DECstation
212LP/316SX/320SX
Service Guide

Order Number   EK-PC44A-SV-002

Digital Equipment Corporation

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About This Guide

This service guide is designed to help you diagnose and repair the DECstation 212LP, DECstation 316SX and DECstation 320SX 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 DEC EtherWORKS 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
Ctrl Alt Del	Press and hold Ctrl while you press both Alt and Del. 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 212LP, DECstation 316SX, and the DECstation 320SX. When information applies to a specific DECstation, the full title 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.

Document	Part Number
DECstation 212LP User's Guide	ER-PC441-UG
DECstation 316SX User's Guide	ER-PC442-UG
DECstation 320SX User's Guide	ER-PC443-UG
DECstation 212LP Technical Reference Manual	ER-PC44Y-AA
DECstation 316SX Technical Reference Manual	ER-PC44Y-BB
DECstation 320SX Technical Reference Manual	ER-PC44Y-CC
DECstation Option Installation Guides Service Kit	ER-4XOPS-SV
PCSA Network Troubleshooting Guide	AA-JU54A-TH
DEC EtherWORKS 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

Digital personnel may order documents with part numbers beginning with either ER or EK from:

> Digital Equipment Corporation
> 444 Whitney Street
> Northboro, MA 01532

Attn: Publishing and Circulation Services (NRO2-2) Order Processing Section

On-line orders can be sent ALL-IN-1 mail to Order @NRO or VMS mail to NEST::ORDER.

Digital personnel may order documents with part numbers beginning with AA from:

> Digital Equipment Corporation
> Digital Drive
> Westminster MA 01473-0471

Attn: Attention: Order Administration

Digital self-maintenance customers may order documents with part numbers beginning with either EK, ER, or AA by mail or phone from:

> Digital Equipment Corporation
> Peripherals and Supplies Group
> P.O. Box CS2008
> Nashua, NH 03061

Or, by phone, between 8:30am and 8:00pm Eastern Standard Time, call:

> 1-800-DIGITAL

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.

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Figure 1–1   DECstation Personal Computer

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:

- Main logic board containing:

    — 12 MHz Intel 80286 processor (DECstation 212LP only)

    — 16 MHz Intel 80386SX processor (DECstation 316SX only)

    — 20 MHz Intel 80386SX processor (DECstation 320SX only)

    — Socket for optional Intel 80287 (DECstation 212LP only) or Intel 80387SX (DECstation 316SX only) math coprocessor

    — Socket for optional 386SX math coprocessor

    — 1 (minimum) to 4 (maximum) Mbytes of SIMM RAM memory

    — Serial and parallel ports

    — PS/2 compatible mouse port

    — Intelligent Drive Electronics (IDE) drive connector

    — 16-bit VGA (Video Graphics Array) controller on the main logic board.

    — Three 16-bit (also usable as 8-bit) expansion slots for industry standard options

- 100 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 base system:

- Color or monochrome VGA analog monitor

- 40, 80, 170, or 320 Mbyte SCSI hard disk drive

- 150 Mbyte SCSI Tape cartridge system

- 20, 40, 120, or 105 Mbyte IDE hard disk drive

- 60 Mbyte streaming tape drive (QIC-40)

- 8514/A-Compatible Graphics Adapter

- 3.5 inch 1.44 Mbyte diskette drive

- 5.25 inch 1.2 Mbyte diskette drive

- 5.25 inch 360 Kbyte diskette drive

- 101-key enhanced keyboard (country-specific)

- PS/2 compatible mouse

- Power cord (country-specific)

- 16-bit SCSI host adapter

- Serial/parallel adapter

- 1200/300 internal baud modem

- 2400 internal baud modem

- 10 MHz Intel 80287 math coprocessor (DECstation 212LP)

- 16 MHz Intel 80387SX math coprocessor (DECstation 316SX)

- 20 MHz Intel 80387SX math coprocessor (DECstation 320SX)

- DEC EtherWORKS bus adapter

NOTE
Options listed were available at the time of printing.
Additional options may be available at this time.

1.3.1 System Unit Layout

Figure 1–2 shows the location of both standard and optional equipment within the system unit. Standard equipment (the equipment that is included in the base system) 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 each 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. The packaged systems are listed in Table 1–2.

