

**DECstation  
316+ / 320+ / 325c / 333c / 425c  
Service Guide**

Order Number EK-PC46A-SV-002

**Digital Equipment Corporation**

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## About This Manual

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This service guide is designed to help you diagnose and repair the DECstation 316+, DECstation 320+, DECstation 333C, and DECstation 425C personal computers. This guide contains information on servicing the base system only. Specific information on installing, replacing, and configuring options is covered in the individual option installation guides supplied with those products, and is available to Customer Service personnel in a kit.

### Guide Organization

The guide is organized as follows:

- Chapter 1 provides an overview of the DECstation systems.
- Chapter 2 details troubleshooting instructions.
- Chapter 3 contains procedures for removing and replacing field replaceable units.

For information about network troubleshooting, refer to the *PCSA Network Troubleshooting Guide*. For additional information about PC architecture and the Digital Ethernet Personal Computer Bus Adapter (DEPCA) and DECetherWORKS option boards, refer to the appropriate Service Guides.

### Intended Audience

The procedures in this guide are for service technicians trained only by Digital Equipment Corporation.

## Conventions

This document uses the following conventions:

Convention	Meaning
Warning	Provides information to prevent personal injury
Caution	Provides information to prevent damage to equipment
Note	Provides general information you should be aware of
<code>Ctrl Alt Del</code>	Press and hold <code>Ctrl</code> while you press both <code>Alt</code> and <code>Del</code> . Control key sequences have special functions.
Strike the F1 key	What the screen displays as a prompt or an instruction is shown in monospaced type.

Throughout this guide, *DECstation* refers to the DECstation 316+, the DECstation 320+, the DECstation 325C, the DECstation 333C, and the DECstation 425+. When information applies to a specific DECstation, the full name is used.

The computer industry recognizes two open architectures as industry standards: The IBM-PC/AT bus structure and the Microsoft disk operating system, MS-DOS. The term industry-standard refers to compatibility with these architectures. Support for MS-DOS requires a defined set of ROM-BIOS (read-only memory basic I/O system services) which the DECstation offers.

## Ordering Parts

Customers who maintain their own equipment can order spare parts by either phone or mail, or through any Digital sales office.

To order parts by phone, call 1-800-DIGITAL from 8:30 am to 8:00 pm (Eastern Standard Time).

To order parts by mail, send a purchase order to:

Digital Equipment Corporation  
 P.O. Box CS2008  
 Nashua NH 03061

## Related Documentation

The following related documents are available as supplements to the information provided in this guide.

<b>Document</b>	<b>Part Number</b>
DECstation 316+ User's Guide	ER-PC461-UG
DECstation 320+ User's Guide	ER-PC464-UG
DECstation 325c User's Guide	ER-PC462-UG
DECstation 333c User's Guide	ER-PC463-UG
DECstation 425c User's Guide	ER-PC465-UG
DECstation 316+/325c /333c Technical Reference Manual	ER-PC46Y-AA
DECstation 316+/320+/325c /333c Technical Reference Manual	ER-PC46Y-DD
DECstation 425c Technical Reference Manual	ER-PC46Y-BA
DECstation Option Installation Guides Service Kit	ER-4XOPS-SV
PCSA Network Troubleshooting Guide	AA-JU54A-TH
DECetherWORKS Service Guide	EK-DE21A-SV
DECconnect System Stand-alone ThinWire Networks Planning and Installation Guide	EK-DECSY-TG
DECconnect System Planning and Configuration Guide	EK-DECSY-CG
DECconnect System Installation and Verification Guide	EK-DECSY-VG

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# 1

## Overview

---

### 1.1 Introduction

The DECstation (Figure 1-1) is a desktop computer. It can be used as a standalone personal computer or as a node on a network to a VAX computer or another DECstation with network server software. The DECstation runs Digital and other industry-standard applications.

LJ-1574

**Figure 1-1 DECstation Personal Computer**

1-1

As a node on a Personal Computing System Architecture (PCSA) network, the DECstation is the user's interface with the applications and services that the PCSA family of products provides. As part of a network, the DECstation communicates with other computers on the network and shares the various resources and services offered by Digital computers and servers.

## 1.2 DECstation Base System

The DECstation base system unit consists of the following:

- CPU board with:
  - 16 MHz 80386 processor (DECstation 316+)
  - 20 MHz 80386 processor (DECstation 320+)
  - 25 MHz 80386 processor (DECstation 325C)
  - 33 MHz 80386 processor (DECstation 333C)
  - 25 MHz i486 processor (DECstation 425C)
  - 32 Kilobyte cache memory (DECstation 325C and 333C)
  - Socket for optional math coprocessor
- Main logic board containing:
  - 0K Memory Adapter (containing 1 Mbyte of RAM, minimum)
  - Serial and parallel ports
  - PS/2-type mouse port
  - Intelligent Drive Electronics (IDE) drive connector
  - Six 16-bit expansion slots for industry standard options (usable as 8-bit slots also)
- 200 watt power supply with auxiliary power output (IEC) connector
- 3.5 inch 1.44 Mbyte diskette drive

## 1.3 DECstation Options

The following are options available for the DECstation:

- Color or monochrome VGA analog monitor
- Keyboard (country-specific)
- 16-bit SCSI host adapter
- 40 Mbyte, 80 Mbyte, 170, or 320 Mbyte SCSI hard disk drive
- 150 Mbyte, SCSI Tape Cartridge System
- 20 Mbyte, 40 Mbyte, 120, or 105 Mbyte IDE hard disk drive
- 60 Mbyte streaming tape drive (QIC-40)
- 16-bit Video Graphics Array (VGA) adapter
- 8514/A-Compatible Graphics adapter
- DEC EtherWORKS bus adapter
- A second 0K memory expansion adapter

### 1.3.1 System Unit Layout

Figure 1-2 shows the location of both standard and optional equipment within the system unit. Standard, base system equipment is represented by solid lines. Optional equipment is represented by dotted lines.

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Figure 1-2 System Unit Layout

## 1.4 DECstation System Configurations

The DECstation personal computers are available in two base system configurations (115 or 230 Vac). These systems are available for customers who elect to purchase DECstation supported options separately and configure their own systems. Additionally, customers can order one of several packaged systems which offer optional system memory configurations, mass storage devices, and video adapters installed at the factory.



The base system configurations are listed in Table 1-1.

**Table 1-1 Base System Configurations**

<b>Model Number</b>	<b>Description</b>
PC461-AA	DECstation 316+; 80386/16 MHz, base system box, 0K Memory Adapter with 1 Mbyte RAM (minimum), 3.5" 1.44 Mbyte floppy disk drive, on-board IDE device interface, serial/parallel port, mouse and keyboard port, 6 PC/AT expansion slots (4 full size; 2 half-size), 2 dedicated 32-bit memory slots, 3 additional front panel storage bays (3.5" or 5.25"), 16-bit VGA adapter, with the power supply factory set at 120 Vac, 60 Hz.
PC461-A2	Same as PC461-AA, but with no power cord or keyboard.
PC461-A3	Same as PC461-A2, but the power supply is factory set at 240 Vac, 50 Hz.
PC462-AA	DECstation 325c; 80386/25 MHz base system box, 0K Memory Adapter with 1 Mbyte RAM (minimum), 3.5" 1.44 Mbyte floppy disk drive, on-board IDE device interface, serial/parallel port, mouse and keyboard port, 6 PC/AT expansion slots (4 full size; 2 half-size), 2 dedicated 32-bit memory slots, 3 additional front panel storage bays (3.5" or 5.25"), with the power supply factory set at 120 Vac, 60 Hz.
PC462-A2	Same as PC462-AA, but with no power cord or keyboard.
PC462-A3	Same as PC462-A2, but with no power cord or keyboard, and the power supply is factory set at 240 Vac, 50 Hz.

