INSTALLATION

DECsystem 5500 Installation

Order Number EK-331AA-IN-001

Digital Equipment Corporation
Maynard, Massachusetts

First Printing, August 1990

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

FCC NOTICE: The equipment described in this manual generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense may be required to take measures to correct the interference.

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Contents

Figures

Tables

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Preface

This manual tells you how to install your DECsystem 5500 system. The installation includes the following steps.

1. Check site preparation
2. Check the shipment
3. Position the system
4. Open the system door
5. Install the console terminal
6. Set system controls
7. Connect additional devices to the system
8. Make the system-expander connections, if required
9. Connect the system power cable
10. Turn on the system and select a language
11. Close the system door

CAUTION: *Before installing the system, review your system warranty. The terms of that agreement with Digital may require that a Digital service representative install your system. Contact your local Digital representative if you have any questions.*

Prestoserve™ software, included in your operating system, requires a special CPU configuration. If that configuration will be set up during system installation and you are not a licensed self-maintenance customer, your system should be installed by a Digital service representative.

If you are installing an expander with your system:

1. Use this manual to begin the installation of the system.
2. After you complete step 7, install the expander as described in the installation document (addendum or manual) shipped with the expander.

3. Return to this manual (step 8) to complete the installation of the expander and the system.

A glossary in the *Operation* manual will help you understand new words and acronyms that appear in this manual.

Conventions

The following conventions are used in this manual.

Convention	Meaning
Key	A terminal key used in text and examples. For example, Break indicates that you press the Break key on your terminal keyboard.
NOTE	Provides general information about the current topic.
CAUTION	Provides information to prevent damage to equipment or software.
WARNING	Provides information to prevent personal injury.

The following warning symbols appear on the power supply. Please review their meaning:

Indicates the risk of electric shock.

To reduce the risk of injury, do not remove modules, Integrated Storage Elements (ISEs), or the power supply. No user-serviceable parts are inside. Refer servicing questions to your Digital service representative or your qualified self-maintenance personnel.

The equipment is not designed for connection to an IT power system (a power system without a directly grounded neutral conductor). The equipment should be plugged into a dedicated (isolated) ground circuit.

The system contains an automatic voltage-selection power supply. Voltage selection is not required prior to installation.

1 Check Site Preparation

You may have received a copy of the *Site Preparation* manual, which describes the physical, environmental, and electrical requirements for your system. For your convenience, a copy of that manual is also included in your Customer Hardware Information Kit. If you have not done so, read that manual and follow its instructions for preparing your site.

- The installation instructions that follow assume your site meets all the installation requirements listed in the *Site Preparation* manual.
- These instructions also assume all terminal data lines, telephone lines, and network lines that you plan to connect to your system are in place and clearly labeled.

You will need the following tools to install your system. They are not included in your shipment.

- Scissors
- Flat blade screwdriver
- Phillips (cross point) screwdriver
- Adjustable wrench

2 Check the Shipment

Before unpacking your system, find the Product Delivery Document. It is attached to the outside of a carton and is labeled with a blue "i" symbol. That document lists your order and how it breaks out into the items shipped.

Your shipment may include several cartons:

- One carton contains the system.
- A smaller carton contains the console terminal.
- Another carton contains hardware documentation, software documentation, system software, diagnostic software, and software licenses.

Depending on your order, your shipment may also include cartons containing:

- Additional terminal(s)
- Printer(s)
- Modem(s)
- Expander(s)

Make sure your shipment is complete by checking that each item listed as shipped on the Product Delivery Document appears on a Content Listing or on a barcode label on the outside of one of the cartons in your shipment.

NOTE: *Save all packing materials until you are sure you will not reship any items in the shipment.*

Use the unpacking illustrations on the cartons as a guide to unpack your shipment, one carton at a time. Check the contents of each carton against the Content Listing on its side to ensure you received all items.

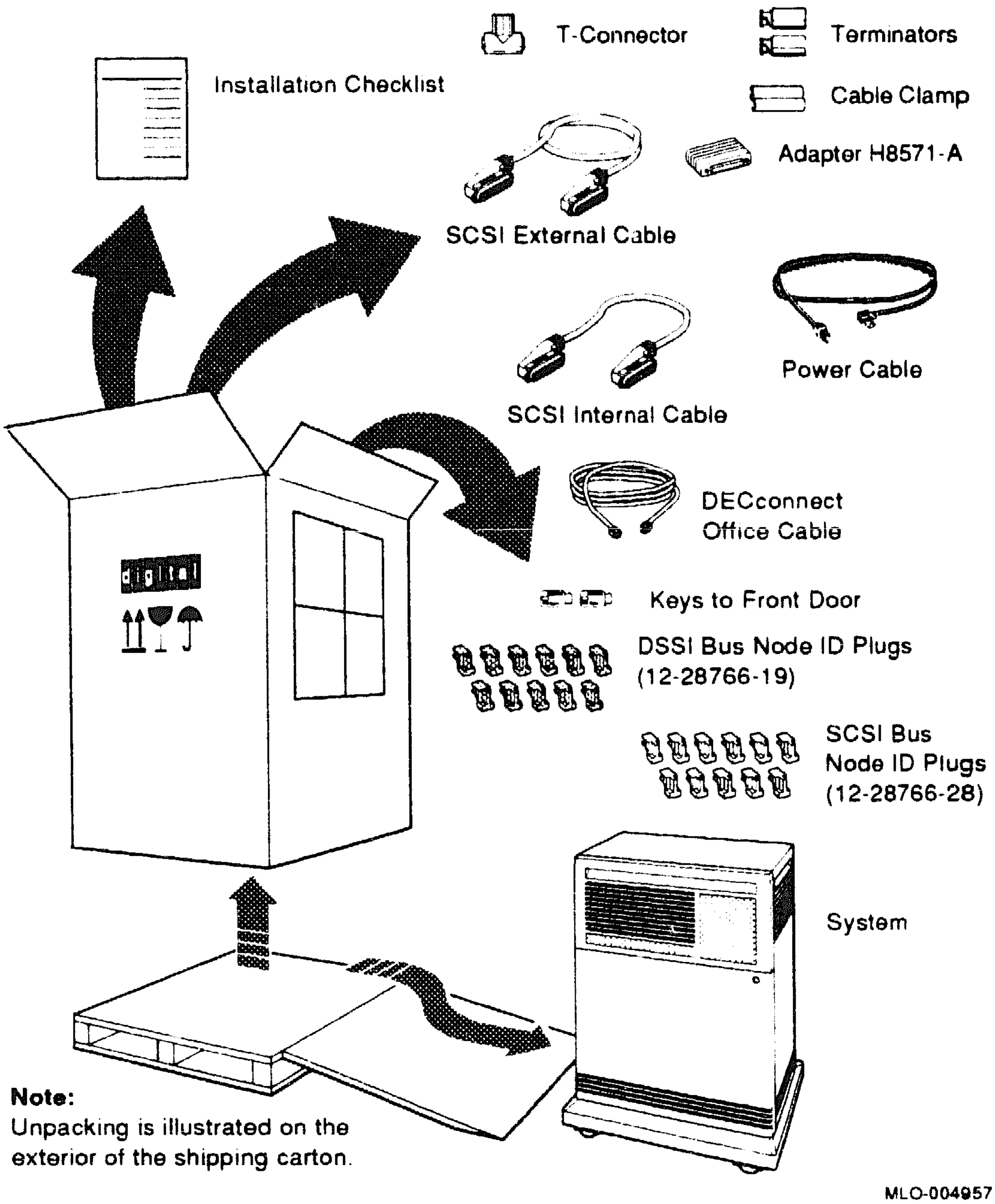
WARNING: *The system weighs 68 kg (150 lb) with all options installed. Use two or more people to move the system.*

If any item is missing or damaged:

- Contact your delivery agent.
- Contact your Digital sales representative.

The carton containing your system has unpacking instructions on its side. Follow those instructions when unpacking the system. Figure 1 shows the contents of the shipping carton.

Figure 1: Shipping Carton Contents



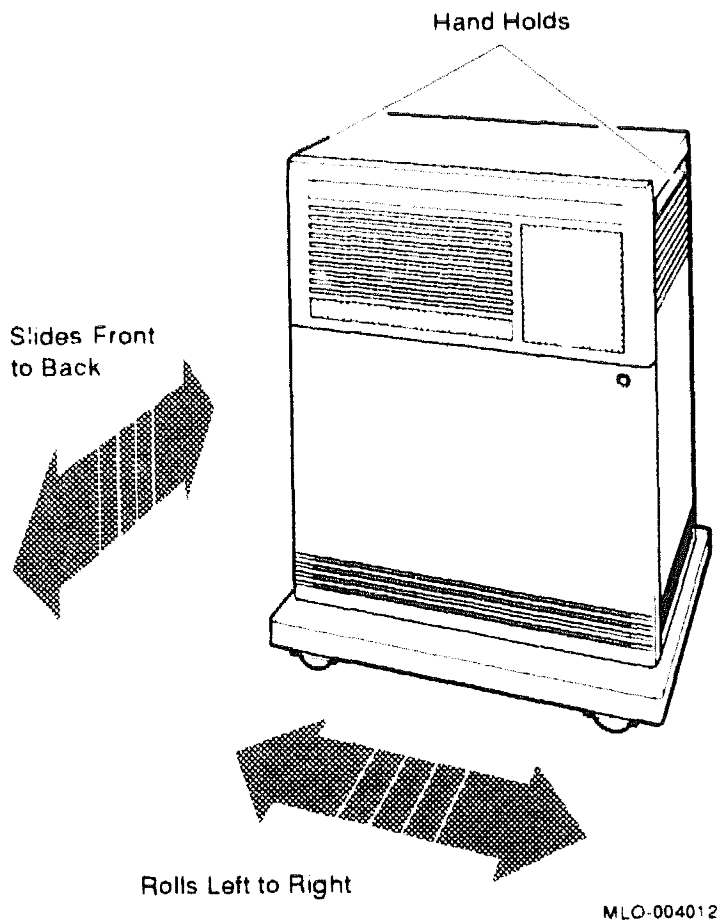
3 Position the System

You can move your system into position in one of two ways as shown in Figure 2.

- Roll it sideways.
- Slide or walk it backward or forward by gripping the hand holds on the side.

WARNING: *Do not use the hand holds to lift the system.*

Figure 2: Sliding the System Into Position



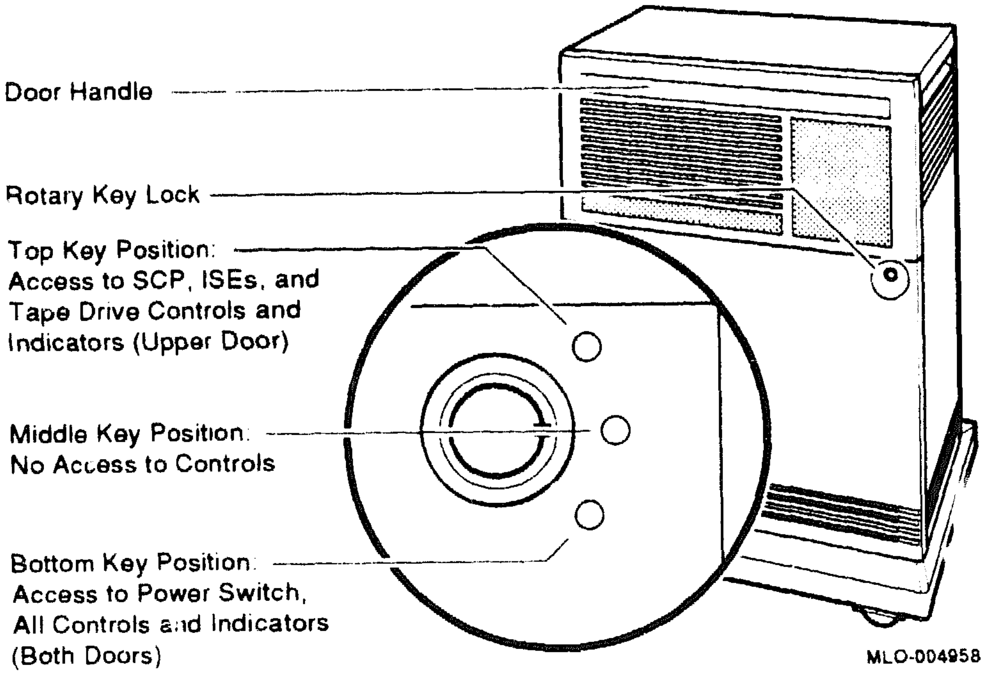
Leave space behind the system for routing cables. Once installation is complete, you can place the system base directly against a wall. The oversized base ensures enough space for proper ventilation.

4 Open the System Door

The system door is locked. To unlock and open it:

1. Find the key in the shipping carton (Figure 1). Two keys are provided, one to keep as a spare.
2. Insert the key in the three-position rotary lock shown in Figure 3. Turn the key to the bottom position to open the upper and lower parts of the door as a single unit.
3. Open the door by pulling on the handle on the upper door. Figure 3 shows the door handle.

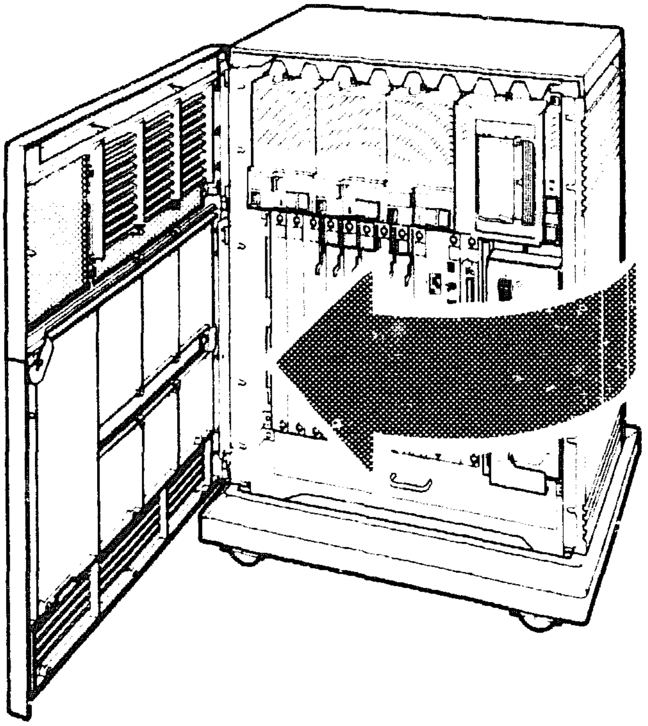
Figure 3: Lock and Key Positions



(SCP stands for System Control Panel and ISE stands for Integrated Storage Element.)

4. Swing the door open. Figure 4 shows the system with the upper and lower parts of the door open.

Figure 4: Opening the System Door



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CAUTION: *Prestoserve™ software, included in your operating system, requires a special CPU configuration. If that configuration will be set up during system installation and you are not a licensed self-maintenance customer, your system should be installed by a Digital service representative.*

The next step in installing your system is to install the console terminal.

5 Install the Console Terminal

You will use the console terminal to communicate with your system.

1. Unpack the terminal and documentation. Your console terminal is packed with the following.
   - Video monitor
   - Keyboard and keyboard cable
   - Console terminal power cable
   - Documentation, including a combined installation guide and user's manual
2. Use the instructions in the terminal installation guide to connect the various parts of the terminal.
3. Turn on the terminal.

   The console terminal performs a self-test every time you turn it on. The documentation for the terminal describes a successful self-test and error messages you receive if the terminal is not operating properly.

Once the terminal passes its self-test, you are ready to perform set-up operations.

5.1 Perform Set-Up Operations

Set-up instructions for terminals vary according to model, or in some cases according to which read-only memory (ROM) is installed in the terminal. Be sure to read the documentation provided with your terminal. The two examples that follow provide set-up instructions for VT300-series and VT200-series terminals.

NOTE: *A new terminal from Digital has the baud rate set to 9600. If your terminal is new and you want to use that rate, you can skip the Baud Rate Set-Up section (5.1.1) and go to Global Set-Up (5.1.2).*

5.1.1 Baud Rate Set-Up

For VT300-Series Terminals:

1. Press [Set-Up] to display the Set-Up Directory.
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 that option, and the left and right arrows to change the setting.
5. Press [Select] to return to the Set-Up Directory.
6. Press [Set-Up] to exit the Set-Up Directory.

For VT200-Series Terminals:

1. Press [Set-Up] to display the Set-Up Directory.
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, using [Enter], 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].
7. Press [Set-Up] to exit the Set-Up Directory.

5.1.2 Global Set-Up

1. Press [Set-Up] to display the Set-Up Directory.
2. Use the arrow keys to select the Global Set-Up option. Press [Enter] to display that option and use the arrow keys to select the Comm1 Port option.
3. If the port in the Current Setting column is selected for RS–232, press [Enter] to select the DEC–423 port.
4. Press [Select] to return to the Set-Up Directory.
5. Use the arrow keys to select the Save Current Settings option and press [Enter].
6. Press [Set-Up] to exit the Set-Up Directory.

Once you test the terminal and perform set-up operations, you are ready to connect the terminal to your system.

5.2 Connect the Console Terminal to the System

Connecting the console terminal to your system involves attaching one end of a cable to the CPU cover panel, and the other end of the cable to a communication port in the back of the terminal.

- The CPU cover panel is on the front of the system and covers backplane slots 2 and 3.
- The port on the back of the console terminal varies with the type of terminal.

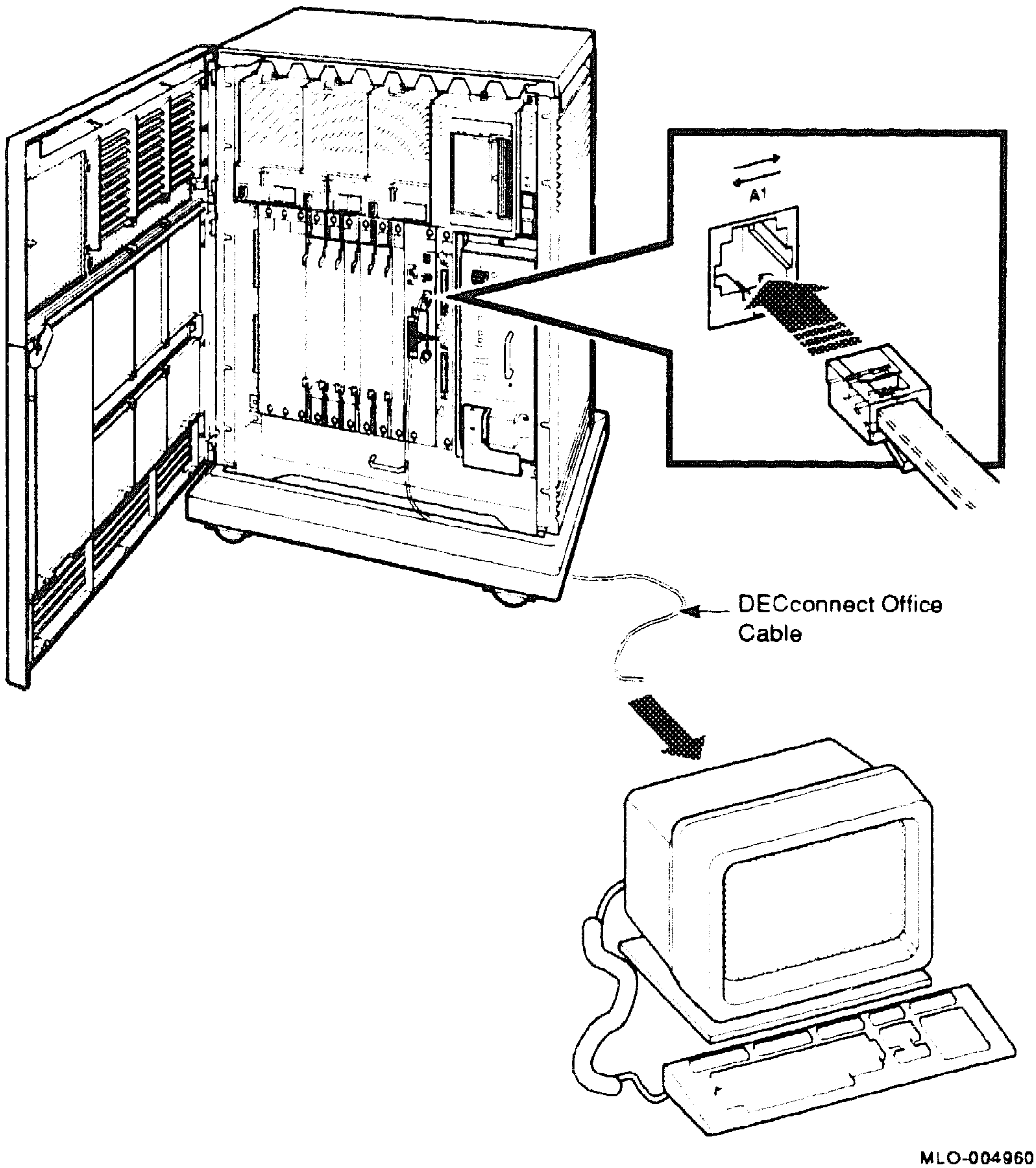
Refer to the separate illustrations and instructions that follow to connect VT300-series and VT200-series terminals.

5.2.1 Connecting VT300-Series Terminals

Connect the console terminal to your system as follows.

1. Turn off the console terminal.
2. Find the console terminal cable. It is labeled DECconnect Office Cable and has a DEC–423 modular plug on each end.
3. Connect the terminal cable to the DEC–423 modular jack labeled 1 on the rear of the terminal, according to the instructions in your terminal installation guide.
4. Feed the other end of the cable under the system base, from behind or from the side. Then draw up the cable and insert it in the DEC–423 modular jack, labeled A1 on the CPU cover panel, as shown in Figure 5.

Figure 5: Connecting a VT300-Series Console Terminal

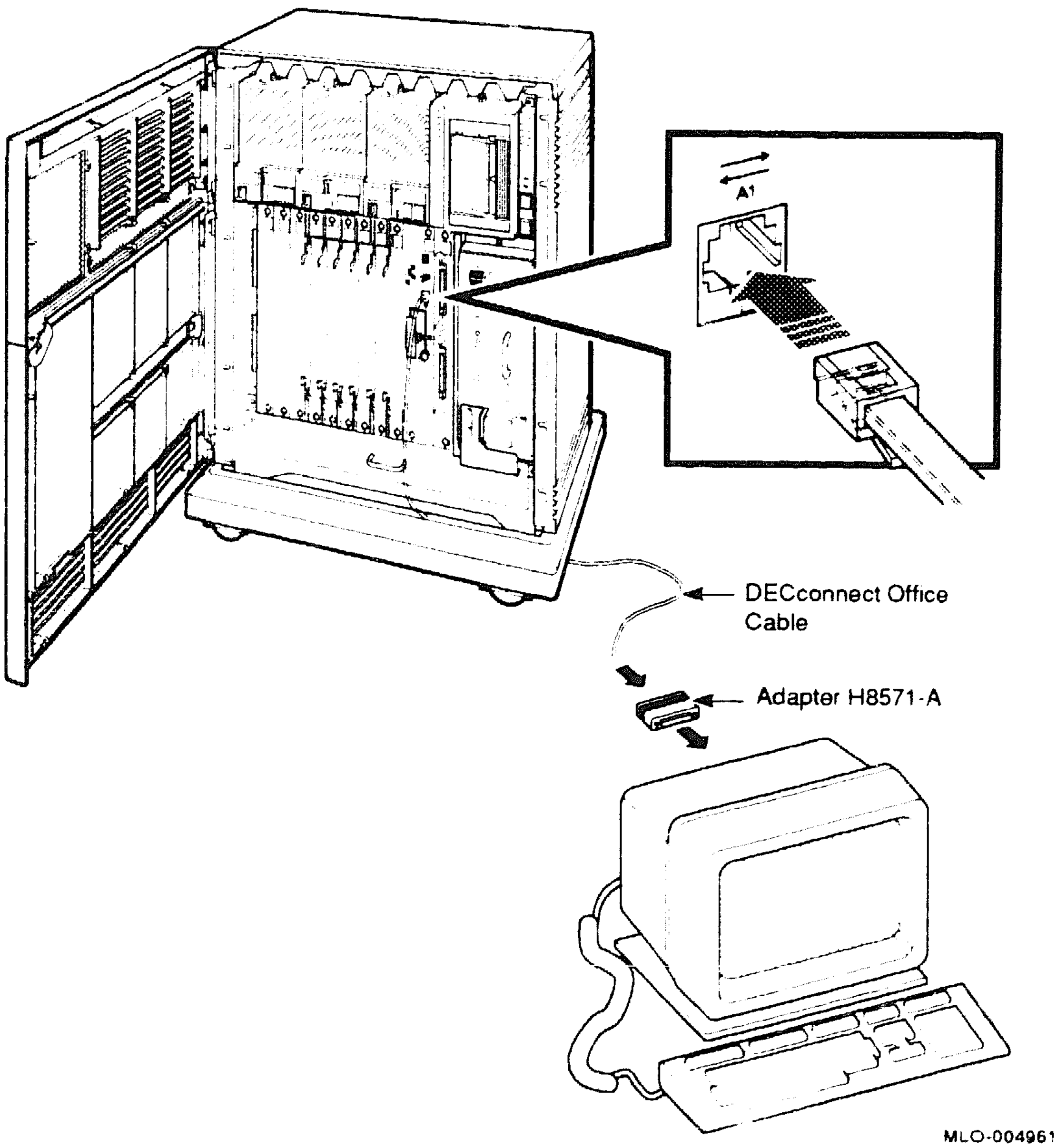


5.2.2 Connecting VT200-Series Terminals

Connect the console terminal to your system as follows.

1. Turn off the console terminal.
2. Find the console terminal cable, and modular-jack to 25-pin adapter.
   - The cable is labeled DECconnect Office Cable and has a DEC—423 modular plug on each end.
   - The adapter is labeled H8571–A.
3. Insert one end of the cable in the 25-pin adapter. Then connect the adapter to the 25-pin communication port labeled COMM on the rear of the terminal, according to the instructions in your terminal installation guide.
4. Feed the other end of the cable under the system base, from behind or from the side. Then draw up the cable and insert it in the DEC–423 modular jack, labeled A1 on the CPU cover panel, as shown in Figure 6.

Figure 6: Connecting a VT200-Series Console Terminal



You are now ready to set the controls on your system.

6 Set System Controls

The system controls are on the mass storage devices, the system control panel (SCP), the CPU cover panel, and the power supply panel. The mass storage devices include Integrated Storage Elements (ISEs) and the tape drives.

6.1 Setting Controls on the System Power Supply

Check the setting of the power switch on the system power supply shown in Figure 7.

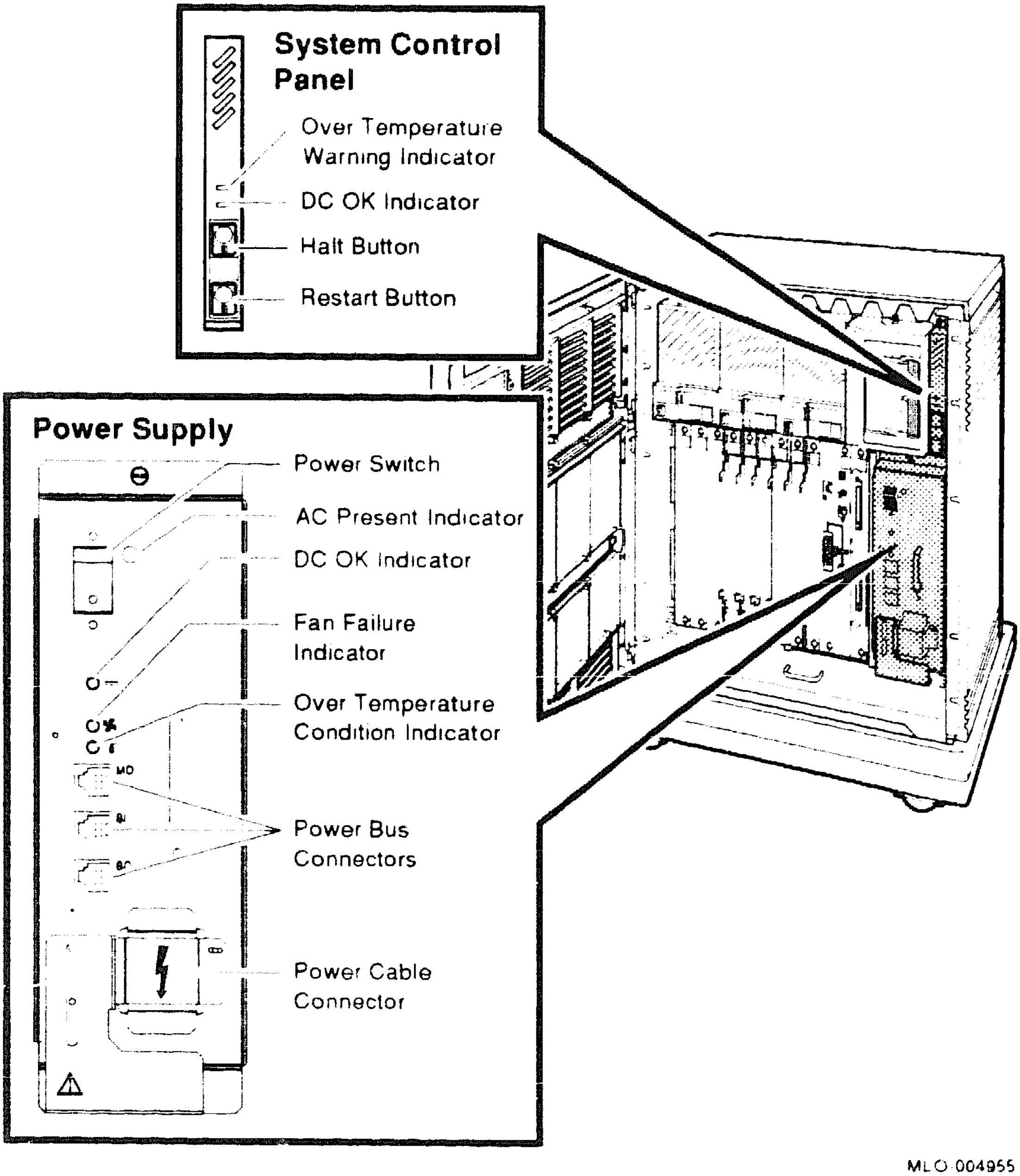
The power switch is near the top. It should be off (set at 0).

6.2 Setting Controls on the System Control Panel (SCP)

Check the setting of the Halt button on the SCP shown in Figure 7.

The Halt button is to the right of the mass storage devices. That button should be set to the out position.

Figure 7: System Controls and Indicators—Power Supply and System Control Panel



6.3 Setting Controls on the RF-Series Integrated Storage Elements (ISEs)

Check the settings on each RF-series ISE. One such ISE is shown in Figure 8.

- Write-Protect button.

  The Write-Protect button is on the right side of each front panel. Make sure that button is in the out (write-enabled, button not lit) position.

- Run/Ready button.

  The Run/Ready button is to the left of the Write-Protect button. Make sure that button is in the in (on-line, button lit) position.

RZ-series ISEs do not have Write-Protect and Run/Ready buttons.

6.4 Setting Controls on the CPU Cover Panel

Check the settings on the CPU cover panel shown in Figure 8. That panel covers backplane slots 2 and 3.

- Operation switch.

  That three-position rotary switch determines how your system powers up. The factory setting is Normal mode, indicated by an arrow. Set the switch to the Action mode (the uppermost position, indicated by a human profile) before you turn on your system the first time.

  NOTE: *If the system self-tests (step 10) complete successfully, set the switch back to Normal.*

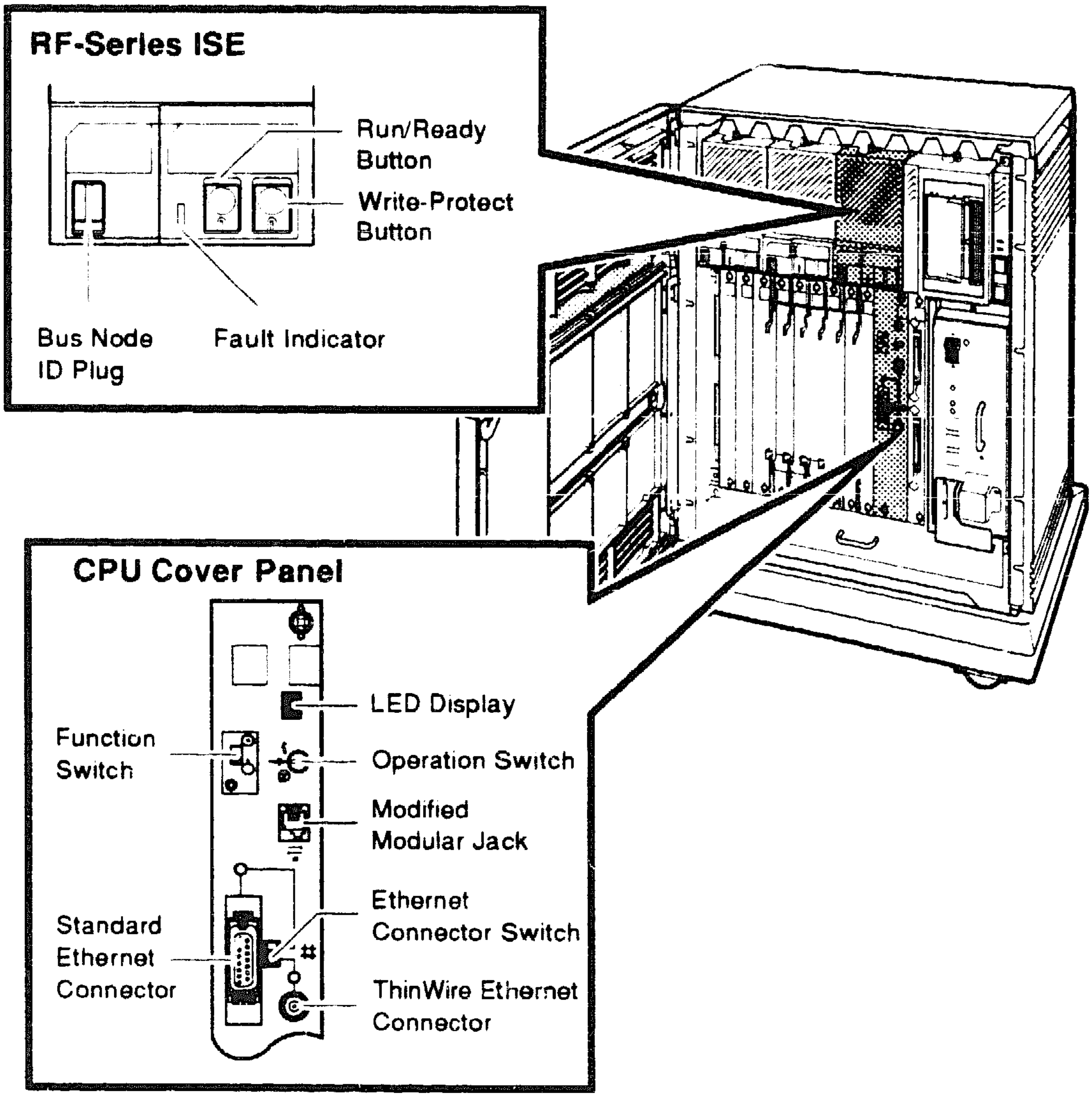
- Baud Rate switch.

  The Baud Rate switch is a rotary (dial) switch on the inside of the CPU cover panel near the top. The factory setting is position 5 (9600). The system and the console terminal must be set to the same baud rate to communicate.

- Function switch.

  The factory setting is break disabled (down), indicated by a dot outside a circle. Leave the switch set to disable while you start the system for the first time and run diagnostic firmware to test the system. Then set the switch to enable (up), indicated by a dot inside a circle. With break enabled (and the Operation switch set to Normal), the system enters Normal mode when powered up, as indicated by the console prompt (>>).

Figure 8: System Controls and Indicators—RF-Series ISE and CPU Cover Panel

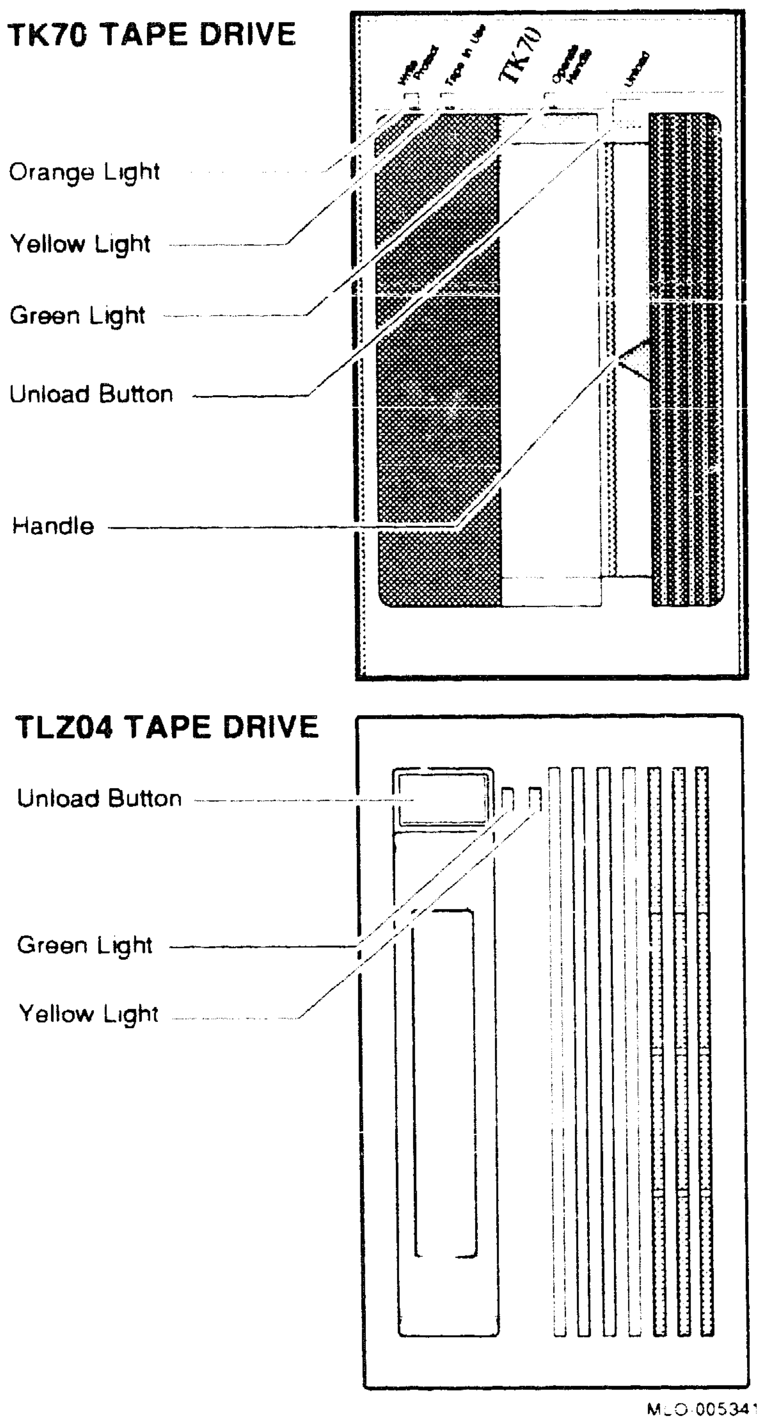


6.5 Setting Controls on the Tape Drive

If a TK70 tape drive is installed, make sure the cartridge insert/release handle, shown in Figure 9, is closed (pushed in).

You do not have to set controls on the TLZ04 tape drive for system installation.

Figure 9: System Controls and Indicators—Tape Drives



You are now ready to connect additional devices to the system.

7 Connect Additional Devices to the System

You can connect additional devices at this time, or you can complete the installation and load system software before connecting additional devices.

- If you have devices that must be installed before you install software, install them now.
- Otherwise, skip to Section 8 if you prefer to connect additional devices later.

Use the following instructions when you are ready to connect the devices.

CAUTION: *To prevent equipment damage, make sure the power switch on the system power supply is set to off (0).*

Make all connections directly to the appropriate module cover.

- Begin with the module at the far right.
- As you complete connections for each module, move left to the next module.

The following numbered sections explain how to connect each type of device.

To help you make the proper connections, each module cover has an identifying label at the top. That label contains the option number and module number. Table 1 lists the identifying labels for all modules you may see on your system. Use the table to identify the modules as you connect additional devices to your system. Not all modules require additional connections.

Table 1: Module Identification Labels

Module Number	Option Number	Description
M7637	KN220–AA	System CPU module
M7638	KN220–AA	System I/O module
M7639–AA	MS220–AA	System memory, 32 megabytes
M3127–PA	DESQA	Ethernet adapter
M3118–YA	CXA16	16-line asynchronous serial interface (RS–423–A, no modem support)
M3118–YB	CXB16	16-line asynchronous serial interface (RS–422, noise immune)
M3119–YA	CXY08	8-line asynchronous serial interface (full modem support)
M7957	DSV11	2-line synchronous serial interface (full modem support)
M7164, M7165	KDA50	Intelligent board controller (RA-series disks)
M7559–PA	TQK70	TK70 tape drive controller
M7546–PA	TQK50	TK50 tape drive controller
M7206–PA	TSV05	TS05 tape drive controller (old)
M7530	TSV05	TS05 tape drive controller (new)
M7740–PA	KLESI	RV20 optical disk or TU81E tape controller
M7552–PA	KRQ50	RRD40 CDROM tabletop controller
M7769	KFQSA	DSSI mass-storage (RF-series ISE) adapter
M5976–SA	KZQSA	Q-bus Small Computer System Interface (SCSI) controller
M8086–SA	LPV11	Dual parallel printer interface

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

Opera g the system without the module covers has the following consequences.

