

# VAX 4000 Model 300

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**digital**

**Operation**

Order Number: EK-336AB-OP-002

# **VAX 4000 Model 300 Operation**

Order Number EK-336AB-OP-002

**Digital Equipment Corporation  
Maynard, Massachusetts**

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March 1990, July 1990

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This document was prepared using VAX DOCUMENT, Version 1.2.

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# Preface

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This manual describes how to use VAX 4000 Model 300 timesharing and VAXserver 4000 Model 300 server systems. The hardware and software for each of these systems differs slightly, according to the function of the system. The VAX 4000 is a multiuser system that uses the VMS operating system. The VAXserver 4000 system is a single-user system that uses VMS or VAXELN operating systems. Both systems can function as an end- or full-function node on an Ethernet network.

The manual is structured as follows:

- Chapter 1 provides an overview of the systems.
- Chapter 2 describes how to use each system.
- Chapter 3 describes how to use options installed in the systems.
- Appendix A lists related documentation.
- Appendix B describes how to set and examine internal parameters for RF-series ISAs.
- Appendix C describes procedures for creating backup files.
- Appendix D describes how to use VMSTAILOR to remove unwanted VMS files from the system disk.
- A glossary explains key terms.

**NOTE:** *VAXserver systems are designed to offer maximum performance for applications that do not require timesharing. Some of the devices referred to in this manual are designed for multiuser systems and may not be suitable for server systems. Contact your Digital service representative if you have any questions about whether use of a specific device is appropriate for your server system.*

# Conventions

The following conventions are used in this manual:

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<b>Convention</b>	<b>Meaning</b>
<b>Key</b>	A symbol denoting a terminal key used in text and examples in this book. For example, <b>Break</b> indicates that you press the Break key on your terminal keypad. <b>Return</b> indicates that you press the Return key on your terminal keypad.
<b>Ctrl/C</b>	A symbol indicating that you hold down the Ctrl key while you press the C key.
<b>BOLD</b>	This bold type indicates user input. For example:  <b>&gt;&gt;&gt;BOOT MUA0</b>  This line shows that the user must enter <b>BOOT MUA0</b> at the console prompt.
<b>NOTE</b>	Provides general information about the current topic.
<b>CAUTION</b>	Provides information to prevent damage to equipment or software.
<b>WARNING</b>	Provides information to prevent personal injury.

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# Chapter 1

## System Overview

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VAX 4000 systems house all components in a BA440 enclosure. This enclosure is a free-standing pedestal that houses the following:

- Card cage
- System controls
- Central processing unit (CPU) module
- Memory modules
- Communications controller modules
- Tape drive controller module
- Console module
- RF-series Integrated Storage Assemblies
- TK70 or TLZ04 tape drive
- Power supply
- Fans

Up to four RF-series Integrated Storage Assemblies (ISAs), or three RF-series ISAs and a tape drive, can be mounted inside the BA440 enclosure.

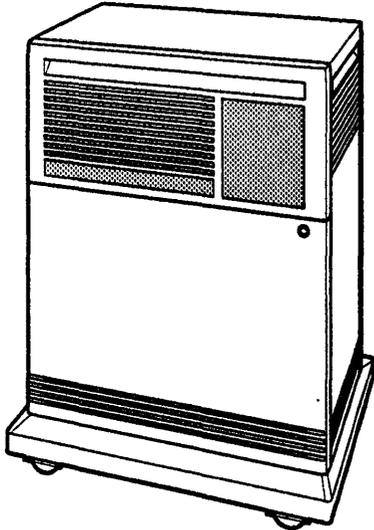
This chapter describes the VAX 4000 system components and their functions.

Chapters 2 and 3 describe how to use the system and options.

### 1.1 Front View and Physical Description

The front of the system has a divided door that restricts access to the system controls. Figure 1-1 shows the system with the front door closed.

**Figure 1-1: VAX 4000 System**

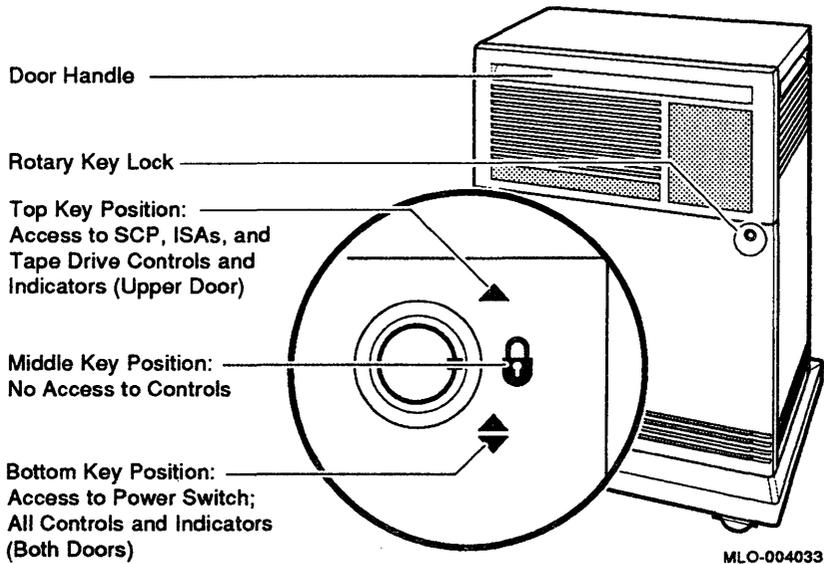


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A three-position rotary lock allows you to lock both the upper and lower doors, or to lock just the lower door. Opening the upper door allows you to access the controls for the RF-series Integrated Storage Assemblies (ISAs), TK70 or TLZ04 tape drive, and the System Control Panel (SCP). Opening the entire door allows you to access all system controls and cable connections.

Figure 1-2 shows the three key positions and the controls accessible in each position.

**Figure 1-2: Key Positions**



### **Opening and Closing the Divided Door**

The divided door allows you to access the mass storage devices and system control panel (SCP), while restricting access to the power switch and the console module. Open and close the door as follows:

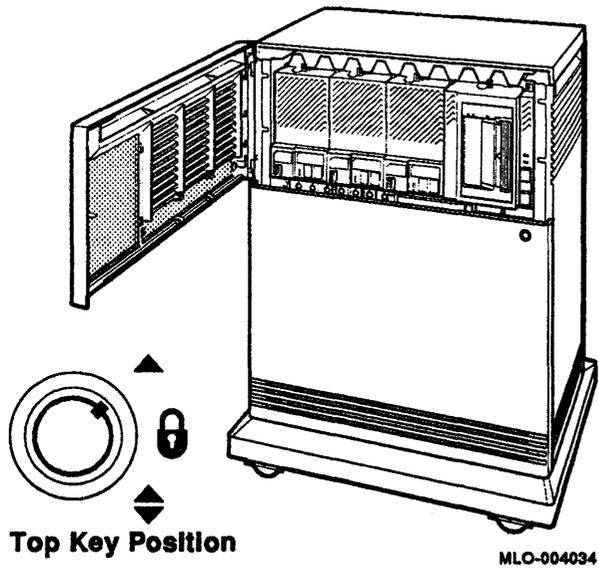
1. Insert the key in the lock on the front door. Turn the key to the top position to open just the upper portion of the door, or to the bottom position to open the entire door.

With the key in the bottom position, the upper and lower portions of the door will open together.

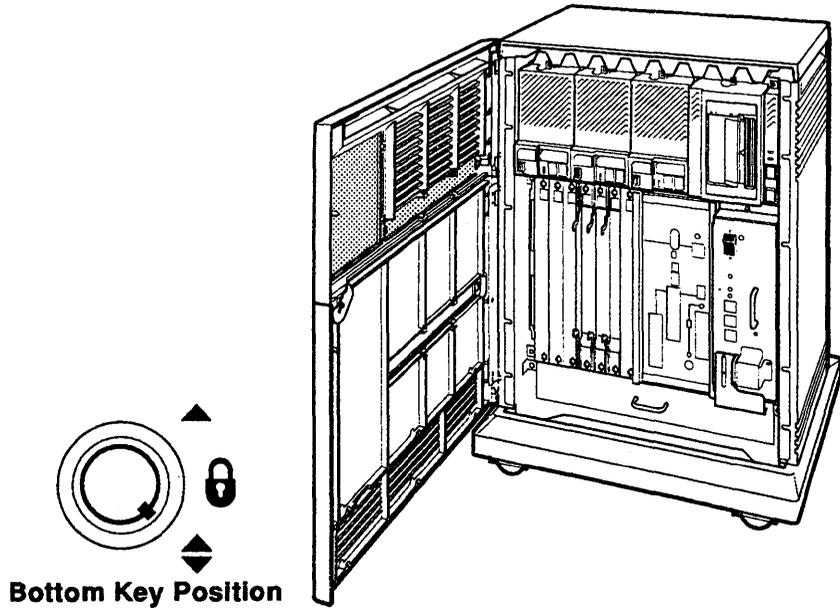
2. Swing the door open.
3. To close the door, simply reverse the procedure. When pushing the doors closed, push gently at the top right of the upper door and the bottom right of the lower door.

Figure 1-3 shows the system with the upper portion of the door opened. Figure 1-4 shows the system with the entire door opened.

**Figure 1-3: Upper Door Opened**



**Figure 1-4: Entire Door Opened**



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The next section describes the BA440 enclosure, which is exposed when you open the entire door.

### **1.1.1 The BA440 Enclosure**

Opening the front door enables you to access the components housed in the BA440 enclosure. Figure 1-5 shows a typical configuration.

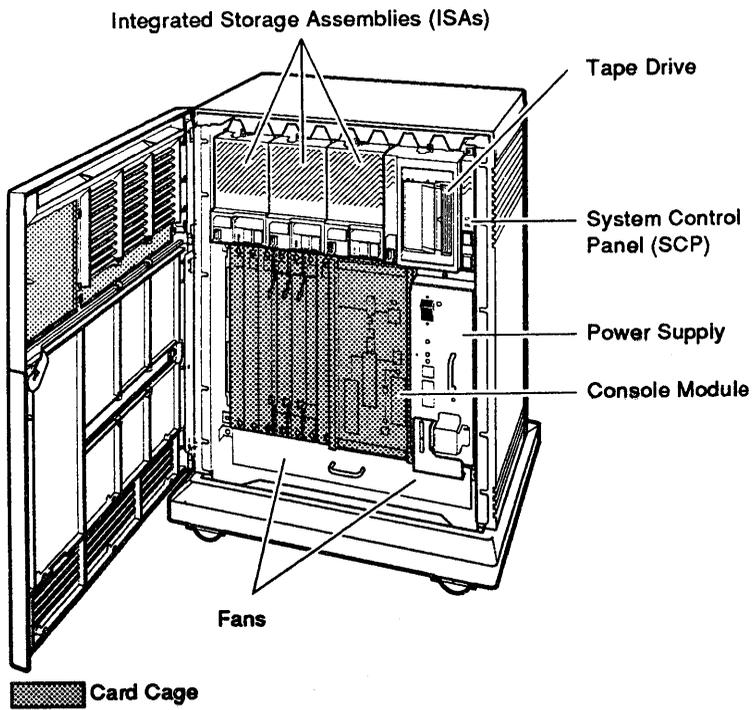
The BA440 enclosure can contain the following:

- Mass storage — TK70 or TLZ04 tape drive and up to three RF-series Integrated Storage Assemblies (ISAs), or four RF-series ISAs and no tape drive

All VAX 4000 systems contain the following:

- System control panel (SCP)
- Card cage containing modules — CPU, memory, communications controllers, mass storage controllers
- Console module
- Power supply
- Fans

**Figure 1-5: Front View of the BA440 Enclosure**

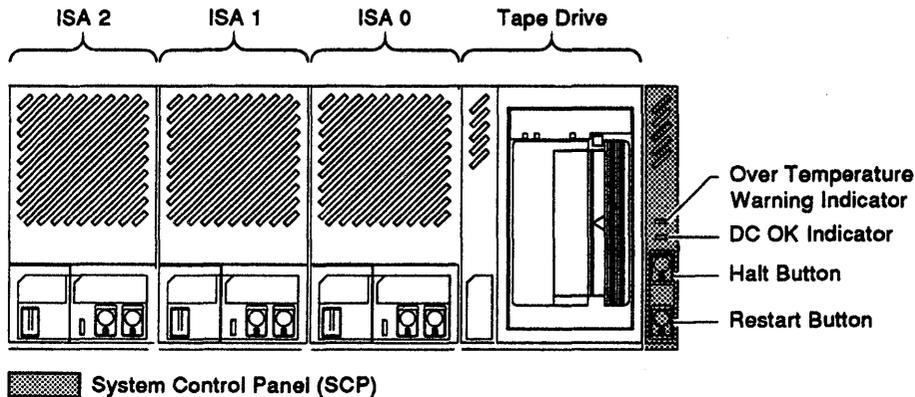


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### 1.1.1.1 Mass Storage Shelf

The mass storage shelf extends across the top of the enclosure. The shelf contains a system control panel (SCP), tape drive, and up to three RF-series ISAs (tapeless systems can have up to four RF-series ISAs). Each ISA has its own panel with controls and indicators. Instructions for using ISAs and the TK70 or TLZ04 tape drive are in Chapter 3. The SCP is to the right of the storage devices. Figure 1-6 shows the mass storage shelf.

Figure 1-6: Mass Storage Shelf



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The SCP has two indicators: the Over Temperature Warning light and the DC OK light. The red Over Temperature Warning indicator flashes to indicate that the system's internal temperature is approaching a level that may cause system components to overheat. In addition to the flashing Over Temperature Warning light, an audible alarm also provides warning of a possible over temperature condition. If the components continue to heat, the system will automatically shut down to prevent components from being damaged. Chapter 2 provides instruction for turning on the system after a preventive shutdown due to overheat conditions.

The green DC OK light indicates that the power supply voltages are within the correct operating range. If the DC OK light is not lit when the system power is on, refer to the *VAX 4000 Troubleshooting and Diagnostics* manual included in the Customer Hardware Information Kit.

Below the indicators are the Halt and Restart buttons. The Halt button is a two-position button. When you press the button, the system halts. A red indicator on the Halt button lights when the button is set to the in position. Before you can enter console commands, press the Halt button again to

return it to the out position. When the Halt button is returned to the out position, the console mode prompt >>> is displayed on the console terminal screen. Now you can enter console commands. If you inadvertently press the Halt button, type "c Return" to continue. Chapter 2 describes halting the system in more detail.

**CAUTION:** *Pressing the Halt button halts the system regardless of the setting of the Break Enable/Disable switch on the console module.*

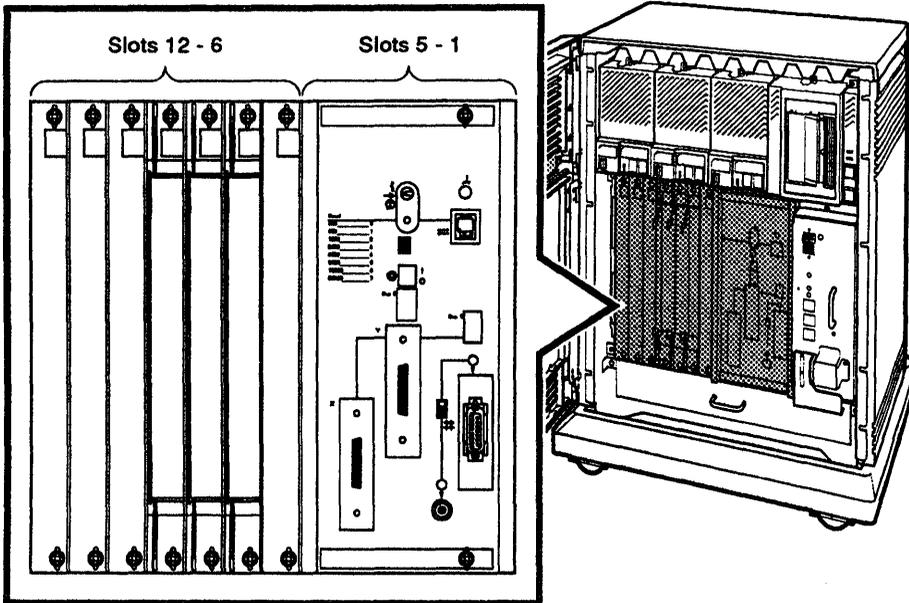
Below the Halt button is the Restart button. The Restart button has a green indicator. When you press the Restart button, the system returns to a power-on condition and self-tests are run. If you have specified a device as the boot device and if the Break/Enable Disable switch is set to disable, the system will reboot system software. Further instructions on restarting your system are in Chapter 2.

**NOTE:** *The Halt and Restart buttons can be disabled to prevent accidental activation. Contact your Digital service representative if you want to disable the controls on the SCP.*

#### **1.1.1.2 Card Cage**

The modules in your system are mounted in a 12-slot card cage under the mass storage shelf, as shown in Figure 1-7.

**Figure 1-7: Card Cage**



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The first four slots are reserved for memory modules. The fifth slot is reserved for the central processing unit (CPU). A console module with system controls and connectors covers these first five slots. Slots 6 through 12 are available for Q-bus option modules.

The number and type of modules installed in your system depend on your configuration. Each Q-bus slot, even an empty one, is protected by a module cover. Together the covers form a shield with a three-fold purpose:

- To protect external devices from electrical interference generated by the system
- To protect the system from electrical interference generated by external devices
- To maintain air flow integrity

**CAUTION:** *Do not operate the system without Digital-supplied module covers. The covers are required to protect the equipment and to meet international regulatory standards. Do not substitute other module covers as they may not meet the required specifications.*

*Operating the system without the module covers has the following consequences:*

- *The system may overheat due to improper air circulation.*
- *The system will not comply with FCC and VDE requirements for electrostatic shielding and may produce electrical interference that affects other equipment.*
- *The system is susceptible to electrical interference or damage from external sources.*

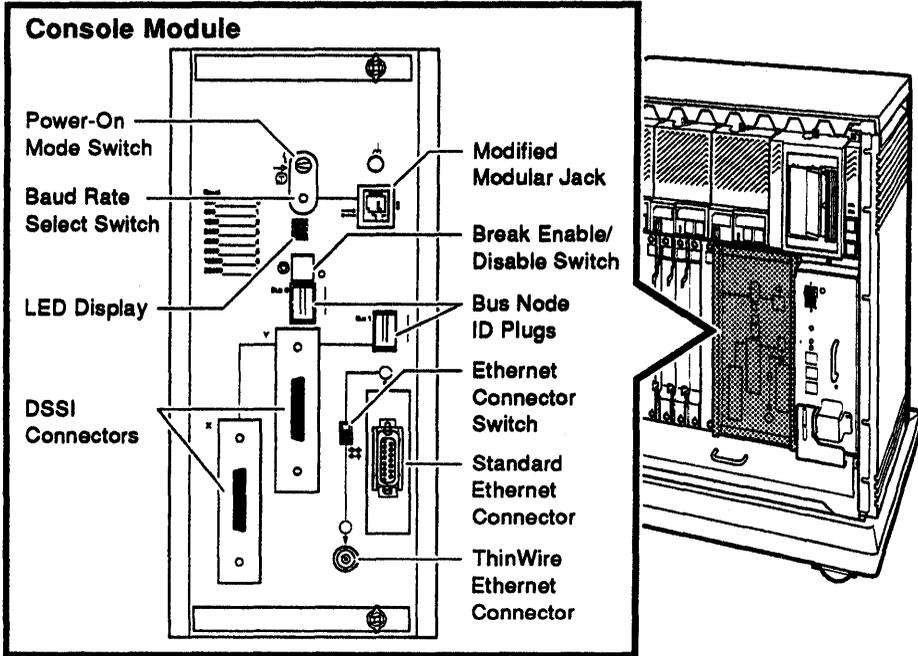
The design of the module covers varies, depending on the type of module installed in the slot. Modules requiring external cable connections, such as communications controllers, have recessed covers that are riveted directly to the module. The recessed module covers allow space for connecting cables. Modules requiring no external cable connections, such as mass storage controllers, are covered by flush covers. Empty slots are also covered by flush covers which may be single or double width. All covers, except those covering empty slots, have a label identifying the module installed in the slot.