Table 1–1 Base System Configurations

Model Number	Description
PC441-AA	DECstation 212LP; 80286/12 MHz base system box, 1 Mbyte (minimum) SIMM RAM, 3.5 inch 1.44 Mbyte floppy diskette drive, on-board IDE device interface, serial/parallel port, mouse and keyboard port, on-board VGA, 3 PC/AT expansion slots (full size), 2 additional front panel storage bays (3.5 and 5.25 inch), with the power supply factory set at 120 Vac, 60 Hz.
PC441-A2	Same as PC441-AA, but with no power cord and keyboard.
PC441-A3	Same as PC441-A2, but with no power cord and keyboard, and is factory set at 240 Vac, 50 Hz.
PC442-A2	DECstation 316SX; 80386/16 MHz base system box, 1 Mbyte (minimum) SIMM RAM, 3.5 inch 1.44 Mbyte floppy diskette drive, on-board IDE device interface, serial/parallel port, mouse and keyboard port, 3 PC/AT expansion slots (full size), 2 additional front panel storage bays (3.5 and 5.25 inch), with the power supply factory set at 120 Vac, 60 Hz. No power cord or keyboard.
PC442-A3	Same as PC442-A2, but with the power supply factory set at 240 Vac, 50 Hz.
PC443-A2	DECstation 320SX; 80386/16 MHz base system box, 1 Mbyte (minimum) SIMM RAM, 3.5 inch 1.44 Mbyte floppy diskette drive, on-board IDE device interface, serial/parallel port, mouse and keyboard port, on-board SVGA, 3 PC/AT expansion slots (full size), 2 additional front panel storage bays (3.5 and 5.25 inch), with the power supply factory set at 120 Vac, 60 Hz. No power cord or keyboard.

Table 1–1 (Cont.)   Base System Configurations

Model Number	Description
PC443-A3	Same as PC443-A2, but with the power supply factory set at 240 Vac, 50 Hz.

1.4.1 DECstation 212LP Main Logic Board

The DECstation 212LP main logic board contains a 12 MHz Intel 80286 CPU microprocessor, a socket for an optional Intel 80287 math coprocessor, floppy disk drive controller, serial and parallel ports, PS/2 compatible mouse port, IDE drive connector, 16-bit VGA controller (800 x 600), four SIMM memory expansion slots, and one bus expansion adapter connector. The bus expansion adapter plugs into the main logic board and contains three 16-bit (also usable as 8-bit) expansion slots.

1.4.2 DECstation 316SX Main Logic Board

The DECstation 316SX main logic board contains a 16 MHz Intel 80386 CPU microprocessor, a socket for an optional Intel 80387SX math coprocessor, floppy disk drives controller, serial and parallel ports, PS/2 compatible mouse port, IDE drive connector, 16-bit VGA controller (800 x 600), four SIMM memory expansion slots, and one bus expansion adapter connector. The bus expansion adapter plugs into the main logic board and contains three 16-bit (also usable as 8-bit) expansion slots.

1.4.3 DECstation 320SX Main Logic Board

The DECstation 320SX main logic board contains a 20 MHz Intel 80386 CPU microprocessor, a socket for an optional Intel 80387SX math coprocessor, floppy disk drives controller, serial and parallel ports, PS/2 compatible mouse port, IDE drive connector, Super VGA controller (1024 x 768) with 512 Kbytes, 1 Mbyte system RAM (fixed) with four SIMM video memory expansion slots, and one bus expansion adapter connector. The bus expansion adapter plugs into the main logic board and contains three 16-bit (also usable as 8-bit) expansion slots.

1.4.4 Power Supply

The DECstation is supplied with a 100 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.

1.4.5 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 2–7.

Table 1–2   Monitors

Model Number	Part Number	Description
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	30-32317-01	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)

Table 1–2 (Cont.)   Monitors

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

Table 1–2 (Cont.)   Monitors

Model Number	Part Number	Description
PC4XV-B6	30-33968-01	SVGA color RGB 14" international version, 240 Vac 50 Hz, with 1024 x 768 resolution, North Hemisphere (IEC plug)
PC4XV-B7	30-33969-01	SVGA color RGB 14" international version, 240 Vac 50 Hz, with 1024 x 768 resolution, South Hemisphere (IEC plug)

1.4.6 Enhanced Keyboards

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

NOTE
Keyboards used with the DECstation 212LP, DECstation 316SX, and DECstation 320SX must be equipped with a 6-pin miniature PS/2 compatible connector.

