digital

Service
Maintenance
Manual

DECpc LPv/LPv+ PC

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Revision History

Revision	Date	Description of Change
Revision 1.0	Januari 96	First release of the Service Maintenance Manual describing the DECpc LPv/LPv+ series computer.

Preface

The DECpc LPv/LPv+ Service Maintenance Manual is a troubleshooting guide that can be used for reference when servicing the DECpc LPv/LPv+ line of PC's.
Digital Equipment Corporation reserves the right to make changes to the DECpc LPv/LPv+ 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 LPv/LPv+ computers are a family of high-performance, low-profile personal computers equipped with the latest microprocessor and onboard video technology. They can be used as stand-alone computers, as clients, or as servers in an network environment. Developed using Intel speed-doubling CPUs and S3's 805 32-bit local-bus video architecture, along with a host of high-performance options, DECpc LPv/LPv+ computers are the most advanced low-profile desktop computers in their class.

All DECpc LPv/LPv+ computers are industry-standard, Intel i486 PCs using a versatile low-profile enclosure.

DECpc LPv/LPv+ features:

- LPv: Intel 80486sx/dx/d2 processor
  LPv+: Intel 80486sx/dx/d2 SL enhanced processor with advanced Power Management
- 4 MB system RAM, expandable up to 64 MB on motherboard
- Optional external cache memory expandable to 128 KB and 256 KB
- SVGA with 1 MB VRAM (up to 1280 x 1024) (GUI Accelerator)
- Embedded IDE controller
- Supports up to four storage devices

Product Models Information

EC = English, French, German, Italian and Spanish.
ED = Danish, Dutch, English, Finnish, French (France excluded), Norwegian and Swedish.

DECpc LPv Models Information

Product	Model	FDD	HDD	Memory	Cache	Options
DECpc LPv 425sx	PC751-A9	-	-	-	None	
	PC751-WA	1.44MB	170MB	4MB	None	
	PC751-WB	1.44MB	240MB	8MB	None	
DECpc LPv 433sx	PC752-A9	-	-	-	None	
	PC752-WA	1.44MB	170MB	4MB	None	
	PC752-WB	1.44MB	240MB	8MB	None	
DECpc LPv 433dx	PC753-A9	-	-	-	None	
	PC753-WA	1.44MB	170MB	4MB	None	
	PC753-WB	1.44MB	240MB	8MB	None	
	PC753-WC	1.44MB	525MB	8MB	None	
DECpc LPv 450d2	PC754-A9	-	-	-	None	
	PC754-WA	1.44MB	170MB	4MB	None	
	PC754-WB	1.44MB	240MB	8MB	None	
	PC754-WC	1.44MB	525MB	8MB	None	
DECpc LPv 466d2	PC756-A9	-	-	-	None	
	PC756-WA	1.44MB	170MB	4MB	None	
	PC756-WB	1.44MB	240MB	8MB	None	
	PC756-WC	1.44MB	525MB	8MB	None	

DECpc LPv+ Models Information

Product	Model	FDD	HDD	Memory	Cache	Options
DECpc LPv+ 425sx	FR-741WW-A9	-	-	-	None	
	FR-741**-WA	1.44MB	170MB	4MB	None	
	FR-741**-WF	1.44MB	340MB	8MB	None	
DECpc LPv+ 433sx	FR-742WW-A9	-	-	-	None	
	FR-742**-WA	1.44MB	170MB	4MB	None	
	FR-742**-WF	1.44MB	340MB	8MB	None	
DECpc LPv+ 433dx	FR-743WW-A9	-	-	-	None	
	FR-743**-WA	1.44MB	170MB	4MB	None	
	FR-743**-WF	1.44MB	340MB	8MB	None	
DECpc LPv+ 450d2	FR-744WW-A9	-	-	-	None	
	FR-744**-WA	1.44MB	170MB	4MB	None	
	FR-744**-WF	1.44MB	340MB	8MB	None	
DECpc LPv+ 466d2	FR-746WW-A9	-	-	-	None	
	FR-746**-WA	1.44MB	170MB	4MB	None	
	FR-746**-WF	1.44MB	340MB	8MB	None	
DECpc LPv+ 4100d4	FR-748WW-A9	-	-	-	None	

Chapter 2   System Utilities & Configuration

System Utilities

This chapter describes how to use the two diskettes supplied with the DECpc LPv/LPv+ computer.

Diskette 1: System and S3 86C805 VGA Utilities and DOS Video Drivers

This diskette contains the following files:

♦   SETUP.COM   Allows to enable the ROM Base Setup option in the BIOS Setup utility.

NOTE	Digital recommends to use SETUP.COM on the System and S3 86C805 VGA Utilities and DOS Video Drivers diskette only when it is necessary to enable the ROM Base Setup option. Otherwise, use the BIOS Setup utility to change the computer's configuration parameters.

♦   SMTR.EXE   Allows to select the monitor type that matches the monitor's resolution
    and
                              refresh rates.
♦   SMODE.EXE   Allows to emulate or display non-standard VGA modes.
♦   DOS and CAD   Provides   installation   instructions   and,   where   applicable,
    application video   the usage and performance tips for several 86C805 video
    drivers.
    drivers ¾
♦   README.DOS   Contains information on the display drivers, "Identifying the Correct ac
                              Power Cord" and configuring the computer to operate with a high
                              resolution monitor.
♦   KP.EXE ¾   Allows to set a keyboard and mouse password.

Using the System Utilities Diskette

The System and S3 86C805 VGA Utilities and DOS Video Drivers allow to:

♦   Access the computer's BIOS Setup utility.
♦   Set a keyboard and mouse password.
♦   Take full advantage of the enhanced video features.

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

1)   Make a backup copy of the System and S3 86C805 VGA Utilities and DOS Video Drivers diskette. Store the original in a safe place.
     Refer to the supplied MS-DOS/Windows documentation for information on copying diskettes.
2)   Turn on or reboot the computer. If the POST detects an error, refer to *"Troubleshooting"* for possible causes and suggested solutions.
3)   Insert the backup copy of the System and S3 86C805 VGA Utilities and DOS Video Driversdiskette into drive A.
4)   Run SETUP.COM to enable the the ROM Base Setup option in the BIOS Setup utility.
     Enable the ROM Base Setup option when it has been have previously disabled.
5)   Run SMTR.EXE to select the monitor type that matches the monitor's available resolution and refresh rates.
6)   If necessary, run SMODE.EXE to emulate or display a non-standard VGA mode.
7)   Install any applicable DOS or CAD application drivers. Additional information about these drivers is provided later in this chapter.
8)   Run KP.EXE to set a keyboard and mouse password.
9)   Remove the backup copy and then reboot the computer so changes immediately take effect.