Cables connecting your system to peripheral devices (such as terminals, modems, and printers) are attached to communications controllers. Each cable can contain multiple lines. The cables run under the BA440 enclosure and out the back or side of the enclosure, where the cables are split into individual lines. Chapter 3 describes these connections in more detail.

### **1.1.1.3 Console Module**

Your system can have up to four memory modules. The memory modules occupy the first four slots of the card cage and are followed by the CPU. The memory and CPU modules are behind the console module that covers the first five slots. The console module, shown in Figure 1-8, has several system controls and connectors.

**Figure 1-8: Console Module Controls and Connectors**



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The console module has the following components:

- **Power-On Mode switch** — This three-position rotary switch determines how the system responds at power-on:
  - ① **Language Inquiry Mode** (in the top position, indicated by a profile of a face) causes the system to display a language selection menu at power-on if your console terminal supports multiple languages. Also, if a default boot device has not been selected, this mode causes the system to issue a list of bootable devices and prompts you to select a device from the list. Once a device is selected, the system autoboots from that device each time you turn it on.



Run Mode (in the middle position, indicated by an arrow) is the normal operating setting.



Loop Back Test Mode (in the bottom position, indicated by a T in a circle) causes the system to run loopback tests on the console serial line at power-on. This setting requires special loopback connectors and is for Digital Customer Services use only.



**Baud Rate Select switch** — The Baud Rate Select switch is used to set the system's baud rate to match that of the console terminal. The factory setting is position 5 (9600).



**Modified modular jack (MMJ)** — This console terminal connector provides the connection for the console terminal.



The light-emitting diode (LED) display shows the testing sequence during power-on.



**Break Enable/Disable switch** — When the switch is down (position 0), breaks are disabled. When the switch is up (position 1), breaks are enabled. When breaks are enabled, pressing **Break** on the console terminal halts the processor and transfers control to the console program. Using the console command **SET CONTROLP**, you can specify the control character, **Ctrl/P**, rather than **Break** to initiate a break signal.

The Break Enable/Disable switch also controls what happens at power-on. When breaks are disabled (down, position 0), the system attempts to automatically boot software at power-on. When breaks are enabled (up, position 1), the system enters console mode (indicated by the >>>prompt) at power-on.

Using the console command, **SET HALT REBOOT** or **SET HALT RESTART\_REBOOT**, you can set your system to automatically boot software after the system is halted due to pressing **Break**.



**Bus node ID plugs** — VAX 4000 systems have two separate Digital Storage System Interconnect (DSSI) busses. Two DSSI bus node ID plugs, one for the internal DSSI bus, Bus 0, and one for the external bus, Bus 1, identify the bus node of the

CPU. These plugs are configured at the factory. For single-host systems, Bus 0 is identified as bus node 6, bus 1 is identified as bus node 7; for dual-host systems, both busses on the first host are identified as bus node 7, and both busses on the second host are identified as bus node 6.

- **DSSI connectors (DSSI Bus 1) —** Two Digital Storage System Interconnect (DSSI) connectors, labeled X and Y, on the console module allow you to expand your system by connecting additional mass storage devices to the second DSSI bus.

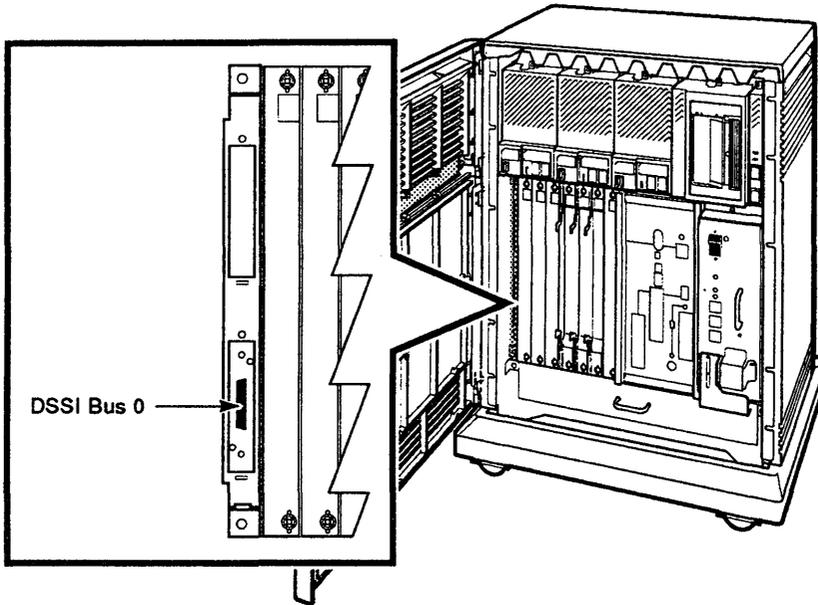


**Ethernet connectors —** The console module has two Ethernet connectors: a BNC-type connector for ThinWire Ethernet, and a 15-pin connector for a standard Ethernet transceiver cable. The Ethernet connector switch allows you to set the type of connection. To use the standard transceiver cable connection, set the switch to the up position. To use the ThinWire cable connection, set the switch to the down position. A green indicator light (LED) for each connector indicates which connection is active.

#### **1.1.1.4 DSSI Connector (DSSI Bus 0)**

To the left of the card cage is the DSSI connector for DSSI Bus 0. Bus 0 provides the DSSI bus for ISAs installed in the system enclosure. The connector allows you to expand your system by connecting additional mass storage devices to the bus. You can also share mass storage devices with a second system by forming a dual-host configuration. Figure 1-9 shows the location of the DSSI connector for DSSI Bus 0.

**Figure 1-9: Connector for DSSI Bus 0**



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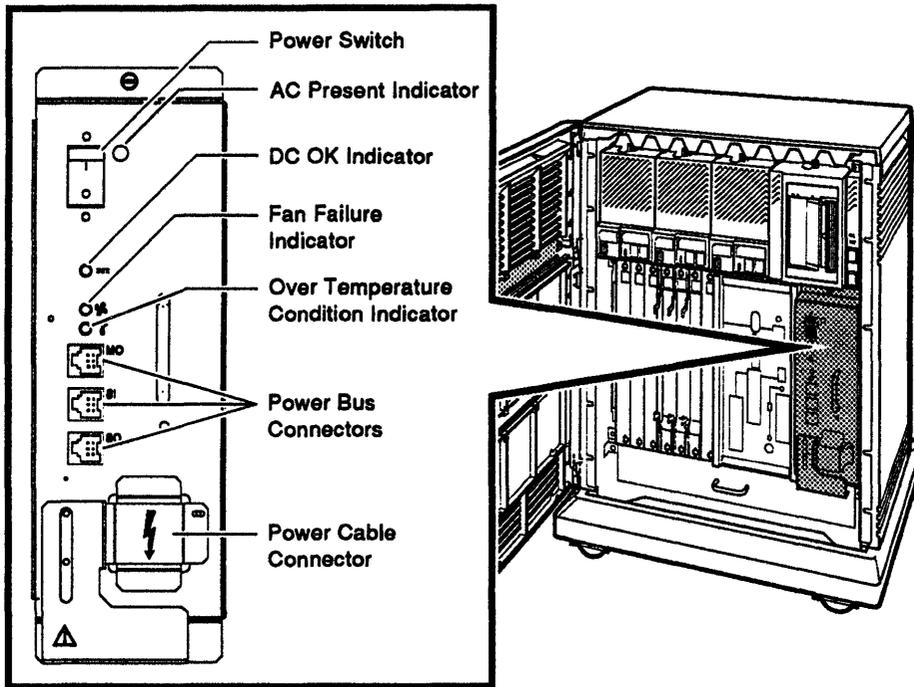
### **1.1.1.5 Power Supply Controls and Indicators**

To the right of the card cage is the power supply. The power supply provides power to the mass storage devices, the modules installed in the card cage, and the fans.

To prevent damage due to overheating, the power supply monitors the internal temperature and the speed of the fans. If the power supply detects overheating or a fan failure, the power supply will shut down the system.

Figure 1-10 shows the controls and indicators on the power supply.

**Figure 1-10: Power Supply Controls and Indicators**



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The controls and indicator lights function as follows:



**Power switch** — The power switch is used to turn system power on and off. The off position is indicated by a 0; the on position is indicated by a 1.

The power switch also functions as the system circuit breaker. In the event of a power surge, the breaker will trip, causing the power switch to return to the off position (0). Turning the system on resets the circuit breaker. If the circuit breaker trips, wait one minute before turning on the system back on.

- **AC Present Indicator** — The orange AC Present indicator lights when the power switch is set to on and voltage is present at the input of the power supply. If the AC Present indicator does not

light when the power switch is set to on, refer to your *VAX 4000 Troubleshooting and Diagnostics* manual.



**DC OK** — When the green DC OK indicator is lit, the power supply voltages are within the correct operating range. If the DC OK indicator does not light when the power switch is set to on, refer to your *VAX 4000 Troubleshooting and Diagnostics* manual.



**Fan Failure indicator** — The amber Fan Failure indicator lights if either of the two cooling fans stop working. The power supply will automatically shut down the system as a precautionary measure when a fan failure is detected. Call your Digital service representative if a fan failure occurs.



**Over Temperature Condition indicator** — The amber Over Temperature Condition indicator lights if the enclosure has shut down due to an over temperature condition. Section 2.9 provides instructions on recovering from an over temperature condition.



**Power bus connectors** — Three power bus connectors allow you to configure a power bus for systems expanded with the R400X or B400X expander. The power bus allows you to turn power on and off for one or more expanders through the power supply designated as the main power supply: this way, one power switch can control power for an entire expanded system. Figure 1-11 illustrates a possible power bus configuration for an expanded system.

**NOTE:** *Dual-host systems should not be configured with a power bus. Inadvertently shutting off a host system defeats the added reliability of a dual-host system.*

**MO**

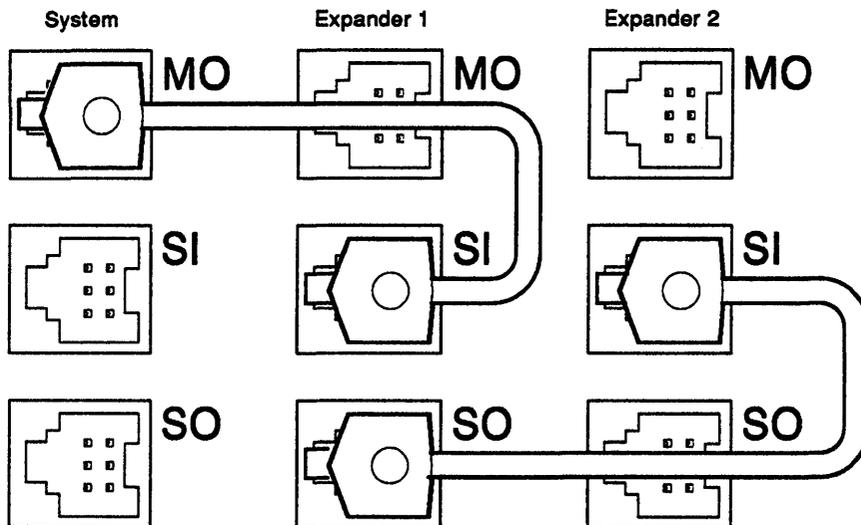
The main out (MO) connector sends the power control bus signal to the expander. One end of a power bus cable is connected here, the other end is connected to the secondary in (SI) connector of an expander power supply.

**SI**

The secondary in (SI) connector receives the power bus control signal from the main power supply. In a power bus with more than one expander, the power control bus signal is passed along, using the secondary in and out connectors as shown in Figure 1-11.

**SO** The secondary out (SO) connector sends the signal down the power bus for configurations of more than one expander.

**Figure 1-11: Sample Power Bus Configuration**



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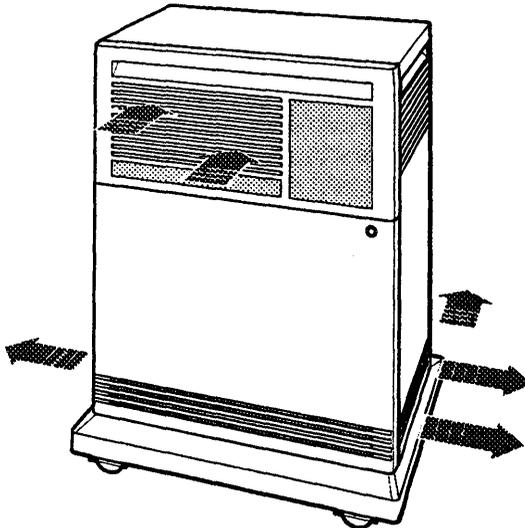
#### 1.1.1.6 Fans

Two fans located under the card cage draw air in through the top of the enclosure, down through the card cage, and out the bottom. The speed of the fans varies, depending on the surrounding room temperature. To reduce the load on the fans, keep the system away from heat sources. Figure 1-12 shows the air flow through the system enclosure.

**NOTE:** *The power supply monitors the fans. If either fan stops working, the Fan Failure indicator on the power supply lights, and the system automatically shuts down as a precautionary measure. Call your Digital service representative if a fan fails.*

**NOTE:** *The fan speed control can be set so that the fans will run at their maximum speed. This setting is recommended if you want potentially higher system module reliability, and do not object to the increased fan noise. Contact your Digital service representative to override the fan speed control.*

**Figure 1-12: System Air Circulation**



MLO-004042

## **1.2 Functional Description of Base System**

Each VAX 4000 system includes base system components common to all systems. Your system may have optional components as well. Your system was configured at the factory, based on your order.

The following sections describe base system components and options, in turn.

### **1.2.1 Base System Components**

Base system components include the following:

- Central processing unit (CPU)
- Console serial line unit (SLU)
- Main memory
- Network controller
- Embedded DSSI host adapters

### **1.2.1.1 Central Processing Unit (CPU)**

The central processing unit (CPU) controls the execution of all instructions and processes. The CPU circuits contain the logic, arithmetic, and control functions used by the system.

### **1.2.1.2 Console Serial Line Unit (SLU)**

Each system has a serial line unit connecting the console terminal to the system. The SLU connector (a modified modular jack) is located on the console module. The console serial line provides a means of communicating with the CPU.

### **1.2.1.3 Main Memory**

Main memory provides the electrical storage area for data and instructions used by the CPU. When you start your system, the operating system is loaded into main memory. Application programs must also be loaded into memory.

When the system cannot load everything into memory at once, it reads in units of data called pages (512 bytes of data) from disk. A large main memory increases the efficiency of processing, since fewer pages must be copied to and from the disk. Each configuration comes with a standard memory option. There is room for up to four memory modules. By adding more main memory, you can increase efficiency.

The contents of memory are volatile. This means they are lost when you turn off power to the system. Use mass storage devices, such as integrated storage assemblies and tape cartridges, to store software and data permanently.

### **1.2.1.4 Network Controller**

Network communications controllers allow you to connect to an Ethernet network. With a network connection and appropriate DECnet software, you can use network services, such as mail; access data stored on other systems; perform operations, such as editing and printing on remote systems; and share resources, such as laser printers. Your system comes with an onboard Ethernet controller that is part of the CPU. The system can connect to an Ethernet network through either standard Ethernet cable or ThinWire Ethernet cable. Connectors for both types of cables are on the console module.

### **1.2.1.5 Embedded DSSI Host Adapters**

Your system has two Digital Storage System Interconnect (DSSI) adapters built into the CPU. The DSSI adapters provide two separate DSSI busses (Bus 0 and Bus 1) through which the CPU can communicate with the RF-series ISAs. Each DSSI bus can support seven RF-series ISAs.

The DSSI host adapters also allow you to link one of the DSSI busses to a second host to form a dual-host configuration. When a DSSI bus is extended to a second system, both systems can share up to six ISAs. Refer to Section 1.3 for further discussion of dual-host systems.

## **1.2.2 Optional Components**

System options can include multiples of components that are part of the base system (for example, additional memory modules or ISAs) and the following kinds of options:

- Mass storage devices and controllers
- Mass storage subsystems
- Mass storage expanders
- Communications controllers and adapters
- Real-time controllers
- Printer interfaces

### **1.2.2.1 Mass Storage Devices and Controllers**

Mass storage devices record data on magnetic media. The data recorded is not lost when you turn off the system, but can be altered or erased if you record over the data. Use mass storage devices to store data and software permanently. When the data or software is needed, the CPU transfers it from the mass storage device into main memory. The two primary types of mass storage devices are the RF-series ISAs and devices with removable media, such as tape cartridges and compact disks.

### **Integrated Storage Assemblies**

Up to four RF-series ISAs can be installed in your system. An ISA is an intelligent storage device that contains its own controller and server. Special mounting bracketry allows the device to plug directly into the BA400-series backplane.

### **Devices with Removable Media**

Devices with removable media, such as tape cartridges, are used as both input and output devices. In addition, compact optical disks are used as

input devices when you install software or copy data to your system. You use tape cartridges and tapes as output devices when you copy software or data from your system. You can copy individual files or programs, or you can copy (back up) the contents of an entire fixed disk. Tapes are commonly used to archive data.

### **Mass Storage Controllers and Adapters**

All mass storage devices require a controller, a device that controls activity between the CPU and the mass storage devices. While the controller for each RF-series ISA is built into the storage assembly, other storage options require a controller module located in your system's card cage. The controller for the TK70 tape drive is the TQK70; the KDA50 is a controller for RA-series disk drives. Each KDA50 controller supports up to four RA-series disk drives.

The KZQSA adapter allows the CPU to communicate with the TLZ04 tape drive or RRD40 digital compact disk drive through a Small Computer System Interface (SCSI). Each KZQSA adapter can support up to three drives.

The CPU communicates with the ISAs through a Digital Storage System Interconnect (DSSI) adapter, which is built into the CPU. Your VAX 4000 system has two DSSI adapters, and hence, two separate DSSI busses. Each DSSI bus is capable of supporting seven integrated storage assemblies. A third and fourth DSSI bus can be added to your system by using up to two KFQSA DSSI storage adapter modules. Each KFQSA storage adapter can support up to seven RF-series ISAs.

