**digital**

# Service
# Maintenance
# Manual

# DECpc LPx/LPx+
# PC

**K-MN-SD00000 19-JG00.A**

MCS LOGISTICS
ENGINEERING
-
NIJMEGEN
THE NETHERLANDS

**January 1996**

Created by:

MCS Logistics Engineering - Nijmegen

Printed in Ireland

# Table of Contents

# Table of Figures

# Revision History

| Revision | Date | Description of Change |
|----------|------|------------------------|
| **A01** | Januari 96 | First release of the Service Maintenance Manual describing the DECpc LPx/LPx+ series computer. This manual also includes the DECpc LPx 560/566. |

# Preface

The DECpc LPx/LPx+ Service Maintenance Manual is a troubleshooting guide that can be used for reference when servicing the DECpc LPx/LPx+ line of PC's.
Digital Equipment Corporation reserves the right to make changes to the DECpc LPx/LPx+ 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 LPx and LPx+ computers are high-performance personal computers equipped with the latest microprocessor and *VL-bus* technology. They can be used as stand-alone computers, as clients, or as servers in an network environment. Developed using modular CPU technology and offering a host of high-performance options, the DECpc LPx/LPx+ offers the most advanced computer in its class.

DECpc LPx 560/566 computers are high-performance personal computers equipped with the latest microprocessor and *PCI local bus* technology.

All DECpc LPx and LPx+ computers are industry-standard Intel i486 or Pentium microprocessor-based PCs using a versatile full profile ISA-style enclosure. The computer features a modular CPU design that allows easy upgrades to the latest available CPU technology.

**DECpc LPx features:**

♦   4 MB system RAM, expandable up to 64 MB on motherboard
♦   Optional external cache memory expandable to 128 KB and 256 KB
♦   ZIF (Zero Insertion Force) socket for easy upgrade to 486 or Pentium
♦   Embedded IDE controller
♦   Overdrive upgrade P24T or overdrive CPU - the socket can also be inserted with SL enhanced 486 or 486 at 25 MHz or 30 MHz
♦   Modular design with a choice of two VESA-LB cards (S3805 or S3864)
♦   Supports up to five storage devices
♦   Six full-size, 16-bit ISA expansion slots, or five full-size, 16-bit ISA expansion slots and one VL local bus slot, or four full-size, 16-bit ISA expansion slots and two VESA local bus slots

**DECpc LPx+ features:**

♦   Energy Star compliant
♦   4 MB system RAM, expandable up to 64 MB on motherboard
♦   Optional external cache memory expandable to 128 KB and 256 KB
♦   ZIF (Zero Insertion Force) socket for easy upgrade to 486 or Pentium
♦   Enhanced IDE allows hard disks bigger than 1024 cylinders
♦   Overdrive upgrade P24T or overdrive CPU - the socket can also be inserted with SL enhanced 486 or 486 at 25 MHz or 30 MHz
♦   Modular design with a choice of two VESA-LB cards (S3805 or S3864)
♦   Supports up to five storage devices
♦   Six full-size, 16-bit ISA expansion slots, or five full-size, 16-bit ISA expansion slots and one VL local bus slot, or four full-size, 16-bit ISA expansion slots and two VESA local bus slots

**DECpc LPx 560/566 features:**

♦   Pentium CPU operating at 60 or 66 MHz
♦   8 MB system RAM, expandable up to 128 MB on motherboard
♦   Standard 256 KB of secondary cache memory
♦   ZIF socket for CPU upgrades
♦   Supports up to five storage devices
♦   4 ISA slots and 2 PCI 32-bit local bus slots or 3 ISA and 3 PCI 32-bit local bus slots

# Product Models Information

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

## DECpc LPx Models Information

| Product | Model | FDD | HDD | Memory | Cache | Options |
|---|---|---|---|---|---|---|
| **DECpc LPx 425sx** | PC761-A9 | - | - | - | None | |
| | PC761-WA | 1.44MB | 170MB | 4MB | None | |
| | PC761-WB | 1.44MB | 240MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx 433sx** | PC762-A9 | - | - | - | None | |
| | PC762-WA | 1.44MB | 170MB | 4MB | None | |
| | PC762-WB | 1.44MB | 240MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx 433dx** | PC763-A9 | - | - | - | None | |
| | PC763-WA | 1.44MB | 170MB | 4MB | None | |
| | PC763-WB | 1.44MB | 240MB | 8MB | None | |
| | PC763-WC | 1.44MB | 525MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx 450d2** | PC764-A9 | - | - | - | None | |
| | PC764-WA | 1.44MB | 170MB | 4MB | None | |
| | PC764-WB | 1.44MB | 240MB | 8MB | None | |
| | PC764-WC | 1.44MB | 525MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx 466d2** | PC766-A9 | - | - | - | None | |
| | PC766-WA | 1.44MB | 170MB | 4MB | None | |
| | PC766-WB | 1.44MB | 240MB | 8MB | None | |
| | PC766-WC | 1.44MB | 525MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx 560** | FR-810WW-xx | - | - | - | | |
| | | | | | | |
| **DECpc LPx 566** | FR-811WW-xx | - | - | - | | |

## DECpc LPx+ Models Information

| Product | Model | FDD | HDD | Memory | Cache | Options |
|---|---|---|---|---|---|---|
| **DECpc LPx+ 433sx** | FR-802WW-A9 | - | - | - | None | |
| | FR-802**-WA | 1.44MB | 170MB | 4MB | None | |
| | FR-802**-WF | 1.44MB | 340MB | 8MB | None | |
| | FR-802**-WC | 1.44MB | 540MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx+ 433dx** | FR-803WW-A9 | - | - | - | None | |
| | FR-803**-WA | 1.44MB | 170MB | 4MB | None | |
| | FR-803**-WF | 1.44MB | 340MB | 8MB | None | |
| | FR-803**-WC | 1.44MB | 540MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx+ 450d2** | FR-804WW-A9 | - | - | - | None | |
| | FR-804**-WA | 1.44MB | 170MB | 4MB | None | |
| | FR-804**-WF | 1.44MB | 340MB | 8MB | None | |
| | FR-804**-WC | 1.44MB | 540MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx+ 466d2** | FR-806WW-A9 | - | - | - | None | |
| | FR-806**-WA | 1.44MB | 170MB | 4MB | None | |
| | FR-806**-WF | 1.44MB | 340MB | 8MB | None | |
| | FR-806**-WC | 1.44MB | 540MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx+ 4100d2** | FR-808WW-A9 | - | - | - | None | |
| | FR-808**-WA | 1.44MB | 170MB | 4MB | None | |
| | FR-808**-WF | 1.44MB | 340MB | 8MB | None | |
| | FR-808**-WC | 1.44MB | 540MB | 8MB | None | |
| | | | | | | |
| **DECpc LPx+ 450s2** | FR-809WW-A9 | - | - | - | None | |
| | FR-809**-WA | 1.44MB | 170MB | 4MB | None | |
| | FR-809**-WF | 1.44MB | 340MB | 8MB | None | |
| | FR-809**-WC | 1.44MB | 540MB | 8MB | None | |

# Chapter 2                   System Utilities & Configuration

## System Utilities

The computer comes with an MS-DOS bootable System Utilities diskette containing the following programs:

| | | |
|---|---|---|
| ♦ | SETUP.EXE ¾ | allows to run an MS-DOS executable version of the BIOS Setup utility. |
| ♦ | EPP3SMC.EXE | allows to configure the printer to operate in EPP (Enhanced Parallel Port) mode (DECpc LPx/LPx+). |
| ♦ | KP.EXE ¾ | allows to set a keyboard and mouse password. |
| ♦ | UPGRADE.EXE ¾ | allows to upgrade or restore the computer's BIOS via Flash ROM (DECpc LPx 560/566). |

When unfamiliar with utility programs and video drivers and their uses, carefully read and understand this chapter before attempting to use the System Utilities Diskette.

## Using the System Utilities Diskette

The System Utilities Diskette allows to:

♦    Run an MS-DOS executable version of the computer's BIOS Setup utility (SETUP.EXE).
♦    Set a keyboard and mouse password (KP.EXE).
♦    Upgrade or restore the computer's BIOS (UPGRADE.EXE) (DECpc LPx 560/566).

| 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 System Utilities diskette and then store original in a safe place.
2)    Turn on or reboot the computer.
3)    Insert backup copy of System Utilities diskette into drive A.
4)    Run UPGRADE.EXE, SETUP.EXE, or KP.EXE.
5)    Remove System Utilities diskette and then reboot computer so changes immediately take effect.

## Running SETUP.EXE

SETUP.EXE allows to select and permanently store information about the computer's installed 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.

To access SETUP.EXE:

1)    Turn on the computer.
2)    Allow POST to complete.
      If an error message appears on the screen, refer to *chapter 4,"Troubleshooting"*.
3)    Insert the backup copy of the System Utilities diskette into drive A.
4)    Type **a:setup** then press **[Enter]**.
      Page 1 of Setup appears.
5)    Press the right arrow key to move the cursor to the ROM Based Setup option.  Change the setting to Enable/Disable.
6)    Exit SETUP.EXE (saving the changes).
7)    Remove the backup copy of the System Utilities diskette and then reboot the computer.

## EPP3SMC.EXE

EPP3SMC.EXE can be executed as an MS-DOS command or added to the CONFIG.SYS file as a device driver.  In either case, use the BIOS Setup utility to set the parallel port to EPP mode.

# 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 you type them.  Each time you enter or change a keyboard and mouse password, the characters also do not appear on the screen as you type them. |
|------|---|

## 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]**.

## 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.

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.

## UPGRADE.EXE (DECpc LPx 560/566)

All computers have BIOS software in a read-only, non-volatile memory (ROM) chip.  This BIOS initializes hardware and boots the operating system when the computer is turned on.  The BIOS also provides access to other services such as keyboard and disk drives.

The computer comes equipped with flash memory.  This means that the computer's BIOS can be restored simply by running the UPGRADE.EXE utility contained on the supplied System Utilities diskette.  You can also upgrade the computer's BIOS to future releases by running UPGRADE.EXE along with any flash BIOS update diskette if necessary.

## Before Using UPGRADE.EXE (DECpc LPx 560/566)

When not familiar with utility programs and their uses, carefully read and understand the following information before attempting to use UPGRADE.EXE:

Have the following items available before you begin:

♦   Blank formatted diskette
♦   System Utilities diskette (supplied with the computer)
♦   Recovery diskette

| NOTE | Before attempting to upgrade the flash BIOS, ensure that **J35** is set correctly.  To perform a flash BIOS upgrade, J35 must be set to enable.  After the upgrade, make sure J35 is set back to disable as a security measure (if desired). |
|------|---|

## Creating a Recovery Diskette (DECpc LPx 560/566)

1)   Insert the backup copy of the System Utilities diskette into drive A.
2)   Turn on the computer.
3)   At MS-DOS prompt, type **a:upgrade**, and then press **[Enter]**.
     This invokes UPGRADE.EXE.  Also, the following menu items appear on the screen:
     ◊     Make Recovery Diskette from Flash
     ◊     Make Recovery Diskette from Image File
     ◊     Upgrade Flash from Image File
     ◊     Save Flash to Image File
     ◊     Compare Flash to Image File
     ◊     BIOS Information
     ◊     Exit
     For additional on-line help,  press **[F1]**.
4)   Select the Make Recovery Diskette from Flash menu option.
     The message, *"Please select the diskette drive that you will use to create a Flash Recovery Diskette, or select "Cancel" to abort"*, appears on screen.
5)   Press **[Tab]** or the up and down arrow keys to the highlight diskette drive you want to use, then press **[Enter]**.  Drive A is the default diskette drive.
     The message, *"Insert a formatted diskette into drive A.  The contents of this diskette will be lost! and replaced with system recovery software and the BIOS image you specified. Select "Continue" to start writing the recovery diskette, or "Cancel" to abort,"* appears on screen.
6)   Insert a blank (formatted) diskette in drive A, and select Continue to proceed with creating a recovery diskette.  A message window notifies you when it completes.  Press any key to continue.
7)   Remove the recovery diskette and store it in a safe place.

## Upgrading the Computer's BIOS (DECpc LPx 560/566)

1) Insert the backup copy of the System Utilities diskette into drive A.
2) Select the Upgrade Flash from Image File menu option.
   You are then prompted to select a BIOS image file to program into flash memory.

---

**NOTE**      If the BIOS resides on a diskette, use that diskette to upgrade the BIOS.

---

3) Press **[Enter]** to list a directory of .BIN (BIOS image) files.  Select the desired image file.
   The message *"Your BIOS will now be replaced by the new BIOS image you selected. Select "Program" to start, or "Cancel" to abort. Keep in mind that programming a new BIOS into Flash memory requires a fair amount of power. If you are running on battery power you should have a full charge!"* appears on screen.
4) Press **[Enter]** to continue programming the new BIOS into flash memory.
   The message *"DO NOT TURN OFF THE POWER"* appears on screen.
   The flash memory is erased, and replaced by a new BIOS.  Depending on the size of flash memory, programming takes 20-40 seconds.  When programming completes, a message briefly appears on screen, then the computer attempts to reboot.
5) Remove the backup copy of the System Utilities diskette and allow the computer to reboot without error.
   If an error occurs, a siren sounds while the computer attempts to boot, signaling that the flash memory is corrupted.  If this occurs, insert the recovery diskette into drive A or B so the original BIOS can be copied back into flash memory.
   If the computer does not reboot and the siren does not sound, turn off the computer.  Set the main logic board jumper **J34** to recovery mode.  This forces a BIOS recovery process.
6) Insert the backup copy of the System Utilities diskette into drive A, invoke UPGRADE.EXE, and then select the Compare Flash to Image File menu option.
   The message, *"Select BIOS Image File Name to compare against flash memory,"* appears on screen.
7) Press **[Enter]** to display a list of .BIN (BIOS image) files.  Select the desired .BIN file to compare with flash memory.
   A message window shows whether flash memory contains the same BIOS as the disk file.
   Press any key to continue.
   If applicable, select the Save Flash to Image File menu option.  This option reads BIOS out of flash memory and stores it on a disk file.  A valid image file can be used with other upgrade commands that need an image file. The default name for the image file is DEFAULT.BIN.  A different file name can be typed if you do not want to use the default name.
9) Exit UPGRADE.EXE and remove the backup copy of the System Utilities diskette.

## Helpful Hints

♦   Several keyboard function keys and numeric keypad keys are assigned to help selecting menus and options, changing option values, and 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.

♦   Press **[Esc]** then press **[F6]** to exit the BIOS Setup utility without changes taking effect.

♦   Press **[Esc]** then press **[F5]** to set all BIOS Setup utility options to their default values.

