DECpc™ 300/400 LP Series
Service Guide

ER-PC740-SV-001

November 1992

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DECSYSTEM-20	MASSBUS	VMS
DECUS	PDP	VT
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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 harmful interference in a residential installation.

Any changes or modifications made to this equipment may void the user's authority to operate this equipment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may 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 or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

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.

All external cables connecting to this basic unit — with the exception of the mouse cable — need to be shielded. For cables connecting to option boards, see the User Manual or installation instructions for those options.

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.

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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.

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

PREFACE

This guide contains all the information you need to carry out service work on DECpc 300/400 LP series computers.

The guide is divided into 9 chapters and 5 appendices:

- Chapter 1 contains a brief description of the different DECpc 300/400 LP series computers.
- Chapter 2 lists technical information about the different DECpc 300/400 LP series computers.
- Chapter 3 shows you how to install and remove the various Field Replaceable Units (FRUs) that make up a DECpc 300/400 LP series computer.
- Chapter 4 shows you how to find faults on a DECpc 300/400 LP series computer. It also shows you how to use the System Setup utility and other utility/application programs supplied with a PC.
- Chapters 5 to 8 list technical information about the different Field Replaceable Units (FRUs) that can be replaced on a DECpc 300/400 LP series computer.
- Chapter 9 looks at how you set up the Main Board and CPU Board (not the DECpc 333sxLP) installed in a DECpc 300/400 LP series computer.
- Appendix A is divided into two parts. The first part looks at the different connectors fitted to the back of a DECpc 300/400 LP series computer and explains the pin assignments for each of these connectors. The second part looks at any special board and device connectors available inside each of the PCs.
- Appendix B lists information about the I/O addresses and interrupts used by a PC. It also contains the memory map of a DECpc 300/400 LP series computer.
- Appendix C lists the general specifications of a DECpc 300/400 LP series computer.

- Appendix D lists the different display modes supported by the video controllers installed in DECpc 300/400 LP series computers.
- Appendix E lists the different FRUs and options available for DECpc 300/400 LP series computers.

Terms

The following terms are used throughout this guide:

- IDE (Integrated Drive Electronics)
- SCSI (Small Computer System Interface)
- MS-DOS (Microsoft Disk Operating System)
- MS-OS/2 (Microsoft Operating System/2)
- Windows (Microsoft Windows Application Software)
- BIOS (Basic Input/Output System)
- DRAM (Dynamic Random Access Memory)
- VRAM (Video Random Access Memory)
- VGA (Video Graphics Array)
- SVGA (Super Video Graphics Array)
- SIMMs (Single In-Line Memory Modules)
- POST (Power-On Self Test)
- ISA (Industry Standard Architecture)
- ROM (Read Only Memory)
- MDA (Monochrome Display Adapter)
- CGA (Color/Graphics Adapter)
- MCGA (Multi-Color Graphics Adapter)
- EGA (Enhanced Graphics Adapter)

Special Notices

Three kinds of special notice are used throughout this guide:

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.

Contents

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1

Overview

Introduction

The DECpc 300/400 LP series of computers (the DECpc 333sxLP, 340dxLP, 425sxLP, 433dxLP, 450D2LP and 466D2LP) are a family of high-performance personal computers. They can be used as stand-alone computers, or as clients and servers in an office network. Their design makes it easy for the user to choose any number of microprocessors (with or without external caching), the amount of memory, and a variety of mass storage devices.

Each Personal Computer system has the following main parts:

- Monitor
- Basic Unit - the Personal Computer itself.
- Keyboard
- Mouse

You can see these different parts in Figure 1-1.

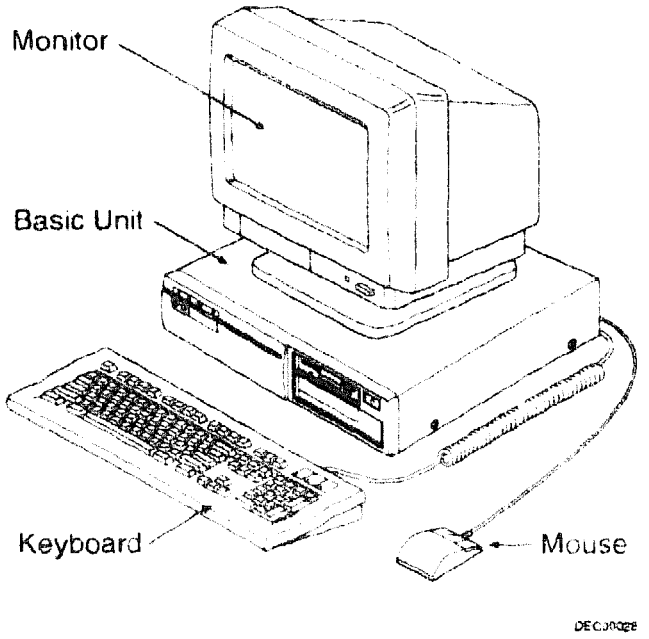


Figure 1-1 - The different parts of a DECpc 300/400 LP Series Computer

All DECpc 300/400 LP series computers (except the DECpc 333sxLP) are based on two circuit boards - a main board and a CPU board. The main board contains all bus, video, ROM, and I/O device circuitry, together with four SIMM sockets for installing extra system memory. The CPU board contains the microprocessor (there are a variety of different speed microprocessors to choose from), optional secondary cache memory and a vacancy socket (for installing coprocessors, overdrive processors, etc.). The CPU Board is joined to the main board by two connectors.

The DECpc 333sxLP is based on a version of the main board on which the CPU and all other parts of the PC are mounted together. There is no separate CPU board.

You can see the difference between the boards fitted to DECpc 333sxLP and all other DECpc 300/400 LP series computers in Figure 1-2.

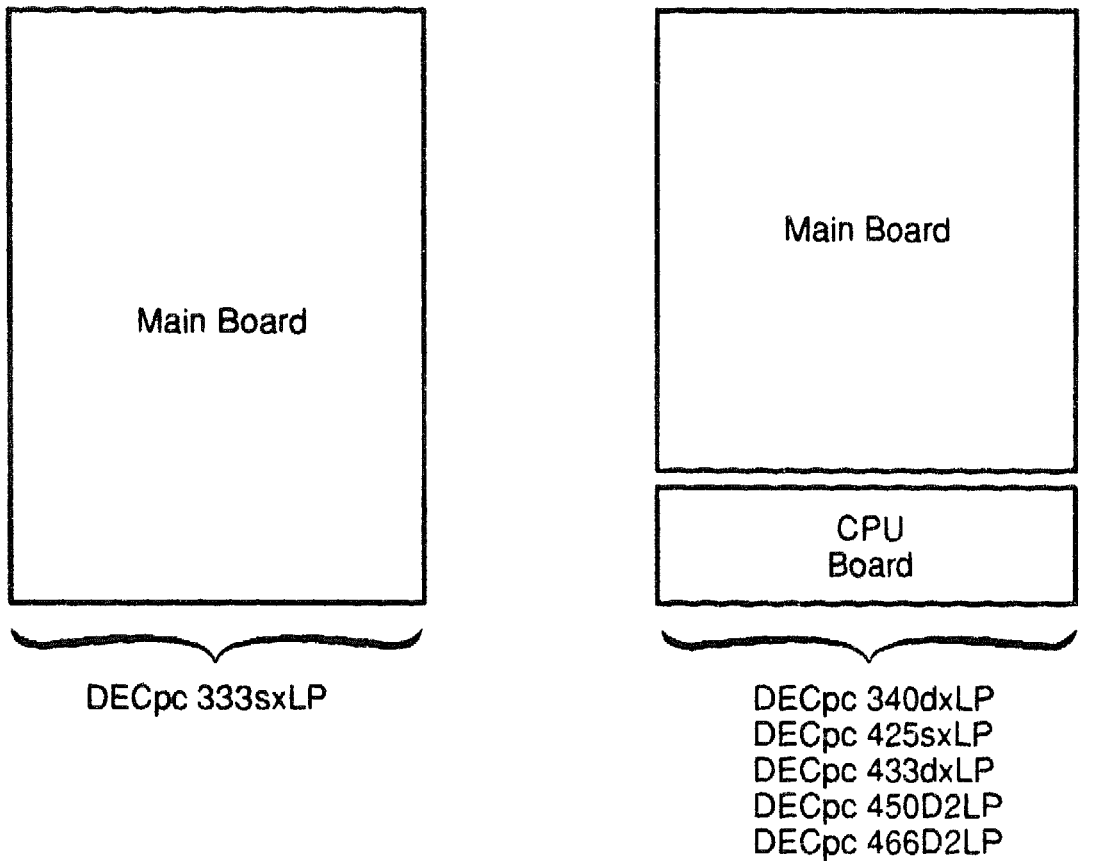


Figure 1-2 - The Boards Fitted to DECpc 300/400 LP Series Computers

The performance features of the main board installed in each PC include:

- Three ISA expansion slots
- OPTI 496/497 ISA chip set (VLSI Scamp II chip set in the DECpc 333sxLP)
- Dual IDE hard disk drive interface
- Diskette drive controller that supports two diskette drives
- Two RS-232C 9-pin serial communication ports
- One 25-pin parallel port
- One PS/2-style keyboard port
- One PS/2-style mouse port
- 16-bit local bus SVGA controller with GUI accelerator and 512 KB VRAM standard (Cirrus GD5422 controller in the DECpc 333sxLP)
- Additional 512 KB VRAM optional
- One speaker
- Phoenix Technologies™ BIOS
- Up to 64 MB of System Memory using SIMMs (up to 16MB in the DECpc 333sxLP)

Each system can support up to four disk drives, or three disk drives and a streaming tape unit - two hard disk drives and two floppy disk drives, or two hard drives, a floppy drive and a streaming tape unit. The two floppy drives can be either two 3 1/2" FDDs or one 3 1/2" FDD and one 5 1/4" FDD.

The same 145-watt power supply is used in all DECpc 300/400 LP series computers. This power supply automatically senses 115 V ac or 230 V ac input - this means that the user does NOT have to select the correct input voltage before using a PC. The power supply also provides an auxiliary AC power connector for switched power to a monitor or peripheral device.

The main board, CPU board (not used in the DECpc 333sxLP), power supply, etc. are contained in the Basic Unit. A mechanical chassis lock on the Basic Unit and software-controlled password protection provide computer security. The chassis lock is operated using either of the two supplied keys - a master key is also available for Service Engineers. Software-controlled passwords can be set using the BIOS setup utility and the password utility supplied on the system and VGA utilities diskette.

Computer Options

A variety of optional equipment can be fitted to DECpc 300/400 LP series computers to enhance their performance. Table 1-1 briefly describes the available options.

Table 1-1 - Options

Option	Description
Monitors	A variety of monochrome or color VGA analog monitors ranging from basic 640 × 480 to multisync 1024 × 768 non-interlaced.
3½-inch diskette drives	1.44 MB and 2.88 MB (not the DECpc 333sxLP) half-height drives.
5¼-inch diskette drives	1.2 MB half-height drive.
IDE hard disk drives	52 MB, 120 MB, and 240 MB 3½-inch, 1-inch height drives.
SCSI devices	A variety of high-performance SCSI hard disk drives, QIC tape back-up, and CD-ROM subsystems.
Computer memory	SIMM kits.
Ethernet network adapters	A variety of adapters for connecting a PC to Digital's PATHWORKS network environment, Novell networks, etc.
Modems and data/FAX modems	A range of 2400 bps to 9600 bps data only or data/FAX modems for communication over telephone lines.
Coprocessors and Overdrive Processors	A range of coprocessors and overdrive processors to enhance the performance of a PC.
CPU Boards (not the DECpc 333sxLP)	A range of CPU boards to upgrade a PC.

2

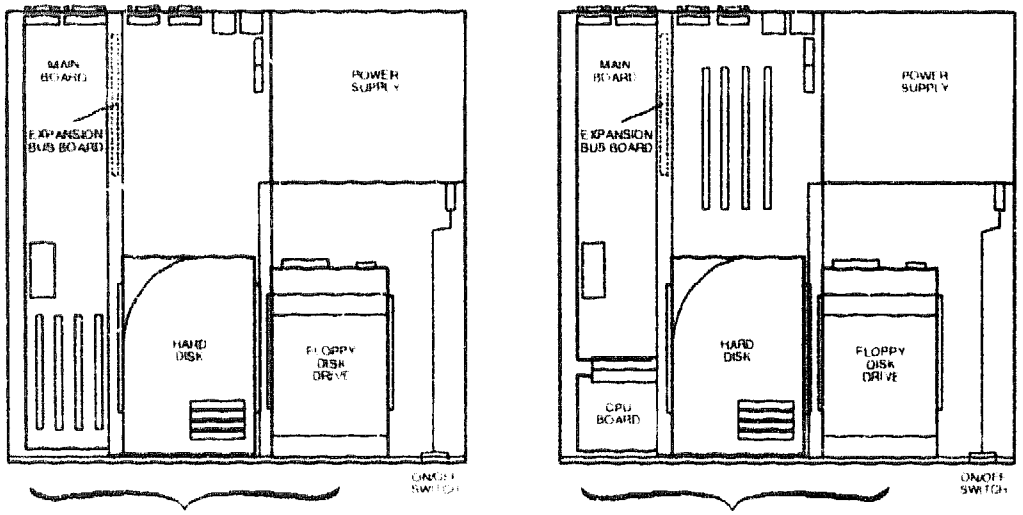
The Basic Unit

Introduction

The Basic Unit contains the following parts:

- CPU board (not used in the DECpc 333sxLP).
- Main Board.
- Front and Rear Panels.
- Expansion BUS Board.
- Power Supply.
- Floppy Disk Drives, Streaming Tape Unit, etc.
- Hard Disk Drives.
- Any optional peripherals (if fitted).

You can see these different parts in Figure 2-1.



DECpc 333sxLP

DECpc 340dxLP
DECpc 425sxLP
DECpc 433dxLP
DECpc 450D2LP
DECpc 466D2LP

Figure 2-1 - The Different Parts of the Basic Unit

The CPU Board (not the DECpc 333sxLP)

All DECpc 300/400 LP series computers (except the DECpc 333sxLP) are fitted with a separate CPU board. There are five different versions of this board:

- 80386dx-40 CPU board fitted to the DECpc 340dxLP.
- 80486sx-25 CPU board fitted to the DECpc 425sxLP.
- 80486dx-33, dx2-50, dx2-66 CPU boards fitted to the DECpc 433dxLP, DECpc 450D2LP and DECpc 466D2LP.

80386dx-40 CPU Board (DECpc 340dxLP)

The 80386dx-40 CPU board consists of the following parts:

1. One 80386dx CPU (40MHz).
2. One vacancy socket for installing an optional maths coprocessor.
3. One 82C497 cache controller supporting a second level cache (write back) of 128 KB extendable to 256 KB (optional).
4. Two connectors for joining the CPU board to the main board.
5. One connector for joining the CPU board to the panel indicator (switch).

You can see these different parts in Figure 2-2.

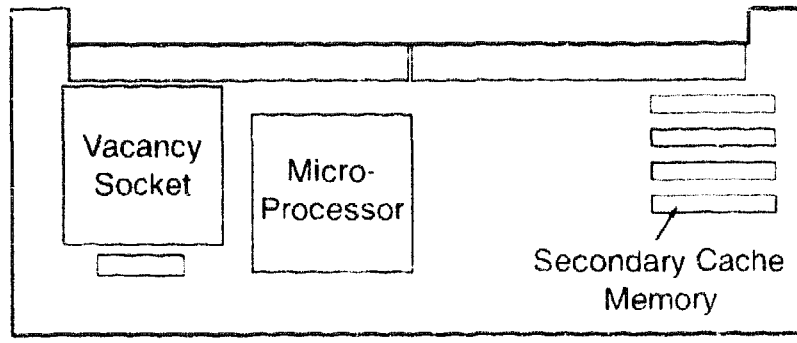


Figure 2-2 - The Different Parts of the CPU Board

80386dx Microprocessor

The 80386dx has the following features:

1. An 8086 Real Address Mode - This is object code compatible with all existing 8086 software and can access one megabyte of physical address space.
2. A Protected Address Mode - This has integrated memory management, four level protection and can access 4 gigabytes of physical address space.
3. A Virtual 8086 Mode - This allows 8086 software to be run in a protected and paged system.
4. Hardware Debugging Support

Vacancy Socket

The CPU board has an empty socket for installing an optional maths coprocessor. See *Chapter 9 - Board Information* to find out more about the upgrade processors you can install.

82C497 Cache Controller

The OPTi 82C497 is a Direct Mapped Write Back cache controller with a one level write buffer and a 16 byte line size. It can support cache sizes of up to 512k with a cacheable address range of up to 64MB. 128KB of cache memory is installed on the processor board. Sockets are provided to extend this to 256KB (Four 32K x 8, 20 ns).

Connectors

The CPU board has three connectors for joining it to the mainboard and switch board.

- Two connectors (64pin) to join it to the mainboard.
- One connector (8pin) to join it to the switch board. The switch board contains the following - Reset Switch, Disk activity LED (IDE hard drive), DC OK LED, Turbo LED, Speaker Port.

Jumper Description

See *Chapter 9 - Board Information* to find out more about the jumper settings for this board.

80486sx-25 CPU Board (DECpc 425sxLP)

The 80486sx-25 CPU board consists of the following parts:

1. One 80486sx-25 CPU.
2. One vacancy socket for installing an optional maths coprocessor or overdrive processor.
3. One 82C497 cache controller supporting a second level cache (write back) of 128KB extendable to 256KB (optional).
4. Two connectors for joining the CPU board to the main board.
5. One connector for joining the CPU board to the panel indicator (switch).

You can see these different parts in Figure 2-3.

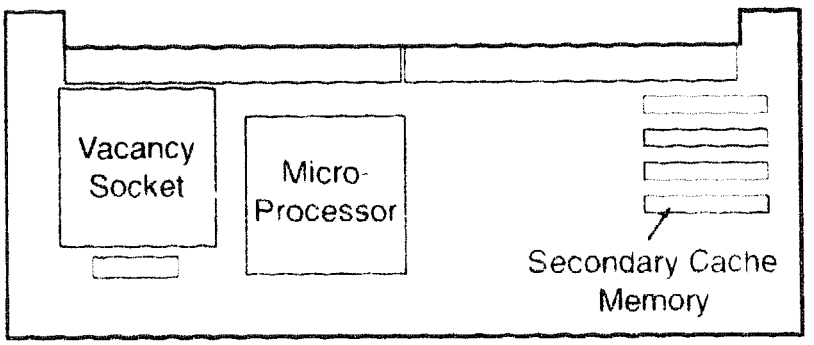


Figure 2-3 - The Different Parts of the CPU Board

80486sx Microprocessor

The 80486sx has the following features:

1. An 8086 Real Address Mode - This is object code compatible with all existing 8086 software and can access one megabyte of physical address space.
2. A Protected Address Mode - This has integrated memory management, four level protection and can access 4 gigabytes of physical address space.
3. A Virtual 8086 Mode - This allows 8086 software to be run in a protected and paged system.
4. An On-Chip 8KB Code and Data Cache (first level).
5. Hardware Debugging Support

Vacancy Socket

The CPU board contains an empty socket into which a maths coprocessor can be installed. Alternatively, by changing a jumper to disable the microprocessor already fitted to the board, a more powerful processor (overdrive processor) can be installed in the socket instead. See *Chapter 9 - Board Information* to find out more about the upgrade processors you can install.

82C497 Cache Controller

The OPTi 82C497 is a Direct Mapped Write Back cache controller with one level write buffer and a 16 byte line size. It can support cache sizes up to 512k with a cacheable address range of up to 64MB. A 128KB cache is already installed on the main board. This can be extended to 256KB (4 32K x 8, 20 ns).

Connectors

The CPU board has three connectors for joining it to the mainboard and switch board:

- Two connectors (64pin) for joining it to the mainboard.
- One connector (8pin) for joining it to the switch board. The switch board contains the following - Reset Switch, Disk activity LED (IDE hard drive), DC OK LED, Turbo LED, Speaker Port.

Jumper Description

See *Chapter 9 - Board Information* to find out more about the jumper settings for this board.

80486dx CPU Boards (DECpc 433dxLP/450D2LP/466D2LP)

The 80486dx CPU boards consist of the following parts:

1. One 80486dx or 80486dx2 CPU.
2. One vacancy socket for installing an optional maths coprocessor or overdrive processor.
3. One 82C497 cache controller supporting a second level cache (write back) of 128KB extendable to 256KB (optional).
4. Two connectors for joining the CPU board main board.
5. One connector for joining the CPU board to the panel indicator (switch).

You can see the different parts of these boards in Figure 2-4.

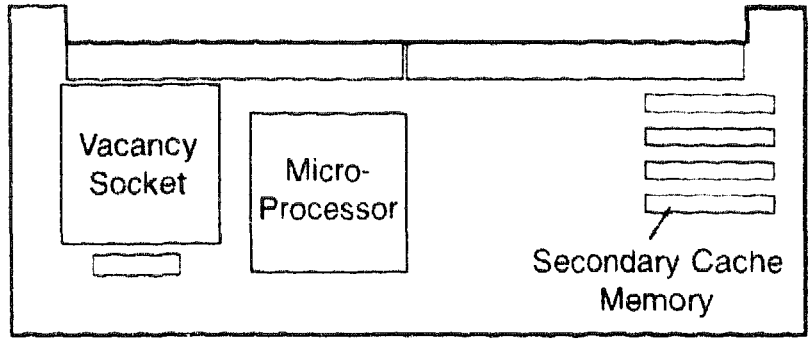


Figure 2-4 - The Different Parts of the CPU Boards

80486dx Microprocessor and 80486dx2 Speed-Doubling Microprocessor

The 80486dx has the following features:

1. An 8086 Real Address Mode - This is object code compatible with all existing 8086 software and can access one megabyte of physical address space.
2. A Protected Address Mode - This has integrated memory management, four level protection and can access 4 gigabytes of physical address space.
3. A Virtual 8086 Mode - This allows 8086 software to be run in a protected and paged system.
4. On-Chip:
   - 8KB Code and Data Cache (first level).
   - Floating Point Unit.
   - Paged, Virtual Memory Management.
5. Hardware Debugging Support.

The 80486dx2 Speed-Doubling Microprocessor has these additional features.

1. The CPU core runs at twice the frequency of the system bus.
2. It is compatible with 33 (dx2-66), 25 (dx2-50) systems.

Vacancy Socket

The CPU board has an empty socket into which a maths coprocessor can be installed. Alternatively, by changing a jumper to disable the microprocessor already fitted to the board, a more powerful processor (overdrive processor) can be installed in the socket instead. See *Chapter 9 - Board Information* to find out more about the upgrade processors you can install.

82C497 Cache Controller

The OPTi 82C497 is a Direct Mapped Write Back cache controller with one level write buffer and a 16 byte line size. It can support cache sizes of up to 512KB with a cacheable address range of up to 64MB. A 128KB cache is already installed on the main board. This can be extended to 256KB (4 32K x 8, 20 ns).

Connectors

The CPU board has three connectors for joining it to the mainboard and switch board:

- Two connectors (64pin) for joining it to the mainboard.
- One connector (8pin) for joining it to the switch board. The switch board contains the following - Reset Switch, Disk activity LED (IDE hard drive), DC OK LED, Turbo LED, Speaker Port.

Jumper Description

See *Chapter 9 - Board Information* to find out more about the jumper settings for this board.

The Main Board

There are two versions of the main board:

- The main board installed in the DECpc 333sxLP computer.
- The main board installed in all other DECpc 300/400 LP series computers.

Main Board Layout

Main Board Installed in the DECpc 333sxLP

Figure 2-5 and Table 2-1 show you how the different parts are laid out on the main board.

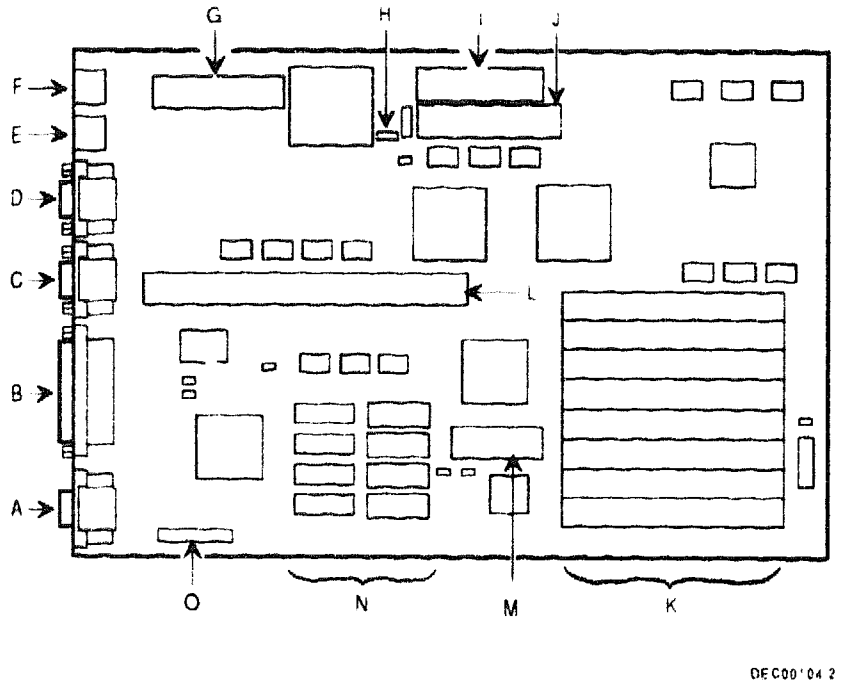


Figure 2-5 - Main Board Layout

Table 2-1 - Main Board Layout

Letter	Part	Letter	Part
A	Video Connector	I	Floppy Disk Interface
B	Parallel Port	J	IDE Hard Disk Interface
C	Serial Port 2	K	SIMM - System Memory
D	Serial Port 1	L	ISA Expansion Bus Board
E	Keyboard	M	ROM BIOS
F	Mouse	N	VRAM - Video Memory
G	Power Connector	O	VGA Feature Connector (output only)
H	Battery		

Main Board Installed in all other DECpc 300/400 LP Series Computers

Figure 2-6 and Table 2-2 show you how the different parts are laid out on the main board.

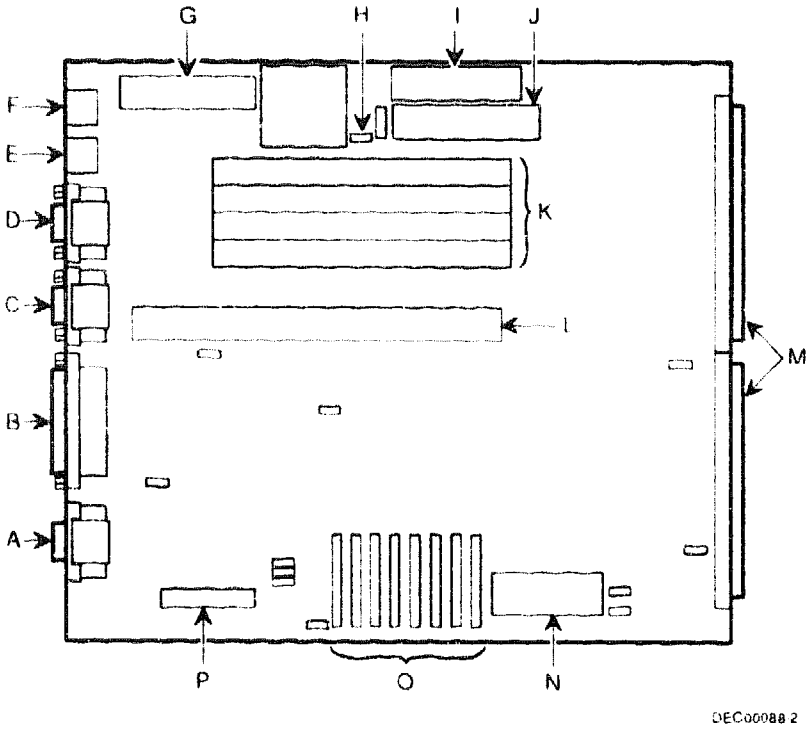


Figure 2-6 - Main Board Layout

Table 2-2 - Main Board Layout

Letter	Part	Letter	Part
A	Video Connector	I	Floppy Disk Interface
B	Parallel Port	J	IDE Hard Disk Interface
C	Serial Port 2	K	SIMM - System Memory
D	Serial Port 1	L	ISA Expansion Bus Board
E	Keyboard	M	CPU Board Connectors
F	Mouse	N	ROM BIOS
G	Power Connector	O	VRAM - Video Memory
H	Battery	P	VGA Feature Connector (output only)

The Parts of the Main Board

System Memory

DECpc 333sxLP

The main board contains eight SIMM sockets (four pairs of sockets designated as banks 0, 1, 2, 3). With these, you can install up to 16MB of system memory using 1MB AND 4MB (70 ns) SIMMs. Each SIMM is 9 bits wide and has 30 pins. Table 2-3 shows you the different combinations of SIMMs that can be installed in the four banks.

Table 2-3 - Different Memory Configurations

BANK 0	BANK 1	BANK 2	BANK 3	MEMORY MB
2MB				2
2MB	2MB			4
2MB	2MB	2MB		6
2MB	2MB	2MB	2MB	8
2MB	2MB	8MB		12
2MB	8MB			10
8MB				8
8MB	2MB	2MB	2MB	14
8MB	8MB			16

DECpc 340dxLP, 425sxLP, 433dxLP, 450D2LP, 466D2LP

The main board contains four SIMM sockets (sockets designated as banks 0, 1, 2, 3). With these, you can install up to 64MB of system memory using 4MB AND 16MB (70 ns) SIMMs. Each SIMM is 36-bits wide and has 72pins. Table 2-4 shows you the different combinations of SIMMs that can be installed in the four sockets.

Table 2-4 - Different Memory Configurations

BANK 0	BANK 1	BANK 2	BANK 3	MEMORY MB
4MB				4
4MB	4MB			8
4MB	4MB	4MB		12
4MB	4MB	4MB	4MB	16
4MB	4MB	16MB		24
4MB	4MB	16MB	16MB	40
16MB				16
16MB	16MB			32
16MB	16MB	16MB		48
16MB	16MB	16MB	16MB	64

ROM BIOS

The main board includes a Phoenix BIOS. This supports all setup features including power-on password protection and a shadow function.

82C206 Integrated Peripherals Controller (IPC)

The main board incorporates an 82C206 Integrated Peripherals Controller. This ensures compatibility with IBM PC/AT system boards.

This device contains the equivalent of:

- Two 8237A DMA controllers
- One 74LS612 memory mapper
- Two 8259A interrupt controllers
- One 8254 counter/timer
- One MC146818 real-time clock

Apart from the keyboard which has its own controller, this device controls all standard peripherals.

Real-Time Clock and Battery Backup

The real-time clock subsystem contains a clock and calendar to maintain the real time and date. It is driven by an external 32.768 KHz oscillator, and contains 114 bytes of RAM. The device is connected to an external battery.

87C311/312 I/O Subsystem

The 87c311/312 supports two 16450/16550 UARTS, one printer port, an IDE AT hard disk interface and Floppy disk controller

RS-232C Serial Interface

Two serial interface ports (COM) are fitted to the main board. They are accessible through two 9-pin
D-subminiature connectors fitted to the rear panel. These connectors are compatible with RS-232C standards. See Appendix A - *Connections* for detailed information about these connectors.

Parallel Interface

A parallel interface port is fitted to the main board and is accessible through a 25-pin D-type connector fitted to the rear panel. The parallel port provides a single *AT* and Centronics compatible, bi-directional parallel (LPT) port. A female, 25 pin D-SUB connector is provided. See Appendix A - *Connections* for detailed information about this connector.

87C311 IDE Drive Interface

The integrated IDE controller built into the 87c311 is compatible with industry standard IDE hard disk drives. The on-board IDE control circuit can be disabled using software so that an external disk drive controller can be used. A shrouded 40 pin connector is installed for standard 3 1/2" and 5 1/4" drives supporting a 40-pin cable interface.

87C311 Diskette Controller

The diskette controller built into the 87c311 integrated floppy disk control system is located on the main board. The diskette controller is capable of supporting two diskette drives joined to the main board through a daisy-chained ribbon-cable.

The controller can support data transfer rates of 250 Kb/s, 300 Kb/s, or 500 Kb/s, 1Mb/s, and is compatible with both high-capacity (1.2 Megabyte) and low-capacity (360 Kilobyte) 5.25-inch diskette drives, and 720 Kilobyte and 1.44MB and 2.88 MB 3.5-inch diskette drives.

Display Interface

DECpc 333sxLP

A Video Graphics Array (VGA) video controller is fitted to the main board. The controller used is the Cirrus GD5422.

The GD5422 has the following features:

- It connects directly to the ISA system BUS.
- Resolutions up to 1024 x 768 with 256 colors. See *Appendix D - Display Modes* for information about the different display modes supported by this video controller.
- Flexible memory configurations supporting 512 KB and 1 MB of VRAM.