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 *"Troubleshooting"* for possible causes and suggested solutions.
3)   Insert the backup copy of the System Utilities diskette into drive A.
4)   Type **a:** then press **[Enter]**.
5)   Type setup then press **[Enter]**. Page 1 of Setup appears.
6)   Press the right arrow key to move the cursor to the ROM Base Setup option.
     Change the setting to Enable.
7)   Follow the instructions on the screen to exit SETUP.COM (saving the changes).

8)   Remove the backup copy of the System Utilities diskette from drive A.
9)   Reboot the computer.

SMTR.EXE

The video controller's monitor type selection must match the monitor's available resolution and refresh rates. These monitor resolution and refresh rates are listed in the monitor's support documentation and in the SMTR.EXE utility on the System and S3 86C805 VGA Utilities and DOS Video Drivers diskette. To select the correct monitor type:

1)   Turn on or reboot the computer and allow POST to complete.
2)   Insert the backup copy of the System and S3 86C805 VGA Utilities and DOS Video Drivers diskette into drive A.
3)   Type **A:** then press **[Enter]**.
4)   Type **CD\UTILS** and press **[Enter]**.
5)   Type **SMTR** and press **[Enter]**.
6)   Select the correct monitor type following the instructions on the monitor screen.
       For example:
       If you want to run the monitor at a resolution of 1024 ´ 768, select: 1024x768@72Hz/NI.
7)   Exit the SMTR.EXE utility following the instructions on the monitor screen.
8)   Remove the System and S3 86C805 VGA Utilities and DOS Video Drivers diskette.
9)   To access SMTR.EXE from the computer's hard disk drive, create a directory and then copy the SMTR.exe file into it.

> **CAUTION**
>
> **Do not select a monitor type setting that exceeds the monitor's resolution, refresh rate (vertical synchronization)and interlace or non-interlace specifications. Refer to the monitor's support documentation for performance specifications.**

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:
♦   Monochrome adapter (MDA)
♦   Color graphics adapter (CGA)
♦   Expanded graphics adapter (EGA)
♦   Hercules monochrome graphics adapter (HGC)

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 S3 86C805 VGA Utilities and DOS Video Drivers diskette into drive A.
4)   Type **A:** and press **[Enter]**.
5)   Type **cd\utils** and press **[Enter]**.

If you want to	Type SMODE followed by	Example
Display a non-standard VGA mode	<hex mode #> VGA	SMODE 55 VGA
Emulate a non-VGA mode	Either EGA, CGA, MDA, or Hercules	SMODE MDA[1]

[1] SMODE MDA allows the main logic board's video circuitry to emulate a monochrome adapter.

6)   If applicable, copy the SMODE.EXE file to a directory on the computer's hard disk drive.
7)   Remove the System and S3 86C805 VGA Utilities and DOS Video Drivers diskette from drive A and store it in a safe place.

DOS Video Drivers

These files contain installation instructions and, where applicable, the usage and performance tips for DOS and CAD applications. Some of these are:

♦   CadKey/DataCad
♦   Cadvance
♦   Generic CADD
♦   Autodesk ADI (protected mode only)
♦   Microstation PC (protected and real mode)
♦   VersaCad
♦   Lotus 1-2-3
♦   Microsoft Word
♦   Word Perfect

Installing DOS or CAD application video drivers differ with each software application. Specific instructions are located in the README.DOS file and in the appropriate DOS or CAD application directories and files. Follow the procedures on the System and S3 86C805 VGA Utilities and DOS Video Drivers diskette.

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.

Copying KP.EXE onto Hard Disk

1)   Turn on the computer and allow POST to complete without error.
2)   Insert the backup copy of the System Utilities diskette into drive A.
3)   At the MS-DOS prompt type **a:** then press **[Enter]** to access drive A.
4)   At the A:\> prompt type **copy kp.exe c:** then press **[Enter]**.
      KP.EXE is then copied onto drive C of the computer's hard disk.
5)   Remove the backup copy of the System Utilities diskette.

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 2: S3 86C805 Windows 3.x Drivers

This diskette contains the following files:

♦   Windows 3.x application drivers   Provides S3 86C805 video drivers.
♦   README.WIN   Contains information on how to load S3 86C805 drivers into
                                            Windows 3.x.

Depending on how the computer is setup and what software applications are to be used, it might be necessary to install one or more of these drivers to optimize the capabilities of the computer.

NOTE	Before installing a video device driver, refer to the information in the associated README file contained on this diskette and the System and S3 86C805 VGA Utilities and DOS Video Drivers diskette.

To install a Windows 3.x video driver, perform the following:

1)   Type **CD WINDOWS** at the C:\> prompt, then press **[Enter]**.
      The following prompt appears: C:\WINDOWS>.
2)   Type **SETUP** and press **[Enter]**.
      The computer displays the SETUP screen.
3)   Select the Display option and press **[Enter]**.

4) Toggle through the Display option to select Other (Requires disk provided by hardware manufacturer).
5) Place the S3 86C805 Windows 3.x Drivers diskette in drive A, then press **[Enter]**.
    A list of S3 video drivers appears in a box at the bottom the screen.
6) Select the desired video resolution then press **[Enter]**.

NOTE   The resolution and refresh rate must be the same as the selection made using the SMTR.EXE utility.

Example: If you select 1024x768@72Hz/NI using the SMTR.EXE utility, an appropriate selection is: S3 86C805 V1.1 1024x768 256 Colors Large Fonts.

The video setup screen appears again with the S3 driver.
7) Press **[Enter]** to accept the configuration.
8) The MS-DOS prompt appears when SETUP completes.
9) Type **WIN** and press **[Enter]** to start Microsoft Windows.

Setting High Resolution Mode for the Monitor Display

To use the high resolution modes on the computer, perform the following steps:

1) Use the BIOS Setup utility to correctly set the Video Card option.
2) Use the SMTR.EXE utility to correctly set a Monitor Type.
3) Use Windows Setup to copy the appropriate driver (from diskette 2: S3 86C805 Windows 3.x Drivers) into Windows.

CAUTION

Do not connect a low resolution monitor to a system that has been configured with high-resolution video drivers. High resolution drivers can damage a 640 X 480 monitor.

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 there is a need 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.

NOTE	Do not use SETUP.COM on the System and S3 86C805 VGA Utilities and DOS Video Drivers diskette to make changes to the computer's BIOS Setup utility.
	Use SETUP.COM on the System S3 86C805 VGA Utilities and DOS Video Drivers diskette only when it is necessary to enable the ROM Base Setup option.

To run the BIOS Setup utility:

1) Turn on the computer and allow POST to complete.
2) Make a note of any configuration errors listedand 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.

Helpful Hints

♦ Several keyboard function keys and numeric keypad keys are assigned to help selecting menus and options, changing option valuesand displaying help information. These keys are displayed at the bottom of each setup configuration screen.
♦ 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 correct field for a selected option. To access these screens, highlight an option and press **[F1]**.
♦ Press **[F2]** to display important computer information. Record all pertinent information.
♦ Press **[Esc]** then press **[F4]** to exit the BIOS Setup utility and reboot the computer so changes immediately take effect.