- The system may overheat due to inadequate 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.

7.1 Connect Terminals and Serial Printers

You can connect up to 16 terminals and/or serial printers for each CXA16 or CXB16 module installed in the system. If your site was prepared properly, the lines for the additional terminals and printers are clearly labeled and terminate near the system.

- You do not connect the terminals and printers directly to the system, but to a cable concentrator (H3104) which has connections for up to eight terminals and printers.
- You then connect the cable concentrator to the system with a BC16D cable.

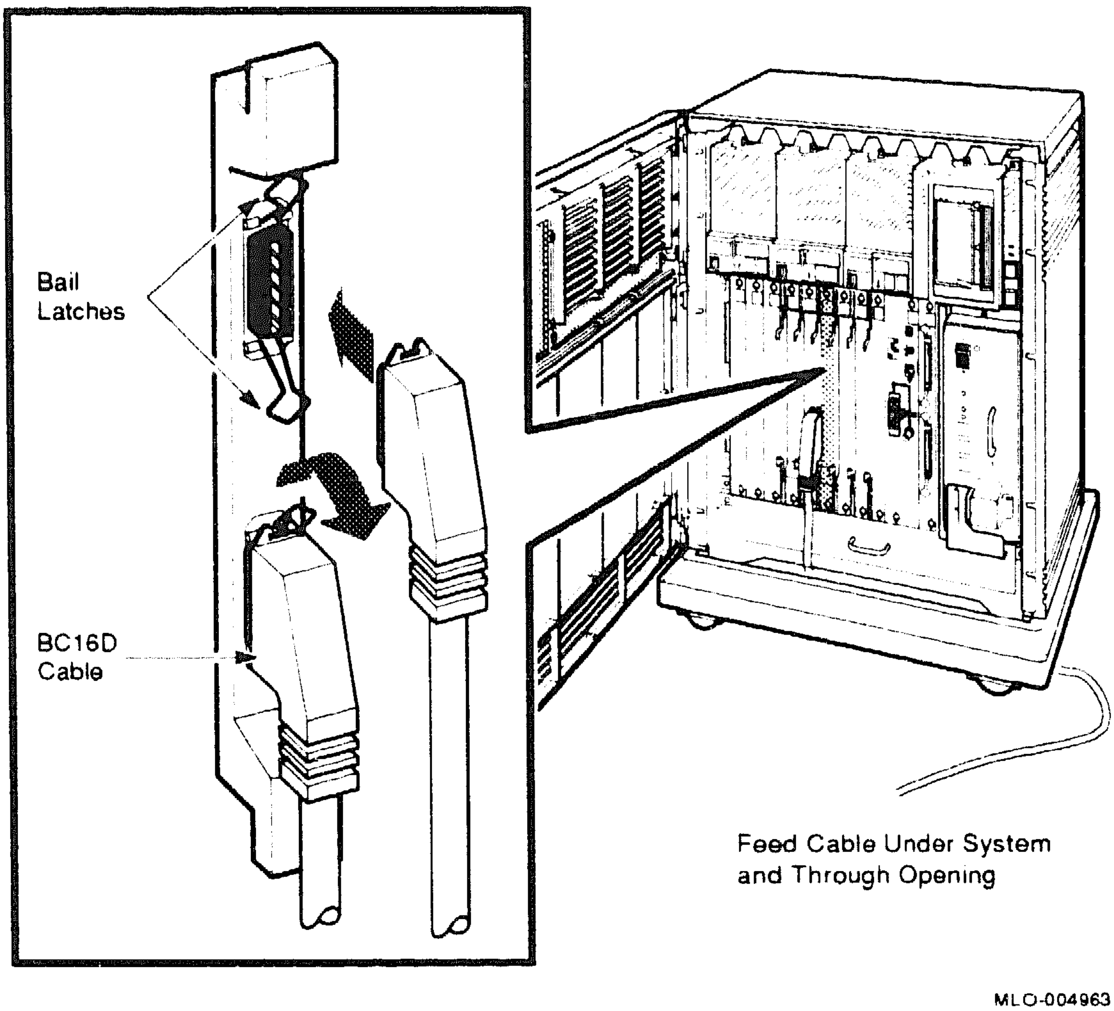
Two H3104 cable concentrators and two BC16D cables for each CXA16 module are shipped with the system.

Connect the additional terminals and printers as follows.

1. Find the H3104 cable concentrator and BC16D cable.
2. Feed one end of the BC16D cable under the system from the back or side and insert it in the connector.
   - If you are connecting both BC16D cables, connect the first to the connector labeled 8–15 on the CXA16 module cover.
   - If you are connecting only one BC16D cable, connect that cable to the connector labeled 0–7.

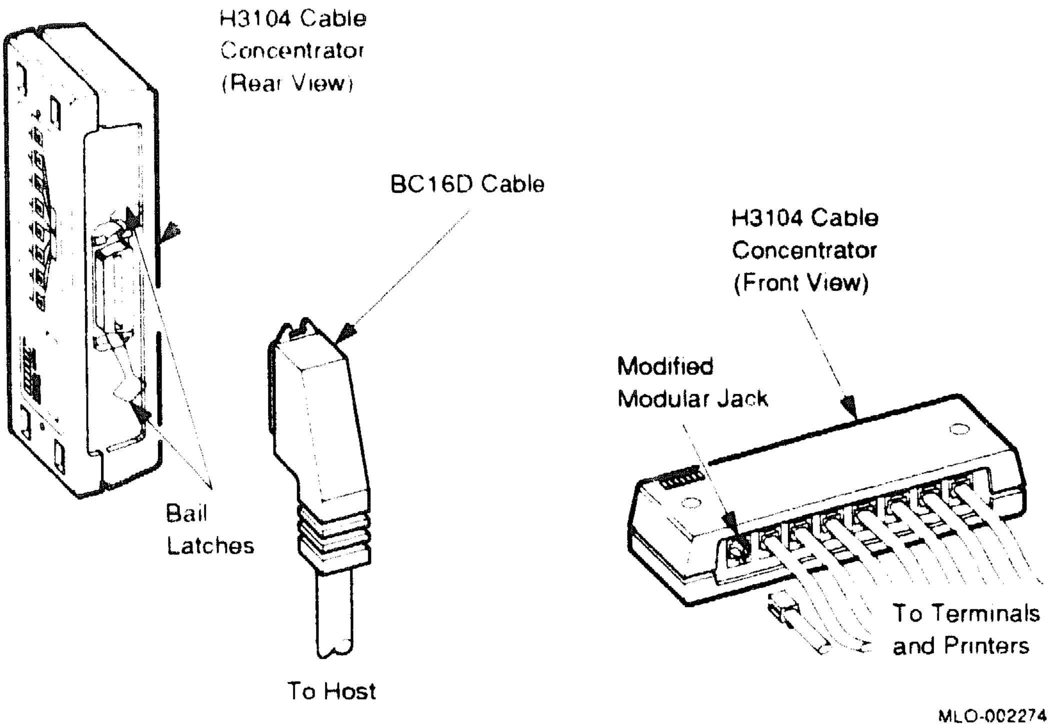
   Lock the connector in place by using the bail latches shown in Figure 10.

Figure 10: Connecting Devices to the CXA16 Module



3. Insert the other end of the BC16D cable in the cable concentrator shown in Figure 11. Lock the connector in place by using the bail latches.

Figure 11: Connecting Devices to the Cable Concentrator



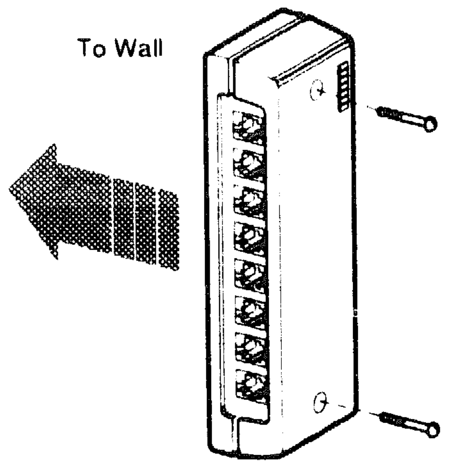
4. Connect each printer and terminal cable to one of the modified modular jacks on the cable concentrator as shown in Figure 11.

5. If you have not done so, connect the remote terminal or printer to the other end of the cable. Your terminal or printer documentation shows how to connect the cable. If the printer or terminal does not have a modified modular jack connection, use a passive adapter (H8571–A), available in 25-pin and 9-pin models.

Follow the same procedure for connecting a second BC16D cable to the CXA16 module, except insert the cable in the connector labeled 0–7.

You can mount the cable concentrator on a wall. Wall mounting keeps cables off the floor. Use two screws as shown in Figure 12.

Figure 12: Mounting the Cable Concentrator



NOTE: *Be sure you mount the cable concentrator less than 7.6 meters (25 feet) from the system, to ensure the BC16D cable reaches the system.*

7.2 Connect Parallel Printers to the System

You can connect up to two parallel printers for each LPV11 module installed in your system.

Connect parallel printers to the LPV11 module as follows.

1. Find the BC27L–30 cable(s).
2. Feed one end of the first BC27L cable under the system from the back or side. Then insert it in the connector labeled J1 on the LPV11 module cover. Lock the connector in place by using the bail latches.
3. Insert the other end of the BC27L cable in the printer.

Follow the same procedure for connecting a second printer to the LPV11 module, except insert the cable in the connector labeled J2 on the LPV11 module cover.

7.3 Connect Synchronous Modems to the System

You can connect up to two synchronous modems for each DSV11 module installed in your system.

Connect a synchronous modem to a DSV11 module using the protocol adapter and extension cables as follows.

1. Feed the socket end of the 0.6-meter (24-inch) adapter cable (BC19–B/D/E/F) under the system from the back or side and connect it to the DSV11 module. Tighten the two screws on the cable connector using the screwdriver shipped with your system.
2. Connect the extension cable (BC55D, BC22F or BC19L) to the other end of the adapter cable. Secure the cables by tightening the two screws at the connection.
3. Connect the other end of the extension cable to the modem. Refer to your modem documentation for the location of the connector and for instructions on using the modem.

7.4 Connect Asynchronous Modems to the System

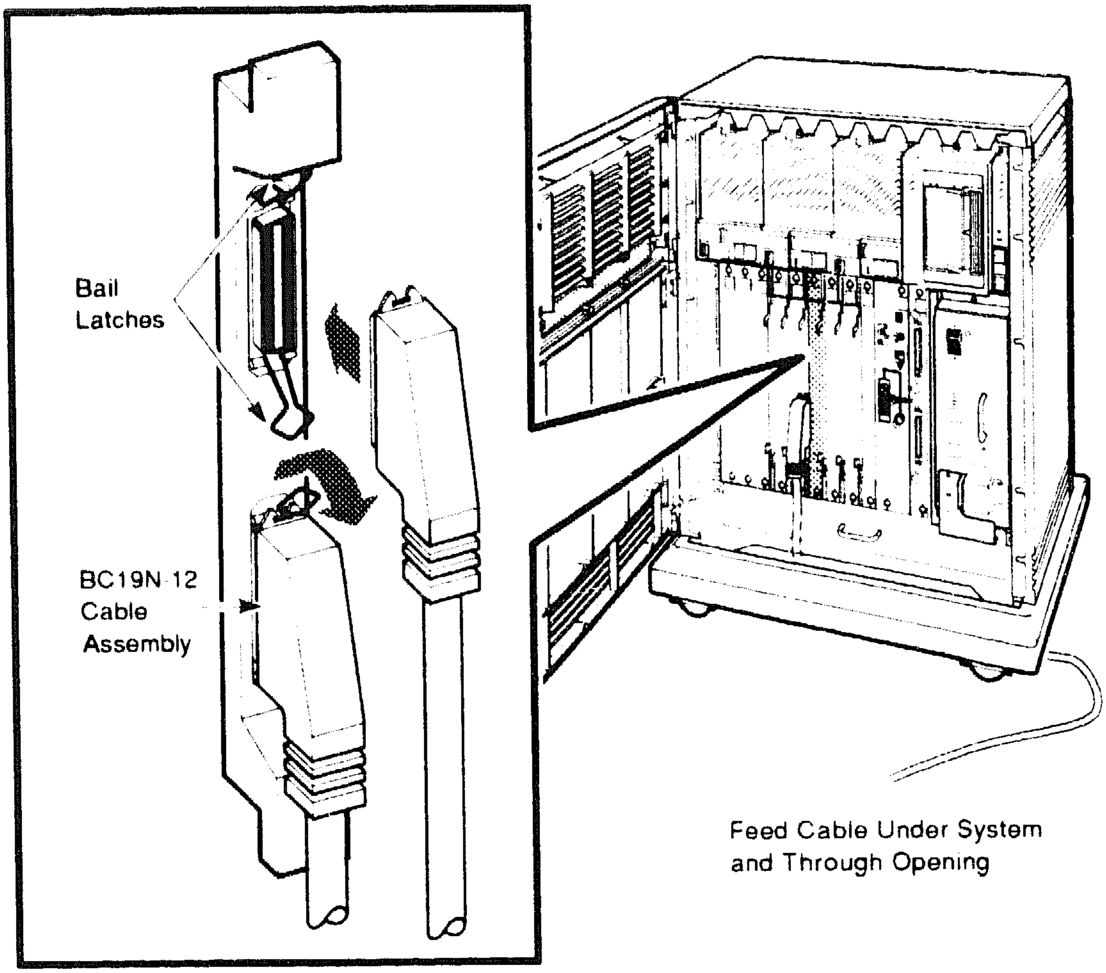
You connect asynchronous modem lines to the CXY08 module which supports up to eight lines.

To connect a modem to a CXY08 module:

1. Find the BC19N–12 cable.
2. Feed one end of the cable under the system and insert it in the connector as shown in Figure 13.
   - If you are connecting both BC19N–12 cables, connect the first to the connector labeled 4–7 on the CXY08 module cover.
   - If you are connecting only one cable, connect the cable to the connector labeled 0–3.

   Lock the connector in place with the bail latches.

Figure 13: Connecting a Modem to a CXY08 Module



3. Attach a modem to one of the four connectors at the opposite end of the cable. If you want to place the modem farther away from the system, attach a BC22F modem cable between the cable assembly and the modem. Refer to your modem documentation for the location of the connector and for instructions on using the modem.

Repeat the same procedure for connecting a second BC19N cable, except insert the cable in the connector labeled 0–3.

7.5 Connect to an Ethernet Network at the CPU Cover Panel

The system CPU module contains an Ethernet controller. By way of the CPU cover panel, you can connect the system to a network using standard or ThinWire Ethernet cabling.

The Ethernet Connector switch on the CPU cover panel activates a standard or ThinWire connector.

- To select standard Ethernet, slide the switch up.
- To select ThinWire Ethernet, slide the switch down.

The indicator next to the selected connector should be lit when the system is powered up, indicating an active connection.

CAUTION: *To avoid disrupting the network, turn off the system before you select a connector.*

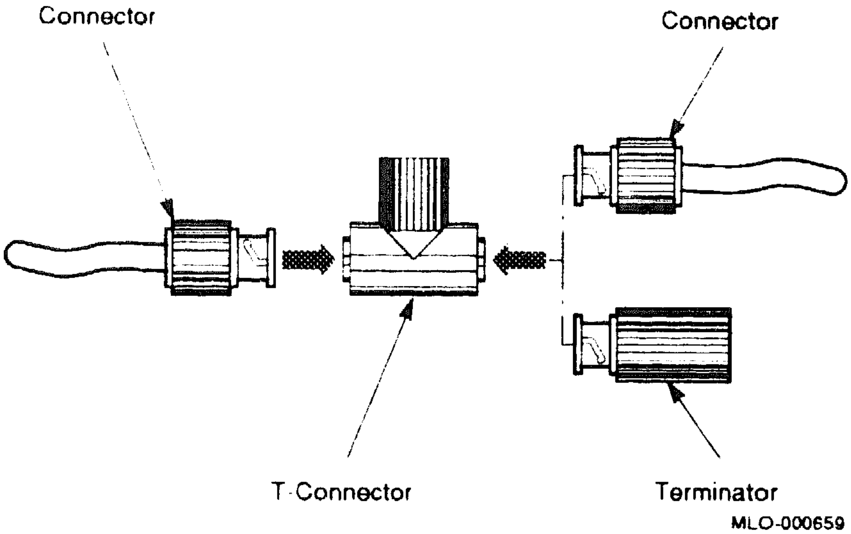
7.5.1 ThinWire Network Connection at the CPU Cover Panel

Make a ThinWire network connection at the CPU cover panel as follows.

1. Find the T-connector, terminators, and cable clamp shown in Figure 1.

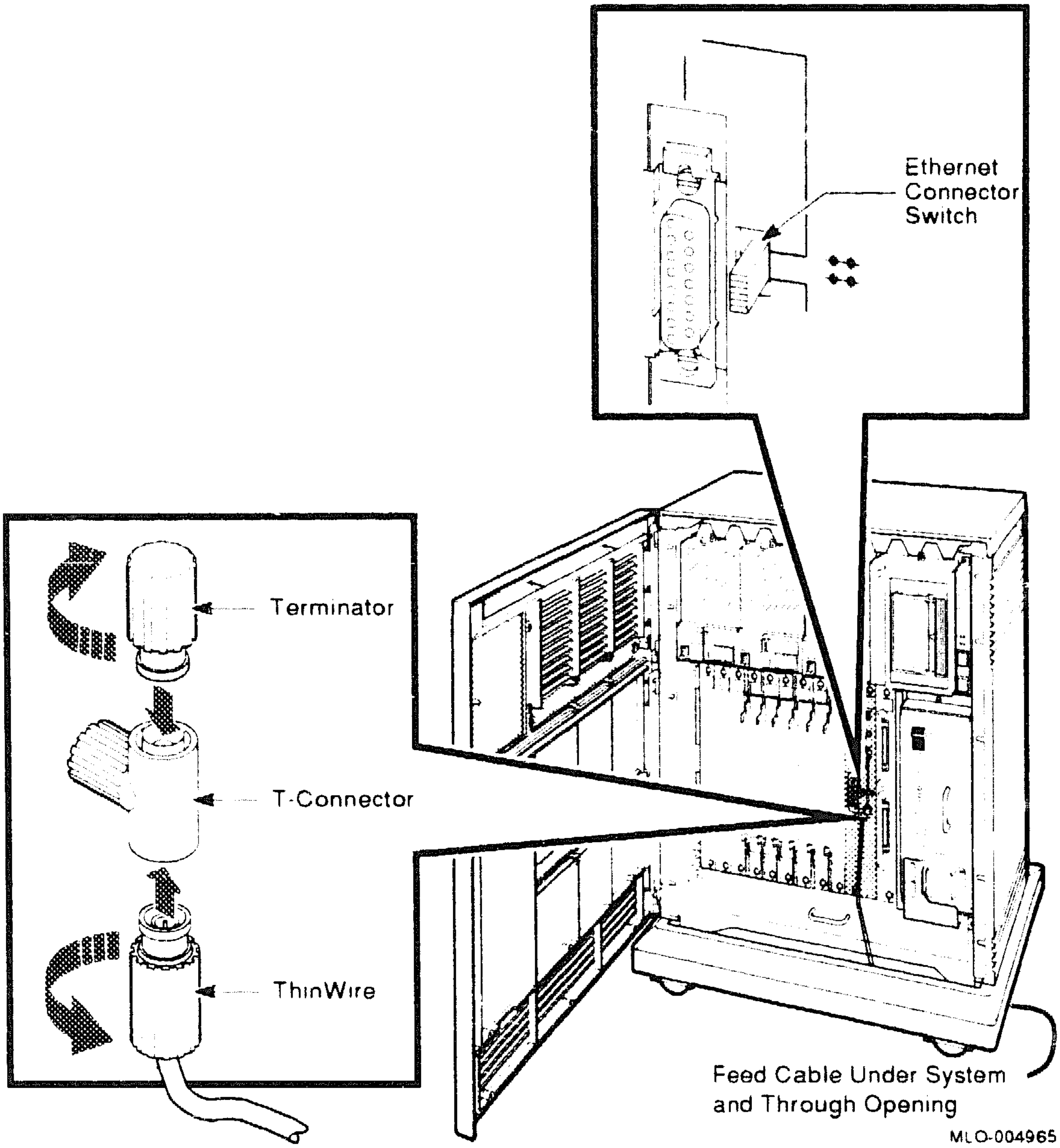
   Figure 14 shows how the T-connector, terminators, and ThinWire cable connectors fit together.

Figure 14: ThinWire Cable, T-Connector, and Terminator



2. Plug the T-connector into the ThinWire connector on the CPU cover panel. Turn the T-connector clockwise until it locks in place.
3. Connect the ThinWire Ethernet cable to the T-connector as shown in Figure 15.

Figure 15: Making a ThinWire Ethernet Connection at the CPU Cover Panel

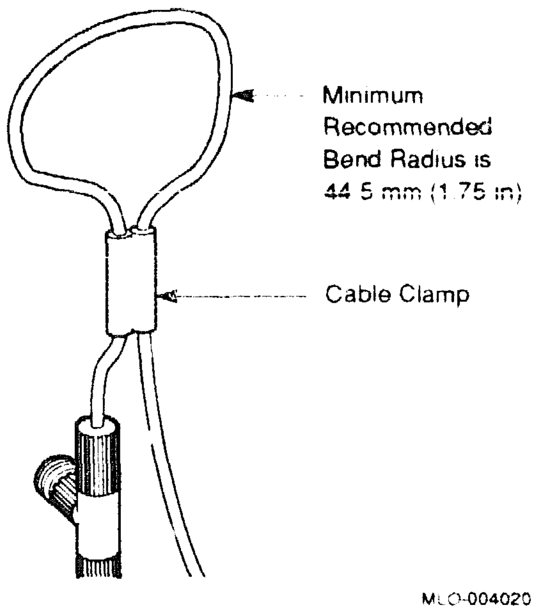


- If your system requires one connection to the network, connect the ThinWire cable to the lower end of the T-connector and connect a terminator to the other end of the T-connector. Push in and turn the connector or terminator clockwise until it locks in place.

- If your system is a link in a network and connects to two additional components, connect one ThinWire cable to one end of the T-connector and connect a second ThinWire cable to the other end. Push in and turn the connectors clockwise until they lock in place.

4. Use the cable clamp to form the upper cable in a loop approximately 10 centimeters (4 inches) in diameter as shown in Figure 16.

Figure 16: Forming the Upper Cable in a Loop at the CPU Cover Panel



5. The ThinWire cable can be connected to one of the following devices.
   - A ThinWire Ethernet Multiport Repeater (DEMPR) connected to a baseband Ethernet cable, which can connect up to eight ThinWire segments in a local area network
   - A ThinWire Ethernet Singleport Repeater (DESPR) connected to a baseband Ethernet cable, which can connect to one ThinWire segment
   - A ThinWire Ethernet adapter in another DECsystem 5500 system

Digital network publications explain the types of network configurations possible.

NOTE: *Contact your network manager or Digital service representative if you have questions about network configurations.*

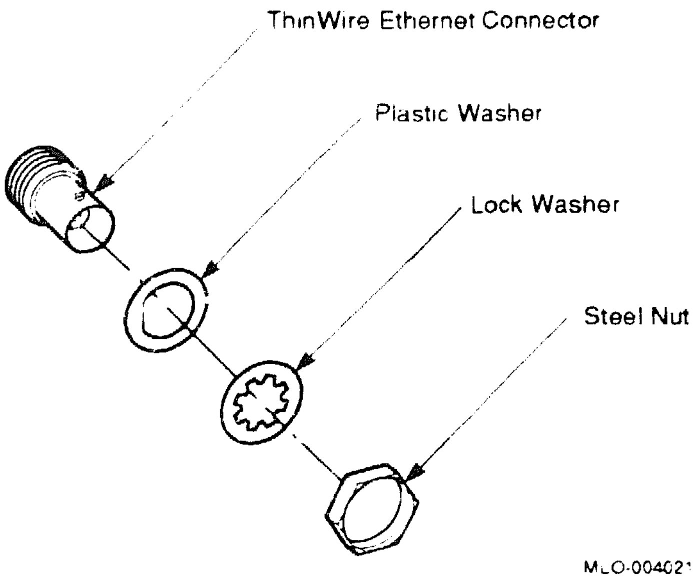
When the ThinWire cable is connected to a DEMPR or DESPR, the ground is provided by the DEMPR or DESPR chassis. If you are using a single-segment ThinWire Ethernet local area network (LAN) with no DEMPR or DESPR, you may need to ground the ThinWire connector on the CPU cover panel.

CAUTION: *Each ThinWire Ethernet segment must have only one grounding point.*

To ground a single-segment ThinWire network at the CPU cover panel:

1. Remove the steel nut, lock washer, and plastic washer from the ThinWire Ethernet connector on the CPU cover panel as shown in Figure 17.

Figure 17: Grounding the ThinWire Ethernet at the CPU Cover Panel



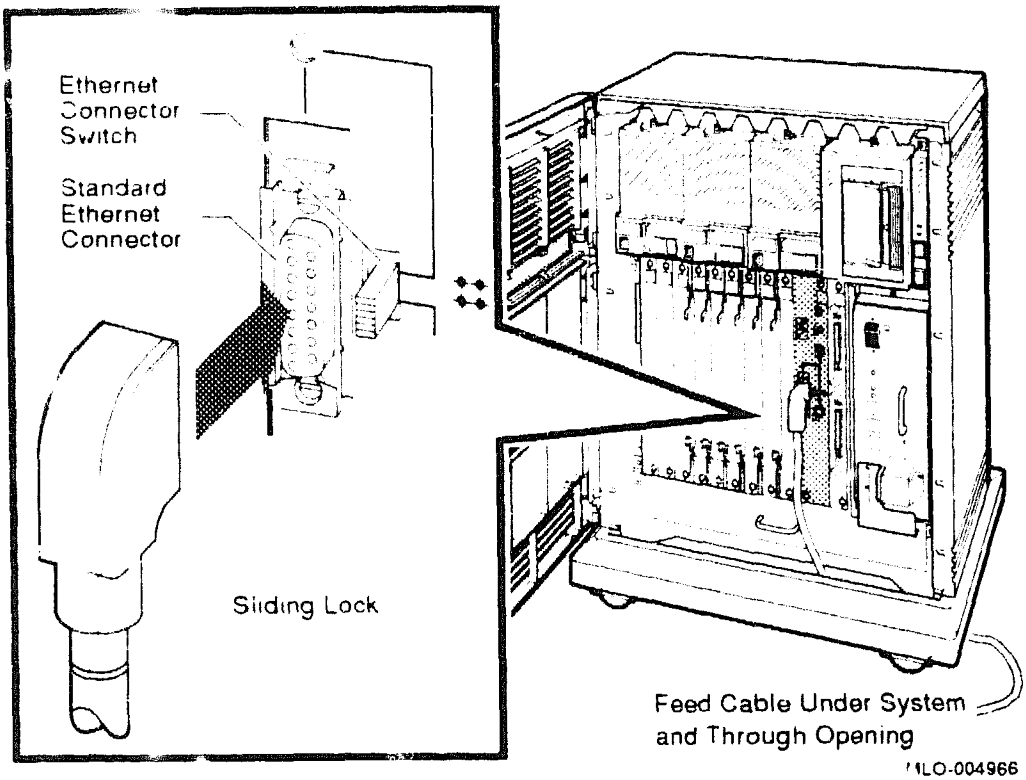
2. Discard the plastic washer.
3. Replace and tighten the lock washer and the steel nut.

7.5.2 Standard Network Connection at the CPU Cover Panel

Make a standard network connection at the CPU cover panel as follows.

1. Find the Ethernet transceiver cable. It has a plug at one end and a socket at the other end.
2. Make sure the lock on the standard Ethernet connector on the CPU cover panel is in the up position. Then feed the plug end of the cable under the system and insert it in the connector. Slide down the lock to secure the connection. Figure 18 shows a standard Ethernet connection.

Figure 18: Making a Standard Ethernet Connection at the CPU Cover Panel



3. Connect the other end of the cable to one of the following devices.
   - An H4000 or H4005 transceiver located on a traditional baseband Ethernet cable

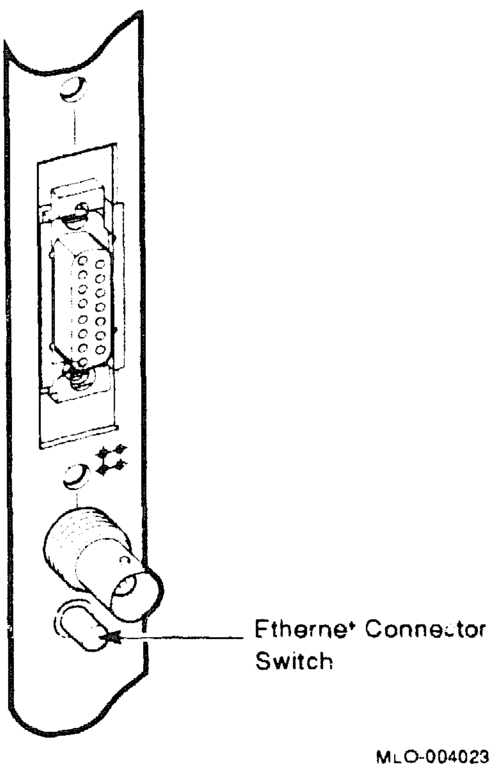
- A DELNI interconnect connected to a baseband Ethernet cable, which connects up to eight systems in a local area network
- A DESTA adapter, which connects the Ethernet transceiver cable to ThinWire Ethernet cabling

Digital network publications explain the types of network configurations possible.

7.6 Connect to an Ethernet Network at the DESQA Module

Your system may have a second Ethernet controller, the DESQA module, with an Ethernet Connector switch that lets you accommodate ThinWire or standard Ethernet cabling. Figure 19 shows the location of the Ethernet Connector switch.

Figure 19: DESQA ThinWire/Standard Ethernet Connector Switch



You can use the Ethernet Connector switch to select a ThinWire or a standard Ethernet connector.

- When the switch is set to the out position, the ThinWire connector is selected.
- When the switch is set to the in position, the standard connector is selected.

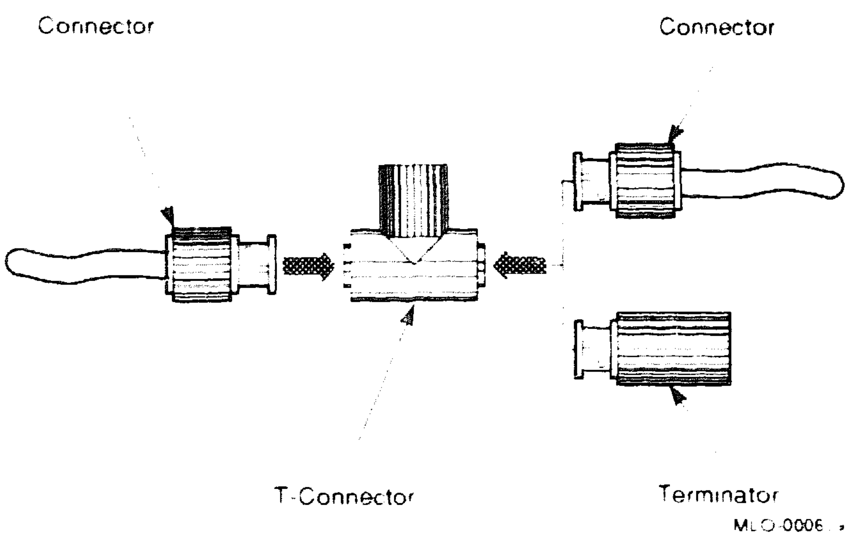
An indicator next to the connector lights when the system is powered up to indicate which connector is selected.

CAUTION: *Turn off your system before you select a connector to avoid disrupting the network.*

7.6.1 ThinWire Network Connection at the DESQA Module

A T-connector and two terminators are on the DESQA module. Figure 20 shows how the ThinWire cable connectors, T-connector, and terminator fit together.

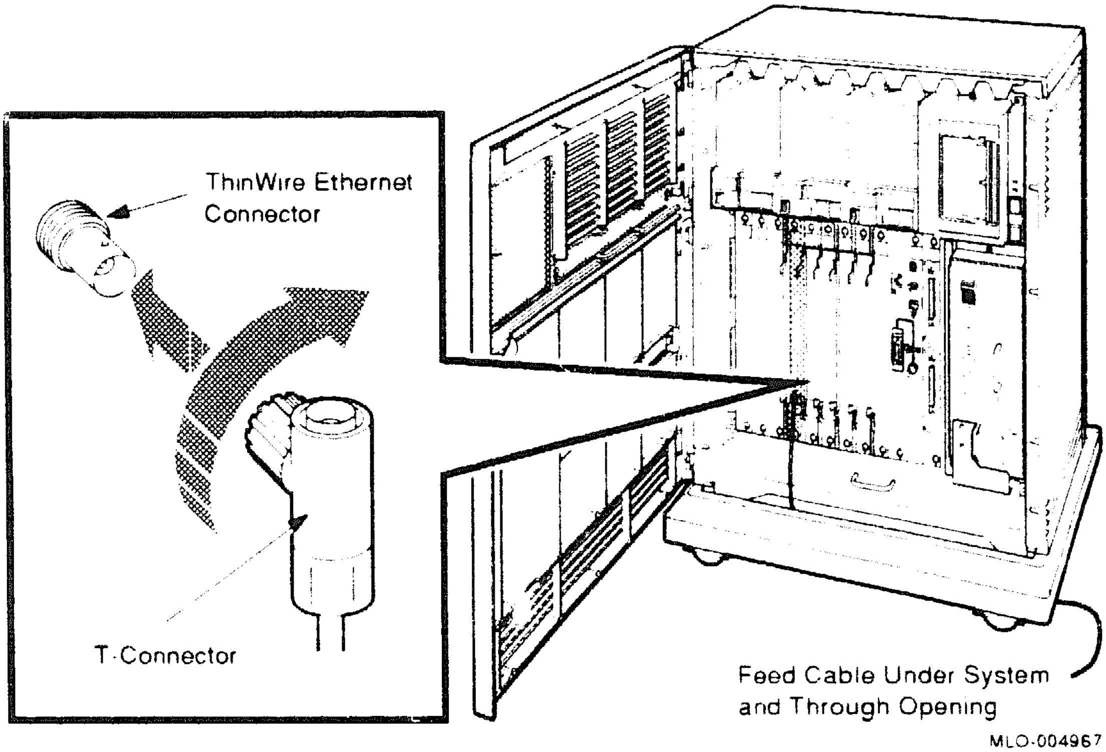
Figure 20: ThinWire Cable, T-Connector, and Terminator



Make a ThinWire network connection at the DESQA module as follows.

1. Remove the T-connector from the module. Push in and turn it counterclockwise until it unlocks.
2. Remove the terminators from the T-connector. Push in and turn them counterclockwise until they unlock.
3. Connect the ThinWire Ethernet cable to the T-connector as shown in Figure 21.

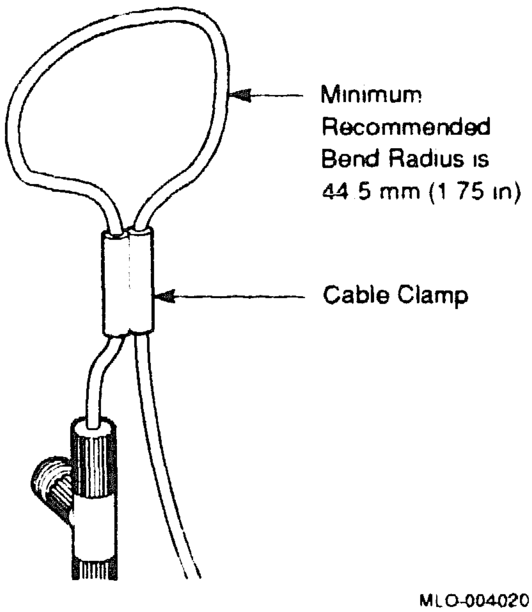
Figure 21: Making a ThinWire Ethernet Connection at the DESQA Module



- If your system requires one connection to the network, connect the ThinWire cable to the lower end of the T-connector and connect a terminator to the other end of the T-connector. Push in and turn the connector or terminator clockwise until it locks in place.
- If your system is a link in a network and connects to two additional components, connect one ThinWire cable to one end of the T-connector and connect a second ThinWire cable to the other end. Push in and turn the connectors clockwise until they lock in place.

4. Insert the T-connector in the ThinWire connector on the DESQA module as shown in Figure 21. Push in and turn the T-connector clockwise until it locks in place.
5. Use the cable clamp shown in Figure 1 to form the upper cable in a loop approximately 10 centimeters (4 inches) in diameter as shown in Figure 22.

Figure 22: Forming the Upper Cable in a Loop at the DESQA Module



6. The ThinWire cable can be connected to one of the following devices.
   - A ThinWire Ethernet Multiport Repeater (DEMPR) connected to a baseband Ethernet cable, which can connect up to eight ThinWire segments in a local area network
   - A ThinWire Ethernet Singleport Repeater (DESPR) connected to a baseband Ethernet cable, which can connect to one ThinWire segment
   - A ThinWire Ethernet adapter in another DECsystem 5500 system

Digital network publications explain the types of configurations possible.

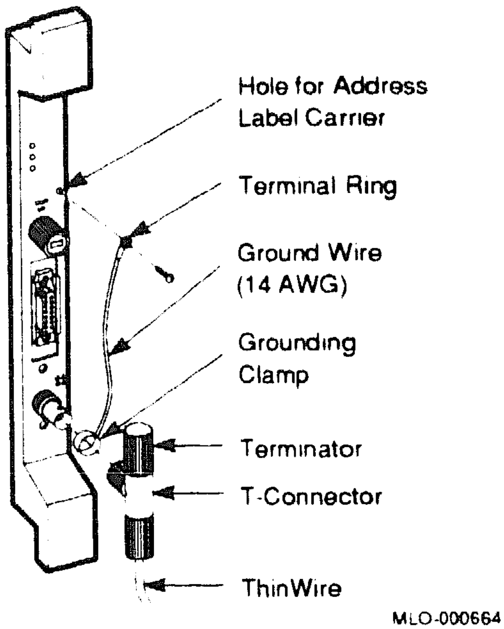
NOTE: *Contact your network manager or Digital service representative if you have questions about network configurations.*

When the ThinWire cable is connected to a DEMPR or DESPR, the ground is provided by the DEMPR or DESPR chassis. If you are using a single-segment ThinWire Ethernet local area network with no DEMPR or DESPR, you may need to ground the ThinWire connector on the DESQA module.

CAUTION: *Each ThinWire Ethernet segment must have only one grounding point.*

To ground a single-segment ThinWire network on the DESQA module, connect a grounding clamp (90–08927–00) and an unshrouded T-connector (12–25534–01) as shown in Figure 23. Contact your Digital sales representative concerning those parts.

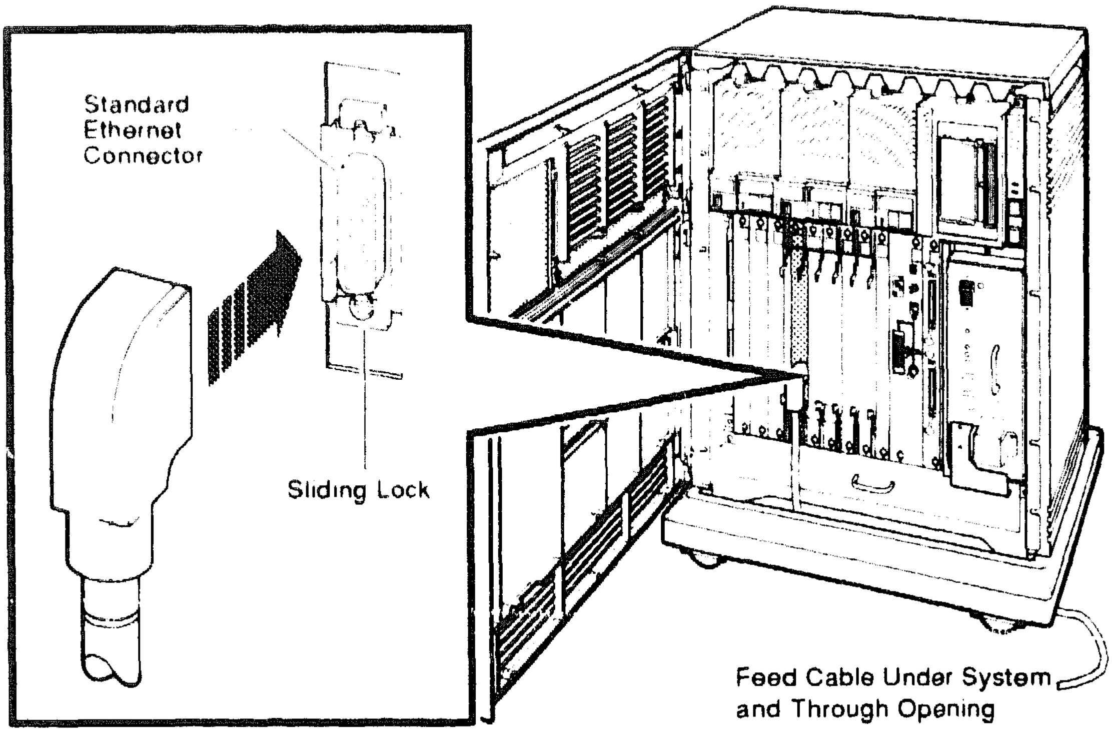
Figure 23: Grounding the ThinWire Ethernet at the DESQA Module



7.6.2 Standard Network Connection at the DESQA Module

Figure 24 shows a standard Ethernet network connection.

Figure 24: Making a Standard Ethernet Connection at the DESQA Module



Make a standard network connection at the DESQA module as follows.