The standard board configuration provides 512KB of video memory. The video memory is upgradable to 1MB on the mainboard via ZIP sockets.

A female, high density 15-pin AT compatible VGA connector is provided, together with a VESA standard feature connector. The feature connector (26 pins) can be provided for Graphic accelerator or multi-display use. See Appendix A - *Connections* for detailed information about these connectors.

DECpc 340dxLP, 425sxLP, 433dxLP, 450D2LP, 466D2LP

A Video Graphics Array (VGA) video controller is fitted to the main board. The controller used is the
S3 86C924 GUI accelerator. This controller is 100% register-level compatible with the IBM VGA.

The S3 86C924 has the following features:

- Register-level VGA compatibility and full register-level CGA, HGC and MDA backward compatibility.
- Advanced pipelined and multiple FIFO architecture.
- Resolutions up to 1024 x 768 with 256 colors. See *Appendix D - Display Modes* for information about the different display modes supported by this video controller.
- It supports 640 x 480, 24 bit direct color mode.
- Non-interlaced video up to 72 Hz refresh.
- VGA text up to 132 columns x 43 rows.
- Software compatibility with EGA.
- Flexible memory configurations supporting 512 KB and 1 MB of VRAM.

The standard board configuration provides 512KB of video memory. The video memory is upgradable to 1MB on the mainboard via (4) ZIP sockets.

The video graphics array is optimized for the Windows environment by having a hardware cursor, 32-bit local bus interface, VRAM and pipelined FIFO architecture.

A female, high density 15-pin AT compatible VGA connector is provided, together with a VESA standard feature connector. The feature connector (26 pins) can be provided for Graphic accelerator or multi-display use. See Appendix A - *Connections* for detailed information about these connectors.

Keyboard/Mouse Controller

The keyboard/mouse controller function is contained in a single-chip microcomputer (Intel 8242) that is programmed to be IBM PC/AT compatible. It can drive DECpc supported keyboards and a PS/2-type mouse. The keyboard and mouse ports are female 6-pin mini-DIN, PS/2 type connectors. The keyboard/mouse controller is programmed to allow either device to operate on either port. See Appendix A - *Connections* for detailed information about these connectors.

Audio Interface

The main board includes an audio interface capable of driving an 8-ohm speaker. This is used to produce audio beep tones for indicating various system conditions.

Battery

A 4.5 volt, alkaline battery is fitted to the main board. This is used to power the CMOS RAM and real-time clock. The battery is joined to the main board via a two-wire (twisted-pair) cable with a 3-pin connector. The battery is secured to the main board with a Velcro patch.

Parts Only Fitted to the DECpc 333sxLP Main Board

As the DECpc 333sxLP has no separate CPU board, the following parts are also fitted to the main board used in this PC:

CPU

A 33MHz 80386 processor.

Cache Controller

An ETEQ PANDA 82C390sx chip with a built-in cache controller. This controller can support up to 64KB of secondary cache memory.

Cache Memory

64KB of cache memory. This CANNOT be increased.

Maths Coprocessor Socket

An empty socket for installing an optional maths coprocessor.

Front Panel Controls and Indicators

Figure 2-7 and Table 2-5 show the front panel of the basic unit and describe the system LEDs and controls.

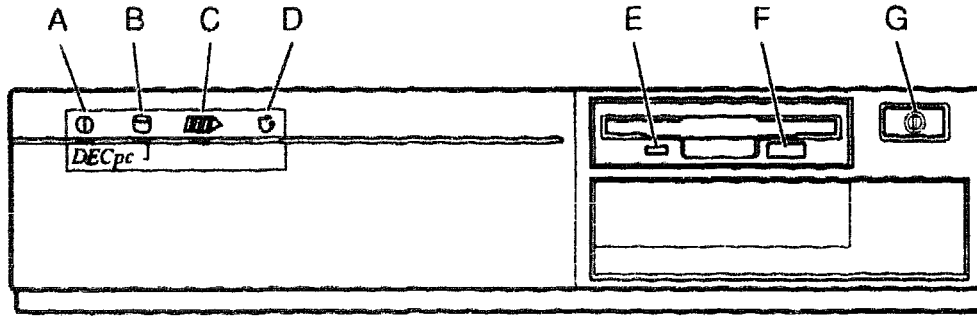


Figure 2-7 - Front Panel

Table 2-5 - Front Panel Controls and Indicators

Figure Legend	Control or Indicator	Function
A	Power On/Off LED	Lights when power is on
B	Hard Disk Drive Access Indicator	Lights when a hard disk drive is in use
C	Turbo Indicator	Lights when the computer runs at its rated microprocessor speed or 8 MHz non-turbo mode
D	Reset Button	Resets the computer and causes POST to run
E	Diskette Access Indicator	Lights when the installed diskette drive is in use
F	Diskette Eject Push-button	Releases a 3½-inch diskette from the diskette drive
G	Power On/Off	Turns ac power on and off

Rear Panel Connectors

Figure 2-8 and Table 2-6 show the rear panel of the basic unit and describe the interface connectors.

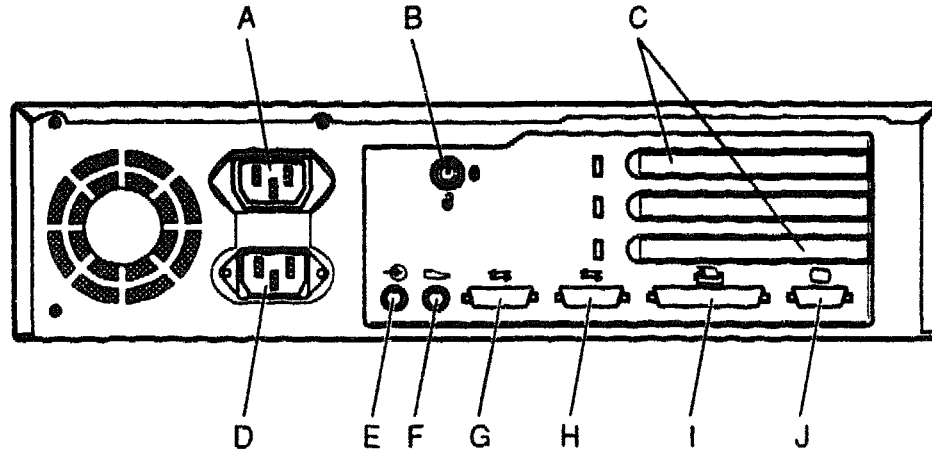


Figure 2-8 - Rear Panel

Table 2-6 - Rear Panel Connectors

Figure Legend	Connector	Function
A	AC Output Connector	Allows you to connect a monitor to ac power
B	Chassis Lock	Mechanically locks the computer's outside cover to prevent unauthorized access
C	Expansion Board Slots	Allows you to install up to three full-size ISA expansion boards
D	AC Line Connector	Allows you to connect the computer to an ac power source
E	Mouse Connector	Allows you to connect a PS/2-compatible mouse

Table 2-6 - Rear Panel Connectors (continued)

Figure Legend	Connector	Function
F	Keyboard Connector	Allows you to connect a 101-key or 102-key keyboard
G	Serial Port Connector	The first of two serial port connectors
H	Serial Port Connector	The second of two serial port connectors
I	Parallel Port Connector	Allows you to connect an industry-standard parallel printer
J	Analog Video Connector	Provides the interface between the onboard graphics controller and a supported monitor

Other Parts of the Main Unit

The BUS Expansion Board

An Expansion BUS Board is installed in each DECpc 300/400 LP series computer. This board contains three 16-bit full-size ISA expansion slots.

The Power Supply

See *Chapter 5 - Power Supply Unit* to find out more about the power supply installed in DECpc 300/400 LP series computers.

The Floppy Disk Drives, Streaming Tape Units, etc.

See *Chapter 7 - Floppy Disk Drives* and the documentation supplied with the Streaming Tape Unit to find out more about the floppy disk drives and streaming tape units that can be installed in DECpc 300/400 LP series computers.

The Hard Disk Drives

See *Chapter 8 - Hard Disk Drives* to find out more about the hard disk drives that can be installed in DECpc 300/400 LP series computers.

3

FRUs

Introduction

In this chapter, we show you how to install and remove the Field Replaceable Units (FRUs) used by DECpc 300/400 LP series computers. We start by showing you how to remove and replace the cover on a PC. We then show you how to install and remove the following FRUs:

1. Hard Disks
2. Floppy Disks, Streaming Tape Units, etc.
3. System Memory
4. Video Memory
5. Option Boards
6. BUS Expansion Board
7. CPU Board (Not the DECpc 333sxLP)
8. Coprocessor
9. Cache Memory
10. System BIOS
11. System Battery (to delete values held in CMOS RAM)
12. System Battery (removing and installing)
13. Power Supply Unit
14. Front Cover and Speaker
15. Main Board
16. Mouse, Keyboard and Monitor

Before You Begin

Before removing the cover of a DECpc 300/400 series computer, read the following SAFETY RULES.

SAFETY RULES

To avoid personal injury:

- **BEFORE** connecting or disconnecting an FRU, switch off all power to the system and any peripherals.
- **BEFORE** opening the Main Module, disconnect ALL power cables and data cables from the Main Module and any peripherals. Organize a clear working space.
- **DO NOT** dismantle the Main Module's power supply.
- **DO NOT** remove the cover of the monitor as the monitor contains very high voltage components.
- **DO NOT** short-circuit the System Battery. Used batteries MUST be discarded according to the manufacturer's instructions.

To avoid damage to the system:

- **BEFORE** installing an FRU, read the documentation supplied with it.
- **Static electricity** can damage electronic components. Touch an EARTHED surface immediately before touching a circuit board or chip.
- **DO NOT** touch board edge connectors or chip pins. Natural oils from your fingers can change the contact resistance.

Removing and Replacing the Outside Cover

Before you can install or remove an FRU, you have to remove the PC's outside cover. Let's start by having a look at how you remove and replace the outside cover.

Removing the Outside Cover

To remove the outside cover:

1. Turn off power to all external devices connected to the computer, for example, a printer or monitor.
2. Turn the computer off.

WARNING

Unplug the ac power cord and monitor power cord before continuing. Personal injury or equipment damage can result if you attempt to remove the computer's outside cover before unplugging the ac or monitor power cords.

3. Disconnect all external cables from the computer and mark them for identification.
4. Unlock the outside cover using the key supplied with the PC or your master key (see Figure 3-1).

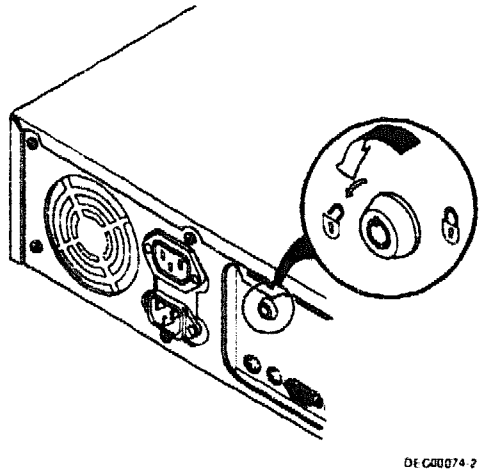


Figure 3-1 - Unlocking the Outside Cover

5. Remove the two retaining screws located at each side of the outside cover (see Figure 3-2).

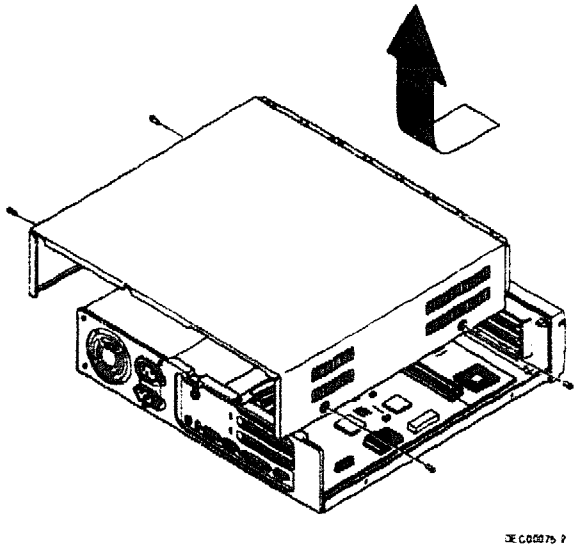


Figure 3-2 - Removing the Outside Cover

6. Carefully slide the outside cover toward the rear of the chassis until it clears the lip of the front bezel (see Figure 3-2). Carefully lift the outside cover from the chassis.

CAUTION

When the outside cover is removed, do not insert foreign objects into the vent openings of the power supply.

Replacing the Outside Cover

To replace the computer's outside cover:

1. Make sure no tools or loose parts have been left inside the computer's chassis.
2. Make sure all interior cables are properly connected and do not project above the front panel of the computer's chassis.
3. Position the outside cover over the computer as shown in Figure 3-3.

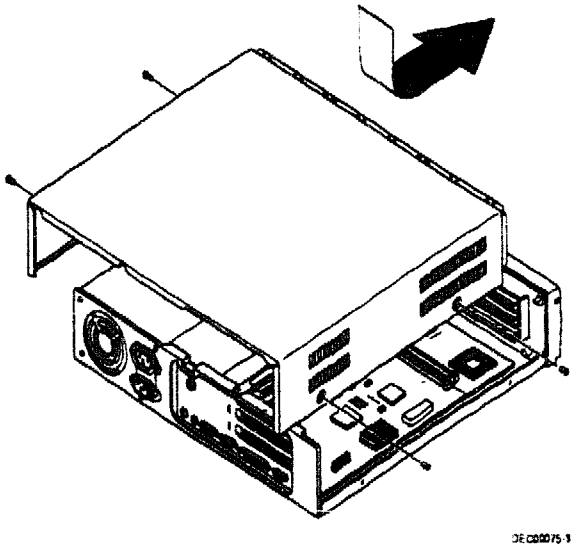


Figure 3-3 - Replacing the Outside Cover

4. Carefully slide the outside cover toward the front of the chassis until it fits under the lip of the front bezel (see Figure 3-3).

5. Secure the outside cover to the computer's chassis using the four previously removed retaining screws (see Figure 3-3).

6. Lock the outside cover (see Figure 3-4).

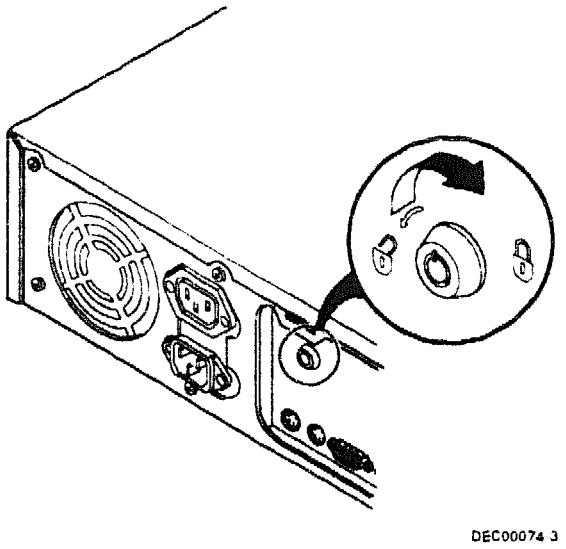


Figure 3-4 - Locking the Outside Cover

7. Connect all previously removed external cables and then remove their identification tags.

1 Installing and Removing Hard Disks

You can install up to two 3½-inch hard disks in a DECpc 300/400 LP series computer. Figure 3-5 shows you where these disks are installed inside the computer.

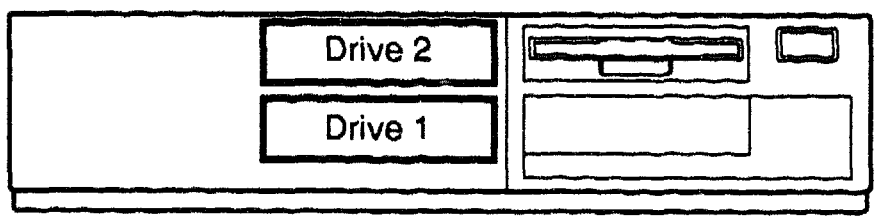


Figure 3-5 - The Hard Disks inside a PC

Installing the First 3½-Inch Hard Disk

To install the first hard disk:

NOTE

See chapter 8 later on in this guide to find out if switches, jumper settings, or terminating resistors need to be set or installed on the hard disk. Set all switch or jumper settings accordingly.

1. Remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.
2. Loosen the four screws securing the internal mounting tray to the chassis. Remove the internal mounting tray and place it on an antistatic surface (see Figure 3-6).

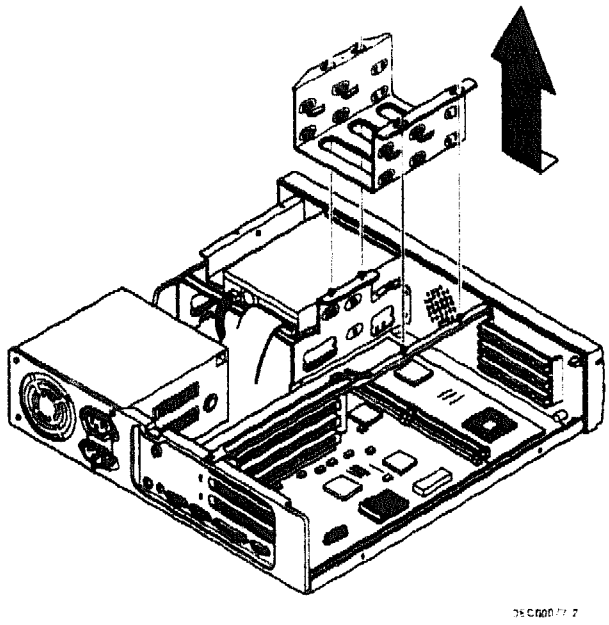


Figure 3-6 - Removing the Mounting Tray

3. Attach the 3½-inch hard disk to the internal mounting tray using the supplied retaining screws (see Figure 3-7).

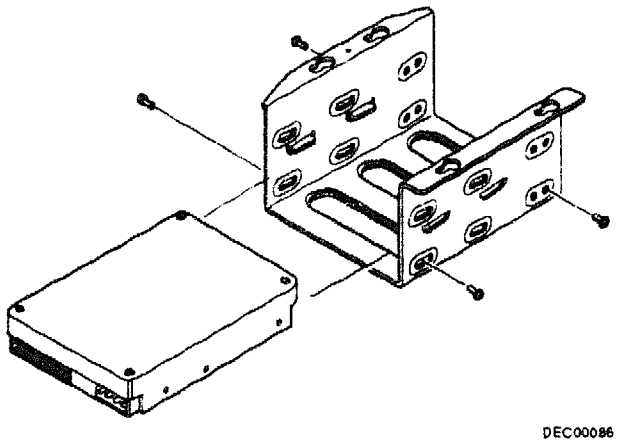


Figure 3-7 - Installing the first Hard Disk Drive into the Mounting Tray

4. Replace the internal mounting tray (see Figure 3-8).

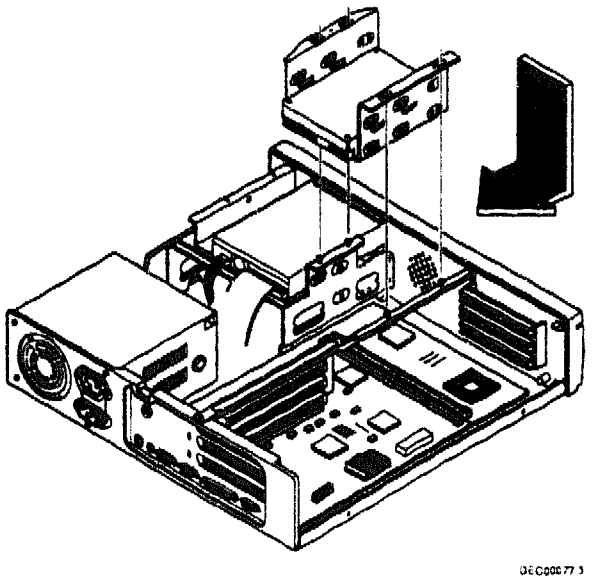


Figure 3-8 - Replacing the Mounting Tray

5. Secure the mounting tray to the chassis by fully tightening the four retaining screws.

6. Connect the power cable and data cable to the drive. To find out how you do this, see *Connecting 3½-inch and 5¼-inch Devices* given later in this chapter.

7. Replace the outside cover. See *Removing and Replacing the Outside Cover given* earlier in this chapter.

Removing the First 3½-Inch Hard Disk

To remove the first hard disk drive, reverse the procedure given above for installing the first hard disk drive.

Installing a Second 3½-Inch Hard Disk

To install a second hard disk:

NOTE

See chapter 8 later on in this guide to find out if switches, jumper settings, or terminating resistors need to be set or installed on the hard disk. Set all switch or jumper settings accordingly.

1. Remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.
2. Disconnect the power cable and data cable from the first hard disk drive if fitted.
3. Loosen the four screws securing the internal mounting tray to the chassis. Remove the internal mounting tray and place it on an antistatic surface (see Figure 3-9).

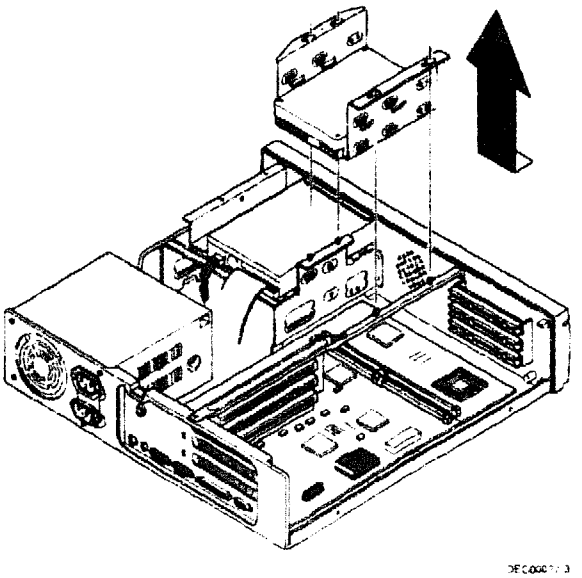


Figure 3-9 - Removing the Mounting Tray

4. Attach the second 3½-inch hard disk to the internal mounting tray using the supplied retaining screws (see Figure 3-10).

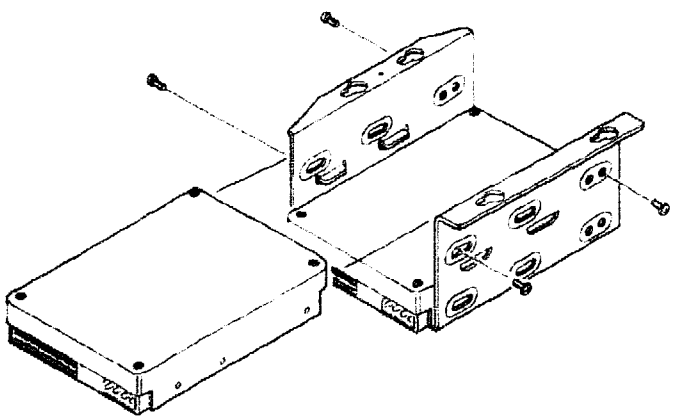


Figure 3-10 - Installing a second Hard Disk Drive in the Mounting Tray

5. Replace the internal mounting tray (see Figure 3-11).

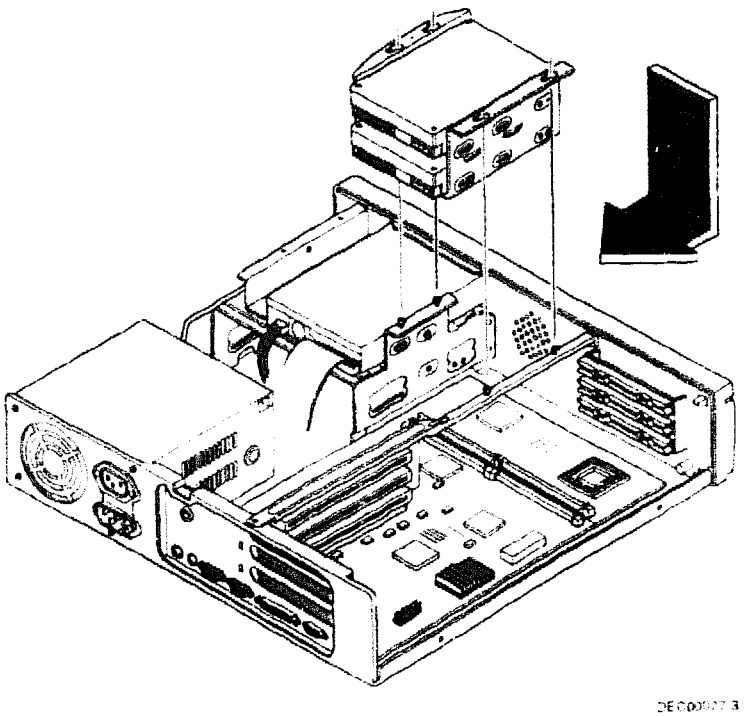


Figure 3-11 - Replacing the Mounting Tray

6. Secure the mounting tray to the chassis by fully tightening the four retaining screws.

7. Connect the power cables and data cables to the drives. To find out how you do this, see *Connecting 3½-inch and 5¼-inch Devices* given later in this chapter.

8. Replace the outside cover. See *Removing and Replacing the Outside Cover given* earlier in this chapter.

Removing a Second 3½-Inch Hard Disk

To remove a second hard disk drive, reverse the procedure given above for installing a second hard disk drive.

2 Installing and Removing 3½" and 5¼" Devices

By device, we mean floppy disk drives, streaming tape units, etc.

You can install up to two 3½-inch devices, or one 3½-inch and one 5¼-inch device in a DECpc 300/400 LP series computer. These devices can either be floppy disk drives or streaming tape units. Figure 3-12 below shows you where these devices are installed inside the computer:

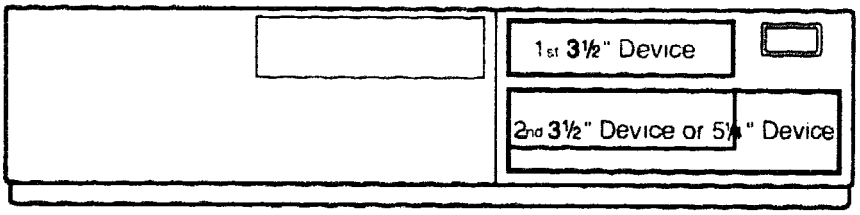


Figure 3-12 - Installing 3½-inch and 5¼-inch Devices inside a PC

Installing the First 3½-Inch Device

To install the first 3½-inch device:

NOTE

See chapter 7 later in this guide to find out if switches, jumper settings, or terminating resistors need to be set or installed on the device. Set all switch or jumper settings accordingly.

1. Remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.
2. Disconnect the power cables and data cables from any hard disk drives if fitted. Mark them for identification.

3. Loosen the four screws securing the internal mounting tray to the chassis. Remove the internal mounting tray and place it on an antistatic surface (see Figure 3-13).

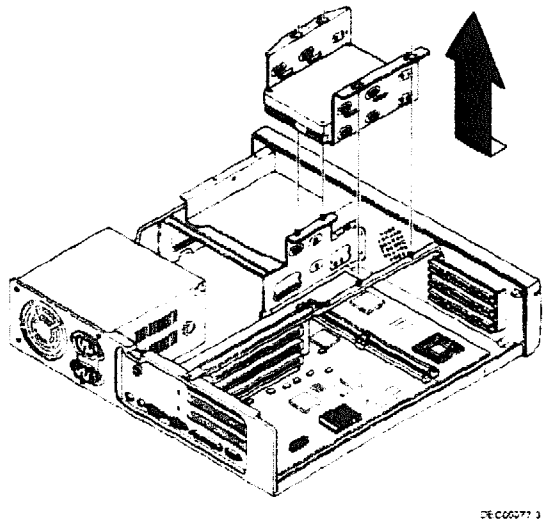


Figure 3-13 - Removing the Mounting Tray

4. Slide the 3½-inch device into the top slot (see Figure 3-14) and tighten the four securing screws.

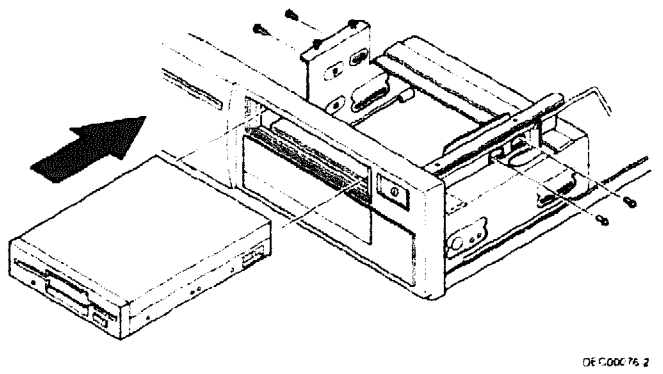


Figure 3-14 - Installing the First 3½-inch Device

5. Replace the internal mounting tray (see Figure 3-15).

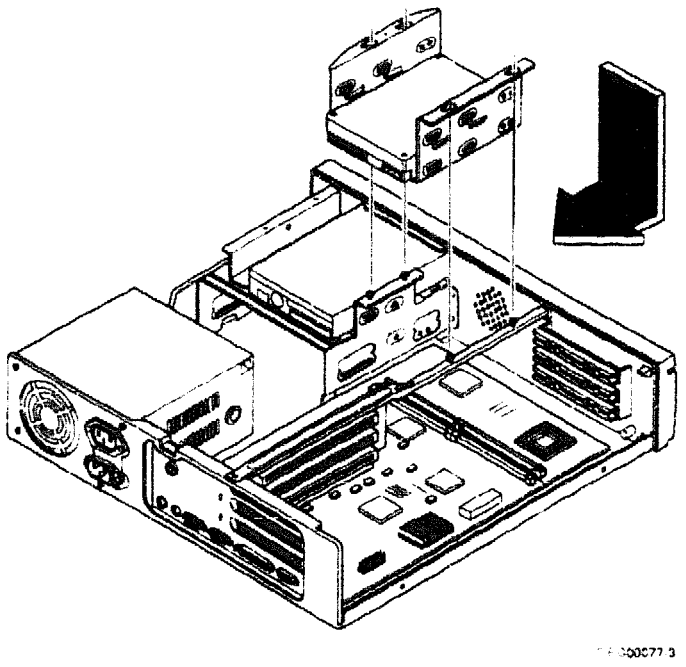


Figure 3-15 - Replacing the Mounting Tray

6. Secure the mounting tray to the chassis by fully tightening the four retaining screws.

7. Connect the power cables and data cables to the devices. To find out how you do this, see *Connecting 3½-inch and 5¼-inch Devices* given later in this chapter.

8. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

Removing the First 3½-Inch Device

To remove the first 3½-inch device, reverse the procedure given above for installing the first 3½-inch device.

Installing a Second 3½-Inch Device

To install a second 3½-inch device:

NOTE

See chapter 7 later in this guide to find out if switches, jumper settings, or terminating resistors need to be set or installed on the device. Set all switch or jumper settings accordingly.

1. Remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.
2. Disconnect the power cables and data cables from any hard disk drives if fitted. Mark them for identification.
3. Loosen the four screws securing the internal mounting tray to the chassis. Remove the internal mounting tray and place it on an antistatic surface (see Figure 3-16).

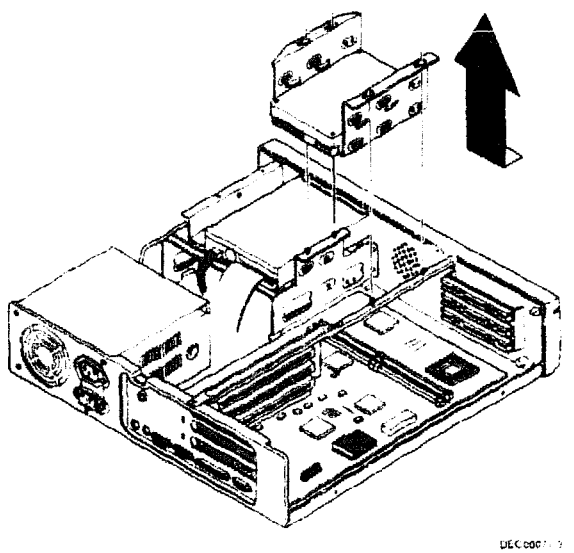


Figure 3-16 - Removing the Mounting Tray

4. Disconnect the power cable and data cable from the first 3½-inch device. Remember to mark each cable.

5. Undo the four retaining screws and slide the first 3½-inch device out of the top slot (see Figure 3-17).

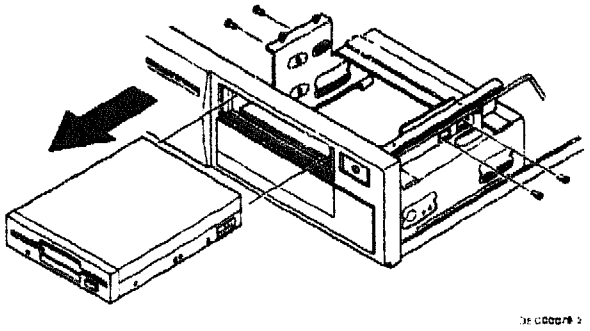


Figure 3-17 - Removing the First 3½-inch Device

6. Remove the two screws securing the 3½-inch device mounting adapter to the chassis. Remove the 3½-inch device mounting adapter (see Figure 3-18).