#### **1.2.2.2 Mass Storage Subsystems**

Several optional mass storage subsystems are available for VAX 4000 systems. Such subsystems include RRD40 Digital Disk Subsystems, the RV20 Optical Disk Subsystem, TS05 and TU81 tape drives, and the SA600 Storage Array (with up to eight RA90 disk drives). If your system includes an optional mass storage subsystem, refer to the user's guide or owner's manual for that subsystem for instructions on how to operate the device.

#### **1.2.2.3 Mass Storage Expanders**

You can expand the mass storage and Q-bus capacity of your VAX 4000 system by using expanders. The R400X mass storage expander provides space for up to seven additional RF-series ISAs. Using R400X expanders, you can fill both DSSI busses for a total of 14 ISAs.

The B400X expander provides 11 additional Q-bus slots and space for up to four additional RF-series ISAs. Refer to the addendum shipped with the expander for more information.

### 1.2.2.4 Communications Controllers

Besides the console serial line, most systems have additional communications controllers for connecting additional terminals, and for communicating with other systems over telephone or network lines. Communications controllers provide standard interfaces between peripheral devices and the system. Many communications controllers provide support for multiple data lines.

The following types of communications controllers are available:

- Asynchronous serial controllers
- Synchronous serial controllers
- DEC servers
- Network controllers

Serial controllers transmit data one character at a time. A device at the transmitting end breaks bytes of data into bits. A device at the receiving end assembles incoming bits into bytes of data.

#### Asynchronous Serial Controllers

Asynchronous serial controllers provide low-speed connections between peripheral devices and the system. Asynchronous communication between the system and the peripheral depends on recognition of a pattern of start and stop bits, not on a time interval.

Asynchronous serial controllers may be divided into those without modem support and those with modem support.

You use serial controllers without modem support to connect additional terminals and printers to your system. For example, the CXA16 module provides connections for up to 16 serial lines with no modem support.

**NOTE:** *Printers equipped with a microprocessor (intelligent printers) may require modem control signals to function correctly. Do not attach a printer requiring modem control signals to a controller with no modem support. Check your printer documentation to determine the proper communications interface for your printer.*

Communications controllers with modem support allow you to communicate over telephone lines. With a modem connected to your system, you can access other computers and you can dial into your system from a remote terminal or computer.

Computers transmit digital signals, while telephone lines (with the exception of digital leased lines) transmit analog signals. When two

computers communicate over telephone lines, a modem is required at both the transmitting and receiving ends of the line. At the transmitting end, the modem converts digital signals from the computer (or terminal) to analog signals prior to transmission. At the receiving end, another modem converts the analog signals back into digital signals the computer can process.

The degree of modem support depends on the number of modem control signals recognized by the device. Full modem support (according to Digital standards) requires recognition of eleven signals. The CXY08 module supports up to eight serial lines with full modem support.

### **Synchronous Serial Controllers**

Synchronous serial controllers provide high-speed connections between systems. Communication between synchronous devices depends on time intervals that are synchronized before transmission of data begins. Synchronous devices can also have modem support.

### **DECservers**

DECservers are terminal servers (a combination of hardware and software) that allow you to connect multiple terminals or printers to hosts in an Ethernet Local Area Network (LAN).

Terminal servers perform the functions of traditional data terminal switches but multiplex the lines over the Ethernet. Using a DECserver offloads communications processing from the host system.

### **Network Controllers**

Network communications controllers allow you to connect to an Ethernet LAN or other network type. With a network connection and appropriate DECnet software, you can use network services, such as mail; access data stored on other systems; perform operations, such as editing and printing on remote systems; and share resources, such as laser printers. The network controller function for your system is implemented on the CPU module, but a second network controller, the DESQA Ethernet, adapter module can be added to your system.

#### **1.2.2.5 Real-Time Controllers**

Real-time controllers interface with devices that monitor or control particular processes, for example, laboratory equipment or manufacturing equipment connected to the system. Typically, real-time controllers are parallel devices, not serial devices.

### 1.2.2.6 Printer Interfaces

Some printers require specific interfaces to communicate with the system. For example, the LG01, LG02, and LP25–LP29 printers require the LPV11–SA interface module.

### 1.2.2.7 Other Available Options

Your system arrives configured with the options you ordered. As your needs change, you can add more options. Your Digital sales representative can advise you on available options. *VAX 4000 Model 300 Technical Information* describes the options currently available for VAX 4000 systems. Digital provides installation for additional options that you order.

## 1.3 Dual-Host Capability (VMS Systems Only)

A dual-host system consists of two systems in a VAXcluster sharing their ISAs via a Digital Storage System Interconnect (DSSI) bus. Each system can have direct access to any of the ISAs in either system; this can include a shared common system disk.

The primary application for such a configuration is a VAXcluster system. The simplest dual-host configuration, for example, is to configure one system disk to be used as the system disk by both systems. The system disk physically resides in one enclosure, however, both systems have equal access to the system disk and to any other DSSI mass storage device in either enclosure.

A DSSI ISA, such as the RF71, has a built-in dual-host capability that allows it to connect to two DSSI host adapters. The DSSI storage adapter, embedded in the system's CPU, allows you to extend a DSSI bus by physically connecting it to a second system.

Using an external DSSI cable, any two DSSI-based systems can be connected to form a dual-host configuration. Figure 1–13 shows a dual-host configuration with two VAX 4000 systems.

**NOTE:** *Dual-host capability for VAX 4000 systems is only supported under VMS (version 5.3–2 and later) when the two systems are configured into the same VAXcluster.*

The benefits of a dual-host configuration are:

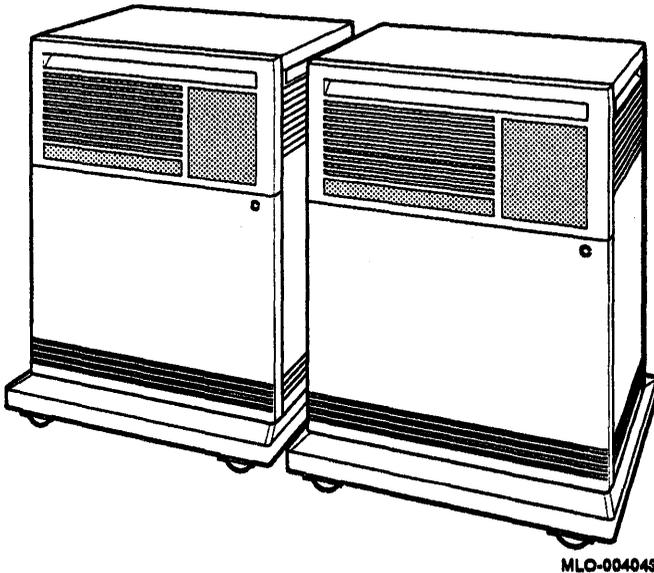
- VAXcluster features such as shared data across systems and satellite nodes.
- Higher system availability — If one of the DSSI-based systems is unavailable, for example, due to a system malfunction, the satellites

booted through it are able to continue operating through the other system.

If one of the DSSI-based systems fails, all satellite nodes booted through that system lose connections to the system disk. Each satellite node knows, however, that the system disk is also available through a second path. The satellite nodes establish a new connection through the other system and continue operation.

To increase system availability, a second system disk may be added to each boot node. In the event of one system disk failure, the remaining system disk would continue to serve one DSSI-based system and the satellite nodes booted through it. As with any VAXcluster, however, a second system disk improves availability while increasing system management tasks.

**Figure 1-13: Dual-Host Configuration**



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*VAX 4000 Dual-Host Systems* provides more information on dual-host configurations.

## Chapter 2

# Operating the System

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This chapter describes how to operate your VAX 4000 system once the system software has been installed or you have completed startup procedures for factory-installed VMS.

## 2.1 Before You Operate the System

This chapter assumes that your system has been properly installed. Installation includes running the diagnostic software shipped with your system and installing the base operating system, or completing the first time startup procedures for factory-installed VMS. Refer to Appendix A of the *VAX 4000 Model 300 Installation* manual for instructions on starting up factory-installed VMS. To install other operating system options or layered products, see the instructions in your system software installation manual or layered product installation manual. Some of the instructions may require you to open the front door of the system to change switch settings on the console module.

The remainder of this chapter assumes that system software has been installed and first time startup procedures for factory-installed VMS have been completed.

## 2.2 Switch Settings

Switch settings vary, depending on the operation being performed. The next two sections describe switch settings for normal and for special operations. Set the switches according to your needs.

### 2.2.1 Normal Operation

Switch settings for normal operation are the following:

- The Break Enable/Disable switch on the console module is set to disable (down, position 0). Digital recommends you run the system with breaks disabled to prevent the user from inadvertently halting the system by pressing **Break** on the console terminal. Halting the system causes all activity to stop.

With breaks disabled, the system automatically boots system software when powered on.

**NOTE:** *You can use the console command SET CONTROLP to specify the control character, `CtrlP`, rather than `Break`, to initiate a break signal.*

*Using the console command, SET HALT REBOOT or SET HALT RESTART\_REBOOT, you can set your system to automatically boot software after the system is halted due to pressing `Break`.*

- The Power-On Mode switch on the console module is set to Run (indicated by an arrow).
- The Baud Rate Select switch on the console module is set to 9600 (indicated by a switch setting of 5).
- The Write-Protect button for each RF-series ISA is set to out (not lit). This setting allows system software to write to the storage element.
- The Run/Ready button for each RF-series ISA is set to in (glows green when the storage element is not being used). This setting makes the storage element available for use.
- The Halt button on the SCP is set to out (not lit).
- For expanded systems using power bus cables to link the R400X or B400X expander, the power switches on all expander power supplies should remain on (set to 1) at all times. The system power supply sends the power bus signal needed to turn the expanders on or off.

## 2.2.2 Special Operation

Certain operations require that you change some of the normal operating settings.

- If you need the ability to halt the system from the console terminal, for example, when installing system software or performing certain types of backup, set the Break Enable/Disable switch to enable (up, position 1). This allows you to halt the system by pressing `Break` on the console terminal.

**NOTE:** *You can use the console command SET CONTROLP to specify the control character, `CtrlP`, rather than `Break`, to initiate a break signal.*

*Using the console command, SET HALT REBOOT or SET HALT RESTART\_REBOOT, you can set your system to automatically boot software after the system is halted due to pressing `Break`.*

- If you want data on a particular ISA to be write-protected, you must set the Write-Protect switch to in (glows).

**NOTE:** *ISAs containing system software and user accounts must remain write-enabled. ISAs containing applications or sensitive data may be write-protected.*

- If you want to use the Language Selection Menu to select a new language for the console program, before you turn on your system, set the Power-On Mode switch to Language Inquiry Mode. A human profile indicates the language inquiry mode. When you turn on your system, a Language Selection Menu appears, as shown in Figure 2-1.

### Figure 2-1: Language Selection Menu

KA670-A Vn.n VMB n.n

- 1) Dansk
  - 2) Deutsch (Deutschland/Osterreich)
  - 3) Deutsch (Schweiz)
  - 4) English (United Kingdom)
  - 5) English (United States/Canada)
  - 6) Español
  - 7) Français (Canada)
  - 8) Français (France/Belgique)
  - 9) Français (Suisse)
  - 10) Italiano
  - 11) Nederlands
  - 12) Norsk
  - 13) Português
  - 14) Suomi
  - 15) Svenska
- (1..15):

Select a language by typing in the number listed next to the language. Save the language you have selected by rotating the Power-On Mode switch to Run Mode, indicated by an arrow.

**NOTE:** *If you do not select a language within thirty seconds, the system defaults to English (United States/Canada).*

If the Power-On Mode switch is set to Run Mode (indicated by an arrow), then the language selected is saved and is automatically used during subsequent reboots of the system.

**NOTE:** *If the Power-On Mode switch is set to Language Inquiry Mode (indicated by the human profile), the system will prompt for the language at each power-on.*

In addition to the Language Selection Menu, the system may issue a list of bootable devices and prompt you to select a device from the list. If this happens, refer to Section 2.4.1 for more information.

If your system has been powered off for more than 10 days, the battery unit that saves the system clock and the language selection may have run down. The Language Selection Menu will be automatically displayed when you power on your system, regardless of the Power-On Mode switch setting. Once the system is booted, reset the system clock as described in your system software manual.

## 2.3 Turning On the System

Once you have set the switches correctly, you are ready to turn on the system. Use the following procedure:

1. Turn on the console terminal and wait for it to complete its self-tests.
2. Turn on the system by setting the power switch to 1.

**NOTE:** *For systems using the R400X or B400X expander linked by a power bus cable, the power switch on the VAX 4000 provides the power control bus signal to the expander(s). Setting the power switch to on (1) on the VAX 4000 will cause the expander(s) to power on as well. The power switch on the expander(s) should always remain in the on position (1).*

When you turn on the power, you should see the indications listed in Table 2-1.

**Table 2-1: Normal Power-On Indications**

<b>Indicator</b>	<b>Normal Indication</b>
System DC OK lights (power supply and SCP)	Glow green
AC Present light (power supply)	Glow orange
RF-series ISA Run/Ready lights	Glow green steadily within 20 seconds
RF-series ISA Fault light	Lights temporarily at power-on.

**Table 2-1 (Cont.): Normal Power-On Indications**

<b>Indicator</b>	<b>Normal Indication</b>
TK70 tape drive indicator lights	Orange, yellow, and green lights glow during self-tests. The green light remains on.
TLZ04 tape drive indicators	Tape and drive indicators flash during self-tests. The drive indicator glows green when self-tests are successfully completed.

If you do not observe the indications in Table 2-1, refer to *VAX 4000 Troubleshooting and Diagnostics*.

Every time you turn on your system, it runs a series of self-tests on the CPU and memory. Your console terminal first displays a line of information identifying the CPU, the version of the firmware, and the version of VMB—the primary bootstrap program. In the sample screens provided in this chapter, the CPU is identified as a KA670-A, and the versions of the firmware and primary bootstrap are indicated as n.n. Your system will display actual version numbers. The console terminal then displays a countdown as the system tests itself. When the self-tests are successful, the system either autoboots system software or goes into console mode, as described in Sections 2.4.1 and 2.4.2.

If your system detects an error during its self-tests, it displays an error summary consisting of several lines of hexadecimal numbers. A Digital service representative can use the error summary to diagnose the system. Depending on the type of error, one or more error summaries may display on the console terminal. A sample error summary is shown in Figure 2-2.

**Figure 2-2: Sample Error Summary**

```
KA670-A Vn.n VMB n.n

Performing normal system tests.
66..65..64..63..62..61..60..59..58..57..56..55..54..53..52..51..
50..49..48..47..46..45..44..43..42..41..40..39..38..37..36..35..
34..33..32..31..30..29..28..27..26..25..24..23..22..21..20..19..
18..17..16..15..14..13..12..11..10..09..08..07..

?5F 2 15 FF 0000 0000 02          ; SUBTEST_5F_15, DE_SGEC.LIS

P1=00000000 P2=00000002 P3=5839FF00 P4=00000000 P5=00000000
P6=00000000 P7=00000000 P8=00000000 P9=0000080A P10=00000003
r0=00000054 r1=20084019 r2=00008206 r3=00000000 r4=00004210
r5=00000044 r6=000048DC r7=20008000 r8=00008000 EPC=FFFF90D6
06..05..04..03..
Normal operation not possible.

>>>
```

If possible, print out the error summary and give it to your Digital service representative.

## 2.4 Booting the System

VAX 4000 systems boot in one of two ways. You can configure the system to autoboot on power-on or you can manually boot the system from console mode. The Break Enable/Disable switch setting determines how the system boots.

### 2.4.1 Autobooting the System

When the Break Enable/Disable switch is set to disable (the normal operating setting), the system runs self-tests and, on completion, attempts to load system software. Additionally, if the Break Enable/Disable switch is set to enable, and the halt action REBOOT or RESTART\_REBOOT has been defined using the SET HALT command, the system will automatically attempt to load system software.

Depending on whether or not a boot device has been selected, the system loads system software or prompts you to select a boot device.

#### Loading System Software (With Boot Device Selected)

When a boot device has been selected, the system identifies the boot device and the number "2" displays on the screen. As the system begins booting, the countdown continues from 1 to 0.

Figure 2-3 shows a successful power-on and automatic boot when DIA0 has been selected as the boot device.

### Figure 2-3: Successful Power-On and Automatic Boot

```
KA670-A Vn.n, VMB n.n
Performing normal system tests.
66..65..64..63..62..61..60..59..58..57..56..55..54..53..52..51..
50..49..48..47..46..45..44..43..42..41..40..39..38..37..36..35..
34..33..32..31..30..29..28..27..26..25..24..23..22..21..20..19..
18..17..16..15..14..13..12..11..10..09..08..07..06..05..04..03..
Tests completed.
Loading system software.
(BOOT/R5:0 DIA0)

    2..
-DIA0
    1..0..
```

### Loading System Software (No Boot Device Selected)

If you have not selected a boot device when the Break Enable/Disable switch is set to disable, the system runs self-tests and, on completion, issues a list of bootable devices. You are prompted to select a boot device from the list, as shown in Figure 2-4.

### Figure 2-4: Successful Power-On to List of Bootable Devices

```
KA670-A Vn.n VMB n.n
Performing normal system tests.
66..65..64..63..62..61..60..59..58..57..56..55..54..53..52..51..
50..49..48..47..46..45..44..43..42..41..40..39..38..37..36..35..
34..33..32..31..30..29..28..27..26..25..24..23..22..21..20..19..
18..17..16..15..14..13..12..11..10..09..08..07..06..05..04..03..
Tests completed.
Loading system software.
No default boot device has been specified.
Available devices.
-DIA0 (RF71)
-DIA1 (RF71)
-MUA0 (TK70)
-EZA0 (08-00-2B-06-10-42)
Device? [EZA0]:
```

To select a boot device, enter a device name at the system prompt. When you have selected a boot device, the system boots from that device. Figure 2-5 shows a successful power-on when DIA0 has been selected as the boot

device. The next time the system is turned on, it will autoboot from the device you have just selected.

**NOTE:** *If you do not enter a device name within thirty seconds, the system attempts to boot from the Ethernet device, EZAO.*

### Figure 2-5: Selecting a Bootable Device

```
KA670-A Vn.n VMB n.n
```

```
Performing normal system tests.
```

```
66..65..64..63..62..61..60..59..58..57..56..55..54..53..52..51..  
50..49..48..47..46..45..44..43..42..41..40..39..38..37..36..35..  
34..33..32..31..30..29..28..27..26..25..24..23..22..21..20..19..  
18..17..16..15..14..13..12..11..10..09..08..07..06..05..04..03..
```

```
Tests completed.
```

```
Loading system software.
```

```
No default boot device has been specified.
```

```
Available devices.
```

```
-DIA0 (RF71)
```

```
-DIA1 (RF71)
```

```
-MUA0 (TK70)
```

```
-EZA0 (08-00-2B-06-10-42)
```

```
Device? [EZA0]:DIA0
```

```
(BOOT/R5:0 DIA0)
```

```
2..
```

```
-DIA0
```

```
1..0..
```

### Changing the Boot Device

Once a boot device is identified, the system autoboots from that device each time you turn it on, until you do one of the following:

- Change the setting of the Break Enable/Disable switch to enable (up, position 1). If you do so, the system will not autoboot but will enter console mode after completing self-tests (assuming you have not defined a halt action of REBOOT or RESTART\_REBOOT using the SET HALT console command). Refer to Section 2.4.2 for instructions on booting from console mode.
- Change the boot device by using the SET BOOT command.