# 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<br>Français<br>Deutsch<br>Italiano<br>Español | Sets the desired language.<br>DECpc LPx 560/566: The language field in SETUP.EXE contains all the languages listed as possible settings. The BIOS Setup utility has English only. Run the UPGRADE.EXE program from the System Utilities diskette to load one of the five languages available on the multilingual BIOS diskette. The BIOS Setup utility appears as an F1 prompt each time the computer is booted. |
| **Diskette A /**<br>**Diskette B** | 3.5", 1.44 MB<br>3.5", 2.88 MB<br>Not Installed<br>5.25", 360 KB<br>5.25", 1.2 MB<br>3.5", 720 KB | Sets the size and density of diskette drives. |
| **Hard disk 1 /**<br>**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.<br><br>**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 press the [Enter] key. |
| **Base memory** | 640 KB | Displays the size of base (conventional) memory.<br><br>**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. |
| **Extended memory** | 3072 KB | Displays the current amount of extended memory. |
| **Video card** | VGA or EGA<br>CGA 40 Col.<br>CGA 80 Col.<br>Monochrome<br>Not Installed | Sets the video controller type. |
| **Keyboard** | Installed<br>Not Installed | Enables or disables the keyboard when using the computer as a network server.<br>**Note**: The computer must initially be set up with a keyboard. |
| **NumLock on boot** | On<br>Off | Enables or disables the NumLock feature each time the computer boots. |
| **Password (LPx)** | Not Installed<br>Installed | Enables or disables a power-on password. |

## BIOS Setup Utility Options (continued)

| Menu Field | Settings | Comments |
|---|---|---|
| **Password (LPx+)** | Setup only<br>System only<br>System and setup<br>Not Installed | Enables or disables a system power-on and/or BIOS setup password. |
| **Password (LPx 560/566)** | System power-on password<br>Setup password<br>System power-on and setup password<br>Not Installed | Enables or disables a system power-on and/or BIOS setup password. |
| **ROM based setup** | Enabled<br>Disabled | Enables or disables the ROM base setup utility.<br><br>**Note**: Disabling this option prevents unauthorized personnel from changing any computer's configuration parameters. |
| **Mouse port** | Enabled<br>Disabled | Enables the mouse port and assigns IRQ12.<br>Disables the mouse port and frees up IRQ12 for option use. |
| **Parallel port** | Enabled at:<br>378h-37Ah (IRQ7)<br>278h-27Ah (IRQ7)<br>3BCh-3BEh (IRQ7)<br>Disabled<br>Bi-directional mode<br>Compatible mode<br>Extended mode[2]<br><br>EPP mode[1]<br>ECP mode[1] | Enables or disables any desired onboard printer port at the specified address.<br><br><br><br><br><br>Allows to select between standard printer and bi-directional applications.<br><br><br><br><br>Allows to select between enhanced parallel port (EPP) and extended capabilities port (ECP) applications. |
| **Serial port 1** | Enabled at:<br>3F8h-3FFh (IRQ4)<br>2F8h-2FFh (IRQ3)<br>3E8h-3EFh (IRQ4)<br>2E8h-2EFh (IRQ3)<br>Disabled | Enables or disables any desired onboard serial port at the specified address.<br><br>The computer logically assigns LPT*x* and COM*x* names to:<br>      Parallel ports in the address order 378h and 278h<br>      Serial ports in the address order 3F8h, 2F8h, 3E8h, and 2E8h<br>This occurs during each boot process. For example, when the serial port is disabled that is assigned to 3F8h as COM1, during the next boot cycle the computer reassigns the name COM1 to the next enabled serial port in the sequence. |

## BIOS Setup Utility Options (continued)

| Menu Field | Settings | Comments |
|---|---|---|
| **Serial port 2** | Enabled at:<br>2F8h-2FFh<br>(IRQ3)<br>3E8h-3EFh<br>(IRQ4)<br>2E8h-2EFh<br>(IRQ3)<br>Disabled<br>3F8h-3FFh<br>(IRQ4) | Enables or disables any desired onboard serial port at the specified address. |
| **Diskette drive** | Enabled<br>Disabled | Enables or disables the onboard diskette drive controller. |
| **Exchange diskette drives** | Disabled<br>Enabled | Allows to logically exchange physical diskette drive designations. |
| **Diskette write protection**[1] | Disabled<br>Enabled | Enables or disables the selected diskette drive's write protect option.<br><br>**Note**: This option allows to write protect any installed diskette drive. Enabling this option prevents unauthorized personnel from writing data to a diskette. |
| **IDE hard disk drives** | Enabled<br>Disabled | Enables or disables the onboard IDE disk drive controller.<br>Disable this option when having a SCSI controller installed in one of the expansion slots. |
| **HDD user definable types** | Types 2 and 3<br>Types 48 and 49 | The BIOS Setup utility allows types 2 and 3 or types 48 and 49 to be user definable.<br>Drive type 48 or 49 information is aliased to drive type 2 or 3 when application software does not recognize drive types above 47.<br>Auto-detection of IDE drive parameter is supported in types 2 and 3 and types 48 and 49.<br>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. |
| **Large drive addressing**[1] | Standard<br><br><br>LBA convert | The drives cylinder/ head/ sector values are used by the computers BIOS and operating system (hard disk drives up to 528 MB).<br><br>Allows the computers BIOS to convert the logical cylinder/ head/ sector used by the operating system to the drives cylinder/ head/ sector value (hard disk drives greater than 528 MB). |

## BIOS Setup Utility Options (continued)

| Menu Field | Settings | Comments |
|---|---|---|
| **HDD data transfer method**[1] | Standard PIO | Allows for a standard, compatible data transfer method (one data block per interrupt). |
| | Auto optimum | Allows the computer's BIOS to automatically set up the installed drive for optimum performance (multiple data blocks per interrupt). |
| | | **Note**: This option lets you take advantage of new IDE hard disk drive technologies. Setting this option to *Auto Optimum* allows the computer's BIOS to interrogate and automatically set up any installed IDE hard disk drive for optimum performance. |
| **Boot from diskette A** | Enabled Disabled | Enables or disables drive A as the logical boot device.

**Note**: The computer comes from the factory with options Boot From Diskette A and Boot From Hard Disk C enabled.  This means that each time the computer is turned on or reset, it attempts to first boot from diskette A and then from hard disk drive C.  When choosing to change the computer's boot sequence, be aware of the following: When a second diskette drive has been installed, you can choose which one to boot from, using the "Exchange Diskette Drives" setup option. |
| **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. |

## BIOS Setup Utility Options (continued)

| Menu Field | Settings | Comments |
|---|---|---|
| **Secondary cache** | Enabled<br>Disabled | Enables or disables the computer's external (secondary) cache.<br><br>**Note**: Enabling the secondary cache significantly improves computer performance by reducing the average number of wait states seen by the microprocessor.<br>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.<br><br>**Note**: When no secondary cache has been installed, make sure this option is set to *disabled*. |
| | Enabled WT[2]<br>Enabled WB[2] | Enables or disables the computer's external cache in WT (Write Through) or WB (Write Back) mode.<br><br>**CAUTION**: If the computer contains a Pentium CPU module, ensure that this option is set to Write-Through mode. |
| **AT bus space**[1] [2] | Disabled | Memory hole not available, upper memory is contiguous. |
| | F80000h, .5MB | Sets the memory hole at address F80000 with .5 MB memory available. |
| | F00000h, 1MB | Sets the memory hole at address F00000 with 1 MB memory available. |
| | E00000h, 1MB | Sets the memory hole at address E00000 with 1 MB memory available. |
| | E00000h, 2MB | Sets the memory hole at address E00000 with 2 MB memory available. |
| | C00000h, 4MB | Sets the memory hole at address C00000 with 4 MB memory available.<br><br>**Note**: This option allows to select a memory hole in upper memory (between 1 MB and 16 MB) to be used by optional network expansion boards or optional software using frame-grab memory.  Selecting an available memory hole range avoids memory address conflicts by mapping the physical memory that has been addressed to the region to the top of main memory.<br>Refer to the user documentation supplied with the optional network expansion board or optional software to see if a specific memory range is required for proper operation.  Also make sure the operating system can support the memory hole selections prior to enabling this feature.<br><br>Banyan Vines users must select AT Bus Space E00000h, 1 MB to eliminate memory address conflicts. |

## 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.<br><br>**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.<br><br>**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.<br><br>**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. |
| Cache video ROM | Enabled Disabled | Enables or disables the computer's cache video ROM option.<br><br>This option allows the computer to cache video BIOS information. Caching the computer's video ROM provides greater performance at the VGA level, however, when running certain application software, conflicts might occur. |
| Shadow 32K at C8000[1] [2] | Enabled Disabled | Enables or disables the computer's C8000 shadow option.<br><br>**Note**: This option allows the computer to shadow any device BIOS located in the C8000 address space. Shadowing device BIOS in this area increases the computer's overall performance.<br>Refer to the device's documentation to determine if this function can be performed. |
| Shadow 32K at D0000[1] [2] | Enabled Disabled | Enables or disables the computer's D0000 shadow option.<br><br>**Note**: This option allows the computer to shadow any device BIOS located in the D0000 address space. Shadowing device BIOS in this area increases the computer's overall performance.<br>Refer to the device's documentation to determine if this function can be performed. |

## BIOS Setup Utility Options (continued)

| Menu Field | Settings | Comments |
|---|---|---|
| **Shadow 32K at D8000**[1] [2] | Enabled<br>Disabled | Enables or disables the computer's D8000 shadow option.<br><br>**Note**: This option allows the computer to shadow any device BIOS located in the D8000 address space. Shadowing device BIOS in this area increases the computer's overall performance.<br>Refer to the device's documentation to determine if this function can be performed. |
| **512KB-640 KB mapping**[2] | Main memory<br><br>PCI/ISA | Allows to map the memory region between 512KB to 640KB to the computer's main memory.<br><br>Allows to map the memory region between 512KB and 640KB to the PCI or ISA bus.<br><br>**Note**: When this option is enabled, the amount of conventional memory under MS-DOS is reduced by 128 KB. |
| **PCI device**[2] | Enable device:<br>  Enabled<br>  Disabled<br><br>Device IRQ:<br>  None<br>  IRQ5<br>  IRQ9<br>  IRQ10<br>  IRQ15<br>  IRQ14<br><br>Enable master:<br>  Enabled<br>  Disabled<br><br>Latency timer<br>Default | Allows to individually enable or disable each PCI slot.<br><br><br>Allows to individually set an IRQ default for each PCI slot.<br><br><br><br><br><br>Allows to enable or disable a PCI device that requires master capability.<br><br><br>Allows to set the PCI latency timer (in PCI clocks) for each PCI device.<br>**CAUTION**: The PCI Device selections for factory installed PCI expansion boards should stay at the factory default settings. Modifications can cause computer failure. |
| **Power mngmnt**[1] | Disabled<br>Enabled | Enables or disables the computer's power management features. |
| **Monitor Off Timer**[1] | Disabled<br>1 min.<br>5 min.<br>10 min.<br>15 min.<br>20 min.<br>25 min.<br>30 min. | Allows to disable the monitor off feature, or, after a set period of keyboard or mouse inactivity, allows to place the monitor in an off state (one-half power saving state).<br><br>When placed in the off state, the monitor resumes its full-power capabilities with minimal delays. |

## BIOS Setup Utility Options (continued)

| Menu Field | Settings | Comments |
|---|---|---|
| **Monitor Suspend Timer**[1] | Disabled<br>1 min.<br>5 min.<br>10 min.<br>15 min.<br>20 min.<br>25 min.<br>30 min. | Allows to disable the monitor suspend feature, or, after a set period of keyboard, mouse, or keyboard controller inactivity, allows to place the monitor in a suspend state (minimum power saving state).<br><br>When placed in the suspend state, the monitor instantaneously resumes to full-power capabilities. |
| **Hard Disk Suspend Timer**[1] | Disabled<br>Enabled | Allows to disable or enable the hard disk suspend feature, or, after a set period of disk drive inactivity, allows the hard disk drive to spin down it's motor to save power.<br><br>**Note**: This option allows to place the hard disk drive in suspend power saving mode. When enabled, and after approximately 20 minutes of hard disk drive inactivity, the hard disk drives spindle and actuator motor will spin down with the drive head parked in the landing zone until disk activity resumes. |
| **System Suspend Timer**[1] | Disabled<br>30 min.<br>1 hour<br>1.5 hours<br>2 hours<br>3 hours<br>6 hours<br>12 hours | Allows to disable the system suspend feature, or, after a set period of computer inactivity, allows to place the computer in a suspend state (maximum power saving state).<br><br>**Note**: This option allows to place the computer in suspend power saving mode. While in suspend, the computer enters the maximum power saving mode. This means the monitor is off, the hard disk drive enters its suspend state, the CPU clock stops, and the cooling fan stops. Note that computer interrupts can break the system suspend state with the exception of IRQ 0 and 8. |

[1] (LPx+ only).

[2] (LPx 560/566 only).

# 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.
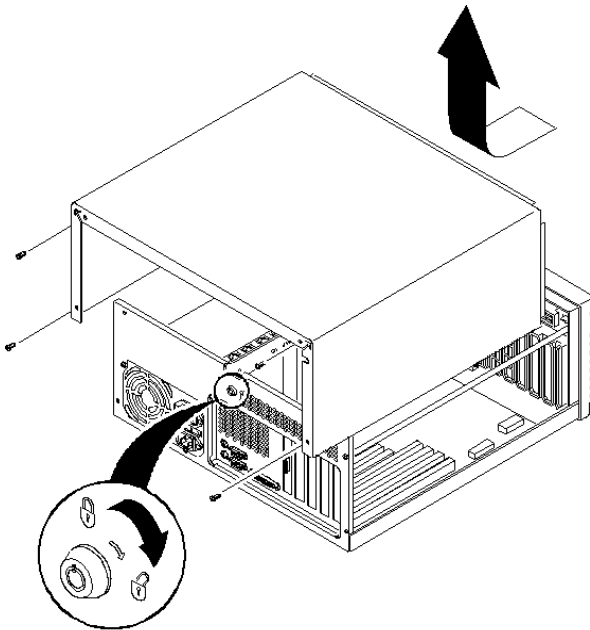


To remove the outside cover:

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 |
| B | Six ISA expansion slots |
| C | Main logic board |
| D | 3½-inch diskette drive |
| E | Front access drive bays |
| F | Internal drive bay |
| G | Two VESA-compliant VL-bus (local bus) expansion slots |
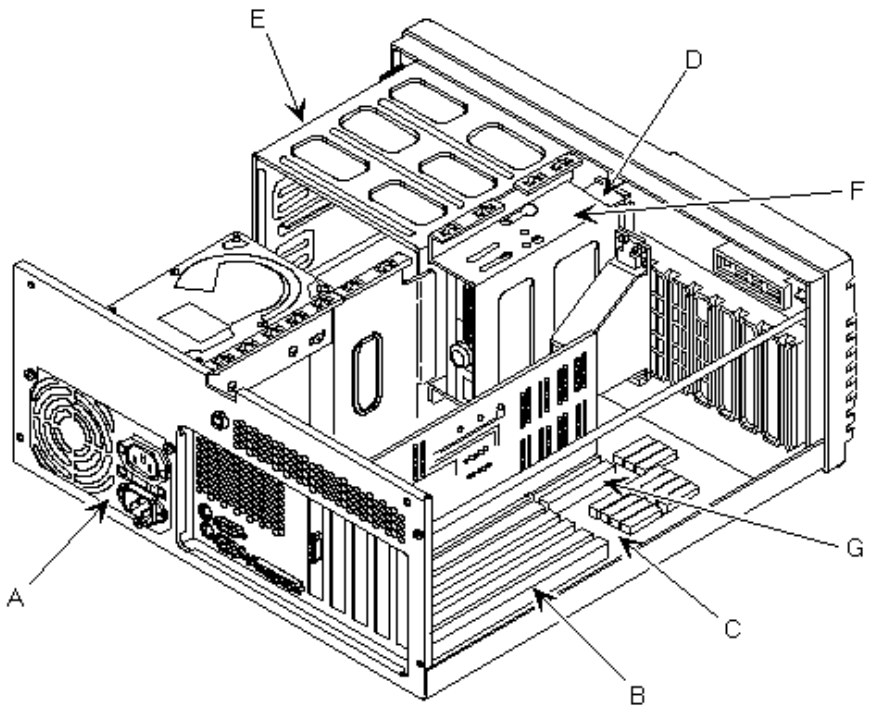
**Figure 3 - 2  LPX Computer Model Components**

# Expansion Slots

The DECpc LPx/LPx+ computer contains six expansion board slots that support standard 16-bit ISA expansion boards and 32-bit VESA-compliant VL-bus (local bus) expansion boards.

