DECstation 5000 Model 240 Workstation Reference Card

WS33R002

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Table 1. Boot Commands

Command	Description
boot	Boots the system software as specified by the boot environment variable.
boot 3/tz5/vmunix -a	Boots the system software from the tape drive that has SCSI ID 5 on the base system SCSI connector.
boot 3/rz0/vmunix -a	Boots the system software from the optical compact disc drive that has SCSI ID on the base system SCSI connector.
boot 3/mop -a	Boots the system software from the network.

Table 2. Configuration Display Commands

Command	Description
cnfg	Displays the general hardware configuration for the workstation.
cnfg 3	Displays the detailed hardware configuration for the base system.
cnfg 0	Displays the detailed hardware configuration for option slot 0.
cnfg 1	Displays the detailed hardware configuration for option slot 1.
cnfg 2	Displays the detailed hardware configuration for option slot 2.

Table 3. Console Commands

Command	Description
?	Displays a list of console commands and formats.
cat *slot #/scriptname*	Displays the contents of a specific script.
d	Writes values to memory. See your DECstation 5000 Model 240 Operator's Guide for details.
e	Examines contents of memory. See your DECstation 5000 Model 240 Operator's Guide for details.
erl	Displays a log of error messages.
go	Transfers control of the workstation to the specified address.
init	Resets the system.

Table 3 (Cont.). Console Commands

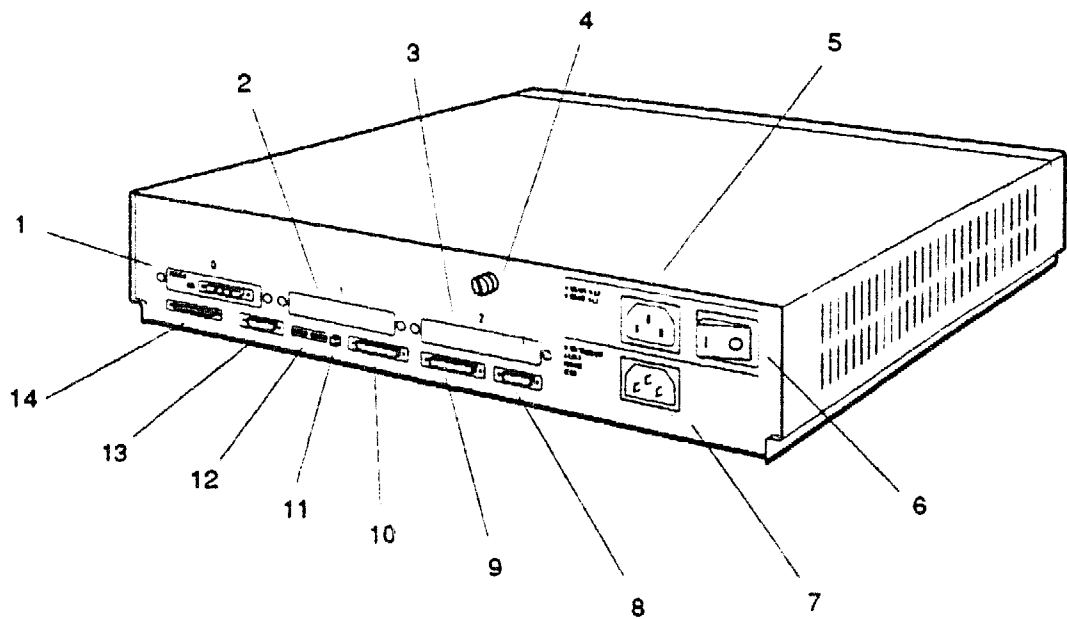| Command	Description
ls [#]	Displays a list of the files in a module ROM. If no slot number is specified, files for all modules are listed.
passwd	Prompts you for the password that allows access to privileged console commands.
passwd -s	Sets a new password. The new password takes effect after the system is reset.
passwd -c	Clears the existing password.
printenv	Displays the value of environment variables.
restart	Restarts the worksystem software.
script	Enters a short script at the console.
setenv *variable value*	Sets the value of an environment variable.
sh	Activates or runs a script.
t	Runs module self-tests.
test	Tests all system hardware.
0/pst-t	Tests the hardware connected to option slot 0.
1/pst-t	Tests the hardware connected to option slot 1.
2/pst-t	Tests the hardware connected to option slot 2.
3/pst-t	Tests the base system hardware.
unsetenv *variable value*	Deletes an environment variable.

Table 4. Environment Variables Set by the User

Variable	Description
boot	The default bootpath specification. Some sample values are 3/rz0/vmunix, 3/tz5, 3/mop/filename, and 6/tftp.
console	Specifies which device acts as the console terminal. Value s = use printer port; any value other than s = auto configure the console. Use the H8571A communications adapter that comes with the workstation to attach the console terminal to the workstation.
testaction	Selects the level of self-test to be executed automatically. Possible values are q for brief tests and t for more thorough tests.
haltaction	Specifies which action the console performs at powerup or following a reset. Possible values are h = halt, r = restart and b = bootstrap.

Table 5. SCSI ID Switch Settings

ID Number	Hard Disk Drive RRD42 Compact Disc Drive TZ30 Tape Drive[1]	TK50Z Tape Drive TLZ04 Tape Drive[2] RX23, RX33 Floppy Disk Drive
7	Reserved	Reserved
6	Up Up Down	Down Down Up
5	Up Down Up	Down Up Down
4	Up Down Down	Down Up Up
3	Down Up Up	Up Down Down
2	Down Up Down	Up Down Up
1	Down Down Up	Up Up Down
0	Down Down Down	Up Up Up

[1]Switch 1 (the left switch) on the TZ30 tape drive should always be in the up position. ID switch settings listed for this drive start with switch 2.

[2]Switch 1 (the left switch) on the TLZ04 tape drive should always be in the up position. ID switch settings listed for this drive start with switch 2.

1. TURBOchannel option slot 0
   with graphics module installed
2. TURBOchannel option slot 1
3. TURBOchannel option slot 2
4. Cover-release screw
5. Monitor-to-system-unit power connector
6. On/off switch
7. System unit power connector

8. Keyboard-mouse connector
9. Communications connector 2
10. Communications connector 3
11. Halt button
12. Diagnostic LED display
13. Base system ThickWire Ethernet
    connector
14. Base system SCSI connector

WS3PO013

EK-PM38G-RC-001

INSTALLATION GUIDE

DECstation 5000 Model 240

Hardware Installation Guide

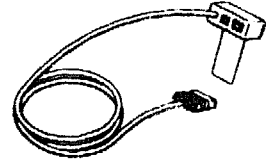# Parts of the Basic Workstation

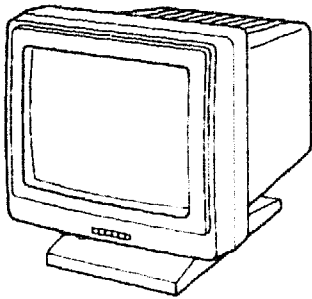## The basic workstation includes the following items:
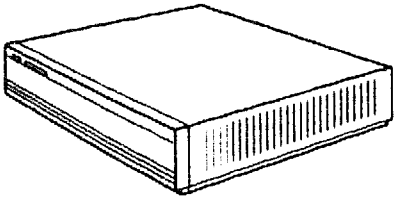
System unit

Keyboard with cable
(Keyboard ordered may
differ from the one shown.)

Keyboard-mouse cable assembly

Monitor

Mouse with cable

System-unit-to-expansion-box cable

**One of these three video
cable assemblies:**

Antistatic wrist strap

Monitor-to-system-unit
power cable

Gray-scale video cable assembly

Screwdrivers

System unit power cord
(This may need to be ordered separately
out side of the U S A)

Color video cable assembly

Communication
connector adapter

Monitor power cord
(This may need to be ordered separately
out side of the U S A)

Monochrome video cable assembly

ThickWire Ethernet
loopback connector

WS3PI057

Contents

Figures

Tables

Step 1—Open each box of your workstation shipment and identify its contents.

1. Keep together all hardware, cables, and power cords that came in the same carton.

   Caution: Do not remove internal option modules from their antistatic bags until you are ready to install them. Handling a module without first attaching an antistatic wrist strap can damage the module.

2. Identify the items in each box, using the packing list that came with your shipment, the "Parts of the Basic Workstation" figure on page ii of this guide, and the following general list.

   The basic workstation includes

   - System unit
   - Monitor
   - Keyboard
   - Mouse
   - Associated cables, power cords, and connectors

   In addition to these components, your workstation shipment should include

   - Any internal option modules you ordered
   - Any external storage devices (tape, disk, or compact disc drives) you ordered
   - Cables, power cords, and connectors for the optional items you ordered
   - Any software you ordered
   - User documentation for the basic workstation
   - Documentation for the optional hardware you ordered
   - Documentation for the software you ordered

   Each workstation component comes with its own set of required and optional cables and connectors. This may result in some duplicate items in your shipment that you will not use.

Step 2—Find and organize all workstation hardware documentation.

Find the following hardware documentation for your basic workstation, organize it, and put it into the hardware documentation binder, separated by tabs:

- *DECstation 5000 Model 240 Hardware Installation Guide*
- *DECstation 5000 Model 240 Hardware Operator's Guide*
- *TURBOchannel Options User's Guide*, if included

Locate and organize any other hardware documentation that was shipped with your workstation components:

- Documentation for any external storage devices you ordered
- Documentation for any external communications devices you ordered
- Any other hardware documentation

Step 3—Set up the system unit.

Caution: It takes two people to unpack the system unit safely.

1. Place the system unit flat on a level surface.

   Caution: Standing the system unit on its side blocks the cooling vents and can damage the unit by causing it to overheat.

Power
indicator
light
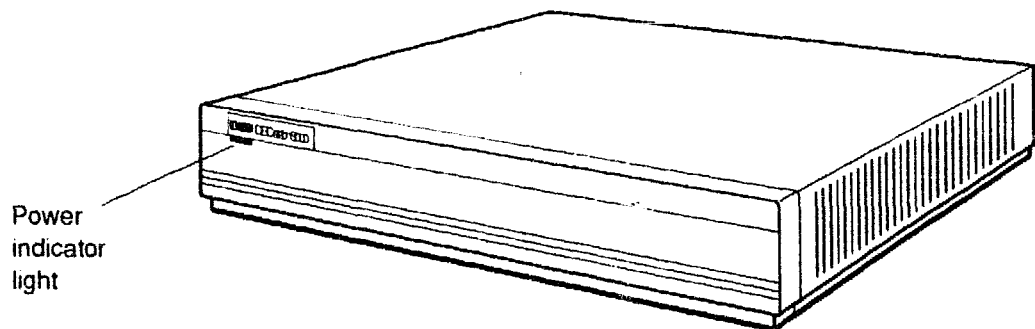
WS3PI098

Figure 1.   Front of the system unit

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2. Locate the three TURBOchannel option slots, the five base system connectors, the diagnostic LED display, the halt button, and the on/off switch on the back of the system unit.

TURBOchannel option slot 0 (shown with a graphics module installed)

TURBOchannel option slot 1

TURBOchannel option slot 2

On/off switch

Base system SCSI connector

Base system ThickWire Ethernet connector

Base system communications connector 3

Base system keyboard-mouse connector

Diagnostic LED display

Halt button

Base system communications connector 2
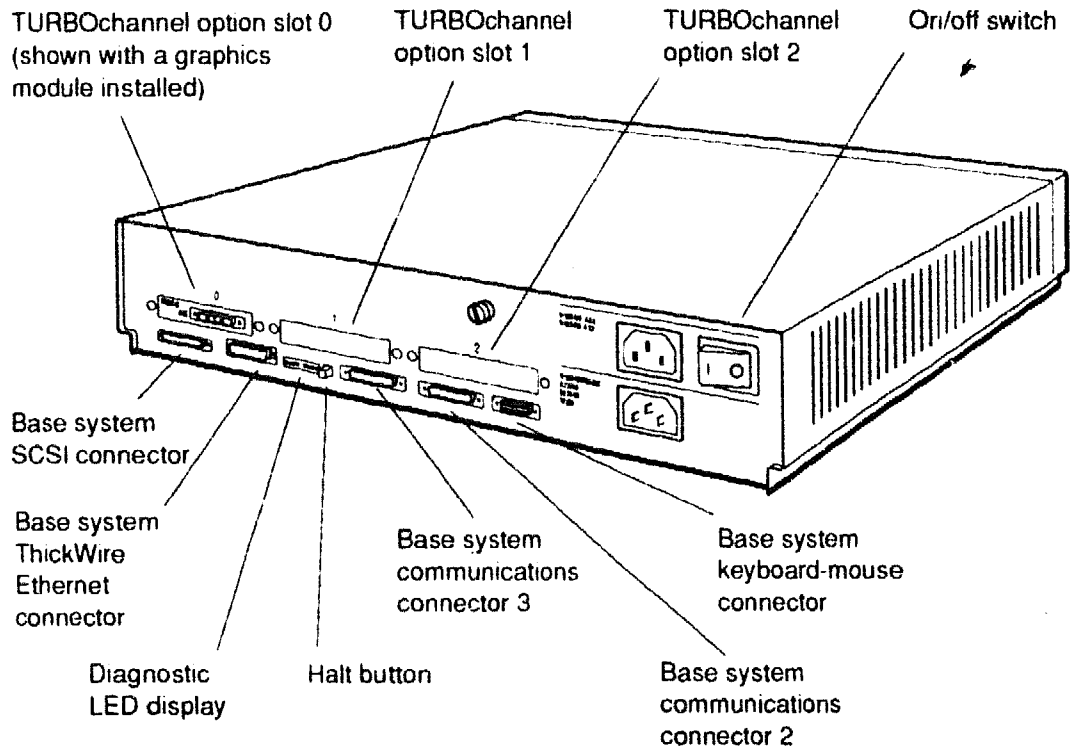
WS3PI009

Figure 2. Back of the system unit

The connectors on the back of the system unit are labeled with the following icons to remind you of their functions:

⌗	Ethernet	⇄	Communications
▬	Keyboard	⫽	Reset button
⊕	Mouse	◇	SCSI
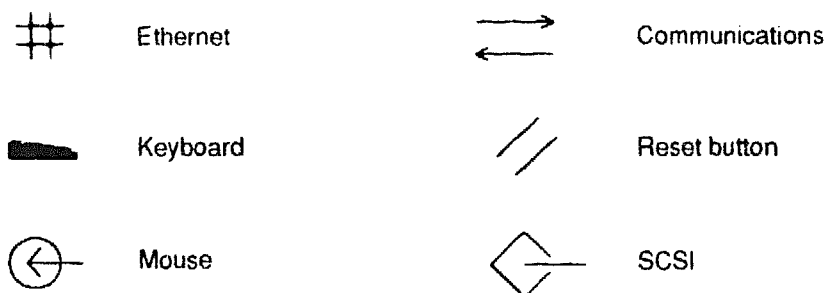
WS3PI097

Figure 3. Icons on the system unit

3. Find the ThickWire Ethernet loopback connector that came with your workstation.

Front   Back
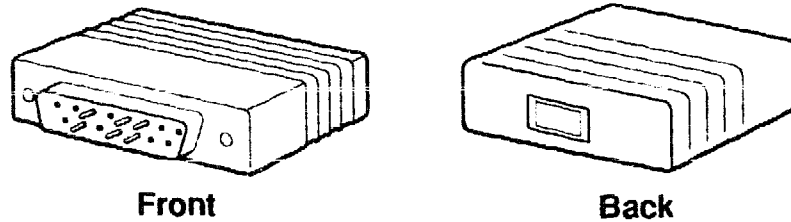
WS3PI030

Figure 4. ThickWire Ethernet loopback connector

4. Hold the ThickWire Ethernet loopback connector so the widest part of the metal connector frame is on top and push the connector directly into the ThickWire connector on the base system unit.

ThickWire Ethernet
loopback connector

Base system
ThickWire Ethernet
connector
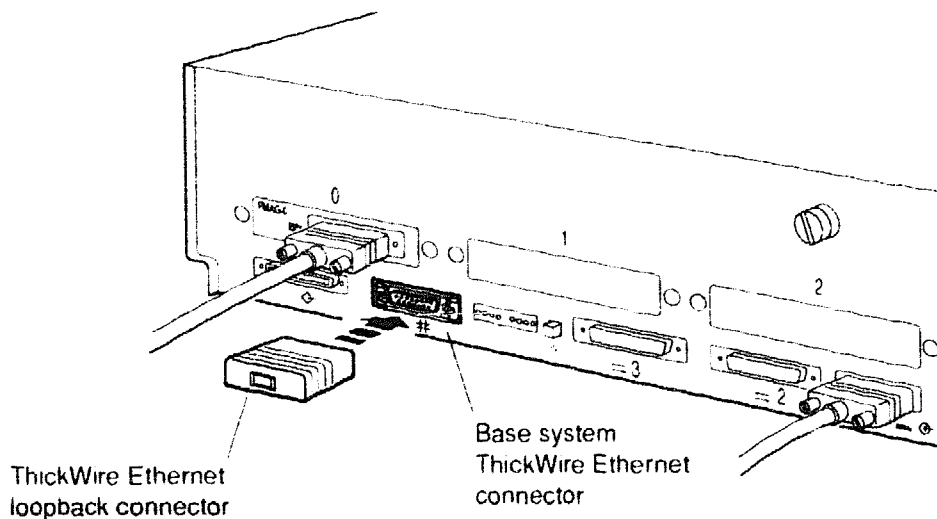
WS3PI031

Figure 5. Connecting a ThickWire Ethernet loopback connector to the system unit

4

5. If you have any Ethernet controller options in the TURBOchannel option slots, put Ethernet loopback connectors on these connectors also. (The workstation comes with only one Ethernet loopback connector. An extra loopback connector must be ordered for each Ethernet controller option module you have in a TURBOchannel option slot.)

Caution: *The workstation will not perform correctly unless all unused Ethernet connectors are properly terminated with loopback connectors.*

6. Check the voltage requirement labels printed on the back of the system unit (or check for a yellow voltage label covering the system unit power connector).

Caution: *Connecting a device to a power source that does not meet the voltage requirements of that device can damage the device.*
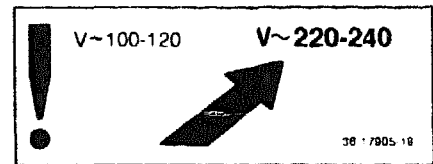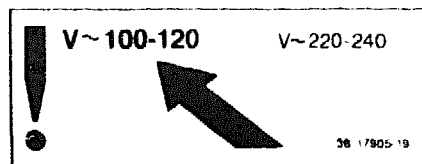
WS3PI007

Figure 6. Voltage labels

7. Make sure the on/off switch on the system unit is in the off position.

Press the 0 on
this type of switch

WS3PI034

Figure 7. On/off switch in the off position

8. Connect the appropriate end of the system unit power cord to the system unit power connector.

Do not plug the power cord into a power outlet until you have installed all of the other workstation components.

Caution: Installing workstation components while the system unit is connected to a power source may damage the components if the power is on.
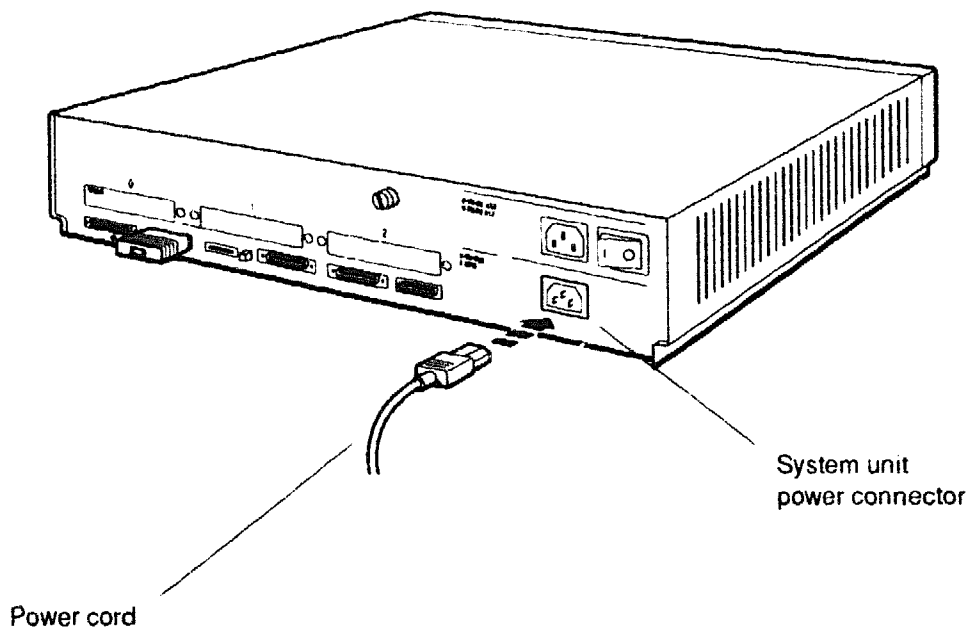
WS3PI100

Figure 8. Connecting the system unit power cord to the system unit

Step 4—Install any internal options in the system unit or expansion boxes.

Most workstations come with internal options preinstalled at the factory. Some options may be shipped separately and will need to be installed in the system unit or in an expansion box.

Caution: Always use an antistatic wrist strap when handling internal option modules. Touching the modules without antistatic protection can damage the modules.

1. If you need to install an internal tape, disk, or compact disc drive inside a BA42 expansion box, mark your place in this guide and refer to the appropriate section of the *BA42 Installation Guide*. Do not connect the BA42 box to the system unit yet.

2. If you need to install an internal tape, disk, or compact disc drive inside a TURBOchannel extender (TCE), mark your place in this guide and refer to the appropriate section of the *TURBOchannel Extender Operator's Guide*. Do not connect the TCE to the system unit or to an expansion box with a SCSI cable yet. Leave the TCE cover off for now if you also have TURBOchannel options to install in the TCE.

3. If you have memory modules, an NVRAM module, a CPU module, or any TURBOchannel option modules that you plan to install in the system unit, remove the system unit cover.

    a. Loosen the captive screw on the back of the unit (it can be loosened, but not removed).

    b. Stand in front of the unit, grasp both sides of the cover with your hands, and pull the cover straight toward you about 2 inches (6 centimeters). Then pull up.
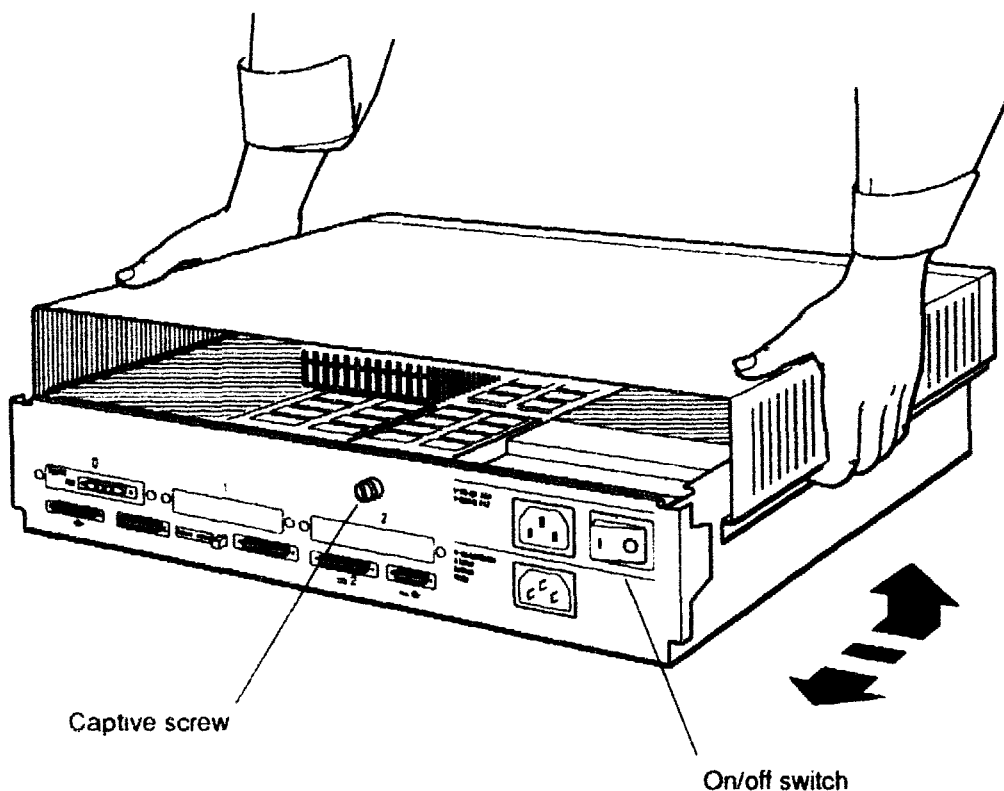
Captive screw

On/off switch

Figure 9. Removing and replacing the system unit cover

4. If you need to install any memory modules, an NVRAM module, or a CPU module in the system unit, mark your place in this guide and refer to Chapter 9 of the *DECstation 5000 Model 240 Hardware Operator's Guide*. If you also have TURBOchannel option modules to install in the system unit, leave the system unit cover off and continue with the next step in this procedure.

5. If you have TURBOchannel option modules to install in the system unit, mark your place in this guide and refer to the chapter in the *TURBOchannel Options User's Guide* that tells you how to install that option.

    If you are installing a TURBOchannel option module (such as a graphics module) inside a TURBOchannel extender, mark your place in this guide and refer to the appropriate section of the *TURBOchannel Extender Operator's Guide*.

Step 5—Connect any external storage devices to the system unit.

If you are not connecting external storage devices at this time, turn to page 21 and continue with "Step 6—Set up the monitor."

External storage devices for the DECstation 5000 Model 240 workstation are small computer systems interface (SCSI) drives (such as tape, disk, and compact disc drives) that are contained in external boxes you connect to the system unit. A SCSI drive can be self-contained in its own box or it can be in a multiple-drive expansion box, such as a BA42 expansion box or TURBOchannel extender.

1. Determine what external storage devices you have:

   - BA42 expansion box

   - TCE, if it has internal drives

   - Self-contained tape, disk, or compact disc drive (such as a TK50Z tape drive, TLZ04 cassette tape drive, or RRD42 compact disc drive)

2. Make sure the number of drives and number of expansion boxes to be connected are within allowable limits. You can connect up to seven drives, contained in up to three boxes, to the base system SCSI connector. (Additional storage devices can be connected to any SCSI connectors you may have in the TURBOchannel option slots.)

   - A self-contained drive contains one drive in its own box.

   - A BA42 expansion box can contain one or two drives. (See the *BA42 Installation Guide* if you need information on which drives can be installed in the BA42 expansion box.)

   - A TURBOchannel extender box can contain up to three drives. (See the *TURBOchannel Extender Operator's Guide* if you need information on which drives can be installed in the TURBOchannel extender.)

If you need to connect more than three expansion boxes to one SCSI connector, see Chapter 5 of the *DECstation 5000 Model 240 Hardware Operator's Guide* for instructions on how to ensure that the total SCSI cable length for the group of boxes is within the allowable limit of 236 inches.

Caution: Using more than 236 inches (6 meters) of SCSI cable on one SCSI connector makes the drives attached to that connector unreliable.

3. Check to make sure each drive has a unique SCSI ID within the group of devices you are connecting to one SCSI connector. If you don't know the specific SCSI ID for your device, assume it has the SCSI ID shown in Table 1.

   The SCSI ID for a single drive in its own box is usually displayed in a small window on the back of the box. Table 1 lists the usual SCSI IDs assigned to drives preinstalled in single-drive, BA42, or TCE expansion boxes. The actual SCSI ID assigned to a drive may differ from the one listed here.

Table 1. Usual SCSI ID Assignments for External Drives

Type of External Drive	Usual SCSI ID
Hard disk drive	0
Hard disk drives in a multiple-drive expansion box	0 and 1
Diskette drive	4
Optical compact disc drive	4
Tape drive	5

If two or more of the drives to be connected to a SCSI connector have the same SCSI ID, you must change the duplicate SCSI IDs. Mark your place in this guide and refer to Chapter 5 of the *DECstation 5000 Model 240 Hardware Operator's Guide* for instructions on changing SCSI IDs.

4. Position the storage expansion boxes next to or on top of the system unit. If one of the boxes is a TURBOchannel extender, place it directly on top of the system unit, as one of its interconnecting cables is very short. You can stack the boxes one on top of the other.

5. Set the on/off switches on the storage expansion boxes to the off position.
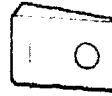
Press the 0 on
this type of switch

WS3PI034

Figure 10. On/off switch in the off position

6. If the *only* device you are connecting is a TURBOchannel extender (TCE), skip the rest of this procedure, mark your place in this guide, and refer to the *TURBOchannel Extender Operator's Guide* for instructions on installing the TCE. When done, turn to page 21 and continue with "Step 6—Set up the monitor."

Otherwise, continue with these instructions.

7. Find the system-unit-to-expansion-box cable that came with your workstation.

To a SCSI connector
on the system unit

To a SCSI connector
on the expansion box
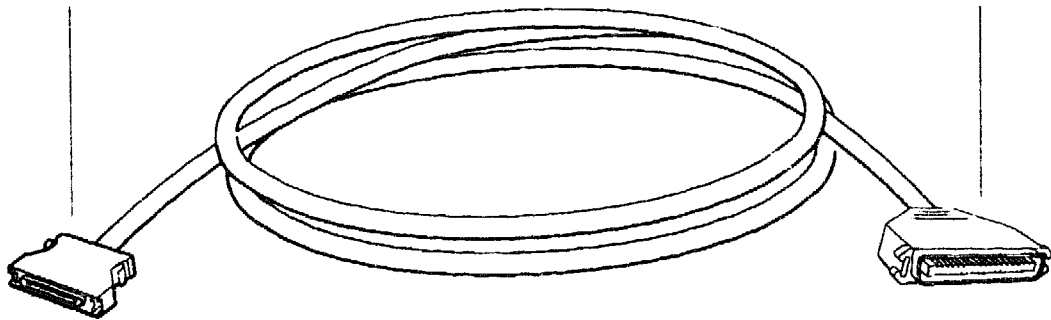
WS3PI035

Figure 11. System-unit-to-expansion-box cable

8. Attach the smaller connector on the system-unit-to-expansion-box cable to the SCSI connector on the system unit.

Base system
SCSI connector

Position the smaller
cable connector
so the widest part
is on top.

SCSI icon

WS3PI037
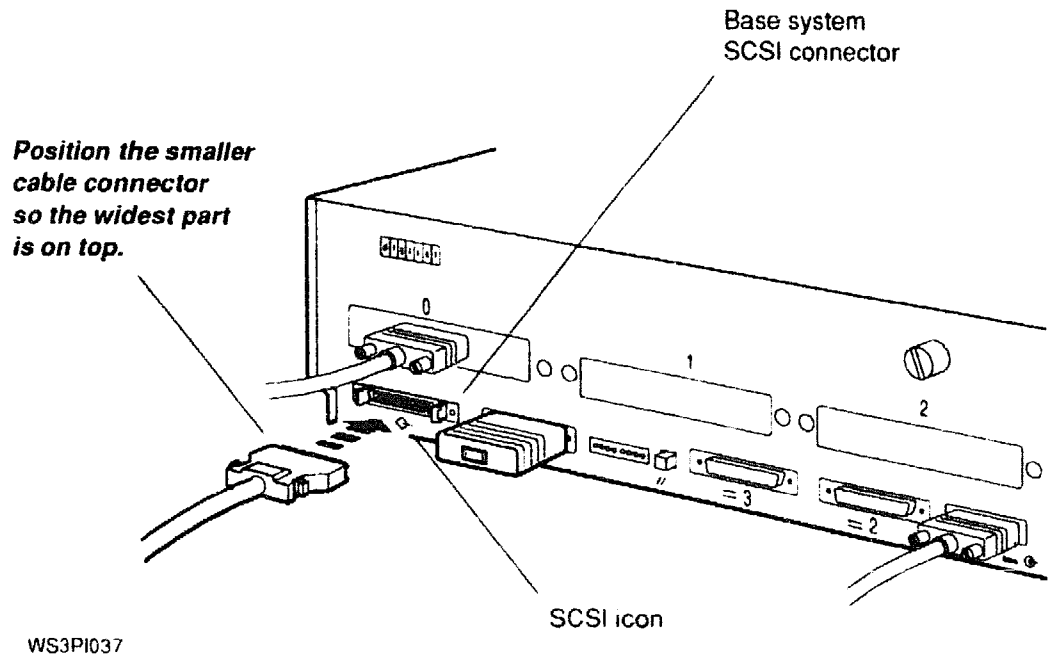
Figure 12. Attaching the smaller connector on the system-unit-to-expansion-box cable to the SCSI connector on the system unit

9. Attach the larger connector on the system-unit-to-expansion-box cable to either one of the SCSI connectors on the first non-TCE box closest to the system unit.

Do not connect this cable to a TCE, if you have one. Skip the TCE and connect the system-unit-to-expansion-box cable to the next box. (The TCE requires a different type of cable and must be connected last.)

1. *Gently press the two wire brackets on the SCSI connector away from the connector.*

Expansion box

2. *Hold the cable connector so the widest part is on the top and push the cable connector into the SCSI connector as far as it will go.*

Groove   Wire bracket

3. *Press the two wire brackets firmly against the sides of the cable connector until they lock into the grooves on the connector.*
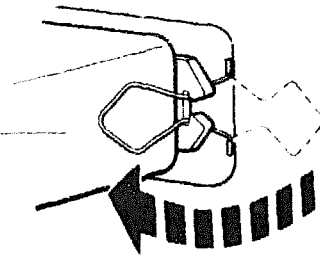
WS3PI038

Figure 13. Attaching the system-unit-to-expansion-box cable to the non-TCE box closest to the system unit

10. Connect any additional non-TCE expansion boxes to the first box using box-to-box SCSI cables.
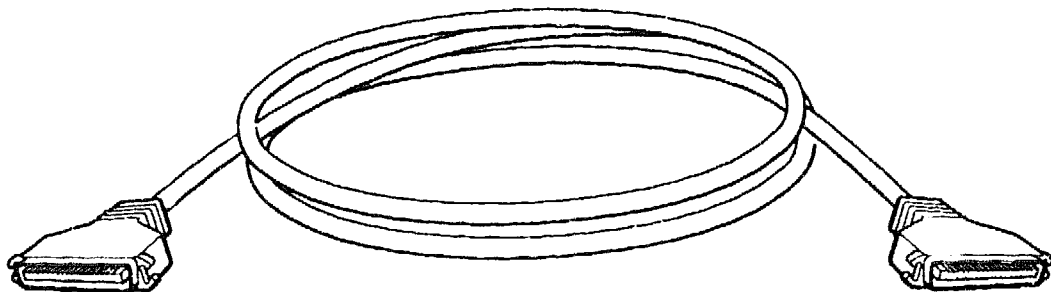
Figure 14. SCSI box-to-box cable

Attach one end of the cable to the unused SCSI connector
on the previously installed box. Connect the other end of
the cable to a SCSI connector on the next box.

1. Gently press the two wire brackets on the
   SCSI connector away from the connector.

2. Hold the connector so the
   widest part of the connector
   is on top and push it into
   the SCSI connector on the
   expansion box.

3. Press the two wire brackets
   firmly against the side of
   the cable connector until
   they lock into the groves on
   the sides of the connector.

Wire
bracket
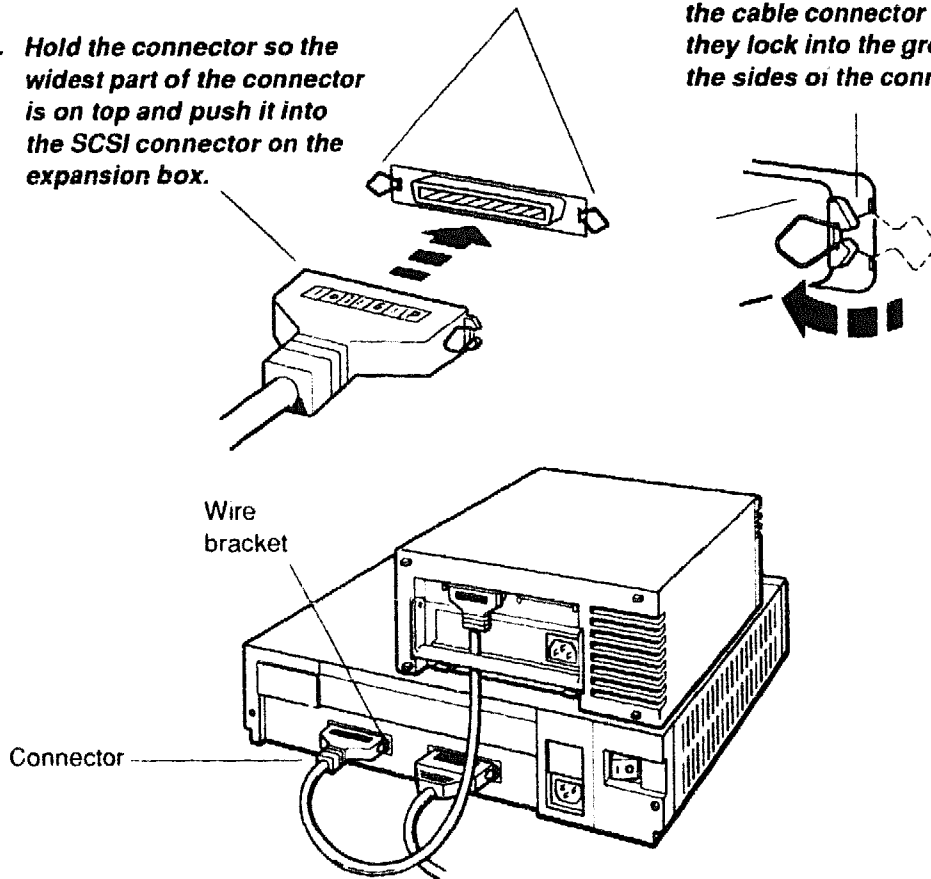
Connector

WS3PI002

Figure 15. Connecting additional non-TCE expansion boxes

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11. If one of the storage devices is a TCE with internal drives, connect the TCE to the previous expansion box or self-contained drive.

   a. Find the TCE-to-expansion box cable that came with the TCE (identical to the system-unit-to-expansion-box cable).

To a SCSI connector
on the system unit

To a SCSI connector
on the expansion box
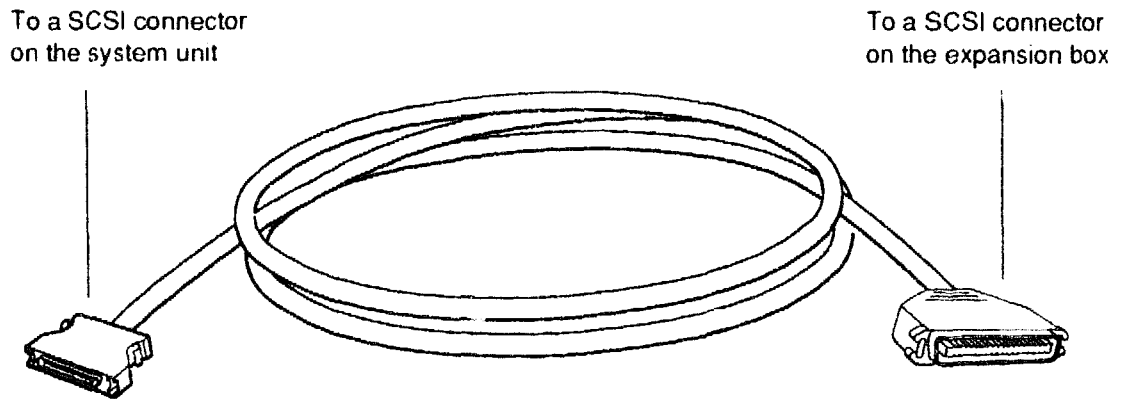
WS3PI091

Figure 16. TCE-to-expansion-box cable

b. Connect the small metal end of the TCE-to-expansion-box cable to the SCSI connector on the TCE and connect the large end to the unused SCSI connector on the previous expansion box. The TCE must be the last box in the chain of storage devices.

TCE-to-expansion-box cable

TK50Z tape drive expansion box

BA42 storage expansion box

TURBOchannel extender
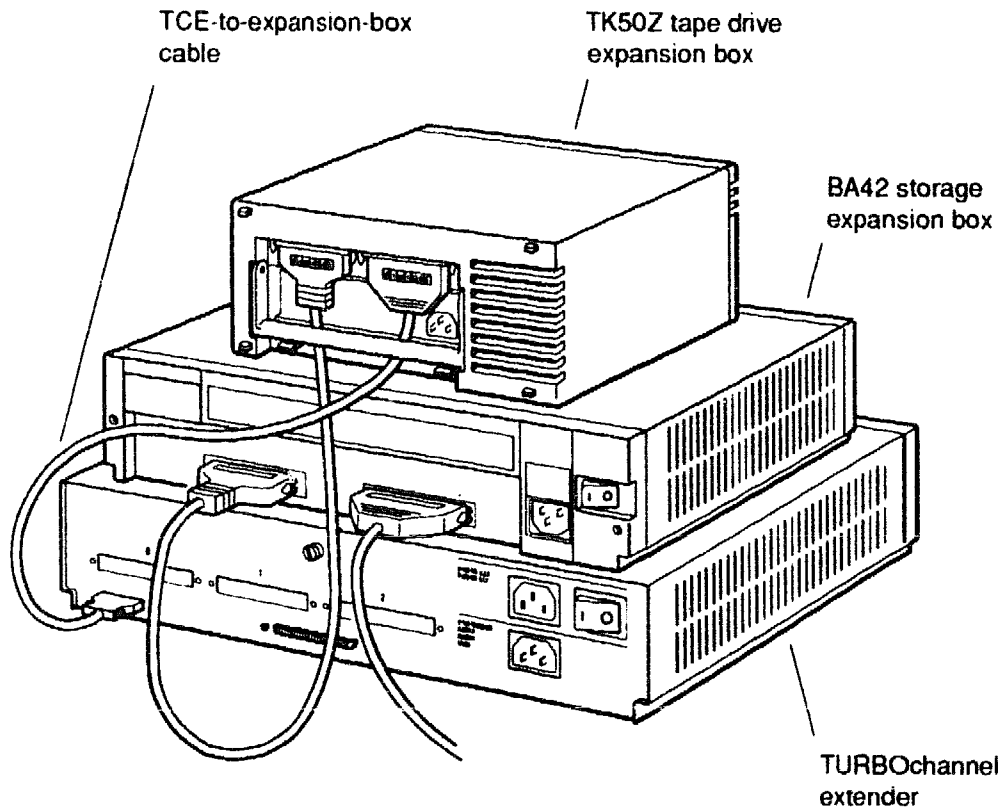
WS3PI093

Figure 17. Connecting the TCE-to-expansion-box cable to the SCSI connector

12. Put a SCSI drive terminator on the unused SCSI connector on the last external storage device you connected, unless the last device you connected was a TCE, which has its own internal SCSI terminator.

Hold the terminator so the widest part of its connector is on top and push the terminator onto the unused SCSI connector.

Terminator

Wire brackets
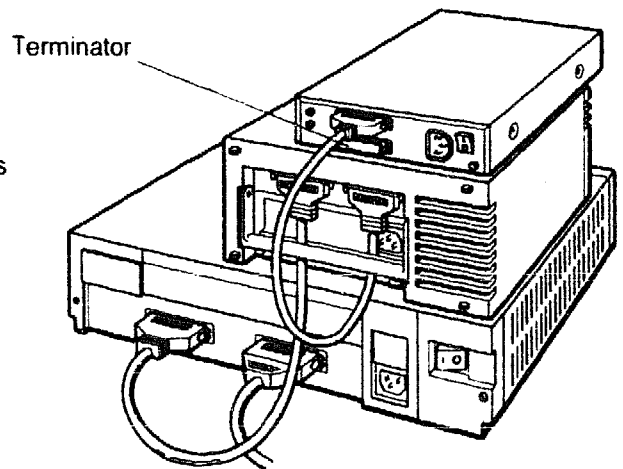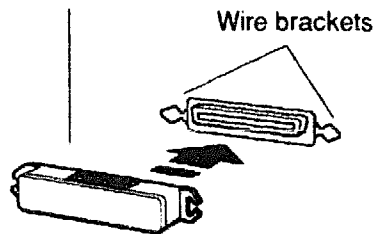
WS3PI003

Figure 18. Attaching a SCSI drive terminator

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13. For each expansion box, connect one end of the power cord that came with the device to the expansion box and connect the other end to a power outlet.

Caution: *Check the voltage requirements for the device. Connecting a device to a power source that does not meet the voltage requirements of that device can damage the device.*

Power cord connector

To power outlet
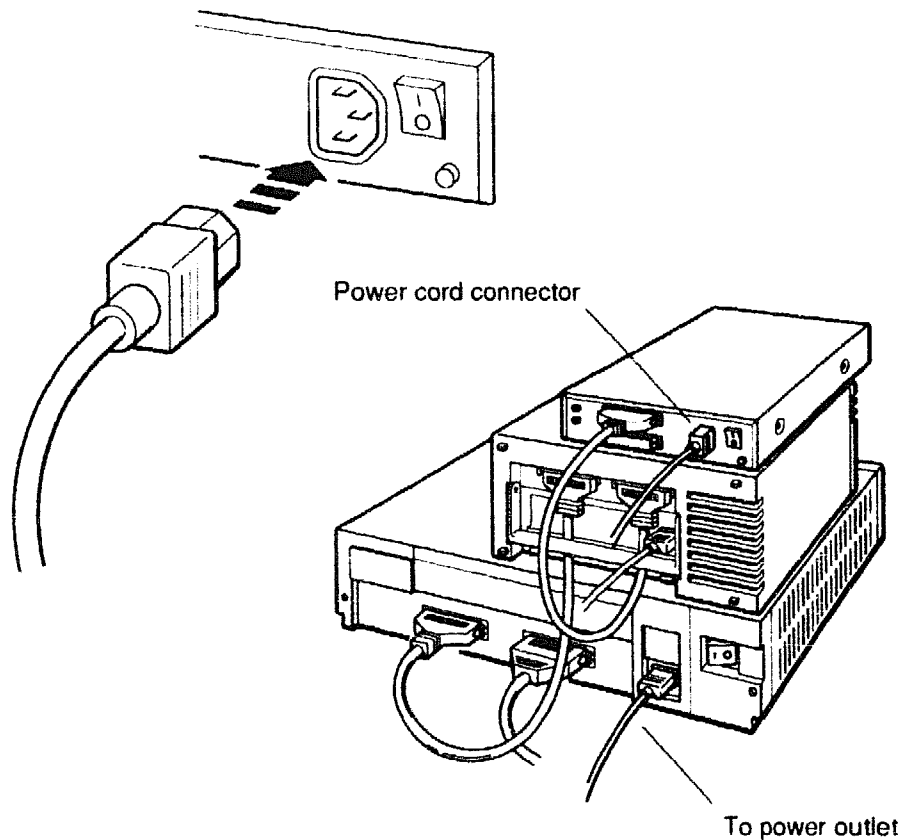
WS3PI042

Figure 19. Connecting the power cords

14. If you have additional SCSI connectors in the TURBOchannel option slots, repeat this procedure to connect any additional storage devices to these SCSI connectors.

Try to distribute the drives as evenly as possible among the SCSI connectors on the base system unit and in the TURBOchannel option slots.

Step 6—Set up the monitor.

Caution: It takes two people to unpack the monitor safely.

1. Place the monitor on top of or beside the system unit, on top of the external storage devices, or wherever is convenient.

   Caution: Avoid placing the monitor near electromagnetic devices, such as printers or electric pencil sharpeners, or near iron or steel objects, such as filing cabinets or beams in walls, as this can interfere with its performance.

2. Determine whether you have a color, gray scale, or monochrome monitor.

3. Locate the video connector to which you will attach your monitor. The video connector is on the system unit or TURBOchannel extender (TCE) unit. The examples used here assume that the video connector is in TURBOchannel option slot 0.

Color or gray scale
video connector

Monochrome video
connector
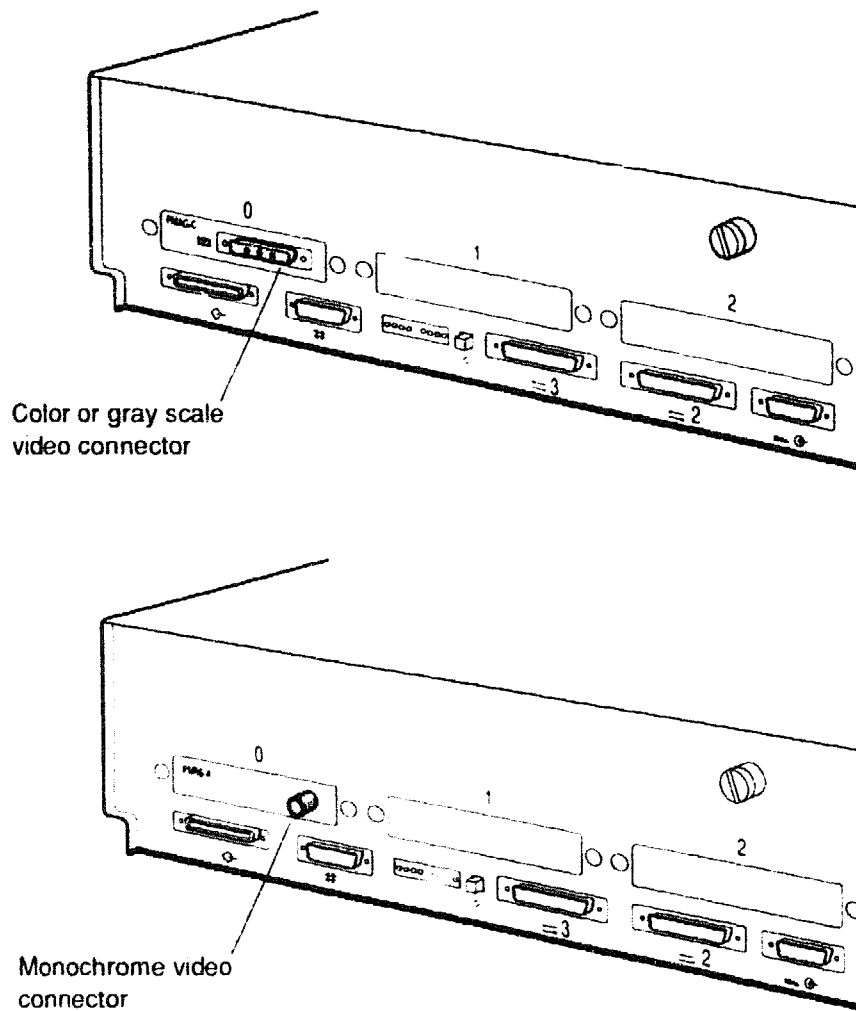
WS3PI092

Figure 20. Video connectors

4. If you are connecting more than one monitor to a
    workstation, locate all additional video connectors you
    will use. You can connect an additional monitor for each
    additional graphics option module in your workstation.
    Follow the instructions for connecting a single monitor to
    each one. (See the *DECstation 5000 Model 240 Hardware
    Operator's Guide* for more information on connecting
    multiple monitors.)

5. Be sure the on/off switches on the system unit and monitor
    are in the off position.

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The monitor shown here is one of several different monitors you can order for your workstation. The exact type and position of the on/off switch will vary depending on the monitor you ordered.

Monitor on/off switch
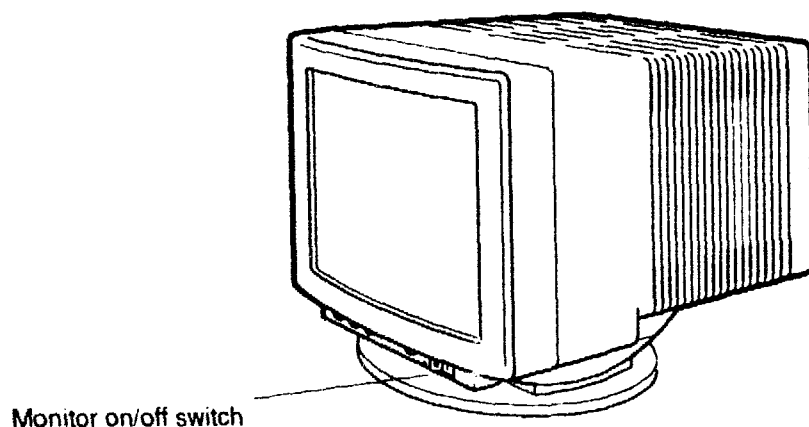
WS3PI090

Figure 21. Monitor example

Press the 0 on this type of switch	Press and release this type of switch	Press and release this type of switch until it is in the out position.

WS3PI008

Figure 22. Monitor on/off switches

Step 7—Connect the monitor video cable.

The monitors shown in the following examples may differ in appearance from the monitor you have, but the instructions are accurate for all monitors of that general type.

To connect a color monitor video cable, continue with the instructions "To connect a color monitor video cable" on this page.

To connect a gray scale monitor video cable, turn to page 27.

to connect a monochrome monitor video cable, turn to page 30.

To connect a color monitor video cable

1. Find the color video cable assembly that came with your shipment.

3-pin cable connector

Red-green-blue (RGB) signal cables
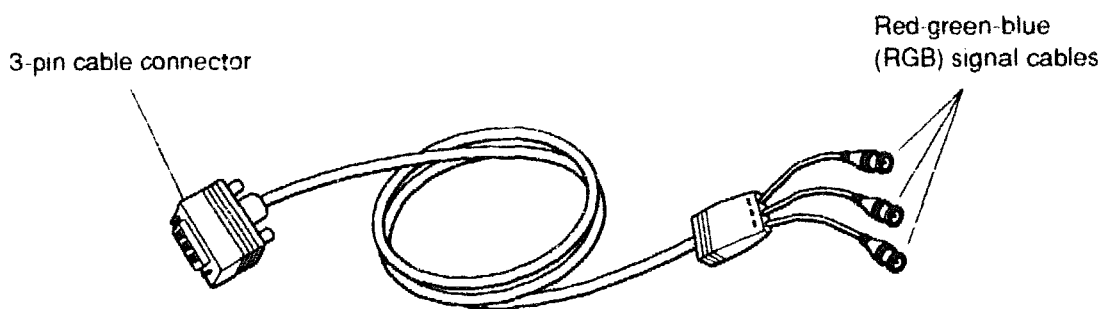
WS3PI010

Figure 23. Color video cable assembly

2. Connect the red, green, and blue signal cable connectors to the three round video connectors labeled R, G, and B on the monitor. The small collars on the cable connectors have two slots that fit over corresponding pins on the monitor connectors.

If your monitor has two sets of these connectors, use the bottom set, labeled VIDEO IN.

Turn the signal cable connectors to your right until they slide forward and lock into place.

Monitor video connectors
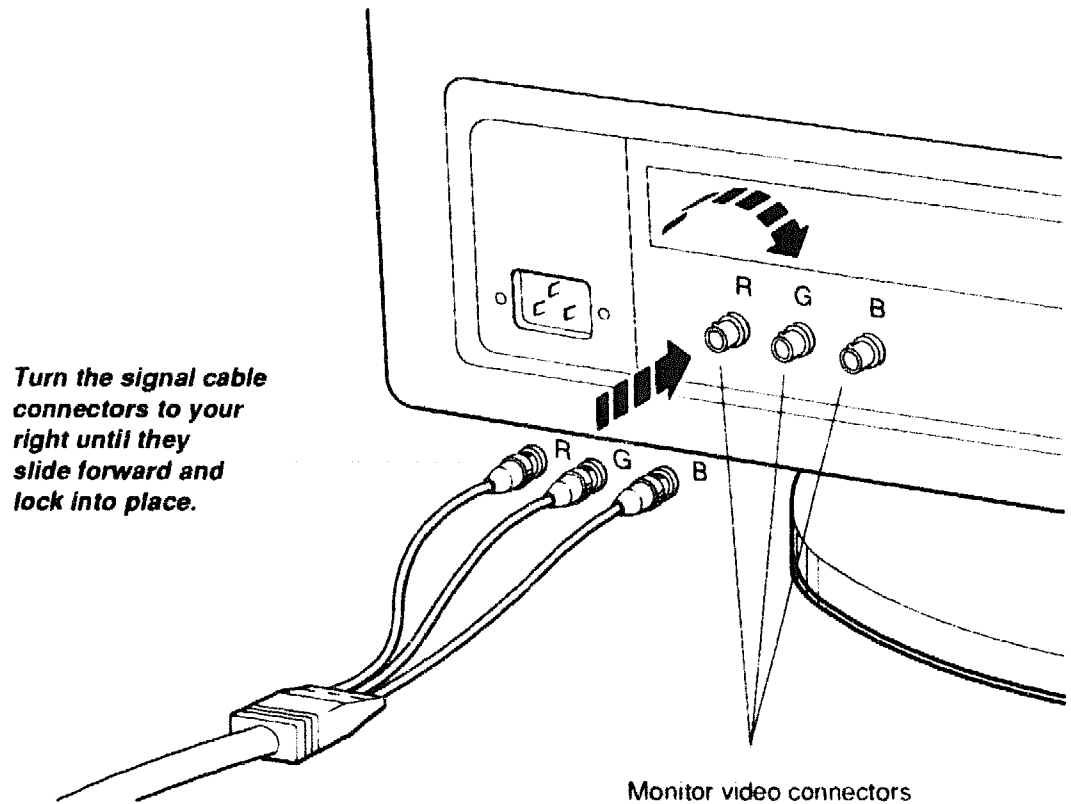
WS3PI011

Figure 24. Connecting a video cable assembly to a color monitor

3. Connect the 3-pin cable connector to the system unit video connector in the system unit or TCE box.

1. Position the 3-pin cable connector so the widest part of the connector is on top.

System unit video connector in TURBOchannel option slot 0

2. Turn the screws to your right to hold the connector in place.
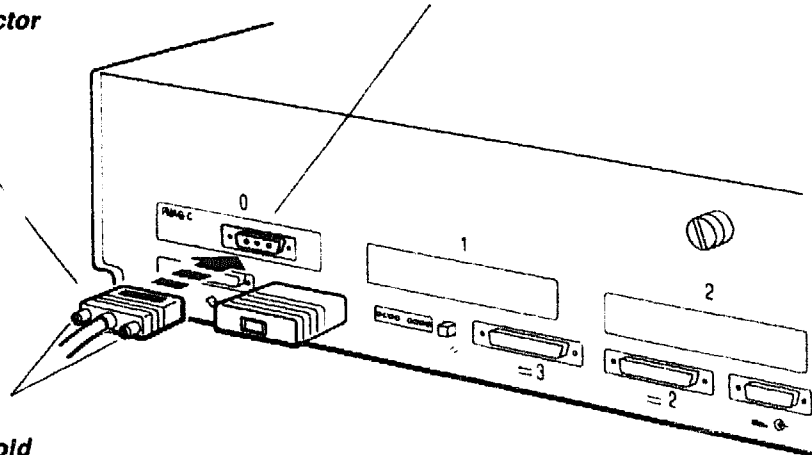
WS3PI015

Figure 25. Connecting a 3-pin cable connector to the system unit

4. Turn to page 33 and continue with "Step 8—Connect the monitor to a power source."

To connect a gray scale monitor video cable

1. Find the gray scale cable assembly that came with your shipment.

3-pin cable connector

Connector block

Monitor video connector

Large plastic screw
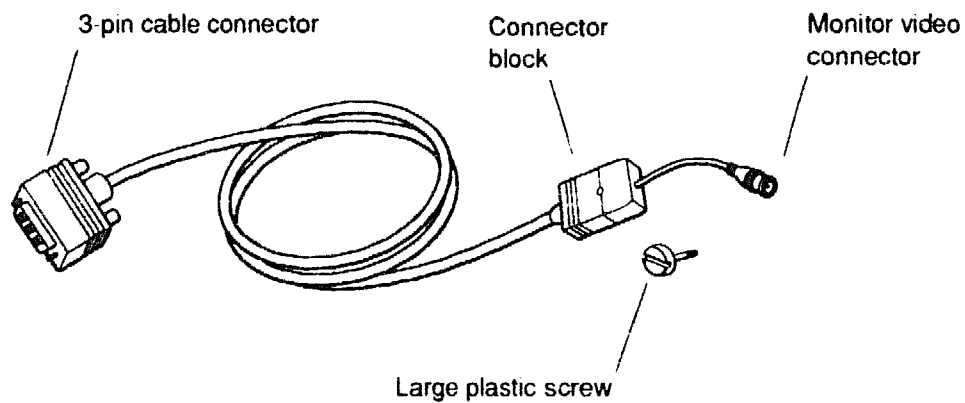
WS3PI013

Figure 26. Gray scale video cable assembly

2. Attach the round cable connector to the monitor.

3. Attach the connector block to the back of the monitor.

Monitor video
connector

1. Press the round cable
connector onto the
video connector
and turn the round
cable connector to
your right until it
slides forward and
locks into place.