## Using the SET BOOT Command

To direct the system to boot automatically from a specific device or to change the setting of the default boot device, put the system into console mode and at the >>> prompt, enter "SET BOOT *device-name*". For example,

```
>>>SET BOOT EZA0
```

sets the system default boot device to be the Ethernet controller.

Once you have selected a boot device, the system autoboots from that device each time you turn it on.

Using "SET BOOT *device-name,device-name,device-name*", you can also specify a string of default boot devices (up to 32 characters, with devices separated by commas and no spaces) for which the system will check for bootable software. The system checks the devices in the order specified and boots from the first one that contains bootable software. For example,

```
>>>SET BOOT DUA0 , DIA0 , MUA0 , EZA0
```

directs the system to use DUA0, DIA0, MUA0, and EZA0 as the default boot devices. When the system autoboots, or if the BOOT command is used without specifying a device, the system will boot from the first default boot device that contains bootable software.

**NOTE:** *If included in a string of boot devices, the Ethernet device, EZA0, should only be placed as the last device of the string. The system will continuously attempt to boot from EZA0.*

To determine the name of the device from which to boot the system, refer to Table 2-2, or enter the SHOW DEVICE command at the console prompt >>>. Figure 2-6 shows a sample list of devices. The system displays the logical device name, preceded by a dash (-), for each device.

**NOTE:** *Selecting a default boot device other than the Ethernet device, EZA0, is not appropriate for diskless and tapeless systems which must boot software over the network.*

**Figure 2-6: Sample SHOW DEVICE Display**

```
>>>SHOW DEVICE
DSSI Bus 0 Node 0 (CLYDE)
-DIAO (RF71)
DSSI Bus 0 Node 1 (BONNIE)
-DIA1 (RF71)
DSSI Bus 0 Node 6 (*)
DSSI Bus 1 Node 7 (*)
UQSSP Tape Controller 0 (774500)
-MUAO (TK70)
SCSI Adaptor 0 (761400), SCSI ID 7
-MKAO (DEC TLZ04 1989(c)DEC)
Ethernet Adapter
-EZAO (08-00-2B-06-10-42)
```

**Table 2-2: Device Names**

Device Type	Controller/Adapter	Device Logical Name
RF-series ISA	Embedded DSSI host adapter (part of CPU)	DImn <sup>1</sup>
RF-series ISA	KFQSA storage adapter	DUcn <sup>2</sup>
TK70 tape drive	TQK70	MUcn <sup>3</sup>
TLZ04 tape drive	KZQSA adapter	MKAn
PROM (programmable read only memory)	MRV11 module	PRAn
Ethernet adapter	On-board (part of CPU)	EZAO
Ethernet adapter	DESQA Ethernet controller	XQAn
RA-series drives	KDA50	DUcn <sup>2</sup>

<sup>1</sup>m = DSSI bus adapter (A = first bus (0), B = second bus (1), and so on.)  
n = unit number

When under operating system control, DIBn devices are recognized as DIAn devices.

<sup>2</sup>c = MSCP controller designator (A = first, B = second, and so on.)  
n = unit number

<sup>3</sup>c = TMSCP controller designator (A = first, B = second, and so on.)  
n = unit number

For more information about the VAX 4000 system's booting process, refer to *VAX 4000 Model 300 Technical Information*.

## 2.4.2 Booting the System from Console Mode

When the Break Enable/Disable switch is set to enable, the system powers on to console mode (indicated by the >>> prompt) after successfully completing its self-tests (assuming you have not defined a halt action of REBOOT or RESTART REBOOT using the SET HALT console command). Figure 2-7 shows a successful power-on to console mode.

**Figure 2-7: Successful Power-On to Console Mode**

```
KA670-A Vn.n VMB n.n
Performing normal system tests.
66..65..64..63..62..61..60..59..58..57..56..55..54..53..52..51..
50..49..48..47..46..45..44..43..42..41..40..39..38..37..36..35..
34..33..32..31..30..29..28..27..26..25..24..23..22..21..20..19..
18..17..16..15..14..13..12..11..10..09..08..07..06..05..04..03..
Tests completed.
>>>
```

### Loading System Software

To load system software from console mode, enter the BOOT command, "BOOT *device name*". For example,

```
>>>BOOT MUA0
```

tells the system to boot software from a cartridge in the TK70 tape drive.

If you enter the BOOT command without specifying a device, the system will attempt to boot from the default boot device, or string of devices defined by the SET BOOT command.

Using "BOOT *device-name,device-name,device-name*", you can also specify a string of boot devices (up to 32 characters, with devices separated by commas and no spaces) for which the system will attempt to boot software. The system checks the devices in the order specified and boots from the first one that contains bootable software. For example,

```
>>>BOOT DUA0 , DIA0 , MUA0 , EZA0
```

directs the system to boot from the first device in the list that contains bootable software.

**NOTE:** *If included in a string of boot devices, the Ethernet device, EZA0, should only be placed as the last device of the string. The system will continuously attempt to boot from EZA0.*

**NOTE:** *To determine the name of the device from which to boot the system, refer to Table 2-2.*

Software manuals may instruct you to power on with break enabled and to use the BOOT command.

## 2.5 Using the System

Once the system software is loaded, the first display for the system software appears on the console terminal after a few seconds. That display is described in the system software documentation.

You are now ready to use the system. Refer to the system software manuals and application manuals for more specific instructions on using the system.

Your system software manuals cover the following:

- Installing software on your system
- Running software to perform tasks
- Making and restoring backup copies of system software or data files
- Accessing devices and utilities in your system

## 2.6 Halting the System

Halting the system interrupts all processes and returns control to the console program. You may need to halt the system during software installation. Or, you may want to boot the system from another device, for example, a tape cartridge containing MicroVAX Diagnostic Monitor (MDM) software.

**CAUTION:** *Halting your system without following the shutdown procedure described in your system software manuals may result in loss of data.*

You can halt the system in two ways:

- You can press the Halt button twice — in to halt the system, and out to enter console mode.
- If the Break Enable/Disable switch on the console module is set to enable (indicated by 1) you can press the **Break** key on the console terminal. If the Break Enable/Disable switch is not set to enable and you wish to halt the system by pressing **Break**, change the setting of the Break Enable/Disable switch from disable to enable.

**NOTE:** *You can use the console command SET CONTROLP to specify the control character, `[CrVP]`, rather than `[Break]`, to initiate a break signal.*

**CAUTION:** *If you shut off your console terminal while breaks are enabled, the system interprets the action as a break, and the system halts.*

*If you are using a system that is part of a VAXcluster, do not halt, restart, or turn off the system without consulting the cluster manager. Performing any of these activities will interrupt the processes of the entire cluster.*

When the console mode prompt (`>>>`) is displayed on your screen, the system is halted.

If you inadvertently halt the system, type "`c` `[Return]`" at the console prompt. The processes interrupted by the halt will continue.

## 2.7 Restarting the System

**NOTE:** *Restarting the system aborts all current and pending operations. To prevent loss of data, warn all users to log off prior to restarting the system. Follow the shutdown procedure described in your system software manuals before restarting the system.*

Restarting returns the system to a power-on condition. All current and pending operations are aborted and the usual power-on tests are run.

You restart the system by pressing the Restart button on the system control panel.

**NOTE:** *The Halt button must be out (not lit) to effect a restart operation.*

## 2.8 Turning Off the System

**CAUTION:** *Turning off your system without following the shutdown procedure described in your system software manuals may result in loss of data.*

Once you have completed the recommended procedure, you can turn off your system by setting the power switch to 0.

**NOTE:** *For systems expanded with the R400X or B400X expander and linked by a power bus cable, you need only turn off the system unit: The expander(s) will power off when you set the system power switch to off (0). Note that the orange ac indicator on the expander power supply should remain lit even though the system is powered off.*

## **2.9 Recovering from an Over Temperature Condition**

If your system's internal temperature approaches a level that may cause components to overheat, an audible alarm will sound and the Over Temperature Warning indicator on the SCP will flash. If the temperature continues to increase, the system will automatically shut down.

If the overheat warnings are activated, the alarm sounds and the Over Temperature Warning indicator flashes.

When the system shuts down due to overheating, the Over Temperature Condition indicator on the power supply remains lit. To recover from a shutdown, set the power switch to off (0) and wait five minutes before turning on the system.

To prevent an over temperature condition, use the following precautions:

- Make sure your system is away from heat sources.
- Check that the system's air vents are not blocked.
- Check that the room temperature is within acceptable limits as specified in your *VAX 4000 Site Preparation* manual.

## Chapter 3

# Operating the System Options

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This chapter describes how to use options that may already be part of your system, or that you can add to your system. The following types of options are covered:

- Mass storage devices and controllers
- Communications controllers
- Real-time controllers
- Printers

**NOTE:** *Some of these options may not be appropriate for VAXserver 4000 systems. Contact your Digital representative if you have any questions about whether a specific option is appropriate for your system.*

### 3.1 Mass Storage Options

The following mass storage options are included with VAX 4000 systems:

- RF-series Integrated Storage Assembly (ISA)
- TK70 or TLZ04 tape drive

**NOTE:** *In addition, the RV20 Optical Disk Subsystem, RRD40 Digital Disk Subsystems, and TSV05 and TU81 tape drives can be attached to the VAX 4000 system. If your system contains one of these options, refer to the user's guide or owner's manual for instructions on how to operate the device.*

This chapter describes how to use the controls for the RF-series ISAs and the TK70 and TLZ04 tape drives. In the case of the tape drives, it also describes how to insert and remove the tape cartridge. To use any mass storage device, you must properly identify the device to the operating system and use appropriate operating system commands. Refer to your system software documentation for details.

### 3.1.1 RF-Series Integrated Storage Assemblies

Your system may have up to four RF-series ISAs, or up to three RF-series ISAs and a TK70 tape drive. When your system has multiple ISAs, Digital recommends that you separate them according to function. For example, if your system has two ISAs, you may want to use them as follows:

- ISA 0 contains the operating system and applications installed on the system.
- ISA 1 contains work areas for each user with an account on the system.

The storage capacities and other specifications for RF-series ISAs are listed in *VAX 4000 Model 300 Technical Information*.

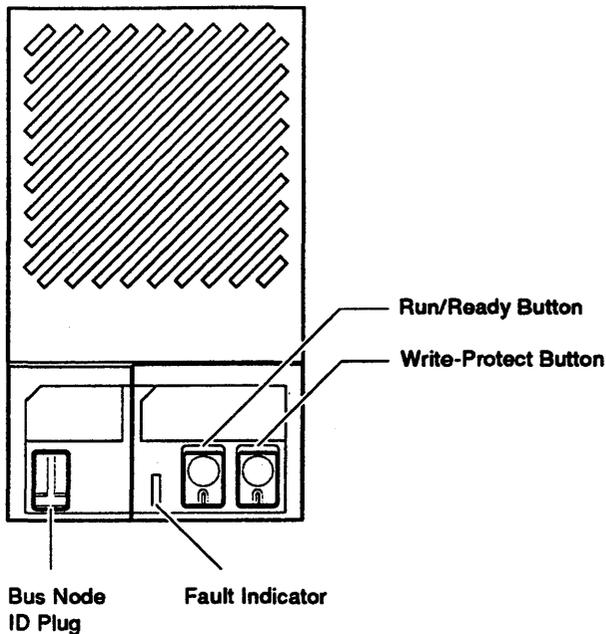
Refer to Appendix B of this manual for information on setting or examining internal parameters for RF-series ISAs.

#### RF-Series Controls and Indicators

Each RF-series ISA has controls and indicators on its front panel. To access the ISA controls you need only open the upper door (top key position). Figure 3-1 shows the front panel of an RF-series ISA.

**NOTE:** *If your system has less than the maximum number of ISAs: three if you have a TK70 tape drive, or four without the tape drive, a blank ISA front panel with no controls or indicators is used to cover the empty ISA cavities. The front panels are required to meet international regulatory standards.*

**Figure 3-1: RF-Series ISA Controls and Indicators**



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Each ISA has the following controls and indicators on its front panel.

- Bus node ID plug
- Fault indicator
- Write-Protect button
- Run/Ready button

Bus node ID plugs identify the bus node number of the ISAs to the system, as well as the unit number by default. Bus node numbers are configured at the factory in consecutive order from right to left: the rightmost ISA as 0, the center ISA as 1, and the leftmost ISA as 2. (Tapeless systems can have up to four ISAs, with the leftmost ISA as 3.)

Table 3-1 lists RF-series controls and indicators.

**Table 3-1: RF-Series Controls and Indicators**

<b>Control</b>	<b>Position</b>	<b>Function</b>
<b>Bus Node ID Plug</b>	<b>Installed</b>	The bus node ID plug identifies the bus node ID number of the ISA to the system and is, by default, the unit number. The ISA bus node ID is factory set to a number 0 through 6.
	<b>Not Installed</b>	The ISA bus node number is undefined. The ISA fault indicator lights.
<b>Fault</b>	<b>Lit</b>	Indicates an error condition in the ISA. The light is on temporarily during power-on sequence (normal condition).
	<b>Not lit</b>	Indicates an error-free condition in the ISA.
<b>Run/Ready</b>	<b>In (lit, green)</b>	ISA is on-line. When the ISA is available for use, the green indicator light in the switch is on. Under normal operation the green indicator flashes as seek operations are performed.
	<b>Out (not lit)</b>	ISA is off-line and cannot be accessed. The green indicator light cannot be lit when the Run/Ready button is out.
<b>Write-Protect</b>	<b>In (lit, amber)</b>	ISA is write-protected. Prevents system software from writing to the ISA.
	<b>Out (not lit)</b>	ISA is not write-protected. Normal position for software operation. System software is free to read from or write to the ISA.

The Write-Protect button controls whether the system can write data to the ISA. The system can read from the ISA regardless of the setting of the Write-Protect button. When the Write-Protect button is out (not lit), the system can write to the ISA. Your system disk (the ISA containing system software) and ISAs containing work areas for users should be write-enabled, the normal operating setting.

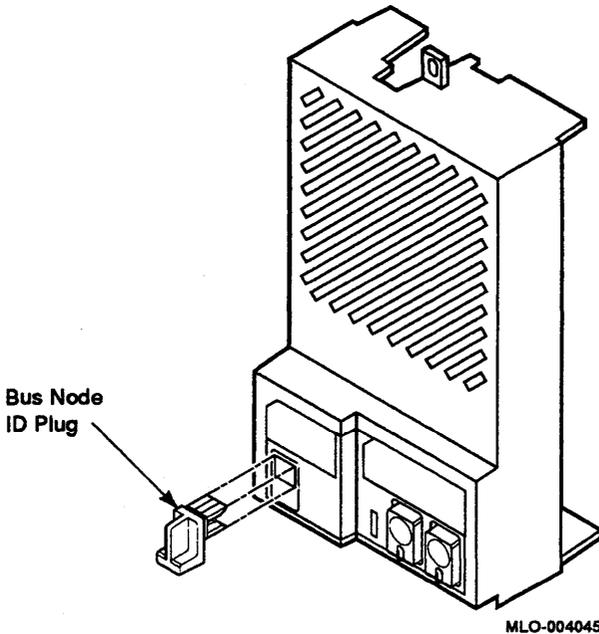
If you want to write-protect an ISA containing sensitive data that you do not want changed or accidentally erased, set the Write-Protect button to in (lit).

### **Changing the Bus Node ID Plugs**

Spare bus node ID plugs are supplied with your system. Use the spare plugs to renumber your ISAs if you reconfigure your system with an R400X expander, or if you create a dual-host configuration.

The bus node ID plugs have prongs on the back that indicate the bus node number (and by default, the unit number) of the ISA. To remove a bus node ID plug, grasp it firmly and pull straight out. To insert a bus node ID plug, align the two center prongs with the two center slots and press the plug into the slots. See Figure 3-2.

**Figure 3-2: Inserting Bus Node ID Plugs**



Use the rules below for renumbering your storage assemblies:

- For each DSSI bus, do not duplicate bus node numbers for your storage assemblies. You can only have one storage assembly on bus 0 identified as bus node 1, one storage assembly as 2, and so on; you can only have one storage assembly on bus 1 identified as bus node 1, one storage assembly as 2, and so on.
- By convention, the ISAs are numbered in increasing order from right to left.

**NOTE:** *If you change the bus node ID plugs while the system is operating, you must turn off the system and then turn it back on for the new plug positions to take effect.*

### 3.1.2 TK70 Tape Drive

The TK70 tape drive is located behind the upper door of the system. To use the drive, move the key to the top position and open the door.

The TK70 tape drive holds one removable magnetic tape cartridge. The drive can read data written on either a CompacTape II or CompacTape cartridge. You can identify the type of cartridge by the label on the cartridge.

You can use a CompacTape II or CompacTape cartridge as an input device to load software or data into your system. The TK70 drive can read data on both types of cartridges, written by either a TK70 drive or a TK50 drive. (The TK50 drive records data in a format different from that of the TK70.)

You should use a CompacTape II as an output device to make copies or backups of software or data. The TK70 drive cannot write to a CompacTape II or CompacTape that has been previously written by a TK50 tape drive.

#### TK70 Tape Drive Controls

The tape drive has two primary controls: the cartridge insert/release handle (subsequently referred to as "the handle") and the Unload button. You use the handle to insert or remove cartridges and lock them into position. Pull the handle open to insert or remove a tape cartridge. Push the handle closed to lock a tape cartridge into position and load the tape.

You use the Unload button to rewind and unload the tape. Unloading and rewinding can also be controlled by software. Refer to your system software manuals for appropriate commands.

The drive also has three indicator lights that tell you the status of the drive.

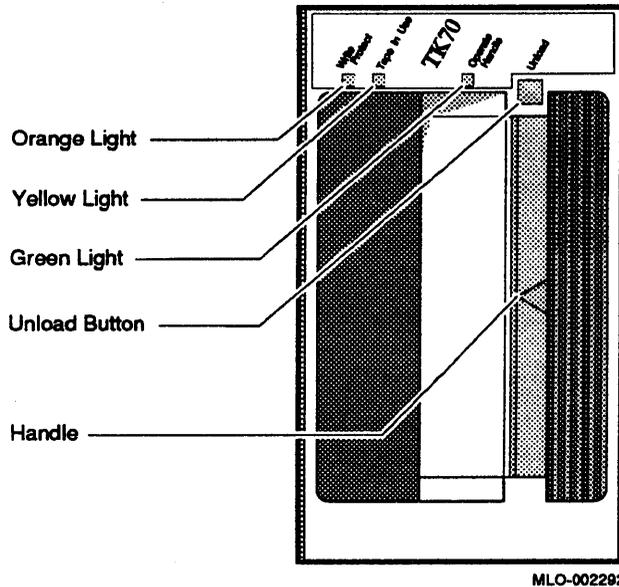
- Orange light (Write-Protected): A steady orange light indicates that the cartridge is write-protected.
- Yellow light (Tape in Use): A steady yellow light indicates that the tape is loaded. A blinking yellow light indicates that the tape is in motion.
- Green light (Operate Handle): A steady green light indicates that you can move the handle to insert or remove a tape. A blinking green light indicates a cartridge load fault. You can also move the handle when the green light is blinking.