The DECpc LPx 560/566 computer contains seven expansion board slots. Four of the slots support industry-standard 16-bit ISA expansion boards. The remaining three expansion slots support 32-bit PCI local bus expansion boards.

## Expansion slots for LPx Models

The table below gives specific information about the expansion slots for the LPx computer.

| Expansion Slot | Slot Type | Description |
|---|---|---|
| **J8 - J11** | ISA | Supports industry-standard 16-bit ISA. |
| **J6 - J7** | ISA / VL-bus | Supports industry-standard 16-bit ISA expansion boards or 32-bit VL-bus expansion boards. |

## LPx Expansion Slots
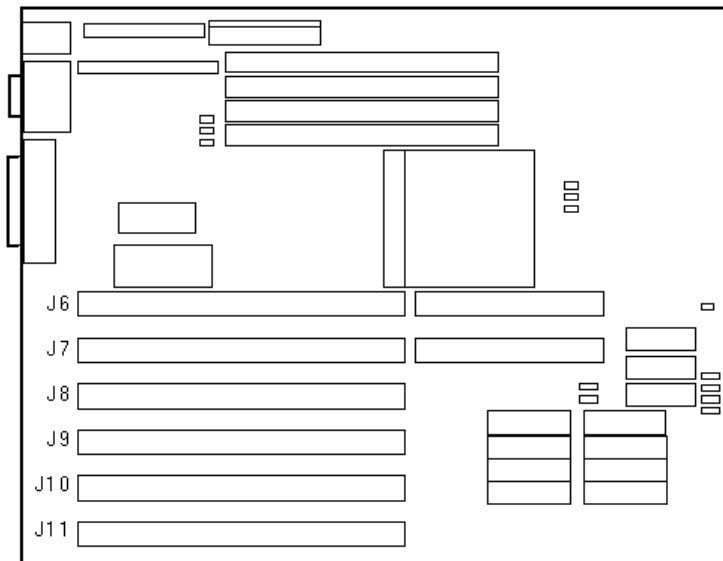


**Figure 3 - 3  LPx Expansion Slots**

## Expansion slots for LPx+ Models

The table below gives specific information about the expansion slots for the LPx+ computer.

| Expansion Slot | Slot Type | Description |
|---|---|---|
| **J29 - J32** | ISA | Supports industry-standard 16-bit ISA. |
| **J33 - J34** | ISA / VL-bus | Supports industry-standard 16-bit ISA expansion boards or 32-bit VL-bus expansion boards. |

## LPx+ Expansion Slots
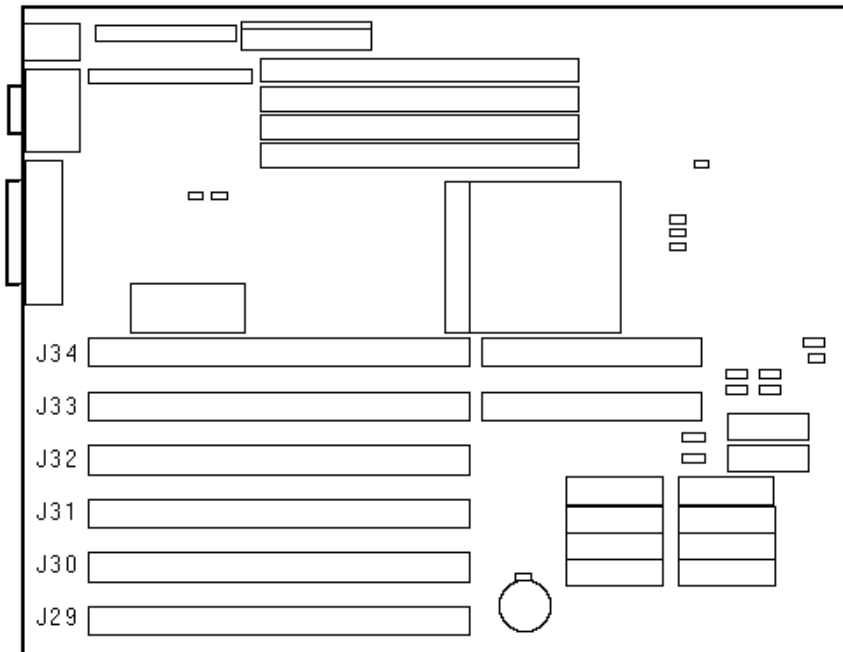


**Figure 3 - 4  LPx+ Expansion Slots**

## Expansion slots for LPx 560/566 Models

The table below gives specific information about the expansion slots for the LPx 560/566 computer.

| Expansion Slot | Slot Type | Description |
|---|---|---|
| J7, J8, J9 | ISA | Supports industry-standard 16-bit ISA expansion boards. |
| J6 | ISA | Supports industry-standard 16-bit ISA expansion boards. Designated as a shared slot with PCI slot J13. |
| J11/PCI slot 1 | PCI | Supports non-bus mastering 32-bit PCI expansion boards. Digital recommends that you install the 32-bit PCI video adapter in this slot. |
| J12/PCI slot 2 | PCI | Supports bus mastering 32-bit PCI expansion boards. Digital recommends to install 32-bit bus mastering PCI expansion boards in this slot. |
| J13/PCI slot 3 | PCI | Supports bus mastering 32-bit PCI expansion boards. Designated as a shared slot with ISA slot J6. |

## Px 560/566 Expansion Slots
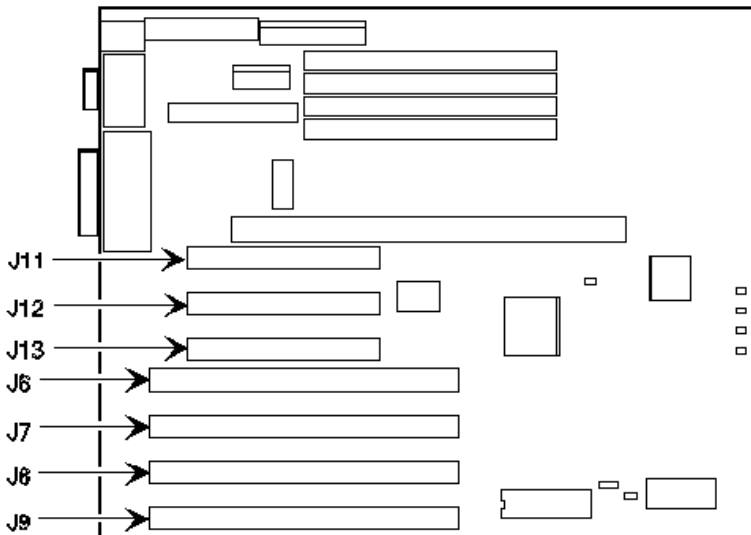


**Figure 3 - 5  LPx 560/566 Expansion Slots**

## Installing Expansion Boards

To install an ISA or VL-bus expansion board:

1)   Turn off the computer.
2)   Disconnect external devices, ac power, and monitor power.
3)   Unlock and remove outside cover.
4)   Unscrew and remove the metal filler plate for the desired expansion slot.
5)   Insert new expansion board into socket.
     Push expansion board firmly into place.
6)   Secure expansion board to slot with screw removed in step 4.
7)   Replace and lock outside cover.
8)   Connect external devices and restore power.
9)   Run BIOS setup utility to configure computer.
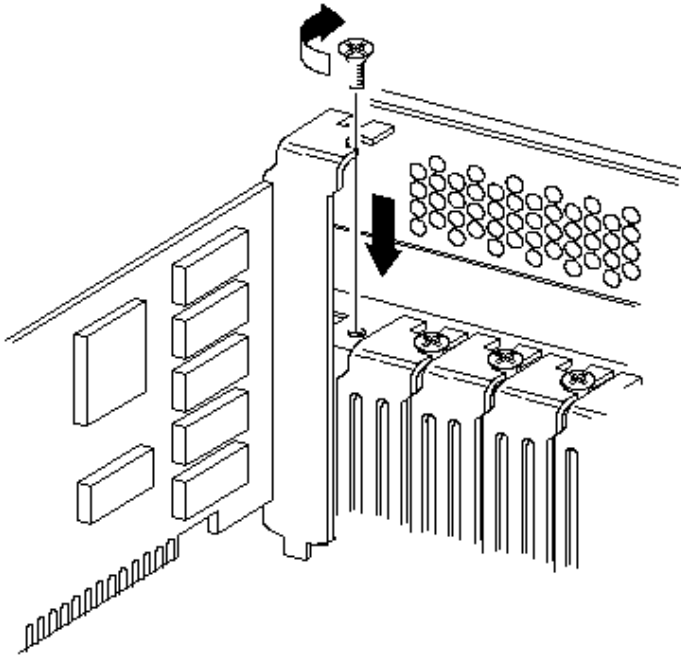


**Figure 3 - 6  Installing Expansion Slots**

# 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.**

# LPx Main Logic Board Jumper Settings

Settings shown in *bold italics* are factory defaults.

| *Feature* | *Description* | *Setting* |
|---|---|---|
| **Factory test** | ***Normal*** <br> MFG test | ***J16, open*** <br> J16, jumpered |
| **Video display type** | ***Mono monitor*** <br> Color monitor | ***J15, open*** <br> J15, jumpered |
| **CPU clock input** | 50 Mhz <br><br> 40 MHz <br><br> ***33 MHz*** <br><br><br> 25 MHz | J24, open <br> J25, open <br> J26, open <br><br> J24, open <br> J25, open <br> J26, jumpered <br><br> ***J24, jumpered*** <br> ***J25, open*** <br> ***J26, jumpered*** <br><br> J24, jumpered <br> J25, jumpered <br> J26, open |
| **Cache size select** | ***0 KB*** <br><br><br><br> 128 KB <br><br><br><br> 256 KB | ***J35, open*** <br> ***J36, open*** <br> ***J37, open*** <br> ***J38, open*** <br><br> J35, pins 1 and 2 jumpered <br> J36, pins 1 and 2 jumpered <br> J37, pins 1 and 2 jumpered <br> J38, pins 1 and 2 jumpered <br><br> J35, pins 2 and 3 jumpered <br> J36, pins 2 and 3 jumpered <br> J37, pins 2 and 3 jumpered <br> J38, pins 2 and 3 jumpered |
| **Recovery mode** | Recovery mode <br> ***Normal operation*** | J14, jumpered <br> ***J14, open*** |
| **VL bus write wait state** | ***Zero wait write*** <br> One wait write | ***J27, pins 1 and 2 jumpered*** <br> J27, pins 2 and 3, jumpered |
| **Reset switch** | ***Enable*** <br> Disable | ***J33, jumpered*** <br> J33, open |
| **RDY signal type** | ***VLRDY->CPURDY (VL bus ready connects to CPU bus ready)*** <br> VLRDY->LRDY (VL bus ready synchronized through chipset | ***J28, pins 1 and 2 jumpered*** <br><br><br> J28, pins 2 and 3 jumpered |

## LPx Main Logic Board Jumper Locations
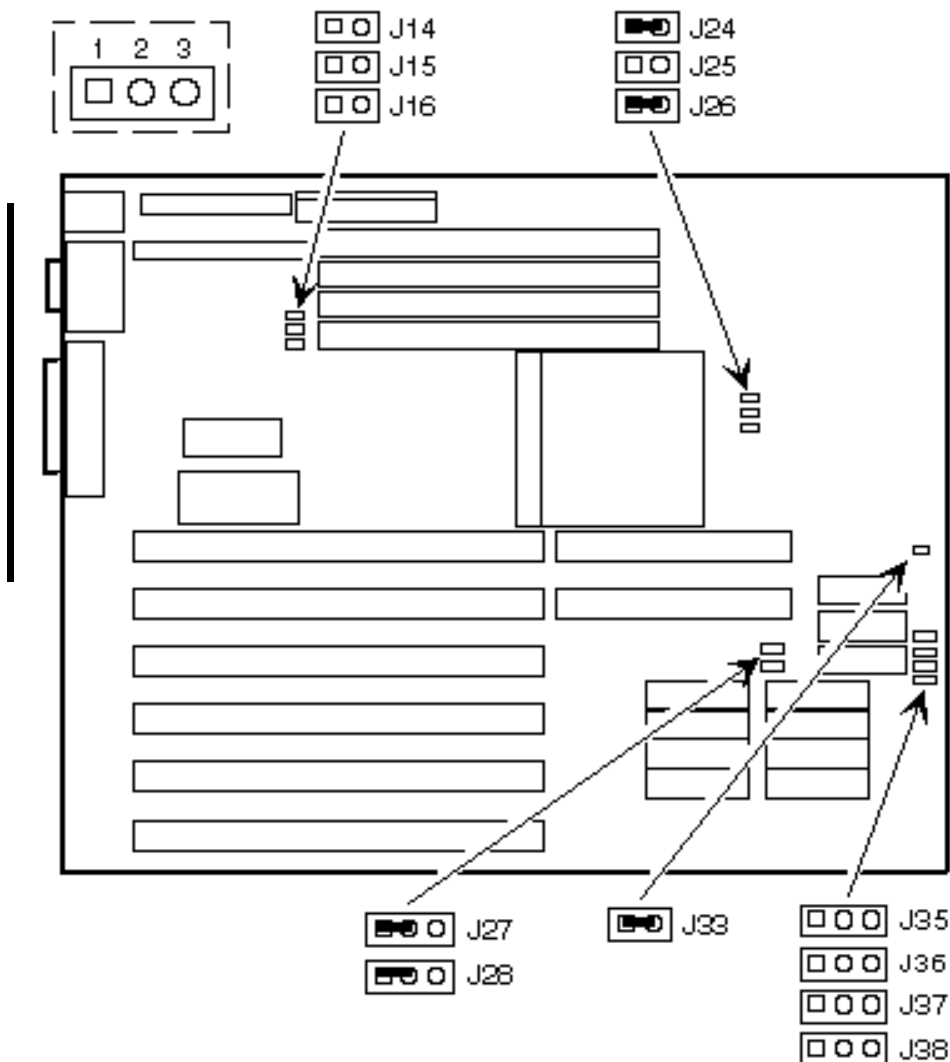


**Figure 3 - 7  LPx Main Logic Board Jumper Locations**

# LPx+ Main Logic Board Jumper Settings

Settings shown in ***bold italics*** are factory defaults.