2. Attach the
connector
block here.

3. Turn the large plastic
screw to your right to
hold the connector block
in place against the monitor.

Connector block

WS3PI014
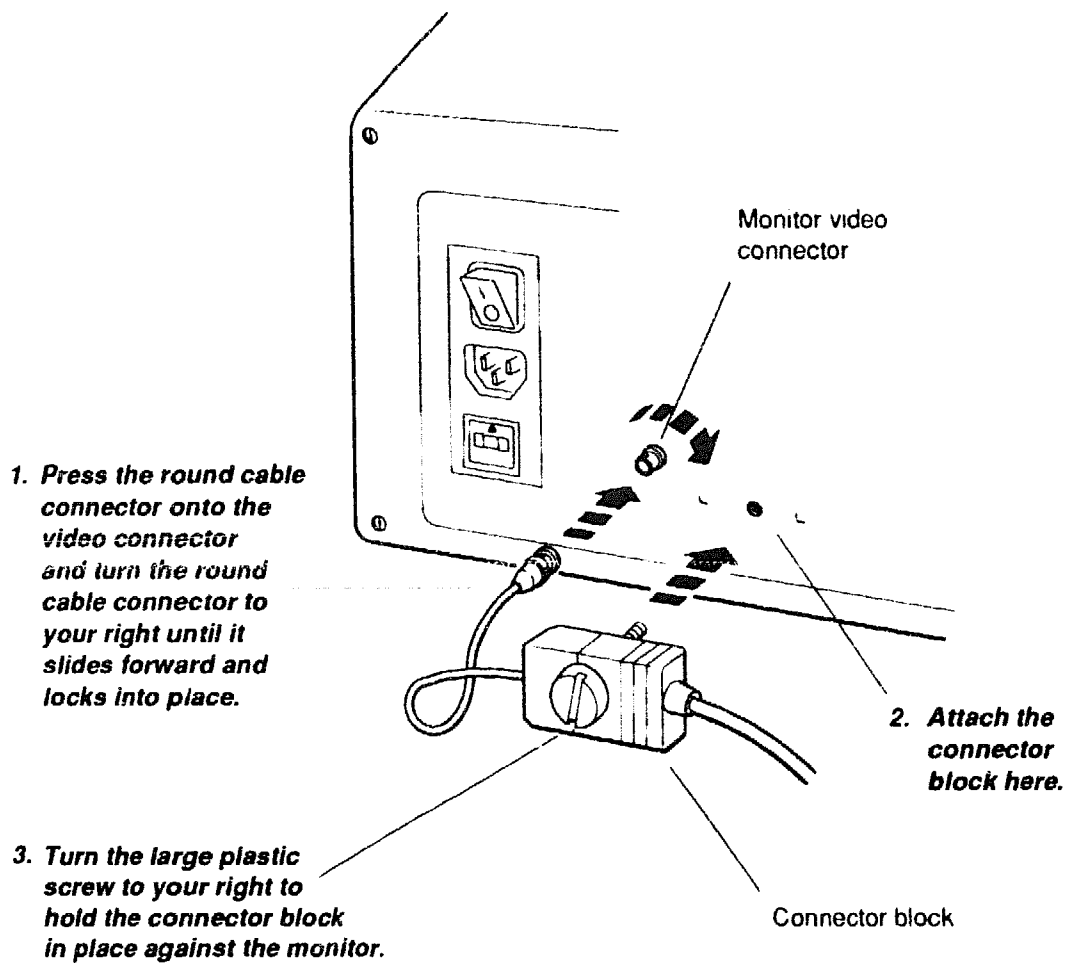
Figure 27.   Connecting a video cable assembly to a gray scale monitor

4. Attach the 3-pin cable connector to the workstation video connector in the system unit or TCE box.

1. Position the 3-pin cable connector so the widest part of the connector is on top.

System unit video connector in TURBOchannel option slot 0

2. Turn the screws to your right to hold the connector in place.
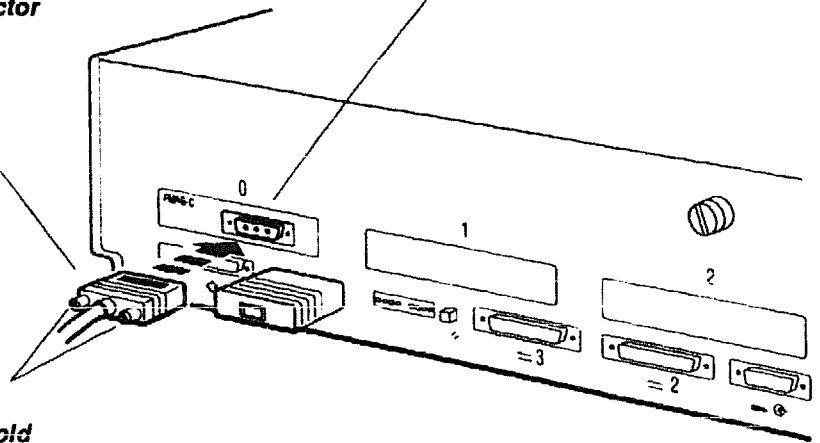
WS3PI015

Figure 28.   Connecting a gray scale video cable assembly to the system unit

5. Turn to page 33 and continue with "Step 8—Connect the monitor to a power source."

To connect a monochrome monitor video cable

1. Find the monochrome video cable assembly that came with your shipment.

Slots

Threads

Slotted signal
cable connector

Threaded signal
cable connector
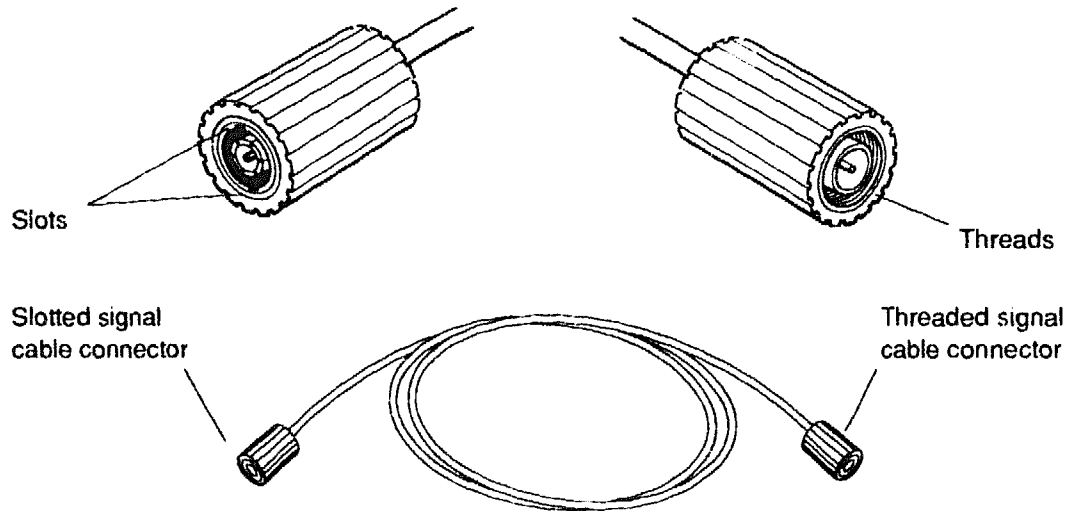
WS3PI016

Figure 29.   Monochrome video cable assembly

2. Attach the slotted cable connector to the monitor video connector.

1. *Align the slots on the cable connector with the pins on the monitor video connector.*

2. *Press the slotted cable connector onto the monitor connector and turn the slotted cable connector to your right until it slides forward and locks into place.*

Monitor video connector
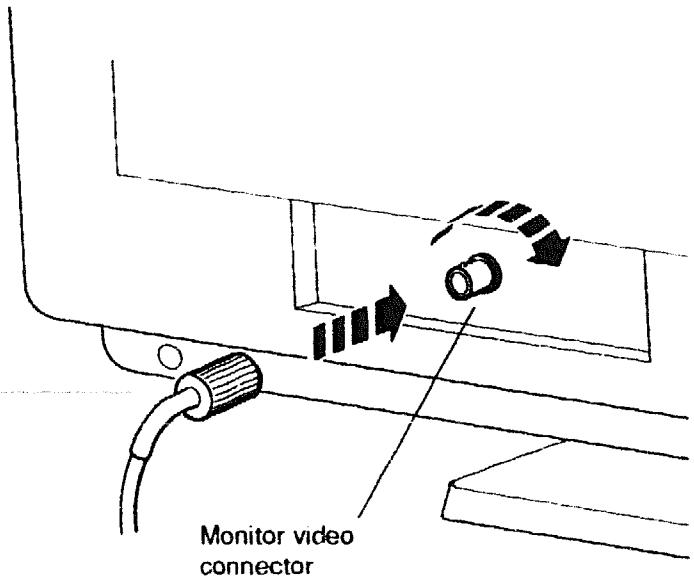
WS3PI018

Figure 30. Connecting a video cable assembly to a monochrome monitor

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3. Attach the threaded cable connector to the video connector in the system unit or TCE box.

Press the threaded cable connector onto the video connector and turn the threaded connector to your right as far as it will go.

System unit
video connector in
TURBOchannel
option slot 0
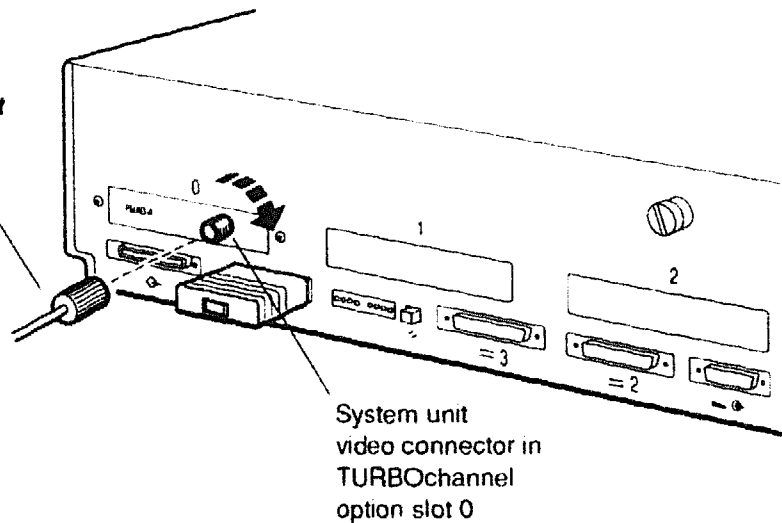
WS3PI017

Figure 31. Connecting a monochrome video cable assembly to the system unit

4. Turn to page 33 and continue with "Step 8—Connect the monitor to a power source."

Step 8—Connect the monitor to a power source.

1. Find the monitor-to-system-unit power cable or the monitor power cord (identical to the system unit power cord) that came with your workstation.
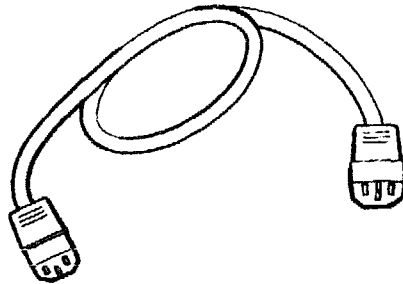
Monitor-to-system-unit
power cable
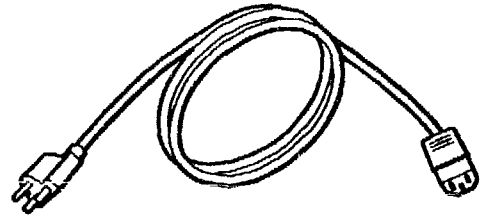
Monitor power cord

WS3PI058

Figure 32. Monitor-to-system-unit power cable and monitor power cord

2. Check the monitor voltage requirement labels printed on the monitor (or check for a yellow voltage label covering its power connector).

    Caution: *Connecting a device to a power source that does not meet the voltage requirements of that device can damage the device.*

3. If the monitor is too far from the system unit for the monitor-to-system-unit power cable to reach, connect the monitor directly to a power outlet or power strip with the monitor power cord.

    Otherwise, plug the appropriate end of the monitor-to-system-unit power cable into the power connector on the monitor. Plug the other end into the monitor-to-system-unit power connector on the system unit.

Monitor-to-system-unit
power cable

Monitor-to-system-unit
power connector

Monitor power
connector
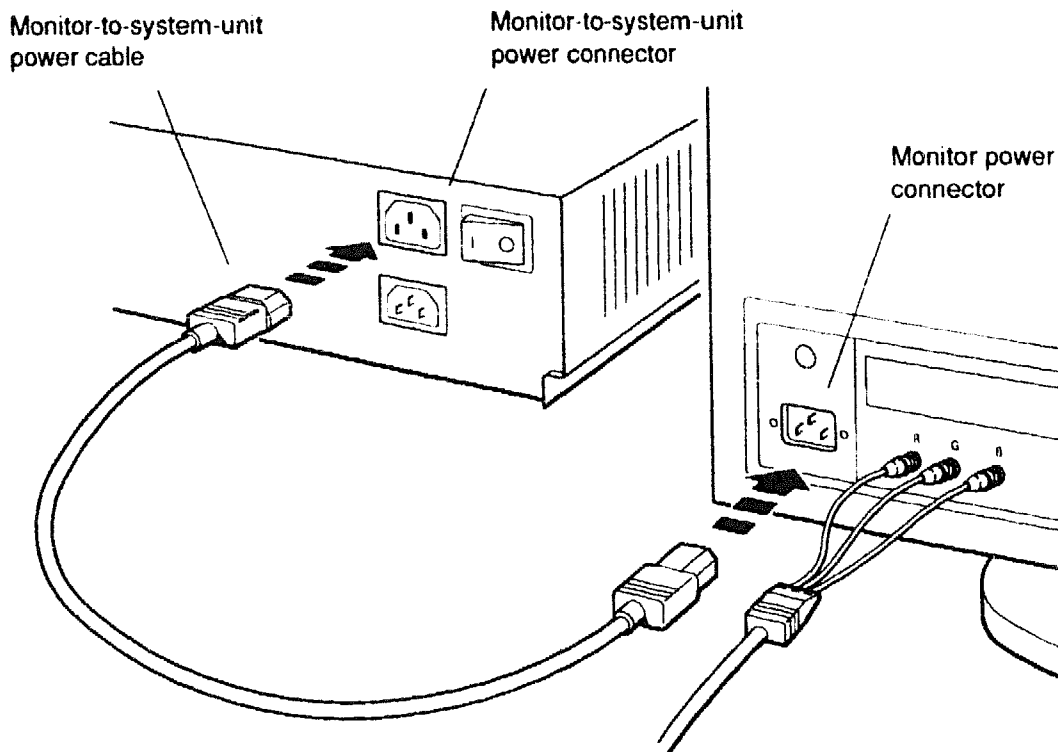
WS3PI033

Figure 33. Connecting the monitor-to-system-unit power cable

4. If you connected your monitor to the power outlet on
the system unit, set the monitor power switch to the on
position.
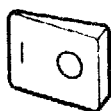
Press the I on
this type of switch

Press and release this
type of switch

Press this type
of switch in.

WS3PO057

Figure 34. Turning on the monitor

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Step 9—Connect the keyboard and the mouse or tablet to the system unit.

1. Find the keyboard-mouse cable assembly that came with your workstation.
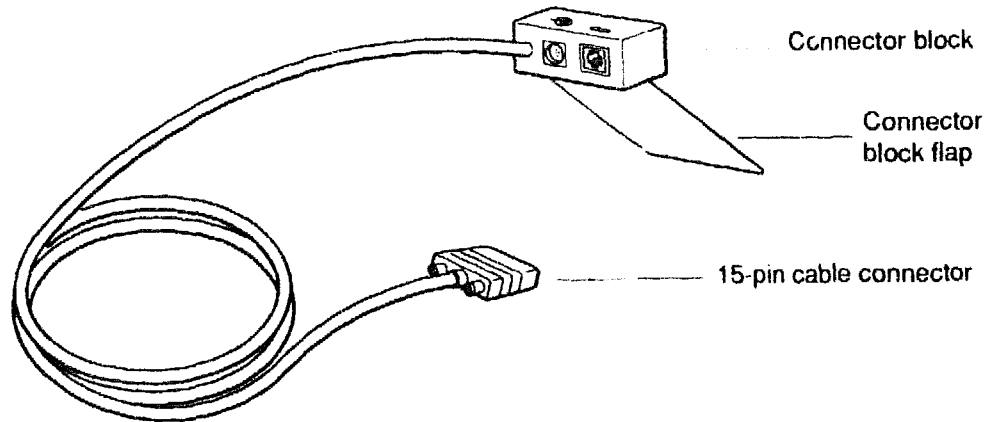
WS3PI068

Figure 35. Keyboard-mouse cable assembly

2. Plug the 15-pin connector on the keyboard-mouse cable assembly into the keyboard-mouse connector on the system unit.

1. Position the keyboard-mouse cable connector so the widest part of the connector is on top.

2. Turn the screws to your right to hold the connector in place.

Keyboard and mouse icons
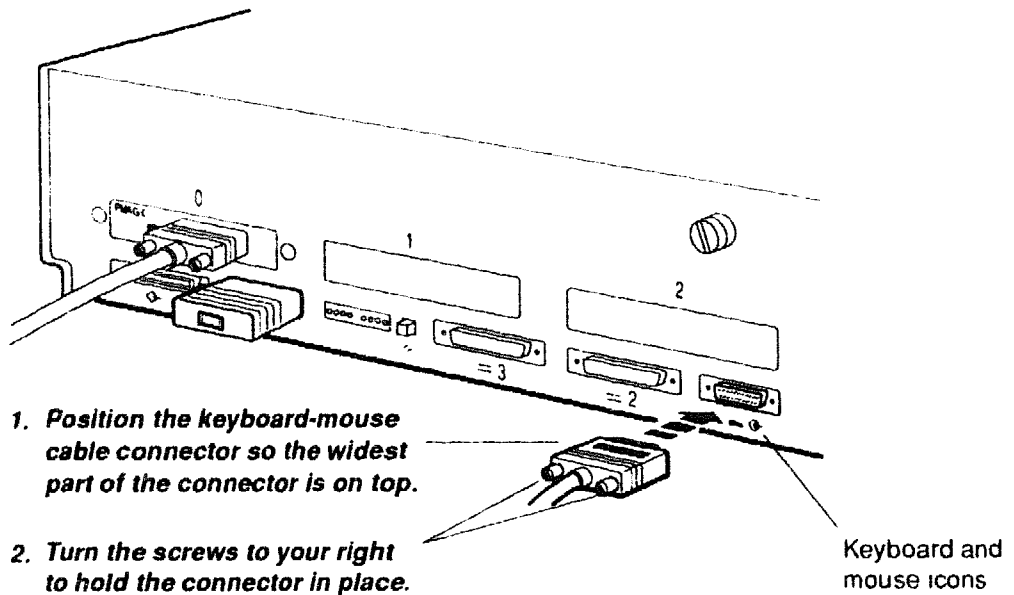
WS3PI020

Figure 36. Connecting the keyboard-mouse cable assembly to the system unit

3. Insert the mouse or tablet cable connector and the keyboard cable connector into the connector block of the keyboard-mouse cable assembly.

1. Position the mouse or tablet cable connector so the icon on it is below the mouse icon on the connector block. Then push the connector into the connector block.

Connector block flap
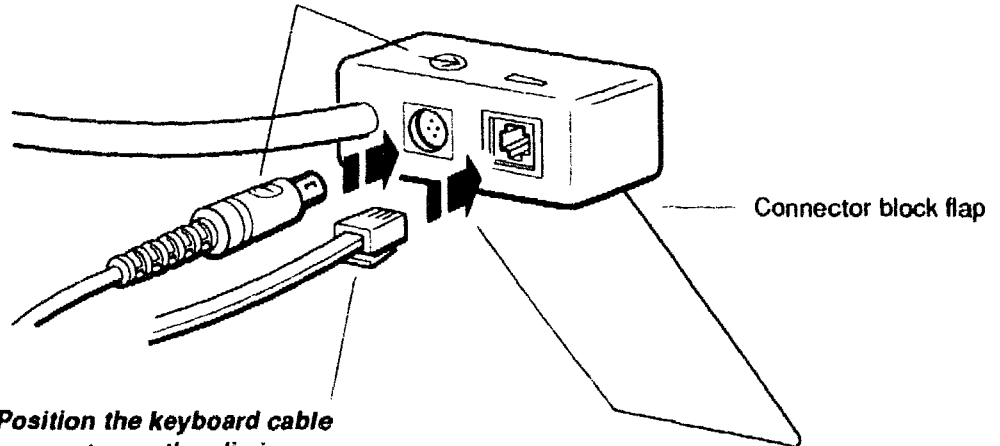
2. Position the keyboard cable connector so the clip is on the bottom and push the connector into the connector block until it clicks into place

WS3PI019

Figure 37. Connecting the keyboard cable to the connector block

4. Lift the back of the monitor slightly, slide the plastic flap on the connector block under the base of the monitor, and lower the base onto the flap.

Be sure that the entire flap is under the base.

Connector block

Connector block flap
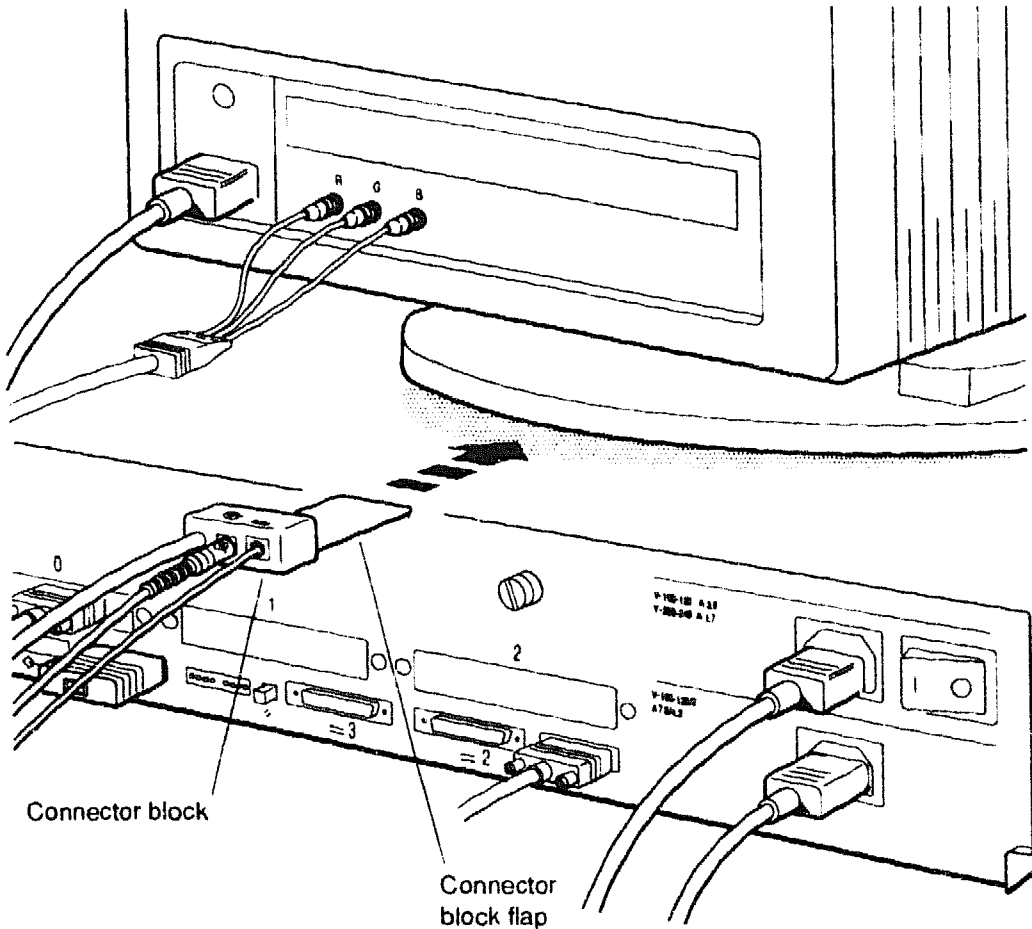
WS3PI047

Figure 38. Positioning the connector block

Step 10—Connect any communication devices to the system unit.

If you have optional communication devices such as modems or printers, mark your place in this guide and refer to Chapter 7 of the *DECstation 5000 Model 240 Hardware Operator's Guide* for installation instructions.

If you have no optional communication devices to install, continue with "Step 11—Turn on and test the workstation."

Step 11—Turn on and test the workstation.

Before turning on your workstation for the first time,

- Plug the system unit power cord into a wall outlet or power strip.

- Make sure the monitor and any external devices are plugged into a power source.

- If any part of your workstation is plugged into a power strip, make sure the power strip is plugged into a power outlet.

- If you intend to control power to your workstation by turning the power strip on and off, make sure all power switches on the workstation components are set to the on position.

If all parts of your workstation are plugged into a power strip, turn on the power strip to turn on your workstation.

Otherwise, turn on your workstation in the order described here:

1. Turn on any external devices. Most devices have rocker switches. Some have push switches.

2. If necessary, turn on the monitor.

   - If the monitor gets its power through the system unit, and if you have set the monitor power switch to the on position, it will go on when you turn on the system unit.

- If the monitor is plugged into a wall outlet, or if the monitor power switch is in the off position, turn it on now (for instructions, refer to the documentation that came with the monitor).

When the monitor is receiving power, a green indicator light glows on the front of the monitor. The monitor must run for 10 to 15 seconds before it is warmed up enough for the display to be visible.

3. Turn on the system unit by pressing the 1 on the on/off switch on the back of the system unit.

On/off switch
in the on position
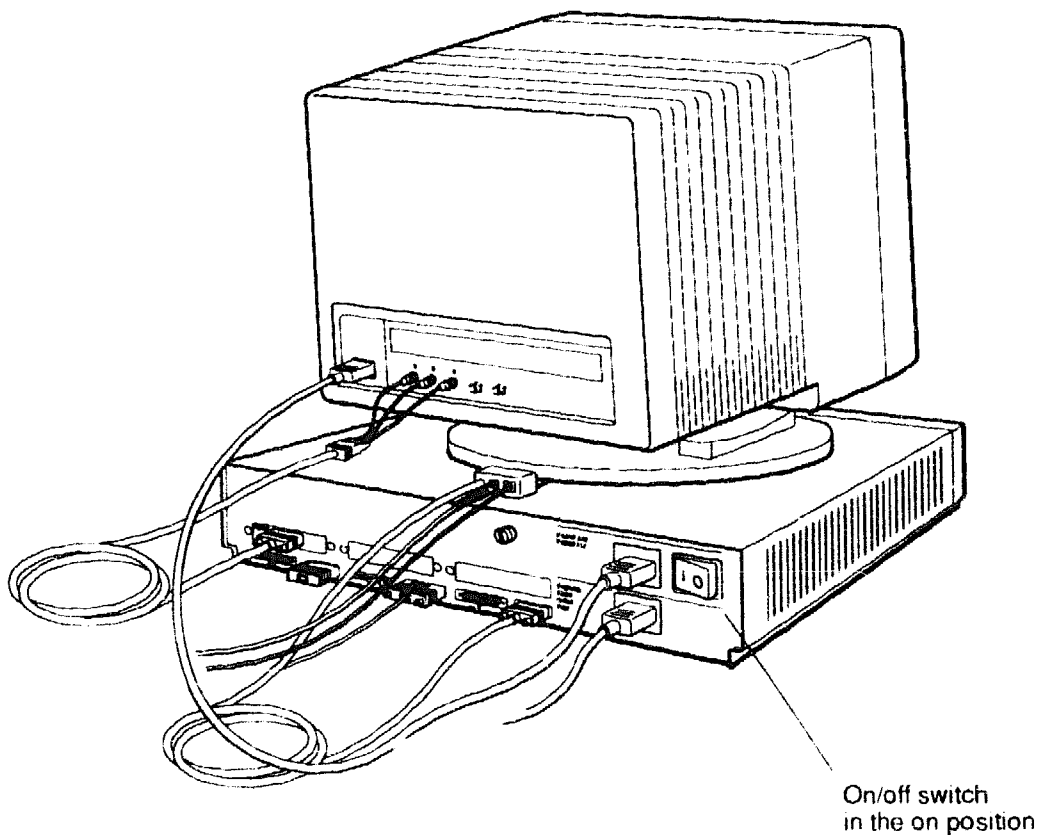
WS3PI096

Figure 39. Turning on the system unit

4. When you turn on the system unit, the following things happen:

   ■ The green power indicator light glows on the front of the system unit.

   ■ The system unit runs the automatic power-up self-test, which takes from 1 to 5 minutes. It displays the names of each subtest that it runs at the bottom of the screen. Some tests display asterisks (*) and other symbols, and some tests cause the screen to flicker.

   If you have multiple monitors connected to your workstation, the monitor connected to the graphics module in the lowest-numbered option slot will display all system test information.

   At the end of the power-up self-test, messages explaining any errors that occurred during any of the subtests scroll across the screen. (You can redisplay these messages later.)

5. If you are installing the workstation for the first time, you will be prompted to select the keyboard language. The screen displays the following language menu:

```
 1) Dansk                       9) Français (Suisse Romande)
 2) Deutsch                    10) Italiano
 3) Deutsch (Schweiz)          11) Nederlands
 4) English (American)         12) Norsk
 5) English (British/Irish)    13) Portûques
 6) Español                    14) Suomi
 7) Français                   15) Svenska
 8) Français (Canadien)        16) Vlaams
(1..16): _
```

   Type the number that corresponds to your language and press Return. The console prompt (>>) appears on the screen when the language is set.

   If you need to change the workstation language, type **setenv console 0** at the console prompt and press Return. The language menu will be redisplayed. Select a language and press Return.

6. The screen displays the console prompt (>>) or the restricted console prompt (R>) when the system is ready to accept user commands.

    ■ Users can execute all console commands at the console prompt (>>).

    ■ The restricted console prompt (R>) indicates that someone has set up a password requirement to restrict access to the system. At the restricted console prompt, you can use only the boot and passwd console commands until you enter the correct password.

       To enter your password, type **passwd** and press Return. Then enter the console password at the pwd prompt and press Return again. If you don't know the password, contact your system manager or a Digital service representative.

    If anything other than the console prompt (>>), or restricted prompt (R>) appears, refer to Chapter 11 of the *DECstation 5000 Model 240 Hardware Operator's Guide* for troubleshooting instructions.

7. At the console prompt, type **erl** and press Return to display a complete list of any error messages that scrolled across the screen during the self-test.

    If you see any error messages, or if you see a message that begins with ?TFL:, refer to Chapter 11 of the *DECstation 5000 Model 240 Hardware Operator's Guide* for troubleshooting instructions. After correcting the error, turn the system unit off and then turn it back on again.

8. If your system unit fails to turn on, turn it off and check to be sure that

    ■ Power cords are connected properly and the power strip, if there is one, is plugged in and turned on.

    ■ There is power at all power outlets.

    ■ All power switches are set to the on position.

    If the system unit still fails to work, refer to Chapter 11 of the *DECstation 5000 Model 240 Hardware Operator's Guide* for troubleshooting instructions.

Step 12—Check to see if your workstation recognizes all internal option modules.

1. At the console prompt, type **cnfg** and press Return to see if your workstation lists all of the memory and the TURBOchannel option modules that you installed (or that were pre-installed) in your workstation.

   A display similar to the following sample appears on your screen:

```
>>cnfg
3:  KN03-AA    DEC    X2.0d    TCF0    (224 MB,    1 MB NVRAM)
                                       (enet: 08-00-2b-0f-45-72)
                                       (SCSI = 7)
0:  PMAG-DA    DEC    V5.3d    TCF0    (DA:PXG+ - D=8 z=24)
1:  PMAD-AA    DEC    V5.3d    TCF0    (enet: 08-00-2b-0f-45-31)
```

2. Find the 3: and the 0: in the leftmost column of the sample display. These numbers identify the base system or TURBOchannel option slots for which information is being provided. The display shows only the base system slot (slot 3) and any TURBOchannel option slots that contain option modules. In this example, slots 0 and 1 contain option modules.

3. Check to see if the amount of memory displayed is correct. Look at the entry in parentheses at the end of the line starting with 3:. The first entry tells you how much memory you have (in this example, 224 megabytes). The second entry in the parentheses tells you how much battery backed-up memory you have (in this example, 1 megabyte). Battery backed-up memory is optional. If the amount of memory differs from the amount ordered for or installed in your workstation, refer to Chapter 11 of the *DECstation 5000 Model 240 Hardware Operator's Guide* for troubleshooting instructions.

4. Make sure any TURBOchannel option modules that should have been installed are listed in the display.

Look at the lines that begin with 0: and 1: in the sample display. These lines describe the modules installed in TURBOchannel option slots 0 and 1 in this example. To find out what kind of TURBOchannel option module is present in a TURBOchannel option slot, look at the entry in the parentheses on the line beginning with that slot number. Then compare it with the entries in Table 2. For example, the option module DA:PXG+ installed in option slot 0 is a low 3D graphics accelerator, according to the table.

If the modules that should have been installed in the system unit do not appear in the configuration display, turn to Chapter 11 of the *DECstation 5000 Model 240 Hardware Operator's Guide* for troubleshooting instructions. (If you have a TURBOchannel module installed in a TCE, it will be listed as installed in the system unit slot to which the TCE is connected. That slot actually contains the TCE option module connected to the TURBOchannel module in the TCE, but only the TURBOchannel module in the TCE will appear in the display.)

Table 2. Base System and TURBOchannel Option Module Codes

CX---d=8 or 24	True color frame buffer, where d=8 indicates color or gray scale and d=24 indicates "true" color (any color the eye can see). This module can be installed in any TURBOchannel option slot.
CXT 8 plane	Smart frame buffer. This module can be installed in any TURBOchannel option slot.
DA: PXG+---D=8 or 24	Low 3D graphics accelerator, where D=8 indicates color or gray scale and D=24 indicates "true" color (any color the eye can see). This module occupies two adjacent TURBOchannel option slots, but is connected to the system through the lower-numbered slot.

Table 2 (Cont.). Base System and TURBOchannel Option Module Codes

EA: PXG+---D=8 or 24	Mid 3D graphics accelerator, where D=8 indicates color or gray scale and D=24 indicates "true" color (any color the eye can see). This module occupies two adjacent TURBOchannel option slots, but is connected to the system through the lower-numbered slot.
enet:	Ethernet controller. A ThickWire Ethernet controller is built into the base system. Other Ethernet controllers may be installed in the TURBOchannel option slots. The long number after enet: is a unique Ethernet station address that identifies the controller for the network software.
FA: PXGTurbo+	High 3D graphics accelerator. This module occupies three adjacent TURBOchannel option slots, but is connected to the system through the lower-numbered slot.
MB	Memory module. The number indicates the megabytes of memory installed in base slot 3.
MX---D=1	Monochrome frame buffer, where D=1 indicates black and white. This module can be installed in any TURBOchannel option slot.
NVRAM	Nonvolatile random access memory module. An NVRAM module is an optional module that is preinstalled in the base system, if purchased for your workstation. It provides 1 megabyte of battery backed-up memory that will retain data during power failures.
PX---D=8	2D graphics accelerator, where D=8 indicates color or gray scale. This module can be installed in any TURBOchannel option slot.
SCSI	SCSI controller. One is built into base slot 3; others may be installed in the TURBOchannel option slots.

Step 13—Find and report your Ethernet station address.

If your workstation will *not* be connected to an Ethernet network, skip this step and continue with "Step 14—Check to see if your workstation recognizes all external storage devices."

Every Ethernet connector has a built-in controller. That controller has a unique ID called an Ethernet station address. The system manager needs the Ethernet address (or addresses) for your workstation in order to connect your workstation to the network for you. You need to find and report the Ethernet station address for each Ethernet controller on your workstation.

1. In the cnfg display, look for any entries within parentheses that start with enet:. The entry after enet: is the Ethernet station address.

```
>>cnfg
3:  KN03-AA    DEC       X2.0d     TCF0      (224 MB,     1 MB NVRAM)
                                             ❶
                                             (enet: 08-00-2b-0f-45-72)
                                             (SCSI = 7)
0:  PMAG-DA    DEC       V5.3d     TCF0      (DA:PXG+  - D=8  z=24)
                                             ❷
1:  PMAD-AA    DEC       V5.3d     TCF0      (enet: 08-00-2b-0f-45-31)
>>
```

In this display, both lines 3: and 1: show Ethernet station addresses:

❶ The Ethernet address for the Ethernet controller in base slot 3 is 08-00-2b-0f-45-72.

❷ The Ethernet address for the Ethernet controller in option slot 1 is 08-00-2b-0f-45-31.

2. Write down the Ethernet address for each Ethernet controller to be connected to a network. Report the addresses to your system manager and ask the manager to complete the Ethernet connections for you.

Step 14—Check to see if your workstation recognizes all external storage devices.

1. Type **cnfg 3** at the console prompt (>>) and press Return to check the slot configuration for the base system (slot 3).

   The following is a sample slot configuration display for the base system:

```
>>cnfg 3
3:  KN03-AA    DEC    X2.0d    TCF0    (224 MB,    1 MB NVRAM)
                                       (enet: 08-00-2b-0f-45-72)
                                       (SCSI = 7)
        ------------------------------------------------------------
        DEV    PID                     VID         REV    SCSI DEV
        =====  ===================     =========   ======  ========
        rz0    RZ55       (C)  DEC     DEC         0700    DIR
        rz1    RZ24       (C)  DEC     DEC         0700    DIR
        rz4    RRD42      (C)  DEC     DEC         0700    CD-ROM
        tz5                                                SEQ
    dcache( 64 KB),   icache( 64KB)
    mem( 0):   a0000000: a1ffffff       ( 32 MB)
    mem( 1):   a2000000: a3ffffff       ( 32 MB)
    mem( 2):   a4000000: a5ffffff       ( 32 MB)
    mem( 3):   a6000000: a7ffffff       ( 32 MB)
    mem( 4):   a8000000: a9ffffff       ( 32 MB)
    mem( 5):   aa000000: abffffff       ( 32 MB)
    mem( 6):   ac000000: adffffff       ( 32 MB)
    mem(14):   bc000000: bc0fffff       (  1 MB)       Presto-NVR
    mem(14):   clean, batt OK, armed
>>
```

2. Check the slot configuration display to see if the system recognizes all of the drives in the external storage devices you connected to the SCSI connector in that slot.

   a. Look in the column labeled SCSI DEV for a coded description of the type of drive (in this example, DIR, CD-ROM, and SEQ).

   b. Look in the column labeled PID for a coded description of the part ID number (in this example, RZ55, RZ24, and RRD42).

   c. Look in the column labeled DEV for the device code and SCSI ID for each of the drives connected to the base system SCSI connector (in this example, rz0, rz1, rz4, and tz5). The last character of the code is the SCSI ID. The drives in this example have the SCSI IDs 0, 1, 4, and 5.

Table 3 lists the device codes, device descriptions, and types of drives you may see in your slot configuration display.

Table 3.   Device Codes for Different Types of SCSI Drives

Device Code (DEV)	Device Description (SCSI DEV)	Type of Drive
rx	DIR	Diskette
rz	CD-ROM	Optical compact disc
rz	DIR	Hard disk
tz	SEQ	Tape

    d. The slot configuration display should show a separate SCSI ID for every external drive you connected to the SCSI connector in that slot. If a drive is not listed, turn to Chapter 11 of the *DECstation 5000 Model 240 Hardware Operator's Guide* for troubleshooting instructions.

3. If you have any external storage devices attached to a SCSI connector in a TURBOchannel option slot, type **cnfg** *slot-number*, replacing *slot-number* with the number of the option slot (0, 1, or 2) you want to check.

Then check for the presence of all drives connected to that slot, as described in the previous step.

Step 15—Install the worksystem software.

You need the following ULTRIX manuals to install the worksystem software:

- *Guide to Installing ULTRIX*
- ULTRIX release notes

To install the worksystem software from a network

1. Make sure that you reported your Ethernet address to your system manager and that your workstation has been connected to the Ethernet network.

2. Ask your system manager to install the worksystem software for you.

To install the worksystem software from a tape drive

1. Remove the ULTRIX software installation tape cartridge from your ULTRIX tape cartridge kit (refer to the *Guide to Installing ULTRIX* for the full name of the installation tape). Make sure the tape is write-protected.

Slide the write-protect switch on the front of the tape cartridge to the left until the orange dot is visible on the switch.

Tape cartridge

Orange dot

Write-protect switch

Write-protected position
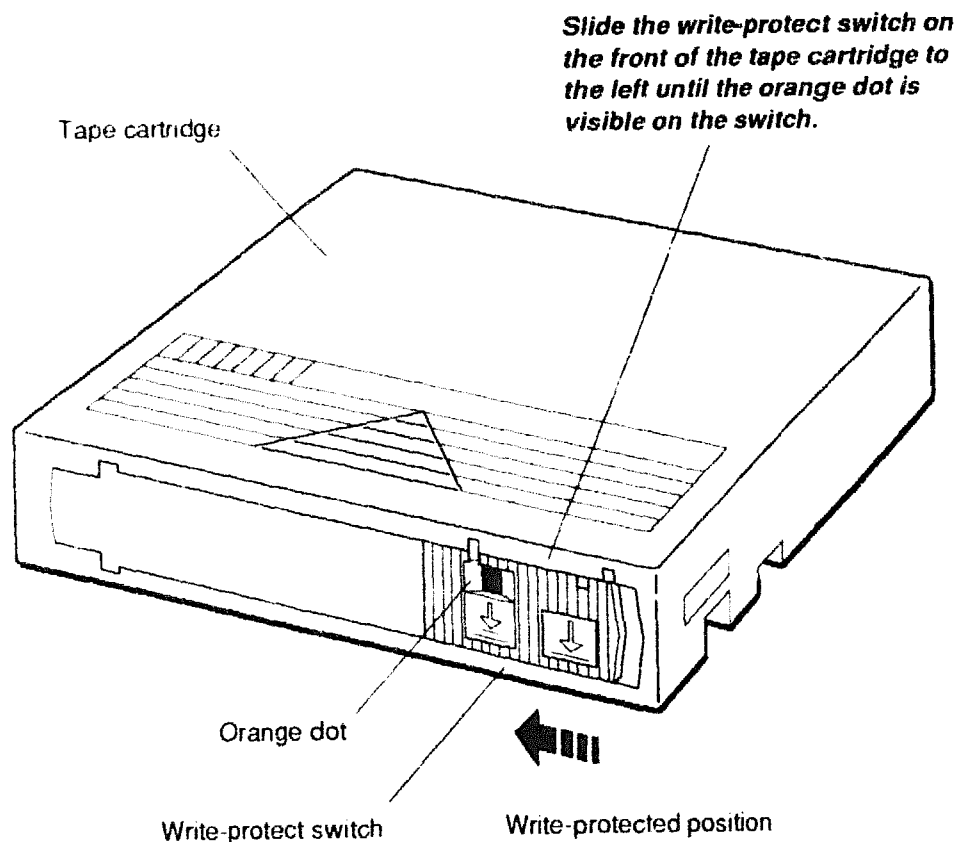
WS3PI048

Figure 40. ULTRIX software installation tape cartridge

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2. Open the door to the tape drive.

Insert three fingers behind the lip on the left side of the top of the drive door and pull the door away from the drive to open it.
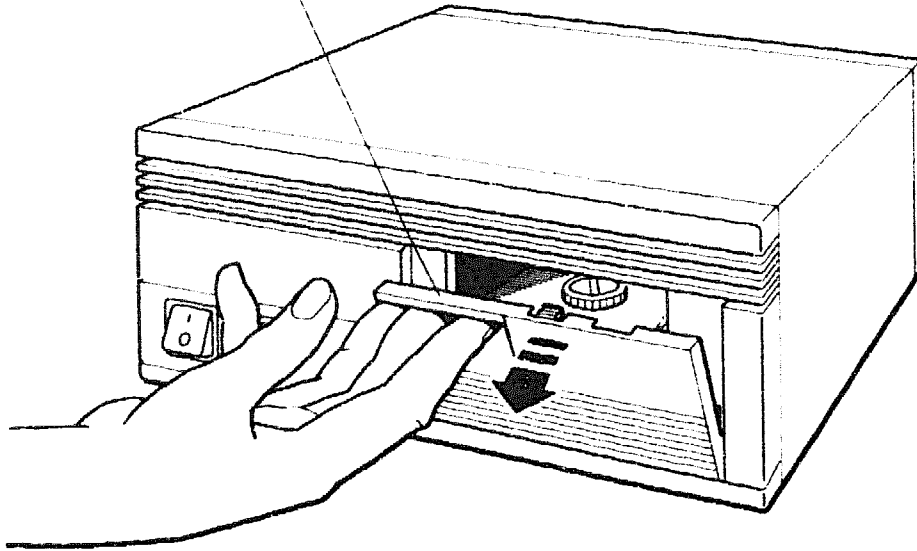
WS3PI049

Figure 41. Opening the door to the tape drive

3. Make sure the load/unload button on the tape drive is in the unload (out) position. Then turn on the power by pressing the power button. Wait for the drive self-test to run.

The red indicator light shines steadily for 5 to 15 seconds while an internal self-test runs. Then the red indicator light goes off and the green indicator light comes on. If at any time the red light flashes rapidly, there is a problem with the tape drive. See the troubleshooting section of the tape drive owner's manual for help or contact your field service representative.

Power switch

Green indicator light

Red indicator light and load/unload button
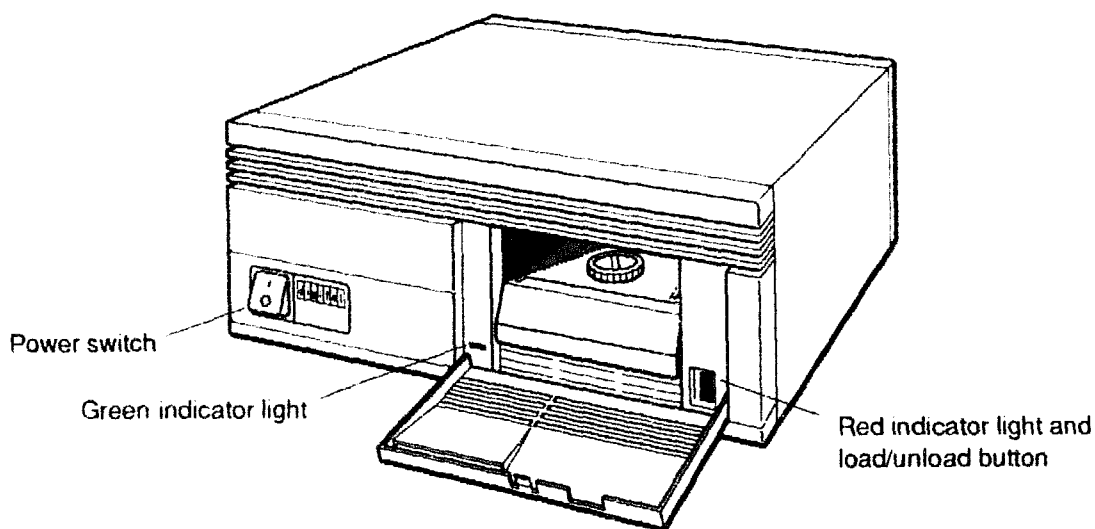
WS3PI050

Figure 42. Power switch and indicator lights on tape drive

4. Lift the cartridge insert/release handle.

Caution: *Never lift the handle when the green light is off or blinking, as this may cause an error or damage the drive.*

Raise the insert/release
handle behind the bottom
of the door until the handle
locks into position.
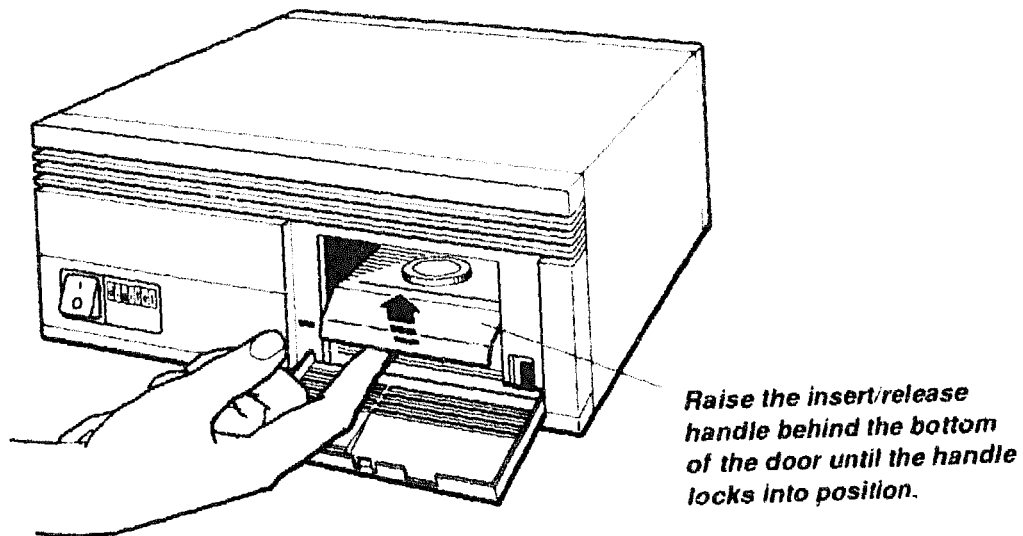
WS3PI051

Figure 43. Lifting the cartridge insert/release handle

5. With the arrow on the tape cartridge pointing away from you, load the tape cartridge into the drive. (The owner's manual for the drive explains how to insert and remove tapes.)

Caution: You will feel some resistance as you push the cartridge into place. It is very important not to stop at this point, but to continue pushing the cartridge firmly until it locks into place.

Insert the tape cartridge smoothly and completely into the tape drive.
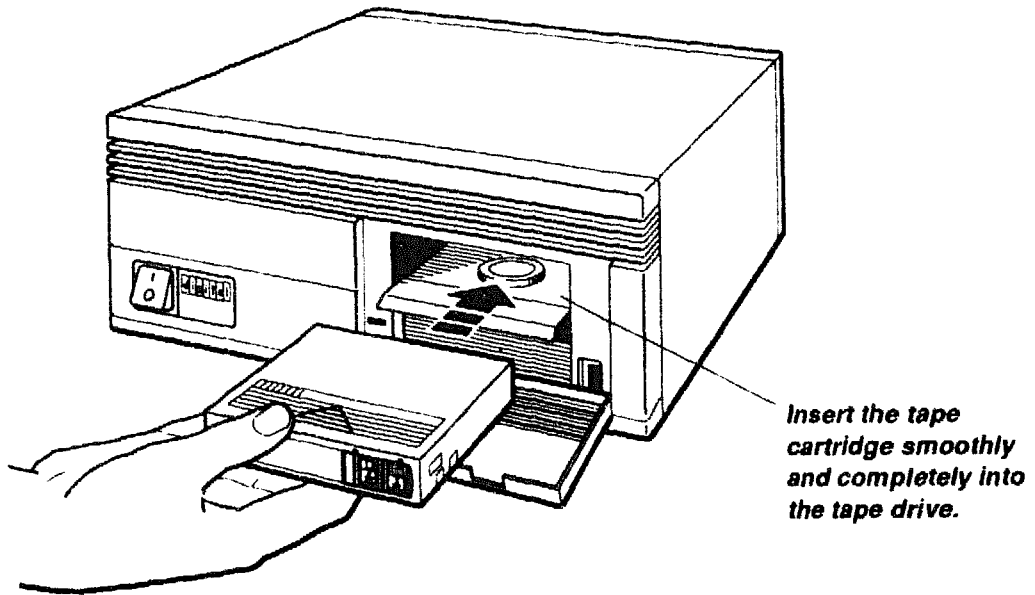
WS3F.056

Figure 44.   Inserting the tape cartridge

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6. When the red indicator light turns on and the green indicator light goes off, lower the cartridge insert/release handle to the locked (closed) position.
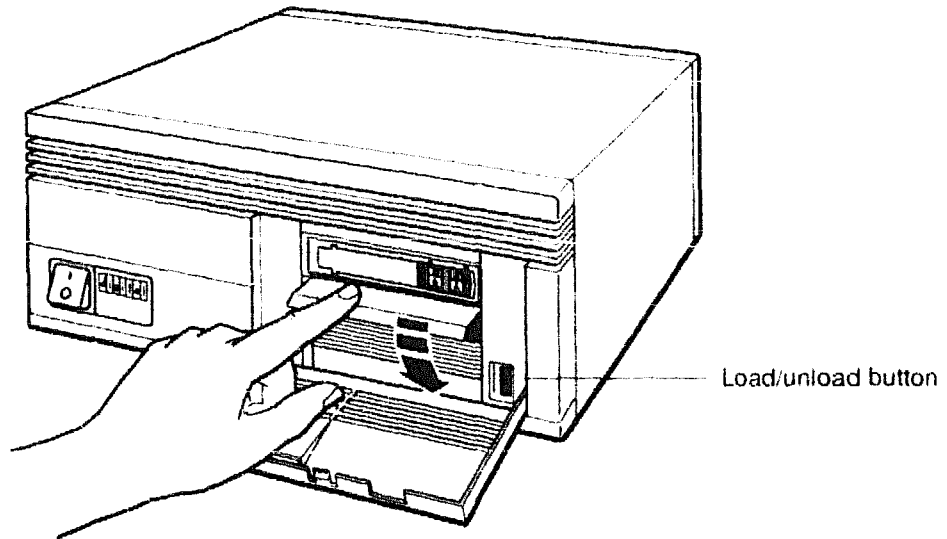
Load/unload button

WS3PI004

Figure 45. Lowering the cartridge insert/release handle

After several seconds, the green indicator light glows steadily and the red indicator light turns off.

7. Press the load/unload button so it is in the load (in) position.

The tape goes through a load process that takes 5 to 7 seconds. Both lights come on and glow steadily when the tape reaches its beginning and is ready for use.

8. Find the device code and SCSI ID for the tape drive you are using.

At the console prompt (>>), type **cnfg** *slot-number*, replacing *slot-number* with the number of the slot in which the tape drive is installed (0, 1, 2, or 3). For example, if the tape drive is attached to the base system SCSI connector, type **cnfg 3**. Then press Return.

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Here is the relevant portion of a sample display:

```
>>cnfg 3
3:  KN03-AA    DEC    X2.0d    TCF0   (224 MB,    1 MB NVRAM)
                                      (enet: 08-00-2b-0f-45-72)
                                      (SCSI = 7)
---------------------------------------------------------------
DEV    PID                  VID        REV       SCSI DEV
=====  ===================  =========  ======    ========
rz0    RZ55      (C) DEC    DEC        0700      DIR
rz2    RZ24      (C) DEC    DEC        0700      DIR
rz4    RRD42     (C) DEC    DEC        0700      CD-ROM
tz5                                              SEQ
```

All device codes in this display appear in the column labeled DEV. The device code for all tape drives begin with tz. In the example, the device code for the tape drive is tz5.

9. Type **boot** *slot-number*/*device-code*. Replace *slot-number* with the tape drive's slot number (0, 1, 2, or 3) and *device-code* with the device code of the tape drive. Then press Return. For the drive in the example, you would type **boot 3/tz5**.

If the message ?IO: 3/tz5 (bb rd) appears on the screen, make sure that the proper tape cartridge is in the drive and the red and green lights are glowing steadily. If retyping the boot command still causes this message to appear, contact your Digital service representative.

10. Follow the instructions on your screen to complete the basic worksystem software installation.

This procedure takes about 2 hours using a tape drive. For further assistance, refer to the *Guide to Installing ULTRIX*.

When the installation is complete, the login screen with the DIGITAL logo appears on your monitor.

Remove the tape from the drive after completing the installation. Follow the instructions in the tape drive owner's guide.

To install the worksystem software from a compact disc drive

1. Remove the ULTRIX software installation compact disc from your ULTRIX optical compact disc kit (refer to the *Guide to Installing ULTRIX* for the full name of the installation compact disc).