All three lights blinking simultaneously indicates a fault condition.

Figure 3-3 shows the TK70 tape drive with the controls and indicator lights labeled.

To operate the drive properly, you must carefully monitor the indicator lights. The instructions for inserting and removing cartridges, which appear later in this section, tell you what should happen at each step. A table at the end of the section summarizes light and control combinations.

**Figure 3-3: TK70 Tape Drive**



### 3.1.2.1 Design of the Drive

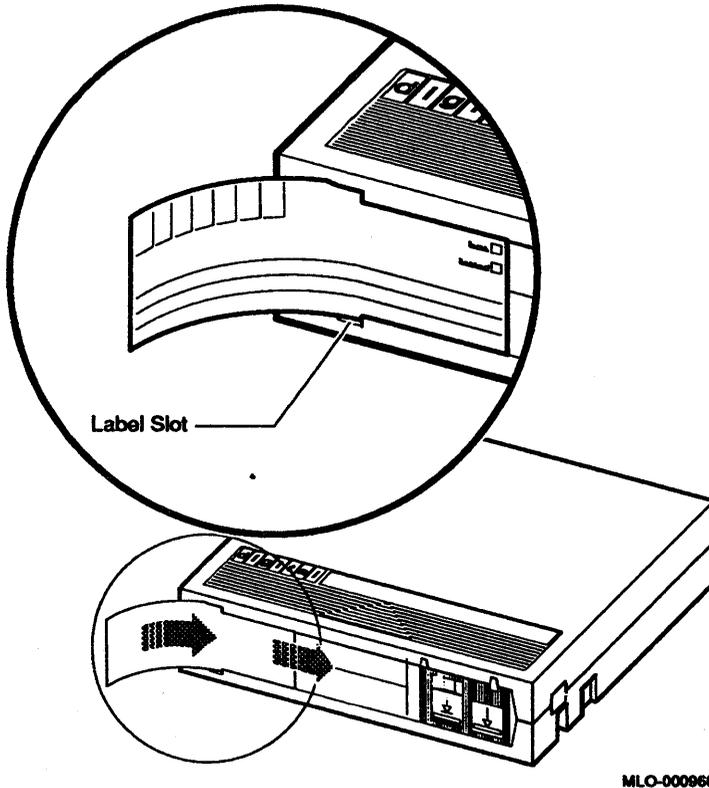
The TK70 tape drive operates like a reel-to-reel tape deck. Inside the drive is a take-up reel with a leader attached. Inside the cartridge is a single reel containing the magnetic tape. When you insert the cartridge and push in the handle, the leader in the drive automatically couples with the leader in the cartridge, and the tape winds onto the take-up reel. The coupling and winding process is called loading. When the automatic loading process is complete, the tape is ready to use.

Once the cartridge is loaded, you cannot remove it without rewinding and uncoupling the leaders, a process called unloading. Even if you have not used the tape, you must unload it before you can remove the cartridge. When you press the Unload button, the tape rewinds into the cartridge and the leaders uncouple.

### 3.1.2.2 Labeling a Tape Cartridge

When recording data on a cartridge, label its contents. For your convenience, a slot for the label is provided on the front of the cartridge. Write the identification on the label and insert the label in the slot on the front of the cartridge, as shown in Figure 3-4. The label is visible when the tape is in the drive.

Figure 3-4: Labeling a Tape Cartridge



To indicate that the tape was recorded on a TK70 tape drive, check the box labeled 296MB. The 95MB box is used for tapes recorded on a TK50 drive.

**NOTE:** Do not write on the tape cartridge or attach labels to the top, bottom, or sides of the cartridge.

### 3.1.2.3 Write-Protecting a Tape Cartridge

Write-protecting a tape cartridge prevents accidental erasure of information stored on the tape. You can write-protect a tape cartridge in two ways:

- Set the write-protect switch on the cartridge to the write-protect position.
- Write-protect the cartridge by using operating system commands described in your system software manuals.

Your system can read information on the tape regardless of the position of the write-protect switch or whether writing is software-disabled. However, the system cannot write data to the tape when the write-protect switch is set to the write-protect position, or when writing is software disabled.

When you use a cartridge to install software, make sure the cartridge is write-protected. Two icons on the switch indicate the write-protect status, as shown in Figure 3–5. An orange rectangle is visible when the switch is in the write-protect position. If you do not see an orange rectangle, slide the switch toward the label slot.

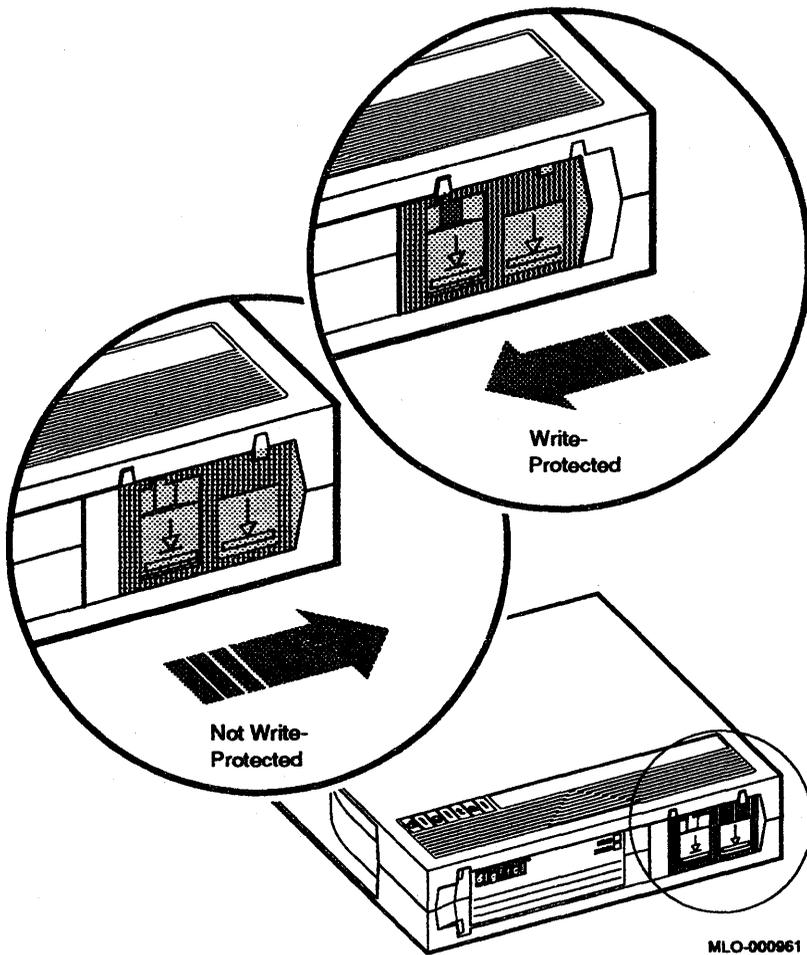
When you insert a write-protected cartridge into the drive, the orange indicator light comes on. The system recognizes the tape as being write-protected under any one of the following conditions:

- The write-protect switch on the cartridge is set to the write-protect position.
- An operating system command has write-protected the tape.
- A tape recorded on a TK50 tape drive is inserted into the drive.

Removing write-protection depends on how the tape was recorded and how it is write-protected. You cannot write-enable a tape recorded on a TK50 tape drive either by moving the write-protect switch on the cartridge or by using software commands. The TK70 drive always recognizes a tape recorded on a TK50 drive as write-protected. You can remove write-protection on tapes recorded on a TK70 drive as follows:

- If the cartridge is write-protected *only* by the write-protect switch on the cartridge and not the operating system, moving the switch to the write-enabled position causes the orange light to go out at the end of the executing command.

**Figure 3-5: Tape Cartridge Write-Protect Switch**



- If the cartridge is write-protected *only* by a software command and not the write-protect switch, removing the operating system restriction causes the orange light to go out.
- If the cartridge is write-protected by *both* the switch on the cartridge and a software command, you must change the switch setting and remove the operating system restriction.

When you use a CompacTape II cartridge to make a backup copy of files, make sure the orange write-protect light on the TK70 drive is off. If the light is not off, check for any of the write-protect conditions described above. Change the switch setting and/or operating system restriction as necessary. Do not begin your operation until the orange light goes off.

#### **3.1.2.4 Tape Cartridge Handling and Storage Guidelines**

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

#### **3.1.2.5 Inserting a Tape Cartridge**

Before you use the tape drive, make sure the system is turned on (the power switch glows). During power-on, the TK70 drive runs self-tests that last a few seconds. All three lights (orange, yellow, and green) come on momentarily, then the yellow light blinks during the self-tests. At the end of the tests, the yellow light goes off and the green light comes on, accompanied by a short beep. The green light and the beep indicate that you can move the cartridge release handle.

**CAUTION:** *Move the handle only when the green indicator light is on. Moving the handle while the yellow light is on could damage the drive. If all three lights blink rapidly at any time, a fault condition exists. Press the Unload button once. If the fault is cleared, the tape unloads. The yellow light blinks during unloading, then the green light comes on. If the fault*

*is not cleared, the three lights continue to flash. Do not attempt to use the tape drive or to remove the tape cartridge. Call your Digital service representative.*

Use the following procedure to insert a tape cartridge (see Figure 3-6):

1. Pull the handle open.
2. Position the cartridge so the arrow on the cartridge faces left and points toward the drive. Insert the cartridge into the TK70 tape drive until you feel the cartridge lock into place.
3. Push the handle closed.

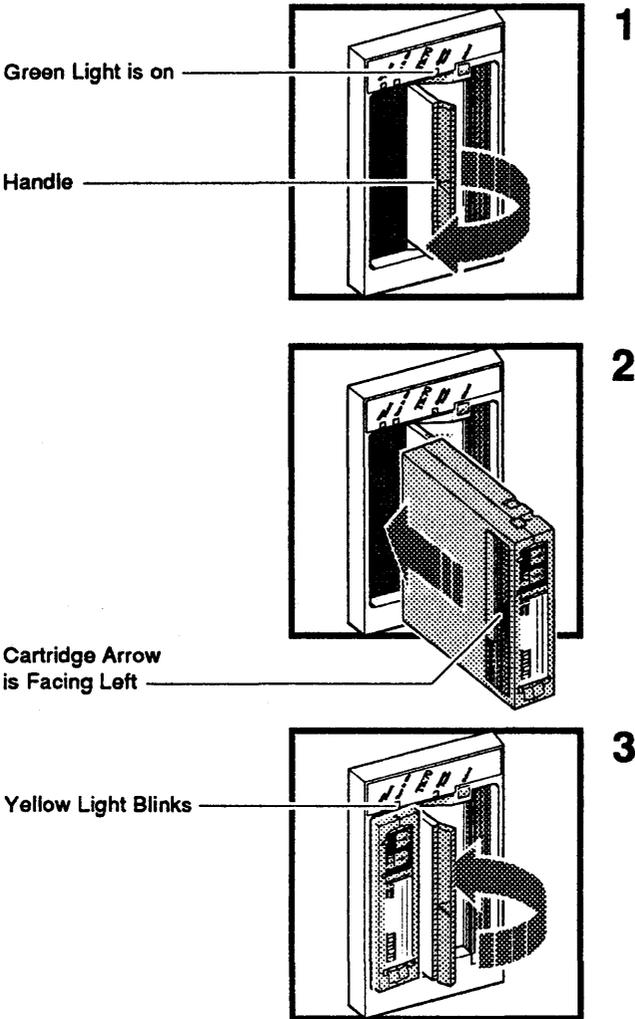
The green light goes off and the yellow light blinks as the tape loads. When the yellow light glows steadily, the tape is ready to use.

**NOTE:** *If the green light blinks rapidly when you push the handle closed, the drive has detected a cartridge fault. Pull the handle open and remove the cartridge. Use another cartridge.*

Refer to Appendix C of this manual for instructions on how to create backup files on a tape cartridge.

**NOTE:** *If a cartridge is new, the drive performs a calibration sequence that takes approximately 30 seconds when the drive receives the first command from the operating system. The yellow light blinks rapidly and irregularly during calibration.*

**Figure 3-6: Inserting a Tape Cartridge**



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### 3.1.2.6 Removing a Tape Cartridge

You must unload a tape before you can remove the cartridge from the tape drive. Use the following procedure (see Figure 3-7):

1. Press the Unload button. You can also issue a software command to unload the cartridge. Refer to your system software manuals for the appropriate command.

The yellow light blinks slowly, as the tape rewinds and unloads into the cartridge. This may take up to 90 seconds.

2. When the yellow light goes off and the green light comes on (you also hear a beep), pull the handle open.

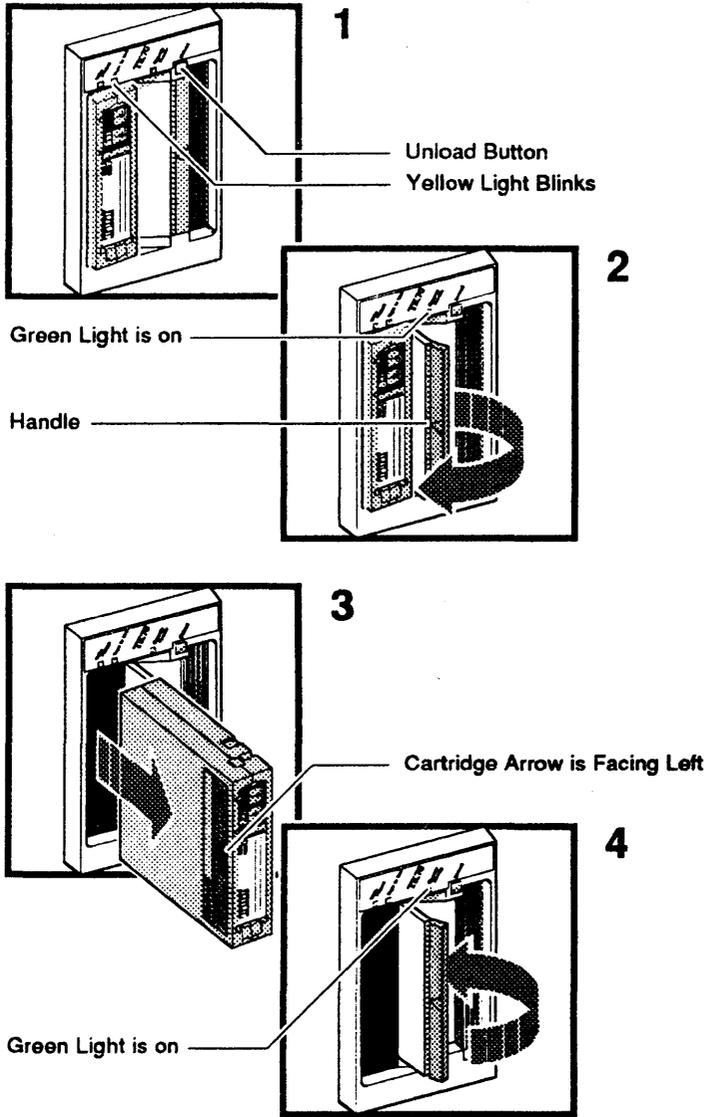
**CAUTION:** *Move the handle only when the yellow indicator light is off and the green indicator light is on. Moving the handle while the yellow light is blinking could damage the drive.*

3. Remove the tape cartridge and store it in its container.
4. Push the handle closed.

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

**CAUTION:** *Remove the tape cartridge from the tape drive when the cartridge is not in use or before you turn off the system. Failure to remove the cartridge may damage the tape cartridge.*

**Figure 3-7: Removing a Tape Cartridge**



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### 3.1.2.7 Summary of TK70 Tape Drive Controls and Indicator Lights

Table 3-2 summarizes the TK70 tape drive controls. Table 3-3 describes the meaning of the indicator lights.

**Table 3-2: TK70 Tape Drive Controls**

Control	Position	Function
Handle	Open	Lets you insert or remove a tape after rewind and unload operations are completed.
	Closed	Locks tape in operating position and begins load sequence.
Unload button	Momentary contact switch	Rewinds and unloads the tape.

**Table 3-3: TK70 Tape Drive Indicator Lights**

Orange	Yellow	Green	Condition
Off	Off	Off	No power to the tape drive.
Off	Off	On steadily	Safe to move cartridge release handle. Power is present.
Off	Off	Blinking	Load fault. The cartridge leader may be defective. Pull out the handle and remove the cartridge. Do not use the cartridge.
On/Off	On steadily	Off	Tape is loaded but not in motion.
On/Off	Blinking	Off	Tape is in motion.
On	On steadily/ blinking	On	Cartridge is write-protected.
Blinking	Blinking	Blinking	A fault is occurring. Press the Unload button to unload the tape cartridge. If the fault is cleared, the yellow light blinks while the tape rewinds. When the green light comes on, you can move the handle to remove the cartridge. If the fault is not cleared, all three lights continue to blink. Do not attempt to remove the tape cartridge. Call your Digital service representative.

### **3.1.3 TLZ04 Tape Drive**

The TLZ04 tape drive is located behind the upper door of the system. To use the drive, move the key to the top position and open the door.

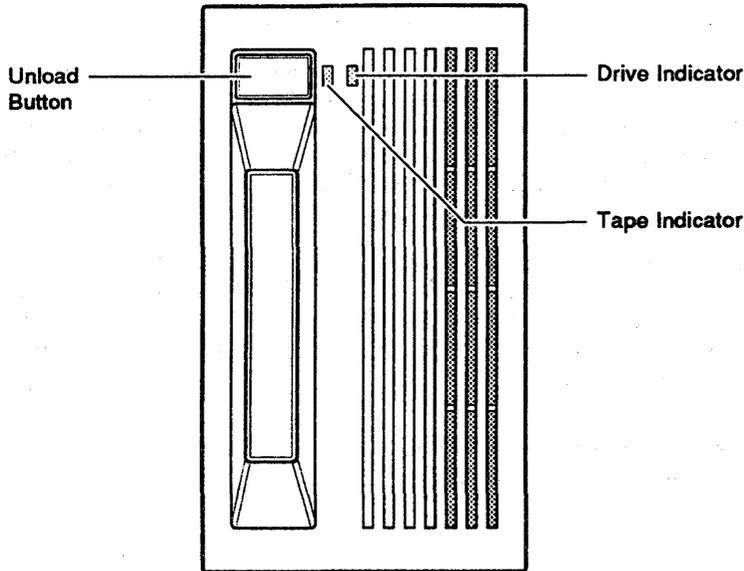
The TLZ04 tape drive is a backup device that uses digital data storage (DDS) and digital audio tape (DAT) recording technologies. Digital audio tape, such as TLZ04 cassettes, takes advantage of the TLZ04 tape drive's helical scan technology. This technology allows more data to be stored on tape by recording data diagonally. DAT recording also minimizes "crosstalk," providing you with higher data integrity.