**Table 1-1 (Cont.) Base System Configurations**

<b>Model Number</b>	<b>Description</b>
PC463-AA	DECstation 333c; 80386/33 MHz base system box, 0K Memory Adapter with 1 Mbyte RAM (minimum), 3.5" 1.44 Mbyte floppy disk drive, on-board IDE device interface, serial/parallel port, mouse and keyboard port, 6 PC/AT expansion slots (4 full size; 2 half-size), 2 dedicated 32-bit memory slots, 3 additional front panel storage bays (3.5" or 5.25"), with the power supply factory set at 120 Vac, 60Hz. No power cord or keyboard.
PC463-A2	Same as PC463-AA, but with the power supply factory set at 120 Vac, 50 Hz.
PC463-A3	Same as PC463-A2, but with the power supply factory set at 240 Vac, 50 Hz.
PC464-AA	DECstation 320+; 80386/20 MHz, base system box, 0K Memory Adapter with 1 Mbyte RAM (minimum), 3.5" 1.44 Mbyte floppy disk drive, on-board IDE device interface, serial/parallel port, mouse and keyboard port, 6 PC/AT expansion slots (4 full size; 2 half-size), 2 dedicated 32-bit memory slots, 3 additional front panel storage bays (3.5" or 5.25"), 16-bit VGA adapter, with the power supply factory set at 120 Vac, 60 Hz.
PC464-A2	Same as PC464-AA, But with no power cord or keyboard.
PC464-A3	Same as PC465-A2, but the power supply is factory set at 240 Vac, 50 Hz.

**Table 1-1 (Cont.) Base System Configurations**

<b>Model Number</b>	<b>Description</b>
PC465-AA	DECstation 425c; 80486/25 MHz, base system box, 0K Memory Adapter with 1 Mbyte RAM (minimum), 3.5" 1.44 Mbyte floppy disk drive, on-board IDE device interface, serial/parallel port, mouse and keyboard port, 6 PC/AT expansion slots (4 full size; 2 half-size), 2 dedicated 32-bit memory slots, 3 additional front panel storage bays (3.5" or 5.25"), 16-bit VGA adapter, with the power supply factory set at 120 Vac, 60 Hz.
PC465-A2	Same as PC465-AA, But with no power cord or keyboard.
PC465-A3	Same as PC465-A2, but the power supply is factory set at 240 Vac, 50 Hz.

### 1.4.1 DECstation Main Logic Board

The DECstation main logic board contains a floppy disk controller, serial and parallel ports, PS/2-style mouse port, IDE drive connector, six 16-bit expansion slots (usable as 8-bit also), and two dedicated 32-bit memory expansion slots (one slot contains a 0K Memory Adapter with 1 Mbyte of RAM minimum).

### 1.4.2 DECstation 316+ CPU Board

The CPU board of the DECstation 316+ contains a 16 MHz Intel 80386 CPU chip and a socket for an optional Intel 80387 math coprocessor. No cache memory is provided on the DECstation 316+.

### 1.4.3 DECstation 325c CPU Board

The CPU board of the DECstation 325c contains a 25 MHz Intel 80386 CPU chip, 32 Kbytes of cache memory, and a socket for an optional Intel 80387 math coprocessor.

#### **1.4.4 DECstation 333c CPU Board**

The CPU board of the DECstation 333c contains a 33 MHz Intel 80386 CPU chip, 32 Kbytes of cache memory, and a socket for an optional Intel 80387 math coprocessor.

#### **1.4.5 DECstation 320+ CPU Board**

The CPU board of the DECstation 320+ contains a 20 MHz Intel 80386 CPU chip and a socket for an optional Intel 80387 math coprocessor. No cache memory is provided on the DECstation 320+.

#### **1.4.6 DECstation 425c CPU Board**

The CPU board of the DECstation 425c contains a 25 MHz Intel i486 CPU chip and a socket for an optional 25 MHz WIETEK 4167 math coprocessor. No external cache memory is provided on the DECstation 320+. The Intel i486 CPU has an integral 8 Kbyte cache memory.

#### **1.4.7 Power Supply**

The DECstation is supplied with a 200 watt power supply that includes an auxiliary ac power output (IEC) connector. The power supply is switch selectable between either 115 Vac, 60 Hz or 230 Vac, 50/60 Hz power input.

#### **1.4.8 Monitors**

The DECstation supports both color and monochrome VGA analog monitors. The monitors are available in different voltage input variations and video alignments to meet international requirements. See Table 1-2.

**Table 1-2 Monitors**

<b>Model Number</b>	<b>Part Number</b>	<b>Description</b>
PC4XV-AA	30-32317-01	VGA monochromatic 14" for all versions of DECstation personal computers. Requires PC4XG-AA or -AB VGA adapter, except on the PC44- models. Displays 64 shades of grey, 640 x 480 resolution. 120 Vac 60 Hz (US and Canada)
PC4XV-A2	30-32317-02	VGA monochromatic 14" International Version, 120 Vac 60 Hz, with 640 x 480 resolution, North Hemisphere (IEC Plug)
PC4XV-A3	30-32319-01	VGA monochromatic 14" international version, 240 Vac 50 Hz, with 640 x 480 resolution, North Hemisphere (IEC Plug)
PC4XV-A4	30-32320-01	VGA monochromatic 14" international version, 240 Vac 50 Hz, with 640 x 480 resolution, South Hemisphere (IEC Plug)
PC4XV-A5	30-32318-01	VGA monochromatic 14" international version, 120 Vac 60 Hz, with 640 x 480 resolution, South Hemisphere (IEC Plug)
PC4XV-A6	30-33966-01	VGA monochromatic RGB 14" international version, 240 Vac 50 Hz, with 640 x 480 resolution, North Hemisphere (IEC Plug)
PC4XV-A7	30-33967-01	VGA monochromatic RGB 14" international version, 240 Vac 50 Hz, with 640 x 480 resolution, South Hemisphere (IEC Plug)

**Table 1-2 (Cont.) Monitors**

<b>Model Number</b>	<b>Part Number</b>	<b>Description</b>
PC4XV-BA	30-30901-01	VGA monochromatic RGB 14" for all versions of DECstation personal computers. Requires PC4XG-AA or -AB VGA adapter, except on the PC44- models, 120 Vac 60 Hz (US and Canada), with 640 x 480 resolution.
PC4XV-B2	30-32313-01	VGA monochromatic RGB 14" international version, 120 Vac 60 Hz, with 1024 x 768 resolution, North Hemisphere (IEC Plug)
PC4XV-B3	30-32315-01	VGA monochromatic RGB 14" international version, 240 Vac 50 Hz, with 640 x 480 resolution, North Hemisphere (IEC Plug)
PC4XV-B4	30-32316-01	VGA monochromatic RGB 14" international version, 240 Vac 50 Hz, with 640 x 480 resolution, South Hemisphere (IEC Plug)
PC4XV-B5	30-32314-01	VGA monochromatic RGB 14" international version, 120 Vac 60 Hz, with 1024 x 768 resolution, South Hemisphere (IEC Plug)
PC4XV-B6	30-33968-01	VGA monochromatic RGB 14" international version, 240 Vac 50 Hz, with 1024 x 768 resolution, North Hemisphere (IEC Plug)
PC4XV-B7	30-33969-01	VGA monochromatic RGB 14" international version, 240 Vac 50 Hz, with 1024 x 768 resolution, South Hemisphere (IEC Plug)

### 1.4.9 Video Graphics Array Adapter

The Video Graphics Array (VGA) adapter provides the video display control functions of the DECstation. The VGA adapter is available in 8-bit or 16-bit (800 x 600 resolution) models, and is also compatible with the following video standards. (Note: There is also a 16-bit VGA 1024 x 768 resolution model available).

- MCGA - Multi-color Graphics Array
- EGA - IBM Extended Graphics Adapter
- CGA - IBM Color Graphics Adapter
- MDA - IBM Monochrome Display Adapter
- Hercules graphics - Hercules graphic card

The VGA adapter can run software written for any of the video standards on any supported monitor. For example, you can run monochrome or color software on supported DECstation color monitors. The VGA also supports 132 column text mode. The text mode and color or monochrome mapping can be set by using the VGA.EXE utility supplied with the system.

### 1.4.10 Enhanced Keyboards

There are two different keyboards that are available as options on the DECstation: The 101-key enhanced keyboard, and the LK250 keyboard.

#### NOTE

**Keyboards used with the DECstation must be equipped with a 6-pin miniature PS/2-style connector.**

#### 1.4.10.1 101-Key Enhanced Keyboard

The 101-key enhanced keyboard provides the industry-standard IBM-PC/AT-style key arrangement on a smaller, desktop keyboard.

#### 1.4.10.2 LK250 Keyboard

The LK250 keyboard provides the standard Digital key arrangement available in several country-specific language variations.

