not be recorded on the resulting backup copy.

Use standalone BACKUP to make a complete backup of the system disk. Standalone BACKUP is a version of the Backup Utility that runs without the support of the entire VMS operating system. Before you use standalone BACKUP, you must shut down the VMS operating system. The shutdown procedure sends the contents of the caches back to the disk and closes any open files. By shutting the system down and using standalone BACKUP, you can make an exact copy of the system disk.

You can keep standalone BACKUP on the system disk, a tape cartridge, a diskette, or any other media that the system supports. Digital recommends that you keep standalone BACKUP on your system disk and on a tape cartridge or diskette. Usually you boot standalone BACKUP from the system disk because it saves time. However, you need to keep a copy of standalone BACKUP on tape cartridge or diskette in case the system disk becomes damaged. As part of your distribution kit, you received standalone BACKUP on either a tape cartridge or a diskette.

4.1.1 Installing Standalone BACKUP on the System Disk

You can install standalone BACKUP in any available root directory on the system disk from [SYS1] to [SYSE]. However, Digital has established [SYSE] as the standard directory for standalone BACKUP.

To install standalone BACKUP in [SYSE] on the system disk, use the following procedure:

1. Log into the SYSTEM account.
2. Enter the following command and press Return:

   ```
   $ @SYS$UPDATE:STABACKIT SYS$SYSDEVICE:
   ```

   The procedure places the files in the directories [SYSE.SYSEXE] and [SYSE.SYS$LDR] on the system disk. It lists the files as they are copied. When the procedure finishes, it displays the following message:

   ```
   The kit is complete.
   ```

3. To boot standalone BACKUP from the system disk, go to Section 4.1.2.

4.1.2 Booting Standalone BACKUP from the System Disk

To boot standalone BACKUP from the system disk, use the following procedure:

1. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

   ```
   $ @SYS$SYSTEM:SHUTDOWN
   ```

   Answer the questions. When the procedure asks if an automatic system boot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

   ```
   SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
   ```

2. Press the HALT button.
3. Enter the BOOT command in the following format:

   ```
   >>> B/E0000000 ddcu
   ```

Substitute the device name of the system disk for *ddcu*. The device name of the system disk is either DUA0 or DUA1, depending on whether your system disk is in the system box, or an expansion box. If you do not specify the device name of the system disk, the system does a sniffer boot.

4. Standalone BACKUP displays the following message:

```
VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
```

5. The procedure might ask you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

```
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
```

6. The procedure displays a list of the local devices on your system and, if you have them, HSC and MSCP-served devices. For example:

```
Available device DUA0:                          device type Generic_DU
Available device MUA0:                          device type TK50
```

Check the list of devices. If the list is incomplete, make sure that all the drives are properly connected to the system. See your hardware manuals for details.

7. When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt ($):

```
%BACKUP-I-IDENT, Standalone BACKUP V5.4; the date is 19-JUN-1990 15:00
$
```

To make a backup copy of the system disk, go to Section 4.2. To restore the system disk, go to either Section 4.2.4 or Section 4.2.2.

4.1.3 Installing Standalone BACKUP on a Diskette

If your configuration includes a diskette drive, Digital recommends that you keep standalone BACKUP on a diskette in case the system disk becomes damaged. To install standalone BACKUP on an RX33 diskette, use the following procedure:

Note

If you have a diskette distribution kit, you should already have standalone BACKUP on a diskette. If the original diskette becomes damaged or if you need to make extra copies, use the procedure in this section.

1. Obtain one blank RX33 diskette. Write the name S/A BKUP V5.4 on the paper label. Affix the paper label to the diskette.
2. Log in to the SYSTEM account.
3. Insert the diskette labeled S/A BKUP V5.4 in the diskette drive.
4. Enter the following command and press Return:

```
$ @SYS$UPDATE:STABACKIT
```

Note

If you inserted the diskette in to the drive upside down, or if it is improperly aligned, you may receive the following error message:

```
%MOUNT-F-MEDOFL, medium is offline
```

If you receive this error message, remove the diskette from the drive and reinsert it.

5. The procedure asks for the name of the target device. Type DUA2 and press Return. For example:

```
%STABACKIT-I-SYMDEL, all global symbols deleted
Enter the name of the device on which to build the Kit: DUA2
```

6. The procedure displays the following message. Type Y (for YES) to initialize the diskette. For example:

```
Do you want to initialize _DUA2:?
Note that this will erase all files currently on the volume.

It is not necessary to initialize the disk, and you would not want to
initialize if you want to add a kit to an existing Files-11 disk. The
disk must be a valid Files-11 disk if you wish to skip initializing, however.

[Do you want to initialize [Yes/No, default No]:  Y
```

The procedure displays verification messages informing you that files are being copied. When the procedure finishes, it displays a message similar to the following:

```
Ending time   19-JUN-1990 13:45:29.90
Starting time 19-JUN-1990 13:22:39.05

The Kit is complete.

$
```

7. Remove the diskette labeled S/A BKUP V5.4 from the diskette drive.
8. Write-protect the diskette and store it in a safe place.