2. Load the software installation compact disc into the drive. (The owner's manual for the drive explains how to insert and remove discs.)
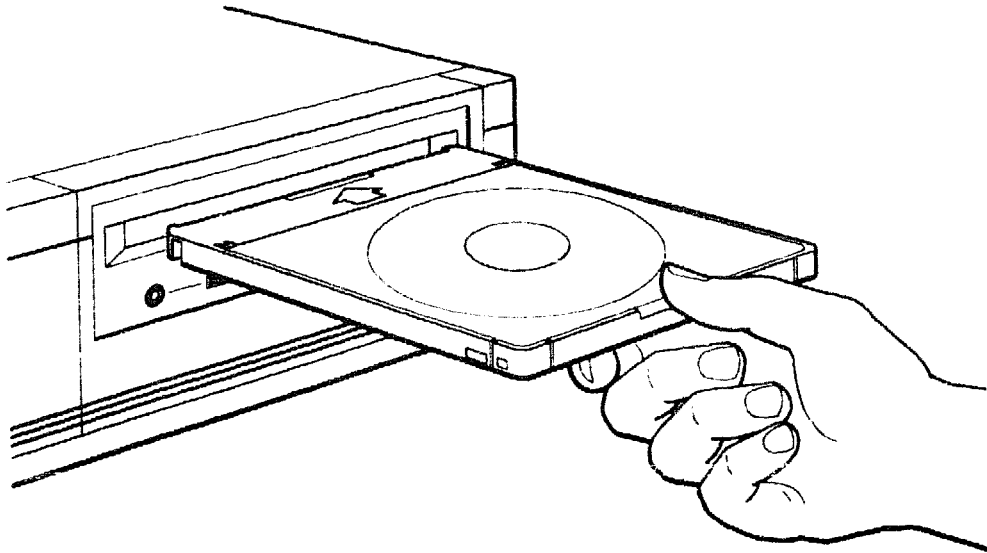
WS3PI053

Figure 46. Loading the software installation compact disc

3. Find the device code and SCSI ID assigned to your compact disc drive.

   At the console prompt (>>), type **cnfg** *slot-number*, replacing *slot-number* with the number of the slot in which the compact disc drive is installed (0, 1, 2, or 3). For example, if the compact disc drive is attached to the base system (slot 3) SCSI connector, type **cnfg 3**. Then press Return.

```
>>cnfg 3
3:  KN03-AA   DEC   X2.0d   TCF0   (224 MB,    1 MB NVRAM)
                                   (enet: 08-00-2b-0f-45-72)
                                   (SCSI = 7)
-------------------------------------------------------------
DEV    PID                   VID        REV      SCSI DEV
.====  ==================    ==========  ======  ========
rz0    RZ55     (C) DEC      DEC         0700     DIR
rz2    RZ24     (C) DEC      DEC         0700     DIR
rz4    RRD42    (C) DEC      DEC         0700     CD-ROM
tz5                                               SEQ
```

The drive with the CD-ROM device description in the SCSI DEV column is the optical compact disc drive. To find its device code, look at the entry on the same line in the column labeled DEV. In this example, the CD-ROM device code is rz4.

4. After the green indicator light stops glowing, at the console prompt (>>) type **boot** *slot-number/device_code/***vmunix**, replacing *slot-number* with the CD-ROM's slot number and *device-code* with the CD-ROM's device code from the DEV column of the display. Then press Return. For the drive in the example, you would type **boot 3/rz4/vmunix**.

5. Follow the instructions that appear on the screen to complete the basic worksystem software installation.

    This procedure takes about an hour using a compact disc drive. For further assistance, refer to the *Guide to Installing ULTRIX*.

When the installation is complete, the login screen with the DIGITAL logo appears on your monitor.

To remove the compact disc from the device drive after completing the installation, follow the instructions in the disc drive owner's guide.

OPERATOR'S GUIDE

DECstation 5000
Model 240

Hardware Operator's Guide

First printing, December 1991

U.S.A.

This equipment 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. Operation of this equipment in a residential area may cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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DECnet	PDP	VAXBI
DECstation	ThinWire	VAXcluster
DECsystem	TURBOchannel	VAXstation
DECUS	ULTRIX	VMS
DESTA	ULTRIX-32	VT
MicroVAX	UNIBUS	digital™

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Using This Guide

This guide explains how to operate the hardware components of your DECstation 5000 Model 240 Series workstation. It discusses the following topics:

In Part I, "Introducing Your Workstation,"

- The parts that make up the basic DECstation 5000 Model 240 Series workstation
- The function of each workstation component
- How to set up each part of your workstation
- How to adjust your workstation hardware for your comfort
- The site and voltage requirements for your workstation
- How to power up, test, and shut down your workstation
- How to read the configuration displays and interpret the power-up and system self-test results
- How to dismantle your workstation in preparation for moving

In Part II, "External Additions to Your Workstation,"

- How to connect external storage devices to your workstation
- How to connect your workstation to the Ethernet network
- How to connect external communications options to your workstation

In Part III, "Internal Parts and Additions to Your Workstation,"

- What each internal component of the system unit does
- The internal components you can add to improve workstation performance
- How to open and close the system unit
- How to use an antistatic wrist strap
- How to install and remove internal options

In Part IV, "Managing Your Workstation,"

- How to use console and operating modes
- How to install and use a terminal as a separate system console
- How to use console commands
- How to diagnose and solve basic hardware problems

In Part V, "Appendixes,"

- Specifications for your workstation components
- Part numbers for your workstation components
- Pin assignments for your workstation cables and connectors
- Regulatory information for the UK

Table 1. Conventions Used in This Guide

Convention	Use
Monospace type	Anything that appears on your monitor is set in monospace type like this.
Boldface type	**Anything that you are asked to type is set in boldface type like this.**
Caution note	Information that protects the workstation from being damaged is set off in a caution note.
Warning note	Information that protects you from being harmed is set off in a warning note.

1

The Main Components and How to Install Them

This chapter tells you about the main parts of your workstation and how to install each of the following parts:

- System unit
- Monitor
- Keyboard
- Mouse and other pointing devices

The System Unit

The system unit is the central component of your workstation. It contains the memory, central processing unit (CPU), power supply, and connectors by which you attach the monitor, keyboard and mouse, and all other parts of your workstation.

The system unit has a built-in small computer systems interface (SCSI) connector to which you can attach multiple external storage devices (tape, disk, and compact disc drives). It also has a built-in ThickWire Ethernet connector to connect your workstation to an Ethernet network. You can connect terminals, printers, plotters, or modems to its two synchronous/asynchronous RS232 serial communications connectors.

There are three TURBOchannel option slots on the system unit in which you can install TURBOchannel option modules. TURBOchannel option modules provide the hardware needed to connect and operate various workstation additions and options. The basic workstation comes with a graphics option module to which you attach the workstation monitor. The graphics option module can be installed in one of the TURBOchannel option slots on the system unit or in a TURBOchannel extender unit connected to the system unit.

The following sections explain and describe

- Front of the system unit
- Back of the system unit
- Installing the system unit

For information about replaceable modules inside the system unit, refer to Chapter 8.

Front of the System Unit

The front of the system unit has a green power indicator light. The light glows steadily when the system is operating correctly.

Power
indicator
light
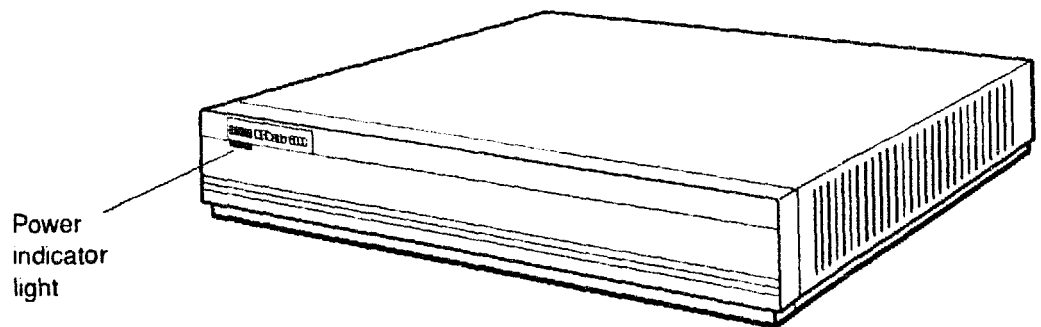
WS3PO014

Figure 1-1. Front of the system unit

Back of the System Unit

On the back of the system unit you will find the items shown in Figure 1-2. Table 1-1, which follows, explains each item.

1. TURBOchannel option slot 0 with graphics module installed
2. TURBOchannel option slot 1
3. TURBOchannel option slot 2
4. Cover-release screw
5. Monitor-to-system-unit power connector
6. On/off switch
7. System unit power connector
8. Keyboard-mouse connector
9. Communications connector 2
10. Communications connector 3
11. Halt button
12. Diagnostic LED display
13. Base system ThickWire Ethernet connector
14. Base system SCSI connector

WS3PO013

Figure 1-2. Back of the system unit

Table 1-1. Connectors, Controls, LED Display, and Lights on the System Unit

Item	Function
TURBOchannel option slots 0, 1, and 2	The points at which optional TURBOchannel hardware can connect to the system unit.
Cover-release screw	A captive screw that allows the cover to be removed from the system unit.
Monitor-to-system-unit power connector	The point at which power can pass from the system unit to the monitor.
On/off switch	The switch that turns the system unit on and off. Pressing the 1 turns the system unit on. Pressing the 0 turns it off.
System-unit power connector	The point at which power from the power source reaches the system unit.
Keyboard-mouse connector	The point at which the keyboard-mouse cable connects the keyboard and mouse or tablet to the system unit.
Communications connectors	The points at which communications devices, such as modems and printers, connect to the system unit.
Diagnostic LED display	Eight small red lights that indicate an error code by means of the on-off pattern displayed when a system failure occurs.
Halt button	The switch that stops the worksystem software and puts the workstation in console mode.
Base system ThickWire Ethernet connector	The point at which Ethernet network cables connect to the system unit.
Base system SCSI connector	The point at which external SCSI storage devices connect to the base system.
Power indicator light	The light on the front of the system unit that indicates whether the unit is on or off.

Icons on the System Unit

The connectors on the back of the system unit are labeled with the following icons to remind you of their functions:

⧻	Ethernet	⇄	Communications
▬	Keyboard	⫽	Reset button
⊖	Mouse	◇	SCSI
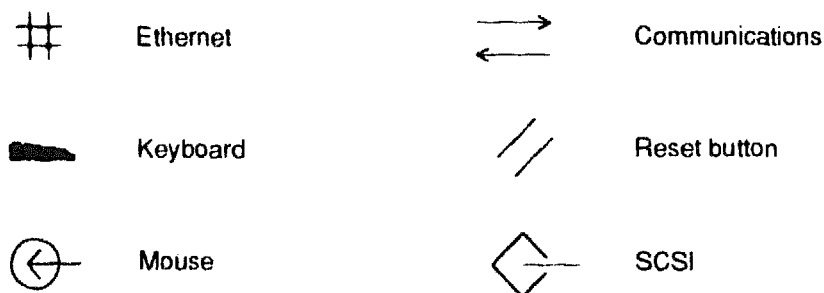
WS3PO015

Figure 1-3. Icons on the system unit

Setting Up the System Unit

Before setting up the system unit, check the voltage requirement labels printed on the back of the system unit (or check for a yellow voltage label covering the system unit power connector).

Caution: *Connecting a device to a power source that does not meet the voltage requirements of that device can damage the device.*

1. Place the system unit flat on a level surface.

   Caution: *Standing the system unit on its side blocks the cooling vents and can damage the unit by causing it to overheat.*

2. Install a ThickWire Ethernet loopback connector on the base system Ethernet connector and on each Ethernet connector you may have in a TURBOchannel option slot. Hold the loopback connector so the widest part of the metal rim on the connector is on top. Then firmly press the connector onto the system unit Ethernet connector. (See Chapter 6 for information on connecting your workstation to an Ethernet network.)

ThickWire Ethernet loopback connector

Base system ThickWire Ethernet connector
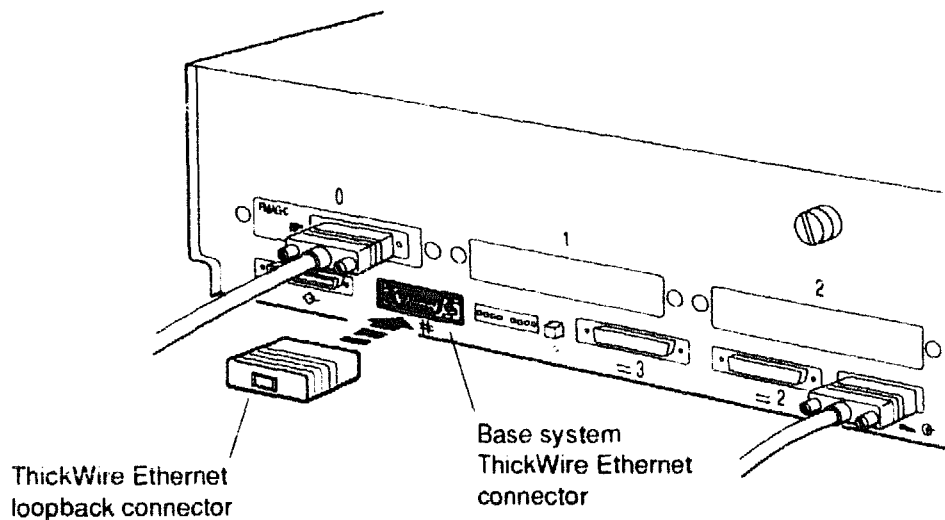
WS3PO030

Figure 1-4. Attaching a ThickWire Ethernet loopback connector

3. Connect the appropriate end of the system unit power cord to the system unit power connector.

    Do not plug the power cord into a power outlet until you have installed all of the other workstation components.

    Caution: *Installing workstation components while the system unit is connected to a power source may damage the components if the power is on.*

Power cord

System unit
power connector
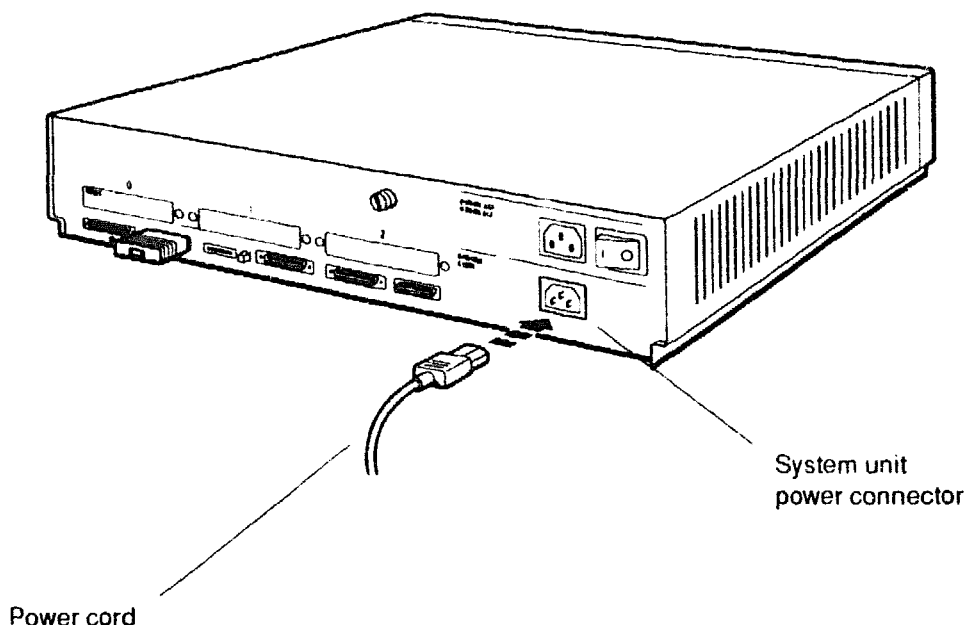
WS3PO084

Figure 1-5. Connecting the power cord to the system unit

The Monitor

Your workstation comes with a color, monochrome, or gray-scale graphics monitor for use with your worksystem software and as a system console. You can also connect a terminal to your workstation for use as an alternate system console (see Chapter 10 for details).

The monitors shown in the illustrations for this guide are examples of several different monitors you can order for your workstation. The exact position of the on/off switch, connectors, and controls will vary depending on the monitor you ordered.

The video connector to which the monitor attaches can be located in any one of the TURBOchannel option slots on the system unit or in a TURBOchannel extender (TCE) unit, connected to the system unit. The examples used here assume that the video connector is in TURBOchannel option slot 0.

Turning Your Monitor On and Off

Before connecting the monitor, make sure the monitor and system unit power switches are in the off position, and that neither unit is plugged into a power source.

Caution: *Connecting or disconnecting your monitor while power is turned on can damage the monitor.*

Figure 1-6 shows how to turn the monitor power off with three different types of switches.

Press the 0 on
this type of switch

Press and release this
type of switch

Press this type
of switch so it is out.
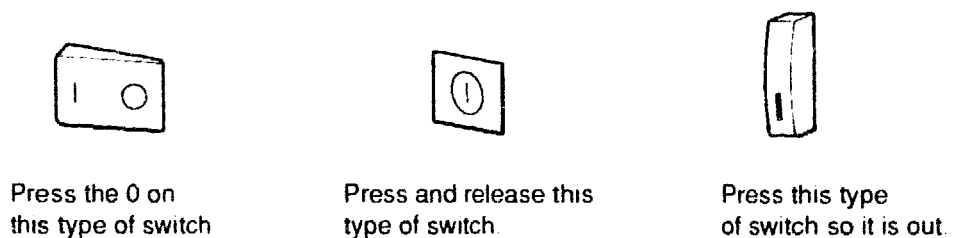
WS3P0017

Figure 1-6. Turning off your monitor

You can turn your monitor on and off independently, or you can install it so that it goes on and off when you turn the main workstation power on or off (for details, see "Supplying Power to the Monitor" on page 1-18). Figure 1-7 explains how to set the monitor power switch to the on position.

Press the I on this type of switch.

Press and release this type of switch.

Press this type of switch in.
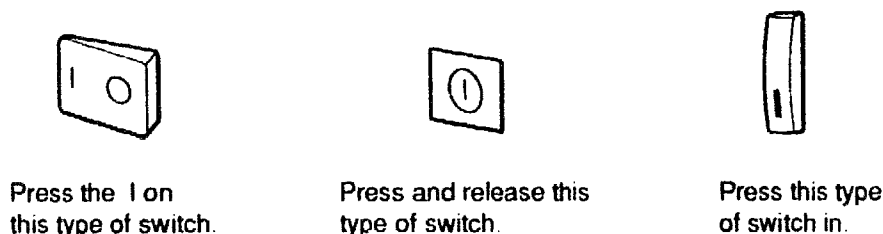
WS3PO057

Figure 1-7. Turning on your monitor

Positioning the Monitor

Place the monitor next to or on top of the system unit if you intend to connect its power cord to the system unit (see "Supplying Power to the Monitor" on page 1-18 for other options).

Caution: *Placing the monitor near an electromagnetic device, such as a printer or an electric pencil sharpener, or near magnetized objects, such as filing cabinets or steel beams in walls, can interfere with its performance.*

Connecting the Monitor Video Cable

You connect one of the following monitor video cables to your monitor and to the system unit.

Threaded video
cable connector

Slotted signal
cable connector

For a monochrome monitor

3-pin connector

3-pin connector

RGB connectors

Signal cable
connector

For a color monitor   **For a gray-scale monitor**
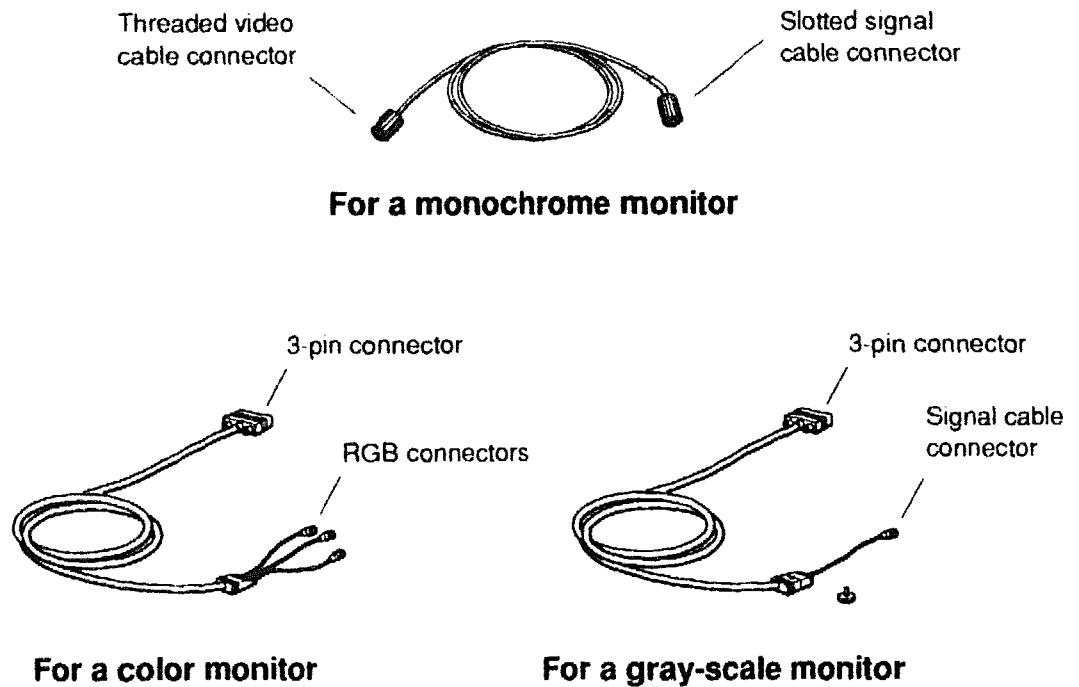
WS3PO016

Figure 1-8. Video cable assemblies

To Connect a Color Video Cable

1. The color video cable divides into red, green, and blue (RGB) cables at one end. Match the colors of these cables with the round RGB connectors on the monitor (labeled R, G, and B for red, green, and blue). The small collars on the cable connectors have two slots that fit over corresponding pins on the monitor connectors.

   If your monitor has two sets of round RGB connectors, use the ones labeled VIDEO IN. The monitor will have no display if you use the other set of connectors.

Turn the signal cable connectors to your right until they slide forward and lock into place.

R G B

R G B

Monitor video connectors
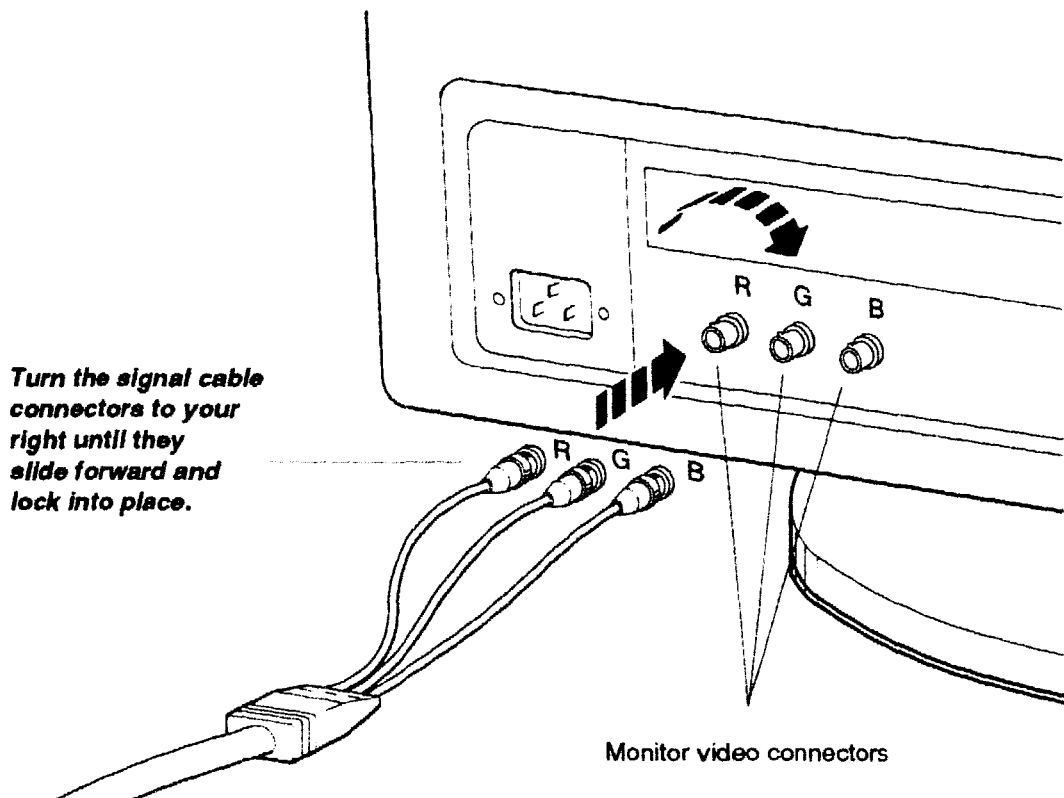
WS3PO019

Figure 1-9. Connecting a video cable assembly to a color monitor

2. Connect the 3-pin cable connector to the workstation video connector in the system unit or TCE box.

1. **Position the 3-pin cable connector so the widest part of the connector is on top.**

System unit video connector in TURBOchannel option slot 0

2. **Turn the screws to your right to hold the connector in place.**
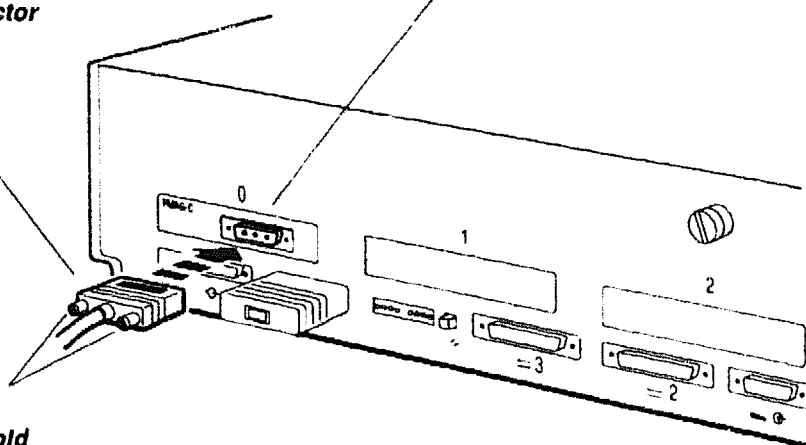
WS3PO073

Figure 1-10. Connecting a color video cable to the system unit

To Connect a Gray-scale Video Cable

1. Attach the round cable connector to the monitor.

2. Attach the connector block to the back of the monitor.

Monitor video
connector

1. Press the round cable
   connector onto the
   video connector
   and turn the round
   cable connector to
   your right until it
   slides forward and
   locks into place.

2. Attach the
   connector
   block here.

3. Turn the large plastic
   screw to your right to
   hold the connector block
   in place against the monitor.

Connector block
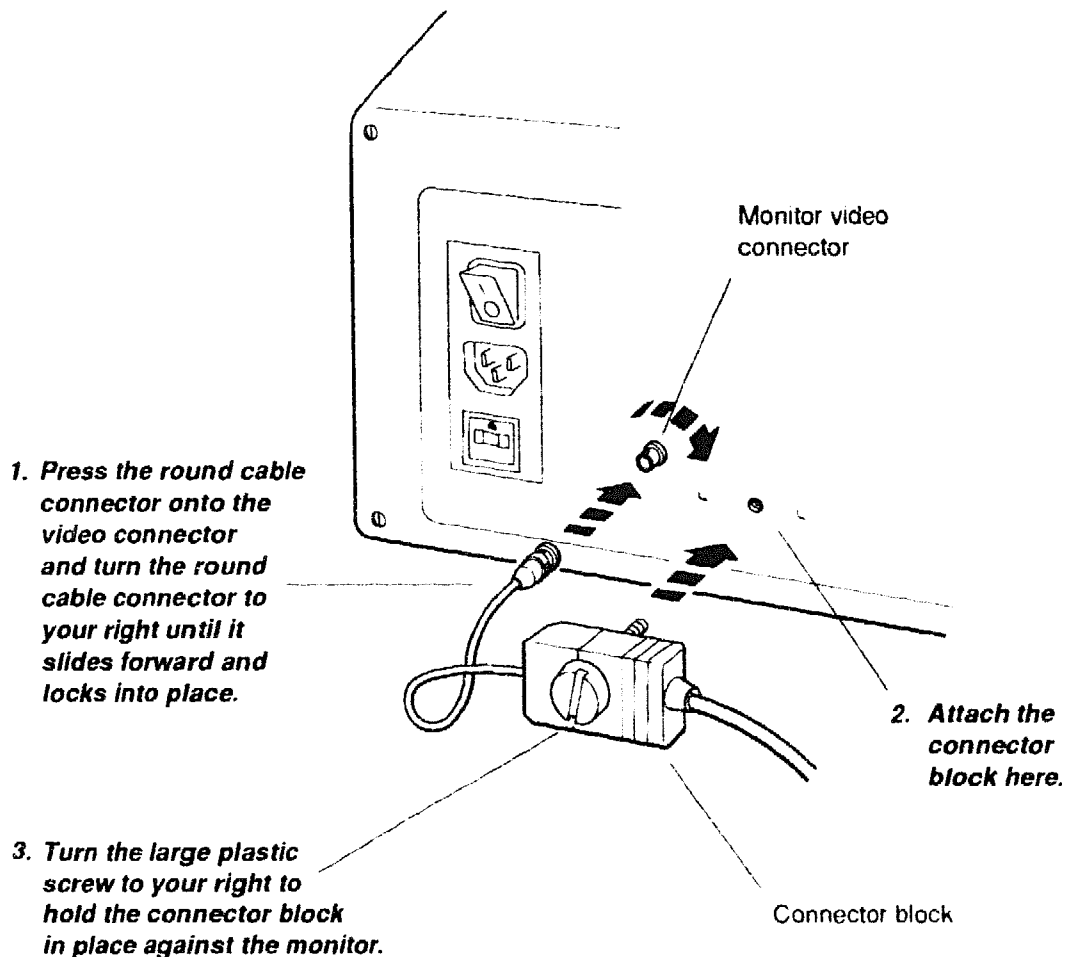
WS3PO020

Figure 1-11. Connecting a video cable assembly to a gray-scale
             monitor

3. Attach the 3-pin cable connector to the system unit video connector in the system unit or TCE box.

1. Position the 3-pin cable connector so the widest part of the connector is on top.

System unit video connector in TURBOchannel option slot 0

2. Turn the screws to your right to hold the connector in place.
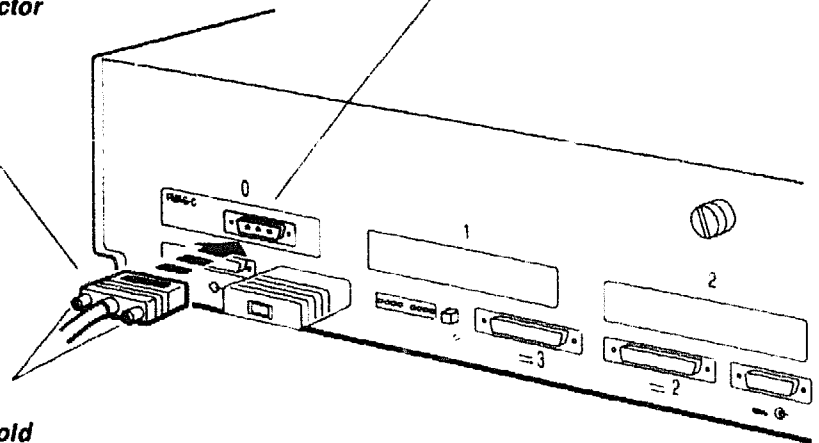
WS3PO073

Figure 1-12. Connecting a grey-scale video cable assembly to the system unit

To Connect a Monochrome Video Cable

1. Attach the slotted cable connector to the monitor video connector.

1. *Align the slots on the cable connector with the pins on the monitor video connector.*

2. *Press the slotted cable connector onto the monitor connector and turn the slotted cable connector to your right until it slides forward and locks into place.*

Monitor video connector
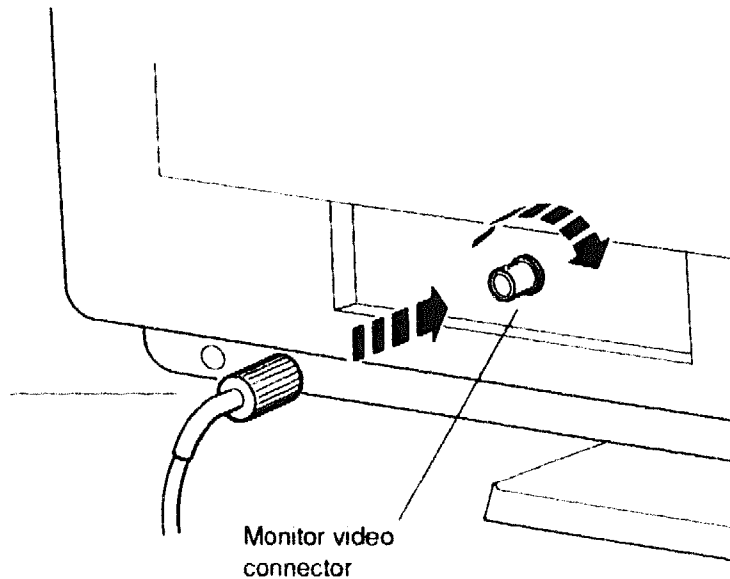
WS3PO072

Figure 1-13. Connecting a video cable assembly to a monochrome monitor

2. Attach the threaded cable connector to the video connector in the system unit or TCE box.

Press the threaded cable connector onto the video connector and turn the threaded connector to your right as far as it will go.

System unit
video connector in
TURBOchannel
option slot 0
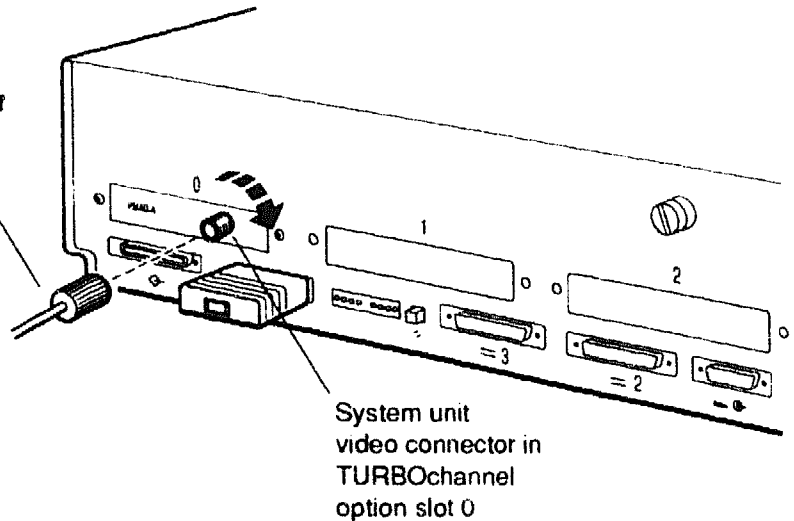
WS3PO071

Figure 1-14.   Connecting a monochrome video cable assembly to the system unit

Connecting More Than One Monitor to a Workstation

You can connect an additional monitor for each TURBOchannel graphics option module you may have installed. All graphics option modules must be the same type. Also, your workstation must be running an advanced installation of ULTRIX version 4.2 or higher. No matter how many monitors you attach to your workstation, you can use only one keyboard and mouse or other pointing device.

To connect additional monitors to your workstation, follow the instructions for connecting a single monitor. To install graphics option modules inside the system unit, follow the instructions in your TURBOchannel user documentation.

Supplying Power to the Monitor

The monitor can get its power from one of these:

- System unit

    When the monitor is connected to the power outlet on the system unit, the monitor goes on or off whenever you turn the system unit on or off, if you set and leave the monitor power switch in the on position.

- Power strip

    When the monitor is connected to a power strip, you can turn it on and off by turning the power strip on or off, if you set and leave the monitor power switch in the on position.

- Separate wall outlet

    When the monitor is connected to a separate wall outlet, you have to turn the monitor on and off independently of the system unit.

The length of the cable supplied with your workstation to connect the monitor to the system unit power outlet may limit the location of the monitor. If you want to install the monitor at a distance from the system unit, connect the monitor to a power strip or wall outlet with a monitor power cord, or you can order a longer monitor-to-system-unit power cable.

Before connecting any power cords or cables, check for a yellow voltage label covering the power connector on the monitor or a voltage requirement printed on the monitor near the power outlet.

Caution: *Connecting a device to a power source that does not meet the voltage requirements of that device can damage the device.*

To Connect the Monitor to the System Unit Power Outlet

1. Find the monitor-to-system-unit power cable.
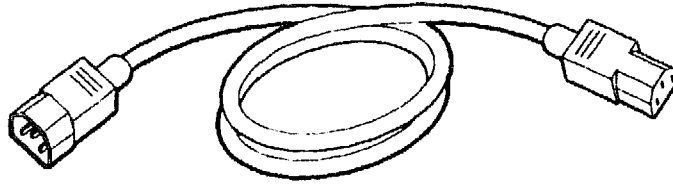
WS3PO085

Figure 1-15. Monitor-to-system-unit power cable

2. Plug the appropriate end of the monitor-to-system-unit power cable into the power connector on the back of the monitor.

   Plug the other end into the monitor-to-system-unit power connector on the back of the system unit.

Monitor-to-system-unit
power cable

Monitor-to-system-unit
power connector

Monitor power
connector
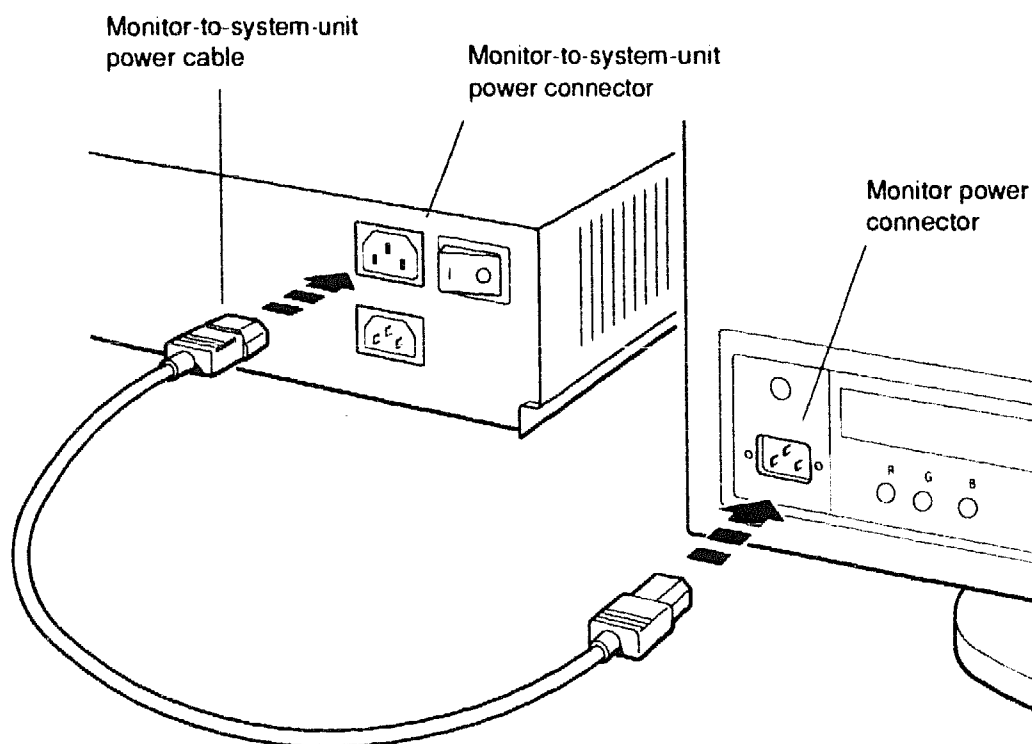
WS3PO070

Figure 1-16. Connecting the monitor-to-system-unit power cable

3. Check to make sure the power to the system unit is off. Then set the monitor power switch to the on position (see "Turning Your Monitor On and Off" on page 1-9).

To Connect the Monitor to an Independent Power Outlet

1. Find the monitor power cord (identical to the system unit power cord).
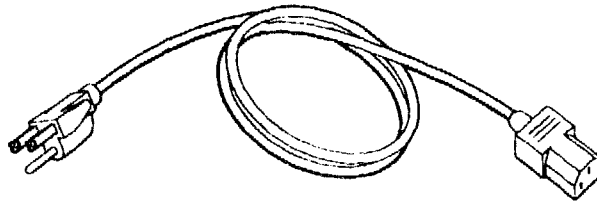
WS3PO086

Figure 1-17. Monitor power cord

2. Plug the appropriate end of the monitor power cord into the power connector on the back of the monitor.

   Plug the other end of the power cord into a power strip or separate wall outlet.

Monitor power connector

To power
source
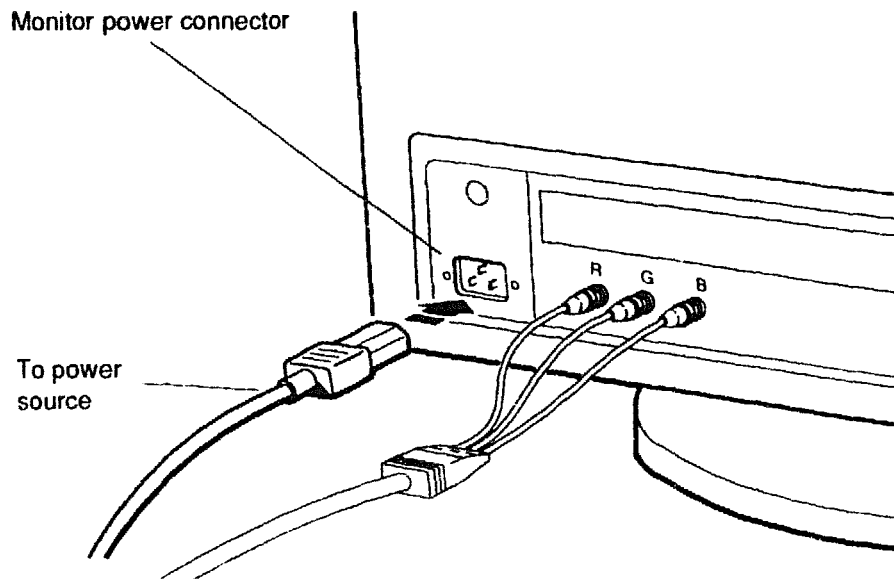
WS3PO035

Figure 1-18. Connecting a separate monitor power cord

3. If you intend to turn your monitor on and off independently, set the monitor power switch to the off position.

   If you intend to control the power to your monitor by turning the power strip on and off, set the monitor power switch to the on position.

   For instructions on operating the monitor power switch, see "Turning Your Monitor On and Off" on page 1-9.

Input Devices

The following input devices can be connected to your workstation:

- Keyboard
- Mouse
- Tablet and puck or stylus
- Dial and button box

The Keyboard

You have a choice of a full-sized or smaller version of the keyboard.

The LK401 Keyboard

The LK401 is a full-sized keyboard. The main part of the LK401 keyboard resembles a typewriter keyboard. In addition to the main keys, the LK401 keyboard has some special function keys, a special editing keypad, and a numeric/application keypad. The manuals for your software explain how to use the special keys.
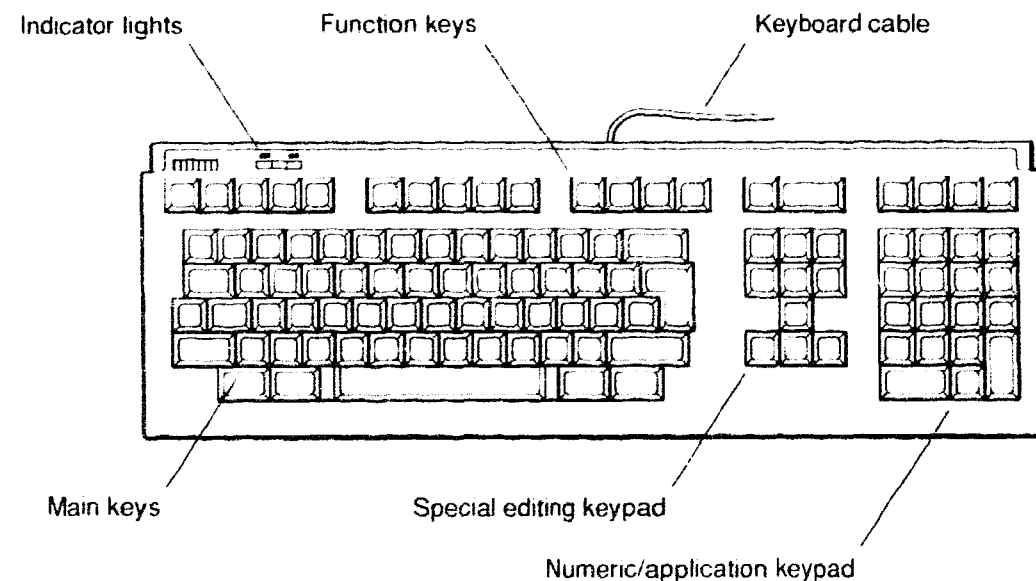
Figure 1-19. LK401 keyboard

The LK421 keyboard

The LK421 is a smaller keyboard that more closely resembles a typewriter keyboard. In addition to the main typewriter-style keys, it has cursor control keys and special function keys F1 to F12. It has no separate editing keypad or numeric/application keypad.

Function keys   Keyboard cable

                                  Curser control keys

Main keys
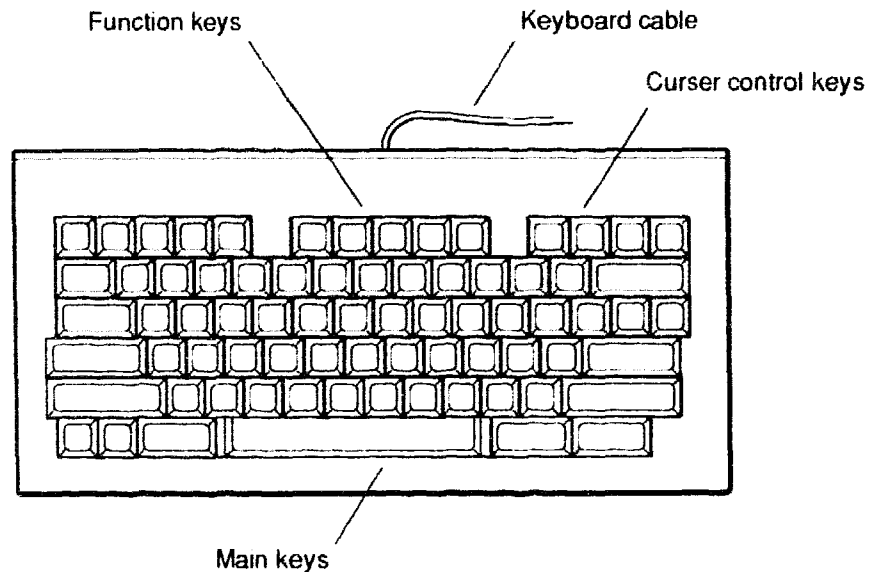
WS3PO068

Figure 1-20.   LK421 keyboard

Connect the Keyboard to the System Unit

You connect the keyboard to the system unit using a keyboard-mouse cable assembly.

Connector block

Connector block flap

15-pin cable connector
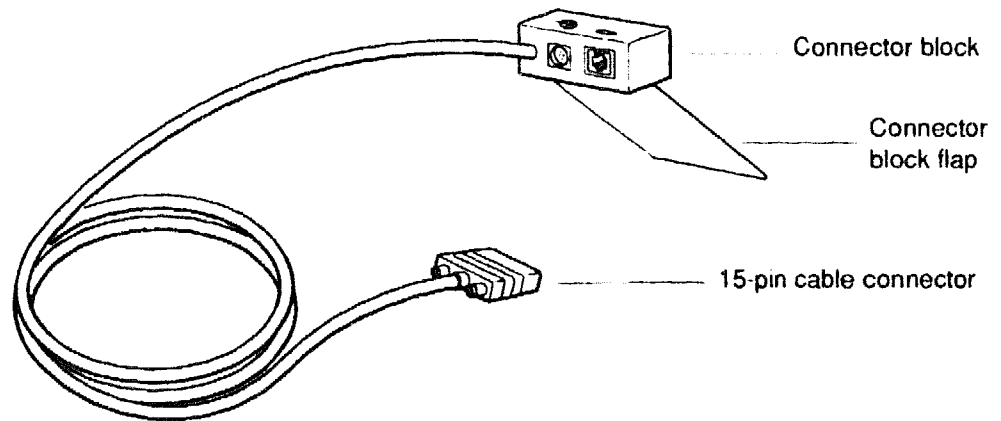
WS3PO082

Figure 1-21.   Keyboard-mouse cable assembly

1. Plug the 15-pin connector on the keyboard-mouse cable assembly into the keyboard-mouse connector on the system unit.

1. *Position the keyboard-mouse cable connector so the widest part of the connector is on top.*

2. *Turn the screws to your right to hold the connector in place.*

Keyboard and mouse icons
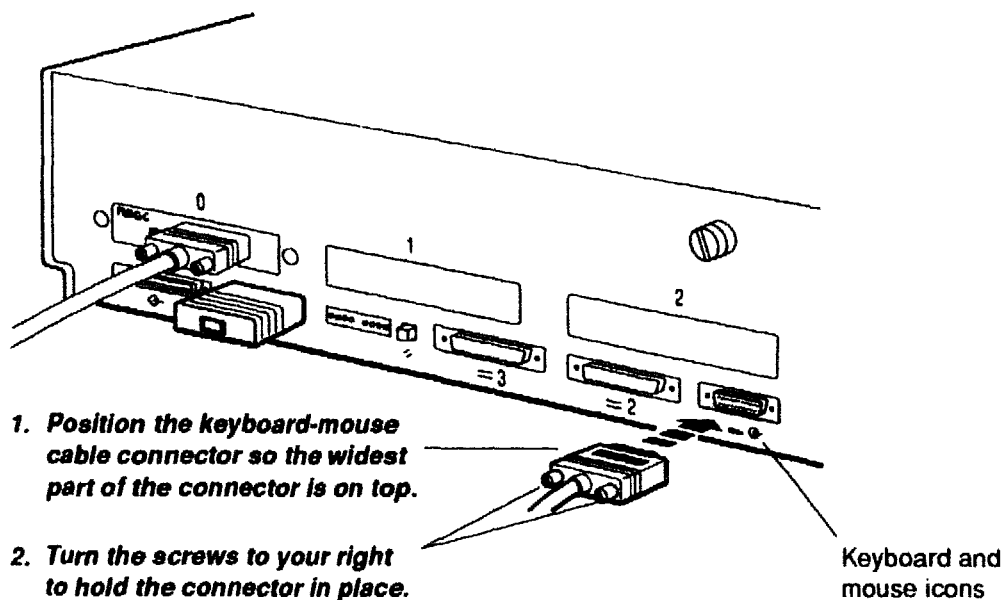
WS3PO081

Figure 1-22. Connecting the keyboard-mouse cable assembly to the system unit

2. Insert the keyboard cable connector into the connector block of the keyboard-mouse cable assembly.

Connector block flap

Position the keyboard cable connector so the clip is on the bottom and push the connector into the connector block until it clicks into place.
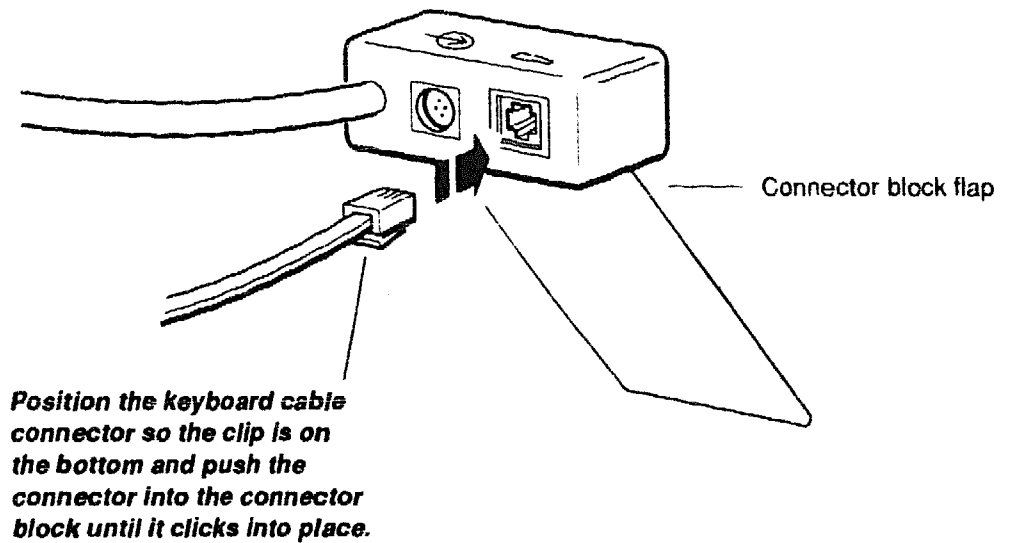
WS3PO083

Figure 1-23. Connecting the keyboard cable to the connector block

3. Lift the back of the monitor, slide the flap on the connector block under the base of the monitor, and lower the base onto the flap. Be sure the entire flap is under the base.

Connector block

Connector block flap
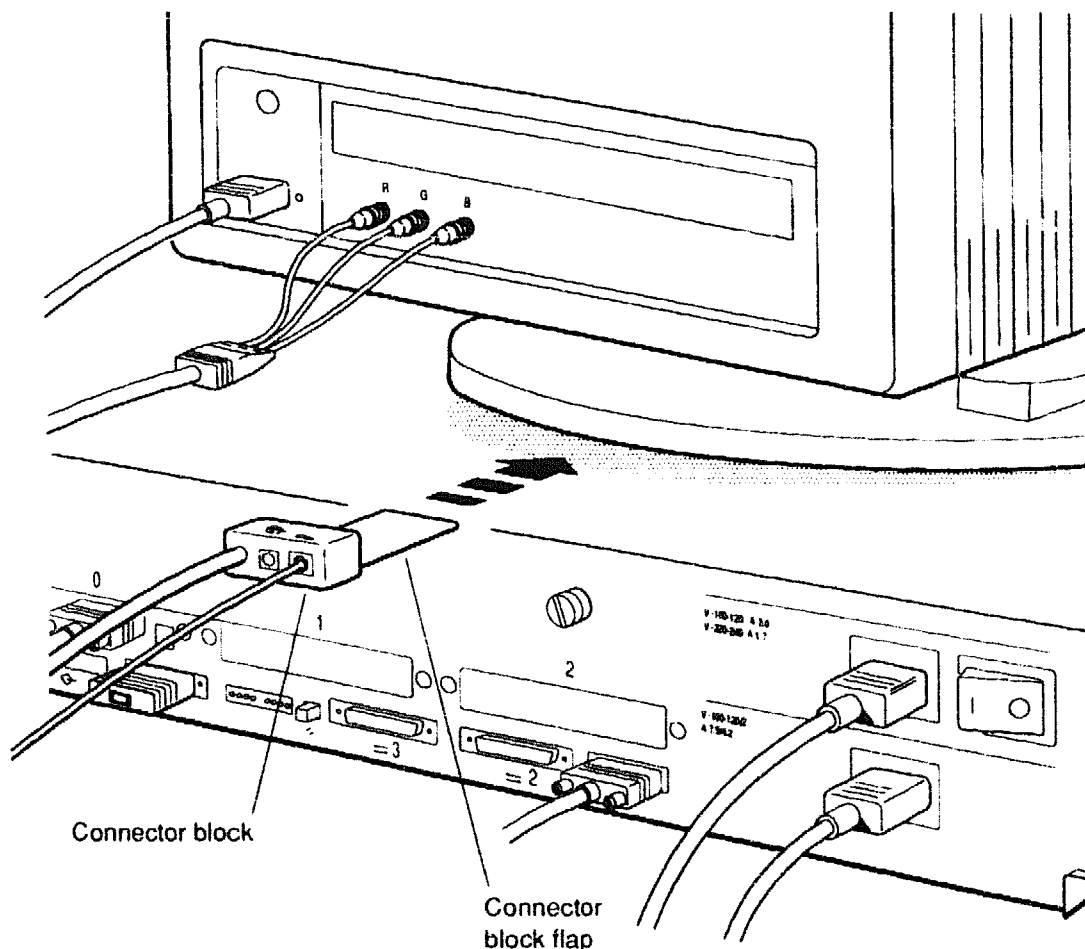
WS3PO026

Figure 1-24. Positioning the connector block

To Adjust the Keyboard Feet

You can use the keyboard in either of two positions, depending on which you find most comfortable: you can lay the keyboard flat on your work surface, or you can slant it towards you at a slight angle. To position the keyboard, you raise or lower the hinged feet on the bottom of the keyboard.

Hinged feet
on keyboard
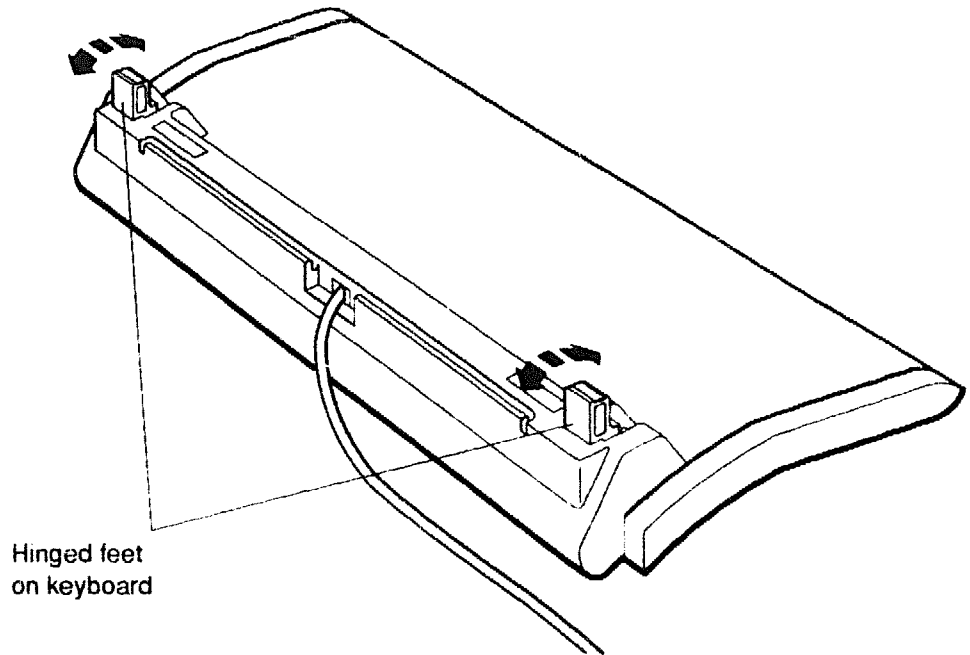
WS3PO023

Figure 1-25.   Raising and lowering the hinged feet on the keyboard

Pointing Devices

You use a pointing device to move the pointer and cursor on the monitor screen.

The Mouse and Tablet

The main pointing device for your workstation is a mouse. As an alternative to a mouse, you can use a tablet and stylus as a pointing device. You cannot use both a mouse and a tablet and stylus at the same time.

Your software manuals explain how to use the devices.

