DECpc 420SX

DECpc 420SX

Service Guide

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Contents

Figures

Tables

Page vi is a blank page

About This Guide

This service guide is designed to help you diagnose and repair the DECpc 420SX computer. This guide cont ins 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.

Organization

This guide is organized as follows:

- Chapter 1 provides an overview of the DECpc system.

- 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 Trouble-shooting Guide*. For additional information about PC architecture and the Digital Ether-WORKS option board, refer to the *DEC EtherWORKS Service Guide*.

Intended Audience

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

Conventions

This document uses the following conventions:

Convention	Meaning
WARNING	Information to prevent personal injury.
CAUTION	Information to prevent damage to equipment.
NOTE	General information you should be aware of.
CTRL+ALT+DEL	Key sequence. Press and hold the indicated keys in the order shown. In this example, press and hold CTRL while you press both ALT and DEL. Key sequences have special functions.
Strike the F1 key	Prompts displayed on the screen. Shown in monospaced type in this manual.

Throughout this guide, DECpc refers to the DECpc 420SX.

The DECpc 420SX is compatible with the industry-standard IBM PC/AT architecture and the Microsoft disk operating system (MS-DOS). Support for MS-DOS requires a defined set of ROM-BIOS (Read-Only Memory, Basic Input/Output System) services, which the DECpc 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 a.m. to 8:00 p.m. (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 documents are available as supplements to the information provided in this guide.

Document Title	Part Number
DECpc 420SX User's Guide	ER-PC445-UG
DECpc 420SX User's Guide (multilingual)	ER-PC44Y-CF
DECpc 420SX Technical ReferenceManual	ER-PC44Y-EE
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 Verification Guide	EK-DEC-VG

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

> Digital Equipment Corporation
> 444 Whitney Street
> Northboro, MA 01532
>
> Attn: Publishing and Circulation Services (NR03/W3)
> Order Processing Section

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> Digital Equipment Corporation
> Digital Drive
> Westminster, MA 01473-0471
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To order documents by mail, write to:

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

CHAP 1

1

Overview

Introduction

The DECpc 420SX is a desktop computer. It can be used as a stand-alone personal computer or as a node on a network to a VAX computer or another DECpc with network server software. The DECpc runs Digital and other industry-standard applications.
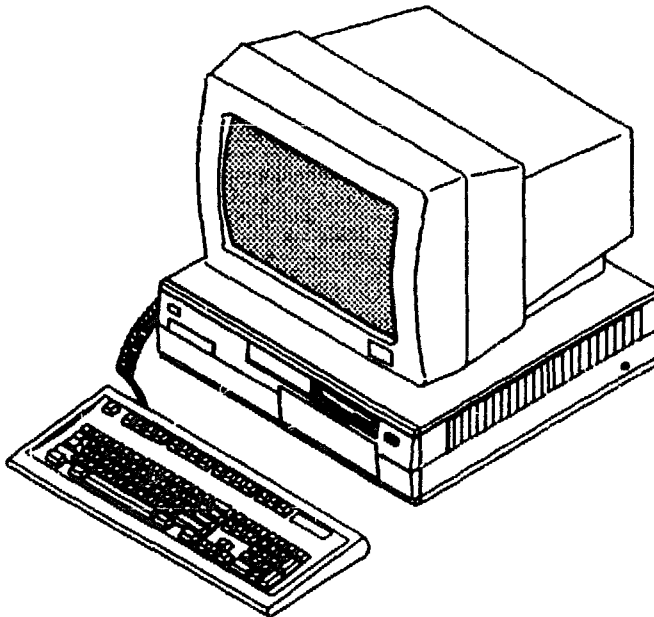
Figure 1-1. The DECpc 420SX

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

DECpc Base System

The DECpc base system unit consists of the following components:

- low-profile desktop case
- main logic board containing:

    20 MHz Intel i486SX microprocessor

    4MB RAM, expandable to 32MB on the main logic board

    eight SIMM sockets on the main logic board

    serial and parallel ports

    PS/2-compatible mouse port

    PS/2-style AT-compatible keyboard interface

    Integrated 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 1.44MB diskette drive

DECpc Options

The following are options available for the DECpc base system:

- color or monochrome VGA analog monitor

- keyboard (country-specific)

- serial/parallel port adapter

- 52MB, 105MB, and 120MB IDE hard disk drives

- 16-bit SCSI host adapter

- 40MB, 80MB, 170MB, 209MB, 320MB, and 429MB SCSI hard disk drives

- CD-ROM drive

- 150MB SCSI tape cartridge system

- 60MB streaming tape drive (QIC-40)

- 8514/A-compatible graphics adapter

- 3.5-inch 1.44MB diskette drive

- 3.5-inch 2.88MB diskette drive

- 5.25-inch 1.2MB diskette drive

- 5.25-inch 360KB diskette drive

- PS/2-compatible mouse

- power cord (country-specific)

- 2400-baud internal modem

- 1200/300-baud internal modem

- DEC EtherWORKS bus adapter

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

System Unit Layout

The figure below 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.

Power Supply

Option Slot PCB
(Bus Adapter Board)

Power Switch
Button

Option Slots

Diskette Drive

Reset Button

Optional Drives

Main Logic Board
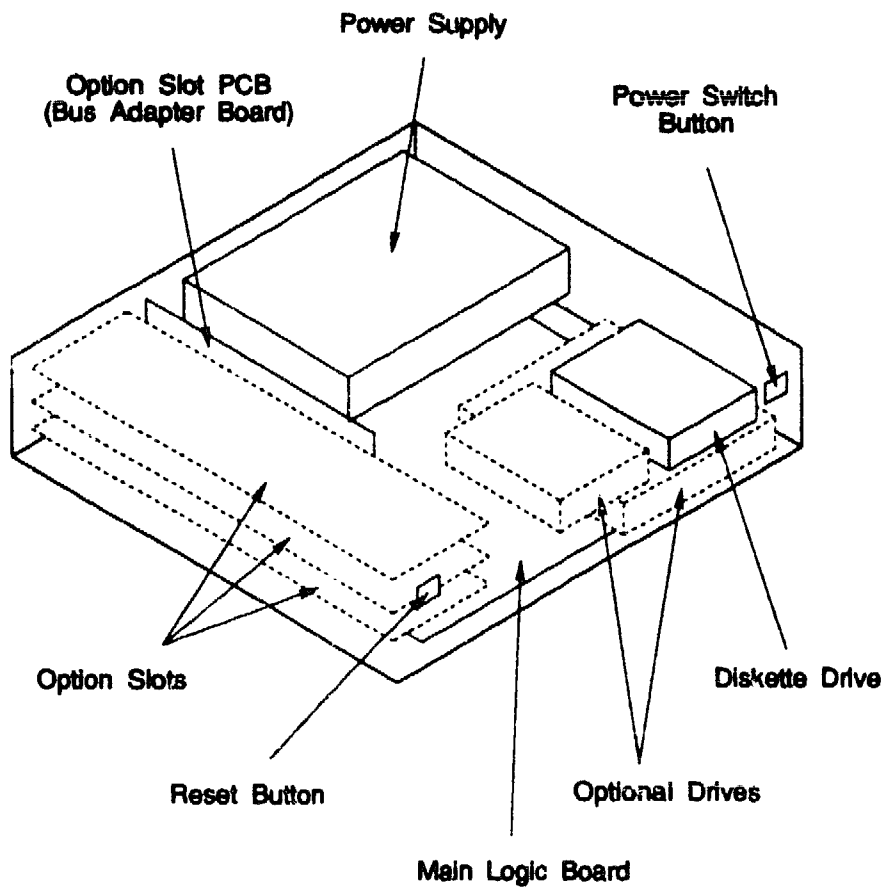
Figure 1-2. System Unit Layout

DECpc System Configurations

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

Table 1-1. Base System Configurations

Model Number	Description
PC445-A2	DECpc 420SX; i486SX/20 MHz base system box, 4MB (minimum) RAM, 3½-inch 1.44MB diskette drive, on-board IDE hard drive interface, two serial ports, parallel port, mouse and keyboard port, on-board SVGA, three ISA expansion slots (full size), two additional front panel half-height drive bays (3½ and 5¼ in.), with the power supply factory set at 115 VAC, 60 Hz (no power cord or keyboard)
PC445-A3	Same as PC445·∴ ∵ with the power supply factory set at 230 VAC, 50 H..
PC445-AA	Same as PC445-A2, plus 115 VAC (U.S.) power cord

Table 1-2. Packaged Systems

Model Number	Description
DJ-PC445-AA	DECpc 420SX system, 115 VAC (U.S.) power cord, 4MB memory, 52MB IDE hard disk drive, 14-inch monochrome monitor, industry standard keyboard, mouse, and MS-DOS 5.0 operating system software
DJ-PC445-AB	DECpc 420SX system, 115 VAC (U.S.) power cord, 4MB memory, 52MB IDE hard disk drive, 14-inch color monitor, industry standard keyboard, mouse, and MS-DOS 5.0 operating system software

DECpc 420SX Main Logic Board

The DECpc 420SX main logic board contains a 20 MHz Intel i486SX microprocessor, floppy disk drive controller, serial and parallel ports, PS/2-compatible mouse port, IDE drive connector, 16-bit Super VGA controller (1024 x 768) with 512KB video RAM, 4MB system RAM with eight 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 ISA (also usable as 8-bit) expansion slots.