4.1.4 Booting Standalone BACKUP from a Diskette

If the system disk containing standalone BACKUP should become unusable, you can boot standalone BACKUP from an RX33 diskette. You need an RX33 diskette that contains standalone BACKUP (either the distribution diskette or one that you created). To boot standalone BACKUP from diskettes, use the following procedure:

1. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

   ```
   $ @SYS$SYSTEM:SHUTDOWN
   ```

   Answer the questions. When the procedure asks if an automatic system boot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

   ```
   SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
   ```

2. Press the HALT button.
3. Insert the standalone BACKUP diskette in to the diskette drive (DUA2).
4. Enter the following command and press Return:

   ```
   >>> B DUA2
   ```

5. Standalone BACKUP displays the following message:

```
VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
```

6. The procedure might ask you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

```
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
```

7. The procedure displays a list of the local devices on your system and, if you have them, HSC and MSCP-served devices. For example:

```
Available device DUA0:                          device type Generic_DU
Available device DUA2:                          device type RX33
```

When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt ($):

```
%BACKUP-I-IDENT, Standalone BACKUP V5.4; the date is 19-JUN-1990 15:00
$
```

8. Remove the standalone BACKUP diskette from the diskette drive.

To make a backup copy of the system disk, go to Section 4.2.

To restore the system disk, go to either Section 4.2.4 or Section 4.2.2.

4.1.5 Installing Standalone BACKUP on a Tape Cartridge

If your system has a tape cartridge drive, Digital recommends that you keep standalone BACKUP on a tape cartridge in case the system disk becomes damaged. To install standalone BACKUP on a tape cartridge, use the following procedure:

Note

You should have standalone BACKUP on the tape cartridge that came with your distribution kit. Use the procedure in this section if your copy of standalone BACKUP becomes damaged, or if you need to make extra copies.

1. Obtain one blank tape cartridge. Write the name S/A BKUP V5.4 on the paper label. Insert the label in the label slot.
2. Write-enable the tape cartridge.
3. Insert the tape cartridge labeled S/A BKUP V5.4 in to the drive.
4. Log in to the SYSTEM account.
5. Enter the following command and press Return:

```
$ @SYS$UPDATE:STABACKIT
```

6. The procedure asks you for the name of the target device. Type MUA0 and press Return. For example:

```
Enter the name of the device on which to build the kit: MUA0
```

7. The procedure displays the following message:

```
.
.
.
Please place the scratch tape cartridge in drive _MUA0:
This volume will receive the volume label SYSTEM.

Enter "YES" when ready:
```

8. When you are ready to continue, type Y (for YES) and press Return.
9. The system displays verification messages informing you that files are being copied.
10. When standalone BACKUP is installed, the procedure displays a message similar to the following:

```
Ending time   19-JUN-1990 16:44:29.90
Starting time 19-JUN-1990 16:30:39.05

The Kit is complete.

$
```

11. Remove the tape cartridge labeled S/A BKUP V5.4 from the tape cartridge drive.
12. Write-protect the tape cartridge and store it in a safe place.

4.1.6 Booting Standalone BACKUP from a Tape Cartridge

If the system disk containing standalone BACKUP should become unusable, you can boot standalone BACKUP from a tape cartridge. Booting standalone BACKUP from a tape cartridge takes approximately 20 minutes. You need a tape cartridge that contains standalone BACKUP (either the distribution tape cartridge or one that you created). To boot standalone BACKUP from a tape cartridge, use the following procedure:

1. If the VMS operating system is not running, go to step 2.

   If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

   ```
   $ @SYS$SYSTEM:SHUTDOWN
   ```

   Answer the questions. When the procedure asks if an automatic system boot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

   ```
   SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
   ```

2. Press the HALT button.
3. Insert the tape cartridge that contains standalone BACKUP in to the tape cartridge drive.
4. To boot standalone BACKUP, enter the following command at the console-mode prompt (>>>) and press Return:

   ```
   >>> B MUA0
   ```

5. Standalone BACKUP displays the following message:

   ```
   VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
   ```

6. The procedure might ask you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

```
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
```

7. The procedure displays a list of the local devices on your system and, if you have them, HSC and MSCP-served devices. For example:

```
Available device DUA0:                          device type Generic_DU
Available device MUA0:                          device type TK50
```

8. When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt ($):

```
%BACKUP-I-IDENT, standalone BACKUP V5.4; the date is 19-JUN-1990 15:50
$
```

9. Remove the tape cartridge containing standalone BACKUP from the tape cartridge drive.

   To make a backup copy of the system disk, go to Section 4.2.

   To restore the system disk, go to either Section 4.2.4 or Section 4.2.2.

4.2 Backing Up the System Disk

Standalone BACKUP uses a subset of Backup Utility qualifiers to back up and restore your system disk. It is especially important that you understand the functions of the /IMAGE and /PHYSICAL qualifiers to the BACKUP command before using standalone BACKUP.

Qualifier	Function
/IMAGE	Lets you create a functionally equivalent copy of the entire system disk.
/PHYSICAL	Copies, saves, restores, or compares the entire system disk in terms of logical blocks, ignoring any file structure.

