DECpc 316SX

DECpc 316SX

Service Guide

Order Number ER-PC444-SV-001

Digital Equipment Corporation

November 1991

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About This Guide

This service guide is designed to help you diagnose and repair the DECpc 316SX computer. This guide contains information on servicing the base system only. Information on installing, replacing, and configuring specific options is provided 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 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 EtherWORKS 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`	A prompt or an instruction displayed on the screen. Shown in monospaced type in this manual.

Throughout this guide, DECpc refers to the DECpc 316SX.

The DECpc 316SX 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 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 documents are available as supplements to this guide.

Document Title	Part Number
DECpc 316SX User's Guide	ER-PC444-UG
DECpc 316SX Technical Reference	ER-PC44Y-DD
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

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

Digital Equipment Corporation
Digital Drive
Westminster, MA 01473-0471

Attn: Order Administration

Digital customers who maintain their own equipment can order documents with part numbers beginning with EK, ER, or AA by mail or by phone.

To order documents by phone, call 1-800-DIGITAL between 8:30 am and 8:00 pm Eastern Standard Time.

To order documents by mail, write to:

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

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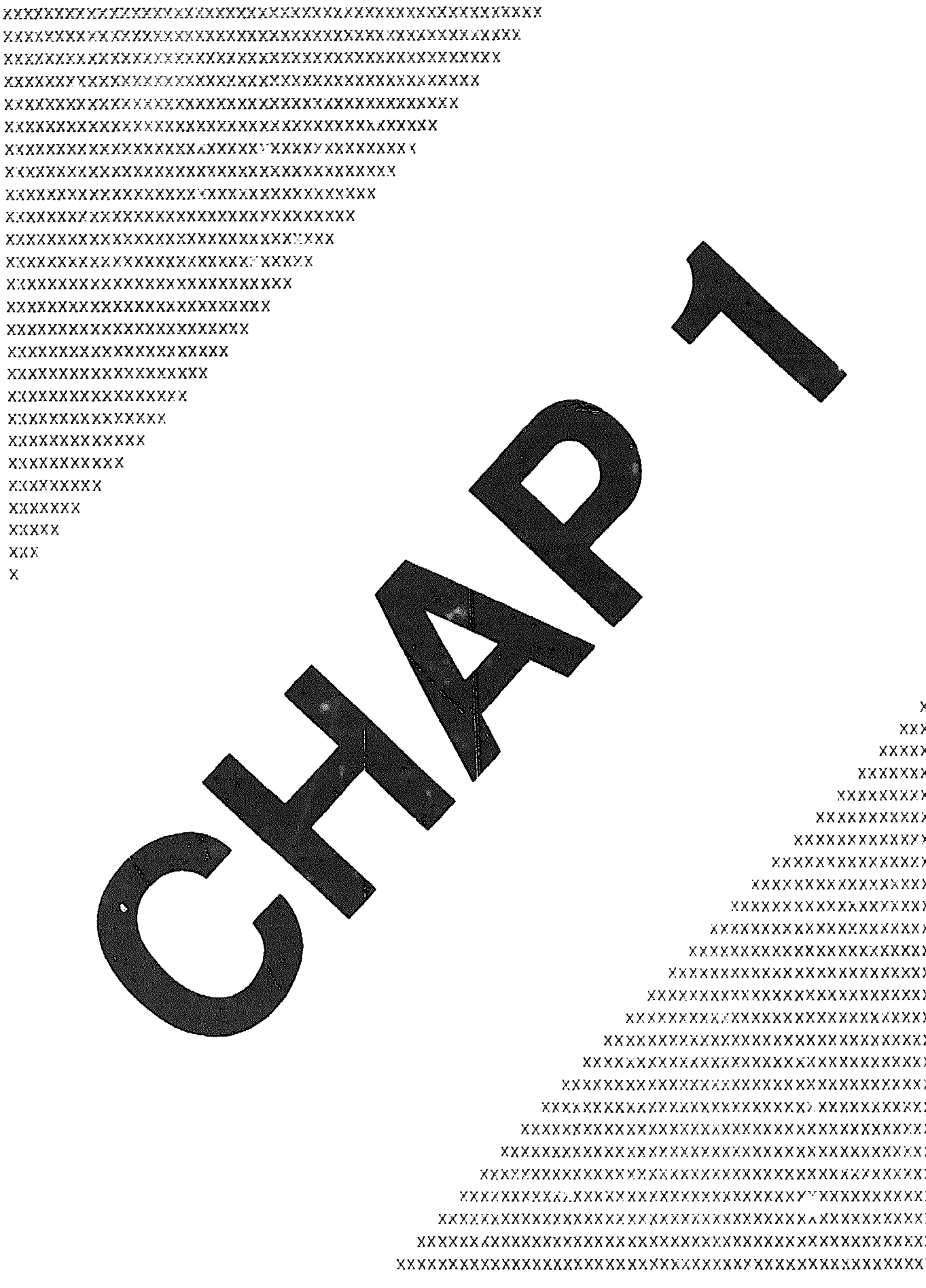
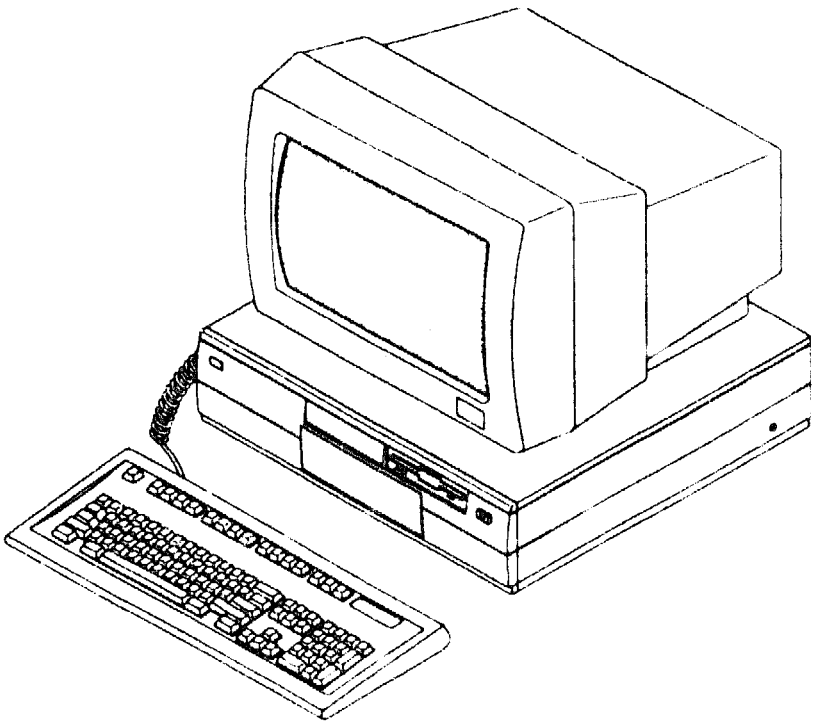

СНАР 1

Overview

Introduction

The DECpc 316SX (shown below) 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.