1.4.6.1 101-Key Enhanced Keyboard
The 101-key enhanced keyboard provides the industry-standard IBM-PC/AT-style key arrangement on a smaller, desktop keyboard.

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

1.4.7 Math Coprocessor

The 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

Model Number	Description
PC44P-AA	10 MHz optional Intel 80287 coprocessor for the DECstation 212LP
PC46P-BB	16 MHz optional Intel 80387 coprocessor for the DECstation 316SX
PC44P-CC	16 MHz optional Intel 80387sx coprocessor for the DECstation 320SX

2
Troubleshooting

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

Tool	Part Number	Definition
Diagnose Diagnostics	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 212LP Utilities Diskette	29-28243-01	Use to reconfigure the CPU when options are installed.
DECstation 316sx Utilities Diskette	29-28111-01	Use to reconfigure the CPU when options are installed.
DECstation 320sx Utilities Diskette	29-28854-01	Use 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 message displays 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

    — 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 is to help 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 is to help 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 is to help 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 and/or system is 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 0K Memory Adapter. If you suspect a bad SIMM, first replace one SIMM and then the other.

Table 2–2   Primary Beep Codes

Beep Code	Possible Problem	Corrective Action
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.
	Clock chip lost power	Turn the computer off, wait 20 seconds and then turn it on again. Check the CMOS battery connection.
Long-short-long-short beep	Video failure	Be sure the VGA jumper setting is enabled on the main logic board.
Several bursts of beeps[1]	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.

[1]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

Beep Code	Description of Test or Failure
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 [1]
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
2-2-3	1st 64K RAM chip or data line failure - bit 6

[1] 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

Beep Code	Description of Test or Failure
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[2]
3-4-1	Screen initialization test in-progress or failure
3-4-2	Screen retraces tests in-progress or failure

[2]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

Error Number	Error Message
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
18	Invalid configuration information - please run SETUP program

Table 2–4 (Cont.)   BIOS Error Messages

Error Number	Error Message
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
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

Problem	Possible Cause	Corrective Action
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.
	Monitor is off.	Turn on the monitor.
	Monitor cable incorrectly installed.	Make sure the monitor cable is installed properly.

Table 2–5 (Cont.)   System Unit Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
	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 Ctrl Alt Del 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.
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.

Table 2–5 (Cont.)   System Unit Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
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.
	Hardware conflict (remote boot).	Make sure system is not set for remote boot.
System does not reboot when the power is turned off and on.	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**

Problem	Possible Cause	Corrective Action
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**

Problem	Possible Cause	Corrective Action
	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

Problem	Possible Cause	Corrective Action
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

Problem	Possible Cause	Corrective Action
	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

Problem	Possible Cause	Corrective Action
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 Section 3.3.1 and Section 3.3.2 of this manual or the software manual.
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 *before* 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

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 so noted. Only qualified service technicians should remove and replace FRUs. Use only Digital supplied spares.

Table 3–1 lists standard FRUs and their part numbers for the DECstation systems. Table 3–2 lists optional FRUs and their part numbers.

Table 3–1   DECstation Standard Field Replaceable Units

FRU	Digital Part Number
DECstation 212LP main logic board with 1 Mbyte memory	29-28137-01
DECstation 316SX main logic board with 0 Kbyte memory	29-28112-01
DECstation 320SX main logic board with 1 Mbyte memory (fixed)	29-28679-01
100W power supply with fan and IEC assembly	29-28113-01
Rear bezel with IEC	29-28114-01
Card guide	29-28115-01
Speaker with cable assembly	29-28138-01

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

FRU	Digital Part Number
Actuator with LED assembly	29-28116-01
Reset button assembly	29-28117-01
DECstation 212LP battery and real time clock	29-28242-01
DECstation 316SX/320SX battery	29-27439-01
Floppy drive ribbon cable assembly	29-28108-01
Floppy drive, 3.5 inch, 1.44 Mbyte	30-30942-01
Option slot PCB assembly	29-28109-01
Keyboard adapter plug	29-28100-01
Top/front cover assembly (without nameplate)	29-28110-01
Bezel, 212LP nameplate	not available
Bezel, 316SX nameplate	29-28117-01
DECstation 212LP utilities diskette	29-28243-01
DECstation 316SX utilities diskette	29-28111-01
DECstation 320SX utilities diskette	29-28854-01
DECstation VGA Graphics Utilities and User Guides (set of two diskettes)	n/a
DECstation VGA 1024 Graphics Utilities and User Guides (set of two diskettes)	n/a

