DECpc™ 400ST Series

Service Guide

Order Number: ER-PCT15-SV-002

Digital Equipment Corporation
Maynard, Massachusetts

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DECUS	PDP	VT
DECpc	OpenVMS	

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The FCC wants you to know...

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, can cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Move the computer away from the receiver.
- Connect the computer into an outlet on a circuit different from that to which the receiver is connected.
- Move the cables connected to the computer to minimize the interference.
- Tighten all screws on cables and the computer housing.
- Install blank panels, originally supplied with the computer, in all unused card slots.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems.*

This booklet is available from the U.S. Government Printing Office, Washington, D.C., 20402. Stock No. 004-00398-5.

CAUTION

Any changes or modifications not expressly approved by the grantee of this device can void the user's authority to operate the equipment.

NOTE

If a Class A device is installed within this computer, then the computer is to be considered a Class A computer.

To maintain the Class B limit on this computer product, only peripherals (computer input/output devices, terminals, printers) that comply with the Class B limits may be attached. Operation with non-compliant peripherals is likely to result in interference to radio and TV reception. For continued compliance to Class B limits, this product should use shielded interface cables.

This device complies with Part 15 of the FCC Rules. Operation of this device is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This digital apparatus does not exceed the Class B limits for radio noise emissions set out in the radio interference regulations of the Canadian Department of Communications.

In the event that the data cables specified by Digital must be exchanged, the user is to ensure that the replacement cables comply with the design and shielding quality of the original Digital cables if protection against interference is to be guaranteed.

この装置は、第二種情報装置（住宅地域又はその隣接した地域において使用されるべき情報装置）で住宅地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）基準に適合しております。

しかし、本装置をラジオ、テレビジョン受信機に近接してご使用になると、受信障害の原因となることがあります。

取扱説明書に従って正しい取り扱いをして下さい。

This equipment is in the 2nd Class category (information equipment to be used in a residential area or an adjacent area thereto) and conforms to the standards set by the Voluntary Control Council For Interference by Data Processing Equipment and Electronic Office Machines aimed at preventing radio interference in such residential area.

When used near a radio or TV receiver, it may become the cause of radio interference. Read the instructions for correct handling.

This equipment meets or exceeds requirements for safety in the U.S. (UL 1950), Canada (CSA C22.2 No. 950), and Europe (EN 60950, 1988 and IEC 950) with Nordic requirements.

This equipment meets or exceeds the ergonomic requirements of ZH1/618 and is certified to bear the GS mark by TUV Rheinland of N.A.

This equipment has been tested for radio frequency emissions and has been verified to meet VDE 0871 Class B

Declaration of the Manufacturer or Importer

We hereby certify that the DECpc 400ST Series computer is in compliance with vfg 1046/1984 and is RFI suppressed.

The marketing and sale of the equipment was reported to the German Postal Service.

The right to retest this equipment to verify compliance with the regulation was given to the German Postal Service.

Digital Equipment Corporation

ADVARSEL

Lithiumbatteri - Eksplosjonsfare.
Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten.
Brukt batteri returneres apparatleverandøren.

VARNING

Explsionsfara vid felaktigt batteribyte.
Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren.
Kassers använt batteri enlight fabrikantens instruktion.

VAROITUS

Paristo voi rÆjÆhtÆÆ, jos se on virheellisesti asennettu.
Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin.
HÆvitÆ kÆytetty paristo valmistajan ohjeiden sukaisesti.

For more information regarding lithium battery replacement, refer to Chapter 3 "System Box FRU Replacement."

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About This Guide

Purpose

This service guide is designed to help you diagnose faulty components and repair the DECpc 400ST Series computer. This guide only contains information for servicing the base system and generic options. Specific information on configuring and installing mass storage options is covered in the individual option installation guides supplied with those products.

Audience

This guide is written specifically for an authorized repair technician. It also assumes a familiarity with the general terminology associated with personal computers.

Organization

This service guide is organized as follows:

Chapter 1	System Description — briefly describes the computer's major components.
Chapter 2	Troubleshooting — provides troubleshooting information for the computer.
Chapter 3	System Box FRU Replacement — describes how to remove and replace system box FRUs.
Chapter 4	SCU and BIOS Setup Utility — describes the SCU and system configuration information.
Chapter 5	Updating the System BIOS — describes the procedure involved to update the system BIOS.
Appendix A	Power Consumption — provides power consumption specifications for the system board and system box.
Appendix B	System Board Jumpers — describes the system board jumper configurations.
Appendix C	Interface Connectors — lists interface information for all external connectors.
Appendix D	Device Mapping — provides tables listing the system memory map, I/O address map, interrupt map, and DMA map.
Appendix E	CPU Module Jumpers — describes the CPU module jumper configurations.
Index	Index — an index of service guide information.

Notational Conventions

Notational conventions used throughout this guide include:

*	In connector pin-out listings, the asterisk (*) indicates an active low signal, for example, IOCHCK*
h	An h suffix to a numerical value denotes hexadecimal numbers, for example, 0F8h equals 0F8 (hexadecimal).
Kb	A Kb suffix to a numerical value indicates size in kilobits, for example, 512 Kb. A kilobit equals 1024 bits.
KB	A KB suffix to a numerical value indicates size in kilobytes, for example, 640 KB. A kilobyte equals 1024 bytes.
Mb	An Mb suffix to a numerical value indicates size in megabits, for example, 4 Mb. A megabit equals 1,048,576 bits.
MB	An MB suffix to a numerical value indicates size in megabytes, for example, 1 MB. A megabyte equals 1,048,576 bytes.
GB	A GB suffix to a numerical value is used to indicate size in gigabytes, for example, 1 GB, 256 GB, etc. A gigabyte equals 1,073,741,824 bytes.

An italicized word or phrase is used to represent a variable or to lend emphasis in textual descriptions.

Special Notices

Three kinds of special notices are used throughout this guide to emphasize specific information:

WARNING

WARNING indicates the presence of a hazard that can cause personal injury if the hazard is not avoided.

CAUTION

CAUTION indicates the presence of a hazard that might cause damage to hardware or that might corrupt software.

NOTE

Notes are used to provide important or explanatory information.

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

Ordering Documents

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

Digital Equipment Corporation
444 Whitney Street
Northboro, MA 01532
Attn: Publishing and Circulation Services Ordering 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 self-maintenance customers can order documents with part numbers beginning with EK, ER, or AA by mail from:

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

Or, by calling 1-800-DIGITAL between the hours of 8:30 am to 8:00 pm (Eastern Standard Time).

Related Documentation

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

Document	Part Number
DECpc 400ST Series User's Guide (Multilingual)	ER-PCT15-UM
DECpc 400ST Series User's Guide (English)	ER-PCT15-UA
DECpc 400ST Series Installation Guide (Multilingual)	ER-PCT15-IM
DECpc 400ST Series Installation Guide (English)	ER-PCT15-IA
DECpc 400ST Series Technical Reference Manual	ER-PCT15-TR
DECpc 400ST Series 25 MHz, 33 MHz, 50 MHz CPU Upgrade Kit Installation Guide (Multilingual)	ER-T16AA-IG
DECpc 400ST Series Intel486 DX2 50 MHz and 66 MHz CPU Upgrade Kit Installation Guide (Multilingual)	ER-T31AA-IM
DECpc 400ST Series Intel486 DX2 50 MHz and 66 MHz CPU Upgrade Kit Installation Guide (English)	ER-T31AA-IA

1

System Description

Introduction

The DECpc 400ST Series of computers are high-performance, Extended Industry Standard Architecture (EISA)-compatible PCs that can operate as standalone computers or as clients and file servers in a network environment (see Figure 1-1).

Their modular design and versatility increases reliability and reduces the number of service actions that can be done in the field. In general, service actions are removing and replacing field replaceable units (FRU's).

The remainder of this chapter briefly describes the FRUs and major components for DECpc 400ST Series computers. Major components include:

- System box
- Keyboard
- Mouse

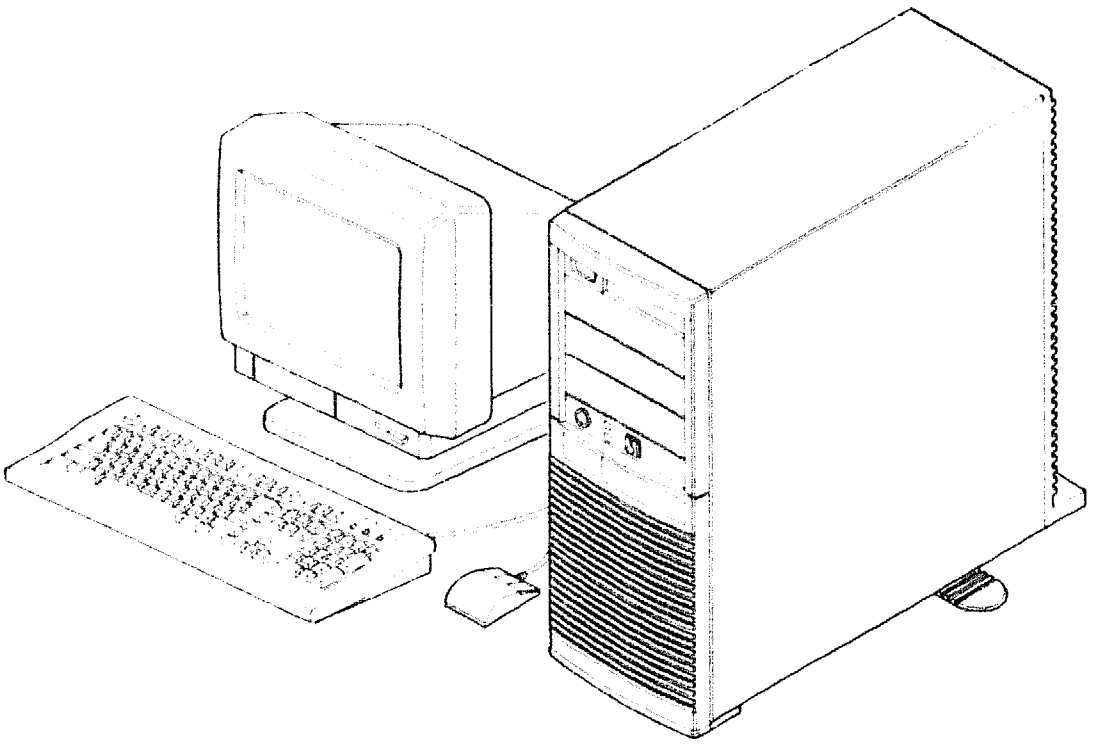


Figure 1-1. Typical DECpc 400ST Series Computer

System Box

The system box contains the system level FRUs listed in Table 3-1 and supports the optional FRUs listed in Table 3-2.

System Board

System board FRUs include SIMMs, a CPU module, optional memory module, and Real-Time Clock (RTC), which contains the system battery. All other system board components are soldered in place, making field replacement impractical.

SIMMs

There are two SIMM banks (bank 0 and bank 1) on the system board. Each bank has two SIMM sockets. SIMM sizes can be 2 , 4 , 8, or 16 MB. DECpc 400ST Series computers will also support 32 MB SIMMs when they become available.

Different SIMM sizes can be used at the same time, however, SIMM types within a bank must be identical. The computer uses SIMMs having an access of 80 ns or faster.

The base computer is shipped with 4 MB of SIMM memory. Additional SIMMs may have been installed by the customer. If a system board needs to be replaced, SIMMs should be removed and reinstalled on the replacement system board.

CPU Module

A variety of CPU modules are available for the DECpc 400ST Series computers. Refer to Appendix E for a current list.

Memory Module

The optional memory module contains eight SIMM sockets for installing up to 128 MB of DRAM (256 MB when 32 MB SIMMs become available).

External Cache

An external cache can be installed on some CPU modules and is fixed on others. Refer to Appendix E for information regarding specific modules.

Real-Time Clock (RTC)

The RTC contains a lithium battery that provides power for non-volatile CMOS configuration information when power is removed from the computer.

Optional Drives

Optional drives include: 3 1/2-inch diskette drive, 5 1/4-inch diskette drives, Intelligent Drive Electronics (IDE) hard drives, Small Computer System Interface (SCSI) hard drives, and SCSI tape drives.

Power Supply

A 254 W auto-sensing power supply is used to power the system board, drives, and the auxiliary fan.

Keyboard

There are no service procedures for the keyboard other than replacement.

Mouse

Service procedures for the mouse are limited to cleaning the mouse ball and tracking mechanism. Refer to the appropriate documentation supplied with the mouse.

2

Troubleshooting

Introduction

This chapter provides troubleshooting instructions for DECpc 400ST Series computers. It is divided into the following sections:

- Special tools
- Power-on Self Test (POST)
- Initial troubleshooting
- System box troubleshooting
- Disk drive troubleshooting
- Monitor troubleshooting

Special Tools

A standard field service tool kit and the special tools, listed in Table 2-1, are needed to troubleshoot and repair the DECpc 400ST Series computer.

Table 2-1. Special Tools

Tool	Part Number	Description
Diagsoft QA Plus	22-0098-02	Stand-alone diagnostics available separately. Documentation included with software kit.
Tri-wrap Loopback Connector	FD-10164-00	This triple connector is used to test 25-pin and 9-pin serial ports, and 25-pin parallel ports.
DECpc 400ST Series System Configuration Diskettes		This software kit is used to reconfigure the computer when options are installed.
- English	AK-PN9UA-XA	
- French	AK-PN9VA-XA	
- German	AK-PN9WA-XA	
- Italian	AK-PN9XA-XA	
- Spanish	AK-PN9YA-XA	

POST

Before the DECpc 400ST Series computer can be used, all components must be initialized and tested, and the operating system must be loaded into memory. The BIOS that is stored in FLASH ROM controls this sequence of actions. A portion of the BIOS contains a Power-on Self Test (POST). POST is responsible for initializing and testing system components each time power is applied or when the computer boots. The remainder of the BIOS loads the operating system and specific applications.

Each time you turn on the DECpc 400ST Series computer, POST displays a numeric countdown (840 to 000) sequence as it tests the system board, Intel486 microprocessor, system board timers and logic devices, keyboard, memory, etc.

POST tests are divided into two types of tests: system board hardware and peripheral hardware. The following sections describe these tests as well as the POST sequence and POST messages.

System Board Hardware Tests

POST tests the system board hardware first. If any of these tests fail, a fatal error condition exists and further testing and initialization is not possible. You are notified that an error condition exists by an error message displayed on the monitor screen or by beeps from the system speaker. Refer to the POST error messages and beep codes provided at the end of this chapter. The following identifies the system hardware tests and their order of execution:

- CPU
- ROM BIOS (checksum)
- Programmable Interrupt Timer (PIT)
- Base 64 KB DRAM
- CMOS RAM
- EISA devices
- DMA controller
- Programmable Interrupt Controller (PIC)
- Video controller
- Keyboard controller
- RTC test

Peripheral Hardware Tests

The first peripheral hardware test procedure verifies that the system configuration data stored in CMOS RAM matches the hardware present. Then, the procedures continue to test and initialize other peripheral hardware. This testing includes memory on the system board and, if one is installed, on the memory module. A test failure generally results in an error message on the monitor screen. The following list identifies the peripheral hardware tests and their order of execution:

- ISA CMOS RAM and EISA non-volatile (FLASH) memory configuration data
- Serial/parallel interface circuitry
- Video
- Keyboard
- RAM memory above 64 KB
- Coprocessor
- Diskette drive controller
- Hard disk controller
- CPU internal cache memory
- Option ROMs, such as SCSI and LAN

POST Sequence

While POST is running, a numeric countdown (840 to 000) is displayed on the monitor screen as it sequences through the test procedures.

NOTE

During the POST memory test, the amount of memory being tested is displayed on the screen. Depending on the amount of extended memory installed, the POST memory test can take several minutes to complete. POST does not check memory after a soft boot (CTRL + ALT + Delete).

POST displays a different message depending on whether it detects any configuration errors. An example of each situation follows.

If POST does not detect any configuration errors, the computer beeps twice and displays a message similar to the following:

```
PhoenixBIOS (TM) E486 Version x.xx.xx.xxx
Copyright (C) 1985-1991 Phoenix Technologies Ltd.
All Rights Reserved


    640K Base Memory
  03072K Extended Memory

135

To continue press: ..................................... SPACEBAR

To configure system in English press: ..................... F1

Pour configurer le système en français appuyez sur: ...... F2

System konfiguration in Deutsch dur Drücken von: ......... F3

Per configurare il sistema in italiano premere: .......... F4

Para configurar el sistema en Español pulse: ............. F5
```

NOTE

After the above message appears, you have approximately 10 seconds to press the appropriate function key to display the initial Setup screen. If you do not press the appropriate function key within the specified time, and if POST failed to detect any configuration errors, the computer will attempt to boot.

If configuration errors are found, the computer beeps more than once and displays a message similar to the following:

```
PhoenixBIOS (TM) E486 Version x.xx.xx.xxx
Copyright (C) 1985-1991 Phoenix Technologies Ltd.
All Rights Reserved


    640K Base Memory
  03072K Extended Memory

000
042: Invalid ISA Configuration Information - Please Run
Configuration Utility


To retry boot press:..................................... Esc

To configure system in English press:.................... F1

Pour configurer le système en français appuyez sur:..... F2

System konfiguration in Deutsch dur Drücken von:........ F3

Per configurare il sistema in italiano premere:.......... F4

Para configurar el sistema en Español pulse:............. F5
```

It is normal for the above message to appear the first time you start the computer. If any error messages appear on the screen, refer to "POST and Boot Messages" later in this chapter for possible causes and suggested solutions.

NOTE

If you press Esc to continue, the computer might not operate correctly because of a configuration error. Press the appropriate function key to display the initial Setup screen.

Running Setup

To run Setup, wait for POST to prompt you. Then, press the appropriate function key to display the following initial Setup screen in the chosen language:

```
                    **** NOTE ****

Since values specified using the BIOS Setup Utility will be
overwritten when the System Configuration Utility (SCU) is
run, it is recommended that the BIOS Setup Utility be used
only if you:

o   Need to enable your diskette drive

o   Do not have access to a diskette drive

o   Have only ISA expansion boards and will not be using the
    SCU

To exit Setup press ESC.

To continue Setup press F1.
```

NOTE

If you use the ROM BIOS setup utility to change any configuration parameter other than time, date, or password, the message "EISA configuration not assured" will be displayed during the next POST cycle. Any subsequent POST cycle or running the System Configuration Utility (SCU) clears this message.

For further information on configuring the system with the SCU, refer to Chapter 4.

POST and Boot Messages

POST displays messages to alert you to errors in hardware, software, and firmware, or displays information about your computer.

During POST, the system board speaker beeps to alert you to specific POST steps. Two beeps signal the start of the time during which you can enter Setup. Another beep signals the end of that time, and then a subsequent beep signals a computer boot has begun.

If an error occurs during POST, the countdown is stopped. If an error occurs before the monitor is initialized, specific beep codes sound to alert you to a problem. If an error occurs after the monitor is initialized, both the POST number and the error message are displayed on the monitor.

Table 2-2 lists a general grouping of messages arranged by POST countdown number. Where applicable, the message is accompanied by an error message and a recommended solution to the problem.

NOTE

Italics indicate variable parts of a message such as memory addresses, hex values, etc. These messages can differ at each occurrence.

Table 2-2. POST and Boot Messages

POST No.	Message	Error Message	Solution
840	Start of POST		
830	CPU register test		
820	8742 initialization		
810	RTC RAM and register test	RTC RAM and register test failure	Contact your Digital service representative.
800	System BIOS checksum test	System BIOS checksum failure	Contact your Digital service representative.
790	Initialize programmable interval timer	Programmable interval timer failure	Contact your Digital service representative.
780	DMA channel test	DMA channel failure	Contact your Digital service representative.
770	DMA page register test	DMA page register failure	Contact your Digital service representative.
760	Verify RAM refresh test	RAM refresh failure	Contact your Digital service representative.

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
740	First 64 Kb RAM test		
755		First 64 Kb RAM chip or data line failure, bit 0-15	Contact your Digital service representative.
756		First 64 Kb RAM chip or data line failure-multi-bit	Contact your Digital service representative.
757		First 64 Kb RAM odd/even logic failure	Contact your Digital service representative.
758		First 64 Kb RAM address line failure	Contact your Digital service representative.
759		First 64 Kb RAM parity test failure	Contact your Digital service representative.
730	Initialize stack		
710	Initialize keyboard buffer		
700	Chipset initialization 4	Shadow of onboard BIOS failed	Computer DRAM has failed. Replace any failed SIMM.
702	VGA/EGA adapter installed option selected	No BIOS found at C0000h	Run the SCU and deselect the VGA/EGA adapter installed option.
690	CMOS checksum test	CMOS power failure	The configuration information stored in CMOS does not agree with your hardware configuration. Run the SCU to verify configuration. Reboot computer.

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
691		CMOS checksum failure	See 690.
692		Extended CMOS checksum failure	See 690.
693	Flash erasure or write failure occurred	Default configuration failure, unable to write FLASH memory	Run the SCU to properly configure your computer.
680	Initialize EISA slots		
670	Initialize serial ports		
660	Initialize parallel ports		
655	DMA register test (slave)	DMA register failure (slave)	Contact your Digital service representative.
650	DMA register test (master)	DMA register failure (master)	Contact your Digital service representative.
645	Programmable interrupt controller register test (master)	Programmable interrupt controller register failure (master)	Contact your Digital service representative.
640	Programmable interrupt controller register test (slave)	Programmable interrupt controller register failure (slave)	Contact your Digital service representative.
620	Initialize interrupt vector table		
610	Enable timer tick interrupt		
600	Initialize keyboard controller	Keyboard controller failure	Contact your Digital service representative.
590	Check video configuration		
570	VGA/EGA expansion board configured but not detected	VGA/EGA configuration error	Run the SCU to properly configure your computer.