| Feature | Description | Setting |
|---|---|---|
| **Password clear (MFG testing)** | ***Normal***(1)<br>Password clear (MFG test) | ***J15, open***<br>J15, jumpered |
| **Video display type** | ***Mono monitor***<br>Color monitor | ***J14, open***<br>J14, jumpered |
| **CPU clock input** | 50 MHz | J1, open<br>J2, open<br>J3, open |
| | 40 MHz | J1, jumpered<br>J2, open<br>J3, open |
| | ***33 MHz*** | ***J1, jumpered***<br>***J2, open***<br>***J3, jumpered*** |
| | 25 MHz | J1, open<br>J2, jumpered<br>J3, jumpered |
| **Cache size select** | ***0 KB*** | ***J4, open***<br>***J5, open***<br>***J6, open***<br>***J7, open*** |
| | 128 KB | J4, pins 1 and 2 jumpered<br>J5, pins 1 and 2 jumpered<br>J6, pins 1 and 2 jumpered<br>J7, pins 1 and 2 jumpered |
| | 256 KB | J4, pins 2 and 3 jumpered<br>J5, pins 2 and 3 jumpered<br>J6, pins 2 and 3 jumpered<br>J7, pins 2 and 3 jumpered |
| **Factory setting** | ***Enabled*** | ***J36, jumpered*** |
| **VL bus write wait state** | ***Zero wait write***<br>One wait write | ***J28, pins 1 and 2 jumpered***<br>J28, pins 2 and 3, jumpered |
| **CPU type** | P24T,P24D<br>***SX,DX*** | J35, pins 1 and 2 jumpered<br>***J35, pins 2 and 3 jumpered*** |
| **Reset switch** | ***Enable***<br>Disable | ***J24, jumpered***<br>J24, open |
| **RDY signal type** | ***VLRDY->CPURDY (VL bus ready connects to CPU bus ready)***<br>VLRDY->LRDY (VL bus ready synchronized through chipset | ***J44, pins 1 and 2 jumpered***<br><br>J44, pins 2 and 3 jumpered |

## LPx+ Main Logic Board Jumper Locations
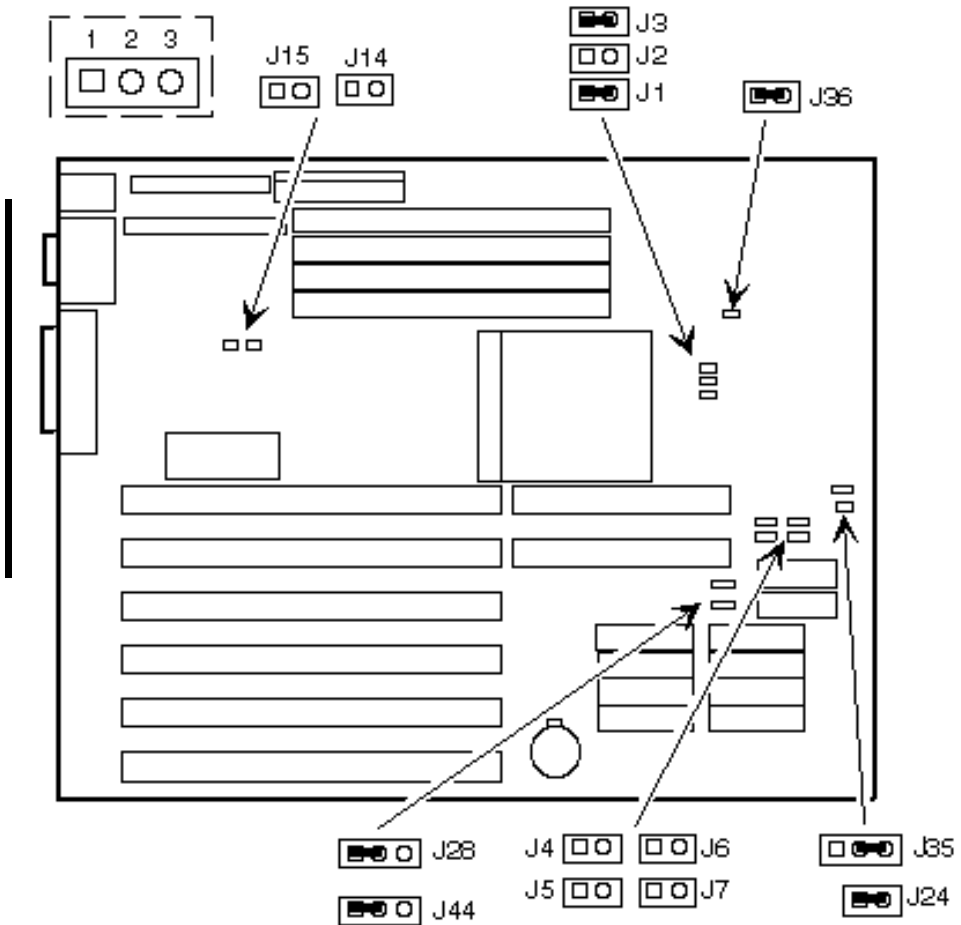


**Figure 3 - 8  LPx+ Main Logic Board Jumper Locations**

## LPx 560/566 Main Logic Board Jumper Settings

**NOTE**    The HD Active Display connector **(J44)** is used for external SCSI/IDE adapters to display hard drive activity.

⚠ **CAUTION**
**Do not use the password clear jumper (J32); use instead the clear CMOS jumper (J29). Using the clear CMOS jumper then sets all other CMOS settings back to the defaults.**

Settings shown in ***bold italics*** are factory defaults.

| *Feature* | *Description* | *Setting* |
|---|---|---|
| **Flash ROM upgrade** | ***Enable***<br>Disable | ***J35, jumpered***<br>J35, open |
| **Recovery mode** | ***Normal***<br>Recovery mode | ***J34, open***<br>J34, jumpered |
| **Display type** | ***Mono***<br>Color | ***J33, open***<br>J33, jumpered |
| **Password clear** | ***Normal***<br>Password clear (MFG test) | ***J32, open***<br>J32, jumpered |
| **Clear CMOS to default settings** | ***Normal operation***<br>Clear CMOS | ***J29, open***<br>J29, jumpered |
| **CPU type** | ***Intel***<br>Alpha | ***J39, open***<br>J39, jumpered |
| **Reprogram boot block** | Disable<br>***Enable*** | J40, pins 1 & 2 jumpered<br>***J40, pins 2 & 3 jumpered*** |

## LPx 560/566 Main Logic Board Jumper Locations
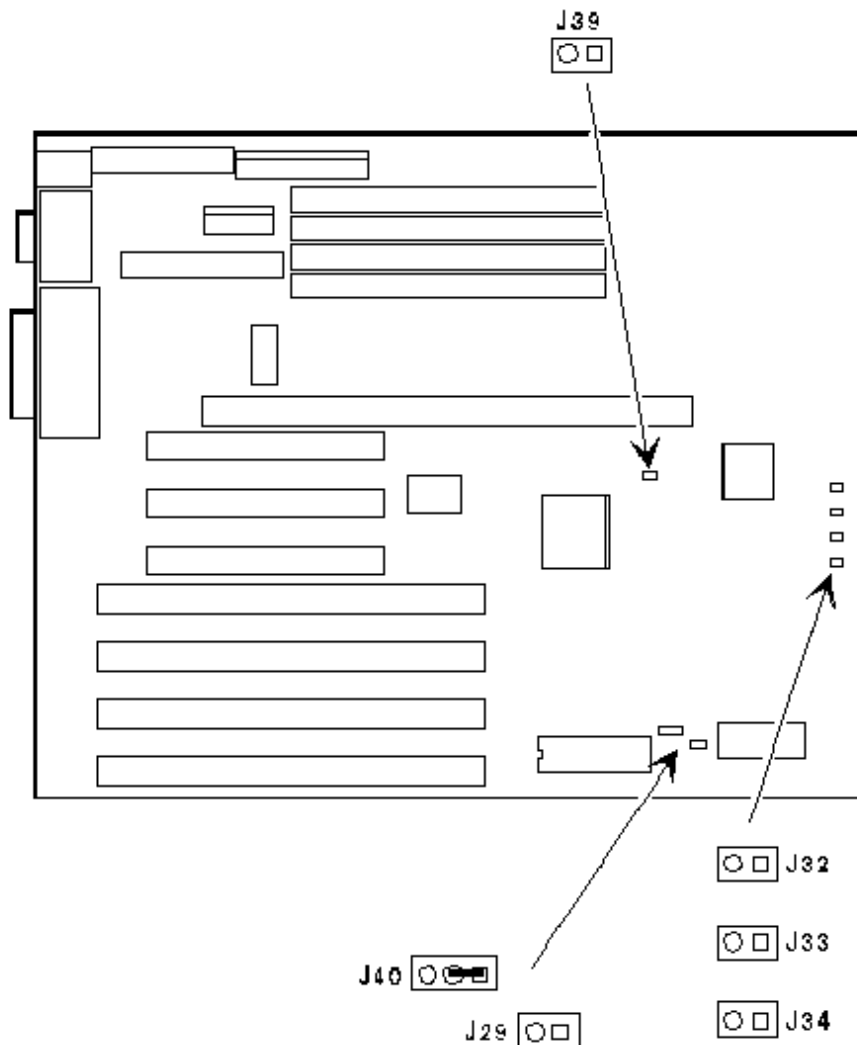


**Figure 3 - 9  LPx 560/566 Main Logic Board Jumper Locations**

## LPx 560/566 CPU Board Jumper Settings

| Feature | Description | Setting |
|---|---|---|
| **CPU clock input** (Default depends on the CPU installed at the factory.) | 60 MHz 66 MHz | J5, pins 2 and 3 jumpered J5, pins 1 and 2 jumpered |

## LPx 560/566 CPU Board Jumper Locations
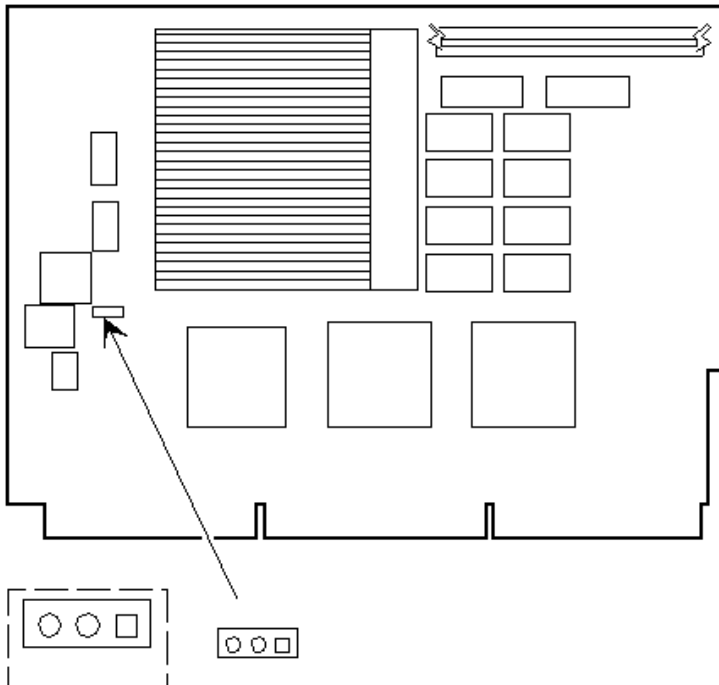


**Figure 3 - 10  LPx 560/566 CPU Board Jumper Locations**

# Computer Memory Configurations

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

## LPx and LPx+ Memory Configurations

The computer comes with at least 4 MB of memory. This amount can be increased up to 64 MB (128MB for the LPx+ computer), 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, 8 MB, 16 MB, 32 MB and 64 MB.
♦ Fill banks 0 and 1(marked A on the illustration) before banks 2 and 3 (marked B on the illustration).

| Bank 0 | Bank 1 | Bank 2 | Bank 3 | Total |
|--------|--------|--------|--------|-------|
| 4 MB | | | | **4 MB** (standard) |
| 4 MB | 4 MB | | | **8 MB** |
| 8 MB | | | | **8 MB** |
| 4 MB | 4 MB | 4 MB | | **12 MB** |
| 4 MB | 4 MB | 4 MB | 4 MB | **16 MB** |
| 8 MB | 8 MB | | | **16 MB** |
| 16 MB | | | | **16 MB** |
| 4 MB | 16 MB | | | **20 MB** |
| 4 MB | 4 MB | 16 MB | | **24 MB** |
| 8 MB | 8 MB | 8 MB | | **24 MB** |
| 16 MB | 16 MB | | | **32 MB** |
| 8 MB | 8 MB | 8 MB | 8 MB | **32 MB** |
| 4 MB | 16 MB | 16 MB | | **36 MB** |
| 4 MB | 32 MB | | | **36 MB** |
| 4 MB | 4 MB | 16 MB | 16 MB | **40 MB** |
| 4 MB | 4 MB | 32 MB | | **40 MB** |
| 16 MB | 16 MB | 16 MB | | **48 MB** |
| 16 MB | 32 MB | | | **48 MB** |
| 16 MB | 16 MB | 16 MB | 16 MB | **64 MB** |
| 64 MB | | | | **64 MB** |
| 16 MB | 16 MB | 32 MB | | **64 MB** |
| 32 MB | 32 MB | | | **64 MB** |