The DECpc 316SX

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:
  - 16 MHz Intel 386SX microprocessor
  - socket for optional Intel 387SX math coprocessor
  - 1MB RAM, expandable to 5MB on the main logic board
  - four SIMM (random access memory) sockets on the main logic board
  - serial and parallel ports
  - PS/2-compatible mouse port
  - PS/2-style AT-compatible keyboard interface
  - 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
- 3½-inch 1.44MB diskette drive

DECpc Options

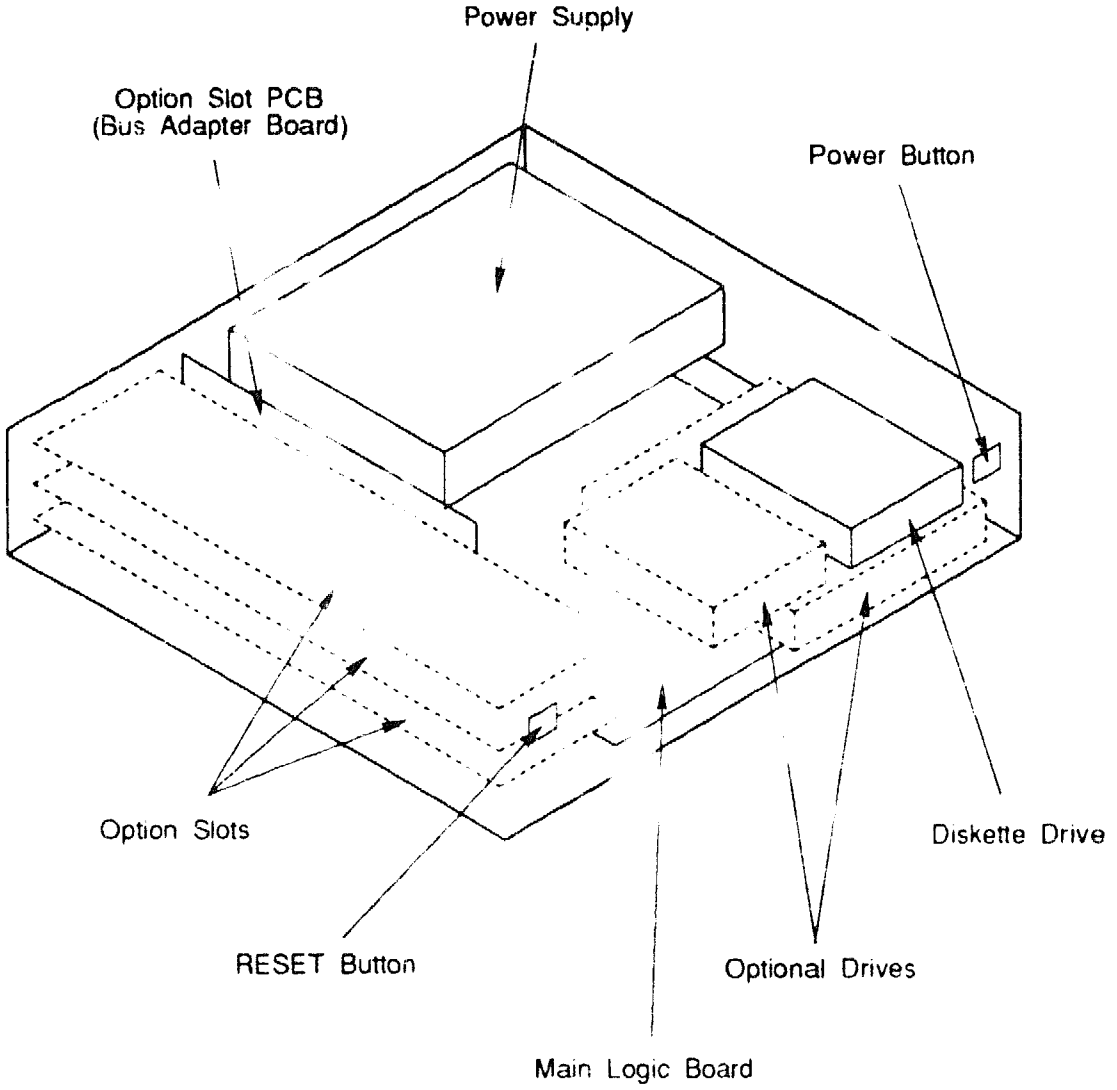
The following are options available for the DECpc base system:

- color or monochrome VGA analog monitor
- keyboard (country-specific)
- serial/parallel port adapter
- 52MB, 105 MB, 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
- 3½-inch 1.44MB diskette drive
- 5¼-inch 1.2MB diskette drive
- 5¼-inch 360KB diskette drive
- PS/2-compatible mouse
- power cord (country-specific)
- 2400-baud internal modem
- 1200/300-baud internal modem
- 16 MHz Intel 387SX math coprocessor
- DEC EtherWORKS bus adapter

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

System Unit Layout

The following figure shows the location of both standard and optional equipment within the system unit. Standard equipment (equipment that is included in the base system) is represented by solid lines. Optional equipment is represented by dotted lines.



System Unit Layout

DECpc System Configurations

DECpc personal computers 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.