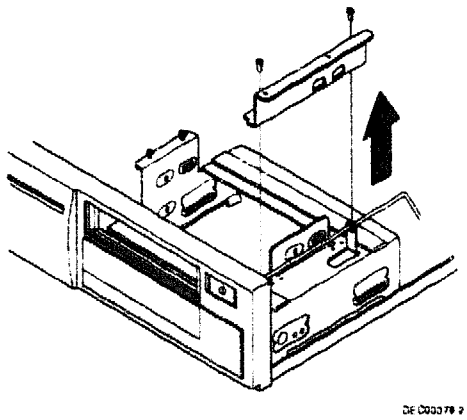


Figure 3-18 - Removing the Mounting Adapter

7. Attach the mounting adapter to the new 3½-inch device (see Figure 3-19). Also, make sure its drive ID is set to 1. Refer to the supplied kit installation instructions for the appropriate drive ID locations.

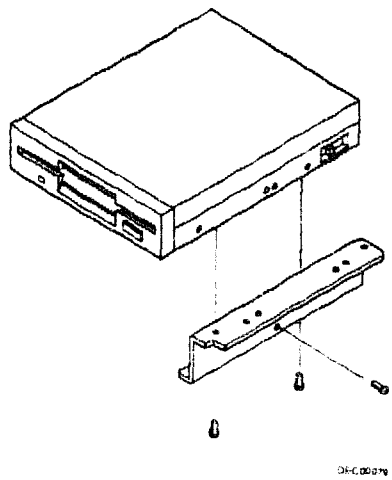


Figure 3-19 - Attaching a 3½-Inch Diskette Drive to the Mounting Adapter

8. Using a screwdriver, carefully release the plastic locking tabs securing the two filler panels to the chassis. Remove both filler panels (see Figure 3-20).

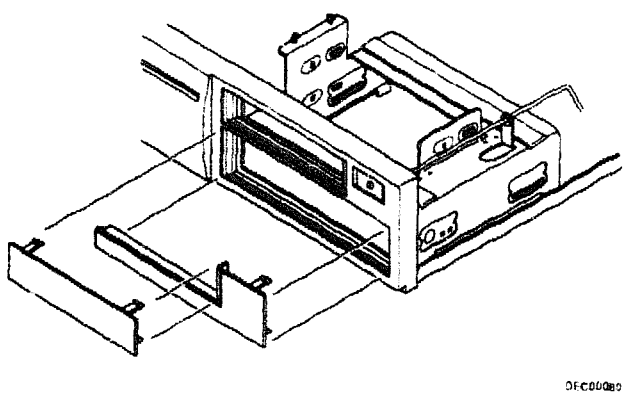


Figure 3-20 - Removing Filler Panels

9. Insert the new 3½-inch device into the bottom slot until the mounting adapter screw holes line up with the holes in the chassis (see Figure 3-21).

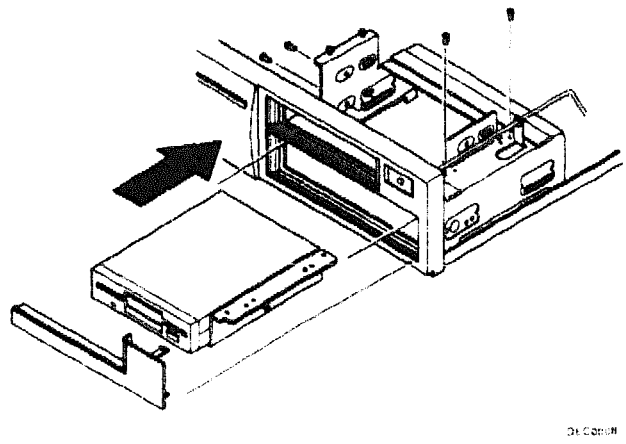


Figure 3-21 - Installing a second 3½-Inch Device (Diskette Drive)

10. Secure the 3½-inch device to the chassis using the two mounting adapter retaining screws. Secure the opposite side of the 3½-inch device using two supplied retaining screws .

11. Replace the large filler panel.

12. Replace the first 3½-inch device in the top slot and any hard disks if fitted.

13. Connect the power cables and data cables to the devices. To find out how you do this, see *Connecting 3½-inch and 5¼-inch Devices* given later in this chapter.

14. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter

Installing a 5¼-Inch Device

To install a 5¼-inch device:

NOTE

See chapter 7 later in this guide to find out if switches, jumper settings, or terminating resistors need to be set or installed on the device. Set all switch or jumper settings accordingly.

1. Remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.
2. Disconnect the power cables and data cables from any hard disk drives if fitted. Mark the cables for identification.
3. Loosen the four screws securing the internal mounting tray to the chassis. Remove the internal mounting tray and place it on an antistatic surface (see Figure 3-16).
4. Disconnect the power cable and data cable from the first 3½-inch device installed in the top slot. Mark both cables for identification.
5. Remove the four screws securing the first 3½-inch device. Remove the 3½-inch device and place it on an antistatic surface (see Figure 3-17).
6. Using a screwdriver, carefully release the plastic locking tabs securing the two filler panels to the chassis. Remove both filler panels (see Figure 3-20).
7. Make sure its drive ID is set to 1. Refer to the supplied kit installation instructions for the appropriate drive ID locations.
8. Slide the 5¼-inch device into the bottom slot (see Figure 3-22).

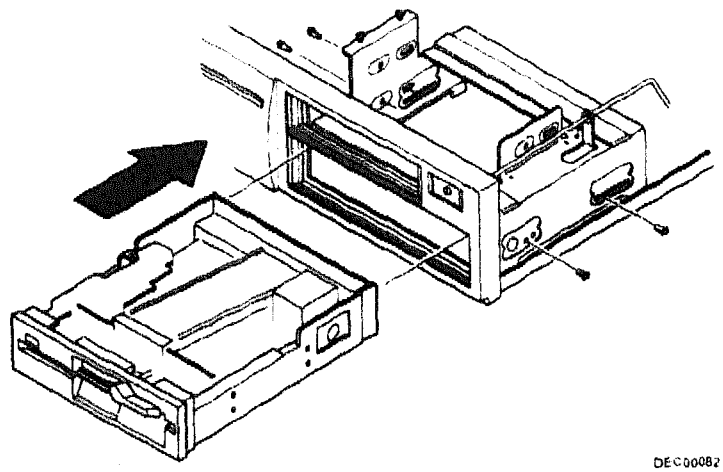


Figure 3-22 - Installing a 5¼-Inch Device

9. Secure the 5¼-inch device to the bottom drive bay using the supplied retaining screws .

10. Replace the first 3½-inch device and any hard disk drives if fitted.

11. Connect the power cables and data cables to the drives. To find out how you do this, see *Connecting 3½-inch and 5¼-inch Devices* given later in this chapter.

12. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

Removing a 5¼-Inch Device

To remove a 5¼-inch device, reverse the procedure given above for installing a 5¼-inch device.

Connecting 3½-Inch and 5¼-Inch Devices

To connect a 3½-inch or 5¼-inch device to the computer's main board and power supply:

1. Plug an available power connector (A) and appropriate data cable connector (B) into the mating connectors located at the rear of the appropriate device. See Figure 3-23 for 3½-inch device, Figure 3-24 for a typical 3½-inch hard disk drive, and Figure 3-25 for a typical 5¼-inch device.

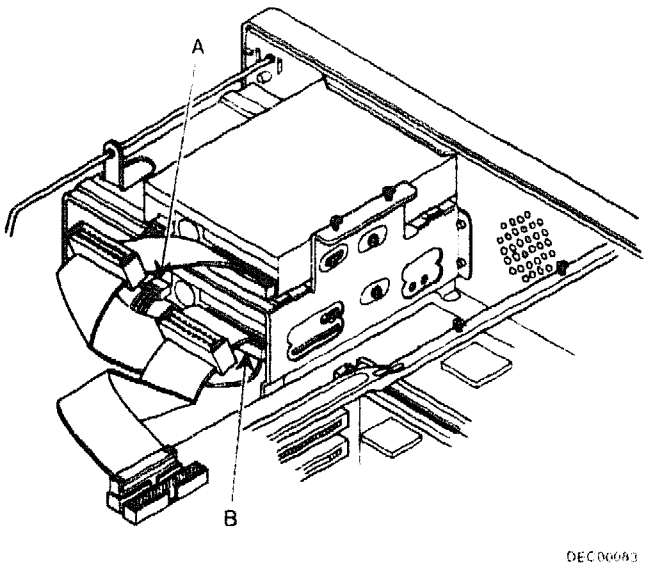


Figure 3-23 - Typical 3½-Inch Device Rear Connections

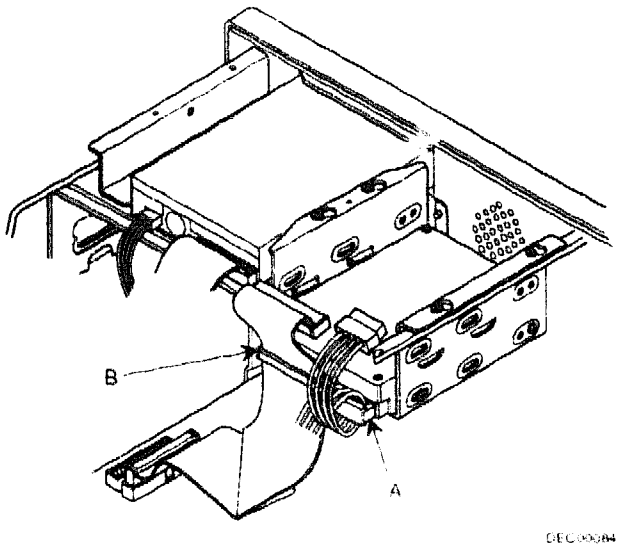


Figure 3-24 - Typical 3½-Inch Hard Disk Drive Rear Connections

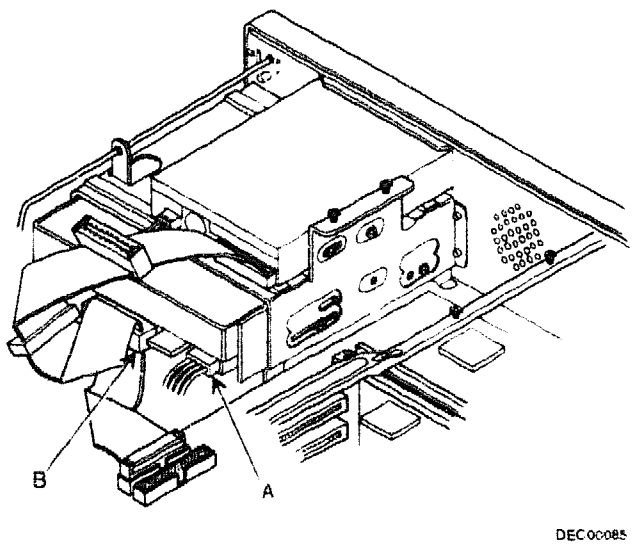


Figure 3-25 - Typical 5¼-Inch Device Rear Connections

NOTE

The device drive and IDE drive ribbon cables can only be installed one way. Before making any connection, make sure the key on the appropriate ribbon cable connector lines up with the slot in the device's rear connector.

In addition, DECpc 300 and 400 LP series computers are supplied with a 3½-inch diskette drive set up as device A. If you add an additional 3½-inch or 5¼-inch device and you want to make either one device A, you must use the proper device drive cable connectors (see Table 3-1 and Figure 3-26).

Table 3-1 - Diskette Drive Cabling Scheme

Optional Diskette Drive	Drive Designation	Connector Number
3½-inch	B	3
3½-inch	A	1
5¼-inch	B	4
5¼-inch	A	2

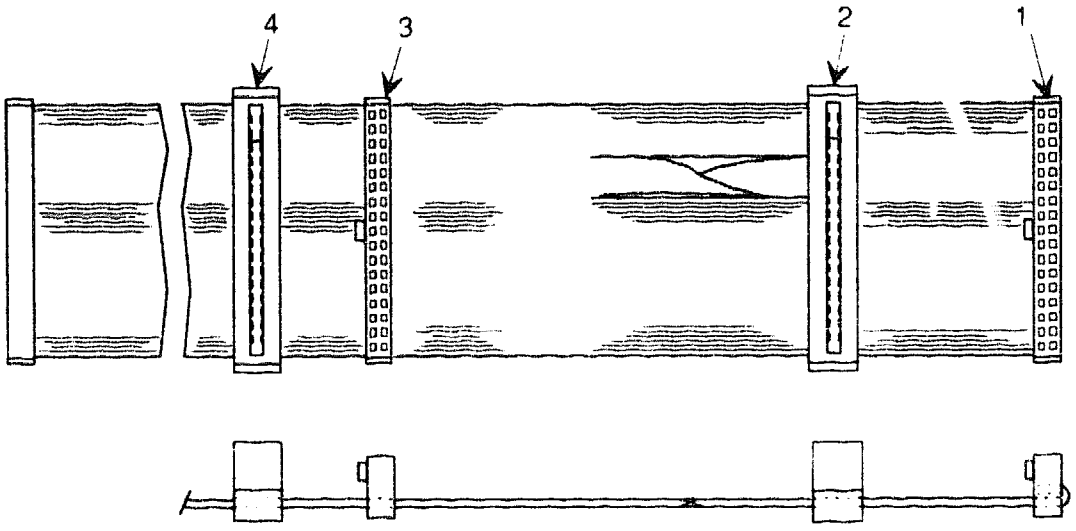


Figure 3-26 - Diskette Drive Cable Connector Locations

3 Installing and Removing System Memory

Installing Main Board DRAM

DECpc 333sxLP

The DECpc 333sxLP PC is supplied with 2 MB of DRAM (minimum standard configuration). You can increase the standard amount of DRAM (up to 16 MB) using the eight SIMM sockets located on the main board (see Table 3-2 and Figure 3-27). The eight SIMM sockets are arranged in four banks (bank 0 to bank 3), with each bank having two SIMM sockets. Each bank can be filled with either 1 MB or 4 MB (x9) SIMMs.

A computer may contain more than 2 MB of DRAM, if specified at the time of order. When you add DRAM, see Table 3-2 and note the following:

- The DECpc 333sxLP PC requires SIMMs having an access time of 70 ns
- Always fill bank 0 before bank 1 (see Figure 2-5), starting with the left-most vacant socket (looking from the front of the computer)
- Each socket must be filled with either 1 or 4 MB SIMMs
- Two SIMMs must be installed in any given bank

Table 3-2 - Computer DRAM Expansion

Bank 0	Bank 1	Bank 2	Bank 3	Total Computer Memory
(2) 1 MB				2 MB
(2) 1 MB	(2) 1 MB			4 MB
(2) 1 MB	(2) 1 MB	(2) 1 MB		6 MB
(2) 1 MB	(2) 1 MB	(2) 1 MB	(2) 1 MB	8 MB
(2) 4 MB				8 MB
(2) 4 MB	(2) 1 MB			10 MB
(2) 4 MB	(2) 1 MB	(2) 1 MB		12 MB
(2) 4 MB	(2) 1 MB	(2) 1 MB	(2) 1 MB	14 MB
(2) 4 MB	(2) 4 MB			16 MB

To install additional DRAM:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

CAUTION

Do not touch any electrical component unless you are properly grounded. You can make sure that you are properly grounded by wearing a grounded wrist strap or by touching an exposed metal part of the computer's chassis. A static discharge from your fingers can result in permanent damage to electronic components.

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

2. Holding the SIMMs only by their edges, individually remove them from their antistatic package.

3. Looking from the front of the computer, carefully position each SIMM with the notch facing you. Insert its bottom edge into the socket slot beginning with the left-most vacant socket (see Figure 3-27).

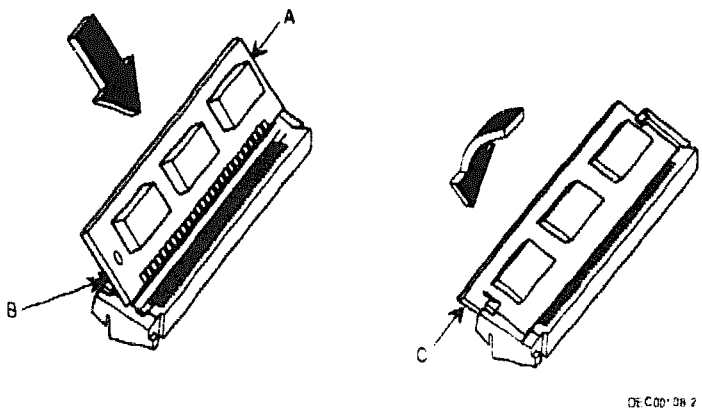


Figure 3-27 - Installing SIMMs

4. When each SIMM seats correctly, hold the ends (Figure 3-27, A) and gently push the top edge toward the slot retaining clips (Figure 3-27, B) until it snaps into place (Figure 3-27, C).

5. If a SIMM did not seat correctly, gently spread the retaining clips just enough to permit the top edge of the SIMM to be pulled away from the clips and then reseat.

6. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

7. Run the BIOS setup utility to configure the computer for the additional amount of installed DRAM. See *Chapter 4 - Troubleshooting* for detailed instructions on running the BIOS setup utility.

DECpc 340dxLP, 425sxLP, 433dxLP, 450D2LP, 466D2LP

All other DECpc 300/400 LP series computers are supplied with 4 MB of DRAM (minimum standard configuration). You can increase the standard amount of DRAM (up to 64 MB) using the four SIMM sockets located on the main board (see Table 3-3 and Figure 3-28). Each socket holds one 4 MB or 16 MB double-sided 36-bit SIMM as follows:

- 4 MB SIMMs consist of eight 1 MB × 4–bit data devices and four 1 MB × 1–bit parity devices
- 16 MB SIMMs consist of sixteen 4 MB × 4-bit data devices and eight 1 MB × 1-bit parity devices

A computer may contain more than 4 MB of DRAM, if specified at the time of order. When you add DRAM, see Table 3-3 and note the following:

- DECpc 300/400 LP Series computers require SIMMs having an access time of 70 ns or faster
- Always fill bank 0 before bank 1 (see Figure 2-6), starting with the left-most vacant socket (looking from the front of the computer)
- Each socket must be filled with either 4 or 16 MB SIMMs

Table 3-3 - Computer DRAM Expansion

Bank 0	Bank 1	Bank 2	Bank 3	Total Computer Memory
4 MB				4 MB
4 MB	4 MB			8 MB
4 MB	4 MB	4 MB		12 MB
4 MB	4 MB	4 MB		16 MB
4 MB	4 MB	16 MB		24 MB
4 MB	4 MB	16 MB	16 MB	40 MB
16 MB				16 MB
16 MB	16 MB			32 MB
16 MB	16 MB	16 MB		48 MB
16 MB	16 MB	16 MB	16 MB	64 MB

To install additional DRAM:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

CAUTION

Do not touch any electrical component unless you are properly grounded. You can make sure that you are properly grounded by wearing a grounded wrist strap or by touching an exposed metal part of the computer's chassis. A static discharge from your fingers can result in permanent damage to electronic components.

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

2. Holding the SIMMs only by their edges, individually remove them from their antistatic package.

3. Looking from the front of the computer, carefully position each SIMM with the notch facing you. Insert its bottom edge into the socket slot beginning with the left-most vacant socket (see Figure 3-28, A).

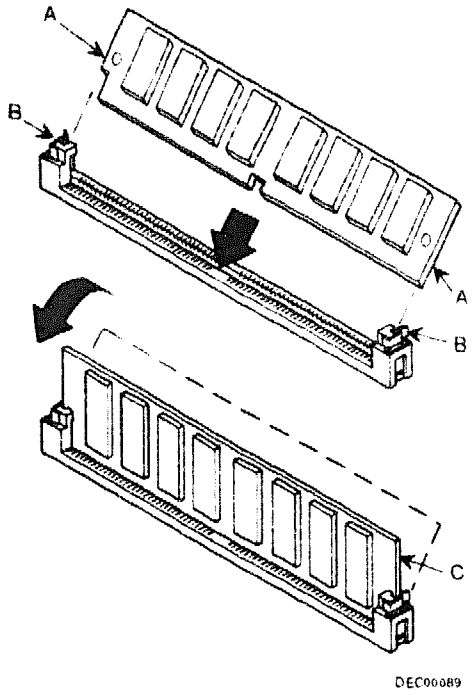


Figure 3-28 - Installing SIMMs

4. When each SIMM seats correctly, hold the ends and gently push the top edge toward the slot retaining clips (Figure 3-28, B) until it snaps into place (Figure 3-28, C).

5. If a SIMM did not seat correctly, gently spread the retaining clips just enough to permit the top edge of the SIMM to be pulled away from the clips and then reseat.

6. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

7. Run the BIOS setup utility to configure the computer for the additional amount of installed DRAM. See *Chapter 4 - Troubleshooting* for detailed instructions on running the BIOS setup utility.

Removing Main Board DRAM

To remove the Main Board DRAM, reverse the procedures given above for installing DRAM.

4 Installing and Removing Video RAM

Installing Video RAM

DECpc 333sxLP

The DECpc 333sxLP comes with 512 KB of DRAM as standard. Four DIP sockets located on the main board are provided to support installation of an additional 512 KB DRAM option to provide a total of 1 MB of DRAM. See Figure 2-5 for DRAM location.

To install DRAM:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

CAUTION

Do not touch any electrical component unless you are properly grounded. You can make sure that you are properly grounded by wearing a grounded wrist strap or by touching an exposed metal part of the computer's chassis. A static discharge from your fingers can result in permanent damage to electronic components.

Use extreme care when installing DRAM. The metal leads on the DRAM chips can be easily bent or broken by using too much force.

2. Remove the four DRAM chips from their antistatic packaging. Handle each DRAM by the edges only.

3. Position each DRAM chip with the notched end facing toward the rear of the main board and then insert each one into the appropriate socket (see Figure 3-29 - pin 1 is marked with the letter A).

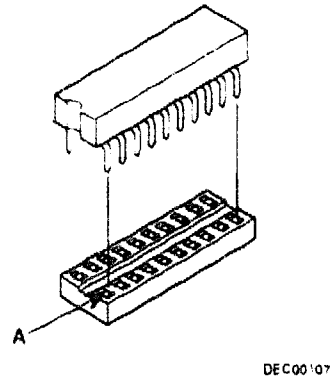


Figure 3-29 - Installing DRAM

4. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

DECpc 340dxLP, 425sxLP, 433dxLP, 450D2LP, 466D2LP

All other DECpc 300/400 LP series computer come with 512 KB of VRAM as standard. Four ZIP sockets located on the main board are provided to support installation of an additional 512 KB VRAM option to provide a total of 1 MB of VRAM. See Figure 2-6 for VRAM location.

To install VRAM:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

CAUTION

Do not touch any electrical component unless you are properly grounded. You can make sure that you are properly grounded by wearing a grounded wrist strap or by touching an exposed metal part of the computer's chassis. A static discharge from your fingers can result in permanent damage to electronic components.

Use extreme care when installing VRAM. The metal leads on the VRAM chips can be easily bent or broken by using too much force.

2. Remove the four VRAM chips from their antistatic packaging. Handle each VRAM by the edges only.

3. Position each VRAM chip with the beveled edge toward the inside of the main board and then insert each one into the appropriate socket (see Figure 3-30 - pin 1 is marked with the letter A).

4. Change the position of the VRAM size select jumper to match the amount of installed VRAM. See *Chapter 9 - Board Information* for further information about changing the jumper setting.

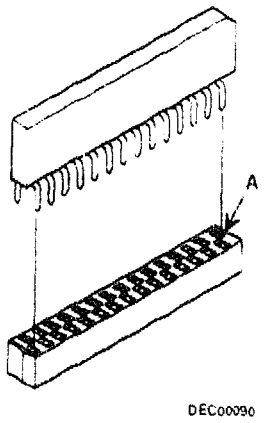


Figure 3-30 - Installing VRAM

5. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

Removing Video RAM

To remove VRAM, reverse the procedures given above for installing VRAM.

5 Installing and Removing Expansion Boards

Installing an Expansion Board

To install any ISA expansion board:

NOTE

Read and fully understand the documentation provided with the optional expansion board prior to installing it.

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.
2. Find the expansion slots on the BUS Expansion Board. To do this, see Figures 2-5 and 2-6.
3. Select an expansion slot and then remove its metal cover (see Figure 3-31). Save the metal cover for future use.

CAUTION

Do not touch any electrical component unless you are properly grounded. You can make sure that you are properly grounded by wearing a grounded wrist strap or by touching an exposed metal part of the computer's chassis. A static discharge from your fingers can result in permanent damage to electronic components.

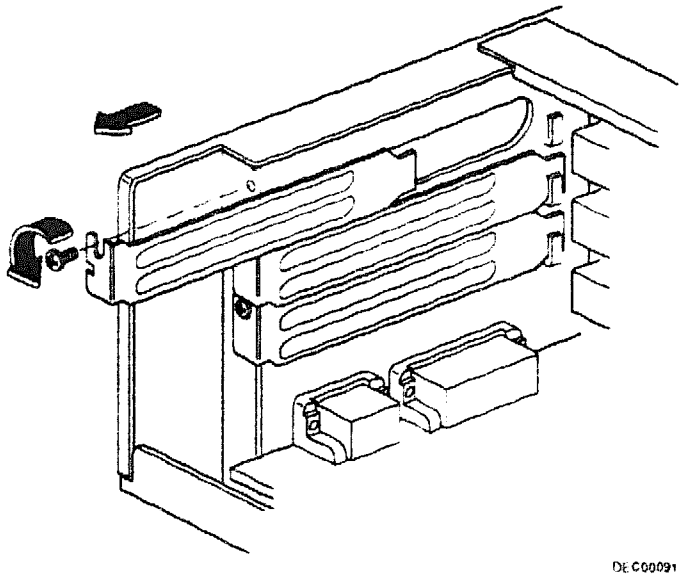


Figure 3-31 - Removing an Expansion Slot's Metal Cover

4. Holding the expansion board only by its edges, remove it from its antistatic wrapper.

5. Record the expansion board's serial number and any jumper or switch settings.

6. Insert the expansion board's connectors into an open slot on the BUS Expansion Board. Also, make sure the end of the expansion board engages the appropriate slot in the card guide. Press firmly on the expansion board while holding its top edge or upper corners (see Figure 3-32).

7. Align the hole in the expansion board's retaining bracket with the screw slot at the rear of the computer's chassis. The expansion board retaining bracket fits into the space that was previously occupied by the expansion slot's metal cover.

8. Insert the screw making sure the bracket screw slot is pushed all the way against the screw before tightening. If this is not done, the board's retaining bracket might interfere with an adjacent expansion board bracket.

9. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

10. See the expansion board's documentation for information on completing the installation.

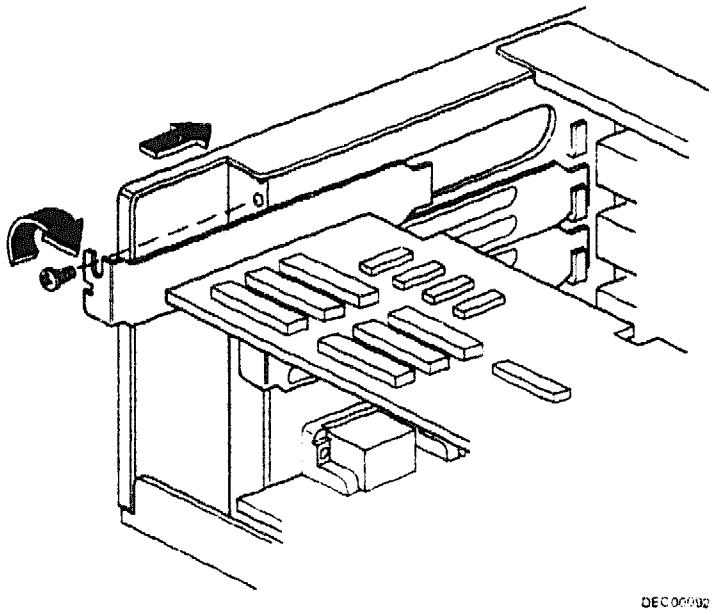


Figure 3-32 - Installing an Expansion Board

Removing an Expansion Board

To remove an Expansion Board, reverse the procedure given above for installing an Expansion Board.

6 Installing and Removing the BUS Expansion Board

Installing the BUS Expansion Board

To install the BUS Expansion Board:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

2. Find the BUS Expansion Board socket on the Main Board. To do this, see Figures 2-5 and 2-6.

3. Position the Expansion Board just above the socket on the Main Board. You can do this without removing the strut (Figure 3-33). You may need to tilt the board.

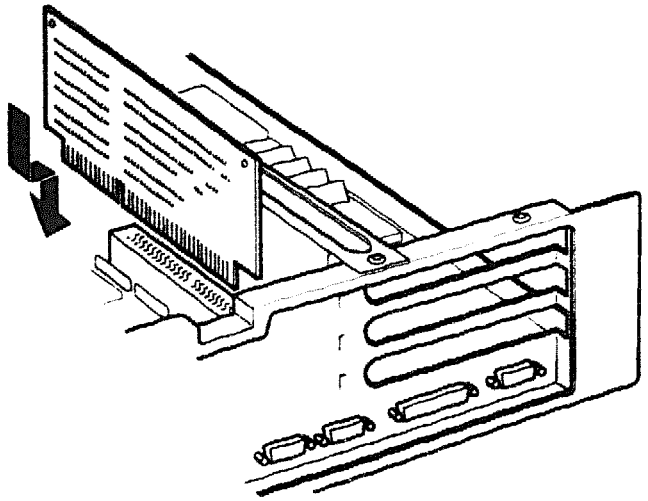


Figure 3-33 - Positioning the BUS Expansion Board

4. Plug the BUS Expansion Board into the socket and tighten the two securing screws (Figure 3-34).

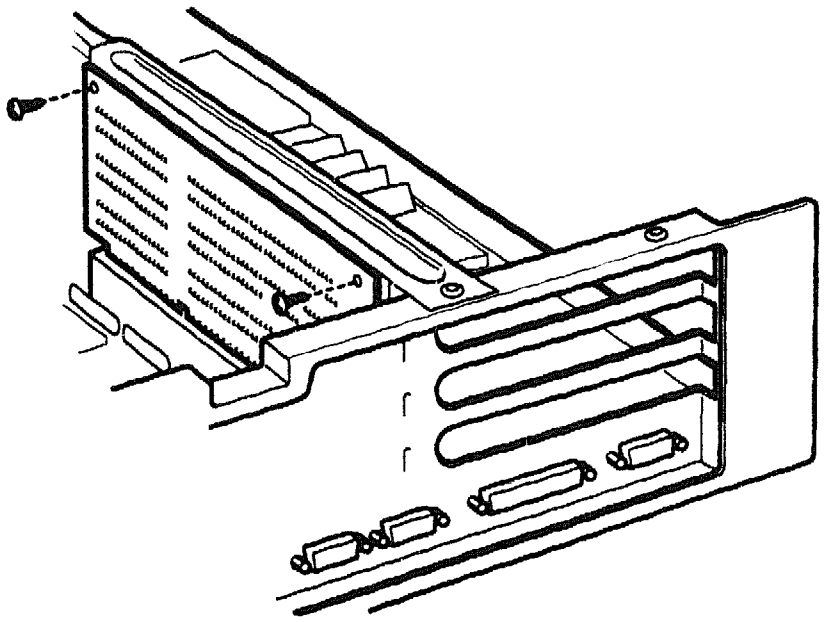


Figure 3-34 - Installing the BUS Expansion Board

5. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter

Removing the BUS Expansion Board

To remove the BUS Expansion Board, reverse the procedure given above for installing the BUS Expansion Board.

7 Installing and Removing a CPU Board

NOTE

Remember, there is NO separate CPU Board in the DECpc 333sxLP computer.

Installing a CPU Board

To install a CPU Board:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.
2. Remove the Main Board. See *Installing and Removing the Main Board* later in this chapter.
3. Make sure that the CPU Board is set up correctly. To check this, see *Chapter 9 - Board Information*.
4. Plug the CPU Board into the connectors on the Main Board (Figure 3-35).