Mouse

Tablet

Stylus

Puck

Tablet with puck and stylus
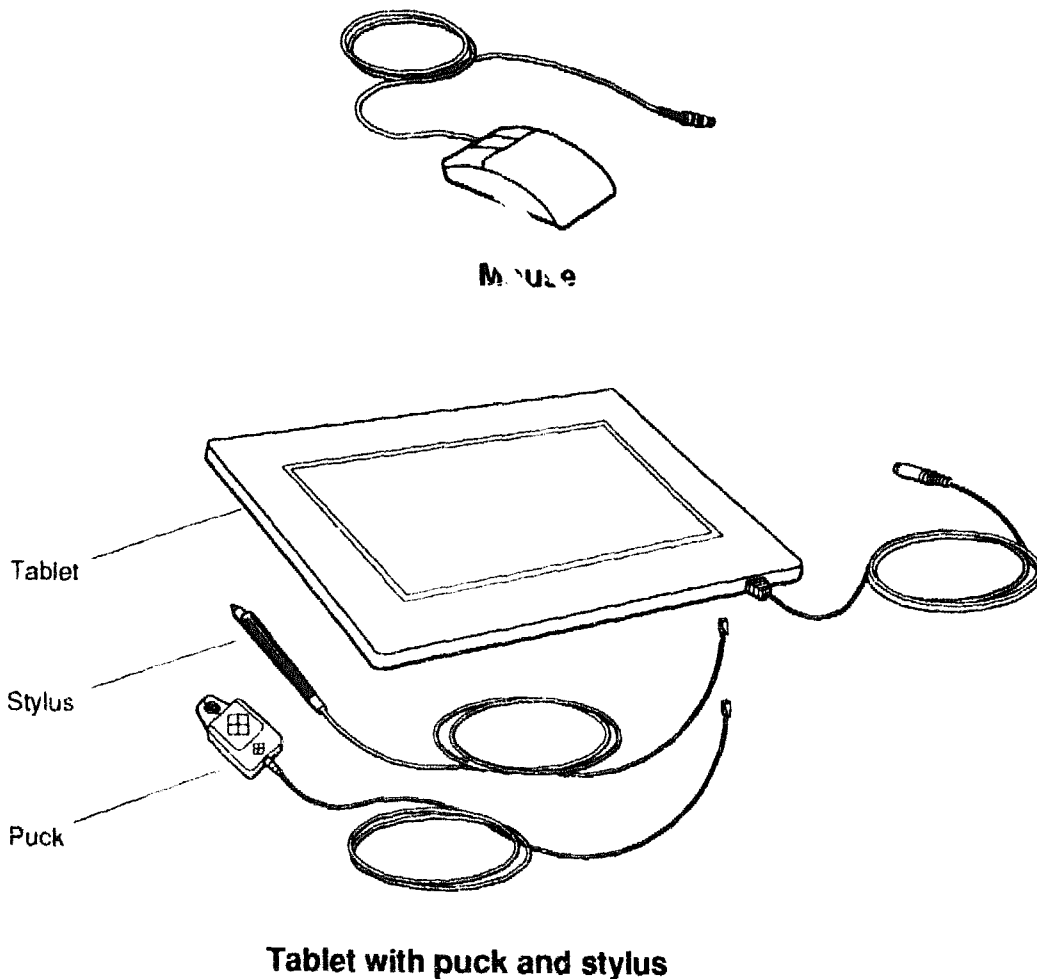
WS3PO002

Figure 1-26.   Pointing devices

You connect the mouse (or tablet and stylus) to the connector block on the keyboard-mouse assembly that attaches to the system unit.

1. Position the mouse or tablet cable connector so the icon on it is below the mouse icon on the connector block.

2. Push the cable connector as far as it will go into the connector block.
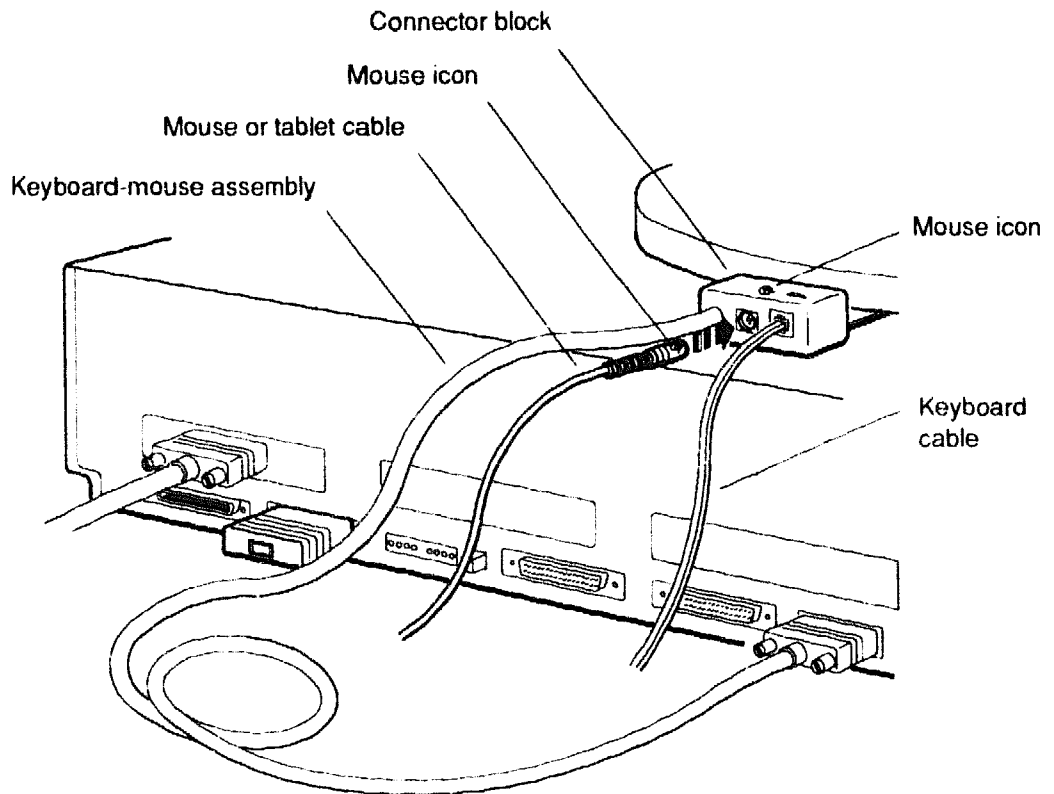
WS3PO028

Figure 1-27. Connecting the mouse or tablet

Dial and Button Boxes

If you are using computer-aided design (CAD) applications
with your workstation, you may want to connect a dial box
or a button box in addition to the mouse or tablet. Dial and
button boxes allows you to easily rearrange the contents of
a graphic screen display. You connect a dial or button box to
one of the communications connectors on the system unit. For
installation information, refer to the documentation supplied
with the device.

Communication
device cable

To power
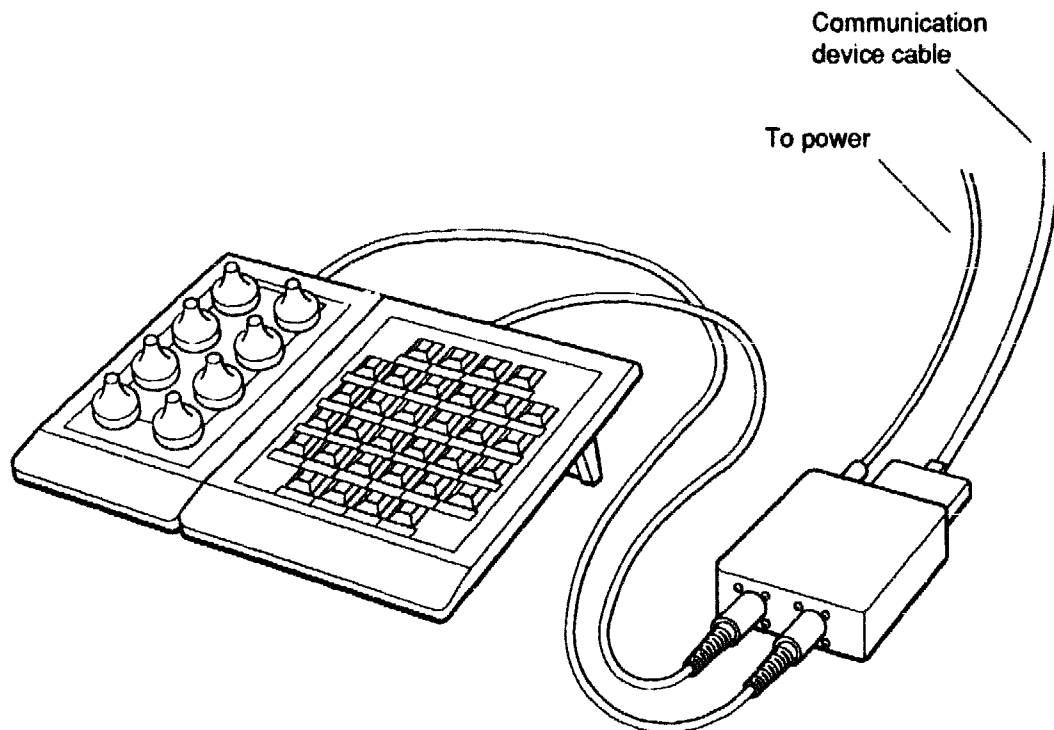
WS3PO024

Figure 1-28.   Dial and button boxes

Adjusting and Positioning Your Workstation for Comfort

You can make several adjustments to your workstation monitor and keyboard for your comfort. You can

- Position the monitor on top of or beside the system unit.

- Anchor the keyboard-mouse cable assembly connector block under the monitor base, or wherever is convenient.

- Tilt and swivel the monitor on its stand.

- Adjust the monitor brightness and contrast controls.

- Slant the keyboard toward you or lay it flat by raising or lowering the hinged keyboard feet.

For more specific instructions, turn to the section of this manual that tells you about that device or refer to the documentation that came with the device.

2

The Right Environment

This chapter discusses

- The environment your workstation needs to function efficiently
- The voltage requirements for your workstation

Site Requirements

To operate at its best, your workstation must be set up in a place that meets certain requirements.

Caution: Failure to meet these requirements can damage equipment.

Temperature and Humidity

- Keep the temperature around the workstation between 50°F (10°C) and 104°F (40°C).
  - Set up your workstation away from heaters, photocopiers, and other sources of heat.
  - Protect your workstation from direct sunlight.
- Allow air to flow freely around your workstation to keep heat from building up and damaging your equipment.
  - Leave 4 inches (10 centimeters) of space between system unit vents and other objects.
  - Leave 3 inches (8 centimeters) of space between monitor vents and other objects.
- Keep relative humidity within the range of 10 to 90 percent.

Cleanliness

- Keep your work area as dust-free as possible.

Interference

- Set up your workstation at least 30 inches (76.2 centimeters) away from other terminals or monitors and from other sources of electrical interference, such as printers or electric pencil sharpeners.
- Limit exposure to static electricity and magnetized objects by setting up your workstation away from busy corridors and other high-traffic areas and away from filing cabinets and steel beams in walls.

Power

- Reserve an entire circuit for your workstation's power source. The fuse for the circuit must be at least 15 amperes.

- Be sure your electrical circuit is properly grounded. The use of a surge-protected power strip is recommended for connecting the power cord to your workstation.

- Be sure the voltage for workstation devices matches that of your power source.

Supplies

- Store supplies, such as tape cartridges, within the same temperature and humidity limits as those for your workstation.

Workstation Voltage Requirements

The voltage for many devices, including most monitors, must match that of your power source. Your power source is either 110/120 or 220/240 volts. Where necessary, a yellow voltage label that covers the power connector on your device tells you the voltage requirements for that device.

Caution: Connecting a device to a power source that does not meet the voltage requirements of that device can damage the device.
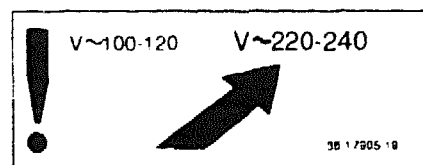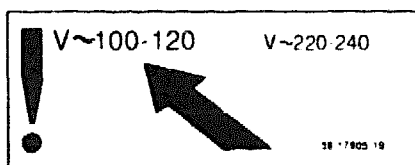
WSE2I021

Figure 2-1. Voltage labels

3

Starting and Testing

This chapter explains

- How to turn on your workstation
- How the power-up and system self-tests operate
- How to set your keyboard language
- How to check your workstation configuration
- How to stop your worksystem software
- How to turn off your workstation

Turning On Your Workstation

Before turning on your workstation for the first time,

- Make sure the system unit power cord is plugged into a wall outlet or power strip.

- Make sure the monitor and any external devices are plugged into a power source.

- If any components of your workstation are plugged into a power strip, make sure the power strip is plugged into a power outlet.

- If you intend to control power to your workstation by turning the power strip on and off, make sure all power switches on the workstation components are set to the on position.

If all workstation components are plugged into a power strip, turn on the power strip to turn on your workstation. If some of your workstation components are plugged into different outlets, turn on your workstation in the order described here:

1. Turn on any external devices. Most devices have rocker switches. Some have push switches.

2. If necessary, turn on the monitor.

    - If the monitor gets its power through the system unit, and if you have set the monitor power switch to the on position, it will go on when you turn on the system unit.

    - If the monitor is plugged into a wall outlet, or if the monitor power switch is in the off position, turn it on now (for instructions, refer to the documentation that came with the monitor or turn to "Turning Your Monitor On and Off" on page 1-9).

    When the monitor turns on, a green indicator light glows on the front of the monitor. The monitor must run for 10 to 15 seconds before it is warmed up enough for the display to be visible.

3. Turn on the system unit by pressing the 1 on the on/off switch on the back of the system unit.

On/off switch
in the on position
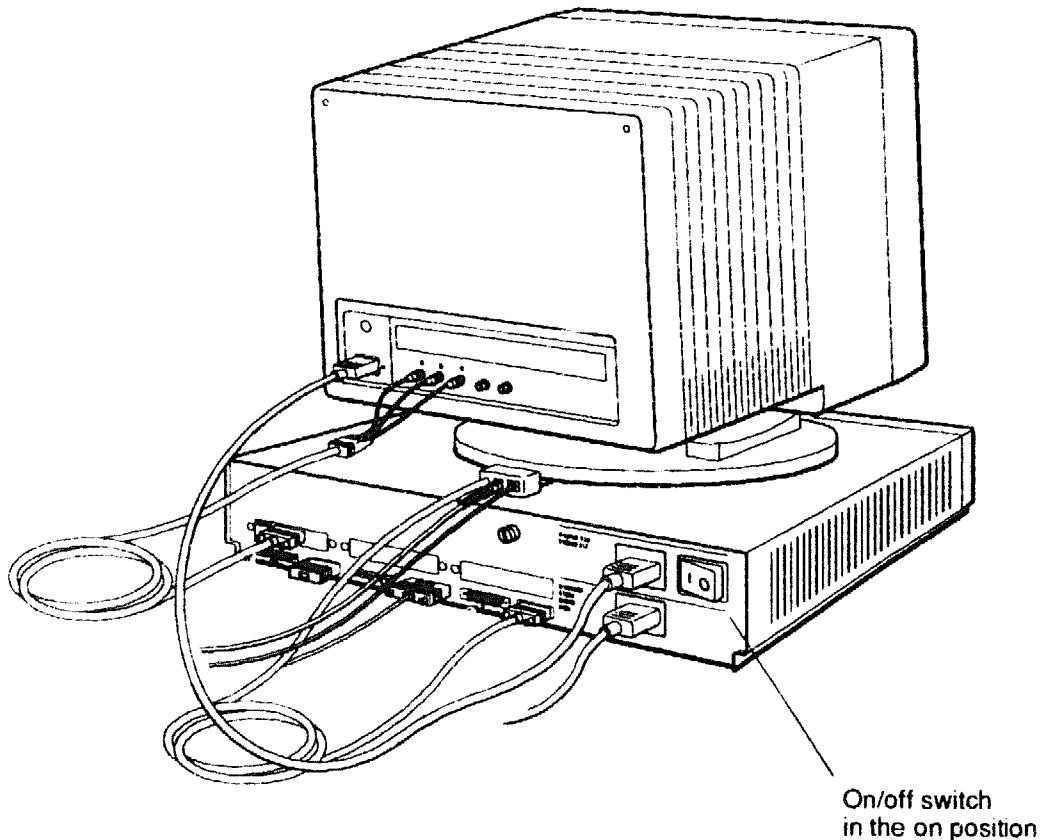
WS3PO058

Figure 3-1. Turning on the system unit

4. When you turn on the system unit, the following things happen:

   ∎ The green power indicator light glows on the front of the system unit.

   ∎ The system unit runs the automatic power-up self-test, which takes from 1 to 5 minutes. It displays the names of each subtest that it runs at the bottom of the screen. Some tests display asterisks (*) and other symbols, and some tests cause the screen to flicker.

If you have multiple monitors, the monitor connected to the graphics module in the lowest numbered option slot displays all system test information. At the end of the power-up self-test, messages explaining any errors that occurred during any of the subtests scroll across the screen. (You can redisplay these messages later.)

For more information on the power-up self-test, see "Testing Your Workstation" on page 3-6.

5. If you are starting your workstation for the first time, you will be prompted to select a keyboard language (for details, see "Setting the Keyboard Language" on page 3-5.

6. The screen displays the console prompt (>>) or the restricted console prompt (R>) when the system is ready to accept user commands.

- Users can execute all console commands at the console prompt (>>).

- The restricted console prompt (R>) indicates that someone has set up a password requirement to restrict access to the system. At the restricted console prompt, you can use only the boot and passwd console commands until you enter the correct password.

  To enter your password, type **passwd** and press Return. Then enter the console password at the pwd prompt and press Return again. If you do not know the password, contact your system manager or a Digital service representative.

If anything other than the console prompt (>>), or restricted prompt (R>) appears, turn to Chapter 11 for troubleshooting instructions.

7. At the console prompt, type **erl** and press Return to display a complete list of any error messages that scrolled across the screen during the self-test.

If you see any error messages, or if you see a message that begins with ?TFL:, turn to Chapter 11 for troubleshooting instructions. After correcting the error, turn the system unit off and then turn it back on again.

If your system unit fails to turn on, turn it off and check to be sure that

- Power cords are connected properly, and the power strip, if there is one, is plugged in and turned on.

- There is power at all power outlets.

- All power switches are set to the on position.

If the system unit still fails to work, turn to Chapter 11 for troubleshooting instructions.

Setting the Keyboard Language

If you are installing the workstation for the first time, the system console displays the following language menu:

```
1) Dansk                       9) Français (Suisse Romande)
2) Deutsch                    10) Italiano
3) Deutsch (Schweiz)          11) Nederlands
4) English                    12) Norsk
5) English (British/Irish)    13) Portûgues
6) Español                    14) Suomi
7) Français                   15) Svenska
8) Français (Canadien)        16) Vlaams
(1..16): _
```

Type the number displayed to the left of the language you want to use. Then press Return.

The console prompt (>>) appears when the language is set.

If you need to change the workstation language, type **setenv console 0** at the console prompt and press Return. The language menu will be redisplayed. Select a language and press Return. Then type **boot** and press Return to restart the workstation.

Testing Your Workstation

Your workstation automatically runs a power-up self-test every time you turn on the power to the system unit. Self-tests are programs that check your workstation hardware to be sure it is functioning properly.

Self-tests have numerous subtests that examine specific workstation components. When a subtest discovers a problem, it displays a coded message, called an error message, on the screen. When all the tests are done, the workstation displays the console prompt (>>).

To Specify the Quick or Full Self-Test

You can issue one of the following console commands at the system console prompt (>>) to change the number of self-tests the workstation runs during power-up:

- To set up your system to run a quick self-test (the default setting), enter the command **setenv testaction q**.

- To set up your system to run a more thorough set of self-tests, enter the command **setenv testaction t**.

Chapter 10 explains in more detail how to use these console commands.

You can run the full set of self-tests, collectively called the system self-test, at any time. However, you must shut down your ULTRIX worksystem software first.

How to Run the Full Self-Test at Any Time

1. If your workstation is running the ULTRIX worksystem software, type **shutdown -h now** at the ULTRIX prompt and press Return to halt the software.

2. At the console prompt (>>), type **test** and press Return.

- As the system performs the subtests that make up the self-test, it briefly displays the name of each subtest on the screen. The tests can take 15 minutes or more to run.

  At the end of the self-test, messages explaining any errors that occurred during any of the subtests scroll across the screen. Then the console displays the console prompt (>>).

- To redisplay the error messages, type **erl** at the console prompt (>>) and press Return.

If a Self-Test Fails

At the end of the system self-test, error messages that have been generated scroll across the screen. Use the error log command (erl) to redisplay these messages and to look for others.

If you see any error messages, or if you see a message that begins with ?TFL:, turn to Chapter 11 for an explanation of the message and troubleshooting instructions.

Checking the Configuration Display

The configuration test tells you which option modules are in your system unit. It identifies each module in your system unit by slot number and a special option module code.

Use the cnfg command to check the workstation configuration (see Chapter 10). Check to be sure that all the modules ordered for your workstation are listed in the display that appears on your screen. The modules you ordered are listed on the packing list for your shipment.

Stopping the Workstation Without Turning It Off

You can shut down the ULTRIX worksystem software by typing **shutdown -h now** at the ULTRIX prompt and pressing Return.

If you are unable to return to console mode using this shutdown command, you can stop your workstation and all worksystem software by pressing the halt button on the back of the system unit. The workstation and software stop whatever they were doing, and the monitor displays the console prompt (>>). Save all open work files, if you can, before pressing the halt button.

Caution: *Pressing the halt button while you are running any worksystem software may cause the loss or corruption of data.*

You can change the specific result of pressing the halt button by issuing a console command to change the setting of the haltaction environment variable. Chapter 10 explains how to change this variable.
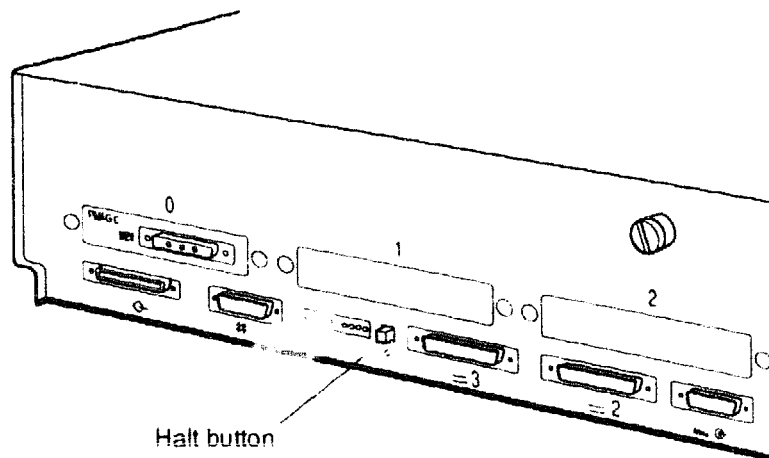
WS3PO059

Figure 3-2.   Halt button and system unit on/off switch

Turning Off the Workstation

1. If your worksystem software has been installed, follow the instructions that came with that software to shut down the software.

2. Turn off the power.

   ■ If your workstation and all the devices connected to it take power from a power strip, turn off the power strip.

   ■ If your workstation is not on a power strip,

      – Turn off any communications device by following the instructions that came with the device.

      – Turn off each expansion box.

      – If the monitor receives its power from a separate wall outlet, turn off the monitor.

        If the monitor receives its power from the system unit, leave it on.

      – Turn off the system unit.

4

Taking Your Workstation Apart

This chapter tells you how to disassemble your workstation and pack it for moving.

Dismantling Your Workstation

1. If the worksystem software is running, shut it down, following the instructions that came with the software.

2. Turn off the power to your workstation, following the procedure described in the section, "Turning Off the Workstation" on page 3-9 of this guide.

3. Wait for the system to power down. Then unplug all power cords from their power sources.

4. Disconnect all external devices, including the monitor, from the system unit. If two or more devices are chained together, disconnect them from each other.

5. Disconnect the keyboard-mouse connector block from the system unit.

6. Disconnect the keyboard and the mouse or tablet from the keyboard-mouse connector block.

7. If you are connected to an Ethernet network, disconnect the Ethernet cable from the system unit.

Packing Your Equipment

Pack each piece of equipment in the carton it came in. Use the padding that came in the carton to hold the equipment securely in place.

Be sure to include the following in each carton:

- Any cables, power cords, adapters, and terminators that came with that device
- Any documentation that came with the device

Reinstalling Your Workstation

To reinstall your workstation, follow the instructions in the *DECstation 5000 Model 240 Hardware Installation Guide*.

5

External Storage Devices

This chapter explains

- What types of storage devices you can connect to your workstation
- What general rules apply to connecting storage devices to your workstation
- How to install external storage devices
- How to determine if the cable length for a group of storage devices is within the allowable limit
- How to check and set the SCSI ID of a storage device
- How to test storage devices after they are installed

Storage Devices You Can Add to Your Workstation

External storage devices for the DECstation 5000 Model 240 workstation are small computer systems interface (SCSI) drives (such as tape, disk, and compact disc drives) that are contained in external boxes you connect to the system unit. A SCSI drive can be self-contained in its own box or can be installed in a multiple-drive expansion box such as a BA42 expansion box or a TCE. You can connect the external devices to the built-in SCSI connector on the system unit or to any SCSI connector you may have in a TURBOchannel option slot.

You can connect any of the following storage devices to your workstation:

- Any drive installed in a BA42 expansion box (for a list of specific drives, see the *BA42 Installation Guide*)

- Any drive installed in a TURBOchannel extender (TCE) unit (for a list of specific drives, see the *TURBOchannel Extender Operator's Guide*)

- Any self-contained tape, disk, or compact disc drive that conforms to SCSI specifications. Some examples are:

  - TK50Z tape drive

  - TLZ04 digital audio tape drive

  - RRD42 optical compact disc drive

RRD42 optical compact disc drive expansion box

TK50Z tape drive expansion box

BA42 storage expansion box
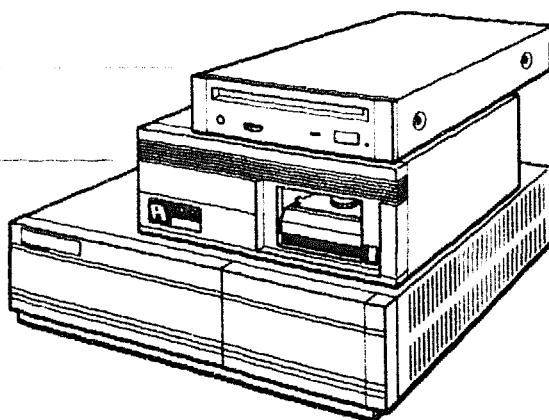
WS3PO005

Figure 5-1. Some typical expansion boxes

Rules for Connecting Storage Devices

External storage devices must be connected to your workstation according to the following rules for the system to work properly:

- You can attach up to seven SCSI drives (either self-contained or installed in multiple-drive expansion boxes) to each SCSI connector.

  - A self-contained drive is one drive in its own box
  - A BA42 expansion box can hold one or two drives
  - A TCE can hold up to three drives

- External storage devices that use the same SCSI connector must be linked together by SCSI cables, forming a single chain of devices. Each expansion box or self-contained storage device has two SCSI connectors:

  - One connects the device or box to the base system or to the previous device or box in the chain.
  - The other connects the device or box to the next device or box in the chain.

- You must connect a SCSI terminator to the unused SCSI connector on the last device or box in a chain.

- Each drive in a chain of devices connected to one SCSI connector must have a unique SCSI ID number (see "Checking and Setting SCSI ID Numbers" on page 5-15, for information about determining and setting SCSI ID numbers.

- You can connect up to three expansion boxes to each SCSI connector.

Installing External Storage Devices

1. Determine what external storage devices you have:

   ■ BA42 expansion box

   ■ TCE, if it has internal drives

   ■ Self-contained tape, disk, or compact disc drive

2. Check to make sure the number of SCSI drives and storage expansion boxes to be connected are within the allowable limits. You can connect up to seven SCSI drives, contained in up to three expansion boxes, to the base system SCSI connector.

3. Make sure each SCSI drive has a unique SCSI ID number within the group of devices you are connecting. If two or more of the drives to be connected to a SCSI connector have the same SCSI ID number, you must change the duplicate SCSI IDs (see "Checking and Setting SCSI ID Numbers" on page 5-15).

4. Position the storage expansion boxes next to or on top of the system unit. If one of the boxes is a TCE, place it directly on top of the system unit, as one of its interconnecting cables is very short. You may stack the boxes one on top of the other.

5. Set the power switches on the storage expansion boxes to the off position.

Press the 0 on
this type of switch

WS3PO101

Figure 5-2. Power switch in the off postion

6. If the *only* device you are connecting is a TURBOchannel extender (TCE), skip the rest of this procedure, mark your place in this guide, and refer to the *TURBOchannel Extender Operator's Guide* for instructions on installing the TCE.

   Otherwise, continue with these instructions.

7. Find the system-unit-to-expansion-box cable that came with your workstation.

To a SCSI connector
on the system unit

To a SCSI connector
on the expansion box
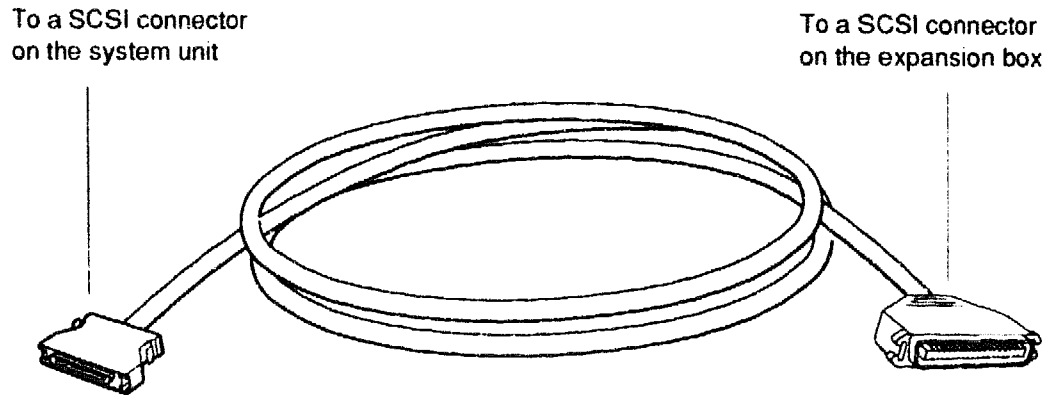
WS3PO102

Figure 5-3. System-unit-to-expansion-box cable

8. Attach the smaller connector on the system-unit-to-expansion-box cable to the SCSI connector on the system unit.

WS3PO100
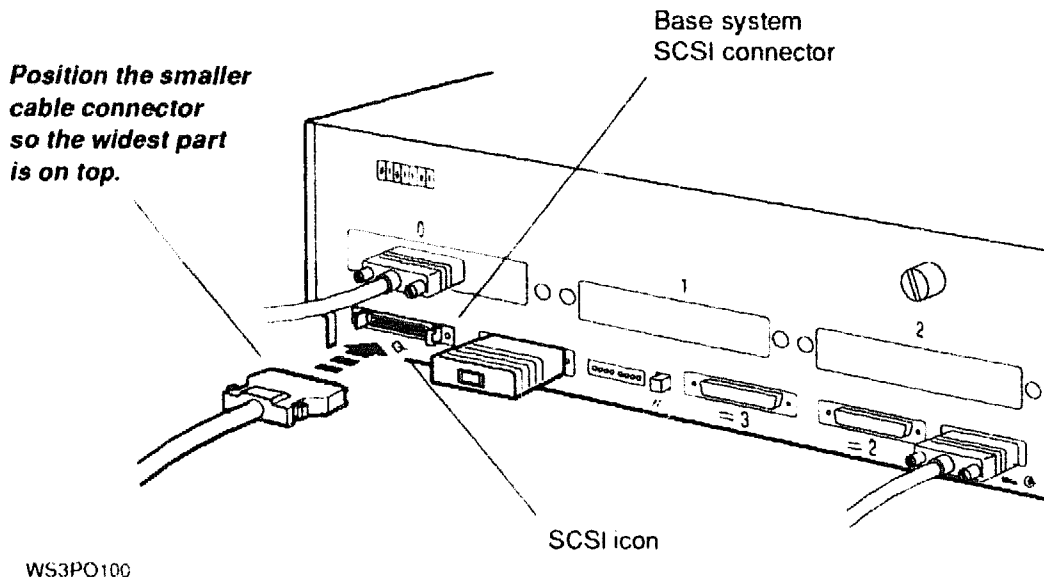
Figure 5-4. Connecting the system-unit-to-expansion-box cable to the system unit

9. Attach the larger connector on the system-unit-to-expansion-box cable to one of the SCSI connectors on an expansion box.

Do not connect this cable to a TCE, if you have one. Skip the TCE and connect the system-unit-to-expansion-box cable to the next box. (The TCE requires a different type of cable and must be connected last.)

1. Gently press the two wire brackets on the SCSI connector away from the connector.

Expansion box

2. Hold the cable connector so the widest part is on the top and push the cable connector into the SCSI connector as far as it will go.

Groove   Wire bracket

3. Press the two wire brackets firmly against the sides of the cable connector until they lock into the grooves on the connector.
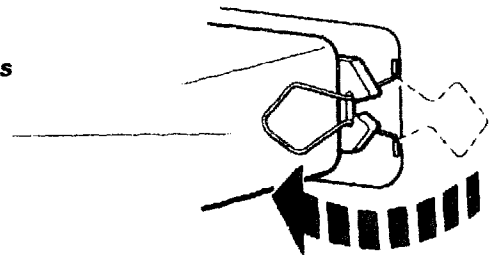
WS3PO099

Figure 5-5. **Connecting the system-unit-to-expansion-box cable to expansion box**

10. Connect additional non-TCE expansion boxes to the first box, using box-to-box SCSI cables.
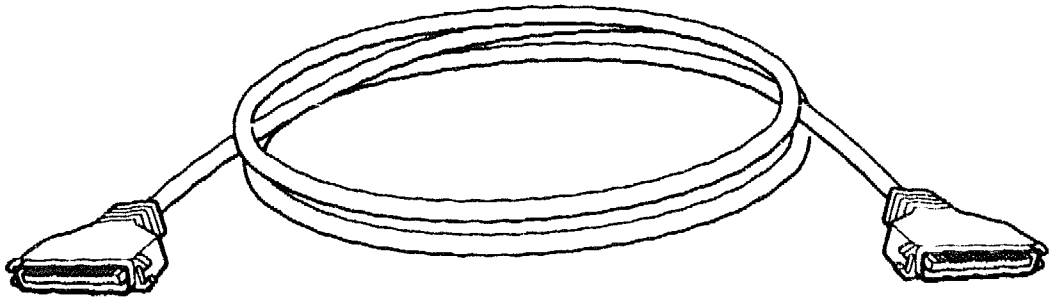
WS3PO103

Figure 5-6. SCSI box-to-box cable

Attach one end of a SCSI box-to-box cable to the unused
SCSI connector on the previously-installed box. Connect
the other end of the cable to a SCSI connector on the next
expansion box.

1. *Gently press the two wire brackets on the
   SCSI connector away from the connector.*

2. *Hold the connector so the
   widest part of the connector
   is on top and push it into
   the SCSI connector on the
   expansion box.*

3. *Press the two wire brackets
   firmly against the side of
   the cable connector until
   they lock into the groves on
   the sides of the connector.*

Wire
bracket
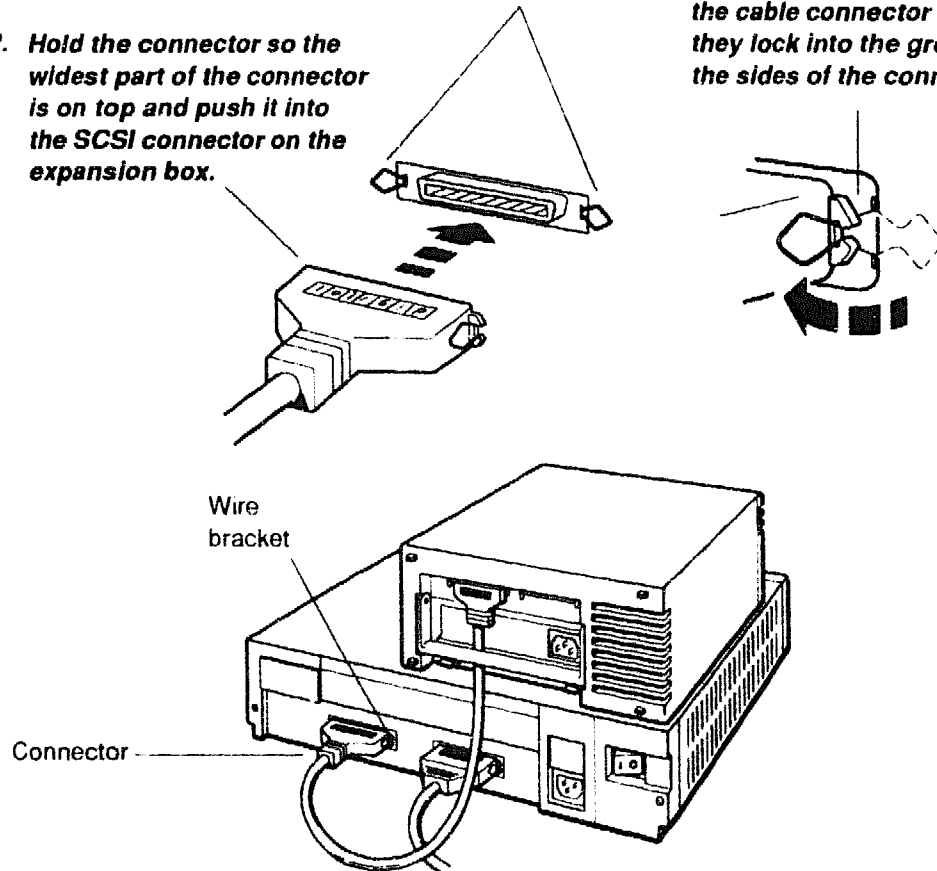
Connector

WS3PO098

**Figure 5-7.   Connecting an additional non-TCE expansion box to the
first box**

11. If one of the storage devices is a TCE with internal drives, connect the TCE to the previous expansion box or self-contained drive.

   a. Find the TCE-to-expansion box cable that came with the TCE (identical to the system-unit-to-expansion-box cable).

To a SCSI connector
on the system unit

To a SCSI connector
on the expansion box
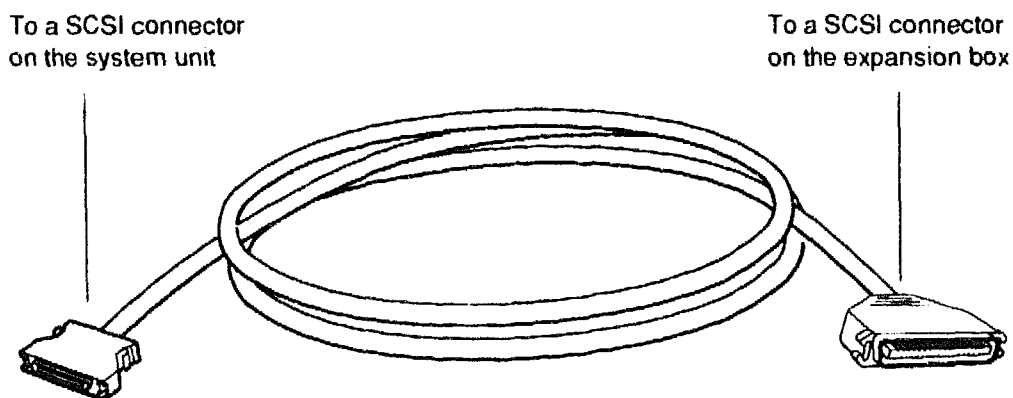
WS3PO104

Figure 5-8. TCE-to-expansion-box cable

b. Connect the small end of the TCE-to-expansion box cable to the SCSI connector on the TCE and connect the large end to the unused SCSI connector on the previous expansion box. (The TCE must be the last box in the chain of storage devices.)
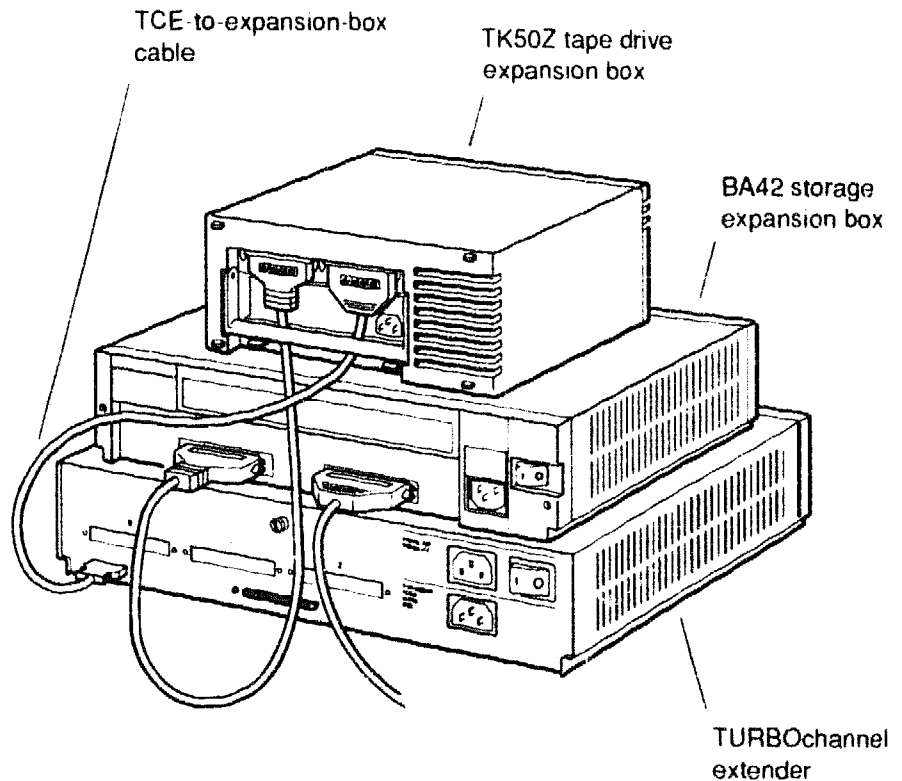
WS2PO092

Figure 5-9. Connecting the TCE to the expansion box

12. Put a SCSI drive terminator on the unused SCSI connector on the last box you connected. If the last device you connected was a TCE, skip this step, as the TCE has its own internal SCSI terminator.

Hold the terminator so the widest part of its connector is on top and push the terminator onto the unused SCSI connector.

Terminator

Wire brackets

WS3PO09/
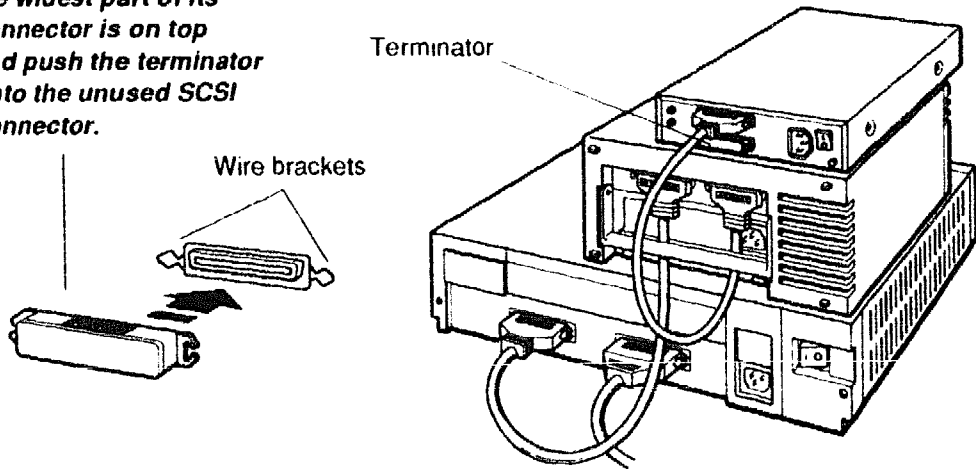
Figure 5-10. Connecting a SCSI drive terminator

13. For each expansion box, connect one end of the power cord that came with the device to the expansion box and connect the other end to a power outlet.

Caution: *Check the voltage requirements for the device. Connecting a device to a power source that does not meet the voltage requirements of that device can damage the device.*

Power cord connector

To power outlet
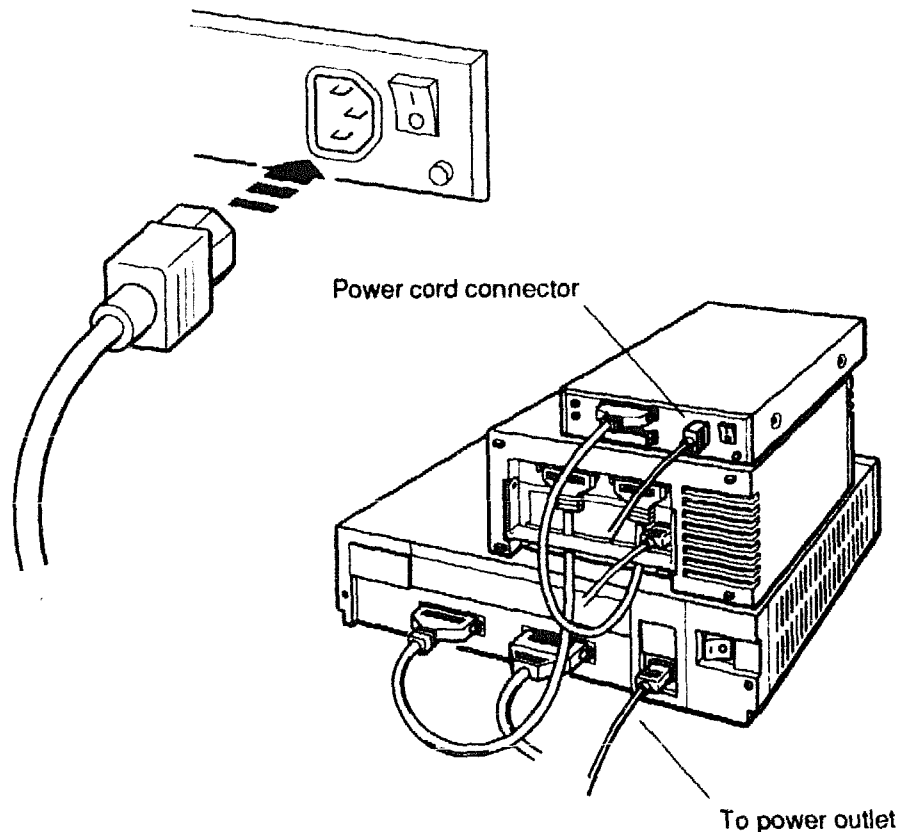
WS3PO096

Figure 5-11. **Connecting the power cord**

14. If you have additional SCSI connectors in the TURBOchannel option slots, repeat this procedure to connect any additional storage devices to these SCSI connectors.

Try to distribute the drives as evenly as possible among the SCSI connectors on the base system unit and in the TURBOchannel option slots.

Checking the Total SCSI Cable Length

If the total length of internal and external cable used in a
chain of storage devices exceeds 236 inches, the drives may not
operate correctly and transmitted data may be lost. To make
sure that the drives in a chain operate properly, put no more
than three expansion boxes in one chain.

If you need to put more than three expansion boxes in a chain,
make sure the total length of SCSI cables in the chain does not
exceed the 236-inch limit. Table 5-1 lists the length of the SCSI
cables linking the drives inside each type of expansion box,
as well as the lengths of SCSI cables you use to connect the
external storage devices to the system unit and to each other.
The table is as accurate as possible, but actual lengths may
vary by an inch or two.

Table 5-1. SCSI Cable Lengths

Cable	Length
Internal cable for BA42 expansion box	31 inches (41 centimeters)
Internal cable for TCE unit	52 inches (133 centimeters)
Internal cable for self-contained storage devices (for devices not listed here, refer to the documentation that came with the device:	
–For TK50Z tape drive	14 inches (36 centimeters)
–For TLZ04 tape drive	37 inches (96 centimeters)
–For RRD42 optical compact disc drive	6.5 inches (16 centimeters)
System-unit-to-expansion-box cable (68-pin to 50-pin)	38 inches (88 centimeters)
System-unit-to-TCE cable (68-pin to 68-pin)	26 inches (60 centimeters)
SCSI box-to-box cable (50-pin to 50-pin)	26 inches (66 centimeters)
Expansion-box-to-TCE cable (50-pin to 68-pin)	38 inches (88 centimeters)

Checking and Setting SCSI ID Numbers

Each storage device in a group must have a SCSI ID, which the workstation uses to identify the device. The SCSI ID for each drive must

- Be a number from 0 to 6. The numbers do not have to be consecutive.

- Be used only once for each group of drives connected to a single SCSI connector on the system unit.

To Check the SCSI ID

The SCSI ID for a single drive in its own box is usually displayed in a small window on the back of the box. Table 5-2 lists the usual SCSI ID numbers assigned to drives preinstalled at Digital Equipment Corporation in BA42 or TCE expansion boxes.

Table 5-2. Usual SCSI ID Assignments for External Drives

Type of External Drive	Usual SCSI ID Number
Hard disk drive	0
Hard disk drives in a multi-drive expansion box	0 and 1
Diskette drive	4
Optical compact disc drive	4
Tape drive	5

You can use the cnfg command to check the SCSI ID of a specific drive. Connect the device to a SCSI connector on the system unit to which no other devices are connected. Then follow the instructions "Testing External Storage Devices" on page 5-17.

To Set the SCSI ID

The SCSI IDs on most storage devices are preset to numbers that make it easy to connect different types of drives to the same SCSI connector without repeating SCSI IDs. However, the drives that you want to connect might have the same SCSI ID. If this happens, you must change the SCSI ID on those drives that repeat a SCSI ID number.

On some drives, such as the RRD42 optical compact disc, you set the SCSI ID by pushing a button to increment or decrement the number displayed in the SCSI ID window. On other drives, you set the SCSI ID by setting toggle switches on the back of the drive. For more information about how to set the SCSI ID on a specific drive, see the user's guide that came with that device.

Table 5-3 lists the SCSI ID switch positions you should use to set the SCSI ID to any number from 0 to 6 on drives installed in expansion boxes.

Table 5-3.   SCSI ID Switch Settings

SCSI ID	Hard Disk Drives or Compact Disc Drives	Tape Drives[1]
6	Up Up Down	Down Down Up
5	Up Down Up	Down Up Down
4	Up Down Down	Down Up Up
3	Down Up Up	Up Down Down
2	Down Up Down	Up Down Up
1	Down Down Up	Up Up Down
0	Down Down Down	Up Up Up

[1]Switch 1 (the left switch) on the TLZ04 tape drive should always be in the down position.

Testing External Storage Devices

1. Turn on the system unit.

   When the system unit has completed the power-up self-test successfully, type **cnfg 3** and press Return.

   A display that describes the SCSI connector and the drives attached to it then appears on the monitor. This is a portion of a sample display for the base system SCSI controller (slot 3).

```
>>cnfg 3
3:  KN03-AA    DEC    X2.0d    TCF0    (224 MB,    1 MB NVRAM)
                                       (enet: 08-00-2b-0f-45-72)
                                       (SCSI = 7)
    ------------------------------------------------------------
    DEV   PID                   VID         REV      SCSI DEV
    ====  ====================  =========   ======   ========
    rz0   RZ55       (C) DEC    DEC         0700     DIR
    rz1   RZ24       (C) DEC    DEC         0700     DIR
    rz4   RRD42      (C) DEC    DEC         0700     CD-ROM
    tz5                                              SEQ
```

   a. Look in the column labeled SCSI DEV for a coded description of the type of drive (in this example, DIR, CD-ROM, and SEQ).

   b. Look in the column labeled PID for a coded description of the part ID number (in this example, RZ55, RZ24, and RRD42).

   c. Look in the column labeled DEV for the device code and SCSI ID for each of the drives connected to the base system SCSI connector (in this example, rz0, rz1, rz4, and tz5). The last character of the code is the SCSI ID. The drives in this example have the SCSI IDs 0, 1, 4, and 5.

   d. Check the slot configuration display to see if the system recognizes all of the drives in the external storage devices you connected to the SCSI connector in that slot.

   Table 5-4 lists the device codes, device descriptions, and types of drives you may see in your slot configuration display.

Table 5-4. Device Codes for Different Types of SCSI Drives

Device Code (DEV)	Device Description (SCSI DEV)	Type of Drive
rx	DIR	Diskette
rz	CD-ROM	Optical compact disc
rz	DIR	Hard disk
tz	SEQ	Tape

2. If you have any external storage devices attached to a SCSI connector in a TURBOchannel option slot, type **cnfg** *slot-number*, replacing *slot-number* with the number of the option slot (0, 1, or 2) you want to check.

   Then check for the presence of all drives connected to that slot, as described in the previous step.

If an expansion box that you installed fails to appear in the configuration display,

- Be sure that all cables are securely connected and a terminator has been installed on the unused connector on the last box.

- Be sure that each drive in the chain has a different SCSI ID number.

- Be sure that the expansion box is connected to an active power source and switched on.

Removing an External Storage Device

The following steps tell you how to remove a self-contained storage device or a drive expansion box.

1. Shut down the software.

2. Turn off all system hardware. First turn off the expansion boxes and other external devices. Then turn off the monitor. Then turn off the system unit.

3. Disconnect the expansion box that you are removing.

   If the box is in the middle of a chain of devices, be sure to reconnect all of the remaining devices. Be sure that a terminator is on the unused connector of the last device on the chain.

4. Turn the system hardware on again. First turn on the drive expansion boxes and other external devices. Next, turn on the monitor. Then turn on the system unit.

5. Use the cnfg command to test the slot from which you removed the expansion box.

Installing a Drive in an Expansion Box

To install a drive in a BA42 storage expansion box, see the *BA42 Storage Expansion Box Installation Guide* for directions.

To install a drive in a TCE unit, see the *TURBOchannel Extender Operator's Guide* for directions.

6

Optional Network Connections

This chapter explains

■ Where your workstation's Ethernet connector is located

■ When to use, how to install, and how to remove an Ethernet loopback connector

■ How to operate the sliding lock on the Ethernet connectors

■ How to connect your workstation to ThickWire, ThinWire, and twisted-pair Ethernet networks

■ How to find the Ethernet station address for your workstation

Locating Your Workstation Ethernet Connector

The basic workstation comes with one ThickWire Ethernet connector built into the base system unit for attaching to a single Ethernet network. You can connect the workstation to more than one Ethernet network if you have additional ThickWire Ethernet connectors in any of the TURBOchannel option slots. (For instructions on how to install TURBOchannel ThickWire Ethernet modules, refer to your TURBOchannel user documentation.) The illustrations in this guide show the Ethernet connector on the base system unit.

Installing and Removing an Ethernet Loopback Connector

Every Ethernet connector must be either connected to an Ethernet cable or terminated with an Ethernet loopback connector in order for your workstation to function correctly.

Front   **Back**
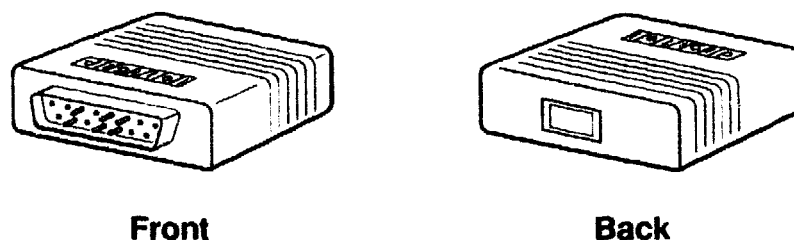
WS3PO079

Figure 6-1. ThickWire Ethernet loopback connector

If your workstation is *not* connected to an Ethernet network, you need to put an Ethernet loopback connector on the base system Ethernet connector and on any Ethernet connectors you may have in the TURBOchannel option slots.

When you connect the workstation to a network, you must remove the loopback connector.

Figure 6-2 shows how to attach and remove an Ethernet loopback connector. When attaching it, hold the connector so the widest part of the metal rim is uppermost and matches the connector on the system unit.

ThickWire Ethernet
loopback connector

Base system
ThickWire Ethernet
connector with
Sliding lock
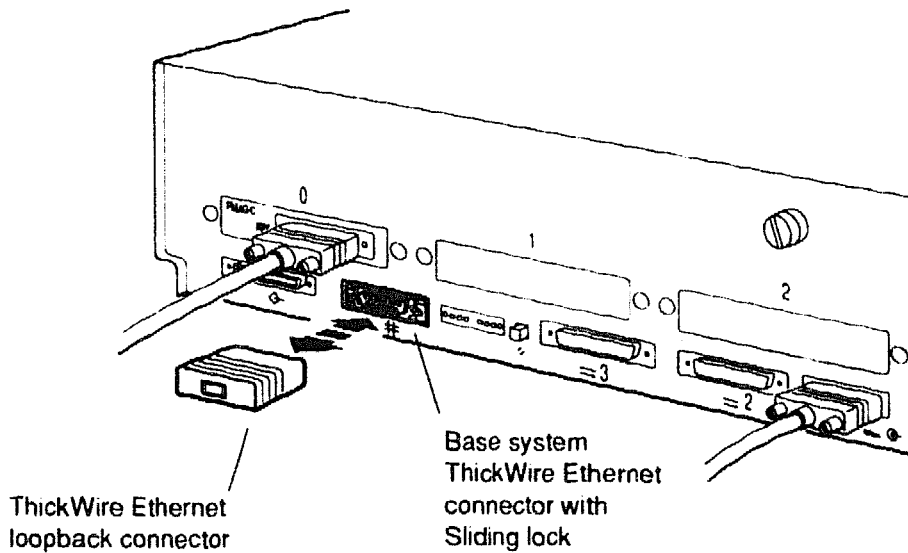
WS3PO044

Figure 6-2.   Installing and removing an Ethernet loopback connector

Operating the Ethernet Connector Sliding Lock

There is a sliding lock on the ThickWire Ethernet connector
on the base system and on each Ethernet option module that
may be installed in the TURBOchannel option slots. There is
also a sliding lock on one end of the ThickWire Ethernet cable
that connects your workstation to the Ethernet network. The
following instructions explain how to operate the sliding lock
mechanism.

■ To unlock the sliding lock on the system unit Ethernet connector or on a ThickWire Ethernet cable, slide the lock in the direction of the small, u-shaped notch. (On the system unit, push the lock to the right with a flat-blade screwdriver. On the cable, push the lock either left or right toward the small notch, depending on the way the lock is mounted.)