Base System Configurations

Model Number	Description
PC444-A2	DECpc 316SX; 80386/16 MHz base system box, 1MB (minimum) RAM, 3½-inch 1.44MB diskette drive, on-board IDE hard drive interface, serial/parallel port, mouse and keyboard port, on-board SVGA, 3 ISA expansion slots (full size), 2 additional front panel half-height drive bays (3½ and 5¼ in.), with the power supply factory-set at 120 VAC, 60 Hz (no power cord or keyboard)
PC444-A3	Same as PC444-A2, but with the power supply factory-set at 240 VAC, 50 Hz
PC444-AA	Same as PC444-A2, plus 115 VAC (U.S.) power cord

Packaged Systems

Model Number	Description
DJ-PC444-AA	DECpc 316SX system, 115 VAC (U.S.) power cord, 2MB memory, 52MB IDE hard disk drive, 14-inch monochrome monitor, industry standard keyboard, mouse, and MS-DOS 3.3 operating system software
DJ-PC444-AB	DECpc 316SX system, 115 VAC (U.S.) power cord, 2MB memory, 52MB IDE hard disk drive, 14-inch color monitor, industry-standard keyboard, mouse, and MS-DOS 3.3 operating system software

DECpc 316SX Main Logic Board

The DECpc 316SX main logic board contains a 16 MHz Intel 386SX microprocessor, a socket for an optional Intel 387SX math coprocessor, diskette 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, 1MB system RAM (fixed) with 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 ISA expansion slots (also usable as 8-bit 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 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.

387SX Math Coprocessor

The 387SX is a processor extension to the 386SX microprocessor. It enhances the 386SX's numeric processing abilities, particularly in floating point precision. The 387SX also extends the 386SX instruction set to include transcendental (trigonometric and logarithmic) functions. The 387SX plugs directly into a socket on the main logic board.

NOTE:
The DECpc 316SX requires a 387SX that will run at 16 MHz or faster.

CHAP 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 EtherWORKS 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.

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 316SX Utilities Diskette	AK-PC444-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.

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.
5. If the system does not power up:
   a. Turn off the system unit and the monitor.
   b. Unplug the system and the monitor from the AC outlet.
   c. Disconnect power to all the hard disk drives, and remove all options.
   d. Plug the monitor and the system into a working AC outlet.
   e. 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.
   f. Try booting the system from the operating system startup diskette.
   g. 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.
   a. If the system does not boot, verify that all jumpers are set correctly. Then, reboot the system.
   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. 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 classes of beep codes. The primary class consists of a combination of long and short beeps that indicate possible system malfunction. The secondary class 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 a main logic board failure, a memory failure, a memory configuration error, or a 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.

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 jumper 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.

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 not being properly seated in its socket.

[2]Test failures from this point on can usually be attributed to the VGA components on the main logic board. Try disabling the on-board video and installing a VGA adapter in an open 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.

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 *yyyyy* failure at *xxxx* 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 *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
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.

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.

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 jumper on the main logic board is enabled. If the jumper is 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.

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; repartition 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.

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	Repartition 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 [illegible]	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.

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, and 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 jumper on the main logic board is enabled. If the jumper is enabled, 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 Troubleshooting Procedures (Continued)

Problem	Possible Cause	Corrective Action
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
	Main logic board failure	Replace the monitor. If that does not solve the problem, make sure the VGA jumper on the main logic board is enabled. If the jumper is enabled, 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 jumper on the main logic board is enabled. If the jumper is enabled, 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 jumper on the main logic board to a standard supported by your software. Refer to the software manual and "Jumper Settings" in this manual
Screen displays partially highlighted characters	Main logic board VGA jumpers set incorrectly	Make sure the VGA jumper on the main logic board is enabled. If the jumper is enabled, 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 jumper 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 VGA jumper 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 `Setup` 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 default CPU clock speed is 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

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

- The type of diskette drive for drive A and optional drive
- 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 speeds. The CPU speed is the CPU processing speed, and the bus speed is the I/O expansion bus transmission speed

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.

Execute the setup utility as follows:

1. Turn on the monitor.
2. Insert the System Utilities diskette into 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.

   The monitor displays an option menu.
4. Select Option 4 (`Setup`), and press ENTER.

   The monitor displays the setup utility's menu.
5. 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.

   NOTE:
   Use the key**board** arrow keys to select a configuration. Do not use the numeric key**pad** arrow keys.

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

CHAP 3

FRU Replacement

Introduction

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

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

DECpc Standard FRUs

FRU	Digital Part Number
Main logic board with 1MB fixed memory	29-29549-01
100 W power supply with fan speed control, IEC assembly, and drive power cables	29-29550-01
Rear bezel with IEC cutout and connector icons	29-28114-01
Expansion adapter card guide	29-28115-01
Speaker with cable assembly	29-28138-01
Power actuator/button (plastics only)	74-43941-01
Power actuator/button with LED assembly	29-29551-01
RESET button assembly	74-43940-01
CMOS battery (CR-2032)	849-1012
Diskette drive ribbon cable assembly for RX23 compatible drives	17-03425-01
Option slot PCB assembly	29-28109-01
Case top	74-43942-01
Front bezel	74-43943-01
DECpc 316SX System Utilities diskette	3785348
VGA 1024 installation diskette	3785103

DECpc Optional FRUs

FRU	Digital Part Number
14" color monitor 120V Northern Hemisphere	30-32313-01
14" color monitor 120V Southern Hemisphere	30-32314-01
14" color monitor 240V Northern Hemisphere	30-32315-01
14" color monitor 240V Southern Hemisphere	30-32316-01
14" color monitor 120V Northern Hemisphere	30-32317-01
14" color monitor 120V Southern Hemisphere	30-32318-01
14" color monitor 240V Northern Hemisphere	30-32319-01
14" color monitor 240V Southern 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 VGA ribbon cable	29-28681-01
1280 x 1024 Intelligent Graphics Controller	PCXAG-AD
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
16 MHz Intel 387SX math coprocessor	19-30973-01
2400 BPS internal modem	30-31072-01
1200 BPS internal modem	30-31073-01
Three-button mouse, PS/2-type, Microsoft compatible	30-34905-01
115 VAC power cord for system unit	17-02607-01

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

Before Replacing FRUs

Adhere to the following guidelines when removing or installing DECpc FRUs.