For a complete description of the qualifiers for the Backup Utility see the *OpenVMS System Management Utilities Reference Manual* and the *OpenVMS System Manager's Manual*.

4.2.1 Backing Up the System Disk to Diskettes

To back up the system disk to diskettes, use the following procedure:

1. Boot standalone BACKUP as described in Section 4.1.2, Section 4.1.4, or Section 4.1.6.
2. Determine the device name of the system disk you are backing up.
   - DUA0—disk in the system box
   - DUA1—disk in the expansion box

Note

You use at least 25 diskettes to back up the system disk. Label the diskettes in sequence. The procedure asks you for each diskette until the operation is complete.

3. Write-enable a scratch diskette. To write-enable a diskette, remove the foil adhesive tab covering the write-protect notch.
4. Insert the diskette in the diskette drive.
5. Enter the BACKUP command in the following format and press Return:

   ```
   $ BACKUP/IMAGE/VERIFY source-drive: DUA2:saveset.BCK/SAVE_SET
   ```

   where:

   - *source-drive:* is the location of the files you want to back up. Use the device name of the system disk, either DUA0 (the disk in the system box) or DUA1 (the disk in the expansion box).
   - *saveset.BCK* is the name of the save set (the name should reflect the contents of the backup diskette and cannot exceed 17 characters).

   For example:

   ```
   $ BACKUP/IMAGE/VERIFY DUA0: DUA2:DEC_31_BACKUP.BCK/SAVE_SET
   ```

6. The procedure displays the following message:

   ```
   %BACKUP-I-STARTVERIFY, starting verification pass
   ```

7. The procedure displays the following messages:

   ```
   %BACKUP-I-RESUME, Resuming operation on volume 2
   %BACKUP-I-READYREAD, Mount volume 2 on DUA2: for writing
   Enter "YES" when ready.
   ```

   a. Remove the backup diskette from the drive.
   b. Label the diskette COMPLETE SYSTEM BACKUP, number it, and include the date.
   c. Write-protect the backup diskette.
   d. Write-enable another scratch diskette, and insert it in the drive.
   e. When you are ready to continue, Type Y (for YES) and press Return.
   f. The procedure displays the following message:

      ```
      %BACKUP-I-STARTVERIFY, starting verification pass
      ```

   Each time the procedure displays a mount request, follow steps a through e.

8. When the procedure is finished, it displays the following message:

   ```
   %BACKUP-I-PROCDONE, Operation completed. Processing finished at 19-JUN-1990
   15:30. If you do not want to perform another standalone BACKUP operation,
   use the console to halt the system.

   If you do want to perform another standalone BACKUP operation,
   ensure the standalone application volume is online and ready.
   Enter "YES" to continue:
   ```

9. Remove the last backup diskette from the drive. Label the diskette COMPLETE SYSTEM BACKUP, number it, and include the date.
10. Write-protect the diskette.
11. Press the HALT button.
12. Reboot the system disk.

Store the backup diskettes in a safe place.

Note

The BACKUP command creates a system disk that includes a Digital-provided set of volume parameters, including a CLUSTER_SIZE (disk access scheme) of one. (The CLUSTER_SIZE refers to the way files are stored on the disk, NOT to VAXclusters.) You can change most volume parameters later with the SET VOLUME command. However, to change the CLUSTER_SIZE you must back up the system disk to a disk that has been previously initialized with the CLUSTER_SIZE that you want. To prevent the BACKUP command from reinitializing the target disk, use the /NOINITIALIZE qualifier. For more information about initializing a disk, see the *OpenVMS System Manager's Manual*. For more information on the BACKUP command, see the *OpenVMS System Management Utilities Reference Manual*.

4.2.2 Restoring the System Disk from Diskettes

To restore the system disk from diskettes, use the following procedure:

1. Boot standalone BACKUP as described in Section 4.1.2, Section 4.1.4, or Section 4.1.6.
2. Determine the device name of the system disk which you are restoring.
   - DUA0—disk in the system box
   - DUA1—disk in the expansion box
3. Insert the first backup diskette in the diskette drive.
4. Enter the BACKUP command in the following format and press Return:

   ```
   $ BACKUP/IMAGE/VERIFY DUA2:save set.BCK/SAVE_SET target-drive:
   ```

   where:

   - *saveset.BCK* is the name of the save set.
   - *target-drive:* is the device name of the system disk which you are restoring, either DUA0 (the disk in the system box) or DUA1 (the disk in the expansion box).

   For example:

   ```
   $ BACKUP/IMAGE/VERIFY DUA2:DEC_31_BACKUP.BCK/SAVE_SET DUA0:
   ```

5. The procedure displays the following message:

   ```
   %BACKUP-I-STARTVERIFY, starting verification pass
   ```

6. The procedure displays the following messages:

   ```
   %BACKUP-I-RESUME, Resuming operation on volume 2
   %BACKUP-I-READYREAD, Mount volume 2 on DUA2: for reading
   Enter "YES" when ready.
   ```

   a. Remove the backup diskette from the drive.

   b. Make sure the next backup diskette is write-protected and insert it in the drive.

   c. When you are ready to continue, type Y (for YES) and press Return.

d. The procedure displays the following message:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

Each time the procedure displays a mount request follow steps a through c.