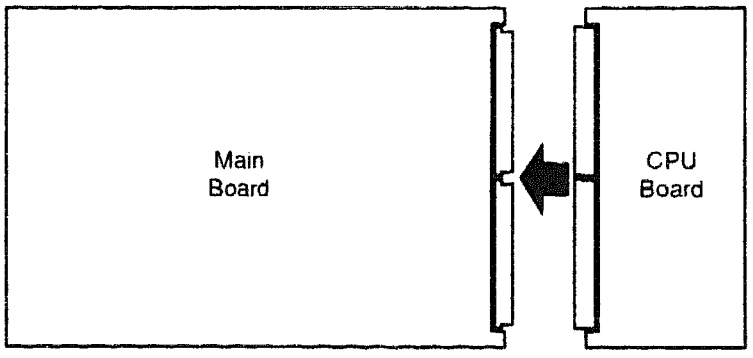


Figure 3-35 - Joining the CPU Board to the Main Board

5. Re-install the Main Board (together with the CPU Board) and other parts of the PC.

6. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

Removing a CPU Board

To remove a CPU Board, reverse the procedure given above for installing a CPU Board.

8 Installing and Removing a Coprocessor or Overdrive Processor

Installing a Coprocessor or Overdrive Processor

DECpc 333sxLP

You can plug a maths coprocessor directly into a socket on the main board. To install a maths coprocessor:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

CAUTION

Do not touch any electrical component unless you are properly grounded. You can make sure that you are properly grounded by wearing a grounded wrist strap or by touching an exposed metal part of the computer's chassis. A static discharge from your fingers can result in permanent damage to electronic components.

Use extreme care when installing a math coprocessor. The metal pins on the chip can be easily bent or broken by using too much force.

2. Remove the maths coprocessor from its antistatic packaging. Handle the maths coprocessor by the edges only.

3. Position the math coprocessor above the socket on the main board. Make sure the detent (A) on the maths coprocessor lines up with the pin 1 (A) on the main board (see Figure 3-36).

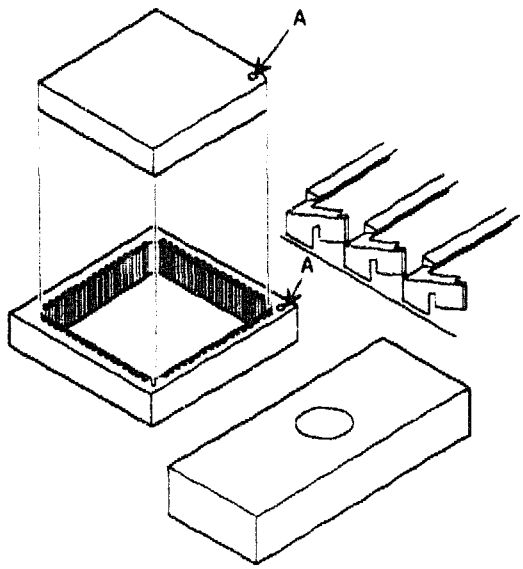


Figure 3-36 - Installing a Maths Coprocessor

4. Press down firmly on the coprocessor until it seats inside the socket. Be careful NOT to bend any of the pins.

5. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

DECpc 340dxLP, 425sxLP, 433dxLP, 450D2LP, 466D2LP

To install a coprocessor or overdrive processor:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

2. Position the coprocessor or overdrive processor above the vacancy socket on the CPU Board. Make sure that pin 1 is properly aligned with the correct hole on the socket (Figure 3-37). The correct hole for pin 1 is marked with an A.

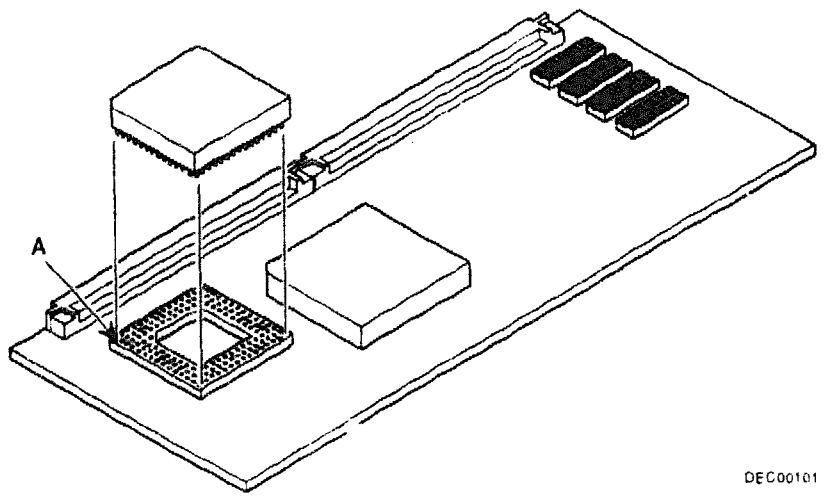


Figure 3-37 - The correct way to install the Coprocessor/Overdrive Processor

3. Press the Coprocessor or Overdrive Processor into the socket. Be careful NOT to bend any of the pins on the processor.

4. Set up the CPU Board to allow for the new processor. To find out how you do this, see *Chapter 9 - Board Information.*

5. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter

Removing a Coprocessor or Overdrive Processor

To remove a coprocessor or overdrive processor, reverse the procedure given above for installing a Coprocessor or Overdrive Processor.

9 Installing and Removing Secondary Cache Memory

NOTE

You cannot install additional cache memory in a DECpc 333sxLP computer or remove cache memory from a DECpc 333sxLP computer.

Installing Secondary Cache Memory

128 KB of secondary cache memory is already installed on the CPU board in each PC. You can install an additional 128 KB of cache memory to increase the secondary cache memory to 256 KB. The additional memory is supplied as a kit. This kit consists of four 20 ns 32 KB × 8 SRAM DIP chips.

To install additional cache memory:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

2. Position the first SRAM chip above the first spare socket on the CPU Board. Make sure that pin 1 is properly aligned with the correct hole on the socket (Figure 3-39). The correct hole for pin 1 is marked with an A.

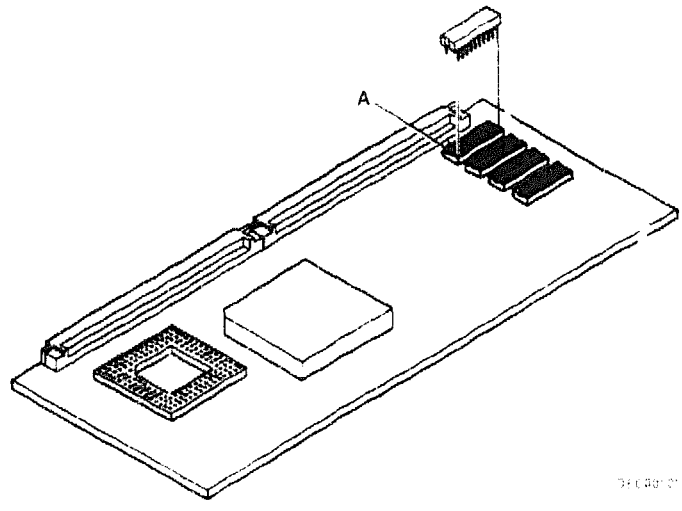


Figure 3-39 - The correct way to install a Cache Memory chip

3. Press the SRAM chip into the socket. Be careful NOT to bend any of the pins on the processor.

4. Repeat steps 2 and 3 for the remaining SRAM chips.

5. Set up the CPU Board to allow for the additional cache memory. To find out how you do this, see *Chapter 9 - Board Information.*

6. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

Removing Secondary Cache Memory

To remove additional cache memory, reverse the procedures given above for installing additional cache memory.

10 Installing and Removing the BIOS

Installing the BIOS

To install the BIOS:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

2. Find the BIOS socket on the Main Board. To do this, see Figures 2-5 and 2-6.

3. Position the BIOS chip above the BIOS socket on the CPU Board. Make sure that pin 1 is properly aligned with the correct hole on the socket (Figure 3-40). The correct hole for pin 1 is marked with an A.

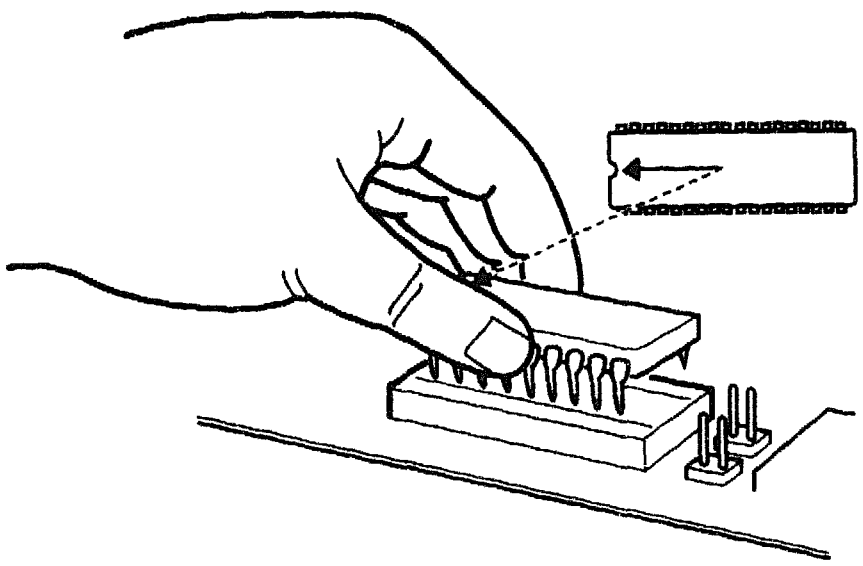


Figure 3-40 - The correct way to install the BIOS chip

4. Press the BIOS chip into the socket. Be careful NOT to bend any of the pins on the processor.

5. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

Removing the BIOS

To remove the BIOS, reverse the procedure given above for installing the BIOS chip.

11 Deleting Values Held in CMOS RAM

The CMOS RAM holds all the values entered using the BIOS set up program or the SETUP.EXE program supplied on the Utility disk. You can delete all this information from the CMOS RAM by disconnecting the computer's battery.

To delete information held in CMOS RAM:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.
2. Disconnect the battery cable from the main board (see Figure 3-41).
3. Reconnect the battery.
4. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.
5. Run the BIOS setup utility to restore the computer's setup values. See *Chapter 4 Troubleshooting* for detailed instructions on running the BIOS setup utility.

12 Replacing the Computer's Battery

To replace the battery:

1. First, make sure you have written down all the computer setup values. If you are not sure how to display these values, see *Chapter 4 Troubleshooting* for detailed instructions on running the BIOS setup utility.

2. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

3. Disconnect the battery cable from the main board (see Figure 3-41).

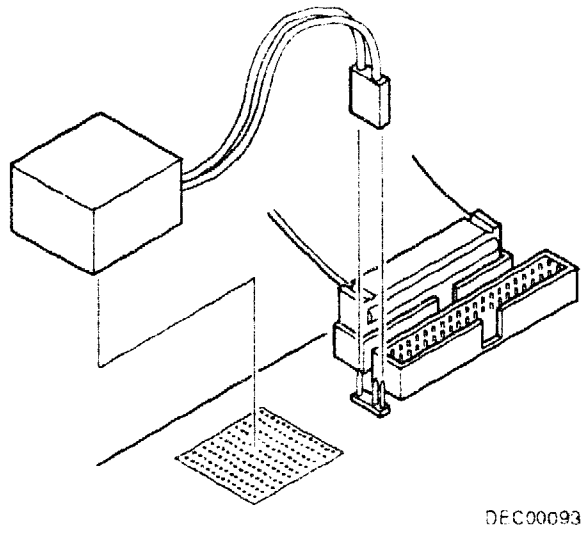


Figure 3-41 - Replacing the Computer's Battery

4. Remove the battery from its mounting pad located on the main board.

5. Place the replacement battery on the mounting pad.

6. Plug the replacement battery cable into the main logic board (see Figure 3-37).

7. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

8. Run the BIOS setup utility to restore the computer's setup values. See *Chapter 4 Troubleshooting* for detailed instructions on running the BIOS setup utility.

13 Installing and Removing the Power Supply Unit

Installing the Power Supply Unit

To install the Power Supply Unit (PSU):

1. Remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

2. Carefully place the PSU into the computer's chassis with the power socket facing the rear of the computer and tighten the six securing screws (Figure 3-42).

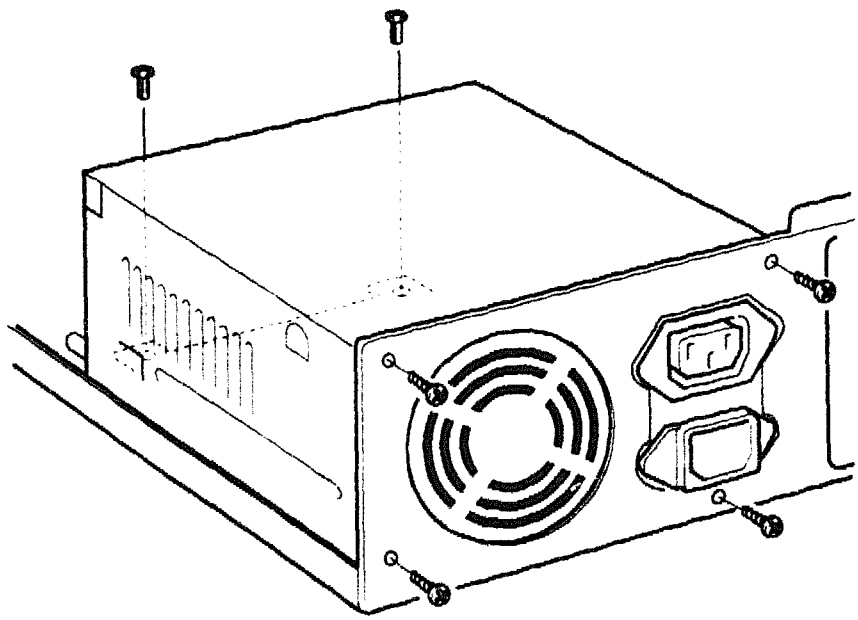


Figure 3-42 - Positioning the PSU

3. Join the on/off button to the PSU (Figure 3-43).

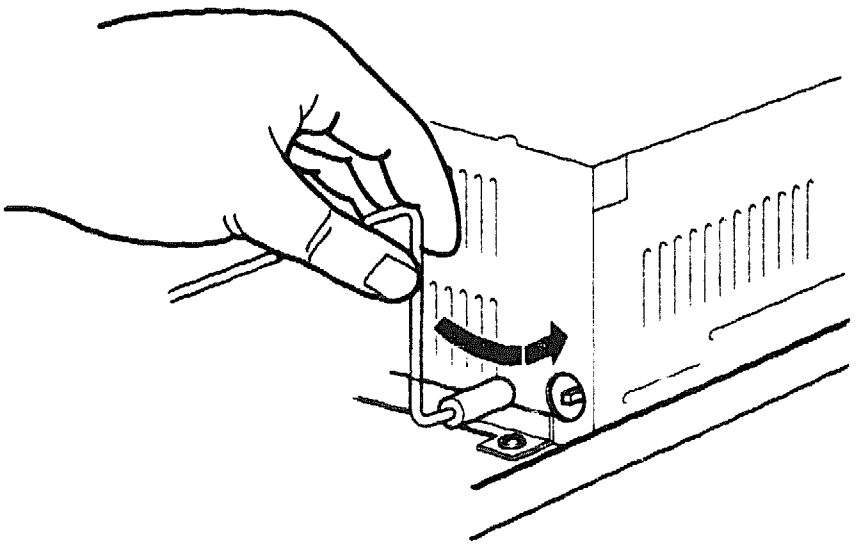


Figure 3-43 - Joining the On/Off Button

4. Connect the PSU conectors to the Main Board, hard disks and other devices installed in the computer.

5. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

Removing the Power Supply Unit

To remove the Power Supply Unit, reverse the procedure given above for installing the PSU.

14 Installing and Removing the Front Cover

Installing the Front Cover

DECpc 333sxLP

To install the Front Cover:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

2. There is a small ribbon cable attached to the front cover. Put this ribbon cable through the slot in the front of the computer chassis and align the four clips on the Front Cover with the holes in the front of the computer's chassis (Figure 3-44).

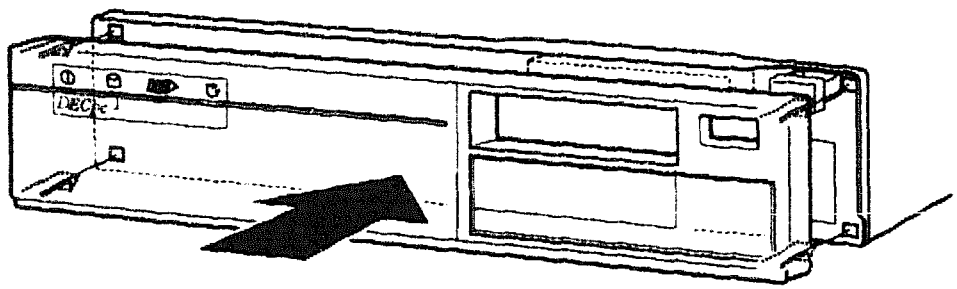


Figure 3-44 - Aligning the Front Cover

3. Press the front cover onto the chassis. Make sure that all four clips are properly fixed into the chassis.

4. Connect the small ribbon cable to the main board (Figure 3-45).

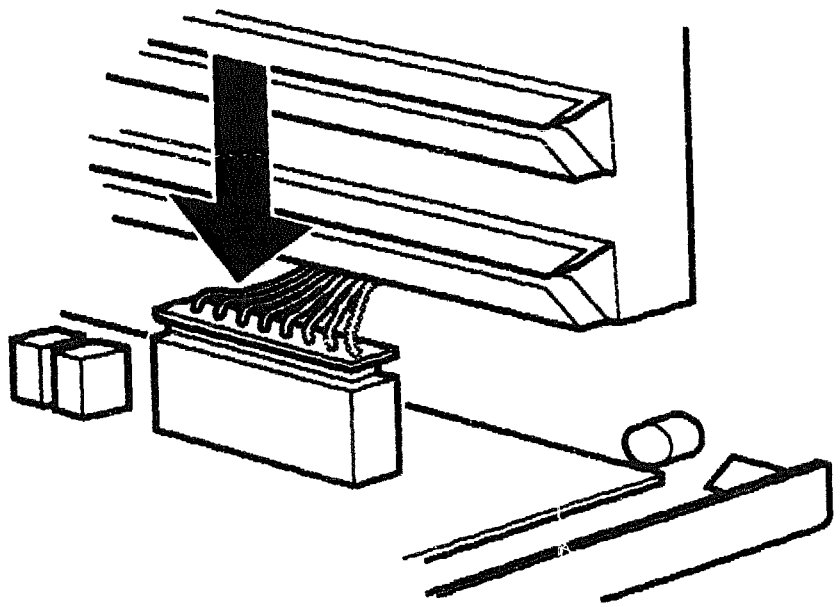


Figure 3-45 - Joining the Ribbon Cable to the Main Board

5. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

DECpc 340dxLP, 425sxLP, 433dxLP, 450D2LP, 466D2LP

To install the Front Cover:

1. Turn off the power and remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

2. There is a small ribbon cable attached to the front cover. Put this ribbon cable through the slot in the front of the computer chassis and align the four clips on the Front Cover with the holes in the front of the computer's chassis (Figure 3-46).

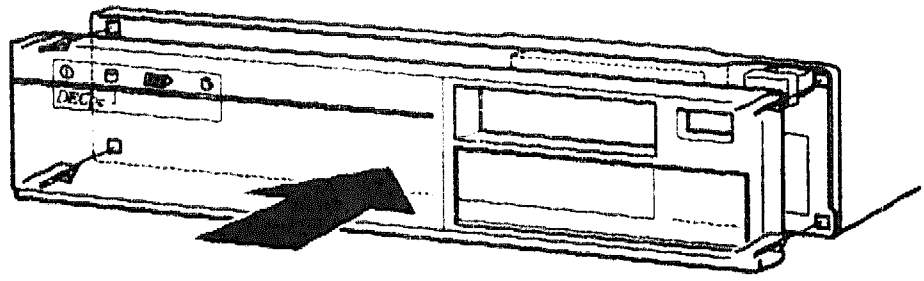


Figure 3-46 - Aligning the Front Cover

3. Press the front cover onto the chassis. Make sure that all four clips are properly fixed into the chassis.

4. Connect the small ribbon cable to the CPU Board (Figure 3-47).

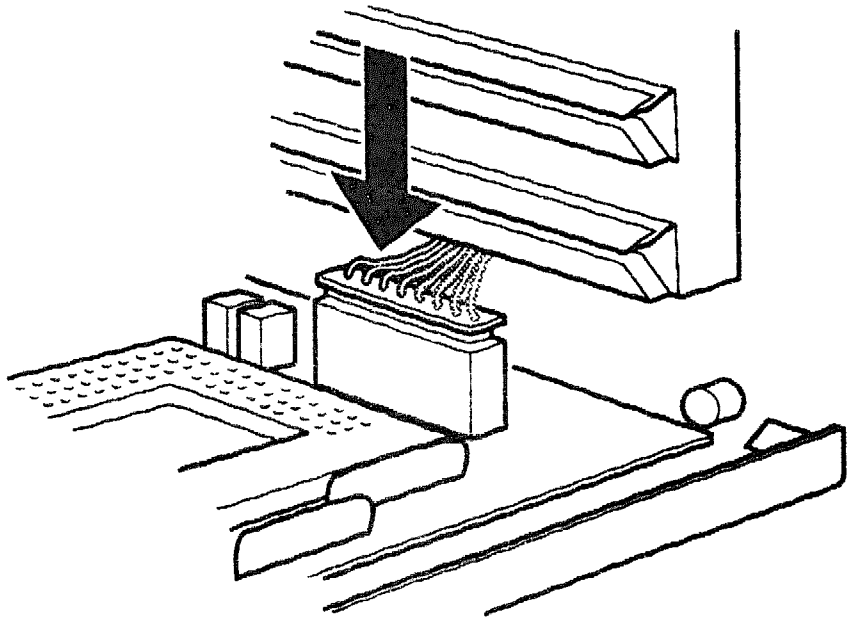


Figure 3-47 - Joining the Ribbon Cable to the CPU Board

5. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

Removing the Front Cover

To .emove the Front Cover, reverse the procedures given above for installing the Front Cover.

15 Installing and Removing the Main Board

Installing the Main Board

DECpc 333sxLP

To install the Main Board:

1. Remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

2. Carefully place the Main Board into the computer's chassis, with the interface connectors facing the rear of the chassis (Figure 3-48). You do NOT have to remove the strut. However, you can remove the Front Cover if you need more room. See *Installing and Removing the Front Cover* given earlier in this chapter.

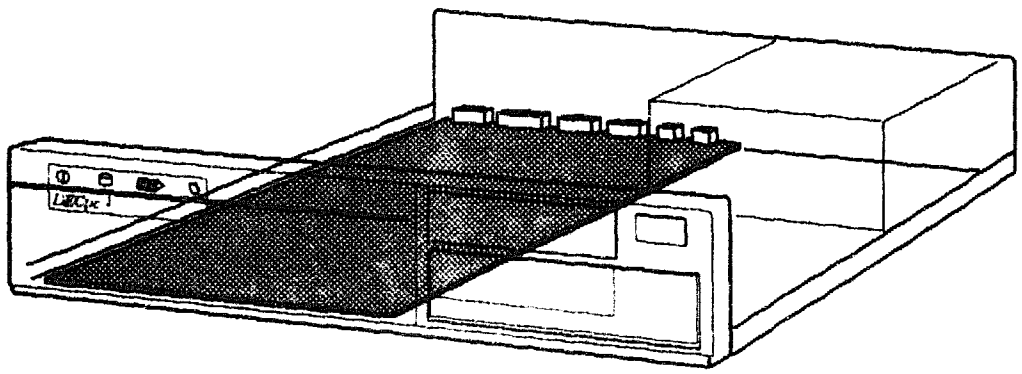


Figure 3-48 - Placing the Main Board into the Computer's Chassis

3. Tighten the four securing screws.

4. Connect the computer's battery. To find out how you do this, see *Replacing the Computer's Battery* given earlier in this chapter.

5. Connect the power supply and the data cables from the hard disks and other devices installed in the PC.

6. Install the BUS Expansion Board. To find out how you do this, see *Installing and Removing the BUS Expansion Board* given earlier in this chapter.

7. Connect the small ribbon cable from the Front Cover to the CPU Board. To find out how you do this, see *Installing and Removing the Front Cover* given earlier in this chapter.

8. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

DECpc 340dxLP, 425sxLP, 433dxLP, 450D2LP, 466D2LP

To install the Main Board (and CPU Board if present):

1. Remove the computer's outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

2. Carefully place the Main Board (and CPU Board) into the computer's chassis, with the interface connectors facing the rear of the chassis (Figure 3-49). You do NOT have to remove the strut. However, you can remove the Front Cover if you need more room. See *Installing and Removing the Front Cover* given earlier in this chapter.

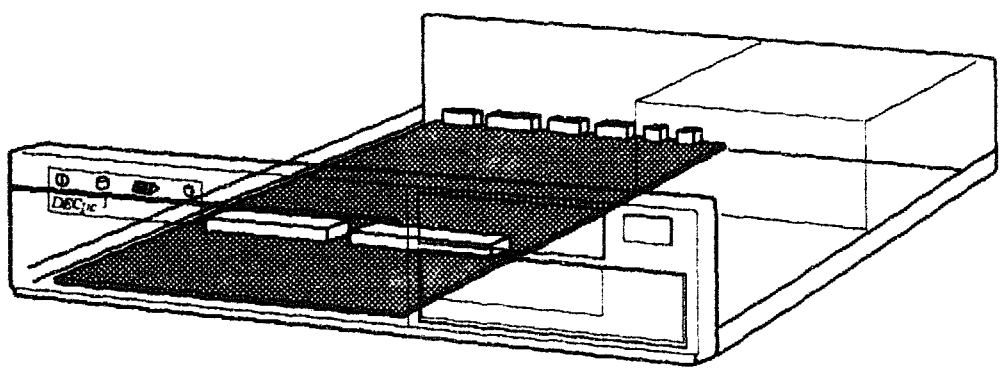


Figure 3-49 - Placing the Main Board (and CPU Board) into the Computer's Chassis

3. Tighten the four securing screws.

4. Connect the computer's battery. To find out how you do this, see *Replacing the Computer's Battery* given earlier in this chapter.

5. Connect the power supply and the data cables from the hard disks and other devices installed in the PC.

6. Install the BUS Expansion Board. To find out how you do this, see *Installing and Removing the BUS Expansion Board* given earlier in this chapter.

7. Connect the small ribbon cable from the Front Cover to the CPU Board. To find out how you do this, see *Installing and Removing the Front Cover* given earlier in this chapter.

8. Replace the outside cover. See *Removing and Replacing the Outside Cover* given earlier in this chapter.

Removing the Main Board

To remove the Main Board, reverse the procedures given above for installing the Main Board.

16 Connecting the Mouse, Keyboard and Monitor

Connecting the Mouse

Plug the mouse cable connector into the socket located at the computer's rear panel (see Figure 2-50). Rotate the connector until the arrow marking is on top, which indicates the keyway (notch) on the cable connector is aligned with the keyway on the computer socket.

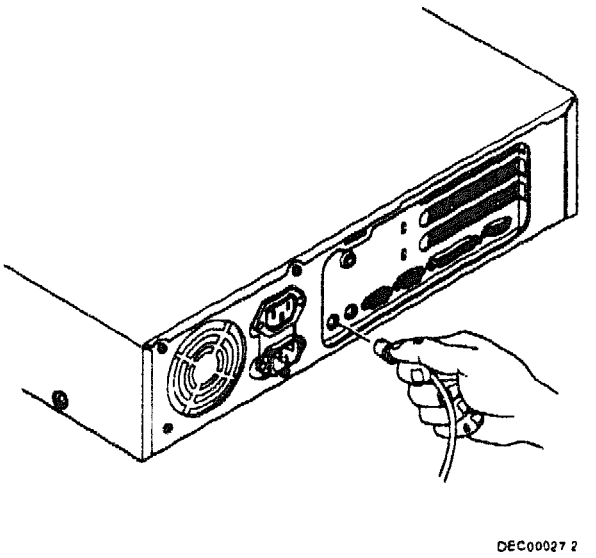


Figure 3-50 - Connecting the Mouse

Connecting the Keyboard

Plug the keyboard cable connector into the socket located at the computer's rear panel (see Figure 3-51). Rotate the connector until the arrow marking is on top, which indicates the keyway (notch) on the cable connector is aligned with the keyway on the computer socket.

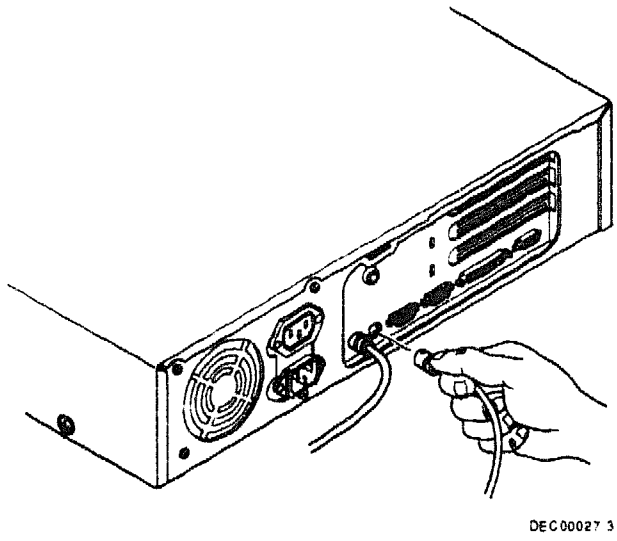


Figure 3-51 - Connecting the Keyboard

Connecting the Monitor

Connect and fully tighten the monitor signal cable to the connector at the rear of the computer (see Figure 3-52).

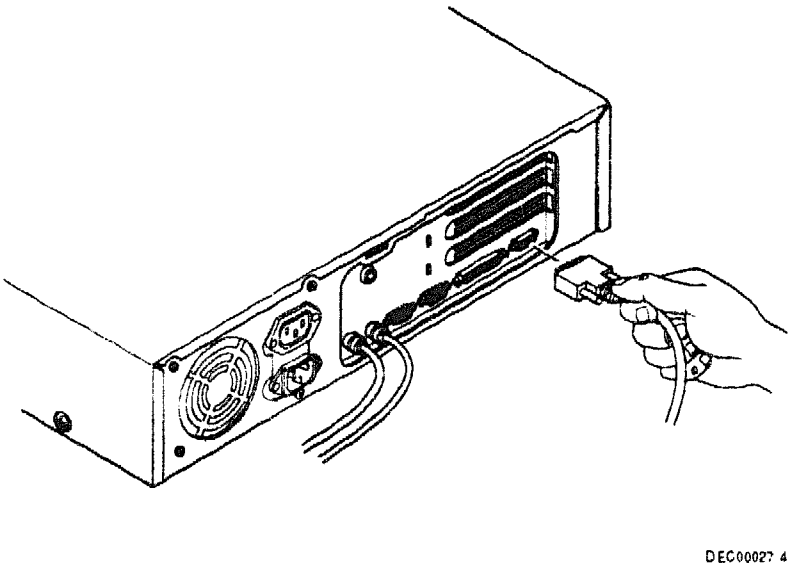


Figure 3-52 - Connecting the Monitor Signal Cable

Connect the monitor power cord to the power connector at the rear of the unit (if necessary) and to the outlet located at the rear of the computer's power supply (see Figure 3-53). This allows you to power up the computer and monitor at the same time.

CAUTION

Do not connect a monitor or other peripheral device that exceeds the 100-120 V ac, 2/1 A rating of the ac output power connector.

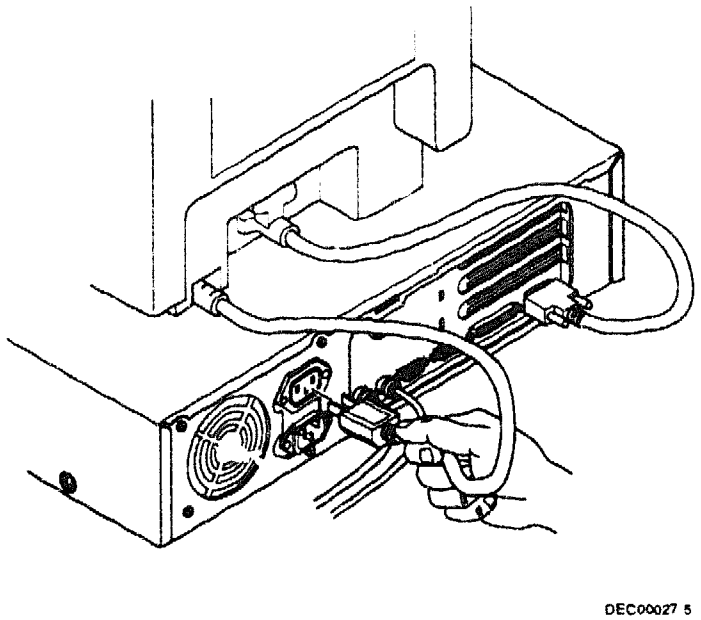


Figure 3-53 - Connecting the Monitor Power Cord

4

Troubleshooting

Introduction

This chapter is divided into two parts. In the first part of this chapter, we show you how to locate faults on DECpc 300/400 LP series computers. We then suggest possible causes for each of these faults. In the second part of the chapter, we show you how to configure a PC using the Setup utility built in to each PC. We also show you how to use the utilities and application drivers supplied on disk with each PC.