Large notch

Small notch

Sliding lock on the base system
ThickWire Ethernet connector
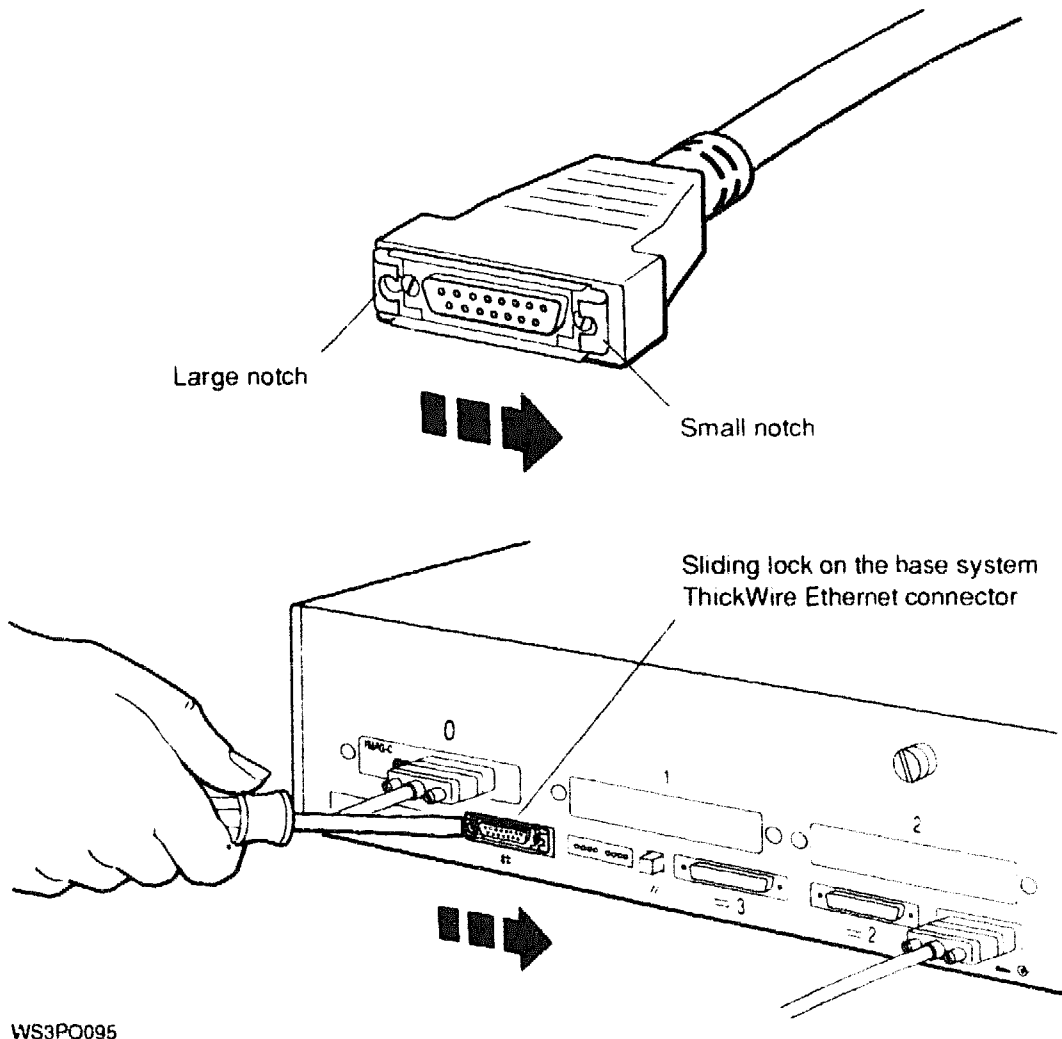
WS3PO095

Figure 6-3. Unlocking the Ethernet sliding lock

- To lock the sliding lock on the system unit Ethernet connector or on a ThickWire Ethernet cable, push the protruding edge of the lock toward the center of the connector until it clicks into place. Check to make sure the cable is locked securely in place before proceeding.

ThickWire-to-ThinWire adapter

To the ThickWire
Ethernet connector
on the system unit
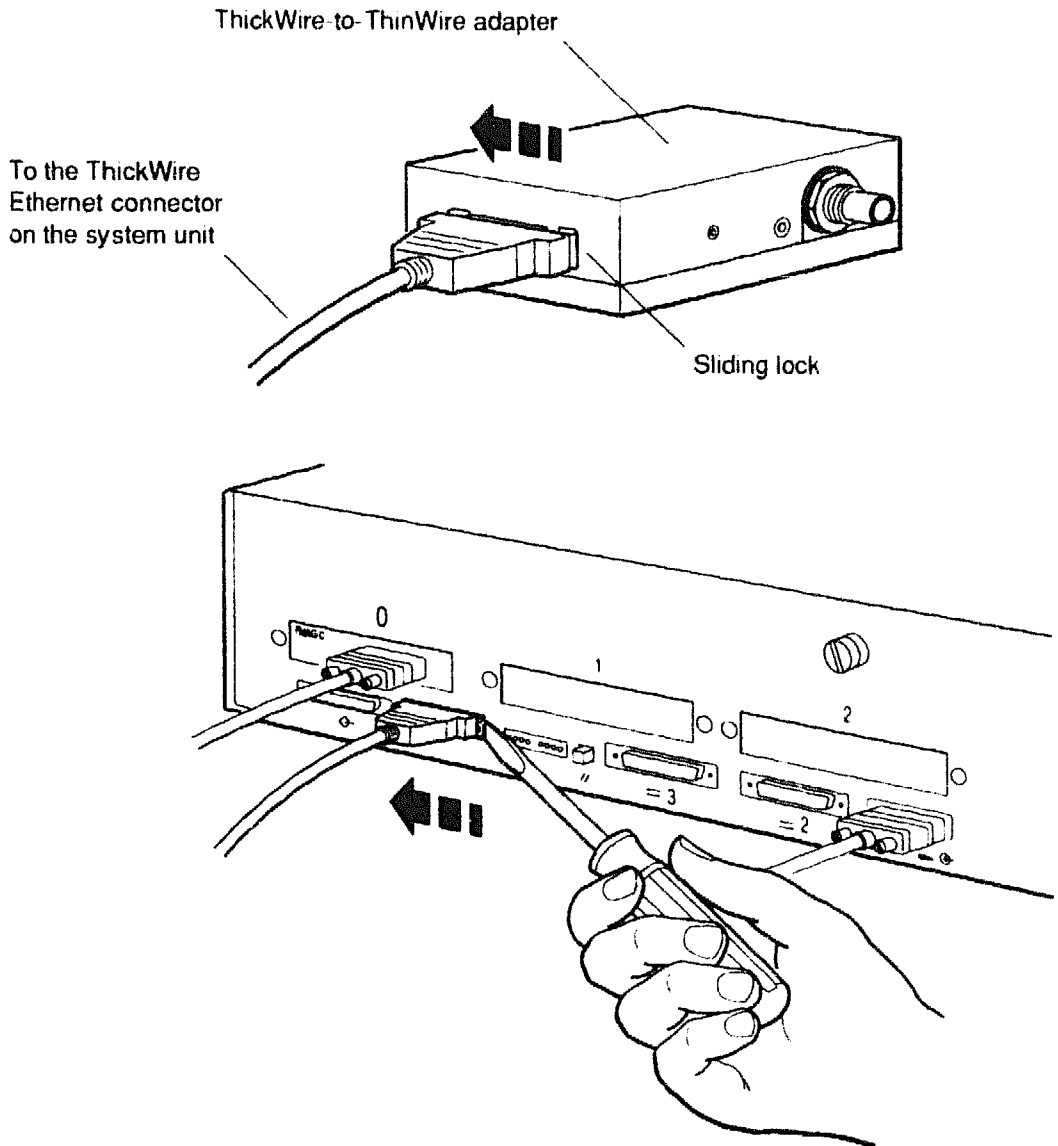
Sliding lock

WS3PO094

Figure 6-4.   Locking the Ethernet sliding lock

Finding Your Ethernet Station Address

Every Ethernet connector has a built-in controller. That controller has a unique ID called an Ethernet station address. The system manager needs the Ethernet address (or addresses) for your workstation in order to complete the network connection for you. You need to find and report the Ethernet station address for each Ethernet controller on your workstation, using the following procedure.

1. At the workstation console prompt (>>), type **cnfg** and press Return. A display similar to the following appears on the screen:

```
>>cnfg
3:   KN03-AA    DEC      X2.0d     TCF0     (224 MB,    1 MB NVRAM)
                                            (enet:  08-00-2b-0f-45-72)
                                            (SCSI = 7)
0:   PMAG-BA    DEC      V5.3d     TCF0     (CX -- d=8)

1:   PMAD-AA    DEC      V5.3d     TCF0     (enet:  08-00-2b-0f-45-31)
>>
```

The 3: at the extreme left on the first line indicates that the information that follows is for slot 3, the base system unit. Look at the second line of the display. The entry after enet: within the parentheses is the Ethernet station address for the base system, slot 3.

The 0: and the 1: at the extreme left indicate that the information that follows is for TURBOchannel option slots 0 and 1.

In this display, both lines 3: and 1: show Ethernet station addresses.

❶ The Ethernet address for the Ethernet controller in base slot 3 is 08-00-2b-0f-45-72.

❷ The Ethernet address for the Ethernet controller in option slot 1 is 08-00-2b-0f-45-31.

2. Write down the Ethernet address for each Ethernet controller to be connected to a network. Report the addresses to your system manager and ask the manager to complete the Ethernet connections for you.

Connecting the Workstation to an Ethernet Network

A workstation can only be connected to your in-house Ethernet network by a system manager or other authorized personnel.

Caution: *Attempting to connect your workstation to the network without prior authorization and proper precautions can result in the loss of data being transmitted to or from other workstations on the network.*

You can remove the Ethernet terminator and connect one end of the ThickWire Ethernet cable to your workstation, as well as any ThinWire or twisted-pair adapters, without completing the connection to your in-house network. However, your workstation will not function properly until it is connected to the network, once the Ethernet terminator is removed.

To connect the workstation to a ThickWire Ethernet network, see the following section, "To Connect a ThickWire Ethernet Cable."

To connect the workstation to a ThinWire or Twisted-pair Ethernet network, start with the section, "To Connect a ThickWire Ethernet Cable." Then follow the directions to connect a ThinWire Ethernet adapter on page 6-11 or a twisted-pair Ethernet adapter on page 6-15.

To Connect a ThickWire Ethernet Cable

1. Obtain the Ethernet station address for the workstation from the workstation user.

2. Find the ThickWire Ethernet cable that was ordered for the workstation. Notice that one end of the cable has a sliding lock on it and the other does not.

3. Follow the instructions that came with the worksystem software to shut down the software.

4. Turn off the system unit by pressing the 0 on the on/off switch on the back of the unit. Leave the power cord plugged in.

To the ThickWire
Ethernet connector
on the system unit
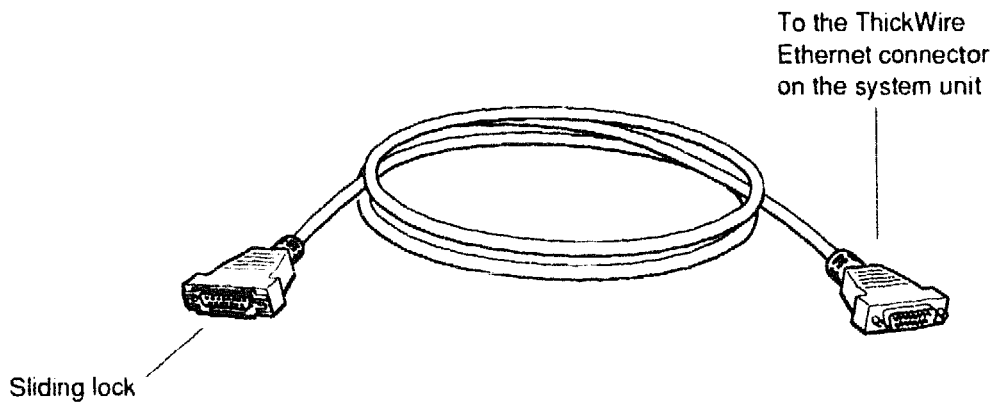
Sliding lock

WS3PO047

Figure 6-5.   ThickWire Ethernet cable

5. Remove the loopback connector (if present) from the Ethernet connector on the system unit (see Figure 6-2 on page 6-3).

6. Position the cable connector that does *not* have the sliding lock so the widest part is on top.

   Push the connector directly onto the base system ThickWire Ethernet connector.

Base system ThickWire Ethernet
connector with sliding lock

ThickWire Ethernet cable
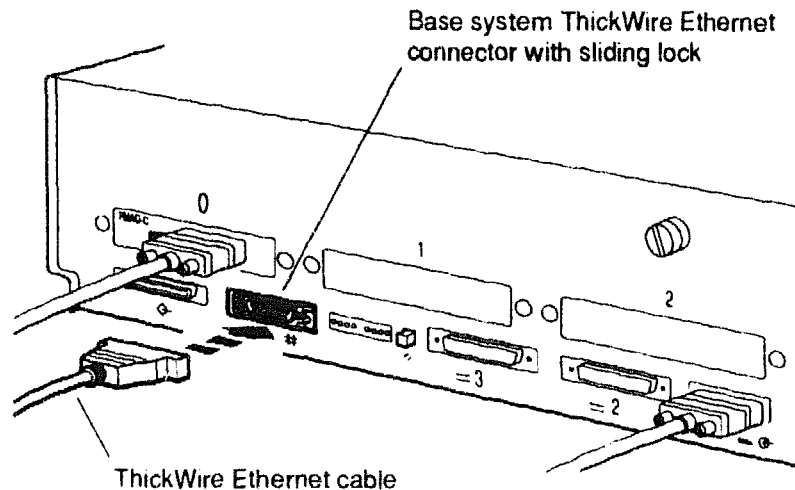
WS3PO048

Figure 6-6.   Connecting a ThickWire Ethernet cable to the system unit

7. Slide the lock on the system unit Ethernet connector to the locked position (see Figure 6-4 on page 6-5).

8. If connecting the workstation to a ThinWire network, continue with the instructions, "To Connect a ThinWire Ethernet Adapter" on page 6-11.

   If connecting the workstation to a twisted-pair network, continue with the instructions, "To Connect a Twisted-Pair Ethernet Adapter" on page 6-15.

   If connecting the workstation to a ThickWire network, continue with step 9.

9. Put Ethernet loopback connectors on all unused Ethernet connectors you may have in the TURBOchannel option slots (see Figure 6-2 on page 6-3).

10. Then do one of the following:

   ■ If you are connecting the workstation to a ThickWire network, contact your system manager or, if authorized to do so, follow your in-house procedures to finish connecting the workstation to the network when the network is not active. Your workstation will not operate properly with an unterminated Ethernet cable until it is connected to the network.

   ■ If you are connecting the workstation to a ThinWire network, continue with the instructions "To Connect a ThinWire Ethernet Adapter" on page 6-11.

   ■ If you are connecting the workstation to a twisted-pair network, continue with the instructions "To Connect a Twisted-Pair Ethernet Adapter" on page 6-15.

To Connect a ThinWire Ethernet Adapter

You connect a DECstation 5000 Model 240 workstation to the ThinWire Ethernet network cable using the ThickWire-to-ThinWire adapter.

1. Follow the instructions "To Connect a ThickWire Ethernet Cable" on page 6-8.

2. Find the ThickWire-to-ThinWire adapter, the T-connector, and the T-connector terminator that you ordered for your workstation.

ThinWire Ethernet connector

ThickWire
Ethernet
connector

ThickWire-to-ThinWire adapter

T-connector
terminator
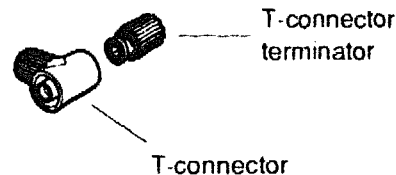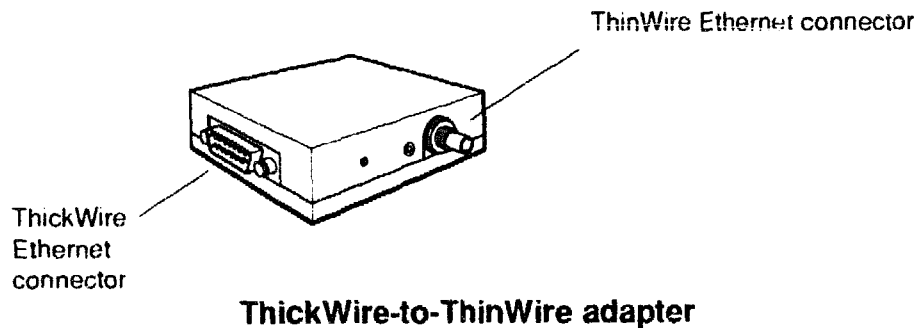
T-connector

T- connector and terminator

WS3PO078

Figure 6-7.   Parts used to connect a workstation to a ThinWire network

3. Find the connector with the sliding lock on the other end of the ThickWire Ethernet cable you connected to your workstation.

   Make sure the sliding lock on the cable connector is in the unlocked position (see Figure 6-3 on page 6-4).

4. Hold the ThickWire-to-ThinWire adapter and the free end of the ThickWire cable so that the connectors match. Push the ThickWire cable connector with the sliding lock onto the ThickWire connector on the adapter.

5. Slide the lock on the cable attached to the adapter to the locked position (see Figure 6-4 on page 6-5).

ThickWire-to-ThinWire adapter

Base system
ThickWire
Ethernet
connector

ThickWire Ethernet cable
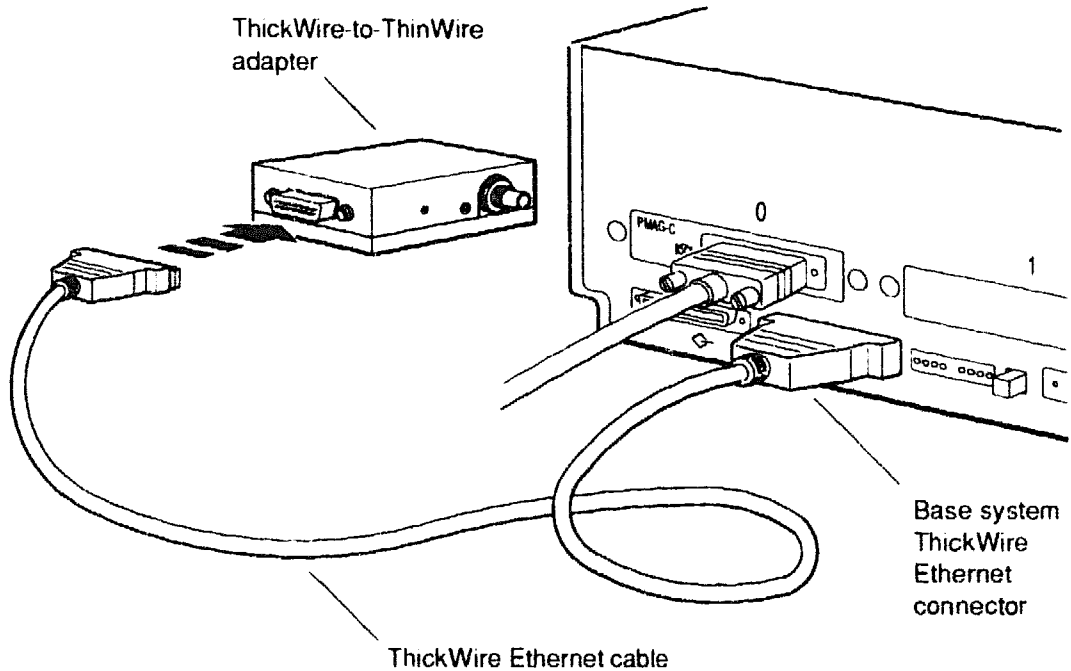
WS3PO089

Figure 6-8. Connecting a ThickWire cable to the ThinWire adapter

6. Attach the T-connector to the ThinWire Ethernet connector on the adapter.

ThickWire-to-ThinWire adapter

Press the T-connector into the adapter and turn the connector to the right until it slides forward and locks into place.

To the ThickWire Ethernet connector on the system unit
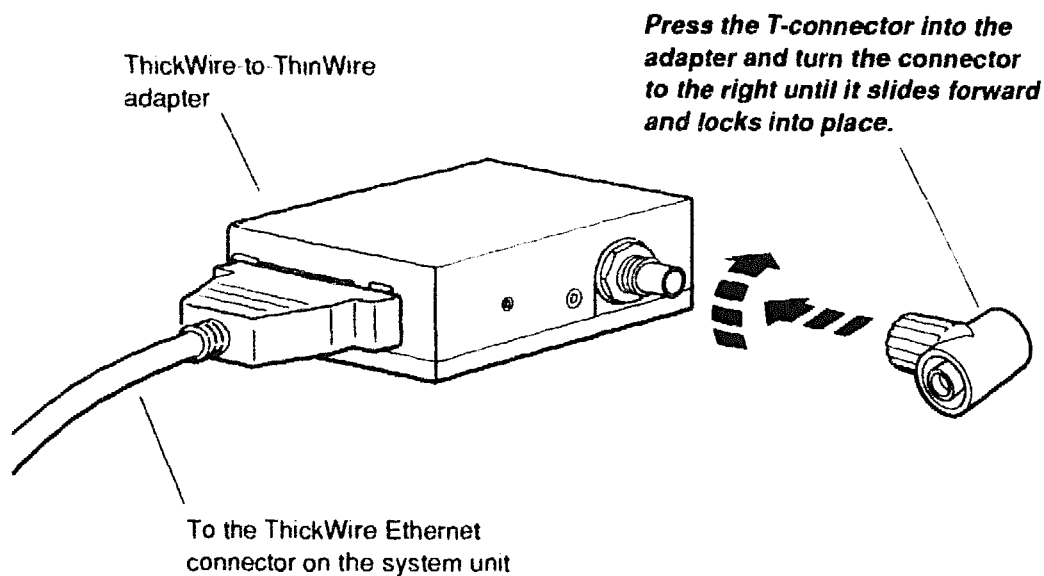
WS3PO074

Figure 6-9. Attaching a T-connector

7. If you are connecting the workstation *within* a network cable segment, leave both ends of the T-connector free to attach your in-house network cables.

If you are connecting the workstation at the *end* of a network cable segment, attach a T-connector terminator to the open end of the T-connector on the adapter.

Press the T-connector terminator into the T-connector and turn the terminator to the right until it slides forward and locks into place.

ThickWire-to-ThinWire adapter

T connector

To the ThickWire Ethernet connector on the system unit
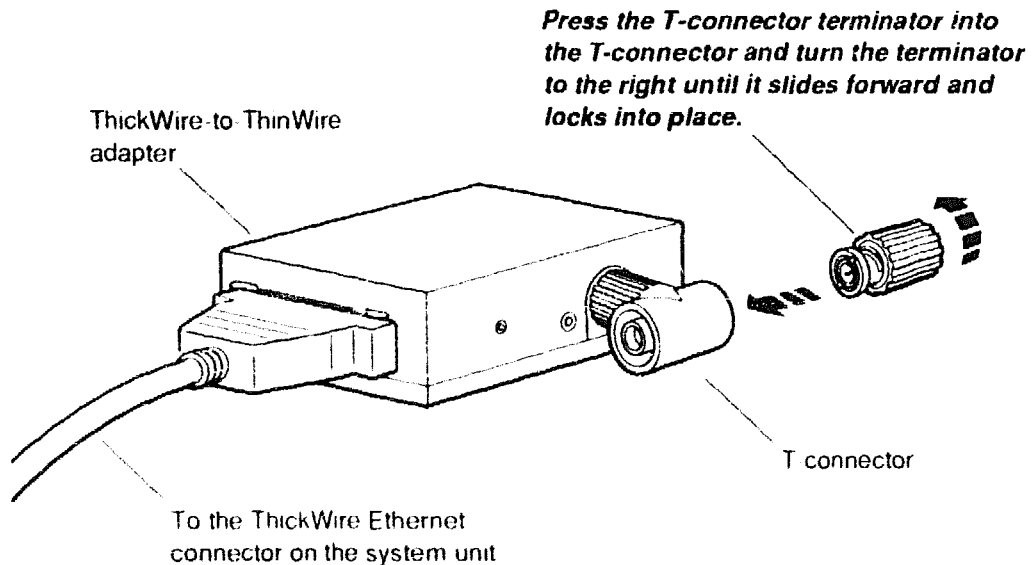
WS3PO093

Figure 6-10. Attaching a T-connector terminator

8. Put an Ethernet loopback connector on all unused Ethernet connectors you may have in the TURBOchannel option slots (see Figure 6-2 on page 6-3.)

9. Contact your system manager or, if authorized to do so, follow your in-house procedures to finish connecting the workstation to the ThinWire network when the network is not active. Your workstation will not operate properly with an unterminated ThinWire adapter until it is connected to the network.

To Connect a Twisted-Pair Ethernet Adapter

You connect a DECstation 5000 Model 240 workstation to an unshielded twisted-pair Ethernet network using a ThickWire-to-twisted-pair adapter.

1. Follow the instructions "To Connect a ThickWire Ethernet Cable" on page 6-8.

2. Find the ThickWire-to-twisted-pair adapter and the twisted-pair Ethernet cable that you ordered for your workstation.
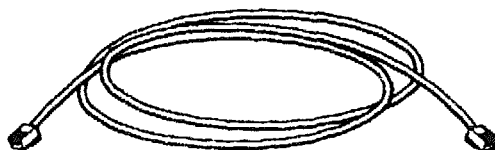
Twisted-pair Ethernet cable

ThickWire Ethernet connector
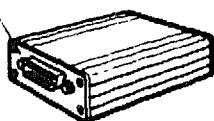
Twisted pair phone-jack type of connector
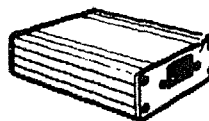
Front view   **Back view**

ThickWire-to-twisted-pair adapter

WS3PO077

Figure 6-11.   Parts used to connect a workstation to a twisted-pair Ethernet network

3. Find the connector with the sliding lock on the other end of the ThickWire Ethernet cable you connected to your workstation.

    Make sure the sliding lock on the cable connector is in the unlocked position (see Figure 6-3 on page 6-4).

4. Hold the ThickWire-to-twisted-pair adapter and the free end of the ThickWire cable so that the connectors match up. Push the ThickWire cable connector with the sliding lock onto the ThickWire connector on the adapter.

ThickWire-to-twisted-pair adapter

0

1

Base system ThickWire Ethernet connector

ThickWire Ethernet cable
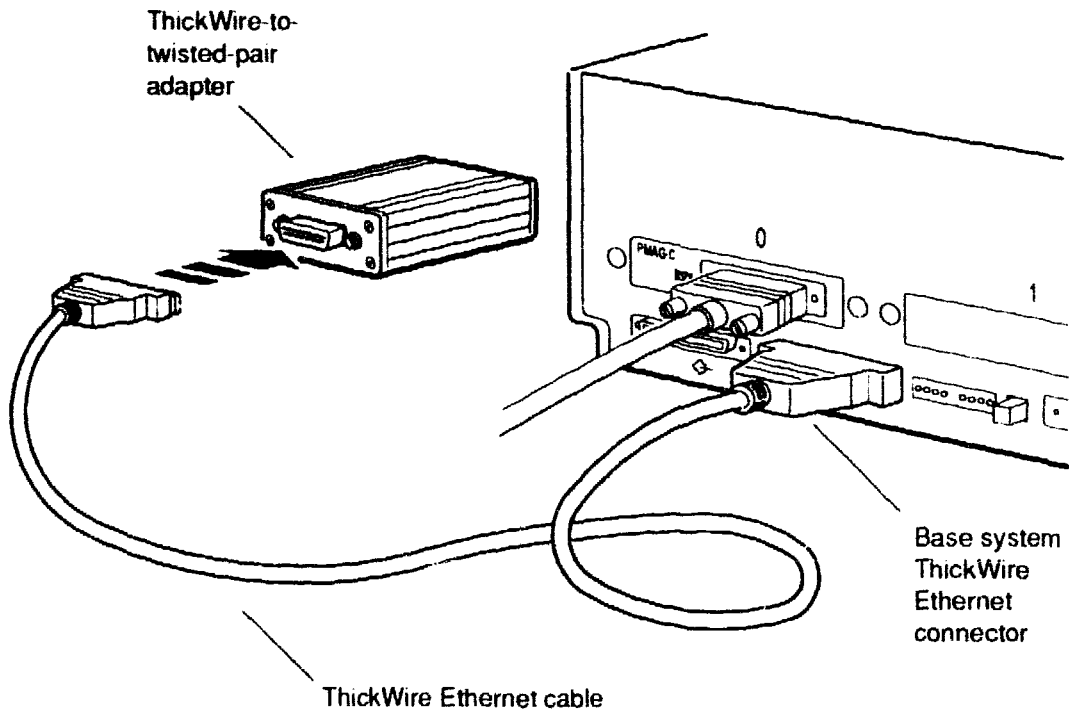
WS3PO087

Figure 6-12. Connecting the ThickWire-to-twisted-pair-adapter

5. Slide the lock on the cable attached to the adapter to the locked position (see Figure 6-4 on page 6-5).

6. Find the twisted-pair Ethernet cable that you ordered for your workstation. Notice that the telephone-jack type of connectors at both ends are identical.

7. Push one of the connectors on the twisted-pair Ethernet cable into the telephone-jack type of connector on the adapter until it clicks into place.

To the ThickWire Ethernet connector on system unit

ThickWire-to- twisted-pair adapter

Hold the telephone-jack type of connector so the clip is on the bottom.
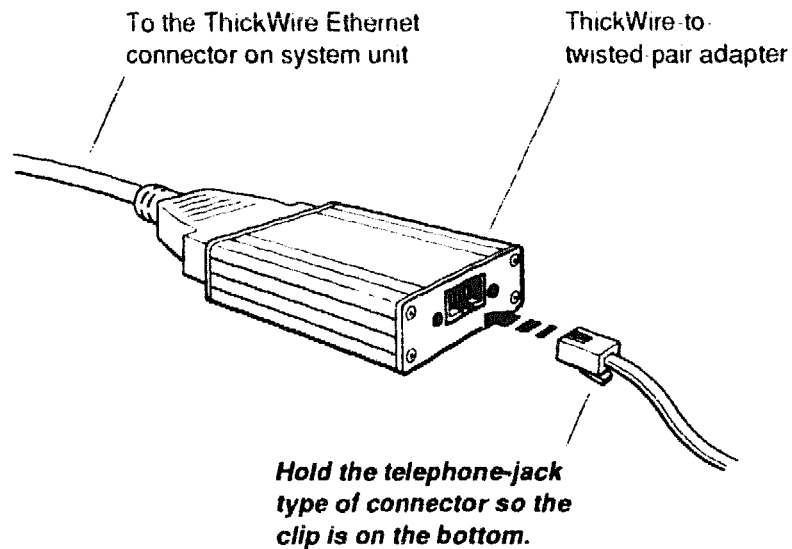
WS3PO076

Figure 6-13. Connecting the twisted-pair cable to the twisted-pair adapter

8. Put Ethernet loopback connectors on all unused Ethernet connectors you may have in the TURBOchannel option slots (see Figure 6-2 on page 6-3.)

9. Contact your system manager or, if authorized to do so, follow your in-house procedures to finish connecting the workstation to the twisted-pair network when the network is not active. Your workstation will not operate properly with an unterminated twisted-pair adapter until it is connected to the network.

7

External Communications Options

This chapter explains

- How to connect a communications device directly to the system unit
- How to use a communications connector adapter
- How to install a terminal as an alternate system console

External Communications Options

Communications devices that can be used with your DECstation 5000 Model 240 workstation include printers, plotters, modems, and console terminals.

Two synchronous/asynchronous RS232 serial communications ports with 25-pin connectors are located on the back of the system unit.

Communications connector 3

Communications connector 2
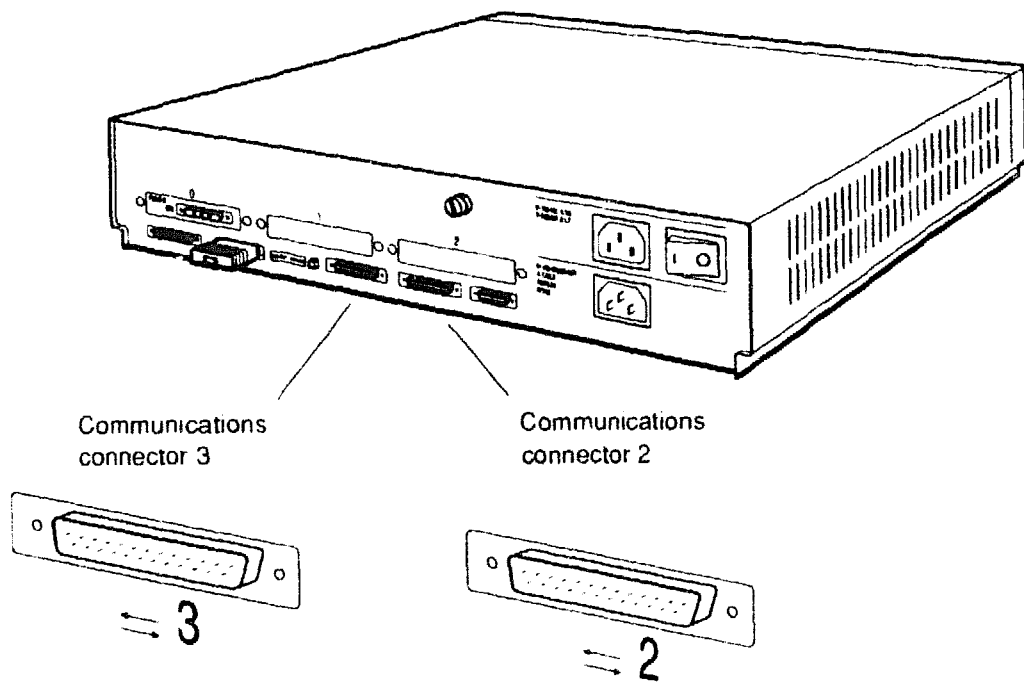
WS3PO052

Figure 7-1. Communications connectors on the system unit

When a terminal is configured as the system console, it occupies one of the communications ports, leaving the other free for an optional serial peripheral device such as a printer, plotter, or modem.

The baud rate of each serial line is independently programmable. The rate can be set at 50 to 204,200 bits per second. The default rate is 9600 baud.

Types of Connectors

Communications devices used with your workstation have two types of connectors:

- 25-pin connector, which can be attached directly to the serial communications ports on the system unit

- Modular connector, which requires a communications connector adapter before it can be connected to the system unit
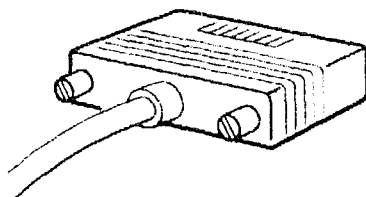
Communication
device cable
connector
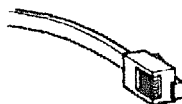
Modular
connector
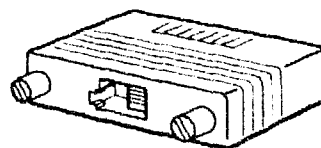
Communications
connector
adapter

WS3PO053

Figure 7-2.   Communications device connectors and an adapter

Installing a Device with a 25-Pin Connector

You can connect 25-pin communication connectors directly to the system unit.

1. Follow the instructions that came with your device to do these tasks:

    ■ Be sure the device is turned off.

    ■ Set up the device and attach the cable and power cord that came with it.

    ■ Set the proper baud rate and control settings on the device and in the worksystem software, if appropriate.

2. Follow the instructions that came with your worksystem software to shut down the software.

3. Turn off the system unit by pressing the 0 on the on/off switch on the back of the unit.

4. Connect the end of the communications device cable to the system unit as shown in Figure 7-3. The connectors are shaped so that they go together only one way.

System unit
communications
connector
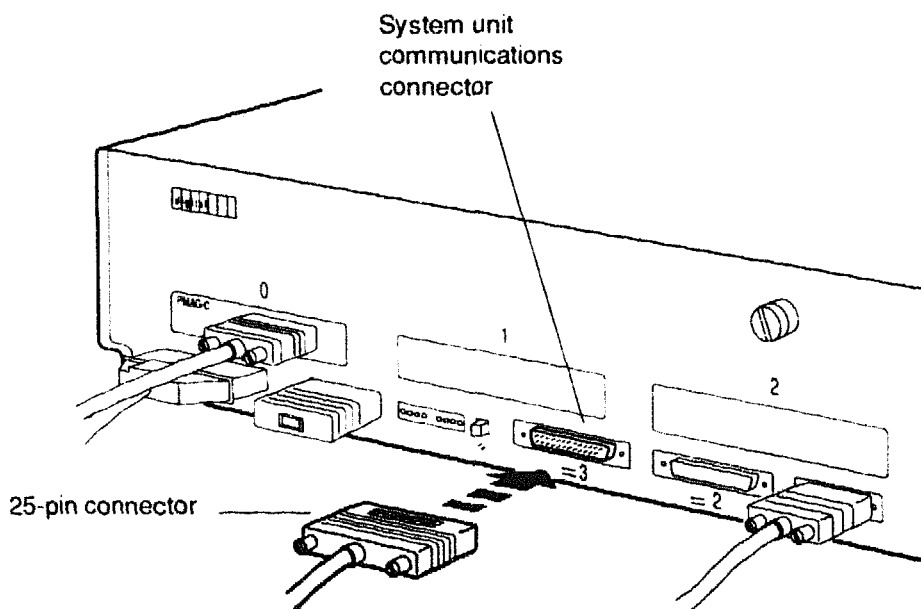
25-pin connector

WS3PO054

Figure 7-3.   Connecting a communications device with a 25-pin connector

5. Plug the power cord into the power outlet.

6. Turn on the communications device.

7. Turn on the system unit by pressing the 1 on the on/off switch on the back of the unit.

   The workstation performs either the quick or the full automatic power-up self-test, depending on how the testaction environment variable has been set. (For information about setting the testaction environment variable or about the power-up self-test, see "Testing Your Workstation" on page 3-6.)

8. If your workstation ran the quick rather than the full power-up self-test, type **test** at the console prompt ($>>$) and press Return. The workstation will then run the complete system self-test.

9. If any part of the self-test fails, the system displays an error message. Turn to Chapter 11 for troubleshooting instructions.

Installing a Device with a Modular Connector

To install a device with a modular (telephone-jack type) connector, you need a 25-pin communications adapter.

1. Follow the instructions in the documentation that came with your communications device to perform these tasks:

   ■ Be sure the device is turned off.

   ■ Set up the device and attach the cable and power cord that came with it.

   ■ Set the proper baud rate and control settings on the device and in the worksystem software, if appropriate.

2. Follow the instructions that came with your worksystem software to shut down the software.

3. Turn off the system unit by pressing the 0 on the on/off switch on the back of the unit.

4. Find the communications connector adapter that came with your shipment (see Figure 7-2 on page 7-3).

5. Hold the adapter so the widest part of the connector is on top. Press the 25-pin connector on the adapter into one of the communications connectors on the system unit and tighten the screws as shown in Figure 7-4 on page 7-7.

6. Hold the modular connector on the communications device cable so the clip is on your left. Push the modular connector into the adapter until the connector clicks into place.
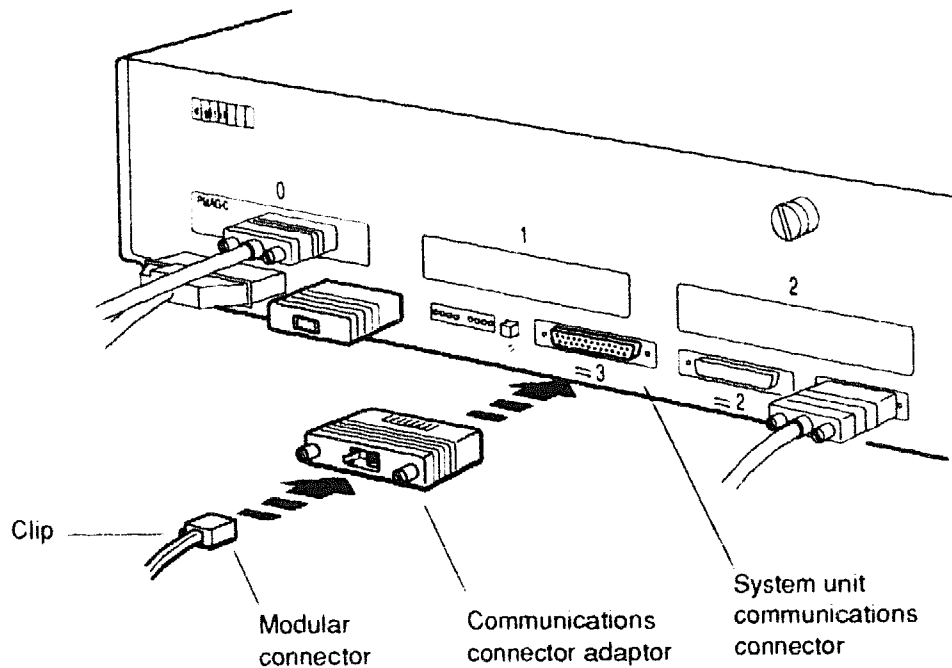
WS3PO055

Figure 7-4. Using an adapter to connect a communications device with a modular connector

7. Plug the power cord into the power outlet.
8. Turn on the communications device.

9. Turn on the system unit by pressing the 1 on the on/off switch on the back of the system unit.

   The workstation performs either the quick or the full automatic power-up self-test, depending on how the testaction environment variable has been set. (For information about setting the testaction environment variable or about the power-up self-test, see "Testing Your Workstation" on page 3-6.)

10. If your workstation ran the quick rather than the full power-up self-test, type **test** at the console prompt (>>) and press Return. The workstation will then run the complete system self-test.

11. If any part of a self-test fails, the system displays an error message. Turn to Chapter 11 for troubleshooting instructions.

8

Inside the System Unit

This chapter explains

- What user-replaceable parts are inside the system unit
- How to improve workstation performance by adding internal options
- How to remove and replace the cover of the system unit
- How to use the antistatic wrist strap

Main Parts of the System Unit

The system unit enclosure contains

- Base system module
- Memory modules
- Central processing unit (CPU) module
- TURBOchannel option modules, if any
- Power supply
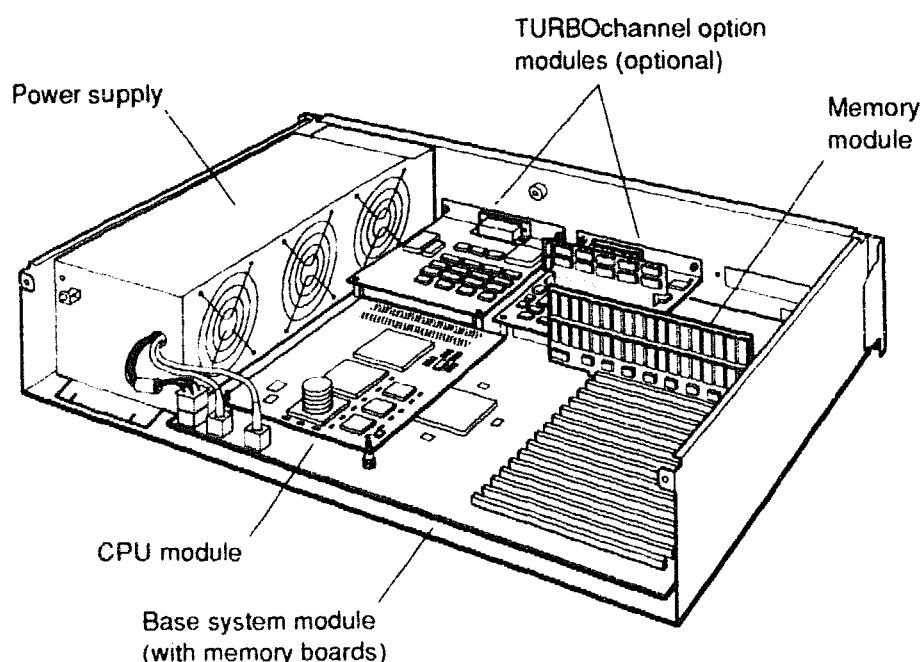
Figure 8-1. Inside of the system unit enclosure

You can improve your workstation's performance by replacing or adding the following internal options:

- Memory modules
- Nonvolatile random-access memory (NVRAM) module
- CPU module
- TURBOchannel option modules

The Base System Module

The base system module contains

- CPU module slot
- 15 memory module slots
- 256 kilobyte power-up self-test and bootstrap read-only memory (ROM)
- System control and status registers
- System clock and 50-byte battery-backed-up random-access memory (RAM)
- Two synchronous/asynchronous RS232 serial communication ports
- Serial line interface for keyboard and mouse or other pointing device
- Network interface for ThickWire Ethernet
- Small computer system interface (SCSI-2) for up to seven devices
- 3 TURBOchannel option slots
- Interrupt halt switch

Memory Modules

Your workstation comes with at least 16 megabytes of memory. The amount of memory can vary, depending on what memory modules you ordered for your workstation. The memory modules plug into the memory slots on the base system module. You can expand your workstation's memory to a total of 480 megabytes by installing up to fifteen 8-megabyte (MS02-AA) or fifteen 32-megabyte (MS02-CA) single in-line memory modules (SIMMS). All memory modules in your system unit must be the same type and have the same capacity. See Chapter 9 for instructions on installing memory modules.

Nonvolatile Random-access Memory (NVRAM) Module

Your workstation optionally comes with 1 megabyte of nonvolatile random-access memory (NVRAM). NVRAM provides a battery-backed-up memory disk cache that retains data during a power failure and improves workstation performance. The NVRAM module plugs into the last memory module slot on the base system module. See Chapter 9 for instructions on installing an NVRAM module.

The CPU Module

The CPU module performs all the data processing functions of the workstation. It plugs into the base system module. You can replace the CPU module to improve workstation performance, as faster CPUs become available.

Your CPU module contains

- 40 MHz central processing unit (CPU) with an R3010 floating-point unit (FPU)

- 64 kilobyte instruction and data cache

For information on installing a CPU module, refer to Chapter 9.

TURBOchannel Option Modules

The system unit has space for up to three TURBOchannel option modules. TURBOchannel option modules can expand the capabilities of your workstation in the following ways:

- Graphics modules allow you to connect one or more monitors to your workstation. Your workstation comes with one graphics option module installed. Graphics modules can be installed in

    - Any TURBOchannel option slot in the system unit

    - A TURBCchannel extender (TCE) unit connected to the system unit

- SCSI controller modules allow you to connect more external storage devices (such as disk, tape, and compact disc drives) to your workstation than the base system SCSI controller can accommodate.

- Ethernet controller modules allow you to connect your workstation to more than one Ethernet network

- Other TURBOchannel option modules allow you to connect special options, such as DECaudio and DECvideo-in, to your workstation

Some TURBOchannel options, including many graphics modules, take up the physical space and power of two or three TURBOchannel option slots, but have only one TURBOchannel address and connector. These TURBOchannel modules are called wide modules. To avoid using more than one slot in your system unit for a double- or triple-wide module, you can install the wide module in a TURBOchannel extender (TCE) unit instead. You connect the TCE to a single-wide TCE option module installed in one of the three TURBOchannel option slots in the system unit. The TCE can contain one wide module (for instance, a graphics module), as well as tape, disk, or compact disc drives.

For more information about TURBOchannel options and how to install them, refer to the *TURBOchannel Options User's Guide*.

The Power Supply

The DECstation 5000 Model 240 workstation has a fully self-contained, 244-watt maximum, fan-cooled power supply. Output voltages are +5.1 volts at 40 amperes, 12.1 volts at 2.7 amperes, and −12.1 volts at 0.2 amperes.

Removing and Replacing the System Unit Cover

To Remove the Cover from the System Unit

1. Follow the instructions that came with your worksystem software to shut down the software.

2. Turn off the system unit by pressing the 0 on the on/off switch on the back of the unit.

3. Unplug the system unit power cord.

4. Loosen the cover-release screw on the back of the system unit. This is a captive screw. It can be loosened, but not removed.

5. Stand in front of the system unit, grasp both sides of the cover with your hands, and pull the cover straight toward you about 2 inches (6 centimeters). Then pull up (see Figure 8-2).

Caution: If your workstation was running prior to removing the system unit cover, wait several minutes for the unit to cool down before touching any of the parts, as they could be hot.

Always use an antistatic wrist strap when working inside of the system unit (see "Using the Antistatic Wrist Strap" on page 8-8 for instructions).

To Replace the Cover on the System Unit

1. Standing at the front of the system unit, position the cover as shown in Figure 8-2.

2. Place the cover on the system unit about 2 inches (6 centimeters) from the back of the unit. Then slide the cover all the way to the back of the system unit.

3. Press and tighten the cover-release screw on the back of the unit.

Captive screw

On/off switch
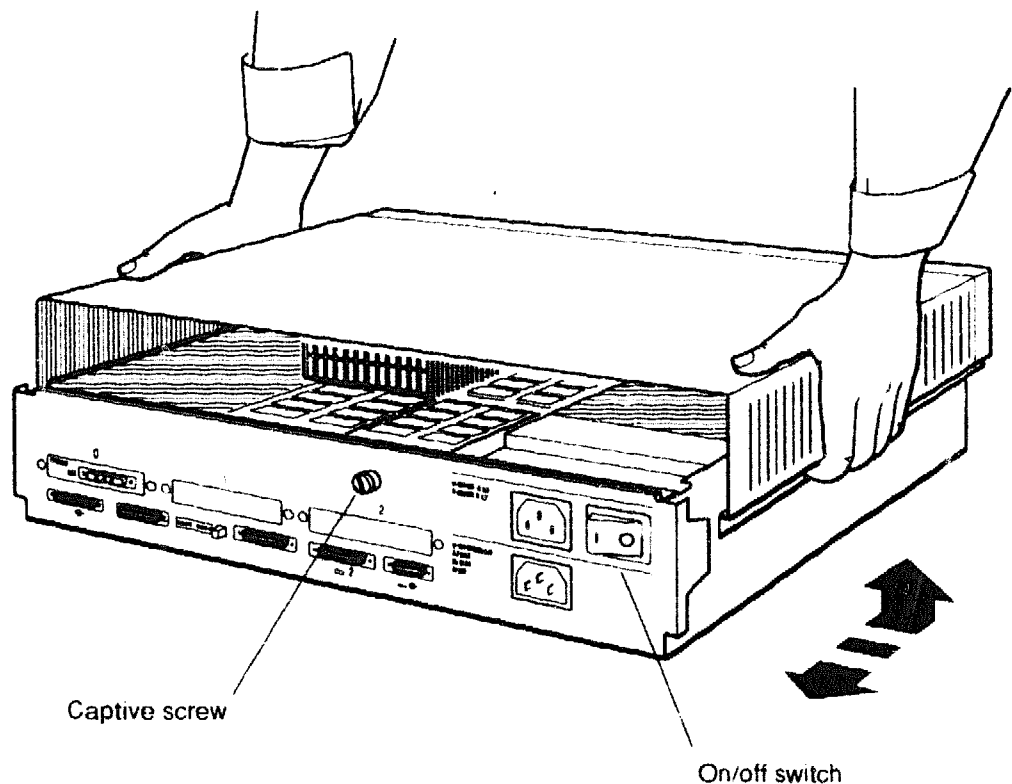
WS3PC037

Figure 8-2. Removing and replacing the system unit cover

Using the Antistatic Wrist Strap

Always use an antistatic wrist strap when you work inside the system unit or with items stored in antistatic bags.

Caution: Failure to use an antistatic device while handling electrostatically sensitive computer parts can result in reduced reliability or damage to the part.

1. Find the antistatic wrist band that came with your workstation or with the parts to be installed.

2. Unwrap the first two folds of the wrist band and wrap the exposed adhesive side firmly around your wrist.

3. Unroll the rest of the band and peel the liner from the copper foil at the opposite end.

4. Attach the adhesive copper foil to the metal frame that encloses the system unit.
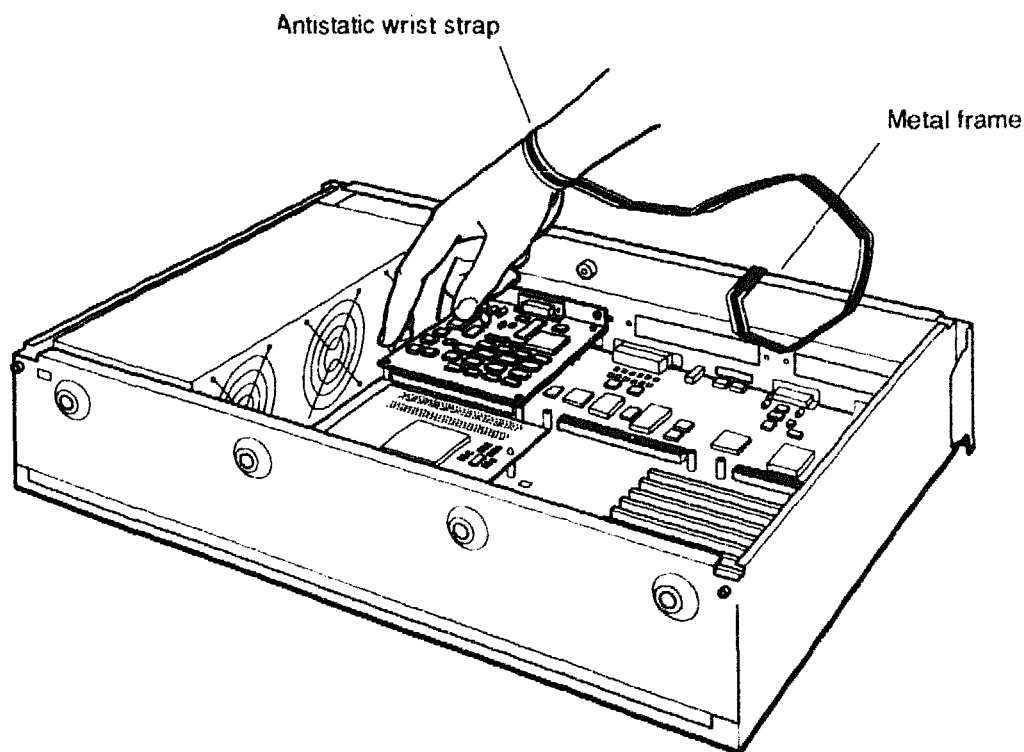
WS3PO0036

Figure 8-3. Using an antistatic wrist strap

9

Installing Internal Option Modules

This chapter explains

- How to install, test, and remove memory modules
- How to install, remove, and test an NVRAM module
- How to replace and test the CPU module
- Where to find information on installing TURBOchannel option modules

Installing and Removing Memory

DECstation 5000 Model 240 workstations come with at least 16 megabytes of memory. You can add more memory by installing additional memory modules in the memory module slots inside the system unit. Your workstation has 15 memory slots. The first 14 slots (slots 0 to 13) can hold either all 8-megabyte or all 32-megabyte single in-line memory modules (SIMMs). The last slot (slot 14) can hold either another SIMM of the same type or an NVRAM module.

- With 8-megabyte memory modules, you can install up to 120 megabytes of memory.

- With 32-megabyte memory modules, you can install up to 480 megabytes of memory.

When adding memory modules, follow these rules:

- Fill the memory slots in order, starting with slot 0.

- Do not leave an empty slot between two filled slots.

- Use only one type of memory module in your workstation: either the MS02-AA or the MS02-CA.

  - Each MS02-AA module contains 8 megabytes of memory.

  - Each MS02-CA module contains 32 megabytes of memory.

The cnfg command shows how much memory is installed in your workstation. Chapter 10 explains how to use the command.

To Install Memory Modules

To install memory modules, you need a medium Phillips screwdriver.

1. Follow the instructions that came with your worksystem software to shut down the software.

2. Turn off the system unit by pressing the 0 on the on/off switch on the back of the unit. Then unplug the system unit power cord.

   Caution: *Allow the unit to cool down several minutes before touching any internal parts, as the parts could be hot.*

3. Remove the cover from the system unit (see "To Remove the Cover from the System Unit" on page 8-6).

4. Attach one end of the antistatic wrist strap to your wrist and attach the other end to the metal frame that encloses the system unit (see "Using the Antistatic Wrist Strap" on page 8-8).

5. Locate the metal bracket that locks the memory modules in place (see Figure 9-1 on page 9-4). Loosen the two screws on the bracket until the bracket can be pulled away from the system unit.