Digital data storage uses a recording format that supports the use of digital audio tape for computer applications. The DDS/DAT format allows you to backup 1.2 gigabytes of data in approximately 2 hours with no operator intervention. In addition, this format has three levels of error correction, which ensures high data integrity.

#### **TLZ04 Tape Drive Controls and Indicators**

Figure 3-8 shows the TLZ04 tape drive.

**Figure 3-8: TLZ04 Tape Drive**



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The Unload button is used to eject the cassette tape. The Tape and Drive indicators show the status of the TLZ04 and can indicate possible error conditions.

**CAUTION:** *Pressing the Unload button during normal tape operations may halt the tape operation in progress.*

Table 3-4 describes the TLZ04 drive indicators as they apply to normal operating conditions. Table 3-5 describes the TLZ04 drive indicators as they apply to abnormal operating conditions.

**Table 3-4: TLZ04 Drive Indicators (Normal Conditions)**

<b>Indicator</b>	<b>Color(s)</b>	<b>Meaning</b>
Tape		Indicates status of cassette tape as follows.
	Solid green	Tape loaded.
	Solid yellow	Tape loaded and write protected.
Drive		Indicates status of TLZ04 drive as follows.
	Solid green	Drive ready/power on.
	Flashing green	Drive active.
	Flashing yellow	Power-on self-test in progress.

**Table 3-5: TLZ04 Drive Indicators (Abnormal Conditions)**

<b>Indicator</b>	<b>Color(s)</b>	<b>Meaning</b>
Tape	Slow flashing green or yellow	Excessive tape errors. Use the head cleaning cassette. If failure repeats itself, use another cassette tape.
Tape and Drive	Solid yellow	High humidity. Adjust operating environment.
Tape	Flashing yellow 1-3 times	Power-on self-test failed.
Drive	Solid yellow	Power-on self-test failed.

### 3.1.3.1 Proper Handling of Cassette Tapes

Digital Equipment Corporation recommends that you use TLZ04 cassette tapes. To ensure optimal performance from your cassette tapes, observe the following guidelines when handling them.

- Avoid placing the cassette tapes near sources of electromagnetic interference, such as terminals, and video or X-ray equipment. Emissions from such equipment can erase data on the tape.
- Keep cassette tapes out of direct sunlight and away from heaters and other sources of heat.
- Store cassette tapes (and cleaning cassette) where the room temperatures are between 5°C and 32°C (40°F and 90°F).
- Store cassette tapes in a dust-free environment where the relative humidity is 20% to 60%.

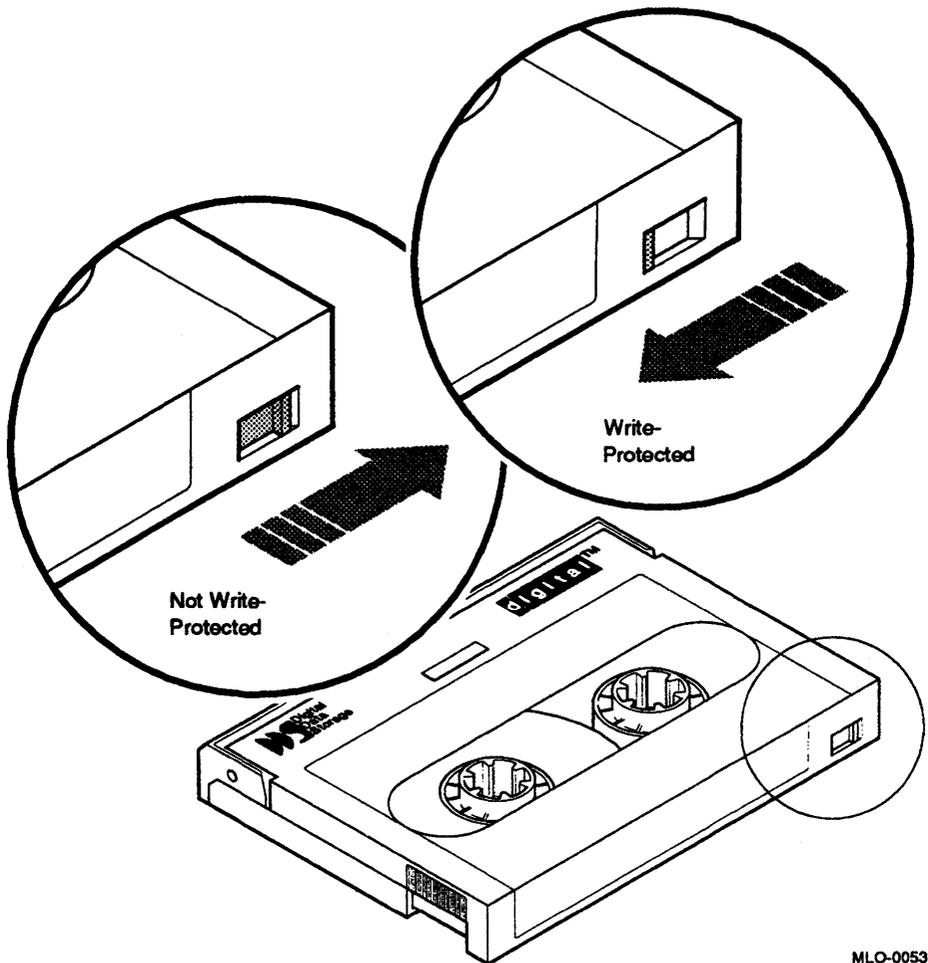
### **3.1.3.2 Setting the Write-Protect Tab on the Cassette Tape**

If you wish to read or copy from a tape, set the write-protect tab on the cassette to write protect. This disables writing to tape, and ensures data integrity. Use a pen (not pencil) to set the write-protect tab (Figure 3-9) to the desired position.

Observe the following guidelines when setting the write-protect tab.

- If you are reading data (copying from tape), set the write-protect tab to write protected.
- If you are writing data, set the write-protect tab to write enabled.
- Write-protect tab position displays in front panel tape indicator.

**Figure 3-9: Setting the Write-Protect Tab on the Cassette Tape**

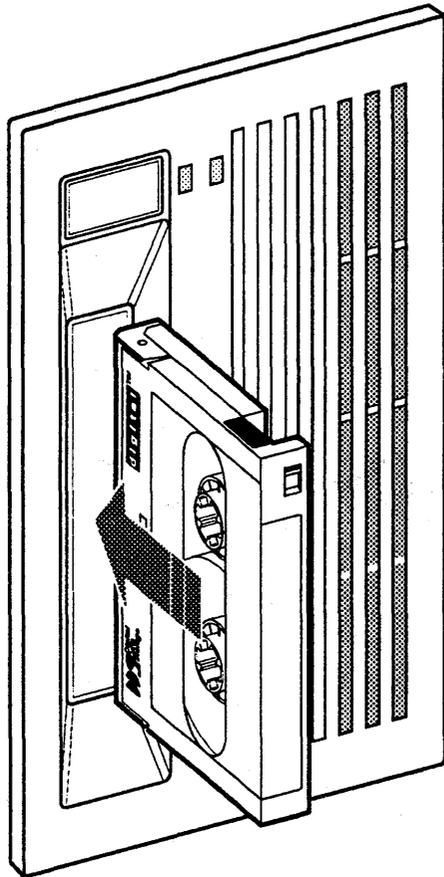


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### **3.1.3.3 Inserting a Cassette Tape Into the Drive**

Insert the TLZ04 cassette tape into the drive with the cassette's write-protect tab at the top, as shown in Figure 3-10.

**Figure 3-10: Inserting a Cassette Tape Into the Drive**



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#### **3.1.3.4 System Software**

System software allows you to execute commands to read and write data to the cassette tape. Your operating system documentation describes specific commands that allow you to do the following:

- Back up data from disk drives to a tape drive
- Copy data from disk to tape, or tape to disk

### 3.1.3.5 Cleaning the Heads

Statistics show that over ninety percent of drive-related problems are associated with the media. Therefore, Digital Equipment Corporation strongly recommends that you follow the instructions for handling cassette tapes and cleaning the heads of the drive.

This section shows you how to perform TLZ04 head cleaning. The heads are the components, in a drive, that magnetically read and write data to and from the media (in this case, a cassette tape).

**NOTE:** *Digital Equipment Corporation recommends that you perform the head cleaning procedure about every two weeks, or after every 25 hours of drive usage.*

*Under normal conditions, it should not be necessary to exceed this cleaning schedule. If a particular cassette causes problems, try changing to another cassette.*

**CAUTION:** *Never attempt to clean the heads in a manner other than described herein. Doing so will void the product warranty.*

To clean the heads, use the head cleaning cassette as follows:

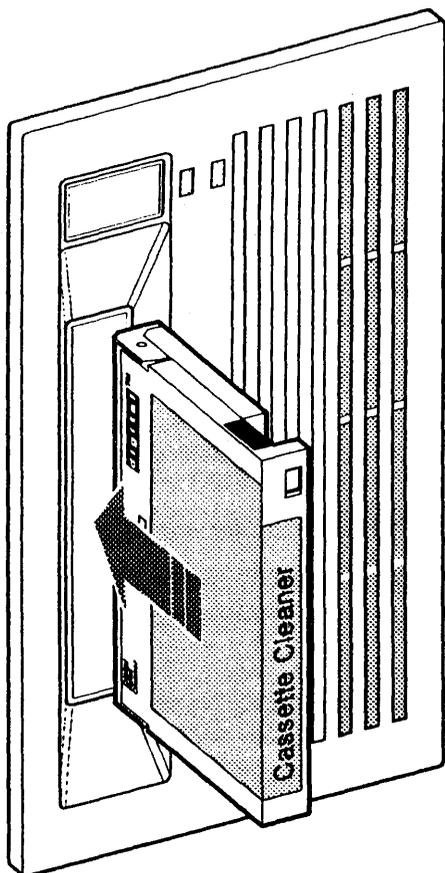
1. Observe that the drive indicator is lit solid green.
2. Insert the head cleaning cassette (part number TLZ04-HA) into the drive as shown in Figure 3-11.
3. With the head cleaning cassette inserted, the drive automatically cleans the head. The drive ejects the head cleaning cassette after approximately 30 seconds.
4. In the space provided on the card enclosed with the head cleaning cassette, place a check mark every time you use the head cleaning cassette.

Under normal conditions, the head cleaning cassette performs for approximately 25 cleanings. Additional cassettes are available from your Digital sales representative or DECdirect.

If the head cleaning cassette has been used more times than it was designed to be used, the drive will eject the cartridge in approximately 8 to 10 seconds. No cleaning action will occur.

**CAUTION:** *Do not exceed the recommended 25 uses of the cleaning cassette. After 25 uses, the cleaning cassette no longer cleans the heads. You must use a new cassette.*

**Figure 3-11: Inserting the Head Cleaning Cassette**



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### **3.1.4 RV20 Optical Disk Subsystem**

If your system includes an RV20 Optical Disk Subsystem, refer to the *RV20 Optical Disk Subsystem Owner's Manual* for instructions on how to operate the device.

### **3.1.5 RRD40 Digital Disk Subsystem**

If your system includes an RRD40 Digital Disk Subsystem, refer to its user's guide for instructions on operating the device.

### **3.1.6 TVS05 Tape Drive**

If your system includes a TVS05 tape drive, refer to the *TVS05 Tape Transport System User's Guide* for instructions on how to operate the device.

**NOTE:** *The TSV05 is a data interchange device and is not supported as a backup device.*

### **3.1.7 TU81-Plus Tape Drive**

If your system includes a TU81-Plus tape drive, refer to the *TU81-Plus Tape Subsystem User's Guide* for instructions on how to operate the device.

## **3.2 Communications Controller Options**

The following types of communications controllers are available for the VAX 4000 systems:

- Asynchronous serial controllers (with or without modem support)
- Synchronous serial controllers (with or without modem support)
- Network controllers

### **3.2.1 Asynchronous Serial Controllers**

The following asynchronous controllers are available for your VAX 4000 system, with and without modem support:

- CXA16—16-line multiplexer, Q-bus controller
- CXB16—16-line multiplexer
- CXY08—8-line multiplexer with modem control, Q-bus controller
- DFA01—2-line controller with integral modems, Q-bus controller
- DSRVB—8-line terminal server, Ethernet device

### 3.2.1.1 Without Modem Support

Before using any peripheral device connected to a serial communications controller, check the following:

- Make sure the peripheral device is properly connected to the system.
- Make sure the peripheral device is properly installed, plugged into an appropriate power source, and turned on.
- Make sure the peripheral device is properly set up. Set-up involves choosing how the device operates. Some set-up choices are matters of personal choice, for example, the number of columns that display on a terminal screen. Others, like baud rate (a measure of the speed at which data is transmitted over a data line), must match the system setting if the peripheral device and system are to communicate. Refer to your terminal or printer manual for complete set-up instructions. Generally, the default settings for your terminal are acceptable.

While most default settings are acceptable, you should perform the set-up procedure for your terminal to ensure appropriate set-up values. The two examples below provide set-up instructions for VT300-series and VT200-series terminals:

#### For VT300-Series Terminals:

1. Press **Set-Up** to display the Set-Up Directory screen.
2. Use the arrow keys to select the "Communications Set-Up" option and press **Enter**.
3. Make sure the "Transmit Speed" option in the "Current Setting" column is set to 9600. Use the left and right arrow keys to change the setting.
4. Make sure the "Receive Speed" option in the "Current Setting" column is set to "receive=transmit." Use the down arrow to move the cursor to this option, and the left and right arrows to change the setting.
5. Press **Select** to return to the Set-Up Directory screen.
6. Use the arrow keys to select the "Global Set-Up" option and press **Enter**.
7. Select the option "Comm Port."
8. If the port in the "Current Setting" column is selected for "RS-232," press **Enter** to select the "DEC-423" port.
9. Press **Select** to return to the Set-Up Directory screen.

10. Use the arrow keys to select the "Save Current Settings" option. Press **[Enter]** to save all current settings; then press **[Set-Up]** to exit the Set-Up Directory.

**For VT200-Series Terminals:**

1. Press **[Set-Up]** to display the Set-Up Directory screen.
2. Use the arrow keys to select the "Default" option and press **[Enter]**. Default correctly sets all values except transmit speed.
3. Use the arrow keys to select the "Comm" option and press **[Enter]** to display the Communications Set-Up menu.
4. Use the arrow keys to select the "Transmit" option and press **[Enter]** to set the speed to 9600.
5. Use the arrow keys to select the "To Directory" option and press **[Enter]**.
6. Use the arrow keys to select the "Save" option and press **[Enter]**; this option stores the set-up values. Then press **[Set-Up]** to exit the Set-Up Directory.

Your operating system may have other requirements for using serial communications devices. Refer to your system software manual.

**3.2.1.2 With Modem Support**

Using serial devices with modem support requires that you install two modems: one connected to the system and one connected to the remote terminal. Both must be connected to phone lines.

Before using modems with your system, check the following:

1. Make sure each modem is connected to the system.
2. Make sure the modem is properly installed and connected to a phone jack.
3. Set controls on the modem according to instructions in the modem user's guide.

Before using the modem connected to the remote terminal, check the following:

1. Make sure the modem is properly installed and connected to a phone jack.
2. Set controls on the modem according to instructions in the modem user's guide.

3. Check the settings on the terminal attached to the modem. Depending on the type of modem and the type of lines used, the baud rate may be 300, 1200, or 2400. Other settings should be the same as those described in the previous section.

Before using a phone line with modem support, you must set certain parameters such as line speed. See your system software manuals for details.

### 3.2.2 Synchronous Controllers

The following synchronous controllers are available for your VAX 4000 system:

- DPV11—Single-line programmable controller
- DSV11—Dual-line controller
- KMV1A—Programmable communications interface, Q-bus controller

Before using a synchronous controller you must verify the following:

- The system you want to communicate with has an appropriate synchronous controller. Synchronous communications require a synchronous controller on both the transmitting and receiving system.
- Both the transmitting and receiving systems must have supporting host software installed. Synchronous communications operate under specific protocols that define how data is interpreted. Two common protocols are X.25 and PSI. Appropriate host software is required to interpret the protocol.

### 3.2.3 Network Controllers

**NOTE:** *VAX 4000 systems contain an Ethernet controller embedded in the CPU module. You can have a second optional Ethernet controller, the DESQA module, included with your system.*

Before using a network controller you must do the following:

1. Make sure the Ethernet cable (either standard transceiver cable or ThinWire cable) is connected to the console module (or optional DESQA module). The light next to the connector should be lit, indicating an active connection. If not lit, move the Ethernet Connector switch to the proper position.

2. Make sure the Ethernet cable is properly connected to the network. A transceiver cable can be connected in one of the following ways:

- To an H4000 or H4005 transceiver located on a traditional Ethernet
- To a local network interconnect (DELNI), which can be connected to a larger Ethernet or can serve to connect up to eight systems in a local area network

A ThinWire cable can be connected as follows:

- To a ThinWire Ethernet multiport repeater (DEMPR) or ThinWire single port repeater (DESPR), which can be connected to a larger Ethernet or can serve to connect many systems in a local area network
- To an available connection on a T-connector of other ThinWire nodes

3. Have the DECnet application installed on your system.

4. Register your node with the network manager so that your node is recognized by other systems in the network.

Some software products, for example, Ethernet-based VAXcluster systems, use the Ethernet hardware address of other systems to operate properly.

To find the hardware address of your Ethernet device, use the command `SHOW ETHER` from console mode. The hardware address of your Ethernet device displays on the terminal as shown in the following example:

```
>>>SHOW ETHERNET
```

```
EZA0 (08-00-2B-03-50-5C)
```

Refer to your software manuals and DECnet manuals for other requirements and further instructions on using a network connection.

### 3.3 Real-Time Options

The following real-time options are available for your VAX 4000 system:

- DRQ3B—High-speed interface with two unidirectional 16-bit data channels
- DRV1W—General purpose interface with one 16-bit input port, one 16-bit output port
- IEQ11—DMA controller that connects a Q-bus to two independent busses
- IBQ01—DMA controller that connects a Q-bus to RS-485 control

- AAV11-S—Digital-to-analog converter with DMA capability
- ADV11-S—Analog-to-digital converter with DMA capability
- KWV11-S—Programmable clock that can count from one to five frequencies
- AXV11—Input/output circuit board for analog devices
- ADQ32—Analog-to-digital converter with DMA capability

Before using a real-time controller, make sure the devices connected to the controller are properly set up. Refer to the documentation for the real-time device.

### 3.4 Printer Options

Before using a printer, make sure it is properly set up and passes any self-tests. Verify that the printer is connected to an appropriate controller. Some printers, such as the LG01 and LG02, require the LPV11-SA interface. Other printers require modem control signals. Consult your printer documentation for the interface requirements.