7. When the procedure is finished, it displays the following message:

```
%BACKUP-I-PROCDONE, Operation completed.  Processing finished at 19-JUN-1990
15:45.

If you do not want to perform another standalone BACKUP operation,
use the console to halt the system.

If you do want to perform another standalone BACKUP operation,
ensure the standalone application volume is online and ready.
Enter "YES" to continue:
```

8. Remove the last backup diskette from the diskette drive.
9. Press the HALT button.
10. Reboot the system.

Store the backup diskettes in a safe place.

4.2.3 Backing Up the System Disk to Tape Cartridges

To back up the system disk to tape cartridges, use the following procedure:

1. Obtain a scratch tape cartridge that you can use for the backup copy.
2. Write-enable the tape cartridge. To write-enable a tape cartridge, slide the write-protect switch away from the tape cartridge label.
3. Insert the tape cartridge in the tape cartridge drive.
4. Boot standalone BACKUP as described in either Section 4.1.2, Section 4.1.4, or Section 4.1.6.
5. Determine the device name of the system disk you are backing up.
   - DUA0—disk in the system box
   - DUA1—disk in the expansion box
6. Enter the BACKUP command in the following format:

```
$ BACKUP/IMAGE/VERIFY source-drive: MUA0:saveset.BCK/REWIND/LABEL=volume-label
```

where:

- *source-drive:* is the location of the files you want to back up. Use the device name of the system disk, either DUA0 (the disk in the system box) or DUA1 (the disk in the expansion box).
- *saveset.BCK* is the name of the save set. The name should reflect the contents of the tape (for example DEC_31_1988.BCK) and cannot exceed 17 characters in length.
- *volume-label* is the volume label of the tape cartridge in the drive. If the tape has been initialized already, use the same volume label that was assigned by the INITIALIZE command. If the tape cartridge has not been initialized, you can assign a volume label at this time. The volume label can have up to six characters.

For example:

```
$ BACKUP/IMAGE/VERIFY DUA1: MUA0:DEC_31_BACKUP.BCK/REWIND/LABEL=BACKUP
```

7. The procedure displays the following message:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

8. If your system disk contains more data than the tape cartridge can store, the procedure displays the following messages and prompt:

```
%BACKUP-I-RESUME, Resuming operation on volume 2
%BACKUP-I-READYWRITE, Mount volume 2 on _MUA0: for writing
Enter "YES" when ready.
```

   If you do not receive these messages, go to step 9.

   a. Remove the backup tape cartridge from the drive.

   b. Label it COMPLETE SYSTEM BACKUP, number it, and include the date.

   c. Write-protect the tape cartridge.

   d. Write-enable another scratch tape cartridge and insert it in the drive.

   e. When you are ready to continue, type Y (for YES) and press Return.

   f. The procedure displays the following message:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

      Each time the procedure displays a mount request, follow steps a through e.

9. When the procedure is finished, it displays the following message:

```
%BACKUP-I-PROCDONE, Operation completed. Processing finished at 19-JUN-1990
15:30. If you do not want to perform another standalone BACKUP operation,
use the console to halt the system.

If you do want to perform another standalone BACKUP operation,
ensure the standalone application volume is online and ready.
Enter "YES" to continue:
```

10. Remove the backup tape cartridge from the drive. Label the tape cartridge COMPLETE SYSTEM BACKUP, number it (if you used more than one tape), and include the date.

11. Write-protect the tape cartridge.

12. Press the HALT button.

13. Reboot the system.

    Store the backup tape cartridge in a safe place.

Note

The BACKUP command creates a system disk that includes a Digital-provided set of volume parameters, including a CLUSTER_SIZE (disk access scheme) of one. (The CLUSTER_SIZE refers to the way files are stored on the disk, NOT to VAXclusters.) You can change most volume parameters later with the SET VOLUME command. However, to change the CLUSTER_SIZE you must back up the system disk to a disk that has been previously initialized with the CLUSTER_SIZE that you want. To prevent the BACKUP command from reinitializing the target disk, use the /NOINITIALIZE qualifier. For more information about initializing a

disk, see the *OpenVMS System Manager's Manual*. For more information on the BACKUP command, see the *OpenVMS System Management Utilities Reference Manual*.

4.2.4 Restoring the System Disk from Tape Cartridges

To restore the system disk from tape cartridges, use the following procedure:

1. Boot standalone BACKUP as described in Section 4.1.2, Section 4.1.4, or Section 4.1.6.
2. Determine the device name of the system disk you want to restore.
   - DUA0—disk in the system box
   - DUA1—disk in the expansion box
3. Insert the first tape cartridge containing the backup of the complete system disk in the tape drive. Make sure the tape cartridge is write-protected.
4. Enter the BACKUP command in the following format and press Return:

   ```
   $ BACKUP/IMAGE/VERIFY MUA0:saveset.BCK/REWIND target-drive:
   ```

   where:

   - *saveset.BCK* is the name of the save set.
   - *target-drive:* is the device name of the system disk which you are restoring, either DUA0 (the disk in the system box) or DUA1 (the disk in the expansion box).