Let's start by having a look at how you locate faults.

Locating Faults on a PC

Power-On Self Test (POST)

Every time you turn on a DECpc 300/400 LP series PC, the computer carries out a Power-On Self Test (POST) automatically. It displays a countdown (200 to 000) as it checks the computer's microprocessor, main board timers and logic devices, keyboard, memory, etc.

NOTE

During the POST memory test, the amount of memory being tested appears on the monitor screen. Depending on the amount of memory installed, the POST memory test can take up to 60 seconds to complete.

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

```
PhoenixBIOS(TM) A486 Version x.xx.xx
Copyright (C) 1985-1992 Phoenix Technologies Ltd.
All Rights Reserved

DECpc xxx Version xx.xx

 640K Base Memory
15360K Extended Memory

090

                To enter Setup press:..... [F1]
```

After about 5 seconds, the PC boots automatically. If you want to enter Setup, you must press **F1** before the PC boots.

However, if POST detects configuration errors, the computer beeps and/or displays a message similar to the following:

```
PhoenixBIOS(TM) A486 Version x.xx.xx
Copyright (C) 1985-1992 Phoenix Technologies Ltd.
All Rights Reserved

DECpc xxx Version xx.xx

 640K Base Memory
15360K Extended Memory

040

Fixed disk 1 failure
Invalid configuration information - please run SETUP program

                To continue press:..... [Esc]
                To enter Setup press:..... [F1]
```

QAPLUS Diagnostic Software

Each PC is supplied with a copy of QAPLUS. This is a diagnostic software package that lets you test the different parts of a PC. For example, you can test the CPU, graphics adapter, base memory, extended memory, etc.

If POST detects an error that is NOT fatal, you can use QAPLUS to help you find the cause of the problem. To find out more about QAPLUS, see the separate documentation supplied with the package.

Finding a Fault

To find a fault on a DECpc 300/400 LP series PC:

1. Switch on the PC.
2. Press and release the CTRL, ALT and DEL keys together.
3. If the PC does not seem to do anything, have a look at the section *General Troubleshooting* given later on in this chapter.

   If the PC is working, it will automatically carry out the Power-On Self Test. Then, if there is a problem with the PC, it will display error messages and/or beep. If this happens:

   1. Start by having a look at the section *Error Message or Beep Code* given later on in this chapter.
   2. If you still have problems, see the section *General Troubleshooting* also given later in this chapter.
   3. Make sure that none of the boards installed in the PC:
      - Share the same memory address range.
      - Use the same interrupt level.
      - Use the same DMA address.
      - Use the same I/O address range.

      Also, make sure that the power supply fitted to the PC is capable of supporting all the boards.
   4. Finally, if you cannot find the cause of the problem and the error is NOT fatal, try using QAPLUS.

General Troubleshooting

Table 4-1 below lists a variety of problems and possible causes. If the PC does not beep or display error messages, have a look at this table.

Table 4-1 - General Troubleshooting

Problem	Possible Cause
No response when the computer is turned on	Computer is not plugged in
	No power at the wall outlet
	Main logic board failure
	CPU module failure
	CPU module jumpers incorrectly set
Power is on, but there is no monitor display	Monitor brightness and contrast controls are not properly set
	Monitor is off
Power is on, but there is no monitor display	Monitor cable is incorrectly installed
Computer does not boot from an IDE hard disk drive	Operating system software is not installed on the IDE hard disk drive
	IDE hard disk drive is not properly formatted or the requested partition does not exist
	There is no software on the requested partition
	IDE hard disk drive jumpers incorrectly set
	IDE drive type incorrect
	Loose cables

Table 4-1 - General Troubleshooting *(continued)*

Problem	Possible Cause
Computer does not boot from a SCSI hard disk drive	Operating system software is not installed on the SCSI hard disk drive
	Requested partition does not exist
	SCSI hard disk drive jumpers incorrectly set
	SCSI ID conflicts
	Terminating resistors not removed from the SCSI hard disk drive
	Computer not configured for SCSI hard disk operation
Computer does not boot from a target diskette drive	Drive ID incorrectly set
	Diskette drive not enabled
	Diskette does not contain start-up files
	Diskette drive is empty
	Diskette is worn or damaged
	Loose cables
No response to keyboard commands	Keyboard is password protected
	Keyboard is not connected
	Keyboard is connected to the mouse port
No response to mouse commands	Mouse is password protected
	Mouse is not connected
	Mouse is connected to the keyboard port
	Mouse driver not installed

Table 4-1 - Disk Drive Troubleshooting

Problem	Possible Cause
IDE/SCSI hard disk drive cannot read or write information	Incorrect disk drive jumper settings
	Loose or incorrectly installed cables
	IDE/SCSI hard disk drive is not properly formatted or partitioned
	IDE drive type incorrect
	Computer not configured for SCSI hard disk operation
Target diskette drive cannot read or write information	Diskette is not formatted
	Diskette is worn or damaged
	Diskette is write-protected
	Diskette drive is empty

Table 4-1 - Monitor Troubleshooting

Problem	Possible Cause
Monitor power indicator is not on	Monitor is turned off
	Power cord is not connected
	No power at wall outlet
	Power indicator is defective
No monitor display	Configuration error
	Configuration error
	Monitor brightness and contrast controls are not properly set
Distorted, rolling, or flickering screen display, or wrong/uneven color	Monitor incorrectly adjusted
	Monitor signal cable incorrectly installed
Color monitor displaying monochrome	Computer was turned on before the monitor was turned on
	Video jumper incorrectly set

Error Message or Beep Code

Error Messages

If an error message is displayed on the screen, have a look at Table 4-2 below. This table lists the different error messages that can be displayed on a PC, together with an explanation. If the PC just beeps, have a look at the Beep codes explained later in this chapter.

Table 4-2 - Error Messages

Error Message Number	Message
0007	No timer tick
0001	Shutdown failure
0009	Timer 2 failure
0010	Keyboard stuck key Keyboard controller Keyboard clock line Keyboard data line Keyboard failure
0041	Mouse failure
0017	Time-of-day clock stopped
0018	Invalid configuration information
0011	Diskette drive failure
0015	Hard disk controller failure
0016	Hard disk 0 failure
0021	*xxxx0h* optional ROM bad checksum = *xx*
0019	Time-of-day not set
0020	Keyboard is locked
	Enable NMI
	Enable cache

Beep Codes

If an error occurs and a message cannot be displayed, the computer's 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 RAM is indicated by a 2-1-4 beep code (a burst of two beeps, a single beep, and a burst of four beeps).

Tables 4-3 and 4-4 below list the beep codes and the values written to I/O port 80h when it encounters an error. Table 4-3 lists fatal errors (errors that lock up the computer). Table 4-4 lists non-fatal errors (errors that do not lock up the computer).

Table 4-3 - Beep Codes for Fatal Errors

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

Table 4-3 - Beep Codes for Fatal Errors *(continued)*

Beep Code	Error Message	Port 80H
2-2-3	Bit 6 1st 64 KB RAM failure	16h
2-2-4	Bit 7 1st 64 KB RAM failure	17h
2-3-1	Bit 8 1st 64 KB RAM failure	18h
2-3-2	Bit 9 1st 64 KB RAM failure	19h
2-3-3	Bit A 1st 64 KB RAM failure	1Ah
2-3-4	Bit B 1st 64 KB RAM failure	1Bh
2-4-1	Bit C 1st 64 KB RAM failure	1Ch
2-4-2	Bit D 1st 64 KB RAM failure	1Dh
2-4-3	Bit E 1st 64 KB RAM failure	1Eh
2-4-4	Bit F 1st 64 KB RAM failure	1Fh
3-1-1	Slave DMA register test or failure	20h
3-1-2	Master DMA register test or failure	21h
3-1-3	Master interrupt mask register test or failure	22h
3-1-4	Slave interrupt mask register test or failure	23h
3-2-4	Keyboard/mouse controller test or failure	27h
4-2-1	Timer tick interrupt test or failure	34h
4-2-2	Shutdown test or failure	35h
4-2-3	Gate A20 failure	36h
4-2-4	Unexpected interrupt in protected mode	37h
4-3-1	RAM test or failure (above 0FFFFh)	38h
4-3-3	Interval timer 2 test or failure	3Ah
4-3-4	Time of day clock test or failure	3Bh
4-4-1	Serial port test or failure	3Ch
4-4-2	Parallel port test or failure	3Dh
4-4-3	Math coprocessor test or failure	3Eh

Table 4-4 - Beep Codes for Non-Fatal Errors

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

System Setup

BIOS Setup Utility

The BIOS supplied with the DECpc 300/400 LP series PCs contains a *Setup* program. This program can display information in five different languages - English, French, German, Italian and Spanish.

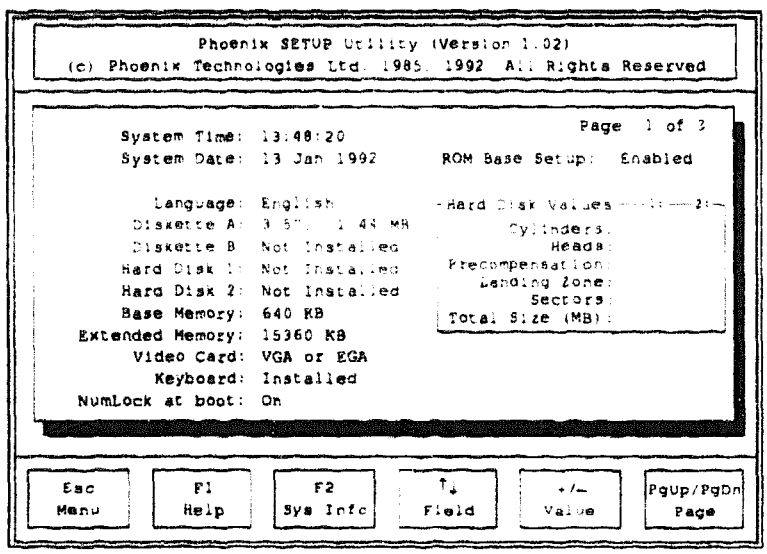
The BIOS setup utility lets you select and permanently store information about the computer's installed hardware and software in the battery-backed memory of the CMOS RAM. This information takes effect each time the computer boots and can be changed each time you run setup. The stored information includes:

- Time and date
- Language options
- Diskette drive type
- Hard disk drive type
- Amount of base memory
- Amount of extended memory
- Video options
- Keyboard availability
- NumLock on at boot status
- ROM based setup status
- Password
- Parallel port addressing
- Serial port addressing
- Diskette drive status
- IDE hard disk drive status
- Drive boot status
- User definable drives
- Exchange diskette drives
- CPU speed
- Posted write status
- Primary cache
- Secondary cache
- Shadow BIOS ROM
- Shadow video ROM
- Monitor type

Running the BIOS Setup Utility

To run the BIOS setup utility:

1. Turn on the computer and allow POST to complete.
2. Make a note of any configuration errors listed, and then press **F1** to display the first of three setup screens (see Figures 4-1, 4-2 and 4-3).



DEC00073-2

Figure 4-1 - Setup Screen One

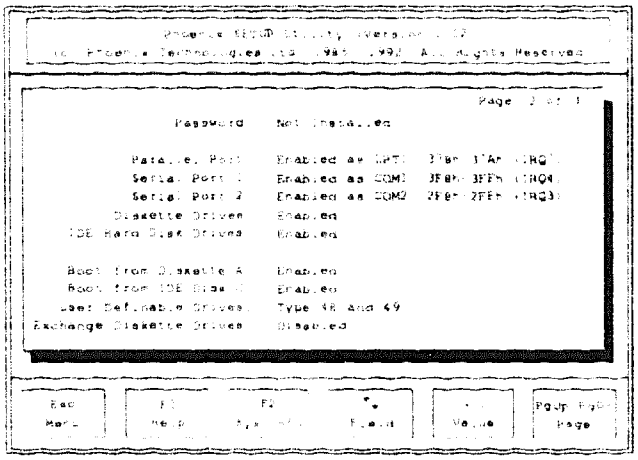
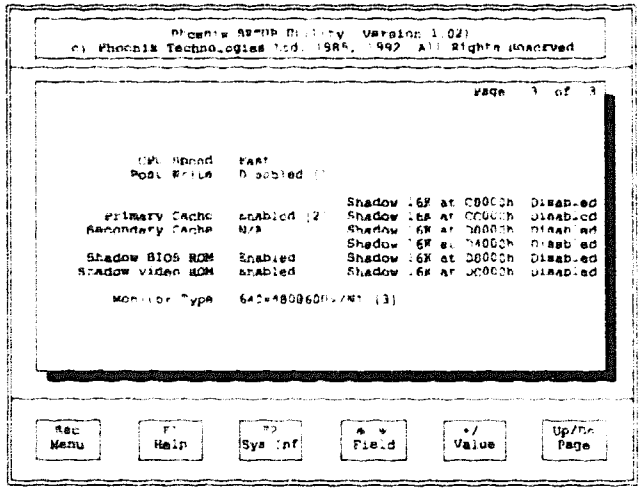


Figure 4-2 - Setup Screen Two



(1) Not available or displayed on the setup screen for the DECpc 333sxLP
(2) Not available on the DECpc 333sxLP
(3) Not available or displayed on the setup screen for the DECpc 333sxLP

Figure 4-3 - Setup Screen Three

CAUTION

Do not connect a monitor to the computer that does not meet the high resolution specifications of the main board's video controller. Connecting a low-end monitor with high-resolution drivers installed can damage the monitor. Refer to the documentation supplied with the monitor for specific video specifications.

3. Update the computer's configuration using the options displayed in the three setup screens.

NOTE

Several keyboard function keys and numeric keypad keys are assigned to help you select menus and options, change option values, and display help information. These keys are displayed at the bottom of each setup configuration screen.

4. Press **F2** to display important computer information.
5. Exit the BIOS setup utility and reboot the computer so that changes immediately take effect.

Moving Through Setup Screen One

The following sections provide detailed information about the options displayed on setup screen one.

System Time

If the time is incorrect, use the up or down arrow key to move the cursor to the time option fields on the monitor screen.

Time: 07:36:40

The time option contains three fields: hours, minutes, and seconds. To change these fields, highlight them using the up or down arrow key and then press the + or – key to update. If you choose, hold down the + or – key to increase or decrease the value continuously. To set the seconds field, highlight it and press the + or – key. The time is saved and automatically updated even if the computer is turned off.

System Date

If the date is incorrect, use the up or down arrow key to move the cursor to the fields of the date option.

Date: 13 January 1992

The date option contains three fields - date of the month, month, and year. Increase or decrease the three fields using the + or – key. After setting a field, press the up or down arrow key to move to a different field. The date is saved and automatically updated even if the computer is turned off.

Language

If you want to change the language in which information is displayed, use the up or down arrow key to move the cursor to the language option field on the monitor screen.

Language: English

Change the language option by pressing the + or - key. The following languages are available:

English
Français
Deutsch
Italiano
Español

Diskette Drive Type

The BIOS setup utility displays information about the installed diskette drive(s). If the information about the diskette drive(s) is incorrect, use the up or down arrow key to move to the diskette drive type option. The default setting is:

Diskette: 3.5", 1.44 MB

Change the diskette drive type field by pressing the + or – key. Field selections are:

3.5", 1.44 MB
3.5", 2.88 MB
Not Installed
5.25", 360 KB
5.25", 1.2 MB
3.5", 720 KB

Hard Disk Drive 1/Hard Disk Drive 2

CAUTION

It is essential to specify the correct IDE hard disk drive type because the main board's BIOS cannot independently verify this information. The main board BIOS will not recognize the installed IDE hard disk drive if the drive type is incorrect.

Refer to the manufacturer's documentation packaged with the hard disk drive for drive type information. If the drive type is provided, position the cursor on the IDE disk field and press the + or – key until your IDE hard disk type appears on the monitor screen. Once selected, the parameters for that drive also appear on the monitor screen.

Depending on the drive manufacturer, only the IDE hard disk drive parameters are provided instead of a drive type. If this is the case, scroll through the setup screen drive types and try to match supplied parameters. If there is no match, type in the supplied IDE hard disk drive parameters using the user definable drive types 2 and 3 or types 48 and 49.

NOTE

Choose types 48 and 49, unless there is a conflict with your network; otherwise, select types 2 and 3. However, if you select types 2 and 3, make sure you shadow the main board's BIOS. Refer to the BIOS setup utility shadow option discussion later in this chapter.

After selecting drive types 2 and 3, highlight the hard disk drive type option and then press the + or – key to match the setting of the user definable drive type selected. Once selected, type in the number of drive cylinders, heads, and sectors according to the supplied manufacturer's documentation.

NOTE

If the primary bootable drive is a SCSI device, set both hard disk drive options to `Not Installed`. Refer to the documentation supplied with the SCSI controller for more information.

Base Memory

The main board reserves the first 1024 KB of address space for computer use. Base memory (640 KB) is first assigned to the operating system, the remaining 384 KB is assigned to either shadow main board BIOS, video BIOS, or for other computer use.

Base Memory: 640 KB

Base memory is always 640 KB unless an error is detected. If an error is detected, the BIOS setup utility determines the actual memory found (base and extended) and places the values in their respective fields.

To change the base memory size, position the cursor on the base memory field option and type in 640 KB.

Extended Memory

This function defines the extended memory resident on the computer's main board. This memory is automatically detected. You cannot modify the size of extended memory found.

Video Card

This option displays information about the installed video controller. If the information about the video controller is incorrect, use the up or down arrow key to move to the video card option. The default setting is:

Video Card: VGA or EGA

Change the video card field by pressing the + or – key. Field selections are:

VGA or EGA
CGA 40 Column
CGA 80 Column
Monochrome
Not Installed

Keyboard

This option lets you operate the computer with or without a keyboard. If you plan on operating the computer as a network server, change the keyboard field to `Not Installed`. Otherwise, leave the option as it was set at the factory.

NOTE

You must initially set up the computer with a keyboard.

To change this setting, highlight the keyboard option using the up or down arrow key and then press the + or – key to select the desired field. Field selections are:

Installed
Not Installed

NumLock on at Boot

This option lets you choose whether or not the keyboard's Numlock feature is turned on or off each time the computer boots. The default setting for this option is:

NumLock on a boot: Yes

To change this setting, highlight the NumLock on a boot option using the up or down arrow key and then press the + or – key to select the desired field. Field selections are:

Yes
No

ROM Based Setup

This option lets you enable or disable the ROM based setup utility. The default setting for this option is:

ROM Based Setup: Enabled

CAUTION

If you select `Disabled`, make sure the computer is bootable and you have a working copy of *setup.com* provided on the supplied system and VGA utilities diskette.

To change this setting, highlight the ROM based setup option using the up or down arrow key and then press the + or – key to select the desired field. Field selections are:

Enabled
Disabled

Moving Through Setup Screen Two

The following sections provide detailed information about the options displayed on setup screen two.

Password

This option lets you assign a power on password. The default setting for this option is:

Password: Not Installed

To change this setting, highlight the password option using the up or down arrow key and then press the + or – key to select the password initialization menu. Follow the instructions displayed to you want to set a power on password.

Parallel Port

This option lets you assign printer port designations (LPT1, LPT2, or LPT3). The default setting for this option is:

Parallel Port: Enabled as LPT1: 378h-37Ah (IRQ7)

To change this setting, highlight the parallel port option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled as LPT1: 378h-37Ah (IRQ7)
Enabled as LPT2: 278h-27Ah (IRQ5)
Enabled as LPT3: 3BCh-3BEh (IRQ7)
Disabled

Serial Port 1

This option lets you assign serial port designations (COM1 through COM4). The default setting for this option is:

Enabled as COM1: 3F8h-3FFh (IRQ4)

To change this setting, highlight the serial port 1 option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled as COM1: 3F8h-3FFh (IRQ4)
Enabled as COM2: 2F8h-2FFh (IRQ3)
Enabled as COM3: 3E8h-3EFh (IRQ4)
Enabled as COM3: 338h-33Fh (IRQ4)
Enabled as COM3: 2E8h-2EFh (IRQ4)
Enabled as COM3: 220h-227h (IRQ4)
Enabled as COM4: 2E8h-2EFh (IRQ3)
Enabled as COM4: 238h-23Fh (IRQ3)
Enabled as COM4: 2E0h-2E7h (IRQ3)
Enabled as COM4: 228h-22Fh (IRQ3)
Disabled

Serial Port 2

This option also lets you assign serial port designations (COM1 through COM4). The default setting for this option is:

Enabled as COM2: 2F8h-2FFh (IRQ3)

To change this setting, highlight the serial port option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled as COM2: 2F8h-2FFh (IRQ3)
Enabled as COM3: 3E8h-3EFh (IRQ4)
Enabled as COM3: 338h-33Fh (IRQ4)
Enabled as COM3: 2E8h-2EFh (IRQ4)
Enabled as COM3: 220h-227h (IRQ4)
Enabled as COM4: 2E8h-2EFh (IRQ3)
Enabled as COM4: 238h-23Fh (IRQ3)
Enabled as COM4: 2E0h-2E7h (IRQ3)
Enabled as COM4: 228h-22Fh (IRQ3)
Disabled
Enabled as COM1: 3F8h-3FFh (IRQ4)

Diskette Drives

This option lets you enable or disable the diskette drive controller. The default setting for this option is:

Diskette Drives: Enabled

To change this setting, highlight the diskette drives option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled
Disabled

IDE Hard Disk Drives

This option lets you enable or disable the IDE hard disk drive controller. The default setting for this option is:

IDE Hard Disk Drives: Enabled

To change this setting, highlight the IDE hard disk drives option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled
Disabled

Boot From Diskette A

This option lets you enable or disable diskette drive A as a logical boot device. The default setting for this option is:

Boot From Diskette A: Enabled

To change this setting, highlight the boot from diskette A option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled
Disabled

Boot From IDE Disk C

This option lets you enable or disable IDE drive C as a logical boot device. The default setting for this option is:

Boot From IDE Disk C: Enabled

To change this setting, highlight the boot from drive C option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled
Disabled

User Definable Drives

Refer to the Hard Disk 1 and Hard Disk 2 options described earlier in this chapter.

Exchange Diskette Drives

This option lets you logically exchange physical diskette drive designations. The default setting for this option is:

Exchange Diskette Drives: Disabled

To change this setting, highlight the exchange diskette drives option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled
Disabled

Moving Through Setup Screen Three

The following sections provide detailed information about the options displayed on setup screen three.

CPU Speed

The normal speed of a DECpc 300/400 LP Series computer depends on the processor(s) fitted to the computer. However, some copyrighted software can only run at 8 MHz (industry-standard PC speed). If you are using this type of software, you must select the slow option in the BIOS setup utility. Selecting the slow option causes the computer to boot in slow mode and operate at the speed of 8 MHz.

Posted Write (Not available on the DECpc 333sxLP)

This option lets you enable or disable the posted write feature of the main board's ISA chip set. Selecting Enabled will enhance the overall performance of the computer. The default setting for this option is:

Posted Write: Enabled

NOTE

Some expansion boards and high-speed microprocessors (for example, an Intel486 DX2 50 MHz or Intel 486DX 50 MHz) might not operate or be able to take full advantage of this performance option. If this is the case, disable the posted write option to remedy any conflicts.

To change this setting, highlight the posted write option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled
Disabled

Primary Cache (Not available on the DECpc 333sxLP)

This option lets you enable or disable the microprocessor's internal (primary) cache. Enabling the cache controller significantly improves computer performance by reducing the average number of wait states seen by the microprocessor.

However, in some instances you might want to disable the primary cache. For example, while using time-dependent software. In this instance, the computer will operate but not at full potential. The default setting for this option is:

Enabled

To change this setting, highlight the primary cache option using the up or down arrow key and then press the + or – key to select the desired field. Field selections are:

Enabled
Disabled

Secondary Cache

This option detects whether or not a secondary (external) cache is installed in the computer. You cannot modify this option.

Shadow BIOS ROM

The main board reserves an area of DRAM for a copy of the system BIOS. This DRAM, called *shadow memory*, is write-protected and has the same addresses as the BIOS ROM locations. When you shadow the main board BIOS, the ROM information is copied into an appropriate area in DRAM. This increases the computer's performance because the BIOS instructions are in fast DRAM instead of ROM. The default setting for this option is:

Enabled

NOTE

You must enable shadowing before selecting user definable drive types 2 and 3. Refer to the *Hard Disk 1* option described earlier in this chapter.

To change this setting, highlight the shadow BIOS ROM option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled
Disabled

Shadow Video ROM

The main board also reserves an area of DRAM for a copy of the video BIOS. This DRAM is also write-protected and has the same addresses as the BIOS ROM locations. The default setting for this option is:

Enabled

To change this setting, highlight the shadow video ROM option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

Enabled
Disabled

Monitor Type (Not available on the DECpc 333sxLP)

This option enables you to select the monitor type that matches the high-resolution performance capabilities of the main board's video controller. The default setting for this option is:

Monitor Type: 640x480@60Hz/NI

To change this setting, highlight the monitor type option using the up or down arrow key and then press the + or – key to select the field you want. Field selections are:

640x480@60Hz/NI
640x480@72Hz/NI
800x600@60Hz/NI
800x600@72Hz/NI
800x600@56Hz/NI
1024x768@43Hz/I
1024x768@60Hz/NI
1024x768@70Hz/NI
1024x960@43Hz/I
1280x1024@43Hz/I

Help

On-line help pop-up screens are available at anytime during the setup process. These screens provide information about highlighted options and in some cases, offer suggestions on how to choose the proper field for a selected option. To access these screens, simply highlight an option and press **F1**.

System Information Menu

Pressing the **F2** function key lets you display a system information pop-up screen. This menu displays the following information:

- Microprocessor type
- Microprocessor clock
- Coprocessor type
- BIOS version
- Video mode

Write down the above information. You will need this information if problems occur during the setup process or if the computer needs servicing.

Exiting Setup

To exit Setup after changing all desired options, press the **Esc** key to display the *Exiting SETUP* pop-up screen (see Figure 4-4). Next, press the **F4** function key to save your changes and to boot the computer.

NOTE

After the computer boots, make sure POST completed with no errors (000 will be displayed on the screen). If POST failed to complete, take the appropriate action to correct any errors.

In addition, if this is the first time the computer booted with no operating system installed, a *no boot device available* message will appear on the monitor screen. Do not concern yourself with the message at this time. It will disappear once the computer is properly configured and the operating system software is installed.

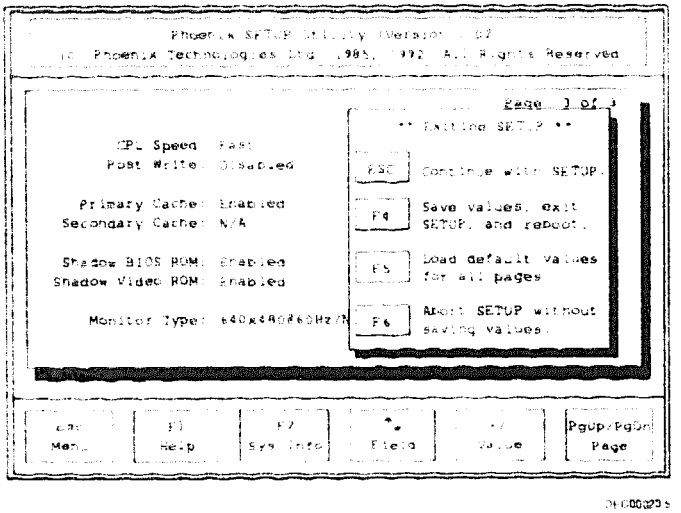


Figure 4-4 - Exiting Setup Pop-Up Screen

Utility and Application Diskettes

A variety of utility and application video driver diskettes are supplied with each 300/400 LP Series computer. These diskettes let you enable the BIOS setup utility and take full advantage of the advanced features of the computer's video circuitry.

DECpc 333sxLP

System and VGA Utilities

Using these utilities, you can enable the computer's BIOS setup utility, set a keyboard/mouse password, or install a particular application video driver. If this is the first time these utilities have been used, it is a good idea to follow the procedures in the order given. If this is not the first time, refer to the appropriate sections to modify your computer's configuration.

1. Install any optional hardware, i.e., disk drives, ISA expansion boards, etc.
2. If the operating system was installed at the factory, use its copy diskette function to make a back-up copy of the diskettes containing the system and VGA utilities. If you are unable to make back-up copies, use the originals cautiously.
3. Turn on your computer.
4. Allow POST to complete.

NOTE

If POST detects a configuration error(s), see the earlier part of this chapter for information about finding the fault.

5. Insert the diskette containing the utilities you want to use into drive A.
6. If applicable, run *setup.com* to enable the computer's BIOS setup utility.

NOTE

Digital recommends that you only use *setup.com* to enable the computer's BIOS setup utility. Digital does not recommend using *setup.com* to change computer parameters.

7. If applicable, run *kp.exe* to install a keyboard/mouse password.
8. If applicable, install the application video drivers you want to use.
9. Remove the diskette containing the utilities from drive A and reboot the computer so changes immediately take effect.
10. If required, install the operating system and any application software. Refer to the supplied operating system documentation and any associated application software documentation for further information.

setup.com

setup.com lets you select and permanently store information about the computer's installed hardware and software in the battery-backed memory of the CMOS RAM. This information takes effect each time the computer boots and can be changed each time you run *setup.com*.

To use *setup.com*:

1. Turn on the computer.
2. Allow POST to complete.

NOTE

If POST detects a configuration error(s), see the earlier part of this chapter for information about finding the fault.

3. Insert the diskette containing *setup.com* into drive A.
4. Type *a:* and press *Enter*.

5. Type *setup* and press *Enter*.

7. Follow the instructions on the monitor screen to enable the BIOS setup utility.

8. Follow the instructions on the monitor screen to exit *setup.com*.

9. If applicable copy *setup.com* to a directory on the hard disk drive.

10. Remove the diskette from drive A.

11. Reboot the computer.

kp.exe

kp.exe lets you lock the keyboard and mouse without turning off the computer. Each time the keyboard and mouse are locked, the computer will not process any input other than the current keyboard password.

NOTE

When you specify a power-on password (using the BIOS setup utility), the computer automatically sets the keyboard and mouse password to the same value. If you do not specify a different keyboard and mouse password, entering the power-on password unlocks the keyboard and mouse.

Also, the keyboard and mouse password is removed each time you turn off the computer. When you turn the computer on again, you must create a new keyboard and mouse password or use the current power-on password.

Keyboard and mouse passwords can have as many as seven upper or lower case keyboard characters and is recorded exactly as you enter it. For example, if you use the 6 from the typewriter key section of the keyboard, you cannot substitute the 6 from the numeric keypad.

NOTE

When you create a keyboard and mouse password, each character is displayed on the monitor screen as you type them. Each time you enter or change a keyboard and mouse password, the characters are not displayed on the monitor screen as you type them.

To set a keyboard and mouse password:

1. Turn on the computer.
2. Allow POST to complete.

NOTE

If POST detects a configuration error(s), see the earlier part of this chapter for information about finding the fault.

3. Insert the diskette containing *kp.exe* into drive A.
4. Type *a:* and press *Enter*.
5. Type *kp* and press *Enter*.
6. Follow the instructions on the monitor screen to set a keyboard and mouse password.
7. Follow the instructions on the monitor screen to exit *kp.com*.
8. If applicable, copy *kp.com* to a directory on your hard disk drive.
9. Remove the system and VGA utilities diskette from drive A.

Application Video Drivers

To install a particular application video driver:

1. Turn on the computer.
2. Allow POST to complete.
3. Insert the diskette containing the driver installation program into drive A.
4. Type *a:* and press *Enter*.
5. Type *install* and press *Enter*.
6. Select the video driver you want to install using the instructions displayed on the screen.
7. Remove the diskette from drive A.

NOTE

See the README files supplied on disk to find out more about each of the video drivers you can install.

All Other DECpc 300/400 LP Series Computers

System and VGA Utilities

Using these utilities, you can enable the computer's BIOS setup utility, set a keyboard/mouse password, and emulate or display specific video modes. If this is the first time these utilities have been used, it is a good idea to follow the procedures in the order given. If this is not the first time, refer to the appropriate sections to modify your computer's configuration.