Power Supply

The DECpc is supplied with a 100-watt power supply that includes an auxiliary AC power (IEC) connector. The power supply is switch selectable between 115 VAC, 60 Hz, and 230 VAC, 50/60 Hz power input.

Monitors

The DECpc supports both color and monochrome VGA analog monitors. Monitors with different input voltage and alignment specifications are available to meet international requirements.

Enhanced Keyboards

Several keyboards are available as options on the DECpc. Keyboards used with the DECpc 420SX must be equipped with a 6-pin miniature DIN (PS/2-style) connector.

Industry Standard PS/2-Style 101-Key Keyboard

The 101-key enhanced keyboard provides the industry-standard PS/2-style key arrangement with American English keys.

International 102-Key Industry Standard Keyboards

The international keyboards provide a standard 102-key arrangement in language-specific variations. Country-specific keyboards are available for Belgium, Denmark, Finland, France, Germany, Israel, Italy, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

CHAP 2

2

Troubleshooting

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

- Diagnostics

- Special Tools

- Normal Power-Up

- Troubleshooting Procedures

- Error Codes and Messages

- Troubleshooting by Symptom

- Troubleshooting Problems Occurring During System Operation

- Using the System Utilities Diskette

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

Diagnostics

The DECpc 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 error messages displayed on the screen. These error messages are described in "Error Codes and Messages."

Special Tools

The following table lists the special tools needed to troubleshoot the DECpc system.

Table 2-1. Troubleshooting Tools

Tool	Part Number	Definition
DiagSoft QA Plus Diagnostics Software Version 4.52 or greater	22-00908-02	Stand-alone diagnostics, available separately. For information about using these diagnostics, refer to the *QA Plus User's Guide*.
Tri-wrap Loopback Connector	FD-10164-00	Triple connector. Consists of three loopback connectors (male 25-pin parallel, female 25-pin serial, and female 9-pin serial), bundled together and housed in a convenient package.
DECpc 420SX Utilities Diskette	AK-PC445-AA	Use to reconfigure the CPU when options are installed.

Normal Power-Up

A normal system power-up routine includes the following sequence of events:

1. Power to the monitor and system unit is turned on. Both power indicators are illuminated.

2. The system executes its power-up tests and displays the BIOS ROM version, the copyright information, and the memory size. Depending on the option(s) installed, additional information might be displayed.

   If an error occurs during any power-up test, the system 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. The actual information displayed at this time depends on the system software.

_____ NOTE _____

Allow 15-20 seconds between turning power off and turning power on to ensure proper power supply recovery when restarting the computer.

_____

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 QA Plus diagnostic package. Perform the steps in "Getting Started" and then proceed to the recommended procedure.

_____ CAUTION _____

Do not connect or disconnect the video cable from the monitor or system when the monitor and/or system is on. Doing this can damage the system. Always turn off the monitor and system, and then disconnect the power cord before you remove the system unit cover. Observe antistatic precautions.

_____

_____ CAUTION _____

If the DECpc is connected to a network, disconnect it from the network before troubleshooting.

_____

Getting Started

The following steps prepare you for troubleshooting a DECpc:

1. Ask the customer to describe the problem. Find out:

    *   when the problem started

    *   whether any new hardware options were added to the system around the time the problem started and whether the options are Digital-certified or third party

    *   whether 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 following system configuration information:

    *   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 other than the on-board VGA)

    *   any other options installed in the system

4. Observe the problem. Based on your observations, refer to one of the following procedures:

    *   If the system does not power up, see "No Power."

    *   If the system powers up but will not boot, see "System Does Not Boot."

    *   If the system powers up and boots, see "System Boots."

No Power

·This procedure is to help determine the cause of the problem when the DECpc does not power up. Before starting, be sure you have completed the steps in "Getting Started."

_____ CAUTION _____

If the DECpc is connected to a network, disconnect it from the network before beginning to troubleshoot.
_____

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 the monitor power cord into a working AC outlet.

4. Turn on the monitor and system unit. Check for indications of system power:

   • Power indicators (LEDs) on the system unit and the monitor are on.

   • You can hear the fan running.

   • You can hear the hard disk spinning.

If the system does not power up:

1. Turn off the system unit and the monitor.

2. Wait 20 seconds to allow the power supply circuitry to reset.

3. Unplug the system and the monitor from the AC outlet.

4. Disconnect power to all the hard disk drives, and remove all options.

5. Plug the monitor and the system into a working AC outlet.

6. Turn on the monitor and the system. If the system powers up, a device is faulty, too many options are installed, or there is another power-related problem.

7. Try booting the system from the operating system startup diskette.

8. Replace the Digital certified options one at a time. See whether the system powers up each time an option is replaced or a disk drive is reconnected.

   If the system powers up and does not boot, refer to "System Does Not Boot."

   If the system powers up and boots, refer to "System Boots."

System Does Not Boot

This procedure is to help determine why the DECpc does not boot. Before starting this procedure, be sure you have done the steps in "Getting Started."

_____ CAUTION _____

If the DECpc is connected to a network, disconnect it from the network before beginning to troubleshoot.

_____

1. Remove any third party options and try to reboot the system. If the system generates any beep codes, refer to "Power-Up Beep Codes."

2. Try booting from the operating system startup diskette.

    *   If the system does not boot, verify that all switches are set correctly. Then, reboot the system.

    *   Lack of beep codes and video indicate a possible bad main logic board.

    *   If the system still does not boot, remove all options and try to boot the system.

    *   Replace the Digital-certified options one at a time. See whether 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 "System Boots."

System Boots

This procedure is to help determine the cause of a problem that arises after the DECpc powers up and boots normally. Before starting this procedure, be sure you have completed the steps in "Getting Started."

_____ CAUTION _____

If the DECpc is connected to a network, disconnect it from the network before beginning to troubleshoot.

_____

1. Determine what the failure is. Refer to "Error Codes and Messages" for a list of possible error messages. If there are no error messages, refer to "Troubleshooting by Symptom" for a list of symptoms and possible causes.

2. Run the QA Plus diagnostics.

3. Replace the necessary FRU.

Error Codes and Messages

During the power-up sequence, the DECpc executes built-in diagnostic and *bootstrap* routines. Initially, the system generates beep codes on the speaker if the test program detects a fatal error. After screen initialization and verification, the built-in diagnostic routine sends non-fatal error messages to video memory and the system displays the message(s) 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. Doing this can damage the system. Always turn off the monitor and the system, and then disconnect the power cord before you remove the system unit cover. Observe antistatic precautions.

The system generates two levels of beep codes. The primary level consists of combinations of long and short beeps that indicate possible system malfunction. The secondary level uses bursts of beeps to indicate specific malfunction locations on the main logic board.

Primary Beep Codes

The table on the following page lists the primary beep codes. The primary beep codes indicate main logic board failure, memory failure, memory configuration error, or video error. If a memory failure is indicated, check and reseat the single-in-line memory modules (SIMMs) in the system. If you suspect a bad SIMM, replace one SIMM at a time and test for recurrence of the error after installing each SIMM.