BIOS Setup Utility Options

Menu Field	Settings	Comments
System time	Current time	Displays the current time.
System date	Current date	Displays the current date.
Language	English Français Deutsch Italiano Español	Sets 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. **Note**: This option allows to disable or configure the computer for the IDE hard disk drives that are installed. There is the option of manually selecting drive types or using an auto-detect feature. To use the auto-detect feature, first select either drive types 2 and 3 or drive types 48 and 49. Once selected, you are prompted to execute the auto-detect feature by pressing the [Enter] key.
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.
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.

BIOS Setup Utility Options (continued)

Menu Field	Settings	Comments
ROM based setup	Enabled Disabled	Enables or disables the ROM base setup utility. Note: Disabling this option prevents unauthorized personnel from changing any computer's configuration parameters.
Mouse port	Enabled Disabled	Enables the mouse port and assigns IRQ12. Disables the mouse port and frees up IRQ12 for option use.

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.

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.

BIOS Setup Utility Options (continued)

Menu Field	Settings	Comments
Diskette drive	Enabled Disabled	Enables or disables the onboard diskette drive controller.
Exchange diskette drives	Disabled Enabled	Allows to logically exchange physical diskette drive designations.
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.
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.
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*.

BIOS Setup Utility Options (continued)

Menu Field	Settings	Comments
Cache BIOS ROM	Enabled Disabled	Allows to enable or disable a caching request for the computer's BIOS. **Note**: This option allows the computer's BIOS to be cached in the primary cache and secondary cache (if installed). This increases computer performance because BIOS instructions are executed in cache instead of RAM.
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.
E00000h selection	Local memory AT bus	Allows to select the E00000h - EFFFFFh memory allocation. **Note**: This option allows to enable or disable the E00000h to EFFFFFh DRAM range. When using optional software, such as frame grabbers and/or certain LAN network expansion boards, it may be necessary to disable this DRAM range and force it to the ISA bus to avoid memory conflicts. Refer to the documentation supplied with the software to see if this memory range is required for proper operation.

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.
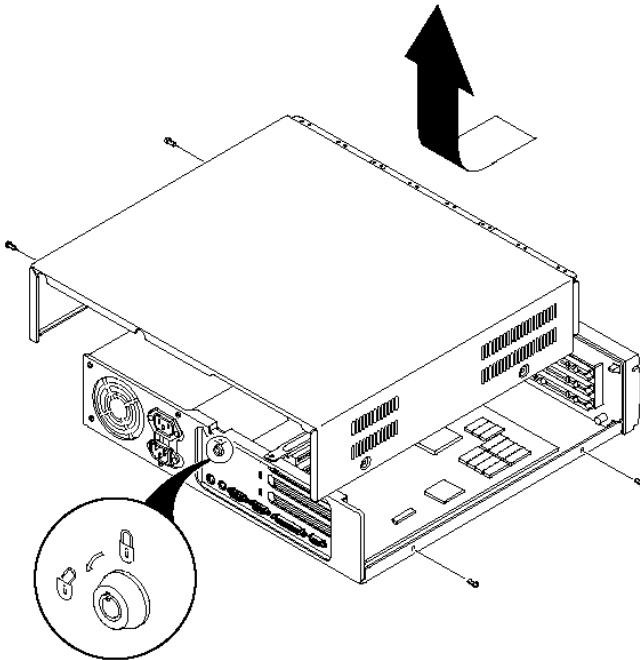
To remove the outside cover:

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 Removing the Outside Cover

Computer Components

Legend	Description
A	Power supply (under the internal drive bay)
B	Three ISA expansion slots
C	Main logic board
D	3½-inch diskette drive
E	Front access drive bays
F	Internal drive bay
G	ISA slots
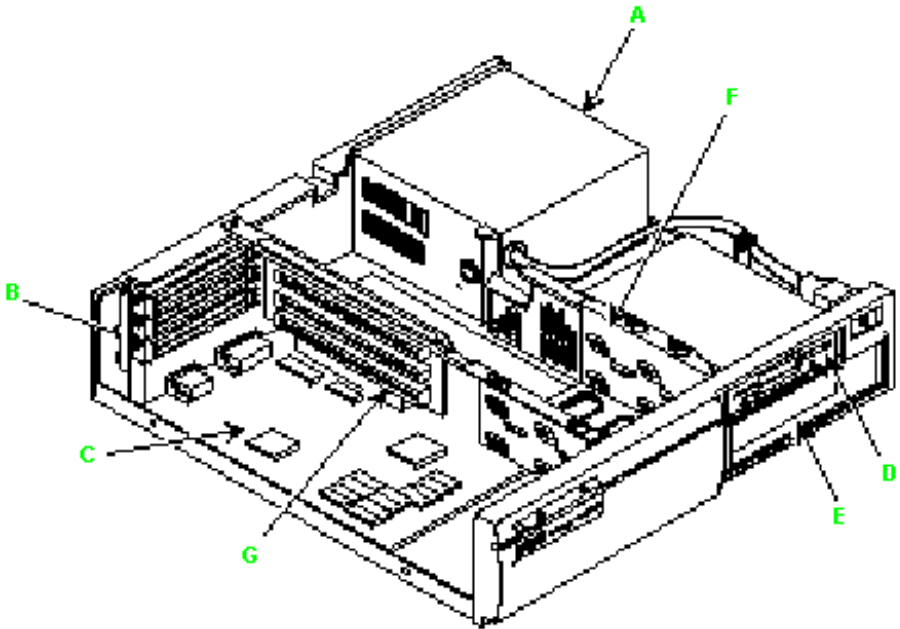
Figure 3 - 2 LPv Computer Model Components

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.

LPv Main Logic Board Jumper Settings

Settings shown in **_bold italics_** are factory defaults.

Feature	Description	Setting
Onboard VGA (IRQ9)	**_Disable IRQ9_** Enable IRQ9	**_J25, open_** J25, jumpered
Onboard VGA	**_Disable VGA_** Enable VGA	**_J23, pins 1 and 2 jumpered_** J23, pins 2 and 3 jumpered
Factory test	**_Normal_** MFG test	**_J28, open_** J28, jumpered
Video display type	**_Mono monitor_** Color monitor	**_J29, open_** J29, jumpered
Flash ROM update	**_Enable_** Disable	**_J13, Jumpered_** J13, open
CPU clock input	50 Mhz	J18, open J19, open J20, open
	40 MHz	J18, jumpered J19, open J20, open
	33 MHz	**_J18, jumpered_** **_J19, open_** **_J20, jumpered_**
	25 MHz	J18, open J19, jumpered J20, jumpered

LPv Main Logic Board Jumper Settings (continued)