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

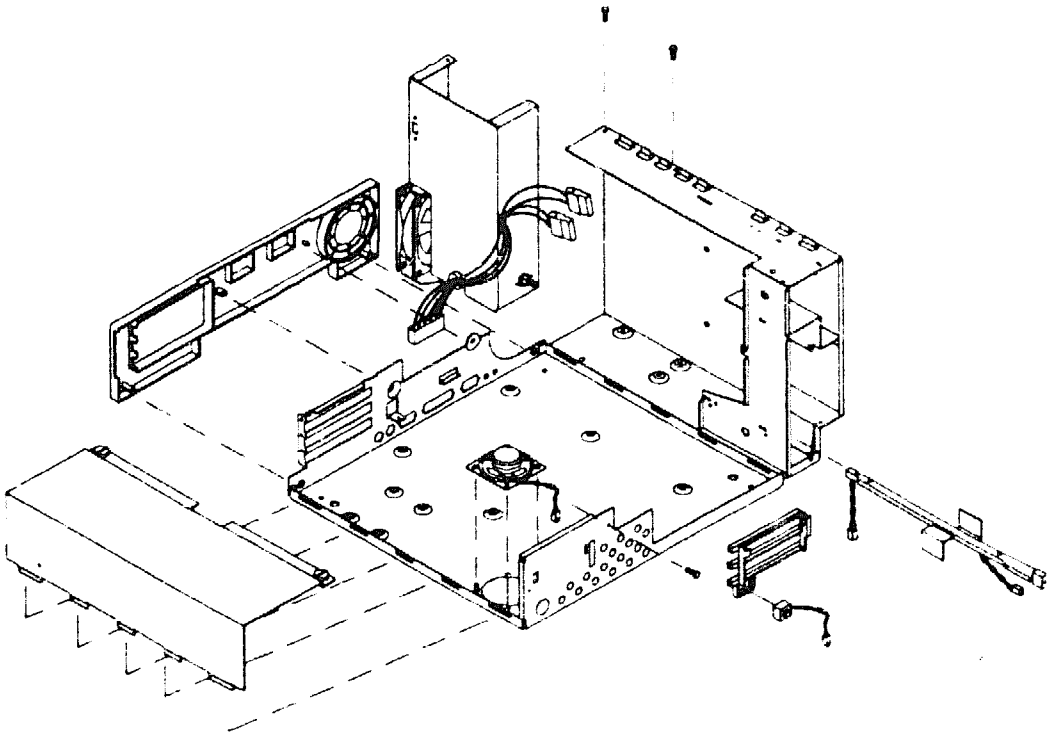
NOTE:
Before disconnecting the DECpc from a network, inform the system administrator that you are going to disconnect the ThinWire T-connector from the computer. Do not disconnect any cable or terminator from the T-connector. Doing so disrupts network operation.

CAUTION:
Always use a grounded wrist strap and an earth-grounded work surface when opening the system unit or handling any external component 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.

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.



DECpc chassis, exploded view

Keyboard Replacement

Replace the keyboard as follows:

1. Turn off the system unit and the 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 system unit and the monitor on again.

Monitor Replacement

Replace the monitor as follows:

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

Mouse Replacement

Replace the mouse as follows:

1. Turn off the system unit and the monitor.

   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 system unit and the monitor on again.

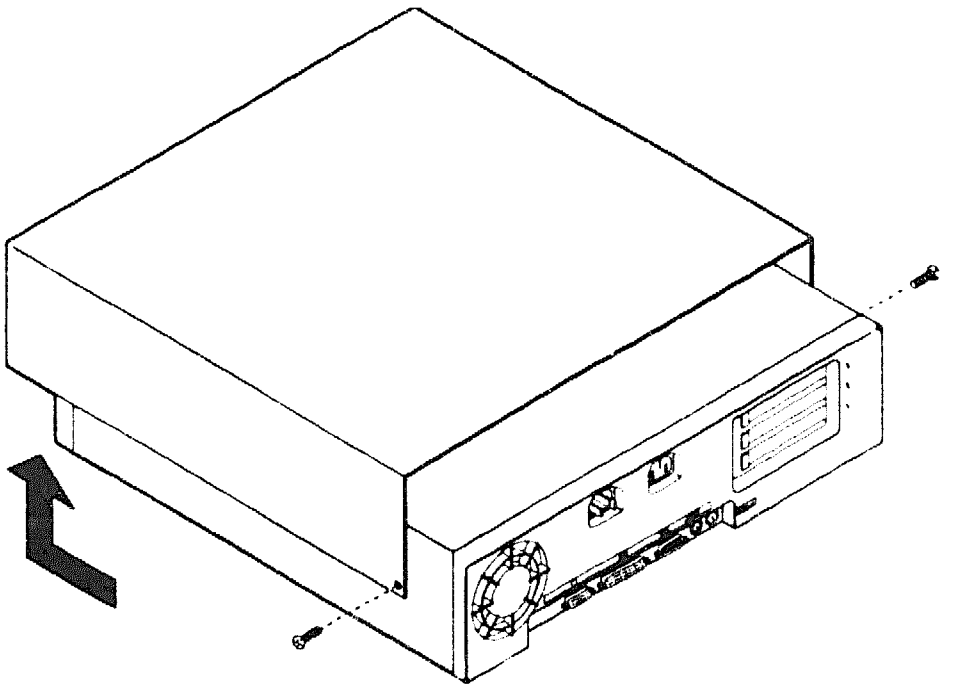
System Cover Removal

Remove the system cover as follows:

1. Turn off the system unit and the monitor.

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

2. Disconnect all cables from the back of the system unit.
3. Remove the two countersunk screws that secure the cover to the system unit chassis.
4. Slide the cover forward about 3 inches to clear the locating pins on the inside of the front bezel. Remove the cover.