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 the drive cables are firmly connected and the drive switch/jumper 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	Verify the configuration information entered with the computer's setup utility.
	Configuration record bad	Check the information entered with the computer's setup utility. See the hard disk installation guide for configuration information. Check the CMOS battery connection.
	Clock chip lost power	Turn off the computer, wait 20 seconds, and then turn it on again. Check the CMOS battery connection.
	Network controller configuration error	Reset the system. Verify all IRQ, memory, and I/O address jumper settings. Refer to the *DEC EtherWORKS Owner's Manual* for more information.
Long-short-long-short	Video failure	Verify the VGA switch settings on the main logic board.
Several bursts of beeps[1]	BIOS ROM, CMOS, DMA, RAM, interrupt, or read/write error	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 "Secondary Beep Codes."

Secondary Beep Codes

The following table lists the secondary beep codes and the test in progress or test failure that corresponds to each numeric beep code pattern. When several bursts of beeps are generated, listen carefully and remember 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 64KB 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 64KB RAM chip of data line failure - multiple-bit[1]
1-3-4	1st 64KB RAM odd/even logic failure
1-4-1	1st 64KB RAM address line failure
1-4-2	1st 64KB parity test in-progress or failure
2-1-1	1st 64KB RAM chip or data line failure - bit 0
2-1-2	1st 64KB RAM chip or data line failure - bit 1
2-1-3	1st 64KB RAM chip or data line failure - bit 2
2-1-4	1st 64KB RAM chip or data line failure - bit 3
2-2-1	1st 64KB RAM chip or data line failure - bit 4
2-2-2	1st 64KB RAM chip or data line failure - bit 5
2-2-3	1st 64KB RAM chip or data line failure - bit 6
2-2-4	1st 64KB RAM chip or data line failure - bit 7
2-3-1	1st 64KB RAM chip or data line failure - bit 8
2-3-2	1st 64KB RAM chip or data line failure - bit 9
2-3-3	1st 64KB RAM chip or data line failure - bit A
2-3-4	1st 64KB RAM chip or data line failure - bit B
2-4-1	1st 64KB RAM chip or data line failure - bit C
2-4-2	1st 64KB RAM chip or data line failure - bit D
2-4-3	1st 64KB RAM chip or data line failure - bit E
2-4-4	1st 64KB 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

[1] Any of the RAM failures can be caused by a SIMM improperly seated in its socket.
[2] Test failures from this point on may be attributed to the VGA components on the main logic board. Try disabling the on-board video and installing a VGA adapter in an expansion slot.

Test Messages

After screen initialization and verification, the system displays non-fatal error messages on the monitor. The following table lists the non-fatal error messages and the corresponding BIOS error numbers.

Table 2-4. BIOS Error Messages

Error Number	Error Message
1	Gate A20 failure
2	Unexpected interrupt in protected mode
3	Unexpected SW interrupt at *xxxx:xxxx*
	Type (S)hut off NMI, (R)eboot, other keys to continue
4	Memory tests terminated by keystroke
5	Memory *yyyy* failure at *xxx* read *xxxx* expecting *xxxx*
6	Display adapter failed; using alternate
7	No timer tick interrupt
8	Shutdown failure
9	Timer chip counter 2 failed
10	Keyboard *xxxx* 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 utility
19	Time-of-day not set - please run setup utility
20	Keyboard is locked - please unlock
21	Optional ROM bad checksum = *xx*
22	Strike the F1 key to continue, F2 to run the setup utility
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 -
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
48	Enter Password:
49	Password is incorrect
50	Password OK
51	Password has been removed
52	New password has been installed
53	System halted! Must power down

Troubleshooting by Symptom

This section describes causes and corrective actions for minor system unit, drive, monitor, and pointing device problems.

System Unit Problems

The following table lists some common system unit problems, possible causes, and suggested corrective actions. If a corrective action does not work and it is possible to run the QA Plus diagnostics, use the diagnostics to 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 off the system. Plug in the system, and then turn it on again.
	No power at wall outlet.	Use a working AC wall outlet.
	Voltage selector switch incorrectly set.	Make sure the 115/230 VAC voltage selector 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.
	Main logic board failure.	Make sure the VGA switches on the main logic board are enabled. If the switches are enabled, replace the main logic board.
A DEC EtherWORKS board is installed, but the node does not boot when you try to reboot after using the System Utilities diskette.	Using a diskette generated reset is not compatible with the Ethernet board.	Press CTRL+ALT+DEL (a soft reset) to properly reset the hardware, and then turn the system off and on.

Table 2-5. System Unit Troubleshooting Procedures (continued)

Problem	Possible Cause	Corrective Action
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 onto 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 set correctly.
	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.
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.

Disk-Related Problems

The following table lists some common disk-related problems, possible causes, and suggested corrective actions. If the corrective action does not work, run the QA Plus diagnostics to isolate the problem and then replace the failing FRU.

If a disk-related problem occurs, verify the information recorded with the setup utility. Incorrect identification in the setup configuration can lead to unexpected responses from the drive.

Table 2-6. Disk-Related 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.	Files possibly corrupted.	Re-partition and reformat disk; restore disk from backup files.
Hard disk works but files contain extra characters or garbled text.	Hard disk is affected by static electricity.	Move system away from any motors, magnetic devices, and photocopiers.
		Increase the humidity in the room, and use antistatic mats around the system.
System won't start from the diskette drive or displays the message Abort, Retry, Fail	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 formatted diskette.
	Cable not connected properly.	Verify correct cable connection.
	Diskette is worn or damaged.	Try another diskette.

Monitor Problems

The following table 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 QA Plus diagnostics, use the diagnostics to isolate the problem and then
replace the failing FRU.

Table 2-7. Monitor Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
Green LED on monitor is not lit.	Power to the monitor is off.	Turn on the monitor, then turn on the system.
	Power cord is not connected.	Make sure the power cord is connected to an AC wall outlet.
	No power at wall outlet.	Use another outlet.
Screen is blank; monitor LED is on.	Contrast and brightness controls set to minimum.	Adjust the contrast and brightness controls.
	Main logic board failure.	Replace the monitor. If that does not solve the problem, make sure the VGA switches on the main logic board are enabled. If so, replace the main logic board.
Screen goes blank after successful power-up; monitor LED is off.	Power or monitor failure.	Turn off the monitor and the system. Disconnect the monitor from the AC outlet and the system. Plug the monitor into an active AC wall outlet. If the monitor LED does not turn on, there is a problem with the monitor or the monitor LED.
Monitor LED is off, but display is OK.	Faulty LED.	Replace the monitor.
Monitor is on, but no cursor or text is displayed.	Power to the system is off.	Turn on the system.
	Contrast control is set to minimum.	Turn up the contrast control.

Table 2-7. Monitor Troubleshooting Procedures (continued)

Problem	Possible Cause	Corrective Action
	Main logic board failure.	Replace the monitor. If that does not solve the problem, ensure the VGA switches on the main logic board are enabled. If so, replace the main logic board.
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.
	Main logic board failure.	Replace the monitor. If that does not solve the problem, make sure the VGA switches on the main logic board are set correctly. If so, replace the main logic board.
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.
	Main logic board failure.	Replace the monitor. If that does not solve the problem, make sure the VGA switches on the main logic board are set correctly. If so, replace the main logic board.
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 main logic board VGA controller.	Reconfigure the software for VGA, or set the VGA switches on the main logic board to a standard supported by your software. Refer to the software manual and "Jumper Settings" in this manual.

Table 2-7. Monitor Troubleshooting Procedures (continued)

Problem	Possible Cause	Corrective Action
Screen displays partially highlighted characters.	Main logic board VGA switches set incorrectly.	Make sure the VGA switches on the main logic board are enabled. If so, replace the main logic board. If that does not solve the problem, replace the monitor.
You have a color monitor, and the display is monochrome.	System was turned on **before** the monitor was turned on.	Turn off the monitor and the system. Wait at least 20 seconds. Turn on the monitor, and then turn on the system.

Troubleshooting Problems Occurring During System Operation

Use the following list to help isolate a problem to a specific subsystem. See also "Troubleshooting by Symptom."