Feature	Description	Setting
Cache size select	*0 KB*	*J3, open*
		J4, open
		J6, open
		J7, open
	128 KB	J3, pins 1 and 2 jumpered
		J4, pins 1 and 2 jumpered
		J6, pins 1 and 2 jumpered
		J7, pins 1 and 2 jumpered
	256 KB	J3, pins 2 and 3 jumpered
		J4, pins 2 and 3 jumpered
		J6, pins 2 and 3 jumpered
		J7, pins 2 and 3 jumpered
Recovery mode	Recovery mode	J14, jumpered
	Normal operation	*J14, open*
CPU type	*DX*	*J11, pins 1 and 2 jumpered*
		J12, pins 1 and 2 jumpered
	SX	J11, pins 2 and 3 jumpered
		J12, pins 2 and 3 jumpered
Reset switch	*Enable*	*J33, jumpered*
	Disable	J33, open
RDY signal type	*VLRDY->CPURDY (VL bus ready connects to CPU bus ready)*	*J28, pins 1 and 2 jumpered*
	VLRDY->LRDY (VL bus ready synchronized through chipset	J28, pins 2 and 3 jumpered

LPv Main Logic Board Jumper Locations
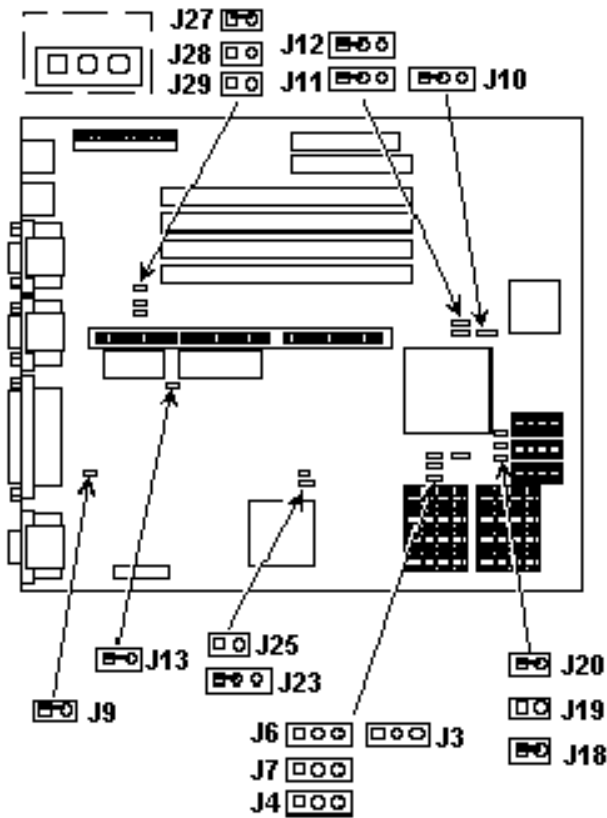
Figure 3 - 3 LPv Main Logic Board Jumper Locations

Computer Memory Configurations

Adding more memory allows the computer to run larger, more complicated software and to run it faster.

LPv and LPv+ Memory Configurations

The computer comes with at least 4 MB of memory. 4 MB or 16 MB single in-line memory modules (SIMMs) may be added.
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.
♦   Supported SIMM sizes: 4 MB or 16 MB.

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	16 MB			**20 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**

LPv and LPv+ SIMM Socket Locations
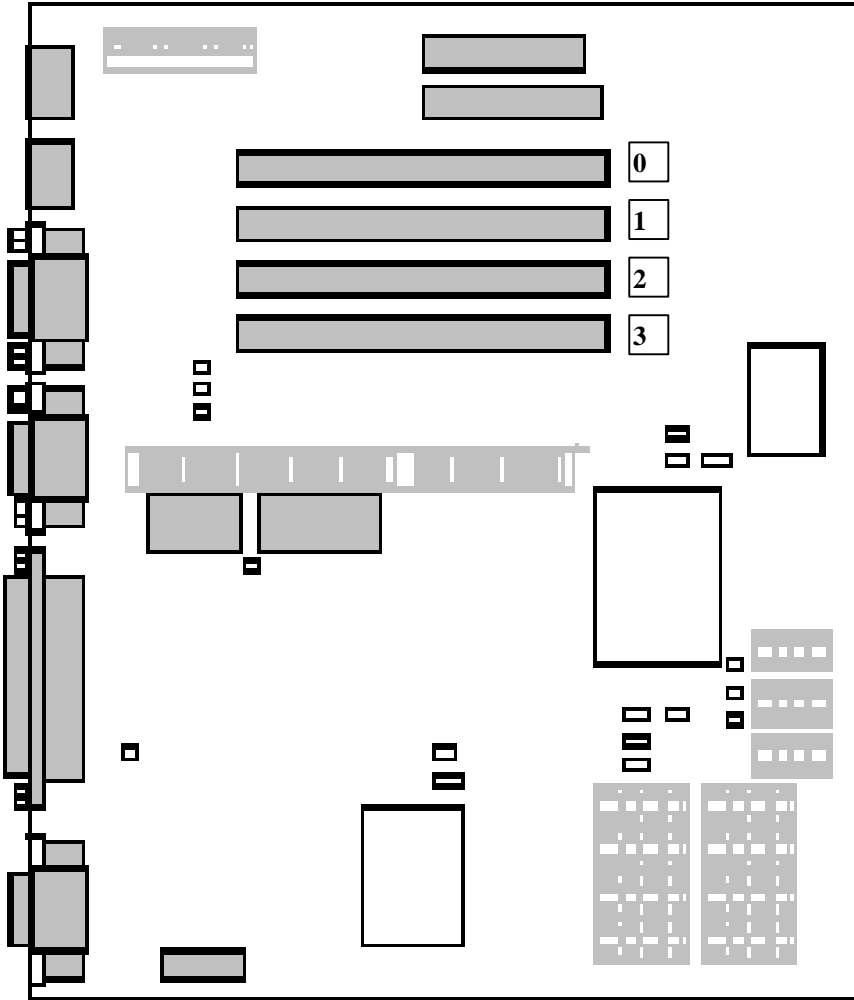
Figure 3 - 4 LPv and LPv+ SIMM Socket Locations

Removal Procedures

Removing a 5¼-Inch FDD

To remove a 5¼-Inch FDD:

1) Turn off the computer.
2) Remove two retaining screws from each side of bottom bay.
3) Remove FDD from bay.
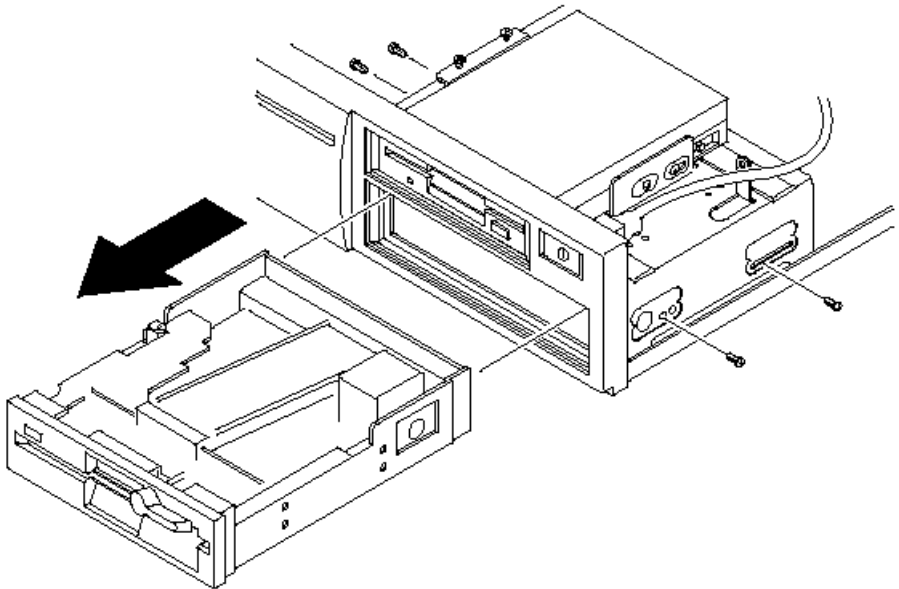
Figure 3 - 5 Removing a 5¼-Inch FDD

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)   From the top bay, remove two retaining screws from each side.
6)   Remove FDD from bay.
7)   From the bottom bay, remove two retaining screws securing the mounting adapter to chassis.
8)   Remove FDD from bay with filler panel.
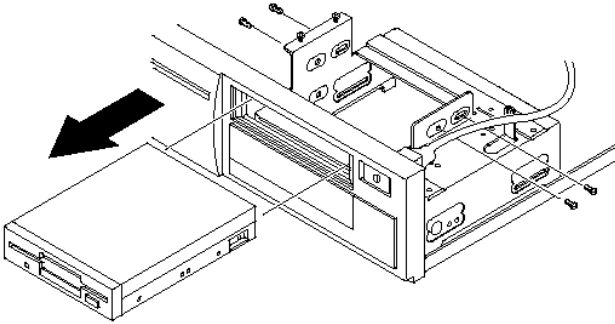
Figure 3 - 6 Removing a 3½-Inch FDD from the Top Bay
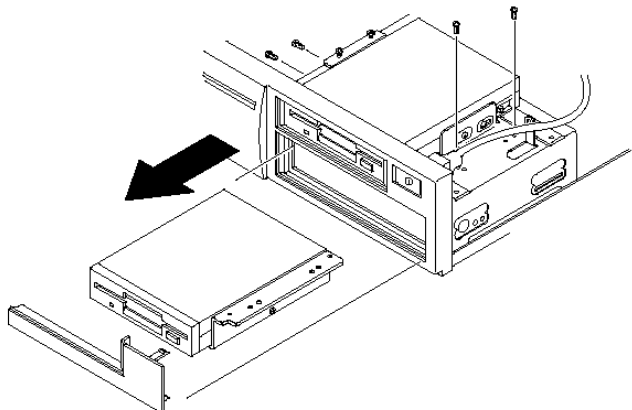
Figure 3 - 7 Removing a 3½-Inch FDD from the Bottom Bay

Removing the Mounting Adapter

To remove the Mounting Adapter:

1) Remove one retaining screw.
2) Remove mounting adapter from chassis.

NOTE	Mounting bracket is required when installing a 3½ inch device in the lower 5¼ inch drive bay.
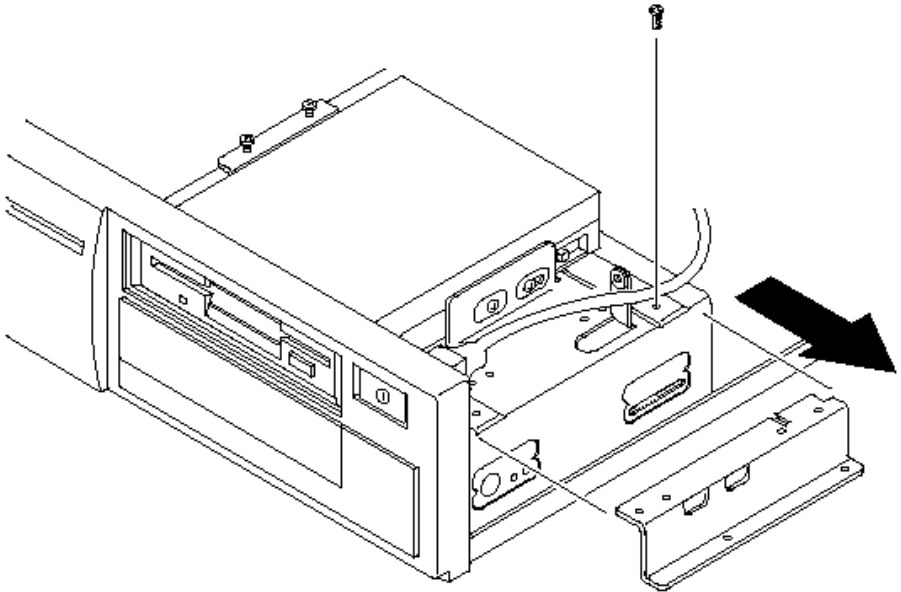
Figure 3 - 8 Removing the Mounting Adapter

Removing the Internal Mounting Tray

To remove the Mounting Adapter:

1)   Loosen four retaining screws.
2)   Lift mounting tray out of chassis.
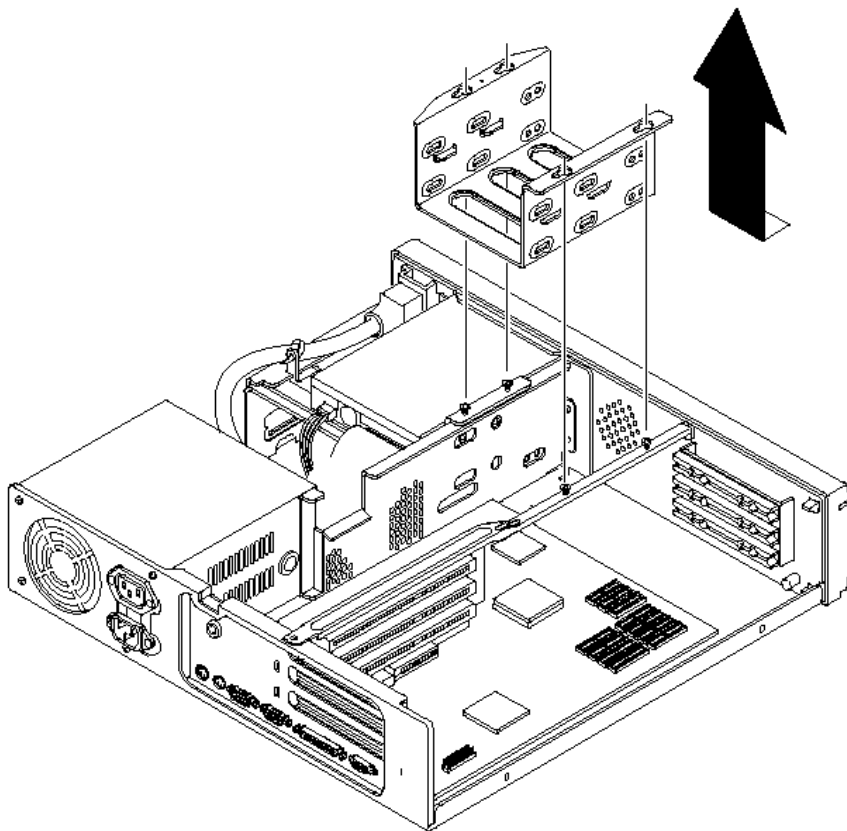
Figure 3 - 9 Removing the Internal Mounting Tray