1. Install any optional hardware, i.e., disk drives, ISA expansion boards, etc.

2. If the operating system was installed at the factory, use its copy diskette function to make a back-up copy of the diskettes containing the system and VGA utilities. If you are unable to make back-up copies, use the originals cautiously.

3. Turn on your computer.

4. Allow POST to complete.

NOTE

If POST detects a configuration error(s), see the earlier part of this chapter for information about finding the fault.

5. Insert the diskette containing the utilities you want to use into drive A.

6. If applicable, run *setup.com* to enable the computer's BIOS setup utility.

NOTE

Digital recommends that you only use *setup.com* to enable the computer's BIOS setup utility. Digital does not recommend using *setup.com* to change computer parameters.

7. If applicable, run *kp.exe* to install a keyboard/mouse password.

8. If applicable, run *smode.exe* to emulate or display the desired video mode (not the DECpc 333sxLP).

9. Remove the diskette containing the utilities from drive A and reboot the computer so changes immediately take effect.

10. If required, install the operating system and any application software. Refer to the supplied operating system documentation and any associated application software documentation for further information.

setup.com

setup.com lets you select and permanently store information about the computer's installed hardware and software in the battery-backed memory of the CMOS RAM. This information takes effect each time the computer boots and can be changed each time you run *setup.com*.

To use *setup.com*:

1. Turn on the computer.
2. Allow POST to complete.

NOTE

If POST detects a configuration error(s), see the earlier part of this chapter for information about finding the fault.

3. Insert the diskette containing *setup.com* into drive A.
4. Type *a:* and press *Enter*.
5. Type *setup* and press *Enter*.
7. Follow the instructions on the monitor screen to enable the BIOS setup utility.
8. Follow the instructions on the monitor screen to exit *setup.com*.
9. If applicable copy *setup.com* to a directory on the hard disk drive.
10. Remove the diskette from drive A.
11. Reboot the computer.

kp.exe

kp.exe lets you lock the keyboard and mouse without turning off the computer. Each time the keyboard and mouse are locked, the computer will not process any input other than the current keyboard password.

NOTE

When you specify a power-on password (using the BIOS setup utility), the computer automatically sets the keyboard and mouse password to the same value. If you do not specify a different keyboard and mouse password, entering the power-on password unlocks the keyboard and mouse.

Also, the keyboard and mouse password is removed each time you turn off the computer. When you turn the computer on again, you must create a new keyboard and mouse password or use the current power-on password.

Keyboard and mouse passwords can have as many as seven upper or lower case keyboard characters and is recorded exactly as you enter it. For example, if you use the 6 from the typewriter key section of the keyboard, you cannot substitute the 6 from the numeric keypad.

NOTE

When you create a keyboard and mouse password, each character is displayed on the monitor screen as you type them. Each time you enter or change a keyboard and mouse password, the characters are not displayed on the monitor screen as you type them.

To set a keyboard and mouse password:

1. Turn on the computer.
2. Allow POST to complete.

NOTE

If POST detects a configuration error(s), see the earlier part of this chapter for information about finding the fault.

3. Insert the diskette containing *kp.exe* into drive A.
4. Type *a:* and press *Enter*.
5. Type *kp* and press *Enter*.
6. Follow the instructions on the monitor screen to set a keyboard and mouse password.
7. Follow the instructions on the monitor screen to exit *kp.com*.
8. If applicable, copy *kp.com* to a directory on your hard disk drive.
9. Remove the system and VGA utilities diskette from drive A.

smode.exe

smode.exe lets you emulate or display various video modes for the computer's video controller. To access *smode.exe*:

1. Turn on the computer.
2. Allow POST to complete.
3. Insert the diskette containing *smode.exe* into drive A.
4. Type *a:* and press *Enter*.
5. Type *cd\vga_util* and press *Enter*.
6. Type *smode* and press *Enter*.
7. Select the desired video option following the instructions on the monitor screen.
8. If applicable, copy *smode.exe* to a directory on the hard disk drive.
9. Remove the diskette from drive A.

Windows 3.0/3.1 Drivers

Each PC comes with a variety of Windows-compatible video device drivers. Depending on how the computer's video is setup, you might have to install one or more of these drivers to properly configure the computer. To install any of the supplied video device drivers, do the following:

1. Configure the computer for the desired video mode.

2. Follow the procedures provided in Appendix A of the Microsoft Windows™ 3.0 User's Guide or Chapter 5 of the Microsoft Windows™ 3.1 User's Guide to properly install all applicable video device drivers.

DOS and CAD Application Drivers

Each PC comes with a variety of DOS and CAD video application drivers. Depending on how the computer's video is setup and the type of DOS or CAD software, you might have to install one or more of these drivers to properly configure the computer. To install any of the supplied DOS and CAD video device drivers, do the following:

1. Configure the computer for the desired video mode (see Chapter 5).

2. Read and fully understand the documentation supplied with your purchased DOS or CAD software package.

3. Install your DOS or CAD software.

NOTE

Prior to installing any video application driver, read and understand the information given in the associated *readme.doc* file. This file contains pertinent information relating to the computer's video circuitry, hardware requirements, and software requirements.

6. Install any applicable DOS or CAD application driver following the procedures in the DOS or CAD software documentation and appropriate *readme.doc* file.

5

Power Supply Unit

Introduction

This chapter is divided into two parts. The first part lists technical information about the power supply unit (PSU) fitted to DECpc 300/400 LP series computers (Table 5-1). The second part lists the pin assignments of the various connectors fitted to the power supply unit.

Specification

Table 5-1 - Power Supply Unit Specification

INPUT CHARACTERISTICS	
Input Line Voltage	100V ac - 120V ac in 115V ac mode 200V ac - 240V ac in 230V ac mode
Input Voltage Range	88V ac - 132V ac in 115V ac mode 176V ac to 264V ac in 230V ac mode
Input Line Frequency Range	47 Hz to 63 Hz
Input Current	4 A maximum at 100V ac - 120V ac 2.5A maximum at 200V ac - 240V ac
Inrush Current	45A maximum at nominal line and full load
Outlet Rate	2A maximum in 120V ac mode 1A maximum in 240V ac mode
Input Protection	Non-accessible fuse
OUTPUT CHARACTERISTICS	
Short Circuit Protection	All outputs are short circuit protected
Over Voltage Protection	Standard on +5V output, set at 7V maximum
Hold-Up Time (At 100/200V, 50/60 Hz)	20 milliseconds minimum at 75% full load 17 milliseconds minimum at full load
Efficency (ratio of output power to input power)	Not less than 65%
Reduced Input Voltage	Reduced input voltages of no more than 20 seconds will not damage the unit

Connectors

There are seven output connectors fitted to the power supply unit:

- One pair of 4-pin connectors for supplying power to 3½" devices installed in the PC (e.g. floppy disk drives, streaming tape units, etc)
- Three 4-pin connectors for supplying power to hard disk drives and 5¼" devices (e.g. floppy disk drives)
- Two 6-pin connectors for supplying power to the Main Board.

Connectors for 3½" Devices

Figure 5-1 shows how the pins are arranged on the connectors used for 3½" devices.

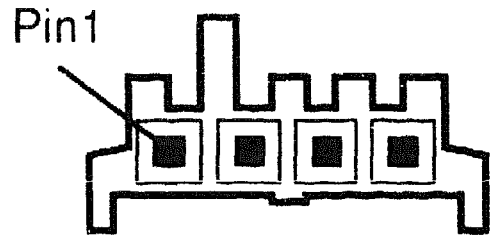


Figure 5-1 - Device Connector

Table 5-2 shows the pin assignments for the 3½" device connectors.

Table 5-2 - Pin Assignments

Pin Number	Wire Colour	Function
1	Red	+5V
2	Black	GND
3	Black	GND
4	Blue	+12V

Connectors for 5¼" Devices and Hard Disk Drives

Figure 5-2 shows how the pins are arranged on the connectors used for 5¼" devices and hard disk drives.

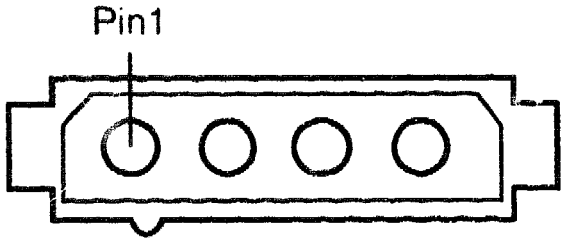


Figure 5-2 - Device Connector

Table 5-3 shows the pin assignments for the 5¼ device and hard disk connectors.

Table 5-3 - Pin Assignments

Pin Number	Wire Colour	Function
1	Blue	+12V
2	Black	GND
3	Black	GND
4	Red	+5V

The First Main Board Connector

Figure 5-3 shows how the pins are arranged on the first Main Board connector.

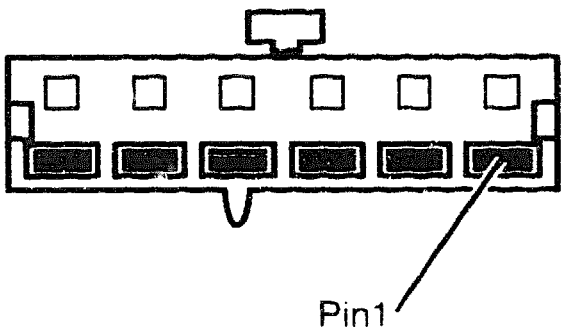


Figure 5-3 - Main Board Connector

Table 5-4 shows the pin assignments for the first Main Board connector.

Table 5-4 - Pin Assignments

Pin Number	Wire Colour	Function
1	White	PWR Good
2	Red	+5V
3	Blue	+12V
4	Yellow	-12V
5	Black	GND
6	Black	GND

The Second Main Board Connector

Figure 5-4 shows how the pins are arranged on the second Main Board connector.

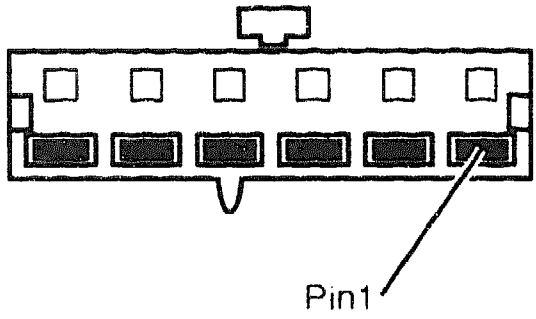


Figure 5-4 - Main Board Connector

Table 5-5 shows the pin assignments for the second Main Board connector.

Table 5-5 - Pin Assignments

Pin Number	Wire Colour	Function
1	Black	GND
2	Black	GND
3	Grey	-5V
4	Red	+5V
5	Red	+5V
6	Red	+5V

6

Monitors

Introduction

This chapter is divided into two parts. The first part lists general technical information about the types of monitor that can be used with a DECpc 300/400 LP series PC (Table 6-1). The second part lists the pin assignments of the connector fitted to the back of suitable monitors.

Specification

Table 6-1 - Monitor Specification

INPUT CHARACTERISTICS	
Video and SYNC specifications	Syncronised through SYNC on green, H/V composite or separate H and V SYNC signals. All three signals can be present simultaneously.
Video Input Signal	????
Video Inputs	Three inputs representing Red, Green and Blue (RGB).
Termination	75 Ohms +/- 2%
Signal Amplitude	
Composite	Green signal is 1.0V +/- 10% when terminated with 75 Ohms.
Non-composite	0.714V +/- 10% SYNC may be positive or negative.
Allowable DC Offset	For both composite and non-composite +/- 1.0V
OUTPUT CHARACTERISTICS	
White Balance	Defined when all three inputs receive identical signals with equal amplitude (except for SYNC).
POWER INPUT	
Voltage Range	For 100V - 120V ac range 88V - 132V ac For 220V - 240V ac range 180V - 264V ac
Frequency Range	47 Hz to 63 Hz
Power Consumption	Less than 100 Watts
Maximum Input Current	At 132V no more than 1.0 amps At 264V no more than 0.5 amps
Power Factor	Greater than 0.6
AC Rush-In Current	Cold Start: At 120V no more than 30A peak At 220V no more than 35A peak Warm Start: At 120V no more than 40A peak At 220V no more than 80A peak
Circuit Protection	By fuse

Connectors

Suitable monitors must be fitted with the following 15-pin connector (Figure 6-1).

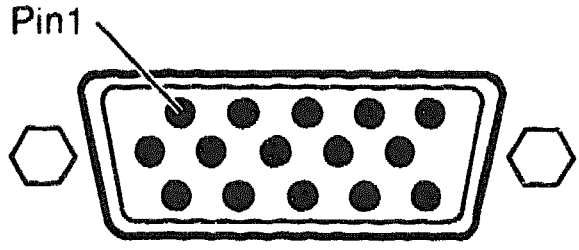


Figure 6-1 - Video Connector

Table 6-2 gives the pin assignments for this connector.

Table 6-2 - Pin Assignments

Pin Number	Function	Pin Number	Function
1	Red	9	No Connection
2	Green	10	Hsync Return
3	Blue	11	VDU Ground
4	VDU Ground	12	No Connection
5	Vsync Return	13	Horizontal Sync
6	Red Return	14	Vertical Sync
7	Green Return	15	No Connection
8	Blue Return		

7

Floppy Disk Drives

Introduction

This chapter is divided into two parts. The first part lists technical information about the different floppy disk drives that can be installed in any of the DECpc 300/400 LP series computers (Table 7-1). The second part shows you how to set up each of these drives before installing them in a PC.

Specification

Table 7-1 - Floppy Disk Drive Specifications

	Sony 3½-inch 1.44 MB	Teac 5¼-inch 1.2 MB
Height	25.4 mm (1.0 inches)	41 mm (1.62 inches)
Width	101.6 mm (4.0 inches)	146 mm (5.75 inches)
Depth	150.0 mm (5.9 inches)	195 mm (7.57 inches)
Weight	420 g (0.93 lb)	1.2 Kg (2.6 lb)
High Density	2.0 MB/disk, 1.0 MB/surface	1.666 MB/disk
Normal Density	1.0 MB/disk, 0.5MB/surface	0.5 MB/disk
Burst Transfer Rate		
High Density	500 Kbits/s for MFM	500 Kbits/s for MFM
Normal Density	250 Kbits/s for MFM	300 Kbits/s for MFM
Track-to-Track Slew Rate	3 ms minumum	3 ms minimum
Head Settling Time	15 ms maximum	15 ms maximum
Motor Start Time	500 ms maximum	500 ms maximum
Rotation Speed	300 rpm	360 rpm
Recording Density - High Density	17434 bpi	9870 bpi
Recording Density - Normal Density	8717 bpi	5922 bpi
Track Density	135 tpi	96 tpi (high) 48 tpi (normal)
Number of Cylinders	80	80 (high) 40 (normal)
Number of Tracks	160	160 (high) 80 (normal)
Number of Read/Write Heads	2	????
Stanby Power Consumption	0.1 W maximum	????
Operational Power Consumption	1.1 W typically	????
Supply Voltage	+5.0 V dc +/- 10%	????
Standby Current	20 mA maximum	????
Read/Write Current	220 mA typically	0.6 A typically
Motor Start Current	680 mA maximum	????
Current Step During Motor Rotation	890 mA maximum	1.0 A maximum

Settings

Sony 3½-inch 1.44MB Floppy Disk Drive

You set up this disk drive using a four-position switch mounted on the drive. Figure 7-1 shows you where you can find this switch.

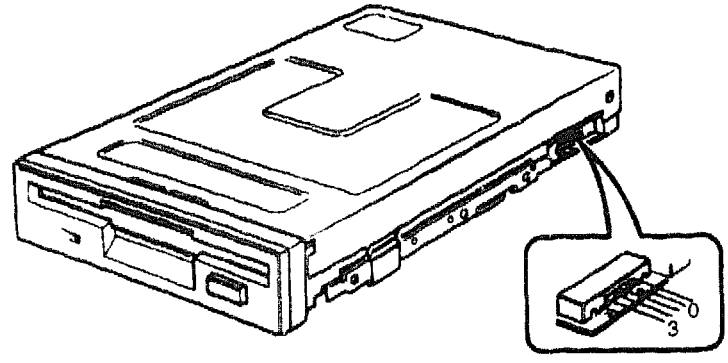


Figure 7-1 - Four-Position Switch

Table 7-2 shows you what the different switch positions mean.

Table 7-2 - Switch Positions

Switch Setting	Function
0	Configures the drive as the only floppy disk drive in the PC.
1*	Configures the drive as the second floppy disk drive (in a daisy chain) in the PC.
2	Configures the drive as the third floppy disk drive (in a daisy chain) in the PC - this is NOT supported on any of the DECpc 300LP/DECpc 400LP computers.
3	Configures the drive as the fourth floppy disk drive (in a daisy chain) in the PC- this is NOT supported on any of the DECpc 300LP/DECpc 400LP computers.

* Factory setting

Teac 5¼-inch 1.2MB Floppy Disk Drive

You set up this disk drive using jumpers mounted on the drive. If you are not sure what we mean by jumpers, see *Chapter 11 - Board Information*. Figure 7-2 shows you where you can find these jumpers.

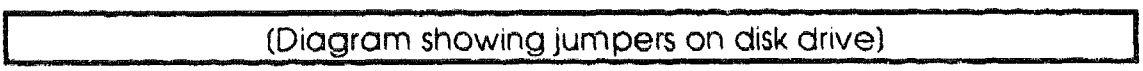


Figure 7-2 - Jumpers

Table 7-3 shows you what the different jumper settings mean.

Table 7-3 - Jumper Settings

Jumper Pins	Jumper Setting	Function
TD	Jumpered	Reserved for factory use.
DS2	Open	When jumpered, this indicates that the drive is the third drive of three floppy disk drives - this is NOT supported on any of the DECpc 300LP/DECpc 400LP computers.
DS1	Jumpered	When jumpered, this indicates that the drive is the second drive of two floppy disk drives
DS0	Open	When jumpered, this indicates that the drive is the first drive of two floppy disk drives
MX	Open	Reserved for factory use.
DS3	Open	When jumpered, this indicates that the drive is the fourth drive of four floppy disk drives - this is NOT supported on any of the DECpc 300LP/DECpc 400LP computers.
SB	Jumpered	Reserved for factory use.
SS	Open	Reserved for factory use.
ND	Open	Reserved for factory use.
DD	Open	Reserved for factory use.
HR	Open	Reserved for factory use.
IL	Open	Reserved for factory use.
IS	Open	Reserved for factory use.
MM	Jumpered	Reserved for factory use.
MS	Open	Reserved for factory use.
IR	Open	Reserved for factory use.
IU	Open	Reserved for factory use.
RI	Jumpered	Reserved for factory use.
RD	Open	Reserved for factory use.
DC	Jumpered	Reserved for factory use.
SR	Open	Reserved for factory use.

All the settings shown in this table are factory settings.

8

Hard Disk Drives

Introduction

This chapter is divided into two parts. The first part lists technical information about the different hard disk drives that can be installed in any of the DECpc 300/400 LP series computers (Table 8-1). The second part shows you how to set up each of these drives before installing them in a PC.

Specification

Table 8-1 - Hard Disk Drive Specifications

	Quantum 52MB Drive	Quantum 120MB Drive	Quantum 240MB Drive
Formatted Capacity	52 MB	122 MB	245 MB
Internal Transfer Rate:			
From the Disk	1.75 MB/second	1.87 MB/sec (min) 3.75 MB/sec (max)	1.87 MB/sec (min) 3.75 MB/sec (max)
From the Buffer	4.0 MB/second	5.0 MB/second	5.0 MB/second
Access Times:			
Track-to-Track	6.0 ms	2.5 ms	2.5 ms
Average	17.0 ms	16.0 ms	16.0 ms
Maximum	33.0 ms	30.0 ms	30.0 ms
Recording Method	2 of 7 RLL code	????	????
Disk Rotation Speed	3662 rpm (+/- 0.2%)	4306 rpm	4306 rpm
Number of Heads	2	2	4
Number of Disks	1	1	2
Look-Ahead Feature	????	????	????
Buffer	64 KB	256 KB	256 KB
Duration	10,000 start/stop cycles min	????	????
Hard Disk Type	IDE	IDE	IDE

Settings

Quantum 52MB Hard Disk Drive

You set up this disk drive using jumpers mounted on the drive. If you are not sure what we mean by jumpers, see *Chapter 11 - Board Information*. Figure 8-1 shows you where you can find these jumpers, and Table 8-2 shows you what the different jumper settings mean.

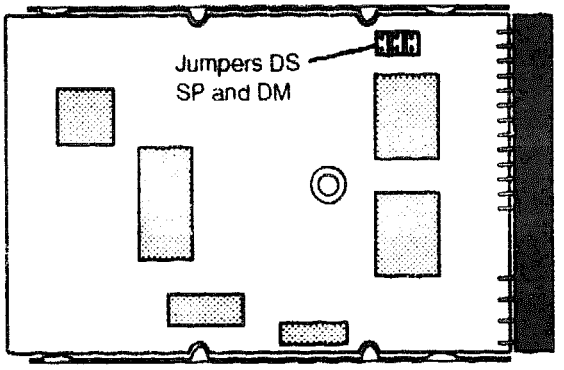


Figure 8-1 - Jumpers

Table 8-2 - Jumper Settings

Jumper Pins	Jumper Setting	Function
5 + 6 (DS) and 3 + 4 (SP)	Jumpered* Open*	Indicates that the drive is the only IDE hard disk drive installed in the PC
5 + 6 (DS) and 3 + 4 (SP)	Jumpered Jumpered	Indicates that this is the first of two hard disk drives installed in the PC
5 + 6 (DS) and 3 + 4 (SP)	Open Open	Indicates that this is the second of two hard disk drives installed in the PC
1 + 2 (DM)	Open*	Reserved for future use

* Factory settings.

Quantum 120MB Hard Disk Drive

You set up this disk drive using jumpers mounted on the drive. If you are not sure what we mean by jumpers, see *Chapter 11 - Board Information*. Figure 8-2 shows you where you can find these jumpers, and Table 8-3 shows you what the different jumper settings mean.

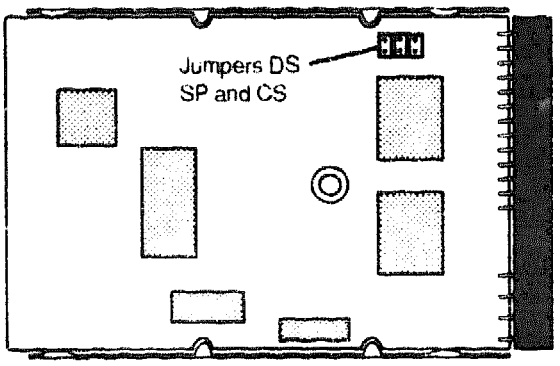


Figure 8-2 - Jumpers

Table 8-3 - Jumper Settings

Jumper Pins	Jumper Setting	Function
3 + 4 (DS) and 1 + 2 (SP)	Jumpered* Open*	Indicates that the drive is the only IDE hard disk drive installed in the PC.
3 + 4 (DS) and 1 + 2 (SP)	Jumpered Jumpered	Indicates that this is the first of two hard disk drives installed in the PC.
3 + 4 (DS) and 1 + 2 (SP)	Open Open	Indicates that this is the second of two hard disk drives installed in the PC.
5 + 6 (CS)	Open*	Reserved for future use.

* Factory settings.

Quantum 240MB Hard Disk Drive

You set up this disk drive using jumpers mounted on the drive. If you are not sure what we mean by jumpers, see *Chapter 11 - Board Information*. Figure 8-3 shows you where you can find these jumpers, and Table 8-4 shows you what the different jumper settings mean.

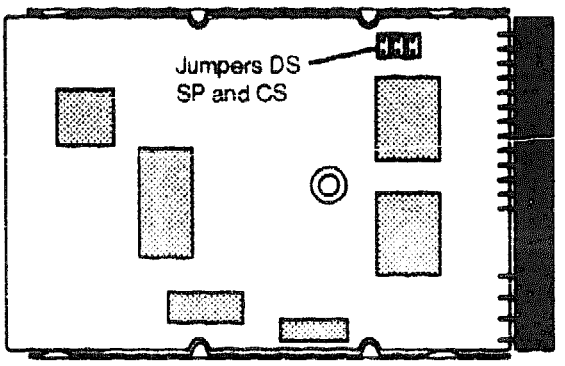


Figure 8-3 - Jumpers

Table 8-4 - Jumper Settings

Jumper Pins	Jumper Setting	Function
3 + 4 (DS) and 1 + 2 (SP)	Jumpered* Open*	Indicates that the drive is the only IDE hard disk drive installed in the PC.
3 + 4 (DS) and 1 + 2 (SP)	Jumpered Jumpered	Indicates that this is the first of two hard disk drives installed in the PC.
3 + 4 (DS) and 1 + 2 (SP)	Open Open	Indicates that this is the second of two hard disk drives installed in the PC.
5 + 6 (CS)	Open*	Reserved for future use.

* Factory settings.

9

Board Information

Introduction

In this chapter, we show you how to set up the Main Board and CPU Board (not the DECpc 333sxLP) installed in DECpc 300/400 LP series computers.

How do you set up a board?

You set up a board using *jumper pins*. Jumper pins are small metal pins fitted to each board. You can see these pins in Figure 9-1.

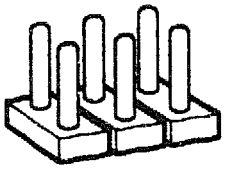


Figure 9-1 - Jumper Pins

To set up a board using these pins, you move *jumper blocks* between different pairs of pins. A jumper block is a small plastic-encased conductor (shorting plug) that slips over the pins. You can see this in Figure 9-2.

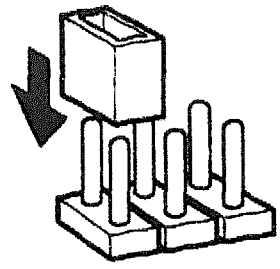


Figure 9-2 - Using a Jumper Block

To change a jumper setting, you remove the jumper from one pair of pins and place it over another pair of pins. When you do this, you must be careful not to bend the pins.

The Main Board

There are two different versions of the Main Board - the Main Board installed in the DECpc 333sxLP, and the Main Board installed in all other DECpc 300/400 LP PCs.

DECpc 333sxLP PC

Table 9-1 lists the main board jumpers and factory default settings. Figure 9-3 shows you where to find the main board jumper pins. The square pin of each jumper block is pin 1.

CAUTION

Do not touch any electronic component unless you are properly grounded. You can make sure that you are properly grounded 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.

Table 9-1 - Main Board Jumper Settings

Feature	Description	Setting
Onboard VGA (IRQ9)	Disable IRQ9 Enable IRQ9	J1, pins 1 and 2 open (1) J1, pins 1 and 2 jumpered
Enable/disable onboard VGA	Enable VGA Disable VGA	J2, pins 1 and 2 jumpered(1) J2, pins 1 and 2 open
CMOS memory	Normal operation Clear CMOS memory	J3, pins 1 and 2 jumpered(1) J3, pins 2 and 3 jumpered
Enable/disable computer RESET switch	Enable RESET switch Disable RESET switch	J4, pins 1 and 2 jumpered(1) J4, pins 1 and 2 open
Parallel port	Printer Bidirectional	J5, pins 1 and 2 jumpered(1) J5, pins 2 and 3 jumpered
Video display type	Color monitor Mono monitor	J6, pins 1 and 2 jumpered(1) J6, pins 1 and 2 open
Factory test	Normal operation Factory test mode	J7, pins 1 and 2 open(1) J7, pins 1 and 2 jumpered

(1) Factory setting

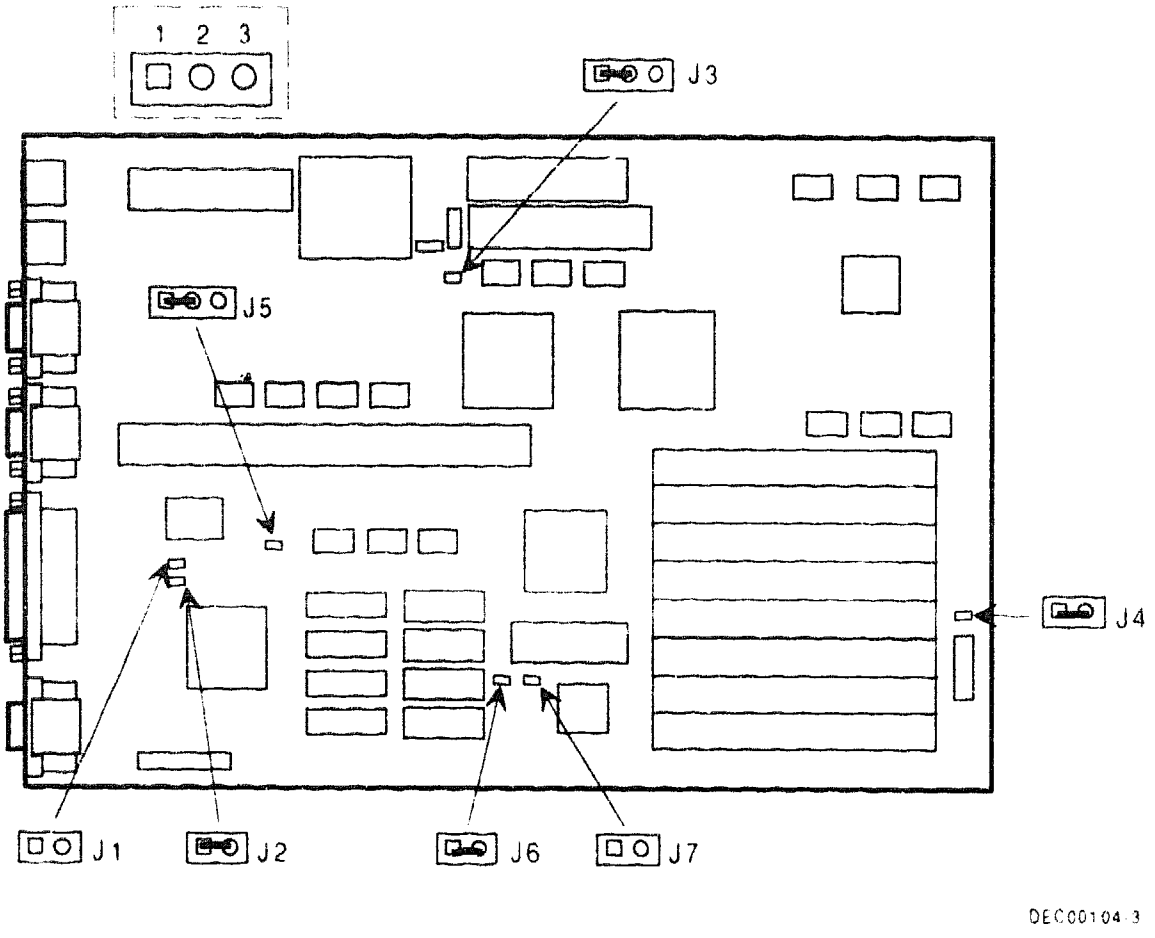


Figure 9-3 - Main Board Jumper Locations

All Other DECpc 300/400 LP Series PCs

Table 9-2 lists the main board jumpers and factory default settings. Figure 9-4 shows you where to find the main board jumper pins. The square pin of each jumper block is pin 1.

CAUTION

Do not touch any electronic component unless you are properly grounded. You can make sure that you are properly grounded 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.