## LPx and LPx+ SIMM Socket Locations
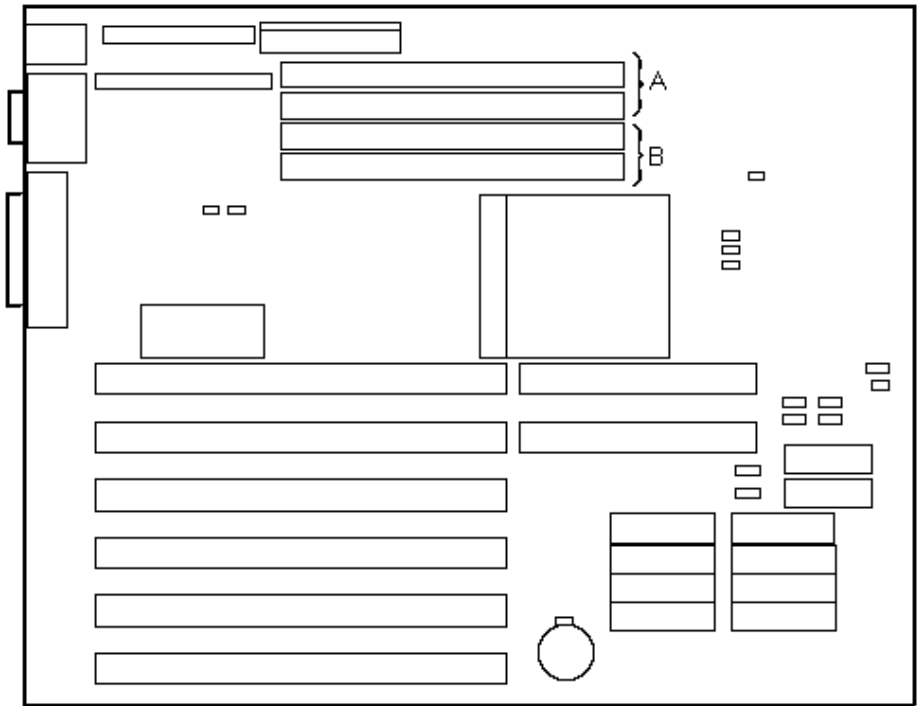


**Figure 3 - 11  LPx and LPx+ SIMM Socket Locations**

## LPx 560/566 Memory Configurations

The computer comes with at least 8 MB of memory. This amount can be increased up to 128 MB, however, when adding additional memory make sure to:

♦   Install 36-bit SIMMs having an access time of 70 ns or less.
♦   Fill two sockets at a time using the same SIMM size, type and speed.
    Supported SIMM sizes:  4 MB, 8 MB, 16 MB, and 32 MB.
♦   Fill banks 0 and 1(marked A on the illustration) before banks 2 and 3 (marked B on the illustration).

| *Bank 0* | *Bank 1* | *Bank 2* | *Bank 3* | *Total* |
|----------|----------|----------|----------|---------|
| 4 MB | 4 MB | | | **8 MB** (standard) |
| 4 MB | 4 MB | 4 MB | 4 MB | **16 MB** |
| 8 MB | 8 MB | | | **16 MB** |
| 4 MB | 4 MB | 8 MB | 8 MB | **24 MB** |
| 8 MB | 8 MB | 8 MB | 8 MB | **32 MB** |
| 16 MB | 16 MB | | | **32 MB** |
| 4 MB | 4 MB | 16 MB | 16 MB | **40 MB** |
| 8 MB | 8 MB | 16 MB | 16 MB | **48 MB** |
| 16 MB | 16 MB | 16 MB | 16 MB | **64 MB** |
| 32 MB | 32 MB | | | **64 MB** |
| 4 MB | 4 MB | 32 MB | 32 MB | **72 MB** |
| 8 MB | 8 MB | 32 MB | 32 MB | **80 MB** |
| 16 MB | 16 MB | 32 MB | 32 MB | **96 MB** |
| 32 MB | 32 MB | 32 MB | 32 MB | **128 MB** |

## LPx 560/566 SIMM Socket Locations
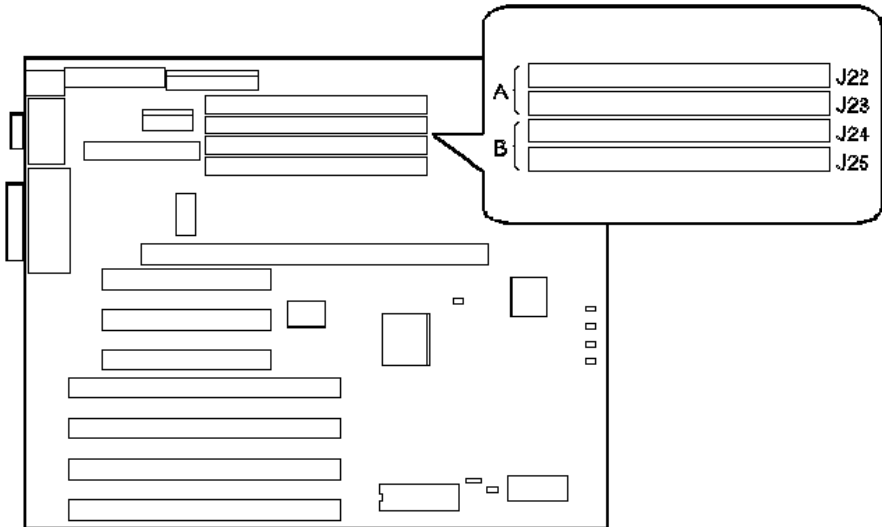


**Figure 3 - 12  LPx 560/566 SIMM Socket Locations**

# Removal Procedures

## Removing the 3½-Inch Diskette Drive

To remove the 3½-inch diskette drive:

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) Loosen screw securing drive's mounting tray to chassis.
6) Carefully slide mounting tray towards rear of computer until its locking tabs at bottom clear corresponding chassis slots.  Remove diskette drive and mounting tray.
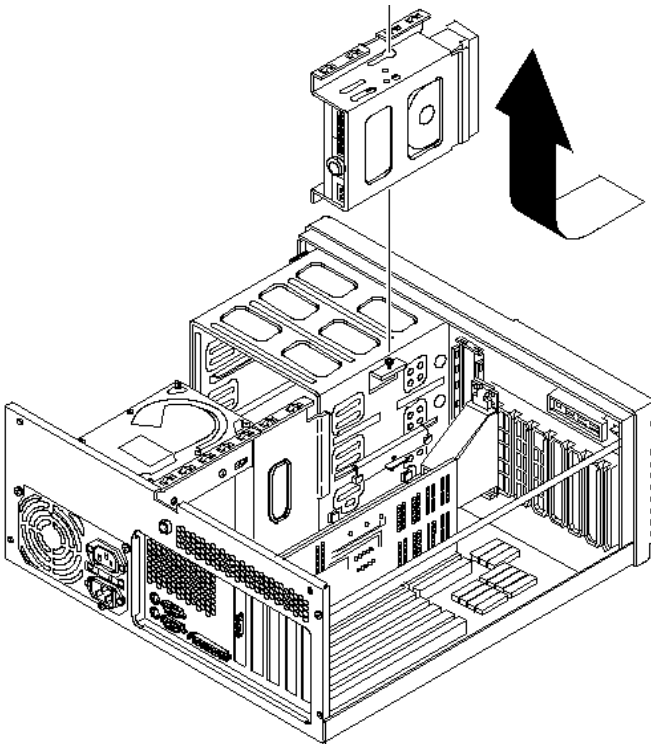
**Figure 3 - 13
Removing the 3½-
Inch Diskette**

# Removing a 5¼-Inch Device

To remove a 5¼-Inch Device:

| NOTE | The 3½-inch diskette drive and fan pipe must be removed prior to removing any 5¼-inch device. |
| --- | --- |

1)   Turn off the computer.
2)   Disconnect external devices, ac power, and monitor power.
3)   Unlock and remove outside cover.
4)   Remove 3½-inch diskette drive and fan pipe.
5)   Remove retaining screws from each side of selected drive bay.
6)   Slide 5¼-inch device forward out of drive bay.
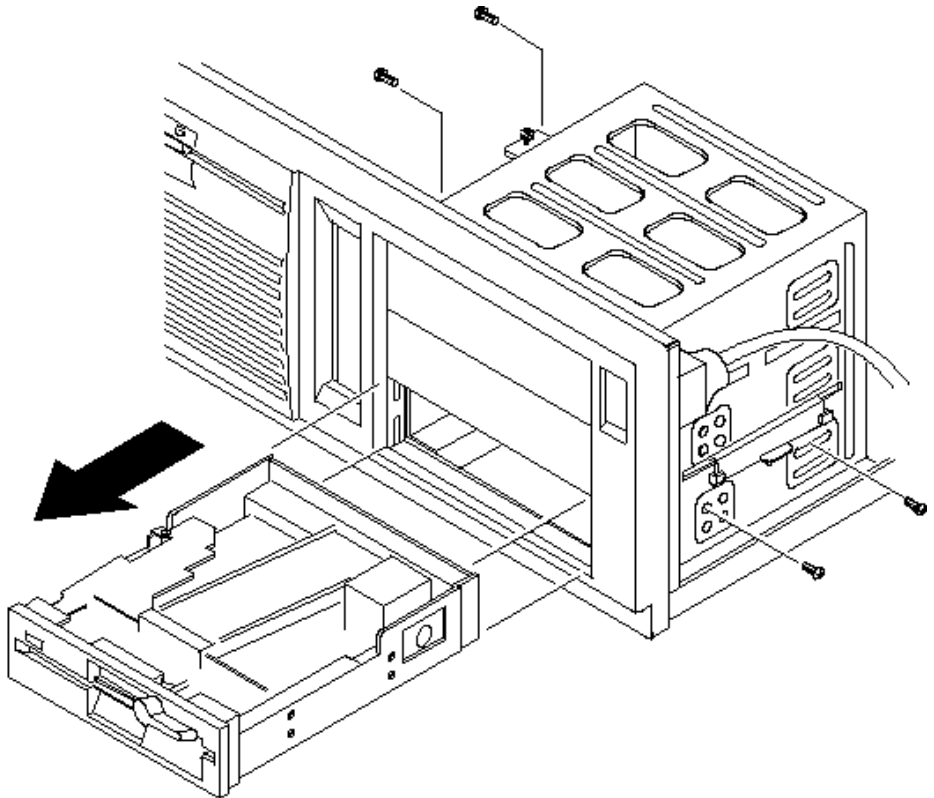


**Figure 3 - 14  Removing a 5¼-Inch Device**

## Removing a 3½-Inch Mass Storage Device (Internal Drive Bay)

To remove a 3½-Inch Mass Storage Device from the internal drive bay:

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 four mounting screws.
6)   Pull drive from internal drive bay.
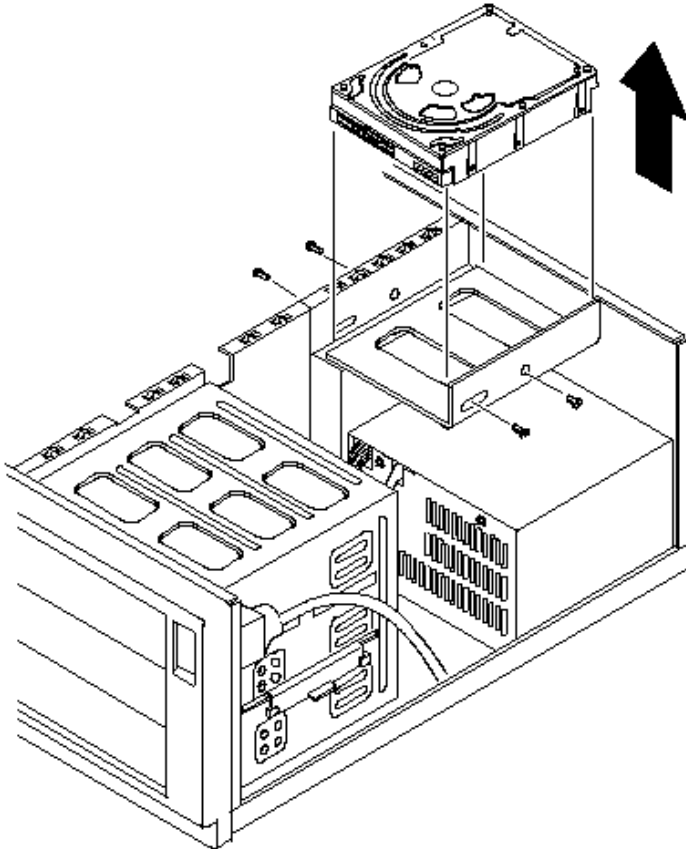


**Figure 3 - 15  Removing a 3½-Inch Mass Storage Device from the Internal Drive Bay**

## Removing the Fan Pipe

To remove the Fan Pipe:

1)    Turn off the computer.
2)    Disconnect external devices, ac power, and monitor power.
3)    Unlock and remove outside cover.
4)    Remove the 3½-Inch diskette drive.
5)    Remove CPU module retaining bracket.
6)    Unhook plastic fan pipe from card guide.
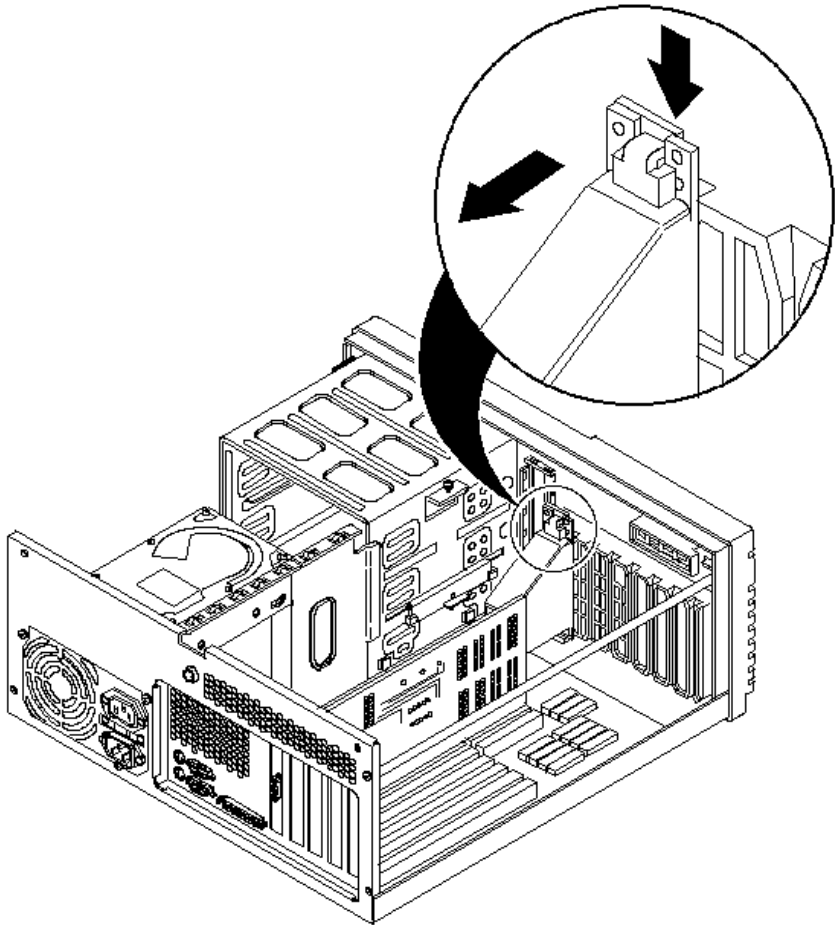