   For example:

   ```
   $ BACKUP/IMAGE/VERIFY MUA0:DEC_31_BACKUP.BCK/REWIND DUA0:
   ```

5. The procedure displays the following message:

   ```
   %BACKUP-I-STARTVERIFY, starting verification pass
   ```

6. If your system disk contained more data than one tape cartridge could store, you receive the following messages and prompt:

   ```
   %BACKUP-I-RESUME, Resuming operation on volume 2
   %BACKUP-I-READYREAD, Mount volume 2 on MUA0: for reading
   Enter "YES" when ready.
   ```

   If you do not receive these messages, go to step 7.

   a. Remove the backup tape cartridge from the drive.

   b. Insert the next backup tape cartridge in the drive.

   c. When you are ready to continue, type Y (for YES) and press Return.

   d. The procedure displays the following message:

      ```
      %BACKUP-I-STARTVERIFY, starting verification pass
      ```

      Each time the procedure displays a mount request, follow steps a through c.

7. When the procedure is finished, it displays the following message:

```
%BACKUP-I-PROCDONE, Operation completed. Processing finished at 19-JUN-1990
15:30. If you do not want to perform another standalone BACKUP operation,
use the console to halt the system.

If you do want to perform another standalone BACKUP operation, ensure the
standalone application volume is online and ready. Enter "YES" to continue:
```

8. Remove the last backup tape cartridge from the drive.
9. Press the HALT button.
10. Reboot the system.
11. Store the backup tape cartridge(s) in a safe place.

A

Configuring Devices

This appendix describes how to prevent the VAXstation 2000/MicroVAX 2000 from automatically configuring the devices in your system. It also describes how to use the CONNECT command to configure the devices in your system manually.

Note

Digital recommends that you let SYSGEN automatically configure the devices in your system.

The MicroVAX 2000/VAXstation 2000 automatically configures the devices attached to the system when you boot the system. This configuration is a static determination that can only be performed when the system boots. For example, if you leave an expansion box unplugged when the system boots, you cannot use the SYSGEN AUTOCONFIGURE command to configure the expansion box once the system has booted.

To configure devices that were turned off or unplugged when the system booted, reboot the system or manually configure the devices. Before you can configure the devices in your system manually, you must prevent autoconfiguration using the instructions in Section A.1.

A.1 Preventing Autoconfiguration

Although Digital recommends that you let the command procedure SYS$SYSTEM:STARTUP.COM start SYSGEN and configure the devices in your system, you can prevent a device from being configured.

The command procedure STARTUP.COM contains the SYSGEN command AUTOCONFIGURE ALL. This command uses the information in Table A–1 to configure the devices in your system. To prevent a device from being configured, you must set the SYSGEN parameter NOAUTOCONFIG to 1 as follows:

1. Log in to the system manager's account (SYSTEM). If the system manager menu is available, select option 1 to exit to DCL.
2. Enter the following command at the DCL prompt and press Return:

```
$ RUN SYS$SYSTEM:SYSGEN
```

3. Enter the following commands at the SYSGEN> prompt. Press Return after each one:

```
SYSGEN> USE CURRENT
SYSGEN> SHOW NOAUTOCONFIG
```

SYSGEN displays the following information:

```
Parameter Name          Current   Default   Minimum   Maximum  Unit   Dynamic
--------------          -------   -------   -------   -------  ----   -------
NOAUTOCONFIG                  0         0         0         1  Boolean     D
```

4. Enter the following commands at the SYSGEN> prompt. Press Return after each one:

```
SYSGEN> SET NOAUTOCONFIG 1
SYSGEN> SHOW NOAUTOCONFIG
```

SYSGEN displays the following information:

```
Parameter Name          Current   Default   Minimum   Maximum  Unit   Dynamic
--------------          -------   -------   -------   -------  ----   -------
NOAUTOCONFIG                  1         0         0         1  Boolean     D
```

5. Enter the following command at the SYSGEN> prompt and press Return:

```
SYSGEN> WRITE CURRENT
```

6. Reboot the system.

If you choose to prevent autoconfiguration, you should make sure that the base asynchronous serial ports are always autoconfigured. Enter the following command at the SYSGEN> prompt and press Return:

```
SYSGEN> AUTOCONFIGURE ALL/SELECT=TT:
```

Or you may enter the following command, making sure that you do not include "TT" in the list of device names:

```
SYSGEN> AUTOCONFIGURE ALL/EXCLUDE=(device-name[,...])
```

To configure the devices in your system manually, proceed to Section A.2.

A.2 Using the CONNECT Command

CAUTION

Use the CONNECT command with extreme caution. An incorrect command can cause the system to fail. Note that the "O" following the percent sign (%) in the /VECT argument is a capital letter O (abbreviation for octal), rather than a zero.

You can use the CONNECT command to configure devices manually after your system boots. Table A–1 shows the appropriate *csr_addr* values for the command's /CSR qualifier. These *csr_addr* values are offsets from the beginning of VAXstation 2000/MicroVAX 2000 I/O space, rather than the bus address value that you would specify for a UNIBUS device.