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
540	VGA/EGA video BIOS failed to initialize	Video BIOS failed to initialize	Run the SCU to properly configure your computer for VGA/EGA adapter.
520	Initialize console redirection		
500	Display signon message		
490	Timer tick interrupt test	No timer tick interrupt	Contact your Digital service representative.
480	Shutdown test	Shutdown failure	Contact your Digital service representative.
460	EISA extended devices test	Fail safe timer NMI failure	Contact your Digital service representative.
461		Software port NMI failure	Contact your Digital service representative.
450	Chipset initialization 6		
440	Size memory above 64 Kb	Gate A20 failure	The computer cannot switch into protected mode. Contact your Digital service representative.
441		Unexpected interrupt in protected mode	The computer received an interrupt while in protected mode (probably while testing memory). If the problem persists, contact your Digital service representative.

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
430	Interval timer 2 test	Timer 2 failure	The Integrated System Peripheral (ISP) chip on the system board might have failed. If the problem persists, contact your Digital service representative.
390	Initialize keyboard flags		
370	Test keyboard	Keyboard controller failure	Contact your Digital service representative.
371		Keyboard clock line failure	The keyboard or the keyboard cable connection has failed. Check the keyboard connection. If the connection is good, the keyboard might have failed. Try another keyboard. If the problem persists, Contact your Digital service representative.
372		Keyboard data line failure	See 371.
373		Keyboard stuck key failure	One or more of the keys were pressed. Release the key or keys and try again.
374		Keyboard failure	Replace keyboard.
350	Re-initialize keyboard controller		
330	Initialize auxiliary device		
310	Initialize keyboard controller output port		

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
300	Initialize gate A20		
290	Test memory above 64 Kb	Memory parity failure at *XXXX*:0000 to *XXXX*:FFFF	One of the SIMMs or associated circuitry has failed. Check for failed SIMM and replace if necessary. If the message repeats, contact your Digital service representative.
291		Memory data line failure at *XXXX*:0000 to *XXXX*:FFFF	See 290.
292		Memory odd/even logic failure at *XXXX*:0000 to *XXXX*:FFFF	One of the SIMMs or associated circuitry has failed. Check for failed SIMM and replace if necessary. If the message repeats, contact your Digital service representative.
293		Memory double word logic failure at *XXXX*:0000 to *XXXX*:FFFF	See 292.
294		Memory high address failure at *XXXX*:0000 to *XXXX*:FFFF	See 292.
295		Memory address line failure at *XXXX*:*YYYY*, read *QQQQ* expecting *ZZZZ*	See 292.
296		Memory write/read failure at *XXXX*:*YYYY*, read *QQQQ* expecting *ZZZZ*	See 292.

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
297		Decreasing available memory	This message immediately follows any memory error message informing you that memory modules are failing. Check that all SIMMs are installed correctly.
270	Initialize extended BIOS data area		
250	Chipset initialization 7		
230	Enable hardware interrupts		
210	Read keyboard ID		
190	Real-time clock test	Real-time clock failure	The internal battery for the clock is probably dead. Replace the real-time clock device.
160	Coprocessor test	Coprocessor failed	The coprocessor failed or is missing.
150	Check for invalid configuration		
140	Shadowing of system BIOS failed	Shadow of system BIOS failed	Contact your Digital service representative.

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
130	Initialize diskette subsystem	Diskette drive failure	Drive has either failed or is missing. Verify the drive settings using the BIOS Setup Utility. Make sure drive is present and the diskette is inserted properly. If they are, drive might have failed.
131		Diskette drive 0 failure	Drive 0 has either failed or is missing. Verify the settings for drive 0 using the BIOS Setup program. Make sure drive 0 is present and the diskette is inserted properly. If it is, drive 0 might have failed.
132		Diskette drive 1 failure	See 131.
135	Enter ROM BIOS Setup utility(1)		
120	Initialize hard drive subsystem	Hard drive configuration error	Check the computer configuration and drive type by running the SCU.
122		Hard drive 0 failure	See 120 and 121.
121		Hard drive controller failure	See 120. Check both ends of the controller's cables.
110	Chipset initialization 9		

(1) Earlier versions of the BIOS allowed you to enter the setup utility at POST countdown message 130

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
090	Enable cache	Internal cache test failed–cache disabled	Cache failed. Replace CPU module.
080	Initialize option ROMs	*XXXX0*h optional ROM bad checksum=*YY*h	Expansion board configuration error. Run the SCU.
085	Shadowing of ISA address range E0000h to E7FFFh failed	Shadow of BIOS at E0000h to E7FFFh failed	Contact your Digital service representative.
084	Shadowing of ISA address range C8000h to CFFFFh failed	Shadow of BIOS at C8000h to CFFFFh failed	Conta ' your Digital service representative.
083	Shadowing of ISA address range C0000h to C7FFFh failed	Shadow of BIOS at C0000h to C7FFFh failed	Contact your Digital service representative.
070	Set system clock	Time of day clock not set	Run the SCU.
060	Check for electrical keylock	Keyboard is locked–please unlock	Unlock the keyboard.
040	Report configuration errors and prompt for configuration utility	Configuration error; slot *X*	Run the SCU for the board in slot *X*.

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
041		ID mismatch error; slot *X*	(A) The board in slot *X* is bad and returns a bad ID. (B) The board ID does not match the ID that the SCU expects for slot *X*. The mismatch is due to either the wrong board in the slot or the wrong configuration file for the board. Run the SCU to configure slot *X*, or replace the bad board. If the problem persists, contact your Digital service representative.
042		Invalid ISA configuration information	An ISA board has not been properly configured. Run the SCU and check switch and jumper settings.
043		Invalid EISA configuration information	An EISA board has not been properly configured. Run the SCU and verify all settings.
044	Computer configuration has changed without running the SCU	EISA configuration NOT ASSURED!	Run the SCU to configure your computer.
020	Enable parity checking and NMI		
000	Boot	Diskette read failure	No diskette in drive A. Insert a diskette and try again.

Table 2-2. POST and Boot Messages *(continued)*

POST No.	Message	Error Message	Solution
001		Not a bootable diskette	The diskette in Drive A is not formatted as a bootable diskette. Replace the diskette with a bootable diskette and try again.
002		No boot device available	If booting from a diskette, it is a non-bootable type or the diskette drive has failed. If booting from a hard disk drive, it might not be formatted or the drive might have failed. The problem might also be the SCSI controller board. Make sure the diskette in drive A contains an operating system. If applicable, make sure the hard disk drive contains an operating system.
003		Hard drive read failure	The hard disk drive has failed. Check the computer configuration and drive type by running the SCU. Check both ends of the controller's cables, and reseat the hard disk controller board. If the problem persists, contact your Digital service representative.
004		No boot sector on hard drive	The hard disk drive is not formatted as a bootable disk.

Run-Time Error Messages

Run-time messages are displayed on the monitor screen and the LCD (if installed) if an error occurs after the computer boots. Table 2-3 lists the run-time error messages by POST countdown number.

Table 2-3. Run-Time Error

POST No.	Message	Solution
980	Unresolved memory parity error	Computer DRAM has failed. Replace any failed SIMM.
981	Memory parity error at *XXXX:YYYY*	See 980.
982	I/O expansion board NMI; slot *X*	Malfunction or configuration error for expansion board in slot *X*. Run the SCU and verify settings.
983	Unresolved I/O expansion board NMI	See 982. Slot is unknown.
984	Expansion board disabled	Configuration error or malfunctioning expansion board. Run the SCU and verify settings.
985	Fail safe time NMI	Expansion board malfunction. Replace defective board.
986	Unresolved bus timeout NMI	See 985.

Table 2-3. Run-Time Error Messages *(continued)*

POST No.	Message	Solution
987	Bus timeout NMI; slot *X*	
988	Software NMI	
970	Unexpected software interrupt	There is an error in a software utility. Try turning the computer off and then on again. If the problem persists, contact your software manufacturer's representative.
971	Unexpected hardware interrupt	This could be any hardware-related problem. Check all cables, connections, jumpers, and boards. If the problem persists, contact your Digital service representative.

Beep Codes

If POST finds an error and cannot display a message, the system board speaker emits a series of beeps to indicate the error and places a value in I/O port 80h.

For example, a failure of bit three in the first 64 KB of DRAM is indicated by a 2-1-4 beep code (a burst of two beeps, a single beep, and a burst of four beeps).

Tables 2-4 and 2-5 list the beep codes and the values POST writes to I/O port 80h when it encounters an error. Table 2-4 lists fatal errors (errors that lock up the computer), and Table 2-5 lists non-fatal errors (errors that do not lock up the computer).

One beep code is not listed in either table: a long beep followed by one or more short beeps indicates a monitor controller failure.

Table 2-4. Beep Codes for Fatal Errors

Beep Code	Error Message	Port 80h
1-1-3	RTC write/read failure	02h
1-1-4	ROM BIOS checksum failure	03h
1-2-1	Programmable interval timer failure	04h
1-2-2	DMA initialization failure	05h
1-2-3	DMA page register write/read failure	06h
1-3-1	DRAM refresh verification failure	08h
1-3-3	1st 64 KB DRAM chip or data line failure	0Ah
1-3-4	1st 64 KB DRAM odd/even logic failure	0Bh
1-4-1	1st 64 KB DRAM address line failure	0Ch
1-4-2	1st 64 KB DRAM parity test in progress/failure	0Dh
2-1-1	Bit 0 1st 64 KB DRAM failure	10h
2-1-2	Bit 1 1st 64 KB DRAM failure	11h
2-1-3	Bit 2 1st 64 KB DRAM failure	12h
2-1-4	Bit 3 1st 64 KB DRAM failure	13h
2-2-1	Bit 4 1st 64 KB DRAM failure	14h
2-2-2	Bit 5 1st 64 KB DRAM failure	15h

Table 2-4. Beep Codes for Fatal Errors *(continued)*

Beep Code	Error Message	Port 80h
2-2-3	Bit 6 1st 64 KB DRAM failure	16h
2-2-4	Bit 7 1st 64 KB DRAM failure	17h
2-3-1	Bit 8 1st 64 KB DRAM failure	18h
2-3-2	Bit 9 1st 64 KB DRAM failure	19h
2-3-3	Bit A 1st 64 KB DRAM failure	1Ah
2-3-4	Bit B 1st 64 KB DRAM failure	1Bh
2-4-1	Bit C 1st 64 KB DRAM failure	1Ch
2-4-2	Bit D 1st 64 KB DRAM failure	1Dh
2-4-3	Bit E 1st 64 KB DRAM failure	1Eh
2-4-4	Bit F 1st 64 KB DRAM failure	1Fh
3-1-1	Slave DMA register failure	20h
3-1-2	Master DMA register failure	21h
3-1-3	Master interrupt mask register failure	22h
3-1-4	Slave interrupt mask register failure	23h
3-2-4	Keyboard/mouse controller test failure	27h

Table 2-5. Beep Codes for Non-Fatal Errors

Beep Code	Error Message	Port 80h
3-3-4	Screen memory test failure	2Bh
3-4-1	Screen initialization failure	2Ch
3-4-2	Screen retrace test failure	2Dh

Initial Troubleshooting

Follow this general procedure to initially troubleshoot the DECpc 400ST Series computer:

1. Press the Ctrl + Alt + Del keys. If your system fails to boot, turn it off, wait 20 seconds, and then turn it back on.
2. Check for loose cables and connections.
3. Check the system and monitor indicator lights.
4. Observe any POST messages. Take the appropriate steps to correct the problem, and then reset the system.
5. Seek assistance. Contact Digital Customer Service for software or hardware related problems.
6. If you are connected to a network, call the system administrator. If you are not connected to a network, call Digital Customer Service.
7. If you need to return a failed component, pack it in the original container and return it to Digital for service or call Digital Customer Service for assistance and recommendations.

System Box Troubleshooting

Tables 2-6 lists some possible problems, causes, and corrective actions to aid in troubleshooting the system box.

Table 2-6. System Box Troubleshooting

Problem	Possible Cause	Action
No response when the system box is turned on	System box is not plugged in	Turn off the system box, plug it in, and turn it on again
	No power at the wall outlet	Use another wall outlet
	Power actuator arm is not connected properly to the power supply	Open the system box covers and re-seat the actuator arm
Power is on, but there is no monitor display	Monitor brightness and contrast controls are not properly set	Adjust the monitor brightness and contrast controls
	Monitor is off	Turn on the monitor
	Monitor cable is incorrectly installed	Check all monitor connections
	Video expansion board failure	Make sure the video expansion board is properly installed and firmly seated

Table 2-6. System Box Troubleshooting *(continued)*

Problem	Possible Cause	Action
System does not boot from an IDE hard disk drive	Operating system software is not installed on the IDE hard disk drive	Install the operating system on the hard disk
	IDE hard disk drive is not properly formatted or the requested partition does not exist	Format the IDE hard disk drive or correctly partition the IDE hard disk drive using the supplied operating system software
	There is no software on the requested partition	Install software on the requested partition
	IDE hard disk drive jumpers incorrectly set	Refer to the supplied IDE hard disk drive kit installation instructions
	IDE drive type incorrect	Run the SCU to identify the correct drive type
	Loose cables	Check all cable connections
No monitor display until end of POST	Configuration error	Run the SCU to set VGA/EGA adapter installed option to *yes*.

Table 2-6. System Box Troubleshooting *(continued)*

Problem	Possible Cause	Action
System box does not boot from a SCSI hard disk drive	Operating system software is not installed on the SCSI hard disk drive	Install the operating system
	Requested partition does not exist	Partition the SCSI hard disk drive and then reload the operating system
	SCSI hard disk drive jumpers incorrect	Refer to the supplied SCSI hard disk drive kit installation instructions
	SCSI ID conflicts	Refer to the supplied SCSI hard disk drive kit installation instructions on setting SCSI IDs
	Terminating resistors not removed from the SCSI hard disk drive	Remove terminating resistors. Refer to the supplied kit installation instructions
	System not configured for SCSI hard disk operation	Run the SCU to configure the system for SCSI operation
	IDE drive is configured in the system	Remove the IDE drive or install the boot software on the IDE drive

Table 2-6. System Box Troubleshooting *(continued)*

Problem	Possible Cause	Action
System box does not boot from a target diskette drive	Drive ID incorrectly set	Make sure the drive ID is correctly set
	Diskette drive not enabled	Run BIOS Setup Utility to enable diskette drive
	Diskette does not contain start-up files	Insert diskette with correct start-up files
	Diskette drive is empty	Insert the diskette that contains an operating system
	Diskette is worn or damaged	Try another diskette
	Loose cables	Check all cable connections
System box will not boot from System Configuration Diskette	System Configuration Diskette faulty	Contact Digital or an authorized dealer

Table 2-6. System Box Troubleshooting *(continued)*

Problem	Possible Cause	Action
No response to keyboard commands	Keyboard is password protected	Enter the keyboard password
	Keyboard is not connected	Connect the keyboard
	Keyboard is connected to the mouse port	Connect the keyboard to keyboard port
	Keyboard is locked	Unlock the keyboard
BIOS recovery operation will not complete	An expansion board's BIOS is mapped to the E0000h address space	Map the BIOS to another area or physically remove the expansion board.

Disk Drive Troubleshooting

Table 2-7 lists some possible problems, causes, and corrective actions for troubleshooting the disk drives.

Table 2-7. Disk Drive Troubleshooting

Problem	Possible Cause	Action
IDE/SCSI hard disk drive cannot read or write information	Incorrect jumper settings	Refer to the supplied kit installation instructions
	Loose or incorrectly installed cables	Make sure all cables are correctly installed
	IDE/SCSI hard disk drive is not properly formatted or partitioned	Format and partition as required using the supplied operating system
	IDE drive type incorrect	Run the SCU to identify the correct drive type
	System box not configured for SCSI hard disk operation	Run the SCU to configure the system box for SCSI operation

Table 2-7. Disk Drive Troubleshooting *(continued)*

Problem	Possible Cause	Action
Target diskette drive cannot read or write information	Diskette is not formatted	Format the diskette
	Diskette is worn or damaged	Try another diskette
	Diskette is write-protected	Slide the write-protect switch so the hole is not visible (3 1/2-inch diskette) or uncover the write-protect notch (5 1/4-inch diskette)
	Diskette drive is empty	Insert a diskette

Monitor Troubleshooting

Table 2-8 lists some possible problems, causes, and corrective actions for troubleshooting the monitor.

Table 2-8. Monitor Troubleshooting

Problem	Possible Cause	Action
Monitor power indicator is not on	Monitor is turned off	Turn on the monitor
	Power cord is not connected	Connect the power cord to the system box
	No power at wall outlet	Use another outlet
	Power indicator is defective	Contact your local Digital service representative
No monitor display	Configuration error	Check video board cabling and jumper settings
	Monitor brightness and contrast controls are not properly set	Adjust the monitor brightness and contrast controls

Table 2-8. Monitor Troubleshooting *(continued)*

Problem	Possible Cause	Action
Distorted, rolling, or flickering screen display, or wrong/uneven color	Monitor incorrectly adjusted	Adjust accordingly
	Monitor signal cable incorrectly installed	Straighten any bent connector pins and then reseat
Color monitor displaying monochrome	System box was turned on before the monitor was turned on	Turn off the system box, turn on the monitor, then turn the system box back on

3

System Box FRU Replacement

Introduction

This chapter contains a list of system box Field Replacement Units (FRUs), FRU removal and replacement instructions, and information regarding electric shock and electrostatic discharge (ESD) that should be read before beginning any procedure.

System Box FRUs

Tables 3-1 and 3-2 list the available FRUs for DECpc 400ST Series computers.

Many FRU replacement procedures require you to run the SCU to configure the computer. Refer to Chapter 4 or the DECpc 400ST Series User's Guide for information about the SCU.

Table 3-1. System Box FRUs

FRU	Digital PN#
System board	54-21594-01
25 MHz Intel486SX CPU module(1)	54-21819-01
33 MHz Intel486DX CPU module(1)	54-21821-01
50 MHz Intel486DX CPU module(1)	54-21823-01
50 MHz Intel486 DX2 CPU module(1)	54-22285-01
66 MHz Intel486 DX2 CPU module(1)	54-20583-01
Fan assembly	70-29559-01
Keyswitch/keylock assembly	12-38186-01
Assembly, control panel	70-29534-01
Power supply	30-37197-01
Power supply bracket	
Rocker switch/actuator rod (power supply)	12-38185-01
Floppy cable assembly	17-03458-01
Floppy disk unit	RX23-AA
IDE cable assembly	17-03541-01
SCSI cable assembly	17-03459-01
SCSI activity cable assembly w/ terminator	17-03457-01
SCSI terminator	12-37791-01
Real-time clock chip (battery)	21-32423-01
System configuration diskettes (SCU)	
- English	AK-PN9UA-XA
- French	AK-PN9VA-XA
- German	AK-PN9WA-XA
- Italian	AK-PN9XA-XA
- Spanish	AK-PN9YA-XA

(1) Refer to Appendix E for specific CPU module information

Table 3-2. Optional Field Replaceable Units

Optional FRU	Digital PN#
80 ns 4 MB 36-bit SIMM kit	PCTAM-CC
80 ns 8 MB 36-bit SIMM kit	PCTAM-CD
80 ns 16 MB 36-bit SIMM kit	PCTAM-CE
70 ns 32 MB 36-bit SIMM kit	PCTAM-DF
0 MB memory expansion adapter	54-21817-01
64 KB external cache upgrade	19-35616-01
128 KB external cache upgrade	19-35616-02 or 19-35616-03
3 1/2-inch, 1.44 MB diskette drive	30-37894-01
2.88 MB diskette drive w/ 3 1/2-inch bezel	PCXDR-AB
1.2 MB diskette drive	30-31071-01
16-bit SCSI controller (AHA-1520)	30-37789-01
32-bit EISA SCSI controller (AHA-1740A)	21-37790-01
245 MB SCSI hard disk drive	PCXAR-AA
429 MB SCSI hard disk drive	PCXAR-AB
800 MB SCSI hard disk drive	PCXAR-AC

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

Optional FRU	Digital PN#
1.0 GB SCSI hard disk drive	PCXBR-AB
525 MB SCSI tape drive kit	PCXAT-AA
52 MB IDE hard disk drive	30-35418-01
105 MB IDE hard disk drive	30-34429-01
120 MB IDE hard disk drive	RE23L-E
240 MB IDE hard disk drive	RE24L-E
Serial/parallel port adapter	20-30946-01
Dual serial port adapter	20-33970-01
2400 baud modem	30-31072-01
Low-cost thinwire ethernet adapter	DE100-AA
TURBO ethernet thinwire adapter	DE200-AC
TURBO ethernet twisted pair adapter	DE201-AC
1280 x 1024 high resolution video controller	PCXAG-AD
VGA 1024 graphics adapter	20-34334-01
1024 x 768 non-interlaced video controller	30-37239-01

Before You Begin

WARNING

Risk of electrical shock. Failure to disconnect the source of power before opening the covers can result in personal injury.

CAUTION

Do not touch any electrical component unless you are properly grounded. Proper grounding can be established by wearing a grounded wrist strap or by touching an exposed metal part of the system box chassis. A static discharge from your fingers can result in permanent damage to electronic components.

Outside Cover

To remove the outside cover, do the following:

1. Turn off power to all external devices connected to the system box.
2. Turn off power to the system box.
3. Tag and disconnect all external cables from the system box, including all system box power cords.
4. Unlock the outside cover. The lock is located on the rear of the system box.
5. Loosen the two captive screws at the rear of the outside cover.
6. Remove the outside cover (see Figure 3-1).

To replace the outside cover, do the following:

1. Orient the outside cover as shown in Figure 3-1.
2. Align the outside cover with the opening at the top of the chassis and with the outer locking tab openings at the bottom of the chassis. Push the outside cover towards the front of the chassis until it engages the locking tabs.
3. Tighten the two captive screws at the rear of the outside cover.
4. Lock the outside cover.
5. Replace all previously removed external cables and power cables and then remove the identification tags.
6. Turn on power to the system box.