**Figure 3 - 16  Removing the Fan Pipe**

## Removing the Fan /Speaker Assembly

To remove the Fan /Speaker Assembly:

1) Turn off the computer.
2) Disconnect external devices, ac power, and monitor power.
3) Unlock and remove outside cover.
4) Remove fan and speaker connections from main logic board.
5) Press down on the two retaining clips.
6) Tilt assembly away from front panel and lift out.
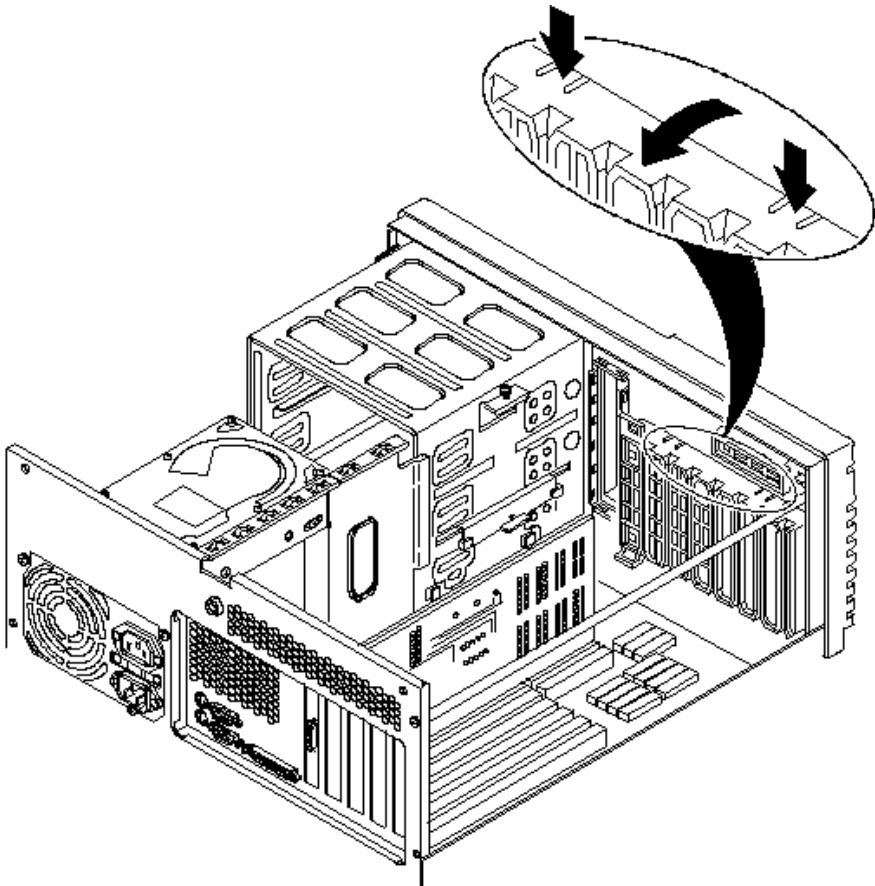
**Figure 3 - 17  Removing the Fan /Speaker Assembly**

## 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 CPU module retaining bracket and CPU module.
6)     Remove all expansion boards.
7)     Remove fan/speaker assembly.
8)     Remove lower drives.
9)     Loosen screws and slide off standoffs.

## LPx Main Logic Board Connections
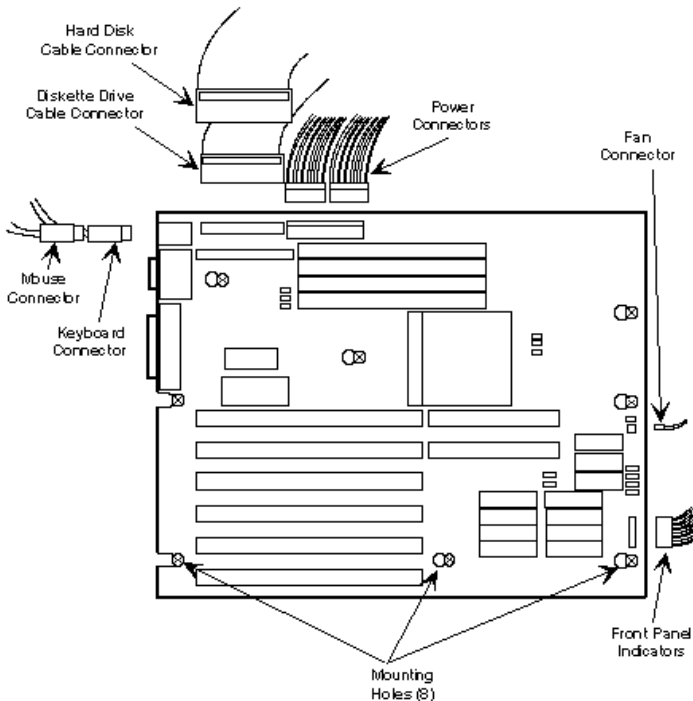


**Figure 3 - 18  LPx Main Logic Board Connections**

## LPx+ Main Logic Board Connections
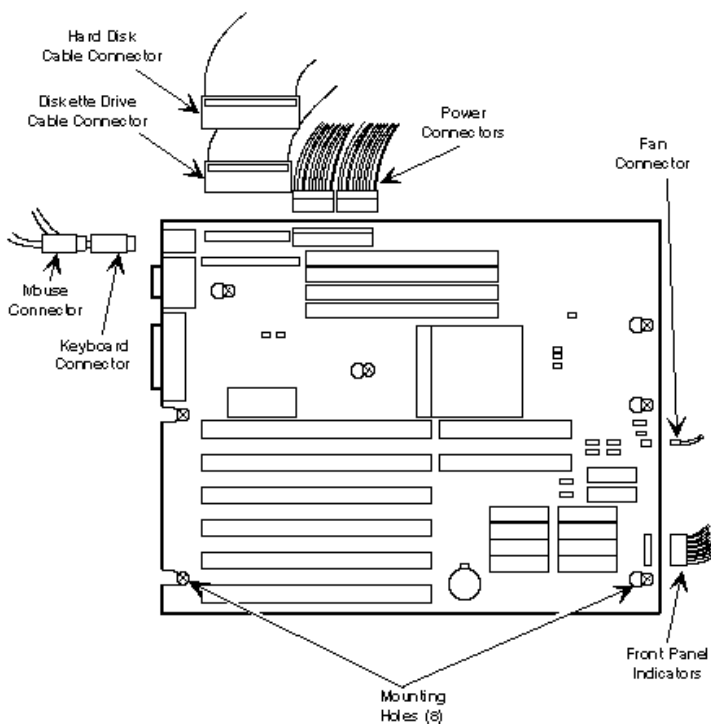


**Figure 3 - 19  LPx+ Main Logic Board Connections**

## LPx 560/566 Main Logic Board Connections
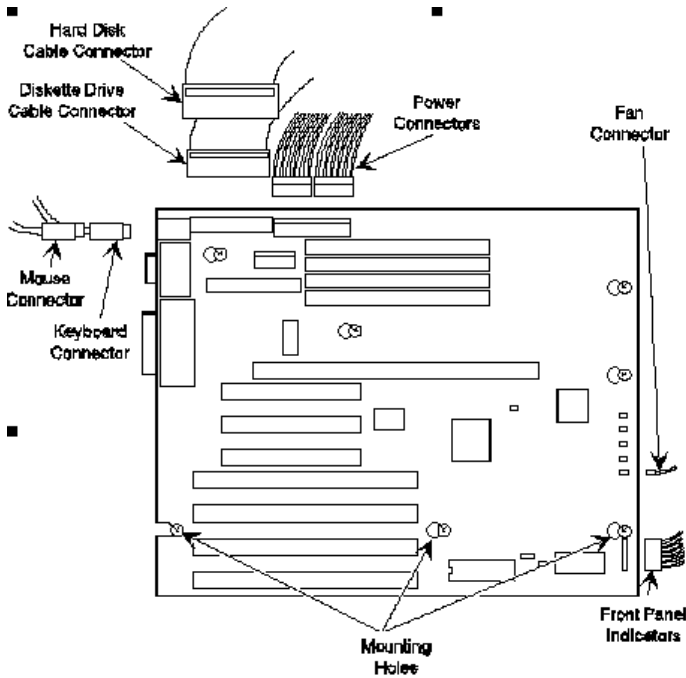


**Figure 3 - 20  LPx 560/566 Main Logic Board Connections**

## Removing the CPU Module (LPx 560/566)



**CAUTION**

**Before installing a new CPU module, update the computer's BIOS. Do not wait to update the BIOS until after installing a new CPU module.**

To remove the CPU module:

1)    Turn off the computer.
2)    Disconnect external devices, ac power, and monitor power.
3)    Unlock and remove outside cover.
4)    Remove CPU module retaining bracket.
5)    Carefully remove CPU module from main logic board.
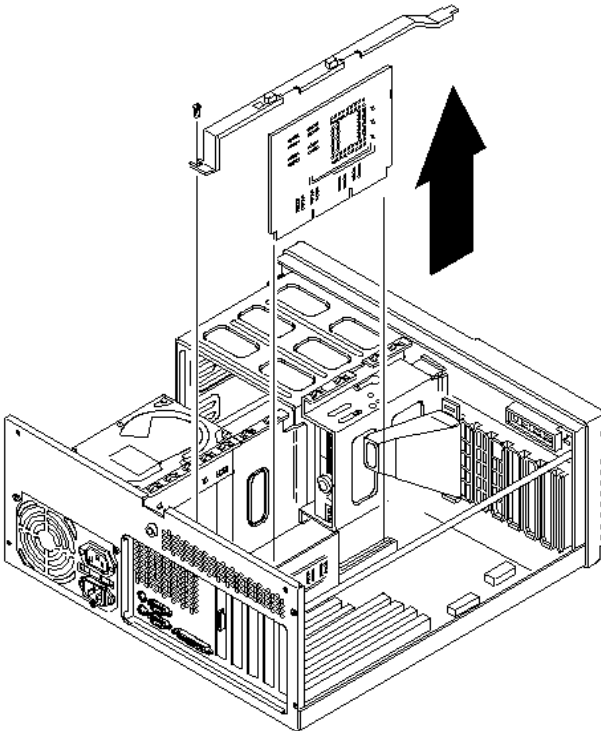


**Figure 3 - 21
Removing a CPU
Module (LPx
560/566)**

# Removing the LPx(+) Power Supply

To remove the power supply:

1)    Turn off the computer.
2)    Disconnect external devices, ac power, and monitor power.
3)    Unlock and remove outside cover.
4)    Remove screw securing power on/off cable from chassis.
5)    Pull off Power On/Off button from switch at front panel.
6)    Remove two screws securing power supply to chassis.
7)    Remove four screws securing power supply to rear panel.
8)    Remove power supply from computer.
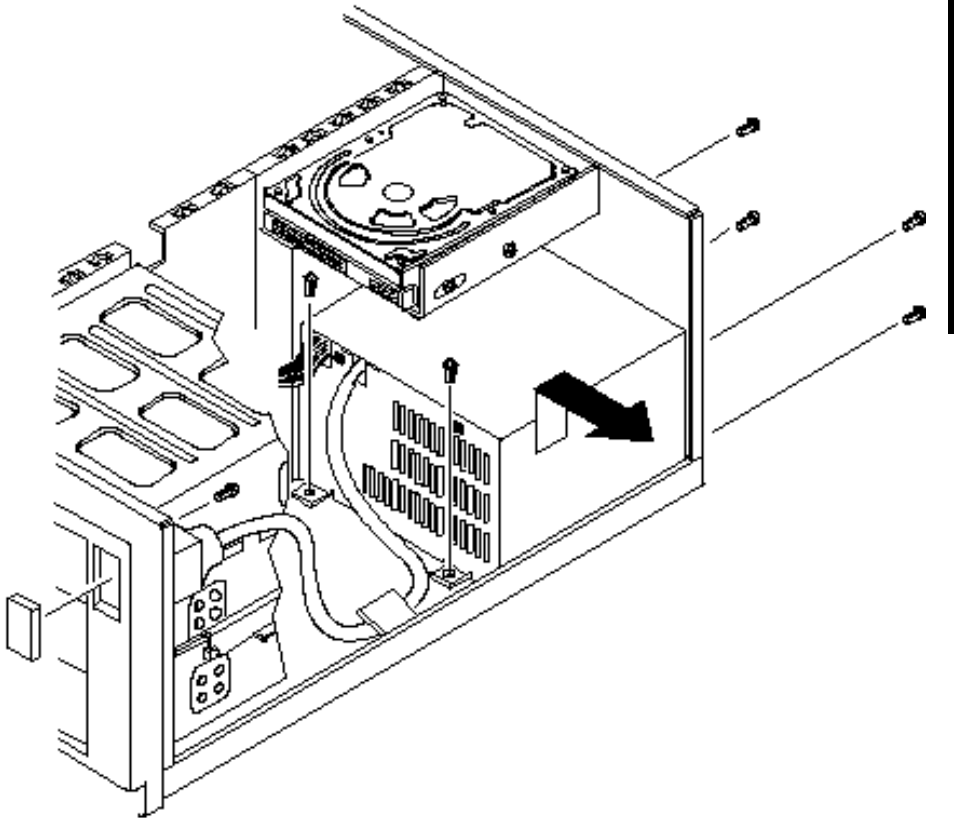


**Figure 3 - 22  Removing the LPx(+) Power Supply**

## Removing the Filler Panel

To remove the Filler Panel:

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 and release plastic
      locking tabs securing filler panel to front bezel.
5)    Remove and save filler panel.
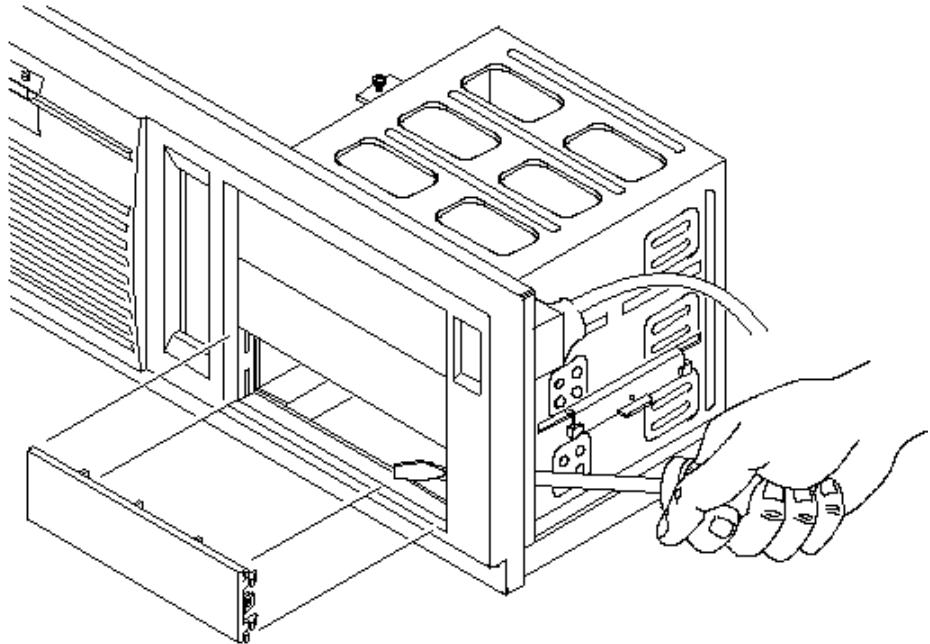


**Figure 3 - 23  Removing the LPx(+) Filler Panel**

# 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 LPx, 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.

For the DECpc LPx+, secondary cache memory consists of four or eight 32 KB x 8 cache SRAM chips and two 32 KB x 8 cache tag SRAM chips.