If the problem occurs during diskette drive access:

- Check the drive select jumper setting on the diskette drive(s).

- Look for loose drive cables.

- Check the main logic board switch settings.

- If possible, run the diagnostics. The problem might be with the main logic board, a terminating resistor pack, or faulty loading on the data bus.

If 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, if installed. Make sure it is seated properly and its jumpers are set correctly.

If the problem seems to be video related:

- Check the main logic board video jumper and switch settings.

If the problem seems to be keyboard related:

- Check the keyboard connection.

- Run the QA Plus diagnostics. The problem might be with the keyboard interface on the main logic board.

If the problem is not reproducible or is intermittent:

- Expansion options might be competing for interrupt request (IRQ) lines, I/O, or memory addresses.

If the problem seems to be heat related:

- Make sure that the system is clean and there is sufficient air flow around it.

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 is displayed when the System Utilities diskette is booted. After a language is selected, an option menu is displayed. Selecting Set up from the option menu runs the setup utility. The setup utility must be run each time any of the following occurs:

- the amount of memory in the system is changed

- diskette drives are added or removed

- the battery-backed-up date and time are changed

- the CMOS battery is disconnected or replaced

- the serial or parallel port is reconfigured

_____ **NOTE** _____

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

Running the Setup Utility

_____ **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)

Execute the setup utility as follows:

1. Turn on the monitor.

2. Insert the System Utilities diskette in the drive and turn on the system. The power-up tests run, and then the monitor displays a language selection menu.

3. Select a language, and then press ENTER.

4. The monitor displays an option menu. Select Option 4 (Setup), and 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 the configuration and restart the system.

_____ NOTES _____

Use the keyboard arrow keys to select a configuration. Do not use the numeric keypad arrow keys.

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

_____

CHAP 3

3

FRU Replacement

Introduction

This chapter contains procedures for removing and replacing each DECpc field replace-able unit (FRU). When the installation for a FRU is the reverse of the removal procedure, it is so noted. Only qualified service technicians should remove and replace FRUs. Use only Digital-supplied spares.

The following tables list standard and optional DECpc FRUs and their part numbers.

Table 3-1. DECpc Standard FRUs

Standard FRU Name	Part Number
Main Logic Board, 0KB Fixed Memory	29 -29832-01
100W Power Supply with fan speed control,IEC assmebly, and floppy power cables	29-29550-01
Rear Bezel with IEC and Icons	889DRB6
Card Guide	29-28115-01
Option Slot PCB Assembly	29-28109-01
Actuator /Button (plastics only)	74-43941-01
Actuator w/LED Assembly	29-29551-01
Speaker With Cable Assembly	29-28138-01
Reset Button Assembly	74-43940-01
Case Top	74-43942-01
Front Bezel	74-43943-01
Floppy Drive Ribbon Cable Assembly	29-28108-01
CMOS Battery	29-27439-01
DECpc 420SX Utilities Diskette	3785371
VGA 1024 NI Installation Diskette #1	3785376
VGA 1024 NI Installation Diskette #2	3785377
Floppy drive, 3.5-inch, 1.44MB (RX23 compatible)	889FDD2

Table 3-2. DECpc Optional FRUs

FRU	Digital Part Number
14" Color monitor 120V North Hemisphere	30-32313-01
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
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
1280 x 1024 Intelligent Graphics Controller	PCXAG-AD
2.88MB 3.5" diskette drive	PCXDR-AB
1.2MB 5.25" diskette drive	30-31071-01
360KB 5.25" diskette drive	30-33156-01
Tape drive, 60MB, (QIC-40)	30-34181-01
Mini-Tape cartridge, 1/4" (QIC-40)	30-34769-01
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, 40MB, 3.5"	30-30903-01
SCSI hard disk drive, 80MB, 3.5"	30-30904-01
SCSI hard disk drive, 170MB, 5.25"	30-30905-01
SCSI hard disk drive, 209MB, 3.5"	PCXAR-AA
SCSI hard disk drive, 320MB, 5.25"	30-33157-01
SCSI hard disk drive, 429MB, 3.5"	PCXAR-AB
IDE hard disk drive, 40MB, 3.5"	30-32345-01
IDE hard disk drive, 105MB, 3.5"	30-34429-01
IDE hard disk drive, 120MB, 3.5"	30-32344-01
IDE dual drive ribbon cable assembly	29-27912-01
512KB 80 ns SIMM Memory Kit	PC4XM-CA
2MB 80 ns SIMM Memory Kit	PC4XM-CB
8MB 80 ns SIMM Memory Kit	PC4XM-DC
Three-button mouse, PS/2-type, Microsoft compatible	30-34905-01
115 VAC power cord for system unit	17-02607-01

Table 3-2. DECpc Optional FRUs (continued)

FRU	Digital Part Number
101/102-key keyboard (PS/2-style)	
US keycaps (101-key)	PCXAL-AA
Belgian keycaps (102-key)	PCXAL-AB
Danish keycaps (102-key)	PCXAL-AD
UK keycaps (102-key)	PCXAL-AE
German keycaps (102-key)	PCXAL-AG
Italian keycaps (102-key)	PCXAL-AI
Norwegian keycaps (102-key)	PCXAL-AN
French keycaps (102-key)	PCXAL-AP
Spanish keycaps (102-key)	PCXAL-AS
Spanish 2 keycaps (102-key)	PCXAL-AR
Hebrew keycaps (102-key)	PCXAL-AT
Portuguese keycaps (102-key)	PCXAL-AV
Swedish/Finnish keycaps (102-key)	PCXAL-CA
Swiss keycaps (102-key)	PCXAL-CH
DEC EtherWORKS Products	
LC network interface board (Thinwire)	70-26601-01
Turbo network interface board (Thinwire)	70-22837-01
LC/TP network interface board (Twisted Pair)	54-19559-01
Turbo/TP network interface board (Twisted Pair)	54-20426-01
2400 BPS internal modem	30-31072-01
1200 BPS internal modem	30-31073-01

Before Replacing FRUs

The following criteria apply when removing or installing DECpc FRUs.

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

_____ **NOTE** _____

Before disconnecting the DECpc 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 an earth-grounded work surface when opening the system unit or handling any external component. Static electricity can damage printed circuit boards and mass storage devices.

After replacing the FRU, verify that it and the system function properly.

Replacing FRUs

This section describes how to remove and replace the various FRUs in the DECpc. The following figure shows an exploded view of the DECpc chassis. The figure on the following page shows an exploded view of the DECpc main logic board and options.
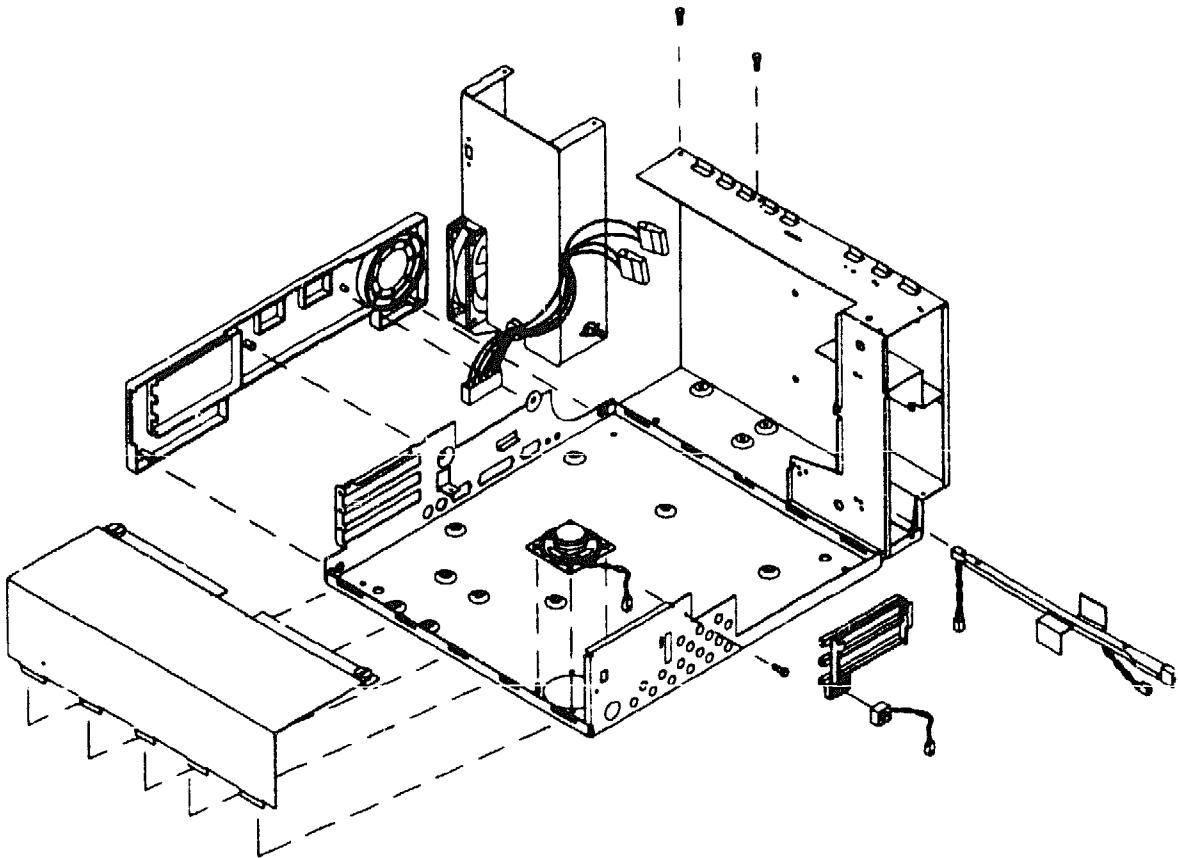
Figure 3-1. DECpc chassis, exploded view