Table 3–2   DECstation Optional Field Replaceable Units

FRU	Digital Part Number
14" VGM100 Monochrome monitor (US)	30-30902-01
14" VGM300 Color monitor (US)	30-30901-01
14" Color monitor 120V North Hemisphere	30-32313-01

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

FRU	Digital Part Number
14" Color monitor 120V South Hemisphere	30-32314-01
14" Color monitor 240V North Hemisphere	30-32315-01
14" Color monitor 240V South Hemisphere	30-32316-01
14" Color monitor 120V North Hemisphere	30-32317-01
14" Color monitor 120V South Hemisphere	30-32318-01
14" Color monitor 240V North Hemisphere	30-32319-01
14" Color monitor 240V South Hemisphere	30-32320-01
512 Kbyte 80 ns SIMM Memory Kit (320sx)	19-32974-02
512 Kbyte 100 ns SIMM Memory Kit (212lp/316sx)	19-32974-01
2 Mbyte 80 ns SIMM Memory Kit (320sx)	19-32975-02
2 Mbyte 100 ns SIMM Memory Kit (212lp/316sx)	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, 3.5"	30-30903-01
SCSI hard disk drive, 80 Mbyte, 3.25"	30-30904-01
SCSI hard disk drive, 170 Mbyte, 5.25"	30-30905-01
SCSI hard disk drive, 320 Mbyte, 5.25"	30-33157-01
Tape drive, 60 Mbyte, (QIC-40)	30-34181-01
Mini-Tape cartridge, 1/4" (QIC-40)	30-?????-01
IDE hard disk drive, 20 Mbyte, 3.5"	30-32375-01
IDE hard disk drive, 40 Mbyte, 3.5"	30-32345-01

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

FRU	Digital Part Number
IDE hard disk drive, 105 Mbyte, 3.5"	30-34429-01
IDE hard disk drive, 120 Mbyte, 3.5"	30-32344-01
IDE dual drive ribbon cable assembly	29-27912-01
2400 BPS integral modem	30-31072-01
1200 BPS integral modem	30-31073-01
10 MHz Intel 80287 math coprocessor	19-30951-01
16 MHz Intel 80387sx math coprocessor	19-30973-01
20 MHz Intel 80387sx math coprocessor	19-?????-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	29-28680-01-01
Keyboard, 101-key enhanced MD	29-32503-01
Two-Button mouse, PS/2-Type, Microsoft compatible	30-25322-01
DEPCA adapter	70-24252-01
DEPCA Turbo	70-22837-01 or -02
115 Vac system box power cord	17-02607-01

3.1.1 Before Replacing FRUs

The following criteria apply when removing or installing DECstation FRUs.

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

- Always turn power to the system and monitor off 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.

  CAUTION
  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.

New Illustration LJ-1711

Figure 3–1   Exploded View of DECstation Chassis

New Illustration LJ-1710

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

3.2.1 Keyboard Replacement

Replace the keyboard as follows:

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

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 power to the system unit and monitor off.

2. Unplug the power cord to the system unit 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 system unit 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 power to the system unit and monitor off.

   CAUTION
   All power must be off when connecting or disconnecting the mouse or damage to the mouse and/ or main logic 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 power to the system unit and monitor off.

   CAUTION
   To avoid damage to the hard disk, do not move or perform the following procedure for at least 20 seconds after you turn power to the system off.

2. Disconnect all cables from the back of the system unit.

3. Remove the two countersunk screws that secure the cover to the chassis of the system unit (Figure 3–3).

4. Slide the cover forward about three inches to clear the locating pins on the inside of the front bezel and remove the cover (Figure 3–3).