1. Find the Ethernet transceiver cable. It has a plug at one end and a socket at the other end.
2. Make sure the sliding lock on the standard Ethernet connector on the DESQA module is in the up position.
3. Feed the plug end of the cable under the system and insert it in the connector. Slide down the lock to secure the connection.
4. Connect the other end of the cable to one of the following devices.
   - An H4000 transceiver located on a traditional baseband Ethernet cable
   - A DELNI interconnect connected to a baseband Ethernet cable, which connects up to eight systems in a local area network

Digital network publications explain the types of network configurations possible.

8 Make the System-Expander Connections, if Required

If you are not installing an expander with your system, skip to step 9.

If you are installing an expander with your system:

1. Install the expander as described in the document (addendum or manual) shipped with the expander.
2. Return to this manual to connect the expander cable(s) to one or more of the system connections shown in Figure 25. Make the following connections as applicable:

   - Connect the two (crossed) Q-bus cables to the two Q-bus Out connectors.

     The Q-bus connectors should be in the left-most backplane slot.

   - Connect the DSSI cable to the DSSI Out connector, after removing the DSSI terminator.

     The DSSI Out connector is the lower connector on the left side of the card cage.

   - Connect the SCSI cable to the lower SCSI In/Out connector.

     The lower SCSI In/Out connector is near the right side of the card cage (next to the power supply). Make sure a SCSI terminator or another SCSI cable is connected to the upper SCSI In/Out connector.

     NOTE: *The SCSI In connector on the left side of the card cage and the upper SCSI In/Out connector on the right side of the card cage are used for connecting SCSI devices that are installed in the system. If SCSI devices are installed in your system, a cable should be connecting those two connectors.*

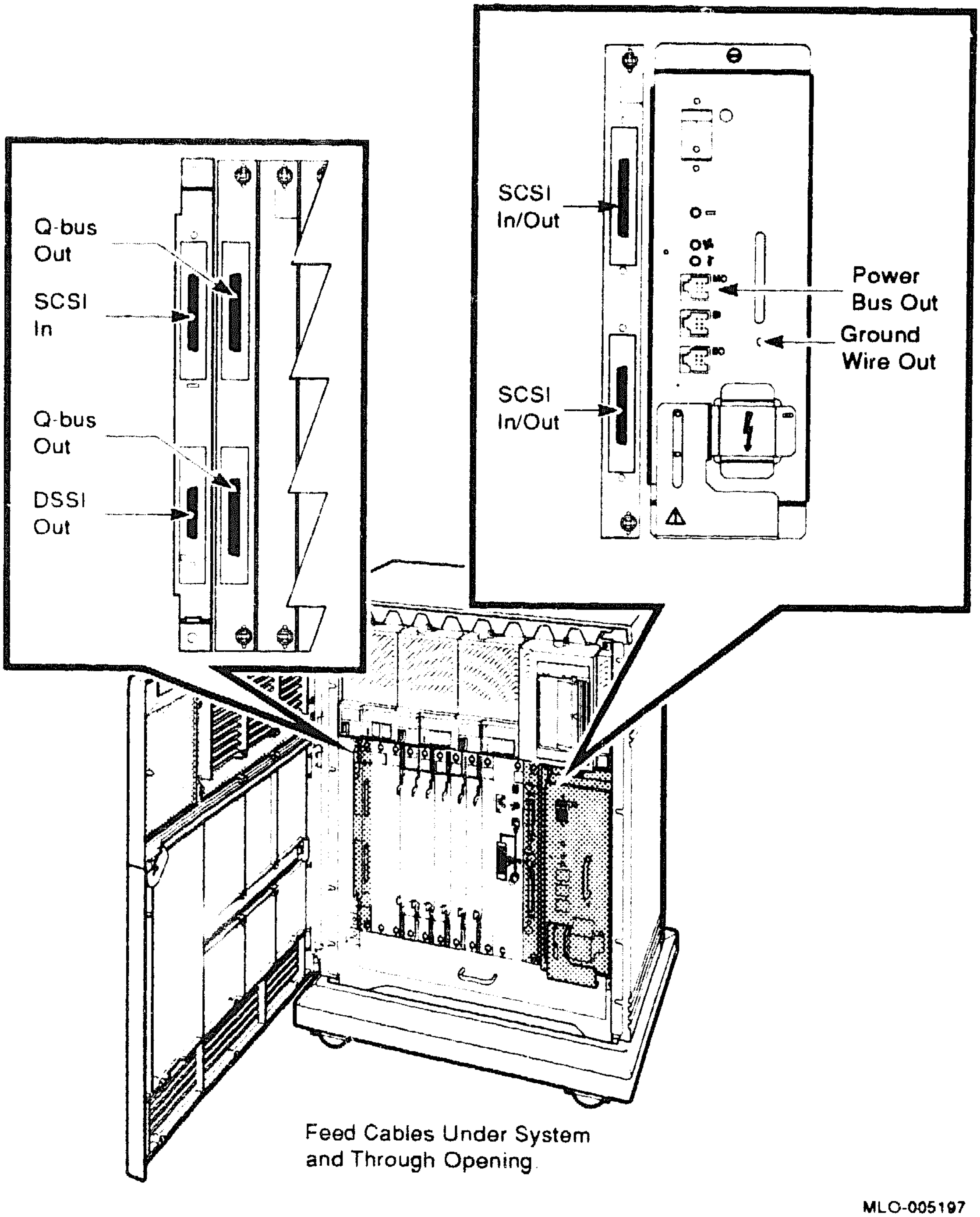
   - Connect the Power Control Bus cable to the Power Bus Out (MO) connector.

     The Power Bus Out connector is on the power supply. It is the top-most of three connectors stacked below the power (1/0) switch.

   - Connect the ground cable to the Ground Wire Out bolt.

     The Ground Wire Out bolt is on the power supply. It is to the right of the three power bus connectors.

Figure 25: System Connections for Expanders



3. Complete the installation of the expander as described in the expander document.
4. Complete the installation of your system by completing the steps remaining in this manual.

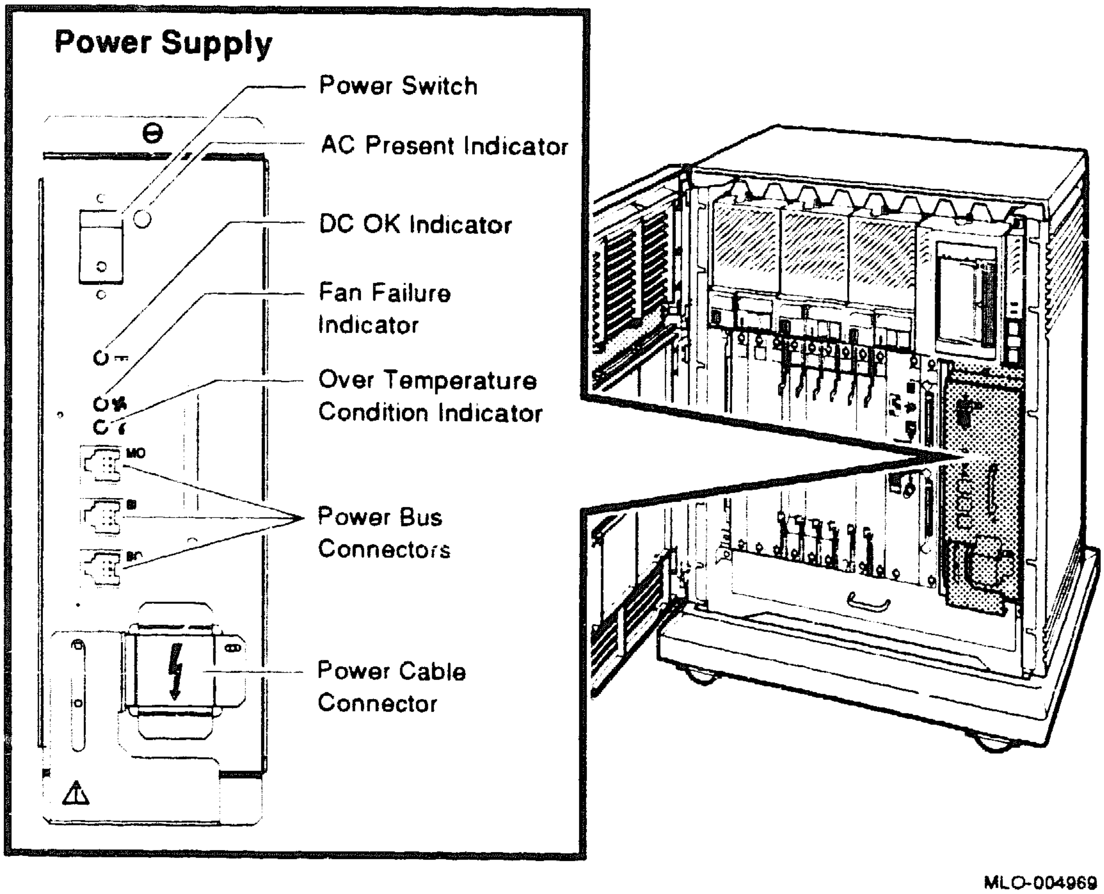
9 Connect the System Power Cable

NOTE: *This system contains an automatic voltage-selection power supply. Voltage selection is not required prior to installation.*

Connect the power cable to the system as follows.

1. Make sure the system power (1/0) switch, shown in Figure 26, is set to off (0), and make sure all devices connected to the system are turned off.

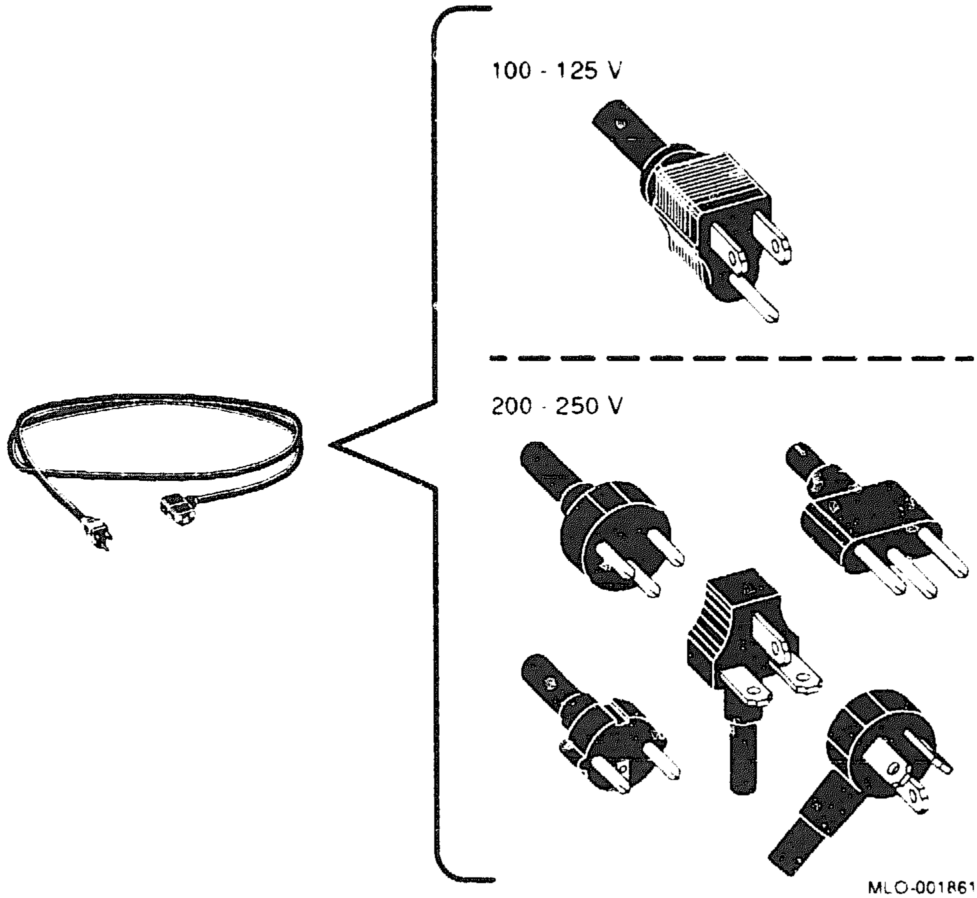
Figure 26: Power Supply Panel



2. Find the system power cable.

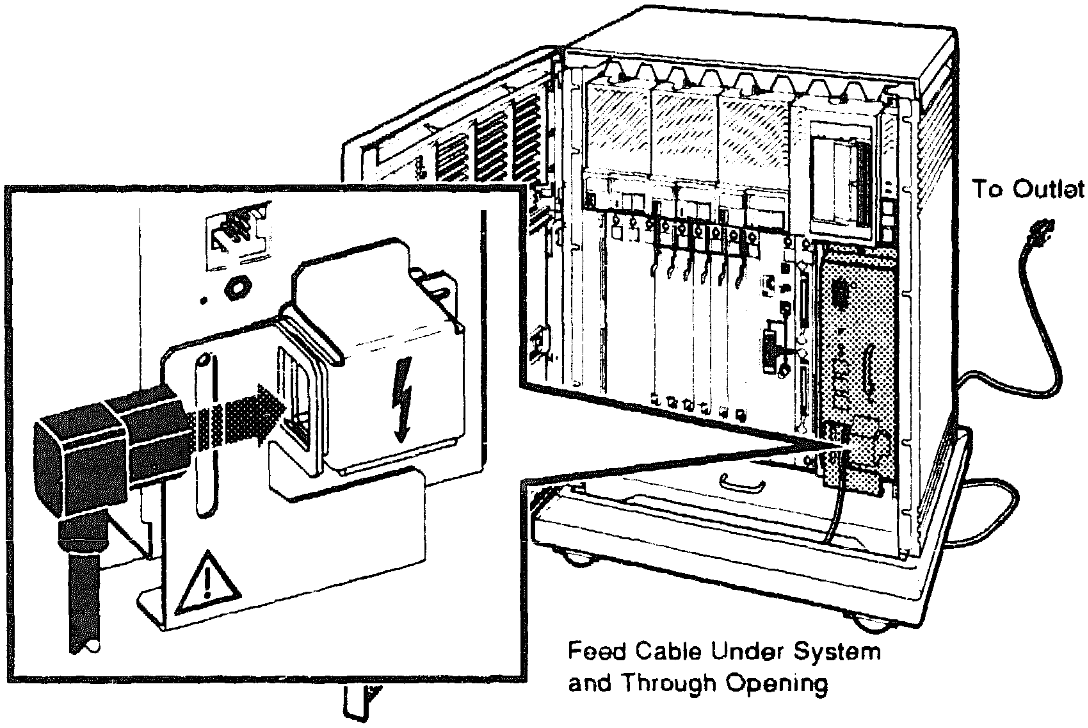
3. Make sure the plug end of the power cable matches your wall outlet. Several types of plugs are shown in Figure 27.

Figure 27: Power Cables



4. Feed the opposite end of the cable under the system from the rear or left and attach it to the power supply as shown in Figure 28.

Figure 28: Attaching the Power Cable to the System



5. Insert the plug end of the power cable in your wall outlet.

You are now ready to turn on the system and select a language.

10 Turn On the System and Select a Language

The language you select controls only the language of the system messages in the console program which is a part of the firmware in the CPU. That firmware lets you give commands to the system and also generates error messages. CPU firmware is described in your *Technical Information* manual which is included in the Customer Hardware Information Kit.

Turn on your system and select a language as follows.

1. Turn on the console terminal and wait until it performs its self-tests successfully.
2. If a B400X or R400X expander is connected to your system, turn on the expander.

   The AC indicator on the expander power supply should glow orange.

3. Turn on the system by setting the power switch to on (1).

   The AC Present indicator, next to that switch, should glow orange.

   NOTE: *If your system uses a B400X or R400X expander linked by a Power Control Bus cable, the system power switch sends a power control signal to the expander. Setting the power switch to on (1) causes the expander to turn on as well.*

   Within a few moments, a Language Selection Menu should appear on the console terminal as shown in Figure 29.

Figure 29: Language Selection Menu

```
KN220-A Vn.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) Portugues
14) Suomi
15) Svenska
 (1..15):
```

4. Select a language by typing the number corresponding to your choice and pressing Return.

   NOTE: *If you do not select a language within 30 seconds, the system defaults to English (United States/Canada). If you have an older terminal that does not support multiple languages, the Language Selection Menu does not appear and the system defaults to English.*

   After you select a language, the system runs its power-up self-tests. Within a few moments the console terminal should display a series of numbers as the system tests itself. The example in Figure 30 shows that display after successful power-up tests.

Figure 30: Successful Power-Up Tests

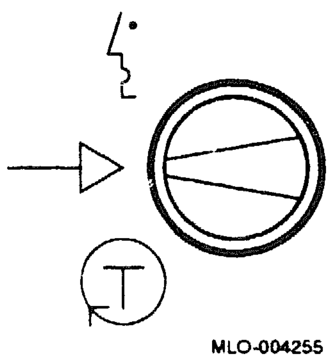
```
KN220-A Vn.n
Performing normal system tests.
83..82..81..80..79..78..77..76..75..74..73..72..71..70..69..68..67..
66..65..

?79 1 0A FF 0000 0000
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.
Memory Size: 67108864 (0x4000000) bytes
Ethernet Address: 08-00-2b-17-e9-60
>>
```

If the self-tests do not start or do not complete successfully, as shown in Figure 30, your system may have a problem. For instructions on finding the source of the problem, refer to your *Troubleshooting and Diagnostics* manual which is included in the Customer Hardware Information Kit.

5. If the self-tests complete successfully, turn the Operation switch to Normal, indicated by an arrow on the CPU cover panel as shown in Figure 31. That saves the language you selected.

Figure 31: Setting the Operation Switch

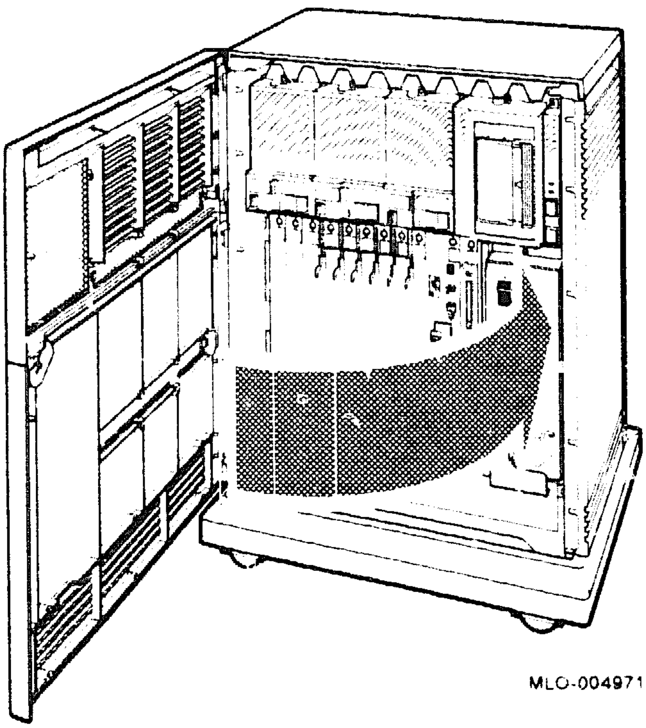


The final step of the installation is closing the system door.

11 Close the System Door

If you plan to run the diagnostic software immediately following the installation, leave the upper door open. If not, close the door as shown in Figure 32.

Figure 32: Closing the Door



1. Push gently at the top right of the upper door and the bottom right of the lower door.
2. Turn the key to the middle or top position.

12 After Installation

You should now read your system *Operation* manual to learn how to use the system. You must know how to operate the system controls and the tape drive before you install system software or run diagnostic software.

While optional, Digital strongly recommends that you run the diagnostic software supplied with your system before you install system software. The diagnostics:

- Verify the system configuration.
- Check to see if each device is working properly.

The diagnostic software is on a CDROM disk or on a tape cartridge labeled MV DIAG CUST TK50. Your system *Troubleshooting and Diagnostics* manual tells you how to run the diagnostic software.

Index

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xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
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DECsystem 5500 Operation

Order Number EK–332AA–OP–001

Digital Equipment Corporation
Maynard, Massachusetts

First Printing, August 1990

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

FCC NOTICE: The equipment described in this manual generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense may be required to take measures to correct the interference.

S1298

This document was prepared using VAX DOCUMENT, Version 1.2.

Contents

Chapter 2 Operating the System

Chapter 3 Operating the System Options

Figures

Tables

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Preface

This manual describes how to use the DECsystem 5500 system. The system uses the RISC-based KN220 CPU module set and ULTRIX operating system. The DECsystem 5500 system is housed in the BA430 pedestal enclosure.

The manual is structured as follows:

- Chapter 1 provides an overview of the system.
- Chapter 2 describes how to use the system.
- Chapter 3 describes how to use options installed in the system.
- Appendix A lists related documentation.
- A glossary explains key terms.

Conventions

The following conventions are used in this manual:

Convention	Meaning
Return	A key name is shown enclosed to indicate that you press a named key on the keyboard.
Ctrl/x	A sequence such as Ctrl/x indicates that you must hold down the key labeled Ctrl while you press another key.
[ ]	Arguments enclosed in square brackets are optional.
Italic type	Italic type indicates an argument for which you must supply a value, environment variables, and references to other documents.
bold	This bold lowercase type indicates a command name. For example: The **setenv** command is described in the next section.
`bold user input`	This bold upper or lowercase type indicates user input. For example: Type **`maint`** at the console prompt. or >>> **`show device`**
NOTE	Notes provide general information about the current topic.
CAUTION	Cautions provide information to prevent damage to equipment or software. Read these carefully.
WARNING	Warnings provide information to prevent personal injury. Read these carefully.

CHAPTER 1

Chapter 1
System Overview

DECsystem 5500 systems house all components in a BA430 enclosure. This enclosure is a free-standing pedestal that houses the following:

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

Up to four storage devices in the following combinations can be mounted inside the BA430 enclosure:

- Four RF-series or RZ-series Integrated Storage Elements (ISEs), or a combination of both
- One tape device, the TK70 or TLZ04 tape drive, and up to three RF-series or RZ-series ISEs, or a combination of both

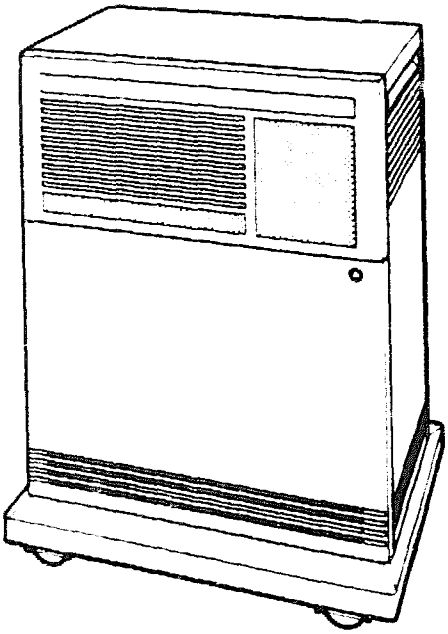
This chapter describes the system components and their functions.

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: DECsystem 5500 System

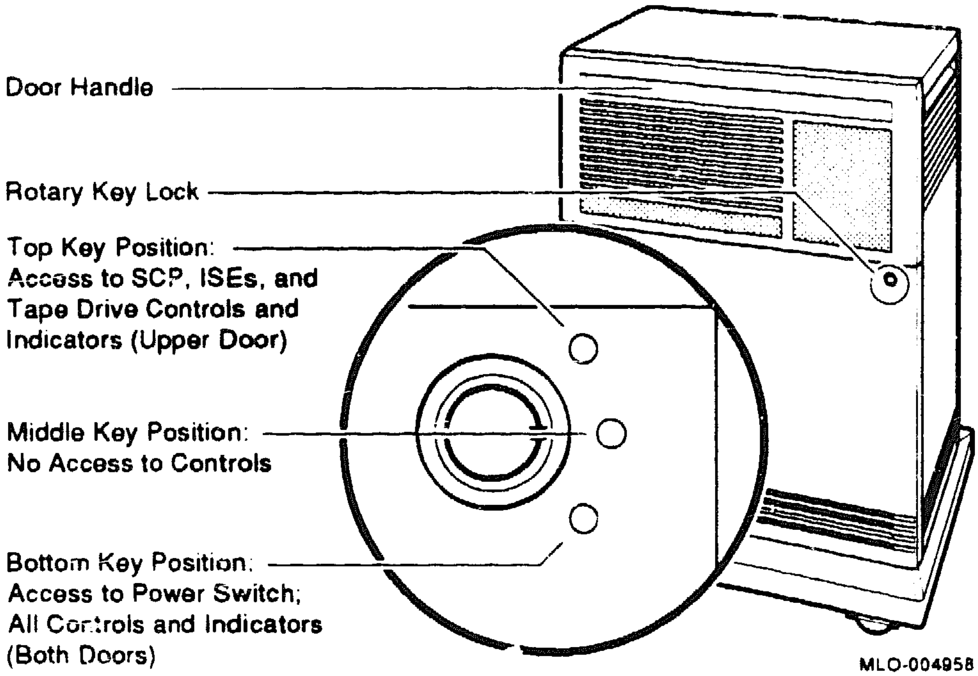


MLO-004032

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 storage devices 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 (Figure 1–3) to open just the upper portion of the door, or to the bottom position (Figure 1–4) to open the entire door.

   With the key in the bottom position, the upper and lower doors 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: Upper Door Opened

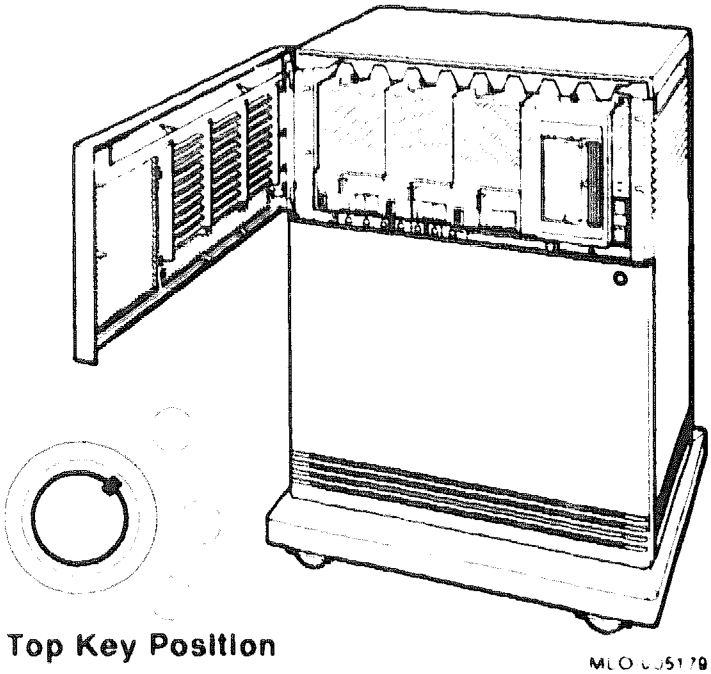
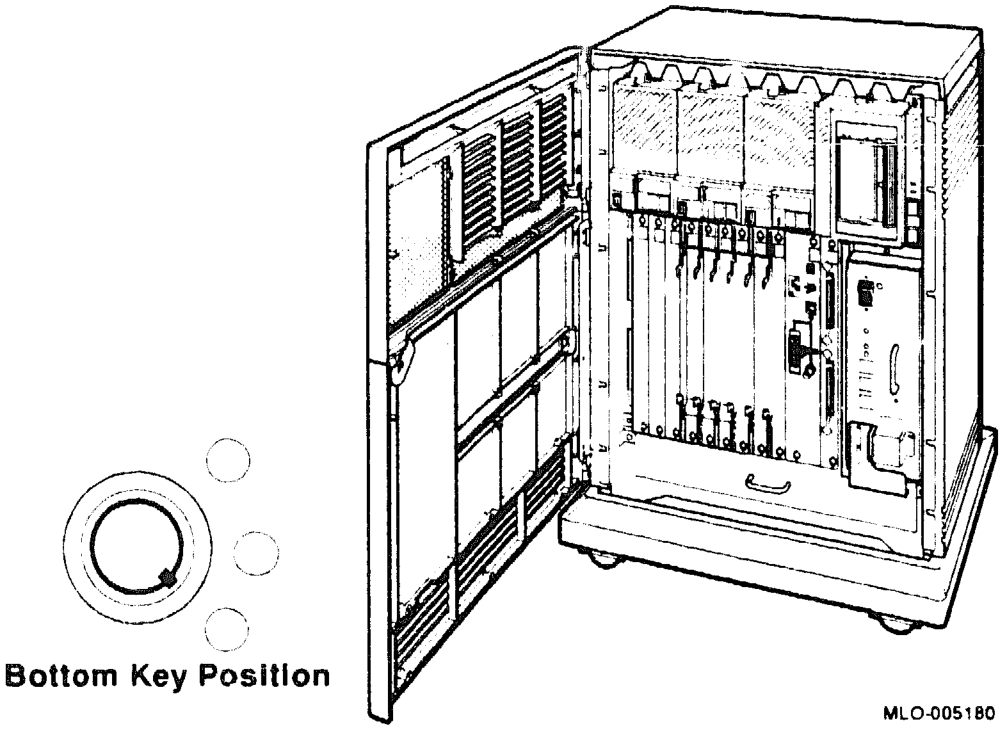


Figure 1–4: Entire Door Opened



The next section describes the BA430 enclosure, which is exposed when you open the entire door.

1.1.1 The BA430 Enclosure

Opening the front door enables you to access the components housed in the BA430 enclosure. Figure 1–5 shows a typical configuration.

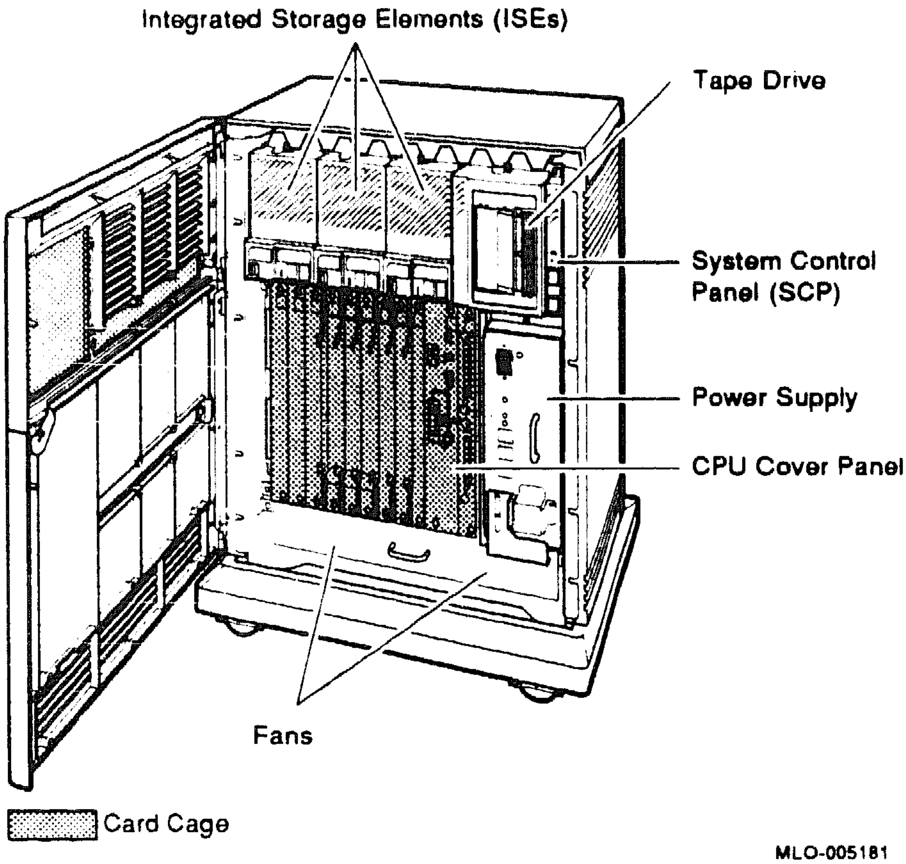
The BA430 enclosure can contain the following:

- Mass storage —
  - TK70 or TLZ04 tape drive and up to three RF-series or RZ-series ISEs, or a combination of both
  - No tape drive and up to four RF-series or RZ-series ISEs, or a combination of both

All DECsystem 5500 systems contain the following:

- System Control Panel (SCP)
- Card cage containing modules — CPU, memory, communications controllers, mass storage controllers
- CPU cover panel
- Power supply
- Fans

Figure 1–5: Front View of the BA430 Enclosure

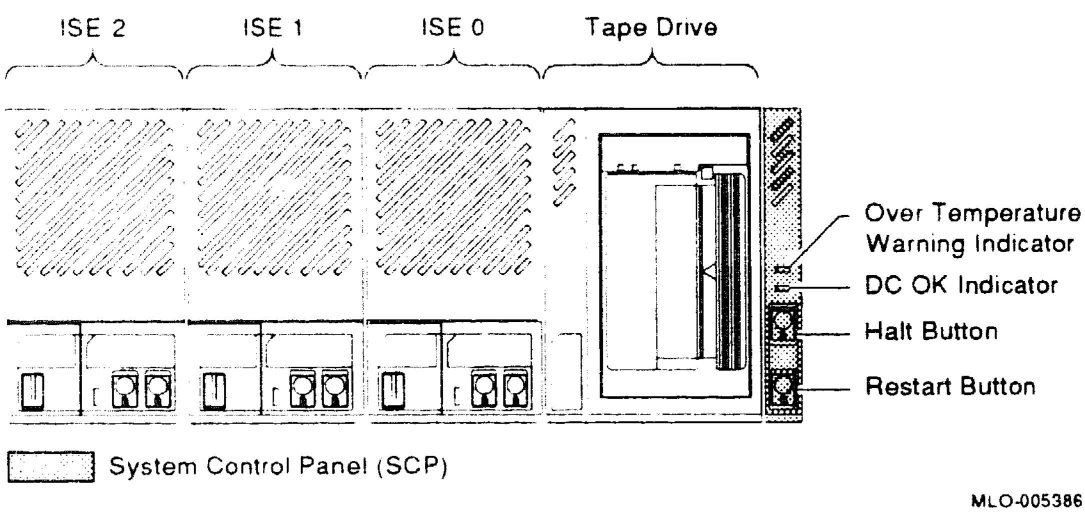


1.1.1.1 Mass Storage Shelf

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

NOTE: *RZ-series hard disk drives do not have controls or indicators on their front panel.*

Figure 1–6: Mass Storage Shelf



The SCP has two indicators: the DC OK indicator and the Over Temperature Warning indicator. The green DC OK light indicates that the power supply voltages are within the correct operating range. If the DC OK indicator is not lit when the system power is on, refer to the *DECsystem 5500 Troubleshooting and Diagnostics* manual included in the Customer Hardware Information Kit.

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.

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, you must 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, enter `continue` 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 Function switch on the console module.*

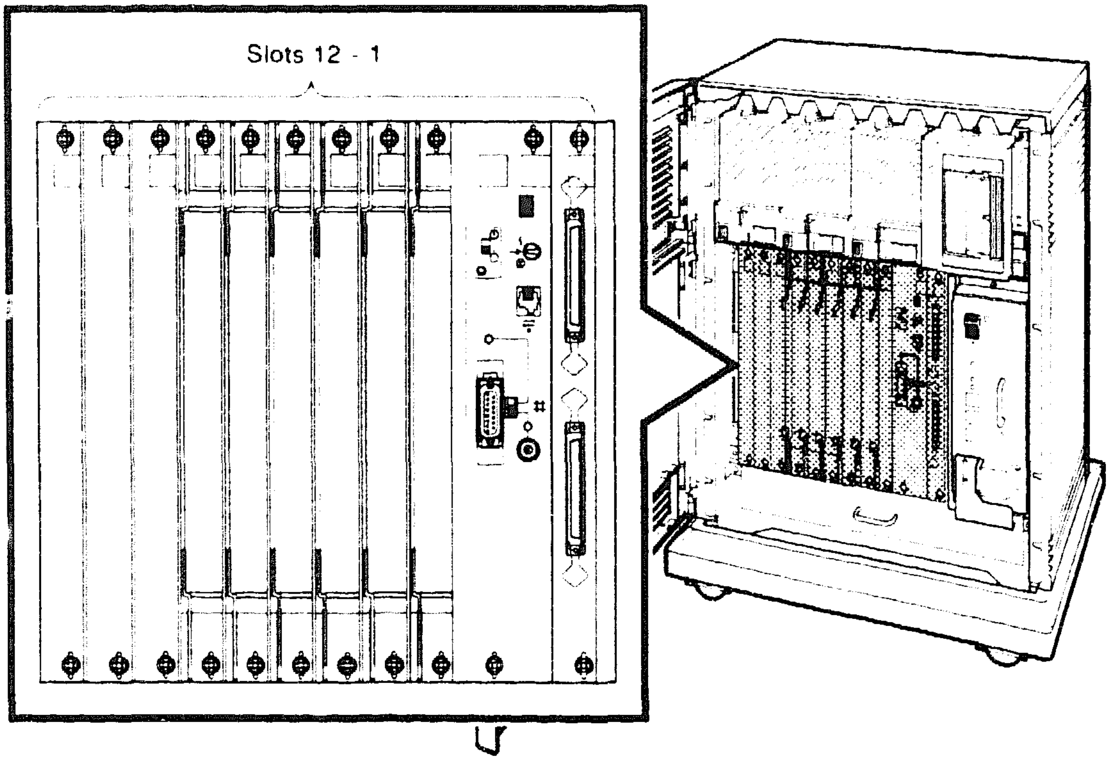
Below the Halt button is the Restart button. The Restart button has a green indicator. When you press the Restart button, the system returns to a power-up condition and self-tests are run. If the *bootmode* variable is set to *a* and you have assigned a value to the *bootpath* environment variable, the system will reboot system software. Chapter 2 contains additional instructions on restarting your system.

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



The central processing unit (CPU) module set is installed in slots 1 and 2 with its associated memory module in slot 3. Additional memory modules may be installed in slots 4 through 6. Remaining slots 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. The purpose of the shield is as follows:

- 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.*

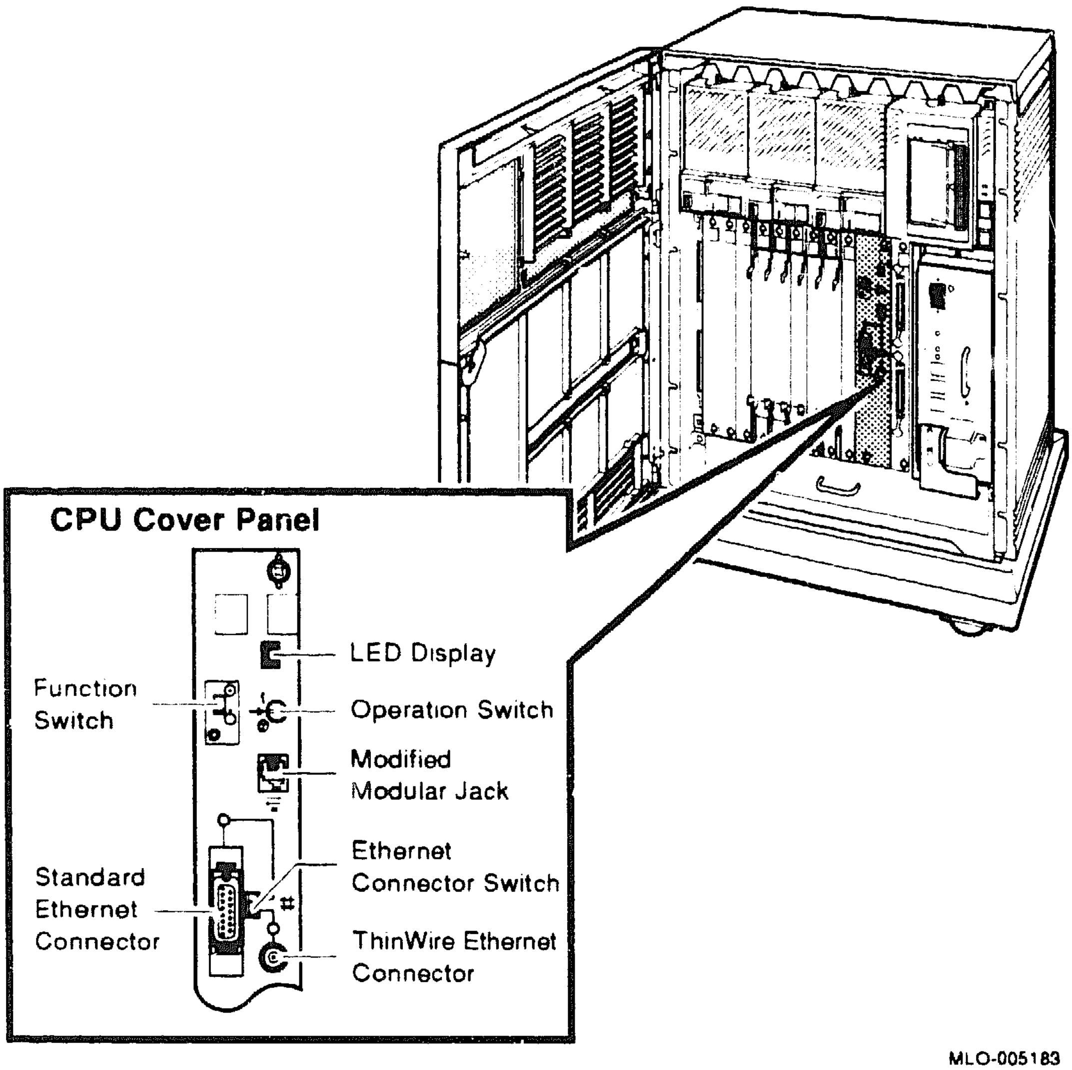
The design of the module covers varies, depending on the type of module installed in the slot. Modules requiring external cable connections, such as communications controllers, have recessed covers that are riveted directly to the module. The recessed module covers allow space for connecting cables. 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 BA430 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.