Screws

Metal bracket

Memory module

Antistatic wrist strap
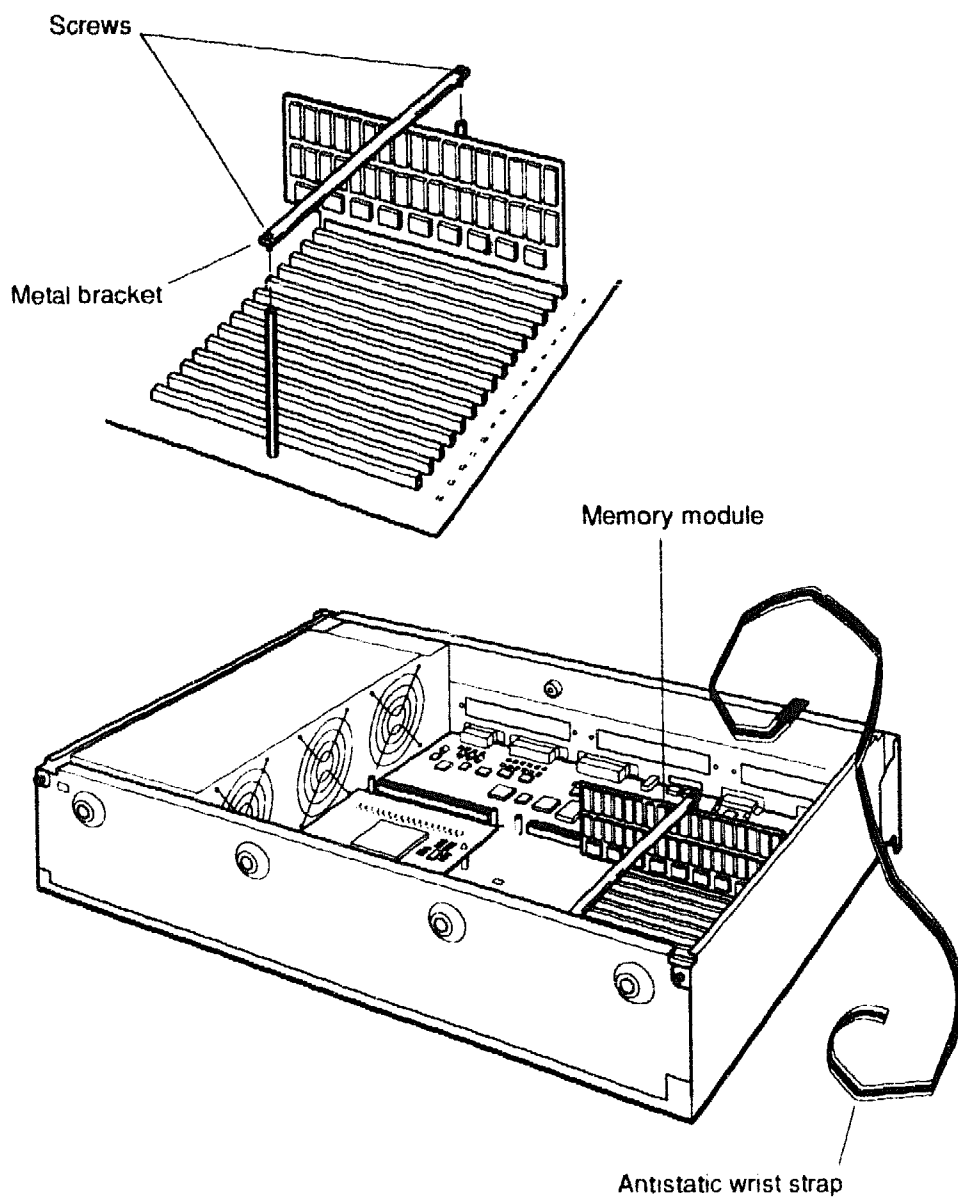
WS3PO038

Figure 9-1. Releasing the memory module bracket

6. Unpack a new memory module.

Caution: *Do not touch the contacts along the bottom of the*
memory module, as this can damage or destroy the module.
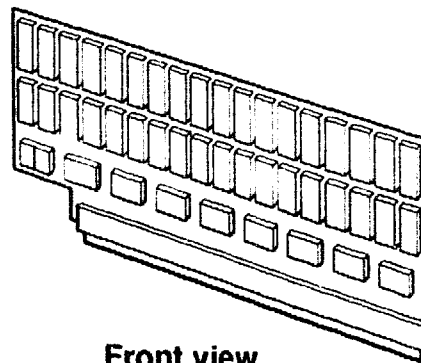
Front view
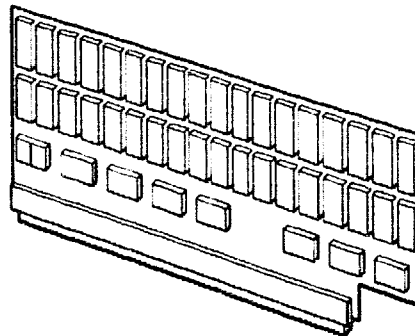
Back view

Figure 9-2. Memory module

7. Look at the numbers printed beside the memory slots inside the system unit. Align the connector on the module with the lowest-numbered vacant connector in the system unit. Then push the memory module straight down and all the way into the memory connector on the system unit.

Memory slot
numbers
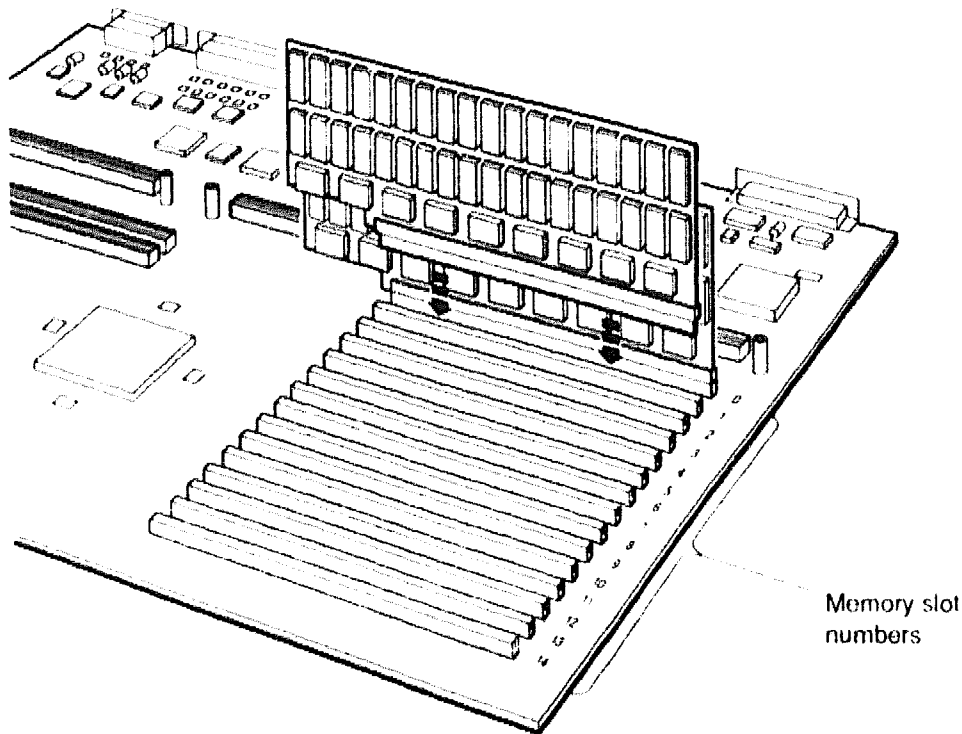
WS3PO040

Figure 9-3. Memory slots inside the system unit

8. Repeat the installation for every memory module you are installing. Be sure to install each module in the slot with the lowest number.

9. Replace the metal bracket and the two screws that hold it in place.

10. Remove the antistatic wrist strap from your wrist and from the system unit.

11. Replace the cover on the system unit (see "To Replace the Cover on the System Unit" on page 8-7).

To Test Memory Modules

1. Turn on the monitor. Then turn on the system unit.

    The system unit runs the power-up self-test. For details about the self-test, see Chapter 3.

2. At the console prompt (>>), type one of the following:

    ■ **t 3/mem** * to test all of the memory modules

    ■ **t 3/mem** followed by a space and the number of a memory slot to test the memory module installed in that slot. For example, to test the module in memory slot 2, type **t 3/mem 2**.

    A display similar to the following appears on your screen as the memory test progresses (testing all memory modules can take up to 5 minutes):

    ⋆ ⋆ \

    When the test is done, the console prompt (>>) appears. If an error message appears, turn to Chapter 11 for troubleshooting instructions.

3. Type **cnfg 3** at the console prompt and press Return to see the total amount of memory in the workstation. A display like the following appears on your screen:

```
>>cnfg 3
3:  KN03-AA    DEC    X2.0d    TCF0    (224 MB,    1 MB NVRAM)
                                       (enet: 08-00-2b-0f-45-72)
                                       (SCSI = 7)
        ------------------------------------------------------------
        DEV    PID                     VID         REV     SCSI DEV
        =====  ===================     =========   ======  ========
        rz0    RZ55       (C) DEC      DEC         0700    DIR
        rz2    RZ24       (C) DEC      DEC         0700    DIR
        rz4    RRD42      (C) DEC      DEC         0700    DIR
        tz5                                                SEQ
    dcache( 64 KB),   icache( 64KB)
    mem( 0):   a0000000: a1ffffff       ( 32 MB)
    mem( 1):   a2000000: a3ffffff       ( 32 MB)
    mem( 2):   a4000000: a5ffffff       ( 32 MB)
    mem( 3):   a6000000: a7ffffff       ( 32 MB)
    mem( 4):   a8000000: a9ffffff       ( 32 MB)
    mem( 5):   aa000000: abffffff       ( 32 MB)
    mem( 6):   ac000000: adffffff       ( 32 MB)
    mem(14):   bc000000: bc0fffff       (  1 MB)      Presto-NVR

    mem(14):   clean, batt OK, armed
>>
```

The first number in the parentheses on the first line of the display shows the total amount of memory in your workstation (in this example, 224 megabytes). The lines beginning with mem show the amount of memory installed in each memory slot. If the display does not list the correct amount of memory, check to make sure the correct memory modules are installed in the system unit in consecutive slots. If the correct modules are installed, turn to Chapter 11 for troubleshooting instructions.

To Remove Memory Modules

Follow these rules when you remove memory modules:

- Remove memory modules from one memory slot at a time, always starting with the highest-numbered slot.
- Do not leave an empty slot between memory modules.
- Be sure you have at least 16 megabytes of memory to operate your workstation.

Then proceed as follows:

1. Follow the instructions that came with your worksystem software to shut down the software.

2. Turn off the system unit by pressing the 0 on the on/off switch on the back of the unit. Then unplug the system unit power cord.

   Caution: *Allow the unit to cool down several minutes before touching any internal parts, as the parts could be hot.*

3. Remove the cover from the system unit (see "To Remove the Cover from the System Unit" on page 8-6).

4. Attach one end of the antistatic wrist strap to your wrist and attach the other end to the metal frame that encloses the system unit (see "Using the Antistatic Wrist Strap" on page 8-8).

5. Locate the metal bracket that locks the memory modules in place (see Figure 9-4). Loosen the two screws on the bracket until the bracket can be pulled away from the system unit.

Screws

Metal bracket

Memory module

Antistatic wrist strap
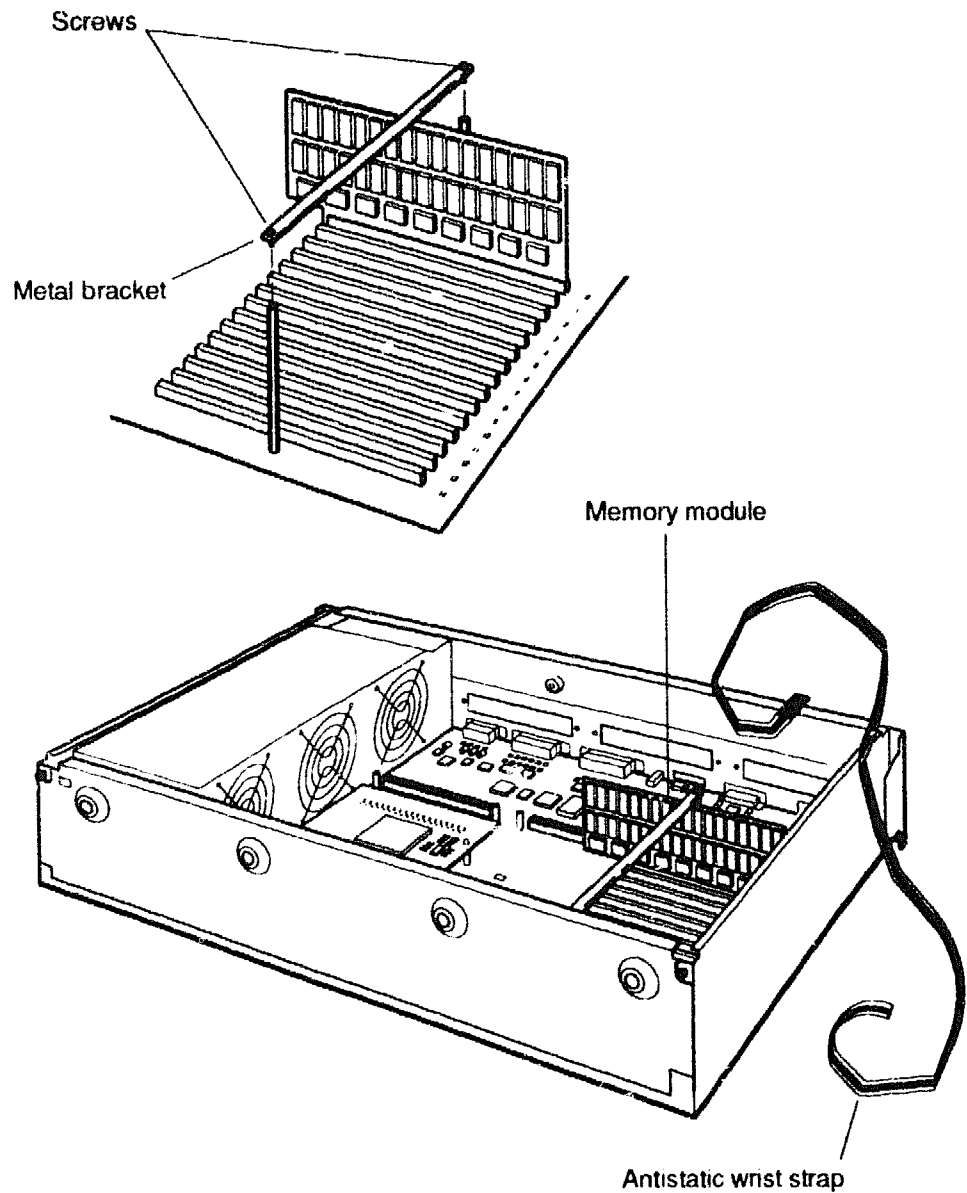
WS3PO038

Figure 9-4. Releasing the memory module bracket

6. Locate the memory module in the highest-numbered memory slot and pull that module straight up until it is free of its connector. Store the module in an antistatic bag.

Antistatic wrist strap

Memory module

WS3P0042
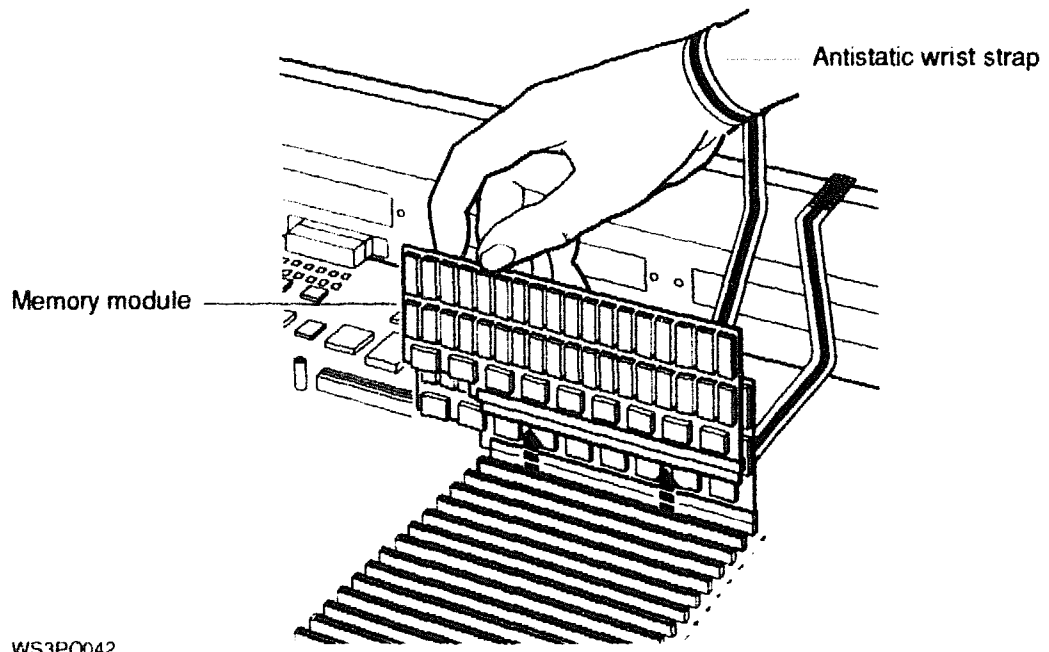
Figure 9-5. Removing a memory module

7. Continue removing memory modules until you have removed all that you intend to. (You must have at least 16 megabytes of memory to operate your workstation.) Always remove memory modules from the highest-numbered memory slots first.

8. If you are replacing the existing memory modules with new ones, turn to the section, "To Install Memory Modules," on page 9-3.

9. Replace the metal bracket and tighten the screws.

10. Remove the antistatic wrist strap from the system unit and your wrist and replace the cover on the system unit (see "To Replace the Cover on the System Unit" on page 8-7).

Installing and Removing a PrestoServe/NVRAM Module

The PrestoServe nonvolatile random-access memory (NVRAM) module is an option you can purchase for your workstation that provides 1 megabyte of battery-backed up memory. The NVRAM module (MS02-NV) can only be installed in memory slot 14 on the base system module. You install and remove an NVRAM module in basically the same way you install and remove memory modules (see "To Install Memory Modules" on page 9-3 and "To Remove Memory Modules" on page 9-8).

To test an NVRAM module,

1. Turn on your workstation.

   The system unit runs the power-up self-test. For details about the self-test, see Chapter 3.

   When the test is done, the console prompt (>>) appears. If an error message appears, turn to Chapter 11 for troubleshooting instructions.

2. Type **cnfg 3** at the console prompt and press Return. A display like the following appears on your screen (the numbers in the black circles correspond to the explanations in the list that follows):

```
3:  KN03-AA    DEC      X2.0d     TCF0     (64 MB,    1 MB NVRAM)  ❶
                                           (enet: 08-00-2b-0f-45-72)
                                           (SCSI = 7)

       ------------------------------------------------------------
       DEV   PID                  VID        REV      SCSI DEV
       ===== ==================== ========== ======== ========
       rz2   RZ55         (C) DEC DEC        0700     DIR
       rz4   RX23         (C) DEC DEC        0700     DIR
       tz1                                            SEQ

    dcache  ( 64 KB), icache ( 64 KB)
         ❷                          ❸
    mem( 0):   a0000000: a1ffffff     ( 32 MB)
    mem( 1):   a2000000: a3ffffff     ( 32 MB)
    mem(14):   bc000000: bc0fffff     (  1 MB) ❹ Presto-NVR
                    ❺
    mem(14):   clean, batt OK, armed
>>
```

❶ Indicates that 1 megabyte of NVRAM is present in the base system slot (slot 3)

❷ Indicates that the NVRAM module has been installed in memory slot 14

❸ Indicates the status of the NVRAM module

A clean cache has no data in it, in which case the battery disconnect circuits are armed and the battery is disconnected from the cache, as it is not currently needed. A valid cache has valid data in it, in which case the battery disconnect circuits are unarmed and the battery is connected to the cache to preserve the data in the event of a power failure.

Caution: Turning the workstation off when battery disconnect circuits are unarmed (NVRAM battery is connected to the cache and the cache is valid) will cause the batteries to drain unnecessarily.

Turn to Chapter 11 for troubleshooting instructions in any of the following circumstances:

- The system self-test displayed an error message referring to prcache.

- The cnfg 3 display does not list the NVRAM module.

- The cnfg 3 display shows the status of the NVRAM module to be anything other than: clean, batt OK, armed

Replacing CPU Modules

You may need a flat-blade screwdriver to install a new CPU module.

To Remove a CPU Module

1. Follow the instructions that came with your worksystem software to shut down the software.

2. Turn off the system unit by pressing the 0 on the on/off switch on the back of the unit. Then unplug the system unit power cord.

   Caution: Allow the unit to cool down several minutes before touching any internal parts, as the parts could be hot.

3. Remove the cover from the system unit (see "To Remove the Cover from the System Unit" on page 8-6).

4. Attach one end of the antistatic wrist strap to your wrist and attach the other end to the metal frame that encloses the system unit (see "Using the Antistatic Wrist Strap" on page 8-8).

5. Find the CPU module inside the system unit (see Figure 9-6.

6. Locate the lock at the top of one of the mounting posts on the CPU module. Use your fingernails or a pair of small pliers to press the lock into the post while gently pulling up on the corner of the CPU module until it is free of the lock. Do not lift the module completely off the mounting post.

7. Use the same procedure to pull the other corners of the module free of the locks on the other mounting posts.

CPU module connector

CPU module

Heat sink

Lock

Mounting posts
(one of four)
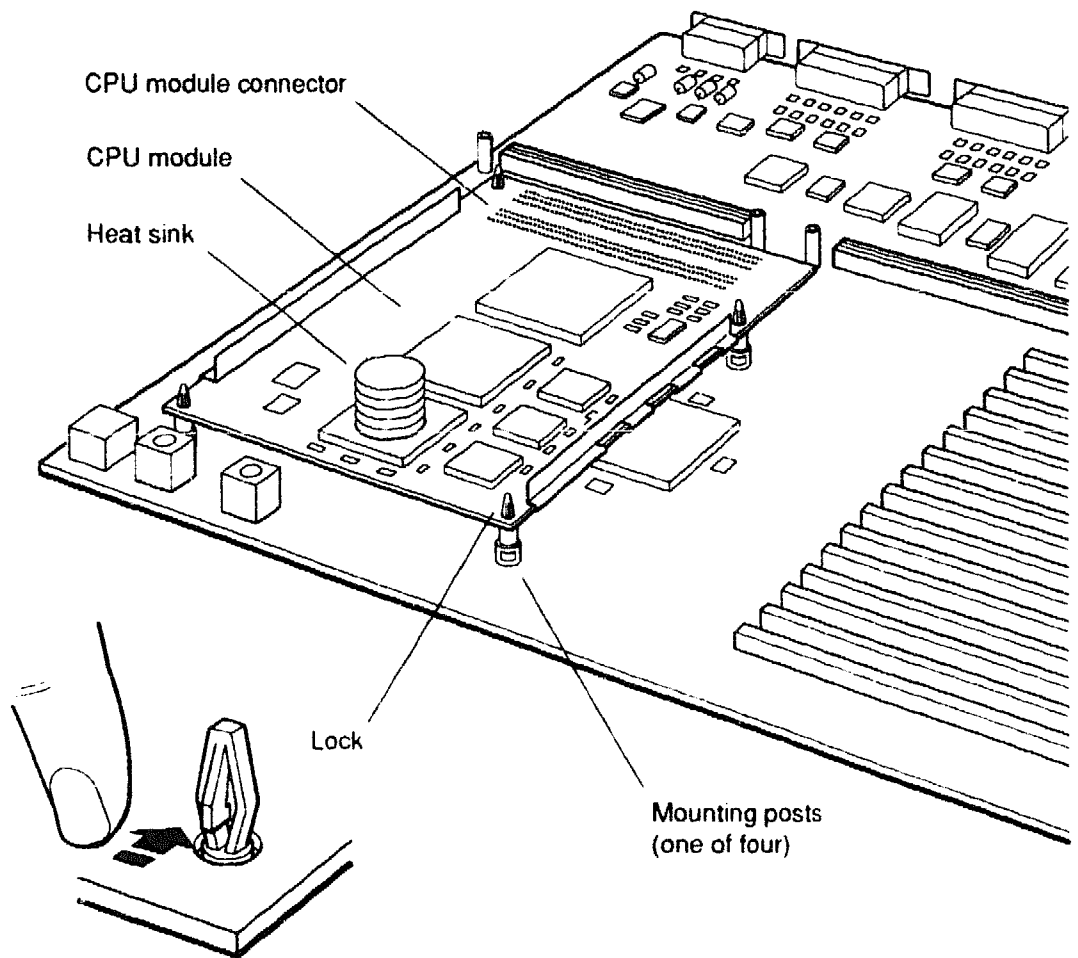
WS3PO062

Figure 9-6. Typical CPU module

8. When the module is free of the mounting post locks, pull
    the module completely out of the module connector and
    remove it from the system unit.

    Caution: *Do not pull on the heat sinks, as that can damage the*
    CPU module.

9. Set the CPU module aside carefully. Put it in an antistatic
    bag, if you have one, or use the bag from the new CPU
    module after you unpack it.

To Install a New CPU Module

1. Remove the new CPU module from the antistatic bag.

    Caution: Do not touch the pins in the module connector as this can damage the CPU module.

2. Align the mounting holes on the CPU module with the mounting posts on the base module in the system unit. Then push the CPU module straight down over the posts and into the CPU connector on the base module.

CPU module connector

Mounting posts
(one of four)
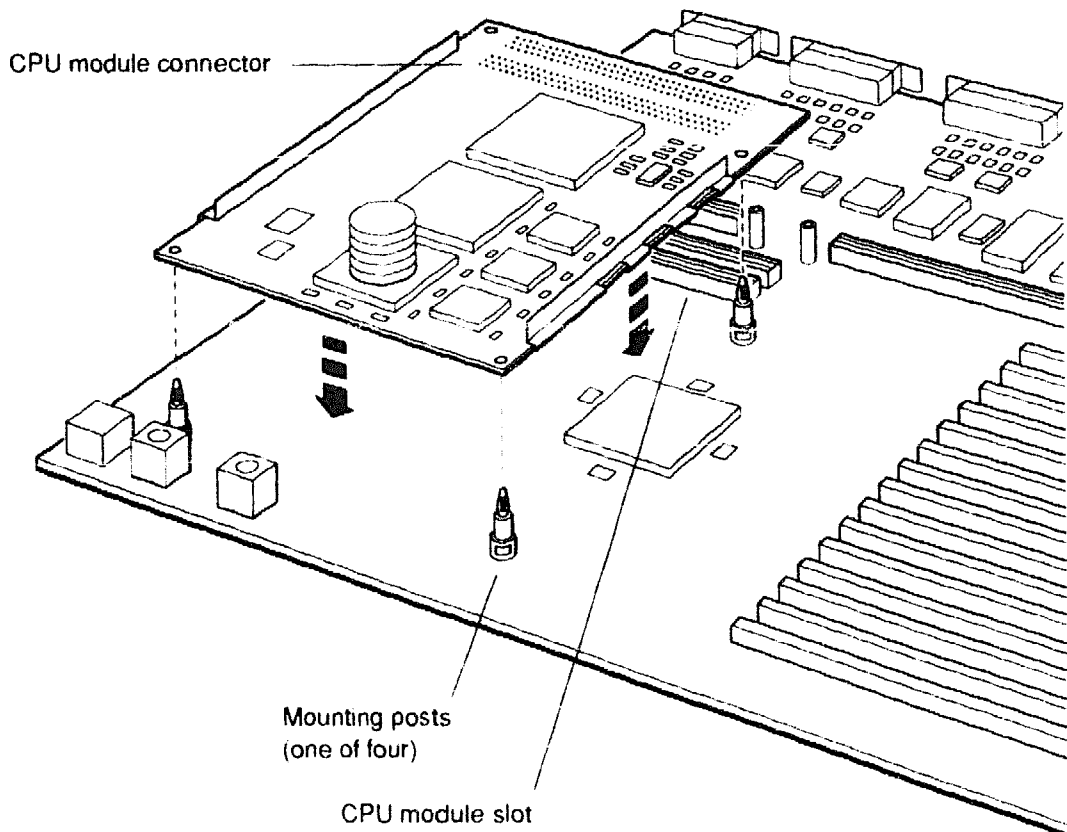
CPU module slot

WS3PO063

Figure 9-7. Installing a CPU module

3. If you are installing a different model CPU than the one your workstation came with, replace the nameplate medallion on the outside of the system unit cover.

a. Turn the system unit cover upside down and remove the nameplate medallion. Squeeze the tabs on the back of the medallion and push them through the holes as shown in Figure 9-8.

b. Press the medallion for the new CPU module into the nameplate holes on the front of the cover.

Nameplate medallion tabs

System unit cover (upside down)
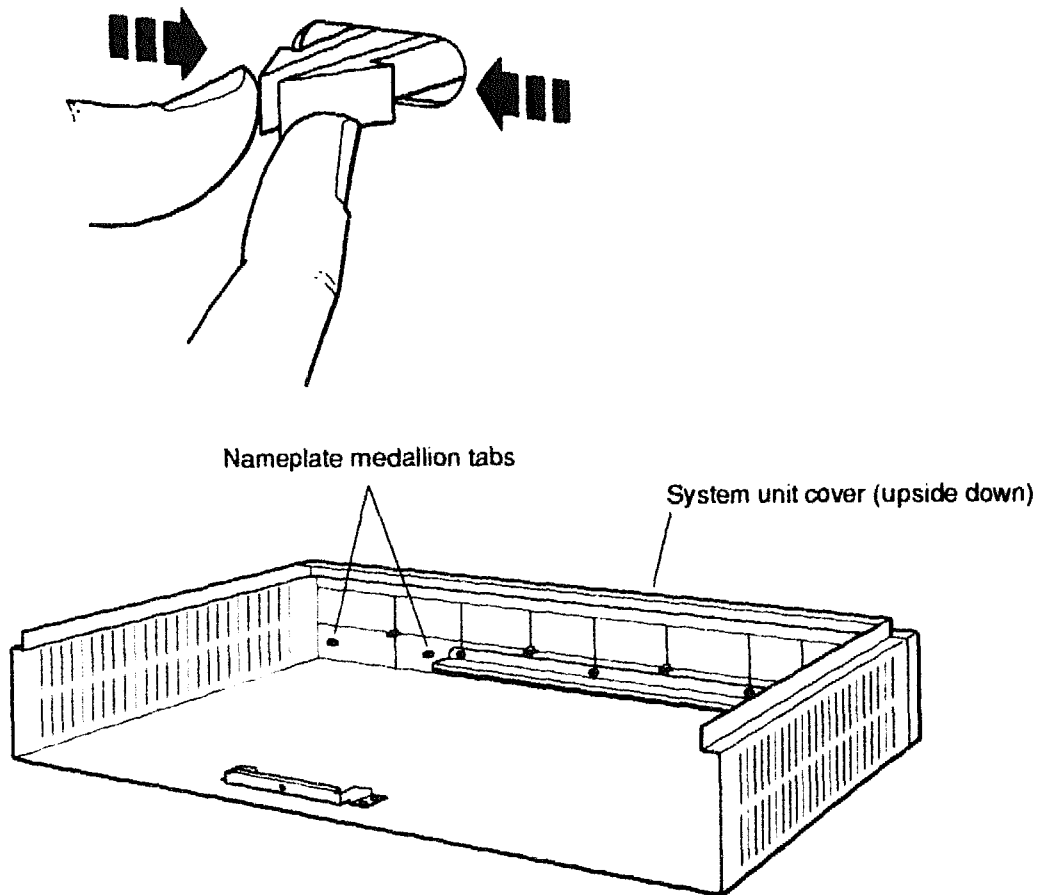
WS3PO004

Figure 9-8. Removing the nameplate

4. Replace the cover of the system unit (see "To Replace the Cover on the System Unit" on page 8-7).

To Test the CPU Module

1. Turn on your workstation.

2. The workstation runs the power-up self test. For details about the self-test, see Chapter 3.

3. When the console prompt (>>) appears, type **t3/misc/cpu-type**.

   If the system recognizes the CPU module, it displays the message: 3/misc/cpu-type's code: *type-code*

   The *type-code* displayed should match that of the CPU module you installed.

If your workstation fails to recognize the CPU you just installed, try installing the CPU module again. The module connectors may not have been aligned correctly. If the test fails again, call your Digital service representative for help.

Installing and Removing TURBOchannel Option Modules

Your DECstation 5000 Model 240 workstation comes with three TURBOchannel option slots in which you can install various TURBOchannel option modules. You can install a double- or triple-wide TURBOchannel module in either the system unit or a TCE. For a discussion of TURBOchannel options, refer to "TURBOchannel Option Modules" in Chapter 8.

If you are installing a TURBOchannel module in a TCE, you also need to install a TCE option module in the system unit, which connects to the module in the TCE. Follow these instructions:

1. Remove the cover from the workstation system unit (see "Removing and Replacing the System Unit Cover" on page 8-6 for instructions).

2. Refer to the *TURBOchannel Extender Operator's Guide* for instructions on installing the TURBOchannel module in the TCE and the TCE option module in the system unit.

If you are installing TURBOchannel option modules in the system unit, follow these instructions:

1. Remove the cover on the system unit (see "Removing and Replacing the System Unit Cover" on page 8-6 for instructions).

2. Refer to the chapter in the *TURBOchannel Options User's Guide* that discusses the option you want to install.

10

Using the Console Commands

This chapter tells you how to

- Select console and operating modes
- Install a terminal as an alternate system console
- Use the console commands
- Set environment variables

Console and Operating Modes

Your workstation functions in two modes: console mode and operating mode. When your workstation is in console mode, you are using the setup and testing software that is built into the workstation. You use console mode and the console commands for such tasks as

■ Running workstation self-tests

■ Displaying workstation hardware configurations

■ Setting workstation environment variables

■ Booting (starting) the operating system

When your workstation is in operating mode, you are using your worksystem software for such activities as

■ Running applications in DECwindows

■ Backing up files

■ Sending and receiving electronic mail

This manual explains how to use the workstation in console mode. Your worksystem software manuals explain how to use the workstation in operating mode.

Using Console Mode

The workstation starts in console mode and stays in that mode until you start your worksystem software. While you are in console mode, you can use the console commands, which are the commands of the built-in setup and testing software.

You enter console commands at the system console. If you connected only one monitor to your workstation, that monitor is your system console. If you connected multiple monitors, the monitor in the TURBOchannel option slot with the lowest number is the system console. If you connected a terminal and you have typed **setenv console s**, the terminal is your system console.

To enter console mode

To enter console mode, do one of the following:

- If you are using ULTRIX worksystem software, type **shutdown -h now** at the ULTRIX prompt and press Return

- Press the halt button on the back of the system unit

- Turn off the power to the system unit and turn it back on again.

Caution: Turning off the power or pressing the halt button while your workstation and any worksystem software are running may cause the loss or corruption of data.

Console prompts

When you use console mode, the workstation displays one of these two prompts on the screen of the system console: >> or R>.

- The >> prompt means that the workstation is in privileged mode. Users can execute all console commands at the console prompt.

- The R> prompt means that the workstation is in restricted mode. The restricted console prompt (R>) indicates that someone has set up a password requirement to restrict access to the console prompt. At the restricted console prompt, you can use only the boot and passwd console commands until you enter the correct password.

  To change to the console prompt (>>), type **passwd** and press Return. Then enter the console password and press Return again. If you don't know the password, contact your system manager or a Digital service representative.

Installing a Terminal as an Alternate System Console

The system console displays error messages and other system messages from the workstation, from networks, and from the worksystem software. You also use the system console to enter console commands, such as the cnfg command.

You generally use your workstation monitor in console mode as the system console. If a monitor is not available, you can use a terminal as an alternate system console. A terminal can display text only; it cannot display illustrations, DECwindows, or DECwindows applications; therefore, you cannot use a terminal as a standard workstation monitor. Some users prefer to connect both a monitor and a terminal to their workstations. In console mode, with both a monitor and a terminal configured, the monitor screen displays graphics tests while the terminal screen displays other tests and text input.

The following instructions explain how to install a terminal and keyboard as a system console.

Contact your Customer Support Center if you have questions about using a terminal.

To Install a Terminal as a System Console

1. Follow the instructions that came with your worksystem software to shut down the software.

2. Turn off the system unit by pressing the 0 on the on/off switch on the back of the system unit.

3. Plug a communications connector adapter into one of the serial communications connectors on the system unit (communications port 3 is preferred).

4. Find the terminal-to-system-unit cable that came with your terminal. Notice that it has telephone-jack-type connectors on both ends.

   Plug one end of the terminal-to-system-unit cable into the communications connector adapter (see Figure 10-1).

5. Plug the other end of the terminal-to-system-unit cable into the modular connector on the back of the terminal.

Terminal

Terminal-to-system-unit cable
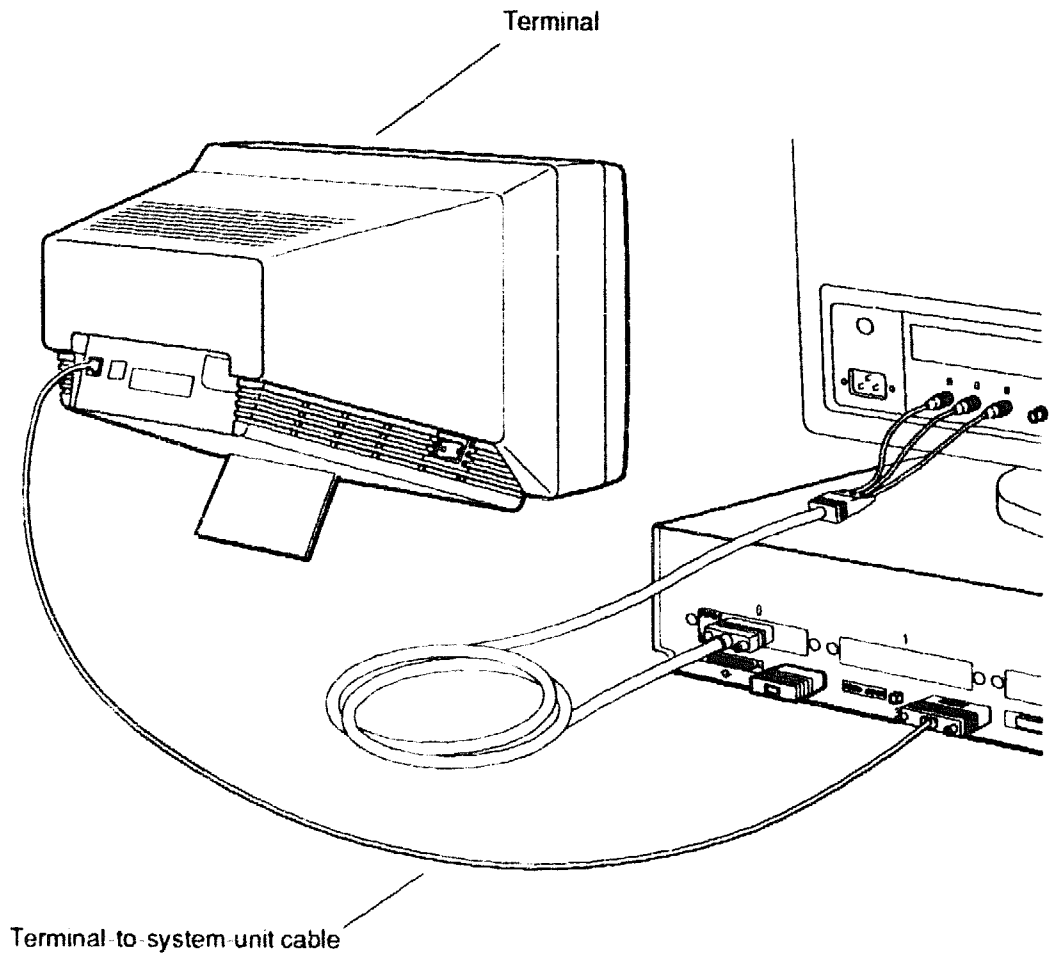
WS3PO056

Figure 10-1. Connecting a VT320 terminal to the system unit

6. Find the coiled keyboard cable that came with your terminal. Notice that it has telephone-jack-type connectors at both ends, and that one end has a keyboard icon.

   Plug the end of the terminal keyboard cable with the keyboard icon into the connector on the side of the terminal.

7. Plug the other end of the terminal keyboard cable into the modular connector on the end of the terminal keyboard.

8. Put a keyboard-mouse port terminator on the system unit keyboard-mouse connector if the connector is not in use (that is, no monitor keyboard cable is attached).

9. Connect a power cord to the terminal and to a power outlet.

10. Turn on the terminal and the system unit and wait for the system self-test to finish before proceeding. The workstation monitor, rather than the terminal, is still acting as the system console at this point.

    To activate the terminal as the system console, refer to "To Activate the Terminal as the System Console".

To Activate the Terminal as the System Console

You must set the console environment variable to s to make the terminal your system console. The operating system will then be under the control of the terminal each time you boot the system, until you change the console environment variable again.

1. Follow the instructions that came with your worksystem software to shut down the software.

2. To activate the terminal as the system console, type **setenv console s** at the workstation monitor console prompt and press Return.

To Make Your Workstation Monitor the System Console

The workstation monitor is the system console by default. If you have set the console environment variable to s, your terminal is currently the system console. To make your monitor the system console again,

1. Follow the instructions that came with your worksystem software to shut down the software.

2. Type **setenv console** * at the console prompt on the terminal and press Return.

3. Turn off the terminal if you are using the monitor as the system console.

Rules for Typing Console Commands

You can use all console commands when the system monitor displays the console prompt (>>). A restricted console prompt (R>) indicates that someone has set up a password requirement. You can use only the boot and passwd commnds at the restricted console prompt until you enter the correct password. Then the normal console prompt (>>) appears.

To use a console command, type the command as shown, add appropriate options and arguments, and press Return.

Follow these rules:

- Type uppercase and lowercase letters exactly as they appear in the manual. The system recognizes the difference between uppercase and lowercase letters.

- Press Return after typing a command.

- Use these handy key combinations:

  - Ctrl-s freezes the screen display.

  - Ctrl-q releases a frozen screen display.

  - Ctrl-c aborts a command.

  - Ctrl-u erases a partially typed command line.

  - DEL erases the last character typed.

- To type a hexadecimal number, precede the number with 0x (zero x). To type an octal number, precede the number with 0 (zero). To type a decimal number, do not precede the number with any leading 0's (zeros).

- To use the Ctrl commands, hold down the Ctrl key while you type the letter of the command. For example, to use Ctrl-s, hold down Ctrl while you type **s**.

Conventions Used in This Chapter

■ **Letters in boldface type like this** should be typed exactly as they appear.

■ *Words in italic type like this OR LIKE THIS* are options or arguments for the commands. You must replace them with the appropriate information. For example, the script command has a *scriptname* argument. When you type the command, you replace *scriptname* with the name of the script you are creating.

■ Options are read by the console programs. Arguments are read by the worksystem software.

■ When options and arguments are shown in brackets, you should use them only if they are appropriate. When they are not in brackets, you must use them all the time. For example, the printenv command is shown like this:

printenv *[env]*

Because *[env]* is enclosed in brackets, you should use it only when it is appropriate, which in this case is when you want to display the setting of one environment variable.

The script command is shown like this:

script *scriptname*

Because *scriptname* is not shown in brackets, you must use it in every script command.

Do not enclose options and arguments in brackets when you type them. The brackets are just a way of showing you when to use them.

■ When an argument is followed by an ellipsis, you can use more than one argument with the command.

Console Commands

This section explains all of the console commands for workstation users, system managers, service representatives, and other technical specialists.

Table 10-1 lists the console commands.

Table 10-1. Console Commands

Command	Function
?	Displays a list of console commands and formats
boot	Boots the system
cat	Displays scripts
cnfg	Displays system configuration information
d	Deposits (that is, writes) data into memory
e	Examines memory contents
erl	Displays a log of error messages
go	Transfers control to a specific address
init	Resets the system
ls	Displays a list of files present in a module ROM
passwd	Sets and clears the console password
printenv	Prints environment variables
restart	Restarts the worksystem software
script	Enters a short script at the console
setenv	Sets environment variables
sh	Starts a script
t	Starts module diagnostic tests
unsetenv	Deletes environment variables

To display the help menu, type a question mark (?) and press Return. The console commands appear in the help menu on the screen as follows:

```
boot [[-z #] [-n] #/path [ARG...]]
cat SCRPT
cnfg [#]
d [-bhw] [-S #] RNG val
e [-bhwcdoux] [-S #] RNG
erl [-c]
go [ADR]
init [#] [-m] [ARG...]
ls [#]
passwd [-c] [-s]
printenv [EVN]
restart
script SCRPT
setenv EVN STR
sh [-belvS] [SCRPT] [ARG...]
t [-l] #/STR [ARG...]
unsetenv EVN
```

The following subsections describe the console commands in detail. Note that the command descriptions do not always use the format that appears in the help menu.

?

>>? [command]

The ? command displays the help menu. If you enter the name of a specific command after the ?, the screen displays the help message for that command only.

boot

>>**boot** [OPTIONS] [#/path]
[argument...]

Options are

-a   Use a multiuser bootstrap.

-n   Load but do not execute *path* program.

-z *number*   Wait for *number* seconds, then boot.

The boot command loads and executes the program specified by #/*path*, where # is the slot number of the device that you are booting from, and *path* is the file specification of the program. The -a argument boots for a multiuser environment; to perform a single-user boot, enter the boot command without the -a

argument. The -n option suppresses execution of the program after it is loaded. The -z option causes the system to wait before booting. When you enter the command with no options, path, or argument, it uses the options, path, and argument in the boot environment variable (see "Environment Variables" on page 10-23.)

The following example of the boot command uses the options and arguments that you set in the boot environment variable:

```
boot
```

The following command boots from a tape drive in base slot 3 (tz is the device code of the drive, and 5 is its SCSI ID number):

```
boot 3/tz5
```

The following command boots from the network that is connected to your workstation at option slot 2:

```
boot 2/mop
```

The following command performs a multiuser boot (-a) using the file vmunix on an external drive (rz1) in base slot 3 (rz1 is the device code and SCSI ID for the drive):

```
boot 3/rz1/vmunix -a
```

cat

```
>>cat #/scriptname
```

The cat command displays the contents of the script specified by *scriptname*. The # option indicates the number of the slot where the script is stored.

cnfg

>>**cnfg** [#]

The cnfg command displays important information about the configuration of your workstation. The information tells you what kind of hardware is in the workstation and connected to it. If you type a slot number for #, the command displays configuration information for that slot. Otherwise, it displays general information for all the slots.

The following example shows the display for a cnfg command in which the specific slot number was not specified. This information shows what kind of modules are in the base system slot (base slot 3) and in the option slots. The workstation has option modules in slots 0 and 1, but not in slot 2. The numbers in black circles correspond to the descriptions that follow.

```
>>cnfg
❶        ❷                                      ❸
3:   KN03-AA     DEC     X2.0d     TCF0     (224 MB,     1 MB NVRAM)
                                            (enet: 08-00-2b-0f-45-72)
                                            (SCSI = 7)
0:   PMAG-AA     DEC     V5.3d     TCF0     (CX -- D=8)
1:   PMAD-AA     DEC     V5.3d     TCF0     (enet: 08-00-2b-0f-45-31)
```

❶ Slot number.

❷ Model code. This code indicates the model of the hardware item. For example, KN03-AA is the model code of the system module.

❸ Module code. This code shows what kind of module is installed in the slot.

Slot 3 is the system module slot (often referred to as base slot 3). It always contains the memory (MB) modules, a base system Ethernet (enet) controller, and a base system SCSI (SCSI) controller. The MB code shows the total amount of memory installed in the workstation (in this case, 224 megabytes). The SCSI code (in this case, 7) is the SCSI ID of the SCSI controller for the slot. The enet code is the Ethernet address for the Ethernet controller in that slot.

Table 10-2 lists the module codes that may appear in item 3 of the cnfg display:

Table 10-2. Module Codes

Module Code	Description
CX---d=8 or 24	True color frame buffer, where d=8 indicates color or gray scale, and d=24 indicates "true" color (any color the eye can see). This module can be installed in any TURBOchannel option slot.
CXT 8 plane	Smart frame buffer. This module can be installed in any TURBOchannel option slot.
DA: PXG+---D=8 or 24	Low 3D graphics accelerator, where D=8 indicates color or gray scale, and D=24 indicates "true" color (any color the eye can see). This module occupies two adjacent TURBOchannel option slots, but is connected to the system through the lower-numbered slot.
EA: PXG+---D=8 or 24	Mid 3D graphics accelerator, where D=8 indicates color or gray scale, and D=24 indicates "true" color (any color the eye can see). This module occupies two adjacent TURBOchannel option slots, but is connected to the system through the lower-numbered slot.
enet:	Ethernet controller. A ThickWire Ethernet controller is built into the base system. Other Ethernet controllers may be installed in the TURBOchannel option slots. The long number after enet: is a unique Ethernet station address that identifies the controller for the network software.
FA: PXGTurbo+	High 3D graphics accelerator. This module occupies three adjacent TURBOchannel option slots, but is connected to the system through the lower-numbered slot.

Table 10-2 (Cont.). Module Codes

Module Code	Description
MB	Memory module. The number indicates the megabytes of memory installed in base slot 3.
MX---D=1	Monochrome frame buffer, where D=1 indicates black and white. This module can be installed in any TURBOchannel option slot.
NVRAM	Nonvolatile random-access memory (RAM) module. An NVRAM module is an optional module that is preinstalled in the base system, if purchased for your workstation. It provides 1 megabyte of battery backed-up memory that will retain data during a power failure.
PX---D=8	2D graphics accelerator, where D=8 indicates color or gray scale. This module can be installed in any TURBOchannel option slot.
SCSI	SCSI controller. One is built into base slot 3; others may be installed in the TURBOchannel option slots.

The next example shows a configuration display for a specified option slot. In this case, it is for the base system slot (slot 3).

The numbers in black circles correspond to the item descriptions in the table that follows. Notice that the first three numbered pieces of information have already been described in the previous example.

The rest of the display provides details regarding the devices and memory that are installed in the base slot (three devices and six memory modules).

① **②** **③**
```
3:  KN03-AA    DEC       X2.0d     TCF0     (224 MB,    1 MB NVRAM)
                                            (enet: 08-00-2b-0f-45-72)
                                            (SCSI = 7)
```

④ **⑤**   **⑥**
```
    ----------------------------------------------------------------
    DEV    PID                      VID        REV     SCSI DEV
    =====  ====================     ==========  ======  ========
    rz2    RZ55            (C) DEC  DEC         0700    DIR
    rz4    RX23            (C) DEC  DEC         0700    DIR
    tz1                                                 SEQ

    dcache  ( 64 KB),  icache ( 64 KB)
```
⑦   **⑧**
```
    mem(  0):    a0000000: a1ffffff       ( 32 MB)
    mem(  1):    a2000000: a3ffffff       ( 32 MB)
    mem(  2):    a4000000: a5ffffff       ( 32 MB)
    mem(  3):    a6000000: a7ffffff       ( 32 MB)
    mem(  4):    a8000000: a9ffffff       ( 32 MB)
    mem(  5):    aa000000: abffffff       ( 32 MB)
    mem(  6):    ac000000: adffffff       ( 32 MB)
    mem( 14):    bc000000: bc0fffff       (  1 MB)        Presto-NVR
```
⑨
```
    mem(14):    clean, batt OK, armed
>>
```

❶ Slot number.

❷ Model code.

❸ Module code.

❹ Device code with SCSI ID number of the device. For example, in rz4, the SCSI ID number is 4.

❺ Product ID. Some devices show a product ID in this column, but others do not.

❻ Device descriptor, which provides a general description of the device. DIR indicates direct access drives (diskette and hard disk drives), SEQ indicates sequential access drives (tape drives), and CD-ROM indicates optical compact disc drives.

❼ Memory slot number.

❽ Amount of memory in the slot. The amount can be 8 or 32 megabytes for SIMMs, and 1 megabyte for NVRAM (in memory slot 14 only). All the slots must have the same amount of memory, except for the NVRAM module.

❾ Status of the NVRAM module.

Table 10-3 shows the device codes and device descriptors of SCSI devices, as indicated in items 4 and 6 of the cnfg display.

Table 10-3.   SCSI Device Codes and Descriptors

Device Code	Device Descriptor	Type of Drive
rx	DIR	Diskette
rz	CD-ROM	Optical compact disc
rz	DIR	Hard disk
tz	SEQ	Tape

d

```
>>d [OPTIONS]
RANGE value
```

Options can be

-w	Word (default).
-h	Halfword.
-b	Byte.
-S *count*	Repeat deposit *count* times.

Ranges can be

address	Single address.
address:address	Start and end address.
address#count	Start address and count.
range,range	More than one range.

The d, or deposit, command writes values to memory. Values can be stored as words, halfwords, or bytes. The default option is word. The command writes the specified *value* through the range of specified addresses. No intervening blanks are allowed in an address range. You can specify the address range as follows:

- A single address (*address*).

- A starting and an ending address (*address:address*).

- A starting address and the number of addresses (*address#count*).

■ Multiple address ranges separated by commas *(range.range)*. Note that no space follows the comma in an address range.

The -S option causes a value to be stored repeatedly in memory. The value is stored *count* times at each address in the address range.

e

```
>>e [OPTIONS] RANGE
```

Options can be

-w	Word (default).
-h	Halfword.
-b	Byte.
-S *count*	Repeat examine *count* times.
-x	Display in hexadecimal format.
-o	Display in octal format.
-u	Display in unsigned decimal format.
-d	Display in decimal format.
-c	Display as ASCII characters.

Ranges can be

address	Single address.
address:address	Start and end address.
address#count	Start address and count.
range,range	More than one range.

The e, or examine, command examines the contents of memory. Memory can be examined as words, halfwords, or bytes. The default option is word. The e command examines values in the range of addresses specified. You can specify the address range in these ways:

◢ A single address *(address)*.

■ A starting and an ending address *(address:address)*.

■ A starting address and the number of addresses *(address#count)*.

- Multiple address ranges separated by commas *(range,range)*. Note that no intervening space follows the comma in an address range.

You can choose how to display the memory data with format options: -x, -o, -u, -d, and -c. You can use more than one option, in which case the data is displayed in every format that you choose. If you do not indicate a format, the system displays the data in hexidecimal format.

The -S option fetches the contents of each address in the address range *count* times. The screen displays only the final value in each range.

erl

>>**erl** [-c]

The erl command displays the log of error messages (see Chapter 11). The system records error messages in a special error log buffer, and the erl command displays the contents of this buffer. If you specify -c, the buffer is cleared. The system stops recording error messages when the buffer is full and resumes when the buffer is cleared.

go

>>**go** [address]

The go command transfers control of the workstation to the specified address. If you do not specify an address, go uses the execution address returned by the last boot -n command. If the boot -n command has not been executed and no address is specified, the system ignores the go command.

init

>>**init** [#] [argument...]

The init command initializes module hardware. If you specify a slot number (#), the command initializes the modules in that slot only.

Arguments are specific to each module.

ls

`>>ls [#]`

The ls (list) command displays a list of the files in a module ROM. If you do not specify a slot number (#), the command lists the files for all modules.

passwd

`>>passwd [OPTIONS]`

Options can be

-s	Set a new console password.
-c	Clear the console password.

Use the passwd command to enter, set, or clear your console password.

The console password keeps unauthorized people from using the console commands on your workstation. You do not need to use the password if security is not an issue in your workplace.

When you first set up your workstation, you do not need a console password. The only way that a console password can be required is if you choose to start using one.[1]

To start using a console password, type **passwd -s** and press Return. The system displays a prompt (pwd:) asking you to type the password that you want to use. Type a word with at least six characters. You can use letters and numbers; the system recognizes the difference between uppercase and lowercase letters.

The system displays the pwd: prompt twice. Type the same password each time. For the sake of security, the screen does not display what you type, so type something that is easy to remember.

---

[1] The console password is not the same as the passwords required by your worksystem software or networks. The console password protects your workstation hardware by controlling access to the console commands.

Once you choose a password, the system displays a restricted console prompt when you first start your workstation. It looks like this:

```
R>
```

At this prompt, you can only boot your worksystem software or enter your console password.

- Boot your worksystem software. Type **boot** and press Return. This is the only boot command that you can use. It has no options or arguments. It uses the values that you set in the boot environment variable (see "Environment Variables" on page 10-23.) If you have not set the variable, the command does not work.

- Enter your console password. Type **passwd** and press Return. Then type your console password at the `pwd:` prompt. For the sake of security, the screen does not display what you type.

After you enter your console password, the prompt changes to the standard console prompt (>>). You can now use all the console commands that are described in this chapter.

To stop using your console password, type **passwd -c** at the standard console prompt and press Return. Afterwards, you will have unrestricted access to the console commands.

printenv

```
>>printenv [env]
```

The printenv command displays the values of environment variables. If you specify the name of an environment variable, the command displays the value of only that variable. See "Environment Variables" on page 10-24 for more information.

restart

```
>>restart
```

The restart command attempts to restart the worksystem software. This command relies on a restart facility that you have to enable in the worksystem software.

script

>>**script** *scriptname*

The script command allows you to write a short temporary script at the system console. A script is a miniprogram. After you write the script, you can run it with the sh command, or you can type the name (*scriptname*) of the script by itself at the console prompt to execute the script.

To write a script, type **script** followed by a name for the script and press Return. Then write the script line by line. When you are done, go to a new line and press Return.

setenv

>>**setenv** *env value*

The setenv command sets the value of an environment variable. Note that you must enclose the command in double quotation marks if *value* contains blank spaces. See "Environment Variables" on page 10-24 for more information.

sh

>>**sh** *[OPTIONS]* *[#/scriptname]*
[argument...]

Options can be

-e	Exit on error.
-b	Branch to script.
-v	Verbose; echo to console.
-S	Suppress script-not-found errors.
-l	Execute in a loop. (This option is the letter "el," not the number one.)

The sh, or shell, command activates, or runs, a script. Replace # with the slot number of the module that contains the script.

If you specify a script name for the *scriptname* option, the script is used as the input. Otherwise, what you type at the console is the input, and a subshell is created. When you run a shell script, environment variable 0 is set to the script name, 1 is set to the first argument in the script, 2 is set to the second argument, and so on.

The -e option directs the shell to exit when an error occurs. Normally, the shell ignores errors. The -b option executes the script specified by *scriptname* instead of creating a subshell. The -v option causes the script to be echoed to the console when it is executed. The default setting is no echo. The -S option suppresses any error message if the script is not found and causes the sh command to return a status that indicates success. The -1 option causes a script to be executed continuously until a system reset occurs or you press Ctrl-c.

t

```
>>t [OPTIONS]    #/testname
[argument...]
```

Options can be

-1   Execute in a loop.

The t, or test, command runs module tests. Specify a test with #/*testname*, where # is the slot number, and *testname* is a module-specific test.

The -1 option makes the test run continuously until a system reset occurs or you press Ctrl-c.

If the t command is part of a script, the system console displays #/*testname* as each test runs.

To display the tests and test formats for a specific module, type **t #/?**, where # is the slot number of the module.

Type **test** to run the script that performs a thorough test of the entire system. Typing **test** is a shorthand way of typing **sh 3/test**. If you type **sh -1 3/test**, the test runs continuously.

unsetenv

```
>>unsetenv env
```

The unsetenv command deletes the value of an environment variable. See "Environment Variables" for more information.

Environment Variables

Environment variables store system parameters and scripts and pass information to the operating system. Some environment variables stay in memory, but others are lost when you turn off the power.

Table 10-4 summarizes the console commands for setting environment variables. Table 10-5 lists the standard environment variables that you can set.

Table 10-4. Console Commands for Environment Variables

Command	Description
printenv	Displays the value of environment variables
setenv	Sets the value of an environment variable
unsetenv	Deletes the value of an environment variable

Table 10-5. Environment Variables Set by the User

boot[1]	Specifies arguments for the boot command (see page 10-24).
console[1]	Chooses the system console. You normally do not set this variable. Any setting except s, including the default "blank" setting, selects autoconfiguration and makes your monitor and monitor keyboard the system console. Autoconfiguration makes the monitor in the lowest-numbered option slot the system console. If the workstation has no monitor connected to a graphics module, communications connector 3 becomes the system console slot.
	To activate a terminal as an alternate system console, set console to s. Chapter 7 explains how to install the terminal. Set console to * to make your graphics monitor the system console again.
	To display the language menu on the system console, set console to zero.
	If more than one monitor is connected to the system unit, the monitor in the lowest-numbered slot is the system console.

---

[1]These environment variables stay in memory until you delete them.

Table 10-5 (Cont.). Environment Variables Set by the User

haltaction[1]	Specifies what happens when you press the halt button or turn on the power:
	b Boots the worksystem software, as specified by the boot environment variable.
	h Halts the worksystem software and displays the console prompt.
	r Restarts the worksystem software. If the restart fails, boots the software.
more	Specifies the greatest number of lines of text that can fit on the screen at one time. When text scrolls on the screen, the system stops the scrolling at the number of lines that you set. If you set the number to zero, the text scrolls continuously.
testaction[1]	Controls the power-up self-test:
	t Specifies a thorough (but slow) testing of the system.
	q Specifies a quicker but less thorough test.
	m Specifies manufacturing tests. You should not use this setting.
#	The number of the module that contains the current script. If no script is active, the system module is assumed.