#### 1.4.11 Math Coprocessor

The optional math coprocessors listed in Table 1-3 plug into the main logic board and allow each DECstation to process numeric data faster.

**Table 1-3 Math Coprocessors**

<b>Model Number</b>	<b>Description</b>
PC43P-AA	20 MHz Intel 80387 coprocessor for the DECstation 320+ (also compatible with DECstation 320)
PC46P-AA	16 MHz Intel 80287 coprocessor for the DECstation 316+
PC46P-BB	25 MHz Intel 80387 coprocessor for the DECstation 325c
PC46P-CC	33 MHz Intel 80287 coprocessor for the DECstation 333c
PC46P-EE	25 MHz WIETEK 4167 coprocessor for the DECstation 425c



# 2

## Troubleshooting

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This chapter provides troubleshooting instructions for the DECstation systems. It is divided into the following sections:

- Special tools
- Diagnostics
- Normal power up
- Troubleshooting procedures
- Error codes and how to use them
- Troubleshooting by symptom
- Troubleshooting during system operation
- Using the System Utilities diskette

For information about jumper settings, troubleshooting, and servicing of the DEC EtherWORKS option board and related network connections refer to the *DEC EtherWORKS Service Guide*.

### 2.1 Special Tools

The special tools needed to troubleshoot the DECstation system are given in Table 2-1.

**Table 2-1 Troubleshooting Tools**

<b>Tool</b>	<b>Part Number</b>	<b>Definition</b>
<i>Diagnose</i> Diagnostics (Version 3.0)	29-27462-01	These standalone diagnostics are available separately. For information about using these diagnostics, refer to the accompanying manual.
Tri-wrap Loopback Connector	FD-10164-00	This triple connector consists of a male 25-pin parallel loopback connector, a female 25-pin serial loopback connector, and a female 9-pin serial loopback connector bundled together and housed in a streamlined package.
DECstation 316+ Utilities Diskette	29-28153-01	Used to reconfigure the CPU when options are installed.
DECstation 320+ Utilities Diskette	29-28852-01	Used to reconfigure the CPU when options are installed.
DECstation 325c Utilities Diskette	29-28101-01	Used to reconfigure the CPU when options are installed.
DECstation 333c Utilities Diskette	29-28152-01	Used to reconfigure the CPU when options are installed.
DECstation 425c Utilities Diskette	29-28678-01	Used to reconfigure the CPU when options are installed.

## 2.2 Diagnostics

The DECstation has internal ROM-based diagnostics to aid in troubleshooting. These diagnostics are run at system power-up and verify the operation of the machine. Error messages are given in two formats: Beep codes and messages displayed on the screen. These error messages are explained in Section 2.5.

## 2.3 Normal Power Up

In a normal system power up the following takes place:

1. Power to the monitor and system unit is turned on. Both power indicators are on.
2. The system executes its power-up tests, displays the BIOS ROM version, assorted copyright information, and the memory size. Depending on the option(s) installed in the system additional information may be displayed.

If there is an error during any of the power-up tests the system either generates a beep error code or displays an error message.

3. The system generates a single beep, displays information about the operating system, and gives the date prompt. Note that the actual information displayed at this time depends on the system software.

## 2.4 Troubleshooting Procedures

This section describes three troubleshooting procedures that can be used depending on the state of the system. Each procedure will get the system to a state where it can run the Diagnose diagnostic package. Perform the steps in Section 2.4.1 and then go to the recommended procedure.

### CAUTION

**Before troubleshooting the DECstation, it must be disconnected from any network.**

### 2.4.1 Getting Started

The following steps prepare you for troubleshooting a DECstation:

1. Ask the customer to describe the problem. You need to find out:
  - When the problem started

2-4 Troubleshooting

- If any new hardware options were added to the system around the time the problem started and if the options are Digital certified or third party
- If any new software was added to the system
- 2. Have the customer supply you with a *copy* of the operating system diskette(s) that came with the system.
- 3. Have the customer provide you with the system configuration.
  - Type of monitor
  - Type of keyboard
  - Type and number of disk drives
  - Type and amount of memory
  - Type of network adapter
  - Type of mouse
  - Type of disk adapter (if on-board disk adapter is disabled)
  - Type of video graphics adapter (if on-board VGA is disabled)
  - Any other options installed in the system
- 4. Observe the problem. Based on what you observe refer to one of the following procedures:
  - If the system does not power up see Section 2.4.2, No Power.
  - If the system powers up but will not boot see Section 2.4.3, System Does Not Boot.
  - If the system powers up and boots see Section 2.4.4, System Boots.

## 2.4.2 No Power

This procedure helps determine the cause of the problem when the DECstation does not power up. Before starting this procedure be sure you have done the steps in Section 2.4.1.

1. Check the system for loose cables and connections.
2. Check the 115/230 Vac switch on the back of the system unit.
3. Plug the system unit and monitor power cord into a working ac outlet.
4. Turn on power to the monitor and system unit. Check for system power. The following are indications that the system and monitor have powered up:
  - Power indicators on the system unit and monitor are **on**.
  - You can hear the fan running.
  - You can hear the hard disk spinning.
5. If the system does not power up:
  - a. Turn off power to the system unit and monitor.
  - b. Unplug the system and monitor from the ac outlet.
  - c. Disconnect power to all the hard disk drives and remove all options.
  - d. Plug the monitor and system into a working ac outlet.
  - e. Turn the monitor and system power on. If the system powers up there was either a faulty device, too many options installed, or another power related problem.
  - f. Try booting the system from the operating system startup diskette.
  - g. Replace the Digital certified options one at a time and see if the system powers up each time an option is replaced or a disk drive is reconnected.
6. If the system powers up and does not boot refer to Section 2.4.3.

7. If the system powers up and boots refer to Section 2.4.4.

### 2.4.3 System Does Not Boot

This procedure helps determine why the DECstation does not boot. Before starting this procedure be sure you have done the steps in Section 2.4.1.

1. Remove any third party options and try to reboot the system. If the system generates any beep codes refer to Section 2.5.1, Power Up Beep Codes.
2. Try booting from the operating system startup diskette.
  - a. If the system does not boot verify that all jumpers are set correctly. Reboot the system after verifying the jumper settings.
  - b. Lack of beep codes and video indicate a possible bad main logic board.
  - c. If the system still does not boot remove all options and try to boot the system.
  - d. Replace the Digital certified options one at a time and see if the system powers up and boots each time an option is replaced or a disk drive is reconnected.
3. When the system boots refer to Section 2.4.4.

### 2.4.4 System Boots

The DECstation can have a problem but still boot on power-up. This procedure helps determine the problem with a DECstation that boots but still emits error beep codes or displays an error message. Before starting this procedure be sure you have done the steps in Section 2.4.1.

#### CAUTION

**The system must be disconnected from any network before running the Diagnose diagnostics.**

1. Determine what the failure is. Refer to Section 2.5 for a list of possible error messages. If there are no error messages refer to Section 2.6 for a list of symptoms and possible causes.

2. Run the Diagnose diagnostics.
3. Replace the necessary FRU.

## 2.5 Error Codes and Messages

During the power-up sequence, the DECstation executes built-in diagnostic and *bootstrap* routines. During the first portion of power up testing, the system generates beep codes on the speaker if the test program detects a fatal error. The system uses the beep codes to report test results only until screen initialization and screen retrace verification have occurred. After screen initialization and verification the built-in diagnostic sends non-fatal error messages to video memory and the system displays the messages on the monitor.

### CAUTION

**Do not connect or disconnect the video cable from the monitor or system when the monitor or system, or both, are on. This can cause damage to the system. Always turn the monitor and system off, then wait 20 seconds and disconnect the power cord before you remove the system unit cover. Observe anti-static precautions.**

### 2.5.1 Power Up Beep Codes

During the power up self test, the system generates two levels of beep codes. The primary level consists of a combination of long and short beeps which indicate possible system malfunction conditions. The secondary level utilizes bursts of beeps in a numeric beep code pattern to indicate specific malfunction locations on the main logic board.

Table 2-2 lists the primary beep codes. The primary beep codes indicate a main logic board failure, memory failure, memory configuration error, or a video error. If a memory failure is indicated, check and reseat the single-in-line memory modules (SIMMs) on the OK Memory Adapter. If you suspect a bad SIMM, first replace one SIMM and then the other.