Keyboard Replacement

Replace the keyboard as follows:

1. Turn off 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.

Monitor Replacement

Replace the monitor as follows:

1. Turn off the system unit and monitor.

2. Unplug the monitor power cord.

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 auxiliary outlet of the DECpc.

6. Turn the power on again.

Mouse Replacement

Replace the mouse as follows:

1. Turn off the system unit and monitor.

_____ CAUTION _____

All power must be off when connecting or disconnecting the mouse, or damage to the mouse 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.

System Cover Removal

Remove the system cover as follows:

1. Turn off the system unit and monitor.

_____ **CAUTION** _____

To avoid damaging the hard disk, do not move it and do not perform the
following procedure for at least 20 seconds after you turn it 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.

4. Slide the cover forward about 3 inches to clear the locating pins on the inside of
   the front bezel. Remove the cover.

screws
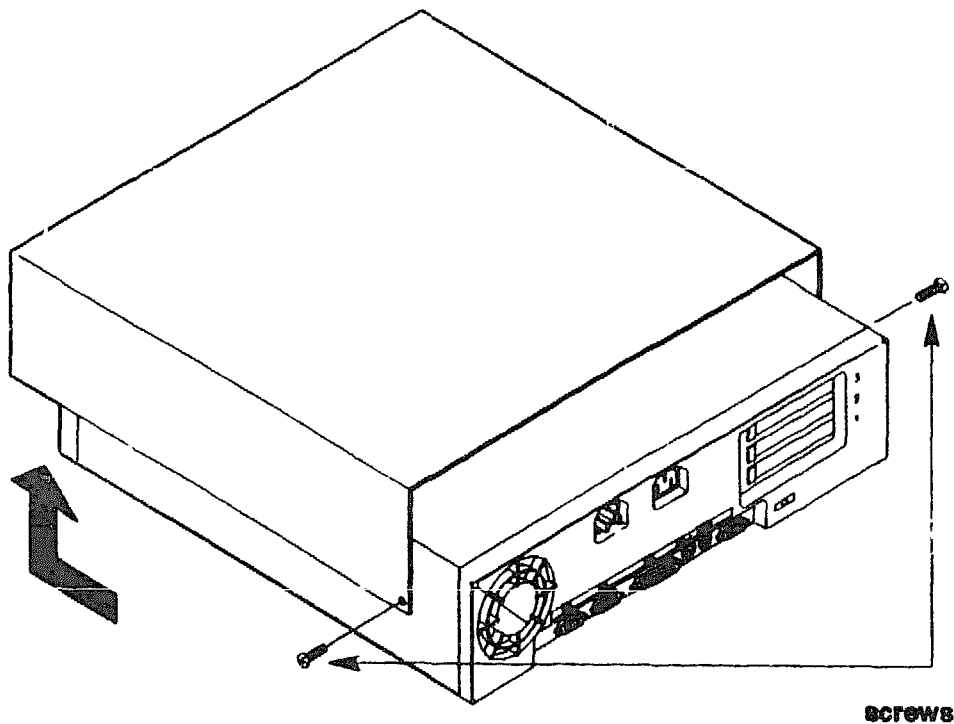
Figure 3-2. Removing the DECpc system cover

Opening the System Unit

Open the system unit as follows:

1. Using the key, unlock the system chassis.

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

3. Lift the option cover (smaller side) counterclockwise and remove it.

4. Lift the carriage (larger side) clockwise.
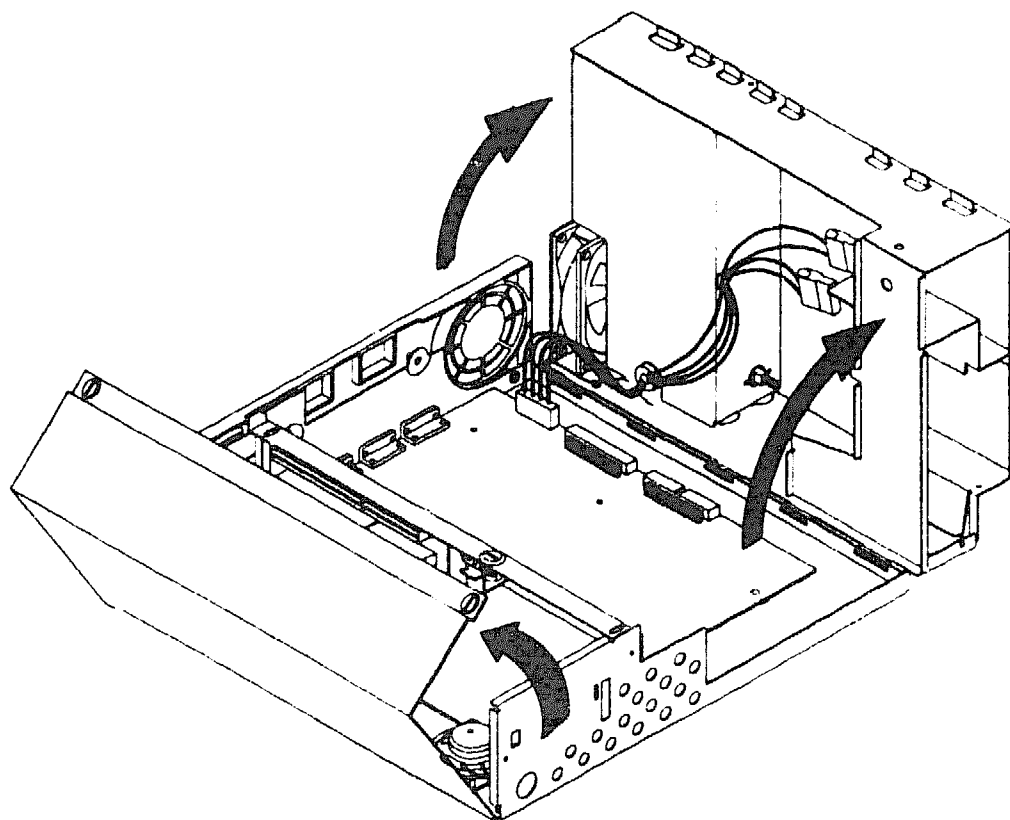
Figure 3-3. Opening the system unit

Option Board Replacement

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

1. Remove the cover and open the system unit.

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

_____ **NOTE** _____

When removing an option board, note its 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 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.

Option Slot Printed Circuit Board Replacement

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

1. Remove the cover and open the system unit.

2. Remove any option boards, if installed.

3. 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.

4. Lift the chassis support and option slot PCB upward and out of the system unit.

5. Remove the two screws securing the option slot PCB to the chassis support.

6. Secure the new option slot PCB to the chassis support.

7. 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.

