digital

Service Maintenance Manual

DECpc LP PC

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MCS LOGISTICS
ENGINEERING
-
NIJMEGEN
THE NETHERLANDS

March 1996

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Created by:
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Revision History

Revision	*Date*	*Description of Change*
Revision A01	March 96	First release of the Service Maintenance Manual describing the DECpc LP series computer.

Preface

The DECpc LP Service Maintenance Manual is a troubleshooting guide that can be used for reference when servicing the DECpc LP line of PC's.
Digital Equipment Corporation reserves the right to make changes to the DECpc LP series without notice. Accordingly, the diagrams and procedures in this document may not apply to the computer(s) to be serviced since many of the diagnostic tests are designed to test more than one product.

CAUTION

Digital recommends that only A+ certified engineers attempt to repair this equipment. All troubleshooting and repair procedures are detailed to support subassembly/module level exchange. Because of the complexity of the indivual boards and subassemblies, no one should attempt to make repairs at component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard. Any indications of component replacement or printed wiring board modifications may void warranty or exchange allowances.

Chapter 1 Product Description

Product Introduction

DECpc LP Series computers are a family of high-performance, low-profile personal computers equipped with the latest microprocessor technology. They can be used as stand-alone computers, as clients, or as servers in an office network environment. Developed using modular CPU technology, along with a host of high-performance options, DECpc LP computers are the most advanced low-profile desktop computers in their class.

All DECpc LP computers are industry-standard Intel i486 PCs using a versatile low-profile enclosure.

DECpc LP features:

- Three ISA expansion slots
- OPTI 496/497 ISA chip set
- Dual IDE hard disk drive interface
- Intel 80486sx/dx/d2 processor
- 2MB system RAM, expandable up to 64MB on motherboard
- Optional external cache memory expandable to 64KB
- 32-bit local bus SVGA controller with GUI accelerator and 512KB VRAM standard
- Additional 512KB VRAM optional
- Supports up to four storage devices

Product Models Information

DECpc LP Models Information

Product	*Model*	*FDD*	*HDD*	*Memory*	*Cache*	*Options*
DECpc 333sxLP	PC734-xx	-	-	-		
DECpc 340dxLP	PC736-xx	-	-	-		
DECpc 425sxLP	PC741-xx	-	-	-		
DECpc 433dxLP	PC743-xx	-	-	-		
DECpc 450d2LP	PC744-xx	-	-	-		
DECpc 466d2LP	PC746-xx	-	-	-		

Chapter 2 System Utilities & Configuration

System Utilities

Three utilities and application driver diskettes are supplied with the LP series computer. These diskettes allow to enable the BIOS setup utility and take advantage of the advanced features of the computer's video circuitry.

Diskette 1: System and VGA Utilities

This diskette contains the following files:

- SETUP.COM — Allows to enable the ROM Base Setup option in the BIOS Setup utility.
- SMODE.EXE — Allows to emulate or display non-standard VGA modes.
- KP.EXE — Allows to set a keyboard and mouse password.

NOTE Digital recommends to use SETUP.COM only to enable the computer's BIOS setup utility. Digital does not recommend using SETUP.COM to change computer parameters.

Using the System and VGA Utilities Diskette

The System and VGA Utilities allow to:

- Access the computer's BIOS Setup utility
- Set a keyboard and mouse password
- Emulate or display specific video modes

NOTE If this is the first time using the System Utilities diskette, it is recommended to follow the procedures in the order given.

1) Install any optional hardware, i.e. disk drives, ISA exansion boards, etc.
2) If the operating system was installed at the factory, use its copy diskette function to make a backup copy of the system and VGA utilities diskette. Otherwise use another computer to make a backup copy.
3) Turn on the computer and allow POST to complete.
4) Insert the backup copy of the System and VGA Utilities diskette into drive A.
5) Run SETUP.COM to enable the the computer's BIOS setup utility.
6) Run KP.EXE to set a keyboard and mouse password.
7) If applicable, run SMODE.EXE to emulate or display the desired video mode.
8) Remove the backup copy and then reboot the computer so changes immediately take effect.
9) If required, install the operating system and any application software.

Running SETUP.COM

The SETUP.COM file allows to 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.

NOTE Use SETUP.COM on the System Utilities diskette only when it is necessary to enable the ROM Base Setup option.

To access SETUP.COM:

1) Turn on the computer.
2) Allow the POST to complete. If the POST detects a configuration error, refer to Chapter 4,*"Troubleshooting"* for possible causes and suggested solutions.
3) Insert the backup copy of the System and VGA Utilities diskette into drive A.
4) Type **a:** then press **[Enter]**.
5) Type **setup** then press **[Enter]**. Page 1 of Setup appears.
6) Follow the instructions on the screen to exit SETUP.COM (saving the changes).
7) If applicable copy SETUP.COM to a directory on the hard drive.
8) Remove the backup copy of the System and VGA Utilities diskette from drive A.
9) Reboot the computer.

SMODE.EXE

The SMODE utility allows the main logic board's video circuitry to emulate and display non-standard VGA modes. With SMODE, it is possible to run software applications written for the following non-VGA modes:

- Standard VGA, EGA and MCGA modes with resolutions up to 640 x 480
- Super VGA modes with resolutions up to 1024 x 786 and display text up to 132 col x 43 rows
- CGA, Hercules and MDA modes required by applications designed to run under earlier video standards

The following procedure describes how to access SMODE:

1) Turn on the computer.
2) Allow the POST to complete.
3) Insert the backup copy of the System and VGA Utilities diskette into drive A.
4) Type **a:** and press **[Enter]**.
5) Type **cd\vga_util** and press **[Enter]**.
6) Select the desired video option following the instructions on screen.
7) If applicable, copy the SMODE.EXE file to a directory on the computer's hard disk drive.
8) Remove the System and VGA Utilities diskette from drive A and store it in a safe place.

KP.EXE

KP.EXE is an MS-DOS executable file that allows to set a password for the keyboard and mouse without turning off the computer. When setting this password, the keyboard and mouse can not process any input other than the current keyboard and mouse password. Setting this password secures the computer against unauthorized access while the computer remains turned on.
When a keyboard and mouse password has been set, each time the computer is turned off, the password is deleted. When turning on the computer again, a new keyboard and mouse password have to be set. When a power-on password has been set, the power-on password becomes the keyboard and mouse password.
Keyboard and mouse passwords can have as many as seven upper or lower case keyboard characters and are recorded exactly as they are entered. For example, when using the 6 from the typewriter key section of the keyboard, the 6 from the numeric keypad cannot be substituted.

NOTE When you create a keyboard and mouse password, the characters do not appear on the screen as they are typed. Each time you enter or change a keyboard and mouse password, the characters also do not appear on the screen as they are typed.

Setting a Keyboard and Mouse Password

After copying KP.EXE onto the computer's hard disk, a keyboard and mouse password can be set using the following procedure:

1) At the MS-DOS prompt type **kp** then press **[Enter]**. You are then prompted to enter a password.

NOTE Other applications, such as QEMM386 V6.01, use the character string *kp* to invoke or enable commands. When having such an application installed, add the ***/nic*** parameter when to set a keyboard and mouse password using the Keyboard Password utility.

2) Enter a password then press **[Enter]**. You are then prompted to type the password again to verify it.
3) Enter the password then press **[Enter]**. The keyboard has been locked.
4) To unlock the keyboard, enter the password and press **[Enter]**.

Diskette 1: Windows 3.0/3.1 Drivers

This diskette contains a variety of Windows-compatible video device drivers. To install any of the supplied video device drivers do the following:

1) Make sure the computer is operating as expected.
2) If applicable, install the operating system and any application software.
3) Configure the computer for the desired video mode.
4) Follow the procedures provided in the Microsoft Windows 3.0/3.1 User's Guide to properly install all applicable video device drivers.