New Illustration LJ-1709

Figure 3–3   Removing the DECstation System Cover

3.2.5 Opening the System Unit

Open the system unit as follows (Figure 3–4):

1. Using the key, unlock the system box.

2. Remove the two shake-proof fittings that secure the system unit option cover and carriage (metal fold-outs).

3. Lift the option cover (left side) counter-clockwise and remove.

4. Lift the carriage (right side) clockwise.

New Illustration LJ-1708

Figure 3–4   Opening the DECstation System Unit

3.2.6 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 cover (Section 3.2.4) and open the system unit (Section 3.2.5).

2. Note the position of all cables (if any) connected to the option board and disconnect them.

    NOTE
    When removing an option board note it's location and the location and routing of all cables (if any) attached to the option board.

3. Remove the mounting screw that secures the option board to the chassis.

4. Remove the board by sliding it to the left 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 bus adapter board.

7. Secure the board to the chassis with the mounting screw.

8. Reconnect any cables you removed.

3.2.7 Option Slot Printed Circuit Board Replacement

Remove the option slot printed circuit board (PCB) as follows:

1. Remove the cover (Section 3.2.4) and open the system unit (Section 3.2.5).

2. Remove the two screws that secure the chassis support to the system unit, one in the front of the system unit and one in the rear of the chassis support (Figure 3–5).

3. Lift the chassis support and option slot PCB upward and out of the system unit (Figure 3–5).

4. Remove the two screws securing the option slot PCB to the chassis support (Figure 3–5).

5. Secure the new option slot PCB to the chassis support (Figure 3–5).

6. Re-install the chassis support and option slot PCB by reversing these steps.

   CAUTION
   There is a mylar insulator in back of the option slot PCB. Make sure it is installed and in position when replacing the option slot PCB.

   NOTE
   When replacing the chassis support make sure the slotted tab at the rear connects to the rear panel.

New Illustration LJ-1707

Figure 3–5   Removing the Bus Adapter Board

3.2.8 Speaker Replacement

Replace the speaker as follows:

1. Remove the cover (Section 3.2.4) and open the system unit (Section 3.2.5).

2. Disconnect the speaker cable from the main logic board (Figure 3–1).

3. Remove two 5/16-inch nuts and lock washers securing the speaker to the bottom of the chassis (Figure 3–1).

4. Remove the speaker.

   Replace the speaker and connect the cable to the main logic board.

3.2.9 Battery Replacement

Replace the battery as follows:

1. Remove the cover (Section 3.2.4) and open the system unit (Section 3.2.5).

2. Remove the battery as follows:

   • On the DECstation 212LP, remove the battery by lifting it out of the socket on the main logic board (Figure 3–6).

   • On the DECstation 316SX and DECstation 320SX, remove the cable from J3 on the main logic board (Figure 3–7). Remove the battery from the system unit by pulling it off the Velcro mounting strip.

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

3. Replace the battery by reversing the steps.

New Illustration LJ-1706

Figure 3–6   Removing the DECstation 212LP Battery

New Illustration LJ-1705

Figure 3–7   Removing the DECstation 316sx/ 320sx Battery

3.2.10 Reset Button Removal

Remove the reset button as follows:

1. Remove the cover (Section 3.2.4) and open the system unit
    (Section 3.2.5).

2. Remove all option boards from the system unit (if any)
    (Section 3.2.6).

3. Disconnect the reset button cable from the main logic board (Figure 3–8).

4. Depress the option board card guide clip (Figure 3–8).

5. Slide the card guide to the left and remove it from the system unit (Figure 3–8).

6. From the back of the card guide, push the reset button (and cable) forward through the card guide (Figure 3–8).

Replace the reset button by reversing these steps.

New Illustration LJ-1704

Figure 3–8   Removing the Reset Button

3.2.11 Single-In-Line Memory Module Replacement

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

1. Remove the cover (Section 3.2.4) and open the system unit (Section 3.2.5).

2. Remove any option boards that might obstruct the removal and installation of SIMMs.

3. Use both hands and spread the retaining clips that hold the SIMM in place (Figure 3–9 and Figure 3–10).

4. Move the SIMM forward to the vertical position (Figure 3–9 and Figure 3–10).

5. Use your index fingers to pull the SIMM away from the retaining brackets (Figure 3–9 and Figure 3–10) and remove the SIMM.

6. Grasp the SIMM at both ends and insert it into the socket (Figure 3–9 and Figure 3–10) and replace the SIMM. Make sure the SIMM is fully seated in the connector.