**Table 2-2 Primary Beep Codes**

<b>Beep Code</b>	<b>Possible Problem</b>	<b>Corrective Action</b>
Two short beeps	Keyboard failure	Be sure the keyboard cable is firmly connected.
	Hard disk failure	Be sure the drive cables are firmly connected and all drive and adapter jumpers are set correctly.
	Diskette drive failure	Be sure drive cables are firmly connected and the drive switch is set correctly.
	Tape drive failure	Be sure the drive cables are firmly connected and all drive and host adapter jumpers are set correctly.
	Invalid configuration	Check the information entered with the Setup utility.
	Configuration record bad	Check the information entered with the Setup utility. See the hard disk installation guide for configuration information. Check the CMOS battery connection.
Long-short-long-short beep	Clock chip lost power	Turn the computer off, wait 20 seconds and then turn it on again. Check the CMOS battery connection.
	Video failure	Be sure the VGA jumper setting is enabled on the main logic board.
Several bursts of beeps <sup>1</sup>	BIOS ROM, CMOS, DMA, RAM, interrupt, or read/write errors	Check cable connections and jumper and switch settings. If the problem persists, there might be a problem on the main logic board.

<sup>1</sup>If the system generates bursts of beeps, refer to Table 2-3 for a list of specific failure locations corresponding to the particular numeric beep code pattern.



When several bursts of beeps are generated, listen carefully and remember the numeric beep code pattern. This pattern establishes the secondary level of beep codes. Table 2-3 lists the secondary beep codes and the test in-progress or test failure that corresponds to the numeric beep code pattern. For example, "2-1-4" (a burst of two beeps, a single beep, and a burst of four beeps) indicates that a failure of bit 3 in the first 64K of RAM has been detected.

**Table 2-3 Secondary Beep Codes**

<b>Beep Code</b>	<b>Description of Test or Failure</b>
1-1-3	CMOS write/read test in-progress or failure
1-1-4	BIOS ROM checksum test in-progress or failure
1-2-1	Programmable Interval Timer test in-progress or failure
1-2-2	DMA initialization test in-progress or failure
1-2-3	DMA page register write/read test failure
1-3-1	RAM refresh verification test in-progress or failure
1-3-3	1st 64K RAM chip of data line failure - multi-bit <sup>1</sup>
1-3-4	1st 64K RAM odd/even logic failure
1-4-1	1st 64K RAM address line failure
1-4-2	1st 64K parity test in-progress or failure
2-1-1	1st 64K RAM chip or data line failure - bit 0
2-1-2	1st 64K RAM chip or data line failure - bit 1
2-1-3	1st 64K RAM chip or data line failure - bit 2
2-1-4	1st 64K RAM chip or data line failure - bit 4
2-2-1	1st 64K RAM chip or data line failure - bit 4
2-2-2	1st 64K RAM chip or data line failure - bit 5

<sup>1</sup>Any of the RAM failures can be caused by a SIMM not being properly seated in its socket.

**Table 2-3 (Cont.) Secondary Beep Codes**

<b>Beep Code</b>	<b>Description of Test or Failure</b>
2-2-3	1st 64K RAM chip or data line failure - bit 6
2-2-4	1st 64K RAM chip or data line failure - bit 7
2-3-1	1st 64K RAM chip or data line failure - bit 8
2-3-2	1st 64K RAM chip or data line failure - bit 9
2-3-3	1st 64K RAM chip or data line failure - bit A
2-3-4	1st 64K RAM chip or data line failure - bit B
2-4-1	1st 64K RAM chip or data line failure - bit C
2-4-2	1st 64K RAM chip or data line failure - bit D
2-4-3	1st 64K RAM chip or data line failure - bit E
2-4-4	1st 64K RAM chip or data line failure - bit F
3-1-1	Slave DMA register test in-progress or failure
3-1-2	Master DMA register test in-progress or failure
3-1-3	Master interrupt mask register test in-progress or failure
3-1-4	Slave interrupt mask register test in-progress or failure
3-2-4	Keyboard controller test in-progress or failure
3-3-4	Screen memory test in-progress or failure <sup>2</sup>
3-4-1	Screen initialization test in-progress or failure
3-4-2	Screen retraces tests in-progress or failure

<sup>2</sup>Test failures from this point on can usually be attributed to the VGA adapter or the slot connector. Try moving the adapter to a different slot.

## 2.5.2 Test Messages

After screen initialization and verification, the built-in diagnostics send non-fatal error messages to video memory and the system displays the messages on the monitor. Table 2-4 lists the BIOS error numbers and the corresponding error messages that displays on the screen.

**Table 2-4 BIOS Error Messages**

<b>Error Number</b>	<b>Error Message</b>
01	Gate A20 failure
02	Unexpected interrupt in protected mode
03	Unexpected SW interrupt at xxxx:xxxx Type (S)hut off NMI, (R)eboot, other keys to continue
04	Memory tests terminated by keystroke
05	Memory yyyyy failure at xxxx read xxxx expecting xxxx
06	Display adapter failed; using alternate
07	No timer tick interrupt
08	Shutdown failure
09	Timer chip counter 2 failed
10	Keyboard xxxxx failure
11	Diskette subsystem reset failed
12	Diskette drive 0 seek failure
13	Diskette drive 1 seek failure
14	Hard disk configuration error
15	Hard disk controller failure
16	Hard disk failure
17	Time-of-day clock stopped

**Table 2-4 (Cont.) BIOS Error Messages**

<b>Error Number</b>	<b>Error Message</b>
18	Invalid configuration information - please run SETUP program
19	Time-of-day not set - please run SETUP program
20	Keyboard is locked - please unlock
21	Optional ROM bad checksum = xx
22	Strike the F1 key to continue
23	Diskette read failure -
24	Not a boot diskette -
25	No boot device available -
26	Hard disk read failure -
27	No boot sector on hard disk -
28	Insert system diskette and Strike the F1 key to retry boot
29	I/O card parity interrupt at xxxx:xxxx Type (S)hut off NMI, (R)eboot, other keys to continue
30	Memory parity interrupt at xxxx:xxxx Type (S)hut off NMI, (R)eboot, other keys to continue
31	Unexpected type 02 interrupt at xxxx Type (S)hut off NMI, (R)eboot, other keys to continue
32	Enter Password:
33	Password is incorrect
34	Password OK
35	Password has been removed
36	New password has been installed

**Table 2-4 (Cont.) BIOS Error Messages**

<b>Error Number</b>	<b>Error Message</b>
37	System halted! Must power down.

## 2.6 Troubleshooting by Symptom

This section describes causes and corrective actions for minor system problems that you can fix. The troubleshooting procedures are separated into system unit, hard disk and diskette drives, monitor, and pointing device problems.

### 2.6.1 System Unit Problems

Table 2-5 lists some common problems with the system unit, possible causes, and suggested corrective actions. If the corrective action does not work and it is possible to run the Diagnose diagnostics, use them to further isolate the problem and then replace the failing FRU.

**Table 2-5 System Unit Troubleshooting Procedures**

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
No response when the system is turned on.	System is not plugged in.	Turn the system off. Plug in the system, then turn the system on again.
	No power at wall outlet.	Use a working wall outlet.
	Voltage select switch incorrectly set.	Make sure the 115/230 Vac voltage select switch is set correctly.
Power is on, but there is no monitor display.	Brightness and contrast controls are not set properly.	Adjust brightness and contrast controls.

**Table 2-5 (Cont.) System Unit Troubleshooting Procedures**

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
	Monitor is off.	Turn on the monitor.
	Monitor cable incorrectly installed.	Make sure the monitor cable is installed properly.
	Main logic board failure.	Make sure the VGA jumper is enabled on the main logic board. If so, replace the main logic board.
An Ethernet network adapter is installed but the node does not boot when you try to reboot after using the utilities diskette.	Using a diskette generated reset is not compatible with the Ethernet board.	Press <b>Ctrl</b> <b>Alt</b> <b>Del</b> at the same time (a soft reset) to properly reset the hardware, then turn system power off and then on.
System does not boot from the hard disk.	There is no software on the partition.	Install software on the partition.
	System software is not on the hard disk.	Load the system software on the hard disk.
	Requested partition does not exist or is not formatted.	Check the partition. Format the partition; re-partition if necessary.
	Primary and secondary drives are set incorrectly.	Make sure the drive jumpers are correctly set.
	Hard disk is not installed properly.	Check hard disk installation.