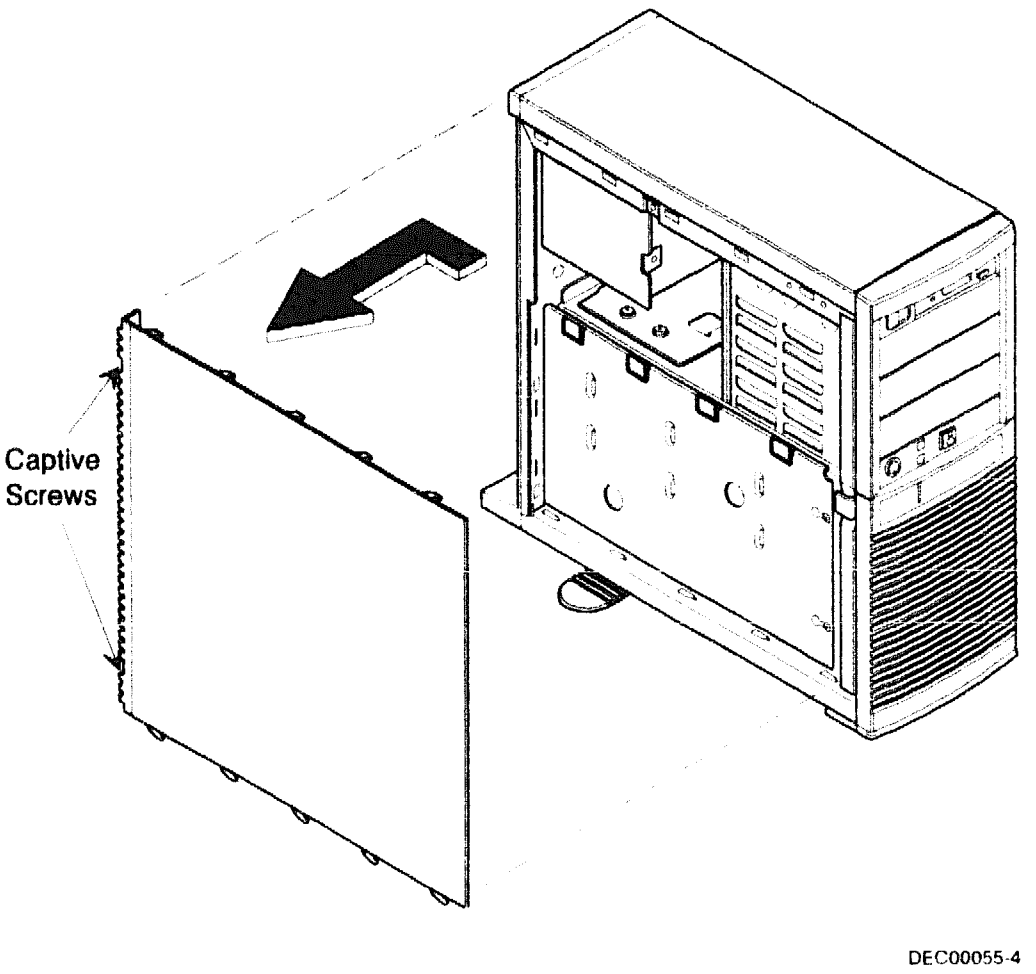


Figure 3-1. Removing the System Box Outside Cover

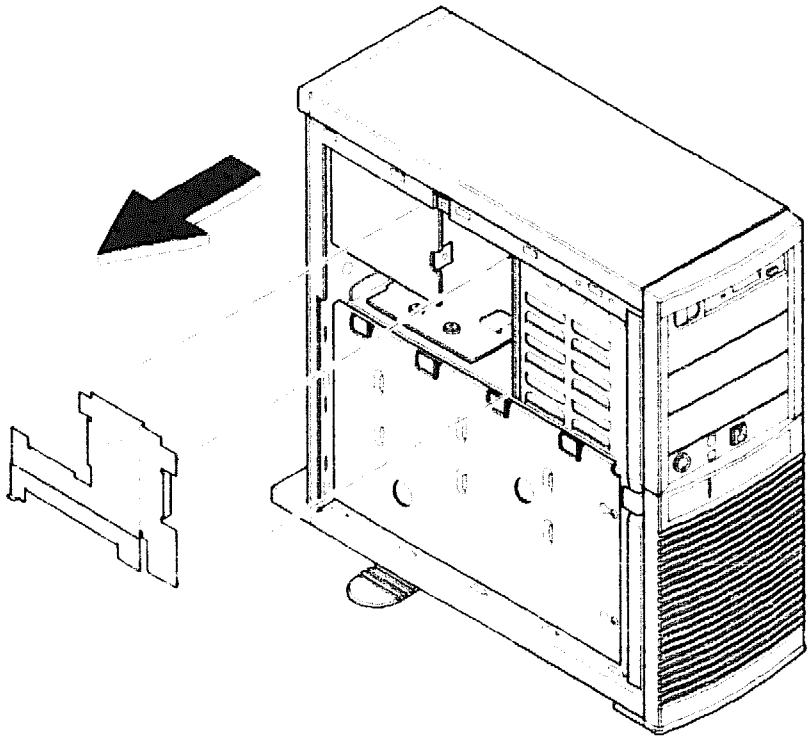
Peripheral Bay Bracket

Some system boxes have a peripheral bay bracket. This bracket must be removed before removing the inner cover. To remove the peripheral bay bracket, do the following:

1. Follow the procedures for removing the system box outside cover.
2. Remove the peripheral bay bracket by pulling it straight out (see Figure 3-2.

To replace the peripheral bay bracket do the following:

1. Orient the bracket as shown in Figure 3-2 and press it into place.



DEC00112

Figure 3-2. Removing the Peripheral Bay Bracket

Inner Cover

To remove the system box inner cover, do the following:

1. Follow the procedures for removing the system box outside cover.
2. Remove the two screws that secure the inner cover to the system box (see Figure 3-3).
3. Remove the inner cover by sliding it towards the front of the system box and pulling it straight out.

To replace the system box inner cover, do the following:

1. Orient the inner cover as shown in Figure 3-3.
2. Align the inner cover with the inner locking tab openings at the bottom of the chassis. Push the inner cover towards the rear of the chassis until it engages the locking tabs

NOTE

To minimize EMI, make sure the three tabs at the left rear of the inner cover fully engage the corresponding slots at the rear of the chassis.

3. Replace the two screws to secure the inner cover to the system box.
4. Replace the system box outside cover.

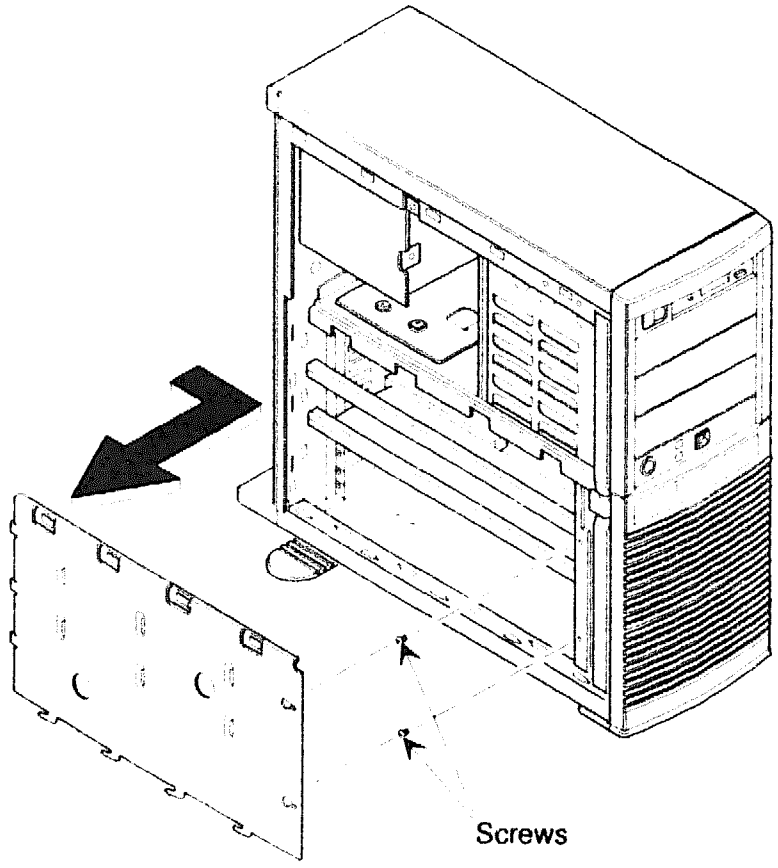


Figure 3-3. Removing the System Box Inner Cover

Installing a Drive

The DECpc 400ST system box contains a front peripheral device bay that supports a variety of 3 1/2-inch and 5 1/4-inch drives. The system box also contains an internal peripheral device bay that supports a single 3 1/2-inch device. Refer to the following procedures to install drives into either peripheral device bay.

NOTE

If you plan on installing a SCSI device, you will also need to install a SCSI host adapter that supports up to seven internal or external SCSI devices.

To facilitate cabling inside the system box, note the following guidelines:

1. Install an optional diskette drive in the bay just below the supplied 3 1/2-inch diskette drive (top slot).
2. If you are installing a streaming tape or CD-ROM, place either one in the bay just below the optional diskette drive. Otherwise, place them in the bay just below the supplied 3 1/2-inch diskette drive.
3. If you are installing one IDE hard disk drive, place it in the internal bay below the power supply. After connecting the drive, place the rest of the IDE ribbon cable between the internal bay and the power supply.
4. If you are installing two IDE hard disk drives, place the first one in the internal bay below the power supply and the second one in the very bottom slot of the front peripheral device bay.

5. If you are installing a full-height SCSI device, use the two bays just below the supplied 3 1/2-inch diskette drive (if an optional drive is not already installed in one of bays). Otherwise, use the next two available bays.
6. SCSI half-height can be installed in any of the remaining front peripheral device bays.
7. SCSI half-height hard disk drives can also be installed in the internal peripheral device bay.

Front Peripheral Bay Bezel

The front peripheral bay bezel is located on the front of the system box. Remove this bezel to access the peripheral bays and control panel. To remove the bezel, do the following:

1. Turn off power to the system box.
2. Follow procedures for removing the outside cover and inner cover.
3. Pull the locking latch for the front peripheral bay bezel. This latch is located on the left side at the front of the system box (see Figure 3-4).
4. Lift the bezel up from the bottom and then out from its hinges.

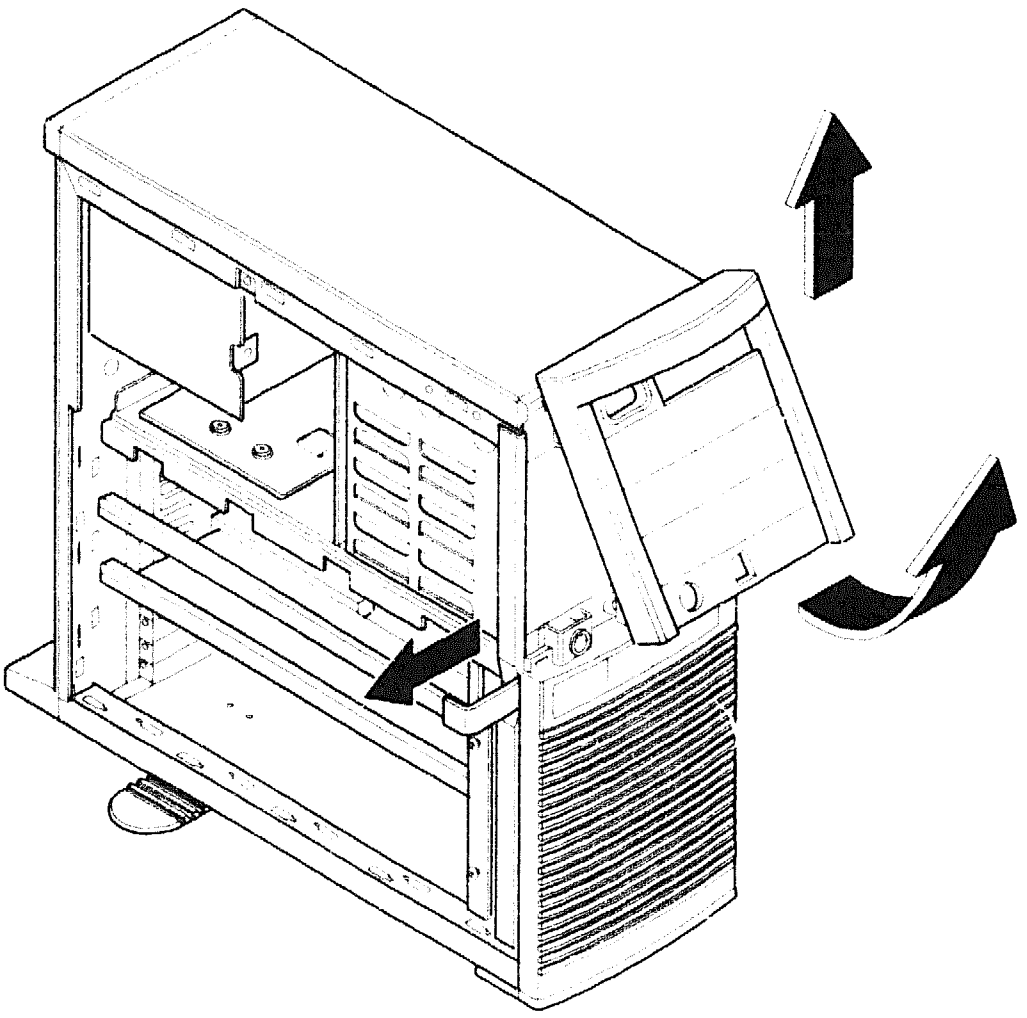


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Figure 3-4. Removing the Front Peripheral Bay Bezel

Filler Panels

Filler panels are located on the front bezel. They cover peripheral bay slots which are not in use or slots which contain hard disk drives. To remove a filler panel, do the following:

1. Follow procedures for removing the system box outside and inner covers.
2. Remove the front peripheral bay bezel (see Figure 3-4).
3. Holding the front peripheral bay bezel in one hand and the filler panel in the other, gently pull the bezel away from one side of the filler panel (see Figure 3-5).

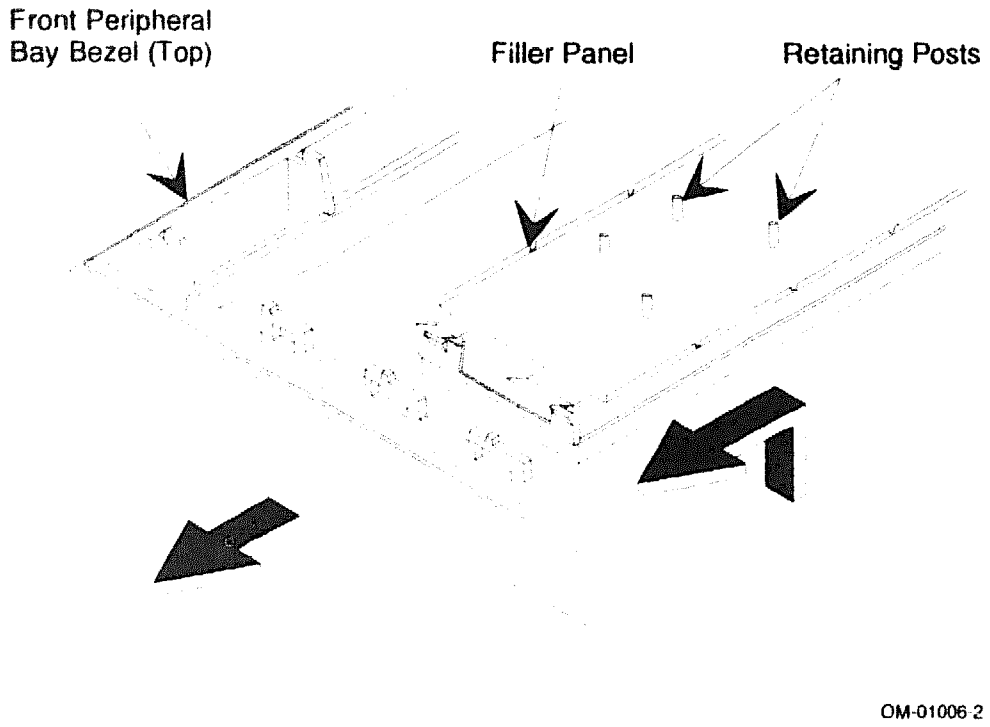

Figure 3-5. Removing a Filler Panel

4. Carefully lift out the edge of the filler panel and then pull it away from the front peripheral bay bezel.

To replace a filler panel, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the front peripheral bay bezel (see Figure 3-4).
3. Note the orientation of the retaining posts for EMI shield. The more widely spaced posts are always on the bottom Follow this orientation when installing a filler panel.
4. Working from inside the peripheral bay bezel, press the filler panel into place.

Front Bay Drives

The following procedures describe the removal and replacement procedures for drives in the front peripheral bay.

3 1/2-Inch Diskette Drive (Top Slot)

To remove the 3 1/2-inch diskette drive, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the front peripheral bay bezel (see Figure 3-4).
3. Remove any drive installed in the second slot. Refer to the specific removal instructions later in this chapter.

4. Tag and disconnect the power and data cables from the drive (see Figure 3-6).

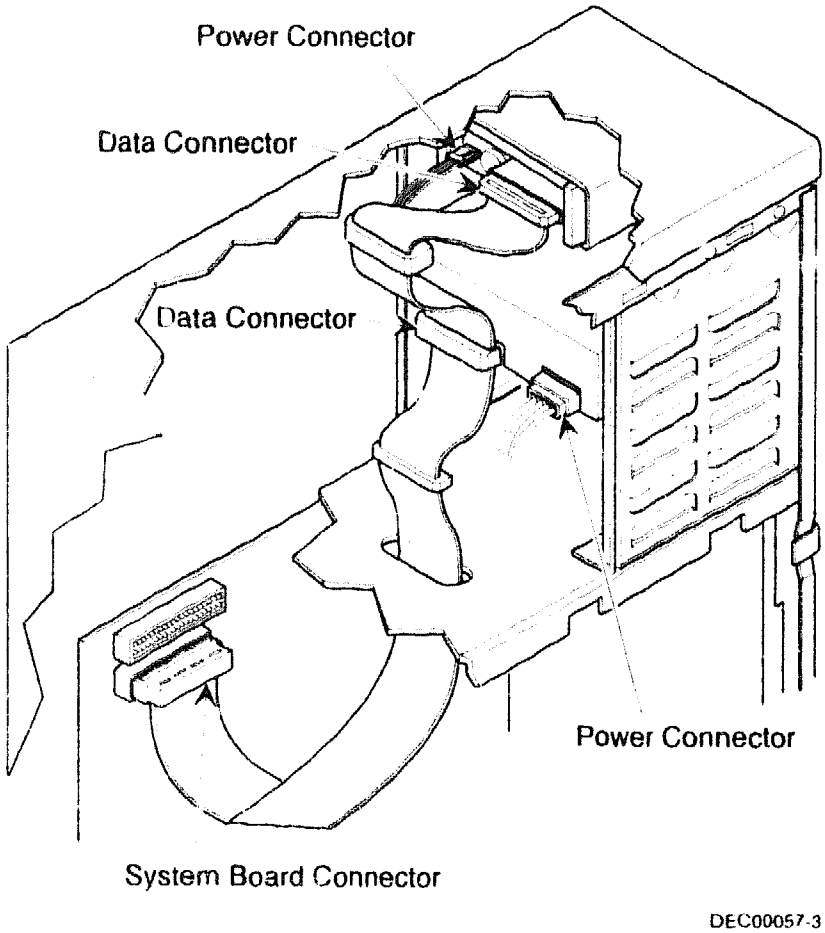

Figure 3-6. 3 1/2-Inch Diskette Drive Rear Connections (Top Slot)

5. Remove the retaining screw for the 3 1/2-inch diskette drive mounting bracket

6. Remove the mounting bracket with the 3 1/2-inch diskette drive (see Figure 3-7).

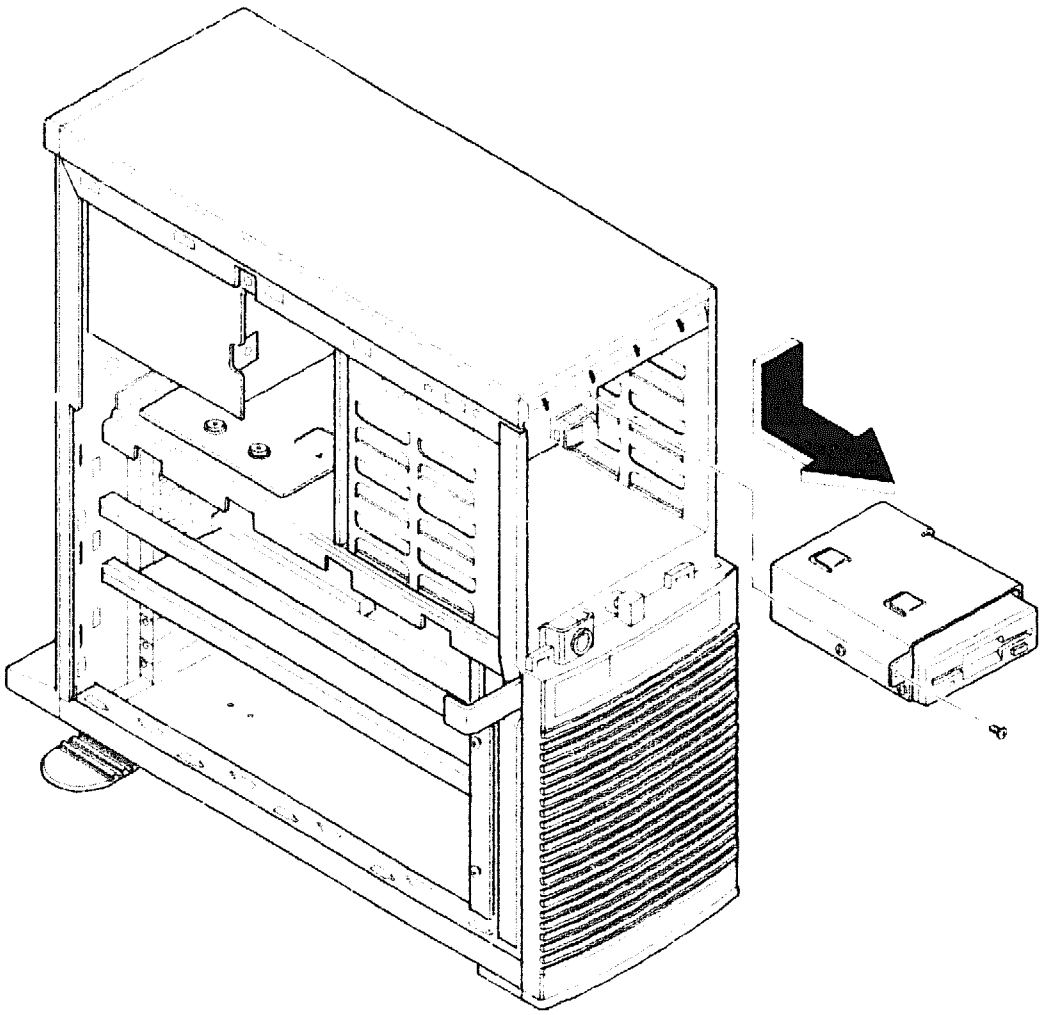

Figure 3-7. Removing the 3 1/2-Inch Diskette Drive (Top Slot)