Diskette 2: Windows 3.0/3.1 Drivers

This diskette contains a variety of DOS and CAD video application drivers. To install any of the supplied application drivers do the following:

1) Make sure the computer is operating as expected.
2) If applicable, install the operating system.
3) Configure the computer for the desired video mode.
4) Install the DOS or CAD software.
5) Install any DOS or CAD application driver following the procedures in the DOS or CAD software documentation and appropriate README.DOC file.

Configuring the Computer

The information listed below explains how to configure the computer using the BIOS Setup utility. If the computer was delivered with factory-installed software, it has already been configured.
When familiar with utility programs and their uses, refer to the material in the options table while updating the computer. Otherwise, carefully read and understand all the information in these topics before attempting to modify the computer's configuration settings.

Running the BIOS Setup Utility

The BIOS Setup utility enables to select and permanently store information about the computer's hardware and software in the battery-backed memory of CMOS RAM. This information takes effect each time the computer boots and can be changed each time you run setup.
Use the BIOS Setup utility when experiencing problems with the hard disk or when it is necessary to reconfigure the computer. In addition, the BIOS Setup utility should be used to modify the configuration after adding or removing hardware, or changing computer settings.

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.
3) Follow the instructions on screen and any on-line help pop-up screens to configure the computer.

BIOS Setup Utility Options

Menu Field	*Settings*	*Comments*
System time	Current time	Displays the current time.
System date	Current date	Displays the current date.
ROM based setup	Enabled Disabled	Enables or disables the ROM base setup utility. **Note**: 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.
Language	English Français Deutsch Italiano Español	Sets the desired language. **Note:** You must exit the BIOS setup utility and reboot the computer to get the setup screens to display the desired language.
Diskette A / Diskette B	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	Sets the size and density of diskette drives.
Hard disk 1 / hard disk 2	Drive types 1 through 49	Enables hard drive size and specific parameters from a predetermined list of drive types. Drive types 2 and 3 or 48 and 49 are user definable for hard drives not listed in the BIOS drive table. Caution: It is essential to specify the correct IDE hard disk type because the main logic board's BIOS cannot independently verify this information. The BIOS will not recognize the installed IDE hard disk if the drive type is incorrect. **Note**: Choose types 48 and 49, unless there is a conflict with the network; in that case select types 2 and 3. If you select types 2 and 3 make sure to shadow the main board's BIOS. **Note:** If the primary bootable device is a SCSI device, set both hard disk options to NOT INSTALLED.
Base memory	640 KB	Displays the size of base (conventional) memory. **Note**: The main logic 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 shadow main logic board BIOS, video BIOS, or for other computer use. 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.
Extended memory	Not user selectable	Displays the current amount of extended memory.

BIOS Setup Utility Options (continued)

Menu Field	*Settings*	*Comments*
Video card	VGA or EGA CGA 40 Col CGA 80 Col Monochrome Not Installed	Sets the video controller type.
Keyboard	Installed Not Installed	Enables or disables the keyboard when using the computer as a network server. **Note**: The computer must initially be set up with a keyboard.
NumLock on boot	On Off	Enables or disables the NumLock feature each time the computer boots.
Password	Not Installed Installed	Enables or disables a power-on password.
Parallel port	Enabled at: 378h-37Ah (IRQ7) 278h-27Ah (IRQ7) 3BCh-3BEh (IRQ7) Disabled Bi-directional mode Compatible mode	Enables or disables any desired onboard printer port at the specified address. Allows to select between standard printer and bi-directional applications.
Serial port 1	Enabled as COM1: 3F8h-3FFh (IRQ4) Enabled as COM2: 2F8h-2FFh (IRQ3) Enabled as COM3: 3E8h-3EFh (IRQ4) Enabled as COM4: 2E8h-2EFh (IRQ3) Disabled	Enables or disables any desired onboard serial port at the specified address.

BIOS Setup Utility Options (continued)

Menu Field	*Settings*	*Comments*
Serial port 2	Enabled as COM2: 2F8h-2FFh (IRQ3) Enabled as COM3: 3E8h-3EFh (IRQ4) Enabled as COM4: 2E8h-2EFh (IRQ3) Enabled as COM1: 3F8h-3FFh (IRQ4) Disabled	Enables or disables any desired onboard serial port at the specified address.
Diskette drive	Enabled Disabled	Enables or disables the onboard diskette drive controller.
IDE hard disk drives	Enabled Disabled	Enables or disables the onboard IDE disk drive controller. Disable this option when having a SCSI controller installed in one of the expansion slots.
Boot from diskette A	Enabled Disabled	Enables or disables drive A as the logical boot device.
Boot from hard disk C	Enabled Disabled	Enables or disables drive C as the logical boot device.
HDD user definable types	Types 2 and 3 Types 48 and 49	The BIOS Setup utility allows types 2 and 3 or types 48 and 49 to be user definable. Drive type 48 or 49 information is aliased to drive type 2 or 3 when application software does not recognize drive types above 47. Auto-detection of IDE drive parameter is supported in types 2 and 3 and types 48 and 49. Some operating systems do not recognize hard disk drive types above 29. Auto-detection of IDE drive parameter is supported in types 2 and 3 and types 48 and 49.
Exchange diskette drives	Disabled Enabled	Allows to logically exchange physical diskette drive designations.
CPU speed	Fast Slow	Determines the speed used by the computer each time it is turned on or rebooted. **Note**: This option determines the speed used by the computer each time it is turned on or rebooted. Fast¾ is the normal speed and causes the CPU to run at its rated speed. Slow¾ (equivalent to 8 MHz) is used to reduce the effective CPU speed to be compatible with some speed-dependent application programs. If an application program does not run correctly at full speed, try disabling all caches or changing the CPU speed to slow. Computer performance will be severely degraded while operating in slow mode.

BIOS Setup Utility Options (continued)

Menu Field	*Settings*	*Comments*
Post Write	Enabled Disabled	Allows to enable or disable the posted write feature of the main logic board's ISA chip set. Selecting enabled will enhance the overall performance of the computer. **Note:** Some expansion boards and high speed microprocessors 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.
Primary cache	Enabled Disabled	Enables or disables the CPU's internal (primary) cache. **Note**: 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 can operate but not at full potential.
Secondary cache	Enabled Disabled	Enables or disables the computer's external (secondary) cache. **Note:** Enabling the secondary cache 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 secondary cache, for example, while using time-dependent software. In this instance, the computer can operate but not at full potential. **Note**: When no secondary cache has been installed, make sure this option is set to *disabled*.
Shadow BIOS ROM	Enabled Disabled	Enables or disables the computer's shadow BIOS ROM option. **Note**: This option must be enabled before selecting user definable drive types 2 and 3.
Shadow video ROM	Enabled Disabled	Enables or disables the computer's shadow video ROM option. **Note**: The main logic board reserves an area of DRAM for a copy of video BIOS ROM. This DRAM called "shadow memory" is write-protected and has the same addresses as the video BIOS ROM locations. When the video BIOS ROM is shadowed, the ROM information is copied into an appropriate area in DRAM. This increases the computer's performance because the video BIOS instructions are in fast DRAM instead of ROM.
Monitor Type	640x480 @60Hz/NI : : 1280x1024 @43Hz/I	Enables to select the monitor type that matches the high resolution capabilities of the main logic board's video controller.

Chapter 3 Service Procedures

Safety Requirements

WARNING
Static electricity collects on non-conductors such as paper, cloth, or plastic. A static discharge can be damaging even though you often cannot see or feel it.