The VAX 4000 systems have several printer options available. Consult the *VAX 4000 Model 300 Technical Information* for a list of printers and printer interface requirements.

### 3.5 Adding Options

If you have available Q-bus slots, you may be able to add modules to your system. Possible limitations to adding modules include the following:

- Power limitations
- Physical space limitations
- Bus limitations (ac/dc loading)

Your Digital sales representative can advise you about modules available for your system and what you need to order. A Digital service representative should perform the installation, since the system must be properly configured to work correctly.

**CAUTION:** *Do not attempt to remove, rearrange, or install modules. Contact your Digital service representative for assistance.*

# Appendix A

## Related Documentation

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<b>Document</b>	<b>Order Number</b>
<b>Hardware Documentation</b>	
KA670 CPU Systems Maintenance	EK-347AA-MG
KA670 CPU Module Technical Manual	EK-KA670-TM
R400X Expander Addendum to Customer Hardware Information	EK-R400X-CM
TSV05 Tape Transport System User's Guide	EK-TSV05-UG
RF30/RF71 User Guide	EK-RF71D-UG
<b>Software Documentation</b>	
Overview of VMS Documentation	AA-LA95A-TE
VMS VAXcluster Manual	AA-LA27A-TE
VMS Networking Manual	AA-LA48A-TE
Guide to DECnet-VAX Networking	AA-LA47AA-TE
VMS Installation and Operations	AA-LB35B-TE
VAXELN Host System Guide	AA-JG87B-TE
VAXELN Run-Time Facilities Guide	AA-JM81B-TE
<b>Microcomputer Handbook Series</b>	
VAX Architecture Handbook	EB-19580-20
VAX Software Handbook	EB-21812-20

Documentation specific to supported options is listed with the option in *VAX 4000 Model 300 Technical Information*.



## Appendix B

# Programming Parameters for RF-Series ISAs

---

This appendix describes the procedures for setting and examining parameters for RF-series ISAs.

VAX 4000 Model 300 systems have two DSSI host adapters built into the CPU. Each host adapter provides a separate DSSI bus that can support up to seven RF-series ISAs. The host adapters make a connection between the CPU and the requested ISA on their respective DSSI bus. Each ISA has its own controller and server that contain the intelligence and logic necessary to control data transfers over the DSSI bus.

Four principal parameters are associated with each RF-series ISA:

- ALLCLASS
- UNITNUM
- NODENAME
- Bus Node ID

The ALLCLASS parameter determines the device allocation class. The allocation class is a numeric value from 0 to 255 that is used by the VMS operating system to derive a path-independent name for multiple access paths to the same ISA. RF-series ISAs are shipped from the factory with a default allocation class of zero. Each RF-series ISA to be served to the cluster should have an allocation class that matches the allocation class of the host system. Refer to the *VMS VAXcluster* manual for rules for specifying allocation class values.

The UNITNUM parameter determines the unit number of the ISA. By default, the ISA unit number is supplied by the bus node ID plug on the ISA front panel. To set unit numbers and override the default values, you use the console-based diagnostic and utility protocol (DUP) driver utility to supply values to the UNITNUM parameter and to set a value of zero to ISA parameter FORCEUNI.

The NODENAME parameter allows each ISA to have an alphanumeric node name of up to eight characters. RF-series ISAs are shipped from the

factory with a unique identifier, such as R7CZZC, R7ALUC, etc. You can provide a node name of your choosing if you prefer.

The Bus Node ID parameter is provided by the bus node ID plug on the ISA front panel. Each DSSI bus can support up to seven ISAs, bus nodes 0 through 6. Refer to Section 3.1.1 for instructions on changing bus node ID plugs.

**NOTE:** *All ISA parameters, with the exception of the Bus Node ID, are programmed and examined using the console-based DUP driver utility. The ISA Bus Node ID is physically determined by the numbered bus node ID plug that inserts into the ISA front panel.*

With an allocation class of zero, the operating system can use the default parameter values to provide each ISA with a unique device name. The operating system uses the node name along with the device logical name in the following manner:

**NODENAME\$DIA $u$**

where

**NODENAME** is a unique node name and  $u$  is the unit number.

With a nonzero allocation class, the operating system relies on unit number values to create a unique device name. The operating system uses the allocation class along with the device logical name in the following manner:

**\$ALLCLASS\$DIA $u$**

where

**ALLCLASS** is the allocation class for the system and ISAs, and  $u$  is a unique unit number.

Using mass storage expanders, you can fill both DSSI busses (0 and 1), giving a total of 14 RF-series ISAs. Each bus can have seven ISAs (bus nodes 0–6). When devices are added to the second bus (bus 1), and your system is using a nonzero allocation class, you need to assign new unit numbers for ISAs on one of the busses, as the unit numbers for ISAs throughout the system must be unique. The following table illustrates the need to program unit numbers for a system using both DSSI busses (0 and 1), and a nonzero allocation class. In the case of the nonzero allocation class, the operating system sees the ISAs as having duplicate device names.

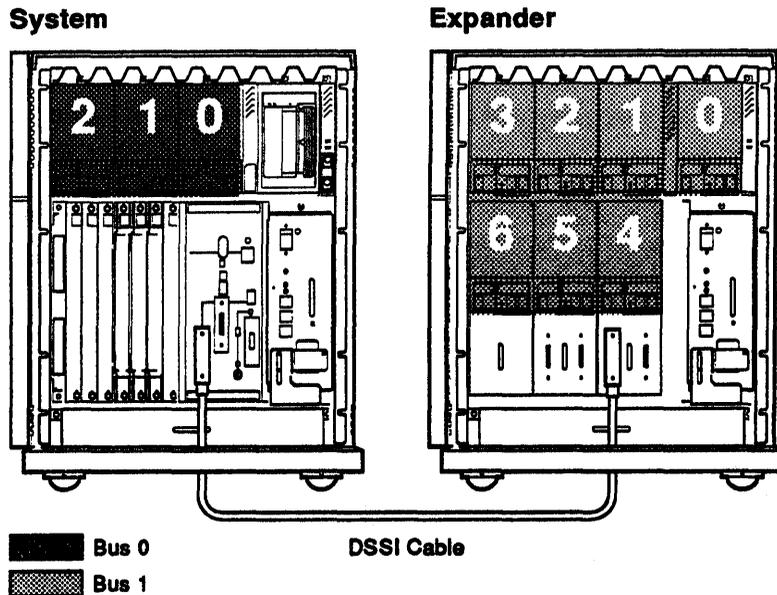
<b>Allocation Class=0</b>	<b>Nonzero Allocation Class (Example: ALLCLASS=1)</b>
R7CZZC\$DIA0	\$1\$DIA0
R7ALUC\$DIA1	\$1\$DIA1
R7EB3C\$DIA2	\$1\$DIA2
R7IDFC\$DIA0	\$1\$DIA0
R7IBZC\$DIA1	\$1\$DIA1
R7IKJC\$DIA2	\$1\$DIA2
R7ID3C\$DIA3	\$1\$DIA3
R7XA4C\$DIA4	\$1\$DIA4
R7QIYC\$DIA5	\$1\$DIA5
R7DA4C\$DIA6	\$1\$DIA6

The following instructions describe how to change ISA parameters using the DUP driver utility. In the sample procedures, the allocation class will be set to 2, the ISAs for bus 0 (in the VAX 4000) will be assigned new unit numbers, and the system disk will be assigned a new node name.

Figure B-1 shows the DSSI busses and bus node IDs for an expanded VAX 4000 system.

**NOTE:** *Your system need not have the maximum number of ISAs, as do the examples in this appendix.*

**Figure B-1: DSSI Busses for an Expanded VAX 4000 System**



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**1. Enter the console mode.**

The procedure for programming internal parameters for RF-series ISAs requires that you issue commands to those RF-series ISAs at the console prompt (>>>). You may type these commands in either uppercase or lowercase letters. Unless otherwise instructed, type each command, then press **[Return]**.

Enter console mode as follows.

- a. Set the Break Enable/Disable switch on the console module of the VAX 4000 system to the enable position (up, position 1).
- b. Set the power switch for each unit (both hosts for a dual-host system, and any R400X expanders for expanded systems) to on (1).

Wait for the system to display the console prompt (>>>).

**2. Make sure the ISAs for which you want to set parameters are on line and are not write-protected. The Run/Ready button should be in (lit), and the Write-Protect button should be out (not lit).**

3. At the console prompt, enter `SHOW DSSI` for a display of all DSSI devices in your expanded system.

The firmware displays two lines of information for each ISA. The first line contains the bus number, node number, and node name. The second line contains the device name and unit number followed by the device type in parentheses. The device name consists of the letters DIA or DIB—devices on bus 0 are listed as DIA, devices on bus 1 are listed as DIB. The DSSI host adapter for each bus is identified by an asterisk (\*).

In Example B-1, the system contains three RF71 ISAs (unit numbers 0-2), and the R400X expander contains seven RF71 ISAs (unit numbers 0-6).

### Example B-1: SHOW DSSI Display

```
>>>SHOW DSSI
DSSI Bus 0 Node 0 (R7CZC)
-DIA0 (RF71)
DSSI Bus 0 Node 1 (R7ALUC)
-DIA1 (RF71)
DSSI Bus 0 Node 2 (R7EB3C)
-DIA2 (RF71)
DSSI Bus 0 Node 6 (*)

DSSI Bus 1 Node 0 (SNEEZY)
-DIB0 (RF71)
DSSI Bus 1 Node 1 (DOPEY)
-DIB1 (RF71)
DSSI Bus 1 Node 2 (SLEEPY)
-DIB2 (RF71)
DSSI Bus 1 Node 3 (GRUMPY)
-DIB3 (RF71)
DSSI Bus 1 Node 4 (BASHFUL)
-DIB4 (RF71)
DSSI Bus 1 Node 5 (HAPPY)
-DIB5 (RF71)
DSSI Bus 1 Node 6 (DOC)
-DIB6 (RF71)
DSSI Bus 1 Node 7 (*)
>>>
```

In this example, each ISA will be assigned an allocation class of 2, and the system disk will be given a new node name. When both DSSI busses (0 and 1) contain devices, and a nonzero allocation is used, each DSSI device with the same allocation class must have a unique unit number. This is to guarantee that all device names in the cluster are unique.

In this example, the ISAs in the VAX 4000, DIA0, DIA1, and DIA2 will be assigned unit numbers 10, 11, and 12.

### Entering the DUP Driver Utility

To examine and change internal RF-series ISA parameters, you must first activate the DUP driver utility by setting host to the specific ISA for which you want to modify or examine parameters.

Use the command

```
SET HOST/DUP/DSSI/BUS:<BUS_NUMBER> <NODE_NUMBER> PARAMS
```

where

<bus\_number> is the DSSI bus number (0 or 1), and <node\_number> is the bus node ID (0-6) for the ISA on the bus.

In Example B-2, SET HOST/DUP/DSSI/BUS:0 0 PARAMS is entered at the console prompt to start the DUP server for the ISA at bus 0, node 0.

### Example B-2: Starting the DUP Driver Utility

```
>>>SET HOST/DUP/DSSI/BUS:0 0 PARAMS
Starting DUP server...
Copyright (c) 1990 Digital Equipment Corporation
PARAMS>
```

### Setting Allocation Class

After entering the DUP driver utility for a specified ISA, you can examine and set the allocation class for the ISA as follows:

1. At the PARAMS> prompt, enter SHOW ALLCLASS to check the allocation class of the ISA to which you are currently connected.
2. Enter SET ALLCLASS 2 (or enter the allocation class you desire).
3. Enter SHOW ALLCLASS to verify the new allocation class.

Example B-3 shows the steps examining and changing the allocation class for a specified ISA. In the example, the allocation class is changed from an allocation class of 0 to an allocation class of 2.

### Example B-3: Setting Allocation Class for a Specified ISA

```
PARAMS> SHOW ALLCLASS
Parameter      Current      Default      Type      Radix
-----
ALLCLASS      0              0           Byte      Dec      B

PARAMS> SET ALLCLASS 2
PARAMS> SHOW ALLCLASS
Parameter      Current      Default      Type      Radix
-----
ALLCLASS      2              0           Byte      Dec      B
```

### Setting Unit Number

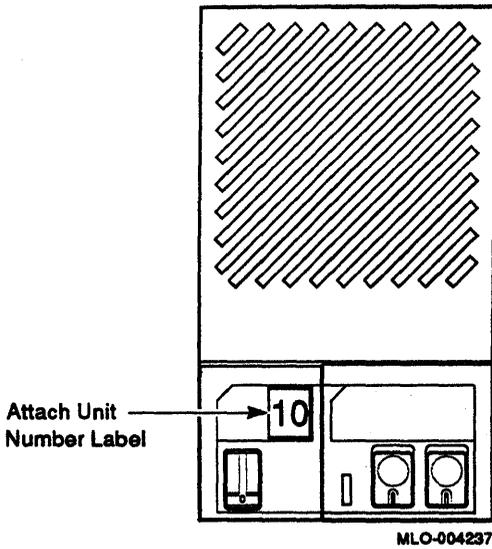
After entering the DUP driver utility for a specified ISA, you can examine and set the unit number for the ISA as follows:

1. At the `PARAMS>` prompt, enter `SHOW UNITNUM` to check the unit number of the ISA to which you are currently connected.
2. Enter `SET UNITNUM 10` (or enter the unit number you desire).
3. Enter `SET FORCEUNI 0` to override the default unit number value supplied by the bus node ID plug.
4. Enter `SHOW UNITNUM` to verify the new unit number.
5. Enter `SHOW FORCEUNI` to verify that the current value for the `FORCEUNI` parameter is 0.

Example B-4 shows the steps for changing the unit number of a specified ISA from unit number 0 to unit number 10.

6. Label the ISA with its unit number using the unit number labels shipped with your system and R400X expander. Figure B-2 shows where to affix a unit number label on the ISA front panel.

**Figure B-2: Attaching a Unit Number Label to the ISA Front Panel**



**Example B-4: Setting a Unit Number for a Specified ISA**

```

PARAMS> SHOW UNITNUM
Parameter      Current      Default      Type      Radix
-----
UNITNUM              0              0      Word      Dec      U

PARAMS> SET UNITNUM 10
PARAMS> SET FORCEUNI 0
PARAMS> SHOW UNITNUM

Parameter      Current      Default      Type      Radix
-----
UNITNUM              10              0      Word      Dec      U

PARAMS> SHOW FORCEUNI
Parameter      Current      Default      Type      Radix
-----
FORCEUNI              0              1      Boolean   0/1      U
    
```

## Setting Node Name

After entering the DUP driver utility for a specified ISA, you can examine and set the node name for the ISA as follows:

1. At the `PARAMS>` prompt, enter `SHOW NODENAME` to check the node name of the ISA to which you are currently connected.
2. Enter `SET NODENAME SYSDSK` (or enter the desired alphanumeric node name of up to 8 characters).
3. Enter `SHOW NODENAME` to verify the new node name.

Example B-5 shows the steps for changing the node name of a specified ISA from the factory-supplied name to `SYSDSK`.

### Example B-5: Changing a Node Name for a Specified ISA

```
PARAMS> SHOW NODENAME
Parameter      Current          Default          Type          Radix
-----
NODENAME       R7CZZC          RF71             String        Ascii        B

PARAMS> SET NODENAME SYSDSK

PARAMS> SHOW NODENAME
Parameter      Current          Default          Type          Radix
-----
NODENAME       SYSDSK          RF71             String        Ascii        B
```

## Exiting the DUP Server Utility

After you have completed setting and examining internal ISA parameters, enter the `WRITE` command at the `PARAMS>` prompt to save the ISA parameters you have changed using the `SET` command. The changes are recorded to nonvolatile memory.

If you have changed the allocation class or node name of an ISA, the DUP driver utility will ask you to initialize the controller. Answer Yes (Y) to allow the changes to be recorded, and to exit the DUP driver utility.

If you have not changed allocation class or node name, enter the `EXIT` command at the `PARAMS>` prompt to exit the DUP driver utility for the specified ISA. Example B-6 shows the procedure for saving parameter changes. In the example, the controller is initialized.

### Example B-6: Exiting the DUP Driver Utility for a Specified ISA

```
PARAMS> WRITE
Changes require controller initialization, ok? [Y/(N)] Y
Stopping DUP server...
>>>
```

**NOTE:** *You must repeat the procedures in this appendix for each ISA for which you want to change parameters.*

Example B-7 shows the display for the SHOW DSSI command after the unit numbers for the ISAs on bus 0 have been changed from 0, 1, and 2 to 10, 11, and 12. Notice that the bus 0 device names are now DIA10, DIA11, and DIA12.

### Example B-7: SHOW DSSI Display

```
>>>SHOW DSSI
DSSI Bus 0 Node 0 (SYSDSK)
-DIA10 (RF71)
DSSI Bus 0 Node 1 (R7ALUC)
-DIA11 (RF71)
DSSI Bus 0 Node 2 (R7EB3C)
-DIA12 (RF71)
DSSI Bus 0 Node 6 (*)

DSSI Bus 1 Node 0 (SNEEZY)
-DIB0 (RF71)
DSSI Bus 1 Node 1 (DOPEY)
-DIB1 (RF71)
DSSI Bus 1 Node 2 (SLEEPY)
-DIB2 (RF71)
DSSI Bus 1 Node 3 (GRUMPY)
-DIB3 (RF71)
DSSI Bus 1 Node 4 (BASHFUL)
-DIB4 (RF71)
DSSI Bus 1 Node 5 (HAPPY)
-DIB5 (RF71)
DSSI Bus 1 Node 6 (DOC)
-DIB6 (RF71)
DSSI Bus 1 Node 7 (*)
>>>
```

## Appendix C

# Backup Procedures

---

This appendix describes the following procedures:

- Installing and booting standalone BACKUP on the system disk
- Installing and booting standalone BACKUP on a TK50 tape cartridge
- Backing up and restoring the system disk

### C.1 Overview of 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 down the system and using standalone BACKUP, you can make an exact copy of the system disk.

You can keep standalone BACKUP on the system disk, a TK50 tape cartridge, or any other media the system supports. DIGITAL recommends that you keep standalone BACKUP on the system disk and on a tape cartridge.

Usually you boot standalone BACKUP from the system disk because it saves time. You should, however, keep a copy of standalone BACKUP on a tape cartridge in case the system disk becomes damaged.

### C.1.1 Installing Standalone BACKUP on 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 in to the SYSTEM account.
2. Enter the following command:

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

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

```
The kit is complete.
```

3. To boot standalone BACKUP from the system disk, see Section C.1.2.

### C.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, enter the following command to shut down the system:

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

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

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

2. Stop the system by pressing the Halt button on the SCP.
3. Enter the BOOT command in the following format:

```
>>> B/E0000000 device_name 
```

Substitute the device name of the system disk for device\_name. For example, if the system disk has a device name of DIA0, enter the following:

>>> B/E0000000 DIA0

4. Standalone BACKUP displays a message similar to the following:

```
VAX/VMS Version V5.3-2 Major version id = 1 Minor version id = 0
```

5. A few minutes later the procedure asks for the date and the time. Enter the date and time using the 24-hour clock format, for example:

```
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM)
19-APR-1990 13:00 
```

6. The system displays a list of the local devices on your system, for example:

```
Available device MUA0:      device type TK70
Available device DIA0:      device type RF71
.
.
.
```

Check the list of devices. If the list is incomplete, make sure that all the devices are connected properly to the system. See the *VAX 4000 Model 300 Installation* manual for details.