Table A–1 VAXstation 2000/MicroVAX 2000 Autoconfiguration Table

Device	Name	Driver	CSR (Offset)	No. of Vectors	First Vector	Vector Offset
Standard Serial Lines	TT	YEDRIVER	^X0800	2	^O300	4

(continued on next page)

Table A–1 (Cont.) VAXstation 2000/MicroVAX 2000 Autoconfiguration Table

Device	Name	Driver	CSR (Offset)	No. of Vectors	First Vector	Vector Offset
ST506 Disk Controller	DU	DVDRIVER	^X0C00	1	^O774	—
TK50 Tape Controller	MU	TVDRIVER	^X0C80	1	^O770	—
Ethernet Controller	ES	ESDRIVER	^X4E00	1	^O120	—
Black & White Video Option	VC	VEDRIVER	^X5000	1	^O104	—

The following are examples of CONNECT commands for VAXstation 2000/MicroVAX 2000 devices:

```
SYSGEN> CONNECT ESA0 /ADAP=0 /CSR=%X4E00 /VECT=%O120 /NUMV=01 /DRIVER=ESDRIVER
SYSGEN> CONNECT MUA0 /ADAP=0 /CSR=%X0C80 /VECT=%O770 /NUMV=01 /DRIVER=TVDRIVER
SYSGEN> CONNECT DUA0 /ADAP=0 /CSR=%X0C00 /VECT=%O774 /NUMV=01 /DRIVER=DVDRIVER
SYSGEN> CONNECT DUA1 /ADAP=0 /CSR=%X0C00 /VECT=%O774 /NUMV=01 /DRIVER=DVDRIVER
SYSGEN> CONNECT DUA2 /ADAP=0 /CSR=%X0C00 /VECT=%O774 /NUMV=01 /DRIVER=DVDRIVER
SYSGEN> CONNECT VCA0 /ADAP=0 /CSR=%X5000 /VECT=%O104 /NUMV=01 /DRIVER=VEDRIVER
```

To exit from SYSGEN, enter the following command at the SYSGEN> prompt and press Return:

```
SYSGEN> EXIT
```

B

VAXstation 2000/MicroVAX 2000 I/O Space

This appendix contains information about the physical addresses in the VAXstation 2000/MicroVAX 2000 I/O space.

Table B–1 lists the physical addresses in VAXstation 2000/MicroVAX 2000 I/O space where existing and configured components can be found. The VAXstation 2000/MicroVAX 2000 initialization procedures map various regions of this address space. All values in Table B–1 appear in hexadecimal radix.

VMS defines symbols for VAXstation 2000/MicroVAX 2000 physical addresses in the macro $IO410DEF and for the respective offsets from the virtual address contained in EXE$GL_CPUNODSP in the macro $KA410DEF. Both macros reside in SYS$LIBRARY:LIB.MLB.

When using the offsets defined by the $KA410DEF macro in system code, you must first obtain the starting address of nodespace and use the symbolic offsets as displacements from that address. The following example illustrates this technique:

```
MOVL    G^EXE$GL_CPUNODSP,R0          ;Get starting address of nodespace
MOVB    KA410$B_INTMSK(R0),R1         ;Get interrupt mask register
```

Table B–1 VAXstation 2000/MicroVAX 2000 Address Map

Physical Reference		Contents	Virtual Reference
Physical Address	**Symbol**	**Description**	**Symbol**
System Board Addresses			
00000000—001FFFFF	—	System board RAM	—
00200000—00FFFFFF	—	Memory option board RAM	—
20020000	IO410$AB_CFGTST	Configuration and test register (on read) I/O reset register (on write)	KA410$B_CFGTST
20040000—2007FFFF	—	System board ROM	—
20040004	IO410$AL_SIDEX	System ID extension register	KA410$L_SIDEX
20040020—2004003F	—	Interrupt vector numbers	—
20080000	IO410$AL_HLTCOD	Halt code register	KA410$L_HLTCOD

(continued on next page)