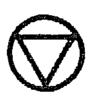
1.1.1.3 CPU Cover Panel

The CPU module set is behind a double-width cover panel that has internal cable connections to the memory module(s). Figure 1–8 shows the CPU cover panel.

Figure 1–8: CPU Cover Panel



The CPU cover panel has the following components:



Function switch — When the switch is down (dot outside the circle), breaks are disabled. When the switch is up (dot inside the circle), breaks are enabled. When breaks are enabled, pressing Break on the console terminal halts the processor and transfers control to the console program.

The setting of the Function switch is also used in conjunction with the three-position Operation switch to control what occurs during a power-up sequence.

Operation switch — This three-position rotary switch determines how the system responds at power-up. The Operation switch and its uses relative to the Function switch setting are described below:

Action Mode — If the Function switch is set to down (dot outside the circle), the system displays a Language Selection Menu at power-up. If your console terminal does not support multiple languages, it defaults to English. After you select a language, the power-up tests are run and the console prompt (>>) is displayed.

If the Function switch is set to up (dot inside the circle), the console serial line external loopback test is executed. This function requires special loopback connectors and is for Digital Field Service use only.

Normal Mode — Power-up self-tests run, and the system either enters Normal console mode, indicated by the >> prompt, or the system autoboots from a device previously defined by the user. The system autoboots only if you have set the *bootmode* environment variable to *a*, and have assigned a value to the *bootpath* environment variable.

If the Function switch is set to up (dot inside the circle), breaks are enabled. If the Function switch is set to down (dot outside the circle), breaks are disabled.

Maintenance Mode — Power-up self-tests run. Then the system enters Maintenance mode, indicated by the >>> prompt.

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

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

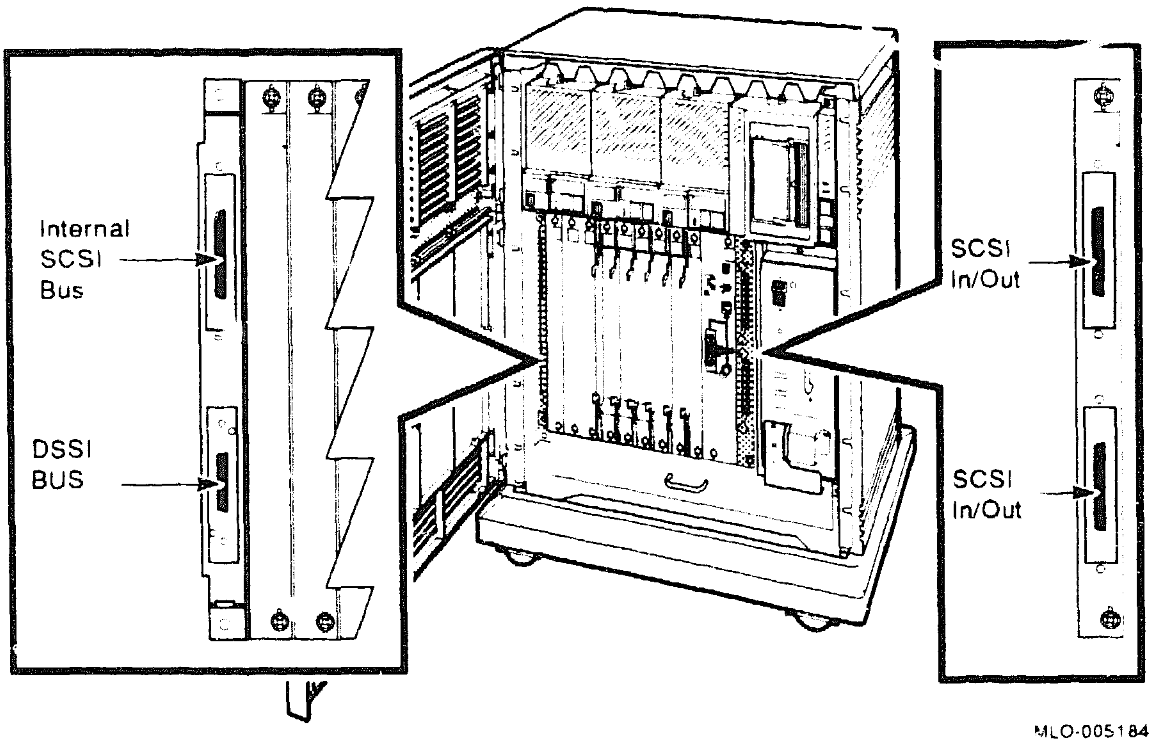
Ethernet connectors — The CPU cover panel has two Ethernet connectors: a BNC-type connector for ThinWire Ethernet, and a 15-pin connector for a standard Ethernet transceiver cable. The Ethernet connector switch allows you to set the type of connection.

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 and SCSI Connectors

Two panels provide connectors for DSSI and SCSI busses. The connectors allow you to expand your system by connecting additional mass storage devices to the busses. Figure 1–9 shows the locations of the DSSI and SCSI connectors available for mass storage expansion.

Figure 1–9: Connectors for DSSI and SCSI Busses



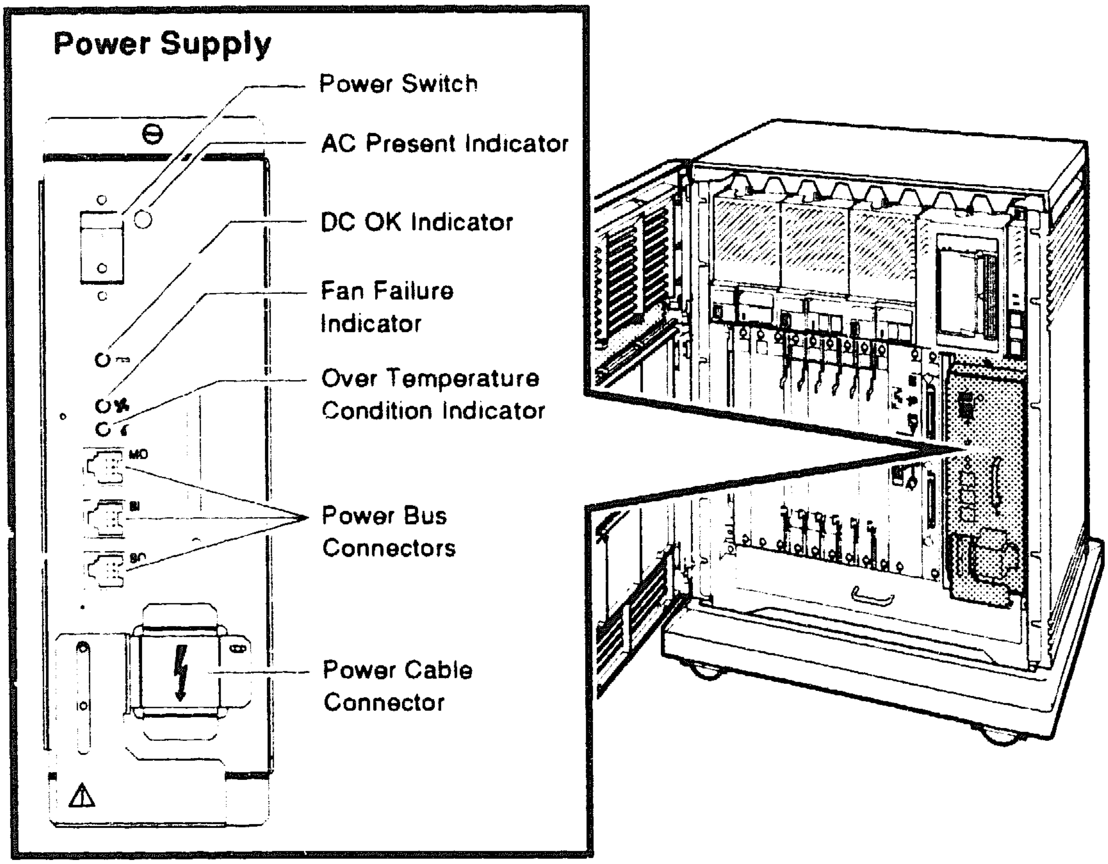
1.1.1.5 Power Supply Controls and Indicators

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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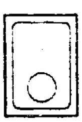
The controls and indicator lights function as follows.



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 on the system resets the circuit breaker. If the circuit breaker trips, wait one minute before turning on the system again.

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 *DECsystem 5500 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 *DECsystem 5500 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 2.10 provides instructions on recovering from an over temperature condition.

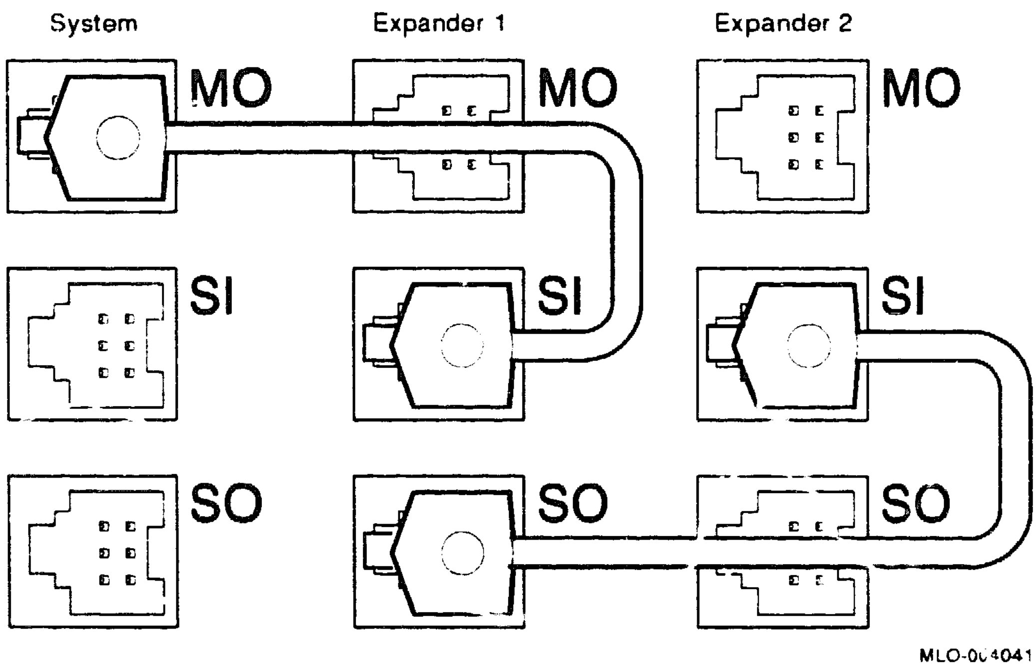
Power bus connectors — Three power bus connectors allow you to configure a power bus for systems expanded with a B400X or R400X expander. The power bus allows you to turn power on and off for one or more expanders through the power supply designated as the main power supply; this way, one power switch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

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 (system) 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



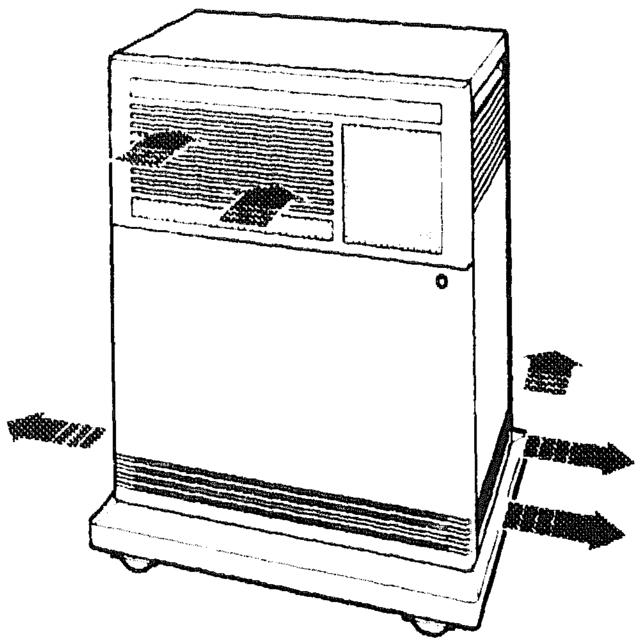
1.1.1.6 Fans

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



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1.2 Functional Description of Base System

Each DECsystem 5500 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 adapter
- Embedded SCSI adapter

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. DECsystem 5500 systems use the RISC-based KN220 CPU module set.

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 CPU cover panel. 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 and capacity 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 elements 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 network 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 on-board Ethernet controller that is part of the CPU module set. The system can be connected to either a standard Ethernet cable or a ThinWire Ethernet cable. Connectors for both types of cables are on the CPU cover panel.

1.2.1.5 Embedded DSSI Adapter

Your system has a Digital Storage System Interconnect (DSSI) adapter built into the CPU. The DSSI adapter provides a DSSI bus through which the CPU can communicate with the RF-series ISEs. A DSSI bus can support seven RF-series ISEs.

1.2.1.6 Embedded SCSI Adapter

Your system has a Small Computer System Interface (SCSI) adapter built into the CPU. The SCSI adapter provides a SCSI bus through which the CPU can communicate with the RZ-series ISEs, TLZ04 tape drive, or RRD40 compact disk drive. A SCSI bus can support up to seven devices.

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 ISEs) and the following kinds of options:

- Mass storage devices and controllers
- Mass storage subsystems
- Mass storage expanders
- Communications controllers and adapters
- 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 or RZ-series ISEs, and devices with removable media, such as tape cartridges and compact disks.

RF-Series Integrated Storage Elements (DSSI)

Up to four DSSI RF-series ISEs can be installed in your system. An ISE is an intelligent storage device that contains its own controller. Special mounting hardware allows the device to plug directly into the BA400-series backplane.

RZ-Series Integrated Storage Elements (SCSI)

Up to four SCSI RZ-series ISEs can be installed in your system. RZ-series ISEs deliver the capacity, speed, and dependability required by DECsystem

5500 systems, while meeting SCSI standards. Each RZ-series ISE contains its own controller. Special mounting hardware 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 RF-series ISEs, RZ-series ISEs, and the TLZ04 tape drive have built-in controllers, 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 CPU communicates with the RF-series ISEs through a DSSI adapter, which is built into the CPU. The CPU communicates with the RZ-series ISEs and the TLZ04 tape drive through a SCSI adapter, which is also built into the CPU.

Additional DSSI busses can be added to your system by using the KFQSA DSSI storage adapter. Each KFQSA storage adapter can support up to seven RF-series ISEs. Additional SCSI busses can be added to your system by using the KZQSA SCSI storage adapter. Each KZQSA storage adapter can support up to seven SCSI devices.

1.2.2.2 Mass Storage Subsystems

Several optional mass storage subsystems are available for DECsystem 5500 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 and Q-bus Expanders

You can expand the mass storage capacity of your DECsystem 5500 system by using the R400X expander. The R400X expander provides space for up to seven additional RF-series or RZ-series ISEs, or a combination of both.

The B400X expander provides 11 additional Q-bus slots for a system total of 22 Q-bus slots. The B400X also has room for up to four mass storage devices. See your Digital representative for more information on these and other expander products.

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
- DECservers
- 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

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 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.

1.2.2.6 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. *DECsystem 5500 Technical Information* describes the options currently available for DECsystem 5500 systems. Digital provides installation for additional options that you order.

CHAPTER 2

Chapter 2

Operating the System

This chapter describes how to operate your DECsystem 5500 once the system software has been installed.

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 ULTRIX operating system. To install the operating system 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 remove the front panel of the system to change switch settings on the CPU cover panel.

NOTE: *The use of Prestoserve™ software, included with your operating system, requires a special CPU configuration. If the line*

```
?79 1 0A FF 0000 0000
```

is displayed during power-up tests, your CPU is not configured to run Prestoserve software. Contact your Digital service representative before running Prestoserve software.

The remainder of this chapter assumes that system software has been installed.

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:

- Digital recommends you run the system with breaks disabled (Function switch down, dot outside the circle) to prevent the user from inadvertently halting the system by pressing Break on the console terminal. Halting the system causes all activity to stop.

- The Operation switch on the CPU cover panel is set to Normal (indicated by an arrow).
- The baud rate switch inside the CPU cover panel is set to 9600.
- The Write-Protect button for each RF-series ISE 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 ISE is set to in (glows green when the storage element is not being used). This setting makes the storage element available for use (on line)
- The Halt button on the SCP is set to out (not lit).
- For expanded systems using power bus cables to link an expander(s), 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 Function switch to up (dot inside the circle). This allows you to halt the system by pressing Break on the console terminal.
- If you want data on a particular ISE to be write-protected, during backup procedures for example, you must set the Write-Protect switch to in (glows).

  NOTE: *ISEs containing system software and user accounts must remain write-enabled. ISEs 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 Operation switch to the Action mode. A human profile indicates the Action mode. Set the Function switch to down (dot outside the circle). When you turn on your system, a Language Selection Menu appears, as shown in Figure 2–1.

Figure 2–1: Language Selection Menu

```
KN220-A Vn.n
 1) Dansk
 2) Deutsch (Deutschland/Österreich)
 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 Operation switch to Normal 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 Operation switch is set to Normal mode (indicated by an arrow), then the language selected is saved and is automatically used during subsequent reboots of the system.

NOTE: *If the Operation switch is set to Action mode (indicated by the human profile) and the Function switch is set to down (dot outside the circle), the system will prompt for the language at each power-up.*

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 automatically display when you power up your system, regardless of the Operation 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 DECsystem 5500 provides the power control bus signal to the expander(s). Setting the power switch to on (1) on the DECsystem 5500 will cause the expander(s) to power up as well. The power switch on each expander should always remain set to on (1).*

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

Table 2–1: Normal Power-Up Indications

Indicator	Normal Indication
System DC OK lights (power supply and SCP)	Glow green
AC Present light (power supply)	Glows orange
RF-series ISE Run/Ready lights	Glow green steadily within 20 seconds
RF-series ISE Fault light	Lights temporarily at power-up.
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 *DECsystem 5500 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 the hardware. In the sample screens provided in this chapter, the CPU is identified as a KN220–A, and the version of the firmware is indicated as Vn.n. Your system will display actual version numbers. The console terminal then displays a countdown as the system tests itself. Depending on the value of the *bootmode* environment variable, 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 and enters Maintenance mode (>>>). 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

```
KN220-A Vn.n
Performing normal system tests.
83..82..81..80..79..78..77..76..75..74..73..72..71..70..69..68..67..
66..65..

?79 2 06 FF 0000 0007

P1 =28000000  P2 =2807FFFC  P3 =00000000  P4 =00000000  P5 =00000000
P6 =00000000  P7 =00000000  P8 =00000000  P9 =00000000  P10=00000000
P11=00000000  P12=00000000  P13=00000000  P14=00000000  P15=00000000
P16=00000000  P17=00000000  P18=00000000  P19=00000000  P20=00000000
gp =1C270008  sp =B8001B1C  fp =00000000  sr =B048FF04
epc=BFC2903C  badvaddr =00000000  cause =00000000
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..
Normal operation not possible.

>>>
```

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

2.4 Booting the System

DECsystem 5500 systems boot in one of two ways. You can manually boot the system from console mode or you can configure the system to autoboot on power-up. The value of the *bootmode* environment variable determines how the system boots.

2.4.1 Booting the System from Console Mode

When the *bootmode* environment variable is not initialized (as shipped from the factory) the system powers up to console mode (>> prompt) after successfully completing its self-tests.

NOTE: *The memory size and Ethernet address are displayed when self-tests complete successfully.*

Figure 2–3 shows a successful power-up to console mode.

Figure 2–3: Successful Power-Up to Console Mode

```
KN220-A Vn.n
Performing normal system tests.
83. 82..81..80..79..78..77..76..75..74..73..72..71..70..69..68..67..
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.
Memory Size: 16777216 (0x1000000)
Ethernet Address: 08-00-2b-0c-c4-7a
>>
```

NOTE: *If the line*

```
?79 1 0A FF 0000 0000
```

is displayed during power-up tests, your CPU is not configured to run Prestoserve™ software. Contact your Digital service representative before running Prestoserve software.

Loading System Software

To load system software from console mode, use the command

boot [-f *file*] [-s | -m] [-n] [*arg*...]

For example,

```
>> boot -f tm(0,0)
```

tells the system to boot software from a cartridge in the TK70 tape drive. For a complete description of the **boot** command, refer to the section on console commands, Section 2.11.

Software manuals may instruct you to power up with the Function switch set to breaks enabled, or up (dot inside the circle), and to use the **boot** command.

2.4.2 Autobooting the System

By assigning values to environment variables, you can define a device from which the system will automatically boot at power up. Use the **setenv** command to assign values to the *bootpath* and *bootmode* environment variables. The *bootpath* variable specifies a device from which to autoboot. The *bootmode* variable must be set to *a* for the system to autoboot. For example,

```
>> setenv bootpath  rf(0,0,0)vmunix
>> setenv bootmode a
```

defines an RF-series ISE with controller 0, unit number 0, and logical block number 0 as the boot device; and a value of *a* (autoboot) is assigned to the *bootmode* variable. Now, when the system is powered up, the system runs self-tests and, on completion, attempts to load system software from ISE 0. For a complete description of the **setenv** and **unsetenv** commands, refer to Section 2.11.

Figure 2–4 shows a successful power-up and automatic boot when a boot device has been specified.

Figure 2–4: Successful Power-Up and Automatic Boot

```
KN220-A Vn.n
Performing normal system tests.
83..82..81..80..79..78..77..76..75..74..73..72..71..70..69..68..67..
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.

Autoboot:Waiting to load rf(0,0,0)vmunix(CTRL-C to abort)...loading
```

NOTE: *If the line*

```
?79 1 0A FF 0000 0000
```

is displayed during power-up tests, your CPU is not configured to run Prestoserve™ software. Contact your Digital service representative before running Prestoserve software.

Changing the Boot Device

Once you have set the environment variables to recognize a boot device and to autoboot, the system autoboots from that device each time you turn on the system. These environment variables are stored in nonvolatile memory and will remain in effect until you change their values. You can change the variables by using the **setenv** command to assign a new boot device. To display console environment variables and their current values, use the **printenv** command at the console prompt (>>). For a complete description of each console command, refer to Section 2.11.

2.5 Using Console Security

DECsystem 5500 systems have a console security feature as part of the console firmware. The security feature allows you to secure the system. When the system is secure, unprivileged users (users who do not know the security password) are limited to the **boot** command (with no arguments). Privileged users, knowing the security password, have access to all console commands.

Securing the System

To secure the system, use the **passwd** command as follows:

NOTE: *If unprivileged users are to be allowed to boot the system, the system manager should assign values to the bootpath and bootmode variables before securing the system. Once the system is secure, unprivileged users cannot issue the boot command with arguments.*

1. At the console prompt (>>), enter the set password command,

   `passwd -s`.

2. At the "New password:" prompt, enter a password of 8 to 32 characters.

   You must retype the password for verification.

3. After the password has been accepted, enter the command

   `passwd -u`

   which causes the console module to display the unprivileged console prompt (s>). Unprivileged users are limited to the **boot** command with no arguments.

   The following example shows how to secure the system.

```
>> passwd -s
New password:
Retype new password:
New password accepted
>> passwd -u
Memory Size: 16777216 (0x1000000) bytes
Ethernet Address: 08-00-2b-12-81-22
s>
```

4. To maintain security, the Operation switch should remain set to Normal mode (indicated by the arrow) and the lower front door should be locked.

Privileged Users

By entering the security password, privileged users have access to all the console commands. In the example below, the **passwd** command is used to access the privileged console prompt (>>).

```
s> passwd
Password:
Password accepted.
Memory Size: 16777216 (0x1000000) bytes
Ethernet Address: 08-00-2b-12-81-22
>>
```

For a complete description of the **passwd** command, refer to Section 2.11.13.

Unsecuring the System

Privileged users can remove the security restrictions by entering the **clear password** command, **passwd -c**, at the console prompt (>>). For example,

```
>> passwd -c
>>
```

removes all security restrictions from the console firmware. The system is now unsecure.

If you forget the security password, you must use the following procedure to clear the password.

1. Set the Operation switch to the Maintenance mode setting (indicated by a T inside a circle).
2. Press the Restart button on the System Control Panel (SCP).
3. After the system completes self-tests, enter the maintenance command **unpriv** at the Maintenance mode prompt (>>>).
4. Reset the Operation switch to the Normal mode setting (indicated by an arrow).

5. Press the Restart button and wait for self-test to complete. You can now enter a new security password.

For a complete description of the **passwd** and **unpriv** commands, refer to Section 2.11.

2.6 Using the System

Once the system software is loaded, the first screen for the system software is displayed 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

2.7 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 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 Function switch on the CPU cover panel is set to up, or breaks enabled (dot inside the circle), you can press the Break key on the console terminal. If the Function switch is not set to up and you wish to halt the system by pressing Break, change the setting of the Function switch from down to up (dot inside the circle).

  NOTE: *If the power is on when you change the setting of the Function switch, you must press the Restart button or power up your system again for the new setting to take effect.*

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

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

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

2.8 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-up condition. All current and pending operations are aborted and the usual power-up tests are run.

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

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

2.9 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. The expander(s) will power down when you set the system power switch to off (0). The power switch for each expander should always remain set to on (1). Note that the orange AC indicator on the expander power supply should remain lit even though the system is powered down.*

2.10 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.

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 operating limits: 10°C to 40°C (50°F to 104°F).

2.11 Console Commands

The console program displays the >> prompt when it is ready to accept commands. Observe the following rules when typing console commands:

- All commands typed at console level are case-sensitive. The console firmware does not recognize uppercase and lowercase letters as the same input.
- Command execution begins when you press Return.
- Enter numeric values as follows:
  - Enter *decimal values* as a string of decimal digits with no leading zeros (for example, 123).
  - Enter *octal values* as a string of octal digits with a leading zero (for example, 0177).
  - Enter *hexadecimal values* as a string of hexadecimal digits preceded by 0x (for example, 0x3ff).
  - Enter *binary values* as a string of binary digits preceded by 0b (for example, 0b1001).
  - When reading or writing to memory, you have a choice of data sizes: byte, halfword, or word. Because a word is four bytes, successive addresses, when referenced by a word, are successive

multiples of four. For example, the address following 0x80000004 is 0x80000008. An error will occur if you try to specify an address that is not on a boundary for the data size you are using.

Conventions Used in This Section

- Letters in **`bold monospace`** type are to be typed exactly as shown.
- Letters in *italics* represent arguments for which you supply values. (Note that help and menu screens display these arguments in all capital letters.)
- Arguments enclosed in square brackets ([ ]) are optional.
- Ellipses (...) follow an argument that can be repeated.
- A vertical bar (|) separates choices. You can think of it as a symbol meaning *or*.
- Parentheses are used as in algebraic expressions. For example,

  -(b | h | w)

  means enter -b or -h or -w.

Getting Help

You can get help with console command syntax in several ways:

- You can enter **`help`** or a question mark (?) to display a menu of all console commands.
- You can enter the name of the command for which you want help as an argument to **help** or **?**.

  For example, entering **? e** at the console prompt (>>) displays the syntax for the **examine** (**e**) command:

  ```
  e [-(b|h|w)] ADDR
  >>
  ```

- If you type an incorrect command line, you get a help screen.

  For example, the **e** command requires an *addr* argument. Entering **e -b** at the console prompt (>>) without entering an address causes the screen to display the correct syntax for the command:

  ```
  e [-(b|h|w)] ADDR
  >>
  ```

Console Commands

Table 2–2 lists the console commands.

Table 2–2: Console Commands

Command	Description
continue	Returns control to the processes interrupted by a **halt** signal
boot	Boots the operating system
d	Deposits data at a given address
dump	Dumps memory to the screen
e	Examines memory
exit[1]	Exits Maintenance mode and returns control to Normal console mode
fill	Deposits data in an address range
go	Resumes execution of the program in memory
help	Displays the syntax of console commands
?	Displays the syntax of console commands
init	Reinitializes memory
maint	Causes the console to enter Maintenance mode
passwd	Allows you to use the console security feature
printenv	Displays console environment variables
setenv	Sets console environment variables
show device[1]	Displays a list of available devices, their unit numbers, and controller numbers
show dssi[1]	Displays a list of available DSSI storage devices, their unit numbers, and controller numbers
show ethernet[1]	Displays the hardware address of your Ethernet controller.
show scsi[1]	Displays a list of available SCSI storage devices, their unit numbers, and controller numbers
unpriv[1]	Sets the security password to zero
unsetenv	Unsets console environment variables

[1]This command is only available in Maintenance mode.

2.11.1 The boot Command

boot [-f *file*] [-s | -m] [-n] [*arg*...]

This command loads the file that contains the operating system.

- The optional -f flag followed by the *file* parameter specifies the file you want to use during a boot procedure. If you do not specify the -f flag and a file, the file specified by the environment variable *bootpath* is loaded.

  The *file* parameter has the format

  dev([*controller*][,*unit-number*] [,*logical block number*])[*filename*]

  — *dev* indicates the device from which you are booting the operating system. Typical devices are *rf* for RF-series ISEs, *rz* for RZ-series ISEs, *ra* for RA-series hard disk drives, *tm* for a TK70 tape drive, *tz* for a TLZ04 tape drive, and *mop* for a network. Entering *mop* nullifies the other arguments in the list, so that *file* takes the form *mop*( ). Table 2–3 lists the device names for each device.

Table 2–3: Device Names

Device Type	Protocol	Number of Units	Device Name
RF-series ISE	DSSI	8	*rf*
RZ-series ISE	SCSI	8	*rz*
RA-series fixed-disk	MSCP	4	*ra*
TK70 tape drive	TMSCP	4	*tm*
TLZ04 tape drive	SCSI	2	*tz*
Ethernet adapter	MOP	1	*mop*
Ethernet adapter	TFTP	1	*tftp*

  — *controller* indicates the ID number of the controller for the device from which you are booting the operating system.

  — *unit-number* indicates the unit number of the device from which you are booting the operating system.

  To display a list of devices, their unit numbers and controller numbers, enter Maintenance mode and enter the command `show device` at the Maintenance prompt >>>. After reviewing the display, enter `exit` and press Return to return to the Normal console prompt >>.

Example:

```
>> maint
>>>show device
DSSI Node 0 (R7QJNG)
 -rf(0,0,*)   (RF71)

DSSI Node 1 (TEST2)
 -rf(1.1,*)   (RF71)

DSSI Node 2 (BILLY)
 -rf(2,2,*)   (RF71)

DSSI Node 7 (*)

SCSI Node 0
 -tz(0,0,*) (.....) -DIA0

SCSI Node 1
 -rz(0,1,*) (RZ56 )

SCSI Node 7 (*)

Ethernet Adapter
 -mop() -EZA0   (08-00-2B-12-81-22)

VME Interface Board - Not Installed

>>>exit
>>
```

As in the preceding example, the **show device** command displays the device names followed by the controller number and unit number in parentheses. The asterisk indicates the logical block number variable, which is determined during installation of the operating system software.

— *logical block number* specifies the absolute block number from the beginning of the disk. Logical block numbers are only meaningful for disk devices.

— *file name* indicates the name of the operating system file.

— The optional -s flag causes the operating system to boot in single-user mode. Unless -s is specified, the system will boot in multiuser mode -m.

— The optional -n flag causes the specified file to be loaded but not executed.

— The optional *arg* parameter contains any information to be passed to the booted image.

Examples:

```
>> boot -f rf(2,2,0)vmunix
```

This command boots the file *vmunix*, located at logical block number 0 of the second RF-series ISE (unit number 2), using controller 2.

```
>> boot -f rz(0,2,0)vmunix
```

This command boots the file *vmunix*, located at logical block number 0 of the second RZ-series ISE (unit number 2), using controller 2.

```
>> boot -f ra(0,0,0)vmunix
```

This command boots the file *vmunix*, located at logical block number 0 of the first hard disk (unit number 0), using controller 0.

```
>> boot -f tm(0,0)
```

This command boots from a TK70 tape drive, which is unit 5 in this example.

```
>> boot -f tz(0,5)
```

This command boots from a TLZ04 tape drive, which is unit 0 in this example.

2.11.2 The continue Command

continue

This command returns control to the processes interrupted by a halt signal. Use this command if you inadvertently halt the system by pressing Break or the Halt button.

Pressing Break or the Halt button causes the system state to be saved in the halt state memory block. When you enter the **continue** command, the system state is reloaded and execution continued.

2.11.3 The d (deposit) Command

d [[[-(b | h | w)] [*addr*]] | [-H *reg-name*]] *val*

This command deposits a single byte, halfword, or word value at the specified address. If you repeat the command without specifying an address, the data will be deposited in the next word location.

The first parameter, which is optional, indicates the data size. If not given, data size defaults to word. If you do not specify a data size a word is used.

- Use -b to deposit 1 byte of data.

- Use -h to deposit a halfword (2 bytes) of data.
- Use -w to deposit a word (4 bytes) of data.

The *addr* parameter indicates the address to which you want data written. System address space ranges from 0x80000000 to 0xbf000000.

The -H parameter specifies that the data is to be deposited to a register in the halt state memory block. This memory location is where all the R3000 internal registers are saved when the system is halted. The *reg-name* parameter specifies the name of the particular R3000 internal register for which you want data written.

The *val* parameter contains the data you want deposited at the given address.

Example:

```
>> d -w 0x80000000 0xffffffff
```

This command deposits the value 0xffffffff, with a data size of one word, at address 0x80000000.

Example:

```
>> d -H at 0x00ab
```

This command deposits the value 0x00ab, with a data size of one word, for the R3000 internal register named "at" currently stored in the halt state memory block.

2.11.4 The dump Command

dump [-H] | [[[-(b | h | w)] [-(o | d | u | x | c | B)]] | [-I]] *rng*

This command shows a formatted display of the contents of memory.

The -H parameter displays the contents of the halt state memory block. All R3000 internal registers are stored in the halt state memory block when the system is halted. The -H parameter option cannot be used with any other command parameter.

The second parameter, which is optional, indicates the data size. If you do not specify a data size, the system uses a word.

- -b displays memory in bytes.
- -h displays memory in halfwords.
- -w displays memory in words.

The next parameter, also optional, determines how data is displayed.

- -o displays memory in octal format.
- -d displays memory in decimal format.
- -u displays memory in unsigned decimal format.
- -x displays memory in hexadecimal format.
- -c displays memory in ASCII format.
- -B displays memory in binary format.

If no format argument is given, hexadecimal format is used.

The -I parameter displays memory in assembly language format.

The *rng* parameter indicates the range of memory you want to see. You can specify the range in one of two ways:

- *addr#cnt* displays the number of addresses specified by *cnt*, beginning at *addr*.
- *addr:addr* displays all values between the specified addresses.

Examples:

```
>> dump 0x80000000#0xf
```

This command uses hexadecimal format to dump the first 15 words of memory to the screen.

```
>> dump -b 0x80000000#0xf
```

This command uses hexadecimal format to dump the first 15 bytes of memory to the screen. The dump display shows rows of address contents. The left-most column gives the address of the first field in each row.

```
>> dump -I 0x80030200:0x80030220
0x80030200:     c048228     jal        0x801208a0
0x80030204:        2021     addu       a0,zero,zero
0x80030208:    8fbf0014     lw         ra,0x14(sp)
0x8003020c:    27bd0018     addiu      sp,0x18
0x80030210:     3e00008     jr         ra
0x80030214:           0     nop
0x80030218:    27bdffe8     addiu      sp,0xffe8
0x8003021c:    afbf0014     sw         ra,0x14(sp)
>>
```

This command displays in assembly language format, all values between the specified addresses. The first column lists the memory location in hexadecimal, the second column lists the contents of the memory location, the third column lists the R3000 assembly language instruction, and the fourth column lists the corresponding operand.

2.11.5 The e (examine) Command

e [-(b | h | w)] *addr*

This command examines the byte, halfword, or word at the specified address. If you repeat the command without specifying an address, the next word location will be examined.

The first parameter, which is optional, indicates the data size. If not given, data size defaults to word. If you do not specify the data size, a word is used.

- -b indicates a single byte.
- -h indicates a halfword.
- -w indicates a word.

The *addr* parameter indicates an address in the range 0x80000000 to 0xbf000000.

When you enter the examine command, a display similar to the following appears:

```
0x80000005:  65 0x41    'A'
```

The left-most field echoes the address you entered.

The next three fields display the contents of the address in decimal, hexadecimal, and ASCII formats, respectively. If the ASCII character is unprintable, it is displayed as an octal value preceded by a backslash: for example, '\032'.

Example:

```
>> e 0x80000000
```

This command examines the word at address 0x80000000. The resulting display might look like this:

```
0x80000000:         1008385985       0x3c1abfc1     '\301'
```

2.11.6 The exit Command

exit

This command is used in Maintenance mode (>>>) to return control to Normal console mode (>>).

Example:

```
>>>exit
>>
```

2.11.7 The fill Command

fill [-(b | h | w)] [-v *val*] *rng*

This command writes a specified value to a range of memory. If you do not specify a value, the system puts zeros in the memory range.

The first parameter, which is optional, indicates the data size. If not given, data size defaults to word.

- -b indicates bytes.
- -h indicates halfwords.
- -w indicates words.

The optional parameter -v *val* specifies the numeric value to write to memory. If you do not specify a value, all zeros are written. If the size of *val* does not match the data size parameter, *val* is truncated or expanded as necessary.

The *rng* parameter indicates the memory range. You can specify the range in one of two ways:

- *addr#cnt* fills addresses beginning at *addr* and continuing for *cnt* locations.
- *addr addr* fills all locations between the two given addresses.

Example:

```
>> fill -v 0xffffffff 0x80000010:0x800000ff
```

This command sets all bits to 1 at addresses 16 to 255.

2.11.8 The go Command

go [*pc*]

This command transfers control to the indicated entry-point address.

The optional *pc* parameter indicates the entry-point address you want to use.

If you do not specify an entry address, the system uses the entry point of the program module that was most recently loaded. If no program module was previously loaded, the system uses 0 as the entry-point address.

2.11.9 The help Command

help [*cmd*]

This command displays the correct syntax for the console commands.

The optional *cmd* parameter indicates the command for which you want information. If you do not specify *cmd*, the complete console menu appears.

2.11.10 The ? Command

? [*cmd*]

This command functions exactly like the help command.

2.11.11 The init Command

init

This command fully initializes the system.

The effect of the init command is identical to turning on the power or pressing the Reset button, except that the system does not execute its self-test. The memory size and Ethernet address are displayed.

2.11.12 The maint Command

maint

This command causes the console to enter Maintenance mode (>>>). This command must be used before entering Maintenance mode commands. Its companion command, **exit**, is used to return the console to Normal mode.

Example:

```
>>
>> maint
>>>
>>>exit
>>
```

2.11.13 The passwd Command

passwd [-s | -c | -u]

The four variants of this command are used to control the console security feature. Using the console security feature, you can secure the system and limit unprivileged users (users who do not know the security password) to the **boot** console command. Refer to Section 2.5 for more information.

The use of the **passwd** command with flags [-s | -c | -u] is restricted to privileged mode (>>), while the use of **passwd** without flags is restricted to unprivileged mode (s>).

passwd -s — This command is used to set a new security password. The security password can be from 8 to 32 characters long. This variant is available only in privileged mode (>>).

passwd -u — This command causes the console user to be unprivileged. The unprivileged console prompt (s>) is displayed.

passwd — This command enables the console user to enter the security password to access the privileged console prompt (>>).

passwd -c — This command removes security restrictions by clearing the security password.

2.11.14 The printenv Command

printenv [*evar*...]

This command displays the current value for the specified environment variable, or for all the environment variables.

The optional *evar* parameter indicates the variable whose value you want to see. If you do not specify a variable, the complete environment variable table is displayed. A typical display looks like this:

```
bootpath=
bootmode=*
console=0
scsiid0=7
scsiid1=7
scsiid2=7
scsiid3=7
scsiid4=7
scsiid5=7
scsiid6=7
scsiid7=7
baud=9600
systype=0x820b0a00
bitmap=0xa3ff0000
bitmaplen=0x1000
memdescriptor=0x5
osconsole=0
```

There are three types of variables: volatile (lost when power resumes), nonvolatile (maintained after power resumes), and fixed (rebuilt when power is turned on). Table 2–4 lists the default variables.

Table 2–4: Default Environment Variables

Variable	Type	Description
bootpath	Nonvolatile	Indicates the default bootpath. The system uses this variable when you type the **auto** command. An example of a bootpath definition is: rf(0,0,0)vmunix.
bootmode	Nonvolatile	Determines what programs run when the system is turned on or reset. Use one of the following codes. *a* Autoboots the operating system using the *bootpath* variable *d* Bypasses self-tests, system enters console mode (>>).
console	Fixed	The system always selects TTY(0) as the console device.
scsiid#	Fixed	The SCSI controller number. The variable may be 0–7. The default value is 7.
baud	Fixed	The baud rate of the console terminal line is determined by the Baud Rate switch inside the CPU cover panel. The factory setting is 9600. For instructions on changing the baud rate, refer to your *DECsystem 5500 Technical Information* manual. Allowed values are 300, 600, 2400, 4800, 9600, 19200, and 38400.
systype	Fixed	Identifies the processor. Bits 24–31 contain the CPU type; bits 16–23 contain the system type (6 for KN220); bits 08–15 contain the firmware revision level; and bits 00–07 contain the hardware version level.
bitmap	Fixed	Indicates the address of the memory bitmap. The bitmap keeps track of good and bad memory pages. Each bit corresponds to one page in memory; 1 indicates the page is good, and 0 indicates the page is bad. Do not change this variable.
bitmaplen	Fixed	Indicates the length of the memory bitmap. Do not change this variable.
memdescriptor	Volatile	Used to describe the memory configuration of the system. This variable is set using test 9A in Maintenance mode.
osconsole	Fixed	The system always selects TTY(0) as the console device.

2.11.15 The setenv Command

setenv *evar str*

This command assigns new values to the specified environment variable. Refer to the discussion of the **printenv** command for a description of each variable.

- The *evar* parameter indicates the variable you want to set.
- The *str* parameter indicates the value you want to specify.

Example:

```
>> setenv bootmode a
```

The command in the above example assigns a value of *a* to the *bootmode* variable. This will cause the system to autoboot at power-up.

You can also add your own environment variables. These variables are stored in volatile memory. The environment variables table can contain up to 16 variables, for a total of 256 characters.

2.11.16 The show device Command

show device

This Maintenance mode command displays a list of available devices, their unit numbers, and controller numbers. The device names are followed by the controller number and unit number in parentheses.

NOTE: *This command may require a few minutes to list devices.*

Example:

```
>> maint
>>>show device
DSSI Node 0 (R7QJNG)
 -rf(0,0,*)  (RF71)

DSSI Node 1 (TEST2)
 -rf(1,1,*)  (RF71)

DSSI Node 2 (BILLY)
 -rf(2,2,*)  (RF71)

DSSI Node 7 (*)

SCSI Node 0
 -tz(0,0,*) (.....)
```

```
SCSI Node 1
 -rz(0,1,*) (RZ56 )

SCSI Node 7 (*)

Ethernet Adapter
 -mop() -EZA0  (08-00-2B-12-81-22)

VME Interface Board - Not Installed

>>>exit
>>
```

2.11.17 The show dssi Command

show dssi

This Maintenance mode command displays a list of available DSSI storage devices. The device names are followed by the controller number and unit number in parentheses.

NOTE: *This command may require a few minutes to list devices.*

Example:

```
>> maint
>>>show dssi
DSSI Node 0 (R7QJNG)
 -rf(0,0,*)  (RF71)

DSSI Node 1 (TEST2)
 -rf(1,1,*)  (RF71)

DSSI Node 2 (BILLY)
 -rf(2,2,*)  (RF71)

DSSI Node 7 (*)

>>>exit
>>
```

2.11.18 The show ethernet Command

show ethernet

This Maintenance mode command displays the hardware address of your on-board Ethernet controller, as well as the address for any additional DESQA Ethernet controller in your system. As in the following example, the DESQA module is indicated by XQA0.

Example:

```
>> maint
>>>show ethernet
Ethernet Adapter
 -mop() -EZA0  (08-00-2B-12-81-22)

Ethernet Adapter 0 (774440)
 -XQA0 (08-00-2B-06-16-F2)
>>>exit
>>
```

2.11.19 The show scsi Command

show scsi

This Maintenance mode command displays a list of available SCSI storage devices. The device names are followed by the controller number and unit number in parentheses.

NOTE: *This command may require a few minutes to list devices.*

Example:

```
>> maint
>>>show scsi

SCSI Node 0
 -tz(0,0,*) (TLZ04)

SCSI Node 1
 -rz(0,1,*) (RZ56 )

SCSI Node 2
 -rz(0,2,*) (RRD40) -DIA2

SCSI Node 4
 -tz(0,4,*) (.....) -DIA4

SCSI Node 7 (*)

>>>exit
>>
```

A second variation of this command, **show scsi/full**, provides the following additional information for each SCSI device:

Device type
Storage capacity

Product identification
Revision number
Removable or fixed storage medium (r or f)

```
>> maint
>>>show scsi/full

Boot   Path     Dev      Cap (in Hex)     Product Id         Revs    r/f
-----------------------------------------------------------------------
-tz(0,0,*)     TAPE       4B0 MBs      TLZ04 1989(C)DEC    0304     r
-rz(0,1,*)     DISK       27A MBs      RZ56       (C) DEC  0200     f
-rz(0,2,*)     CDROM      23B MBs      RRD40      TM DEC   250E     r
-tz(0,4,*)     TAPE        5A MBs      ................    ....     r

SCSI Node 7

>>>exit
>>
```

2.11.20 The unpriv Command

unpriv

This Maintenance mode command clears the security password by setting it to zero. This command is used to unsecure the console security feature if you forget the security password. To enter Maintenance mode, set the Operation switch to Maintenance mode (indicated by a T inside a circle). Press the Restart button on the SCP. After clearing the password, you must reset the Operation switch to Normal mode (indicated by an arrow) and press the Restart button again.

2.11.21 The unsetenv Command

unsetenv *evar*

This command removes the specified variable from the environment variables table.

The *evar* parameter indicates the variable you are removing. Refer to Table 2–4 earlier in this section for a description of each variable.

The **unsetenv** command does not affect the environment variables stored in nonvolatile memory. These variables are reset at the next reset or power cycle.

2.12 Control Characters

Table 2–5 lists the key combinations that have an immediate effect in console mode.

Table 2–5: Normal-Mode Control Characters

Character	Action
Return	Also <CR>. Ends a command line. Command characters are buffered until you press Return.
DELETE	Deletes the previously typed character. If you define the console terminal as hard copy (environment variable *term* set to *hardcopy*), the deleted text is displayed surrounded by backslashes. If the console terminal is a CRT (environment variable *term* set to *crt*), each delete is displayed with the sequence <BS><SP><BS>. Deletes received are ignored when there are no characters to be deleted.
CTRL/C	Causes the console to abort the processing of a command.
CTRL/O	Causes console output to be discarded until you enter the next CTRL/O or until the next console prompt or error message is issued. CTRL/O is also canceled when you enter CTRL/C.
CTRL/Q	Resumes console output that was suspended when you entered CTRL/S.
CTRL/R	Causes the current command line to be displayed without any deleted characters.
CTRL/S	Suspends output on the console terminal until you enter CTRL/Q.
CTRL/U	Discards all characters accumulated for the current line.
CTRL/V	Suppresses any special meaning associated with the next character.

CHAPTER 3

Chapter 3
Operating the System Options

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
- Printers

3.1 Mass Storage Options

The following mass storage options are available with DECsystem 5500 pedestal systems:

- TK70 tape drive
- TLZ04 tape drive
- RF-series Integrated Storage Elements
- RZ-series Integrated Storage Elements

NOTE: *In addition, the RV20 Optical Disk Subsystem, RRD40 Digital Disk Subsystems, and TSV05 and TU81 tape drives can be attached to the DECsystem 5500 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 TK70 and TLZ04 tape drives; it also describes how to use the controls for RF-series and RZ-series ISEs. In the case of the tape drive, 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 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.

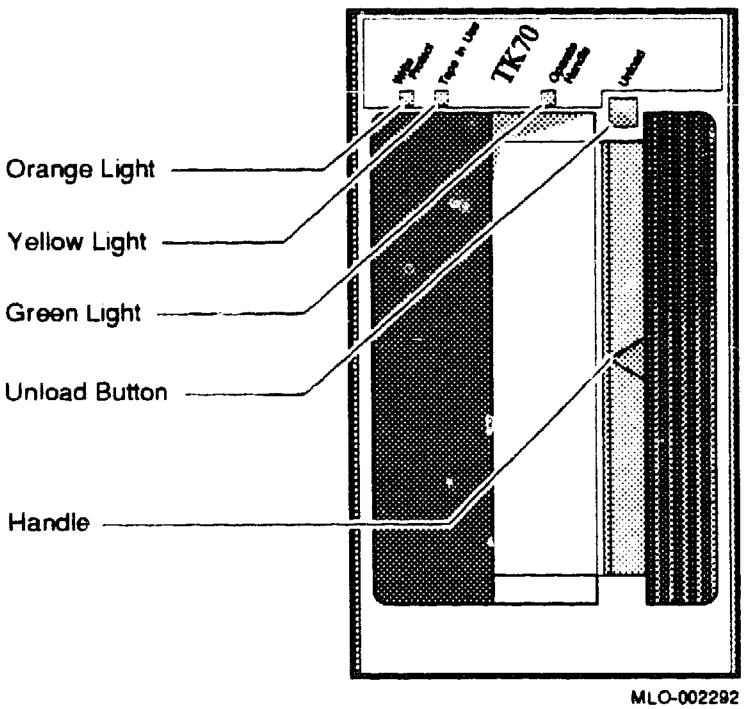
- Orange light (Write-Protected): A steady orange light indicates that the cartridge is write-protected.
- Yellow light (Tape in Use): A steady yellow light indicates that the tape is loaded. A blinking yellow light indicates that the tape is in motion.
- Green light (Operate Handle): A steady green 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 3–1 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 3–1: TK70 Tape Drive



3.1.1.1 Design of the Drive

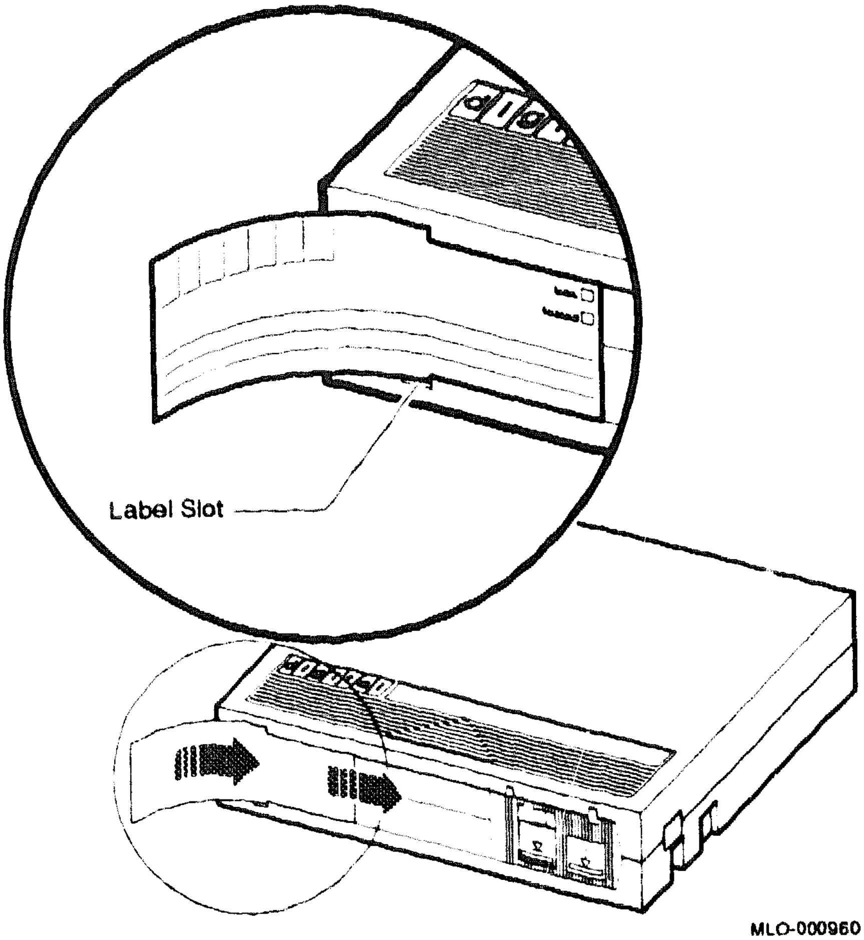
The TK70 tape drive operates like a reel-to-reel tape deck. Inside the drive is a take-up reel with a leader attached. Inside the cartridge is a single reel containing the magnetic tape. When you insert the cartridge and push in the handle, the leader in the drive automatically couples with the leader 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.

3.1.1.2 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 3–2. The label is visible when the tape is in the drive.

Figure 3–2: 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.*

3.1.1.3 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 3–3. 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.

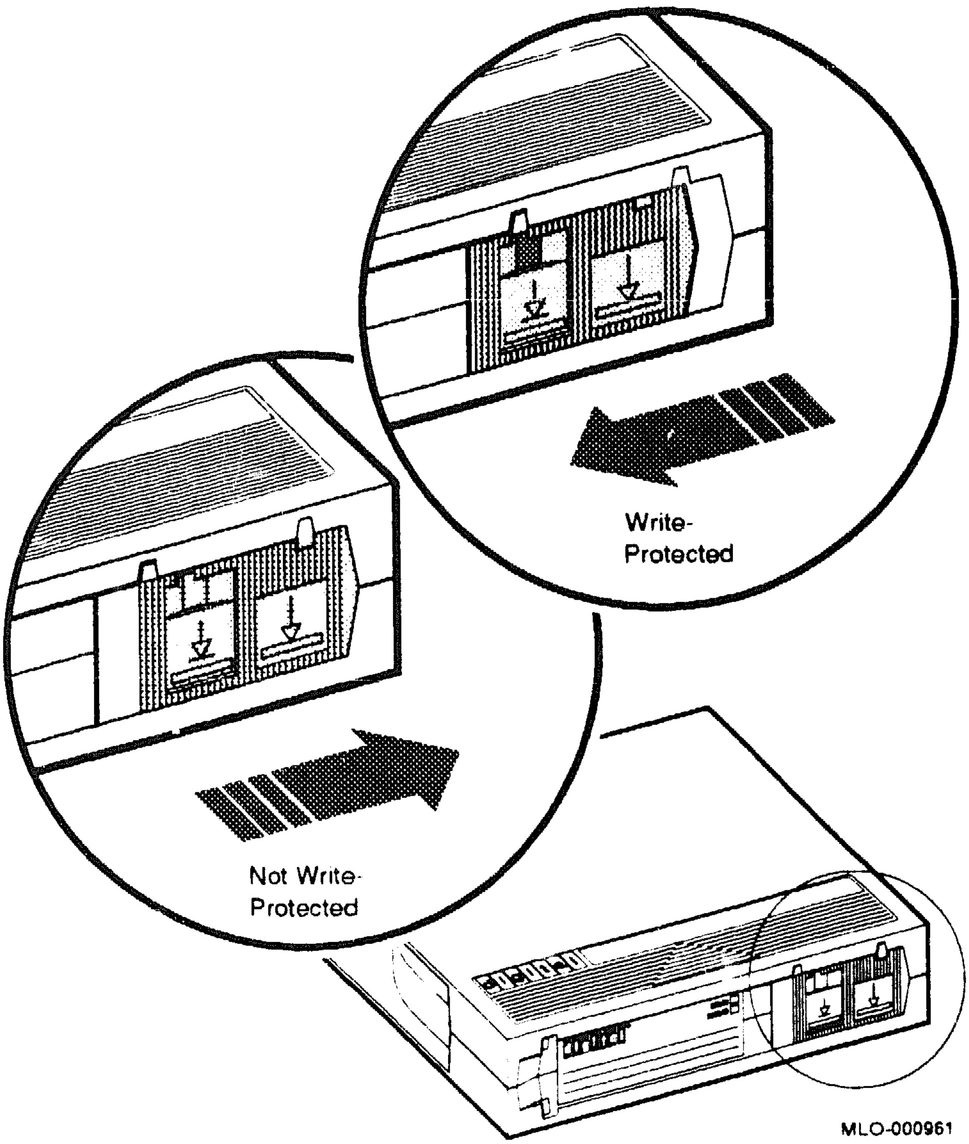
When you insert a write-protected cartridge into the drive, the orange indicator light comes on. The system recognizes the tape as being write-protected under any one of the following conditions:

- 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 3–3: 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.

3.1.1.4 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° Celsius (50° and 104° Fahrenheit).
- 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.

3.1.1.5 Inserting a Tape Cartridge

Before you use the tape drive, make sure the system is turned on (the power switch glows). During power-up, 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 3–4):

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.

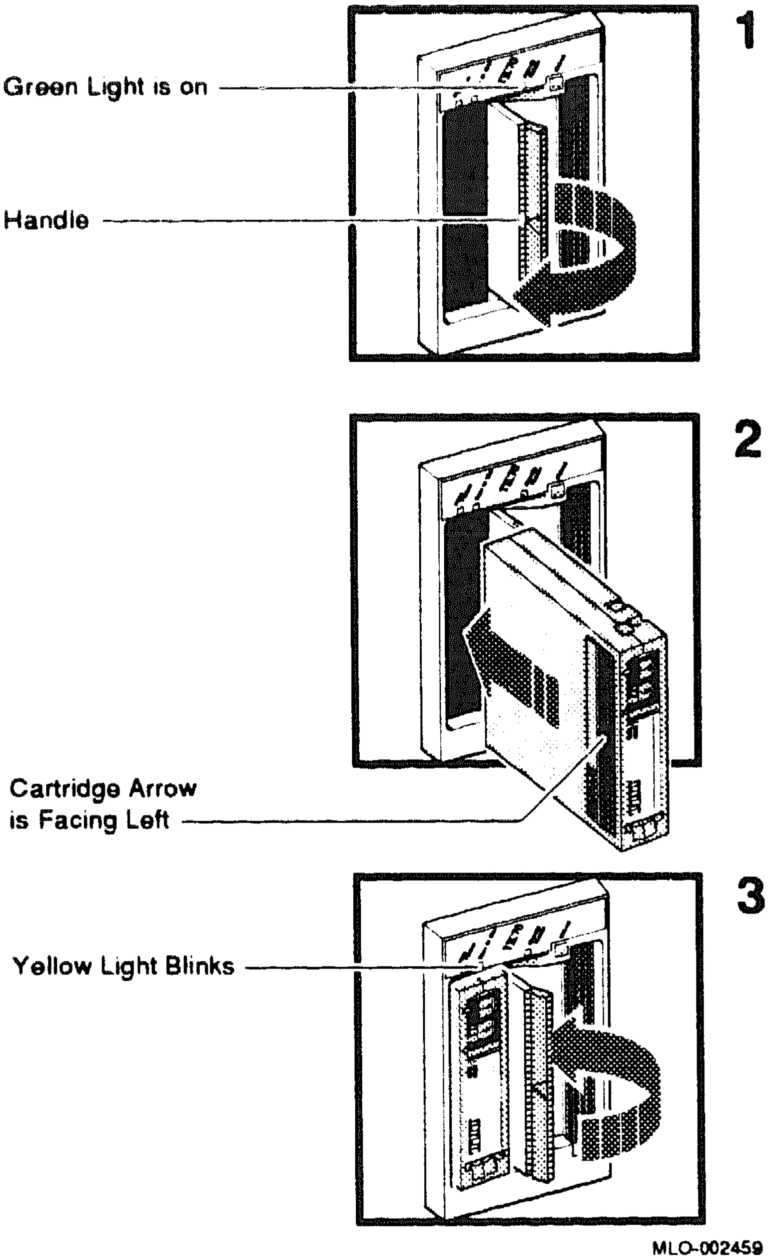
   The green light goes off and the yellow light blinks as the tape loads. When the yellow light glows steadily, the tape is ready to use.

   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 3–4: Inserting a Tape Cartridge



3.1.1.6 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 3–5):

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.*

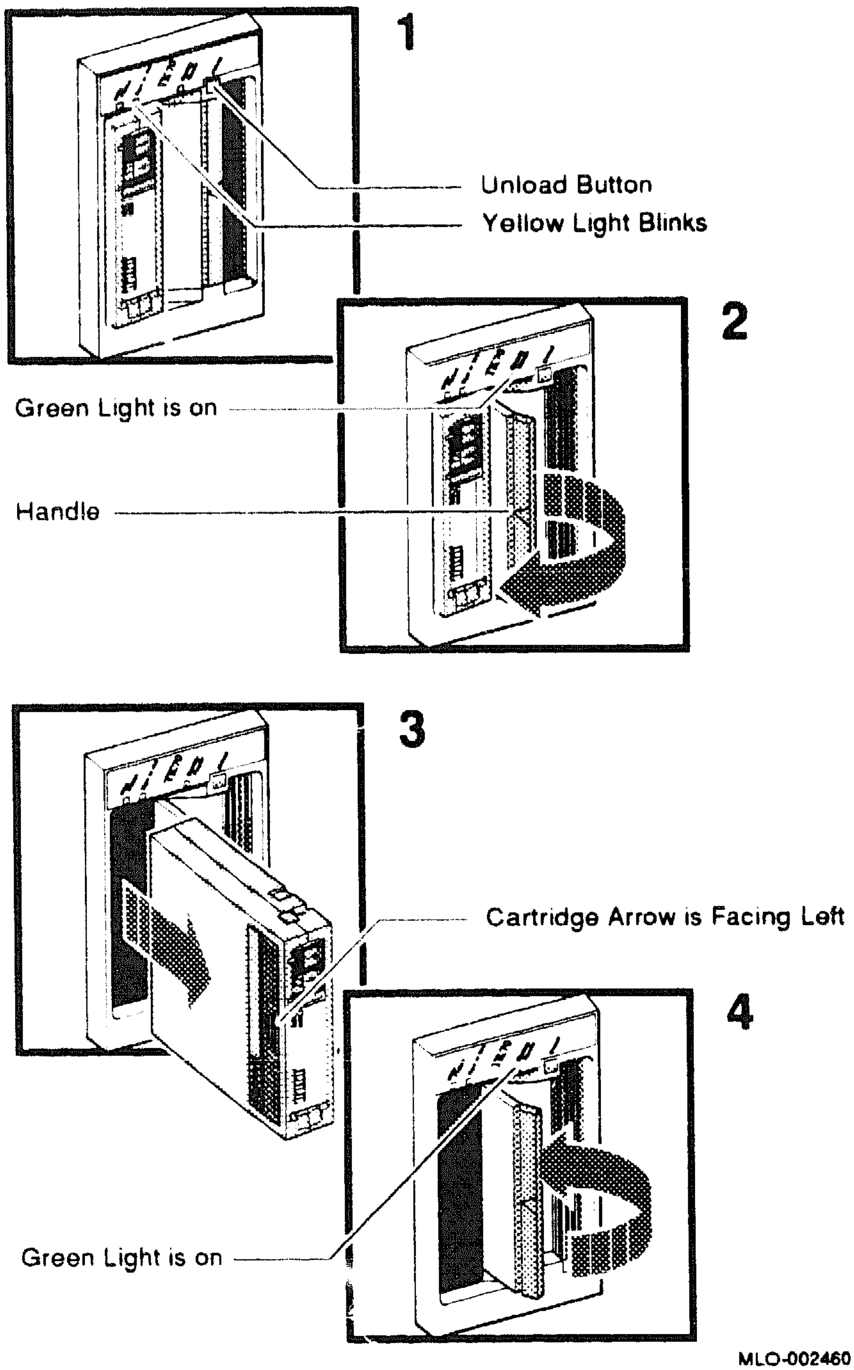
3. Remove the tape cartridge and store it in its container.

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 3–5: Removing a Tape Cartridge



3.1.1.7 Summary of TK70 Tape Drive Controls and Indicator Lights

Table 3–1 summarizes the TK70 tape drive controls. Table 3–2 describes the meaning of the indicator lights.

Table 3–1: 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 3–2: 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.

3.1.2 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 back up 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 3–6 shows the TLZ04 tape drive.

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

Figure 3–6: TLZ04 Tape Drive

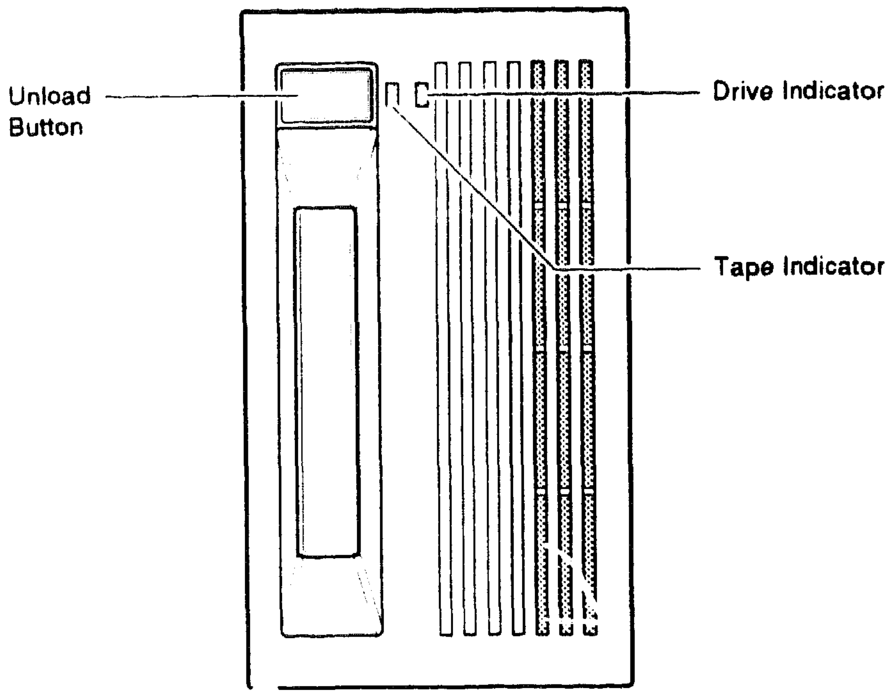


Table 3–3: TLZ04 Drive Indicators (Normal Conditions)

Indicator	Color(s)	Meaning
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 3–4: TLZ04 Drive Indicators (Abnormal Conditions)

Indicator	Color(s)	Meaning
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.

3.1.2.1 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%.

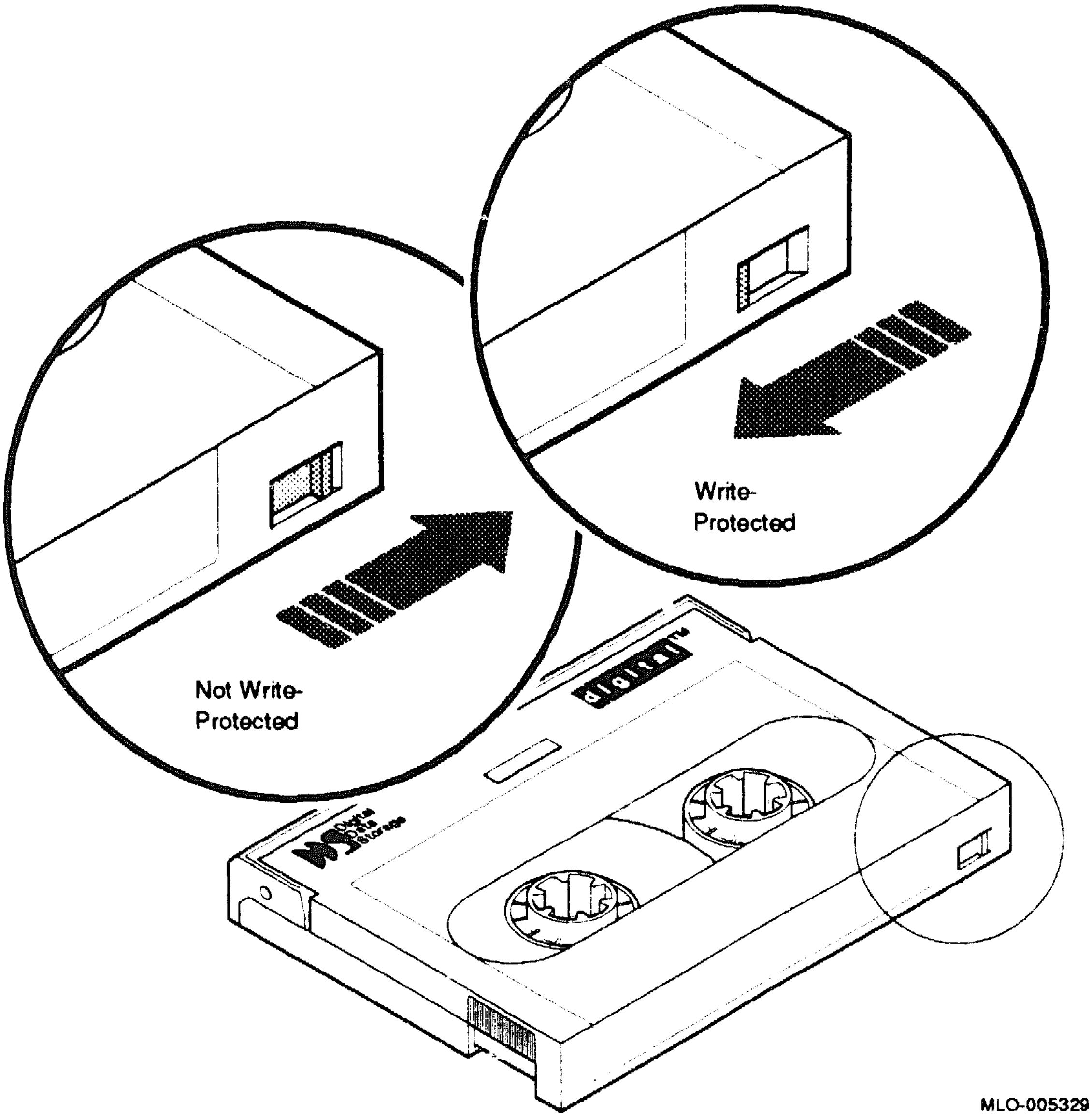
3.1.2.2 Setting the Write-Protect Tab on the Cassette Tape

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 3–7) 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.

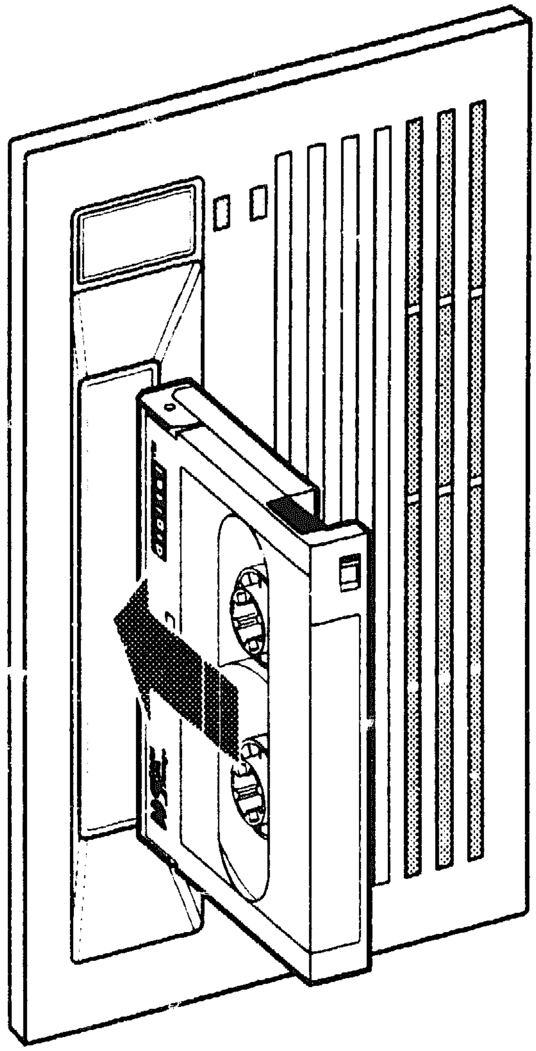
Figure 3–7: Setting the Write-Protect Tab on the Cassette Tape



3.1.2.3 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 3–8.

Figure 3–8: Inserting a Cassette Tape Into the Drive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3.1.2.4 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

3.1.2.5 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 2 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:

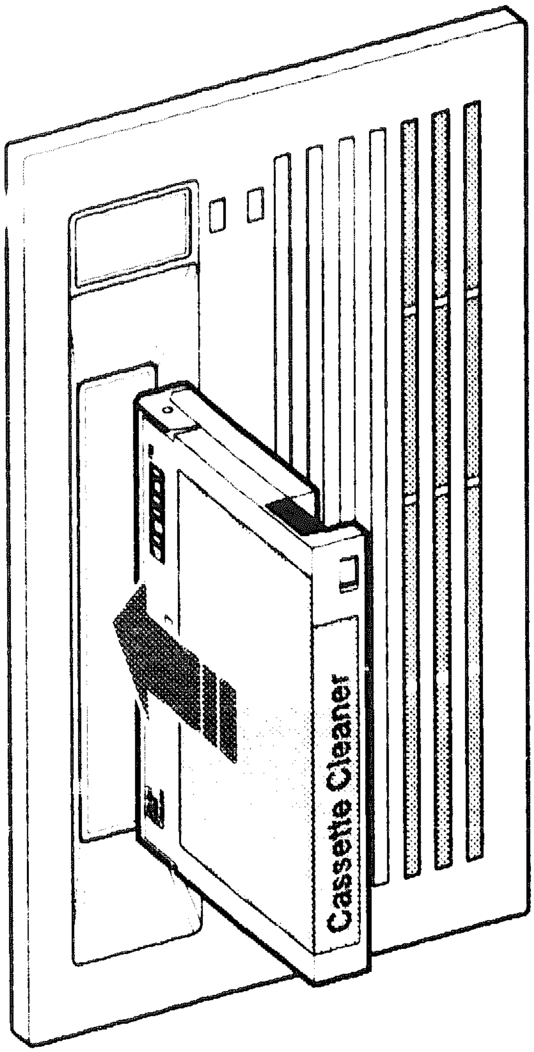
1. Observe that the drive indicator is lit solid green.
2. Insert the head cleaning cassette (part number TLZ04–HA) into the drive as shown in Figure 3–9.
3. With the head cleaning cassette inserted, the drive automatically cleans the head. The drive ejects the head cleaning cassette after approximately 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 3–9: Inserting the Head Cleaning Cassette



3.1.3 RF/RZ-Series Integrated Storage Elements

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

- ISE 0 contains the operating system and applications installed on the system.

- ISE 1 contains work areas for each user with an account on the system.

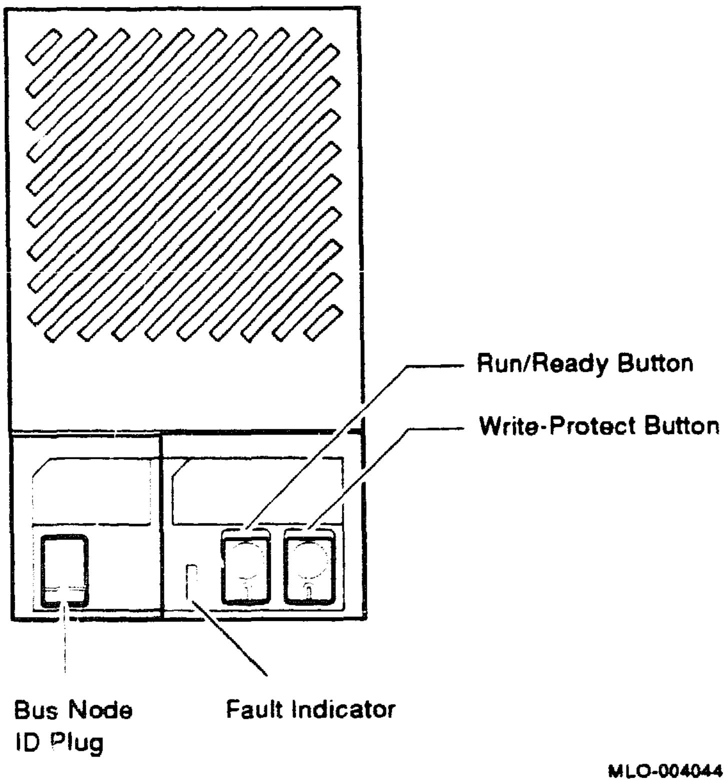
The storage capacities and other specifications for RF-series ISEs are listed in *DECsystem 5500 Technical Information*.

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

RF-Series Controls and Indicators

Each RF-series ISE has controls and indicators on its front panel. To access the ISE controls you need only open the upper door (top key position). Figure 3–10 shows the front panel of an RF-series ISE.

Figure 3–10: RF-Series ISE Controls and Indicators



Each ISE 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 ISEs 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 right-most ISE as 0, the center ISE as 1, and the left-most ISE as 2. (Tapeless systems can have up to four ISEs, with the left-most ISE as 3.)

Table 3–5 lists RF-series controls and indicators.

Table 3–5: RF-Series Controls and Indicators

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

The Write-Protect button controls whether the system can write data to the ISE. The system can read from the ISE regardless of the setting of the

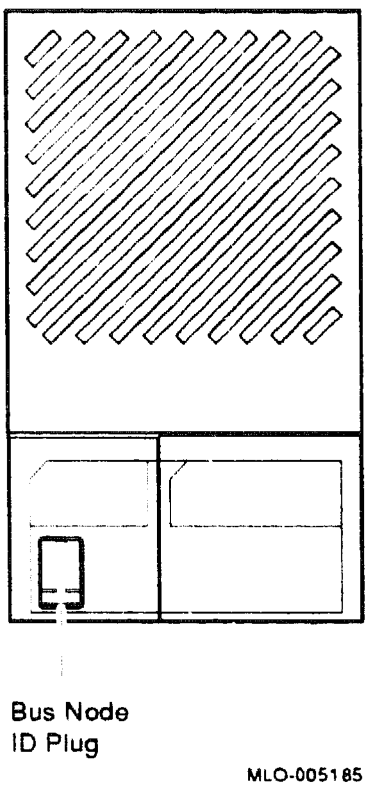
Write-Protect button. When the Write-Protect button is out (not lit), the system can write to the ISE. Your system disk (the ISE containing system software) and ISEs containing work areas for users should be write-enabled, the normal operating setting.

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

RZ-Series Front Panel

Each RZ-series ISE has a front panel that contains a bus node ID plug. To access the front panel you need only open the upper door (top key position). Figure 3–11 shows the front panel of an RZ-series ISE.

Figure 3–11: RZ-Series ISE Front Panel

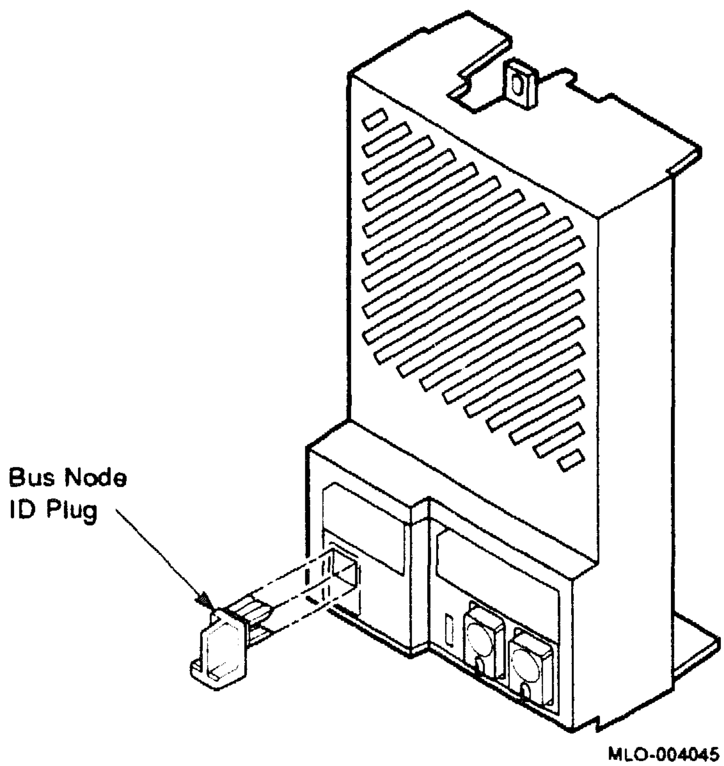


Changing the Bus Node ID Plugs

Spare bus node ID plugs are supplied with your system. The DSSI plugs for RF-series ISEs are dark gray. The part number for these plugs is 12–28766–19. The SCSI plugs for RZ-series ISEs are a lighter gray. The part number for these plugs is 12–28766–28. Use the spare plugs to renumber your ISEs if you reconfigure your system with an expander.

The bus node ID plugs have prongs on the back that indicate the bus node number (and by default, the unit number) of the ISE. 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 3–12.

Figure 3–12: Inserting Bus Node ID Plugs



Use the rules below for renumbering your storage elements:

- For each DSSI or SCSI bus, do not duplicate bus node numbers for your storage elements. You can only have one storage element on Bus 0 identified as bus node 1, one storage element as 2, and so on; you can only have one storage element on Bus 1 identified as bus node 1, one storage element as 2, and so on.
- By convention, the ISEs 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.*

3.1.4 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 guide for instructions on how to operate the device.

3.1.6 TS05 Tape Drive

If your system includes a TS05 tape drive, refer to the *TS05 Tape Transport System User's Guide* for instructions on how to operate the device.

NOTE: *The TS05 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 DECsystem 5500 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 DECsystem 5500 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

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 DSV11 dual-line synchronous controller is available for your DECsystem 5500 system:

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: *DECsystem 5500 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 use the Ethernet hardware address of other systems to operate properly.

The hardware address of your on-board Ethernet device is displayed after the self-tests complete at each power-up. If you have an additional DESQA Ethernet adapter, use the **show ether** command at the Maintenance mode console prompt to display the hardware address. As in the following example, the DESQA module is indicated by XQA0:

```
>> maint
>>>show ether
Ethernet Adapter
 -mop() -EZA0  (08-00-2B-12-81-22)