_____
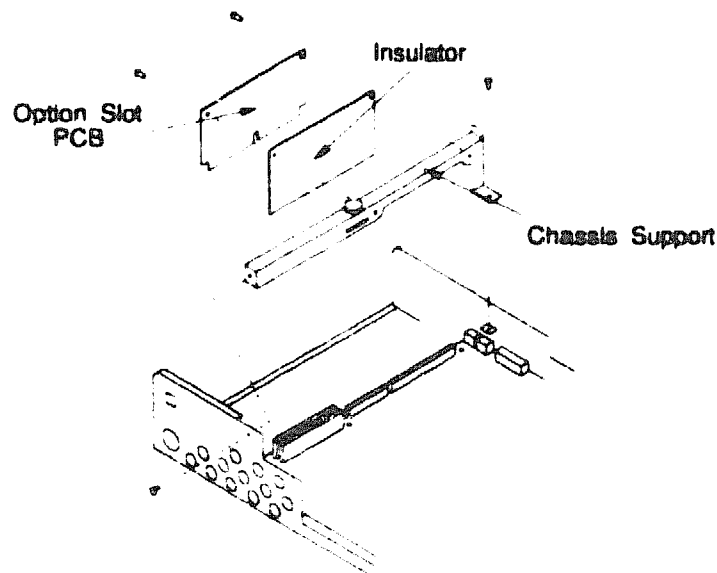
Figure 3-4. Removing the Option Slot PCB

Speaker Replacement

Replace the speaker as follows:

1. Remove the cover and open the system unit.

2. Disconnect the speaker cable from the main logic board.

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

4. Remove the speaker.

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

Battery Replacement

Replace the battery as follows:

1. Remove the cover and open the system unit.

2. Disconnect the battery cable from the battery connector on the main logic board and remove the battery from its Velcro mount.

_____ **CAUTION** _____

Do not dispose of the battery at the customer site. Do not incinerate the battery or take it apart. Replace the battery with the same type of battery. Do not recharge, disassemble or heat the battery above 100C. Do not solder directly to batery or expose contents to water.

_____

3. Place the new battery on the Velcro mount, and connect the cable.

4. Run the setup utility and reset the system unit to enter the configuration information.
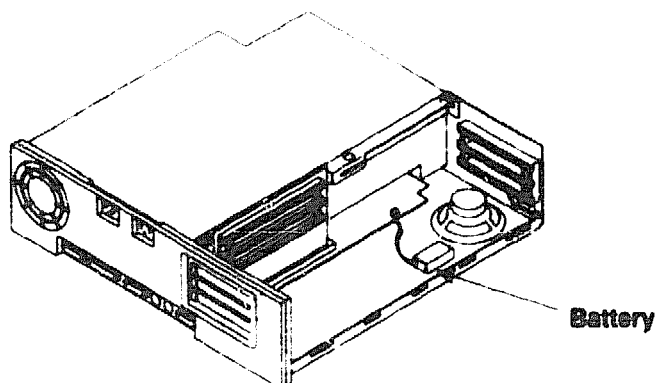
Figure 3-5. Removing the DECpc battery

Reset Button Removal

Remove the reset button as follows:

1. Remove the cover and open the system unit.

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

3. Disconnect the reset button cable from the main logic board.

4. Press the option board card guide clip.

5. Slide the card guide to the left and remove it from the system unit.

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

Replace the reset button by reversing these steps.
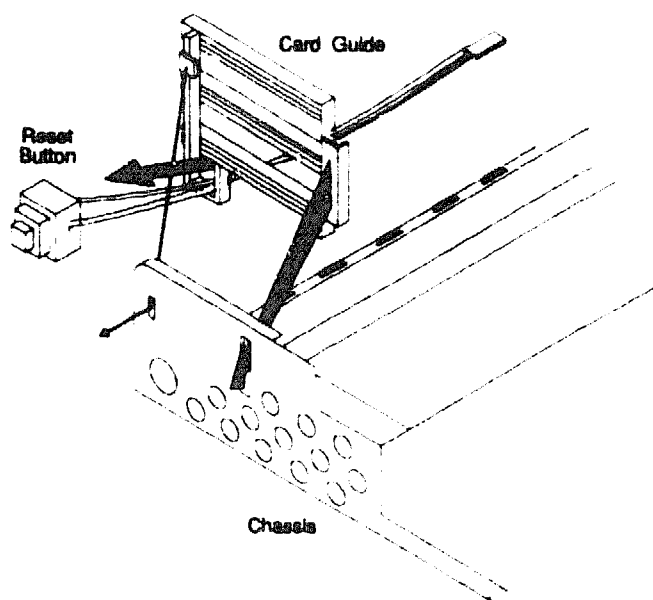
Figure 3-6. Removing the DECpc reset button

Single-In-Line Memory Module Replacement

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

1. Remove the cover and open the system unit.

2. Carefully push apart the retaining clips on the socket that hold the SIMM in place.

3. While holding the latches apart, tip the SIMM until it clears the retaining latches.

4. Pull the SIMM up and out of the socket.

5. Grasp a new SIMM at both ends, and insert it into the socket. Make sure the SIMM is fully seated in the connector.

6. Press the top edge of the SIMM forward so that it latches into place. Be sure the retaining latches snap the SIMM into place.

_____ **NOTE** _____

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

_____
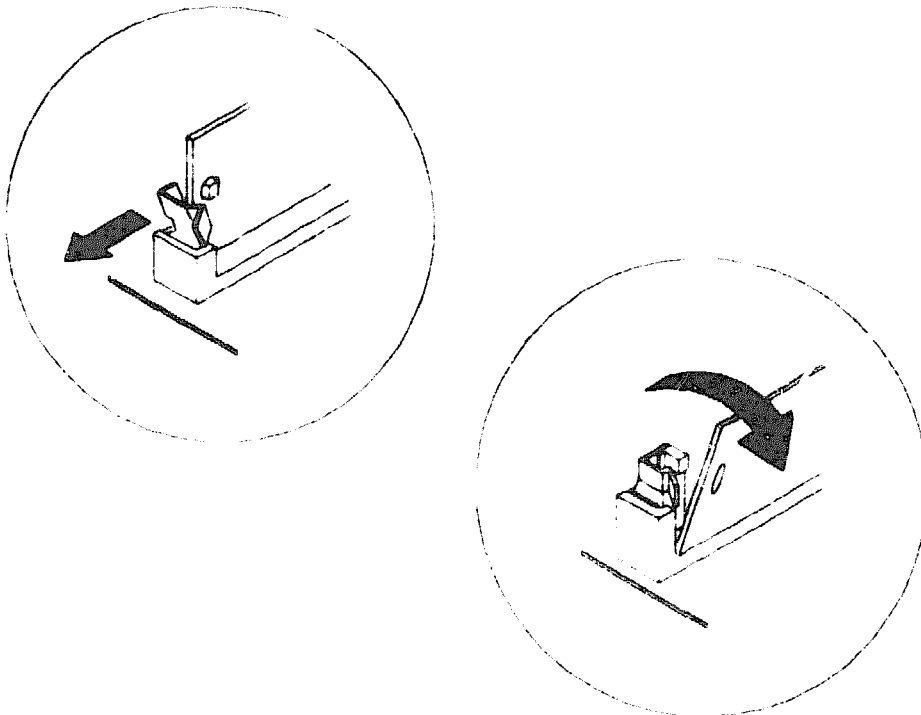
Figure 3-7. Removing a DECpc SIMM

Main Logic Board Replacement

Replace the main logic board as follows:

1. Remove the cover and open the system unit.

2. Remove all option boards and their cables, if any.

3. Remove the system unit chassis support and the bus adapter board.

4. Remove all SIMMs installed on the main logic board.

5. Remove the power supply cables, power-on LED, drive interface cables, and IDE interface cables attached to the main logic board.

_____ NOTE _____

When removing cables, note their locations and routing.