7. Press 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.

Insert version LJ-1703

Figure 3–9   Removing and Replacing the 212LP SIMM

Insert version LJ-1784

Figure 3–10   Removing and Replacing the 316sx/320sx SIMM

3.2.12 Math Coprocessor Replacement

Replace the math coprocessor as follows:

1. Remove the cover (Section 3.2.4) and open the system unit (Section 3.2.5).

2. Locate the math coprocessor on the main logic board (Figure 3–11 and Figure 3–12).

3. Remove the math coprocessor as follows:

   • DECstation 212LP: Use a small, flat-blade screwdriver and alternately lift each end of the coprocessor. (Figure 3–11).

   • DECstation 316SX and DECstation 320SX: Use a special tool to simultaneously lift each corner of the coprocessor. (Figure 3–12).

   NOTE
   While lifting the coprocessor out of the socket be careful not to damage it or the socket, or bend any pins.

4. Before installing the new math coprocessor, straighten any pins (if necessary) so they align with the holes in the socket.

5. Make sure pin 1 of the math coprocessor is aligned with pin 1 of the socket.

   NOTE
   Facing the front of the DECstation 212LP, the pin 1 location is indicated by a dot near the lower left corner of the socket (Figure 3–11).

   Facing the front of the DECstation 316SX and DECstation 320SX, the pin 1 location is indicated by a numeral 1 near the lower right corner of the socket (Figure 3–12).

6. Install the new math coprocessor in the socket by alternately pressing each end into the socket. Do this until it is firmly seated in the socket (Figure 3–11 and Figure 3–12).

Insert version LJ-1701

Figure 3–11   Replacing the 212LP Math Coprocessor

New Illustration LJ-1700

Figure 3–12   Replacing the 316sx Math Coprocessor

New Illustration LJ-1785

Figure 3–13   320sx Math Coprocessor Replacement

3.2.13 Main Logic Board Replacement

Replace the main logic board as follows:

1. Remove the cover (Section 3.2.4) and open the system unit (Section 3.2.5).

2. Remove all option boards and their cables, if any, (Section 3.2.6).

3. Remove the system unit chassis support and bus adapter board (Section 3.2.7).

4. Remove all the SIMMs installed on the main logic board (Section 3.2.11).

5. Remove the math coprocessor if one is installed (Section 3.2.12).

6. Remove the power supply, power on LED, floppy/ hard/ tape drive interface, and IDE interface cables attached to the main logic board (Figure 3–14 and Figure 3–15).

   NOTE
   When removing the cables note their location and routing.

7. Remove six 3/16-inch hex standoffs that secure the serial, parallel, and monitor connectors to the system unit (Figure 3–14 and Figure 3–15).

   NOTE
   The connectors are soldered to the main logic board. Each connector (and main logic board) is secured to the system unit by the six standoffs.

8. Remove the six screws securing the main logic board to the system unit (Figure 3–14 and Figure 3–15).

9. Remove the main logic board (Figure 3–14 and Figure 3–15).

10. Set all switches and jumpers on the new main logic board to the same positions as those set on the old main logic board.

11. Install all options (if any) that were removed from the old main logic board onto the new main logic board.

12. Replace the main logic board by reversing the steps used to
remove the board.

NOTE
There is a mylar insulator under the main logic board.
Make sure it is installed and in position when replacing
the main logic board (Figure 3–14 and Figure 3–15).

New Illustration LJ-1699

Figure 3–14   Removing the 212LP Main Logic Board

New Illustration LJ-1698

Figure 3–15   Removing the 316sx Main Logic Board

New Illustration LJ-1786

Figure 3–16   Removing the 320sx Main Logic Board

3.2.14 Floppy Drive Replacement

Replace the floppy drive as follows (Figure 3–17):

1. Remove the cover (Section 3.2.4) and open the system unit (Section 3.2.5).

2. Remove the ribbon cable from the back of the drive.

3. Remove the three mounting screws that hold the drive in place. One screw is located underneath the left side and two are on the right side of the floppy.