**Table 2-5 (Cont.) System Unit Troubleshooting Procedures**

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
Tape does not work in the tape drive.	Tape is not fully inserted into the tape drive.	Make sure the tape is fully inserted and the cartridge release handle is locked down.
	Tape is worn or damaged.	Try another tape.
System does not boot from the diskette drive.	Diskette is not in the diskette drive.	Insert a diskette containing bootable system software.
	Drive switch is set incorrectly.	Make sure the drive switch is set correctly.
	Diskette is not bootable.	Use a diskette containing bootable system software.
	Diskette is worn or damaged.	Try another diskette.
System does not reboot when the power is turned off and on.	Hardware conflict (remote boot).	Make sure system is not set for remote boot.
	Power was not off long enough.	Turn the power off for at least 20 seconds before rebooting.

## 2.6.2 Disk Related Problems

Table 2-6 lists some common disk related problems, possible causes, and suggested corrective actions. If the corrective action does not work, run the Diagnose diagnostics to further isolate the problem and then replace the failing FRU.

**Table 2-6 Hard Disk and Diskette Drive Troubleshooting Procedures**

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
Hard disk cannot read or write information.	Problem exists with the drive or drive adapter.	Make sure all jumpers are set correctly.
Intermittent hard disk read/write problems.	Possible corrupted files.	Restore disk from back-up files.
Hard disk works but produces extra characters or garbled text.	Hard disk is affected by static electricity.	Move system away from any motors, magnetic devices, or photocopiers.  Increase the humidity in the room and use anti-static mats around the system.
System won't start from the diskette drive or displays the message Abort, Retry, Ignore.	The diskette has been demagnetized.	Make sure the disk drive cable is correctly installed. Replace the diskette.
	Improperly formatted diskette.	Reformat the diskette.
Diskette drive cannot read or write information.	The diskette drive is empty.	Insert a diskette into the diskette drive.
	Diskette is not formatted.	Use a preformatted diskette.



**Table 2-6 (Cont.) Hard Disk and Diskette Drive Troubleshooting Procedures**

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
	Diskette is worn or damaged.	Try another diskette.

### 2.6.3 Monitor Problems

Table 2-7 lists some common monitor problems, possible causes, and suggested corrective actions. If the corrective action does not work and it is possible to run the Diagnose diagnostics, use them to further isolate the problem and then replace the failing FRU.

**Table 2-7 Monitor Troubleshooting Procedures**

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
Monitor green LED is not on.	Monitor is not turned on.	Turn on the monitor and then the system.
	Power cord is not connected.	Make sure the power cord is connected to the wall outlet.
	No power at wall outlet.	Use another outlet.
There is no light at the F1 key when you start the system.	Setup utility was not run.	Run the Setup utility. Use your monitor and adapter board manuals and utilities diskette(s).
Screen is blank and monitor LED is on.	Contrast and brightness controls set to minimum.	Adjust the contrast and brightness controls.

**Table 2-7 (Cont.) Monitor Troubleshooting Procedures**

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
	Main logic board failure.	Replace the monitor. If that doesn't fix the problem make sure the VGA jumper is enabled on the main logic board. If it is enabled, replace the main logic board.
Screen goes blank after successful power up; monitor LED is off.	Power or monitor failure.	Turn the monitor and system off. Disconnect the monitor from the system and wall. Plug the monitor into an working wall outlet. If the monitor LED does not turn on, there is a problem with the monitor or monitor LED.
Monitor LED is off, but display is OK.	Faulty LED.	Replace the monitor.
Monitor is on, but no cursor or text displays.	System is not on.	Turn on the system.
	Contrast control is set to minimum.	Turn up the contrast control.
	Main logic board failure.	Replace the monitor. If that doesn't fix the problem make sure the VGA jumper is enabled on the main logic board. If it is enabled, replace the main logic board.

**Table 2-7 (Cont.) Monitor Troubleshooting Procedures**

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
Screen display distorted, rolling, flickering, or wrong or uneven color.	Monitor cable connector pins bent or broken.	Straighten pins or replace the monitor.
	Electromagnetic interference exists.	Move any electromechanical device away from the monitor or move the monitor.
Screen displays distorted images or goes blank when you run the software.	Software is not configured for, or is incompatible with, the current settings of the VGA board.	Reconfigure the software for VGA or set the VGA jumper on the main logic board to a standard supported by your software. See the software and VGA manuals.
Screen displays partially highlighted characters.	Main logic board VGA board jumpers incorrectly set.	Make sure the VGA jumper is enabled on the main logic board. If so, replace the main logic board. If that doesn't fix the problem replace the monitor.
You have a color monitor and the display is monochrome.	System was turned on <i>before</i> turning on the monitor.	Turn off the monitor and system. Wait at least 20 seconds. Turn on the monitor, then the system unit.

## 2.7 Troubleshooting Problems Occurring During System Operation

Sometimes problems occur during system operation. Use the following list to help isolate a problem to a specific subsystem by determining how or when the problem occurs.

### **The problem occurs during diskette drive access.**

- Check the diskette drive and the jumper setting.
- Look for slightly loose cables.
- Check the main logic board jumper settings.
- If possible, run the diagnostics. The problem may be with the main logic board decoding, resistor pack, or faulty loading on the data bus.

See also Section 2.6.

### **The problem occurs during hard disk drive access.**

- Check the hard disk drive, including jumper and switch settings.
- Check for loose drive cables.
- Check the SCSI board. Make sure it is seated properly and its jumpers are set correctly.

### **The problem seems to be video related.**

- Check the main logic board VGA jumper setting.

### **The problem seems to be keyboard related.**

- Keyboard lock may be partially engaged.
- Check the keyboard connection.
- Run the Diagnose diagnostics. The problem may be the keyboard interface on the main logic board.

### **The problem is reproducible or intermittent.**

- Expansion options may be competing for interrupt request lines, I/O address range, or memory address range.

**The problem seems to be heat related.**

- Make sure there is sufficient air flow around the system.
- The system unit may be clogged with dust.

## 2.8 Using the System Utilities Diskette

The menu driven System Utilities diskette (shipped with the system and required as a Customer Service tool) must be used when options are added to the system. A language option menu displays first when the System Utilities diskette is booted. After a language is selected, an option menu displays. Selecting Setup from the option menu displays the Setup utility menu. The Setup utility must be run anytime the following occur:

- The amount of memory in the system is changed.
- Diskette drives are added or removed.
- A different video display board is installed in the system.
- The battery-backed-up date and time are changed.
- The CMOS battery is disconnected or changed.

**NOTE**

**MS-DOS and OS/2 users should use the format command present in their operating system. Do not use the format command provided on the System Utilities diskette.**

### 2.8.1 Running the Setup Program

**NOTE**

**If you have installed a new SCSI hard disk drive, format the drive before you run the Setup utility. See your SCSI hard disk installation guide.**

You need the following information when you run the Setup utility:

- The type of diskette drive for drive A and optional drive B.
- System base memory size (displayed on the screen at power-up).

- Expansion memory size (displayed on the screen at power-up).
- Primary video adapter type (VGA).
- CPU and BUS clock speeds.

CPU speed is the CPU processing speed, and BUS speed is the I/O expansion bus transmission speed.

The Setup utility is run as follows:

1. Turn power to the monitor on.
2. Insert the Utilities diskette in the drive and turn power to the system on.
3. The power-up tests run, then the monitor displays a language selection menu. Select a language, then press **Enter**.
4. The monitor displays an option menu. Select option 4 (SETUP), then press **Enter**.
5. The monitor displays the Setup utility menu. Follow the instructions on the bottom of the screen and select the correct system configuration, then press **F2** to save and exit the menu.

**NOTE**

**Use the keyboard arrow keys to select a configuration in the Setup utility menu; do not use the keypad arrow keys.**

6. Reboot the system using one of the following methods.
  - Press the **Ctrl Alt Del** keys simultaneously (preferred method).
  - Press the Reset button on the front of the system unit. When the system displays the copyright page the setup procedure is complete.

**NOTE**

**If the hard disk is not formatted, a hard disk failure message might display on the copyright screen.**

# 3

## FRU Replacement

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### 3.1 Introduction

This chapter contains procedures for removing and replacing each DECstation field replaceable unit (FRU). To install many of the FRUs, perform the reverse of the procedure when it is so noted. Only qualified service technicians should remove and replace FRUs. Use only Digital supplied spares.