The following safety precautions must be observed to insure product and personal safety and prevent damage to circuit boards and/or components:

- Always wear an ESD wrist strap when handling ESD sensitive material and be sure it is properly connected.
- Keep circuit boards and components away from non-conductors.
- Keep clothing away from circuit boards and components.
- Keep circuit boards in anti-static bags.
- Be cautious when AC power is exposed when working on an assembly.
- Always use an ISOLATION TRANSFORMER when diagnosing any terminals, monitors or power supplies when AC power is applied.
- Be cautious of very high voltage potentials when working with monitors.

There should be an approved insulating mat (for technician safety) in front of any workbench where monitors, terminals or power modules are being serviced when power is applied.

NOTE Do NOT wear ESD straps when working on terminals,monitors or power supplies when AC power is applied. This is to avoid the hazard of electrical shock.

Recommended Tools

The following tools will be needed for servicing Digital PC systems. Note that test equipment must be in calibration.

- Multimeter (4 1/2 digit)
- A philips screwdriver
- An antistatic wrist strap

Other Needed Materials

Cleaning agent should be an all purpose cleaner that is used in-house.

Required Special Tools

None.

Remedial Diagnostic Test Software

- ***QAPLUS/fe*** , PC Advanced Diagnostic Software, latest version.
  Partnumber : 22-00908-06

Recommended Virus Detection and Cleanup Software

- ***F-PROT***, Virus Detection and Cleanup Software, latest version.
  Network locations:

  North America, South America, Australia and New Zealand:
  MINOTR::USER6:[VIRUS.F-PROT}

  Europe, Africa, Middle and Far East:
  VARDAF::EUROPUB:[VIRUS_SCANNER.F-PROT]

ECO/FCO Information

BIOS version information.

Refer to the Digital DECpc Bulletin Board Support , for the latest information on BIOS upgrades

Network locations:

North America, South America, Australia and New Zealand:
PCBUHD::DKB300:[WC30.BBSFILES]

Europe, Africa, Middle and Far East:
SUTRA::D6:[PUBLIC].

Unlocking and Removing Cover

WARNING
You might injure yourself or damage the computer when attempting to remove the cover before unplugging ac and monitor power cords.

Before removing the outside cover, do the following:

1) Turn off power to all external devices connected to computer.
2) Turn computer off.
3) Unplug power cord from wall outlet.
4) Disconnect power cord and monitor cord from computer.

To remove the outside cover:

1) Unlock outside cover.
2) Remove four retaining screws located at rear of computer.
3) Carefully slide outside cover toward rear of chassis until it clears lip of front bezel. Carefully lift outside cover from chassis.

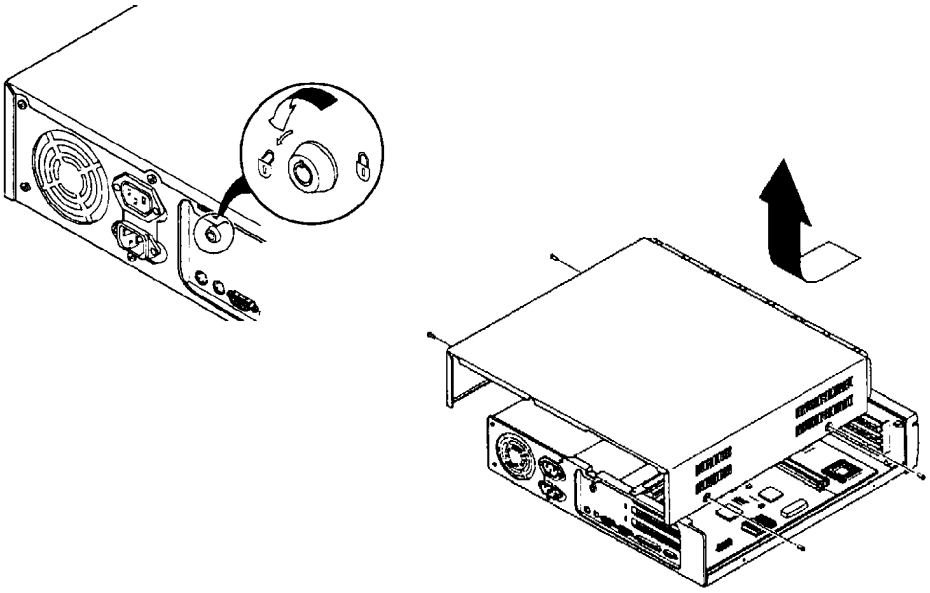


Figure 3 - 1 Unlocking and Removing the Outside Cover

Computer Components

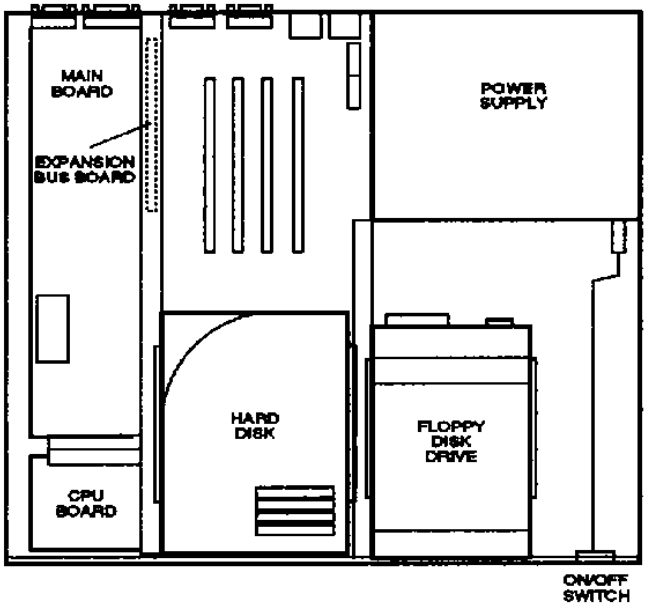


Figure 3 - 2 LP Computer Model Components

Main Logic Board Jumpers

Jumper pins allow to set specific computer parameters. They are set by changing the pin location of jumper blocks. Note that the square pin of each jumper block is pin 1. A jumper block is a small plastic-encased conductor (shorting plug) that slips over the pins. To change a jumper setting, remove the jumper from its current location. Place the jumper over the two pins designated for the desired setting. Press the jumper evenly onto the pins. Be careful not to bend the pins.

CAUTION
Do not touch any electronic component unless you are safely grounded. Wear a grounded wrist strap or touch an exposed metal part of the system box chassis. A static discharge from your fingers can result in permanent damage to electronic components.

DECpc 3xx/4xx LP Main Logic Board Jumper Settings

Settings shown in ***bold italics*** are valid for the **Cornerstone ImageAccel** controllers.