4. Remove the floppy disk drive.

5. Set the switch on the new drive to match that of the old drive.

6. Install the new drive and re-install the three mounting screws

7. Reconnect the ribbon cable to the floppy drive.

8. After replacing the drive reconnect all system cables.

9. Verify the operation of the new drive.

10. Reinstall the system cover.

3.2.15 Replacing An Optional Floppy Drive

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

3.2.16 Replacing an Optional Hard Disk or Tape Drive

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

New Illustration LJ-1697

Figure 3–17   Replacing the Floppy Disk Drive

3.2.17 DECstation Power Supply Removal

Remove the DECstation power supply as follows (Figure 3–18):

1. Remove the cover (Section 3.2.4) and open the system unit (Section 3.2.5).

2. Remove the ribbon cable from the back of the drive.

3. Disconnect the power supply and power on LED cables from the main logic board.

4. Remove the LED actuator arm from the power supply by sliding the tie wrap toward the front of the system unit and lifting the arm up and off the power supply switch.

5. Facing the front of the system unit, remove the three mounting screws on the right side of the power supply.

6. Tilt the carriage up 90° and remove the two screws on top of the carriage holding the power supply.

7. Separate the power supply unit from the system unit by sliding it away from the front of the system unit.

   NOTE
   Check the power supply fuse before installing a new power supply. The fuse is rated at 4 AMPS/ 250 Vac and is approx. 3/4 inch in length.

To replace the power supply unit perform the previous steps in reverse order.

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Figure 3–18   Removing the DECstation Power Supply

3.3 Main Logic Board Jumpers

3.3.1 212LP Main Logic Board Jumpers

Figure 3–19 shows the location of the jumpers on the main logic board. Table 3–3 describes the jumper configurations and provides a recommended default setting for the jumpers.

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Figure 3–19   212LP Main Logic Board Jumper Locations

Table 3–3   212LP Main Logic Board Jumper Settings

Feature	Description	Jumper Setting
Video interrupt	Standard[1]	E12 and E13, No connection
	IRQ9	E12 and E13, installed
On-board video	Enabled[1]	E15 and E16, installed
	Disabled	E14 and E15, installed
BIOS ROM type	4 Mbyte or 8 Mbyte ROM[1]	E10 and E11, installed
	Two 32 Kbyte EEPROMs (U17 and U18)	E9 and E10, installed
Expansion bus speed	Same as system clock speed [1]	E2 and E4, installed
	One-half system clock speed	E4 and E8, installed
Memory parity check	Enabled[1]	E5 and E6, installed
	Disabled	E6 and E7, installed

[1]Default Setting

3.3.2 316sx Main Logic Board Jumpers

Figure 3–20 shows the location of the jumpers on the main logic
board. Table 3–4 describes the jumper configurations and provides
a recommended default setting for the jumpers.

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Figure 3–20   316sx Main Logic Board Jumper Locations

Table 3–4   316sx Main Logic Board Jumper Settings

Feature	Description	Jumper Setting
Math coprocessor	80387sx installed[1] 80387sx not installed	E30 and E31, installed E31 and E32, not installed
BIOS ROM type	128 Kbyte (16 KB)	E2 and E3, installed E5 and E6, installed
	256 Kbyte (32 KB)[1]	E1 and E2, installed E5 and E6, installed
	512 Kbyte (64 KB)	E1 and E2, installed E4 and E5, installed
Printer port interrupt	IRQ5 select IRQ7 select [1]	E19 and E20, installed E20 and E21, installed
Serial port interrupt	IRQ3 select IRQ4 select [1]	E16 and E18, installed E14 and E16, installed
Video mode	Color monitor[1] Monochrome monitor	E7 and E8, installed E8 and E9, installed
Video port interrupt	Disable IRQ9[1] Enabled IRQ9	E25 and E26, No connection E26 and E27, installed
On-board video	VGA enabled[1] VGA disabled	E33 and E34, installed E34 and E35, installed

[1]Default Setting

3.3.3 DECstation 316sx Main Logic Board Switch Settings

Figure 3–21 shows the location of the switch on the main logic board. Table 3–5 describes the switch configurations and provides a recommended default setting for each switch.