[1] These environment variables stay in memory until you delete them.

There are other environmental variables. Some, like oconsole, should not be changed. Others can be set as implementation-specific side effects of various bootstrap and test procedures.

11

Troubleshooting

This chapter explains

- What kind of information your Customer Support Center needs when you ask for help

- How to be sure all components of your workstation are functioning

- How to use the system self-tests to diagnose common problems new users often have

- How to diagnose and solve other problems

Where to Look for Which Problem

- If some part of your workstation fails to turn on, refer to the section "Is It On?" beginning on page 11-4.

- If the workstation turns on, but a component doesn't function properly, look in the section "Is It Connected Properly?" beginning on page 11-9.

- If the workstation turns on and everything is connected, but the workstation still doesn't function properly, look in the section "Is It Working?" beginning on page 11-18.

Contacting Your Customer Support Center

If you follow the recommendations in this chapter and your problem is still not fixed, call your Customer Support Center.

The service representative in the center will ask you these questions:

- What kind of workstation do you have?
  - What is its serial number?
  - How much memory does it have?
  - What kind of monitor is connected to it?
  - What internal drives does it have?
  - What external storage devices and other options does it have?
- What is wrong?
- What error messages were displayed?
- What was the on/off pattern of lights in the diagnostic LED display?
- Did you try to fix the problem yourself? If so, what did you do?

The service representative will try to help you fix the problem while you are on the telephone, so make your call from a telephone near the workstation.

Is It On?

An indicator light on each hardware component of your workstation shows whether the unit has power or not. In addition, eight small, red diagnostic LED lights on the back of the system unit indicate whether or not the basic components of the workstation are ready to use.

If the workstation is not functioning and no error messages appear on the monitor, check the power indicator lights and the diagnostic LED display. The on/off pattern of the LED display indicates which portion of the power-up self-test failed.

Power indicator light

Eight red diagnostic
LED lights

WS3PO060

Figure 11-1. Indicator light and LED display

Table 11-1 shows you how to interpret the LED display codes.
The codes are shown in the order in which the tests run, so
you can determine which subtests ran successfully and at what
point the test failed.

If the LED display indicates a problem with your workstation,
try the suggestion provided for that LED code in Table 11-1.
If no specific suggestion is given, or if the suggested procedure
does not solve the problem, try reinstalling the CPU module
and the memory modules on the base system module. Then
restart the workstation. If the problem still exists, call your
system manager or the Digital Customer Support Center.

Table 11-1.   Interpreting the LED Codes

LED Code		Meaning
●●●●	●●●●	Workstation hardware initialization could not begin.
○○●●	●●●●	Workstation firmware initialization could not be completed.
○○●●	○●○●	Firmware could not initialize the input-output subsystem on the system module to a known state. The input-output subsystem controls the Ethernet and SCSI interfaces, as well as the keyboard, mouse, and other serial-line communications.
○○●●	○●●○	Memory slot 0 could not be initialized. Try replacing the memory module in memory slot 0 (see Chapter 9 for instructions).
○○●●	○●●●	Firmware could not calculate the cache size. Try reinstalling the CPU module (see Chapter 9 for instructions).
○○●●	●●●○	Firmware could not calibrate the millisecond delay loop. Try reinstalling the CPU module (see Chapter 9 for instructions).
○○●●	●●○●	Firmware could not configure the system. Try reinstalling the CPU module and all memory modules (see Chapter 9 for instructions).

Explanation:

   ○   Light is off.
   ●   Light is on.

Table 11-1 (Cont.). Interpreting the LED Codes

LED Code		Meaning
oooo	oooo	*If the workstation turns on,* all workstation components have been initialized, and the workstation is ready for use. *If the workstation does not turn on,* a device or module is not connected properly or is broken. Make sure all cables are securely attached and that all external components of the workstation have been installed properly and are plugged into a power source.
oooo ooo● oo●o oo●●	●o●● ●o●● ●o●● ●o●●	The system console programs not be initialized. The lights on the left show the slot number of the module with the problem, from slot number 0 (Off Off Off Off) to slot number 3 (Off Off On On). Try reinstalling the option module in the slot indicated by the LED code. If the problem is in the base slot (slot 3), try reinstalling the CPU module and all memory modules (see Chapter 9 for instructions).
oooo ooo● oo●o oo●●	ooo●o ooo●o ooo●o ooo●o	A read-only memory (ROM) object could not be loaded. This could be a portion of the system module, system firmware, or firmware for an option module. The lights on the left show the slot number of the module with the problem, from slot number 0 (Off Off Off Off) to slot number 3 (Off Off On On). Try reinstalling the option module in the slot indicated by the LED code. If the problem is in the base slot (slot 3), try reinstalling the CPU module and all memory modules (see Chapter 9 for instructions).
oooo ooo● oo●o oo●●	ooo●● ooo●● ooo●● ooo●●	The workstation was initialized, but there is a problem in the system module or one of the option modules. The lights on the left show the slot number of the module with the problem, from slot number 0 (Off Off Off Off) to slot number 3 (Off Off On On). Type **erl** at the console prompt >> to display any error messages relating to the problem. Then turn to the section "How to Interpret Self-Test Messages" on page 11-19 and look up the error message.

Explanation:

o   Light is off.

●   Light is on.

Table 11-1 (Cont.). Interpreting the LED Codes

LED Code		Meaning
oooo	ooo●	The worksystem software could not be loaded. The lights on the left
ooo●	ooo●	show the slot number of the module where the software is stored,
oo●o	ooo●	from slot number 0 (Off Off Off Off) to slot number 3 (Off Off On On).
oo●●	ooo●	Check to make sure that the device on which the software is stored
		has power, is properly connected to the system unit, and has a unique
		SCSI ID (see Chapter 5 for instructions). If the problem persists,
		try reinstalling the SCSI controller module in the slot indicated by the
		LED code. If the problem is in the base slot (slot 3), try reinstalling the
		CPU module and all memory modules (see Chapter 9 for instructions).

Explanation:

o   Light is off.
●   Light is on.

Is It Connected Properly?

Table 11-2 lists some problems that new users may have, and some problems that may occur after new hardware has been installed. Many of these problems can be solved easily by following the suggestions in the table. If these solutions do not resolve the problem, see "Is It Working?" on page 11-18.

Table 11-2. Solutions to Common Problems

Problem	Solution
Amount of memory in the cnfg 3 display is incorrect.	1. Note the slot location and size of each memory module listed in the cnfg 3 display and compare it to the actual memory module in the specified system unit memory slot. Reinstall any memory modules that do not appear in the display (see Chapter 9 for instructions).
	2. If the problem persists, type **t 3/mem** * at the console prompt and see "How to Interpret Self-Test Messages" on page 11-19 to interpret the test results.
The NVRAM module you ordered does not appear in the cnfg 3 display.	1. Turn off your workstation.
	2. Check to make sure the NVRAM module is installed in memory slot 14.
	3. Reinstall the NVRAM module (see Chapter 9 for instructions).
	4. Turn on your workstation and try the cnfg 3 command again.
The status of the NVRAM module in the cnfg 3 display is anything other than clean, batt OK, armed.	See the NVRAM chapter in the *TURBOchannel Options User's Guide* for an explanation and instructions.

Table 11-2 (Cont.). Solutions to Common Problems

Problem	Solution
A TURBOchannel module for your workstation does not appear in the cnfg display.	**1.** If the missing module is a TCE option module, check to see if the option module in the TCE (to which it is connected) is displayed. The cnfg display only lists the module in the TCE–not the TCE option module in the system unit.
	2. Check to make sure you specified the correct slot number for the missing module in the cnfg command.
	3. Reinstall the missing option module (see Chapter 9 for instructions).
An external drive does not appear in the cnfg display	**1.** Check to make sure you specified the correct slot number for the missing drive in the cnfg command.
	2. Turn off the workstation.
	3. Make sure the external device in which the missing drive is located is turned on and is connected to an active power source.
	4. Make sure the external device in which the drive is installed is properly connected to your workstation (see Chapter 5 for instructions).
	5. Make sure the missing drive has a unique SCSI ID from 0 to 6 (see Chapter 5 for instructions).
	6. If the missing drive is in a TCE or BA42 expansion box, reinstall the drive inside the box (see the *BA42 Installation Guide* or *TURBOchannel Extender Operator's Guide* for instructions).
	7. Turn on your workstation and try the cnfg command again.

Table 11-2 (Cont.). Solutions to Common Problems

Problem	Solution
The screen is blank.	

1. Press any key on your keyboard. If your screen saver was active, the display will reappear.

2. Make sure the system unit and monitor are turned on.

3. Adjust the brightness and contrast controls.

4. Turn off the system unit and monitor.

5. Make sure the system unit power cord and the monitor-to-system-unit power cable or the monitor power cord are connected correctly.

6. Make sure the video cable is securely connected to the monitor and system unit.

7. Make sure that your monitor is compatible with the graphics module you are using (see the chapter in the *TURBOchannel Options User's Guide* that discusses the graphics module or monitor you are using).

8. Turn on the system unit and monitor.

The screen display is distorted or unstable.

1. Shut down your worksystem software, if necessary, and turn off the system unit and monitor.

2. Make sure the video cable connectors are correctly attached to the monitor and system unit.

3. Make sure that your monitor is compatible with the graphics module you are using (see the chapter in the *TURBOchannel Options User's Guide* that discusses the graphics module or monitor you are using).

4. Turn on the system unit and monitor.

Table 11-2 (Cont.). Solutions to Common Problems

Problem	Solution
Color is distorted or unclear.	1. Move such items as magnetic paper clip holders and electric pencil sharpeners or other electromechanical devices away from the monitor.
	2. If your monitor has a degauss button, press it for 5 seconds. If the monitor has no degauss button, turn the monitor off and then on again.
	3. See the manuals for your monitor for further troubleshooting instructions.
Red or blue is missing from the display on your color monitor.	1. Shut down your worksystem software and turn off the system unit and monitor.
	2. Make sure the video cable connectors are attached to the monitor correctly. Chapter 1 explains how to connect monitors.
	3. Turn on the system unit and monitor.
The DIGITAL logo is red instead of blue on the login screen on your color monitor.	1. Shut down your worksystem software and turn off the system unit and monitor.
	2. Remove the video cable connector from the video connector on the system unit.
	3. Unplug the cable connector. Holding the cable connector so the widest part of the connector is on top, reattach the cable connector to the system unit.
	4. Turn on the system unit and monitor.

Table 11-2 (Cont.). Solutions to Common Problems

Problem	Solution
Nothing happens on the screen when you type.	1. Check the Hold Screen indicator light on the keyboard. If the light glows green, press the Hold Screen key.
	2. Shut down your worksystem software, if necessary, and turn off the system unit.
	3. Disconnect the keyboard cable from its connector on the keyboard-mouse connector block and then reconnect it.
	4. Make sure the keyboard-mouse cable is firmly attached to the system unit and turn on the system unit.
	5. Turn off the system unit and monitor, connect another keyboard, and turn on the system unit and monitor again.
You cannot connect to your networks, and you know the worksystem and network software are functioning.	1. Shut down your worksystem software and turn off the system unit.
	2. Make sure the Ethernet connectors on the system unit are attached correctly (see Chapter 6). If you are using adapters to connect ThinWire or twisted-pair Ethernet cable to your workstation, check those connectors, too.
	3. Turn on the system unit.

Table 11-2 (Cont.). Solutions to Common Problems

Problem	Solution
No cursor appears on the screen	1. Check the Hold Screen indicator light on the keyboard. If the light glows green, press the Hold Screen key.
	2. Move the mouse around on your desktop, or move the puck or stylus around on your tablet, to see if you accidentally moved the cursor off the screen.
	3. Shut down your worksystem software and turn off the system unit.
	4. Make sure the mouse cable is correctly connected to the keyboard-mouse connector blocks, and the keyboard-mouse cable is correctly connected to the system unit.
	5. Turn on the system unit.
	6. If the problem is not fixed, install another mouse or tablet.
The cursor on the screen fails to follow the movement of your pointing device (mouse, puck, or stylus).	1. Shut down your worksystem software and turn off the system unit.
	2. Make sure the cable for the device is connected securely to the keyboard-mouse connector block and to the device itself.
	3. Turn on the system unit.
	4. If the problem is not fixed, install another pointing device.

Table 11-2 (Cont.). Solutions to Common Problems

Problem	Solution
You cannot install worksystem software from an external storage device.	*If you have only one external storage device,*

If you have only one external storage device,

1. Make sure the device is turned on and the power outlet it is plugged into has power.

2. Use the cnfg command to determine whether the workstation lists the device.

3. If the device is missing from the display, turn off the device and the system unit and check the following:

   ▪ Make sure the SCSI expansion cable is correctly connected to the device and to the system unit.

   ▪ Make sure a terminator is correctly attached to the second SCSI connector on the device (unless the device is a TCE, which has an internal SCSI terminator).

   ▪ Check the SCSI ID switch settings or SCSI ID display window on the device to make sure the SCSI ID is within the range 0 to 6. If not, change the SCSI ID accordingly. See Chapter 5 for instructions on checking and changing the SCSI ID.

4. Turn on the device and the system unit.

   If the problem still exists, refer to the manual that came with the device and to the installation guide for your workstation software.

Table 11-2 (Cont.). Solutions to Common Problems

Problem	Solution
	If you have more than one external storage device,

1. Make sure all the devices are turned on and the power outlets they are plugged into are active.

2. Type **cnfg** and the number of the slot in which the device is connected.

   If the device does not appear in the configuration display on the screen, turn off all devices connected to the system unit and then turn off the system unit. Then check the following:

   ■ Make sure the SCSI cables are connected to all the devices in the chain and to the system unit. The SCSI cables between devices should be 18-inch Digital cables.

   ■ Make sure a terminator is correctly attached to the second SCSI connector on the last device in the chain (unless the device is a TCE, which has an internal SCSI terminator).

   ■ Check the SCSI ID switch settings or SCSI ID display window on all devices in the chain to make sure the SCSI ID of the missing device is unique and is within the range 0 to 6. If not, change the SCSI ID accordingly. See Chapter 5 for instructions on checking and changing the SCSI ID.

3. Make sure you have attached no more than three expansion boxes to a single SCSI connector. If you have attached more than this, you may have exceeded the total allowable cable length for a single SCSI connector (236 inches,) or 6 meters, for all SCSI cabling. Table 5-1 in Chapter 5 provides a table with SCSI cable lengths for each expansion box and explains how to calculate the total cable length for a group of expansion boxes.

4. Turn on the system unit and the devices.

   If the problem still exists, refer to the manual that came with the missing device and to the installation guide for your workstation software.

Table 11-2 (Cont.). Solutions to Common Problems

Problem	Solution
A red light blinks rapidly on the front of your TK50Z tape drive.	1. Push the load/unload button four times.
	2. Turn the tape drive off and on once.
Nothing happens when you try to use your printer.	1. Make sure the printer is turned on.
	2. Check your worksystem and communications software to be sure that the device is installed and enabled properly.
	3. Check your system software to be sure the printer is installed in the software.
	4. Shut down your worksystem software, if necessary, and turn off the printer and the system unit.
	5. Make sure the printer power cord is connected to a live power source.
	6. Make sure the printer cable connector is correctly attached to one of the communications connectors on the system unit.
	7. Turn on the system unit and the printer.
	If the problem is not fixed, see the manuals for your printer.

Table 11-2 (Cont.). Solutions to Common Problems

Problem	Solution
Nothing happens when you try to use a communications device.	1. Make sure the device is turned on.
	2. Shut down your worksystem software, if necessary, and turn off the device and the system unit.
	3. Make sure the device power cord is connected to an active power source.
	4. Make sure the connector on the communications device cable is correctly attached to the communications connector or the communications connector adapter on the system unit.
	5. Make sure the right type of cable is connected to the device. Check the guide that came with the device to determine the proper cables.
	6. Turn on the system unit and the device.
	If the problem is not fixed, see the manuals for the device.

Is It Working?

If your workstation components have power and all components seem to be properly connected, but the workstation still does not function properly, try running a full system self-test. To do this, you must first shut down your ULTRIX worksystem software by typing **shutdown -h now** at the ULTRIX prompt and pressing Return. Then, at the console prompt (>>), type **test** and press Return.

For more complete instructions on how run a self-test, see "Testing Your Workstation" on page 3-6.

How to Interpret Self-Test Messages

Self-tests display error messages when they discover problems in the hardware. The number after ?TFL: is the slot number of the module that has a problem.

- If 0, 1, or 2 follows ?TFL:, the problem is in the TURBOchannel option slot that has the same number. For troubleshooting instructions, see the *TURBOchannel Options User's Guide* chapter that discusses the TURBOchannel module installed in that slot.

- If 3 follows ?TFL:, the problem is in the base system hardware. Copy the messages and then look for them in Table 11-3. This table explains how you can probably fix the problem. If you cannot fix it, call the Digital Customer Support Center.

For example, here is an error message with an explanation of every part:

①   ②③   ④   ⑤   ⑥
?TFL: 3/ni/promisc   (903: LANCE-start timeout.)   [KN03-AA]

①   Test failure message. You can fix problems when the error message begins with TFL.

②   Slot number of the hardware that reported a problem. If the slot number in the error message is 3, look in Table 11-3 for an explanation of the error message.

③   Subtest that found the problem.

④   Part of the subtest that found the problem. Some messages do not have this information.

⑤   Explanation of the problem.

⑥   ID of the module in the slot.

Table 11-3. Self-Test Error Messages for the Base System Slot

cache/data cache/fill cache/isol cache/reload cache/seg	The random-access memory (RAM) cache in the CPU module is faulty. Copy the entire message and call your system manager or Customer Support Center.
ecc	The error correction or detection logic is faulty. This indicates a bad CPU module, memory module, or base system module. Reseat the CPU module, all memory modules, and the base system module; if the problem persists, replace the memory module in slot 0 (see Chapter 9 for instructions). If the message reappears, copy the entire message and call your system manager or the Customer Support Center.
fpu	The math coprocessor in the CPU module is faulty. Copy the entire message and call your system manager or Customer Support Center.

Table 11-3 (Cont.).   Self-Test Error Messages for the Base System Slot

mem	Random-access memory (RAM) is faulty. Make sure that all the memory modules are firmly seated in their connectors in the system unit and then run the memory test. Type **t 3/mem** * and press Return. The memory test checks every memory module, taking several minutes for each one. If it finds a problem, it displays a message with one of the following formats, where *slot-num* indicates where the faulty memory module is installed.

?TFL: 3/mem (1:board *slot-number*, MBE= *number*, SBE= *number*

?TFL: 3/mem (2:board *slot-number*, too many SBEs: *number*

Remove or replace the faulty memory module (see Chapter 9 for instructions). You must retain at least 16 megabytes of memory for your workstation to operate correctly. After removing or replacing all faulty memory modules, run the memory test again. If the test still reports a problem, copy the entire message and call your system manager or Customer Support Center.

mem/float10, mem/init, mem/select	A memory module is faulty. If one of these error messages appears, copy the entire message and call your system manager or Customer Support Center.
misc/halt	The halt button or the built-in halt program is faulty. Copy the entire message and call your system manager or Customer Support Center.
misc/kbd	The keyboard, keyboard cable, or connectors are faulty. Make sure that the cable is connected properly (see Chapter 1). Then turn the system unit off and on. If the test message appears again, try replacing first the keyboard cable and then the keyboard. If the message still appears, copy the entire message and call your system manager or Customer Support Center.
misc/mouse	The mouse, mouse cable, or connector is faulty. Make sure that the cable is connected properly (see Chapter 1). Then turn the system unit off and on again. If the test message appears again, replace the mouse. If the message still appears, copy the entire message and call your system manager or Customer Support Center.

Table 11-3 (Cont.). Self-Test Error Messages for the Base System Slot

misc/pstemp	The flow of air through the system unit is inadequate, or the temperature in your office is more than 104°F (40°C). Make sure there is a space of at least 4 inches (10 cm) between the vents in the system unit cover and other items on your work table. Then turn the system unit off, wait a moment, and turn it on. If a misc/pstemp error message appears again, turn off the system unit, copy the entire message, and call your system manager or Customer Support Center.
misc/wbpart	The CPU module or system memory is faulty. Copy the entire message and call your system manager or Customer Support Center.
ni/clisn ni/common ni/crc ni/ctrs ni/dma1 ni/dma2 ni/int ni/int-lb ni/m-cst ni/promisc ni/regs ni/setup	The Ethernet controller in the base system slot is faulty. If your workstation is connected to a network, disconnect from the network, attach a loopback connector, and retry the test. If the message reappears, copy the entire message and call your system manager or Customer Support Center.
ni/esar	The base system Ethernet address chip is faulty. Copy the entire message and call your system manager or Customer Support Center.
ni/ext-lb	The built-in Ethernet connector in the base system slot or the loopback connector attached to the Ethernet connector is faulty. Replace the loopback connector, if there is one, or make sure that the network cable is connected properly (see Chapter 6). If the test message appears again, copy the entire message and call your system manager or Customer Support Center.
prcache	The NVRAM module is faulty. Reinstall the NVRAM module (see Chapter 9 for instructions). If the message reappears, copy the entire message and call your system manager or Customer Support Center.
rtc/nvr rtc/period trc/regs rtc/time	Interrupt handling or timekeeping in the system module is faulty. Copy the entire message and call your system manager or Customer Support Center.
scc/access scc/dma	The controller for a communications connector is faulty. Copy the entire message and call your system manager or Customer Support Center.

Table 11-3 (Cont.). Self-Test Error Messages for the Base System Slot

scc/int	The controller for a communications device fails to interrupt the communications signals when appropriate. If the scc/int error message appears, copy the entire message and call your system manager or Customer Support Center.
scc/io	The controller for one of the communications connectors, the connector itself, or a cable attached to the connector is faulty. Make sure that the cables to all your communications devices are plugged in. Then turn the system unit off and on. If the message appears again, copy the entire message and call your system manager or Customer Support Center.
scc/pins	One of the communications connectors is faulty. If an scc/pins test error message appears, copy the entire message and call your system manager or Customer Support Center.
scc/tx-rx	The controller for one of the communications connectors, the connector itself, or a cable attached to the connector is faulty. Make sure that the cables to all your communications devices are plugged in. Then turn the system unit off and on. If the message appears again, copy the entire message and call your system manager or Customer Support Center.
scsi/cntl	The controller for the base system SCSI connector is faulty. Turn the system unit off and on. If the test message appears again, copy the entire message and call your system manager or Customer Support Center. Note that you can still use the SCSI connectors in the option slots.
scsi/sdiag	A SCSI device connected to the base system SCSI controller is faulty, or one of the SCSI cables that is connected to a device in that slot is faulty. Make sure that all SCSI cables are plugged in securely. If you connected a chain of external devices to the slot, make sure that the last device has a SCSI terminator in the unused SCSI connector. Then turn the system unit off and on. If the test message appears again, copy the entire message and call your system manager or Customer Support Center. Note that you can still use the SCSI connectors in the option slots.

Table 11-3 (Cont.).   Self-Test Error Messages for the Base System Slot

scsi/target	One of the devices connected to the base system SCSI controller is not reading or writing data properly.
	Make sure that all SCSI cables are plugged in securely. If you connected a chain of external devices to the slot, make sure that the last device has a SCSI terminator in the unused SCSI connector. Then turn the system unit off and on. If the test message appears again, copy the entire message and call your system manager or Customer Support Center. Note that you can still use the SCSI connectors in the option slots.
tlb/prb tlb/reg	The CPU module is faulty. Copy the entire message and call your system manager or Customer Support Center.

A

Equipment Specifications

This appendix lists the physical specifications, operating conditions, and nonoperating conditions for the following items:

- DECstation 5000 Model 240 system unit
- LK401-AA keyboard
- LK421-AA keyboard
- VSXXX-GA mouse
- VSXXX-AB tablet
- BA42 expansion box
- RZ55 hard disk drive
- RZ56 hard disk drive
- RZ57 hard disk drive
- RZ58 hard disk drive
- TK50Z tape drive
- TZ30 tape drive
- TZK10 QIC tape drive
- TLZ04 cassette tape drive
- RRD42 optical compact disc drive
- RX23 diskette drive
- RX33 diskette drive

DECstation 5000 Model 240 System Unit Equipment Specifications

Table A-1. System Unit Description

Weight	12.70 to 22.70 kg (28.00 to 50.00 lb)
Height	9.14 cm (3.60 in)
Width	51.03 cm (20.09 in)
Depth	43.48 cm (17.12 in)
Input voltage	Auto adjust 100–120 Vac or 220–240 Vac
Input current	5 A at 100–120 Vac 2.4 A at 220–240 Vac
Power	
– Frequency	50 to 60 Hz
– Heat dissipation	359 watts, maximum

Table A-2. System Unit Operating Conditions

Temperature range[1]	10°C to 40°C (50°F to 104°F)
Temperature change rate	11°C (52°F) per hour, maximum
Relative humidity	20% to 80%, noncondensing
Maximum wet-bulb temperature	28°C (82°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	2,400 m (8,000 ft) maximum

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-3. System Unit Nonoperating Conditions

Temperature range	–40°C to 66°C (–40°F to 151°F)
Relative humidity	10% to 95%, noncondensing
Maximum wet-bulb temperature	46°C (115°F), packaged
Altitude	4,900 m (16,000 ft) maximum

LK401-AA Keyboard Equipment Specifications

Table A-4. LK401-AA Keyboard Description

Weight	1.16 kg (2.56 lb)
Height	4.76 cm (1.88 in)
Width	47.80 cm (19.00 in)
Depth	19.20 cm (7.56 in)
Number of keys	108
Number of indicators	2 status LEDs
Language variations	15 Software selectable (keycaps required)
Cable	1.8 m (6 ft) uncoiled length 4-pin mmj connector at one end
Baud rate	4800
Electrical interface	EIA RS 423
Power consumption	2.0 watts maximum
Power input	12 V $\pm 6\%$ at 350 ma
Volume control	8 levels, plus off
Keystroke timing	20 ms minimum

Table A-5. LK401-AA Keyboard Operating Conditions

Temperature range [1]	10°C to 40°C (50°F to 104°F)
Relative humidity	10% to 90% noncondensing
Maximum wet-bulb temperature	32°C (90°F)
Minimum dew-point temperature	15°C (60°F)
Altitude	2,400 m (8,000 ft) maximum

[1] Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-6. LK401-AA Keyboard Nonoperating Conditions

Temperature range	–40°C to 66°C (–40°F to 151°F)
Relative humidity	10% to 95%, noncondensing
Maximum wet-bulb temperature	52°C (126°F), packaged
Altitude	4,900 m (16,000 ft) maximum

LK421-AA Keyboard Equipment Specifications

Table A-7. LK421-AA Keyboard Description

Weight	1.16 kg (2.56 lb)
Height	4.76 cm (1.88 in)
Width	47.80 cm (19.00 in)
Depth	19.20 cm (7.56 in)
Number of keys	108
Number of indicators	2 status LEDs
Language variations	15 Software selectable (keycaps required)
Cable	1.8 m (6 ft) uncoiled length 4-pin mmj connector at one end
Baud rate	4800
Electrical interface	EIA RS 423
Power consumption	2.0 watts maximum
Power input	12 V ±6% at 350 ma
Volume control	8 levels, plus off
Keystroke timing	20 ms minimum

Table A-8. LK421-AA Keyboard Operating Conditions

Temperature range [1]	10°C to 40°C (50°F to 104°F)
Relative humidity	10% to 90% noncondensing
Maximum wet-bulb temperature	32°C (90°F)
Minimum dew-point temperature	15°C (60°F)
Altitude	2,400 m (8,000 ft) maximum

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-9. LK421-AA Keyboard Nonoperating Conditions

Temperature range	−40°C to 66°C (−40°F to 151°F)
Relative humidity	10% to 95%, noncondensing
Maximum wet-bulb temperature	52°C (126°F), packaged
Altitude	4,900 m (16,000 ft) maximum

VSXXX-GA Mouse Equipment Specifications

Table A-10. VSXXX-GA Mouse Description

Weight	97 g (3.4 oz) without cable
Height	32.5 mm (1.28 in)
Diameter	60.9 mm (2.4 in)
Buttons	3
Cable length	1.5 m (5 ft) shielded, 5 conductors and terminals in a 7-pin micro-DIN-type connector (male)
Accuracy	±3% 0 to 25 cm (0 to 10 in) per second in any direction

±15% 25 to 50 cm (10 to 20 in) per second in any direction
±30% 50 to 75 cm (20 to 30 in) per second in any direction

Baud rate	4800
Data format	Delta mode
Electrical interfaces	RS-232 or TTL
Operating modes	Incremental or polling
Power requirements	+5 V ±5% at 130 ma −8 to −13 V at 20 ma (RS-232 mode)
Resolution	79 counts per cm (200 counts per in)
Tracking speed	76 cm (30 in) per second
Tracking rate	In incremental mode: 55 reports per second In polling mode: up to 95 reports per second

Table A-11. VSXXX-GA Mouse Operating Conditions

Temperature range [1]	10°C to 40°C (50°F to 104°F)
Relative humidity	10% to 90% noncondensing
Maximum wet-bulb temperature	18°C (64°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	3,050 m (10,000 ft) maximum

[1] Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-12. VSXXX-GA Mouse Nonoperating Conditions

Temperature range	−40°C to 66°C (−40°F to 151°F)
Relative humidity	5% to 95% noncondensing
Maximum wet-bulb temperature	46°C (115°F) packaged
Altitude	7,600 m (25,000 ft) maximum

VSXXX-AB Tablet Equipment Specifications

Table A-13. VSXXX-AB Tablet Description

Weight	3.18 kg (7.00 lb)
Height	20.32 cm (8.00 in)
Width	40.64 cm (16.00 in)
Depth	41.15 cm (16.20 in)
Puck	4 buttons
Stylus	2 buttons
Cable length	1.5 m (5 ft), terminated in a 7-pin Micro-DIN-type connector
Output connector (power and data)	7-pin Micro-DIN (male)
Mating connector	7-pin Micro-DIN (female)
Active area	280 mm by 280 mm (11 in by 11 in)
Baud rate	4800 or 9600 baud (software selectable)
Electrical interfaces	Serial, asynchronous, full-duplex EIA RS-232-C signal levels
Incremental	Position reports generated when cursor is in motion and when pushbuttons are pressed or released
Operating modes	Incremental and polling
Power requirements	+12 V dc ±10% at 0.3 A
Proximity (nominal)	1.27 cm (5 in) cursor
Resolution	79 counts per cm (200 counts per in)
	0.63 cm (0.25 in) stylus
Remote request	X-Y coordinate update and proximity report when polled by host
Tracking rates	
– In incremental mode	55, 72, or 120 reports per second
– In polling mode	50 reports per second at 4800 baud 80 reports per second at 9600 baud

Table A-14. VSXXX-AB Tablet Operating Conditions

Temperature range [1]	10°C to 40°C (50°F to 104°F)
Relative humidity	20% to 80% noncondensing
Maximum wet bulb temperature	28°C (82°F)
Minimum dew point temperature	2°C (36°F)
Altitude	2400 m (8000 ft) maximum

[1] Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-15. VSXXX-AB Tablet Nonoperating Conditions

Temperature range	−40°C to 66°C (−40°F to 151°F)
Relative humidity	10% to 95% noncondensing
Maximum wet bulb temperature	46°C (115°F) packaged
Altitude	4900 m (16,000 ft) maximum

BA42 Storage Expansion Box Equipment Specifications

Table A-16. BA42 Storage Expansion Box Description

Weight	17.24 kg (38.00 lb) maximum
Height	10.16 cm (4.00 in)
Width	46.02 cm (18.12 in)
Depth	40.64 cm (16.00 in)
Input voltage	Automatically adjusting ac input 120–240 Vac
Frequency range	47 to 63 Hz
Power	90 watts maximum

Table A-17. BA42 Storage Expansion Box Operating Conditions

Temperature range[1]	10°C to 40°C (50°F to 104°F)
Temperature change rate	11°C (20°F) per hour maximum
Relative humidity	20% to 80% noncondensing
Maximum wet-bulb temperature	28°C (82°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	2400 m (8000 ft) maximum

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-18. BA42 Storage Expansion Box Nonoperating Conditions

Temperature range	5°C to 50°C (41°F to 122°F)
Relative humidity	10% to 95% noncondensing
Maximum wet-bulb temperature	46°C (115°F) packaged
Altitude	4900 m (16,000 ft) maximum

RZ55 SCSI Hard Disk Drive Equipment Specifications

Table A-19. RZ55 SCSI Hard Disk Drive Description

Expansion box	
– Weight	13.15 kg (29.00 lb)
– Height	13.97 cm (5.50 in)
– Width	32.39 cm (12.75 in)
– Depth	28.55 cm (11.25 in)
Internal drive	
– Weight	3.81 kg (8.40 lb)
– Height	8.26 cm (3.25 in)
– Width	14.61 cm (5.75 in)
– Depth	20.83 cm (8.20 in)
Capacity	
– Bytes per drive	332.3 MB
– Blocks per drive	649,040
– Block size	512 bytes
Data transfer rate	
– Bus asynchronous mode	1.5 MB per second
– Bus synchronous mode	4 MB per second
– To and from media	1.25 MB per second
Seek time	4 ms track-to-track
	16 ms average
	35 ms maximum
Average latency	8.3 ms
Interface	SCSI

Table A-20. RZ55 SCSI Hard Disk Drive Operating Conditions

Temperature range[1]	10°C to 55°C (50°F to 131°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	20% to 80% noncondensing
Maximum wet-bulb temperature	25.6°C (78°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	−300 to 4600 m (−1000 ft to 15,000 ft)

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-21. RZ55 SCSI Hard Disk Drive Nonoperating Conditions

Temperature range	−40°C to 66°C (−40°F to 151°F)
Temperature change rate	20°C (36°F) per hour, maximum
Relative humidity	20% to 95% packaged
Maximum wet-bulb temperature	46°C (115°F) packaged
Altitude	−300 to 12,200 m (−1000 ft to 40,000 ft)

RZ56 SCSI Hard Disk Drive Equipment Specifications

Table A-22. RZ56 SCSI Hard Disk Drive Description

Internal drive	
Weight	3.81 kg (8.40 lb)
Height	8.26 cm (3.25 in)
Width	14.61 cm (5.75 in)
Depth	20.32 cm (8.00 in)
Capacity	
– Bytes per drive	655.17 MB
– Blocks per drive	1,299,174
– Block size	512 bytes
Data transfer rate	
– Bus asynchronous mode	1.6 MB per second
– Bus synchronous mode	4.0 MB per second
– To and from media	1.875 MB per second
Seek time	4 ms track-to-track 16 ms average 35 ms maximum
Average latency	8.3 ms
Interface	SCSI

Table A-23. RZ56 SCSI Hard Disk Drive Operating Conditions

Temperature range[1]	10°C to 55°C (50°F to 131°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	8% to 80% noncondensing
Maximum wet-bulb temperature	25.6°C (78°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	−300 to 4600 m (−1000 to 15,000 ft)

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-24. RZ56 SCSI Hard Disk Drive Nonoperating Conditions

Temperature range	−40°C to 66°C (−40°F to 151°F)
Temperature change rate	20°C (36°F) per hour, maximum
Relative humidity	8% to 95% packaged
Maximum wet-bulb temperature	46°C (115°F) packaged
Altitude	−300 to 12,200 m (−1000 to 40,000 ft)

RZ57 SCSI Hard Disk Drive Equipment Specifications

Table A-25. RZ57 SCSI Hard Disk Drive Description

Internal drive	
– Weight	3.81 kg (8.40 lb)
– Height	8.26 cm (3.25 in)
– Width	14.61 cm (5.75 in)
– Depth	20.32 cm (8.00 in)
Capacity	
– Bytes per drive	1.0 gigabytes
– Blocks per drive	1,954,050
– Block size	512 bytes
Data transfer rate	
– Bus asynchronous mode	1.6 MB per second
– Bus synchronous mode	4.0 MB per second
– To and from media	2.5 MB per second
Seek time	4 ms track-to-track
	14.5 ms average
	33 ms maximum
Average latency	8.3 ms
Interface	SCSI

Table A-26. RZ57 SCSI Hard Disk Drive Operating Conditions

Temperature range[1]	10°C to 55°C (50°F to 131°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	8% to 80%, noncondensing
Maximum wet-bulb temperature	26°C (78°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	−300 to 4600 m (−1000 to 15,000 ft)

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-27. RZ57 SCSI Hard Disk Drive Nonoperating Conditions

Temperature range	−40°C to 66°C (−40°F to 151°F)
Temperature change rate	20°C (36°F) per hour, maximum
Relative humidity	8% to 95%, packaged
Maximum wet-bulb temperature	46°C (115°F), packaged
Altitude	−300 to 12,200 m (−1000 to 40,000 ft)

RZ58 SCSI Hard Disk Drive Equipment Specifications

Table A-28.   RZ58 SCSI Hard Disk Drive Description

Internal drive	
– Weight	3.81 kg (8.40 lb)
– Height	8.26 cm (3.25 in)
– Width	14.61 cm (5.75 in)
– Depth	20.32 cm (8.00 in)
Capacity	
– Bytes per drive	1.38 gigabytes
– Blocks per drive	2,698,061 not including spares
– Block size	512 bytes
Data transfer rate	
– Bus asynchronous mode	1.6 MB per second
– Bus synchronous mode	5.0 MB per second
– To and from media	2.5 MB per second
Seek time	2.5 ms track-to-track
	12.5 ms average
	25 ms maximum
Average latency	5.6 ms
Interface	SCSI II

Table A-29.   RZ58 SCSI Hard Disk Drive Operating Conditions

Temperature range[1]	10°C to 55°C (50°F to 131°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	8% to 80%
Maximum wet-bulb temperature	26°C (78°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	–300 to 4600 m (–1000 to 15,000 ft)

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-30. RZ58 SCSI Hard Disk Drive Nonoperating Conditions

Temperature range	−40°C to 66°C (−40°F to 151°F)
Temperature change rate	20°C (36°F) per hour, maximum
Relative humidity	8% to 95%, packaged
Maximum wet-bulb temperature	46°C (115°F), packaged
Altitude	−300 to 12,200 m (−1000 to 40,000 ft)

TK50Z Tape Drive Equipment Specifications

Table A-31. TK50Z Tape Drive Description

Expansion box	
– Weight	12.70 kg (28.00 lb)
– Height	13.97 cm (5.50 in)
– Width	32.39 cm (12.75 in)
– Depth	28.58 cm (11.25 in)
Bit density	6,667 bits per in
Cartridge capacity	95 MB approximate
Frequency	50 to 60 Hz
Heat dissipation	32 watts maximum
Input current	2.4 A: 100 to 120 Vac
	1.3 A: 220 to 240 Vac
Media	12.77 mm (0.5 in), 183 m (600 ft) long magnetic tape
Mode of operation	Streaming
Number of tracks	22
Power	160 watts
Track format	Serpentine
Data transfer rate	360 Kbits per second (45 KB per second)
Tape speed	75 in per second

Table A-32. TK50Z Tape Drive Operating Conditions

Temperature range[1]	10°C to 40°C (50°F to 104°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	10% to 80% noncondensing
Maximum wet-bulb temperature	28°C (82°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	2,400 m (8,000 ft) maximum

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-33. TK50Z Tape Drive Nonoperating Conditions

Temperature range	−30°C to 66°C (−22°F to 151°F)
Temperature change rate	20°C (36°F) per hour, maximum
Relative humidity	10% to 95% noncondensing
Maximum wet-bulb temperature	46°C (115°F) packaged
Altitude	9,140 m (30,000 ft) maximum

TZ30 Tape Drive Equipment Specifications

Table A-34.   TZ30 Tape Drive Description

Internal drive	
– Weight	1.50 kg (3.31 lb)
– Height	4.14 cm (1.63 in)
– Width	14.48 cm (5.70 in)
– Depth	21.59 cm (8.50 in)
Bit density	2624 bits per cm (6667 bits per in)
Cartridge capacity	95 Mbytes, formatted (approximate)
Media	12.77 mm (0.5 in) unformatted magnetic tape
Mode of operation	Streaming
Number of tracks	22
Tape speed	190 cm per second (75 in per second)
Track format	Multiple track serpentine recording
Data transfer rate	62.5 Kbytes per second

Table A-35.   TZ30 Tape Drive Operating Conditions

Temperature range[1]	10°C to 40°C (50°F to 104°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	20% to 80% noncondensing
Maximum wet-bulb temperature	25°C (77°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	2400 m (8000 ft) maximum

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-36. TZ30 Tape Drive Nonoperating Conditions

Temperature range	$-40°C$ to $66°C$ ($-40°F$ to $151°F$)
Temperature change rate	$20°C$ ($36°F$) per hour, maximum
Relative humidity	10% to 95%
Maximum wet-bulb temperature	$2°C$ ($36°F$)
Altitude	9100 m (30,000 ft) maximum

TZK10 QIC Tape Drive Equipment Specifications

Table A-37. TZK10 QIC Tape Drive Description

Internal drive	
– Weight	1.09 kg (2.40 lb)
– Height	4.39 cm (1.73 in)
– Width	14.61 cm (5.75 in)
– Depth	20.83 cm (8.20 in)
Cartridge capacity	320 MB (approximate) with DC6320
	525 MB (approximate) with DC6525
Data density	16,000 bits per in
Drive interface	SCSI-2
Media	DC6320, DC6525, or Digital-approved equivalent
Mode of operation	Streaming
Number of tracks	26
Power consumption, normal	20 watts
Power consumption, peak	33 watts
Transfer rate	200 KB per second at average streaming mode
	1.5 MB per second at SCSI maximum
Tape speed	305 cm (120 in) per second
Track format	Multiple track serpentine recording

Table A-38. TZK10 QIC Tape Drive Operating Conditions

Temperature range[1]	5°C to 40°C (50°F to 104°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	2% to 80% noncondensing
Maximum wet-bulb temperature	28°C (82°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	3900 m (13,000 ft) maximum

[1] Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-39. TZK10 QIC Tape Drive Nonoperating Conditions

Temperature range	−30°C to 60°(−22°F to 151°F)
Temperature change rate	20°C (36°F) per hour, maximum
Relative humidity	10% to 95%
Maximum wet-bulb temperature	46°C (115°F)
Altitude	12,200 m (40,000 ft) maximum

TLZ04 Cassette Tape Drive Equipment Specifications

Table A-40. TLZ04 Cassette Tape Drive Description

Expansion box	
– Weight	7.7 kg (17.00 lb)
– Height	11.50 cm (4.50 in)
– Width	35.00 cm (14.00 in)
– Depth	30.00 cm (12.00 in)
Cassette capacity	1.2 gigabyte
Drive interface	SCSI
Media	TLZ04-CA cassette tape
Mode of operation	Streaming and start/stop
Power consumption	230 watts
Power requirements	1.6 A: 100 to 120 Vac
	1.0 A: 200 to 240 Vac
Track format	Digital data storage (DDS)
Transfer rate	156 KB per second

Table A-41. TLZ04 Cassette Tape Drive Operating Conditions

Temperature range[1]	10°C to 40°C (50°F to 104°F)
Relative humidity	20% to 80% noncondensing
Altitude	0 m to 4600 m (0 to 15,000 ft)

[1] Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-42. TLZ04 Cassette Tape Drive Nonoperating Conditions

Temperature range	–40°C to 70°C (40°F to 158°F)
Relative humidity	5% to 95% noncondensing
Altitude	0 m to 15,200 m (0 to 50,000 ft)

RRD42 Compact Disc Drive Equipment Specifications

Table A-43. RRD42 Compact Disc Drive Description

RRD42-AA	
– Weight	1.3 kg (2.8 lb)
– Height	4.15 cm (1.63 in)
– Width	14.60 cm (5.75 in)
– Depth	20.81 cm (8.2 in)
Capacity	600 MB
Seek time	450 ms average (typical)
	700 ms maximum (typical)
Burst transfer rate	1.5 MB per second
Sustained transfer rate	150 KB per second
Heat dissipation	14 watts (typical)
Initialization startup time	2.0 seconds maximum
Interface	SCSI

Table A-44. RRD42 Compact Disc Drive Operating Conditions

Temperature range[1]	5°C to 50°C (41°F to 122°F)
Relative humidity	10% to 90% noncondensing
Maximum wet-bulb temperature	28°C (82°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	−300 to 4600 m (−1000 to 15,000 ft)

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-45. RRD42 Compact Disc Drive Nonoperating Conditions

Temperature range	−30 °C to 55°C (−22°F to 131°F)
Relative humidity	10 to 90% packaged, noncondensing
Maximum wet-bulb temperature	46°C (115°F) packaged, noncondensing
Altitude	−300 to 12,200 m (−1000 to 40,000 ft)

RX23 Diskette Drive Equipment Specifications

Table A-46. RX23 Diskette Drive Description

Internal drive	
– Weight	0.48 kg (1.06 lb)
– Height	3.00 cm (1.18 in)
– Width	10.16 cm (4.00 in)
– Depth	15.01 cm (5.91 in)
Number of tracks	80
Number of heads	2
Step rate	3 ms per track
Diskette size	8.9 cm (3.5 in)
Recording surfaces per diskette	2
Sectors per track	9 double density
	18 high density
Capacity	
– Bytes per drive	737 KB double density
	1,474 KB high density
– Blocks per drive	1,440 double density
	2,880 high density
– Block size	512 bytes
Data transfer rate	
– To and from media	250 Kbits per second double density
	500 Kbits per second high density
Operating power	3.0 watts
Standby power	0.3 watts

Table A-47. RX23 Diskette Drive Operating Conditions

Temperature range[1]	5°C to 50°C (40°F to 122°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	8% to 80%, noncondensing
Maximum wet-bulb temperature	29°C (80°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	−300 to 3060 m (−1,000 ft to 10,000 ft)

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-48. RX23 Diskette Drive Nonoperating Conditions

Temperature	−40°C to 66°C (−40°F to 151°F)
Temperature change rate	20°C (36°F) per hour, maximum
Relative humidity	5% to 95%, packaged
Maximum wet-bulb temperature	46°C (115°F), packaged
Altitude	−300 to 12,300 m (−1,000 ft to 40,000 ft)

RX33 Diskette Drive Equipment Specifications

Table A-49. RX33 Diskette Drive Description

Internal drive	
– Weight	1.10 kg (2.43 lb)
– Height	4.32 cm (1.70 in)
– Width	14.61 cm (5.75 in)
– Depth	20.32 cm (8.00 in)
Number of tracks	80
Number of heads	2
Track density	96 tracks per inch
Step rate	3 ms per track
Diskette size	13.13 cm (5.25 in)
Recording surfaces per diskette	2
Sectors per track	10 normal density 15 high density
Capacity	
– Bytes per drive	409 KB normal density 1200 KB high density
– Blocks per drive	800 normal density 2400 high density
– Block size	512 bytes
Data transfer rate	
– To and from media	250 Kbits per second normal density 500 Kbits per second high density
Operating power	4.1 watts
Standby power	1.5 watts

Table A-50. RX33 Diskette Drive Operating Conditions

Temperature range[1]	10°C to 46°C (50°F to 115°F)
Temperature change rate	11°C (20°F) per hour, maximum
Relative humidity	20% to 80% noncondensing
Maximum wet-bulb temperature	45°C (113°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	2400 m (8000 ft) maximum

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-51. RX33 Diskette Drive Nonoperating Conditions

Temperature	−34°C to 60°C (−30°F) to 140°F)
Temperature change rate	20°C (36°F) per hour, maximum
Relative humidity	5% to 90%
Maximum wet-bulb temperature	45°C (113°F) packaged
Altitude	9100 m (30,000 ft) maximum

B

Part Numbers

This appendix lists the order numbers for the following components and options for the DECstation 5000 Model 240 workstation:

- Basic workstation components (Table B-1)
- User-replaceable modules in the system unit (Table B-2)
- Cords and cables (Table B-3)
- Adapters, connectors, and terminators (Table B-4)
- Software documentation (Table B-5)
- Hardware documentation (Table B-6)

For more information on any item, see the *DECdirect Desktop Edition* catalog.

Table B-1. Basic Components

Item	Order Number
External Storage Devices (see the *DECdirect Desktop Edition* catalog)	
Keyboard (full-sized)	LK401-AA
Keyboard (small)	LK421-AA
Monitors (see the *DECdirect Desktop Edition* catalog)	
Mouse	VSXXX-GA
Tablet	VSXXX-AB
Terminals (see the *DECdirect Desktop Edition* catalog)	

Table B-2. User-replaceable Modules in the System Unit

Item	Order Number
CPU module, 40 MHz	KN03-GA
Memory module (SIMM), 8Mbyte	MS02-AA
Memory module (SIMM), 32Mbyte	MS02-CA
NVRAM module, 1Mbyte	MS02-NV
TURBOchannel option modules (see the *DECdirect Desktop Edition* catalog)	

Table B-3.   Cords and Cables

Item	Order Number
Keyboard-mouse cable (comes with workstation)	N/A
Monitor-to-system unit power cable (Europe)	BN19P-K
Monitor-to-system-unit power cable (U.S.) (comes with workstation)	N/A
Power cord for system unit, monitor, or expansion box	
- for North America, Japan, Mexico - 120 V	BN19P-1K
- for UK, Ireland - 240 V	BN19A-2E
- for Austria, Belgium, Finland, France, Germany, Holland, Norway, Portugal, Spain, Sweden - 220 V	BN19C-2E
- for Switzerland - 220 V	BN19E-2E
- for Australia, New Zealand - 240/230 V	BN19H-2E
- for Denmark - 220 V	BN19K-2E
- for Italy - 220 V	BN19M-2E
- for India, South Africa - 220 V	BN19S-2E
- for Israel - 240 V	BN18L-2E
SCSI Cables	
- Expansion-box-to-expansion-box SCSI cable	BC19J-1E
- System-unit-to-expansion-box SCSI cable	BC09D-06
- System-unit-to-TCE SCSI cable	BC19J-1E
- TCE-to-expansion-box SCSI cable	BC09D-06
Serial line cable	BC16E-10
System-unit-to-TCE TURBOchannel interface cable (comes with TCE)	N/A
ThickWire Ethernet cable	BNE4C-02
ThinWire Ethernet cable (15 or 30 ft)	BC16M-15/30
ThinWire LAN assembly kit	BC16T-12
Twisted-pair Ethernet cable (comes in kit)	N/A
Twisted-pair LAN assembly kit	DEMPR-CA/CBA
Video cable, color	BC29G-03
Video cable, gray scale	BC09M-10
Video cable, monochrome (comes with monitor)	N/A

Table B-4. Adapters, Connectors, and Terminators

Item	Order Number
Communications connector adapter (comes with workstation)	N/A
Communications loopback connector	H3200
SCSI expansion box (drive) terminator (comes with expansion box)	N/A
ThickWire loopback connector (comes with workstation)	N/A
ThickWire-to-ThinWire Ethernet adapter	DESTA-BA
ThickWire-to-twisted-pair Ethernet adapter	H3350-AA
ThinWire T-connector	H8223
ThinWire T-connector terminator	H8225

Table B-5. Software Documentation

Item	Order Number
ULTRIX Media and Doc-TK50	QA-VV1AA-H5
ULTRIX Guide to the Error Logger	AE-ME95B-TE
Technical Summary for RISC Processors	AA-MM35A-TE
Documentation Overview for RISC Processors	AA-MM05A-TE

Table B-6. Hardware Documentation

Item	Order Number
DECstation 5000 Model 240 User Documentation Kit	EK-PM38A-DK
DECstation 5000 Model 240 Hardware Installation Guide	EK-PM38B-IN
DECstation 5000 Model 240 Hardware Operator's Guide	EK-PM38C-OG
DECstation 5000 Model 240 Workstation Reference Card	EK-PM38D-RC
DECstation/DECsystem 5000 Model 240 Maintenance Guide	EK-PM38G-MG
DECstation 5000 Model 240 Field Service Pocket Guide	EK-PM38E-PS
Components and Add-Ons	
The RZ55 Disk Drive Service Manual	EK-RZ55D-SV
The RZ56 Disk Drive Subsystem Service Manual	EK-RZ56D-SV
The RZ57 Disk Drive Subsystem Service Manual	EK-RZ57D-SV
The RRD42 Owner's Manual	EK-RRD40-OM
The TLZ04 Cassette Tape Drive Owner's Manual	EK-TLZ04-OM
Installing and Using the LN03	EK-0LN03-UG
LN03 PLUS User Guide	EK-LN03S-UG
ScriptPrinter Installation Guide	EK-LN03R-UG
ScriptPrinter Operator Guide	EK-LN03R-OG
LA100 Letterwriter User Documentation Kit	EK-LW100-UG
Installing and Using the LA75 Companion Printer	EK-0LA75-UG
Installing and Using the LJ250/252 Companion Color Printer	EK-LJ250-DK
TK50Z Tape Drive Subsystem Owner's Manual	EK-LEP05-OM
TK50Z User's Guide	EK-OTK50-UG
TK50Z Technical Manual	EK-OTK50-TM

C

Connector Pin Assignments

This appendix lists pin assignments for the following connectors:

- SCSI cable connectors
- Keyboard and mouse or tablet
- Communications
- ThickWire Ethernet
- Power supply
- Modem loopback
- Ethernet loopback

It also provides a

- Summary of loopback connectors

Table C-1. SCSI Cable Connector Pin Assignments

Pin	Signal	Pin	Signal
50	~ I/O	25	GND
49	~ REQ	24	GND
48	~ C/O	23	GND
47	~ SEL	22	GND
46	~ MSG	21	GND
45	~ RST	20	GND
44	~ ACK	19	GND
43	~ BSY	18	GND
42	GND	17	GND
41	~ ATN	16	GND
40	GND	15	GND
39	RSVD	14	GND
38	TERMPWR	13	NC
37	RSVD	12	GND
36	GND	11	GND
35	GND	10	GND
34	~ PARITY	9	GND
33	~ DATA<7>	8	GND
32	~ DATA<6>	7	GND
31	~ DATA<5>	6	GND
30	~ DATA<4>	5	GND
29	~ DATA<3>	4	GND
28	~ DATA<2>	3	GND
27	~ DATA<1>	2	GND
26	~ DATA<0>	1	GND

Table C-2. Keyboard and Mouse or Tablet Connector Pin Assignments

Pin	Source	Signal	Description
1		GND	Ground
2		KEY.TX	Keyboard transmitted data
3	Keyboard	KEY.RX	Keyboard received data
4		+12V	Keyboard/tablet power
5		GND	Ground
6	Mouse/Tablet	MSE.RX	Mouse received data
7		MSE.TX	Mouse transmitted data
8		GND	Ground
9		GND	Ground
10		NC	
11		NC	
12		NC	
13		+5V	Mouse power
14		−12V	Mouse power
15		GND	Ground

Table C-3. Communications Connectors Pin Assignments

Pin	Source	Signal	CCITT[1]	EIA[2]	Description
1		GND	102	AB	Signal ground
2	KNO3A-AA	TX	103	BA	Modem transmitted data
3	Modem/printer	RX	104	BB	Modem received data
4	KNO3A-AA	RTS	105	CA	Request to send
5	Modem/printer	CTS	106	CB	Clear to send
6	Modem/printer	DSR	107	CC	Data set ready
7		GND	102	AB	Signal ground
8	Modem/printer	CD	109	CF	Carrier detector
9					Unconnected
10					Unconnected
11					Unconnected
12	Modem/printer	SI	112	CI	SPDMI
13					Unconnected
14					Unconnected
15	Modem/printer	TxCk (DCE)	114	DB	Modem transmit clock
16					Unconnected
17	Modem/printer	RxCk (DEC)	115	DD	Modem transmit clock
18					Unconnected
19					Unconnected
20	KNO3A-AA	DTR	108.2	CD	Data terminal ready
21					Unconnected
22	Modem/printer	RI	125	CE	Ring indicator
23	KNO3A-AA	SS	111	CH	DSRS
24					Unconnected
25					Unconnected

[1]Comite Consultatif International Telegraphique et Telephonique, an international consultative committee that sets international communications standards

[2]Electronic Industries Association

Table C-4. ThickWire Ethernet Connector Pin Assignments

Pin	Source	Signal	Description
1			Shield
2	XCVR	ACOL+	Collision presence
3	KNO3A-AA	ATX+	Transmission
4		GND	Ground
5	XCVR	ARX+	Reception
6	XCVR	GND	Power return
7		CTL+	Control output
8		GND	Ground
9	XCVR	ACOL–	Collision presence
10	KNO3A-AA	ATX–	Transmission
11		GND	Ground
12	XCVR	ARX–	Reception
13	KNO3A-AA	+12V	Power
14		GND	Ground
15		CTL–	Control output

Table C-5. Power Supply Pin Assignments

Pin	Signal	Wire Gauge
1	+12 volt	18
2	Ground	18
3	–12 volt	22
4	Ground	22
5	POK	22
6	Warning	22

Table C-6. Modem Loopback Connector Pin Assignments

From Pin No.	Signal	To Pin No.	Signal	
P4-2	TX2	P4-3	RX2	
P4-4	RTS2	P4-5	CTS2	
P4-6	DSR2	P4-20	DTR2	
P4-12	SPDMI2	P4-23	DSRS2	
P4-18	LLPBK2	P4-8	CI2	
P4-18	LLPBK2	P4-22	RI2	
P4-18	LLPBK2	P4-25	TMI2	

Table C-7. Ethernet Loopback Connector Pin Assignments

From Pin No.	Signal	To Pin No.	Signal	Description
P6-3	TRA+	P6-5	REC+	Through capacitor
P6-10	TRA–	P6-12	REC–	Through capacitor
P6-13	PWR	P6-6	RET	Through resistor and LED

Table C-8. Summary of Loopback Connectors

Function	Standard/ Unique	Option Number
Communications loopback connector	Standard	H3200
ThickWire loopback connector	Standard	N/A
ThinWire T-connector	Standard	H8223
ThinWire terminator	Standard	H8225

D

Regulatory Information for the UK

This document provides user information on the DECstation 5000 Model 240 Series workstation that is required by the United Kingdom.

The DECstation 5000 Model 240 Series workstation is manufactured by Digital Equipment Corporation. The model number of the communication option is KN03A-AA.

Service Requirements

The following table describes the service category, interface type, data rate, service requirements, and PTO for the KN03A-AA.