Feature	*Description*	*Setting*
Onboard VGA (IRQ9)	Enable IRQ9 ***Disable IRQ9***	J1, jumpered ***J1, open***
Onboard VGA	Enable VGA ***Disable VGA***	J2, jumpered ***J2, open***
CMOS Memory	Normal Operation Clear CMOS Memory	J3, pin 1 and 2 jumpered J3, pin 2 and 3 jumpered
Reset switch	Enable Disable	J4, jumpered J4, open
Parallel Port	Printer Bidirectional	J5, pin 1 and 2 jumpered J5, pin 2 and 3 jumpered
Factory test	Normal MFG test mode	J10, open J10, jumpered
Video display type	***Color monitor*** Mono monitor	***J11, jumpered*** J11, open
VRAM size	512 KB VRAM 1 MB VRAM	J28, pin 1 and 2 jumpered J28, pin 2 and 3 jumpered
Reserved	Factory use only	J29, open
Reserved	Factory use only	J30, open
Reserved	Factory use only	J31, open
VGAIOW	Local Local and ISA	J35, pin 1 and 2 jumpered J35, pin 2 and 3 jumpered

DECpc 3xx/4xx LP Main board Jumper Locations

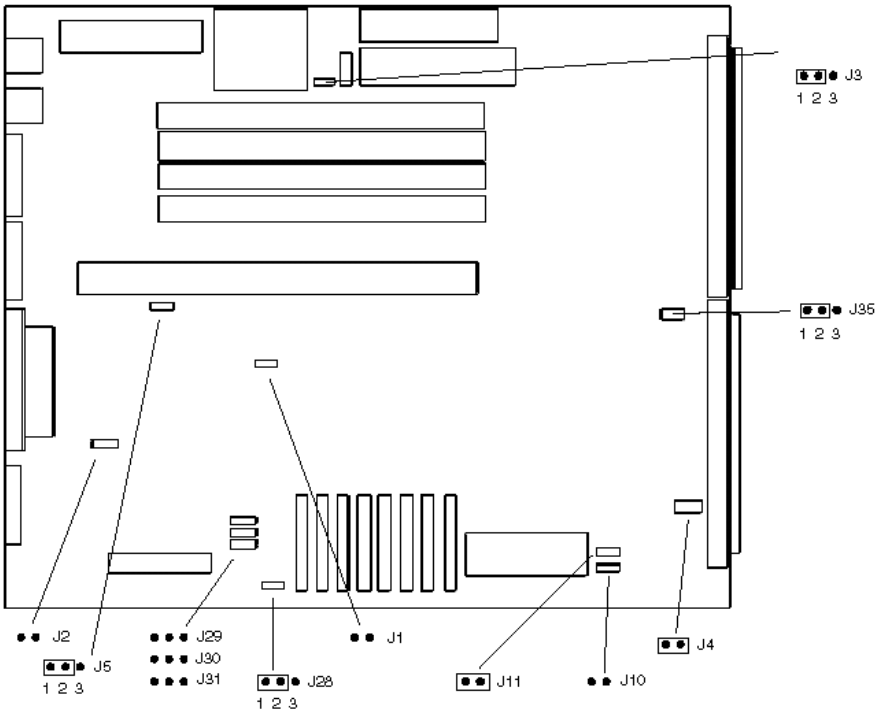


Figure 3 - 3 DECpc 3xx/4xx LP Mainboard Jumper Locations

DECpc 450D2LP/466D2LP CPU Board Jumper Settings

Feature	*Description*	*Setting*
Vacancy socket	Empty or Intel Overdrive microprocessor installed	J101, pins 1 and 2 jumpered J102, pins 1 and 2 jumpered J103, pins 1 and 2 jumpered
	Intel 486DX or Intel 486DX2 installed	J101, pins 2 and 3 jumpered J102, pins 2 and 3 jumpered J103, pins 2 and 3 jumpered
Processor type(1)	486DX	J114, pins 1 and 2 jumpered J115, pins 1 and 2 jumpered
	486SX	J114, pins 2 and 3 jumpered J115, pins 2 and 3 jumpered
Cache size	128 KB	J103, pins 1 and 2 jumpered J104, pins 1 and 2 jumpered
	256 KB	J103, pins 2 and 3 jumpered J104, pins 2 and 3 jumpered
CPU clock input	25 MHz(2)	J109 jumpered J110 open J111 open J112 open
	33 MHz(1)	J109 jumpered J110 open J111 open J112 open
	40 MHz	Not applicable
	50 MHz	Not applicable

(1) DECpc 466d2LP only

(2) DECpc 450d2LP only

DECpc 450D2LP/466D2LP CPU Board Jumper Locations

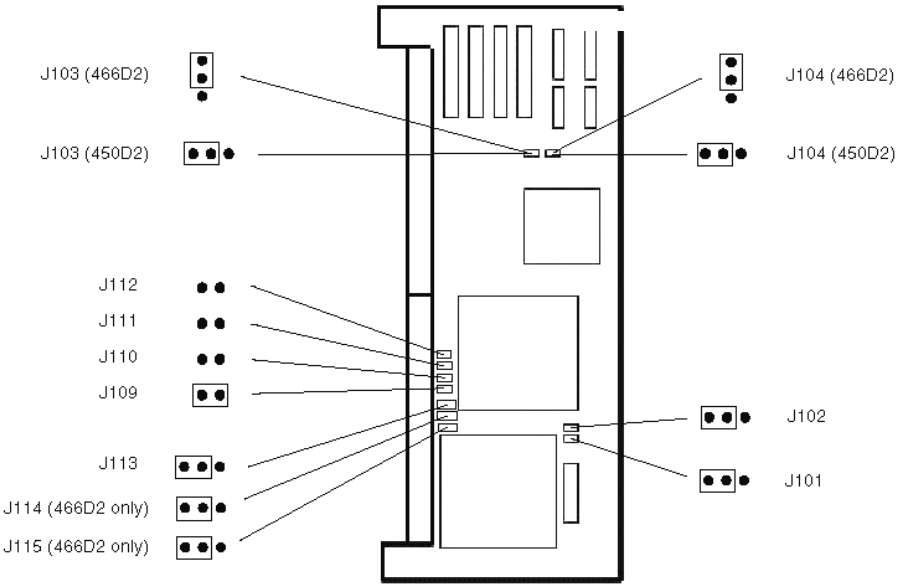


Figure 3 - 4 DECpc 450D2LP/466D2LP CPU Board Jumper Locations

Computer Memory Configurations

Adding more memory allows the computer to run larger, more complicated software and to run it faster.
The computer comes with at least 4 MB of memory.
This amount can be increased up to 64 MB. However, when adding additional memory make sure to:

- Install 36-bit SIMMs having an access time of 70 ns or less.
- Only those configurations listed below are allowed.
- 4 MB or 16 MB single in-line memory modules (SIMMs) may be added.
- Fill bank 0 before bank 1, starting from the leftmost vacant socket (looking from the front of the computer).

Bank 0	***Bank 1***	***Bank 2***	***Bank 3***	***Total***
4 MB				**4 MB**
4 MB	4 MB			**8 MB**
4 MB	4 MB	4 MB		**12 MB**
4 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**

SIMM Socket Locations

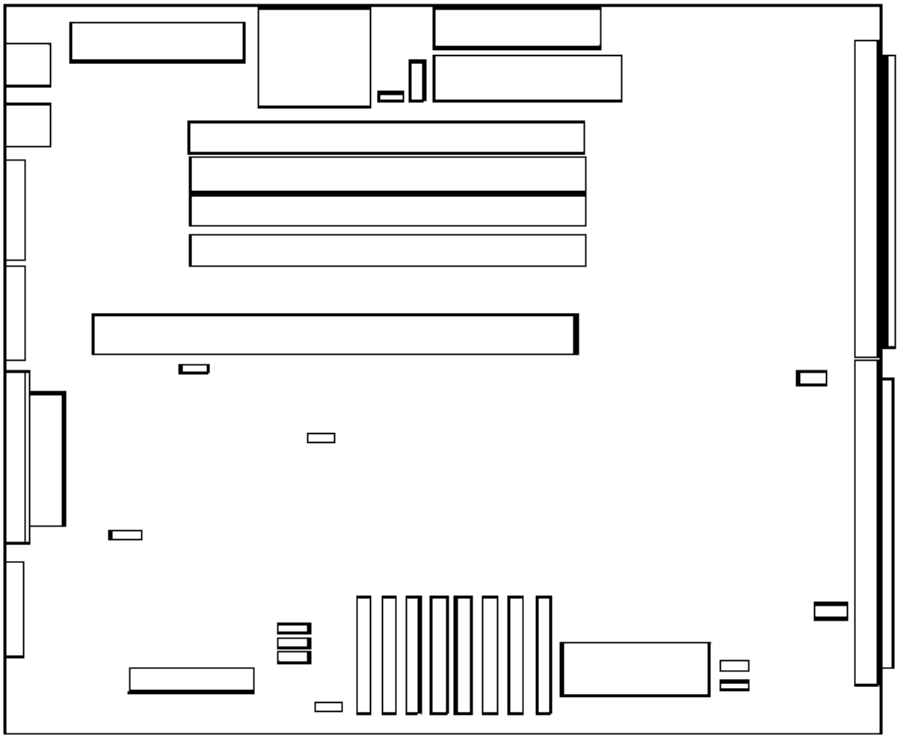


Figure 3 - 5 SIMM Socket Locations

Removal Procedures

Removing a 5¼-Inch FDD

To remove a 5¼-Inch FDD:

1) Turn off the computer.
2) Remove outside cover.
3) Remove two retaining screws from each side of bottom bay.
4) Remove FDD from bay.

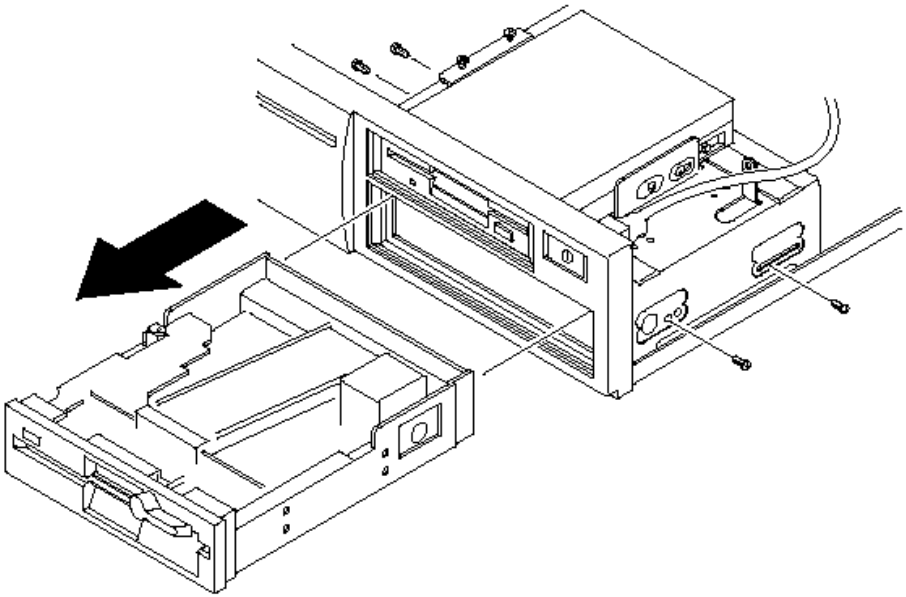


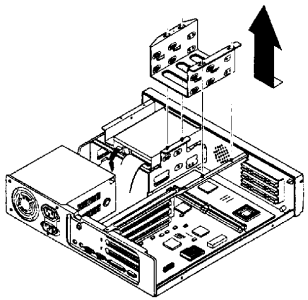
Figure 3 - 6 Removing a 5¼-Inch FDD

Removing a 3½-Inch FDD

To remove a 3½-Inch FDD:

1) Turn off the computer.
2) Disconnect external devices, ac power and monitor power.
3) Unlock and remove outside cover.
4) Disconnect power and ribbon cables.
5) Remove the HDD mounting tray (to access the FDD retaining screws).
6) Remove the four FDD retaining screws.
7) Remove FDD from bay.

Figure 3 - 7 Removing the HDD Mounting Tray



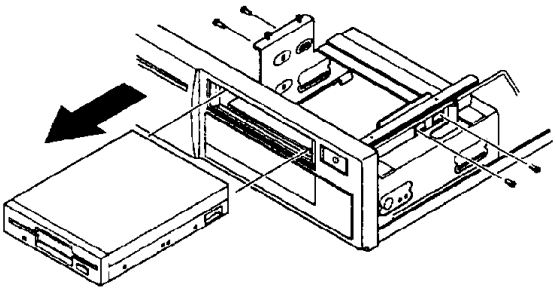


Figure 3 - 8 Removing the 3½-Inch FDD

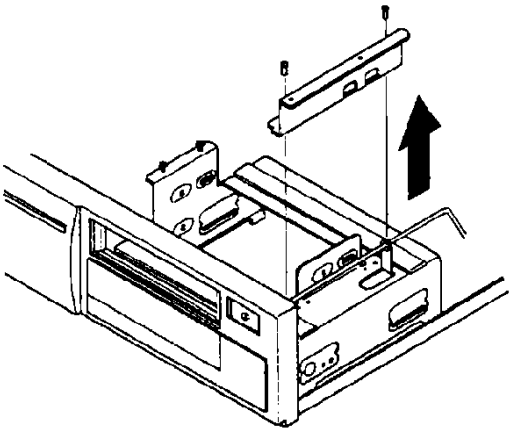


Figure 3 - 9 Removing the FDD Adapter Plates

Removing the HDD Mounting Tray

To remove the Mounting Adapter:

1) Disconnect the device to be removed.
2) Loosen four retaining screws holding the tray to the chassis and remove the tray.
3) Remove the four screws holding the device to the tray and remove the device.

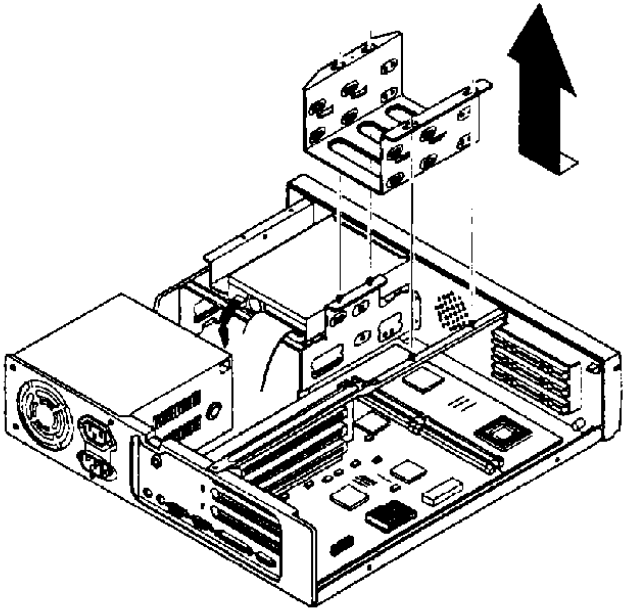


Figure 3 - 10
Removing the HDD Mounting Tray

Removing the Main Logic Board

To remove the main logic board:

1) Turn off the computer.
2) Disconnect external devices, ac power, and monitor power.
3) Unlock and remove outside cover.
4) Disconnect all connectors from the board.
5) Remove the expansion board (if fitted).
6) Disconnect and remove the battery (see figure).
7) Remove the board retaining screws and carefully lift the board free from the chassis.