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Figure 3–21   DECstation 316sx Main Logic Board Switch Location

Table 3–5   DECstation 316sx Main Logic Board Switch Settings

Feature	Description	Switch Setting
Parallel Port Enable (SW1)	Enabled[1] Disabled	SW1, on SW1, off
Parallel Port Address(SW2)	LPT1= 378-37F HEX [1] LPT2= 278-27F HEX	SW2, on SW2, off
Serial Port Enable (SW3)	Enabled[1] Disabled	SW3, on SW3, off
Serial Port Address (SW4)	COMM1= 3F8-3FF HEX[1] COMM2= 2F8-2FF HEX	SW4, on SW4, off
Parallel Port Mode (SW5)	Enabled unidirectional [1] Enabled bi-directional	SW5, on SW5, off
Diskette Drive Address (SW6)	Primary= 3F0-3F7 HEX[1] Secondary= 370-377 HEX	SW6, on SW6, off
IDE Drive Enable (SW7)	Enable IDE connector[1] Disable IDE connector	SW7, on SW7, off
IDE Drive Address (SW8)	Primary= 1F0-1F7 HEX for CS0 [1] 376-377 HEX for CS1[1]	SW8, on
	Secondary= 170-177 HEX for CS0 376-377 HEX for CS1	SW8, off

[1]Default Setting

3.3.4 320sx Main Logic Board Jumpers

Figure 3–22 shows the location of the jumpers on the main logic board. Table 3–6 describes the jumper configurations and provides a recommended default setting for the jumpers.

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Figure 3–22   320sx Main Logic Board Jumper Locations

Table 3–6   320sx Main Logic Board Jumper Settings

Feature	Description	Jumper Setting
BIOS ROM Type	256 Kbyte (32 KBx8)[1]	E5 and E6, installed E1 and E2, installed
Reserved for future use	Reserved for future use	Reserved for future use
Parallel port interrupt	IRQ5 IRQ7 [1]	E13 and E14, installed E14 and E15, installed
Serial port interrupt	IRQ3 IRQ4 [1]	E17 and E18, installed E16 and E17, installed
Video mode	Color [1] Monochrome monitor	E8 and E9, installed E7 and E8, installed
Video interrupt	Disable [1] Enabled IRQ9	E22, E23, and E24 fixed
On-Board video enable	Enabled[1] VGA disabled	E19 and E20, installed E20 and E21, installed

[1]Default Setting

3.3.5 DECstation 320sx Main Logic Board Switch Settings

Figure 3–23 shows the location of the switch on the main logic board. Table 3–7 describes the switch configurations and provides a recommended default setting for each switch.

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Figure 3–23   DECstation 320sx Main Logic Board Switch Location

Table 3–7   DECstation 320sx Main Logic Board Switch Settings

Feature	Description	Switch Setting
Parallel port	Enabled[1] Disabled	SW1, on SW1, off
Parallel port address	LPT1= 378-37F HEX [1] LPT2= 278-27F HEX	SW2, on SW2, off
Serial port	Enabled[1] Disabled	SW3, on SW3, off
Serial port address	COMM1= 3F8-3FF HEX[1] COMM2= 2F8-2FF HEX	SW4, on SW4, off
Parallel port mode	Enabled unidirectional [1] Enabled bi-directional	SW5, on SW5, off
Diskette drive address	Primary= 3F0-3F7 HEX[1] Secondary= 370-377 HEX	SW6, on SW6, off
IDE drive	Enable IDE connector[1] Disable IDE connector	SW7, on SW7, off
IDE drive address	Primary= 1F0-1F7 HEX for CS0 [1] 376-377 HEX for CS1[1]	SW8, on
	Secondary= 170-177 HEX for CS0 376-377 HEX for CS1	SW8, off

[1]Default Setting

A
Power Consumption

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

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

Table A–1   DECstation Base System Power Consumption

Current	+5 Volts Amps	-12 Volts Amps	+12 Volts Amps	+12 Peak Amps	DC Power (VA)
Available current	12.80	0.300	2.700	5.00	—
Current required	2.70	0.024	0.030	—	—
Reserve current	10.10	0.280	2.670	5.00	—
Power consumed	13.50	0.120	0.150	—	13.77
Power available	—	—	—	—	86.23

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

Pin Number	Function
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
15	Error
16	Initialize

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

Pin Number	Function
17	Select in
18 to 25	Ground

Table B–2   RS-232C Serial Port Connector

Pin Number	Function
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

Pin Number	Function
1	Data
2	Reserved
3	Ground
4	+5 Vdc
5	Clock
6	Reserved

Table B–4   Video Port Connector

Pin Number	Function
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.**

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.