Table 3-1 lists standard FRUs for the DECstation systems and their part numbers. Table 3-2 lists optional FRUs for the DECstations 316+, 320C, 325C, 333C, and 425C, and their part numbers.

**Table 3-1 DECstation Standard Field Replaceable Units**

<b>FRU</b>	<b>Digital Part Number</b>
DECstation 325c main logic board	29-28091-01
DECstation 333c main logic board	29-28141-01
DECstation 316+ main logic board	29-28139-01
DECstation 320+ main logic board	29-28850-01
DECstation 425c main logic board	29-28554-01
DECstation 325c CPU board	29-28092-01
DECstation 333c CPU board	29-28142-01
DECstation 316+ CPU board	29-28140-01
DECstation 425c CPU board	29-28553-01
DECstation 320+ CPU board	29-28851-01

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**Table 3-1 (Cont.) DECstation Standard Field Replaceable Units**

<b>FRU</b>	<b>Digital Part Number</b>
200W power supply w/IEC assembly	29-28118-01
Fan assembly	29-28093-01
Rear bezel	29-28094-01
Card guide	29-28095-01
Speaker assembly	29-27440-01
Front cover assembly	29-28677-01
Actuator arm with LED assembly	29-28096-01
Battery	29-27439-01
Floppy drive ribbon cable assembly	29-28097-01
Floppy drive, 3.5 inch, 1.44 Mbyte	30-30942-01
Drive bay slide mounts	29-28098-01
OK memory board	20-32970-01
Keyboard adapter plug	29-28100-01
DECstation 320+ utilities diskette	29-28852-01
DECstation 316+ utilities diskette	29-28153-01
DECstation 325c utilities diskette	29-28101-01
DECstation 333c utilities diskette	29-28152-01
DECstation 425c utilities diskette	29-28678-01

**Table 3-2 DECstation Optional Field Replaceable Units**

<b>FRU</b>	<b>Digital Part Number</b>
8-bit VGA graphics adapter board	20-30947-01
16-bit VGA graphics adapter board	20-32343-01
14" VGM100 Monochrome monitor (US)	30-30902-01
14" VGM300 Color monitor (US)	30-30901-01
14" Color monitor 120V North Hem	30-32313-01



**Table 3-2 (Cont.) DECstation Optional Field Replaceable Units**

<b>FRU</b>	<b>Digital Part Number</b>
14" Color monitor 120V South Hem	30-32314-01
14" Color monitor 240V North Hem	30-32315-01
14" Color monitor 240V South Hem	30-32316-01
14" Color monitor 120V North Hem	30-32317-01
14" Color monitor 120V South Hem	30-32318-01
14" Color monitor 240V North Hem	30-32319-01
14" Color monitor 240V South Hem	30-32320-01
512K, 80 ns SIMM Memory Kit	19-32974-02
512K, 100 ns SIMM Memory Kit	19-32974-01
2 Mbyte, 80 ns SIMM Memory Kit	19-32975-02
2 Mbyte, 100 ns SIMM Memory Kit	19-32975-01
1.2 Mbyte diskette drive, 5.25"	30-31071-01
360 Kbyte diskette drive, 5.25"	30-33156-01
16-bit SCSI adapter board (AHA-1540/A)	20-30945-01
16-bit SCSI adapter board (AHA-1540/B)	20-33154-01
SCSI drive ribbon cable assembly	29-27441-01
SCSI hard disk drive, 40 Mbyte, 5.25"	30-30903-01
SCSI hard disk drive, 80 Mbyte, 5.25"	30-30904-01
SCSI hard disk drive, 170 Mbyte, 5.25"	30-30905-01
SCSI tape drive, 150 Mbyte, 5.25" tape cartridge	30-30905-01
Tape drive, 60 Mbyte (QIC-40)	30-34181-01
Mini-Tape cartridge, 1/4" (QIC-40)	30-34769-01
IDE hard disk drive, 20 Mbyte, 3.5"	30-32375-01
IDE hard disk drive, 40 Mbyte, 3.5"	30-32345-01
IDE hard disk drive, 120 Mbyte, 3.5"	30-32344-01
IDE dual drive ribbon cable assembly	29-27912-01

**Table 3-2 (Cont.) DECstation Optional Field Replaceable Units**

<b>FRU</b>	<b>Digital Part Number</b>
2400 BPS integral modem	30-31072-01
1200/200 BPS integral modem	30-31073-01
16 MHz Intel 80387 math coprocessor	19-30950-01
25 MHz Intel 80387 math coprocessor	19-30972-01
20 MHz Intel 80387 math coprocessor	19-34906-01
25 MHz WIETEK 4167 math coprocessor	19-34341-01
33 MHz Intel 80387 math coprocessor	19-30971-01
Keyboard, 101-key enhanced MD	29-32503-01
Two-Button Mouse PS/2-Type, Microsoft Compatible	30-25322-01
DEPCA adapter	70-24252-01
115 VAC system box power cord	17-02607-01
8514/A-Compatible graphics adapter	20-34173-01
8514/A-Compatible graphics adapter utilities diskette	29-28680-01
8514/A-Compatible VGS ribbon cable	29-28680-01

### 3.1.1 Before Replacing FRUs

The following criteria apply when removing or installing DECstation FRUs.

#### CAUTION

**After you turn power off to the system, do not disconnect the power cord from the system unit or wall outlet for at least 20 seconds.**

- Always turn off the power to the system and monitor and disconnect all external cables before removing any FRU.

#### NOTE

**Before disconnecting the DECstation from a network, inform the system administrator that you are going to disconnect the ThinWire T-connector from the computer. Do not disconnect any cable or terminator from the T-connector. Doing so disrupts network operation.**

- Always use a grounded wrist strap and grounded work surface-to-earth ground when opening the system unit or handling any external component and its replacement. Static electricity can damage printed circuit boards and mass storage devices.
- After replacing a FRU verify that it and the system function properly.

## 3.2 Replacing FRUs

This section describes how to remove and replace the various FRUs in the DECstation. Figure 3-1 shows an exploded view of the DECstation chassis. Figure 3-2 shows an exploded view of the DECstation main logic board and options.

LJ-1715

**Figure 3-1 Exploded View of DECstation Chassis**

LJ-1716

**Figure 3-2 Exploded View of DECstation Main Logic Board and Options**

### 3.2.1 Keyboard Replacement

Replace the keyboard as follows:

1. Turn off power to the system unit and monitor.
2. Disconnect the keyboard cable from the system unit.
3. Connect the cable from the new keyboard to the system unit.
4. Turn the power on again.

### 3.2.2 Monitor Replacement

Replace the monitor as follows:

1. Turn off power to the system unit and monitor.
2. Unplug the power cord to the monitor from the auxilliary outlet of the DECstation.
3. Disconnect the monitor cable from the system unit.
4. Connect the cable from the new monitor to the system unit.
5. Plug the power cord from the new monitor into the auxilliary outlet of the DECstation.
6. Turn the power on again.

### 3.2.3 Mouse Replacement

Replace the mouse as follows:

1. Turn off power to the system unit and monitor.

#### **CAUTION**

**All power must be off when connecting or disconnecting the mouse or damage to the mouse and/or CPU board will result.**

2. Disconnect the mouse cable from the system unit.
3. Connect the cable from the new mouse to the system unit.
4. Turn the power on again.

### **3.2.4 System Cover Removal**

Remove the system cover as follows:

1. Turn off power to the system unit and monitor.
2. Disconnect all cables from the back of the system unit.
3. Remove the three screws that secure the cover to the back of the system unit as shown.
4. Remove the cover (Figure 3-3).

Insert modified version of LJ-1740A

**Figure 3-3 Removing the DECstation System Cover**

### **3.2.5 Floppy Disk Drive Replacement**

Replace the floppy disk drive as follows (Figure 3-4):

1. Remove the system cover (Section 3.2.4).
2. Remove the actuator arm (Figure 3-12).
3. Remove the ribbon cable from the back of the drive.
4. Remove the three mounting screws that hold the drive in place and remove the drive.
5. Set the switch on the replacement drive to match that of the removed drive.
6. Install the replacement drive using the three mounting screws.
7. Reconnect the ribbon cable to the floppy drive and the power switch extender to the switch on the power supply (Figure 3-12).
8. After replacing the drive reconnect all system cables.
9. Verify the operation of the replaced drive.
10. Reinstall the system cover.