Main Logic Board Connections

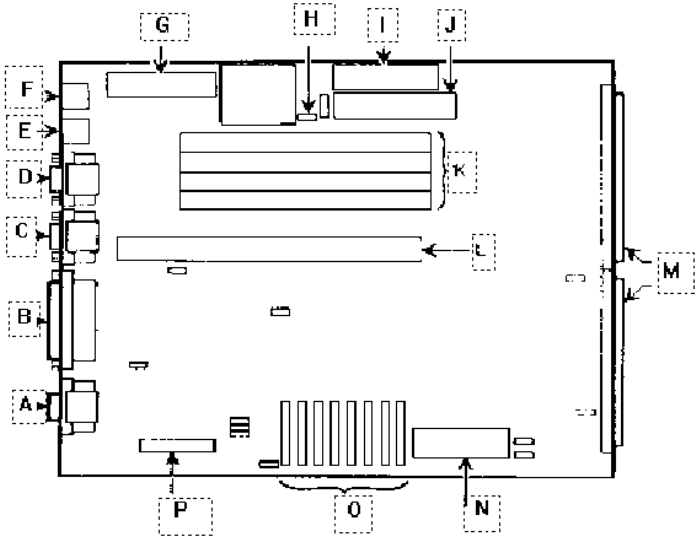


Figure 3 - 11 Main Logic Board Connections

Legend	*Description*
A	Video connector
B	Parallel port
C	Serial port 2
D	Serial port 1
E	Keyboard connector
F	Mouse connector
G	Power connector
H	Battery
I	Floppy disk interface
J	IDE hard disk interface
K	SIMM system memory
L	ISA expansion bus board
M	CPU board connectors
N	ROM BIOS
O	VRAM
P	VGA feature connector (output only)

Removing the Power Supply

To remove the power supply:

1) Disconnect power cord.
2) Disconnect all of the power supply connectors.
3) Pull off the remote ON/OFF mechanical connector.
4) Remove the six PSU retaining screws.
5) Slide the PSU backwards and free of the chassis.

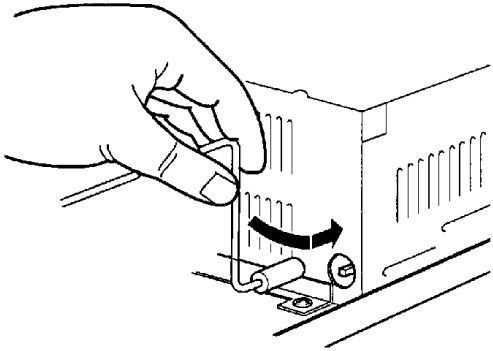


Figure 3 - 12 Pulling off Remote On/Off connector

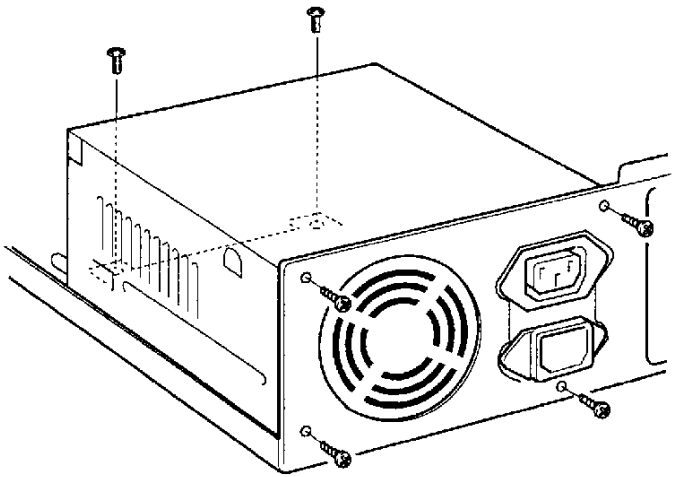


Figure 3 - 13 Removing the Power Supply

Installation Procedures

Installing the Bus Expansion Board

To install the bus expansion board:

1) Position the Bus Expansion Board above the socket on the main board and slide it into the connector (you may have to tilt the board slightly to avoid the support unit).
2) Fit the two securing screws.

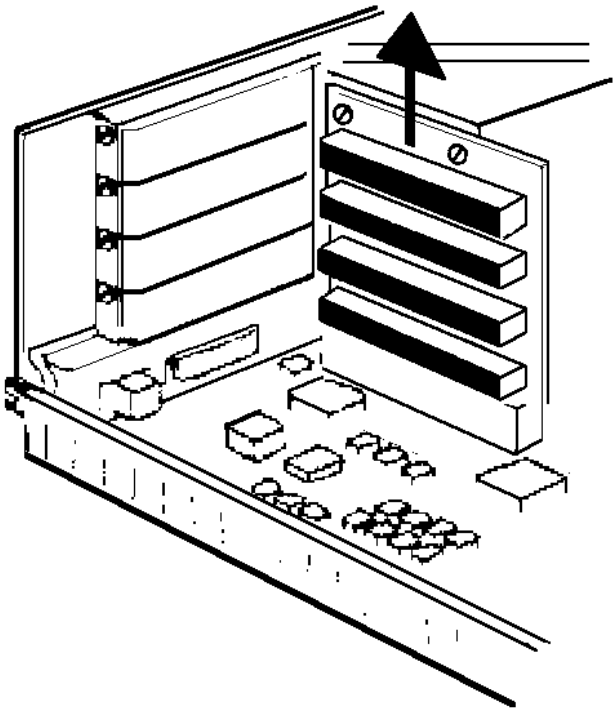


Figure 3 - 14 Installing Bus Expansion Board

Replacement Procedures

Replacing the Computer Battery

To replace the computer battery/real time clock:

1) Record computer configuration settings.
2) Turn off the computer.
3) Unlock and remove outside cover.
4) Disconnect the battery cable from header BATTERY CONN on the main logic board.
5) Remove battery from its mounting pad located on the main logic board.
6) Plug the replacement battery cable into header BATTERY CONN.
7) Replace and lock outside cover.
8) Run BIOS setup to restore the computer's setup values.

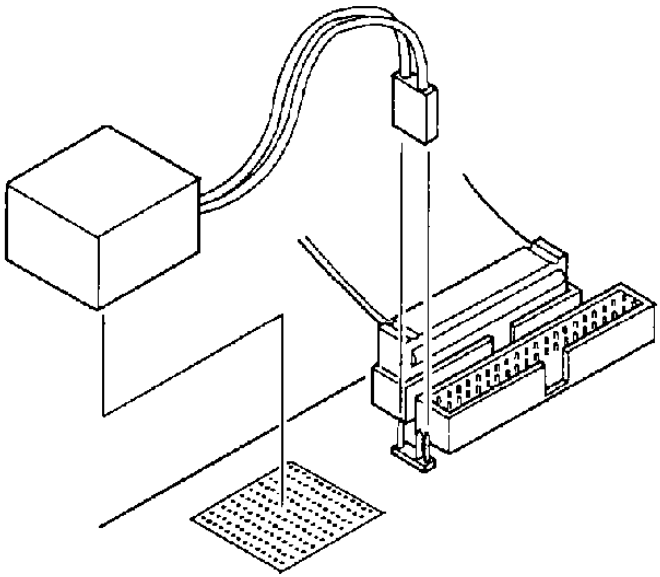


Figure 3 - 15 Disconnecting and removing the Battery

Connecting Optional Mass Storage Devices

To connect optional mass storage devices, perform the following:

1) Plug an available power connector into a mating power connector located at the rear of the appropriate mass storage device.
2) For diskette drives , make sure one end of the supplied ribbon cable is connected into the diskette drive header on the main logic board. Connect the other end into the data/control connector at the rear of the appropriate diskette drive.
3) For IDE hard disk drives, connect one end of the supplied ribbon cable into the IDE header on the main logic board. Connect the other end into the data/control connector at the rear of the hard disk drive.
4) Replace and lock outside cover.
5) Run the BIOS setup utility if any of the installed mass storage devices (diskette or IDE) is an addition to the computer or a different type.