Table 9-2 - Main Board Jumper Settings

Feature	Description	Setting
Onboard VGA (IRQ9)	Disable IRQ9 Enable IRQ9	J1, pins 1 and 2 open (1) J1, pins 1 and 2 jumpered
Enable/disable onboard VGA	Enable VGA Disable VGA	J2, pins 1 and 2 jumpered(1) J2, pins 1 and 2 open
CMOS memory	Normal operation Clear CMOS memory	J3, pins 1 and 2 jumpered(1) J3, pins 2 and 3 jumpered
Enable/disable computer RESET switch	Enable RESET switch Disable RESET switch	J4, pins 1 and 2 jumpered(1) J4, pins 1 and 2 open
Parallel port	Printer Bidirectional	J5, pins 1 and 2 jumpered(1) J5, pins 2 and 3 jumpered
Factory test	Normal operation Factory test mode	J10, pins 1 and 2 jumpered(1) J10, pins 1 and 2 open
Video display type	Color monitor Mono monitor	J11, pins 1 and 2 jumpered(1) J11, pins 1 and 2 open
VRAM size	512 KB VRAM 1 MB VRAM	J28, pins 1 and 2 jumpered(1) J28, pins 2 and 3 jumpered
Reserved	Factory use only	J29, open(1) J30, open(1) J31, open(1)
VGAIOW	Local Local and ISA	J35, pins 1 and 2 jumpered(1) J35, pins 2 and 3 jumpered

(1) Factory setting

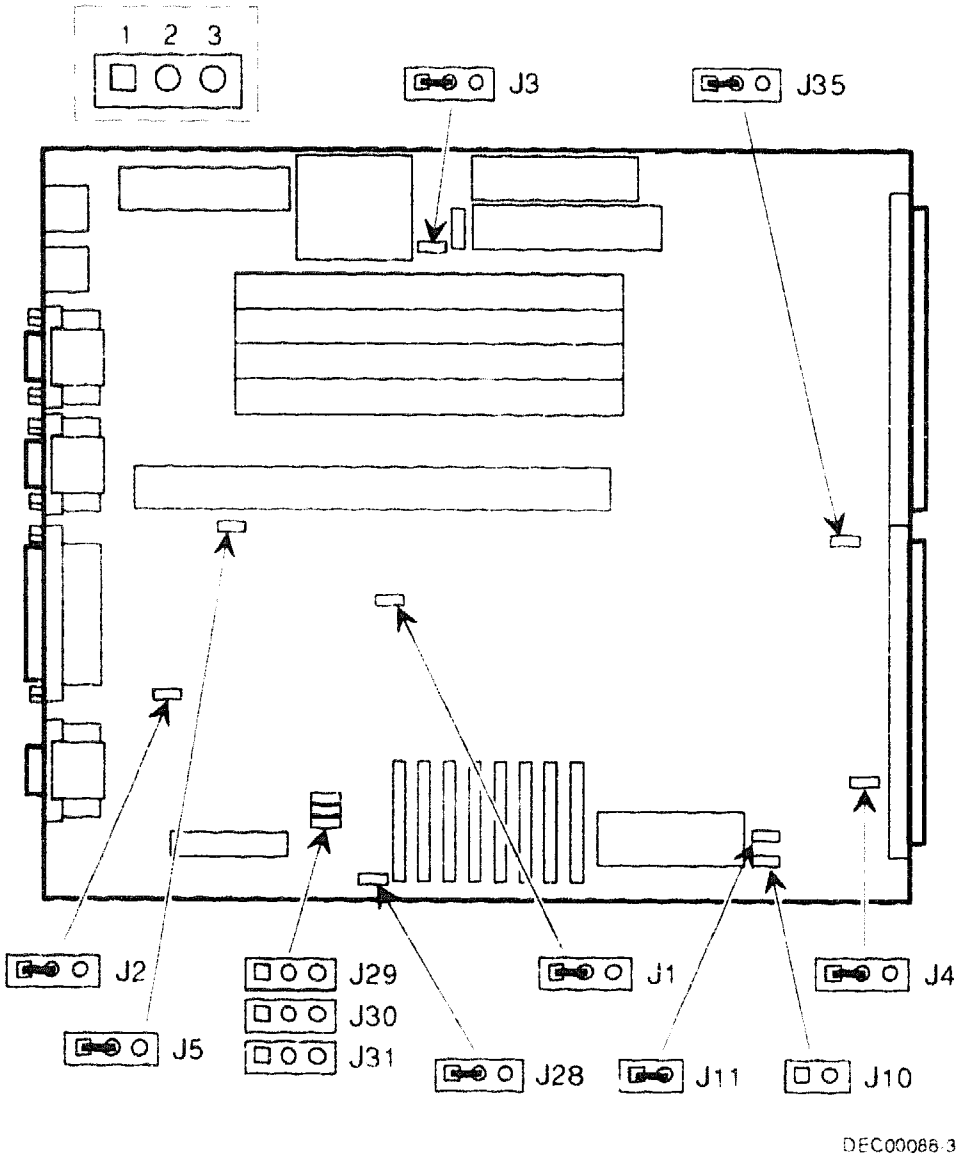


Figure 9-4 - Main Board Jumper Locations

CPU Board

All DECpc 300/400 LP series computers (except the DECpc 333sxLP) are fitted with a separate CPU board. There are five different versions of this board:

- 80386dx-40 CPU board fitted to the DECpc 340dxLP.
- 80486sx-25 CPU board fitted to the DECpc 425sxLP.
- 80486dx-33 CPU board fitted to the DECpc 433dxLP.
- 80486dx2-50 CPU board fitted to the DECpc 450D2LP.
- 80486dx2-66 CPU board fitted to the DECpc 466D2LP.

You can install one of a variety of upgrade processors (maths coprocessor, overdrive processor, etc.) on these boards to improve their performance. You install the upgrade processor into an empty socket on the board. Table 9-3 lists the different boards and shows you what type of upgrade processors you can install.

Table 9-3 - Upgrade Processors that can be Installed

CPU Board	Maths Coprocessor	Overdrive* Processor
80386dx-40 (fitted to the DECpc 340dxLP)	YES	NO
80486sx-25 (fitted to the DECpc 425sxLP)	YES - If available	YES
80486dx-33 (fitted to the DECpc 433dxLP)	Not needed because it is already built in.	YES
80486dx2-50 (fitted to the DECpc 450D2LP)	Not needed because it is already built in.	YES
80486dx2-66 (fitted to the DECpc 466D2LP)	Not needed because it is already built in.	YES - When available

* The Overdrive Processor is used instead of the existing microprocessor fitted to the CPU Board. When you install an overdrive processor, you have to disable the microprocessor already fitted to the board by changing a jumper setting.

80386dx-40 CPU Board fitted to the DECpc 340dxLP

Expansion Sockets and Jumper Locations

Figure 9-5 shows you where to find the vacancy socket (B) and the 128 KB secondary cache memory upgrade sockets (A) on the board. It also shows you where to find the different jumpers used to set up the board. Table 9-4 lists the factory settings for these jumpers. The square pin of each jumper block is pin 1.

Table 9-4 - 80386dx-40 CPU Board Jumper Settings

Feature	Description	Setting
Cache size	128 KB	J102, pins 1 and 2 jumpered(1) J103, pins 1 and 2 jumpered(1) J104, pins 1 and 2 jumpered(1)
	256 KB	J102, pins 2 and 3 jumpered J103, pins 2 and 3 jumpered J104, pins 2 and 3 jumpered
CPU speed	Reserved for factory use only	J105, pins 2 and 3 jumpered(1)

(1) Factory setting

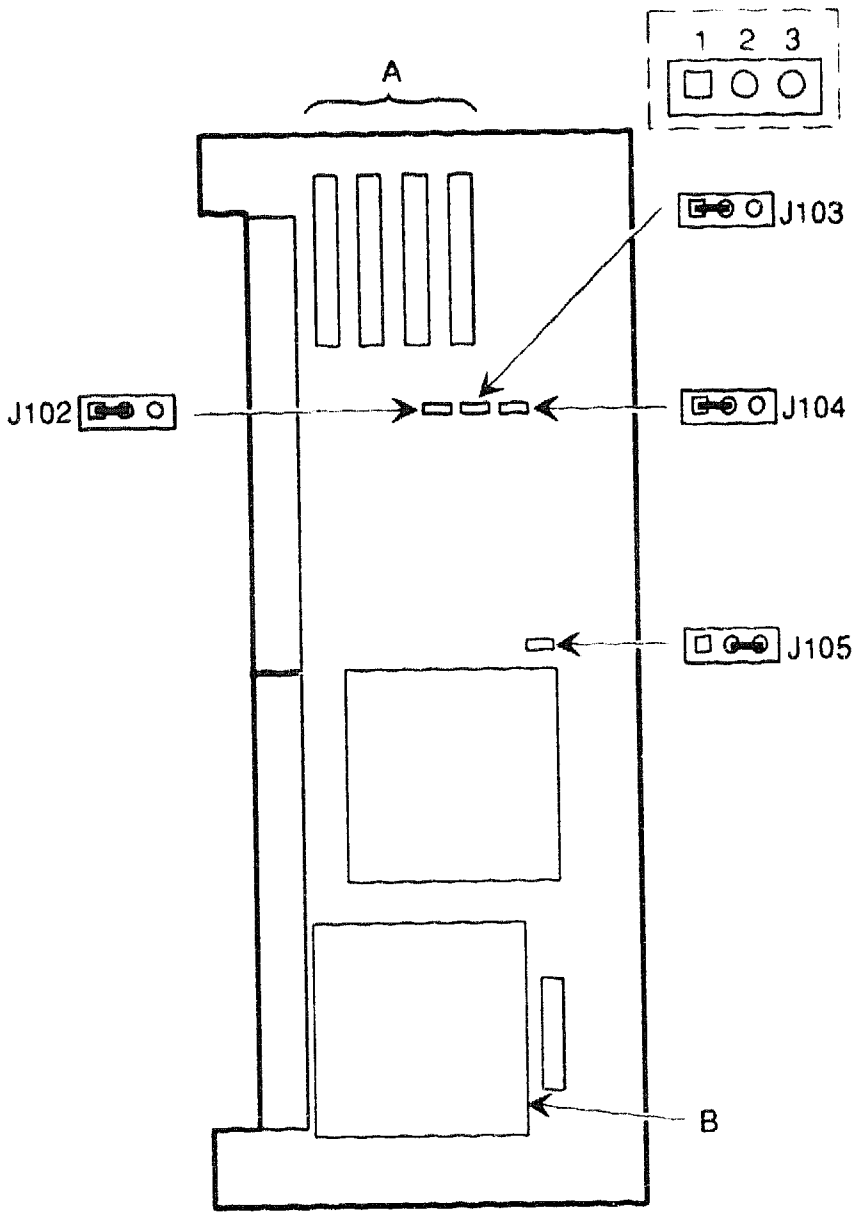


Figure 9-5 - 80386dx-40 CPU Board

80486sx-25 CPU Board fitted to the DECpc 425sxLP

Expansion Sockets and Jumper Locations

Figure 9-6 shows you where to find the vacancy socket (B) and the 128 KB secondary cache memory upgrade sockets (A) on the board. It also shows you where to find the different jumpers used to set up the board. Table 9-5 lists the factory settings for these jumpers. The square pin of each jumper block is pin 1.

Table 9-5 - 80486sx-25 CPU Board Jumper Settings

Feature	Description	Setting
Vacancy socket	Empty or Intel OverDrive microprocessor installed	J101, pins 1 and 2 jumpered(1) J102, pins 1 and 2 jumpered(1) J113, pins 1 and 2 jumpered(1)
	Intel486DX or Intel486 DX2 microprocessor installed	J101, pins 2 and 3 jumpered J102, pins 2 and 3 jumpered J113, pins 2 and 3 jumpered
Cache size	128 KB cache	J103, pins 1 and 2 jumpered(1) J104, pins 1 and 2 jumpered(1)
	256 KB cache	J103, pins 2 and 3 jumpered J104, pins 2 and 3 jumpered
CPU clock input	25 MHz(1) 33 MHz 40 MHz 50 MHz	J109, pins 1 and 2 jumpered(1) J110, pins 1 and 2 open J111, pins 1 and 2 open J112, pins 1 and 2 open

(1) Factory setting

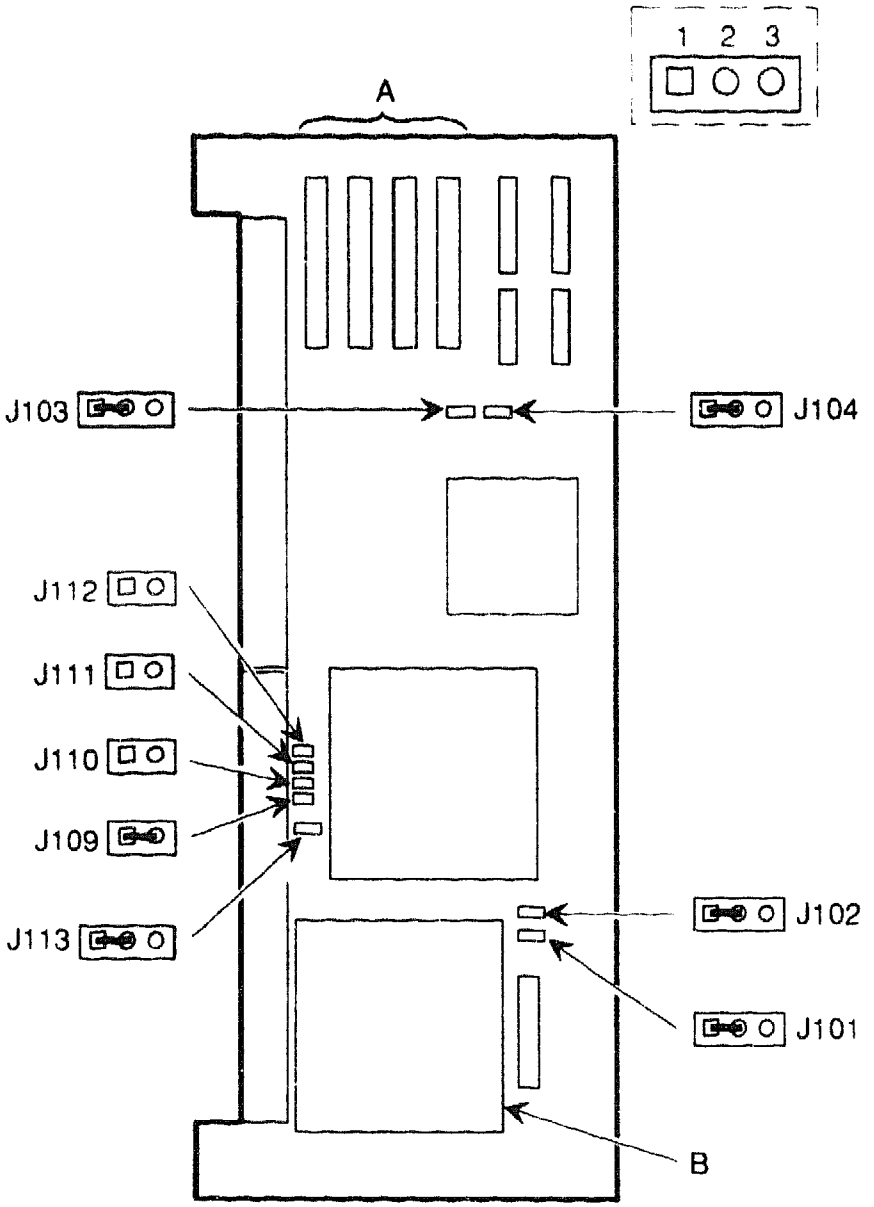


Figure 9-6 - 80486sx-25 CPU Board

80486dx-33 CPU Board fitted to the DECpc 433dxLP

Expansion Sockets and Jumper Locations

Figure 9-7 shows you where to find the vacancy socket (B) and the 128 KB secondary cache memory upgrade sockets (A) on the board. It also shows you where to find the different jumpers used to set up the board. Table 9-6 lists the factory settings for these jumpers. The square pin of each jumper block is pin 1.

Table 9-6 - 80486dx-33 CPU Board Jumper Settings

Feature	Description	Setting
Vacancy socket	Empty or Intel OverDrive microprocessor installed	J101, pins 1 and 2 jumpered(1) J102, pins 1 and 2 jumpered(1) J113, pins 1 and 2 jumpered(1)
	Intel486DX or Intel486 DX2 microprocessor installed	J101, pins 2 and 3 jumpered J102, pins 2 and 3 jumpered J113, pins 2 and 3 jumpered
Cache size	128 KB cache	J103, pins 1 and 2 jumpered(1) J104, pins 1 and 2 jumpered(1)
	256 KB cache	J103, pins 2 and 3 jumpered J104, pins 2 and 3 jumpered
CPU clock input	25 MHz	J109, pins 1 and 2 open
	33 MHz(1)	J110, pins 1 and 2 jumpered(1)
	40 MHz	J111, pins 1 and 2 open
	50 MHz	J112, pins 1 and 2 open

(1) Factory setting

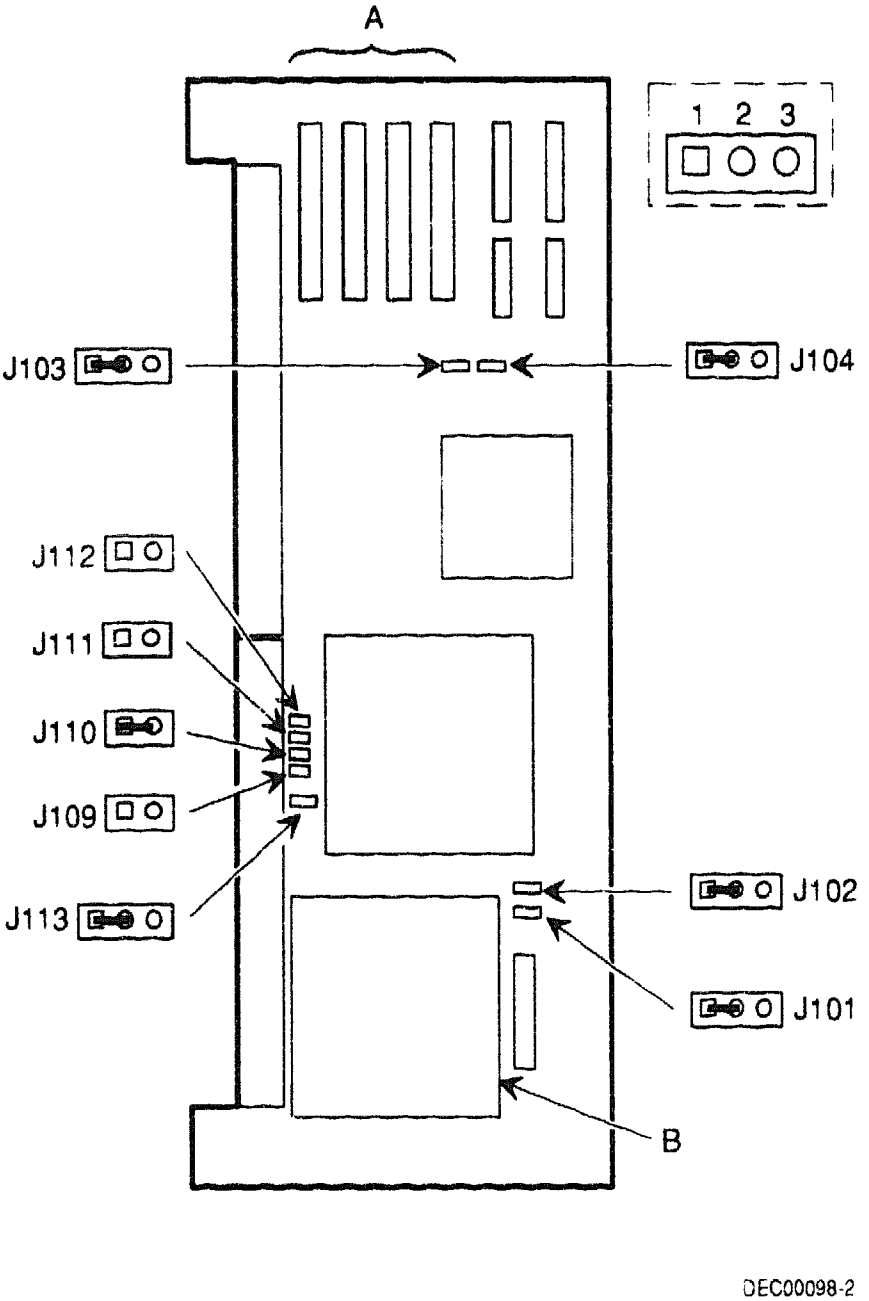


Figure 9-7 - 80486dx-33 CPU Board

80486dx2-50 CPU Board fitted to the DECpc 450D2LP

Expansion Sockets and Jumper Locations

Figure 9-8 shows you where to find the vacancy socket (B) and the 128 KB secondary cache memory upgrade sockets (A) on the board. It also shows you where to find the different jumpers used to set up the board. Table 9-7 lists the factory settings for these jumpers. The square pin of each jumper block is pin 1.

Table 9-7 - 80486dx2-50 CPU Board Jumper Settings

Feature	Description	Setting
Vacancy socket	Empty or Intel OverDrive microprocessor installed	J101, pins 1 and 2 jumpered(1) J102, pins 1 and 2 jumpered(1) J113, pins 1 and 2 jumpered(1)
	Intel486DX or Intel486 DX2 microprocessor installed	J101, pins 2 and 3 jumpered J102, pins 2 and 3 jumpered J113, pins 2 and 3 jumpered
Cache size	128 KB cache	J103, pins 1 and 2 jumpered(1) J104, pins 1 and 2 jumpered(1)
	256 KB cache	J103, pins 2 and 3 jumpered J104, pins 2 and 3 jumpered
CPU clock input	25 MHz(1)	J109, pins 1 and 2 jumpered(1)
	33 MHz	J110, pins 1 and 2 open
	40 MHz	J111, pins 1 and 2 open
	50 MHz	J112, pins 1 and 2 open

(1) Factory setting

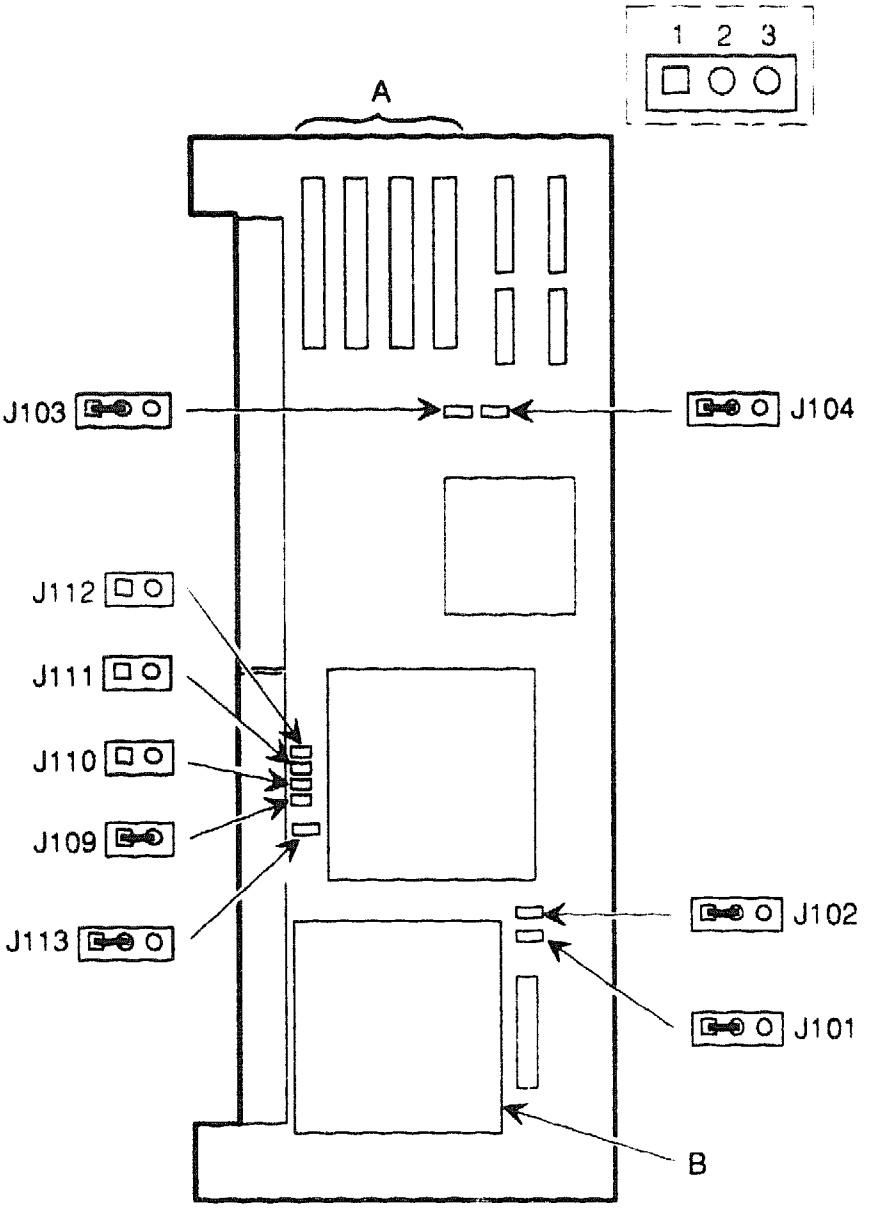


Figure 9-8 - 80486dx2-50 CPU Board

80486dx2-66 CPU Board fitted to the DECpc 466D2LP

Expansion Sockets and Jumper Locations

Figure 9-9 shows you where to find the vacancy socket (B) and the 128 KB secondary cache memory upgrade sockets (A) on the board. It also shows you where to find the different jumpers used to set up the board. Table 9-8 lists the factory settings for these jumpers. The square pin of each jumper block is pin 1.

Table 9-8 - 80486dx2-66 CPU Board Jumper Settings

Feature	Description	Setting
Vacancy socket	Empty or Intel OverDrive microprocessor installed	J101, pins 1 and 2 jumpered(1) J102, pins 1 and 2 jumpered(1) J113, pins 1 and 2 jumpered(1)
	Intel486DX or Intel486 DX2 microprocessor installed	J101, pins 2 and 3 jumpered J102, pins 2 and 3 jumpered J113, pins 2 and 3 jumpered
Cache size	128 KB cache	J103, pins 1 and 2 jumpered(1) J104, pins 1 and 2 jumpered(1)
	256 KB cache	J103, pins 2 and 3 jumpered J104, pins 2 and 3 jumpered
CPU clock input	25 MHz(1) 33 MHz 40 MHz 50 MHz	J109, pins 1 and 2 jumpered(1) J110, pins 1 and 2 open J111, pins 1 and 2 open J112, pins 1 and 2 open

(1) Factory setting

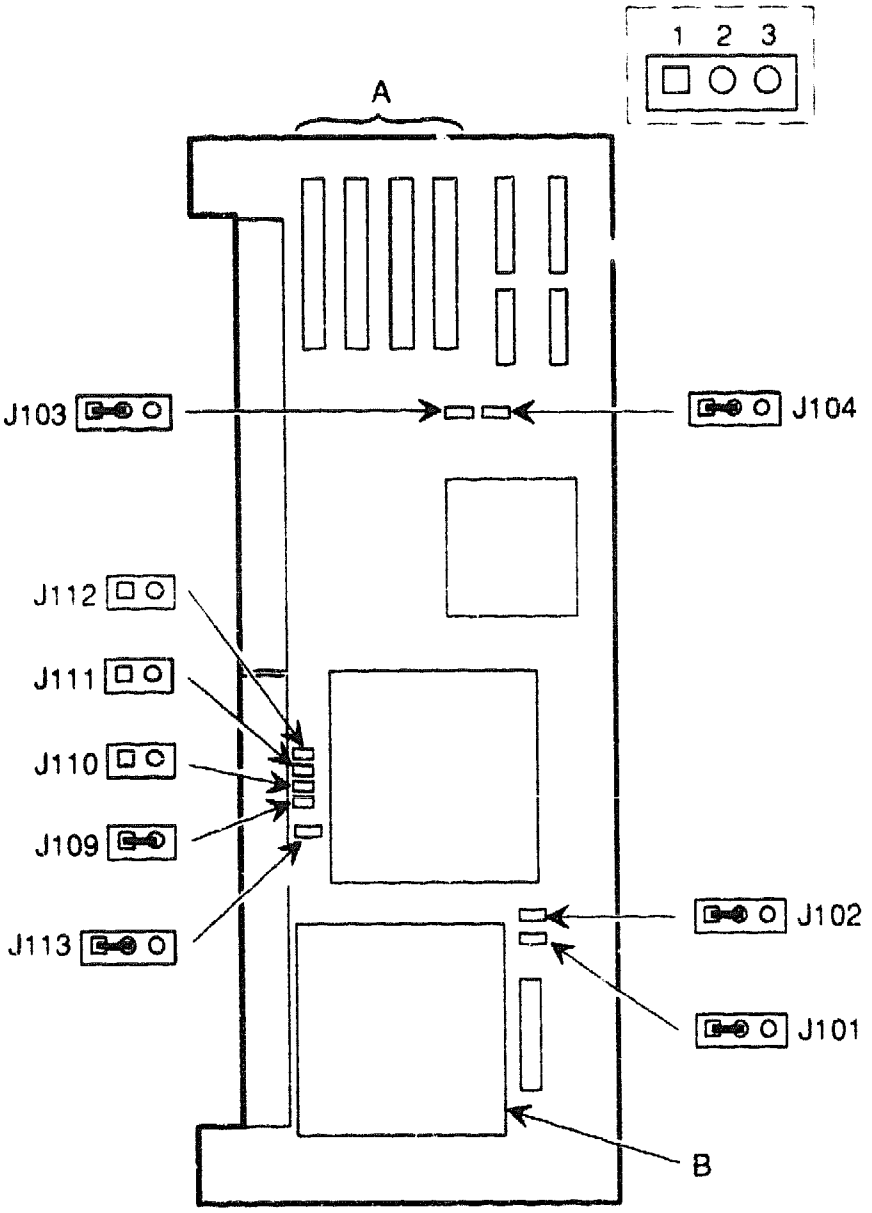


Figure 9-9 - 80486dx2-66 CPU Board

A

Connections

Introduction

This appendix is divided into two parts. The first part looks at the different connectors fitted to the back of a DECpc 300/400 LP series computer and explains the pin assignments for each of these connectors. The second part looks at any special board and device connectors available inside each of the PCs.

Connectors on the Back of a PC

Figure A-1 and Table A-1 show the different connectors fitted to the back of a DECpc 300/400 LP series computer.

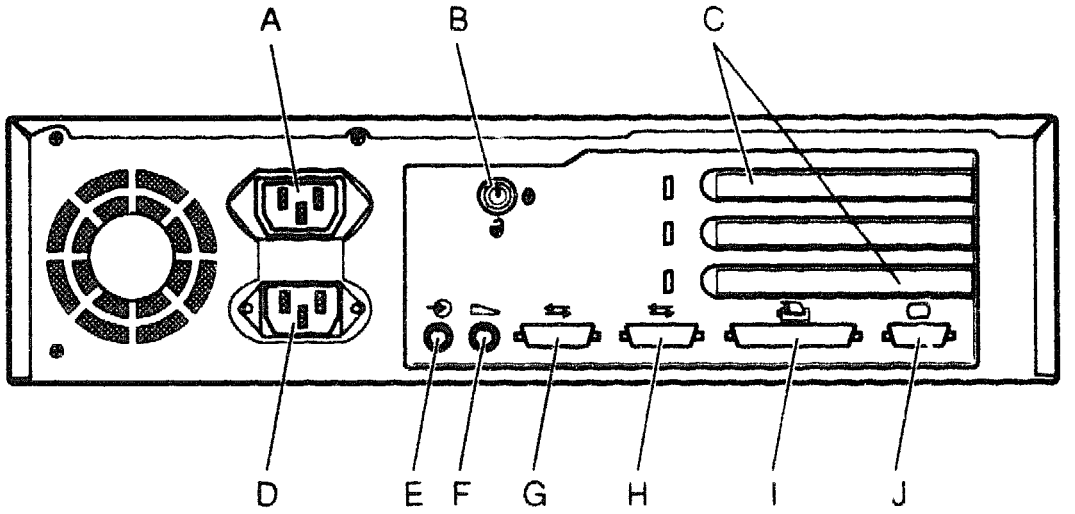


Figure A-1 - Connectors on the Back of a PC

Table A-1 - Rear Panel Connectors

Legend	Connector	Function
A	AC Output Connector	Allows you to connect a monitor to ac power
B	Chassis Lock	Mechanically locks the computer's outside cover to prevent unauthorized access
C	Expansion Board Slots	Allows you to install up to three full-size ISA expansion boards
D	AC Line Connector	Allows you to connect the computer to an ac power source
E	Mouse Connector	Allows you to connect a PS/2-compatible mouse
F	Keyboard Connector	Allows you to connect a 101-key or 102-key keyboard
G	Serial Port Connector	The first of two serial port connectors
H	Serial Port Connector	The second of two serial port connectors
I	Parallel Port Connector	Allows you to connect an industry-standard parallel printer
J	Analog Video Connector	Provides the interface between the onboard graphics controller and a supported monitor

Figures A-2 to A-5 show each of the different connectors in detail. Tables A-2 to A-5 list the pin assignments for these different connectors.