Table D-1. KN03A-AA service requirements

Service Category	Interface Type	Data Rate	Physical Requirements	Electrical Requirements	PTO BT[1]/MCL[2]/Hull[3]
	CCITT	2400	ISO 2110	V.24/V.28	Yes/Yes/Yes
	Recommend	4800			Yes/Yes/Yes
1	X.21bis	9600	BS.6623:	Cable:	Yes/Yes/Yes
		19200	Part 1 1985	BC13P-10	No/No/Yes

[1]BT - British Telecommunications plc

[2]Hull - Kingston Communications (Hull) plc

[3]MCL - Mercury Communications Limited.

The maximum approved cable length is 10 feet, comprising:

Cat 1 V.24 10 feet for extension BC13P-10

Communication Port Pin Assignments

See Appendix C of the DECstation 5000 Model 240 Series Hardware Operator's Guide for information on the communication port pin assignments.

Approvals for Digital Circuits

The KN03A-AA is approved for direct connection to a particular digital circuit. This approval includes interconnecting cable with mating connectors conforming to BS6623 part 1 and part 4.

If the product is connected to the service with anything other than its own approved cables, then those cables must benefit from the relevant general approval and/or conform with any other applicable requirements.

Caution:: Ports J5, J9, J10, J11, J12, J17, J19, J31, J49, J51, E1, and E3 (shown in the diagram attached to the end of this document) do not provide sufficient isolation to satisfy the requirements of the relevant parts of standard BS6301. Any product connected to these ports must meet one of the following conditions:

- *Be covered by OFTEL's General Approval NS / G / 1234 / J / 100003. All products supplied by Digital comply with this General Approval*

- *Have been approved to the relevant parts of standard BS6301*

- *Have previously been evaluated against the British Telecom (Post Office) Technical Guide 2 or 26 and given permission to attach*

Other usage will invalidate any approval given to this apparatus.

Interconnection directly, or by way of other apparatus, of ports marked by the safety warning label with other ports that are marked or not so marked, may produce hazardous conditions on the network. Seek advice from a competent engineer before making any such connection.

Host Independent Approvals

The KN03A-AA is approved only for installation in an approved host with approved attachments. For approval, the host and host attachments must be either of the following:

- Type-approved (meaning the equipment is built exactly like the models that were originally approved).)

- If the equipment was supplied after 1st March 1989, it must be marked with or supplied with a statement that the host is supplied under General Approval Number NS/G/1234/J/100003.

Except at the edge connector which plugs into the host's expansion slot, clearance and creepage distances of Xmm and Ymm, as listed below must be maintained between the KN03A-AA and other parts of the host, including any other expansion cards fitted.

Table D-2. Clearance and Creepage Specs for KN03A-AA

Clearance Xmm	Creepage Ymm	Voltage[1]
2.0	2.4 (3.8)	up to 50
2.6	3.0 (4.8)	up to 125
4.0	5.0 (8.0)	up to 250
4.0	6.4 (10.0)	up to 300

[1] Used or generated by other parts of the host or expansion card (Vrms or Vdc)

The creepage distances apply when installed in a normal office environment. The creepage distance shown in parentheses apply where the local environment within the Host Computer is subject to conductive pollution or dry non-conductive pollution which could become conductive due to condensation. These distances can be checked by measuring between the adjacent parts.

If in doubt, advice should be obtained from a competent telecom safety engineer. Failure to install the KN03A-AA in accordance with these instructions will invalidate the approval.

Host Power Rating

The user must ensure that the power drawn by the KN03A-AA together with the host and other auxiliary apparatus drawing power from the host, is within the rating of the host power supply.

Digital has designed all permutations of the host configuration to operate within the limits of the host power rating.

The module power rating is:

Table D-3. Module Power Rating for KN03A-AA

Supply (+/- 4%) (Volts)	Maximum Current (Amps)	Typical Current (Amps)
+5.1	22	7
+12.1	1.6	0.09
-12.1	0.1	0.05

Power Supply Characteristics

Electrical output from the H7878-A power supply in the DECstation 5000 Model 240 has the following characteristics:

Table D-4. H7878-A Power Supply Output Characteristics

Parameter	Requirement			Units
	Minimum	Typical	Maximum	
+5.1V (short-term regulation)	+4.95	+5.10	+5.20	Volts
+5.1V (long-term regulation)	+4.90	+5.10	+5.25	Volts
+12.1V (short-term regulation)	+11.86	+12.10	+12.34	Volts
+12.1V (long-term regulation)	+11.74	+12.10	+12.46	Volts
-12V	-1.40	-12.00	-12.60	Volts
Load range				
+5.1V	3.0	--	40.0	Amps
+12.1V	0.0	--	2.7	Amps
-12V	0.0	--	0.2	Amps
Output ripple/noise,				
+5.1V	--	30.0	50.0	mV
1Hz to 10Mhz ,+12.1V	--	50.0	70.0	mV
1Hz to 10MHz, +12.1V fan	--	70.0	100.0	mV
1Hz to 10MHz, -12.1V	--	--	120.0	mV
All output (except +5.1V) ripple/noise, 10MHz to 50MHz	--	1.0	2.0	%
+5.1V output ripple/noise, 10MHz to 50MHz	--	--	50	mV
Temperature coefficient	--	0.02	--	% /C

Table D-4 applies to all AC line input conditions per Table A-1. Individual output regulation specifications are valid at all other specified output loadings at the output connector.

Noise and ripple are peak to peak to be measured as follows:

- Input voltages within specified operating ranges.

- Loads on all outputs within specified ranges.

- Measurement taken with Tektronix P6046 probe and an oscilloscope (minimum 100 MHz bandwidth.)

- Loads to be resistive.

- Measurement taken at load side of output connector using "Bendix" type connectors (recommended) with very short leads. The measurements will be taken with a 10uf tantalum capacitor terminated in both minimum and maximum resistive loads.

- This measurement is for use during qualification during testing.

Dynamic load regulation

Dynamic load regulation for +5.1V shall be 100 mV peak and 2 ms maximum.

Dynamic load regulation for +12.1V shall be 240 mV peak and 2 ms maximum.

This load regulation is expressed as the peak deviation from the steady-state DC-output voltage, and the time required for the output voltage to settle back to within 0.5% of its new steady-state value after an instantaneous change in the output current, with all other factors held constant. The instantaneous voltage shall not exceed the total regulation limit.

DI/DT load steps

DI/DT load steps for +5.1V shall be 0.06a/uS for a 15A step.

DI/DT load step for +12.1V shall be 0.2A/uS for 0.6A to 1.0A.

The rate of change of load current which may be stepped while keeping the output voltages in regulation. Current steps are either positive or negative going and shall be within the limits specified. The time period between steps shall not be less than three times the settling time specified in the previous section, "Dynamic Load Regulation."

Environmental Conditions

See Appendix A in the DECstation 5000 Model 240 Series Hardware Operator's Guide for further environmental information.

Unsupported System Module Ports

Figure D-1 is the unit assembly drawing for DECstation 5000 Model 240 system module. Shaded areas indicate ports that are not supported.
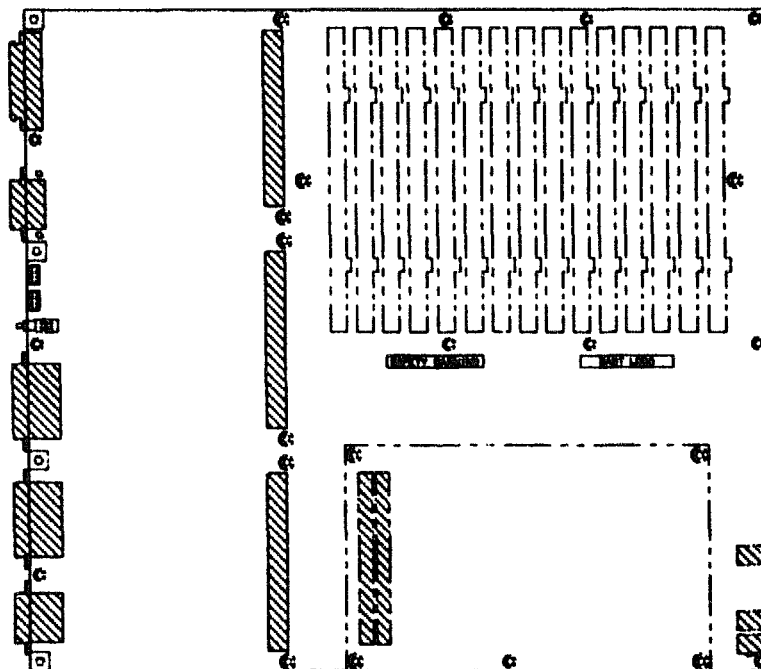
Figure D-1. Unsupported ports on the DECstation 5000 Model 240 system module

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Order No: EK-PM38B-OG-001

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8

TC OPTIONS
USER'S GUIDE

TURBOchannel Options

User's Guide

Using This Guide

This guide explains how to operate the TURBOchannel options that are in your system.

- Chapter 1, *Using TURBOchannel Options*, tells you what TURBOchannel options are and how they can be combined in a system.

- Each of the later chapters describes an individual option that your system has. Each chapter tells you

  - About the hardware for the option

  - How to install and remove the option

  - How to make sure that the option is operating properly

Conventions Used in This Guide

Table 1.

Convention	Use
Monospace type	Anything that appears on your monitor screen is set in monospace type like this.
Boldface type	**Anything that you are asked to type is set in boldface type like this.**

1

Using TURBOchannel Options

This chapter explains

- What TURBOchannel options are

- How TURBOchannel options connect to the base system of your workstation

- Where to find detailed installation and testing information about specific TURBOchannel options.

A Look at TURBOchannel Options

TURBOchannel options include TURBOchannel modules that connect to your base system and the devices that those modules support.

These options operate on any base system that supports TURBOchannel. The number of TURBOchannel modules that a system supports depends on the specific system.

TURBOchannel modules can have different widths, but all TURBOchannel modules have similar connectors that attach to TURBOchannel expansion slots on the system module or an intermediate module that connects to the system module. An opening in the wall of the system unit allows the TURBOchannel module to connect to an external device.
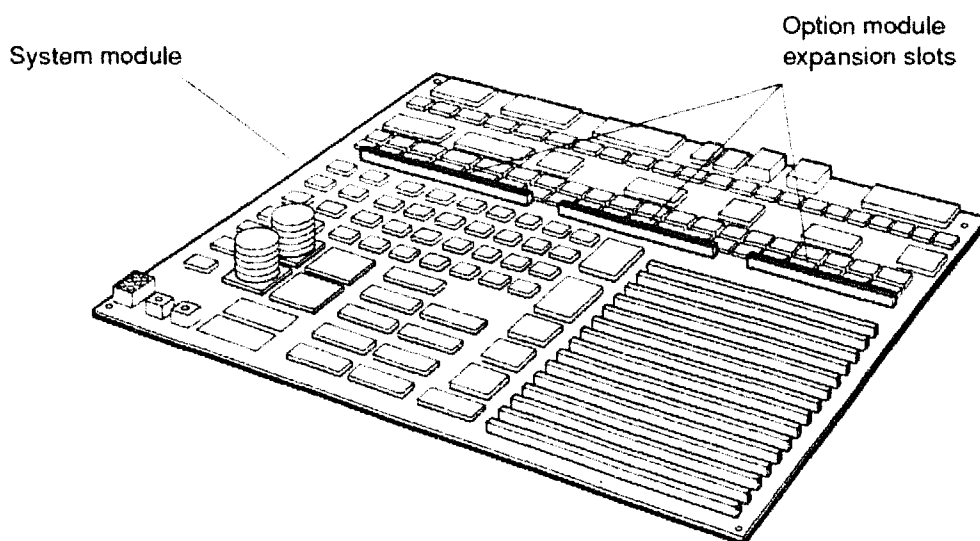
WSETM001

Figure 1-1.   TURBOchannel connectors on a typical system module

External
connector

System module
connector

Single width module

External
connector

System module
connectors

Double width module
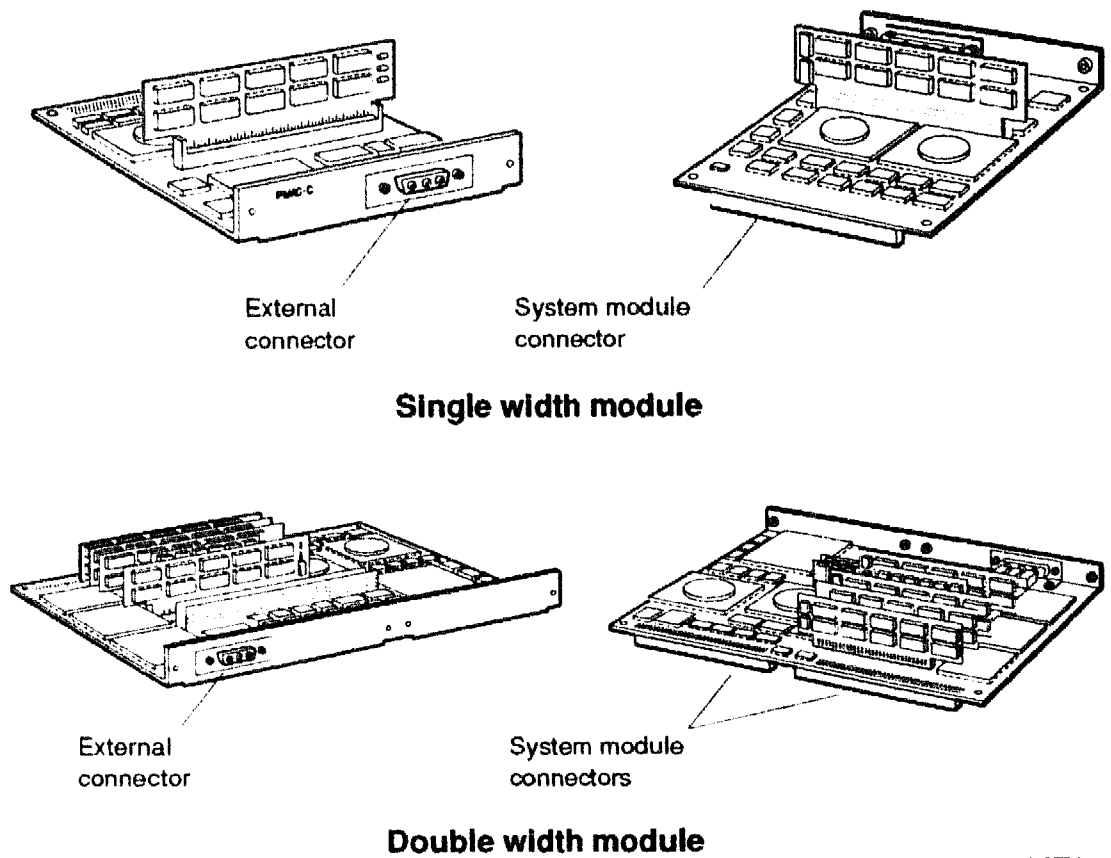
WSETU001

Figure 1-2. Typical TURBOchannel modules

For Further Information

For detailed information about a specific TURBOchannel option
in your workstation, see the chapter later in this guide that
describes that TURBOchannel option.

VRT16 MONITOR

digital™

VRT16 Monitor

EK-VRT16-TC-001

This chapter describes the VRT16 monitor. It tells you about

- VRT16 monitor controls and indicators
- Graphics modules that work with the VRT16 monitor
- How to connect a VRT16 monitor to your workstation

The following are trademarks of Digital Equipment Corporation:

DEC	ThinWire
DECstation	TURBOchannel
DECsystem	ULTRIX

digital™

VRT16 Monitor Hardware

The VRT16 monitor is a 16-inch color monitor. Different models of the VRT16 operate at different frequencies.

- The VRT16-DA/D4 monitor operates at 66 Hz.

- The VRT16-HA/H4 automatically operates at 66 or 72 Hz to match the frequency of the graphics module to which the monitor is connected.

The monitor model number appears on the label next to the high-scan/low-scan switch on the back of the monitor.

Several controls and connectors on the VRT16 monitor let you adjust the monitor and connect it to your workstation.

Vertical static
convergence
(V-STAT) control

Horizontal static
convergence
(H-STAT) control

Vertical centering
(V-CENT) control

On/off switch

Power indicator light

Brightness control

Contrast control

Power connector

High-scan/low-scan switch

RGB connectors (video out)

RGB connectors (video in)
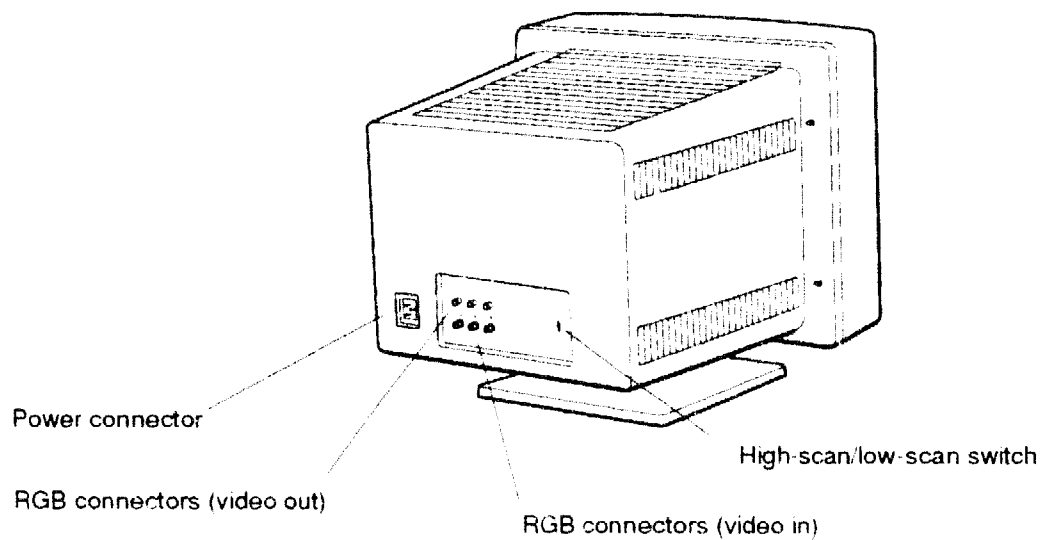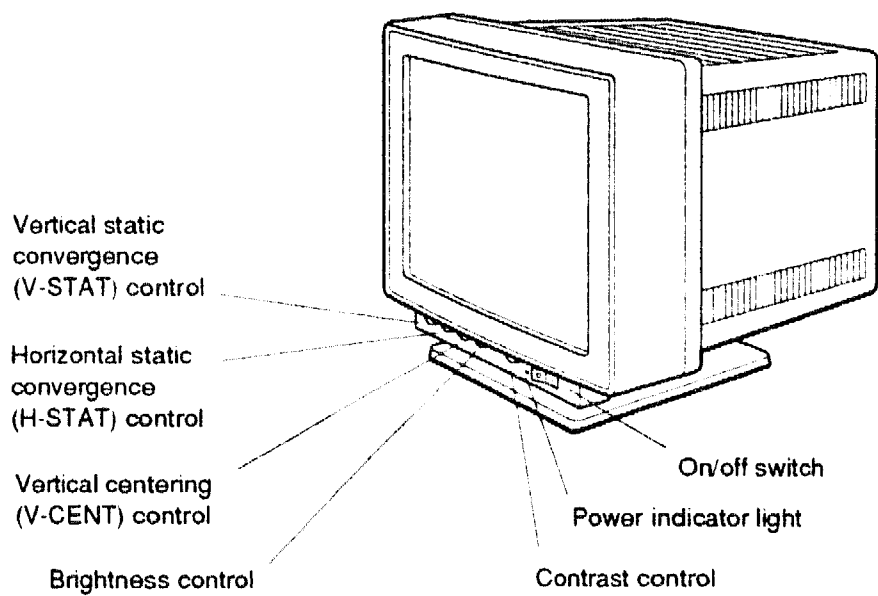
WS33O063

Figure 1.   VRT16 monitor controls and indicators

3

Table 1 lists the purpose of each control and connector.

Table 1. Controls and Connectors on the VRT16 Monitor

Item	Function
Power indicator light	Glows green when the monitor power is receiving power
Contrast control	Adjusts the contrast in the monitor display
Brightness control	Adjusts the brightness of the monitor display
Vertical centering (V-CENT)	Moves the picture upward or downward on the screen
Vertical static convergence (V-STAT) control	Moves the red and blue horizontal lines in the display in relation to the green horizontal line in the display
Horizontal static convergence (H-STAT) control	Moves the red and blue vertical lines in the display in relation to the green vertical line in the display
RGB signal cable connectors	Connects the video cable to the monitor
Fuse	Protects the monitor from electrical damage
Power connector	Connects the power cord to the monitor
On/off switch	Turns the monitor on and off
High-scan/low-scan switch	Not used by the VRT16 monitor

Connecting the VRT16 Monitor to a Graphics Module

The VRT16-DA/D4 monitor can display graphics generated by these TURBOchannel graphics modules:

- True color frame buffer module, model type PMAG-JA
- Smart frame buffer module, model type PMAGB-BA
- 2D graphics accelerator module, model type PMAG-CA
- Low 3D graphics accelerator module, model type PMAG-DA
- Mid 3D graphics accelerator module, model type PMAG-EA
- High 3D graphics accelerator module, model type PMAG-FA

The VRT16-HA/H4 monitor can display graphics generated by these TURBOchannel graphics modules:

- True color frame buffer module, model types PMAG-JA and PMAGB-JA
- Smart frame buffer module, model types PMAGB-BA, PMAGB-BC, and PMAGB-BE
- 2D graphics accelerator module, model type PMAG-CA
- Low 3D graphics module, model type PMAG-DA
- Low 3D graphics plus module, model type PMAGB-DA
- Mid 3D graphics module, model type PMAG-EA
- Mid 3D graphics plus module, model type PMAGB-EA
- High 3D graphics module, model type PMAG-FA
- High 3D graphics plus module, model type PMAGB-FA

To Connect the VRT16 Monitor to a Graphics Module

1. Find the monitor cable that came with your shipment.

2. Turn off the monitor. Then turn off the workstation or TURBOchannel extender that contains the graphics module to which you want to connect the monitor.

3. Hold the widest part of the 3-pin connector on the video cable so the widest part of the connector is on top. Be sure to align the connector correctly. If the connector is upside down, the connectors for red and blue displays are reversed, and these colors will be reversed on the monitor.

4. Firmly push the cable connector into the graphics module connector.

5. Tighten the two screws on the 3-pin connector to lock the connector securely in place.

6. Connect the red, green, and blue signal cables to the bottom set of RGB connectors on the monitor.

   a. Align the slots on the collar of the red signal cable connector with the pins on the monitor connector labeled R.

   b. Push the signal cable connector onto the monitor connector. Then twist the cable connector to the right to lock it.

   c. Repeat steps a and b to connect the green and blue signal cables. Connect the green signal cable to the monitor connector labeled G. Then connect the blue signal cable connector to the monitor connector labeled B.

Red, green, and blue
signal connectors

3-pin connector

WSETU008

Figure 2. Connecting a VRT16 monitor

To Disconnect a VRT16 Monitor

1. Turn off the monitor. Then turn off the workstation or TURBOchannel extender attached to the monitor that you want to disconnect.

2. Twist the red signal cable connector all the way to the left. Then pull the connector away from the monitor.

3. Repeat step 2 for the green and blue signal cable connectors.

4. Loosen the two screws that hold the 3-pin connector to the graphics module.

5. Pull the 3-pin connector away from the graphics module.

For Further Information

For information about the graphics module that connects to the monitor, see the chapter in this guide that describes that module.

A

VRT16 Monitor Specifications

Table A-1.   VRT16-HA and VRT16-H4 Monitor Description

Weight	34.02 kg (75.00 lb)
Height	47.55 cm (18.72 in)
Width	48.0 cm (18.90 in)
Depth	50.45 cm (19.86 in)
External controls, switches, and indicators	Brightness Contrast Power switch Power indicator V-CENT, H-STAT, V-STAT
Swivel range	±45°
Tilt range	−5° to +15°
Cathode-ray tube (CRT)	508 mm (20 in) diagonal Trinitron aperture grill 0.31 mm triad pitch 90° deflection angle 3 color High-efficiency antiglare, antistatic treatment
Display characteristics	1,280 by 1,024 pixels Maximum brightness no less than 30 footlamberts (fl)
Video input	
− Termination	75 ohms BNC

Table A-1 (Cont.). VRT16-HA and VRT16-H4 Monitor Description

– Amplitude	Red: 0.7 Vpp Green (with sync): 1 Vpp Blue: 0.7 Vpp Monitor syncs automatically to 66 hz (mode 1) or 72 hz (mode 2)
Horizontal rate timing	
– Active video	9.7853 μs (1280 pixels)
– Back porch	1712.4 ns (224 Pixels)
– Blanking interval	3.1802 μs (416 pixels)
– Frequency	77.1728 kHz
– Front porch	244.6 ns (32 pixels)
– Horizontal period	12.9656 μs (1696 pixels)
– Sync pulse	1223.2 ns (160 pixels)
Vertical rate timing	
– Active video	13.2768 ms
– Blanking interval	39 horizontal lines
– Frequency	72.5562 Hz
– Front porch	3 horizontal lines
– Sync pulse	3 horizontal lines
– Vertical period	13.7824 ms
Power	
– ac input voltage	90–132 or 198–264 Vac Switch selectable
– Frequency	47 to 63 Hz
– Power consumption	220 watts maximum

Table A-2. VRT16-HA and VRT16-H4 Monitor Operating Conditions

Temperature range [1]	10°C to 40°C (50° to 104°F)
Relative humidity	10% to 95%
Maximum wet-bulb temperature	32°C (89°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	10,000 ft maximum

[1] Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-3. VRT16-HA and VRT16-H4 Monitor Nonoperating Conditions

Temperature range	−40°C to 60°C (−40°F to 145°F)
Relative humidity	10% to 95%
Maximum wet-bulb temperature	46°C (115°F) packaged
Altitude	12,780 m (50,000 ft) maximum

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VRT19 Monitor

EK-VRT19-TC-001

This chapter describes the VRT19 monitor. It tells you about

- VRT19 monitor controls and indicators
- Graphics modules that work with the VRT19 monitor
- How to connect a VRT19 monitor to your workstation

The following are trademarks of Digital Equipment Corporation:

DEC	ThinWire	
DECstation	TURBOchannel	**digital**™
DECsystem	ULTRIX	

VRT19 Monitor Hardware

The VRT19 monitor is a 19-inch color monitor. Different models of the VRT19 operate at different frequencies.

- The VRT19-DA/D4 monitor operates at 66 Hz.

- The VRT19-HA/H4 automatically operates at 66 or 72 Hz to match the frequency of the graphics module to which the monitor is connected.

The monitor model number appears on the label next to the high-sc/low-scan switch on the back of the monitor.

Several controls and connectors on the VRT19 monitor let you adjust the monitor and connect it to your workstation.

Vertical static convergence (V-STAT) control

Horizontal static convergence (H-STAT) control

Vertical centering (V-CENT) control

Brightness control

Contrast control

On/off switch

Power indicator light

Power connector

RGB connectors (video out)

RGB connectors (video in)

High-scan/low-scan switch

WSE2O045
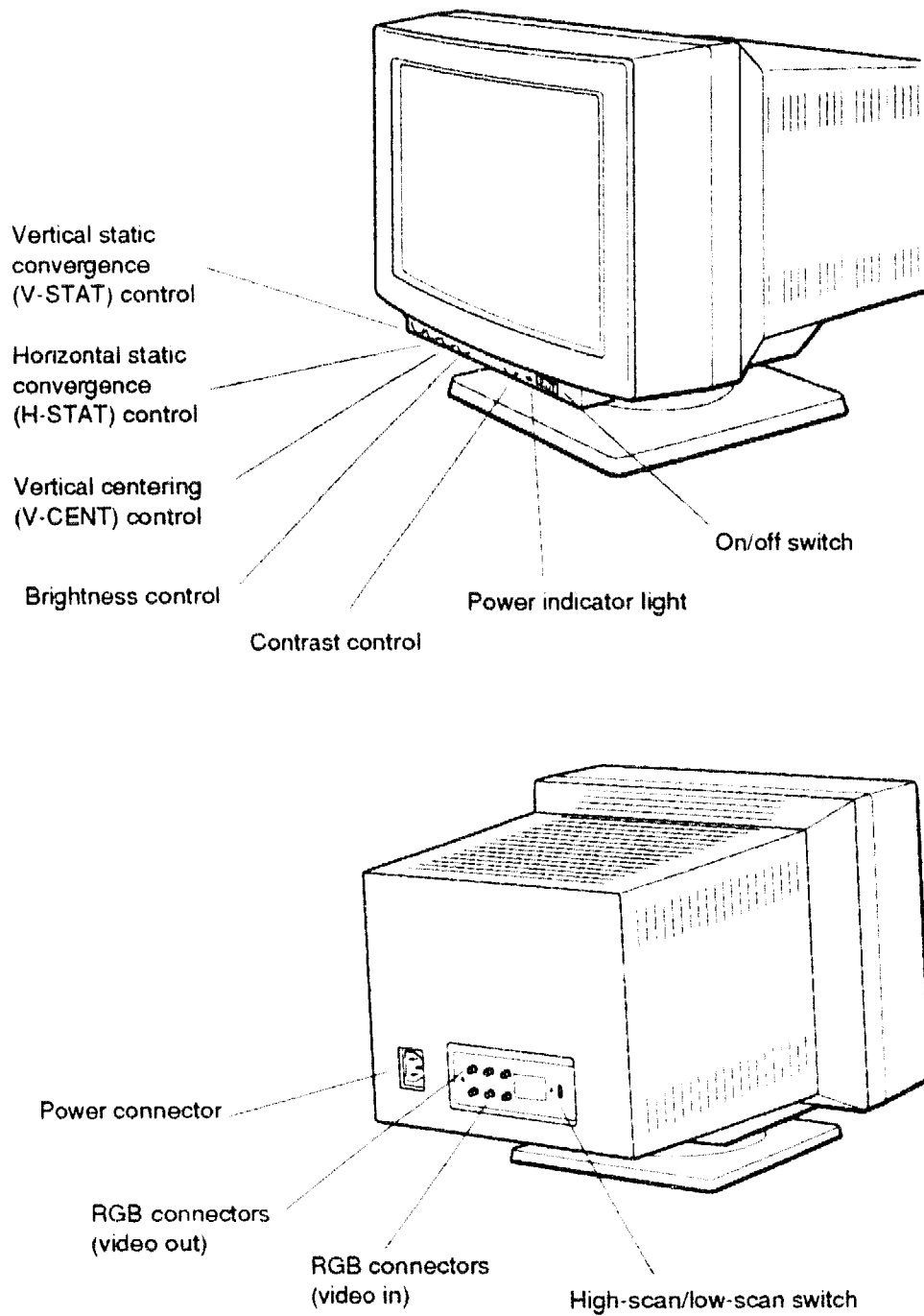
Figure 1. VRT19 monitor controls and indicators

3

Table 1 lists the purpose of each control and connector.

Table 1. Controls and Connectors on the VRT19 Monitor

Item	Function
Power indicator light	Glows green when the monitor power is receiving power
Contrast control	Adjusts the contrast in the monitor display
Brightness control	Adjusts the brightness of the monitor display
Vertical centering (V-CENT)	Moves the picture upward or downward on the screen
Vertical static convergence (V-STAT) control	Moves the red and blue horizontal lines in the display in relation to the green horizontal line in the display
Horizontal static convergence (H-STAT) control	Moves the red and blue vertical lines in the display in relation to the green vertical line in the display
RGB signal cable connectors	Connects the video cable to the monitor
Fuse	Protects the monitor from electrical damage
Power connector	Connects the power cord to the monitor
On/off switch	Turns the monitor on and off
High-scan/low-scan switch	Not used by a VRT16 monitor when connected to a TURBOchannel graphics module

Connecting the VRT19 Monitor to a Graphics Module

The VRT19-DA/D4 monitor can display graphics generated by these TURBOchannel graphics modules:

- True color frame buffer module, model type PMAG-JA
- Smart frame buffer module, model type PMAGB-BA
- 2D graphics accelerator module, model type PMAG-CA
- Low 3D graphics accelerator module, model type PMAG-DA
- Mid 3D graphics accelerator module, model type PMAG-EA
- High 3D graphics accelerator module, model type PMAG-FA

The VRT19-HA/H4 monitor can display graphics generated by these TURBOchannel graphics modules:

- True color frame buffer module, model types PMAG-JA and PMAGB-JA
- Smart frame buffer module, model types PMAGB-BA, PMAGB-BC, and PMAGB-BE
- 2D graphics accelerator module, model type PMAG-CA
- Low 3D graphics module, model type PMAG-DA
- Low 3D graphics plus module, model type PMAGB-DA
- Mid 3D graphics module, model type PMAG-EA
- Mid 3D graphics plus module, model type PMAGB-EA
- High 3D graphics module, model type PMAG-FA
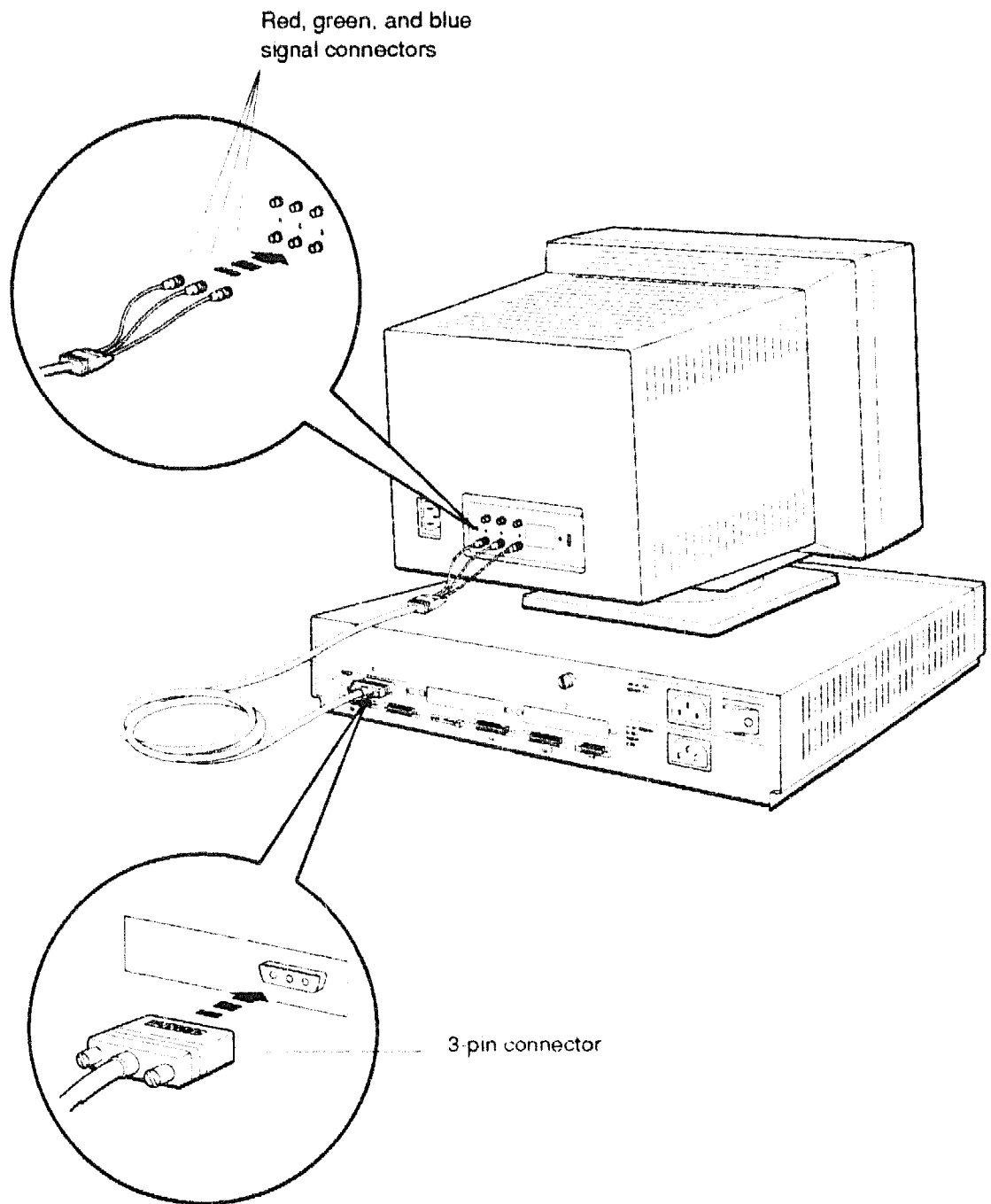- High 3D graphics plus module, model type PMAGB-FA

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To Connect the VRT19 to a Graphics Module

1. Find the monitor cable that came with your shipment.

2. Turn off the monitor. Then turn off the workstation or TURBOchannel extender that holds the graphics module to which you want to connect the monitor.

3. Hold the 3-pin connector on the video cable so the widest part of the connector is on top.

   Be sure to align the connector correctly. If the connector is upside down, the connectors for red and blue displays are reversed, and these colors will be reversed on the monitor.

4. Firmly push the cable connector into the graphics module connector.

5. Tighten the two screws on the 3-pin connector to lock the connector securely in place.

6. Connect the red, green, and blue signal cables to the bottom set of RGB connectors on the monitor.

   a. Align the slots on the collar of the red signal cable connector with the pins on the monitor connector labeled R.

   b. Push the signal cable connector onto the monitor connector. Then twist the cable connector to the right to lock it.

   c. Repeat steps a and b to connect the green and blue signal cables. Connect the green signal cable to the monitor connector labeled G. Then connect the blue signal cable connector to the monitor connector labeled B.

Red, green, and blue
signal connectors

3-pin connector

WSETU002

Figure 2.   Connecting a VRT19 monitor to a graphics module

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To Disconnect a VRT19 Monitor

1. Turn off the monitor. Then turn off the workstation or TURBOchannel extender attached to the monitor that you want to disconnect.

2. Twist the red signal cable connector all the way to the left. Then pull the connector away from the monitor.

3. Repeat step 2 for the green and blue signal cable connectors.

4. Loosen the two screws that hold the 3-pin connector to the graphics module.

5. Pull the 3-pin connector away from the graphics module.

For Further Information

For information about the graphics module that connects to the monitor, see the chapter in this guide that describes that module.

A

VRT19 Monitor Specifications

Table A-1. VRT19-HA and VRT19-H4 Monitor Description

Weight	34.02 kg (75.00 lb)
Height	47.55 cm (18.72 in)
Width	48.0 cm (18.90 in)
Depth	50.45 cm (19.86 in)
External controls, switches, and indicators	Brightness Contrast Power switch Power indicator V-CENT, H-STAT, V-STAT
Swivel range	±45°
Tilt range	-5° to +15°
Cathode-ray tube (CRT)	508 mm (20 in) diagonal Trinitron aperture grill 0.31 mm triad pitch 90° deflection angle 3 color High-efficiency antiglare, antistatic treatment
Display characteristics	1,280 by 1,024 pixels Maximum brightness no less than 30 footlamberts (fl)
Video input – Termination	75 ohms BNC

(continued on next page)

Table A-1 (Cont.). VRT19-HA and VRT19-H4 Monitor Description

– Amplitude	Red: 0.7 Vpp Green (with sync): 1 Vpp Blue: 0.7 Vpp Monitor syncs automatically to 66 hz (mode 1) or 72 hz (mode 2)
Horizontal rate timing	
– Active video	9.7853 μs (1280 pixels)
– Back porch	1712.4 ns (224 pixels)
– Blanking interval	3.1802 μs (416 pixels)
– Frequency	77.1728 kHz
– Front porch	244.6 ns (32 pixels)
– Horizontal period	12.9656 μs (1696 pixels)
– Sync pulse	1223.2 ns (160 pixels)
Vertical rate timing	
– Active video	13.2768 ms
– Blanking interval	39 horizontal lines
– Frequency	72.5562 Hz
– Front porch	3 horizontal lines
– Sync pulse	3 horizontal lines
– Vertical period	13.7824 ms
Power	
– ac input voltage	90–132 to 198–264 Vac
– Frequency	47 to 63 Hz
– Power consumption	220 watts maximum

Table A-2. VRT19-HA and VRT19-H4 Monitor Operating Conditions

Temperature range [1]	10°C to 40°C (50° to 104°F)
Relative humidity	10% to 95%
Maximum wet-bulb temperature	32°C (89°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	10,000 ft maximum

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-3. VRT19-HA and VRT19-H4 Monitor Nonoperating Conditions

Temperature range	−40°C to 60°C (−40°F to 145°F)
Relative humidity	10% to 95%
Maximum wet-bulb temperature	46°C (115°F) packaged
Minimum dew-point temperature	2°C (36°F)
Altitude	12,780 m (50,000 ft) maximum

VR319 Monitor

EK-VR319-TC-001

This chapter describes the VR319 monitor. It tells you about

■ VR319 monitor controls and indicators

■ Graphics modules that work with the VR319 monitor

■ How to connect a VR319 monitor to your workstation

VR319 Monitor Hardware

The VR319 monitor is a 19-inch monitor that can display monochrome or gray-scale graphics. There are two versions of the VR319 monitor, each of which operates at a different frequency.

- The VR319-CA operates at 66-Hz.

- The VR319-DA operates at 72-Hz.

The monitor model number appears on the back of the monitor on the label next to the cable connector.

Several controls and connectors on the VR319 monitor let you adjust the monitor and connect it to your workstation. Table 1 lists the purpose of each control and connector.

Table 1. Controls and Connectors on the VR319 Monitor

Item	Function
Power indicator light	Glows green when the monitor is receiving power
Contrast control	Adjusts the intensity of the display on the screen
Brightness control	Adjusts the brightness of the background on the screen
Vertical centering (V-CENT)	Moves the picture upward or downward on the screen
Horizontal centering (H-CENT) control	Moves the picture sideways on the screen
Rotational (ROT) control	Rotates the picture around the center of the screen
Video cable connector	Connects the video cable to the monitor
Power connector	Connects the power cord to the monitor
On/off switch	Turns the monitor on and off

2

On/off switch

Contrast control   Brightness control

Horizontal centering (H-CENT) control

Vertical centering (V-CENT) control   Rotational (ROT) control

Cable connector

Power connector
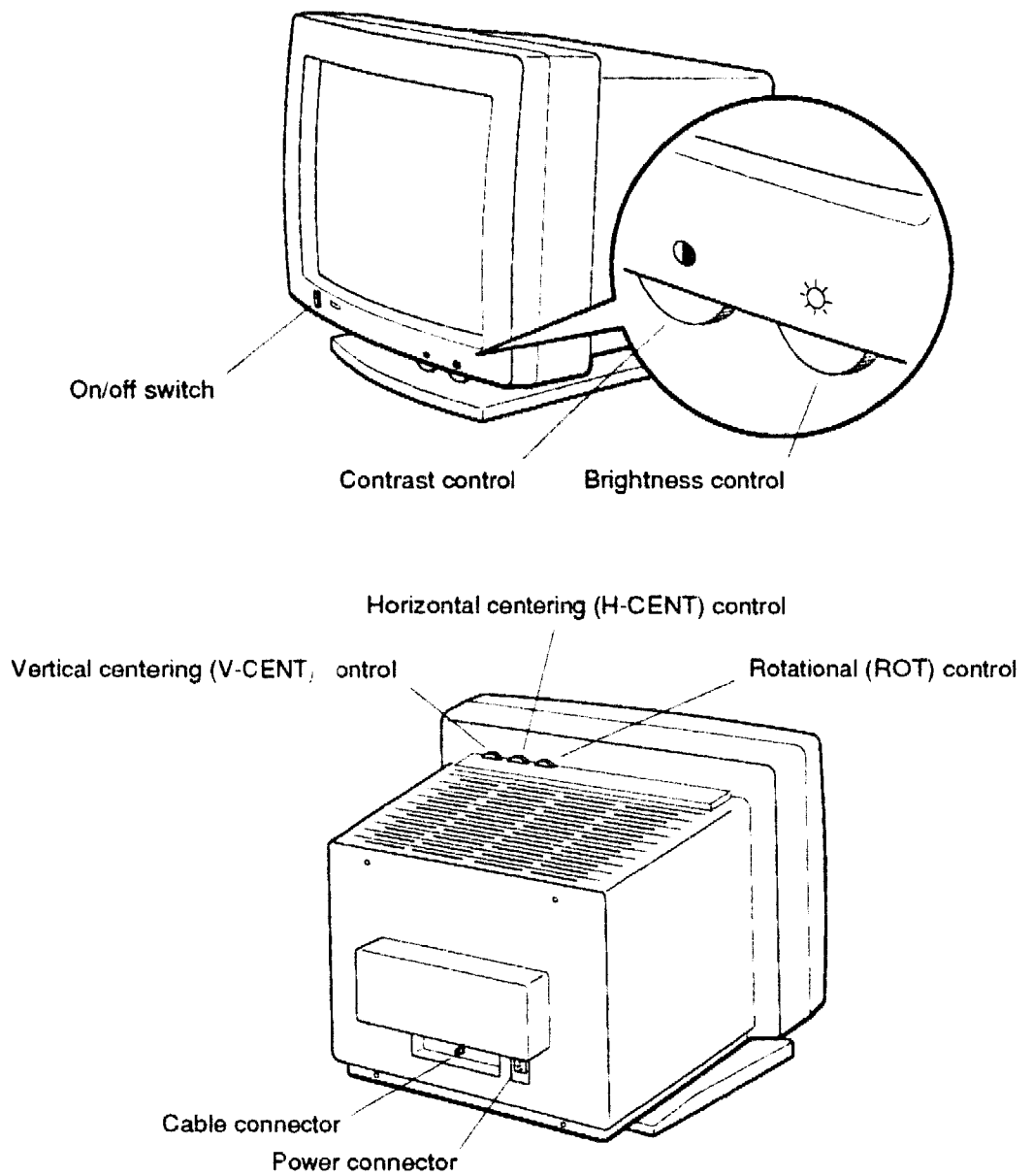
WS33O079

Figure 1.   VR319 monitor controls and indicators

Connecting the VR319 Monitor to a Graphics Module

The VR319-CA/C4 monitor can display graphics generated by these TURBOchannel graphics modules:

- 2D graphics accelerator module, model type PMAG-CA
- Smart frame buffer module, model type PMAGB-BA
- Low 3D graphics module, model type PMAG-DA
- Low 3D graphics plus module, model type PMAGB-DC

The VR319-DA/D4 monitor can display graphics generated by these TURBOchannel graphics modules:

- Monochrome frame buffer module, model type PMAG-AA
- Smart frame buffer module, model types PMAGB-BA, PMAG-BC, and PMAGB-BE
- Low 3D graphics plus module, model type PMAGB-DA

To connect the VR319 Monitor to a Color Graphics Module

1. Find the gray-scale video cable that came with your shipment.

2. Turn off the monitor. Then turn off the workstation or TURBOchannel extender that contains the graphics module to which you want to connect the monitor.

3. Hold the 3-pin connector of the cable assembly so the widest part of the connector is on top.

4. Firmly push the cable connector into the 2D graphics accelerator module connector on the system unit.

5. Tighten the screws on the 3-pin connector to lock the connector securely in place.

6. Align the slots on the collar of the signal cable connector with the pins on the monitor connector.

7. Push the signal cable connector onto the monitor connector. Then twist the cable connector to the right to lock it.

To Disconnect a VR319 Monitor from a Color Graphics Module

1. Turn off the monitor. Then turn off the workstation or TURBOchannel extender connected to the monitor that you want to disconnect.

2. Twist the signal cable connector all the way to the left. Then pull the connector away from the monitor.

3. Loosen the two screws that hold the 3-pin connector to the graphics module.

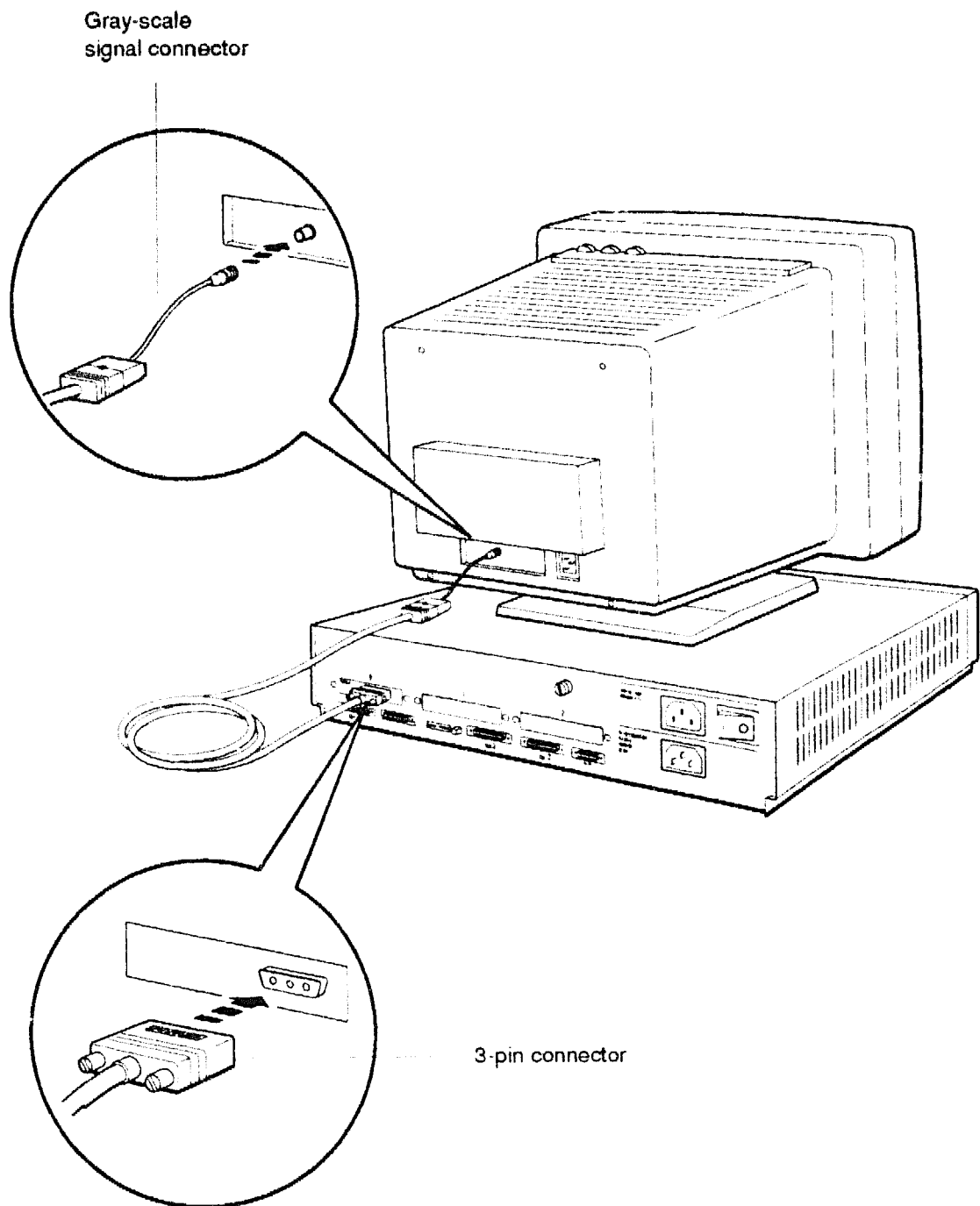4. Pull the 3-pin connector away from the graphics module.

Gray-scale
signal connector

3-pin connector

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Figure 2. Connecting a VR319 monitor to a color graphics module

To Connect a VR319 Monitor to a Monochrome Frame Buffer Module

1. Locate the video cable that came with your shipment.

2. Turn off the monitor. Then turn off the workstation or TURBOchannel extender that contains the graphics module to which you want to connect the monitor.

3. Press the threaded video cable connector onto the monochrome frame buffer module connector and twist it to the right to tighten it.

4. Align the slots on the collar of the slotted connector with the pins on the monitor connector.

5. Push the slotted connector onto the monitor connector. Then twist the connector to the right to lock it.

To Disconnect a VR319 Monitor from a Monochrome Frame Buffer Module

1. Turn off the monitor. Then turn off the workstation or TURBOchannel extender attached to the monitor that you want to disconnect.

2. Twist the signal cable connector all the way to the left. Then pull the connector away from the monitor.

3. Twist the video cable connector all the way to the left. Then pull the connector away from the monochrome frame buffer module.

Signal cable connector

Video cable connector
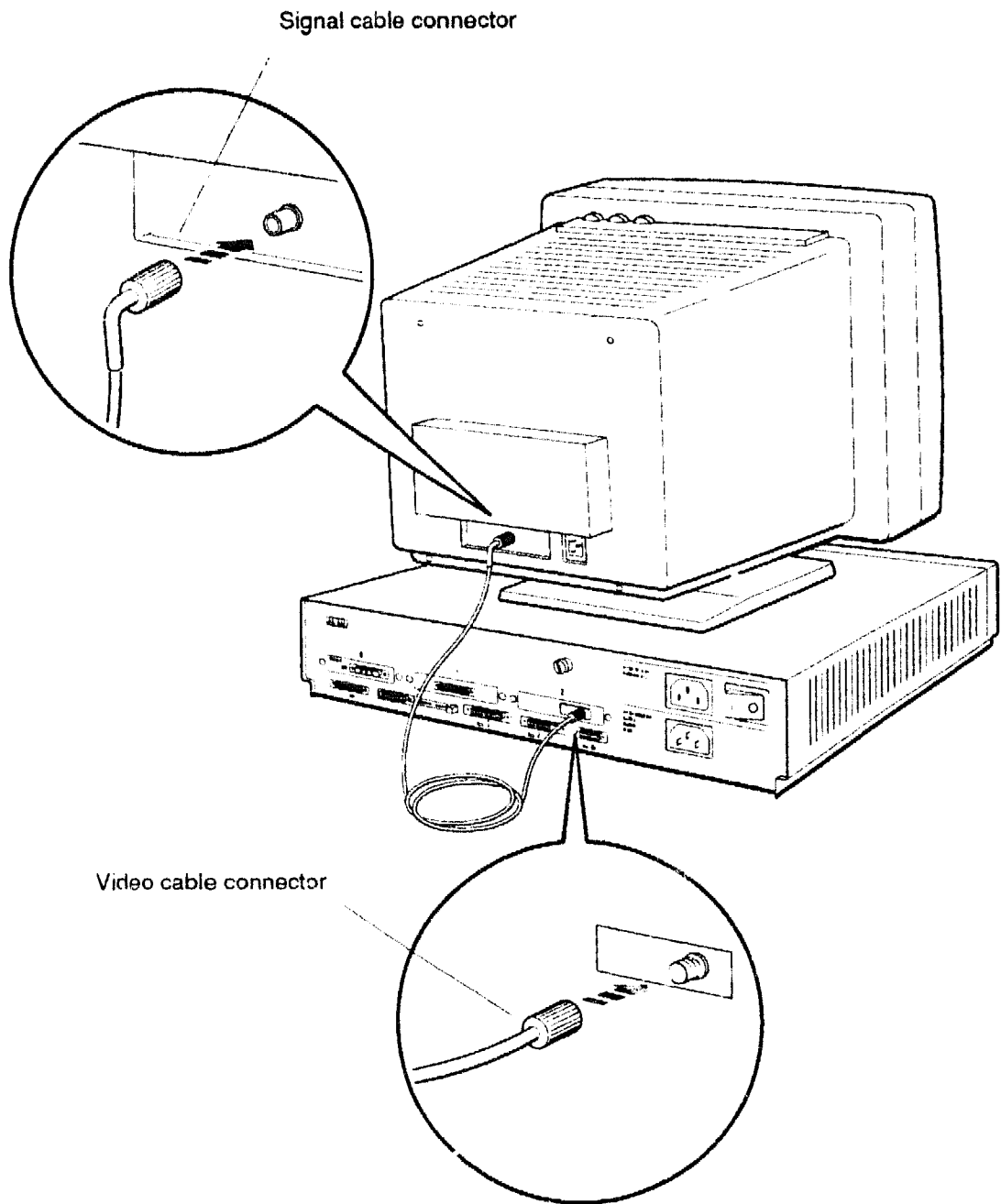
WSETU006

Figure 3. Connecting a VR319 monitor to a monochrome frame buffer module

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For Further Information

For information about the graphics module that connects to the monitor, see the chapter in this guide that describes that module.

A

VR319 Monitor Specifications

Table A-1.   VR319-DA and VR319-D4 Monitor Description

Weight	22.68 kg (50.00 lb)
Height	45.72 cm (18.00 in)
Width	49.55 cm (19.50 in)
Depth	40.13 cm (15.80 in)
External controls, switches, and indicators	Brightness Contrast Degauss Power switch Power indicator Rotation H-center V-center
Tilt range	5° to 15°
Swivel range	±90°
Cathode-ray tube (CRT)	483 mm (19 in) diagonal Monochrome High resolution Paper-white phosphor High-efficiency antiglare treatment
Display characteristics	1280 pixels horizontal by 1024 lines vertical Approximate picture size 342 by 273 mm Maximum brightness no less than 30 footlamberts (fl)

Video input	
– Termination	75 ohms BNC
– Amplitude	1.0 Vpp composite video
Refresh rate	72 Hz
	Factory or field service configurable
Horizontal rate timing	
– Active video time	9.7853 μs
– Back porch	1.7124 ns
– Blanking interval	3.1802 μs
– Frequency	77.173 kHz
– Front porch	0.2446 ns
– Horizontal period	12.9579 μs
– Pixels displayed	9.7853
– Sync pulse	1.2232 ns
Vertical rate timing	
– Active video time	13.2767 μs
– Back porch	0.427864 ns
– Blanking interval	0.505658 μs
– Front porch	0.038897 ns
– Horizontal period	13.7842 μs
– Lines displayed	13.2767
– Sync pulse	0.038897 ns
Power	
– Power supply type	Switch mode ac to dc converter
– ac input	Automatic voltage select
– Frequency	47 to 63 Hz
– Power consumption	Approximately 123 watts
Fuse	250 V: 5 A
	6.35 by 31.8 mm (0.25 by 1.25 in) slow blow

Table A-2.   VR319-DA and VR319-D4 Monitor Operating Conditions

Temperature range [1]	10°C to 40°C (50°F to 104°F)
Temperature change rate	11° (52°F) per hour maximum
Relative humidity	10% to 90% noncondensing
Maximum wet-bulb temperature	28°C (82°F)
Minimum dew-point temperature	2°C (36°F)
Altitude	2,400 m (8,000 ft) maximum

[1]Reduce maximum temperature by 1.8°C for each 1,000 meter (1.0°F for each 1,000 ft) increase in altitude.

Table A-3.   VR319-DA and VR319-D4 Monitor Nonoperating Conditions

Temperature range	−40°C to 66°C (−40°F to 151°F)
Relative humidity	10% to 95% noncondensing
Maximum wet-bulb temperature	46°C (115°F) packaged
Altitude	4,900 m (16,000 ft) maximum