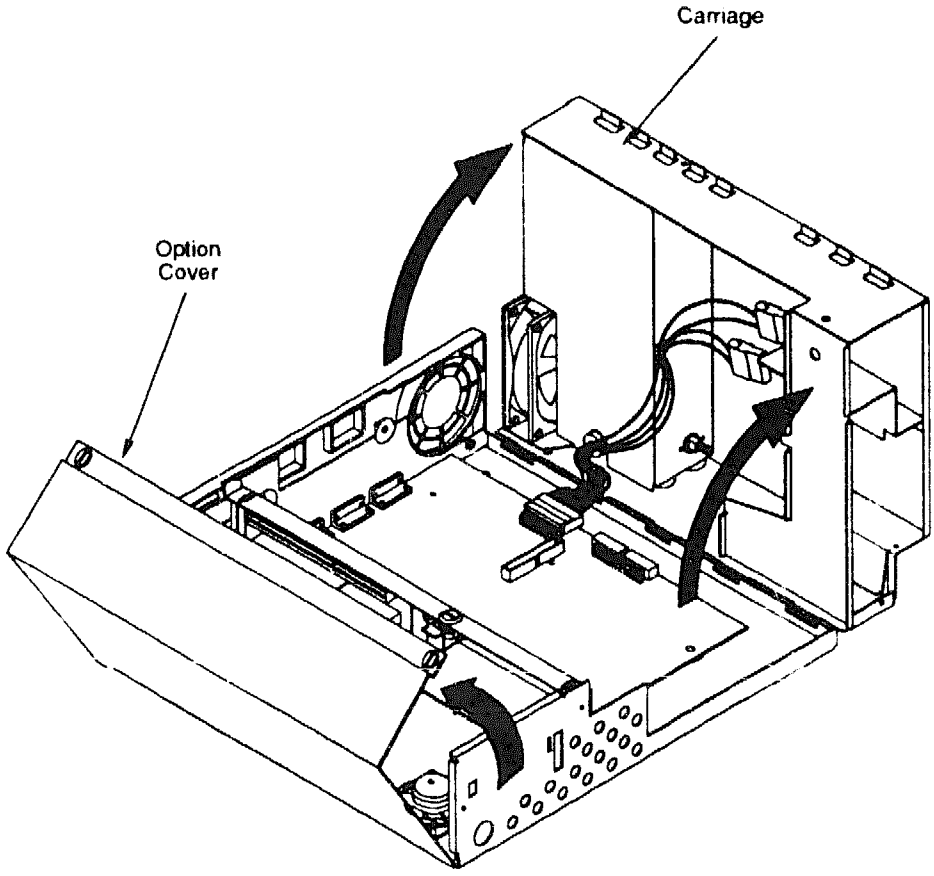


Removing the DECpc system cover

Opening the System Unit

Open the system unit as follows:

1. Unlock the system unit with the key, if necessary.
2. Remove the two shake-proof fittings that secure the system unit option cover and the carriage (metal fold-outs).
3. Lift the option cover (left side) counterclockwise and remove.
4. Lift the carriage (right side) clockwise.



Opening the system unit

Expansion Adapter Replacement

The procedure for replacing an expansion adapter in the DECpc is similar for the different options in the system.

1. Remove the system cover, and open the system unit.
2. Note the position of all cables (if any) connected to the expansion adapter, and disconnect the cables.

   NOTE:
   When removing an expansion adapter note its location and the location and routing of all cables (if any) attached to the expansion adapter.
3. Remove the mounting screw that secures the expansion adapter 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.

Option Slot Printed Circuit Board Replacement

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

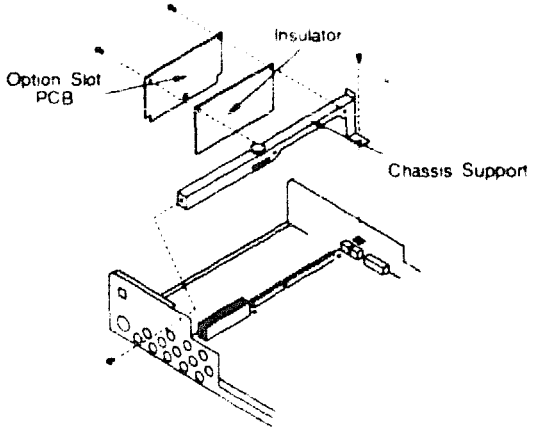
1. Remove the system cover, and open the system unit.
2. Remove any expansion adapters.

   NOTE:
   When removing an expansion adapter note its location and the location and routing of all cables (if any) attached to the expansion adapter.
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.

Re-install the chassis support and option slot PCB by reversing the previous 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.



Removing the Option Slot PCB

Speaker Replacement

Replace the speaker as follows:

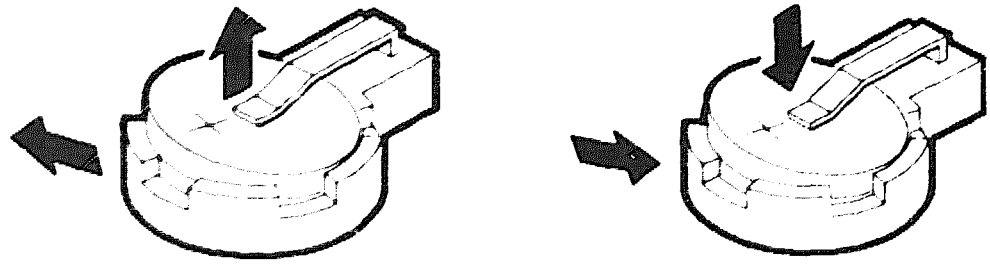
1. Remove the system cover, and open the system unit.
2. Disconnect the speaker cable from the main logic board.
3. Remove the two 5/16-inch nuts and lock washers securing the speaker to the bottom of the chassis.
4. Remove the speaker.
5. Replace the speaker, and connect the speaker cable to the main logic board.

Battery Replacement

Replace the battery as follows:

1. Remove the system cover, and open the system unit.
2. Gently lift the battery clip and remove the old battery from the socket on the main logic board.

   WARNING:
   The replacement battery must be the same type as the old battery. Do not dispose of the battery at the customer site. Do not incinerate the battery or take it apart.
3. Position the new battery with the positive (+) side up. Lift the clip and insert the battery.
4. Run the setup utility and reset the computer to enter the configuration information.