Serial Connector

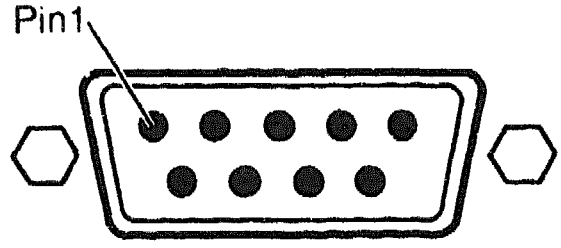


Figure A-2 - Serial Interface Connector

Table A-2 - Serial Interface Pin Assignments

Pin No.	Function
1	Carrier Detect
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request To Send
8	Clear To Send
9	Ring Indicator

Parallel Connector

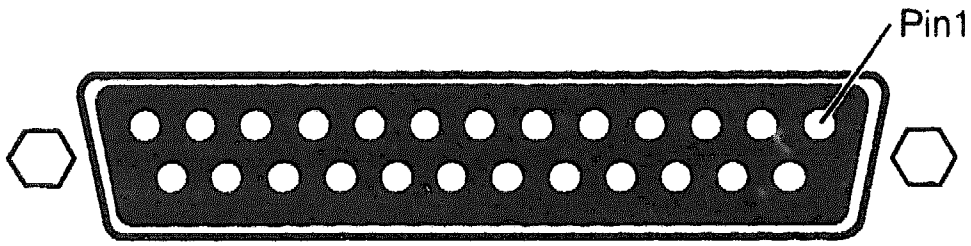


Figure A-3 - Parallel Interface Connector

Table A-3 - Parallel Interface Pin Assignments

Pin No.	Function	Pin No.	Function
1	Strobe *	10	Acknowledge *
2	Data Bit 0	11	Busy
3	Data Bit 1	12	Paper End
4	Data Bit 2	13	Select
5	Data Bit 3	14	Auto Feed *
6	Data Bit 4	15	Error *
7	Data Bit 5	16	Initialize *
8	Data Bit 6	17	Select In *
9	Data Bit 7	18 - 25	Ground

* low TRUE logic.

VGA Connector

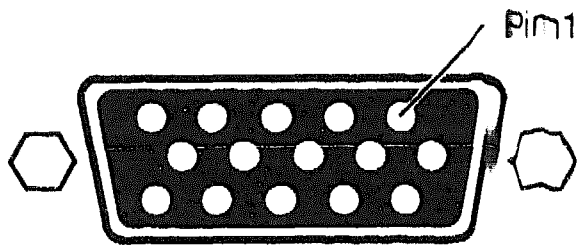


Figure A-4 - VGA Interface Connector

Table A-4 - VGA Connector Pin Assignments

Pin No.	Function	Pin No.	Function
1	Red video	9	Key (no pin)
2	Green video	10	Sync Return (ground)
3	Blue video	11	Monitor ID Bit 0 (not used)
4	Monitor ID Bit 2 (not used)	12	Monitor ID Bit 1 (not used)
5	Ground	13	Horizontal Sync
6	Red Return (ground)	14	Vertical Sync
7	Green Return (ground)	15	Not used
8	Blue Return (ground)		

Keyboard and Mouse Connectors

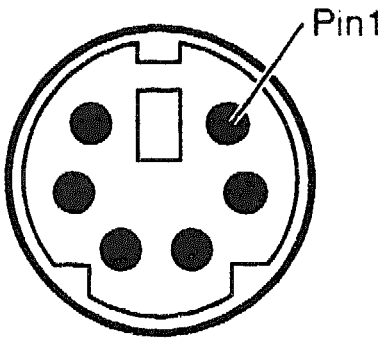


Figure A-5 - Keyboard and Mouse Connectors

Table A-5 - Keyboard and Mouse Pin Assignments

Pin No.	Function
1	Data
2	Reserved
3	Ground
4	+5V DC
5	Clock
6	Reserved

Special Connectors Inside a PC

Figure A-6 shows the VESA connector available inside all DECpc 300/400 LP series computers.
Table A-6 lists the pin assignments for this connector.

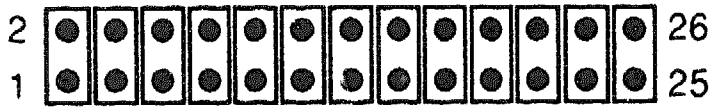


Figure A-6 - VESA Interface Connector

Table A-6 - VESA Connector Pin Assignments

Pin No.	Function	Pin No.	Function
1	Ground	14	Pixel Data 0
2	Ground	15	Pixel Data 1
3	Ground	16	Pixel Data 2
4	N/C (1)	17	Pixel Data 3
5	N/C (2)	18	Pixel Data 4
6	N/C (3)	19	Pixel Data 5
7	N/C (not used)	20	Pixel Data 6
8	Ground	21	Pixel Data 7
9	Ground	22	Pixel Clock
10	Ground	23	Blanking
11	Ground	24	Horizontal Sync
12	N/C (not used)	25	Vertical Sync
13	N/C (key)	26	Ground

B

I/O Addresses, Interrupts, Memory Map

Introduction

This appendix lists information about the I/O addresses and interrupts used by a PC. It also contains the memory map of a DECpc 300/400 LP series computer.

Tables B-1 and B-2 show the I/O addresses and interrupt levels used by all DECpc 300/400 LP series computers. Table B-3 shows the memory map of a DECpc 300/400 LP series PC.

I/O Addresses

Table B-1 - I/O Address Map

Range (in hex)	Function
000:00F	DMA controller one
020:021	Interrupt controller one
022	Index register (82C206, 82C496, 82C497)
023	Data register (82C206)
024	Data register (82C496, 82C497)
040:043	Inteval timer
060:06F	Keyboard controller
070:07F	Real-time Clock (RTC), NMI
080:08F	DMA page register
0A0:0A1	Interrupt controller two
0C0:0CF	DMA controller two
0F0	Clear math coprocessor busy
0F1	Reset math coprocessor
0F8:0FF	Math coprocessor
1F0:1F8	IDE controller
2F8:2FF	COM2
378:37F	LPT
3B0:3DF	VGA registers
3F0:3F7	Diskette controller
3F6:3F7	IDE controller (alt status, device address)
3F8:3FF	COM1
46E8	VGA enable register

Interrupts

Table B-2 - Computer Interrupt Levels

Priority	Interrupt Controller	Interrupt Number	Interrupt Source
1	1	IRQ0	Timer tick
2	1	IRQ1	Keyboard controller
	1	IRQ2	Cascade interrupt
3	2	IRQ8	Real-time clock (RTC)
4	2	IRQ9	Reserved
5	2	IRQ10	Reserved
6	2	IRQ11	Reserved
7	2	IRQ12	Mouse interrupt
8	2	IRQ13	Math coprocessor
9	2	IRQ14	Hard disk drive
10	2	IRQ15	Reserved
11	1	IRQ3	COM2
12	1	IRQ4	COM1
13	1	IRQ5	Reserved
14	1	IRQ6	Diskette drive
15	1	IRQ7	LPT

Memory Map

Table B-3 - Memory Map

Address Range	Function	Size
0h to 9FFFFh	Base memory	640 KB
A0000h to BFFFFh	Video RAM	128 KB
C0000h to C7FFFh	VGA BIOS	32 KB
C8000h to DFFFFh	BIOS extension ROM (AT bus usage)	96 KB
E0000h to EFFFFh	Reserved	64 KB
F0000h to FFFFFh	Computer BIOS	64 KB
100000h to 3FFFFFFFh	Extended memory	63 MB

C

Specifications

Introduction

This appendix contains general information about all DECpc 300/400 LP series computers.

Specifications

Table C-1 - Computer Dimensions

Dimension	Specification
Width	15.67 inches (39.8 cm)
Length	16.14 inches (41 cm)
Height(1)	3.62 inches (9.2 cm)
Weight(1)	20.94 pounds (9.5 kg)

(1) With chassis feet attached

Table C-2 - Computer Environmental Specifications

Attributes	Specification
Operating temperature	10 ° C to 40 ° C (50 ° F to 104 ° F)
Storage temperature	–20 ° C to 65 ° C (–4 ° F to 149 ° F)
Operating humidity (non-condensing)	10% to 90% relative humidity, max wet bulb 40 ° C
Storage humidity (non-condensing)	5% to 95% relative humidity, max wet bulb 65 ° C
Altitude	
Operating	8,000 feet (2,438 m) maximum
Non-operating	16,000 feet (4,876 m) maximum
Maximum idle noise	40 dB at operator's position
Shipping vibration	IAW Federal Standard 101, method 5019
Non-operating shock	30 G, 25 ms halfsine

Table C-3 - Acoustics: Preliminary Declared Values per ISO 9296 and ISO 7779(1)

	LwAd	LpAm(2)
Fans only idle mode	3.4 bels @ 23° C 3.9 bels @ 27° C	36 dBA
Fans and disk drives idle mode	4.0 bels @ 23° C 4.7 bels @ 27° C	40 dBA

(1) Current values for specific configurations are available from Digital representatives
(2) Operator position

Table C-4 - Computer Input Power Requirements

Rated Voltage Range	Maximum Range	Maximum Input Current(1)	Operating Frequency Range
100 - 120 V ac	88 - 132 V ac	6 A	47 - 63 Hz
200 - 240 V ac	176 - 264 V ac	3.5 A	47 - 63 Hz

(1) Includes outlet current

D

Display Modes

Introduction

This appendix lists the different display modes supported by the video controllers installed in DECpc 300/400 LP series computers.

There are two different types of video controller:

- The video controller installed in the DECpc 333sxLP.
- The video controller installed in all other DECpc 300/400 series computers.

These controllers support a variety of different display modes. The tables below list information about these different controllers.

Display Modes

DECpc 333sxLP

The VGA controller installed in this PC supports a variety of different display modes with resolutions from 640 x 480 pixels to 1280 x 1024 pixels. Some of these modes can be used with the standard 512KB of DRAM supplied with each PC. Other modes need 1MB of DRAM. Table D-1 shows you whether or not you need to install additional DRAM to use a particular mode. For example, looking at the table you can see that to use a mode with a resolution of 800 x 600 pixels that offers 256 colours, you need to add the extra 512KB of DRAM to the PC.

Table D-1 - DRAM Needed

Resolution	0.5 MB DRAM	1 MB DRAM	Colours
640 x 480	X (NI)	X (NI)	256
640 x 480		X (NI)	64k
640 x 480		X (NI)	16 million
800 x 600	X (NI)	X (NI)	16
800 x 600		X (NI)	256
1024 x 768	X (I/NI)	X (I/NI)	16
1024 x 768 *		X (I/NI)	256
1280 x 1024 *		X (I)	16

I = Interlaced (43 Hz) * NI = Non-interlaced (60/70Hz)
NI = Non-interlaced (60/72Hz)

Table D-2 lists the different modes offered by the VGA controller.

Table D-2 - Standard VGA Modes

Mode No.	VESA No.	Colors (K)	Char/ Row	Char/ Cell	Screen Format	Display Mode	Pixel Freq (MHz)	Horiz Freq (Khz)	Vert Freq (Hz)
0,1	0,1	16/256	40x25	9x16	360x400	Text	14	31.5	70
2,3	2,3	16/256	80x25	9x16	720x400	Text	28	31.5	70
4,5	4,5	4/256	40/25	8x8	320x200	Graphics	12.5	31.5	70
6	6	2/256	80x25	8x8	640x200	Graphics	25	31.5	70
7	7	Mono	80x25	9x16	720x400	Text	28	31.5	70
D	D	16/256	40x25	8x8	320x200	Graphics	12.5	31.5	70
E	E	16/256	80x25	8x14	640x200	Graphics	25	31.5	70
F	F	Mono	80x25	8x14	640x360	Graphics	25	31.5	70
10	10	16/256	80x25	8x14	640x360	Graphics	25	31.5	70
11	11	2/256	80x30	8x16	640x480	Graphics	25	31.5	60
12	12	16/256	30x30	8x16	640x480	Graphics	25	31.5	60
12+	12+	16/256	30x30	8x16	640x480	Graphics	31.5	37.9	72
13	13	256/256	40x25	8x8	320/200	Graphics	12.5	31.5	70

Table D-2 - Extended VGA Modes

Mode No.	VESA No.	Colors (K)	Char/ Row	Char/ Cell	Screen Format	Display Mode	Pixel Freq (MHz)	Horiz Freq (Khz)	Vert Freq (Hz)
54	10A	16/256	132x43	8x8	1056x350	Text	41.5	31.5	70
55	109	16/256	132x25	8x14	1056x350	Text	41.5	31.5	70
58,6A	102	16/256	100x37	8x16	800x600	Graphics	36	35.2	56
58,6A	102	16/256	100x37	8x16	800x600	Graphics	40	37.8	60
58,6A	102	16/256	100x37	8x16	800x600	Graphics	50	48.1	72
5C	103	256/256	100x37	8x16	800x600	Graphics	36	35.2	56
5C	103	256/256	100x37	8x16	800x600	Graphics	40	37.9	60
5C	103	256/256	100x37	8x16	800x600	Graphics	50	48.1	72
5D	104	16/256	128x48	8x16	1024x768	Graphics	65	48.3	60
5D	104	16/256	128x48	8x16	1024x768	Graphics	75	56	70
5D(1)	104	16/256	128x48	8x16	1024x768	Graphics	44.9	35.5	87(1)
5F	101	256/256	80x30	8x16	640x480	Graphics	25	31.5	60
5F	101	256/256	80x30	8x16	640/480	Graphics	25	31.5	72
60(1)	105	256/256	128x48	8x16	1024x768	Graphics	44.9	35.5	87(1)
60	105	256/256	128x48	8x16	1024x768	Graphics	65	48.3	60
60	105	256/256	128x48	8x16	1024x768	Graphics	75	56	70
64	111	64			640/480	Graphics	25	31.5	60
64	111	64			640x480	Graphics	31.5	37.9	72
65	114	64			800x600	Graphics	36	35.2	58
66	110	32(2)			640x480	Graphics	25	31.5	60
66	110	32(2)			640x480	Graphics	31.5	37.9	72
67	113	32(2)			800x600	Graphics	36	31.5	56
6C(1)	106	16/256	160x64	8x16	1280x1024	Graphics	75	48	87(1)
6F	10E	64	40x25	8x8	320x200	Graphics	12.5	31.5	70
70	10F	16 M	40x25	8x8	320x200	Graphics	12.5	31.5	70
71	112	16 M	80x30	8x16	640x480	Graphics	25	31.5	60

(1) Character stands for interlaced mode
(2) Character stands for 32 KB direct-color/256-color mixed mode

DECpc 340dxLP, 425sxLP, 433dxLP, 450D2LP, 466D2LP

The VGA controller installed in these PCs supports a variety of different display modes with resolutions from 640 x 480 pixels to 1280 x 1024 pixels. Some of these modes can be used with the standard 512KB of VRAM supplied with each PC. Other modes need 1MB of VRAM. Table D-3 shows you whether or not you need to install additional VRAM to use a particular mode. For example, looking at the table you can see that to use a mode with a resolution of 800 x 600 pixels that offers 64 colours, you need to add the extra 512KB of VRAM to the PC.

Table D-3 - VRAM Needed

Resolution	0.5 MB VRAM	1 MB VRAM	Colours
640 x 480	X (NI)	X (NI)	256
640 x 480		X (NI)	64k
800 x 600	X (NI)	X (NI)	16
800 x 600		X (NI)	64
1024 x 768	X (I/NI)	X (I/NI)	16
1024 x 768 *		X (I/NI)	256
1280 x 1024 *		X (I)	16

I = Interlaced (43 Hz) * NI = Non-interlaced (60/70Hz)
NI = Non-interlaced (60/72Hz)

Table D-4 lists the different modes offered by the VGA controller.

Table D-4 - Standard VGA Modes

Mode No.	Display Mode	Screen Resolution	Colors	Buffer Start	Sweep Refresh Rate	External Clock
00	Text	40 × 25	b/w	B8000	31.5 KHz/70 Hz	25.175 MHz
00*	Text	40 × 25	b/w	B8000	31.5 KHz/70 Hz	25.175 MHz
00+	Text	40 × 25	b/w	B8000	31.5 KHz/70 Hz	28.322 MHz
01	Text	40 × 25	16	B8000	31.5 KHz/70 Hz	25.175 MHz
01*	Text	40 × 25	16	B8000	31.5 KHz/70 Hz	25.175 MHz
01+	Text	40 × 25	16	B8000	31.5 KHz/70 Hz	28.322 MHz
02	Text	80 × 25	b/w	B8000	31.5 KHz/70 Hz	25.175 MHz
02*	Text	80 × 25	b/w	B8000	31.5 KHz/70 Hz	25.175 MHz
02+	Text	80 × 25	b/w	B8000	31.5 KHz/70 Hz	28.322 MHz
03	Text	80 × 25	16	B8000	31.5 KHz/70 Hz	25.175 MHz
03*	Text	80 × 25	16	B8000	31.5 KHz/70 Hz	25.175 MHz
03+	Text	80 × 25	16	B8000	31.5 KHz/70 Hz	28.322 MHz
04	Graphics	320 × 200	4	B8000	31.5 KHz/70 Hz	25.175 MHz
05	Graphics	320 × 200	4	B8000	31.5 KHz/70 Hz	25.175 MHz
06	Graphics	640 × 200	2	B8000	31.5 KHz/70 Hz	25.175 MHz
07	Text	80 × 25	Mono	B0000	31.5 KHz/70 Hz	28.322 MHz
07+	Text	80 × 25	Mono	B0000	31.5 KHz/70 Hz	28.322 MHz
0D	Graphics	320 × 200	16	A0000	31.5 KHz/70 Hz	25.175 MHz
0E	Graphics	640 × 200	16	A0000	31.5 KHz/70 Hz	25.175 MHz
0F	Graphics	640 × 350	Mono	A0000	31.5 KHz/70 Hz	25.175 MHz
10	Graphics	640 × 350	16	A0000	31.5 KHz/70 Hz	25.175 MHz
11	Graphics	640 × 480	2	A0000	31.5 KHz/70 Hz	25.175 MHz
12	Graphics	640 × 480	16	A0000	31.5 KHz/70 Hz	25.175 MHz
13	Graphics	320 × 200	256	A0000	31.5 KHz/70 Hz	25.175 MHz

Table D-4 - Extended VGA Modes

Mode No.	Display Mode	Screen Resolution	Colors	Buffer Start	Sweep Refresh Rate	External Clock
54	Text	132 × 43	16	B8000	37.9 KHz/60 Hz	40.000 MHz
55*	Text	132 × 25	16	B8000	37.9 KHz/60 Hz	40.000 MHz
101+	Graphics	640 × 480	256	A0000	31.5 KHz/60 Hz	25.175 MHz
101	Graphics	640 × 480	256	A0000	37.9 KHz/72 Hz	31.500 MHz
102*	Graphics	800 × 600	16	A0000	31.5 KHz/56 Hz	36.000 MHz
102+	Graphics	800 × 600	16	A0000	37.9 KHz/60 Hz	40.000 MHz
102	Graphics	800 × 600	16	A0000	48.1 KHz/72 Hz	50.000 MHz
103*	Graphics	800 × 600	256	A0000	31.5 KHz/56 Hz	36.000 MHz
103+	Graphics	800 × 600	256	A0000	37.9 KHz/60 Hz	40.000 MHz
103	Graphics	800 × 600	256	A0000	48.1 KHz/72 Hz	50.000 MHz
104*	Graphics	1024 × 768	16	A0000	35.5 KHz/43 Hz(1)	44.900 MHz
104+	Graphics	1024 × 768	16	A0000	48.4 KHz/60 Hz	65.000 MHz
104	Graphics	1024 × 768	16	A0000	56.5 KHz/72 Hz	75.000 MHz
105	Graphics	1024 × 768	256	A0000	35.5 KHz/43 Hz(1)	44.900 MHz
105	Graphics	1024 × 768	256	A0000	48.4 KHz/60 Hz	65.000 MHz
105	Graphics	1024 × 768	256	A0000	56.5 KHz/72 Hz	75.000 MHz
110	Graphics	640 × 480	32768	A0000	31.5 KHz/60 Hz	50.000 MHz
111	Graphics	640 × 480	65535	A0000	31.5 KHz/60 Hz	50.000 MHz
112	Graphics	640 × 480	16.7 M	A0000	31.5 KHz/60 Hz	75.000 MHz
201	Graphics	640 × 480	256	A0000	31.5 KHz/60 Hz	25.175 MHz
201	Graphics	640 × 480	256	A0000	37.9 KHz/72 Hz	31.500 MHz
202	Graphics	800 × 600	16	A0000	31.5 KHz/56 Hz	36.000 MHz
202	Graphics	800 × 600	16	A0000	37.9 KHz/60 Hz	40.000 MHz
202	Graphics	800 × 600	16	A0000	48.1 KHz/72 Hz	50.000 MHz
203	Graphics	800 × 600	256	A0000	31.5 KHz/56 Hz	36.000 MHz
203	Graphics	800 × 600	256	A0000	37.9 KHz/60 Hz	40.000 MHz
203	Graphics	800 × 600	256	A0000	48.1 KHz/72 Hz	50.000 MHz
204	Graphics	1024 × 768	16	A0000	35.5 KHz/43 Hz(1)	44.900 MHz

Table D-4 - Extended VGA Modes

Mode No.	Display Mode	Screen Resolution	Colors	Buffer Start	Sweep Refresh Rate	External Clock
204	Graphics	1024 × 768	16	A0000	48.4 KHz/60 Hz	65.000 MHz
204	Graphics	1024 × 768	16	A0000	56.5 KHz/70 Hz	75.000 MHz
205	Graphics	1024 × 768	256	A0000	35.5 KHz/ 43 Hz(1)	44.900 MHz
205	Graphics	1024 × 768	256	A0000	48.4 KHz/60 Hz	65.000 MHz
210	Graphics	640 × 480	32768	A0000	31.5 KHz/60 Hz	50.000 MHz
211	Graphics	640 × 480	65535	A0000	31.5 KHz/60 Hz	50.000 MHz
212	Graphics	640 × 480	16.7 M	A0000	31.5 KHz/60 Hz	75.000 MHz
301	Graphics	640 × 480	32768	A0000	31.5 KHz/60 Hz	50.000 MHz

E

Options and FRUs

Introduction

This appendix lists the DEC specific options and Field Replaceable Units (FRUs) available for the DECpc 300 LP and DECpc 400 LP series of Personal Computers.

Options and FRUs

Figure E-1 and Table E-1 show you where you can find the different options and FRUs inside a DECpc 300/400LP series computer. Tables E-2 to E-9 list the different options and FRUs.

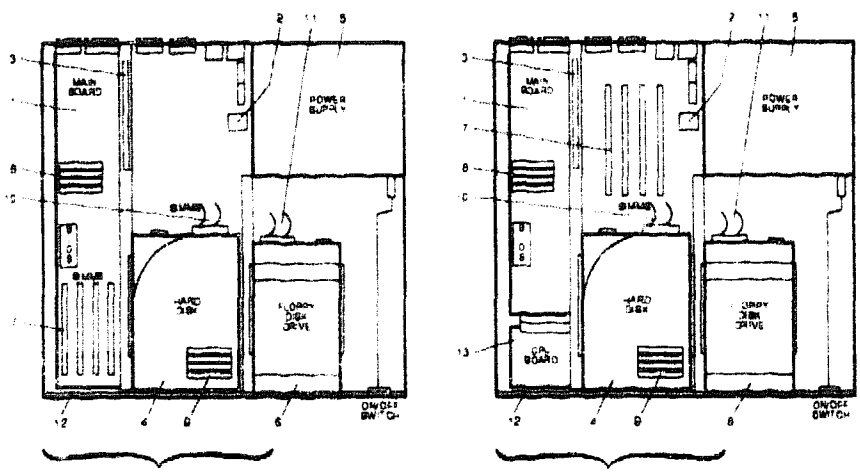


Figure E-1 - Location of Options and FRUs

Table E-1 - Location of Options and FRUs

Number	Option or FRU
1	Main Board
2	Battery
3	Expansion BUS Board
4	Hard Disk Drive
5	Power Supply Unit
6	Floppy Disk Drive
7	System Memory
8	Video Memory
9	Secondary Cache Memory
10	Cable Assembly for Hard Disk Drives
11	Cable Assembly for Floppy Disk Drives
12	Front Panel Assembly
13	CPU Board (Not the DECpc 333sxLP)

System Memory, Video Memory and Secondary Cache Memory

Table E-2 - System Memory, Video Memory and Secondary Cache Memory

DEC Part Number	Option Description
ME522-BE	1 MB (1M x 9), 70ns SIMM - system memory
ME522-FE	2 x 1 MB, 70ns SIMM - system memory
ME542-BE	4 MB (4M x 9), 70ns SIMM - system memory
ME542-FE	2 x 4 MB, 70ns SIMM - system memory
ME524-DE	4 MB, 70ns, SIMM - system memory
ME544-DE	16 MB, 70ns, SIMM - system memory
PC74M-CA	512 KB VRAM, 80ns, DIP - video memory
PC73M-CA	512 KB DRAM, 70ns video memory (DECpc 333sxLP only)
PC74M-BA	128KB SRAM, 20ns, DIP - cache memory

Floppy Disk Drives and Hard Disk Drives

Table E-3 - Floppy Disk Drives and Hard Disk Drives

DEC Part Number	Option Description
PC7XR-CA	52 MB IDE Hard Disk
RE23L-E	122 MB IDE Hard Disk
RE24L-E	245 MB IDE Hard Disk
PC7XR-AA	3.5" 1.44 MB Floppy Disk
PC7XR-BA	5.25" 1.2 MB Floppy Disk
17-03460-02	Cable Assembly, 34, Cond, Flat, 17 (2 x 17) - IDE Connector Cable
17-03461-01	Cable Assembly, 40, Cond, Flat - Floppy Connector Cable

Main Boards, CPU Boards and Processors

Table E-4 - Main Boards, CPU Boards and Processors

DEC Part Number	Option Description
54-22032-01	DECpc 333sxLP Main Board with Cache Assembly
54-22042-01	DECpc 340dxLP, 425sxLP, 433dxLP, 450D2LP and 466D2LP Main Board.
54-22040-01	DECpc 425sxLP CPU Board
54-22036-01	DECpc 433dxLP CPU Board
54-22036-02	DECpc 450D2LP CPU Board
54-22036-04	DECpc 466D2LP CPU Board
54-22038-02	DECpc 340dxLP CPU Board
PC73P-DA	Cyrix Coprocessor for DECpc 333sxLP
PC73P-FA	Cyrix Coprocessor for DECpc 340dxLP

Monitors

Table E-5 - US Monitors

DEC Part Number	Option Description
PC7XV-KA	Monochrome Monitor, 120V/60HZ, N
PC7XV-KC	Monochrome Monitor, 120V/60HZ, S
PC7XV-KB	Monochrome Monitor, 240V/50HZ, N
PC7XV-KD	Monochrome Monitor, 240V/50HZ, S
PC7XV-LB	Monochrome Monitor, 240V/50HZ, N, Low Radiation
PC7XV-LD	Monochrome Monitor, 240V/50HZ, S, Low Radiation
PC7XV-AA	640 x 480 0.39mm VGA Color Monitor, N, 120V/60HZ
PC7XV-AC	640 x 480 0.39mm VGA Color Monitor, S, 120V/60HZ
PC7XV-AB	640 x 480 0.39mm VGA Color Monitor, N, 240V/50HZ
PC7XV-AD	640 x 480 0.39mm VGA Color Monitor, S, 240V/50HZ
PC7XV-BA	640 x 480 0.29mm VGA Color Monitor, N, 120V/60HZ
PC7XV-BC	640 x 480 0.29mm VGA Color Monitor, S, 120V/60HZ
PC7XV-BB	640 x 480 0.29mm VGA Color Monitor, N, 240V/50HZ
PC7XV-BD	640 x 480 0.29mm VGA Color Monitor, S, 240V/50HZ
PC7XV-EA	640 x 480 0.28mm Color Monitor, Low Radiation, N, 240V/50HZ
PC7XV-EC	640 x 480 0.28mm Color Monitor, Low Radiation, S, 240V/50HZ
PC7XV-CA	640 x 480 0.28mm SVGA International Monitor, N, 120V/240V
PC7XV-CC	640 x 480 0.28mm SVGA International Monitor, S, 120V/240V

Table E-5 - US Monitors (continued)

DEC Part Number	Option Description
PC7XV-DA	640 x 480 0.28mm SVGA Non-I/laced Monitor, N, 120V/240V
PC7XV-DC	640 x 480 0.28mm SVGA Non-I/laced Monitor, S, 120V/240V
PC7XV-DE	640 x 480 0.28mm SVGA Non-I/laced Monitor, Low Radiation, N, 120V/240V
PC7XV-DG	640 x 480 0.28mm SVGA Non-I/laced Monitor, Low Radiation, S, 120V/240V
PCXAV-EA	1024 x 768 16" Color Monitor
PCXAV-AA	1280 x 1024 19" Monochrome Monitor
PCXAV-BA	1280 x 1024 19" Color Monitor
PCXAV-DA	1280 x 1024 19" Color Trinitron
PCXAV-CA	1280 x 1024 16" Color Trinitron

Table E-6 - European Monitors

DEC Part Number	Option Description
PCXCV-A3	640 x 480 VGA Monochrome Monitor 60Hz
PC6XV-C3	640 x 480 VGA Monochrome Monitor 60Hz
PCXAV-A3	1280 x 1024 20" Hi-Res Monochrome Monitor 72Hz
PCXBV-A3	1024 x 768 VGA+ Color Monitor 60Hz, 640 x 480 VGA+ Color Monitor 60/70Hz
PCXBV-BC	1024 x 768 VGA+ Color Monitor 72Hz, 640 x 480 VGA+ Color Monitor 60/70Hz, 640 x 480 VGA+ Color Monitor 72Hz
PCXAV-C3	1280 x 1024 Hi-Res 17" Color Monitor 66Hz, 1280 x 1024 Hi-Res 17" Color Monitor 72Hz
PCXAV-BC	1280 x 1024 Hi-Res 19" Color Monitor 72Hz
PCXAV-D3	1280 x 1024 Hi-Res 19" Color Monitor 66Hz, 1280 x 1024 Hi-Res 19" Color Monitor 72Hz

Keyboards and Mice

Table E-7 - US Keyboards and Mice

DEC Part Number	Option Description
PC7XL-AA	PS/2 Keyboard - US
PC7XL-AC	PS/2 Keyboard - CANADA/FRENCH
PC7XL-AE	PS/2 Keyboard - UK
PC7XL-AG	PS/2 Keyboard - GERMAN
PC7XL-AP	PS/2 Keyboard - FRENCH
PC7XL-AS	PS/2 Keyboard - SPANISH
PC7XL-AT	PS/2 Keyboard - HEBREW
PC7XL-AV	PS/2 Keyboard - PORTUGESE
PC7XL-BI	PS/2 Keyboard - TRADITIONAL CHINESE
PC7XL-BK	PS/2 Keyboard - KOREAN
PC7XL-CB	PS/2 Keyboard - THAILAND
PC7XS-AA	PS/2 2-Button Mouse

Table E-8 - European Keyboards and Mice

DEC Part Number	Option Description
PCXAL-LR	PS/2 Keyboard - ARABIC
PCXAL-KB	PS/2 Keyboard - BELGIAN
PCXAL-LM	PS/2 Keyboard - BULGARIAN
PCXAL-LV	PS/2 Keyboard - CZECHOSLOVAKIAN
PCXAL-KD	PS/2 Keyboard - DANISH
PCXAL-KH	PS/2 Keyboard - DUTCH
PCXAL-KA	PS/2 Keyboard - ENGLISH (AMERICAN)
PCXAL-KE	PS/2 Keyboard - ENGLISH (BRITISH)
PCXAL-MR	PS/2 Keyboard - FARSI-IRANIAN
PCXAL-MA	PS/2 Keyboard - FINNISH
PCXAL-KP	PS/2 Keyboard - FRENCH
PCXAL-KG	PS/2 Keyboard - GERMAN
PCXAL-LH	PS/2 Keyboard - GREEK
PCXAL-KT	PS/2 Keyboard - HEBREW
PCXAL-LQ	PS/2 Keyboard - HUNGARIAN
PCXAL-MQ	PS/2 Keyboard - ICELANDIC
PCXAL-KI	PS/2 Keyboard - ITALIAN
PCXAL-KN	PS/2 Keyboard - NORWEGIAN
PCXAL-LP	PS/2 Keyboard - POLISH
PCXAL-KV	PS/2 Keyboard - PORTUGUESE
PCXAL-LL	PS/2 Keyboard - ROMANIAN
PCXAL-LT	PS/2 Keyboard - RUSSIAN
PCXAL-LY	PS/2 Keyboard - SERBIAN

Table E-8 - European Keyboards and Mice (continued)

PCXAL-MZ	PS/2 Keyboard - SLOVAK
PCXAL-KS	PS/2 Keyboard - SPANISH
PCXAL-MA	PS/2 Keyboard - SWEDISH
PCXAL-MH	PS/2 Keyboard - SWISS
PCXAL-LU	PS/2 Keyboard - TURKISH Q
PCXAL-MU	PS/2 Keyboard - TURKISH F

Miscellaneous Options

Table E-9 - Miscellaneous Options

DEC Part Number	Option Description
30-37796-01	Expansion BUS Board
-PC7XH-GA	Alkaline Battery, 4.5V, 600 mAH
12-37977-01	Mechanical Lock Assembly for Main Module
12-37977-02	Master Key
30-38882-01	145W Power Supply
70-30563-01	Bottom Assembly
70-30562-01	Top Cover Assembly
70-30011-02	Front Panel Sub-assembly
22-00908-03	QA PLUS - Field Engineer Version
22-00908-01	QA PLUS - Customer Version