_____

6. Remove the eight 3/16-inch hex standoffs that secure the serial, parallel, and monitor connectors to the system unit.

_____ NOTE _____

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

_____

7. Remove the seven screws that fasten the main logic board to the system unit.

8. Remove the main logic board.

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

10. Re-install all options (if any) that were removed from the main logic board.

11. Install the main logic board by reversing these steps.

_____ 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.

_____
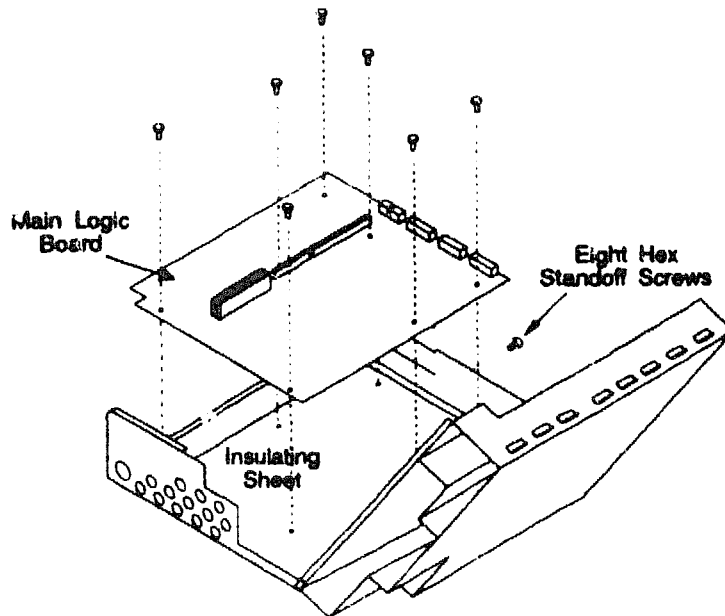
Figure 3-8. Removing the DECpc main logic board

Diskette Drive Replacement

Replace the drive as follows:

1. Remove the cover and open the system unit.

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

3. Remove the four mounting screws that hold the drive in place. Two screws are located underneath the drive. Two are on the right side of the drive.

4. Remove the drive.

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

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

7. Connect the ribbon cable and power cable to the drive.

8. After replacing the drive, reconnect all system cables.

9. Verify the operation of the new drive.

10. Re-install the system cover.
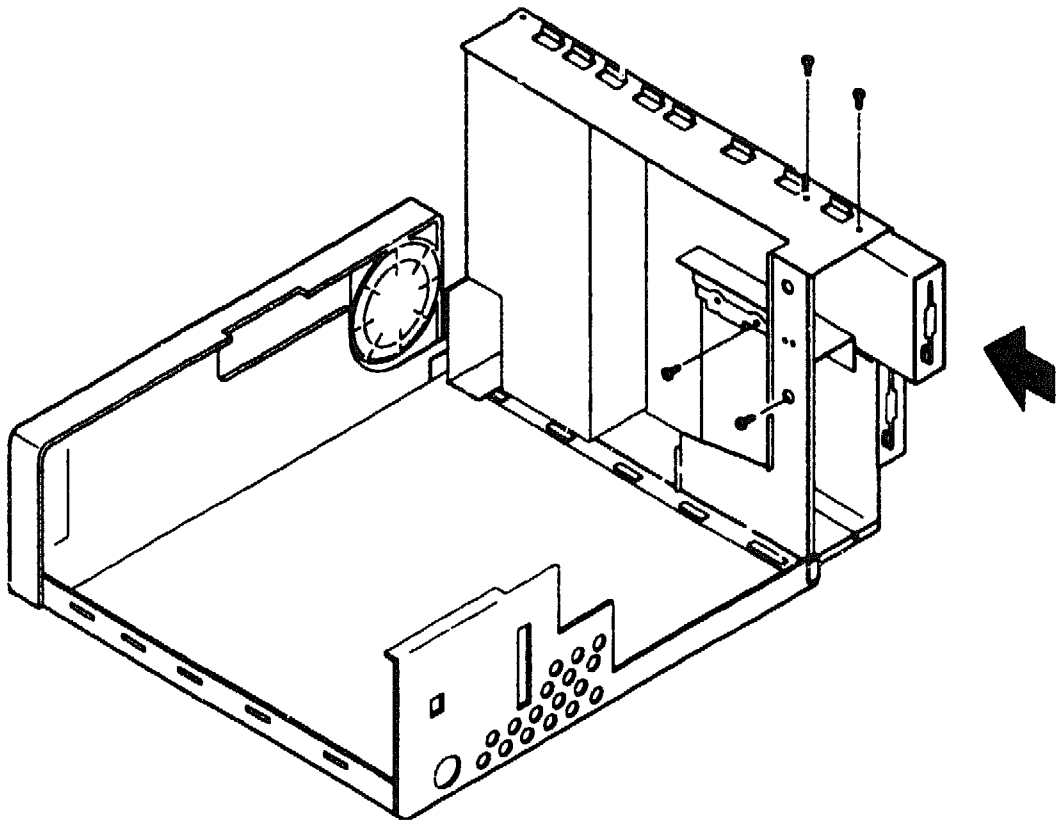
Figure 3-9. Replacing the DECpc diskette drive

Replacing an Optional Diskette Drive

To remove or replace an optional diskette drive, refer to the *DECpc 420SX User's Guide*.

Replacing an Optional Hard Disk or Tape Drive

To remove or replace an optional hard disk or tape drive, refer to the *DECpc 420SX User's Guide*.

DECpc Power Supply Removal

Remove the DECpc power supply as follows:

1. Remove the cover and open the system unit.

2. Remove the ribbon and power cables from the back of the drive(s).

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 holding the power supply to the carriage.

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 approximately 3/4 inch long

_____

To replace the power supply, perform the previous steps in reverse order.
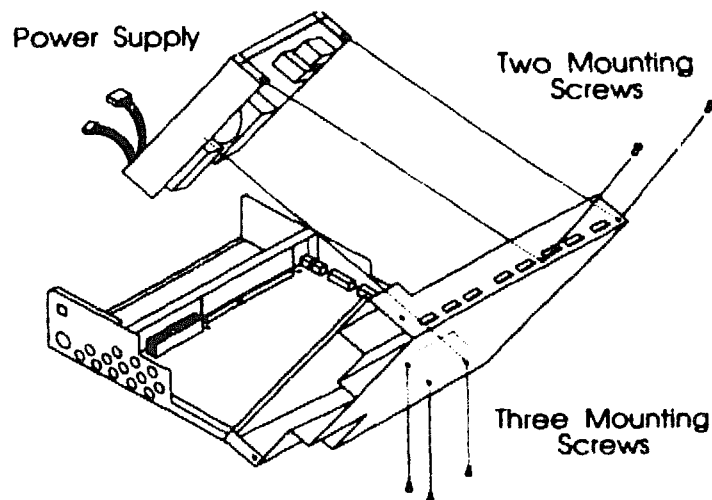
Figure 3-10. Removing the DECpc power supply