**LPx Cache chip locations**

| Cache Upgrade | Main Logic Board Cache Sockets | Main Logic Board Cache Tag Sockets |
|---|---|---|
| **0 to 128 KB** | E39 through E42 | E63 through E65 |
| **0 to 256 KB** | E39 through E42<br>E52 through E55 | E63 through E65 |
| **128 to 256 KB** | E52 through E55 | |

**LPx+ Cache chip locations**

| Cache Upgrade | Main Logic Board Cache Sockets | Main Logic Board Cache Tag Sockets |
|---|---|---|
| **0 to 128 KB** | E9 through E12 | E6 through E7 |
| **0 to 256 KB** | E9 through E16 | E6 through E7 |

To install a cache SRAM chip:

1)   Turn off the computer.
2)   Disconnect external devices, ac power, and 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.**
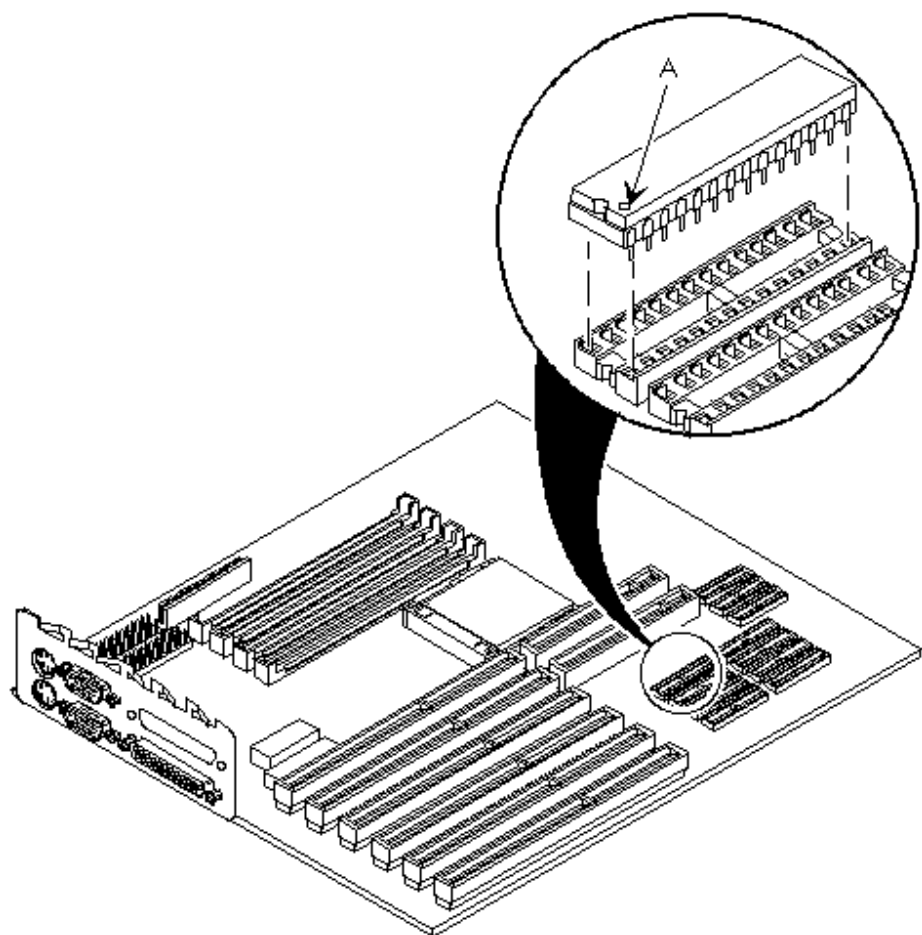
**Figure 3 - 24  Installing External Cache Memory**

## Installing a Higher Performance CPU (LPx/LPX+)

> **CAUTION**
> **Before installing a new CPU chip, update the computer BIOS. Do not wait to update the BIOS until after installing a new CPU chip.**
>
> **When installing an i486 microprocessor, make sure to align the chip with the outside row of pins visible.**

To install a higher performance CPU:

1) Turn off the computer.
2) Disconnect external devices, ac power, and monitor power.
3) Unlock and remove outside cover.
4) Lift up on the lever to release the CPU.
5) Remove the CPU, noting its pin 1 location.
6) Install new CPU.
7) Return release lever to its original position and then set all appropriate CPU jumpers.
8) Run BIOS Setup utility. Record new CPU's type, if necessary.
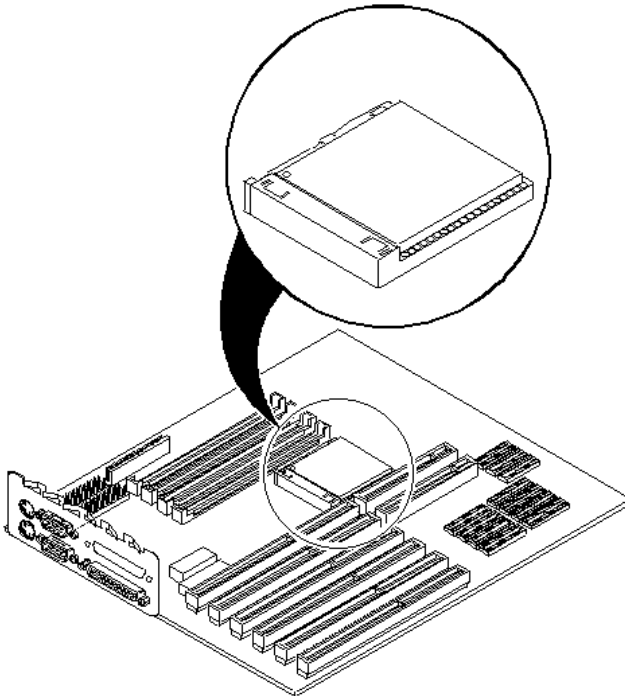


**Figure 3 - 25  Installing a Higher Performance CPU (LPx/Lpx+)**

## Installing a Higher Performance CPU (LPx 560/566)

**CAUTION**
**Before installing a new CPU chip, update the computer BIOS.  Do not wait to update the BIOS until after installing a new CPU chip.**

**NOTE**      Earlier versions of the CPU module did not have a voltage regulator card (66 MHz version) as shown or jumper card (60 MHz version).

To install a higher performance CPU:

1)   Remove the CPU module.
2)   Lift up on the lever to release the CPU.
3)   Remove the CPU, noting its pin 1 location.
4)   Install new CPU.
5)   Return release lever to its original position and then set all appropriate CPU jumpers.
6)   Run BIOS Setup utility.  Record new CPU's type, if necessary.
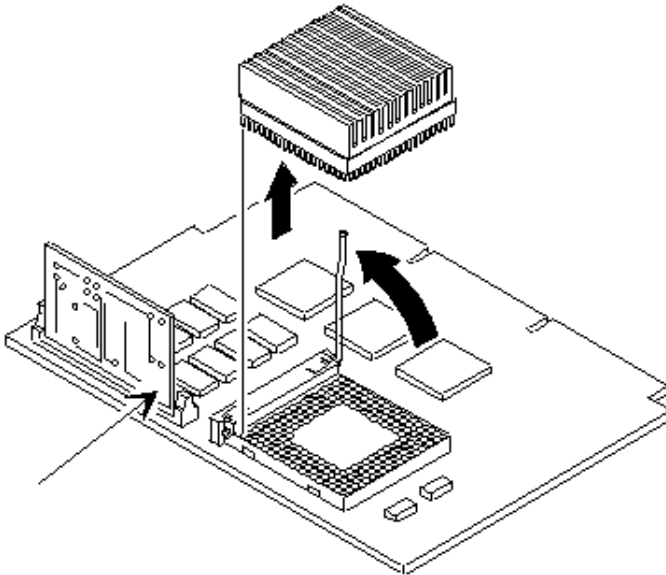
**Figure 3 - 26
Installing a Higher
Performance CPU
(LPx 560/566)**

# Replacement Procedures

## Replacing the Computer Battery/Real Time Clock (RTC) (LPx)

⚠ **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) Disconnect external devices, ac power, and monitor power.
4) Unlock and remove outside cover.
5) Remove battery.
6) Install new battery.
7) Replace and lock outside cover.
8) Connect external devices and restore power.
9) Run BIOS Setup utility to reconfigure computer using recorded configuration settings from step 1.
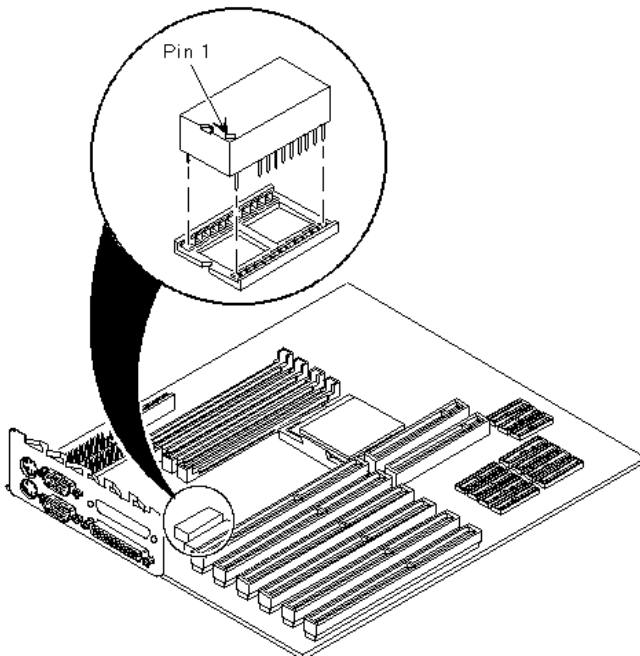
**Figure 3 - 27  Replacing the Computer Battery /Real Time Clock (LPx)**

## Replacing the Computer Battery (LPx+)

To replace the computer battery:

1) Record computer configuration settings.
2) Turn off the computer.
3) Disconnect external devices, ac power, and monitor power.
4) Unlock and remove outside cover.
5) Remove battery.
6) Install new battery (Toshiba CR2032 or equivalent).
7) Replace and lock outside cover.
8) Connect external devices and restore power.
9) Run BIOS Setup utility to reconfigure computer using recorded configuration settings from step 1.
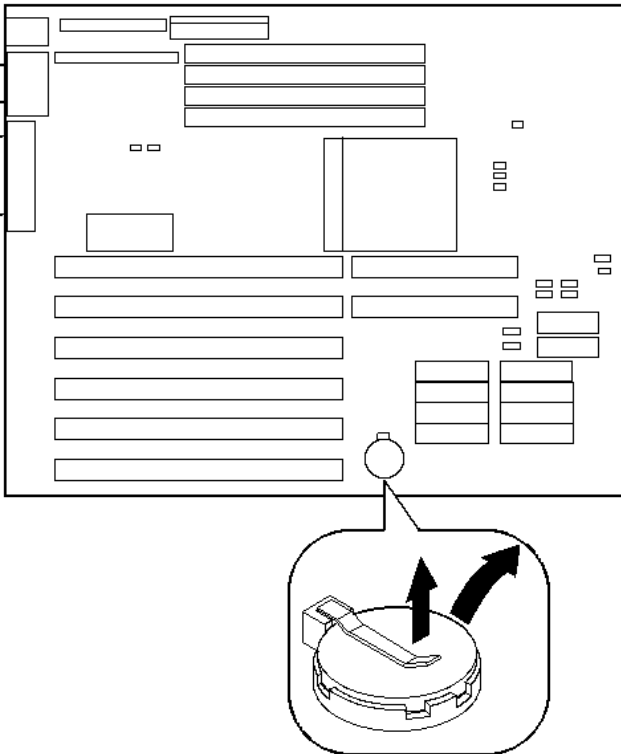


**Figure 3 - 28  Replacing the Computer Battery (LPx+)**

# Replacing the Computer Battery/Real Time Clock (RTC) (LPx 560/566)

⚠️ **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) Disconnect external devices, ac power, and monitor power.
4) Unlock and remove outside cover.
5) Remove battery.
6) Install new battery.
7) Replace and lock outside cover.
8) Connect external devices and restore power.
9) Run BIOS Setup utility to reconfigure computer using recorded configuration settings from step 1.
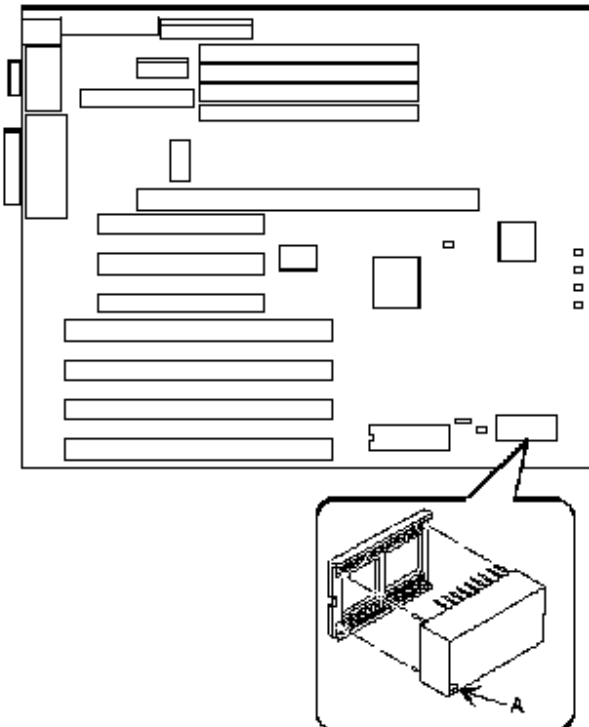