Removing the IDE Disk Drive from Mounting Tray

To remove the IDE Disk Drive from Mounting Tray:

1)   Remove four retaining screws.
2)   Pull drive from mounting tray.
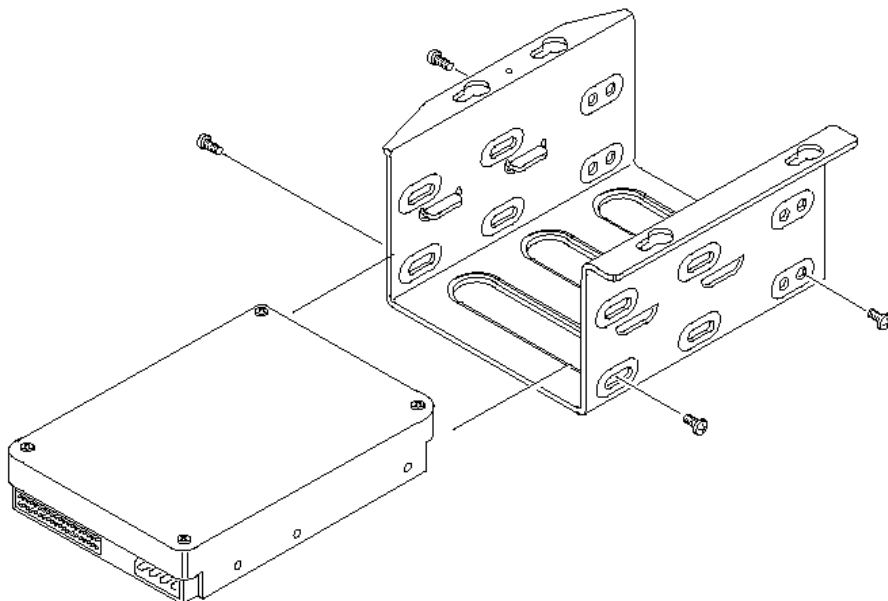
Figure 3 - 10 Removing the IDE Disk Drive from Mounting Tray

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)   Remove all connectors.
5)   Remove expansion boards riser card.
6)   Remove mounting screws and lift main logic board from computer.

Main Logic Board Connections
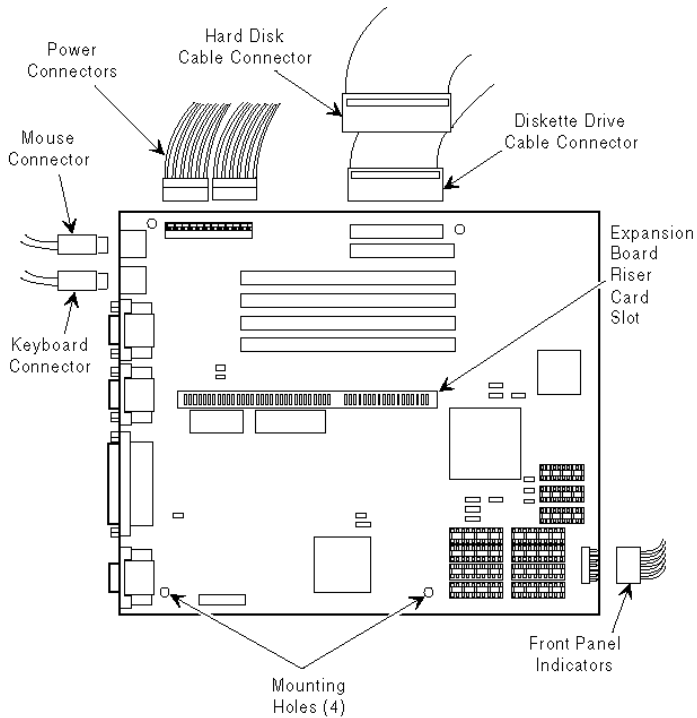
Figure 3 - 11 Main Logic Board Connections

Removing the Power Supply

To remove the power supply:

1) Disconnect power cord.
2) Remove screw securing power on/off cable.
3) Remove two screws securing power supply to chassis.
4) Remove four screws securing power supply to rear panel.
5) Remove power supply from computer.
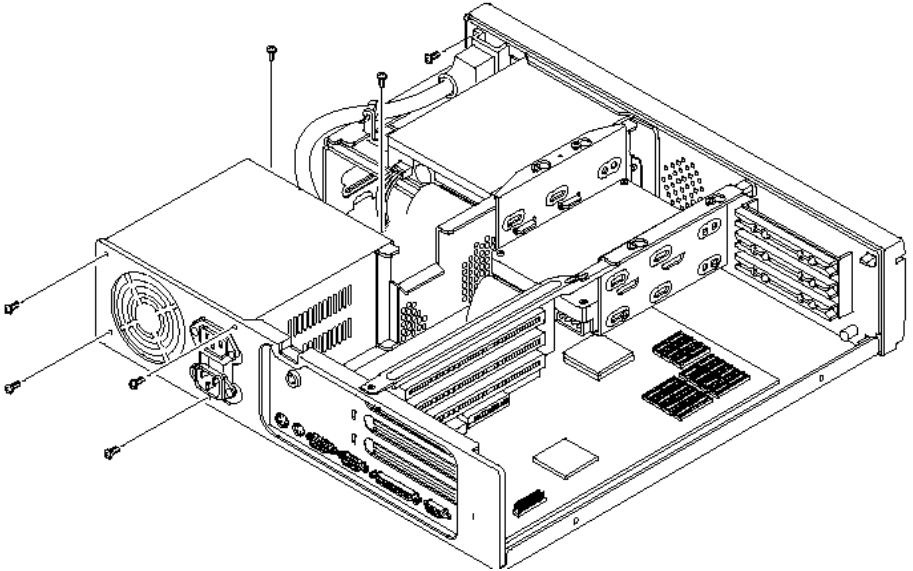
Figure 3 - 12 Removing the Power Supply

Removing the Filler Panels

To remove the Filler Panels:

1) Turn off the computer.
2) Disconnect external devices, ac power and monitor power.
3) Unlock and remove outside cover.
4) Carefully place screwdriver through hole provided at side of front access drive bay.
5) Release plastic locking tabs.
6) Remove both filler panels.
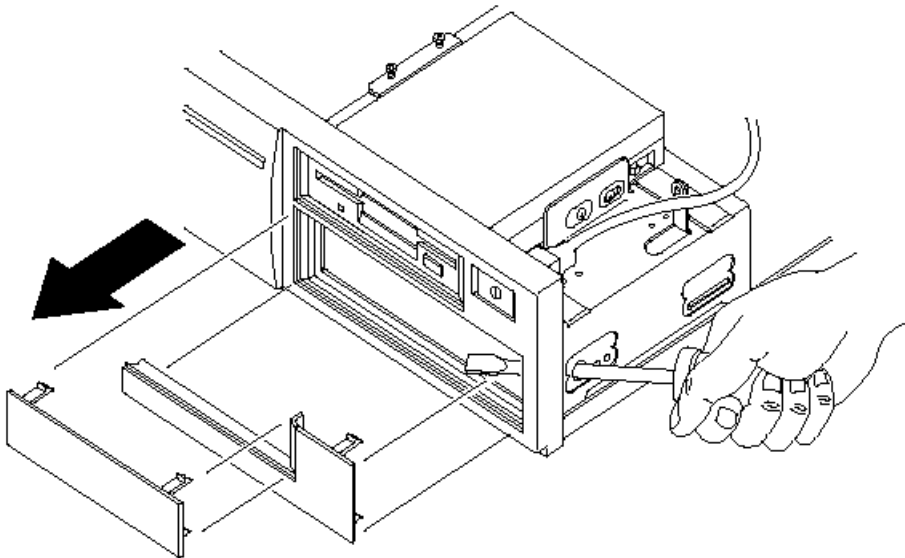
Figure 3 - 13 Removing the Filler Panels

Installation Procedures

Installing External Cache Memory

The computer's main logic board supports up to 256 KB of direct-mapped write back secondary cache memory. Secondary cache memory is designed to improve the performance of the CPU and is installed in designated DIP sockets on the main logic board.

For the DECpc LPv, secondary cache memory consists of four or eight 32 KB x 8 cache SRAM chips and three 16 KB x 4 cache tag SRAM chips.

LPv Cache chip locations

Cache Upgrade	Main Logic Board Cache Sockets	Main Logic Board Cache Tag Sockets
0 to 128 KB	E15 through E18	E6 through E8
0 to 256 KB	E15 through E18 E12 through E14	E6 through E8
128 to 256 KB	E12 through E14	

To install a cache SRAM chip:

1) Turn off the computer.
2) Disconnect external devices, ac powerand monitor power.
3) Unlock and remove outside cover.
4) Locate appropriate DIP sockets on main logic board.
5) Remove secondary cache memory chips from antistatic packaging, handling each chip only by edges.
6) Position each chip with notched end facing rear of computer. Insert each chip into appropriate DIP socket.
7) Set all appropriate cache jumpers.
8) Replace and lock outside cover.
9) Connect external devices and restore power.

CAUTION

Installing external cache memory incorrectly might cause the computer to malfunction.
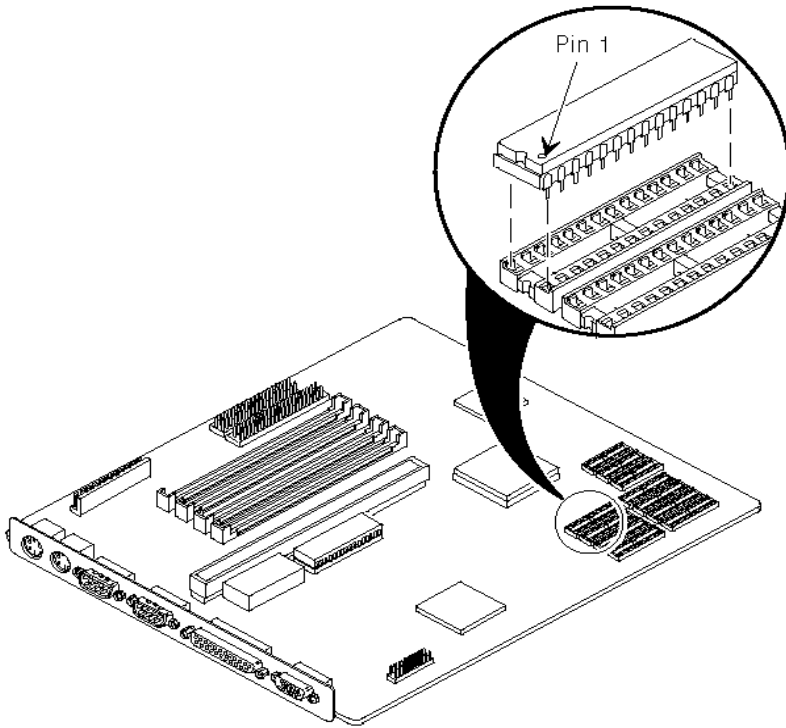
Figure 3 - 14 Installing External Cache Memory

Installing a Higher Performance CPU

To install a higher performance CPU:

1) Disconnect power cord.
2) Unlock and remove outside cover.
3) Remove the CPU.
4) Install new CPU.
5) Set appropriate jumpers.
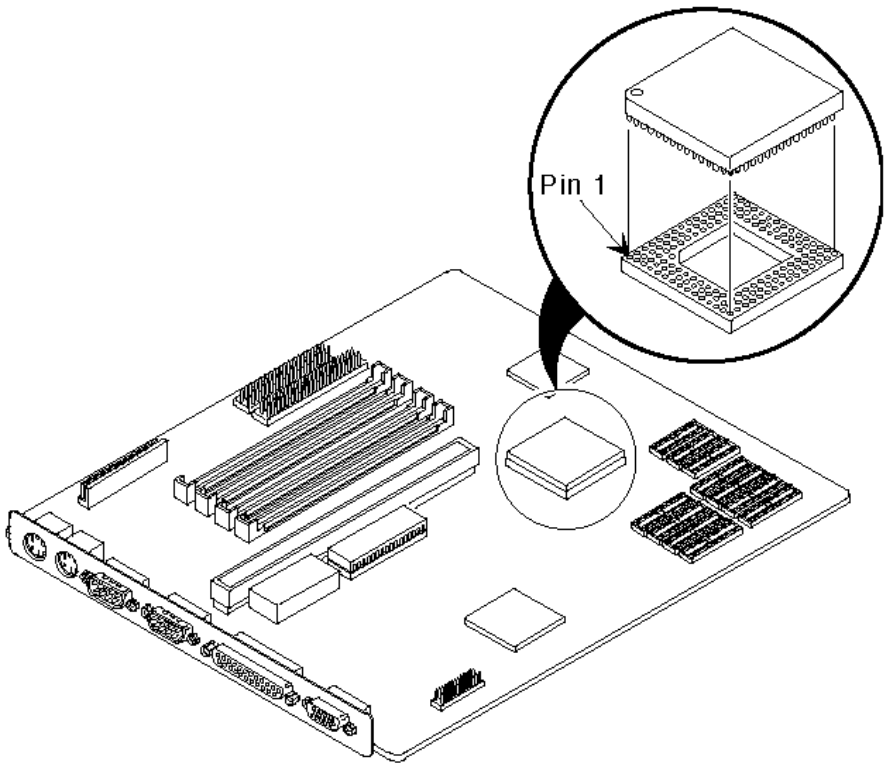
Figure 3 - 15 Installing a Higher Performance CPU

Replacement Procedures

Replacing the Computer Battery/Real Time Clock (RTC)

⚠ **WARNING**

Make sure pin 1 on battery is correctly aligned with location on socket (see figure). Incorrect installation can cause faulty computer operation.