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**Figure 3-4 Replacing the Floppy Disk Drive**

**3.2.5.1 Replacing An Optional Floppy Drive**

To remove or replace an optional floppy disk drive, refer to the appropriate option installation guide.

### **3.2.6 Replacing an Optional Hard Disk/Tape Drive**

To remove or replace an optional hard disk or tape drive, refer to the appropriate option installation guide.

### **3.2.7 CPU Board Replacement**

Replace the DECstation CPU board as follows:

1. Locate the CPU board within the DECstation chassis (Figure 3-5 for the DECstation 325c and DECstation 333c, see Figure 3-6 for the DECstation 316+, or Figure 3-7 for the DECstation 320+ and the 425c)
2. Remove the two mounting screws that secure the CPU board to the chassis.
3. Remove the board by pulling it up and out of the slot connector.
4. Install the new CPU board by performing the previous steps in reverse order.

### **3.2.8 DECstation 325c/ 333c Math Coprocessor Replacement**

Replace the math coprocessor as follows:

1. Remove the CPU board as described in Section 3.2.7.
2. Locate the math coprocessor on the CPU board (Figure 3-5).
3. Remove the coprocessor using a small, flat-blade screwdriver to alternately lift each end. While lifting the coprocessor out of the socket be careful not to damage the socket or bend any of the pins on the coprocessor.
4. Before installing the new math coprocessor, straighten any pins so they align with the holes in the socket.
5. Make sure pin 1 of the coprocessor aligns with pin 1 of the socket. Pin 1 is located in the upper right corner (Figure 3-5).

6. Install the coprocessor in the socket by alternately pressing each end into the socket. Do this until the coprocessor is firmly seated in the socket.

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**Figure 3-5 DECstation 325c/ 333c CPU Board**

### **3.2.9 DECstation 316+/ 320+ Math Coprocessor Replacement**

Replace the math coprocessor as follows:

1. Locate the math coprocessor on the DECstation 316+ or 320+CPU board (Figure 3-6).
2. Remove the coprocessor using a small, flat-blade screwdriver to alternately lift each end. While lifting the coprocessor out of the socket be careful not to damage the socket or bend any of the pins on the coprocessor.
3. Before installing the new math coprocessor, straighten any pins so they align with the holes in the socket.
4. Make sure pin 1 aligns with pin 1 of the socket. Pin 1 is located in the lower right corner (Figure 3-6).
5. Install the coprocessor in the socket by alternately pressing each end into the socket. Do this until the coprocessor is firmly seated in the socket.

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**Figure 3-6 DECstation 316+/320+ CPU Board**

### **3.2.10 425c Math Coprocessor Replacement**

Replace the math coprocessor as follows:

1. Locate the math coprocessor on the DECstation 425c CPU board (Figure 3-7).
2. Remove the coprocessor using a small, flat-blade screwdriver to alternately lift each end. While lifting the coprocessor out of the socket be careful not to damage the socket or bend any of the pins on the coprocessor.
3. Before installing the new math coprocessor, straighten any pins so they align with the holes in the socket.
4. Make sure pin 1 aligns with pin 1 of the socket. Pin 1 is located in the lower left corner (Figure 3-7).
5. Install the coprocessor in the socket by alternately pressing each end into the socket until the coprocessor is firmly seated in the socket.

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**Figure 3-7 DECstation 320+/425c CPU Board**

### 3.2.11 The 0K Memory Adapter

One 0K Memory Adapter is included as standard equipment with each DECstation, and is installed in the front connector of slot 2 (Figure 3-8).

**NOTE**

**The front connectors of both slot 1 and slot 2 are dedicated for use with 0K Memory Adapters. If the system includes a second 0K Memory Adapter (optional), it must be installed in the front connector of slot 1.**

**NOTE**

**Early boards were factory installed in slot 1 and had a foil backing with a tab that was grounded to the chassis. Replacement boards may not include this foil backing. If a board is equipped with the foil backing do not remove the foil backing.**

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Figure 3-8 The 0K Memory Adapter (With no foil backing)



LJ-1719A

**Figure 3-9 The 0K Memory Adapter (With foil backing)**

### 3.2.11.1 Single-In-Line Memory Module Replacement

Replace the Single-In-Line Memory Modules (SIMMs) as follows:

1. Remove the system cover (Section 3.2.4).
2. Remove the OK memory adapter from the system by first removing the mounting screw that secures it to the chassis, and then pulling the board up and out of the slot connector.
3. To remove a SIMM use both hands to spread the retaining clips that hold the SIMM in place (Figure 3-10). If the SIMM to be replaced is the bottom one in a pair it will be necessary to remove the top one first and then the bottom one.
4. Move the SIMM forward to the vertical position.
5. Use your index fingers to pull the SIMM away from the retaining brackets.
6. To install a new SIMM, grasp the SIMM at both ends and insert it into the socket (Figure 3-10). Make sure the SIMM is fully seated in the connector by pressing backward and down on the SIMM to lock it into place.

#### NOTE

**The number of chips on the SIMM modules may vary based on the vendor.**

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**Figure 3-10 SIMM Removal and Replacement**

### **3.2.12 Option Board Replacement**

The procedure for replacing an option board in the DECstation is similar for the different options in the system.

1. Remove the system cover (Section 3.2.4).
2. Note the position of any cables connected to the option board and disconnect them.
3. Remove the mounting screw that secures the option board to the chassis.
4. Remove the board by pulling it up and out of the expansion slot connector.
5. Configure the jumpers and switches on the new board to match those on the old board.
6. Install the new board in the slot from which the old board was removed. Make sure the board is firmly seated in the connector(s) on the main logic board.
7. Secure the board to the chassis with the mounting screw.
8. Reconnect any cables you removed.

### 3.2.13 Power Supply Removal

Remove the DECstation power supply as follows:

#### **CAUTION**

**After you turn power off to the system, do not disconnect the power cord from the system unit or ac outlet for at least 20 seconds.**

1. Remove the cover from the system unit (Section 3.2.4).
2. Remove the rear bezel (Figure 3-11).
3. Remove the actuator arm from the power supply (Figure 3-12).
4. Disconnect the power supply cables from the main logic board and disk drives.
5. Remove the five mounting screws that hold the power supply in the system unit. Separate the power supply unit from the system unit by sliding it toward the front of the system unit while lifting it up and out slightly Figure 3-12.
6. Reach into the inside of the power supply chassis and disconnect the fan power connector Figure 3-12. Remove the power supply from the system unit.
7. To install the new power supply unit perform the previous steps in reverse order.

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**Figure 3-11 Removing the Rear Bezel**

LJ-1738A

**Figure 3-12 Removing the Power Supply**

### 3.2.14 Fan Removal

Remove the DECstation fan assembly as follows:

**CAUTION**

**After you turn power off to the system, do not disconnect the power cord from the system unit or ac outlet for at least 20 seconds.**

1. Remove the power supply and the fan power cable (Section 3.2.13.)
2. Remove the fan by removing the four mounting screws that hold it in place (Figure 3-13).

To replace the fan, perform the previous steps in reverse order.



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**Figure 3-13 Fan Removal and Replacement**

### 3.2.15 Main Logic Board Replacement

Replace the main logic board as follows:

**NOTE**

**DECstations 316+/325C/333C were introduced with a Rev C main logic board (Figure 3-16) Later models may be equipped with a Rev D main logic board).**

**DECstations 320+/425C have a Rev D main logic board (Figure 3-17). Jumper settings on both Rev C and D main logic boards must be configured specifically for each DECstation model. See Section 3.3 for jumper locations and configuration information.**

1. Remove the system cover (Section 3.2.4).
2. Remove all option boards. (Section 3.2.12).
3. Remove the power supply from the system (Section 3.2.13).
4. Disconnect all cables connected to the main logic board and note their location and routing.
5. Remove the mounting tray for floppy drive B by removing the two mounting screws that secure the tray to the front of the system chassis.
6. Remove the card guide by removing the two mounting screws that secure it to the front of the system chassis (one of the screws will have been removed already when the CPU board was removed).
7. Remove the main logic board by performing the following steps:
  - a. Remove the two screws that secure the keyboard/serial connector to the back of the chassis.
  - b. Remove the 11 screws that secure the main logic board to the chassis.
  - c. Remove the main logic board as shown in Figure 3-14.
8. Set the jumpers and switches on the replacement board to match those on the old board

9. Install the new main logic board by reversing the steps used to remove the old board.

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**Figure 3-14 Removing the Main Logic Board**

### 3.2.16 Speaker Removal

Remove the speaker as follows:

1. Remove the system cover (Section 3.2.4).
2. Disconnect the speaker cable from the main logic board (Figure 3-2).
3. Remove the two screws securing the speaker to the front of the chassis.
4. Remove the speaker.