**Figure 3 - 29  Replacing the Computer Battery /Real Time Clock (LPx 560/566)**

# 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. |

## Diskette/IDE Connections

| Legend | Diskette Drive Component |
|--------|-------------------------|
| A | Power supply |
| B | Power connections |
| C | Diskette drive connection |
| D | IDE drive connection |
| E | Diskette drive |
| F | Hard disk drive |
| G | Optional storage devices |
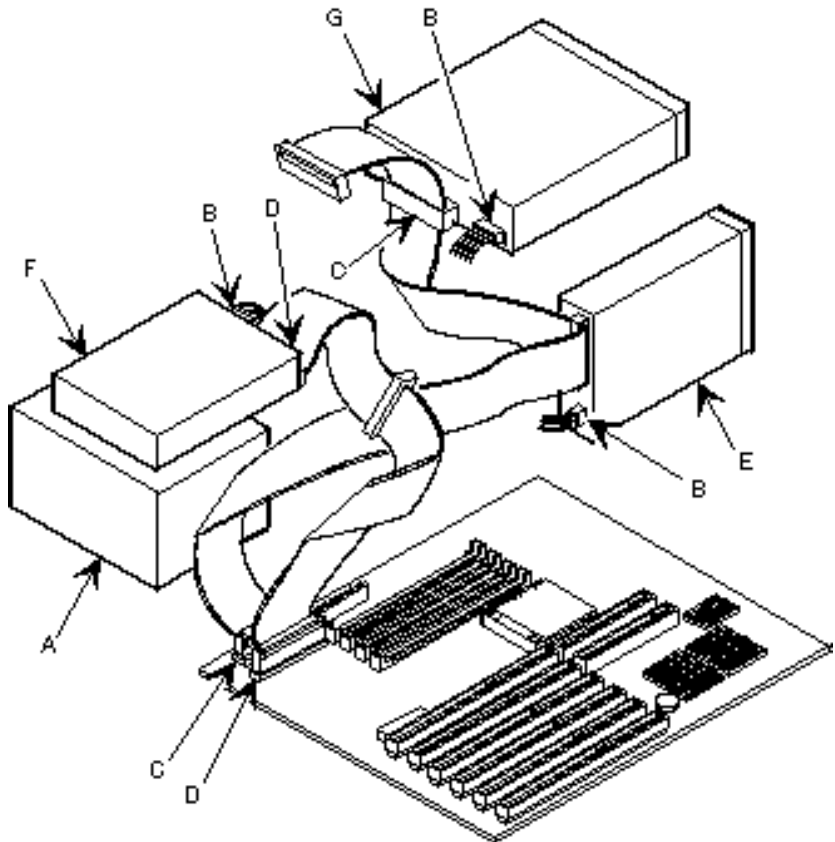


**Figure 3 - 30  Diskette/IDE Connections**

# 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.

## SCSI Connections

| Legend | Diskette Drive Component |
|--------|--------------------------|
| A | Power supply |
| B | Power connections |
| C | SCSI cable |
| D | SCSI controller connector |
| E | SCSI hard disk drive |
| F | CD-ROM drive (or other SCSI device) |
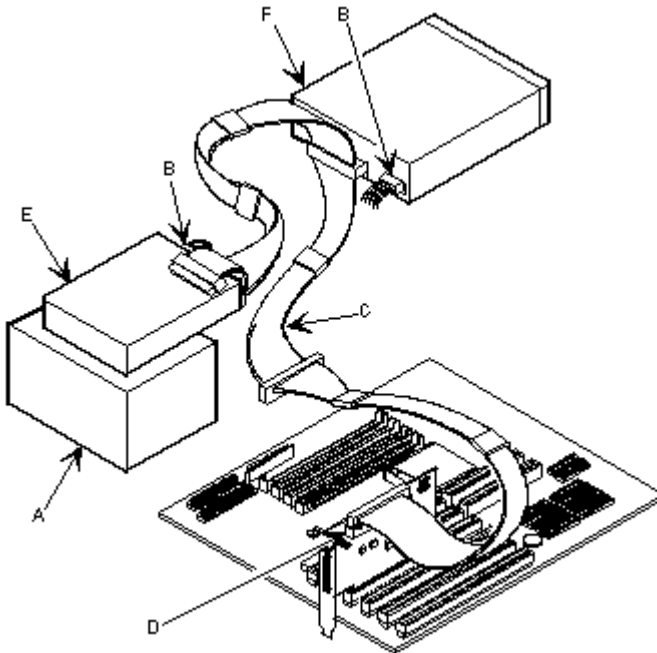


**Figure 3 - 31  SCSI Connections**

# 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 LPx/LPx+ 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 *"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 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, 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**<br>**Keyboard controller**<br>**Keyboard clock line**<br>**Keyboard data line**<br>**Keyboard failure** | Check the keyboard connection.<br>If the connection is secure, the keyboard or keyboard controller might have failed.<br>Replace keyboard. |
| **Mouse failure** | Check the mouse connection.<br>If the problem persists, replace the mouse. |
| **640 KB base memory**<br>**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.<br>Check all connections.<br>If the problem persists, replace the diskette drive. |
| **Hard disk controller failure** | Run the BIOS Setup utility.<br>Check all connections.<br>If the problem persists, replace the controller. |
| **Hard disk 0 failure** | Run the BIOS Setup utility.<br>Check all connections.<br>If the problem persists, replace the hard disk. |
| **xxxx0h optional ROM bad checksum = xx** | Correct the address conflict.<br>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.<br><br>Main logic board jumpers incorrectly set. | Replace main logic board.<br><br>Set all appropriate jumpers. |
| Power is on, but there is no screen display | Brightness and contrast controls are not correctly set.<br><br>Monitor cable is incorrectly installed.<br><br>Video adapter not seated in the expansion slot correctly. | Adjust the brightness and contrast controls.<br><br>Check all monitor connections.<br><br>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.<br><br>IDE hard disk drive is not correctly formatted or the requested partition does not exist.<br><br>There is no software on the requested partition.<br><br>IDE hard disk drive jumpers incorrectly set.<br><br>IDE drive type incorrect.<br><br><br><br>Loose cables.<br><br>Onboard IDE interface disabled.<br><br>"Boot from Hard Disk C" is disabled via BIOS Setup utility. | Install the appropriate operating system.<br><br>Format the IDE hard disk drive or partition the IDE hard disk drive using the supplied operating system software.<br><br>Install software on the requested partition.<br><br>Refer to the supplied IDE hard disk drive kit installation instructions.<br><br>Run the BIOS Setup utility to identify the correct drive type. See drive type label on drive or consult drive documentation.<br><br>Secure all cable connections.<br><br>Run the BIOS Setup utility and set the IDE Hard Disk Drives option to "Enabled".<br><br>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.<br><br>Power indicator is defective. | Turn on the monitor.<br><br>Replace the failed component. |
| No screen display | Configuration error.<br><br><br><br><br>Monitor brightness and contrast controls are incorrectly set. | Run the BIOS SETUP UTILITY to configure the computer for VGA operation.<br>Set the jumper for VGA operation. Refer to *"Main Logic Board Jumpers"*.<br><br>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.<br><br>Monitor signal cable incorrectly installed. | Adjust accordingly.<br><br>Straighten any bent connector pins and then reconnect. |
| Color monitor displaying monochrome | Computer was turned on before the monitor was turned on.<br><br>Video jumper incorrectly set. | Turn off the computer, turn on the monitor, then turn the computer back on.<br><br>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.<br>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.**

## Memory Map (LPx/LPx+)

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

| Address Range | Function | Notes |
|---|---|---|
| 00000 to 9FFFF | Base memory | 640 KB |
| A0000 to BFFFF | Video RAM | 128 KB |
| C0000 to C7FFF | VGA BIOS | 32 KB |
| C8000 to DFFFF | BIOS extension ROM (AT bus usage) | 96 KB |
| E0000 to FFFFF | Computer BIOS | 128 KB |
| 100000 to 3FFFFFF | Extended memory | 63 MB |

## Memory Map (LPx 560/566 Full Range)

| Range | Function | Notes |
|---|---|---|
| 0 KB to 512KB | main memory | PC compatibility range |
| 512KB to 1024KB (1MB) | main memory | PC compatibility range EISA/ISA memory lower limit |
| 1MB to 16MB | main memory | EISA/ISA memory upper limit |
| | memory space gap | PCI memory hole (4MB max size) |
| 16MB to 128MB | main memory | Pentium upper limit |
| 128MB to 4GB | PCI memory | |

## Memory Map (LPx 560/566 PC Compatibility Range)

| Address Range | Function | Size |
|---|---|---|
| 0000 to 7FFFF | Main memory | 512 KB |
| 80000 to 9FFFF | Main/PCI/ISA memory | 128 KB |
| A0000 to BFFFF | PCI/ISA video buffer memory | 128 KB |
| C0000 to C7FFF | Video memory BIOS | 32 KB |
| C8000 to DFFFF | PCI/ISA card BIOS and buffer memory | 96 KB |
| E0000 to EBFFF | ISA/PCI adapter RAM after POSTUsed by BIOS Setup during POST | 64 KB (48 KB if SCSI BIOS enabled) |
| EC000 to EFFFF | SCSI BIOS (if enabled) | 16 KB |
| F0000 to FFFFF | Planar BIOS memory | 64 KB |

## I/O Address Map (LPx/LPx+)

| 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 |

## CPU I/O Address Map (LPx 560/566)

| Range (hexadecimal) | Function |
|---|---|
| 0000 to 0CF7 | PCI I/O space |
| 0CF8 | Configuration space enable register |
| 0CF9 | Turbo and reset control register |
| 0CFA to BFFF | PCI I/O space |
| C000 to CFFF | PCI configuration space |
| D000 to FFFF | PCI I/O space |

## I/O Address Map (LPx 560/566)

| Range (hexadecimal) | Function |
|---|---|
| 060 to 064 | Keyboard/mouse controller |
| 0F0 to 0FF | Math co-processsor |
| 1F0 to 1F7 | IDE controller (if enabled) |
| 278 to 27F | LPT2 (if enabled) |
| 2F8 to 2FF | COM2 (if enabled) |
| 378 to 37F | LPT1 (if enabled) |
| 3BC to 3BE | LPT3 (if enabled) |
| 3F0 to 3F7 | Diskette controller (if enabled) |
| 3F8 to 3FF | COM1 (if enabled) |

## PCI Configure Space Address Map (LPx 560/566)

| Range (hexadecimal) | Function |
|---|---|
| C0xx | CPU bridge |
| C1xx | Onboard PCI SCSI (if applicable) |
| C2xx | ISA bridge |
| C6xx | PCI slot 1 |
| C7xx | PCI slot 2 |
| C8xx | PCI slot 3 |

## Computer Interrupt Levels (LPx/LPx+)

| 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 |

## Computer Interrupt Levels (LPx 560/566)

| Interrupt Number | Interrupt Source |
|---|---|
| IRQ1 | Keyboard controller |
| IRQ3 | COM2 (if enabled) |
| IRQ4 | COM1 (if enabled) |
| IRQ6 | Diskette drive (if enabled) |
| IRQ7 | LPT1, LPT2, LPT3 (if enabled) |
| IRQ12 | Mouse interrupt |
| IRQ13 | Math co-processor |
| IRQ14 | Hard disk drive (if enabled) |

## DMA Channel Assignment (all models)

| Channel | Controller | Function |
|---|---|---|
| 0 | 1 | Refresh |
| 1 | 1 | Not used |
| 2 | 1 | Diskette controller |
| 3 | 1 | Not used, (ECP, standard on LPx+) |
| 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:
◊     MS-DOS version 5.0 and later
◊     OS/2 version 2.0 and later
◊     SCO Open Desktop Release 3
◊     Windows NT (DECpc LPx+ with 12 MB client/ 16 MB server memory minimum recommended)
◊     SCO UNIX System V release 2.0 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 LPx/LPx+ series computer.

# Appendix B      Useful Information

## Related Documentation

| Description | Order's |
|---|---|
| **DECpc LPx/LPx+ Quick Reference Guide** | EK-A0883-RG |
| **SMM Spares Catalogue** | EK-A0815-RG |
|  |  |
| **DECpc LPx/LPx+ Installation Card (English)** | ER-800WW-IA |
| **DECpc LPx/LPx+ Installation Card (French)** | ER-800WW-IP |
| **DECpc LPx/LPx+ Installation Card (Italian)** | ER-800WW-II |
| **DECpc LPx/LPx+ Installation Card (German)** | ER-800WW-IG |
| **DECpc LPx/LPx+ Installation Card (Spanish)** | ER-800WW-IS |
| **DECpc LPx/LPx+ Installation Card (Dutch)** | ER-800WW-IH |
|  |  |
| **DECpc LPx/LPx+ User's Guide (English)** | ER-800WW-UA |
| **DECpc LPx/LPx+ User's Guide (French)** | ER-800WW-UP |
| **DECpc LPx/LPx+ User's Guide (Italian)** | ER-800WW-UI |
| **DECpc LPx/LPx+ User's Guide (German)** | ER-800WW-UG |
| **DECpc LPx/LPx+ User's Guide (Spanish)** | ER-800WW-US |
| **DECpc LPx/LPx+ User's Guide (Dutch)** | ER-800WW-UH |
|  |  |
| **805 VGA Users Guide (English)** | ER-76HEA-UA |
| **805 VGA Users Guide (Multilingual)** | ER-76HEA-UM |
|  |  |
| **864 VGA Users Guide (English)** | ER-XAGAL-UA |
| **864 VGA Users Guide (Multilingual)** | ER-XAGAL-UM |
|  |  |
| **928 VGA Users Guide (English)** | ER-76HEB-UA |
| **928 VGA Users Guide (Multilingual)** | ER-76HEB-UM |

# 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].***

# Document Feedback

If you have comments on the contents or layout of this document we highly appreciate your feedback.
We will do our best to make this document a valuable support to your service efforts for Digital.
Please fill -out the reader feedback form and send or fax it to:

**Digital Equipment Parts Center b.v.**
**Att: MCS Logistics Engineering Call Desk**
**P.O. Box 6774**
**6503 GG  Nijmegen**
**Holland**

If you have questions about this document please do not hesitate to get in contact with our Call Desk. The
number is:

**Phone: xx31-24-3529666**

**Fax: xx31-24-3563106**

# READERS COMMENTS

## DECpc LPx/LPx+ Service Maintenance Manual
## K-MN-SD00000-19-JG00.A

**This form is for documents only. Commitments submitted on this form are used at Digital's direction.**
**Did you find errors in this manual? If so, specify by page.**

.............................................................................................................................................................

.............................................................................................................................................................

.............................................................................................................................................................

**What is your general reaction to this manual (format, completeness, organisation etc.)?**

.............................................................................................................................................................

.............................................................................................................................................................

.............................................................................................................................................................

**Is the documentation understandable, usable, and sufficient for your needs? What material is missing?**

.............................................................................................................................................................

.............................................................................................................................................................

.............................................................................................................................................................

**Additional comments:**

.............................................................................................................................................................

.............................................................................................................................................................

.............................................................................................................................................................

.............................................................................................................................................................

**Name**      .............................................................................................................................................

**Title**      .............................................................................................................................................

**Company** ...................................................     **Dept** ...................................................

**Address**   .............................................................................................................................................

**City**      ...................................................     **State** ...................................................

**Country**   .............................................................................................................................................