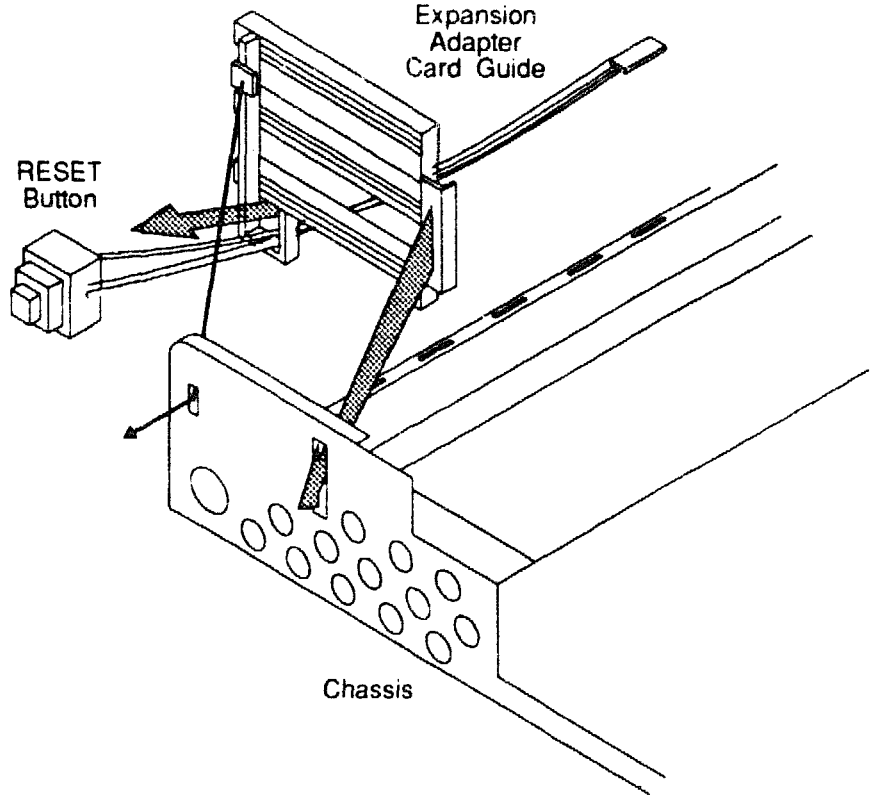
Removing the DECpc battery

RESET Button Removal

Remove the RESET button as follows:

1. Remove the system cover, and open the system unit.
2. Remove all expansion adapters from the system unit (if any).
3. Disconnect the RESET button cable from the main logic board.
4. Press the expansion adapter card guide clip.
5. Slide the expansion adapter card guide to the left, and remove it from the system unit.
6. From the back of the expansion adapter guide, push the RESET button (and cable) forward through the expansion adapter guide.

Replace the RESET button by reversing these steps.



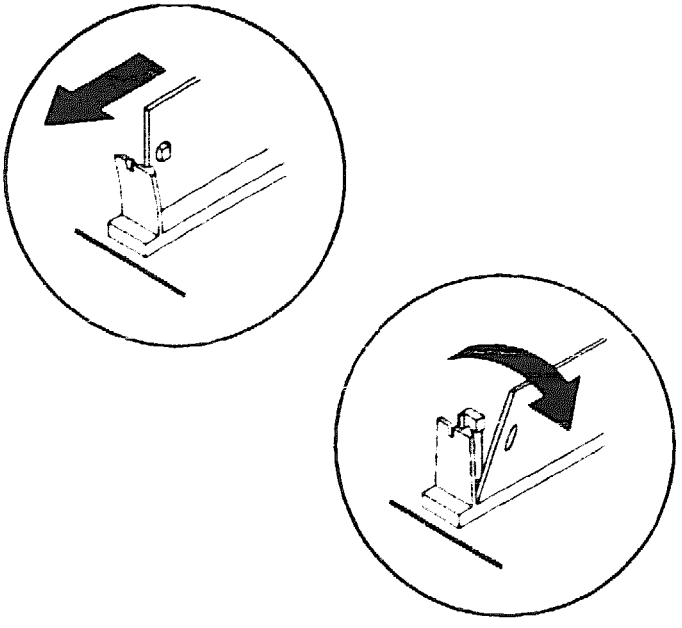
Removing the DECpc RESET button

Single-In-Line Memory Module Replacement

Replace SIMMs as follows:

1. Remove the system 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.



Removing a DECpc SIMM

Math Coprocessor Replacement

Replace the math coprocessor as follows:

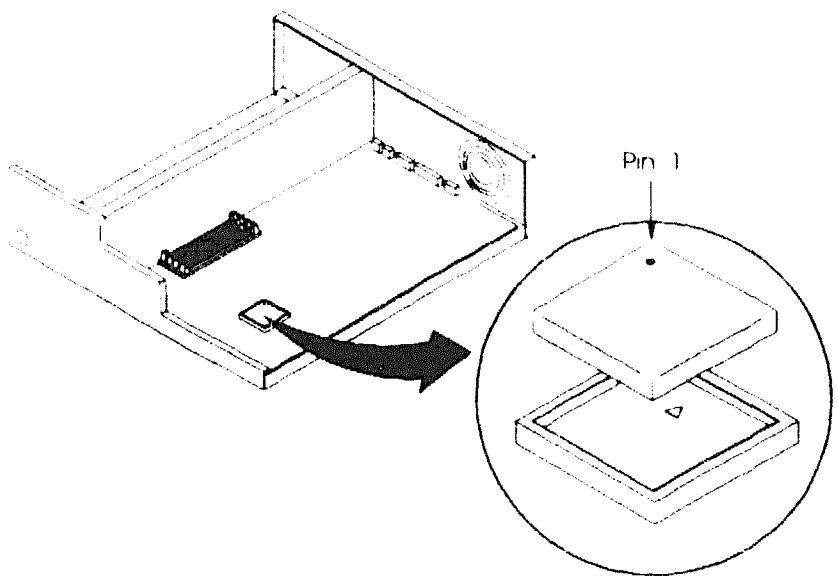
1. Remove the system cover, and open the system unit.
2. Locate the math coprocessor on the main logic board.
3. Use a special tool to simultaneously lift each corner of the coprocessor.

   NOTE:
   While lifting the coprocessor from 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 that 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:
   As you face the front of the DECpc 316SX, the pin 1 location is indicated by a numeral 1 near the upper left corner of the socket.

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



Replacing the DECpc math coprocessor

Main Logic Board Replacement

Replace the main logic board as follows:

1. Remove the system cover, and open the system unit.
2. Remove all expansion adapters 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 math coprocessor, if one is installed.
6. Remove the power supply cable, the power-on LED cable, and any floppy/hard/tape drive interface cables attached to the main logic board.