7. Remove the 3 1/2-inch diskette drive from the mounting bracket (see Figure 3-8).

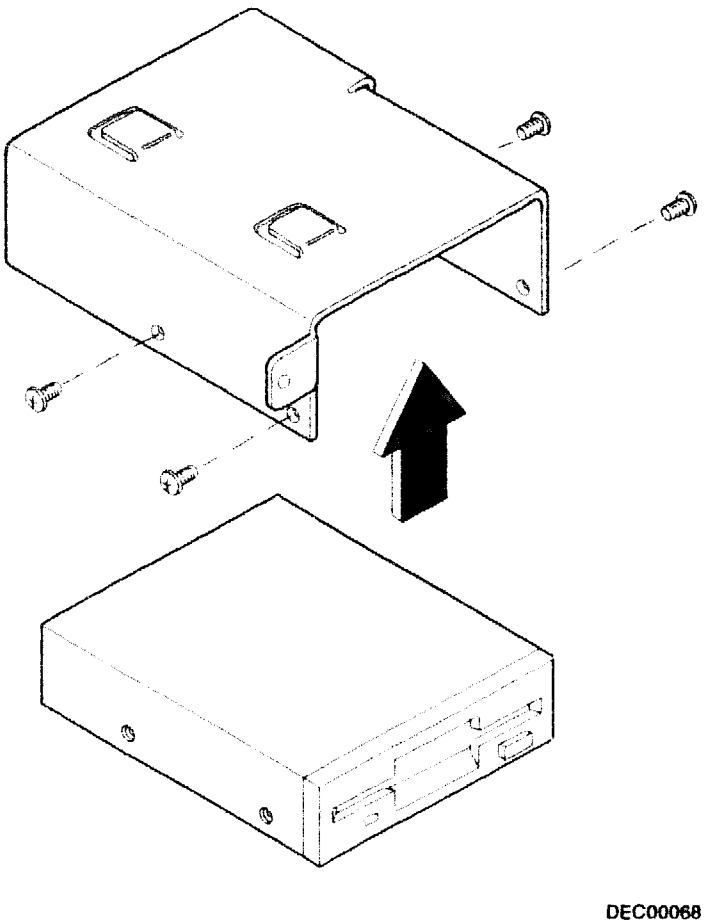

Figure 3-8. Removing the Drive from the Mounting Bracket

To replace the 3 1/2-inch diskette drive, do the following:

1. Set any appropriate jumpers. Refer to the documentation supplied with the diskette drive.
2. Attach the 3 1/2-inch diskette drive to its mounting bracket.
3. Install the 3 1/2-inch diskette drive into the top slot.
4. Secure the 3 1/2-inch diskette drive to the system box using the retaining screw.
5. Connect the power and data cables, then remove the identification tags (refer to Table 3-3 and Figure 3-6).
6. If applicable, replace the drive installed in the second slot. Refer to the specific replacement instructions later in this chapter.
7. Replace the front peripheral bay bezel.
8. Replace the system box inner and outside covers.

9. Run the SCU "Configure Computer" option if the installed drive (diskette or IDE) is an addition to the system box or a different drive type. Refer to Chapter 4 for instructions on running the SCU.

Table 3-3. Diskette Drive Cabling Scheme

Optional Diskette Drive	Drive Designation	Connector Number
3 1/2-inch	B	4
3 1/2-inch	A	1
5 1/4-inch	B	3
5 1/4-inch	A	2

5 1/4-Inch Drives

To remove a 5 1/4-inch drive, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the front peripheral bay bezel (see Figure 3-4).

3. Disconnect the power and data cables from the drive (see Figure 3-9).

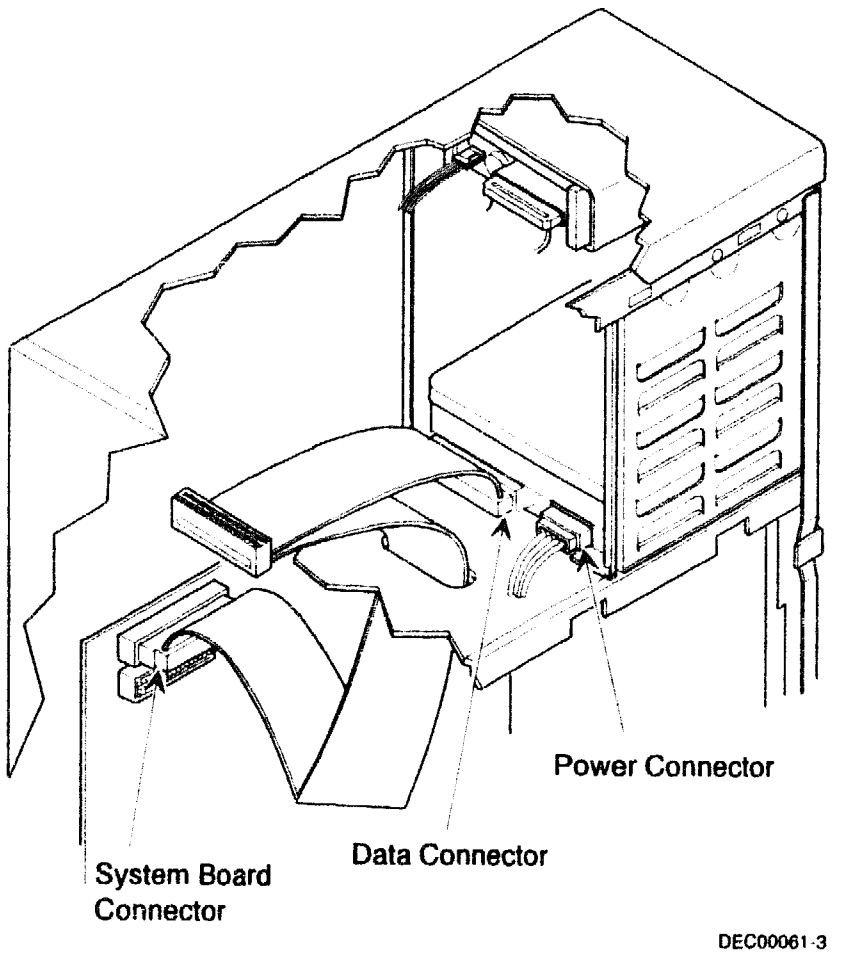

Figure 3-9. Typical 5 1/4-Inch Device Rear Connections for an IDE Drive

4. Remove the 5 1/4-inch drive (see Figure 3-10).

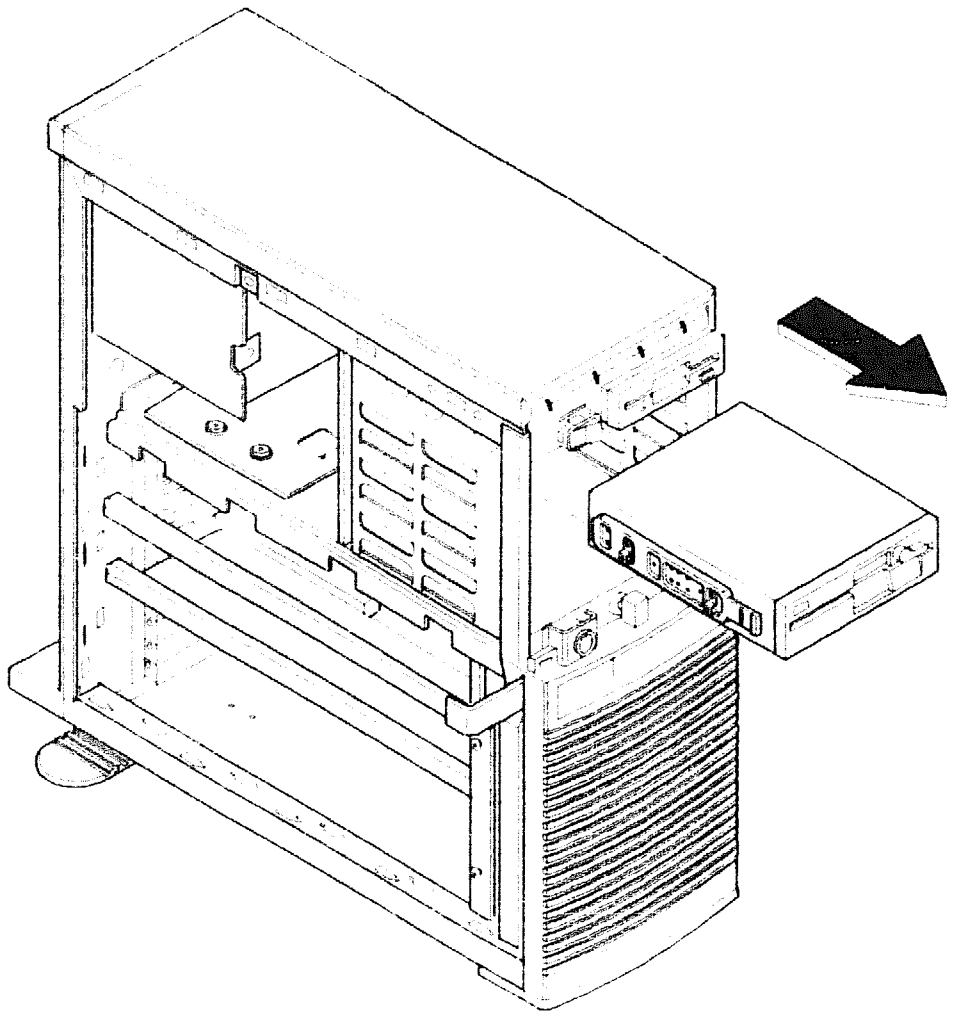

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Figure 3-10. Removing a 5 1/4-Inch Drive

5. Remove the slide rails and grounding clips from the 5 1/4-inch drive (see Figure 3-11).

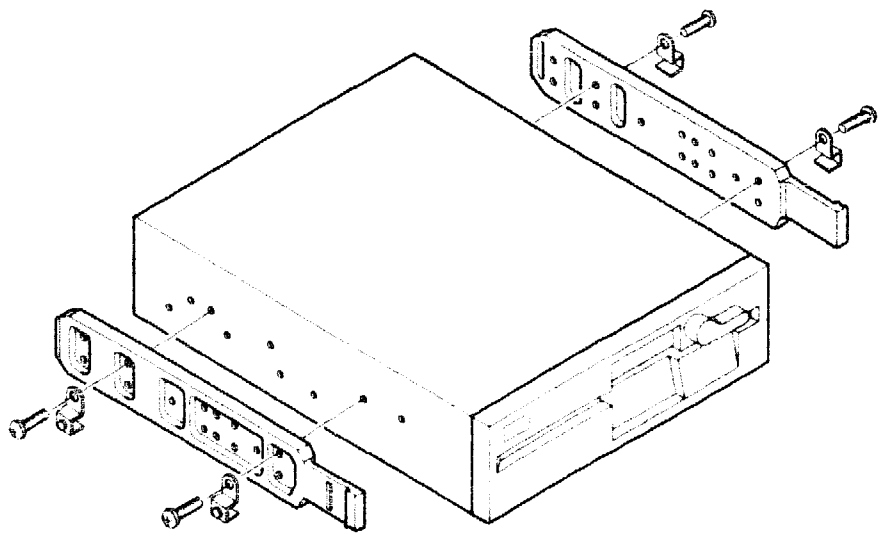


Figure 3-11. Removing Slide Rails and Grounding Clips

To replace a 5 1/4-inch drive, do the following:

1. Set any appropriate jumpers. Refer to the documentation supplied with the drive.
2. Attach slide rails and grounding clips to the 5 1/4-inch drive.
3. Install the 5 1/4-inch drive into an empty slot in the front peripheral bay.

4. Connect the power and data cables to the drive.
5. Replace the front peripheral bay bezel.
6. Replace the system box inner and outside covers.
7. Run the SCU "Configuring Your Computer" option if the installed drive (diskette or IDE) is an addition to the system box or a different drive type. Refer to Chapter 4 for detailed instructions on running the SCU.

3 1/2-Inch Drives

To remove a 3 1/2-inch drive, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the front peripheral bay bezel (see Figures 3-4).
3. Disconnect the power and data cables from the drive (see Figure 3-6).
4. Remove the 3 1/2-inch drive.

5. Remove the expansion brackets, slide rails, and grounding clips from the 3 1/2-inch drive (see Figure 3-12).

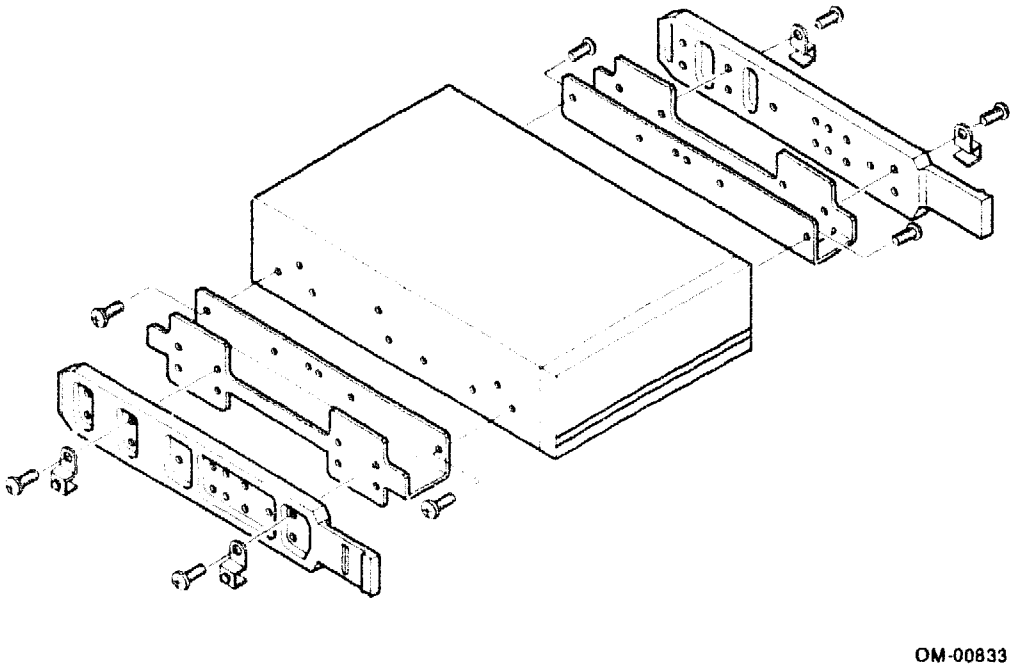


Figure 3-12. Removing Expansion Brackets, Slide Rails, and Grounding Clips

To replace a 3 1/2-inch drive, do the following:

1. Set any appropriate jumpers. Refer to the documentation supplied with the drive.
2. Attach expansion brackets, slide rails, and grounding clips to the 3 1/2-inch drive.
3. Install the 3 1/2-inch drive into an empty slot in the front peripheral bay.
4. Connect the power and data cables to the drive.
5. Replace the front peripheral bay bezel.
6. Replace the system box inner and outside covers.
7. Run the SCU "Configuring Your Computer" option if the installed drive (diskette or IDE) is an addition to the system box or a different drive type. Refer to Chapter 4 for detailed instructions on running the SCU.

Internal Bay Drive Replacement

To remove the 3 1/2-inch drive located just below the power supply, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Disconnect the data and power cables from the drive (see Figure 3-13).
3. Loosen the captive mounting tray retaining screw.

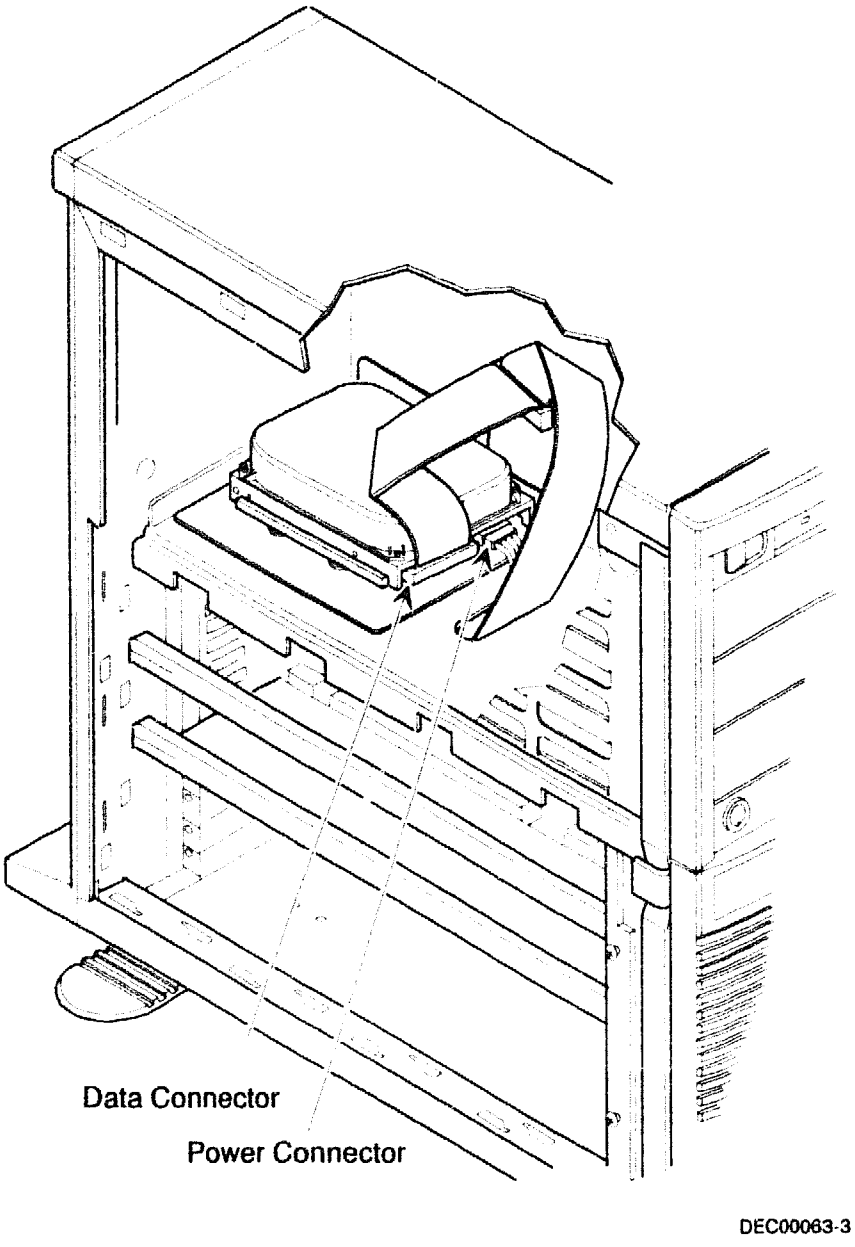


Figure 3-13. 3 1/2-Inch Drive Rear Connections (Internal Bay)

4. Remove the mounting tray with the 3 1/2-inch drive (see Figure 3-14).

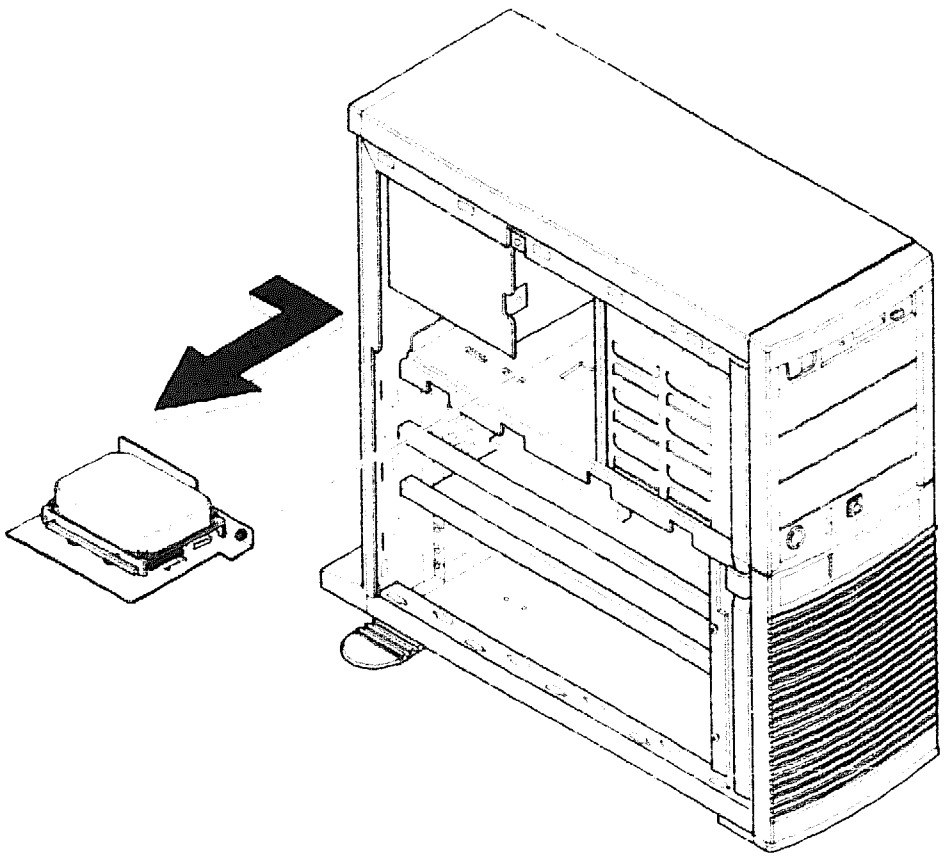


Figure 3-14. Removing the 3 1/2-Inch Drive (Internal Bay)