Table B–1 (Cont.) VAXstation 2000/MicroVAX 2000 Address Map

Physical Reference		Contents	Virtual Reference
Physical Address	**Symbol**	**Description**	**Symbol**
System Board Addresses			
20080004	IO410$AL_MSER	Memory system error register	KA410$L_MSER
20080008	IO410$AL_MEAR	Memory error address register	KA410$L_MEAR
2008000C	IO410$AB_INTMSK	Interrupt mask register	KA410$B_INTMSK
2008000D	IO410$AB_VDCORG	Monochrome display origin	KA410$B_ VDCORG
2008000E	IO410$AB_VDCSEL	Video interrupt select	KA410$B_VDCSEL
2008000F	IO410$AB_INTREQ	Interrupt request register (on read)	KA410$B_INTREQ
	IO410$AB_INTCLR	Interrupt request clear (on read)	KA410$B_INTCLR
20090000—2009007F	IO410$AB_NIADRS	Network address ROM	KA410$B_NIADRS
200A0000—200A000F	IO410$AW_SERCSR	Serial line controller	KA410$W_ SERCSR
200B0000—200B00FF	IO410$AL_TODSEC	Time-of-year clock and non-volatile RAM	KA410$L_TODSEC
200C0000—200C0007	IO410$AB_DKCREG	Disk controller ports	KA410$B_ DKCREG
200C0080—200C009F	IO410$AB_SCTLS	TK50 controller chip	KA410$B_SCTLS
200C00A0	IO410$AB_SCDADR	TK50 DMA address register	KA410$B_SCDADR
200C00C0	IO410$AW_SCDCNT	TK50 DMA byte count register	KA410$W_ SCDCNT
200C00C4	IO410$AB_SCDDIR	TK50 DMA transfer direction	KA410$B_SCDDIR
200D0000—200D3FFF	IO410$AB_DKBUFS	Disk/tape data buffer RAM	KA410$B_ DKBUFS
200F0000—200F003F	IO410$AW_VCCMD	Monochrome video cursor chip	KA410$W_VCCMD
30000000—3001FFFF	IO410$AB_VMEMS	Monochrome video RAM	—
Option Board Addresses			
200E0000—200EFFFF	IO410$AW_NIRDP	Network option, signal NIENA	KA410$W_NIRDP
22000000—23FFFFFF	IO410$AB_PCCSR	Future option CSRs	KA410$B_PCCSR
24000000—25FFFFFF	IO410$AB_XCSR	Future option CSRs	KA410$B_XCSR
20100000—2013FFFF	IO410$AB_NIROMS	Network option ROM	KA410$B_NIROMS

(continued on next page)

Table B–1 (Cont.) VAXstation 2000/MicroVAX 2000 Address Map

Physical Reference		Contents	Virtual Reference
Physical Address	**Symbol**	**Description**	**Symbol**
Option Board Addresses			
20140000—2017FFFF	IO410$AB_VDROMS	Video option ROM	KA410$B_ VDROMS
20180000—201BFFFF	IO410$AB_PCROMS	Additional option 1 ROM	KA410$B_ PCROMS
201C0000—201FFFFF	IO410$AB_XROMS	Additional option 2 ROM	KA410$B_XROMS
38000000—3BFFFFFF	IO410$AB_VDCSR1	Video option (32-bit path)	KA410$B_VDCSR1
3C000000—3C00FFFF	IO410$AB_VDCSR2	Video option (16-bit path)	KA410$B_VDCSR2
Ethernet Network Option Board Addresses			
200E0000—200E0007	IO410$AW_NIRDP	DESVA registers	KA410$W_NIRDP
20100000—2011FFFF	IO410$AB_NIROMS	Firmware ROM	KA410$B_NIROMS

C

VAXstation 2000/MicroVAX 2000 Disk Driver

Digital Storage Architecture (DSA) disk operation. In particular, the driver supports block revectoring and bad block replacement. These functions provide the system with a logically perfect disk medium.

Like other DSA disks, if a serious error occurs during a replacement operation, the disk becomes write-protected to prevent further changes. This is done to preserve data integrity and minimize damage that could be caused by failing hardware. Unlike other DSA disks, there is no visible indication on the drive itself that it is write-protected.

You can tell that the disk is write-protected by the following indications:

- ERRFMT messages
- The disk enters mount verification and hangs
- DCL command SHOW DEVICE output indicates that the disk is write-locked
- Error messages from programs and utilities attempt to write to the disk

If the disk becomes write-protected, use the following procedure:

1. Shut down the system.
2. Use standalone BACKUP to create a full backup of the disk.
3. Format the disk with the disk formatter.
4. Restore the disk from the backup using standalone BACKUP. Note that any files with sectors flagged with a forced error may be corrupted and need to be restored from a previous backup.

If chronic errors occur during replacement operations, call Digital Customer Service.

Glossary

boot or bootstrap

The process of loading system software into a processor's main memory. This guide uses the term *boot* to refer to this process.

boot server

A computer that is part of a local area VAXcluster. The boot server in a local area VAXcluster has a system disk that contains cluster common files; other nodes in the cluster (satellite nodes) can access these files. See also satellite node.

console mode

In console mode, you control the system by entering console-mode commands. In console mode, the VMS operating system is not running.

device name

The name you use to identify a device on the system. A device name indicates the device code, controller designation, and unit number.

local area VAXcluster

Consists of a VAX computer that acts as a boot server and a number of low-end VAX computers that act as satellite nodes. Ethernet connects all of the computers. These computers share a single file system. See also boot server and satellite node.

media

A generic term that refers to any packaging agent capable of storing computer software. Examples of media are magnetic tapes, diskettes, disk packs, compact disks (CD–ROM), and tape cartridges.

mixed-interconnect VAXcluster

A computer system consisting of a number of VAX computers. It uses both the computer interconnect (CI) and the Ethernet to communicate with other VAX computers in the cluster.

program mode

In program mode, the CPU is running and the system is controlled by the VMS operating system. In program mode, you can enter DCL commands, run programs, and receive system messages. See also console mode.

satellite node

A computer that is part of a local area VAXcluster. A satellite node is booted remotely from the system disk of the boot server in the local area VAXcluster. See also boot server.

save set

The format that the Backup Utility stores files in. The VMS operating system is shipped in this format.

scratch media

Media that are blank or have files that you no longer need. For example, a scratch tape cartridge.

sniffer boot

A type of system boot where you do not specify a device name. During a sniffer boot, the system successively attempts to boot devices until it finds one that it can boot from.

standalone Backup

A version of the Backup Utility that is booted into memory. It runs without the control of the VMS operating system.

system disk

The disk that contains (or will contain) the VMS operating system. A VMS system disk is set up so that most of the VMS files can be shared by several computers. In addition, each computer has its own directory on the system disk that contains its page, swap, and dump files.