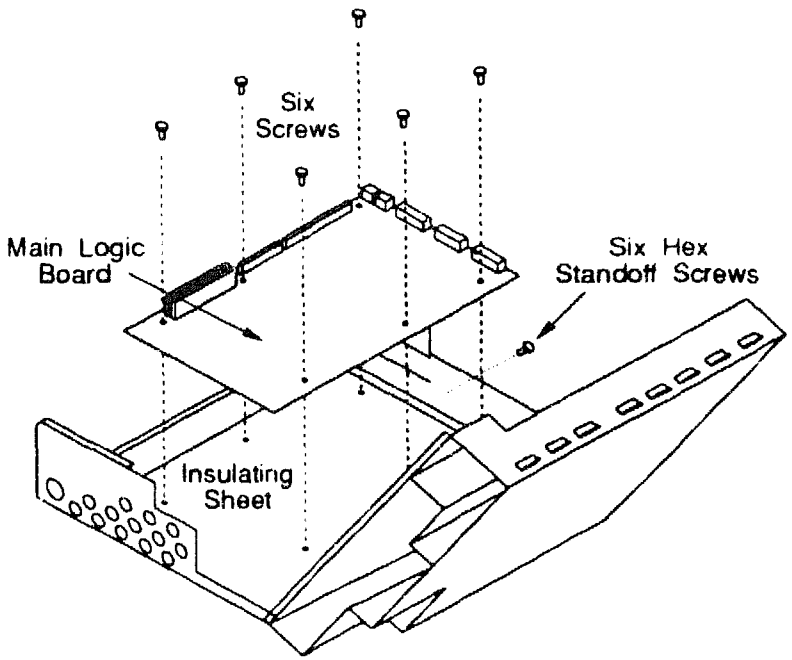
   NOTE:
   When removing the cables, note their locations and routing.

7. Remove the six 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 six standoffs.

8. Remove the six screws that secure the main logic board to the system unit.
9. Remove the main logic board.
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 onto the new main logic board all options (if any) that were removed from the old main logic board.
12. Install the new main logic board by reversing the steps used to remove the old 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.

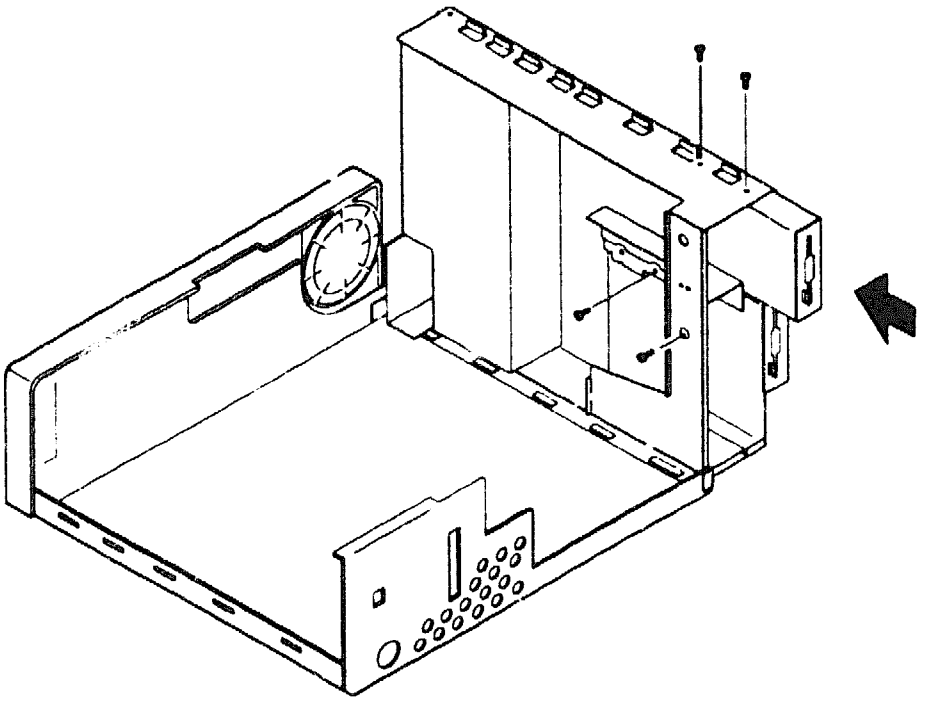


Removing the DECpc main logic board

Diskette Drive Replacement

Replace the diskette drive as follows:

1. Remove the system cover, and open the system unit.
2. Disconnect the ribbon data cable and the power 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. The other two are on the right side of the drive.
4. Remove the diskette 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. Connect the ribbon cable to the diskette drive.
8. After replacing the drive, reconnect all system cables.
9. Verify the operation of the new drive.
10. Re-install the system cover.



Replacing the DECpc diskette drive

Replacing an Optional Diskette Drive

To remove or replace an optional diskette drive, refer to the *DECpc 316SX 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 316SX User's Guide*.

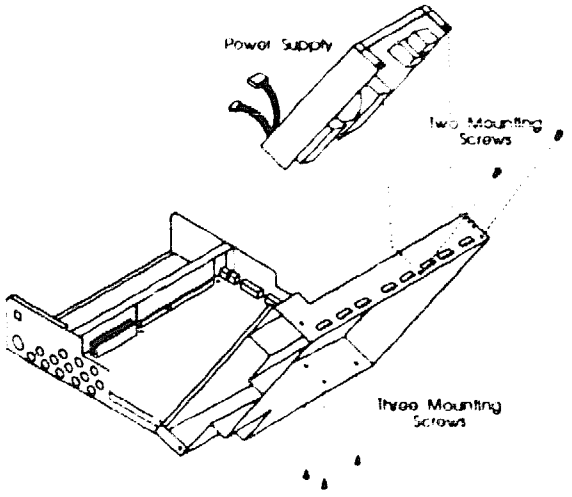
Power Supply Removal

Remove the DECpc power supply as follows:

1. Remove the system 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 degrees, 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. Replace the fuse with the same type, if necessary.