5. Remove the 3 1/2-inch drive from the mounting tray (see Figure 3-15).

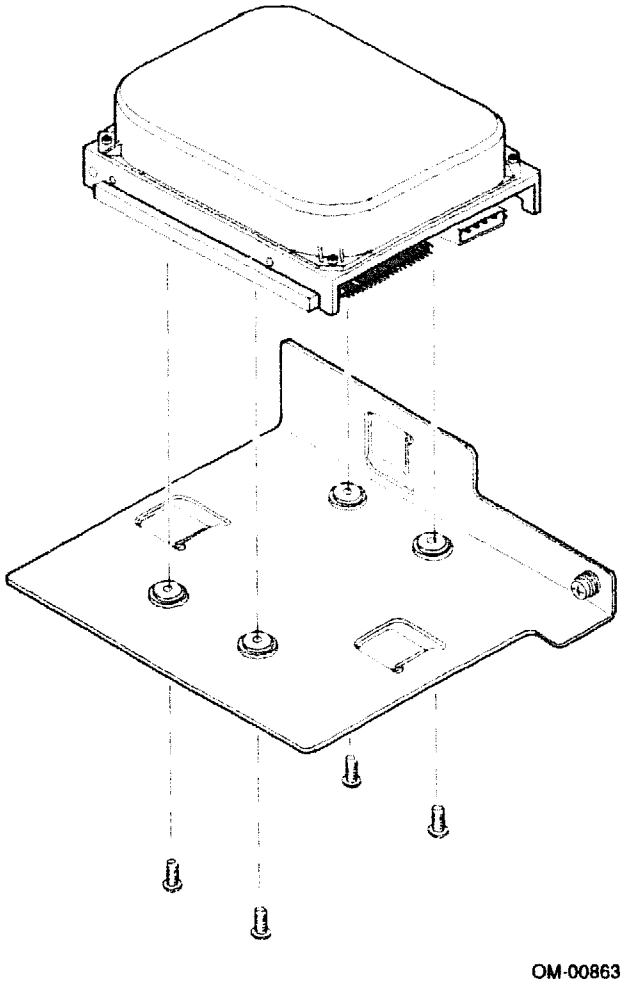


Figure 3-15. Removing the 3 1/2-Inch Drive from its Mounting Tray

To replace the 3 1/2-inch drive, do the following:

1. Set any appropriate jumpers. Refer to the documentation supplied with the drive.
2. Attach the 3 1/2-inch drive to the mounting tray.
3. Install the 3 1/2-inch drive.
4. Connect the data and power cables to the drive.
5. Secure the mounting tray to the chassis using the captive retaining screw.
6. Replace the system box inner and outside covers.
7. Run the SCU "Configuring Your Computer" option if the installed drive (diskette or IDE) is an addition to the system box or a different drive type. Refer to Chapter 4 for detailed instructions on running the SCU.

System Board SIMMs

To remove system board SIMMs, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the CPU module and any memory module (if applicable).

3. Locate the SIMM sockets (see Figure 3-16).

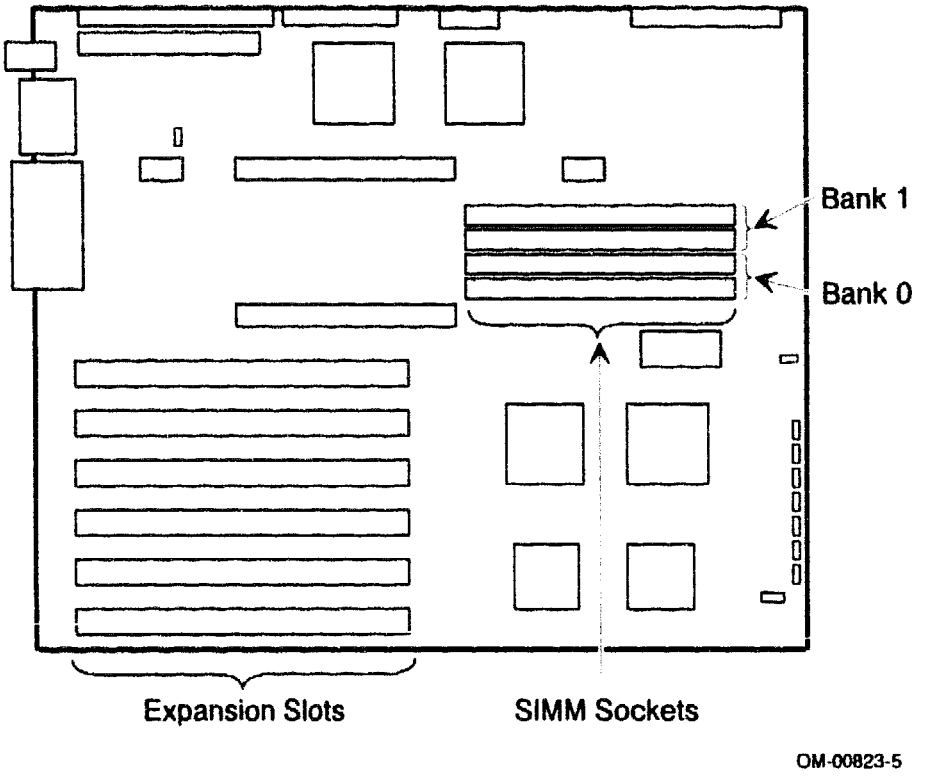
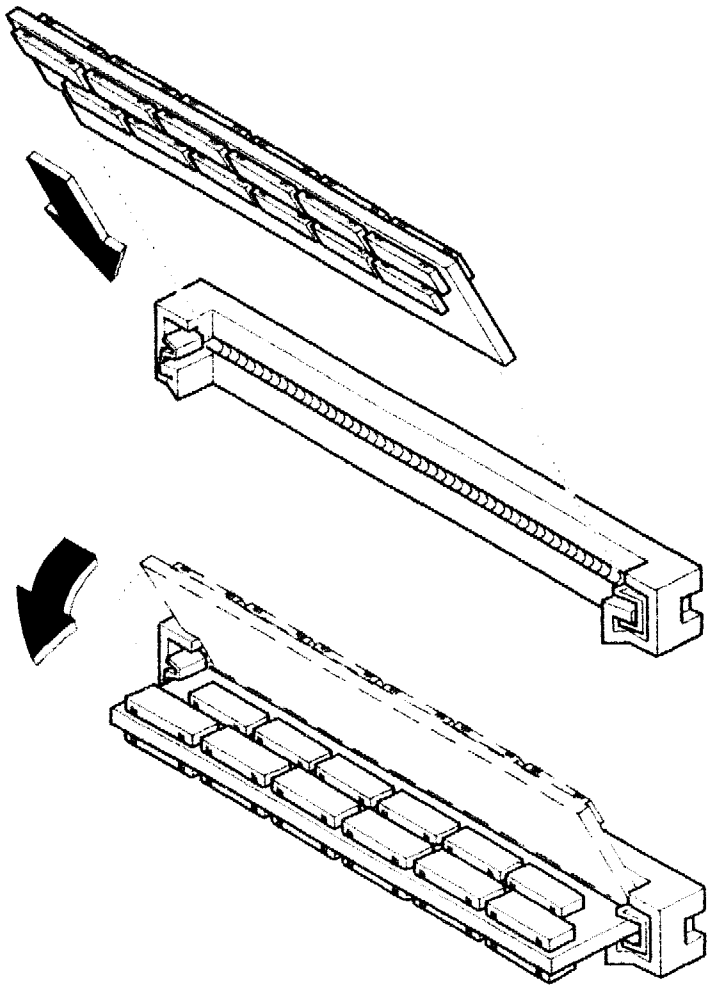


Figure 3-16. SIMM Socket Locations

4. Open the retaining clips to free the SIMM.
5. Lift the SIMM from its socket slot (see Figure 3-17).



OM-00841-2

Figure 3-17. Removing System Board SIMMs

CAUTION

Use care when removing or installing SIMMs. The retaining clips on the sockets can be bent or broken by using too much force.

6. Place the SIMMs in an antistatic package.

To replace system board SIMMs, do the following:

1. Remove the SIMMs from the antistatic package.
2. Insert the SIMM into the socket slot and press down firmly while maintaining the proper insertion angle.

NOTE

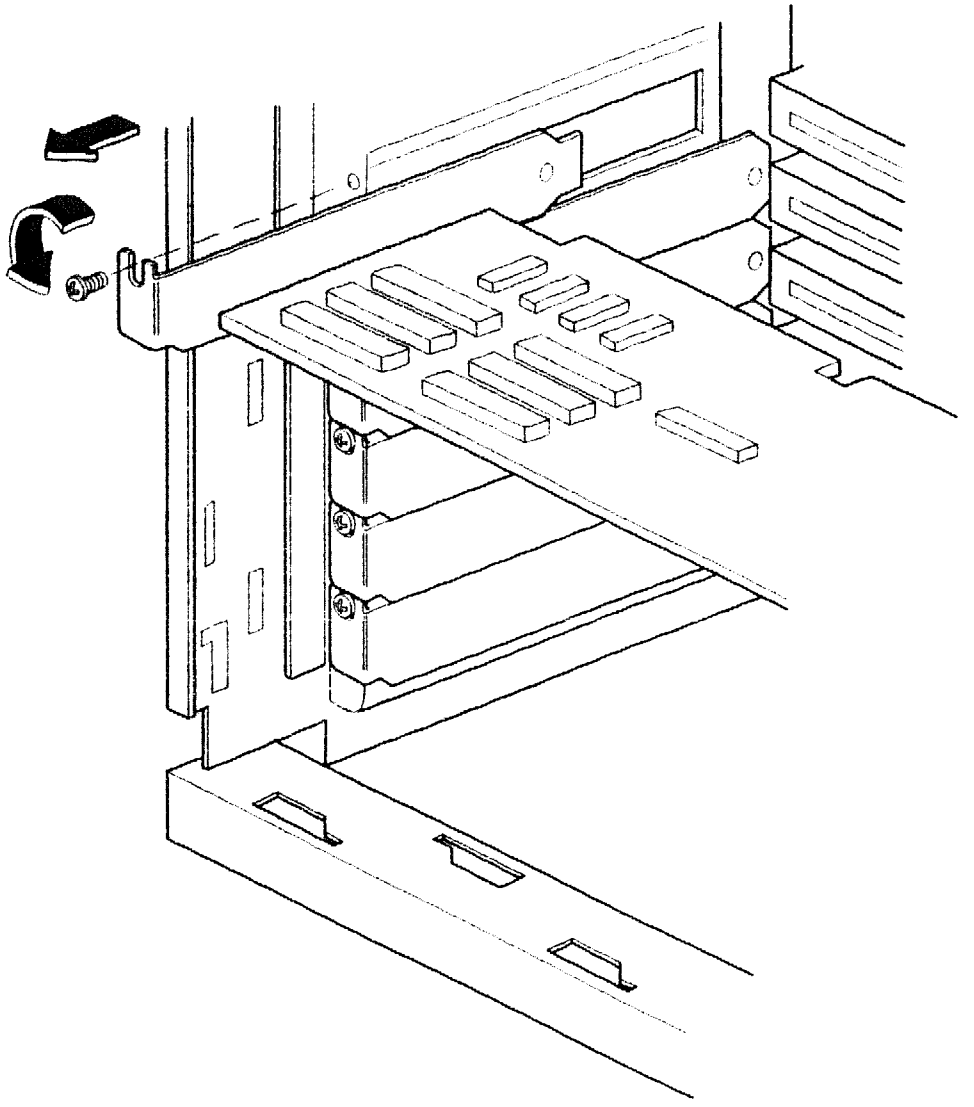
If 16 MB or 32 MB SIMMs are being installed, jumpers must be set. Refer to Appendix B.

3. When the SIMM seats, hold it at each end and gently push the top edge towards the retaining clips until it snaps into place.
4. If the SIMM does not seat, gently spread the retaining clips enough to pull the top edge of the SIMM away from the clips and then reseat.
5. Install the CPU module and memory module (if applicable).
6. Replace the system box inner and outside covers.
7. Run the SCU.

Expansion Boards

To remove an EISA/ISA expansion board, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the expansion board retaining screw (see Figure 3-18).
3. Note the position of any cables connected to the expansion board and disconnect them.
4. Remove the expansion board.
5. Note the position of any jumpers or switches.
6. Place the expansion board in an antistatic package.



DEC00066-3

Figure 3-18. Removing an Expansion Board

To replace an EISA/ISA expansion board, do the following:

1. If a new expansion board is being installed, remove the approrpiate expansion slot metal cover.

CAUTION

Do not lay the expansion board on any ungrounded surface after removing it from its protective wrapper. This includes laying it on the wrapper itself, which can contain static voltage on its outside layers.

2. Remove the expansion board from its antistatic package.
3. Record the expansion board's serial number in the equipment log.
4. Set any jumper or switch settings to match those on the board being replaced.
5. Install the expansion board, ensuring the board is firmly seated in the connector on the system board.
6. Secure the expansion board retaining screw.
7. Connect any cables previously removed.
8. Replace the system box inner and outside covers.
9. Run the SCU to configure the computer for the installed expansion board.

Memory Module

To remove a memory module, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the module retaining bracket. The procedure for removing the retaining bracket pertains both to the memory module and CPU module (see Figure 3-19).

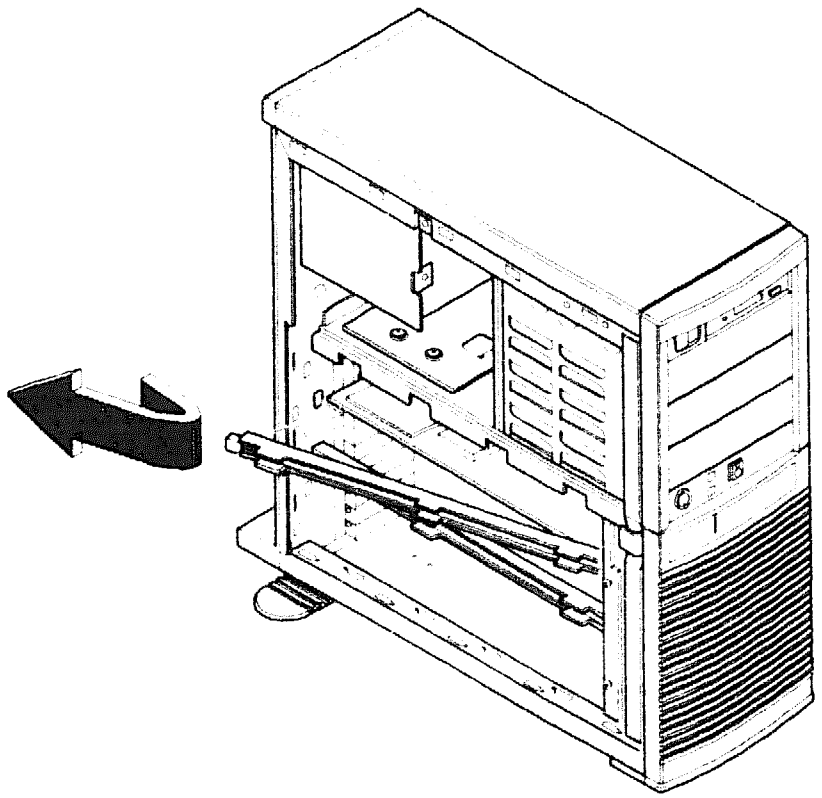
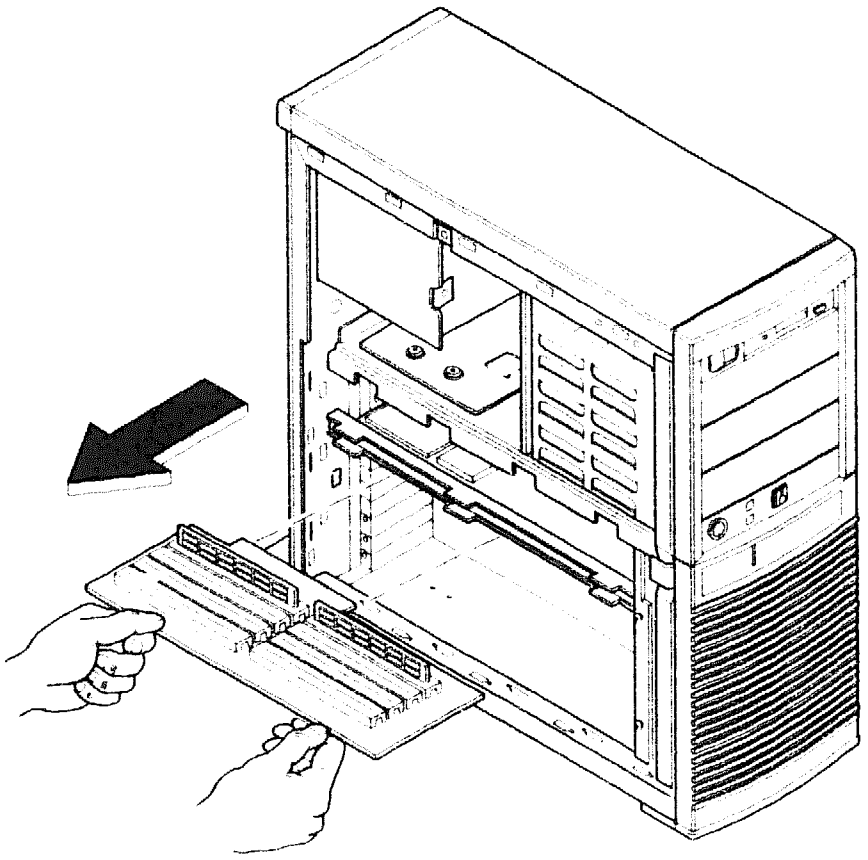


Figure 3-19. Removing the Module Retaining Bracket

3. Remove the memory module (see Figure 3-20).
4. Remove any SIMMs from the memory module.
5. Place the memory module in an antistatic package.



DEC00060-3

Figure 3-20. Removing the Memory Module

To replace a memory module, do the following:

1. Remove the memory module from the antistatic package.
2. Record the serial number of the memory module in the equipment log.
3. Install any SIMMs on the memory module.
4. Install the memory module.
5. Replace the module retaining bracket.
6. Replace the system box inner and outside covers.
7. Run the SCU to configure the computer.

CPU Module

NOTE

If the CPU module is an upgrade, refer to Appendix E for detailed information on setting CPU module jumpers.

To remove a CPU module, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the module retaining bracket (see Figure 3-19).
3. Remove the CPU module (see Figure 3-21).
4. If applicable, remove any external cache.
5. Place the CPU module in an antistatic package.

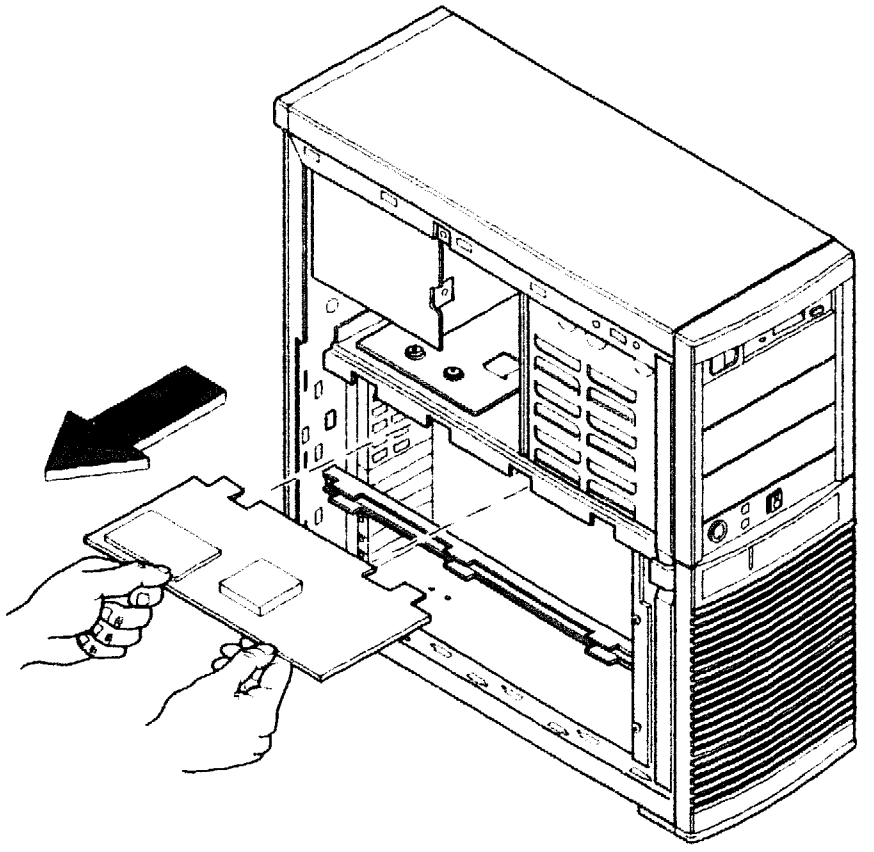
To replace a CPU module, do the following:

1. Remove the CPU module from the antistatic package.
2. Record the serial number of the CPU module in the equipment log.
3. Install an external cache (if applicable) on the CPU module.
4. Set jumpers on the CPU module. Refer to Appendix E for further information on setting jumpers.
5. Install the CPU module.
6. Install the CPU module retaining bracket.
7. Replace the system box inner and outside covers.