VAXcluster environment

A computer system consisting of a number of highly integrated VAX computers. There are three types of VAXcluster environments: CI-only, local area, and mixed-interconnect.

Index

W

How to Order Additional Documentation

Technical Support

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

Electronic Orders

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

Telephone and Direct Mail Orders

From	Call	Write
U.S.A.	DECdirect Phone: 800-DIGITAL (800-344-4825) FAX: (603) 884-5597	Digital Equipment Corporation P.O. Box CS2008 Nashua, NH 03061
Puerto Rico	Phone: (809) 781-0505 FAX: (809) 749-8377	Digital Equipment Caribbean, Inc. 3 Digital Plaza, 1st Street Suite 200 Metro Office Park San Juan, Puerto Rico 00920
Canada	Phone: 800-267-6215 FAX: (613) 592-1946	Digital Equipment of Canada Ltd. 100 Herzberg Road Kanata, Ontario, Canada K2K 2A6 Attn: DECdirect Sales
International	————	Local Digital subsidiary or approved distributor
Internal Orders[1] (for software documentation)	DTN: 241-3023 (508) 874-3023	Software Supply Business (SSB) Digital Equipment Corporation 1 Digital Drive Westminster, MA 01473
Internal Orders (for hardware documentation)	DTN: 234-4325 (508) 351-4325 FAX: (508) 351-4467	Publishing & Circulation Services Digital Equipment Corporation NR02-2 444 Whitney Street Northboro, MA 01532

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

Reader's Comments

OpenVMS VAX Upgrade and Installation Supplement: VAXstation 2000, MicroVAX 2000
AA–PS6YA–TE

Your comments and suggestions help us improve the quality of our publications.

Thank you for your assistance.

I rate this manual's:	Excellent	Good	Fair	Poor
Accuracy (product works as manual says)	☐	☐	☐	☐
Completeness (enough information)	☐	☐	☐	☐
Clarity (easy to understand)	☐	☐	☐	☐
Organization (structure of subject matter)	☐	☐	☐	☐
Figures (useful)	☐	☐	☐	☐
Examples (useful)	☐	☐	☐	☐
Index (ability to find topic)	☐	☐	☐	☐
Page layout (easy to find information)	☐	☐	☐	☐

I would like to see more/less _____

_____

_____

What I like best about this manual is _____

_____

_____

What I like least about this manual is _____

_____

_____

I found the following errors in this manual:

Page	Description
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Additional comments or suggestions to improve this manual:

_____

_____

_____

_____

For software manuals, please indicate which version of the software you are using: _____

_____

Name/Title _____ Dept. _____

Company _____ Date _____

Mailing Address _____

_____ Phone _____

---- Do Not Tear - Fold Here and Tape ----

digital™

No Postage Necessary if Mailed in the United States

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 33 MAYNARD MASS.

POSTAGE WILL BE PAID BY ADDRESSEE

DIGITAL EQUIPMENT CORPORATION
OpenVMS Documentation
110 SPIT BROOK ROAD ZKO3–4/U08
NASHUA, NH 03062–2642

---- Do Not Tear - Fold Here ----

Reader's Comments

OpenVMS VAX Upgrade and Installation Supplement: VAXstation 2000, MicroVAX 2000
AA–PS6YA–TE

Your comments and suggestions help us improve the quality of our publications.

Thank you for your assistance.

I rate this manual's:	Excellent	Good	Fair	Poor
Accuracy (product works as manual says)	☐	☐	☐	☐
Completeness (enough information)	☐	☐	☐	☐
Clarity (easy to understand)	☐	☐	☐	☐
Organization (structure of subject matter)	☐	☐	☐	☐
Figures (useful)	☐	☐	☐	☐
Examples (useful)	☐	☐	☐	☐
Index (ability to find topic)	☐	☐	☐	☐
Page layout (easy to find information)	☐	☐	☐	☐

I would like to see more/less _____

_____

_____

What I like best about this manual is _____

_____

_____

What I like least about this manual is _____

_____

_____

I found the following errors in this manual:

Page	Description
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Additional comments or suggestions to improve this manual:

_____

_____

_____

_____

For software manuals, please indicate which version of the software you are using: _____

_____

Name/Title _____ Dept. _____

Company _____ Date _____

Mailing Address _____

_____ Phone _____

Do Not Tear - Fold Here and Tape

digital™

No Postage Necessary if Mailed in the United States

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 33 MAYNARD MASS.

POSTAGE WILL BE PAID BY ADDRESSEE

DIGITAL EQUIPMENT CORPORATION
OpenVMS Documentation
110 SPIT BROOK ROAD ZKO3–4/U08

NASHUA, NH 03062–2642

Do Not Tear - Fold Here