Replace the speaker by performing the reverse of these steps.

### 3.2.17 Battery Replacement

Replace the battery as follows:

1. Remove the system cover (Section 3.2.4).
2. Disconnect the battery from the main logic board (Figure 3-2).
3. Remove the battery from the system by pulling it off of the Velcro mounting strip.

**WARNING**

**Do not dispose of the battery at the customer site. Do not burn the battery or take it apart.**

4. Install the new battery and connect it to the main logic board.

### 3.3 Jumper Locations and Configurations

Figure 3-15 shows the location of the jumpers on the 425C CPU logic board.

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**Figure 3-15 CPU Logic Board Jumper Location (425C)**

Figure 3-16 shows the location of the jumpers on the 316+, 325c, 333c main logic boards. Table 3-3 describes main logic board jumpers configurations, and provides a recommended default setting for the jumpers.

Figure 3-17 shows the location of the jumpers on the 320+ and 425C main logic boards. Table 3-4 describes main logic board jumpers configurations, and provides a recommended default setting for the jumpers.

**Table 3-3 DECstation 325C/316+ Main Logic Board Jumper Settings for Rev C Boards**

<b>Feature</b>	<b>Description</b>	<b>Jumper Setting</b>
Monitor type	Selection by SETUP <sup>1</sup>	E11 and E12, Installed
	Color monitor	E10 and E11, Installed
	Monochrome monitor	E10, E11, and E12, No connection
BIOS ROM Type	128 KB (16 KB)	E22 and E23, No connection E24 and E25, No connection
	256 KB (32 KB) <sup>1</sup>	E22 and E23, No connection E24 and E25, Installed
	512 KB (64 KB)	E22 and E23, Installed E24 and E25, Installed
	1 Mbyte (128 KB)	E22 and E23, Installed E24 and E25, Installed
IDE IOCHRDY	Enabled <sup>1</sup>	E1 and E2, Installed
	Disabled	E1 and E2, No connection
IDE DIAG	Normal operation <sup>1</sup>	E3 and E4, No connection
	Diagnostics (factory)	E3 and E4, Installed

<sup>1</sup>Default Setting

**Table 3-3 (Cont.) DECstation 325c/316+ Main Logic Board  
Jumper Settings for Rev C Boards**

<b>Feature</b>	<b>Description</b>	<b>Jumper Setting</b>
I/O Recovery	Enabled <sup>1</sup>	E8 and E9, Installed
	Disabled	E8 and E9, No connection
System timing	316+/ 325c <sup>1</sup>	E14 and E15, Installed E17 and E18, Installed E20 and E21, Installed
	333c <sup>1</sup>	E13 and E14, Installed E17 and E18, Installed E19 and E20, Installed

<sup>1</sup>Default Setting

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**Figure 3-16** Rev. C Main Logic Board Jumper Locations (316+/325C/333C)



**Table 3-4 DECstation 425C/320+ Main Logic Board Jumper Settings for Rev D Boards**

<b>Feature</b>	<b>Description</b>	<b>Jumper Setting</b>
Monitor type	Selection by SETUP <sup>1</sup>	E11 and E12, Installed
	Color monitor	E12 and E13, Installed
	Monochrome monitor	E11, E12, and E13, No connection
IDE IOCHRDY	Enabled <sup>1</sup>	E1 and E2, Installed
	Disabled	E1 and E2, No connection
IDE DIAG	Normal operation <sup>1</sup>	E3 and E4, No connection
	Diagnostics (factory)	E3 and E4, Installed
System Timing	Reserved for factory use	E6 and E7, Installed E9 and E10, Installed E14 and E15, Installed E17 and E18, Installed E19 and E20, Installed E21 and E22, Installed E23 and E24, Installed E25 and E27, Installed E26 and E28, Installed E29 and E30, Installed E31 and E40, No connection (parked) E32 and E41, No connection (parked) E33 and E42, Installed E34 and E43, Installed E35 and E36, Installed E38 and E39, Installed E44 and E45, Installed E37 and E46, Installed E47 and E48, No connection E49 and E50, Installed

<sup>1</sup>Default Setting

**Table 3-4 (Cont.) DECstation 425c/320+ Main Logic Board  
Jumper Settings for Rev D Boards**

<b>Feature</b>	<b>Description</b>	<b>Jumper Setting</b>
	320+	E6 and E7, Installed E9 and E10, Installed E15 and E16, Installed E17 and E18, Installed E19 and E20, Installed E21 and E22, No connection E23 and E24, No connection E25 and E27, No connection E26 and E28, Installed E29 and E30, No connection E31 and E40, No connection E32 and E41, No connection E33 and E34, Installed E35 and E36, Installed E38 and E39, No connection E42 and E43, Installed E44 and E45, Installed E37 and E46, Installed E47 and E48, No connection E49 and E50, Installed

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**Figure 3-17 Rev. D Main Logic Board Jumper Locations (320+/425C)**



# A

## Power Consumption

---

The following table lists the power consumption for the DECstation base system.

### NOTE

**The reserve current row indicates the amount of current that is available for options and may be distributed between the other slots as needed.**

**Table A-1 DECstation Base System Power Consumption**

<b>Current</b>	<b>+5 Volts Amps</b>	<b>-12 Volts Amps</b>	<b>+12 Volts Amps</b>	<b>+12 Peak Amps</b>	<b>DC Power (VA)</b>
Available current	20.00	0.30	8.00	9.00	—
Current required	5.300	0.030	0.039	—	—
Reserve current	14.70	0.27	7.96	9.00	—
Power consumed	26.50	0.15	0.20	—	26.84
Power available	—	—	—	—	173.15



# B

## Peripheral Interface

---

The following tables list the pin assignments and function of each peripheral interface connector on the rear panel of the DECstation systems.

**Table B-1 Parallel I/O Port Connector**

---

<b>Pin Number</b>	<b>Function</b>
1	Strobe
2	Data bit 0
3	Data bit 1
4	Data bit 2
5	Data bit 3
6	Data bit 4
7	Data bit 5
8	Data bit 6
9	Data bit 7
10	Acknowledge
11	Busy
12	Paper end
13	Select
14	Auto Feed

B-2 Peripheral Interface

**Table B-1 (Cont.) Parallel I/O Port Connector**

<b>Pin Number</b>	<b>Function</b>
15	Error
16	Initialize
17	Select In
18 to 25	Ground

**Table B-2 RS-232C Serial Port Connector**

<b>Pin Number</b>	<b>Function</b>
1	Carrier detect
2	Receive data
3	Transmit data
4	Data terminal ready
5	Signal ground
6	Data set ready
7	Request to send
8	Clear to send
9	Ring indicator

**Table B-3 Keyboard and Mouse Connectors**

<b>Pin Number</b>	<b>Function</b>
1	Data
2	Reserved
3	Ground
4	+5 Vdc



**Table B-3 (Cont.) Keyboard and Mouse Connectors**

<b>Pin Number</b>	<b>Function</b>
5	Clock
6	Reserved

**Table B-4 Video Port Connector**

<b>Pin Number</b>	<b>Function</b>
1	Red video
2	Green video
3	Blue video
4	Monitor ID bit 2 (not used)
5	Ground
6	Red return (ground)
7	Green return (ground)
8	Blue return (ground)
9	Key (no pin)
10	Sync return (ground)
11	Monitor ID bit 0 (not used)
12	Monitor ID bit 1 (not used)
13	Horizontal Sync
14	Vertical Sync
15	Not used

**NOTE**

**The monitor type (color or monochrome) is determined when power to the system is turned on.**

B-4 Peripheral Interface

**NOTE**

**Monochrome monitors use the green video for all video input and ignore the red and blue video.**

**NOTE**

**A monochrome monitor does not use the monitor ID bits.**

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