NOTE

If a write-back external cache was installed, make sure you enable it using the View and Edit Details from the SCU.

8. Run the SCU to configure the computer.



DEC00054-2

Figure 3-21. Removing the CPU Module

External Cache

NOTE

If an external cache is being installed, refer to Appendix E for detailed information on setting CPU module jumpers.

Use the following procedures to remove an external cache.

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the CPU module.
3. Remove the external cache (see Figure 3-22).
4. Place the external cache in an antistatic package.

To replace an external cache, do the following:

1. Remove the external cache from its antistatic package.
2. Install the external cache on the CPU module. Align the external cache pins with the socket contacts. Make sure the guide pin on the external cache lines up with the appropriate pin on the socket (see Figure 3-22).
3. Verify the jumper settings on the CPU module and change them if necessary. Refer to Appendix E for information on setting jumpers.
4. Install the CPU module.
5. Replace the system box inner and outside covers.

NOTE

If a write-back external cache was installed, make sure you enable it using the View and Edit Details from the SCU.

6. Run the SCU to configure the computer.

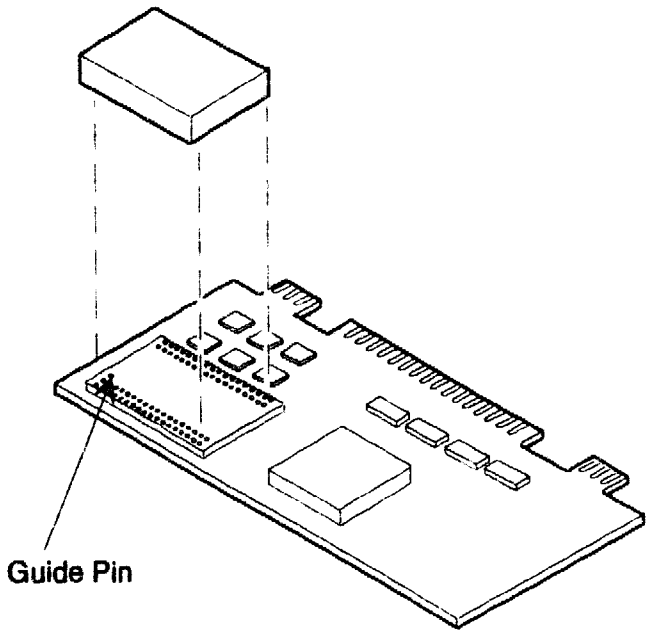


Figure 3-22. Removing an External Cache

Real-Time Clock Chip (RTC)

CAUTION

The RTC contains a lithium battery. It is safety sealed and should not be opened. To prevent explosion hazards, avoid shorting the battery. Do not attempt to recharge it.

For continued safe operation of this computer, only replace the RTC with the recommended Digital part.

To replace the RTC, do the following:

1. Run the SCU to create a SYSTEM.SCI file if one has not been created.
2. Follow the procedures for removing the system box outside and inner covers.
3. Remove the CPU module and memory module (if applicable).

NOTE

For Nordic requirements regarding lithium battery replacement, see front matter in this manual.

4. Lift the RTC from its socket, noting the position of pin 1, which is marked by a dot (see Figure 3-23).

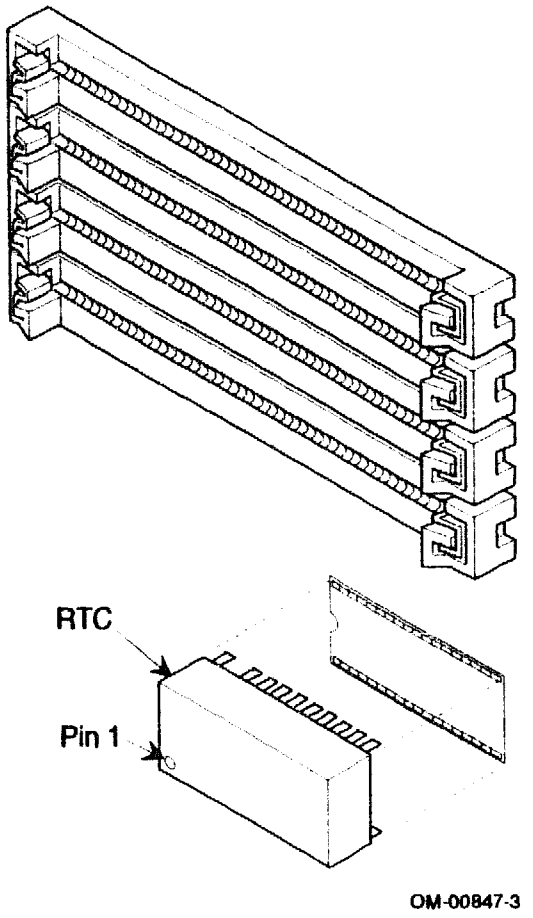


Figure 3-23. Replacing the RTC

5. Properly dispose of the RTC.
   a. Clip all exposed chip leads. Do not short any leads together.
   b. Wrap the chip in insulating tape to prevent accidental shorting.
   c. Pack the chip so it cannot be crushed.
   d. Place the chip into an appropriate trash receptacle.

6. Install the new RTC so that pin 1 is aligned with the pin 1 marking on the system board.
7. Install the CPU module and memory module (if applicable).
8. Replace the system box inner and outside covers.
9. Run the SCU to configure the computer.

System Board

To remove the system board, do the following:

1. Run the SCU to create a SYSTEM.SCI backup configuration file if one has not been created.
2. Turn system power off.
3. Follow the procedures for removing the system box outside and inner covers.
4. Remove the CPU module and memory module (if applicable).
5. Tag and disconnect all cables to the system board.
6. Remove any expansion boards.

7. Remove the system board retaining screws from the system board (see Figure 3-24).

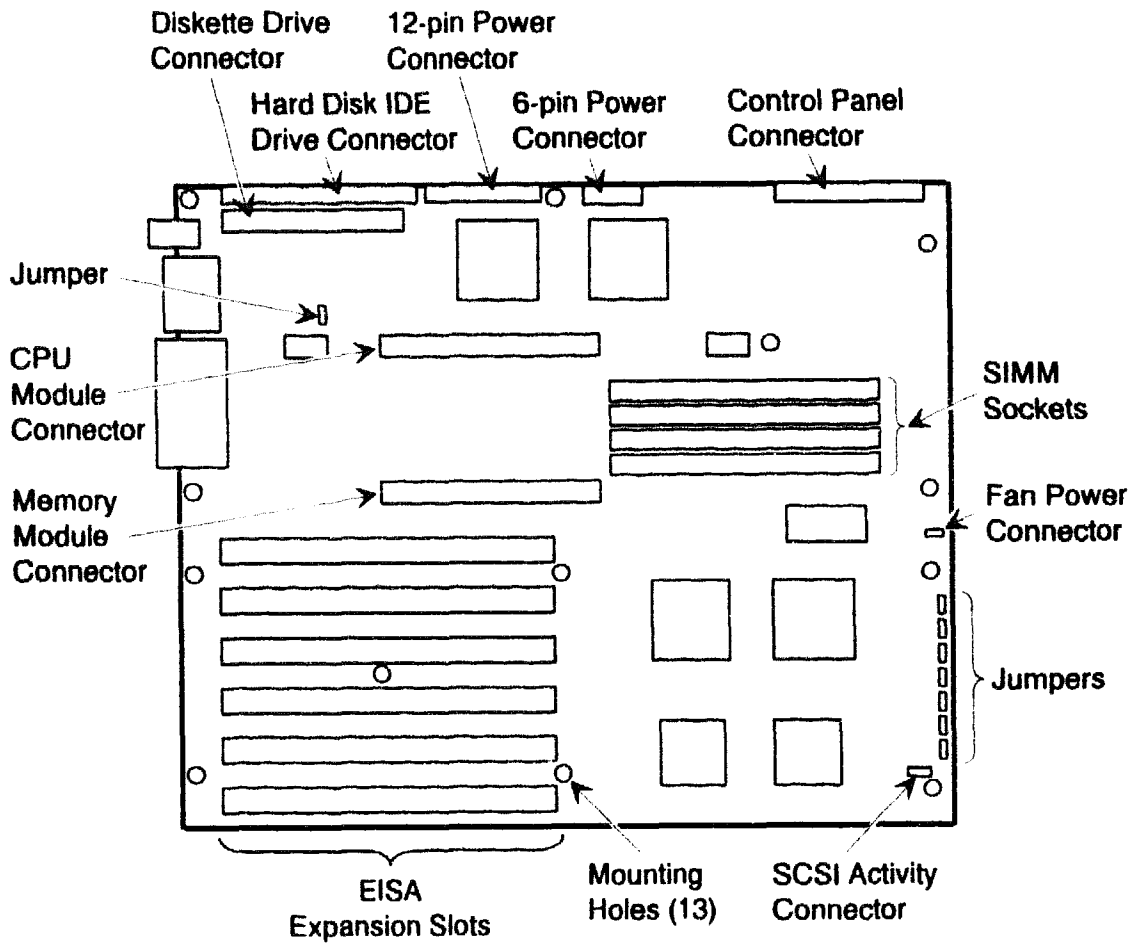


Figure 3-24. System Board Connectors, Jumpers, and Mounting Holes

8. Remove the system board and place it on an antistatic surface.
9. Remove the SIMMs from the system board.
10. Place the system board in an antistatic package.

To replace the system board, do the following:

1. Remove the replacement system board from its antistatic package.
2. Install any SIMMs.
3. Verify that jumpers are installed in the same position as on the old system board. The FLASH Memory Write jumper must be enabled in order to configure the system board. Refer to Appendix B for more information on jumper options.
4. Install the replacement system board.
5. Secure the system board retaining screws.
6. Connect all cables to the system board and remove the tags.
7. Install any expansion boards.
8. Install the CPU module and memory module.
9. Replace the system box covers.
10. Run the SCU to configure the computer.

Power Supply

To remove the power supply, do the following:

WARNING

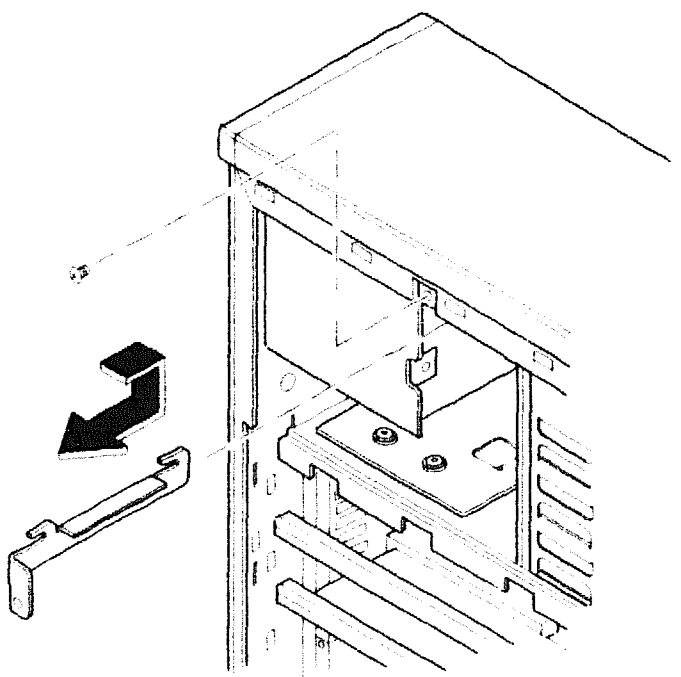
Disconnect the ac power cord and monitor power cord before performing the following procedure. Failure to disconnect power before removing the system box outside cover can result in personal injury or equipment damage.

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the 3 1/2-inch drive from the internal peripheral bay.
3. Tag and disconnect all power supply cables from the system board and peripheral devices.
4. Remove the actuator rod connecting the power switch and the power supply.

5. Remove the power supply retaining bracket screw (see Figure 3-25).

NOTE

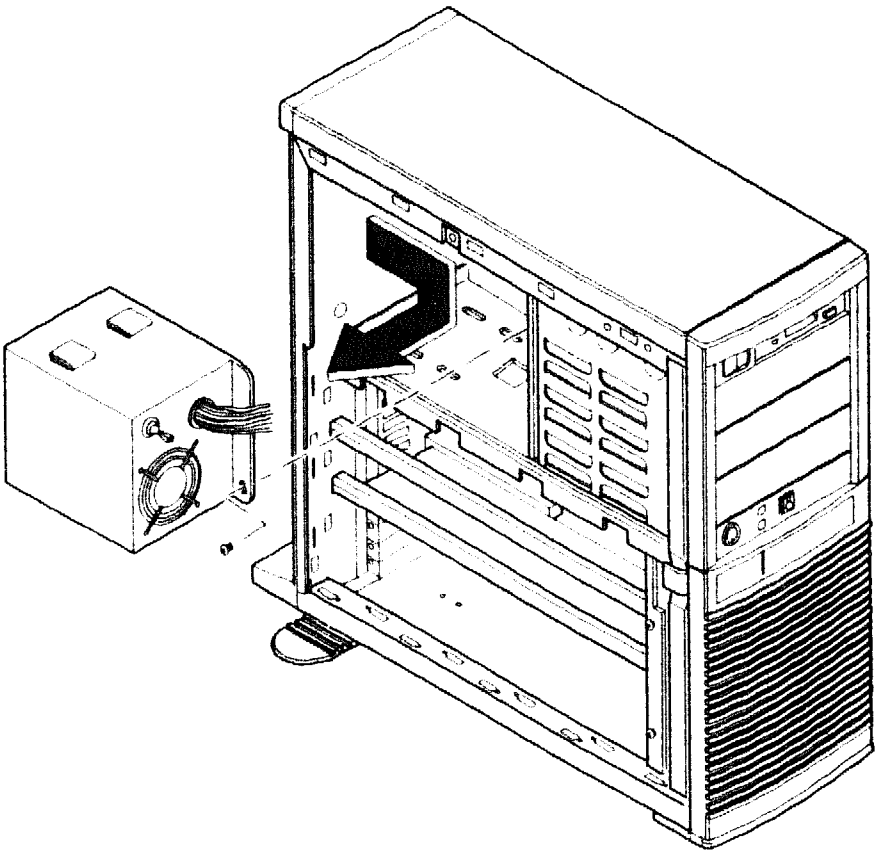
Some DECpc 400ST Series computers might not have the power supply retaining bracket.



DEC00069-2

Figure 3-25. Removing the Power Supply Retaining Bracket

6. Push down to release the power supply retaining bracket from the locking tabs and then remove it from the chassis.
7. Remove the power supply retaining screw (see Figure 3-26).
8. Pull the power supply toward the front of the system box, down, and then out.



DEC00070-2

Figure 3-26. Removing the Power Supply

To replace the power supply, do the following:

1. Replace the power supply with the recommended Digital equivalent.
2. Replace the power supply retaining screw.
3. Insert the power supply retaining bracket into the slots at the back of the chassis and then pull up on it to lock it into place (if applicable).
4. Replace the power supply retaining bracket screw (if applicable).
5. Install the power supply actuator rod.
6. Install the internal drive with its tray.
7. Connect all power supply cables to the system board and peripheral devices. Remove any identification tags.
8. Replace the system box inner and outside covers.

Auxiliary Fan

To remove the auxiliary fan, do the following

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the CPU module and memory module (if applicable).
3. Disconnect the fan power cable from its connector on the system board (see Figure 3-24).
4. Remove the screw securing the fan mounting bracket to the system chassis (see Figure 3-27).

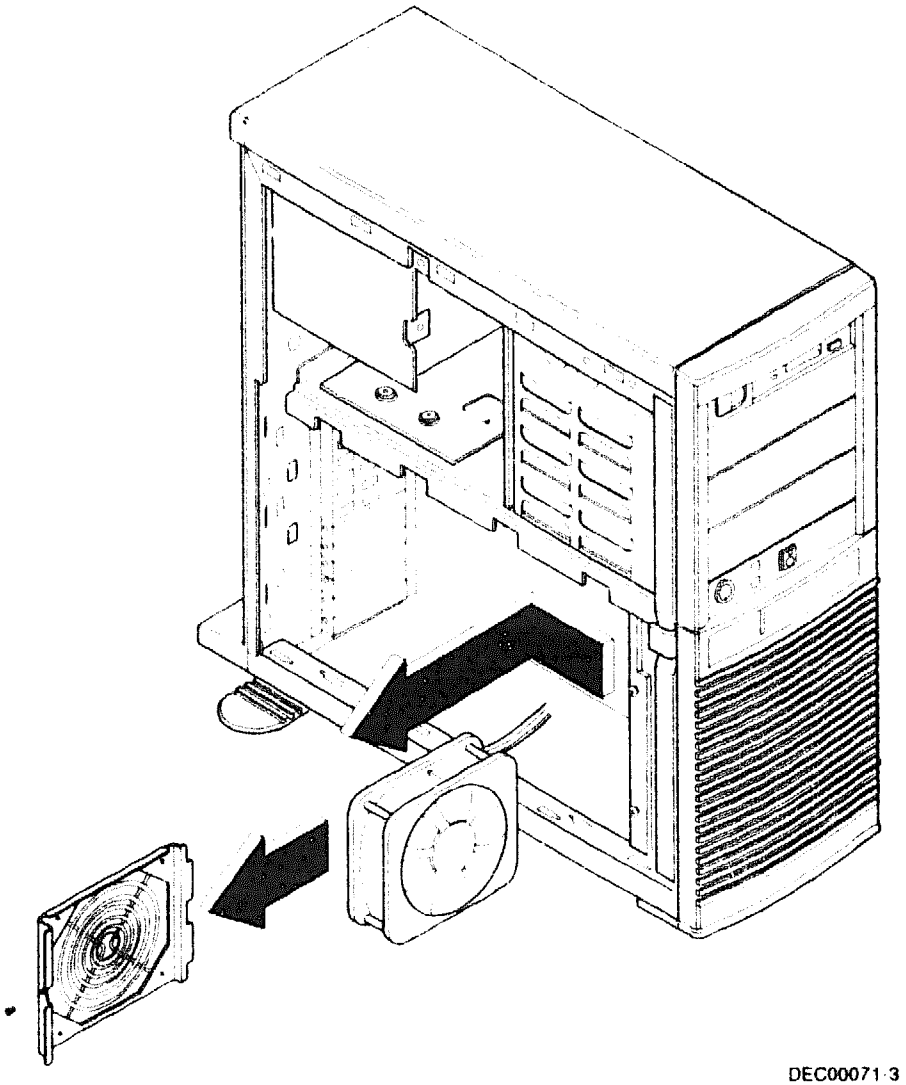


Figure 3-27. Removing the Auxiliary Fan

5. Remove the fan mounting bracket.
6. Remove the fan by pulling it back and then out.

To replace the auxiliary fan, do the following:

1. Mount the replacement fan in the mounting bracket.
2. Install the fan.
3. Connect the fan power cable.
4. Secure the mounting bracket retaining screw.
5. Install the CPU module and memory module (if applicable).
6. Replace the system box inner and outside covers.

Control Panel

To remove the control panel, do the following:

1. Follow the procedures for removing the system box outside and inner covers.
2. Remove the front peripheral bay bezel (see Figure 3-4).
3. Pull the left side of the control panel away from the retaining post.
4. Move the control panel to the left out of its slot and then forward (see Figure 3-28).

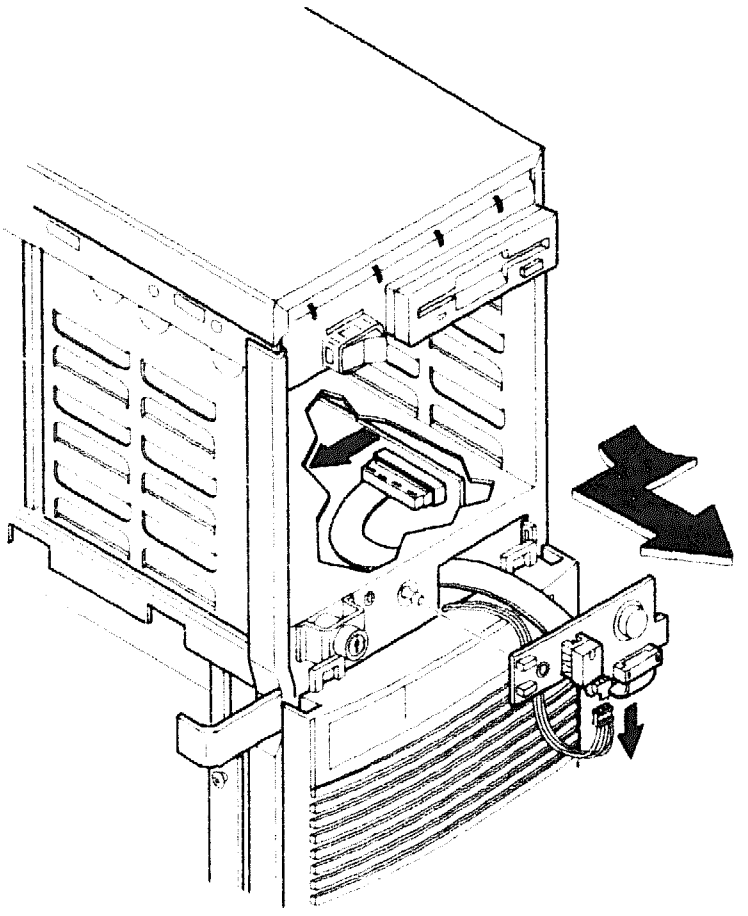


Figure 3-28. Removing the Control Panel

5. Disconnect the keylock cable from the control panel (see Figure 3-28).
6. Disconnect the panel cable from the system board.
7. Properly label and store the control panel.

To replace the control panel, do the following:

1. Remove the replacement control panel from its packaging.
2. Connect the control panel cable to the system board.
3. Connect the keylock cable to the control panel
4. Place the control panel flush and then move it to the right into its slot.
5. Push the left side of the control panel onto the retaining post.
6. Replace the front peripheral bay bezel.
7. Replace the system box inner and outside covers.