Main Logic Board Switches

Main Logic Board Diagram

The following figure shows the location of switches and other components on the main logic board. There are no configurable jumpers on the board.
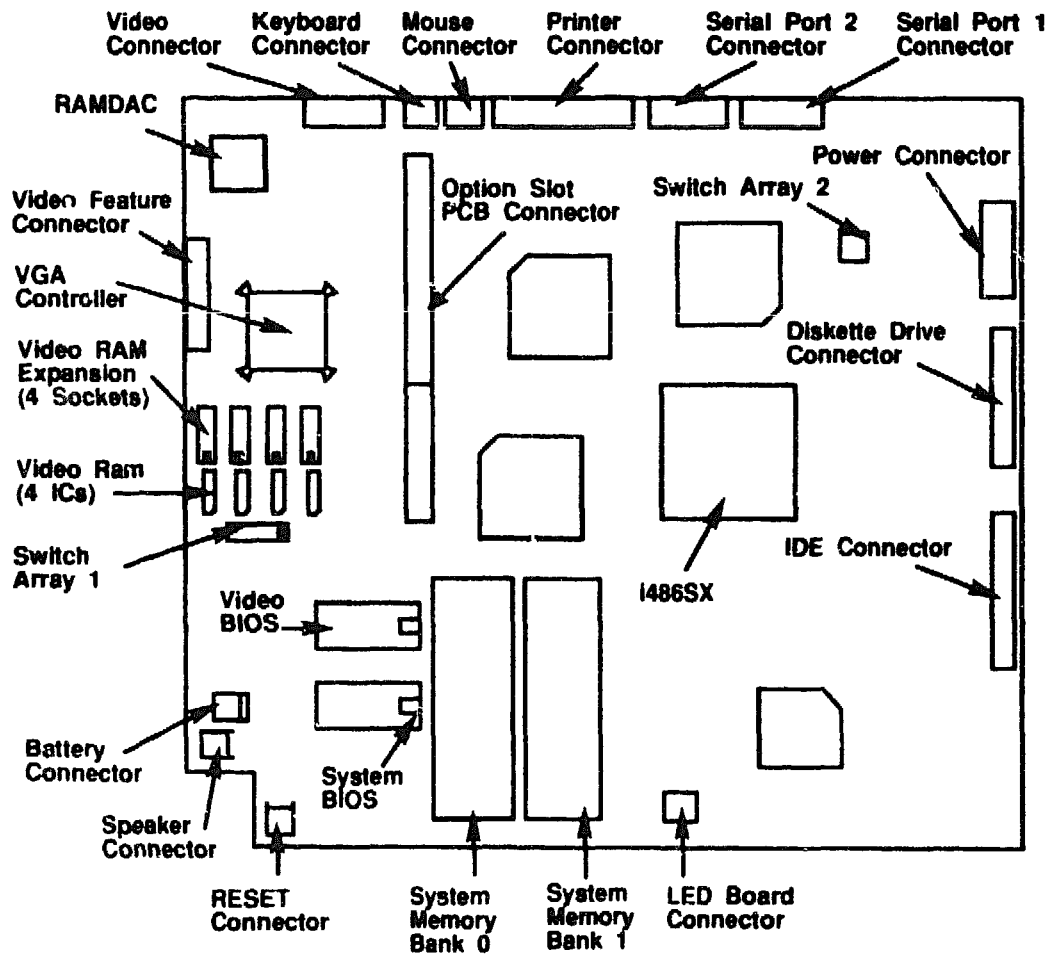
Figure 3-11. Main Logic Board

Switch Settings

The following tables describe the switches on the main logic board and the factory default settings. Asterisks indicate default settings.

Switch Array 1

Table 3-3. VGA Modes and Switch Settings

Switch(es)	Setting	Mode Description
1, 2	OFF, OFF*	800 x 600, 2-color, 56 Hz 800 x 600, 16-color, 56 Hz 800 x 600, 256-color, 56 Hz
	OFF, ON	800 x 600, 2-color, 60 Hz 800 x 600, 16-color, 60 Hz 800 x 600, 256-color, 60 Hz
	ON, OFF	800 x 600, 2-color, 72 Hz 800 x 600, 16-color, 72 Hz 800 x 600, 256-color, 72 Hz
	ON, ON	800 x 600, 2-color, 56 Hz 800 x 600, 16-color, 56 Hz 800 x 600, 256-color, 56 Hz
3, 4	OFF, OFF*	1024 x 768, 2-color, interlaced 1024 x 768, 16-color, interlaced 1024 x 768, 256-color, interlaced
	OFF, ON	1024 x 768, 2-color, 60 Hz, non-interlaced 1024 x 768, 16-color, 60 Hz, non-interlaced 1024 x 768, 256-color, 60 Hz, non-interlaced
	ON, OFF	1024 x 768, 2-color, 70 Hz, non-interlaced 1024 x 768, 16-color, 70 Hz, non-interlaced 1024 x 768, 256-color, 70 Hz, non-interlaced
	ON, ON	1024 x 768, 2-color, interlaced 1024 x 768, 16-color, interlaced 1024 x 768, 256-color, interlaced

*Default setting.

Table 3-3. VGA Modes and Switch Settings (continued)

Switch(es)	Setting	Mode Description
5	OFF*	31.5 kHz Standard Modes (0-13)[1]
	ON	40 kHz Standard Modes (0-13)[1]

Table 3-4. Video Configuration Settings

Switch(es)	Setting	Function
6	ON*	512KB memory installed
	OFF	1024KB memory installed
7, 8	ON, OFF*	Enable on-board video
	OFF, ON	Disable on-board video

*Default setting.

[1]See Table A-1 in the "Video Modes" appendix.

Switch Array 2

Table 3-5. Microprocessor Select

Switch 1	Switch 2	Microprocessor
OFF*	OFF*	i486SX CPU
–	–	All other settings reserved

Table 3-6. Video Select

Switch 3	Monitor Type
OFF*	Color Monitor Installed
ON	Monochrome Monitor Installed

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A

Electrical Specifications

The following table lists the electrical specifications for the DECpc 420SX base system:

Table A-1. Electrical Specifications

| Parameter	Range
Input Voltage (nominal)	115 VAC
Input Frequency (nominal)	60 Hz or 50 Hz
Input Frequency Range	47 to 63 Hz
Peak Input Current	50 A
Input Low Voltage Threshold	90 VAC 190 VAC
Power Consumption (maximum continuous)	143 watts
DC Output Power	138.5 watts peak
AC Receptacle Output Current (nominal)	(IEC 320)

APP B

Peripheral Interface Connectors

The following tables and diagrams describe the pin assignments and functions of the external interface connectors on the DECpc 420SX system.

Parallel Port Connector

The following are signal definitions for the 25-pin parallel port connector:

Table B-1. Parallel Port Connector

Pin	Signal	Function
1	STROBE–	Strobe
2	PRTDAT0	Data bit 0
3	PRTDAT1	Data bit 1
4	PRTDAT2	Data bit 2
5	PRTDAT3	Data bit 3
6	PRTDAT4	Data bit 4
7	PRTDAT5	Data bit 5
8	PRTDAT6	Data bit 6
9	PRTDAT7	Data bit 7
10	PRTACK–	Acknowledge
11	PRTBSY	Busy
12	PRTPE	Paper End
13	PRTSEL–	Select
14	PRTAF–	Auto Feed
15	PRTFLT–	Fault
16	PRTINIT	Initialize
17	PRTSEL–	Select input
18	GND	Ground
19	GND	Ground
20	GND	Ground
21	GND	Ground
22	GND	Ground
23	GND	Ground
24	GND	Ground
25	GND	Ground
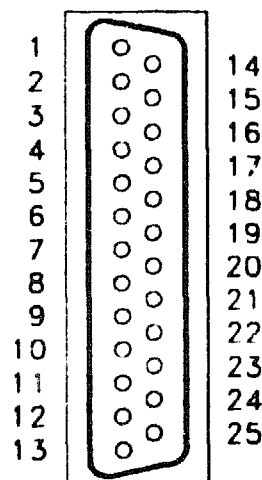
Serial Port Connector

The following are signal definitions for the 9-pin RS-232 serial port connector:

Table B-2. Serial Port Connectors

Pin	Signal	Function
1	DCD	Data carrier detect
2	RXD	Receive data
3	TXD	Transmit data
4	DTR	Data terminal ready
5	GND	Signal ground
6	DSR	Data set ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator

Keyboard/Mouse Connector

The keyboard and mouse use standard 6-pin miniature DIN connectors. The pin assignments are listed in the following table:

Table B-3. Keyboard/Mouse Connectors

Pin	Signal
1	Data
2	N/C
3	GND
4	+5 VDC
5	N/C
6	Reserved

Video Port Connector

Table B-4. Video Port Connector

Pin	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 (ground)
12	Monitor ID bit 1 (ground)
13	Horizontal sync
14	Vertical sync
15	Not used

Power Supply Connector

The following tables list the pin assignments for the connectors from the power supply to the main logic board and to the disk drives.

System Board Power Connector (J20)

Table B-5. System Board Power Connector

Pin	Signal
1	+5 VDC
2	+5 VDC
3	+5 VDC
4	GND
5	GND
6	GND
7	GND
8	–12 VDC
9	+12 VDC

Hard Disk Drive Power Connector

Table B-6. Hard Disk Drive Power Connector

Pin	Signal
1	+12 VDC
2	GND
3	GND
4	+5 VDC

Diskette Drive Power Connector

Table B-7. Diskette Drive Power Connector

Pin	Signal
1	+5 VDC
2	GND
3	GND
4	+12 VDC