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) Use device puller and gently remove RTC from socket.
5) Install new battery.
6) Replace and lock outside cover.
7) Connect external devices and restore power.
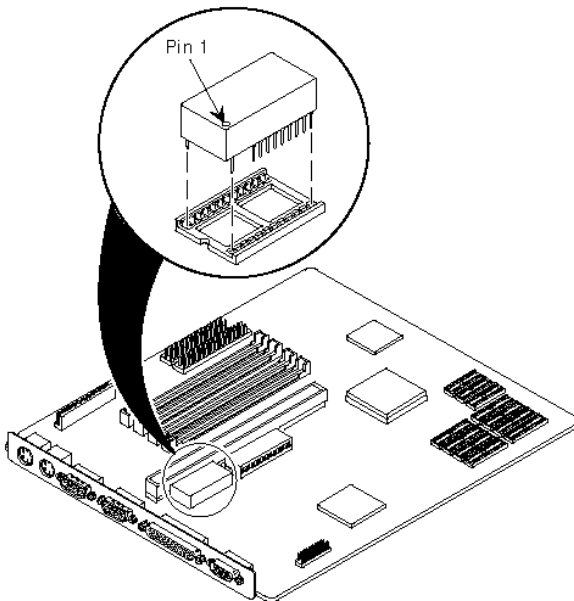
Figure 3 - 16 Replacing the Computer Battery /Real Time Clock

Connecting Diskette and IDE Devices

To connect diskette and IDE devices, perform the following:

1) Connect supplied ribbon cable to appropriate device as shown.
2) Connect appropriate power cable to device.
3) Replace and lock outside cover.
4) Connect external devices and restore power.

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.

Connecting SCSI Devices

To connect SCSI devices, perform the following:

1) Connect supplied ribbon cable to appropriate device as shown:
2) Connect appropriate power cable to device.
3) Replace and lock outside cover.
4) Connect external devices and restore power.
5) Run BIOS Setup utility to configure computer.

Chapter 4   Troubleshooting

The following pages provide initial troubleshooting procedures and tables listing specific problems, probable causesand 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 LPv/LPv+ computer:

♦   Press [Ctrl] + [Alt] + [Del]. If the computer fails to boot, turn it off, wait until all hard disk drives spin down completelyand then turn it back on.
♦   Ensure that all cables and connections are secure.
♦   If the POST detects an error refer to *"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 beepand 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 failure
3-4-1	Screen initialization failure
3-4-2	Screen retrace failure

POST and Boot Messages

The POST displays messages to alert to errors in hardware, softwareand 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 valuesand 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. Video adapter not seated in the expansion slot correctly.	Adjust the brightness and contrast controls. Check all monitor connections. Reseat the video adapter.
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. Loose cables. Onboard IDE interface disabled. "Boot from Hard Disk C" is disabled via BIOS Setup utility.	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. Secure all cable connections. Run the BIOS Setup utility and set the IDE Hard Disk Drives option to "Enabled". Enable the "Boot from Hard Disk C" via BIOS Setup utility.

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.
		Replace the SCSI adapter.
	SCSI adapter failure.	
Computer does not recognize an internal or external SCSI device	SCSI device jumpers incorrectly set.	Refer to the supplied SCSI device kit installation instructions.
	SCSI ID conflicts.	Refer to the supplied SCSI device kit installation in structions on setting SCSI IDs.
	Terminating resistors not removed from the SCSI device.	Remove terminating resistors. Refer to the supplied kit installation instructions.
	SCSI cable not terminated.	Terminate each end of the SCSI cable.
	SCSI adapter failure.	Replace the SCSI adapter.
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.
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.
No monitor display while loading Windows video drivers	Monitor type incorrectly set.	Set the correct monitor type. Refer to appropriate video driver documentation.
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.
Monitor fails to switch to high-resolution mode	Appropriate high-resolution video drivers are not installed or incorrectly installed.	Correctly install all appropriate high-resolution video drivers. Refer to the documentation supplied with the monitor and/or video drivers.
Monitor display not centered while loading Windows video drivers	Monitor type incorrectly set.	Set the correct monitor type. Refer to appropriate video driver documentation.

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 FFFFFh	Computer BIOS	128 KB
100000h to 3FFFFFFh	Extended memory	63 MB

NOTE   After the computer completes the POST, the E0000h address range is available for EMS page frame.

I/O Address Map

Range (hexadecimal)	Function
000 - 00F	DMA controller one
020 - 021	Interrupt controller one
022	Index register (85C461)
023	Data register (85C461)
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 - 1F7	IDE controller
278 - 27A	LPT2
2E8 - 2EF	COM4
2F8 - 2FF	COM2
378 - 37A	LPT1
3BC - 3BE	LPT3
3E8 - 3EF	COM3
3B0 - 3DF	VGA registers
3F0 - 3F7	Diskette controller
3F6 - 3F7	IDE controller (alt status, device address)
3F8 - 3FF	COM1
46E8	VGA enable register
42E8	VGA enhanced mode 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, COM4
12	1	IRQ4	COM1, COM3
13	1	IRQ5	Reserved
14	1	IRQ6	Diskette drive
15	1	IRQ7	LPT1, LPT2, LPT3

DMA Channel Assignment

Channel	Controller	Function
0	1	Refresh
1	1	Not used
2	1	Diskette controller
3	1	ECP (optional)
4	2	Cascade DMA
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 (LPv+):
◊   MS-DOS version 5.0 and later
◊   OS/2 version 2.0 and later
◊   SCO UNIX System V Release 3.2.4 and later
◊   SCO Open Desktop Release 2.0 and later
◊   Windows NT (DECpc 433 Lpv+ not recommended)
◊   Windows NT (DECpc 450 LPv+ with 12 MB client/ 16 MB server memory minimum recommended)

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 LPv/LPv+ series computer.

Appendix B Useful Information

Related Documentation

Description	Order's
DECpc LPv/LPv+ Quick Reference Guide	EK-A0882-RG
SMM Spares Catalogue	EK-A0815-RG
DECpc LPv/LPv+ User's Guide	ER-740WW-UA
DECpc LPv/LPv+ Installation Card	ER-740WW-IA

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

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

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