4

Configuring the Computer

Introduction

The System Configuration Utility (SCU), which is used to configure the system board as well as EISA and ISA options, is contained on the System Configuration Diskette. The SCU stores configuration settings in both FLASH memory and CMOS RAM. Digital recommends that you use the SCU to configure the computer when you add, remove, or replace hardware or change system settings.

The system board BIOS also contains a Setup program that enables you to change configuration settings that are stored in CMOS RAM. BIOS Setup options are a subset of those provided in the Configure Computer option of the SCU with the exception of password which is a separate SCU Main Menu option.

Since values configured with the BIOS Setup Utility are written only to CMOS RAM and will be overwritten when the SCU is run, it is recommended that the BIOS Setup utility be used only if you:

- Need to enable your diskette drive
- Do not have access to a diskette drive
- Have only ISA expansion boards and will not be using the SCU

NOTE

If you use the ROM BIOS setup utility to change any configuration parameter other than time, date, or password, the message "EISA configuration not assured" will be displayed during the next POST cycle. Any subsequent POST cycle or running the System Configuration Utility (SCU) clears this message.

Configuring Your Computer

This section describes general instructions for configuring the computer using the SCU. For more detailed information, refer to the DECpc 400ST Series User's Guide.

EISA computers identify hardware using a unique product identification code. The SCU matches this product identifier with the appropriate configuration files on the System Configuration Diskette and attempts to automatically configure the system board and EISA expansion boards.

The SCU automatically detects any EISA expansion boards installed in your computer. It does not automatically detect ISA expansion boards.

1. Insert a write-enabled copy of the System Configuration Diskette into drive A.
2. Soft boot the computer (CTRL + ALT + DEL). After a short wait, the SCU introductory screen will be displayed on your monitor screen.

NOTE

The SCU contains help pop-up screens for any selected menu item. Press F1 at anytime to display them and Esc to remove them.

3. Press Enter to display the SCU Welcome screen.

   If no configuration errors appear, the Welcome screen will display information about the SCU. Press Enter to display the Main menu.

NOTE

If a configuration error appears, the Welcome screen will display information about the error and tell you to reconfigure your computer. Press Enter to display the Main menu, select the View and Edit Details menu item from the Configure Computer option, make any changes as indicated by POST error messages, then exit to boot the computer so changes take effect.

4. Using the Select Keyboard Type option, select the keyboard type that best describes the keyboard you are using.

5. Select the Configure Computer option to configure your computer. The SCU will prompt you for any option configuration (CFG) files it cannot find on the System Configuration Diskette.

NOTE

If the message "Unable to update configuration information in FLASH memory" appears on the monitor screen while configuring the computer, make sure the FLASH Memory Write jumper is correctly set before continuing. Refer to Appendix B for additional information on the FLASH Memory Write jumper.

6. After properly configuring your computer, select the "Exit From This Utility" option to end the SCU session.

Advanced Features

The SCU provides three advanced features. Pressing CTRL/A at the Welcome screen provides access to these features. Details of these features are listed below.

Extended Memory Range Definition

This feature is used to display and change the address ranges defined as extended memory. These address ranges define the extended memory that is available for use by memory management software. This feature can be used on both the system board extended memory and, if applicable, for the memory module. When memory is added or removed, the SCU automatically updates these ranges.

Use this feature to display the address ranges for extended memory and to verify that extended memory has been modified when the "Expansion Board Address Space" option is enabled.

CAUTION

The SCU automatically checks extended memory and lists the default address ranges for it. We recommend using the default address ranges whenever possible. Use caution when modifying these extended memory ranges.

Expansion Board Address Space

Certain expansion boards require 128 KB of address space to run. Because this address space may not be available in certain situations, it can be mapped into extended memory or into the memory space between 512 KB and 640 KB.

If expansion boards are installed that require 128 KB of address space and at least 16 MB of memory is installed on the system board or memory module, select the "Enabled" option. This opens a 1 MB space between 15 MB and 16 MB in memory. The upper 128 KB is reserved for the system BIOS and the remainder of the 1 MB (F00000h to FDFFFFh) provides 896KB of memory for expansion boards.

If less than 16 MB of memory is installed, map expansion boards requiring 128 KB of address space to the memory space between 512 KB and 640 KB or to an address range outside actual extended memory but within the 16 MB range.

CAUTION

Certain operating systems cannot function properly with an open 1 MB space in extended memory.

Expansion Slot 4 Operation

This feature sets the operation of expansion slot 4 depending on the type of expansion board installed.

The available options for slot 4 are "EISA Compatible" and "ISA Compatible." Setting the option to EISA Compatible implements the EISA addressing scheme. The default setting is "EISA Compatible." This setting enables the fourth slot to accept EISA expansion boards as well as ISA expansion boards that do not use I/O addresses in the 0 to 255 (decimal) range.

If you install an ISA expansion board that uses I/O addresses between 0 and 255 (decimal), install the board in slot 4 and set this option to "ISA Compatible."

5

Updating the System BIOS

Introduction

This appendix contains instructions for updating the system BIOS and instructions for recovery of the system BIOS if it becomes corrupt.

System BIOS updates are distributed on the FLASH Memory Update diskette. This diskette contains the update utility (FMUP.EXE), the BIOS update files, and other required files (refer to Table 5-1). The README.TXT file provided with the FLASH Memory Update diskette may contain additional information.

Table 5-1. Contents of the FLASH Memory Update Utility Diskette

File Types	File Names	Description
Utility files	FMUP.EXE	FLASH memory update utility
	FLASH.PCX	Startup banner
	AUTOEXEC.BAT	Starts the FLASH update software
	COMMAND.COM	MS-DOS commands used to update the system BIOS
	BEEP.COM	Utility used to make speaker the beep
	SHOWHDR.EXE	Displays header information on system BIOS update files
	README.TXT	System BIOS update information
	(system boot files)	Any files required to boot the computer
BIOS recovery files	BIOSR0F.REC	System BIOS recovery files
	BIOSR0F.RE1	
	BIOSR0F.RE2	
BIOS update files	(*BIOS version*)R0F.BIO	System BIOS update files
	(*BIOS version*)R0F.BI1	
	(*BIOS version*)R0F.BI2	

BIOS File Header Information

The SHOWHDR.EXE utility is provided on the FLASH Memory Update diskette to display the header information on specified BIOS recovery or update files. Use this utility to check the time stamp and other data in the header of the specified files.

Invoke the utility from the DOS prompt using the following syntax:

```
SHOWHDR filename
```

where `filename` is the name of the BIOS recovery or update file.

For example:

```
A:>showhdr 99999ROF.BIO

SHOWHDR (Show FLASH Data Image Header -- Release x.x)
Image Title: Sample Title 00.00.00.R0 RELEASE BIOS
BIOS INFO
        Logical Area Type: 1
        Logical Area Size: 0x38000
        Load From File --- : TRUE
        Reboot Required -- : TRUE
        Update All Of Image: TRUE
Time Stamp --------- : 01/01/99-12:00
This File Start Addr : 0x0
This File Data Length: 0x10000
Last File in Chain   : FALSE
Next File Name ----- : 99999ROF.BI1
BIOS Reserved String : 0.00.00.R0
```

FLASH Memory Update Utility

CAUTION

To avoid memory conflicts, do not run the FLASH update utility from your operating system prompt. Use the following procedure to boot your system and invoke the FLASH update utility.

1. Insert the FLASH Memory Update diskette into drive A.
2. Boot the computer.

The FLASH update utility will automatically be invoked. The main menu provides the following selections:

- Verify FLASH Memory Area With a File
- Save FLASH Memory Area To a File
- Update FLASH Memory Area From a File

You can verify, save, and update both the system BIOS area and the user area of FLASH memory. The user area is currently unused and does not need to be verified, saved, or updated.

Verify FLASH Memory Area With a File

Select "Verify FLASH Memory Area With a File" menu item to verify that the FLASH memory area matches the contents of the BIOS update file you specify.

If the FLASH memory area does not match the specified files, you may want to compare the system BIOS date and version number (displayed briefly when the computer is booting) with the date and version number in the header of the update files. To show the header information in the update files, exit the FLASH update utility and run the SHOWHDR.EXE utility from the DOS prompt.

Save FLASH Memory Area to a File

Select "Save FLASH Memory Area to a File" to save the contents of the FLASH memory to a file.

Run this procedure to create a backup of the system BIOS before updating it.

Update FLASH Memory Area from a File

The "Update FLASH Memory Area from a File" menu item is used to update the system BIOS in FLASH memory. To update the sytem BIOS, do the following:

1. Run the SCU on your System Configuration Diskette to create a backup file (SYSTEM.SCI) of your system configuration. Refer to the DECpc 400ST Series User's Guide or the SCU help screens for information on creating this file.
2. Power off the computer.
3. Ensure that jumper E0721 is in the "FLASH memory write enable" position (this is the default position). The jumper should be between pins 1 and 2.
4. Ensure that jumper E0191 is in the "FLASH normal boot" position (this is the default position). The jumper should be between pins 1 and 2.
5. Insert the FLASH Memory Update diskette into drive A.
6. Power up the computer. The computer will boot off the diskette and start the FLASH update utility.
7. Select the "Save FLASH Memory Area to a File" option to backup the current system BIOS to a file. Use the tab key to select the desired options on this and other FLASH update utility menus.
8. Select the "Update FLASH Memory Area from a File" option.
9. Select the "Update System BIOS" option.
10. You will be prompted for the desired BIOS update. You may enter the title yourself or select from those the FLASH update utility has found on the diskette.

11. Once a BIOS update is selected, information is displayed about the selected BIOS update file. If this is the correct BIOS update file, select the "Continue with programming" option.

12. Wait for approximately one minute while the update process completes.

13. Select "Exit Program" on the main menu to exit the FLASH update utility.

14. Run the SCU to configure the computer.

If the system BIOS becomes corrupted during the update procedure, e.g., a power outage occurs, follow the recovery procedure in the following section.

BIOS Recovery Procedure

The BIOS recovery procedure described in this section is used to restore the system BIOS from a diskette in the event it becomes corrupted.

The system BIOS is located in upgradeable FLASH memory and contains the normal boot procedure. The system BIOS can become corrupted, for example, when the update procedure is aborted due to a power outage. The FLASH memory also contains a protected area that cannot be corrupted. The code in this protected area is used to boot the computer from drive A when the system BIOS has been corrupted. After booting, the FLASH update utility is used to automatically recover the system BIOS from the BIOS recovery files on the diskette.

NOTE

If you have an expansion board's BIOS mapped to any part of the E0000h address range, you must either map it to another area or physically remove it before a BIOS recovery operation can be completed. You do not have to remove expansion boards for normal BIOS updates.

To recover the system BIOS, do the following:

1. Power off the computer.
2. Ensure that jumper E0721 is in the "FLASH memory write enable" position (this is the default position). The jumper should be between pins 1 and 2. See Figure 5-1 for the location of jumper E0721.

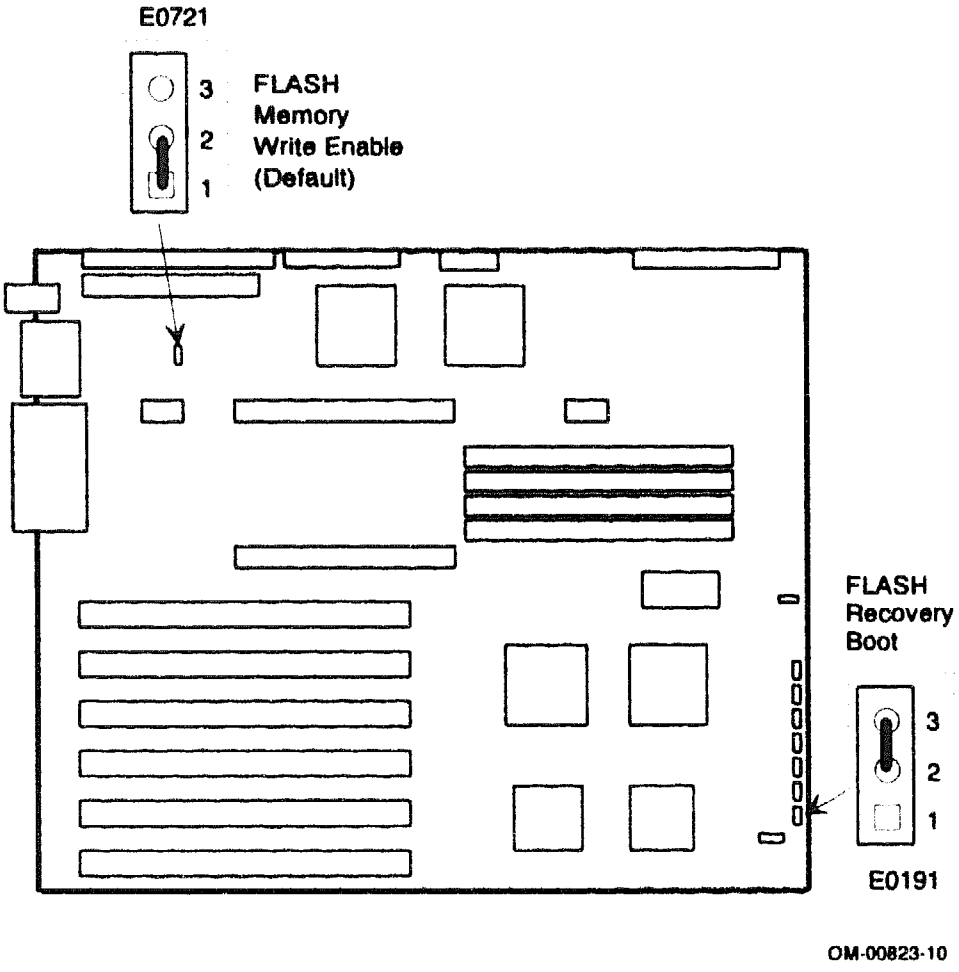


Figure 5-1. Location of FLASH Write Enable and Recovery Jumpers

3. Move jumper E0191 to the "FLASH recovery boot" position . The jumper should be between pins 2 and 3. See Figure 5-1 for the location of jumper E0191.
4. Insert the FLASH Memory Update diskette in drive A.
5. Power up the computer.
6. A single beep will signal that the system has booted successfully.
7. Wait 2 - 3 minutes for the recovery process to take place.

NOTE

During the recovery process, no video output is displayed and the keyboard is disabled as the system automatically attempts to recover the BIOS. Because there is no video displayed, the recovery status is identified through beep codes. Table 5-2 lists the beep codes used during the recovery procedure.

Table 5-2. Recovery Procedure Beep Codes

Beep Code	Meaning
2 beeps	Successful completion, no errors.
4 long beeps	The computer could not boot from the diskette. The diskette may not be bootable.
Continuous series of low beeps	The wrong BIOS recovery files are being used and/or the FLASH Memory Write Enable jumper (E0721) is not set properly.

8. When the process is finished, two beeps will sound signalling successful completion.
9. Power off the computer.
10. Move jumper E0191 to the "FLASH normal boot" position . The jumper should be between pins 1 and 2. See Figure 5-1 for the location of jumper E0191.
11. Return jumper E0721 to its original position (the default position for this jumper is between pins 1 and 2).
12. Remove the update diskette from drive A.
13. Power up the computer.

A

Power Consumption

Introduction

This appendix contains power requirement information for the DECpc 400ST Series computer. Also included are current requirements for the system board and components that obtain power from the system board.

Power Supply and Input Power Requirements

The 254 W power supply provides four dc voltages: +12 V dc, -12 V dc, +5 V dc, and -5 V dc. These voltages are used by the various components within the computer. Table A-1 lists the input power requirements.

Table A-1. Computer Input Power Requirements

Rated Voltage Range	Maximum Range	Maximum Input Current(1)	Operating Frequency Range
100 - 120 V ac	90 - 132 V ac	10 A	47 - 63 Hz
200 - 240 V ac	180 - 264 V ac	5.5 A	47 - 63 Hz

(1) Includes outlet current

System Board Current Requirements

The system board and system peripherals must use power within the +5 V maximum power ratings supplied by the power supply. When adding peripherals or add-in boards, care must be taken to ensure they do not exceed the power supply's capacity. The maximum available +5 V current allowable to any peripheral or add-in board (through the expansion slot) depends upon the following parameters:

- Power supply capacity of 35 A at +5 V
- The +5 V requirements of the board set, including CPU and memory modules
- The +5 V requirements of the peripherals up to 2.5 A
- The power demands of all other slots in use

WARNING

EISA bus add-in boards are limited to 4.5 A at +5 V maximum per board. The power supply connectors are limited to 5 A per pin maximum having a total of 35 A maximum for 7 pins. These limitations plus the maximum capacity of the power supply itself may be more restrictive than the current limitations of the pins/connectors and expansion slots. As an overall limitation, do not exceed 35 A total when computing total +5 V current drain for the system board. This avoids damage to the power supply and system board.

Computer Component Current Requirements

Table A-2 lists typical current requirements for the computer components.

CAUTION

Do not exceed 254 Watts of total power at 35 A +5 V dc power. Be sure to include power consumed by boards installed in the EISA expansion slots, the system board, the memory module, and CPU module when calculating power consumption. The power limitation is a function of the power connectors not the power supply. Exceeding this limit can damage the computer.

Table A-2. Computer Component Current and Power Requirements

Assembly	+5 V	+12 V	-12 V	Total Power (w/o surge)
System board (32 MB memory)	6.0 A	0.06 A	0.06 A	31.4 W
Intel486/50, 256 KB cache	4.7 A			23.5 W
Intel486/33, 128 KB cache	4.2 A			21.0 W
Intel486SX/25, 128 KB cache	4.0 A			20.0 W
64 MB memory	3.0 A			15 W
3 1/2-inch diskette drive	0.8 A	1.00 A		16 W
5 1/4-inch diskette drive	0.2 A	0.20A		3.4 W
Keyboard and mouse	0.5 A			2.5 W
1 EISA slot	2.0 A	0.06 A	0.06 A	11.4 W
6 EISA slots	12 A	0.36 A	0.36 A	69 W
3 1/2-inch hard drive	1.1 A	0.80 A (2 A surge)		15.1 W
5 1/4-inch hard drive (half-height)	1.0 A	1.50 A (4.5 A surge)		23 W
5 1/4-inch hard drive (full-height)	1.5 A	2.00 A (4.5 A surge)		31.5 W

NOTE

If your hard disk drives are configured to spin up at power on, calculate the total +12 V dc current requirement using the surge values. If this requirement exceeds 10 A, you should configure one or more of the drives to spin up on command if your controller supports it.

B

System Board Jumpers

Introduction

The system board contains jumper blocks. Each of the jumper blocks is a group of pins that can be connected in several combinations with a jumper. The jumper physically connects or disconnects system board circuits that relate to the jumper block function. These circuits enable or disable specific system operations or set hardware parameters that are not controlled with software.

To change a jumper, do the following:

1. Power off the computer.
2. Gain access to the jumper blocks.
3. Remove the jumper from its current location.
4. Position the jumper over its new location and press it evenly onto the pins. Be careful not to bend the pins.

Jumpers

Jumper pins on the system board allow you to:

- Reset the system configuration to default values
- Clear the system password
- Write protect FLASH memory
- Write protect the diskette drives
- Specify the SIMM size
- Enable FLASH recovery boot mode

Figure B-1 shows the location of the system board jumper pins. Note that the square pin is pin 1. Table B-1 lists the jumper settings and their descriptions.

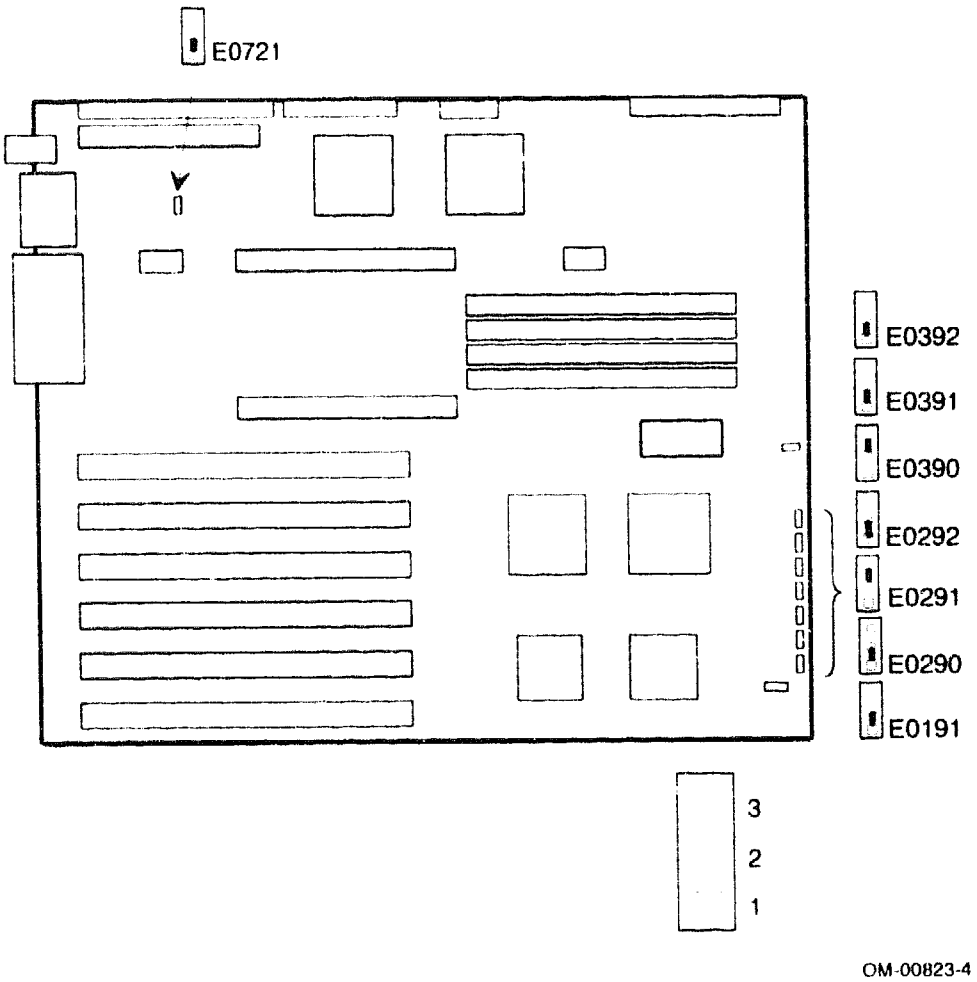


Figure B-1. System Board Jumper Locations

Table B-1. System Board Jumper Settings

Jumper Block	Jumper Setting	Description
E0191	1, 2 (1)	FLASH normal boot
	2, 3	FLASH recovery boot
E0290	1, 2 (1)	Not implemented
E0291	1, 2	Diskette write protect
	2, 3 (1)	Diskette write enable
E0292	1, 2 (1)	System configuration reset disabled
	2, 3	System configuration reset enabled
E0390	1, 2	Password disable/clear
	2, 3 (1)	Password enable
E0391		Memory bank 1 SIMM size
	1, 2 (1)	2, 4, or 8 MB
	2, 3	16 or 32 MB
E0392		Memory bank 0 SIMM size
	1, 2 (1)	2, 4, or 8 MB
	2, 3	16 or 32 MB
E0721	1, 2 (1)	FLASH memory write enable
	2, 3	FLASH memory write protect

(1) Factory setting

Diskette Write Protect

This jumper enables writing to all installed diskette drives. Setting this jumper to the write-protect position, pins 1 and 2, implements a security lock on the onboard diskette controller, thereby providing computer security. For example, users would not be able to copy information from the computer's hard disk drive to a diskette. See Figure B-1 for the jumper location.