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

```
%BACKUP-I-IDENT, stand-alone BACKUP V5.3--2; the date is
  19-APR-1990 13:00:00.00
$
```

To back up the system disk, see Section C.2.1.

To restore the system disk, see Section C.2.2.

### C.1.3 Installing Standalone BACKUP on a Tape Cartridge

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

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

1. Obtain a blank tape cartridge. Write the name on the paper label. For example, you would use the name S/A BKUP V5.3-2 TK50 to build a version 5.3-2 kit. Insert the label into the label slot.

2. Write-enable the tape cartridge.
3. Insert the tape cartridge labeled S/A BKUP V5.3-2 TK50 in the tape cartridge drive.
4. Log in to the SYSTEM account.
5. Enter the following command:

```
$ @SYSSUPDATE:STABACKIT 
```

6. The system asks for the name of the target device. Enter MUA0, for example:

```
%STABACKIT-I-SYMDEL, all global symbols deleted
Enter the name of the device on which to build the kit:
MUA0 
```

**NOTE:** *If your system uses the TLZ04 tape drive, enter the device name MKA0.*

7. The system 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, enter 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 system displays a message similar to the following:

```
Ending time 19-APR-1990 13:45:29.90
Starting time 19-APR-1990 13:22:39.05
The kit is complete.
$
```

11. Remove the tape cartridge labeled S/A BKUP V5.3-2 TK50 from the tape cartridge drive.
12. Write-protect the tape cartridge and store it in a safe place.

## C.1.4 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, enter the following command to shut down the operating system:

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

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

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

2. Stop the system by pressing the Halt button on the SCP.
3. Insert the tape cartridge containing standalone BACKUP in the tape cartridge drive.
4. To boot standalone BACKUP, enter the following command at the console prompt (>>>):

```
>>> B MUA0 
```

5. Standalone BACKUP displays a message similar to the following:

```
VAX/VMS Version V5.3--2 Major version id=1 Minor version id=0
```

6. The procedure asks for the date and the time. Enter the date and time using the 24-hour clock format, for example:

```
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM)  
19-APR-1990 13:00 
```

7. The system displays a list of the local devices on your system, for example:

```
Available device MUA0:      device type TK70  
Available device DIA0:      device type RF71  
.  
.  
.
```

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

```
%BACKUP-I-IDENT, stand-alone BACKUP V5.3--2; the date is
 19-APR-1990 13:00:00.00
$
```

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

To back up the system disk, see Section C.2.1.

To restore the system disk, see Section C.2.2.

## C.2 Backing Up the System Disk

There are several reasons to back up a system disk:

- 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 occurs, you can restore the backup copy of the system disk.
- To prevent loss of system files if they are deleted accidentally: *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: Fragmentation happens when files are not stored contiguously 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, which uses a subset of Backup Utility qualifiers, to back up and restore the 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.

**Table C-1: Standalone BACKUP Qualifiers**

Qualifier	Function
/IMAGE	Allows you to 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 Backup Utility and its qualifiers, see the *VMS Backup Utility Manual*.

### C.2.1 Backing Up the System Disk

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

1. Decide whether you want to back up the system to another fixed disk or to a tape cartridge. If you are using a tape cartridge, obtain a scratch tape that you can use for the backup copy. A scratch tape cartridge is a tape cartridge that is either blank or contains files that you no longer need.
2. If you are using a tape cartridge, write-enable it. To write-enable a tape cartridge, slide the write-protect switch away from the tape cartridge label. Insert the tape cartridge in the tape cartridge drive.
3. Determine the device name of the drive holding the system disk and the drive holding the backup disk or tape cartridge. Enter the SHOW DEVICE command at the console prompt (>>>).
4. Boot standalone BACKUP as described in Section C.1.2 or Section C.1.4.
5. Enter the BACKUP command in one of the following formats:

```
$ BACKUP/IMAGE/VERIFY source_drive: target_drive: 
```

```
$ BACKUP/IMAGE/VERIFY source_drive: target_drive:-   
-$ saveset.BCK/LABEL=volume_label/REWIND 
```

where:

- source\_drive is the location of the files that you want to back up. Use the device name of the drive holding the system disk.
- target\_drive is the destination. Use the device name of the drive holding the backup disk or tape cartridge.

- `saveset.BCK` is the name of the saveset (the name should reflect the contents of the backup tape and cannot exceed 17 characters in length).
- `volume_label` is the volume label of the tape cartridge in the tape drive. If the tape has been initialized already, use the same volume label that was assigned by the `INITIALIZE` command. If the tape has not been initialized, you can assign a volume label at this time. The volume label cannot have more than six characters.

The following example uses the `BACKUP` command to make a backup disk. You can use a backup disk as the system disk:

```
$ BACKUP/IMAGE/VERIFY DIA0: DIA1 
```

The following example uses the `BACKUP` command to make a backup tape cartridge. The contents of the backup tape cartridge must be restored to a disk before you can use them. For more information, see Section C.2.2.

```
$ BACKUP/IMAGE/VERIFY DIA0: MUA0:- 
- $ APR_19_1990.BCK/LABEL=19APRF/REWIND 
```

6. The system displays the following message:

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

7. If you are backing up the system disk to another disk, proceed to step 8.

If you are backing up your system disk to a tape cartridge and the contents of the system disk fit on one tape cartridge, remove the backup tape cartridge from the drive. Label the tape `COMPLETE SYSTEM BACKUP`, number it, and include the date. Proceed to step 8.

If you are backing up your system disk to a tape cartridge and the system disk contains more data than one tape cartridge can store, the system displays the following messages:

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

Do the following:

- a. Remove the backup tape cartridge from the drive.
- b. Label the tape `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, enter Y (for Yes) and press Return. 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, the system displays the following message:

`%BACKUP-I-PROCDONE, operation completed. Processing finished at 19-APR-1990 15:00:00.00`

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

If you do not want to perform another standalone BACKUP operation, ensure the standalone application volume is online and ready.

Enter "YES" to continue:

9. Press the Halt button

10. 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 value 1. (The CLUSTER\_SIZE parameter refers to the way files are stored on the disk, NOT to VAXcluster environments.) You can change most volume parameters later with the SET VOLUME command. However, to change the CLUSTER\_SIZE parameter, you must back up the system disk that has been initialized previously with the CLUSTER\_SIZE value 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 Guide to Maintaining a VMS System. For more information on the BACKUP command, see the VMS Backup Utility Manual.*

## C.2.2 Restoring the System Disk

To restore the system disk from a tape cartridge, use the following procedure.

1. Determine the device names of the drive holding the system disk and the drive holding the backup disk or tape cartridge. Enter the SHOW DEVICE command at the console prompt (>>>).
2. Boot standalone BACKUP as described in Section C.1.2 or Section C.1.4.
3. If you have a backup tape cartridge, make sure it is write-protected. Insert it in the drive.
4. Enter the BACKUP command in one of the following formats:

```
$ BACKUP/IMAGE/VERIFY source_drive: target_drive: 
```

```
$ BACKUP/IMAGE/VERIFY source_drive:-   
-$ saveset.BCK/SAV/REWIND target_drive: 
```

where:

- source\_drive is the location of the files that you want to restore. Use the device name of the drive holding the backup disk or tape cartridge.
- target\_drive is the destination. Use the device name of the drive holding the system disk.
- saveset.BCK is the name of the saveset, if you have a backup tape cartridge.

```
$ BACKUP/IMAGE/VERIFY DIA0: DIA1: 
```

The following example uses the BACKUP command to restore the system disk from a backup tape cartridge:

```
$ BACKUP/IMAGE/VERIFY-   
-$ MUA0:APR_19_1990.BCK/SAV/REWIND DIA0: 
```

5. The system displays the following message:

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

If you are backing up to a disk or if your saveset fits on one tape, proceed to step 7.

6. If you have more than one backup tape cartridge, the system displays the following message:

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

Remove the backup tape cartridge from the drive. Insert the next backup tape cartridge in the drive, enter Y (for Yes) and press Return. Each time you receive a mount request, repeat this step.

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

```
%BACKUP-I-PROCDONE, operation completed.  
Processing finished at 19-APR-1990 15:00:00.00  
If you do not want to perform another standalone BACKUP  
operation, use the console to halt the system.
```

```
If you do not want to perform another standalone BACKUP  
operation, ensure the standalone application volume is  
online and ready.
```

```
Enter "YES" to continue:
```

8. Press the Halt button.
9. Reboot the system.



## Appendix D

# Removing Unwanted VMS Files

---

### D.1 Using VMSTAILOR

Read this appendix if you want to remove the VMS operating system and DECwindows files that you do not need from the system disk. For example, if you are not running DECnet-VAX, you do not need the network support files. You can remove unwanted files with the VMSTAILOR program. Enter the following command to log in to the SYSTEM account:

```
$ RUN SYS$UPDATE:VMSTAILOR 
```

The VMSTAILOR program asks you if you want to tailor files ON or OFF. Type OFF to remove unwanted files.

**CAUTION:** *Do not delete files from the factory-installed software (FIS) system until you have backed up your software. A VMS distribution kit is needed to return files to the system disk. Also, VMSTAILOR and DECW\$TAILOR procedures cannot restore files from a backup set. It may be necessary to reload the system software from a backup set if files are incorrectly deleted and if a VMS distribution kit is not available.*

The VMSTAILOR program lists each group of files and its size in blocks. Files are grouped according to their function. For example, all the files required for cluster support are in one group. A file group is made up of many small subgroups. You can eliminate an entire group of files, or you can eliminate one or more of its subgroups.

Decide which file groups or subgroups you do not need to support your system. The VMSTAILOR program displays step-by-step instructions that are easy to follow.

VMSTAILOR displays the names of the files it deletes. After it finishes, AUTOGEN runs automatically to make the adjustments that are necessary after system files are deleted.

**NOTE:** *You can use VMSTAILOR at any time to delete or add groups of VMS files to the system disk. After adding files to the system disk, you should apply any updates that affect them.*

For example, suppose you do not need the VMS Version 5.0 MAIL utility and you run VMSTAILOR to remove those files. Later on, if you decide you want to use mail, you can run VMSTAILOR to return the MAIL files to the system disk. You then apply any VMS upgrade or update that has occurred since Version 5.0 that affected the MAIL utility. To remove VMS DECwindows files from the system disk, enter the following command:

```
$ RUN SYS$UPDATE:DECW$TAILOR 
```

The DECW\$TAILOR program works just like the VMSTAILOR program.

# Glossary

---

**Application program**

A program designed to meet specific user needs, such as a program that monitors a manufacturing process.

**Allocation class**

The allocation class is used by the VMS operating system to derive a common lock resource name for multiple access paths to the same device.

**Backplane**

1. The connector block that printed circuit boards plug into.
2. A printed circuit board containing the bus.

**Back up**

The process of making copies of the data stored in the ISA(s) so that you can recover that data after an accidental loss. You make these copies on a tape cartridge and then store it in a safe place.

**Backup copy**

A duplicate copy of data on the ISA that is stored on a tape cartridge.

**Baud rate**

The speed at which signals are transmitted serially over a communication line.

**Binary**

A number system that uses only two digits: 0 and 1. These digits are usually represented in circuitry by two voltage levels.

**Bit**

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

**Boot**

To use a bootstrap program to start a computer system.

**Bootable medium**

A fixed disk or magnetic tape containing software (such as an operating system) that the bootstrap program can load into the system memory.

**Boot node**

The management center for the cluster and its major resource provider.

**Bootstrap**

A program that you start when you turn on the system. The bootstrap loads software contained on a fixed disk or magnetic tape cartridge into memory. The system then stops executing the bootstrap and starts executing the software in memory. The software usually loads an operating system or other software into memory, so that the system can start processing.

**Bug**

An error in the design or implementation of hardware or software system components.

**Bus**

The connection between the central processing unit (CPU) and input/output devices in the system. Information signals such as address, data, and control signals are carried through the bus.

**Byte**

A group of eight binary digits (bits). A byte is one-half the size of a word and one-quarter the size of a longword.

**Central processing unit (CPU)**

The part of a computer system that controls the interpretation and execution of instructions.

**Cluster**

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

**Command**

An order given by a user to a computer, often through a terminal keyboard.

**Communication line**

A cable along which electrical signals are transmitted. Systems or devices connected by communication lines can share information and resources.

**Computer system**

A combination of computer hardware, software, and external devices that performs specific operations or tasks.

**Console terminal**

The terminal you use when installing software and running diagnostic programs.

**Controller**

A component that regulates the operation of one or more peripheral devices. Controllers are often called interface units.

**CPU**

See *Central processing unit*.

**Data**

A representation of facts, concepts, or instructions, suitable for communication, interpretation, or processing by human beings or by machines.

**DAT**

Digital audio tape. Used in digital data storage recording technology.

**Data transmission**

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

**DDS**

Digital data storage.

**Debug**

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

**DECnet**

Digital networking software that runs on nodes in both local and wide area networks.

**DECwindows**

Digital's workstation management product, a superset of the industry standard X Window System. It can be used to run windowing applications efficiently on single workstations, or in distributed processing networks of workstations and non-workstations systems.

**Default**

A value or setting that in most cases is normal or expected.

**Device**

The general name for any entity connected to a system that is capable of receiving, storing, or transmitting data.

**Device name**

The name by which a device or controller is identified within a system. You use the device name to refer to that device when communicating with the system.

**Diagnostic program**

A program that detects and identifies abnormal hardware operation. The MicroVAX Diagnostic Monitor software contains several diagnostic programs.

**Disk**

A flat circular plate with a coating on which data is stored magnetically in concentric circles (tracks).

**Disk drive**

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

**DSSI**

Digital Storage System Interconnect (DSSI) is the technology used for efficient management of integrated disk storage products. DSSI is a member of the Digital Storage Architecture (DSA) product family.

**EIA**

Electronic Industries Association.

**Error message**

A message displayed by the system to indicate it has detected an error or malfunction.

**File**

A collection of related information treated by the computer as a single item.

**Firmware**

Software instructions stored in a fixed form, usually in read-only memory (ROM). In a VAX 4000 system, the power-on self-tests and bootstrap program are firmware.

**Formatted data**

Data laid out in a particular pattern to conform to a predetermined structure. The structure is dictated by the system software.

**Hardware**

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

**Head**

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

**Input device**

A piece of equipment used to transfer data into the computer. A keyboard is an input device.

**Input/Output (I/O) device**

A piece of equipment that accepts data for transmission both to and from a computer. A terminal is an input/output device.

**Interactive**

The method of communicating with a computer system. You enter a command at the keyboard, the system executes the command, and then responds with a message or prompts for another command.

**Integrated Storage Assembly**

Integrated Storage Assemblies are intelligent storage devices that contain their own controller and MSCP server.

**Interface**

A device or piece of software that lets different components of a computer communicate with one another.

**I/O**

Abbreviation for input/output.

**ISA**

See *Integrated Storage Assembly*.

**Kbyte**

1024 bytes.

**LED**

Light-emitting diode. An LED on the console module displays a hexadecimal countdown during the power-on sequence.

**Load**

1. To move software, usually from a peripheral device into memory.
2. To place a disk in a disk drive, or tape in a tape drive.

**Longword**

A group of 32 bits, equal to two words or four bytes.

**Magnetic tape**

A long strip of plastic coated with magnetic oxide, used for storing data. Often called magtape. The tape contained in a tape cartridge.

**Mbyte**

1,048,576 bytes.

**Memory**

The area where a computer finds the instructions and data it will process.

**Menu**

A displayed list of options. The list usually contains commands you can enter.

**Network**

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

**Network coordinator**

The network coordinator manages the network, assigns unique node names and addresses for each system on the network, and provides administrative assistance to network users.

**Node**

An individual information processing unit, such as a computer, workstation, or device, that is connected to a network. A node is an end point to any branch of a network or a junction common to two or more branches.

**Off line**

Pertaining to equipment, devices, and events that are not under direct control of the computer system.

**Operating system**

A collection of programs that controls the overall operation of a computer and performs such tasks as:

- Assigning places in memory to programs and data
- Processing requests, scheduling jobs
- Controlling the operation of input and output devices

**Output device**

A device by means of which data can be extracted from a computer system, for example, a printer.

**Peripheral device**

Any device distinct from the central processing unit that provides it with additional memory storage or communication capability. Examples are disk and diskette drives, video terminals, and printers.

**Power-on sequence**

A series of ordered events that occurs when you supply power to a system by turning it on.

**Printer**

A peripheral device that provides paper copies of information stored in a computer.

**Product Authorization Key (PAK)**

A PAK is a printed certificate containing information that must be input to the VMS License Management Facility to authorize the VMS user to run a particular software product.

**Program**

The complete sequence of instructions necessary for a computer to perform a task. See *Software*.

**Prompt**

A character(s) or word(s) that a computer displays to indicate it is waiting for you to type a command.

**Quorum disk**

A quorum disk acts as a virtual node in a system using the quorum scheme. See the *VMS VAXcluster Manual* for further information on quorum disks and the quorum scheme.

**Read-only memory (ROM)**

A memory that does not allow modification of its contents. The computer can use data in a ROM but cannot change it.

**Reboot**

To restart a computer system. Pressing the Reset button reboots the system.

**Record**

A set of related data that a program can treat as a unit. A file consists of a number of records.

**ROM**

See *Read-only memory*.

**Run**

1. A single continuous execution of a program.
2. To execute a program.

**Satellite system**

A system that is booted remotely from the system disk on the boot node. A computer system that obtains a specific set of services from a server system.

**Server**

Hardware or software that provides a specific set of services to a satellite.

**Server system**

In a VAXcluster, a computer that is used to start the satellite systems and to manage their use of common resources.

**Software**

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

**Software package**

A set of related programs that performs a specific task.

**Storage medium**

Any device capable of recording information, for example, a tape cartridge.

**Store**

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

**System**

A combination of computer hardware and software and external devices that performs specific processing operations.

**System Disk**

The disk or ISA that holds VMS factory-installed software.

**System management**

Tasks performed by the operating system to control the overall operation of the computer system.

**Tailoring**

Using the VMSTAILOR program to remove the VMS operating system and DECwindows files that you do not need from the system disk.

**Terminal**

An input/output device generally used for communication between the users of a computer system and the system itself.

**Video terminal**

A terminal that displays information on the screen of a cathode ray tube (CRT).

**VMS**

Digital's proprietary operating system.

**Word**

A word is 16-bits long.

**Write-protect**

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



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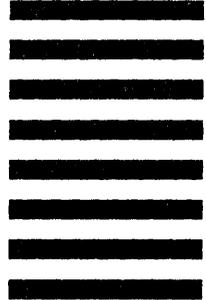
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