NOTE Make sure the cable is connected with correct orientation. Most cables and sockets are keyed so they cannot be connected backwards. If the cable or device is not keyed, connect pin 1 of cable to pin 1 of device's socket.

Pin 1 of the cable is on the edge with colored stripe. Pin 1 of the device's socket should be marked with a number or symbol at one end of the socket or with a number or symbol printed on the circuit board near one end of the socket. If necessary, refer to the device's documentation for pin 1 orientation.

Diskette Drive Cabling Scheme

DECpc 3xx/4xx LP Series computers are shipped with a 3½-Inch diskette drive designated as drive A.When adding add an additional 3½-Inch or 5¼-Inch diskette drive and you want to designate either one as diskette drive A use the proper diskette drive cable connectors.

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

Chapter 4 Troubleshooting

The following pages provide initial troubleshooting procedures and tables listing specific problems, probable causes, and recommended actions to take if the computer fails after configuration or after installation of optional hardware or software.
Refer to the documentation supplied with additional options when experiencing problems with specific options that have been installed.

Initial Troubleshooting

Follow these general procedures to troubleshoot the DECpc LP computer:

- Press [Ctrl] + [Alt] + [Del]. If the computer fails to boot, turn it off, wait until all hard disk drives spin down completely, and then turn it back on.
- Ensure that all cables and connections are secure.
- If the POST detects an error refer to Chapter 4,*"Troubleshooting"* and take the appropriate steps to correct the problem. After the problem has been resolved, restart the computer.
- Run the diagnostic software.
- Run the BIOS Setup utility.

NOTE If you need to return a failed component, pack it in its original container and return it to Digital for service.

Fill in the appropriate fields of the Part Exchange Form with the relevant error information!!

Beep Codes

If the POST finds an error and cannot display a message, 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 3 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).
The table below lists the beep codes and the values the POST writes to I/O port 80h when it encounters a fatal error. This table lists fatal errors that lock up the computer. Nonfatal errors that do not lock up the computer are listed in a separate table.

Beep Codes for Fatal Errors

Beep Code	*Error Message*
1-1-3	CMOS write/read failure
1-1-4	ROM checksum failure
1-2-1	Interval timer failure
1-2-2	DMA failure
1-2-3	DMA page register write/read failure
1-3-1	RAM refresh failure
1-3-3	1st 64 KB RAM chip or data line failure
1-3-4	1st 64 KB RAM odd/even logic failure
1-4-1	1st 64 KB RAM address line failure
1-4-2	1st 64 KB RAM parity failure
2-1-1	Bit 0 1st 64 KB RAM failure
2-1-2	Bit 1 1st 64 KB RAM failure
2-1-3	Bit 2 1st 64 KB RAM failure
2-1-4	Bit 3 1st 64 KB RAM failure
2-2-1	Bit 4 1st 64 KB RAM failure
2-2-2	Bit 5 1st 64 KB RAM failure
2-2-3	Bit 6 1st 64 KB RAM failure
2-2-4	Bit 7 1st 64 KB RAM failure
2-3-1	Bit 8 1st 64 KB RAM failure
2-3-2	Bit 9 1st 64 KB RAM failure
2-3-3	Bit A 1st 64 KB RAM failure
2-3-4	Bit B 1st 64 KB RAM failure
2-4-1	Bit C 1st 64 KB RAM failure
2-4-2	Bit D 1st 64 KB RAM failure
2-4-3	Bit E 1st 64 KB RAM failure
2-4-4	Bit F 1st 64 KB RAM failure
3-1-1	Slave DMA register failure
3-1-2	Master DMA register failure
3-1-3	Master interrupt mask register failure
3-1-4	Slave interrupt mask register failure
3-2-4	Keyboard/mouse controller failure
4-2-1	Timer tick interrupt failure
4-2-2	Shutdown failure

Beep Codes for Fatal Errors (continued)

Beep Code	*Error Message*
4-2-3	Gate A20 failure
4-2-4	Unexpected interrupt in protected mode
4-3-1	RAM failure (above 0FFFFh)
4-3-3	Interval timer 2 failure
4-3-4	Time-of-day clock failure
4-4-1	Serial port failure
4-4-2	Parallel port failure
4-4-3	Math coprocessor failure

Beep Codes for Non-Fatal Errors

Beep Code	*Error Message*
3-3-4	Screen memory or failure
3-4-1	Screen initialization or failure
3-4-2	Screen retrace or failure

POST and Boot Messages

The POST displays messages to alert to errors in hardware, software, and firmware or to provide operating information about the computer.
Each time the POST displays a message on the screen, the computer's speaker beeps twice. If an error occurs before the monitor is initialised, specific beep codes sound to alert to a problem. The following table lists a general grouping of system messages. In addition, each message is accompanied by text describing the message and in most cases, a recommended solution to the problem.

NOTE *Italics* indicate variable parts of a message such as memory addresses, hexadecimal values, and so on.

These messages can differ at each occurrence.

POST and Boot Messages (continued)

Message	*Solution*
No timer tick	Replace main logic board.
Shutdown failure	Replace main logic board.
Timer 2 failure	Replace main logic board.
Keyboard stuck key **Keyboard controller** **Keyboard clock line** **Keyboard data line** **Keyboard failure**	Check the keyboard connection. If the connection is secure, the keyboard or keyboard controller might have failed. Replace keyboard.
Mouse failure	Check the mouse connection. If the problem persists, replace the mouse.
640 KB base memory **0 KB extended memory**	
Time-of-day clock stopped	Replace RTC.
Invalid configuration information	Run the BIOS Setup utility.
Diskette drive failure	Run the BIOS Setup utility. Check all connections. If the problem persists, replace the diskette drive.
Hard disk controller failure	Run the BIOS Setup utility. Check all connections. If the problem persists, replace the controller.
Hard disk 0 failure	Run the BIOS Setup utility. Check all connections. If the problem persists, replace the hard disk.
xxxx0h optional ROM bad checksum = xx	Correct the address conflict. If the problem persists, replace the ROM chip.
Time-of-day not set	Run BIOS Setup utility and set the time and date.
Keyboard is locked	Unlock the keyboard.
Enable NMI	
Enable cache	
Boot	

Computer Troubleshooting

Problem	*Possible Cause*	*Action*
No response when the computer is turned on	Main logic board failure. Main logic board jumpers incorrectly set.	Replace main logic board. Set all appropriate jumpers.
Power is on, but there is no screen display	Brightness and contrast controls are not correctly set. Monitor cable is incorrectly installed.	Adjust the brightness and contrast controls. Check all monitor connections.
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 correctly 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. IDE main logic board jumper incorrectly set. Loose cables.	Install the appropriate operating system. Format the IDE hard disk drive or partition the IDE hard disk drive using the supplied operating system software. Install software on the requested partition. Refer to the supplied IDE hard disk drive kit installation instructions. Run the BIOS Setup utility to identify the correct drive type. See drive type label on drive or consult drive documentation. Set the jumper for IDE operation. Secure all cable connections.

Computer Troubleshooting (continued)

Problem	*Possible Cause*	*Action*
Computer does not boot from an internal SCSI hard disk drive	Operating system software is not installed on the SCSI hard disk drive.	Install the appropriate operating system.
	Requested partition does not exist.	Partition the SCSI hard disk drive and then reload the operating software.
	SCSI hard disk drive jumpers incorrectly set.	Refer to the supplied SCSI hard disk drive kit installation instructions.
	SCSI ID conflicts.	Refer to the supplied SCSI hard disk drive kit installation instructions on setting SCSI IDs.
	Terminating resistors not removed from the SCSI hard disk drive.	Remove terminating resistors. Refer to the supplied kit installation instructions.
	Computer not configured for SCSI hard disk drive operation.	Run the BIOS Setup utility and set Hard Disk 1/Hard Disk 2 to "Not Installed" and IDE Hard Disk Drives options to "Disabled". This disables the onboard IDE interface. **NOTE:** When both IDE and SCSI hard disk drives are installed, the computer uses the IDE hard disk drive as the boot device.
	IDE main logic board jumper incorrectly set.	Disable the IDE main logic board jumper.
No response to mouse commands	Mouse is password protected.	Enter the keyboard and mouse password.
	Mouse is connected to the keyboard port.	Power down the computer and connect the mouse to the mouse port.
	Mouse driver not installed.	Install the appropriate mouse driver. Refer to the supplied application software documentation.