System Configuration Reset

This jumper resets the system configuration information stored in FLASH memory and CMOS RAM to the factory default settings every time the computer boots. The FLASH Memory Write jumper (E0721) must be set in the enabled position to allow the configuration information stored in FLASH memory to be reset.

Set the System Configuration Reset jumper (E0292) between pins 2 and 3 to reset the system configuration information. After the factory defaults are restored, run the SCU to restore any user specified system configuration information. Reset the jumper to pins 1 and 2 after the factory defaults have been restored. See Figure B-1 for the jumper location.

Password

This jumper enables setting the power-on and network password (both are the same). It can also be used to clear the password if it is forgotten. Clear the system password by using the following procedure:

1. Power off the computer.
2. Gain access to the Password jumper block.
3. Move the Password jumper from "enabled" to "disabled/clear" (pins 1 and 2). See Figure B-1 for the jumper location.
4. Power up the computer and wait for POST to complete.
5. Power off the computer.
6. Move the jumper from "disabled/clear" to "enabled" (pins 2 and 3).
7. Power up the computer.
8. Run the SCU to specify a new password.

Memory Bank 0, 1

Jumper blocks E0391 and E0392 specify the size of the SIMMs installed in the SIMM sockets. See Table B-1 for jumper settings and Figure B-1 for jumper locations.

FLASH Memory Write

This jumper enables writing to FLASH memory. Writing to FLASH memory is necessary for BIOS upgrades, running the BIOS Setup utility to configure user-defineable hard drives, configuring the system with the SCU, and resetting the system configuration to its default values. See Figure B-1 for the jumper location. For additional information on upgrading the BIOS, refer to Chapter 5.

This jumper also provides security by protecting system configuration information. By default, the jumper is set to "FLASH memory write enable." To protect configuration information, set the jumper to "FLASH memory write protect" (pins 2 and 3).

FLASH Recovery Boot

There are two portions of FLASH memory: protected and non-protected. The protected portion contains the recovery BIOS that enables the CPU to boot from a diskette installed in drive A. Follow the FLASH recovery boot procedure described in Chapter5 +if the system BIOS becomes corrupt. This procedure uses the FLASH Memory Update utility to restore the system BIOS from diskette.

See Figure B-1 for the jumper location. For additional information on recovering the system BIOS, refer to Chapter 5.

C

Interface Connectors

Introduction

This appendix provides information about the external connectors on the DECpc 400ST Series computer.

External System Box Connectors

This section lists all external computer connectors located at the rear of the system box. Detailed descriptions and pin-outs follow later in the appendix. Figure C-1 shows the location of the external connectors.

- Parallel printer port connector, 25-pin D-subminiature female
- Serial connectors, 9-pin D-subminiature male
- Keyboard and mouse connectors, 6-pin mini-DIN

Also, note that in the following external connector listings, an asterisk (*) that follows a signal name indicates an active low signal. For example, STB-R*.

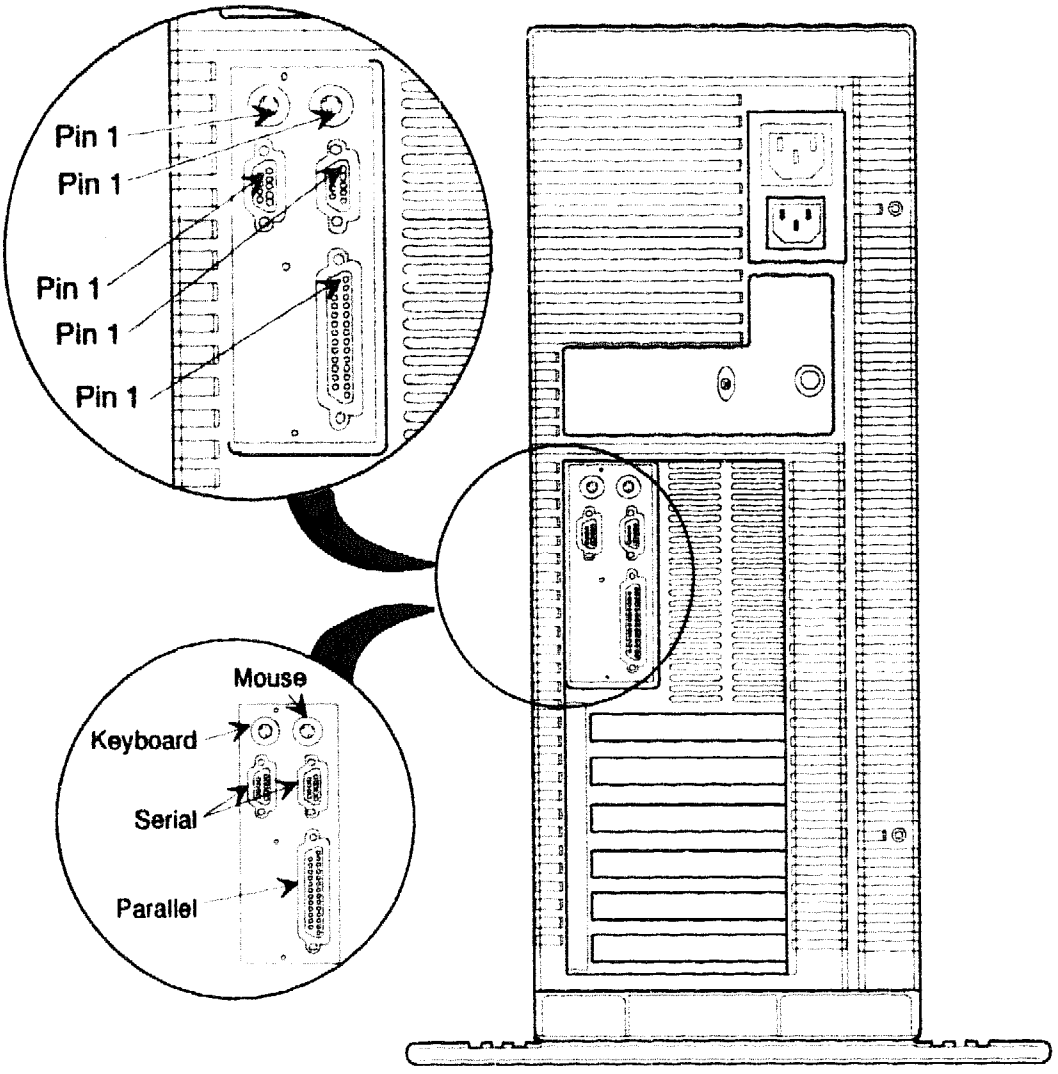


Figure C-1. External Connectors

Parallel Printer Port Connector

The parallel printer port connector provides an interface to a printer or other parallel device. See Figure C-1 for the location of the parallel printer port connector. Table C-1 lists the pinout specifications for the parallel printer port connector, giving the pin number and signal function.

NOTE

The computer logically assigns LPT*x* names to parallel ports in the address order 378h and 278h. This occurs during each boot process. For example, if you disable the parallel port that is assigned to 378h as LPT1, during the next boot cycle the computer will reassign the name LPT1 to the next enabled parallel port in the sequence.

Table C-1. Parallel Printer Port Pinout

DB25 Pin	Signal	Function
1	STB-R*	Strobe
2	PRTD0	Printer data bit 0
3	PRTD1	Printer data bit 1
4	PRTD2	Printer data bit 2
5	PRTD3	Printer data bit 3
6	PRTD4	Printer data bit 4
7	PRTD5	Printer data bit 5
8	PRTD6	Printer data bit 6
9	PRTD7	Printer data bit 7
10	ACK*	Acknowledge
11	BUSY	Busy
12	PE	Paper end
13	SLCT	Select
14	AUTOFDXT*	Auto feed
15	ERR*	Error
16	INIT*	Initialize printer
17	SLCTIN*	Select input
18-25	GND	Ground

Serial Port Connectors

The serial port connectors consist of two 9-pin D-subminiature connectors. These two serial port connectors are not interchangeable. The connector closet to the system board is serial port 2; the other is serial port 1. See Figure C-1 for the location of the serial port connectors. The baud rates supported by the system for the serial ports are 300, 1200, 2400, 4800, 9600, 19200, and 38400.

NOTE

The computer logically assigns COMx names to serial ports in the address order 3F8h, 2F8h, 3E8h, and 2E8h. This occurs during each boot process. For example, if you disable the serial port that is assigned to 3F8h as COM1, during the next boot cycle the computer will reassign the name COM1 to the next enabled serial port in the sequence.

The pin-out specifications for the 9-pin versions of serial port 1 and 2 are listed in Table C-2.

Table C-2. Nine-Pin Serial Port Pinout.

DB9 Pin	Signal	Function
1	DCD	Data carrier detect
2	RXD	Receive data
3	TXD	Transmit data
4	DTR	Data terminal ready
5	GND	Ground
6	DSR	Data set ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator

Keyboard and Mouse Connectors

The keyboard and mouse connectors consist of two 6-pin mini-DIN connectors. See Figure C-1 for the location of the keyboard and mouse connectors. Table C-3 lists the pin assignments for the two connectors.

Table C-3. Keyboard and Mouse Connector Pinouts

Pin	Signal
1	Data
2	No connection
3	Ground
4	+5 V dc (fused)
5	Clock
6	No connection

D

Device Mapping

Introduction

This appendix provides four tables that list the computer's memory map, I/O address map, interrupt map, and DMA channel map.

Table D-1. Computer Memory Map

Address Range (in hex)	Function	Size	Shadow	Cache
0010 0000 to 01FF FFFF	Extended memory(1)	192 MB	No	Yes
000F 0000 to 000F FFFF	System BIOS	64 KB	Yes	Yes
000E 8000 to 000E FFFF	EISA configuration information(2)	32 KB	No	No
000E 0000 to 000E 7FFF	Adapter BIOS extension	32 KB	Yes(3)	Yes
000D 0000 to 000D FFFF	Adapter BIOS extension	64 KB	No	No
000C 8000 to 000C FFFF	Adapter BIOS extension	32 KB	Yes(3)	Yes
000C 0000 to 000C 7FFF	Video BIOS or adapter BIOS extension	32 KB	Yes(3)	Yes
000A 0000 to 000B FFFF	Video RAM	128 KB	No	No
0000 0000 to 0009 FFFF	Base memory	640 KB	No	Yes

(1) The SCU provides an option for creating a 1 MB open space between 15 MB and 16 MB to which you can map expansion board BIOS (refer to Chapter 4)
(2) Not available for mapping expansion board memory or BIOS
(3) User configurable (refer to Chapter 4)

NOTE

The DECpc 400ST Series computers do not support the use of the 000E 0000 to 000E FFFF address range for DEC EtherWORKS (DEPCA) controllers. DEC EtherWORKS controllers should be configured for the 000D 0000 to 000D FFFF address range to run in the 64 KB mode or for 000C 8000 to 000C FFFF to run in the 32 KB mode.

Table D-2. I/O Address Map

Range (in hex)	Function
0000:000F	ISP DMA controller one
0020:0021	ISP interrupt controller one
0026	MECA and CLASIC configuration index
0027	MECA and CLASIC configuration data
0040:0043	IPS timer one
0048:004B	ISP timer two
0060	Keyboard data
0061	ISP NMI
0064	Keyboard command/status
0070 (bit 7)	ISP enable NMI
0070 (bits 6:0)	Real-time clock address
0071	Real-time clock data
0078	BIOS timer
0080:008F	ISP DMA
0092	System control port
00A0:00A1	ISP interrupt
00C0:00DE	ISP DMA
00F0	Reset numeric error
01F0:01F7	IDE controller
0278:027B	Parallel 2
02E8:02EF	Serial 4
02F8:02FF	Serial 2

Table D-2. I/O Address Map *(continued)*

Range (in hex)	Function
0378:037F	Parallel 1
03B0:03BB	Video registers
03C0:03BF	Alternate parallel port(1)
03E8:03EF	Serial 3
03F0:03F5	Diskette controller
03F6	IDE
03F7 (bits 1:0)	Diskette data rate (write
03F7 (bits 6:0)	IDE status
03F7 (bit 7)	Diskette controller status
03F8:03FF	Serial 1
0400:040B	ISP high DMA
040C:040F	ISP control and test
0461:0464	ISP extended NMI
0464:0465	ISP bus master
0480:048F	ISP high DMA
04C2:04CE	ISP extended DMA
04D0:04D1	ISP interrupt edge/level
04D2:04FF	ISP extended DMA
0C01:0C07	Baseboard configuration
0C09:0C79	Baseboard configuration
0C80:0C83	Baseboard EISA identification
0C84	Baseboard enable
0C85:0CFF	Baseboard configuration

(1) Used only with MDA video

Table D-3. Computer Interrupt Table

Priority	Interrupt Controller	Interrupt Number	Interrupt Source
1	1	IRQ0	System timer
2	1	IRQ1	Keyboard controller
3-10	1	IRQ2	Interrupt controller 2
3	2	IRQ8*	Real-time clock
4	2	IRQ9	EISA connector
5	2	IRQ10	COMx/EISA connector(1)
6	2	IRQ11	COMx/EISA connector(1)
7	2	IRQ12	Mouse/EISA connector
8	2	IRQ13	Numeric coprocessor
9	2	IRQ14	Hard disk drive/EISA connector
10	2	IRQ15	EISA connector
11	1	IRQ3	COMx/EISA connector(1)
12	1	IRQ4	COMx/EISA connector(1)
13	1	IRQ5	LPTy/EISA connector(2)
14	1	IRQ6	Diskette drive/EISA connector
15	1	IRQ7	LPTy/EISA connector(2)

(1) Can be COM1 through COM4
(2) Can be either LPT1 or LPT2

Table D-4. DMA Channel Assignments

Channel	Controller	Function
0	1	Refresh
1	1	Not used
2	1	Diskette controller
3	1	Not used
5	2	Not used
6	2	Not used
7	2	Not used

E

CPU Module Jumpers

Introduction

Some DECpc 400ST Series CPU modules have jumper blocks that designate the microprocessor type and cache memory size. The following sections describe the jumper blocks associated with the currently available CPU modules.

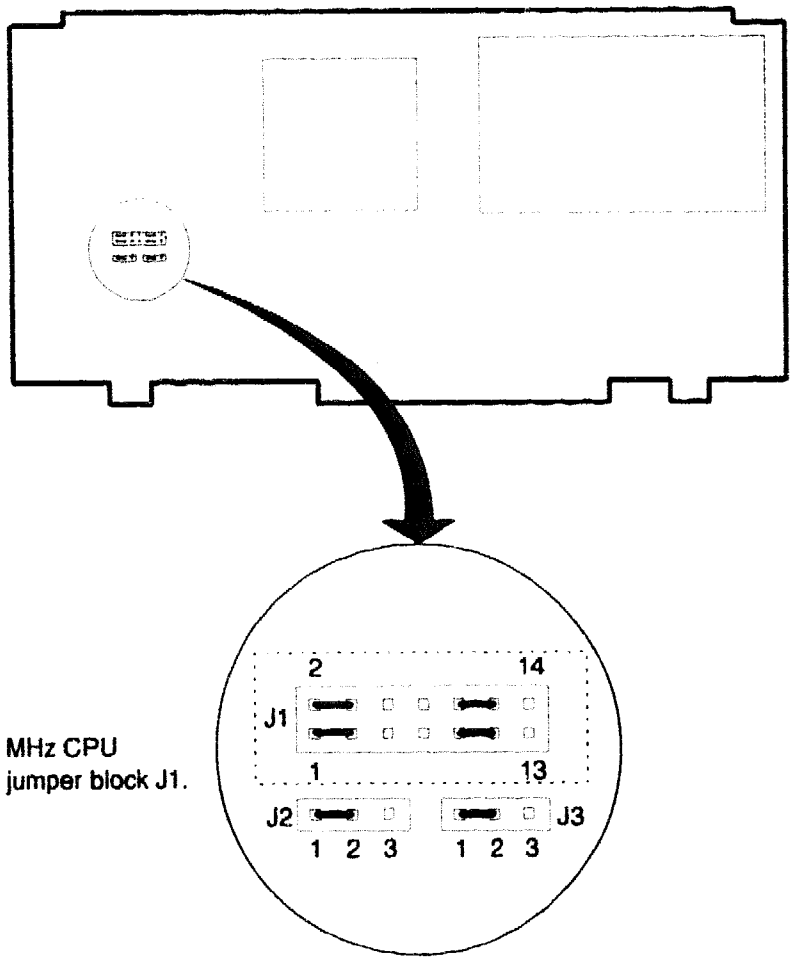
25 MHz CPU Module Jumpers

Jumper block J1 sets the type of microprocessor installed on the CPU module. Jumper block J3 sets the size of the external cache (refer to Table E-1 and Figure E-1).

Table E-1. 25 MHz CPU Module Jumper Settings

Jumper Block	Jumper Setting	Description
J1	1, 3(1) 2, 4(1) 9, 11(1) 10, 12(1)	Microprocessor type
J2		Not used
J3(2)	1, 2	Cache memory size — 128 KB
	2, 3	Cache memory size — 64 KB

(1) Factory setting
(2) If no cache is installed, jumper can be in either position



Note: Only the 25 MHz CPU module has jumper block J1.

Figure E-1. 25 MHz and 33 MHz CPU Module Jumper Settings

33 MHz CPU Module Jumpers

Jumper block J2 sets the type of microprocessor installed on the CPU module. Jumper block J3 sets the size of external cache (refer to Table E-2 and Figure E-1).

Table E-2. 33 MHz CPU Module Jumper Settings

Jumper Block	Jumper Setting	Description
J2	1, 2(1)	Microprocessor type
J3(2)		Cache memory size —
	1, 2	128 KB
		Cache memory size —
	2, 3	64 KB

(1) Factory setting
(2) If no cache is installed, the jumper can be in either position

Intel486 DX2 50 MHz and 66 MHz CPU Module Jumpers

Jumper block J3 sets the size of external cache (refer to Table E-3 and Figure E-2).

Table E-3. Intel486 DX2 50 MHz and 66 MHz CPU Module Jumper Settings

Jumper Block	Jumper Setting	Description
J3(1)		Cache memory size —
	1, 2	128 KB
		Cache memory size —
	2, 3	64 KB

(1) If no cache is installed, jumper can be in either position

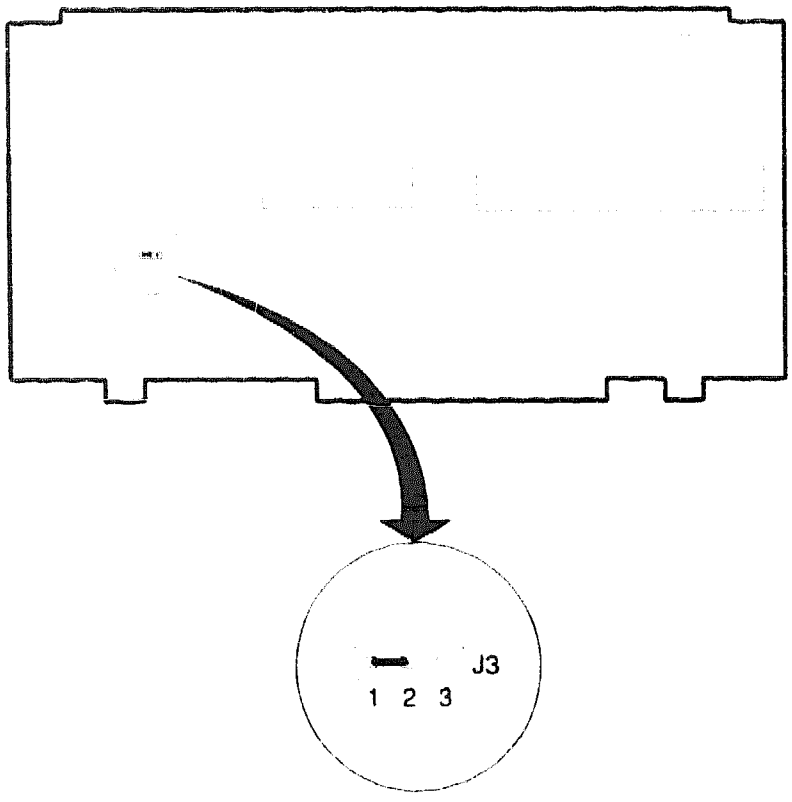


Figure E-2. Intel486 DX2 50 MHz and 66 MHz CPU Module Jumper Location

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