Ethernet Adapter 0 (774440)
 -XQA0 (08-00-2B-06-16-F2)
>>>exit
>>
```

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

3.3 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.

DECsystem 5500 systems have several printer options available. Consult the *DECsystem 5500 Technical Information* manual for a list of printers and printer interface requirements.

3.4 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

Appendix A
Related Documentation

Document	Order Number
Hardware Documentation	
KN220 CPU System Maintenance	EK–375AA–SM
R400X Expander Installation	EK–R400X–CM
B400X Expander Installation	EK–B400X–AD
RF30/RF71 User Guide	EK–RF71D–UG
Software Documentation	
ULTRIX Basic Installation Guide	AA–PBL0A–TE
ULTRIX Guide to System and Network Setup	QA–ME88B–TE
ULTRIX Reader's Guide	AA–ME82B–TE
ULTRIX Guide to Prestoserve for RISC	TBD

Documentation specific to supported options is listed with the option in *DECsystem 5500 Technical Information*.

GLOSSARY

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 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 ISE(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 the operating system or data on the ISE 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.

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.

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.

Data transmission

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

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-up 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 Element

Integrated Storage Elements 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.

ISE

See *Integrated Storage Element*.

Kbyte

1024 bytes.

LED

Light-emitting diode. An LED on the console module displays a hexadecimal countdown during the power-up 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-up 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 License Management Facility to authorize the 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.

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

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 ISE that holds the system software.

System management

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

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).

TFTP

Trivial File Transfer Protocol.

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.

INDEX

Index

A

B

C

N

O

P

R

S

TROUBLESHOOTING AND DIAGNOSTICS

DECsystem 5500
Troubleshooting and Diagnostics

Order Number EK–425AA–TS–001

Digital Equipment Corporation
Maynard, Massachusetts

First Printing, August 1990

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

FCC NOTICE: The equipment described in this manual generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense may be required to take measures to correct the interference.

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Contents

Chapter 3 Running the MicroVAX Diagnostic Monitor (MDM)

Appendix A System Controls and Indicators

Index

Figures

Preface

Troubleshooting is the process of isolating and diagnosing problems with a system. When your system does not operate as described in the *Operation* manual, use the information in this manual to isolate and diagnose the problem.

This manual contains three chapters and one appendix:

- Chapter 1 describes problems you may experience at power-up and corrective actions for those problems.
- Chapter 2 describes problems you may experience during normal operation and corrective actions for those problems.
- Chapter 3 describes the MicroVAX Diagnostic Monitor (MDM), a diagnostic tool you can use to test your system periodically or to isolate a particular problem.
- Appendix A contains diagrams showing the location of system controls and indicators.

The troubleshooting techniques described in this manual do not identify all possible problems with your system, nor do the actions suggested remedy all problems. If a problem is not described in this manual or if the actions suggested do not solve the problem, call your Digital service representative.

NOTE: *You will find a glossary in the Operation manual to help with word definitions and acronyms.*

Conventions

The following conventions are used in this manual.

Convention	Meaning
Key	A terminal key used in text and examples. For example, Break indicates that you press the Break key on your terminal keyboard.
Ctrl/x	Hold down the Ctrl key while you press another (x) key.
[ ]	Arguments enclosed in square brackets are optional.
Italic type	Italic type indicates an argument for which you must supply a value, environment variables, and references to other documents.
bold	This bold lowercase type indicates a command name. For example: The **setenv** command is described in the next section.
bold user input	This bold upper or lowercase type indicates user input. For example: Type **maint** at the console prompt. or >>> **show device**
NOTE	Provides information about the current topic.
CAUTION	Provides information to prevent damage to equipment or software.
WARNING	Provides information to prevent personal injury.

CHAPTER 1

Chapter 1
Troubleshooting During Power-Up

After you turn on your system, the CPU enters the console mode or performs a series of self-tests and startup routines.

1.1 Booting the System

The system enters the console mode without performing any self-tests, or the system performs the self-tests and attempts to autoboot, depending on the value of the bootmode environment variable.

- If that variable is not initialized (as shipped from the factory) or is set to a value of *d*, the system enters the console mode.
- If that variable is set to a value of *a*, the system attempts to autoboot from a device defined as the boot device.

If the system enters the console mode, you can use the **boot** [-f *file*] [-s | -m] [-n] [*arg*...] command to boot the system manually.

1.2 Troubleshooting Power-Up Problems

If you do not observe the correct power-up and boot sequence responses, refer to the descriptions of problems and corrective actions in the appropriate table in this chapter. If you do not find the problem or if the actions listed do not solve the problem, call your Digital service representative.

Diagrams in Appendix A will help you find the controls and indicators mentioned in the tables.

1.2.1 Problems During Self-Tests

Problem	Possible Cause	Corrective Action
No response when power switch is turned on (AC Present indicator is not lit).	System is not plugged in.	Set the power switch to 0. Plug in the system. Set the power switch to 1.

Problem	Possible Cause	Corrective Action
	No power at wall outlet.	Use a different wall outlet, or check the circuit breaker controlling power to the wall outlet.
	Circuit breaker (power switch) tripped (is in position 0).	Set the power switch to 1. If it trips again, call your Digital service representative.
	Power cable is incorrectly installed.	Set the power switch to 0. Check that the cable is fully seated in the socket. Set the power switch to 1.
System loses power but AC Present indicator is lit and DC OK indicator is not lit.	Power supply or module failure.	Call your Digital service representative.
System has power (AC Present indicator is lit) but nothing displays on console terminal.	Console terminal is turned off.	Turn on the console terminal.
	Console terminal is off line.	Put the terminal on line. Refer to your terminal documentation for instructions.
	Console terminal cable is incorrectly installed.	Make sure the cable is installed properly at both ends.
	Console terminal set-up not done correctly.	Reread the appropriate section in your *Installation* manual.
	Baud rate setting of system and terminal do not match.	Set the terminal baud rate to match the system baud rate. The normal operating setting is 9600.
	Operation switch on CPU cover panel is set to Action and Function switch is set to up position (dot inside circle).	Set the Operation switch to Normal, indicated by an arrow, or set the Function switch to the down position (dot outside circle).
	Terminal is faulty.	Turn off the terminal and turn it on again to see if it passes its self-tests. If it fails the self-tests, call your Digital service representative.
System has power (AC Present and DC OK indicators are lit) but nothing appears on console terminal.	Problem with CPU.	Call your Digital service representative.

Problem	Possible Cause	Corrective Action
System has power (DC OK indicator is lit) but nothing appears on console terminal and LED on CPU cover panel displays E or F.	Problem with CPU.	Call your Digital service representative.
Self-tests halt and error message or error summary appears on console terminal.	stem detected error while running its self-tests.	Copy the number following the question mark in the error message or summary and call your Digital service representative.
Language Selection menu does not appear.	Baud rate on console terminal is different from baud rate on system.	Check that the baud rate on the console terminal is set to 9600. The system is set to 9600 at the factory.
	Terminal does not support multinational character set (MCS).	Use a terminal that supports MCS.

1.2.2 Problems During Boot Sequence

Problem	Possible Cause	Corrective Action
System returns to boot prompt after 4 minutes.	Sanity timer is enabled on DELQA module.	Disable the sanity timer. Refer to the *DELQA–SA Option Installation Guide*.
Instead of autobooting, >> is displayed on console terminal.	Bootmode environment variable is not set to *a*, and system is in console mode.	To autoboot, set the bootmode environment variable to *a*, using the **setenv** command as described in your system *Operation* manual. Reset the system by pressing the Restart button. If you prefer to boot manually from console mode, use the **boot** [-f *file*] [-s | -m] [-n] [*arg*...] command. See your system *Operation* manual for information on the **boot** command.
Instead of autobooting, >>> is displayed on console terminal.	Operation switch is not set to Normal.	Move the Operation switch to Normal (indicated by an arrow) and press the Restart button on the system control panel.
Instead of autobooting, self-tests complete and message `no device and $path not set:` displays.	Bootpath environment variable is not assigned.	Use the **setenv** command to assign a boot device to the bootpath environment variable. Refer to your system *Operation* manual for information on console commands.

Problem	Possible Cause	Corrective Action
Message `filename is not a known device` displays on console terminal.	No bootable media was found. Boot device was not properly specified.	Check to see if you are using the proper device name. The known devices are listed when you receive this error.
Message `bad bootblock` displays.	System cannot load system software from boot device.	See actions listed in subsequent sections for the boot device you are using.

1.2.3 Problems Booting from an RA60 Removable-Disk Drive

Problem	Possible Cause	Corrective Action
Message `bad bootblock couldn't load ra(n,n,n)vmunix` appears.	System cannot load system software from disk.	The system disk is write protected (Write-Protect button is in, lit). Push in and release the Write-Protect button to the out position. Make sure you know which Write-Protect button corresponds to the disk containing system software.
	Disk is not spun-up. Run/Stop button on disk drive control panel not set to in position.	Set the Run/Stop button to the in position. Press the Restart button.
	Drive door is unlocked.	Close the drive door and make sure the Lock Release button is out.
	Disk drive circuit breaker tripped.	Press the Run/Stop button on the disk drive control panel to the out position. Reset the circuit breaker on the disk drive by pushing it down, then up again. Press the Run/Stop button to the in position. Press the Restart button.
	Problem exists with controller or fixed disk.	Run MDM as described in Chapter 3.
	Disk drive is off line. Neither A nor B button on disk drive control panel is set to in position.	Set the appropriate port button, A or B or both, on the disk drive control panel to the in position. Press the Restart button.
	System disk contains no bootable system software.	Install system software.

Problem	Possible Cause	Corrective Action
Fault indicator is lit. Message `bad bootblock couldn't load ra(n,n,n)vmunix` appears.	Problem exists with controller or fixed disk.	Press the Fault button twice. RA60 lights and indicators may begin to flash. If they do not flash or stop flashing, your system may have corrected itself. Run MDM as described in Chapter 3. If the lights and indicators continue to flash, there is a problem with the controller or fixed disk. Call your Digital service representative.

1.2.4 Problems Booting from an RA70 Fixed-Disk Drive

Problem	Possible Cause	Corrective Action
Message `bad bootblock couldn't load ra(n,n,n)vmunix` appears.	System disk is write protected. Write-Protect button is in (lit).	Push in and release the Write-Protect button to the out (unlit) position. Make sure you know which Write-Protect button corresponds to the disk containing system software.
	System disk contains no bootable system software.	Install system software.
	RA70 is off line. Neither A nor B button on disk drive control panel is set to in position.	Set the appropriate port button, A or B or both, on the disk drive control panel to the in position. Press the Restart button.
	RA70 did not finish self-tests.	Wait until the Ready indicator comes on and then press the Restart button.
	System disk contains no bootable system software.	Install system software.
Fault indicator is lit. Message `bad bootblock couldn't load ra(n,n,n)vmunix` appears.	Problem exists with controller or fixed disk.	Press the Fault button twice. RA70 lights and indicators may begin to flash. If they do not flash or stop flashing, your system may have corrected itself. Run MDM as described in Chapter 3. If the lights and indicators continue to flash, there is a problem with the controller or fixed disk. Call your Digital service representative.

1.2.5 Problems Booting from an RA80-Series Fixed-Disk Drive

Problem	Possible Cause	Corrective Action
Message `bad bootblock couldn't load ra(n,n,n)vmunix` appears.	System disk is write protected. Write-Protect button is in (lit).	Push in and release the Write-Protect button to the out (unlit) position. Make sure you know which Write-Protect button corresponds to the disk containing system software.
	Disk is not spun up. Run/Stop button on disk drive control panel not set to in position.	Set the Run/Stop button on the disk drive control panel to the in position. Press the Restart button.
	Disk drive circuit breaker tripped.	Press the Run/Stop button on the disk drive control panel to the out position. Reset the circuit breaker on the disk drive by pushing it down, then up again. Press the Run/Stop button to the in position. Press the Restart button.
	Problem exists with controller or fixed disk.	Run MDM as described in Chapter 3.
	RA80 is off line. Neither A nor B button on disk drive control panel is set to in position.	Set the appropriate port button, A or B or both, on the disk drive control panel to the in position. Press the Restart button.
	System disk contains no bootable system software.	Install system software.
Fault indicator is lit. Message `bad bootblock couldn't load ra(n,n,n)vmunix` appears.	Problem exists with controller or fixed disk.	Press the Fault button twice. RA80 lights and indicators may begin to flash. If they do not flash or stop flashing, your system may have corrected itself. Run MDM as described in Chapter 3. If the lights and indicators continue to flash, there is a problem with the controller or fixed disk. Call your Digital service representative.

1.2.6 Problems Booting from an RA90-Series Fixed-Disk Drive

Problems with RA90-series drives are indicated by the Fault indicator on the front panel of the drive. If that indicator lights or if no front panel activity occurs at power-up, select the Fault switch on the drive's front panel. When you select that switch, a fault code should appear on the control panel.

Problem	Possible Cause	Corrective Action
0F displays when you select Fault switch.	Drive is write protected.	Disable the write protection by deselecting the Write-Protect switch at the RA90 control panel or turn off the software write protection.
22 or 2D displays when you select Fault switch.	Drive is overheated.	Spin down and remove power from the drive. Ensure the front filter is clean and that room temperature is within recommended limits. Call your Digital service representative if the filter or temperature did not cause the overheating.
6F displays when you select Fault switch.	A write-protect error.	Disable the write protection by deselecting the Write-Protect switch at the RA90 control panel or turn off the software write protection.
Fault code other than those described above displays when you select Fault switch.	–	Call your Digital service representative.

1.2.7 Problems Booting from an RF-Series Integrated Storage Element (ISE)

Problem	Possible Cause	Corrective Action
Operating system error messages display on console terminal.	System disk is write protected. Write-Protect button is in (glows orange).	Push in and release the Write-Protect button to the out (unlit) position. Make sure you know which Write-Protect button corresponds to the system disk.
Message `bad bootblock couldn't load rf(n,n,n)vmunix` appears.	System disk contains no bootable system software.	Install system software.
	System disk is off line. Ready button is in.	Press the appropriate Ready button (0, 1, or 2) to the out position. Press the Restart button.

Problem	Possible Cause	Corrective Action
Fault indicator is lit or begins to flash.	Problem with controller or ISE.	If the Fault indicator stops flashing, your system may have corrected itself. Run MDM as described in Chapter 3. If the Fault indicator remains lit, call your Digital service representative.

1.2.8 Problems Booting from an RZ-Series Integrated Storage Element (ISE)

Problem	Possible Cause	Corrective Action
Operating system error messages display on console terminal.	System disk is write protected.	Issue the appropriate command to write enable that disk.
Message `bad bootblock couldn't load rz(n,n,n)vmunix` appears.	System disk contains no bootable system software.	Install system software.
	System disk is off line.	Get into the maintenance mode (>>>) and enter the **show scsi** command. If device information does not appear, make sure the bus node ID plug, SCSI cable, and SCSI terminator are plugged in. If using an external drive, also make sure the drive's power cable is plugged in and the SCSI bus is terminated.
	Problem with controller or ISE.	Run MDM as described in Chapter 3 and call your Digital service representative.

1.2.9 Problems Booting from a Tape Drive

Problem	Possible Cause	Corrective Action
Message `couldn't load tm (5,0)` displays.	No tape in tape drive.	Insert a cartridge or cassette containing system software in the tape drive.
	Tape is not bootable (does not contain bootstrap program).	Use a tape containing a bootstrap program to start the system software.

Problem	Possible Cause	Corrective Action
	Tape is worn or damaged.	Try another tape cartridge or cassette.
	Problem with controller or tape drive.	Call your Digital representative.
	TLZ04 tape head is dirty	Perform the TLZ04 head cleaning procedure.

CHAPTER 2

Chapter 2

Troubleshooting During Normal Operation

Problems that occur during normal operation of your system may result from a fault in the system, from faulty settings, or from incorrect procedures.

This chapter lists problems, possible causes, and corrective actions. If the problem is not listed in this chapter or if the actions listed do not solve the problem, call your Digital service representative.

Diagrams in Appendix A will help you find the controls and indicators mentioned in the tables.

2.1 System Problems

Problem	Possible Cause	Corrective Action
System halts unexpectedly. Console mode prompt appears.	Break key on console terminal pressed inadvertently.	Enter **continue** and press Return. To prevent recurrences, set the Function switch on the CPU cover panel to down (dot outside the circle) to disable the break function and then press the Restart button to reset the system.
System has power (DC OK indicator is lit) but nothing appears on console terminal. LED on CPU cover panel displays E or F.	Problem with CPU.	Call your Digital service representative.
System loses power. AC Present indicator is not lit.	System is not plugged in.	Set the power switch to 0. Plug in the system. Set the power switch to 1.
	No power at wall outlet.	Use a different wall outlet or check the circuit breaker controlling power to the wall outlet.

Problem	Possible Cause	Corrective Action
	Power switch tripped.	Set the power switch to 1. If it trips again, call your Digital service representative.
	Power cable is incorrectly installed.	Set the power switch to 0. Make sure the cable is fully seated in the socket. Set the power switch to 1.
System loses power. DC OK indicator is not lit.	Power supply failed.	Turn off your system and call your Digital service representative.
System loses power. Power switch is off (position 0).	Power switch, which acts as system circuit breaker, tripped.	To reset the circuit breaker, set the power switch to off (position 0). Wait 1 minute. Set the switch to on (position 1). If switch trips again, call your Digital service representative.
Over Temperature indicator is lit. System loses power.	System shut itself down to prevent overheating.	Make sure vents are clear, system is not near a heat source, and room temperature is within the guidelines in your *Site Preparation* manual. Set the power switch to off. Wait 5 minutes, then set switch on. If switch trips off again, call your Digital service representative.
System loses power. Fan Failure indicator is lit.	The fan(s) failed.	Call your Digital service representative.
System halts unexpectedly. Console mode prompt appears.	Break key or Ctrl/P keys on console terminal pressed inadvertently, or console terminal was momentarily turned off or disconnected.	Enter **continue** and press Return. To prevent recurrences, set the Function switch on the CPU cover panel to down (dot outside circle) and press the Restart button to restart the system. Pressing the Restart button causes the system to reboot.
System reboots.	Restart button pressed inadvertently.	Let rebooting run to completion. To prevent recurrences, you can disable the Restart button. Call your Digital service representative to perform that service.

2.2 RA60/70/81/82 Disk Drive Problems

Problem	Possible Cause	Corrective Action
RA70 Drives: Fixed-disk write error message appears.	Disk is write protected (Write-Protect button glows orange.)	Press and release Write-Protect button (not lit).
Fault indicator is lit.	Problem with controller or disk drive.	Run MDM as described in Chapter 3. Call your Digital service representative.
RA60/80-series Drives: Fault indicator is lit.	Problem with controller or disk drive.	Press the Fault button twice. Device lights and indicators may begin to flash. If they do not flash or stop flashing, your system may have corrected itself. Run MDM as described in Chapter 3. If the lights and indicators continue to flash, there is a problem with the controller or disk drive. Call your Digital service representative.
Fixed-disk read error message displays.	Disk is not spun up because Run/Stop button is out (not lit).	Press the Run/Stop button to the in position (glows yellow) to spin up the drive. When the Ready indicator comes on, the drive is available for use.

2.3 RA90-Series Disk Drive Problems

Problems with RA90-series drives are indicated by the Fault indicator on the front panel of the drive. If that indicator lights, select the Fault switch on the drive's front panel. When you select that switch, a fault code should appear on the control panel.

Problem	Possible Cause	Corrective Action
0F displays when you select Fault switch.	Drive is write protected.	Disable the write protection by deselecting the Write-Protect switch at the RA90 control panel or turn off the software write protection.
22 or 2D displays when you select Fault switch.	Drive is overheated.	Spin down and remove power from the drive. Ensure the front filter is clean and that room temperature is within recommended limits. Call your Digital service representative if the filter or temperature did not cause the overheating.

Problem	Possible Cause	Corrective Action
6F displays when you select Fault switch.	A write-protect error.	Disable the write protection by deselecting the Write-Protect switch at the RA90 control panel or turn off the software write protection.
Fault code other than those described above displays when you select Fault switch.	–	Call your Digital service representative.

2.4 RF-Series Integrated Storage Element (ISE) Problems

Problem	Possible Cause	Corrective Action
Write-error message displays.	ISE is write protected (Write-Protect button glows orange.)	Press and release the Write-Protect button (not lit).
Fault indicator is lit or begins to flash.	Problem with controller or ISE.	If the Fault indicator stops flashing, the system may have corrected itself. Run MDM as described in Chapter 3. If the Fault indicator remains lit, call your Digital service representative.
Read-error message displays.	ISE is not spun up because the Ready button is out.	Press the Ready button to the in position. When the green light comes on, the ISE is available for use.

2.5 RZ-Series Integrated Storage Element (ISE) Problems

Problem	Possible Cause	Corrective Action
Write-error message appears.	Disk is write protected.	Issue the appropriate command to write enable the disk.

Problem	Possible Cause	Corrective Action
Read-error message appears.	Disk is off line.	Get into the maintenance mode (>>>) and enter the **show scsi** command. If device information does not appear, make sure the bus node ID plug, SCSI cable, and SCSI terminator are plugged in. If using an external drive, also make sure the drive's power cable is plugged in and the SCSI bus is terminated.
	Problem with controller or ISE.	Run MDM as described in Chapter 3 and call your Digital service representative.

2.6 TK70 Tape Drive Problems

Problem	Possible Cause	Corrective Action
Green light blinks rapidly after you insert tape.	Tape cartridge leader is defective.	Pull the handle open and remove the cartridge. Use another cartridge.
Orange, yellow and green lights blink in unison.	Problem with drive.	Press the Unload button once. If the orange and green lights go out and the yellow light blinks, the cartridge is unloading. When the green light comes on and you hear a beep, remove the tape cartridge. If all three lights continue to blink after you press the Unload button, the fault is not cleared. Do not try to remove the cartridge. Call your Digital service representative.
Handle does not move.	Power-up test in progress.	If you are inserting a cartridge, wait for the orange and yellow lights to go off and the green light to remain on steadily. Then try again.
	Tape drive is active.	Do not move the handle while the yellow light is on.
Handle does not lock.	Cartridge is not inserted properly.	Reinsert the tape cartridge. If the problem persists, call your Digital service representative.
Cartridge does not unload.	Unload button is not working properly.	Try unloading the cartridge with a software command. Refer to your system software manuals.

Problem	Possible Cause	Corrective Action
TK70 passes power-up self-test but does not work.	Controller may be bad or connection between drive and controller may be loose.	Call your Digital service representative.

2.7 TLZ04 Tape Drive Problems

Problem	Possible Cause	Corrective Action
Unable to copy to tape. Tape indicator is yellow.	Cassette is write protected.	Set Write-Protect tab on cassette to write enable.
Unable to copy to tape. Drive indicator is green.	No cassette in drive.	Insert cassette in drive.
Unable to copy to or from tape. Tape and drive indicators are not lit.	If using external drive, bad fuse or power cable not plugged in.	Check the drive fuse and power cable.
	Problem with controller or tape drive.	Run MDM as described in Chapter 3 and call your Digital service representative.
Unable to copy to or from tape. Tape and drive indicators are green.	Tape drive is off line.	Get into the maintenance mode (>>>) and enter the **show scsi** command. If device information does not appear, make sure the SCSI cable and SCSI terminator are plugged in. If using an external drive, make sure the SCSI ID switches are set correctly and the SCSI bus is terminated.
	Problem with controller or tape drive.	Run MDM as described in Chapter 3 and call your Digital service representative.
Excessive tape errors. Tape indicator is blinking green or yellow.	Dirty read/write heads or worn tape.	Use the head cleaning cassette. If problem persists, try another cassette.
Tape and drive indicators are yellow.	Excessive humidity.	Adjust climate of room.

2.8 TU81–Plus Tape Drive Problems

Problem	Possible Cause	Corrective Action
Drive does not power up.	Circuit breaker tripped.	Set the power switch to 0. Reset the circuit breaker. Set the power switch to 1. If the circuit breaker trips again, call your Digital service representative.
	Switch on power controller is set to B.	Set the switch to A.
	No power at wall outlet.	Use a different wall outlet or check the circuit breaker controlling power to the wall outlet.
	System is unplugged.	Set the power switch to 0. Plug in the system. Set the power switch to 1.

CHAPTER 3

Chapter 3
Running the MicroVAX Diagnostic Monitor (MDM)

The MicroVAX Diagnostic Monitor (MDM) is a software package containing diagnostic tests that:

- Isolate and identify faults in your system
- Let you display your system configuration
- Test how devices work together

The diagnostic tests are packaged with your system on a CDROM disk or on a tape cartridge labeled MV DIAG CUST TK50. MDM operating instructions begin in Section 3.2.

CAUTION: *If your system is connected to a cluster, notify your cluster manager before halting the system to load MDM.*

You generally run MDM in four situations:

- Before you install system software on a new system
- After you add a device to your system
- After you receive an error message or experience a problem with your system
- When you want to test your system periodically to ensure that all components are operating correctly

How the MDM Tests Work

MDM tests individual devices in your system, but it performs limited diagnostics:

- MDM performs reads from each drive and checks each controller. It does not write to the drives as writing to them could destroy data.

  NOTE: *MDM will test a tape drive only when the tape is inserted in the drive.*

- MDM checks only devices and not the connections or lines between the devices and the system.
- MDM does not check each device as thoroughly as the service diagnostic tests described below.

If the devices pass the tests but you still experience problems, contact a Digital service representative for more testing.

If you require more complete diagnostic testing you should purchase the MicroVAX Maintenance Kit. That kit includes a system maintenance guide and service diagnostic tests. The MDM version you received with your system is a subset of the service version.

NOTE: *Only qualified service personnel should use the service diagnostic tests. Data on disks can be destroyed by those tests.*

If your system is part of a local area network (LAN), you may want to reduce the time required to load MDM on each system by obtaining the MicroVAX Ethernet Server Customer Diagnostics Kit. That kit lets you install MDM software on your operating system and downline load MDM to other systems that are part of the LAN, using the DECnet/Ethernet network facilities. When MDM is downline loaded to target systems from a host system, the time required to load MDM is reduced significantly.

3.1 Preparing to Run MDM on a Diskless or Tapeless System

If you have a diskless or tapeless system that is part of a local area network (LAN), obtain the MicroVAX Ethernet Server Customer Diagnostics Kit. You must run MDM using the diagnostics in the kit that is labeled MV DIAG ENET CUST or MV DIAG ULTRIX ENET CUST.

NOTE: *If your diskless or tapeless system is not part of a local area network (LAN), you cannot run MDM. To diagnose problems, call your Digital service representative.*

Go to the *MicroVAX Diagnostic Monitor Ethernet Server User's Guide* at this time. Once you install and downline load MDM software, return to this manual for specific instructions on running MDM.

3.2 Starting MDM

Unless instructed to do so, do not change any settings or manipulate devices while the tests are running. The diagnostic software interprets any change of state as an error.

3.2.1 CDROM Instructions

Refer to the booklet that is packaged with the CDROM disk.

3.2.2 TK50 Tape Instructions

Before you run MDM, be sure you understand the instructions in your *Operation* manual for using the TK70 tape drive.

The diagnostics run the same way whether or not system software is loaded. You should manually boot the diagnostic software as described below. Follow the directions carefully for setting switches.

CAUTION: *Before booting MDM on a system with software installed and running, warn all users to log off and then perform system shutdown as described in your system software manuals.*

1. Make sure the Write-Protect switch on the tape cartridge is in the write-protect position.
2. Write protect all disk drives and ISEs.
3. Enable the Break key by moving the Function switch to enable (up, dot inside the circle).
4. Select the Maintenance mode by moving the Operation switch on the CPU cover panel to maintenance (down, T inside a circle).
5. Turn on the system if it is off. If the system is on, press the Restart button

   While you are inserting the tape cartridge in the next step, the normal power-up countdown should appear on your console terminal. After the countdown, you should see the Maintenance mode prompt (>>>).
6. When the green light on the tape drive glows steadily (orange and yellow lights go out), insert the tape cartridge containing the MDM software in the tape drive and lock it in place.
7. Tell your system to load the MDM software from the tape cartridge by using the command **boot mu*x*0** where *x* indicates the controller.

Loading the software takes several minutes. A yellow light on the tape drive flashes while loading occurs. Section 3.2.3 describes the display you see when loading is completed.

8. After loading is completed, place all ISEs on line. If the ISEs are not on line, they cannot be tested completely.

3.2.3 MDM Introductory Display

After MDM software is loaded, the MDM introductory display appears.

Make sure the current date and time in the introductory display are correct.

- If the date and time are correct, press [Return] to continue.
- If the date and time are incorrect, type the correct date and time using the format shown in the introductory display. For example, type 10–OCT–1990 02:30 and press [Return] to continue.

The Main Menu appears. Section 3.3 describes options on the Main Menu.

3.3 Main Menu Options

The Main Menu provides six options, as shown in Figure 3–1.

Figure 3–1: The Main Menu

```
MAIN  MENU                              Release nnn   Version  xx.xx

 1 - Test the System

 2 - Display System Configuration and Devices

 3 - Display the System Utilities Menu

 4 - Display the Service Menu

 5 - Display the Connect/Ignore Menu

 6 - Select Single Device Tests

Type the number; then press the RETURN key. >
```

Choose an option by typing its number and pressing [Return].

NOTE: *The MDM release and version numbers are represented by nnn and xx.xx in the sample displays provided throughout this chapter.*

Option 4, Display the Service Menu, is available only if you purchased the MicroVAX Maintenance Kit. That kit contains service diagnostics and the system maintenance guide. Only qualified service personnel should use that kit.

The following sections describe the Main Menu options you can use.

3.3.1 Test the System

The Test the System option runs a test of the devices in your system and how they work together. You can run the test at any time without jeopardizing data.

After you select the option, the diagnostics are prepared for testing. If this is the first MDM option you selected, the diagnostics are loaded. The loading process takes several minutes. If the diagnostics do not load, the following message may appear.

```
All devices disabled, no tests run.
```

Report that message to your Digital service representative.

After the preparations and loading are complete, you are prompted to press [Return]. A display explaining the testing procedures then appears.

When you are ready to begin the test, press [Return]. The system displays:

```
Begin Device Tests
```

As each device passes the test, it is listed on the display.

NOTE: *Because of the internal similarity of some communication options, the diagnostic test sees the options as the same device. A CXA16 and CXB16 appear the same to the diagnostic test. A generic device name, DH–CX0, is listed for similar communication options. The last letter in each device name differentiates among multiple devices of the same type. For example, DH–CX0A indicates one communication option, DH–CX0B a second, and so forth.*

If a device fails the test, you receive a failure message.

Each failure message identifies the device being tested, when the failure occurred, and the field-replaceable unit (FRU). Copy the failure message and report it to your Digital service representative. Figure 3–2 shows an example of an unsuccessful test.

Figure 3–2: Example of an Unsuccessful Test

```
BEGIN FUNCTIONAL TEST

     Device                     Result

     DEQNAA ...............     FAILURE DETECTED

     A failure was detected while testing the

          OPTION: DEQNAA  Ethernet controller

     The Field-Replaceable Unit (FRU) identified is the:

          Ethernet controller
```

When a failure message occurs, the testing stops.

When all devices pass the first part of the test, the exerciser tests begin. Those tests take about 4 minutes and test how the devices work together. If the devices pass, you receive a success message.

At the end of the system test, press Return to return to the Main Menu.

From the Main Menu you can exit MDM as described in Section 3.4 or you can choose one of the other options.

3.3.2 Display System Configuration and Devices

The Display System Configuration and Devices option identifies devices recognized by the diagnostic software.

After you select the option, the diagnostics are prepared for testing. If this is the first MDM option you selected, the diagnostics are loaded. The loading process takes several minutes. After the preparations and loading are complete, you are prompted to press Return.

After you press Return, the configuration is displayed. Figure 3–3 shows a sample system configuration and devices display.

Figure 3–3: System Configuration and Devices

```
MAIN  MENU                                  Release nnn   Version xx.xx
SYSTEM CONFIGURATION AND DEVICES

    CPUA ... DECsystem CPU
        KN220-A ,  MC=02 HW=01
    MEMA ... DECsystem memory system
        32 Megabytes. 65536 Pages
             MS220-AA ... 32MB memory module
    DSIA ... DSSI Subsystem
             RF71 ...  Unit #0, Dssi Disk, Online
    SGCA ... Second Generation Ethernet Controller
        SGEC V3 08-00-2B-17-E9-62
    SCSA ... SCSI I/O Subsystem
             RRD40 ... Unit #0, SCSI CDROM
    DEQNAA ... Ethernet controller
        DELQA/DESQA L 08-00-2b-08-f7-15
    DH-CX0A ... CXA16/CXB16/CXF32/DHF11 - 16 lines,No Modem control
        ROM Rev: CONTROL = 17 OCTART = 1
    TKXXA ... TK50/TK70 CONTROLLER
        TQK70-REV MC=3

Press the RETURN key to return to the previous menu. >
```

Up to two lines of information are provided for each device. One line lists the name of the device and gives a brief description; a second line may indicate the revision level of the device. The revision level can refer to hardware or microcode. For example, the KN220 CPU described above is at revision 2 for microcode (MC=02) and at revision 1 for hardware (HW=01).

Besides the general information listed for each device, more information for specific devices may be given:

- CPUA — Type of CPU, microcode revision, and hardware revision
- MEMA — Total amount of memory in megabytes and pages, number and type of memory modules
- KFQSA — For systems with the KFQSA storage adapter, the type of DSSI device and its unit number for each ISE
- DSIA—Type of DSSI device and its unit number for each ISE
- DESQA — The Ethernet station address
- SGEC — The onboard Ethernet controller station address
- SCSI — Type of SCSI device and its unit number

- Communication devices — The type of device and whether it has modem control

In addition to showing information about testable device options, MDM displays messages indicating the presence of nontestable system devices. If a device is in the system but is not described under the System Configuration and Devices display, one of the following two messages can indicate the reason.

Message 1:

```
No Dg KAA ... Diagnostic not loaded
```

The `No Dg` (no diagnostic) `KAA` (KN220 CPUA) message appears in place of the device name because a diagnostic was not loaded for the CPUA. That can happen when the medium is not installed properly or the diagnostic is not present on the medium.

MDM displays a `No Dg` message for each Digital device in your system under those circumstances. For example, if MDM cannot find the TK70 tape drive diagnostic, the message `No Dg TKA` appears. TKA indicates that the device is a TK tape drive.

Message 2:

```
Unknown ... Diagnostic not loaded
```

The `Unknown` (unknown device) message indicates that a device not recognized by MDM is attached to your system. That message appears under the following circumstances.

- A device is configured to a nonstandard CSR address.
- A Digital device that has no diagnostic is attached to the system. That may occur if a device not supported on the system is attached.
- A non-Digital device is attached to the system.

Once all devices are listed, you can return to the Main Menu by pressing [Return].

From the Main Menu you can exit MDM as described in Section 3.4 or you can choose one of the other options.

3.3.3 Display the System Utilities Menu

Choose the Display the System Utilities menu option to display the System Utilities menu. If system utilities in addition to the IOADDRES option are available for your system configuration, they are listed on the menu.

NOTE: *The ISEs are preformatted. You cannot format them.*

After you select the option, the diagnostics are prepared for testing. If this is the first MDM option you selected, the diagnostics are loaded. The loading process takes several minutes. When the preparations and loading are complete, you are prompted to press [Return].

After you press [Return], the System Utilities menu appears. Figure 3–4 shows a sample System Utilities menu for a system with two KRQ50 controllers. If your system does not have an RRD40 optical disk subsystem, only one option, IOADDRES, will be available.

Figure 3–4: System Utilities Menu

```
MAIN MENU
SYSTEM UTILITIES

    Utility selections are:

    1 - IOADDRES
    2 - RRAA - Update drive unit number for RRD40 controller A.
    3 - RRAB - Update drive unit number for RRD40 controller B.
```

Choose the option by typing the option number on the menu and pressing [Return].

From the Main Menu you can exit MDM as described in Section 3.4 or you can choose one of the other options.

3.3.3.1 IOADDRES

NOTE: *The IOADDRES option is for users of industrial systems.*

The IOADDRES option supplies a list of standard CSR addresses and interrupt vectors that MDM uses in testing devices. The first available CSR address and interrupt vector for configuring devices with a nonstandard address is also supplied.

The devices in your system were configured properly at the factory. Any new options added to your system are configured properly by a Digital service representative.

3.3.3.2 Update Drive Unit Number for the RRD40 Compact Disk

That utility lets you update the unit number for the RRD40 compact-disk subsystem. Refer to the *RRD40 Disk Drive Owner's Manual* for instructions.

NOTE: *Only an RRD40 disk connected to a KRQ50 controller can have its drive unit number updated.*

3.3.4 Display the Connect/Ignore Menu

NOTE: *The Connect / Ignore Menu is for users of industrial systems.*

The Connect/Ignore Menu options let you customize MDM diagnostics. You can load your own diagnostics to a particular device, as well as load MDM diagnostics to a device with a nonstandard CSR address and interrupt vector.

3.3.5 Select Single Device Tests

The Select Single Device Tests option lets you run tests for a single device.

- A test of the device's individual circuits, called a functional test, is performed during the single device tests.
- The functional test is followed by an exerciser test to ensure that the device as a whole is working properly.

After you select the option, the diagnostics are prepared for testing. If this is the first MDM option you selected, the diagnostics are loaded. The loading process takes several minutes.

When the preparations and loading are complete, you are prompted to press Return. A display listing the devices included in your system appears. Figure 3–5 shows an example of such a display.

Figure 3–5: Select Single Device Test Menu

```
MAIN  MENU                                    Release nnn   Version xx.xx
SELECT SINGLE DEVICE TEST

Select the device number to be tested.  The functional tests
will be run followed by the exercisers for 4 minutes.

1 - CPUA - DECsystem CPU
2 - MEMA - DECsystem memory system
3 - DSIA - DSSI Subsystem
4 - SGCA - Second Generation Ethernet Controller
5 - SCSA - SCSI I/O Subsystem
6 - DEQNAA - Ethernet controller
7 - DH-CX0A -  CXA16/CXB16/CXF32/DHF11 - 16 lines, No Modem control
8 - TKXXA - TK50/TK70 CONTROLLER

Type the number; then press the RETURN key,
or type 0 and press the RETURN key to return to the Main Menu. >
```

NOTE: *Because of the internal similarity of some communication options, the diagnostic tests see those options as the same device. A CXA16 and*

CXB16 appear the same to the diagnostic tests. A generic device name, DH–CX0, is listed for similar communication options. The last letter in each device name differentiates among multiple devices of the same type. For example, DH–CX0A indicates one communication option, DH–CX0B a second, and so forth.

Select a device for testing by typing the corresponding number and pressing [Return].

After you press [Return], the system testing begins. If the device passes the functional test, a message to that effect appears and the exerciser test begins. The exerciser test runs for approximately 4 minutes. Figure 3–6 shows an example of a successful test.

Figure 3–6: Example of a Successful Test

```
BEGIN FUNCTIONAL TEST

     Device                          Result

     CPUA ...................... PASSED

BEGIN EXERCISER TEST

     Results are reported at the end of the testing.