Computer Troubleshooting (continued)

Problem	*Possible Cause*	*Action*
Computer does not boot from a target diskette drive	Drive ID incorrectly set.	Make sure the drive ID is correctly set (refer to the documentation supplied with the diskette drive).
	Diskette drive not enabled.	Run the BIOS Setup utility to enable the diskette drive.
	Diskette boot option disabled.	Run the BIOS Setup utility and set Boot From Diskette A to "Enabled".
	Diskette does not contain start-up files.	Insert a diskette with the correct start-up files.
	Loose cables.	Secure all cable connections.
No response to keyboard commands	Keyboard is password protected.	Enter the keyboard password.
	Keyboard is connected to the mouse port.	Power down the computer and connect the keyboard to the keyboard port.

Disk Drive Troubleshooting

Problem	*Possible Cause*	*Action*
IDE/SCSI hard disk drive cannot read or write information	Incorrect disk drive jumper settings.	Refer to the supplied kit installation instructions.
	Loose or incorrectly installed cables.	Make sure all cables are correctly installed.
	IDE drive type incorrect.	Run the BIOS Setup utility to identify the correct drive type.
	Onboard IDE interface disabled.	Run the BIOS Setup utility and set the IDE controller option to “Enabled”.
	IDE/SCSI hard disk drive is not correctly formatted or partitioned.	Format and partition as required using the supplied operating system.
	Computer is not configured for SCSI hard disk operation.	Run BIOS setup utility to configure computer for SCSI operation.
Target diskette drive cannot read or write information	Onboard diskette controller disabled.	Run the BIOS Setup utility and set the diskette controller to “Enabled”.
	Diskette write protection is enabled.	Run the BIOS Setup utility and set the diskette write protection to “Disabled”.

Monitor Troubleshooting

Problem	*Possible Cause*	*Action*
Monitor power indicator is not on	Monitor is turned off. Power indicator is defective.	Turn on the monitor. Replace the failed component.
No screen display	Configuration error. Monitor brightness and contrast controls are incorrectly set.	Run the BIOS SETUP UTILITY to configure the computer for VGA operation. Set the jumper for VGA operation. Refer to *"Main Logic Board Jumpers"*. Adjust the monitor brightness and contrast controls.
Distorted-rolling-or flickering screen display-or wrong/ uneven color	Monitor incorrectly adjusted. Monitor signal cable incorrectly installed.	Adjust accordingly. Straighten any bent connector pins and then reconnect.
Color monitor displaying monochrome	Computer was turned on before the monitor was turned on. Video jumper incorrectly set.	Turn off the computer, turn on the monitor, then turn the computer back on. Set the jumper for VGA operation.

QAPlus/FE Error Messages

Component	*Messages*	*Solution*
CPU	Arithmetic Function Failed. General Functions Failed. Exception Interrupt in Protected Mode. Refresh Failure. Logic Functions Failed.	Reset CPU. Replace CPU.
Hard disk	Butterfly Cylinder Access Test Failed. Cylinder 0 Errors. Random Cylinder Access Failed. Linear Cylinder Access Failed.	Low-level format hard disk. Replace disk.
Hard drive/controller	Controller Diagnostic Test Failed. Questionable Controller Card. Hard drives failed.	Run Setup, Check connections, Reset controller, Replace controller, Replace disk.
Floppy diskette	Media Mismatch. Drive Not Ready. Write Protected Media. Unformatted Media.	Use known good diskette. Check size and density of diskette. Close drive door. Remove write protection. Format diskette.
Floppy drive	Floppy Drives Failed.	Check connections, Replace drive.
Battery/clock	Clock Stopped. Invalid Date. RTC Interrupt Failed.	Run Setup. Replace battery/clock.
CMOS	CMOS Clock Test Failed.	Change time from Setup menu in QAPLUS.
Serial port	COM port failed. Serial Chip Error. Serial Compare Error. Serial Timeout Error.	Check COM device. Check connections. Replace COM device. Replace COM device.
Video adapter	Video Failed. Error in Video Buffer.	Replace video adapter. Replace video adapter.

Chapter 5 Device Mapping

This section provides a series of tables listing mapping and address information related to computer memory and various main logic board devices (keyboard controller, interrupt controller, DMA controller, etc.).
The computer's memory and address locations are allocated at the factory to operate within a standard PC environment. However, due to the number of optional devices and/or expansion boards that are available, sometimes memory and address locations need to be changed. For example, some network expansion boards require a specific memory location. If that location is already allocated, a memory conflict results and the expansion board will not operate as expected. Note that some memory, I/O and interrupt locations can be changed using the BIOS Setup utility.

CAUTION

Before changing any memory or address location, refer to the documentation supplied with the optional device, expansion board, or software application and make sure adequate information is available.

Computer 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 3FFFFFFh	Extended memory	63 MB

I/O Address Map

Range (hexadecimal)	*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	Interval 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

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

DMA Channel Assignment

Channel	*Controller*	*Function*
0	**1**	Refresh
1	**1**	Not used
2	**1**	Diskette controller
3	**1**	Not used
4	**2**	Not used
5	**2**	Not used
6	**2**	Not used
7	**2**	Not used

Chapter 6 Pass / Fail Criteria

As Final Acceptance Test the following tests should be run to meet the Pass/Fail criteria:

1) **Successful completion of the POST tests.**

2) **Successful completion of the following QAPLUS/fe module tests (one pass):**

- System Board (all tests)
- Memory (all tests)
- Video (all tests)
- Hard Disk (all tests, **except: Sequential write/read (destructive test !!) and Sequential write/random read (destructive test !!)**)
- Floppy Disk (all tests)
- Keyboard (all tests)
- COM Ports (all tests)
- LPT Ports (all tests)
- Pointer Device (all tests)

3) **Successful bootstrap of the on the computer installed Operating System.**

Operating Systems Supported (LP):
- ◊ MS-DOS version 5.0 and later
- ◊ OS/2 version 1.3 and later

Remove any software that was put on the hard drive to enable repair of the system before shipping.

When completed carefully clean the outside of the unit with cleaning solution.

Appendix A Service Notes

This appendix contains the service notes for the DECpc LP series computer.

Appendix B Useful Information

Related Documentation

Order Number	*Description*
EK-A0899-RG	DECpc LP Quick Reference Guide
EK-A0815-SV	SMM Spares Catalogue
ER-PC740-UA	DECpc 300/400 LP User's Guide
ER-PC700-GA	DECpc 300/400 LP Getting Started Handbook

On-Line Bulletin Boards

The most current product information and technical support is also available on line. The most current device drivers, Setup diskettes and technical tips can be found on all of these bulletin boards.

- ***DECpc Bulletin Board Server***
  DECpc BBS provides an easy-to-use, menu-driven bulletin board providing on-line access to the latest PC product information, device drivers, shareware and freeware.

  Network Location for ;
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  PCBUHD::DKB300:[WC30.BBSFILES]

  Europe, Africa, Middle and Far East:
  SUTRA::D6:[PUBLIC].

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