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

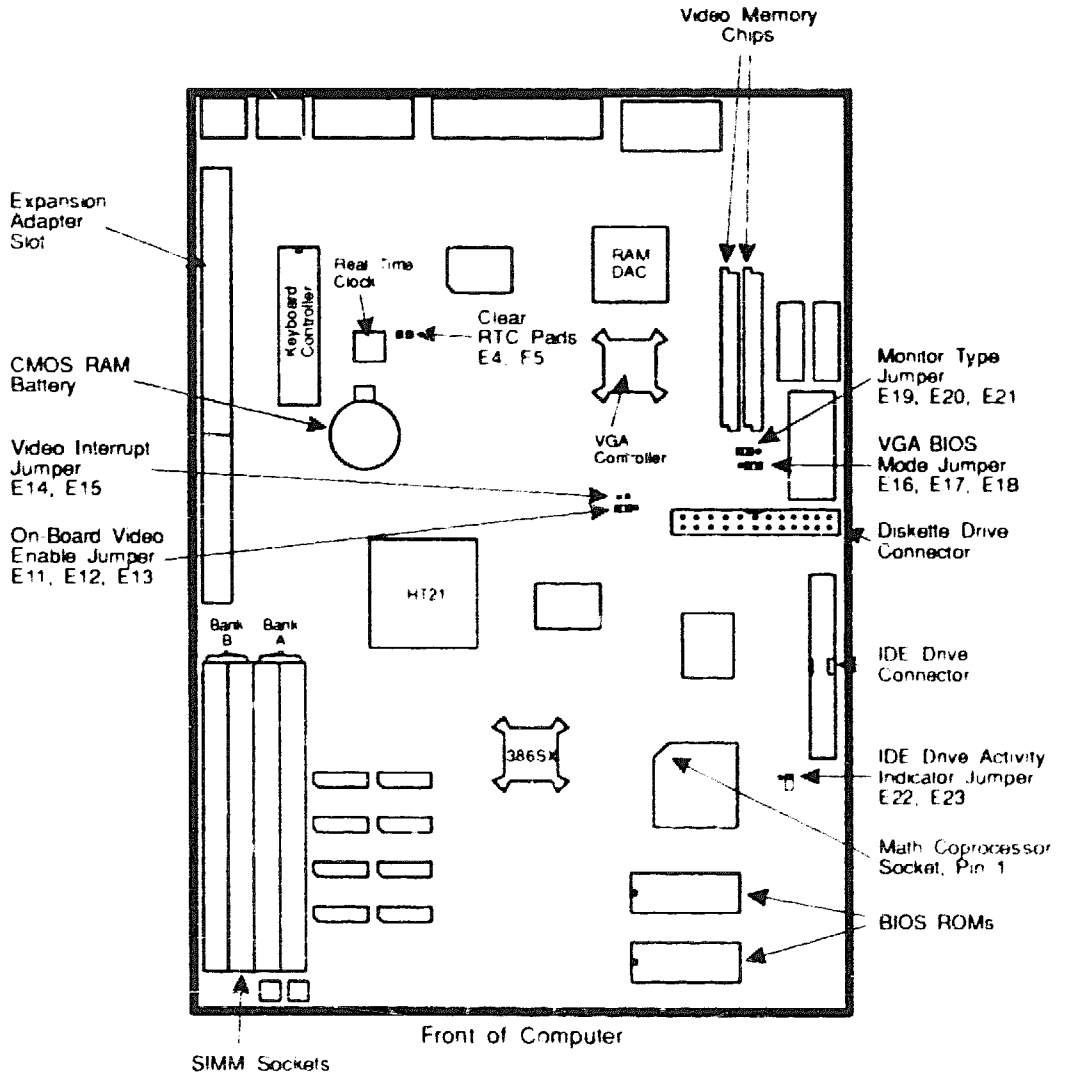


Removing the DECpc power supply

Main Logic Board Jumpers

Main Logic Board Diagram

The follcwing figure shows the location of the jumpers and other components on the main logic board:



Jumper Settings

The following table describes the jumper configurations and provides the recommended default setting for each jumper.

Feature	Description	Jumper
Video Interrupt	Standard/none	*E14,E15 no connection
	IRQ9	E14-E15 installed
On-Board Video	Enabled	*E11-E12 installed
	Disabled	E12-E13 installed
Monitor Type	VGA analog monitor or standard muitiple-frequency monitor	*E19-E20 installed
	Non-standard multiple-frequency monitor	E20-E21 installed
VGA BIOS	PS/2 mode	*E17-E18 installed
	AT mode	E16-E17 installed
IDE Drive Activity Indicator	Disable	*E22,E23 no connection
	Enable	E22-E23 installed

* Indicates factory setting


APPA

Appendix A

Electrical Specifications

The following table lists the electrical specifications for the DECpc 316SX base system:

Input Voltage (nominal)	120 VAC	230 VAC
Input Voltage Range	90 to 135 VAC	190 to 264 VAC
Input Frequency (nominal):	60 Hz	50 Hz
Input Frequency Range	47 to 63 Hz	
Input Surge Current	50 A peak	
Efficiency	70% or greater	
Power Consumption (typical)	143 watts	
DC Output Power (max.):	138.5 watts peak/100 watts continuous	
AC Receptacle	IEC 320	

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APP B

Appendix B

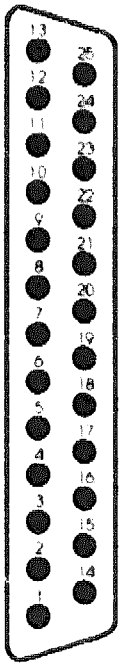
Peripheral Interface Connectors

The following tables and diagrams describe the pin assignments and functions of the external interface connectors on the DECpc 316SX.

Parallel Port Connector

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

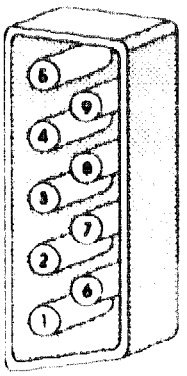
Pin	Signal	Function
1	STROBE–	Strobe
2	PRTDAT0	Data bit 0
3	PRTDAT1	Data bit 1
4	PRTDAT2	Data bit 2
5	PRTDAT3	Data bit 3
6	PRTDAT4	Data bit 4
7	PRTDAT5	Data bit 5
8	PRTDAT6	Data bit 6
9	PRTDAT7	Data bit 7
10	PRTACK–	Acknowledge
11	PRTBSY	Busy
12	PRTPE	Paper End
13	PRTSEL–	Select
14	PRTAF–	Auto Feed
15	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-232C serial port connector:

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



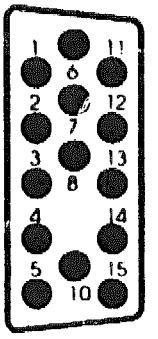
Keyboard/Mouse Connector

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

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

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 Connectors

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)

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

Disk Drive Power Connector

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