SINGLE DEVICE TEST PASSED
```

If a device fails the test, you receive a failure message. Each failure message identifies the device being tested when the failure occurred and the field-replaceable unit (FRU). Copy the failure message and report it to your Digital service representative. Figure 3–7 shows an example of an unsuccessful test.

When a failure message occurs, the testing stops.

Press [Return] to return to the Single Device Menu for more testing.

From the Main Menu you can exit MDM as described in Section 3.4 or you can choose one of the other options.

Figure 3–7: Example of an Unsuccessful Test

```
BEGIN FUNCTIONAL TEST

     Device                      Result

     DEQNAA ................     FAILURE DETECTED

     A failure was detected while testing the

          OPTION: DEQNAA  Ethernet controller

     The Field-Replaceable Unit (FRU) identified is the:

          Ethernet controller
```

3.4 Exiting MDM

You can exit MDM in one of three ways:

- Press Break.
- Press and then release the Halt button.
- Press the Restart button.

Remove the tape cartridge as explained in your system *Operation* manual. Turn off the system. Set the Operation switch to normal, indicated by an arrow.

- If you ran MDM on a new system, you are ready to install your system software. Follow the instructions in your system software manuals. Set the Write-Protect button to write enable and install system software.
- If you ran MDM on a system containing system software, you must reboot your system software.

You can reboot your system software in one of two ways:

- You can manually boot the software by using the **boot** [-f *file*] [-s | -m] [-n] [*arg*...] command at the console mode prompt as described in your system *Operation* manual.
- You can autoboot the software if the bootmode environment variable is set to a value of *a*. The system will boot at power-up from the device you defined as the boot device.

Refer to your system *Operation* manual for information on booting.

APPENDIX A

Appendix A
System Controls and Indicators

The diagrams in this appendix show the controls and indicators on your system.

Figure A–1 shows them on the system control panel and the power supply.

Figure A–2 shows them on the RF-series ISE and the CPU cover panel.

Figure A–3 shows them on the tape drives.

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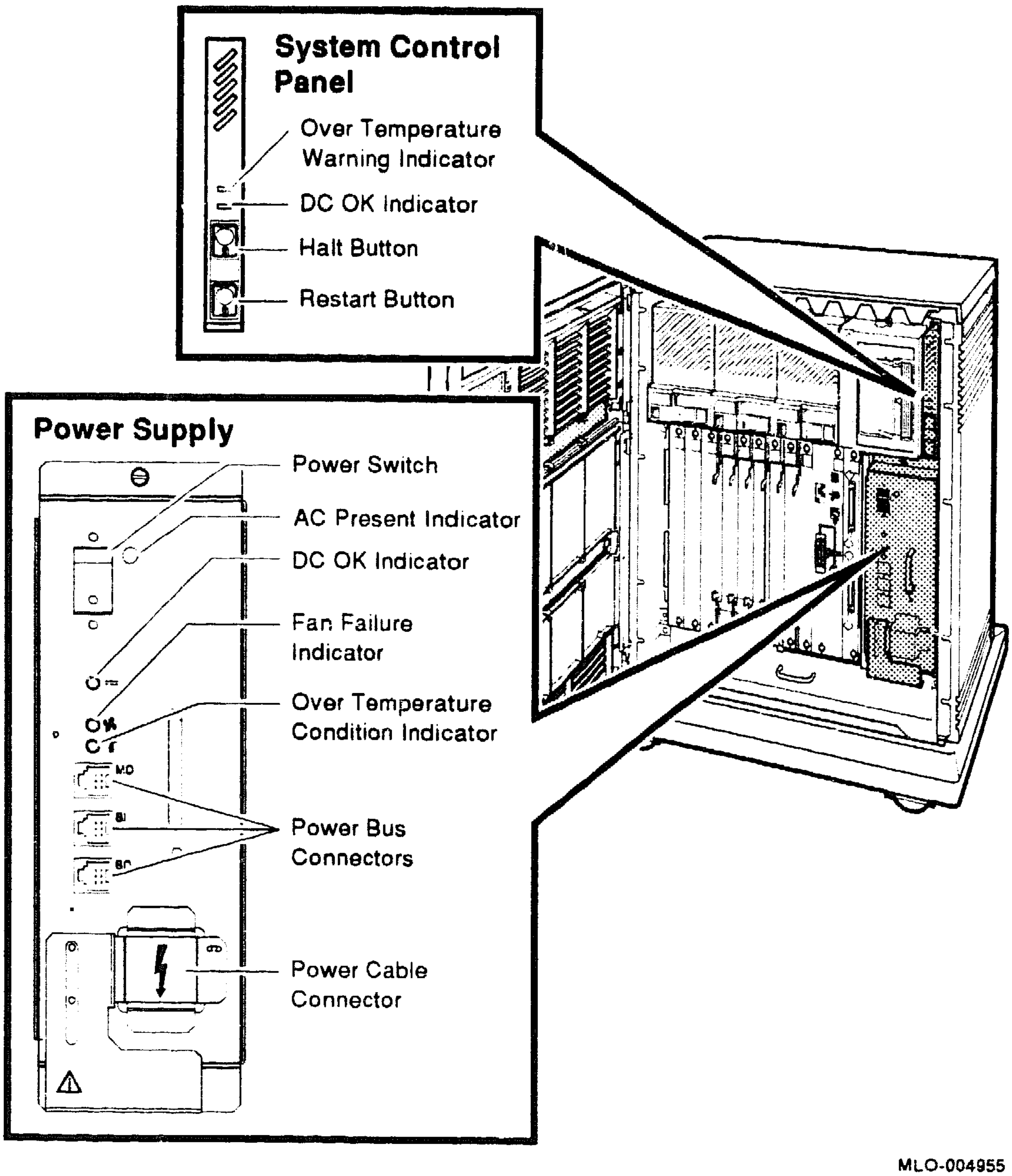
Figure A-1: System Controls and Indicators—System Control Panel and Power Supply



PAGE A-4 INTENTIONALLY LEFT BLANK

Figure A–2: System Controls and Indicators—RF-Series Integrated Storage Element and CPU Cover Panel

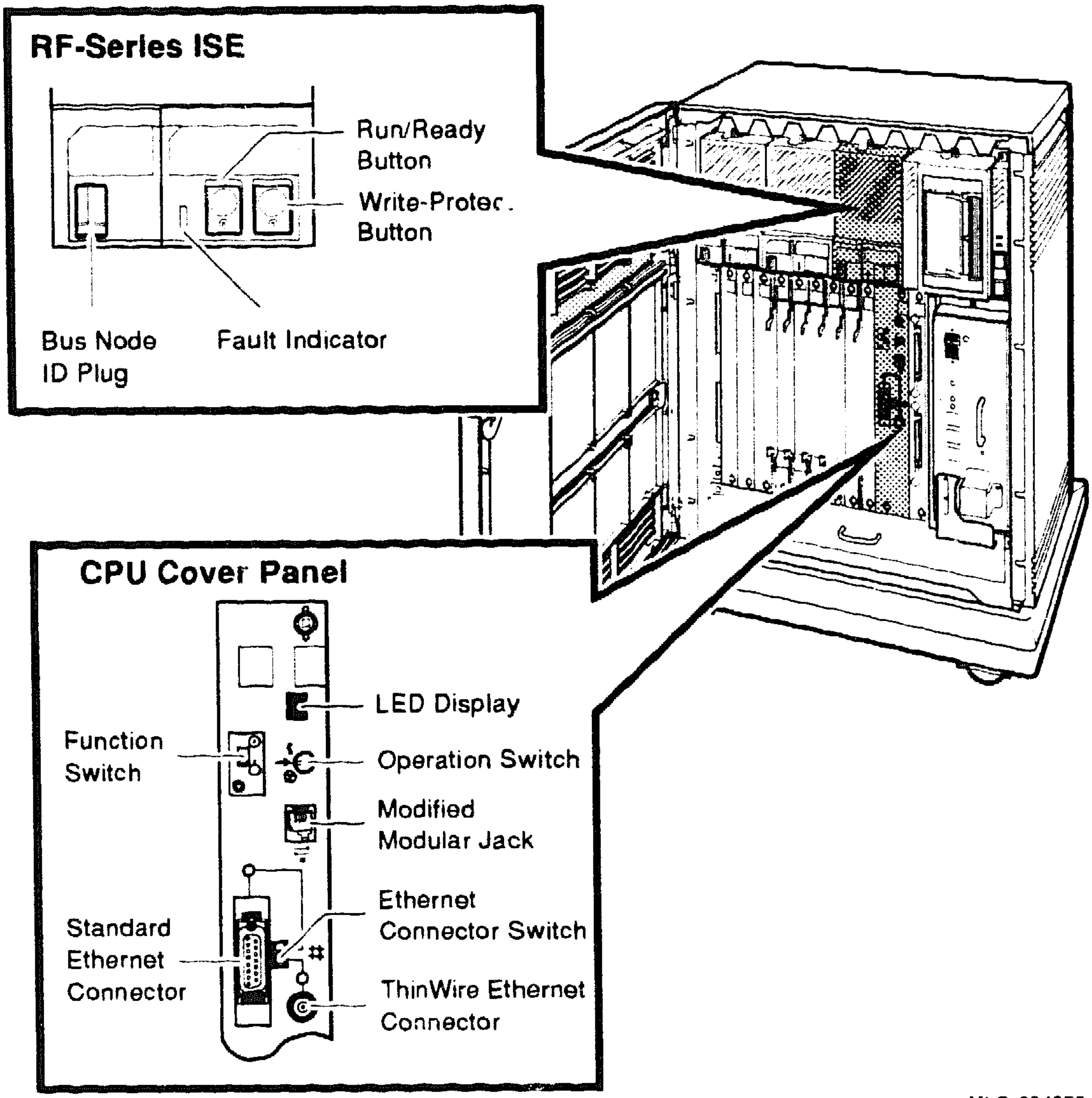


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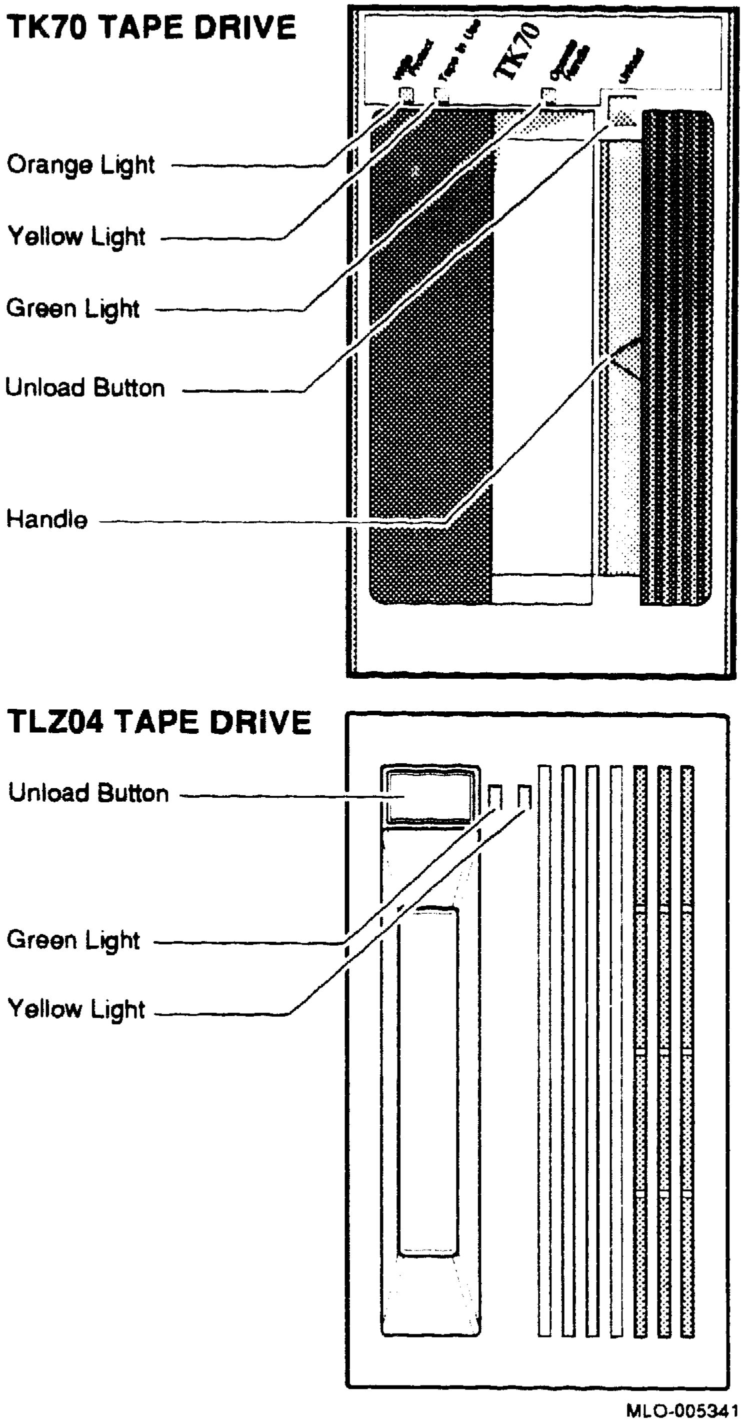
Figure A–3: System Controls and Indicators—Tape Drives



INDEX

Index

TECHNICAL INFORMATION

DECsystem 5500 Technical Information

Order Number EK-333AA-TI-001

Digital Equipment Corporation
Maynard, Massachusetts

First Printing, August 1990

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

FCC NOTICE: The equipment described in this manual generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense may be required to take measures to correct the interference.

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Contents

Chapter 3 System Expansion: Storage and Backplane

Index

Examples

Figures

Tables

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Preface

This manual provides a summary of technical information about the DECsystem 5500 base system and its options.

This manual is organized as follows:

- Chapter 1 describes the base system and lists specifications for the KN220–AA CPU module set and MS220–AA memory option.
- Chapter 2 dε :ribes the optional components available for the DECsystem 5500 and lists their specifications.
- Chapter 3 contains information on expanding your DECsystem 5500 system.

Convention	Meaning
Return	A key name is shown enclosed to indicate that you press a named key on the keyboard.
Ctrl/x	A sequence such as Ctrl/x indicates that you must hold down the key labeled Ctrl while you press another key.
Italic type	Italic type indicates an argument for which you must supply a value, environment variables, and references to other documents.
Bold user input	This bold upper or lowercase type indicates user input. For example: Type **maint** at the console prompt. or >>> **SHOW DEVICE**
NOTE	Notes provide general information about the current topic.

CHAPTER 1

Chapter 1

Base System Description

This chapter describes the DECsystem 5500 base system, including the following:

- Power-up self-tests
- Digital Storage System Interconnect (DSSI) architecture
- Small Computer Storage Interface (SCSI) architecture
- CPU cover panel
- Specifications for the KN220–AA CPU module set and MS220–AA memory

1.1 DECsystem 5500 System Overview

DECsystem 5500 base systems are shipped in the BA430 enclosure, which provides a 12-slot backplane and room for four mass storage devices.

The base system contains the following:

- A KN220–AA module set consisting of a central processing unit (CPU) module, an I/O module, and a memory module. The KN220 I/O module (M7638–AA) is installed in slot 1. The KN220 CPU module (M7637–AA) is installed in slot 2.
- From one to four MS220–AA memory modules. MS220–AA memory modules (M7639–AA) are installed in slots 3 through 6.

1.2 Firmware Overview

Control passes to one of the firmware programs under any one of the following conditions:

- You turn on the system.
- You press the Restart button.
- You assert the Q22-bus BHALT signal either by pressing the Halt button or by pressing Break when the Function switch is enabled (up).
- You press the Halt button on the front control panel.
- A system error occurs.

Three read-only memory (ROM) chips on the KN220 module set contain the firmware. This firmware consists of the following four major programs, which include the system power-up self-tests and diagnostics:

1. A console program that allows you to control the system by entering Maintenance mode commands, and make use of environment variables to pass information to the ULTRIX–32 operating system by entering Normal mode commands
2. A set of self-tests and diagnostics for the CPU and memory
3. A bootstrap program for ULTRIX–32
4. A bootstrap program for the MicroVAX Diagnostic Monitor (MDM)

The console program receives control whenever the processor halts. In a processor halt, processor control passes to the console program and instruction execution continues.

1.3 Power-Up

When you turn on the system, the system enters Power-Up mode. In Power-Up mode, the console program determines the console device type and console language, then runs the self-tests for the CPU and memory.

You determine the type of Power-Up mode by setting the Function and Operation switches. See your *DECsystem 5500 Operation* manual for the following power-up information:

- Power-up procedures
- Operation switch and Function switch settings
- Examples of successful power-up sequences
- Boot and autoboot procedures for the ULTRIX–32 operating system

See your *DECsystem 5500 Troubleshooting and Diagnostics* manual for a list of problems you might encounter during power-up and their solutions.

After power-up, the system enters the mode you select with the Operation switch: Normal mode or Maintenance mode.

1.4 Mode Overview

If the Operation switch is set to Normal (indicated by an arrow), the KN220 console program enters Normal mode after the power-up self-tests are completed successfully. The Normal mode lets you make use of environment variables to pass information to the ULTRIX–32 operating system.

In Normal mode, you can boot the ULTRIX–32 operating system, set up automatic booting, set the baud rate, and examine memory by entering certain console commands and characters at the Normal mode prompt (>>).

1.4.1 Control Characters in Normal Mode

Table 1–1 lists the keypad characters that have special meaning in Normal mode.

Table 1–1: Normal Mode Control Characters

Character	Action
Return	Ends a command line. Command characters are buffered until you press Return.
Delete	Deletes the previously entered character. If you define the console terminal as hard copy (environment-variable **term** set to hardcopy), the deleted text is displayed surrounded by backslashes. If the console terminal is a CRT (environment-variable **term** set to crt), each delete is displayed with the sequence <BS><SP><BS>. Deletes received are ignored when there are no characters to be deleted.
Ctrl/C	Causes the console to abort the processing of a command.
Ctrl/O	Causes console output to be discarded until you enter the next Ctrl/O or until the next console prompt or error message is issued. Ctrl/O is also canceled when you enter Ctrl/C.
Ctrl/Q	Resumes console output that was suspended when you entered Ctrl/S.
Ctrl/R	Causes the current command line to be displayed without any deleted characters.
Ctrl/S	Suspends output on the console terminal until you enter Ctrl/Q.
Ctrl/U	Discards all characters accumulated for the current line.
Ctrl/V	Suppresses any special meaning associated with the next character.

Enter all Normal mode commands as follows:

- Lowercase letters for commands and variables, and uppercase or lowercase or both for filenames; enter filenames as they are shown in the directory listing.
- ASCII characters only.
- Enter numeric values as decimal, hexadecimal, octal, or binary. Decimal values are represented by a string of decimal digits with no leading zeros (123). Octal values are represented by a string of octal digits preceded by a leading zero (0177). Hexadecimal values are represented by hexadecimal digits preceded by 0x (0x3ff). Binary values are represented by binary digits preceded by 0b (0b1001).

1.4.2 Environment Variables in Normal Mode

The KN220 console program makes use of environment variables to pass information to the operating system. Some of the environment variables are maintained in nonvolatile RAM (NVRAM) so that their contents are not lost when the system is turned off.

You can define additional environment variables, but those you define will be lost when the system is turned off.

Table 1–2 lists the environment variables that are maintained in NVRAM and those that are automatically initialized (init) by the console program.

Table 1–2: Environment Variables (Normal Mode)

Variable	enter	Definition
baud	Init[1]	Baud rate of the console terminal line. The baud rate defaults to 1200. Allowed values are 300, 600, 1200, 2400, 4800, 9600, 19,200, and 38,400.
bootpath	NVRAM[2]	A string containing the complete boot path.
bootmode	NVRAM[2]	A one-character code controlling what action the console is to take on power-up or following a reset. Overrides the settings of the H3602–AC switches. Three codes are defined: *a* (for autoboot), *d* (to halt the system after the power-up self-tests), and *r* (to perform a restart). Allowable console device is tty(0) for console serial line.
bitmap	Init[1]	The hexadecimal address of good bitmap pages.
bitmaplen	Init[1]	The length of the memory bitmap.
osconsoie	Init[1]	Tty(0).
console	NVRAM[2]	Selects tty(0).
systype	Init[1]	Contains information used to identify the processor. Bits 24–31 contain the CPU type. Bits 16–23 contain the system type. Bits 8–15 contain the firmware revision level. Bits 0–7 contain the hardware version level.
scsiid	memdescriptor	SCSI identification number, 0–7.

[1]Automatically initialized by console program

[2]Maintained in nonvolatile memory

1.4.3 Normal Mode Commands (>>)

Table 1–3 lists the Normal mode commands that you enter at the >> prompt. Normal mode commands and variables are case-sensitive; the filenames must be in the case as shown in the directory listing.

Table 1–3: Console Commands in Normal Mode

Command[1]	Qualifiers	Action
?	[command-list]	Identical to the HELP command.
boot	[-f*file*] [-n] [-s/-m] [*args*]	Loads the file following the flag -f. If you do not specify the -f flag, the file that is specified by the environment-variable bootpath is loaded. If you specify -n, the file is loaded but control is not passed to the program. If any arguments are present, they are passed to the booted image using the standard argc/argv mechanism. You must enter two hyphens to denote a hyphen (for example, to pass the -f flag to the program to be booted, enter - -f). The -s and -m flags boot either single or multiusers; default is multiusers.
continue	none	Causes the processor to begin execution at the address currently in the saved program counter. The processor state saved at the last console entry is restored before leaving Normal mode.
d	[-bhw] address value	Deposits a single byte, halfword, or word value at the indicated address.
dump	[-bcdoux] [-bhw] range	Performs a formatted display of the contents of memory. Memory contents may be displayed (simultaneously) as binary (-b), as ASCII characters (-c), or in decimal (-d), octal (-o), unsigned decimal (-u), or in hex (-x). Memory contents may be dumped as bytes (-b), halfwords (-h), or words (-w). You may specify the range of memory to be dumped as base-address (a single value is dumped), base-address#count (a specified number of values are dumped), or as base-address:limit-address (all values between the base address and the limit address are dumped).

[1]Enter commands and variables in lowercase letters only.

Table 1–3 (Cont.): Console Commands in Normal Mode

Command[1]	Qualifiers	Action
e	[-bhw] address	Displays the byte, halfword, or word at the address.
fill	[-bhw] [-vvalue] range	Sets the range of memory specified to the value you specify. If you do not specify a value, zero is used. Memory contents may be filled as bytes (-b), halfwords (-h), or words (-w). Specify the range of memory to be filled by entering the dump command.
go	[entry]	Transfers control to the entry point address you indicate. If you do not indicate an entry point address, the entry point address of the last program module loaded is used.
help	[command-list]	Displays a brief explanation of the command that you specify. If you do not specify a command, the console displays a list of all the commands.
init	none	Performs a full initialization similar to that performed at power-up or reset, except that no diagnostics are executed.
maint	none	Causes the console to enter Maintenance mode. Any saved program state is discarded.
passwd	[-s] [-c] [-u]	Executed with no flags when the system is unprivileged, the operator is prompted for a password. Executed with the following flags when the system is privileged. The -s flag enters a password into NVRAM; the -c flag clears the system password and turns off security; when executed in privileged mode, the -u flag causes the operator to be unprivileged.
printenv	[variable-list]	Displays the environment variable that you indicate. If you do not indicate an environment variable, all the console environment variables are displayed.
setenv	variable value	Assigns a value to the environment variable that you indicate.

[1]Enter commands and variables in lowercase letters only.

Table 1–3 (Cont.): Console Commands in Normal Mode

Command[1]	Qualifiers	Action
test	[-r] test_number	Executes the CPU module ROM diagnostic specified by test_number specified in hex (number preceded by 0x.) With the -r flag, it repeats continuously.
unsetenv	variable	Removes the environment variable that you indicate from the set of console environment variables. The environment variables stored in nonvolatile memory are not affected by this command.
x	[-l] [-u]	Loads ([-l]) or unloads ([-u]) commands for automatic testing systems that load programs through the console when the I/O board is not present.

[1]Enter commands and variables in lowercase letters only.

1.5 Maintenance Mode Overview

If the Operation switch is set to Maintenance (indicated by a T inside the circle), the KN220 console program enters Maintenance mode after the power-up self-tests are completed successfully. In Maintenance mode, you can examine and alter the state of the processor by entering certain console commands and characters at the Maintenance mode prompt (>>>).

The console program also enters Maintenance mode in response to any halt condition except the HALT instruction.

1.5.1 Control Characters in Maintenance Mode

Table 1–4 lists the keypad control characters that have special meaning in Maintenance mode.

Table 1–4: Maintenance Mode Control Characters

Character	Action
Return	Also <CR>. The carriage return ends a command line. No action is taken on a command until after it is terminated by a carriage return. A null line terminated by a carriage return is treated as a valid, null command. No action is taken, and the console prompts for input. Carriage return is echoed as carriage return, line feed (<CR><LF>).
X	When you press X (rubout), the console deletes the previously enterd character. The resulting display differs, depending on whether the console is a video or a hardcopy terminal. **For hardcopy terminals**, the console echoes a backslash (\) followed by the character being deleted. If you press additional rubouts, the additional deleted characters are echoed. If you enter a non-rubout character, the console echoes another backslash, followed by the character entered. The result is to echo the characters deleted, surrounding them with backslashes. For example: EXAMI;E X X NE<CR> The console echoes: EXAMI;E\E;\NE<CR> The console sees the command line: EXAMINE<CR> **For video terminals**, the previous character is erased and the cursor is restored to its previous position. The console does not delete characters past the beginning of a command line. If you press more rubouts than there are characters on the line, the extra rubouts are ignored. A rubout entered on a blank line is ignored.
Ctrl/U	Echoes ^U<CR> and deletes the entire line. Entered, but otherwise ignored if entered on an empty line.
Ctrl/S	Stops output to the console terminal until you enter Ctrl/Q. Not echoed.

Table 1–4 (Cont.): Maintenance Mode Control Characters

Character	Action
Ctrl/Q	Resumes output to the console terminal. Not echoed.
Ctrl/R	Echoes <CR><LF>, followed by the current command line. Can be used to improve the readability of a command line that has been heavily edited.
Ctrl/C	Echoes ^C<CR> and aborts processing of a command. When entered as part of a command line, deletes the line.
Ctrl/O	Ignores transmissions to the console terminal until you enter Ctrl/O. Echoes ^O when disabling output. Not echoed when it reenables output. Output is reenabled if the console prints an error message, or if it prompts for a command from the terminal. Output is also enabled by entering Maintenance mode, by pressing Break, or by entering Ctrl/C.

The console accepts commands up to 80 characters long. Longer commands produce error messages. The character count does not include rubouts, rubbed-out characters, or the RETURN at the end of the command.

The console treats two or more consecutive spaces and tabs as a single space. Leading and trailing spaces and tabs are ignored. You can place command qualifiers after the command keyword or after any symbol or number in the command.

All numbers (addresses, data, counts) are hexadecimal, but symbolic register names contain decimal register numbers. The hexadecimal digits are 0 through 9 and A through F. You can use uppercase and lowercase letters in hexadecimal numbers (A through F) and commands.

The following symbols are qualifier and argument conventions:

[ ] an optional qualifier or argument

{ } a required qualifier or argument

1.5.2 Maintenance Mode Commands (>>>)

Table 1–5 lists and describes the Maintenance mode commands. They are not case-sensitive. You can display the list of commands by entering **HELP** at the console prompt (>>>).

Table 1–5: Console Commands in Maintenance Mode

Command	Action
BOOT	Initializes the processor and transfers execution to the VMB.
CONFIGURE	Invokes an interactive mode that permits you to enter Q22-bus device names, then generates a table of Q22-bus I/O page device CSR addresses and interrupt vectors.
CONTINUE	Causes the processor to begin instruction execution at the address currently contained in the program counter (PC). Does not perform a processor initialization.
DC	Reports the status of the nonvolatile disk cache as dirty (written to) or clean.
DCRESTORE	Restores from a named storage device the saved contents of an NVRAM disk cache.
DCSAVE	Saves contents of nonvolatile disk cache RAM onto a TK70 or TK50Z tape. Used when recovery of NVRAM is required.
DCZERO	Clears the contents of nonvolatile disk cache.
DEPOSIT	Deposits data into the address you specify. If you do not specify an address space or data size qualifier, the console uses the last address space and data size used in a DEPOSIT, EXAMINE, MOVE, or SEARCH command.
EXAMINE	Examines the contents of the memory location or register of the address you specify. If you do not specify an address, + is assumed.
EXIT	Exits from Maintenance mode (>>>) to Normal mode (>>). Idles the CVAX chip.
FIND	Searches main memory starting at address 0 (zero) for a page-aligned 128-Kbyte segment of good memory, or a restart parameter block (RPB).
HALT	The HALT command has no effect. It is included for compatibility with other VAX consoles.
HELP	Displays the correct syntax for all console commands.
INITIALIZE	Performs a processor initialization.
MOVE	Copies the block of memory starting at the source address to a block beginning at the destination address.
NEXT	Executes the number of macro instructions you specify. If you do not specify a number, 1 (one) is assumed.
REPEAT	Repeatedly displays and executes the command you specify. Enter Ctrl/C to stop the command. You can specify any valid console command except the REPEAT command.
SEARCH	Finds all occurrences of a pattern and reports the addresses where the pattern was found. If you include the /NOT qualifier, the command reports all addresses at which the pattern did not match.

Table 1–5 (Cont.): Console Commands in Maintenance Mode

Command	Action
SET BFLAG	Sets the default R5 boot flags. The value must be a hexadecimal number of up to eight digits.
SET BOOT	Sets the default boot device for CVAX. The device must be a valid CVAX boot device
SET HOST	Connects to the DUP or MAINTENANCE driver on the node or device you specify.
SET LANGUAGE	Sets the console language and keyboard type.
SHOW BFLAG	Displays the default R5 boot flags.
SHOW BOOT	Displays the default boot device.
SHOW DEVICE	Displays all devices displayed by the SHOW DSSI, SHOW ETHERNET, SHOW SCSI, and SHOW UQSSP commands.
SHOW DSSI	Displays the status of all nodes that can be found on the DSSI bus. For each node, the firmware displays the node number, the node name, the boot name, and device type, if available. Does not indicate whether the device contains a bootable image.
SHOW ETHERNET	Displays the hardware Ethernet address for all Ethernet adapters that can be found, both on-board and on the Q22-bus.
SHOW LANGUAGE	Displays console language and keyboard type.
SHOW MEMORY	Displays main memory configuration, board by board.
SHOW QBUS	Displays all Q22-bus I/O addresses that respond to an aligned word read, plus vector and device name information. For each address, the console displays the address in the VAX I/O space in hexadecimal, the address as it would appear in the Q22-bus I/O space in octal, and the word data that was read in hexadecimal. Also displays the vector that you should set up and device name or names that could be associated with the CSR.
SHOW SCSI	Displays the status of all nodes that can be found on the SCSI bus. For each node, the firmware displays the node number, the boot name and device type, if available. Does not indicate whether the device contains a bootable image.
SHOW UQSSP	Displays the status of all disks and tapes that can be found on the Q22-bus that support the UQSSP protocol. For each such disk or tape on the Q22-bus, the firmware displays the controller number, the controller CSR address, and the boot name and type of each device connected to the controller. The command does not indicate whether the device contains a bootable image.
SHOW VERSION	Displays the current firmware version.
START	Starts instruction execution at the address you specify. If you do not give an address, the current Program Counter (PC) is used. If memory mapping is enabled, macro instructions are executed from virtual memory, and the address is treated as a virtual address. Equivalent to a DEPOSIT to PC, followed by a CONTINUE. Does not perform a processor initialization.

Table 1–5 (Cont.): Console Commands in Maintenance Mode

Command	Action
TEST	Invokes a diagnostic test program specified by the test number you enter. If you enter a test number of 0 (zero), all tests allowed to be executed from the console terminal are executed. The console accepts an optional list of up to five additional hexadecimal arguments.
UNJAM	Performs an I/O bus reset, by writing a 1 (one) to IPR 55 (decimal).
UNPRIV	Clears the security mode password
X	Loads or unloads (that is, writes to memory or reads from memory) the specified number of data bytes through the console serial line (regardless of console enter), starting at the specified address. For use by automatic systems communicating with the console.

Examples 1–1 through 1–8 show sample displays for the commonly used commands BOOT, EXIT, SHOW, and SET. Example 1–9 shows the DC commands.

The BOOT command boots the MDM diagnostics. Table 1–6 lists the MDM device names. The SHOW command displays the console parameter you specify. The SET command sets the parameter to the value you specify.

Example 1–1: BOOT Display

```
>>> BOOT XQA0
(BOOT/R5:10 MUA0)
  2..
MUA0
>>>
```

Table 1–6: MDM Device Names

Controller Type	Controller	Device Name[1]
MSCP (tape)	TQK70	MUmn
Ethernet adapter	DESQA	XQmn
Network interface	SGEC	EZA0

[1]m = MSCP controller designator (A = first, B = second, and so on)
n = unit number

Example 1–2: EXIT Display

```
>>> EXIT
>>
```

Example 1–3: SHOW QBUS Display

```
>>> SHOW QBUS
Scan of Qbus I/O Space
-20001468 (772150)=4000 (154) RQDX3/KDA50/RRD50/RQC25/X-DISK
-2000146A (772152)=0B40
-20001940 (774500)=0000 (260) TQK70/TU81E/RV20/X-TAPE
-20001942 (774502)=0BC0
-20001F40 (777500)=0020 (004) IPCR
Scan of Qbus Memory Space
>>>
```

For each address, the console displays the address in the Q-bus I/O space in hexadecimal, the address as it would appear in the Q22-bus I/O space in octal, and the word data that was read in hexadecimal.

Example 1–4: SHOW DEVICE Display

```
>>> SHOW DEVICE

DSSI Node 0 (R7YRMS)
-rf(0,0,*) (RF71)

DSSI Node 7 (*)


SCSI Node 0
-rz(0,0*) (RZ56) -DIA0

SCSI Node 7 (*)

UQSSP Tape Controller 0 (774500)
-tm(0,0) (TK70) -MUA0

Ethernet Adapter
-mop() -EZA0 (08-00-2B-12-81-22)

Ethernet Adapter 0
       -XQA0 (08-00-2B-08-CB-5C)

VME Interface Board -- Not Installed
```

For each device, the console displays the controller, the node, and the address on the first line, and the device name and option on the second line.

Example 1–5: SHOW ETHERNET Display

```
>>> SHOW ETHERNET

Ethernet Adapter
 -mop() -EZA0   (08-00-2B-12-81-22)

Ethernet Adapter 0 (774440)
       -XQA0  (08-00-2B-08-CB-5C)
>>>
```

Example 1–6: SHOW LANGUAGE Display

```
>>> SHOW LANGUAGE
English (United States/Canada)
>>>
```

Example 1–7: SET LANGUAGE Command

```
>>> SET LANGUAGE 5
>>>
```

In this example, selection 5 (English) is chosen from the Language Selection Menu.

Example 1–8: SET BOOT Command

```
>>> SET BOOT MUA0
>>>
```

In this example, entering the MUA0 command sets the TK70 tape drive as the default boot device for Maintenance mode only.

Example 1–9: DC Commands

```
>>>DC
Disk Cache -  Dirty
>>>

>>>DC
Disk Cache -  Clean
>>>

>>>DC/SAVE MUA0
Disk Cache -  Dirty
Do you want to continue (y/n)? y

-MUA0
Zero Disk Cache (y/n)? y
>>>

>>>DC/SAVE MUA0
Disk Cache -  Clean
>>>
```

The following examples show the DC/RESTORE command with dirty and clean caches, respectively.

```
>>>
>>>DC/RESTORE MUA0
Disk Cache -  Dirty
Do you want to continue (y/n)? n
>>>

>>>DC/RESTORE MUA0

-MUA0
>>>
```

The following example shows the DC/ZERO command with a dirty cache.

```
>>>DC/ZERO
Do you want to continue (y/n)? n
>>>
```

In the event of an abnormal shutdown, the disk cache (DC) commands allow you to check, save, restore, or clear the data in the NVRAM cache that is waiting to be written to disk. The DC commands are used only when the Prestoserve™ program is enabled by means of ULTRIX–32.

- The DC command prompts the system to tell whether the NVRAM data cache contains data.
- The DC/SAVE command prompts the system to save the NVRAM data cache on a tape device. This command is used to recover the NVRAM cache in the event of a fatal CPU failure, and should be executed before the module is replaced.
- The DC/RESTORE command prompts the system to read the saved NVRAM data cache from the tape once the CPU board (M7637–AA) has been replaced.
- The DC/ZERO command prompts the system to clear data from the NVRAM cache.

1.6 Mass Storage Busses: DSSI and SCSI

The DECsystem 5500 accommodates both the DSSI (Digital Storage System Interconnect) and the SCSI (Small Computer Systems Interface) busses.

1.6.1 DSSI Bus and the RF-Series ISEs

The DSSI bus is dedicated to mass storage devices in the DECsystem 5500 (BA430) enclosure.

DSSI architecture features a storage adapter located on the KN220 I/O module, which is the interface between the CPU and the Integrated Storage Elements (ISEs).

An ISE is an intelligent storage device that handles device operations internally, rather than through a controller.

One DSSI bus has the following characteristics:

- A 4-Mbytes-per-second bandwidth
- Up to eight daisy-chained nodes (one adapter and seven mass storage devices)
- Eight data lines
- One parity line
- Eight control lines

A KFQSA module can be configured in the DECsystem 5500 backplane to act as another DSSI adapter, thus allowing for more than one DSSI bus in each system.

ISEs can be configured internal to a system or external, inside a storage expansion enclosure, as listed in Table 2–1.

1.6.2 SCSI Bus: Both Disk and Tape

SCSI devices in the DECsystem 5500 can be internal or external, and they can be either tape or disk devices, referred to as integrated storage elements (ISEs). The DECsystem 5500 supports the TLZ04, RZ56 and RZ57, and the RRD40 as SCSI devices.

The SCSI bus is dedicated to mass storage devices in the DECsystem 5500 (BA430) enclosure.

SCSI architecture features a storage adapter located on the KN220 I/O module, which is the interface between the CPU and the ISEs. An ISE is an intelligent storage device that handles device operations internally, rather than through a controller.

One SCSI bus has the following characteristics:

- A 4-Mbytes-per-second bandwidth
- Up to eight daisy-chained nodes (one adapter and seven mass storage devices)
- Eight data lines
- One parity line
- Eight control lines

A KZQSA module can be configured in the DECsystem 5500 backplane to act as an additional SCSI adapter for TLZ04, RRD40, RZ56, or RZ57.

ISEs can be configured internal to a system or external, inside a storage expansion enclosure, as listed in Table 2–1.

1.7 CPU Cover Panel

The outside of the CPU cover panel contains the following components, as shown in Figure 1–1:

- Operation switch

  Three-position switch for mode selection

- Function switch for Break Enable/Disable and for Language Inquiry mode

  See your *DECsystem 5500 Operation* manual for a description of the Function switch.

- Red LED display

  The diagnostics ru. automatically on power-up. While the diagnostics are running, the LED on the CPU cover panel displays a hexadecimal countdown of the tests from F to 4 (though not in precise reverse order) before booting the operating system, and 2 to 0 while booting the operating system. A different countdown appears on the console terminal screen.

- Ethernet Connector switch

  Select the appropriate Ethernet connector by using the Ethernet Connector switch. A lighted green LED indicates +12 Vac for the selected Ethernet connector.

- ThinWire Ethernet connector and green LED

  BNC connector for ThinWire Ethernet coaxial cable

- Standard Ethernet connector and green LED

  15-pin connector for standard Ethernet cable

- One modified modular jack (MMJ) for the console terminal serial line unit (SLU) (Section 1.7.1)

1.7.1 Modified Modular Jack Connector

Connect the console cable to the CPU cover panel through a modified modular jack (MMJ), as shown in Figure 1–1. An internal cable connects the MMJ to the CPU module. The MMJ cable connects the console module with the I/O module.

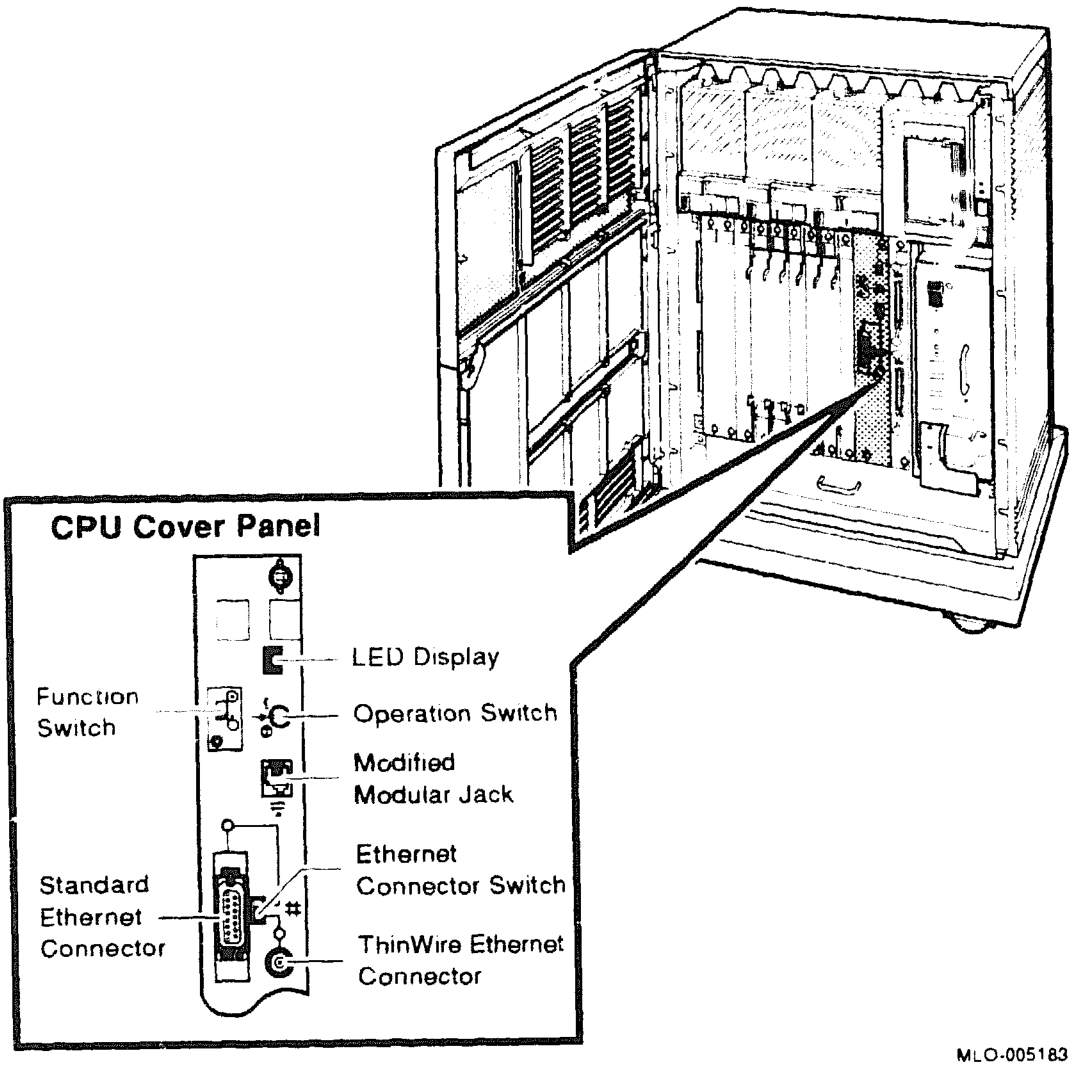
1.7.2 Baud Rate Select Switch

The inside of the CPU cover panel contains the Baud Rate Select rotary switch.

Use the following procedure to remove the CPU cover panel and to change the baud rate on your DECsystem 5500.

1. Set the power switch to off (0).

Figure 1–1: CPU Cover Panel



2. Remove the front panel of the enclosure.
3. Use a Phillips-head screwdriver to release the quarter-turn screws on the top and bottom of the CPU cover panel. Push each screw in and turn to the left until the screw releases.
4. Holding the top of the cover panel with one hand, carefully pull out the bottom of the cover panel, just until you have released the cover panel from the enclosure. You cannot disconnect the cover panel completely because cables connect it to the CPU module.

5. Tilt the top of the panel out as far as possible. The baud rate switch is located on the inside of the cover panel, above the list of baud rate settings. Table 1–7 lists the baud rate settings. Move the switch to the desired setting.
6. To replace the CPU cover panel, line it up with the other cover panels and press the bottom of the cover panel back into position. Hold the bottom firmly in place with one hand, and gently push the top of the panel until it locks into position.

Table 1–7: Baud Rate Settings

Setting	Baud Rate
0	300
1	600
2	1200
3	2400
4	4800
5	9600[1]
6	19,200
7	38,400

[1]Factory setting

7. To tighten the quarter-turn screws at the top and bottom of the cover panel, push each screw in with the Phillips-head screwdriver and turn to the right until tightened.
8. Set the power switch to on (1).
9. Perform the initialize routine in Normal mode to initialize the new baud rate.

   NOTE: *Make sure you set the baud rate on your terminal to match the baud rate on the CPU cover panel.*

1.8 KN220 CPU Module Set Specifications

The DECsystem 5500 includes the KN220 CPU module set, which consists of the KN220 CPU module (M7637–AA) and the KN220 I/O module (M7638–AA).

Central Processing Unit	
Clock rate	30 MHz
Data path width	32 bits
Number of instructions	74
Number of data types	1
General purpose registers	32 (32-bit wide)
Addressing modes (3)	I-enter (immediate)
	J-enter (jump)
	R-enter (register)
Time bases, 100 Hz	10-millisecond interval timer
Programmable timers	Two
I/O bus interface	One Q22-bus interface with 8192 entry map and DSSI, SCSI, and Ethernet interfaces
Backplane termination	240 Ω

Memory Management and Control	
Page size	4 Kbytes
Virtual address space	4 Gbytes
Physical memory space	512 Mbytes
Number of memory modules	4 maximum

Performance	
Data cache and address cache	
Size (each)	64 Kbyte
Speed	12 nanoseconds
	Direct mapped
Translation buffer	
Size	64-entry
Associativity	Fully associative
Q22-bus address translation map cache	
Size	16-entry
Associativity	Fully associative

Performance

Q22-bus buffer size	
Input	32 bytes
Output	4 bytes
Maximum Q22-bus bandwidth	
Block mode DMA read	2.4 Mbytes/s
Block mode DMA write	3.3 Mbytes/s

Ethernet Port (SGEC)

Supported protocols	Ethernet V2.0 DEC standard 134, IEEE 802.3
Supported media types	Standard Ethernet ThinWire Ethernet
Data path width	32 bits

Digital Storage System Interconnect Port (DSSI)

Maximum supported devices	7
Data path width	8 bits
Maximum bandwidth	4 Mbytes/s
Buffer size	128 Kbytes

Small Computer Storage Interface (SCSI) (H3605 Module Cover)

Maximum supported devices	7
Data path width	8 bits
Maximum bandwidth	4 Mbytes/s
Buffer size	128 Kbytes

Console Serial Line

Interface standards	EIA RS-423-A/CCITT V.10 X.26 EIA RS-232-C/CCITT V.28 DEC-423
Data format	1 start bit, 8 data bits, 0 parity bits, 1 stop bit
Baud rates	300; 600; 1200; 2400; 4800; 9600; 19,200; 38,400

CPU Cover Panel (H3602-AC)

Switches	Break Enable/Disable function (2-position).
	Standard/ThinWire Ethernet selection (2-position).
	CPU operation selection (3-position).
	Console SLU baud rate selection (8-position).
Display	LED hex display for console program status.
	Two green LEDs to indicate the selected Ethernet connector.
Battery for Time-of-Year Clock	3.75 V (nominal) rechargeable NiCad batteries (12-19245-01).
Connections	Modified modular jack (MMJ) for console terminal.
	Cable for console, configuration, battery backup, and hexadecimal display, 40-pin.
	D-subminiature Ethernet transceiver cable connector, 15-pin.
	ThinWire Ethernet BNC connector.

Configuration Information

KN220 CPU module (M7637-AA). Configured as a set with I/O and one memory module	
Form factor	Quad height
Power requirements	+5 Vdc, 7.8 A
	+12 Vdc, 0.14 A
Power consumption	39 W
Bus loads	0.0 ac
	0.0 dc
KN220 I/O module (M7638-AA)	
Form factor	Quad height
Power requirements	+5 Vdc, 6.2 A
	+12 Vdc, 0.23 A
Power consumption	31.0 W
Bus loads	3.5 ac
	1.0 dc

Operating System Support	
ULTRIX–32	Version 4.0 and later

Diagnostic Support	
MicroVAX Diagnostic Monitor	Release 133 (Version 4.4)
Self-tests	Yes

1.9 MS220–AA Memory Specifications

The MS220–AA is a 32-Mbyte memory module that provides memory expansion for the DECsystem 5500 system. The MS220–AA modules interface with the KN220 CPU through the MS220 local memory interconnect, which consists of the CD rows of slots 1 through 5 of the backplane and a 100-pin cable.

You can use up to four MS220-AA modules in the DECsystem 5500.

Operating system support and diagnostic support are the same as for the KN220 CPU module set, listed in Section 1.8.

Performance	
Synchronous longword read	333 nanoseconds
Synchronous unmasked longword write	333 nanoseconds
Synchronous masked longword write	600 nanoseconds
Synchronous quadword read	600–700 nanoseconds

Ordering Information	
MS220–AF	32-Mbyte field-installed kit[1]

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 6.5 A (1.3 A, standby)
	+12 Vdc, 0.0 A
Power consumption	32.5 W
Bus loads	0.0 ac
	0.0 dc

[1] 100-pin CPU memory interconnect cable included.

CHAPTER 2

Chapter 2
Option Specifications

This chapter lists specifications for the options currently supported in the DECsystem 5500, grouped as follows:

- Mass storage
- Communications

The options appear in alphanumerical order within each of the above groups. All weights are approximate.

Some of the options are already installed in your system. If you want to add other options, your Digital sales representative can advise you. Chapter 3 offers some guidelines on determining what options you can add.

Table 2–1 contains a list of options for the DECsystem 5500.

2.1 Options Overview

The option specifications include the following, where applicable:

- Functional information
- Ordering information
- Performance
- Physical specifications
- Configuration information
- Related documentation

Unless otherwise noted, operating system support and diagnostic support for all options are the same as for the KN220 CPU module set.

Table 2–1: Supported Options for DECsystem 5500

Option	Comments
CPU and Memory	
KN220–AA	CPU (M7637), I/O (M7638)
MS220–AA	32 Mbytes (M7639–AA)
Mass Storage	
TQK70–SA/SF	TK70 tape controller
TK70E–AA/AF	296-Mbyte cartridge tape drive
TK50Z–GA/GB	TK50 in desktop enclosure SCSI
TLZ04–FA (RDAT)	FH tabletop 1.2-Gbyte DAT drive
TLZ04–JA (RDAT)	FH embedded 1.2-Gbtye DAT drive
RV20	Write-once optical drive
TU81E	Magnetic tape
KLESI–SA	Controller for TU81E and RV20
RF31E–AA/AF	381-Mbyte DSSI ISE
KFQSA–SE/SG	RF-series ISE adapter
RZ56E–AA/AF	Embedded 665-Mbyte SCSI ISE
RZ57E–AA/AF	5.25-inch 1.0-Gbyte SCSI ISE
KZQSA–SA/SF	Q-bus SCSI controller
KDA50–SE/SG	RA90 controller, 3-wide handle
TSV05–SE/SF/SH	Q-bus TS05 magnetic tape system
M7206–PA	TSV05 controller
RRD40–SA/SB	Tabletop Q-bus optical disk drive
KRQ50–SA/SF	Q-bus controller for RRD40
Communications	
CXA16–AA/AF	16-line asynchronous EIA–423 controller
CXB16–AA/AF	16-line asynchronous EIA–422 controller
CXY08–AA/AF	8-line asynchronous EIA–232 controller
DSV11–SA/SF	Q-bus synchronous controller
DESQA–SA/SF	Ethernet-to-Q-bus controller
Miscellaneous	
LPV11–SA	System printer interface

Table 2–1 (Cont.): Supported Options for DECsystem 5500

Option	Comments
Expansion	
RF71B–DA/DB	3-cavity R215F expander with 1 RF71 ISE
RF71C–DA/DB	3-cavity R215F expander with 2 RF71 ISEs
RZ5X–nn	SCSI mass storage expander (BA42 enclosure)
B400X–B9	3-cavity ISE mass storage, 12-slot Q-bus expander
R400X–B9	7-cavity ISE mass storage expander

2.1.1 Configuration

Options must be properly configured so that the system recognizes them.

Each option in a system has a device address, commonly referred to as a control and status register (CSR) address, and an interrupt vector that must be set when the option is installed. Options are usually configured by setting switches or jumpers on the modules. Digital service representatives configure the option when they install it in your system.

2.2 Mass Storage Options

The DECsystem 5500 supports the mass storage devices listed in Table 2–1.

Each mass storage device has a controller that controls the traffic between the Q-bus and the device itself.

RA-Series

SDI devices include those of the RA-series, which are controlled by the KDA50 module pair. Each KDA50 module pair supports up to four RA-series drives in a mass storage expander.

RF-Series

Digital Storage System Interconnect devices are the RF-series ISEs. The DSSI bus has a storage adapter on the KN220 I/O module that directs its activity. The system supports up to seven ISEs for each DSSI bus. Additional DSSI busses may be added along with KFQSA adapters.

RZ-Series

Small Computer Storage Interface (SCSI) devices are the RZ-series ISEs. The system supports up to seven ISEs for each SCSI bus. Additional SCSI busses may be added.

TK-Series

The DECsystem 5500 also supports the TK-series tape drives in the upper right mass storage area.

2.2.1 KDA50 Storage Adapter

The KDA50 storage adapter allows Q22-bus systems to communicate with RA-series storage devices.

Functional Information	
Controller protocol	MSCP
Bad block replacement	Software dependent
Supported drives	RA90
Drives per controller	4
Drive interconnect	Transformer-coupled radial

Performance	
Read/Write data transfers	Up to 16-byte block mode DMA
Data buffering	32 Kbytes
Command buffering	20 command and response ring buffers

Configuration Information	
Form factor	Two quad height
Power requirements	+5 Vdc, 13.5 A (typical) +12 Vdc, 0.03 A (typical)
Power consumption	67.86 W
Bus loads	3.2 ac 0.5 dc

Related Documentation	
EK-KDA50-UG	KDA50-Q User's Guide

2.2.2 KFQSA Storage Adapter

The KFQSA storage adapter allows Q22-bus systems that support the KFQSA to communicate with storage peripherals based on the Digital Storage Architecture (DSA), using the Digital Storage System Interconnect (DSSI).

Functional Information	
Controller protocol	SSP: to and from Q22-bus host DSSI: to and from ISEs
Supported drive	RF-series ISEs
Drives per adapter	7
Drive interconnect	Direct
Controllers per system	2 maximum

Performance	
Peak transfer rate	4 Mbytes/s
Sustained transfer rate	1.5 Mbytes/s
I/O request throughput	190 I/O requests/s (single-sector reads)
Error detection	DSSI bus parity and check character, all transmissions

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 5.5 A (typical)
Power consumption	27.5 W

Related Documentation	
EK-KFQSA-IN	KFQ Storage Adapter Installation and User Manual

2.2.3 KLESI Controller

The KLESI controller interfaces the TU81–Plus tape drive to the Q22-bus.

Functional Information	
Controller protocol	TMSCP
Supported drive	TU81–Plus
Drives per adapter	1
Drive interconnect	Direct
Controllers per system	1 maximum

Configuration Information	
Form factor	Dual
Power requirements	+5 Vdc, [illegible].2 A (typical)
	+12 Vdc, 0.0 A (typical)
Power consumption	15.0 W
Bus loads	2.3 ac
	1.0 dc

Related Documentation	
EK–LESIB–UG	KLESI–B Module User's and Installation Guide

2.2.4 KZQSA Storage Adapter

The KZQSA is a storage adapter that interfaces Q22-bus systems to their supported SCSI devices.

Functional Specifications	
Supported drives	TLZ04–GA/JA/JF and RRD40–F3; two external cables or seven devices.
Controllers per system	Two

Ordering Information	
KZQSA–SA	BA200/BA400 factory-installed controller
KZQSA–SF	BA200/BA400 field-installed controller
KZQSA–AA	BA23 controller
KZQSA–BA	BA123 controller

Performance	
Peak transfer rate	4-Mbytes synchronous data between devices and KZQSA
Error detection	SCSI bus parity and Q-bus parity

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 5.4 A max
Power consumption	27 W
Bus loads	4.75 Vac 1.40 Vdc

Related Documentation	
EK–KZQSA–IN	KZQ Storage Adapter Installation and User Manual

2.2.5 RF31 ISE

The RF31 DSSI ISE provides 381 Mbytes of formatted storage space. The term *integrated storage element* is used because each DSSI ISE has an on-board intelligent controller and mass storage control protocol (MSCP) server in addition to the drive and the control electronics.

Storage Capacity	
User capacity	381 Mbytes
User capacity (blocks)	781,440

Ordering Information	
RF31–SF	Field-installed kit

Performance	
Average random seek time	19.20 milliseconds
Average rotational latency	8.33 milliseconds
Average access time	34.2 milliseconds
Peak transfer rate	1.5 Mbits/s

Physical Specifications	
Height	7.75 cm (3.05 in)
Width	14.60 cm (5.75 in)
Depth	20.75 cm (8.17 in)
Weight	4.09 kg (9.0 lb)

Configuration Information	
Form factor	Standard 10.5-in footprint
Power requirements	+5 Vdc, 1.25 A
	+12 Vdc, 3.12 A
Power consumption	27.4 W

Related Documentation	
EK–RF31–IN	RF31 Installation Guide

2.2.6 RF71 ISE

The RF71 DSSI ISE provides 400 Mbytes of formatted storage space. The term *integrated storage element* is used because each DSSI ISE has an on-board intelligent controller and mass storage control protocol (MSCP) server in addition to the drive and the control electronics.

Storage Capacity	
User capacity	400 Mbytes
User capacity (blocks)	781,440

Ordering Information	
RF71–SF	Field-installed kit

Performance	
Average random seek time	19.20 milliseconds
Average rotational latency	8.33 milliseconds
Average access time	34.2 milliseconds
Peak transfer rate	1.5 Mbits/s

Physical Specifications	
Height	7.75 cm (3.05 in)
Width	14.60 cm (5.75 in)
Depth	20.75 cm (8.17 in)
Weight	4.09 kg (9.0 lb)

Configuration Information	
Form factor	Standard 10.5-in footprint
Power requirements	+5 Vdc, 1.25 A
	+12 Vdc, 3.12 A
Power consumption	27.4 W

Related Documentation	
EK–RF71D–IM	RF71 Disk Drive Installation Manual
EK–RF71D–UG	RF71 Disk Drive User's Guide

2.2.7 RRD40 Compact Disk Subsystem

The RRD40 is a read-only SCSI optical disk drive with a KRQ50 controller.

Functional Specifications	
Recording media	Magnetic tape
Tape dimensions	1.27 cm (0.5 in) wide, 731 m (2400 ft) long
Average seek time	500 milliseconds
Transfer rate	150 Kbytes/s
Format	CDROM standard data
Controller, Q-bus	KRQ50
Storage Capacity	600 Mbytes

Ordering Information	
RRD40–SF	Field-installed tabletop drive with controller

Performance Specifications	
Drive capacity	600 Mbytes max per disk
Transfer rate, average	176.4 Kbytes/s
Access time, average	Less than 2 seconds
Latency, average	180 ms inner track 400 ms outer track
Load time, max	15 seconds

Physical Specifications	
Height	0.115 cm (4.53 in)
Width	0.32 cm (12.6 in)
Depth	0.264 cm (10.4 in)
Weight	5.2 kg (11.48 lb)
Medium	Replicated optical disk, 120-mm (4.7-in) diameter

Related Documentation	
EK–RRD40–TD	RRD40 Digital Disk Drive Technical Description
EK–RRD40–OM	RRD40 Disk Drive Owner's Manual

2.2.8 RV20 Tape Drive

The RV20 tape drive is a write-once optical tape drive subsystem that is controlled by the KLESI bus adapter.

Functional Information	
Recording media	Magnetic tape
Storage capacity	1 gigabyte per side (formatted)

Performance	
Media life	5 years prerecording; 30 years readable
Latency	62.5 millseconds
Transports per controller	4
Controller per CPU	Up to 4
Transports per controller	4
Transfer rate	262 Gbytes/s (formatted, sustained) 1.33 Mbytes/s (burst rate)
Average seek time	150 milliseconds
Access time (from insertion of tape)	212.5 milliseconds

Configuration Information	
Power requirements	+5 Vdc, 3 A
Power consumption	35.3 W
Bus loads	0.0 ac 0.0 dc

2.2.9 RZ56 ISE

The RZ56 is an embedded SCSI integrated storage element.

Storage Capacity	
User capacity	665 Mbytes
User capacity (blocks)	1,321,920

Ordering Information	
RZ56E–AA/AF	Field-installed kit

Performance	
Average random seek time	Less than 16 milliseconds
Average rotational latency	8.33 milliseconds
Maximum full stroke seek	33.0 milliseconds
Peak transfer rate, bus synchronous	4.0 Mbytes/s

Physical Specifications	
Height	8.26 cm (3.25 in)
Width	14.60 cm (5.75 in)
Depth	20.88 cm (8.40 in)
Weight	3.80 kg (8.4 lb)

Configuration Information	
Form factor	Standard 5.25-in footprint
Power requirements	+5.25 Vdc, 1.48 A peak, 8.8 W
	+12.6 Vdc, 4.8 A peak, 25.2 W
Power consumption	60.48 W peak

Related Documentation	
EK–RZ56D–SV–001	RZ56 Disk Drive Subsystem Service Manual
EK–RZXXD–PS–001	RZ-Series Disk Drive Subsystem Pocket Service Guide

2.2.10 RZ57 ISE

The RZ57 is a 5.25-inch 1.0-Gbyte SCSI integrated storage element.

Storage Capacity	
User capacity	1 Gbyte
User capacity (blocks)	1,954,059

Ordering Informati n	
RZ57E–AA/AF	Field-installed kit

Performance	
Average random seek time	<14.5 milliseconds
Average rotational latency	8.33 milliseconds
Maximum full stroke seek	33.0 milliseconds
Peak transfer rate, bus synchronous	4.0 Mbytes/s

Physical Specifications	
Height	8.26 cm (3.25 in)
Width	14.60 cm (5.75 in)
Depth	20.30 cm (8.40 in)
Weight	3.80 kg (8.4 lb)

Configuration Information	
Form factor	Standard 5.25-in footprint
Power requirements	+5.25 Vdc, 1.48 A peak
	+12.6 Vdc, 4.8 A peak
Power consumption	33 W peak

Related Documentation	
EK–RZXXD–PS–001	RZ-Series Disk Drive Subsystem Pocket Service Guide

2.2.11 TK50Z Tape Subsystem

The following table describes the TK50Z (SCSI) tape drive specifications.

Functional Specifications	
Read/write speed	75 in/s, streaming
Peak transfer rate	Total: 62.5 Kbytes/s; user data: 45 Kbytes/s
Recording method	Serial, serpentine pattern
Recording density	6667 bits/in
Record size	Variable to 64 Kbytes to 1 Kbyte
Maximum capacity	95 Mbytes (formatted)
Recording medium length	182.9 m (600 ft)
Recording medium width	1.3 cm (0.5 in)

Configuration Information	
Voltage	120/240 Vac
Power consumption	230 W
Drive	40 W, maximum
Weight	5 kg (2.3 lb)

Physical Specifications	
Height	30 mm (12 in)
Width	35 mm (14 in)
Depth	11.5 mm (4.5 in)
Weight	7.7 kg (17 lb)

2.2.12 TK70 Tape Drive

The TK70 tape drive is a streaming tape drive subsystem that can store up to 296 Mbytes on a tape cartridge for backup data storage.

Functional Information	
Recording media	Magnetic tape
Tape dimensions	1.27 cm (0.5 in) wide, 182.9 m (600 ft) long
Mode of operation	Streaming
Recording method	Serpentine
Recording density	10,000 bits/in
Number of tracks	48
Storage capacity	296 Mbytes formatted

Ordering Information
Included as part of base system

Performance	
Tape start time	325 milliseconds maximum
Tape stop time	200 milliseconds maximum
Tape speed	390 cm/s (100 in/s)
Streaming data rate	125 Kbytes/s
Access time (from insertion of tape)	
TK50 mode (read-only)	35 minutes maximum
TK70 mode	60 minutes maximum

Physical Specifications	
Height	8.25 cm (3.25 in)
Width	14.60 cm (5.70 in)
Depth	21.44 cm (8.44 in)
Weight	3.07 kg (5.0 lb)

Configuration Information	
Form factor	Standard 5.25-in footprint
Power requirements	+5 Vdc, 1.3 A
	+12 Vdc, 2.4 A
Power consumption	35.3 W

Configuration Information	
Bus loads	0.0 ac 0.0 dc

Related Documentation	
EK–OTK70–OM	TK70 Tape Drive Subsystem Owner's Manual
EK–OTK70–TM	TK70 Tape Drive Subsystem Technical Manual
EK–OTK70–SM	TK70 Tape Drive Subsystem Service Manual

2.2.13 TLZ04 Tape Drive

The TLZ04 is a SCSI cassette tape drive, either tabletop or embedded.

Functional Specifications	
Mode of operation	Streaming and start/stop
Drive interface	Small computer system interconnect (SCSI)

Ordering Information	
TLZ04–AA	Embedded
TLZ04–DA	Tabletop

Performance	
Passes per cassette tape	300
Media	TLZ04–CA cassette tape
Bit density	114 Mbits per square inch
Transfer rate (sustained)	183 Kbyte/s
Recording format	Digital data storage (DDS)
Cassette capacity	1.2 gigabytes

Physical Specifications	
Height	10 cm (3.8 in), tabletop 8.2 cm (3.35 in), embedded
Width	32.5 cm (12.7 in), tabletop 14.6 cm (5.75 in), embedded
Depth	28.5 cm (11.2 in), tabletop 20.3 cm (8.0 in), embedded
Weight	7.72 kg (17 lb), tabletop 2.20 kg (7.72 lb), embedded

Configuration Information	
Power requirements	100 to 120 V, 1.6 A 200 to 240 V, 1.0 A
Power consumption	15.2 W max

2.2.14 TQK70 Controller

The TQK70 controller module provides the interface between the TK70 tape drive and the Q22-bus.

Functional Information

Controller protocol	TMSCP
Supported drive	TK70
Drives per controller	1
Drive interconnect	Direct
Controllers per system	1 maximum

Ordering Information

Included as part of base system

Performance

Data throughput rate	125 Kbytes/s
Read/Write data transfers	Up to 16-word burst mode DMA, truncated to 8-word burst mode if another device is requesting the bus
Buffer size	64 Kbytes

Configuration Information

Form factor	Dual height
Power requirements	+5 Vdc, 3.2 A
	+12 Vdc, 0.0 A
Power consumption	15.0 W
Bus loads	4.3 ac
	0.5 dc

Related Documentation

EK–OTK70–OM	TK70 Tape Drive Subsystem Owner's Manual

2.2.15 TS05 Tape Drive

The TS05 is a magnetic streaming tape drive that provides 40.5 Mbytes of backup storage. The TS05 reads or writes up to 160 Kbytes per s in standard ANSI format.

Functional Specifications	
Recording media	Magnetic tape
Tape dimensions	1.27 cm (0.5 in) wide, 731 m (2400 ft) long
Recording density	1,600 bits/in
Recording method	Phase encoded (PE)
Storage capacity	40 Mbytes, formatted
Mode of operation	Streaming
Rewind speed	180 in/s (max)
Transports/controller	1
Number of tracks	9

Ordering Information	
TSV05–SB	TSV05 tape drive subsystem

Performance	
Handling	Bidirectional reel-to-reel with compliance arm
Tape velocity	64 or 254 cm/s (25 or 100 in/s)
Maximum data transfer rate	40 or 160 Kbytes/s
Rewind time	2.8 minutes/2,400 reel

Physical Specifications	
Height	23 cm (8.75 in)
Width	43 cm (17 in)
Depth	62 cm (24.5 in)
Weight	36 kg (80 lb)

Configuration Information	
Form factor	10.5 in high, full rack width

Related Documentation	
EK-TSV05-UG	**TSV05 Tape Transport System User's Guide**
EK-TSV05-TM	**TSV05 Tape Transport Subsystem Technical Manual**

2.2.16 TSV05 Controller

The TSV05 is a magnetic tape system with control module, hardware for rack-mounting, and the cables.

Functional Specifications	
Controller protocol	Controller unique
Supported drive	TS05
Drives per controller	1
Drive interconnect	Direct

Ordering Information	
TSV05–SB	TSV05 tape drive subsystem

Performance	
Buffer size	3.5 Kbytes

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 6.5 A (typical)
Power consumption	32.5 W
Bus loads	3.2 ac 1.0 dc

Related Documentation	
EK–TSV05–UG	TSV05 Tape Transport System User's Guide

2.2.17 TU81–Plus Tape Drive

The TU81–Plus is a reel-to-reel tape drive mounted in a 101.6-cm (40-in) cabinet. The drive supports two industry-standard recording methods: group coded recording (GCR) and phase encoded (PE).

Storage Capacity	
PE unformatted	45.3 Mbytes
PE formatted	40.0 Mbytes
GCR unformatted	177 Mbytes
GCR formatted	140 Mbytes

Functional Specifications	
Recording media	Magnetic tape
Tape dimensions	1.27 cm (0.5 in) wide, 731 m (2400 ft) long
Mode of operation	Streaming
Recording methods	Group code recording (GCR) Phase encoded (PE)
Recording density	6250 bits/in (GCR) 1600 bits/in (PE)
Number of tracks	9

Ordering Information	
TU81E–DA	TU81–Plus tape drive, KLESI controller for 120 V
TU81E–DB	TU81–Plus tape drive, KLESI controller for 240 V

Performance	
Handling	Bidirectional reel-to-reel
Tape velocity	
High speed	190.5 cm/s (75 in/s)
Low speed	63.5 cm/s (25 in/s)
Channel data transfer rate	
PE high speed	120 Kbytes/s
PE low speed	40 Kbytes/s
GCR high speed	469 Kbytes/s
GCR low speed	156 Kbytes/s
Rewind time (731.5 m (2400 ft) tape on 26.7 cm (10.5 in) reel)	2.75 minutes maximum

Physical Specifications

Height	105.8 cm (41.7 in)
Width	54.6 cm (21.5 in)
Depth	76.2 cm (30.0 in)
Weight	139 kg (295 lb)

Related Documentation

EK-TU81E-UG	TU81-Plus Tape Subsystem User's Guide

2.3 Communications Options

The DECsystem 5500 supports the following communications options:

- CXA16 asynchronous multiplexer (16 lines)
- CXB16 asynchronous multiplexer (16 lines)
- CXY08 asynchronous multiplexer (8 lines)
- DESQA Ethernet controller
- DSV11 synchronous controller

Asynchronous Serial Controllers

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

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.

Ethernet Controllers

Ethernet controllers connect your system to an Ethernet network. With a network connection and appropriate DECnet software, you can use all network services.

2.3.1 CXA16 Asynchronous Multiplexer (16 lines)

The CXA16 is an intelligent, preprogrammed serial controller that can operate in either DHV11 or DHU11 mode, depending on the setting of an on-board switch. The module contains 16 multiplexed lines.

Functional Information	
Supported line interfaces	EIA RS–423–A/CCITT V.10 EIA RS–232–D/CCITT V.28 DEC–423
Split-speed operation	All lines
Flow control (XON/XOFF)	All lines
Supported data formats	16 programmable formats (each with 1 start bit) • 5, 6, 7, or 8 data bits, 0 or 1 parity bit, and 1 stop bit • 5 data bits, 0 or 1 parity bit, and 1.5 stop bits • 6, 7, or 8 data bits, 0 or 1 parity bit, and 2 stop bits Parity, if enabled, can be either odd or even.
Modem control	None

Ordering Information	
CXA16–AF	CXA16 field-installed kit. Includes two 7.6-m (25-ft) BC16D–25 cables, two H3104 cable concentrators, and other accessories required to install the option. • BC16D–25 cable—data only, 36-conductor, terminated with 36-pin Amphenol plug connectors • H3104 cable concentrator—concentrates eight BC16E cables into one BC16D cable; eight modified modular jacks and one 36-pin Amphenol socket connector

Ordering Information

BC16E-series cable	Office cable—data only, six-conductor, terminated with modified modular plugs • BC16E–10: 3 m (10 ft) • BC16E–25: 7.6 m (25 ft) • BC16E–50: 15.2 m (50 ft)
H8572	Cable extender. Null modem cable terminated with modified modular jacks.
H8571–A	25-pin passive adapter[1]
H8571–B	9-pin passive adapter[1]
H3105	Active adapter. Converts EIA RS–232–D signals to DEC–423 signals.

Performance

Transmit data transfers	Single-character programmed transfers or up to 16-character block mode DMA transfers in DHV11 mode
	Single-character or two-character programmed transfers, or up to 16-character block mode DMA transfers in DHU11 mode
Receive data transfers	Single-character programmed transfers in both DHV11 and DHU11 modes
Transmit buffer size	One character for programmed transfers in DHV11 mode
	64-character FIFO for programmed transfers in DHU11 mode
	64-character FIFO for DMA transfers in DHU11 and DHV11 modes
Receive buffer size	256-character FIFO in DHV11 and DHU11 modes
Supported baud rates	16 programmable baud rates: 50; 75; 110; 134.5; 150; 300; 600; 1200; 1800; 2000; 2400; 4800; 7200; 9600; 19,200; 38,400[2]
Throughput at maximum baud rate:	
5 data bits, 0 parity bit, 1 stop bit	140,000 characters/s (all lines)
7 data bits, 1 parity bit, 1 stop bit	110,000 characters/s (all lines)

[1]Converts a D-connector to a modified modular jack. Required for connecting terminals and printers to office cables terminated with modified modular plugs.

[2]38,400 baud rate is not supported by Digital operating systems.

Configuration Information

Form factor	Quad height with integral, recessed cover panel
Power requirements	+5 Vdc, 1.4 A (typical)
	+12 Vdc, 0.14 A (typical)
Power consumption	8.7 W
Bus loads	3.2 ac
	1.5 dc
Module connectors	2 36-pin Amphenol socket connectors

Related Documentation

EK–CAB16–UG	CXA16/CXB16 User's Guide
EK–CAB16–TM	CXA16/CXB16 Technical Manual

2.3.2 CXB16 Asynchronous Multiplexer (16 lines)

The CXB16 is an intelligent, preprogrammed serial controller that can operate in either DHV11 or DHU11 mode, depending on the setting of an on-board switch. The module contains 16 multiplexed lines.

Functional Information	
Supported line interfaces	EIA RS-422-A/CCITT V.11 X.27
Split-speed operation	All lines
Flow control (XON/XOFF)	All lines
Supported data formats	16 programmable formats (each with 1 start bit) • 5, 6, 7, or 8 data bits, 0 or 1 parity bit, and 1 stop bit • 5 data bits, 0 or 1 parity bit, and 1.5 stop bits • 6, 7, or 8 data bits, 0 or 1 parity bit, and 2 stop bits Parity, if enabled, can be either odd or even.
Modem control	None

Ordering Information	
CXB16-AF	Module and cable kit. Includes two 7.6-m (25-ft) BC16D-25 cables, two H3104 cable concentrators, and other accessories required to install the option. • BC16D-25 cable—data only, 36-conductor, terminated with 36-pin Amphenol plug connectors • H3104 cable concentrator—concentrates eight BC16E cables into one BC16D cable; eight modified modular jacks and one 36-pin Amphenol socket connector
BC16E-series cable	Office cable—data only, six-conductor, terminated with modified modular plugs • BC16E-10: 3 m (10 ft) • BC16E-25: 7.6 m (25 ft) • BC16E-50: 15.2 m (50 ft)

Ordering Information

H8572	Cable extender. Null modem cable terminated with modified modular jacks.

Performance

Transmit data transfers	Single-character programmed transfers or up to 16-character block mode DMA transfers in DHV11 mode
	Single-character or two-character programmed transfers, or up to 16-character block mode DMA transfers in DHU11 mode
Receive data transfers	Single-character programmed transfers in both DHV11 and DHU11 modes
Transmit buffer size	One character for programmed transfers in DHV11 mode
	64-character FIFO for programmed transfers in DHU11 mode
	64-character FIFO for DMA transfers in DHU11 and DHV11 modes
Receive buffer size	256-character FIFO in DHV11 and DHU11 modes
Supported baud rates	16 programmable baud rates: 50; 75; 110; 134.5; 150; 300; 600; 1200; 1800; 2000; 2400; 4800; 7200; 9600; 19,200; 38,400[1]
Throughput at maximum baud rate:	
5 data bits, 0 parity bit, 1 stop bit	140,000 characters/s (all lines)
7 data bits, 1 parity bit, 1 stop bit	110,000 characters/s (all lines)

Configuration Information

Form factor	Quad height with integral, recessed cover panel
Power requirements	+5 Vdc, 1.4 A (typical)
	+12 Vdc, 0.14 A (typical)
Power consumption	8.7 W
Bus loads	3.2 ac
	1.5 dc
Module connectors	2 36-pin Amphenol socket connectors

[1]38,400 baud rate is not supported by Digital operating systems.

Related Documentation	
EK–CAB16–UG	CXA16/CXB16 User's Guide
EK–CAB16–TM	CXA16/CXB16 Technical Manual

2.3.3 CXY08 Asynchronous Multiplexer (8 Lines)

The CXY08 asynchronous multiplexer performs data concentration, real-time processing, and interactive terminal handling. The CXY08 can operate in either DHV11 or DHU11 mode, depending on the setting of an on-board switch. The CXY08 supports full modem control.

Functional Information	
Supported line interfaces	EIA RS–423–A/CCITT V.10 EIA RS–232–D/CCITT V.28 DEC–423
Split-speed operation	All lines
Flow control (XON/XOFF)	All lines
Supported data formats	16 programmable formats (each with 1 start bit) • 5, 6, 7, or 8 data bits, 0 or 1 parity bit, and 1 stop bit • 5 data bits, 0 or 1 parity bit, 1.5 stop bits • 6, 7, or 8 data bits, 0 or 1 parity bit, and 2 stop bits Parity, if enabled, can be either odd or even.
Modem control	Full
Supported modems	Bell models 103, 113, 212

Ordering Information	
CXY08–AF	CXY08 field-installed kit. Includes two 3.7-m (12-ft) BC19N–12 cable assemblies and other accessories required to install the option. • BC19N–12 cable assembly—concentrates four 11-conductor cables with 25-pin plug D-connectors into one 44-connector cable terminated by a 50-pin plug CHAMP connector.

Performance	
Transmit data transfers	Single-character programmed transfers or up to 16-character block mode DMA transfers in DHV11 mode

Performance

	Single-character or two-character programmed transfers, or up to 16-character block mode DMA transfers in DHU11 mode
Receive data transfers	Single-character programmed transfers in both DHV11 and DHU11 modes
Transmit buffer size	One character for programmed transfers in DHV11 mode
	64-character FIFO for programmed transfers in DHU11 mode
	64-character FIFO for DMA transfers in DHU11 and DHV11 modes
Receive buffer size	256-character FIFO in DHV11 and DHU11 modes
Supported baud rates	16 programmable baud rates: 50; 75; 110; 134.5; 150; 300; 600; 1200; 1800; 2000; 2400; 4800; 7200; 9600; 19,200; 38,400[1]
Throughput at maximum baud rate:	
5 data bits, 0 parity bit, 1 stop bit	87,771 characters/s (all lines)
7 data bits, 1 parity bit, 1 stop bit	61,440 characters/s (all lines)

Configuration Information

Form factor	Quad height with integral, recessed cover panel
Power requirements	+5 Vdc, 1.3 A (typical)
	+12 Vdc, 0.14 A (typical)
Power consumption	8.2 W
Bus loads	1.5 ac
	1.0 dc
Module connectors	2 50-pin CHAMP socket connectors

Related Documentation

EK–CXY08–UG	CXY08 User's Guide
EK–CXY08–TM	CXY08 Technical Manual

[1]38,400 baud rate is not supported by Digital operating systems.

2.3.4 DESQA Ethernet Controller

The DESQA Ethernet controller provides a high-speed asynchronous connection between a Q22-bus system and a local area network (LAN) based on Ethernet or IEEE 802.3. The DESQA supports either standard or ThinWire Ethernet cabling.

Functional Information	
Supported protocols	Ethernet, IEEE 802.3 Maintenance Operation Protocol (MOP)

Ordering Information	
DESQA–SF	DESQA field-installed kit
External cable (standard)	BNE3B or BNE3D
External cable (ThinWire)	BC16M

Performance	
Transmit/Receive data transfers	Up to 32-byte block mode DMA
Transmit data transfers	2-Kbyte FIFO for DMA transfers
Receive data transfers	4-Kbyte FIFO for DMA transfers
Throughput at maximum rate	10 Mbits/s

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 2.4 A +12 Vdc, 0.22 A
Power consumption	14.64 W
Bus loads	3.3 ac 0.5 dc
Module connectors (standard)	One 15-pin D-type
Module connectors (Thinwire)	T-connector to BNC connector on DESQA

Related Documentation	
EK–DESQA–TM	DESQA Technical Manual

2.3.5 DSV11 Synchronous Controller

The DSV11 is a two-channel, high-speed, synchronous controller that interfaces Q22-bus backplanes.

Functional Information	
Supported line interfaces	RS–423 RF–422 RS–232/V.24, V.35
Supported protocols	DDCMP HDLC/SDLC BISYNC
Operating mode	Full or half-duplex
Modem support	Full modem control

Ordering Information	
DSV11–SF	Field-installed kit (first DSV11)
DSV11–SG	Field-installed kit (additional DSV11s)

Performance Information	
Transmit/Receive data transfers	DMA
Data rate, Mbits/s (maximum)	RS–232–C/V.24 = up to 20K RS–423 = 100K RS–422 = 256K V.35 = 48K

Configuration Information	
Form factor	Quad height
Power requirements	+5 Vdc, 6.5 A (typical) +12 Vdc, 0.875 A (typical)
Power consumption	+5 Vdc, 32.5 W (maximum) +12 Vdc, 10.5 W (maximum)
Bus loads	3.3 ac 1.0 dc

Related Documentation	
EK–DSV11–UG	DSV11–S Communications Option User Guide
EK–DSV11–TD	DSV11 Communications Option Technical Description

2.3.6 Configuration Worksheet

Use Figure 2–1 to be sure a configuration does not exceed system limits for expansion space, power, and bus loads. If you use standard Digital modules, you will not exceed the limits for bus loads.

When changing a configuration, use the worksheet as follows:

1. On the worksheet, list all the devices already installed in the system.
2. List all the devices you plan to install in the system.
3. Fill in the information for each device, using the data listed in Table 2–2.
4. Add up the columns. Make sure the totals are within the limits for the enclosure.

NOTE: *Check the CPU documentation to determine which options are supported for a specific system.*

3.3 Vdc and –12 Vdc are not required on any DECsystem 5500 modules or options.

Figure 2–1: BA430 Configuration Worksheet

SLOT	MODULE	Current (Amps) +5 Vdc	+12 Vdc	-3.3 Vdc	-12 Vdc	Power (Watts)	Bus Load AC	DC
0	M9715							
I/O 1								
CPU 2								
MEM 3								
Qbus/MEM 4								
Qbus/MEM 5								
Qbus/MEM 6								
Qbus 7								
Qbus 8								
Qbus 9								
Qbus 10								
Qbus 11							—	—
Qbus 12								
H3602								
MASS STORAGE:								
Tape							—	—
1								
2								
3								
Total these columns:								
Must not exceed:		60.0 A	22.0 A	15.0 A	3.0 A	584.0 W	31	20

Note: Total output power from +3.3 Vdc and +5 Vdc must not exceed 330 W.

MLO-005360

Table 2–2: Power and Bus Load Data

		Current (Amps) Max		Power Max	Bus Loads	
Option	Module	+5 V	+12 V	Watts	AC	DC
CXA16–M	M3118–YA	1.60	0.20	10.40	3.0	0.5
CXB16–M	M3118–YB	2.00	0.00	10.00	3.0	0.5
CXY08–M	M3119–YA	1.64	0.395	12.94	3.0	0.5
DESQA–SA	M3127–PA	2.40	0.22	14.64	2.2	0.5
DSV11	M3108	5.43	0.69	35.43	3.9	1.0
KDA50–SA	M7164	6.93	0.00	34.65	3.0	0.5
—	M7165	6.57	0.03	33.21	–	–
KFQSA–M	M7769	5.50	0.00	27.50	4.4	0.5
KLESI–SA	M7740–PA	4.00	0.00	20.00	0.5	1.0
KRQ50–SA	M7552	2.70	0.00	13.50	2.7	1.0
KZQSA–SA/SF	–	5.4	0.00	27.00	4.75	1.4
LPV11–SA	M8086–PA	2.80	0.00	14.00	1.8	0.5
RF31E–AA	–	1.00	2.80	38.60	–	–
RF71E–AA	–	1.25	1.64	25.93	–	–
RZ56E–AA/AF	–	1.48	4.8	–	–	–
RZ57E–AA/AF	–	1.48	4.8	–	–	–
TK70E–AA	–	1.50	2.40	36.30	–	–
TLZ04–AA	–	2.2	2.0	15.2	–	–
TQK70–SA	M7559	3.50	0.00	17.50	4.3	0.5
TSV05–SA	M7530	6.50	0.00	32.50	1.5	1.0
TSV05–SA	M7206	6.50	0.00	32.50	2.4	1.0

CHAPTER 3

Chapter 3

System Expansion: Storage and Backplane

This chapter provides guidelines on how to expand your system.

3.1 Planning Your System Expansion

Consider the following when you decide to expand your system:

- Can your system accommodate additional supported options?

  Determine the potential of your system by filling in the BA430 configuration worksheet (Figure 2–1). Fill in the specifications of the options currently installed in your system and those you wish to add.

- If your existing system cannot accommodate a particular set of supported options, you might wish to expand your system with one of the following mass storage and/or Q-bus expanders:

Expander Name	Additional Q22-Bus Slots	Additional Storage Capacity
B213F	11	Up to three RF-series ISEs.
R215F	0	Up to three RF-series ISEs.
H9644	11	Support for up to two RA70 disk drives, one TK70 tape drive, and two RA-series disk drives.
B400X	11	Up to four RF-series and/or SCSI disks, with room for one TK70 tape.
R400X	0	Up to seven RF-series and/or SCSI disks, with room for one TK70 tape.

SCSI expansion is implemented with a BC09P cable. Only one 6-ft cable is used per SCSI bus if the expansion is internal. Two 6-ft cables are used for external expansion.

DSSI storage bus connection to external expanders is implemented with a BC21M–09 cable.

INDEX

Index

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